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Engineer's Report

Drainage District No. 4

Lateral 11

Tile Improvement

Kossuth County, Iowa

Filed: April 29, 2025

Submitted by:

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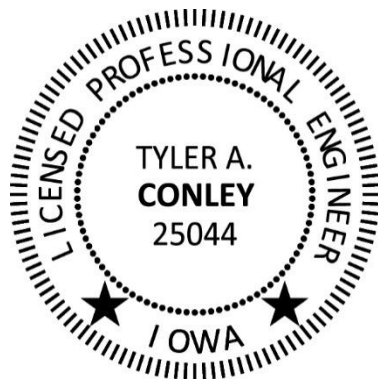
Proj. No. 0P1.129036

Certification

Engineer's Report
for
Drainage District No. 4
Lateral 11
Tile Improvement

Kossuth County, Iowa

April 29, 2025



I hereby certify that this plan, specification or report was prepared by me or under my direct supervision, and that I am a duly Licensed Professional Engineer under the laws of the State of Iowa. My renewal date is December 31, 2025.

By: _____


Tyler A. Conley, P.E.
License No. 25044

Date: 4/29/2025

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I. INTRODUCTION

A. SCOPE OF WORK

The purpose of this report is to provide information related to drainage improvements requested by landowners of Drainage District No. 4 Lateral 11 (DD4L11) Kossuth County, Iowa, following the hearing on a report evaluating a portion of Lateral 11 set to be repaired with assistance from the Union Slough. That previous report dated December 17, 2024 is attached to this report as Appendix A. The Board of Supervisors, acting as Trustees, appointed Tyler A. Conley, P.E., Bolton & Menk, Inc. to complete the necessary preliminary survey, study, and engineering report.

This report examines the conditions that would be necessary to improve the drainage capacities of the district facilities to the modern drainage capacity recommendation. A copy of the drainage petition is attached with this report in Appendix B.

B. LOCATION & DISTRICT FACILITIES

The watershed of DD4L11, that is served by both Lateral 11 of DD4 and the tile facilities of S9DD4, lie within Kossuth County, located generally north of Bancroft, in Section 6 & 7 of Ramsey Township (T-98-N, R-28-W), Sections 31 of Ledyard Township (T-99-N, R-28-W), Sections 1, 2, & 12 of Greenwood Township (T-98-N, R-29-W) and Sections 22, 23, 25, 26, 27, 35 & 36 of Harrison Township (T-99-N, R-29-W).

DD4 Lateral 11 Tile, S9DD4 Main Tile, and S9DD4 Lateral 1 Tile all outlet into Lateral 11 Main Open Ditch of DD4, which is an open ditch lateral of the DD4 Main Open Ditch. DD4 Main Open Ditch flows to the East Fork of the Des Moines River which flows to the Des Moines River and eventually the Mississippi River.

A map of the facility locations and lateral tile watershed is included in the preliminary plans, found in Appendix E. Additionally, a copy of the original map of DD4, the original map of S9DD4, and the profiles of the district facilities of S9DD4 are included in the attached engineer's report in Appendix A.

II. INVESTIGATION

A. SURVEY & INVESTIGATION

A field review was conducted on the outlet of the existing tile facility, downstream open ditch facility, and the upstream junction box to incorporate into this report. It was found that the existing 48" tile that serves as the combined outlet for the parallel tiles has collapsed immediately upstream of the corrugated metal pipe outlet into the open ditch. Additionally, topographic elevations were obtained in order to verify the geometric viability of a proposed improvement. These elevations were utilized with the existing district profiles to calculate the existing design capacities of the combined tile network.

B. CAPACITY ANALYSIS

The standard design method for sub-surface tile drains utilizes drainage coefficients. The drainage coefficient is the rate at which water can be removed and is expressed as the equivalent depth of water covering the design area that can be removed in 24 hours.

Based on the existing profiles of Lateral 11 and the Sub Drainage District No. 9 Main Tile, the capacity of the Facilities could be calculated. By today's standards, the combined system would be considered undersized. Looking at the combined drainage capacity, the majority of

the tile is at or below 0.15" per day, or 30% of the modern drainage coefficient standard. The standard drainage coefficient at the time of construction would have been between $\frac{1}{8}$ " and $\frac{1}{4}$ " per day, however today's drainage standard is $\frac{1}{2}$ " per day with good surface drainage, and up to 1" per day for depressional areas. Additionally, because the theoretical drainage coefficient is calculated using the size, grade, and drainage area, the actual capacity of the tile systems could be considerably less due to factors such as material age, tile damage, tile blockages, sedimentation and joint displacement. Appendix C displays the ideal calculated design capacity of Lateral 11 and the Main Tile as well as the design needs for a $\frac{1}{2}$ " drainage coefficient improvement project.

Because of the existing tile capacities and landowner interest for an improvement of the system, we included pipe sizing for the $\frac{1}{2}$ " drainage coefficients. Based on the larger tile sizes needed for the $\frac{1}{2}$ " drainage coefficient, if a larger drainage coefficient is desired an open channel facility improvement may be worth considering. It is recommended the landowners consider these options and take action to gain a minimum of a $\frac{1}{2}$ " per day drainage coefficient for the tile systems.

III. PROPOSED REPAIR

A. PROPOSED IMPROVEMENT OPTIONS

The Lateral 11 and Main Tile systems are undersized by the design standards of today and consideration should be made for an improvement to increase capacity. The existing tile should be replaced with the appropriately sized pipe at the correct grade to provide at minimum a $\frac{1}{2}$ " drainage coefficient, while also being installed at a depth to provide approximately 3 feet of ground cover. Alternatively, an extension of the existing Lateral 11 Open Ditch has been suggested. Either of these options would be valid considerations for improvement. However, both options have additional improvement criteria that need to be considered to make the best improvement decision for the district.

First, with any improvement, under Iowa Code Chapter 468.126, any upstream farmed wetlands in the District could be assumed converted and mitigation of these converted acres would be required, at a minimum acre for acre basis to meet Farm Program Compliance. Additional information on Farm Program Compliance can be found in Section VI of this report.

Second, district improvement projects can be halted by a process known as "remonstrance". For remonstrance to be met, objections must be made to the auditor by "a majority of the landowners in the district, and these remonstrants must in the aggregate own seventy percent or more of the lands to be assessed for benefits or taxed for said improvement" – Iowa Code Chapter 468.28.

Third, if the improvement options are approved, reclassification is required as stated in *Chapter 468.131 of the Iowa Code: "When an assessment for improvements...exceeds twenty-five percent of the original assessment and the original or subsequent assessment or report of the benefit commission as confirmed did not designate separately the amount each tract should pay for the main ditch and tile lateral drains then the boards shall order a reclassification."*

Pertinent to the option of extending the open ditch, two additional considerations would need to be recognized. First, right-of-way for any new ditch facility construction would need to be acquired by the Drainage District. The process of obtaining right-of-way includes a separate report, appraisers, and public hearing. An estimate of right-of-way costs based on recent land values has been included in Appendix D with the remainder of the cost estimate

for this improvement option. In the same consideration as right-of-way, severance damages would need to be considered for the loss of land value due to splitting property with an open channel. Second, a joint application would need to be submitted to the Iowa Department of Natural Resources (IDNR) and the United States Army Corps of Engineers for their determination of jurisdiction and mitigation requirements. For these reasons along with the potential unpopularity of an open channel by those landowners bisected by the open channel it is not a recommendation that should be made without serious consideration for input from district landowners.

Lastly, it is also worth considering that for either improvement the cost associated with any construction work crossing any Secondary County Roads will be the responsibility of the Kossuth County Secondary Roads Department. Appendix D contains a cost estimate for this improvement option.

B. WORK LIMITS & DAMAGES

Landowners are entitled to full reimbursement for damages resulting from the work on their lands, outside of the District right-of-way. These damages will be established at a project completion hearing after the work is complete. The contractor will be assigned temporary work limits along each side of the tile lines to allow for construction activities. The work limits for the work would be set at approximately 40 to 65 feet on either side of the proposed centerline.

It is anticipated that the work will commence in the Winter of 2025 and continue into the Summer of 2026. Crops that are damaged during construction would be paid for by the District, based on crop appraisals. The construction zone would be minimized, and the work scheduled to minimize the loss of crops.

IV. OPINIONS OF PROBABLE COST

The cost estimates for the repair option are contained in Appendix D. These estimates represent our best judgment of the probable cost, based upon our experience with similar projects and include the proposed contributions of the USFWS grant. The quantities and unit costs for construction are believed to be reasonably accurate for use in this report and hearing. Actual costs are subject to the market for the respective components, and to other economic forces. These estimates carry no actual or implied guarantees.

V. DISTRICT RIGHT-OF-WAY

As stated in the Improvement Options section, if the Open Ditch Improvement is selected, a consistent right-of-way will need to be acquired for the new drainage facility. In order to facilitate maintenance now and into the future, a right-of-way width that is approximately 20 feet outside of the top of bank is typically required to accommodate today's construction equipment. These proposed rights-of-way would need to be acquired following Iowa Code Section 468.24 which states: *"If the board shall find that such improvement will materially benefit said lands, will be conducive to the public health, convenience, welfare, benefit, or utility, and that the law has been complied with as to form and substance of the petition, the service of notice, and the survey and report of the engineer, and that said improvement should be made, then if any claims for damages shall have been filed, further proceedings shall be continued to an adjourned, regular, or special session, the date of which shall be fixed at the time of adjournment, and of which all interested parties shall take notice, and the auditor shall appoint three appraisers to assess damages, one of whom shall be an engineer, and two*

freeholders of the county who shall not be interested in nor related to any person interested in the proposed improvement, and the said appraisers shall take and subscribe an oath to examine the said premises, ascertain and impartially assess all damages according to their best judgment, skill, and ability.” and Code Section 468.25 which states: “The appraisers appointed to assess damages shall view the premises and determine and fix the amount of damages to which each claimant is entitled, and shall place a separate valuation upon the acreage of each owner taken for right-of-way for open ditches or for settling basins, as shown by plat of engineer, and shall, at least five days before the date fixed by the board to hear and determine the same, file with the county auditor reports in writing, showing the amount of damage sustained by each claimant. Should the report not be filed in time, or should any good cause for delay exist, the board may postpone the time of final action on the subject, and, if necessary, the auditor may appoint other appraisers.”.

Open ditch rights-of-way are essential to maintaining district quality and efficiency. These right-of-way purchases include the right of ingress and egress across adjoining land and the right of access for maintenance, repair, improvement and inspection.

Drainage district open ditch rights-of-way are exempt from real estate taxes and drainage assessments. Therefore, deductions should be made to the net acres of those affected parcels and the property records for those affected parcels should be adjusted accordingly. Under Iowa law, landowners have the right to the beneficial use of the spoil bank in the right-of-way subject only to the district’s use of the right-of-way to protect and maintain the open ditch.

VI. FARM PROGRAM COMPLIANCE

A. FARM PROGRAM WETLAND CONSERVATION RULES

The farm program wetland conservation rules are administered by the USDA Farm Service Agency. The USDA Natural Resources Conservation Service (NRCS) provides technical assistance. This technical assistance includes policing for program violations and making certified wetland determinations. At the time of the filing of this report, we made requests to landowners receiving benefits from the proposed improvements to secure certified wetland determinations from the USDA/NRCS, and to provide them to the District. Some landowners have already shared their wetland determination with us. Only landowners or their authorized agents may request the determinations from the USDA. Most landowners will have valid wetland determinations in their USDA files. If the improvement goes forward, wetland determinations will be needed for all the agricultural or potentially agricultural land in the District.

The USDA has in recent years adopted a few revised interpretations of the farm program wetland conservation rules which are applicable here.

- For any improvements constructed by a drainage district, the NRCS will make a rebuttable assumption that every farmed wetland in the drainage district will be converted. This assumption can be appealed by the impacted landowners, but not by the drainage district.
- Mitigation of converted farmed wetland must compensate for all lost wetland functions and must also be made at a minimum acre for acre basis.
- A plan for the mitigation of all converted farmed wetland in the drainage district must be approved by the NRCS prior to the beginning of the construction of the improvements. After all opportunities for appeals are exhausted, the farmed wetland not covered by that mitigation plan would be found converted and the landowner and tenant would be in

technical violation of the farm program. Penalties can be avoided when a drainage district causes the conversion, but only at the price of abandoning farming of the converted farmed wetlands or ceasing to participate in the farm program.

- The planned mitigation must be in place and functioning no later than the completion of the project which converts the farmed wetlands.

If a landowner does not provide a certified wetland determination and he/she happens to end up with a converted farmed wetland which he/she continues to crop, he/she will find himself in technical violation of the farm program rules and be subject to a USDA claim for the forfeiture and possibly refund of farm program payments when the work commences.

The Boards of Supervisors in Iowa may approve and authorize construction of the proposed improvements without accruing risk to the drainage district from farm program wetland conservation rules violations. Obviously, the Board will want to know the wetlands status of all landowners and to help to keep them all in farm program compliance, but the Board cannot allow the failure of an individual landowner to share wetland information to influence the very important decisions they are charged to make for all of the benefitted landowners. By the rules, the program penalties will fall solely to the owners of the converted farmed wetlands for which cropping continues and compensatory mitigation is not secured. It is then fully up to each landowner to cooperate with his/her drainage district toward keeping himself/herself in farm program compliance.

B. CONVERTED WETLAND MITIGATION ALTERNATIVES

Since 1987, the USDA has assumed jurisdiction over the conversion (or improved drainage of) what has become commonly termed “farmed wetland”. It being the rebuttable assumption of the current USDA policies that all farmed wetlands will be converted and that acre-for-acre mitigation will be necessary to put the converted farmed wetlands back into production, the decision process is actually made a little easier—although mitigation is made costlier.

Mitigation options include the purchase of wetland credits in a mitigation bank. Mitigation banks are not common, and their credits are not cheap. New sites for mitigation are currently available from the Iowa Agriculture Mitigation Bank, Inc. (IAMBI). The current price for mitigation at the IAMBI is approximately \$15,000 per acre.

Another alternative is for the District to self-mitigate, wherein a mitigation plan to use a suitable site, inside or outside the District, on which to create wetlands for mitigation of impacted wetlands is developed for review and approval by the NRCS.

A third alternative is to have the District pay the owner of a converted farmed wetland a portion of the cost for mitigation. The landowner may then either purchase mitigation on his own or let the land lay idle until mitigation is acquired.

Farm program rules clearly provide that when a farmed wetland is converted by a drainage district, the conversion act is attributed to the owner of the farmed wetland. However, the farm program rules also clearly provide that the owner of the converted farmed wetland may remain eligible for farm program benefits by opting to not farm the converted farmed wetland. If for some reason mitigation is delayed, this can be a temporary solution for the farmed wetland owners in a drainage district. It is also an option for those who choose not to provide certified farmed wetland determinations and end up with a converted farmed wetland.

C. WETLAND MITIGATION POLICY

How drainage districts address mitigation is relatively new and a statewide standard practice has not yet evolved. This includes how the costs of the mitigation are paid. In several counties, the mitigation costs have been shared between the district and the owners of the converted farmed wetlands, when wetland mitigation credits were available. In some counties, mitigation has been left entirely to the owners of the converted farmed wetlands. Each drainage district's circumstances are different, and the Boards of Supervisors in other counties have exercised flexibility in addressing mitigation on a case by case and district by district basis.

In some other counties, the Board of Supervisors have adopted resolutions that spell out how farmed wetlands will be dealt with for drainage districts under their supervision when drainage improvements are considered.

The resolution provides that if an improvement project is authorized, the drainage district will exercise the third mitigation alternative described above. The owners of all farmed wetlands known at the time of the hearing, and which the USDA eventually determines will be converted by the drainage district project, will be credited or paid up to \$7,500 per acre of converted farmed wetland. This is intended to offset a part of the cost of mitigation.

In order to retain farm program eligibility, the converted farmed wetland owner may need to forego cropping of the converted farmed wetland until mitigation becomes available. In the future the landowner could purchase mitigation and resume farming of the converted farmed wetland or opt to leave the converted wetland site permanently idle.

VII. WATER QUALITY

The hydrologic impacts to tile drainage entails a complex interaction of processes dependent upon landscape, climatic and human influences, watershed scale, soil permeability and rainfall event size. There is a popular and often accepted idea, that an increase in subsurface drainage facilities adds to an increase in both peak and total rainfall values, thereby increasing flooding. Recently published research, from the University of Iowa's IIHR – Hydroscience and Engineering Center, refutes that perception. This University of Iowa report was the result of a water model study of the Clear Creek Watershed in Iowa and Johnson Counties, and found that an increase in field tile and subsurface drainage decreases peak flows, for most storm events. The field scale DRAINMOD model was used in the research, in conjunction with a simplified routing equation, to analyze the impact of tile drains in the Clear Creek Watershed.

However, additional steps are required to slow, impound, or infiltrate water in order to receive benefits in water quality. Water quality is a growing topic throughout the nation and more recently throughout Iowa. The particle loads and nutrient levels within drainage water is a concern that is receiving increased scrutiny. Processes and reduction practices are being developed and incorporated on farms and into projects throughout Iowa, which reduce nitrogen loss and improve water quality. Enhancement of water quality is possible through many different drainage applications that can see both immediate and long-term benefits.

We encourage the landowners of this District to consider multi-purpose drainage management, which incorporates Best Management Practices (BMPs), which utilize effective measures aimed at reducing sediment and nutrient loading and improving water quality. These BMPs are divided into three (3) areas: preventative measures, control measures, and treatment measures.

Preventative measures that can be applied throughout the watershed include crop rotation, cover crops, residue management, and nutrient management. These measures are aimed at controlling sediment, minimizing erosion and nutrient loss, and sustaining the soil's health, all without dramatically changing the current land use of the landscape.

Control measures are practices aimed at improving water quality directly associated with the flow of water by reducing peak flows, providing in stream storage, sedimentation, and nutrient uptake. Examples of control measures include alternative tile intakes, grassed waterways, two (2) stage ditches, water control structures, and controlled subsurface drainage. These practices are directly linked to the conveyance of subsurface tile water or open channel ditch flow.

The function of **treatment measures** is to improve water quality, by directly removing sediment and nutrients from the subsurface or surface water flow throughout a watershed. Examples of treatment measures include surge basins (storage ponds), filter/buffer strips, wetland restorations, woodchip bioreactors, and water and sediment control basins (WASCOBs).

These practices may be incorporated into either the public or private drainage systems.

Funding options are available to landowners through the Environmental Quality Incentives Program (EQIP) and the Iowa Water Quality Initiative. EQIP is a voluntary program that provides financial assistance to individual landowners for various conservative practices as identified above. Also, the State of Iowa, through the Iowa Water Quality Initiative, provides cost share funds to participating landowners to voluntarily install nutrient reduction practices.

A unique opportunity may exist when a wetland is created within the district for the treatment of the tile and/or surface waters of the watershed. A properly sized and created wetland may be able to be utilized as a mitigation site for any farmed wetlands that are found within the drainage district. With the possibility of a large share of the created wetland being funded by the Iowa Water Quality Initiative program, any potential farmed wetlands could be mitigated at a much reduced cost.

If there is landowner interest in any of these water quality features and funding options, further study and review would be required to select, site, and fund the water quality measures appropriate for the area.

VIII. RECLASSIFICATION

As stated earlier, if the improvement option is approved, reclassification is required as stated in Section 468.131 of the Iowa Code: *"When an assessment for improvements...exceeds twenty-five percent of the original assessment and the original or subsequent assessment or report of the benefit commission as confirmed did not designate separately the amount each tract should pay for the main ditch and tile lateral drains then the boards shall order a reclassification."*

IX. SUMMARY & DISCUSSION

Recommendations

DD4 Lateral 11 & S9DD4 Main Improvement Recommendation

This report has confirmed the need for drainage relief for Drainage District No. 4 and Sub Drainage District No. 9 of Drainage District No. 4. Lateral 11 and the Main Tiles of DD4 and S9DD4 respectively are aging, damaged, and undersized based on modern drainage recommendations. We recommend proceeding with the proposed ½" drainage coefficient improvement option. The proposed improvement is considered to be of public benefit and is conducive to public health, convenience or welfare.

Reclassification Recommended

In the event that the improvement is pursued, Chapter 468.131 of the Iowa Code states "When an assessment for improvements...exceeds twenty-five percent of the original assessment and the original or subsequent assessment or report of the benefit commission as confirmed did not designate separately the amount each tract should pay for the main ditch and tile lateral drains then the boards shall order a reclassification."

Installment Payments

Iowa drainage law allows for drainage district costs for large projects to be spread over between ten to twenty years at the discretion of the Board of Supervisors. Typically, the Board would spread assessments of the magnitude contemplated in this report over twenty years. Be reminded that final individual assessments are based upon benefits and that some parcels will likely bear two to three times the average per acre costs.

Recommended Steps

It is recommended that the Board of Supervisors, acting as Trustees, for Drainage District No. 4 & Sub Drainage District No. 9 take appropriate action, with legal guidance, to accomplish the following:

1. Tentatively approve this engineer's report and schedule a public hearing to receive and consider the input of the District landowners.
2. Adopt the improvement alternate recommended for construction, modified as deemed appropriate, to satisfy the desires of the Districts.
3. Direct the engineer to prepare final plans and specifications for the adopted plan and proceed toward a bid letting.
4. Initiate reclassification of benefits for this subdistrict. A separate commissioners' report on reclassification and public hearing on commissioners' report would be required.

Respectfully submitted,
Bolton & Menk, Inc.

Tyler A. Conley, P.E.
Project Manager

Appendix A: Tile Replacement Repair Report



**BOLTON
& MENK**

Real People. Real Solutions.

Engineer's Report

**Drainage District No. 4 & Sub Drainage District No. 9
Lateral 11 & Sub 9 Main
Tile Replacement Repair
Kossuth County, Iowa**

Filed: December 17, 2024

Submitted by:

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Proj. No. 0P1.129036

Certification

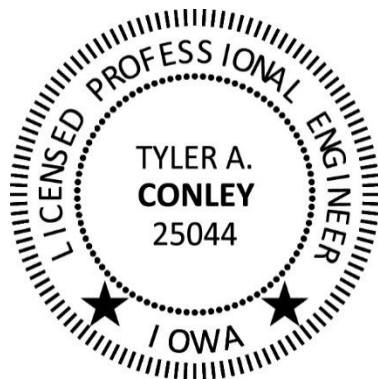
Engineer's Report

for

Drainage District No. 4 & Sub Drainage District No. 9
Lateral 11 & Sub 9 Main
Tile Replacement Repair

Kossuth County, Iowa

December 17, 2024



I hereby certify that this plan, specification or report was prepared by me or under my direct supervision, and that I am a duly Licensed Professional Engineer under the laws of the State of Iowa. My renewal date is December 31, 2025.

By:

Tyler A. Conley, P.E.
License No. 25044

Date: 12/17/2024

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- Appendix A: Televising Report
- Appendix B: Tile Capacities
- Appendix C: Opinions of Probable Cost
- Appendix D: District Plat
- Appendix E: Original District Map and Profiles
- Appendix F: Preliminary Plans

I. INTRODUCTION

A. SCOPE OF WORK

The purpose of this report is to provide information related to drainage relief requested by landowners of Drainage District No. 4 (DD4) & Sub Drainage District No. 9 of Drainage District No. 4 (S9DD4), Kossuth County, Iowa. The Board of Supervisors, acting as Trustees, appointed Tyler A. Conley, P.E., Bolton & Menk, Inc. to complete the necessary preliminary survey, study, and engineering report.

This report addresses landowner requests for facility repairs associated with Lateral Tile 11 of DD4 & the Main Tile of S9DD4. More specifically, this report examines portions of the Lateral 11 and Main Tile that are proposed for replacement that traverse U.S. Fish & Wildlife Service (USFWS) ground in Section 36 of Harrison Township. This report examines the recommendations that have been submitted for replacement that would repair the drainage capacities of the district facilities in that location to the capacity of the most recent drainage configuration. A copy of the current proposed replacement plans is attached as Appendix F.

B. LOCATION & DISTRICT FACILITIES

The watershed of S9DD4, that is served by both Lateral 11 of DD4 and the tile facilities of S9DD4, lie within Kossuth County, located generally north of Bancroft in Section 6 & 7 of Ramsey Township (T-98-N, R-28-W), Sections 31 of Ledyard Township (T-99-N, R-28-W), Sections 1, 2, & 12 of Greenwood Township (T-98-N, R-29-W) and Sections 22, 23, 25, 26, 27, 35 & 36 of Harrison Township (T-99-N, R-29-W).

DD4 Lateral 11 Tile, S9DD4 Main Tile, and S9DD4 Lateral 1 Tile all outlet into Lateral 11 Main Open Ditch of DD4, which is an open ditch lateral of the DD4 Main Open Ditch. DD4 Main Open Ditch flows to the East Fork of the Des Moines River which flows to the Des Moines River and eventually the Mississippi River.

A map of the facility locations and lateral tile watershed is included in Appendix D. Additionally, a copy of the original map of DD4, the original map of S9DD4, and the profiles of the district facilities of S9DD4 are attached to this report as Appendix E.

C. HISTORY SUMMARY

As stated previously, the scope of this report focused on a specific portion of the DD4 Lateral 11 and S9DD4 Main Tile that is damaged through Section 36 Harrison Township on land owned by the USFWS. Bolton & Menk was provided with information regarding a proposed replacement plan, developed by Ducks Unlimited, and information outlining the existing conditions of the district facility proposed to be replaced. Additional investigations to confirm the accuracy of the information provided were conducted. This information was gathered in order to better understand the drainage district's history and what would be required to conserve the existing drainage district capacity. This system is unique in that it appears that Lateral 11 of DD4 existed prior to the establishment of S9DD4. The Main Facility of S9DD4 parallels the Lateral 11 Tile with notes on the District profiles that indicate certain portions of the Main Tile were not constructed or supplemented with different tile sizes.

II. INVESTIGATION

A. SURVEY & INVESTIGATION

A field review was conducted, and the findings were incorporated into the Ducks Unlimited plans. From this field review it was confirmed that a relief lateral tile had been installed that upsized and shortened the original district alignment while still incorporating the original facility capacity. The original Lateral 11 Tile was an 18" tile that transitioned to a 16". The Main Tile of S9DD4 is a 24" tile. From these tile sizes and alignments, an original design facility capacity and an in-situ facility capacity could be calculated so that a proposed single replacement line size could be confirmed. Additionally, included in this report in Appendix A is the televising report from Empire Pipe Services. This televising report outlines the locations and tile lines that were blocked or obstructed by roots, debris, or sedimentation as well as segments of the tile that had collapsed. Ultimately, this televising report is the basis for the repair recommendation.

B. CAPACITY ANALYSIS

The original design segments of DD4 Lateral 11 are 24", 18", and 16" in size while the original design segments of the S9DD4 Main are 24" and 18" in size. The original design grade of these segments is 0.03%. The combined drainage capacity considering a roughness coefficient of 0.013, is **5.75** cubic feet per second. The in-situ conditions of the system, at the downstream portion of the project area, Lateral 11 is an 18" at 0.05% grade and the Main is a 24" at 0.06% grade. The combined drainage capacity, considering a roughness coefficient of 0.013, is **7.91** cubic feet per second. It is important to remember that these calculations are a theoretical maximum drainage capacity that is calculated using the size, grade, and material roughness coefficients. The actual capacity of the tile systems could be and is likely considerably less due to factors such as material age, tile damage, tile blockages, sedimentation and joint displacement. Regardless of this additional potential reduced capacity, the minimum replacement capacity should be designed to accommodate **7.91** cubic feet per second.

The proposed replacement tile line that recommends combining Lateral 11 and the Main Tile into one tile is sized at 36" at a grade of 0.06%. The calculated capacity of the proposed 36" line is **16.38** cubic feet per second when conserving the roughness coefficient from the existing system. Therefore, the proposed replacement line would have sufficient capacity to compensate for the capacity currently being conveyed by two tile facilities.

It should also be noted that, even though the capacity of this segment of district facility is increasing, the downstream receiving facilities only have a design capacity of **7.86** cubic feet per second. Because of this reduction, the proposed replacement line would not be able to perform at the theoretical maximum, until such time that the downstream segments are increased and improved.

The calculations of capacity are attached to this report in Appendix B.

III. PROPOSED REPAIR

A. PROPOSED COMBINATION REPLACEMENT AND COST SHARE

DD4 Lateral 11 and S9DD4 Main are both damaged and in need of repair. It is recommended that Drainage District No. 4 and Sub Drainage District No. 9 of Drainage District No. 4 work together, with the USFWS, to implement the recommended replacement plan presented by Ducks Unlimited, with some considerations regarding what portions should be considered district expenses.

In working with the USFWS, a grant was awarded that would cover the material costs as well as contractor mobilization for the proposed project. The project bidding and installation would then be the responsibility of the Drainage District.

Iowa Code Chapter 468.126 states: "... the board shall keep the improvement in repair" and "may order done whatever is necessary to restore or maintain a drainage or levee improvement in its original efficiency or capacity". Under the code, a repair is defined as maintenance or replacement of existing district tile without increasing the original planned capacity. Additionally, under the code, a repair option also allows for the tile to be replaced with the next commercially available tile size and the tile can be lowered as long as no additional changes to capacity are made.

Appendix C contains a cost estimate for this proposed repair option, with consideration of the grant included. This cost estimate was provided by the USFWS.

B. WORK LIMITS & DAMAGES

Landowners are entitled to full reimbursement for damages resulting from the work on their lands, outside of the District right-of-way. These damages will be established at a project completion hearing after the work is complete. The contractor will be assigned temporary work limits along each side of the tile lines to allow for construction activities. The work limits for the tile would be set at approximately 40 to 65 feet on either side of the tile centerline.

It is anticipated that the work will commence in the Spring of 2025. Considering that this land is unfarmed wetland, seeding of these damaged areas is recommended to be completed by the USFWS, with reimbursement being made at the project completion hearing. Seed mixes for these lands are often specific for the type of conservation practice which is utilized or desired.

IV. OPINIONS OF PROBABLE COST

The cost estimates for the repair option are contained in Appendix C. These estimates represent our best judgment of the probable cost, based upon our experience with similar projects and include the proposed contributions of the USFWS grant. The quantities and unit costs for construction are believed to be reasonably accurate for use in this report and hearing. Actual costs are subject to the market for the respective components, and to other economic forces. These estimates carry no actual or implied guarantees.

V. SUMMARY & DISCUSSION

Recommendations

DD4 Lateral 11 & S9DD4 Main Replacement Recommended

This report has confirmed the need for drainage relief for Drainage District No. 4 and Sub Drainage District No. 9 of Drainage District No. 4. Lateral 11 and the Main Tiles of DD4 and S9DD4 respectively are aging and damaged. The work described herein can accomplish that relief. We recommend proceeding with the proposed replacement option, as outlined on the proposed plans. The proposed repair is considered to be of public benefit and is conducive to public health, convenience or welfare.

Installment Payments

Iowa drainage law allows for drainage district costs for large projects to be spread over between ten to twenty years at the discretion of the Board of Supervisors. Typically, the Board would spread assessments of the magnitude contemplated in this report over ten years. Be reminded that final individual assessments are based upon benefits and that some parcels will likely bear two to three times the average per acre costs.

Recommended Steps

It is recommended that the Board of Supervisors, acting as Trustees, for Drainage District No. 4 & Sub Drainage District No. 9 take appropriate action, with legal guidance, to accomplish the following:

1. Tentatively approve this engineer's report and schedule a public hearing to receive and consider the input of the District landowners.
2. Adopt the repair alternate recommended for construction, modified as deemed appropriate, to satisfy the desires of the Districts.
3. Direct the engineer to prepare final plans and specifications for the adopted plan and proceed toward a bid letting.

Respectfully submitted,
Bolton & Menk, Inc.

Tyler A. Conley, P.E.
Project Manager

Appendix A: Televising Report



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Legend of Classification (Section)

Project

3377_ Blair_ Excavating_CD-4_ 2021_ 07_ 23

7/23/2021

1:

Excellent Condition

Minor Defects- Failure unlikely in the foreseeable future

2:

Good Condition

Defects that have not begun to deteriorate - Pipe unlikely to fail for at least 20 years.

3:

Fair Condition

Moderate defects that will continue to deteriorate - Pipe may fail in 10-20 years.

4:

Poor Condition

Severe Defects that will become Grade 5 defects within the foreseeable future- Pipe will probably fail in 5-10 years

5:

Immediate Attention

Defects require immediate attention- Pipe has failed or will likely fail within the next 5 years or sooner.



Section Profile

Project
3377 Blair Excavating CD-4 2021 07 23

7/23/2021

Nr.	Upstream MH	Downstream MH	Date	Street	Media Label	Material	Total Length	Length Surveyed
4	1428	1345	7/23/2021	Field		Clay Tile (not vitrified clay)	82.70	82.70
5	1528	1674	7/23/2021	Field		Clay Tile (not vitrified clay)	146.00	146.00
8	23.5	0000	7/23/2021	Field		Clay Tile (not vitrified clay)	23.50	23.50

3 x Circular 12 = 252.20 Total Length (252.20 Length Surveyed)

Nr.	Upstream MH	Downstream MH	Date	Street	Media Label	Material	Total Length	Length Surveyed
9	0000	110	7/23/2021	Field		Clay Tile (not vitrified clay)	110.00	110.00

1 x Circular 15 = 110.00 Total Length (110.00 Length Surveyed)

Nr.	Upstream MH	Downstream MH	Date	Street	Media Label	Material	Total Length	Length Surveyed
6	250	0000	7/23/2021	Field		Clay Tile (not vitrified clay)	250.00	250.00
7	0000	21	7/23/2021	Field		Clay Tile (not vitrified clay)	20.80	20.80

2 x Circular 16 = 270.80 Total Length (270.80 Length Surveyed)

Nr.	Upstream MH	Downstream MH	Date	Street	Media Label	Material	Total Length	Length Surveyed
1	580	0000	7/23/2021	Field		Clay Tile (not vitrified clay)	580.00	580.00
2	895	0580	7/23/2021	Field		Clay Tile (not vitrified clay)	315.30	315.30
3	1245	0995	7/23/2021	Field		Clay Tile (not vitrified clay)	250.10	250.10

3 x Circular 22 = 1145.40 Total Length (1145.40 Length Surveyed)

Total: 9 = 1778.40 Total Length (1778.40 Length Surveyed)



Inspection report

Date: 7/23/2021	Work Order: 3377	Weather: Dry	Surveyed By: Ryan B	Certificate Number: U-316-07003575	Pipe Segment Ref.: 580-0000
Year laid:	Pre-cleaning: No Pre-Cleaning	Direction: Upstream	Pipe Joint Length:	Total Length: 580.0 '	Length Surveyed: 580.0 '

City: CD-4	Drainage Area:	Upstream MH: 580
Street: Field	Media Label:	Up Rim to Invert: 0.0
Location Code:	Flow Control: Not Controlled	Downstream MH: 0000
Location Details: Field	Sheet Number:	Down Rim to Invert: 0.0
Pipe shape: Circular	Sewer Use: Stormwater	Total gallons used: 0.0
Pipe size: 22 "	Sewer Category: SEC	Joints passed: 0
Pipe material: Clay Tile (not vitrified clay)	Purpose: Maintenance Related	Joints failed: 0
Lining Method:	Owner: Kossyth Counthy	

Additional Info:

1:5066	Distance	Code	Observation	Counter	Photo	Grade		
	0.00	AMH	Manhole / 0000	00:00:09				
	0.00	MWL	Water Level, 20% of the vertical dimension	00:00:15				
	15.20	S01	CL	Crack Longitudinal at 12 o'clock, within 8 inch, Start	00:00:33			
	164.00	F01	CL	Crack Longitudinal at 12 o'clock, within 8 inch, Finish	00:03:35	S2		
	580.00	MSA	Survey Abandoned / stopped at 180 ft due to mud	00:20:40				
QSR	QMR	QOR	SPR	MPR	OPR	SPRI	MPRI	OPRI
2E00	0000	2E00	60.0	0.0	60.0	2.0	0.0	2.0



Inspection report

Date: 7/23/2021	Work Order: 3377	Weather: Dry	Surveyed By: Ryan B	Certificate Number: U-316-07003575	Pipe Segment Ref.: 895-0580
Year laid:	Pre-cleaning: No Pre-Cleaning	Direction: Upstream	Pipe Joint Length:	Total Length: 315.3 '	Length Surveyed: 315.3 '

City: CD-4	Drainage Area:	Upstream MH: 895
Street: Field	Media Label:	Up Rim to Invert: 0.0
Location Code:	Flow Control: Not Controlled	Downstream MH: 0580
Location Details: Field	Sheet Number:	Down Rim to Invert: 0.0
Pipe shape: Circular	Sewer Use: Stormwater	Total gallons used: 0.0
Pipe size: 22 "	Sewer Category: SEC	Joints passed: 0
Pipe material: Clay Tile (not vitrified clay)	Purpose: Maintenance Related	Joints failed: 0
Lining Method:	Owner: Kossyth Coutny	

Additional Info:

1:2754	Distance	Code	Observation	Counter	Photo	Grade		
	0.00	AMH	Manhole / 0580	00:00:16				
	0.00	MWL	Water Level, 10% of the vertical dimension	00:00:22				
	315.30	MSA	Survey Abandoned / can not get through sag and mud	00:12:37				
QSR	QMR	QOR	SPR	MPR	OPR	SPRI	MPRI	OPRI
0000	0000	0000	0.0	0.0	0.0	0.0	0.0	0.0

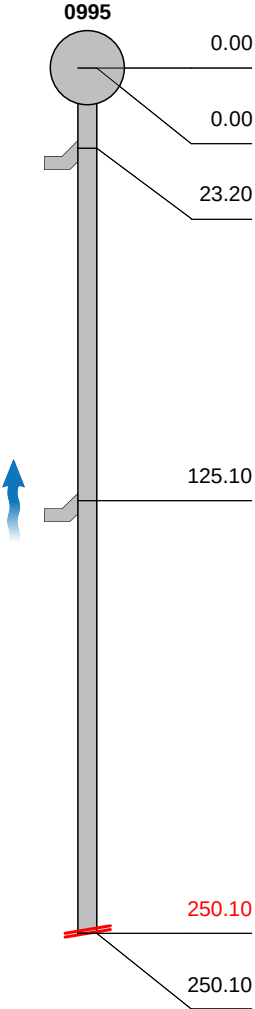


Inspection report

Date: 7/23/2021	Work Order: 3377	Weather: Dry	Surveyed By: Ryan B	Certificate Number: U-316-07003575	Pipe Segment Ref.: 1245-0995
Year laid:	Pre-cleaning: No Pre-Cleaning	Direction: Upstream	Pipe Joint Length:	Total Length: 250.1 '	Length Surveyed: 250.1 '

City: CD-4	Drainage Area:	Upstream MH: 1245
Street: Field	Media Label:	Up Rim to Invert: 0.0
Location Code:	Flow Control: Not Controlled	Downstream MH: 0995
Location Details: Field	Sheet Number:	Down Rim to Invert: 0.0
Pipe shape: Circular	Sewer Use: Stormwater	Total gallons used: 0.0
Pipe size: 22 "	Sewer Category: SEC	Joints passed: 0
Pipe material: Clay Tile (not vitrified clay)	Purpose: Maintenance Related	Joints failed: 0
Lining Method:	Owner: Kossyth Coutny	

Additional Info:

1:2185	Distance	Code	Observation	Counter	Photo	Grade		
	0.00	AMH	Manhole / 0995	00:00:14				
	0.00	MWL	Water Level, 15% of the vertical dimension	00:00:20				
	23.20	TB	Tap Break-In at 2 o'clock, 6inch dim, within 8 inch	00:01:05				
	125.10	TB	Tap Break-In at 2 o'clock, 6inch dim, within 8 inch	00:03:10				
	250.10	RBB	Roots Ball Barrell from 12 o'clock to 12 o'clock, 65% lost, within 8 inch	00:06:41		M5		
	250.10	MSA	Survey Abandoned / 1245 rppts	00:06:49				
QSR	QMR	QOR	SPR	MPR	OPR	SPRI	MPRI	OPRI
0000	5100	5100	0.0	5.0	5.0	0.0	5.0	5.0

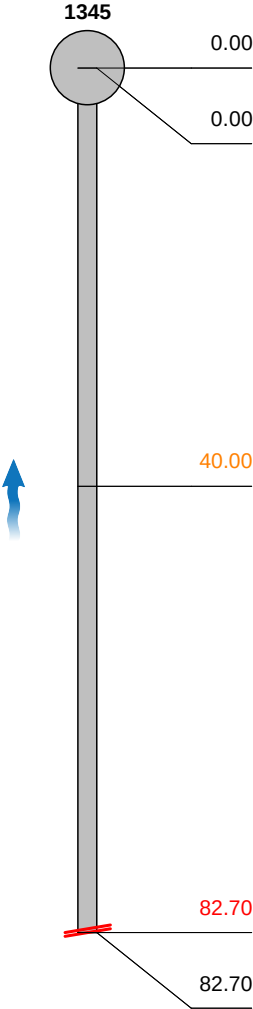


Inspection report

Date: 7/23/2021	Work Order: 3377	Weather: Dry	Surveyed By: Ryan B	Certificate Number: U-316-07003575	Pipe Segment Ref.: 1428-1345
Year laid:	Pre-cleaning: No Pre-Cleaning	Direction: Upstream	Pipe Joint Length:	Total Length: 82.7 '	Length Surveyed: 82.7 '

City: CD-4	Drainage Area:	Upstream MH: 1428
Street: Field	Media Label:	Up Rim to Invert: 0.0
Location Code:	Flow Control: Not Controlled	Downstream MH: 1345
Location Details: lat 60	Sheet Number:	Down Rim to Invert: 0.0
Pipe shape: Circular	Sewer Use: Stormwater	Total gallons used: 0.0
Pipe size: 12 "	Sewer Category: SEC	Joints passed: 0
Pipe material: Clay Tile (not vitrified clay)	Purpose: Maintenance Related	Joints failed: 0
Lining Method:	Owner: Kossyth Coutny	

Additional Info:

1:723	Distance	Code	Observation	Counter	Photo	Grade		
	0.00	AMH	Manhole / 1345	00:00:19				
	0.00	MWL	Water Level, 10% of the vertical dimension	00:00:25				
	40.00	OBP	Obstacles External Pipe or Cable, 20% of cross sectional area from 10 o'clock to 2 o'clock	00:01:29		M3		
	82.70	XP	Collapse Pipe Sewer, 90% lost	00:03:32		S5		
	82.70	MSA	Survey Abandoned / can not make it any further in mud	00:03:37				
QSR	QMR	QOR	SPR	MPR	OPR	SPRI	MPRI	OPRI
5100	3100	5131	5.0	3.0	8.0	5.0	3.0	4.0



Inspection report

Date: 7/23/2021	Work Order: 3377	Weather: Dry	Surveyed By: Ryan B	Certificate Number: U-316-07003575	Pipe Segment Ref.: 1528-1674
Year laid:	Pre-cleaning: No Pre-Cleaning	Direction: Downstream	Pipe Joint Length:	Total Length: 146.0 '	Length Surveyed: 146.0 '

City:	CD-4 lat 60	Drainage Area:		Upstream MH:	1528
Street:	Field	Media Label:		Up Rim to Invert:	0.0
Location Code:		Flow Control:	Not Controlled	Downstream MH:	1674
Location Details:	lat 60	Sheet Number:		Down Rim to Invert:	0.0
Pipe shape:	Circular	Sewer Use:	Stormwater	Total gallons used:	0.0
Pipe size:	12 "	Sewer Category:	SEC	Joints passed:	0
Pipe material:	Clay Tile (not vitrified clay)	Purpose:	Maintenance Related	Joints failed:	0
Lining Method:		Owner:	Kossyth Country		

Additional Info:

1:1276	Distance	Code	Observation	Counter	Photo	Grade		
	0.00	AMH	Manhole / 1528	00:00:06				
	0.00	MWL	Water Level, 10% of the vertical dimension	00:00:10				
	146.00	MSA	Survey Abandoned / can not make it through dirt will stop here	00:02:46				
QSR	QMR	QOR	SPR	MPR	OPR	SPRI	MPRI	OPRI
0000	0000	0000	0.0	0.0	0.0	0.0	0.0	0.0



Empire Pipe Services

415 Truman Street, North Mankato, MN

Tel. 507-388-2895

swenner@empire-pipe.com

Inspection report

Date: 7/23/2021	Work Order: 3377	Weather: Dry	Surveyed By: Ryan B	Certificate Number: U-316-07003575	Pipe Segment Ref.: 250-0000
Year laid:	Pre-cleaning: No Pre-Cleaning	Direction: Upstream	Pipe Joint Length:	Total Length: 250.0 '	Length Surveyed: 250.0 '

City:	CD-4 lat 11 south	Drainage Area:		Upstream MH:	250
Street:	Field	Media Label:		Up Rim to Invert:	0.0
Location Code:		Flow Control:	Not Controlled	Downstream MH:	0000
Location Details:	lat 11 south	Sheet Number:		Down Rim to Invert:	0.0
Pipe shape:	Circular	Sewer Use:	Stormwater	Total gallons used:	0.0
Pipe size:	16 "	Sewer Category:	SEC	Joints passed:	0
Pipe material:	Clay Tile (not vitrified clay)	Purpose:	Maintenance Related	Joints failed:	0
Lining Method:		Owner:	Kossyth Coutny		

Additional Info:

1:2184	Distance	Code	Observation	Counter	Photo	Grade		
	0.00	AMH	Manhole / 0000	00:00:06				
	0.00	MWL	Water Level, 10% of the vertical dimension	00:00:12				
	250.00	MSA	Survey Abandoned / stopping point	00:10:38				
QSR	QMR	QOR	SPR	MPR	OPR	SPRI	MPRI	OPRI
0000	0000	0000	0.0	0.0	0.0	0.0	0.0	0.0

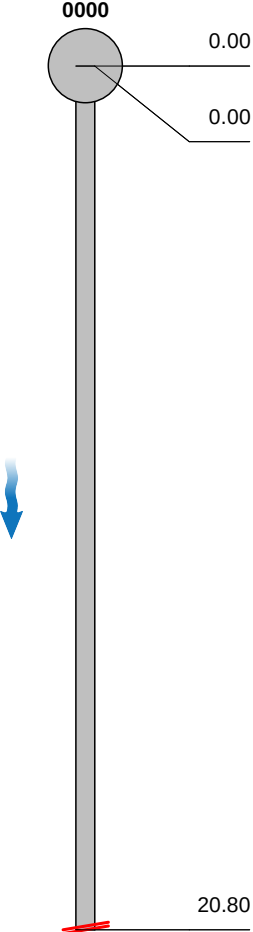


Inspection report

Date: 7/23/2021	Work Order: 3377	Weather: Dry	Surveyed By: Ryan B	Certificate Number: U-316-07003575	Pipe Segment Ref.: 0000-21
Year laid:	Pre-cleaning: No Pre-Cleaning	Direction: Downstream	Pipe Joint Length:	Total Length: 20.8 '	Length Surveyed: 20.8 '

City:	CD-4 lat 11 south	Drainage Area:		Upstream MH:	0000
Street:	Field	Media Label:		Up Rim to Invert:	0.0
Location Code:		Flow Control:	Not Controlled	Downstream MH:	21
Location Details:	lat 11 south	Sheet Number:		Down Rim to Invert:	0.0
Pipe shape:	Circular	Sewer Use:	Stormwater	Total gallons used:	0.0
Pipe size:	16 "	Sewer Category:	SEC	Joints passed:	0
Pipe material:	Clay Tile (not vitrified clay)	Purpose:	Maintenance Related	Joints failed:	0
Lining Method:		Owner:	Kossyth Coutny		

Additional Info:

1:182	Distance	Code	Observation	Counter	Photo	Grade		
	0.00	AMH	Manhole / 0000	00:00:12				
	0.00	MWL	Water Level, 15% of the vertical dimension	00:00:17				
	20.80	MSA	Survey Abandoned / Debris. 21. CANNOT GO FURTHER. STOPPING POINT					
QSR	QMR	QOR	SPR	MPR	OPR	SPRI	MPRI	OPRI
0000	0000	0000	0.0	0.0	0.0	0.0	0.0	0.0



Inspection report

Date: 7/23/2021	Work Order: 3377	Weather: Dry	Surveyed By: Ryan B	Certificate Number: U-316-07003575	Pipe Segment Ref.: 23.5-0000
Year laid:	Pre-cleaning: No Pre-Cleaning	Direction: Upstream	Pipe Joint Length:	Total Length: 23.5 '	Length Surveyed: 23.5 '

City:	CD-4 lat 11 North	Drainage Area:		Upstream MH:	23.5
Street:	Field	Media Label:		Up Rim to Invert:	0.0
Location Code:		Flow Control:	Not Controlled	Downstream MH:	0000
Location Details:	lat 11 North	Sheet Number:		Down Rim to Invert:	0.0
Pipe shape:	Circular	Sewer Use:	Stormwater	Total gallons used:	0.0
Pipe size:	12 "	Sewer Category:	SEC	Joints passed:	0
Pipe material:	Clay Tile (not vitrified clay)	Purpose:	Maintenance Related	Joints failed:	0
Lining Method:		Owner:	Kossyth Coutny		

Additional Info:

1:206	Distance	Code	Observation	Counter	Photo	Grade		
	0.00	AMH	Manhole / 0000	00:00:07				
	0.00	MWL	Water Level, 15% of the vertical dimension	00:00:13				
	23.50	MSA	Survey Abandoned / TOO MUCH DIRT IN LINE, END RUN	00:01:40				
QSR	QMR	QOR	SPR	MPR	OPR	SPRI	MPRI	OPRI
0000	0000	0000	0.0	0.0	0.0	0.0	0.0	0.0

**Empire Pipe Services**

415 Truman Street, North Mankato, MN

Tel. 507-388-2895

swenner@empire-pipe.com

Inspection report

Date: 7/23/2021	Work Order: 3377	Weather: Dry	Surveyed By: Ryan B	Certificate Number: U-316-07003575	Pipe Segment Ref.: 0000-110
Year laid:	Pre-cleaning: No Pre-Cleaning	Direction: Downstream	Pipe Joint Length:	Total Length: 110.0 '	Length Surveyed: 110.0 '

City:	CD-4 lat 11 North	Drainage Area:		Upstream MH:	0000
Street:	Field	Media Label:		Up Rim to Invert:	0.0
Location Code:		Flow Control:	Not Controlled	Downstream MH:	110
Location Details:	lat 11 North	Sheet Number:		Down Rim to Invert:	0.0
Pipe shape:	Circular	Sewer Use:	Stormwater	Total gallons used:	0.0
Pipe size:	15 "	Sewer Category:	SEC	Joints passed:	0
Pipe material:	Clay Tile (not vitrified clay)	Purpose:	Maintenance Related	Joints failed:	0
Lining Method:		Owner:	Kossyth Coutny		

Additional Info:

1:961		Distance	Code	Observation	Counter	Photo	Grade	
	0.00	AMH	Manhole / 0000	00:00:14				
	0.00	MWL	Water Level, 15% of the vertical dimension	00:00:21				
	110.00	MSA	Survey Abandoned / to much mud in line	00:31:51				
QSR	QMR	QOR	SPR	MPR	OPR	SPRI	MPRI	OPRI
0000	0000	0000	0.0	0.0	0.0	0.0	0.0	0.0

Appendix B: Tile Capacities

**COMBINED DISTRICT FACILITY CAPACITY
DRAINAGE COEFFICIENT
DRAINAGE DISTRICT NO. 4 LATERAL 11 & SUB DRAINAGE DISTRICT NO. 9 MAIN & LATERAL 1
KOSSUTH COUNTY, IOWA**

Drainage District No. 4 Lateral 11 & Sub Drainage District No. 9 of Drainage District No. 4 Combined Design Capacity

Segment	Name	Station Start	Station End	Size (in)	Grade (%)	n	S (ft/ft)	A (ft)	P (ft)	R (ft)	Flow Capacity (cfs)	Combined Flow Capacity (cfs)
1	DD4 Lateral 11	0+00	29+00	36	0.050	0.013	0.0005	7.07	9.42	0.75	14.95	18.40
	Sub DD9 Main			16	0.050	0.013	0.0005	1.40	4.19	0.33	1.72	
	Sub DD9 Lateral 1			16	0.050	0.013	0.0005	1.40	4.19	0.33	1.72	
2	DD4 Lateral 11	29+00	37+00	32	0.050	0.013	0.0005	5.59	8.38	0.67	10.92	14.36
	Sub DD9 Main			16	0.050	0.013	0.0005	1.40	4.19	0.33	1.72	
	Sub DD9 Lateral 1			16	0.05	0.013	0.0005	1.40	4.19	0.33	1.72	
3	DD4 Lateral 11	37+00	42+00	32	0.03	0.013	0.0003	5.59	8.38	0.67	8.46	15.58
	Sub DD9 Main			30	0.03	0.013	0.0003	4.91	7.85	0.63	7.12	
4	DD4 Lateral 11	42+00	69+00	32	0.03	0.013	0.0003	5.59	8.38	0.67	8.46	12.39
	Sub DD9 Main			24	0.03	0.013	0.0003	3.14	6.28	0.5	3.93	
5	DD4 Lateral 11	69+00	93+00	30	0.03	0.013	0.0003	4.91	7.85	0.63	7.12	11.05
	Sub DD9 Main			24	0.03	0.013	0.0003	3.14	6.28	0.5	3.93	
6	DD4 Lateral 11	93+00	100+00	24	0.03	0.013	0.0003	3.14	6.28	0.5	3.93	7.86
	Sub DD9 Main			24	0.03	0.013	0.0003	3.14	6.28	0.5	3.93	
7	DD4 Lateral 11	100+00	118+40	24	0.03	0.013	0.0003	3.14	6.28	0.5	3.93	7.86
	Sub DD9 Main			24	0.03	0.013	0.0003	3.14	6.28	0.5	3.93	
8	DD4 Lateral 11	118+40	125+40	18	0.03	0.013	0.0003	1.77	4.71	0.38	1.82	5.75
	Sub DD9 Main			24	0.03	0.013	0.0003	3.14	6.28	0.5	3.93	
9	DD4 Lateral 11	125+40	135+00	18	0.03	0.013	0.0003	1.77	4.71	0.38	1.82	3.65
	Sub DD9 Main			18	0.03	0.013	0.0003	1.77	4.71	0.38	1.82	
10	DD4 Lateral 11	135+00	138+40	18	0.06	0.013	0.0006	1.77	4.71	0.38	2.58	5.16
	Sub DD9 Main			18	0.06	0.013	0.0006	1.77	4.71	0.38	2.58	
11	DD4 Lateral 11	138+40	149+40	16	0.06	0.013	0.0006	1.40	4.19	0.33	1.88	4.46
	Sub DD9 Main			18	0.06	0.013	0.0006	1.77	4.71	0.38	2.58	

In-Situ Drainage District No. 4 Lateral 11 & Sub Drainage District No. 9 of Drainage District No. 4 Main Combined Capacity

Segment	Name	Station Start	Station End	Size (in)	Grade (%)	n	S (ft/ft)	A (ft)	P (ft)	R (ft)	Flow Capacity (cfs)	Combined Flow Capacity (cfs)
7, 8, & 9	DD4 Lateral 11	102+00	132+00	18	0.050	0.013	0.0005	1.77	4.71	0.38	2.36	7.91
7, 8, & 9	Sub DD9 Main	102+00	128+00	24	0.060	0.013	0.0006	3.14	6.28	0.5	5.56	

Proposed Replacement Tile

Segment	Name	Station Start	Station End	Size (in)	Grade (%)	n	S (ft/ft)	A (ft)	P (ft)	R (ft)	Flow Capacity (cfs)	Combined Flow Capacity (cfs)
R3	Combined Replacement	102+00	128+00	36	0.060	0.013	0.0006	7.07	9.42	0.75	16.38	16.38

Appendix C: Opinions of Probable Cost

Tract 10 – Mallard WPA: Restoration Financial Plan Justification - \$440,000 and 103 acres
Grant - \$242,300 Match - \$197,700 Non-Match - \$_____ Completion: December 2025

Item & Work	Units	\$/unit	Total \$	Schedule (month, year)	Funding Source (Grant or Partner name)
CONTRACTS			-		
Mobilization Each	1	\$10,000	\$10,000	Dec-25	G
36" Dual Wall HDPE, NP (Main RR) -LF	2457	\$25	\$61,425	Dec-25	KCDD
18" Dual Wall HDPE, NP (NW RR) - LF	842	\$20	\$16,840	Dec-25	KCDD
18" HDPE Dual Wall Perf Replacement - LF	950	\$20	\$19,000	Dec-25	KCDD
15" HDPE Dual Wall Perf Replacement - LF	865	\$15	\$12,975	Dec-25	KCDD
8" HDPE NP (North RR) - LF	811	\$12	\$9,732	Dec-25	KCDD
8" Non-Perf Single Wall (RA) - LF	768	\$12	\$9,216	Dec-25	KCDD
Tile Break EACH	7	\$500	\$3,500	Dec-25	KCDD
Subtotal Contracts					142,688.00
MATERIALS and EQUIPMENT			-		
Agri Drain In-Line 12' - LS	2	\$5,000	\$10,000	Dec-25	G
36" CMP (Protection Shell) - LS	2	\$1,005	\$2,010	Dec-25	G
36" Ø Dual-Wall HDPE, NP (Main RR) - LF	2,454	\$50	\$122,700	Dec-25	G
18" Ø. Dual-Wall HDPE, NP (NW RR) - LF	842	\$35	\$29,470	Dec-25	G
18" Ø HDPE Dual-Wall, Perf. Replacement - LF	950	\$35	\$33,250	Dec-25	G
15" Ø HDPE Dual-Wall, Perf. Replacement - LF	865	\$30	\$25,950	Dec-25	G
8" Ø HDPE, NP (North RR) - LF	800	\$8.65	\$6,920.00	Dec-25	G
Re-Slope Roadway Embankment - CY-P	100	\$20	\$2,000	Dec-25	G
Subtotal Materials and Equipment					232,300.00
NON-CONTRACT PERSONNEL and TRAVEL					
DU Biologist and Initial Planning	50	\$113.00	\$5,650	Dec-25	DU
DU Topo Survey	82	\$97.00	\$7,954	Dec-25	DU
DU Engineering and Design	104	\$97.00	\$10,088	Dec-25	DU
DU Drafting	126	\$80.00	\$10,080	Dec-25	DU
DU Construction Management	278	\$97.00	\$26,966	Dec-25	DU
DU Lodging (# of nights x cost/night)	8	\$124.90	\$999	Dec-25	DU
DU Mileage (No. of mile x cost/mile)	5000	\$0.66	\$3,275	Dec-25	DU
Subtotal Non-Contract Personnel					\$65,012
TOTAL RESTORATION DIRECT COSTS					\$440,000

Appendix D: District Plat

Drainage District No. 4 & Sub Drainage District No. 9 Lateral 11 & Sub 9 Main Tile Replacement Repair

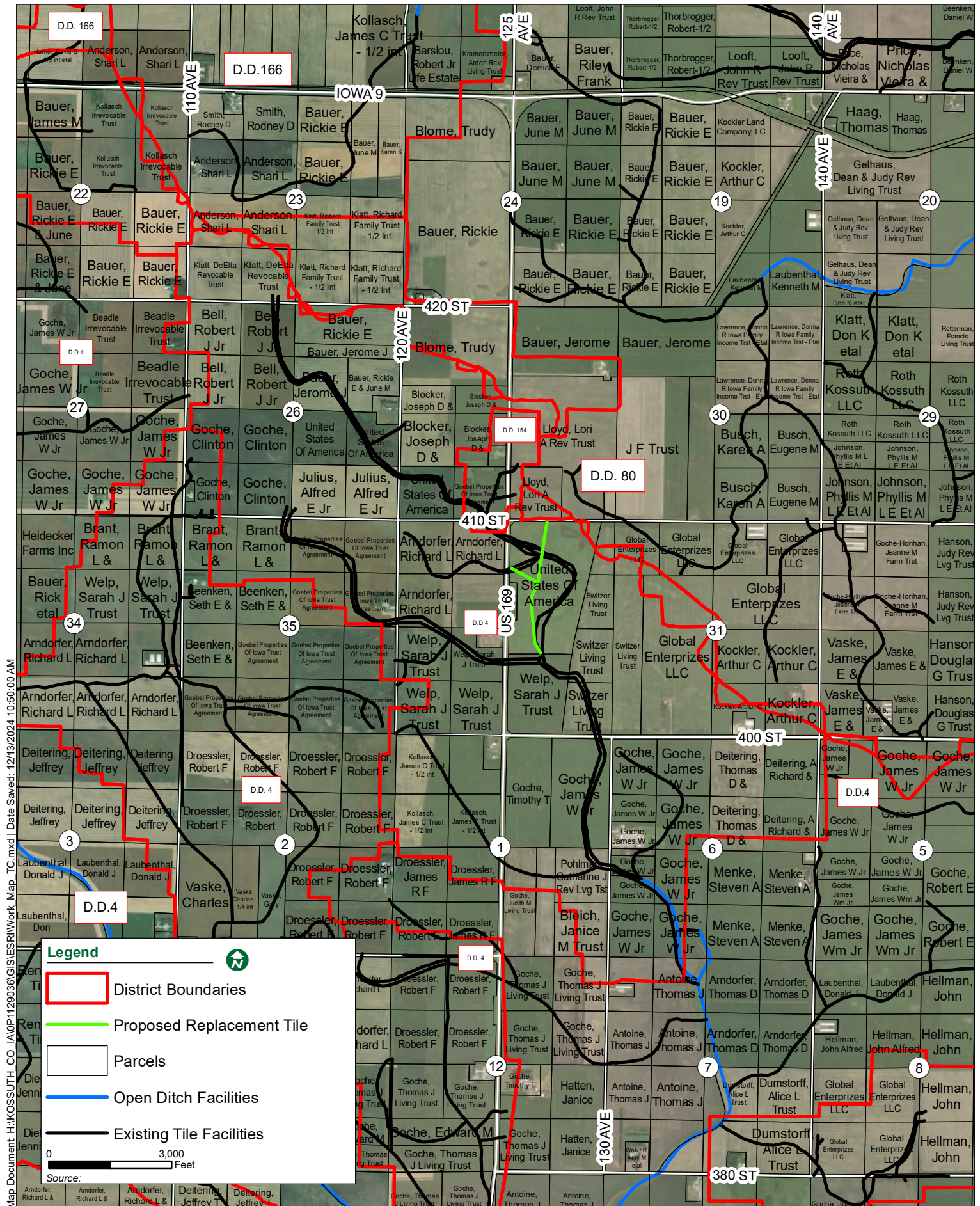
Kossuth County, Iowa

District Plat



**BOLTON
& MENK**

Real People. Real Solutions.

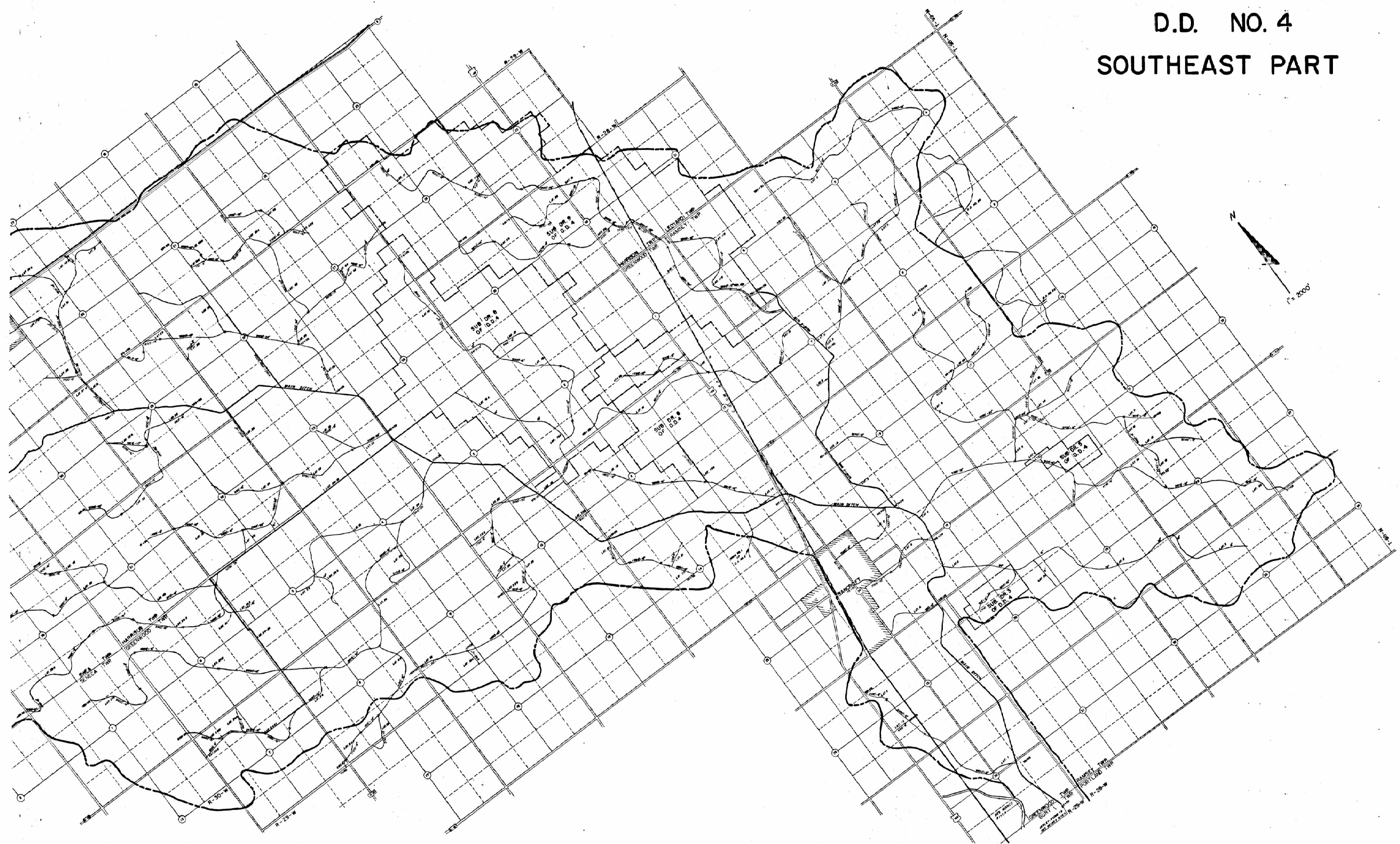


Appendix E: Original District Map and Profiles

KOSSUTH COUNTY

D.D. NO. 4

SOUTHEAST PART

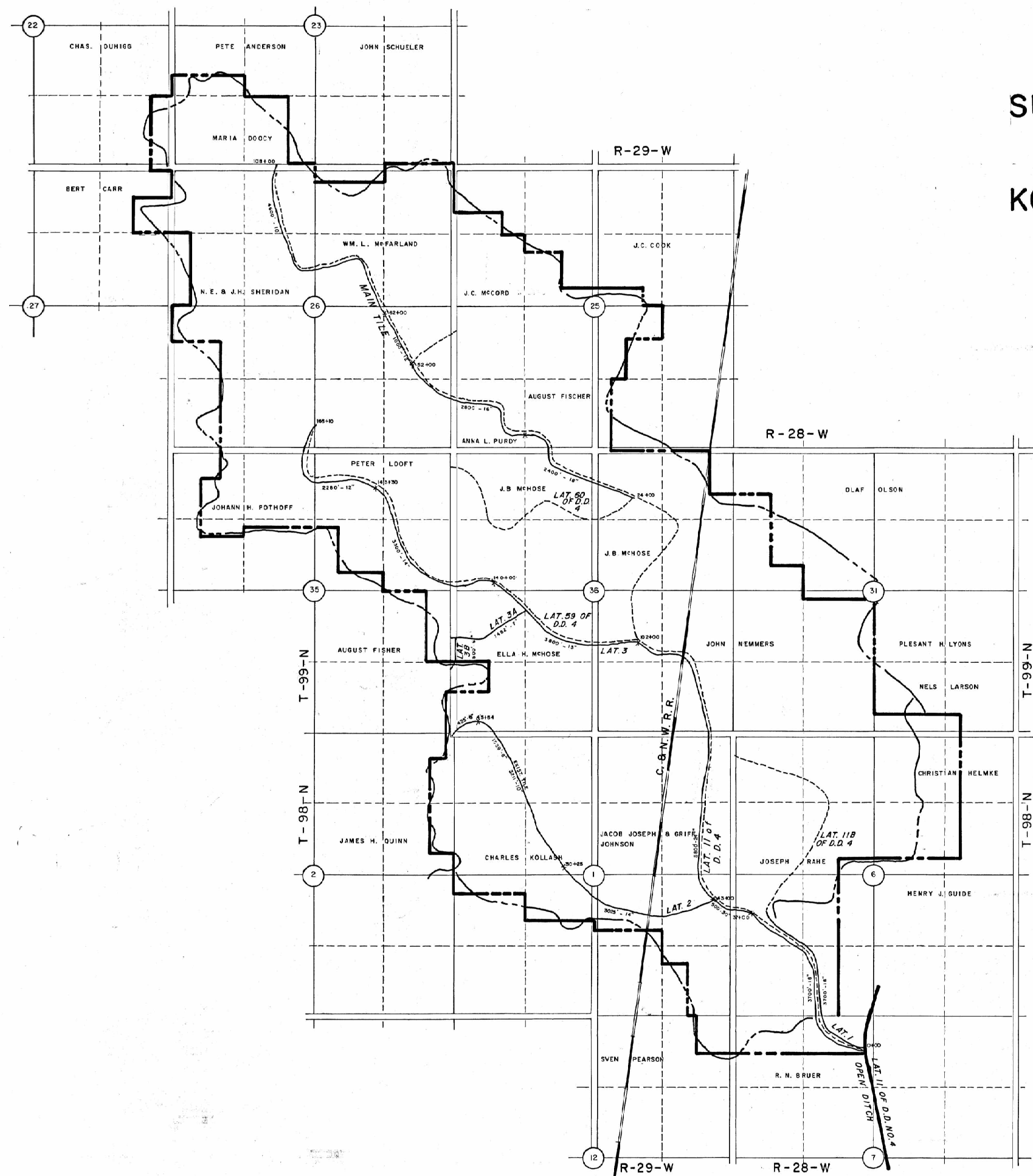
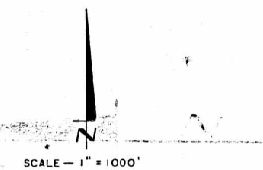


Original plat shown with all amendments
 improvements shown according to available
 plat books records as of 1902.
 By J. H. DODGE, Surveyor
 Port Dodge, Iowa.

[illegible]

KOSSUTH D. D. No. 4 N.W. PART

SUB DRAIN NO. 9 OF KOSSUTH COUNTY D. D. NO. 4



Original plans redrawn with subsequent improvements shown according to available court house records as of 1982.
By: McClure Engineering Company
Fort Dodge, Iowa

PROFILE

DRAINAGE DISTRICT

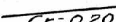
NO-SUB 8 OF 4

Scale Horizontal $\frac{1}{2}$ " = 100' Vertical 1" = 6"

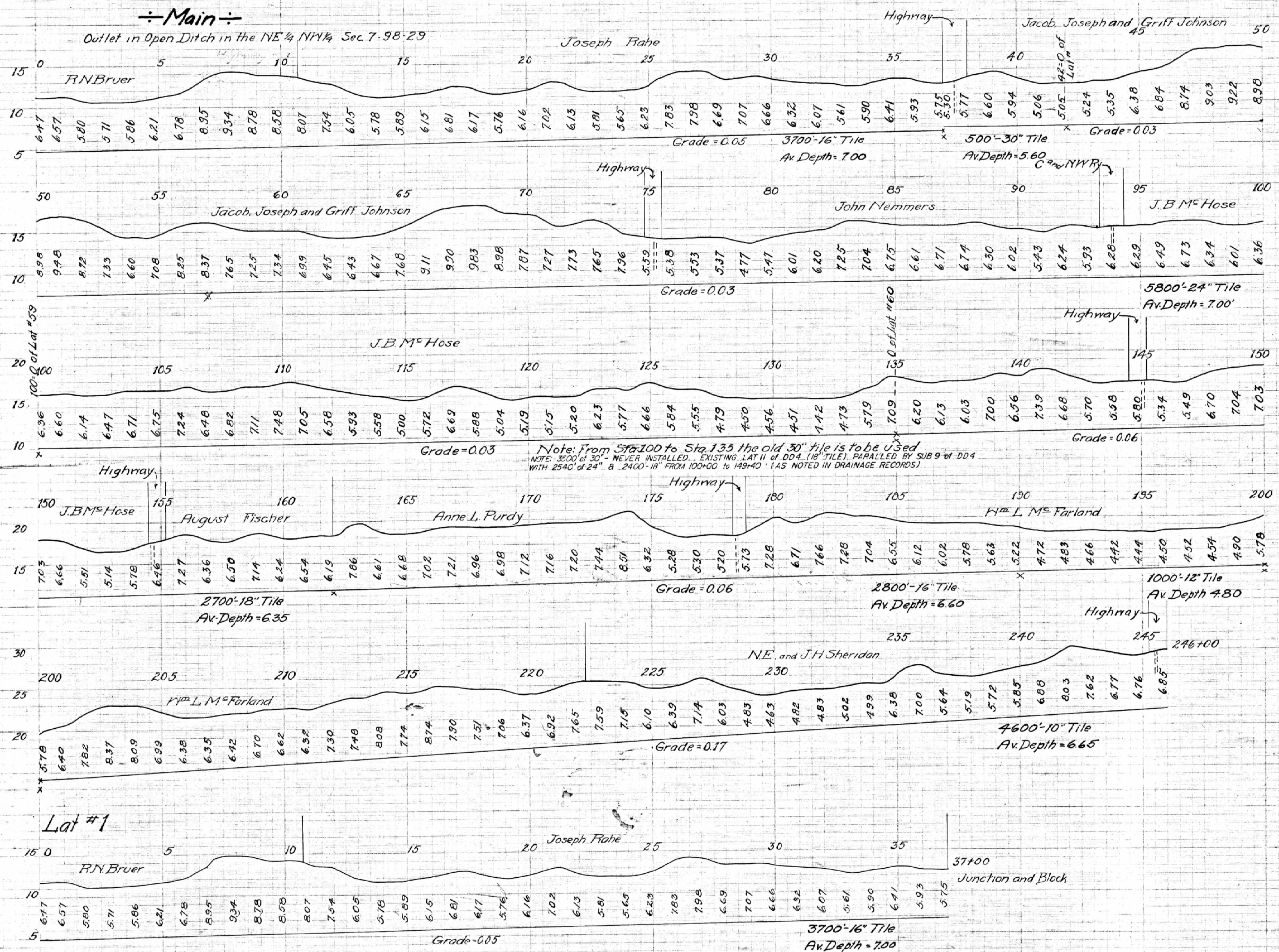
==1919==

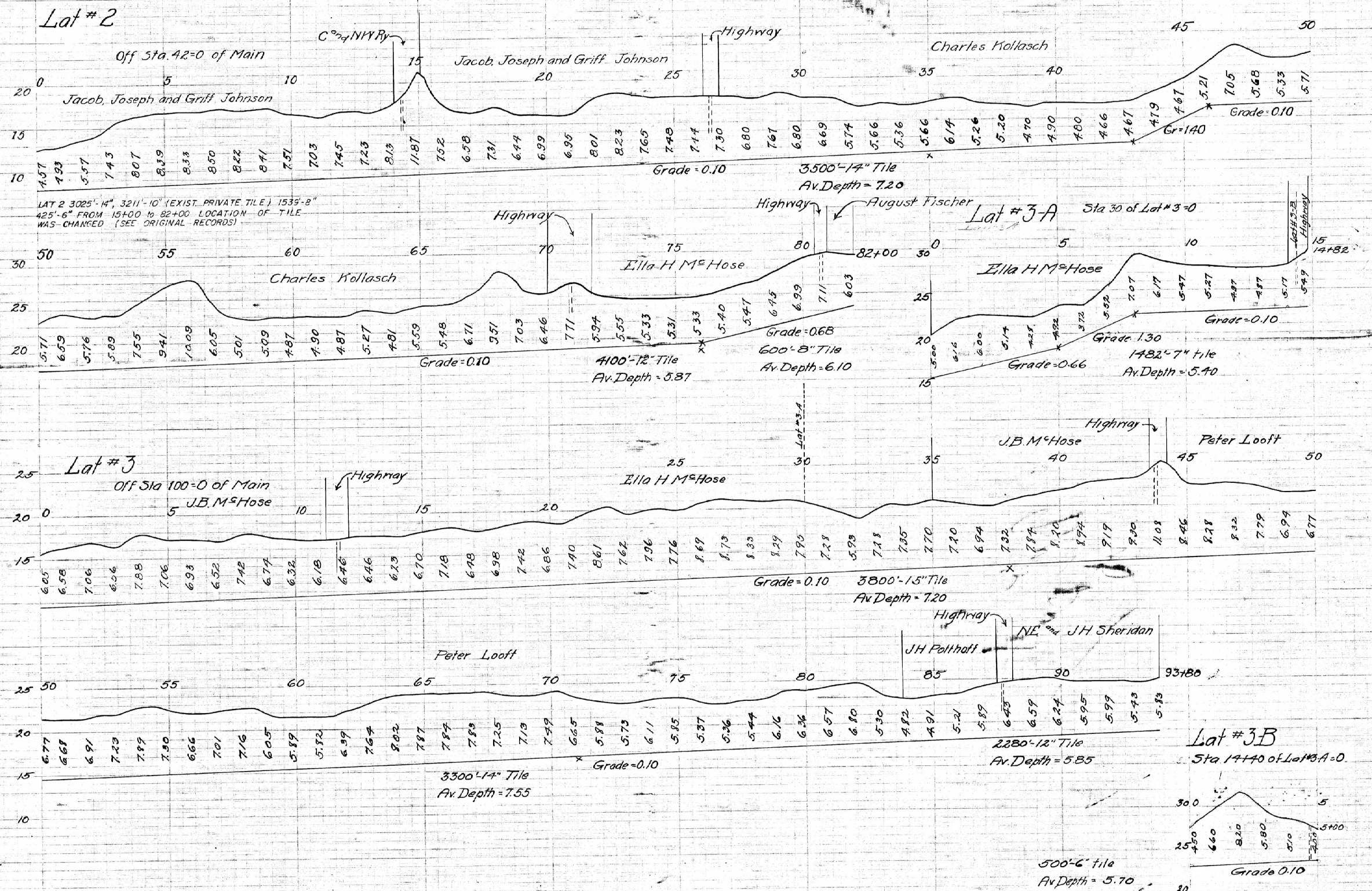
H. D. Hark
ENGINEER

LEGEND

Ground Line	
Grade Line	 GF=0.20
Change in Grade	
Change in Size of Tile	
Intake	
Property Owner	Wm Nelson

FILED Jan 7th 1920
E. B. Bunting





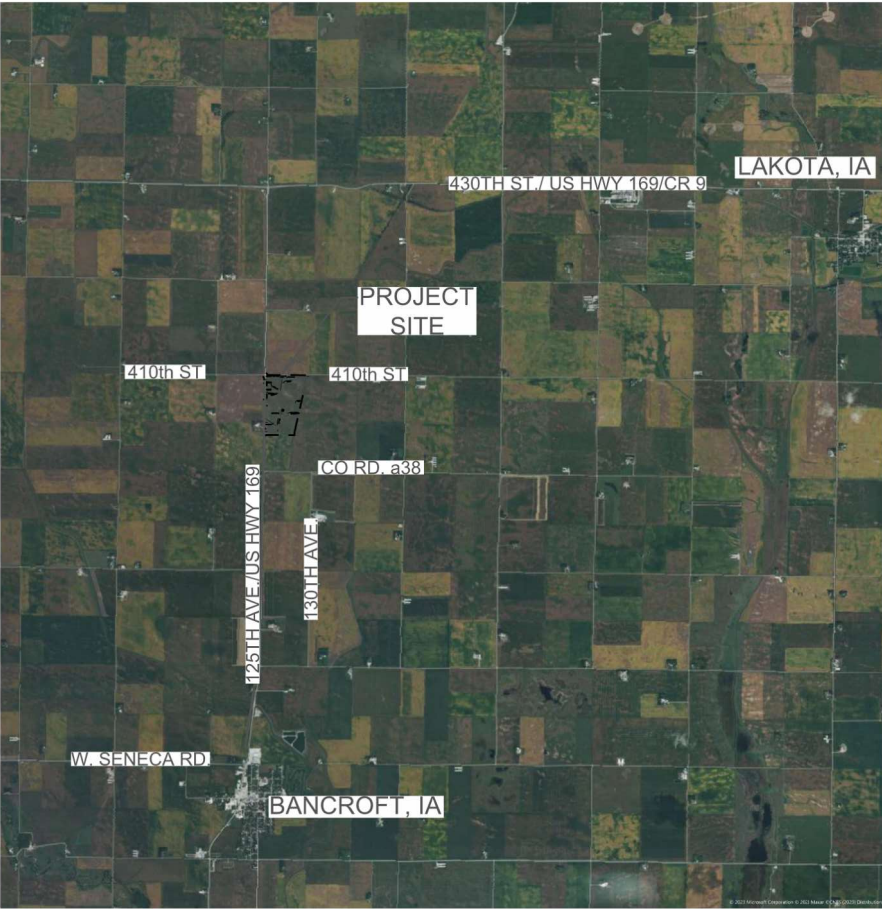
SUB: 1 of 4

Appendix F: Preliminary Plans



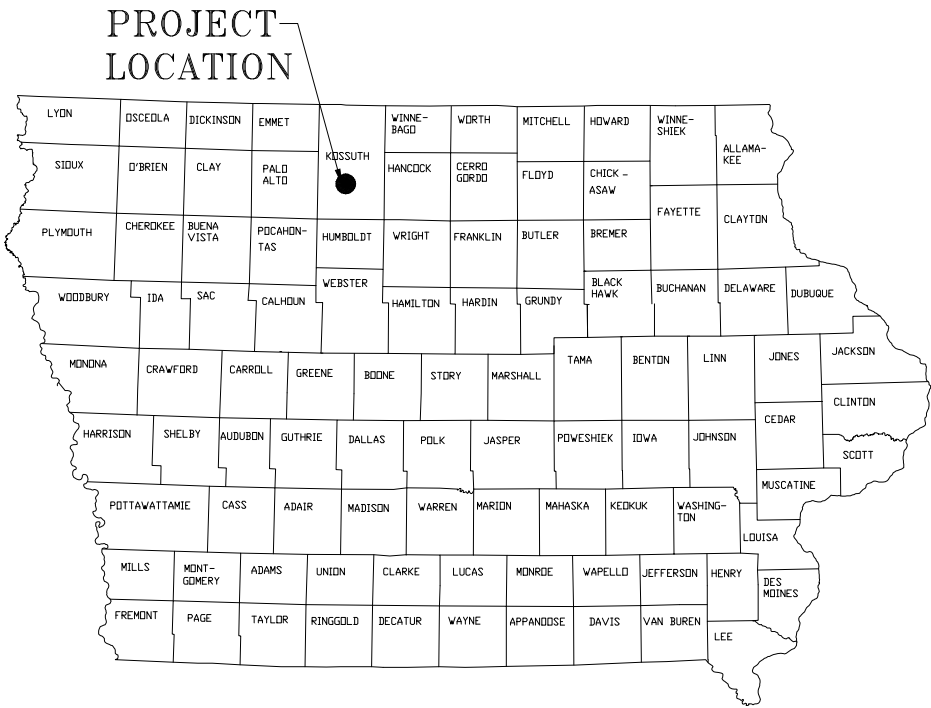
MALLARD WPA
SEC. NE 1/4 OF 36, T 99 N, R 29 W
KOSSUTH COUNTY, IOWA
IN COOPERATION WITH
U.S. FISH & WILDLIFE SERVICE

SHEET INDEX	
Sheet Number	Sheet Title
C001	COVER SHEET
C002	SPECIFICATIONS, QUANTITIES, & NOTES
C051	TOPOGRAPHY & EXISTING TILE
C101	SITE PLAN
C201	MAIN HDPE PIPELINE DETAILS & NOTES
C202	BRANCH PIPELINES DETAILS & NOTES
C301	WCS & PIPELINE DETAILS & NOTES
C302	AGRIDRAIN WCS
C303	ALTERNATE 1 - CONCRETE WCS



VICINITY MAP
NOT TO SCALE

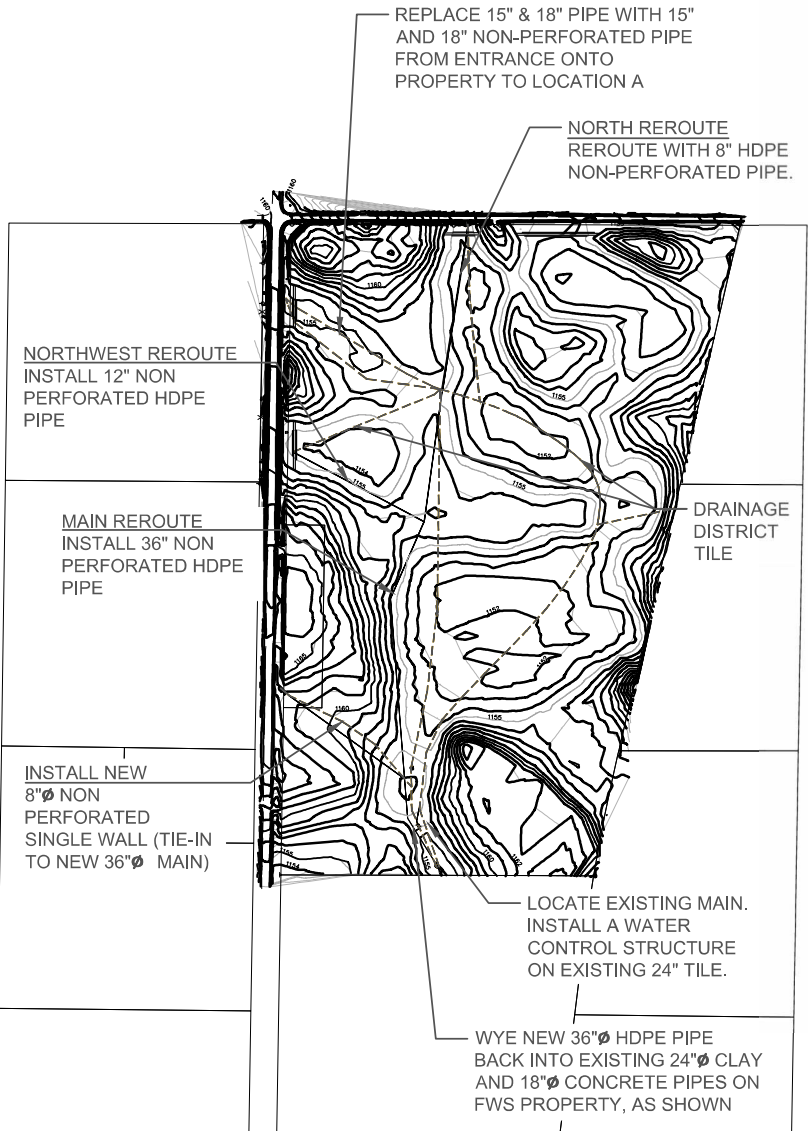
PROJECT IS LOCATED ON US HIGHWAY 169 N APPROXIMATELY 3.8 MILES NORTH OF THE INTERSECTION OF W. SENECA ROAD AND US-169 N/125TH AVE. IN THE TOWN OF BANCROFT, IA.



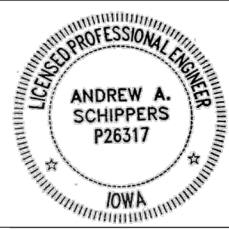
IOWA LOCATION MAP

AGENCY CONTACT
ED MEENDERING
UNION SLOUGH NWR
P.O. BOX 260
1710 360th St.
TITONKA, IA 50480
515-928-2523

DJ CONTACT
ANDREW SCHIPPERS, P.E.
DUCKS UNLIMITED, INC.
7322 NEWMAN BLVD., BLDG. 2
DEXTER, MI 48130
734-623-2000



LOCATION MAP
NOT TO SCALE



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.

Andrew Schippers, P.E. _____ Date _____

My license number is P26317
My license renewal date is December 31, 2025
Pages of sheets covered by this seal: 1 - 9 (C001-C303)



PERMIT REVIEW SET

GREAT LAKES/ATLANTIC REGIONAL OFFICE
7322 NEWMAN BOULEVARD, BUILDING 2
DEXTER, MICHIGAN 48130
(734) 623-2000
www.ducks.org



AFFIX SEAL: DUCKS UNLIMITED, INC.
ON:

COVER SHEET
MALLARD WPA
KOSSUTH COUNTY
IOWA

Revision	Sheet	Revisions	Date	By
0	-	95% PRELIMINARY SET	2-19-24	A.S.
1	-	PERMIT REVIEW SET	3-16-24	A.S.
2	-	ADDITIONAL FWS REVISIONS	4-22-24	A.S.
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-

CAD FILE:
SHEET 1 R1 2023
DESIGNED BY: A.S.
DRAWN BY: M.H.
SURVEYED BY: TRE
BIOLOGIST: M.S.
DATE:
4-22-24
PROJECT NUMBER:
US-IA-360-1
C001

NOT FOR CONSTRUCTION

Topographic map showing a drainage area with contour lines and tile lines. The map includes the following labels and features:

- Top Left:**
 - DU-56-2010
 - N 15,751,515.56
 - E 1,317,253.26
 - ELEV 1165.08
- Top Center:**
 - DUA
 - N TOP 12" RISER
 - N 15,751,679.38
 - E 1,317,955.17
 - ELEV 1153.24
- Top Right:**
 - EDGE OF CULTIVATION
- Map Features:**
 - Contour lines labeled with elevations: 1150, 1152, 1154, 1155, 1160, 1165.
 - Tile lines labeled: EXISTING 15" CONCRETE TILE, EXISTING 18" CONCRETE TILE, EXISTING 12" CONCRETE TILE, EXISTING 8" HDPE TILE, EXISTING 5" CONCRETE TILE, EXISTING 24" CLAY TILE, EXISTING 5" CLAY TILE, EXISTING 16" CONCRETE TILE (TRANSITIONS TO 18" CONCRETE TILE AT SOUTH END), DRAINAGE DISTRICT TILE.
 - Other labels: DU, PP, B, TBM DUA, NAIL SPIKE.
- Bottom Center:**
 - TBM DUA
 - NAIL SPIKE
 - N 15,748,448.95
 - E 1,317,832.00
 - ELEV 1153.93
- Bottom Right:**
 - EDGE OF CULTIVATION

EXISTING TILE LINE
APPROXIMATE LOCATION

TILE BREAKS

IMPORTANT LOCATIONS

DU CONTROL

EDGE OF CULTIVATION

AFFIX SEAL: DUCKS UNLIMITED, INC.

[illegible]

NOT FOR CONSTRUCTION



REROUTES	
MAIN REROUTE	BEGIN REROUTE AT LOCATION A, FLOW LINE ELEV. @ LOCATION A 1147.72
36" HDPE	END REROUTE AT LOCATION F, FLOW LINE ELEV. @ LOCATION F 1146.15
	TILE LENGTH = 2424'. AVERAGE SLOPE .00065 (.65"/1000)
	JUNCTION WITH NORTHWEST REROUTE AT LOCATION B, DISTANCE FROM A 661.8',
	FLOW LINE AT LOCATION B ELEV. - 1147.29
	PI @ LOCATION C, DISTANCE FROM LOCATION B 398.90'
	FLOW LINE AT LOCATION C ELEV. - 1147.03
	PI @ LOCATION E, DISTANCE FROM LOCATION C 1093.57'
	FLOW LINE AT LOCATION E ELEV. - 1146.33 O.K.
	JUNCTION WITH EXISTING 24" CLAY TILE AT LOCATION F, DISTANCE FROM "E" 285.8'
	FLOW LINE AT LOCATION F ELEV. - 1146.15

NORTH REROUTE
8" HDPE

THE NORTH REROUTE WILL COMMENCE AT LOCATION N
THE REROUTE TILE WILL JOIN THE EXISTING 8" HDPE AT ± 1149.1
THE REROUTED 8" HDPE WILL JOIN THE MAIN REROUTE @ LOCATION A
THE LENGTH OF THE REROUTE WILL BE 811' DROPPING 1.38' TO ELEV. - 1147.72.
THE AVERAGE SLOPE WILL BE .0017 (1.7"/1000').
THE ROADWAY DITCH SHALL BE RESLOPED TO DRAIN WATER IN DITCH TO INTAKE

VARIANCES IN LOCATION AND ELEVATION ON TILE SHOULD BE EXPECTED IN THE FIELD. CONTRACTOR SHALL EXCAVATE AT UPSTREAM, AND DOWNSTREAM TIE-IN POINTS OF ALL TILE PRIOR TO INSTALLING NEW IN ORDER TO FIELD VERIFY NEW SLOPES TO ENSURE POSITIVE FLOW ON ALL TILE INSTALLATIONS. CONTRACTOR SHALL SUBMIT SHOP DRAWINGS OF TILE CONNECTIONS FOR APPROVAL PRIOR TO INSTALLING CONNECTIONS.

EXISTING 12" RISER IN DITCH SHALL BE CLEARED / INSPECTED TO ENSURE PROPER DRAINAGE. IF DEFICIENCIES EXIST, THIS SHALL BE REPAIRED / REPLACED AS PART OF PROJECT.

ESTIMATED QUANTITIES		TILE BREAKS WILL BE PAID FOR AT THE UNIT PRICE FOR EACH TILE BREAK DEVELOPED. TILE BREAKS SHALL BE 100' LONG. TILE BREAKS SHALL INCLUDE PLUGGING OPEN END OF TILE WITH MANUFACTURED PLUGS/CAPS OR CONCRETE PLUGS.
36" HDPE (MAIN REROUTE)	2,455 L.F.	
12" HDPE NW REROUTE	842 L.F.	
8" HDPE (NORTH REROUTE)	811 L.F.	
18" HDPE (REPLACES PERFORATED PIPE)	1,013 L.F.	CONNECTIONS INCLUDE THE JOINING OF VARIOUS PIPELINES OF DIFFERENT SIZES AND MATERIALS. THE TYPE OF CONNECTION NEEDED SHALL BE DETERMINED BY THE CONTRACTOR AND SHALL BE TO INDUSTRY STANDARDS OR APPROVED BY THE ENGINEER. CONNECTIONS SHALL BE
15" HDPE (REPLACES PERFORATED PIPE)	865 L.F.	
8" SINGLE WALL	764 L.F.	
TILE BREAK	7 EA.	

CONNECTIONS INCLUDE THE JOINING OF VARIOUS PIPELINES OF DIFFERENT SIZES AND MATERIALS. THE TYPE OF CONNECTION NEEDED SHALL BE DETERMINED BY THE CONTRACTOR AND SHALL BE TO INDUSTRY STANDARDS, OR APPROVED BY THE ENGINEER. CONNECTIONS SHALL BE INCIDENTAL TO THE INSTALLATION OF THE PIPELINE.

PAYMENT IS BASED ON THE ACTUAL LENGTH OF PIPELINE INSTALLED.

PAYMENT FOR EMBANKMENT WILL BE PAID FOR ON A PLAN QUANTITY (NO FURTHER MEASUREMENTS WILL BE MADE) AND WILL INCLUDE RE-SPREADING TOP SOIL ON NEW SLOPE AND BORROW AREA.

LEGEND

EXISTING TILE LINE
APPROXIMATE LOCATION

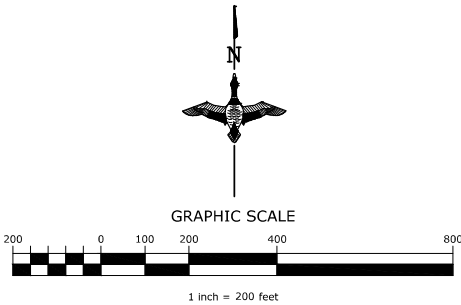
NEW TILE LINES

TILE BREAKS

IMPORTANT LOCATIONS

DU CONTROL

EDGE OF CULTIVATION



52.0 ACRES of WETLANDS (3) RESTORED @ FSL ELEV. 1155

AFFIX SEAL: DUCKS UNLIMITED, INC
ON:

SITE PLAN
MALLARD WPA
KOSSUTH COUNTY
IOWA

[illegible]

CAD FILE:
SHEET 2 R1 2023

DESIGNED BY: A.S.
DRAWN BY: M.H.
SURVEYED BY: TRE
BIOLOGIST: M.S.

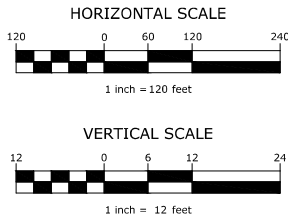
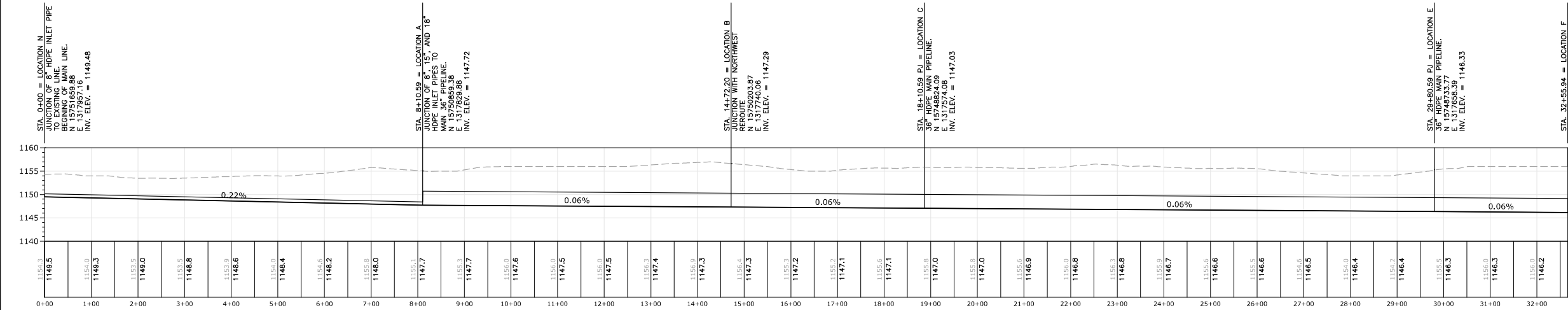
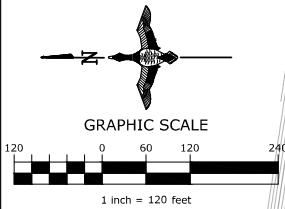
DATE:
4-22-24

PROJECT NUMBER
US-IA-360-1

C101

NOT FOR CONSTRUCTION

STA. 0+00 THROUGH
STA. 32+66 MAIN
REROUTE PIPELINE
PLAN VIEW
SCALE 1" = 120'



MAIN PIPELINE REROUTE LOCATION:
CONTRACTOR SHALL INSTALL 810 L.F. OF NEW 8" HDPE FROM STATION 0+00 AS SHOWN ON SHEET C201.
CONTRACTOR SHALL INSTALL AN ADDITIONAL 2,455 L.F. OF NEW 36" DUAL-WALL HDPE PIPE AT SLOPES SHOWN SHEET C201 FROM THE NEW 8" HDPE THROUGH THE PROPERTY AND INTO THE EXISTING PIPELINE AT OR NEAR STATION 32+65.94 OF THIS PIPELINE. TYPICAL INSTALLATION SHALL BE AS SHOWN ON SHEET C301. CONTRACTOR SHALL USE PLATE COMPACTOR TO COMPACT MATERIAL FROM EDGE OF PIPE TO EDGE OF TRENCH. DU FIELD ENGINEER WILL DETERMINE WHEN/IF AGGREGATE IS REQUIRED TO SUPPORT PIPE. ONLY THE QUANTITY OF SAND OR AGGREGATE USED WILL BE PAID FOR. PAYMENT WILL BE FOR SUPPLY AND INSTALLATION BASED ON THE CONTRACTOR'S UNIT BID PRICE.

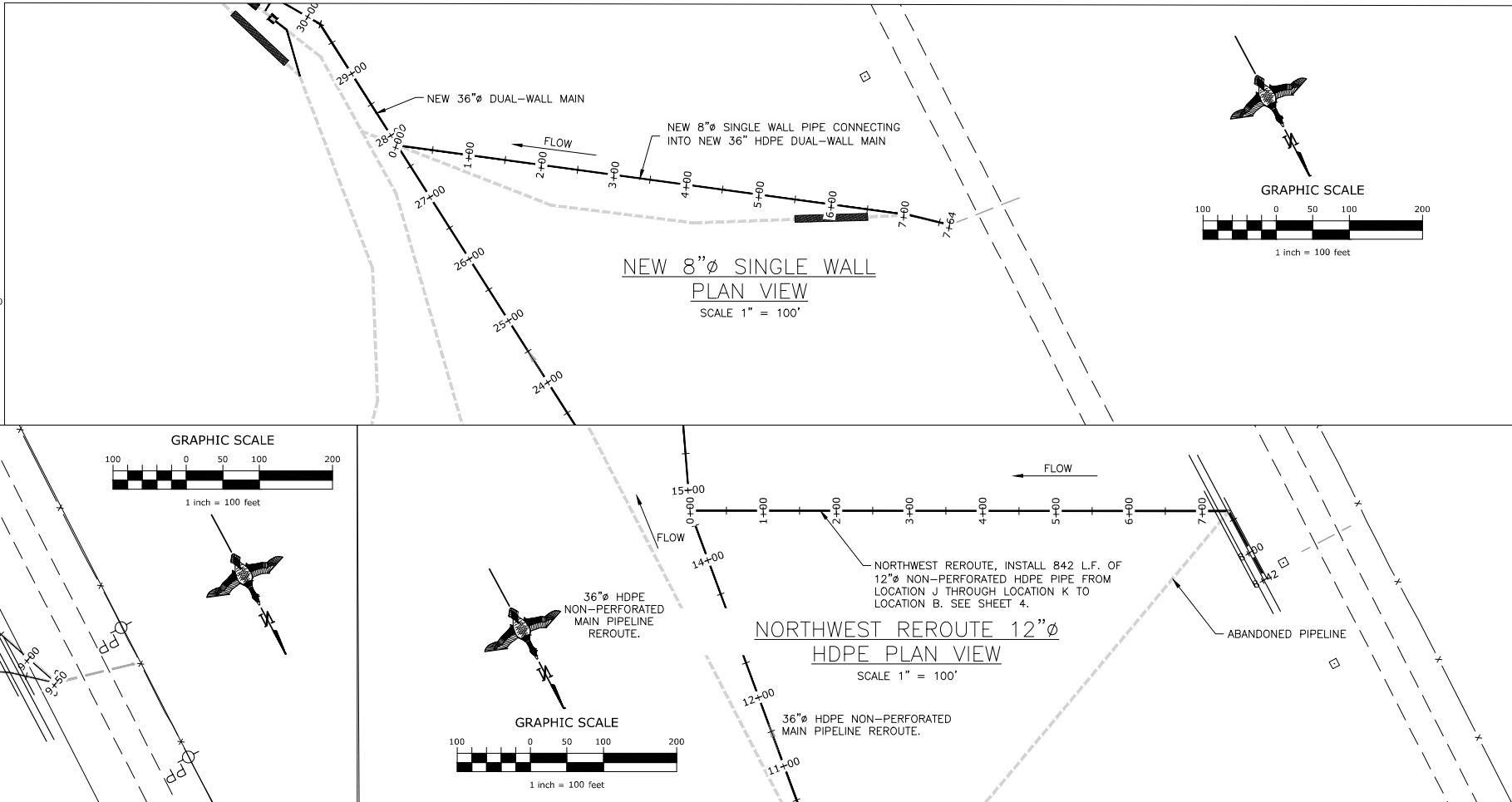
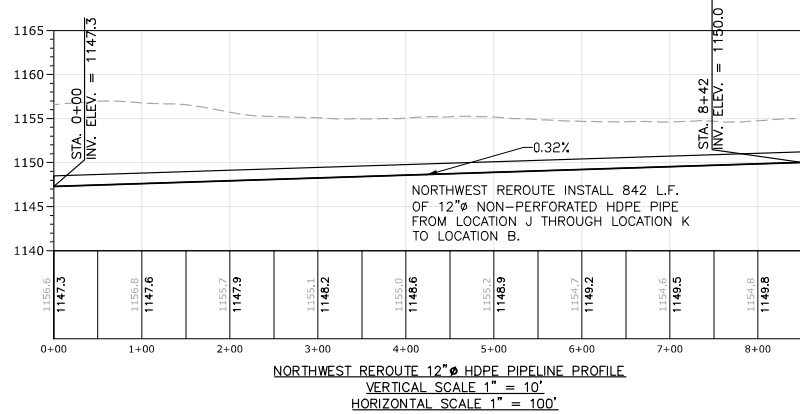
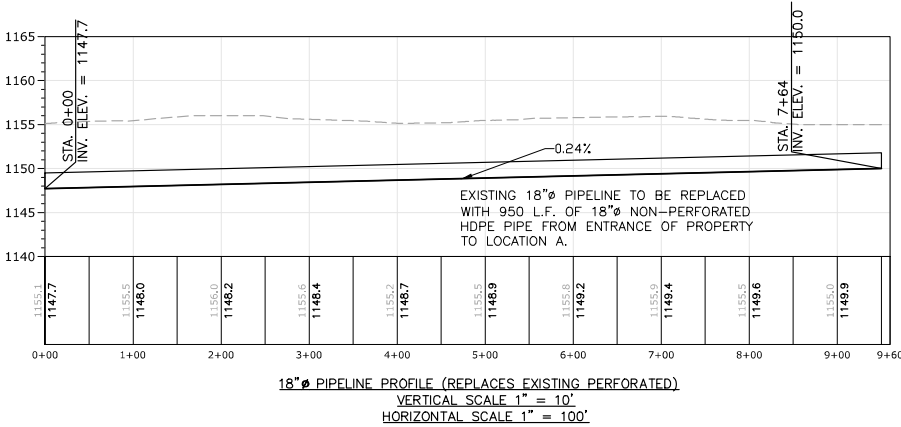
CONTRACTOR SHALL NOTE ALL CALCULATIONS & QUANTITIES ARE BASED ON A 5' WIDE TRENCH. IF A WIDER EXCAVATOR BUCKET OR WIDER TRENCH IS USED BY CONTRACTOR, THEN ANY ADDITIONAL MATERIAL COSTS FOR SAND/AGGREGATE BEDDING & BACKFILL WILL BE AT THE CONTRACTOR'S EXPENSE. PAYMENT FOR PIPE & MATERIALS SHALL BE PAID FOR BASED ON CONTRACTOR'S UNIT BID PRICE FOR THE RESPECTIVE ITEM ON THE BID FORM. THE UNIT BID PRICE SHALL INCLUDE ALL LABOR AND MATERIALS NECESSARY FOR THE THE COMPLETE INSTALLATION AS SHOWN ON THE PLANS. PIPE MATERIALS SHALL CONFORM TO THE FOLLOWING:

HDPE - ALL HDPE PIPE AND FITTINGS PROVIDED BY THE CONTRACTOR SHALL BE DUAL-WALL (FOR PIPE > 12") AND HAVE WATERTIGHT JOINTS. SUCH EXAMPLE PIPE ARE ADS N-12 WT OR MEGA GREEN WT, PRINSCO GOLDFLO WT OR ECOFLO WT, OR OTHER APPROVED EQUAL.

NOTE: THE LOCATION OF THE EXISTING TILE LINES SHOWN IS APPROXIMATE BASED ON PREVIOUS INFORMATION. THE EXACT ALIGNMENT WHERE NEW DUAL-WALL HDPE PIPES INTERSECT OLD TILE LINES WILL BE DETERMINED IN THE FIELD.

SEEDING NOTE:
THE CONTRACTOR SHALL PROVIDE A FINAL
FINISH SUITABLE FOR SEEDING ON ALL
DISTURBED AREAS, AS DIRECTED BY THE DU
FIELD ENGINEER. THE USFWS WILL
COMPLETE THE SEEDING.

C:\Users\aschippers\Ducks Unlimited Incorporated\Iowa - Iowa02 C3D Protect's\IA-360-1 Mallard\C3D DRAWING\SHEET 3 & 4 R1 2023.dwg, 4/22/2024 10:24 AM, Andrew Schippers, BRANCH PIPELINES DETAILS & NOTES, None

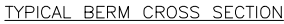
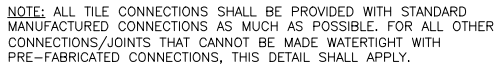
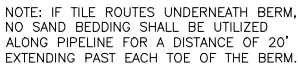
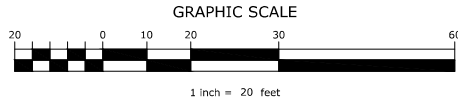


CONTRACTOR SHALL SUBMIT PRODUCT DATA FOR ENGINEER APPROVAL PRIOR TO CONSTRUCTION.

CAD FILE:
SHEET 3 & 4 R1 2023
DESIGNED BY: A.S.
DRAWN BY: M.H.
SURVEYED BY: TRE
BIOLOGIST: M.S.
DATE:
4-22-24
PROJECT NUMBER:
US-IA-360-1
C202

NOT FOR CONSTRUCTION

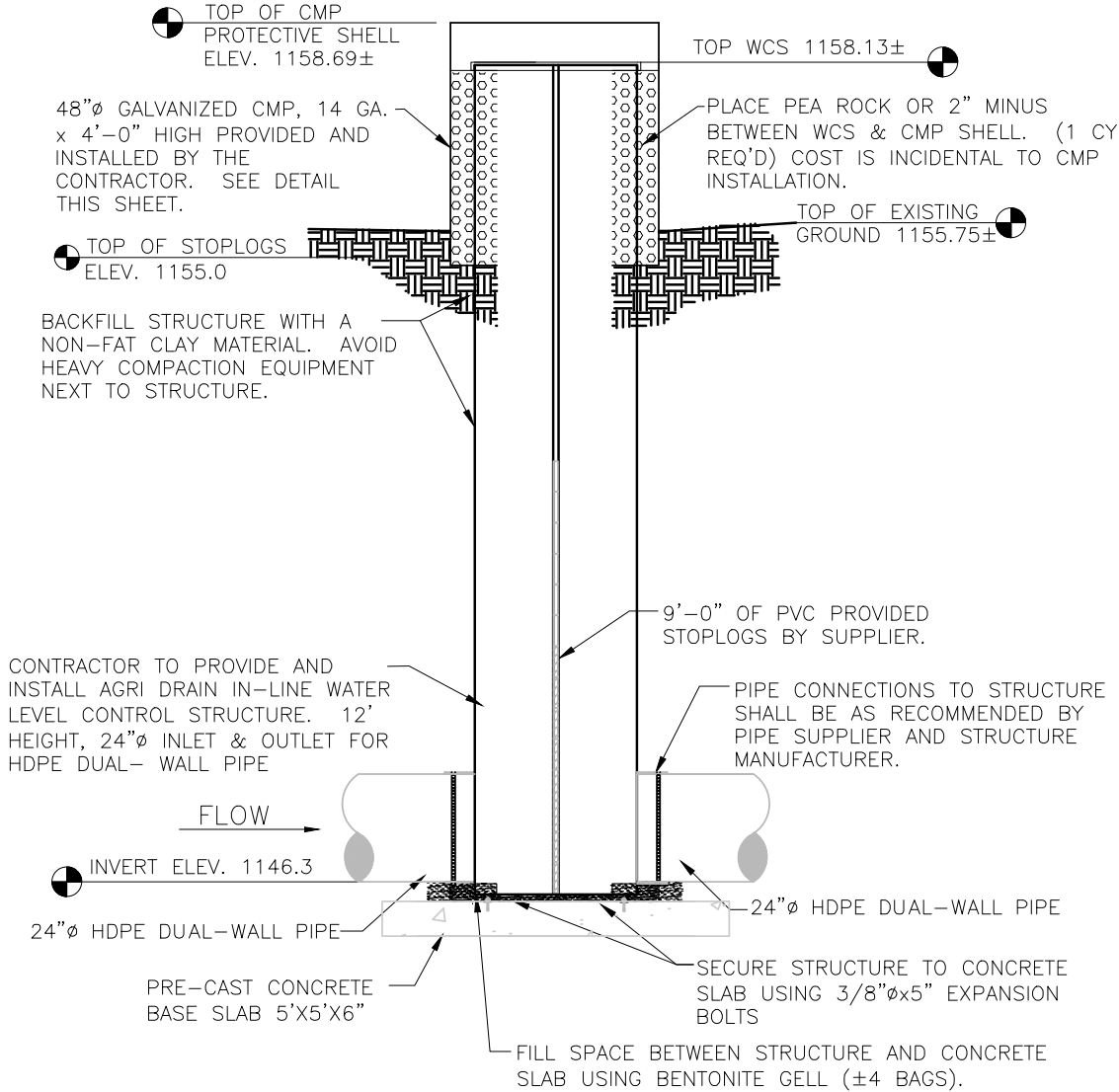
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SEEDING NOTE:
THE CONTRACTOR SHALL PROVIDE A FINAL FINISH SUITABLE FOR SEEDING ON ALL DISTURBED AREAS, AS DIRECTED BY THE DU FIELD ENGINEER. THE USFWS WILL COMPLETE THE SEEDING.

THESE CONSTRUCTION SITE SAFETY IS THE SOLE RESPONSIBILITY OF THE CONTRACTOR. DUCKS UNLIMITED, INC. SHALL NOT ASSUME ANY RESPONSIBILITY FOR THE SAFETY OF THE WORK PERFORMED. PERSONS ENGAGED IN THE WORK, NEARBY STRUCTURES, OR OF OTHER PERSONS ON-SITE. REPRESENTATION OR WARRANTY OF ANY KIND REGARDING THIS MATERIAL, DATA AND INFORMATION, INCLUDING, BUT NOT LIMITED TO, THE ACCURACY OF THE MATERIAL, DATA AND INFORMATION OR ITS SUITABILITY FOR ANY PURPOSE. ALL USE OF THE MATERIAL, DATA AND INFORMATION IS AT THE USER'S SOLE RISK. DUCKS UNLIMITED, INC. SHALL NOT BE RESPONSIBLE FOR ANY DAMAGE, LOSS, INJURY, OR DEATH, INCLUDING REASONABLE ATTORNEY'S FEES, ARISING OUT OF OR IN CONNECTION WITH THE USE OF THE MATERIAL, DATA AND INFORMATION. IT IS A VIOLATION OF LAW FOR ANY PERSON, UNLESS THEY ARE ACTING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER, ARCHITECT, LANDSCAPE ARCHITECT OR LAND SURVEYOR, TO ALTER IN ANY WAY, IN ANY MANNER, THE STAMP OF A LICENSED PROFESSIONAL, ALTERED, THE ALTERING ENGINEER, ARCHITECT, LANDSCAPE ARCHITECT OR LAND SURVEYOR SHALL STAMP THE DOCUMENT AND INCLUDE THE NOTATION "ALTERED BY FOLLOWED BY THEIR SIGNATURE, THE DATE OF SUCH ALTERATION, AND A SPECIFIC DESCRIPTION OF THE ALTERATION."

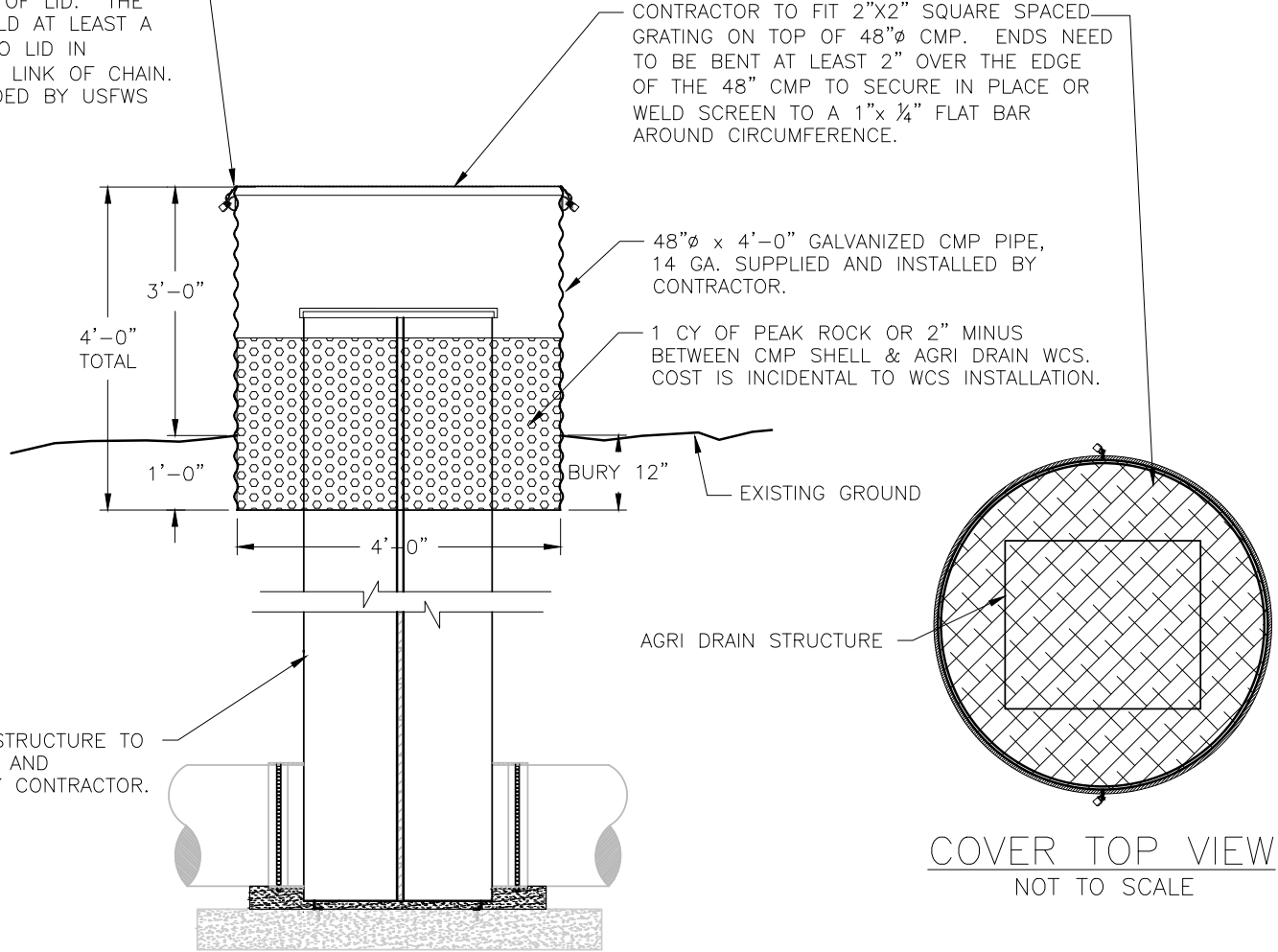
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THE COST OF AGRI DRAIN IN-LINE WATER CONTROL STRUCTURE INSTALLATION SHALL BE PAID AS BID ITEM "AGRIDRAIN WATER CONTROL STRUCTURE & COMPONENTS". THE BID AMOUNT SHALL INCLUDE ALL NECESSARY ITEMS FOR A COMPLETE INSTALLATION INCLUDING, BUT NOT LIMITED TO THE CONCRETE BASE, BENTONITE, EXPANSION BOLTS, STOPLOGS, & LIFTING HOOKS.

INLINE DRAWDOWN STRUCTURE – SECTION
NOT TO SCALE

CONTRACTOR TO WELD EITHER A D-HOOK OR A LINK OF CHAIN TO 48"Ø CMP FOR SECUREMENT OF LID. THE CONTRACTOR SHALL WELD AT LEAST A 6" LENGTH OF CHAIN TO LID IN LOCATION OF D-HOOK/ LINK OF CHAIN. PADLOCK TO BE PROVIDED BY USFWS IF DESIRED.



CMP PROTECTIVE SHELL – SECTION VIEW
NOT TO SCALE

GREAT LAKES/ATLANTIC REGIONAL OFFICE
7322 NEWMAN BOULEVARD, BUILDING 2
DEXTER, MICHIGAN 48130
(734) 623-2000
www.ducks.org

DUCKS UNLIMITED

APPX SEAL: DUCKS UNLIMITED, INC.
ON:

AGRIDRAIN WCS
MALLARD WPA
KOSSUTH COUNTY
IOWA

Revision	Sheet	Revisions	Date	By
0	95% PRELIMINARY SET	2-19-24	A.S.	
1	PERMIT REVIEW SET	3-18-24	A.S.	
2	ADDITIONAL FWS REVISIONS	4-22-24	A.S.	

CAD FILE:
SHEET 5 R1 2023

DESIGNED BY: A.S.

DRAWN BY: M.H.

SURVEYED BY: TRE

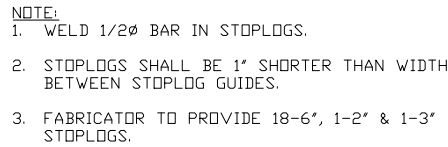
BIOLOGIST: M.S.

DATE:
4-22-24

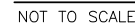
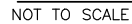
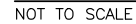
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US-IA-360-1

C302

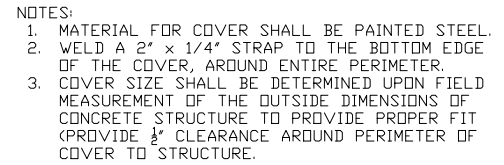
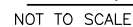
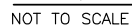
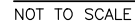
NOT FOR CONSTRUCTION



NOT TO SCALE



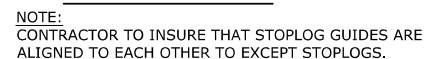
NOTE: L1 AND L2 EQUAL HEIGHT OF RISER PLUS 1' MAX LENGTH FOR EACH 5'. AFTER ADD A SECOND EXTENSION L3 2 PER STRUCTURE



NOT TO SCALE

NOTES:

1. CONTRACTOR SHALL PROVIDE SHOP DRAWINGS FOR CONCRETE STRUCTURE.
2. ALL PREPARATION, EXCAVATION, BEDDING ROCK MATERIAL, BACKFILL, AND ANY OTHER WORK NECESSARY TO COMPLETE STRUCTURE INSTALLATION SHALL BE CONSIDERED INCIDENTAL TO THIS WORK.



NOT TO SCALE

Appendix B: Drainage Petition

DRAINAGE PETITION

TO THE BOARD OF SUPERVISORS OF Kossuth COUNTY, IOWA:

The undersigned ask that a drainage Improvement, researching the possibility of replacing Laterals 1 & 11 in SDD 9/4 commencing at the current outlet into open ditch L-11 in the NW 1/4, Section 11 of Ramsey TWP.

and running thence north and slightly west for approximately 10,000 feet following the existing L-1 and L-11 tile mains.

and terminating at SE the junction box located in the SW 1/4, Section 36 of Harrison TWP - See Map on reverse side of this Petition.

be checked for feasibility of increasing drainage capacity and depth from the current 100+ year old system.

Your petitioners further state that the lands situated in S.D.D. 9/4 including acres within Harrison TWP sections 22,23,24,25,26,27,35 & 36, Ledyard TWP sections 30 & 31, Greenwood TWP section 1, and Ramsey TWP sections 6 & 7. Please refer to map on back of this Petition.

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.

Printed Land Owner Name

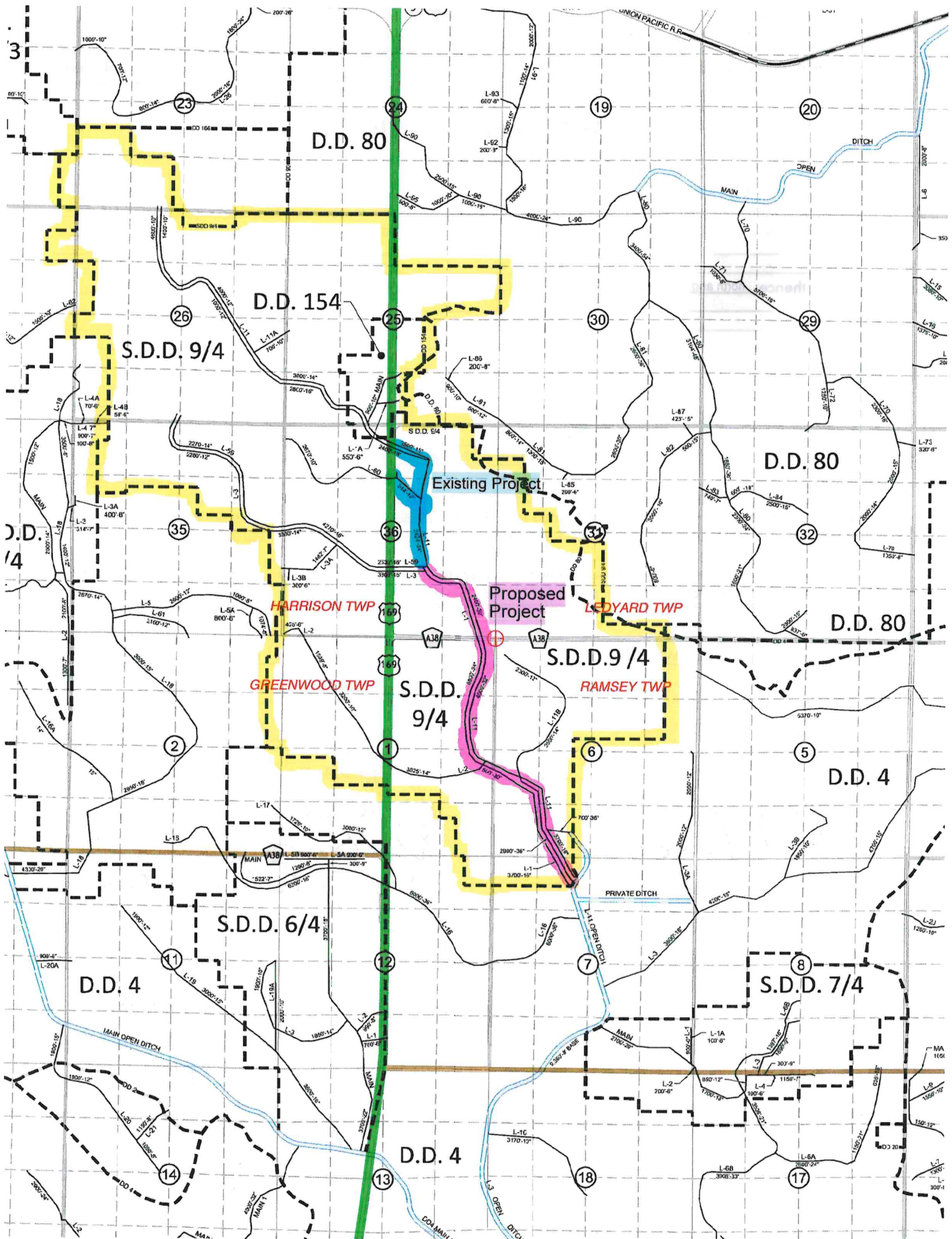
Rick E BauerJUNE M BauerJerry BauerKaren BauerDennis BauerRobert J BellChris Robb Art Rockler

Signature of Land Owner

Rick E BauerJune M. BauerJerry J BauerKaren K BauerDennis BauerRobert J Bell for Rick BauerChris RobbKOSSUTH COUNTY, IOWA
FILED

FEB 25 2025

TAMMY EDEN
COUNTY AUDITOR



D.D. 80

D.D. 154

S.D.D. 9/4

D.D. 80

Existing Project

Proposed Project

HARRISON TWP

LEDYARD TWP

GREENWOOD TWP

RAMSEY TWP

S.D.D. 9/4

S.D.D. 9/4

D.D. 80

D.D. 4

S.D.D. 6/4

D.D. 4

S.D.D. 7/4

D.D. 4

DRAINAGE PETITION

TO THE BOARD OF SUPERVISORS OF Kossuth COUNTY, IOWA:

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Printed Land Owner Name

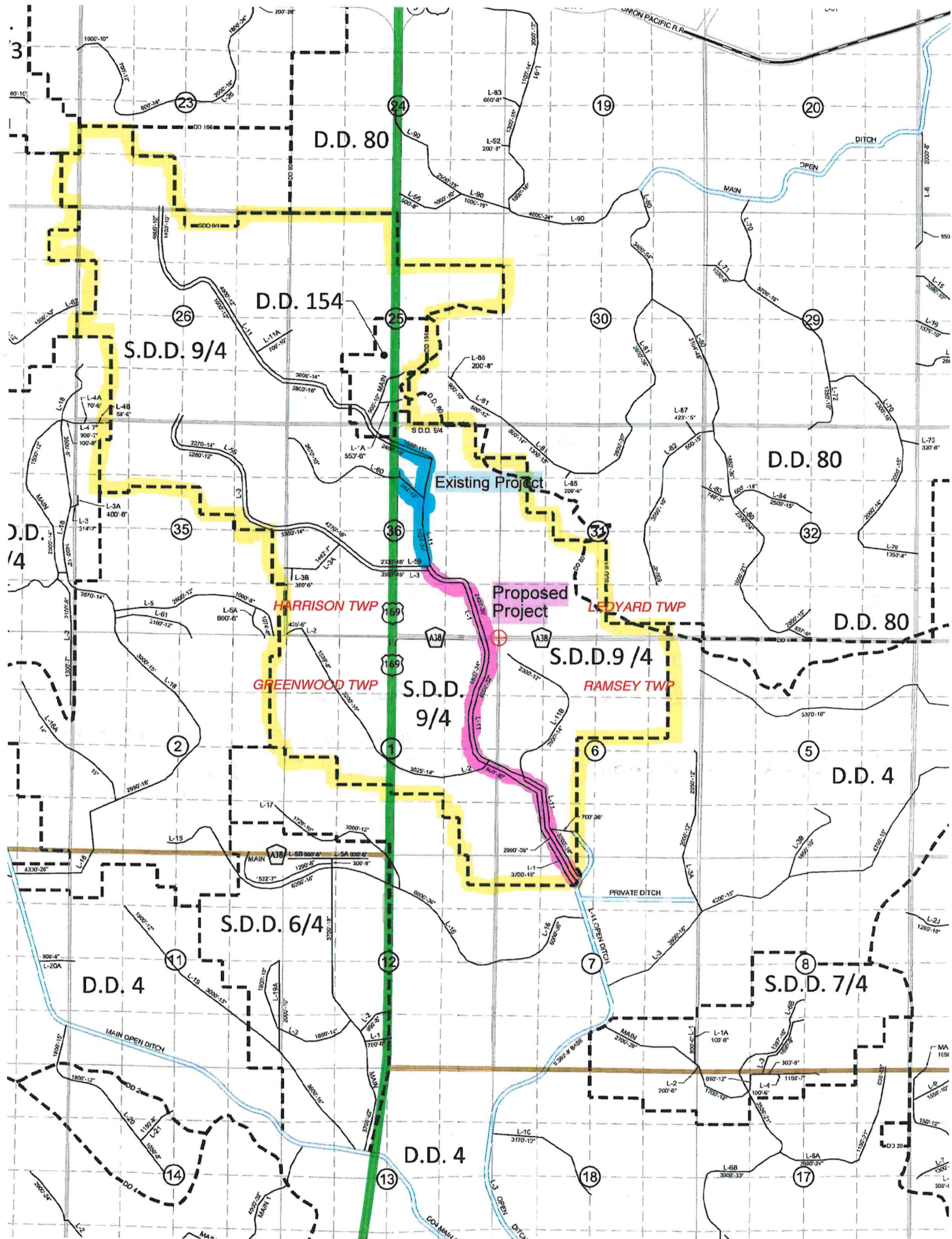
Ramon + Michelle Beenken BrantRichard L. ARNDORFER

Signature of Land Owner

Michelle Beenken Brant by
Daniel W. Beenken with permission
Richard L. ArndorferKOSSUTH COUNTY, IOWA
FILED

FEB 25 2025

TAMMY EDEN
COUNTY AUDITOR



Appendix C: Tile Capacities

COMBINED DISTRICT FACILITY CAPACITY
DRAINAGE COEFFICIENT
DRAINAGE DISTRICT NO. 4 LATERAL 11 & SUB DRAINAGE DISTRICT NO. 9 MAIN & LATERAL 1
KOSUTH COUNTY, IOWA

Drainage District No. 4 Lateral 11 & Sub Drainage District No. 9 of Drainage District No. 4 Combined Design Capacity												
Segment	Name	Station Start	Station End	Size (in)	Grade (%)	n	S (ft/ft)	A (ft)	P (ft)	R (ft)	Flow Capacity (cfs)	Combined Flow Capacity (cfs)
1	DD4 Lateral 11	0+00	29+00	36	0.050	0.013	0.0005	7.07	9.42	0.75	14.95	18.40
	Sub DD9 Main			16	0.050	0.013	0.0005	1.40	4.19	0.38	1.72	
	Sub DD9 Lateral 1			16	0.050	0.013	0.0005	1.40	4.19	0.38	1.72	
2	DD4 Lateral 11	29+00	37+00	32	0.050	0.013	0.0005	5.59	8.38	0.65	10.92	14.36
	Sub DD9 Main			16	0.050	0.013	0.0005	1.40	4.19	0.38	1.72	
	Sub DD9 Lateral 1			16	0.050	0.013	0.0005	1.40	4.19	0.38	1.72	
3	DD4 Lateral 11	37+00	42+00	32	0.03	0.013	0.0003	5.59	8.38	0.65	8.46	15.58
	Sub DD9 Main			30	0.03	0.013	0.0003	4.91	7.85	0.67	7.12	
	Sub DD9 Lateral 1			30	0.03	0.013	0.0003	4.91	7.85	0.67	7.12	
4	DD4 Lateral 11	42+00	69+00	32	0.03	0.013	0.0003	3.14	6.28	0.5	3.93	12.39
	Sub DD9 Main			24	0.03	0.013	0.0003	3.14	6.28	0.5	3.93	
	Sub DD9 Lateral 1			24	0.03	0.013	0.0003	3.14	6.28	0.5	3.93	
5	DD4 Lateral 11	69+00	93+00	30	0.03	0.013	0.0003	4.91	7.85	0.63	7.12	11.05
	Sub DD9 Main			24	0.03	0.013	0.0003	3.14	6.28	0.5	3.93	
	Sub DD9 Lateral 1			24	0.03	0.013	0.0003	3.14	6.28	0.5	3.93	
6	DD4 Lateral 11	93+00	100+00	24	0.03	0.013	0.0003	3.14	6.28	0.5	3.93	7.86
	Sub DD9 Main			24	0.03	0.013	0.0003	3.14	6.28	0.5	3.93	
	Sub DD9 Lateral 1			24	0.03	0.013	0.0003	3.14	6.28	0.5	3.93	
7	DD4 Lateral 11	100+00	118+40	24	0.03	0.013	0.0003	3.14	6.28	0.5	3.93	7.86
	Sub DD9 Main			24	0.03	0.013	0.0003	3.14	6.28	0.5	3.93	
	Sub DD9 Lateral 1			24	0.03	0.013	0.0003	3.14	6.28	0.5	3.93	
8	DD4 Lateral 11	118+40	125+40	18	0.03	0.013	0.0003	1.77	4.71	0.38	1.82	5.75
	Sub DD9 Main			18	0.03	0.013	0.0003	1.77	4.71	0.38	1.82	
	Sub DD9 Lateral 1			18	0.03	0.013	0.0003	1.77	4.71	0.38	1.82	
9	DD4 Lateral 11	125+40	135+00	18	0.03	0.013	0.0003	1.77	4.71	0.38	1.82	3.65
	Sub DD9 Main			18	0.03	0.013	0.0003	1.77	4.71	0.38	1.82	
	Sub DD9 Lateral 1			18	0.03	0.013	0.0003	1.77	4.71	0.38	1.82	
10	DD4 Lateral 11	135+00	138+40	18	0.06	0.013	0.0006	1.77	4.71	0.38	2.58	5.16
	Sub DD9 Main			18	0.06	0.013	0.0006	1.77	4.71	0.38	2.58	
	Sub DD9 Lateral 1			18	0.06	0.013	0.0006	1.77	4.71	0.38	2.58	
11	DD4 Lateral 11	138+40	149+40	16	0.06	0.013	0.0006	1.40	4.19	0.33	1.88	4.46
	Sub DD9 Main			16	0.06	0.013	0.0006	1.40	4.19	0.33	1.88	
	Sub DD9 Lateral 1			18	0.06	0.013	0.0006	1.77	4.71	0.38	2.58	

Segment Capacities	Drainage Area (ac)	Drainage Coefficient (in/day)	% of 1/2" Coefficient
18.40	2913	0.150	30%
14.36	2456.00	0.139	28%
15.58	2446.00	0.152	30%
12.39	1963.00	0.150	30%
11.05	1860.00	0.141	28%
7.86	1641.00	0.114	23%
7.86	996	0.188	38%

DISTRICT FACILITY CAPACITY
1/2" DRAINAGE COEFFICIENT
DRAINAGE DISTRICT NO. 4 LATERAL 11 & SUB DRAINAGE DISTRICT NO. 9 MAIN & LATERAL 1
KOSSUTH COUNTY, IOWA

Segment	Station Start	Station End	Size (in)	Grade (%)	n	Proposed Improvement Capacity							Drainage Area	Drainage Coefficient (in/day)	% of 1/2" Coefficient
						S (ft/ft)	A (ft)	P (ft)	R (ft)	Flow Capacity (cfs)					
1	0+00	29+00	60	0.050	0.012	0.0005	19.63	15.71	1.25	63.26			2913	0.517	103.4%
2	29+00	37+00	60	0.050	0.012	0.0005	19.63	15.71	1.25	63.26			2456	0.613	122.6%
3	37+00	42+00	60	0.030	0.012	0.0003	19.63	15.71	1.25	49.00			2446	0.477	95.4%
4	42+00	69+00	60	0.030	0.012	0.0003	19.63	15.71	1.25	49.00			1963	0.594	118.8%
5	69+00	93+00	60	0.030	0.012	0.0003	19.63	15.71	1.25	49.00			1860	0.627	125.4%
6	93+00	100+00	54	0.030	0.012	0.0003	15.90	14.14	1.13	37.00			1641	0.537	107.3%
7	100+00	118+40	48	0.030	0.012	0.0003	12.57	12.57	1	27.03			996	0.646	129.2%

Appendix D: Opinions of Probable Cost

Engineer's Opinion of Probable Cost
Drainage District No. 4
Lateral Tiles 11 Tile Improvement
Kossuth County, Iowa
2025

Division 1 - Lateral 11 - Work On Private Property -

Item	Description	Unit	Quantity	Unit Price	Total
101	Lateral Tile Connections, 10" Dia. Or Smaller	EA	15	\$400	\$6,000
102	Lateral Tile Connections, 12" Dia. Or Larger	EA	5	\$600	\$3,000
103	60" Dia. HDPE Elbow Section, Fabrication Only	EA	22	\$1,500	\$33,000
104	54" Dia. HDPE Elbow Section, Fabrication Only	EA	3	\$1,500	\$4,500
105	48" Dia. HDPE Elbow Section, Fabrication Only	EA	1	\$1,400	\$1,400
106	Spot Tile Exploration	HR	16	\$200	\$3,200
107	Trench Foundation Stone	TN	725	\$30	\$21,750
108	Drain Tile, Trenched, HDPE, 60" Dia.	LF	9,168	\$200	\$1,833,600
109	Drain Tile, Trenched, HDPE, 54" Dia.	LF	700	\$200	\$140,000
110	Drain Tile, Trenched, HDPE, 48" Dia.	LF	460	\$135	\$62,100
111	Fence Cuts	EA	2	\$100	\$200
112	Mobilization	LS	1	\$105,400	\$105,400
113	Construction Contingency	LS	1	\$220,850	\$220,850

Estimated Construction Cost \$2,435,000

Division 2 - Lateral 11 - Road Crossing 130th Ave. -Drainage Coefficient

Item	Description	Unit	Quantity	Unit Price	Total
201	Drain Tile, Trenched, Class III R.C.P., 60" Dia.	LF	66	\$250	\$16,500
202	Traffic Control	LS	1	\$100	\$100
203	Safety Closure	EA	2	\$1,500	\$3,000
204	Seeding and Fertilization (Rural)	AC	0.1	\$5,000	\$500
205	Silt Fence, Installation and Removal	LF	200	\$5	\$1,000
206	Construction Contingency	LS	1	\$2,400	\$2,400

Estimated Construction Cost \$23,500

Division 3 - Lateral 11 - Road Crossing 400th St. - Drainage Coefficient

Item	Description	Unit	Quantity	Unit Price	Total
301	Drain Tile, Trenched, Class III R.C.P., 60" Dia.	LF	66	\$250	\$16,500
302	Traffic Control	LS	1	\$100	\$100
303	Safety Closure	EA	2	\$1,500	\$3,000
304	Seeding and Fertilization (Rural)	AC	0.1	\$5,000	\$500
305	Silt Fence, Installation and Removal	LF	200	\$5	\$1,000
306	Construction Contingency	LS	1	\$2,400	\$2,400

Estimated Construction Cost \$23,500

Estimated Construction Cost \$2,482,000

**Engineer's Opinion of Probable Cost
Drainage District No. 4
Lateral Tiles 11 Tile Improvement
Kossuth County, Iowa
2025
Non-Construction Costs**

Construction Related Damages	\$22,000
Basic Engineering Services	
Survey, Study & Report, Meetings & Hearing	\$30,000
Wetland Regulations Administration	\$5,000
Reclassification	\$35,000
Construction Plans, Specifications, & Bid Letting	\$60,000
Construction Engineering Services, Staking, & Inspection	\$55,000
Legal Services, Publications, Mailings, Etc..	\$3,900
Finance, Interest & Contingency	<u>\$124,100</u>
Estimated Total Non-Construction Costs	\$335,000
Estimated Total Project Cost - Drainage Coefficient Lateral 11 Improvement	\$2,770,000
Estimated Average Cost Per Benefited Acre (2,913)	\$951
Estimated Average Cost Per Acre Per Year (10 years, 5% interest)	\$117.28
Estimated Average Cost Per Acre Per Year (20 years, 5% interest)	\$72.67

**Engineer's Opinion of Probable Cost
Drainage District No. 4
Lateral Tiles 11 Tile Improvement
Kossuth County, Iowa
2025**

Open Ditch Improvement					
Item	Description	Unit	Quantity	Unit Price	Total
D1	Open Ditch Excavation	CY	99800	\$8.50	\$848,300.00
D2	Spoil Bank Leveling	STA	93	\$730.00	\$67,890.00
D3	Open Ditch Seeding & Fertilizing	STA	93	\$360.00	\$33,480.00
D4	CMP Tile Extension, 12" Dia.	LF	1000	\$39.00	\$39,000.00
D5	CMP Tile Extension, 15" Dia.	LF	500	\$45.00	\$22,500.00
D6	CMP Tile Extension, 18" Dia.	LF	200	\$52.00	\$10,400.00
D7	CMP Tile Extension, 24" Dia.	LF	100	\$66.00	\$6,600.00
D8	Exploratory Excavation	HR	24	\$270.00	\$6,480.00
D9	Crush Tile in Place	LF	11840	\$5.00	\$59,200.00
D10	Mobilization	LS	1	\$54,700.00	\$54,700.00
D11	Construction Contingency	LS	1	\$114,450.00	\$114,450.00
D12	Right-of-Way	AC	24.6	\$15,000.00	\$369,000.00
D13	Serverance	AC	400	\$1,000.00	\$400,000.00
Estimated Construction Cost					\$2,032,000

* Absent is the cost for road crossings

Appendix E: Preliminary Plans

CONSTRUCTION PLANS FOR

DRAINAGE DISTRICT NO.4

FACILITY REPAIRS

KOSSUTH COUNTY, IOWA

2025

GOVERNING SPECIFICATIONS

THE 2023 EDITION OF THE "SUDAS SPECIFICATIONS FOR PUBLIC IMPROVEMENTS" SHALL GOVERN.

IOWA DEPARTMENT OF TRANSPORTATIONS "STANDARD SPECIFICATIONS OF HIGHWAY AND BRIDGE CONSTRUCTION", SERIES 2015 AND ALL CURRENT GENERAL SUPPLEMENTAL SPECIFICATIONS AND MATERIALS INSTRUCTIONAL MEMORANDUM SHALL GOVERN AS REFERENCE.

ALL APPLICABLE FEDERAL, STATE, AND LOCAL LAWS AND ORDINANCES WILL BE COMPLIED WITHIN THE CONSTRUCTION OF THIS PROJECT.



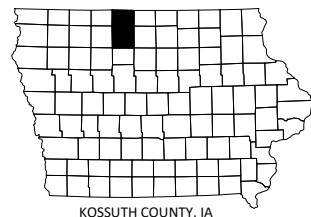
NOTE: EXISTING UTILITY INFORMATION SHOWN ON THIS PLAN HAS BEEN PROVIDED BY THE UTILITY OWNER. THE CONTRACTOR SHALL FIELD VERIFY EXACT LOCATIONS PRIOR TO COMMENCING CONSTRUCTION AS REQUIRED BY STATE LAW. NOTIFY IOWA ONE CALL 1-800-292-8989 OR 811

THE SUBSURFACE UTILITY INFORMATION IN THIS PLAN IS UTILITY QUALITY LEVEL D UNLESS OTHERWISE NOTED. THIS UTILITY LEVEL WAS DETERMINED ACCORDING TO THE GUIDELINES OF CI/ASCE 38-22, ENTITLED "STANDARD GUIDELINE FOR INVESTIGATING AND DOCUMENTING EXISTING UTILITIES".

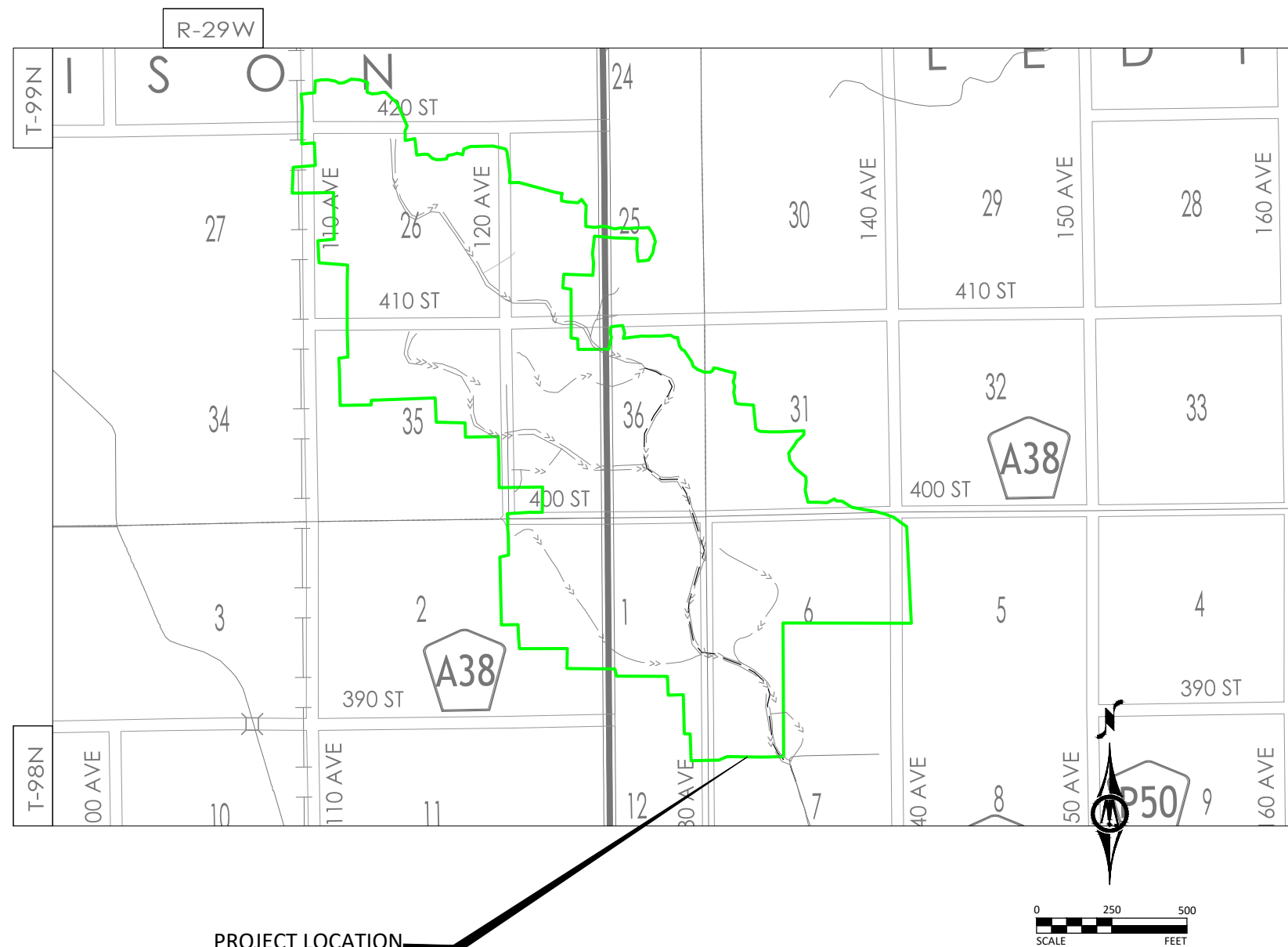
UTILITY CONTACTS

THE FOLLOWING ARE KNOWN, BUT NOT NECESSARILY THE ONLY UTILITY CONTACTS THAT SHOULD BE CONTACTED PRIOR TO BEGINNING OF EXCAVATION.

Company Name	Company Contact Name
Email	Email
Phone	Phone
Company Contact Name	
Email	
Phone	



KOSSUTH COUNTY, IA



PROJECT LOCATION

SHEET INDEX	
SHEET NO.	SHEET TITLE
A.01	TITLE SHEET
####	LANDOWNERS
M.01 - M.04	PLAN AND PROFILE

	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.	
	TYLER A. CONLEY, P.E.	
	LICENSE NUMBER: 25044	DATE: XX/XX/XXXX
	MY LICENSE RENEWAL DATE IS DECEMBER, 2025	
	PAGES OR SHEETS COVERED BY THIS SEAL: ALL SHEET	
PROJECT DATUM: IRCS1 HORIZONTAL: NAD83 VERTICAL: NAVD88		RECORD DRAWING INFORMATION OBSERVER: CONTRACTOR: DATE:

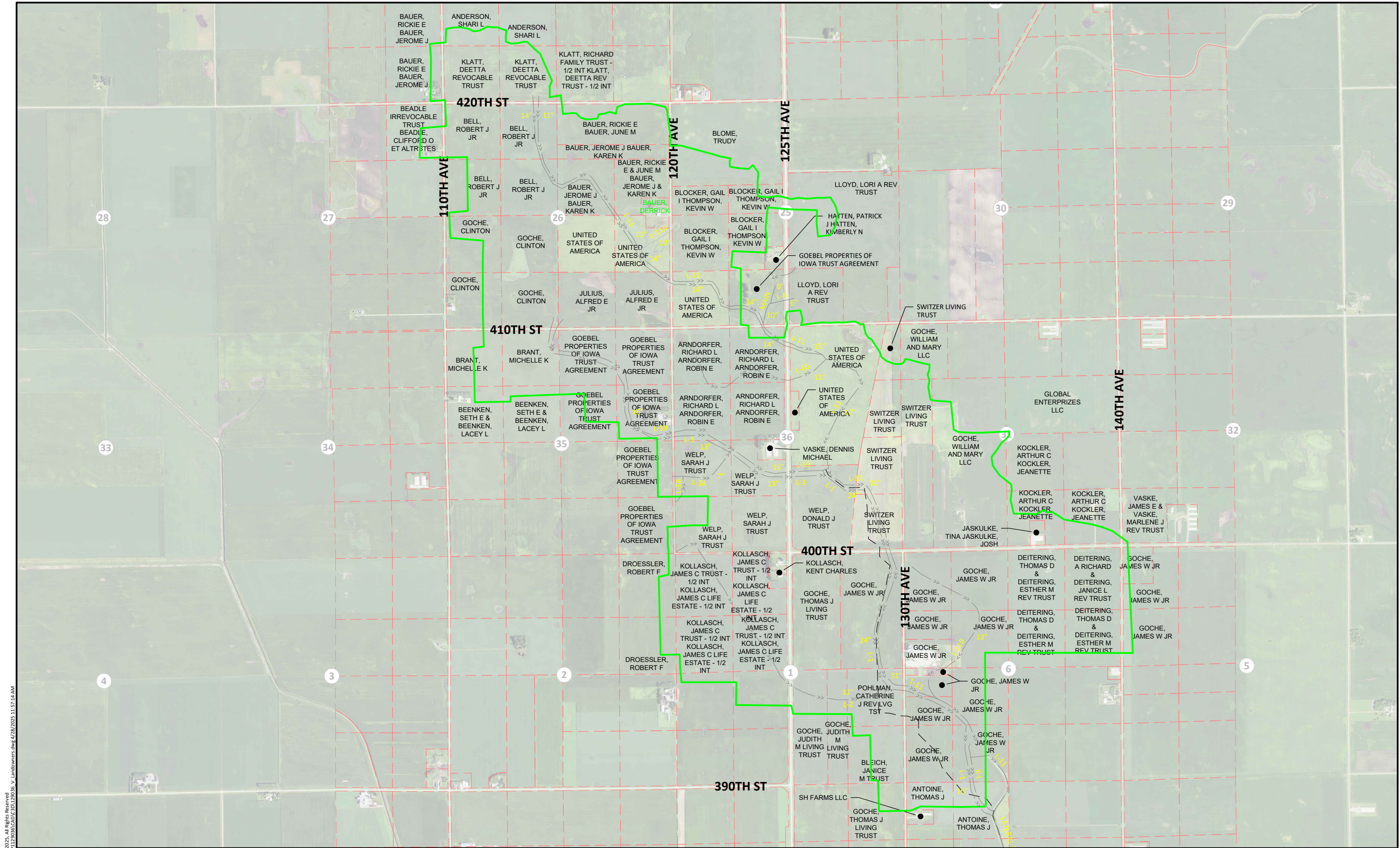


1609 US HWY 18 EAST
ALGONA, IA 50511
Phone: (515) 395-3140
Email: Algona@bolton-menk.com
www.bolton-menk.com

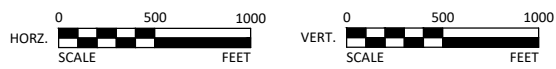
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DRAWN	ALR		
CHECKED	TAC/NRS		
CLIENT PROJ. NO.	0P1129036		

Kossuth County, Iowa
DD 4 REPAIRS
G0 - GENERAL

SHEET
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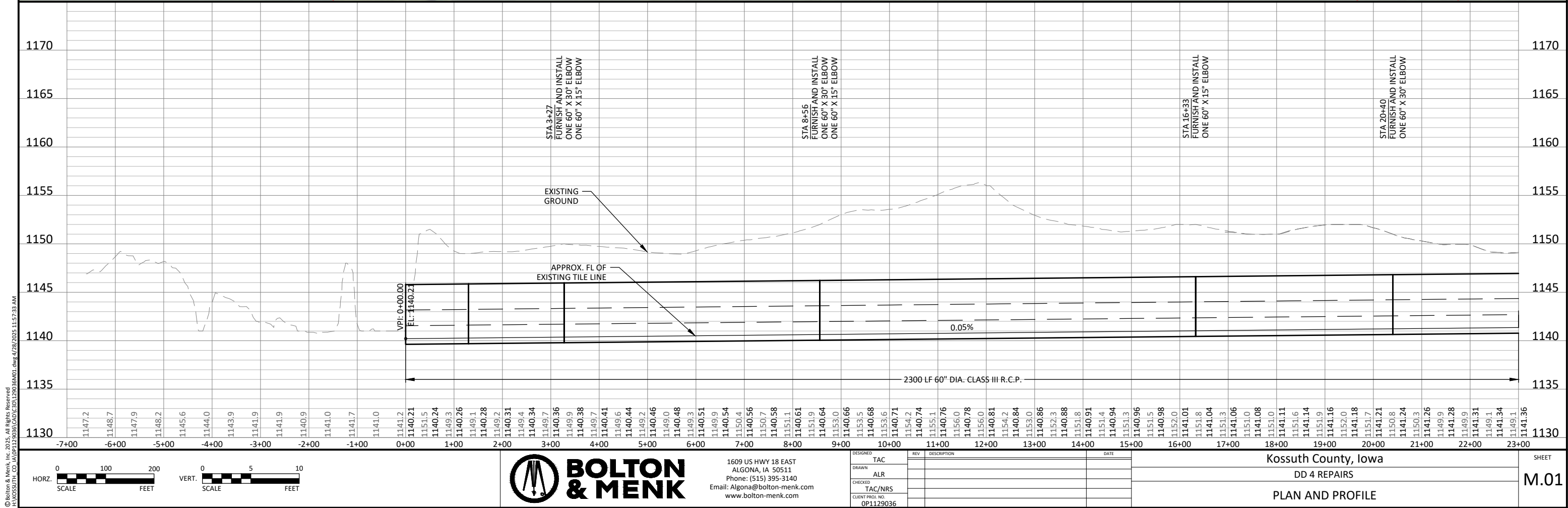
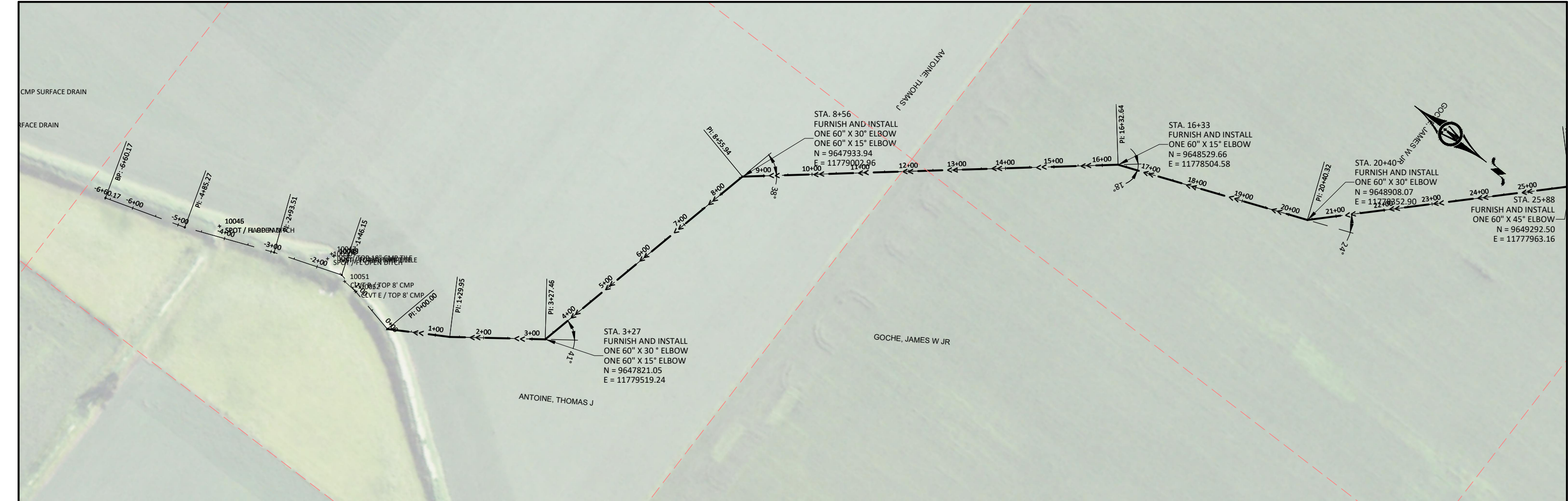


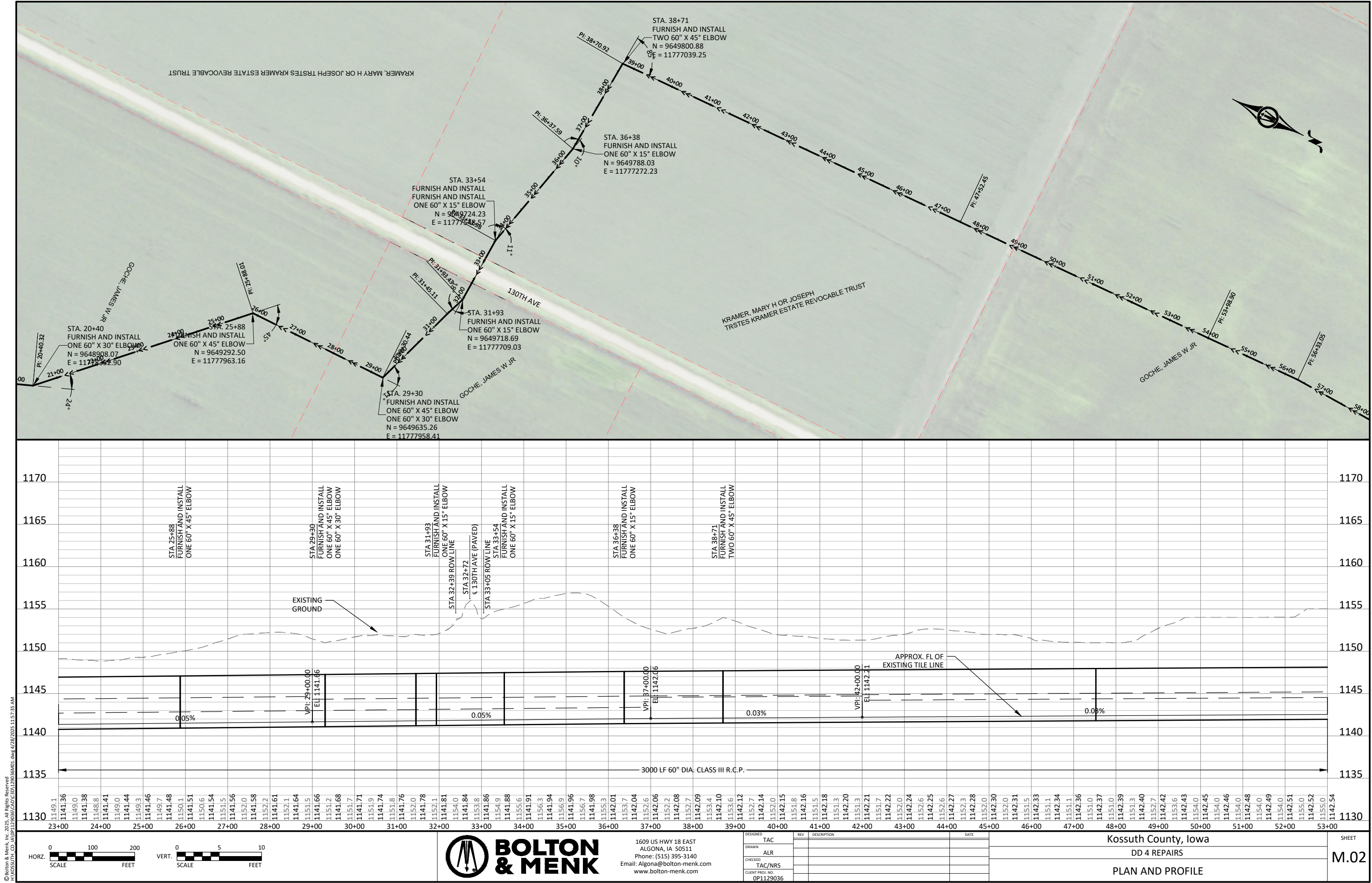
1609 US HWY 18 EAST
ALGONA, IA 50511
Phone: (515) 395-3140
Email: Algona@bolton-menk.com
www.bolton-menk.com

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DRAWN	ALR		
CHECKED	TAC/NRS		
CLIENT PROJ. NO.	0P1129036		

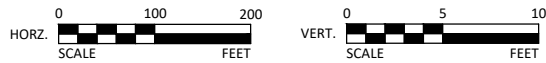
Kossuth County, Iowa
DD 4 REPAIRS
LANDOWNERS

SHEET
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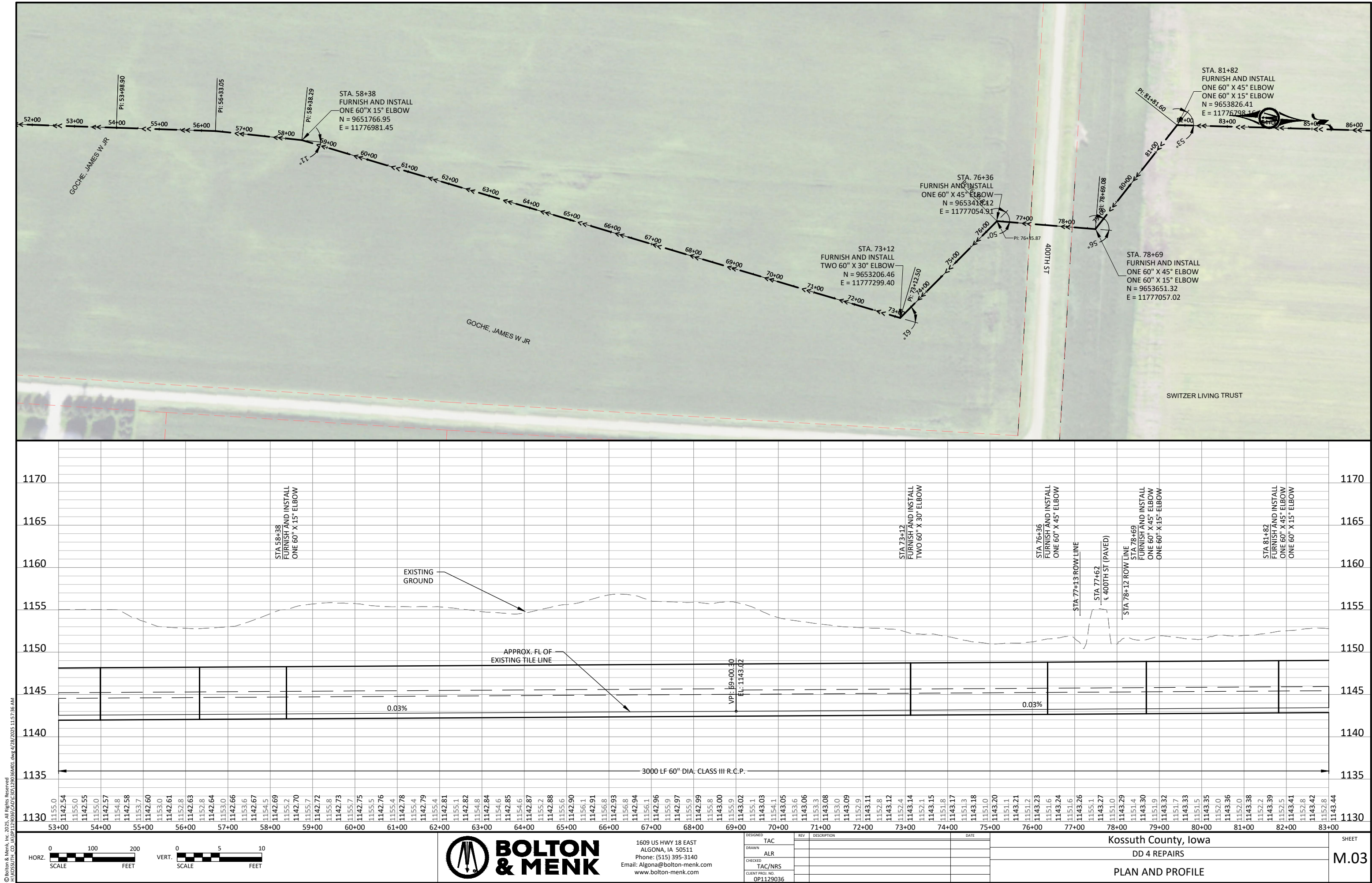
**BOLTON
& MENK**

1609 US HWY 18 EAST
ALGONA, IA 50511
Phone: (515) 395-3140
Email: Algona@bolton-menk.com
www.bolton-menk.com

DESIGNED	TAC	REV	DESCRIPTION	DATE
DRAWN	ALR			
CHECKED	TAC/NRS			
CLIENT PROJ. NO.	0P1129036			

Kossuth County, Iowa
DD 4 REPAIRS
PLAN AND PROFILE

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DRAWN	ALR			
CHECKED	TAC/NRS			
CLIENT PROJ. NO.	0P1129036			

Kossuth County, Iowa
DD 4 REPAIRS

PLAN AND PROFILE

SHEET
M.03

