

Engineer's Report

Drainage District No. 6

Main Open Ditch & Br. 1 and Br. 6 Tile Improvements

Dallas County, Iowa
2026

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Executive Summary

Introduction

Following a petition submitted by a landowner on April 16, 2025, requesting repairs to the open ditch, a comprehensive engineering study was conducted to evaluate the drainage infrastructure of Drainage District No. 6 in Dallas County. At an informational meeting on February 25, 2026, a landowner requested that the scope be extended to include the Branch No. 1 and No. 6 tiles. This report summarizes the findings and presents a recommended plan to restore the ditch to its design capacity and improve drainage across the district.

Problem Assessment

The district's open ditch, originally constructed between 1908 and 1911, no longer performs to its design capacity. Field survey identified silt accumulation, sloughed banks, meanders, and deteriorated outlet pipes that restrict flow and drive up maintenance. Separately, the Branch No. 1 and No. 6 tiles were found to be restrictive and undersized, delivering only 56% of the recommended ½-inch-per-day drainage coefficient. Together, these deficiencies contribute to delayed field operations, waterlogged soils, and crop yield limitations.

Proposed Solution

For the open ditch, we recommend a comprehensive improvement: excavating silt, sloughs, bars, debris, and meanders; cleaning road culverts and bridges; reshaping banks to stable 2:1 slopes; and replacing defective outlet pipes. Extending the ditch approximately 1,800 feet downstream allows the entire channel to be redesigned to a more efficient 0.06% grade, a 50% increase over the existing grade, raising flow velocity and reducing future maintenance. For the tile, we recommend replacing and extending the Branch No. 1 and No. 6 lines to meet the ½-inch-per-day standard. The two projects will be bid independently to attract specialized ditch and tile contractors.

Project Cost

The total estimated cost for all proposed work is \$1,686,000. The open ditch improvement accounts for approximately \$926,000, or about \$141 per acre assessed to all landowners in the district. The Branch No. 1 and No. 6 tile improvement accounts for approximately \$760,000 and is assessed only to the landowners on those branch schedules. These figures include construction, damages, engineering, and administrative expenses.

Implementation and Landowner Considerations

If approved, the work will be publicly bid, with construction anticipated to bid in the fall of 2026 and conclude by fall 2027. Because the open ditch serves the entire district while the branch tiles serve only a portion of it, costs will be allocated through separate assessment schedules so that each parcel pays in proportion to the benefit it receives. Affected landowners will be compensated for crop damages and soil disturbance, and the district will maintain a one-year warranty on construction-related work.

Recommendation

The existing infrastructure is operating below its original design capacity and is a limiting factor for agricultural production within the district. We recommend that the Board of Trustees accept this report and schedule a public hearing to present the findings to all affected landowners. Should there be sufficient support, we further recommend proceeding with the preparation of final plans and specifications for construction.

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Introduction

Overview

Many Iowa landowners benefit from drainage infrastructure without day-to-day consideration of its operation. These systems, managed through legally established drainage districts, construct, repair, and maintain improvements such as tile lines and open ditches, allowing farmland to remain productive by controlling excess surface and subsurface water.

Drainage District No. 6 in Dallas County, like many early 20th-century districts, was established to improve drainage in a wetter, less-developed landscape. The Dallas County Board of Supervisors serves as trustees, overseeing maintenance and ensuring that improvements benefit all landowners within the district. Under Iowa Code Chapter 468, landowners have the right to petition for repairs or improvements. On April 16, 2025, a landowner submitted such a request for repairs to the open ditch. (Appendix A).

Once a valid petition is received, the Board hires a licensed engineer to conduct a preliminary survey and study and prepare a report outlining possible repair or improvements and associated costs. On November 24, 2025, AgriVia was appointed to conduct a study of the open ditch and submit a report recommending what repairs should be done. At an informational meeting on February 25, 2026, a landowner requested the scope of the project be extended to include Branch No. 1 and Branch No. 6 tiles.

This report presents the findings and recommendations resulting from that study and survey. The process is deliberate and transparent, with all landowners entitled to receive notice, review findings, attend hearings, and raise questions before any project proceeds.

Location

Drainage District No. 6 spans lands in sections 8, 9, 10, 15, 16, 17, 20, 21, 22, 23, 27, 28, 29, 32, 33, and 34 of Washington Township. The district lies approximately 6 miles south of Perry, bordering the north side of Highway 44. A map of the area of study is included in Appendix B.

Historical Considerations

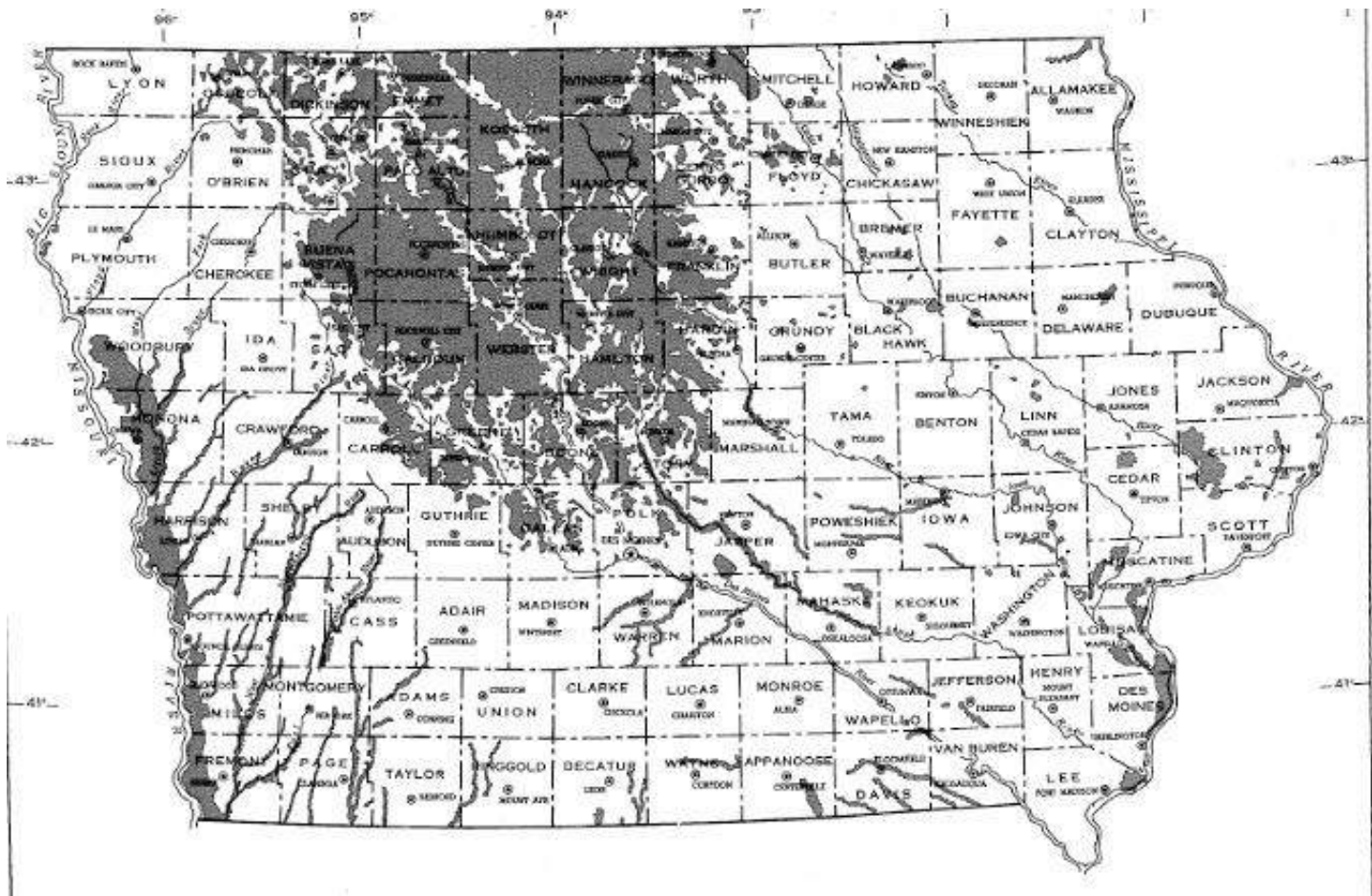
Prehistoric and Geologic Background

Dallas County, Iowa, lies partially within the Des Moines Lobe, shaped by the last glaciation 12,000–15,000 years ago. Glaciers deposited clay-rich till, a dense mix of clay, silt, sand, and boulders, over older bedrock. This till forms the foundation of the region's soils and strongly affects drainage.

The glacial landscape is relatively flat, featuring end moraines, kames, eskers, and knob-and-kettle terrain with prairie potholes (shallow depressions that collect water). Combined with the low permeability of the till and limited natural drainage, these features cause frequent surface ponding and high-water tables.

State-wide Drainage System Overview

Artificial drainage in Iowa began in the late 1800s as settlers converted wetlands into farmland. Steam, and later gasoline-powered machinery accelerated these efforts. A 1904 constitutional amendment enabled the creation of drainage districts, allowing landowners to fund and manage large-scale drainage projects. By 1930, more than 9 million acres of wetlands had been converted to farmland.



Source: Iowa Drainage Districts (1950 US Census of Agriculture)

The scale of Iowa's drainage efforts is striking. By 1912, investments in drainage likely exceeded U.S. spending on the Panama Canal, highlighting the significant labor and engineering required to reshape the landscape. Today, approximately 3,800 drainage districts maintain networks of ditches and tiles statewide.

County-Wide Drainage System Overview

Dallas County is served by approximately 65 drainage districts, encompassing thousands of miles of tiles and ditches and covering roughly 75,000 acres of farmland. Most districts were established before 1930 and are undersized to meet the needs of modern farming practices or require regular upkeep.

Many historical accounts and photographs can be found illustrating the history and importance of drainage in Dallas County. The Dallas County Administration Building has several of these displayed upstairs in the central atrium.

Drainage District No. 6 Historical Overview

Drainage District No. 6 in Dallas County was established to address persistent flooding and wetland conditions that limited agricultural productivity. Key events in the district's development include:

1. Establishment and Original Improvements (1908–1911)

Drainage District No. 6 was established in 1908, with 4,102 acres originally assessed for benefits. The original improvements included an open ditch approximately 22,600 feet long and six tile laterals ranging in size from 26 inches to 12 inches in diameter. The total cost assessed for the original improvements was \$34,256. Initial levies were assessed beginning in 1911.

2. Early and Mid-Century Maintenance Levies (1920–1969)

Maintenance and improvement levies were assessed periodically throughout the mid-20th century. Ditch cleanouts occurred in 1921 and 1929. Replacing the upper part of the ditch with a tile was considered in 1929. Additional levies were assessed in 1942, 1950, 1954, 1961, 1966, and 1969.

3. Cleanouts and Ongoing Maintenance (1970s–1980s)

Further maintenance activity occurred in the 1970s and 1980s, including a cleanout in 1972 and additional levies in 1975 and 1977, the latter associated with a ditch cleanout. Levies were also assessed in 1980 and 1982.

4. District Annexation and Late-Century Improvements (1987–2005)

In 1987, 2,115.25 acres were annexed into Drainage District No. 6, increasing the total district area to 6,217.25 acres. A ditch cleanout occurred in 1989, followed by additional levies in 1992 and 2000. An improvement was considered in 1997 (lowering the ditch by 1.3 ft). It was decided to repair the ditch instead and the cleanout was completed in 1998 at a cost of \$227,085. Another cleanout occurred in 2000. One month after completion of the 1998 cleanout, a significant rainstorm caused damage to district facilities. After FEMA cost sharing, the district incurred \$67,623 in storm damage repair costs. The final levy during this period was assessed in 2005.

5. Recent Cleanout (2013-2016)

In November 2013, an engineer's report was filed recommending repairs to the ditch after sedimentation had accumulated. The project went to bid in 2015, and the contractor repaired the ditch to original design, including installing many additional large surface drainpipes to stop additional sedimentation from overflow.

Historical Agricultural Demands

In the early 20th century, farms in Dallas County were smaller and more diversified. They included a mix of row crops, small grains, hay, pasture, and livestock. Early smaller scale drainage systems helped convert poorly drained land into pasture and dryer upland areas into more productive cropland.

Since then, agriculture in the county has changed dramatically. Today, approximately 80% of Dallas County's land is used for agriculture, down from about 95% in 1920. Most farms today span several hundred acres and operate in a corn–soybean rotation, which now accounts for over 90% of row-cropped land.



Figure 12. A drainage ditch through an area of Canisteo silty clay loam, 0 to 2 percent slopes. Drainage ditches provide outlets for subsurface tile.

Source U.S. Department of Agriculture, Soil Conservation Service. (1986). Soil survey of Hamilton County, Iowa [Map/image]. U.S. Government Printing Office.

Environmental Considerations

Flooding and Subsurface Drainage

Subsurface drainage, while primarily installed to improve agronomic performance and soil workability, also plays a role in broader hydrological outcomes. A 2014 study conducted by the University of Iowa's IIHR—Hydroscience & Engineering Institute concluded that modern subsurface tile drainage systems can reduce peak flow rates during storm events. By gradually drawing down the water table and drying out soils, tile systems allow the soil to soak in more rainfall and delay the timing of runoff compared to surface flow, thereby attenuating flood peaks in receiving streams. This contradicts the common theory that tile drainage always increases flood risk.

Nutrient Loading and Subsurface Drainage

DD 6 lies in the Raccoon River watershed, where tile drainage supports row crops on heavy, poorly drained soils by removing excess water. However, tiles create direct paths for soluble nutrients, especially nitrate-nitrogen (NO_3^- -N), to reach streams. Long-term monitoring by the Iowa DNR and USGS shows elevated nitrate levels in the Raccoon River during high tile flow periods. Tile drainage does not create nutrients but accelerates their movement, making nutrient management and conservation practices essential alongside drainage improvements to reduce nutrient loading and protect water quality.

Climate and Weather Patterns

Long-term weather records dating back to 1895 provide insight into shifting precipitation patterns, temperature trends, and drought cycles.

Historically, Dallas County has received anywhere from 20 to 50 inches of precipitation per year, averaging around 32 inches (Appendix C). The trend from 1895 to 2024 shows increasing annual precipitation, with more years exceeding 40 inches and several such as 1993, 2007, 2008, 2010, and 2015 surpassing 45 inches. In addition to rising totals, rainfall has become more intense and unevenly distributed. Short, high-intensity storms delivering 2 to 4 inches in a single day are increasingly common, especially in spring and early summer.

The Palmer Drought Severity Index (PDSI) reflects this variability. While Dallas County experienced major droughts in the 1930s, 1950s, late 1970s, and late 1980s, recent decades show more frequent wet periods and positive PDSI values (Appendix D), indicating above-normal soil moisture. At the same time, temperature records show moderate warming, especially in winter and early spring, leading to earlier snowmelt, altered freeze-thaw cycles, and longer growing seasons.

Watershed Characteristics

District Landscape

Drainage District No. 6 encompasses a watershed with a very distinct central valley in the south, with numerous concentrated surface swales draining the uplands to it. The north half has a much shallower central valley with numerous potholes and flatter topography. Natural drainage systems are poorly developed, and the soils are heavy with clay. The natural grade from the beginning of the drainage ditch at the highway 44 bridge to the end at I Ave is extremely flat, with only around 11 feet of natural elevation change in over 22,600 linear feet of distance.

Before the district's formation, it is estimated that more than 1,000 acres of land were untillable wet grassland or swamp. Today, nearly all land within the district is considered tillable, a testament to the effectiveness of the installed drainage improvements.

We used LiDAR (Light Detection and Ranging) to map the surface topography of the district. This technology uses laser pulses from aircraft to create highly accurate elevation maps of the ground surface. These maps help us identify where water naturally collects and how it moves across the land. An elevation map is included in Appendix E.

The watershed covers approximately 6,488 acres that naturally drain to the district via surface flow. Additionally, 74 acres outside the natural watershed are tile drained into the ditch, resulting in 6,562 acres draining to the ditch. There may be additional acres tile-drained out of the district, while others outside the surface watershed are tile-drained into it.

A detailed topographic analysis using 6-inch LiDAR contour data identified 390 depressional features within the watershed, covering approximately 460 acres (7% of watershed). These low-lying areas collect water and lack natural surface outlets. They are prone to surface ponding during rain events, alter runoff patterns, and increase reliance on subsurface tile or surface inlets for effective water management. These depressions are mapped in Appendix F.

Historical aerial photos provide valuable insight into long-term drainage patterns and problem areas within the district. By examining past images, we can identify recurring issues such as drown-out spots, standing water, or poor crop growth, all of which are indicators of inadequate drainage.

Soils

Most of the soils within Drainage District No. 6 are classified as clay loam, which tend to retain water and present natural drainage limitations. The four dominant soil types, Canisteo clay loam, Clarion clay loam, Nicollet clay loam, and Harps clay loam, cover roughly three-fourths of the district. Although these soils are highly fertile, their fine texture and landscape position often results in poor natural drainage.

According to the USDA, Canisteo soils are poorly drained and typically occur on flats and in swales. They are characterized by a high-water table, frequently requiring subsurface tile and surface ditches for adequate drainage. Clarion soils are moderately well drained and commonly found on knolls and side slopes with gentle to moderate gradients. Nicollet soils are also moderately well drained, generally occurring on low rises or gently sloping convex side slopes, with a moderately high seasonal water table. Harps soils are poorly drained, calcareous soils located on plains or in upland depressions, where the water table is often near or above the surface during wet periods. All of these soils exhibit significantly improved productivity when supplemented with artificial drainage systems.

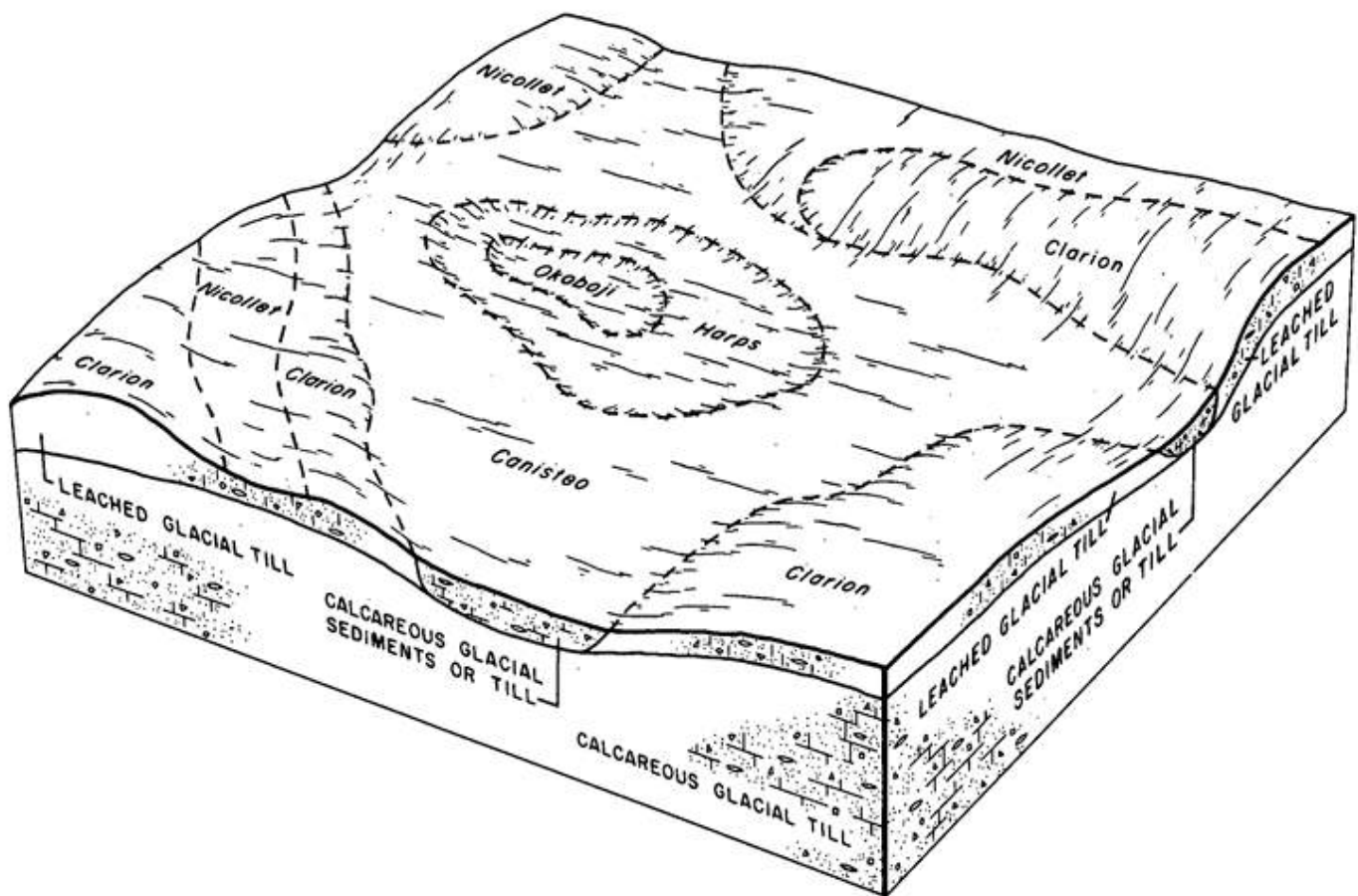


Figure 2.—Pattern of soils and parent material in the Canisteo-Clarion-Nicollet association.

Source U.S. Department of Agriculture, Soil Conservation Service. (1986). Soil survey of Dallas County, Iowa [Map/image]. U.S. Government Printing Office.

A detailed soil drainage class table is included below and supporting soil type and soil drainage class maps are provided in Appendices G and H. Overall, over 57% of the soils in the ditch's watershed fall into the very poorly drained, poorly drained, or somewhat poorly drained categories. This highlights the critical need for artificial drainage to maintain productivity.

Main Open Ditch - Soil Drainage Class		
Drain Class	Acres	Percentage of Watershed
Very Poorly Drained	119	2%
Poorly Drained	2,846	43%
Somewhat Poorly Drained	797	12%
Moderately Well Drained	0	0%
Well Drained	2,783	43%
Somewhat Excessively Well Drained	17	0%
Excessively Drained	0	0%

50% of the soils in the Branch No. 1 and No. 6 tiles' watershed fall into the very poorly drained, poorly drained, or somewhat poorly drained categories as shown in the table below:

Tile Branches No. 1 & No. 6 - Soil Drainage Class		
Drain Class	Acres	Percentage of Watershed
Very Poorly Drained	13	2%
Poorly Drained	260	32%
Somewhat Poorly Drained	133	16%
Moderately Well Drained	0	0%
Well Drained	397	49%
Somewhat Excessively Well Drained	6	1%
Excessively Drained	0	0%

Subsurface and Surface Water Flow Behavior

Subsurface drainage works by collecting water through perforated pipes or the gaps between clay tiles installed below ground. As the soil becomes saturated, water moves laterally through the soil's pore spaces until it reaches the tile line, then enters through small openings and is conveyed to the district main. This process lowers the water table, improves soil aeration, and reduces surface runoff.

A key factor in drainage design is saturated hydraulic conductivity (Ksat), a measure of how quickly water moves through saturated soil. Sandy soils have high Ksat values and drain quickly; clay soils, like those in DD 6, have lower Ksat values and drain more slowly. Most soils in the district are clay loams with moderate to low Ksat values (Appendix I). These values are used to determine necessary drainage coefficients and guide tile spacing and depth for effective system design.

Surface water flow occurs when rainfall or snowmelt exceeds the soil's infiltration capacity, causing water to move downslope into channels or depressions. To model this, we use Curve Numbers (CN)—a standard method for estimating runoff based on land use, soil type, and moisture conditions. In DD 6, CN values typically range from 75 to 90, which is high, for cultivated agricultural land with moderately and poorly drained soils. These values help in designing surface inlets, sizing ditches, and evaluating erosion control needs.

A map of seasonal high-water tables (Appendix J), based on USDA NRCS data, provides a general overview of how close groundwater may rise to the surface during wet periods.

Private Drainage

The primary purpose of a drainage district is to provide a legal and reliable outlet for both surface and subsurface drainage, enabling coordinated water management across multiple properties. While the district maintains the shared infrastructure, such as main tile lines and open ditches, individual landowners are responsible for installing and maintaining private tile systems that connect their land to the district outlet. Over the more than 100 years since the district was established, it is estimated that more than a million feet of tile have been installed within its boundaries.

As part of this ditch project, every known tile and surface drain outlet along the open ditch was located and surveyed. Defective or collapsed pipes will be replaced as part of the work. Damaged outlets do not function properly and can contribute to ditch bank failure through seepage and erosion.

To better understand how private tiling interacts with the district system, we requested tile maps from landowners. Several responded with helpful documentation, which we reviewed and incorporated into our analysis (Appendix K). We also examined the original engineer's notes, which indicate that some private tile lines existed even before the district was formed. Additional information was gathered from historical and recent aerial imagery, and field surveys were conducted to locate surface tile intakes.

Through this combined effort, we found most of the lands in the district are random tiled, as opposed to pattern tiled, with 713,000 feet of private tile that we were able to directly map. The true extent is likely greater, as many older or undocumented tile lines are not visible or recorded.

We also included a map of the district (Appendix L) showing a 30-meter resolution tile-drained croplands using a geospatial modeling approach prepared by Valayamkunnath, P., Barlage, M., Chen, F., Gochis, D.J., and Franz, K.J., 2020. Using this method, we estimate 72% of the drainage district is tile drained including at least some of every parcel in the district.

Existing Infrastructure and Conditions

Field Survey

The initial field survey of Drainage District No. 6 was completed in December of 2025. As part of this effort, we collected photographs and drone video of all major components and areas of interest throughout the Main Open Ditch. Using high-accuracy GPS equipment, we measured the flowline elevations of the ditch at regular intervals. These elevation measurements help us compare existing conditions with the original engineering plans and serve as reliable reference points moving forward.

We surveyed the Branch No. 1 and Branch No. 6 tiles in March of 2026. We surveyed the flowlines of the intakes and the road ditches and culverts. We took photographs and drone video of the tile routes. The drone video of the open ditch can be found on YouTube at <https://www.youtube.com/watch?v=o7phOhh4D7I&t=53s>.

We also documented the condition of major features including bridges, culverts, private crossings, private tile outlets, surface drains, and concrete bulkheads. Photos taken during the field visit are included in Appendix M.

Existing Facilities

Main Open Ditch

The district's open ditch is the headwaters for the East Branch of Panther Creek. It is approximately 22,600 feet long and serves nearly 6,500 acres of predominantly farmland. The ditch functions as the outlet for 5 major district branch tiles and the main tile of Sub District No. 6.

The outlet terminus is into the natural course of the East Branch of Panther Creek at the north side of Hwy 44. It runs a mile north to 230th St. This section is characterized by a particularly defined and steep valley for a Des Moines Lobe landscape, carved by meltwaters at the end of the last ice age.

North of 230th St, the ditch runs through much flatter terrain, characterized by numerous potholes, with knobs and small ridges. Low lying land extends to the west, with steeper hills rising to the east. Various district tiles branch out into valleys and swales in the chaotic natural drainage network at the north end of the ditch.

Branch 1 Tile

The Branch 1 Tile originates around Station 195+50 of the Main Open Ditch. From this point, it extends north approximately 4,000 feet and subsequently northeast for another 2,500 feet, terminating on the north side of 195th St approximately 1,000 feet east of the center of Section 9. This branch drains an estimated 809 acres, primarily consisting of a long, defined valley of poorly drained land. This tile is over a century old.

Branch 2 Tile

The Branch 2 Tile originates near the upper end of the Main Open Ditch. It runs roughly a mile north-northwest terminating at 200th St at the north central boundary of Section 17. It drains roughly 330 acres of a broad, gradual valley with several potholes and many poorly drained soils. The branch currently outlets into the culvert under I Avenue. This should be relocated into daylight west of the road for proper maintenance access. This tile is over a century old.

Branch 3 Tile

The Branch 3 Tile originates at approximately station 221+50 of the Main Open Ditch. It runs south-southwest for roughly 4,500 feet through low relief, wet ground before terminating 1,400 feet east of the center of Section 20. This branch drains approximately 319 acres. This tile is over a century old.

Branch 4 Tile

The Branch 4 Tile outlets into the Main Open Ditch adjacent to Branch 1, at approximately station 195+50. It runs 1,300 feet northeast before terminating at the fenceline 730 feet east of the center of Section 16. Approximately 662 acres drain to this branch, consisting of a ring of ridges surrounding a broad, low valley characterized by poorly drained soils. This tile is over a century old.

Branch 5 Tile

The Branch 5 Tile originates near station 184+00 of the Main Open Ditch. It runs for 3,500 feet to the east and southeast, terminating to the southeast of the intersection of J Ave and F31. It drains approximately 417 acres of a long, broad valley with several pothole trapped areas and many wet soils. This tile is over a century old.

Branch 6 Tile

The Branch 6 Tile connects near the upper end of Branch 1 and runs 2,400 feet to the east, draining 268 acres including a large pothole in the center. This tile is over a century old.

Sub-district 6 Tile

The Sub-district 6 tile system was installed in the 1970s primarily to drain Section 17 of Washington Township. It consists of approximately 16,000 LF of tile mains. The outlet is usually half-submerged due to the inadequate flow capacity of the open ditch and the I Ave road culvert.

Existing Sizes and Capacities

Drainage District No. 6 1909 Original Construction

Partial records of this construction were located, and the design dimensions are summarized approximately below.

Drainage District No. 6 1909 Original Construction Capacity				
Section Name	Bottom Width (ft)	Grade (%)	Side Slopes (h:v)	Approx. Capacity (cfs)
Main Open Ditch (Sta 00+00→26+00)	3	0.04	1:1	54
Main Open Ditch (Sta 26+00→53+00)	4	0.04	1:1	61
Main Open Ditch (Sta 53+00→226+00)	9	0.04	1:1	97

Drainage District No. 6 1997 Repair

In 1997, a major repair project was undertaken. Several feet of silt had accumulated along the channel bottom, and many tile lines were no longer functioning. As part of the repairs, the ditch side slopes were graded to a 2:1 slope to improve long-term stability, and the bottom excavated to a uniform 14-foot width. The numbers in the table below are approximate, and the actual current dimensions, water depths, and flow velocities of the ditch vary significantly.

Drainage District No. 6 Existing Design Ditch Capacity					
Section Name	Bottom Width (ft)	Grade (%)	Side Slopes (h:v)	Depth of Water (ft)*	Velocity (ft/sec)*
Stations 00+00 → 55+00	14	0.04	2:1	4.7	2.4
Stations 55+00 → 113+00	14	0.04	2:1	4.4	2.3
Stations 113+00 → 176+00	14	0.04	2:1	4.1	2.2
Stations 176+00 → 224+00	14	0.04	2:1	2.8	1.8

*Calculated for a 2-year, 48-hour storm event

Drainage District No. 6 Existing Tile Capacity

The existing drainage system performance depends upon the hydraulic characteristics of each section, including pipe diameter, drainage coefficient, and the percentage relative to the modern standard drainage coefficient of 0.5 inches per day. These parameters determine the system's capacity to convey water.

No profiles of Branch No. 1 exist in the county records. A plat labeled the sizes, lengths, and grade for the lower end. Our survey found an average grade of 0.18% for Stations 0-35 of the Branch No. 1 tile, and an average grade of 0.12% for Stations 35-67. The 0.18% grade is considerably steeper than the recorded 0.10% grade. For our estimates, we used 0.10% as the grade for the lower portion, assuming some of the grade is wasted in short sections and at the outlet, and 0.12% for the upper portion.

For Branch No. 6, no profiles exist in the county records. A plat labeled the branch as 16" for 2,400 LF. Taking flowline elevations on two intakes in the depression area toward the upper end showed a 0.16% grade between the intakes. Using these shots alongside the Branch No. 1 tile shots, we estimate the average grade of the system to be approximately 0.33%. The profile is likely steeper at the beginning as it comes up the hill, before flattening out in the depression. For our estimated drainage coefficient, we utilized 0.16% as the grade for our calculations, as the entire drainage area drains to the depression first before discharging through the tile. Because this stretch is the most restrictive, it acts as the controlling grade.

Drainage District No. 6 Existing Branches No. 1 and No. 6 Tile Capacity				
Section Name	Outlet Diameter (inches)	Grade (%)	Drainage Coefficient (in/day)	Percentage of Modern Minimum Standard
Branch 1 Tile (Sta 0+00→38+00)	26	0.10%	0.28	56%
Branch 1 Tile (Sta 38+00→62+00)	24	0.12%	0.34	68%
Branch 1 Tile (Sta 62+00→67+00)	12	0.12%	0.23	46%
Branch 6 Tile (Sta 0+00→24+00)	16	0.16%	0.30	60%

The other branch tiles, with the exception of Branch No. 5, are sized more closely to modern standards. This is likely in part due to the construction of Sub District 6 tile in 1970. This not only was constructed at a 0.46"/day coefficient, it effectively removed acres from the Branch No. 2 and Branch No. 3 tiles raising their drainage coefficient as less acres were relying on those tiles.

The relationship between Branch No. 1, Branch No. 6 and Branch No. 4 should be noted. Our reviews of elevation maps appear to show the area being drained by Branch No. 6 to naturally drain towards Branch No. 4, albeit poorly. The decision to cut through a hill to construct Branch No. 6 to drain this land into Branch No. 1 was a relief to Branch No. 4 and a burden on Branch No. 1. We have no records of why this decision was made.

Other Drainage District No. 6 Existing Tile Capacity				
Section Name	Outlet Diameter (inches)	Grade (%)	Drainage Coefficient (in/day)	Percentage of Modern Minimum Standard
Branch 2 Tile	20	0.15%	0.42	84%
Branch 3 Tile	24	0.06%	0.45	90%
Branch 4 Tile	18	0.38%	0.25	50%
Branch 5 Tile	18	0.11%	0.22	44%
Sub District 6 Tile	24	0.09%	0.46	92%

Downstream Outlet

Drainage District No. 6 outlets into the East Branch of Panther Creek, located in Section 4 of Colfax Township. It merges with the west branch to become Panther Creek several miles to the south, subsequently flowing into the Raccoon River. The Raccoon River is a significant tributary, stretching approximately 226 miles in length to the longest fork, and draining a watershed area of about 3,625 square miles. It flows southeast, joining the Des Moines River in Des Moines, Iowa.

Proposed Project

Project Design

We are proposing an improvement of the open ditch and two branch tiles. As the engineers responsible for overseeing the repairs and improvements to the ditch and tile system, we have followed established design and construction standards developed by the American Society of Agricultural and Biological Engineers (ASABE), the Natural Resources Conservation Service (NRCS), and Iowa State University Extension and Outreach.

Under the authority of Iowa Code Chapter 468, the drainage district holds both the legal right and the obligation to maintain drainage facilities to their original design capacity. To assess the current ditch and Branch No. 1 and No. 6 tiles, we reviewed existing plans to verify the original flowline elevations and channel cross-sections and tile sizes.

Open Ditch Design Standards

The design standard for open ditches is laid out in the Iowa Drainage Guide printed by Iowa State Extension. Open ditches should be sized to handle 2-year 48-hour flows. For calculating this, it provides a chart with three lines:

1. Lands that are lake regulated, sandy, and potholed areas
2. Lands that are a combination of hills and floodplains
3. Lands not truly defined by either of the other two options.

For Drainage District No. 6, we used option 3 for the outlet of the ditch as the upper lands are flat, potholed landscape, and as the ditch moves downstream the lands near the valley are hillier with flat uplands. Using this line, the total runoff of a 2-year 48-hour storm can be estimated at approximately 260 cubic feet per second (cfs). We used option 1 for sizing the ditch upstream of 210th Street to account for the potholed landscape upstream in this area.

Proposed Main Open Ditch Project

We are proposing a comprehensive improvement to restore hydraulic capacity and improve long-term stability while reducing future maintenance. Work includes channel excavation, removing silt, sloughs, bars, debris, and meanders to establish quality channel depth and water flow, cleaning road culverts and bridges, reshaping banks to stable slopes, and replacing defective outlet pipes as shown on the plans. Excavated material will be placed, leveled, and tilled on the existing spoil bank, and all disturbed banks will be seeded. Upon completion, the ditch will function much more effectively, and tile outlets will be improved.

The zones of work on the ditch system are described below:

Main Open Ditch Improvement Sections						
Section	Bottom Width (ft)	Side Slopes	Grade (%)	Design Flow Rate (cfs)	Depth of Water (ft)*	Velocity (ft/sec)*
Sta -18+00 → 00+00	4	Stabilize	0.06%	260	5.8	2.8
Sta 00+00 → 55+00	4	2:1	0.06%	260	5.8	2.8
Sta 55+00 → 113+00	4	2:1	0.06%	230	5.5	2.8
Sta 113+00 → 176+00	4	2:1	0.06%	200	5.2	2.7
Sta 176+00 → 224+00	4	2:1	0.06%	100	3.8	2.2

*Calculated for 2-year, 48-hour storm event

It must be noted that the upper end of the ditch, being already at or below the design grade will continue to have its bottom width at the existing 14-foot width since environmental rules and practicality restrain filling of an open ditch.

Looking at topographic maps, it is apparent how much more natural fall exists downstream of Highway 44 where the current ditch terminates. We surveyed south of the highway and found that by extending the ditch approximately 1,800' downstream, we could redesign the entire ditch to a much more desirable 0.06% grade.

The proposed ditch will be approximately three feet deeper than the existing ditch at the outlet to allow for the increased grade. This increased depth is spent going upstream as the proposed ditch has a steeper grade than the existing grade (0.06% vs. 0.04%). Upstream of Station 209+00 the current ditch is deeper than our design. This is not ideal, however, that is a constraint of the existing design.

Increasing the grade will increase flow velocity, improving the rate of base flow water removal and reducing the rate of sediment deposition. Water levels in the ditch will be lower on average, and the frequency of maintenance should decrease, significantly improving long-term economic returns for members of the district.

As part of the design process, we considered extending the ditch further downstream to achieve more than 0.06% grade. However, in our opinion the cost relative to the return becomes prohibitive beyond 0.06%. Significantly more right-of-way would have to be purchased and a larger area of land would be taken up by the significantly increased size of the ditch, due to the extra depth needed throughout for a steeper grade. The current proposal increases design grade by 50%, which will be a major boost over current performance.

The downstream work will require purchasing right-of-way from the impacted landowner. That parcel also includes a constructed vented ford crossing as shown in Appendix N. The cost to replace this vented ford crossing will be a district expense, as the benefit of lowering the creek is a district benefit, not an individual benefit.

Tile Drain Design Standards

For the tile main design, the defining metric is the drainage coefficient, the amount of water (in inches per day) the system is designed to remove from the land. While typical recommended values range from $\frac{3}{8}$ to 1 inch per day depending on soil type, topography, and crop needs, this system was designed to achieve a drainage coefficient of $\frac{1}{2}$ inch per day. This is the standard recommendation for Iowa's mineral soils under row crop production, as outlined in the Iowa Drainage Guide.

Pipe grade (or slope) is a crucial factor in determining the correct tile size. A steeper grade allows for greater flow capacity, enabling the use of smaller-diameter pipes, while flatter grades require larger pipes to maintain that same capacity. To accurately size the tile based on this relationship, we applied Manning's equation utilizing a roughness coefficient of 0.012, which is consistent with NRCS and ASABE standards for smooth-walled plastic pipe and reinforced concrete pipe (RCP).

Proposed Branches No. 1 and No. 6 Tile Project

Proposed Branches No. 1 & No. 6 Tiles Size and Grade		
Section Name	Diameter (inches)	Grade (%)
Branch No. 1 (Stations 00+00→08+00)	30	0.15
Branch No. 1 (Stations 08+00→21.5+00)	30	0.12
Branch No. 1 (Stations 21.5+00→35.5+00)	30	0.11
Branch No. 1 (Stations 35.5+00→40+00)	30	0.09
Branch No. 1 (Stations 40+00→49+00)	30	0.08
Branch No. 1 (Stations 49+00→66+00)	24	0.17
Branch No. 1 (Stations 66+00→69+00)	15	0.17
Branch No. 6 (Stations 00+00→05+00)	18	0.83
Branch No. 6 (Stations 05+00→18+00)	18	0.25

Preliminary Plans

The proposed construction plans are enclosed with this report. These plans serve as a guide for the contractor and outline the expectations and standards for construction. Included in the plans are the proposed work limits and specific work expected to take place on each landowner's property. The plans also contain profile views showing the proposed depth of the existing and proposed ditch flowline. These plans are preliminary, and may be refined prior to final bidding.

Construction Considerations

The construction will take place as two projects. One for improving the open ditch and the other for improving the Branches No. 1 and No. 6 tiles. If implemented, they will be bid independent of each other. This is because though there are some construction firms that lay pipe and dig ditches, there are more contractors who prefer or specialize in one or the other. We have outlined below the Ditch Construction Methods and Tile Construction Methods detailing the work required for both sections of work.

Main Open Ditch Construction Methods

- **Excavation**

The ditch will be repaired using established methods commonly employed throughout Iowa. Construction will begin at the downstream end and proceed upstream, allowing standing water in upstream sections to drain and helping to flush sediment and debris through the newly cleaned downstream channel. Tracked excavators will be utilized, operating from both sides of the ditch where conditions allow. This approach provides more effective cleaning of the ditch bottom and banks while allowing even spoil placement.

- **Clearing and Grubbing**

All trees located within the right-of-way of the open ditch will be removed as a maintenance measure. Tree growth within the right-of-way shades out grass, increases erosion potential, drops debris into the channel, obstructs maintenance access, and provides material for beaver dam construction. Trees will be removed to ground level. All woody debris will be burned, and the resulting ashes and remnants will be buried within the ditch right-of-way. Landowners wishing to retain wood from trees marked for removal are encouraged to remove the tree prior to the start of construction.

- **Seeding and Fertilizing of Banks**

All ditch banks disturbed during construction will be re-seeded by the contractor to minimize erosion and promote the establishment of desirable vegetation. According to NRCS guidance, the most cost-effective method for stabilizing exposed banks without additional seedbed preparation is to broadcast seed and fertilizer daily as work progresses. We call out that banks are to be scraped with some kind of approved harrow to create ridges and a summer cover crop mixture to be seeded with fertilizer. After completion of the project, the banks will be seeded with a permanent seed mixture via hydroseeding.

However, vegetation establishment is highly weather-dependent and often inconsistent. Some areas may experience weed growth or poor vegetative cover that will require additional maintenance or time to fully stabilize.

- **Spoil Leveling, Tillage and Debris Pick-up**

Spoil generated from ditch excavation will be placed along the top of the ditch bank. After allowing the material to dry, the contractor will spread it into a uniform layer approximately 30 feet wide, providing a smooth, equipment-accessible transition back to the adjacent field. The spoil area will then be tilled, and all debris and rocks larger than softball size will be collected and removed. Final restoration of this area will be completed by the landowner according to their preference.

- **Spoil Seeding**

The 100-foot-wide work area will be seeded with a cover crop after construction to reduce erosion, improve soil health, and break up compaction. Landowners may terminate the cover crop at their discretion.

- **Surface Drain Pipes**

Surface drain pipes were identified during the field survey and are shown on the plans. The project cost estimate includes replacement of any pipes requiring repair. Additional pipes are expected to be discovered during construction, as some may currently be buried, broken, or obscured by vegetation. Any damaged or deteriorated pipes will be replaced with new corrugated metal pipes (CMP) and marked with a flag at the top of the bank. All pipes will be installed so that their discharge ends are positioned above the ditch bottom, ensuring unrestricted flow under normal conditions.

- **Tile Outlets**

Tile outlet pipes will be treated the same as surface drainpipes and will be replaced if in poor condition. All will be marked with a flag at the top of the bank.

- **Riprap**

Existing riprap found in the ditch will be left in place if possible. Additional riprap may be installed in select areas to protect against bank scour during and after construction. Riprap is typically used in locations with sandy soils that are unstable, as well as at sharp bends or downstream of large tile outlets. The exact location and quantity of riprap will be determined in the field during construction. Where suitable, existing field stones found along the ditch may be utilized as riprap.

- **Pollution and Erosion Control**

The contractor will be responsible for minimizing pollution and erosion during construction, under the engineer's direction. Excavation, removing vegetation, and placing spoil material along the banks temporarily increases erosion potential. To minimize the risk, a sediment baffle will be installed at the beginning of the cleanout to allow sediment to settle before flowing downstream. The contractor will also perform daily seeding of exposed ditch banks and apply a temporary seed mix to the top of the banks upon completion. Some erosion is still expected; therefore, the ditch bottom will be over-excavated by six inches to ensure that minor sediment deposition does not reduce the designed capacity of the open ditch.

- **Removal of Fence**

Fences crossed during repair works along the ditch will only be replaced if used for pasture. Two pasture fences are known; others will not be replaced unless landowners submit a written request before project approval.

- **Driveway Restoration**

Once the project is complete, any driveways that were damaged will be restored to their original condition. Photos will be taken before and after to document the work.

- **Mobilization**

Mobilization includes transporting equipment and materials to the site, setting up access, and preparing staging areas. After work is complete, all equipment will be removed and the site cleaned up.

Branches No. 1 & No. 6 Tile Construction Methods

Drainage district pipe will be installed using open-cut excavation and follow Iowa SUDAS standards for storm sewers and culverts. Either reinforced concrete pipe (RCP) or plastic dual-wall pipe (HDPE) may be used, depending on cost, size, and conditions.

Topsoil will be stripped and set aside for final backfill. For RCP, where possible, a shaped "spoon bed" will be used for support without requiring rock. For large HDPE, crushed stone will be placed around the pipe per SUDAS standards.

RCP will be laid in sections and curved using slight joint offsets. Large HDPE will be installed in straight runs with elbows for turns, and joints fused or coupled. Grade and alignment will be controlled using laser or GPS equipment.

Trenches will be backfilled to match the original ground level, and the topsoil will be replaced and seeded with a cover crop to prevent erosion. No compaction testing is required.

HDPE pipe will be tested after backfilling to ensure it has not deformed beyond 5%. RCP will be visually inspected for joint tightness and alignment. All work will be documented and final as-built plans provided.

Existing District Tile

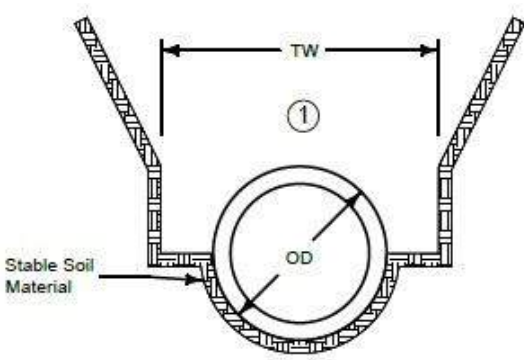
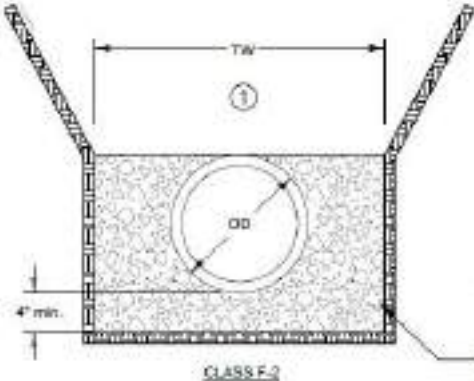
If a new tile system is installed, the old district tile will remain in place but will no longer be maintained by the district. It will be connected to the new tile about every 1,000 feet to serve as a collector, which reduces the number of connections needed and saves the district money. Because the old tile is no longer a district responsibility, individual landowners will take over ownership and maintenance.

Pipe Material Comparison

For the drainage district project, both reinforced concrete pipe (RCP) and plastic dual-wall pipe (HDPE) will be included in the bid package so the final selection can balance cost and performance based on site conditions, following Iowa DOT and SUDAS specifications.

- **Reinforced Concrete Pipe (RCP):**
 - Stiff and durable, supporting heavy loads in poor soils.
 - Expected design life over 100 years, resistant to corrosion and abrasion.
 - Can be installed using native soil for bedding, reducing material costs, and simplifying construction.
 - Can handle gentle curves without extra fittings.
- **HDPE Plastic Pipe:**
 - Lightweight, easier to handle, with a design life of about 50 years.
 - Requires granular (rock) bedding, increasing trucking, compaction, and quality control needs.
 - Prefabricated elbows and straight runs limit alignment flexibility.

While RCP has a higher material cost, it can reduce installation complexity and long-term maintenance. HDPE may be cheaper initially but demands more oversight and bedding materials. The final choice will depend on soil conditions, alignment requirements, and balancing initial versus long-term costs.

Typical RCP Installation	Typical HDPE Installation
 A cross-sectional diagram of a reinforced concrete pipe (RCP) installation. The pipe is circular with an outer diameter (OD) and an inner diameter (ID). It is surrounded by a thick layer of bedding material, indicated by a hatched pattern. A dimension line labeled 'TW' (Total Width) spans the width of the bedding. A label 'Stable Soil Material' points to the bedding. A circled number '1' is located above the pipe.	 A cross-sectional diagram of a high-density polyethylene (HDPE) pipe installation. The pipe is circular with an outer diameter (OD). It is surrounded by a thick layer of bedding material, indicated by a hatched pattern. A dimension line labeled 'TW' (Total Width) spans the width of the bedding. A label 'CLASS A BEDDING MATERIAL OR APPROVED EQUAL' points to the bedding. A dimension line labeled '4" min.' indicates the minimum thickness of the bedding. A circled number '1' is located above the pipe.

Related Construction Methods

The following are common additional items for a tile project:

- **Tile Connections**

Private tiles will be connected to the new district tile using Inserta-Tees for a secure fit. Disturbance will be minimized, with 3 tons of rock used for backfilling. Each connection will be documented with a photo and marked on the final plans.
- **Elbows**

HDPE requires elbows for changes in direction, as it must be laid in straight runs. RCP can curve slightly without fittings. Elbows have a slightly reduced flow capacity by comparison.
- **Reducers**

Reducers connect pipes of different sizes. RCP reducers will be precast; HDPE reducers will be fused or coupled. All will be bedded in rock.

- **Intakes**
12” Hickenbottom or Bar Guard intakes will be placed in road ditches, and 12” Bar Guard intakes on property lines. These intakes let ponded surface water enter the system and allow visual inspection of the tile.
- **Trench Bedding Rock**
HDPE pipe requires rock bedding (crushed stone or gravel) from 4 inches below the pipe to the top. RCP will use shaped native soil ("spoon bed") and typically will not need rock. Rock is used in poor soil conditions and to bed fittings and connections.
- **Pollution Control**
The contractor will be responsible for minimizing pollution and erosion during construction, under the engineer’s direction.
- **Seeding**
The 100-foot-wide work area will be seeded with a cover crop after construction to reduce erosion, improve soil health, and break up compaction. Landowners may terminate the cover crop at their discretion.
- **Tile Exploration**
Existing district tiles will be located and exposed to ensure proper alignment and connections. Each will be measured, marked, and documented.
- **Removal of Fence**
Fences crossed during tile installation will only be replaced if used for pasture. Four pasture fences are known; others will not be replaced unless landowners submit a written request before project approval.
- **Single Wall Corrugated Plastic Tile**
If a private tile connection is far from the main line, single-wall plastic tile will be installed to reach it. These extensions will be noted on the plans and photographed.
- **Driveway Restoration**
If a landowner’s driveway is used for access, approximately 12 tons of rock will be placed to protect it during construction. Once the project is complete, the driveway will be regraded to its original condition. Photos will be taken before and after to document the work.
- **Mobilization**
Mobilization includes transporting equipment and materials to the site, setting up access, and preparing staging areas. After work is complete, all equipment will be removed and the site cleaned up.

Proposed Road Crossings

The proposed ditch cleanout will cross two gravel roads and two paved roads. All road culverts and bridges will be cleaned out to ensure they are not impeding the function of the ditch. The existing box culvert on Highway 44 is too high to match the proposed design flowline of the open ditch. We are proposing a new 54” pipe be bored under Highway 44 to match the design flowline to take base flows. Under Iowa Code §468, the cost of road crossings is the responsibility of the entity that controls the road. A table of all crossings is provided below.

Ditch Road Crossings				
Control Entity	Road	Structure	Size	Work
Iowa DOT	Hwy 44	Box Culvert		Bore new 54" pipe to lower flowline
Dallas County	230 th St	Concrete Bridge		Cleanout
Dallas County	F31/210 th St	Concrete Bridge		Cleanout
Dallas County	I Ave	Steel CMP Pipe	42"	Replace to lower flowline

The proposed Branch No. 1 Tile will cross two gravel roads. Each county road crossing will include a 12" Bar Guard intake in the road ditch. Under Iowa Code §468, the cost of road crossings is the responsibility of the entity that controls the road. A table of all crossings is provided below.

Proposed Tile Road Crossings				
Control Entity	Road	Facility	Size	Method
Dallas County	200 th St	Branch No. 1	30"	Open Cut
Dallas County	195 th St	Branch No. 1	15"	Open Cut

Utility Conflicts and Coordination

A Design One Call was completed on March 25, 2026, identifying communications, water, and natural gas lines within the project area.

Under Iowa Code §468.186, utilities within a drainage district's right-of-way must accommodate drainage work. The district's drainage system predates the utilities, so any necessary utility relocation must be done at the utility's expense.

Before construction begins, the contractor will complete a Construction One Call to ensure all utilities are properly located and marked, helping prevent conflicts and maintain a safe worksite.

Construction Timeline

If approved, we anticipate the work to bid fall of 2026 with a completion date of fall 2027. While contractors must finish all work by this deadline, they are free to choose their own construction schedule. The timeline is intentionally flexible to attract more qualified contractors and encourage competitive bidding, which can lower project costs.

Estimated Costs and Analysis

Cost Estimate

The total estimated cost assessable to landowners for all proposed work is \$1,686,000. This figure includes all anticipated construction activities, damages, engineering services, and administrative expenses. The breakdown is as follows:

Activity	Cost
Main Open Ditch Improvement	\$696,000
Branches No. 1 and No. 6 Tile Improvement	\$637,000
Dallas County Secondary Roads*	\$28,000
Iowa Department of Transportation*	\$150,000
Engineering	\$110,000
Construction Damages and Right-of-Way	\$94,000
Other Expenses (Legal, Administrative, and Interest)	\$149,000

*Costs not paid by landowners

This is a preliminary engineer's estimate, prepared for planning purposes. Costs are based on recent bid tab data from comparable projects and include allowances for contingency and administrative expenses. Final construction costs will depend on market conditions at the time of bidding and may vary from this estimate. As a comparison, we calculated the likely cost of simply repairing the ditch to its previous design. The Trustees are required by law to keep the drainage facility in repair and functioning to its current design. We estimated the cost for such a repair would only be approximately 17% less than the cost of the proposed improvement, for much less benefit.

Costs will be paid by the landowners who benefit. Landowners not included on the Branches No. 1 and No. 6 assessment schedules will not pay for the tile improvements proposed for those branches. All landowners in the district benefit from the open ditch. A detailed itemization of costs is provided in Appendix O showing the breakdown for each assessment schedule's total cost.

Historical Cost Comparison

The estimated cost to landowners for the proposed open ditch project is approximately \$141 per acre. Below is a table to illustrate the comparative costs today with the historical cleanout and open ditch repair work.

Drainage District No. 6 Open Ditch Historical Comparison					
Year	Avg. Assessment Per Acre	Avg Land Value Per Acre	Assessment Relative to Land Value	Avg. Revenue Per Acre for Corn Crop	Assessment Relative to Yearly Corn Revenue
1909-1911*	\$8*	\$113	7%	\$19	44%
1921	\$5	\$261	2%	\$17	31%
1929	N/A	\$156		\$33	
1972	\$5	\$487	1%	\$202	3%
1989	\$3	\$1,161	0.3%	\$322	1%
1998-2000	\$42	\$1,971	2%	\$259	16%
2015	\$106	\$8,150	1%	\$646	16%
2026	\$141	\$11,883	1%	\$912	15%

Drainage District No. 6 Branch No. 1 and No. 6 Historical Comparison					
Year	Avg. Assessment Per Acre	Avg Land Value Per Acre	Assessment Relative to Land Value	Avg. Revenue Per Acre for Corn Crop	Assessment Relative to Yearly Corn Revenue
1909-1911	\$8*	\$113	7%	\$19	44%
2026	\$939	\$11,883	8%	\$912	103%

*Assessment shown is for all improvements including all tile branches and the open ditch

For a true apples-to-apples comparison, we evaluated the estimated landowners' construction-only costs for the proposed Branch No. 1 and Branch No. 6 tile improvements using modern materials, methods, and cost data for the 1909 designs in comparison to the current proposed design. The 1909 design does not meet the recommended ½-inch drainage coefficient standard. Note to replace the existing Branch No. 1 and Branch No. 6 tiles would cost slightly more than our estimated costs of the proposed project. This is largely because current commercial tile sizes do not come in 26" or 16" diameter, so 30" and 18" would need to be used. Deepening the open ditch allows us to lay the proposed tile at a lower flowline and hence a better grade even though the tile size is similar throughout to achieve the desired drainage coefficient increase.

Branch No. 1 and No. 6 Modern Cost Figures Comparison		
Year	Construction Costs	Drainage Coefficient Percent of Recommended
1909	\$652,000	56%
2026	\$637,000	100%

Assessment Schedule Review

District expenses are assessed to benefiting properties in proportion to the drainage benefit received, as required under Iowa Code Chapter 468. The district has never been reclassified and continues to apportion all costs using the original benefit schedule prepared by the appraisers in 1909, as amended only by the 1986–87 classification of annexed lands. While the original assessment schedule served the district at the time of its establishment, it no longer reflects current land use, drainage patterns, watershed boundaries, or the drainage improvements now serving each tract. The original classification schedule is included in Appendix P.

Because the proposed project is an improvement, we recommend that the Board order a reclassification of the district pursuant to Iowa Code §468.65 et seq. A current classification is necessary to ensure that project costs are distributed equitably based on the benefits received by each parcel. In addition, as provided in Iowa Code §468.41(2), separate classification schedules should be prepared for each District tile lateral (Branches 1 through 6), allowing repair costs for an individual branch tile to be assessed only to the lands served by that branch, while costs associated with the Main Open Ditch continue to be assessed district-wide. Under the existing 1909 classification, all landowners share in the cost of repairs to branch tile facilities regardless of whether their property receives a direct benefit, which is no longer consistent with current drainage practices or the intent of Iowa law.

Under Iowa Code §468.38, the Board of Trustees appoints an engineer and two disinterested landowners to serve as reclassification commissioners. The commissioners evaluate each parcel within the district and assign a relative benefit value based on the drainage benefit received rather than market value, ownership, or acreage. Modern evaluation methods, including LiDAR topography, soil surveys, aerial imagery, GIS mapping, and field investigations, provide a substantially more accurate assessment of drainage benefits than was possible when the original classification was prepared. Upon completion, the proposed classification is presented to affected landowners and considered at a public hearing before adoption.

As part of the reclassification process, the commissioners also identify lands outside the existing district boundary that receive drainage benefits from the district but are not currently assessed. Where appropriate, these lands may be annexed pursuant to Iowa Code §468.119 so that all benefiting properties share proportionately in the costs of construction, maintenance, and repair. Any proposed annexation is subject to notice and public hearing requirements prescribed by law.

An estimated reclassification map for Branches 1 and 6 is included in Appendix Q for planning and cost estimating purposes only. This exhibit is not a formal classification and should not be interpreted as the final assessment schedule. The reclassification commissioners may modify or replace these preliminary estimates during the statutory reclassification process.

Installment Payment Options

Under Iowa drainage law, landowners who are assessed for substantial repairs and improvements may be eligible to pay their assessment over time. The Board of Trustees may authorize an installment payment plan with interest, allowing landowners to repay the assessment annually over a period of up to 20 years.

To take advantage of this option, a formal waiver request must be submitted. There is no penalty for early repayment, and landowners who wish to avoid interest may pay the full amount up front or consider private financing alternatives.

Economic Benefit

We understand every farm is different, and each landowner's financial situation is unique. This section is meant to provide a starting point, not a guarantee, so you can evaluate whether drainage improvements make sense for your operation. We have reviewed reliable university research and used available tools to estimate the potential benefits, but actual results will depend on your specific field conditions. This section is primarily focused on the economic benefits to the Branches No. 1 and No. 6 tile improvements. Drainage district open ditches are designed to provide a stable and accessible outlet for these tile systems. When ditches become silted in, tile performance and the resulting economic returns are significantly reduced. However, estimating their direct economic benefits is more difficult and more abstract.

Most of the economic benefit from tile drainage comes from increased crop yields and higher land value. According to *Iowa State University Extension's Understanding the Economics of Tile Drainage* (2023), tile drainage can increase corn yields by 10–20 bushels per acre and soybean yields by 4–8 bushels per acre, depending on soil conditions and weather.

Using ISU's Excel-based calculator, we estimate an annual return of roughly 5.4% for corn and 3.7% for soybeans on a \$939/acre drainage investment, assuming \$4.31 corn and \$10.09 soybean commodity prices. This calculator, along with our example, is available in Appendix R, and you can try it yourself at: extension.iastate.edu/agdm/wholefarm/xls/c2-90tilinganalysis.xlsx. We have included a table summarizing the estimated returns below:

Drainage District No. 6 Branches No. 1 & No. 6 Economic Analysis (Iowa State University Calculator)		
Avg. Assessment Per Acre	Avg. Increased Revenue per Year	Estimated Annual Rate of Return
\$939	\$41	4.4%

The publication also notes important secondary benefits such as earlier planting and harvesting windows, reduced compaction, and more timely field operations. These factors can improve efficiency and reduce risk, especially in wetter growing seasons.

We also reviewed a 1983 ISU study (Drainage Needs and Returns in North-Central Iowa). It found that poorly drained soils, like those covering about 57% of District No. 6, can lose up to 32% of their yield potential without proper drainage. Installing tile in these areas often showed strong economic returns, with benefit-cost ratios greater than 1. However, returns were lower in somewhat poorly drained soils, so prioritizing the worst-drained areas offers the best value. We included the estimated yield table below. Please note corn and soybeans yields were much lower in the 1980's than they are today.

Soil Drainage Class	Poor Drainage (1/4" Drainage Coefficient or Less)		High Drainage (1/2" Drainage Coefficient)		Percent Increase	
	Corn Yield (bu/acre)	Soybeans Yield (bu/acre)	Corn Yield (bu/acre)	Soybeans Yield (bu/acre)	Corn Yield	Soybeans Yield
Very Poorly Drained	28	12	123	48	339%	300%
Poorly Drained	80	31	121	47	51%	52%
Somewhat Poorly Drained	90	34	124	48	38%	41%

The Iowa State 1983 study also points out that many existing drainage system tile mains in the region, installed between 1900 and 1915, are outdated and inadequate by modern standards. They are often the bottleneck of the drainage system as they estimated 69% of private on-farm drainage is adequate.

To estimate the potential crop yield benefits of the proposed drainage improvement, a hydrologic analysis was performed using the Drain Tool developed by Michigan State University (<https://dsiweb.cse.msu.edu/DrainToolApp/>). This tool runs DRAINMOD simulations over a 30-year climate record (1995–2024), calculating crop yield impacts from three stress factors, planting delay, excess soil water stress, and drought stress, each expressed as a percentage of maximum potential yield. The existing condition was modeled at a drainage coefficient of 0.28 inches per day, representing the current district tile capacity, and compared against a design coefficient of 0.5 inches per day. Using potential yields of 250 bushels per acre for corn and 70 bushels per acre for soybean, the model estimates an average yield increase of 18.8 bushels per acre for corn and 3.2 bushels per acre for soybeans. The year-by-year results, included as a chart in Appendix S, show that gains are concentrated in wet years when excess soil water is the dominant stress.

Drainage District No. 6 Branches No. 1 & No. 6 Economic Analysis (Michigan State University Calculator)		
Avg. Assessment Per Acre	Avg. Increased Revenue per Year	Estimated Annual Rate of Return
\$939	\$57	6.1%

A 2026 Iowa State University study looked at five drainage districts in north-central Iowa that recently upgraded their main outlets to modern standards. Using satellite images taken after major rainstorms, the researchers compared improved districts to nearby unimproved ones. Pondered acres dropped by an average of 87% after the upgrades, and the projects paid for themselves in about 18 years on average based on reduced ponding alone, before accounting for the broader district-wide yield gains the researchers also documented (up to 10% for corn and 12% for soybeans).

We used the same satellite method to look at DD 6 Branches No. 1 & No. 6 on five dates between 2018 and 2025, each one captured 1 to 4 days after a major rain event of at least 4 inches in the previous 10 days. Three dates showed approximately 2 acres of ponding, and two dates showed no detectable ponding. Compared to the Iowa State study, these numbers put DD 6 in the range of districts that have already been improved, rather than the unimproved districts.

An MNDWI (Modified Normalized Difference Water Index) map (Appendix T) illustrates the analysis for one of the dates analyzed. Areas with higher MNDWI values, even those still below the ponding threshold, indicate wetter surface conditions, including saturated soils and stressed crop canopies where wet ground shows through thin or struggling stands. These are the acres where outlet capacity improvements are most likely to drive yield gains. The Iowa State researchers stressed that most of the yield benefit from improvements comes from these less-visible effects spread across the entire district, not just from eliminating the few obvious ponded spots.

Long-term research from Ohio State University (1984–2009) showed the value of tile drainage. Corn yields rose by 24–39% and soybeans by 12–45% on tiled fields. Benefit-cost ratios ranged from 1.7:1 to 3.1:1, with newer models suggesting returns as high as 3:1 to 4:1. This means \$3–\$4 in value for every \$1 spent on tile.

While results will vary depending on your soil, crops, and management, research from Iowa State and Ohio State shows that modern tile drainage can significantly boost yields and improve long-term farm value, especially in poorly drained soils like those across DD 6. We have included “Twenty Benefits of Drainage” prepared by the Ohio State Extension highlighting yield and non-yield benefits of drainage in Appendix U.

Taxes

While the district is not authorized to provide tax advice, landowners are encouraged to consult with their accountant or tax advisor to determine whether drainage assessments or related improvements may be deductible or eligible for depreciation under current tax laws.

Permitting

US Army Corps of Engineers (USACE)

Because we are proposing improvements to the ditch and changing the grade, a permit was requested from the USACE. In an effort to avoid costly delays, we applied for the necessary permit prior to filing this report and received confirmation no permit was required.

Iowa Department of Natural Resources (DNR)

All work on the creek and outlet, including bank stabilization, must follow Iowa DNR floodplain regulations. The DNR Floodplain permit application was submitted in advance to avoid delays and we received confirmation no permit was required.

USDA Wetland Conservation Compliance (Swampbuster)

As part of federal conservation compliance requirements under the Food Security Act of 1985, any landowner participating in USDA programs including crop insurance, commodity payments, or CRP must obtain a valid Certified Wetland Determination from the Natural Resources Conservation Service (NRCS) before undertaking drainage improvements that may affect wetland areas. These determinations identify areas that meet federal criteria for wetland protection based on hydric soils, vegetation, and hydrology.

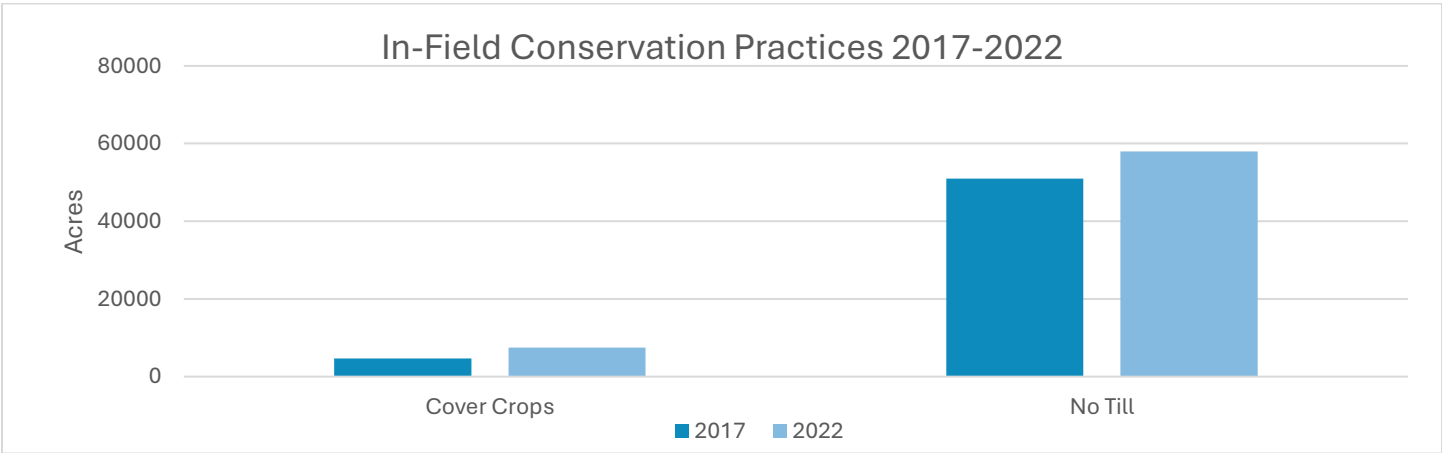
Water Quality Recommendations

Conservation Practices

Farmers in Dallas County have made steady progress in adopting conservation practices that protect soil health and improve water quality. While most conservation measures aim to reduce in-field erosion, they also provide well-documented benefits to downstream water systems.

As of the 2024 Census of Agriculture, about 10,000 acres, roughly 3% of the county’s farmland, is enrolled in the Conservation Reserve Program (CRP). These areas are planted with perennial vegetation to reduce erosion, slow runoff, and filter nutrients before they reach nearby waterways. Many include riparian buffers, filter strips, or wetland restorations, which help protect drainage outlets and reduce the movement of sediment and nutrients downstream.

Between 2017 and 2022, no-till acres increased from 51,000 to 58,000, while cover crop use grew from 4,700 to 7,500 acres. These practices improve water infiltration, limit erosion, and help retain nutrients in the soil, particularly during snowmelt and heavy rains.



Iowa Nutrient Reduction Strategy

Iowa's Nutrient Reduction Strategy (NRS) aims to reduce nitrogen and phosphorus runoff from farmland using a combination of in-field practices (cover crops, nutrient management, reduced tillage) and edge-of-field practices (wetlands, bioreactors, controlled drainage).

Effectively designed drainage works with the NRS by moving water efficiently while allowing nutrient-reducing practices to function effectively. For example, drainage paired with controlled outlets or bioreactors can capture and treat nutrients before they leave the field. Appendix V includes a table of potential practices that can be used, showing options to meet nutrient reduction goals while maintaining productivity and soil health. If any landowner is interested, we can provide a copy of the spreadsheet for use on their farm.

Edge-of-Field Practices

- **Buffer Strips**

Grass buffer strips along streambanks and ditches are one of the most effective ways to intercept runoff. These vegetated zones filter sediment, absorb nutrients like nitrogen and phosphorus, and reduce pesticide transport. They also stabilize stream banks, minimize erosion, and provide habitat for pollinators and wildlife.

- **Grassed Waterways**

For fields with concentrated flow paths, grassed waterways help prevent gully formation and safely carry runoff away from cropland. Their dense vegetation reduces water velocity, limits soil loss, and improves downstream water quality. University of Illinois research (2018) showed that grassed waterways decreased gully erosion by up to 75%.

- **Constructed Wetlands**

Constructed wetlands are engineered systems designed to intercept surface or subsurface drainage before it enters ditches or streams. By slowing water flow, they promote the natural removal of nitrates through microbial activity in the soil. In addition to improving downstream water quality, these systems provide valuable habitat for aquatic life, waterfowl, and other wildlife.

- **Saturated Buffers and Bioreactors**

Saturated buffers and woodchip bioreactors are designed to treat water from subsurface tile outlets before it reaches open water. Saturated buffers route tile water through vegetated riparian areas where soil microbes and plants naturally reduce nitrate levels. Bioreactors use buried woodchips to create an anaerobic zone that encourages denitrification.

Research from Iowa State University (2016–2020) found that saturated buffers reduced nitrate concentrations in drainage water by 40–80%, while bioreactors achieved 20–40% nitrate reduction. Both options are effective tools for addressing nitrogen loss from tile-drained fields.

In-Field Practices

- **Cover Crops**

Cover crops, such as cereal rye, clover, or radish, are planted after harvest to protect the soil during the off-season. Their root systems reduce erosion, improve soil structure, promote microbial activity, and capture residual nutrients, particularly nitrogen, before they leach into tile systems.

A 2017–2021 University of Minnesota study found that cover crops reduced nitrate leaching by 30–60% in tile-drained fields and increased soil organic matter by 0.5–1% over five years, supporting both environmental and agronomic benefits.

- **Conservation Tillage or No-Till**

Reducing tillage helps maintain soil structure, increase organic matter, and reduce erosion and runoff. Better soil structure improves water infiltration, and crop residue left on the surface protects the soil during rainfall events.

An Ohio State University study examining conventional tillage, no-till, and strip-till systems found that conservation tillage performed best when paired with subsurface drainage. No-till and strip-till fields retained higher soil structure and moisture balance, reduced erosion, and improved crop trafficability. In drained fields, corn-soybean rotations under no-till produced the highest yield benefit, while continuous corn also showed consistent improvements. The study concluded that subsurface drainage not only improved yields directly but also enhanced the effectiveness of conservation tillage systems by improving field conditions.

- **Precision Nutrient Management**

Precision agriculture tools like soil sampling, yield mapping, and variable rate technology (VRT) allow targeted application of fertilizers and pesticides. This approach reduces the risk of nutrient runoff, improves fertilizer use efficiency, and increases profit margins by applying inputs only where they are needed.

- **Diversified Crop Rotations**

Rotating corn and soybeans with small grains (e.g., oats or wheat) or forage crops can improve soil health, break pest and disease cycles, and reduce nitrogen imbalances. These rotations increase biological diversity in the field and may open fresh marketing opportunities or enhance farm resilience. A 2019 Kansas State University study reported that diversified rotations reduced nitrogen leaching by 20–30% and improved soil health metrics by 15–25%.

- **Split Nitrogen Applications and Stabilizers**

Applying nitrogen in multiple smaller doses throughout the growing season, instead of a single application, reduces the chance of leaching. Using nitrogen stabilizers or inhibitors further minimizes loss by keeping nutrients in forms more available for plant uptake.

Cost-share funding is often available to help implement these practices. The Iowa Agriculture Water Alliance hosts an online tool- <https://costsharecompare.com/> where landowners can search for financial assistance by ZIP code, compare multiple programs, and identify opportunities to stack funding sources for greater return on investment.

Well-maintained drainage systems improve field conditions for conservation by reducing compaction and allowing timely planting, while conservation practices help drainage systems by limiting sediment buildup and nutrient loading. Although the drainage district cannot require conservation measures, we strongly encourage landowners to work with their local NRCS office to explore available options. In-field and edge-of-field practices can reduce erosion, improve water quality, lower input costs, and support long-term soil health. They are backed by research and may qualify for financial assistance through programs like EQIP, CSP, and the Iowa Water Quality Initiative.

Maintenance and Long-Term Management

Warranty Period

It is common for tiles to be missed or for other issues to arise during or shortly after construction. To address this, the drainage district will maintain a one-year warranty with the contractor to cover construction-related errors or unforeseen problems. If a landowner observes an issue during this period, they should contact the county Drainage Admin so the district can investigate and coordinate any necessary repairs.

Work Orders

After the one-year warranty period expires, any repairs must be initiated through a formal work order. A landowner may submit a work order to the county Drainage Admin to request repairs to the district system. Common issues include tile blowouts, collapsed outlets, bank erosion, or obstructions such as beaver dams.

Once a work order is reviewed and approved, a contractor will be assigned to complete the repair. The drainage district will pay the contractor's invoice, and the cost will be shared among landowners based on the existing assessment schedule. This process ensures that maintenance is handled in a timely, fair, and consistent manner.

Landowner Considerations

Public Input

On December 1, 2025, a letter was mailed to landowners adjacent to the ditch, notifying them that a petition for repairs had been filed, notifying them of our survey, and requesting any information relevant to drainage conditions within the district. A public informational meeting followed on February 25, 2026, at the Dallas County Admin Building, where landowners had the opportunity to meet with the engineer, ask questions, and provide input. A copy of the letter for that meeting is included in Appendix W.

Public Hearing on Report

A public hearing will be scheduled to review this engineer's report and the proposed improvements. Per Iowa Code § 468.14, all landowners in the district will be notified by mail, and notice will also be published in a local newspaper. At the hearing, we will present our findings, proposed plans, and cost estimates, and will be available to answer questions and address concerns. Topics such as construction impacts, and crop damages may also be discussed.

The Board of Trustees will conduct the hearing and may continue it to a later date if more discussion or information is needed. No decision can be made until the hearing is held and all landowner input is considered. This report may be amended as needed in response to feedback received during the hearing, ensuring transparency and meaningful participation.

Objections

Landowners with concerns about the proposed project are encouraged to submit written objections before or during the hearing. Written submissions become part of the official record and help guide any revisions to the report.

Landowner Construction Considerations

If the project is approved, construction will proceed through the standard public bidding process. A bid letting will be held to obtain competitive proposals, and the lowest responsible bid will be submitted to the Board of Trustees for consideration and approval. Prior to construction, all affected landowners will be notified of the expected schedule and scope of work. Construction limits will be staked in the field and shown on the plans. Landowner cooperation, including preserving survey stakes and providing necessary access, will be critical to ensuring efficient completion of the project.

Throughout construction, we will coordinate directly with the contractor and act as the primary point of contact for all landowners. To ensure clear and consistent communication, landowners will be asked to direct any questions or concerns to us rather than contacting the contractor directly.

Right-of-Way and Work Limits

Drainage districts have statutory authority to enter private property to construct, maintain, repair, and improve drainage infrastructure, including both open ditches and subsurface tile systems. Landowners must provide reasonable access, and the district is responsible for minimizing disturbance and compensating landowners for damages resulting from construction activities, such as crop loss, soil compaction, or other temporary impacts.

For this improvement, temporary construction limits are shown on the engineering plans and encompass approximately 80.7 acres across 40 parcels. These limits identify the anticipated area required for construction access, excavation, spoil placement, and restoration. Minor field adjustments may occur during construction to accommodate final alignments or site conditions, and the actual area affected will be documented through construction surveys.

Drainage District No. 6 was established on February 18, 1908, and the Main Open Ditch was constructed during 1908–1909. Although no right-of-way width was formally recorded at the time of establishment, the district acquired the necessary land for the original channel and spoil banks through payment of damages to the affected landowners, as documented in the district records. The district has continuously occupied, maintained, and repaired the ditch for more than a century, including major cleanouts in 1921, 1929, 1972, 1989, 1998–2000, and 2015. Recent maintenance contracts have utilized a working right-of-way extending 50 feet beyond the top of each ditch slope, within which construction activities, spoil placement, and maintenance operations have been confined. For purposes of this report, the existing right-of-way associated with the current ditch cross-section is considered established.

The proposed project constitutes an improvement rather than a repair. The enlarged ditch cross-section will extend beyond the limits of the existing channel, resulting in permanent occupation of approximately 1.6 acres of land outside the district's established right-of-way. Accordingly, additional right-of-way must be acquired from adjacent landowners, with damages appraised and paid in accordance with Iowa Code Chapter 468. The estimated acquisition cost is included in the project cost estimate. Upon completion of the project, it is recommended that the district formally establish and record the entire right-of-way, including both the existing and newly acquired portions, pursuant to Iowa Code §468.126(8), thereby providing a permanent record for future maintenance and administration.

Construction Damages

In accordance with Iowa Code § 468.103, landowners are entitled to compensation for damages resulting from construction activities, including crop loss, soil disturbance, and impacts to land use.

The following are recommendations regarding crop damage compensation:

- **Yield and Price Calculation**

For crops damaged during the growing season we recommend using 110% of the five-year average county yield for the affected crop, multiplied by the average price received over the past 12 months. Both the yield data and average price are to be sourced from the Iowa State University Extension and Outreach and USDA-NASS databases.

- **Field Repair Work Compensation**

In addition to crop losses during the growing season, we recommend payment for the following field work at rates consistent with the most recent Iowa State University Custom Rate Survey (per acre):

- One pass of rock pickup

- Two passes of tillage: one deep tillage and one shallow tillage
- **Other Damages**
Landowners may submit claims for any additional damages not accounted for in this recommendation prior to the completion hearing.

Crop damages and other construction-related compensation will be paid by the drainage district and funded through the assessment schedule. As a result, all landowners within the district including those who incur damages will share in the cost of these payments through their proportionate assessments. The Board of Trustees retains the authority to amend, approve, or deny any such claims. Final decisions regarding crop damages will be made at the completion hearing.

Completion Hearing

Upon completion of construction, a Completion Hearing will be held in accordance with Iowa Code § 468.101. This hearing gives landowners the opportunity to review the finished work, raise concerns about field conditions or project compliance, and submit any remaining claims for damages not previously addressed.

At the hearing, the Board of Trustees will consider all landowner input, evaluate whether the work has been completed in substantial compliance with the approved plans and specifications, and determine final compensation for any valid damage claims. The Board also has the authority to amend, approve, or deny claims based on the evidence presented.

All landowners within the district will be notified of the hearing in advance, as required by law, and are encouraged to attend to ensure their concerns are heard and properly documented before the project is closed out.

Conclusion and Recommendations

Conclusion

The Drainage District No. 6 Main Open Ditch has been found in need of improvement. To address this, we have developed a plan to improve these facilities at an estimated total cost of \$926,000. This plan is designed to meet the petition to restore the design functionality of the ditch system.

The Drainage District No. 6 Branches No. 1 and No. 6 tile have been found to be restrictive and undersized, providing only 56% of the recommended drainage capacity. To address this, we have developed a plan to replace and extend the Branch No. 1 and No. 6 Tile to better serve all lands in the district with a ½” drainage coefficient at an estimated total cost of \$760,000. This plan is designed to meet the recommended drainage capacity and offers a long-term solution to improve drainage across the district.

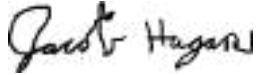
Recommendations

We recommend that the Board accept the filing of this report and schedule a public hearing to formally present the findings and proposed improvements to all affected landowners. The hearing will provide an opportunity for landowners to raise objections, ask questions, and express concerns.

If there are no substantial objections from the landowners at the hearing, we further recommend that the Board proceed with appointing an engineer to prepare detailed plans and specifications for the construction work.

If the Board of Trustees or landowners have any questions or concerns, please contact AgriVia at the phone numbers or emails listed.

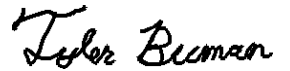
Sincerely,



Jacob Hagan, P.E.

712-250-4318

jacob.agrivia@gmail.com



Tyler Buman, P.E.

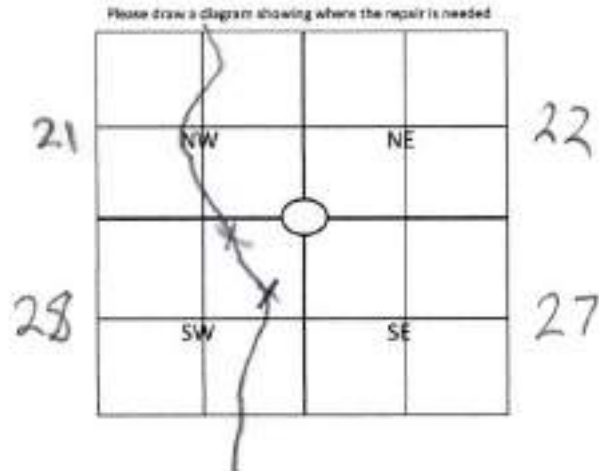
712-579-5296

tyler.agrivia@gmail.com

DALLAS COUNTY REQUEST FOR DRAINAGE REPAIRS

Problem: Ditch Break Spilling off, Piercing the flow of water starting at the bridge (F31) Washington Township going South. This is District 6.

Petitioner's Signature: [Signature] Date: 4-16-23



DD 6 Branch 1 Tile

I, as a landowner on DD 6, would like the Board to order a study on the DD 6 Branch 1 tile located in sections 9 and 16 in Washington township. The lands are subject to over flow and the existing tile is in poor condition.

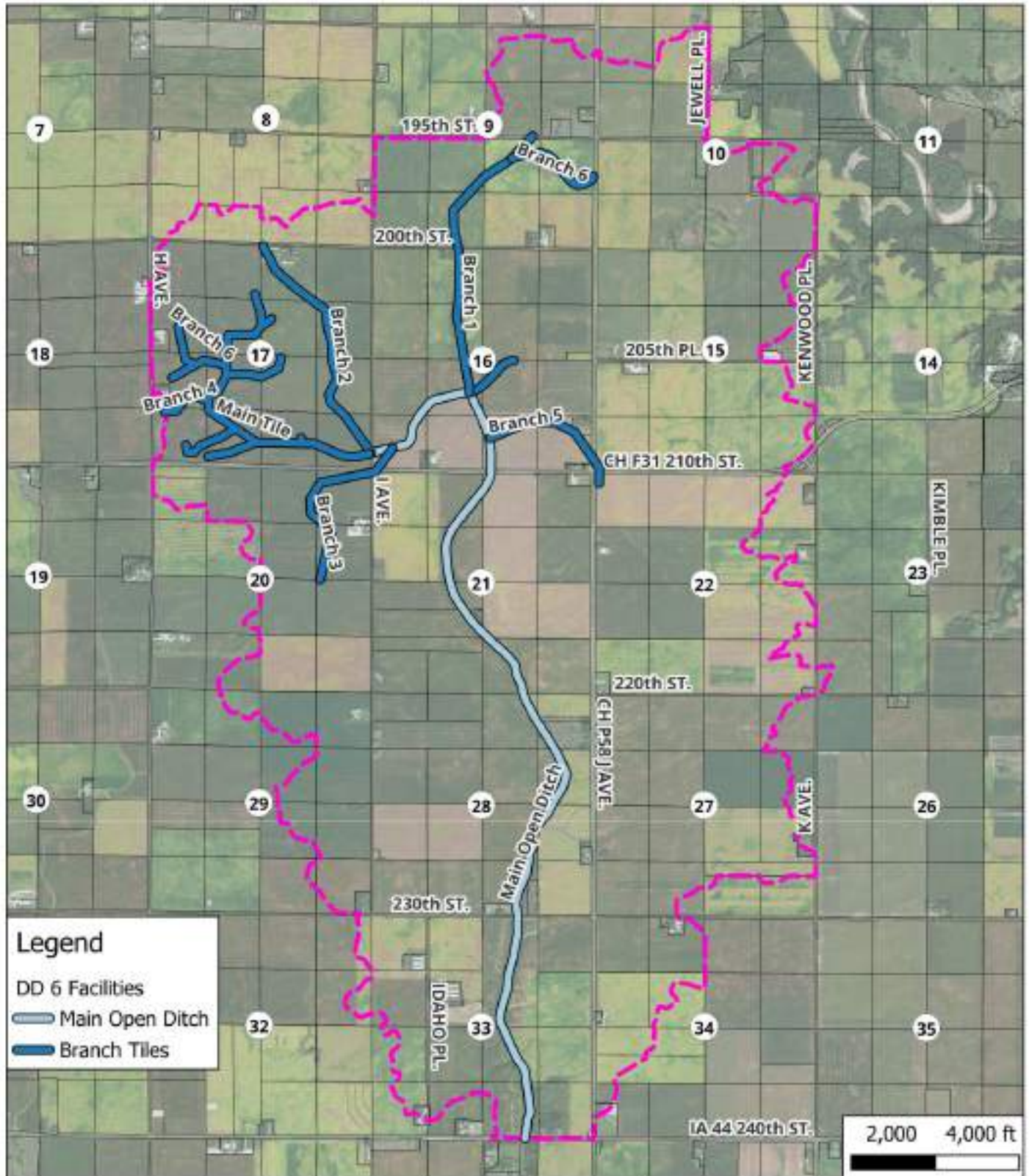
JD Kautzky
Greg Kautzky

Appendix B – Area of Study Map

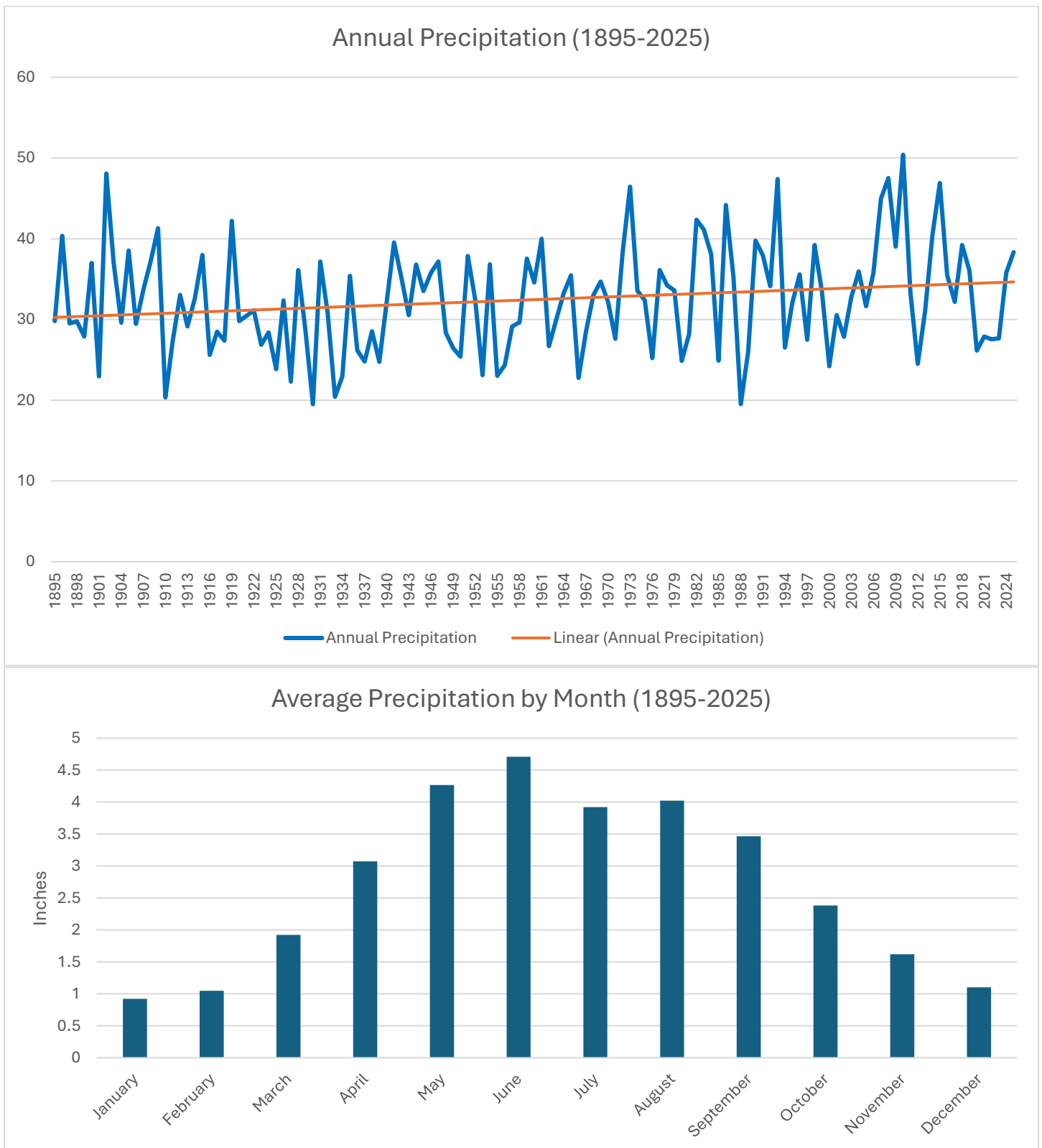


Drainage District No. 6
Dallas County, IA

Area of Study
June 2026



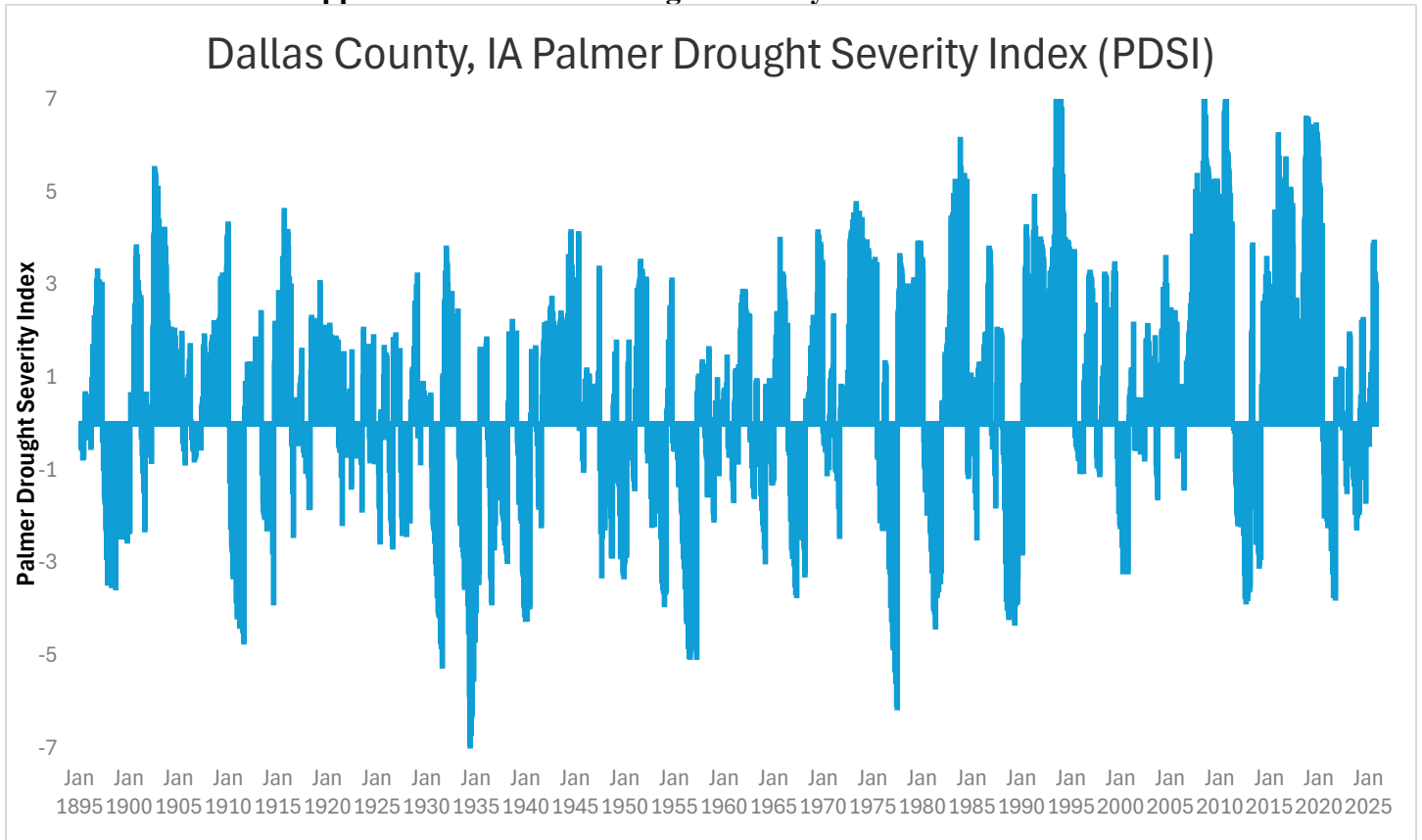
Appendix C – Rainfall Chart: 1895 – Present



Charts created from data provided by:

NOAA National Centers for Environmental Information, *Climate at a Glance: County Time Series*, publish May 2025. Retrieved on January 30, 2026, from <http://www.ncei.noaa.gov/access/monitoring/climate-at-a-glance/county/time-series>

Appendix D – Palmer Drought Severity Index: 1895 – Present

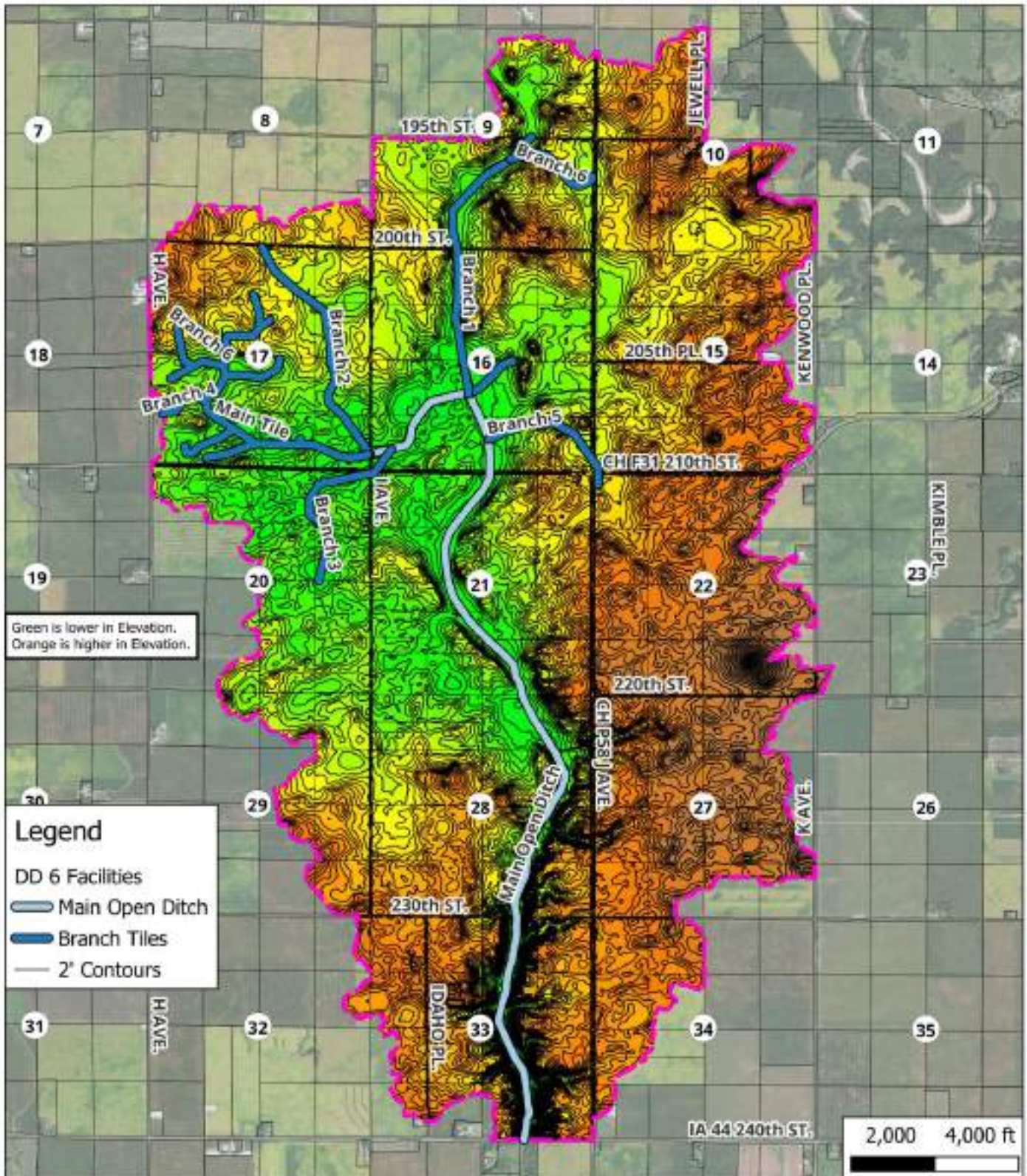


Appendix E – Elevation Map



Drainage District No. 6
Dallas County, IA

Elevation Map
June 2026

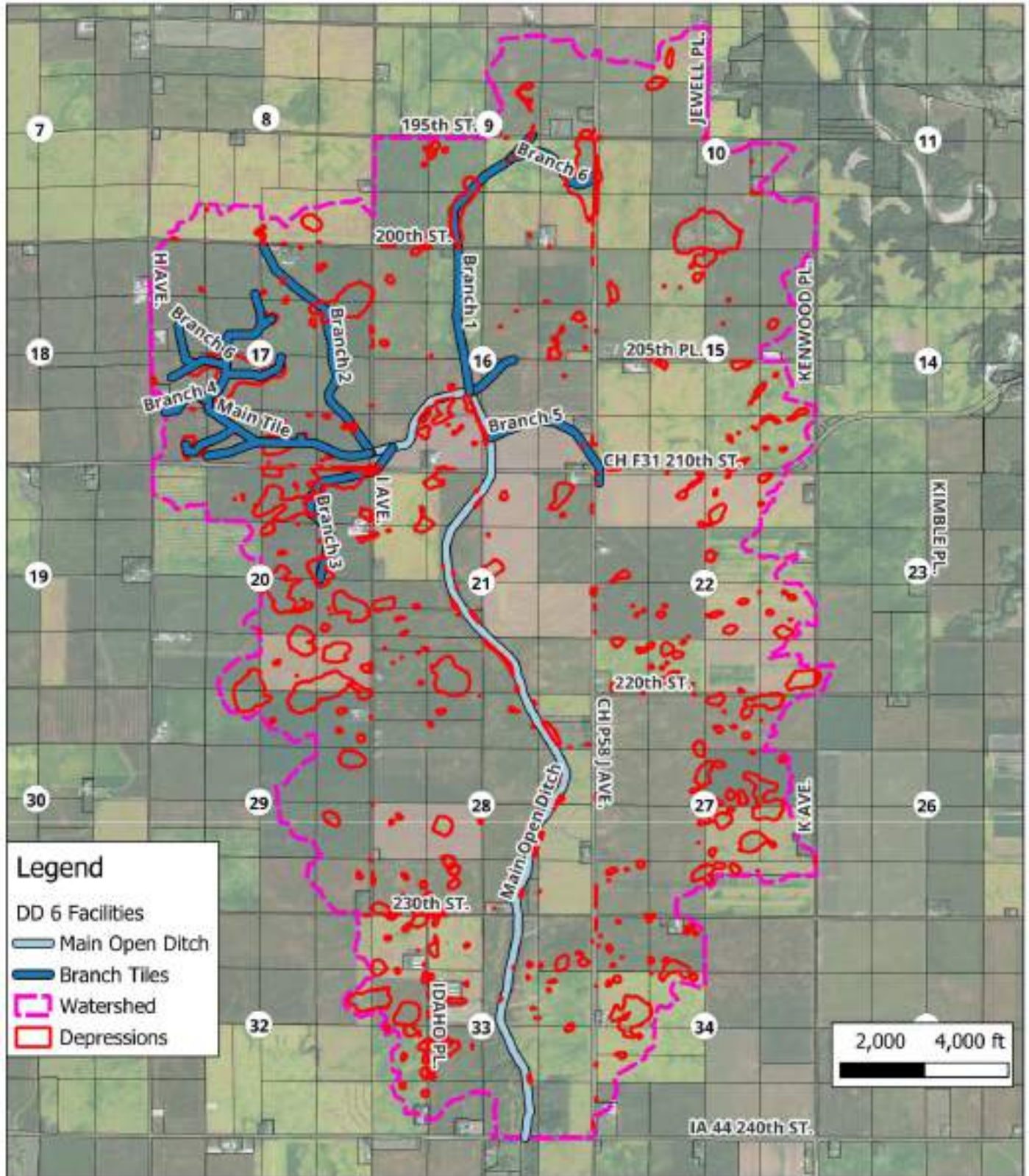


Appendix F – Depressional Areas



Drainage District No. 6
Dallas County, IA

Depressions
(6" min. depth)
June 2026

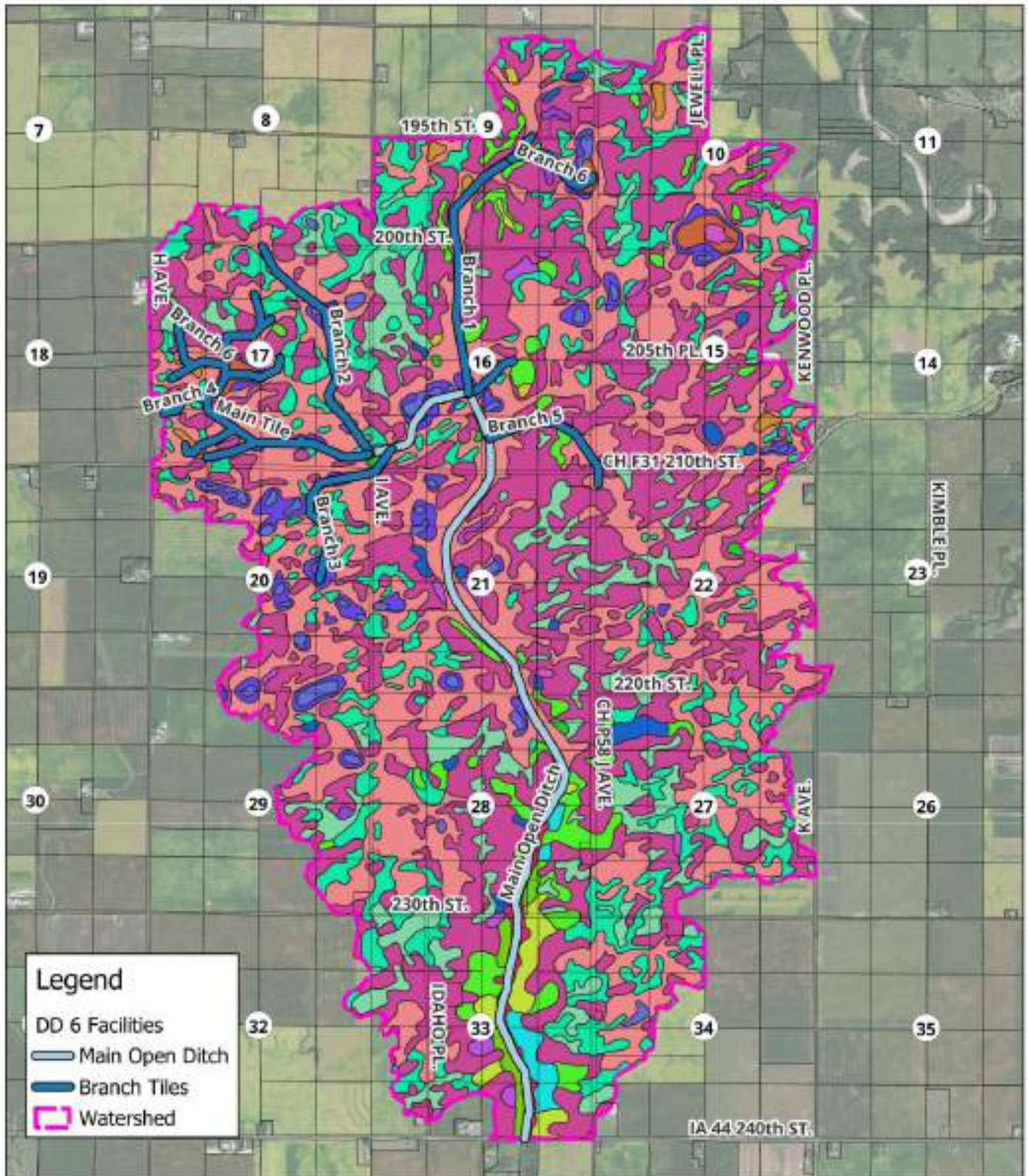


Appendix G – Soil Types



Drainage District No. 6
Dallas County, IA

Soil Types
June 2026

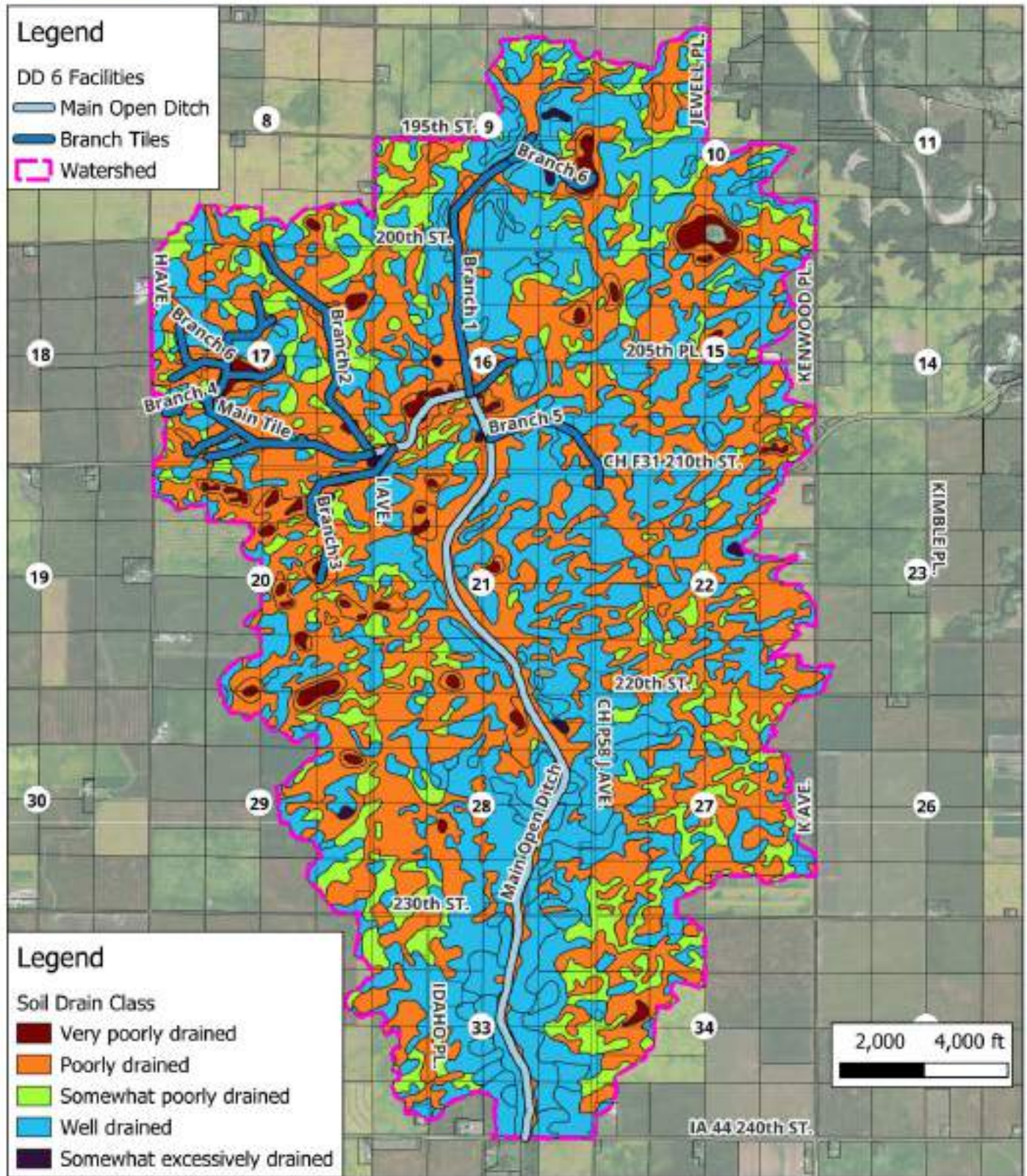




Legend

Soil Types

-  Canisteo clay loam, Bemis moraine, 0 to 2 percent slopes
-  Clarion loam, 9 to 14 percent slopes, moderately eroded
-  Clarion loam, Bemis moraine, 2 to 6 percent slopes
-  Clarion loam, Bemis moraine, 6 to 10 percent slopes
-  Clarion loam, Bemis moraine, 6 to 10 percent slopes, moderately eroded
-  Coland-Terril complex, 2 to 5 percent slopes
-  Harps clay loam, Bemis moraine, 0 to 2 percent slopes
-  Harps-Okoboji complex, Bemis moraine, 0 to 2 percent slopes
-  Nicollet loam, 1 to 3 percent slopes
-  Okoboji mucky silt loam, 0 to 1 percent slopes
-  Okoboji silty clay loam, 0 to 1 percent slopes
-  Storden loam, Bemis moraine, 10 to 16 percent slopes, moderately eroded
-  Storden loam, Bemis moraine, 10 to 22 percent slopes, moderately eroded
-  Storden loam, Bemis moraine, 6 to 10 percent slopes, moderately eroded
-  Water
-  Webster clay loam, Bemis moraine, 0 to 2 percent slopes
-  Zenor sandy loam, 2 to 5 percent slopes
-  Zenor sandy loam, 5 to 9 percent slopes, moderately eroded
-  Zenor-Storden complex, 9 to 14 percent slopes, moderately eroded

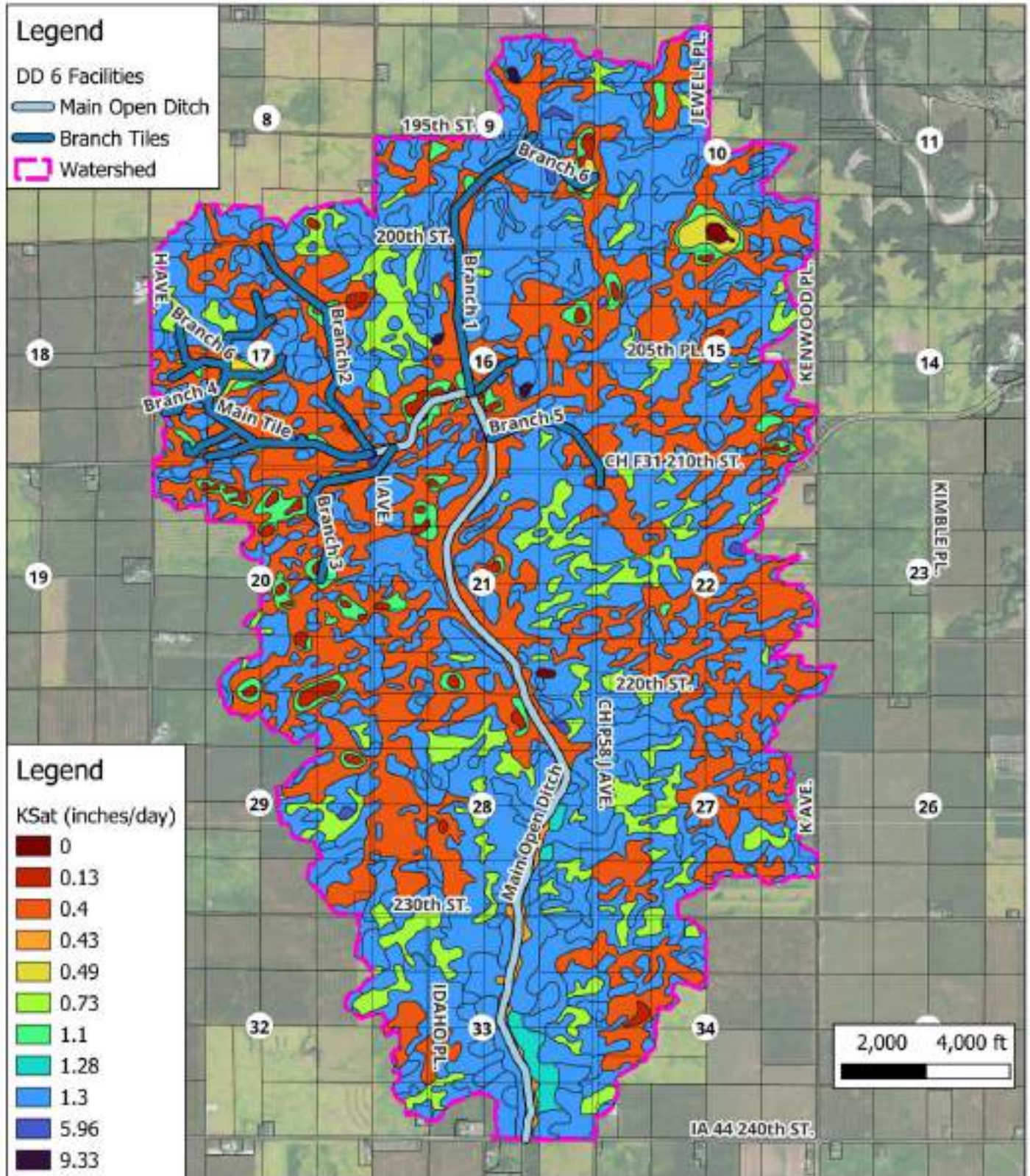


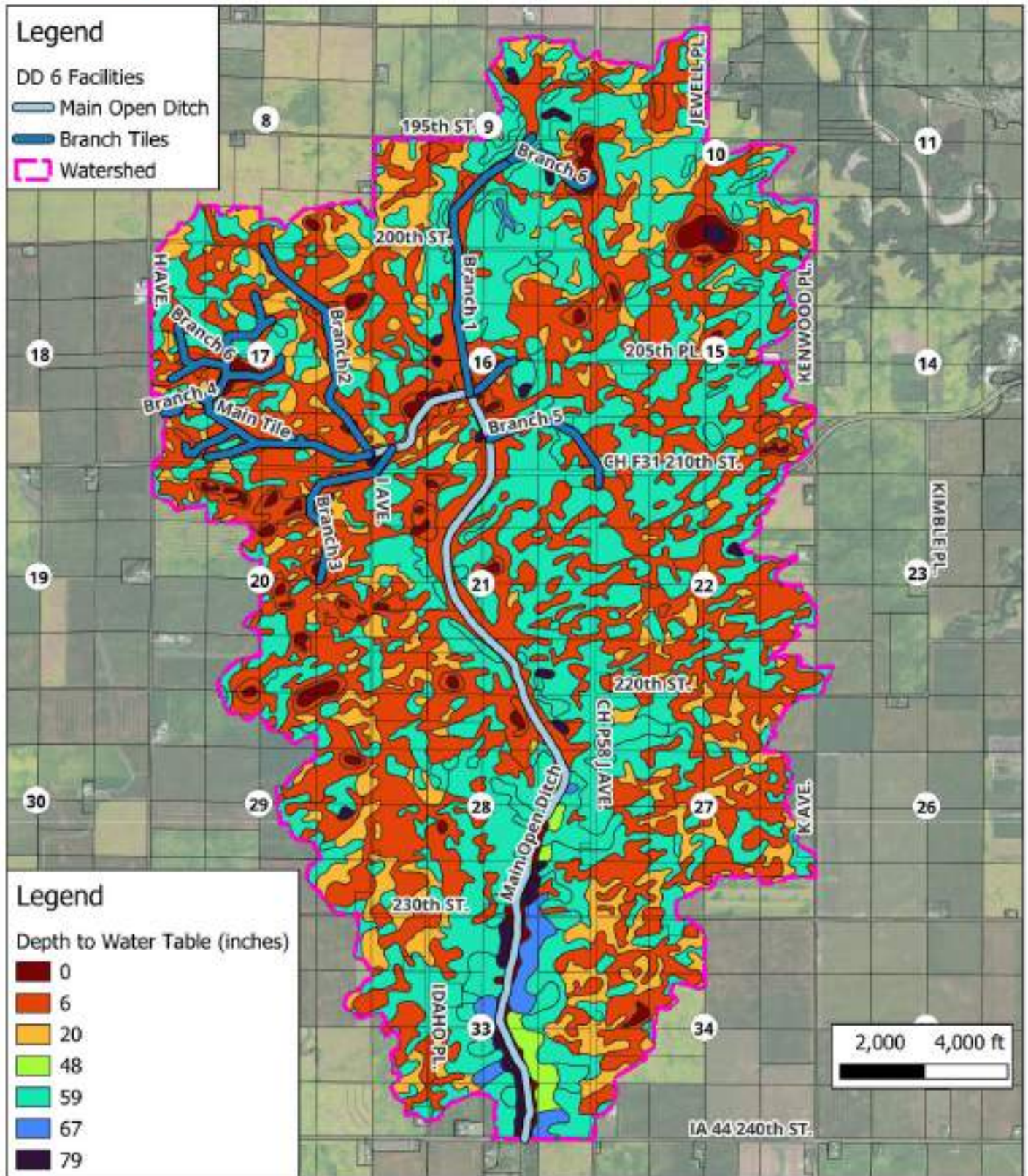
Appendix I – Soil Ksat



Drainage District No. 6
Dallas County, IA

Saturated Hydraulic
Conductivity (Ksat)
June 2026



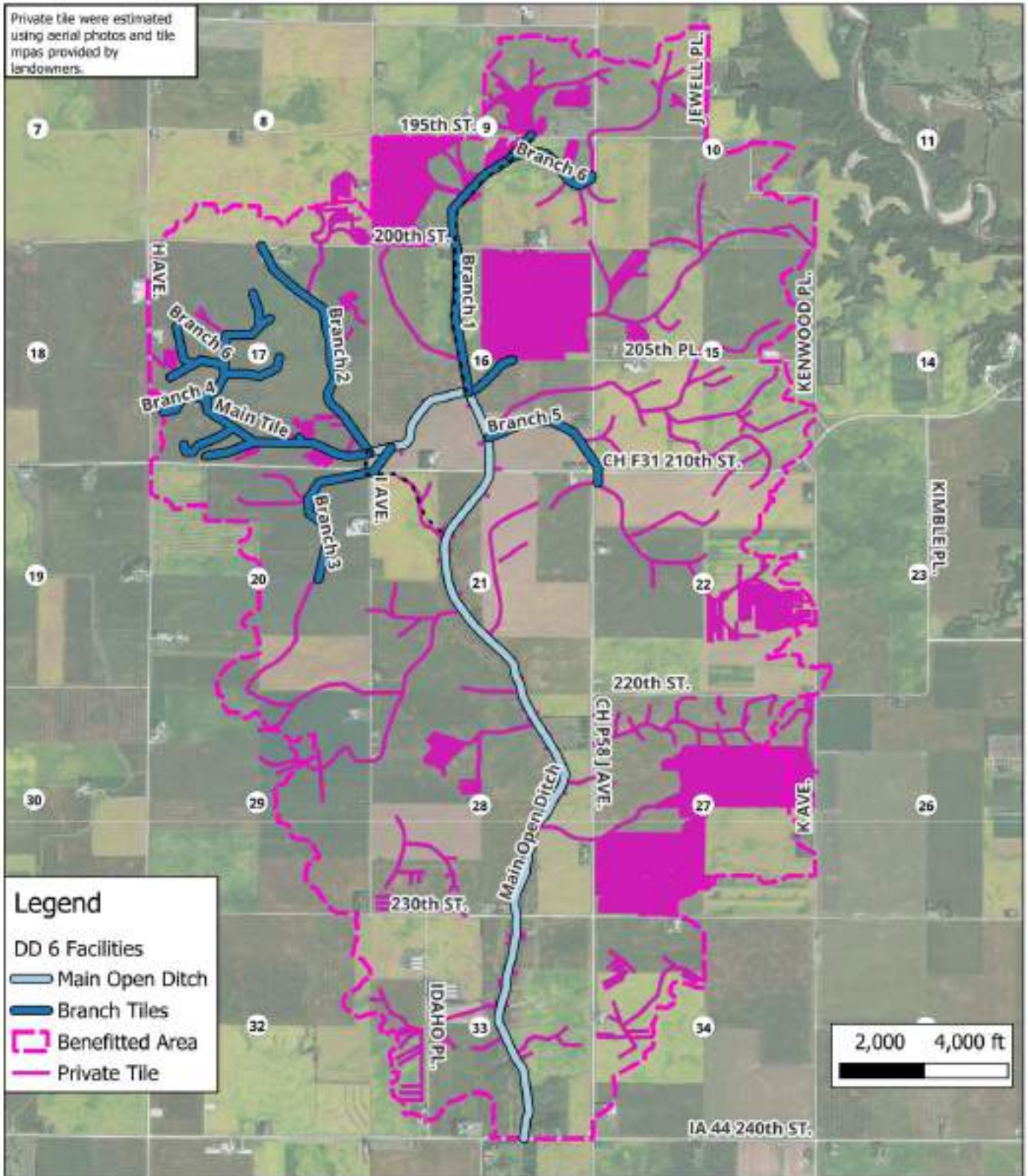


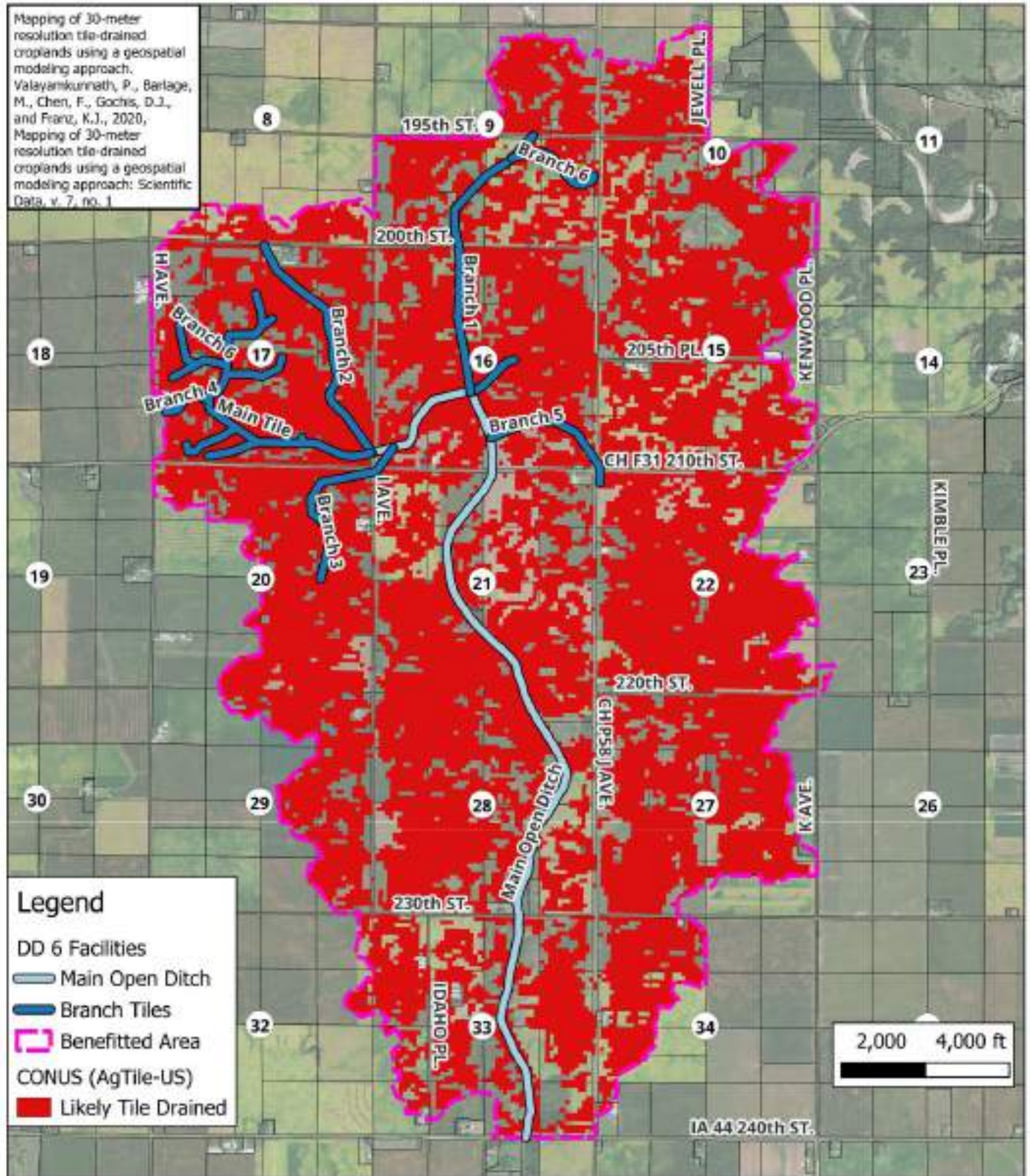
Appendix K – Private Tile



Drainage District No. 6
Dallas County, IA

Private Tile
July 2026





Appendix M – Survey Photos



Open Ditch in Section 16



Open Ditch in Section 28



Open Ditch and Branch No. 1 Bulkhead



Intake on Branch No. 6

Appendix N – Private Farm Crossings



Vented ford crossing downstream of district to be lowered and reconstructed.



Ford crossing to be lowered to match design flowline.

Appendix O – Itemized Cost Estimate

Estimated Costs
Open Ditch Improvements
Drainage District No. 6
Dallas County, IA



Main Open Ditch Construction Cost					
Item No.	Bid Item	Est. Units	Unit	Est. Unit Price	Est. Amount
101	EXCAVATION	88,000	CY	\$3.10	\$ 272,800
102	SPOIL LEVELING (BOTH SIDES)	218	STA	\$176.00	\$ 38,368
103	DAILY SEED & FERTILIZE BANKS	218	STA	\$102.00	\$ 22,236
104	HYDROSEEDING	218	STA	\$300.00	\$ 65,400
105	SPOIL TILLAGE AND ROCK PICK UP	218	STA	\$46.00	\$ 10,028
106	SPOIL TEMPORARY SEEDING	218	STA	\$110.00	\$ 23,980
107	8" TILE OUTLET	580	LF	\$27.00	\$ 15,660
108	12" TILE OUTLET	320	LF	\$33.00	\$ 10,560
109	15" TILE OUTLET	80	LF	\$40.00	\$ 3,200
110	18" TILE OUTLET	140	LF	\$45.00	\$ 6,300
111	24" TILE OUTLET	120	LF	\$58.00	\$ 6,960
112	30" TILE OUTLET	20	LF	\$89.00	\$ 1,780
113	3"- 6" CORRUGATED HDPE PIPE	145	LF	\$8.00	\$ 1,160
114	8"-10" HDPE CORRUGATED PIPE	80	LF	\$16.00	\$ 1,280
115	12" HDPE CORRUGATED PIPE	25	LF	\$19.00	\$ 475
116	18" SURFACE DRAIN PIPE	1640	LF	\$45.00	\$ 73,800
117	24" SURFACE DRAIN PIPE	110	LF	\$58.00	\$ 6,380
118	30" SURFACE DRAIN PIPE	50	LF	\$77.00	\$ 3,850
119	36" SURFACE DRAIN PIPE	50	LF	\$78.00	\$ 3,900
120	48" SURFACE DRAIN PIPE	150	LF	\$79.00	\$ 11,850
121	REMOVE, TURN AND RELAY 48" SURFACE DRAIN PIPE	1	EA	\$2,000.00	\$ 2,000
122	CLEARING AND GRUBBING	1	LS	\$10,000.00	\$ 10,000
123	FENCE REMOVAL	4700	LF	\$2.00	\$ 9,400
124	VENTED FORD CROSSING - REMOVE AND RECONSTRUCT	1	EA	\$5,000.00	\$ 5,000
125	RIPRAP, CLASS E	25	TN	\$77.00	\$ 1,925
126	REMOVE BULKHEAD	2	EA	\$2,000.00	\$ 4,000
127	SEDIMENT BAFFLE	1	LS	\$1,430.00	\$ 1,430
128	24" HDPE DUAL WALL HDPE	20	LF	\$75.00	\$ 1,500
129	24" HDPE DUAL WALL HDPE ELBOW	1	EA	\$1,500.00	\$ 1,500
130	MOBILIZATION	1	LS	\$32,000.00	\$ 32,000
5% Construction Contingency					\$ 32,000
10% Extra Pipe Contingency					\$ 15,000
Subtotal Construction Cost					\$ 696,000.00

Estimated Costs - Page 1

Estimated Costs
Open Ditch Improvements
Drainage District No. 6
Dallas County, IA



Dallas County Secondary Roads Construction Cost					
Item No.	Bid Item	Est. Units	Unit	Est. Unit Price	Est. Amount
201	42" CMP PIPE	80	LF	\$100.00	\$ 8,000
202	CLASS A ROADSTONE	20	TN	\$35.00	\$ 700
203	TRAFFIC CONTROL	1	EA	\$500.00	\$ 500
204	MOBILIZATION	1	LS	\$500.00	\$ 500
5% Construction Contingency					\$ 500
Subtotal Construction Cost					\$ 10,000.00

Iowa DOT Construction Cost					
Item No.	Bid Item	Est. Units	Unit	Est. Unit Price	Est. Amount
301	54" STEEL CASING PIPE, JACK AND BORED	75	LF	\$1,500.00	\$ 112,500
302	54" DIA CL III RCP	52	LF	\$160.00	\$ 8,320
303	54" DIA CL III RCP ELBOW	2	EA	\$1,800.00	\$ 3,600
304	54" DIA CL III RCP APRON	2	EA	\$2,000.00	\$ 4,000
305	CLASS A ROADSTONE	100	TN	\$35.00	\$ 3,500
306	RIPRAP, CLASS E	50	TN	\$77.00	\$ 3,850
307	TRAFFIC CONTROL	1	EA	\$500.00	\$ 500
308	MOBILIZATION	1	LS	\$7,000.00	\$ 7,000
5% Construction Contingency					\$ 7,000
Subtotal Construction Cost					\$ 150,000.00

Additional Non-Construction Project Costs	
Expense	Est. Amount
Survey, Permitting, Engineer's Report, and Preliminary Plans	\$ 40,000
Specifications and Construction Engineering	\$ 35,000
Legal and Administrative	\$ 5,000
Construction Damages and Right-of-Way	\$ 70,000
Interest	\$ 80,000
Subtotal Non-Construction Cost	\$ 230,000.00

Total Project Costs	
Expense	Est. Amount
Main Open Ditch Improvement Construction	\$ 696,000
Dallas County Secondary Roads Construction Cost	\$ 10,000
Iowa DOT Construction Cost	\$ 150,000
Additional Non-Construction Project Costs	\$ 230,000
Total Open Ditch Improvements Cost to Drainage District No. 6	\$ 926,000
Average Cost per Acre Benefitted (6,562 Acres)	\$ 141

Estimated Costs
 Br. 1 & Br. 6 Tile Improvements
 Drainage District No. 6
 Dallas County, IA



Branch No. 1 & Branch No. 6 Construction Cost					
Item No.	Bid Item	Est. Units	Unit	Est. Unit Price	Est. Amount
401	30" DIA CL III RCP	4,834	LF	\$73.00	\$ 352,882
402	24" DIA CL III RCP	1700	LF	\$56.00	\$ 95,200
403	18" DIA CL III RCP	1645	LF	\$42.00	\$ 69,090
404	18" DIA CL III RCP (R-2 BEDDING)	150	LF	\$63.00	\$ 9,450
404	15" HDPE PIPE, DUAL WALL	249	LF	\$35.00	\$ 8,715
405	12" HDPE PIPE, DUAL WALL	360	LF	\$35.00	\$ 12,600
406	4" - 10" HDPE PIPE, SINGLE WALL	105	LF	\$10.00	\$ 1,050
407	REDUCER, RCP, 30" TO 24"	1	EA	\$1,560.00	\$ 1,560
408	REDUCER, RCP, 24" TO 15"	1	EA	\$1,510.00	\$ 1,510
409	WYE, RCP, 18" ON 24"	1	EA	\$970.00	\$ 970
410	INTAKE, 12" HD BAR GUARD	2	EA	\$680.00	\$ 1,360
411	TILE CONNECTIONS, 10" AND SMALLER	21	EA	\$490.00	\$ 10,290
412	TILE CONNECTIONS, 12" AND LARGER	10	EA	\$630.00	\$ 6,300
413	EXCAVATION, EXPLORATORY	8	HR	\$270.00	\$ 2,160
414	TRENCH BEDDING STONE	90	TN	\$35.00	\$ 3,150
416	TILE WORK AREA COVER CROP SEEDING	22	AC	\$54.00	\$ 1,188
417	MOBILIZATION	1	LS	\$30,000.00	\$ 30,000
5% Construction Contingency					\$ 30,000
Subtotal Construction Cost					\$ 637,000.00

Dallas County Secondary Roads Construction Cost					
Item No.	Bid Item	Est. Units	Unit	Est. Unit Price	Est. Amount
501	30" DIA CL III RCP (R-2 BEDDING)	66	LF	\$93.00	\$ 6,138
502	15" DIA CL III RCP (R-2 BEDDING)	66	LF	\$65.00	\$ 4,290
503	CLASS A ROADSTONE	40	TN	\$35.00	\$ 1,400
504	INTAKE, 12" HD BAR GUARD	4	EA	\$680.00	\$ 2,720
505	TRAFFIC CONTROL	2	EA	\$500.00	\$ 1,000
506	MOBILIZATION	1	LS	\$1,000.00	\$ 1,000
5% Construction Contingency					\$ 1,000
Subtotal Construction Cost					\$ 18,000.00

Additional Non-Construction Project Costs	
Expense	Est. Amount
Survey, Permitting, Engineer's Report, and Preliminary Plans	\$ 15,000
Specifications and Construction Engineering	\$ 20,000
Legal and Administrative	\$ 2,000
Construction Damages	\$ 24,000
Interest	\$ 62,000
Subtotal Non-Construction Cost	\$ 123,000.00

Estimated Costs
 Br. 1 & Br. 6 Tile Improvements
 Drainage District No. 6
 Dallas County, IA



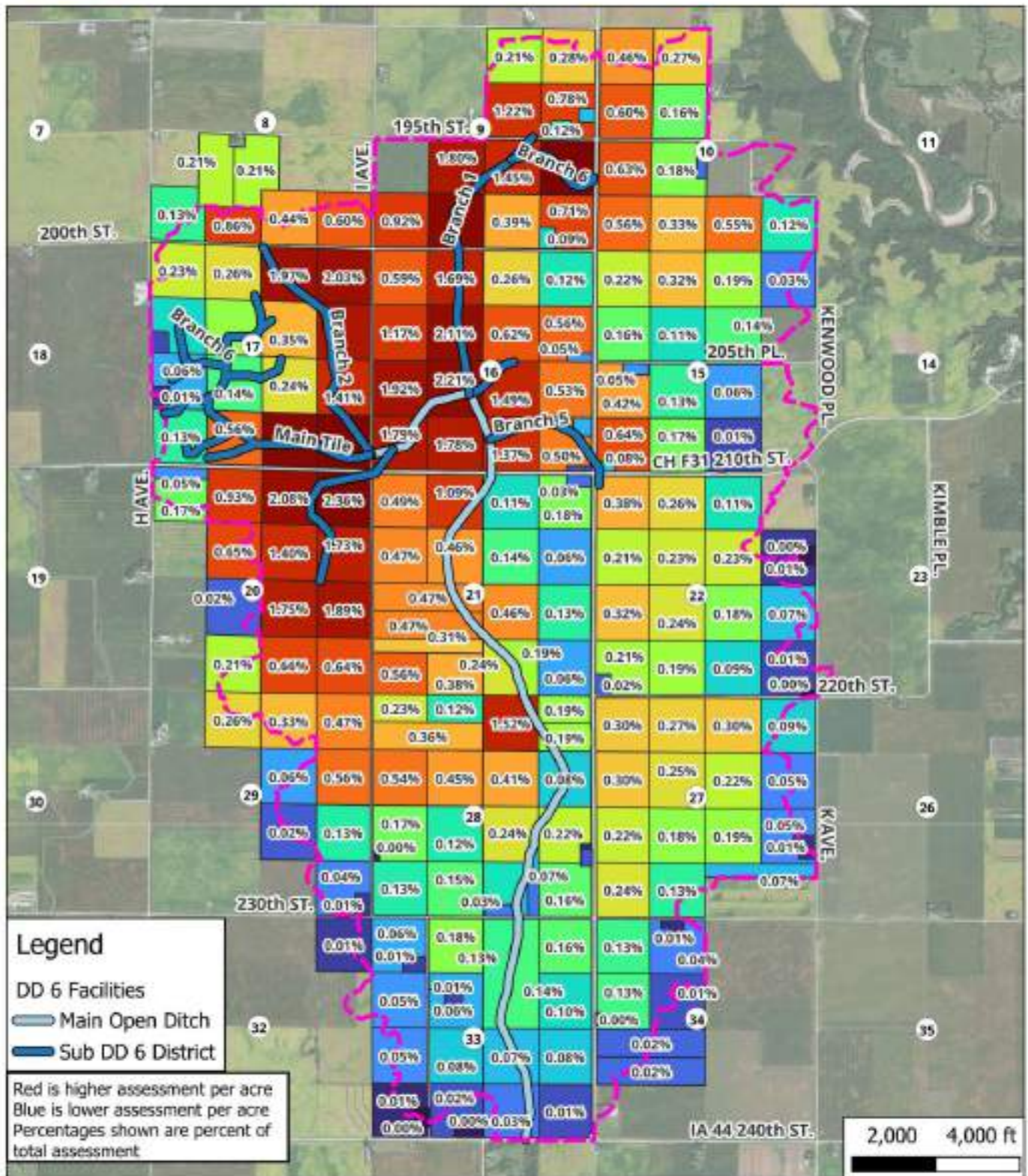
Total Project Costs	
Expense	Est. Amount
Branch No. 1 & No. 6 Improvement Construction	\$ 637,000
Dallas County Secondary Roads	\$ 18,000
Additional Non-Construction Project Costs	\$ 123,000
Total Tile Improvements Cost to Drainage District No. 6	\$ 760,000
Average Cost per Acre Benefitted (809 Acres)	\$ 939

Appendix P – Current Assessment Schedule Map



Drainage District No. 6
Dallas County, IA

Current Assessment
Schedule
July 2026

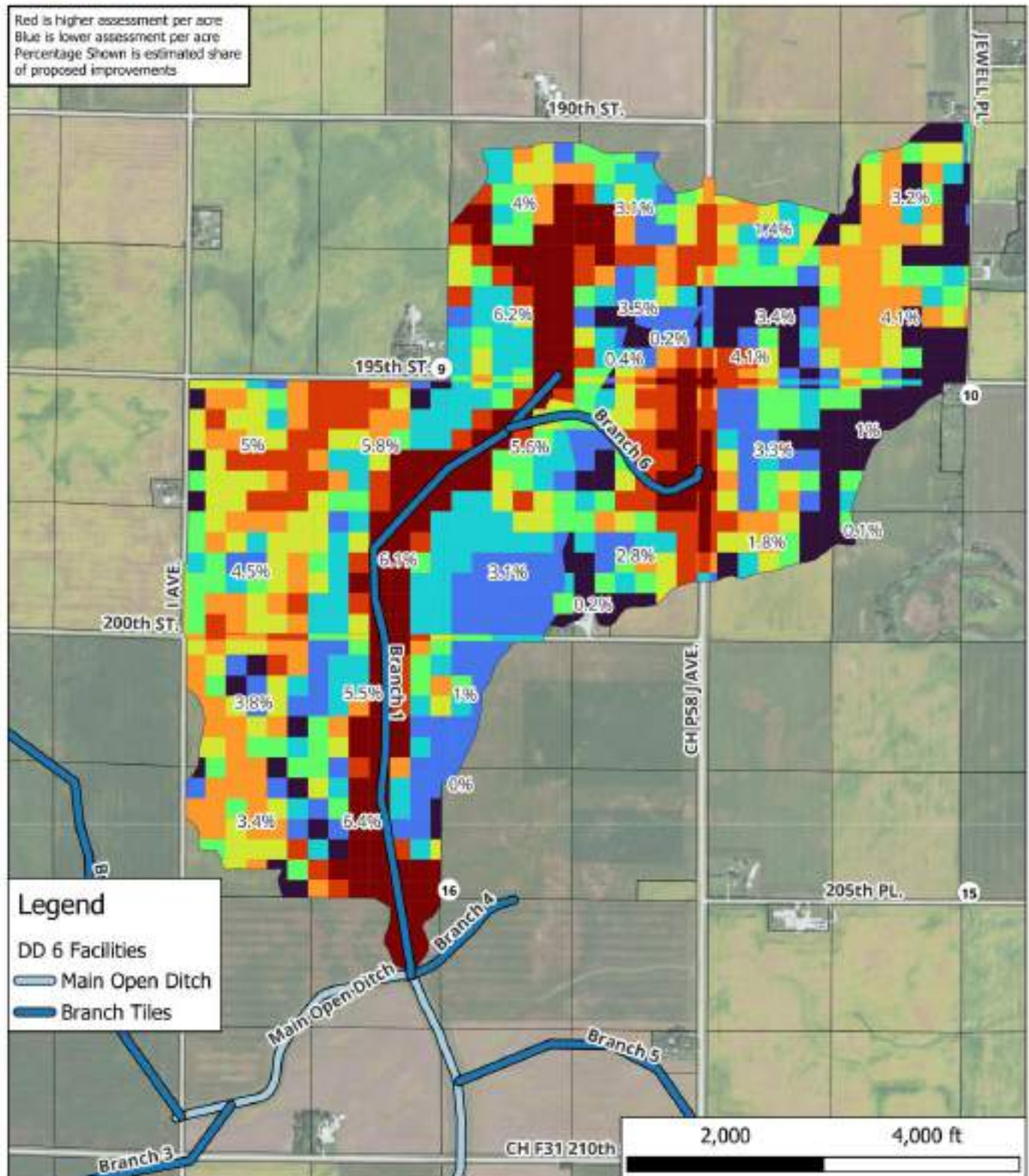


Appendix Q – Branch Nos. 1 and 6 Pre-Classification Assessment Schedule Map



Drainage District No. 6
Br. 1 & Br. 6 Pre-Classification
Dallas County, IA

July 2026



Appendix R – Iowa State Branch No. 1 Tiling Economics

Iowa State University Extension and Outreach

Ag Decision Maker File C2-90

Farmland Tile Drainage Investment Analysis

Ag Decision Maker – Iowa State University Extension and Outreach

Find out more on tiling in Information File C2-90, Understanding the Economics of Tile Drainage.

ISU Extension Spreadsheet modified by AgriVia for Drainage District Improvements.

Drainage District Information

District name	Drainage District No. 6 Br 1 & Br. 6 Tile
Field location (general location or legal description)	Dallas County, IA
District Size (acres to analyze for tile drainage)	805

Field Drainage Needs

Number of Acres by Drainage Needs	Very poorly drained	15
	Poorly drained	256
	Somewhat poorly drained	533
	Moderately well drained	0
	Well drained	403
	Total	805

Estimated Yield Response (enter impacts of tiling for both tiled and non-tiled acres)

	Very Poorly Drained	Poorly Drained	Somewhat Poorly Drained	Moderately Well Drained	Well Drained
Corn (bushels per acre)					
Pre-drainage yield (current expected yield in each category)	126.0	138.0	150.0	158.0	180.0
Post-drainage yield (expected yield after tile drainage installed)	180.0	180.0	180.0	180.0	180.0
Estimated corn yield improvement	54.0	42.0	30.0	12.0	0.0
Soybeans (bushels per acre)					
Pre-drainage yield (current expected yield in each category)	32.0	38.0	42.0	45.0	50.0
Post-drainage yield (expected yield after tile drainage installed)	50.0	50.0	50.0	50.0	50.0
Estimated soybean yield improvement	18.0	12.0	8.0	5.0	0.0

Estimated Additional Costs and Returns per Acre by Crop due to Added Tile Drainage

Enter the additional production costs expected from tiling the land and the expected value of the additional production.

	Corn (per acre)	Soybeans (per acre)	Average (per acre)
Added Cash Income			
Expected field crop rotation on acres being analyzed	48%	48%	
Acres planted to crop based on acres being analyzed and crop rotation	386.4	386.4	
Estimated yield increase (from above section)	19.2	5.4	
Long-term expected sale price	\$4.31	\$10.09	
Additional Cash Income due to Tile Drainage	\$82.69	\$54.77	
Added Cash Production Costs			
Seed	\$7.00	\$5.00	
Fertilizer	\$15.00	\$10.00	
Pesticides	\$0.00	\$0.00	
Hauling, drying, and handling	\$10.00	\$5.00	
Added Cash Costs due to Tile Drainage	\$32.00	\$20.00	
Net Cash Income or Loss	\$50.69	\$34.77	\$41.02

Total Cost of Tile Drainage District Investment

Total	\$ 756,000
Per Tiled Acre (805 acres)	\$ 939

Return on Investment in Tile Drainage (cash return divided by investment) (before income tax)

The added net cash return divided by the investment in the drainage. For owner-operators, the net return is the additional crop net return from tile drainage.

Annual Rate of Return on Tile Investment

Based on Additional Crop Income
Assuming Cash Financed
No Tax Advantages Assumed

Corn	Soybeans	Average
5.4%	3.7%	4.6%

Version 3.0, 4/2023

Kerlin Leibold, Extension farm management specialist

Don Hofstrand, retired agricultural business specialist

Email agdm@iastate.edu for questions regarding this Decision Tool

Date Printed:

7/8/2026

This institution is an equal opportunity provider. For the full non-discrimination statement or accommodation inquiries, go to www.extension.iastate.edu/diversity/ed.

Note: Tile drainage may result in increased land values when sold and is not factored in the results of this Decision Tool.

<https://www.extension.iastate.edu/agdm/wholefarm/tile/c2-90/tilinganalysis.xlsx>

IOWA STATE UNIVERSITY
Extension and Outreach

Appendix S – Michigan State Branch No. 1 Tiling Economics

Michigan State Drain Tool Estimated Yield Increase

Tile Improvements

Drainage District No. 6 Branch Nos. 1 & 6

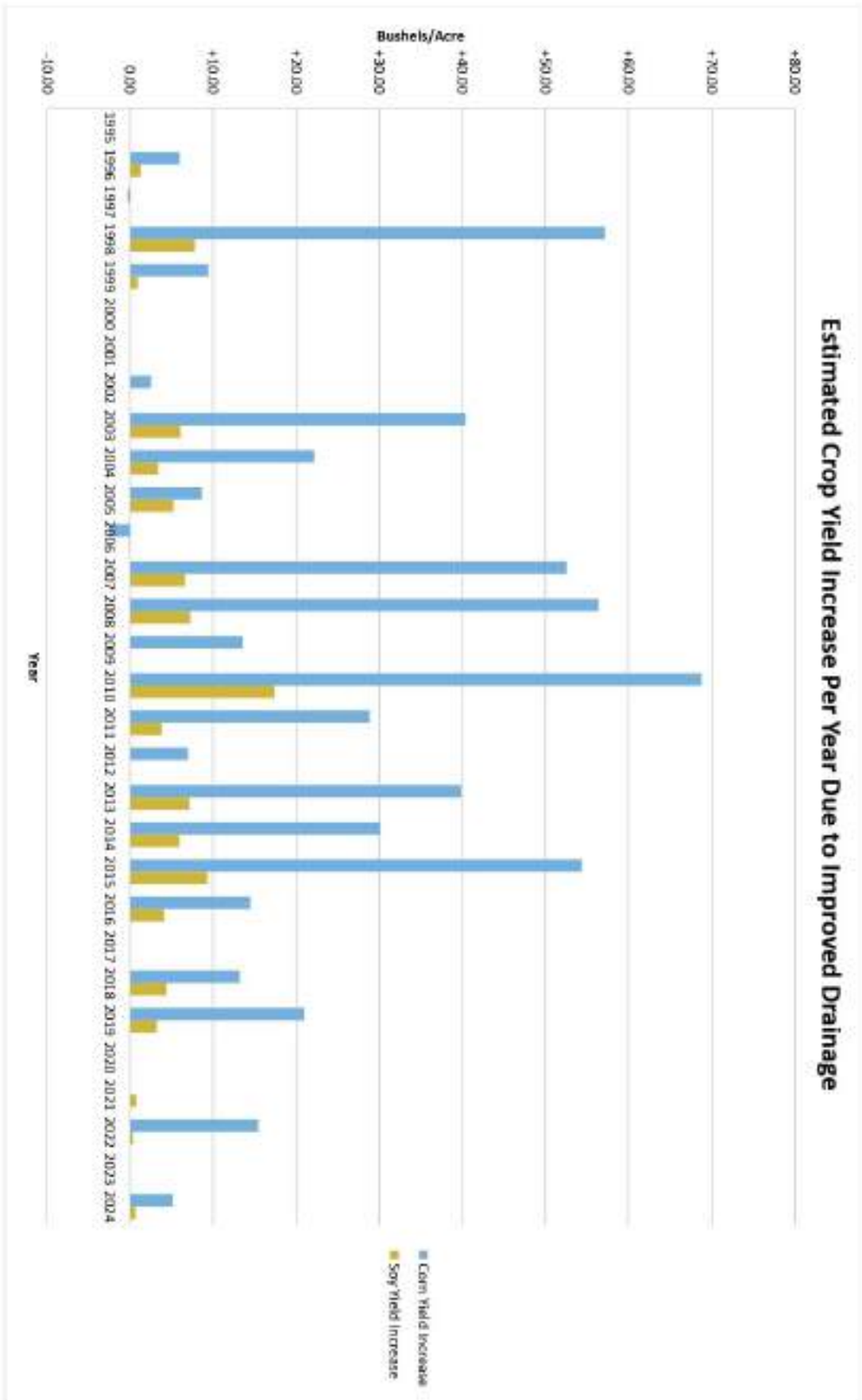
Dallas County, IA

Estimated Crop Yields						
Year	Corn Yield (No Improvement)	Corn Yield (Improved Drainage)	Corn Yield Increase	Soy Yield (No Improvement)	Soy Yield (Improved Drainage)	Soy Yield Increase
1995	250.00	250.00	0.00	70.00	70.00	0.00
1996	238.32	244.30	+5.99	67.04	68.35	+1.31
1997	247.09	246.62	-0.26	65.21	65.20	-0.01
1998	142.26	199.40	+57.14	56.22	64.02	+7.80
1999	239.10	248.54	+9.44	68.97	69.89	+0.93
2000	250.00	250.00	0.00	69.51	69.51	0.00
2001	218.82	218.82	0.00	56.61	56.61	0.00
2002	247.48	250.00	+2.52	65.39	65.39	0.00
2003	181.46	221.83	+40.37	58.64	64.71	+6.07
2004	202.20	224.39	+22.19	63.81	67.22	+3.41
2005	229.06	237.71	+8.65	63.34	68.55	+5.21
2006	246.03	243.49	-2.54	65.94	65.87	-0.07
2007	171.75	224.29	+52.54	58.53	65.13	+6.60
2008	137.51	193.91	+56.40	55.16	62.40	+7.24
2009	229.36	242.94	+13.58	69.82	69.82	0.00
2010	110.29	179.06	+68.78	33.32	50.69	+17.37
2011	208.01	236.86	+28.86	64.70	68.52	+3.82
2012	183.78	190.76	+6.99	59.50	59.50	0.00
2013	160.48	200.32	+39.84	53.63	60.74	+7.12
2014	193.38	223.48	+30.10	60.20	66.15	+5.95
2015	150.55	204.94	+54.39	53.83	63.12	+9.29
2016	224.87	239.40	+14.52	59.93	64.00	+4.07
2017	231.13	231.13	0.00	64.48	64.48	0.00
2018	228.96	242.16	+13.20	60.50	64.91	+4.40
2019	219.13	240.07	+20.94	66.56	69.78	+3.22
2020	214.17	214.17	0.00	56.46	56.46	0.00
2021	250.00	250.00	0.00	66.89	67.65	+0.76
2022	224.62	240.04	+15.41	63.09	63.46	+0.37
2023	250.00	250.00	0.00	68.74	68.74	0.00
2024	240.77	245.89	+5.12	69.07	69.74	+0.67
AVG	210.69	229.49	+18.81	61.84	65.02	+3.18

Chart and Graph created from output data from Michigan State Drain Tool

Yield Increases are estimates only based on Drain Tool.

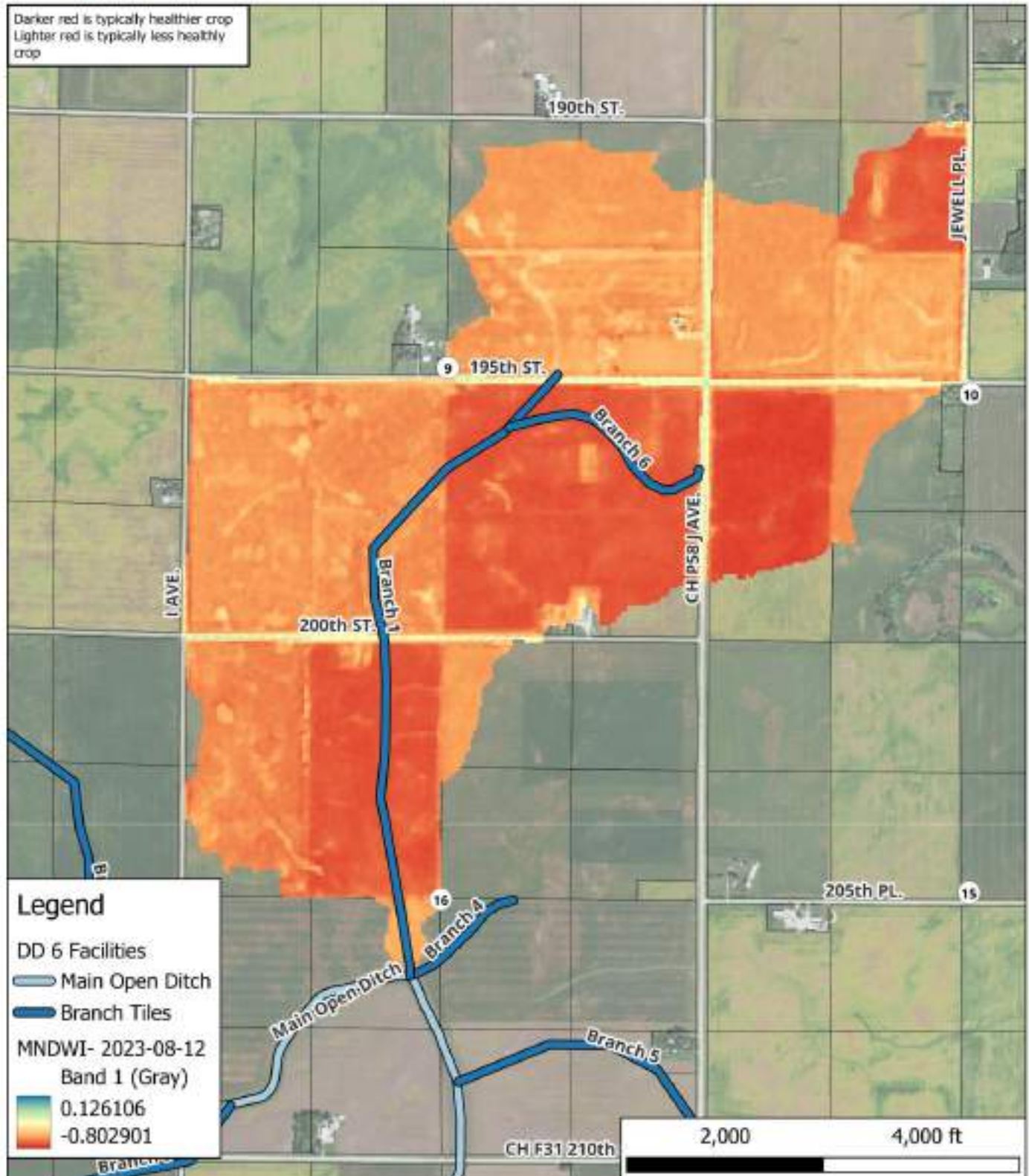
Corn and soybean yields for each year combined from two simulations: 1994-2024 run





Drainage District No. 6
Dallas County, IA

MNDWI- 08-12-2023
July 2026



Appendix U – Twenty Benefits of Drainage (Ohio State Extension)



SOIL AND WATER NO. 31

JULY 1982

TWENTY BENEFITS OF DRAINAGE

Many of the best soils in the United States and throughout the world have drainage problems that need to be solved before efficient agricultural production can be achieved. This discussion of drainage benefits is based on an earlier paper by the author entitled "Ten Benefits of Drainage" and several reports from other agricultural engineers in the United States, Canada, and England. Some of these drainage benefits are difficult to measure precisely, and many are interrelated, but their combined effect has been observed in numerous drainage studies.

1. Better soil aeration results from good drainage (surface water and free water in the root zone removed within 24 hours after heavy rainfall). This permits more extensive root development and a more favorable environment for beneficial soil microorganisms and earthworms. When soil aeration is reduced, the severity of soil-borne root diseases is increased.
2. Better soil moisture conditions with good drainage permit more efficient operation of tillage, planting, and harvesting equipment.
3. Better soil structure can be developed and maintained with good drainage, since there is less chance of destroying soil tilth due to compaction when working soil that is too wet.
4. Soils warm up more quickly in the spring when free water is removed by a drainage system. This results in better seed germination and an increased rate of plant growth.
5. An increased supply of nitrogen can be obtained from the soil when drainage lowers the water table in the root zone. Denitrification often occurs in soils with poor drainage.
6. Longer growing seasons can be achieved with good drainage due to earlier possible planting dates. This also permits the use of higher-yielding crop varieties or extended grazing periods for livestock.
7. Certain toxic substances and disease organisms are removed from the soil due to better drainage and soil aeration. In wet soil, roots can be injured by toxic substances produced in the reduction of iron and manganese salts and the reduction of nitrates to nitrites.
8. Winds are less liable to uproot plants growing in soils that have been properly drained, since root systems are deeper.
9. Soil erosion and sediment loss can be reduced by subsurface drainage, since drained soils have a greater capacity to absorb rainfall and the soil filters out suspended sediment.
10. Good drainage saves fuel that would be used in working around wet areas in fields

(over)

College of Agriculture and Home Economics of The Ohio State University and The United States Department of Agriculture Cooperating

that are not properly drained. Also, since drained land is easier to work, there is less need for dual wheels or four-wheel drive tractors.

11. Good drainage reduces winter crop damage such as frost heaving of alfalfa and smothering of wheat under patches of ice.
12. Good drainage promotes earlier crop maturity and earlier fall harvests when climatic conditions are better for natural drying of grain in the field, thereby saving artificial drying costs.
13. A greater variety of crops can be grown on a farm that has good drainage. Alfalfa and sweet corn are examples of those that a farmer may choose.
14. Weed control is easier with good drainage since shallow-rooted weeds and undesirable grasses often thrive in wet soil, crowding out the planted crop.
15. Well-drained grazing land supports more livestock, with less compaction damage to vegetation and soil from animal traffic.
16. Good drainage reduces diseases that thrive on wet land. These include foot rot and liver fluke that infect livestock, and diseases carried by mosquitoes to both livestock and people.
17. Valuable livestock water supplies can be obtained by draining hillside seeps and piping the water to stock water tanks.
18. Plants are better able to withstand summer droughts with good drainage, since lower water tables in the spring permit deeper root development for extraction of soil moisture and nutrients.
19. Drainage is essential for salinity control in drier regions where irrigation is needed for permanent agricultural production.
20. Overall, good drainage results in higher crop yields, improved crop quality, and reduced risk of crop loss due to waterlogged soil. Also, fewer acres are required to produce our needed food supplies.

Several years of drainage research in Ohio has compared corn and soybean yields from undrained, surface drained only, tile drained only, and combined tile plus surface drained plots. Annual benefit/cost ratios were also calculated for these alternative drainage systems. It was shown that the average annual return per \$100 invested in drainage ranged from \$120 to \$210 for soybeans, and from \$170 to \$220 for corn. Further details on this research are reported in Soil and Water No. 23 (DRAINAGE--What is it Worth on CORN Land?) and Soil and Water No. 24 (DRAINAGE--What is it Worth for SOYBEAN Land?). These leaflets are available from Extension Agricultural Engineers, 2073 Neil Avenue, Columbus, OH 43210.

Actual returns on a drainage investment for a particular farm will vary with factors such as soil type, weather conditions, cost of the drainage system, crops grown, and management. Drainage improvements may involve surface drainage, subsurface drainage, outlet ditches, or a combination of practices. Changes in soil and crop management techniques may also be desirable to improve soil structure and water movement in the soil. Almost 60 percent of Ohio's cropland and 25 percent of all U. S. cropland is in need of drainage.

Melville L. Palmer

Melville L. Palmer
Extension Agricultural Engineer

All educational programs and activities conducted by the Ohio Cooperative Extension Service are available to all potential clientele on a non-discriminatory basis without regard to race, color, national origin, sex, handicap or religious affiliation.

Appendix V – Nutrient Reduction Strategy Example

Nutrient Reduction Calculator							Notes
Practice	Nitrogen Reduction	Phosphorus Reduction	Acres	Avg Annual Cost (\$/Acre)	Total Annual Cost (\$)	Practice Type	
Wetlands	52%	0%	1603	\$15.00	\$ 27,045.00	Edge-of-Field	Highly effective for nitrate removal from tile drainage. Prediction varies.
Bioretention	43%	0%	2635	\$10.00	\$ 26,352.00	Edge-of-Field	Works with wetlands that treat tile drainage water.
Saturated Buffers	91%	58%	0	\$231.00	\$ -	Edge-of-Field	This high N reduction only applies to water that interacts with the buffer's active root zone.
Drainage Water Mgt.	33%	0%	0	\$10.00	\$ -	Edge-of-Field	Load reduction achieved by reducing flow volume, not concentration.
Terraces	0	77%	0		\$ -	Edge-of-Field	An erosion control practice highly effective at reducing sediment and P losses.
Sediment Control	0	85%	0		\$ -	Edge-of-Field	Includes practices like sedimentation basins or ponds.
Reduce N Rate to MHTN	10%	0%	2635	-\$2.00	\$ (5,270.40)	In-Field	MHTN is the Maximum Recommended Nitrogen rate, an economically optimal amount.
Nitrification Inhibitor	9%	0%	1318	-\$3.00	\$ (3,952.80)	In-Field	Used with till-applied anhydrous ammonia.
Moore Fall N to Spring	0%	0%	2635	-\$20.00	\$ (52,704.00)	In-Field	Moves fall fertilizer application to pre-plant in the spring.
Gridless N Application	7%	0%	2635	\$0.00	\$ -	In-Field	Compares side-by-side application to a single pre-plant application.
Cover Crops	31%	28%	545	\$49.00	\$ 26,714.00	In-Field	One of the most effective in-field practices for reducing both N and P.
No-Till	0%	30%	2635	\$12.00	\$ 31,622.40	In-Field	Compares no-till to a chisel plow system.
Conservation Tillage	0%	33%	1318	-\$1.00	\$ (1,317.60)	In-Field	Compares chisel plowing to more intensive no-till or reduced plowing.
Extended Rotations	42%	0%	0	\$30.00	\$ -	Land Use	Includes 4- or 5-year rotation with at least two years of alfalfa.
Land Retirement (CRP)	86%	75%	0	\$152.00	\$ -	Land Use	Consent's cropland to permanent vegetation.
This Example Reduction					\$ 48,496.40		
Nitrogen Reduction					45%		
Phosphorus Reduction					45%		

This spreadsheet is for illustrative purposes only. All acreage figures are averages and not intended to reflect actual values.

Spreadsheet Created by: AgriVia

Appendix W – Landowner Engagement Letters



PO Box 44
1124 Willis Ave
Perry, LA 50220

December 1, 2025

Re: Open Ditch Repairs – Drainage District No. 6

Dear Landowner(s),

This letter is to inform you that a request has been received for a study of repairs to the open ditch in Drainage District No. 6.

In response, the Dallas County Board of Supervisors has appointed Jacob Hagan, P.E. and Tyler Buman of AgriVia to investigate and prepare an engineer's report concerning the requested work.

As part of our preliminary investigation, we are gathering information about the existing open ditch and associated crossings. If you have any records, maps, or other documentation related to the drainage along the ditch, we would appreciate receiving a copy. Likewise, if you have any observations or concerns about the ditch or other drainage facilities, please reach out to us directly.

We plan to conduct survey work along the open ditch as weather allows this winter. This work will include field measurements, mapping, and documentation of existing conditions such as culverts, surface drains, tile outlets, and ditch features. All survey work will be performed with care to minimize disturbance, and no vehicles or UTVs will be used within farm fields.

This letter is being sent only to landowners who own property adjacent to the open ditch. Please forward it to any tenants, neighbors, or other interested parties. Your cooperation and local knowledge are important in helping us complete an accurate assessment of the system's condition. A map is attached for reference.

A handwritten signature in black ink that reads "Jacob Hagan".

Jacob Hagan, P.E.
jacob.agrivia@gmail.com
712-250-4318

A handwritten signature in black ink that reads "Tyler Buman".

Tyler Buman
tyler.agrivia@gmail.com
712-579-5296

AgriVia PLLC



1124 Willis Ave
Perry, IA 50220
PO Box 44

January 30, 2026

Subject: Informational Meeting

Dear Landowners and Trustees of Drainage District No. 6,

You are invited to attend an informational meeting regarding the ongoing engineering study for Drainage District No. 6.

Meeting Details

Date: Wednesday, February 25, 2026

Time: 6:30 PM

Location: 1st Floor Training Room
Dallas County Administration Building
800 Court Street
Adel, IA 50003

The purpose of this meeting is to update landowners on the status of the engineering study and to gather any pertinent information or input that you may have. No formal decisions will be made at this meeting. This is strictly an informational meeting to help guide the direction of the project based on landowner feedback.

We encourage landowners to bring any relevant information they may have about their property, particularly private tile maps. Landowners should also obtain any wetland determinations for their farms. These can be requested from your local NRCS office.

Attendance is not required, but your participation is appreciated, especially if you have input, concerns, or historical knowledge that may be helpful in the planning process. Following the meeting, we will finalize the engineer's report and begin preparing proposed plans for the district based on the feedback received. Thank you for your time and your assistance in this shared effort.

Sincerely,

A handwritten signature in black ink that reads "Jacob Hagan".

Jacob Hagan, P.E.
jacob.agrivia@gmail.com
712-250-4318

A handwritten signature in black ink that reads "Tyler Buman".

Tyler Buman
tyler.agrivia@gmail.com
712-579-5296

cc: Mary Cline, Dallas Co. Drainage Clerk
Dallas County Board of Supervisors

Appendix X – Additional Right-of-Way Needed for Improvement

Additional Right-of-Way Needed
Open Ditch Improvement
Drainage District No. 6
Dallas County, IA



Main Open Ditch Right-of-Way	
Deedholder	Acres
BUSHNELL ACRES, LLC	0.3
HYKES, KENNETH E OR KATHLEEN A JTRS	0.1
TUFF-E FARMS, LLC	0.3
MITCHELL, VICTOR AND LINDA REVOCABLE TRUST	0.2
REISTE, TIMOTHY	0
GR FARMS LLC	0.1
THANG, LIAN UK	0.3
STINE SEED FARM, INC	0.1
T3V FARMS LLC	0.1
SANDER, KEVIN J	0.1
GEORGE A MITCHELL REVOCABLE TRUST 12-7-99, THE	0
BOYD, MARY L & SCOTT TRUSTEES BOYD, MARY L TRUST	0
FREVERT, JAMES G REVOCABLE TRUST 11/5/2002 FREVERT, JAMES G TRUSTEE	0
CARLISLE FARMS LLC	0
CARLISLE FARM LLC	0
ANDREWS, DAVID H	0
REPWAY FARMS INC	0
Total Acres	1.6

Listed above is estimated Right-of-Way needed to enlarge the Main Open Ditch. Actual ROW will be determined in the Right-of-Way Report.

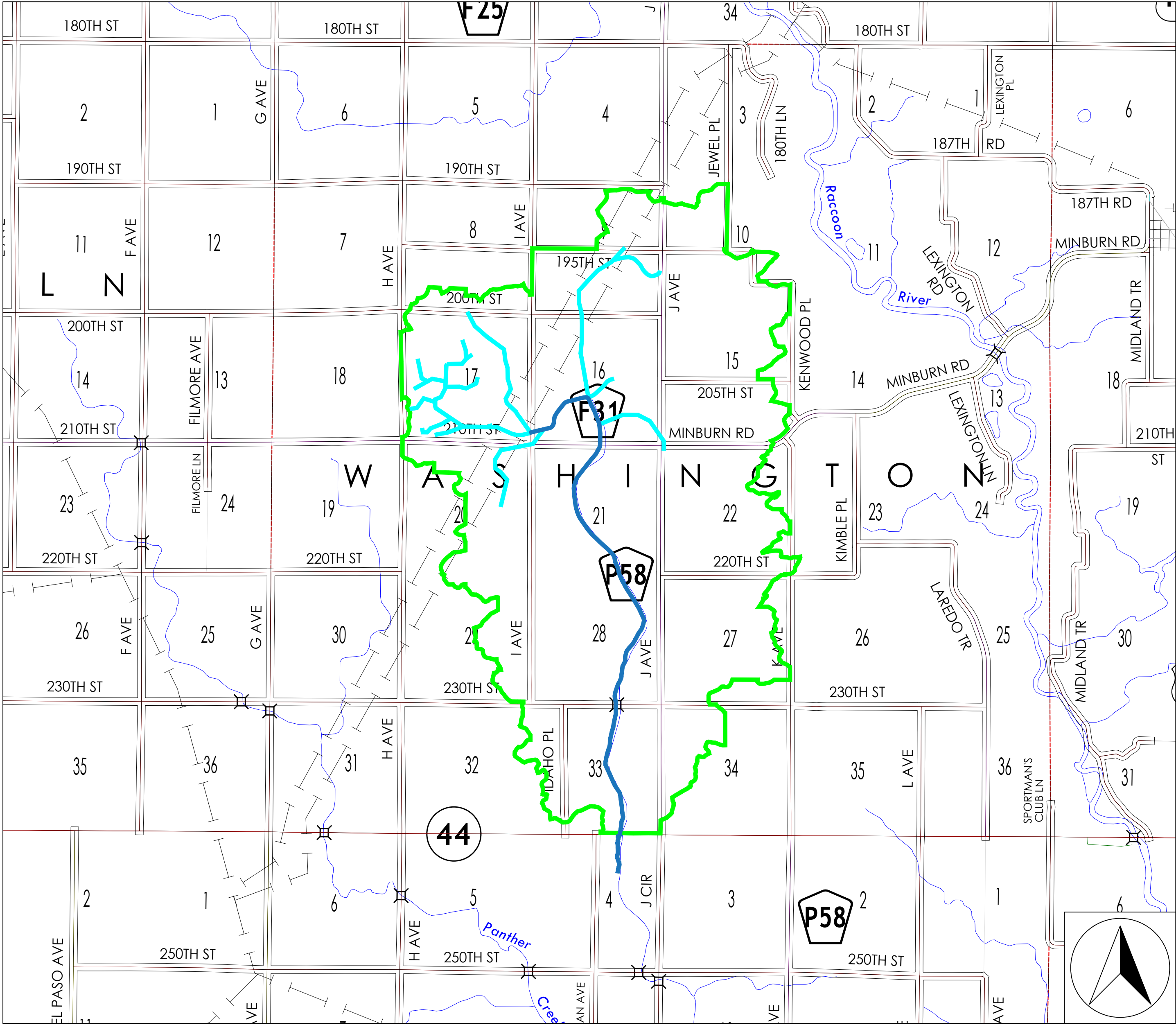
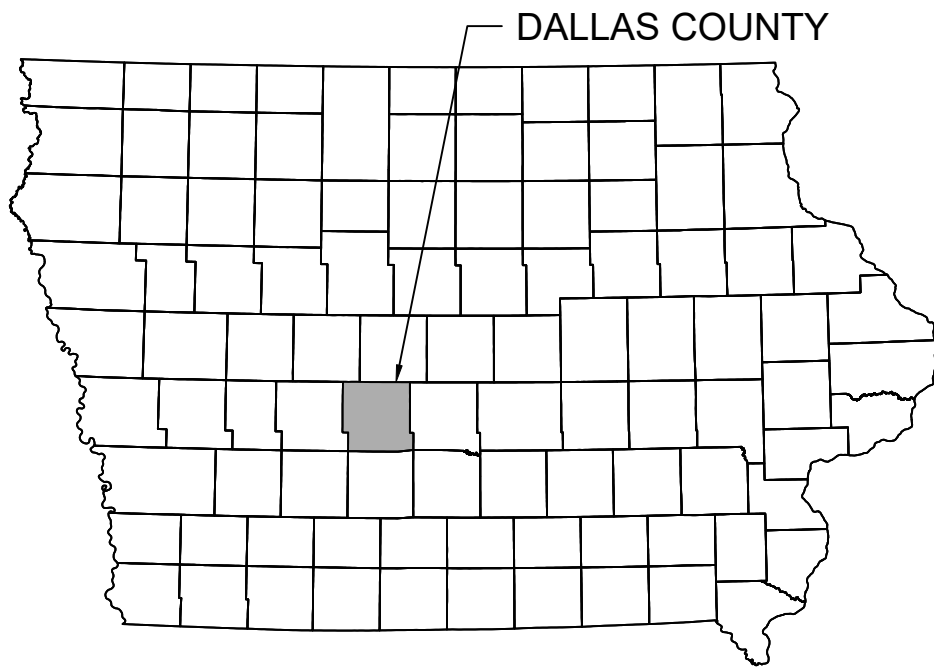
PROPOSED PLANS FOR
DRAINAGE DISTRICT NO. 6
OPEN DITCH IMPROVEMENTS
DALLAS COUNTY, IA
2026



Utilities shown are estimates only. The Engineer makes no guarantee of the location or existence of those shown or not shown on the plans. The Contractor shall field verify exact locations prior to commencing construction as required by state law. Notify Iowa One Call, 811 or 1-800-292-8989.

Specifications
Unless otherwise noted, the governing standards for this project shall be the 2026 edition of the Iowa Statewide Urban Design and Specifications (SUDAS) for Public Improvements, supplemented where referenced by the Iowa Department of Transportation's Standard Specifications for Highway and Bridge Construction, Series 2023, along with all active general supplemental specifications, materials, instructional memoranda, and relevant special provisions.

Where conflicts arise, the stricter requirement shall take precedence. Complete compliance with all applicable federal, state, and local laws, ordinances, and regulations is mandatory throughout the project's execution.



Sheet List			
Number	Title		
A.01	Title Sheet		
A.02	District Plat		
B.01	General & Pipe Details		
B.02	Excavation Details		
C.01	Pipe Table		
C.02	Volume Table		
D.01	Plan & Profile	Main Open Ditch	Sta -20+00 → 0+00
D.02	Plan & Profile	Main Open Ditch	Sta 0+00 → 20+00
D.03	Plan & Profile	Main Open Ditch	Sta 20+00 → 40+00
D.04	Plan & Profile	Main Open Ditch	Sta 40+00 → 60+00
D.05	Plan & Profile	Main Open Ditch	Sta 60+00 → 80+00
D.06	Plan & Profile	Main Open Ditch	Sta 80+00 → 100+00
D.07	Plan & Profile	Main Open Ditch	Sta 100+00 → 120+00
D.08	Plan & Profile	Main Open Ditch	Sta 120+00 → 140+00
D.09	Plan & Profile	Main Open Ditch	Sta 140+00 → 160+00
D.10	Plan & Profile	Main Open Ditch	Sta 160+00 → 180+00
D.11	Plan & Profile	Main Open Ditch	Sta 180+00 → 200+00
D.12	Plan & Profile	Main Open Ditch	Sta 200+00 → 220+00
D.13	Plan & Profile	Main Open Ditch	Sta 220+00 → 226+18
V.01	Hwy 44 Boring		

	I hereby certify that this engineering document was prepared by me or under my direct personal supervision and that I am a duly licensed Professional Engineer under the laws of the State of Iowa. Jacob L. Hagan, P.E. (date) License No. 25738 My license renewal date is December 31, 2026. Pages or sheets covered by this seal: All
	I hereby certify that this engineering document was prepared by me or under my direct personal supervision and that I am a duly licensed Professional Engineer under the laws of the State of Iowa. Tyler J. Buman, P.E. (date) License No. 30759 My license renewal date is December 31, 2027. Pages or sheets covered by this seal: All



Company Information
AgriVia PLLC
PO Box 44
1124 Willis Ave
Perry, IA 50220

Designer:
TJB
Drafter:
TJB
Checker:
JLH

PLAN LEGEND

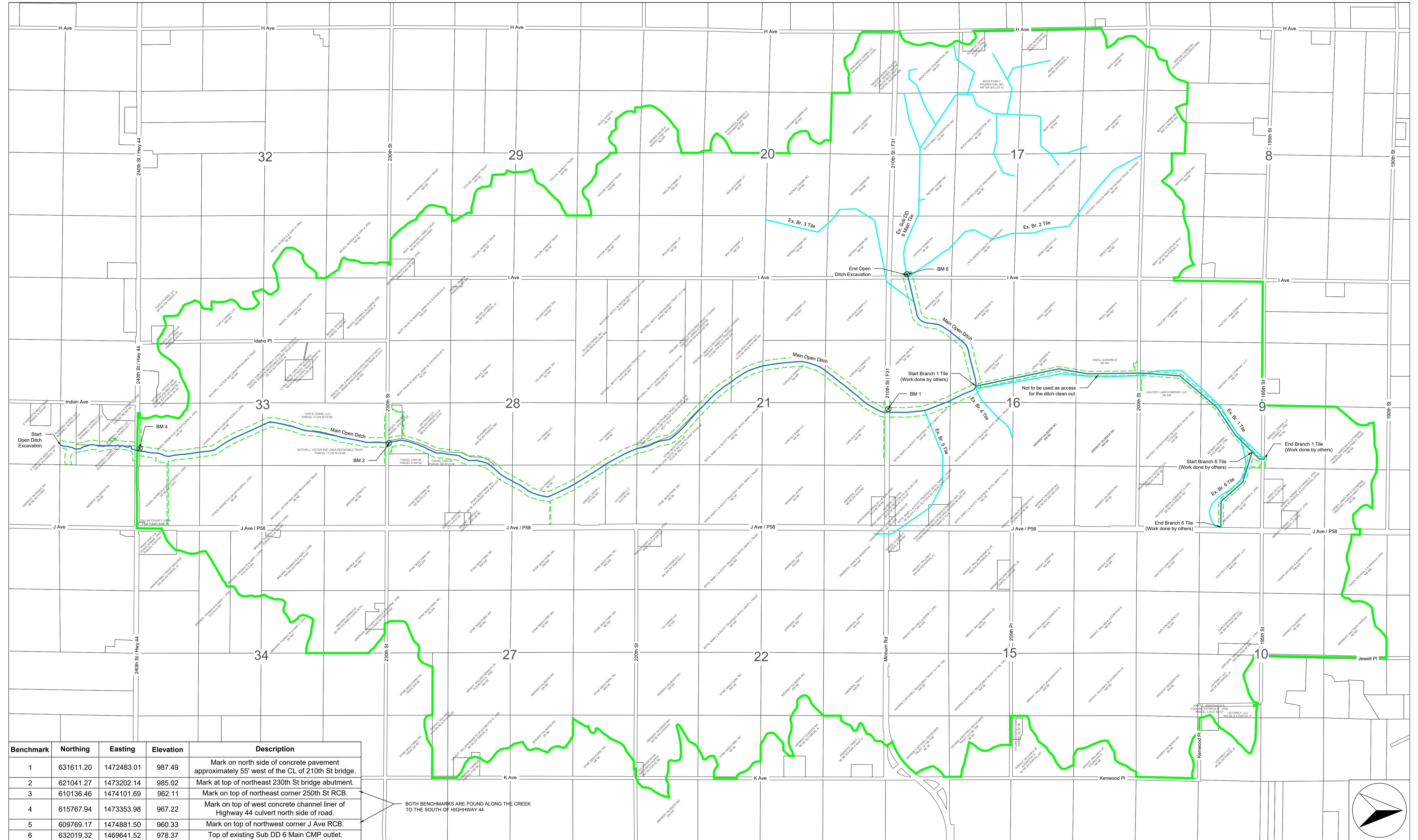
Proposed District Facilities
Existing DD 6 Facilities
Benefitted Area

No.	Revision/Issue	Date

Sheet Name
Title Sheet

Project Name, Client, and Address
Open Ditch Improvements
Drainage District No. 6
Dallas County, IA
Hwy 44 & J Ave, Adel, IA 50003

Project 2531-25	A.01
Date 2026-06-30	
Plan Scale 1" = 6,400'	



Benchmark	Northing	Easting	Elevation	Description
1	631611.20	1472483.01	987.49	Mark on north side of concrete pavement approximately 55' west of the CL of 210th St bridge.
2	621041.27	1473202.14	985.02	Mark at top of northeast 230th St bridge abutment.
3	610136.46	1474101.69	962.11	Mark on top of northeast corner 250th St RCB.
4	615767.94	1473353.98	967.22	Mark on top of west concrete channel liner of Highway 44 culvert north side of road.
5	609769.17	1474881.50	960.33	Mark on top of northwest corner J Ave RCB.
6	632019.32	1469641.52	978.37	Top of existing Sub DD 6 Main CMP outlet.

BOTH BENCHMARKS ARE FOUND ALONG THE CREEK TO THE SOUTH OF HIGHWAY 44



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PLAN LEGEND
Proposed District Facilities
Existing DD 6 Facilities
Benefitted Area
Parcel Lines
Work Area

No.	Revision/Issue	Date

Sheet Name
District Plat

Project Name, Client, and Address
**Open Ditch Improvements
Drainage District No. 6
Dallas County, IA
Hwy 44 & J Ave, Adel, IA 50003**

Project 2531-25	A.02
Date 2026-06-30	
Plan Scale 1"= 2000'	

GENERAL PROVISIONS & PRE-CONSTRUCTION

1. **WORK AREA:** THE PLANS SHOW THE WORK AREA. STANDARD WORK AREA IS 100 FEET FROM THE CENTERLINE OF THE OPEN DITCH UNLESS OTHERWISE NOTED. THE CONTRACTOR MUST STAY WITHIN THIS AREA. ANY DAMAGE OUTSIDE THE WORK AREA WILL BE DEDUCTED FROM FINAL PAYMENT. ALL STAGING AND STORAGE SHALL BE WITHIN THE WORK AREA. NO STORAGE OR STAGING SHALL TAKE PLACE ON ROADWAYS.
2. **ACCESS:** ACCESS TO THE WORK AREA IS LIMITED TO PUBLIC ROAD INTERSECTIONS AND DRIVEWAYS CALLED OUT ON THE PLANS. THE CONTRACTOR IS RESPONSIBLE FOR SECURING ANY ADDITIONAL TEMPORARY ACCESS AGREEMENTS WITH LANDOWNERS OR THE COUNTY ENGINEER FOR ROAD ROW ENTRY. LOCATIONS OF CONSTRUCTION ENTRANCES ARE MARKED ON THE PLANS. OBTAIN APPROVAL FROM THE ENGINEER PRIOR TO USING ANY OTHER ENTRANCES
3. **UTILITIES & LOCATES:** THE CONTRACTOR SHALL NOTIFY IOWA ONE CALL (811) PRIOR TO EXCAVATION. THE CONTRACTOR IS SOLELY RESPONSIBLE FOR PROTECTING ALL MARKED AND UNMARKED UTILITIES.
4. **TILE OUTLET AND SURFACE DRAIN PIPE EXPLORATION:** EXISTING TILE AND SURFACE DRAIN PIPES IS APPROXIMATELY LOCATED ON THE PLANS. THERE LIKELY ARE ADDITIONAL TILE OUTLETS MISSED DURING THE SURVEY ALONG WITH LOCATIONS THAT WILL NEED SURFACE DRAIN PIPES. CONTRACTOR SHALL NOTE ALL MISSED PIPES AND ENGINEER MAY DIRECT THOSE PIPES TO BE REPAIRED OR INSTALLED.
5. **AS-BUILT DOCUMENTATION:** THE CONTRACTOR SHALL PROVIDE THE ENGINEER WITH A COMPLETE SET OF DRAWINGS SUITABLY MARKED TO SHOW ANY DEVIATIONS FROM THE ORIGINAL PLANS, INCLUDING BUT NOT LIMITED TO ACTUAL PIPE ALIGNMENTS, DEPTHS, CONNECTION LOCATIONS, AND ANY FIELD MODIFICATIONS. THIS DOCUMENTATION SHALL BE PROVIDED PRIOR TO FINAL ACCEPTANCE.
6. **THE LANDOWNERS** WHERE THE OPEN DITCH IS BEING REPAIRED ARE PAYING FOR THIS PROJECT. AT COMPLETION OF THE PROJECT, THOSE LANDOWNERS ARE INVITED TO A PUBLIC HEARING AND CAN FILE CLAIMS FOR DAMAGES. THESE SPECIFICATIONS AND PLANS EXIST AS MUCH TO GUIDE AND PROTECT THE CONTRACTOR AS TO PROTECT THE LANDOWNERS. REGULAR DOCUMENTATION ALONG WITH OPEN COMMUNICATION WITH THE ENGINEER IS ESSENTIAL TO A SMOOTH PROJECT FOR ALL PARTIES.

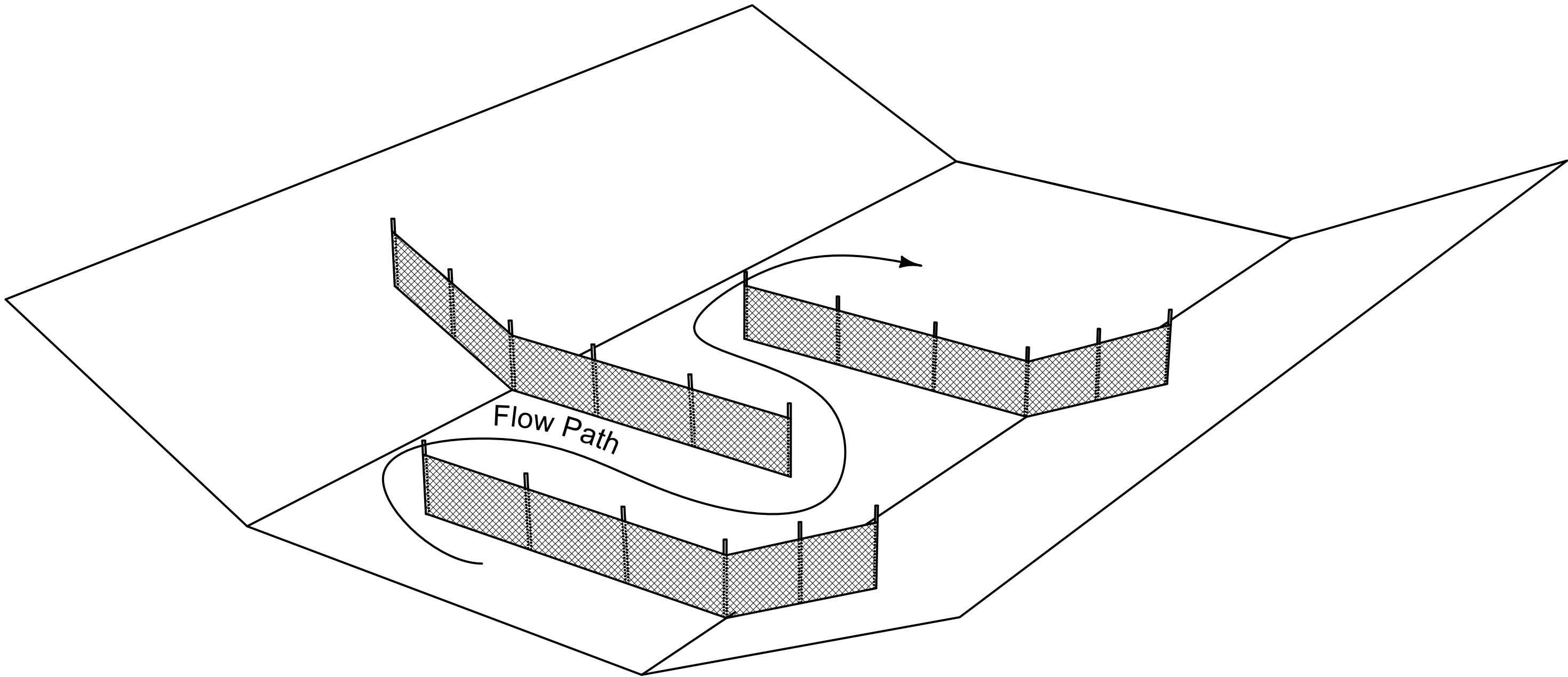
ROADWAY CULVERT CLEANING

1. **PERMITS & NOTIFICATIONS:** THE CONTRACTOR SHALL OBTAIN ALL NECESSARY OCCUPANCY PERMITS FROM THE COUNTY ENGINEER OR IOWA DOT. NOTIFY THE RESPECTIVE AGENCY AND THE PROJECT ENGINEER AT LEAST 48 HOURS PRIOR TO COMMENCING ANY WORK WITHIN THE ROW.
2. **TRAFFIC CONTROL:** THE CONTRACTOR IS RESPONSIBLE FOR ALL TRAFFIC CONTROL, INCLUDING SIGNAGE, BARRICADES, AND FLAGGERS. ALL SETUPS MUST STRICTLY ADHERE TO THE LATEST MUTCD (MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES) STANDARDS AND ANY SPECIFIC REQUIREMENTS SET BY THE COUNTY OR DOT PERMIT.
3. **UTILITY VERIFICATION:** ALL UTILITIES WITHIN THE ROW (FIBER OPTIC, GAS, WATER) MUST BE DAYLIGHTED VIA POTHOLING PRIOR TO THE ARRIVAL OF THE BORING OR TRENCHING EQUIPMENT.
4. **STORAGE AND PARKING:** NO STORAGE OR PARKING OF EQUIPMENT IN PUBLIC RIGHT-OF-WAY. NO CROSSING PAVED ROADS WITH TRACKED EQUIPMENT.
5. **CULVERT CLEANING:** CONTRACTOR SHALL REMOVE SILT AND DEBRIS FROM THE CULVERT VIA ANY METHOD THE CONTRACTOR CHOOSES SUBJECT TO APPROVAL BY THE ENGINEER TO NOT DAMAGE THE CULVERT, DITCH OR ROAD WAY.
6. **SHOULDER REPAIR:** ANY DAMAGE TO THE ROAD SHOULDERS OR SIDE SLOPES SHALL BE RESHAPED TO MATCH THE ORIGINAL PROFILE AND IMMEDIATELY SEEDED/MULCHED.
7. **ROAD CLOSURE:** IF THE ROAD NEEDS TO BE CLOSED, THE ROAD SHALL ONLY BE CLOSED FROM SUN RISE TO SUN SET. BY SUN SET THE ROAD SHALL BE OPEN TO TRAFFIC.

SEDIMENT BAFFLE DETAIL

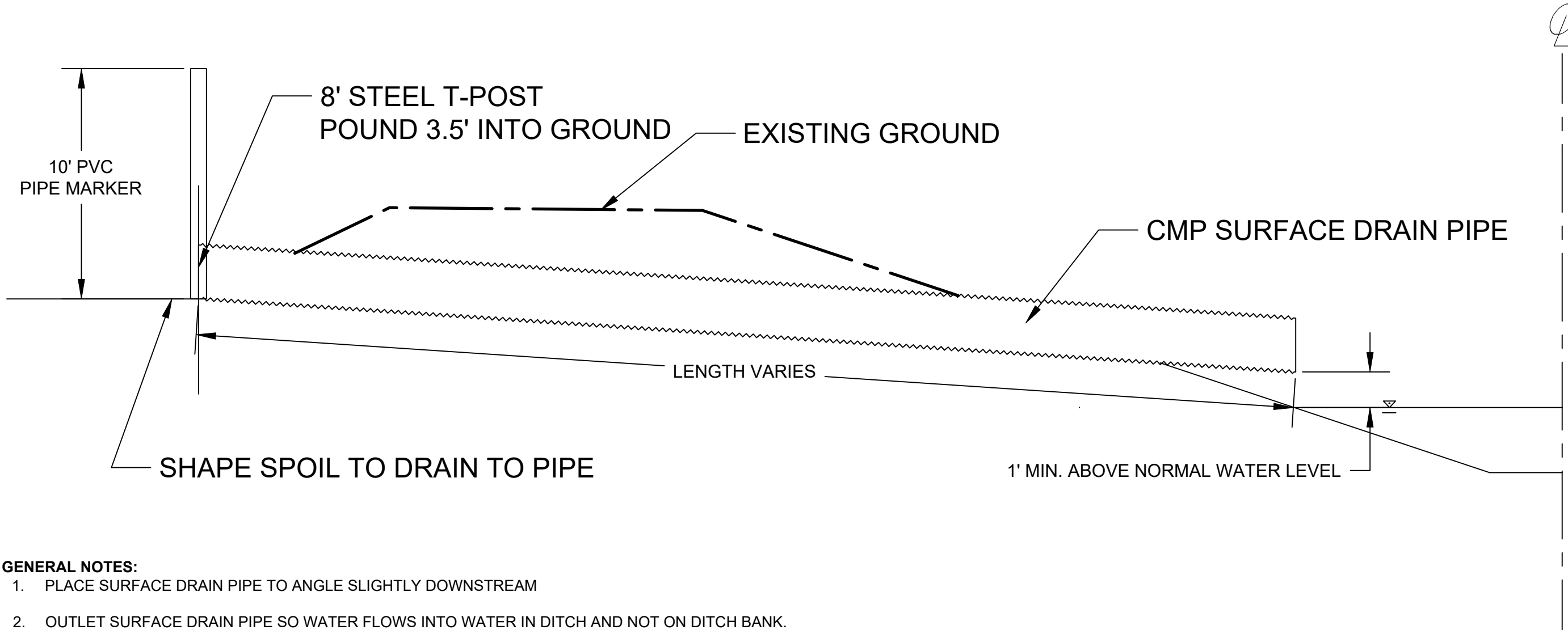
ALL ITEMS AND NOTES SHOWN IN THIS DETAIL ARE INCIDENTAL UNLESS OTHERWISE NOTED

- GENERAL NOTES:
1. CONSTRUCT SEDIMENT BAFFLE BY INSTALLING THREE ROWS OF SILT FENCE ACROSS THE BOTTOM OF THE OPEN DITCH AT THE OUTLET LEAVING AN OPENING EQUAL TO 25% OF THE BOTTOM WIDTH ON ALTERNATING SIDES.
2. SPACE EACH SILT FENCE 4' FROM EACH OTHER.
3. REMOVAL OF THE SILT FENCES AT THE END OF THE PROJECT IS INCIDENTAL TO INSTALLATION.



SURFACE DRAIN PIPE DETAIL

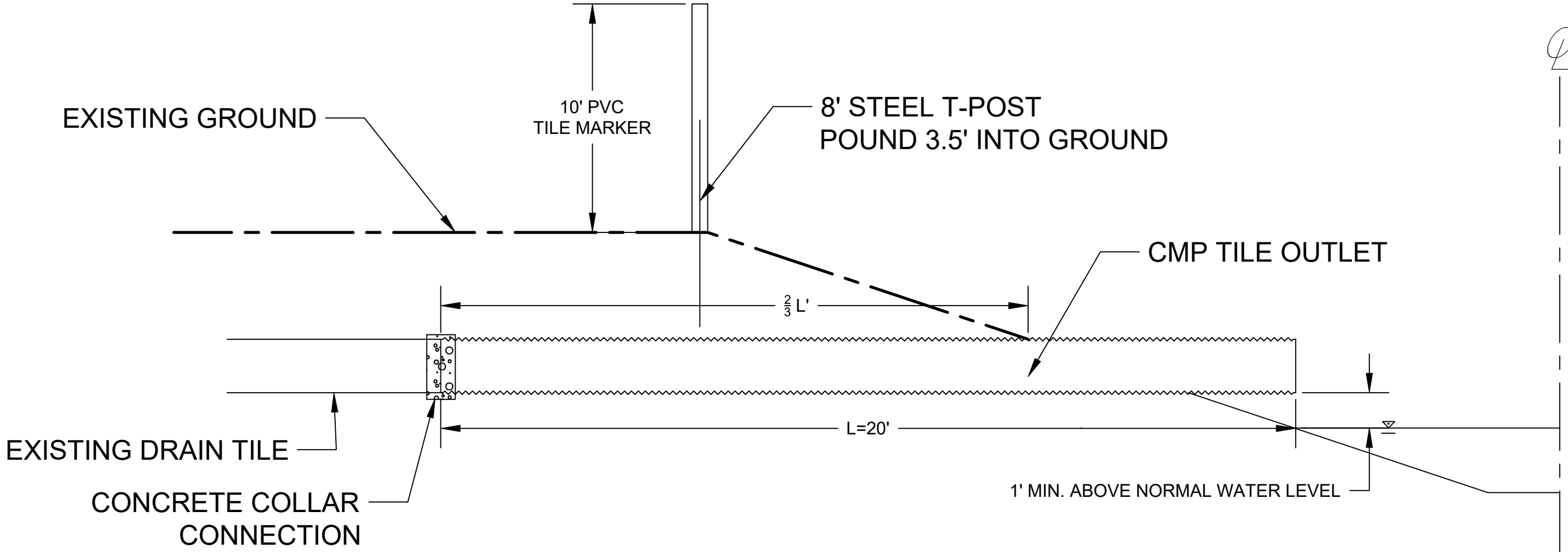
ALL ITEMS AND NOTES SHOWN IN THIS DETAIL ARE INCIDENTAL UNLESS OTHERWISE NOTED



- GENERAL NOTES:
1. PLACE SURFACE DRAIN PIPE TO ANGLE SLIGHTLY DOWNSTREAM
2. OUTLET SURFACE DRAIN PIPE SO WATER FLOWS INTO WATER IN DITCH AND NOT ON DITCH BANK.
3. SHAPE TO DRAIN TO INLET. THIS WORK IS INCIDENTAL TO SURFACE DRAIN PIPE INSTALLATION.

TILE OUTLET DETAIL

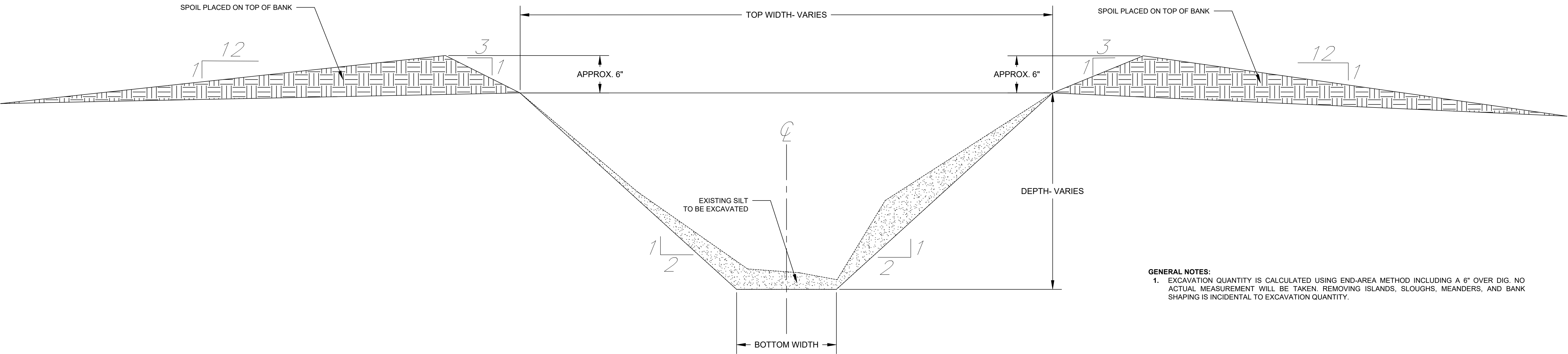
ALL ITEMS AND NOTES SHOWN IN THIS DETAIL ARE INCIDENTAL UNLESS OTHERWISE NOTED



- GENERAL NOTES:
1. PLACE SURFACE DRAIN PIPE TO ANGLE SLIGHTLY DOWNSTREAM
2. OUTLET SURFACE DRAIN PIPE SO WATER FLOWS INTO WATER IN DITCH AND NOT ON DITCH BANK.

TYPICAL OPEN DITCH EXCAVATION AND SPOIL LEVELING DETAIL

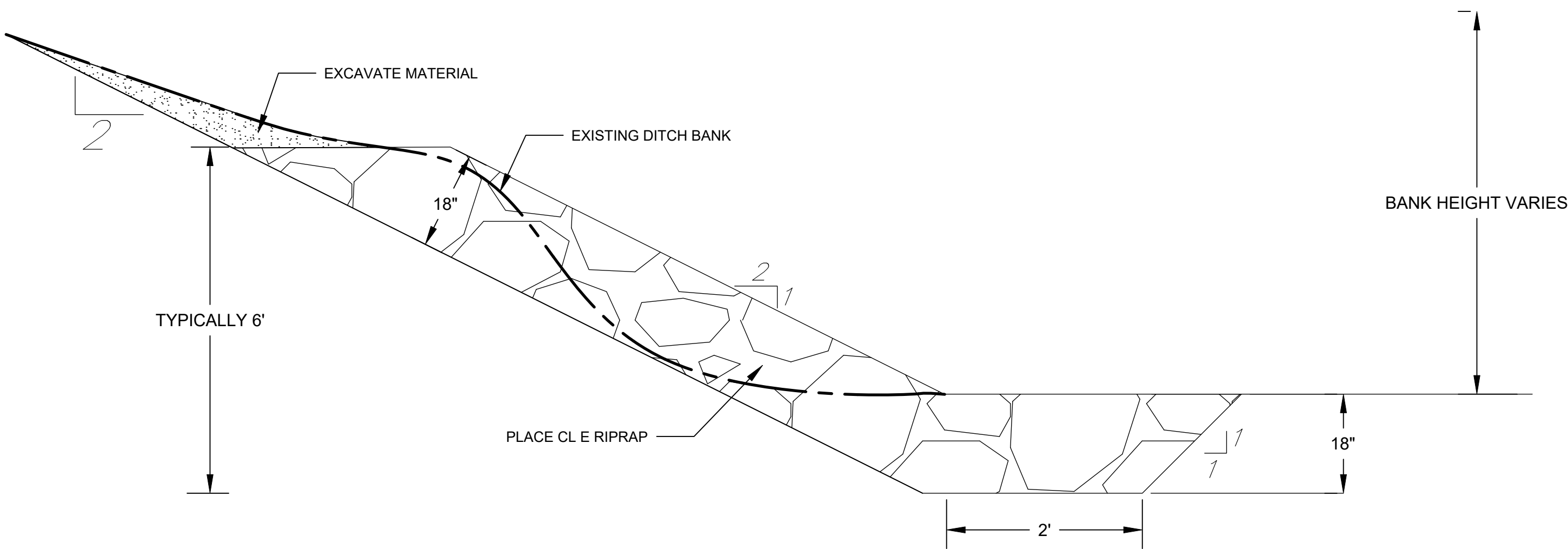
ALL ITEMS AND NOTES SHOWN IN THIS DETAIL ARE INCIDENTAL UNLESS OTHERWISE NOTED



- GENERAL NOTES:**
- EXCAVATION QUANTITY IS CALCULATED USING END-AREA METHOD INCLUDING A 6" OVER DIG. NO ACTUAL MEASUREMENT WILL BE TAKEN. REMOVING ISLANDS, SLOUGHS, MEANDERS, AND BANK SHAPING IS INCIDENTAL TO EXCAVATION QUANTITY.

RIPRAP BANK ARMORING DETAIL

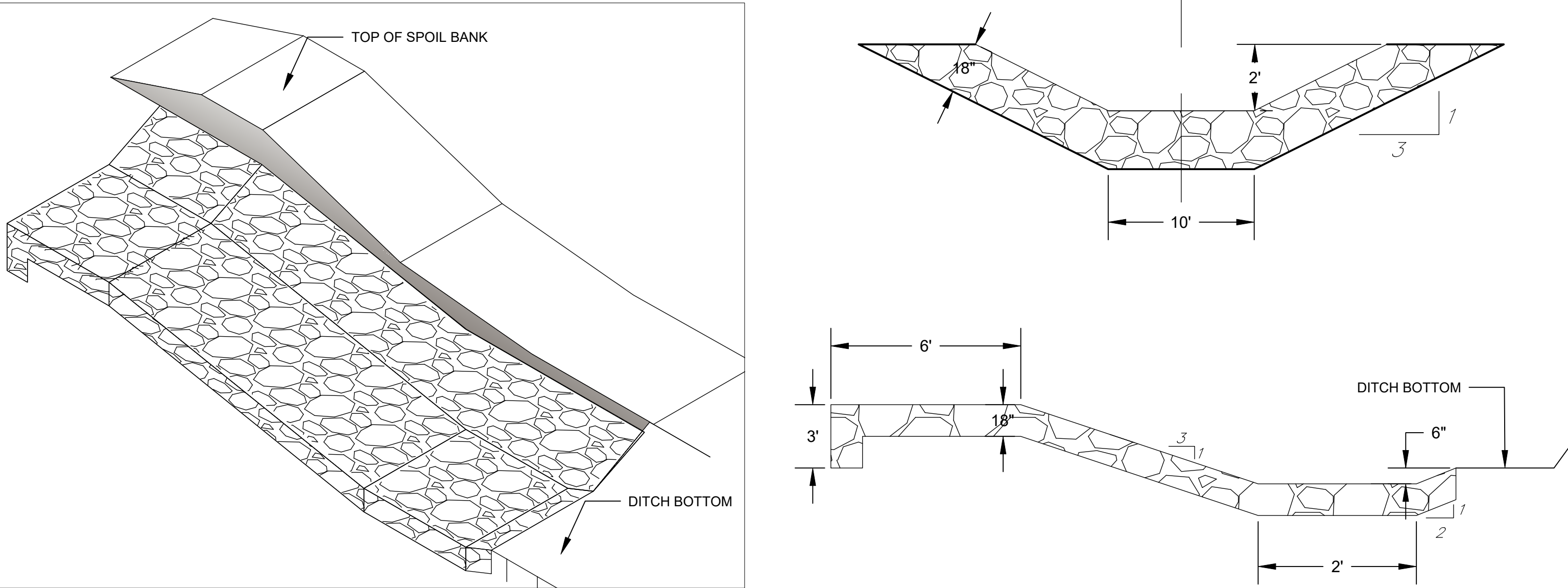
ALL ITEMS AND NOTES SHOWN IN THIS DETAIL ARE INCIDENTAL UNLESS OTHERWISE NOTED



- GENERAL NOTES:**
- RIPRAP WILL BE PAID UNDER RIPRAP, CL E BID ITEM. ALL EXCAVATION, AND SHAPING WILL BE PAID UNDER RIPRAP BID ITEM. FIELD STONE MAY BE USED PER APPROVAL OF ENGINEER.
 - GEOTEXTILE FABRIC IS NOT REQUIRED.

ROCK CHUTE DETAIL

ALL ITEMS AND NOTES SHOWN IN THIS DETAIL ARE INCIDENTAL UNLESS OTHERWISE NOTED

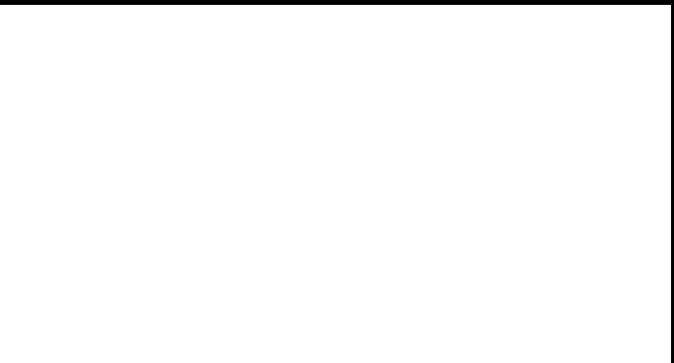
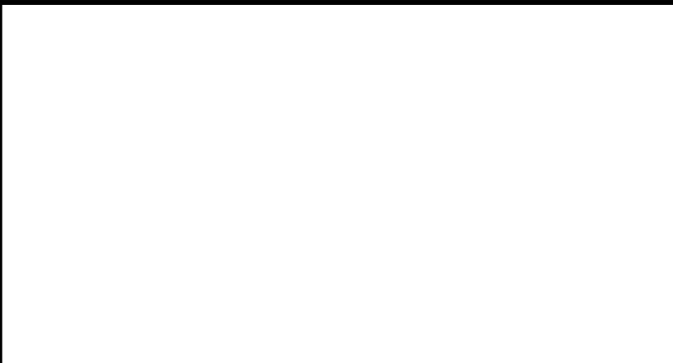


- GENERAL NOTES:**
- RIPRAP WILL BE PAID UNDER RIPRAP, CL E BID ITEM. ALL EXCAVATION, AND SHAPING WILL BE PAID UNDER ROCK CHUTE BID ITEM. FIELD STONE MAY BE USED PER APPROVAL OF ENGINEER.
 - ROCK CHUTE SHALL BE CONSTRUCTED TO ALLOW FOR SURFACE WATER FLOW TO ENTER THE OPEN DITCH. ROCK CHUTE SHALL BE CONSTRUCTED LOW ENOUGH AND SHAPED TO ALLOW WATER TO FLOW THROUGH IT.
 - GEOTEXTILE FABRIC IS NOT REQUIRED.



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No.	Revision/Issue	Date

Sheet Name
Excavation Details

Project Name, Client, and Address
Open Ditch Improvements
Drainage District No. 6
Dallas County, IA
Hwy 44 & J Ave, Adel, IA 50003

Project
2531-25
Date
2026-06-30
Plan Scale

Sheet
B.02

Main Open Ditch						
Station	Existing Size	New Size	Length	Type	Side	Notes
-693	48	48	30	SD	LT	Fill gully. Install new pipe.
155	18	18	40	SD	RT	Fill gully. Install new pipe.
163	18	18	30	SD	LT	Fill gully. Install new pipe.
234	18	18	30	SD	RT	Fill gully. Install new pipe.
300	18	18	30	SD	LT	Fill gully. Install new pipe.
304	18	18	40	SD	RT	Fill gully. Install new pipe.
559	18	18	60	SD	LT	Fill gully. Install new pipe.
610	18		30	SD	RT	Existing-to-remain.
716	18	18	45	SD	RT	Fill gully. Install new pipe.
733	18	18	50	SD	LT	Fill gully. Install new pipe.
843	12	18	30	SD	RT	Replace with 18" CMP SD.
966	18	18	50	SD	RT	Fill gully. Install new pipe.
1012	15	18	30	SD	RT	Replace with 18" CMP SD.
1146	18	18	50	SD	LT	Fill gully. Install new pipe.
1147	18	18	45	SD	RT	Fill gully. Install new pipe.
1264	48	48	40	SD	RT	Fill gully. Install new pipe.
1324	24		50	SD	LT	Existing-to-remain.
1777	15	18	30	SD	RT	Replace with 18" CMP SD.
1907	4	8	20	TO	RT	Replace with 8" CMP TO.
2000	48	48	40	SD	LT	Fill gully. Install new pipe.
2058	18	18	30	SD	RT	Replace.
2071	12	12	20	TO	RT	Replace.
2216	18	18	40	SD	LT	Fill gully. Install new pipe.
2408	15		50	SD	LT	Existing-to-remain.
2565	12	12	20	TO	LT	Replace.
2579	18		50	SD	LT	Existing-to-remain.
2792	18		50	SD	RT	Existing-to-remain.
2798	18	18	40	SD	LT	Fill gully. Install new pipe.
2898	6	8	20	TO	LT	Replace with 8" CMP TO.
3056	12	18	30	SD	LT	Replace with 18" CMP SD.
3235	36		50	SD	LT	Existing-to-remain.
3273	6	8	20	TO	LT	Replace with 8" CMP TO.
3340	36		50	SD	RT	Existing-to-remain.
3355	12	12	20	TO	RT	Replace.
3358	Unk.	18	40	SD	LT	Search for pipe. Assume to replace with 18" SD.
3400	6	8	20	TO	LT	Replace with 8" CMP TO.
3782	6	8	20	TO	LT	Replace with 8" CMP TO.
3797	6	8	20	TO	LT	Replace with 8" CMP TO.
3853	30		50	SD	LT	Existing-to-remain.
3897	8	8	20	TO	LT	Replace.
3918	6	8	20	TO	LT	Replace with 8" CMP TO.
3924	12	18	40	SD	RT	Replace with 18" CMP SD.
4048	6	8	20	TO	LT	Replace with 8" CMP TO.
4093	15	18	30	SD	LT	Replace with 18" CMP SD.
4145	12	12	20	TO	RT	Replace.
4544	24	24	30	SD	RT	Replace.
4818	6	8	20	TO	LT	Replace with 8" CMP TO.
4900	24	24	30	SD	LT	Replace.

Main Open Ditch						
Station	Existing Size	New Size	Length	Type	Side	Notes
4969	15	15	20	TO	RT	Replace.
5001	12	12	20	TO	LT	Replace.
5009	30		50	SD	RT	Existing-to-remain.
5027	12	12	20	TO	RT	Replace.
5682	30		80	SD	RT	Existing-to-remain.
5689	30		80	SD	RT	Existing-to-remain.
5878	15	18	40	SD	LT	Replace with 18" CMP SD.
6286	15	18	40	SD	LT	Replace with 18" CMP SD.
6306	15	18	40	SD	RT	Replace with 18" CMP SD.
6675	30		80	SD	LT	Existing-to-remain.
6851	36	36	50	SD	RT	Replace.
6893	12	12	20	TO	LT	Replace.
7091	6	8	20	TO	LT	Replace with 8" CMP TO.
7117	6	8	20	TO	LT	Replace with 8" CMP TO.
7211	18	18	90	SD	LT	Replace.
7497	18	18	80	SD	LT	Replace.
7520	6	8	20	TO	LT	Replace with 8" CMP TO.
7743	12	12	20	TO	RT	Replace.
7759	36		80	SD	RT	Existing-to-remain.
7767	36		80	SD	RT	Existing-to-remain.
7776	15	15	20	TO	RT	Replace.
7787	18	18	20	TO	RT	Replace.
7933	8	8	80	TO	LT	Replace.
8289	24		70	SD	LT	Existing-to-remain.
8762	10	12	20	TO	RT	Replace with 12" CMP TO.
9040	12		20	TO	RT	Existing-to-remain.
9097	15	18	60	SD	LT	Replace with 18" CMP SD.
9101	15		80	SD	RT	Existing-to-remain.
9474	18	18	40	SD	RT	Replace.
9743	48	48	70	SD	RT	Remove, turn, and relay.
9916	8	8	20	TO	LT	Replace.
10182	12		20	TO	RT	Existing-to-remain.
10183	8	8	20	TO	RT	Replace.
10541	18	18	20	TO	LT	Replace.
10689	15	18	70	SD	LT	Replace with 18" CMP SD.
10696	30		50	SD	LT	Existing-to-remain.
10753	24		50	SD	LT	Existing-to-remain.
10772	6	8	20	TO	RT	Replace with 8" CMP TO.
10772	8	8	20	TO	RT	Replace.
10976	4	8	20	TO	LT	Replace with 8" CMP TO.
11000	8	18	70	SD	RT	Replace with 18" CMP SD.
11221	6	8	20	TO	LT	Replace with 8" CMP TO.
11403	12	12	20	TO	LT	Replace.
11477	24	24	50	SD	RT	Replace.
11720	12	12	20	TO	RT	Replace.
12251	8	8	20	TO	RT	Replace.
12288	30	30	50	SD	RT	Replace.
12976	15	15	20	TO	RT	Replace.

Main Open Ditch						
Station	Existing Size	New Size	Length	Type	Side	Notes
13017	36		50	SD	RT	Existing-to-remain.
13025	36		50	SD	RT	Existing-to-remain.
13052	18	18	20	TO	RT	Replace.
13792	18		20	TO	LT	Existing-to-remain.
13809	42		70	SD	LT	Existing-to-remain.
13838	36		40	SD	LT	Existing-to-remain.
13863	18	18	20	TO	LT	Replace.
13867	18	18	40	SD	RT	Replace.
14267	12		20	TO	RT	Existing-to-remain.
14280	18	18	50	SD	LT	Replace.
15028	8	8	20	TO	LT	Replace.
15356	12		20	TO	RT	Existing-to-remain.
15537	12		20	TO	LT	Existing-to-remain.
15735	10	12	20	TO	RT	Replace with 12" CMP TO.
15757	18		50	SD	LT	Existing-to-remain.
15807	15		20	TO	LT	Existing-to-remain.
16128	6	8	20	TO	RT	Replace with 8" CMP TO.
17062	12	12	20	TO	RT	Replace.
17287	Unk.	18	50	SD	RT	Search for pipe. Assume to replace with 18" SD.
17642	6	8	20	TO	RT	Replace with 8" CMP TO.
17670	6	8	20	TO	RT	Replace with 8" CMP TO.
18272	12	12	20	TO	LT	Replace.
18374	24	24	20	TO	RT	Replace.
18378	24	24	20	TO	RT	Replace.
18877	36		80	SD	RT	Existing-to-remain.
18884	36		80	SD	RT	Existing-to-remain.
18914	6	8	20	TO	RT	Replace with 8" CMP TO.
19225	18		50	SD	RT	Existing-to-remain.
19243	12	12	20	TO	LT	Replace.
19513	36		40	SD	RT	Existing-to-remain.
19561	24	24	20	TO	RT	Replace.
19563	30	30	20	TO	RT	Replace.
19955	30		50	SD	RT	Existing-to-remain.
20330	30		50	SD	RT	Existing-to-remain.
20360	12	12	20	TO	LT	Replace.
20606	18	18	20	TO	RT	Replace.
20700	48	48	40	SD	RT	Replace.
20793	15	18	50	SD	LT	Replace with 18" CMP SD.
21885	18	18	20	TO	LT	Replace.
21909	18	18	50	SD	LT	Replace.
21937	15	18	50	SD	RT	Replace with 18" CMP SD.
22050	24	24	20	TO	LT	Replace.
22530				SD	LT	Existing-to-remain.
22543				SD	RT	Existing-to-remain.
22603	24	24	20	TO	RT	Replace.
22614	15	15	20	TO	LT	Replace.
22619	18	18	20	TO	LT	Replace.
22620	24	24	20	TO	RT	Replace.



Company Information

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No.	Revision/Issue	Date

Sheet Name

Pipe Table

Project Name, Client, and Address

Open Ditch Improvements
Drainage District No. 6
Dallas County, IA
Hwy 44 & J Ave, Adel, IA 50003

Project

2531-25

Date

2026-06-30

Plan Scale

Sheet

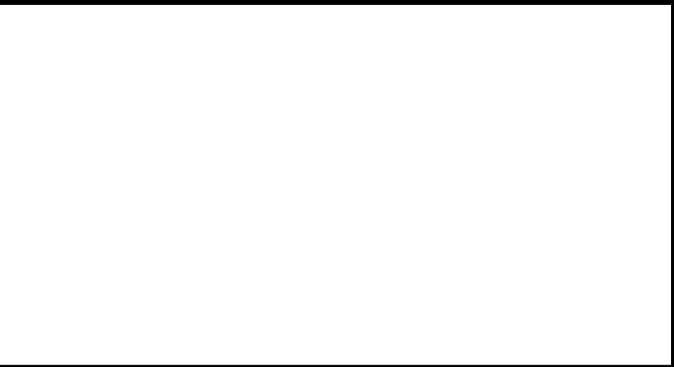
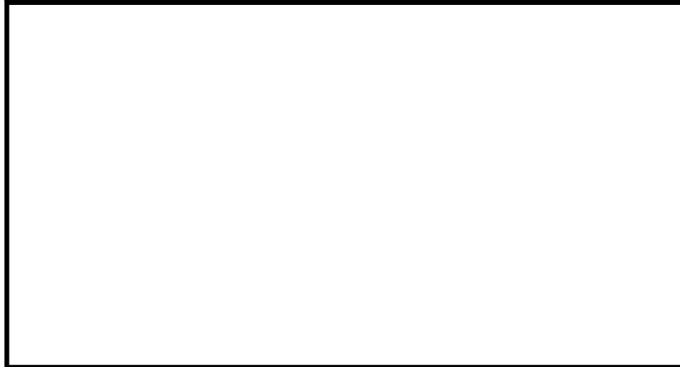
C.01

Main Open Ditch						
Station	End Area (ft²)	Avg. End Area (ft²)	Distance Ahead (ft)	Volume Ahead (ft³)	Volume Ahead (CY)	Cumulative Volume to this Station (CY)
-1733	1	12	224	2688	100	
-1509	23	76	619	47044	1742	100
-890	129	105	226	23730	879	1842
-664	81	108	329	35532	1316	2721
-335	134	255	210	53550	1983	4037
-125	376	218	37	8066	299	6020
88	61	78	339	26442	979	6319
427	95	91	452	41132	1523	7298
879	87	82	430	35260	1306	8821
1309	76	88	378	33264	1232	10127
1687	99	115	446	51290	1900	11359
2133	130	131	598	78338	2901	13259
2731	131	159	316	50244	1861	16160
3047	187	194	437	84778	3140	18021
3484	202	195	443	86385	3199	21161
3927	188	195	444	86580	3207	24360
4371	203	212	436	92432	3423	27567
4807	222	210	346	72660	2691	30990
5153	197	200	451	90200	3341	33681
5604	204	228	263	59964	2221	37022
5867	252	225	455	102375	3792	39243
6322	199	212	526	111512	4130	43035
6848	226	188	360	67680	2507	47165
7208	149	196	766	150136	5561	49672
7974	242	252	439	110628	4097	55233
8413	262	183	432	79056	2928	59330
8845	104	102	365	37230	1379	62258
9210	100	166	503	83498	3093	63637
9713	233	180	836	150480	5573	66730
10549	127	99	424	41976	1555	72303
10973	71	90	438	39420	1460	73858
11411	109	100	362	36200	1341	75318
11773	91	83	471	39093	1448	76659
12244	74	62	376	23312	863	78107
12620	50	48	425	20400	756	78970
13045	46	61	406	24766	917	79726
13451	76	51	426	21726	805	80643
13877	25	34	410	13940	516	81448
14287	42	35	394	13790	511	81964
14681	27	21	423	8883	329	82475
15104	15	15	440	6600	244	82804
15544	15	19	404	7676	284	83048
15948	22	18	446	8028	297	83332
16394	15	16	441	7056	261	83629
16835	17	26	431	11206	415	83890
17266	35	24	438	10512	389	84305
17704	13	21	430	9030	334	84694
18134	28	30	443	13290	492	85028
18577	32	31	463	14353	532	85520
19040	30	24	408	9792	363	86052
19448	19	13	492	6396	237	86415
19940	6	3	383	1149	43	86652
20323	0	0	464	0	0	86695
20787	0	6	434	2604	96	86695
21221	13	11	400	4400	163	86791
21621	10	5	434	2170	80	86954
22055	0	20	472	9440	350	87034
22527	40	20	90	1800	67	87384
22617	0	—	—	—	—	87451



Company Information
AgriVia PLLC
PO Box 44
1124 Willis Ave
Perry, IA 50220

Designer
TJB
Drafter
TJB
Checker
JLH

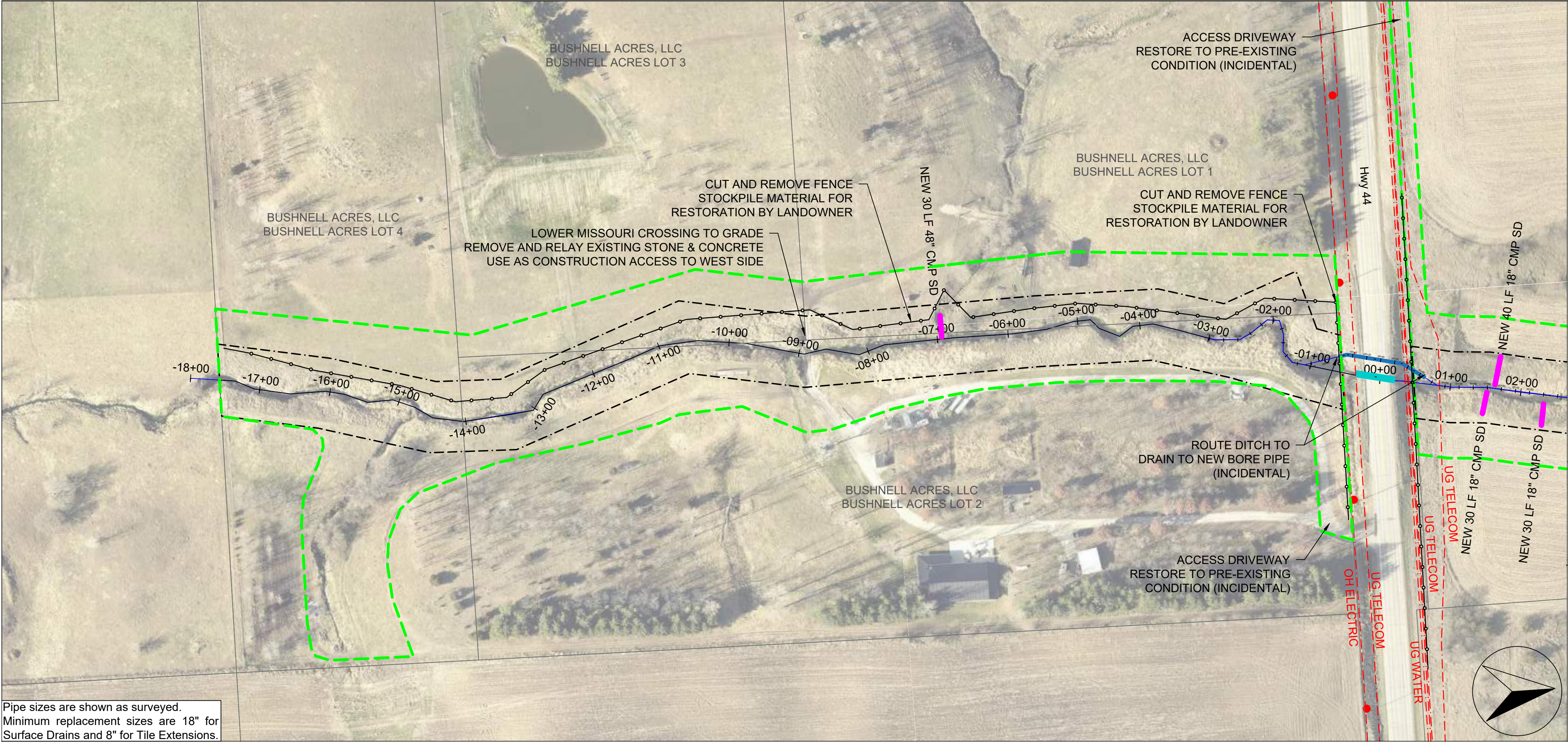


No.	Revision/Issue	Date

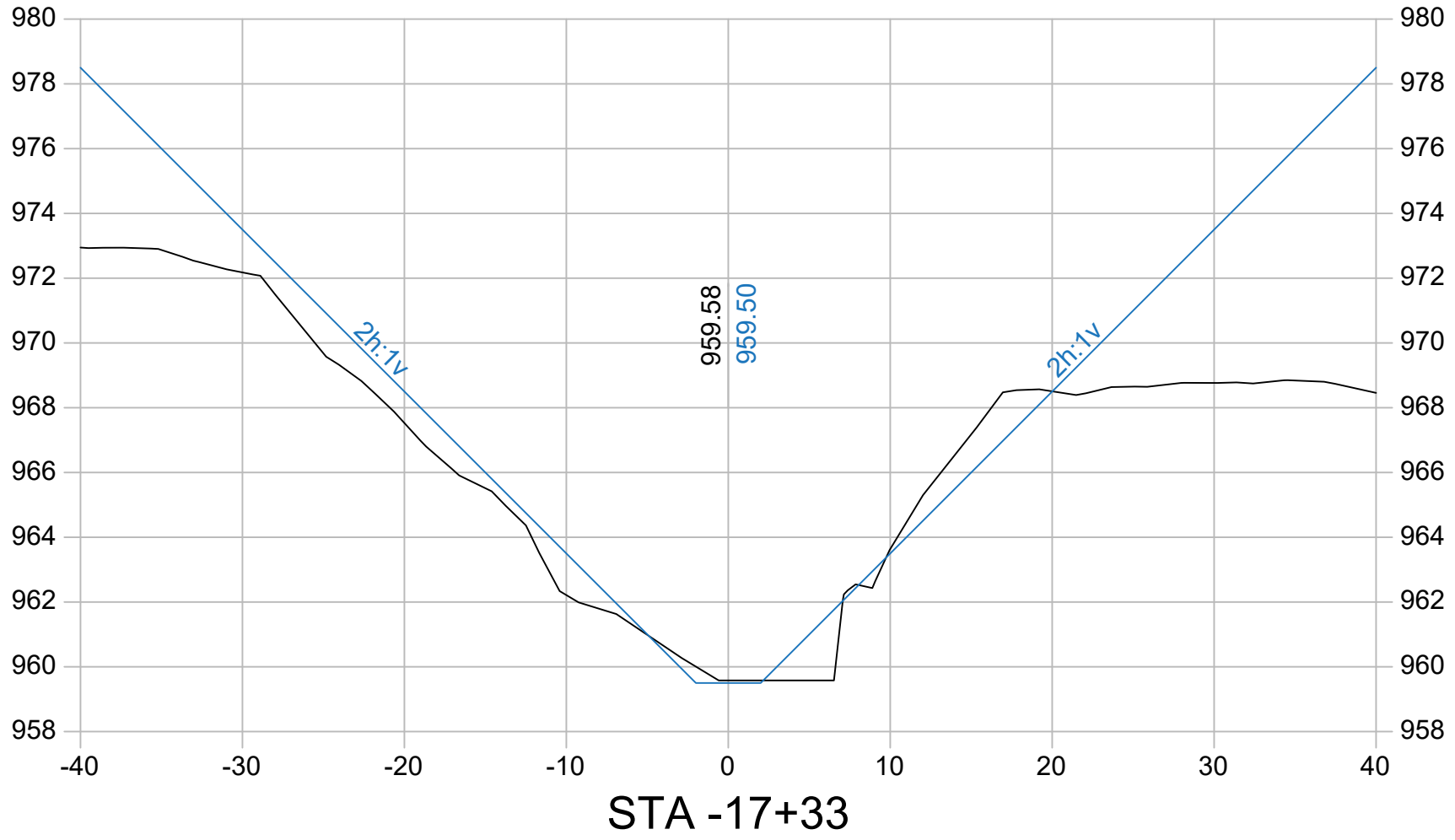
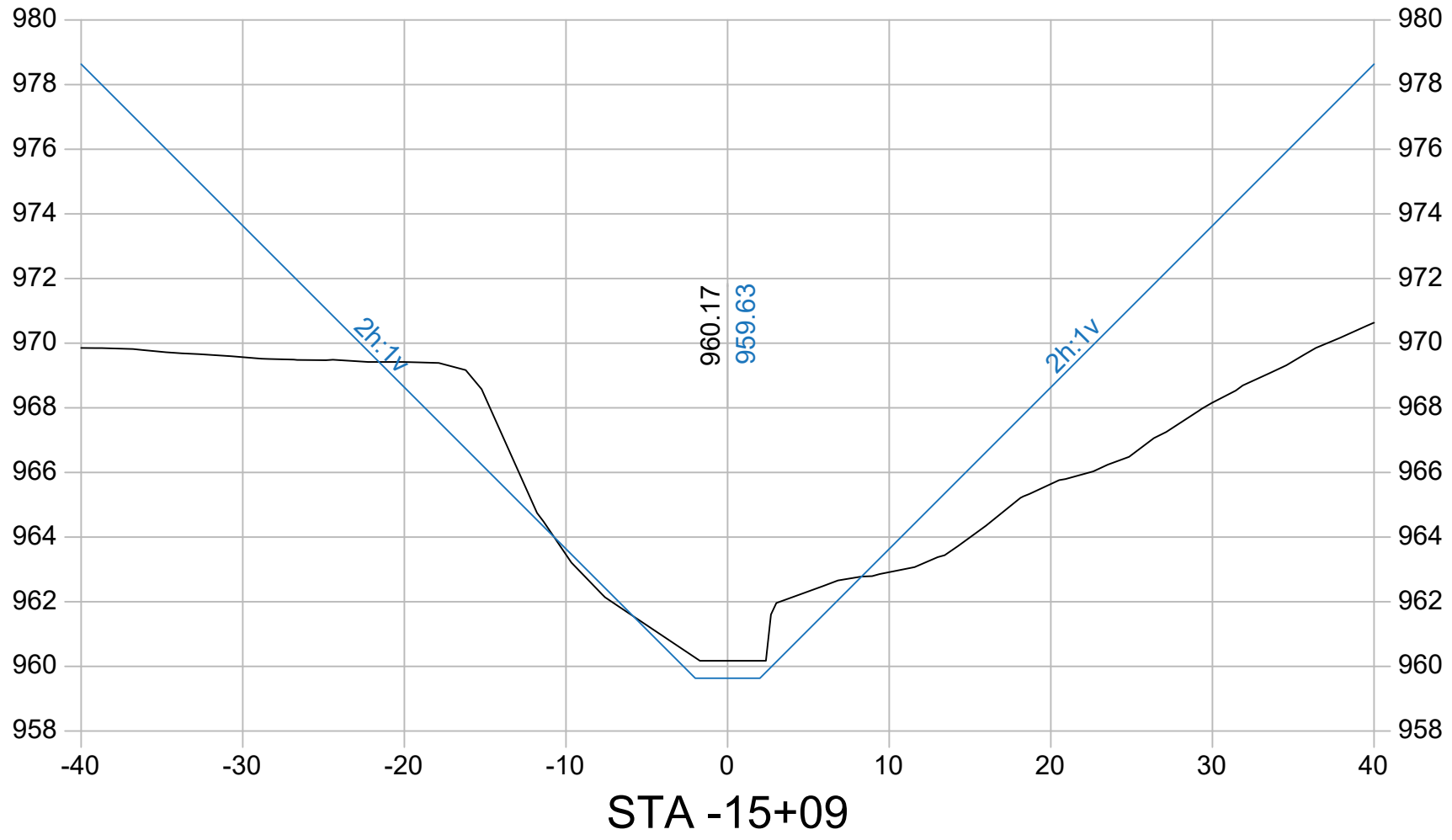
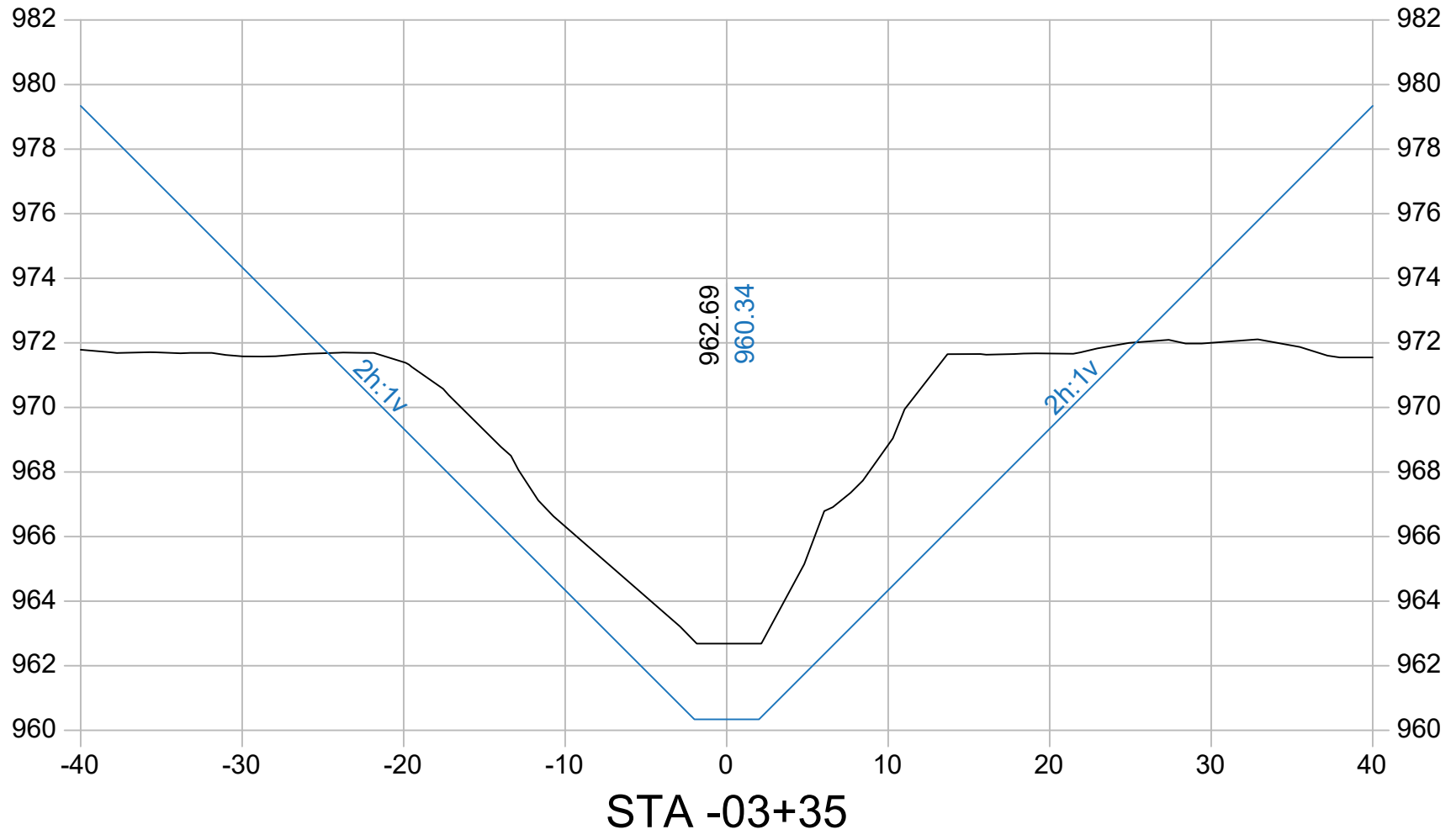
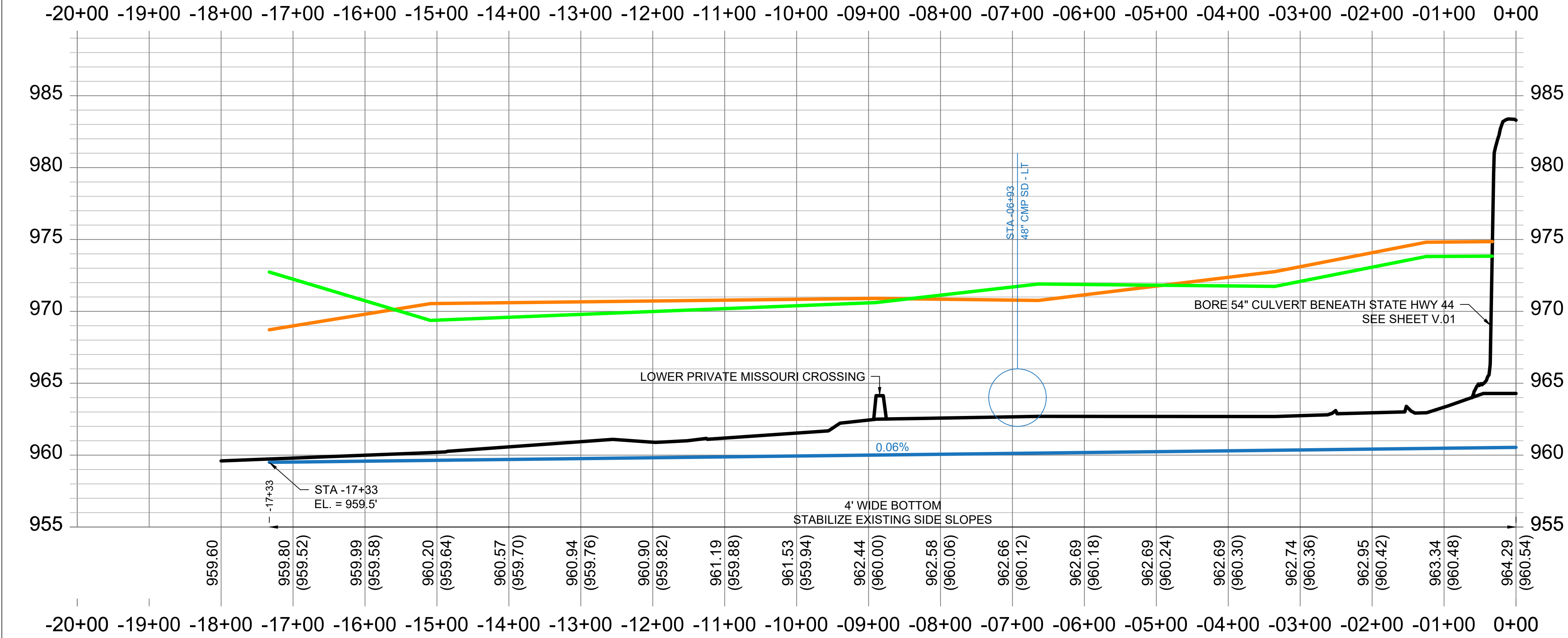
Sheet Name
Volume Table

Project Name, Client, and Address
Open Ditch Improvements
Drainage District No. 6
Dallas County, IA
Hwy 44 & J Ave, Adel, IA 50003

Project 2531-25	C.02
Date 2026-06-30	
Plan Scale	



Pipe sizes are shown as surveyed.
Minimum replacement sizes are 18" for
Surface Drains and 8" for Tile Extensions.



Company Information
AgriVia PLLC
PO Box 44
1124 Willis Ave
Perry, IA 50220

Designer:
TJB
Drafter:
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Checker:
JLH

PLAN LEGEND

- Parcel Lines
- Work Area (100' each side)
- Ditch ROW (50' each side)
- Surface Drains
- Tile Outlets
- Utilities (in red)
- Fences

PROFILE LEGEND

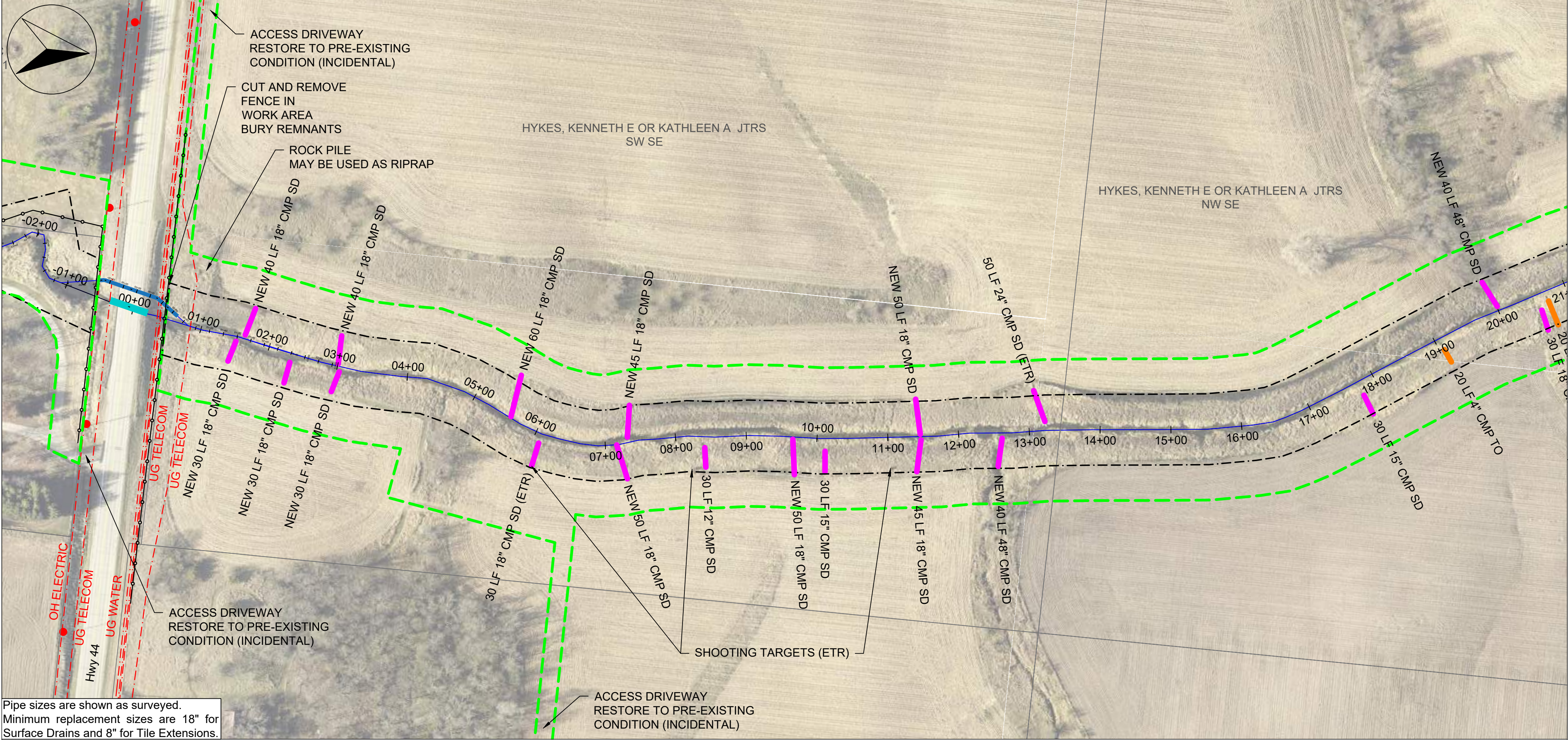
- Design Ditch Grade
- Surveyed Ditch Bottom
- Left Top of Bank
- Right Top of Bank

No.	Revision/Issue	Date

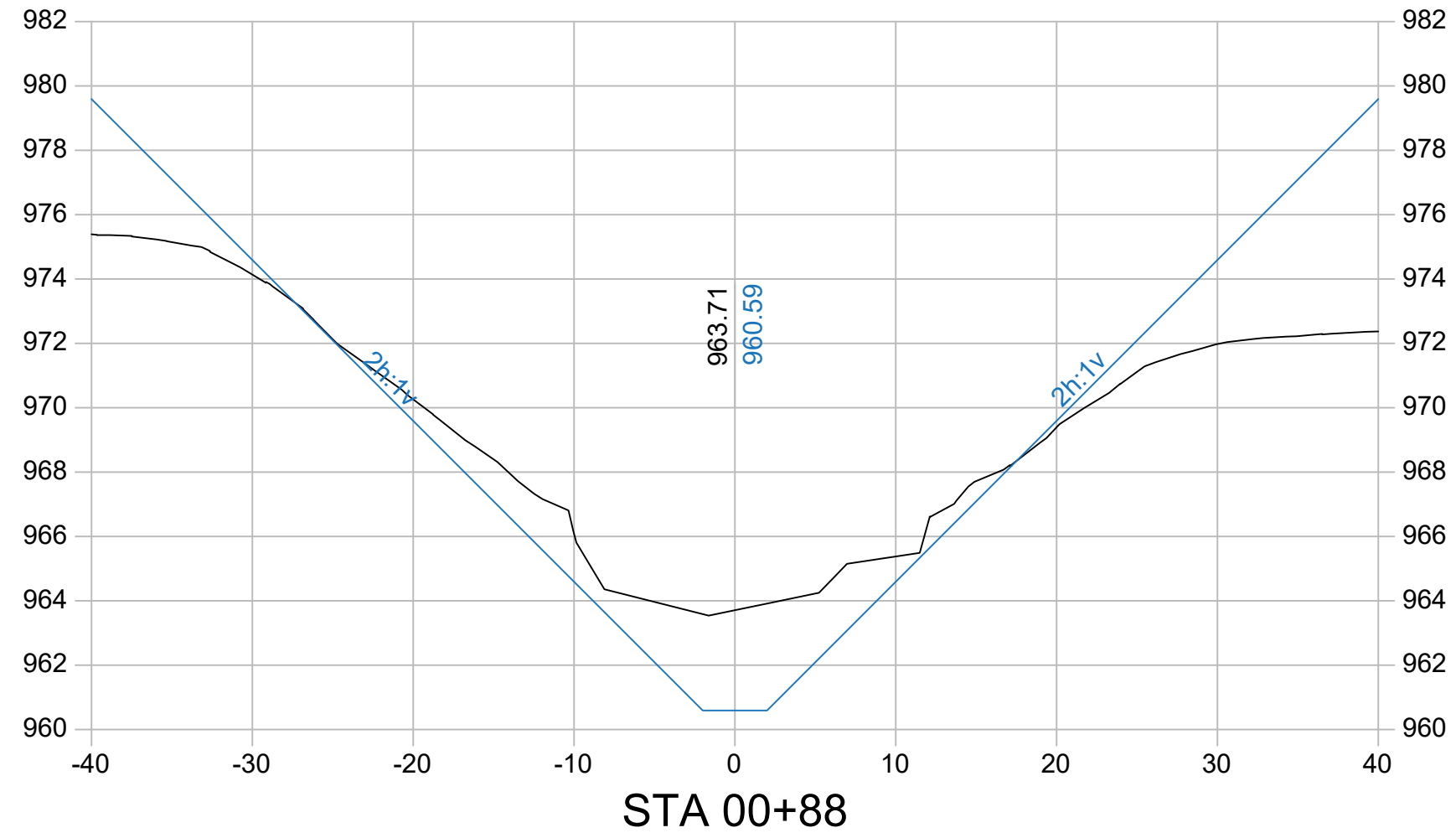
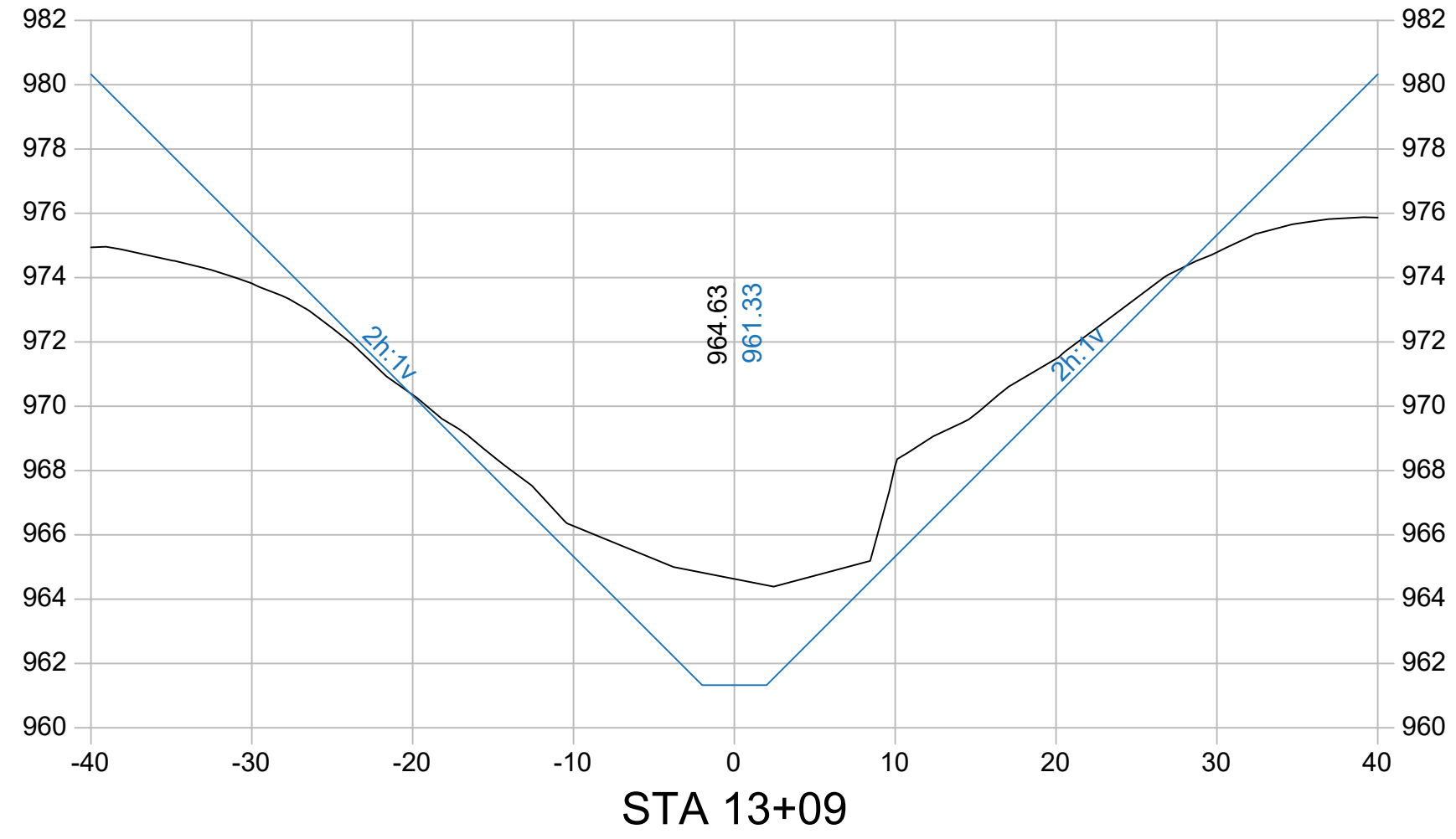
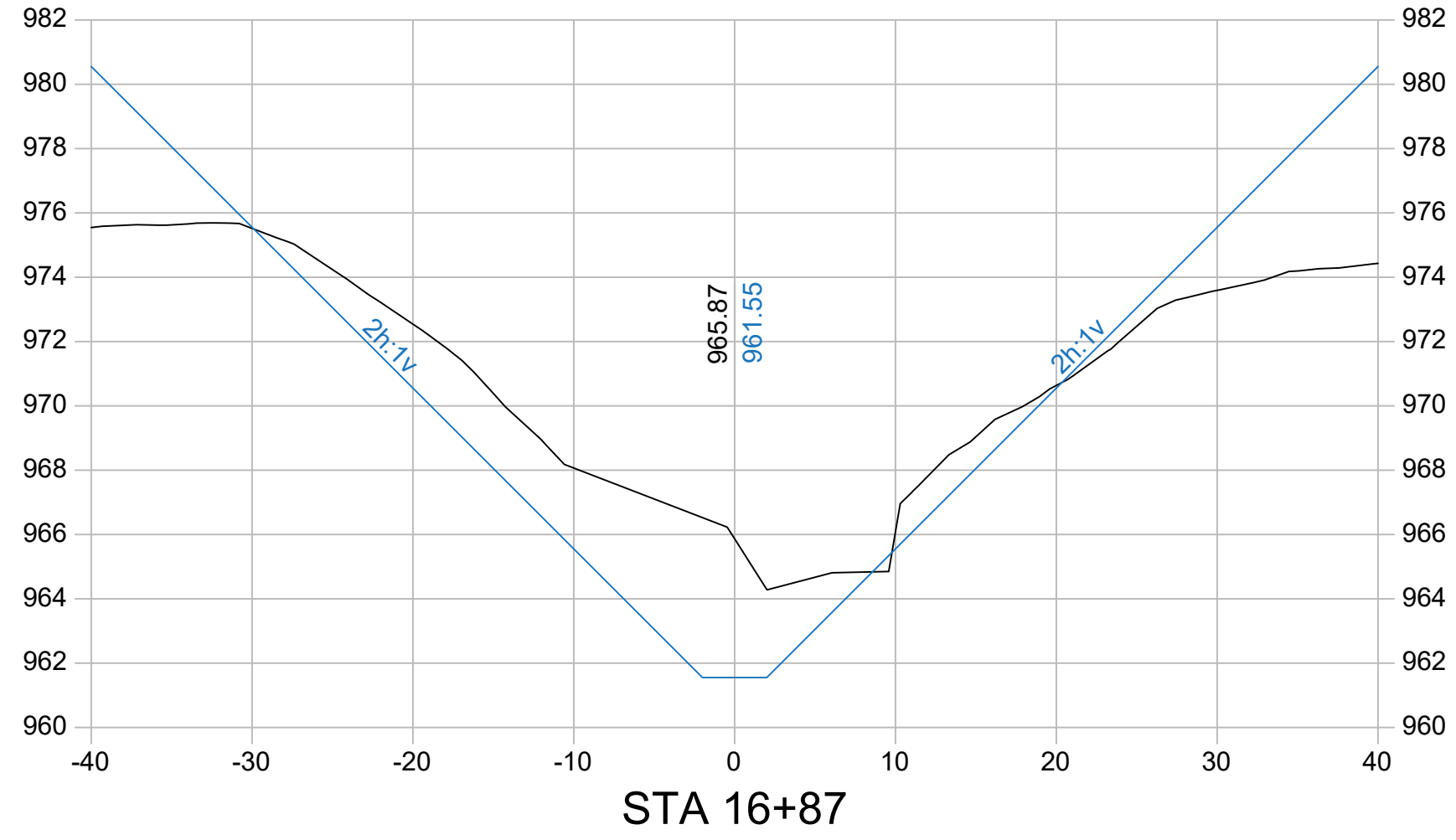
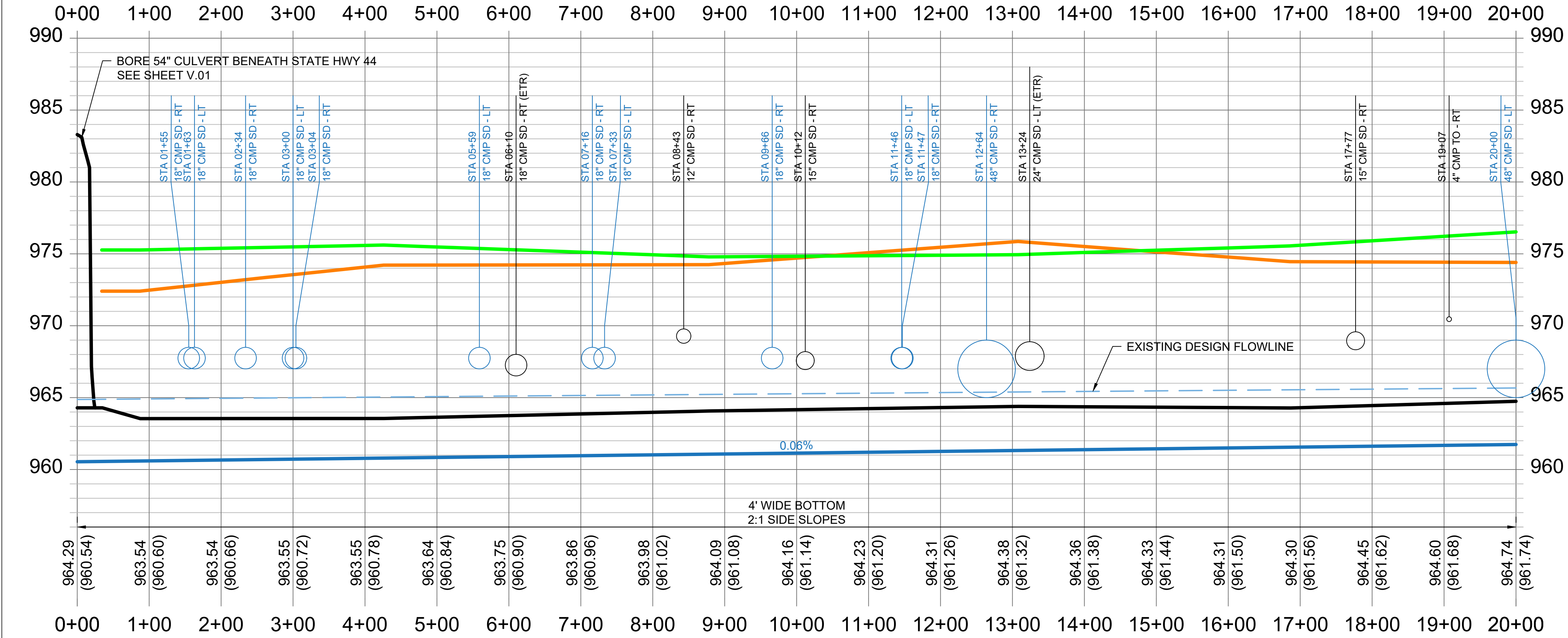
Sheet Name
Plan & Profile
Main Open Ditch
Sta -20+00 → 0+00

Project Name, Client, and Address
Open Ditch Improvements
Drainage District No. 6
Dallas County, IA
Hwy 44 & J Ave, Adel, IA 50003

Project 2531-25	D.01
Date 2026-06-30	
Plan Scale 1" = 200'	



Pipe sizes are shown as surveyed.
Minimum replacement sizes are 18" for
Surface Drains and 8" for
Tile Extensions.



Company Information
AgriVia PLLC
PO Box 44
1124 Willis Ave
Perry, IA 50220

Designer:
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Checker:
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PLAN LEGEND

- Parcel Lines
- Work Area (100' each side)
- Ditch ROW (50' each side)
- Surface Drains
- Tile Outlets
- Utilities (in red)
- Fences

PROFILE LEGEND

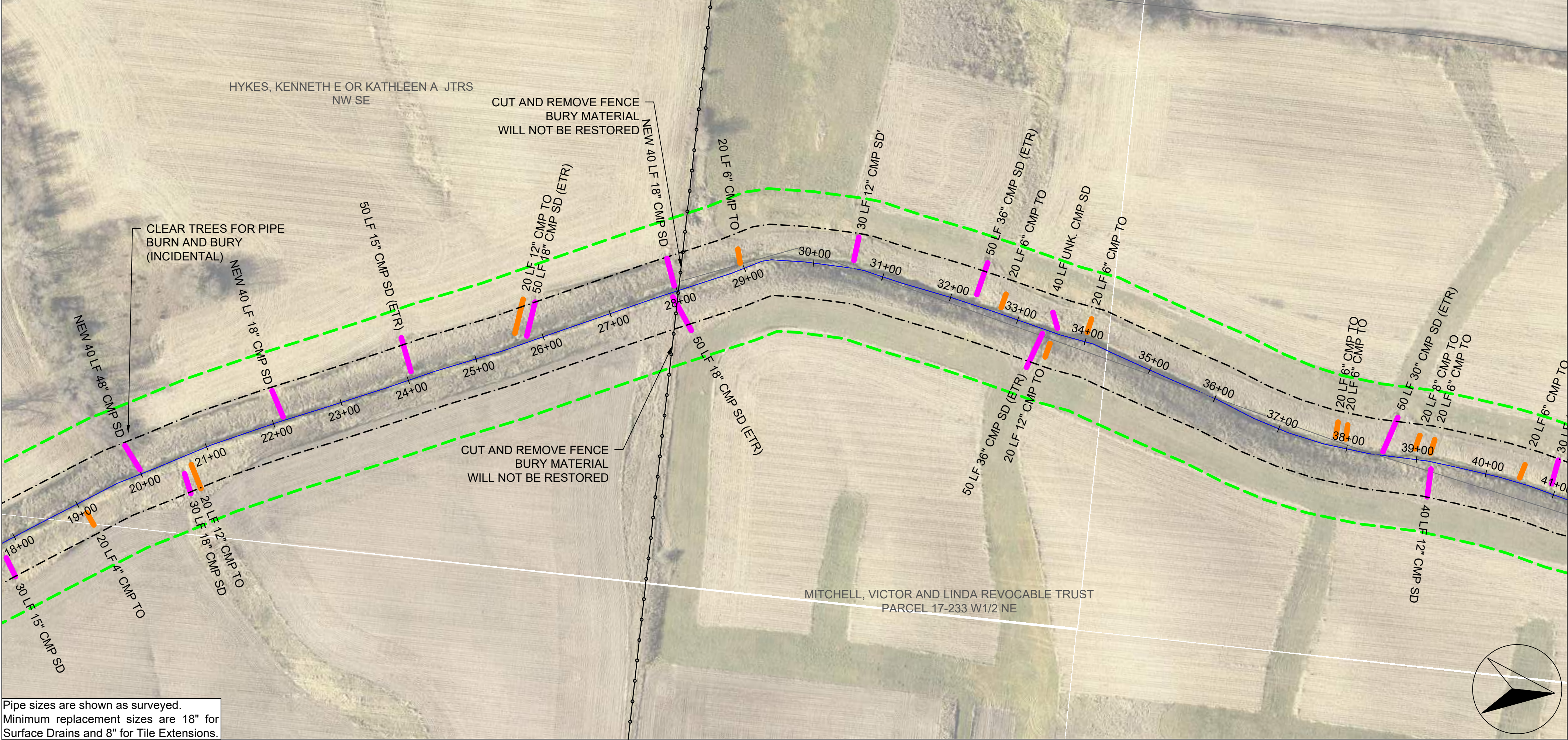
- Design Ditch Grade
- Surveyed Ditch Bottom
- Left Top of Bank
- Right Top of Bank

No.	Revision/Issue	Date

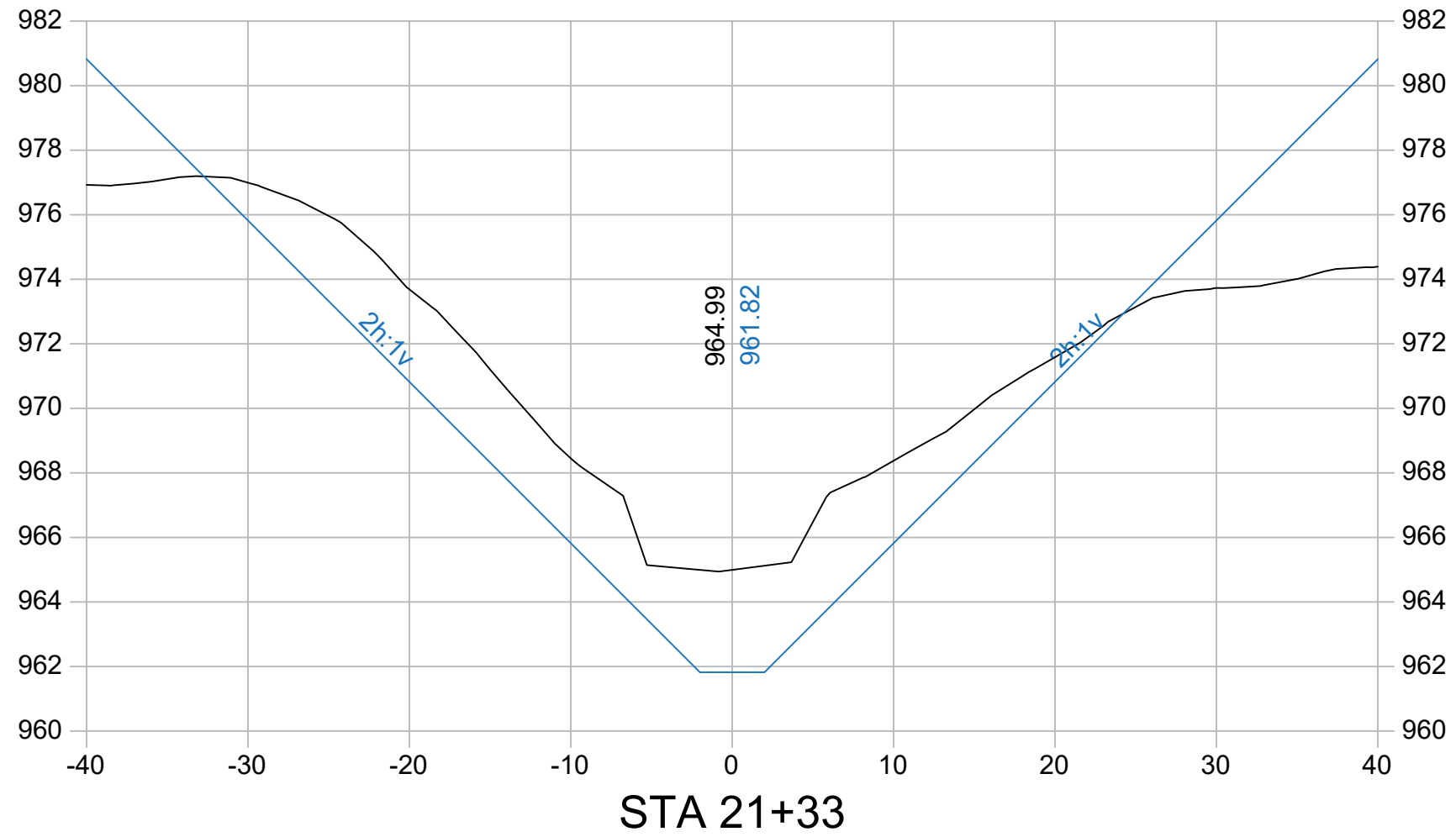
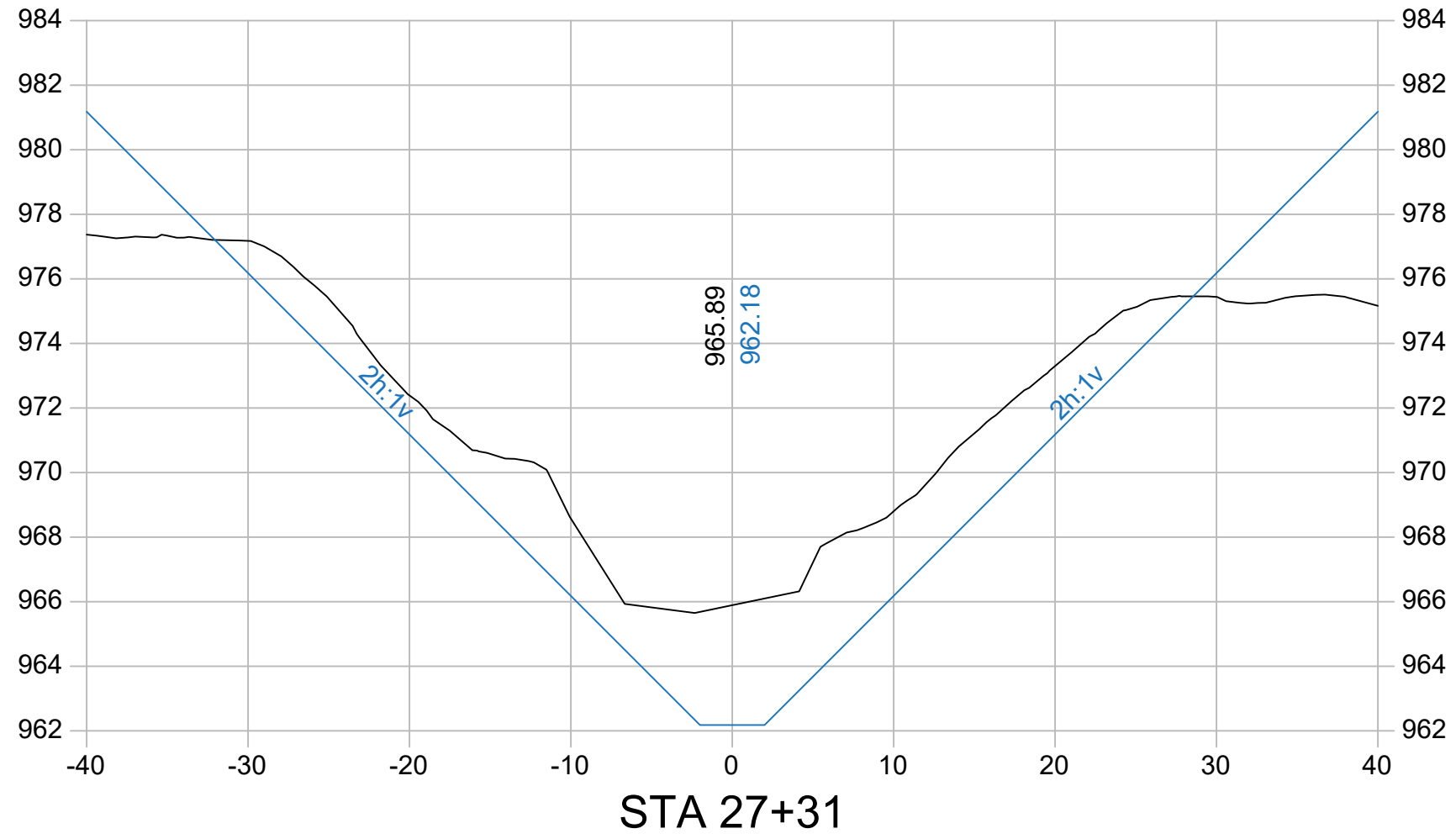
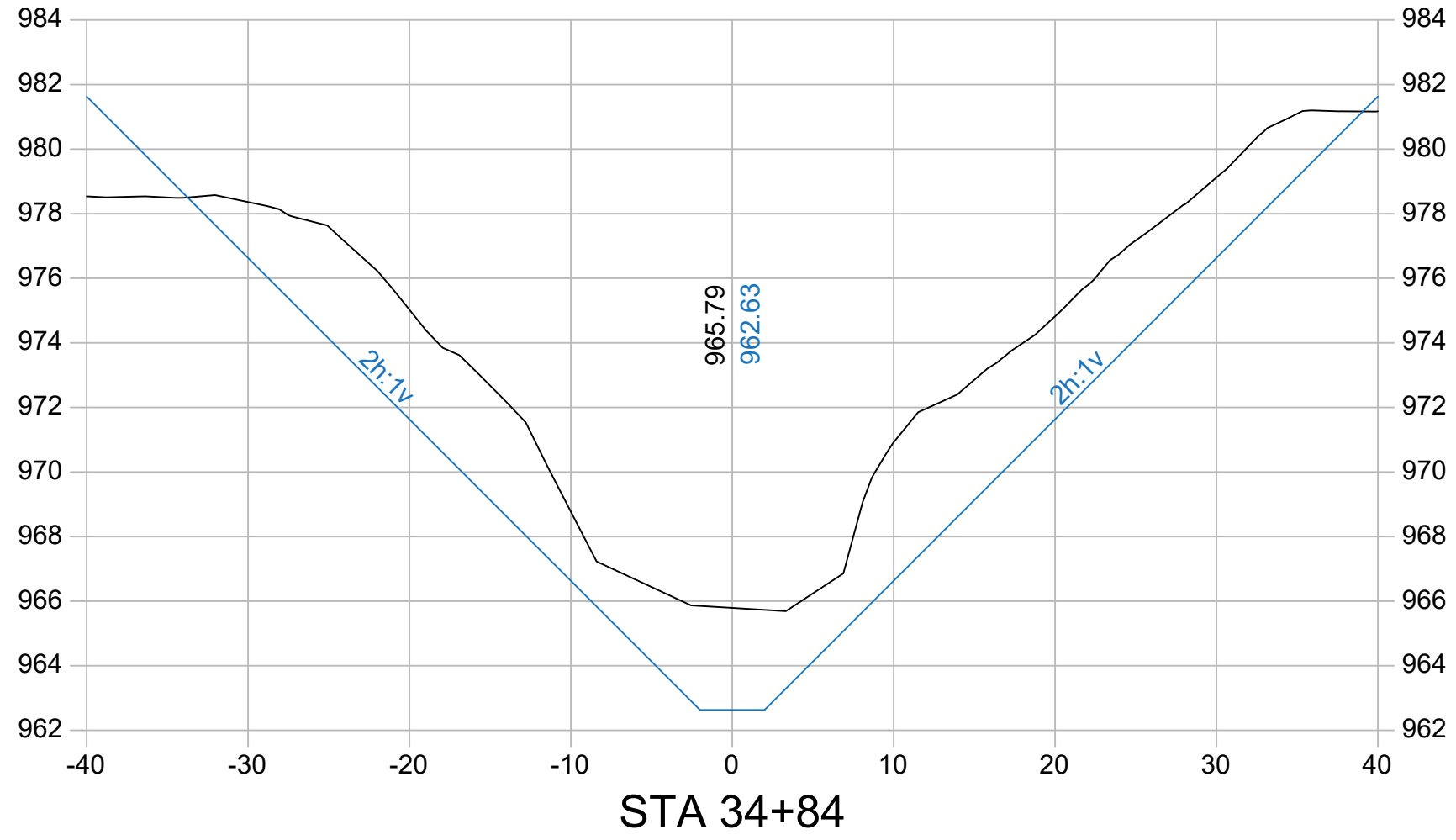
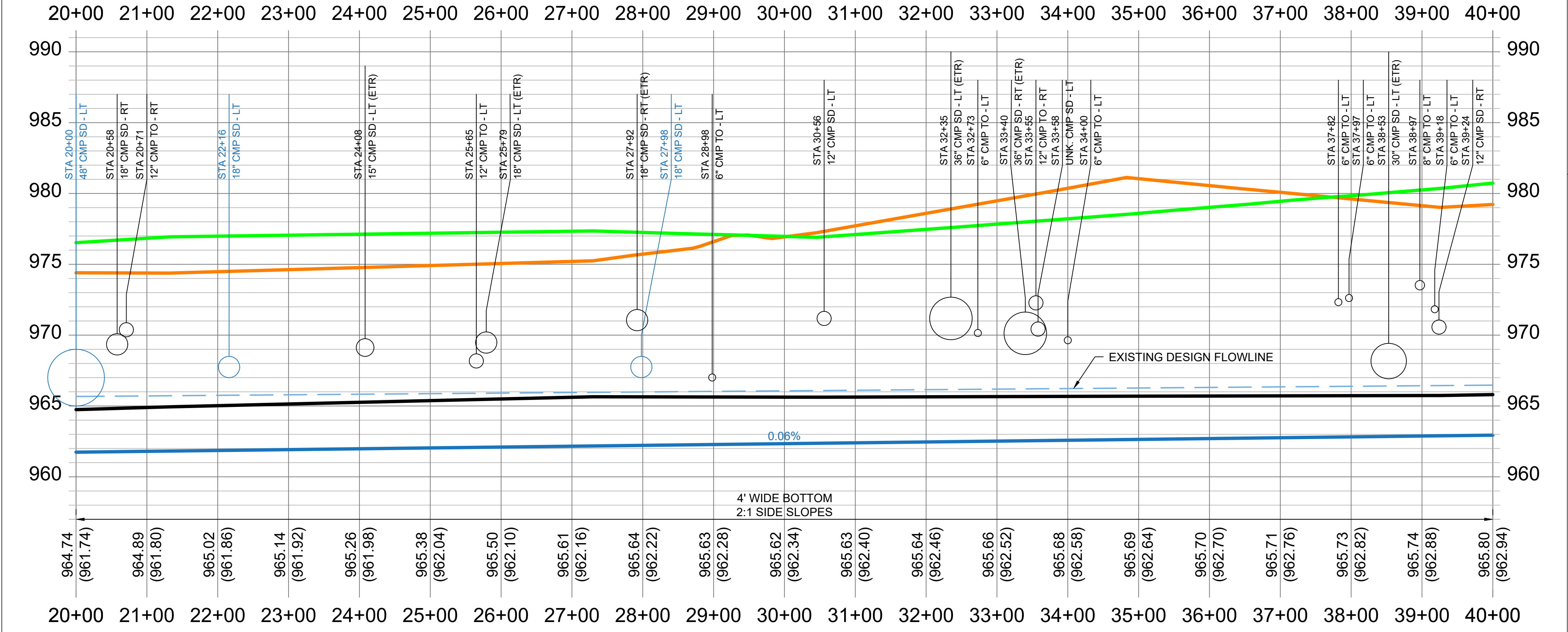
Sheet Name
Plan & Profile
Main Open Ditch
Sta 0+00 → 20+00

Project Name, Client, and Address
Open Ditch Improvements
Drainage District No. 6
Dallas County, IA
Hwy 44 & J Ave, Adel, IA 50003

Project 2531-25	D.02
Date 2026-06-30	
Plan Scale 1" = 200'	



Pipe sizes are shown as surveyed.
Minimum replacement sizes are 18" for
Surface Drains and 8" for Tile Extensions.



Company Information
AgriVia PLLC
PO Box 44
1124 Willis Ave
Perry, IA 50220

Designer:
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Drafter:
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Checker:
JLH

PLAN LEGEND

- Parcel Lines
- Work Area (100' each side)
- Ditch ROW (50' each side)
- Surface Drains
- Tile Outlets
- Utilities (in red)
- Fences

PROFILE LEGEND

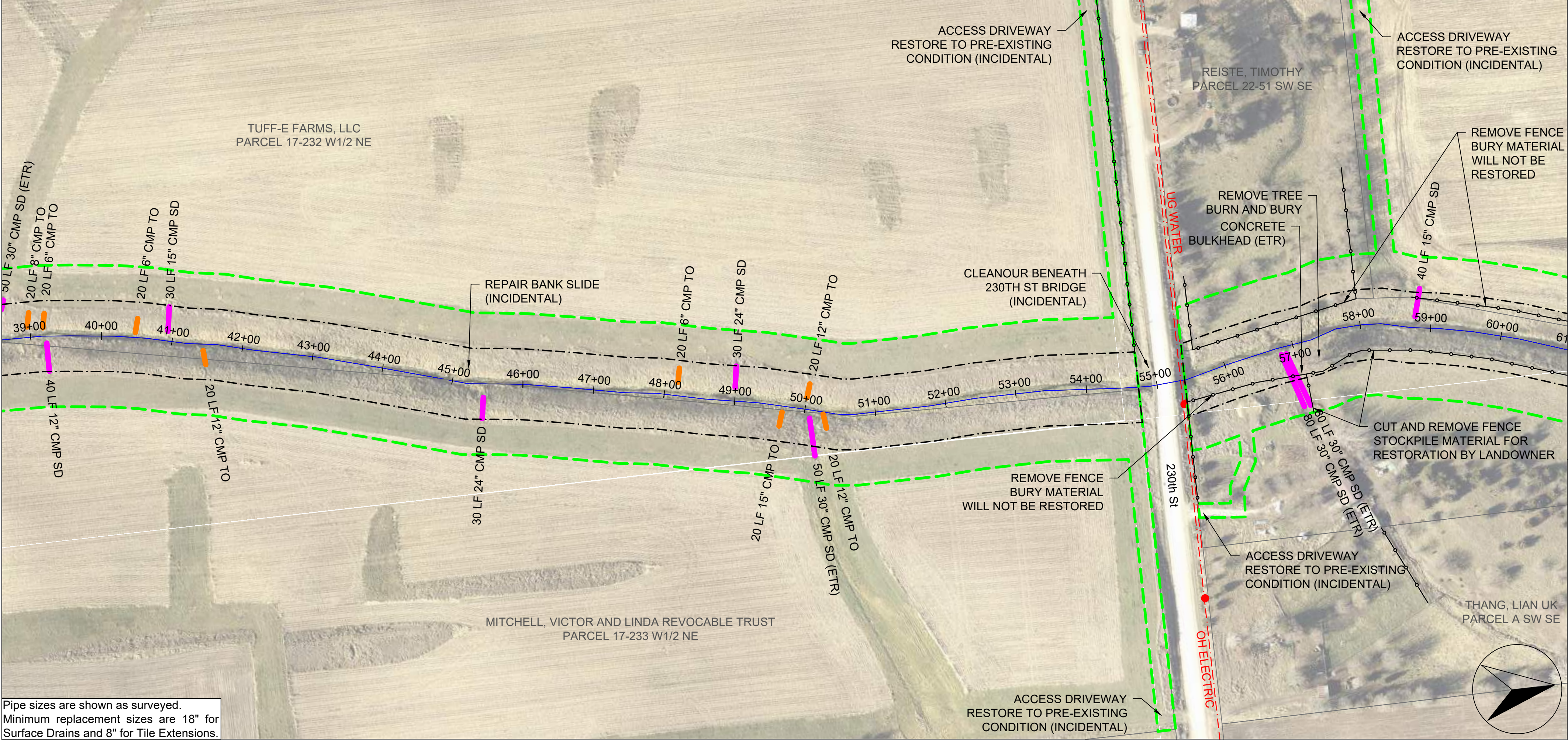
- Design Ditch Grade
- Surveyed Ditch Bottom
- Left Top of Bank
- Right Top of Bank

No.	Revision/Issue	Date

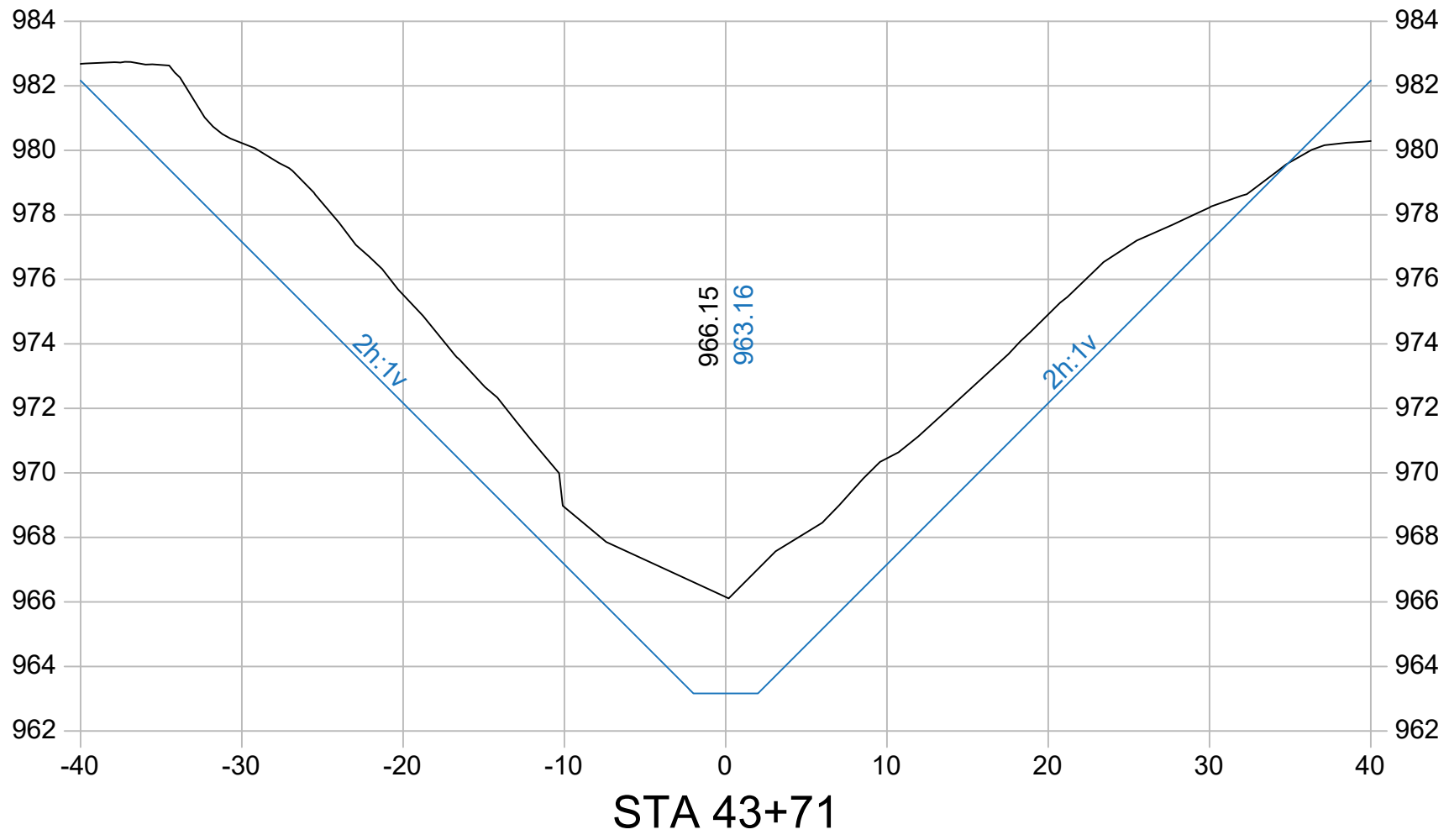
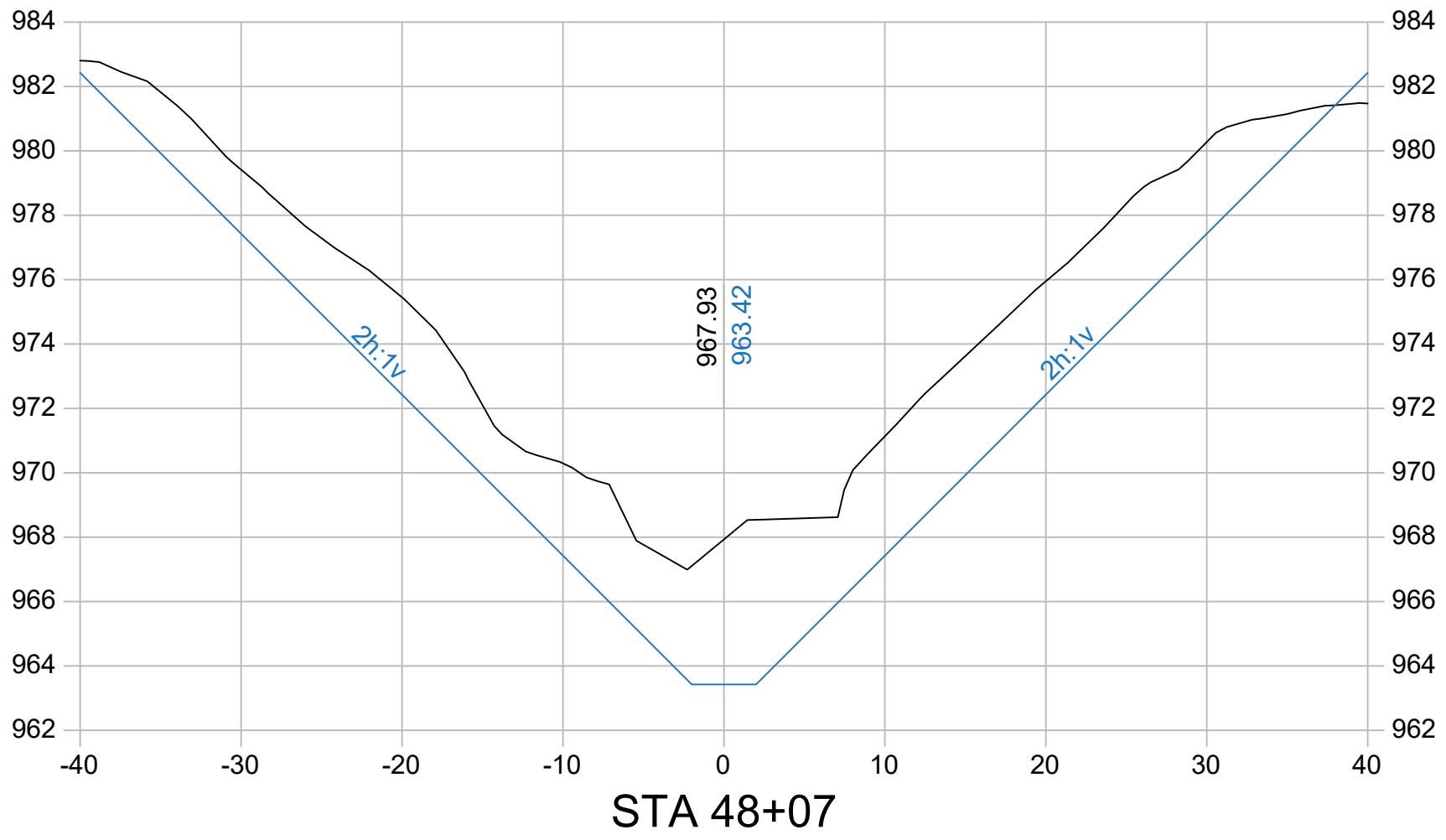
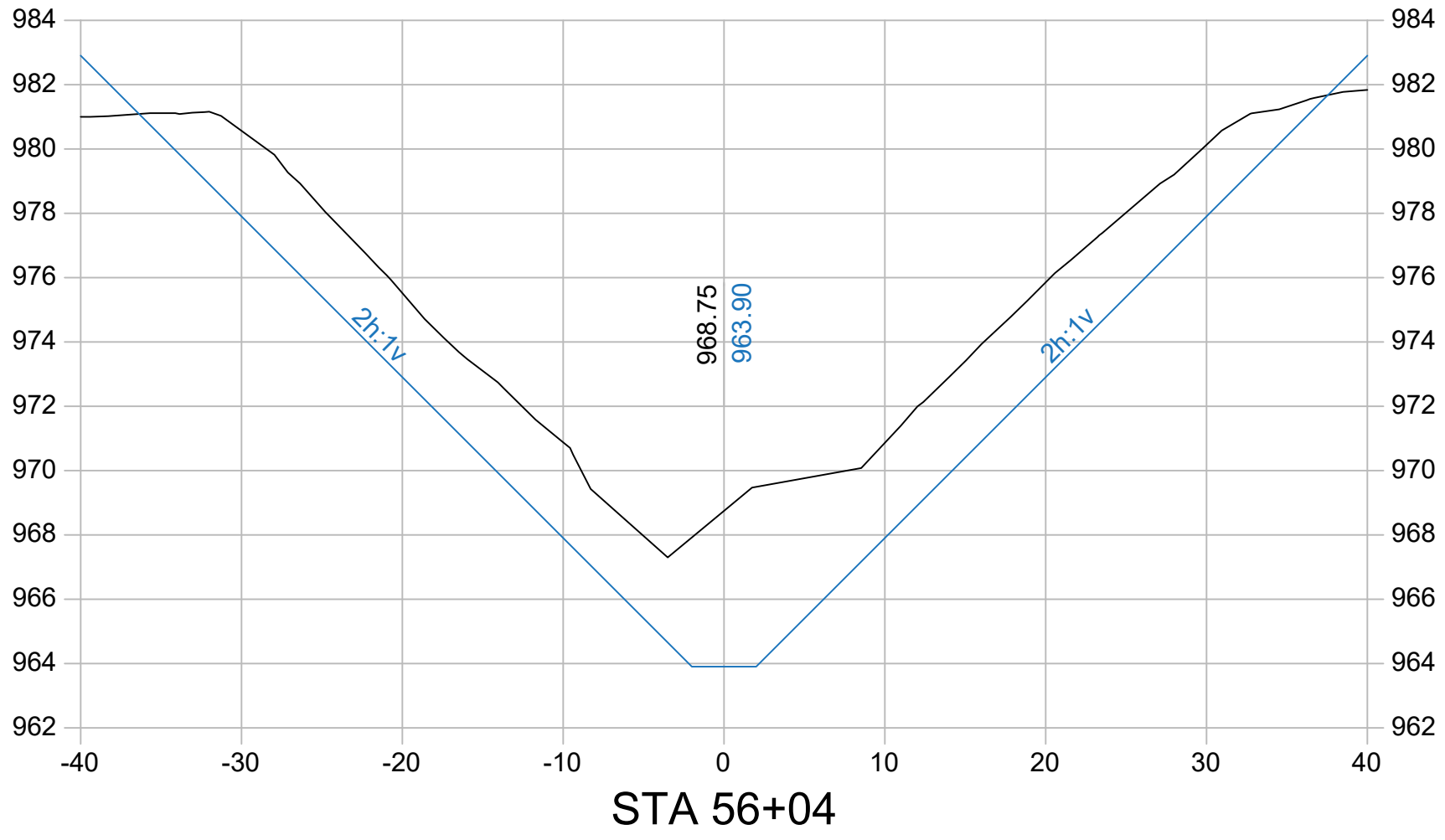
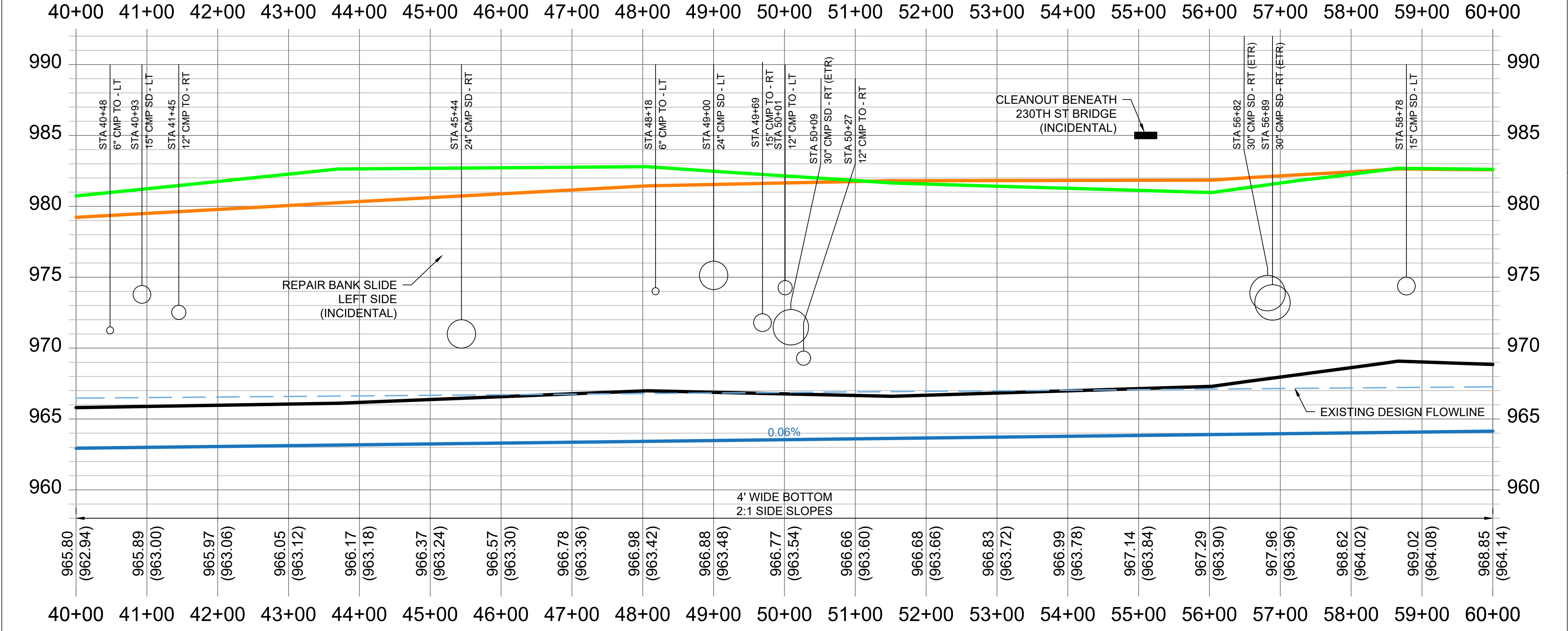
Sheet Name
Plan & Profile
Main Open Ditch
Sta 20+00 → 40+00

Project Name, Client, and Address
Open Ditch Improvements
Drainage District No. 6
Dallas County, IA
Hwy 44 & J Ave, Adel, IA 50003

Project 2531-25	D.03
Date 2026-06-30	
Plan Scale 1" = 200'	



Pipe sizes are shown as surveyed.
Minimum replacement sizes are 18" for
Surface Drains and 8" for Tile Extensions.



Company Information
AgriVia PLLC
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Designer:
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Checker:
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PLAN LEGEND

- Parcel Lines
- Work Area (100' each side)
- Ditch ROW (50' each side)
- Surface Drains
- Tile Outlets
- Utilities (in red)
- Fences

PROFILE LEGEND

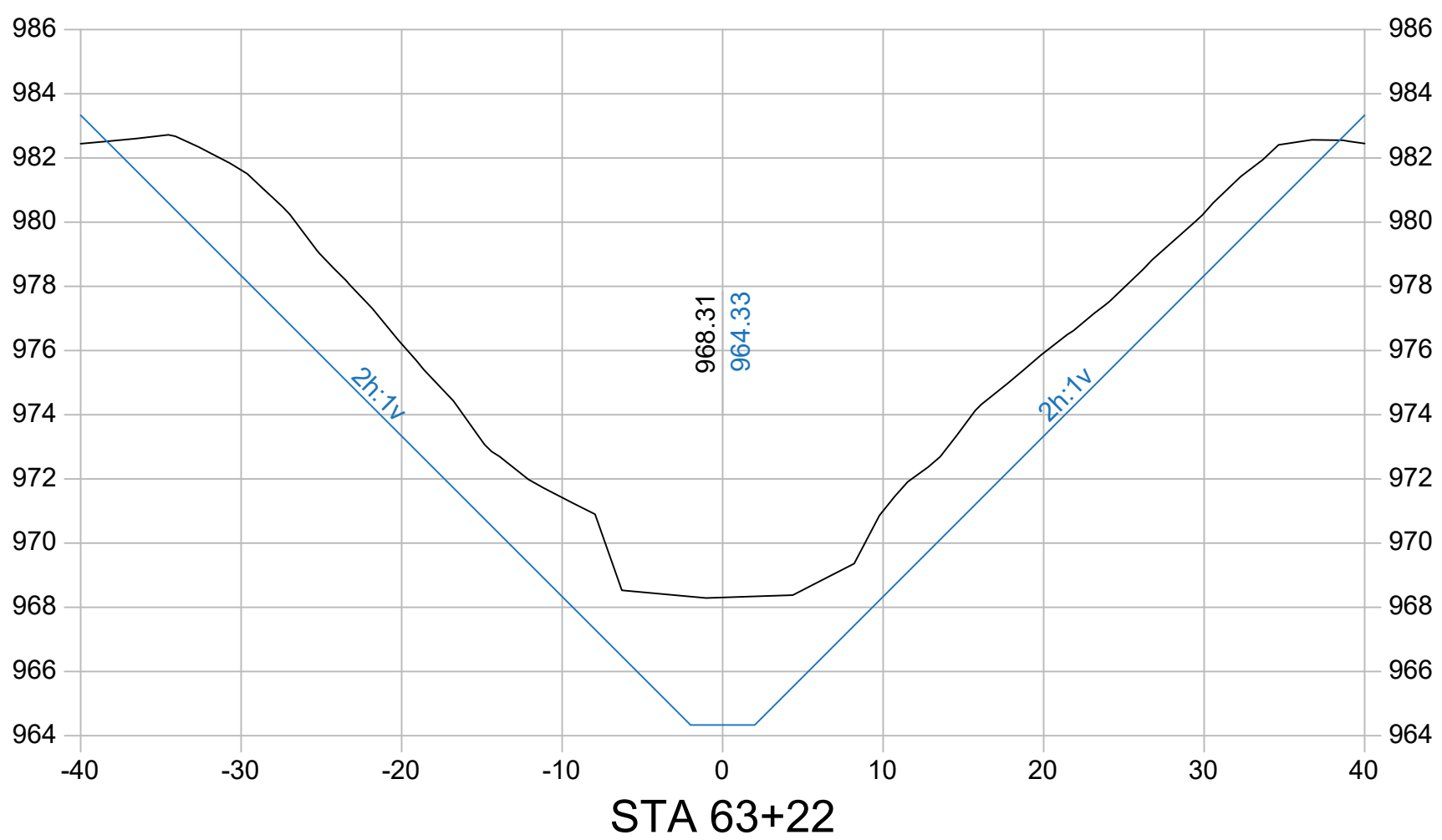
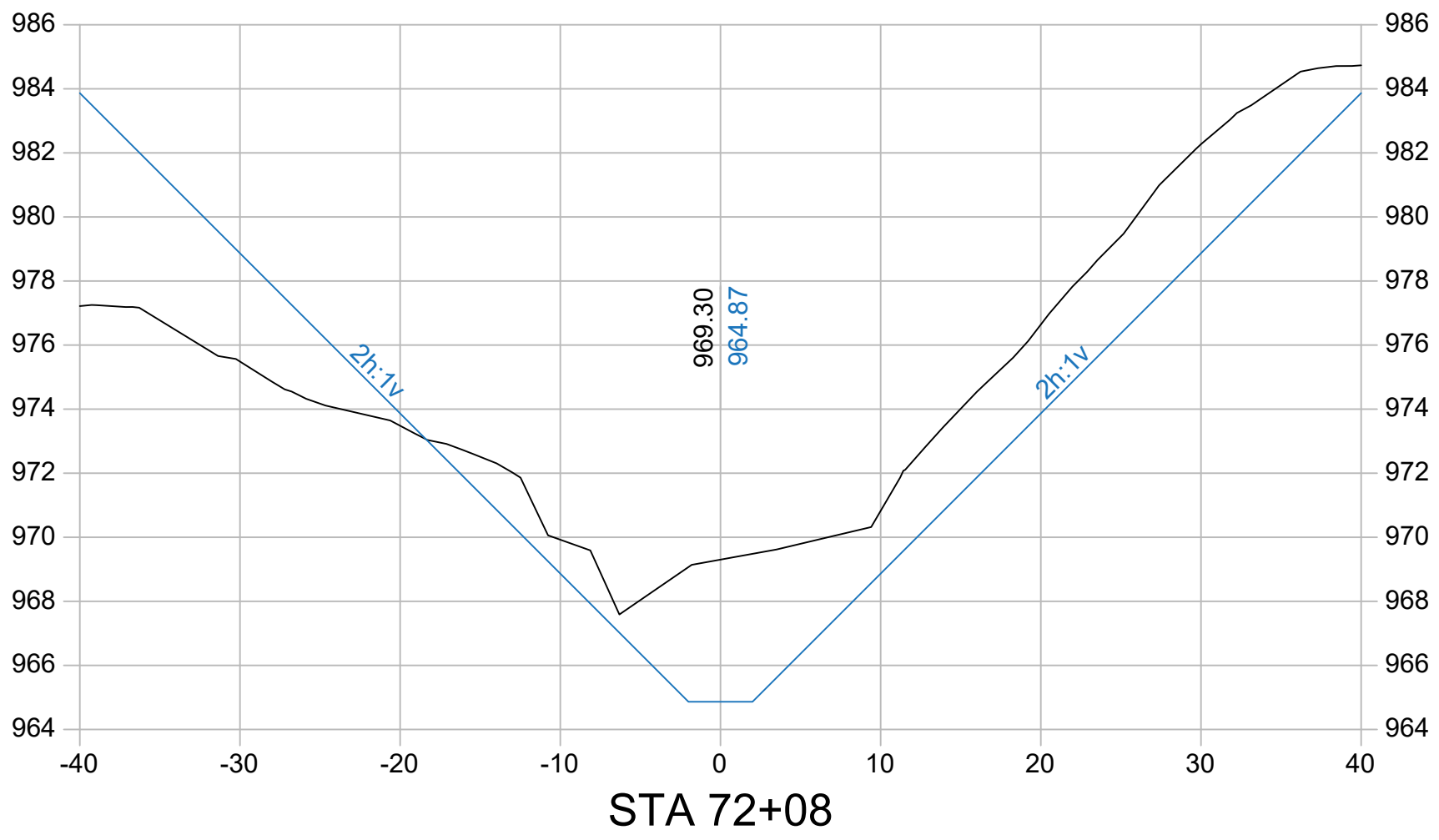
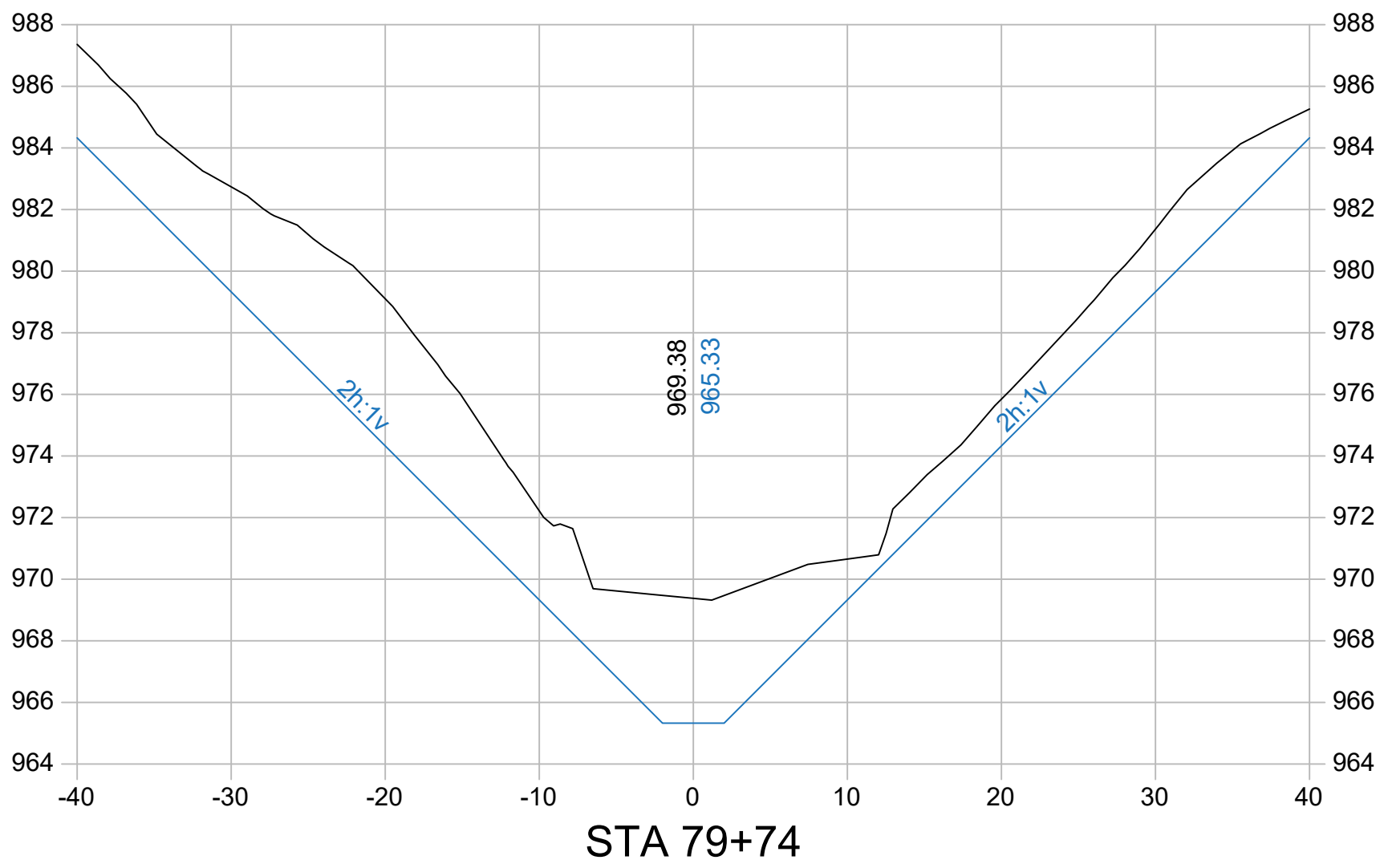
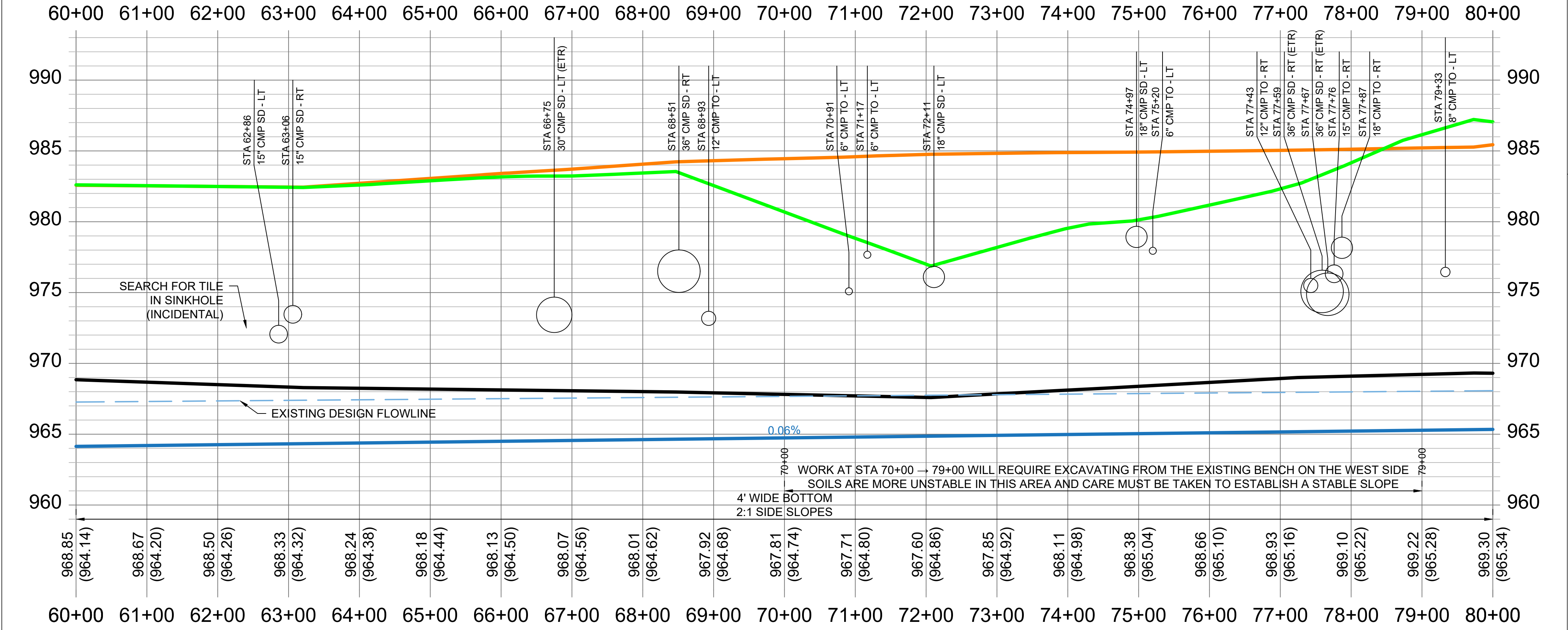
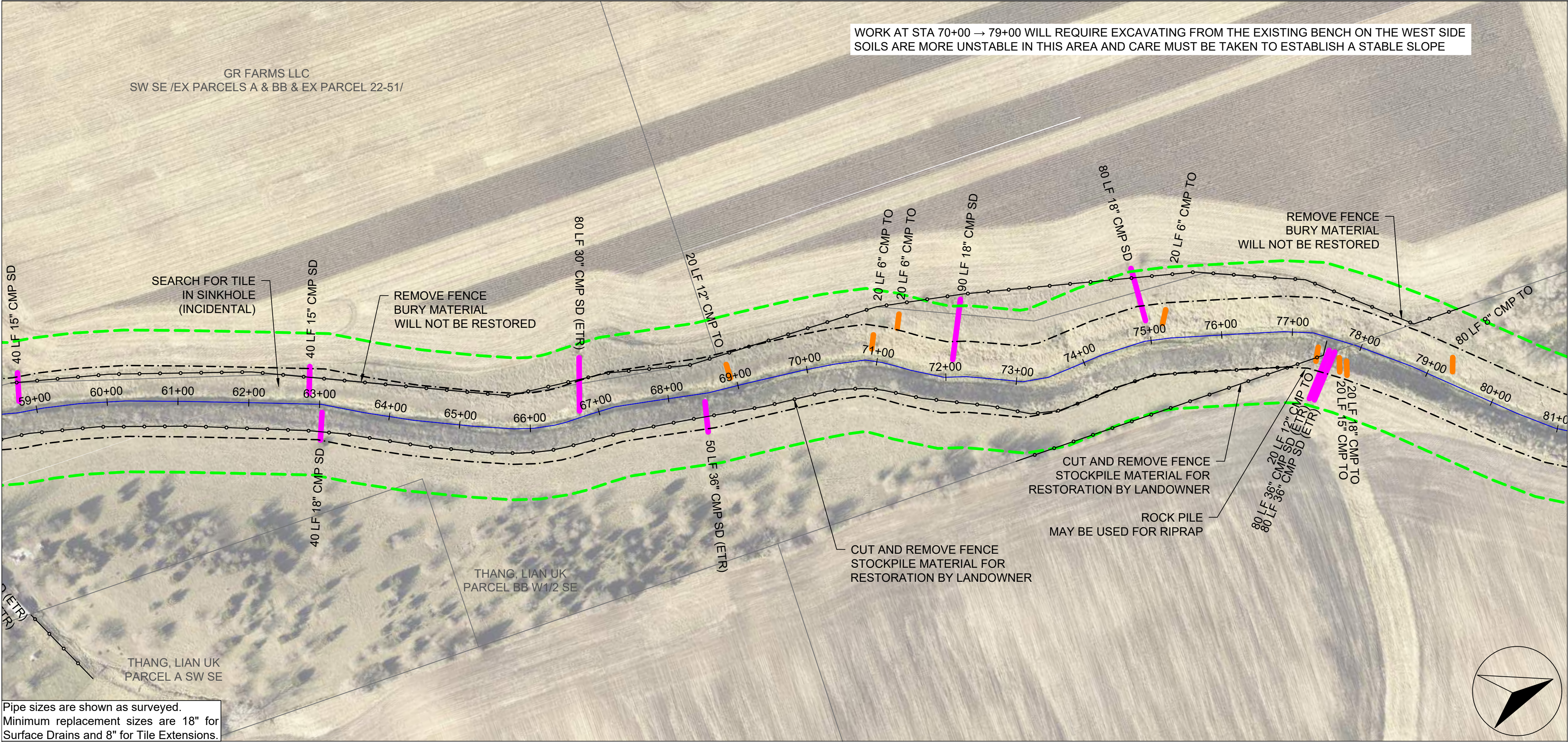
- Design Ditch Grade
- Surveyed Ditch Bottom
- Left Top of Bank
- Right Top of Bank

No.	Revision/Issue	Date

Sheet Name
Plan & Profile
Main Open Ditch
Sta 40+00 → 60+00

Project Name, Client, and Address
Open Ditch Improvements
Drainage District No. 6
Dallas County, IA
Hwy 44 & J Ave, Adel, IA 50003

Project 2531-25	D.04
Date 2026-06-30	
Plan Scale 1" = 200'	



Company Information
AgriVia PLLC
PO Box 44
1124 Willis Ave
Perry, IA 50220

Designer:
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Drafter:
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Checker:
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PLAN LEGEND

- Parcel Lines
- Work Area (100' each side)
- Ditch ROW (50' each side)
- Surface Drains
- Tile Outlets
- Utilities (in red)
- Fences

PROFILE LEGEND

- Design Ditch Grade
- Surveyed Ditch Bottom
- Left Top of Bank
- Right Top of Bank

No.	Revision/Issue	Date

Sheet Name
Plan & Profile
Main Open Ditch
Sta 60+00 → 80+00

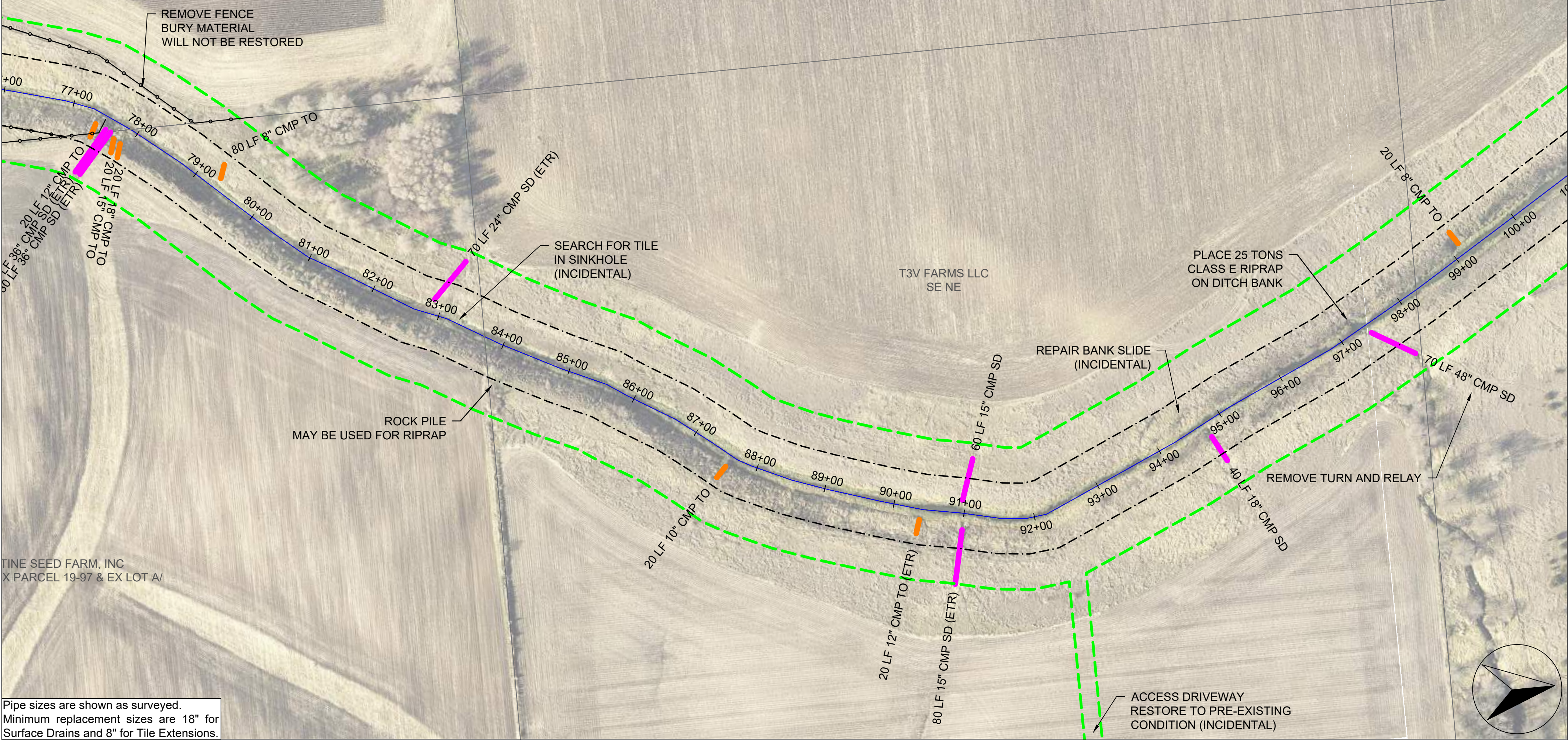
Project Name, Client, and Address
Open Ditch Improvements
Drainage District No. 6
Dallas County, IA
Hwy 44 & J Ave, Adel, IA 50003

Project
2531-25

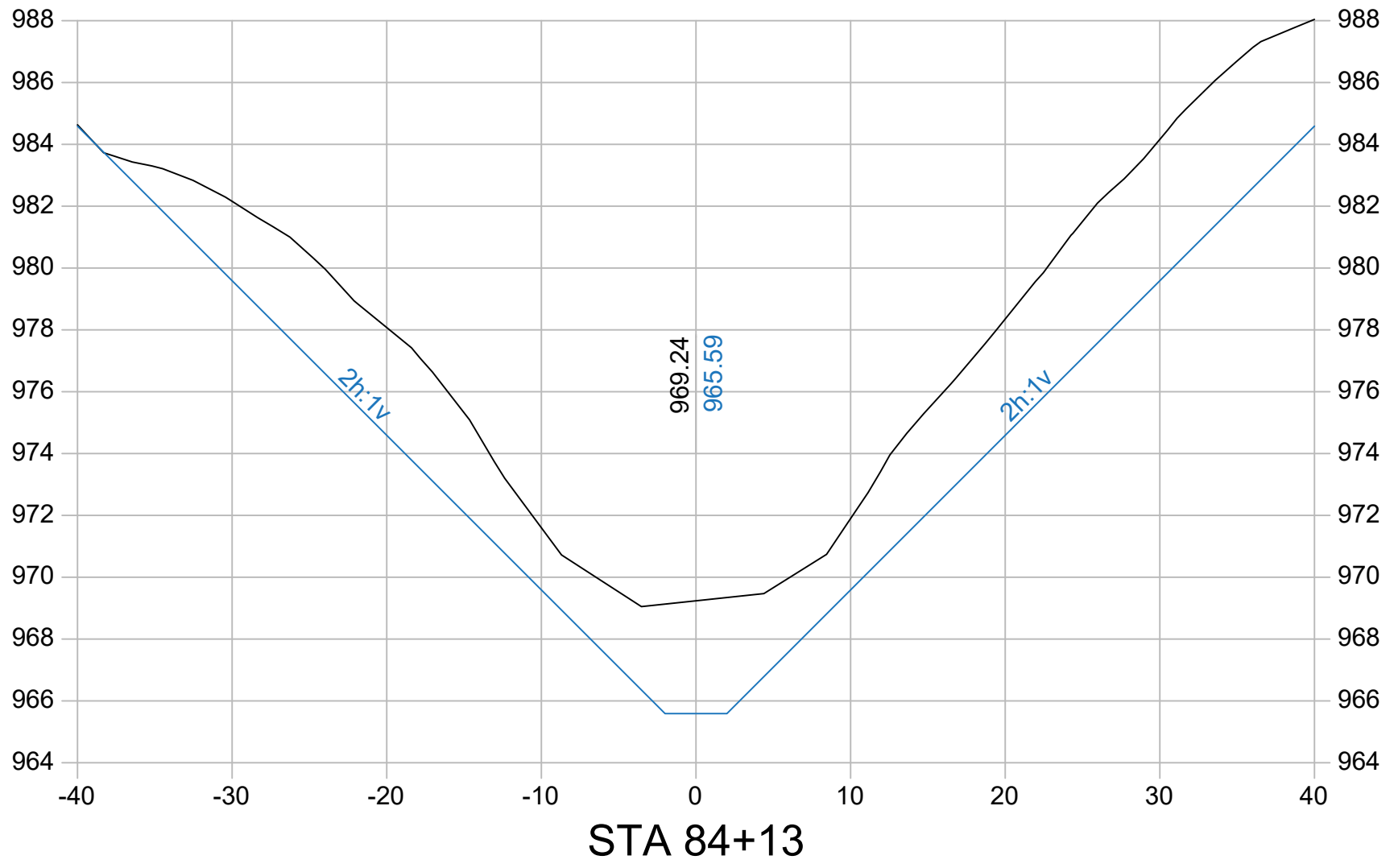
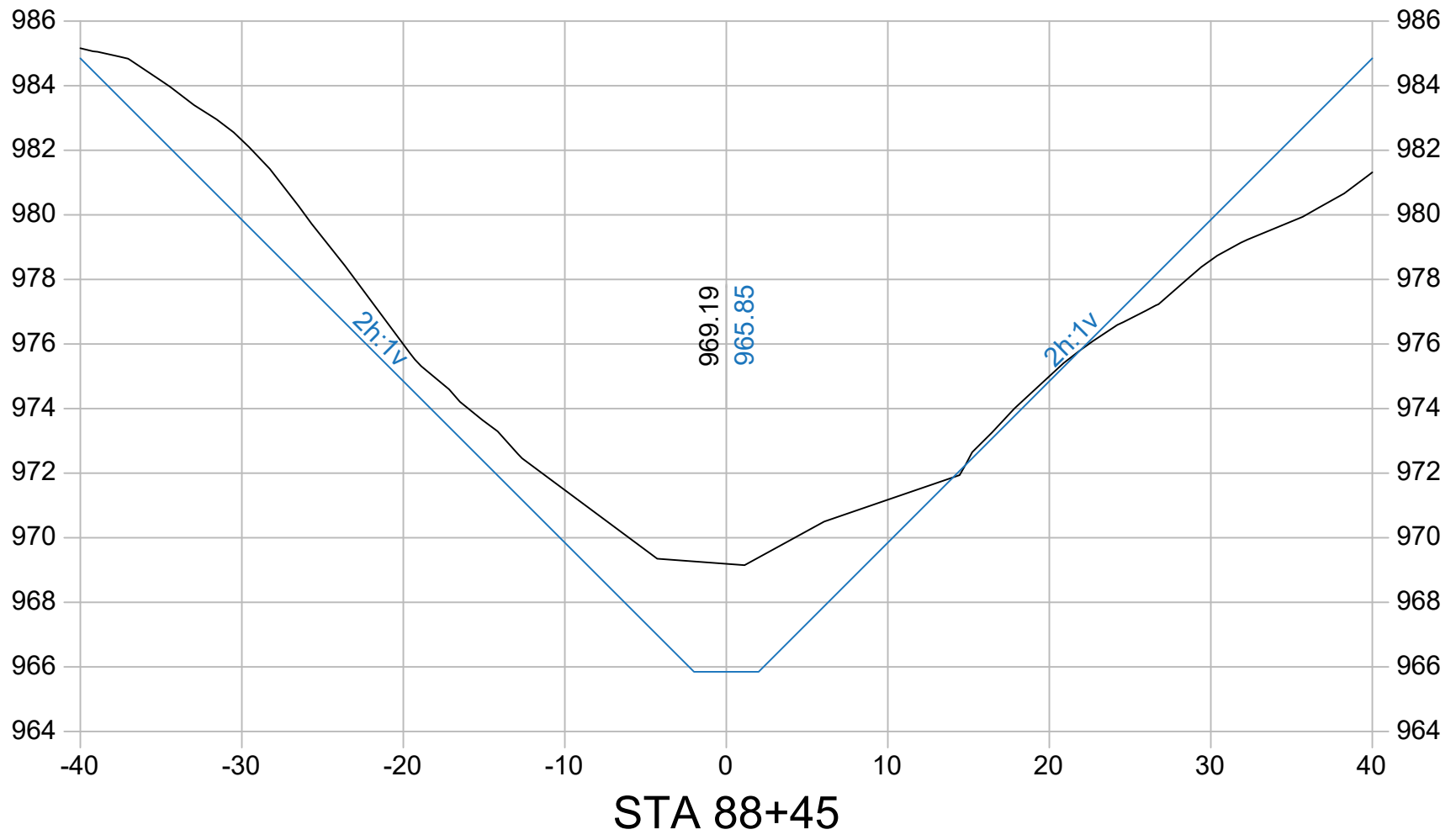
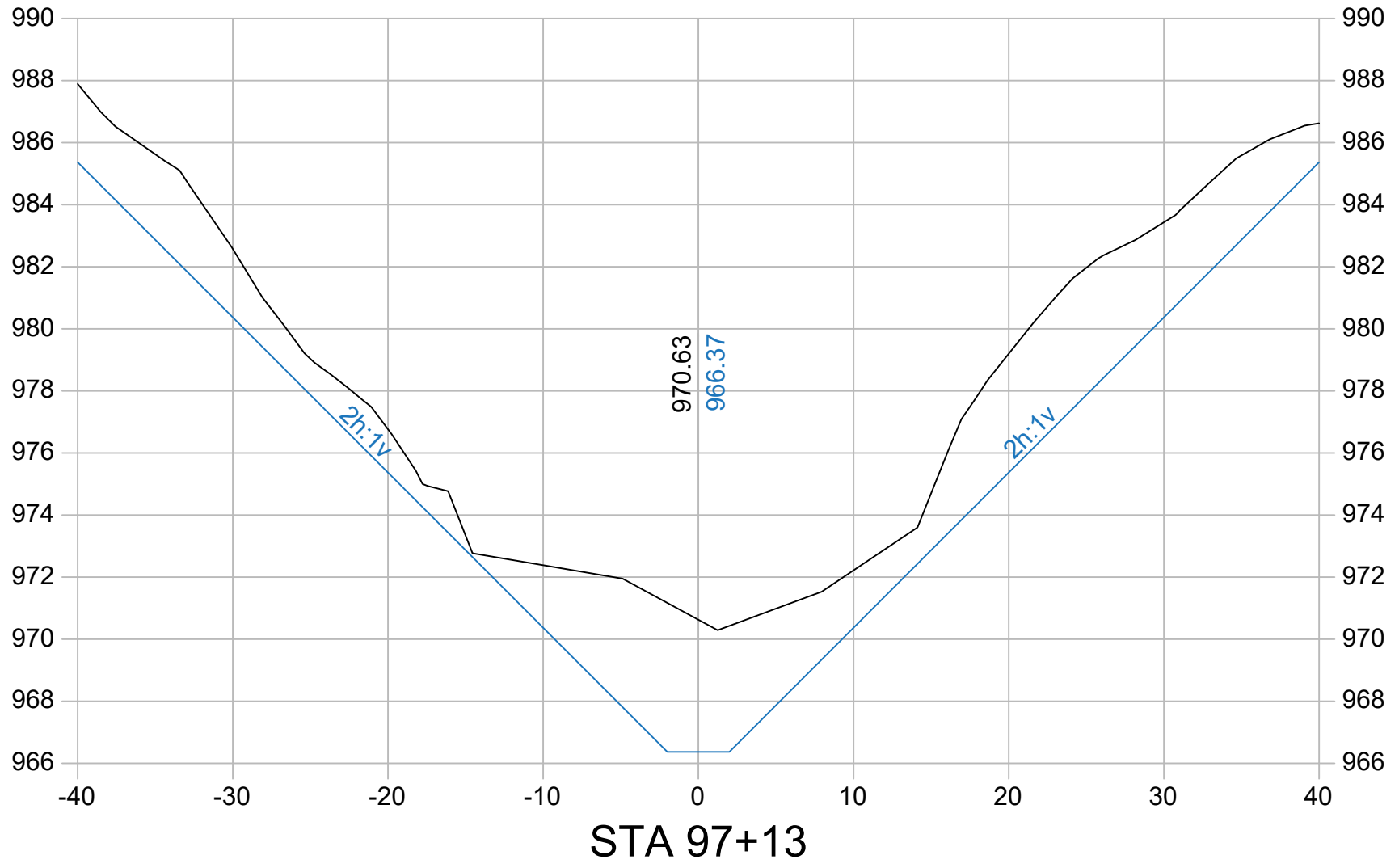
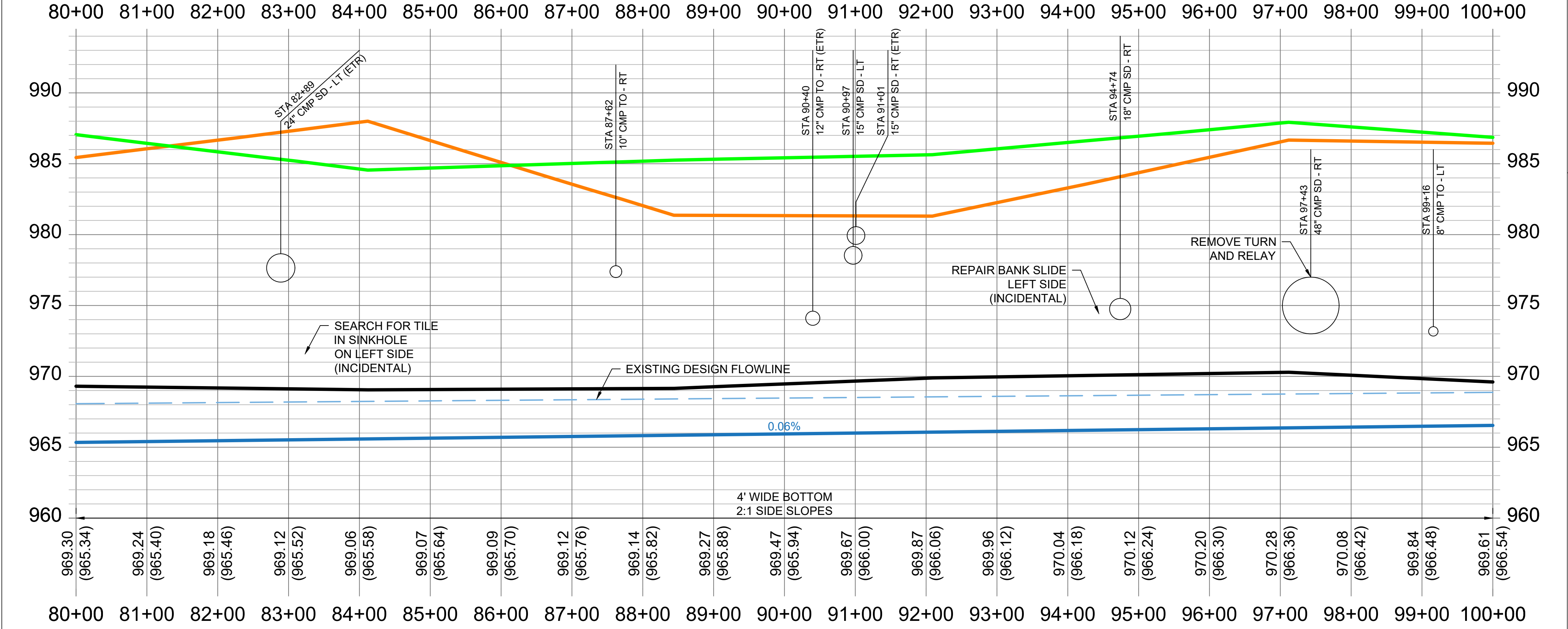
Date
2026-06-30

Plan Scale
1" = 200'

Sheet
D.05



Pipe sizes are shown as surveyed.
Minimum replacement sizes are 18" for
Surface Drains and 8" for
Surface Drains and 8" for Tile Extensions.



Company Information
AgriVia PLLC
PO Box 44
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Perry, IA 50220

Designer:
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Drafter:
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Checker:
JLH

PLAN LEGEND

- Parcel Lines
- Work Area (100' each side)
- Ditch ROW (50' each side)
- Surface Drains
- Tile Outlets
- Utilities (in red)
- Fences

PROFILE LEGEND

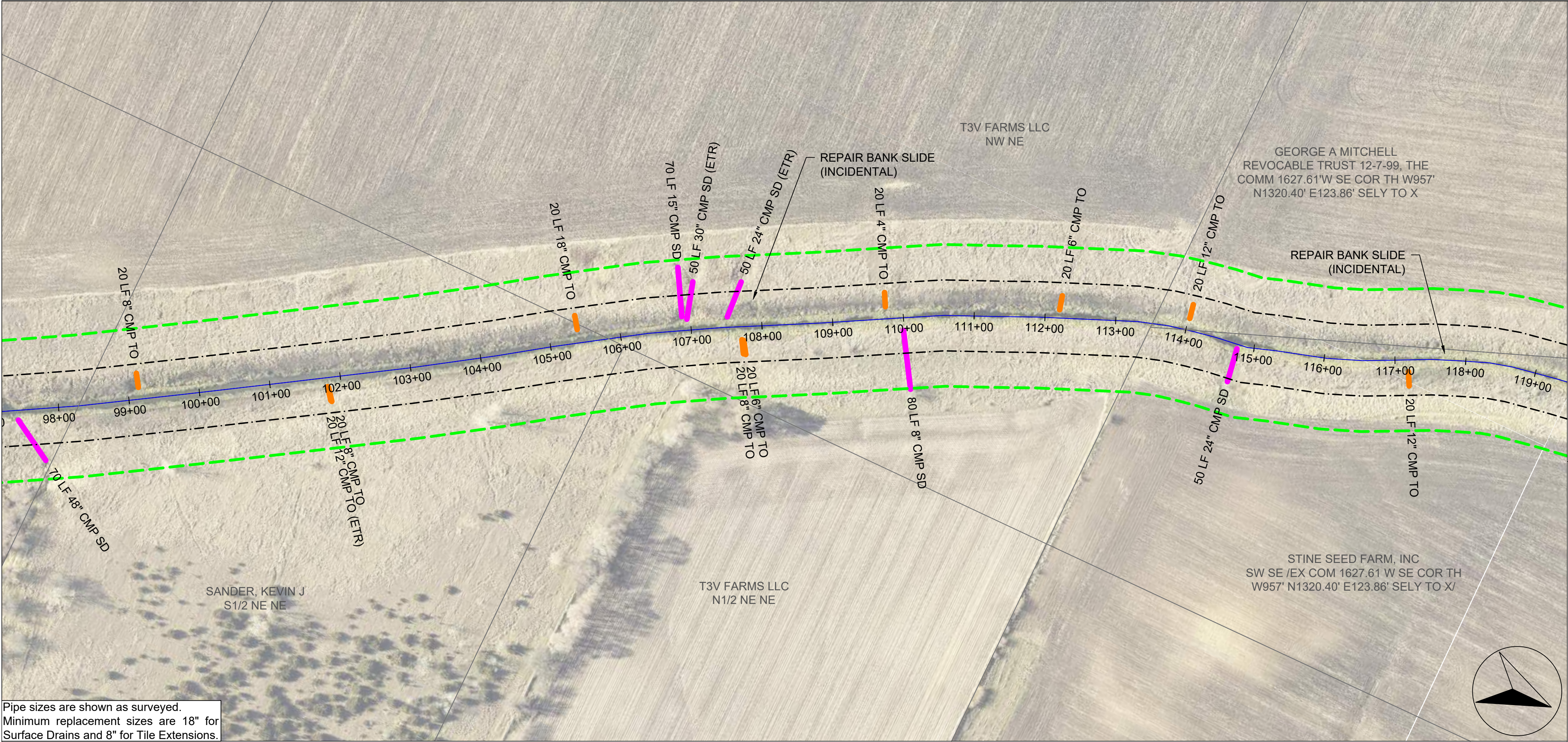
- Design Ditch Grade
- Surveyed Ditch Bottom
- Left Top of Bank
- Right Top of Bank

No.	Revision/Issue	Date

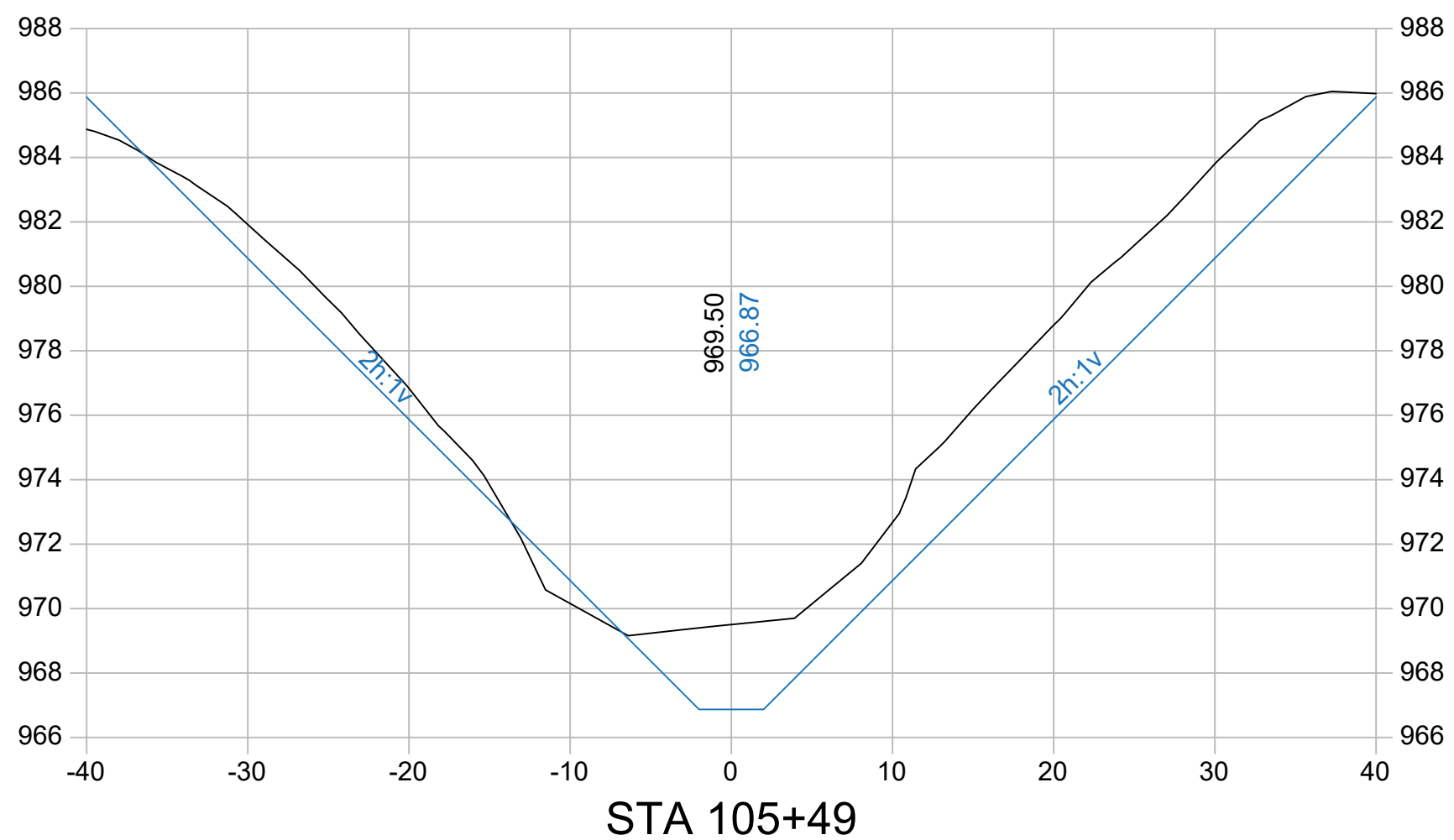
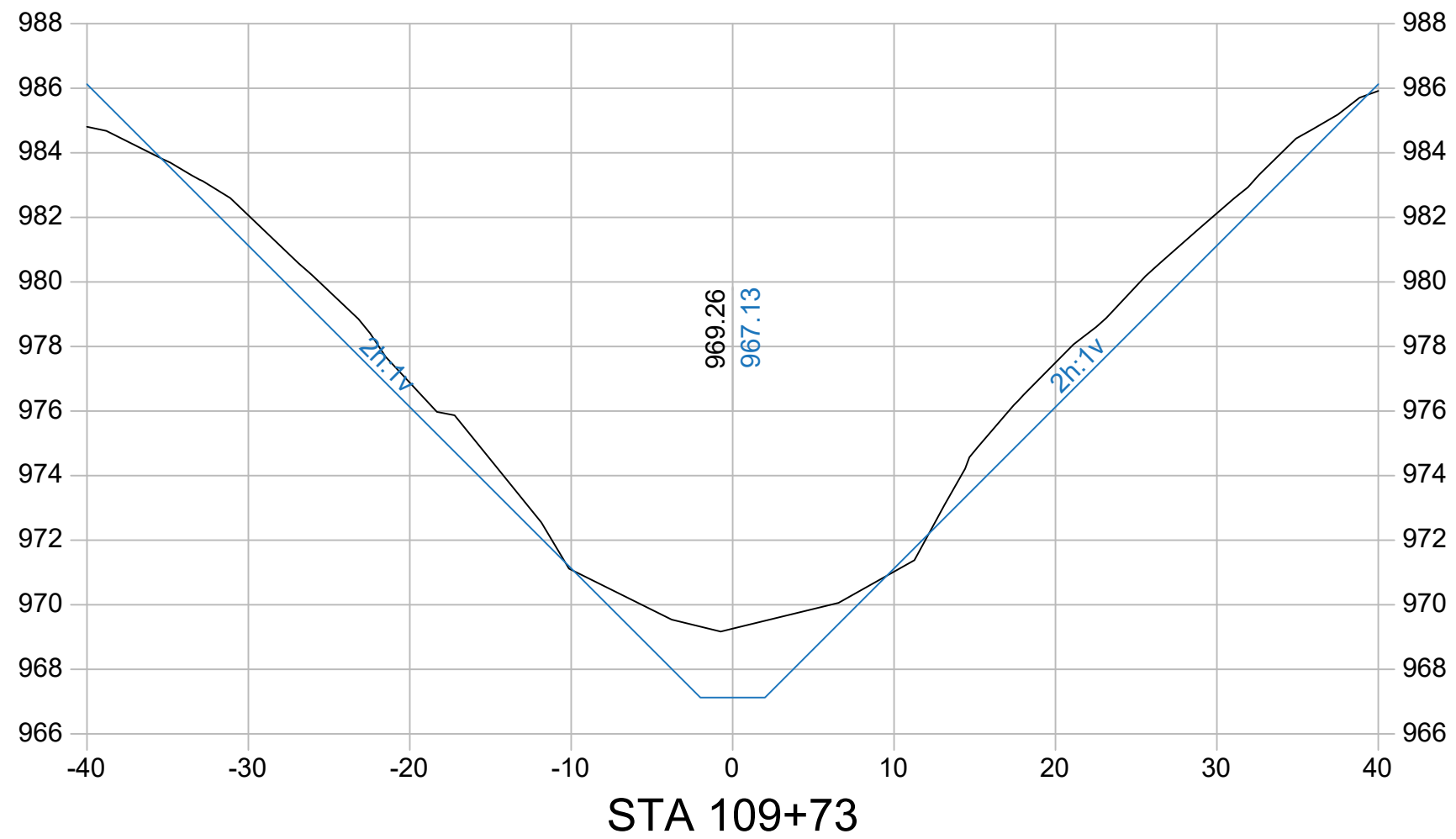
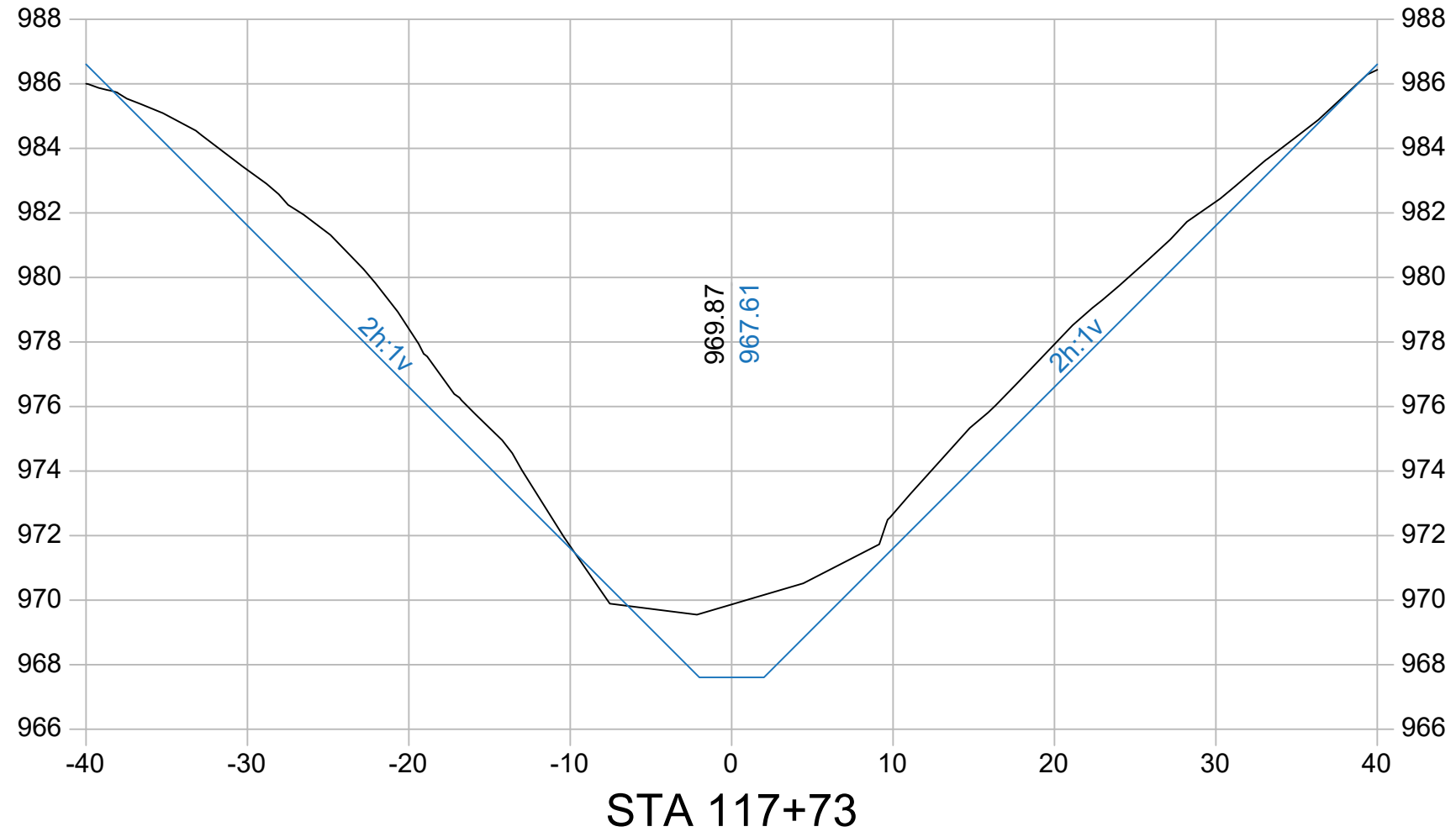
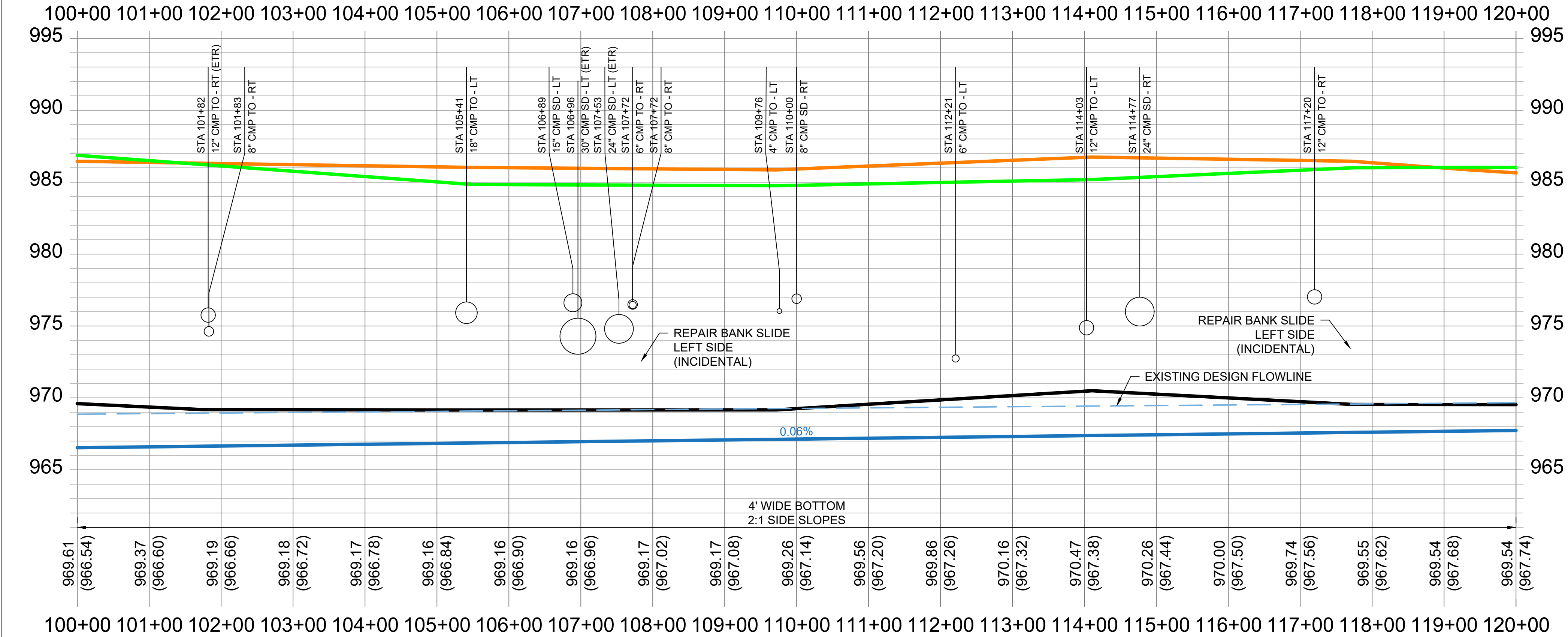
Sheet Name
Plan & Profile
Main Open Ditch
Sta 80+00 → 100+00

Project Name, Client, and Address
Open Ditch Improvements
Drainage District No. 6
Dallas County, IA
Hwy 44 & J Ave, Adel, IA 50003

Project 2531-25	D.06
Date 2026-06-30	
Plan Scale 1" = 200'	



Pipe sizes are shown as surveyed.
Minimum replacement sizes are 18" for
Surface Drains and 8" for Tile Extensions.



Company Information
AgriVia PLLC
PO Box 44
1124 Willis Ave
Perry, IA 50220

Designer
TJB
Drafter
TJB
Checker
JLH

PLAN LEGEND

- Parcel Lines
- Work Area (100' each side)
- Ditch ROW (50' each side)
- Surface Drains
- Tile Outlets
- Utilities (in red)
- Fences

PROFILE LEGEND

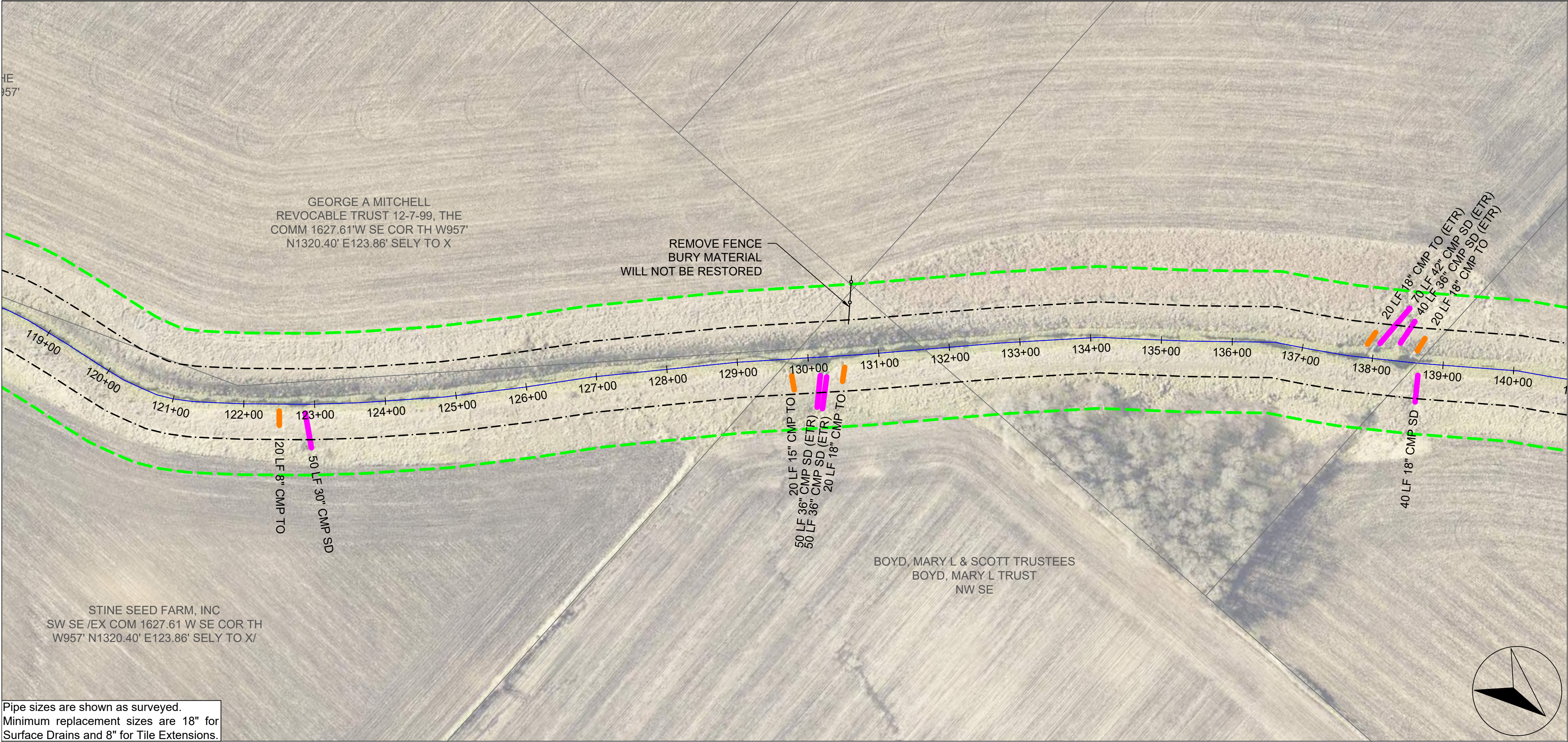
- Design Ditch Grade
- Surveyed Ditch Bottom
- Left Top of Bank
- Right Top of Bank

No.	Revision/Issue	Date

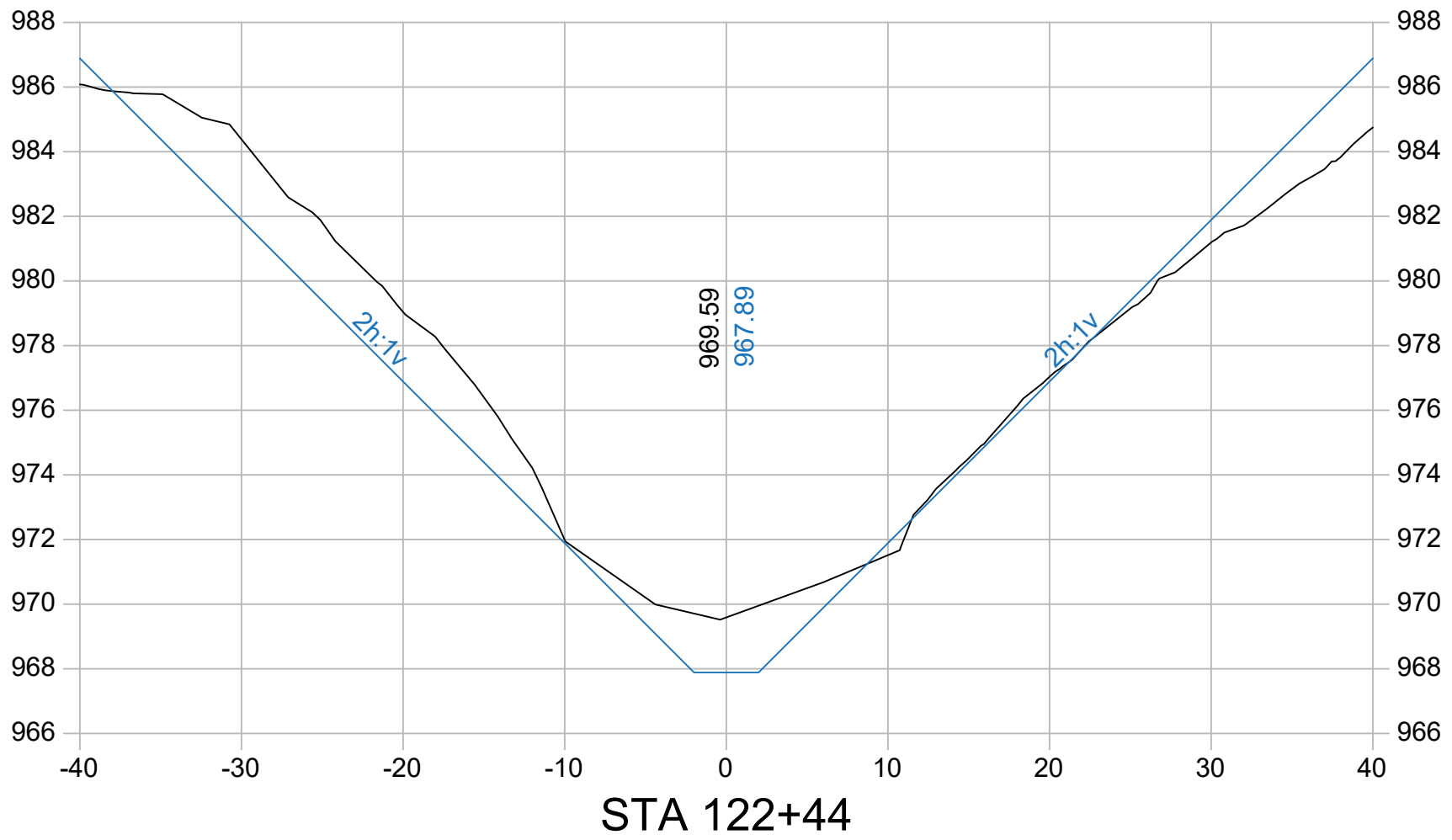
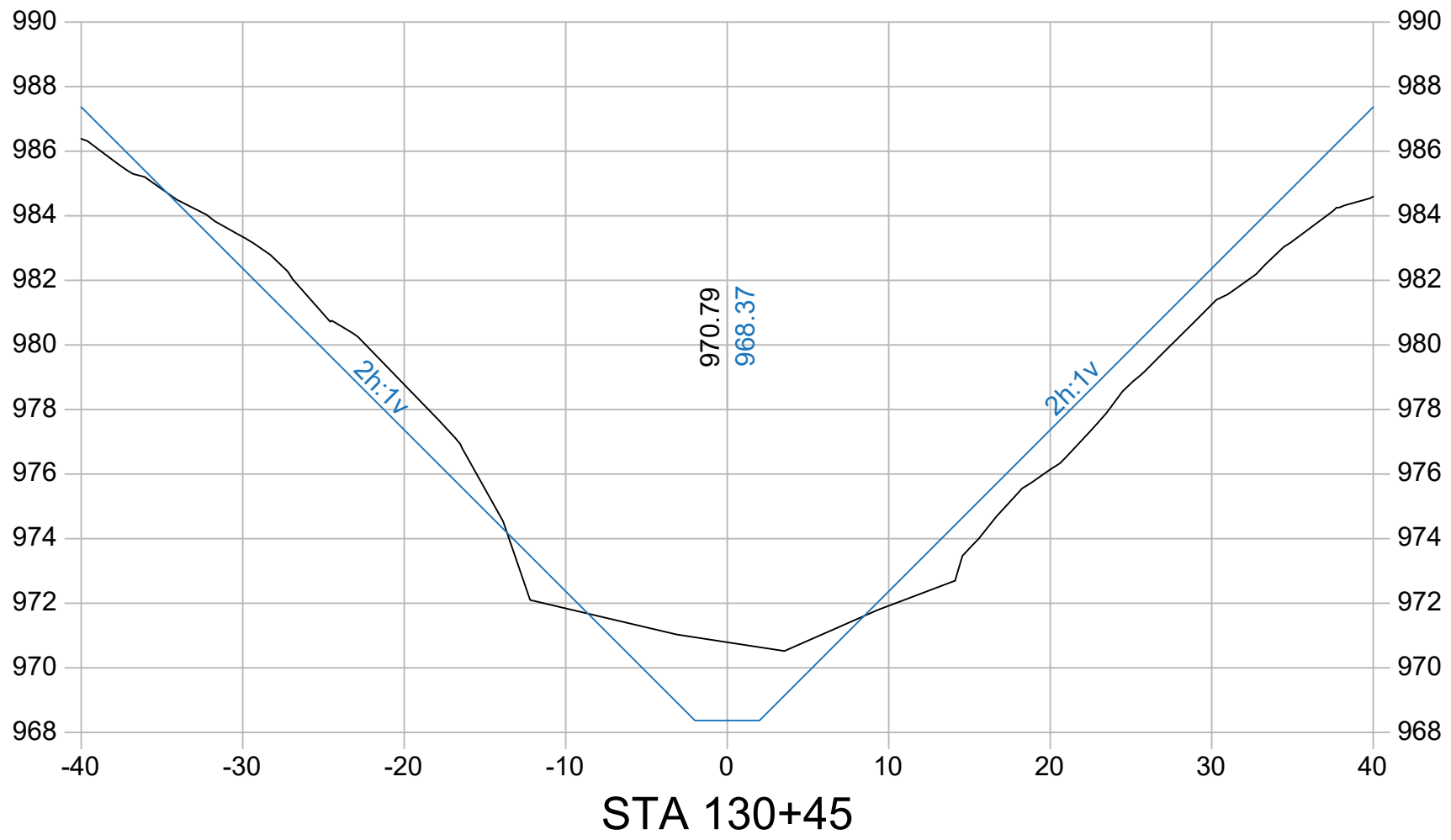
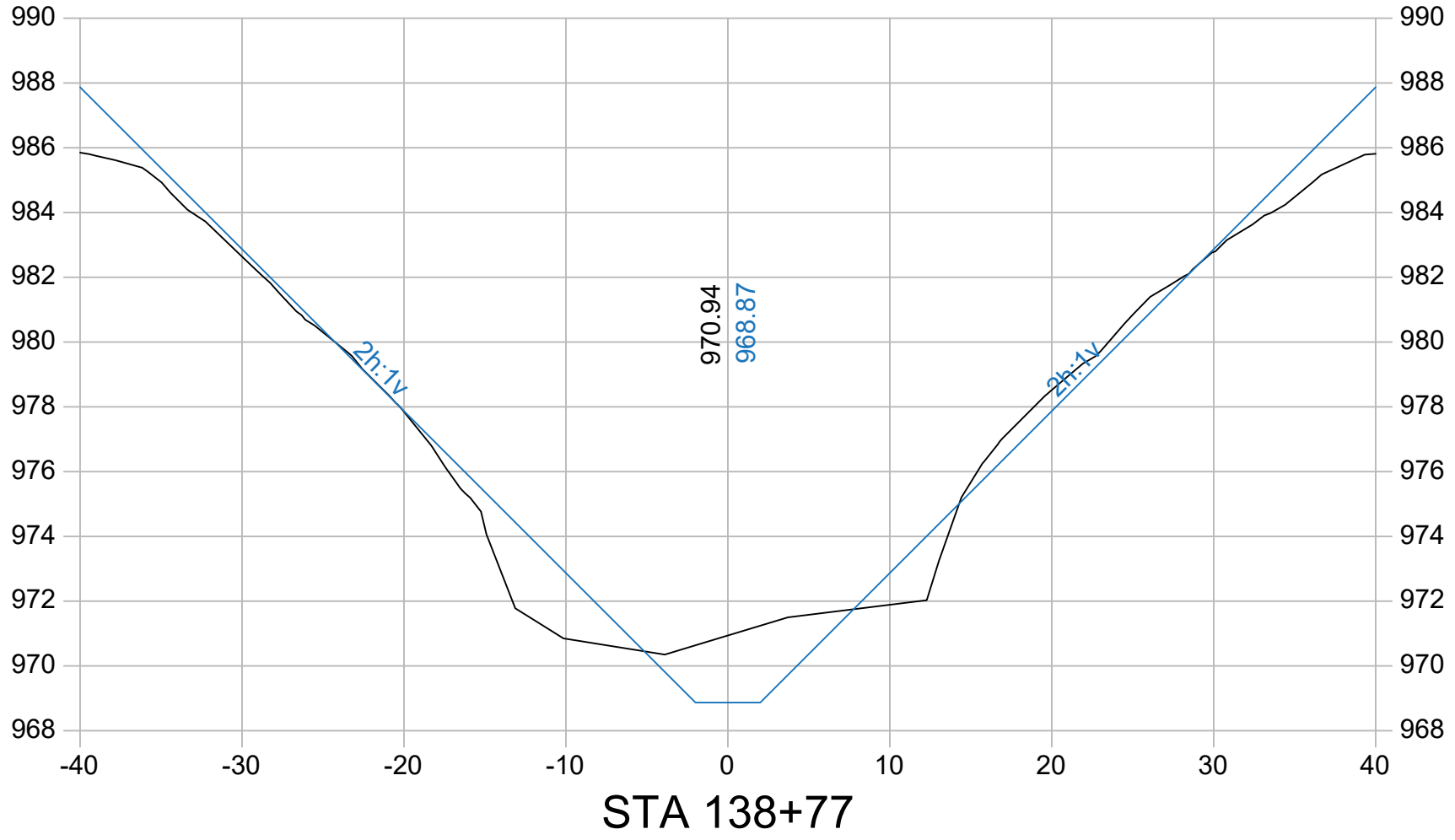
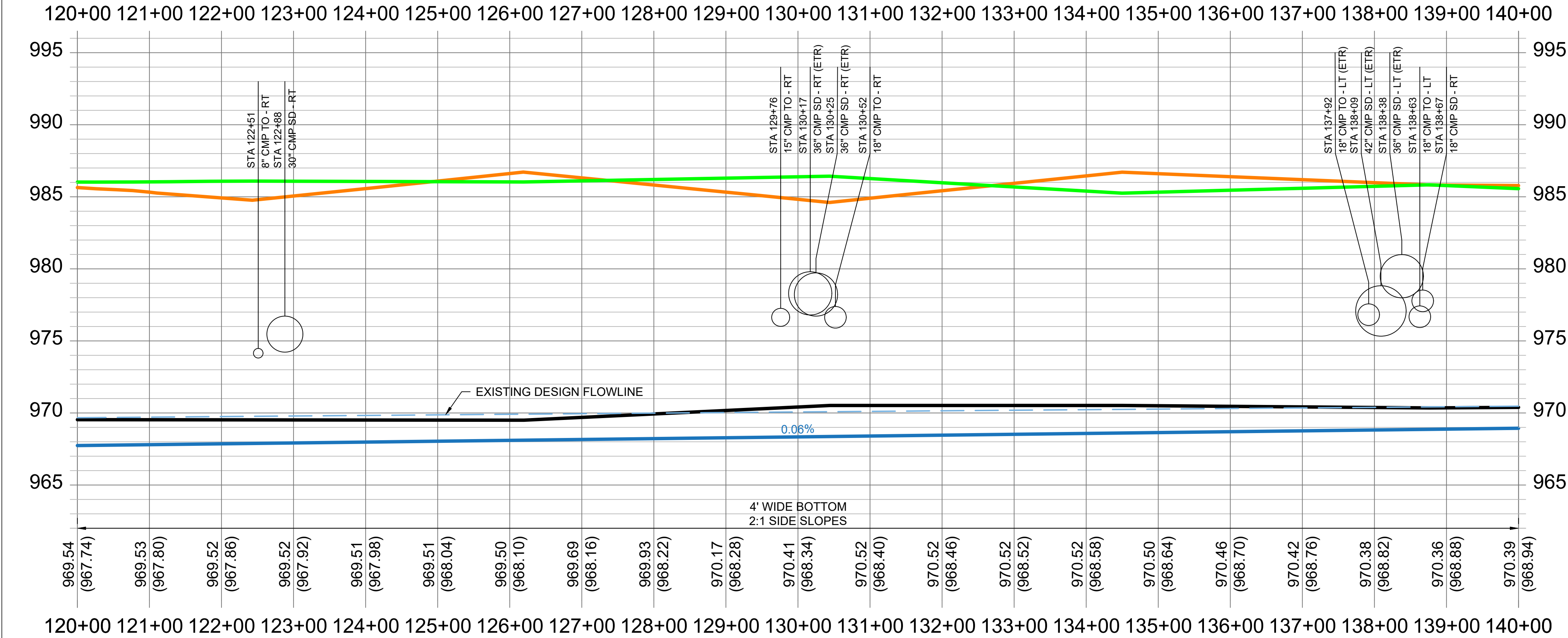
Sheet Name
Plan & Profile
Main Open Ditch
Sta 100+00 →
120+00

Project Name, Client, and Address
Open Ditch Improvements
Drainage District No. 6
Dallas County, IA
Hwy 44 & J Ave, Adel, IA 50003

Project 2531-25	D.07
Date 2026-06-30	
Plan Scale 1" = 200'	



Pipe sizes are shown as surveyed.
Minimum replacement sizes are 18" for
Surface Drains and 8" for Tile Extensions.



Company Information
AgriVia PLLC
PO Box 44
1124 Willis Ave
Perry, IA 50220

Designer:
TJB
Drafter:
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Checker:
JLH

PLAN LEGEND

- Parcel Lines
- Work Area (100' each side)
- Ditch ROW (50' each side)
- Surface Drains
- Tile Outlets
- Utilities (in red)
- Fences

PROFILE LEGEND

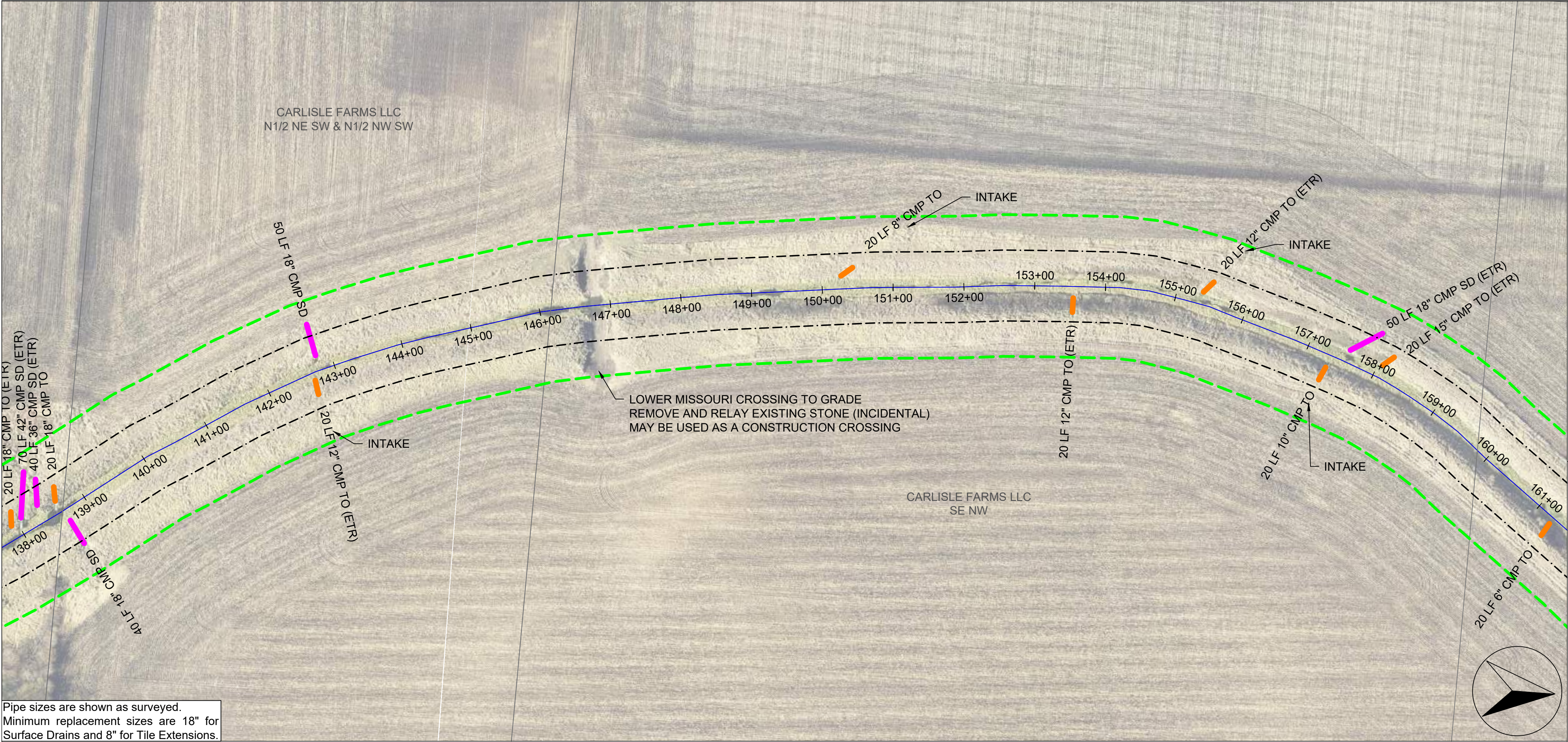
- Design Ditch Grade
- Surveyed Ditch Bottom
- Left Top of Bank
- Right Top of Bank

No.	Revision/Issue	Date

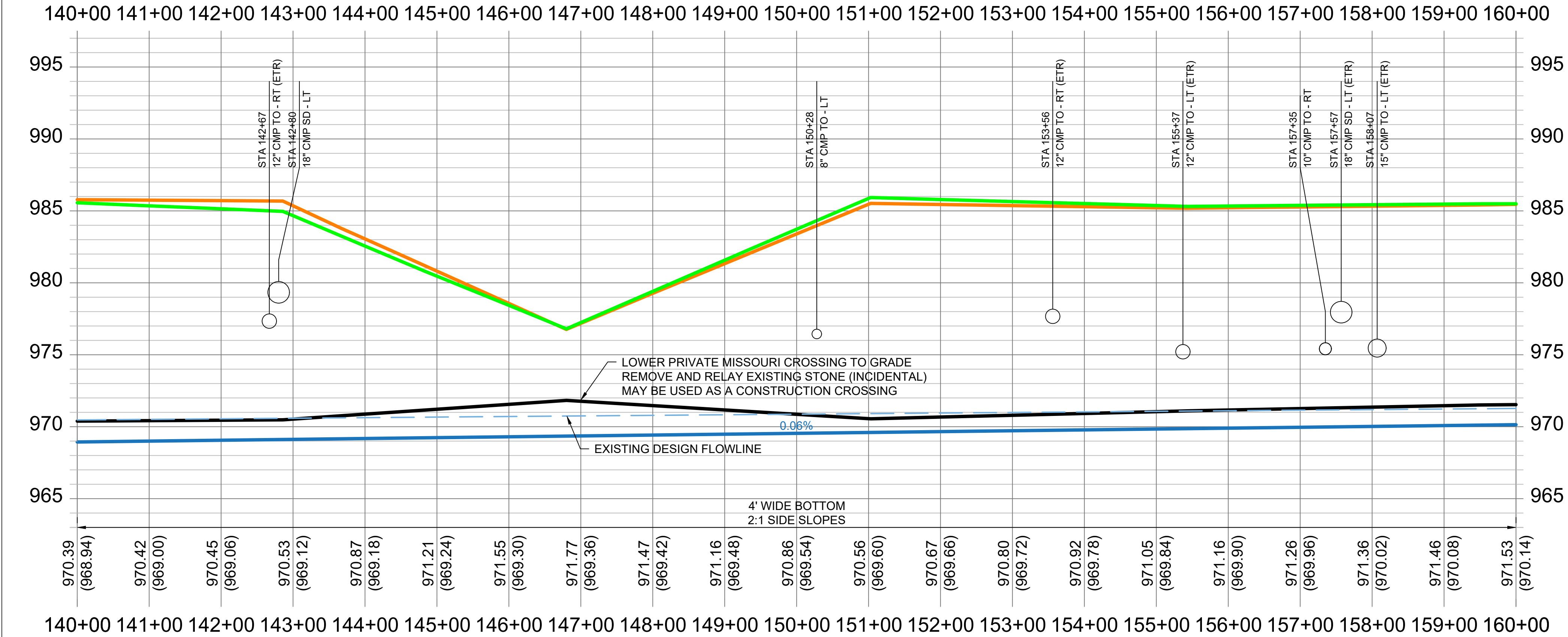
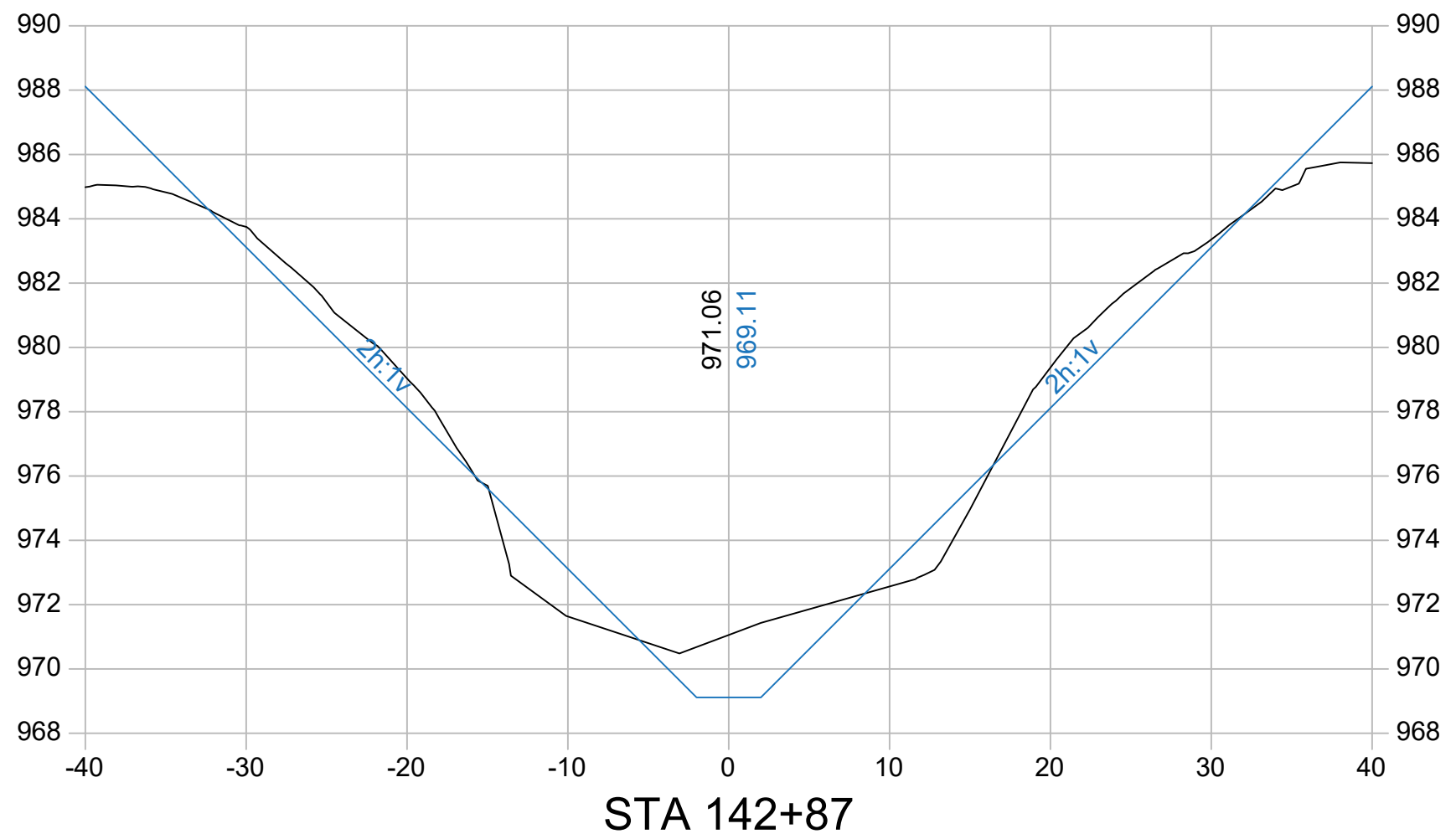
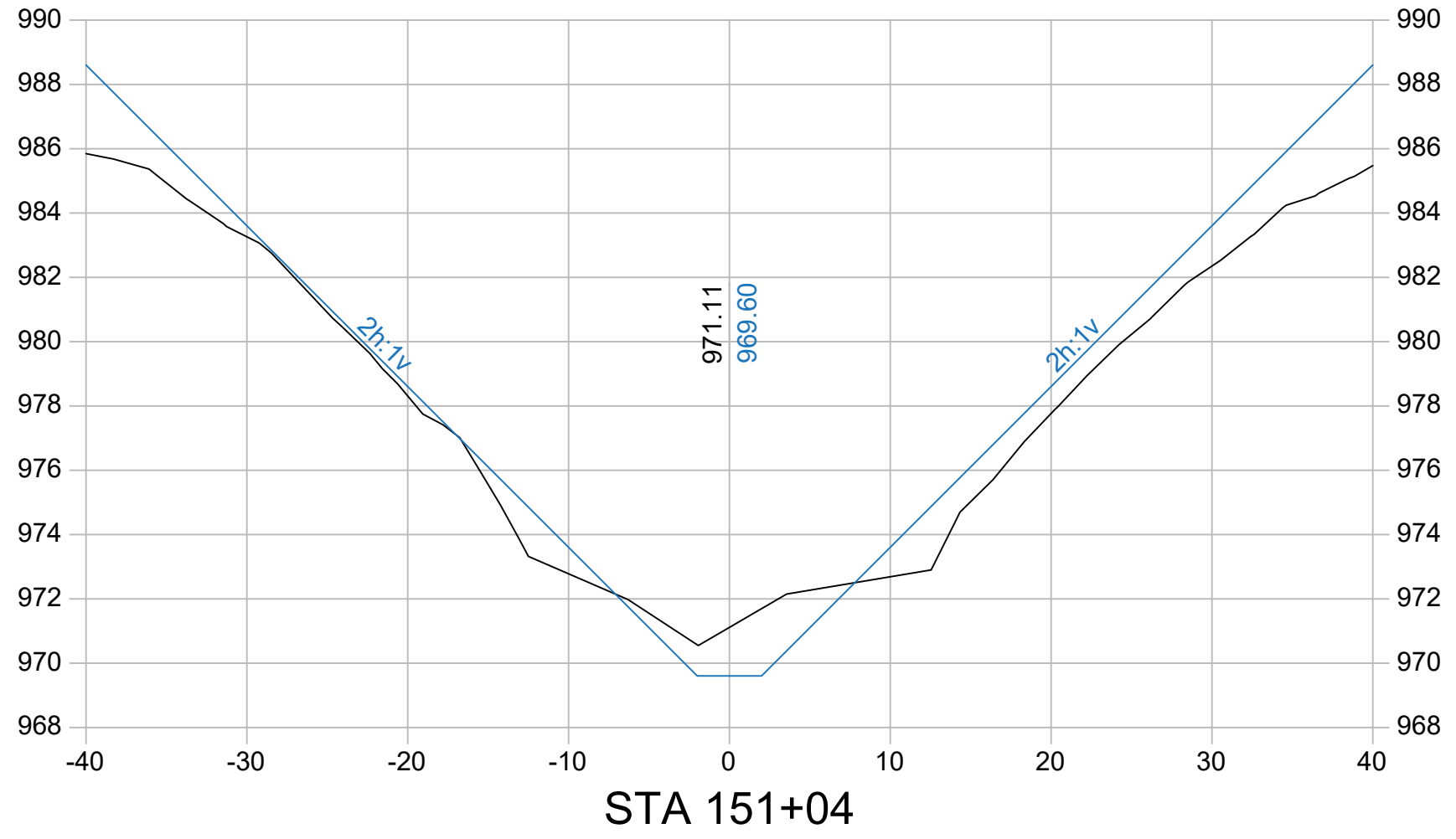
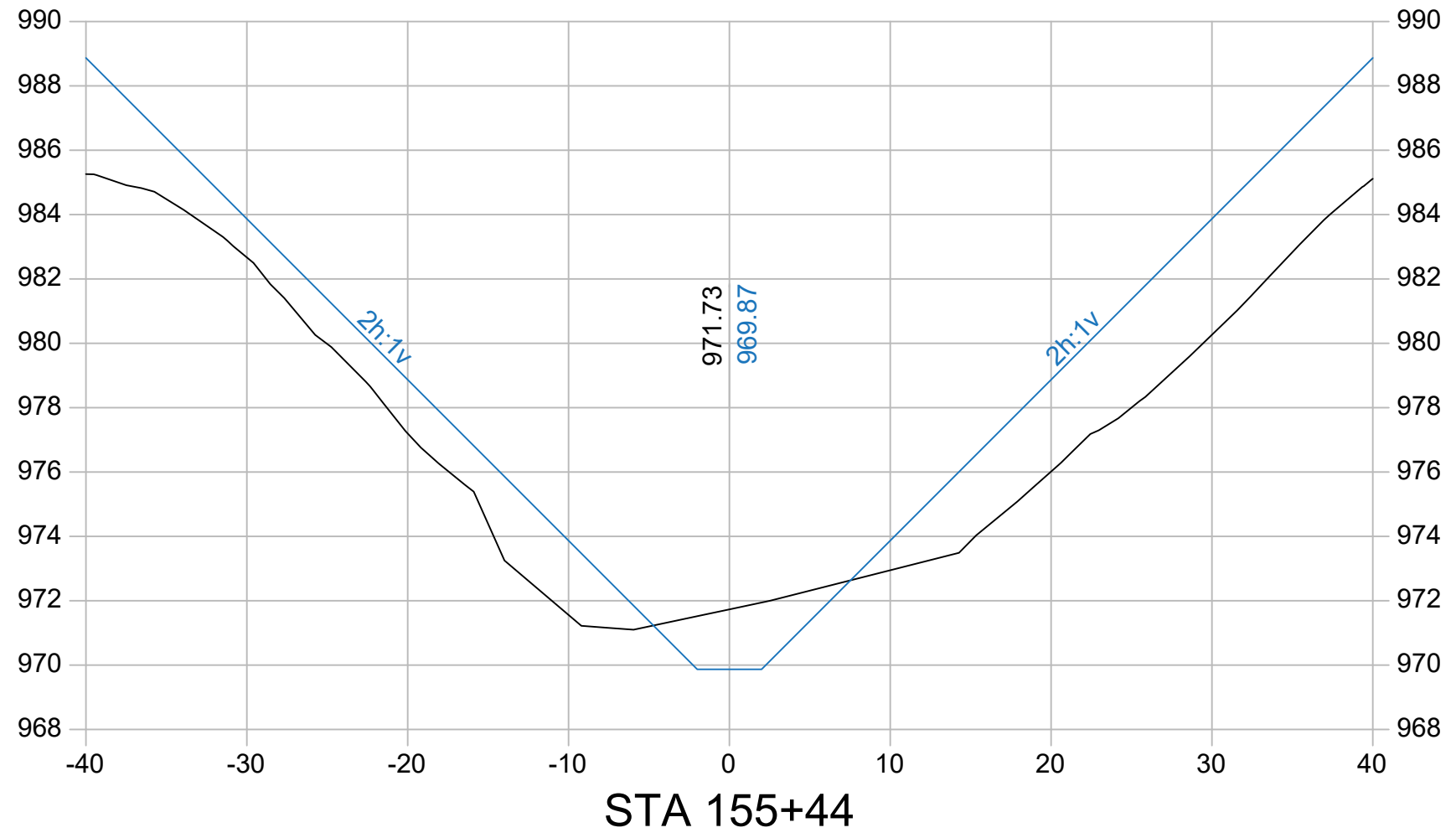
Sheet Name
Plan & Profile
Main Open Ditch
Sta 120+00 →
140+00

Project Name, Client, and Address
Open Ditch Improvements
Drainage District No. 6
Dallas County, IA
Hwy 44 & J Ave, Adel, IA 50003

Project 2531-25	D.08
Date 2026-06-30	
Plan Scale 1" = 200'	



Pipe sizes are shown as surveyed.
Minimum replacement sizes are 18" for
Surface Drains and 8" for Tile Extensions.



Company Information
AgriVia PLLC
PO Box 44
1124 Willis Ave
Perry, IA 50220

Designer:
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Drafter:
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Checker:
JLH

PLAN LEGEND

- Parcel Lines
- Work Area (100' each side)
- Ditch ROW (50' each side)
- Surface Drains
- Tile Outlets
- Utilities (in red)
- Fences

PROFILE LEGEND

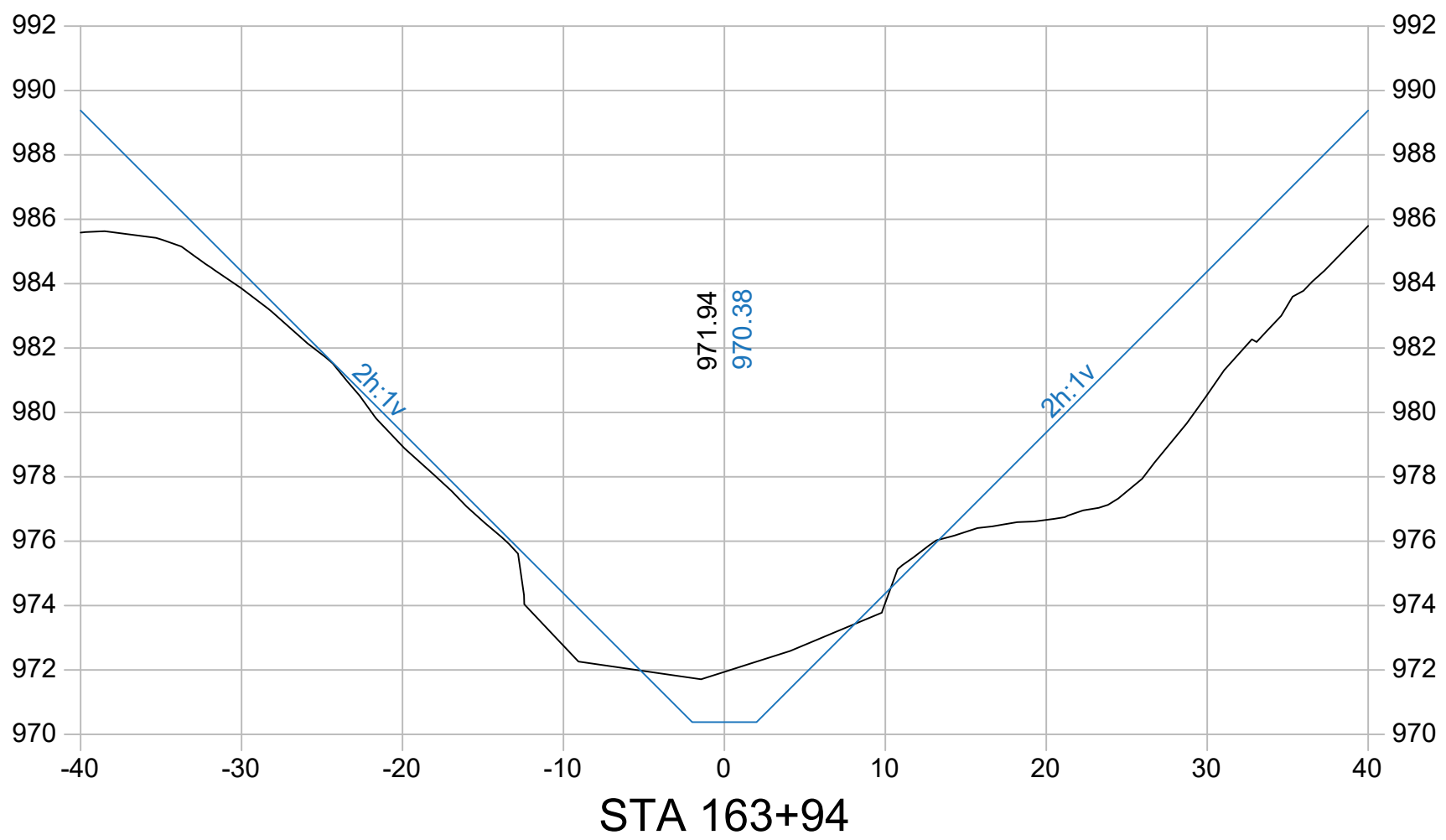
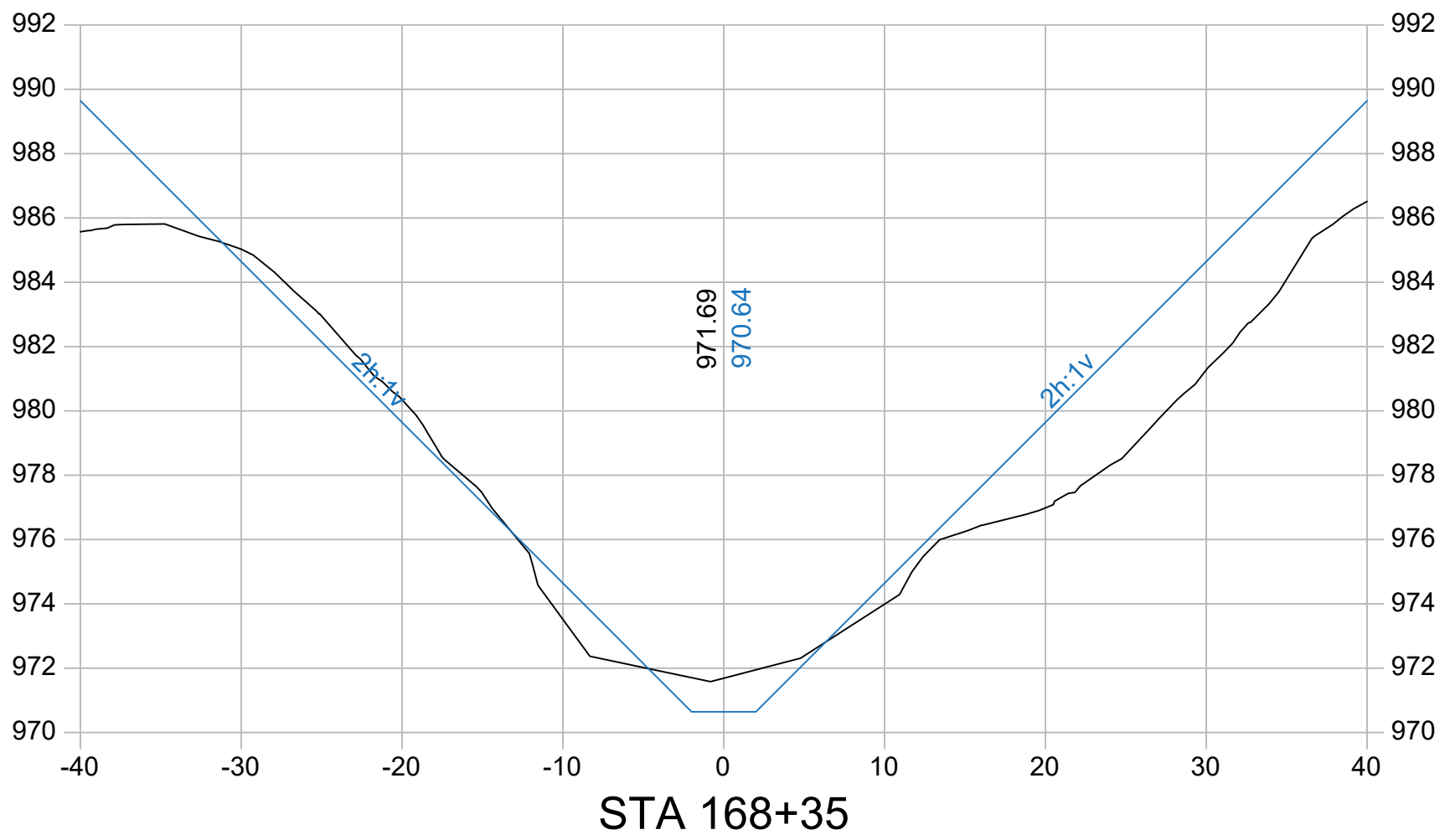
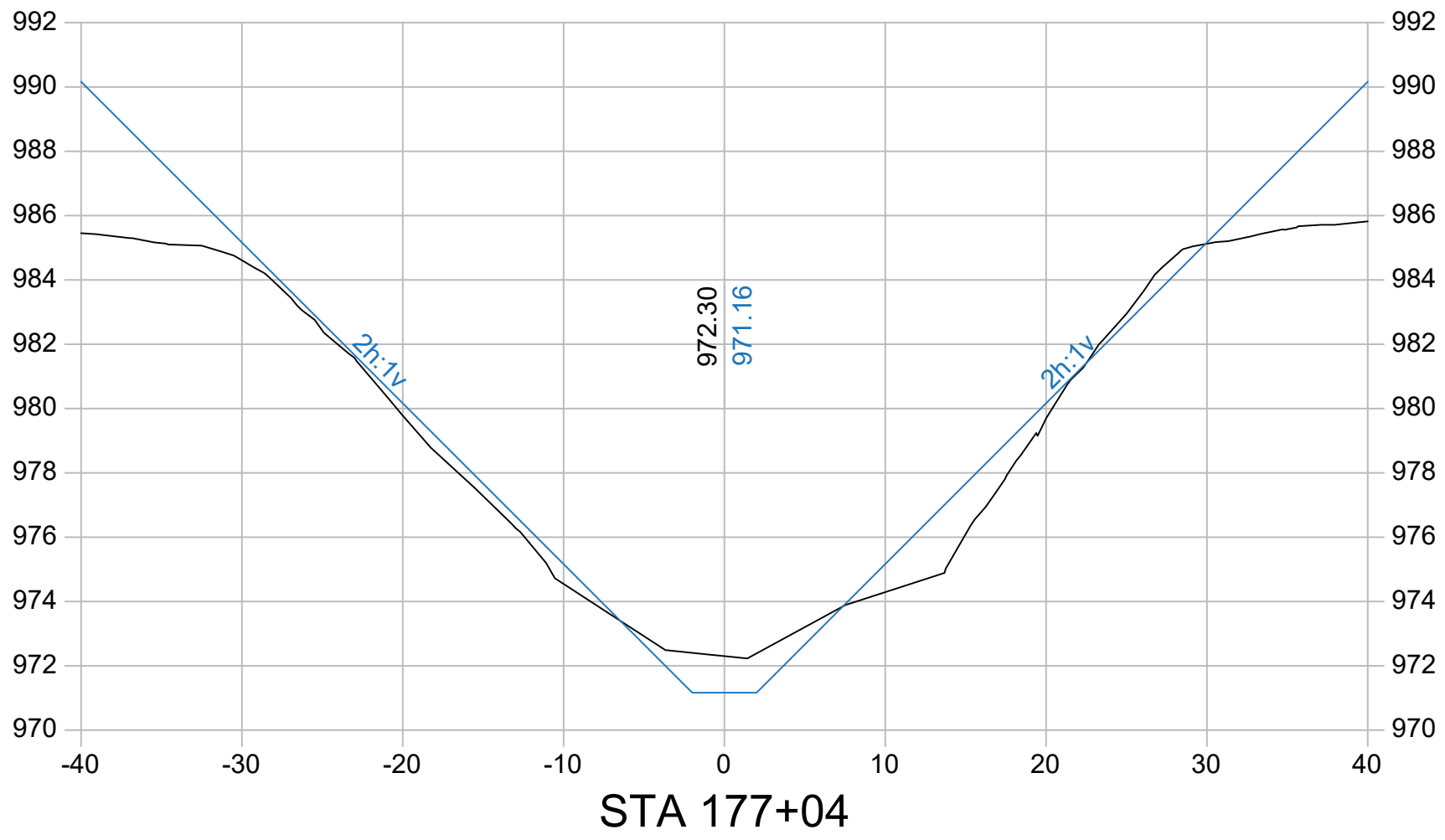
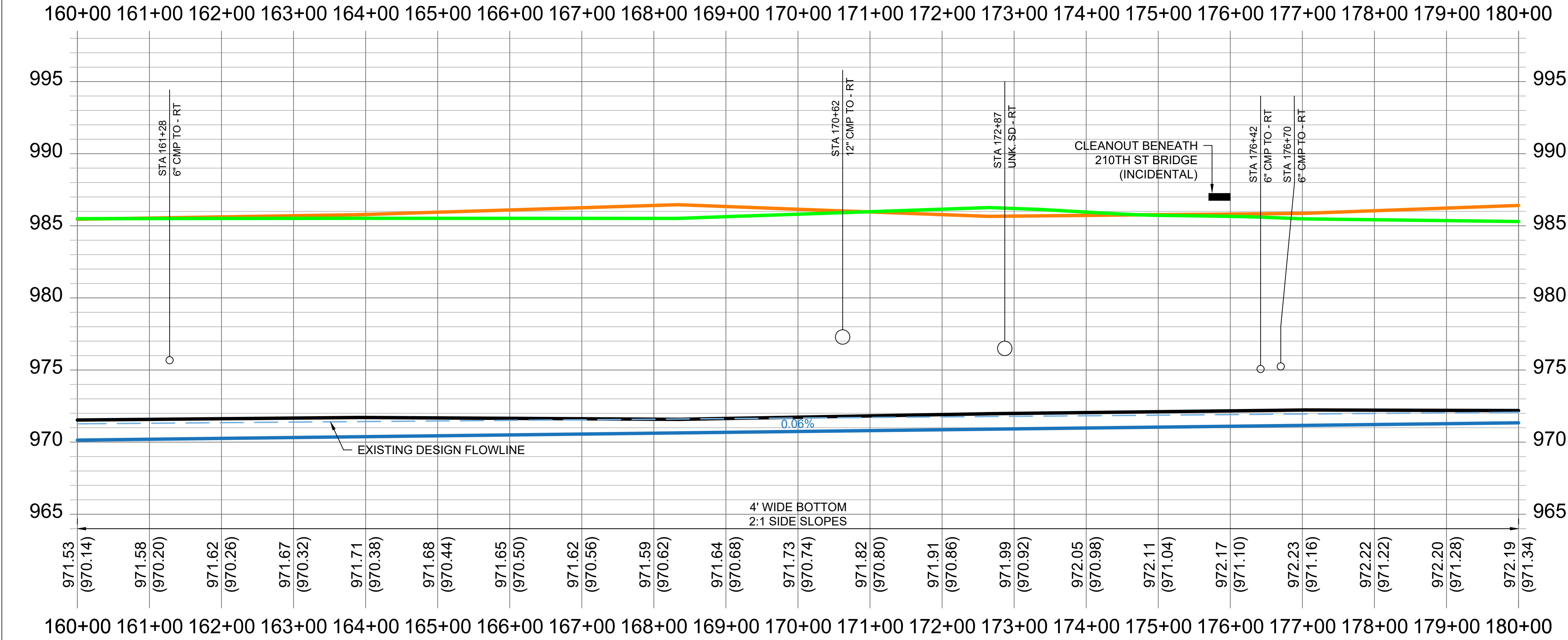
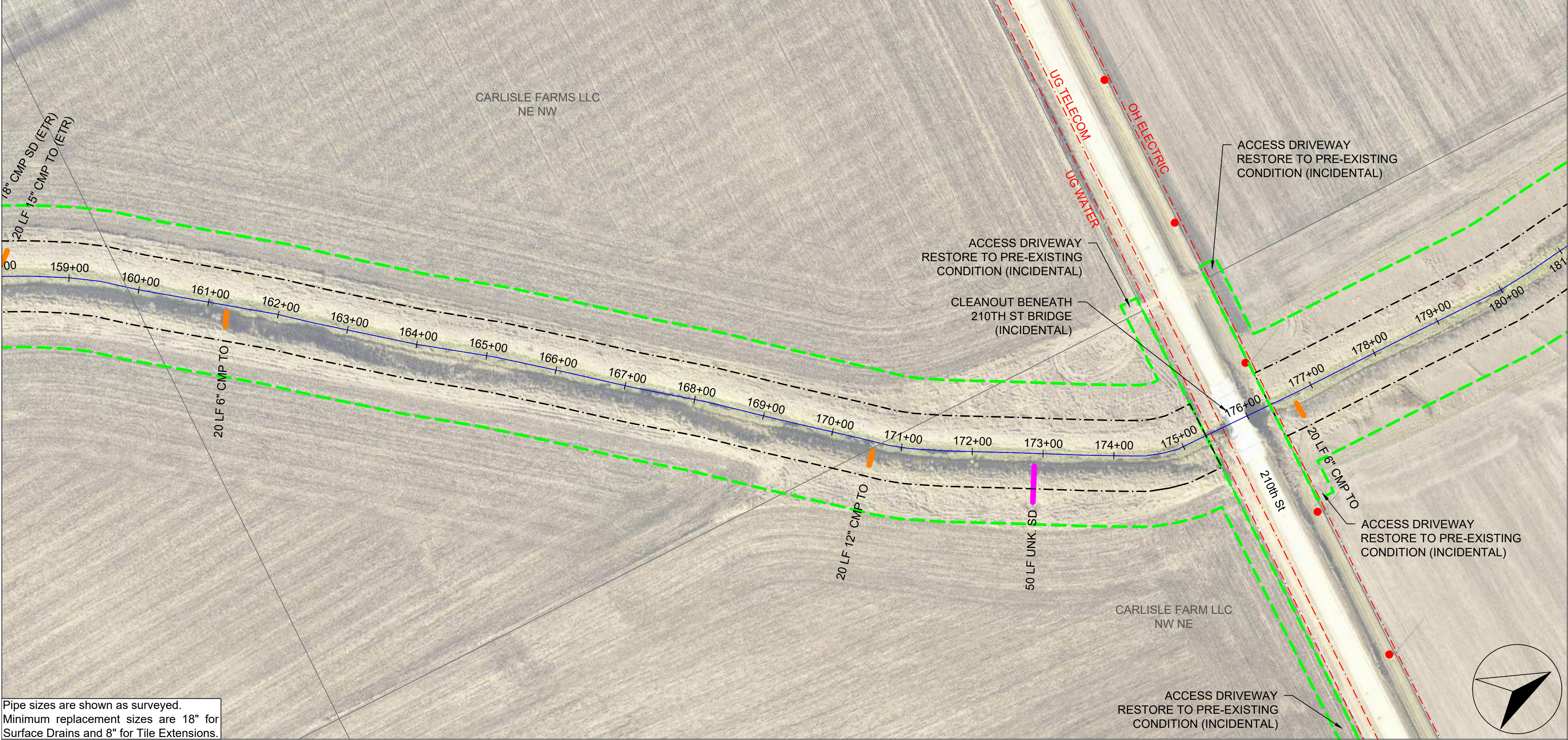
- Design Ditch Grade
- Surveyed Ditch Bottom
- Left Top of Bank
- Right Top of Bank

No.	Revision/Issue	Date

Sheet Name
Plan & Profile
Main Open Ditch
Sta 140+00 →
160+00

Project Name, Client, and Address
Open Ditch Improvements
Drainage District No. 6
Dallas County, IA
Hwy 44 & J Ave, Adel, IA 50003

Project 2531-25	D.09
Date 2026-06-30	
Plan Scale 1" = 200'	



Company Information
AgriVia PLLC
PO Box 44
1124 Willis Ave
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Designer:
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Drafter:
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Checker:
JLH

PLAN LEGEND

- Parcel Lines
- Work Area (100' each side)
- Ditch ROW (50' each side)
- Surface Drains
- Tile Outlets
- Utilities (in red)
- Fences

PROFILE LEGEND

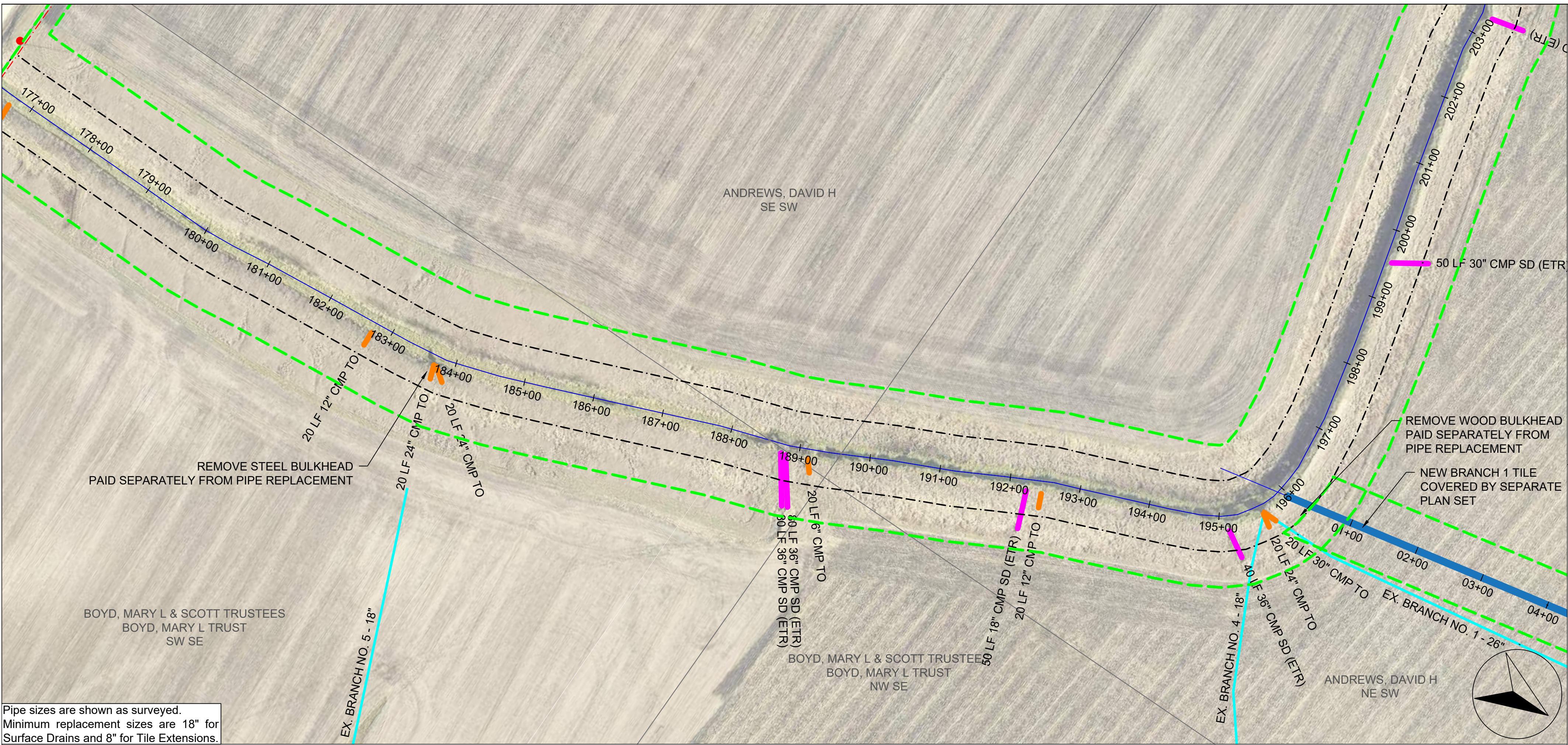
- Design Ditch Grade
- Surveyed Ditch Bottom
- Left Top of Bank
- Right Top of Bank

No.	Revision/Issue	Date

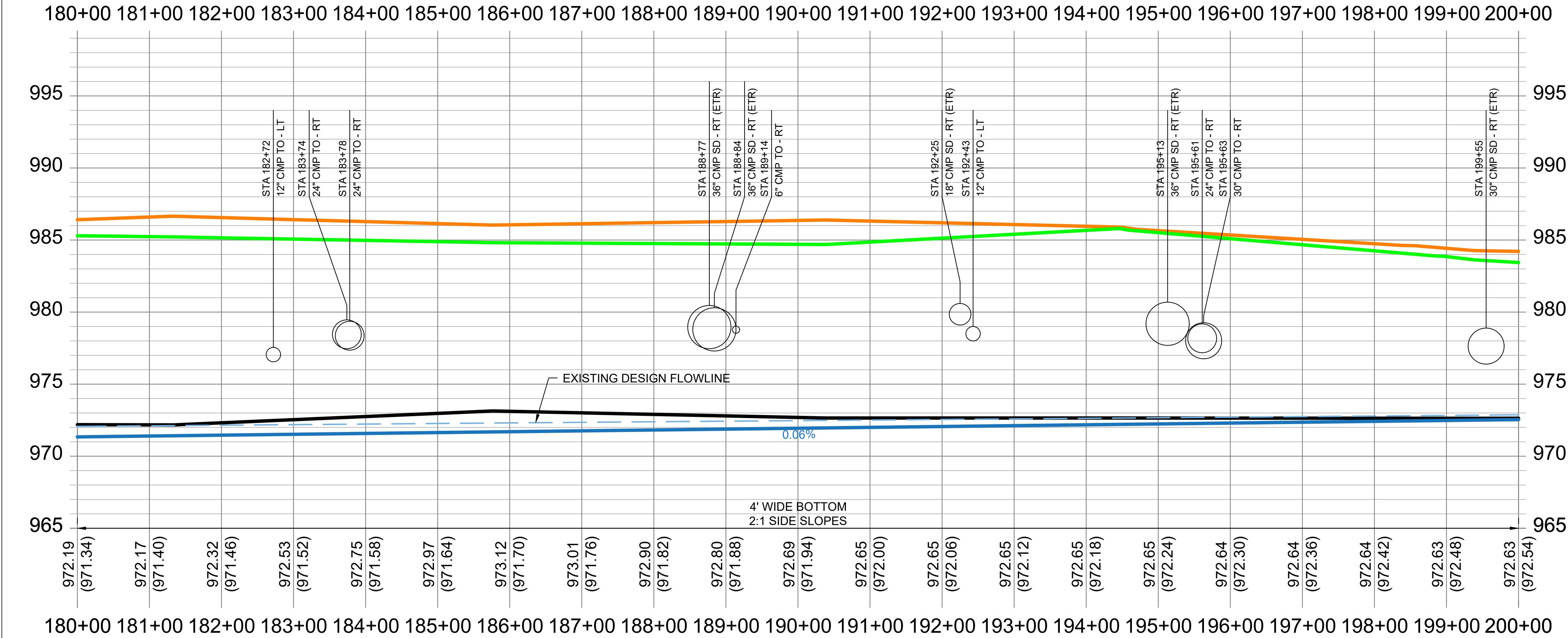
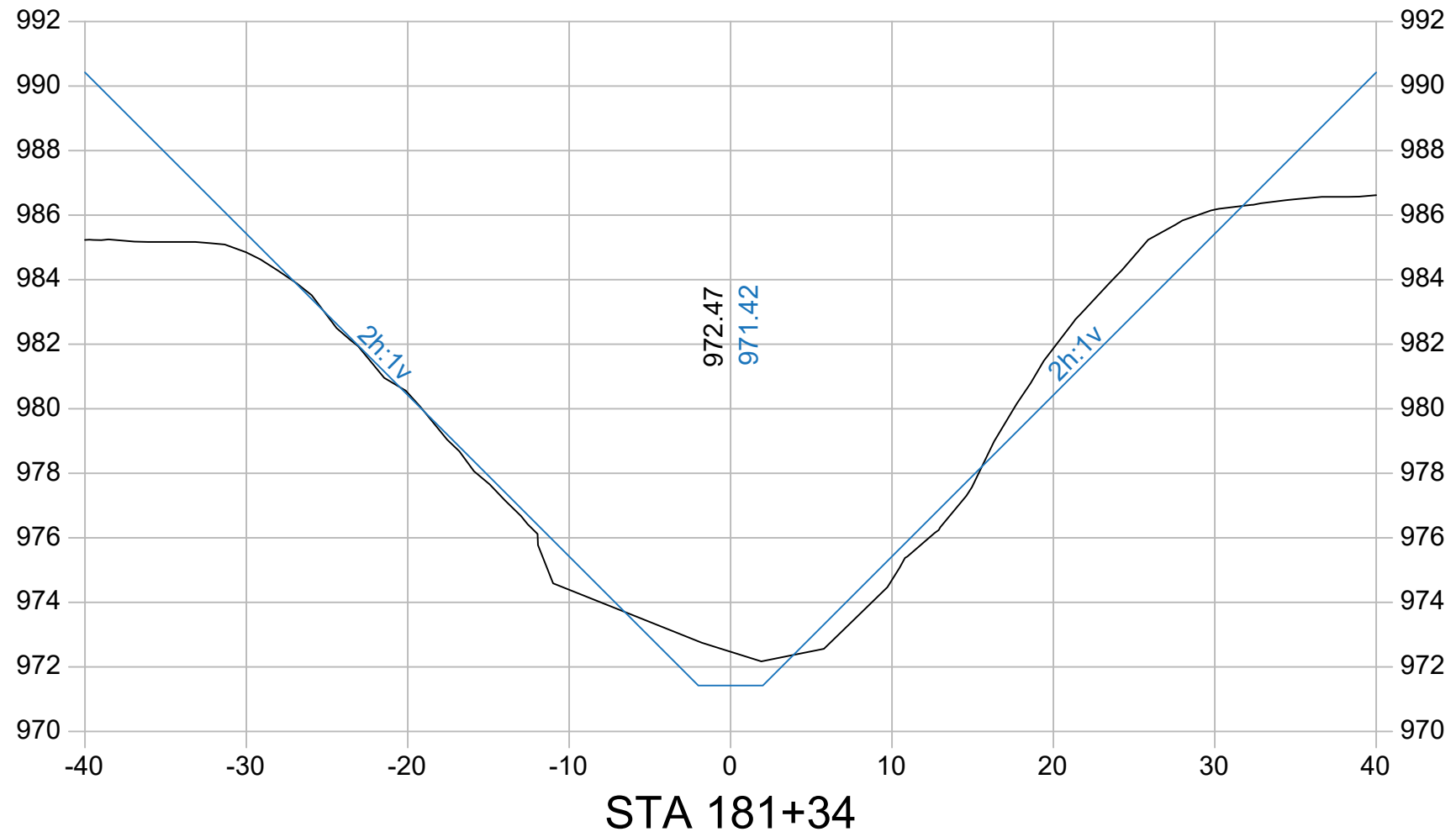
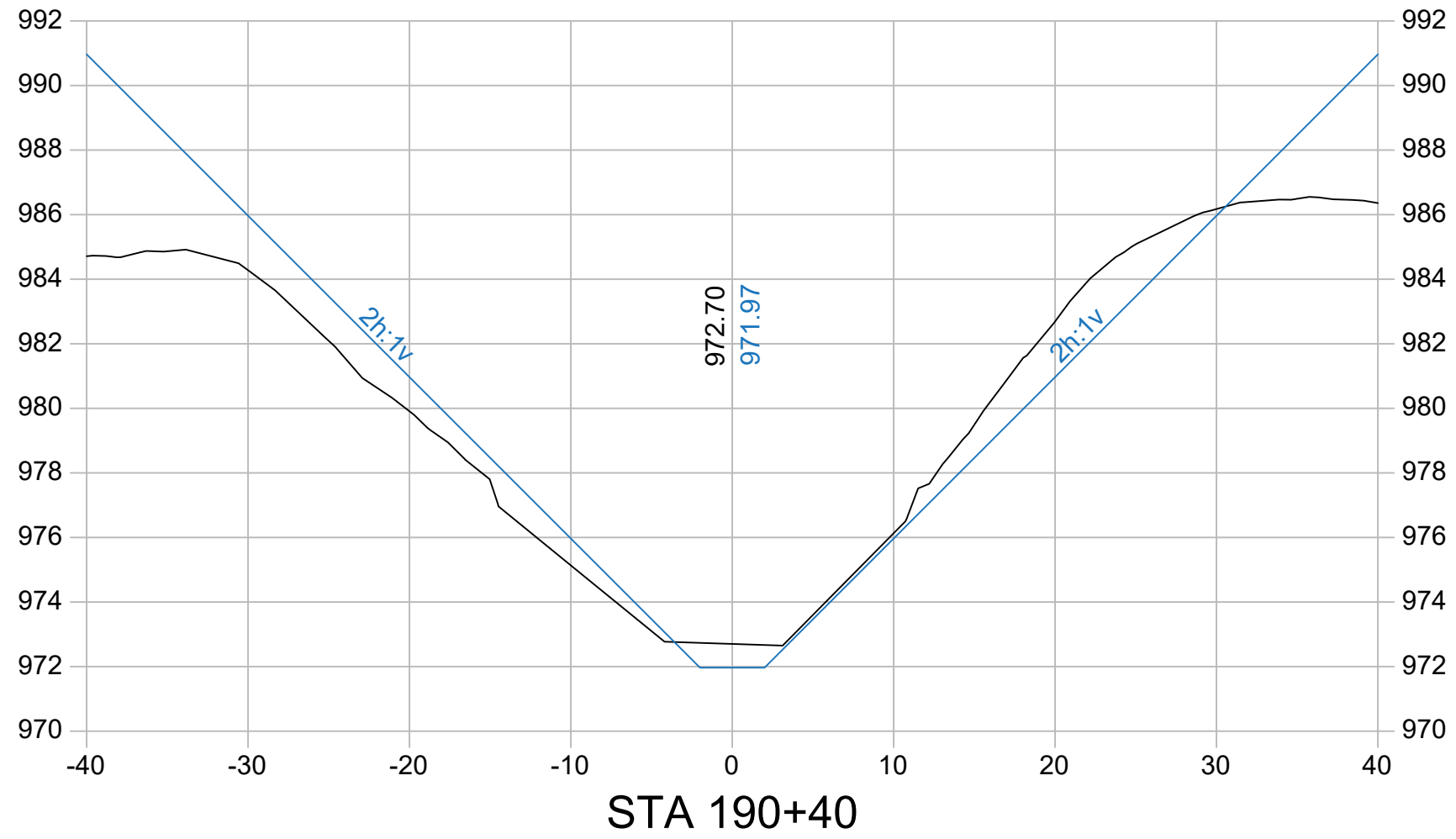
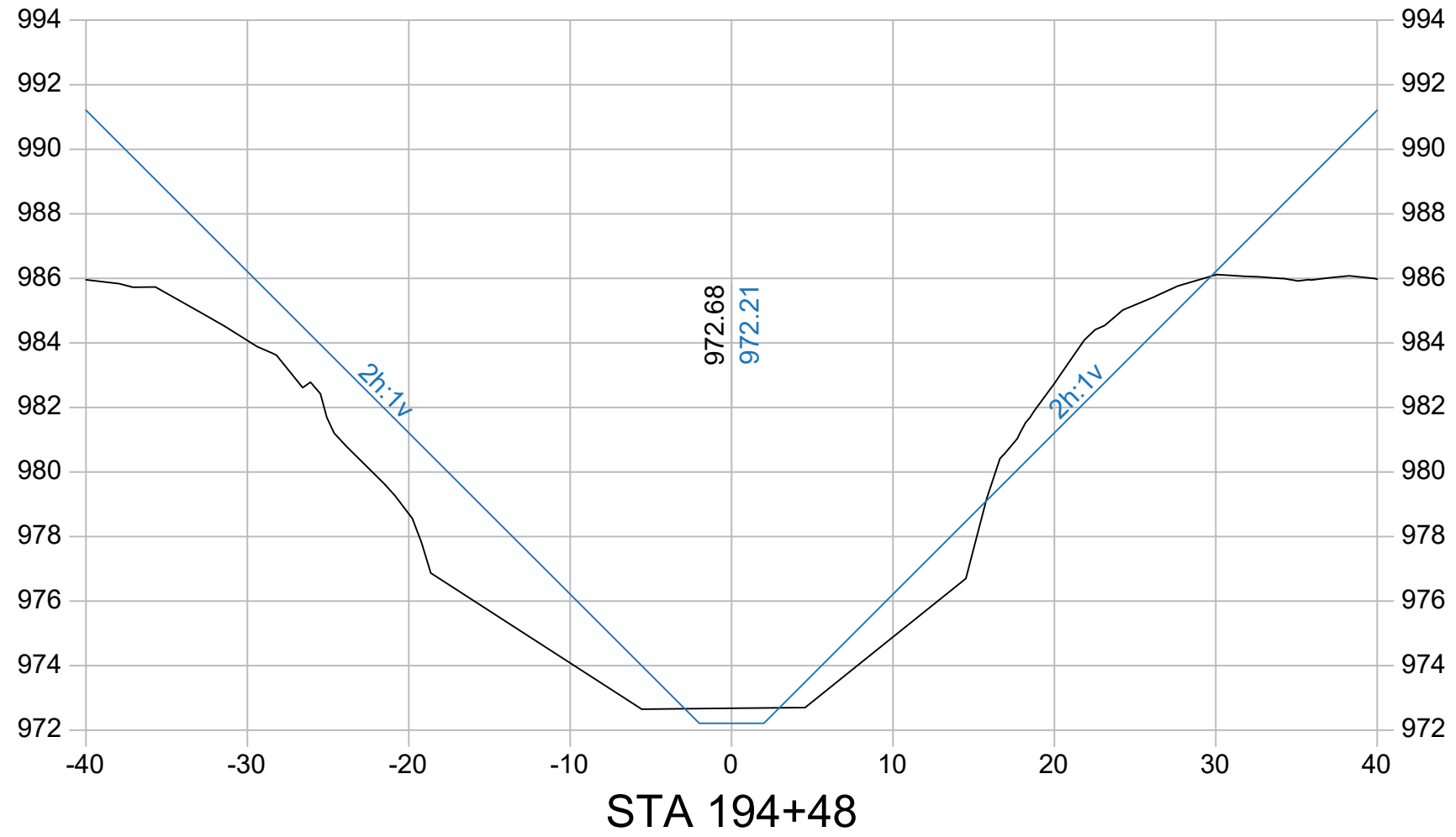
Sheet Name
Plan & Profile
Main Open Ditch
Sta 160+00 →
180+00

Project Name, Client, and Address
Open Ditch Improvements
Drainage District No. 6
Dallas County, IA
Hwy 44 & J Ave, Adel, IA 50003

Project 2531-25	D.10
Date 2026-06-30	
Plan Scale 1" = 200'	



Pipe sizes are shown as surveyed.
Minimum replacement sizes are 18" for
Surface Drains and 8" for Tile Extensions.



Company Information
AgriVia PLLC
PO Box 44
1124 Willis Ave
Perry, IA 50220

Designer:
TJB
Drafter:
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Checker:
JLH

PLAN LEGEND

- Parcel Lines
- Work Area (100' each side)
- Ditch ROW (50' each side)
- Surface Drains
- Tile Outlets
- Utilities (in red)
- Fences

PROFILE LEGEND

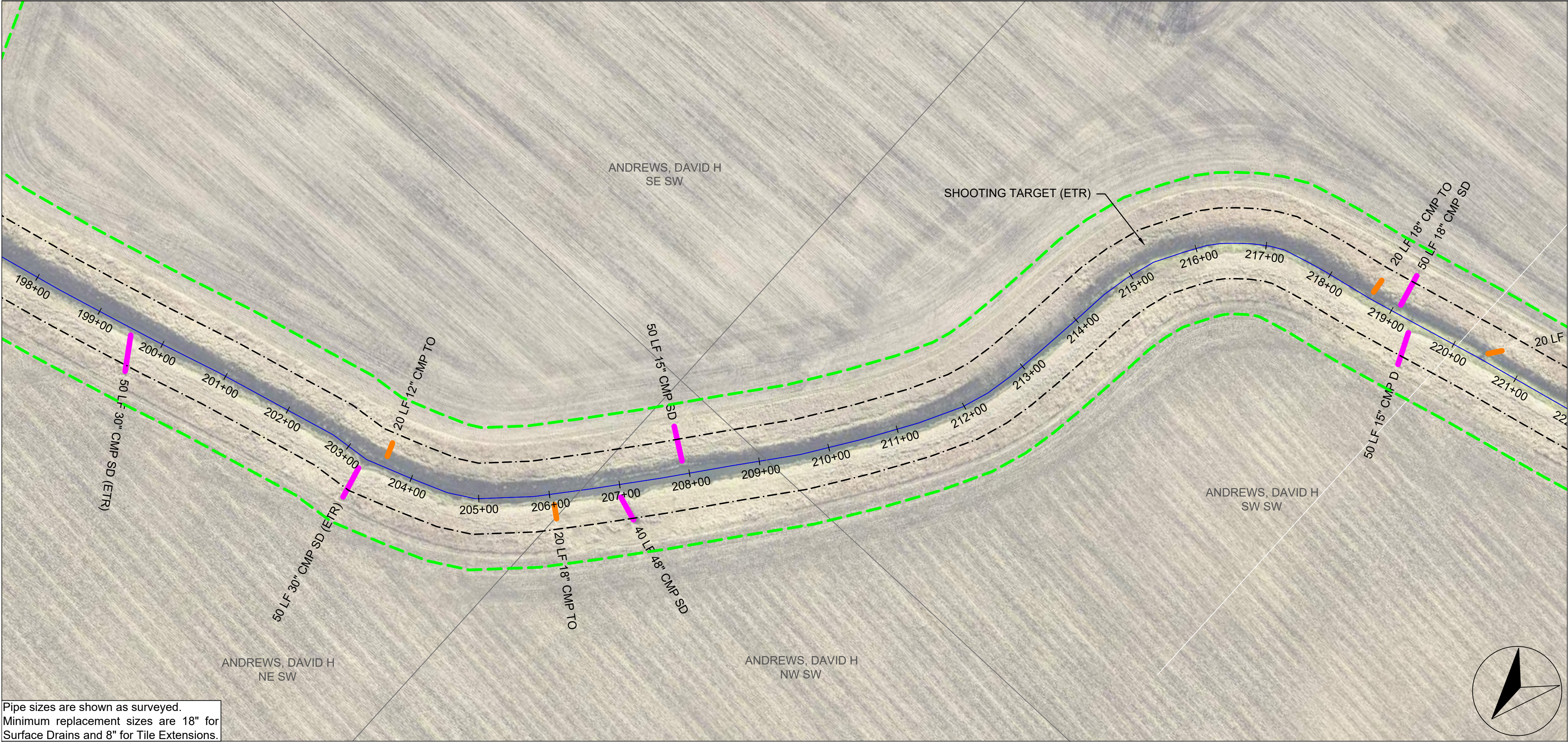
- Design Ditch Grade
- Surveyed Ditch Bottom
- Left Top of Bank
- Right Top of Bank

No.	Revision/Issue	Date

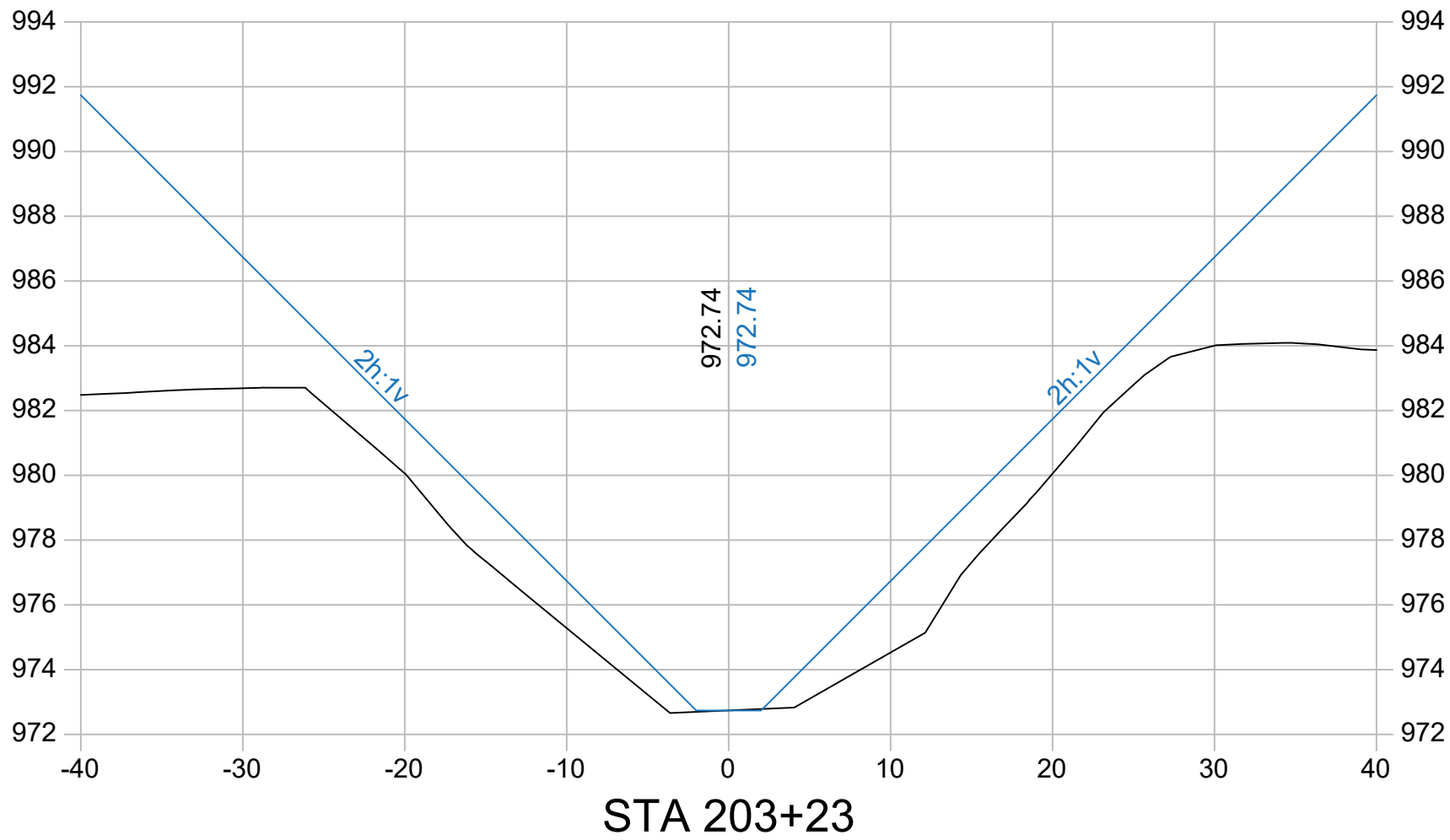
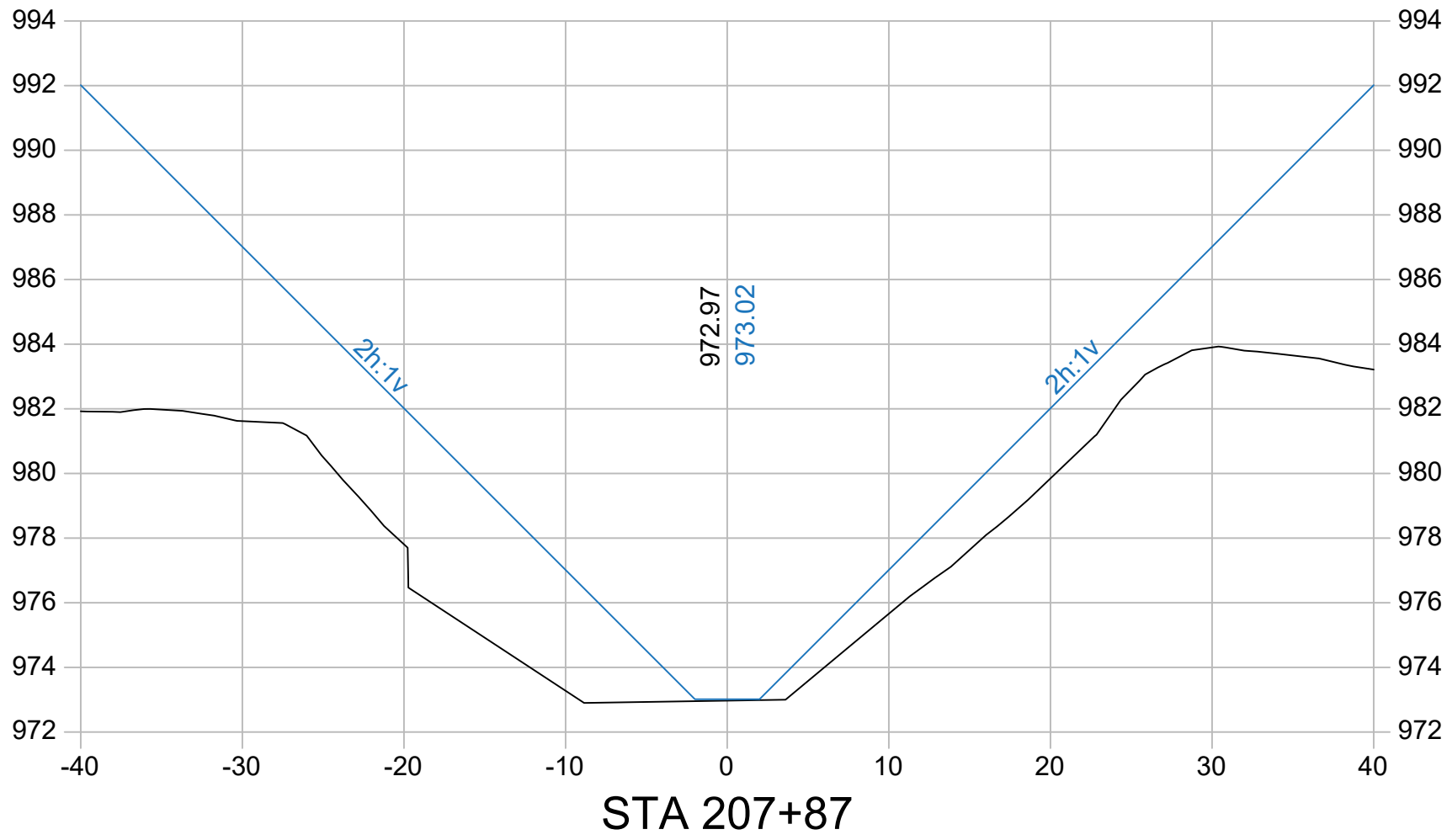
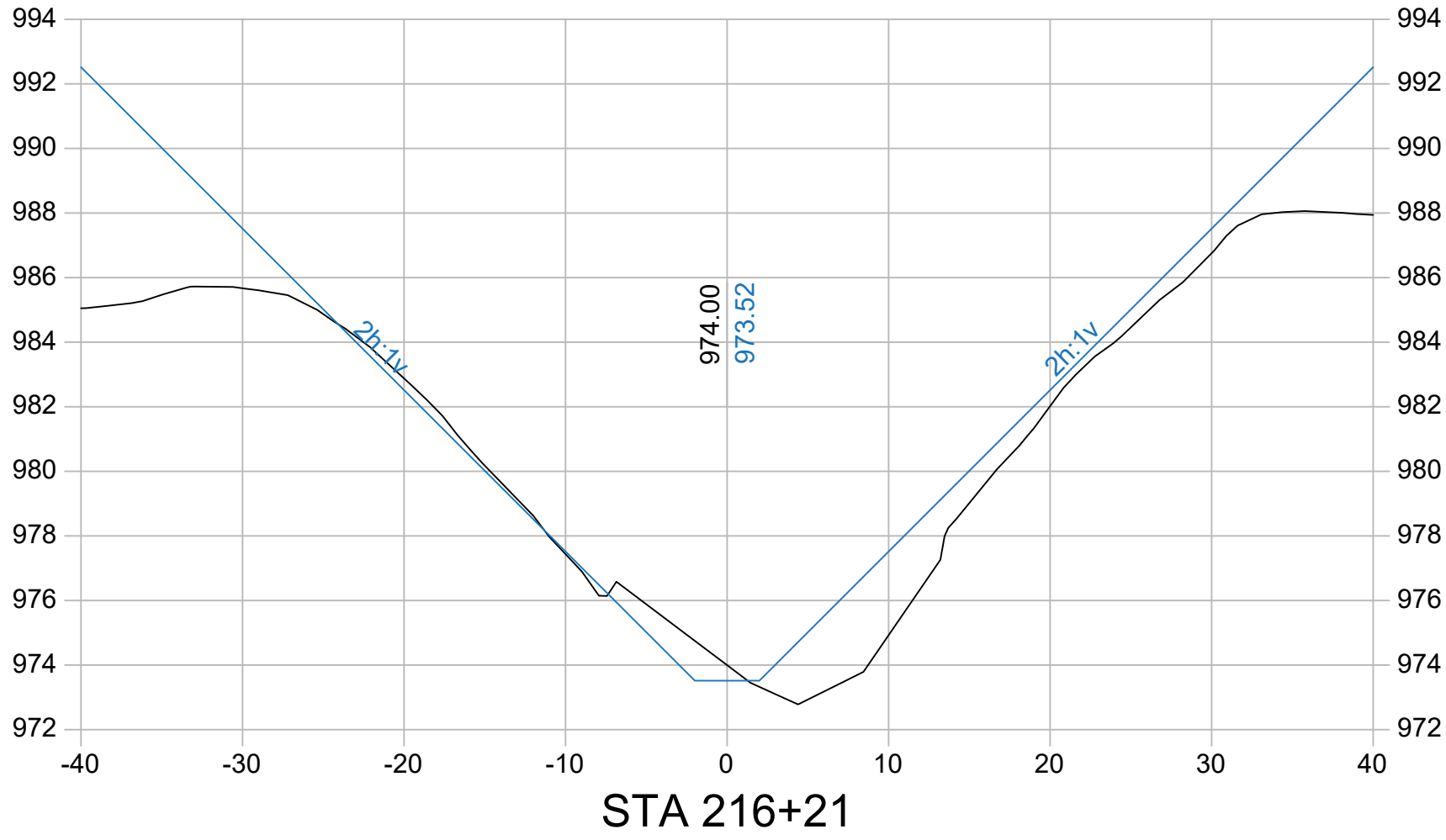
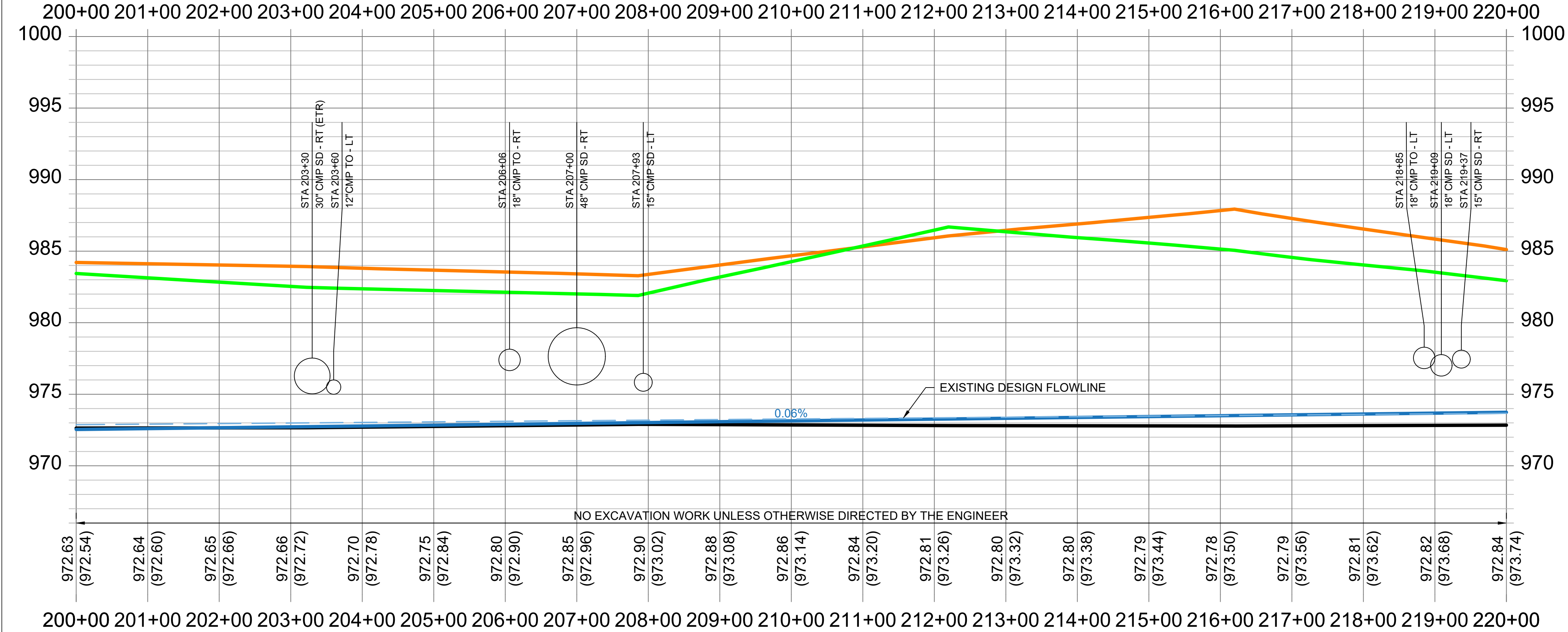
Sheet Name
Plan & Profile
Main Open Ditch
Sta 180+00 →
200+00

Project Name, Client, and Address
Open Ditch Improvements
Drainage District No. 6
Dallas County, IA
Hwy 44 & J Ave, Adel, IA 50003

Project 2531-25	D.11
Date 2026-06-30	
Plan Scale 1" = 200'	



Pipe sizes are shown as surveyed.
Minimum replacement sizes are 18" for
Surface Drains and 8" for Tile Extensions.



Company Information
AgriVia PLLC
PO Box 44
1124 Willis Ave
Perry, IA 50220

Designer:
TJB
Drafter:
TJB
Checker:
JLH

PLAN LEGEND

- Parcel Lines
- Work Area (100' each side)
- Ditch ROW (50' each side)
- Surface Drains
- Tile Outlets
- Utilities (in red)
- Fences

PROFILE LEGEND

- Design Ditch Grade
- Surveyed Ditch Bottom
- Left Top of Bank
- Right Top of Bank

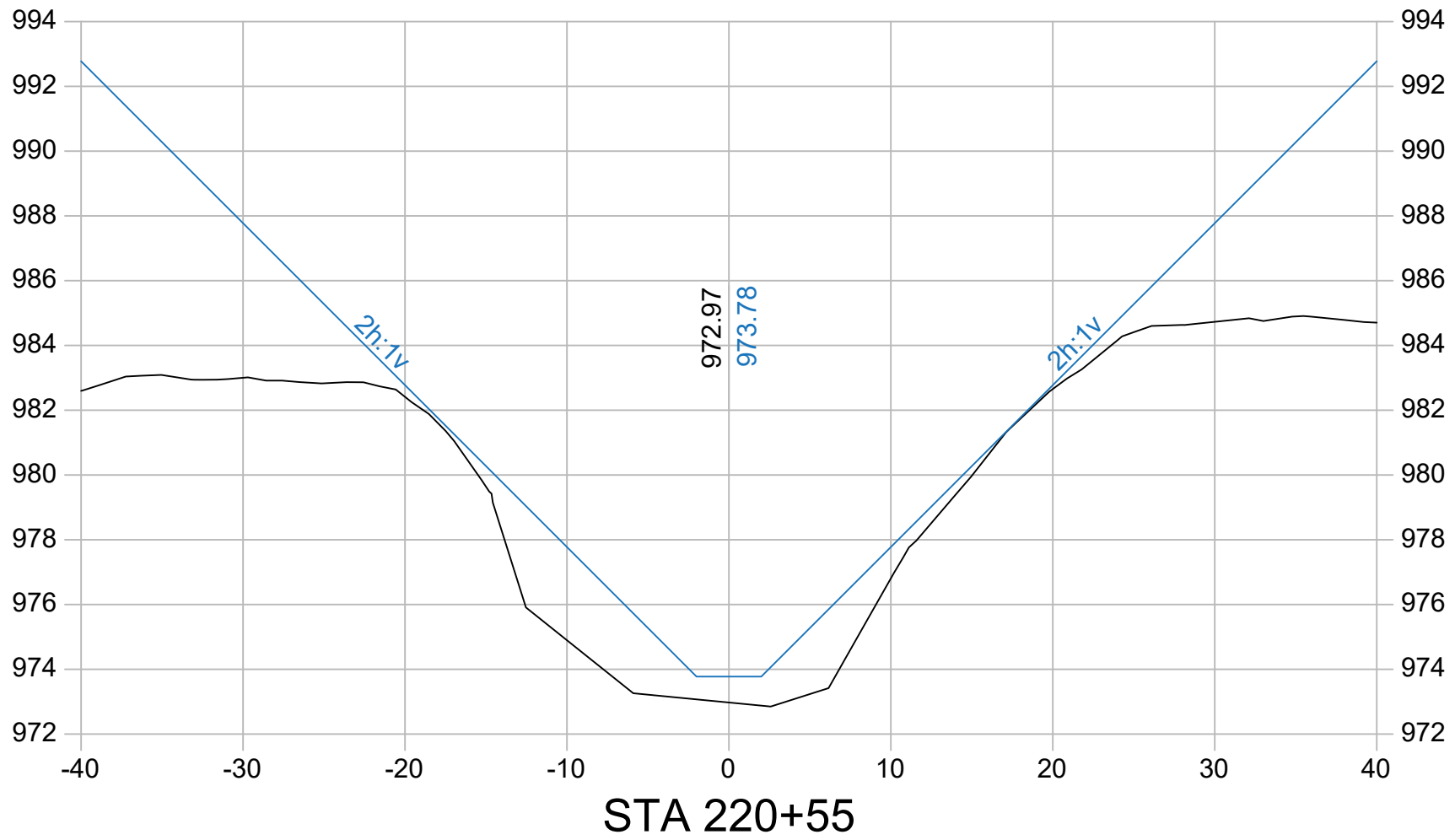
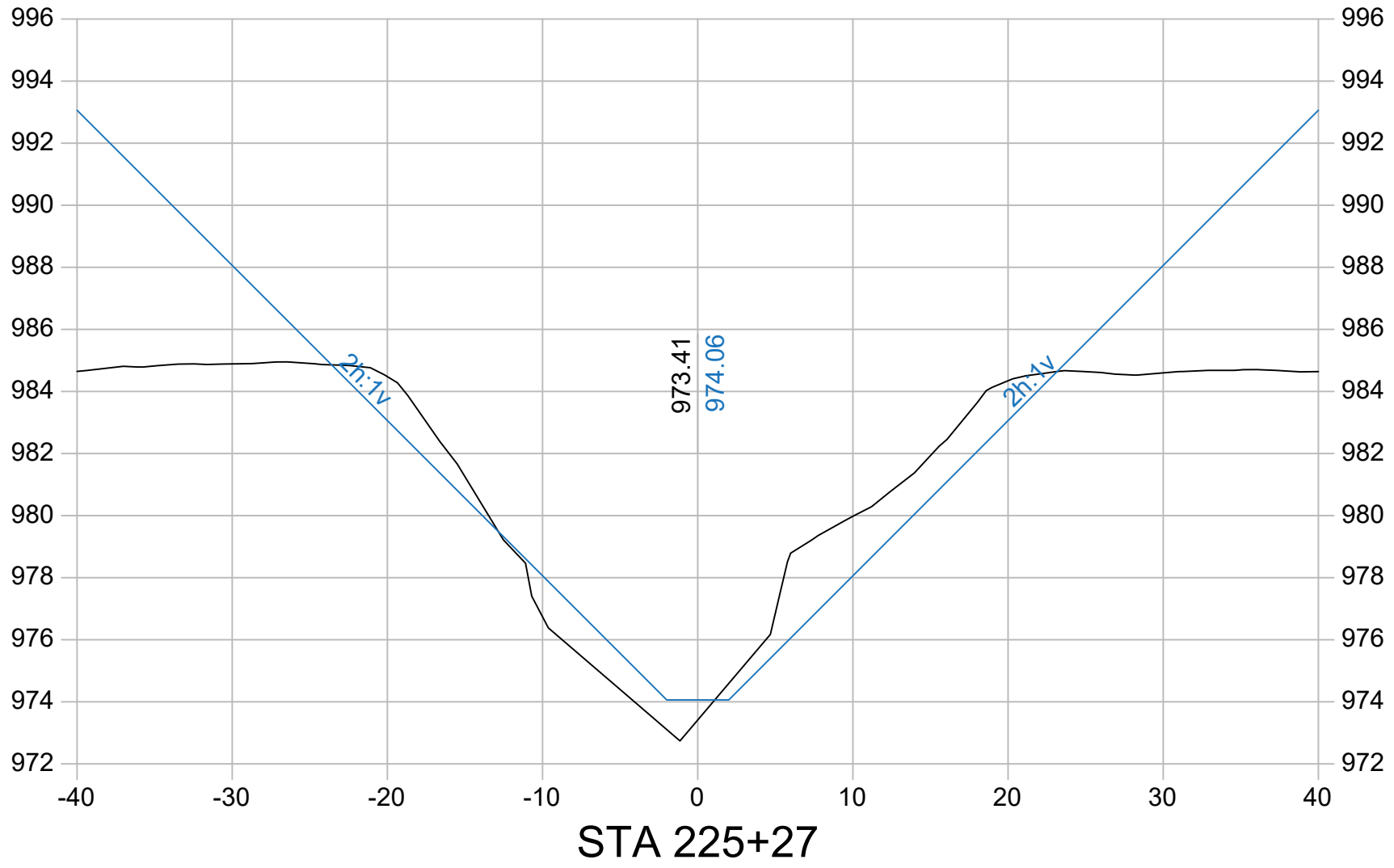
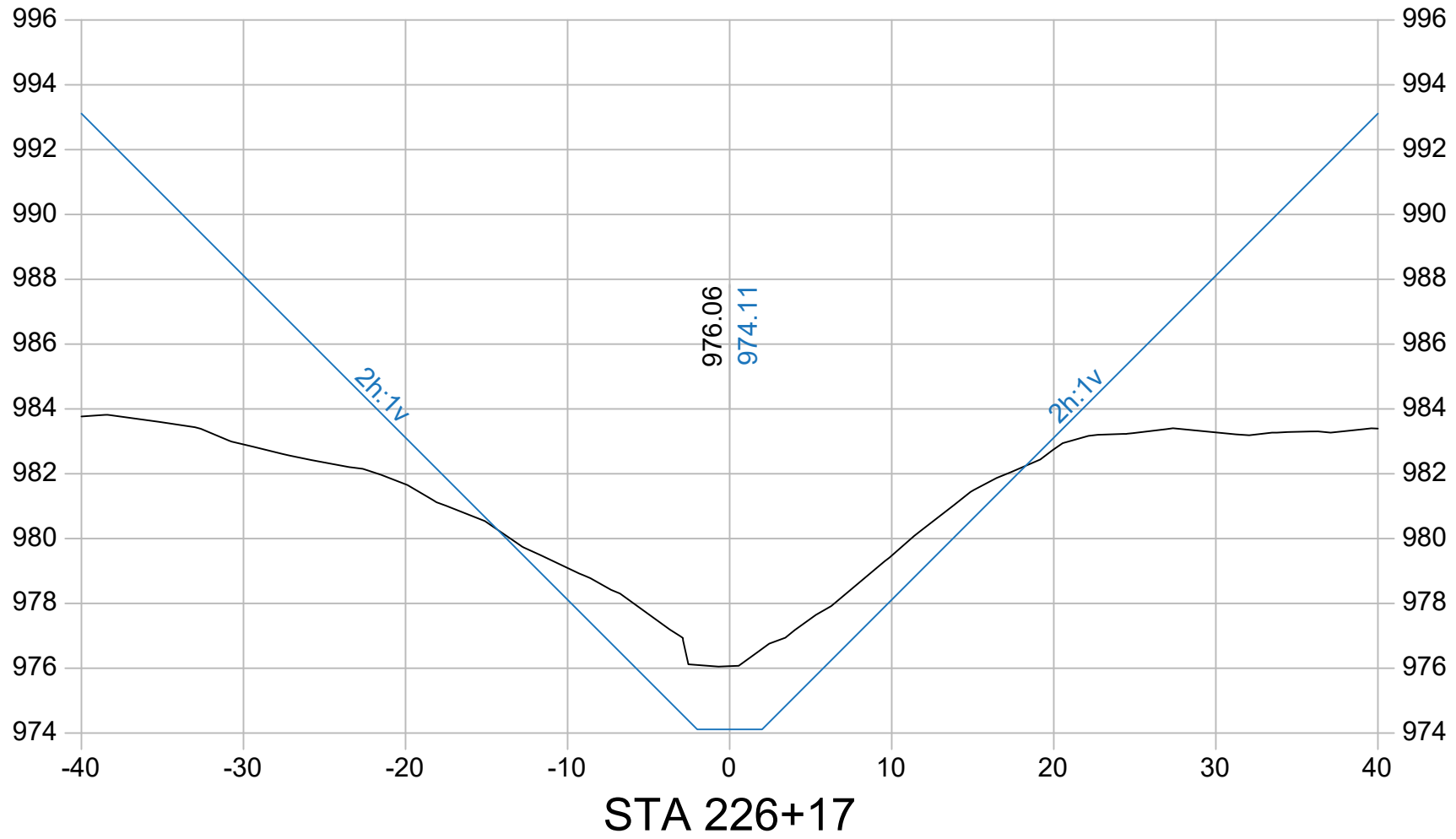
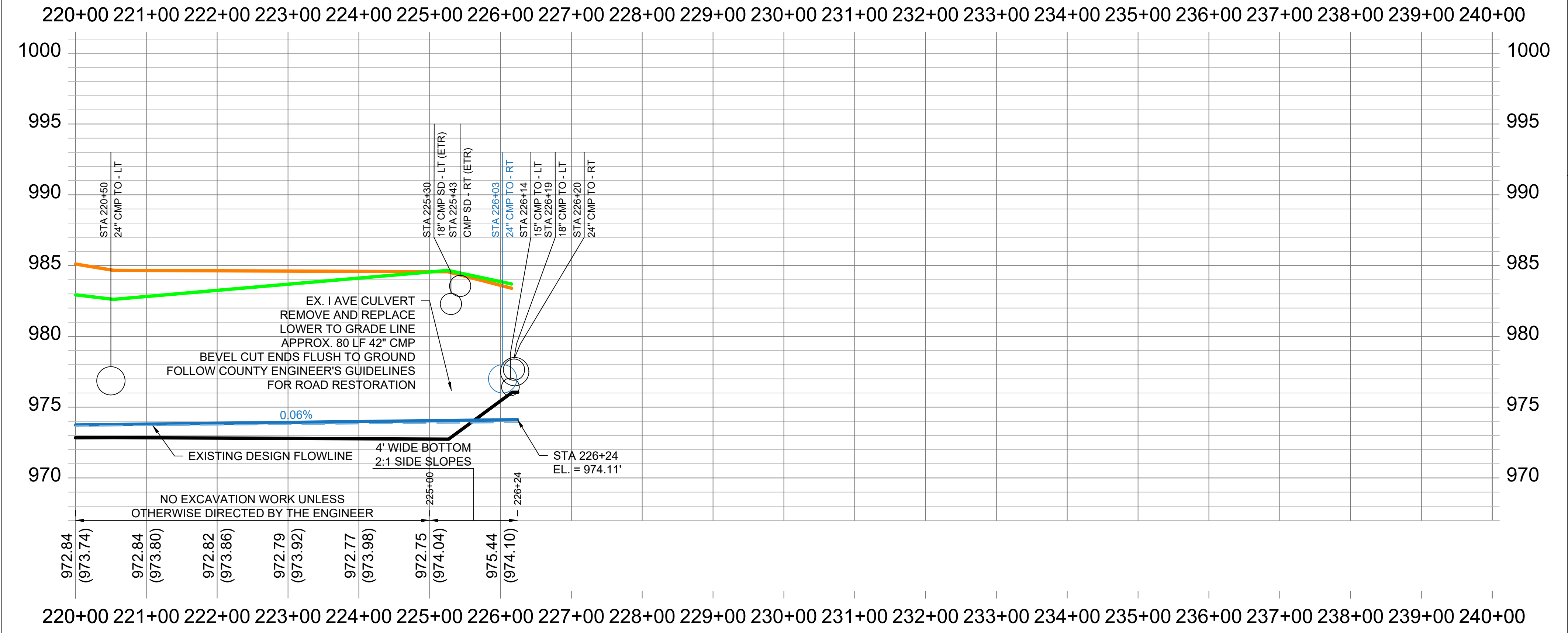
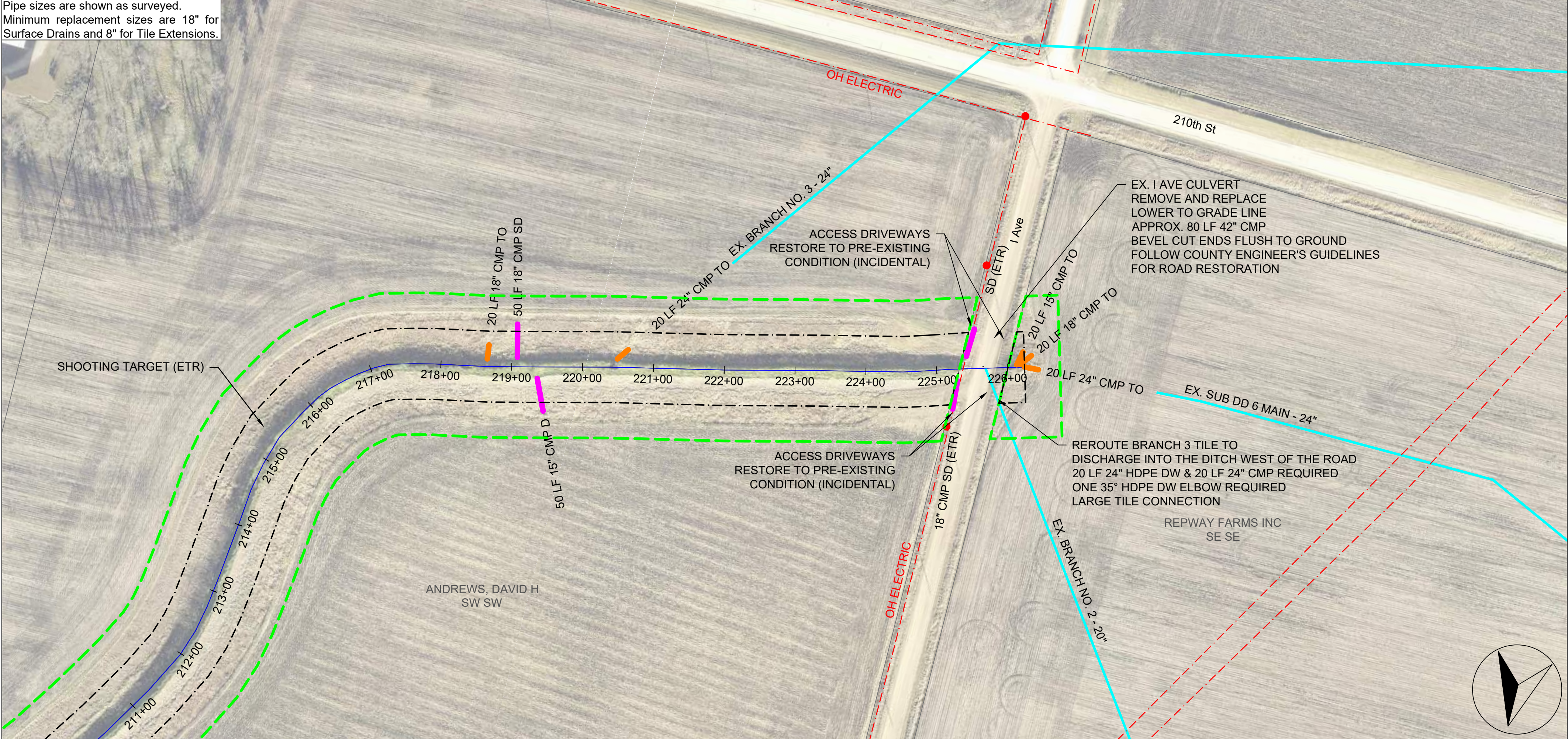
No.	Revision/Issue	Date

Sheet Name
Plan & Profile
Main Open Ditch
Sta 200+00 →
220+00

Project Name, Client, and Address
Open Ditch Improvements
Drainage District No. 6
Dallas County, IA
Hwy 44 & J Ave, Adel, IA 50003

Project 2531-25	D.12
Date 2026-06-30	
Plan Scale 1" = 200'	

Pipe sizes are shown as surveyed.
Minimum replacement sizes are 18" for
Surface Drains and 8" for Tile Extensions.



Company Information
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Designer:
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PLAN LEGEND

- Parcel Lines
- Work Area (100' each side)
- Ditch ROW (50' each side)
- Surface Drains
- Tile Outlets
- Utilities (in red)
- Fences

PROFILE LEGEND

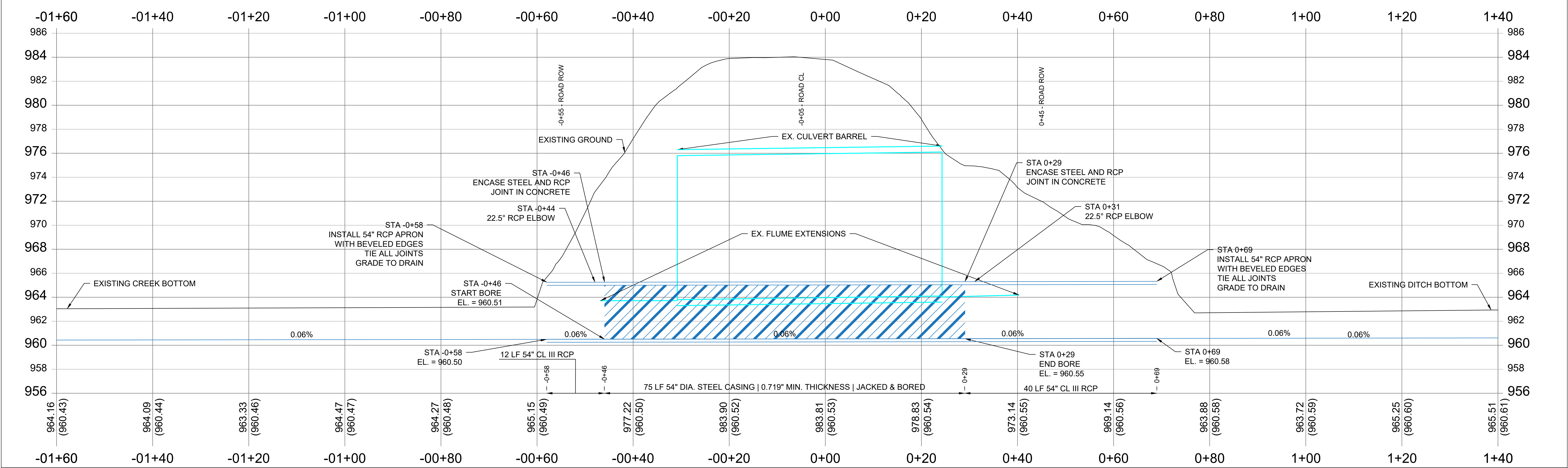
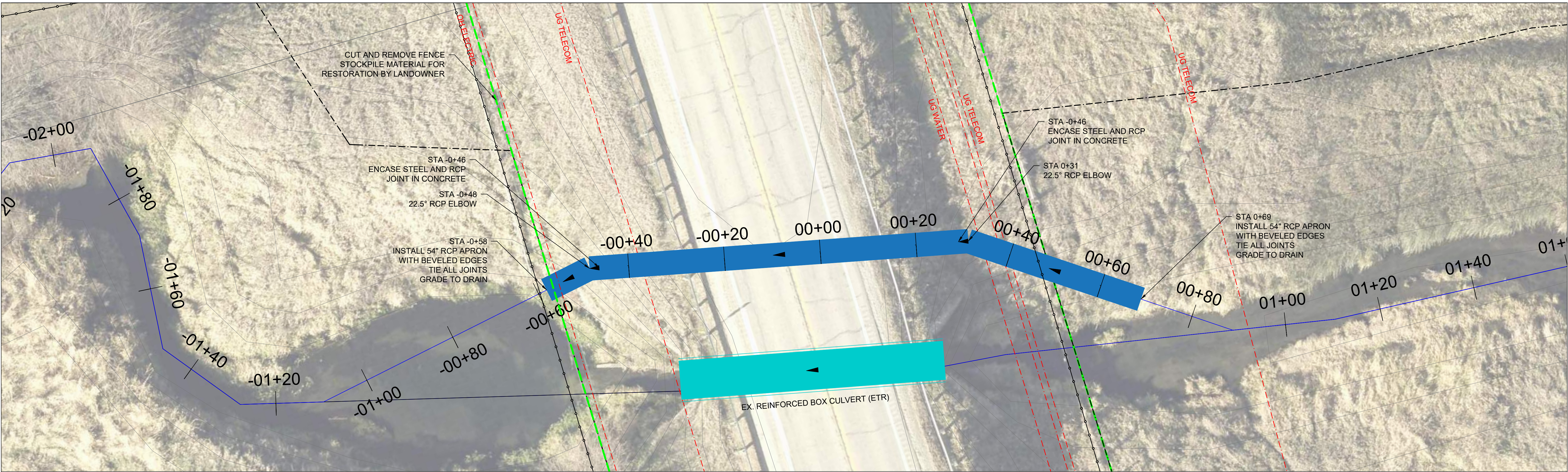
- Design Ditch Grade
- Surveyed Ditch Bottom
- Left Top of Bank
- Right Top of Bank

No.	Revision/Issue	Date

Sheet Name
Plan & Profile
Main Open Ditch
Sta 220+00 →
226+18

Project Name, Client, and Address
Open Ditch Improvements
Drainage District No. 6
Dallas County, IA
Hwy 44 & J Ave, Adel, IA 50003

Project 2531-25	D.13
Date 2026-06-30	
Plan Scale 1" = 200'	



Company Information
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1124 Willis Ave
Perry, IA 50220

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Plan Legend	
Proposed Boring Pipe	
Work Area	
Fenceline	
2' Contours	
Utilities (in red)	

No.	Revision/Issue	Date

Sheet Name
Hwy 44 Boring

Project Name, Client, and Address
**Open Ditch Improvements
Drainage District No. 6
Dallas County, IA
Hwy 44 & J Ave, Adel, IA 50003**

Project 2531-25	V.01
Date 2026-06-30	
Plan Scale 1" = 20'	

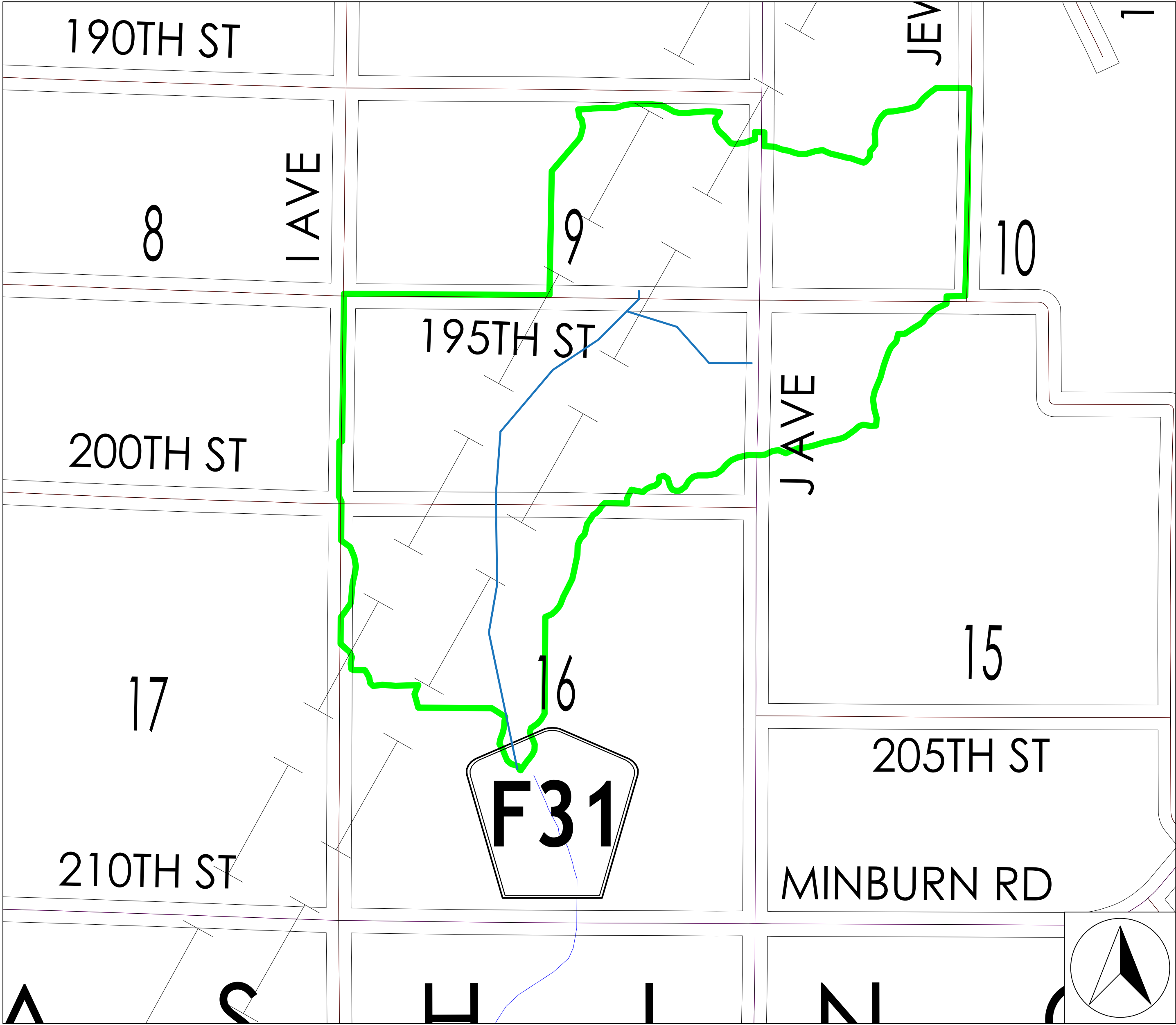
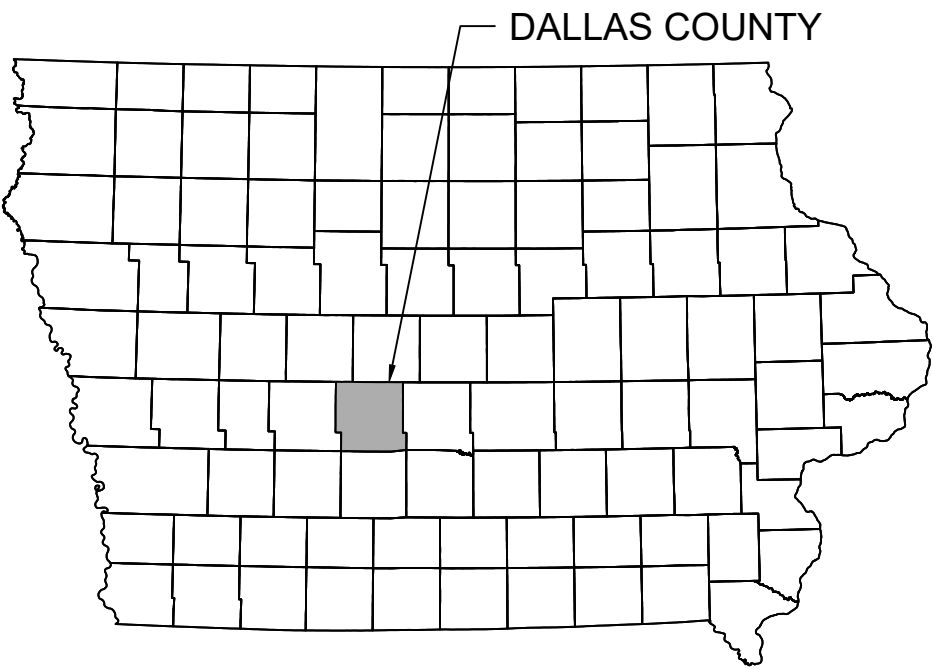
PROPOSED PLANS FOR
DRAINAGE DISTRICT NO. 6
BRANCH 1 & 6 TILE IMPROVEMENTS
DALLAS COUNTY, IA
2026



Utilities shown are estimates only. The Engineer makes no guarantee of the location or existence of those shown or not shown on the plans. The Contractor shall field verify exact locations prior to commencing construction as required by state law. Notify Iowa One Call, 811 or 1-800-292-8989.

Specifications
Unless otherwise noted, the governing standards for this project shall be the 2026 edition of the Iowa Statewide Urban Design and Specifications (SUDAS) for Public Improvements, supplemented where referenced by the Iowa Department of Transportation's Standard Specifications for Highway and Bridge Construction, Series 2023, along with all active general supplemental specifications, materials, instructional memoranda, and relevant special provisions.

Where conflicts arise, the stricter requirement shall take precedence. Complete compliance with all applicable federal, state, and local laws, ordinances, and regulations is mandatory throughout the project's execution.



Sheet List			
Number	Title		
A.01	Title Sheet		
A.02	Branch 1 Plat		
C.01	General Notes		
C.02	Pipe Construction Notes		
C.03	Pipe Structure Notes		
M.01	Plan & Profile	Branch 1	Sta 0+00 → 29+00
M.02	Plan & Profile	Branch 1	Sta 29+00 → 59+00
M.03	Plan & Profile	Branch 1	Sta 59+00 → 89+00
M.04	Plan & Profile	Branch 6	Sta 0+00 → 29+00

PROFESSIONAL ENGINEER

JACOB L. HAGAN
25738

★ I O W A ★

I hereby certify that this engineering document was prepared by me or under my direct personal supervision and that I am a duly licensed Professional Engineer under the laws of the State of Iowa.

Jacob L. Hagan, P.E. (date)
License No. 25738
My license renewal date is December 31, 2026.
Pages or sheets covered by this seal:
All

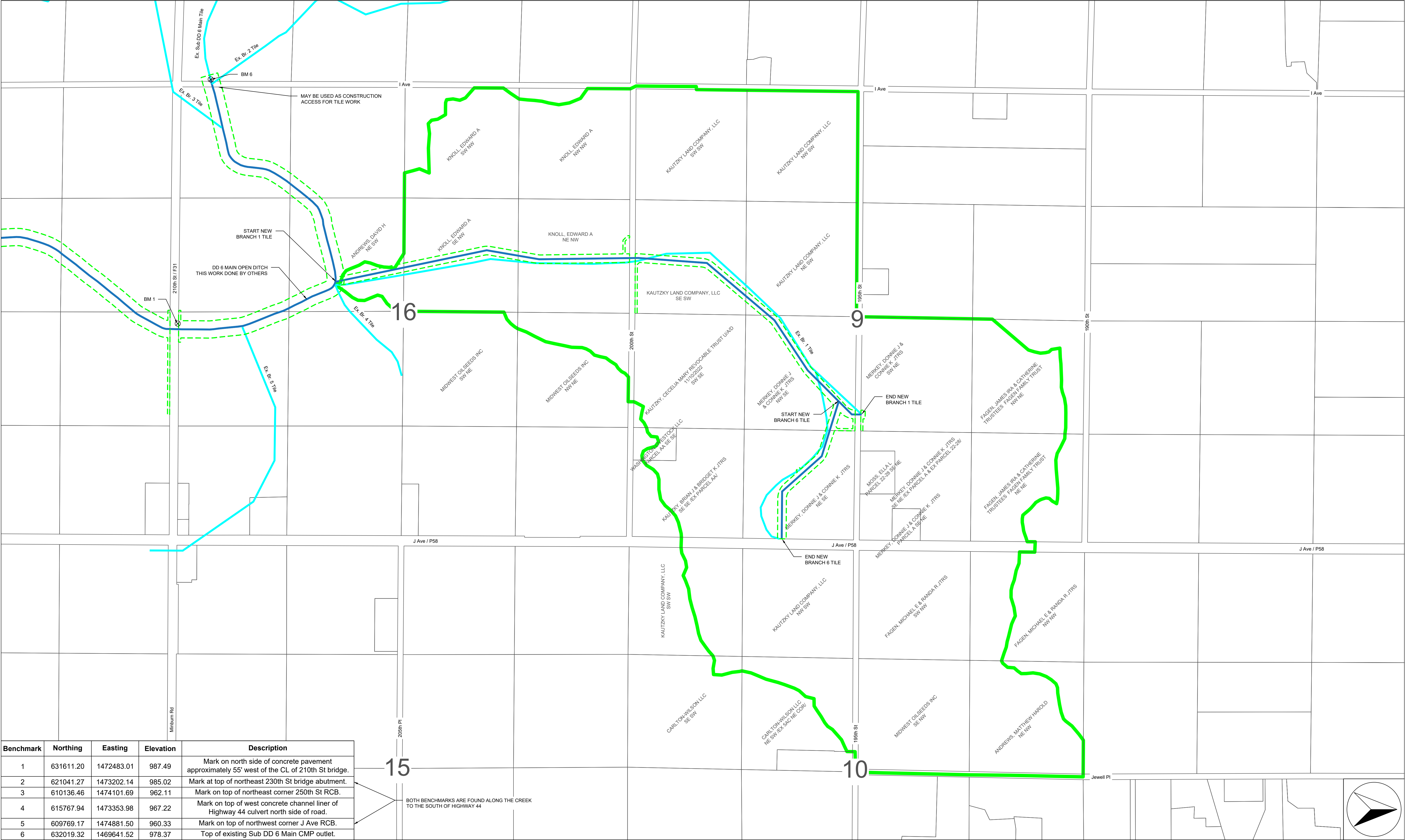
PROFESSIONAL ENGINEER

TYLER J. BUMAN
30759

★ I O W A ★

I hereby certify that this engineering document was prepared by me or under my direct personal supervision and that I am a duly licensed Professional Engineer under the laws of the State of Iowa.

Tyler J. Buman, P.E. (date)
License No. 30759
My license renewal date is December 31, 2027.
Pages or sheets covered by this seal:
All



Benchmark	Northing	Easting	Elevation	Description
1	631611.20	1472483.01	987.49	Mark on north side of concrete pavement approximately 55' west of the CL of 210th St bridge.
2	621041.27	1473202.14	985.02	Mark at top of northeast 230th St bridge abutment.
3	610136.46	1474101.69	962.11	Mark on top of northeast corner 250th St RCB.
4	615767.94	1473353.98	967.22	Mark on top of west concrete channel liner of Highway 44 culvert north side of road.
5	609769.17	1474881.50	960.33	Mark on top of northwest corner J Ave RCB.
6	632019.32	1469641.52	978.37	Top of existing Sub DD 6 Main CMP outlet.



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PLAN LEGEND

- Proposed District Facilities
- Existing DD 6 Facilities
- Benefitted Area
- Parcel Lines
- Work Area

No.	Revision/Issue	Date

Sheet Name
Branch 1 Plat

Project Name, Client, and Address
**Branch 1 & 6 Tile Improvements
Drainage District No. 6
Dallas County, IA
Hwy 44 & J Ave, Adel, IA 50003**

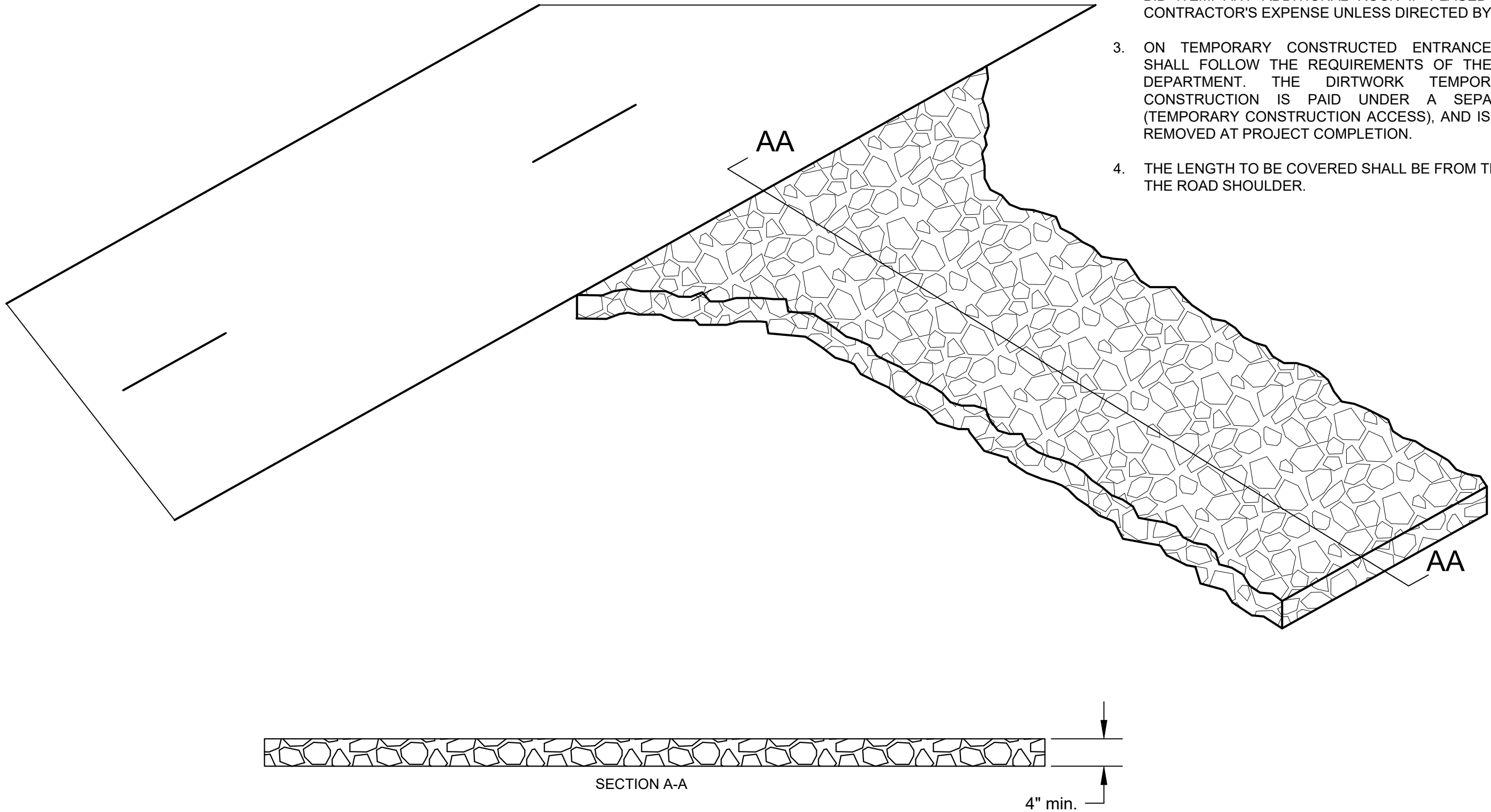
Project 2624-25	A.02
Date 2026-06-30	
Plan Scale 1" = 1000'	

GENERAL PROVISIONS & PRE-CONSTRUCTION

- WORK AREA:** THE PLANS SHOW THE WORK AREA. STANDARD WORK AREA IS 50 FEET EACH SIDE FROM THE CENTERLINE OF THE TILE UNLESS OTHERWISE NOTED. THE CONTRACTOR MUST STAY WITHIN THIS AREA. ANY DAMAGE OUTSIDE THE WORK AREA WILL BE DEDUCTED FROM FINAL PAYMENT. ALL STAGING AND STORAGE SHALL BE WITHIN THE WORK AREA. NO STORAGE OR STAGING SHALL TAKE PLACE ON ROADWAYS.
- ACCESS:** ACCESS TO THE WORK AREA IS LIMITED TO PUBLIC ROAD INTERSECTIONS AND DRIVEWAYS CALLED OUT ON THE PLANS. THE CONTRACTOR IS RESPONSIBLE FOR SECURING ANY ADDITIONAL TEMPORARY ACCESS AGREEMENTS WITH LANDOWNERS OR THE COUNTY ENGINEER FOR ROAD ROW ENTRY.
- UTILITIES & LOCATES:** THE CONTRACTOR SHALL NOTIFY IOWA ONE CALL (811) PRIOR TO EXCAVATION. THE CONTRACTOR IS SOLELY RESPONSIBLE FOR PROTECTING ALL MARKED AND UNMARKED UTILITIES.
- TILE EXPLORATION:** EXISTING TILE IS APPROXIMATELY LOCATED ON THE PLANS. ENGINEER MAY DIRECT CONTRACTOR TO LOCATE TILE BEFORE STARTING AND ADVANCING WORK TO DETERMINE EXISTING TILE LOCATION AND DEPTH TO AVOID POTENTIAL CONFLICTS. CONTRACTOR SHALL BE COMPENSATED ON AN HOURLY BASIS PER EXCAVATION, EXPLORATORY BID ITEM.
- AS-BUILT DOCUMENTATION:** THE CONTRACTOR SHALL PROVIDE THE ENGINEER WITH A COMPLETE SET OF DRAWINGS SUITABLY MARKED TO SHOW ANY DEVIATIONS FROM THE ORIGINAL PLANS, INCLUDING BUT NOT LIMITED TO ACTUAL PIPE ALIGNMENTS, DEPTHS, CONNECTION LOCATIONS, AND ANY FIELD MODIFICATIONS. THIS DOCUMENTATION SHALL BE PROVIDED PRIOR TO FINAL ACCEPTANCE.
- THE LANDOWNERS** WHERE THE TILE IS BEING INSTALLED ARE PAYING FOR THIS PROJECT. AT COMPLETION OF THE PROJECT, THOSE LANDOWNERS ARE INVITED TO A PUBLIC HEARING AND CAN FILE CLAIMS FOR DAMAGES. THESE SPECIFICATIONS AND PLANS EXIST AS MUCH TO GUIDE AND PROTECT THE CONTRACTOR AS TO PROTECT THE LANDOWNERS. REGULAR DOCUMENTATION ALONG WITH OPEN COMMUNICATION WITH THE ENGINEER IS ESSENTIAL TO A SMOOTH PROJECT FOR ALL PARTIES.

CONSTRUCTION ACCESS

- GENERAL NOTES:
- LOCATIONS OF CONSTRUCTION ENTRANCES ARE MARKED ON THE PLANS. OBTAIN APPROVAL FROM THE ENGINEER PRIOR TO USING ANY OTHER ENTRANCES.
 - PLACING 12 TONS OF CLASS I STONE ON EACH EXISTING AND TEMPORARY ENTRANCE WILL BE PAID UNDER THE CLASS I STONE BID ITEM. ANY ADDITIONAL ROCK IF PLACED WILL BE AT THE CONTRACTOR'S EXPENSE UNLESS DIRECTED BY THE ENGINEER.
 - ON TEMPORARY CONSTRUCTED ENTRANCES, CONTRACTOR SHALL FOLLOW THE REQUIREMENTS OF THE COUNTY ROADS DEPARTMENT. THE DIRTWORK TEMPORARY DRIVEWAY CONSTRUCTION IS PAID UNDER A SEPARATE BID ITEM (TEMPORARY CONSTRUCTION ACCESS), AND IS REQUIRED TO BE REMOVED AT PROJECT COMPLETION.
 - THE LENGTH TO BE COVERED SHALL BE FROM THE FIELD EDGE TO THE ROAD SHOULDER.



ROADWAY CROSSINGS

- PERMITS & NOTIFICATIONS:** THE CONTRACTOR SHALL OBTAIN ALL NECESSARY OCCUPANCY PERMITS FROM THE COUNTY ENGINEER OR IOWA DOT. NOTIFY THE RESPECTIVE AGENCY AND THE PROJECT ENGINEER AT LEAST 48 HOURS PRIOR TO COMMENCING ANY WORK WITHIN THE ROW.
- TRAFFIC CONTROL:** THE CONTRACTOR IS RESPONSIBLE FOR ALL TRAFFIC CONTROL, INCLUDING SIGNAGE, BARRICADES, AND FLAGGERS. ALL SETUPS MUST STRICTLY ADHERE TO THE LATEST MUTCD (MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES) STANDARDS AND ANY SPECIFIC REQUIREMENTS SET BY THE COUNTY OR DOT PERMIT.
- UTILITY VERIFICATION:** ALL UTILITIES WITHIN THE ROW (FIBER OPTIC, GAS, WATER) MUST BE DAYLIGHTED VIA POTHOLING PRIOR TO THE ARRIVAL OF THE BORING OR TRENCHING EQUIPMENT.
- SEEDING:** DISTURBED ROAD DITCHES SHALL BE SEEDED FOLLOWING SUDAS TYPE 2 (PERMANENT COOL SEASON MIXTURE FOR SLOPES AND DITCHES) SEED MIXTURE.
- STORAGE AND PARKING:** NO STORAGE OR PARKING OF EQUIPMENT IN PUBLIC RIGHT-OF-WAY. NO CROSSING PAVED ROADS WITH TRACKED EQUIPMENT.
- OPEN CUT: COUNTY GRAVEL ROAD**
 - PIPE SUPPORT:** ALL PIPE UNDER THE ROADWAY MUST BE INSTALLED USING MODIFIED TYPE 4 TRENCHING.
 - MATERIALS:** WITHIN THE ROAD PRISM, NATIVE SOIL SHALL NOT BE USED FOR HAUNCHING. USE 1-INCH CLEAN CRUSHED STONE OR SUDAS CLASS I CRUSHED STONE TO THE SPRINGLINE OF THE PIPE. FROM THE TOP OF THE HAUNCHING TO WITHIN 12 INCHES OF THE ROAD SURFACE, THE TRENCH MAY BE FILLED WITH NATIVE SUBSOIL MATERIAL PER THE ENGINEER'S APPROVAL. THE ENGINEER MAY REQUIRE THE BACKFILL TO BE CLASS I STONE PER THEIR DIRECTION.
 - COMPACTION LIFTS:** BACKFILL SHALL BE PLACED IN MAXIMUM 8-INCH LOOSE LIFTS. EACH LIFT MUST BE MECHANICALLY COMPACTED TO 95% STANDARD PROCTOR DENSITY.
 - SURFACE MATERIAL:** THE TOP 12 INCHES OF THE TRENCH SHALL BE FILLED WITH CLASS A ROAD STONE (OR THE SPECIFIC GRAVEL GRADE USED BY THE COUNTY) AND COMPACTED THOROUGHLY.
 - CROWNING:** THE FINISHED SURFACE OF THE TRENCH SHOULD BE "CROWNED" APPROXIMATELY 1 TO 2 INCHES HIGHER THAN THE ADJACENT ROAD GRADE TO ALLOW FOR INITIAL TRAFFIC-DRIVEN COMPACTION WITHOUT CREATING A DEPRESSION.
 - SHOULDER REPAIR:** ANY DAMAGE TO THE ROAD SHOULDERS OR SIDE SLOPES SHALL BE RESHAPED TO MATCH THE ORIGINAL PROFILE AND IMMEDIATELY SEEDED/MULCHED.
 - ROAD DITCH SEEDING:** SHALL FOLLOW SUDAS 9010. USE TYPE 2 (PERMANENT COOL SEASON MIXTURE FOR SLOPES AND DITCHES) SEED MIXTURE. ENGINEER MAY DIRECT DIFFERENT SEED MIXTURE DUE TO WEATHER OR SEASON CONDITIONS.
 - ROAD CLOSURE:** THE CROSSING NEEDS TO BE COMPLETED IN ONE DAY. THE ROAD SHALL ONLY BE CLOSED FROM SUN RISE TO SUN SET. BY SUN SET THE ROAD SHALL BE OPEN TO TRAFFIC.
- TRENCHLESS / BORED METHOD:** SHALL FOLLOW SUDAS 3020 AND IOWA DOT PERMIT REQUIREMENTS.

PIPE EXCAVATION, TRENCHING & BEDDING NOTES

1. **RIGID PIPE (RCP):** SUDAS SW-102 MODIFIED R-1 BEDDING. THE TRENCH BASE MUST BE EXCAVATED WITH A SHAPED BOTTOM GROOVE CONFORMING TO AT LEAST 1/6 OF THE PIPE OUTSIDE CIRCUMFERENCE TO PROVIDE UNIFORM SUPPORT. IF A FIRM TRENCH BOTTOM IS NOT FOUND, THE CONTRACTOR SHALL OVER-EXCAVATE AND PLACE 1"-3" CLEAN CRUSHED STONE BEDDING (SUDAS CLASS 1) TO STABILIZE THE BASE PER ENGINEER'S DIRECTION. GPS LOCATED AND TIME STAMPED PHOTOS SHALL BE TAKEN EVERY 100 FEET OR ANY TIME ROCK BEDDING IS USED AND ROCK TICKETS SHALL BE SUBMITTED.
2. **FLEXIBLE PIPE (CPDT):** SUDAS SW-103 F-2 BEDDING REQUIREMENTS. TRENCH WIDTH SHALL BE THE OUTSIDE DIAMETER PLUS 12 INCHES. GPS LOCATED AND TIME STAMPED PHOTOS SHALL BE TAKEN EVERY 100 FEET SHOWING THE ROCK TO THE TOP OF THE PIPE BEFORE BACKFILLING WITH DIRT. ALL ROCK TICKETS SHALL BE SUBMITTED, AND ALL ROCK USED IS INCIDENTAL TO INSTALLATION. ROCK TICKETS SHALL BE SUBMITTED WEEKLY WITH A LOG OF LENGTH OF TILE INSTALLED CORRESPONDING TO THE ROCK USED. A SPOON BOTTOM MAY BE USED FOR PIPE 15" OR SMALLER IF LAID USING A TILE PLOW OR TRENCHER WITH GRADE CONTROL. A SPOON BOTTOM (NO ROCK BEDDING) USING AN EXCAVATOR IS NOT ACCEPTABLE FOR ANY SIZE PIPE.

TO ENSURE LONGEVITY AND MINIMIZE SETTLEMENT FOR FLEXIBLE PIPE INSTALLATION, THE CONTRACTOR MUST PARTICIPATE IN THE FOLLOWING VERIFICATION PROCESS:

STEP 1 (DEMONSTRATION): IN THE PRESENCE OF THE ENGINEER, THE CONTRACTOR SHALL DEMONSTRATE THEIR COMPACTION METHOD ON THE FIRST SEVERAL PIPE SECTIONS. DENSITY TESTS MAY BE TAKEN TO CONFIRM THE METHOD ACHIEVES 95% STANDARD PROCTOR DENSITY.

STEP 2 (SPOT CHECKING): ONCE A METHOD IS APPROVED, THE CONTRACTOR MAY PROCEED, BUT MAY BE RANDOMLY TESTED BY THE ENGINEER AT THE ENGINEER'S SOLE DECISION. GPS LOCATED AND TIME STAMPED PHOTOS EVERY 100 FEET SHOWING THE TILE UNBLINDED WITH THE HAUNCHES FILLED AND COMPACTED ARE REQUIRED TO BE SUBMITTED.

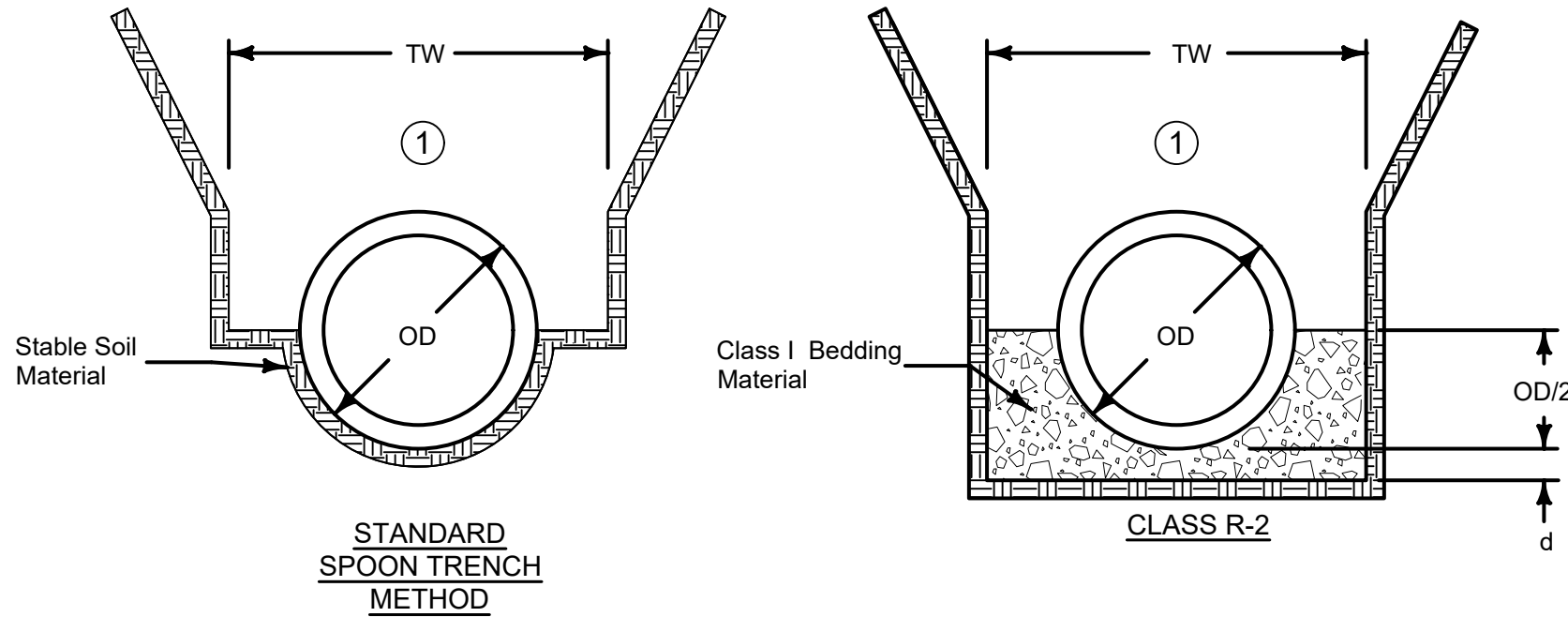
STEP 3 (VIDEO AND DEFLECTION TESTING): PER SUDAS REQUIREMENTS FOR FLEXIBLE PIPE AFTER COMPLETION OF THE PROJECT.

3. **BACKFILL AND TOPSOIL:** TOPSOIL (TOP 12" OR HORIZON A SOIL IF DEEPER) SHALL BE SEGREGATED DURING EXCAVATION AND PLACED ON THE OPPOSITE SIDE OF THE TRENCH AS THE SUBSOIL IS PLACED. THE SUBSOIL SHALL BE PLACED FIRST IN 6-INCH LIFTS AND THE TOPSOIL PLACED ON TOP. ROCKS SHALL BE PICKED UP AND BURIED AT LEAST 4 FEET DEEP. A SMALL MOUND IS ALLOWABLE (MAXIMUM HEIGHT OF 6 INCHES).
4. **ELBOWS AND BENDS:** THE PLANS SHOW BENDS AND ELBOWS. ADDITIONAL BENDS OR ELBOWS MAY BE REQUIRED DEPENDING ON EXISTING TILE LOCATIONS AND UNKNOWN SUBSURFACE CONDITIONS. ALL BENDS AND ELBOWS ARE INCIDENTAL UNLESS CALLED OUT IN BID DOCUMENTS. CONTRACTOR SHALL RECEIVE NO ADDITIONAL COMPENSATION FOR ADDITIONAL RCP BENDS OR HDPE ELBOWS NEEDED DUE TO ALIGNMENT CHANGES.

RCP PIPE: GENTLE CURVES CAN BE ACCOMPLISHED VIA GAPPING THE PIPE. ALL RADIUSSES SHALL BE WRAPPED IN FABRIC. MAXIMUM ALLOWABLE DEGREE PER PIPE SECTION IS 2.5 DEGREE.

HDPE PIPE: ALL CHANGES IN DIRECTIONS SHALL BE DONE USING MANUFACTURED ELBOWS. THE MAXIMUM ALLOWABLE ELBOW TO BE USED IS 22.5 DEGREES. TO ACHIEVE BENDS GREATER THAN 22.5 DEGREES, MULTIPLE ELBOWS SHALL BE USED.

RCP AND VCP CIRCULAR PIPE BEDDING



- ① Use Standard Spoon Trench Method or R-2 unless specified otherwise.
- ① Place remainder of bedding and backfill materials as specified in the contract documents.
- Key**
- OD = Outside diameter of pipe
- TW = Trench width at top of pipe:
Min. = OD+18 inches
Max. = 1.25xOD+12 inches OR 54 inches (whichever is greater)
- d = Depth of bedding material below pipe:
OD/8 or OD/8, OR 4 inches (whichever is greater)

ALLOWABLE BURY DEPTH

CLASS III RCP

Pipe Diameter (in)	Standard "Spoon-Trench" Method	Class R-2 Bedding
12	7'	10'
15	8'	10'
18	8'	11'
21	8'	11'
24	8'	12'
27	10'	15'
30	11'	15'
33	11'	15'
36	11'	15'
42	11'	15'
48	11'	15'
54	11'	15'
60	11'	15'
66	11'	15'
72	11'	15'

CLASS IV RCP

Pipe Diameter (in)	Standard "Spoon-Trench" Method	Class R-2 Bedding
12	12'	15'
15	12'	16'
18	13'	16'
21	13'	18'
24	16'	23'
27	19'	30'
30	19'	29'
33	19'	28'
36	19'	28'
42	18'	27'
48	18'	26'
54	18'	25'
60	18'	25'
66	18'	25'
72	18'	24'

CLASS V RCP

Pipe Diameter (in)	Standard "Spoon-Trench" Method	Class R-2 Bedding
12	18'	23'
15	19'	24'
18	19'	30'
21	25'	40'
24	34'	40'
27	40'	40'
30	40'	40'
33	40'	40'
36	40'	40'
42	37'	40'
48	35'	40'
54	33'	40'
60	32'	40'
66	31'	40'
72	31'	40'

TRENCH BEDDING AND BACKFILL ZONES

Refer to the contract documents for specific material and placement requirements.

- ① Required only when specified in the contract documents or when directed by the Engineer.

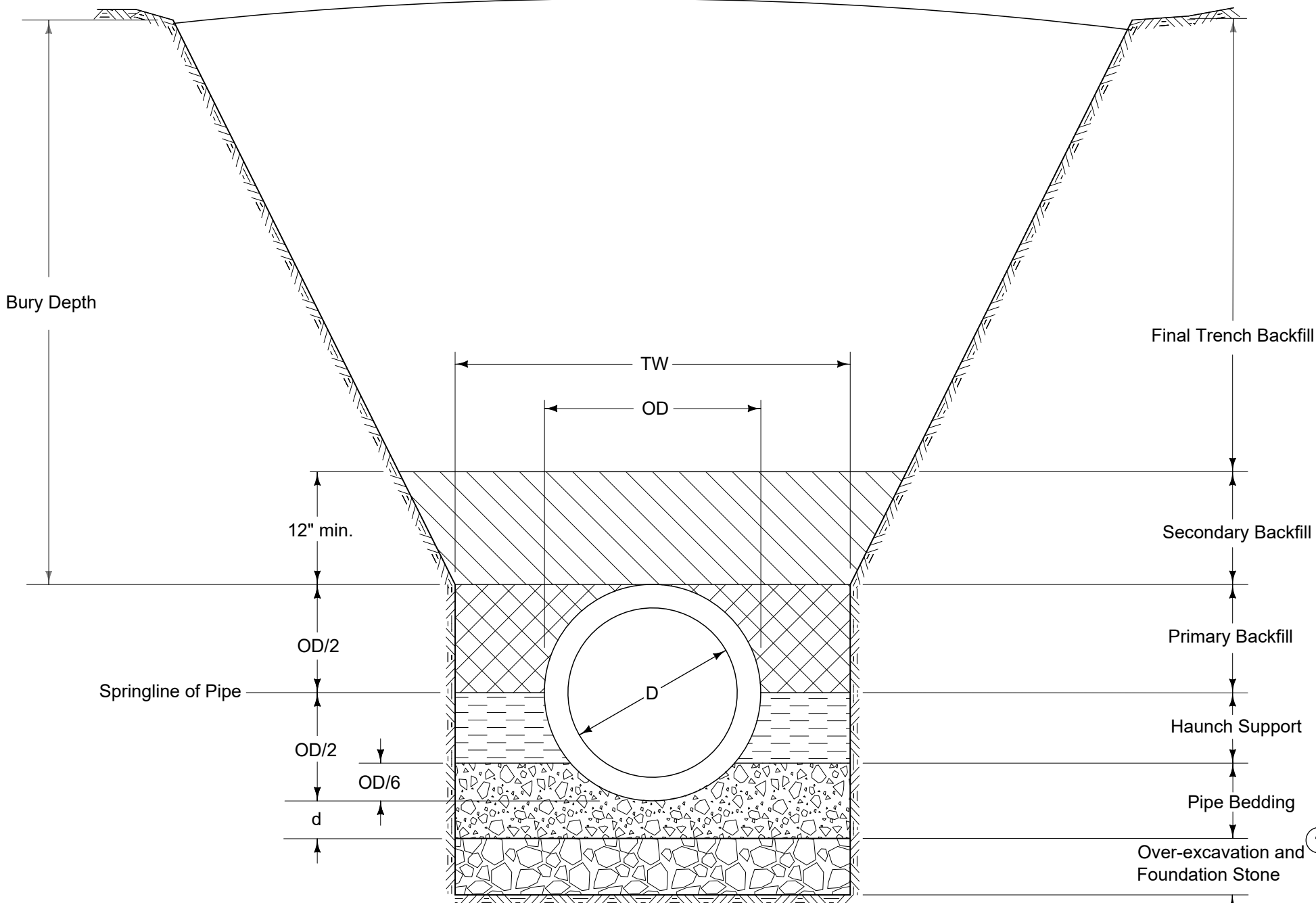
Key

OD = Outside diameter of pipe

D = Inside diameter of pipe

TW = Trench width at top of pipe

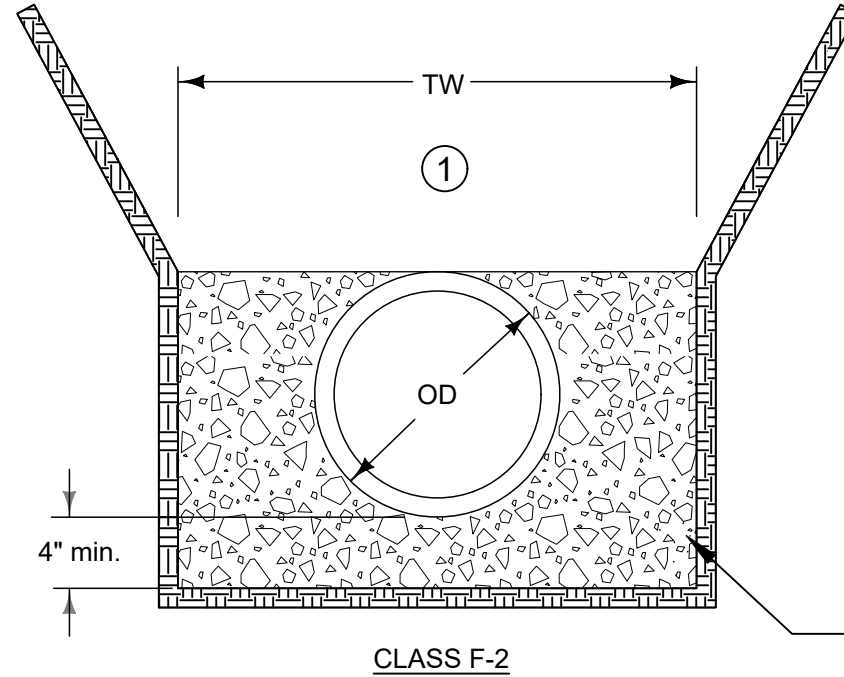
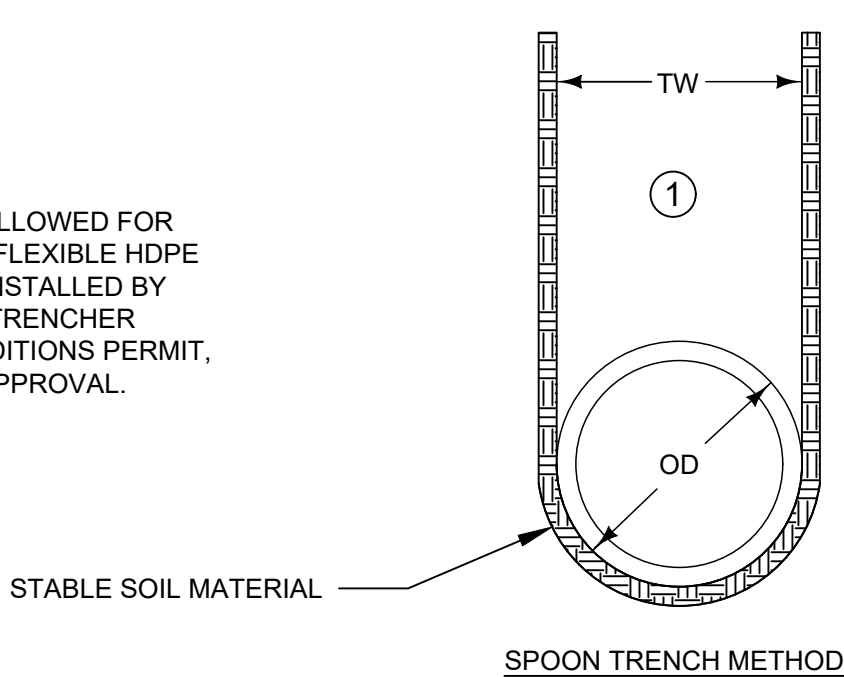
d = Depth of bedding material below pipe



		REVISION
		1 04-17-18
FIGURE 300.101	STANDARD ROAD PLAN	SW-101
		SHEET 1 of 1
REVISIONS: Replaced Iowa DOT and SUDAS logos.		
TRENCH BEDDING AND BACKFILL ZONES		

HDPE & PP PIPE INSTALLATION DETAIL

- NOTE**
1. SPOON METHOD ALLOWED FOR 15" AND SMALLER FLEXIBLE HDPE DUAL WALL PIPE INSTALLED BY PLOW OR WHEEL TRENCHER WHERE SOIL CONDITIONS PERMIT, WITH ENGINEER APPROVAL.



KEY

OD = Outside diameter of pipe

TW = Trench width at top of pipe
Min. = OD+18 inches OR 1.25xOD+12 inches (whichever is greater)

CLASS I BEDDING MATERIAL OR APPROVED EQUAL

ALLOWABLE BURY DEPTH

HDPE PIPE

Pipe Diameter (in)	AASHTO M 294
12	8'
15	9'
18	9'
24	9'
30	9'
36	9'
42	8'
48	8'
54	8'
60	8'

POLYPROPYLENE PIPE

Pipe Diameter (in)	ASTM F 2764
12	24'
15	25'
18	22'
24	20'
30	22'
36	21'
42	22'
48	23'
54	21'
60	21'



Company Information

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PO Box 44
1124 Willis Ave
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Designer:
TJB
Drafter:
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Checker:
JLH

No.	Revision/Issue	Date

Sheet Name

Pipe Construction Notes

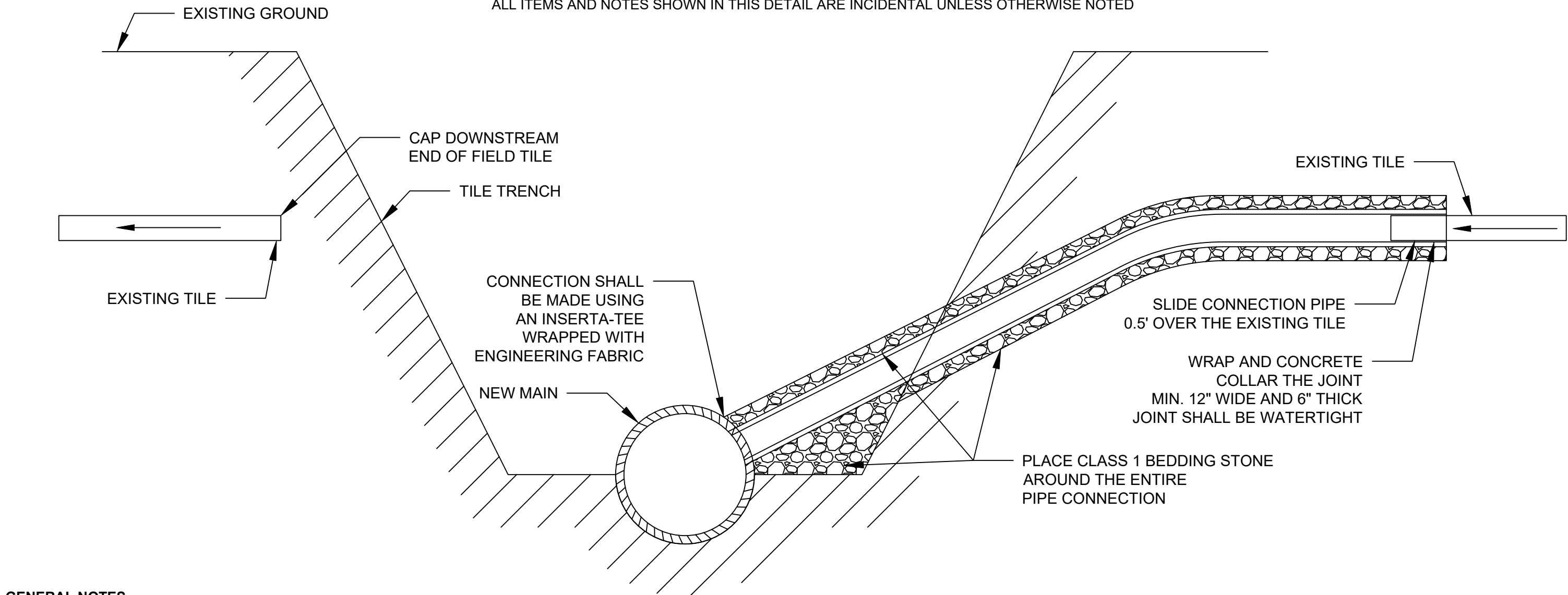
Project Name, Client, and Address

Branch 1 & 6 Tile Improvements
Drainage District No. 6
Dallas County, IA
Hwy 44 & J Ave, Adel, IA 50003

Project	2624-25	C.02
Date	2026-06-30	
Plan Scale		

TYPICAL TILE CONNECTION DETAIL

ALL ITEMS AND NOTES SHOWN IN THIS DETAIL ARE INCIDENTAL UNLESS OTHERWISE NOTED

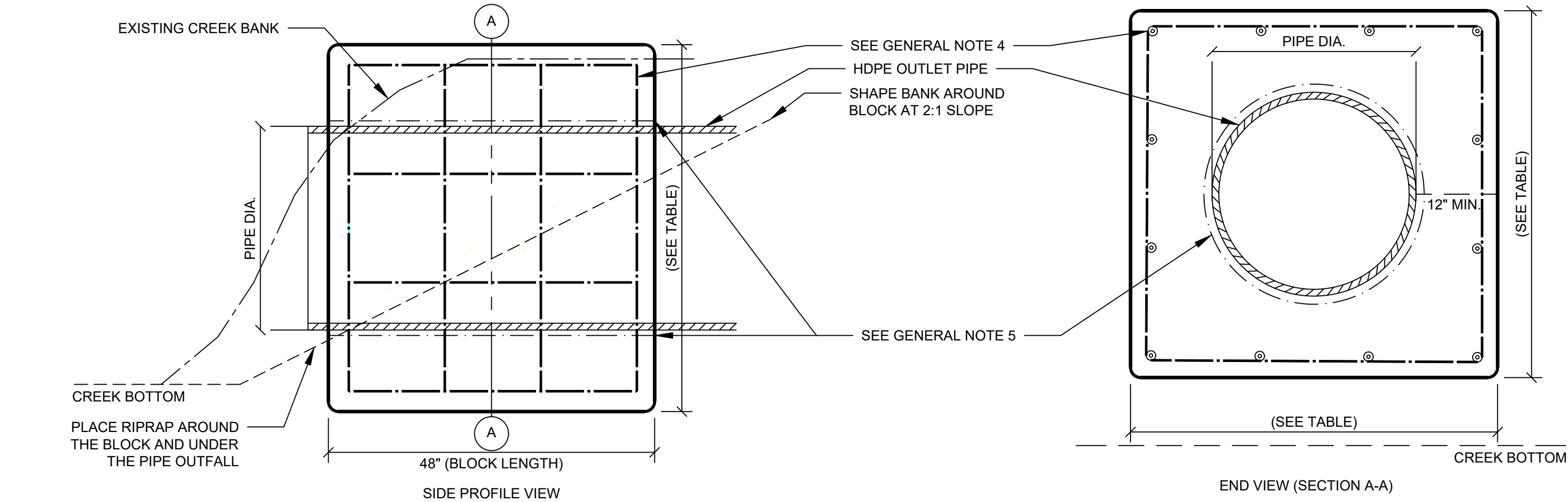


GENERAL NOTES

1. **TILE CONNECTIONS:** ALL EXISTING TILES ENCOUNTERED, WHETHER SHOWN ON PLANS OR NOT, SHALL BE EXPLORED AND RECONNECTED TO THE NEW SYSTEM. ALL TILE CONNECTIONS REQUIRE A MINIMUM OF 3 TONS OF CLASS I BEDDING STONE TO BE PLACED AROUND THE ENTIRE TILE CONNECTION. A TIME-STAMPED AND GPS-LOCATED PHOTO WILL BE REQUIRED FOR EACH CONNECTION. THE PHOTO SHALL BE TAKEN BEFORE THE ROCK HAS COMPLETELY ENCASED THE PIPE. A LOG OF ALL CONNECTIONS INCLUDING SIZE, LOCATION AND EXISTING MATERIAL SHALL BE SUBMITTED PRIOR TO PAYMENT. ROCK TICKETS MUST BE SUBMITTED. ROCK USED IS INCIDENTAL TO INSTALLATION. ANY LATERAL TILE CROSSING THE MAIN LINE TRENCH MUST BE SUPPORTED BY CRUSHED STONE BEDDING TO PREVENT SETTLEMENT AND SHEARING AT THE CONNECTION POINT.
2. TO MAKE THE CONNECTION, SINGLE WALL CORRUGATED DRAIN TILE OF THE SAME OR LARGER SIZE THAN THE EXISTING TILE MAY BE USED FOR TILES UP TO 10" IN DIAMETER. ANY TILE 12" OR LARGER WILL REQUIRE USING FLEXIBLE DUAL WALL DRAIN TILE OF THE SAME OR LARGER TILE TO MAKE THE CONNECTION. 25 LF OF DRAIN TILE IS CONSIDERED INCIDENTAL TO THE CONNECTION, IF LONGER THAN 25 FEET IS USED, IT NEEDS TO BE NOTED IN THE LOG WITH A PHOTO TO BE PAID.
3. THE UPSTREAM END CONNECTING TO THE TILE SHALL BE WRAPPED WITH FABRIC AND CONCRETE COLLARED. THE DOWNSTREAM END OF THE TILE CONNECTION SHALL BE CAPPED WITH BROKEN TILE AND CONCRETE PIECES BONDED WITH SACKRETE OR APPROVED SIMILAR AND WRAPPED WITH FABRIC OR A HDPE END CAP MAY BE USED.
4. 12" TILE INTERCONNECTIONS WITH THE EXISTING DISTRICT TILE WILL BE PAID AS LARGE TILE CONNECTIONS. TILE INTERCONNECTIONS WITH THE EXISTING FIELD TILE WILL BE PAID AS SMALL TILE CONNECTIONS.
5. **RCP DISTRICT TILE CONNECTIONS:** ALL TILE CONNECTIONS 12" OR SMALLER SHALL BE MADE WITH INSERTA-TEE OR APPROVED SIMILAR. ALL TILE CONNECTIONS 15" OR LARGER SHALL BE MADE WITH EITHER AN INSERTA-TEE OR MAY BE CONCRETE COLLARED.
6. **HDPE DISTRICT TILE CONNECTIONS:** ALL TILE CONNECTIONS 10" OR SMALLER SHALL BE MADE WITH AN INSERTA-TEE OR APPROVED SIMILAR. ALL TILE CONNECTIONS 12" OR LARGER SHALL USE A MANUFACTURED TEE CONNECTED VIA A CONCRETE COLLAR OR INTERLOCKED.

LARGE HDPE PIPE OUTLET DETAIL

ALL ITEMS AND NOTES SHOWN IN THIS DETAIL ARE INCIDENTAL UNLESS OTHERWISE NOTED



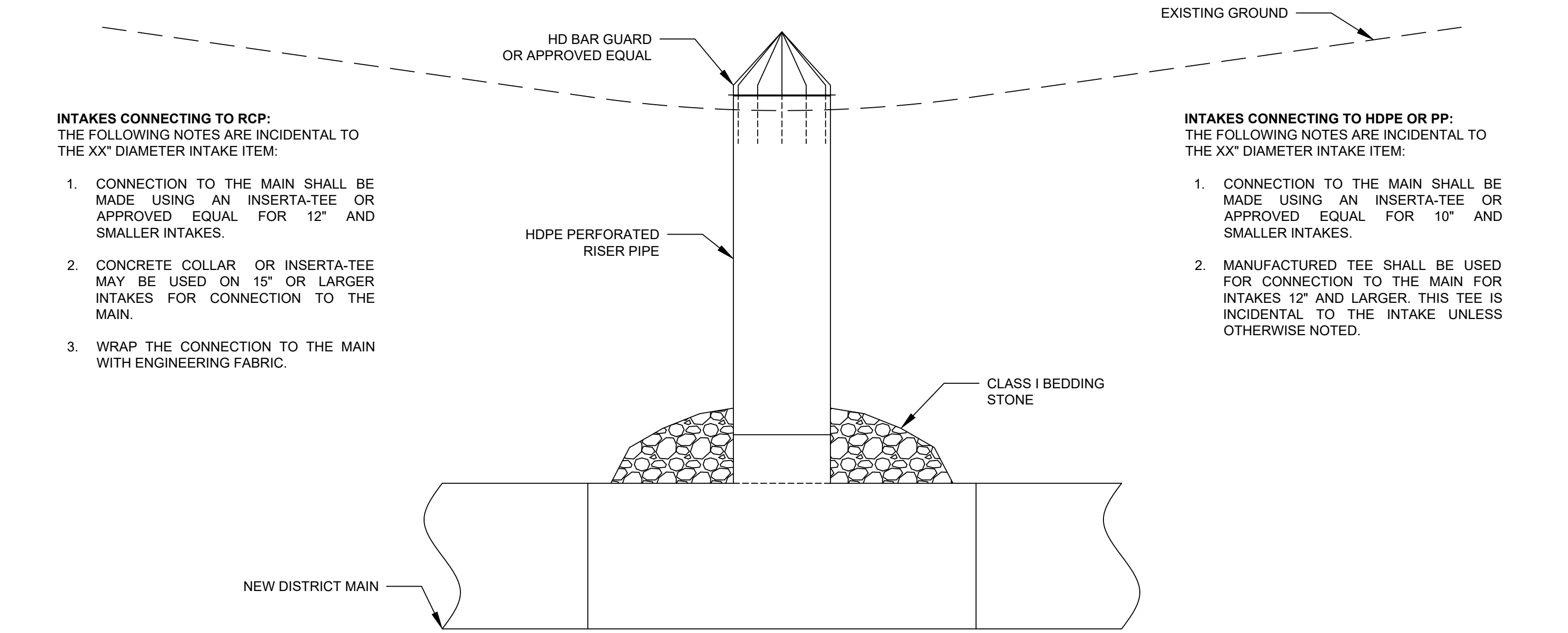
GENERAL NOTES

1. ALL DIMENSIONS IN INCHES U.N.O.
2. PIPE SHALL BE CENTERED IN BLOCK.
3. CONCRETE: 4,000 PSI MIN., 28-DAY.
4. REBAR: ASTM A615, GRADE 60, #4 BARS. PLACE #4 BARS @ 12" O.C. E.W. ON EACH FACE (FRONT, BACK, AND BOTH SIDES), 3" CLR. COVER U.N.O. CUT AND BEND BARS AROUND PIPE OPENING WITH STD. HOOKS. LAP BARS 12" MIN. AT CORNERS. WIRE-TIE ALL INTERSECTIONS. 3" MIN. CONCRETE COVER OVER ALL REBAR.
5. WRAP PIPE W/ 1/4"-1/2" CLOSED-CELL FOAM BEFORE PLACING CONCRETE.
6. BACKFILL IN 6" LIFTS, COMPACT TO 95% STD. PROCTOR.
7. SMOOTH TROWEL ALL EXPOSED CONCRETE FACES.
8. ROUND ALL CONCRETE EDGES AND CORNERS.
9. REBAR QUANTITIES ARE ESTIMATED NET WEIGHTS AND DO NOT INCLUDE LAP SPLICES, HOOKS, BENDS AT PIPE OPENING, OR CUTTING WASTE.
10. PLACE 25 TONS OF RIPRAP AROUND THE CONCRETE BLOCK AND BENEATH THE PIPE OUTFALL. RIPRAP MUST BE KEYED INTO THE SLOPE AND CANNOT IMPEDE THE STREAM FLOW.
11. PLACE 6" COMPACTED CRUSHED STONE BENEATH THE BLOCK AS A BASE.

BLOCK SIZING TABLE					
PIPE DIA.	BLOCK WIDTH	BLOCK HEIGHT	BLOCK LENGTH	CONCRETE	REBAR (#4)
(IN.)	(IN.)	(IN.)	(IN.)	(CU. YD.)	(LBS.)
18"	42"	42"	48"	1.55	65
24"	48"	48"	48"	1.90	75
30"	54"	54"	48"	2.27	100
36"	60"	60"	48"	2.66	110
42"	66"	66"	48"	3.06	135
48"	72"	72"	48"	3.47	145
54"	78"	78"	48"	3.90	175
60"	84"	84"	48"	4.35	190

HD XX" BAR GUARD INTAKE DETAIL

ALL ITEMS AND NOTES SHOWN IN THIS DETAIL ARE INCIDENTAL UNLESS OTHERWISE NOTED



GENERAL NOTES

1. **INTAKES (HICKENBOTTOM/BAR GUARD):** ALL INTAKES ARE CALLED OUT ON THE PLANS. ALL INTAKES REQUIRE A MINIMUM OF 3 TONS OF CLASS I BEDDING STONE TO BE PLACED AROUND THE ENTIRE CONNECTION. A TIME-STAMPED AND GPS-LOCATED PHOTO WILL BE REQUIRED FOR EACH CONNECTION. THE PHOTO SHALL BE TAKEN BEFORE THE ROCK HAS COMPLETELY ENCASED THE PIPE. A LOG OF ALL CONNECTIONS INCLUDING SIZE, LOCATION AND MATERIAL SHALL BE SUBMITTED PRIOR TO PAYMENT. ROCK TICKETS MUST BE SUBMITTED. ROCK USED IS INCIDENTAL TO INSTALLATION. THE GROUND AROUND THE INTAKE SHALL BE RESHAPED TO DRAIN TO THE INTAKE.
2. **BAR GUARD INTAKES:** ALL BAR GUARD INTAKES SHALL BE CONSIDERED HEAVY DUTY. CONSTRUCTED OF 1/2" STEEL ROD WITH A YELLOW POWDER COAT FINISH. AGRI-DRAIN HD YELLOW BAR GUARD OR APPROVED EQUAL.
3. **INTAKE MARKER:** ALL INTAKES PLACED IN ROAD DITCHES SHALL INCLUDE AN INLET TILE MARKER SIGN, SUCH AS PROVIDED AT AGRI-DRAIN OR APPROVED EQUAL. THE SIGN SHALL BE FIXED TO A STEEL OR WOODEN POST AT MINIMUM 6' LONG.
4. **RISER:** PERFORATED HDPE DUAL WALL PIPE SHALL BE USED AS THE RISER, THE APPROXIMATE LENGTH REQUIRED IS SHOWN ON THE PLANS. THE PIPE USED AS A RISER IS CONSIDERED INCIDENTAL TO THE INTAKE INSTALLATION. NO MEASUREMENT WILL BE MADE OF THE LENGTH NEEDED. RISER MUST BE CUT FLUSH TO GROUND LEVEL.

HDPE & PP INSPECTION PORT DETAIL

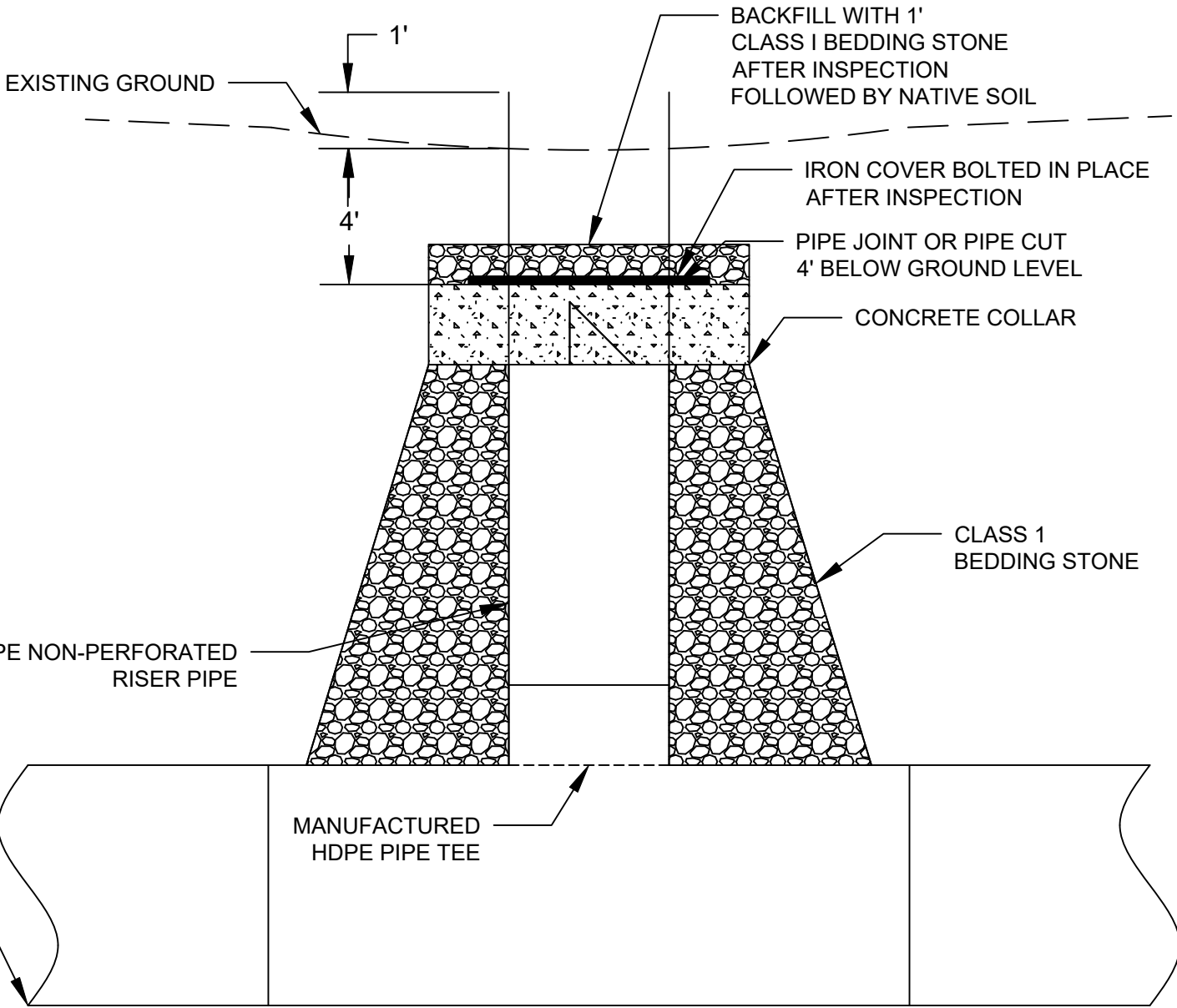
ALL ITEMS AND NOTES SHOWN IN THIS DETAIL ARE INCIDENTAL UNLESS OTHERWISE NOTED

MATERIALS

1. **TEE BASE:** 18" ON "MAIN TILE SIZE" FABRICATED HDPE TEE (WATERTIGHT/SOIL-TIGHT).
2. **RISER PIPE:** 18" DUAL-WALL HDPE (NON-PERFORATED) (AASHTO M294 TYPE S).
3. **COVER ASSEMBLY:** NYLOPLAST 24" DUCTILE IRON SOLID COVER (ADS PART #1801DI OR SIMILAR).
- NOTE:** THE COVER MUST BE H-20 LOAD RATED (CAPABLE OF SUPPORTING 32,000 LBS PER AXLE). DO NOT USE PLASTIC SEPTIC LIDS OR FLAT END CAPS.
4. **SUPPORT STRUCTURE:** 4,000 PSI STRUCTURAL CONCRETE (FOR THE COLLAR).
5. **BEDDING/BACKFILL:** CLEAN, CRUSHED ANGULAR STONE (SUDAS CLASS 1 OR "1-INCH CLEAN") FOR THE BEDDING AND THE FIRST 2 FEET OF RISER BACKFILL.

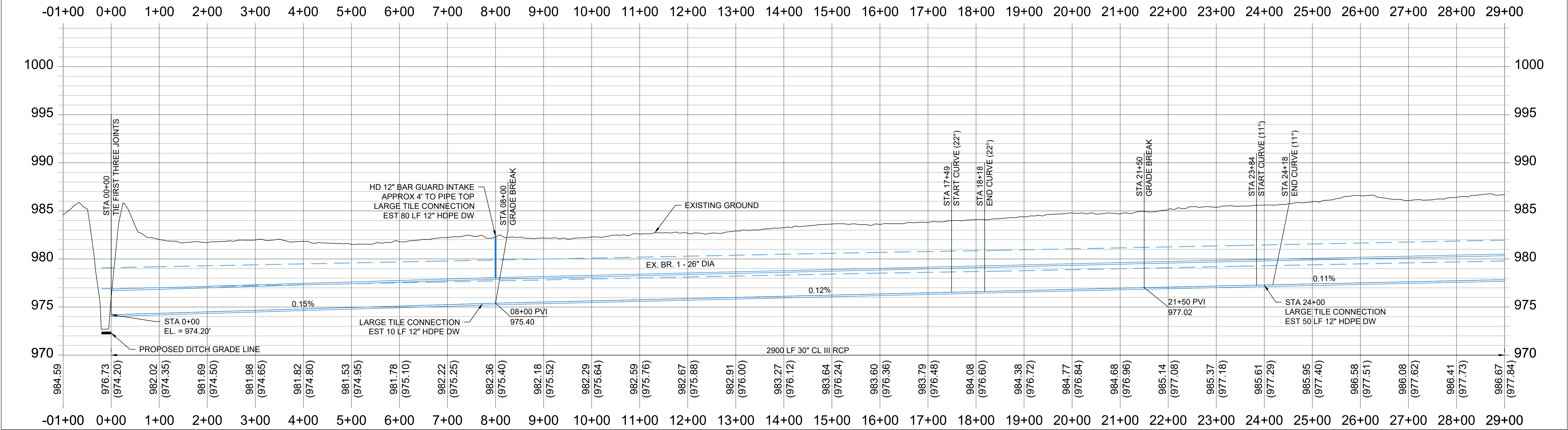
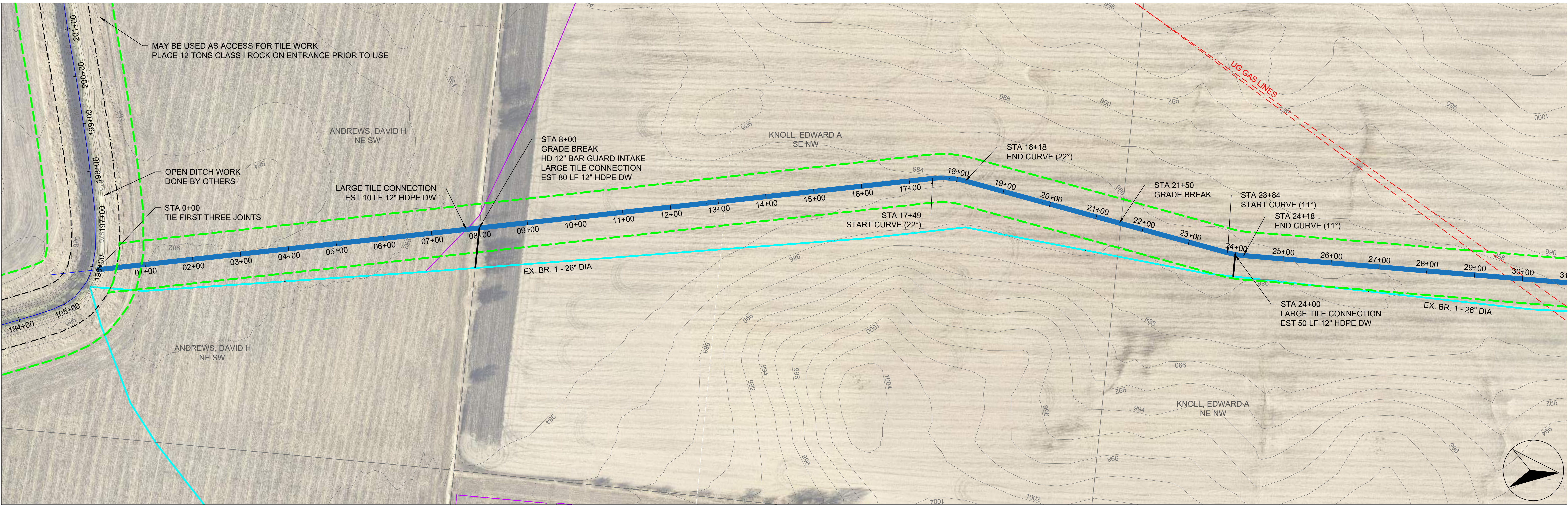
GENERAL NOTES

1. ALL MATERIALS AND INSTALLATION SHALL COMPLY WITH IOWA SUDAS SECTION 4020/4040 AND MANUFACTURER SPECIFICATIONS FOR H-20 TRAFFIC LOADING.
2. INSTALL AT INTERVALS SHOWN ON PLANS (NOMINALLY EVERY 1,000 FEET) OR SHORTER AS REQUIRED BY YOUR TESTING EQUIPMENT.
3. INSPECTION PORTS ARE INCIDENTAL TO THE INSTALLATION OF HDPE AND PP DRAINAGE MAIN TILE. QUANTITY SHOWN ON PLANS IS ESTIMATED TO BE THE MINIMUM REQUIRED TO COMPLETE THE REQUIRED TESTING. IF MORE INSPECTION PORTS ARE NEEDED THAN SHOWN ON THE PLANS TO PROPERLY INSPECT THE PIPE OR IF LARGER INSPECTION PORTS ARE NEEDED FOR THE TOOLS REQUIRED, ANY ADDITIONAL COST FOR INSTALLATION IS THE RESPONSIBILITY OF THE CONTRACTOR FOR SUCH ACCOMMODATIONS. ALL ITEMS SHOWN IN THIS DETAIL ARE INCIDENTAL UNLESS OTHERWISE NOTED.
4. CONTRACTOR SHALL PROVIDE TIMESTAMPED AND GPS LOCATED PHOTOS OF EACH PORT PRIOR TO BACKFILLING. ROCK TICKETS FOR EACH PORT MUST BE SUBMITTED. ROCK USED FOR EACH PORT IS INCIDENTAL.



INSTALLATION

1. **PHASE I: MAIN LINE CONSTRUCTION**
- INSTALL THE 18" ON MAIN TILE SIZE TEE ON A STABLE FOUNDATION OF F-2 BEDDING (PER USER SPEC).
- INSTALL THE 18" RISER PIPE VERTICALLY. FOR THE 30-DAY INSPECTION PERIOD, LEAVE THE PIPE EXTENDING 1 FOOT ABOVE THE SURFACE.
2. **PHASE II: 30-DAY INSPECTION**
- THIRTY (30) DAYS POST-CONSTRUCTION, PERFORM THE REQUIRED CAMERA INSPECTION AND MANDREL PULL THROUGH THE MAIN VIA THE 18" PORT.
- UPON APPROVAL OF THE INSPECTION, PROCEED TO FINAL BURIAL.
3. **PHASE III: FINAL BURIAL & LOAD SUPPORT**
- CUTTING:** EXCAVATE AROUND THE RISER AND CUT THE HDPE PIPE TO A DEPTH OF 4 FEET BELOW FINAL GRADE.
- CONCRETE COLLAR (CRUCIAL):** EXCAVATE A SHELF IN THE NATIVE SOIL AROUND THE TOP OF THE 18" PIPE. POUR AN 8-INCH-THICK CONCRETE COLLAR (SUDAS CLASS C) (APPROX. 36" IN DIAMETER) AROUND THE PIPE.
- LID PLACEMENT:** SET THE NYLOPLAST DUCTILE IRON FRAME AND SOLID COVER INTO THE CONCRETE COLLAR/RISER. ENSURE THE FRAME IS LEVEL AND SUPPORTED BY THE CONCRETE, NOT JUST RESTING ON THE PLASTIC PIPE.
- BEDDING:** PLACE 12 INCHES OF CRUSHED ROCK OVER THE LID TO PROVIDE A DRAINAGE/STABILITY LAYER.
- FINAL BACKFILL:** BACKFILL THE REMAINING 3 FEET WITH NATIVE SOIL IN 6-INCH LIFTS, COMPACTING WITH BUCKET, LEAVE MOUND NOT TO EXCEED 6 INCHES.



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Checker:
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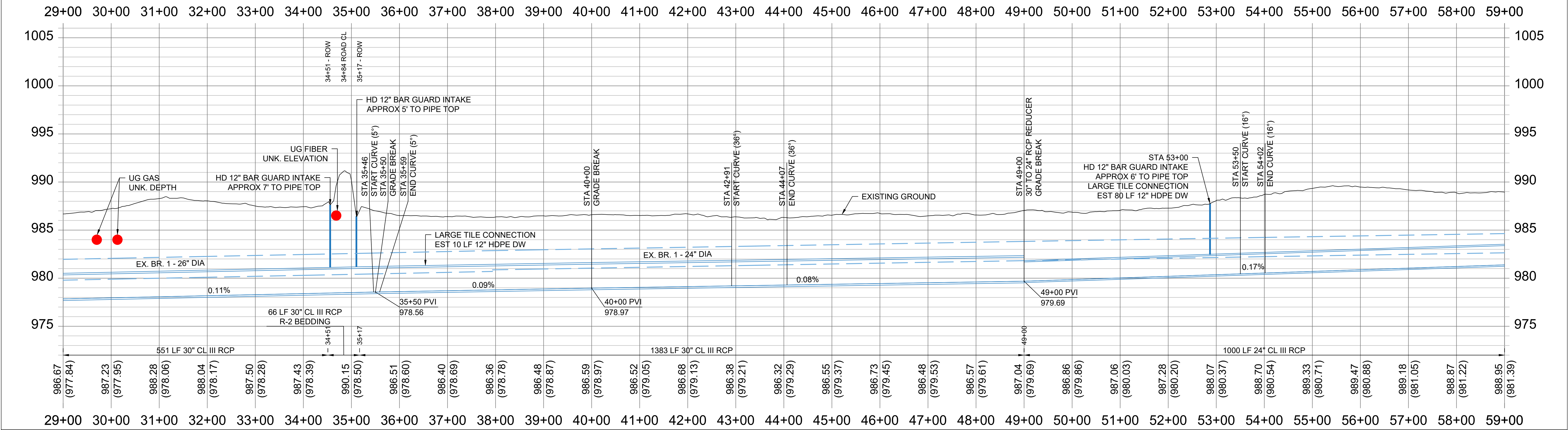
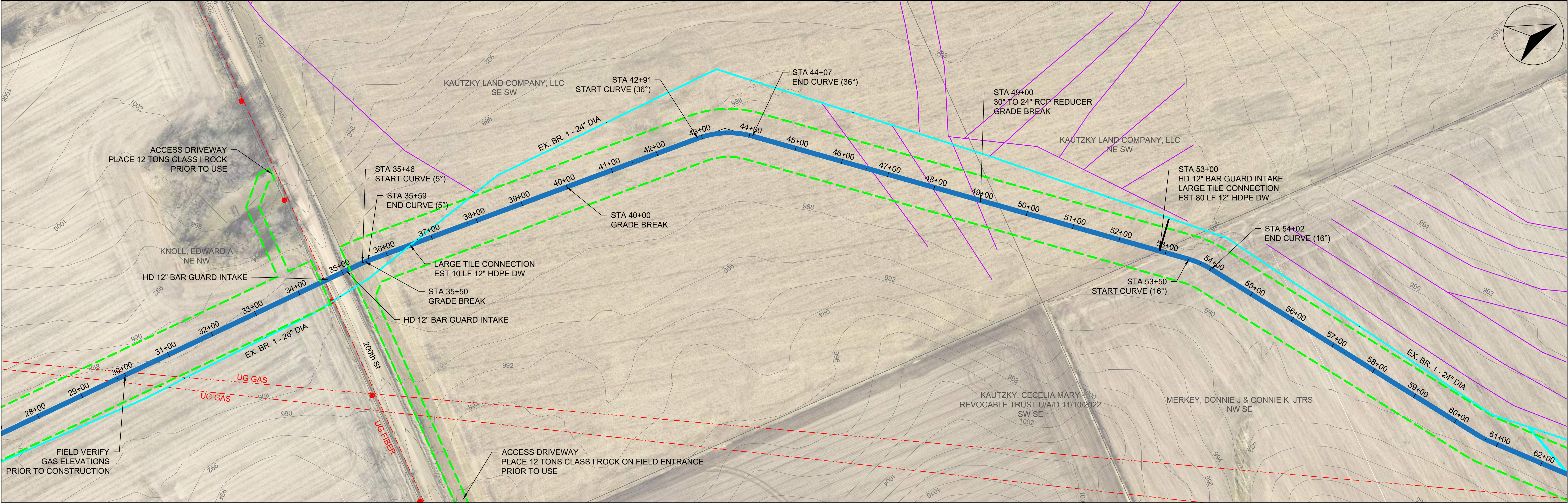
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Old District Tile (Cyan solid line)
Private Tile (Magenta solid line)
Work Area (ROW) (Green dashed line)
Fenceline (Black line with circles)
2' Contours (Grey line)
Utilities (in red) (Red dashed line)

No.	Revision/Issue	Date

Sheet Name
Plan & Profile
Branch 1
Sta 0+00 → 29+00

Project Name, Client, and Address
Branch 1 & 6 Tile Improvements
Drainage District No. 6
Dallas County, IA
Hwy 44 & J Ave, Adel, IA 50003

Project 2624-25	M.01
Date 2026-06-30	
Plan Scale 1" = 200'	



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Old District Tile
Private Tile
Work Area (ROW)
Fenceline
2' Contours
Utilities (in red)

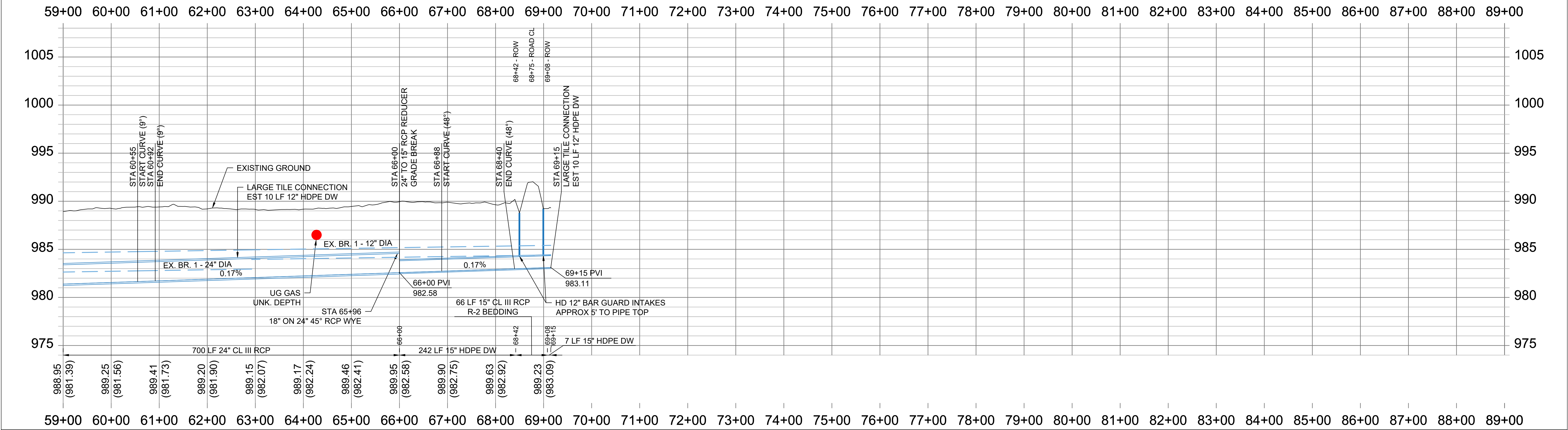
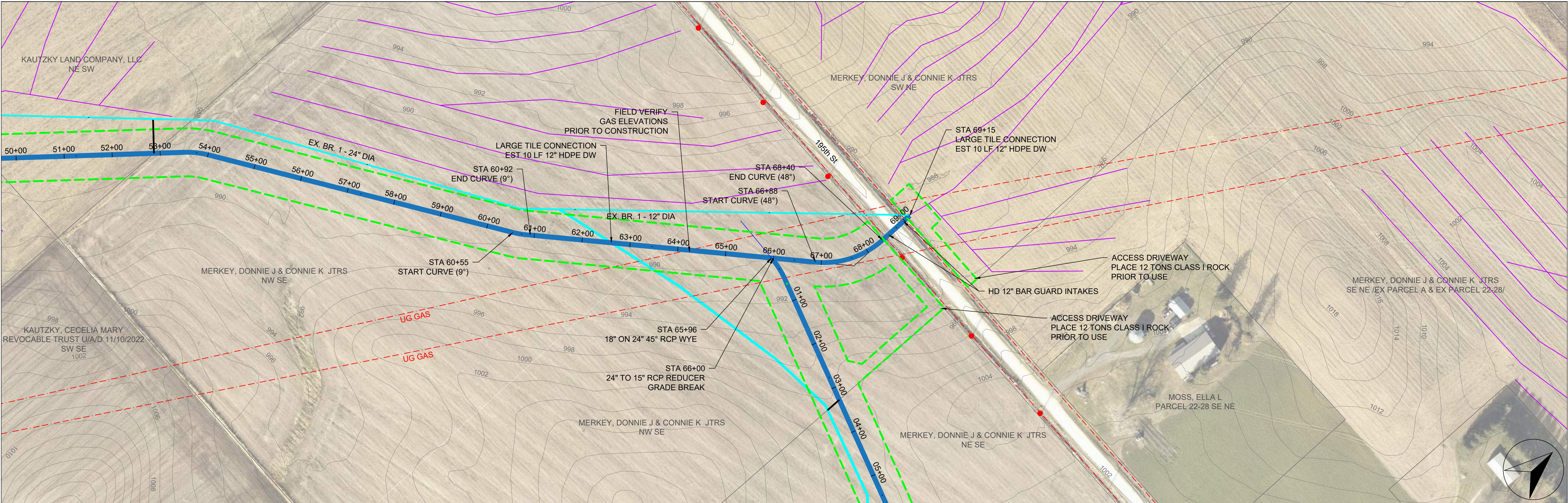
No.	Revision/Issue	Date

No.	Revision/Issue	Date

Project Name
Plan & Profile
Branch 1
Sta 29+00 → 59+00

Project Name, Client, and Address
Branch 1 & 6 Tile Improvements
Drainage District No. 6
Dallas County, IA
Hwy 44 & J Ave, Adel, IA 50003

Project 2624-25	M.02
Date 2026-06-30	
Plan Scale 1" = 200'	



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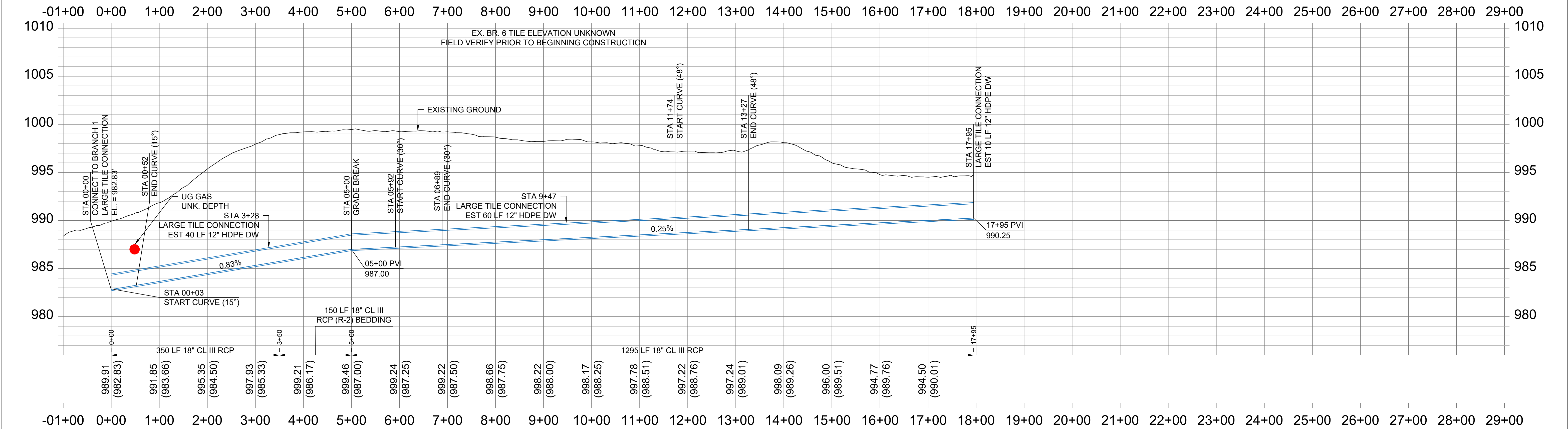
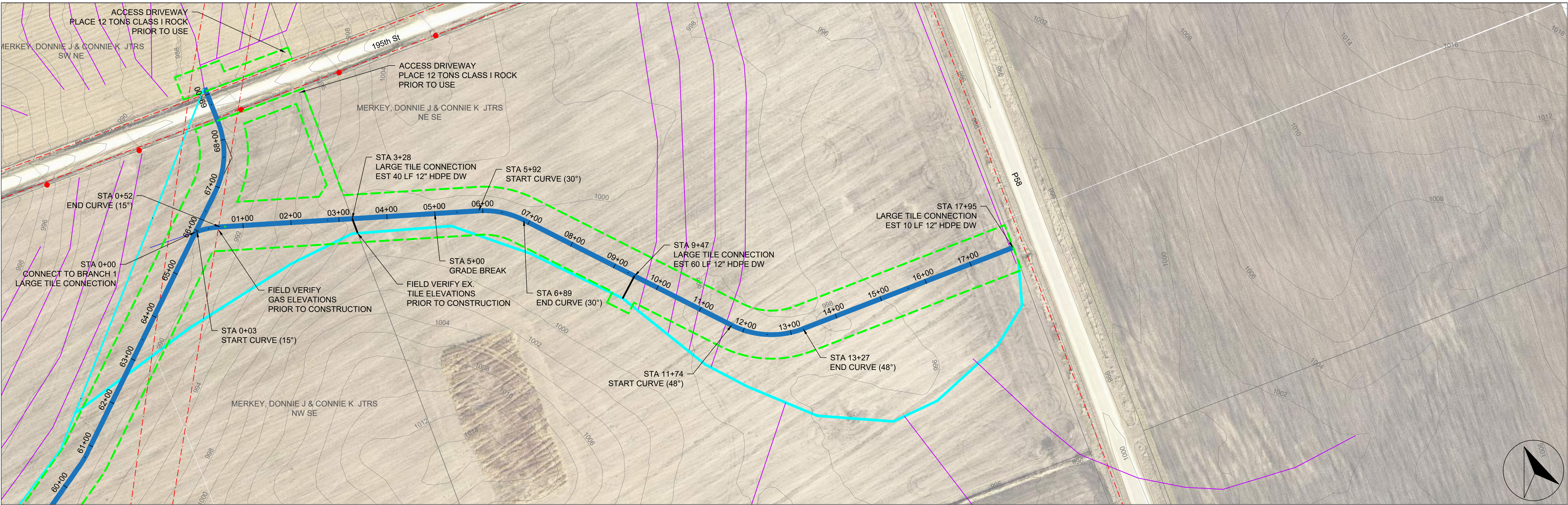
Plan Legend
Proposed District Tile
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Private Tile
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Utilities (in red)

No.	Revision/Issue	Date

Sheet Name
Plan & Profile
Branch 1
Sta 59+00 → 89+00

Project Name, Client, and Address
Branch 1 & 6 Tile Improvements
Drainage District No. 6
Dallas County, IA
Hwy 44 & J Ave, Adel, IA 50003

Project 2624-25	M.03
Date 2026-06-30	
Plan Scale 1" = 200'	



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Plan Legend
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Private Tile
Work Area (ROW)
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Utilities (in red)

No.	Revision/Issue	Date

No.	Revision/Issue	Date

Sheet Name
Plan & Profile
Branch 6
Sta 0+00 → 29+00

Project Name, Client, and Address
Branch 1 & 6 Tile Improvements
Drainage District No. 6
Dallas County, IA
Hwy 44 & J Ave, Adel, IA 50003

Project 2624-25	M.04
Date 2026-06-30	
Plan Scale 1" = 200'	