

# REPAIR REPORT FOR:

## COUNTY DITCH NO. 55 REPAIR: FARIBAULT COUNTY, MINNESOTA

December, 2019

Project No. 18-22272

REPORT FOR:

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# Signature Sheet

I HEREBY CERTIFY THAT THESE CALCULATIONS WERE PREPARED BY ME OR UNDER MY DIRECT SUPERVISION AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MINNESOTA.



---

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**County Ditch No. 55 Repair**  
**Faribault County, Minnesota**

Engineer's Project Number: 18-22272

Dated this 31<sup>st</sup> day of December, 2019



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## PETITION AND PROJECT SCOPE

The Petition for Faribault County Ditch No. 55 (CD 55) includes cleaning portions of the Main open ditch and addressing routine maintenance items. The engineer is requested to determine the extent of repair items to the system, multi-purpose drainage designs, funding options, and providing a cost estimate. The section of the ditch included in the petition consists of 5,700 linear feet of open ditch that runs from the SW  $\frac{1}{4}$  of the SE  $\frac{1}{4}$  of Section 20 of Brush Creek Township to the SW  $\frac{1}{4}$  of the NW  $\frac{1}{4}$  of Section 29 of Brush Creek Township. A portion of the main open ditch in Section 24 of Emerald Township was also reviewed for potential repairs.

Faribault County Drainage Authority appointed ISG as the engineer and the subsequent order added no further requirements. Figure 1 shows the CD 55 watershed map with the petitioned repair area along with the additional area reviewed for repairs.

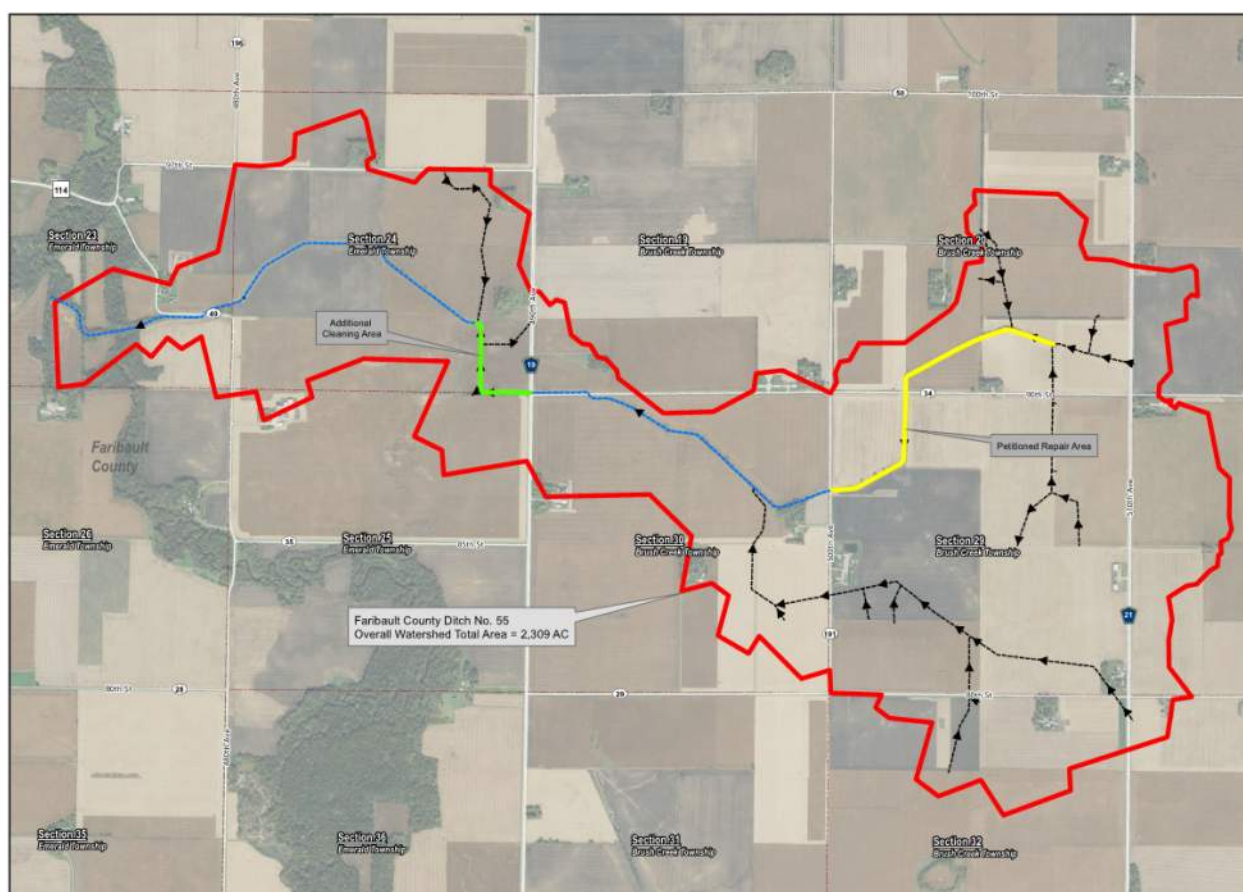


Figure 1. Repair Location Map

## LOCATION + WATERSHED

Faribault County Ditch No. 55 lies within Brush Creek and Emerald Township of Faribault County. The CD 55 Main open ditch drains from SW  $\frac{1}{4}$  of the SE  $\frac{1}{4}$  of Section 20 of Brush Creek Township and runs west to the NE  $\frac{1}{4}$  of the SW  $\frac{1}{4}$  Section 23 of Emerald Township where it outlets into the East Branch Blue Earth River. The Main open ditch has several public subsurface tile branches and no additional public open ditch branches.



The watershed provides drainage to approximately 2,309 acres and includes land from Sections 23, 24, and 25 of Emerald Township and Sections 19-21, 28-30, 32, and 33 of Bush Creek Township in Blue Earth County. Elevations within the watershed range from approximately 1091 to 1175 feet Mean Sea Level (MSL).

The hydrological soil classification of CD 55 watershed is predominantly type "C/D" soils which is considered a dual hydrologic soil group. This means that this soil has the potential to be adequately drained. The "D" in this group corresponds to the soil having over 40 percent clay and restricted water movement. The "C" is named the drained condition. This means that this area consists of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission which require artificial drainage to increase groundwater movement. Figure 2 shows the CD 55 watershed while additional watershed maps are included in Appendix A to illustrate the watershed information.

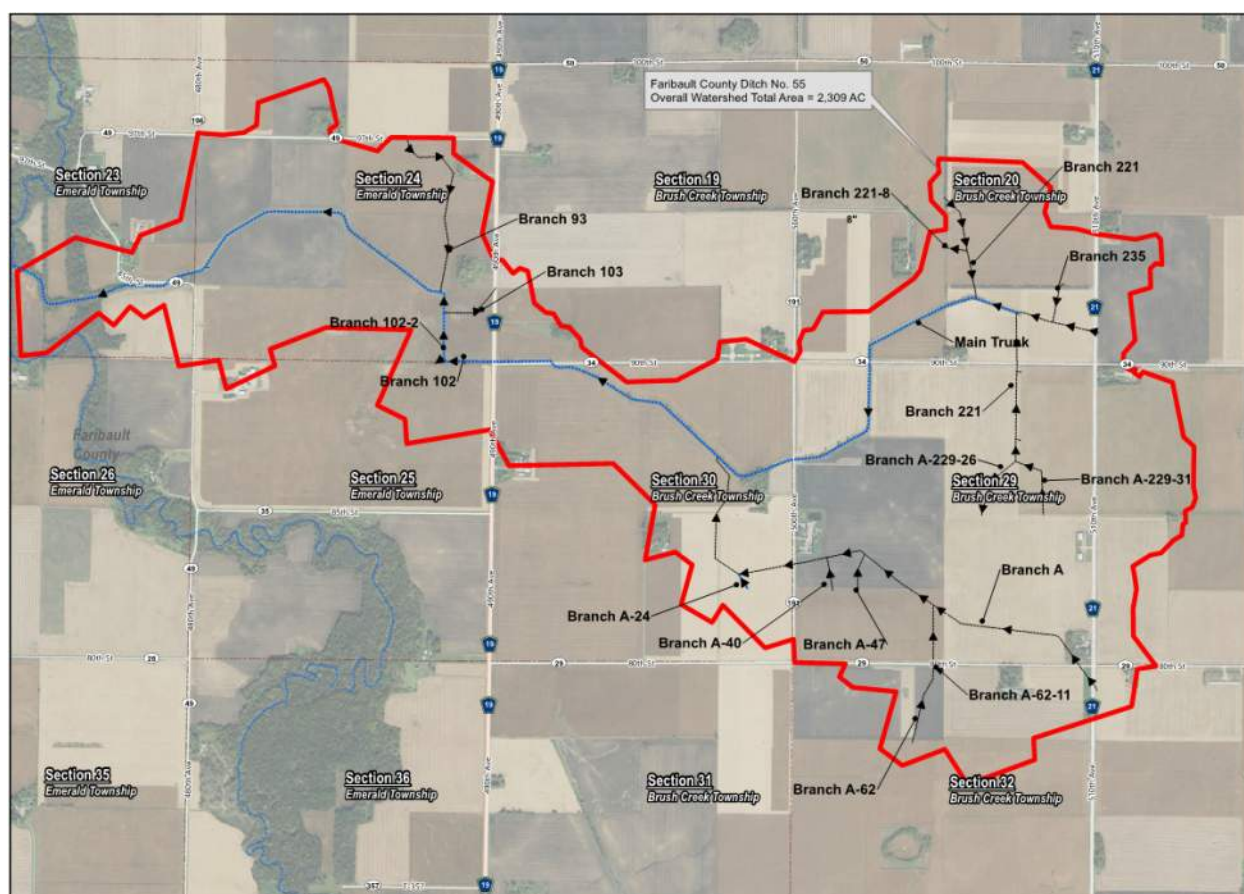


Figure 2. Faribault CD 55 Watershed Map

## HISTORY

Faribault County Ditch No. 55 was first constructed in 1920 with no knowledge of any major repairs or improvements for this system. The originally designed system included 23,200 linear feet of open ditch and 34,400 linear feet of buried tile. The entire 23,200 feet of open ditch was designed with an eight-foot wide bottom with grades ranging from 0.09% to 0.30%. A levy was constructed in 1921. In 1968, brush and trees were cleaned from the open ditch. There was levy repair work in 1953, 1963, 1969, 1980, 1981, and 1985.

## LEGAL GRADE DETERMINATION

To determine the extent to which the repair is to take place, a review of historical documents took place. The original profiles from 1920 gave relative elevations, but no datum elevation or benchmarks. To help determine the legal grade of the system, soil borings were completed in the Main open ditch. They were completed every 500-feet and in areas where the grade changes. Soil borings are intended to analyze the textural changes between fine loose material assumed to be accumulated sediment and a firm bottom assumed to be the original or improved ditch bottom, otherwise known as legal grade. A hand auger was drilled into the thalweg of the open ditch until a clay layer was noticed. The depth to clay layer and water depth was measured. Using a Trimble GPS unit, the water elevation was shot to spatially reference the soil boring. Using the elevation of the water level and the measurements from soil boring, the clay layer elevation can be calculated and used for analysis of the legal grade. Locations and elevations of soil borings are included on the plan and profile sheets in Appendix C while a *Soil Boring Map* is also included in Appendix A.

## EXISTING CONDITIONS

The CD 55 public drainage system consists of approximately 23,200 feet of open ditch and 34,400 feet of subsurface drainage tile. A close representation of the CD 55 watershed was created using the original profile and alignment drawings provided by Faribault County, a topographic survey conducted by ISG in Spring of 2019, LiDAR contours, and aerial photographs. The topographic survey was completed in the petition area in Sections 20 and 29 in Brush Creek Township, the repair area in Section 24 in Emerald Township, and downstream culverts. ISG flew a drone over the system in September, 2018 to assess the condition of the ditch.

Faribault County did an inventory on repair items throughout the CD 55 system. This included identifying tile outlets into the ditch, surface intakes of side inlets, and potential alternative side inlet (ASI) locations. Figure 3 shows this inventory which was utilized to determine the extents of repairs necessary to CD 55.

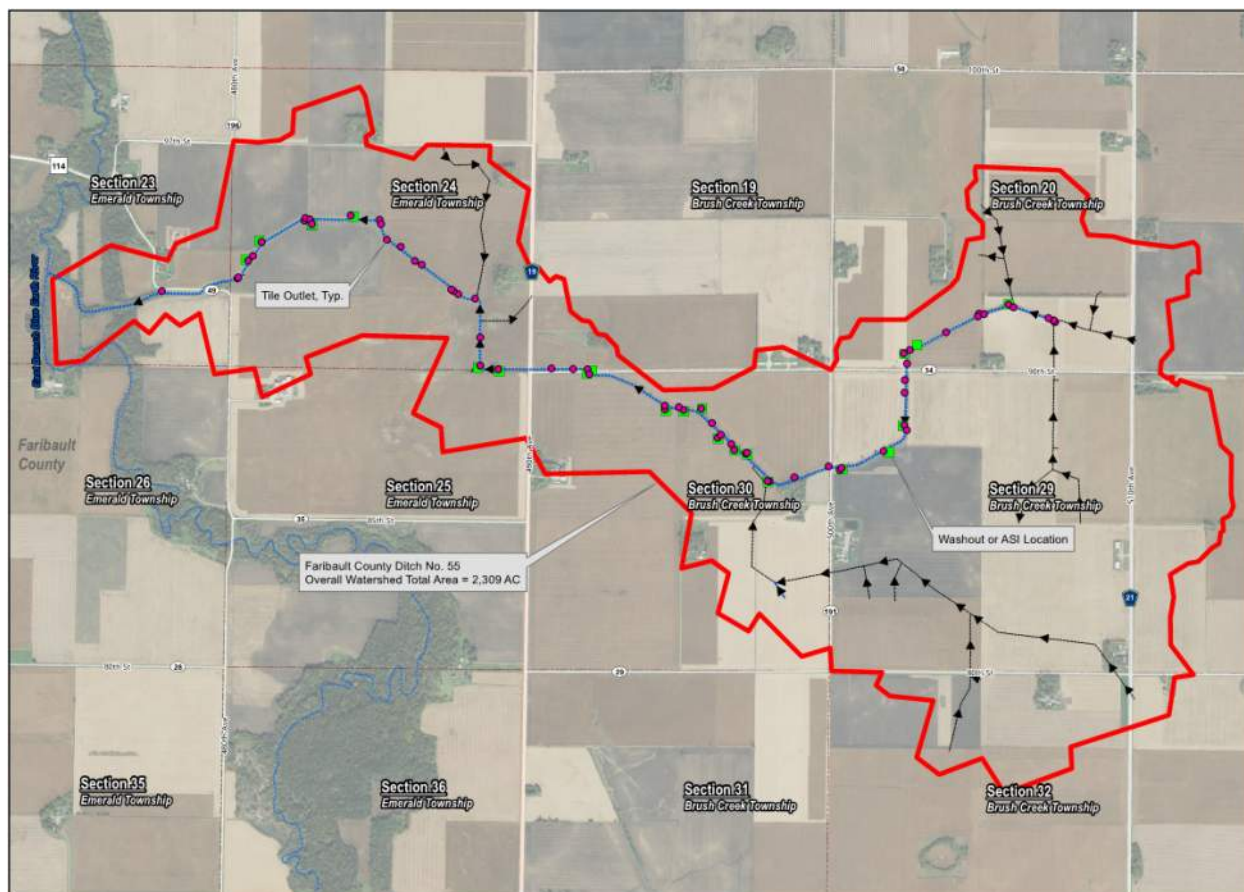


Figure 3. Faribault County Repair Inventory Map

## Sediment Accumulation & Vegetation Growth

After an analysis of soil borings and topographic survey, it was determined that CD 55 has accumulated sediment in the open ditch. The average depth of sediment over legal grade throughout the petition area is approximately 1.5 feet. Accumulated sediment restricts flow and can lead to vegetative growth. A stretch of ditch with accumulated sediment in the channel can be seen in Figure 4.





*Figure 4. Sediment accumulation in NW ¼ of Section 29 of Brush Creek Township*

The effects of vegetation in the open ditch vary depending on what type is present. Annual broadleaves and cattails in the open ditch impede flow and cause localized flooding during rain events. In many areas within the centerline of the channel there is dense vegetation growth that restricts the flow of water.

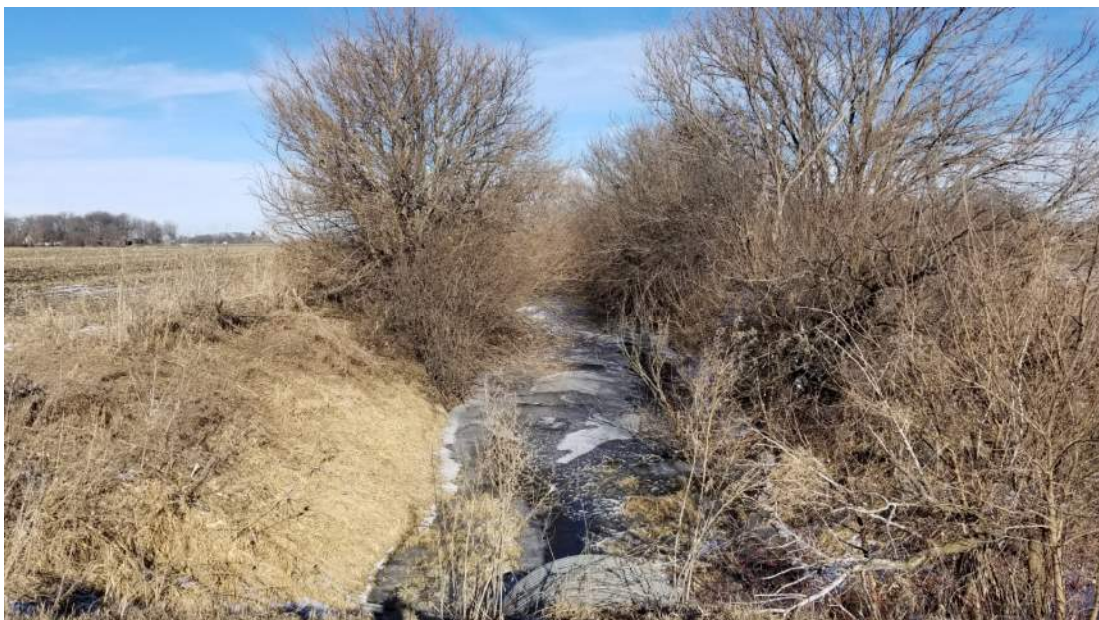
### Buffers

The Minnesota Buffer Law requires a 50-foot buffer along all public waters and a 16.5-foot (1-rod) buffer along public ditches. Buffer strips help prevent sloughing and sediment from entering into the open ditch. The majority of CD 55 contains the appropriate buffer and in some cases the buffer extends well beyond the 1-rod requirement. The buffer law was implemented in 2018 and CD 55 falls into the 1-rod buffer requirement. If any buffers are not compliant or are disturbed during construction, the 1-rod area will be re-seeded.

### Tree and Shrub

Tree and shrub growth along the open ditch contributes to erosion, sediment deposition, and flow restrictions. Trees and shrub in the open ditch create flow restrictions. Trees and shrub in the open ditch create flow restrictions and once vegetation is established can become overgrown and difficult to maintain quickly. Trees along the ditch banks at any time can lose limbs or even fall into the ditch causing flow restrictions. The trees also provide a canopy across the open ditch banks creating poor conditions for grasses and vegetation within the buffer to grow. This causes instabilities and is more susceptible to erosion. Perennial grasses along the ditch bank are more suitable as it provides dense root growth, which creates stable banks less susceptible to erosion. Figure 5 show an example of trees and shrubs in the open ditch and within the 16.5-foot buffer.





*Figure 5. Trees within Open Ditch Upstream of Field Culvert Crossing #8 in the SW ¼ of Section 20 of Brush Creek Township*

## Tile Outlets and Intakes

Many tile outlets within the open ditch are failing and causing or have the potential to cause erosion. Examples of failing tile outlets would include bent, broken, covered, crushed, or completely washed away tile outlets. Almost all tile outlets do not have riprap to protect the ditch banks. Figure 6 shows an example of the many tile outlets that are in poor condition and do not have riprap protection.



*Figure 6. Unprotected Tile Outlet in the SW ¼ of SE ¼ of Section 20 of Brush Creek Township*

## Sloughing

Sloughing was identified at various locations along the ditch. Sloughing occurs when the bank of the open ditch shears and collapses into the open ditch. The main causes of sloughing include overland flow overtopping the ditch bank, lack of buffer vegetation, steep side slopes, and meandering alignment of the open ditch. The sloughing deposits sediment into the CD 55 open ditch which restricts flow and requires maintenance. Figure 7 shows a bank slough on the Main open ditch.



*Figure 7. Bank Slough in the NW ¼ of SW ¼ of Section 24 of Emerald Township*

## Culvert Crossings

County Ditch No. 55 has a total of 9 culvert crossings. These include five road crossings and four field crossings. The crossings consist of both round culverts and box culverts. The box culverts at 480<sup>th</sup> Ave and 90<sup>th</sup> St are in good condition, but a number of the field crossings are made from corrugated metal pipe (CMP) and are in deteriorating condition. After the determination of legal grade, a few of the culverts have been determined to be above legal grade. Figure 8 shows the culvert at 90<sup>th</sup> Street (Section 20) which is over two feet above legal grade. Although Field Crossing #6 is not within the petition or proposed cleaning area, it was shown to be in poor condition and was determined to be above legal grade at the time of the drone flight in September, 2018 as seen in Figure 9.





*Figure 8. Culvert Crossing #8 at 90<sup>th</sup> Street in Section 20*



*Figure 9. Field Crossing #6 in Section 30 of Brush Creek Township*

## Existing Capacities

The capacity of agricultural drainage systems are expressed as a drainage coefficient in inches per day (in/day), and is defined as the depth of water over the entire area of the upstream watershed that a tile, culvert, or open ditch can drain within a 24-hour period. For a system like CD 55, the industry standard recommends a drainage coefficient of 1.00 in/day for crossings along open ditch systems.

Table 1 summarizes the existing open ditch culvert capacities of the existing CD 55 system. Also included in the table is the depth each culvert is above legal ditch grade. Crossing locations can be identified on the *Culvert Map* in Appendix A.

*Table 1: Existing Open Ditch Culvert Capacities*

Crossing #	Location	Proposed Type	Existing Material	Existing Size (in)	Existing Width (ft)	Existing Height (ft)	Depth Above Legal (ft)	Existing Slope (%)	Drainage Area (Acres)	Existing Drainage Coefficient (in/day)
1	Field	ROUND CULVERT	CMP	48	-	-	-	Unknown	2318	Unknown
2	480th Ave	BOX CULVERT	RCP	-	10	8	1.4	0.09%	2226	4.95
3	Field	ROUND CULVERT	CMP	62	-	-	1.93	0.30%	1880	0.79
4	490th Ave	ROUND CULVERT	WOOD	-	10	10	0.86	0.01%	1678	1.41
5A	90th St	BOX CULVERT	RCP	-	8	5	0.39	0.01%	1625	0.69
5B	90th St	BOX CULVERT	RCP	-	8	5	0.39	0.09%	1625	2.08
5 Total										2.77
6	Field	ROUND CULVERT	CMP	72	-	-	0.69	0.17%	1514	1.04
7	500th Ave	ROUND CULVERT	RCP	-	10	10	1.19	0.05%	845	5.85
8	90th St	ROUND CULVERT	CMP	80	-	-	2.54	0.09%	654	1.74
9	Field	ROUND CULVERT	CMP	72	-	-	0.47	0.09%	594	1.41

Most of the culvert crossings along the Main open ditch are above the 1.0 in/day drainage coefficient, however four are over 1-foot above legal grade.

## REPAIRS

The following paragraphs summarize the necessary repairs of the CD 55 system. Detailed repair plans and profiles were prepared as part of this report which identifies and shows the locations of the repairs slated for this project and are located in Appendix C. Formal construction plans will be completed after approval from the Drainage Authority. More photos and video can also be viewed to support the existing conditions and proposed repairs. Aerial images from the drone flight can be seen in Appendix D.

An informational meeting was held with landowners in the CD 55 watershed in December of 2019 where repairs of the system were discussed. After thorough review and discussions, an alternative was prepared by the landowners based and staff based on their review of the system and necessary repairs. Figure 10 summarizes those repairs develop while more details are provided in the following repair items.



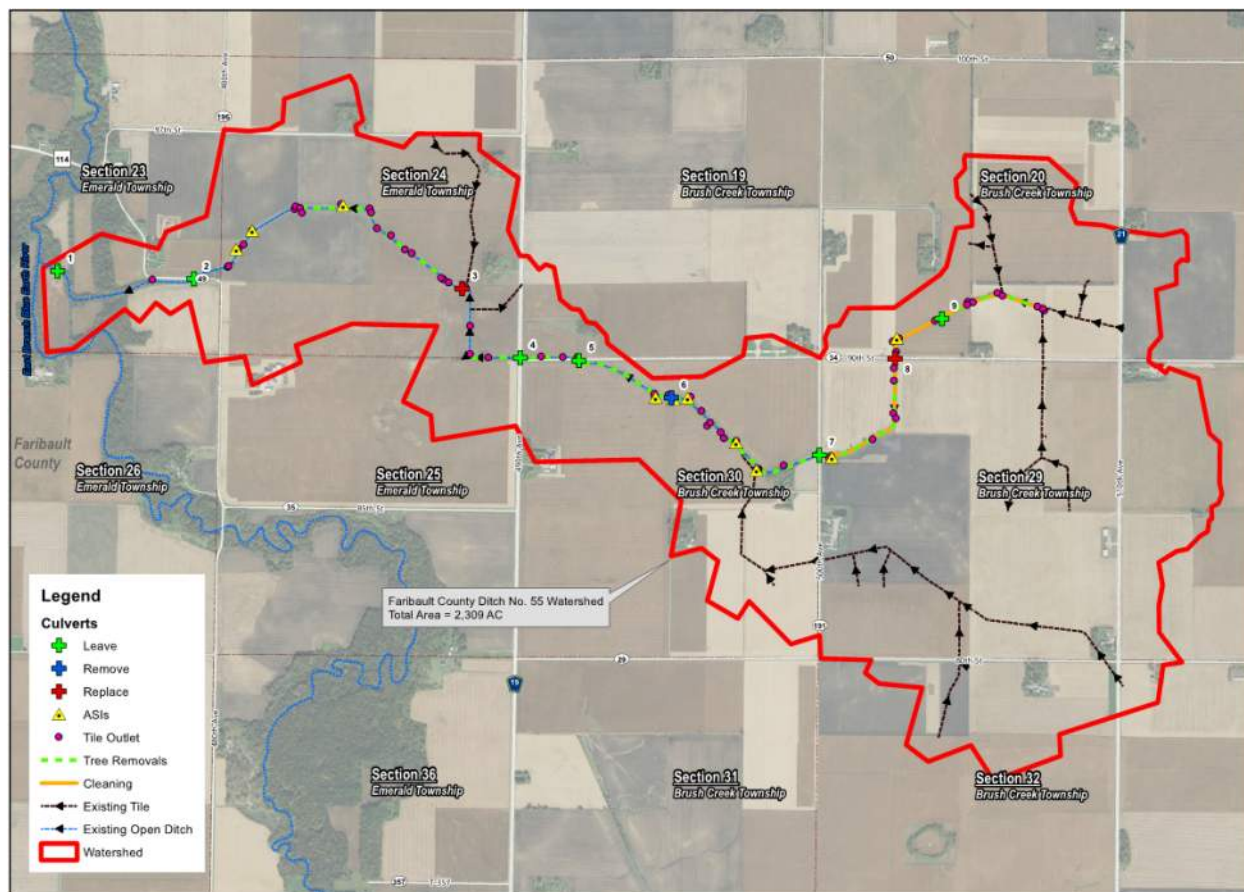


Figure 10. Landowner Developed Repair Option

## Open Ditch Cleaning

The topographic survey of the open ditch revealed that a majority of the open ditch has accumulated sediment in the channel bottom above legal grade. The accumulated sediment has led to vegetation growth and bank erosion within the channel. Cleaning the petition area will include 5,700 linear feet of open ditch cleaning within Section 20 and 29 of Brush Creek Township.

With repairs to Field Crossing #3 in Section 24 and Culvert Crossing #4 at CSAH 19/490<sup>th</sup> Ave; the 2,100 feet of ditch between these two crossings was reviewed for potential repairs due to the accumulated sediment and culvert lowering. With the lowering of the field culvert in this section, the open ditch could be cleaned to restore the flow to the legal conditions. However, the sediment accumulation downstream of the field crossing is still higher than the proposed lowered elevation of the culvert. This would restrict flow upstream of the field crossing for approximately 900 feet which is half of the proposed cleaning in this area. It is not until 1,200 feet downstream of the field crossing where grade matches the legal culvert elevation. Therefore, additional cleaning downstream of the field culvert would be required to fully restore legal flow in this section of ditch.

## Two-Stage Ditch Cleaning

An alternative to standard open ditch cleaning was reviewed in Section 20 and 29 given the characteristics of the open ditch. This stretch of open ditch has an existing channel bottom significantly wider than the legal channel bottom. In lieu of a standard ditch repair, a two-stage repair alternative is reviewed for better long term maintenance while still providing adequate drainage.

The proposed two-stage ditch design is based on natural channel geomorphology and stream-floodplain connection. The two-stage ditch is designed to convey the perennial flows through a smaller channel cleaned at a legal ditch grade while utilizing the outer channel or the existing wide channel as floodplain flow. This design will have higher velocities in the inner channel which will transport sediment more effectively. The larger outer channel will convey larger flows at floodplain stage without affecting the legal capacities of the ditch. As a result, less sedimentation, erosion, and bank failures are anticipated which will result in less long term ditch maintenance.

The two-stage ditch was designed so that the floodplain is 3 to 5 times wider than the top of the inner channel. Because of this, there will be two designs for different sections of the two-stage ditch cleaning to accommodate different bench widths. From Station 198+00 to 210+00, the inner channel will have a 2-foot bottom width. From Stations 210+00 to 228+00, the inner channel will have a 1.5-foot bottom width. In order for an adequate inner channel width to bench width ratio, the sideslopes are designed with 1:1 sideslopes. The same methodology can be utilized for the open ditch in Section 29, using a bottom width of 2-foot if the standard open ditch cleaning is not selected.

Figure 11 shows a section of the ditch proposed to be cleaned as a two-stage ditch and Figure 12 shows a typical two-stage ditch cross section.



*Figure 11. Proposed two-stage ditch segment in SE ¼ of SW ¼ of Section 20 of Brush Creek Township*

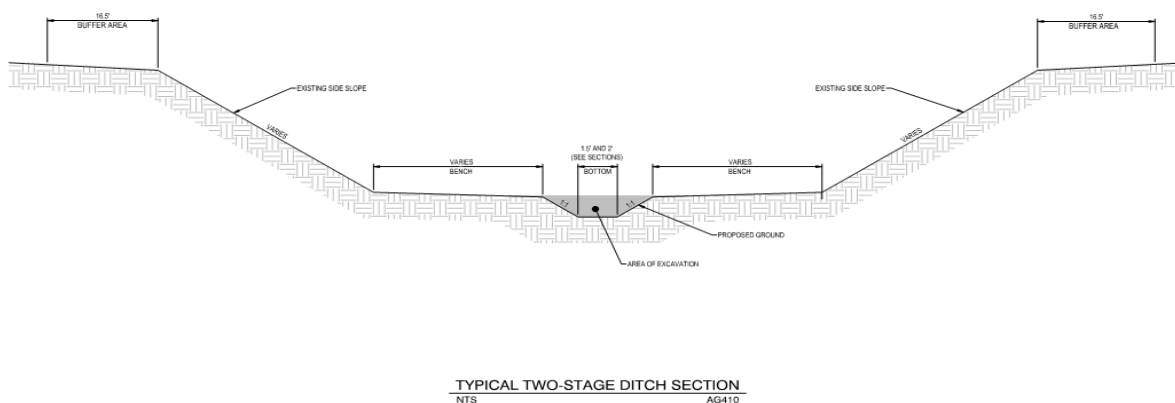


Figure 12. Typical two-stage ditch section

## Tree, Bush, and Shrub Clearing

Well established trees, brush and shrubs were identified along the banks of the open ditch throughout the watershed. The repair will include removing these obstructions to prevent future erosion of the ditch banks. The amount of tree clearing was estimated using aerial photos, topographic survey, and drone footage. Major tree clearing and grubbing is recommended in Section 30 of Brush Creek Township where well developed trees are fully grown on both sides of the ditch bank. Beaver dams are very likely in this area with the trees and have been a nuisance throughout the years.

Tree removals are also recommended in Section 24 of Emerald Township and Section 20 of Brush Creek Township. While the trees are not as dense as in Section 30, heavy tree growth is still observed and can lead to bank instabilities. Heavy vegetation is also well developed in Section 23 of Emerald Township, however does not pose a major flow restriction or erosion at this point and are not required to be removed.

## Topsoil Stripping

Topsoil stripping is recommended in areas where large volumes of sediment are necessary to be cleaned from the open ditch and where high banks exist. With large volumes of sediment to be cleaned, the spoils will not be able to be piled up within the buffer area and retain a stable bank. In order to accomplish a clean out with large volumes at a deep depth and to maintain stable banks, the spoils will be spread outside the buffer area to a distance up to 50-feet from the top of the bank.

The topsoil will be stripped 12-inches deep or the depth of the existing topsoil from the edge of the buffer to the 50-foot offset from the top of the ditch bank. The lower side of the ditch bank will be selected for topsoil stripping to avoid over piling spoils on the higher and potentially unstable side. Spoils from ditch cleaning will be placed and graded in these areas and the stripped topsoil will be reclaimed on top of the spread spoils. If little to no topsoil exists in these areas and the sediment removal is purely organic, topsoil stripping may be adjusted and spoils will be spread out to the 50-foot offset per landowner's permission.

Temporary damages will be paid for the areas where topsoil stripping and spoil placement occurs for disturbance to the agricultural land and is estimated at 3.09 acres.

Areas identified where topsoil stripping is recommended include from Station 102+00 to 111+00 on the north side of the ditch and from Station 172+00 to 190+00 on the south side of the ditch in Section 29 of Brush Creek Township. It should be noted that if a two-stage ditch cleaning is selected in this stretch of ditch in lieu of standard cleaning; topsoil stripping would not be required.

## Slough Repairs

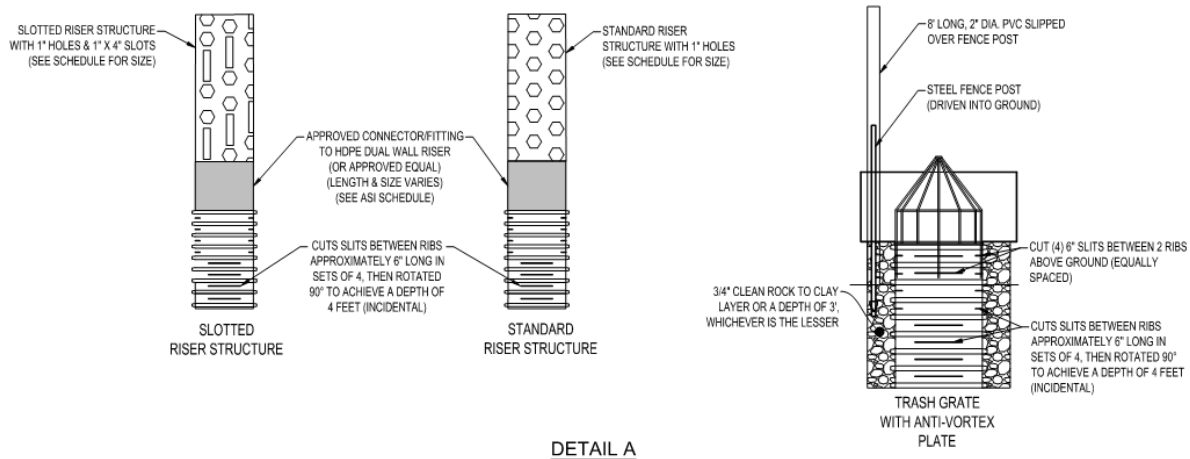
The drone and topographic survey revealed ditch bank sloughing and erosion throughout CD 55. Slough repairs will include re-establishing a stable ditch bank where a slough or erosion is occurring and will also include seeding the repaired area. Further slough repairs may be necessary based on the condition of the banks when construction is occurring.

## Tile Outlet Repairs

All tile outlets into the open ditch will be replaced or repaired as part of this project where construction occurs. Some of the tile outlets are in good shape and only require riprap protection on geotextile fabric; however some tiles are bent, broken, or completely washed away causing erosion to the ditch banks. The repair of damaged tiles will consist of replacing the damaged outlets into the ditch with a section of new tile and protecting the tile from erosion.

## Alternative Side Inlets

Locations along the ditch where there are large concentrated flows with the potential to cause erosion issues will be improved with either an Alternative Side Inlet (ASI) or Alternative Side Inlet with riprap overflow (ASIRO). Both of these implement the same tactics as the originally placed side intakes while protecting the pipe and ditch bank and prevent sediment from entering the open ditch. In addition, the riprap and ditch berm allow the surface water to temporarily pond on the backside of the ditch bank to remove sediment and prevent erosion through the ditch. A detail of an ASI is shown in Figure 13 as well as in the preliminary construction plans in Appendix C. The new alternative side inlets are to be constructed entirely within the buffer strip which will keep them out of the path of equipment as much as possible.





**NOTES:**

INTAKE TYPE & TILE SIZE VARIES PER ASI. (SEE SCHEDULE)

RISER ASSEMBLY SHALL BE A SEPARATE PAY ITEM THAN THE OUTLET ASSEMBLY.

ALL DISTURBED AREAS WITHIN BUFFER EASEMENT SHALL BE SEEDED WITH BUFFER BLEND SEED MIX ON CATEGORY III EROSION CONTROL BLANKET.

ALL EFFORTS SHALL BE MADE TO SEPARATE SOIL TYPES. BACKFILL SHALL BE COMPACTED PRIOR TO PLACEMENT OF TOPSOIL, EXCEPT THE TOP TWO (2) FEET, FOR WHICH COMPACTION SHALL BE MINIMIZED TO THE EXTENT POSSIBLE. TOPSOIL SHALL BE PLACED TO A MINIMUM DEPTH OF 6", OR UNIFORM TO THE TOPSOIL DEPTH OF THE SURROUNDING AREA. ALL EFFORTS SHALL BE MADE TO KEEP TOPSOIL ON TOP AND SEPARATED. NO TOPSOIL SHALL BE PLACED IN THE TRENCH BELOW 2' FROM EXISTING GROUND UNLESS APPROVED BY THE ENGINEER.

ALL INTAKES SHALL BE WRAPPED WITH NON-WOVEN GEOTEXTILE FABRIC. (INCIDENTAL TO RISER ASSEMBLY)

ALL SLITS CUT INTO RISER ARE INCIDENTAL TO RISER ASSEMBLY.

ALL 3/4" CLEAN ROCK IS INCIDENTAL TO RISER ASSEMBLY.

ALL OUTLET RIPRAP IS INCIDENTAL TO OUTLET ASSEMBLY.

INTAKES SHALL BE FIELD ADJUSTED BASED ON ACTUAL LOCATION OF LOW AREAS, AS DETERMINED BY THE ENGINEER.

TILE OUTLET ASSEMBLY SHALL CONFORM TO STANDARD TILE INSTALLATION.

SHAPING OF LOW AREA TO GRADE TO DROP INTAKE SHALL BE INCIDENTAL TO PAY ITEM.

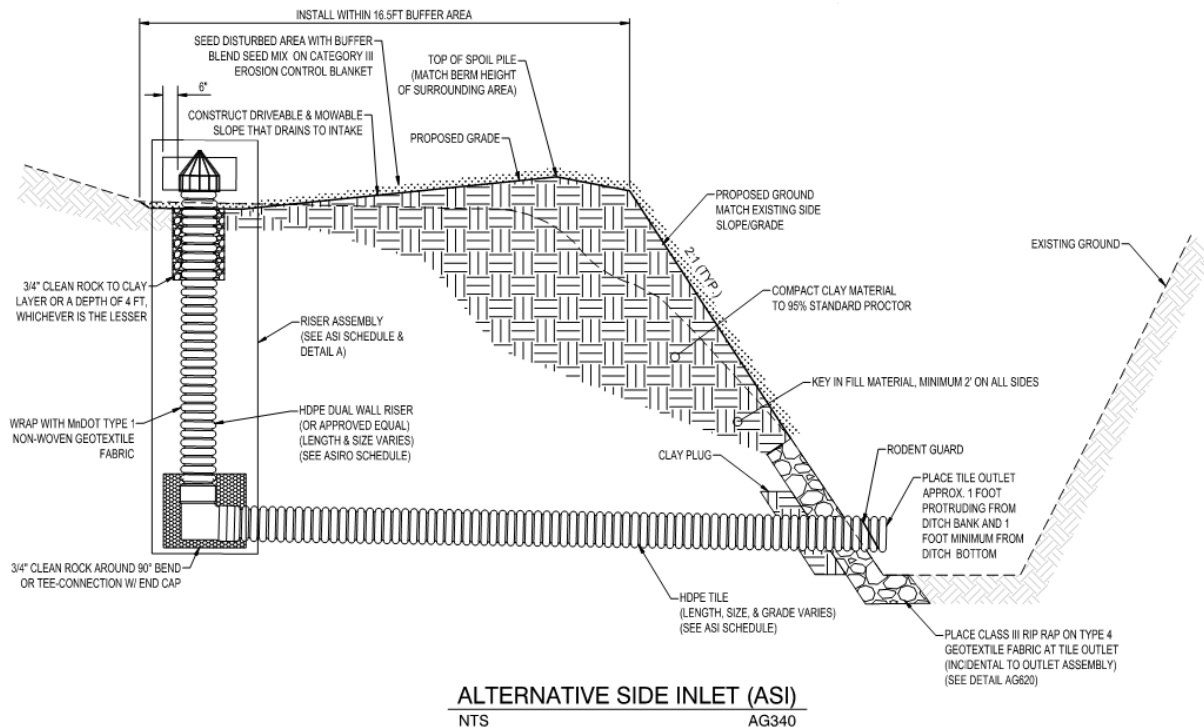
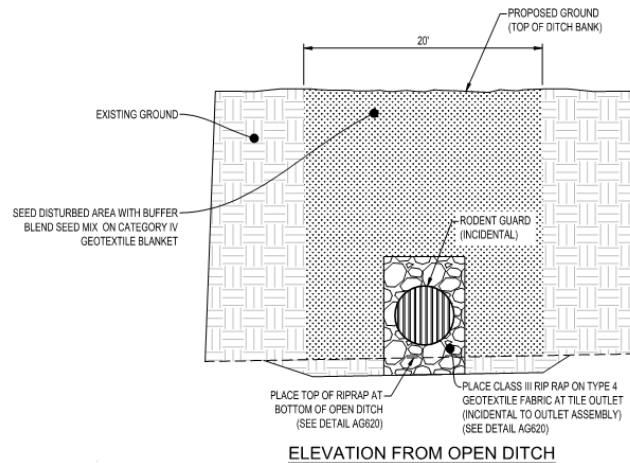


Figure 13. Typical Alternative Side Inlet (ASI) Detail (Not to Scale)

There are two ASIs in the petitioned repair area and eight in other locations throughout the CD 55 ditch system. Figure 14 shows the locations of the proposed ASIs. ASIs can be installed and paid for separately with outside funding for the areas not in the petitioned repairs.

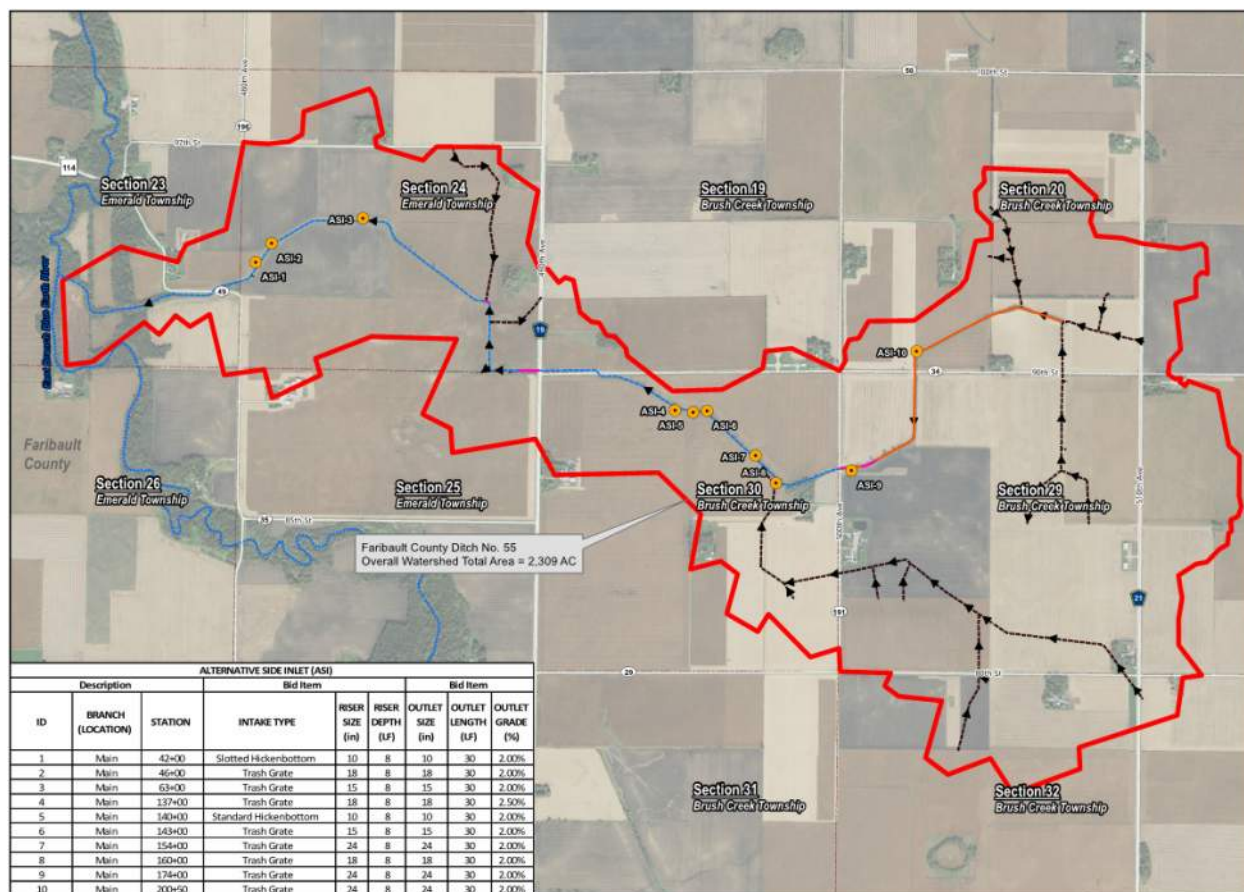


Figure 14. ASI Location Map

## Buffer Acquisition and Seeding

The buffer strips for CD 55 have previously been acquired and vegetation establishment is nearly 100 percent. The majority of CD 55 has the minimum 16.5-foot buffer in place while other areas have buffers much wider than the requirement. With construction to CD 55, some of the buffer areas may be disturbed from spoil placement, tree removals, intake reconstruction, and equipment tracking. Those areas will be re-seeded as part of this project and are estimated at 8 acres.

Seeding will include seeding the buffer strip, side slopes of slough repairs or tile outlet repairs, and side slopes from side slope flattening. Seeding of side slopes will require either blended fiber matrix or erosion control blanket for proper vegetation establishment and erosion control. The recommended seed mixtures and specifications will be included with the construction plans. However, it may not be bid with the rest of the construction project.

## Culvert Crossings

There are three culvert crossings recommended to be replaced as part of this repair. Culverts that are significantly above legal grade are proposed to be replaced. Culverts that are not planned to be replaced will still be addressed with maintenance items. Riprap protection will be placed on the upstream and downstream ends of the culvert to protect ditch banks from erosion such as scouring and downcutting. For culverts with accumulated sediment within, cleaning and sediment removal will take place.

In lieu of corrugated metal pipe (CMP) crossings, crossings are recommended to be replaced with reinforced concrete pipe (RCP) or otherwise decided by the Drainage Authority for long term durability. Figure 15 shows the locations of the culverts to be replaced. Table 2 summarizes the proposed crossing capacities for open ditch crossings. Culvert crossings 3 and 9 are proposed to be replaced and lowered to legal grade. Culvert crossings 6 is recommended to be removed as it is in poor condition and is no longer utilized for crossing the ditch with farm equipment.

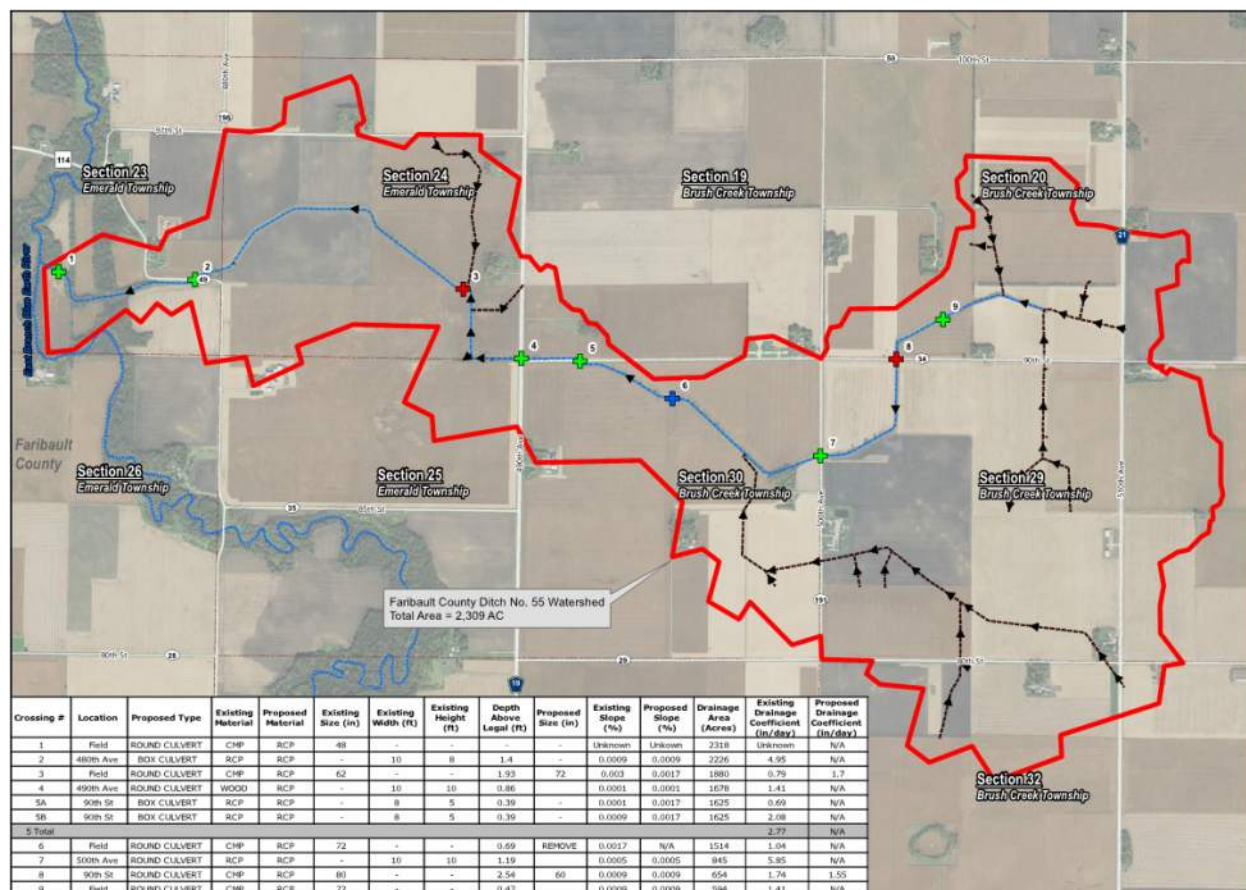


Figure 15. Culvert Crossing Locations

Table 2: Proposed Open Ditch Culvert Crossings

Crossing #	Location	Proposed Type	Existing Material	Proposed Material	Existing Size (in)	Existing Width (ft)	Existing Height (ft)	Depth Above Legal (ft)	Proposed Size (in)	Existing Slope (%)	Proposed Slope (%)	Drainage Area (Acres)	Existing Drainage Coefficient (in/day)	Proposed Drainage Coefficient (in/day)
1	Field	ROUND CULVERT	CMP	RCP	48	-	-	-	-	Unknown	Unknown	2318	Unknown	N/A
2	480th Ave	BOX CULVERT	RCP	RCP	-	10	8	1.4	-	0.0009	0.0009	2226	4.95	N/A
3	Field	ROUND CULVERT	CMP	RCP	62	-	-	1.93	72	0.003	0.0017	1880	0.79	1.7
4	490th Ave	ROUND CULVERT	WOOD	RCP	-	10	10	0.86	-	0.0001	0.0001	1678	1.41	N/A
5A	90th St	BOX CULVERT	RCP	RCP	-	8	5	0.39	-	0.0001	0.0017	1625	0.69	N/A
5B	90th St	BOX CULVERT	RCP	RCP	-	8	5	0.39	-	0.0009	0.0017	1625	2.08	N/A
5 Total													2.77	N/A
6	Field	ROUND CULVERT	CMP	RCP	72	-	-	0.69	REMOVE	0.0017	N/A	1514	1.04	N/A
7	500th Ave	ROUND CULVERT	RCP	RCP	-	10	10	1.19	-	0.0005	0.0005	845	5.85	N/A
8	97th St	ROUND CULVERT	CMP	RCP	80	-	-	2.54	60	0.0009	0.0009	654	1.74	1.55
9	Field	ROUND CULVERT	CMP	RCP	72	-	-	0.47	-	0.0009	0.0009	594	1.41	N/A

## Erosion Control

Erosion control for the repair of CD 55 includes riprap at tile outlets and near culvert crossings to prevent erosion and washouts from the high flow rates. Sloughing and erosion areas stated to be repaired will be regraded and reseeded with blended fiber matrix or erosion control blanket as part of the repair. Spoils from ditch cleaning will be piled to create a soil berm along the edge of the buffer area, graded into the buffer easement and adjacent fields, and seeded upon completion of the repair. It is recommended that seeding occur within 7-days of exposure from repairs to prevent future erosion of the repair areas. In extreme cases where other major repairs may arise as a part of construction; riprap, perimeter control, erosion control blanket, or other similar practices will be applied as necessary to prevent erosion.

## Repair Options

### Repair Option 1

It is proposed in Repair Option 1 to only repair the open ditch within the petitioned area. This will include cleaning 2,600 linear feet of 8-foot bottom ditch, 3,100 linear feet of 2-stage ditch, replacing culvert crossing 8, installing 2 ASIs, tree clearing, repairing tile outlets, and 2.17 acres of topsoil stripping. The standard 8-foot bottom cleaning could also be cleaned as a two-stage channel similar to what is proposed in Section 20 of Brush Creek Township.

### Repair Option 2

It is proposed in Repair Option 2 to repair the open ditch based on landowner and staff input. This includes cleaning the ditch in the petitioned area, however the cleaning would include a two-stage cleaning in lieu of standard ditch cleaning. Culvert crossing 8 under 90<sup>th</sup> Street would be replaced and lowered, however the box culvert under 500<sup>th</sup> Avenue would remain in place 1.19 feet above legal ditch grade. Culvert crossing 3 would also be replaced and lowered while crossing 6 would be removed completely.

The two-stage cleaning in Section 29 would follow a grade line between the lowered culvert under 90<sup>th</sup> Street and the existing culvert under 500<sup>th</sup> Avenue. This cleaning grade is 0.043 percent compared to 0.09 percent legal grade. By cleaning at this grade with a two stage channel, less excavation is required and no topsoil stripping is necessary. The 0.043 percent grade would also convey the flow adequately and keep the channel more stable and self-cleaning.

Tree removals are also included in Option 2 in Sections 24 of Emerald Township and Sections 30, 29, and 20 of Brush Creek. The trees in Section 23 of Emerald Township are not included with this option. Other repairs in Option 2 include installing ASI's, repairing tile outlets, slough repairs, and installing rip rap for erosion control where needed.

### Repair Option 3

It is proposed in Repair Option 3 to clean the entire open ditch and all repair items. This will include cleaning 19,800 linear feet of 8-foot bottom ditch, 3,100 linear feet of 2-stage ditch, replacing culvert crossings 3, 6, and 8, installing 10 ASIs, tree clearing, repairing tile outlets, and approximately 5.3 acres of topsoil stripping.

## COST ESTIMATES

Cost estimates were generated for the three above repair options. Table 4 compares the cost of the three repair options. Detailed cost estimates are included in Appendix B.



Table 4. Repair Options Cost Estimates

Repair Option	Repair Costs
Option 1: Petition Area Repair	\$ 276,765
Option 2: Landowner Recommended Repair	\$ 548,437
Option 3: Full Ditch Cleaning	\$ 860,185

**ROAD CROSSINGS**

90th Street	\$ 57,164
<b>Total</b>	<b>\$ 57,164</b>

All three repair options are practical for a watershed of this size.

## MULTI-PURPOSE DRAINAGE MANAGEMENT

Multi-purpose drainage management 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 the following three areas.

### Preventative 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 soils health, all without dramatically changing the current land use of the landscape.

### Control Measures

Control measures are practices aimed at improving water quality directly associated with the flow of water by reducing peak flow and providing in-stream storage, sedimentation, and nutrient uptake. Examples of control measures include alternative tile intakes, grassed waterways, two 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.

### Treatment Measures

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 to either the public or private drainage systems.

### Conservative Drainage Practices

Conservative drainage practices, such as construction of controlled drainage systems, provide an option for improving the water quality within a drainage system. Through utilization of control structures, these systems are designed to allow agricultural producers to regulate water levels in their fields. The water level in the ground can be lowered during planting and harvest seasons and allowed to rise during the growing season. Water and nutrients stored in the soil during the growing season can then be used by the crops during drier periods, potentially increasing yields.

## Funding

There are several outside sources of funding to potentially help pay for water quality improvements implemented in a ditch improvement project such as this. A main source of funding for this type of project is through the Minnesota Board of Water and Soil Resources (BWSR) Clean Water Fund (CWF). The primary purpose of activities funded with grants associated with the CWF is to restore, protect and enhance water quality. One CWF grant program is the Multipurpose Drainage Management Grant. This grant is geared towards implementing practices that will reduce the transport of sediment and nutrient loads. Some practices that have been funded in the past include grade stabilization, grassed waterways, water and sediment control basins, alternative side inlets, saturated buffers, storage wetlands, denitrifying bioreactors, etc.

Potential locations for additional BMPs are shown on the *Multi-Purpose Drainage Management* map in Appendix A. If landowners are interested in pursuing practices that go beyond this project scope, a few programs may be a source for funding. The Agriculture Best Management Practices (BMP) Loan Program provides loans to rural landowners to encourage BMPs that help counteract pollution problems.

Another option for individual landowners that are interested in pursuing additional practices is the Environmental Quality Incentives Program (EQIP) is a voluntary program through the NRCS that provides financial assistance to individual landowners for various conservative practices as identified above.

In addition, the BWSR Community Partners Grant may be an option. This grant leverages the interest of non-governmental partners such as lake and river associations, boy/girl scout troops and other civic groups to install on-the ground projects that reduce runoff and keep water on the land. It also allows for multiple local government units to work together on a project that involves the Community Partners Grant. Projects installed with the Community Partners Grant are intended to be structural or vegetative practices designed to reduce runoff and/or keep water on the land.

All of the water quality measures proposed with this project are applicable for some source of outside funding. The sources listed above are grants that could be a good fit for this project and if the timing of the project works in conjunction with the grant schedule. These grants can be applied for, if there is support from the drainage authority and/or interest from landowners.

Currently, this project proposes to use Alternative Side Inlets along the open ditch. Potential locations for these and additional BMPs including side slope flattening are shown on the *Multi-Purpose Drainage Management Map* in Appendix A and will be proposed to landowners. Furthermore; additional water quality measures can be implemented with this project if requested.

## CONCLUSIONS + RECOMMENDATIONS

The upstream portions of the CD 55 main open ditch contain well established trees along the ditch banks, sediment accumulation between 6-inches and 2-feet in the open ditch, and multiple slough and erosion areas. Based on the review of the CD 55 system, it is recommended at a minimum to repair the petitioned area located in Sections 20 and 29 of Brush Creek Township. The landowner and staff developed repair option is also recommended as it address the major areas of concern for the CD 55 Main open ditch in the petition area and in areas downstream. The full ditch repair option is not completely necessary at this time, however those outlined repair items may be necessary in the future.

The outlined cost estimates are practical for a repair of this size. It is recommended to hold a public hearing and receive input from the landowners to aid the Drainage Authority it making its decision on repairs to CD 55.

# APPENDIX A: EXHIBITS





# Watershed Map

## County Ditch No 55

Faribault County,  
Minnesota  
Monday, December 30, 2019

### Legend

- Existing Open Ditch
- Existing Tile
- Watershed
- Parcels
- USGS Streams

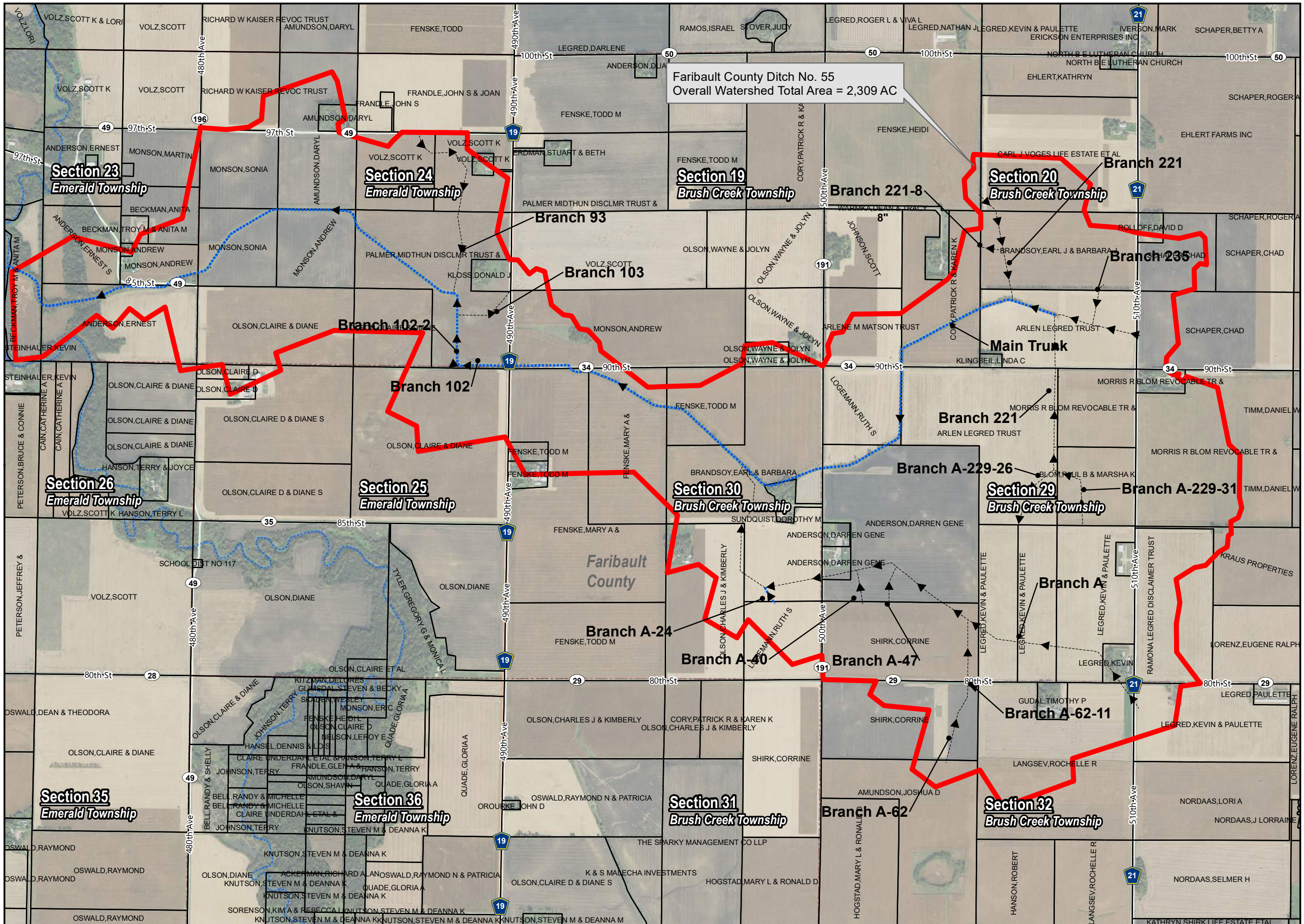
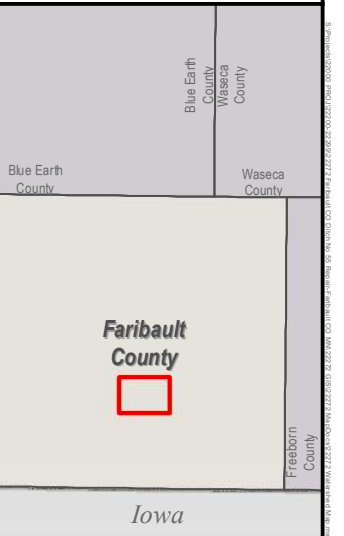
PN: 18-22272

#### Source:

Orthophotograph (MnGeo WMS, 2015)  
Tile/Ditch (Faribault County, 12/16/2016)  
Parcels (Faribault County, 12/16/2016)  
Lakes (MN DNR, July, 2008)  
Major Stream (MN DNR, July 2008)  
Counties (MN DNR, July 2013)  
PLSS (MnGeo/USGS)



0 375 750 1,500  
Feet  
1 inch = 1,500 feet







# Repair Area Map

County Ditch No 55  
Faribault County,  
Minnesota  
Monday, December 30, 2019

## Legend

- Recommended Repair Area
- Petitioned Repair Area
- Open Ditch
- Existing Tile
- Watershed

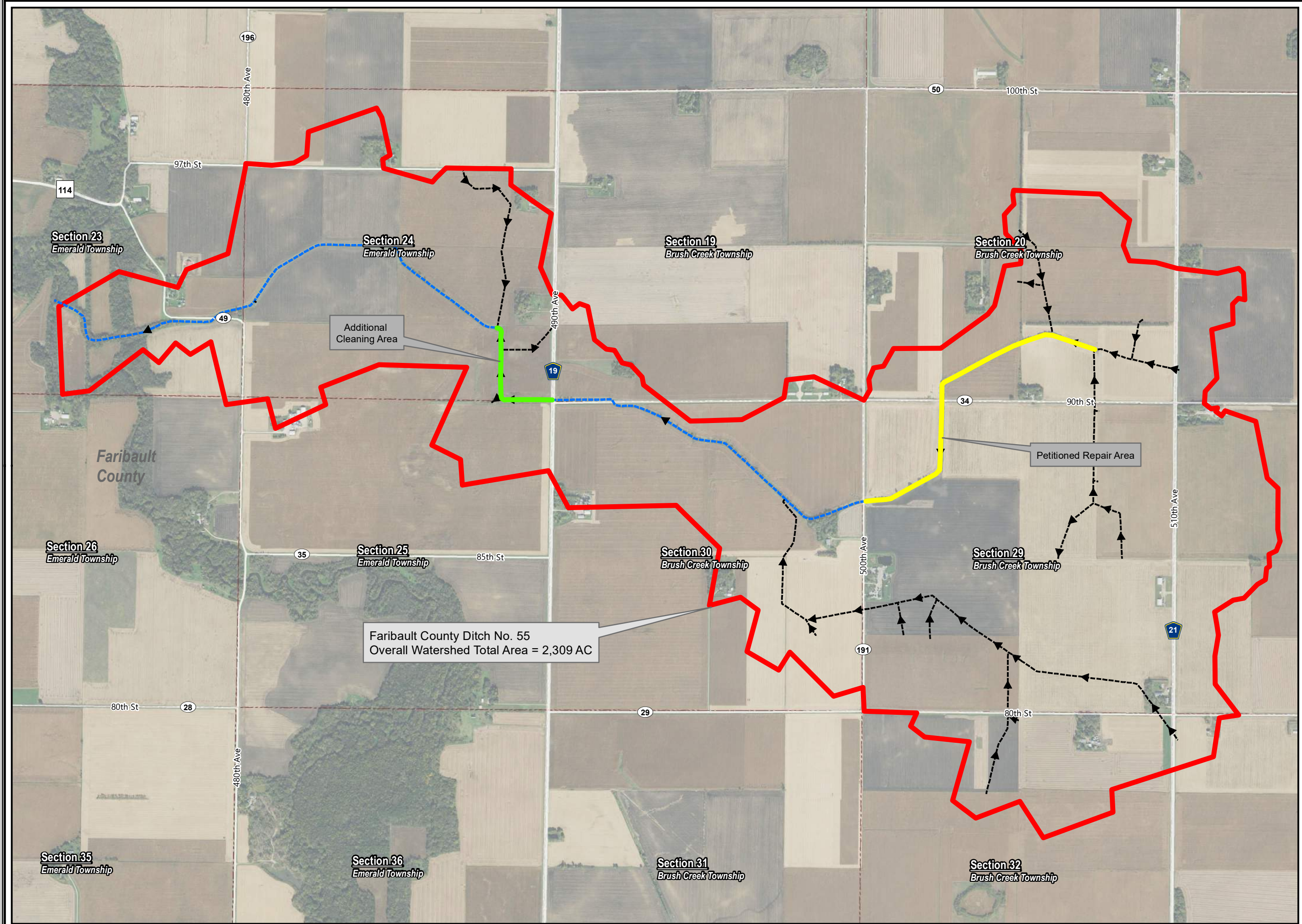
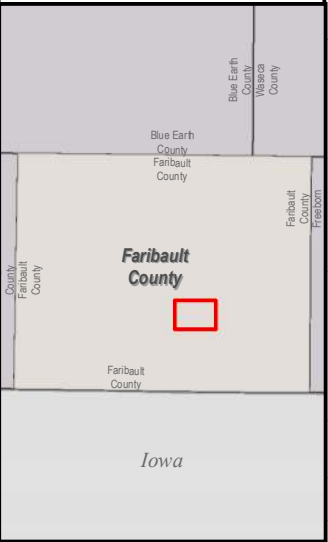
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### Source:

Orthophotograph (MnGeo WMS, 2015)  
Tile/Ditch (Faribault County, 12/16/2016)  
Parcels (Faribault County, 12/16/2016)  
Lakes (MN DNR, July, 2008)  
Major Stream (MN DNR, July 2008)  
Counties (MN DNR, July 2013)  
PLSS (MnGeo/USGS)



0 375 750 1,500 Feet  
1 inch = 1,500 feet







**Faribault  
County  
Inventory**  
County Ditch No 55  
Faribault County,  
Minnesota  
Monday, December 30, 2019

- Legend**
- Tile Outlet
  - Potential ASI Location
  - Existing Open Ditch
  - Existing Tile
  - ▭ Watershed
  - USGS Streams

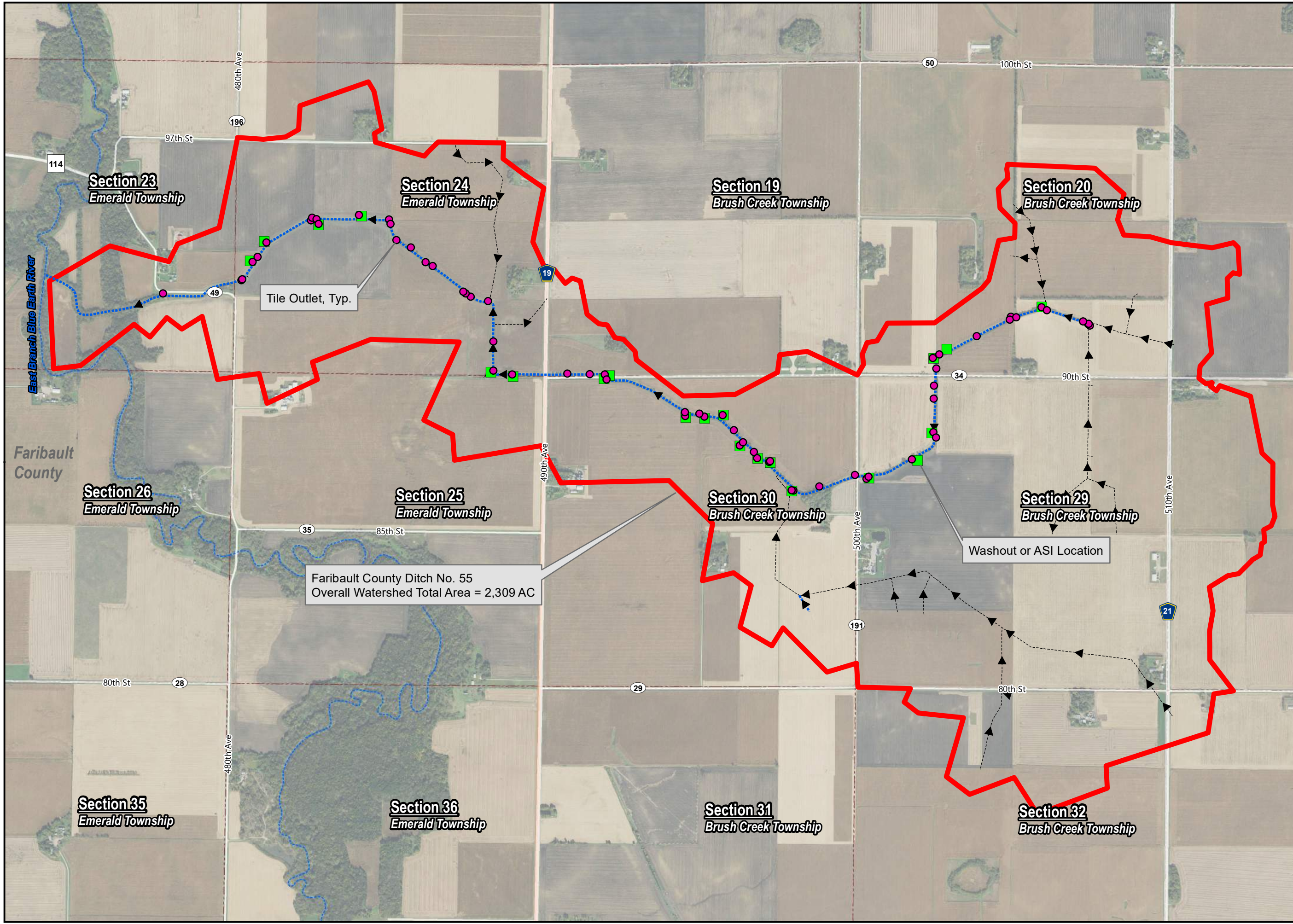
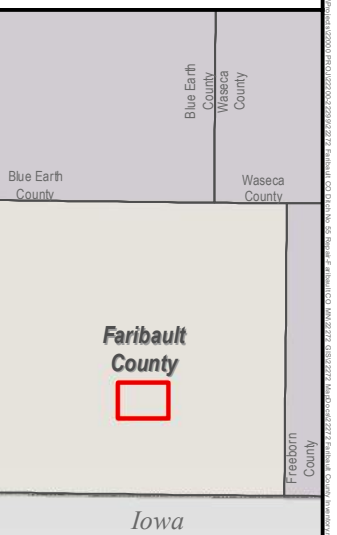
PN: 18-22272

**Source:**

Orthophotograph (MnGeo WMS, 2015)  
Tile/Ditch (XX County, 12/16/2016)  
Parcels (XX County, 12/16/2016)  
Lakes (MN DNR, July, 2008)  
Major Stream (MN DNR, July 2008)  
Counties (MN DNR, July 2013)  
PLSS (MnGeo/USGS)



0 375 750 1,500  
Feet  
1 inch = 1,500 feet







**MDM Map**  
County Ditch No 55  
Faribault County,  
Minnesota  
Monday, December 30, 2019

**Legend**

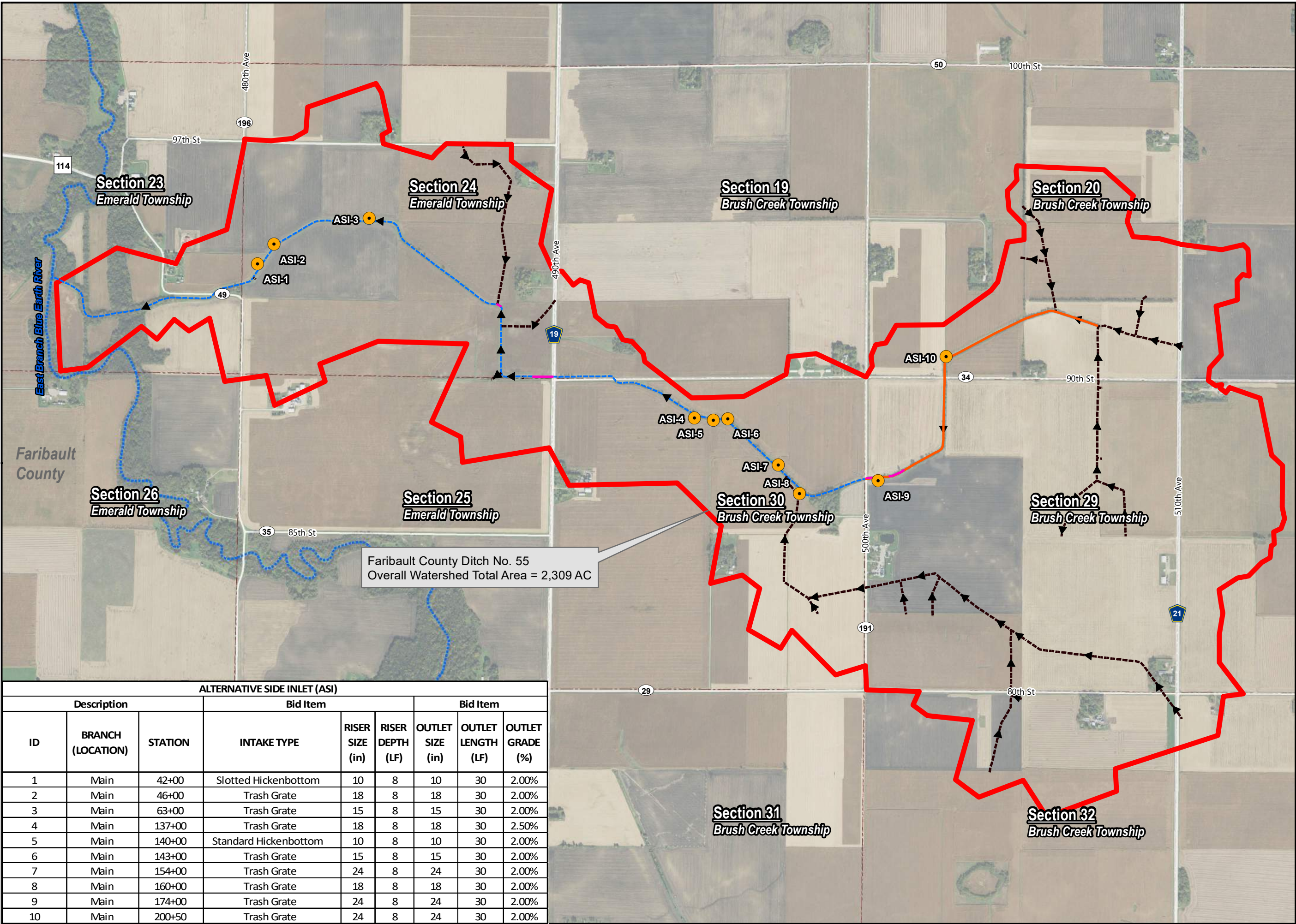
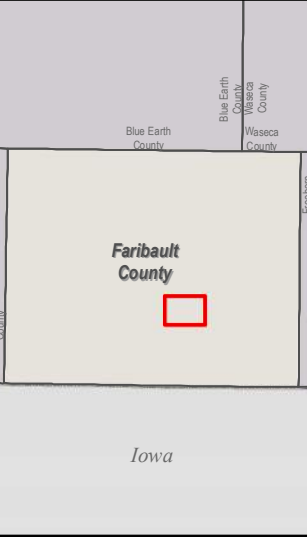
- ASI
- Sideslope Flattening
- Two-Stage Cleaning
- Existing Tile
- Existing Open Ditch
- Watershed

PN: 18-22272  
Source:

Orthophotograph (MnGeo WMS, 2015)  
Tile/Ditch (Faribault County, 12/16/2016)  
Parcels (Faribault County, 12/16/2016)  
Lakes (MN DNR, July, 2008)  
Major Stream (MN DNR, July 2008)  
Counties (MN DNR, July 2013)  
PLSS (MnGeo/USGS)



0 375 750 1,500 Feet  
1 inch = 1,500 feet



ALTERNATIVE SIDE INLET (ASI)								
Description			Bid Item			Bid Item		
ID	BRANCH (LOCATION)	STATION	INTAKE TYPE	RISER SIZE (in)	RISER DEPTH (LF)	OUTLET SIZE (in)	OUTLET LENGTH (LF)	OUTLET GRADE (%)
1	Main	42+00	Slotted Hickenbottom	10	8	10	30	2.00%
2	Main	46+00	Trash Grate	18	8	18	30	2.00%
3	Main	63+00	Trash Grate	15	8	15	30	2.00%
4	Main	137+00	Trash Grate	18	8	18	30	2.50%
5	Main	140+00	Standard Hickenbottom	10	8	10	30	2.00%
6	Main	143+00	Trash Grate	15	8	15	30	2.00%
7	Main	154+00	Trash Grate	24	8	24	30	2.00%
8	Main	160+00	Trash Grate	18	8	18	30	2.00%
9	Main	174+00	Trash Grate	24	8	24	30	2.00%
10	Main	200+50	Trash Grate	24	8	24	30	2.00%





**Culvert  
Repair Map**  
County Ditch No 55  
Faribault County,  
Minnesota  
Monday, December 30, 2019

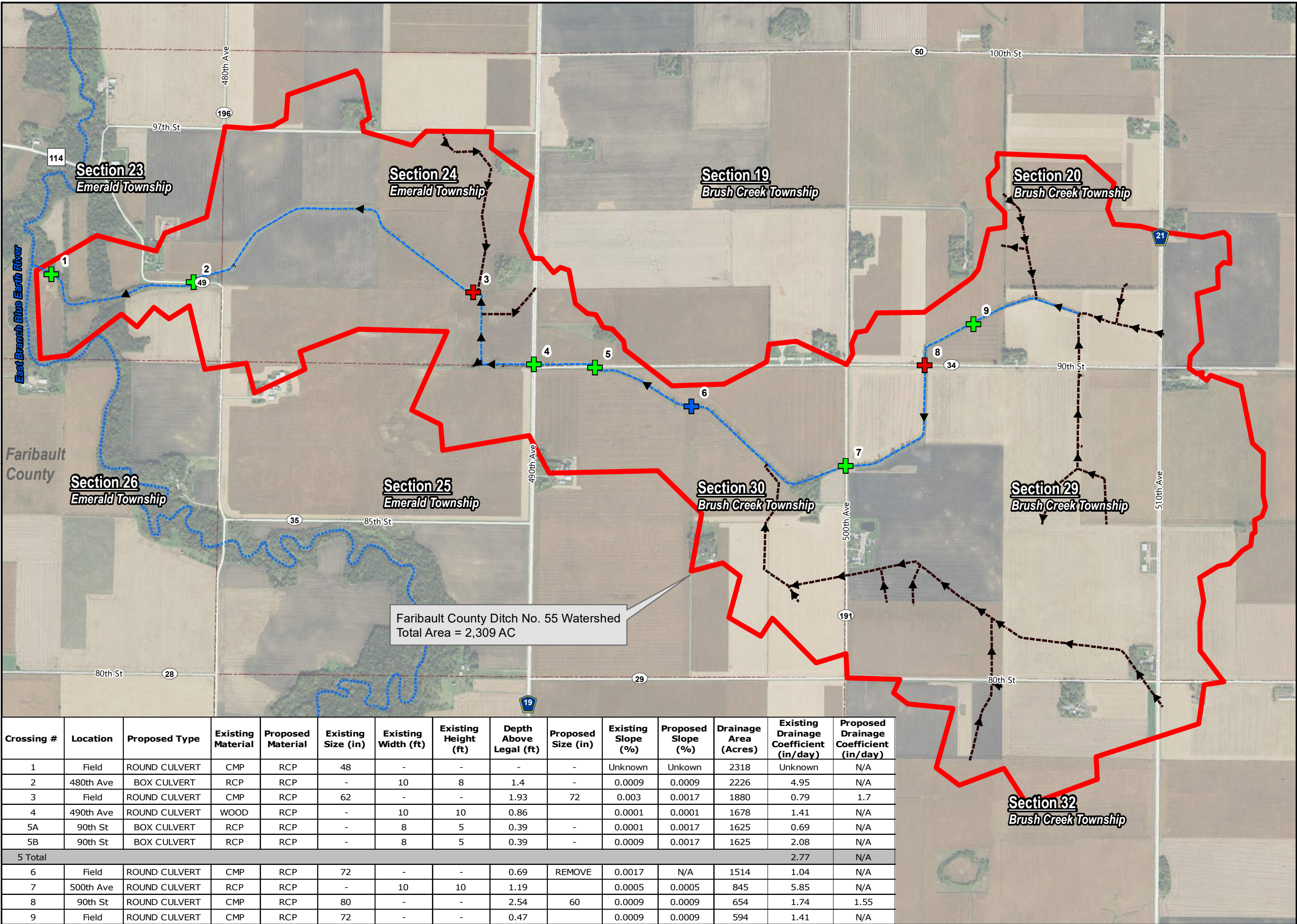
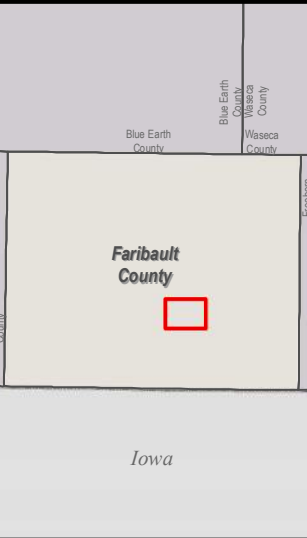
- Legend**
- Culverts**
- Leave
  - Remove
  - Replace
- Existing Tile
- Existing Open Ditch
- Watershed

PN: 18-22272  
Source:

Orthophotograph (MnGeo WMS, 2015)  
Tile/Ditch (Faribault County, 12/16/2016)  
Parcels (Faribault County, 12/16/2016)  
Lakes (MN DNR, July, 2008)  
Major Stream (MN DNR, July 2008)  
Counties (MN DNR, July 2013)  
PLSS (MnGeo/USGS)



0 380 760 1,520  
Feet  
1 inch = 1,500 feet



Crossing #	Location	Proposed Type	Existing Material	Proposed Material	Existing Size (in)	Existing Width (ft)	Existing Height (ft)	Depth Above Legal (ft)	Proposed Size (in)	Existing Slope (%)	Proposed Slope (%)	Drainage Area (Acres)	Existing Drainage Coefficient (in/day)	Proposed Drainage Coefficient (in/day)
1	Field	ROUND CULVERT	CMP	RCP	48	-	-	-	-	Unknown	Unknown	2318	Unknown	N/A
2	480th Ave	BOX CULVERT	RCP	RCP	-	10	8	1.4	-	0.0009	0.0009	2226	4.95	N/A
3	Field	ROUND CULVERT	CMP	RCP	62	-	-	1.93	72	0.003	0.0017	1880	0.79	1.7
4	490th Ave	ROUND CULVERT	WOOD	RCP	-	10	10	0.86	-	0.0001	0.0001	1678	1.41	N/A
5A	90th St	BOX CULVERT	RCP	RCP	-	8	5	0.39	-	0.0001	0.0017	1625	0.69	N/A
5B	90th St	BOX CULVERT	RCP	RCP	-	8	5	0.39	-	0.0009	0.0017	1625	2.08	N/A
5 Total													2.77	N/A
6	Field	ROUND CULVERT	CMP	RCP	72	-	-	0.69	REMOVE	0.0017	N/A	1514	1.04	N/A
7	500th Ave	ROUND CULVERT	RCP	RCP	-	10	10	1.19	-	0.0005	0.0005	845	5.85	N/A
8	90th St	ROUND CULVERT	CMP	RCP	80	-	-	2.54	60	0.0009	0.0009	654	1.74	1.55
9	Field	ROUND CULVERT	CMP	RCP	72	-	-	0.47	-	0.0009	0.0009	594	1.41	N/A





**Landowner  
Repair Map**  
County Ditch No 55  
Faribault County,  
Minnesota  
Monday, December 30, 2019

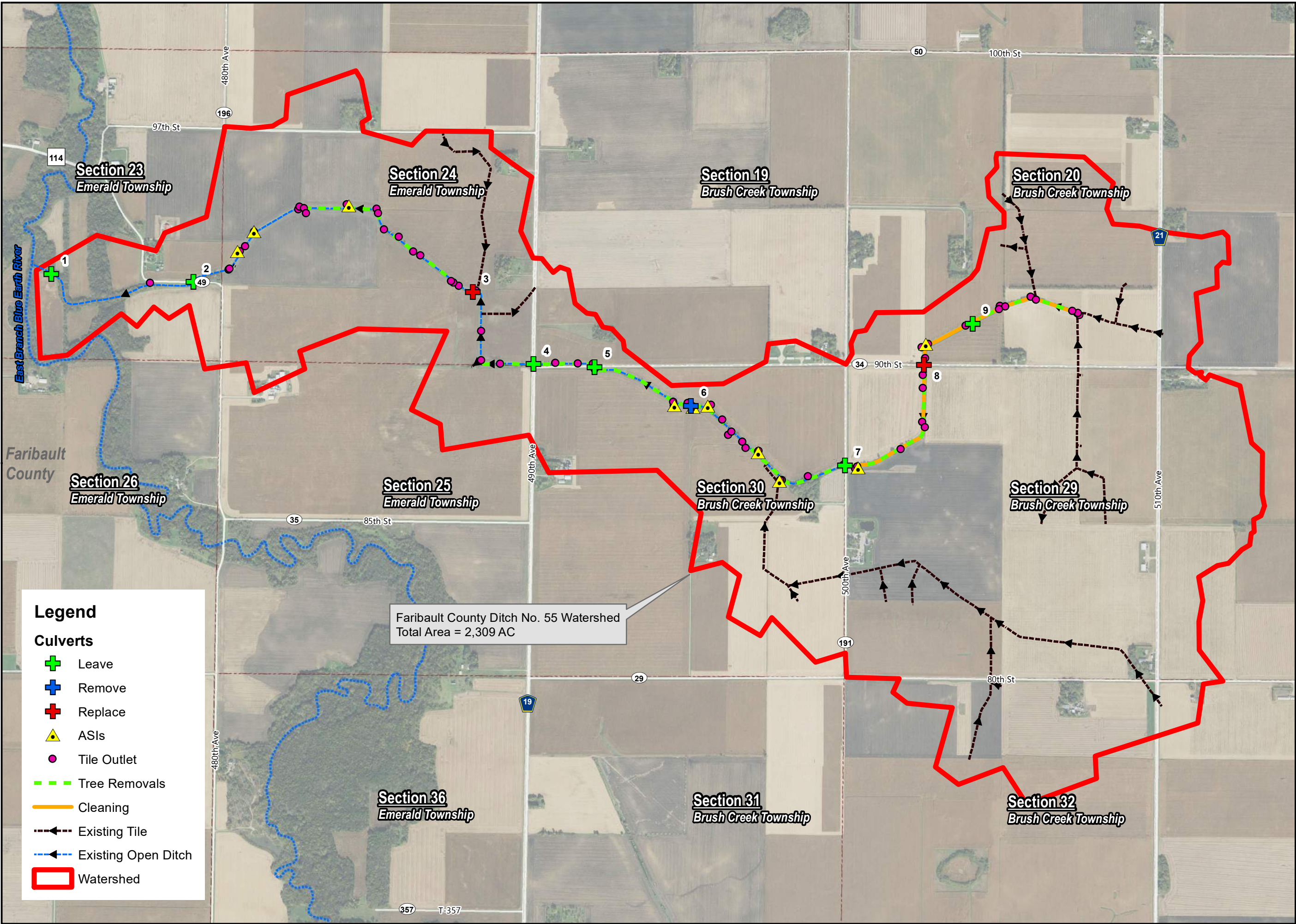
PN: 18-22272

**Source:**

Orthophotograph (MnGeo WMS, 2015)  
Tile/Ditch (Faribault County, 12/16/2016)  
Parcels (Faribault County, 12/16/2016)  
Lakes (MN DNR, July, 2008)  
Major Stream (MN DNR, July 2008)  
Counties (MN DNR, July 2013)  
PLSS (MnGeo/USGS)



0 375 750 1,500  
Feet  
1 inch = 1,500 feet



**Legend**

**Culverts**

- Leave
- Remove
- Replace
- ASIs
- Tile Outlet
- Tree Removals
- Cleaning
- Existing Tile
- Existing Open Ditch
- Watershed





**Soil Boring Map**  
County Ditch No 55  
Faribault County,  
Minnesota  
Tuesday, October 22, 2019

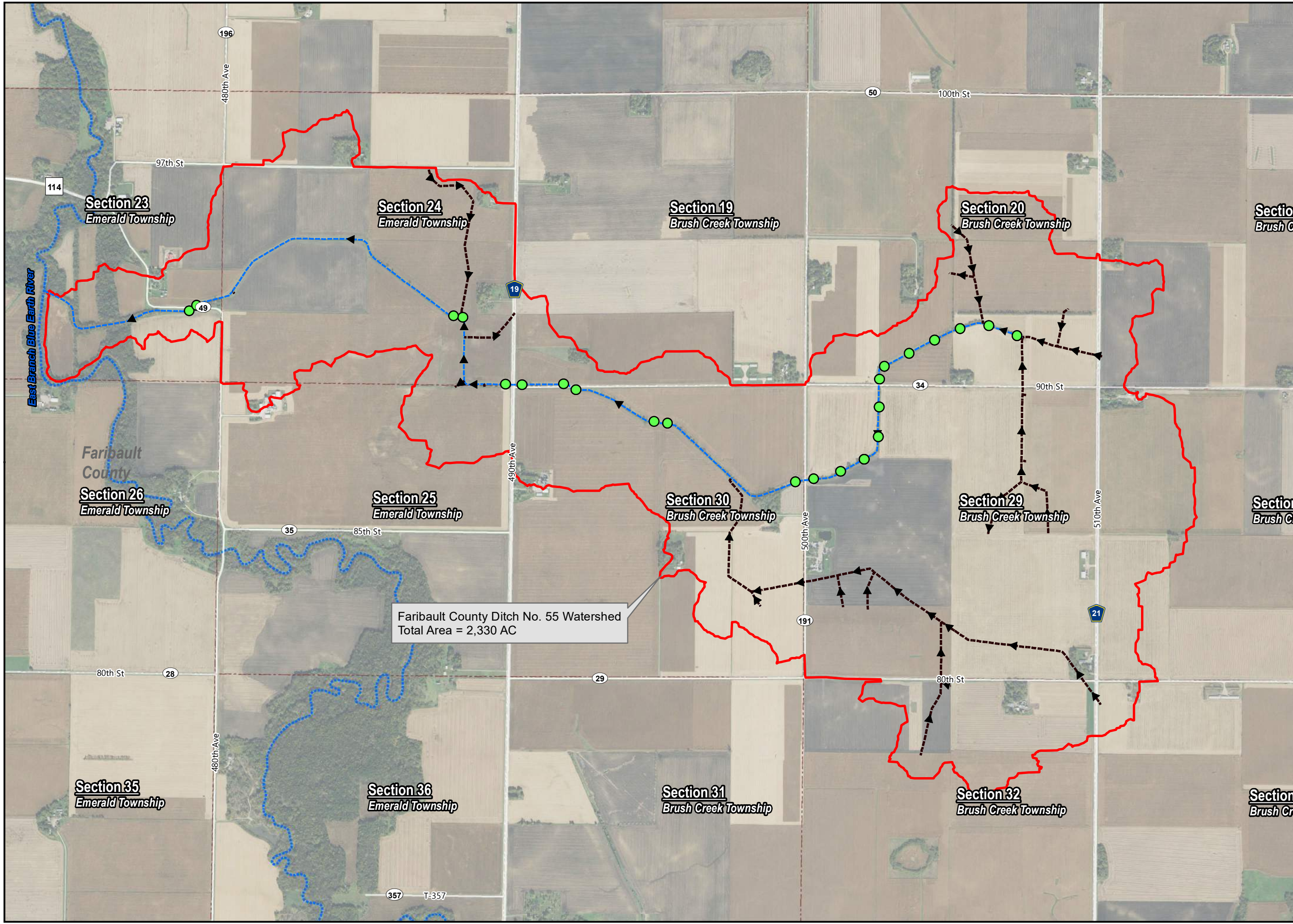
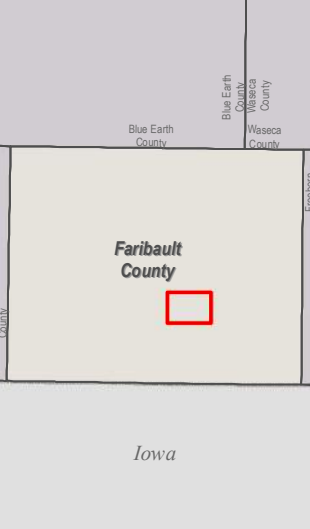
- Legend**
- Soil Borings
  - Existing Tile
  - Existing Open Ditch
  - Watershed

PN: 18-22272  
**Source:**

Orthophotograph (MnGeo WMS, 2015)  
Tile/Ditch (Faribault County, 12/16/2016)  
Parcels (Faribault County, 12/16/2016)  
Lakes (MN DNR, July, 2008)  
Major Stream (MN DNR, July 2008)  
Counties (MN DNR, July 2013)  
PLSS (MnGeo/USGS)



0 400 800 1,600 Feet  
1 inch = 1,600 feet



# APPENDIX B: PRELIMINARY COST ESTIMATE



**Option 1 - Petition Area Repair**

**Open Ditch**

Item No.	Item	Unit	Quantity	Unit Price	Amount
101	MOBILIZATION	LS	1	\$ 8,180.00	\$ 8,180
102	30-INCH TILE OUTLET (20 LF OF PIPE & RIPRAP ON GEOTEXTILE FABRIC)	EA	1	\$ 2,050.90	\$ 2,051
103	24-INCH TILE OUTLET (20 LF OF PIPE & RIPRAP ON GEOTEXTILE FABRIC)	EA	1	\$ 1,658.60	\$ 1,659
104	18-INCH TILE OUTLET (20 LF OF PIPE & RIPRAP ON GEOTEXTILE FABRIC)	EA	1	\$ 1,427.20	\$ 1,427
105	15-INCH TILE OUTLET (20 LF OF PIPE & RIPRAP ON GEOTEXTILE FABRIC)	EA	1	\$ 1,170.70	\$ 1,171
106	12-INCH TILE OUTLET (20 LF OF PIPE & RIPRAP ON GEOTEXTILE FABRIC)	EA	3	\$ 1,094.00	\$ 3,282
107	10-INCH TILE OUTLET (20 LF OF PIPE & RIPRAP ON GEOTEXTILE FABRIC)	EA	4	\$ 1,041.10	\$ 4,164
108	8-INCH TILE OUTLET (20 LF OF PIPE & RIPRAP ON GEOTEXTILE FABRIC)	EA	4	\$ 970.20	\$ 3,881
109	6-INCH TILE OUTLET (20 LF OF PIPE & RIPRAP ON GEOTEXTILE FABRIC)	EA	3	\$ 782.10	\$ 2,346
110	ARMOR TILE OUTLET (RIPRAP & GEOTEXTILE FABRIC)	EA	10	\$ 560.40	\$ 5,604
111	TWO-STAGE DITCH CLEANING (2' WIDE DITCH BOTTOM)	LF	1000	\$ 2.25	\$ 2,250
112	TWO-STAGE DITCH CLEANING (1.5' WIDE DITCH BOTTOM)	LF	2100	\$ 2.00	\$ 4,200
113	DITCH CLEANING (8' WIDE DITCH BOTTOM)	LF	2600	\$ 2.80	\$ 7,280
114	SLOUGH REPAIR	LF	230	\$ 7.50	\$ 1,725
115	CLEARING AND GRUBBING	LS	1	\$ 46,000.00	\$ 46,000
116	COMMON BORROW AND BANK REPAIR	CY	200	\$ 6.00	\$ 1,200
117	CLASS III RIPRAP WITH GEOTEXTILE FABRIC	CY	200	\$ 75.90	\$ 15,180
118	INSTALL 24-INCH ASI RISER ASSEMBLY W/TRASH GRATE	EA	2	\$ 1,529.70	\$ 3,059
119	INSTALL 24-INCH ASI OUTLET ASSEMBLY	EA	2	\$ 1,362.10	\$ 2,724
120	FIELD CROSSING #9	LS	1	\$ 20,658.40	\$ 20,658
121	TOP SOIL STRIP & PLACE SPOILS	AC	2.2	\$ 4,010.00	\$ 8,702
122	16.5' BUFFER STRIP SEEDING (SEED MIX: BUFFER BLEND WITH TYPE 3 MULCH)	AC	8.0	\$ 1,368.20	\$ 10,946
123	STANDARD SIDESLOPE SEEDING (SEED MIX: BUFFER BLEND WITH TYPE 8 MULCH)	AC	2.6	\$ 2,958.50	\$ 7,692
124	BUFFER STRIP MOWING	AC	16.0	\$ 195.50	\$ 3,128
125	WEED SPRAYING	AC	16.0	\$ 331.30	\$ 5,301
<b>TOTAL</b>					<b>\$ 173,900</b>
10% UNFORSEEN					\$ 17,390
<b>SUBTOTAL</b>					<b>\$ 191,290</b>
TEMPORARY DAMAGES		AC	2	\$ 650.00	\$ 1,411
COUNTY ADMINISTRATION COSTS					\$ 9,565
TOPOGRAPHIC SURVEY					\$ 18,550
REPORTS, PLANS AND SPECIFICATIONS					\$ 36,820
CONSTRUCTION STAKING & ADMINISTRATION					\$ 19,129
<b>TOTAL OPEN DITCH REPAIR COST</b>					<b>\$ 276,765</b>

Option 2 - Landowner Recommended Repair

Open Ditch

Item No.	Item	Unit	Quantity	Unit Price	Amount
101	MOBILIZATION	LS	1	\$ 17,770.00	\$ 17,770
102	30-INCH TILE OUTLET (20 LF OF PIPE & RIPRAP ON GEOTEXTILE FABRIC)	EA	1	\$ 2,050.90	\$ 2,051
103	24-INCH TILE OUTLET (20 LF OF PIPE & RIPRAP ON GEOTEXTILE FABRIC)	EA	2	\$ 1,658.60	\$ 3,317
104	18-INCH TILE OUTLET (20 LF OF PIPE & RIPRAP ON GEOTEXTILE FABRIC)	EA	1	\$ 1,427.20	\$ 1,427
105	15-INCH TILE OUTLET (20 LF OF PIPE & RIPRAP ON GEOTEXTILE FABRIC)	EA	3	\$ 1,170.70	\$ 3,512
106	12-INCH TILE OUTLET (20 LF OF PIPE & RIPRAP ON GEOTEXTILE FABRIC)	EA	10	\$ 1,094.00	\$ 10,940
107	10-INCH TILE OUTLET (20 LF OF PIPE & RIPRAP ON GEOTEXTILE FABRIC)	EA	7	\$ 1,041.10	\$ 7,288
108	8-INCH TILE OUTLET (20 LF OF PIPE & RIPRAP ON GEOTEXTILE FABRIC)	EA	12	\$ 970.20	\$ 11,642
109	6-INCH TILE OUTLET (20 LF OF PIPE & RIPRAP ON GEOTEXTILE FABRIC)	EA	14	\$ 782.10	\$ 10,949
110	ARMOR TILE OUTLET (RIPRAP & GEOTEXTILE FABRIC)	EA	20	\$ 560.40	\$ 11,208
111	TWO-STAGE DITCH CLEANING	LF	5700	\$ 2.25	\$ 12,825
112	SLOUGH REPAIR	LF	1000	\$ 7.50	\$ 7,500
113	CLEARING AND GRUBBING	LS	1	\$ 178,560.00	\$ 178,560
114	COMMON BORROW AND BANK REPAIR	CY	200	\$ 6.00	\$ 1,200
115	CLASS III RIPRAP WITH GEOTEXTILE FABRIC	CY	200	\$ 75.90	\$ 15,180
116	INSTALL 10-INCH ASI RISER ASSEMBLY W/SLOTTED HICKENBOTTOM	EA	1	\$ 715.50	\$ 716
117	INSTALL 10-INCH ASI RISER ASSEMBLY W/STANDARD HICKENBOTTOM	EA	1	\$ 760.50	\$ 761
118	INSTALL 15-INCH ASI RISER ASSEMBLY W/TRASH GRATE	EA	2	\$ 1,276.40	\$ 2,553
119	INSTALL 18-INCH ASI RISER ASSEMBLY W/TRASH GRATE	EA	3	\$ 1,521.10	\$ 4,563
120	INSTALL 24-INCH ASI RISER ASSEMBLY W/TRASH GRATE	EA	3	\$ 1,529.70	\$ 4,589
121	INSTALL 10-INCH ASI OUTLET ASSEMBLY	EA	2	\$ 561.80	\$ 1,124
122	INSTALL 15-INCH ASI OUTLET ASSEMBLY	EA	2	\$ 1,050.90	\$ 2,102
123	INSTALL 18-INCH ASI OUTLET ASSEMBLY	EA	3	\$ 1,117.30	\$ 3,352
124	INSTALL 24-INCH ASI OUTLET ASSEMBLY	EA	3	\$ 1,362.10	\$ 4,086
125	FIELD CROSSING #3	LS	1	\$ 25,371.60	\$ 25,372
126	FIELD CROSSING #6	LS	1	\$ 3,500.00	\$ 3,500
127	16.5' BUFFER STRIP SEEDING (SEED MIX: BUFFER BLEND WITH TYPE 3 MULCH)	AC	8.0	\$ 1,368.20	\$ 10,946
128	STANDARD SIDESLOPE SEEDING (SEED MIX: BUFFER BLEND WITH TYPE 8 MULCH)	AC	2.6	\$ 2,958.50	\$ 7,692
129	BUFFER STRIP MOWING	AC	16.0	\$ 195.50	\$ 3,128
130	WEED SPRAYING	AC	16.0	\$ 331.30	\$ 5,301
<b>TOTAL</b>					<b>\$ 375,200</b>
10% UNFORSEEN					\$ 37,520
<b>SUBTOTAL</b>					<b>\$ 412,720</b>
TEMPORARY DAMAGES		AC	2	\$ 650.00	\$ 1,411
COUNTY ADMINISTRATION COSTS					\$ 20,636
TOPOGRAPHIC SURVEY					\$ 18,550
REPORTS, PLANS AND SPECIFICATIONS					\$ 53,840
CONSTRUCTION STAKING & ADMINISTRATION					\$ 41,280
<b>TOTAL OPEN DITCH REPAIR COST</b>					<b>\$ 548,437</b>

Option 3 - Full Ditch Repair

Open Ditch

Item No.	Item	Unit	Quantity	Unit Price	Amount
101	MOBILIZATION	LS	1	\$ 28,380.00	\$ 28,380
102	30-INCH TILE OUTLET (20 LF OF PIPE & RIPRAP ON GEOTEXTILE FABRIC)	EA	1	\$ 2,050.90	\$ 2,051
103	24-INCH TILE OUTLET (20 LF OF PIPE & RIPRAP ON GEOTEXTILE FABRIC)	EA	2	\$ 1,658.60	\$ 3,317
104	18-INCH TILE OUTLET (20 LF OF PIPE & RIPRAP ON GEOTEXTILE FABRIC)	EA	1	\$ 1,427.20	\$ 1,427
105	15-INCH TILE OUTLET (20 LF OF PIPE & RIPRAP ON GEOTEXTILE FABRIC)	EA	3	\$ 1,170.70	\$ 3,512
106	12-INCH TILE OUTLET (20 LF OF PIPE & RIPRAP ON GEOTEXTILE FABRIC)	EA	10	\$ 1,094.00	\$ 10,940
107	10-INCH TILE OUTLET (20 LF OF PIPE & RIPRAP ON GEOTEXTILE FABRIC)	EA	7	\$ 1,041.10	\$ 7,288
108	8-INCH TILE OUTLET (20 LF OF PIPE & RIPRAP ON GEOTEXTILE FABRIC)	EA	12	\$ 970.20	\$ 11,642
109	6-INCH TILE OUTLET (20 LF OF PIPE & RIPRAP ON GEOTEXTILE FABRIC)	EA	14	\$ 782.10	\$ 10,949
110	ARMOR TILE OUTLET (RIPRAP & GEOTEXTILE FABRIC)	EA	20	\$ 560.40	\$ 11,208
111	TWO-STAGE DITCH CLEANING (2' WIDE DITCH BOTTOM)	LF	1000	\$ 2.25	\$ 2,250
112	TWO-STAGE DITCH CLEANING (1.5' WIDE DITCH BOTTOM)	LF	2100	\$ 2.00	\$ 4,200
113	DITCH CLEANING (8' WIDE DITCH BOTTOM)	LF	19800	\$ 2.80	\$ 55,440
114	SLOUGH REPAIR	LF	1000	\$ 7.50	\$ 7,500
115	CLEARING AND GRUBBING	LS	1	\$ 308,000.00	\$ 308,000
116	COMMON BORROW AND BANK REPAIR	CY	200	\$ 6.00	\$ 1,200
117	CLASS III RIPRAP WITH GEOTEXTILE FABRIC	CY	200	\$ 75.90	\$ 15,180
118	INSTALL 10-INCH ASI RISER ASSEMBLY W/SLOTTED HICKENBOTTOM	EA	1	\$ 715.50	\$ 716
119	INSTALL 10-INCH ASI RISER ASSEMBLY W/STANDARD HICKENBOTTOM	EA	1	\$ 760.50	\$ 761
120	INSTALL 15-INCH ASI RISER ASSEMBLY W/TRASH GRATE	EA	2	\$ 1,276.40	\$ 2,553
121	INSTALL 18-INCH ASI RISER ASSEMBLY W/TRASH GRATE	EA	3	\$ 1,521.10	\$ 4,563
122	INSTALL 24-INCH ASI RISER ASSEMBLY W/TRASH GRATE	EA	3	\$ 1,529.70	\$ 4,589
123	INSTALL 10-INCH ASI OUTLET ASSEMBLY	EA	2	\$ 561.80	\$ 1,124
124	INSTALL 15-INCH ASI OUTLET ASSEMBLY	EA	2	\$ 1,050.90	\$ 2,102
125	INSTALL 18-INCH ASI OUTLET ASSEMBLY	EA	3	\$ 1,117.30	\$ 3,352
126	INSTALL 24-INCH ASI OUTLET ASSEMBLY	EA	3	\$ 1,362.10	\$ 4,086
127	FIELD CROSSING #3	LS	1	\$ 25,371.60	\$ 25,372
128	FIELD CROSSING #6	LS	1	\$ 3,500.00	\$ 3,500
129	TOP SOIL STRIP & PLACE SPOILS	AC	5.3	\$ 4,010.00	\$ 21,173
130	16.5' BUFFER STRIP SEEDING (SEED MIX: BUFFER BLEND WITH TYPE 3 MULCH)	AC	12.0	\$ 1,368.20	\$ 16,418
131	STANDARD SIDESLOPE SEEDING (SEED MIX: BUFFER BLEND WITH TYPE 8 MULCH)	AC	3.6	\$ 2,958.50	\$ 10,503
132	BUFFER STRIP MOWING	AC	24.0	\$ 195.50	\$ 4,692
133	WEED SPRAYING	AC	24.0	\$ 331.30	\$ 7,951
<b>TOTAL</b>					<b>\$ 598,000</b>
10% UNFORSEEN					\$ 59,800
<b>SUBTOTAL</b>					<b>\$ 657,800</b>
TEMPORARY DAMAGES		AC	5	\$ 650.00	\$ 3,445
COUNTY ADMINISTRATION COSTS					\$ 32,890
TOPOGRAPHIC SURVEY					\$ 28,950
REPORTS, PLANS AND SPECIFICATIONS					\$ 71,300
CONSTRUCTION STAKING & ADMINISTRATION					\$ 65,800
<b>TOTAL OPEN DITCH REPAIR COST</b>					<b>\$ 860,185</b>



ROAD CROSSINGS

90TH STREET (SECTION 20 BRUSH CREEK)

Item No.	Item	Unit	Quantity	Unit Price	Amount
101	MOBILIZATION	LS	1	\$ 8,000.00	\$ 8,000
102	60-INCH CLASS III RCP PIPE	LF	60	\$ 395.47	\$ 23,728
104	REMOVE CMP CULVERT	EA	1	\$ 6,500.00	\$ 6,500
105	CLASS III RIPRAP WITH GEOTEXTILE FABRIC	CY	50	\$ 65.80	\$ 3,290
106	GRANULAR PIPE FOUNDATION	CY	50	\$ 21.60	\$ 1,080
107	SEED MIX 25-142 W/MNDOT EROSION CONTROL BLANKET CATEGORY 3	SY	450	\$ 2.50	\$ 1,125
108	OPEN CUT & RESTORE GRAVEL ROAD OR DRIVEWAY	EA	1	\$ 1,698.50	\$ 1,699
<b>TOTAL</b>					<b>\$ 45,422</b>
10% CONTINGENCY					\$ 4,542
<b>SUBTOTAL</b>					<b>\$ 49,964</b>
COUNTY ADMINISTRATION COSTS					\$ 1,500
REPORTS, PLANS AND SPECIFICATIONS					\$ 3,500
CONSTRUCTION STAKING & ADMINISTRATION					\$ 2,200
<b>ESTIMATED 90TH STREET (SECTION 20 BRUSH CREEK)</b>					<b>\$ 57,164</b>

**FARIBAULT COUNTY**  
**COUNTY DITCH No. 55**  
December 31, 2019



**REPAIR OPTIONS COST ESTIMATES**

Repair Option	Repair Costs
Option 1: Petition Area Repair	\$ 276,765
Option 2: Landowner Recommended Repair	\$ 548,437
Option 3: Full Ditch Cleaning	\$ 860,185

**ROAD CROSSINGS**

90th Street	\$ 57,164
<b>Total</b>	<b>\$ 57,164</b>



# APPENDIX C: PRELIMINARY CONSTRUCTION PLANS



# FARIBAULT COUNTY COUNTY DITCH NO. 55 REPAIR

FARIBAULT COUNTY, MINNESOTA

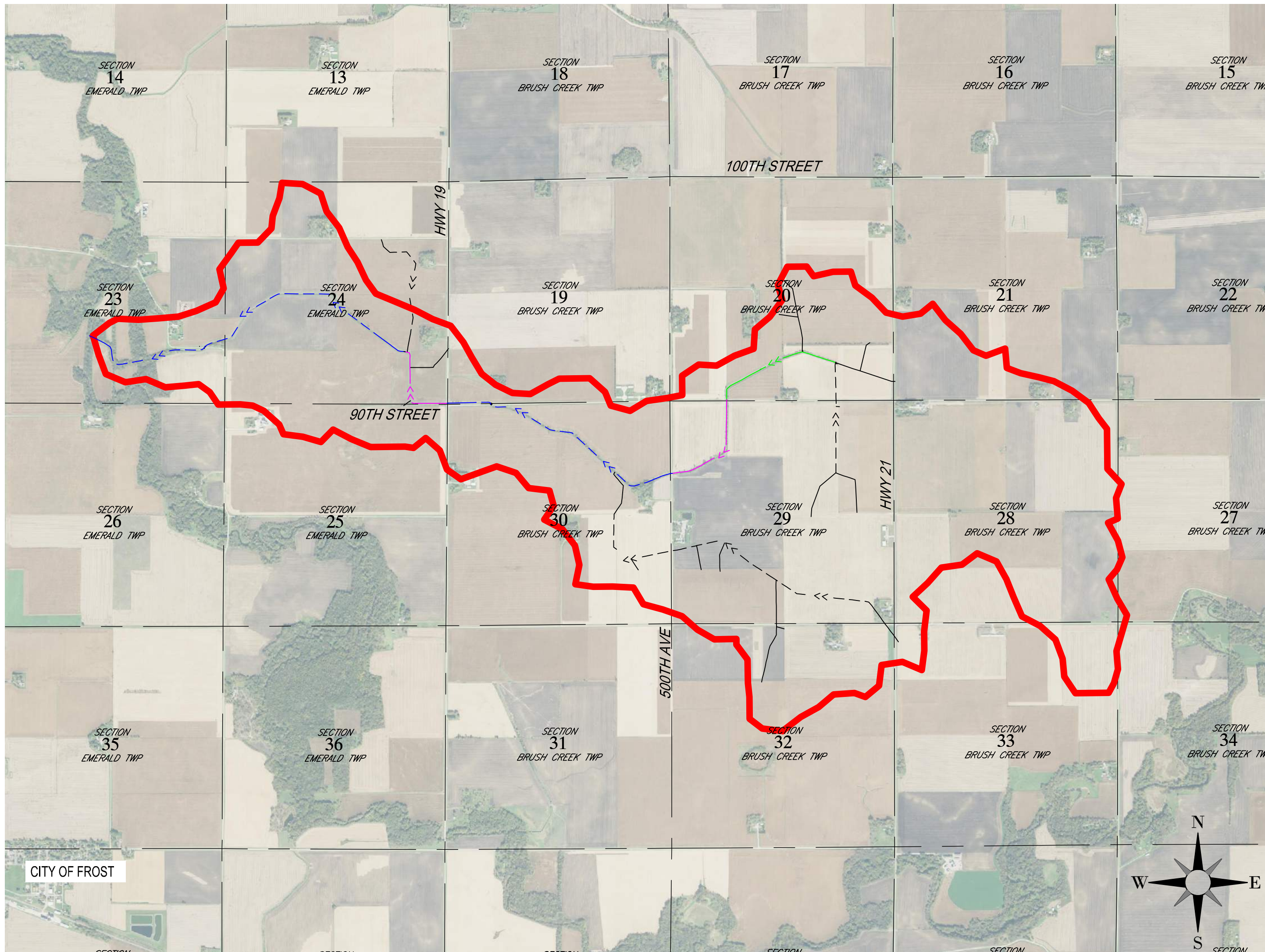
CONSTRUCTION PLANS

ISG PROJECT # 18-22272



## LEGEND

EXISTING	
	CITY LIMITS
	SECTION LINE
	QUARTER SECTION LINE
	RIGHT OF WAY LINE
	PROPERTY / LOTLINE
	EASEMENT LINE
	ACCESS CONTROL
	WATER EDGE
	WETLAND BOUNDARY
	WETLAND / MARSH
	FENCE LINE
	CULVERT
	STORM SEWER
	SANITARY SEWER
	SANITARY SEWER FORCEMAIN
	WATER
	GAS
	OVERHEAD ELECTRIC
	UNDERGROUND ELECTRIC
	UNDERGROUND TELEPHONE
	UNDERGROUND TV
	OVERHEAD UTILITY
	UNDERGROUND UTILITY
	UNDERGROUND FIBER OPTIC
	CONTOUR (MAJOR)
	CONTOUR (MINOR)
	DECIDUOUS TREE
	CONIFEROUS TREE
	TREE LINE
	MANHOLE/STRUCTURE
	CATCH BASIN
	HYDRANT
	VALVE
	CURB STOP
	POWER POLE
	UTILITY PEDESTAL / CABINET
PROPOSED	
	LOT LINE
	RIGHT OF WAY
	EASEMENT
	CULVERT
	STORM SEWER
	STORM SEWER (PIPE WIDTH)
	SANITARY SEWER
	SANITARY SEWER (PIPE WIDTH)
	WATER
	GAS
	OVERHEAD ELECTRIC
	UNDERGROUND ELECTRIC
	UNDERGROUND TV
	CONTOUR
	MANHOLE
	CATCH BASIN
	HYDRANT
	VALVE



LOCATION MAP



## Sheet List Table

- 1 TITLE
- 2 NOTES & QUANTITIES
- 3 DETAILS
- 4 DETAILS
- 5 DETAILS
- 6 OVERALL WATERSHED
- 7 LANDOWNER MAP
- 8 MAINLINE OPEN DITCH PROFILES
- 9 MAINLINE OPEN DITCH PROFILES
- 10 MAINLINE OPEN DITCH PROFILES
- 11 MAINLINE OPEN DITCH PROFILES
- 12 CROSS SECTIONS
- 13 CROSS SECTIONS
- 14 CROSS SECTIONS
- 15 CROSS SECTIONS
- 16 CROSS SECTIONS
- 17 CROSS SECTIONS
- 18 CROSS SECTIONS

## PROJECT GENERAL NOTES

1. ALL WORK SHALL CONFORM TO THE CONTRACT DOCUMENTS, WHICH INCLUDE, BUT ARE NOT LIMITED TO, THE OWNER - CONTRACTOR AGREEMENT, THE PROJECT MANUAL (WHICH INCLUDES GENERAL SUPPLEMENTARY CONDITIONS AND SPECIFICATIONS), DRAWINGS OF ALL DISCIPLINES AND ALL ADDENDA, MODIFICATIONS AND CLARIFICATIONS ISSUED BY THE ARCHITECT/ENGINEER.
2. CONTRACT DOCUMENTS SHALL BE ISSUED TO ALL SUBCONTRACTORS BY THE GENERAL CONTRACTOR IN COMPLETE SETS IN ORDER TO ACHIEVE THE FULL EXTENT AND COMPLETE COORDINATION OF ALL WORK.
3. WRITTEN DIMENSIONS TAKE PRECEDENCE OVER SCALED DIMENSIONS. NOTIFY ARCHITECT/ENGINEER OF ANY DISCREPANCIES OR CONDITIONS REQUIRING INFORMATION OR CLARIFICATION BEFORE PROCEEDING WITH THE WORK.
4. FIELD VERIFY ALL EXISTING CONDITIONS AND DIMENSIONS. NOTIFY ARCHITECT/ENGINEER OF ANY DISCREPANCIES OR CONDITIONS REQUIRING INFORMATION OR CLARIFICATION BEFORE PROCEEDING WITH THE WORK.
5. DETAILS SHOWN ARE INTENDED TO BE INDICATIVE OF THE PROFILES AND TYPE OF DETAILING REQUIRED THROUGHOUT THE WORK. DETAILS NOT SHOWN ARE SIMILAR IN CHARACTER TO DETAILS SHOWN. WHERE SPECIFIC DIMENSIONS, DETAILS OR DESIGN INTENT CANNOT BE DETERMINED, NOTIFY ARCHITECT/ENGINEER BEFORE PROCEEDING WITH THE WORK.
6. ALL MANUFACTURED ARTICLES, MATERIALS AND EQUIPMENT SHALL BE APPLIED, INSTALLED, CONNECTED, ERECTED, CLEANED AND CONDITIONED ACCORDING TO MANUFACTURERS' INSTRUCTIONS. IN CASE OF DISCREPANCIES BETWEEN MANUFACTURERS' INSTRUCTIONS AND THE CONTRACT DOCUMENTS, NOTIFY ARCHITECT/ENGINEER BEFORE PROCEEDING WITH THE WORK.
7. ALL DISSIMILAR METALS SHALL BE EFFECTIVELY ISOLATED FROM EACH OTHER TO AVOID GALVANIC CORROSION.
8. THE LOCATION AND TYPE OF ALL INPLACE UTILITIES SHOWN ON THE PLANS ARE FOR GENERAL INFORMATION ONLY AND ARE ACCURATE AND COMPLETE TO THE BEST OF THE KNOWLEDGE OF I & S GROUP, INC. (ISG). NO WARRANTY OR GUARANTEE IS IMPLIED. THE CONTRACTOR SHALL VERIFY THE SIZES, LOCATIONS AND ELEVATIONS OF ALL INPLACE UTILITIES PRIOR TO CONSTRUCTION. CONTRACTOR SHALL IMMEDIATELY NOTIFY ENGINEER OF ANY DISCREPANCIES OR VARIATIONS FROM PLAN.
9. THE CONTRACTOR IS TO CONTACT "GOPHER STATE ONE CALL" FOR UTILITY LOCATIONS, MINIMUM 2 BUSINESS DAYS PRIOR TO ANY EXCAVATION / CONSTRUCTION (1-800-252-1166).

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PROJECT

**FARIBAULT  
COUNTY**

**COUNTY DITCH  
NO. 55 REPAIR**

FARIBAULT COUNTY MINNESOTA

REVISION SCHEDULE		
DATE	DESCRIPTION	BY

PROJECT NO.	18-22272
FILE NAME	22272 TITLE
DRAWN BY	DMP/KJH
DESIGNED BY	JMW/SMW
REVIEWED BY	MAO
ORIGINAL ISSUE DATE	11-1-19
CLIENT PROJECT NO.	-

TITLE

**TITLE**

SHEET

**1**

OF 18

## PROJECT INDEX:

OWNER:

**FARIBAULT COUNTY DRAINAGE  
AUTHORITY**  
415 S GROVE STREET, SUITE 8  
BLUE EARTH, MN 56013  
PH: (507) 526-2388

PROJECT  
ADDRESS / LOCATION:

**SEC: 19-21, 27-30, 32-34  
BRUSH CREEK TWP  
SEC: 23-26 EMERALD TWP**

**FARIBAULT COUNTY, MINNESOTA**

MANAGING OFFICE:

**MANKATO OFFICE**  
115 EAST HICKORY STREET  
SUITE 300  
MANKATO, MN 56001  
PHONE: 507.387.6651  
FAX: 507.387.3583

PROJECT MANAGER: MARK ORIGER  
EMAIL: MARK.ORIGER@ISGINC.COM

## SPECIFICATIONS REFERENCE

ALL CONSTRUCTION SHALL COMPLY WITH THE COUNTY OF  
FARIBAULT REQUIREMENTS AND MNDOT STANDARD  
SPECIFICATIONS FOR CONSTRUCTION, 2018 EDITION, AND THE  
STANDARD SPECIFICATIONS FOR SANITARY SEWER, STORM  
DRAIN AND WATERMAIN AS PROPOSED BY THE CITY ENGINEERS  
ASSOCIATION OF MINNESOTA 2013, UNLESS DIRECTED  
OTHERWISE.

## PROJECT DATUM

HORIZONTAL COORDINATES HAVE BEEN REFERENCED TO THE  
NORTH AMERICAN DATUM OF 1983 (NAD83), 1986 ADJUSTMENT  
(NAD83(1996)) ON THE FARIBAULT COUNTY COORDINATE  
SYSTEM, IN U.S. SURVEY FEET.  
ELEVATIONS HAVE BEEN REFERENCED TO THE NORTH  
AMERICAN VERTICAL DATUM OF 1988 (NAVD 88).  
RTK GPS METHODS WERE USED TO ESTABLISH HORIZONTAL  
AND VERTICAL COORDINATES FOR THIS PROJECT.

**B.M. ELEVATION=1122.93**  
MNDOT 31 RDS

## TOPOGRAPHIC SURVEY

THIS PROJECT'S TOPOGRAPHIC SURVEY CONSISTS  
OF DATA COLLECTED IN APRIL 2019 BY ISG.



GENERAL OPEN DITCH NOTES:

1. DURING CONSTRUCTION, CONTRACTOR SHALL MAINTAIN A DRAINAGE OUTLET FOR THE ENTIRE FARIBAULT COUNTY DITCH 55 PROJECT AREA.
2. ALL PIPE DIMENSIONS REFERENCED IN THE PLANS REFER TO THE INSIDE DIAMETER.
3. UNLESS OTHERWISE NOTED, CONTRACTOR SHALL LIMIT CONSTRUCTION ACTIVITY TO WITHIN A 33-FOOT WIDE AREA ALONG TOP OF DITCH ALIGNMENTS. DISTURBANCE THROUGH ROAD CROSSINGS, ROAD DITCHES, AND GRASS BUFFERS SHALL BE LIMITED TO THE TRENCH WIDTH NECESSARY FOR SAFE CONSTRUCTION PRACTICES.
4. A 16.5-FOOT GRASS STRIP SHALL BE ESTABLISHED IN AREAS THAT DO NOT HAVE AN EXISTING 16.5-FOOT GRASS STRIP. SEEDING SHALL OCCUR AFTER ALL WORK HAS BEEN COMPLETED IN THE AREA AND SHALL COMPLY WITH THE CONTRACT DOCUMENTS. THESE AREAS WILL BE DETERMINED BY THE ENGINEER.
5. DITCH CLEANING SHALL BE PERFORMED ON THE SIDE OF THE DITCH THAT IS THE LOWEST FOR THE GREATEST DISTANCE ALONG THE OPEN DITCH SEGMENT. DITCH CLEANING SPOILS SHALL BE PLACED WITHIN 16.5-FOOT WIDE GRASS STRIP FROM THE TOP OF DITCH SLOPE UNLESS OTHERWISE DETERMINED BY THE ENGINEER.
6. TOPSOIL IN SPOIL AREAS AS SPECIFIED ON PLANS SHALL BE STRIPPED PRIOR TO SPOIL PLACEMENT.
7. SHAPING AROUND SIDE INLETS, WASCOBs, AND CULVERT INLETS SHALL BE INCIDENTAL TO THEIR RESPECTIVE PAY ITEMS.
8. ALL SPOIL LEVELING, GRADING, AND RESTORATION OF DISTURBED AREAS SHALL BE IN ACCORDANCE TO THE CONTRACT DOCUMENTS AND SHALL BE INCIDENTAL TO THE WORK PERFORMED.
9. ALL EXISTING TILE OUTLETS INTO THE OPEN DITCH, INCLUDING ANY NOT SHOWN ON THE PLANS, SHALL BE REPAIRED. UNLESS SPECIFICALLY NOTED, HDPE OR PVC SHALL BE ACCEPTABLE MATERIAL FOR ALL TILE REPAIRS (SEE DETAILS).
10. EXISTING TILE OUTLETS MAY BE SALVAGED, REUSED, AND PROTECTED WITH RIPRAP IF THE OUTLET IS DETERMINED TO BE IN GOOD CONDITION BY THE ENGINEER. TILE REPAIR AT THESE LOCATIONS SHALL BE PAID FOR AS PAY ITEM "ARMOR TILE OUTLET" (SEE DETAILS).
9. ALL ROAD CROSSING REPAIRS SHALL BE CONSTRUCTED WITH CLASS III RCP ONLY, UNLESS OTHERWISE SPECIFIED ON PLANS OR APPROVED BY THE ENGINEER. TIE ALL PIPE SECTIONS UNDER ROAD CROSSINGS (INCIDENTAL).
10. CONTRACTOR MUST NOTIFY ENGINEER OF ANY CULVERT SECTIONS DEEMED NOT SALVAGEABLE PRIOR TO REMOVAL AND SHALL BE ADDRESSED BEFORE CULVERT WORK IS DONE.
11. MISCELLANEOUS TREE CLEARING SHALL BE INCIDENTAL TO DITCH CLEANING PAY ITEM(S).
12. TREE CLEARING FOR ALL TREES WITHIN THE 1-ROD BUFFER STRIP ARE REQUIRED TO BE REMOVED AND WILL BE PAID FOR AS A LUMP SUM UNIT. APPROXIMATE LOCATIONS ARE INCLUDED ON THE MAP FOR REFERENCE. TREES SHALL BE CLEARED AND GRUBBED AND SPRAY THE AREA AROUND TREE AFTER COMPLETE.
13. ALL TREE REMOVALS MUST BE COMPLETED BY MAY 1, 2020.

ALTERNATIVE SIDE INLET (ASI)								
Description			Bid Item			Bid Item		
ID	BRANCH (LOCATION)	STATION	INTAKE TYPE	RISER SIZE (in)	RISER DEPTH (LF)	OUTLET SIZE (in)	OUTLET LENGTH (LF)	OUTLET GRADE (%)
1	Main	174+00	Trash Grate	24	8	24	30	2.00%
2	Main	200+50	Trash Grate	24	8	24	30	2.00%

TOTAL ESTIMATED QUANTITIES			
Item Code	Item	Unit	Estimated Quantity
2021.501	MOBILIZATION	LS	1
2101.511	TREE REMOVAL	LS	1
2105.603	STANDARD DITCH CLEANING (8' WIDE DITCH BOTTOM)	LF	4730
2105.603	TWO-STAGE DITCH CLEANING (2' WIDE DITCH BOTTOM)	LF	1000
2105.603	TWO-STAGE DITCH CLEANING (1.5' WIDE DITCH BOTTOM)	LF	2100
2105.603	SLOUGH REPAIR	LF	500
2506.502	INSTALL 24-INCH ASI RISER ASSEMBLY W/TRASH GRATE	EA	2
2506.502	INSTALL 24-INCH ASI OUTLET ASSEMBLY	EA	2
2506.603	30-INCH TILE OUTLET (20 LF OF PIPE & RIPRAP ON GEOTEXTILE FABRIC)	EA	1
2506.603	24-INCH TILE OUTLET (20 LF OF PIPE & RIPRAP ON GEOTEXTILE FABRIC)	EA	1
2506.603	18-INCH TILE OUTLET (20 LF OF PIPE & RIPRAP ON GEOTEXTILE FABRIC)	EA	1
2506.603	15-INCH TILE OUTLET (20 LF OF PIPE & RIPRAP ON GEOTEXTILE FABRIC)	EA	2
2506.603	12-INCH TILE OUTLET (20 LF OF PIPE & RIPRAP ON GEOTEXTILE FABRIC)	EA	5
2506.603	10-INCH TILE OUTLET (20 LF OF PIPE & RIPRAP ON GEOTEXTILE FABRIC)	EA	4
2506.603	8-INCH TILE OUTLET (20 LF OF PIPE & RIPRAP ON GEOTEXTILE FABRIC)	EA	4
2506.603	6-INCH TILE OUTLET (20 LF OF PIPE & RIPRAP ON GEOTEXTILE FABRIC)	EA	3
2506.603	ARMOR TILE OUTET (RIPRAP & GEOTEXTILE FABRIC)	EA	20
2511.501	CLASS III RIPRAP WITH GEOTEXTILE FABRIC	CY	200
2575.501	16.5' BUFFER STRIP SEEDING (SEED MIX: BUFFER BLEND WITH TYPE 3 MULCH)	AC	8
2575.501	STANDARD SIDESLOPE SEEDING (SEED MIX: BUFFER BLEND WITH TYPE 8 MULCH)	AC	2.6
2575.541	BUFFER STRIP MOWING	AC	11.72
2575.545	WEED SPRAYING	AC	17.34



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PROJECT

FARIBAULT  
COUNTY

COUNTY DITCH  
NO. 55 REPAIR

FARIBAULT COUNTY MINNESOTA

REVISION SCHEDULE		
DATE	DESCRIPTION	BY

PROJECT NO.	18-22272
FILE NAME	22272 TITLE
DRAWN BY	DMP/KJH
DESIGNED BY	JMW/SMW
REVIEWED BY	MAO
ORIGINAL ISSUE DATE	--/--
CLIENT PROJECT NO.	-

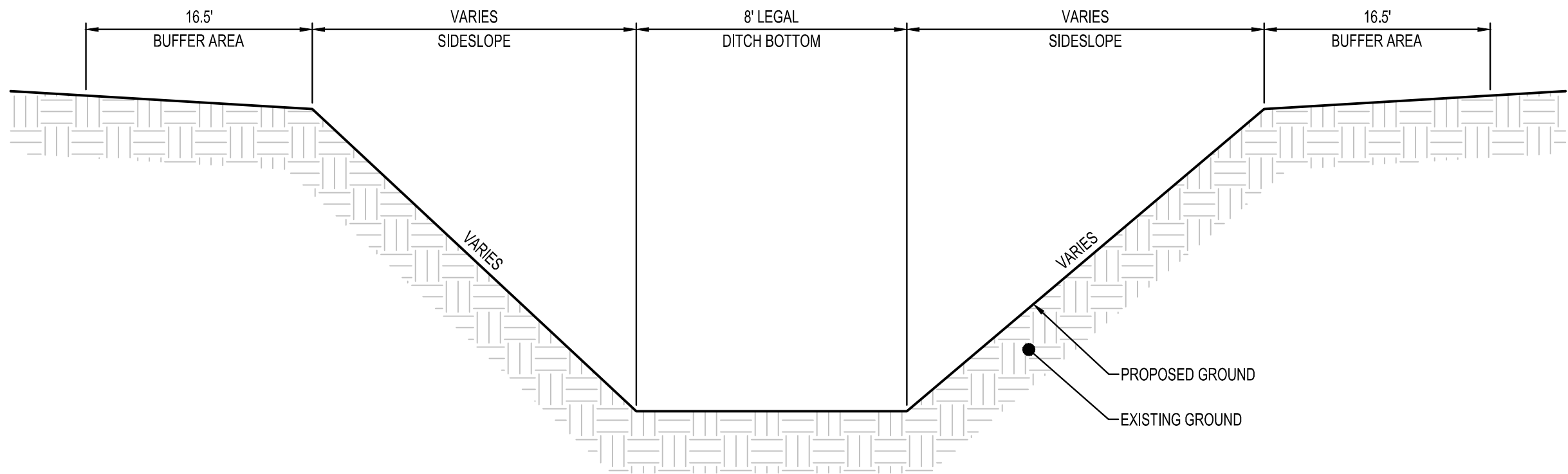
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NOTES &  
QUANTITIES

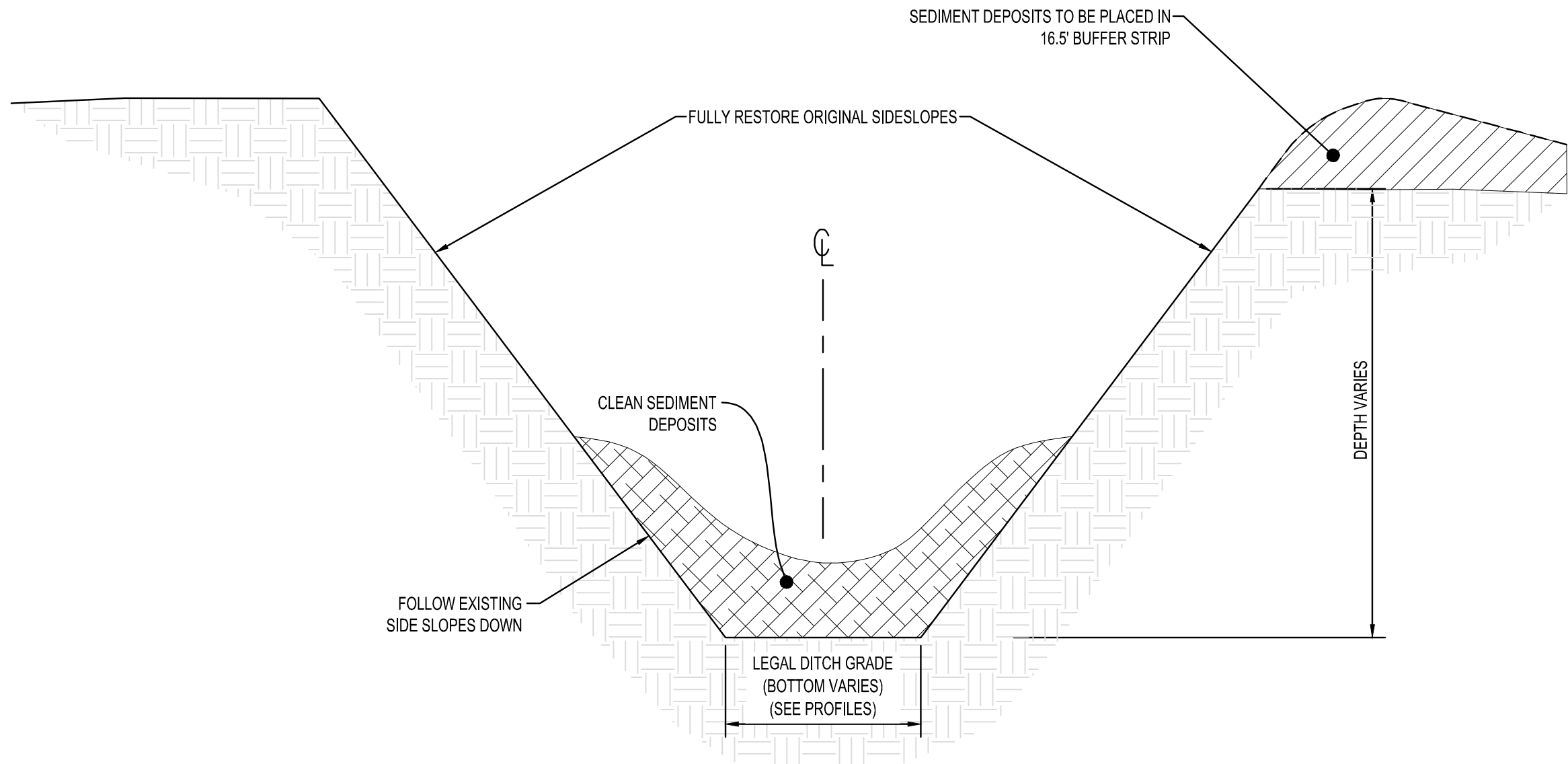
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OF 18

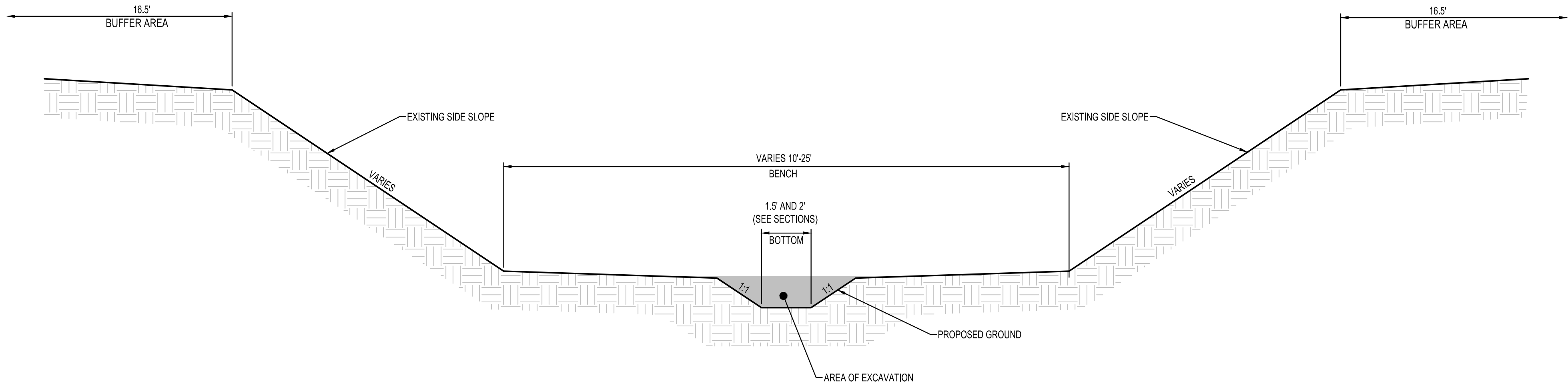


**TRAPEZOIDAL DITCH SECTION**  
NTS AG400



**NOTES:**  
BOTTOM 1/2 NEED NOT BE RESEED.  
ONLY CLEAN TO LEGAL DITCH BOTTOM. ENTIRE DITCH  
BOTTOM NEED NOT BE CLEANED UNLESS SPECIFIED.

**TYPICAL DITCH CLEANING**  
NTS AG420



**TYPICAL TWO-STAGE DITCH SECTION**  
NTS AG410



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PROJECT

**FARIBAULT  
COUNTY**

**COUNTY DITCH  
NO. 55 REPAIR**

FARIBAULT COUNTY MINNESOTA

REVISION SCHEDULE		
DATE	DESCRIPTION	BY

PROJECT NO.	18-22272
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TITLE

**DETAILS**

SHEET

**3**

OF 18





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PROJECT

**FARIBAULT  
COUNTY**

**COUNTY DITCH  
NO. 55 REPAIR**

FARIBAULT COUNTY MINNESOTA

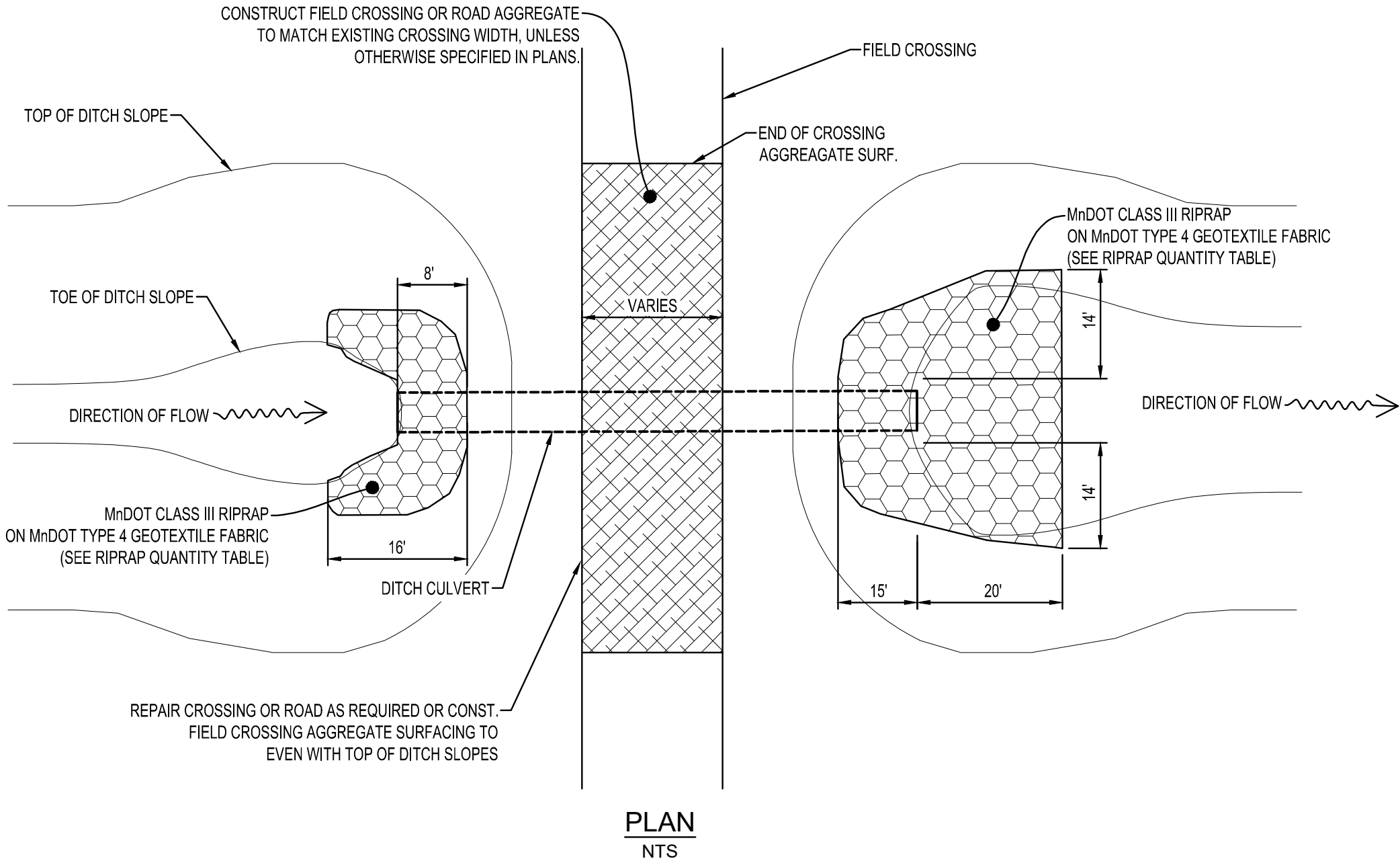
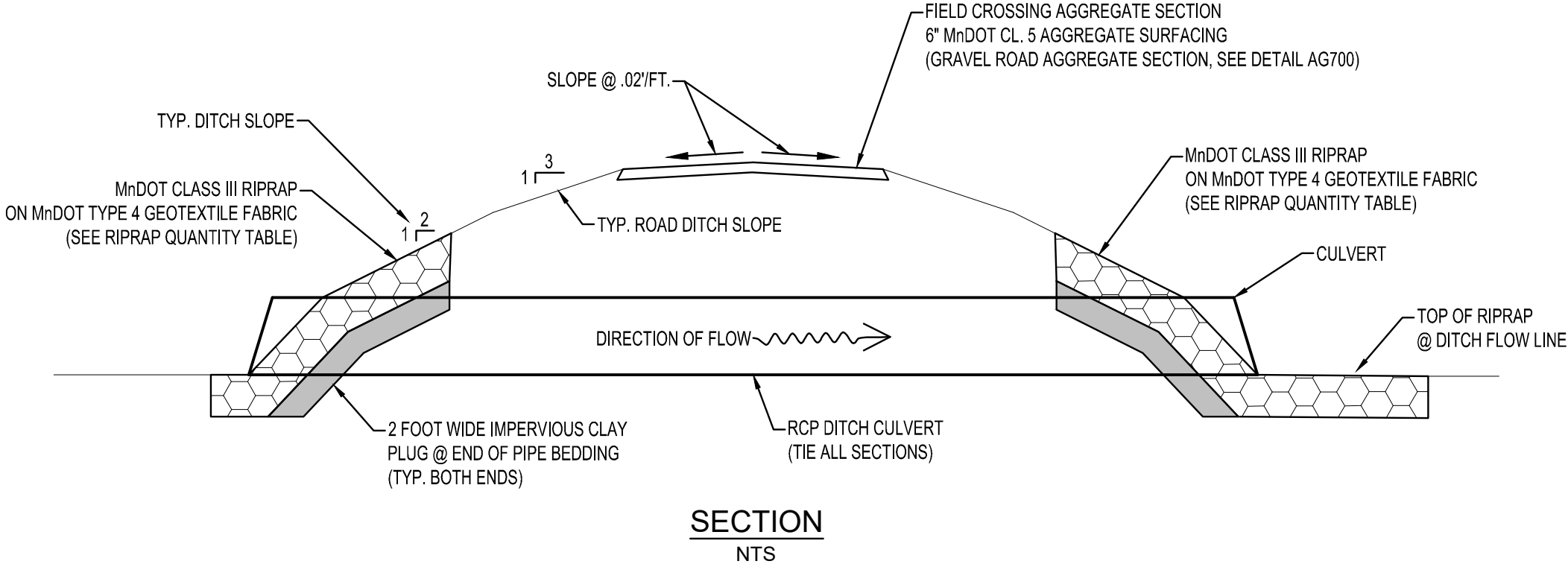
REVISION SCHEDULE		
DATE	DESCRIPTION	BY

PROJECT NO.	18-22272
FILE NAME	22272 DETAILS
DRAWN BY	DMP/KJH
DESIGNED BY	JMW/SMW
REVIEWED BY	MAO
ORIGINAL ISSUE DATE	--/--
CLIENT PROJECT NO.	-

TITLE

**DETAILS**

SHEET

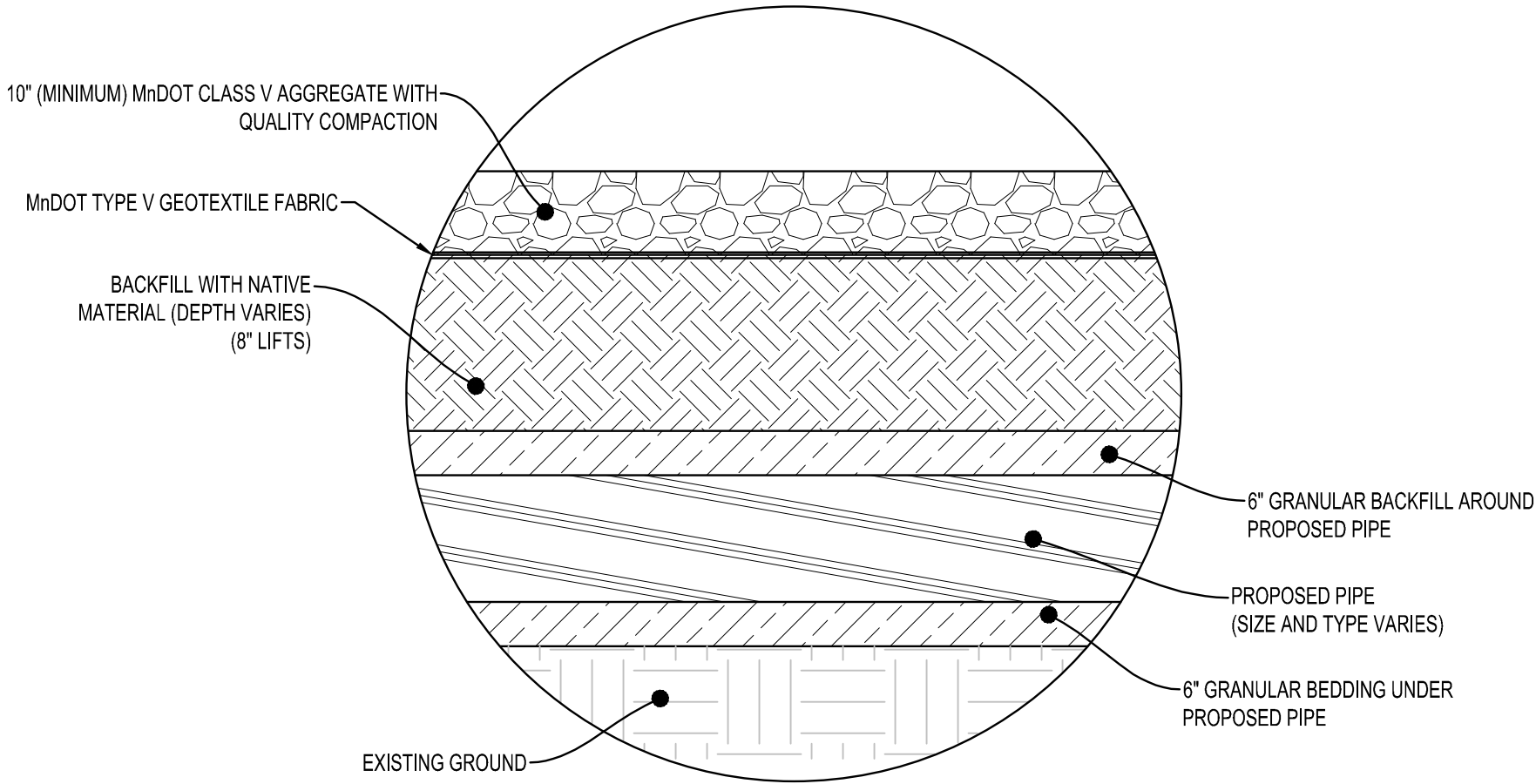


RIPRAP QUANTITY	
EQUIVALENT SIZE	UPSTREAM - DOWNSTREAM
<48"	10 CY - 20 CY

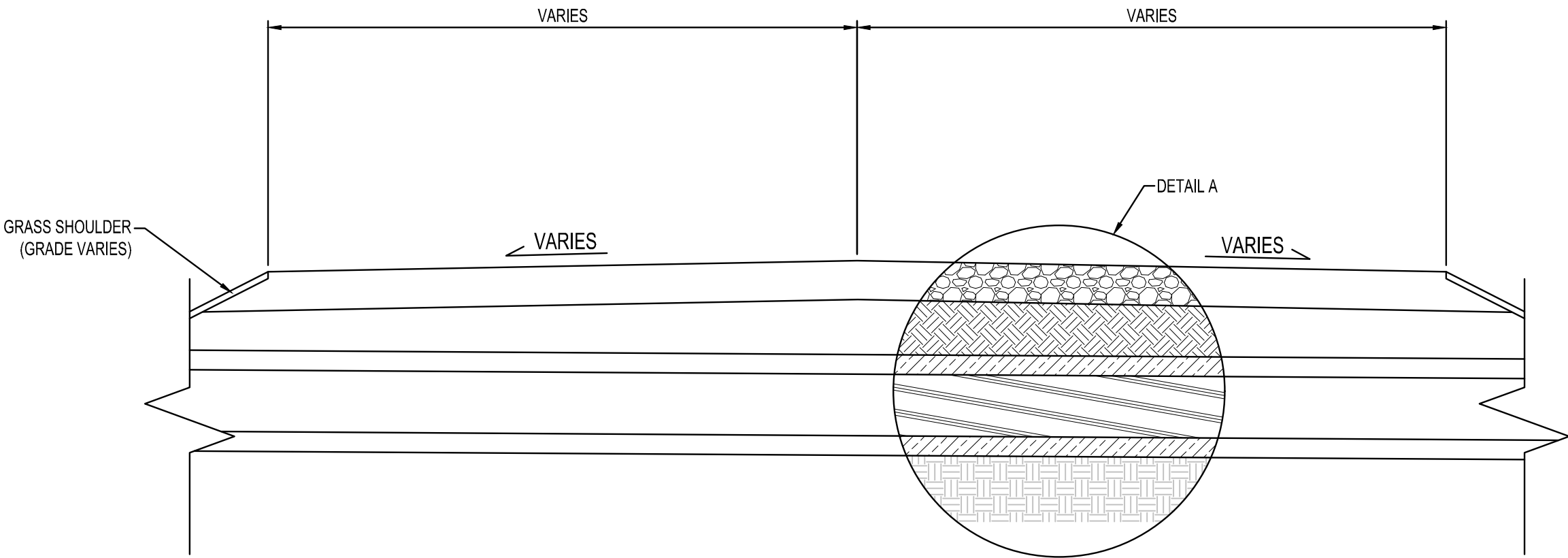
**NOTES:**

OPEN DITCH CULVERTS MUST BE WATERTIGHT, GASKETED, AND TONGUE AND GROOVE DESIGN CONFORMING TO MNDOT 3006F.  
SEE TYPICAL ROAD SECTION DETAIL AG700.  
AGGREGATE SURFACE IS INCIDENTAL TO CROSSING OR ROAD RESTORATION.  
TIE ALL RCP PIPE SECTIONS (INCIDENTAL TO CROSSING).  
RIPRAP QUANTITIES ESTIMATED (AS SHOWN IN TABLE). ADDITIONAL QUANTITY MAY BE REQUIRED BY ENGINEER AND/OR SHOWN ON PLANS. ALL RIPRAP QUANTITIES SHALL BE PAID BY CY INSTALLED.  
ADDITIONAL RIPRAP NEEDED FOR CULVERTS LARGER THAN 48". REFER TO SCHEDULE FOR DIMENSIONS.

**TYPICAL FIELD OR ROAD CROSSING**  
NTS AG710



DETAIL A



SECTION

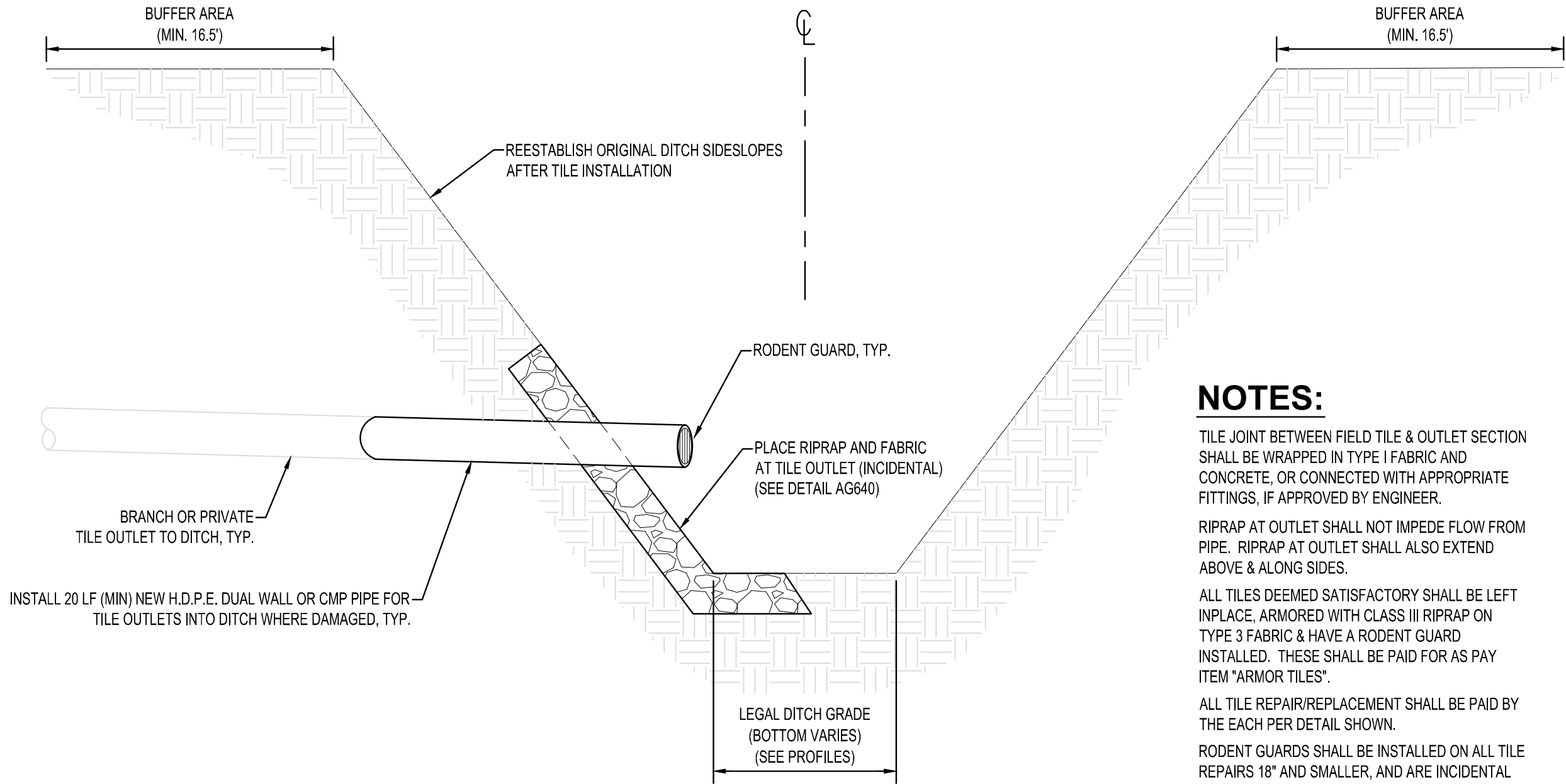
**NOTES:**

SALVAGE & REPLACE EXISTING CROSSING SURFACE MATERIAL. ADDITIONAL CLASS III AGGREGATE MAY BE NEEDED TO MEET MINIMUM 10" DEPTH.  
SEED DISTURBED GRASS SHOULDER WITH MNDOT 25-142 WITH MNDOT CATEGORY 3 EROSION CONTROL BLANKET.  
CONTRACTOR IS RESPONSIBLE TO MAINTAIN THE DISTURBED ROADS UNTIL THE PROJECT IS COMPLETED OR ROAD AUTHORITY HAS RESUMED CONTROL, WHICHEVER IS SOONER.

**TYPICAL ROADWAY SECTION**  
NTS AG700



NOTE: ALL TILE OUTLETS AND FIELD INTAKES SHALL BE REPAIRED OR PROTECTED



TYPICAL TILE OUTLET REPAIR  
NTS AG450

NOTES:

TILE JOINT BETWEEN FIELD TILE & OUTLET SECTION SHALL BE WRAPPED IN TYPE I FABRIC AND CONCRETE, OR CONNECTED WITH APPROPRIATE FITTINGS, IF APPROVED BY ENGINEER.

RIPRAP AT OUTLET SHALL NOT IMPEDE FLOW FROM PIPE. RIPRAP AT OUTLET SHALL ALSO EXTEND ABOVE & ALONG SIDES.

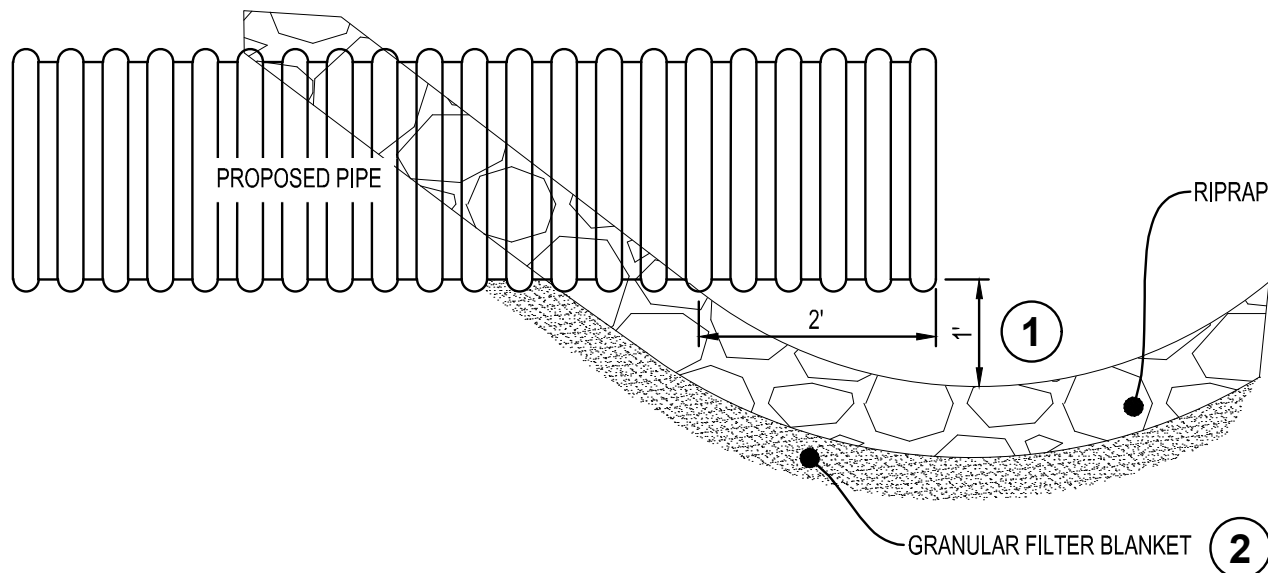
ALL TILES DEEMED SATISFACTORY SHALL BE LEFT INPLACE, ARMORED WITH CLASS III RIPRAP ON TYPE 3 FABRIC & HAVE A RODENT GUARD INSTALLED. THESE SHALL BE PAID FOR AS PAY ITEM "ARMOR TILES".

ALL TILE REPAIR/REPLACEMENT SHALL BE PAID BY THE EACH PER DETAIL SHOWN.

RODENT GUARDS SHALL BE INSTALLED ON ALL TILE REPAIRS 18" AND SMALLER, AND ARE INCIDENTAL TO THE PAY ITEM.

ALL FITTINGS TO CONNECT EXISTING TILE SHALL BE INCIDENTAL TO TILE OUTLET REPAIR.

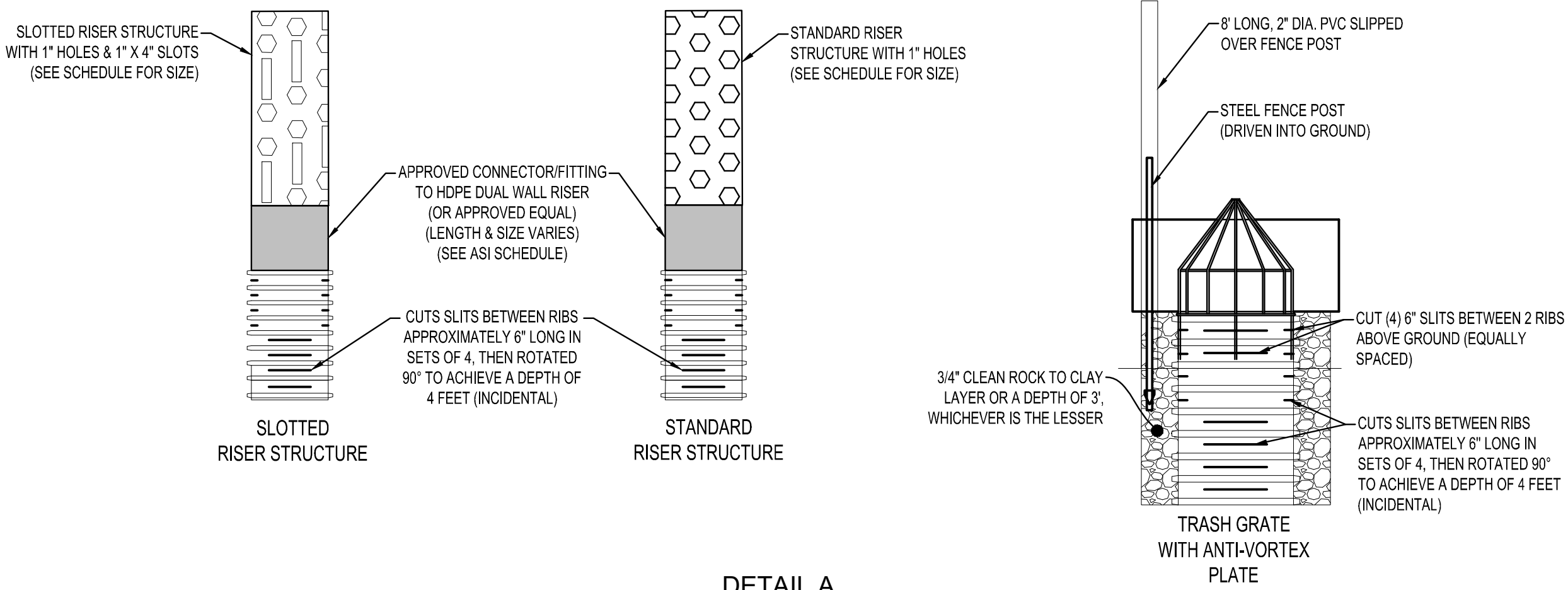
DIMENSIONS	
PIPE DIA	RIPRAP
12" TO 18"	4 CY CLASS III
21" TO 27"	8 CY CLASS III
30" TO 36"	12 CY CLASS III
42" TO 48"	16 CY CLASS III
54" & UP	20 CY CLASS IV



NOTES:

- 1' MIN. ABOVE RIPRAP. FOR PIPES GREATER THAN OR EQUAL TO 30", USE 1.5' - 2'.
  - THE CONTRACTOR, AS AN OPTION, MAY SUBSTITUTE A GEOTEXTILE FABRIC, SPEC. 3601, FOR THE GRANULAR FILTER BLANKET. THE FABRIC SHOULD EXTEND BEYOND THE RIPRAP BY 3' IN ALL DIRECTIONS.
- FOR PIPES LESS THAN 18", INSTALL RODENT GUARD (INCIDENTAL TO TILE OUTLET)
- RIPRAP AT OUTLET SHALL NOT IMPEDE FLOW FROM PIPE, OR RECEIVING BODY. RIPRAP AT OUTLET SHALL ALSO EXTEND ABOVE AND ALONG SIDES OF PIPE.
- ADDITIONAL RIPRAP MAY BE NECESSARY BASED ON ELEVATIONS (PAID FOR BY CY)

RIPRAP AT TILE OUTLET  
NTS AG620



DETAIL A

NOTES:

INTAKE TYPE & TILE SIZE VARIES PER ASI. (SEE SCHEDULE)

RISER ASSEMBLY SHALL BE A SEPARATE PAY ITEM THAN THE OUTLET ASSEMBLY.

ALL DISTURBED AREAS WITHIN BUFFER EASEMENT SHALL BE SEEDED WITH BUFFER BLEND SEED MIX ON CATEGORY III EROSION CONTROL BLANKET.

ALL EFFORTS SHALL BE MADE TO SEPARATE SOIL TYPES. BACKFILL SHALL BE COMPACTED PRIOR TO PLACEMENT OF TOPSOIL, EXCEPT THE TOP TWO (2) FEET, FOR WHICH COMPACTION SHALL BE MINIMIZED TO THE EXTENT POSSIBLE. TOPSOIL SHALL BE PLACED TO A MINIMUM DEPTH OF 6", OR UNIFORM TO THE TOPSOIL DEPTH OF THE SURROUNDING AREA. ALL EFFORTS SHALL BE MADE TO KEEP TOPSOIL ON TOP AND SEPARATED. NO TOPSOIL SHALL BE PLACED IN THE TRENCH BELOW 2' FROM EXISTING GROUND UNLESS APPROVED BY THE ENGINEER.

ALL INTAKES SHALL BE WRAPPED WITH NON-WOVEN GEOTEXTILE FABRIC. (INCIDENTAL TO RISER ASSEMBLY)

ALL SLITS CUT INTO RISER ARE INCIDENTAL TO RISER ASSEMBLY.

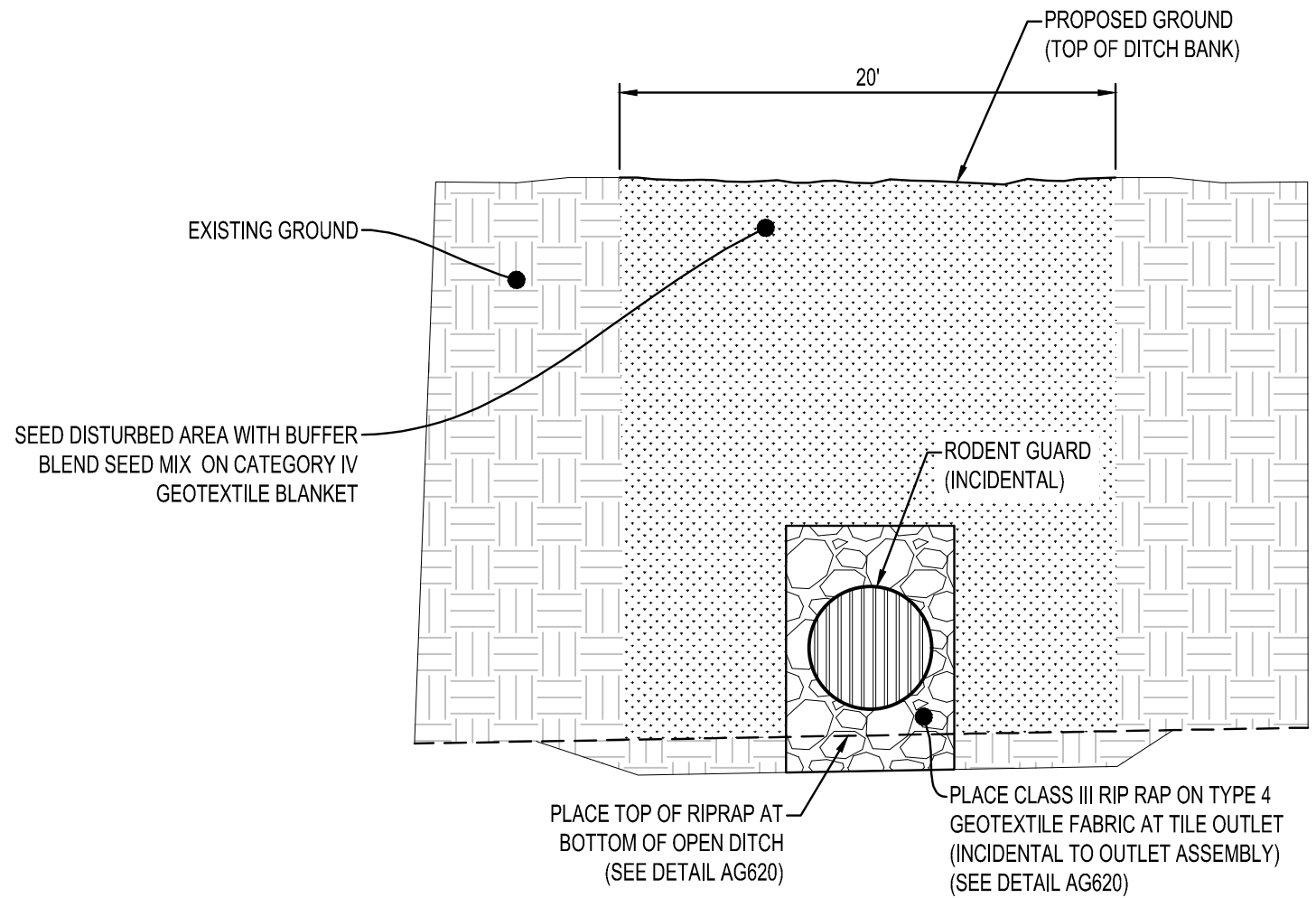
ALL 3/4" CLEAN ROCK IS INCIDENTAL TO RISER ASSEMBLY.

ALL OUTLET RIPRAP IS INCIDENTAL TO OUTLET ASSEMBLY

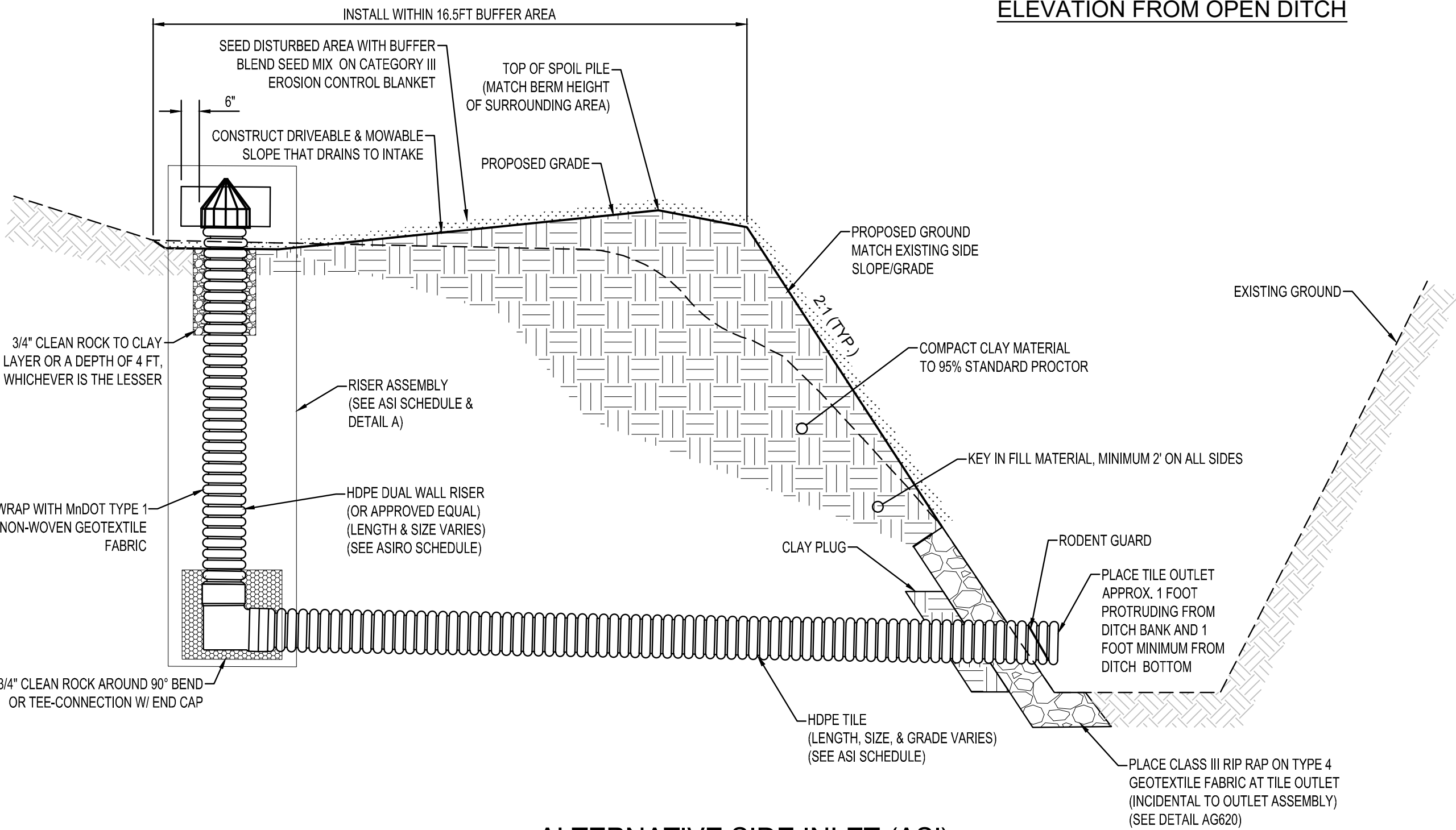
INTAKES SHALL BE FIELD ADJUSTED BASED ON ACTUAL LOCATION OF LOW AREAS, AS DETERMINED BY THE ENGINEER.

TILE OUTLET ASSEMBLY SHALL CONFORM TO STANDARD TILE INSTALLATION.

SHAPING OF LOW AREA TO GRADE TO DROP INTAKE SHALL BE INCIDENTAL TO PAY ITEM.



ELEVATION FROM OPEN DITCH



ALTERNATIVE SIDE INLET (ASI)  
NTS AG340



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PROJECT

**FARIBAULT COUNTY**

**COUNTY DITCH NO. 55 REPAIR**

FARIBAULT COUNTY MINNESOTA

REVISION SCHEDULE		
DATE	DESCRIPTION	BY

PROJECT NO.	18-22272
FILE NAME	22272 DETAILS
DRAWN BY	DMP/KJH
DESIGNED BY	JMW/SMW
REVIEWED BY	MAO
ORIGINAL ISSUE DATE	11-1-11
CLIENT PROJECT NO.	-

TITLE

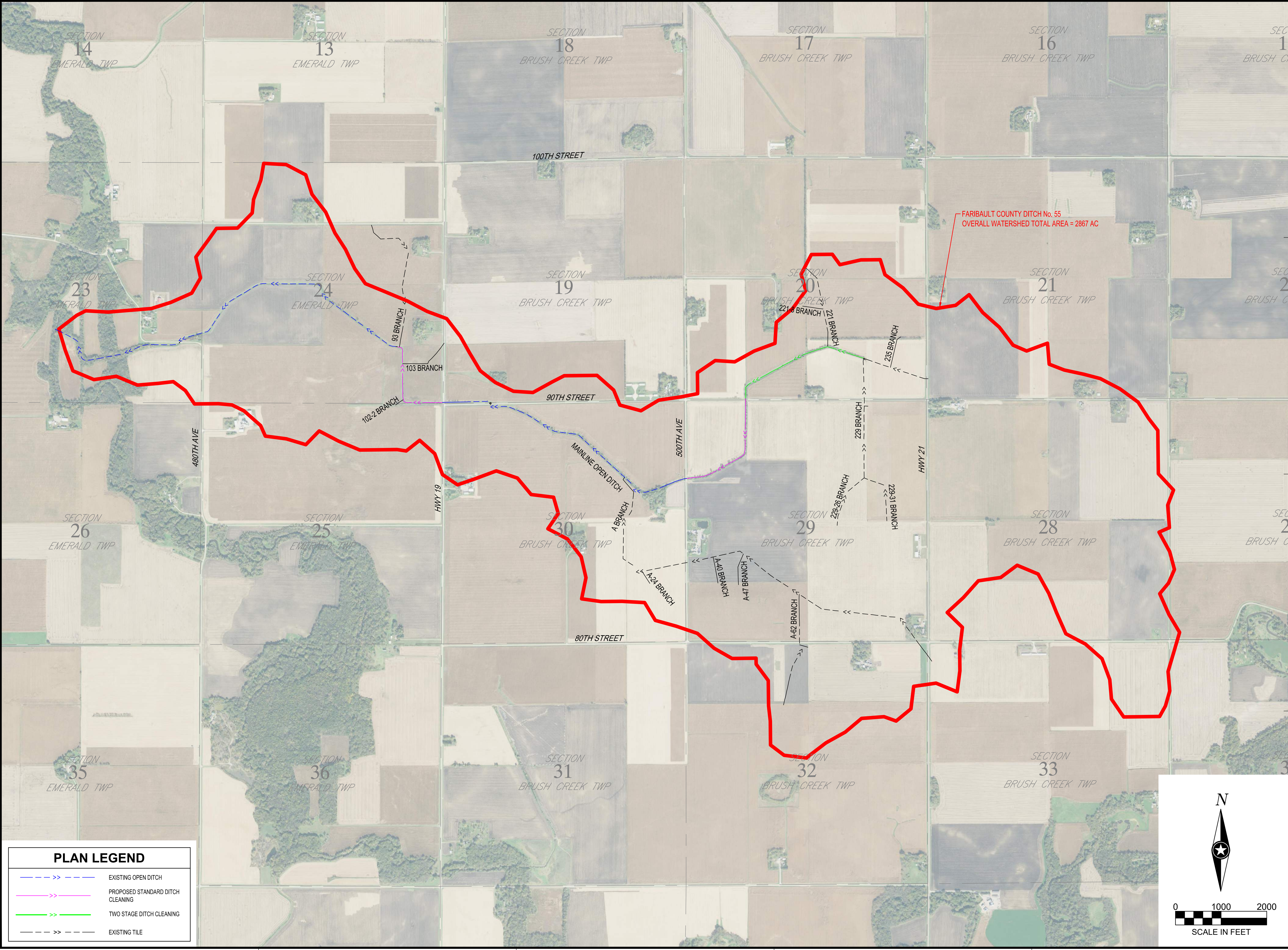
**DETAILS**

SHEET

**5**

OF 18





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PROJECT

**FARIBAULT  
COUNTY  
COUNTY DITCH  
NO. 55 REPAIR**

FARIBAULT COUNTY MINNESOTA

REVISION SCHEDULE		
DATE	DESCRIPTION	BY

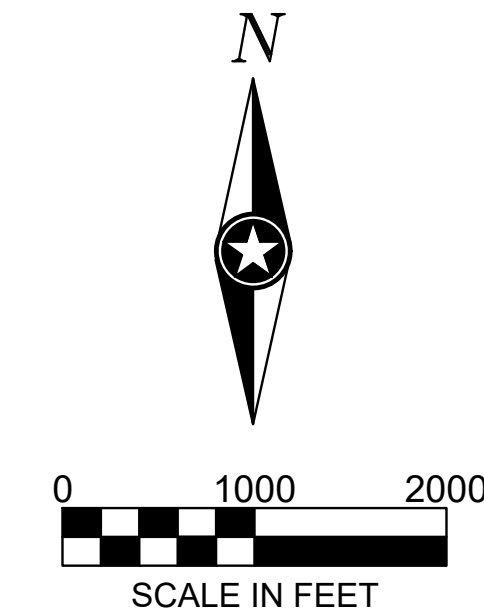
PROJECT NO.	18-22272
FILE NAME	22272 WATERSHED
DRAWN BY	DMP/KJH
DESIGNED BY	JMW/SMW
REVIEWED BY	MAO
ORIGINAL ISSUE DATE	11-1-11
CLIENT PROJECT NO.	-

TITLE

**OVERALL  
WATERSHED**

SHEET

PLAN LEGEND	
	EXISTING OPEN DITCH
	PROPOSED STANDARD DITCH CLEANING
	TWO STAGE DITCH CLEANING
	EXISTING TILE







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PROJECT  
**FARIBAUT  
COUNTY  
COUNTY DITCH  
NO. 55 REPAIR**

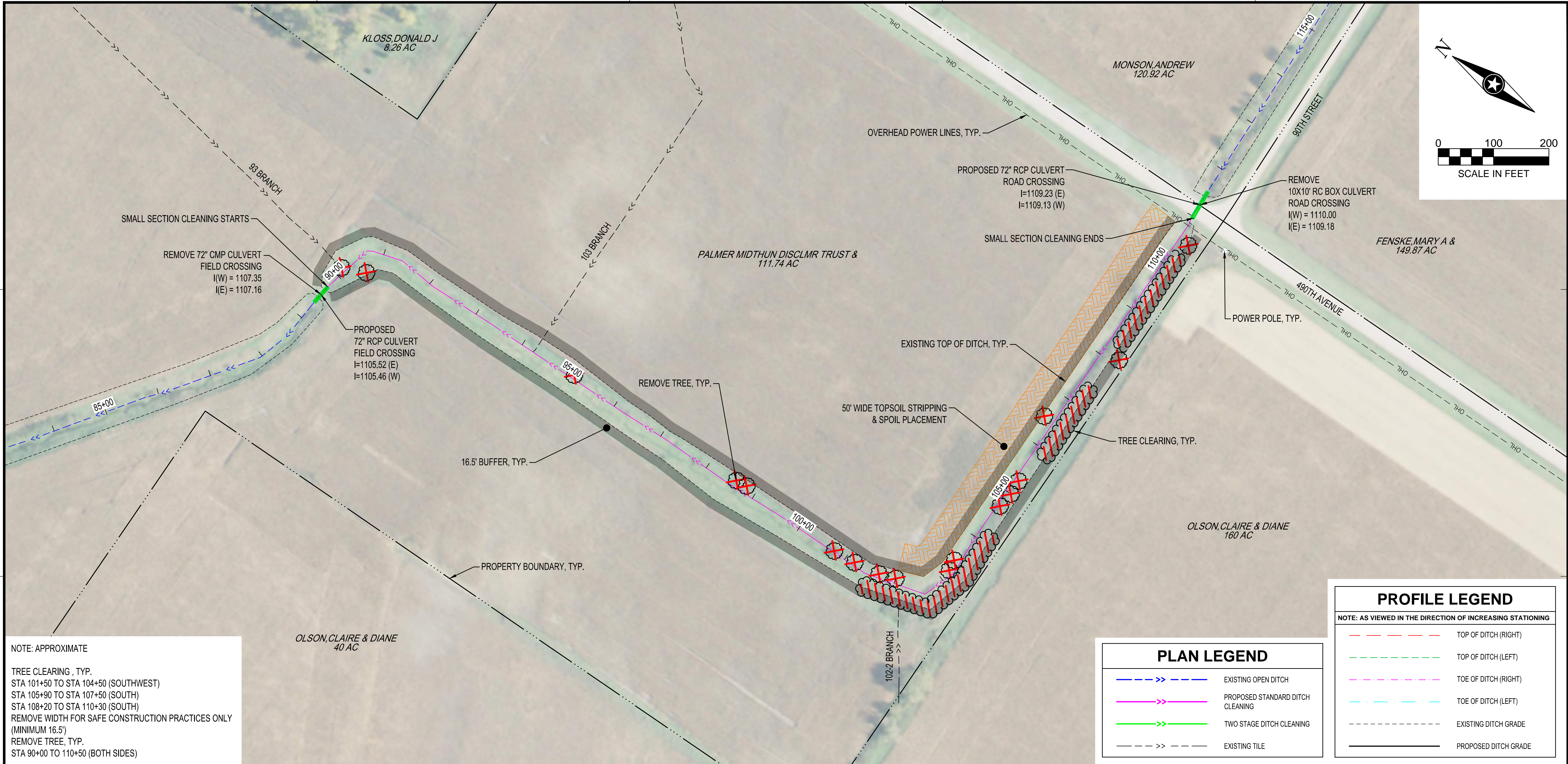
FARIBAUT COUNTY MINNESOTA

REVISION SCHEDULE		
DATE	DESCRIPTION	BY

PROJECT NO.	18-22272
FILE NAME	22272 WATERSHED
DRAWN BY	DMP/KJH
DESIGNED BY	JMW/SMW
REVIEWED BY	MAO
ORIGINAL ISSUE DATE	11-1-18
CLIENT PROJECT NO.	-

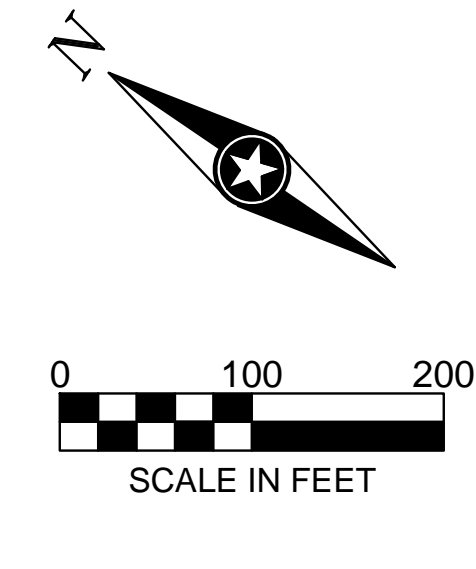
TITLE  
**LANDOWNER MAP**





NOTE: APPROXIMATE

TREE CLEARING, TYP.  
STA 101+50 TO STA 104+50 (SOUTHWEST)  
STA 105+90 TO STA 107+50 (SOUTH)  
STA 108+20 TO STA 110+30 (SOUTH)  
REMOVE WIDTH FOR SAFE CONSTRUCTION PRACTICES ONLY  
(MINIMUM 16.5')  
REMOVE TREE, TYP.  
STA 90+00 TO 110+50 (BOTH SIDES)



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PROJECT

**FARIBAULT  
COUNTY  
COUNTY DITCH  
NO. 55 REPAIR**

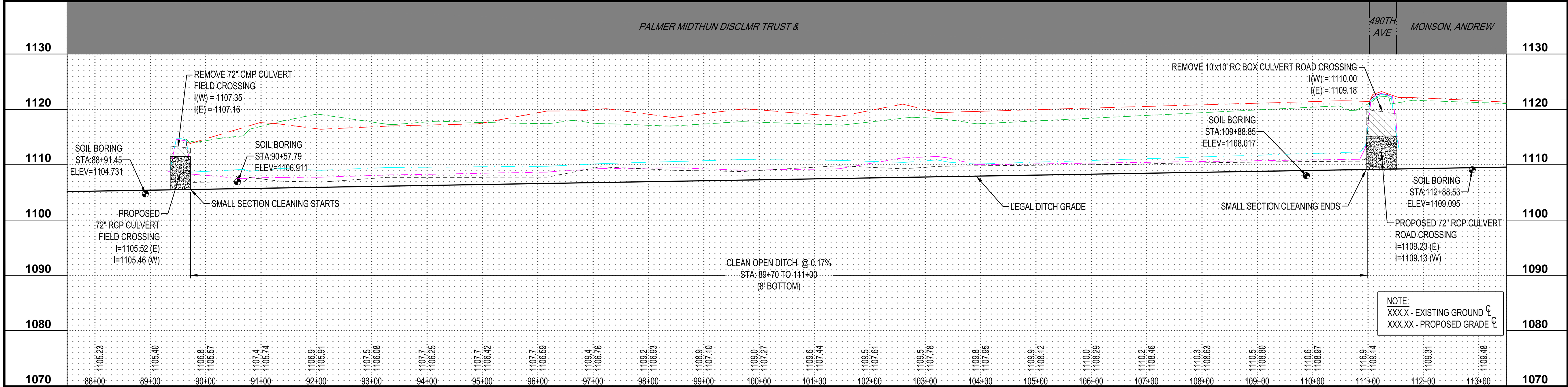
FARIBAULT COUNTY MINNESOTA

REVISION SCHEDULE		
DATE	DESCRIPTION	BY

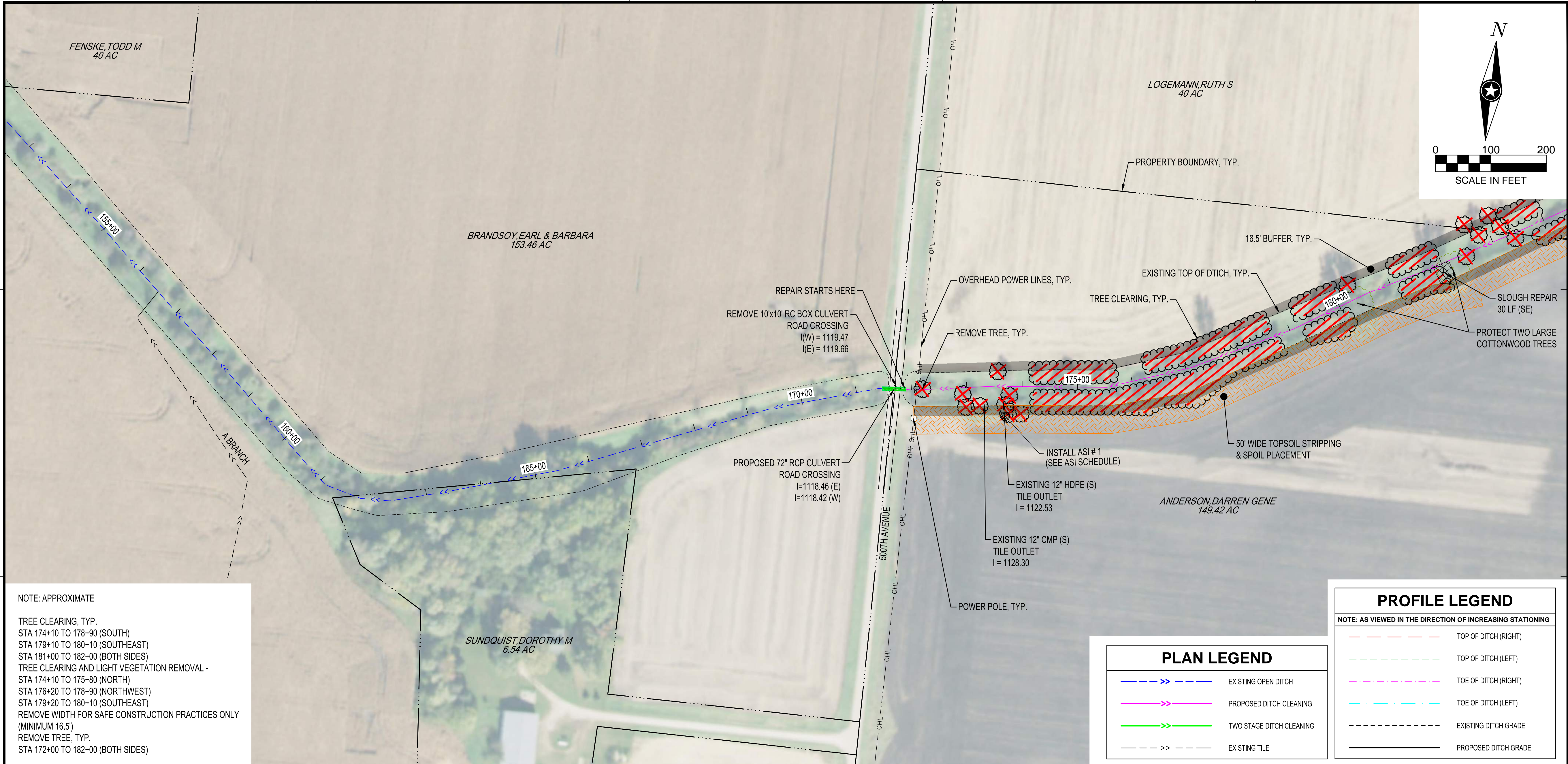
PROJECT NO.	18-22272
FILE NAME	22272 PROF (MAINLINE) - 1
DRAWN BY	DMP/KJH
DESIGNED BY	JMW/SMW
REVIEWED BY	MAO
ORIGINAL ISSUE DATE	--/--
CLIENT PROJECT NO.	

**MAINLINE OPEN  
DITCH PROFILES**

SHEET







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PROJECT

# FARIBAULT COUNTY COUNTY DITCH NO. 55 REPAIR

FARIBAULT COUNTY MINNESOTA

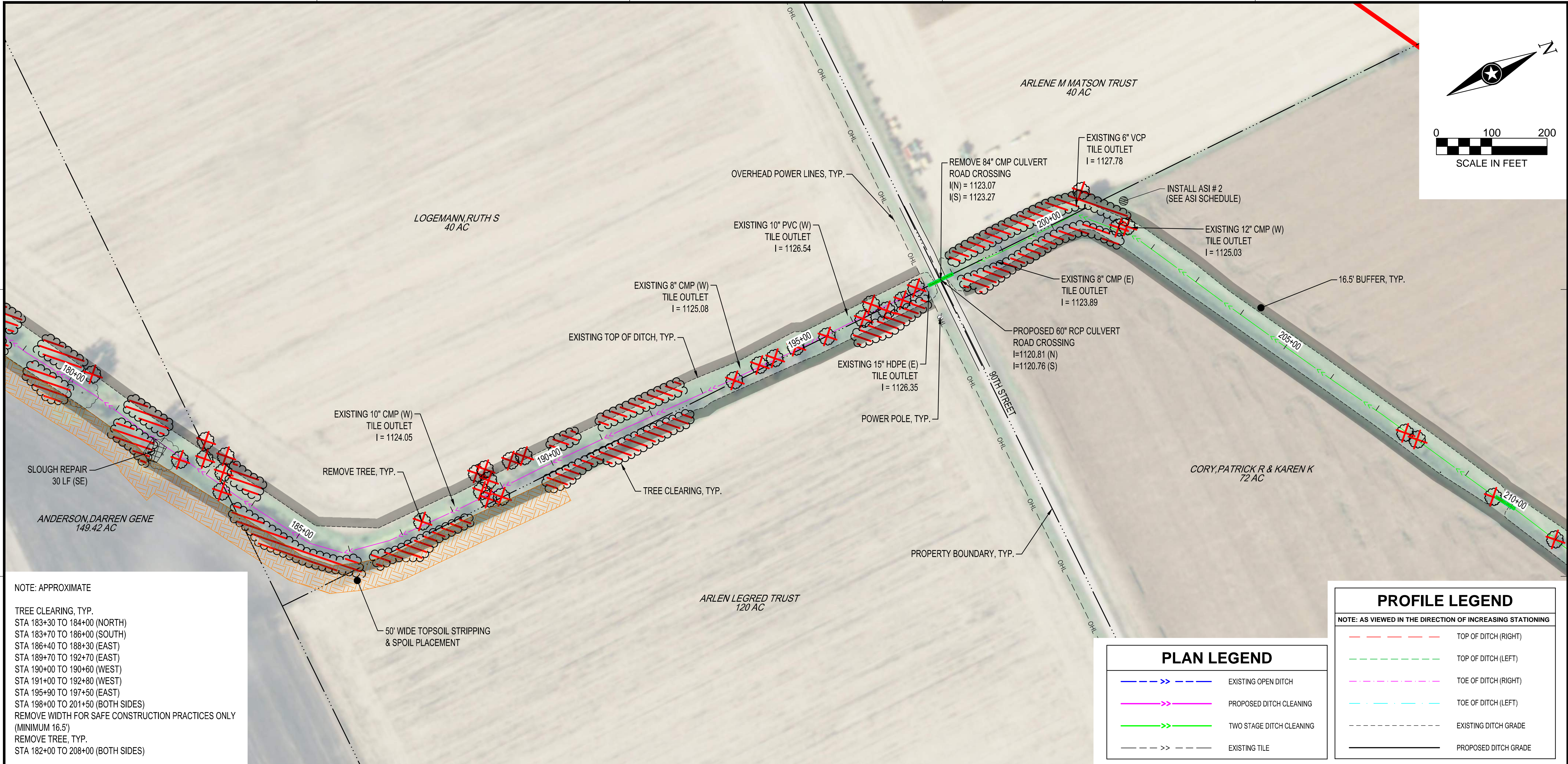
REVISION SCHEDULE		
DATE	DESCRIPTION	BY

PROJECT NO.	18-22272
FILE NAME	22272 PROF (MAINLINE) - 2
DRAWN BY	DMP/KJH
DESIGNED BY	JMW/SMW
REVIEWED BY	MAO
ORIGINAL ISSUE DATE	--/--
CLIENT PROJECT NO.	

## MAINLINE OPEN DITCH PROFILES

SHEET



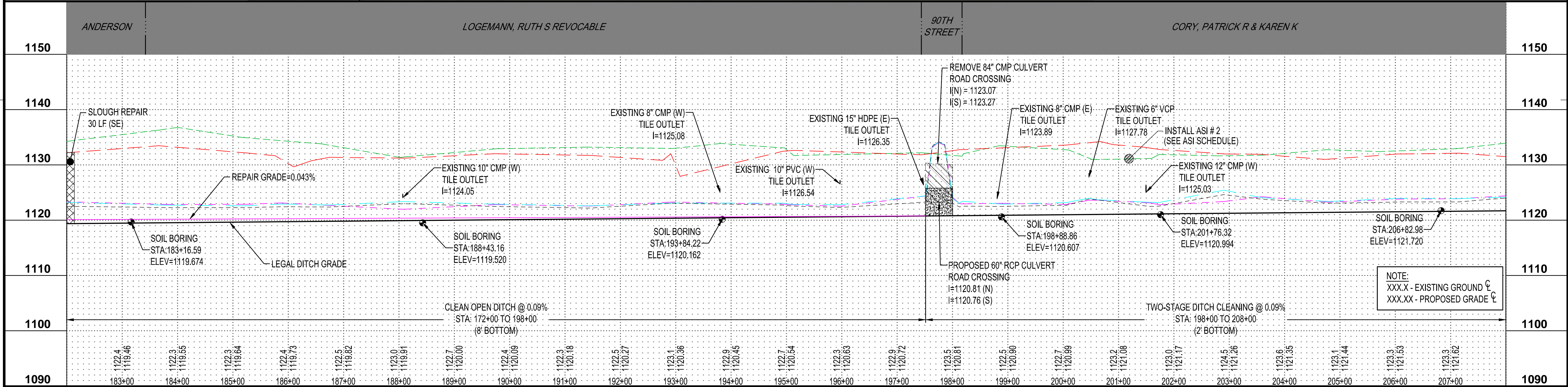


NOTE: APPROXIMATE

TREE CLEARING, TYP.  
STA 183+30 TO 184+00 (NORTH)  
STA 183+70 TO 186+00 (SOUTH)  
STA 186+40 TO 188+30 (EAST)  
STA 189+70 TO 192+70 (EAST)  
STA 190+00 TO 190+60 (WEST)  
STA 191+00 TO 192+80 (WEST)  
STA 195+90 TO 197+50 (EAST)  
STA 198+00 TO 201+50 (BOTH SIDES)  
REMOVE WIDTH FOR SAFE CONSTRUCTION PRACTICES ONLY (MINIMUM 16.5')  
REMOVE TREE, TYP.  
STA 182+00 TO 208+00 (BOTH SIDES)

PLAN LEGEND	
	EXISTING OPEN DITCH
	PROPOSED DITCH CLEANING
	TWO STAGE DITCH CLEANING
	EXISTING TILE

PROFILE LEGEND	
NOTE: AS VIEWED IN THE DIRECTION OF INCREASING STATIONING	
	TOP OF DITCH (RIGHT)
	TOP OF DITCH (LEFT)
	TOE OF DITCH (RIGHT)
	TOE OF DITCH (LEFT)
	EXISTING DITCH GRADE
	PROPOSED DITCH GRADE



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PROJECT

**FARIBAULT  
COUNTY  
COUNTY DITCH  
NO. 55 REPAIR**

FARIBAULT COUNTY MINNESOTA

REVISION SCHEDULE		
DATE	DESCRIPTION	BY

PROJECT NO.	18-22272
FILE NAME	22272 PROF (MAINLINE) - 2
DRAWN BY	DMP/KJH
DESIGNED BY	JMW/SMW
REVIEWED BY	MAO
ORIGINAL ISSUE DATE	-/-/-
CLIENT PROJECT NO.	

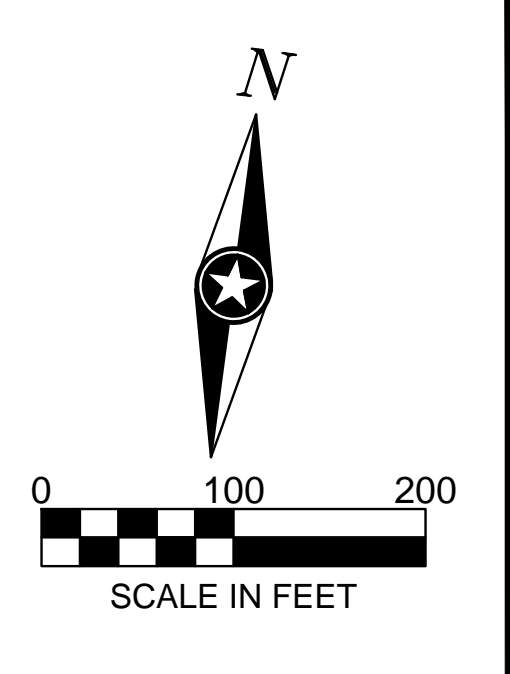
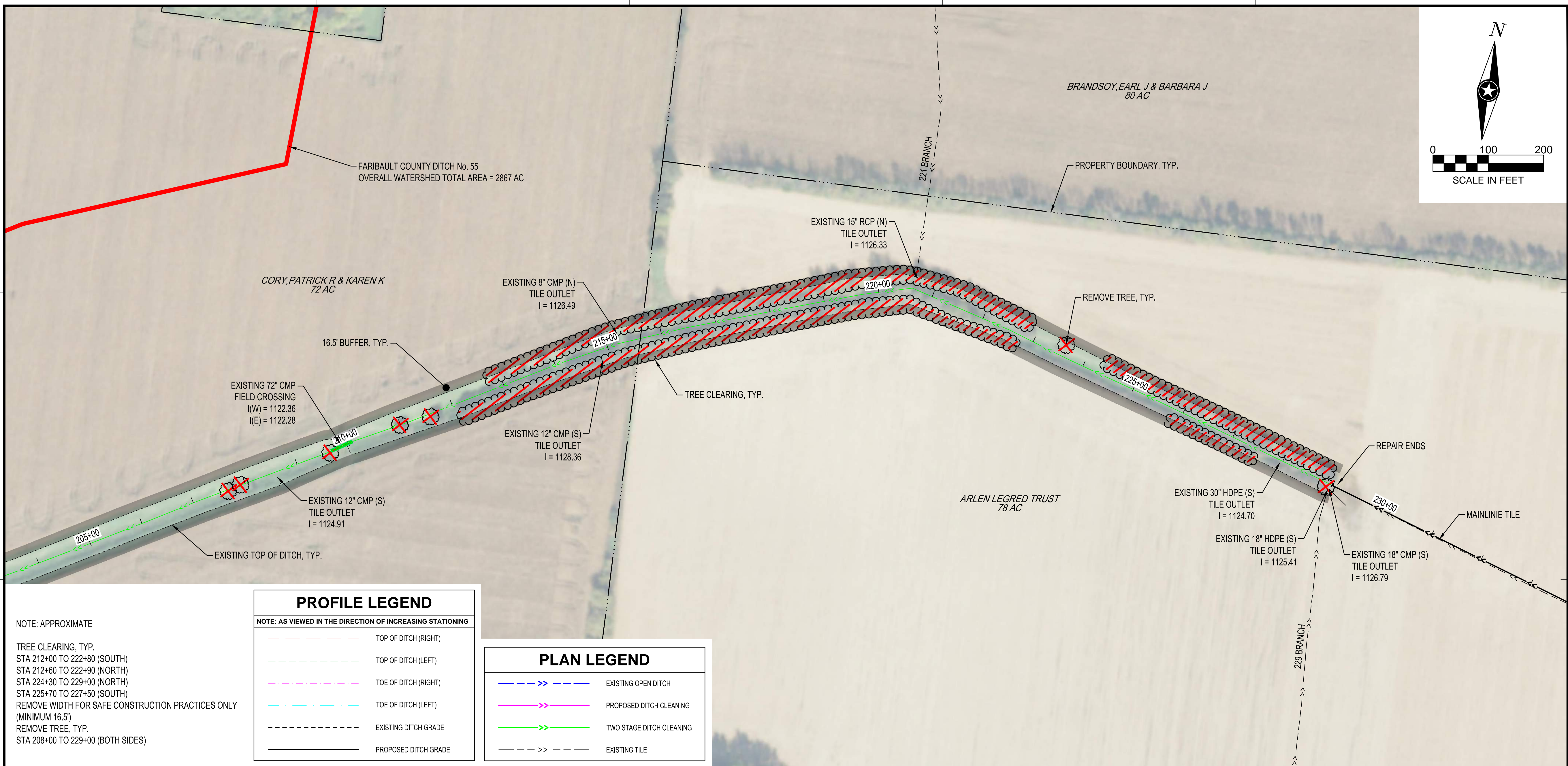
TITLE

**MAINLINE OPEN  
DITCH PROFILES**

SHEET

**10** OF 18





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PROJECT

## FARIBAULT COUNTY COUNTY DITCH NO. 55 REPAIR

FARIBAULT COUNTY MINNESOTA

### REVISION SCHEDULE

DATE	DESCRIPTION	BY

PROJECT NO.	18-22272
FILE NAME	22272 PROF (MAINLINE) - 2
DRAWN BY	DMP/KJH
DESIGNED BY	JMW/SMW
REVIEWED BY	MAO
ORIGINAL ISSUE DATE	--/--
CLIENT PROJECT NO.	

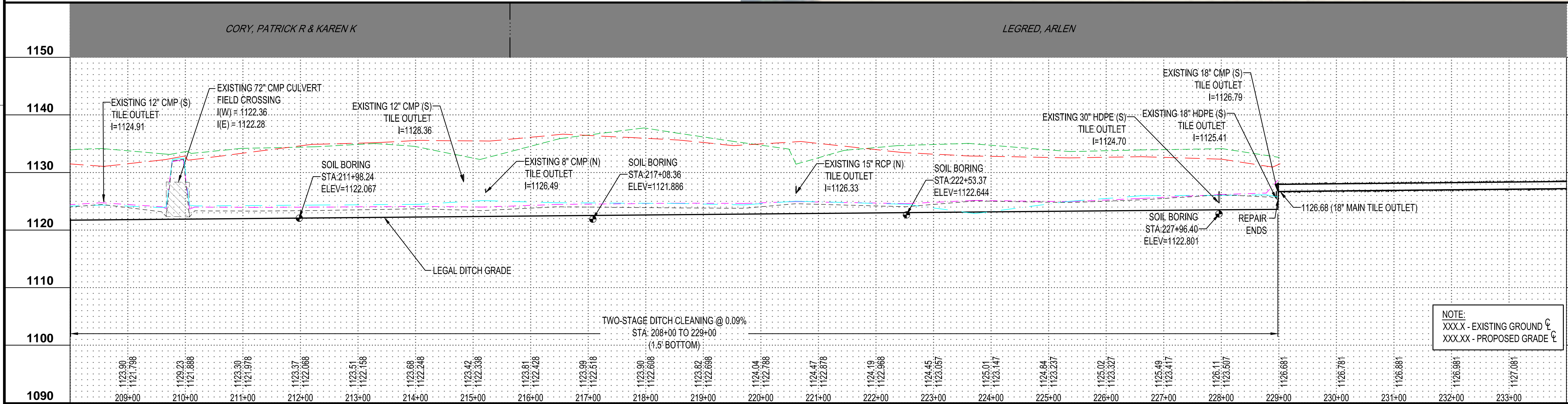
TITLE

## MAINLINE OPEN DITCH PROFILES

SHEET

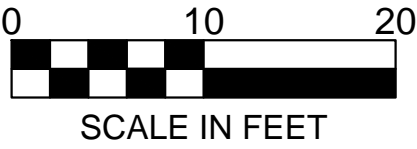
11

OF 18





NOTE:  
CROSS SECTIONS AS VIEWED IN THE DIRECTION OF INCREASING STATIONING.  
PROPOSED CENTERLINE OFFSET MEASURED FROM CENTERLINE OF EXISTING DITCH.



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PROJECT

FARIBAULT  
COUNTY

COUNTY DITCH  
NO. 55 REPAIR

FARIBAULT COUNTY MINNESOTA

REVISION SCHEDULE

DATE	DESCRIPTION	BY

PROJECT NO. 18-22272

FILE NAME 22272 X-SECTIONS

DRAWN BY DMP/KJH

DESIGNED BY JMW/SMW

REVIEWED BY MAO

ORIGINAL ISSUE DATE --/--

CLIENT PROJECT NO. -

TITLE

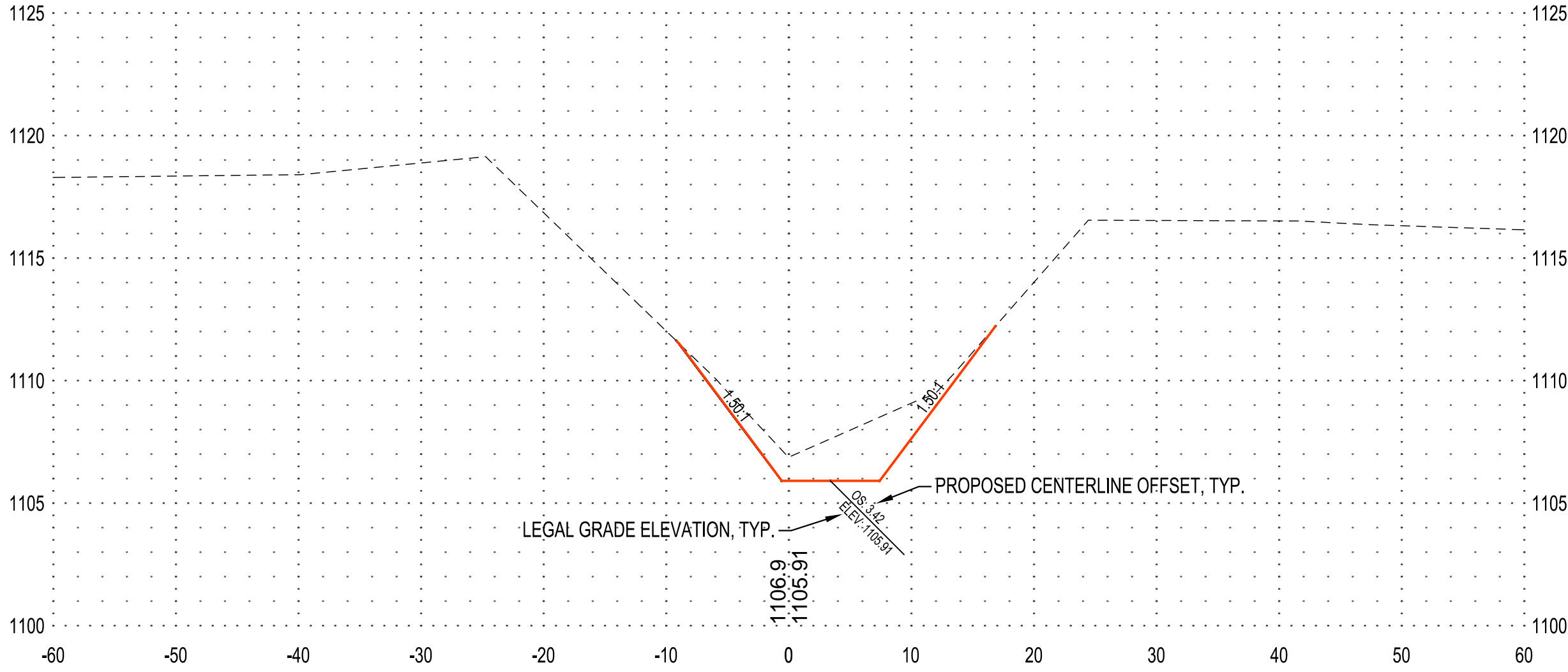
CROSS SECTIONS

SHEET

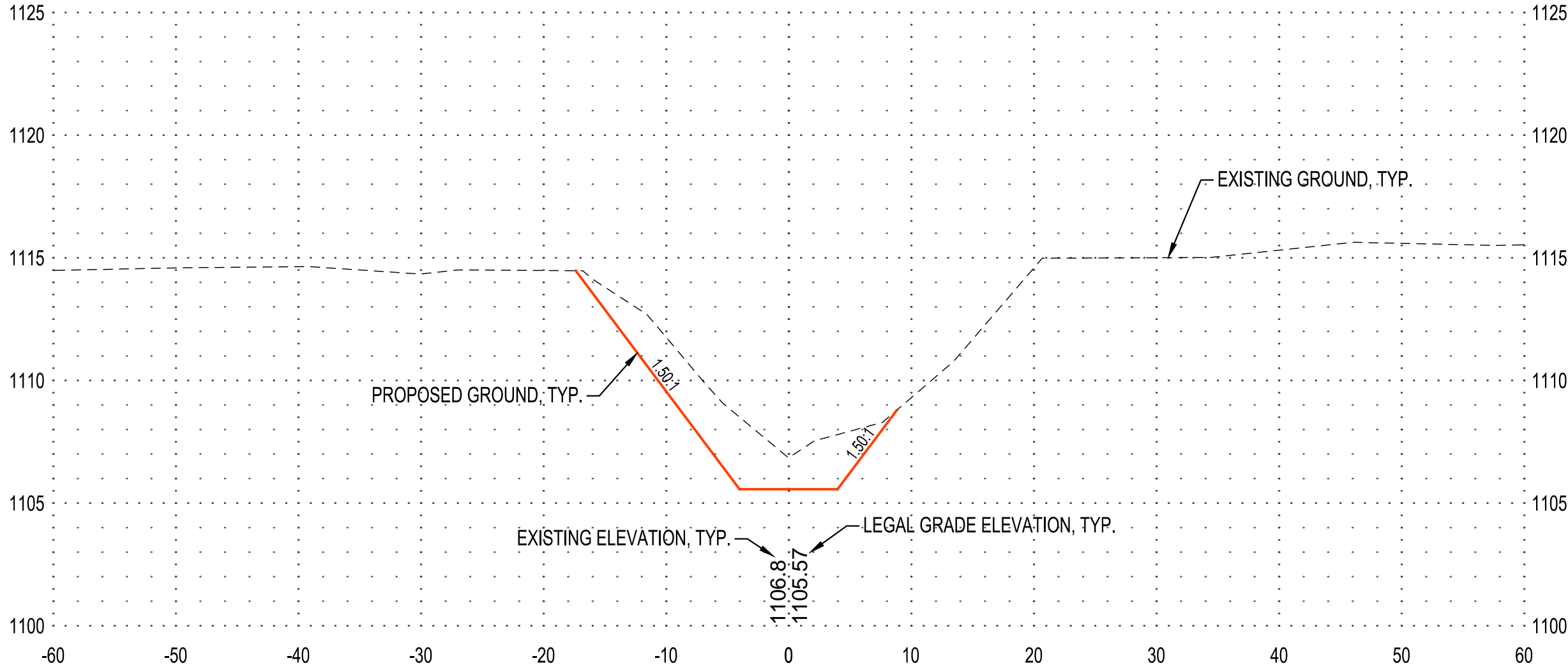
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OF 18

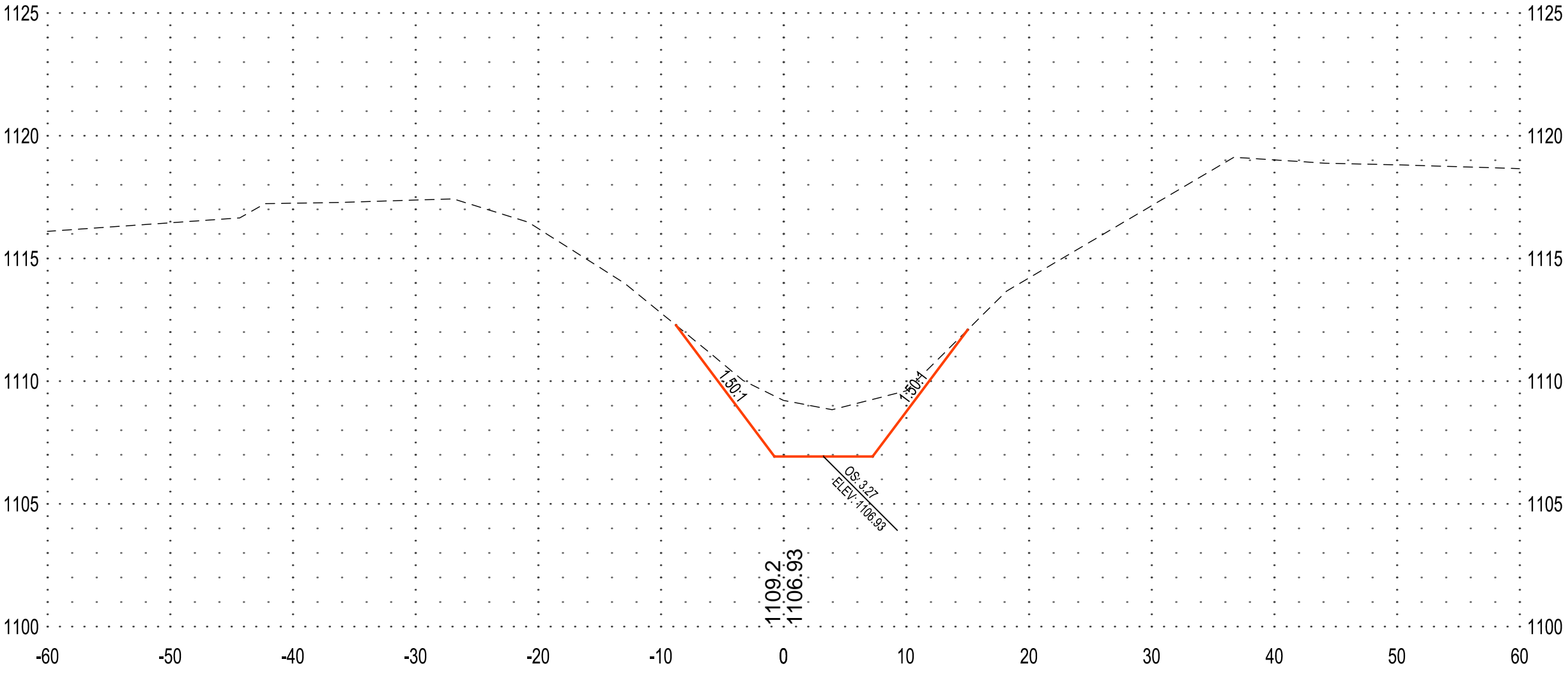
92+00



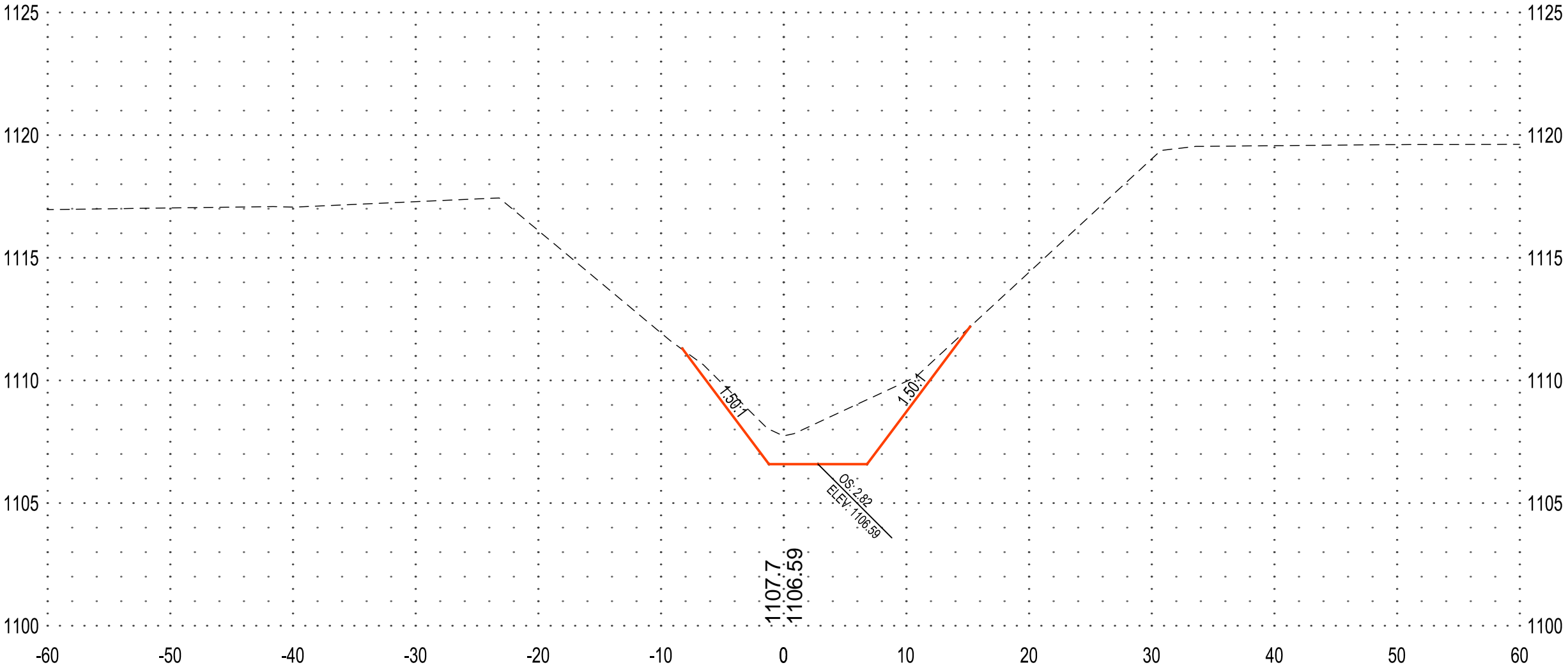
90+00



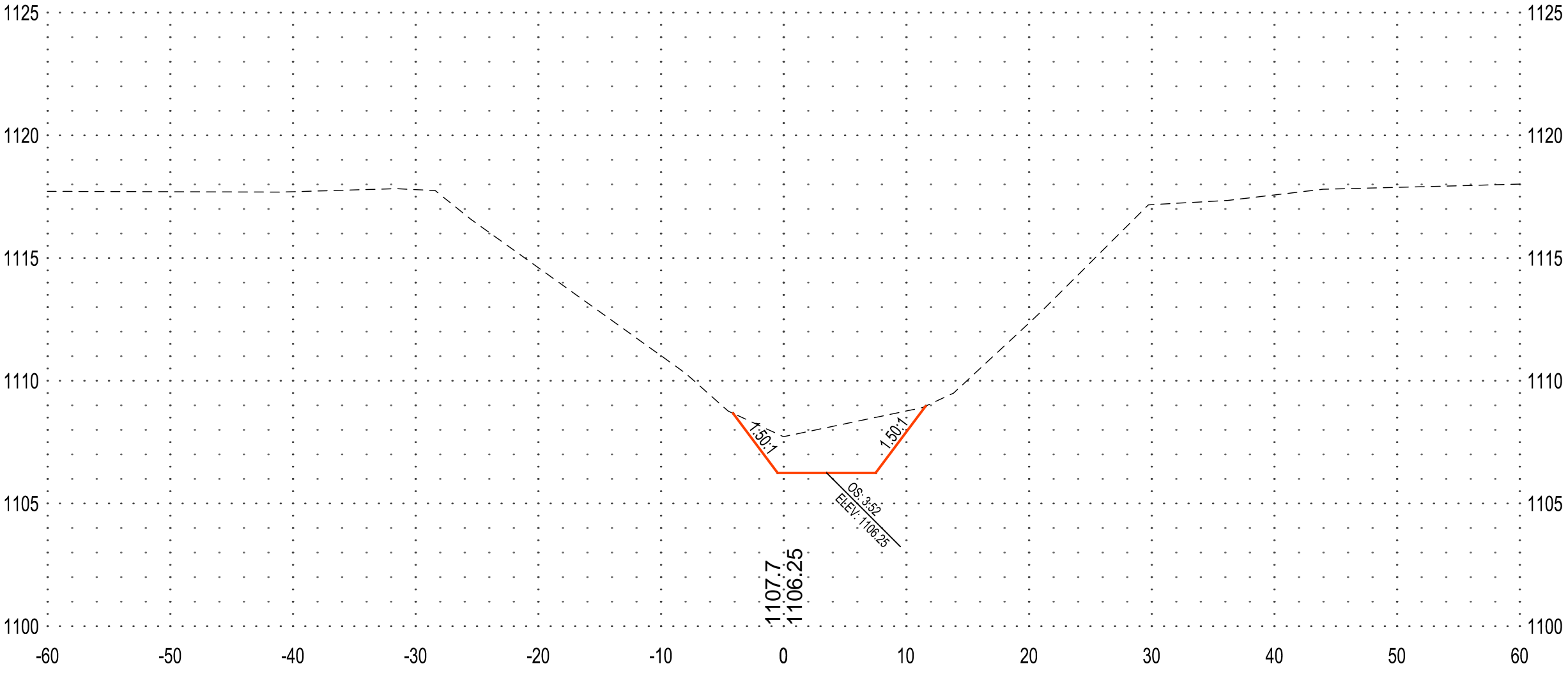
98+00



96+00



94+00

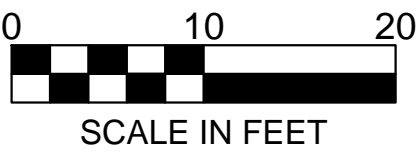


### OPEN DITCH REPAIR LEGEND

STA. TO STA.	OPEN DITCH TYPE/ BOTTOM WIDTH	GRADE
89+70 TO 111+00	STANDARD OPEN DITCH/ 8' BOTTOM	0.17%
172+00 TO 198+00	STANDARD OPEN DITCH/ 8' BOTTOM	0.09%
198+00 TO 208+00	TWO-STAGE OPEN DITCH/ 2' BOTTOM	0.09%
208+00 TO 229+00	TWO-STAGE OPEN DITCH/ 1.5' BOTTOM	0.09%



NOTE:  
CROSS SECTIONS AS VIEWED IN THE DIRECTION OF INCREASING STATIONING.  
PROPOSED CENTERLINE OFFSET MEASURED FROM CENTERLINE OF EXISTING DITCH.



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PROJECT

FARIBAULT  
COUNTY

COUNTY DITCH  
NO. 55 REPAIR

FARIBAULT COUNTY MINNESOTA

REVISION SCHEDULE

DATE	DESCRIPTION	BY

PROJECT NO.	18-22272
FILE NAME	22272 X-SECTIONS
DRAWN BY	DMP/KJH
DESIGNED BY	JMW/SMW
REVIEWED BY	MAO
ORIGINAL ISSUE DATE	--/--
CLIENT PROJECT NO.	-

TITLE

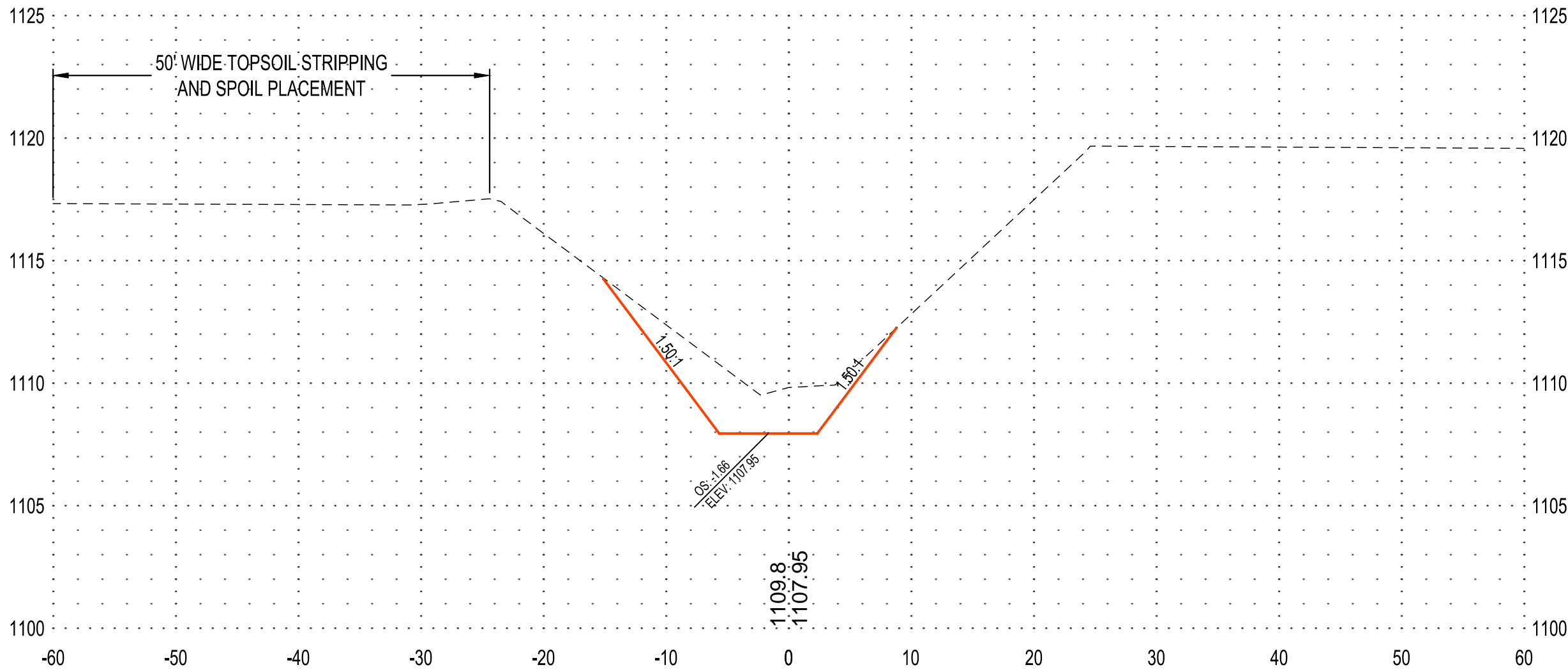
CROSS SECTIONS

SHEET

13

OF 18

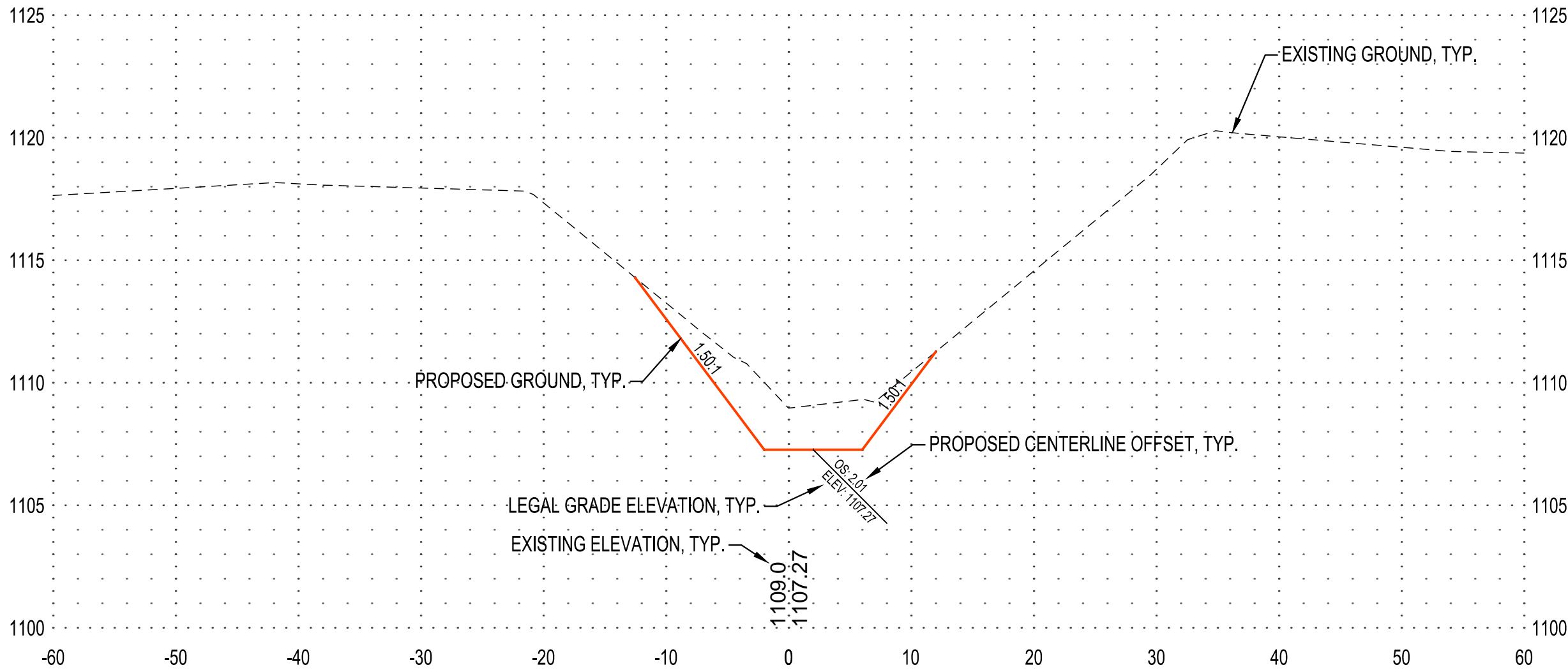
104+00



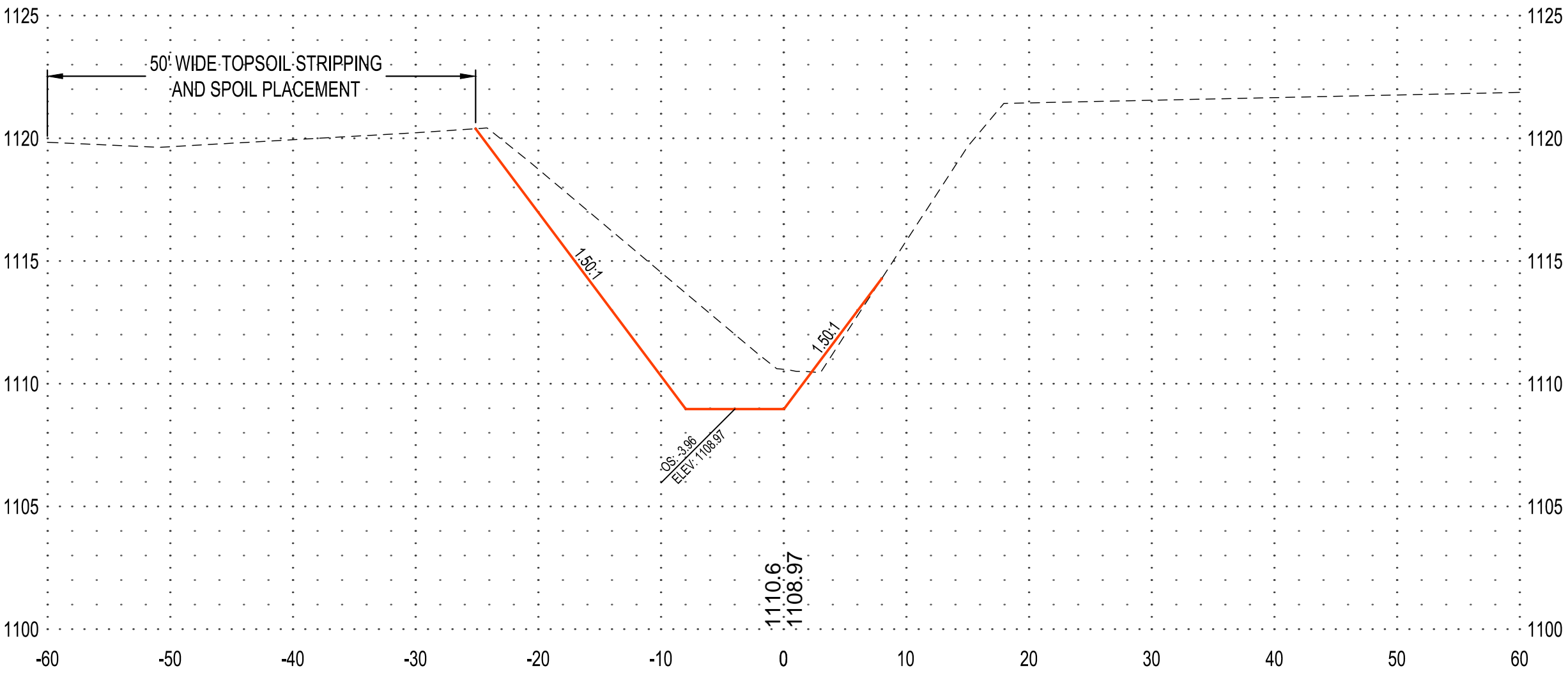
102+00



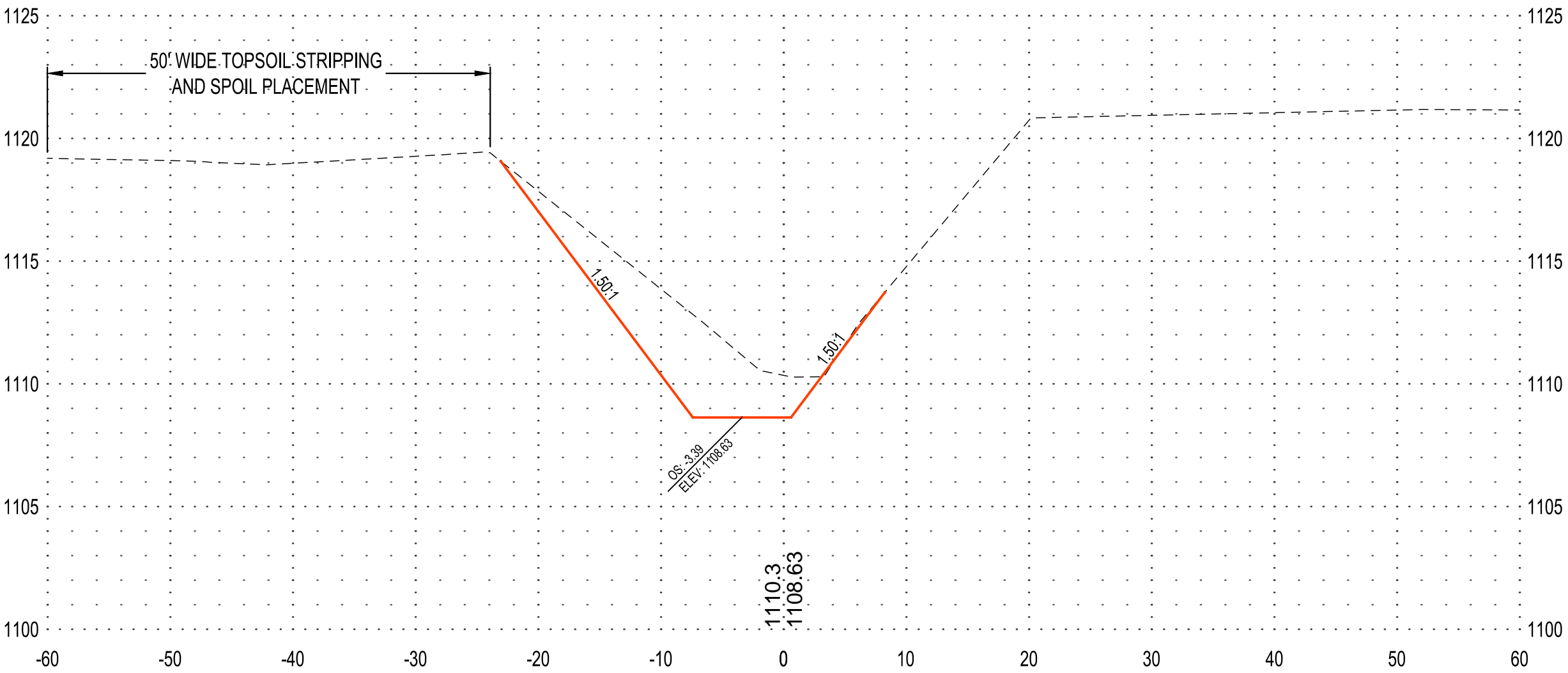
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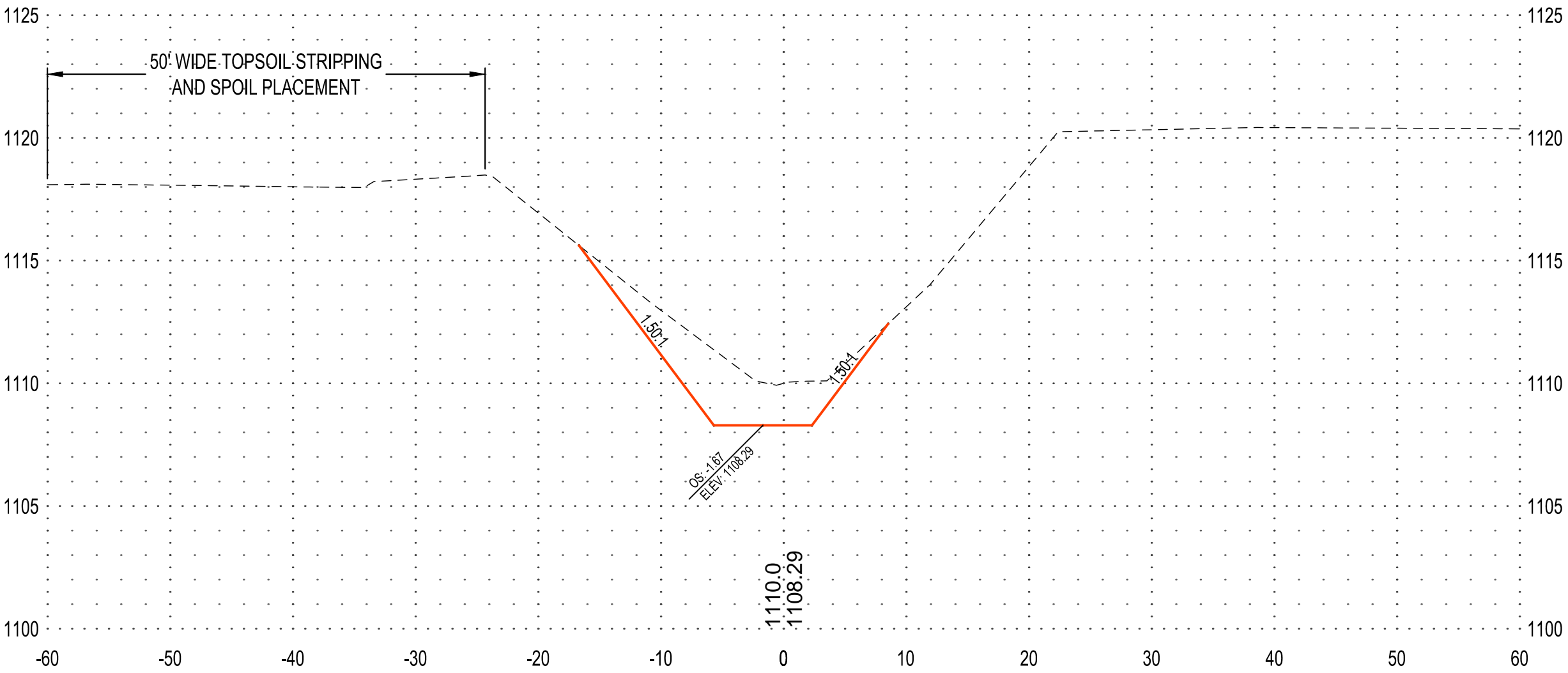
110+00



108+00



106+00



PROPOSED CENTERLINE OFFSET MEASURED FROM CENTERLINE OF EXISTING DITCH.



1140

1135

1130

1125

1120

1115

50' WIDE TOPSOIL STRIPPING AND SPOIL PLACEMENT

EXISTING GROUND, TYP.

PROPOSED GROUND, TYP.

1.50%

1.50%

1.50%

LEGAL GRADE ELEVATION, TYP.

EXISTING ELEVATION, TYP.

112.9'

1116.4'

0.50%

PROPOSED CENTERLINE OFFSET, TYP.

-60 -50 -40 -30 -20 -10 0 10 20 30 40 50 60

Figure 1: Proposed Section Profile. The diagram illustrates the proposed road profile (solid red line) and the existing ground profile (dashed grey line). The horizontal axis represents stationing from -60 to 60, and the vertical axis represents elevation from 1115 to 1140 feet. Key features include a 50' wide topsoil stripping and spoil placement area between stations 30 and 60, and a 10' wide gravel road section between stations 0 and 10. Elevation points are marked at 1121.8, 1119.01, and 1121.34.



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DATE \_\_\_\_\_ LIC. NO. \_\_\_\_\_

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PROJECT

FARIBAULT  
COUNTY

COUNTY DITCH  
NO. 55 REPAIR

FARIBAULT COUNTY MINNESOTA

[illegible]

PROJECT NO.	18-22272
FILE NAME	22272 X-SECTIONS
DRAWN BY	DMP/KJH
DESIGNED BY	JMW/SMW
REVIEWED BY	MAO
ORIGINAL ISSUE DATE	--/--/--
CLIENT PROJECT NO.	-

# CROSS SECTIONS

SHEET



PROPOSED CENTERLINE OFFSET MEASURED FROM CENTERLINE OF EXISTING DITCH.



Figure 1 is a profile view of the proposed road cross-section. The vertical axis represents elevation in feet, ranging from 1115 to 1140. The horizontal axis represents stationing, ranging from -60 to 60. A dashed line shows the existing ground profile, and a solid line shows the proposed road profile. The proposed road profile includes a 50' wide topsoil stripping and spoil placement area, indicated by a bracket. Key elevations are marked: 1123.0 and 1119.91.

This cross-section profile view illustrates the proposed roadway design. The horizontal axis represents stationing from -60 to 60, and the vertical axis represents elevation in feet from 1115 to 1140. The profile shows the existing ground (dashed line), the proposed ground (solid line), and the legal grade elevation (solid line). A 50-foot wide topsoil stripping and spoil placement area is indicated. The proposed ground is shown with a 1:30.1 slope on the left and a 1:30.1 slope on the right. The legal grade elevation is shown with a 1:22.3 slope on the left and a 1:19.55 slope on the right. The existing ground is shown with a 1:30.1 slope on the left and a 1:30.1 slope on the right.

Station	Existing Ground (ft)	Proposed Ground (ft)	Legal Grade (ft)
-60	1135.0	1135.0	1135.0
-40	1136.0	1136.0	1136.0
-20	1130.0	1130.0	1130.0
-10	1123.0	1123.0	1123.0
0	1119.55	1119.55	1119.55
10	1123.0	1123.0	1123.0
20	1130.0	1130.0	1130.0
30	1136.0	1136.0	1136.0
40	1135.0	1135.0	1135.0
60	1134.0	1134.0	1134.0

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TITLE
-------

## CROSS SECTIONS

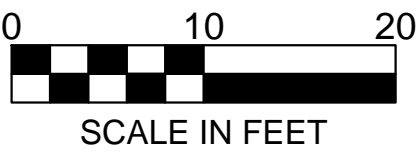
SHEET

15 OF 15





NOTE:  
CROSS SECTIONS AS VIEWED IN THE DIRECTION OF INCREASING STATIONING.  
PROPOSED CENTERLINE OFFSET MEASURED FROM CENTERLINE OF EXISTING DITCH.



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PROJECT

**FARIBAULT  
COUNTY**  
  
**COUNTY DITCH  
NO. 55 REPAIR**

FARIBAULT COUNTY MINNESOTA

REVISION SCHEDULE

DATE	DESCRIPTION	BY

PROJECT NO.	18-22272
FILE NAME	22272 X-SECTIONS
DRAWN BY	DMP/KJH
DESIGNED BY	JMW/SMW
REVIEWED BY	MAO
ORIGINAL ISSUE DATE	--/--
CLIENT PROJECT NO.	-

TITLE

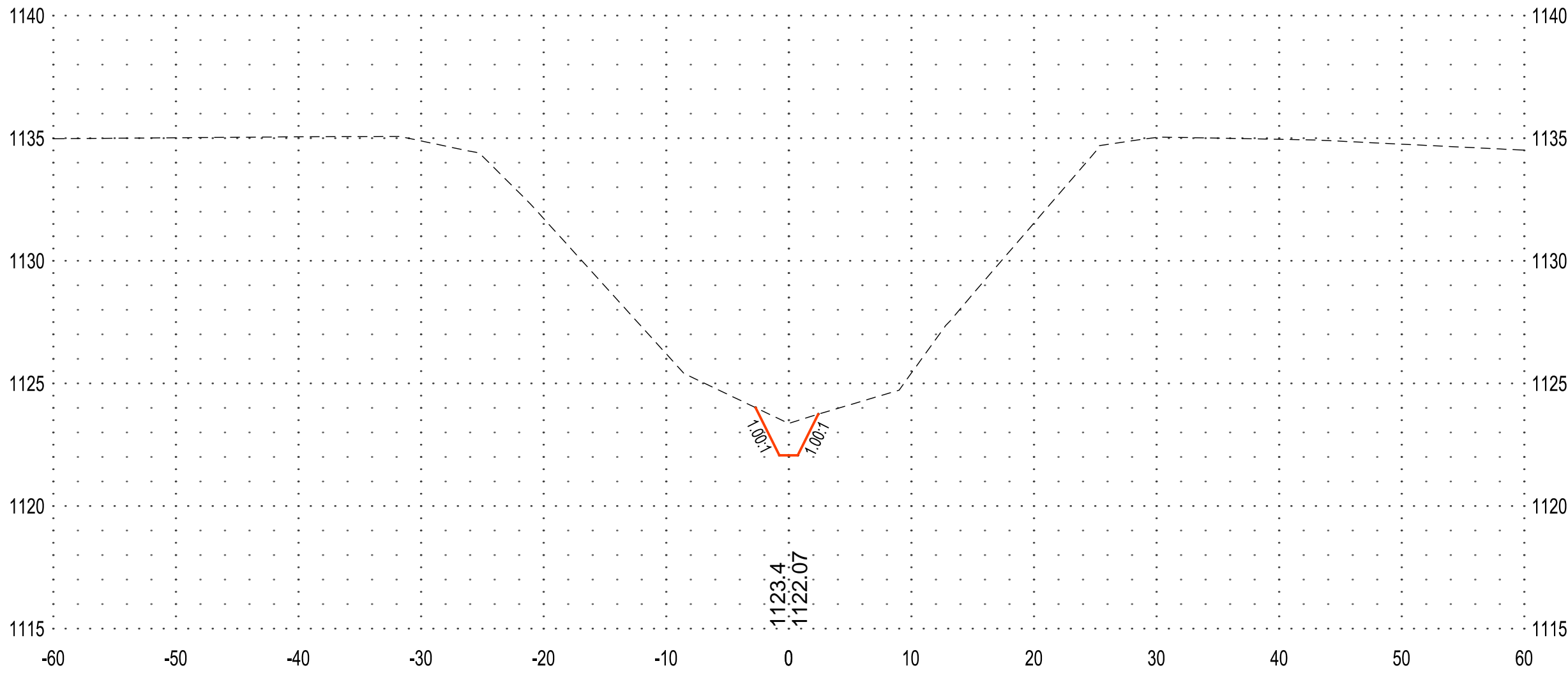
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SHEET

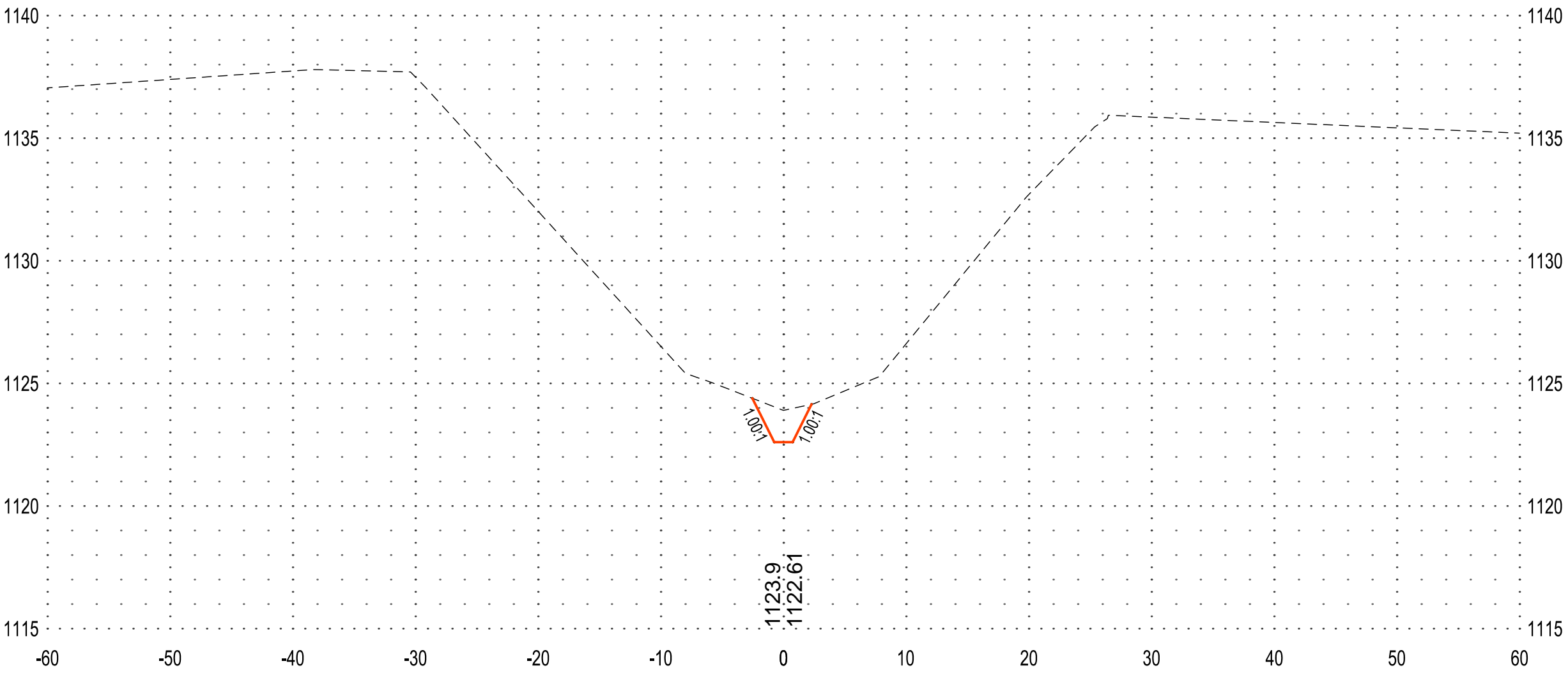
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OF 18

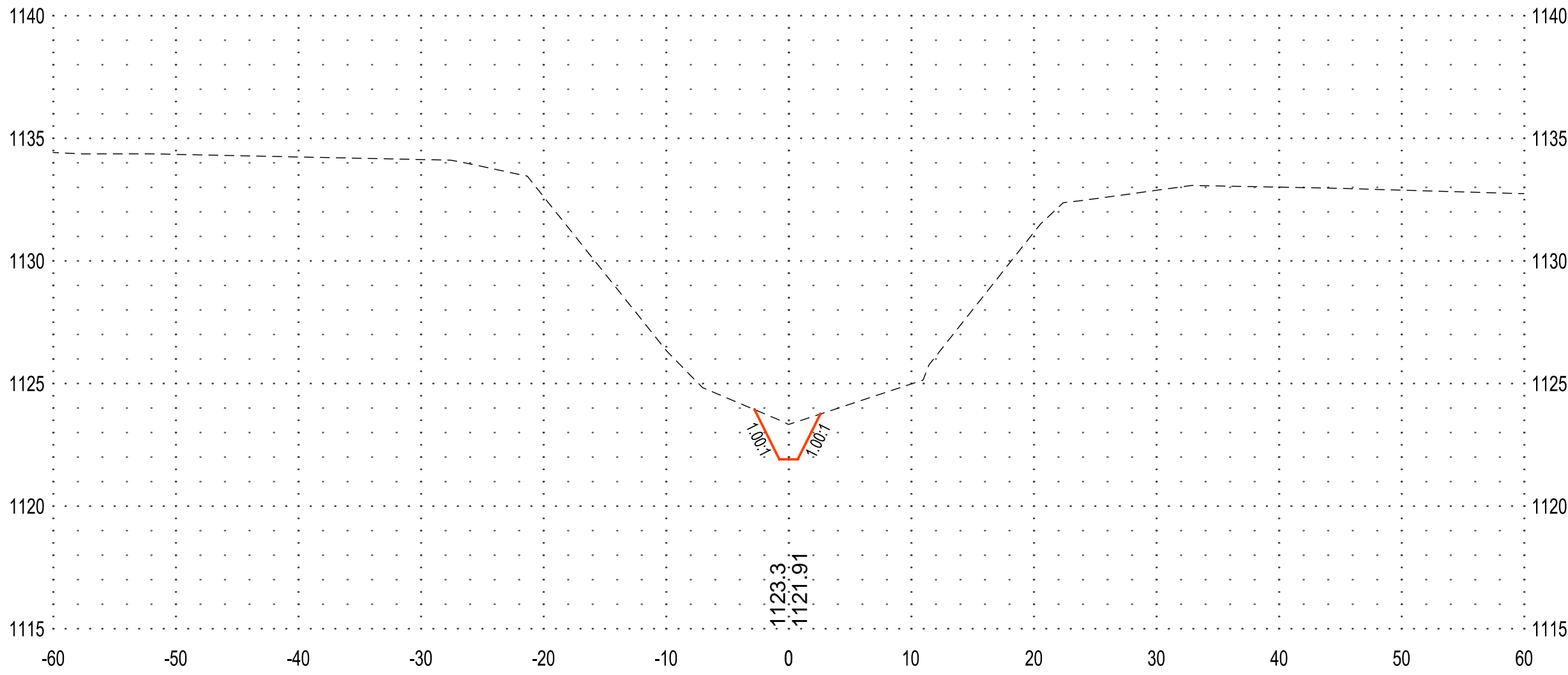
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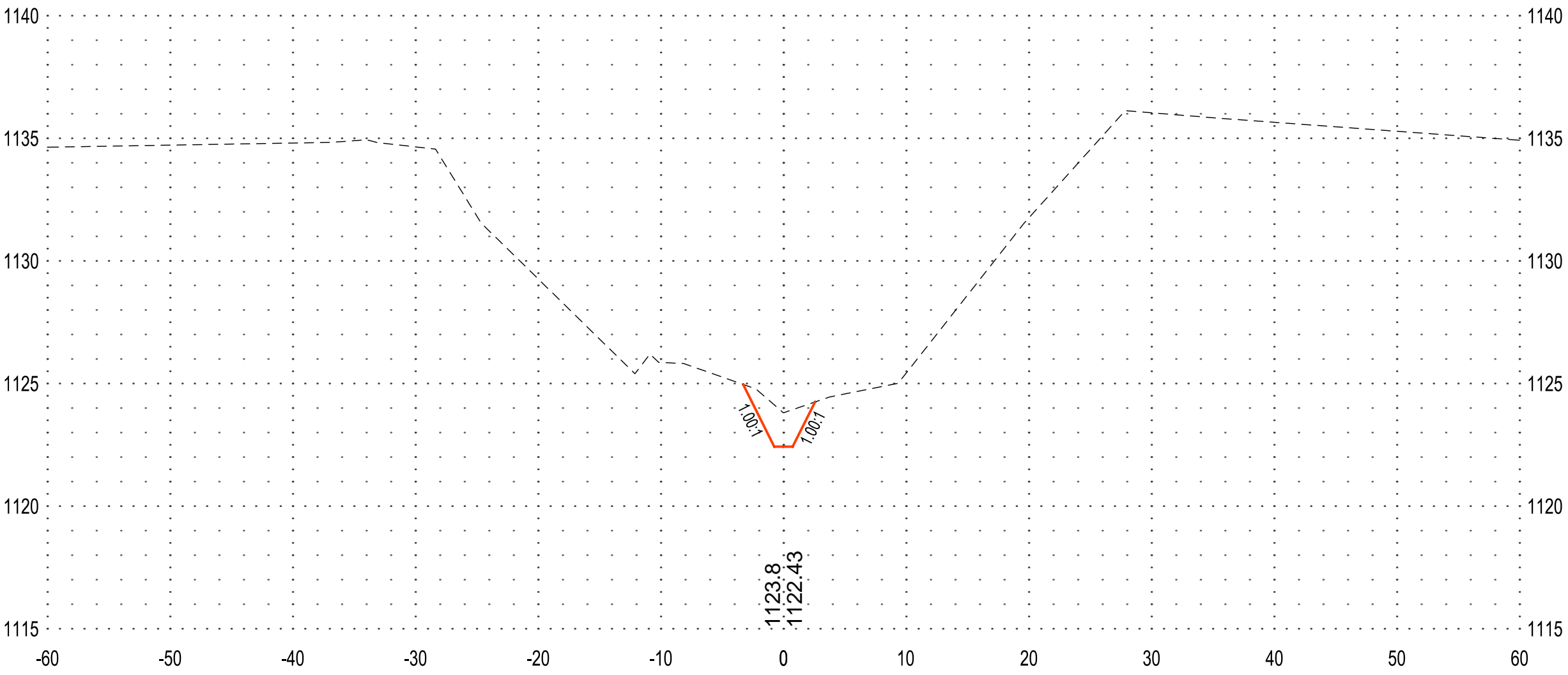
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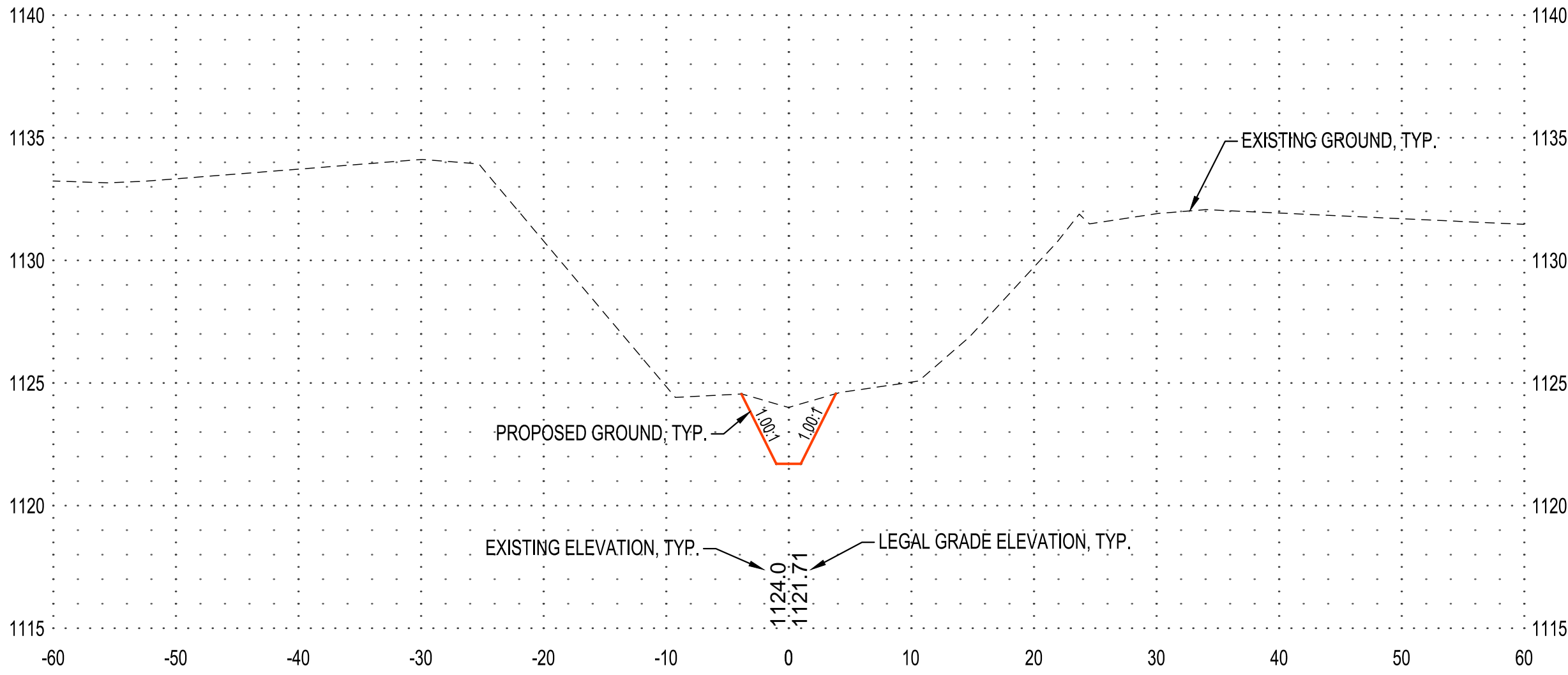
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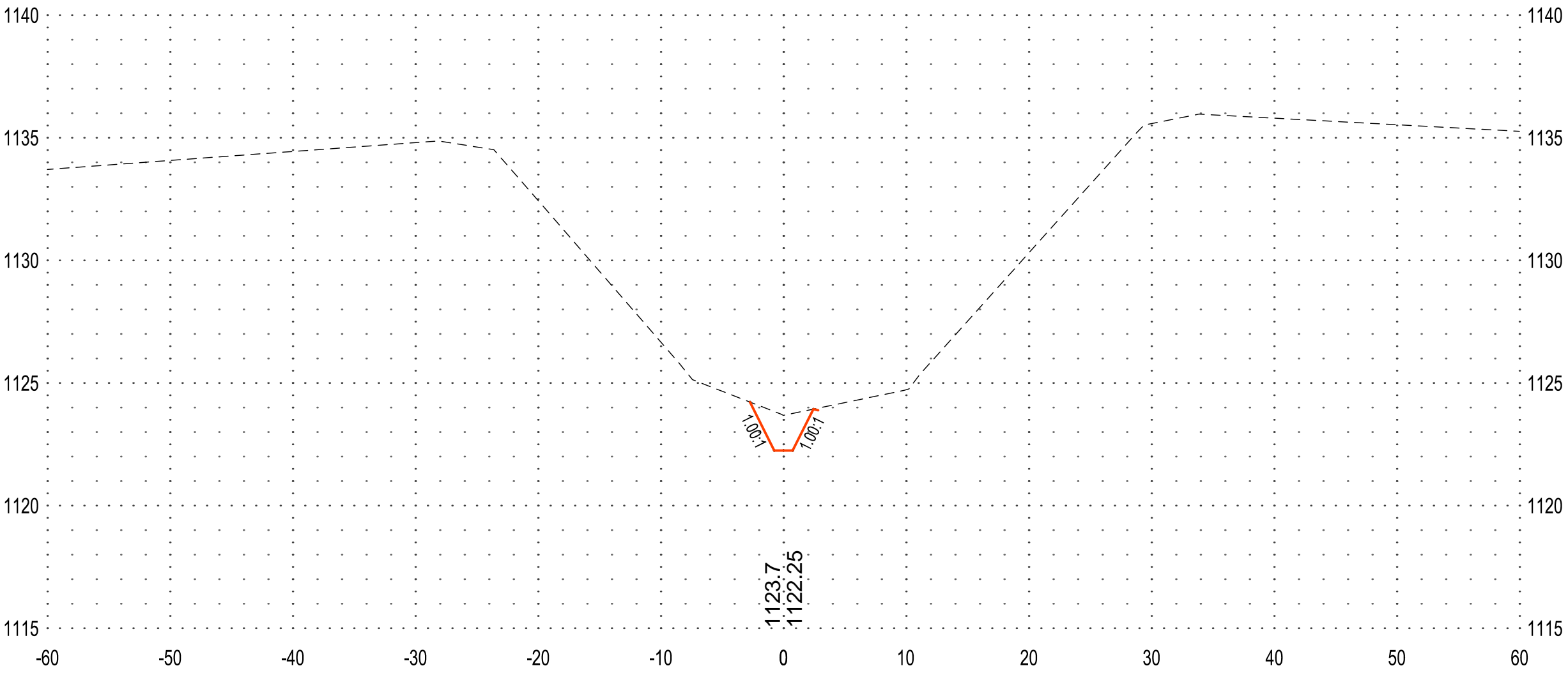
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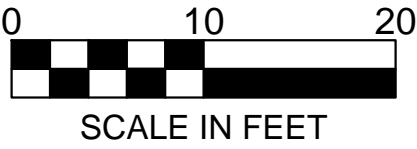
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**214+00**



NOTE:  
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PROPOSED CENTERLINE OFFSET MEASURED FROM CENTERLINE OF EXISTING DITCH.



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PROJECT

FARIBAULT  
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COUNTY DITCH  
NO. 55 REPAIR

FARIBAULT COUNTY MINNESOTA

REVISION SCHEDULE

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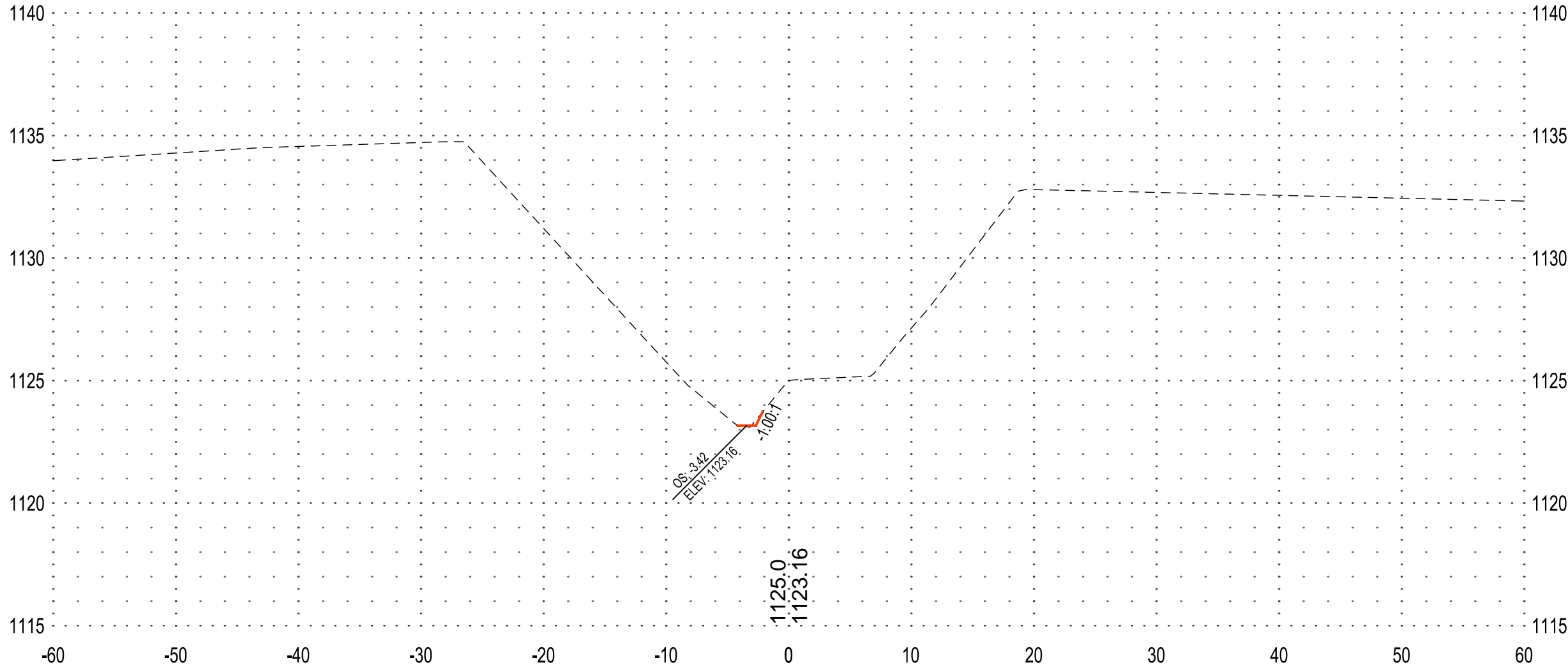
CROSS SECTIONS

SHEET

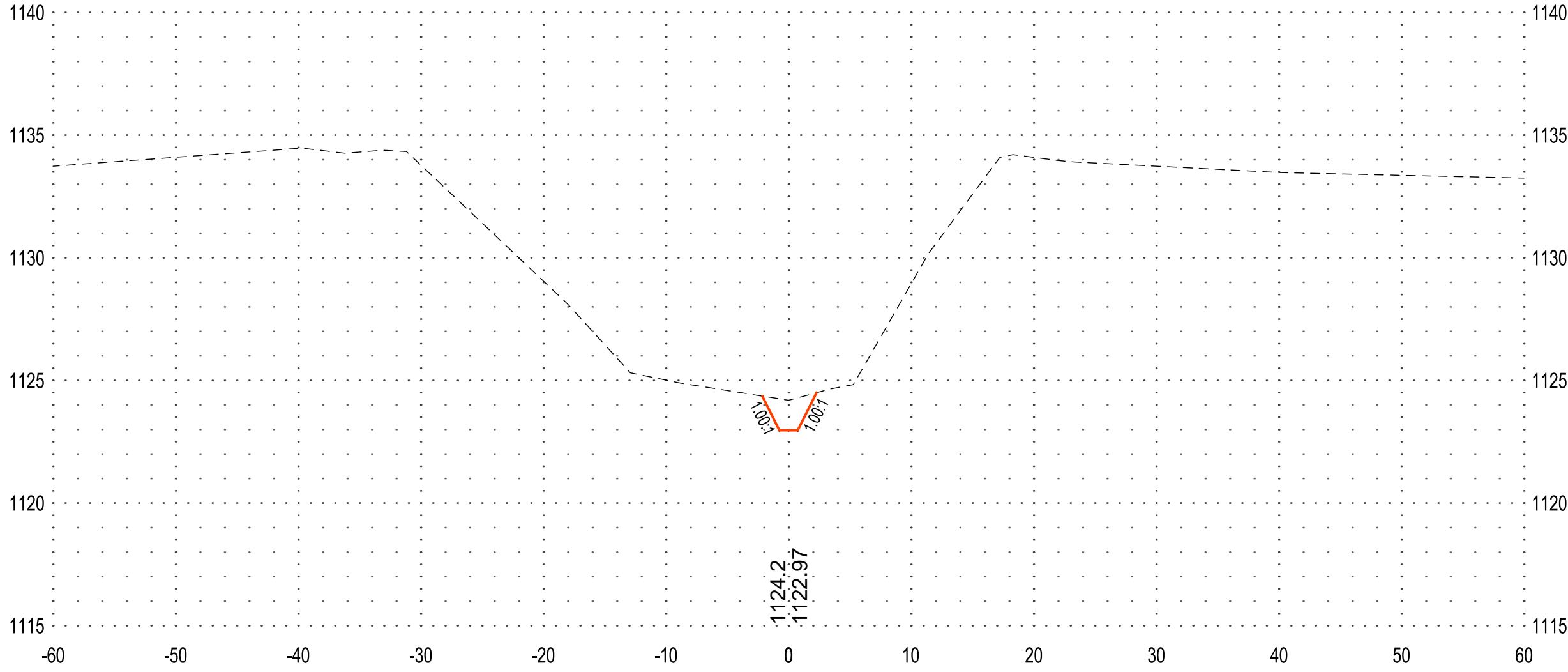
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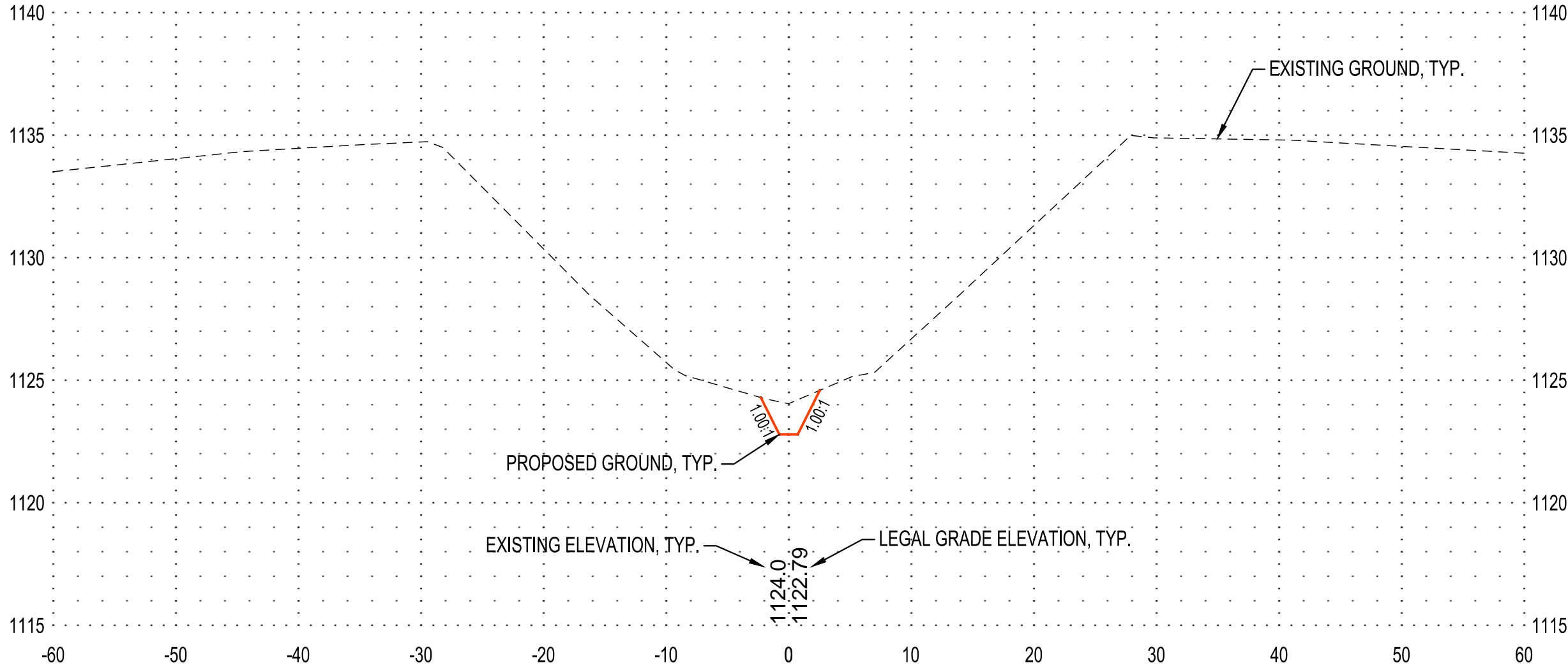
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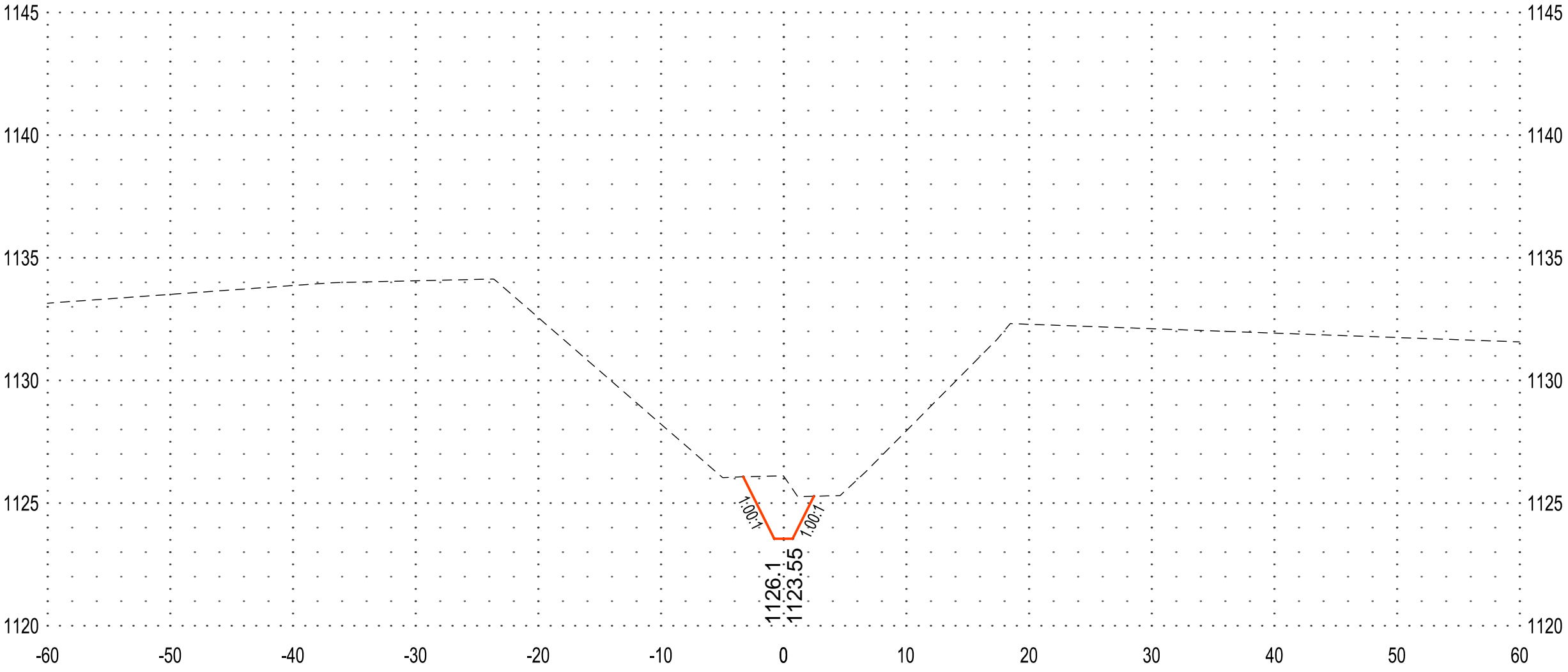
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220+00



228+00



226+00





# APPENDIX D: DRONE FLIGHT PHOTOS

PROJECT NAME	<u>Faribault County Ditch No. 55</u>
PROJECT NO.	<u>22272</u>
REVIEWED DATE	<u>3-18-19</u>
TELEVISION DATE	<u>9-25-18</u>



Picture #1: Field Crossing #6



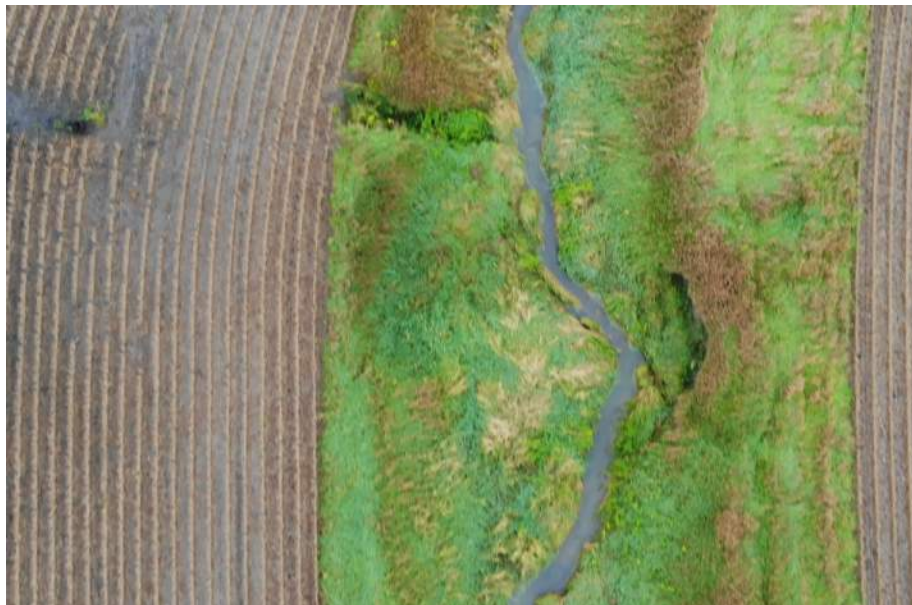
Picture #2: Main Ditch in NE ¼ of NE ¼ of Section 29 of Brush Creek Township



PROJECT NAME	<u>Faribault County Ditch No. 55</u>
PROJECT NO.	<u>22272</u>
REVIEWED DATE	<u>3-18-19</u>
DRONE FLIGHT DATE	<u>9-25-18</u>



Picture #3: Fallen tree blocking ditch flow in NE  $\frac{1}{4}$  of NW  $\frac{1}{4}$  of Section 30 of Brush Creek Township



Picture #4: Bank Sloughing in NW  $\frac{1}{4}$  of SW  $\frac{1}{4}$  of Section 24 of Emerald Township



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Picture #5: Meandering Channel in NW  $\frac{1}{4}$  of SW  $\frac{1}{4}$  of Section 24 of Emerald Township



Picture #6: Natural 2-Stage Ditch Forming in SW  $\frac{1}{4}$  of SW  $\frac{1}{4}$  of Section 24 of Emerald Township

PROJECT NAME	<u>Faribault County Ditch No. 55</u>
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REVIEWED DATE	<u>3-18-19</u>
DRONE FLIGHT DATE	<u>9-25-18</u>



Picture #7: Heavy vegetation in ditch in NE ¼ of NW ¼ of Section 30 of Brush Creek Township



Picture #8: Beaver Dam and Culvert #7