



**BOLTON
& MENK**

Real People. Real Solutions.

Engineer's Report

Proposed Open Ditch Repairs Drainage District No. 13

Worth County, Iowa 2020

Submitted by:

Bolton & Menk, Inc.
218 11th Street SW Plaza
Spencer, IA 51301
P: 712-580-5075
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Certification

Engineer's Report

For

Proposed Open Ditch Repairs

Drainage District No. 13
Worth County, Iowa
A14.119290

2020



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

By: Jonathan P. Rosengren
Jonathan P. Rosengren, P.E.
License No. 21661

Date: April 27, 2020

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I. Introduction

A. Scope of Work

On May 17th, 2019, a petition signed by a landowner in the district was filed with the Board of Supervisors requesting investigation of necessary repairs or improvements needed to bring drainage relief to lands of the petitioners. The Board appointed Bolton & Menk, Inc. to complete the necessary survey, study, plan and report. This report addresses the petitioners' request for repairs to the open ditch within Drainage District No. 13. A copy of the petition is contained in Appendix A of this report.

B. Location

The watershed of Drainage District No. 13 encompasses approximately 4,947 acres within Sections 10, 14, 15, 20-23, 25-28, and 35 of Grove Township in Worth County. The outlet of the Drainage District No. 13 Main Open Ditch lays in the NW SE corner of Section 25 in Grove Township, approximately 3.5 miles east of the City of Northwood, where it flows into the Drainage District No. 11 Main Open Ditch. Drainage District No. 13 was annexed into Drainage District No. 11 in 1980.

C. History

Drainage District No. 13 is a large district with a long history of repairs.

1909-6-30	Petition filed by Lemuel Dwelle and others. Fred R. Lyleford, Engineer hired.
1910-6-11	Engineer's report approved; Drainage District No. 13 established.
1946-6-8	Petition for improvement filed by Lawrence M. Henderson and others. Thomas T. Theall, Engineer hired.
1947-1-18	Engineer's Report filed and approved.
1947-7-21	Drainage District reclassified.
1948-5-10	Improvement completed.
1965-6-29	Deer Creek Watershed Work Plan approved by Board of Supervisors.
1976-9-21	DD 13 Repairs Completed.
1980-5-8	District reclassified.
1980-12-11	DD 13 annexed into DD 11.
1986-4-28	Petition for repairs on Lower Main submitted by Al Robb. Jim Hyde appointed Engineer.
1999-6-21	Petition for repairs on Upper Main submitted by Dale Dahlby. Jim Hyde appointed Engineer. Minor Repairs totaling \$19,070 Completed.
2006-11-6	Petition for repairs on Upper Main submitted by Ernest Walser. Jim Hyde appointed Engineer.

II. Investigation

Full survey of Lateral No. 3 and portions of concern in the Lower and Upper Main open ditches of DD 13 were completed in the winter of 2019. Using the survey and profiles, several cross sections were made and all points of water entry, both surface and subsurface were analyzed in the surveyed reaches. All trees, interfering fences, rock piles and large debris located near or in the open ditch were measured.

A. Lower Main – Station -30+00 to 97+37.81

The investigation found from Station -30+00 to 60+00 that the Lower Main Open Ditch is at or below design grade. From Station 42+00 to the end of the Lower Main, the ditch has approximately one foot of silt on average. The upper end as more trees on the banks causing more erosion of the banks.

B. Upper Main- Station – 0+00 to 55+00

The Upper Main Open Ditch has considerable tree growth causing bank erosion from Station 0+00 to Station 48+00. The lower end of the ditch has more siltation, up to 1.5 feet in places, the upper end of the surveyed reach is at design grade.

C. Lateral 3 – Station 0+00 to 102+60

There is sediment build-up of up to four feet, and about two feet on average, upstream of the 96” culvert crossing Quail Ave. at Station 13+24. From Station 19+00 to 77+00 there is thick tree and brush causing bank erosion. Two large beaver dams were found during the survey at Stations 23+00 and 40+00. The beaver dam at Station 26+75 was approximately 10’ tall, and the beaver dam at Station 28+90 was approximately 9’ tall and extremely well made.

The ditch changes from a 0.10% grade to a 0.20% grade upstream of Station 70+00, and due to the steeper grade, the ditch is at design grade from Station 81+00 to the end of the lateral at Station 102+60.

D. Ditch Crossings

There are two county road crossings on the Lower Main Open Ditch, two county road crossing on the Upper Main, and three county road crossings on Lateral No. 3. On the Lower Main, both crossings are at or below design grade. Both crossings on the Upper Main are above design grade, and all three crossing on Lateral 3 are above the design flowline and two of the three have backfall.

Non-Interfering Crossings – Lower Main Open Ditch			
Station	Existing Culvert Flowline Elevation	Ditch Design Flowline Elevation	Description
29+00	1200.18	1200.87	Raven Ave – 108” Corrugated Metal Pipe
-29+00	1195.26	1195.21	Spruce Ave – 144” Corrugated Metal Pipe

Interfering Crossings – Upper Main Open Ditch			
Station	Existing Culvert Flowline Elevation	Ditch Design Flowline Elevation	Description
0+50	1209.20	1207.04	Quail Ave. 120” Corrugated Metal Pipe at 0.00% (flat) Grade
48+75	1213.51	1211.72	480 th St.- 96” Corrugated Metal Pipe at 0.01% Grade

Interfering Crossings – Lateral No. 3			
Station	Existing Culvert Flowline Elevation	Ditch Design Flowline Elevation	Description
13+24	1210.31	1208.11	480 th Ave – 96” Corrugated Metal Pipe at 0.51% Grade
18+45	1210.96	1208.71	Quail Ave- 96” Corrugated Metal Pipe at -0.26% Grade
74+37	1215.85	1214.65	490 th St.- 96” Ductile Iron Pipe at -1.61% Grade

There are four 96” corrugated metal pipe culverts and one 120” corrugated metal pipe culvert that interfere with the flow of the DD 13 facilities. The condition of these pipes is uncertain. For estimating construction cost, we are assuming they will need to be replaced. We will work with the county engineer to explore alternative options to lower the cost. The five culverts would be funded by Worth County Secondary Roads at an estimated cost of \$136,000.

E. Utilities

Overhead power lines and other utility lines will parallel or cross the ditch at various locations; extra care will need to be taken when working under or near these utility lines. The contractor will be responsible to determine and notify utility companies and to cooperate in locating, marking and protecting their facilities

F. District Right-of-Way

The existing district right-of-way along the open ditch is 80’ (40’ each side of centerline) for both the main ditch and its branches. The existing right of way is shown on the plans and additional right-of-way should not need to be acquired.

III. Farm Program Compliance

A. CRP Damage Waivers

The destruction of CRP vegetation by construction activities places the landowner in technical violation of farm program conservation rules. The penalties can include loss of the CRP contract, forfeiture of back CRP payments and financial penalties. To avoid these penalties, landowners are advised to request a waiver from the USDA Farm Service Agency County Committee. The county committee will grant waivers for ditch or tile work if CRP vegetation restoration, in compliance with NRCS requirements, is timely done after the work is complete. If the project is authorized, all CRP owners in the path of construction must independently seek the FSA County Committee waivers. This process should be initiated immediately if the project is authorized.

B. Nesting Season Restrictions

The CRP rules also restrict disturbances during the primary nesting season, which covers the period of May 15th to August 1st in Worth County. Recent relaxations of this rule, although specific to drainage district maintenance of open ditches having CRP buffers, likely would now favor allowing tile installation work without penalty on CRP during the primary nesting season. It makes no sense for a drainage district to wait for up to 3 months during ideal work weather. This is another situation where only the landowner can seek and secure the needed waiver.

IV. Water Quality

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

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

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

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

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

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

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

V. Proposed Work

A. Proposed Repair

The investigation has confirmed the need for drainage relief within the district. To restore the original drainage efficiency, it is necessary to remove accumulated sediment from the Drainage District No. 13 Lower and Upper Main Open Ditches and Lateral No. 3 Open Ditch. Where there is little sediment the banks will be reshaped, and sloughs and meanders will be removed. Both beaver dams will need to be removed and the trees cleared along the ditch banks. This work will necessitate the removal of much of the bank vegetation, however, this will be limited to only as necessary for the work.

To protect the functional life of the restored open ditch, it is recommended that the entire set of drain tile extension pipes and surface drain pipes be individually evaluated and be placed or replaced as found necessary during the course of the ditch restoration work. It is estimated that this pipe work would include likely more than shown on the plans.

If any fence is cut or removed during construction, the district is not obligated to pay damages associated with fences within the existing right-of-way or on the original spoil pile footprint. Damages can be claimed for fence damages occurring outside the ditch right-of-way within the work limits. Fence owners are encouraged to remove their own fences where it is necessary to do so, especially where they wish to salvage part of the materials.

It is recommended that the newly exposed open ditch banks be fertilized and seeded. NRCS research indicates that broadcasting the seed and fertilizer at the end of each day's work is the best way to secure good growth and because additional seedbed work is not needed, the cost is more reasonable than for other methods. Economically successful seeding remains a difficult goal for drainage ditches, it being so dependent upon favorable weather. Typically, the best that is achieved is a sparse growth that supplements and aids the progress of natural re-vegetation.

There are some locations along the open ditch where we recommend erosion stone be placed to prevent bank scour during and after construction. The actual location and length of riprap placed will be determined in the field at the time of the repair.

The spoil material is recommended to be uniformly leveled and shaped to a typical cross section with a fairly flat top (2% slope) about 16 feet wide, adjacent to the ditch with a 10 to 1 back slope pushed out onto the adjacent land. The leveled spoil will then be deep tilled by the contractor and exposed rocks and debris are to be gathered and disposed of.

1. Buffer Strips & CRP

We note that there are several buffer strips in place along the open ditch where repairs are proposed. There are some manageable drawbacks that must be addressed by the owners of impacted buffer strips and CRP tracts.

The destruction of buffer strip or CRP vegetation by construction activities places the landowner in violation of Farm Program conservation rules. The penalties can include loss of the CRP contract, forfeiture of back CRP payments and penalties. To avoid these, landowners must request a waiver from the USDA Farm Service Agency County Committee. The county committee will grant waivers for ditch maintenance if seeding restoration, in compliance with NRCS requirements is done. If the project is authorized, all farm program buffer strip and CRP owners in the path of construction must independently seek the FSA County Committee waivers. This process may take two or three months and should be initiated immediately if the project is authorized.

2. Right-of-Way Needs

The current right way of 80' is adequate for the proposed project, and further acquisition is unnecessary at this time. Drainage district open ditch right-of-way are exempt from real estate taxes and drainage assessments. Under Iowa law, landowners have the right to the beneficial use of the spoil bank in the right-of-way subject only to the district's use of the right-of-way to protect and maintain the open ditch.

Because landowners may use the right-of-way in this manner, drainage districts may acquire the easement at much below land market values. If right-of-way is to be acquired, an appraisal commission, made up of two landowners from the county and the engineer, are appointed to recommend fair payment. The right-of-way appraisers' report is considered at a public hearing prior to adoption.

3. Work Area

The permanent right-of-way is not intended to be wide enough to accommodate construction activities associated with major repairs or improvements. The district will need a larger area within which to perform the excavation and to dispose of the spoil. The work limits on the open ditch will typically be out to 100 feet from the open ditch centerline on the side or sides in which work will be done. Landowners will also be entitled to compensation for damages in the work area outside the right-of-way both now and in the future. Within the permanent right-of-way, future construction-related damages will not be compensated. It is recommended that whenever possible, a landowner should not crop the work area and instead should request fair rent for the land. Compensation for use of and damages within the temporary work area is normally determined at the project completion hearing.

B. Engineer's Opinion of Probable Cost

The total estimated cost of the proposed project is \$436,000. A detailed opinion of probable cost for the recommended work is included in Appendix B of this report.

VI. Assessment Schedule Review

Drainage District No. 11 which encompasses Drainage District No. 13 is currently in the process of being reclassified. It would be cost effective to do annexation and reclassification of Drainage District No. 13 at the same time as Drainage District No. 11.

A. Benefited Lands Not Now Assessed

There are approximately 4,947 acres within the Drainage District No. 13 watershed, of which approximately 339 acres have never been assessed for benefits from district facilities.

Annexation is expected to cost approximately \$5,000. It would be cost effective to do this annexation as part of the proposed project. Most landowners now in the district would likely support the annexation; those being annexed would likely be opposed. It should be emphasized to the owners of the annexed lands that assessments are based upon relative benefits and that if this benefit is small, the assessment it also relatively small.

B. Existing Assessment Schedule Review

Drainage District No. 13 was last reclassified in 1980, and all facilities are included in this single assessment schedule. Appendix C contains a map showing the existing benefited units assessed per acre and classification for each parcel in the currently assessed area of DD 13.

It has become common practice with reclassification to separate all facilities within a district into individual schedules to prevent landowners who receive no benefit from a particular named facility from having to pay to maintain that facility. It is recommended that the open ditches be divided into separate maintenance schedules to make the cost of future repairs more equitable. The two proposed schedules would include; the Main Open Ditch, and Lateral 3 Open Ditch.

C. General Classification Methodology

The process of reclassification uses several factors to equitably spread project costs based upon benefits received. The three common factors are: Use; Proximity; and Wetness.

The Use Factor considers how much of the facility is required to bring an outlet to a particular location. The more a facility is used by any given property, the higher the Use Factor on that property. A parcel using one mile of a facility should pay less than a parcel using 5 miles of the facility.

The Proximity Factor considers the portion of the outlet provided. Lands nearer to the ditch receive a higher assessment because they have easy access to district facilities. Lands farther from the facility must invest in additional private drainage to access the facility. A 40 acre tract which is crossed by a ditch should pay more than a 40-acre tract a mile away which must build a private system to reach the open ditch.

The Wetness Factor accounts for the soil types' varying natural wetness and need for drainage. Wet soils in a pothole are high because the soils have more need for drainage than drier soils on the hill tops.

Other considerations may be necessary to achieve equitable assessments.

VII. Discussions & Recommendations

The Drainage District No. 13 Main Open Ditch has not cleaned out since the 1980's. Typically in Worth County, repairs to an open ditch occur every 30-40 years. This report confirms the need to repair the drainage efficiency and capacity of the Drainage District No. 13 Lower Main and Lateral 3 Open Ditch. The work described herein can accomplish that repair. It is the opinion of this engineer that this work will restore the design capacity of the Lower Main Open

Ditch and Lateral 3.

The Engineer's Opinion of Probable Cost for the repair of the Drainage District No. 13 Upper and Lower Main Open Ditch and Lateral 3 Open Ditch is \$436,000. We find that the proposed project will be practicable, feasible and beneficial to the public.

Repair Recommended. The repairs proposed will restore the original design capacity of the DD 13 open ditch facilities. The estimated assessable cost of the recommended repair is \$436,000. We find that the proposed repairs will be practicable, feasible, and beneficial to the public.

Annexation Recommended. Approximately 6.9% of the lands now served by Drainage District No. 13 (339 acres) appear to benefit from district facilities, but have not been assessed for maintenance costs of the facilities. For these lands to now be assessed to help pay for future maintenance, it is necessary to bring them into the Drainage District No. 13 benefited area.

Reclassification Recommended. The existing assessment schedule is inequitable and should be reclassified, separating the several district facilities into separate maintenance schedules at the same time. Reclassification is expected to cost approximately \$5 per acre for each schedule developed.

Installment Payments. Iowa drainage district law provides that large repair assessments may be paid in not less than ten nor more than twenty annual installments at the discretion of the Board of Supervisors. Typically, the board would spread assessments of the magnitude contemplated in this report over Ten years. If we assume that the board will allow ten annual installments at 5% interest, repair costs for lands now in the district and within the impacted watersheds would be about \$12 per acre per year for the DD 13 watershed. Be reminded that assessments are based upon benefits and that some parcels will likely bear two to three times the average assessments.

It is recommended that the Board of Supervisors of Worth County, acting as trustees for Drainage District No. 13 take appropriate action, with legal guidance, to accomplish the following:

- Tentatively approve this engineer's report.
- Conduct a public hearing on the proposed repairs.
- Adopt the proposed repair plan, modified as deemed appropriate to satisfy the needs of the district.
- Direct the engineer to prepare the necessary plans and specifications and to proceed toward a bid letting.
- Initiate procedures to annex benefited lands to Drainage District No. 41 and initiate reclassification procedures.

Respectfully submitted,

Bolton & Menk, Inc.



Jonathan P Rosengren, P.E

Appendix A: Petition

Jacob Hagan

From: Jon Rosengren
Sent: Thursday, July 11, 2019 10:21 AM
To: Charlene Heater
Subject: Fwd: DD 13 Open Main

Categories: Filed by Newforma

Sent from my iPhone

Begin forwarded message:

From: "Harris, Dedra" <dedra.harris@worthcounty.org>
Date: July 11, 2019 at 10:18:48 AM CDT
To: Jon Rosengren <Jon.Rosengren@bolton-menk.com>
Subject: DD 13 Open Main

Hopefully you will have received drop box information from Joel. There should be maps of DD 13 Open Main and the laterals. He should have also sent you the historical information for this district also. Everything was to big for me to send, so we had to go with the drop box again.

The Trustees would like these things looked at for lateral 3

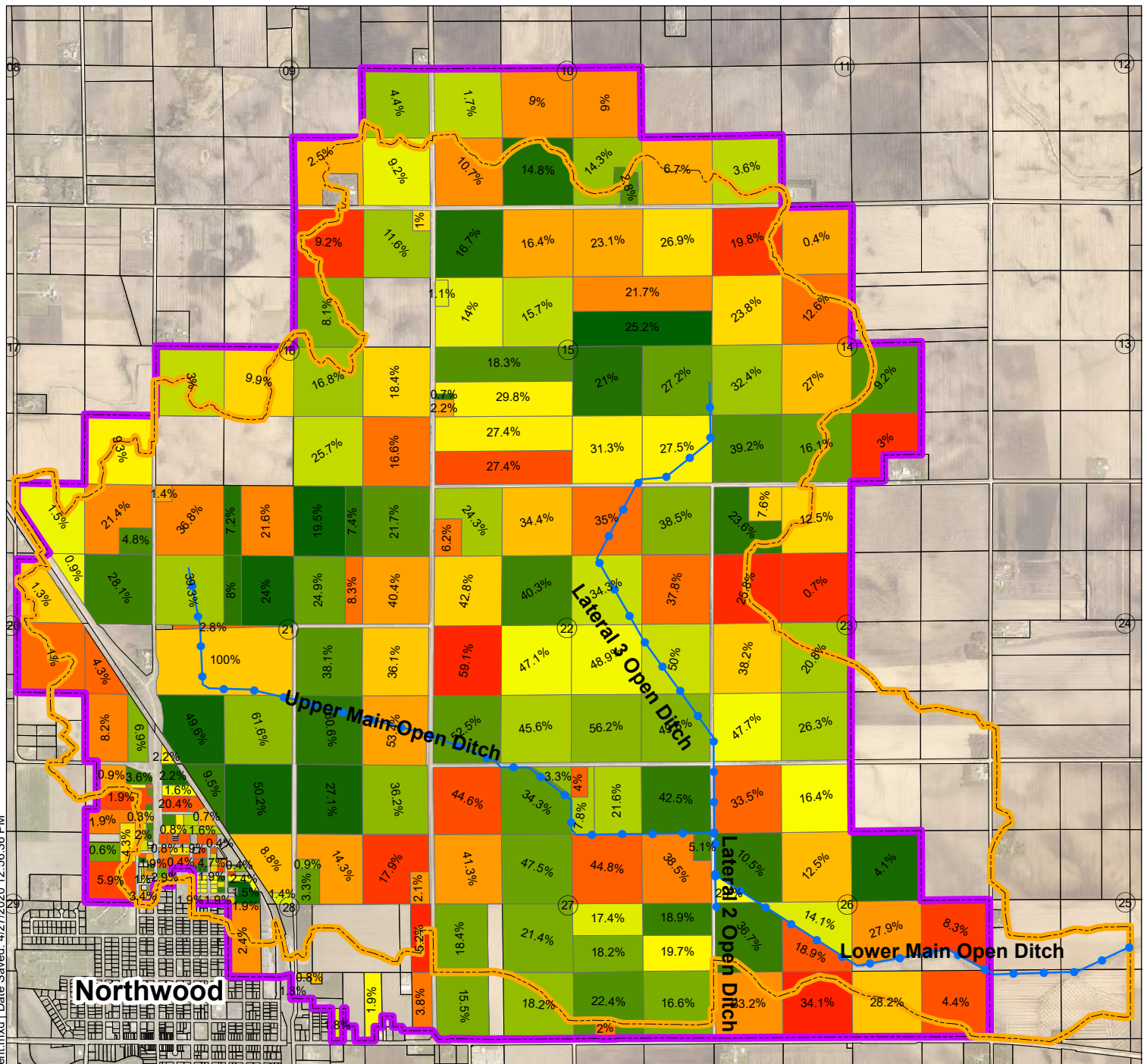
- ❖ Trees removed
- ❖ Ditch bank reshaped
- ❖ Replace tile outlets
- ❖ Ditch cleaned
- ❖ Clean Lower Main
- ❖ Reclassify the Upper and Lower Mains of DD 13 Open Main and possibly Lateral 3

I'm not sure if that would be the only reclassification that would need to be done, I will have to get back to you on that. But at least you have an idea of what they are looking for. Let me know if you have more questions.

Dedra

Dedra Harris
Worth County Auditor's Office

Appendix B: Existing Assessment Schedule
Review



Map Document: H:\WORTH\IA\14119290\GIS\Existing Assessment.mxd | Date Saved: 4/27/2020 12:56:36 PM

Legend

- District Open Ditches
- Benefitted Area
- DD 13 Existing Assessment Area

0 2,500
Feet

Information

Lands shown in shading from Green to Red are currently assessed in the District. Green has lowest assessment per acre and Red has highest assessment per acre.

Percentages shown are relative benefit, 100% be the most benefited. All other parcels are relative to the 100% parcel.

Appendix C: Engineer's Opinion of Probable Cost

**Engineer's Opinion of Probable Cost
Proposed Open Ditch Repairs
Drainage District No. 13
Worth County, Iowa
2020**

Construction Division 1--Private Landowners

<u>Item</u>	<u>Description</u>	<u>Unit</u>	<u>Quantity</u>	<u>Unit Price</u>	<u>Total</u>
100	Excavation	CY	11,000	\$3.50	\$38,500
101	Slough and Meander Removal	STA	70	\$150	\$10,500
102	Spoil Leveling (Both Sides)	STA	226	\$175	\$39,550
103	Spoil Leveling (One Side)	STA	29	\$125	\$3,625
104	Seed & Fertilize Banks	STA	255	\$50	\$12,750
105	Tile Extension- 12" CMP Pipe	LF	300	\$20	\$6,000
106	Tile Extension- 15" CMP Pipe	LF	200	\$22	\$4,400
107	Tile Extension- 18" CMP Pipe	LF	100	\$24	\$2,400
108	Tile Extension- 24" CMP Pipe	LF	100	\$32	\$3,200
109	Surface Drain- 18" CMP Pipe	LF	402	\$40	\$16,080
110	Surface Drain- 24" CMP Pipe	LF	138	\$48	\$6,624
111	Surface Drain- 30" CMP Pipe	LF	100	\$62	\$6,200
112	Erosion Management Plan	LS			\$1,000
113	Clearing and Grubbing	Unit	30,228	\$3.50	\$105,796
114	Riprap, Class D	TN	230	\$60	\$13,800
115	Mobilization	LS			\$15,000

Division 1 Total \$285,000

Construction Division 2--Paid by County Secondary Roads

<u>Item</u>	<u>Description</u>	<u>Unit</u>	<u>Quantity</u>	<u>Unit Price</u>	<u>Total</u>
200	96" CMP Culvert, 12 Gauge	LF	300	\$250	\$75,000
201	120" CMP Culvert, 12 Gauge	LF	80	\$500	\$40,000
202	Class 1 Road Stone	TN	500	\$25	\$12,500
203	Seed & Fertilize Ditch	LS			\$2,000
204	Mobilization	LS			\$4,000
205	Traffic Control	LS			\$2,000

Division 2 Total \$136,000

Total Estimated Construction Cost \$421,000

Construction Contingency \$21,100

Total Estimated Assessable Construction Cost \$306,100

**Engineer's Opinion of Probable Cost
Proposed Open Ditch Repairs
Drainage District No. 13
Worth County, Iowa
2020**

Construction Related Damages	
Damages	\$11,000
Basic Engineering Services	
Survey, Study & Report. Meetings & Hearing	\$45,000
Construction Plans, Specifications, & Bid Letting	\$15,000
Construction Engineering Services	\$30,000
Legal Services, Publications, Mailings, Etc..	\$7,000
Finance, Interest & Contingency	<u>\$22,000</u>
Total Estimated Assessable Project Cost	\$436,000
Estimated Average Cost Per Currently Assessed Acre (4,551 ac)	\$96
Estimated Average Cost Per Acre Per Year (10 years)	\$13
Estimated Average Cost Per Acre Per Year (20 years)	\$8
Estimated Average Cost Per Benefited Acre (4,947 ac)	\$88
Estimated Average Cost Per Acre Per Year (10 years)	\$12
Estimated Average Cost Per Acre Per Year (20 years)	\$7

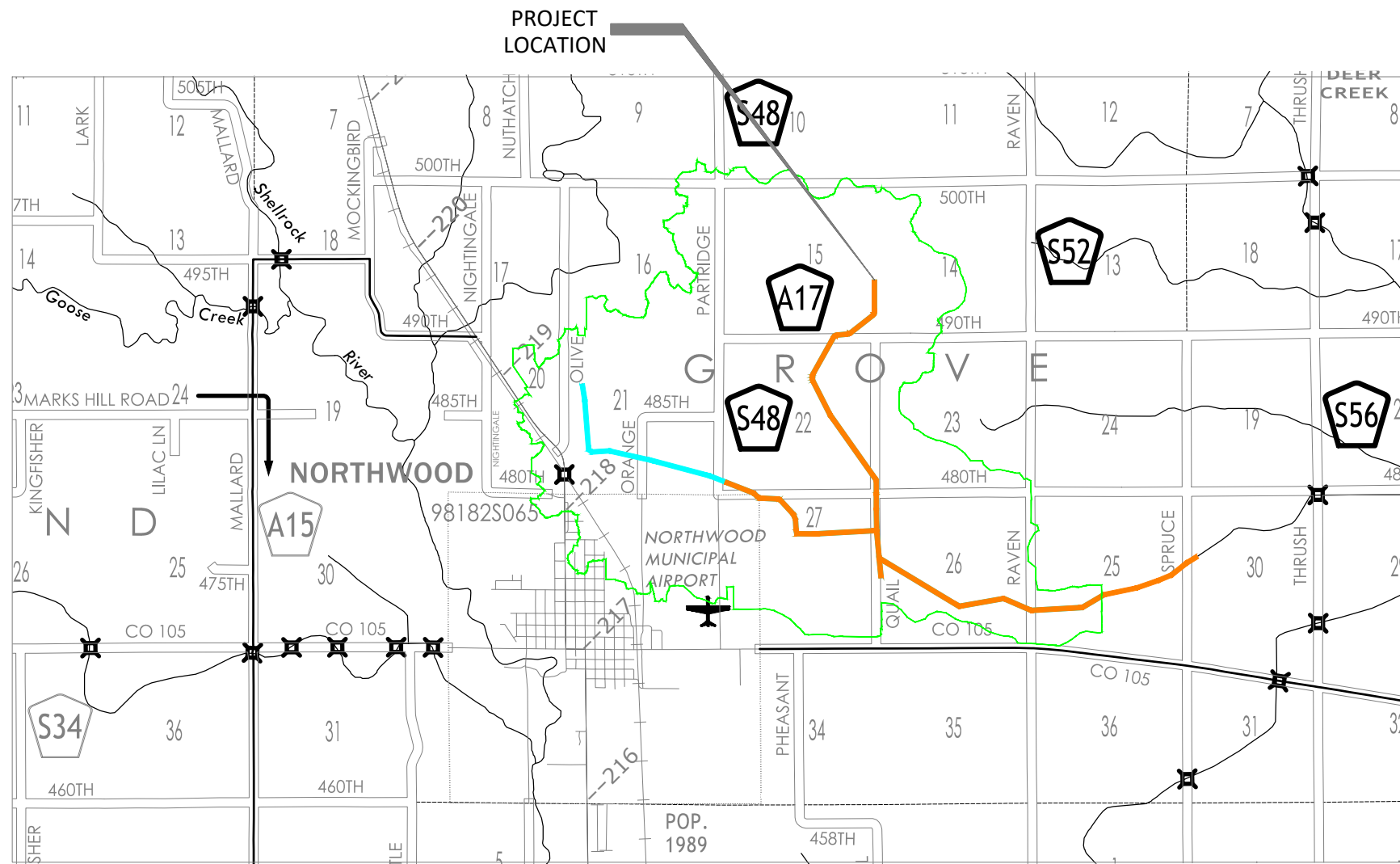
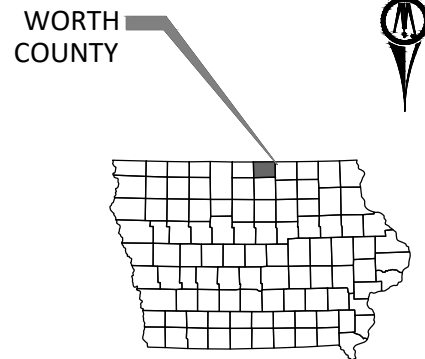
Preliminary Plans

PRELIMINARY PLANS FOR DRAINAGE DISTRICT No. 13 PROPOSED OPEN DITCH REPAIRS WORTH COUNTY, IOWA 2020

SHEET LIST TABLE	
SHEET NUMBER	SHEET TITLE
A.01	TITLE SHEET
A.02	LANDOWNER PLAT
B.01	PIPE TABLES AND TREE COUNTS
D.01 - D.05	PLAN & PROFILE - DD No. 13, LOWER MAIN OPEN DITCH
D.06 - D.07	PLAN & PROFILE - DD No. 13, UPPER MAIN OPEN DITCH
D.08 - D.11	PLAN & PROFILE - DD No. 13, LATERAL 3 OPEN DITCH
G.01 - G.03	ALIGNMENT GEOMETRY
X.01 - X.10	CROSS SECTIONS



THE SUBSURFACE UTILITY INFORMATION IN THIS PLAN IS UTILITY QUALITY LEVEL D. THIS UTILITY QUALITY LEVEL WAS DETERMINED ACCORDING TO THE GUIDELINES OF CI/ASCE 38-02, ENTITLED "STANDARD GUIDELINES FOR THE COLLECTION AND DEPICTION OF EXISTING SUBSURFACE UTILITY DATA."



GOVERNING SPECIFICATIONS

THE 2020 EDITION OF THE "IOWA STATEWIDE URBAN STANDARD SPECIFICATIONS FOR PUBLIC IMPROVEMENTS" SHALL GOVERN.

IOWA DEPARTMENT OF TRANSPORTATION "STANDARD SPECIFICATIONS FOR HIGHWAY AND BRIDGE CONSTRUCTION", SERIES 2020 AND ALL CURRENT GENERAL SUPPLEMENTAL SPECIFICATIONS AND MATERIALS INSTRUCTIONAL MEMORANDUM SHALL GOVERN AS REFERENCED.

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

DATUM EQUATIONS			
DRAINAGE DISTRICT NO. 13 REPAIRS			
1910 DATUM + 1184.05 =	2019 DATUM		
1946 DATUM + 1111.65 =	2019 DATUM		
1977 DATUM + 0.03 =	2019 DATUM		

PROJECT DATUM: STATE PLANE
HORIZONTAL: IOWA NORTH
VERTICAL: NAD 1983

DESIGNED	NO.	ISSUED FOR	DATE
JPR			
CLH			
JPR			
CLIENT PROJ. NO.			



218 11TH STREET SW PLAZA
SPENCER, IOWA 51301
Phone: (712) 580-5075
Email: Spencer@bolton-menk.com
www.bolton-menk.com

DD NO. 13 PROPOSED OPEN DITCH REPAIRS

WORTH COUNTY, IOWA

TITLE SHEET

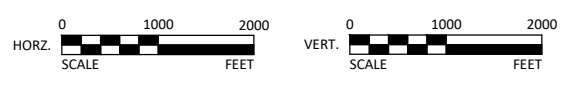
SHEET

A.01

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BENCH MARKS				
No.	DESCRIPTION	NORTHING	EASTING	ELEVATION
70	VFBM	3992156.976'	5006008.816'	1215.998'
71	USGS Station	3987950.68'	4998162.94'	1229'

LEGEND	
	PROPOSED OPEN DITCH ALIGNMENT
	PROPOSED TILE ALIGNMENTS
	PARCEL LINES
	ANNEXATION AREAS
	WATERSHED BOUNDARY
	ASSESSMENT BOUNDARY



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DD NO. 13 PROPOSED OPEN DITCH REPAIRS
 WORTH COUNTY, IOWA
 LANDOWNER PLAT

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A.02

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DD 13 LAT 3 OPEN DITCH PIPE WORK TABLE							
EXISTING							
STATION	L or R	TYPE	DIAMETER (IN)	LENGTH (LF)	MATERIAL	CONDITION	REASON TO REPLACE
9+54	Lt	SD	48"		CMP	UAC	
10+42	Lt	TE	12"		CMP		BAD
12+96	Lt	SD	15"		CMP		BAD
12+99	Rt	SD	12"		CMP		BAD
13+58	Lt	SD	15"		CMP		BAD
13+70	Rt	TE	12"		PLASTIC		
19+24	Lt	TE	12"		PLASTIC		
20+77	Lt	SD	12"		CMP	UAC	
28+19	Rt	SD	12"		CMP	UAC	
43+54	Lt	SD	12"		CMP		BAD
46+32	Rt	SD	15"		CMP		BAD
47+03	Lt	SD	15"		CMP		BAD
50+82	Rt	TE	12"		CMP	UAC	
56+75	Lt	SD	15"		CMP		BAD
66+41	Rt	SD	21"		CMP		BAD
70+49	Rt	SD	15"		CMP		BAD
73+90	Lt	SD	24"		CMP	UAC	
74+10	Rt	SD	18"		CMP	UAC	
74+61	Lt	SD	15"		CMP		BAD
74+87	Lt	TE	15"		CMP		BAD
74+94	Lt	TE	15"		CMP		BAD
79+42	Rt	TE	8"		CMP		
89+41	Rt	SD	15"		CMP	UAC	
90+05	Lt	TE	4"		PLASTIC		
90+11	Lt	SD	30"		CMP	UAC	
91+51	Rt	TE	15"		CMP		BAD
95+86	Lt	TE	8"		CMP		
98+39	Rt	TE	15"		HDPE		
98+50	Rt	TE	15"		CMP		BAD
98+62	Rt	SD	18"		CMP		BAD
102+51	Rt	TE	8"		PLASTIC		

DD 13 LOWER MAIN OPEN DITCH PIPE WORK TABLE							
EXISTING							
STATION	L or R	TYPE	DIAMETER (IN)	LENGTH (LF)	MATERIAL	CONDITION	REASON TO REPLACE
-29+42	Rt	SD	36"		CMP	UAC	
-28+54	Lt	SD	16"		HDPE	UAC	
-28+52	Rt	SD	15"		CMP	UAC	
-23+46	Rt	TE	15"		CMP	UAC	
-16+84	Lt	SD	8"		CMP		TO SMALL
-13+54	Lt	SD	15"		CMP	UAC	
-12+70	Rt	TE	15"		CMP	UAC	
-9+34	Lt	TE	6"		CMP		TO SMALL
-7+45	Lt	TE	12"		CMP	UAC	
-5+41	Rt	TE	12"		CMP		BAD
-0+33	Lt	TE	6"		PLASTIC		TO SMALL
2+45	Lt	SD	12"		CMP		BAD
5+56	Lt	SD	12"		CMP		BAD
11+31	Lt	TE	12"		CMP		BAD
13+85	Rt	SD	15"		CMP		BAD
27+06	Lt	TE	12"		CMP		BAD
27+80	Lt	SD	16"		HDPE	UAC	
31+02	Rt	SD	30"		CMP	UAC	
77+13	Lt	TE	12"		CMP	UAC	
77+70	Lt	TE	15"		CMP	UAC	
89+96	Rt	TE	15"		CMP		BAD
96+87	Lt	TE	15"		CMP		BAD

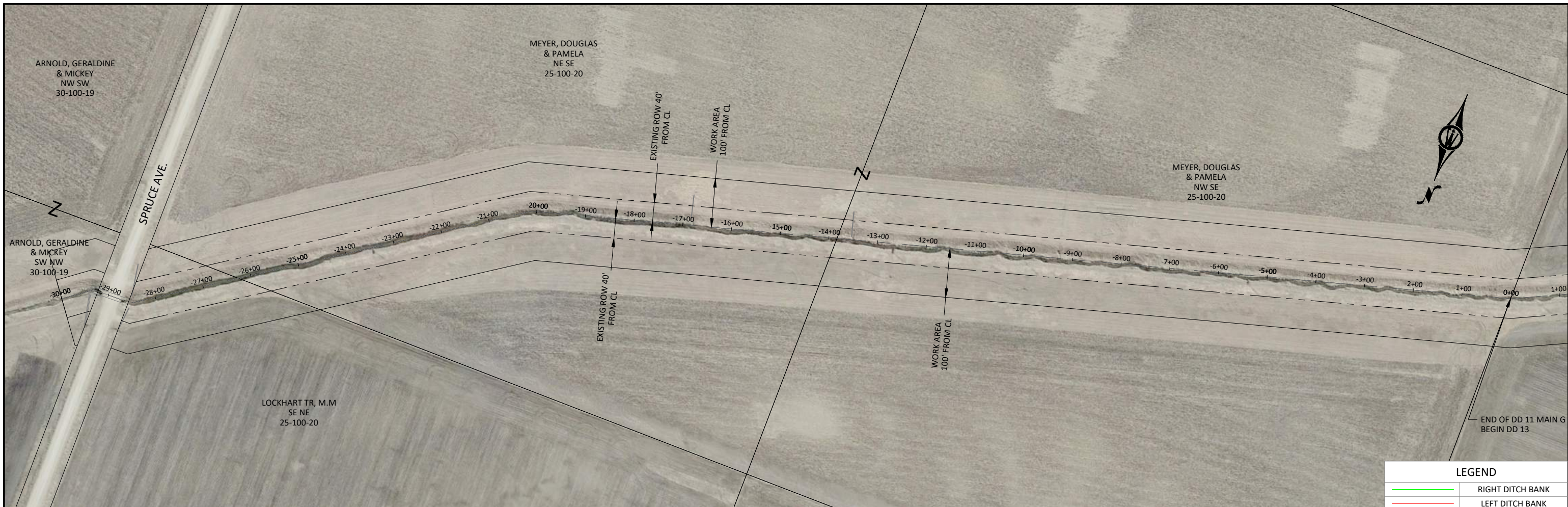
LATERAL 3 Tree count completed in 2019				
LANDOWNERS	Sec. twp range	Parcel	UNITS	
			Lt	Rt
JANSSEN, JOHN	26-100-20	NW NW	0.0	984.5
		TOTAL	984.50	
MMH IOWA ENTERPRISES, LLC	23-100-20	SW SW	0.0	65.3
		TOTAL	65.30	
NEWLIN, DELLA TURVOLD	22-100-20	NE SE	3,735.3	2,407.6
		TOTAL	6,142.90	
DAHLBY, DONOVAN	22-100-20	NW SE	1,423.4	933.5
		TOTAL	2,356.90	
DONLEE CORP	22-100-20	SW NE	3,281.7	5,156.8
		TOTAL	8,438.50	
DE YOUNG, LORRIE TURVOLD	22-100-20	NW NE	2,480.9	1,054.3
		TOTAL	3,535.20	
MMH IOWA ENTERPRISES, LLC	15-100-20	SE SE	4,259.8	424
		TOTAL	4,684.20	

LOWER MAIN Tree count completed in 2019				
LANDOWNERS	Sec. twp range	Parcel	UNITS	
			Lt	Rt
JANSSEN, JOHN	26-100-20	SW NW	0.0	1,285.7
		TOTAL	1,285.70	
KRULL, BOUTELLE THELMA	26-100-20	NW SW	692.0	0.0
		TOTAL	692.00	

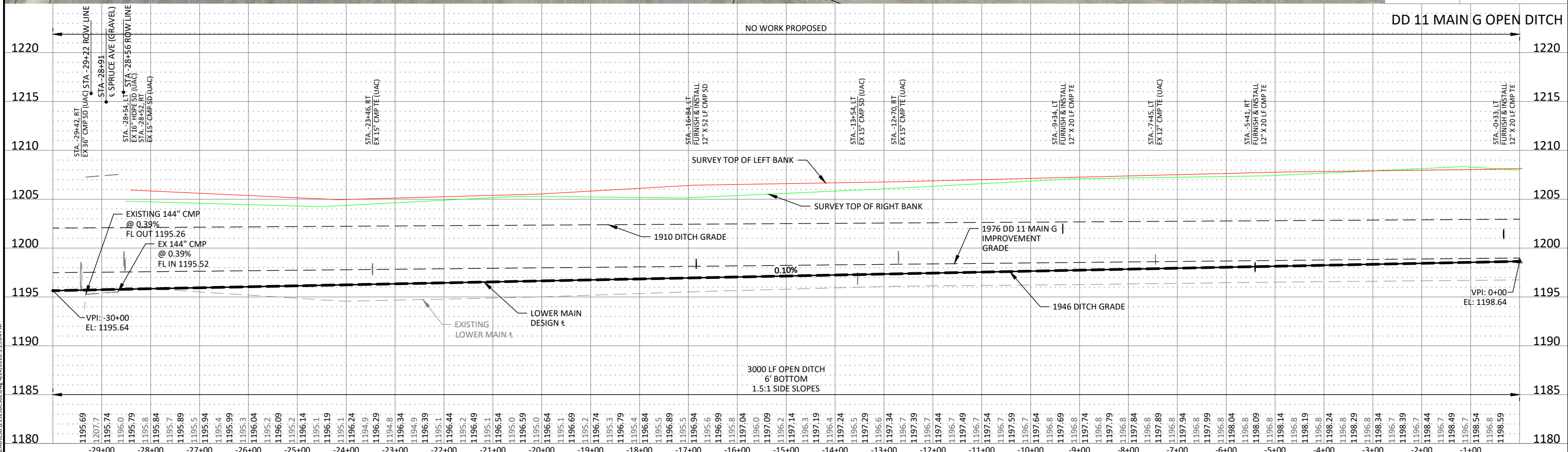
UPPER MAIN Tree count completed in 2019				
LANDOWNERS	Sec. twp range	Parcel	UNITS	
			Lt	Rt
HEIKEN, DANIEL A. (ACREAGE)	27-100-20	SE NE	520.8	0.0
		TOTAL	520.80	
MITTAG, RAYMOND	27-100-20	SE NE	1,527.2	0.0
		TOTAL	1,527.20	



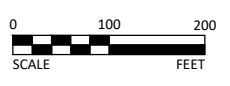
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LEGEND	
	RIGHT DITCH BANK
	LEFT DITCH BANK



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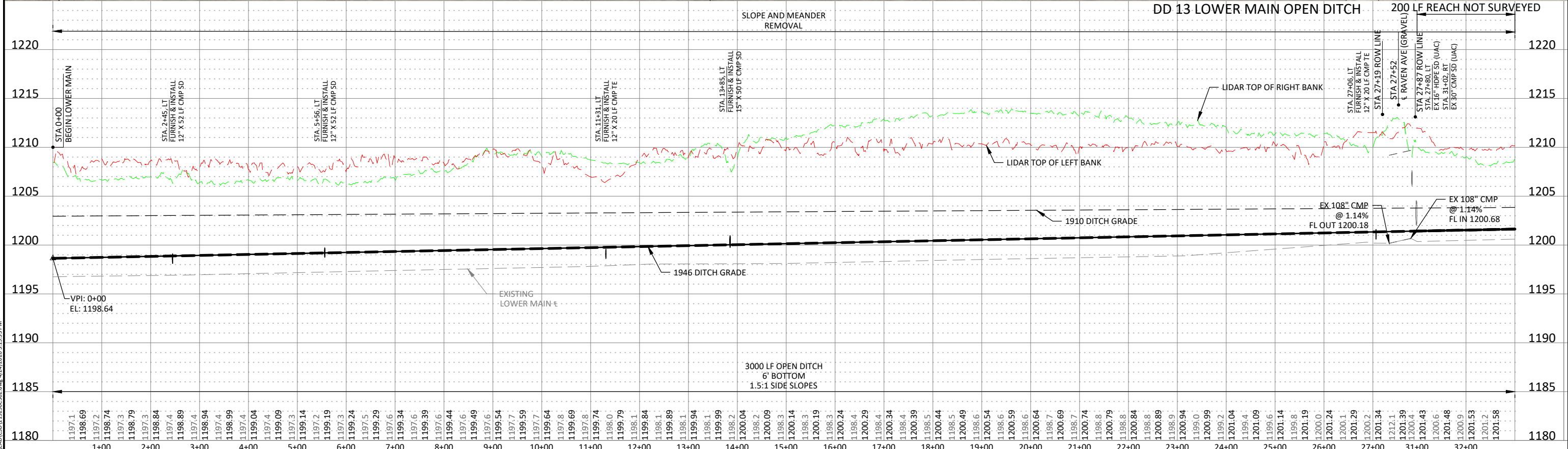


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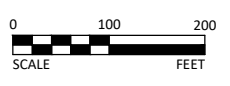
DESIGNED	NO.	ISSUED FOR	DATE
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CLIENT PROJ. NO.			

DD NO. 13 PROPOSED OPEN DITCH REPAIRS
 WORTH COUNTY, IOWA
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 STA. -30+00 - 0+00

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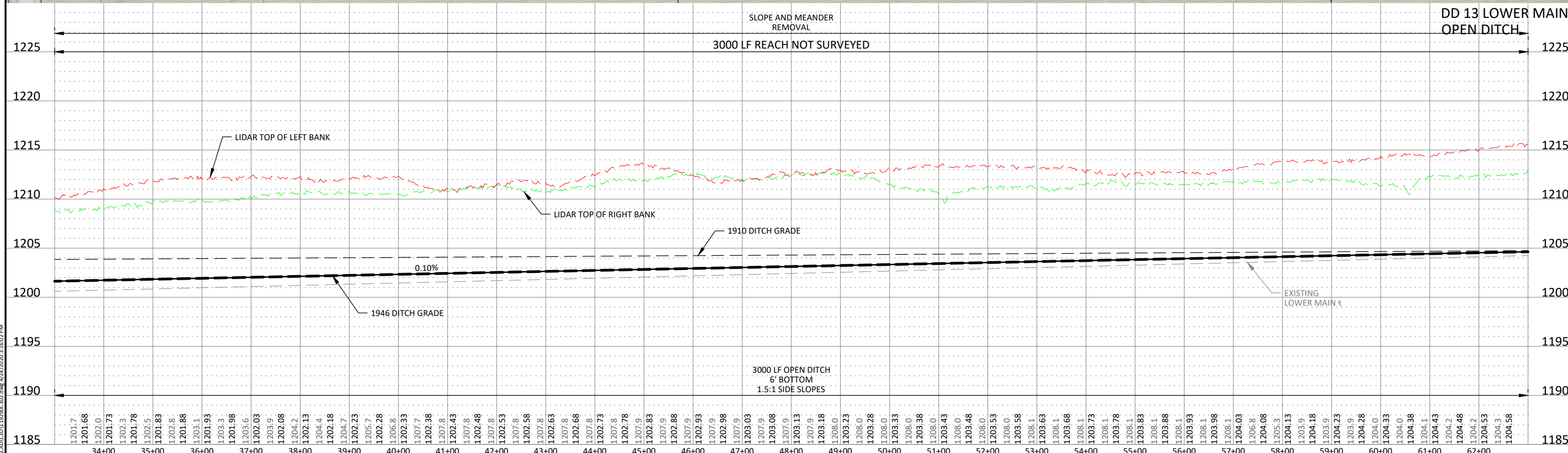
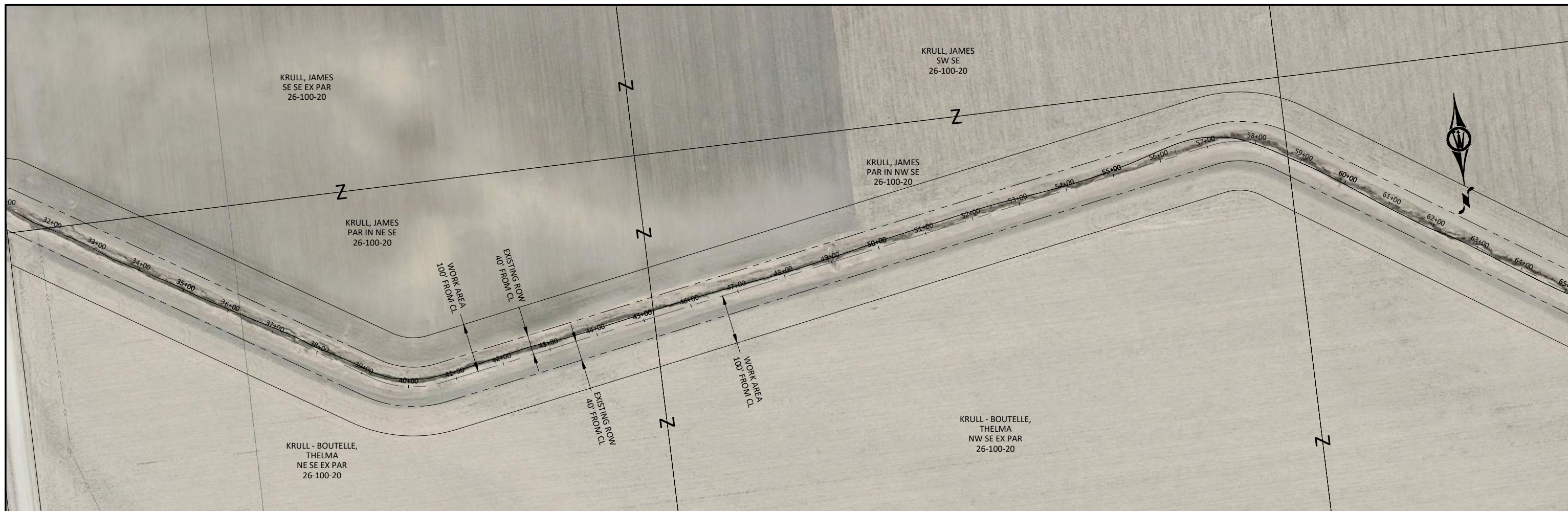


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 STA. 0+00 - 33+00

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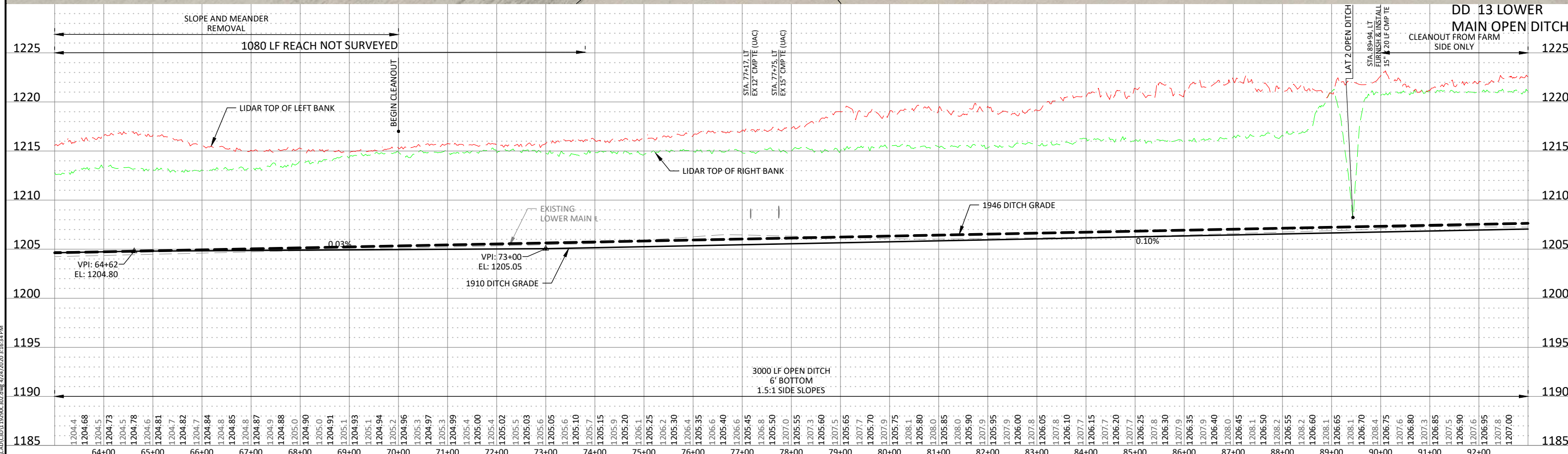
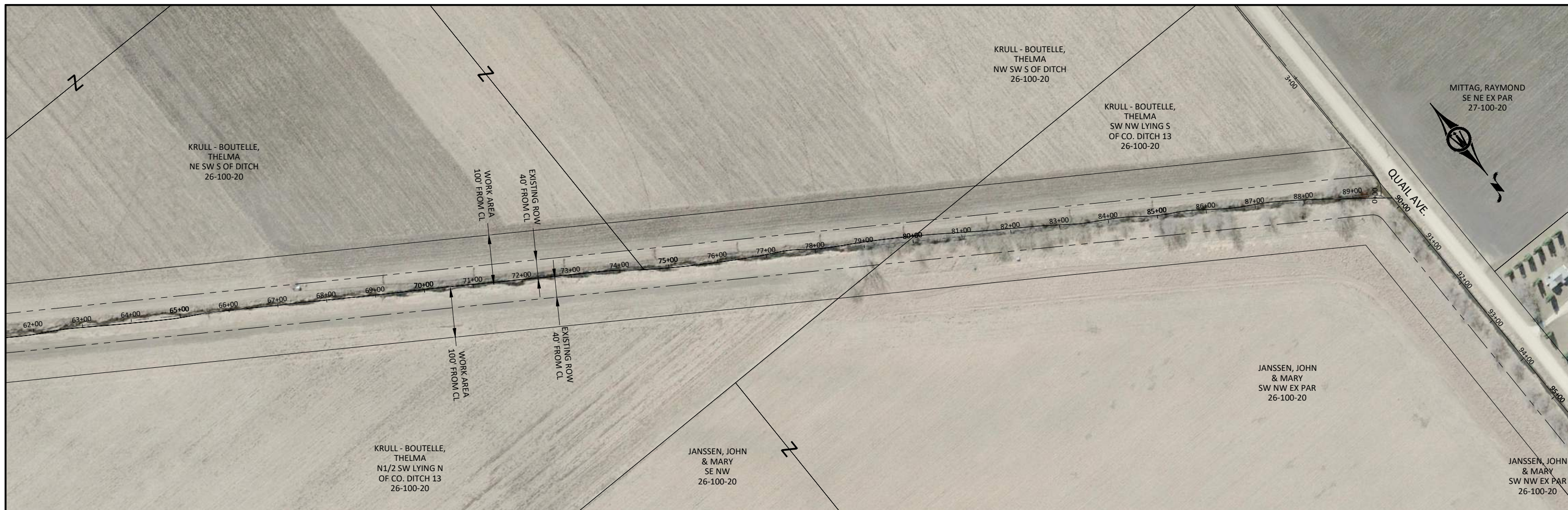


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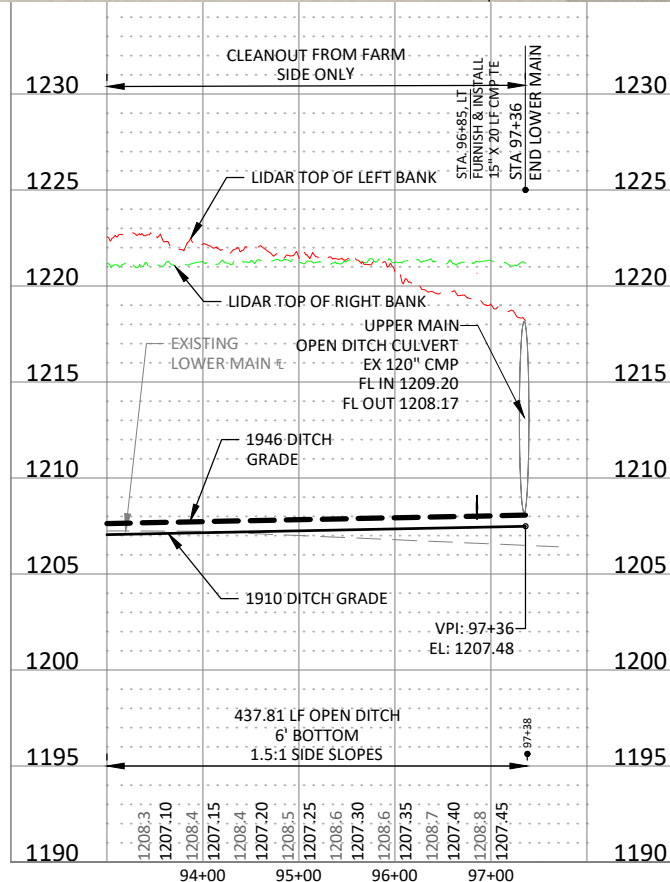
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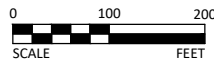
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STA. 63+00 - 93+00

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DD 13 LOWER MAIN OPEN DITCH

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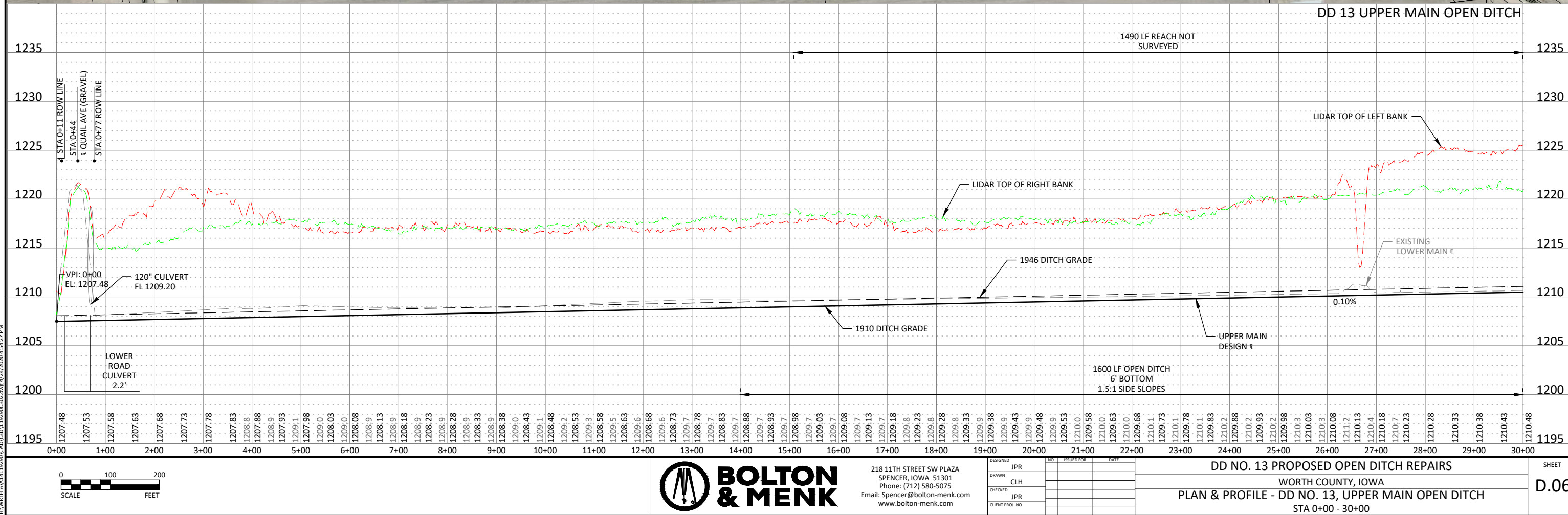
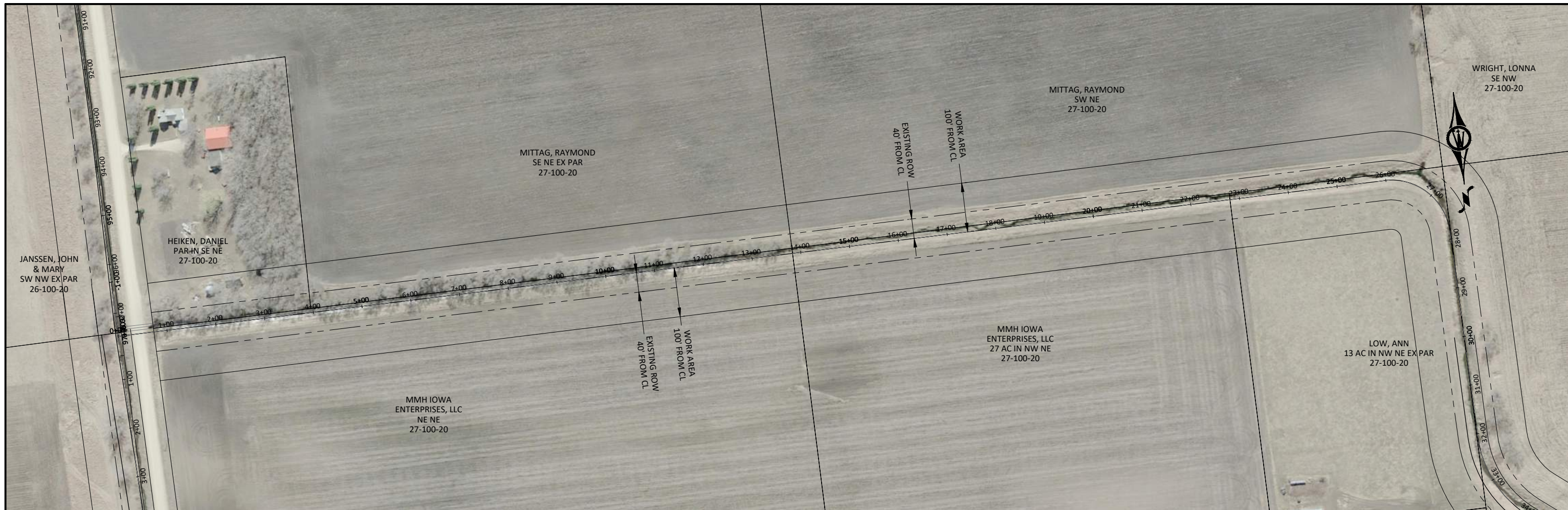


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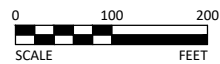
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STA. 93+00 - 97+38

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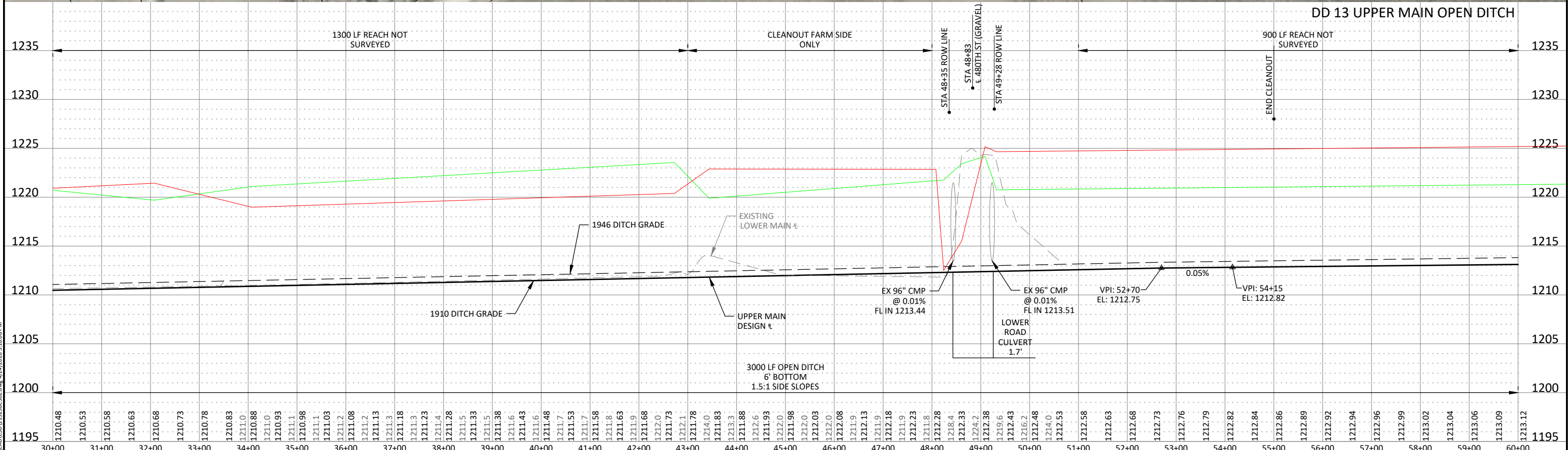


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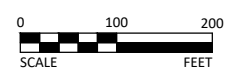
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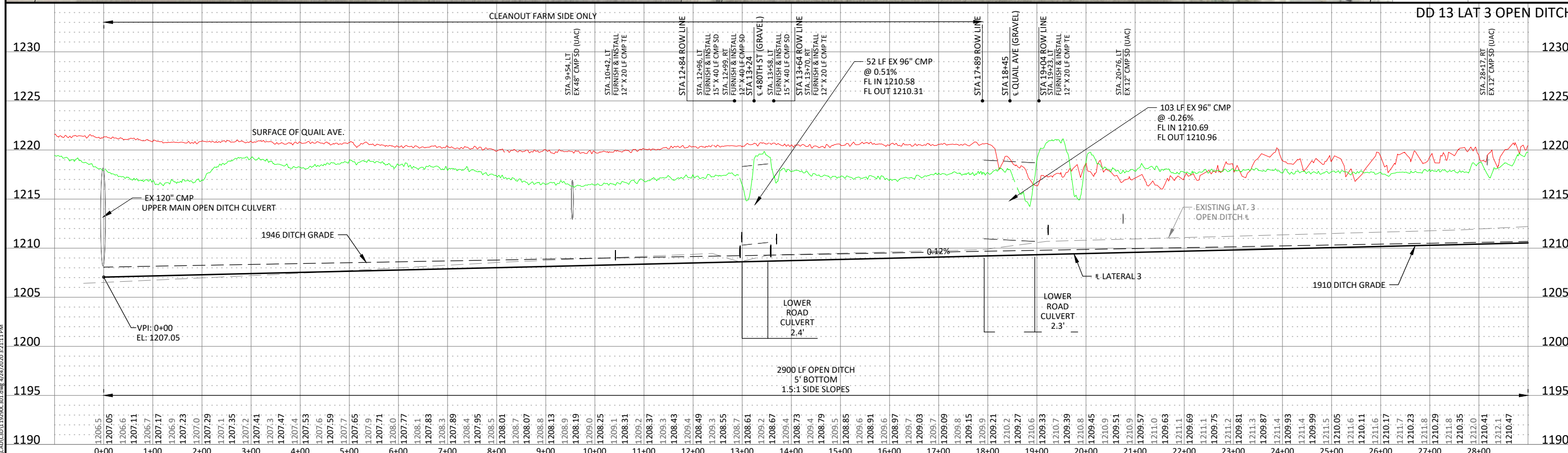
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 STA 0+00 - 30+00

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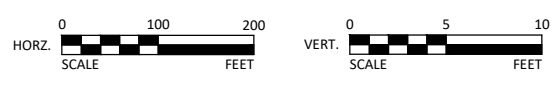


LEGEND

	RIGHT DITCH BANK
	LEFT DITCH BANK



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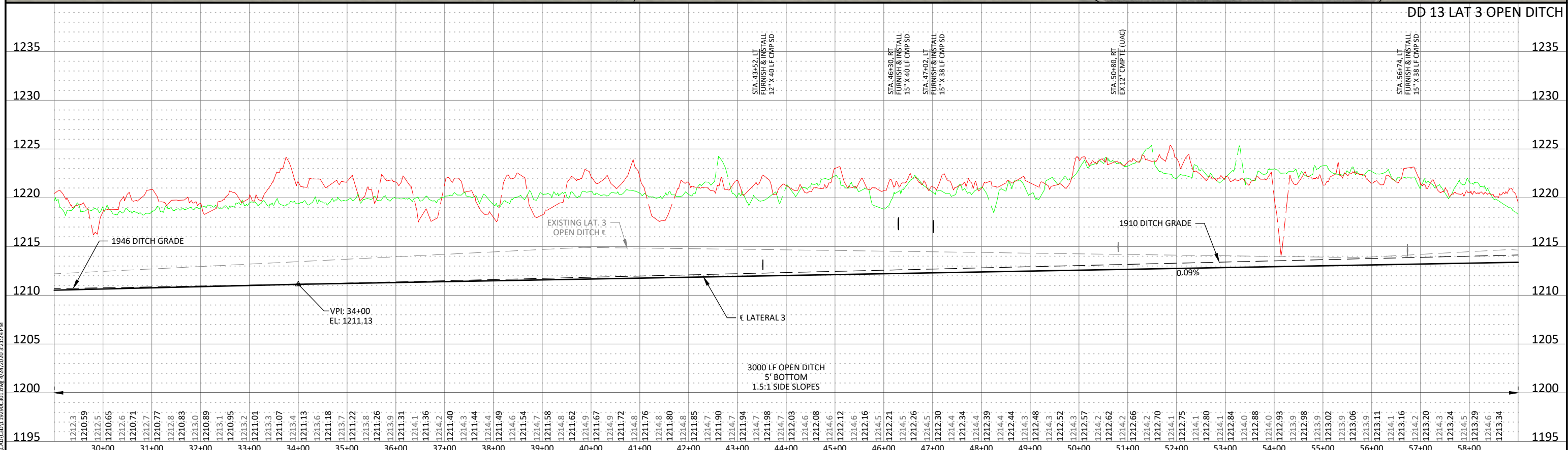
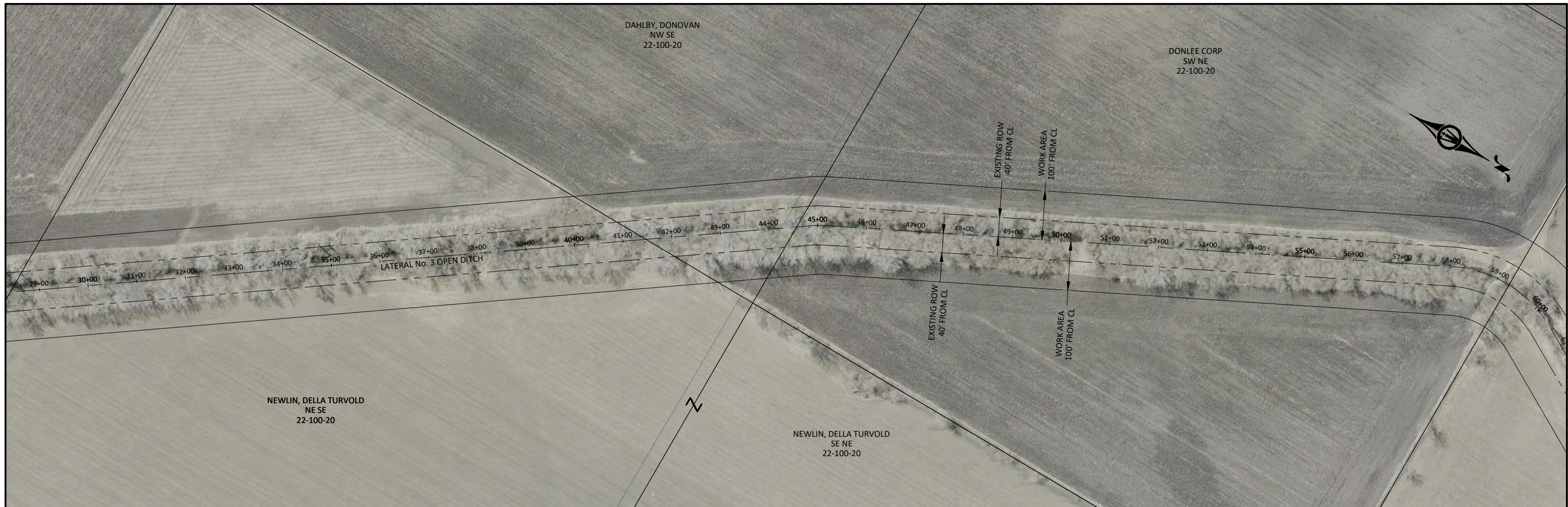


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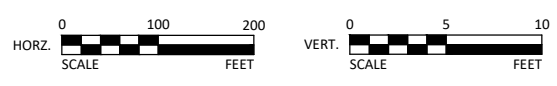
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STA. 0+00 - 29+00

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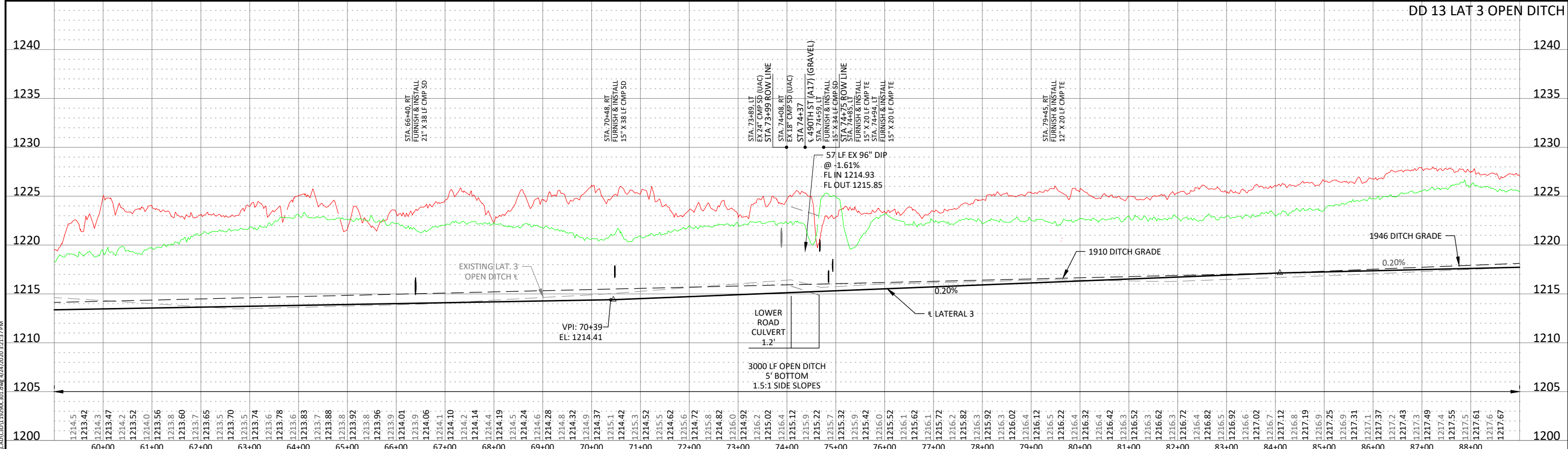
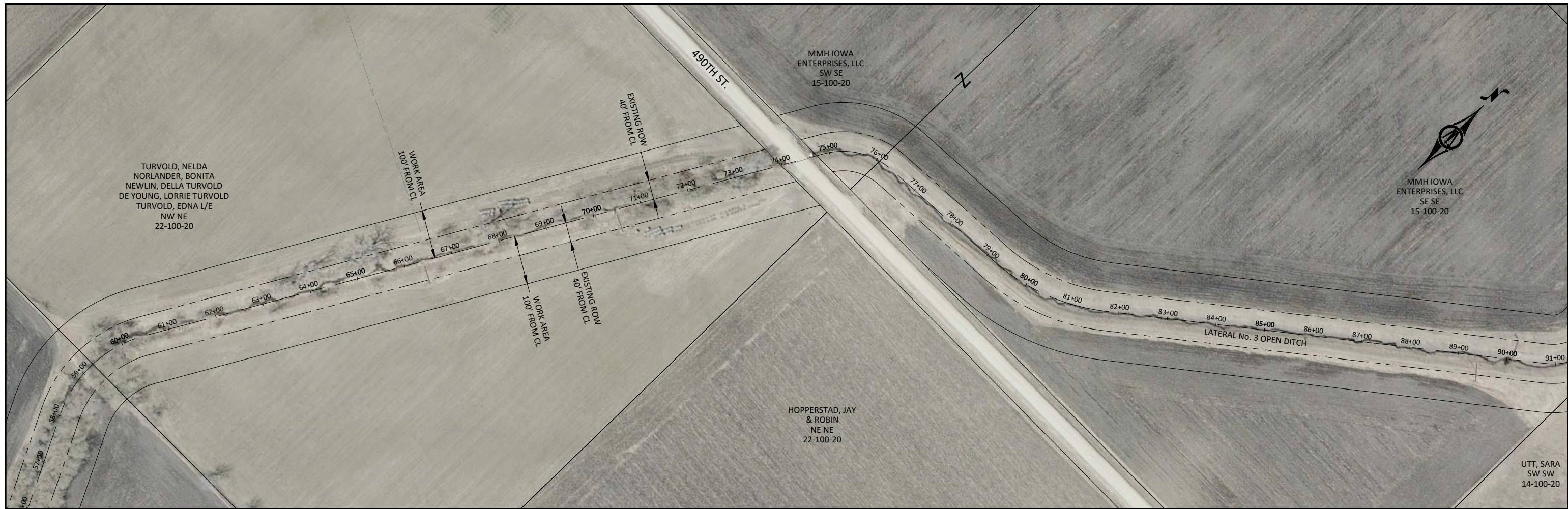


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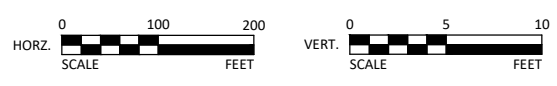
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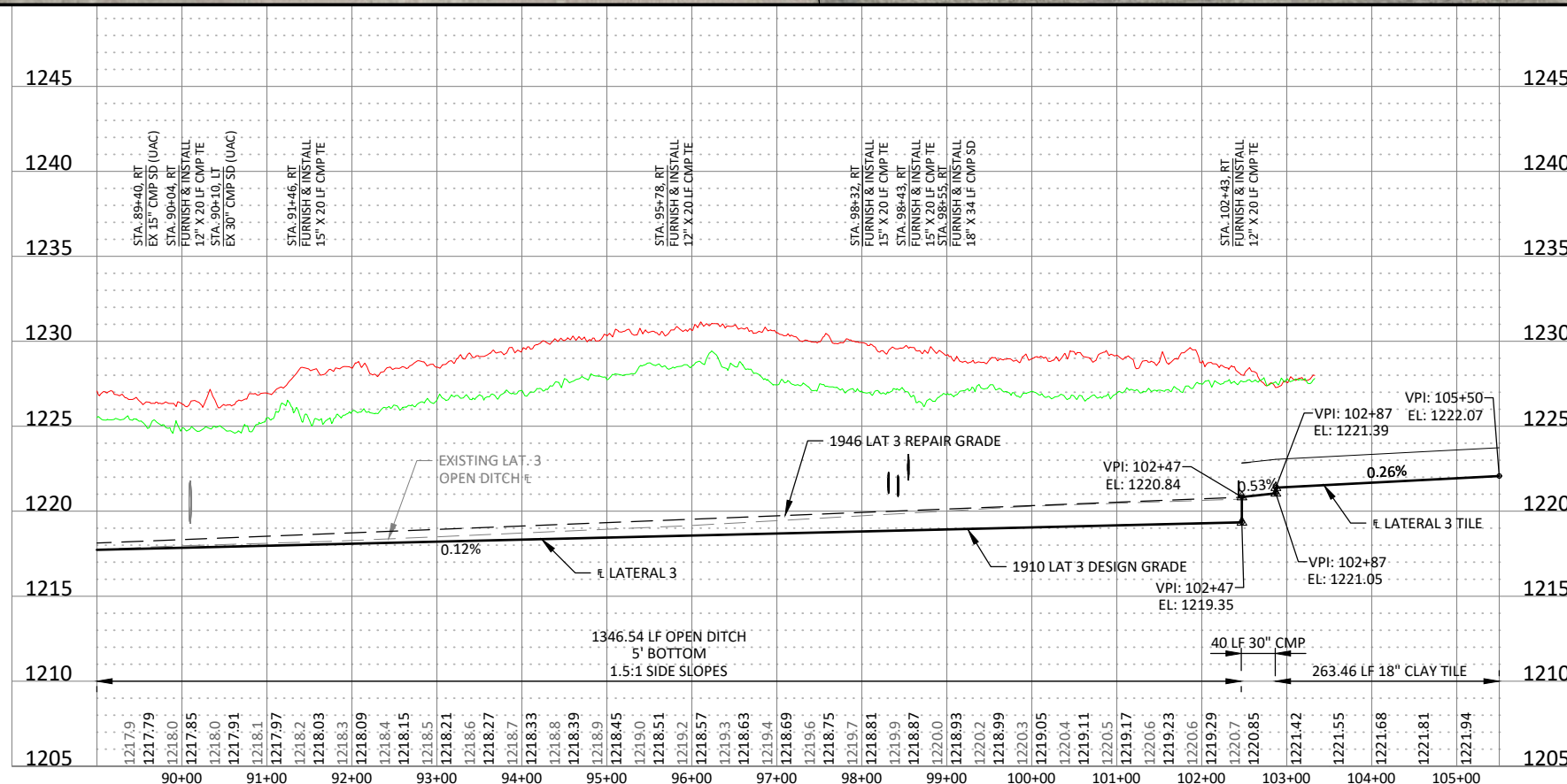
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DD 13 LAT 3 OPEN DITCH



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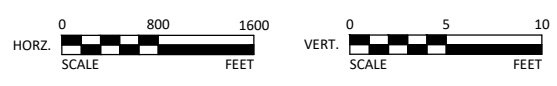
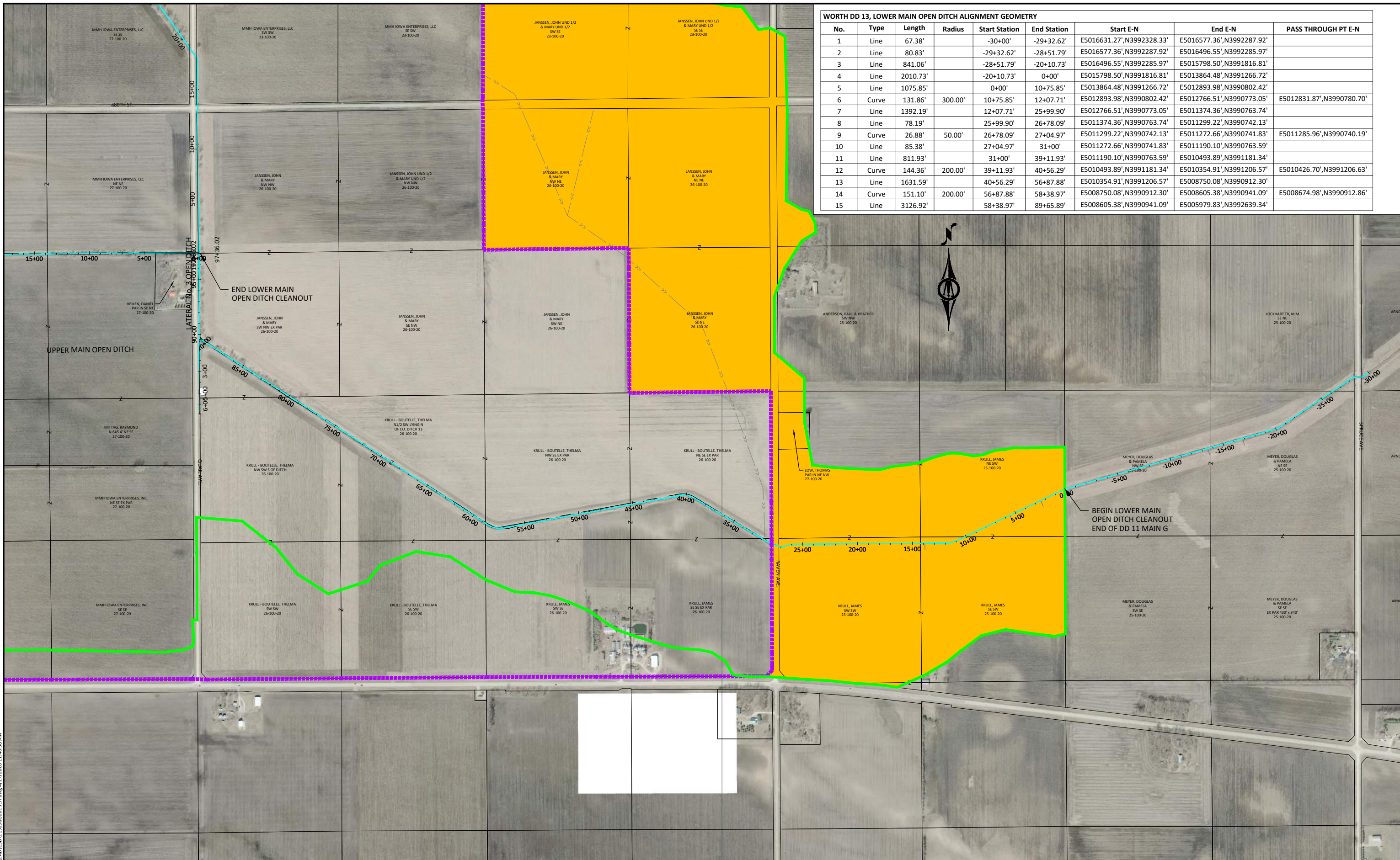
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DD NO. 13 PROPOSED OPEN DITCH REPAIRS
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STA. 89+00 - 102+14

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WORTH DD 13, LOWER MAIN OPEN DITCH ALIGNMENT GEOMETRY								
No.	Type	Length	Radius	Start Station	End Station	Start E-N	End E-N	PASS THROUGH PT E-N
1	Line	67.38'		-30+00'	-29+32.62'	E5016631.27',N3992328.33'	E5016577.36',N3992287.92'	
2	Line	80.83'		-29+32.62'	-28+51.79'	E5016577.36',N3992287.92'	E5016496.55',N3992285.97'	
3	Line	841.06'		-28+51.79'	-20+10.73'	E5016496.55',N3992285.97'	E5015798.50',N3991816.81'	
4	Line	2010.73'		-20+10.73'	0+00'	E5015798.50',N3991816.81'	E5013864.48',N3991266.72'	
5	Line	1075.85'		0+00'	10+75.85'	E5013864.48',N3991266.72'	E5012893.98',N3990802.42'	
6	Curve	131.86'	300.00'	10+75.85'	12+07.71'	E5012893.98',N3990802.42'	E5012766.51',N3990773.05'	E5012831.87',N3990780.70'
7	Line	1392.19'		12+07.71'	25+99.90'	E5012766.51',N3990773.05'	E5011374.36',N3990763.74'	
8	Line	78.19'		25+99.90'	26+78.09'	E5011374.36',N3990763.74'	E5011299.22',N3990742.13'	
9	Curve	26.88'	50.00'	26+78.09'	27+04.97'	E5011299.22',N3990742.13'	E5011272.66',N3990741.83'	E5011285.96',N3990740.19'
10	Line	85.38'		27+04.97'	31+00'	E5011272.66',N3990741.83'	E5011190.10',N3990763.59'	
11	Line	811.93'		31+00'	39+11.93'	E5011190.10',N3990763.59'	E5010493.89',N3991181.34'	
12	Curve	144.36'	200.00'	39+11.93'	40+56.29'	E5010493.89',N3991181.34'	E5010354.91',N3991206.57'	E5010426.70',N3991206.63'
13	Line	1631.59'		40+56.29'	56+87.88'	E5010354.91',N3991206.57'	E5008750.08',N3990912.30'	
14	Curve	151.10'	200.00'	56+87.88'	58+38.97'	E5008750.08',N3990912.30'	E5008605.38',N3990941.09'	E5008674.98',N3990912.86'
15	Line	3126.92'		58+38.97'	89+65.89'	E5008605.38',N3990941.09'	E5005979.83',N3992639.34'	



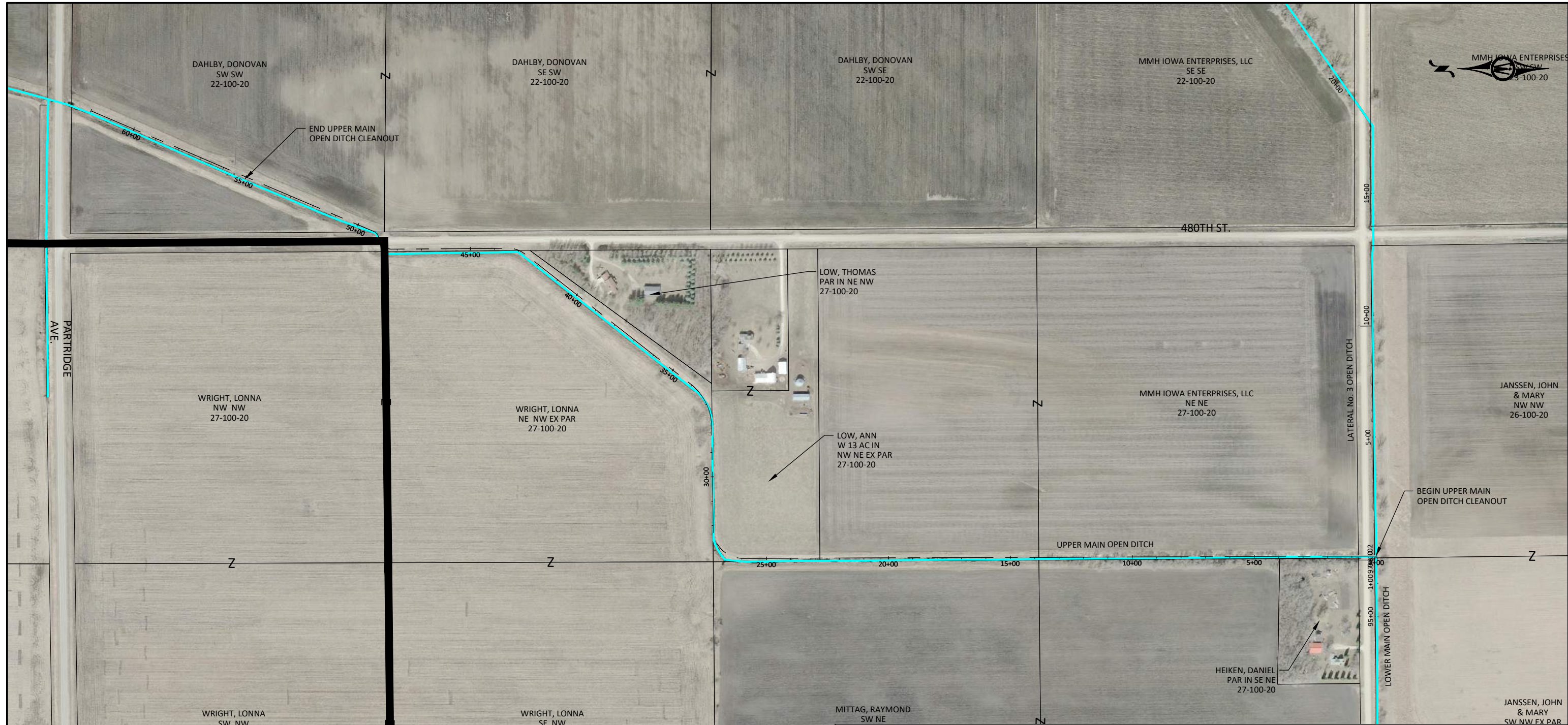
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ALIGNMENT GEOMETRY

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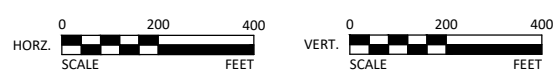


WORTH DD 13, UPPER OPEN DITCH ALIGNMENT GEOMETRY

No.	Type	Length	Radius	Start Station	End Station	Start E-N	End E-N	PASS THROUGH PT E-N
1	Line	2596.61'		0+00'	25+96.61'	(5005974.87',3993422.75',0.00')	(5003378.27',3993413.71',0.00')	
2	Curve	187.48'	120.33'	25+96.61'	27+84.09'	(5003378.27',3993413.71',0.00')	(5003257.54',3993532.09',0.00')	(5003377.85',3993534.04',0.00')
3	Line	423.68'		27+84.09'	32+07.77'	(5003257.54',3993532.09',0.00')	(5003250.67',3993955.72',0.00')	
4	Curve	199.34'	224.13'	32+07.77'	34+07.12'	(5003250.67',3993955.72',0.00')	(5003164.90',3994128.43',0.00')	(5003026.57',3993952.08',0.00')
5	Line	865.61'		34+07.12'	42+72.73'	(5003164.90',3994128.43',0.00')	(5002483.83',3994662.68',0.00')	
6	Curve	70.71'	105.12'	42+72.73'	43+43.44'	(5002483.83',3994662.68',0.00')	(5002418.16',3994685.09',0.00')	(5002418.95',3994579.97',0.00')
7	Line	480.58'		43+43.44'	48+24.02'	(5002418.16',3994685.09',0.00')	(5001937.59',3994681.47',0.00')	
8	Curve	36.70'	35.58'	48+24.02'	48+60.73'	(5001937.59',3994681.47',0.00')	(5001906.93',3994698.56',0.00')	(5001937.32',3994717.05',0.00')
9	Line	47.95'		48+60.73'	49+08.67'	(5001906.93',3994698.56',0.00')	(5001882.01',3994739.52',0.00')	
10	Curve	23.50'	37.86'	49+08.67'	49+32.17'	(5001882.01',3994739.52',0.00')	(5001864.53',3994754.66',0.00')	(5001849.67',3994719.84',0.00')
11	Line	1258.49'		49+32.17'	61+90.66'	(5001864.53',3994754.66',0.00')	(5000707.05',3995248.67',0.00')	

LEGEND

- PROPOSED OPEN DITCH ALIGNMENT
- PROPOSED TILE ALIGNMENTS
- PARCEL LINES
- ANNEXATION AREAS
- WATERSHED BOUNDARY
- ASSESSMENT BOUNDARY



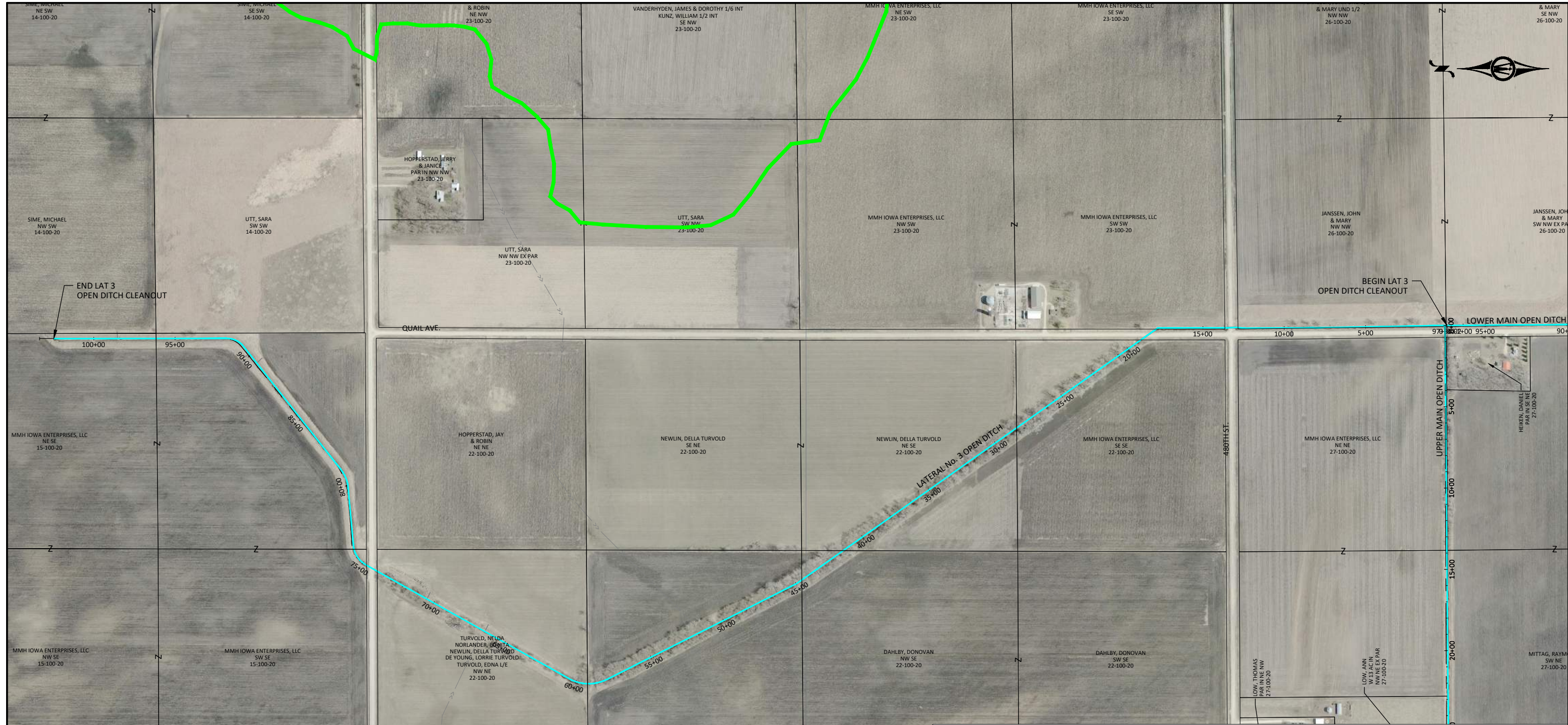
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ALIGNMENT GEOMETRY

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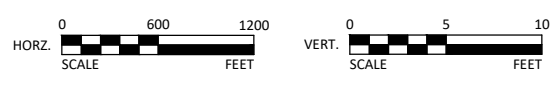


LEGEND

- PROPOSED OPEN DITCH ALIGNMENT
- PROPOSED TILE ALIGNMENTS
- PARCEL LINES
- ANNEXATION AREAS
- WATERSHED BOUNDARY
- - - ASSESSMENT BOUNDARY

WORTH DD 13, LAT 3 OPEN DITCH ALIGNMENT GEOMETRY

No.	Type	Length	Radius	Start Station	End Station	Start E-N	End E-N	PASS THROUGH PT E-N
1	Line	819.03'		-0+00'	8+19.03'	E5005975.07',N3993411.25'	E5005960.36',N3994230.15'	
2	Line	421.40'		8+19.03'	12+40.44'	E5005960.36',N3994230.15'	E5005957.85',N3994651.55'	
3	Line	53.68'		12+40.44'	12+94.11'	E5005957.85',N3994651.55'	E5005962.40',N3994705.03'	
4	Line	61.18'		12+94.11'	13+55.30'	E5005962.40',N3994705.03'	E5005960.09',N3994766.17'	
5	Line	420.63'		13+55.30'	17+75.93'	E5005960.09',N3994766.17'	E5005960.06',N3995186.80'	
6	Line	2727.28'		17+75.93'	45+03.21'	E5005960.06',N3995186.80'	E5004384.85',N3997413.18'	
7	Line	1301.87'		45+03.21'	58+05.08'	E5004384.85',N3997413.18'	E5003798.00',N3998575.28'	
8	Curve	244.76'	250.00'	58+05.08'	60+49.85'	E5003798.00',N3998575.28'	E5003803.14',N3998810.33'	E5003771.22',N3998693.44'
9	Line	1430.52'		60+49.85'	74+80.37'	E5003803.14',N3998810.33'	E5004503.26',N4000057.81'	
10	Curve	145.36'	150.00'	74+80.37'	76+25.73'	E5004503.26',N4000057.81'	E5004620.55',N4000133.79'	E5004552.52',N4000110.29'
11	Line	360.18'		76+25.73'	79+85.91'	E5004620.55',N4000133.79'	E5004979.26',N4000166.27'	
12	Curve	115.61'	200.00'	79+85.91'	81+01.52'	E5004979.26',N4000166.27'	E5005085.17',N4000208.48'	E5005035.29',N4000179.67'
13	Line	969.14'		81+01.52'	90+70.66'	E5005085.17',N4000208.48'	E5005845.79',N4000809.04'	
14	Curve	117.47'	130.00'	90+70.66'	91+88.13'	E5005845.79',N4000809.04'	E5005895.23',N4000911.22'	E5005882.25',N4000854.45'
15	Line	1066.46'		91+88.13'	102+54.58'	E5005895.23',N4000911.22'	E5005894.00',N4001977.68'	



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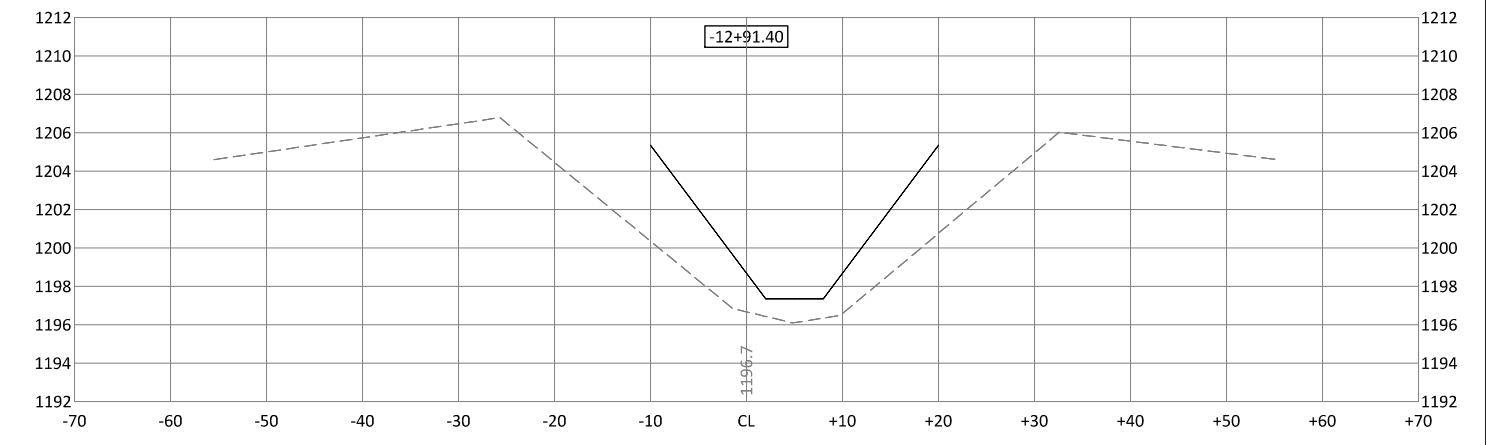
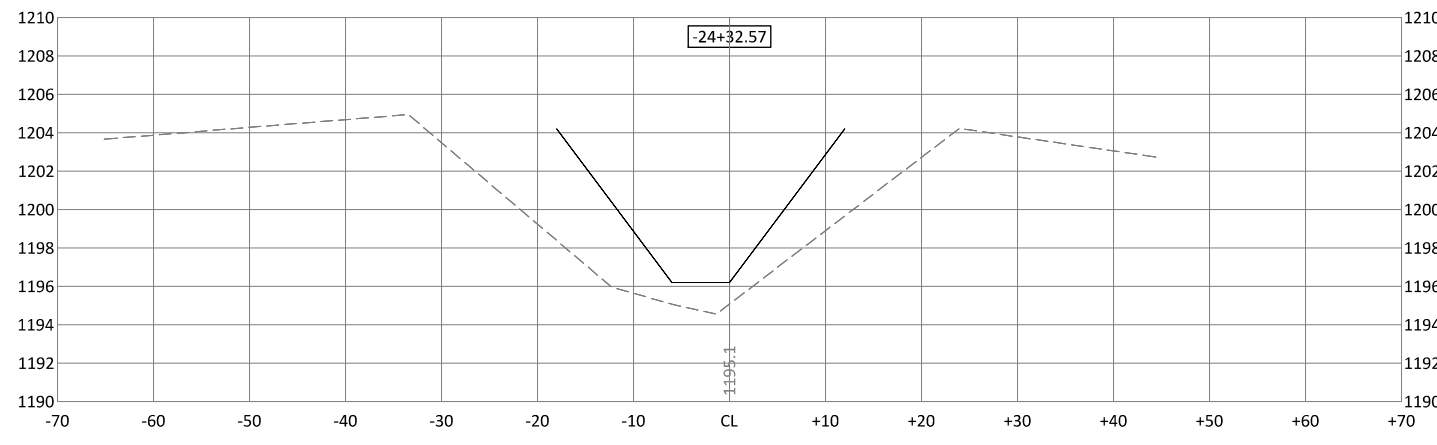
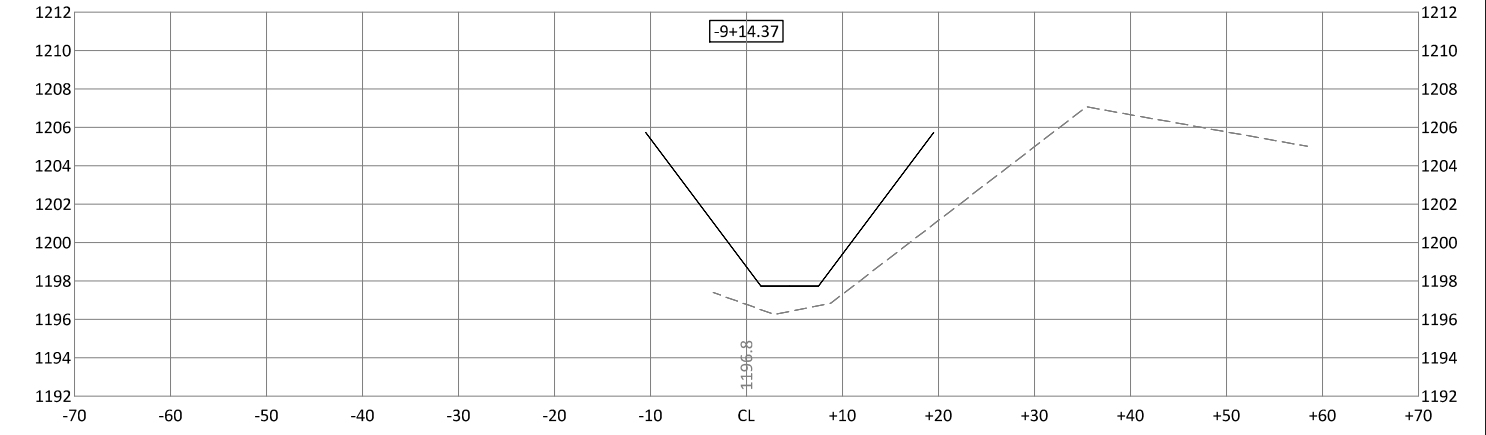
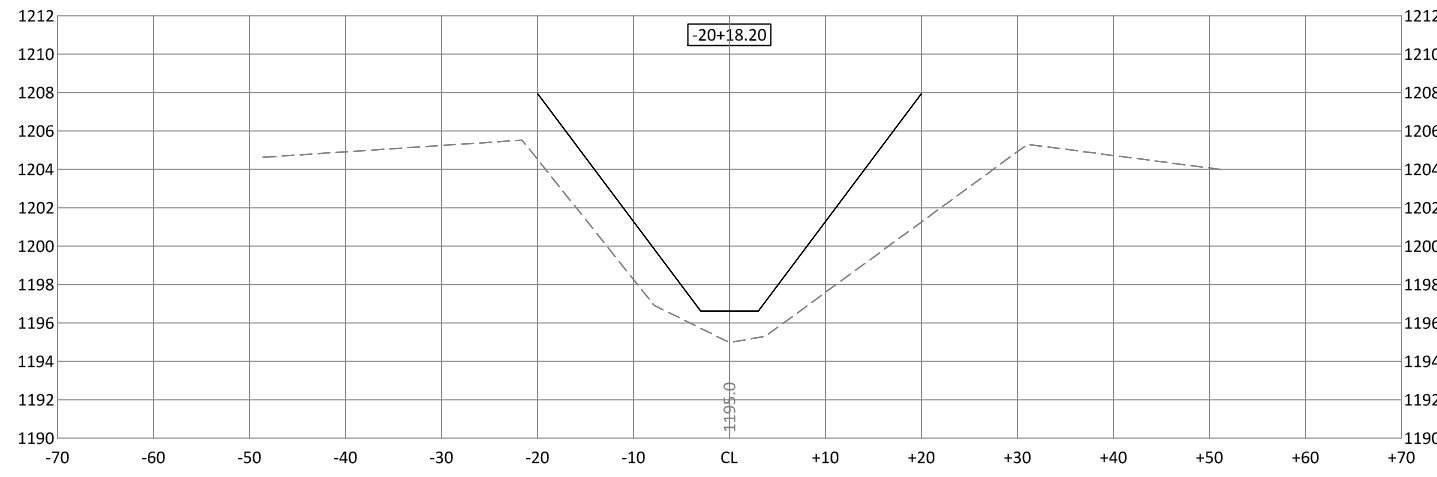
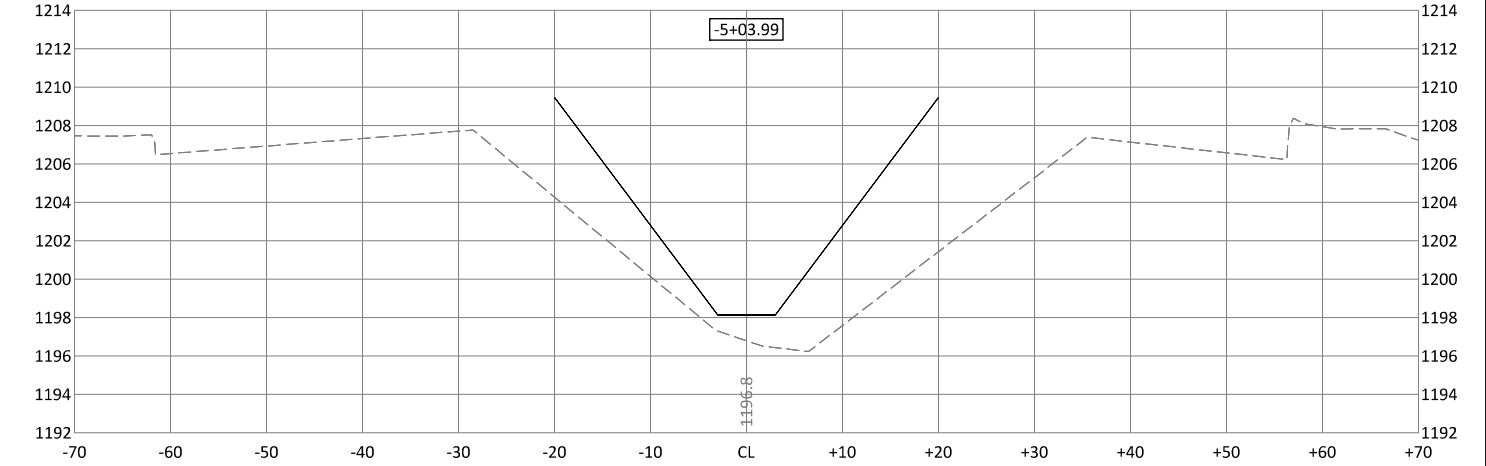
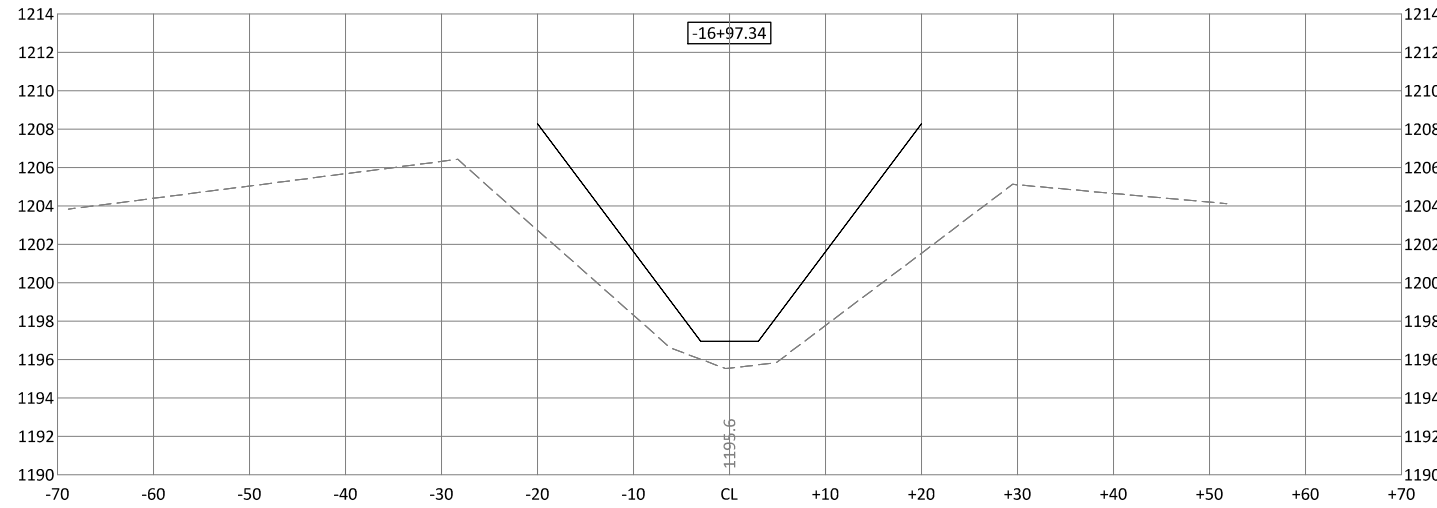
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WORTH COUNTY, IOWA
ALIGNMENT GEOMETRY

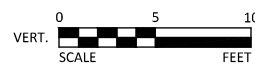
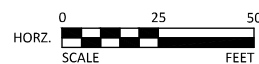
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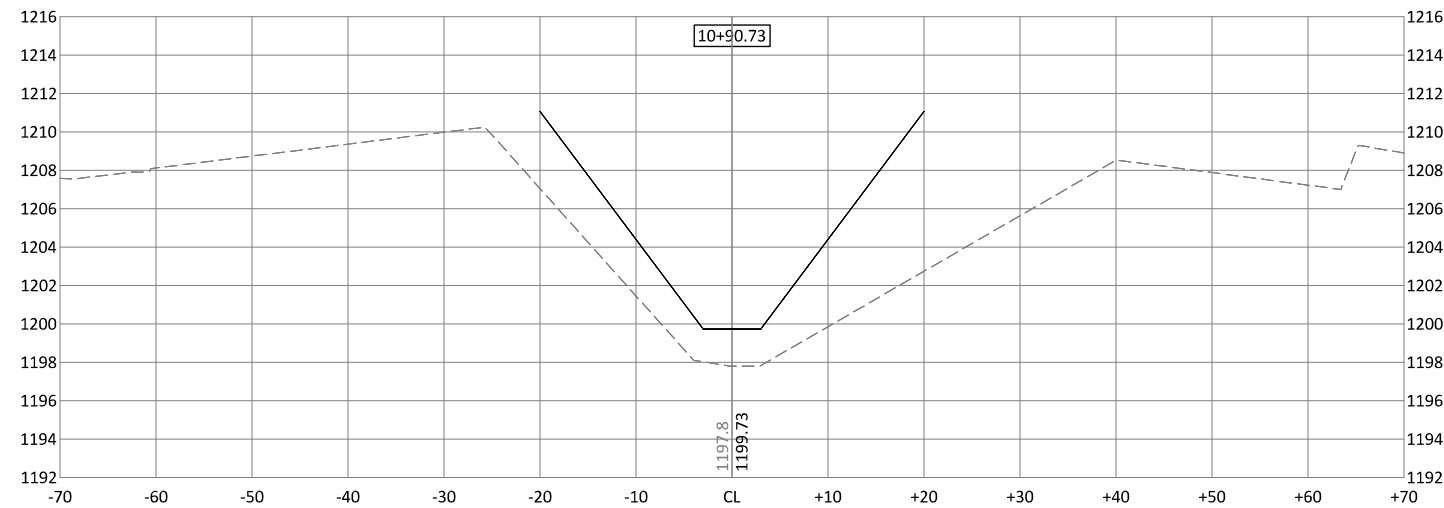
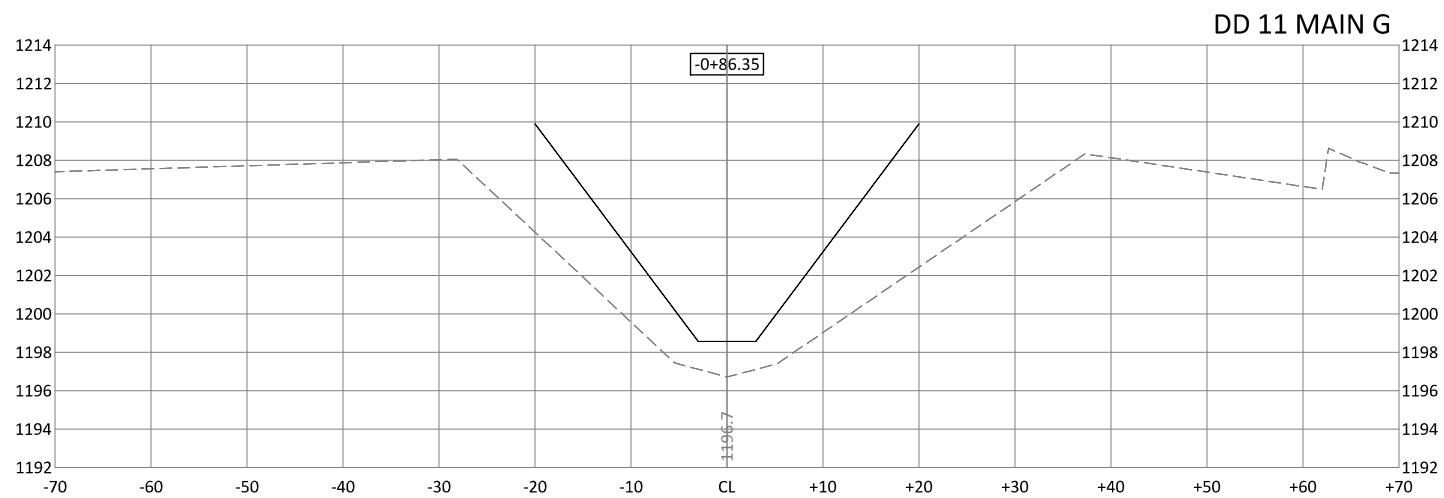
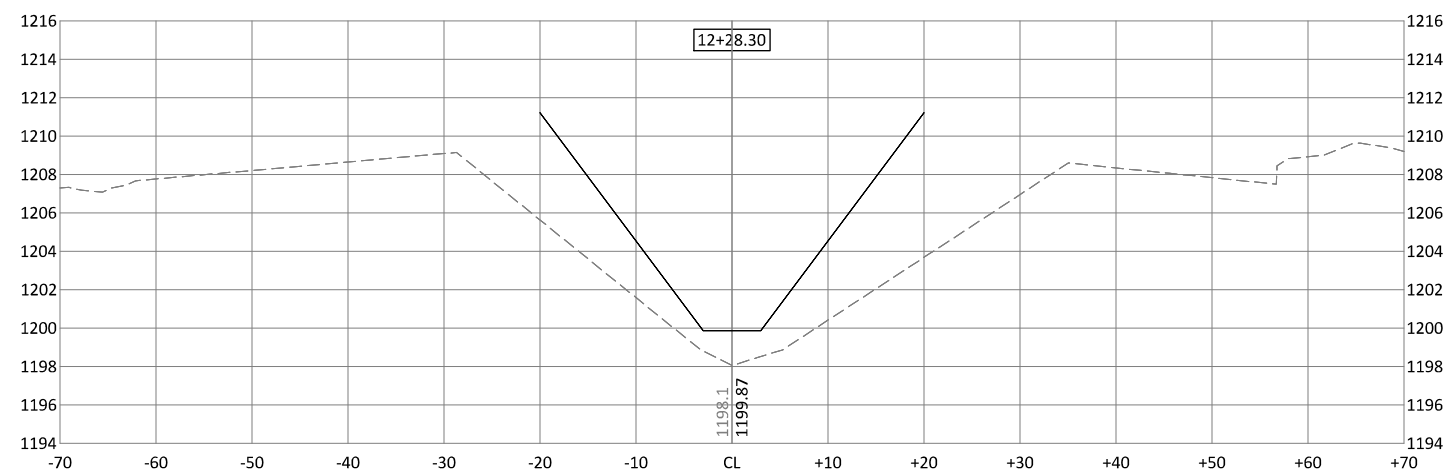
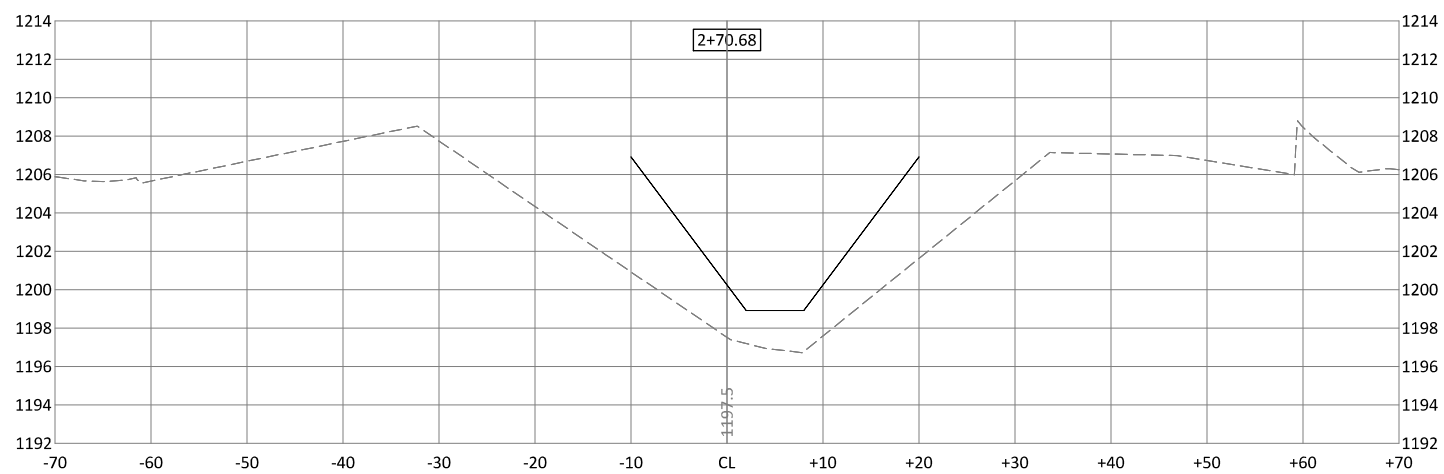
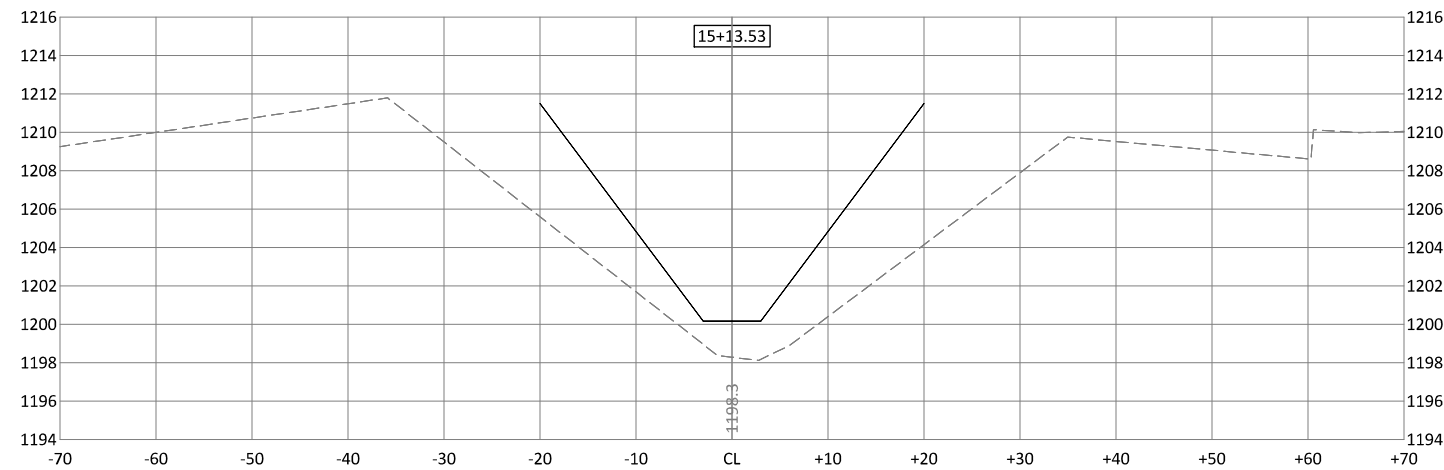
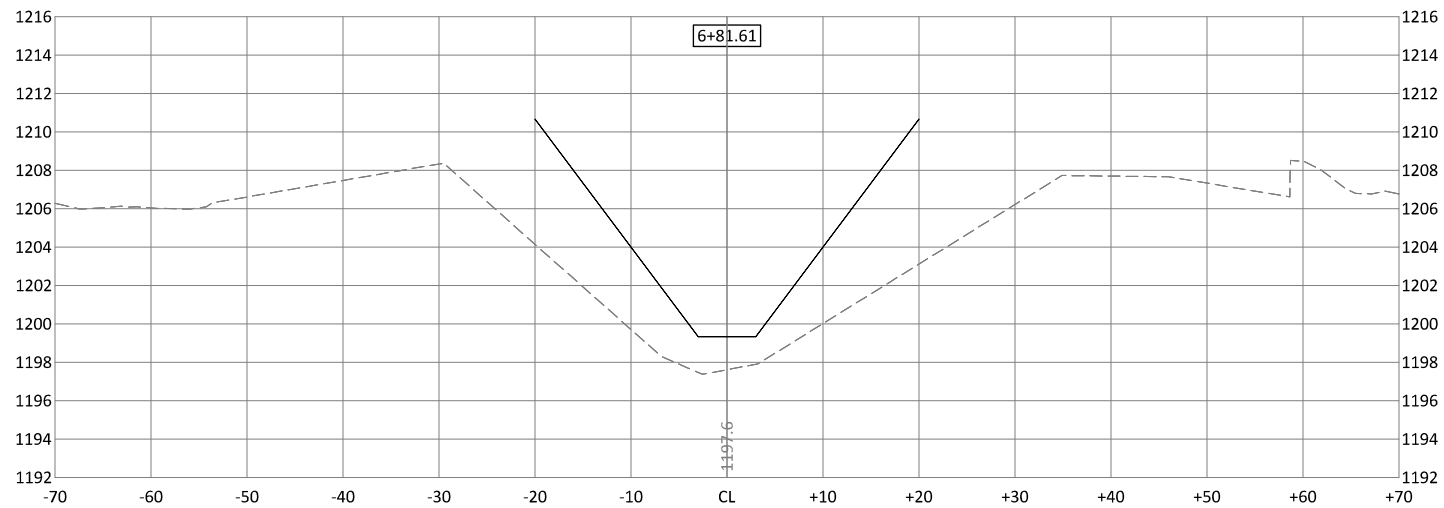
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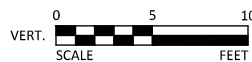
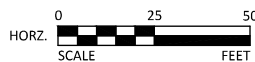
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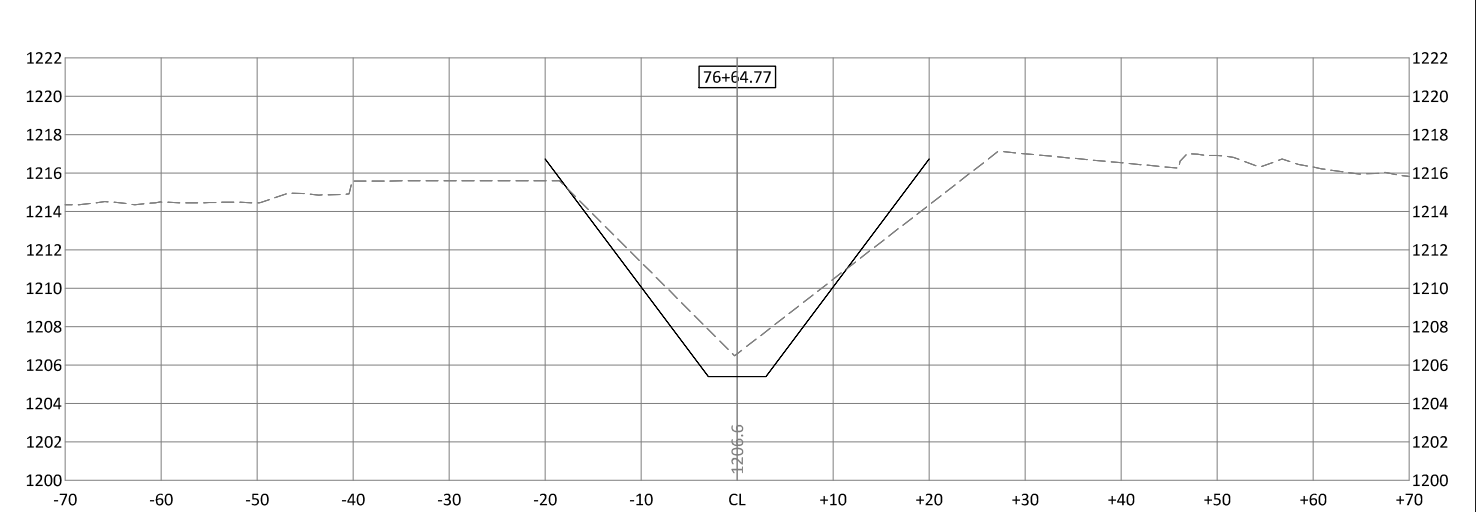
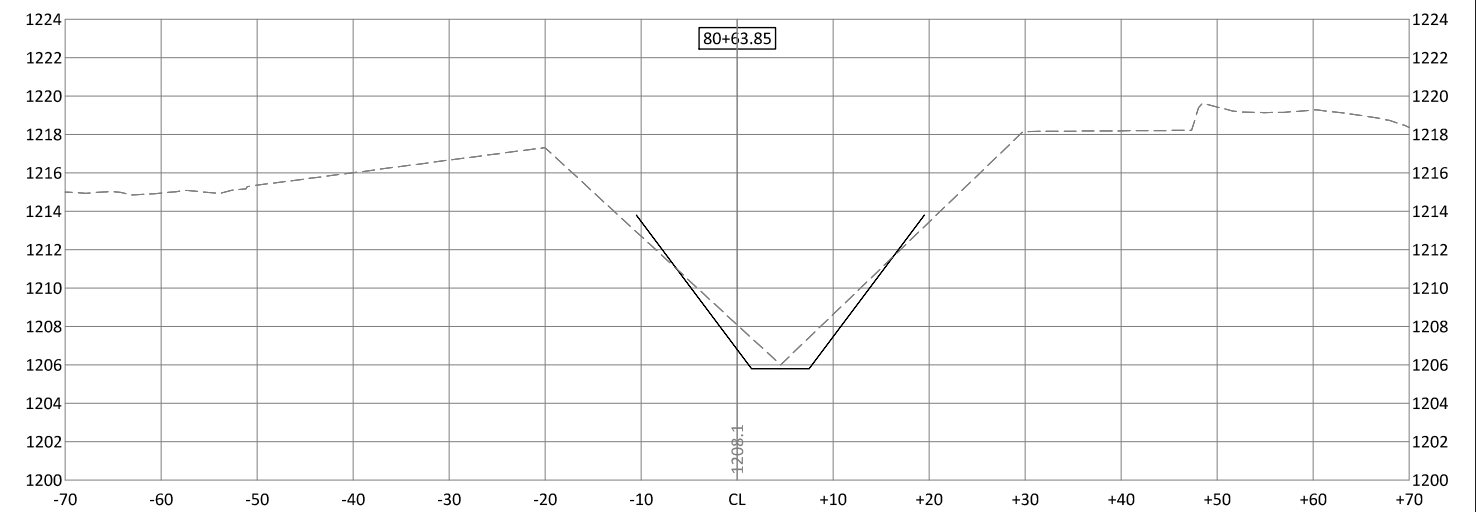
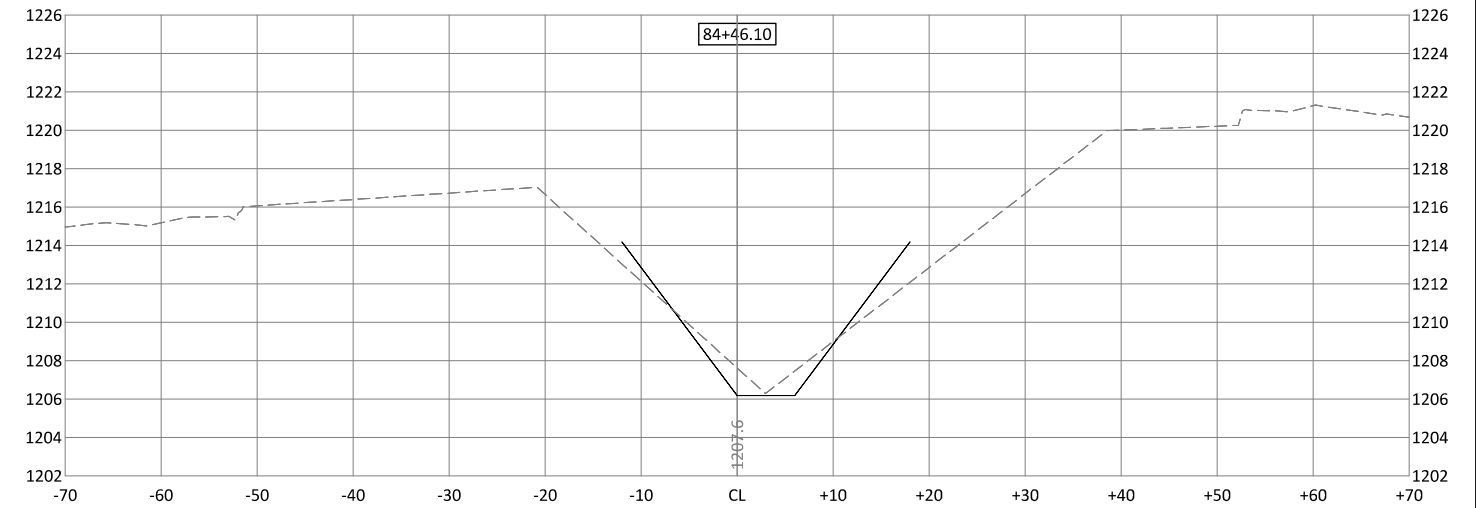
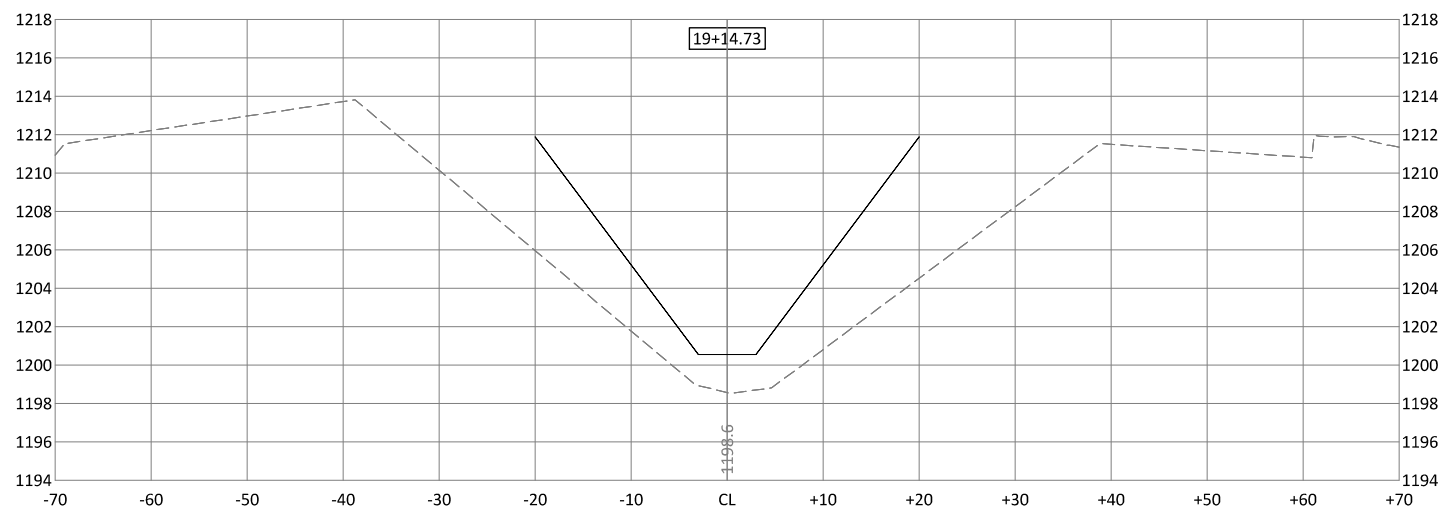
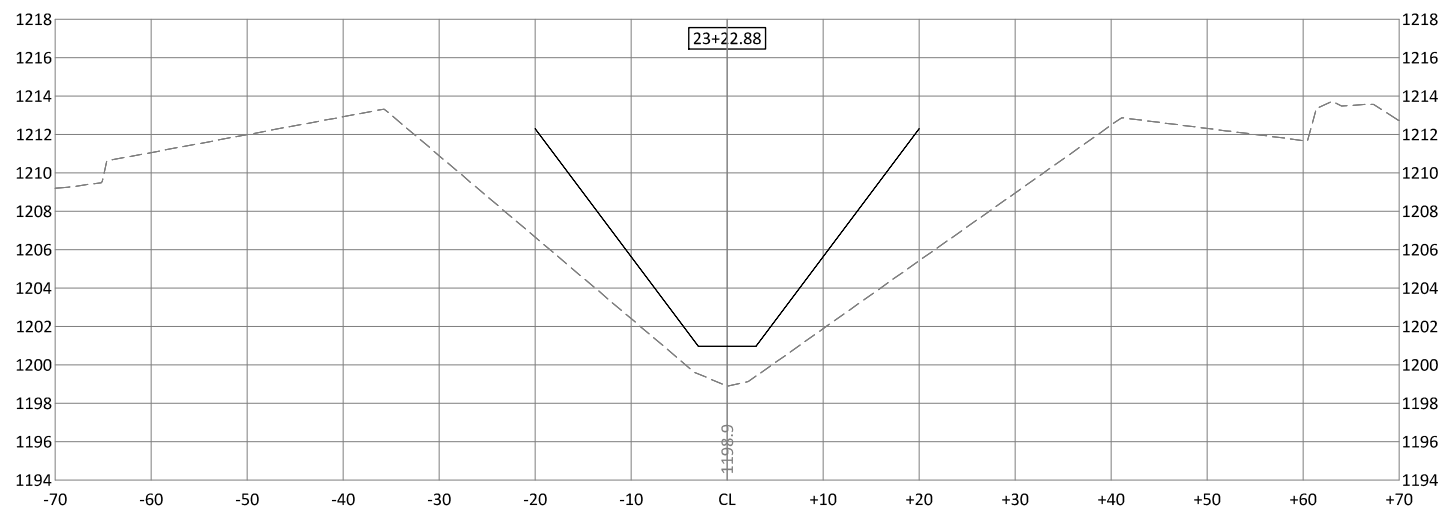
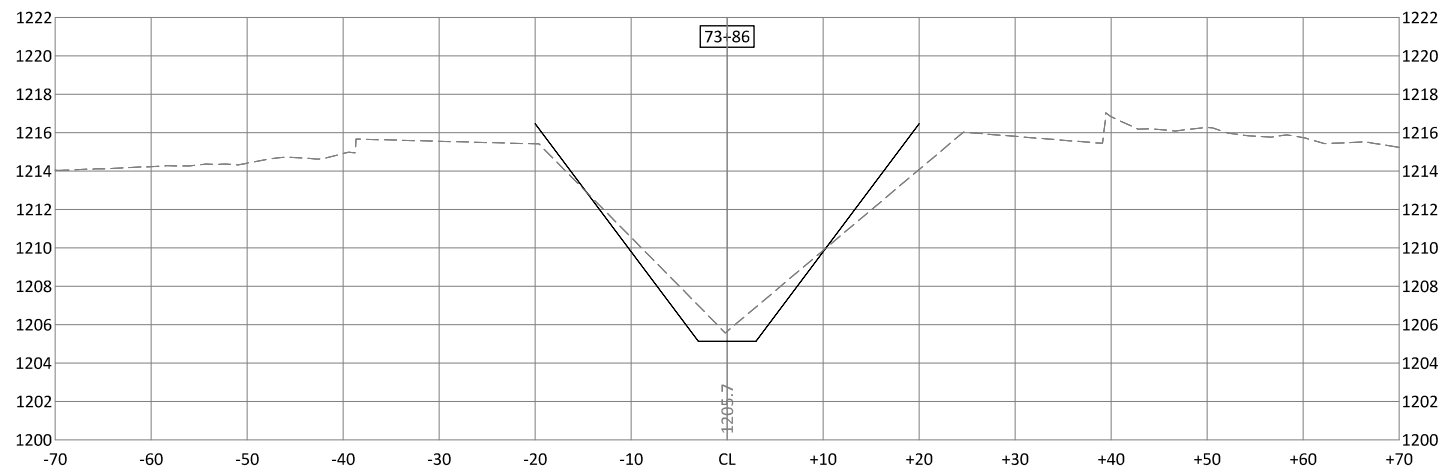
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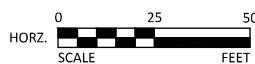
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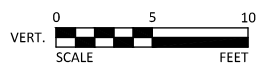
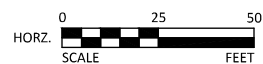
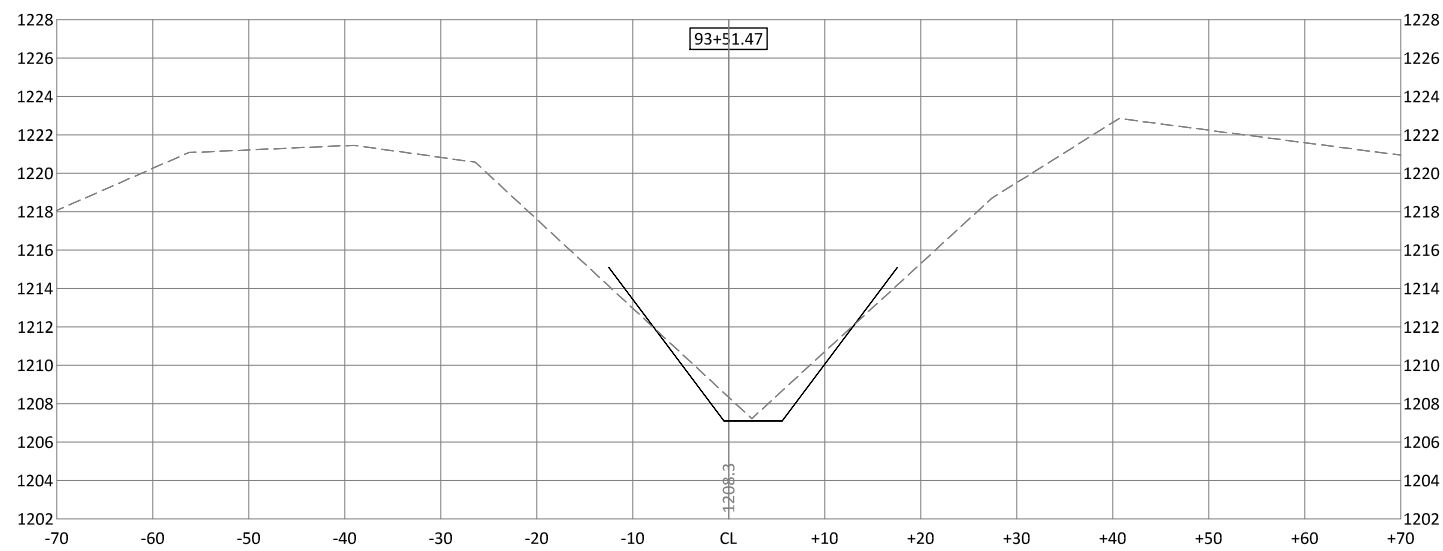
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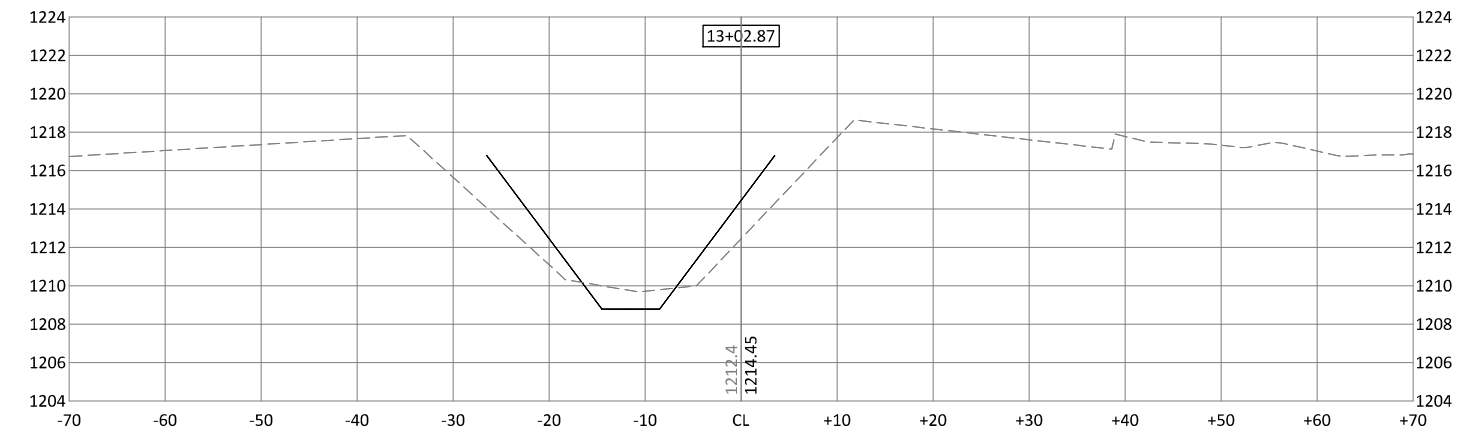
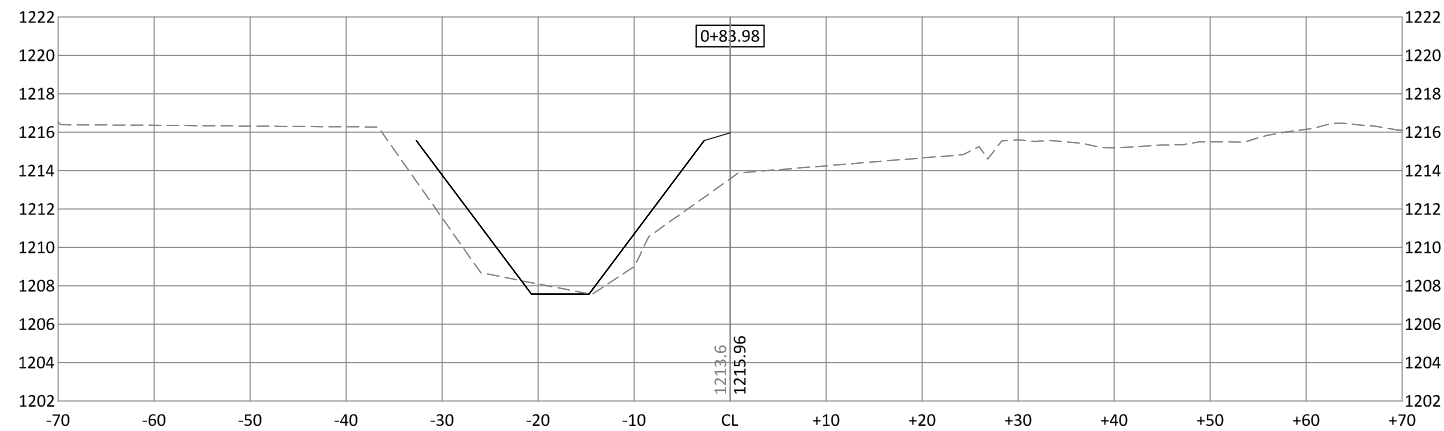
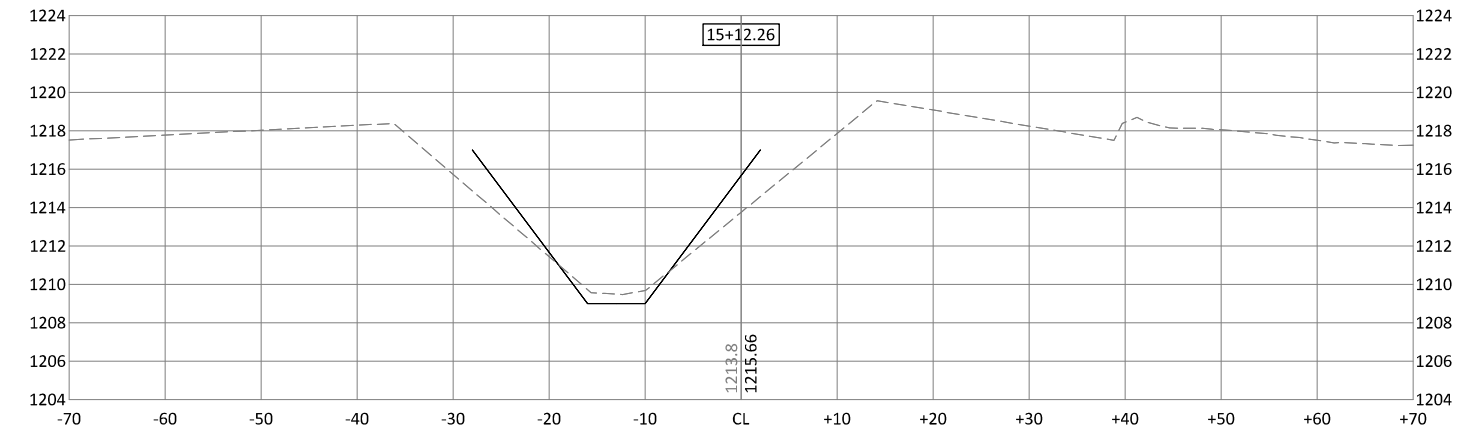
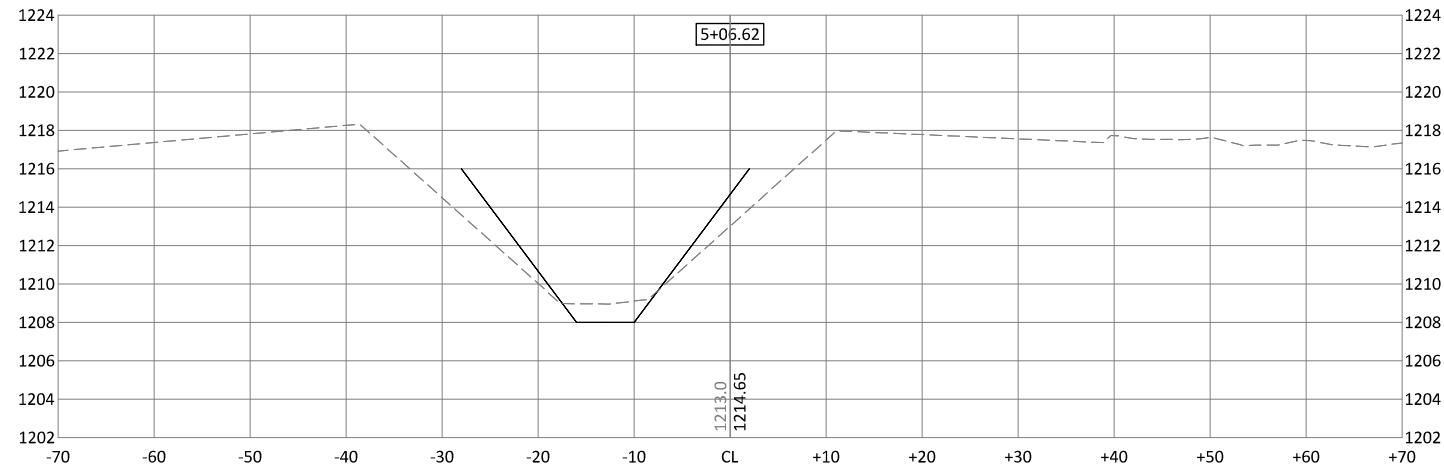
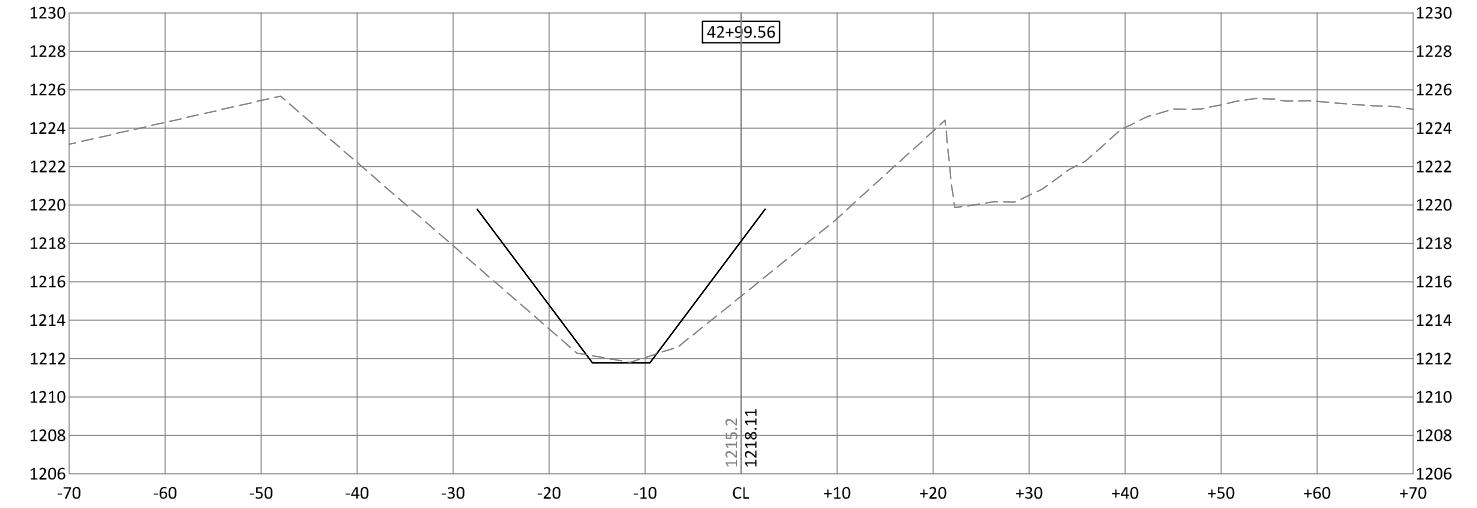
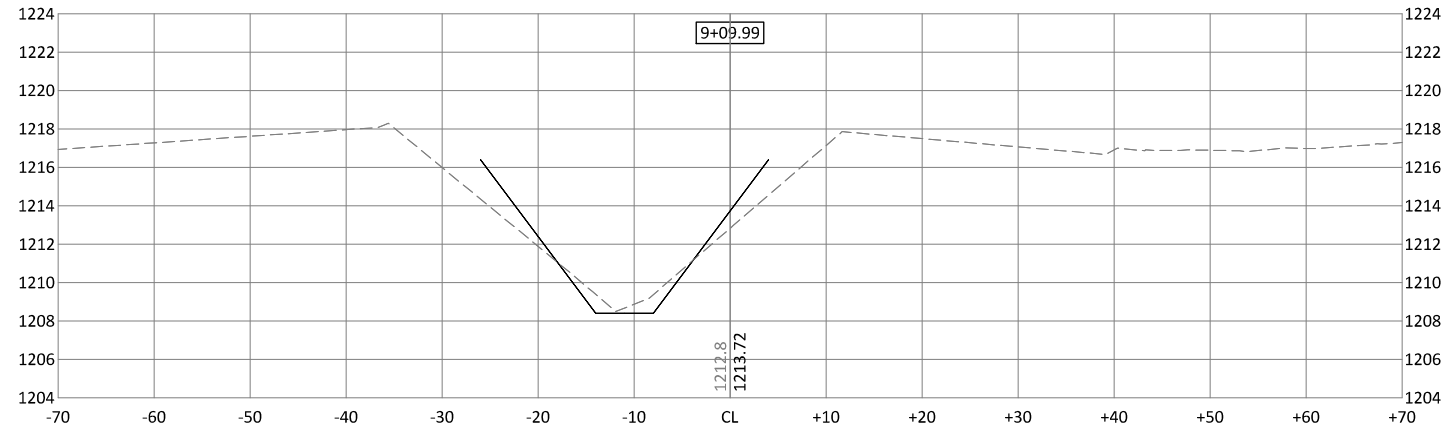
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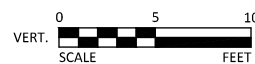
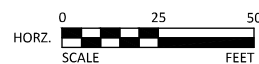
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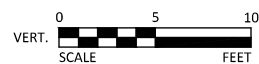
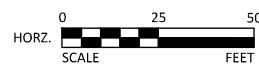
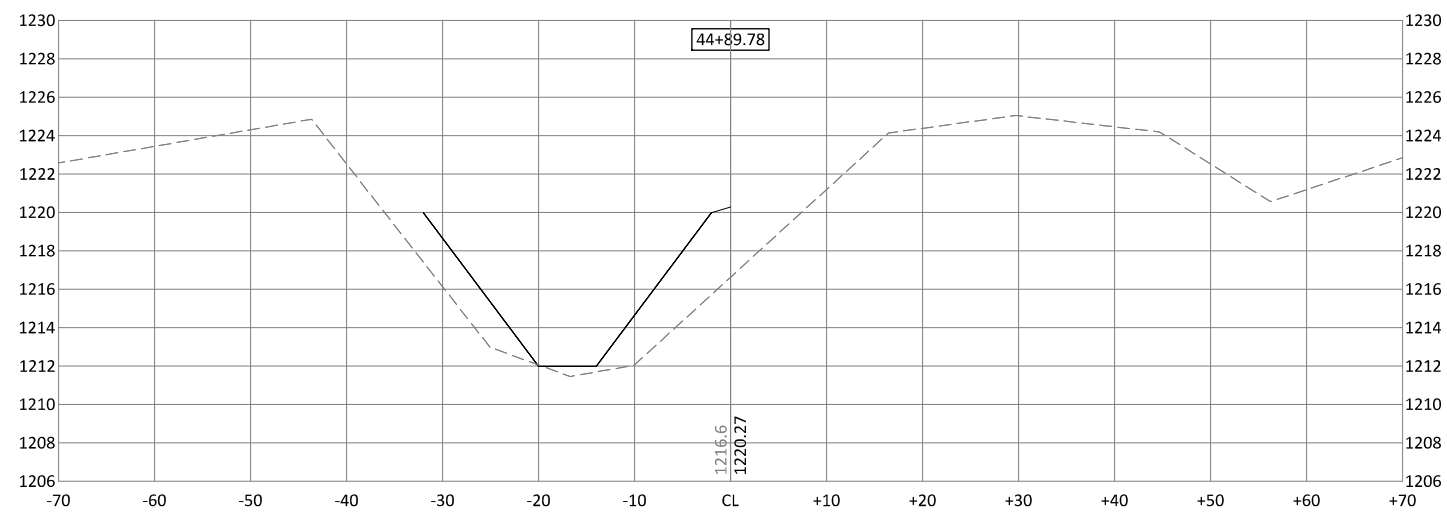
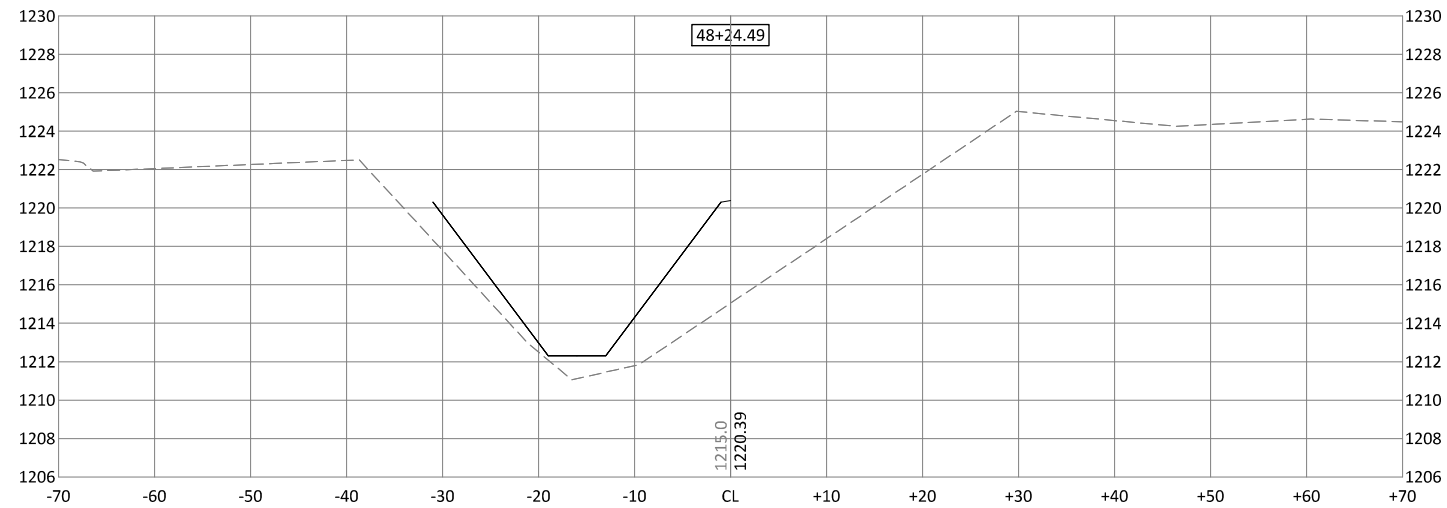
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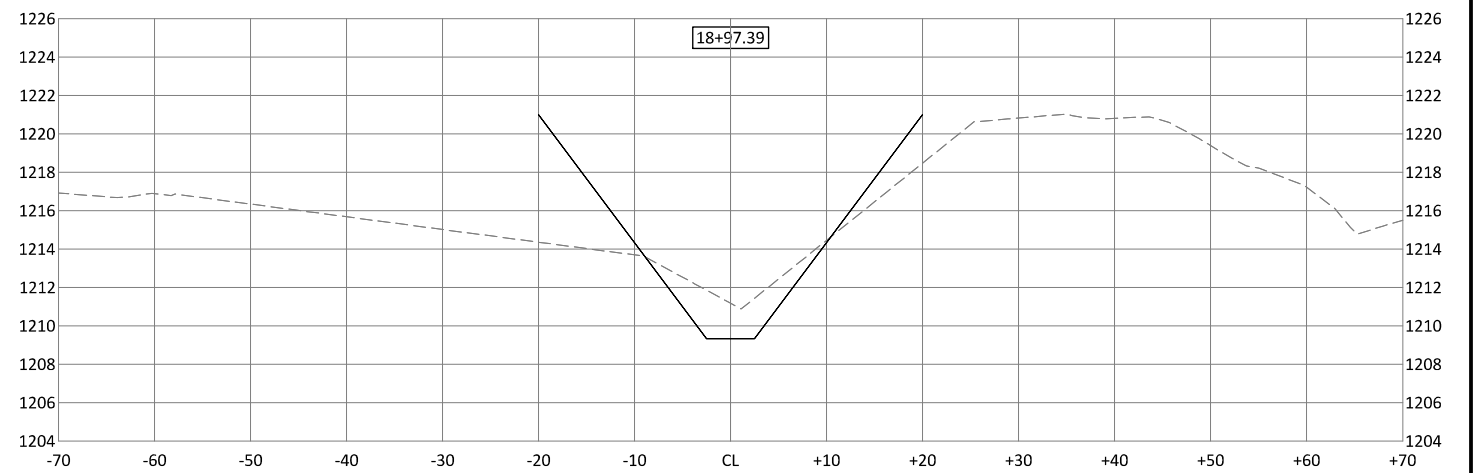
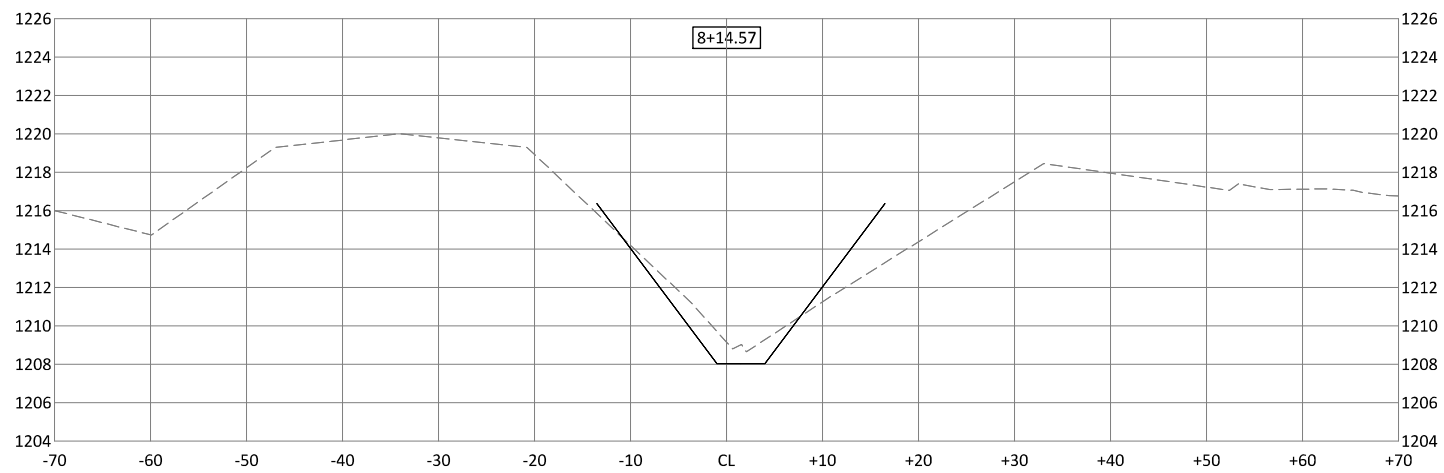
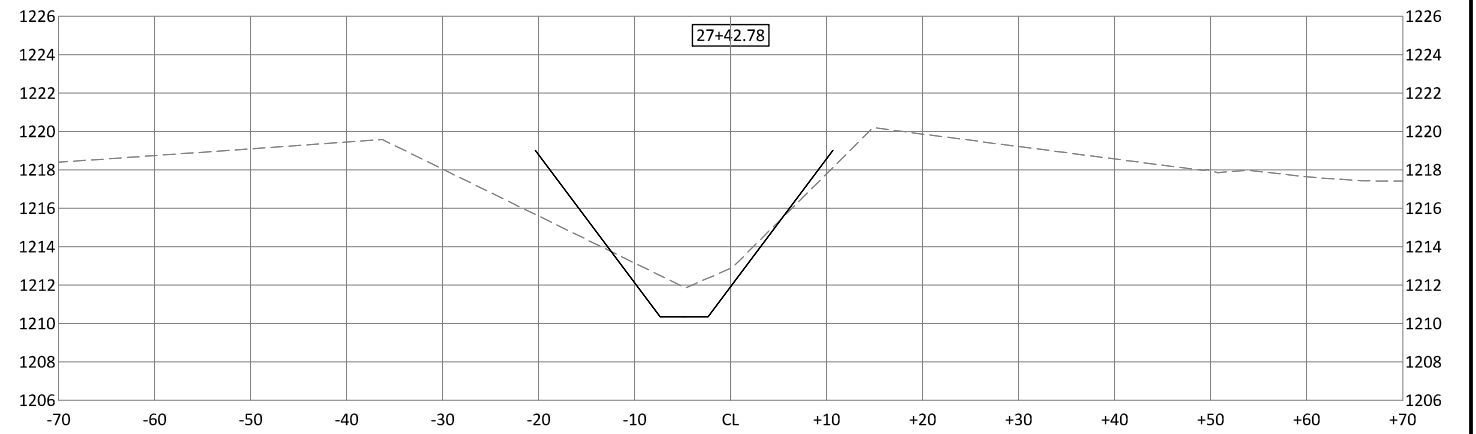
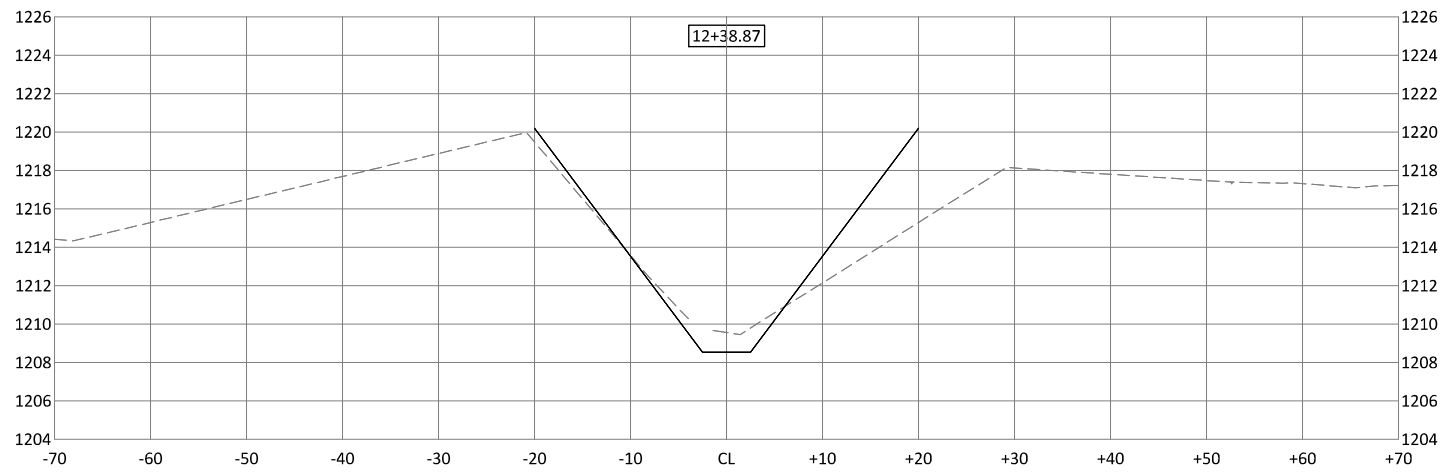
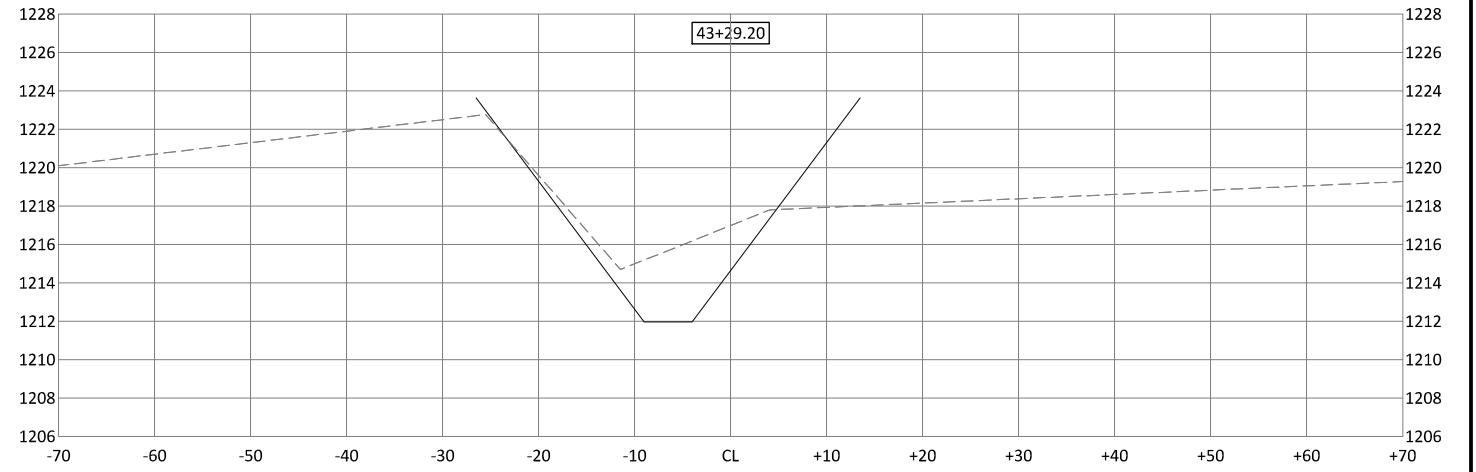
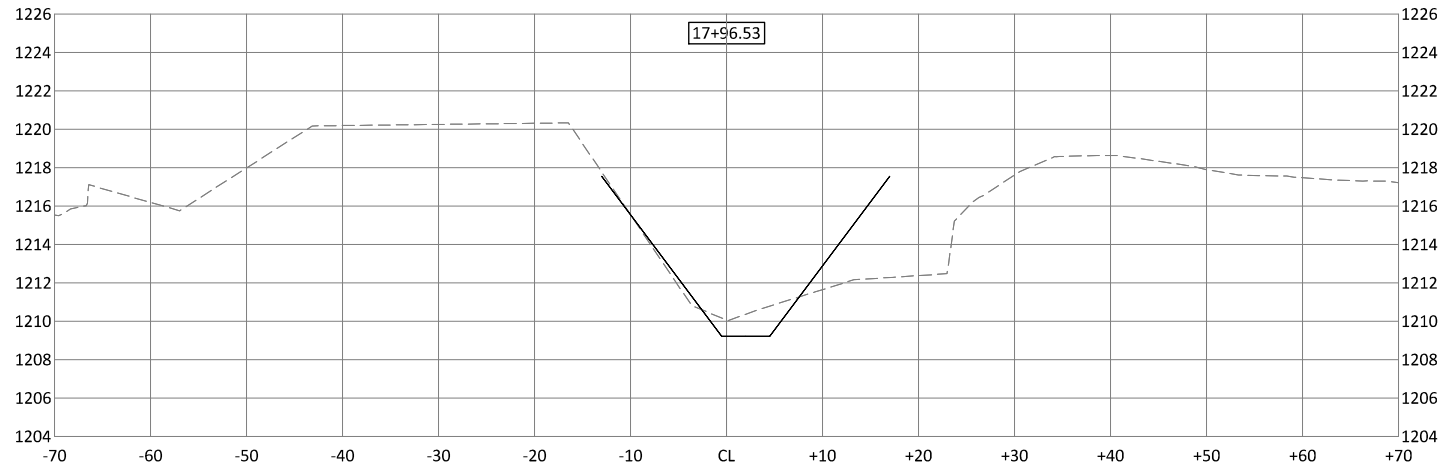
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WORTH COUNTY, IOWA

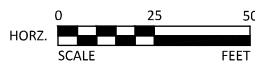
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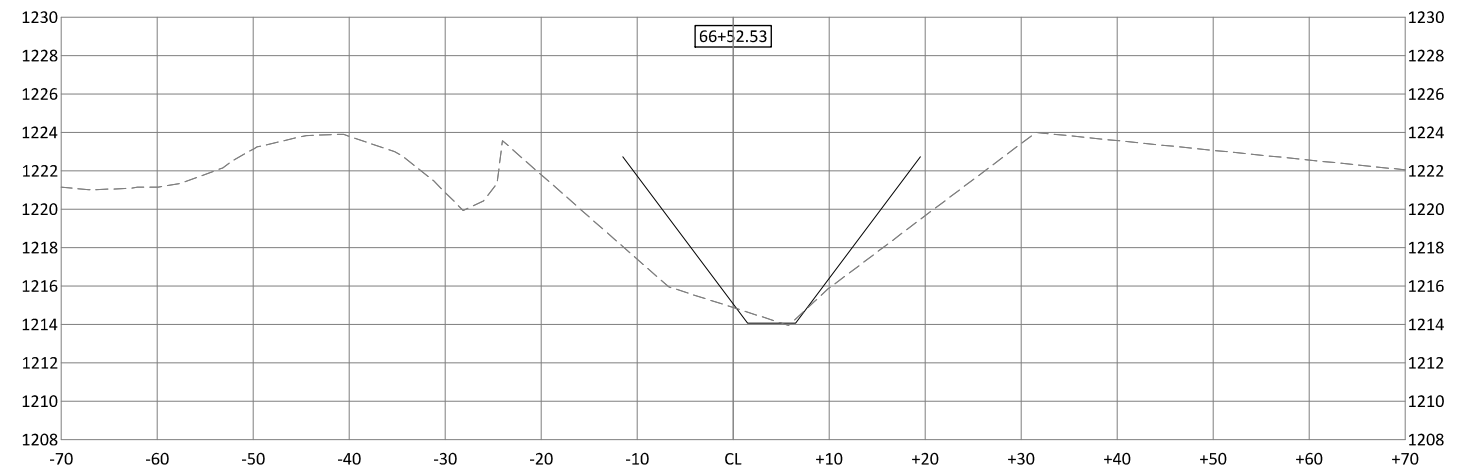
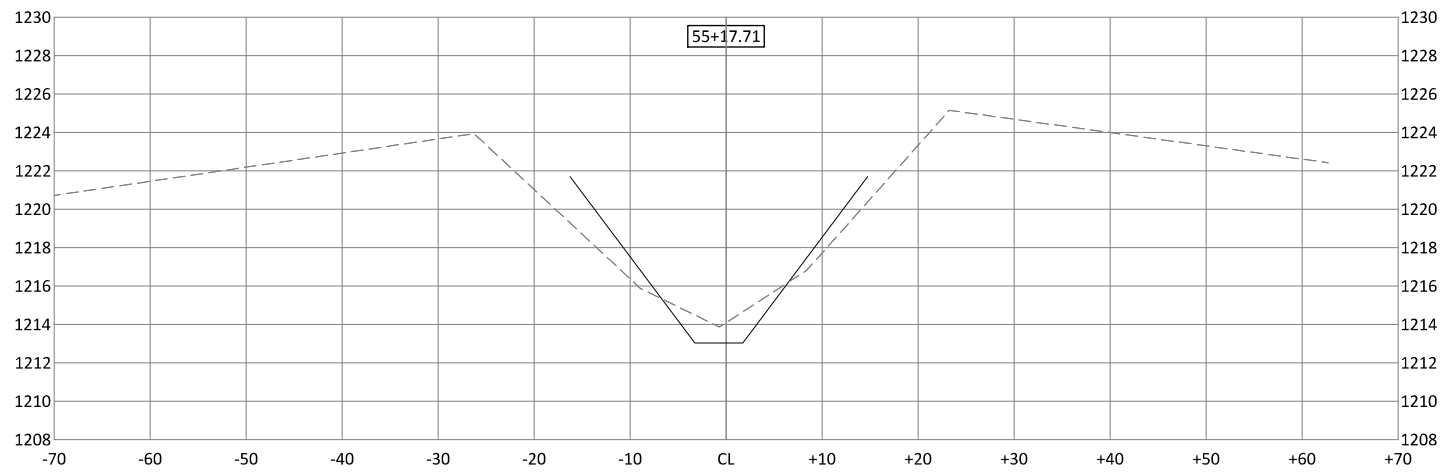
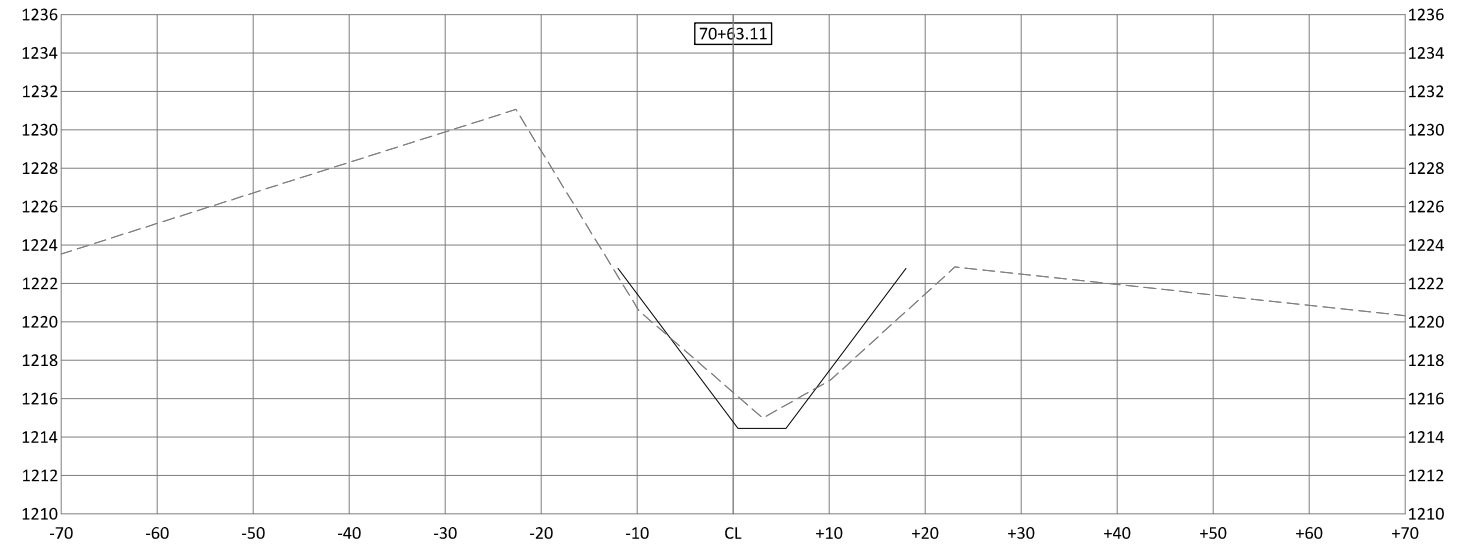
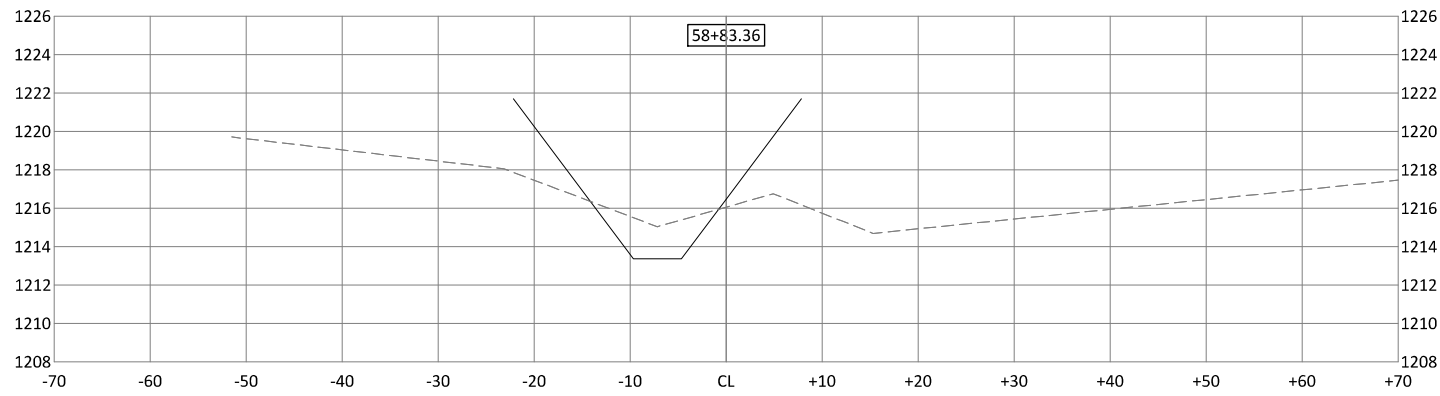
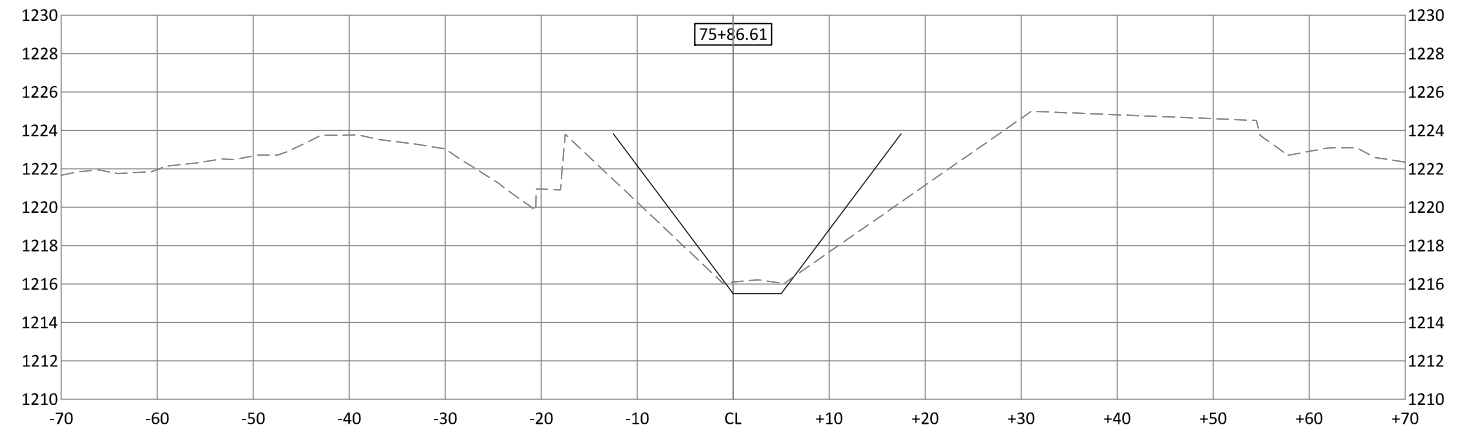
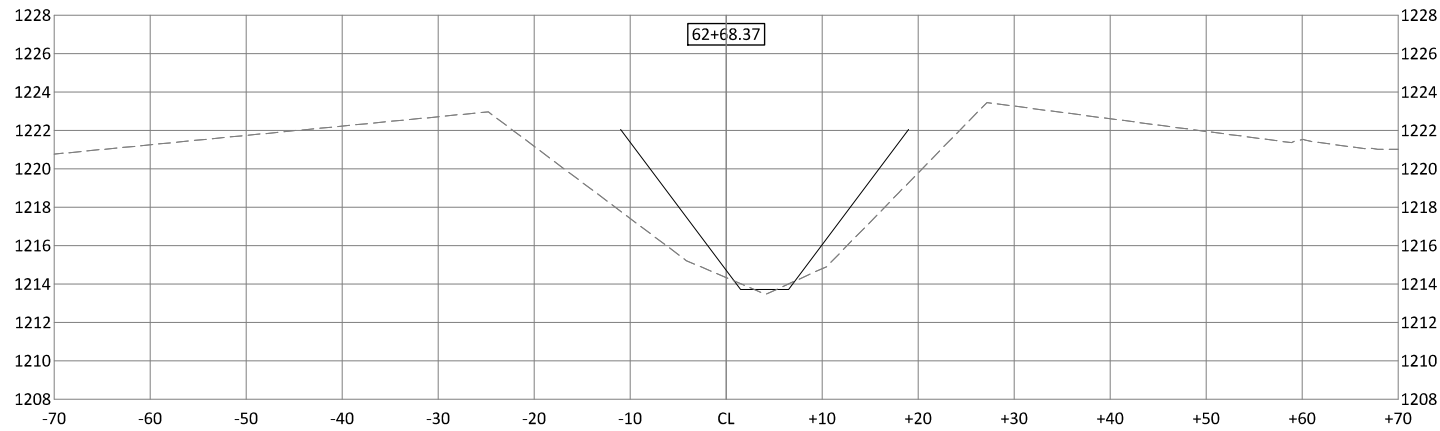
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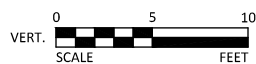
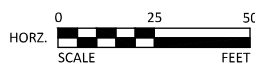
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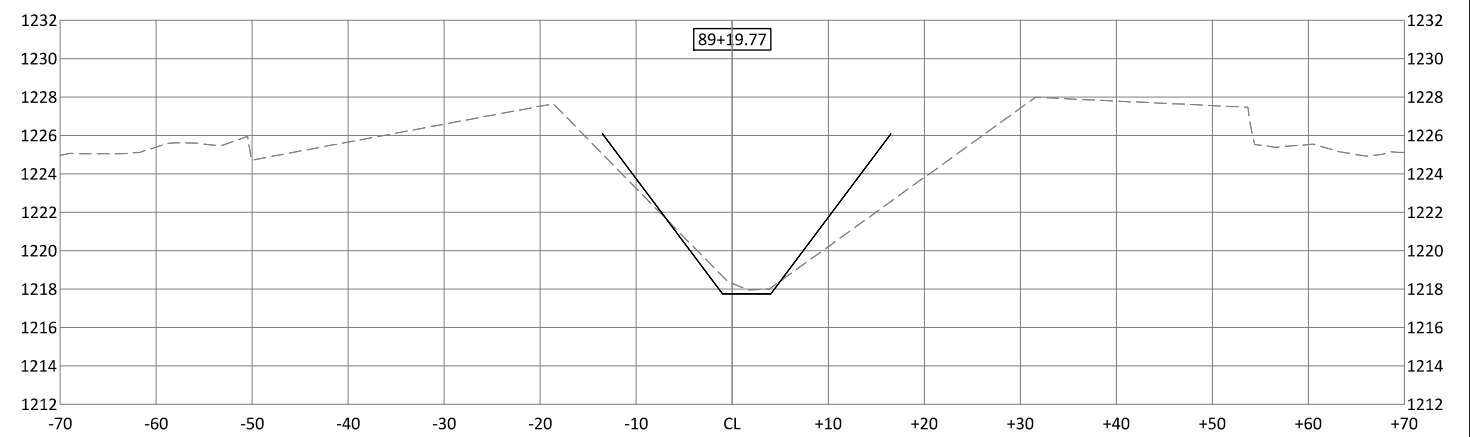
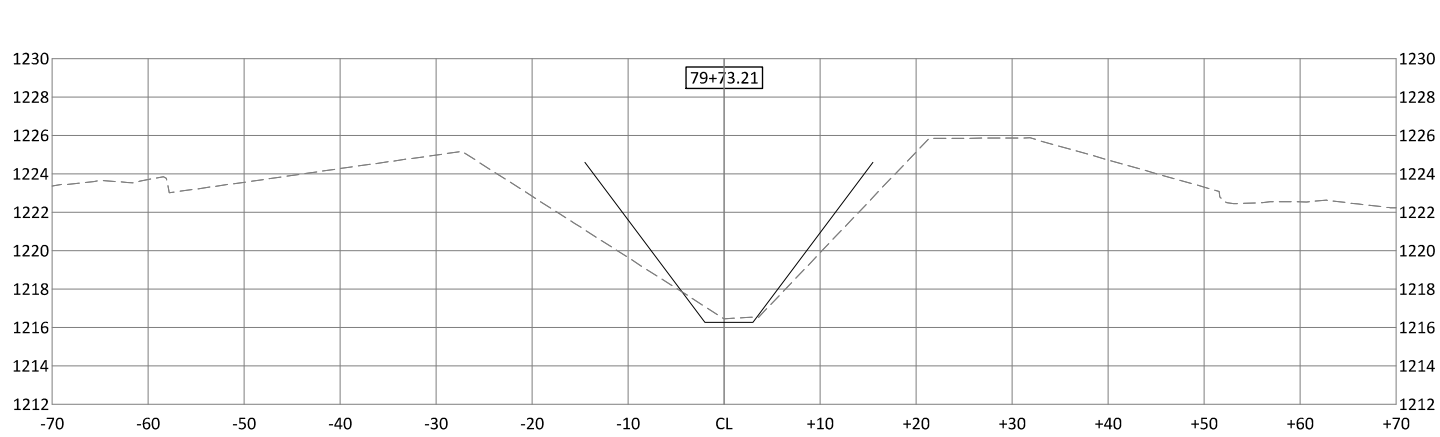
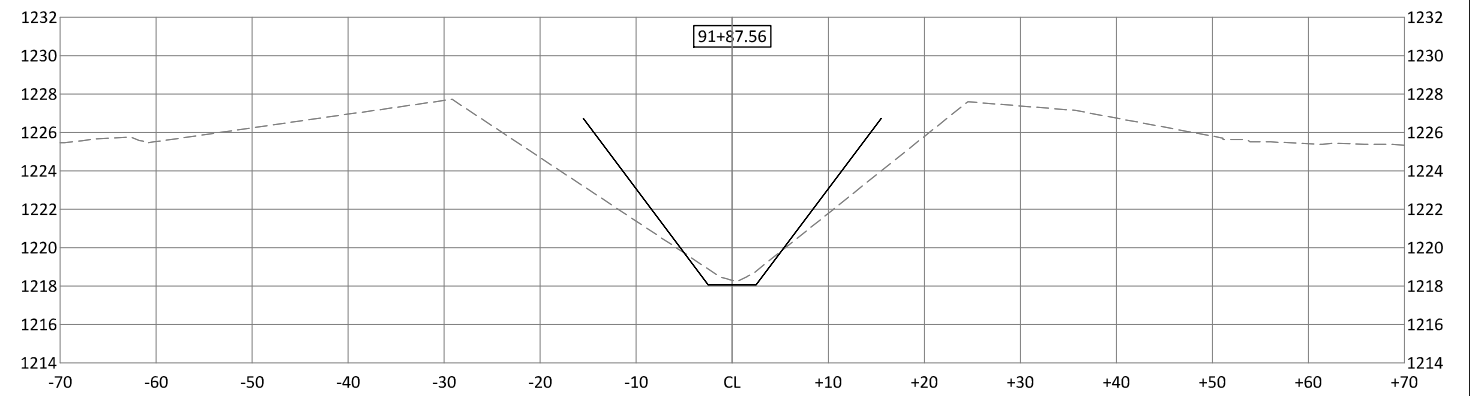
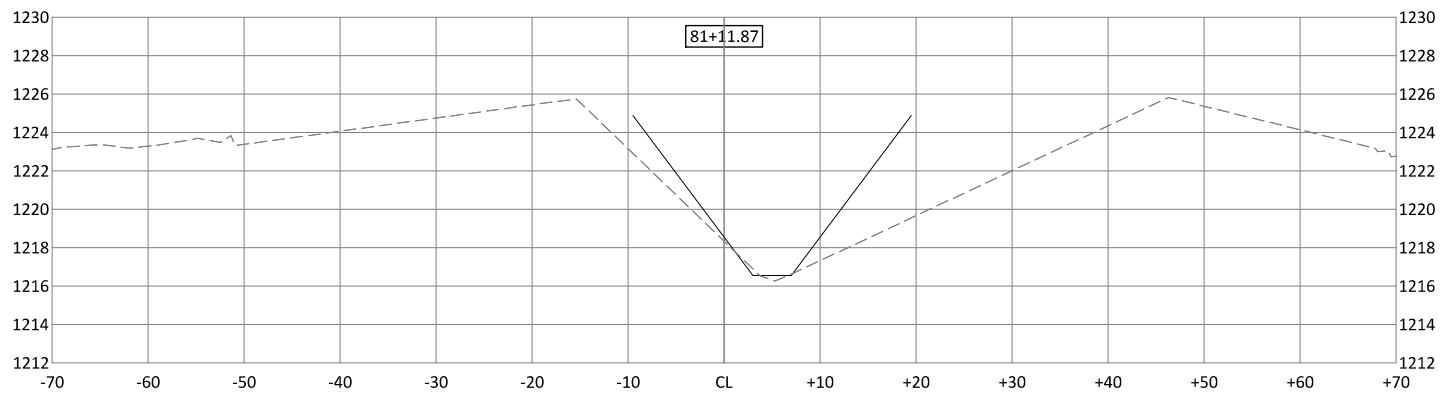
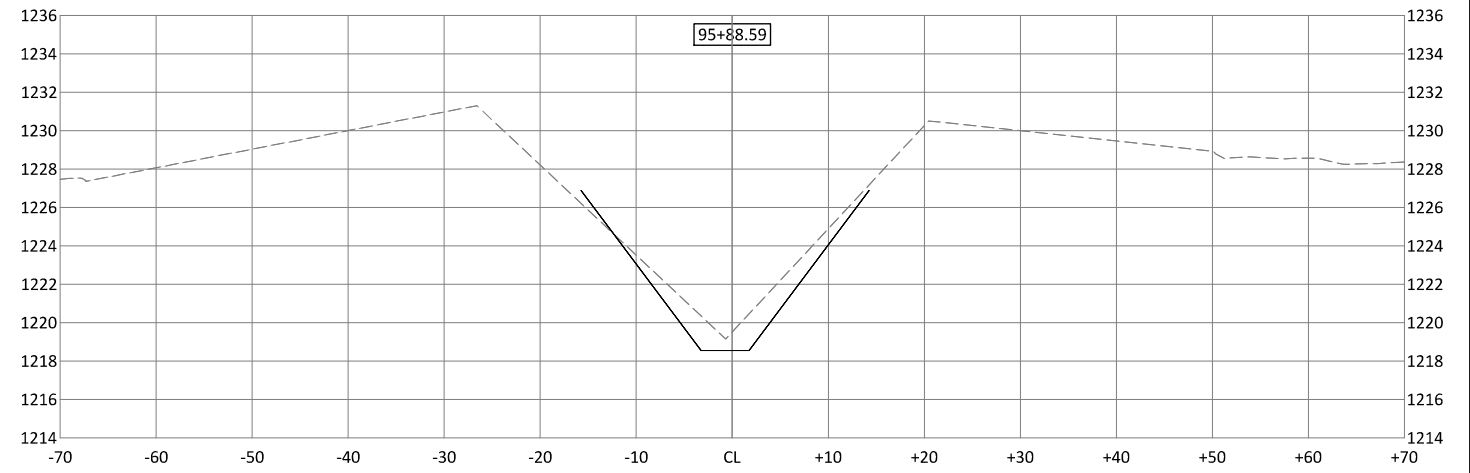
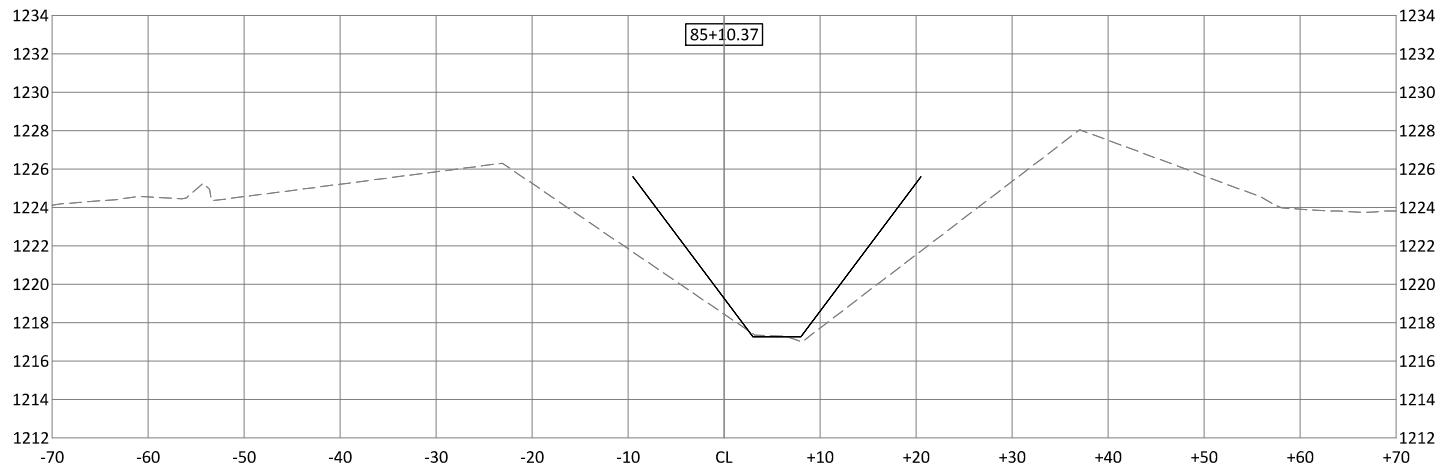
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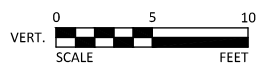
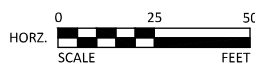
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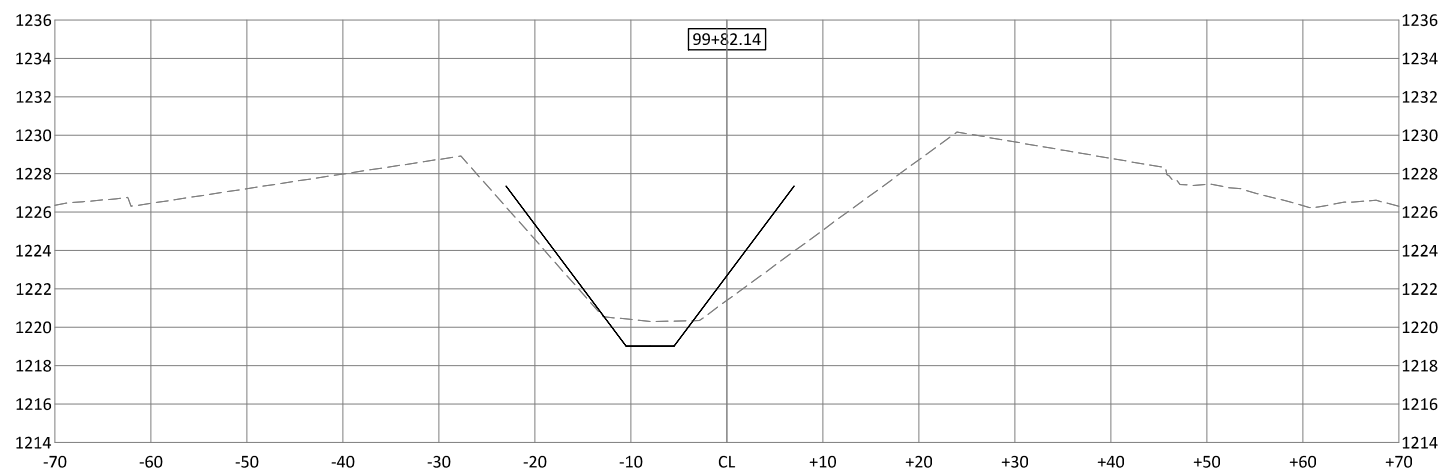
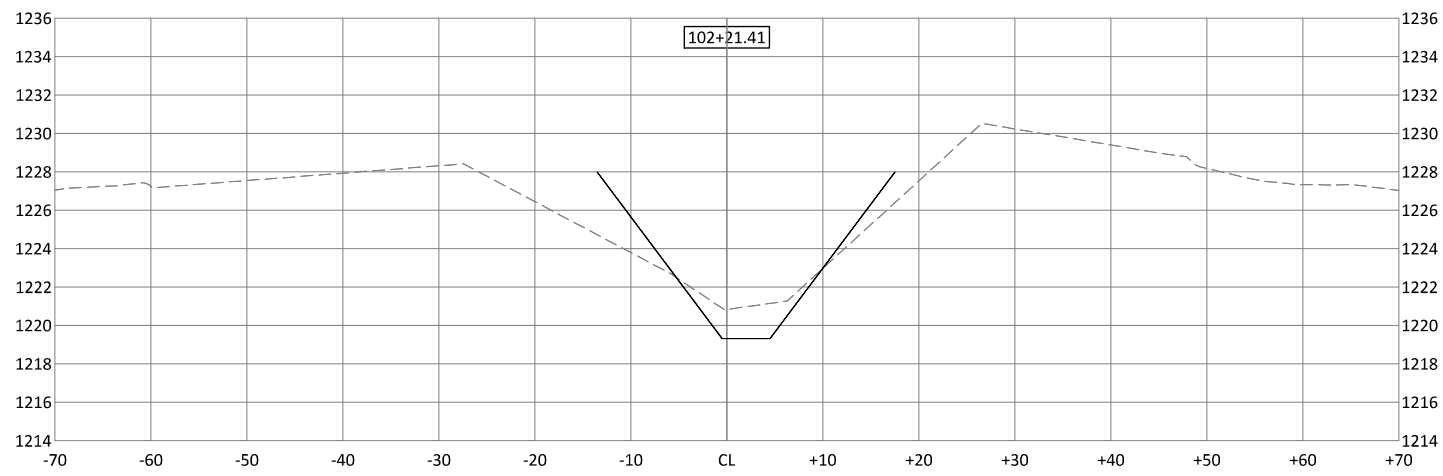
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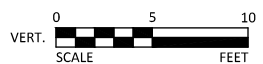
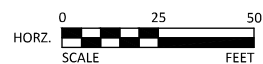
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