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PLANS OF PROPOSED IMPROVEMENT ON THE

PRIMARY ROAD SYSTEM EMMET COUNTY

PAVEMENT REPLACEMENT

IA - 9 in Estherville
From East Limits of the Des Moines River Bridge
2.42 Miles to East of the Brown Creek Bridge

SCALES: As Noted

Refer to the Proposal Form for list of applicable specifications.

Value Engineering Saves. Refer to Article 1105.14 of the Specifications.



REVISIONS

TOTAL
..
PROJECT IDENTIFICATION NUMBER
24-32-009-010
PROJECT NUMBER
NHSX-009-4(051)--3H-32
R.O.W. PROJECT NUMBER
NHSX-009-4(052)--3H-32

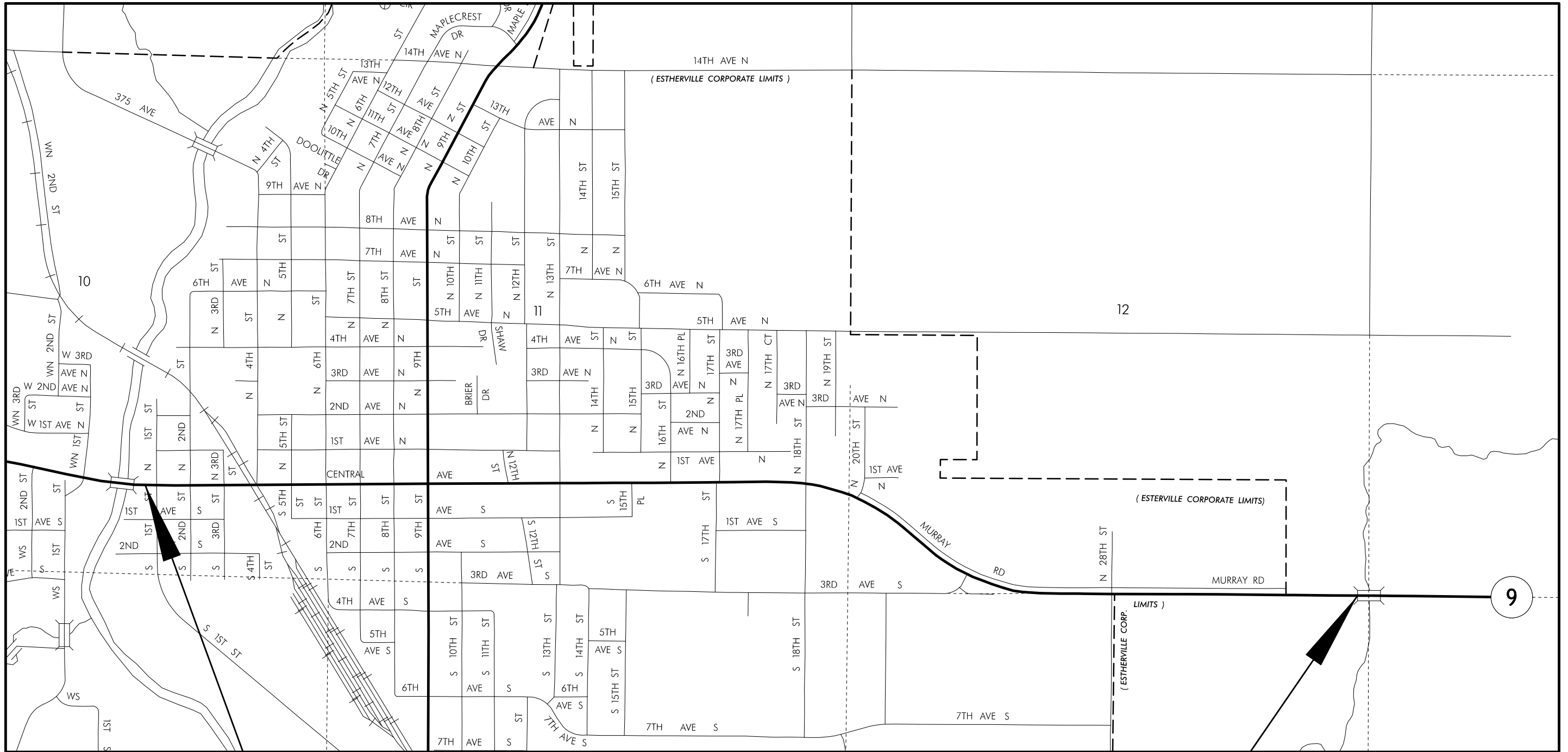
DESIGN DATA URBAN			
20 30	AADT	6,100	V.P.D.
20 50	AADT	6,500	V.P.D.
20 -	DHV	-	V.P.H.
TRUCKS		5	%
Total			
Design ESALs		-	

INDEX OF SEALS			
SHEET NO.	NAME	TYPE	BID QUANTITY SHEETS
A.1	X	Primary Signature Block	X
X	X	X	X

PRELIMINARY PLANS

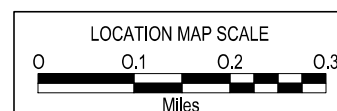
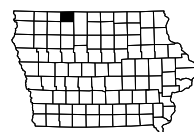
Subject to change by final design.

D2 PLAN - Date: DEC 6, 2024



BEGIN CONSTRUCTION
STA 2208+39.08

END CONSTRUCTION
STA 86+34.91



FINAL PROJECT CONCEPT STATEMENT

IA 9 Reconstruction Concept

Emmet County
Proj.# NHSX-009-4(051)--3H-32

In Estherville, from Des Moines River Bridge to East of Brown Creek Bridge

Prepared by Foth Infrastructure &
Environment for the Iowa Department of
Transportation
District 3

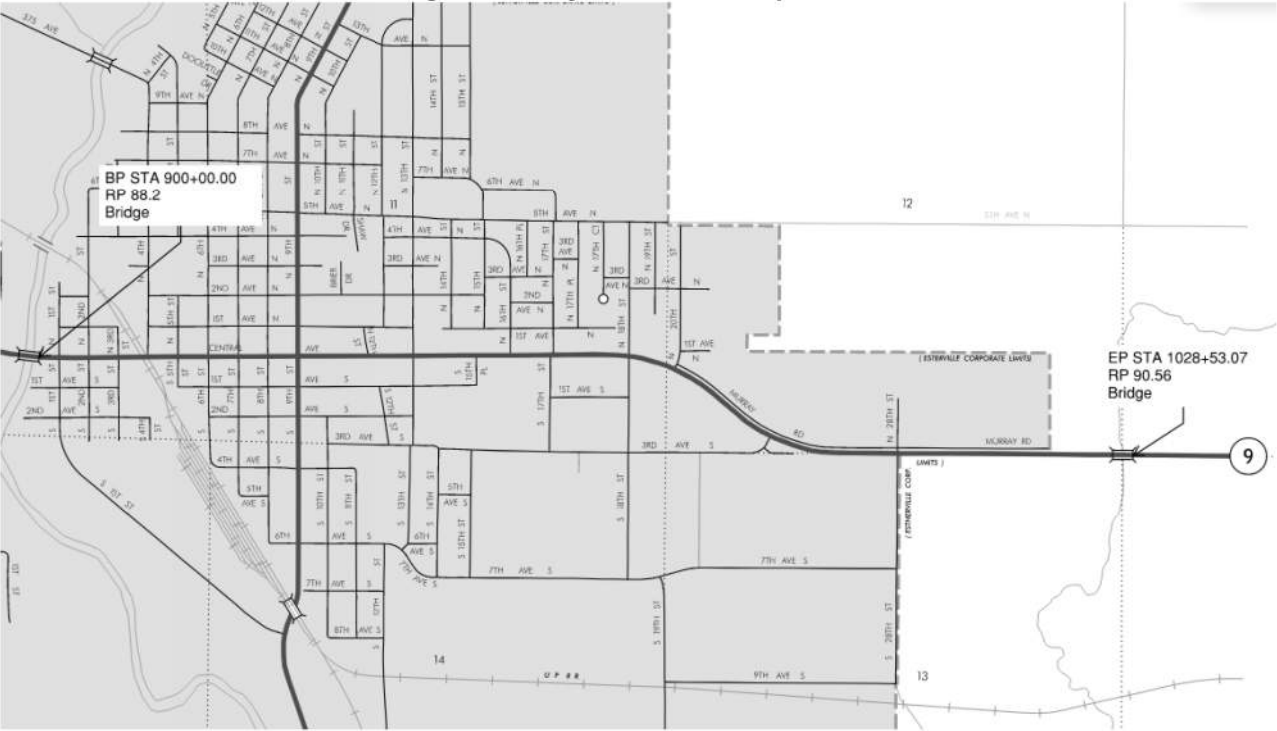
July 11, 2024

I. STUDY AREA

A. Project Description

The project consists of the reconstruction of IA 9 in Estherville from the east limits of the Des Moines River Bridge to just east of the Brown Creek Bridge. The length of reconstruction is approximately 2.42 miles (1.38 miles urban, 1.04 miles rural).

Figure 1 - Project Location Map



B. Need for Project

The IA 9 pavement section through Estherville is in deteriorated condition. The pavement section has developed a moderately rough riding condition with broken or deteriorated concrete panels that require patching. Numerous transverse cracks heave in the winter and create pavement faulting and a rough ride throughout the year. Several areas show significant pavement abrasion with exposed coarse aggregates further expediting deterioration.

C. Pavement History

M.P. 88.41 to M.P. 88.73

Original Pavement: 7" PCC
Year Constructed: 1931

Resurfaced: 1984 with 9.5" of HMA

Milled/Resurfaced: 2006, milled 2" and resurfaced with 1.5" of surface course over 2" of base course

Coarse Aggregate Source: Milford-Leith, Gravel
Project: STPN-009-4(38)--2J-32

HMA Crack Filling: 2021
Project: MP-009-3(710)86--72-32

M.P. 88.73 to M.P. 89.96

Original Pavement: 7" PCC
Year Constructed: 1931

Resurfaced: 1984 with 3.5" of HMA

Milled/Resurfaced: 2006, milled 2.5" and resurfaced with 1.5" of surface course over 1.5" of base course

Coarse Aggregate Source: Milford-Leith, Gravel
Project: STPN-009-4(38)--2J-32

HMA Crack Filling: 2021
Project: MP-009-3(710)86--76-32

M.P. 89.96 to M.P. 90.56

Original Pavement: 7" PCC
Year Constructed: 1931
Coarse Aggregate Source: Wallingford, Gravel
Project: P-702ABCD

Resurfaced: 1962 with 2" of HMA
Coarse Aggregate Source: Bradgate, C.LST.
Project: F-49(5)

Milled/Resurfaced: 1984, milled 2" and resurfaced with 1.5" of surface course over 2.5" of base course
Coarse Aggregate Source: Gilmore City, C.LST.
Project: FN-9-4(31)--21-32

HMA Crack Filling: 2021
Project: MP-009-3(710)86--76-32

D. Traffic Estimates

The estimated Average Daily Traffic (ADT) for 2030 is 6,100 while the estimated ADT for the future design year (2050) is 6,500. The percent truck traffic for both 2030 and 2050 is 5%.

E. Horizontal Curve Review

There are two horizontal curves located on the east end of the project limits within the rural section of the IA 9 corridor. The posted speed limit for this section of roadway is 45 mph. There are currently no existing plans available to review the existing superelevation of the roadway. The measured curve radius of both horizontal curves is approximately 1,900 feet. Using Table 2 from Section 2A-3 of the Iowa DOT Design Manual, shows that for a design speed of 50 mph with a maximum superelevation rate of 6 percent and a radius of 1,900 feet, the horizontal curves should use a superelevation rate of 4.6 percent. Superelevation rate should be confirmed prior to the start of design.

F. Crash Analysis

See Tables 1 and 2 below for crash data obtained from the Iowa DOT's Iowa Crash Analysis Tool (ICAT) along with values from the Iowa DOT Potential for Crash Reduction Tool (PCR) to identify intersections or segments potential for crash reductions and safety improvements.

Table 1 – Intersection Crash Summary

	2018-2022				
Intersection with IA 9/Central Ave	PDO (Property Damage Only)	Injury	Fatality	Total # of Crashes	Potential for Crash Reduction (PCR) 2016-2020
1st Street	5	2	0	7	-0.65
2nd Street	4	1	0	5	0.03
3rd Street	3	0	0	3	-0.72
4th Street	1	3	0	4	-0.23
5th Street	9	0	0	9	-0.26
6th Street	11	0	0	11	-0.63
7th Street	5	0	0	5	-0.79
8th Street	1	0	0	1	-0.49
IA 4/9th Street	9	4	0	13	-0.12
12th Street	3	0	0	3	-0.01
13th Street	6	3	0	9	-0.31
15th Place	2	0	0	2	0.04
16th Street	0	1	0	1	-0.08
17th Street	8	2	0	10	-0.02, 0.05
18th Street	1	3	0	4	-0.02
20th Street	0	1	0	1	0.01
3rd Ave S	0	0	0	0	-0.07
28 th Street	1	1	0	2	-0.03

Table 2 – Segment Crash Summary

	2018-2022				
Segment of IA 9/Central Ave	PDO (Property Damage Only)	Injury	Fatality	Total # of Crashes	Potential for Crash Reduction (PCR) 2016-2020
SW 2nd to IA 4/9th Street	33	13	0	46	2.65
IA 4/9th Street to 20th Street	20	10	0	30	-0.10
20th Street to 28th Street	2	2	0	4	-0.82
28 th Street to Brown Creek	0	0	0	0	-0.01

The segment of IA 9 from SW 2nd Street to IA 4/9th Street has a PCR value of 2.65. According to the Iowa DOT Safety Analysis Guide (SAG), a PCR value greater than 1 falls into the high category. A high PCR indicates the expected crashes are more than the predicted crashes and this segment would likely qualify for safety funds and will require

further analysis and consultation with the Traffic and Safety Bureau to determine potential safety improvements.

All other intersection and segment PCR values are less than 0.2 and fall into the negligible category. A negligible PCR indicates that the expected crashes are less than the predicted crashes, indicating that the potential for crash reduction is negligible, and that the intersections and segments are performing better than expected.

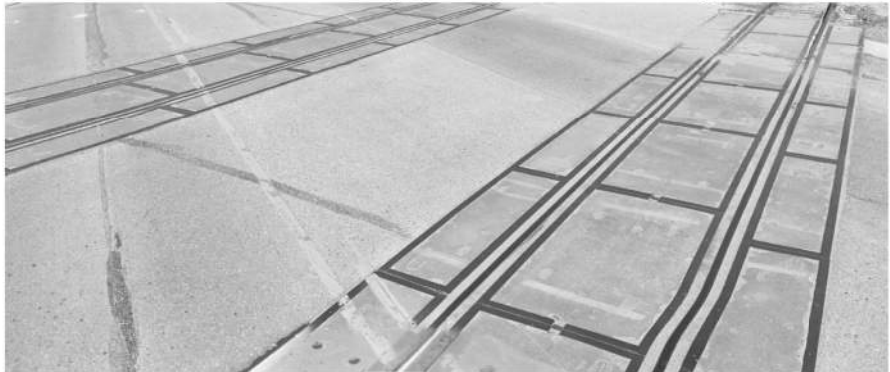
G. Railroads

There is one (1) at grade Union Pacific Railroad (UPRR) crossing within the project limits. Crossing 608099W crosses IA 9 between N 3rd Street and N 4th Street. Warning devices include advance warning signs and pole mounted flashing lights with audible detection and barrier arm. The pole mounted railroad crossing signals are located approximately 8’ and 16’ from the edge of the EB and WB traveled way (no curb and gutter), respectively, with no barrier treatments.

Review of the accident report for this crossing shows only 2 accidents total, with the most recent occurring in 1998. There were no fatalities or injuries with either accident.

An in-person field visit indicates the railroad grade crossing appears to be in relatively good condition with no obvious locations of deterioration (see photo below). For the basis of the cost estimate, it is assumed the existing railroad grade crossing will be used as constructed. Sidewalk/pedestrian crossings are located on both the north and south sides of IA 9. The pedestrian crossings include advance detectable warnings per Standard Road Plan MI-220.

Photo 1 – Existing Railroad Grade Crossing



City utility improvements may require crossing underneath the existing railroad crossing which will require a railroad agreement to be place.

H. Coordination with the City of Estherville

A meeting was held with City leaders (City Administrator, Street Superintendent, Water Superintendent, Electrical Utility Superintendent, Wastewater Superintendent, and Code

Enforcement) of Estherville to coordinate City improvements that could be performed in conjunction with this project. The priorities include the following:

1. Replace existing aging water main and water services along the corridor. The limits of replacement have yet to be determined.
2. Upsize storm sewer in segments of IA 9 where historic drainage issues occur. These sections include from N 3rd Street to N 9th Street. Storm sewer trunk line improvements in this section will need to be bored underneath the railroad and will require obtaining a railroad agreement with UPRR.
3. Complete a sanitary sewer lining project for the existing 12” sanitary sewer and replace any structural damaged sanitary sewer pipe that runs along the centerline of IA 9. The City intends to perform a video inspection of the existing sewer pipe in the Spring of 2024 to fully evaluate the system. Depending on the findings, consideration should be given to complete as much of the sanitary sewer upgrades that do not require any pavement removal and replacement prior to the start of the roadway construction so that the project can be expedited.
4. Maintain and protect the existing light poles or streetlights along the IA 9 corridor throughout construction. It is likely the roadway cross section and profile will not change significantly. Consideration may need to be given to replacing the street light circuits if they conflict with the proposed pavement section.

Other considerations the City is exploring:

1. Bike lanes on each side of IA 9 through the Central Business District. 56-ft is required to maintain a 3-lane roadway with dedicated left turn lanes and EB and WB on-street parking. 59 to 60-ft of roadway cross section is available through the central business district. 5-ft wide bike lanes on each side of IA 9 would require an additional 6-ft, widening out the curb line 3-ft on each side.
2. Right-turn-lane from EB IA 9 to the entrance to Estherville-Lincoln Central High School.
3. Right-turn-lane from EB IA 9 to SB S. 17th Street.

I. Existing Utilities

An Iowa One-Call design locate was performed to determine the presence of existing utilities located within the corridor and are shown in Table 3 – List of Existing Utilities. Utility mapping provide by the utilities can be found in Appendix A.

Consideration for Subsurface Utility Engineering (SUE) should be given during the initial project design phases based on the urban nature of this corridor with limited ability to adjust the roadway design to accommodate existing utilities. SUE will allow the existing utilities to be better incorporated into the design process, minimize potential unknown conflicts discovered during construction, provide the ability to advance relocate utilities that are in conflict, and provide high degree of confidence to the contractors during the bidding phase of the project that will allow them to determine the most efficient construction schedule.

City leaders noted a Lumen-owned concrete encased duct bank that runs from 5th Street to 9th Street. Historically, this duct has been located approximately 9-ft below existing grade. Other utilities crossing this duct typically are shallower in depth and in some instances may encroach into the pavement subgrade.

Table 3 – List of Existing Utilities

Owner	Facility Type
Lumen	Communications
Windstream	Communications
Iowa Communications Network (ICN)	Communications
Premier Communications	Communications
City of Estherville	Electric
City of Estherville	Sanitary Sewer
City of Estherville	Storm Sewer
City of Estherville	Water Main
Unite Private Networks (UPN)	Communications
Black Hills Energy	Gas
Mediacom	TV/Communications
Milford Communications	Communications
Iowa Lake Electric Coop	Electric
Iowa Lakes Regional Water	Water Main

II. PROJECT CONCEPT

A. Proposed Improvements

The purpose of this project is to replace the deteriorated roadway pavement section in-kind from the Des Moines River bridge east to just west of N 28th Street. The proposed project limits consist of 5 typical roadway cross sections:

1. Section 1 (Urban) - Des Moines River bridge to UPRR (N 4th Street): The existing 3-lane 48-ft to 49-ft back-to-back urban roadway cross section will be replaced with a 3-lane section of the same width with a continuous two-way left turn lane (TWLTL) including replacement of the adjacent pedestrian ramps, driveway aprons, and sideroad radius returns.
2. Section 2 (Urban) – N 4th Street to N 9th Street (Central Business District): The existing 59-ft to 60-ft back-to-back urban roadway cross section will be replaced with a 3-lane section of the same width with dedicated left turn lanes and EB and WB on-street parking. This also includes replacement of adjacent pedestrian ramps, driveway aprons, and sideroad radius returns. An additional 5-ft wide sidewalk panel beyond the back-of-curb will need to be replaced to allow for construction clearances. This section could be narrowed up to 56-ft back-to-back to accommodate the 3-lane cross section with on-street parking on both sides in order to avoid removing and reinstalling the existing streetlights located along the

- back-of-curb of the corridor. However, additional storm sewer modifications would be required in order to accommodate a narrower corridor.
3. Section 3 (Urban) – N 9th Street to just west of N 20th Street: The existing 44-ft to 49-ft back-to-back urban roadway cross section will be replaced with a 3-lane section of the same width with a continuous two-way left turn lane (TWLTL) including adjacent pedestrian ramps, driveway aprons, and sideroad radius returns.
 4. Section 4 (Rural) – N 20th Street to east of N 28th Street: The existing 3-lane 46-ft to 47-ft edge-of-pavement to edge-of-pavement rural cross section will be replaced with a 3-lane 36-ft wide rural cross section with 4-ft full-depth paved shoulders and 2-ft granular shoulders and a continuous two-way left turn lane (TWLTL). Longitudinal subdrain will be included in the reconstruction with the subdrain out-letting into adjacent ditches or storm sewer located along the frontage roads. The posted speed limit for this rural section of roadway is 45 mph.
 5. Section 5 (Rural) – East of N 28th Street to Brown Creek Bridge: The existing 2-lane 31-ft to 32-ft edge-of-pavement to edge-of-pavement rural cross section will be replaced with a 2-lane 24-ft wide rural cross section with 4-ft full-depth paved shoulders and 2-ft granular shoulders. Longitudinal subdrain will be included in the reconstruction with the subdrain out-letting into adjacent ditches. Bridge approaches and guardrail on both sides of the Brown Creek Bridge will be replaced. Shoulder rumble strips will also be included in this section of roadway. The posted speed limit for this rural section of roadway is 55 mph.

Existing storm sewer intakes within the reconstruction limits of urban Sections 1, 2, and 3 above will need the tops replaced or possibly the entire structure rebuilt, depending on the condition. If the City of Estherville elects to upsize the storm sewer, this would allow the urban roadway cross-section to be narrowed to a width that is typical for a 3-lane section. The current existing roadway section is wider than what is required in the urban sections. Longitudinal subdrain will be included in the urban sections along with subdrain outlet connections to the existing storm structures. The posted speed limit for the urban sections of roadway is 30 mph.

The proposed vertical profile will match the existing profile in order to minimize impacts to the existing ROW and limits disturbance, unless consideration is needed for ADA compliance.

The Iowa DOT Construction and Materials Bureau recommends a pavement section for the IA 9 corridor that consists of 9.5" of PCC over 12" of modified subbase.

No Permanent Right-of-Way is anticipated with the proposed improvements. However, minimal Temporary Construction Easements are anticipated at the intersections in order to reconstruct the pedestrian curb ramps.

B. Construction Sequence

It is anticipated IA 9 will be closed to thru traffic for the duration of construction. Proposed detour route would follow Emmet County Road N22 north 2.6 miles to A17, then east 6.9 miles to N32, and back south 3.2 miles to IA 9. Total out of distance travel is 12.7 miles. Local traffic routing along with business signing will be needed during each stage of construction.

It is expected that the roadway reconstruction work will be broke into multiple, separate stages of construction to maintain access to businesses, residents, schools, emergency response vehicles, and to minimize local disruption. The following construction sequence was provided by City leaders. Grouping of stages should be developed during preliminary design to expedite the construction timeline.

- Stage 1 – West project limits (Des Moines River Bridge) to UPRR crossing
- Stage 2 – UPRR crossing to N 6th Street
- Stage 3 – N 6th Street to N 9th Street (IA 4)
- Stage 4 – N 9th Street (IA 4) to N 13th Street
- Stage 5 – N 13th Street to N 18th Street
- Stage 6 – N 18th Street to S 28th Street
- Stage 7 – S 28th Street to east project limits (Brown Creek Bridge)

C. Special Considerations

The following conditions were identified for approval and will be implemented during the design process prior to construction:

- Any improvements within the railroad Right-of-Way will require an agreement with UPRR. A Railroad Diagnostic Exam should be scheduled as soon as possible in order to avoid any project delays.
- ADA improvements are required as part of the project. There are several pedestrian curb ramps out of compliance along the corridor that will need to be assessed during preliminary design. There are no plans to alter the existing pedestrian circulation path, therefore, the longitudinal sidewalk along the corridor will be used as constructed per Chapter 12A-2 of the Iowa DOT Design Manual.
- Construction activities will be coordinated with public utilities to avoid potential conflicts and to minimize planned interruptions of service.
- Access to businesses and residences must be maintained throughout construction to limit disruptions.
- A search of the database of the National Register of Historic Places shows there are no buildings or structures located immediately adjacent to the project limits. However, structural assessments of the existing buildings located in the Central Business District should be conducted prior to construction due to the close

proximity of construction activities and minimize potential risks. Vibration Monitoring should also be considered for use during construction.

- Review of the Iowa DNR Facility Explorer data warehouse does not indicate any contaminated soils or leaky underground storage tanks along the IA 9 project corridor.

D. Program Status

The project is currently programmed for FY 2028 with the following estimate:

Table 4 – Cost Estimate (Today's Dollars)

ITEM	UNIT	QUANTITY	UNIT PRICE	TOTAL COST
REMOVAL OF PAVEMENT	SY	70608	\$11.00	\$776,688
SUBDRAIN	LF	25190	\$7.50	\$188,925
MODIFIED SUBBASE	CY	25224	\$46.50	\$1,172,916
PCC PAVEMENT, 9.5"	SY	63248	\$70.00	\$4,427,360
PAVED SHOULDERS, FULL-DEPTH	SY	2193	\$75.00	\$164,475
GRANULAR SHOULDERS	TON	1094	\$32.50	\$35,555
BRIDGE APPROACH, PCC	SY	702.4	\$265.00	\$186,136
REMOVAL OF STEEL BEAM GUARDRAIL	LF	350	\$10.00	\$3,500
STEEL BEAM GUARDRAIL	EA	4	\$6,700.00	\$26,800
RAILROAD APPROACH, PCC	SY	247	\$197.00	\$48,659
RAILROAD GRADE CROSSING	LF	0	\$2,000.00	\$0
RAILROAD CROSSING SIGNALS	LS	1	\$250,000.00	\$250,000
RAILROAD PROTECTIVE LIABILITY INSURANCE, UPRR	LS	1	\$20,000.00	\$20,000
PCC SIDEWALK	SY	3025	\$60.00	\$181,500
DRIVEWAYS, PCC	SY	4465	\$85.00	\$379,525
INTAKES, TOP ONLY	EA	18	\$2,200.00	\$39,600
PAVEMENT MARKINGS	STA	528	\$135.00	\$71,280
SUBTOTAL ROADWAY CONSTRUCTION				\$7,972,919
UNQUANTIFIED ITEMS (10%)	LS	1	\$797,291.90	\$797,292
MOBILIZATION (5%)	LS	1	\$398,645.95	\$398,645.95
TRAFFIC CONTROL (5%)	LS	1	\$398,645.95	\$398,645.95
TOTAL ESTIMATED COSTS				\$9,567,503
CITY FUNDED				
PARKING AREA, PCC PAVEMENT, 9.5"	SY	3630	\$70.00	\$254,100

Roadway	IA-9		
PIN Number	24-32-009-010	Submittal Date	
Project Number	NHSX-009-4(051)--3H-32		Approval Date
District	District 3	Assistant District Engineer	Shane Tymkowicz
County	EMMET	or	
Route	IA-9	Office Director	
Location	In Estherville, Des Moines River Bridge to Brown Creek Bridge		
Work Type	PCC Pavement - Grade and Replace		
Segment Manager			
Designer	Foth		
Design Manual Section 1C-1			
Last Updated: 04-29-19			
Rural Two-Lane Highways (Rural Arterials)			
Design Element		Preferred	Acceptable
Design speed (mph)		60	50
Maximum superelevation rate (Refer to Section 2A-2)		6%	8%
Design lane width (ft)		12	12
Full depth paved width (ft)		12	12
Right turn lane (ft)		12	10
Climbing Lane (ft)		12	12
Left turn lane (ft)		12	10
Pavement cross-slope (on tangent sections)	Through lanes	2%	1.5% minimum, 2% maximum 3% maximum 4% maximum
	Auxiliary and turn lanes	3%	
	Crown break at centerline	4%	
Shoulder cross-slope (on tangent sections)		4%	Shoulder cross-slope cannot be less than the adjacent lane, 6% max for paved or granular shoulders, 8% max for earth shoulders
Curb type (Refer to Section 3C-2)	Design speed = 50 or 55 mph	6-inch sloped	6-inch standard
	Design speed ≥ 60 mph	4-inch sloped	6-inch sloped
Foreslope (For fill areas greater than 40 ft, contact the Soils Design Section for assistance)	Adjacent to shoulder	10:1 for 4' then 6:1	3:1
	Beyond standard ditch depth and design clear zone	3.5:1	3:1
	Curbed roadways	2%	not steeper than 3:1
Backslope (For cut areas greater than 25 feet, contact the Soils Design Section for assistance with backslope benches.)		3:1	2.5:1
Transverse Slopes	w/ drainage structures	8:1	6:1
	w/o drainage structures	10:1	6:1
Ditches (Refer to Section 3G-1)	Outside ditch (depth x width) (ft)	5 x 10	--
Bridge width—new*	Bridge length ≤ 200 ft	design lane widths + effective shoulder widths	design lane widths + effective shoulder widths
	Bridge length > 200 ft	design lane widths + effective shoulder widths	design lane width + 4' right and left of the design lane widths
Bridge width—existing*		design lane widths + no less than 2 ft left and right	design lane widths + 2 ft. offset left and right
Vertical clearance (ft) (above lanes, shoulders and 25 feet left and right of the center of railroad tracks)	Over primary	16.5	16
	Over non-primary	16.5 at interchange locations, 15 at all other locations	14
	Over railroad	23.3	23.3
	Sign trusses and pedestrian bridges	17.5	17
Structural Capacity		Contact Office of Bridges and Structures	Contact Office of Bridges and Structures
Level of Service		B	B
*FHWA notification via email is required if acceptable critera is not met on the NHS system (No formal design exeption is required)			

Roadway Design Speed (mph) =				60											
Design Manual Section 1C-1 Last Updated: 04-29-19				Design Criteria for High Speed Roadways											
Design Element			Preferred Criteria						Acceptable Criteria						Project Values
			Design Speed, mph						Design Speed, mph						
			50	55	60	65	70	75	50	55	60	65	70	75	
Stopping sight distance (ft) (Refer to Section 6D-1)			425	495	570	645	730	820	425	495	570	645	730	820	570
Minimum horizontal curve radius (ft) (Refer to Sections 2A-2 and 2A-3)	Method 5 superelevation and side friction distribution	e _{max} = 6%	833	1060	1330	1660	2040	2500	833	1060	1330	1660	2040	2500	Existing
		e _{max} = 8%	--	--	--	--	--	--	758	960	1200	1480	1810	2210	
Minimum vertical curve length (ft) (Refer to Section 2B-1)			150	165	180	195	210	225	150	165	180	195	210	225	180
Minimum rate of vertical curvature (K) (Refer to Section 2B-1)	crest vertical curves		84	114	151	193	247	312	84	114	151	193	247	312	151
	sag vertical curves	roadways without fixed-source lighting	96	115	136	157	181	206	96	115	136	157	181	206	136
		roadways with fixed-source lighting	96	115	136	157	181	206	54	66	78	91	106	121	
Minimum gradient (%) (Refer to Section 2B-1)			0.5						0.3% with a curb, 0.0% without a curb						0.16%
Maximum gradient (%) (Refer to Section 2B-1)	(Refer to Section 2B-1)	Urban roadways	4		3				7	6	6	—	—	—	
		Rural roadways							5	5	4	4	4	4	5.6%
		Interstates							5	5	4	4	4	4	
Clear zone			See "Preferred Clear Zone" table in Section 8A-2						See "Acceptable Clear Zone" table in Section 8A-2						32

Roadway	IA-9		
PIN Number	24-32-009-010	Submittal Date	
Project Number	NHSX-009-4(051)--3H-32		Approval Date
District	District 3	Assistant District Engineer	Shane Tymkowicz
County	EMMET	or	
Route	IA-9	Office Director	
Location	In Estherville, Des Moines River Bridge to Brown Creek Bridge		
Work Type	PCC Pavement - Grade and Replace		
Segment Manager			
Designer	Foth		

Design Manual Section 1C-1
Last Updated: 04-29-19

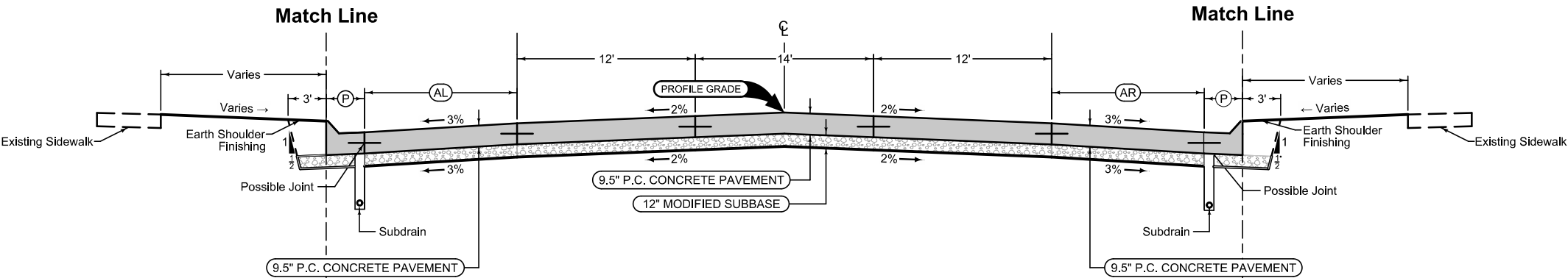
Urban Two-Lane Roadways (Urban Arterials)

Design Element		Preferred	Acceptable Criteria	Project Values
Design speed (mph)		The anticipated posted speed limit	30	25, 30, 35, 45
Maximum superelevation rate (Refer to Section 2A-2)		4%	6%	6%
Design lane width (ft)		12	11	12
Full depth paved width (ft)		Design lane width + curb and gutter unit or 14 feet for roadways with shoulders	Match design lane width	Design lane width + curb & gutter
Right turn lane (ft)		12	10	12
Left turn lane (ft)	With raised or painted median	12 ft + median	10 ft + median	14
	With depressed median	12	10	
Two-way left turn lane		14	11	14
Parking lane width (ft)		10	7	10
Pavement cross-slope (on tangent sections)	Through lanes	2%	1.5% minimum, 2% maximum	2%
	Auxiliary and turn lanes	3%	3% maximum	3%
	Crown break at centerline	4%	4% maximum	4%
Shoulder cross-slope (on tangent sections)	Shoulders	4%	Shoulder cross-slope cannot be less than the adjacent lane, 6% max for paved or granular shoulders, 8% max for earth shoulders	4%
	Curb and gutter units	Match pavement cross-slope	6% maximum	match pavement cross slope
	Parking lanes	1% greater than pavement cross-slope	6% maximum	3%
Curb type (See Section 3C-2)	Design speed ≤ 45 mph	6-inch standard	any shape	6-inch standard
Foreslope (For fill areas greater than 40 ft, contact the Soils Design Section for assistance)	Adjacent to shoulder	10:1 for 4' then 6:1	3:1	6:1
	Beyond standard ditch depth and design clear zone	3.5:1	3:1	N/A
	Curbed roadways	2%	not steeper than 3:1	2%
Backslope (For cut areas greater than 25 feet, contact the Soils Design Section for assistance with backslope benches.)		3:1	2.5:1	N/A
Traverse Slopes	w/ drainage structures	8:1	6:1	8:1
	w/o drainage structures	10:1	6:1	10:1
Ditches (See Section 3G-1)		5 x 10	--	N/A
Bridge width—new*	Bridge length ≤ 200 ft	design lane widths + effective shoulder widths (curbed or uncurbed) or design lane width + 3 ft each side (curbed) which ever is greater	design lane widths + effective shoulder widths or curb-to-curb width in curb and gutter section**	N/A
	Bridge length > 200 ft	design lane widths + effective shoulder widths (curbed or uncurbed) or design lane width + 3 ft each side (curbed) which ever is greater	design lane widths + 4 ft offset each side for roadways with shoulders or curb-to-curb width in curb and gutter section**	N/A
Bridge width—existing*		design lane widths + no less than 2 ft left and right	design lane widths + 2 ft left and right	N/A
Vertical clearance (ft) (above lanes, shoulders and 25 feet left and right of the center of railroad tracks)	Over primary	16.5	16	N/A
	Over non-primary	16.5 at interchange locations, 15 at all other locations	14	N/A
	Over railroad	23.3	23.3	N/A
	Sign trusses and pedestrian bridges	17.5	17	N/A
Structural Capacity		Contact Office of Bridges and Structures	Contact Office of Bridges and Structures	N/A
Level of Service		C	D	N/A

*FHWA notification via email is required if acceptable critera is not met on the NHS system (No formal design exeption is required)

** If travel lanes are less than 12 ft wide contact the Methods Section for assistance.

Roadway Design Speed (mph) =													
Design Manual Section 1C-1 Last Updated: 04-29-19					Design Criteria for Low Speed Roadways								
Design Element			Preferred Criteria					Acceptable Criteria					Project Values
			Design Speed, mph					Design Speed, mph					
			25	30	35	40	45	25	30	35	40	45	
Stopping sight distance (ft) (Refer to Section 6D-1)			155	200	250	305	360	155	200	250	305	360	preferred
Minimum horizontal curve radius (ft) and superelevation rate (Refer to Sections 2A-2 and 2A-3)	Method 2 superelevation and side friction distribution	e = 4% max	See Table 10 in Section 2A-3					--					
	Method 5 superelevation and side friction distribution	e _{max} = 6%	144	231	340	485	643	144	231	340	485	643	Existing
		e _{max} = 8%	--	--	--	--	--	134	214	314	444	587	
Minimum vertical curve length (ft) (Refer to Section 2B-1)			75	90	105	120	135	75	90	105	120	135	preferred
Minimum rate of vertical curvature (K) (Refer to Section 2B-1)	crest vertical curves		12	19	29	44	61	12	19	29	44	61	preferred
	sag vertical curves	roadways without fixed-source lighting	26	37	49	64	79	26	37	49	64	79	
		roadways with fixed-source lighting	26	37	49	64	79	14	20	27	35	44	preferred
Minimum gradient (%)	(Refer to Section 2B-1)		0.5					0.3% with a curb, 0.0% without a curb					0.2% (existing)
Maximum gradient (%)	(Refer to Section 2B-1)	Urban roadways	5					--	9	8	8	7	3.56% (existing)
		Rural roadways						--	--	--	6	6	10
Clear zone			See "Preferred Clear Zone" table in Section 8A-2					See "Acceptable Clear Zone" table in Section 8A-2					



Auxiliary Lane

Longitudinal joint: L or KT
Transverse joint: Match Mainline

STATION TO STATION		AL Feet
2208+38.91	2219+35.78	3
2220+17.56	2226+84.61	8
2227+72.06	2237+18.04	13.5
2231+10.64	2237+15.57	8
2238+00.56	2250+53.40	3
2251+30.64	2280+54.78	0

Curbed Shoulder

Shoulder Jointing:
Longitudinal joint not required when distance from back of curb to nearest joint is less than 15':

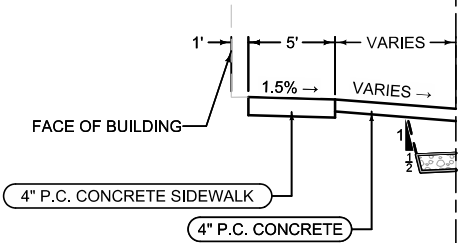
Single pour: L-2
Staged : KT-2
Transverse: C at 17' spacing

STATION TO STATION		P Feet	Curb Type See PV-102
2208+39.48	2250+52.28	2.5	6" Standard
2251+30.64	2280+54.78	3.0	6" Standard

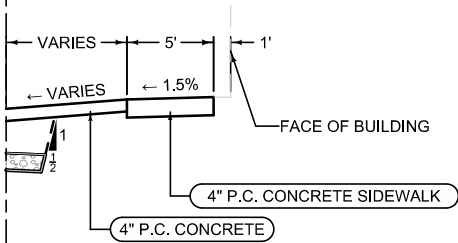
Auxiliary Lane

Longitudinal joint: L or KT
Transverse joint: Match Mainline

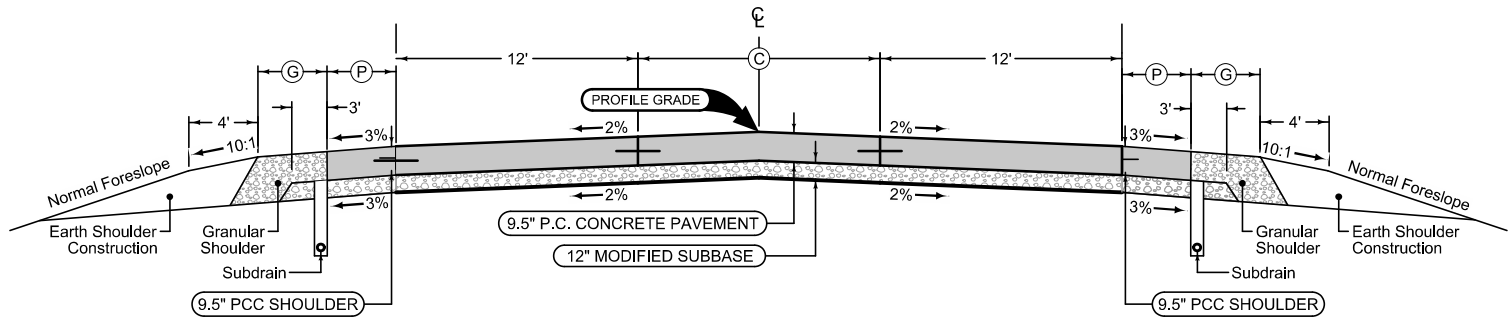
STATION TO STATION		AR Feet
2208+38.91	2219+35.78	3
2220+17.56	2237+00.23	8
2236+87.63	2250+52.28	3
2251+30.64	2280+54.78	0



STATION TO STATION	
2220+69.77	2235+62.48



STATION TO STATION	
2222+39.00	2237+00.00



Full Depth PCC Combination Shoulder

Shoulder Jointing:
Longitudinal joint: BT-2, L-2 or KT-2
Transverse joints: C at 17' spacing

2_C_FullPCC_04-20-21			
STATION TO STATION		(P) Feet	(G) Feet
2280+54.78	63+90.00	4	2

Mainline Jointing:
Transverse joints: CD at 17' spacing
Longitudinal joint: L-2

STATION TO STATION		(C) Feet
2280+54.78	63+90.00	12
63+90.00	67+00.00	VAR
67+00.00	84+16.05	0

Full Depth PCC Combination Shoulder

Shoulder Jointing:
Longitudinal joint: BT-2, L-2 or KT-2
Transverse joints: C at 17' spacing

2_C_FullPCC_04-20-21			
STATION TO STATION		(P) Feet	(G) Feet
2280+54.78	63+90.00	4	2

SURVEY SYMBOLS

	Interstate Highway Symbol		Septic Tank
	U.S. Highway Symbol		Cistern
	Iowa Highway Symbol		L.P. Gas Tank (No Footing)
	County Road Highway Symbol		Underground Storage Tank
	Evergreen Tree		Latrine
	Deciduous Tree		Satellite TV Dish
	Fruit Tree		Water Hook Up
	Shrub (Bushes)		Radio Tower
	Timber		Tower Anchor
	Hedge		Guardrail (Beam or Cable)
	Stump		Guard Post (one or two)
	Swamp		Guard Post (over two)
	Rock Outcrop		Filler Pipe
	Broken Concrete		Gas Valve
	Revetment (Rip Rap)		Water Valve
	Cemetery		Speed Limit Sign
	Grave		Mile Marker Post
	Cave		Sign
	Sink Hole		Traffic Signal Control Box
	Board Fence		Rail Road Signal Control Box
	Chain Link or Security Fence		Telephone Switch Box
	Wire Fence		Electric Box
	Terrace		
	Earth Dam or Dike (Existing)		
	Tile Outlet		
	Edge of Water		
	Existing Drainage		
	Right of Way Rail or Lot Corner		
	Concrete Monument		
	Well		
	Windmill		
	Beehive Intake		
	Existing Intake		
	Existing Utility Access (Manhole)		
	Fire Hydrant		
	Water Hydrant (Rural)		

UTILITY LEGEND

	E1	ALLIANT ENERGY CONTACT: ALLIANT ENERGY FIELD ENGINEER PHONE: 800-255-4268
	W2	IOWA LAKES REGIONAL WATER CONTACT: ADAM KUESTER PHONE: 7122628847
	F04	CENTURYLINK CONTACT: SADIE HULL PHONE: 9185470147
	E2 W	ESTHERVILLE, CITY OF CONTACT: PENNY CLAYTON PHONE: 7123627771
	F03	ESTHERVILLE COMMUNICATIONS LLC CONTACT NAME : KYLE HOUGH PHONE: 7128593300
	F05	IOWA COMMUNICATIONS NETWORK CONTACT: BRANDON HAINES PHONE: 8005723940
	E3	IOWA LAKES ELECTRIC COOP CONTACT: KAY DAHL PHONE: 7123622694
	F03	PREMIER COMMUNICATIONS CONTACT: JOSH SANDBULTE PHONE: 7127223451
	F0	MEDIACOM LLC IOWA CONTACT NAME : JEFF ANFINSON CONTACT PHONE: 7123305198
	G	BLACK HILLS ENERGY SPENCER CONTACT: ASHLEY JOHNSON PHONE: 7125806033
	F06	UNITE PRIVATE NETWORKS, LLC CONTACT: JOE KILZER PHONE: 8164253556
	F02	WINDSTREAM COMMUNICATIONS CONTACT NAME : LOCATE DESK PHONE: 8002891901

PLAN VIEW COLOR LEGEND OF PLAN AND PROFILE SHEETS

LINEWORK	Design Color No.		
Green	(2)		Existing Topographic Features and Labels
Blue	(1)		Proposed Alignment, Stationing, Tic Marks, and Alignment Annotation
Magenta	(5)		Existing Utilities
SHADING	Design Color No.		Transparency
Pink, Dark	(13)		Temporary Pavement Shading 50%
Yellow	(4)		Proposed Pavement Shading 50%
Orange	(6)		Proposed Granular Shading 50%
Orange	(70)		Proposed Shoulder Granular Shading 50%
Yellow	(68)		Proposed Shoulder Paved Full Depth Shading 50%
Yellow	(132)		Proposed Shoulder Paved Partial Depth Shading 50%
Brown, Light	(236)		Grading Shading 50%
Orange, Light	(134)		Proposed Granular Entrance Shading 50%
Yellow	(220)		Proposed Paved Entrance Shading 50%
Tan	(8)		Proposed Sidewalk Shading 50%
Blue, Light	(230)		Proposed Sidewalk Landing Shading 50%
Pink	(11)		Proposed Sidewalk Ramp Shading 50%
Red	(3)		Proposed Structure Shading 50%
Red	(3)		Delineates Restricted Areas 0%

PROFILE VIEW COLOR LEGEND OF PLAN AND PROFILE SHEETS

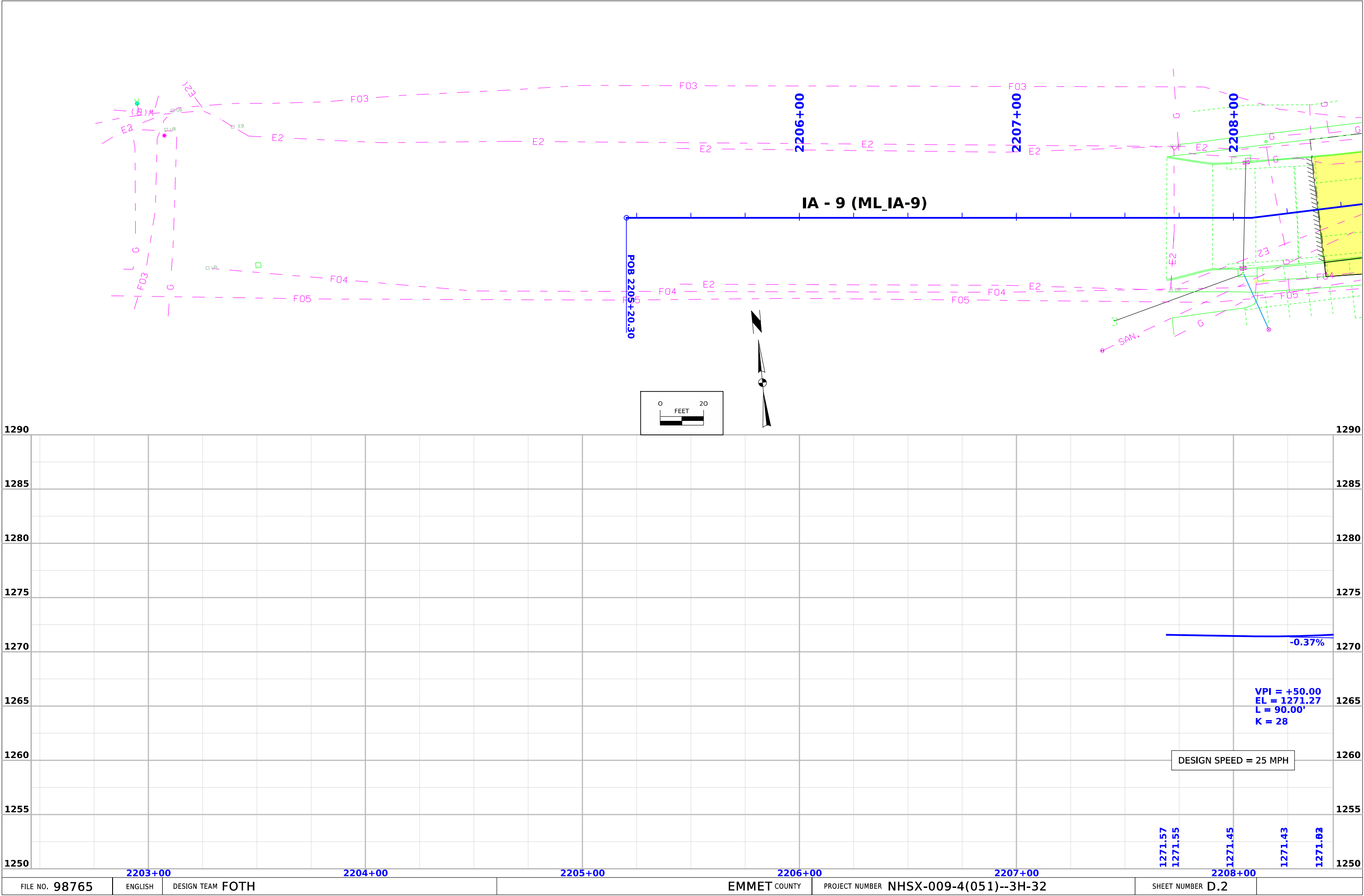
LINEWORK	Design Color No.		
Green	(10)		Existing Ground Line Profile
Blue	(1)		Proposed Profile and Annotation
Magenta	(5)		Existing Utilities
Blue, Light	(230)		Proposed Ditch Grades, Left
Black	(0)		Proposed Ditch Grades, Median
Rust	(14)		Proposed Ditch Grades, Right

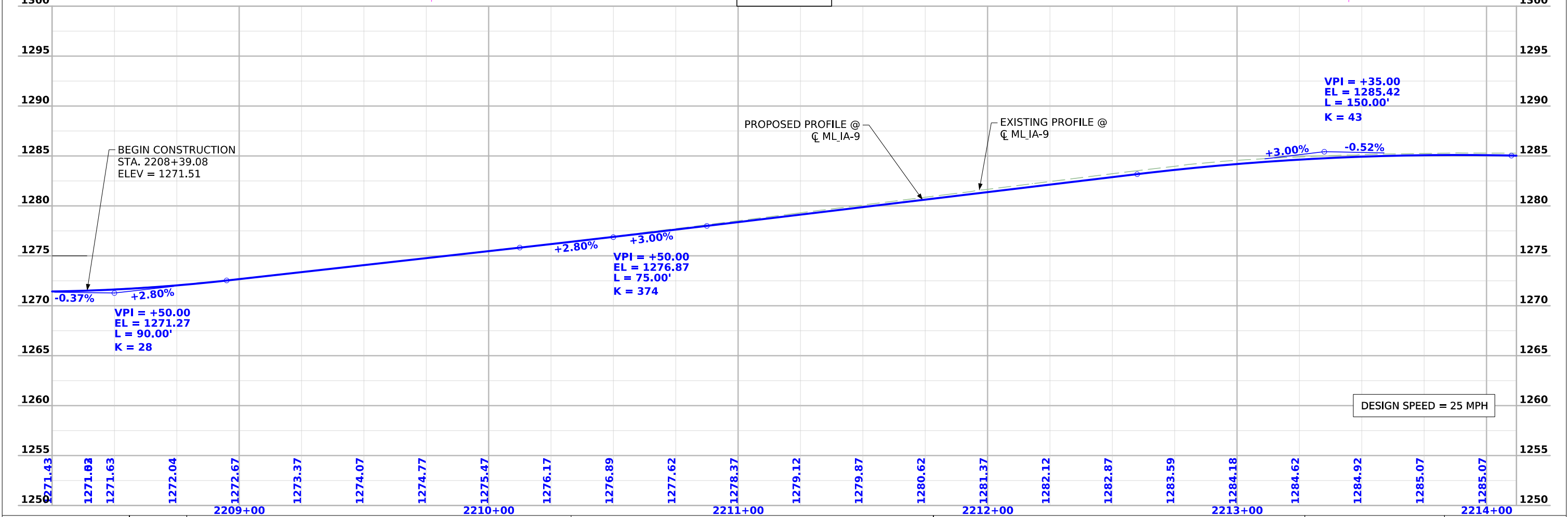
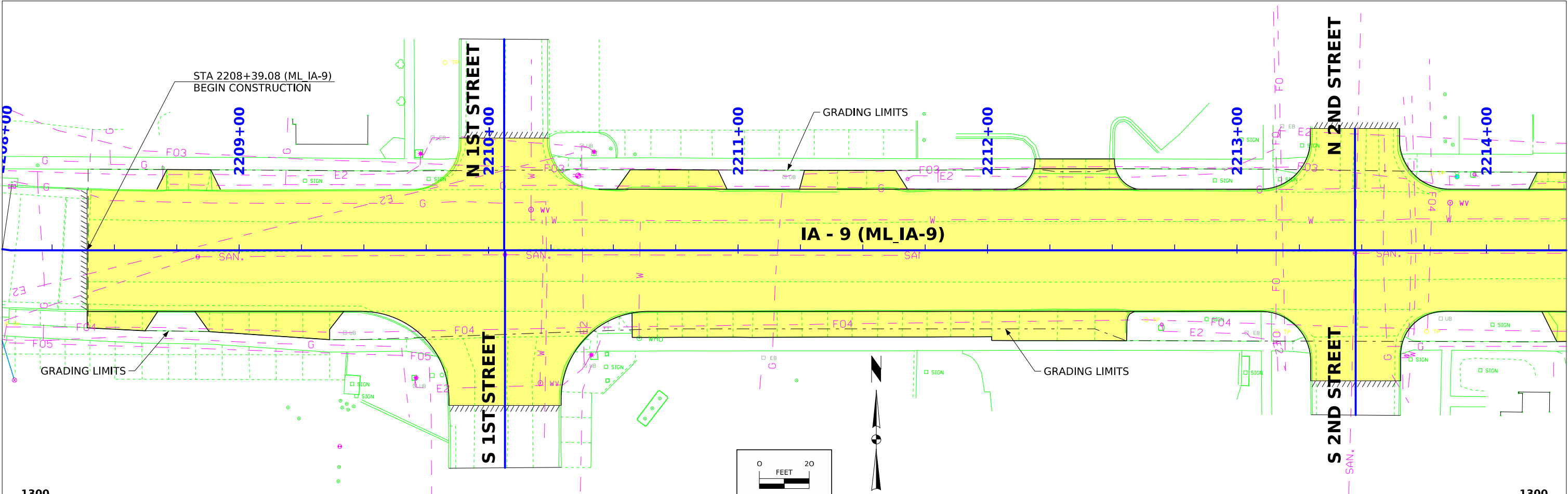
	Reference Point		Survey Line
	Station		Section Corner
	Ground Line Intercept		Saw Cut
	Guardrail		Trench Drain
	HighTension Cable Guardrail		Sheet Pile
	Pavement Removal		Clearing & Grubbing Area

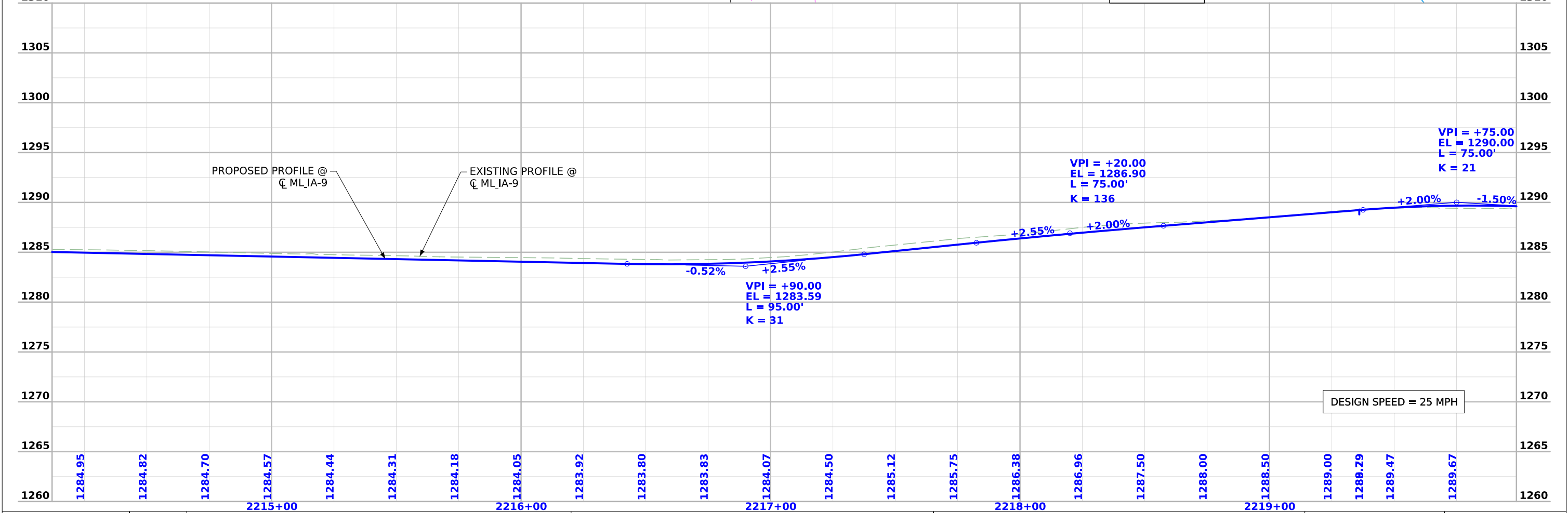
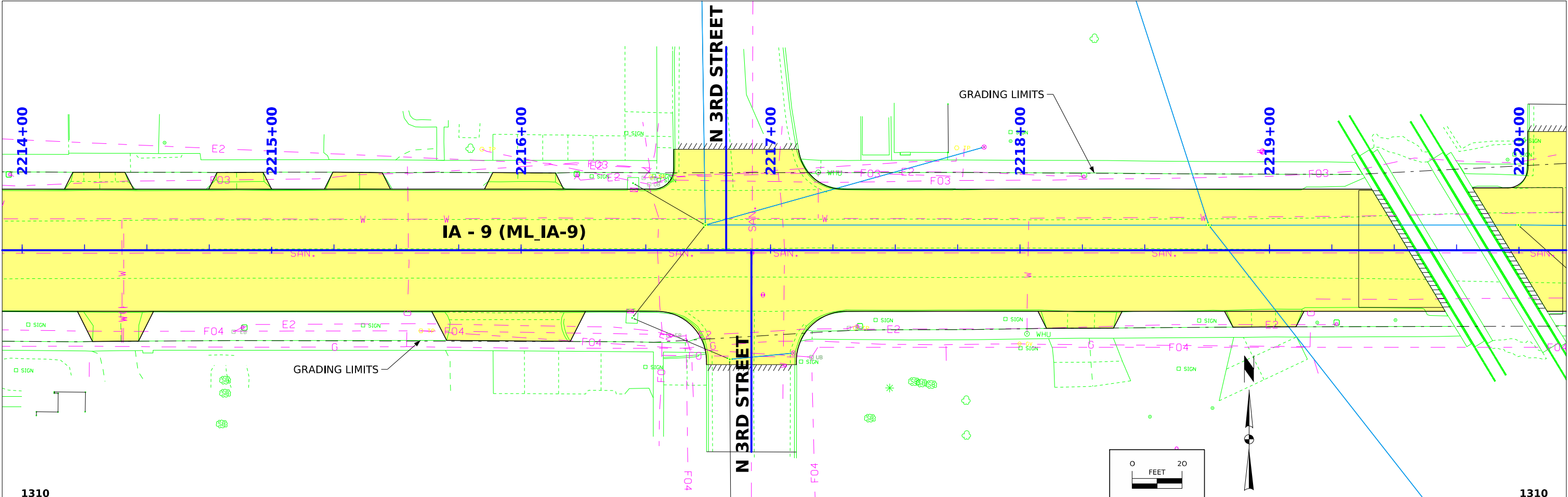
	Proposed Right-of-Way Symbol
	Proposed Right-of-Way Line
	Existing Right of Way
	Existing and Proposed Right-of-Way
	Easement and Existing Right-of-Way
	Easement (Temporary) Symbol
	Easement (Temporary) Line
	Easement
	C/A Access Control
	Property Line Symbol
	Property Line

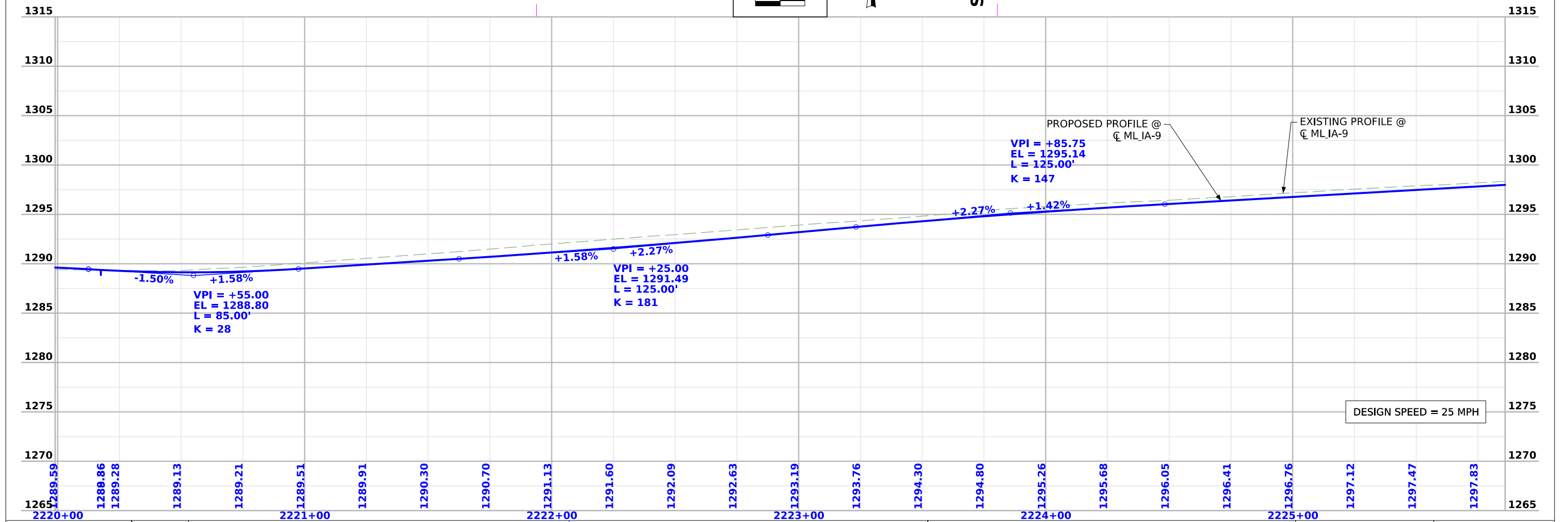
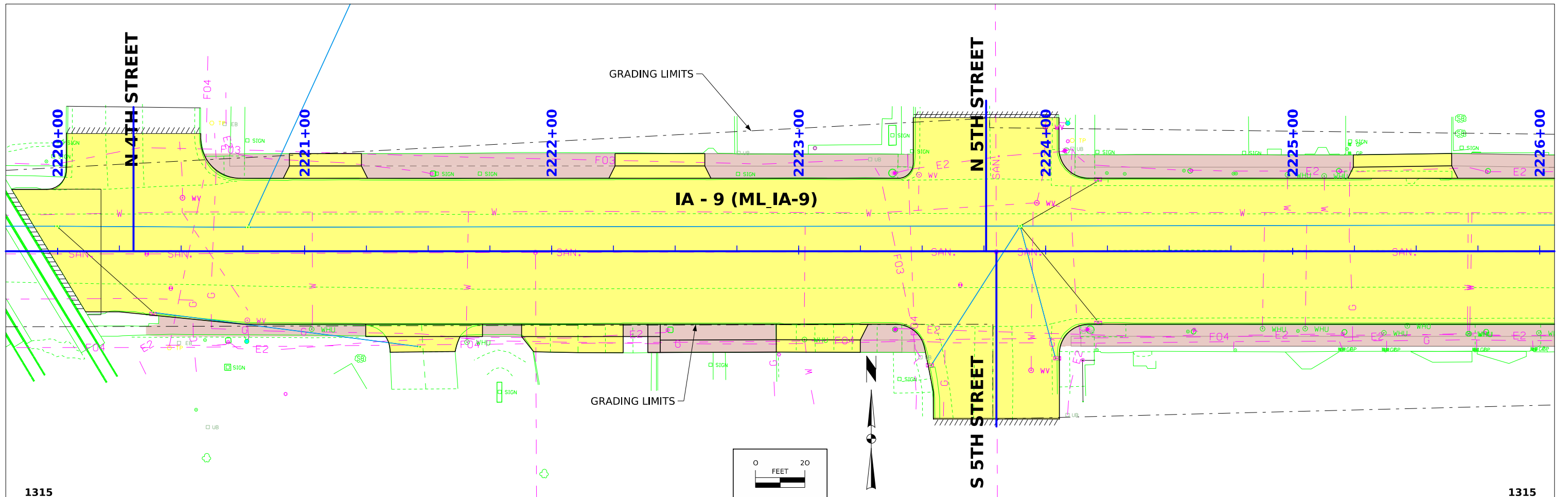
PLAN AND PROFILE
LEGEND AND SYMBOL
INFORMATION SHEET

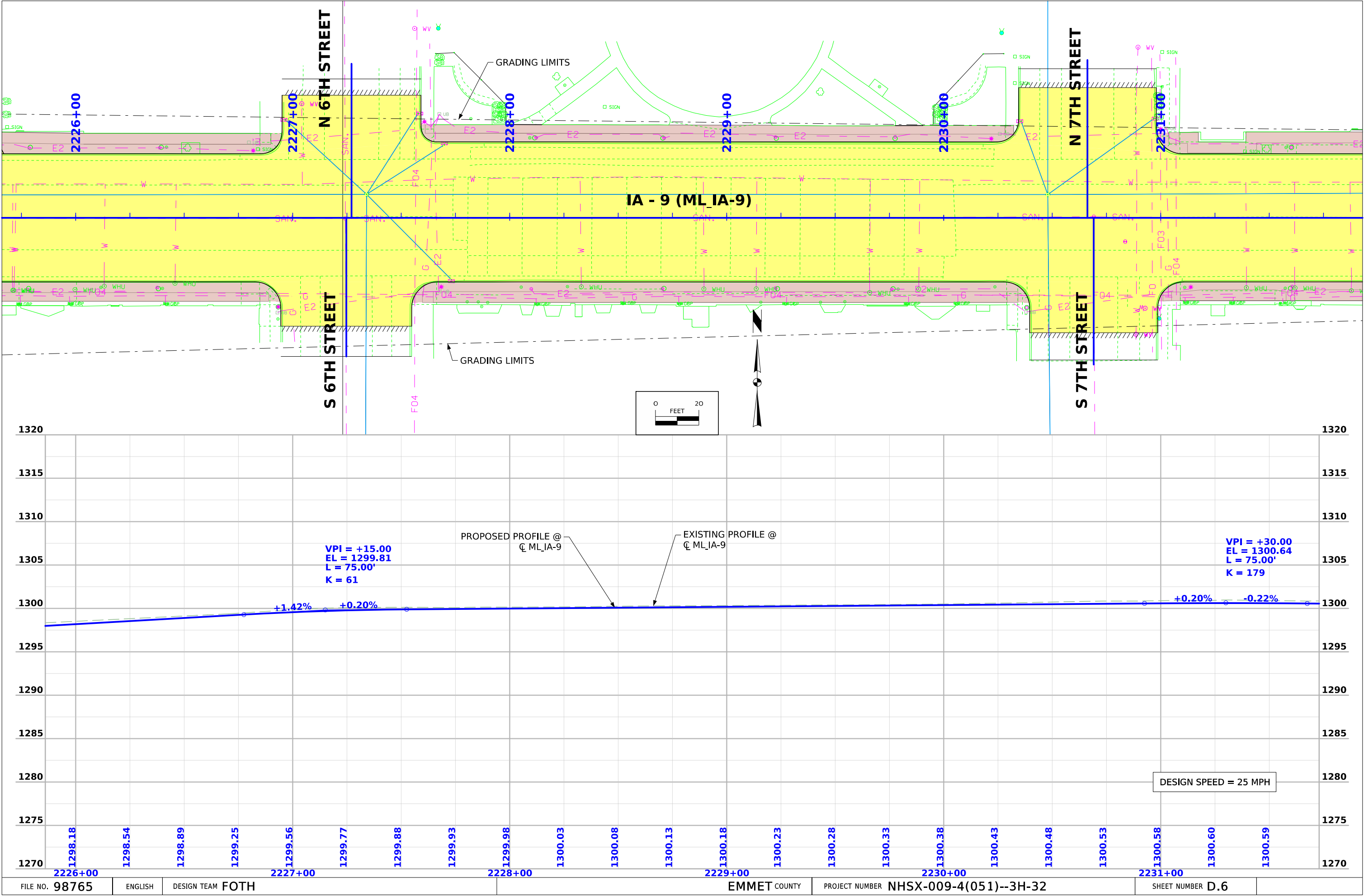
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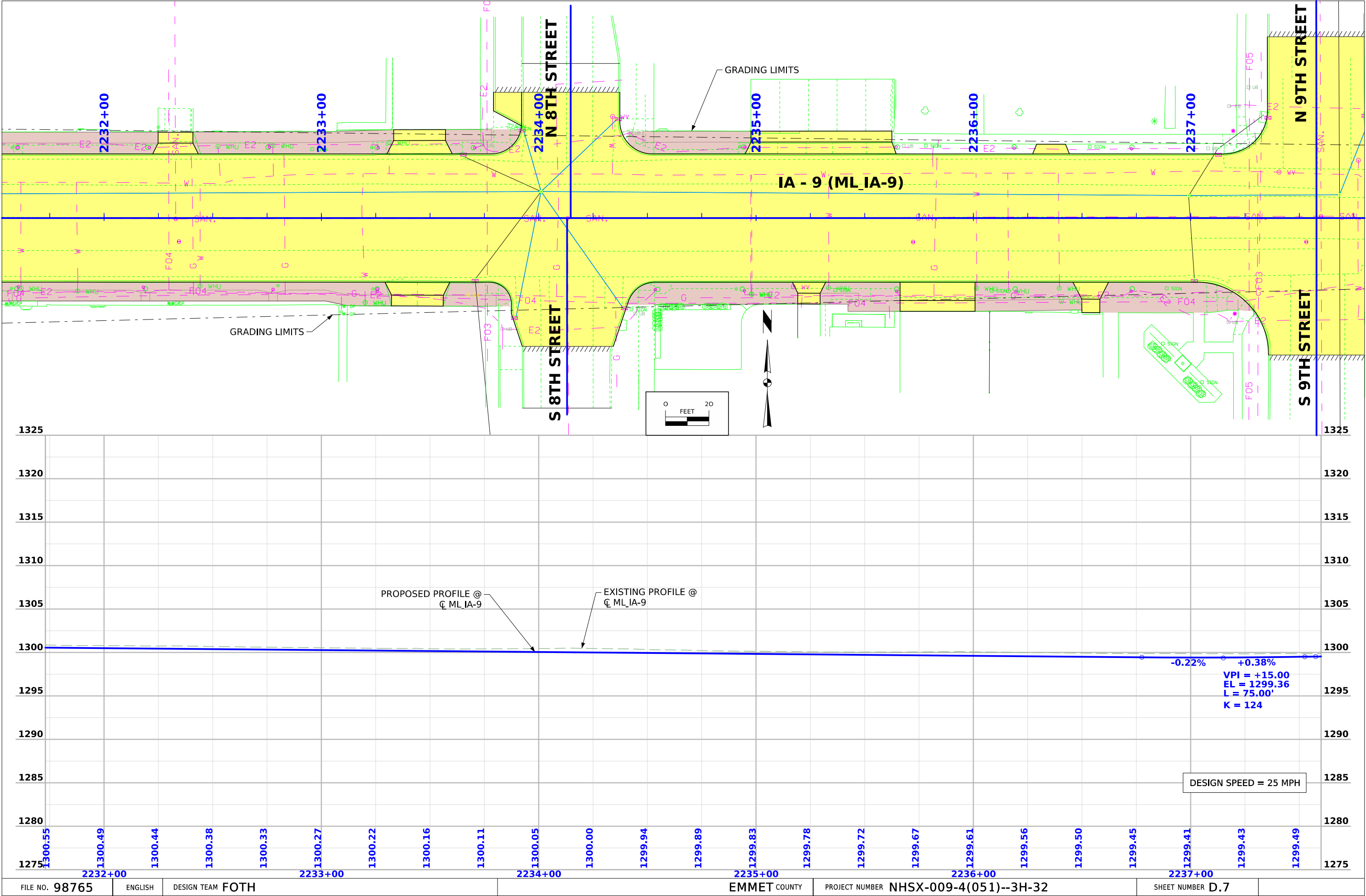




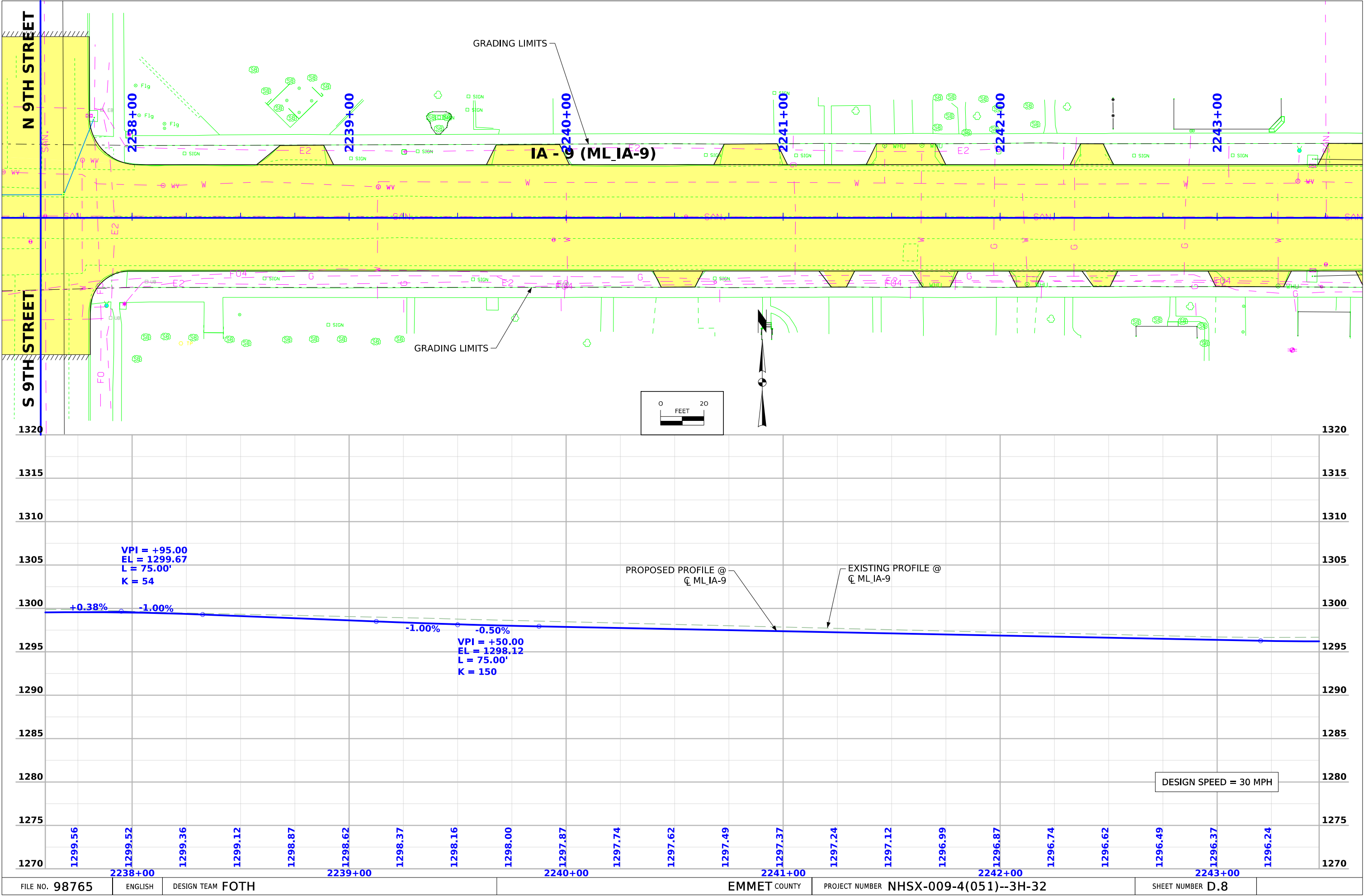


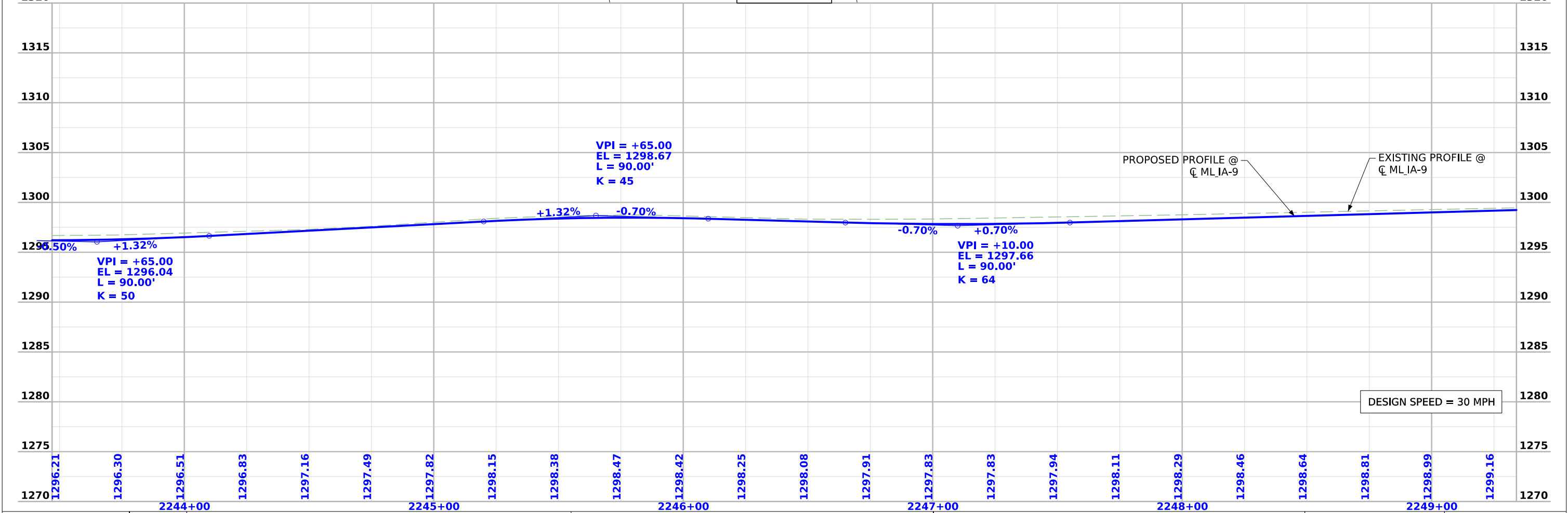
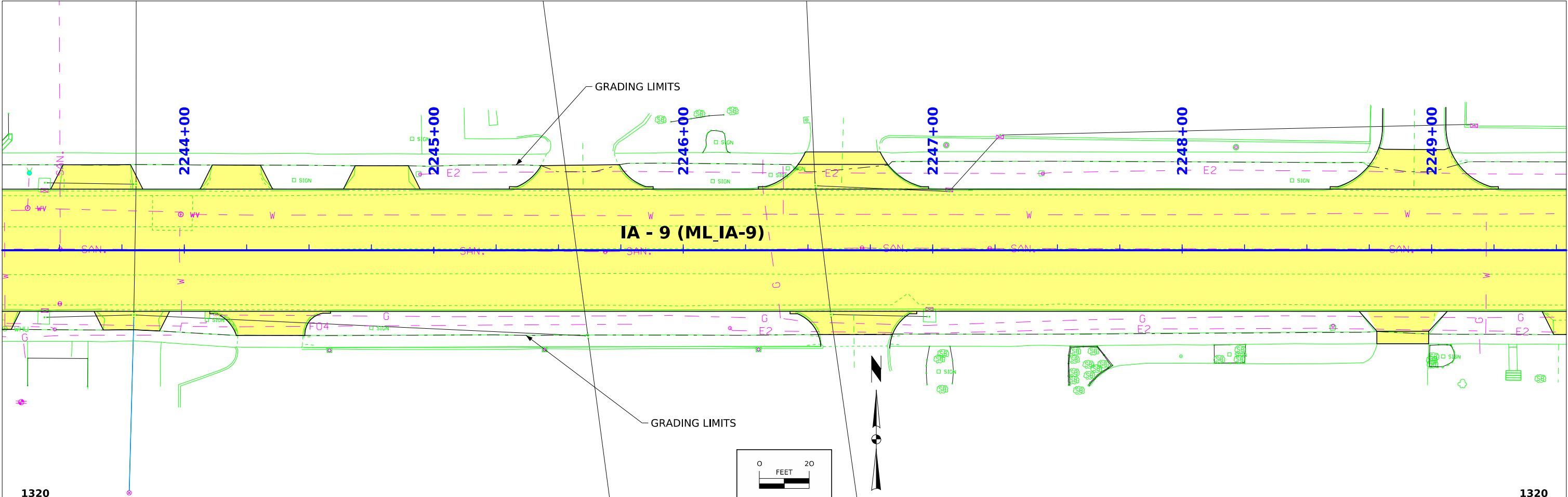


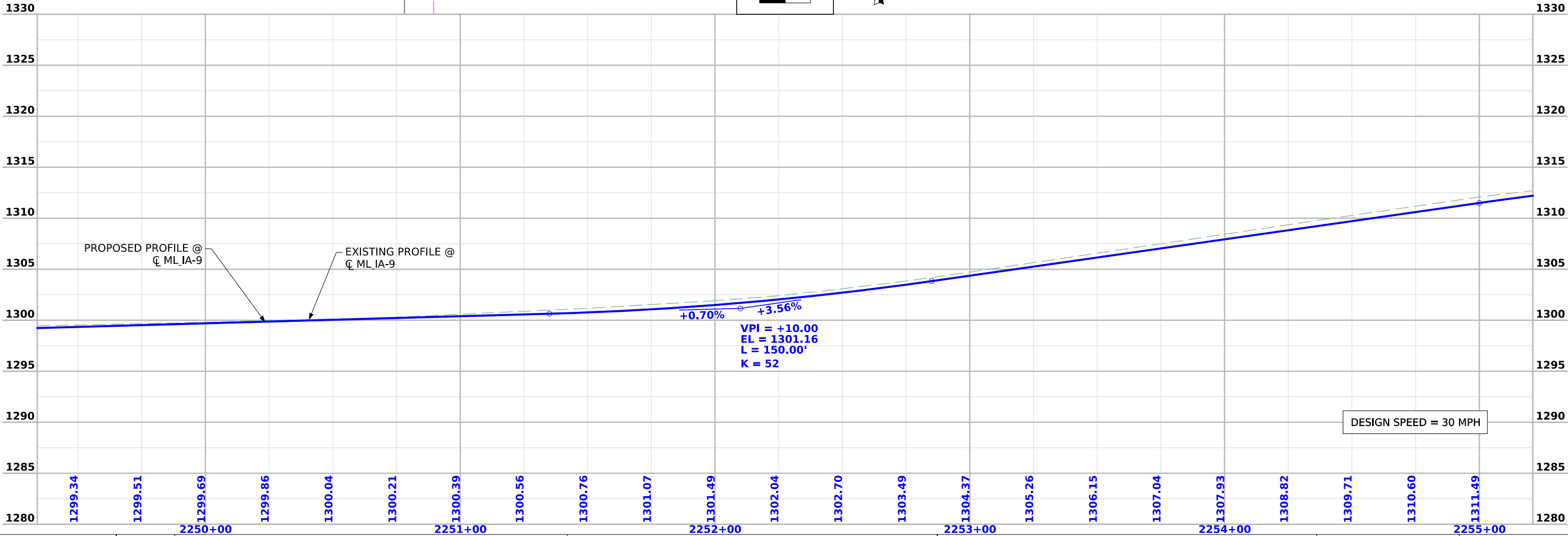
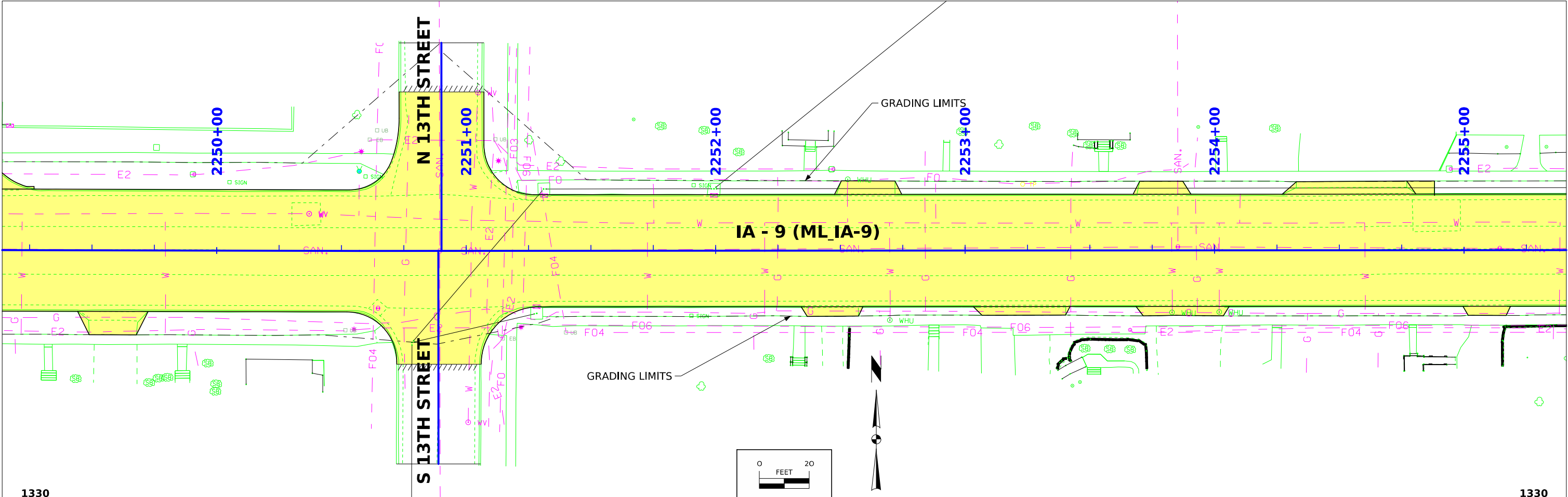


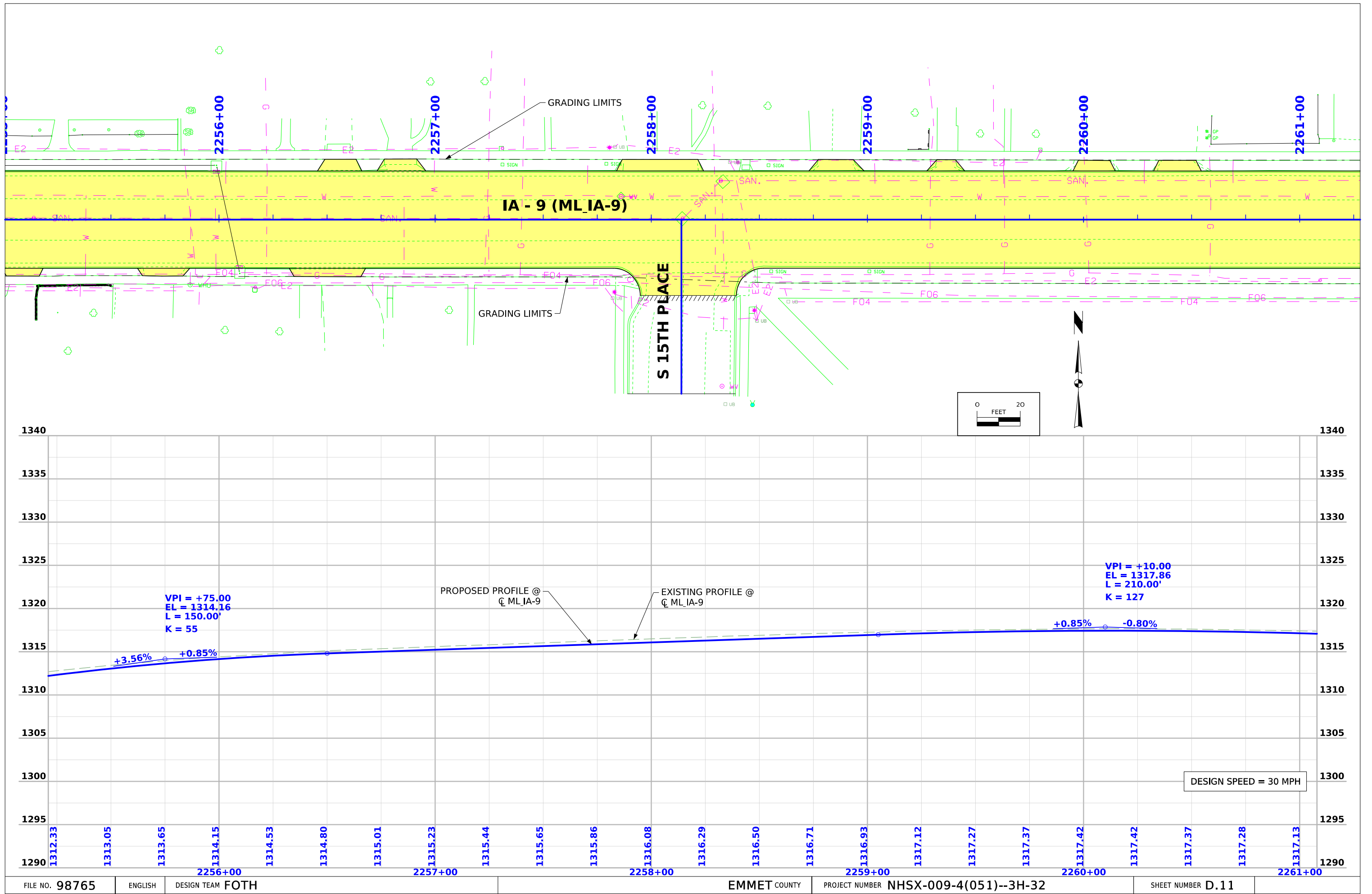


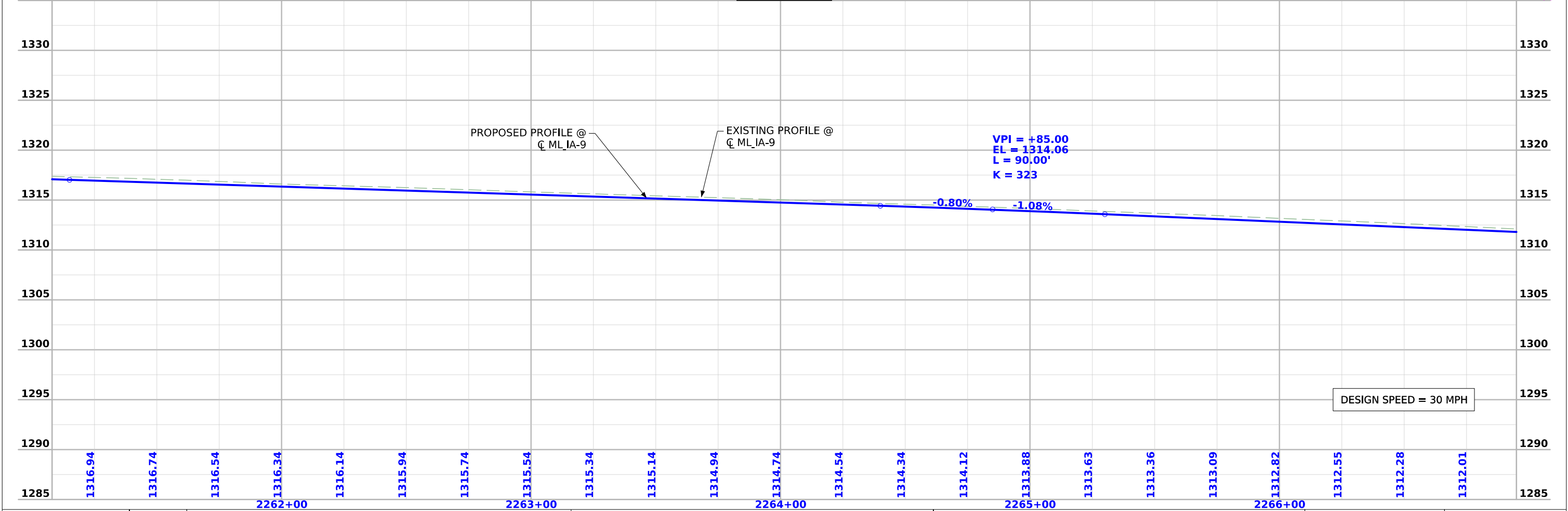
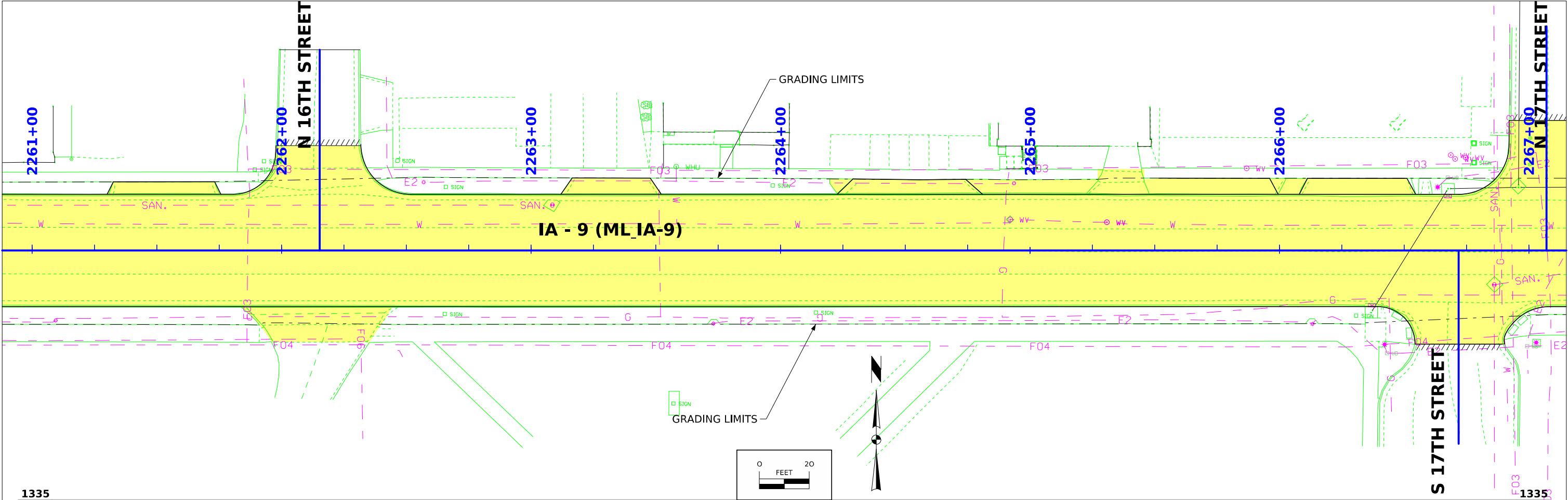
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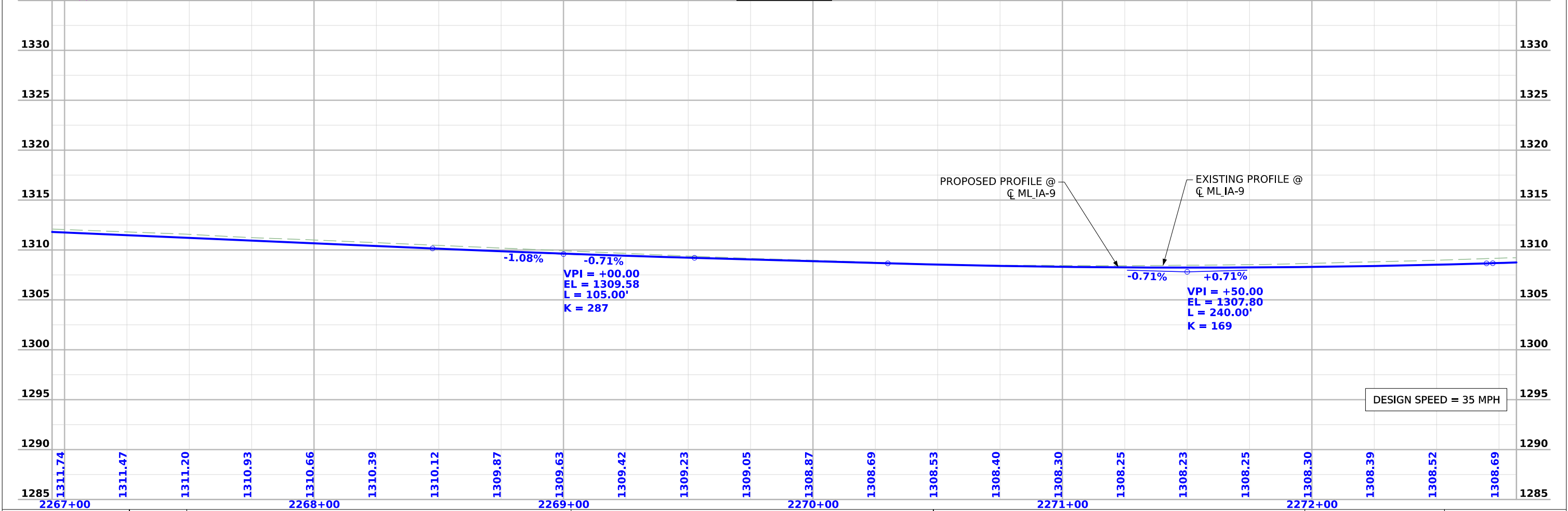
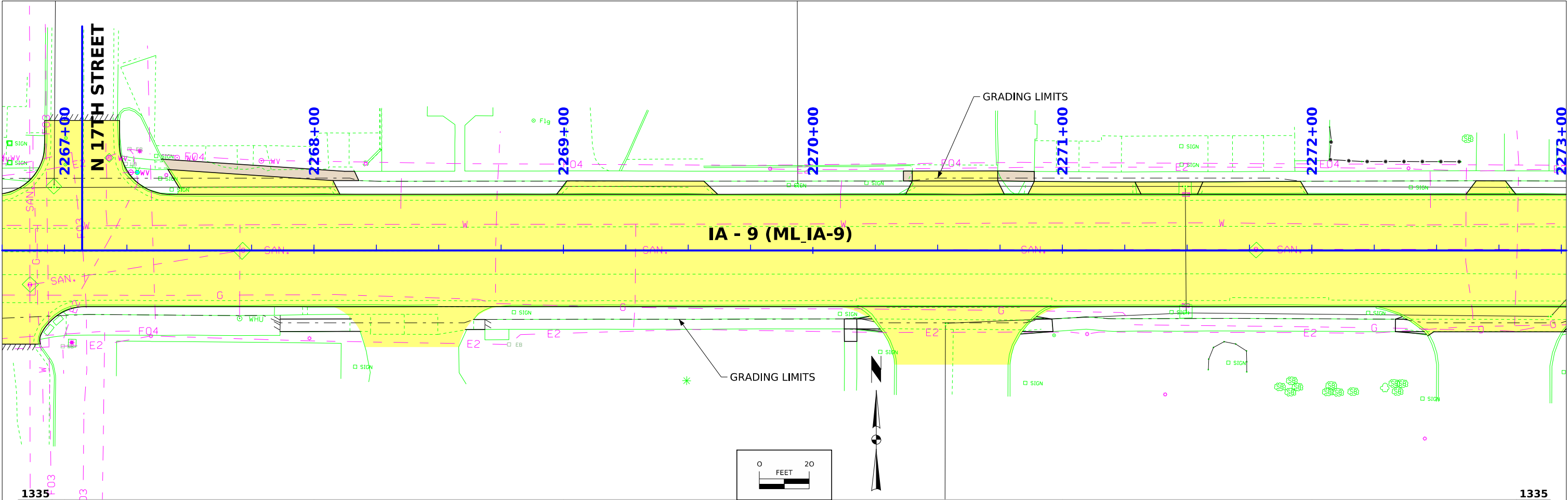


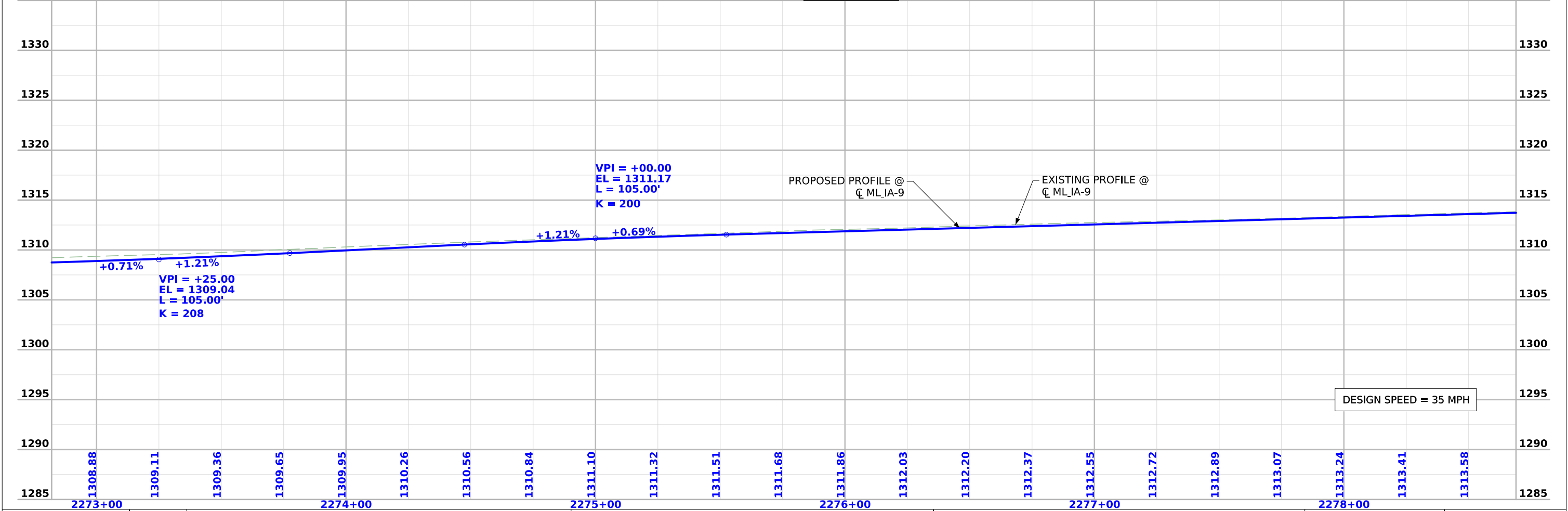
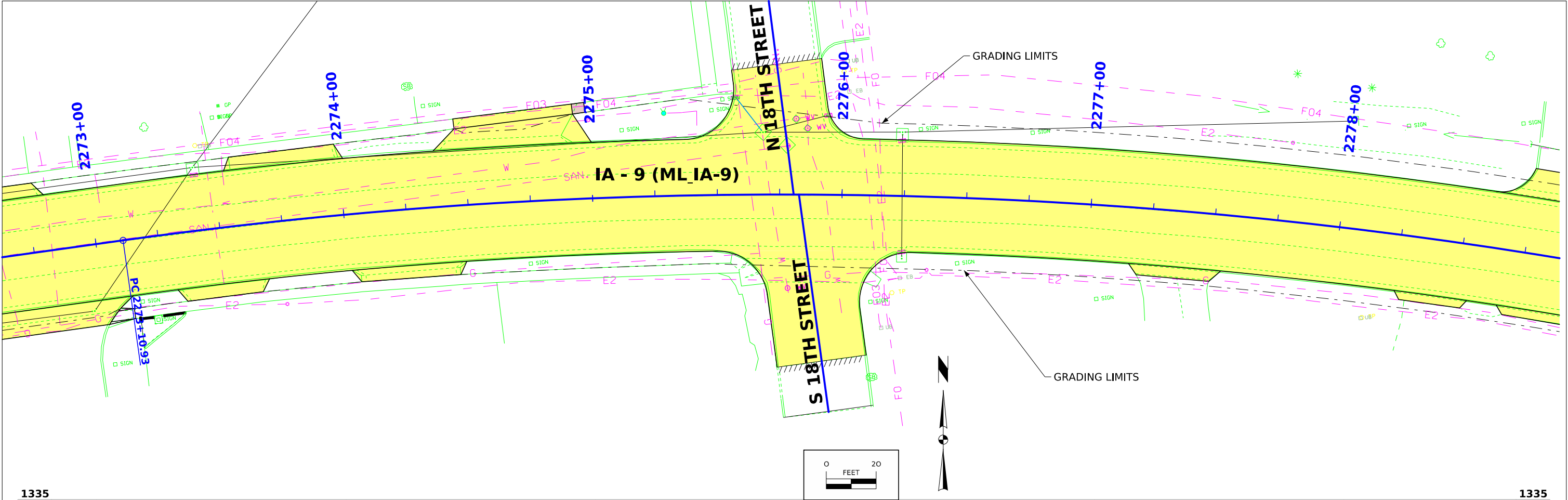


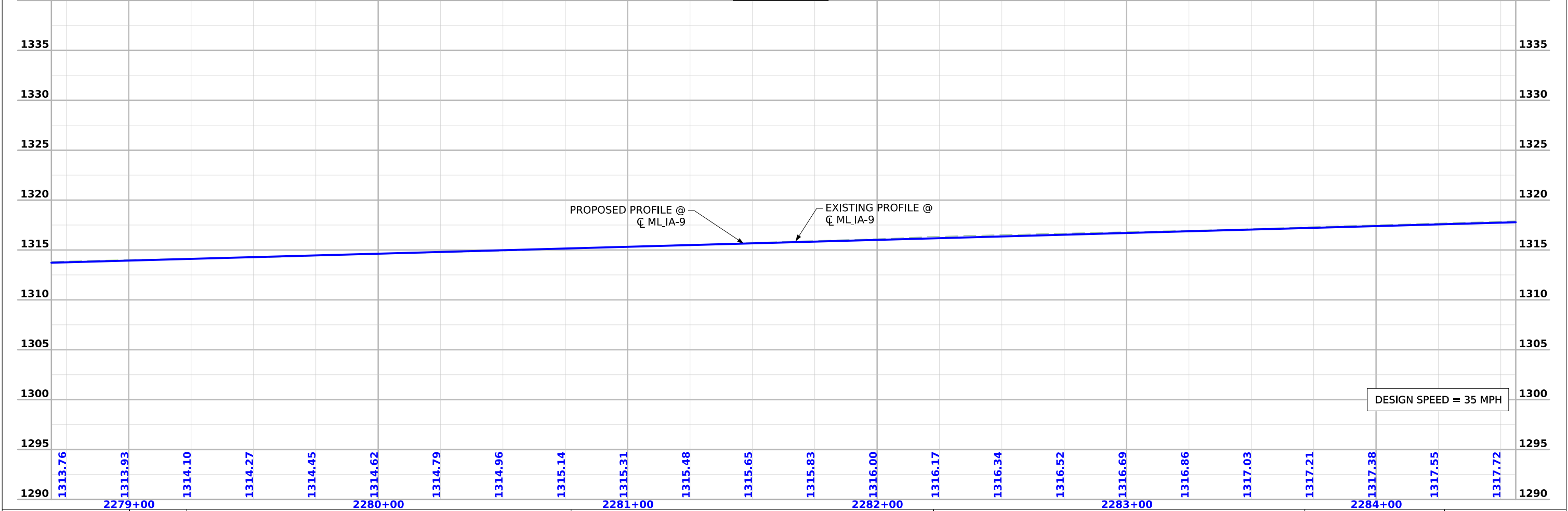
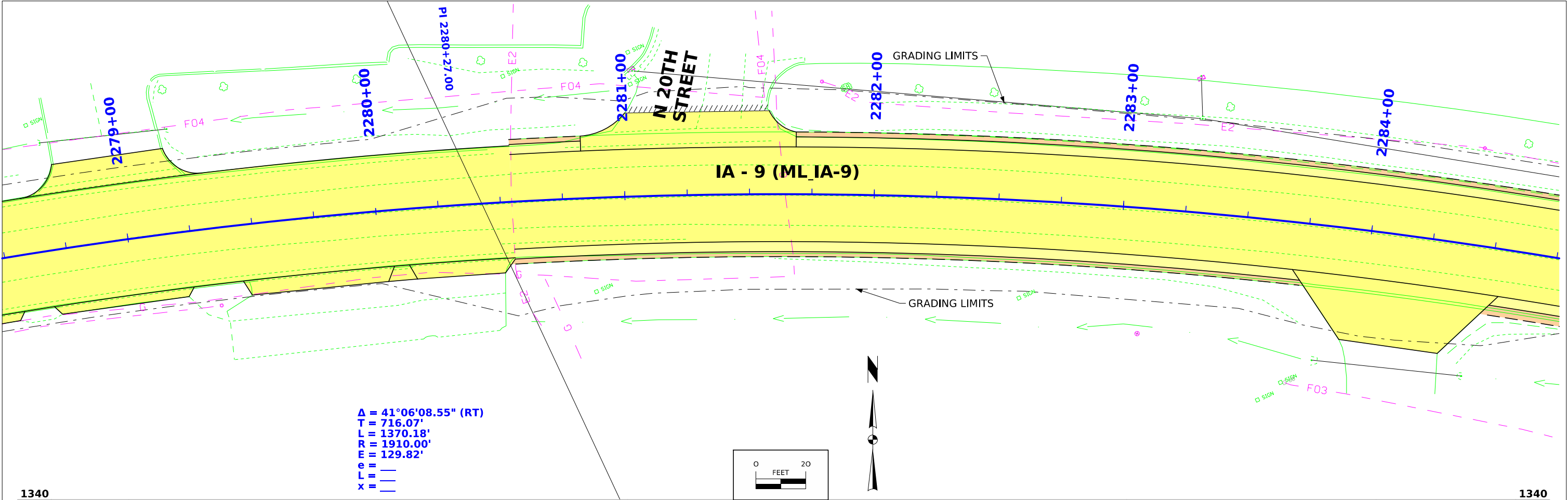


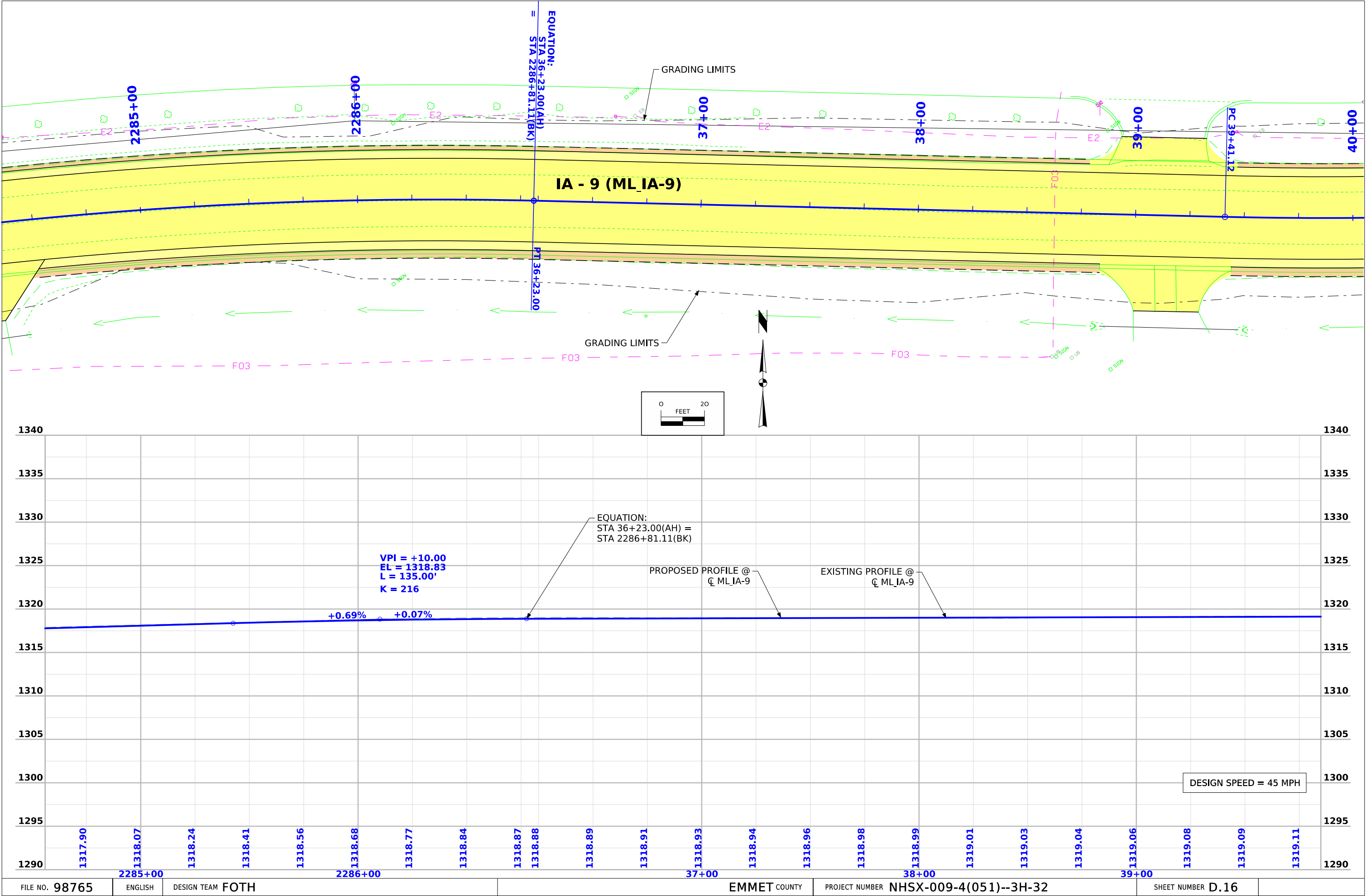


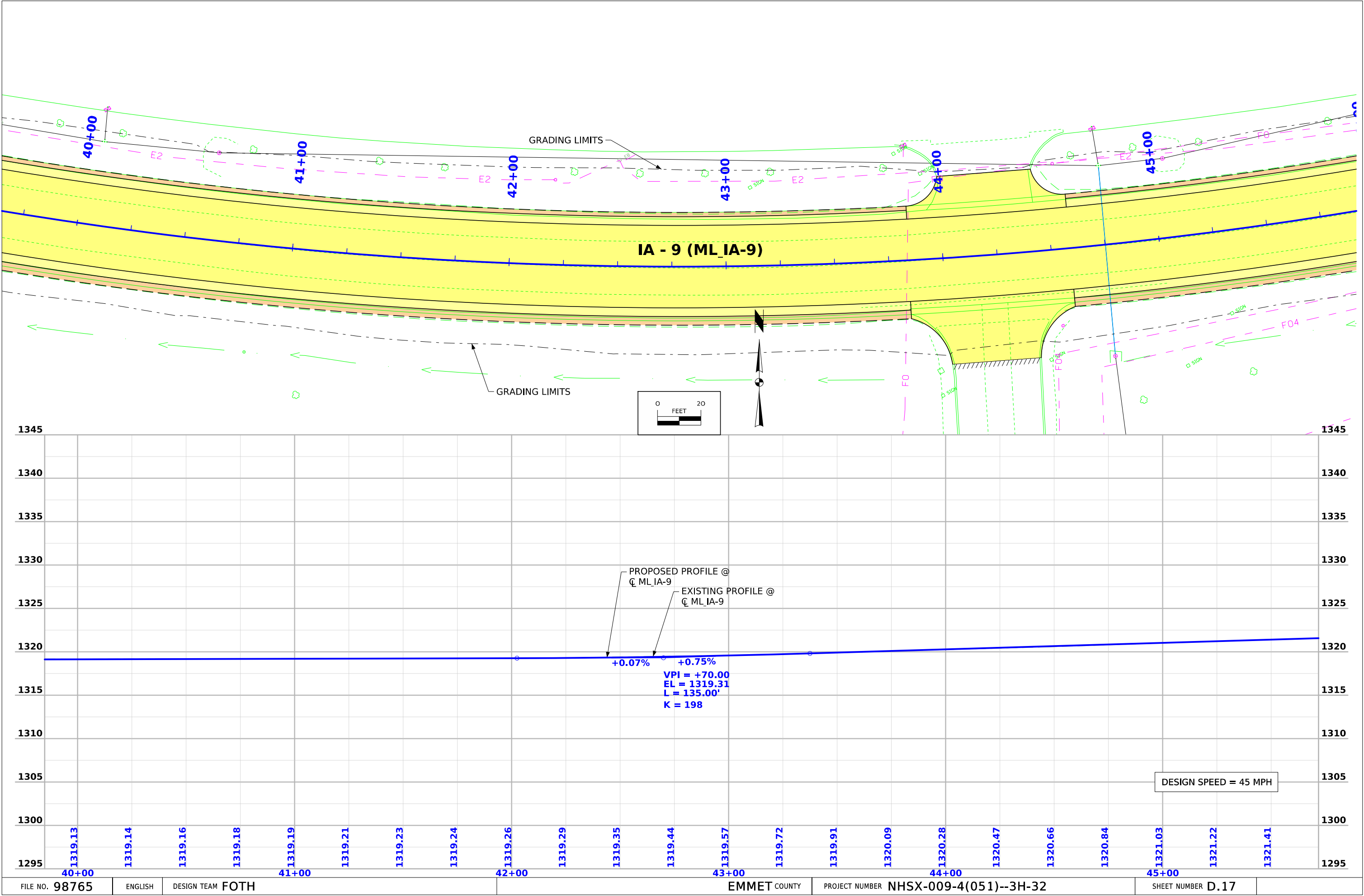


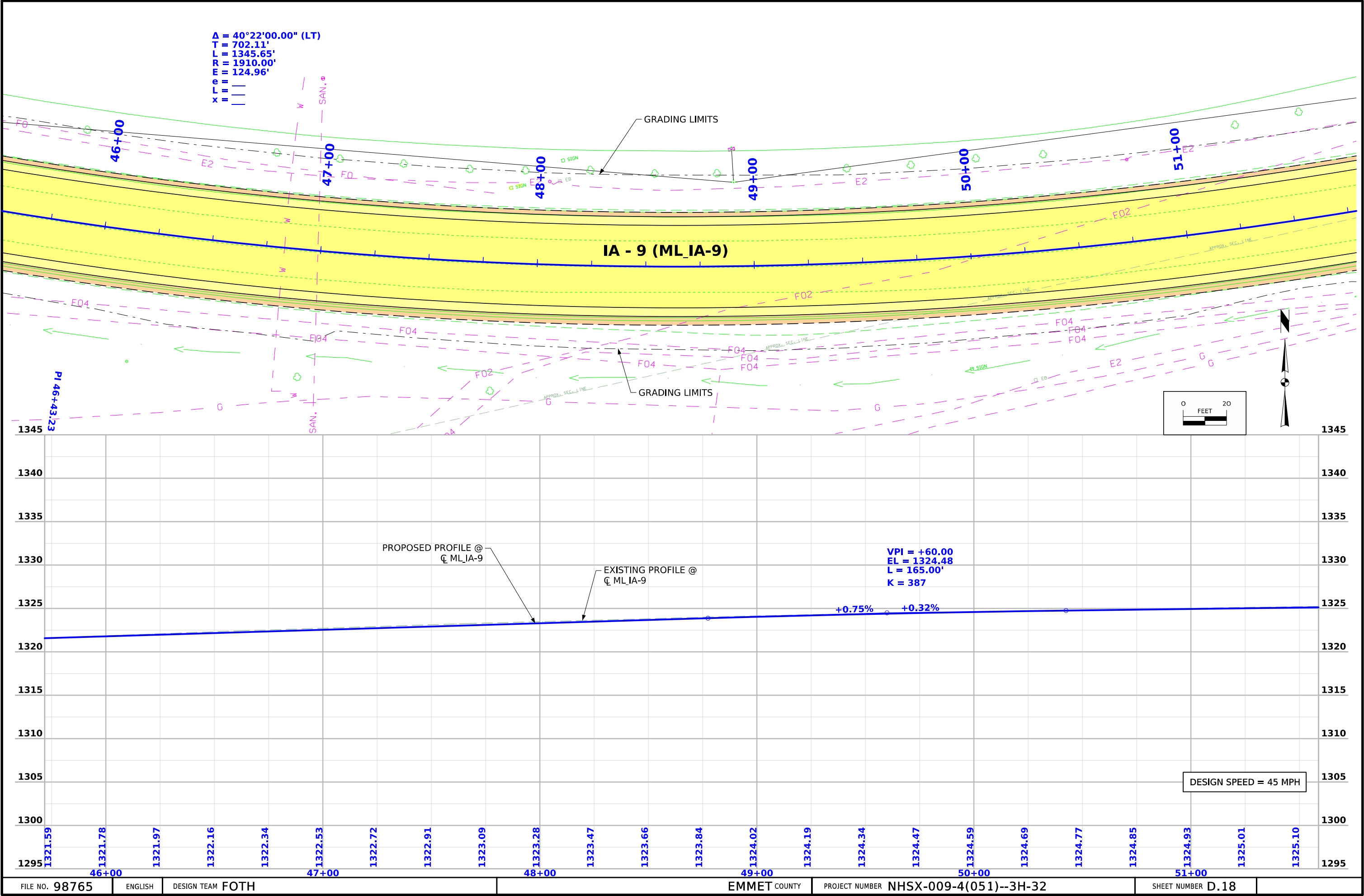


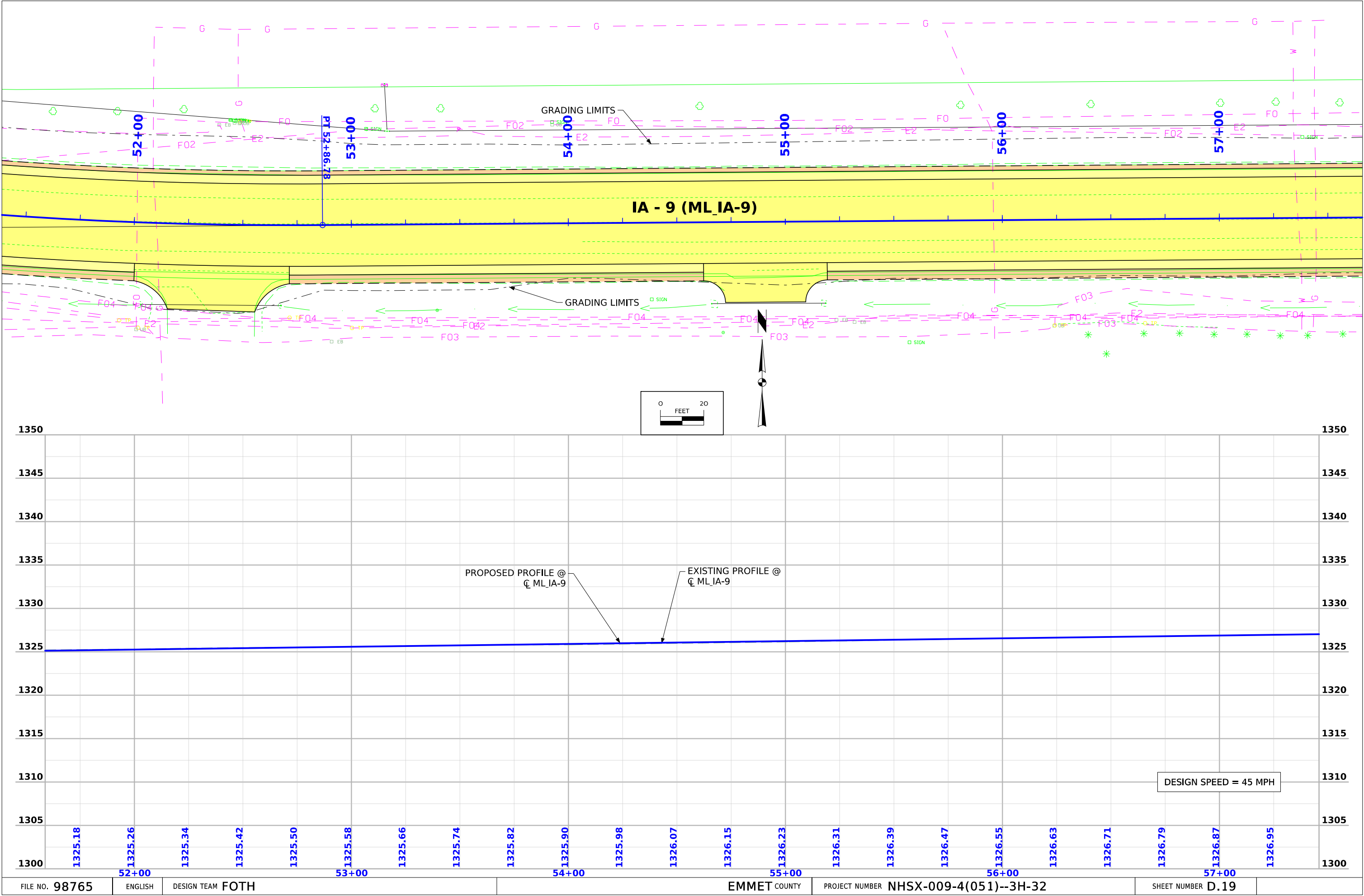


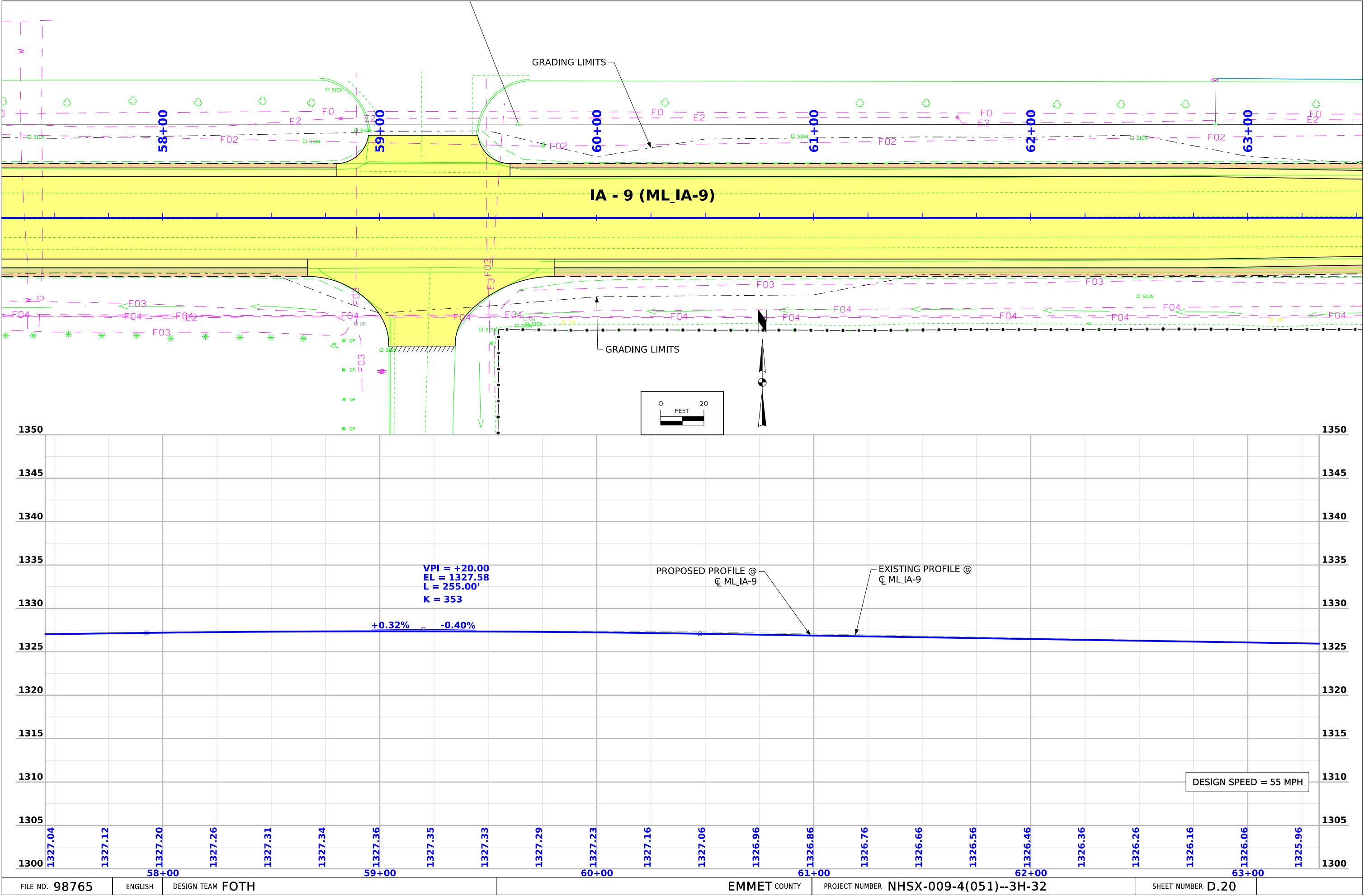


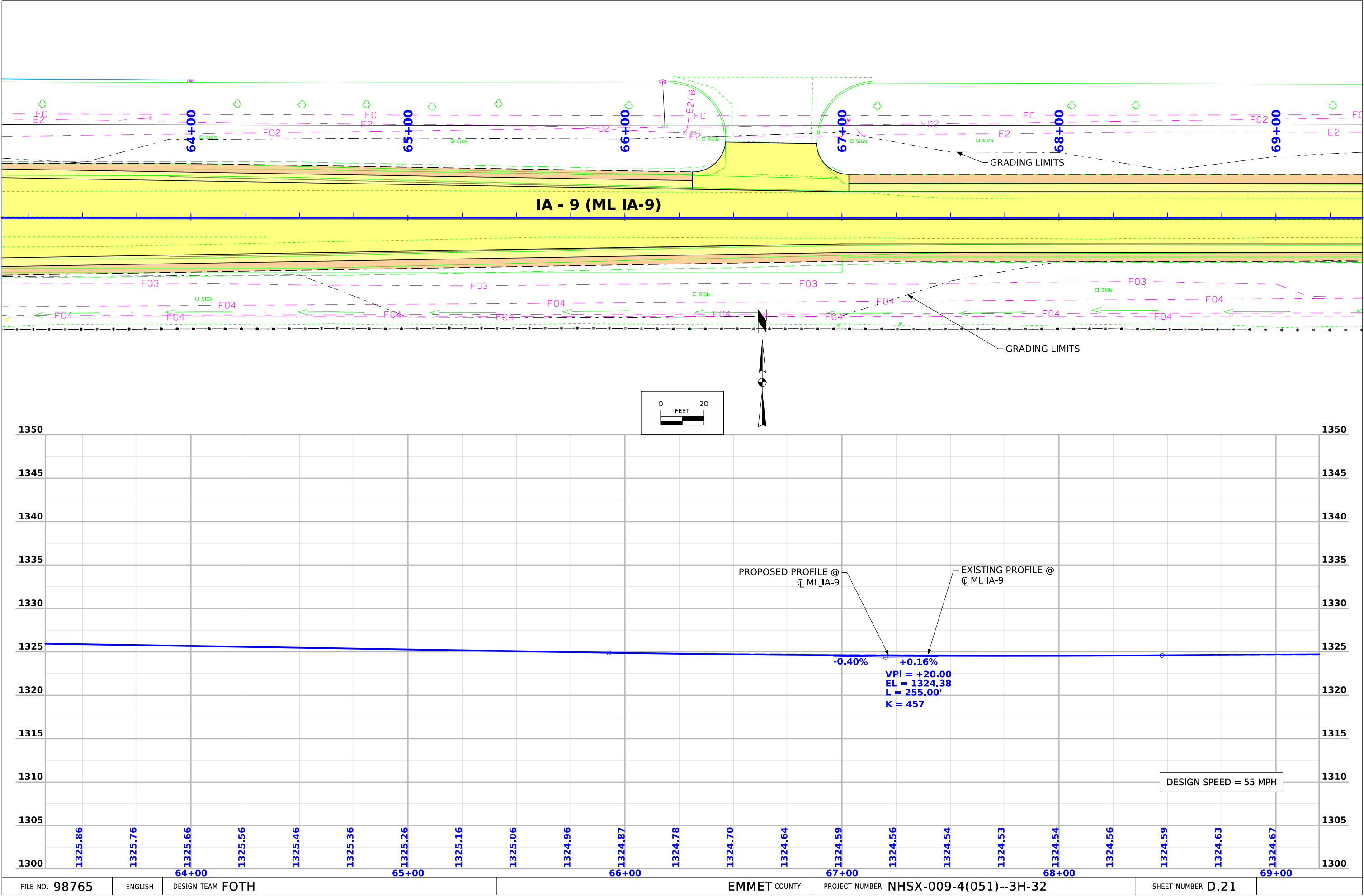


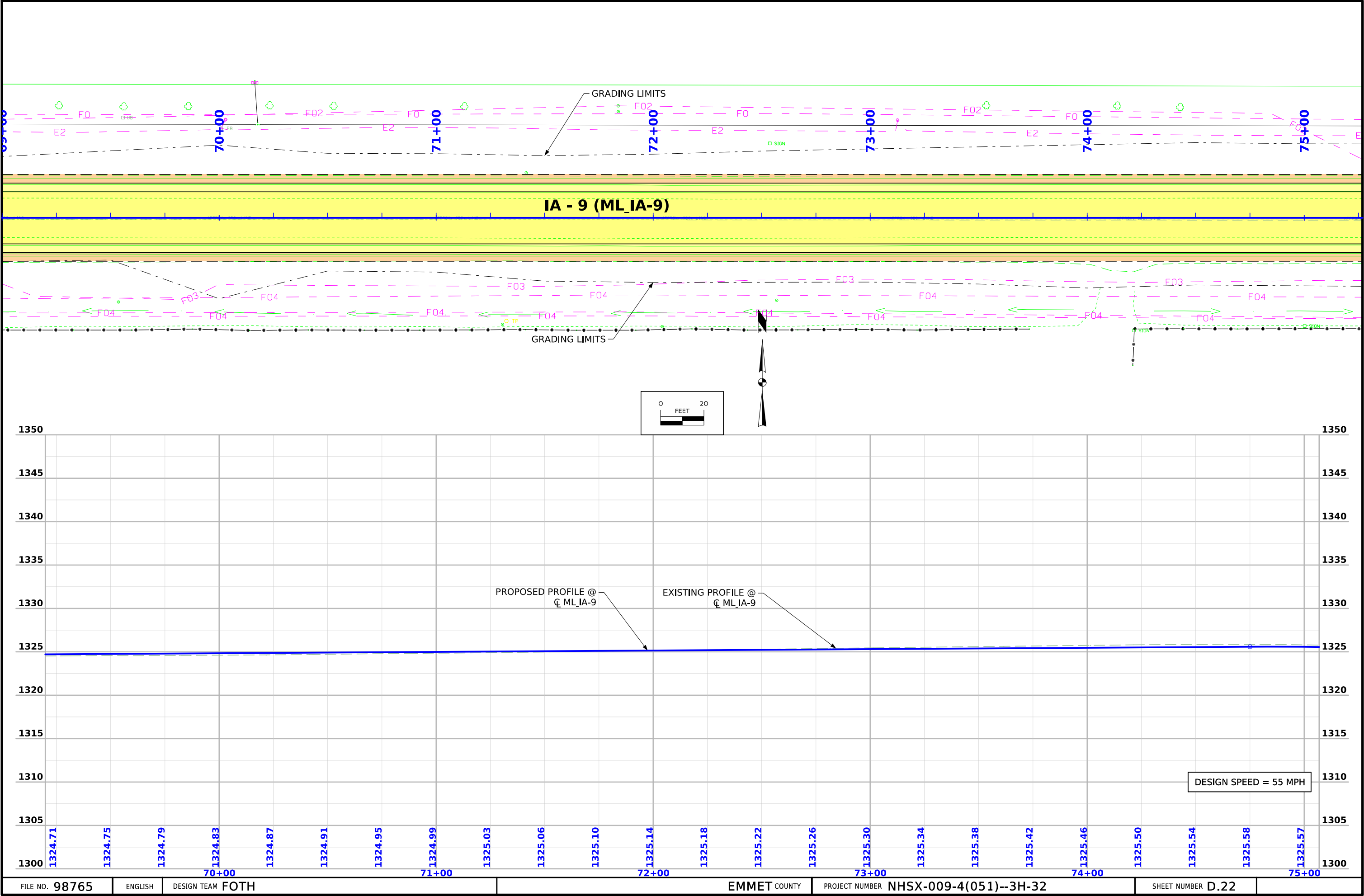


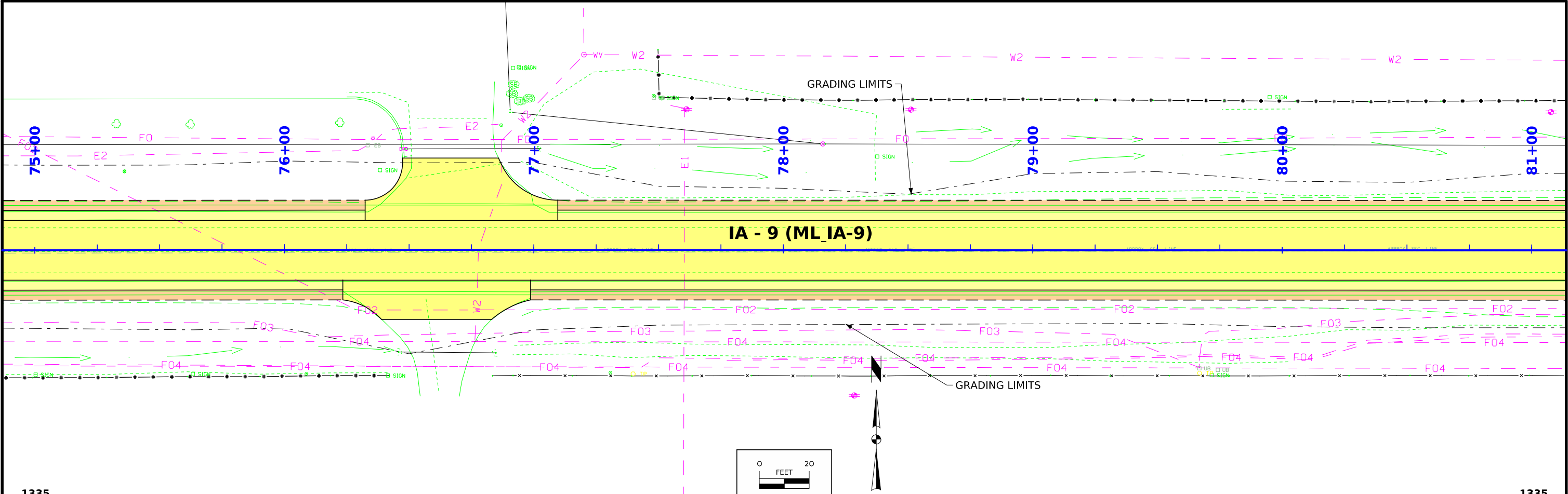






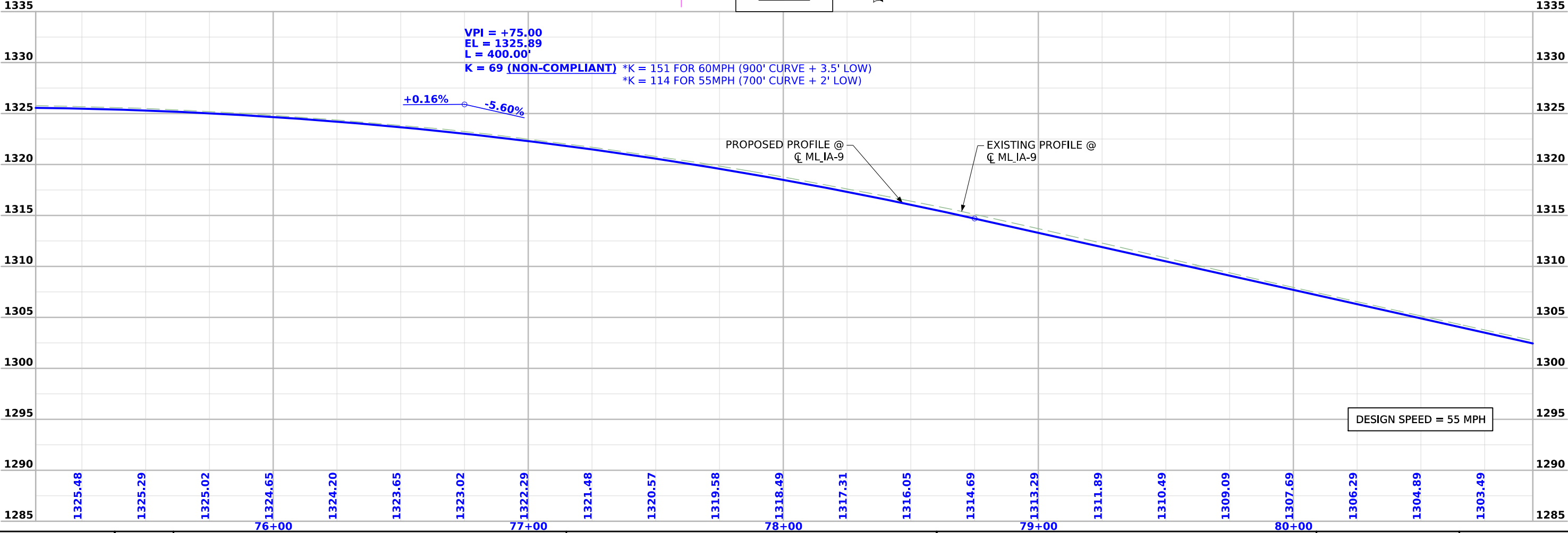




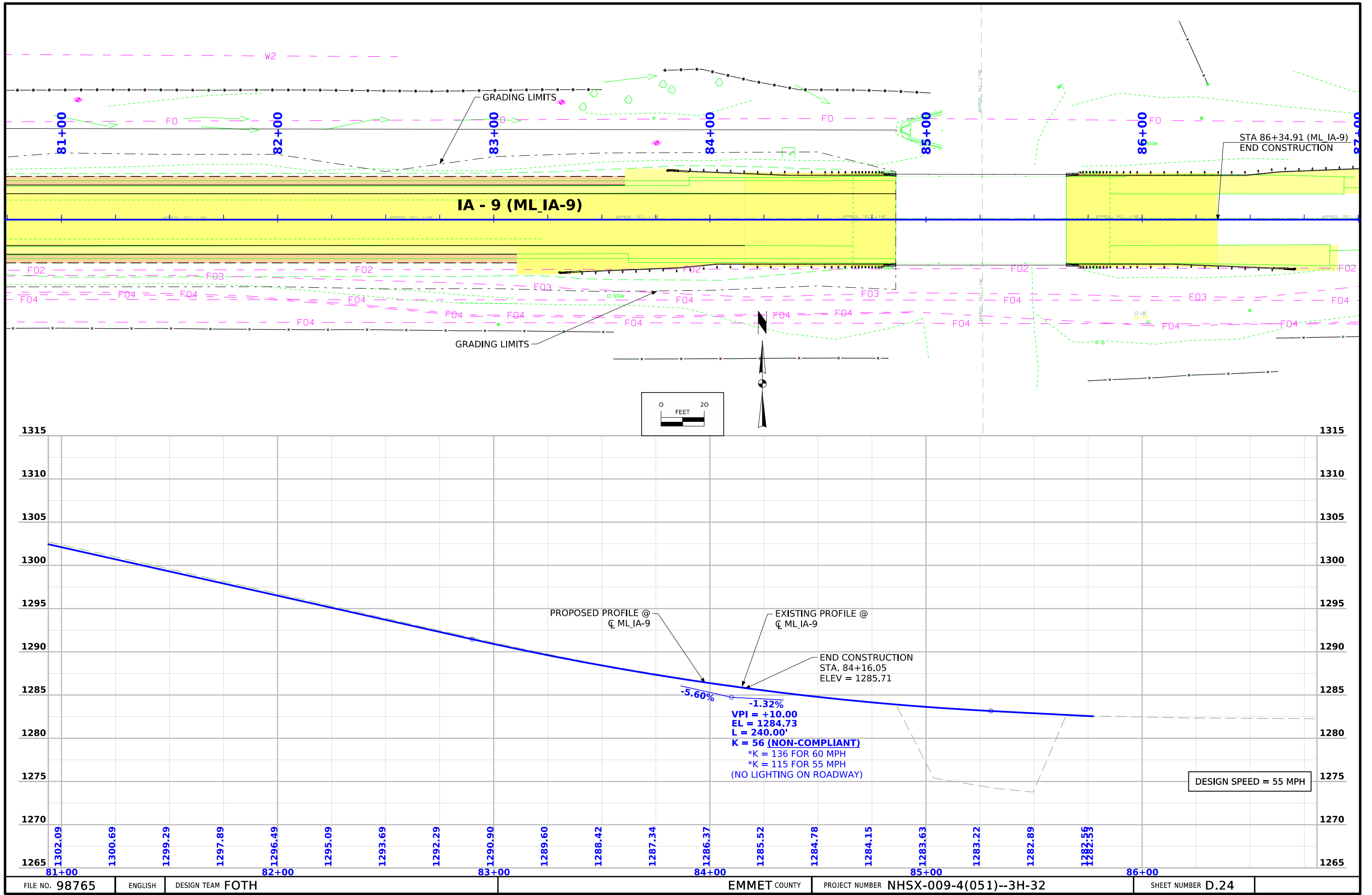


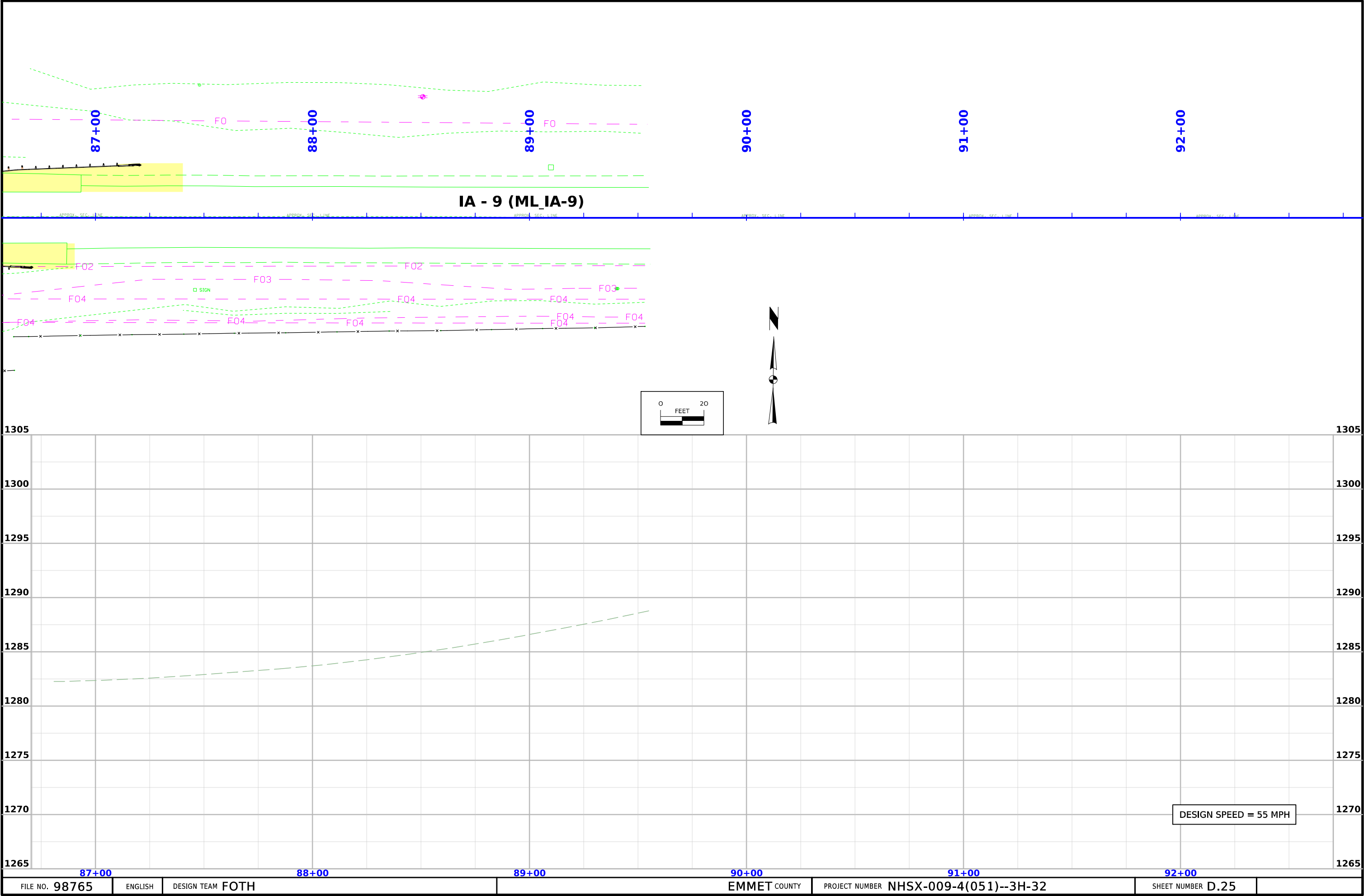
IA - 9 (ML_IA-9)

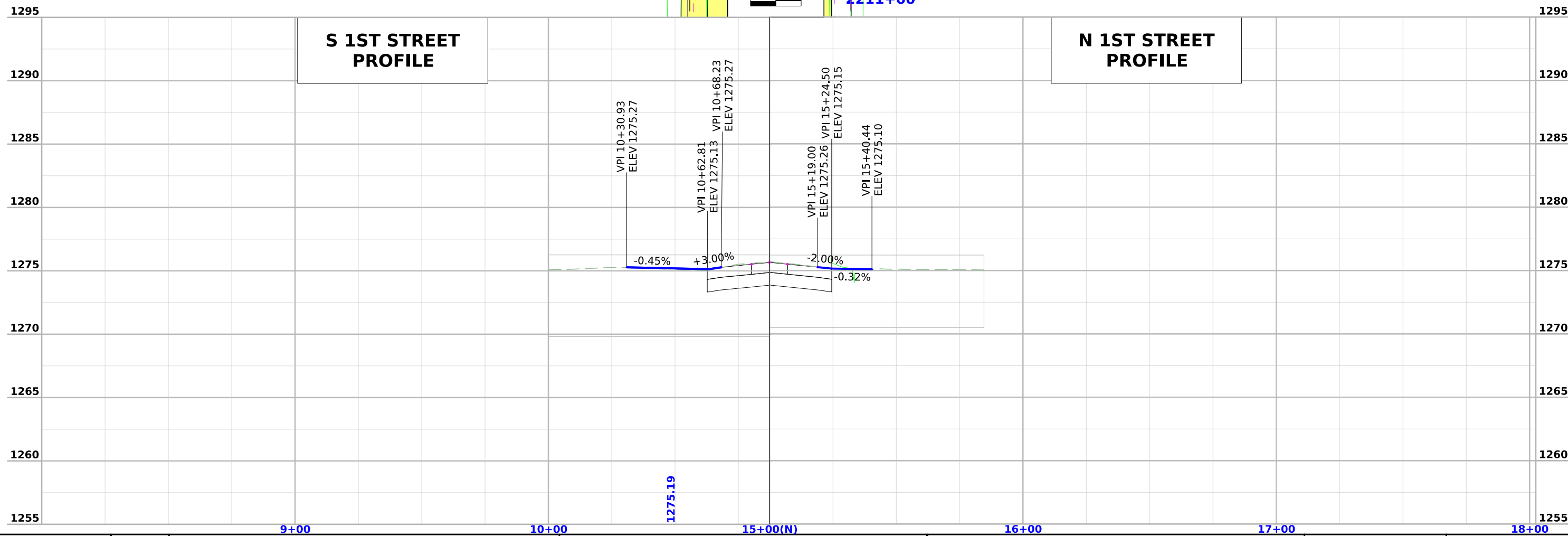
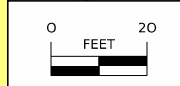
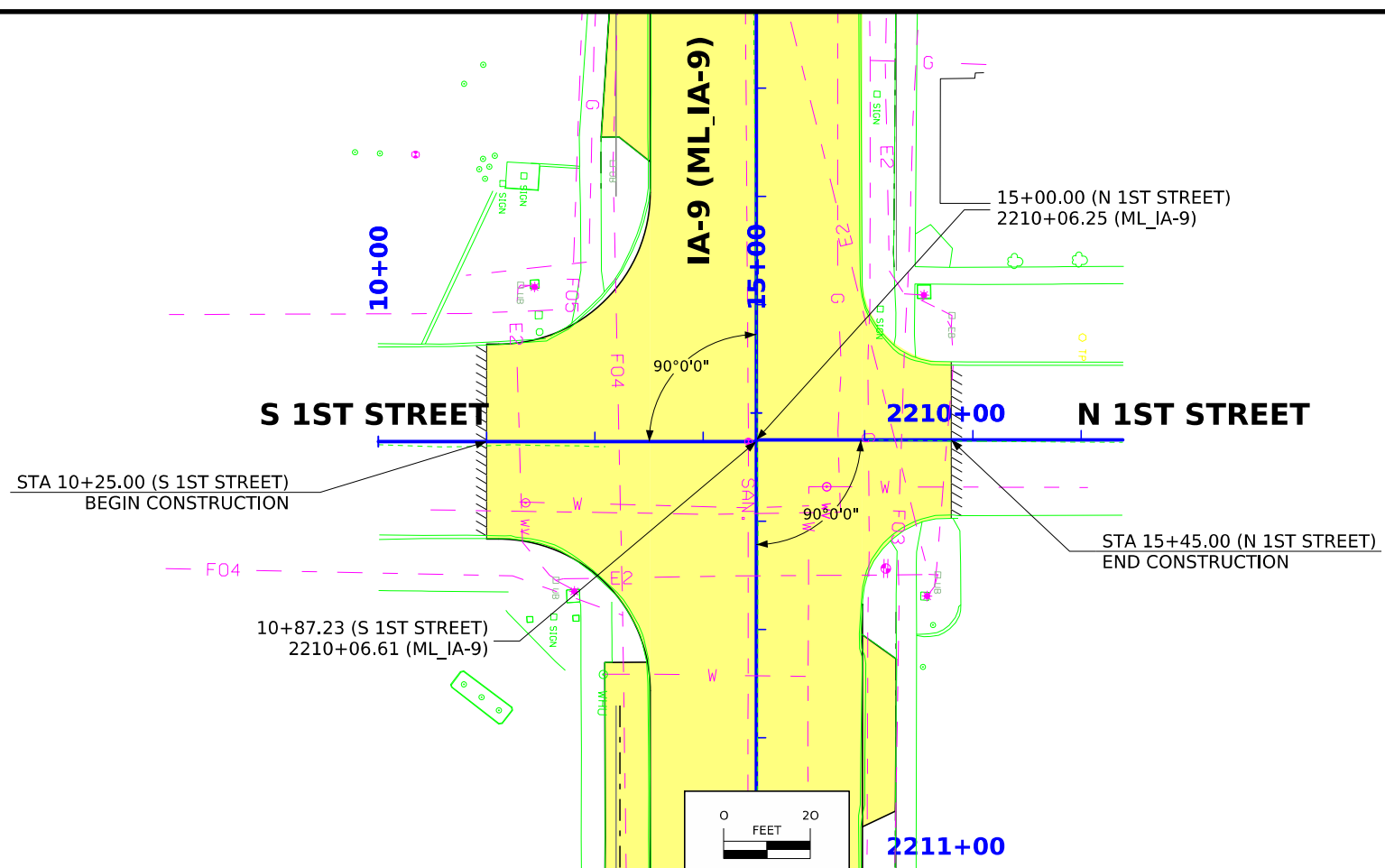
VPI = +75.00
EL = 1325.89
L = 400.00'
K = 69 (NON-COMPLIANT) *K = 151 FOR 60MPH (900' CURVE + 3.5' LOW)
*K = 114 FOR 55MPH (700' CURVE + 2' LOW)

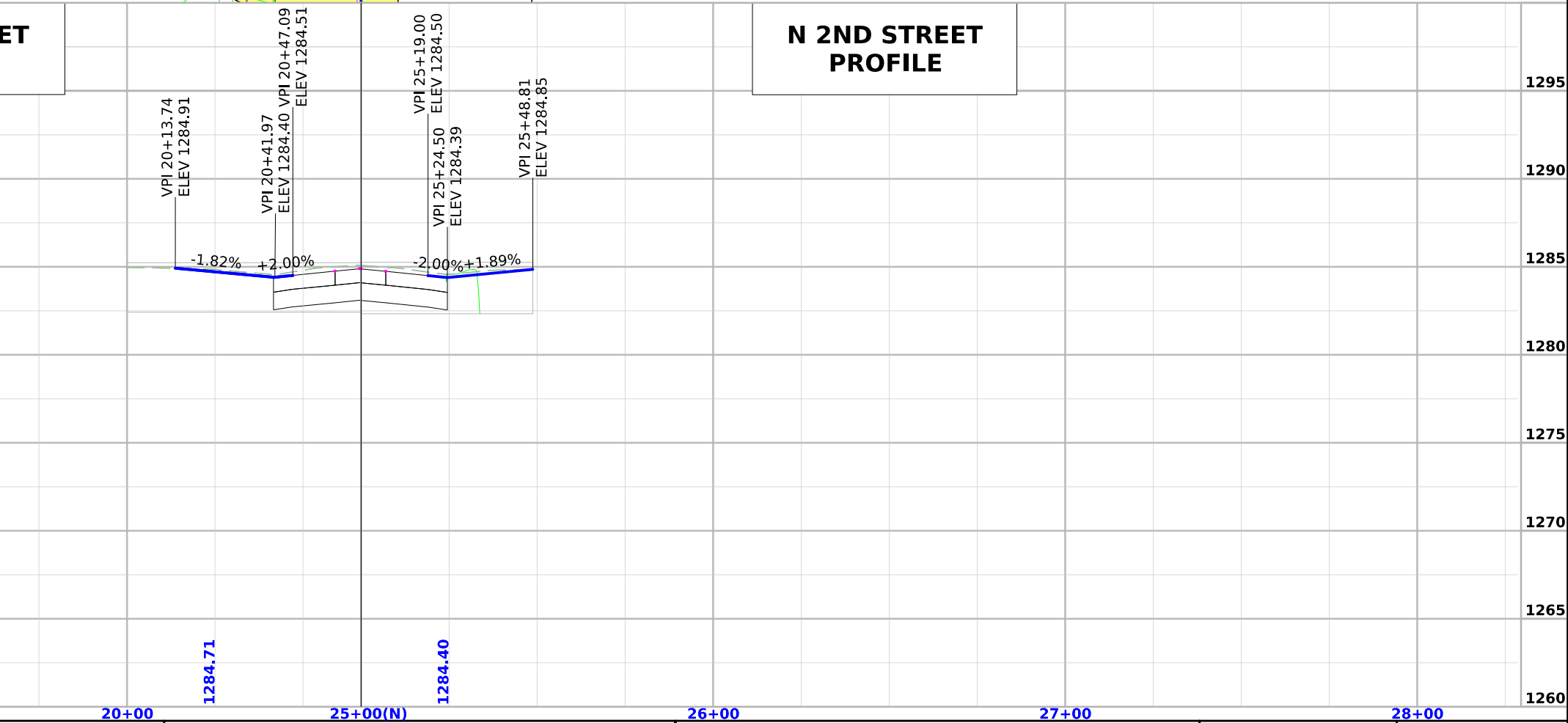
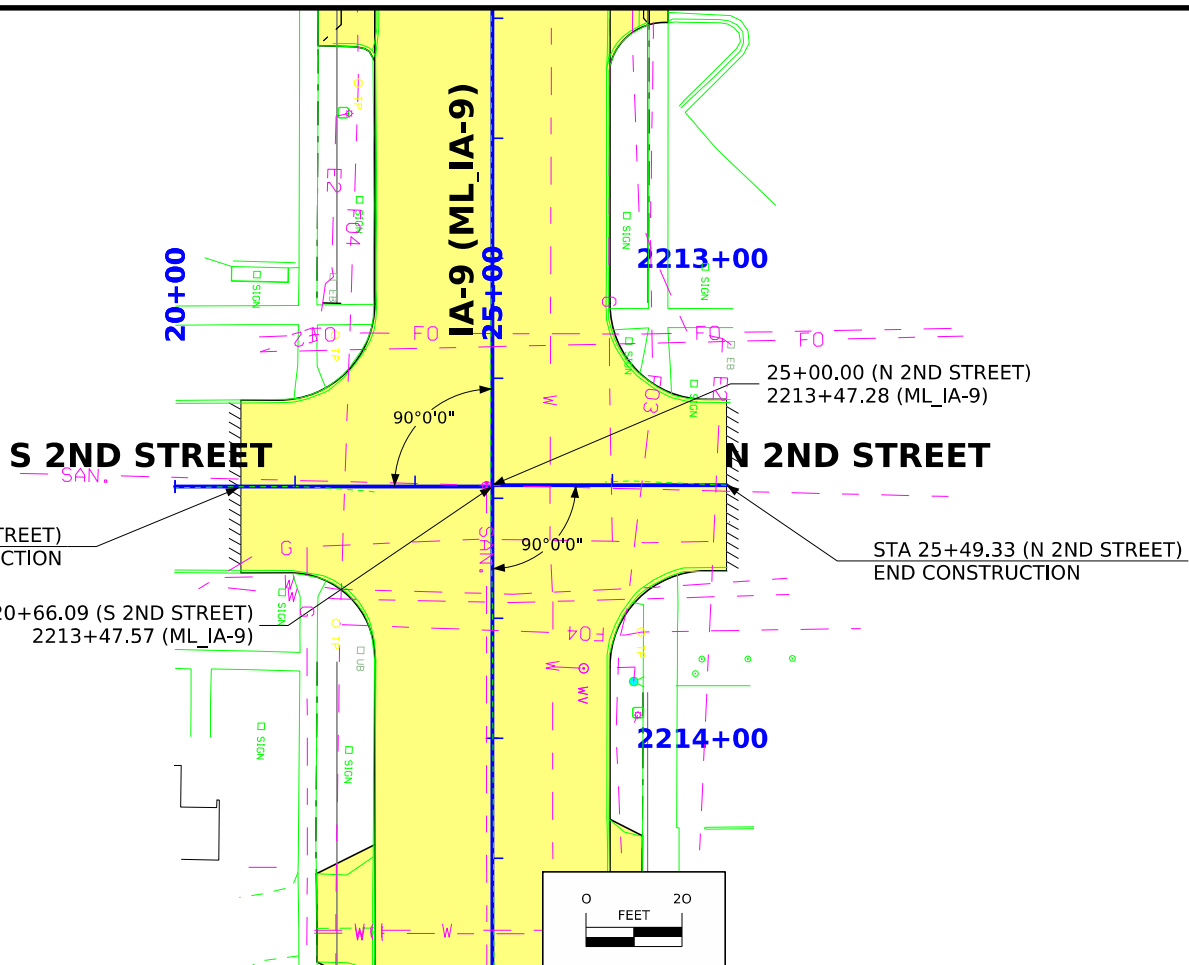


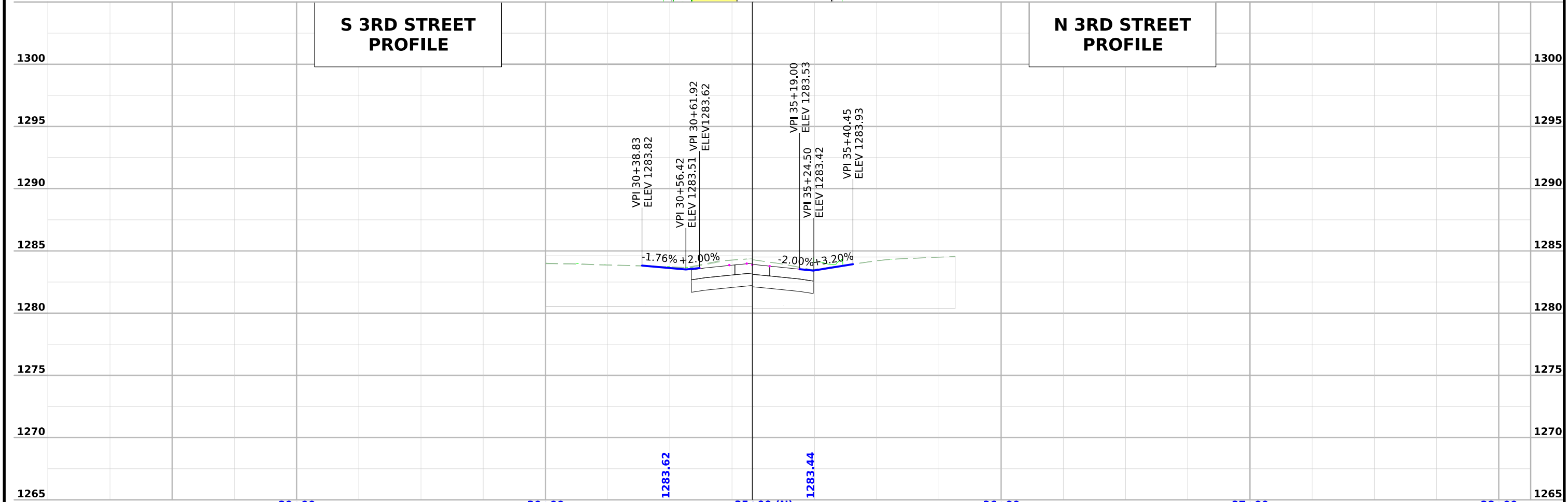
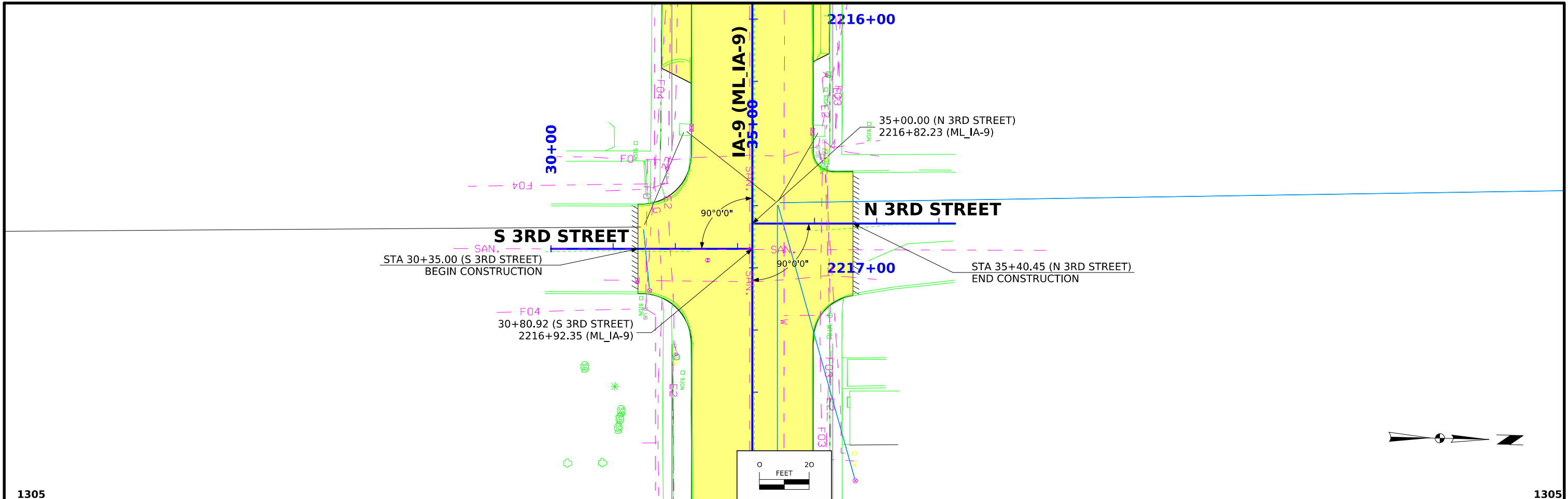
DESIGN SPEED = 55 MPH

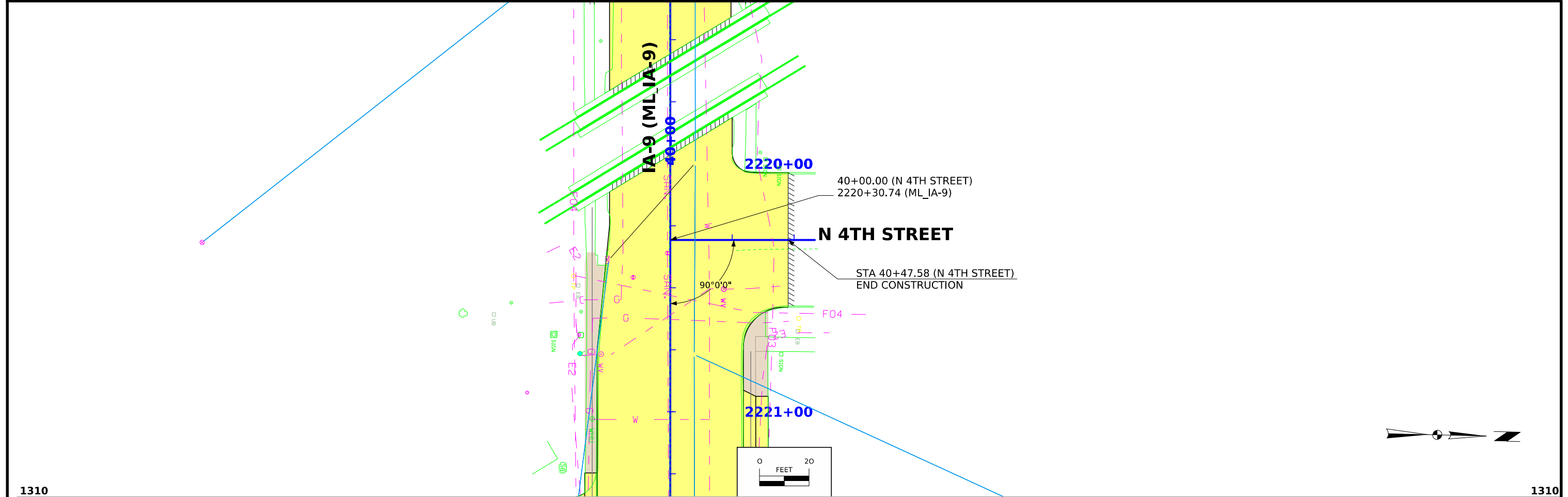




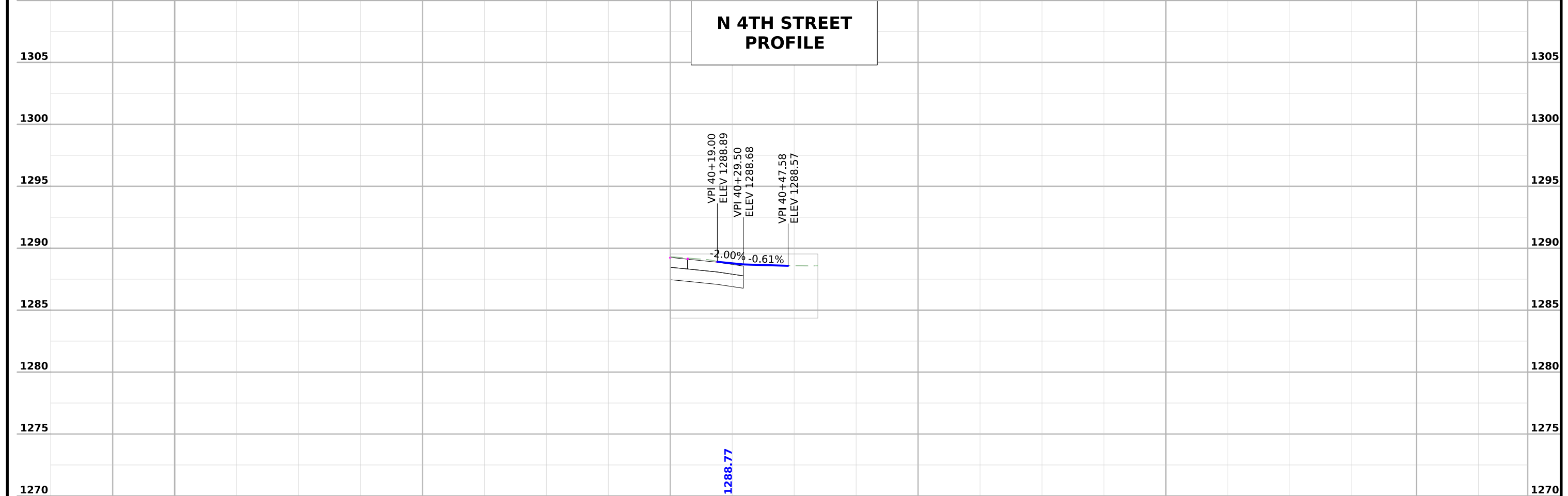


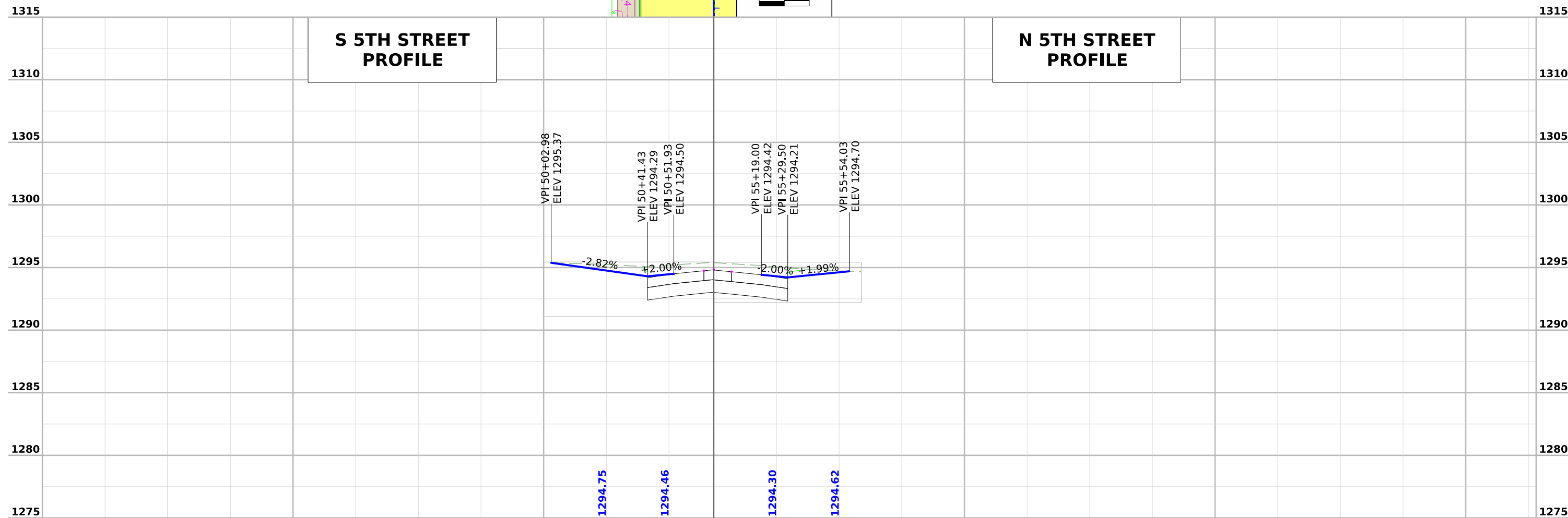
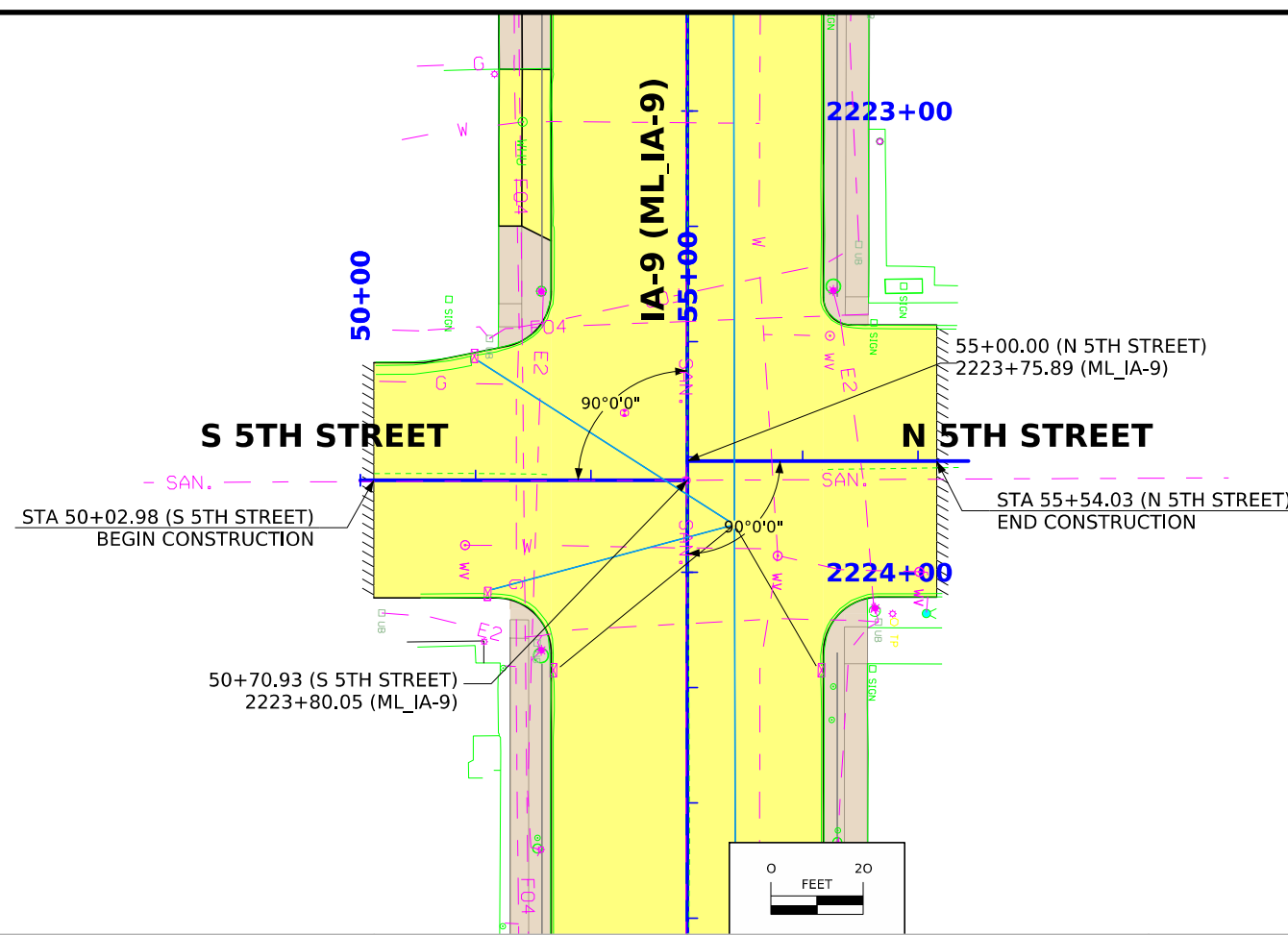


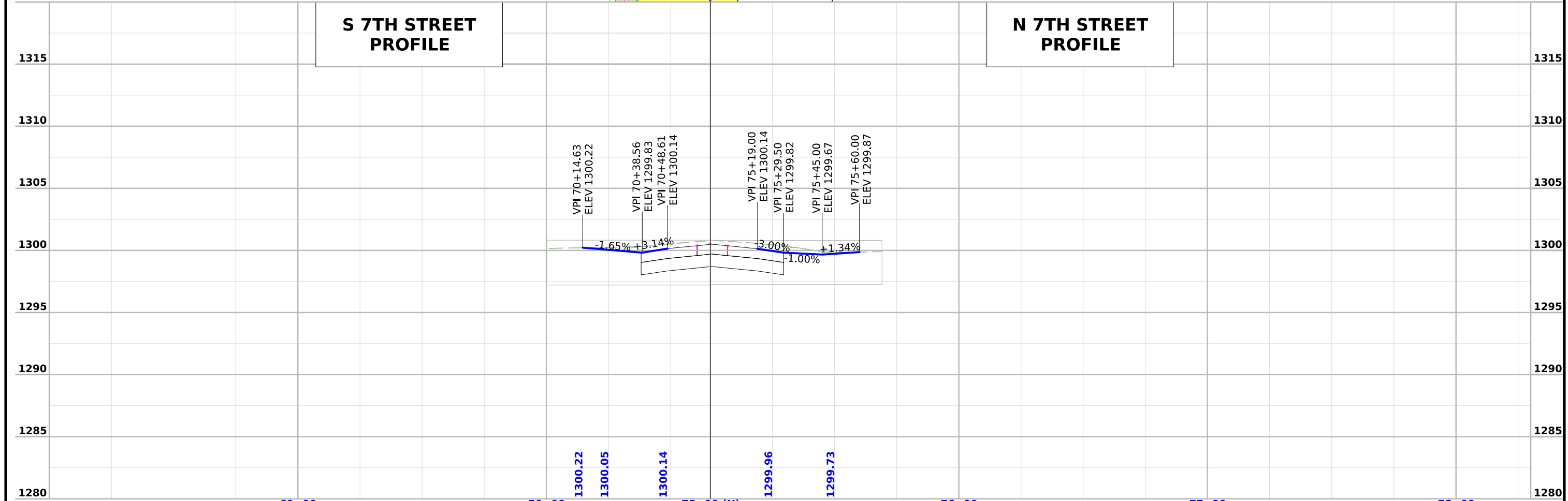
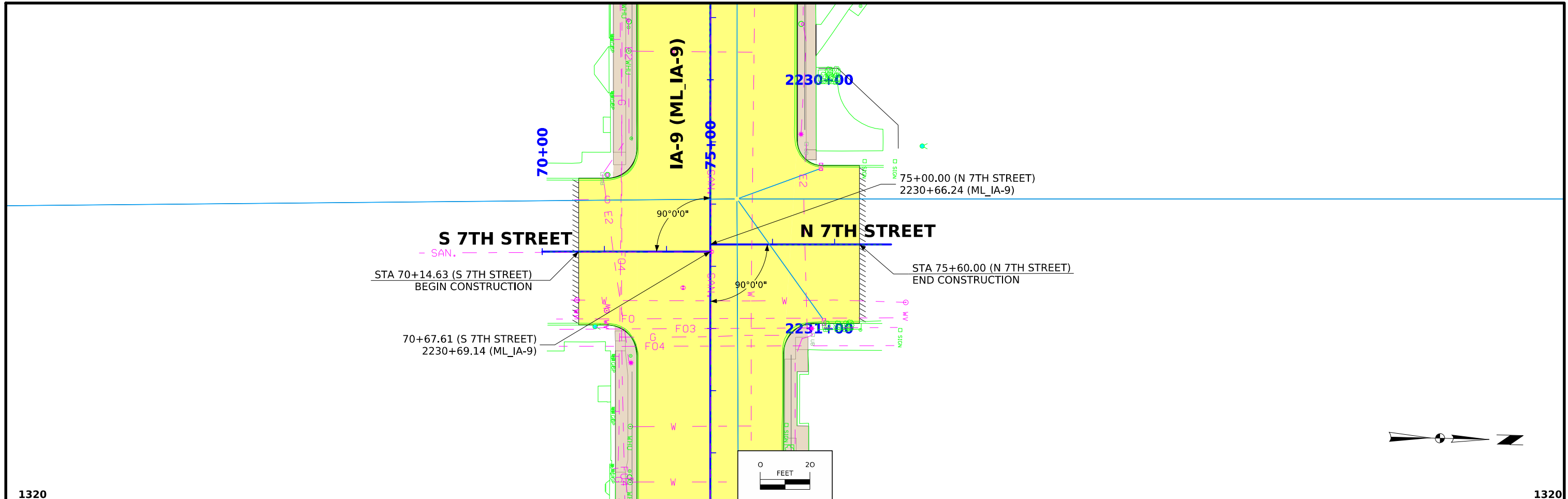


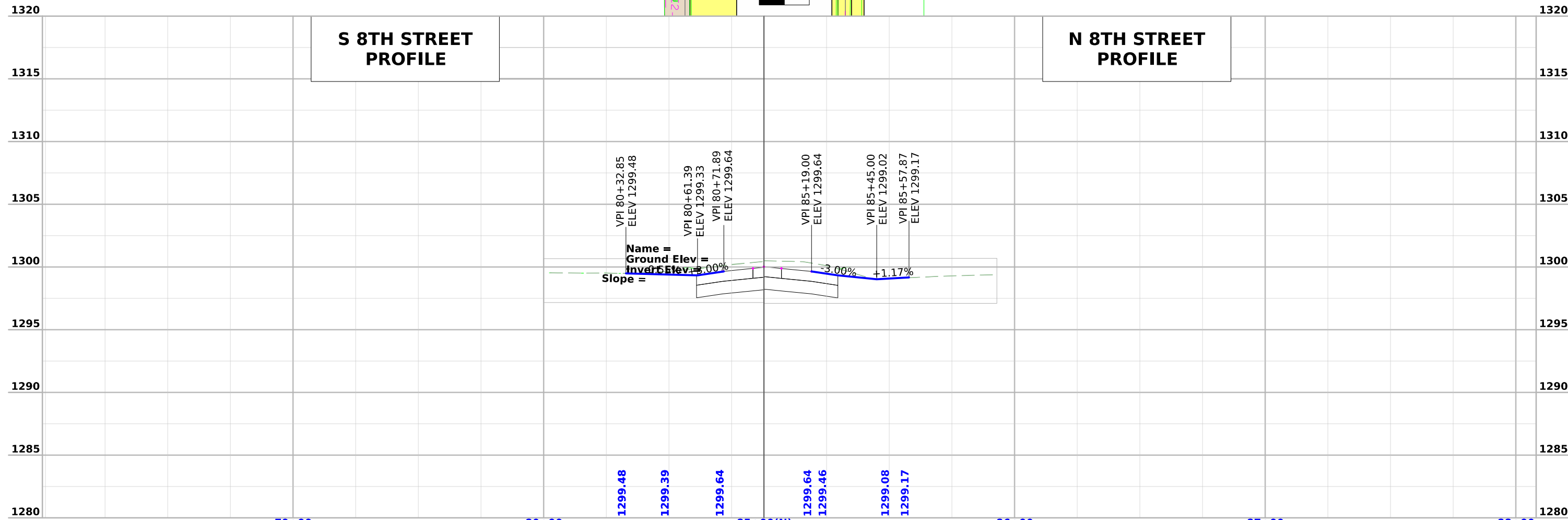
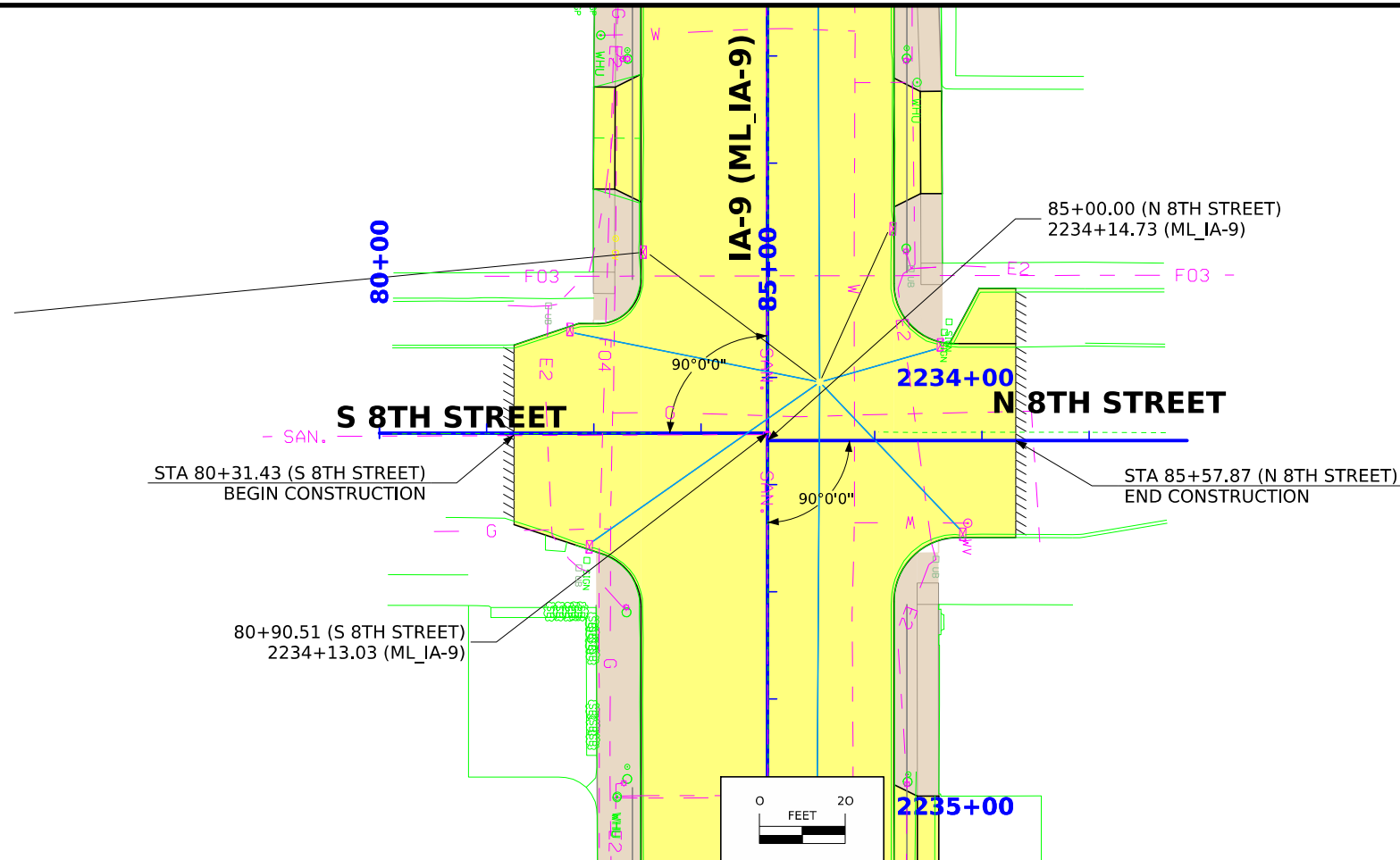


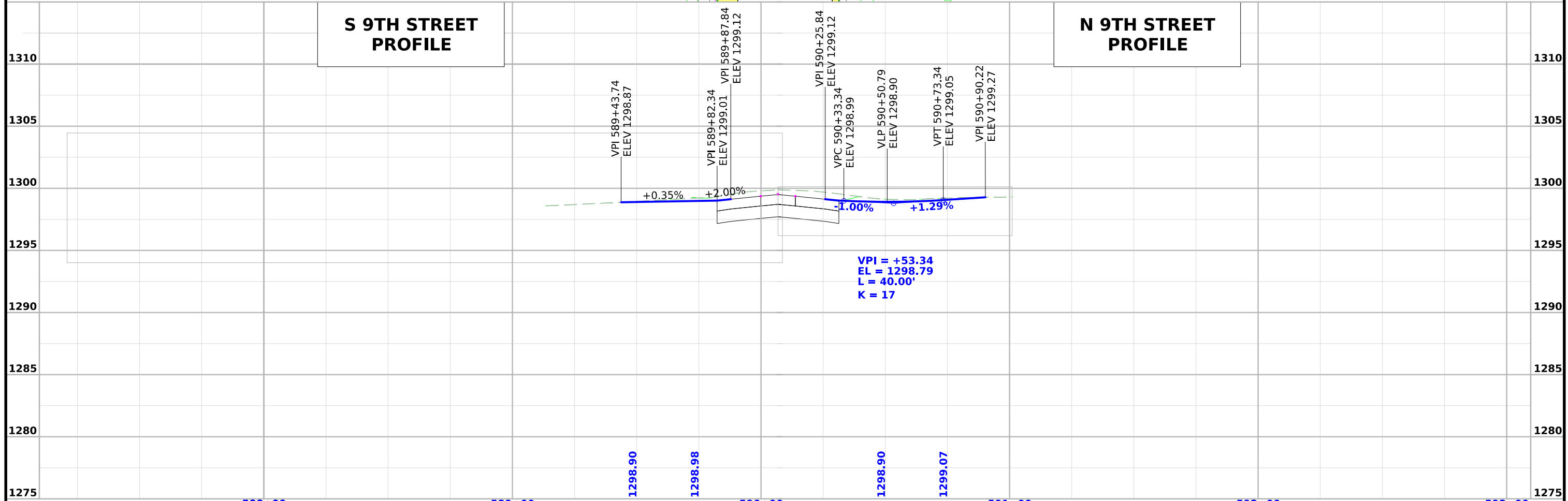
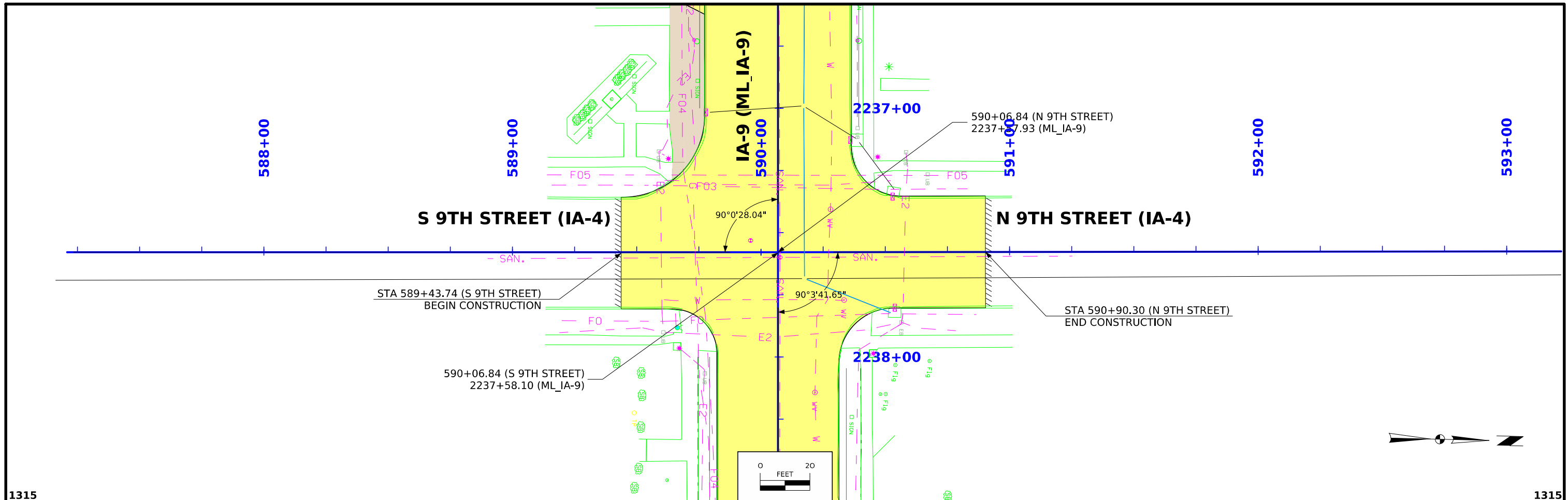
**N 4TH STREET
PROFILE**

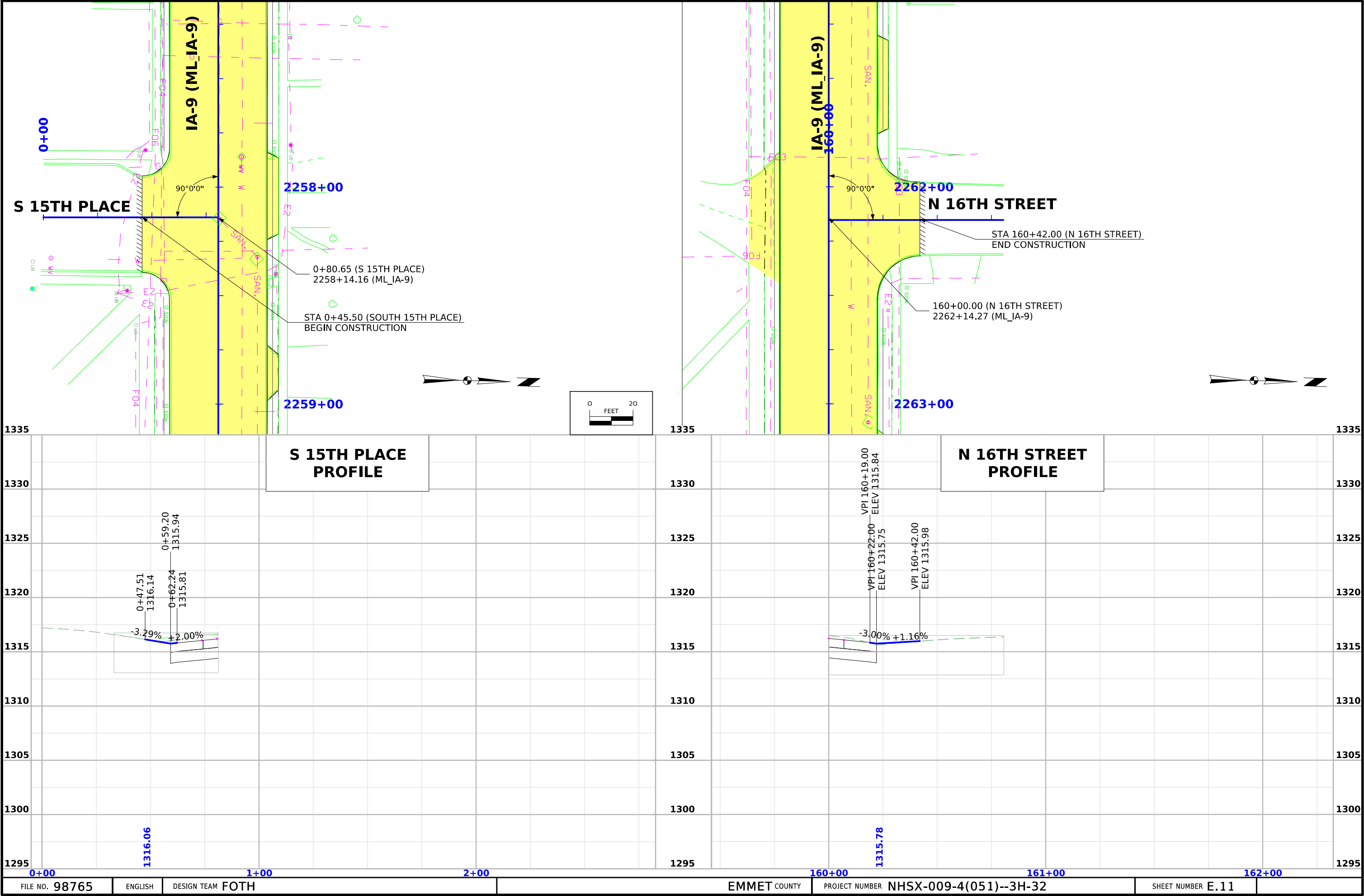


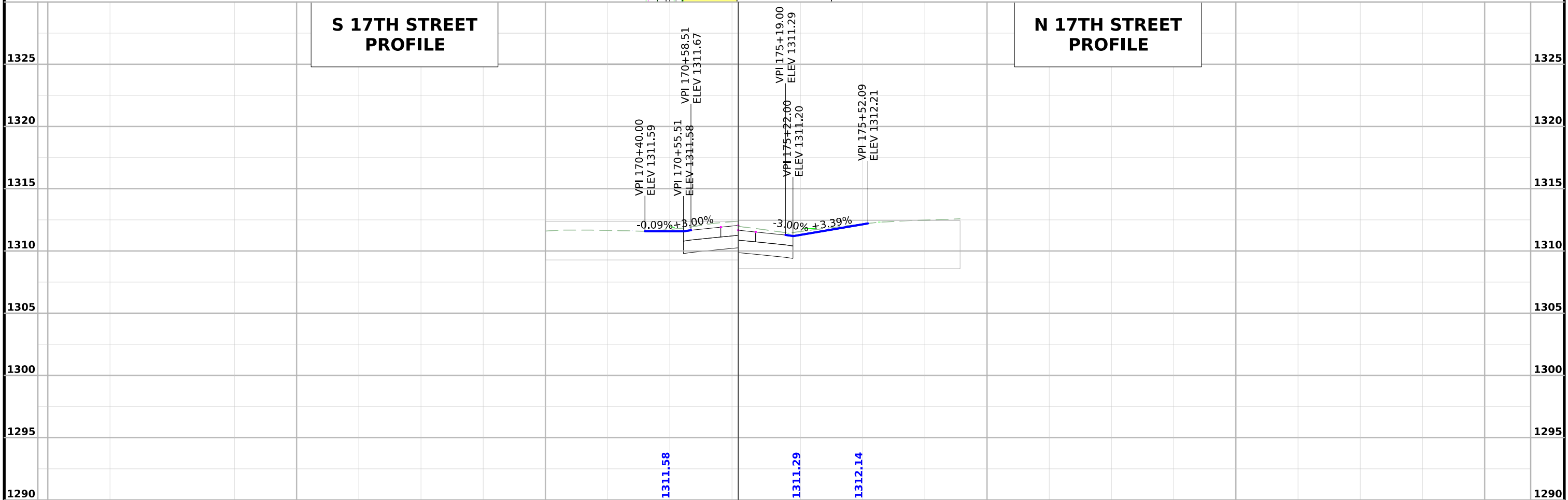
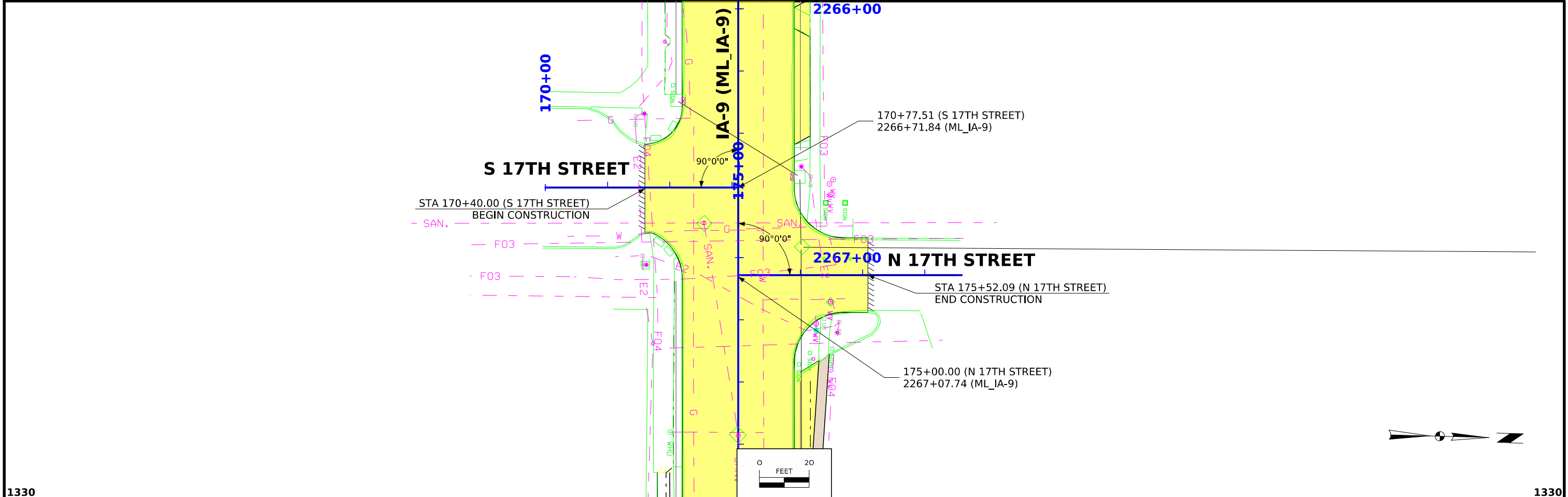


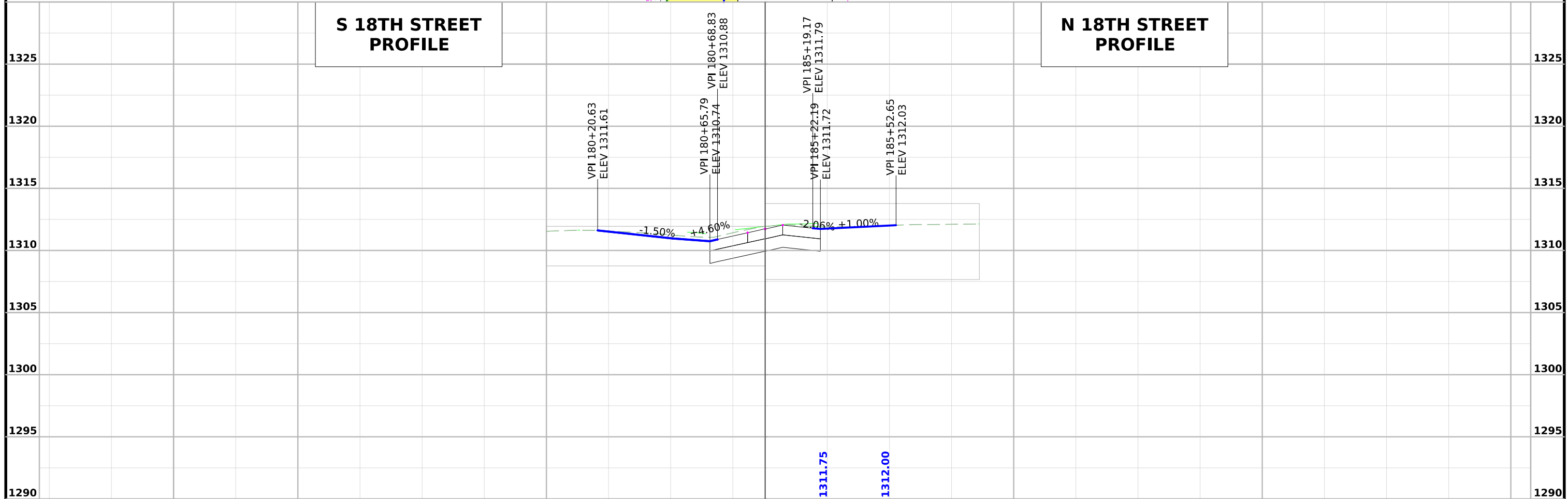
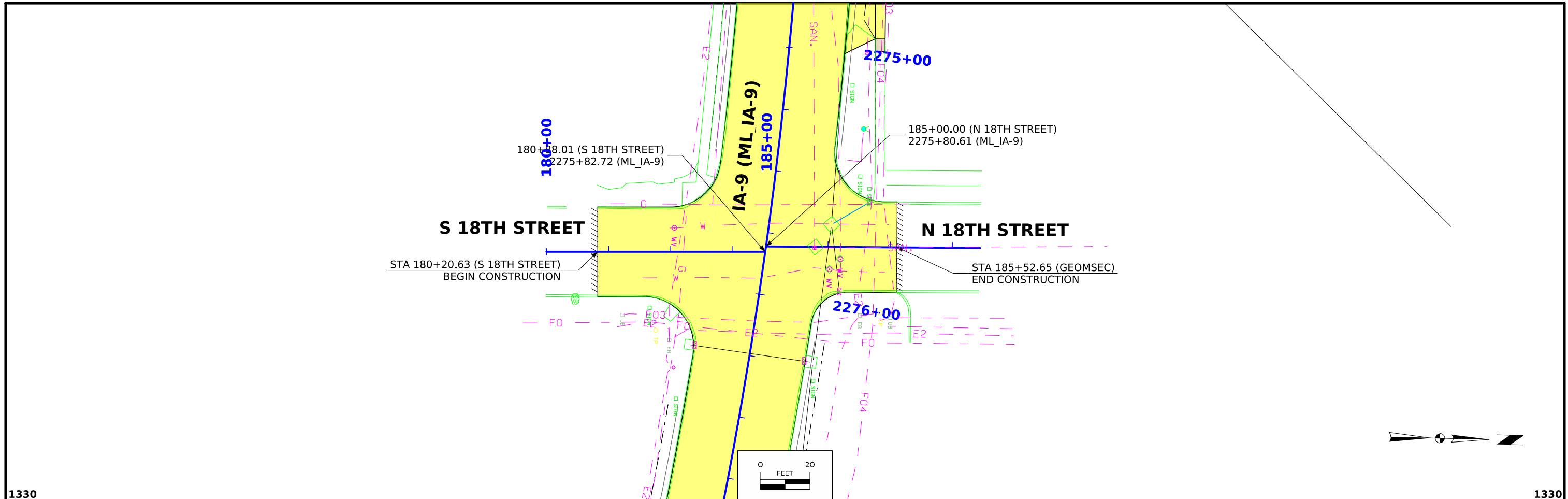


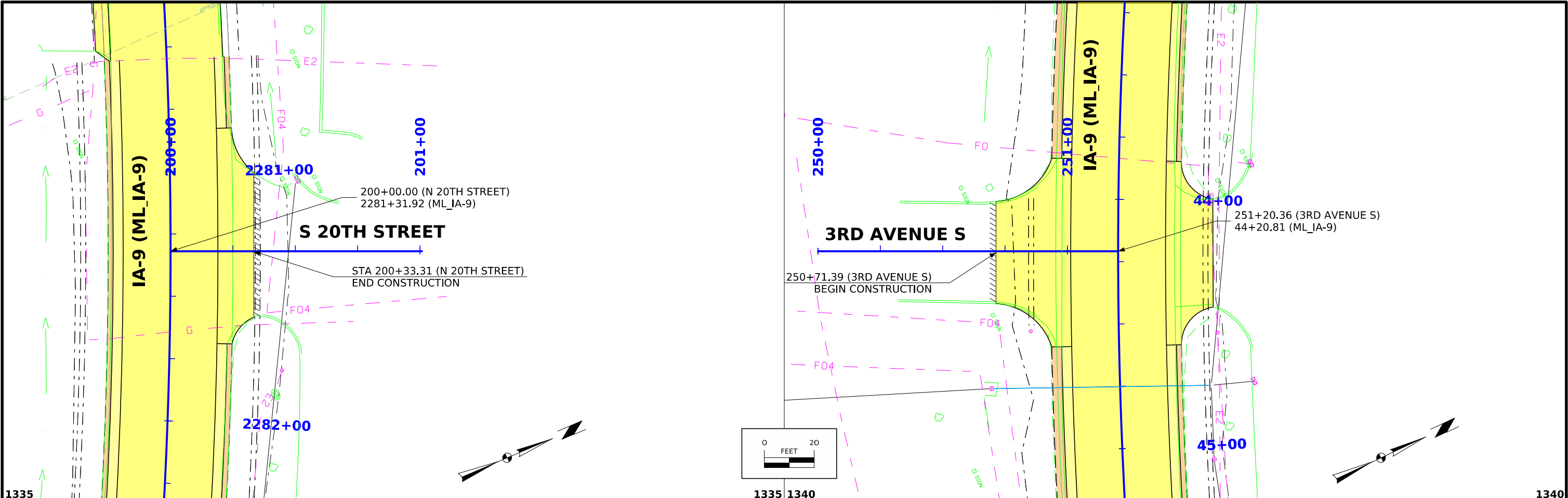


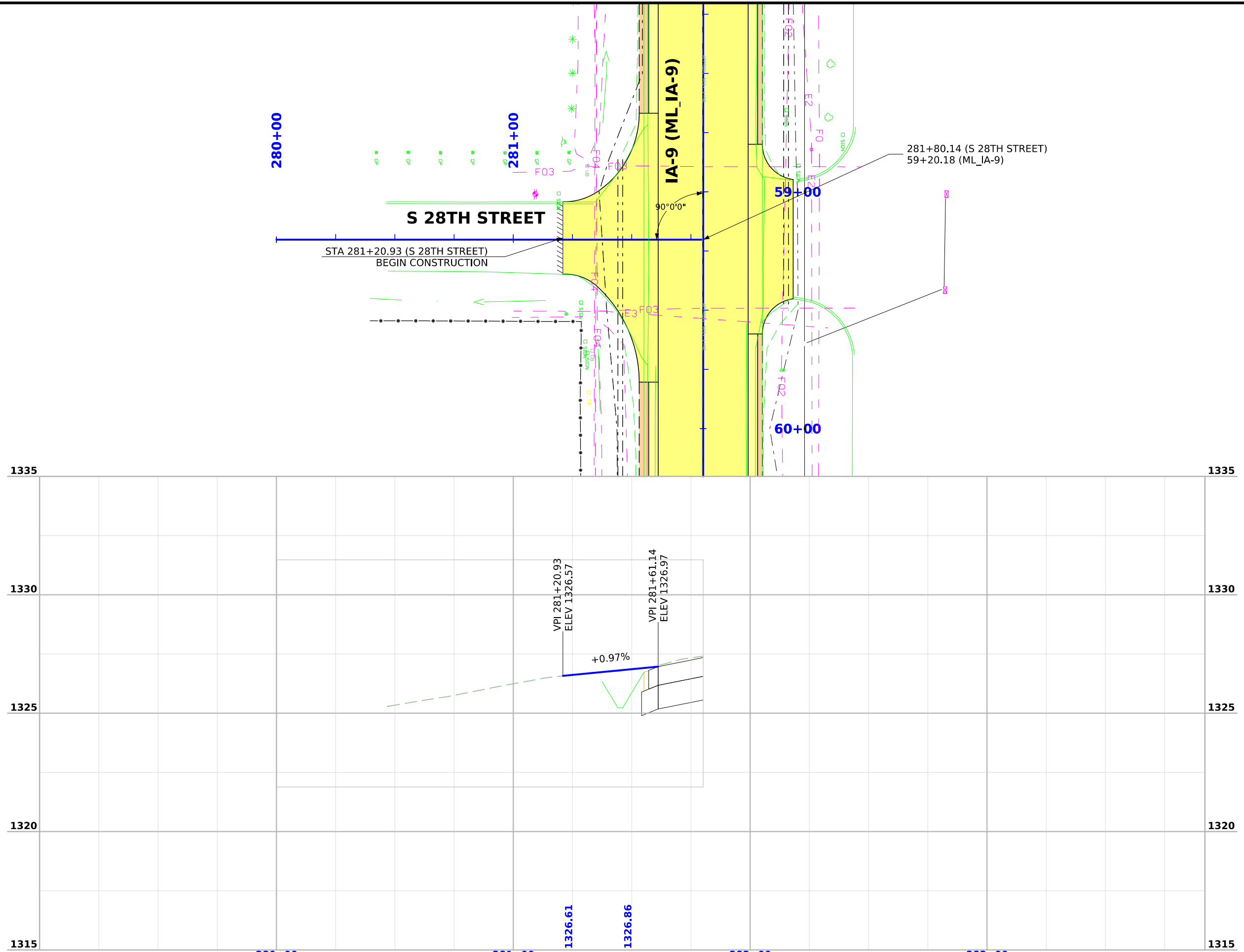




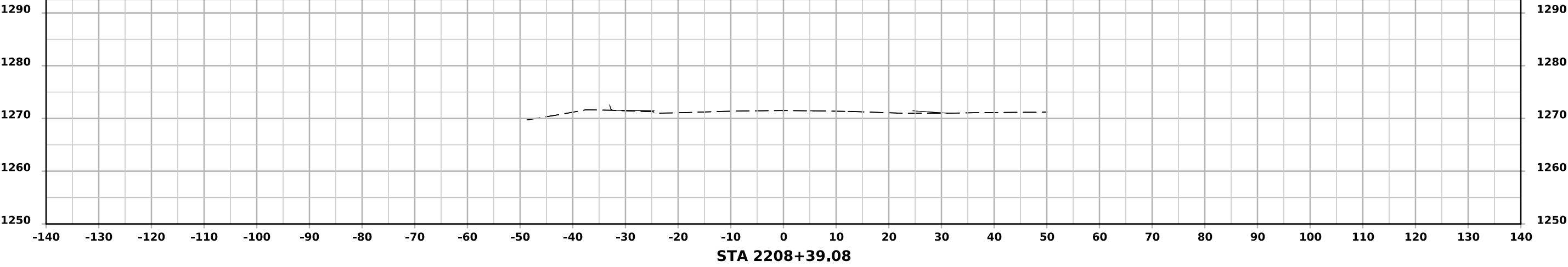
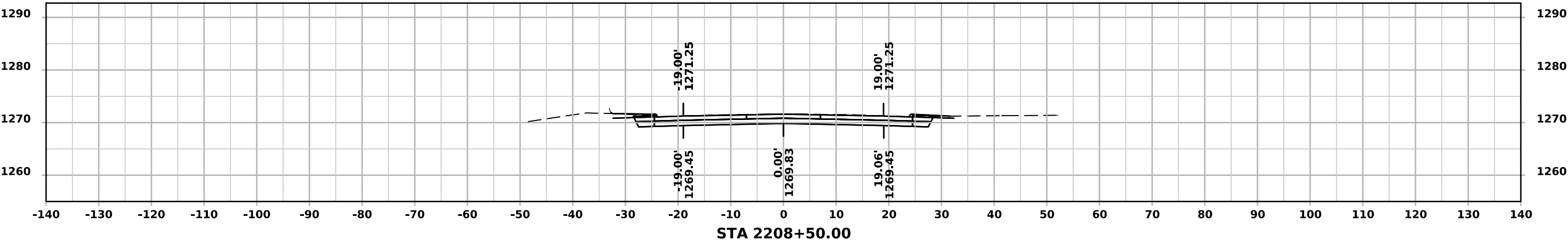
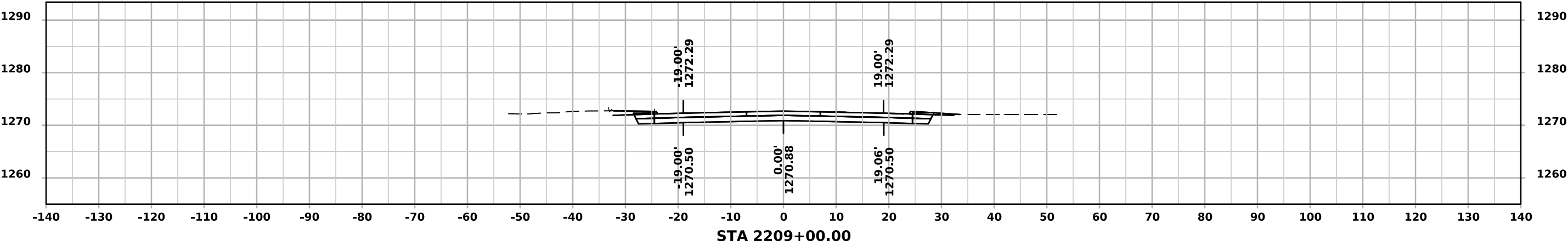




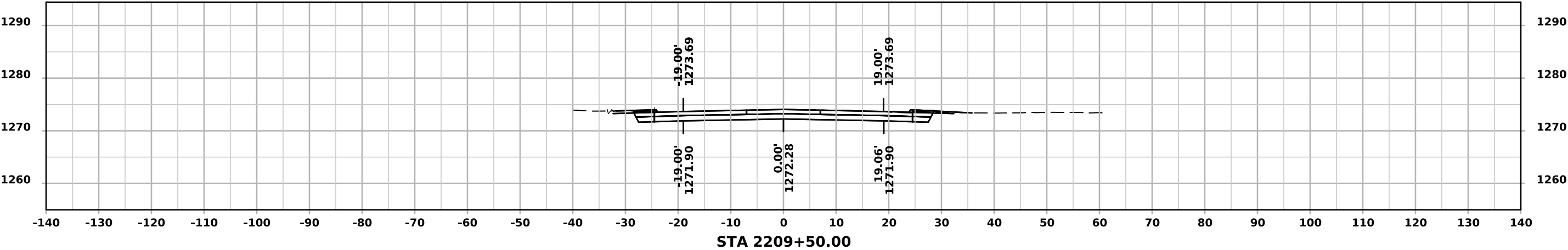
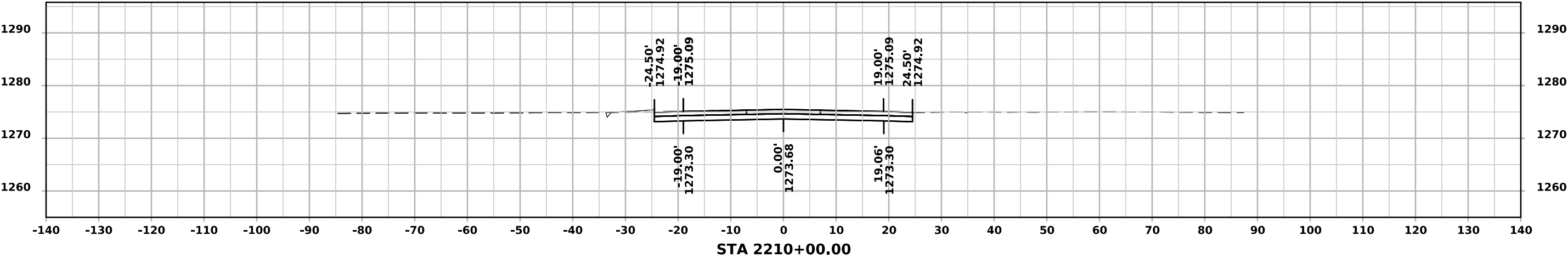
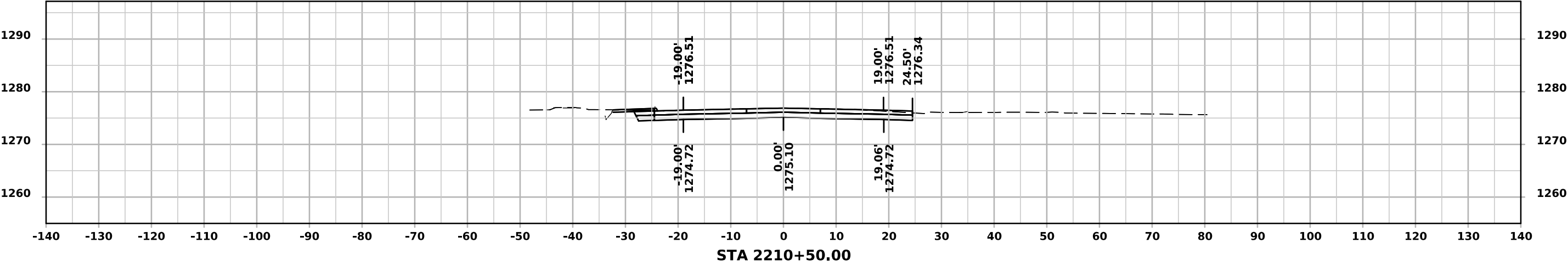




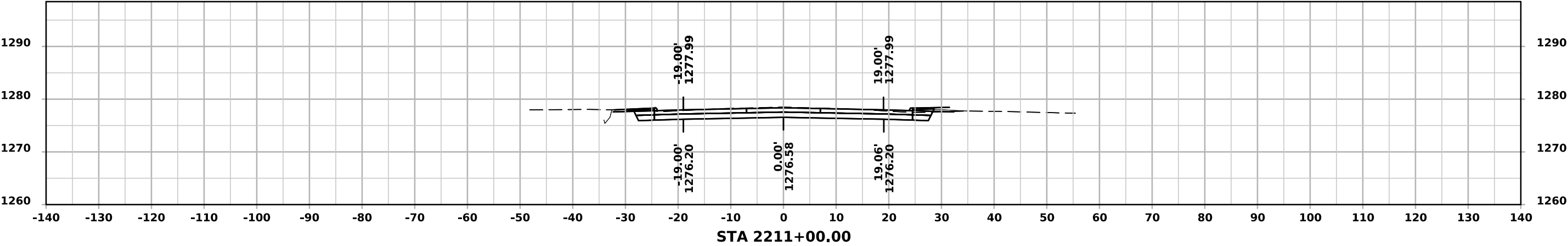
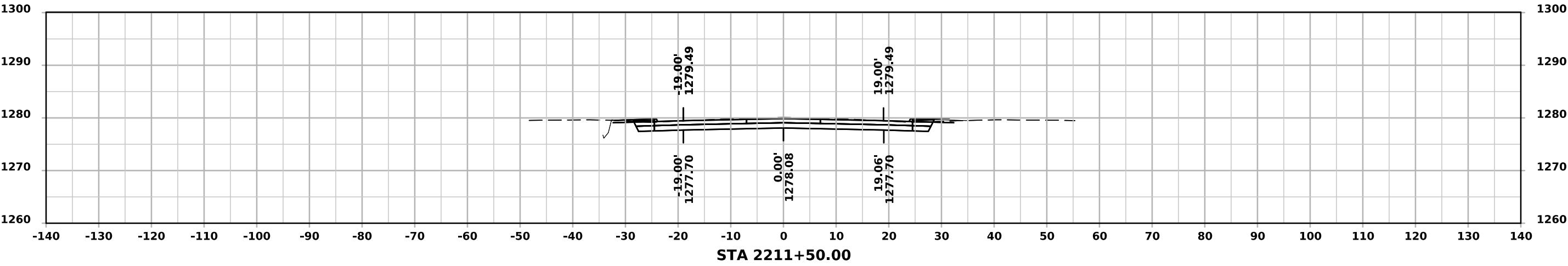
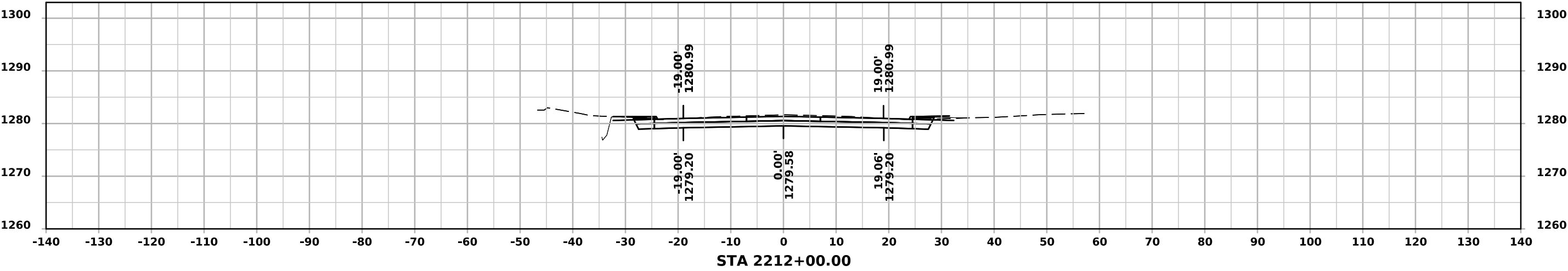
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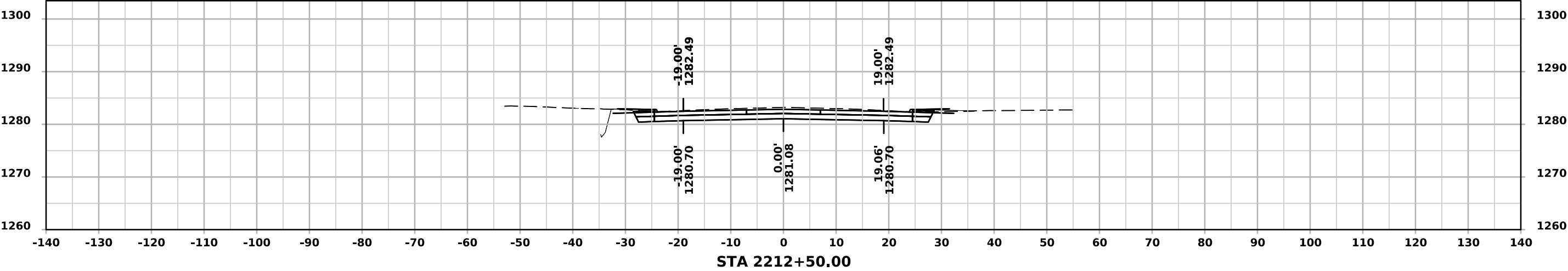
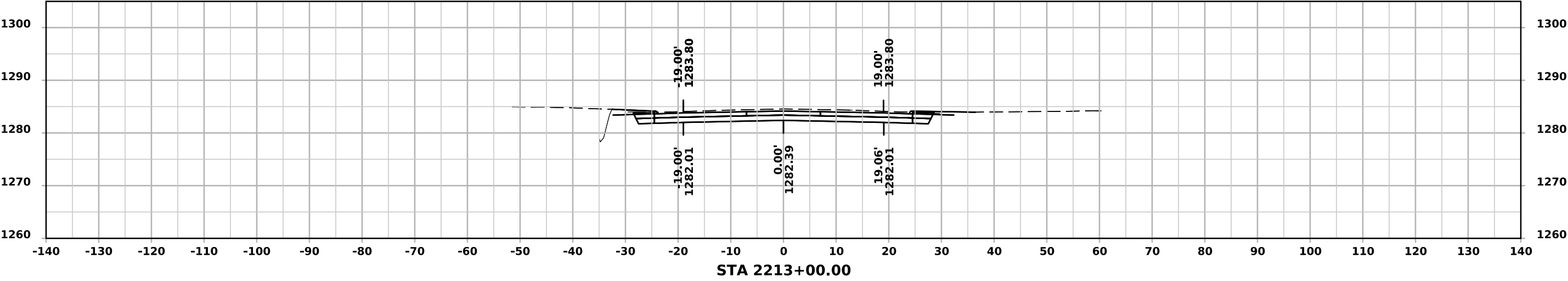
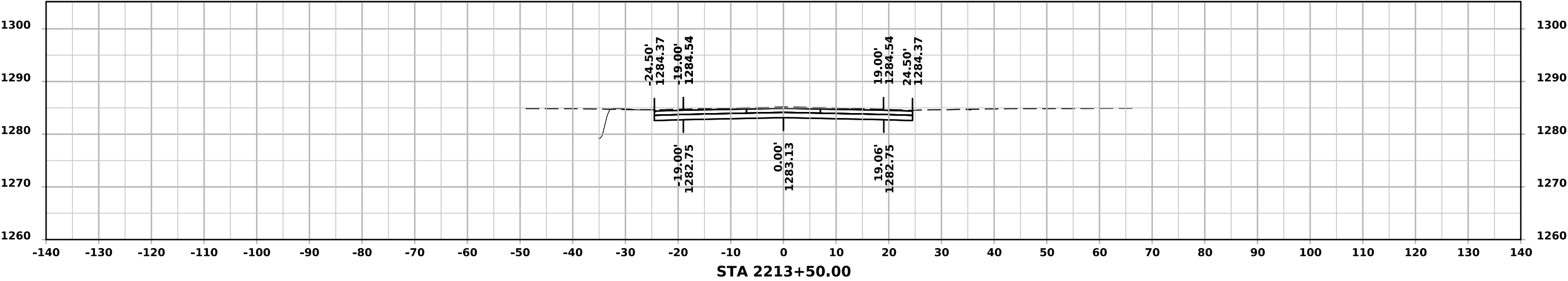
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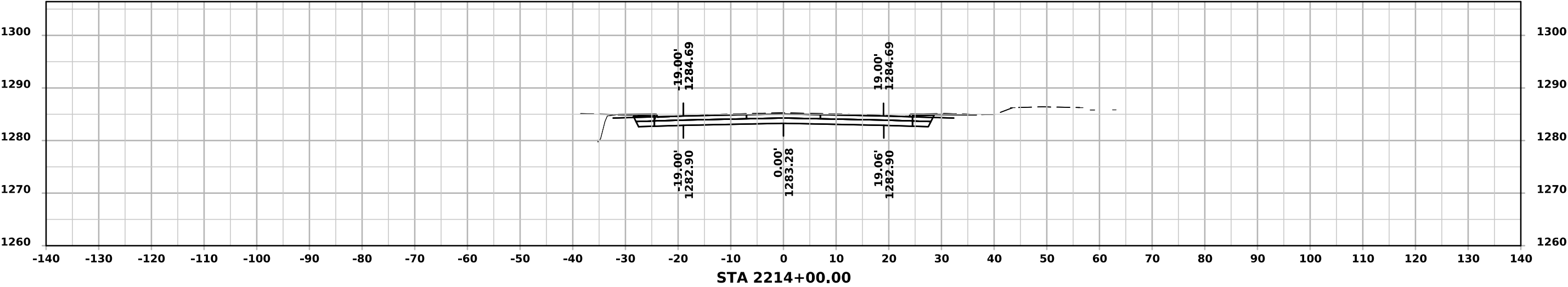
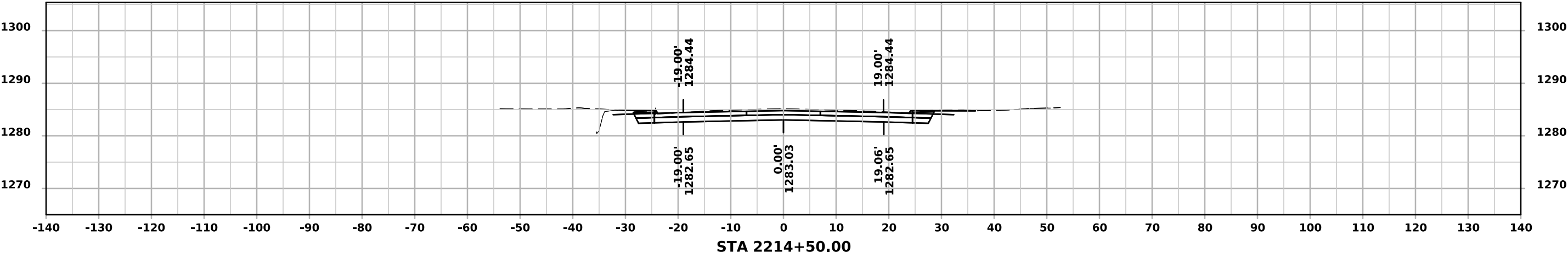
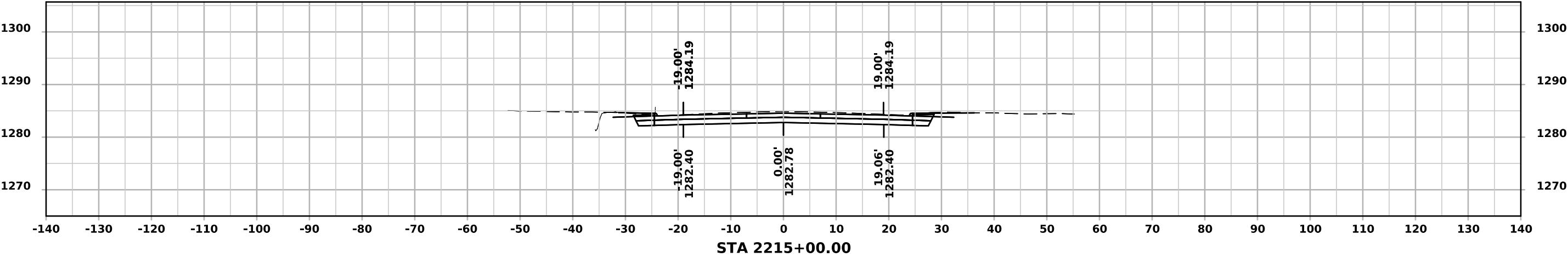
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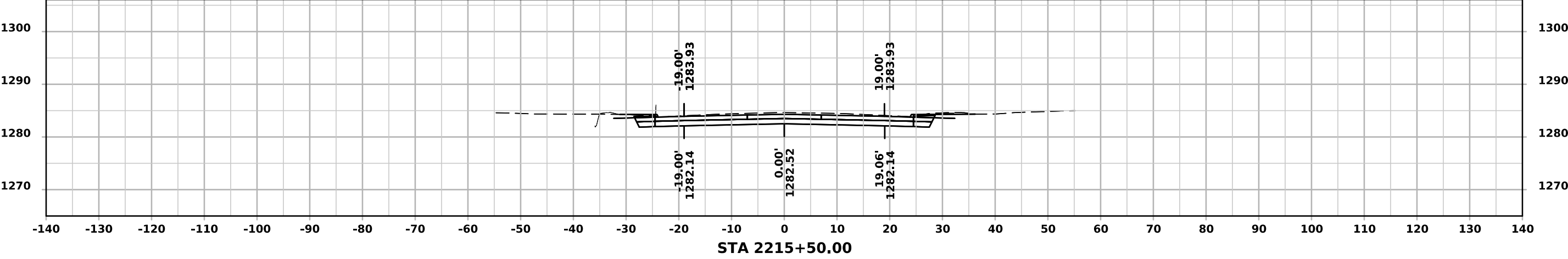
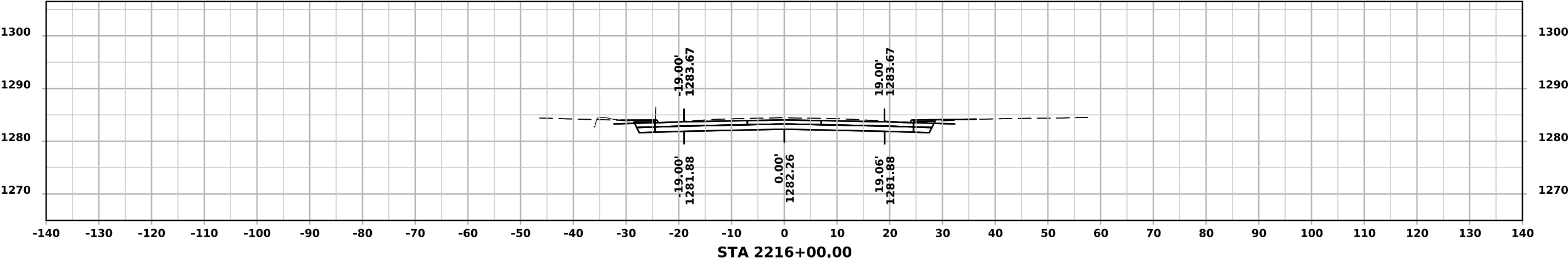
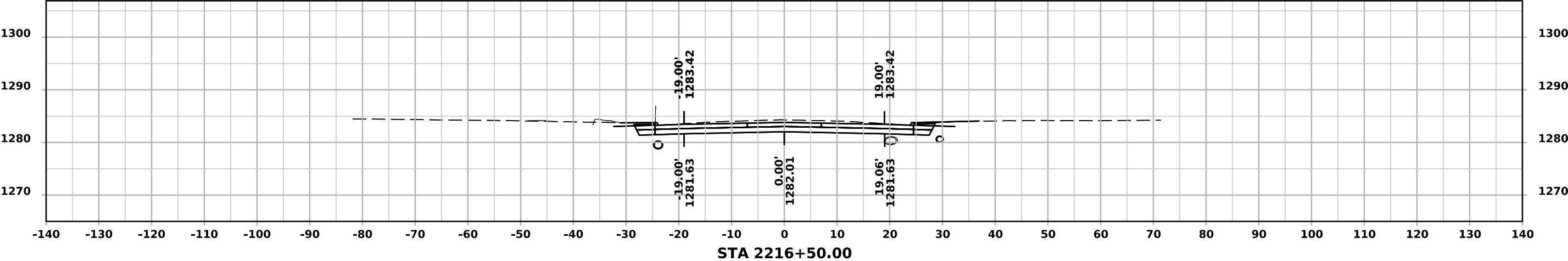
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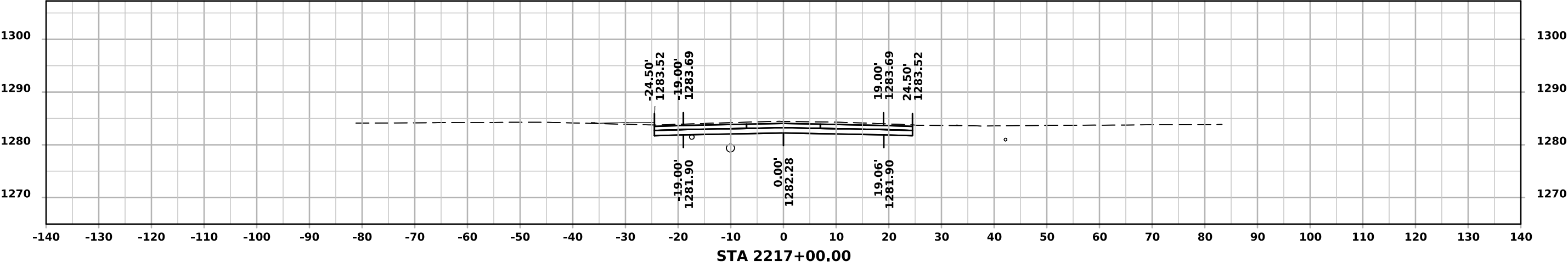
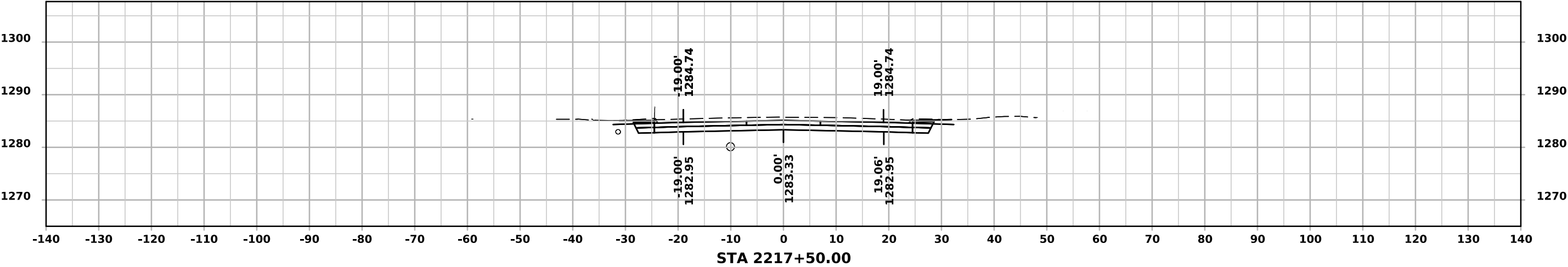
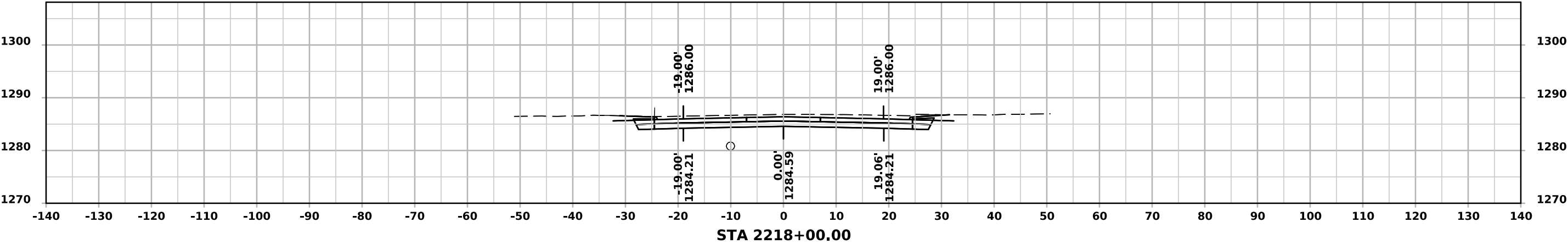
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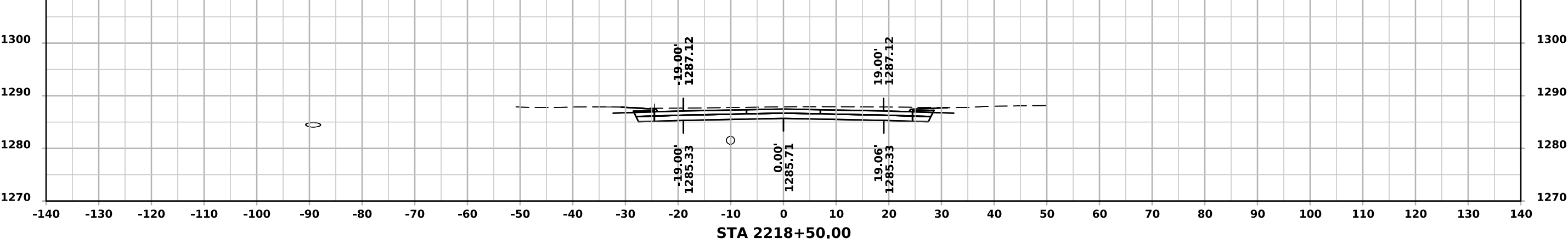
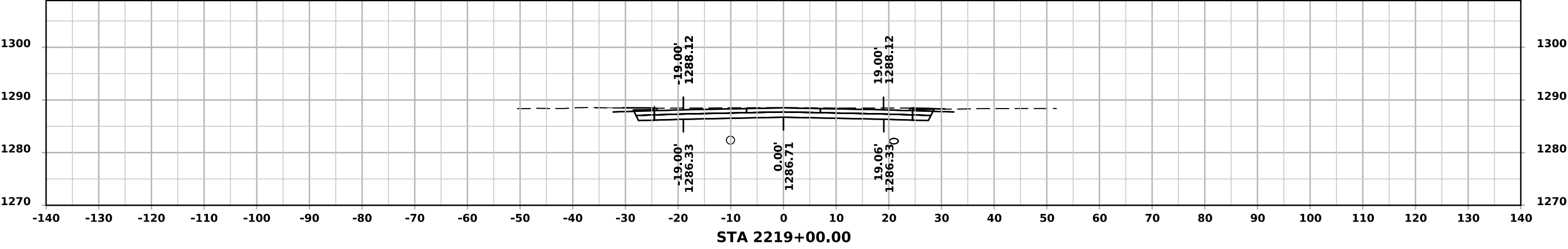
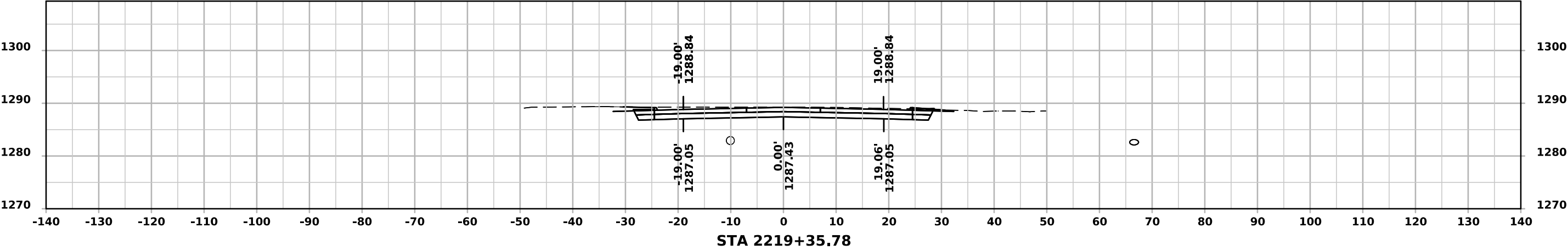
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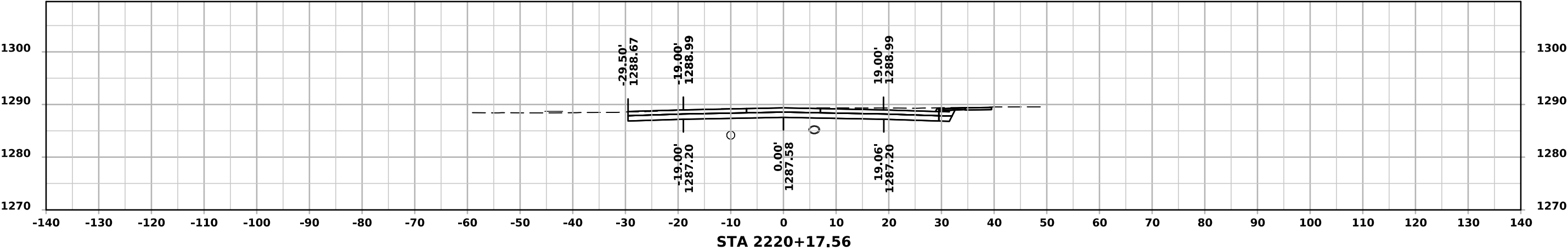
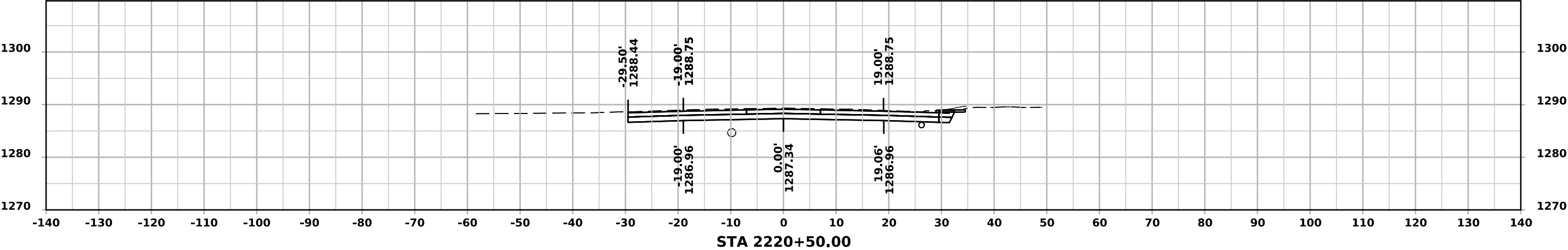
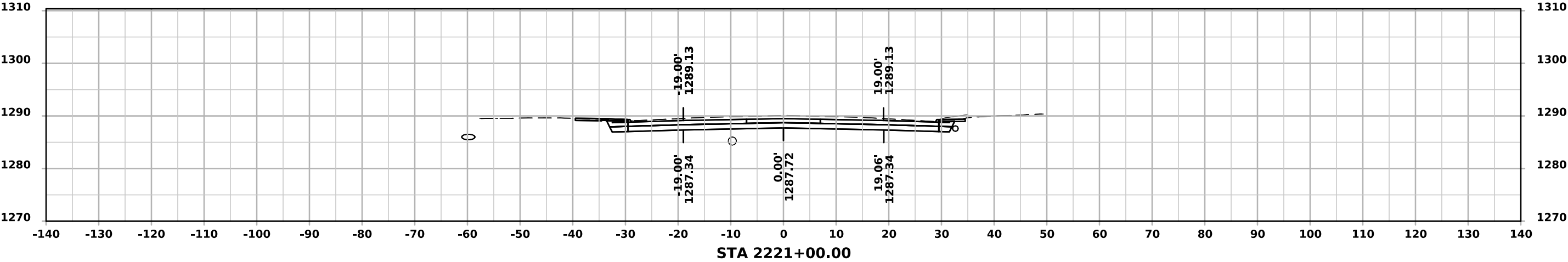
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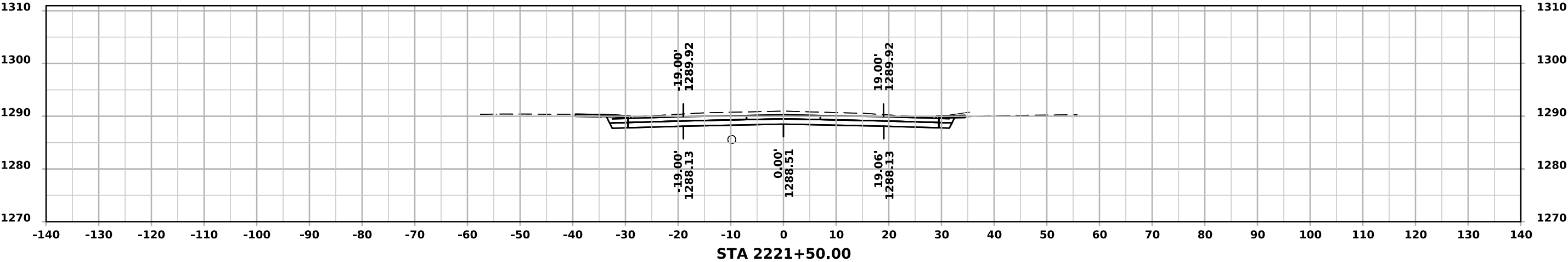
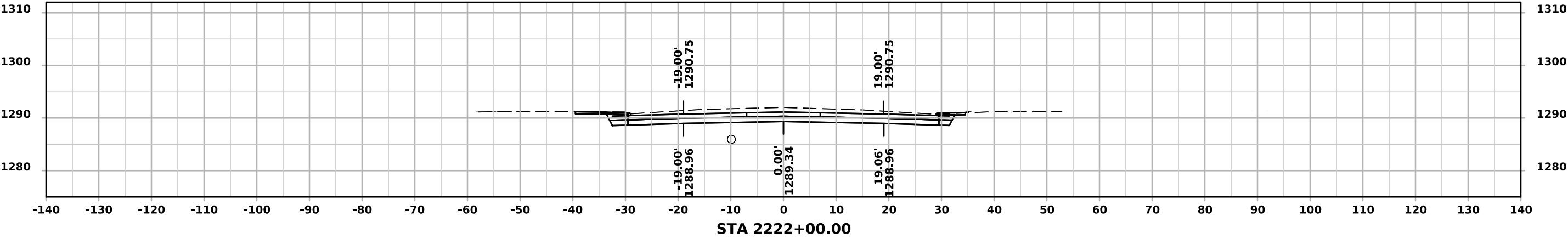
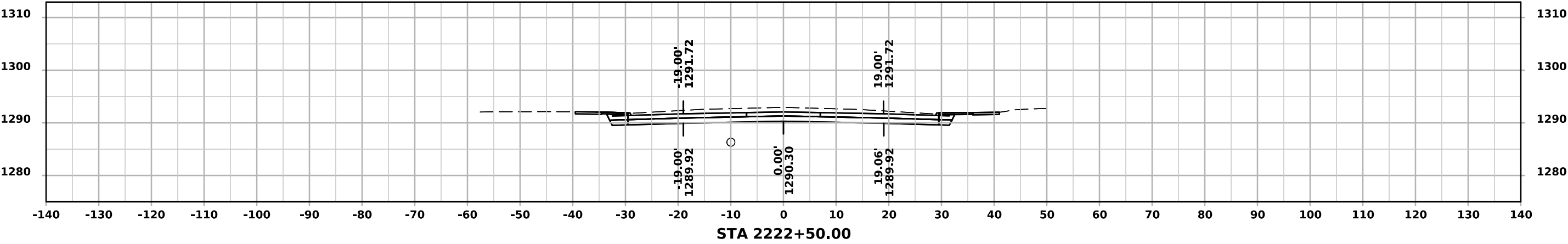
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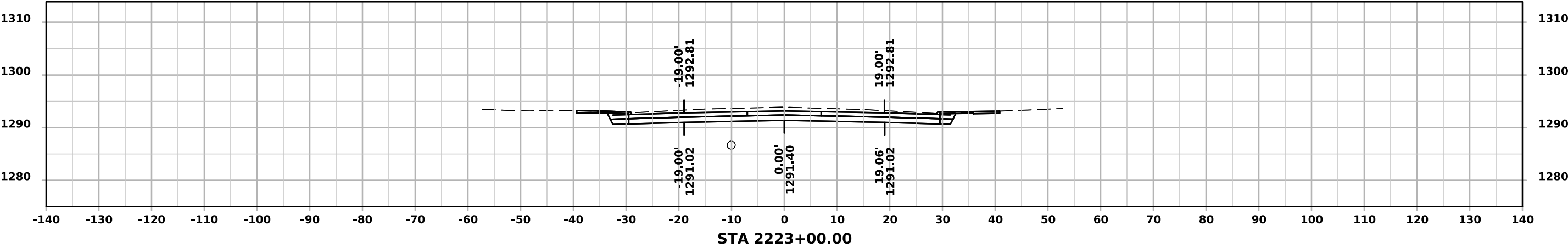
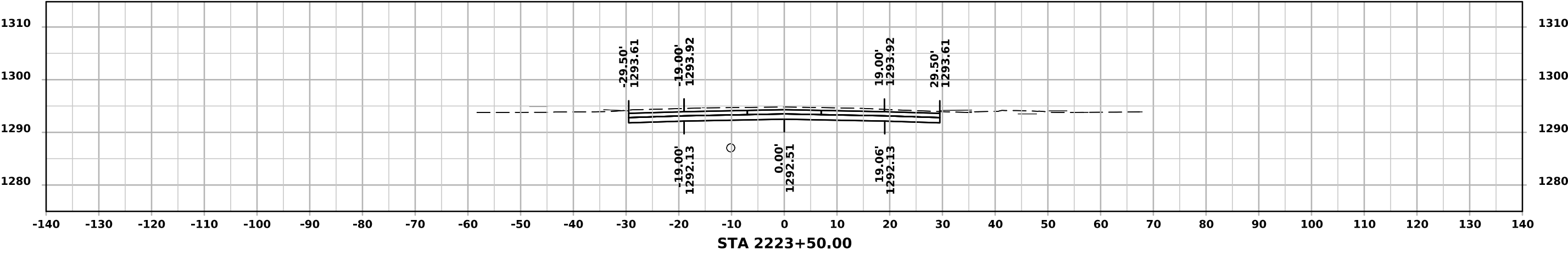
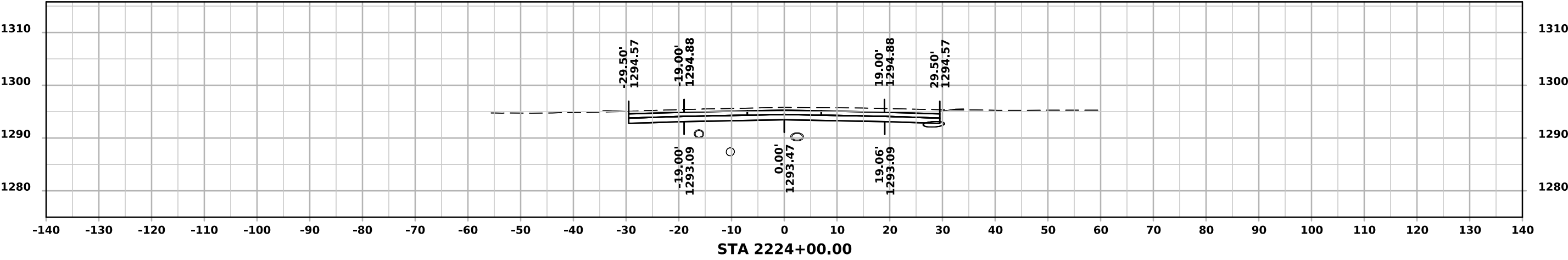
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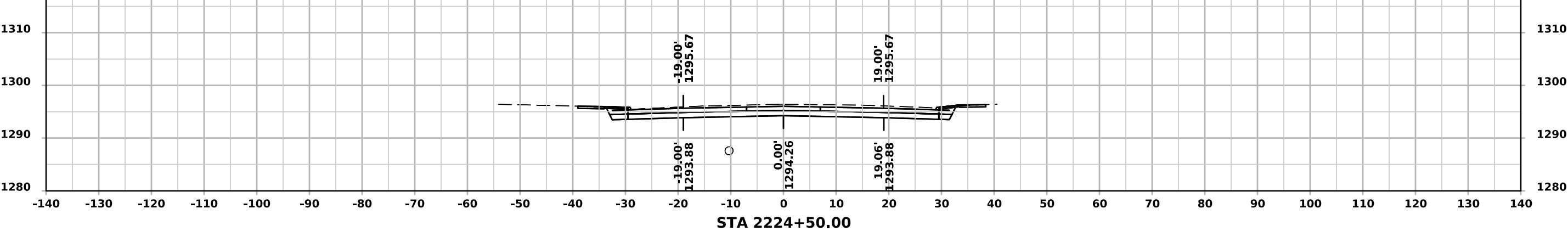
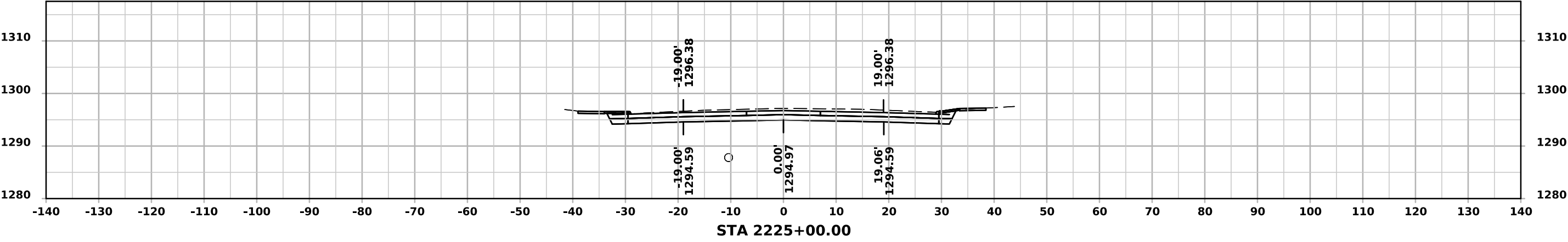
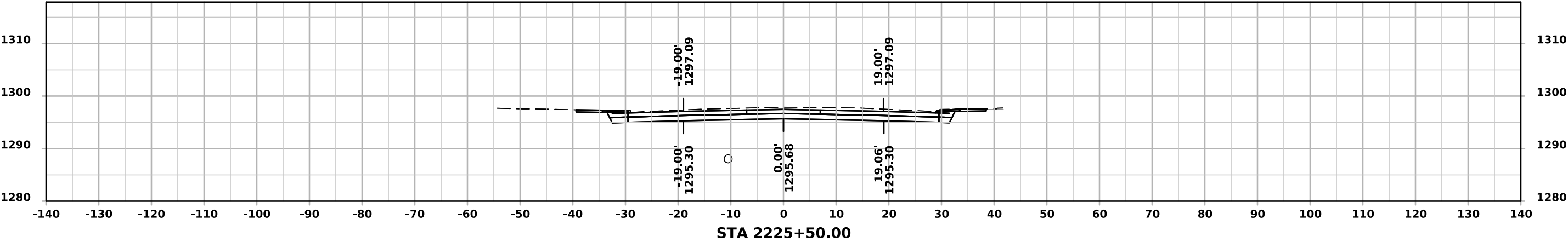
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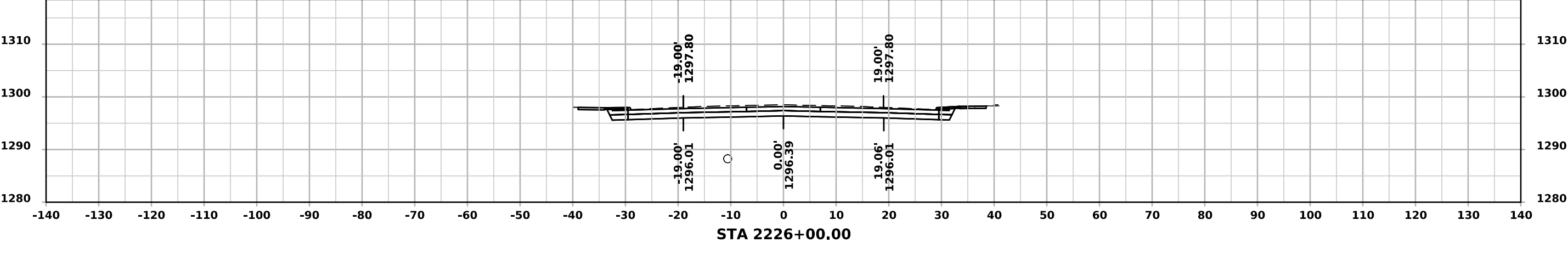
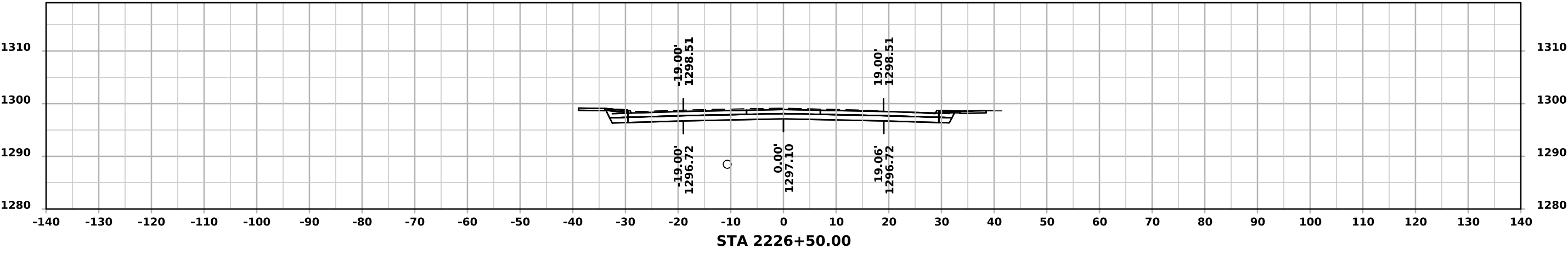
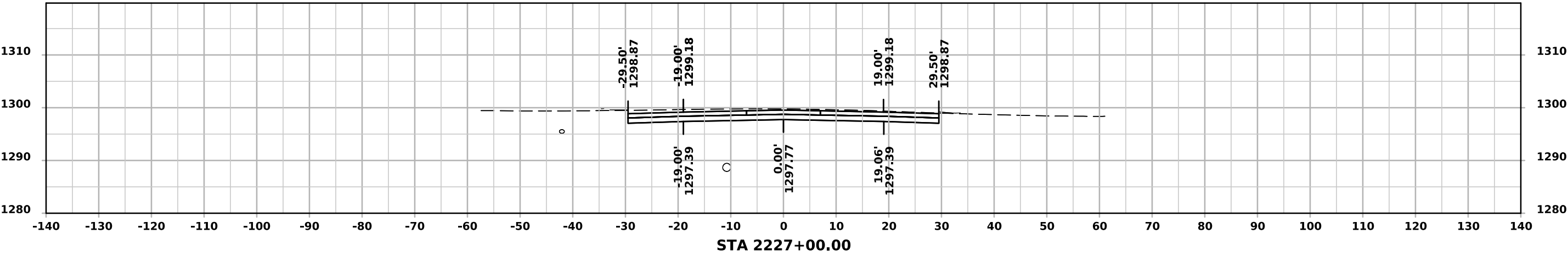
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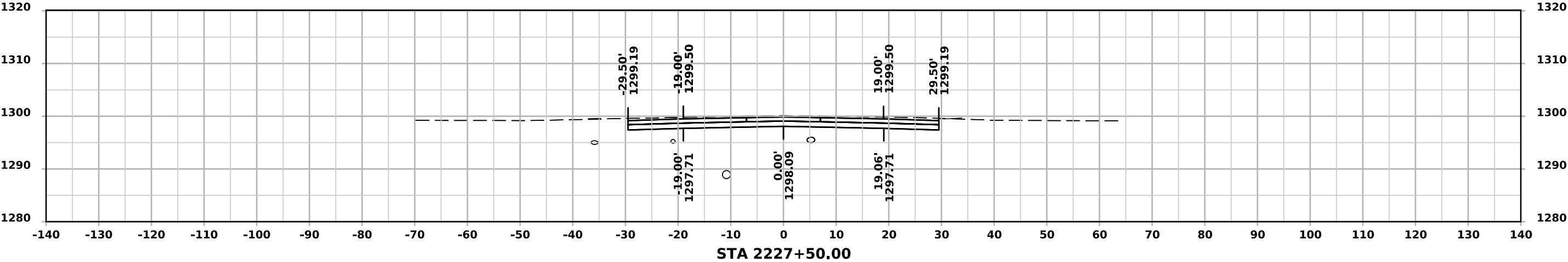
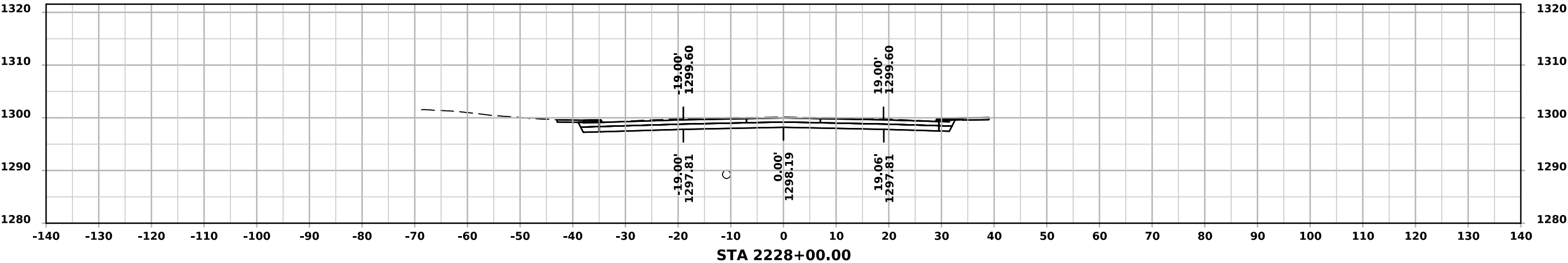
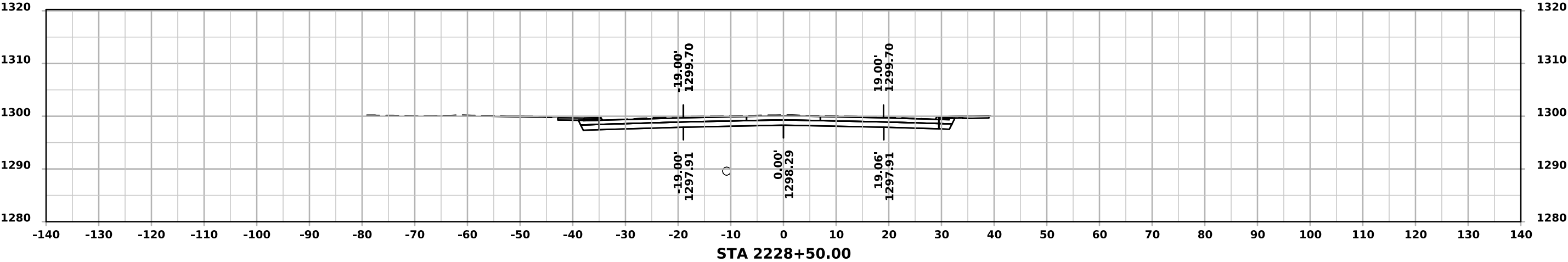
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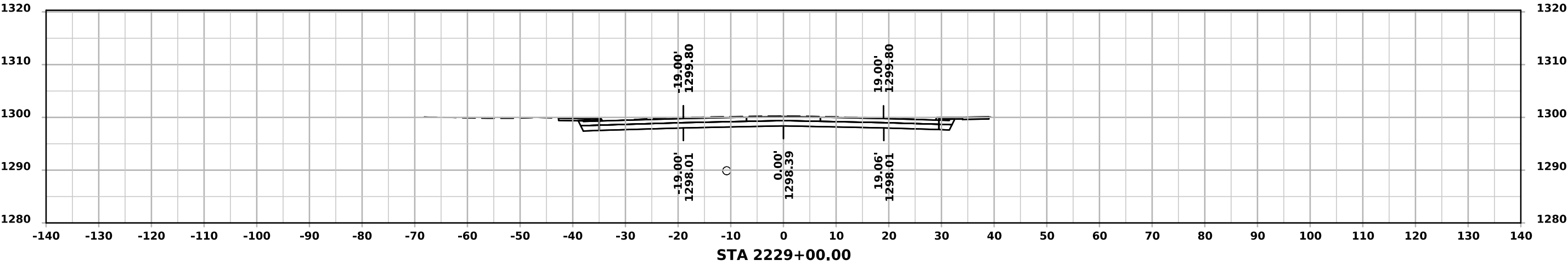
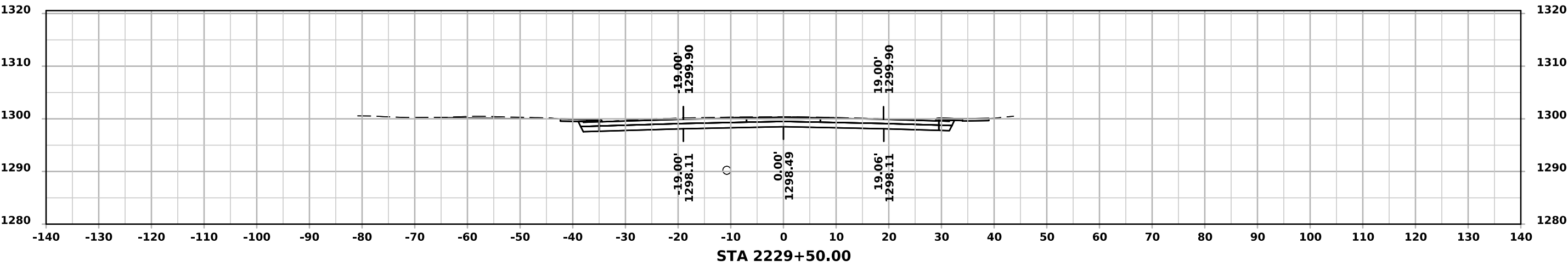
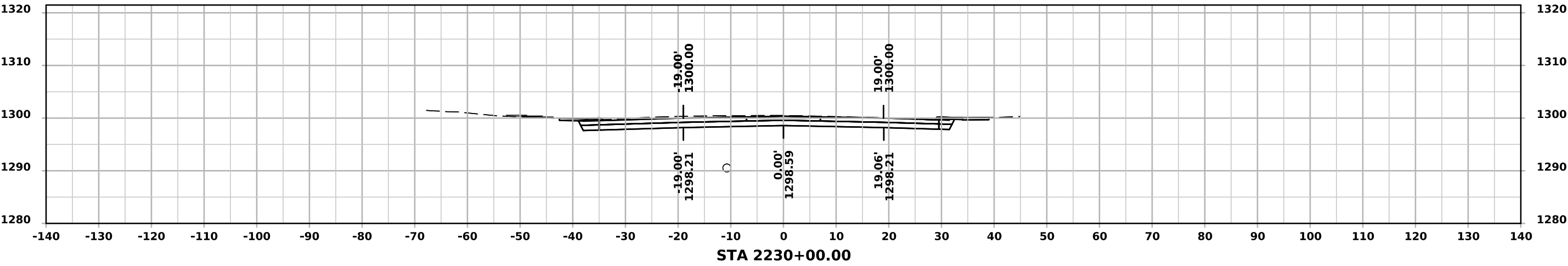
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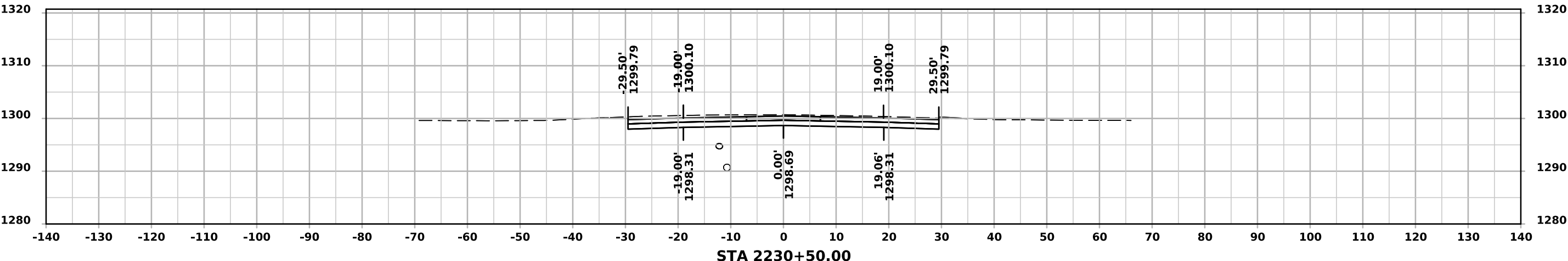
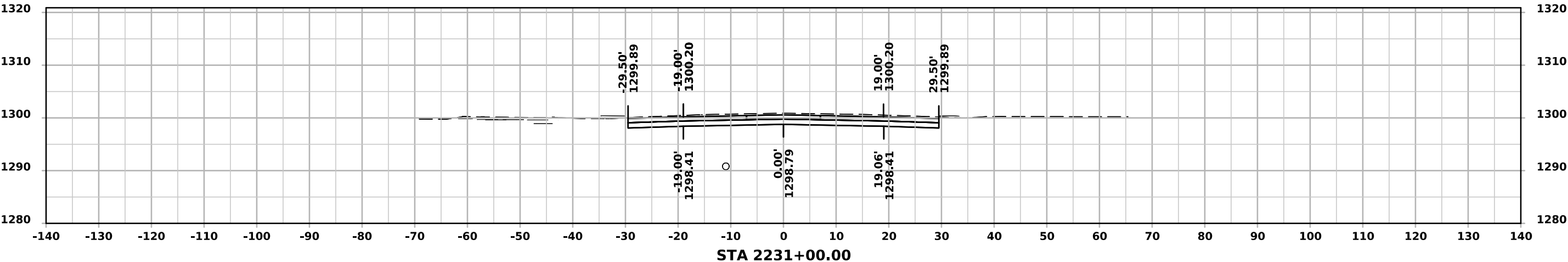
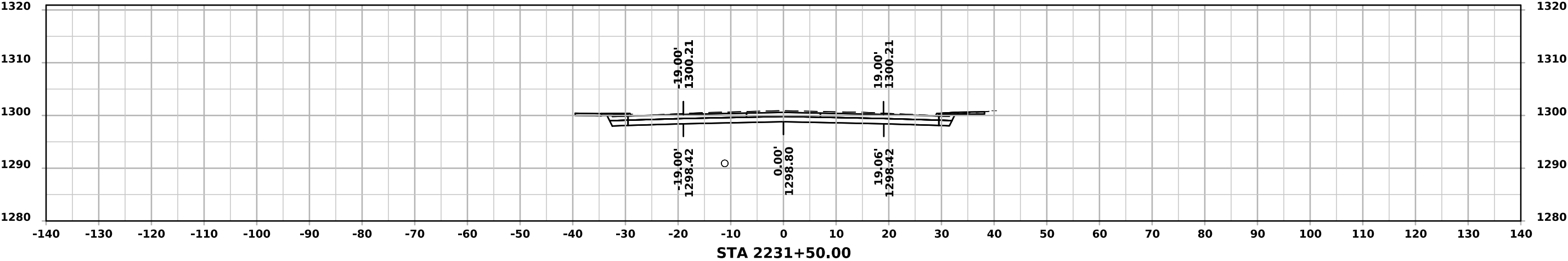
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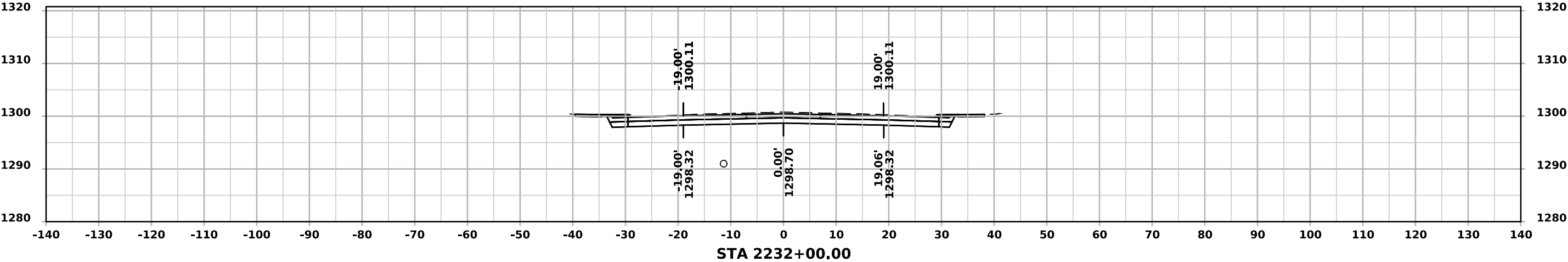
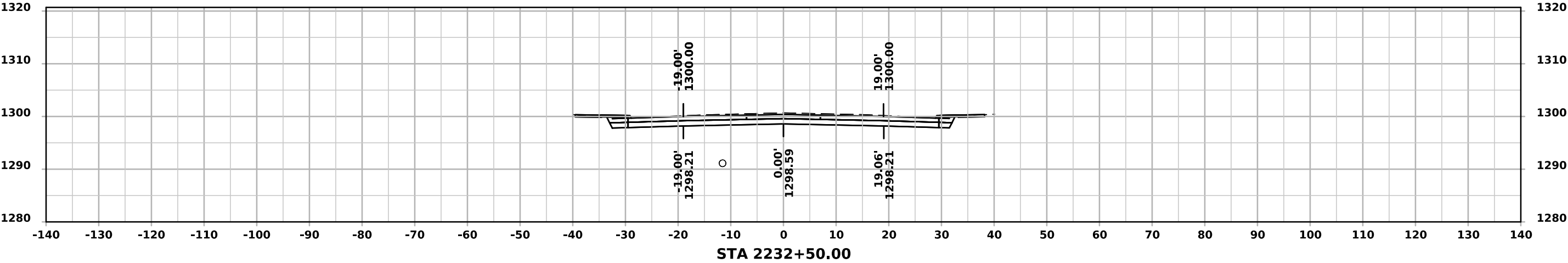
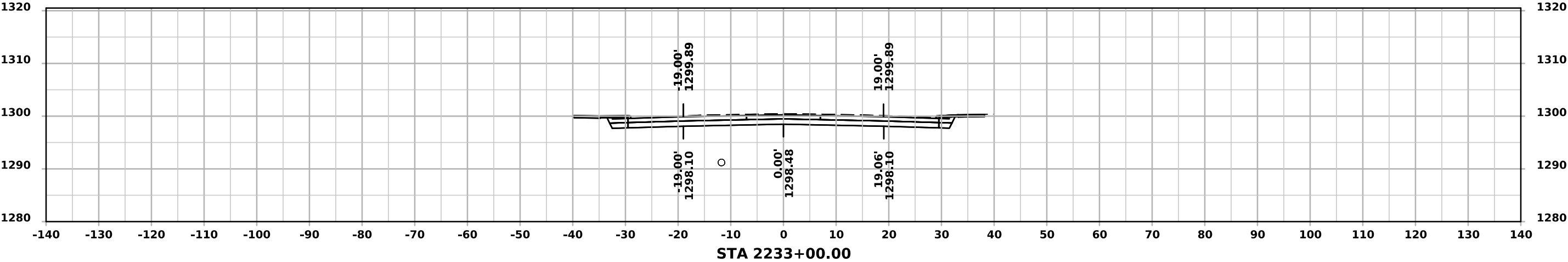
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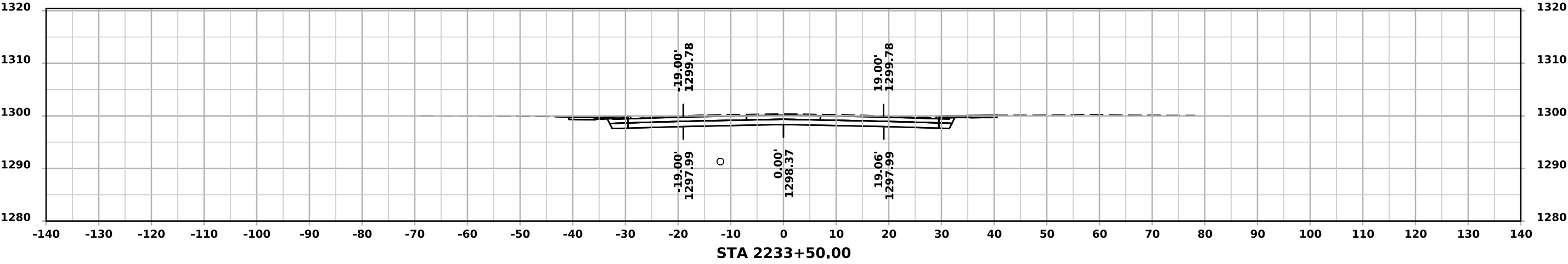
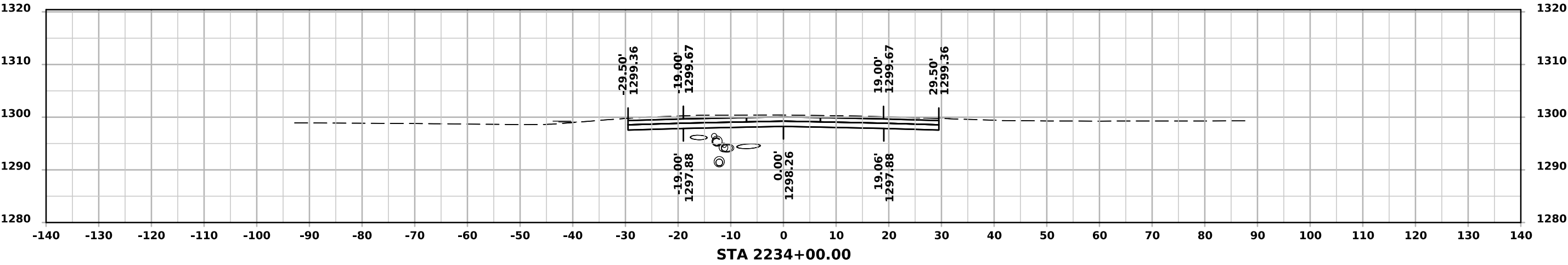
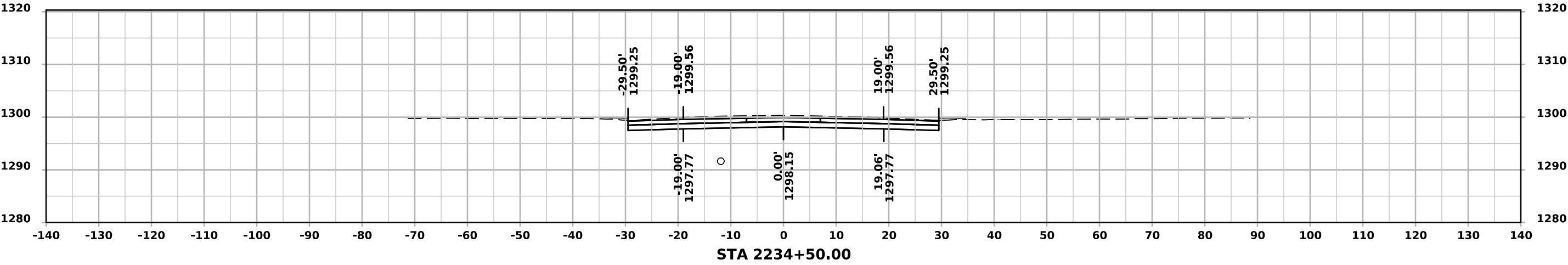
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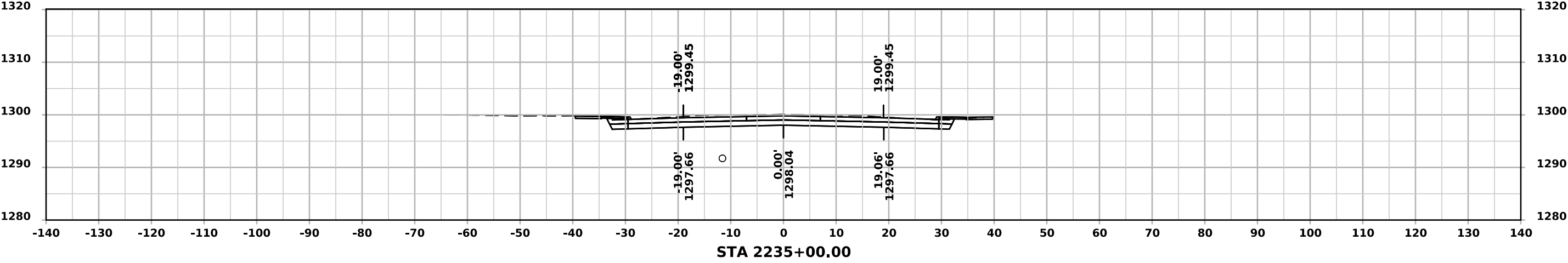
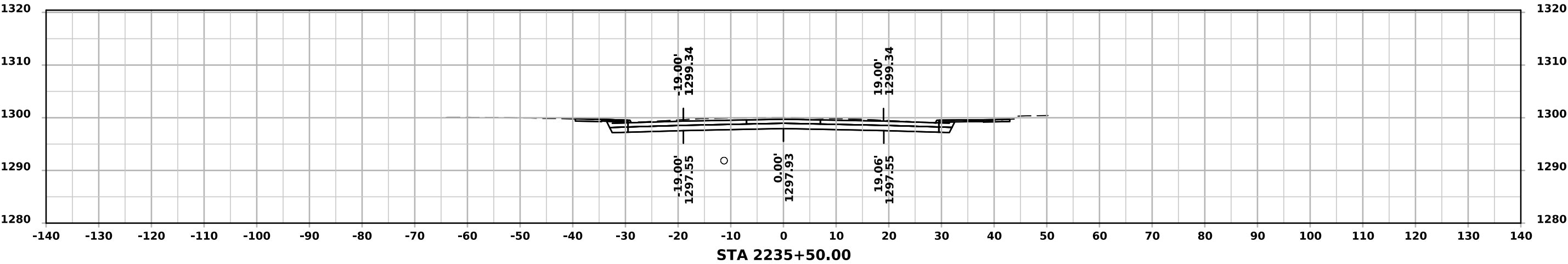
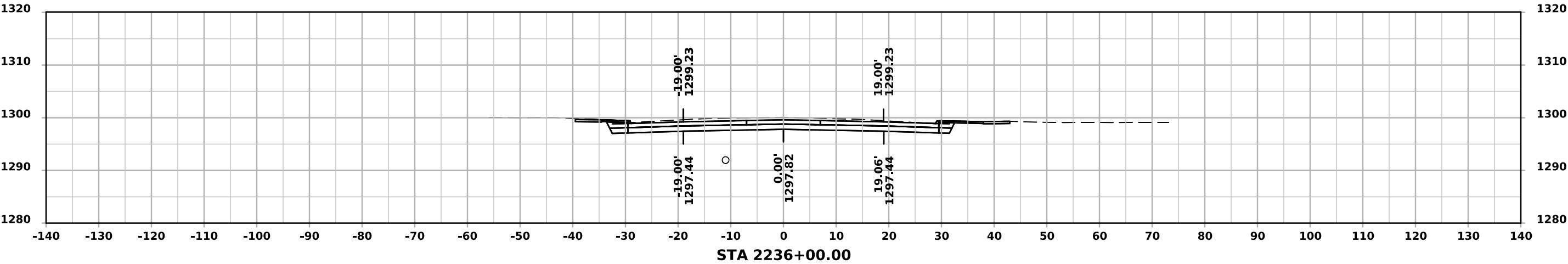
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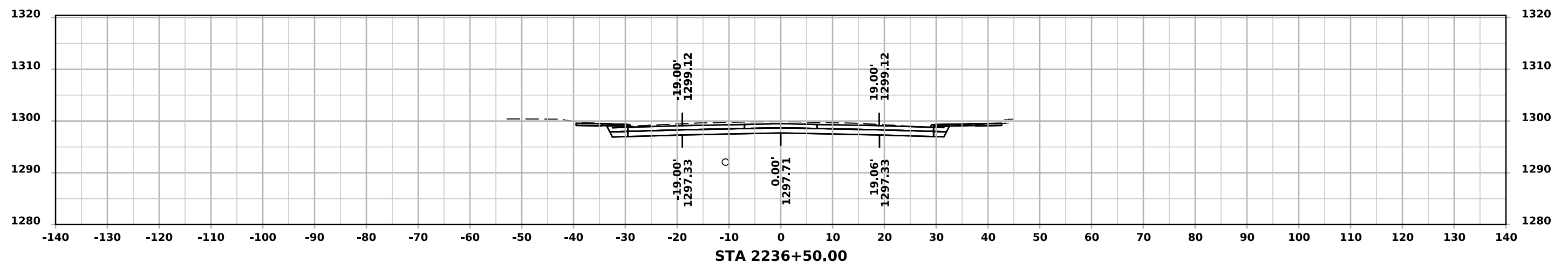
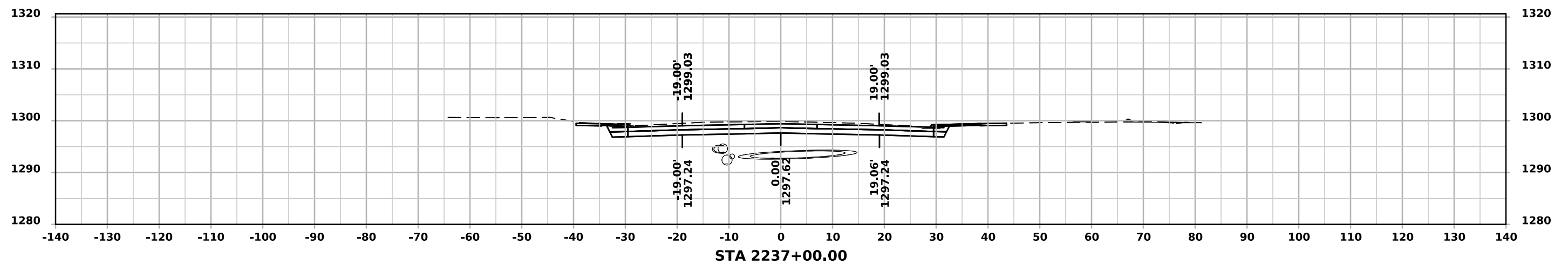
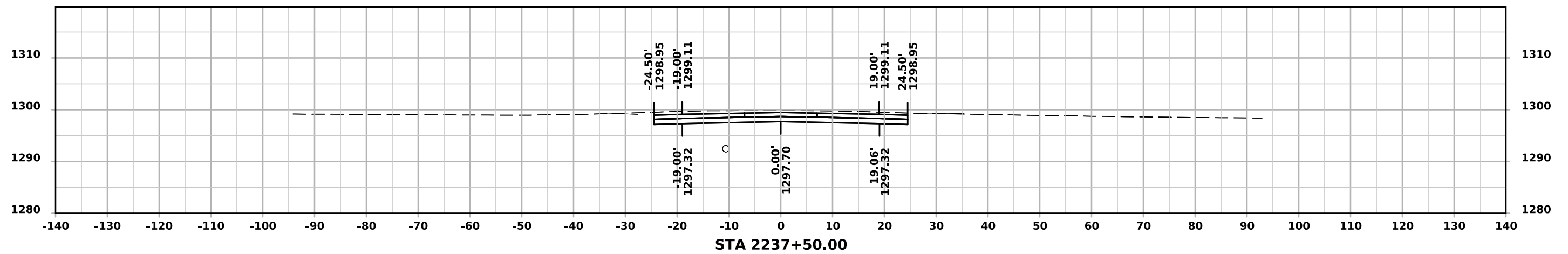
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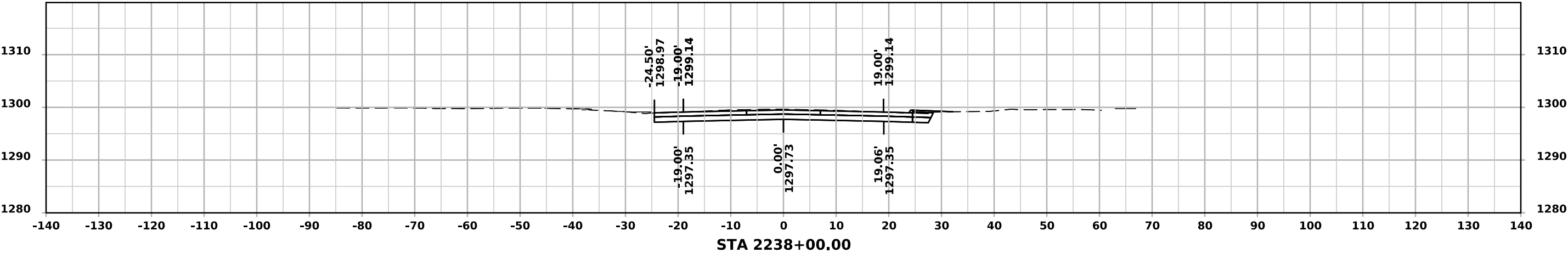
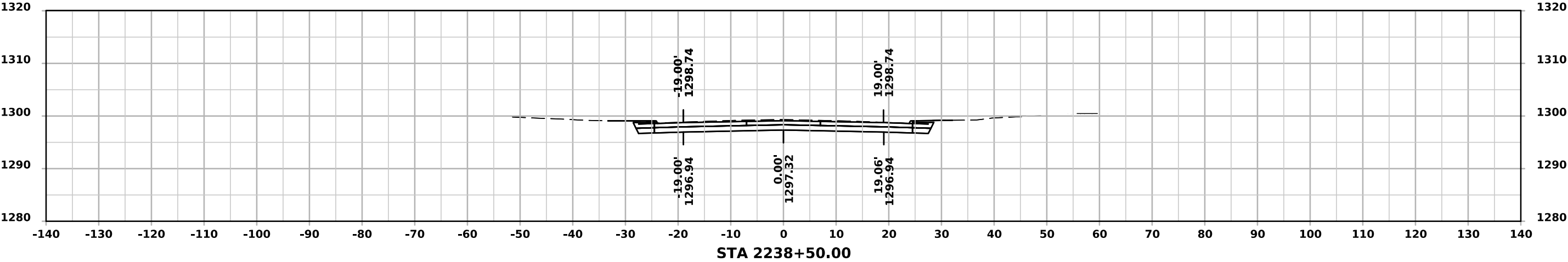
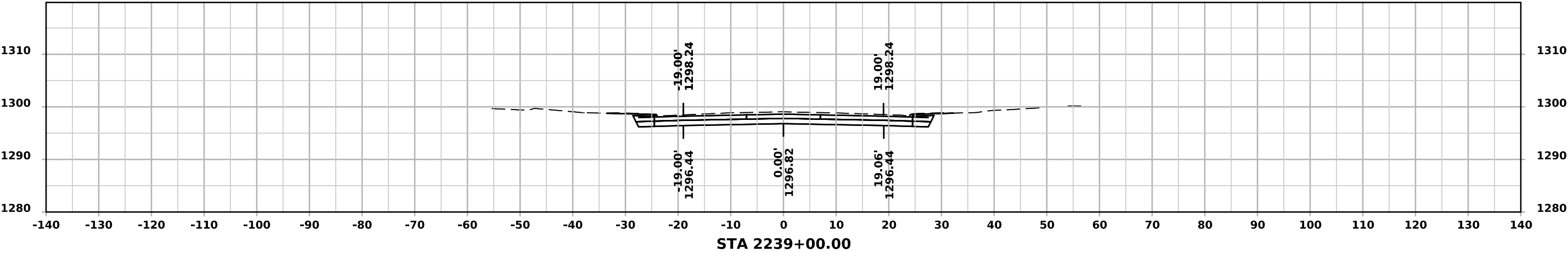
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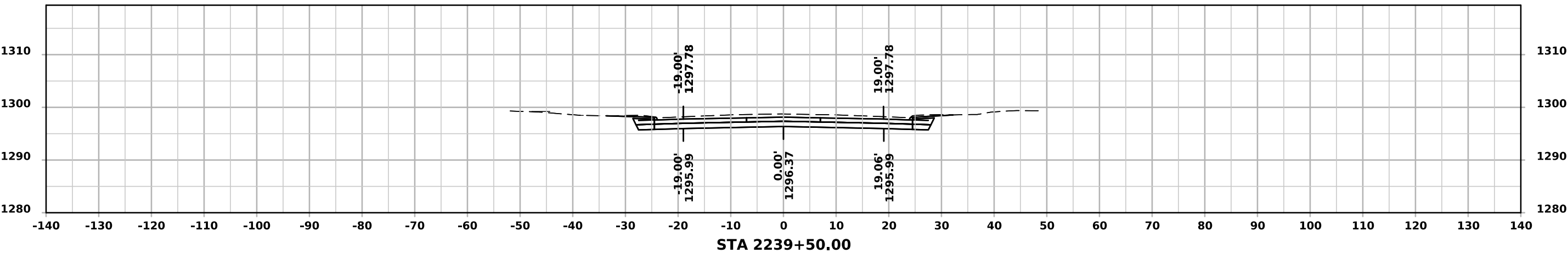
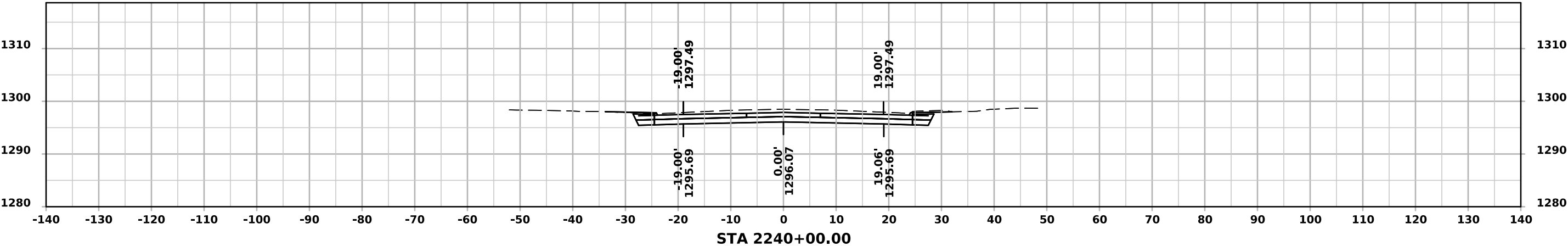
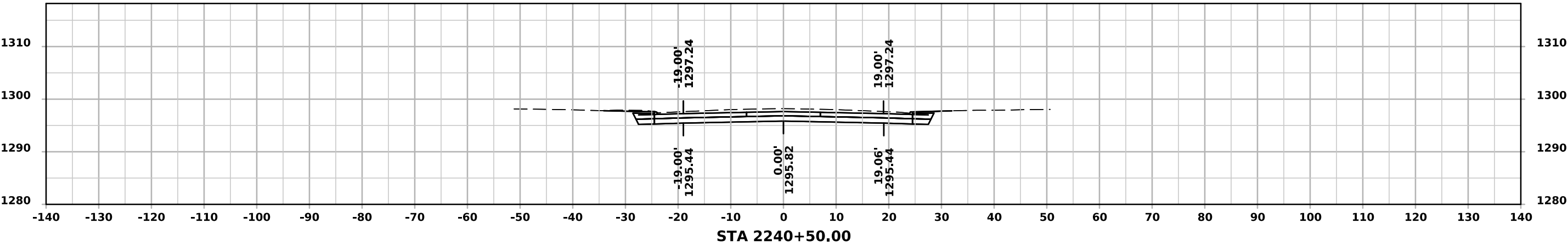
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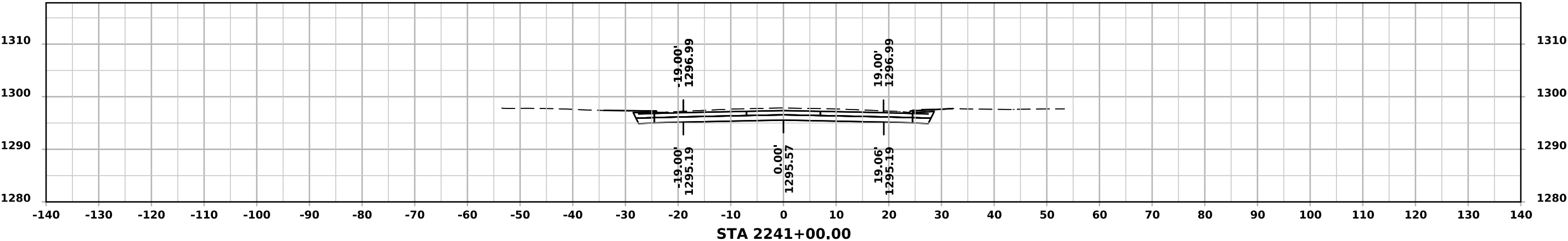
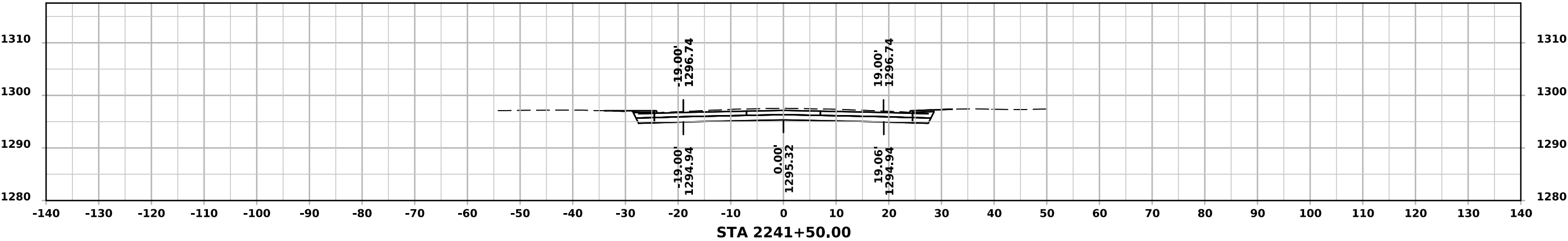
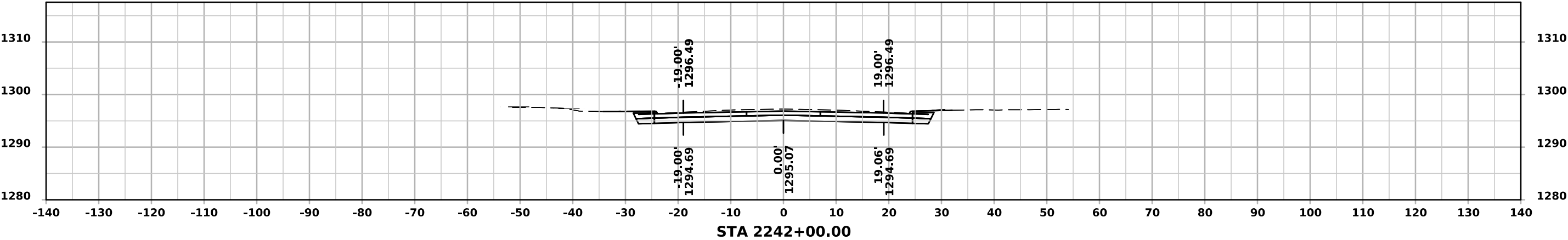
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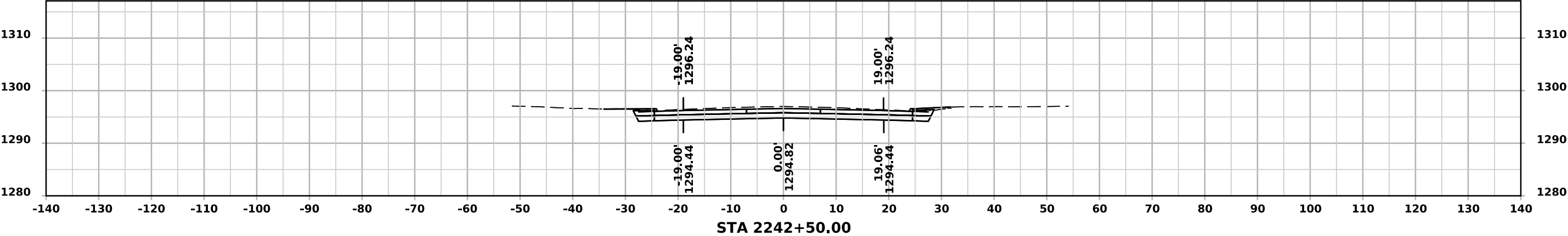
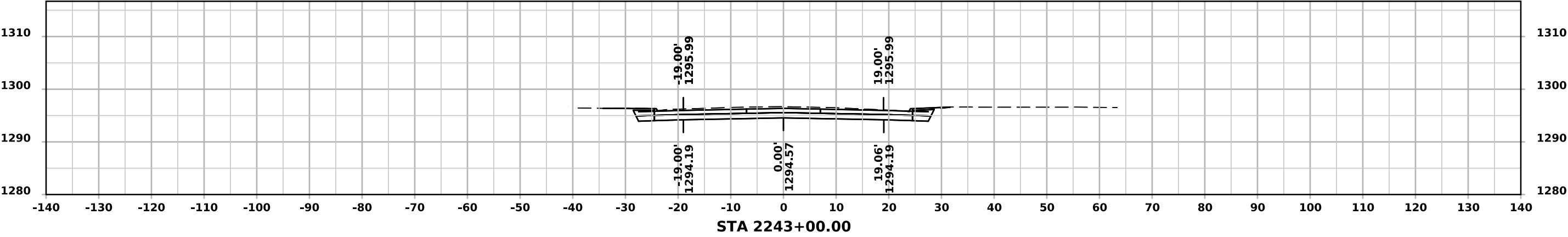
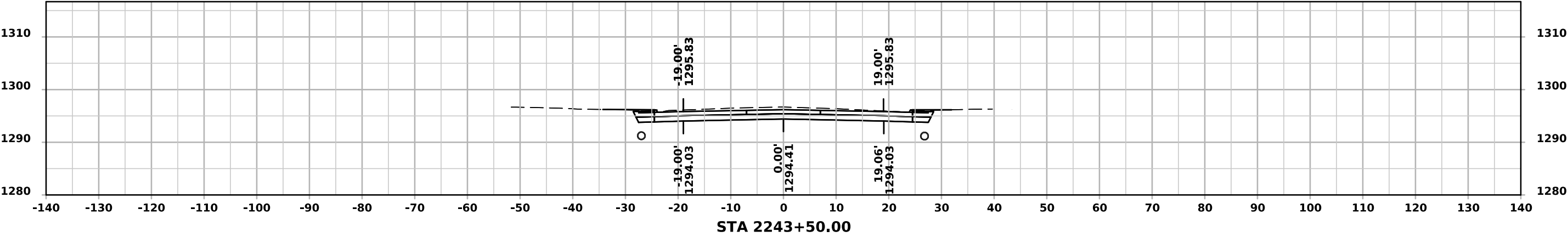
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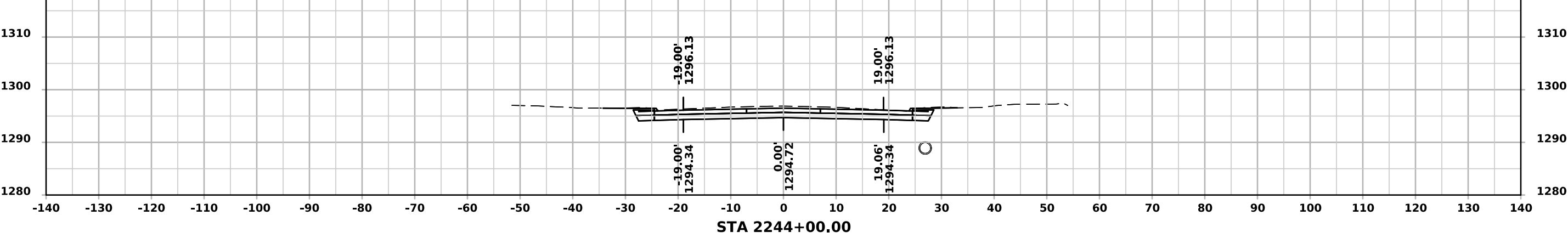
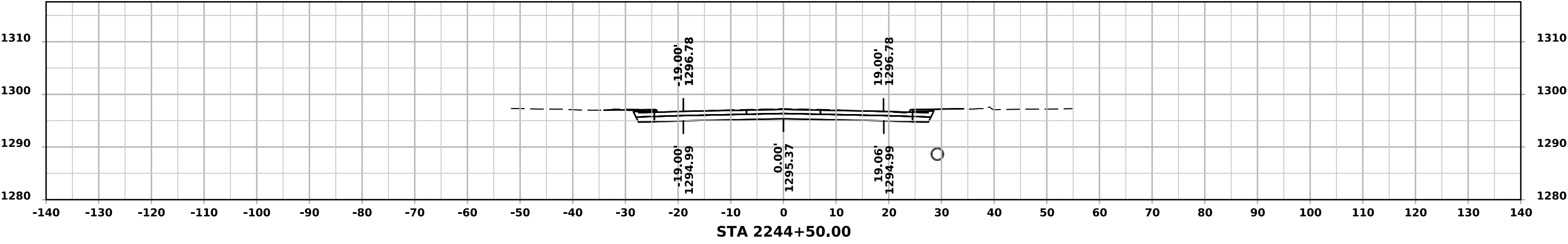
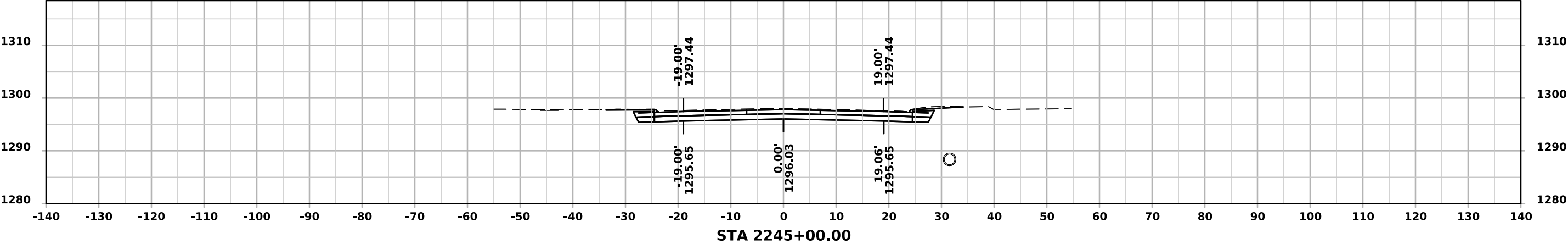
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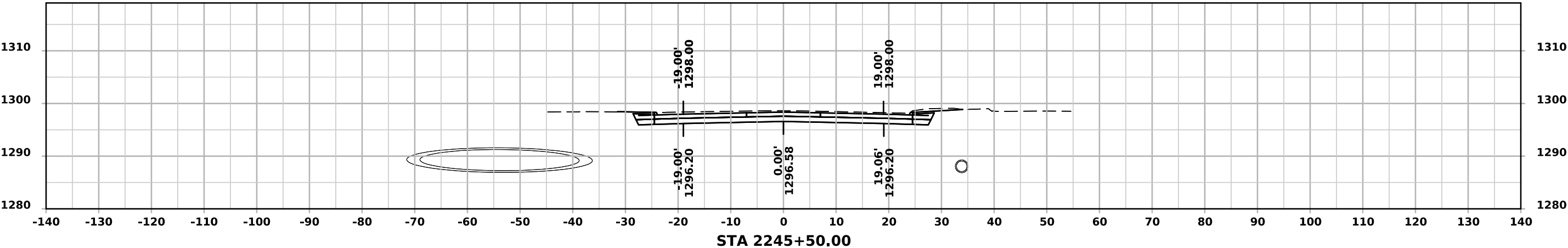
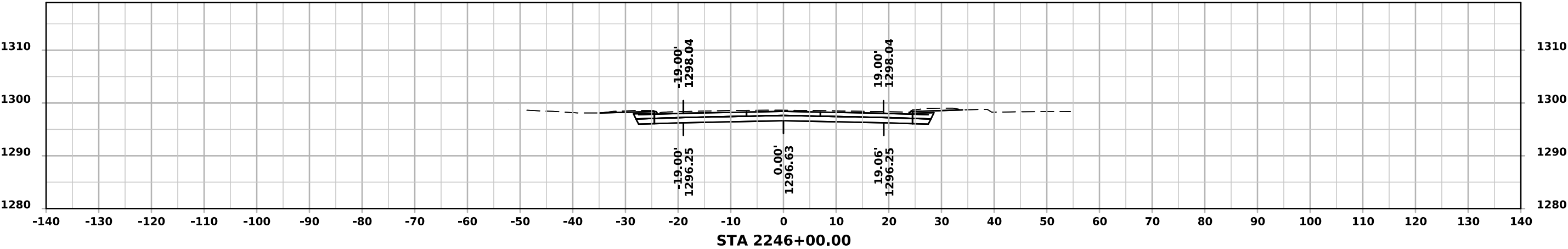
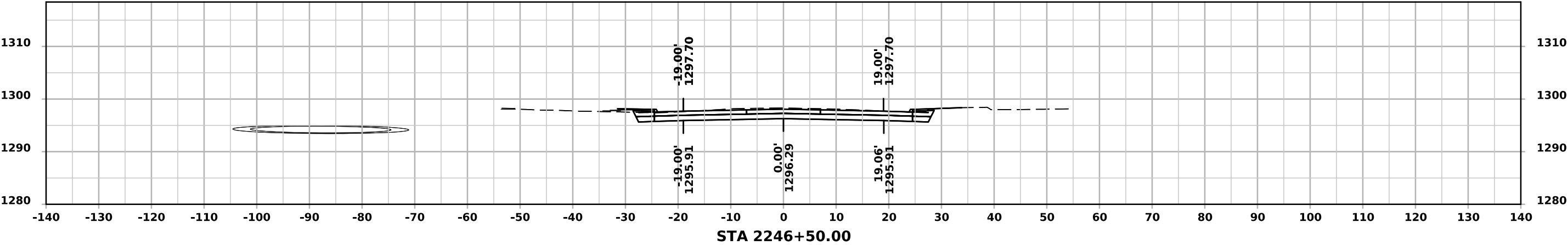
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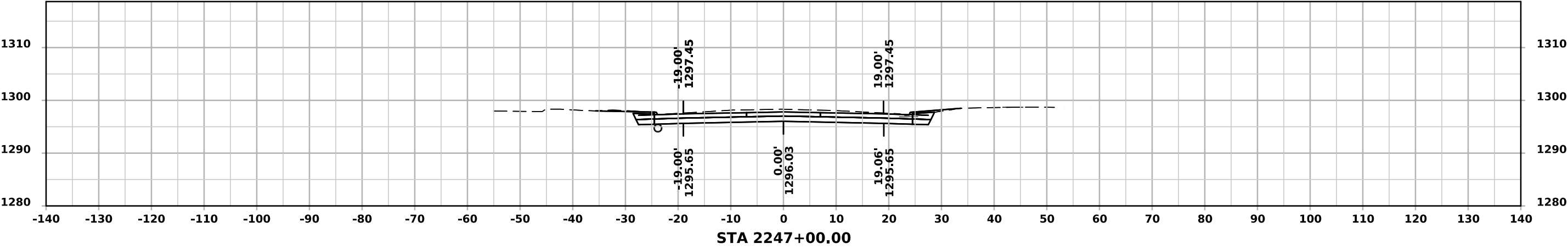
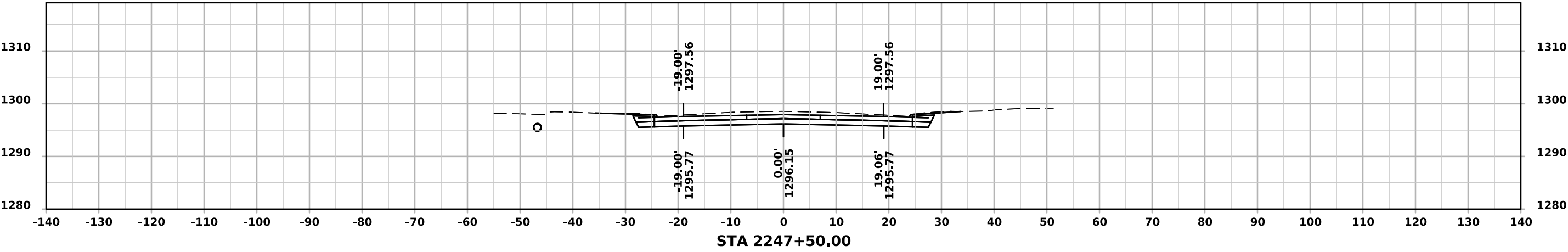
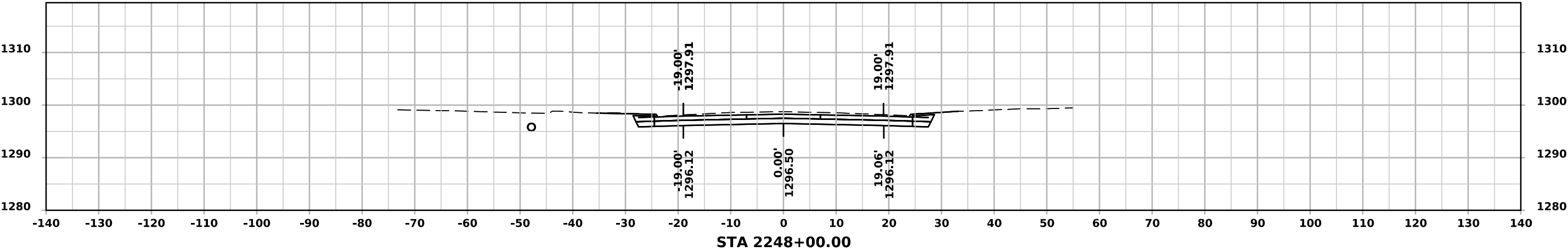
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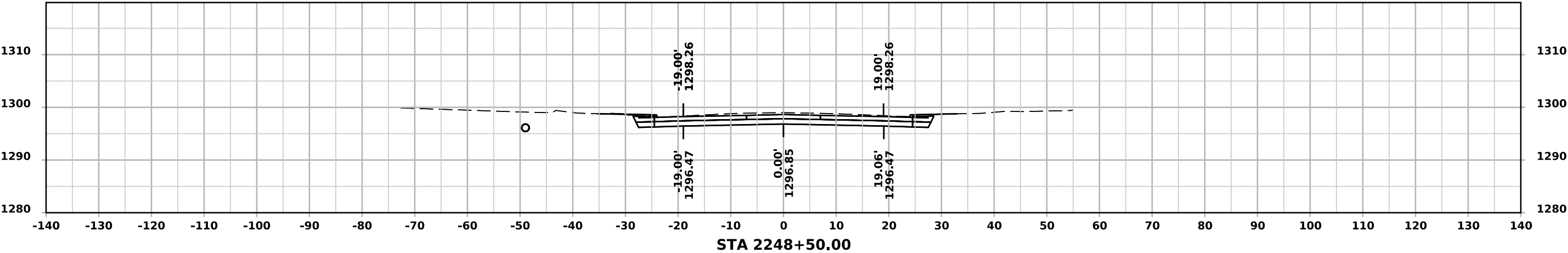
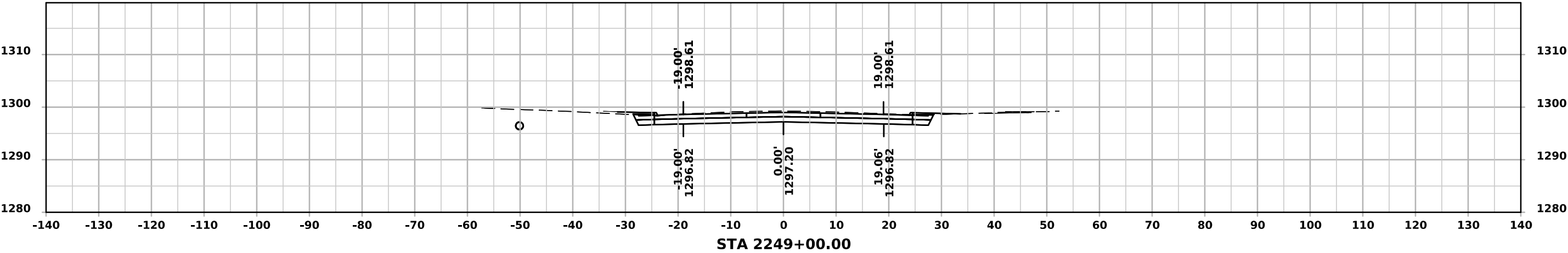
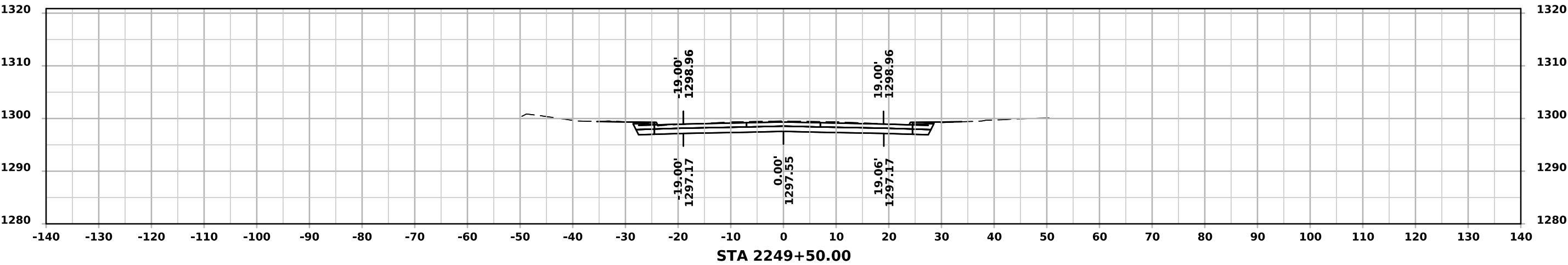
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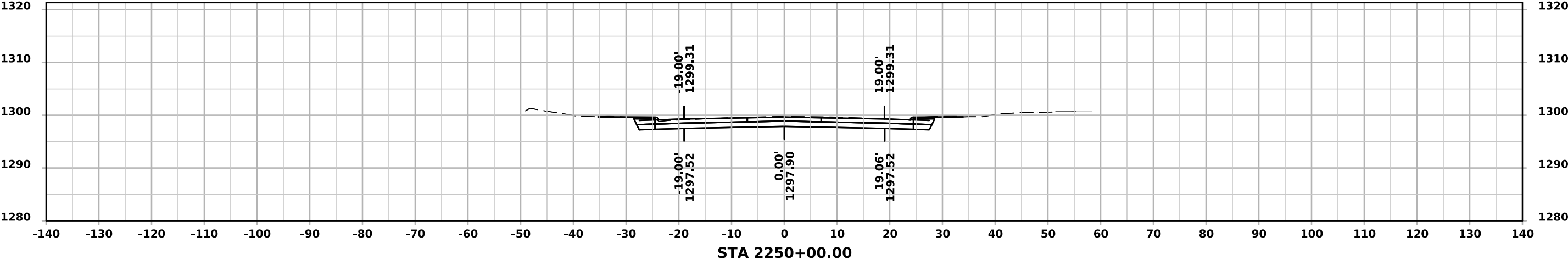
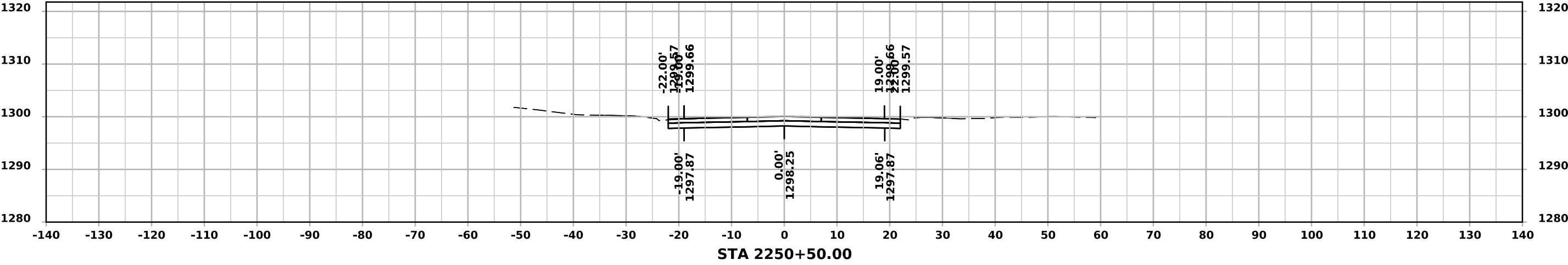
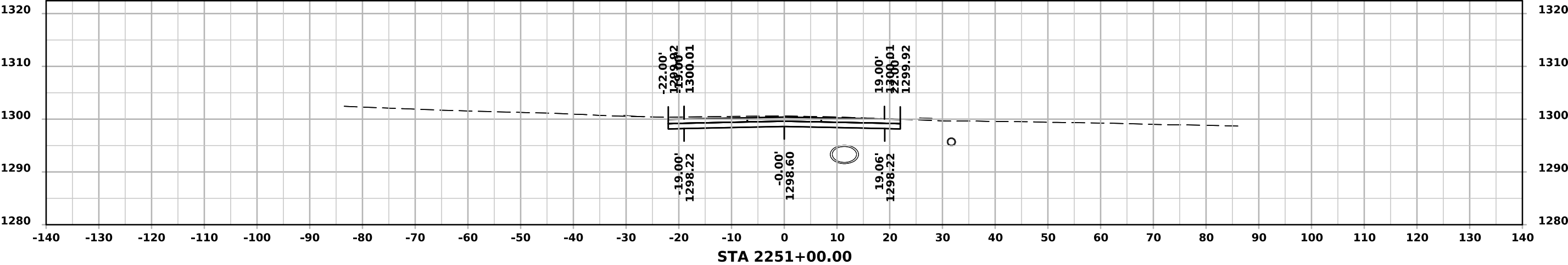
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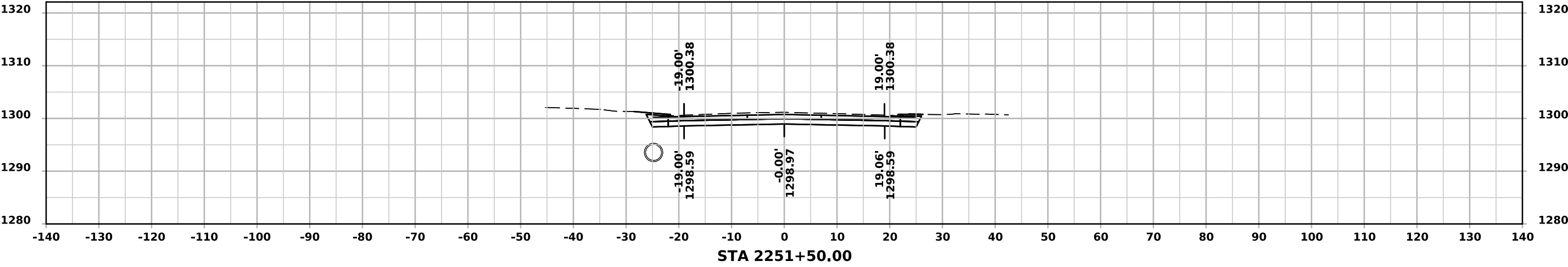
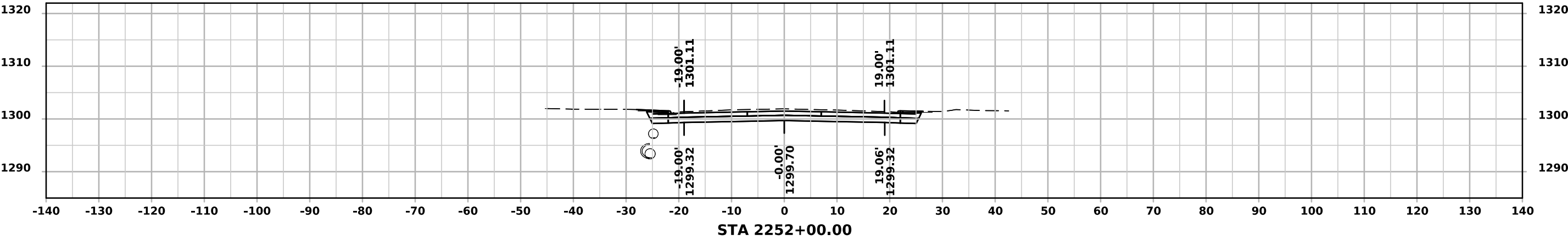
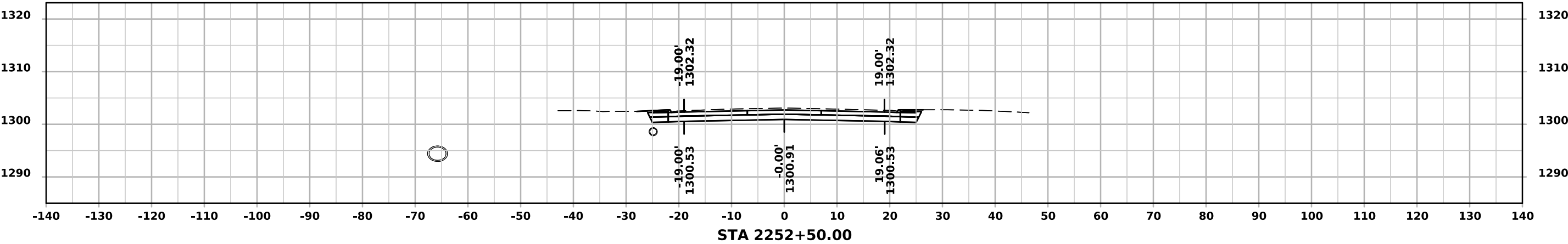
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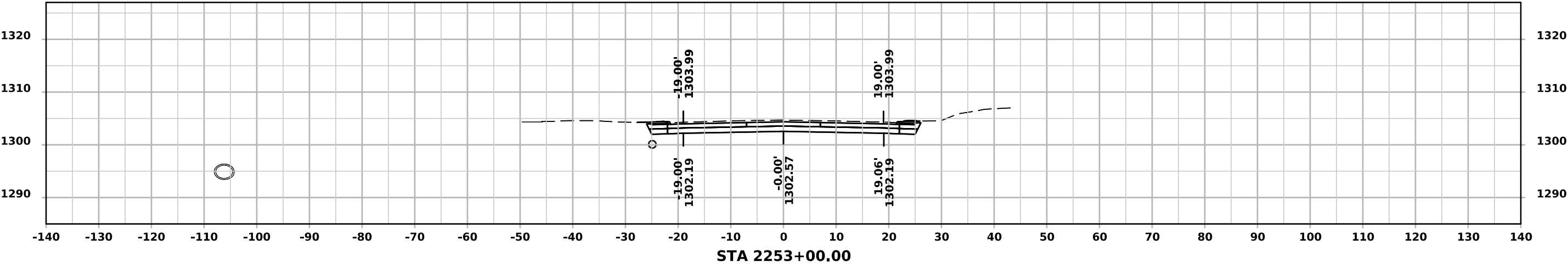
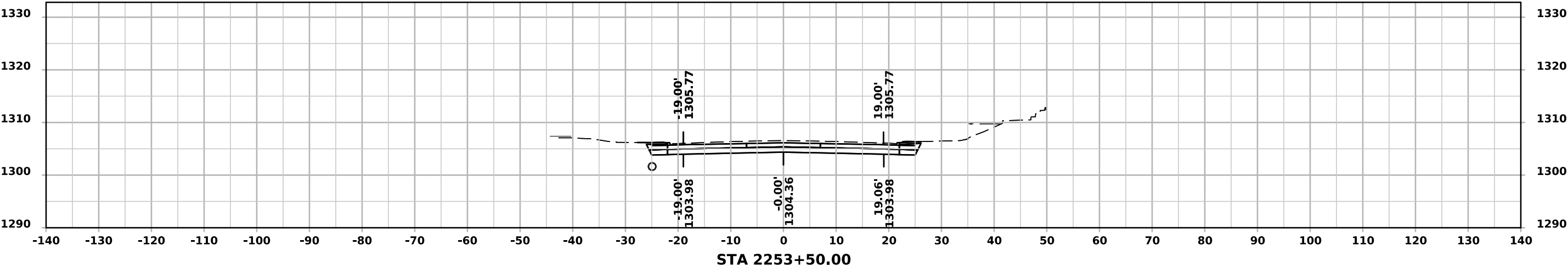
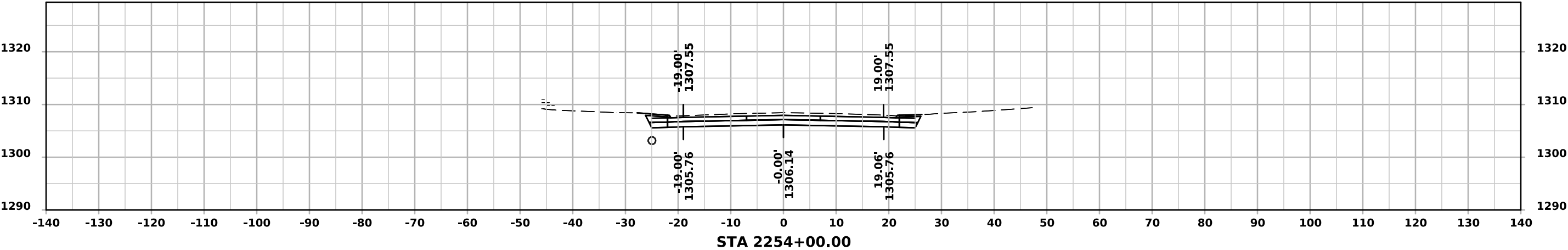
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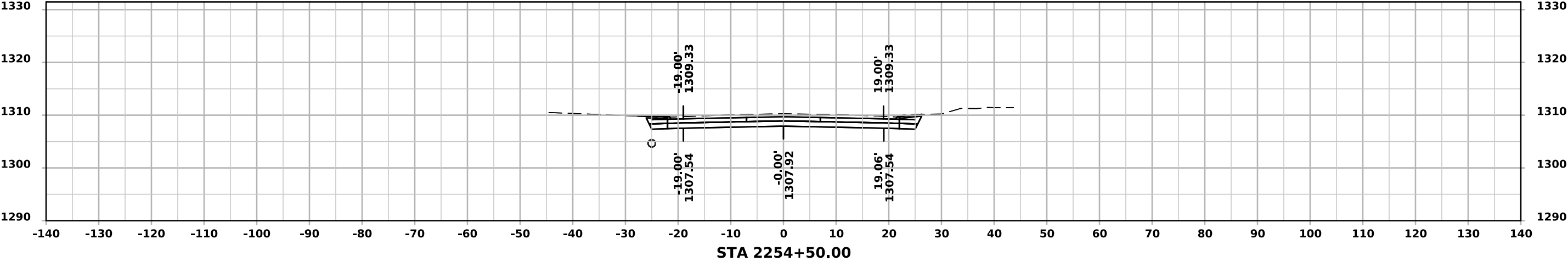
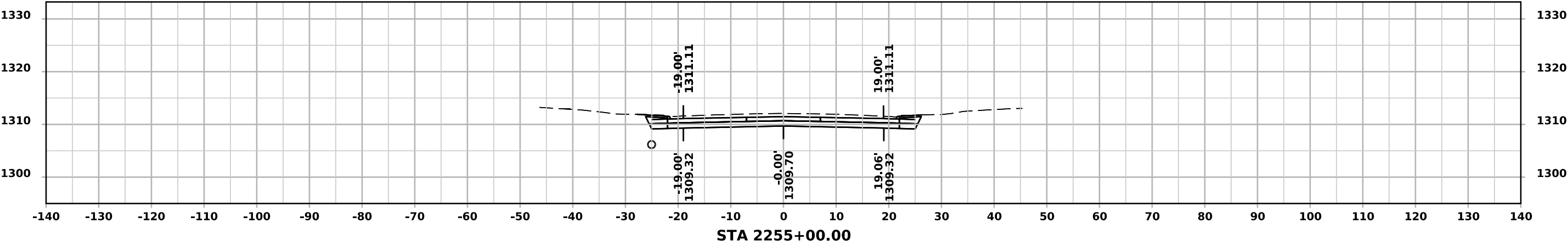
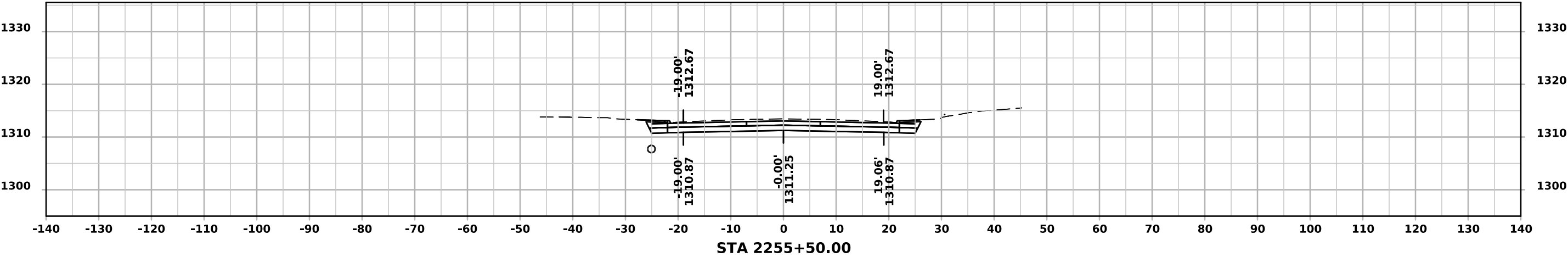
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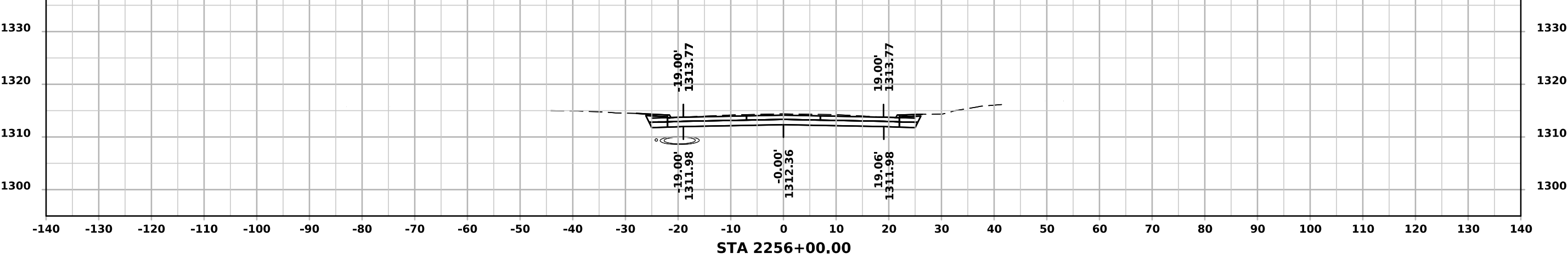
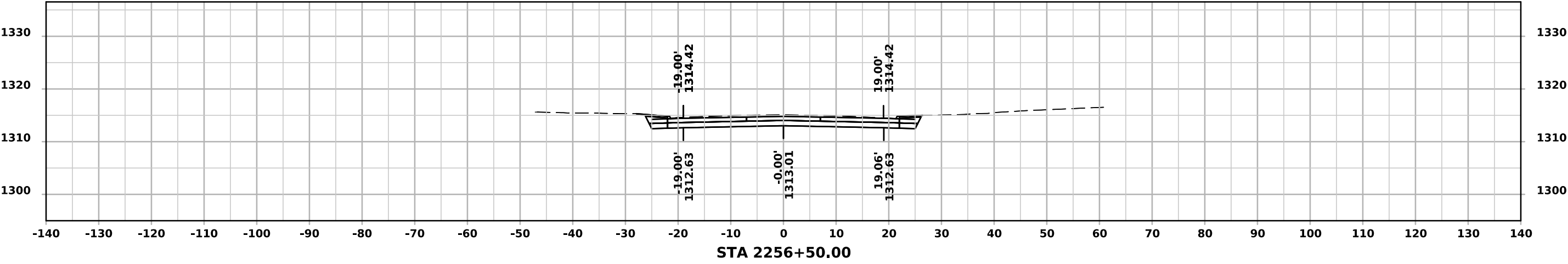
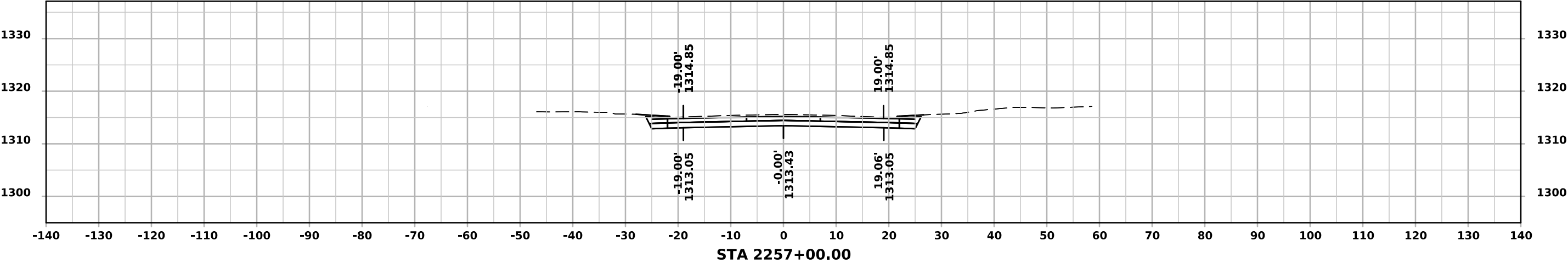
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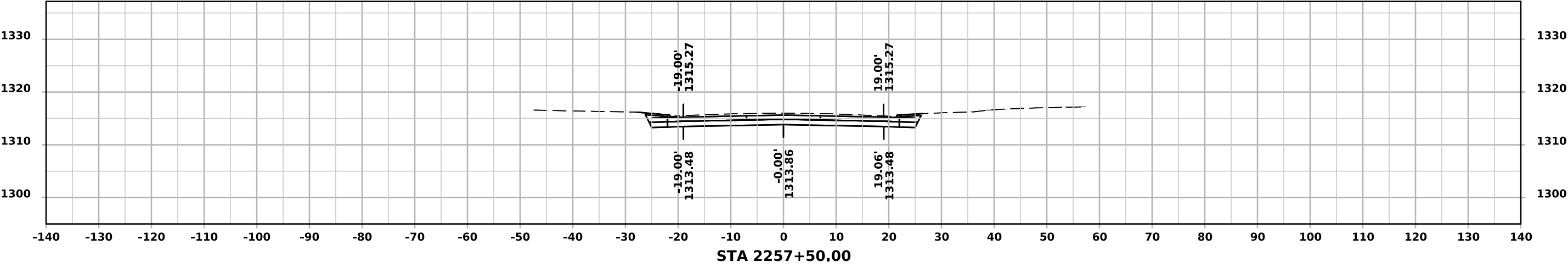
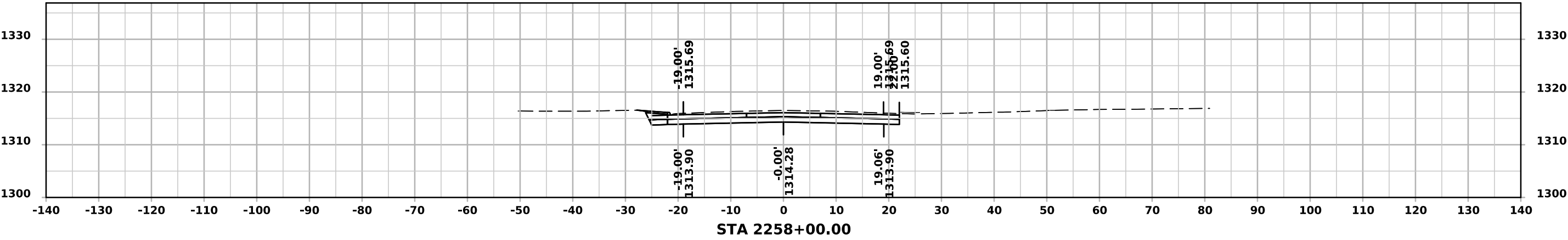
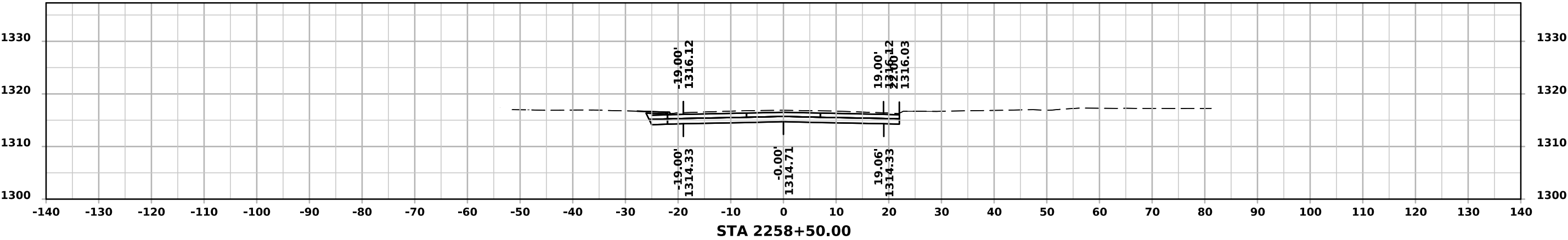
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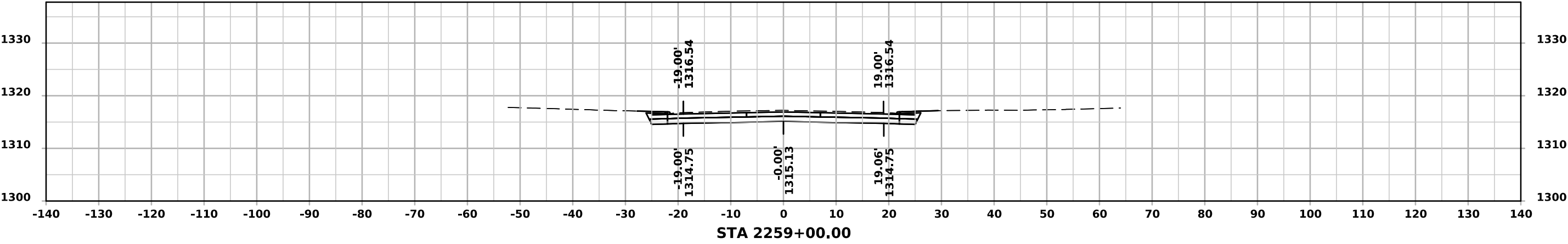
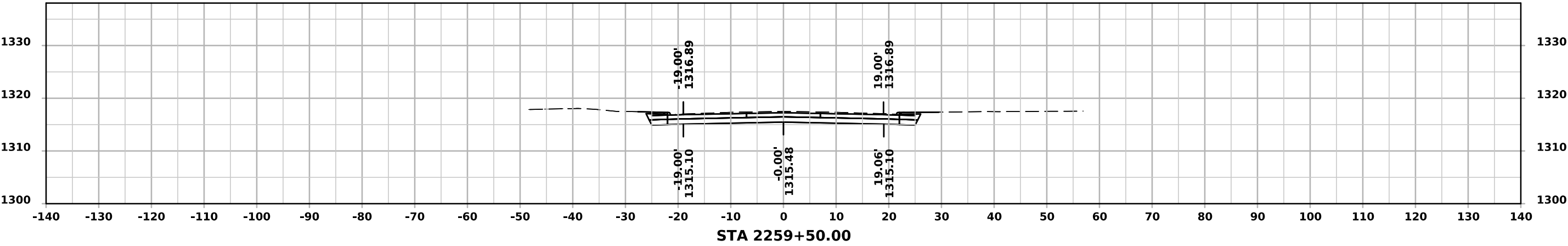
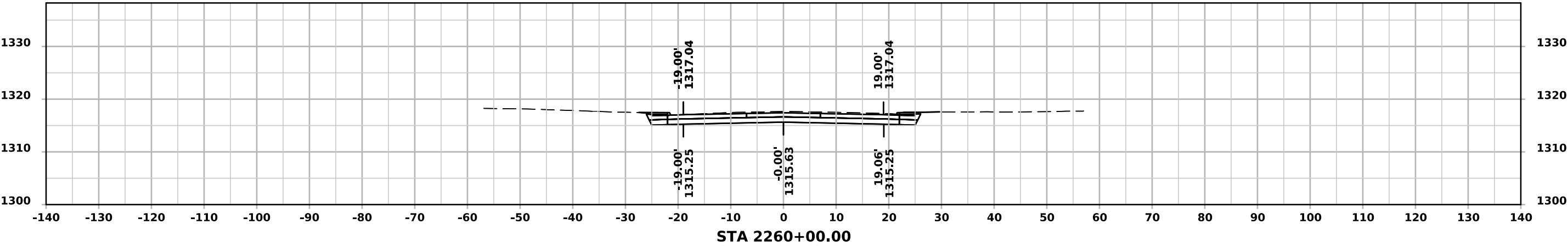
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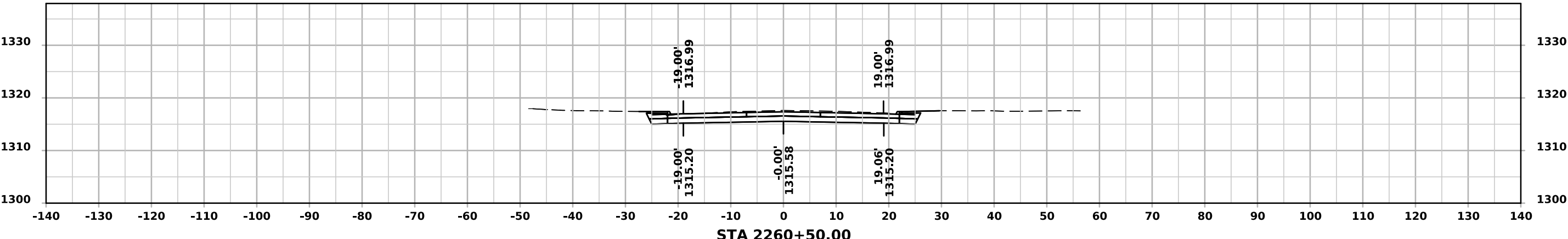
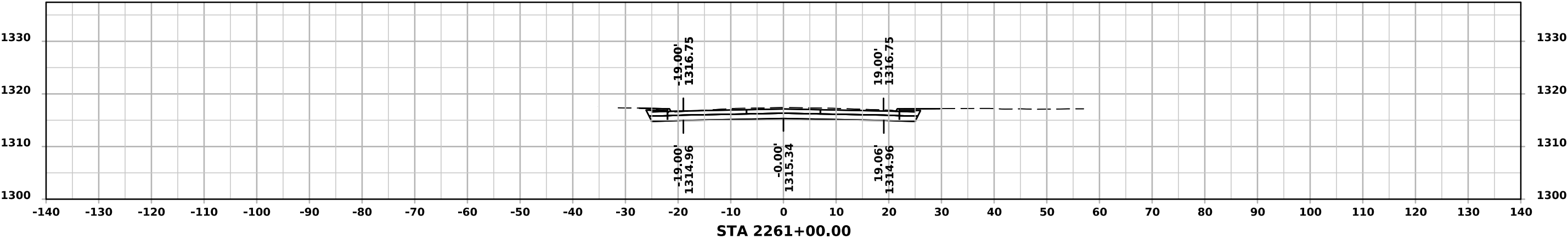
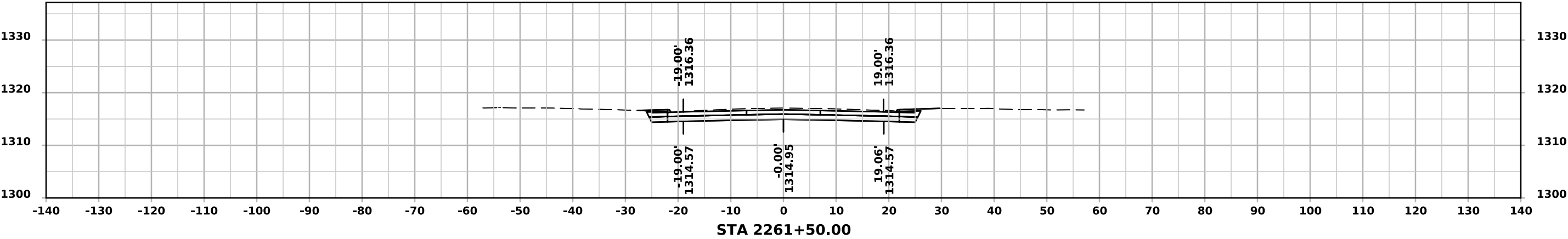
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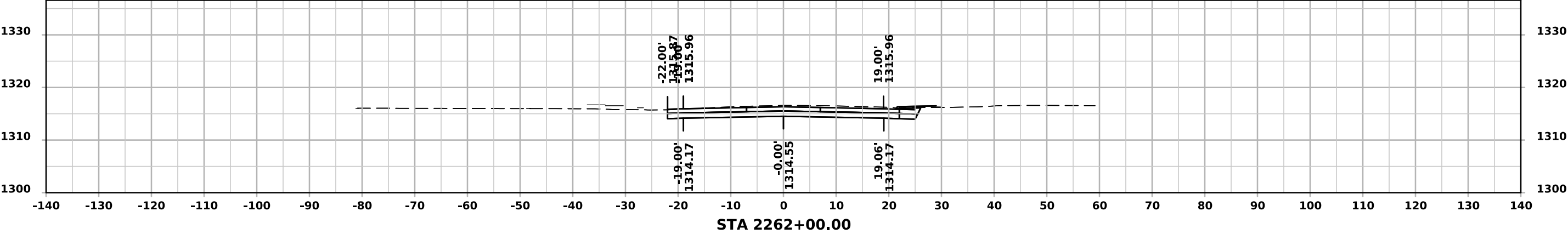
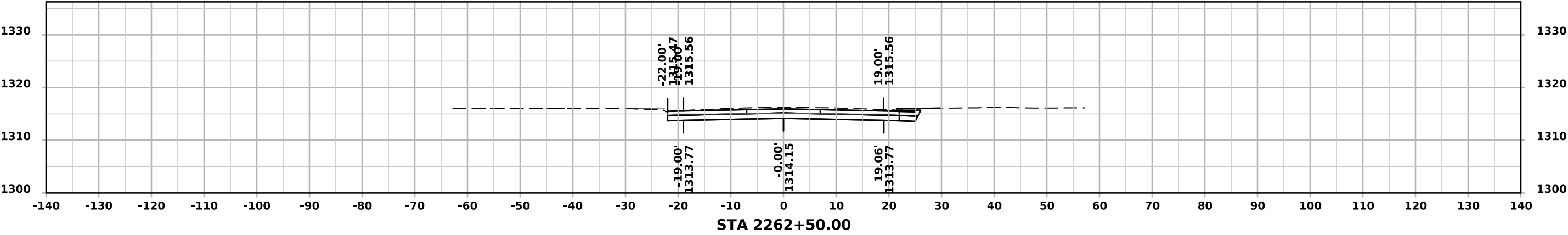
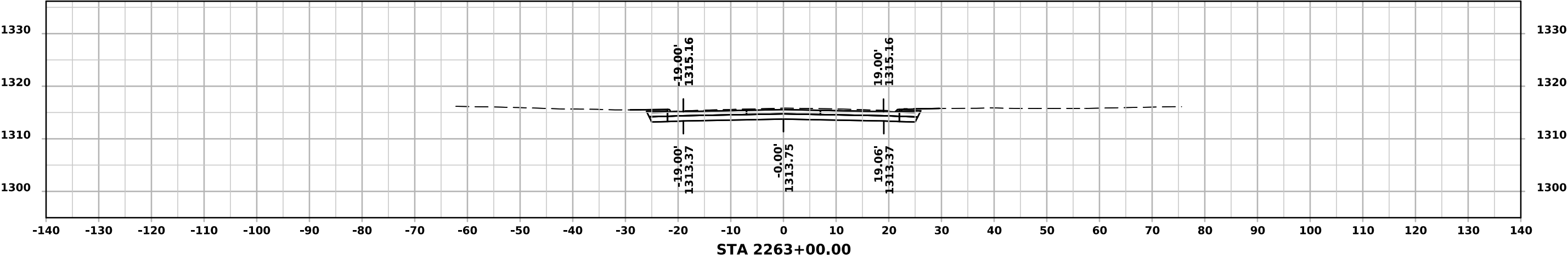
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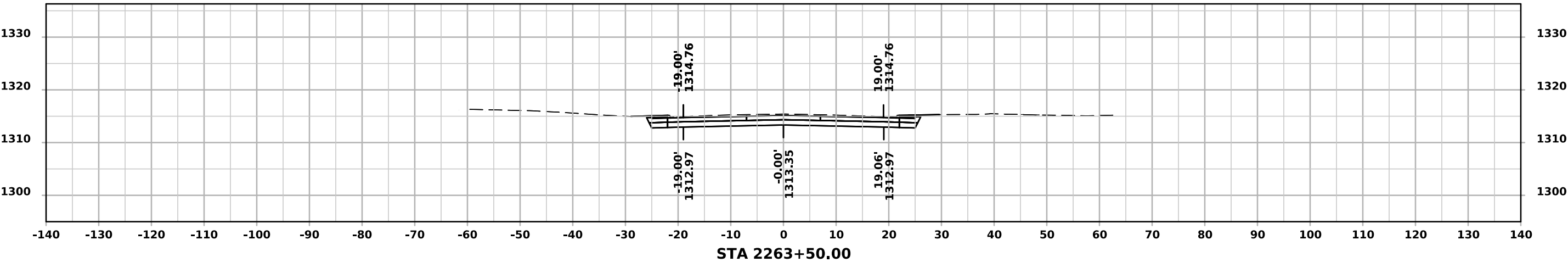
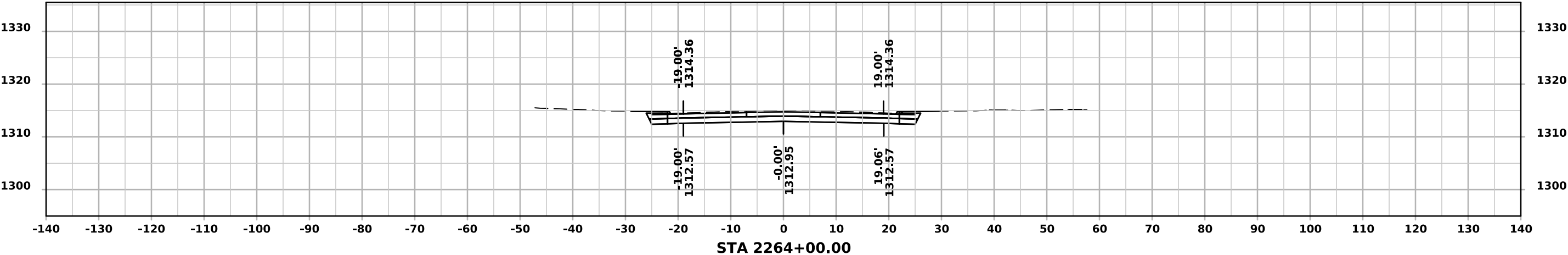
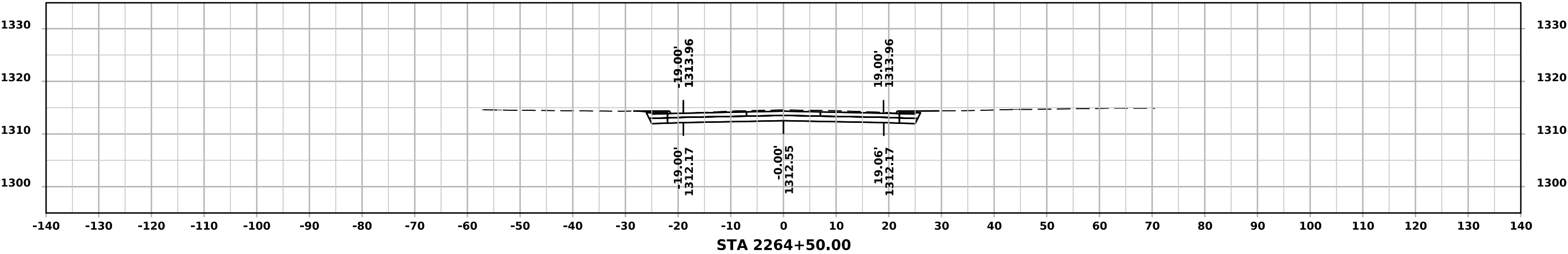
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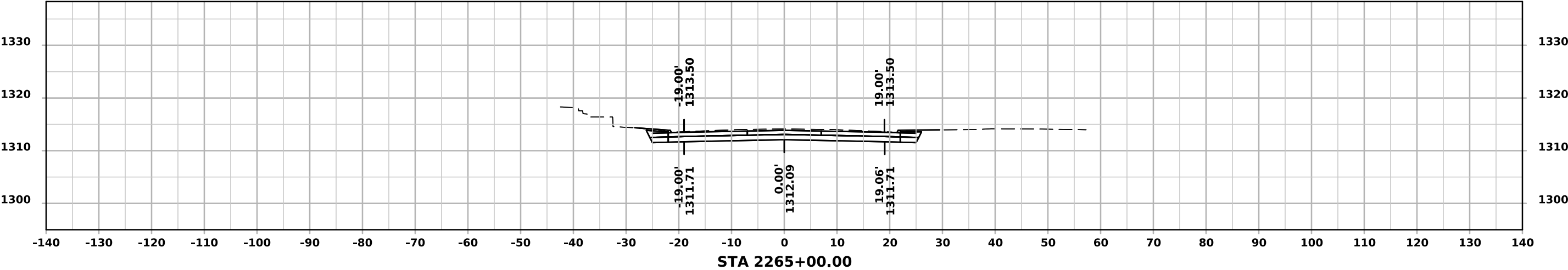
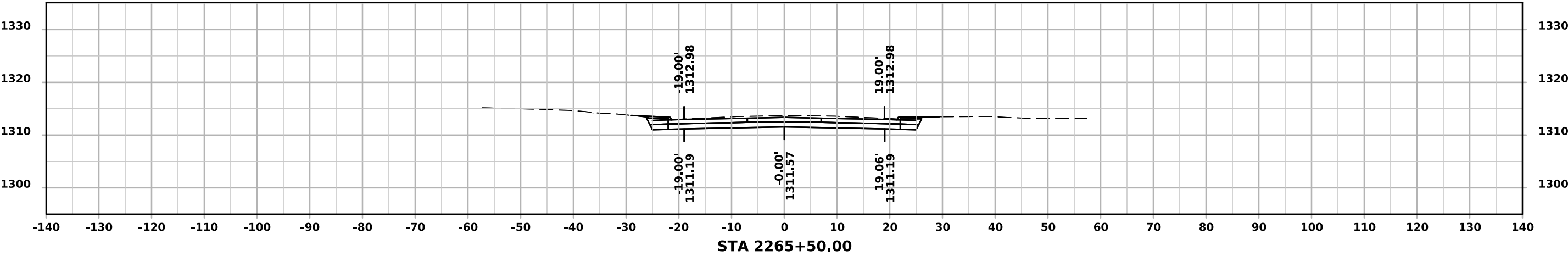
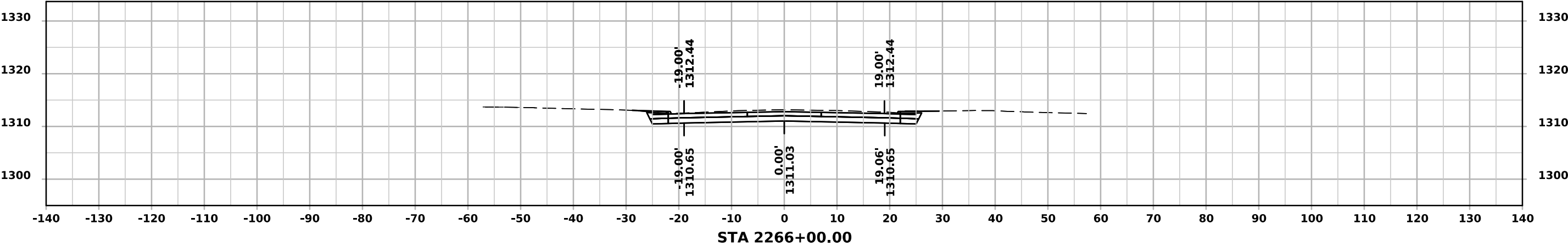
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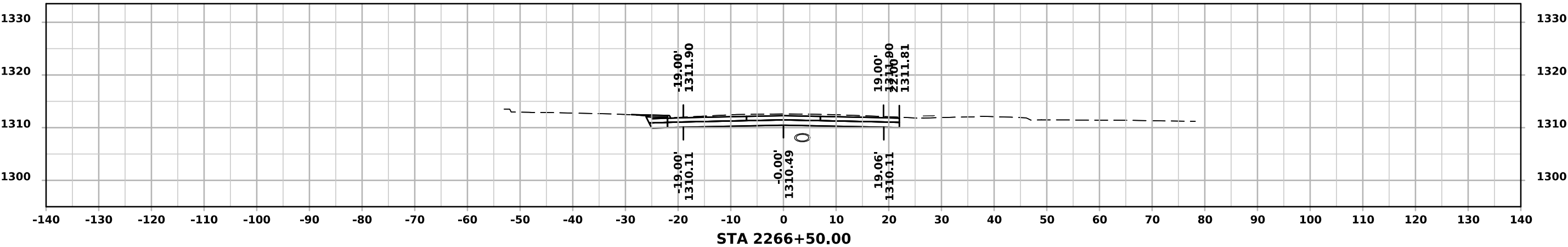
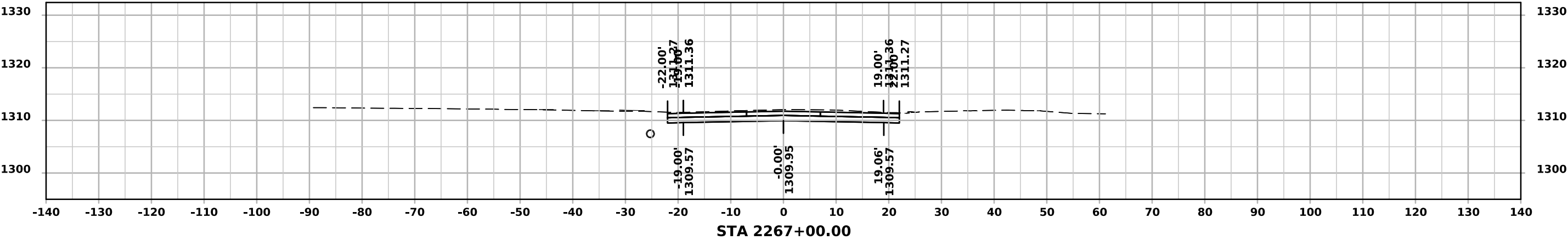
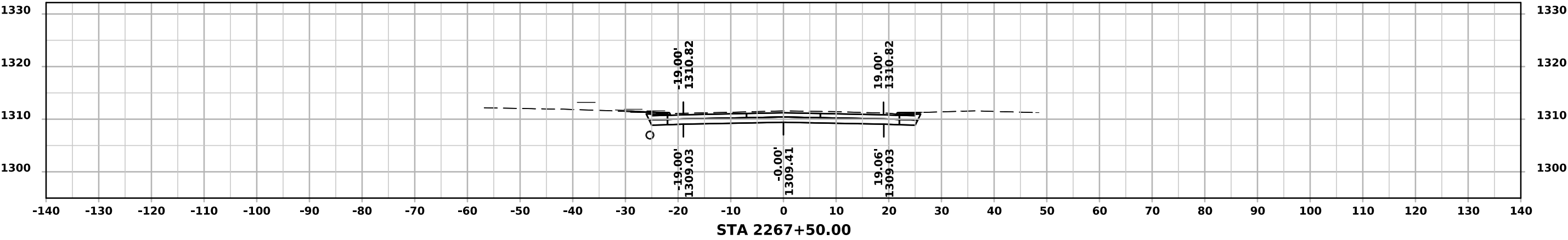
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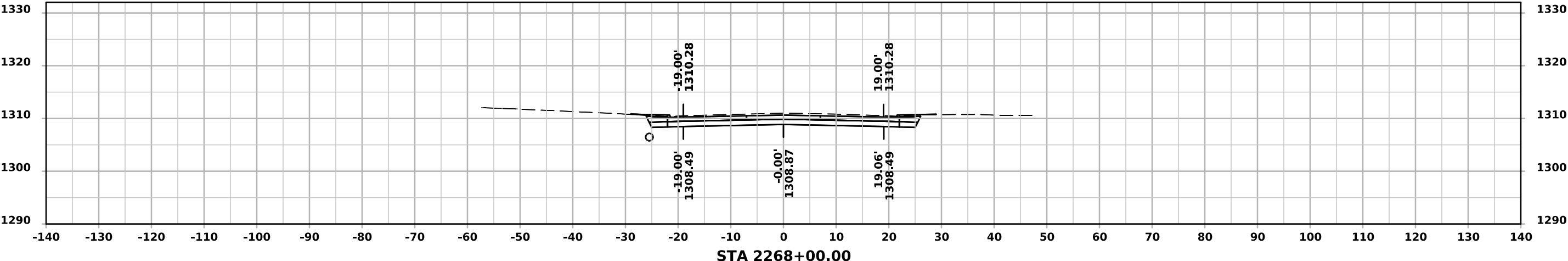
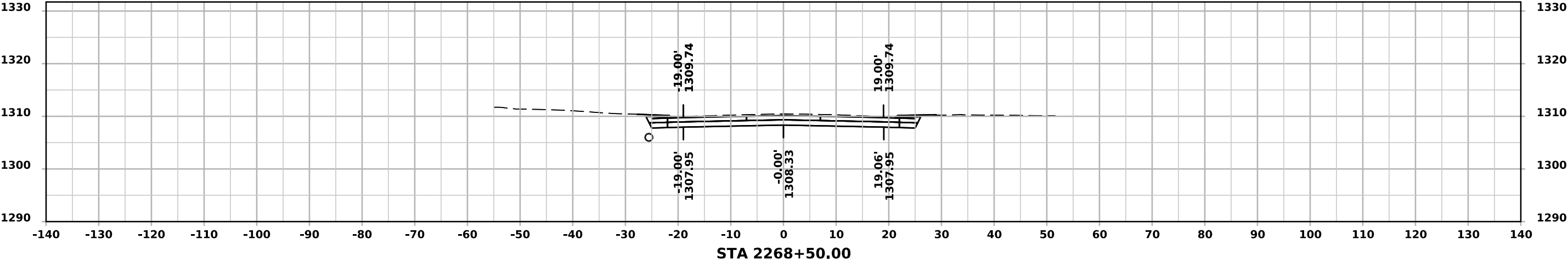
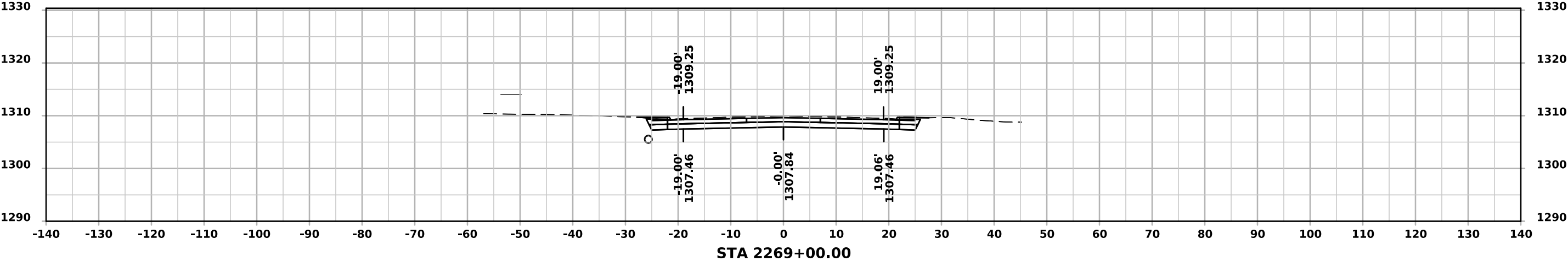
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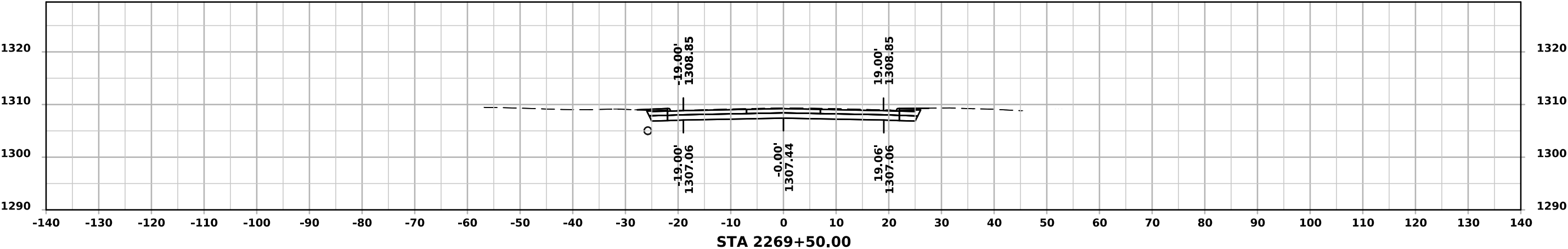
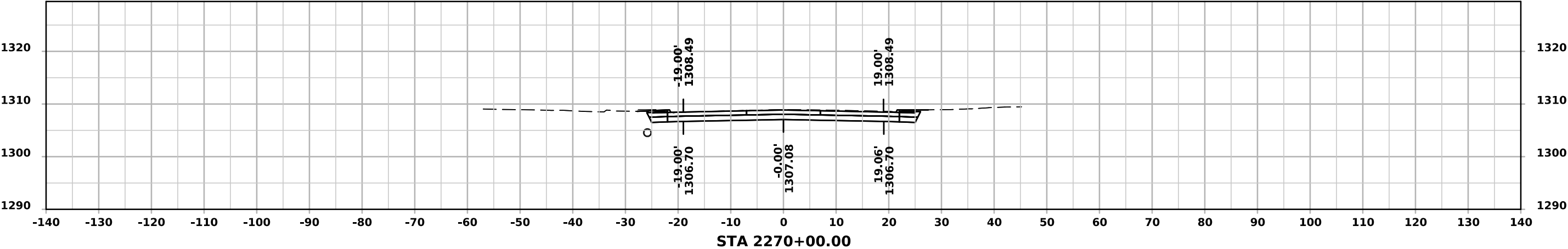
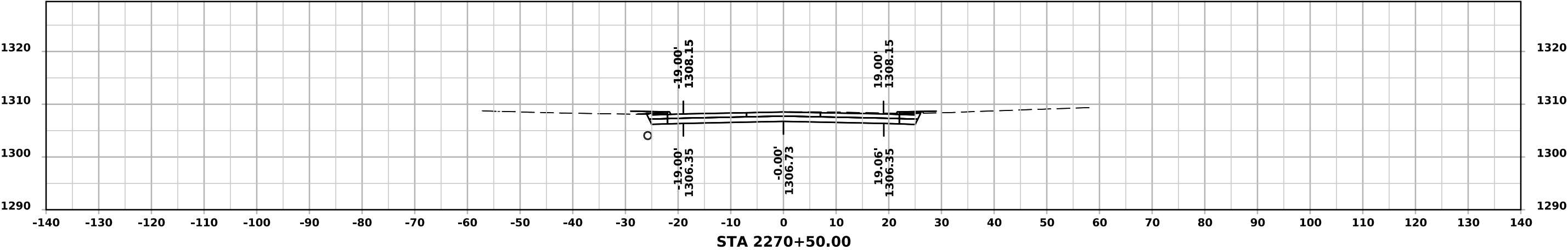
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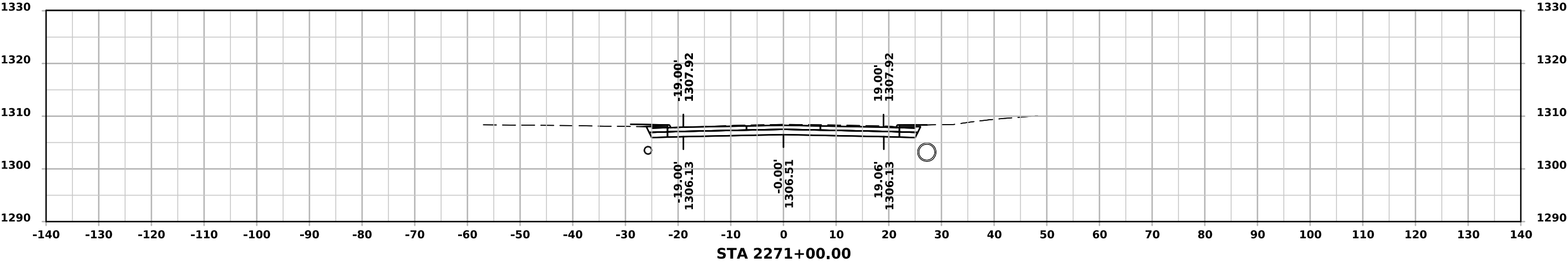
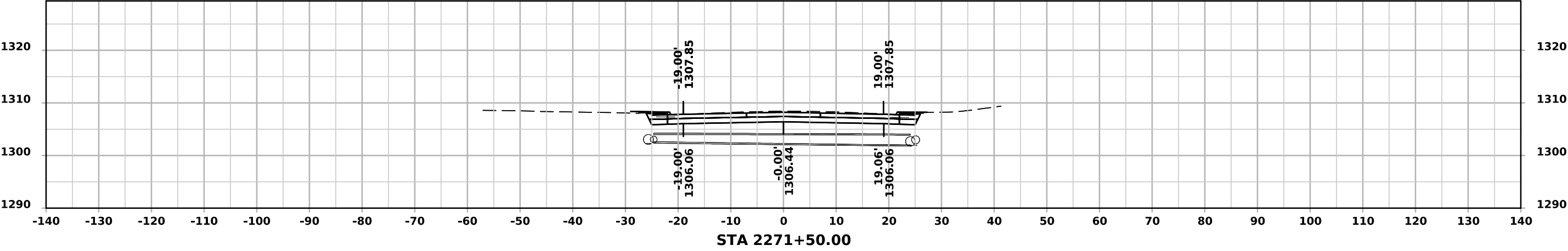
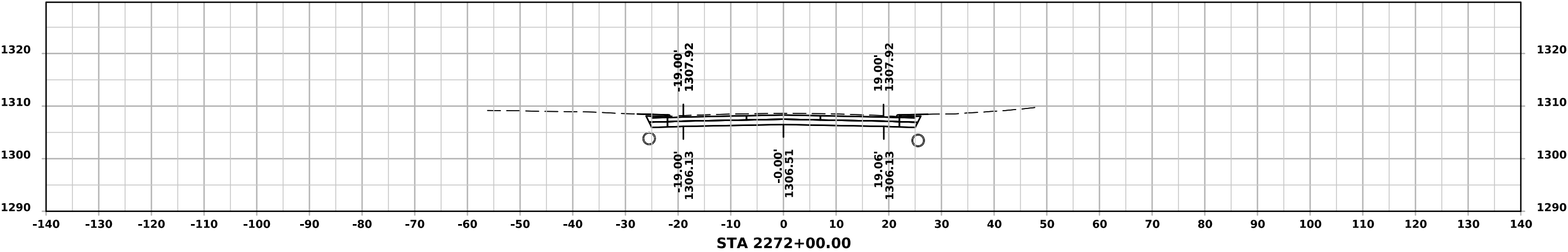
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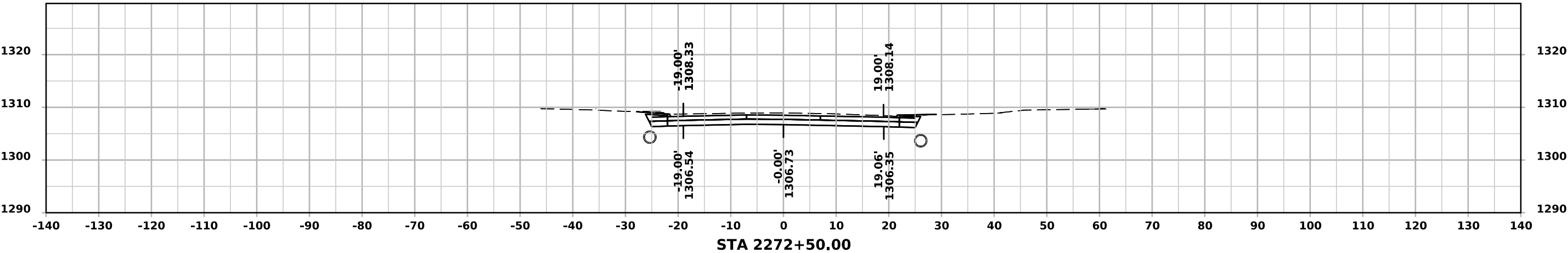
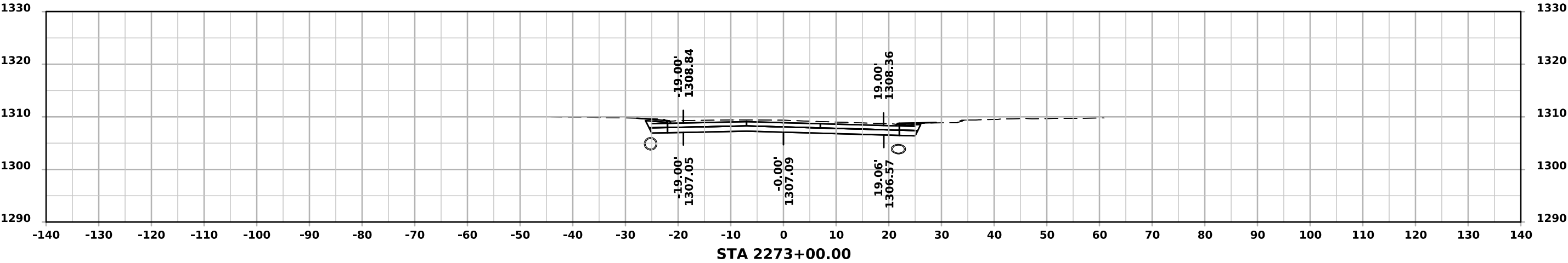
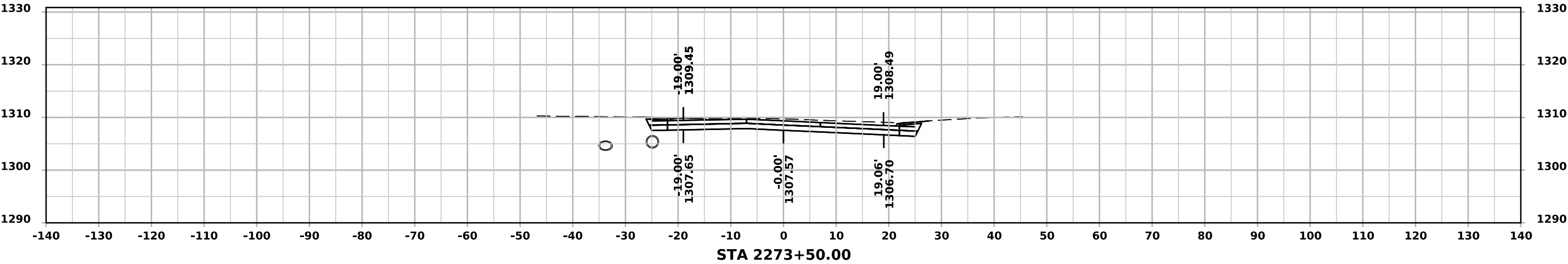
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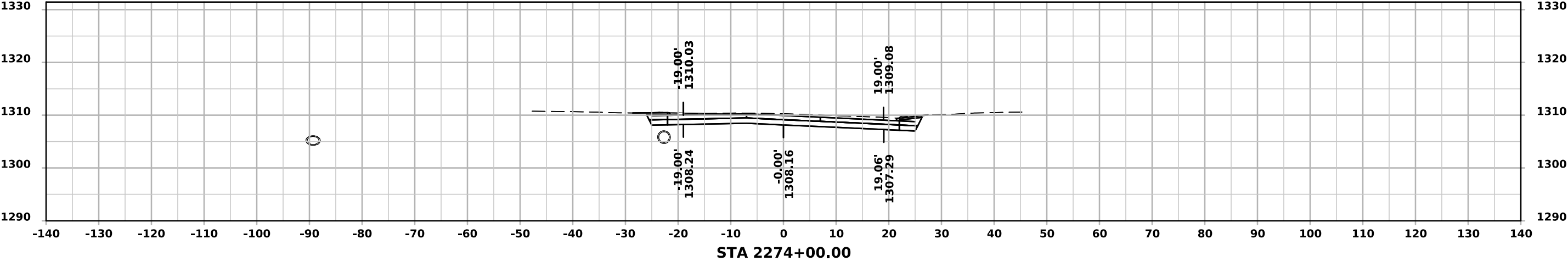
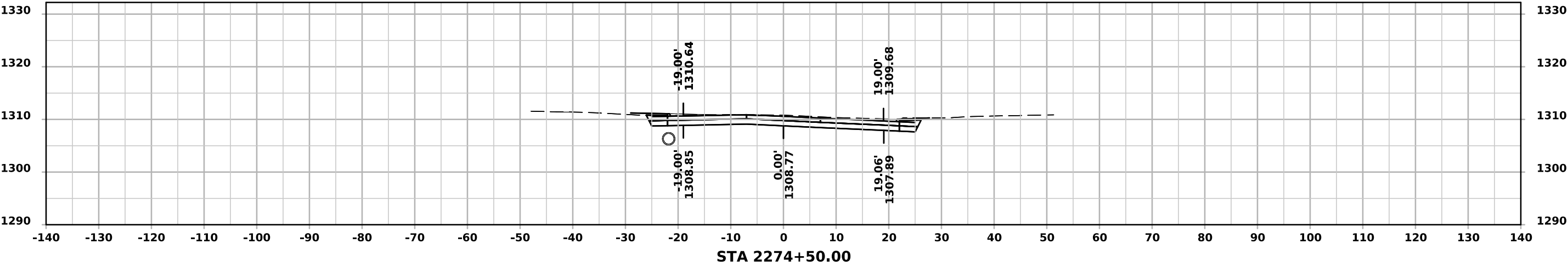
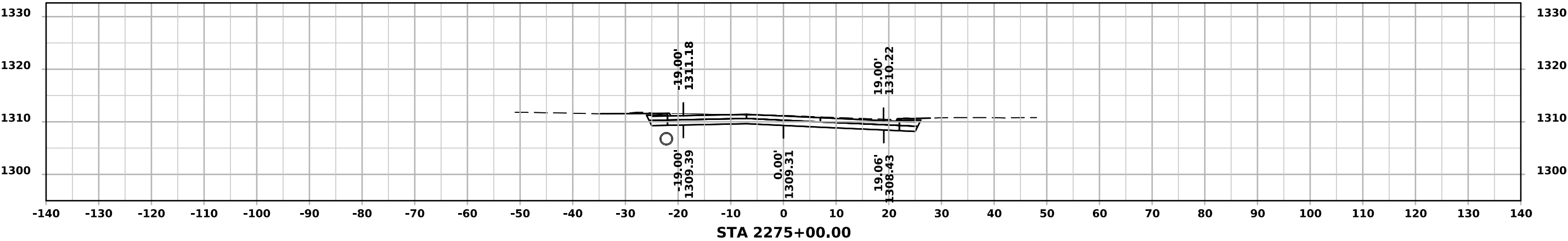
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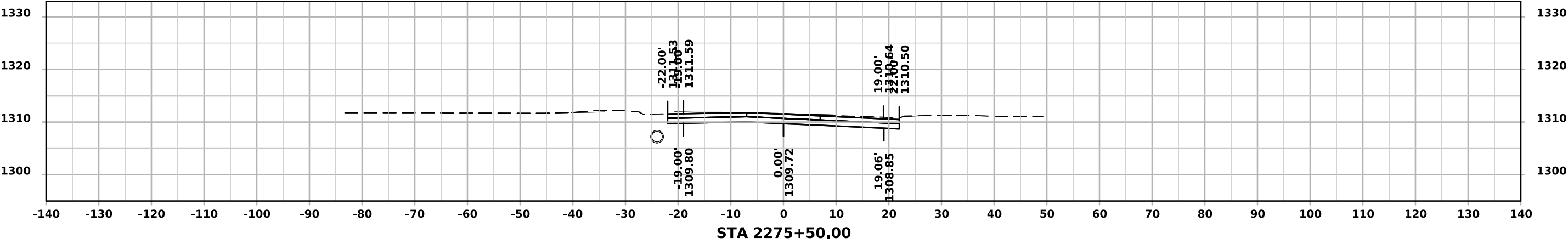
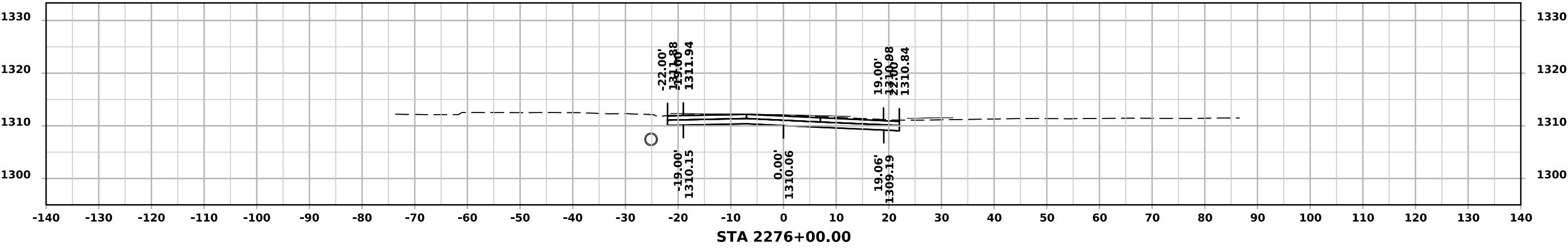
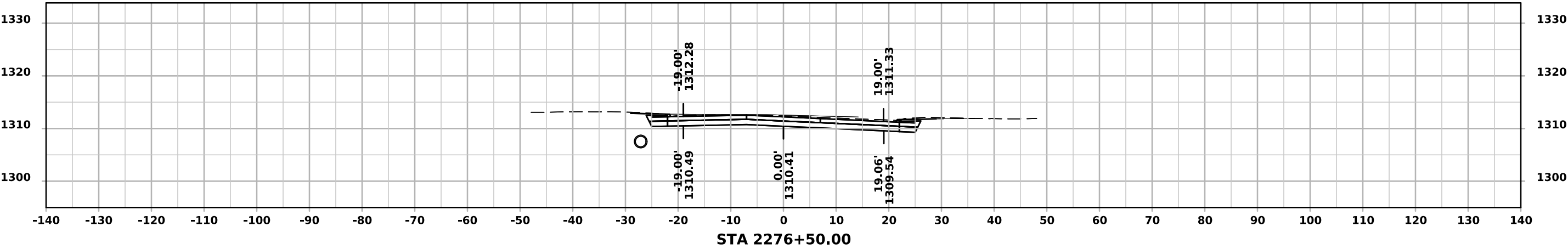
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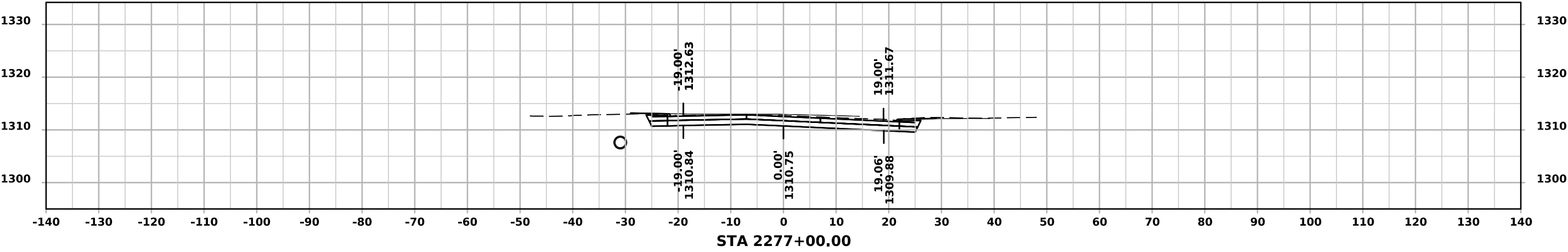
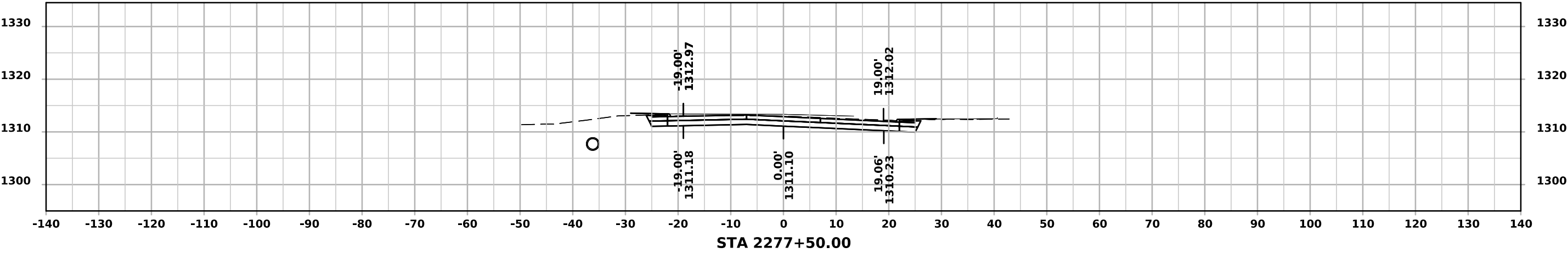
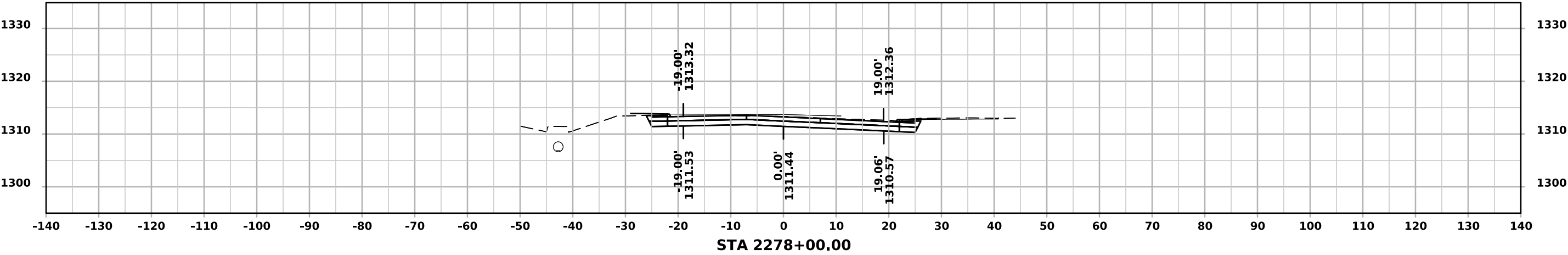
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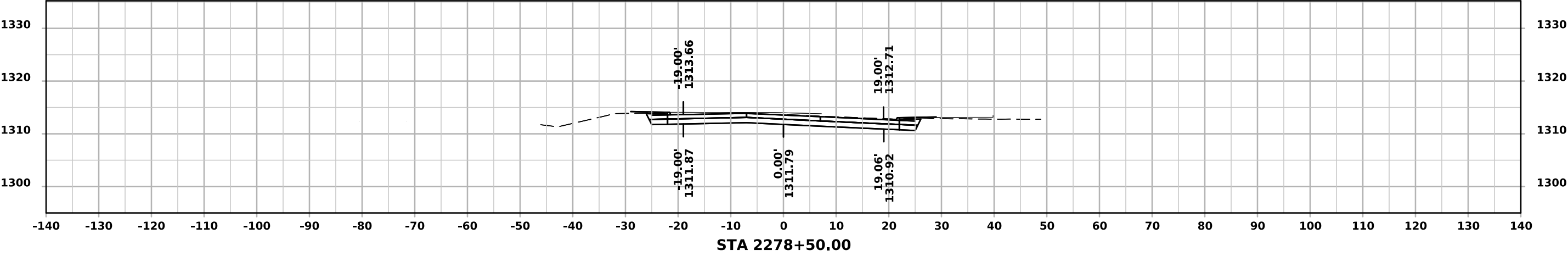
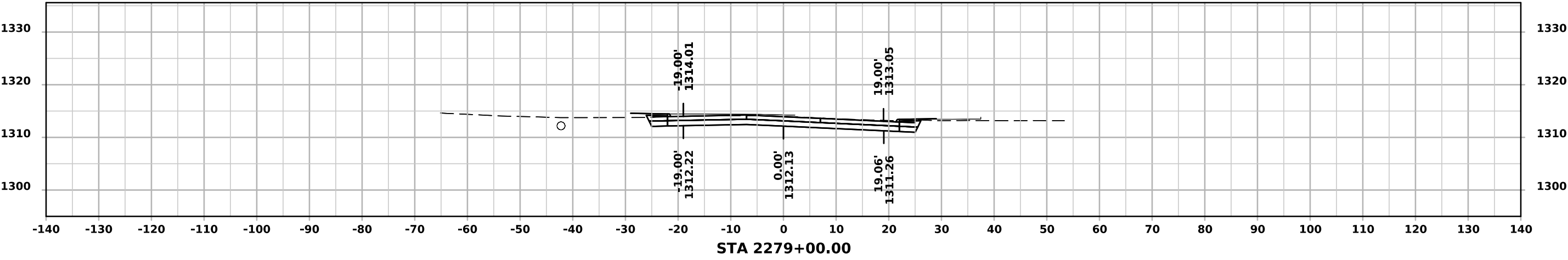
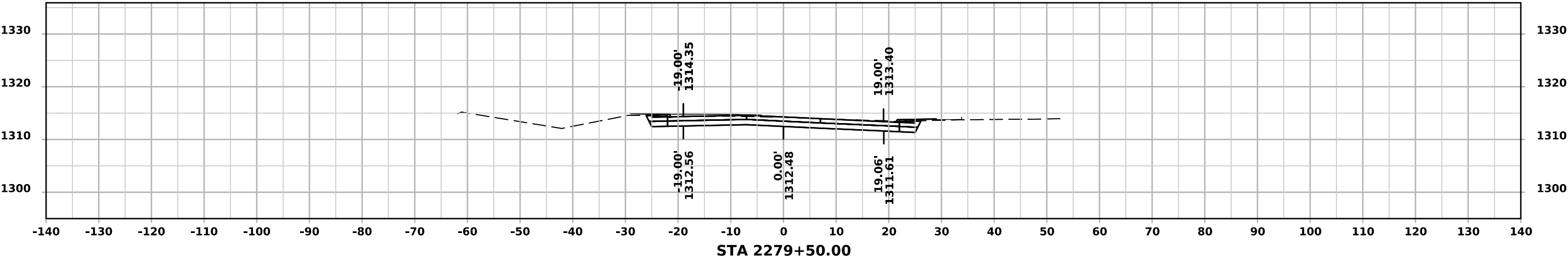
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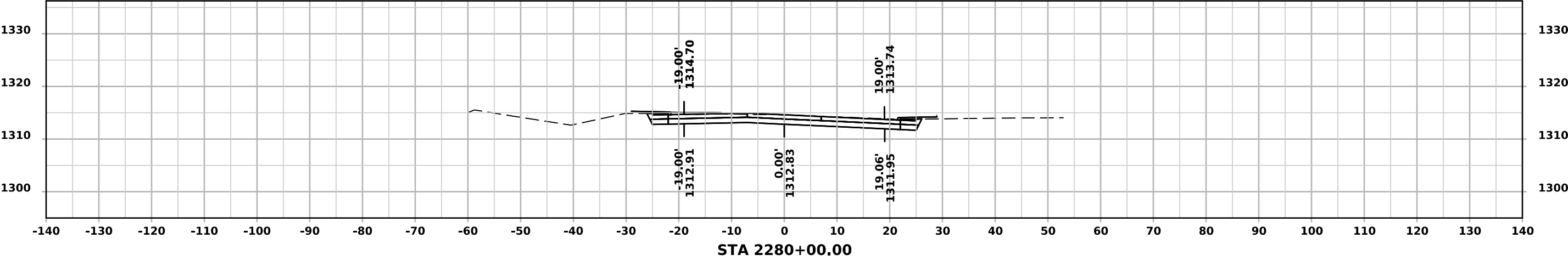
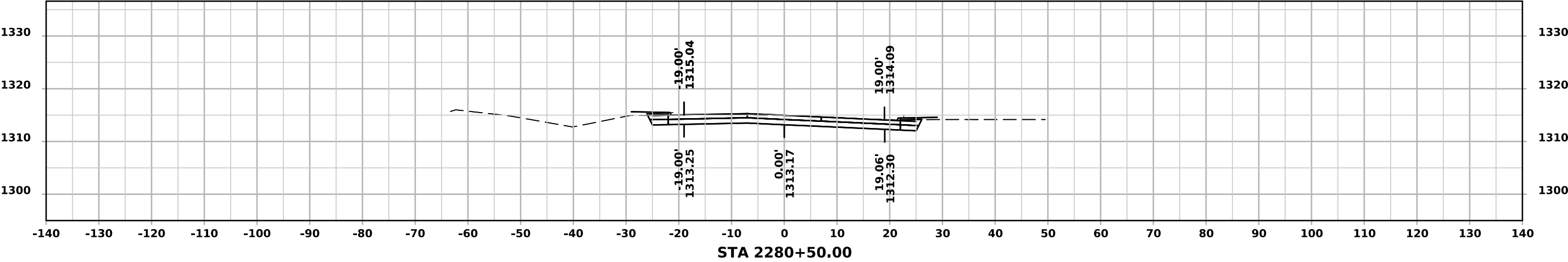
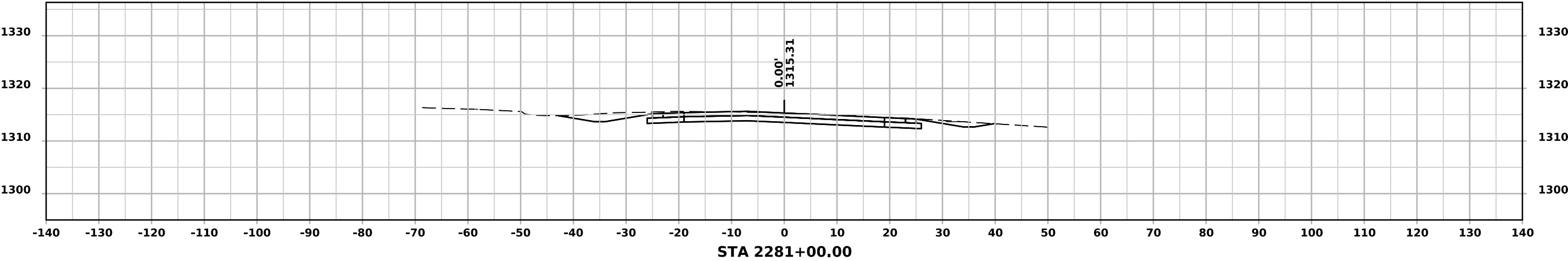
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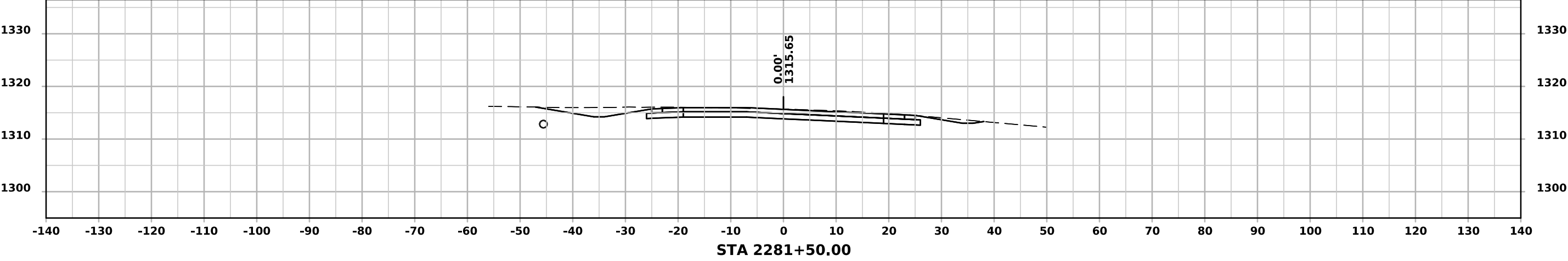
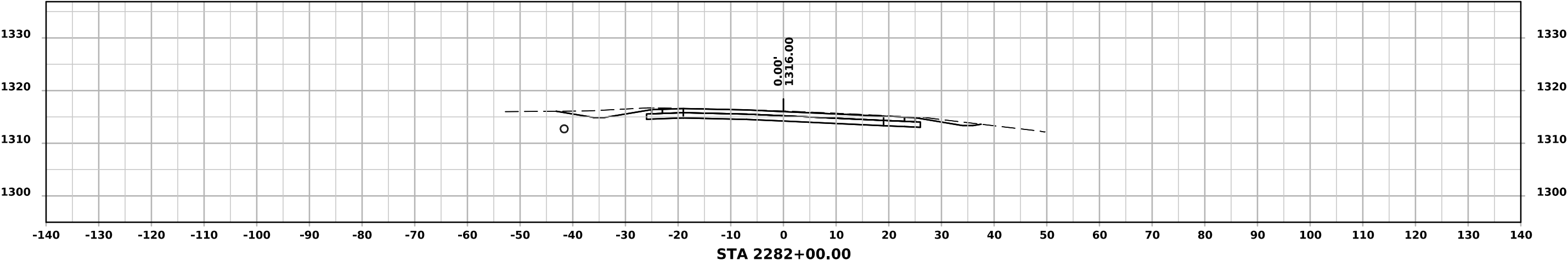
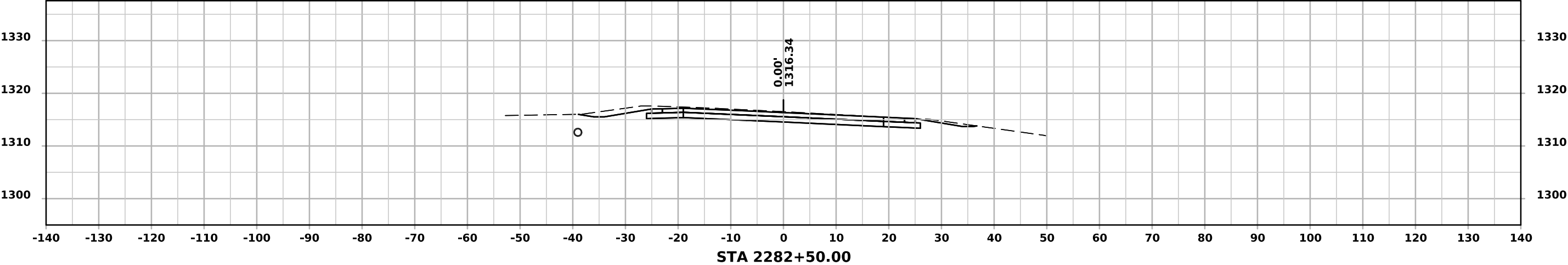
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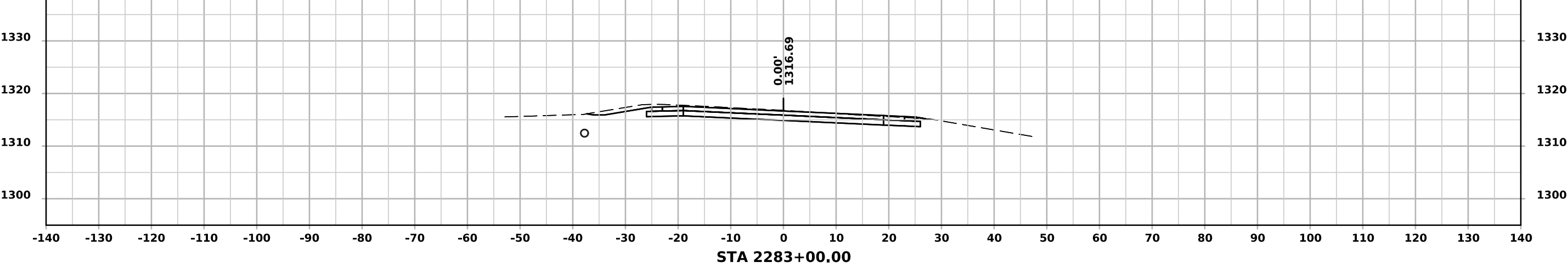
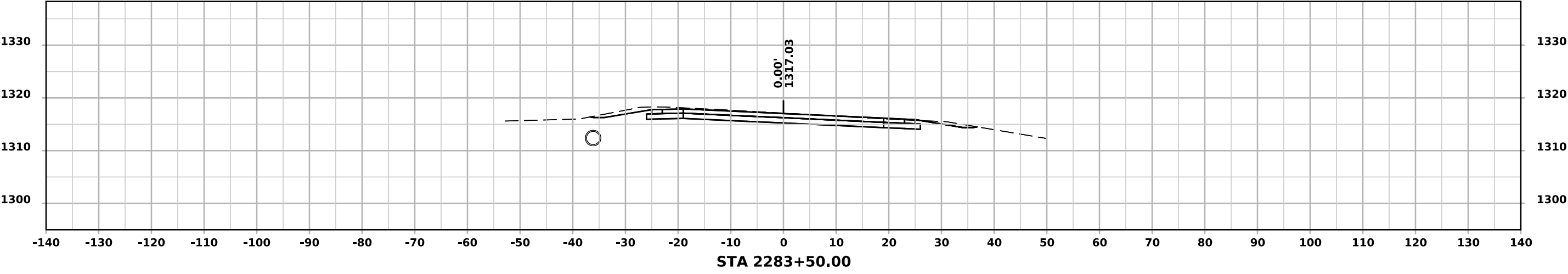
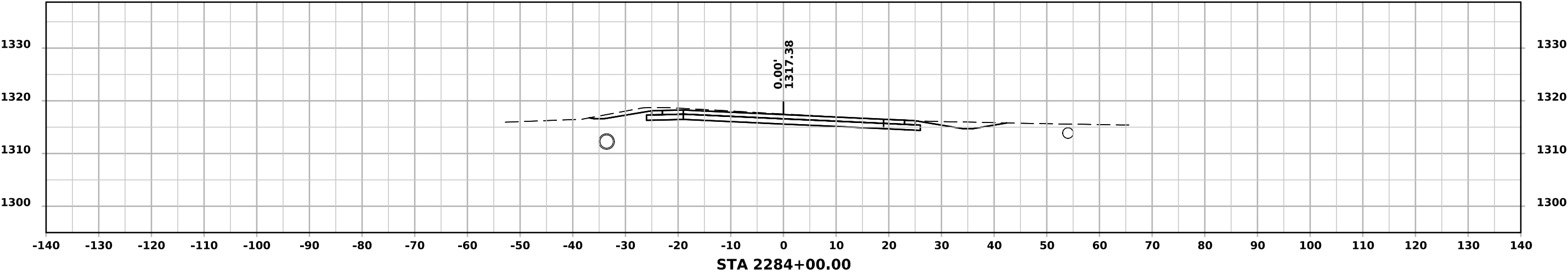
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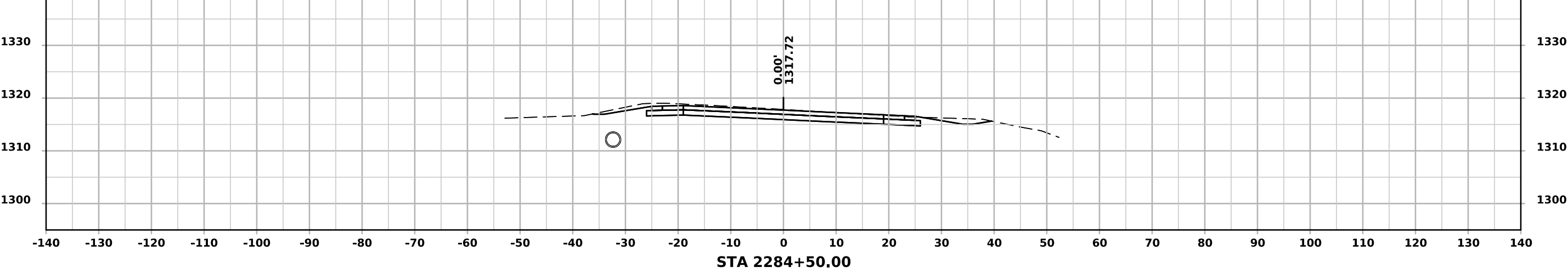
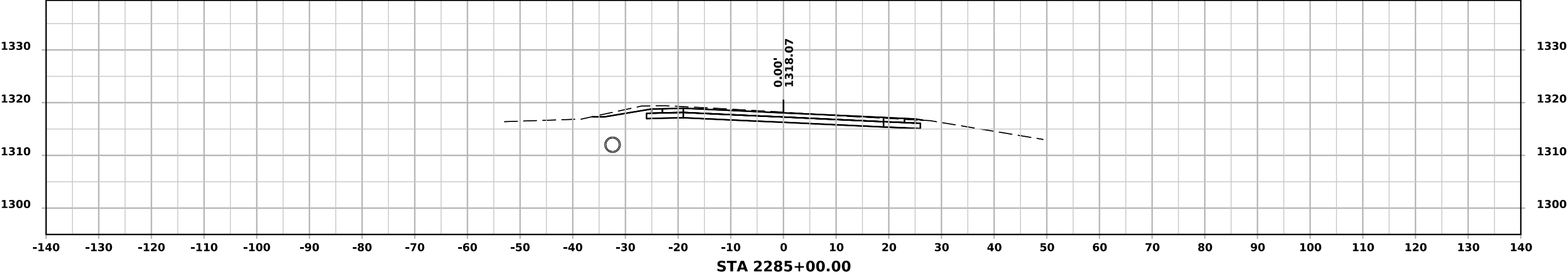
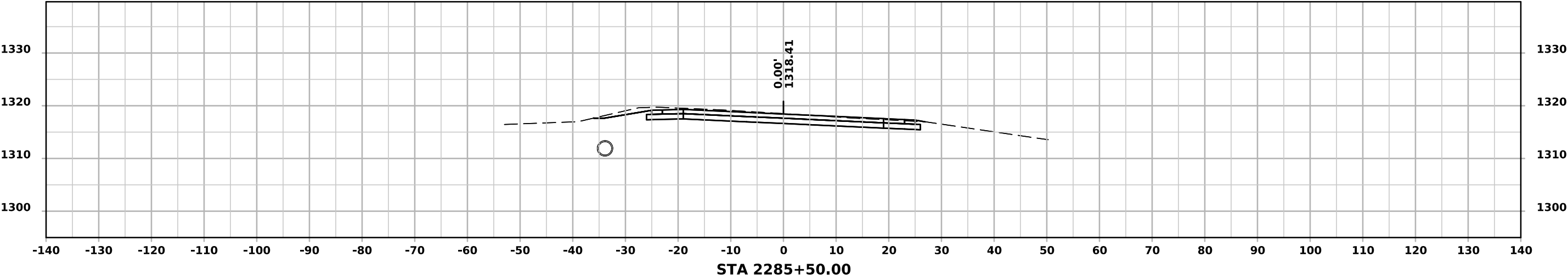
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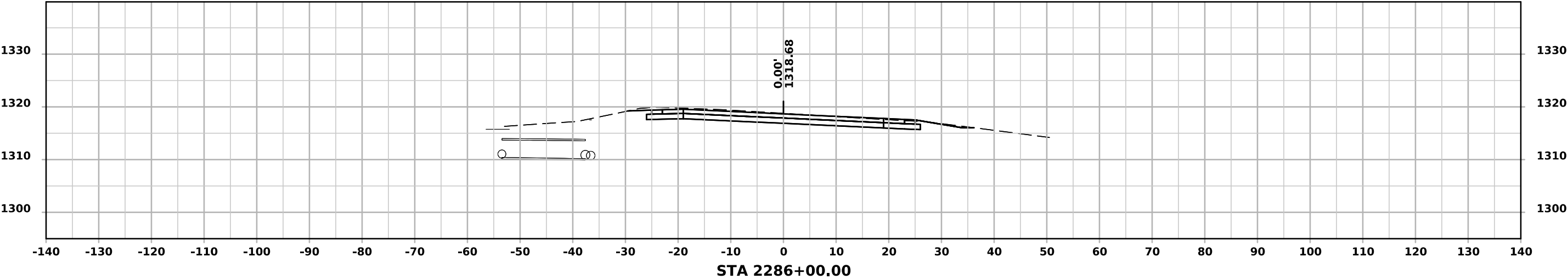
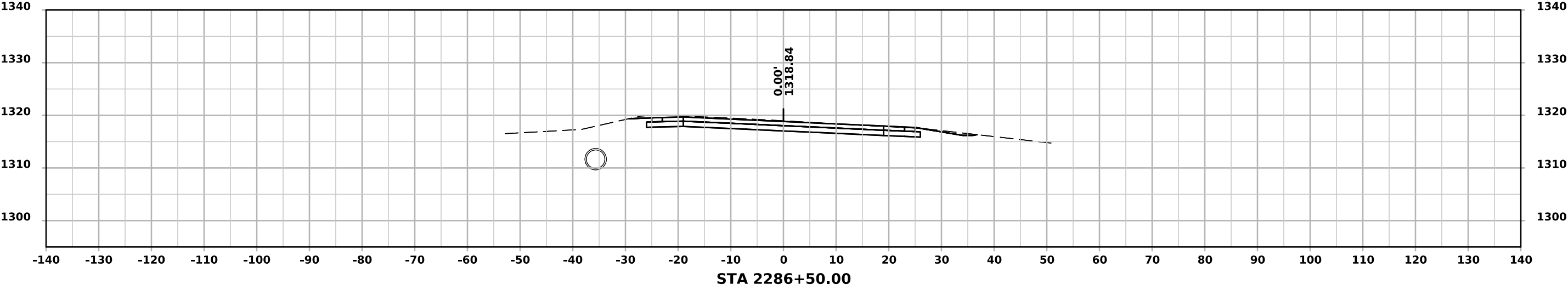
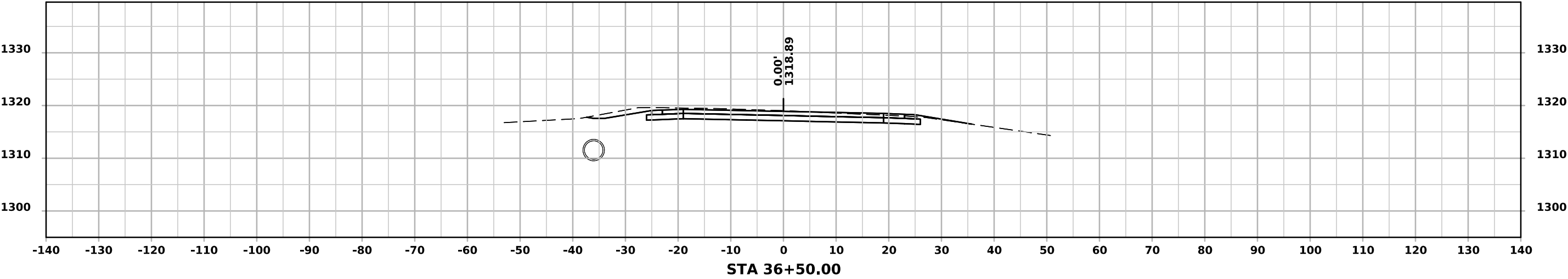
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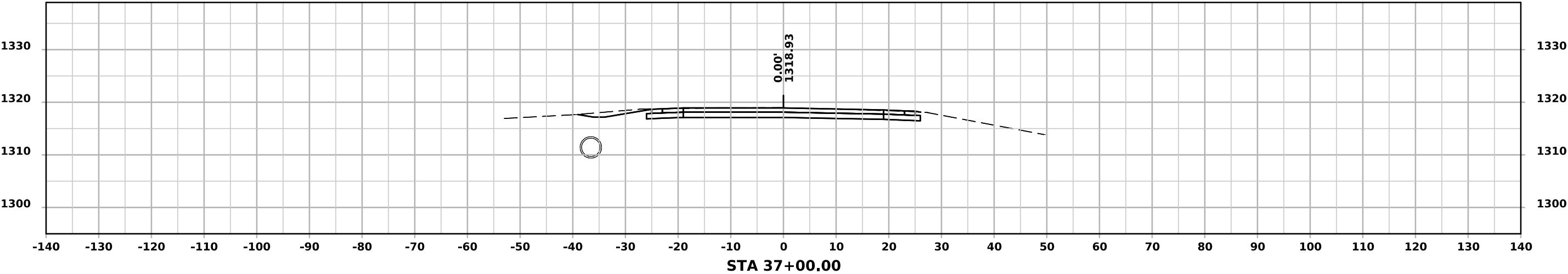
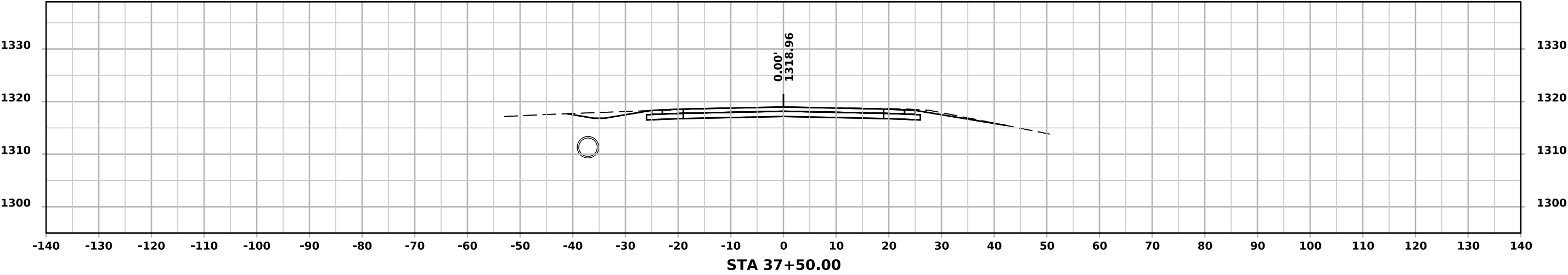
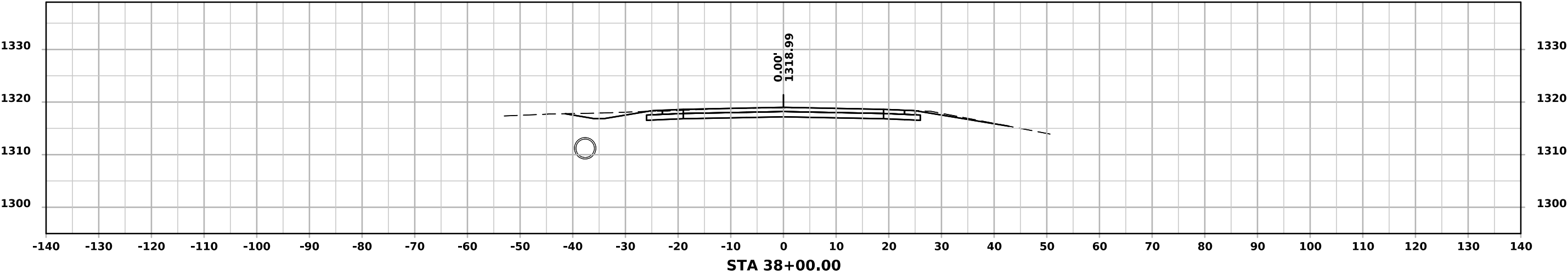
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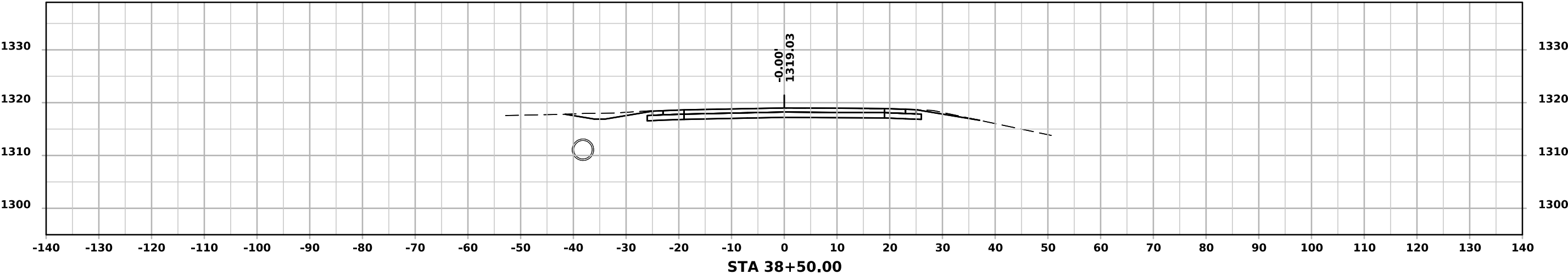
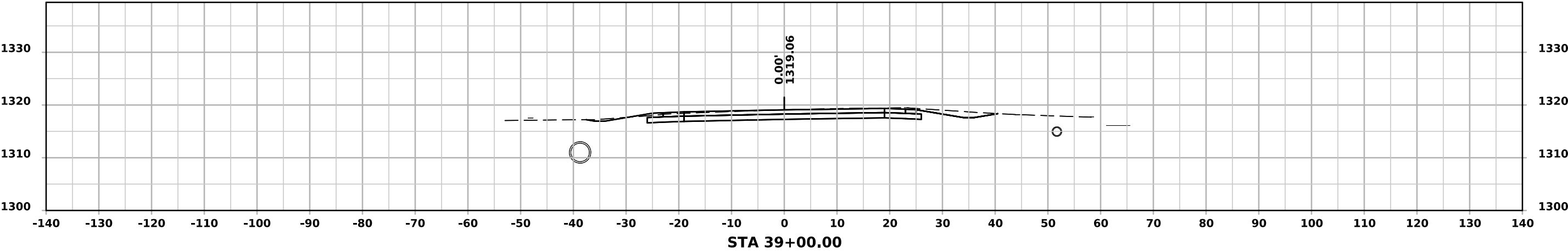
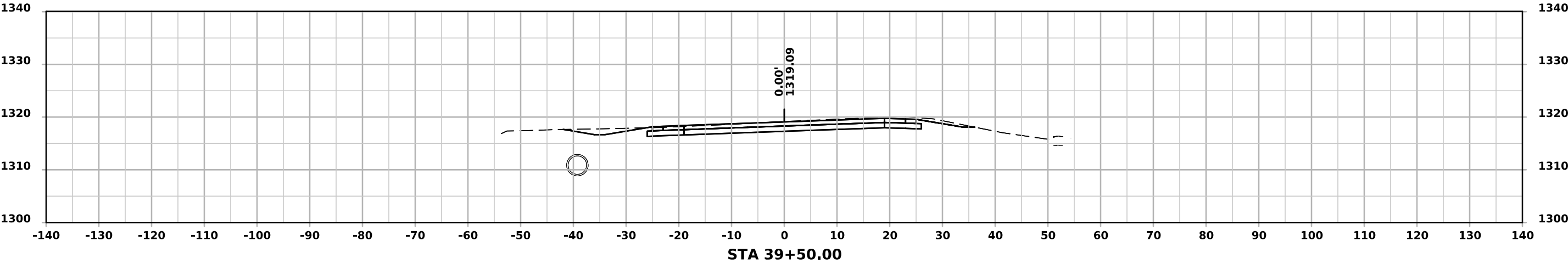
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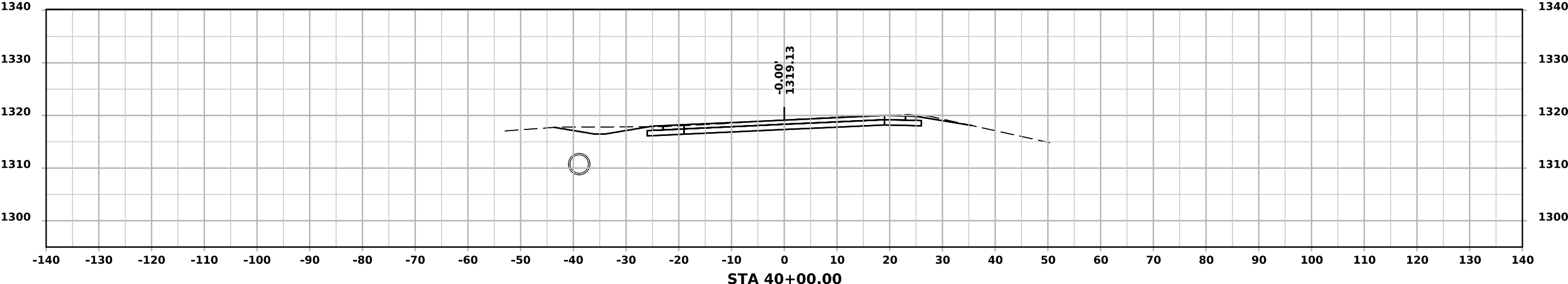
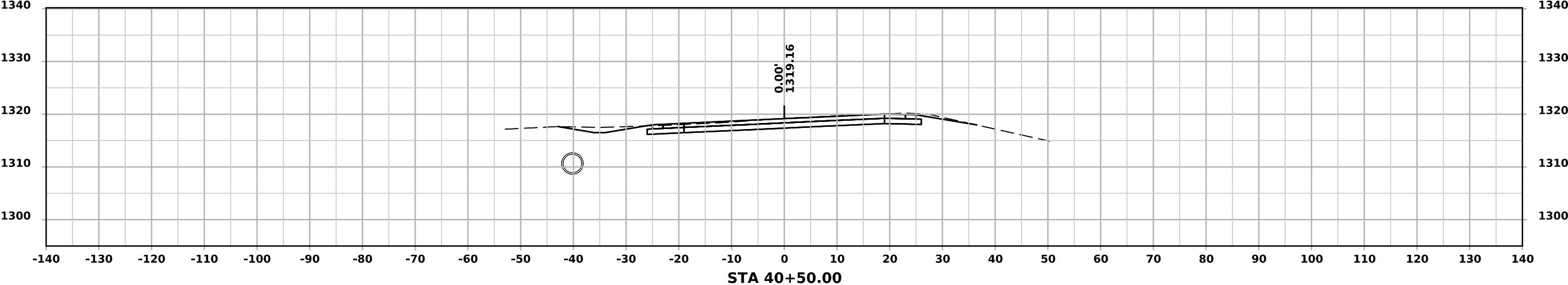
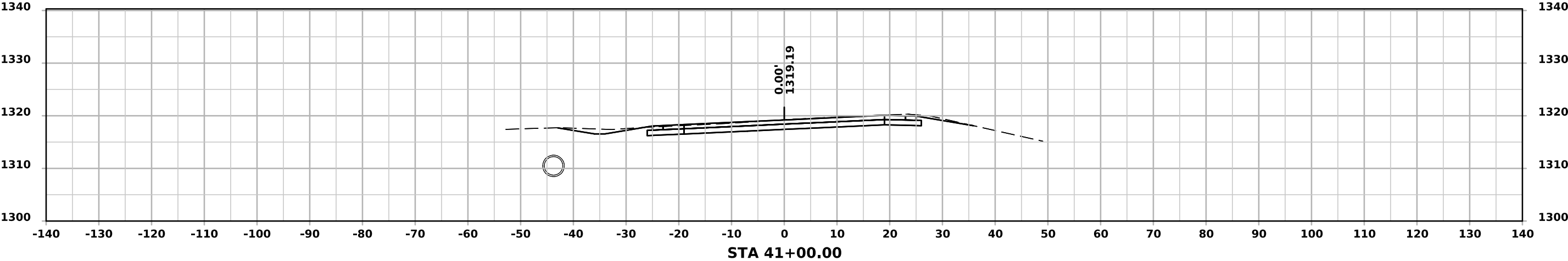
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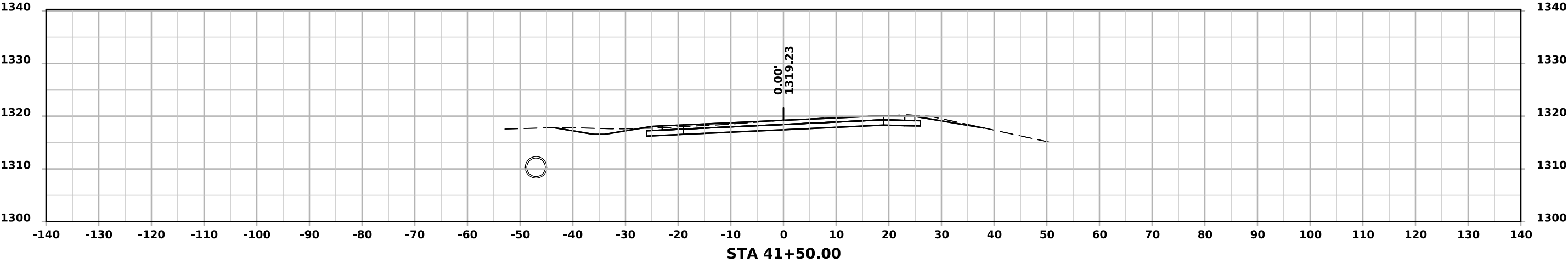
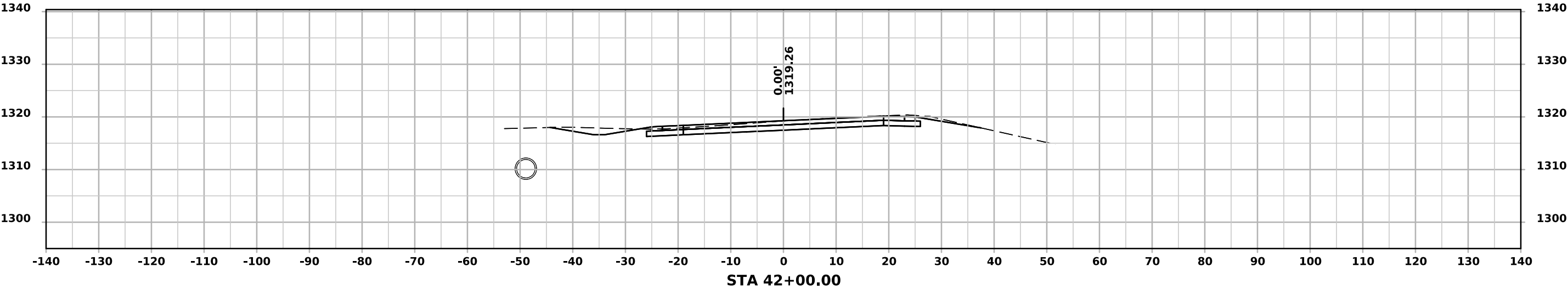
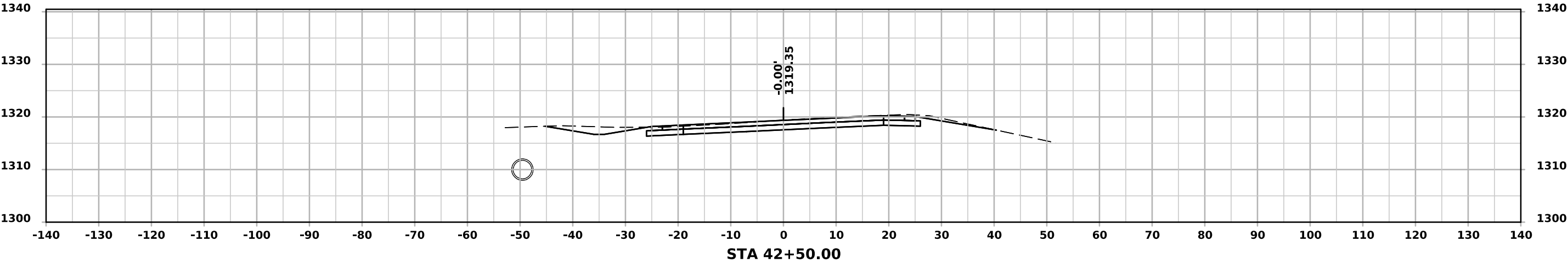
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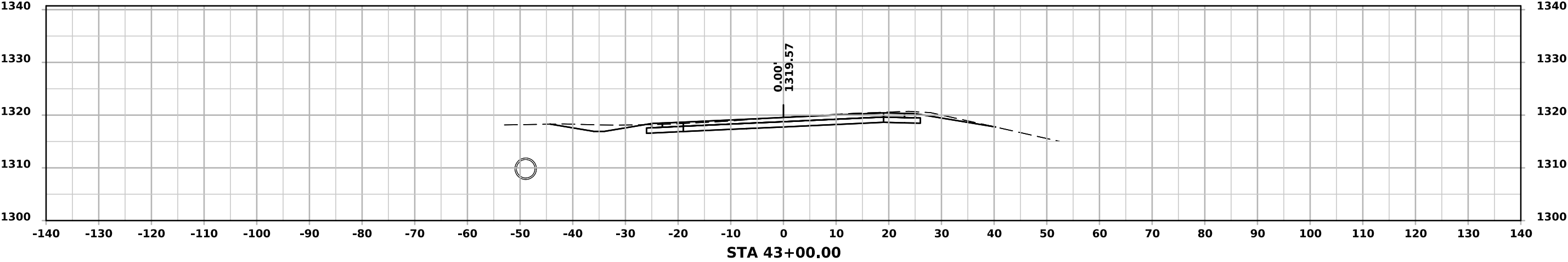
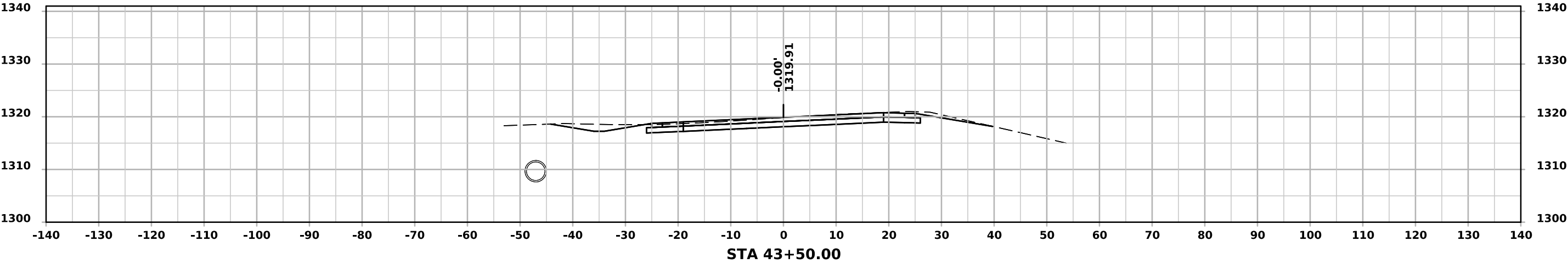
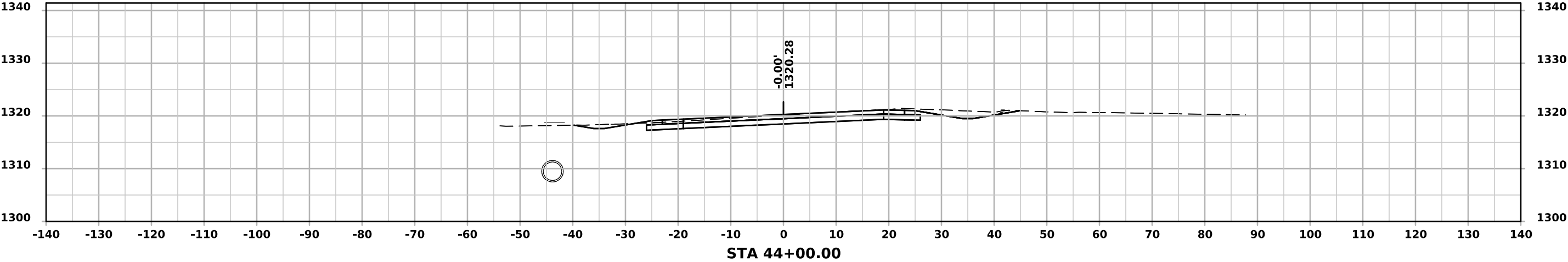
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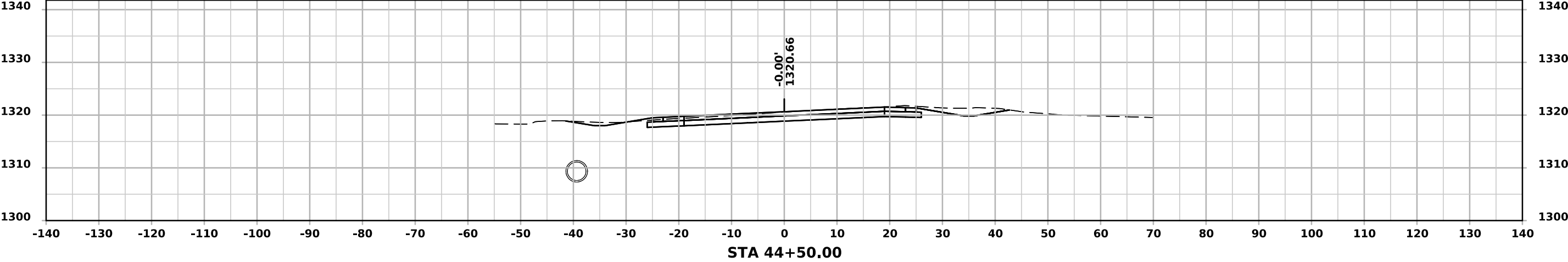
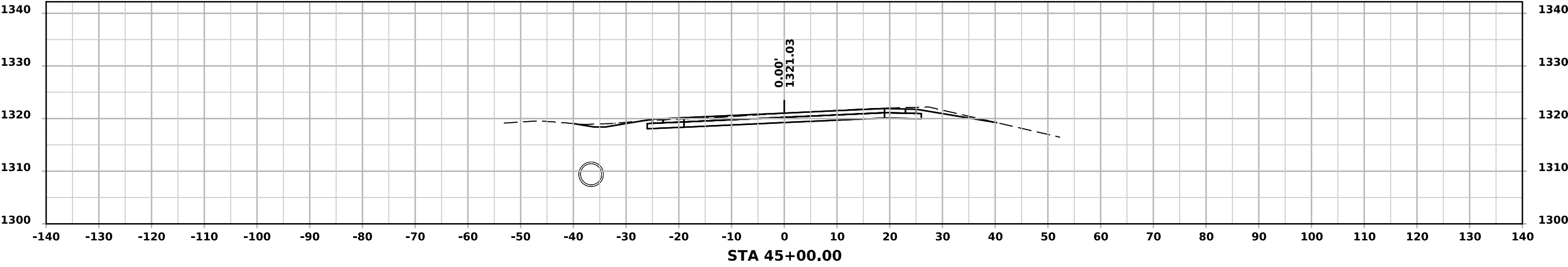
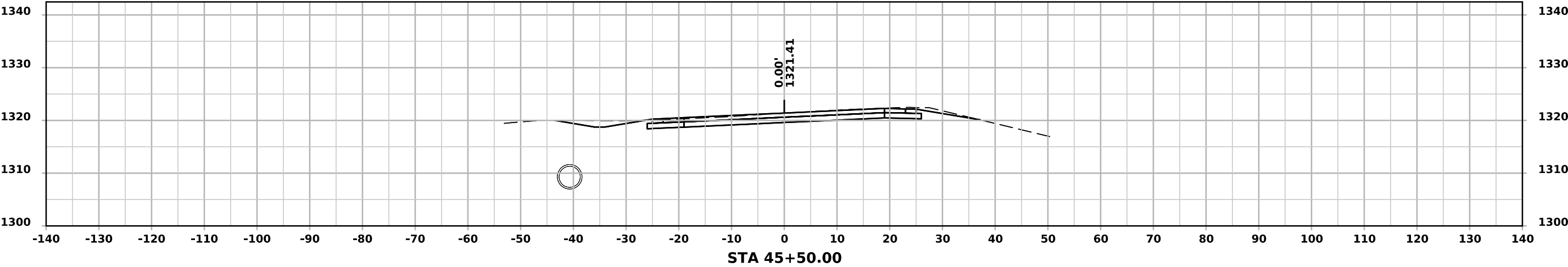
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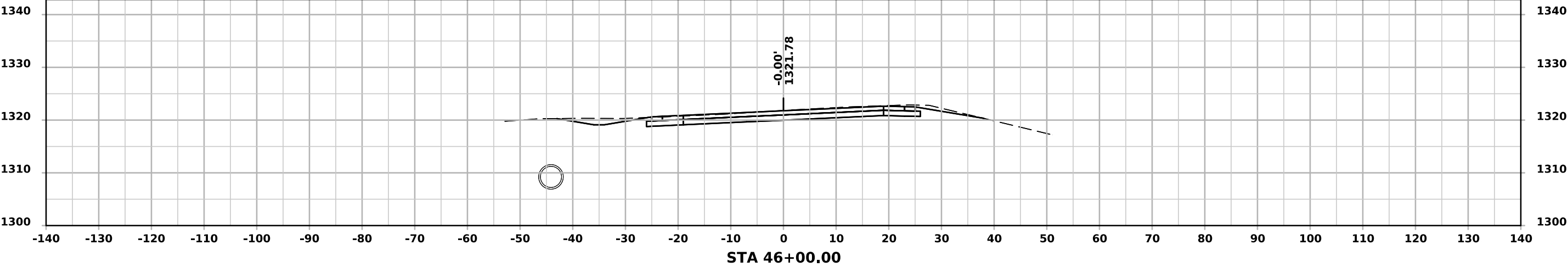
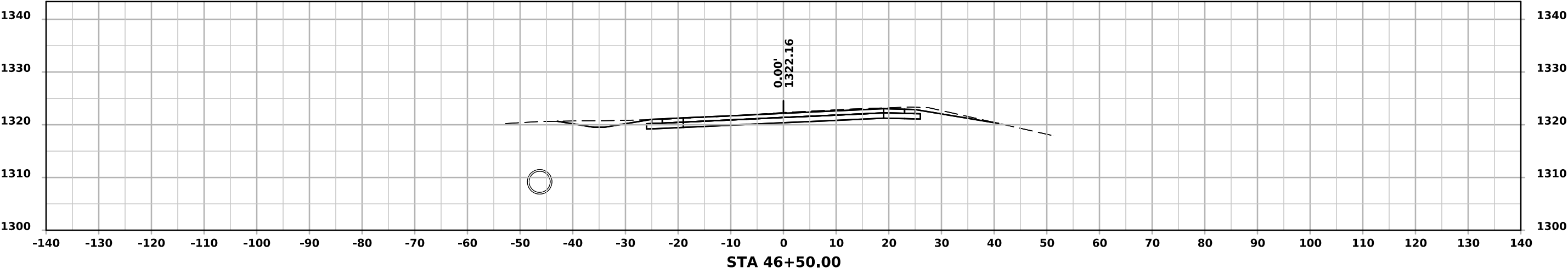
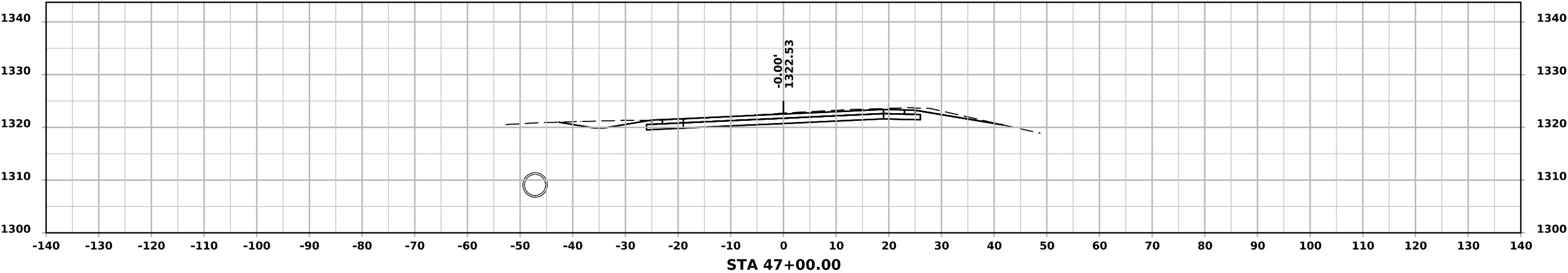
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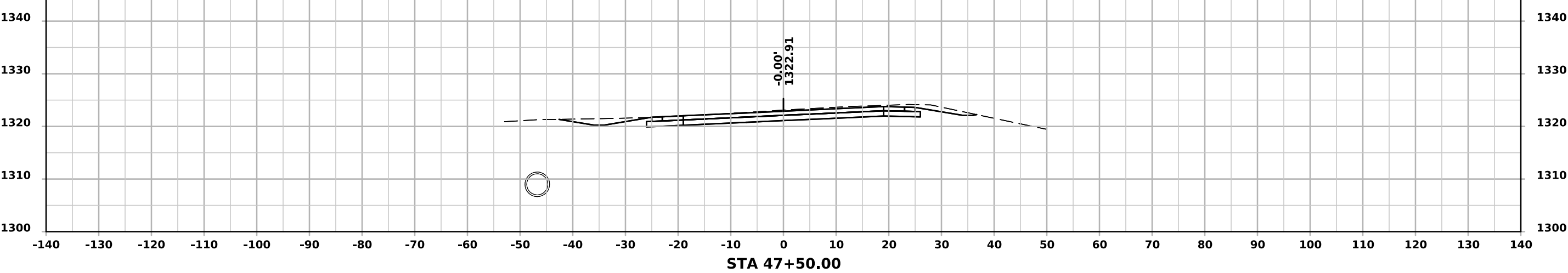
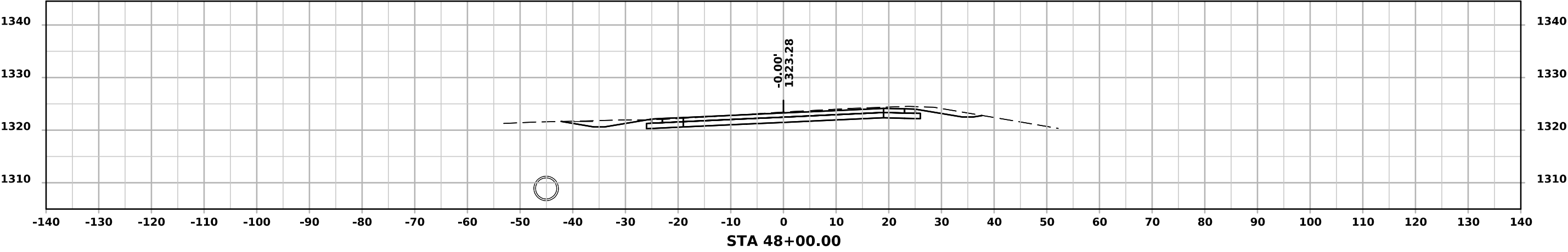
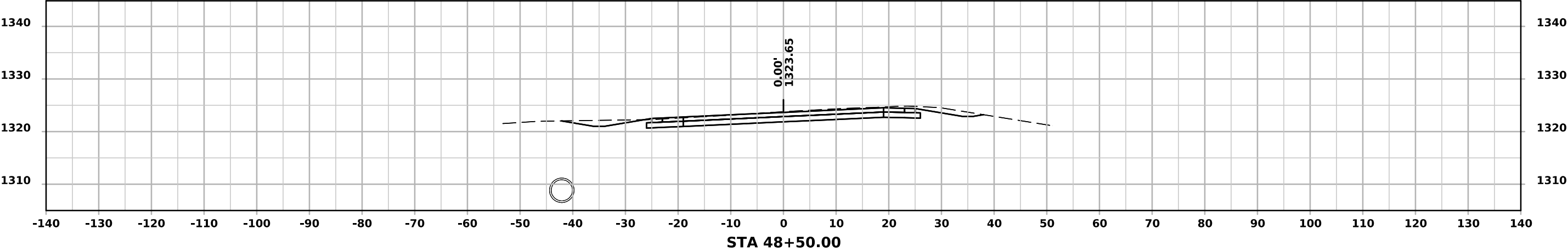
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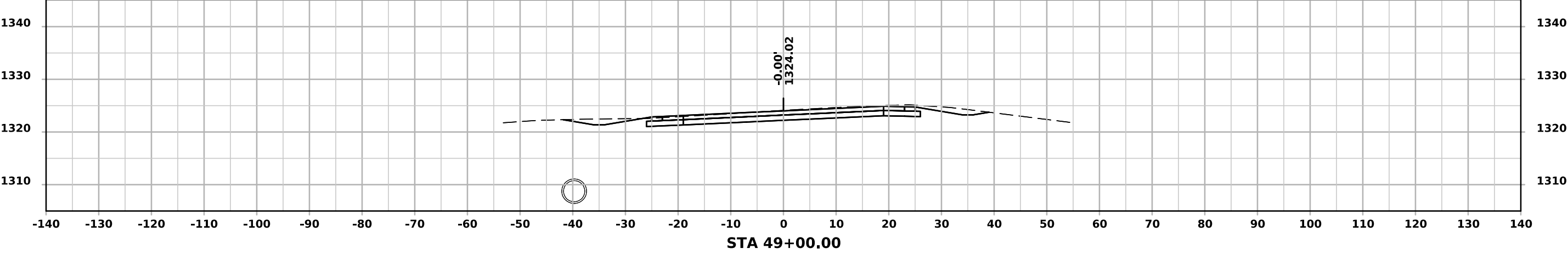
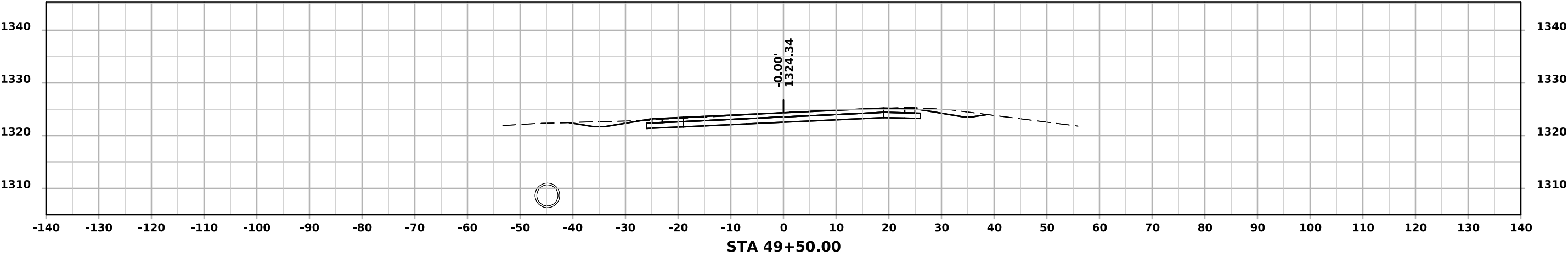
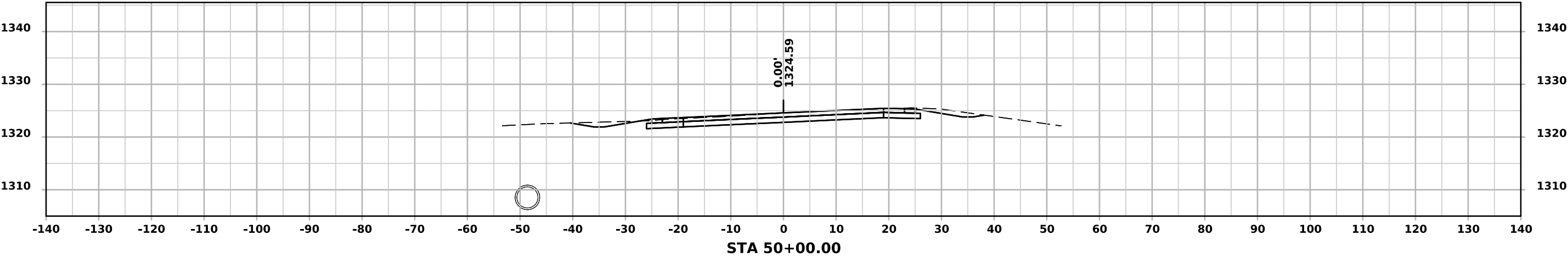
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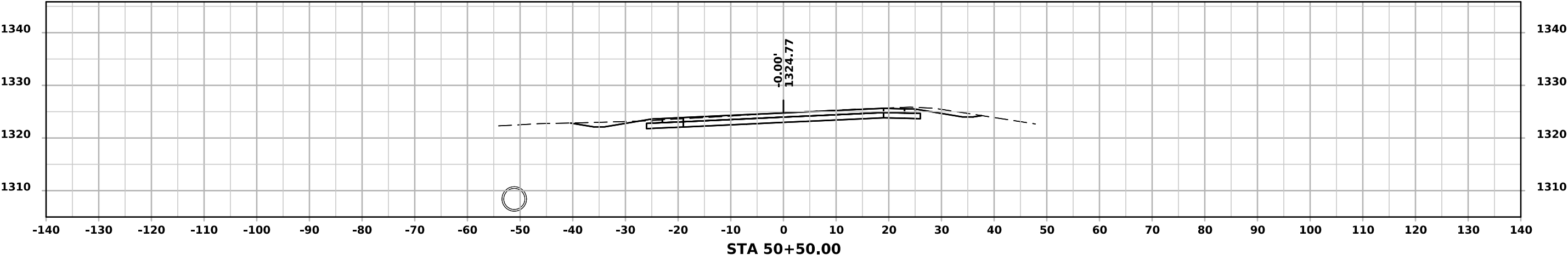
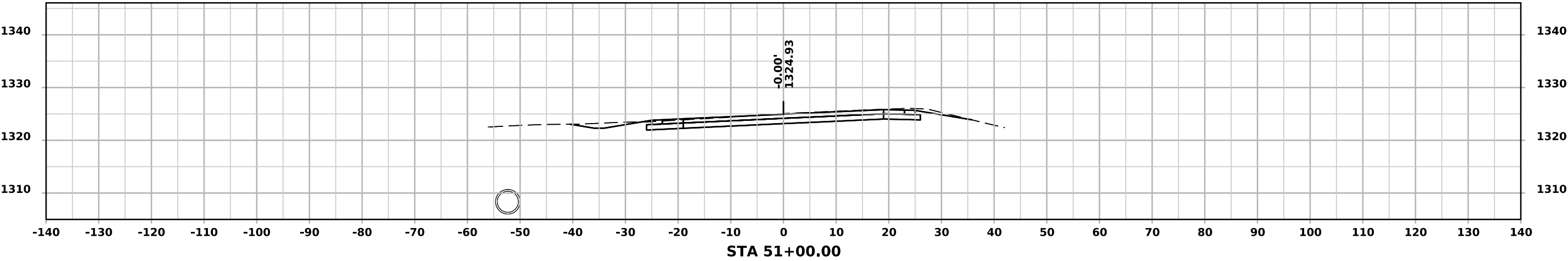
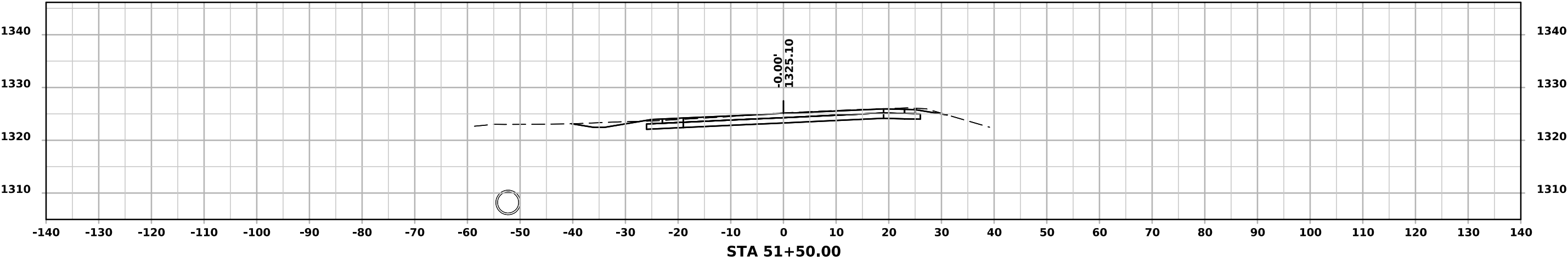
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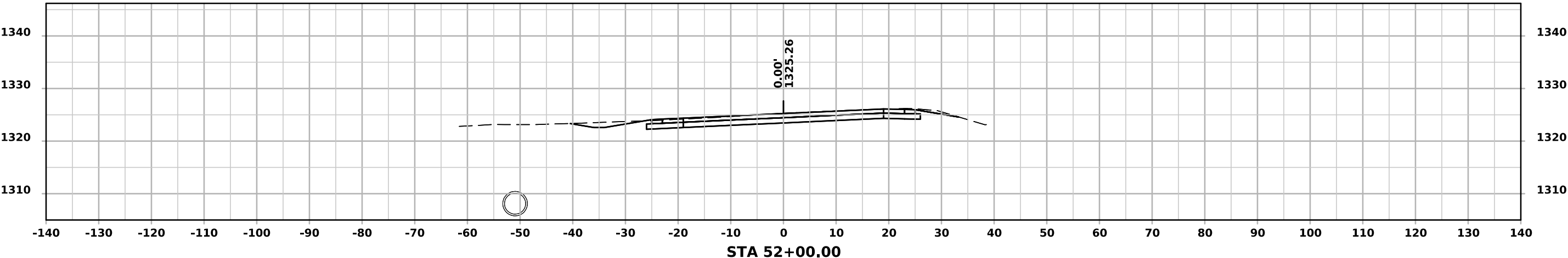
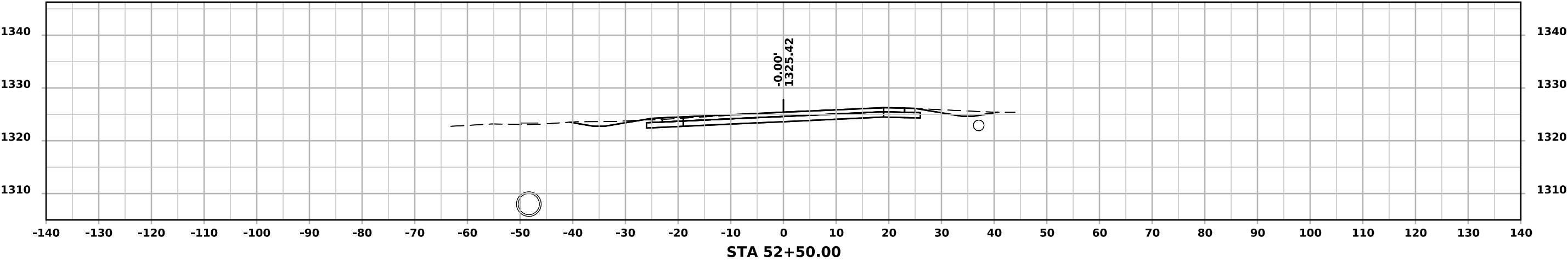
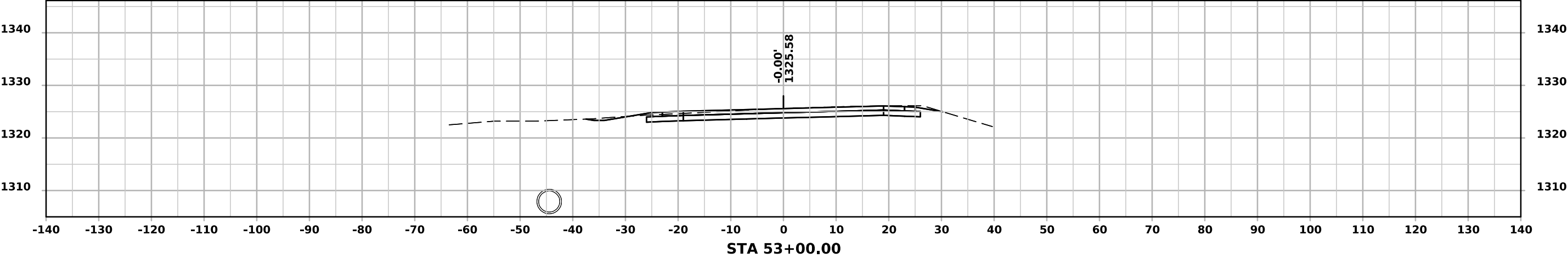
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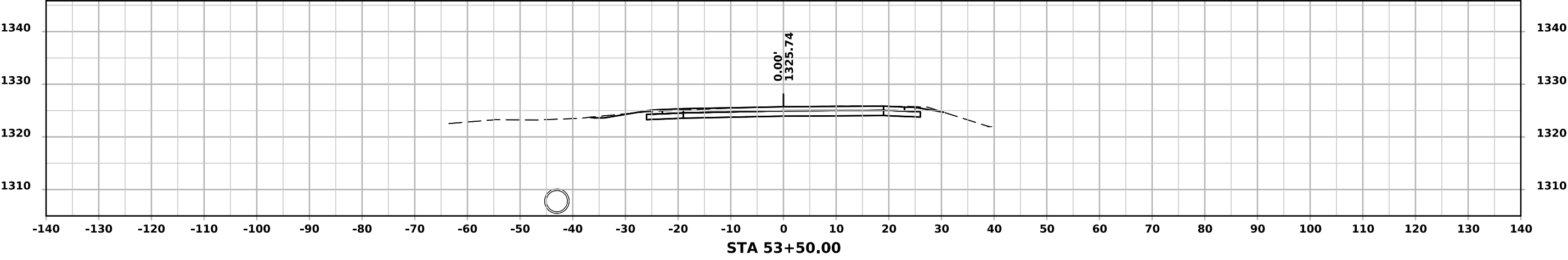
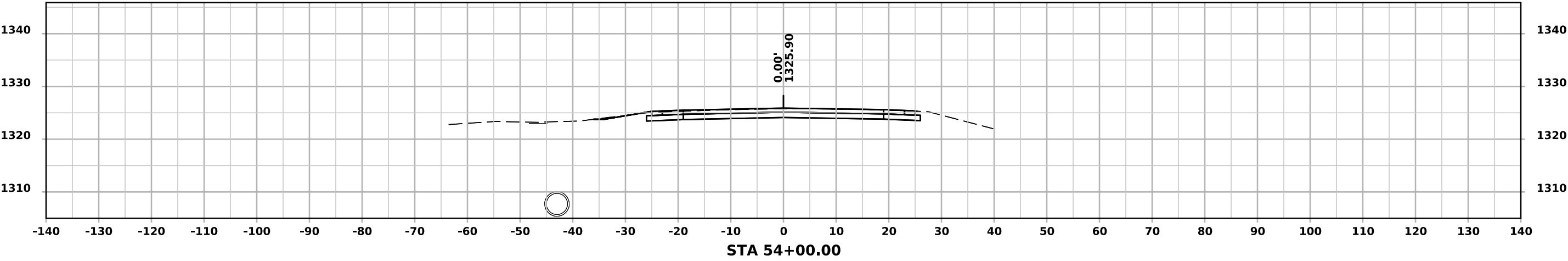
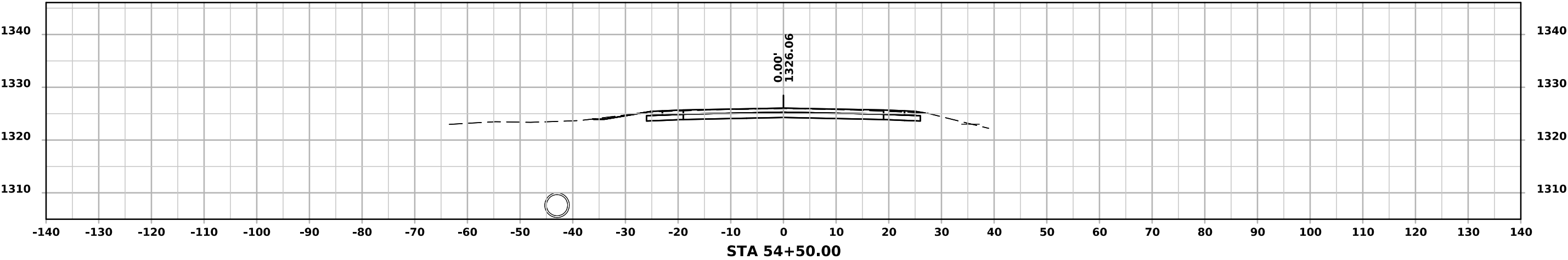
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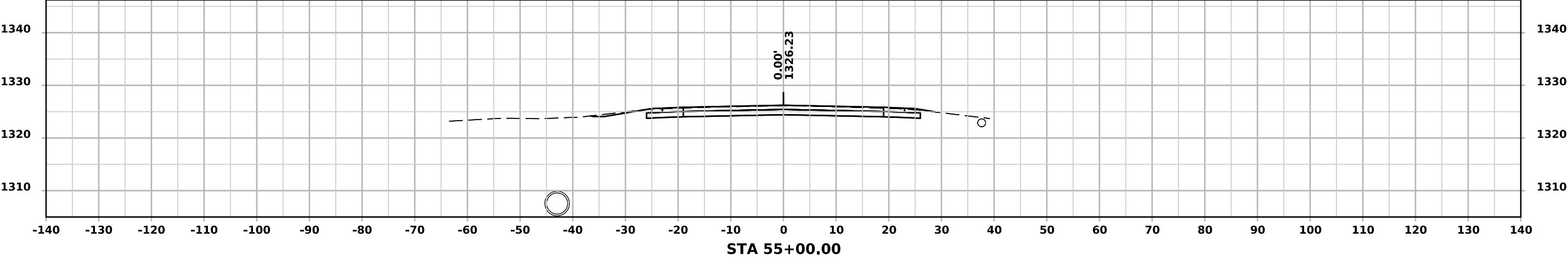
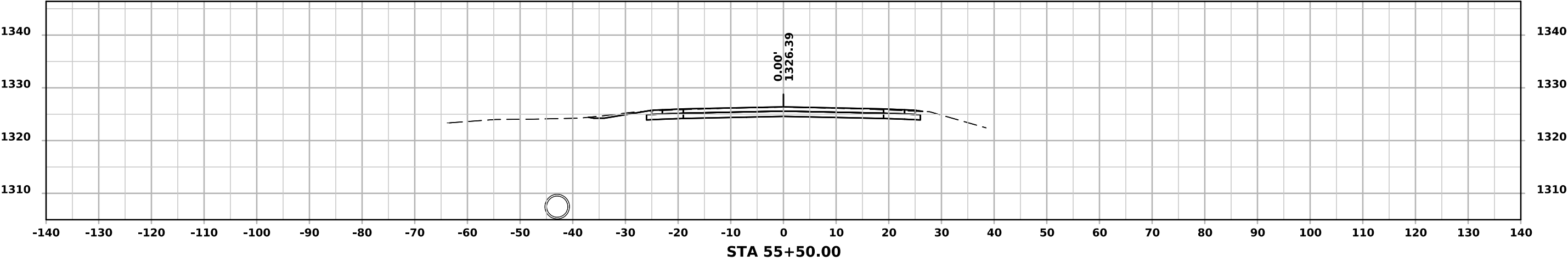
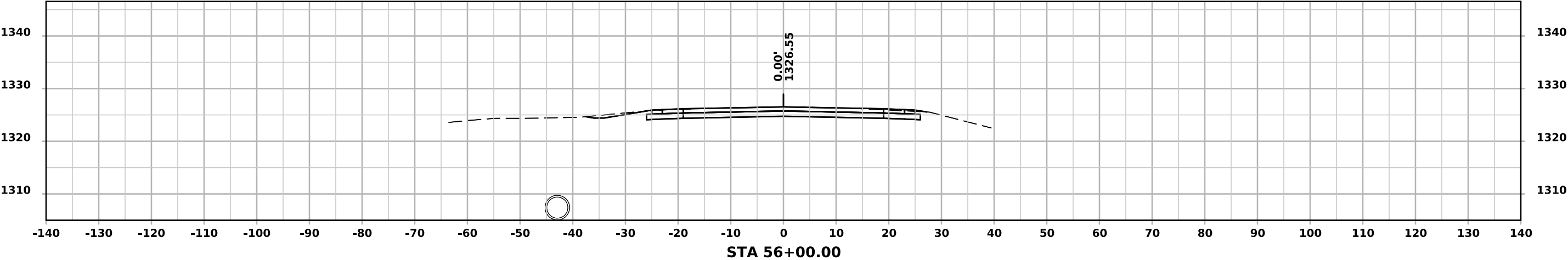
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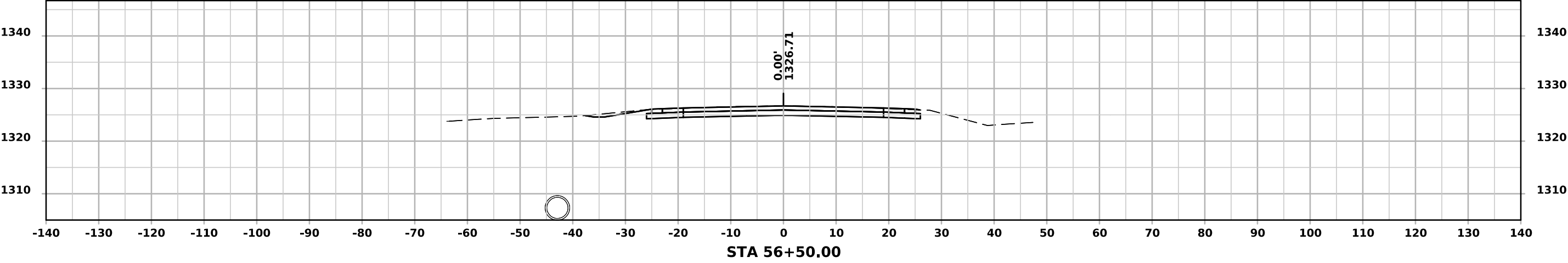
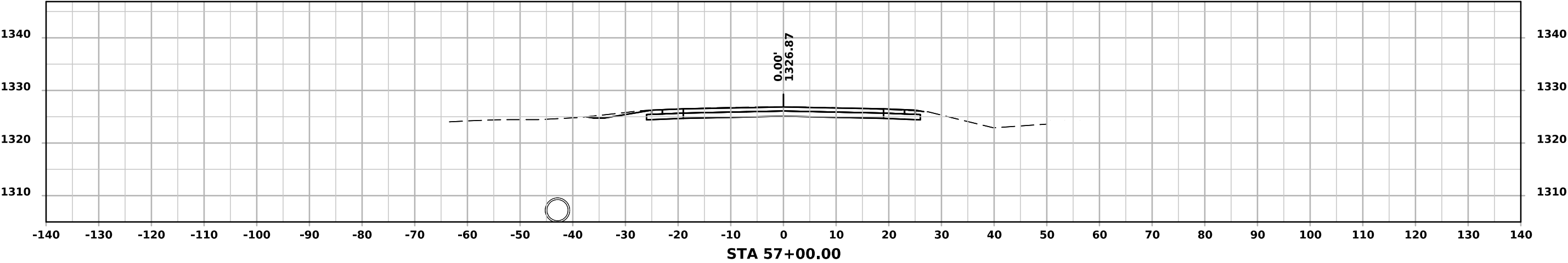
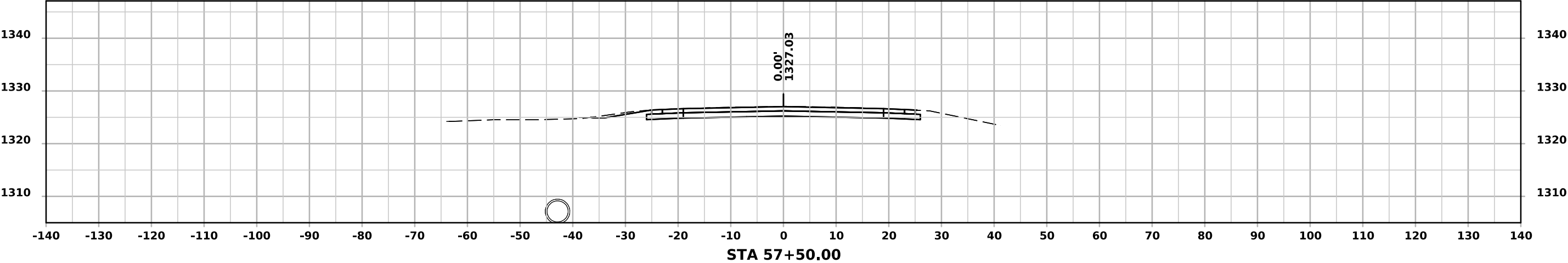
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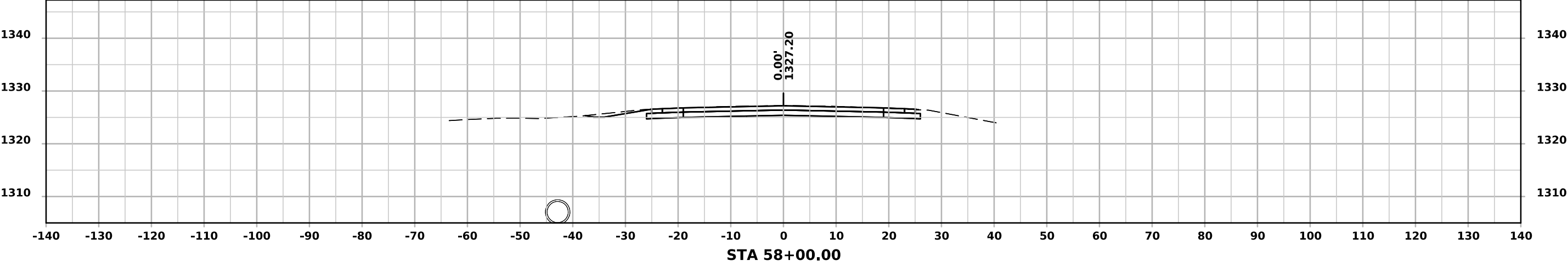
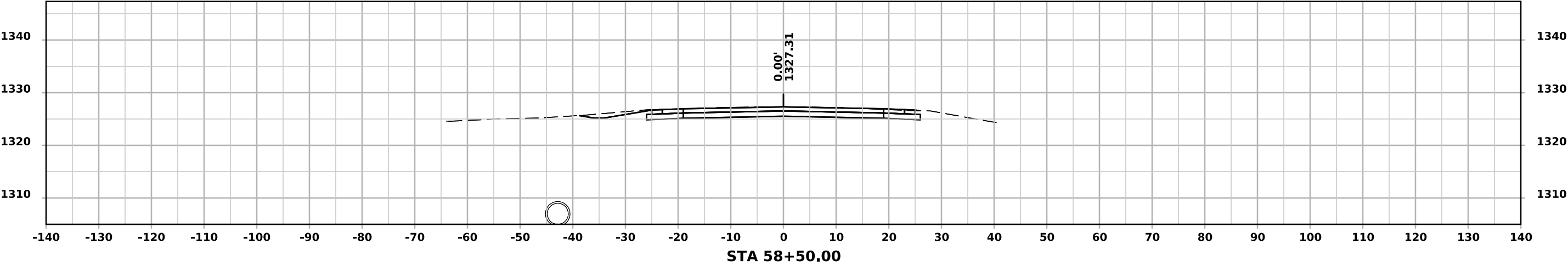
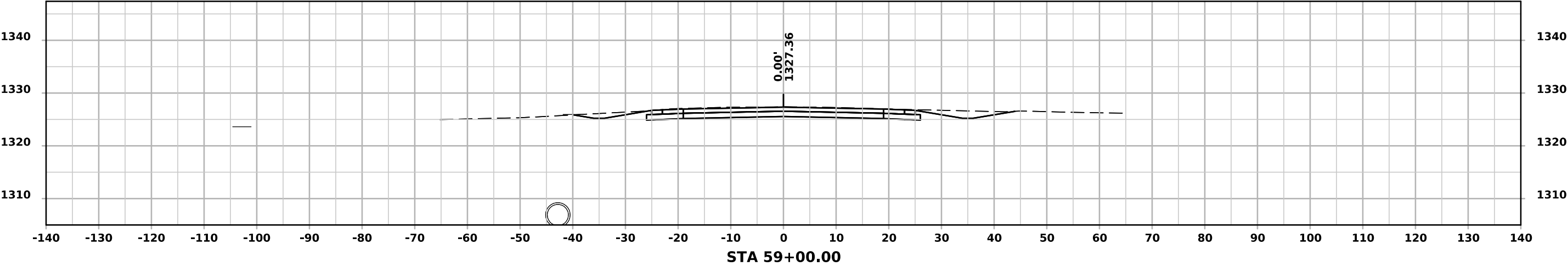
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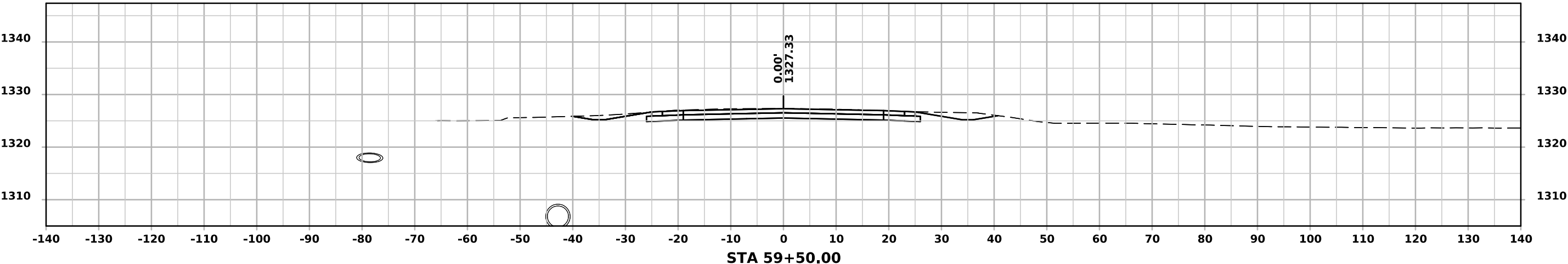
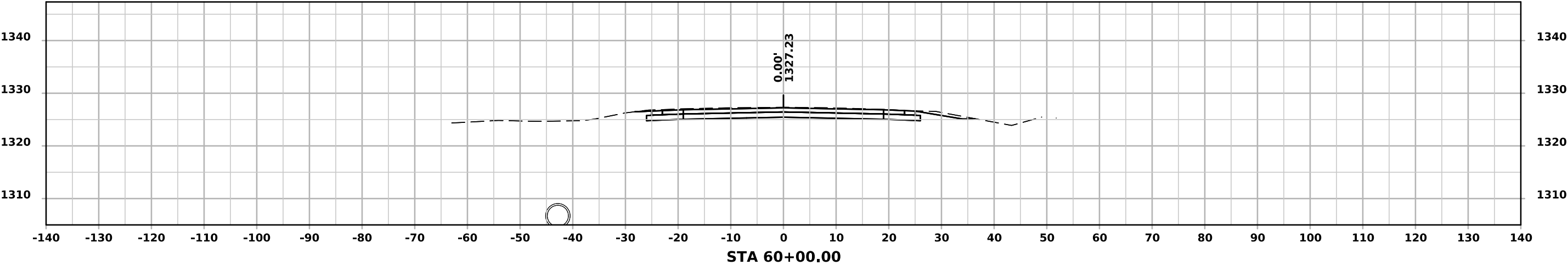
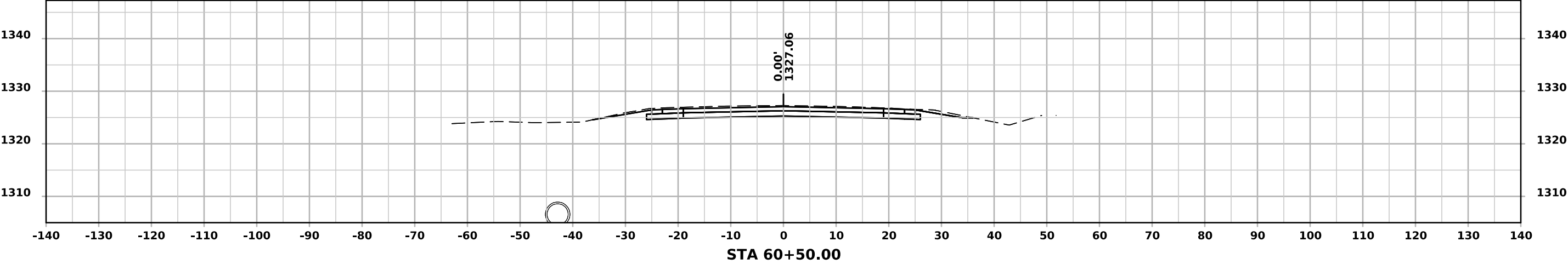
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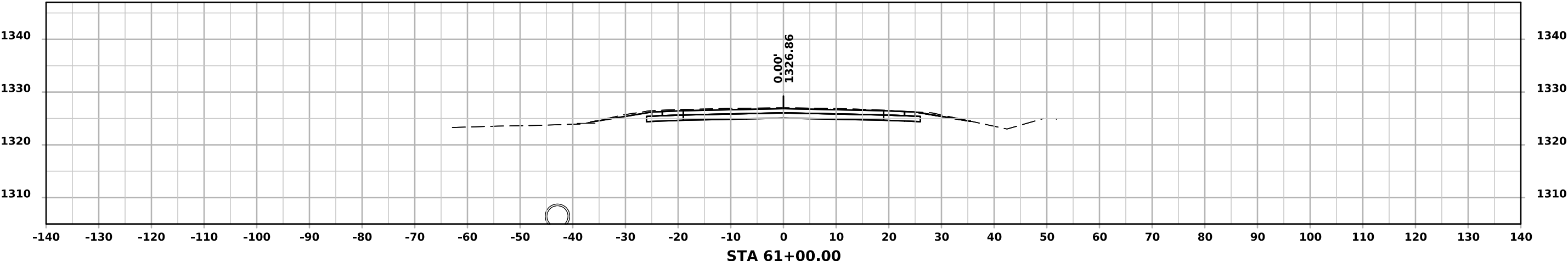
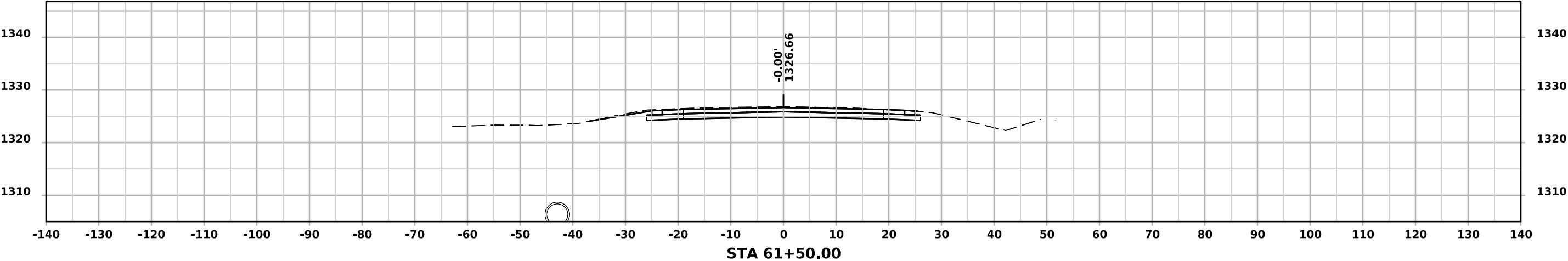
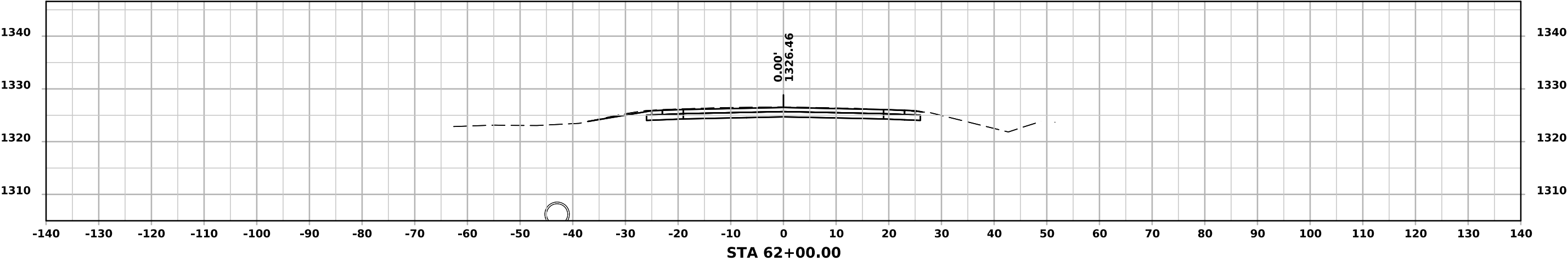
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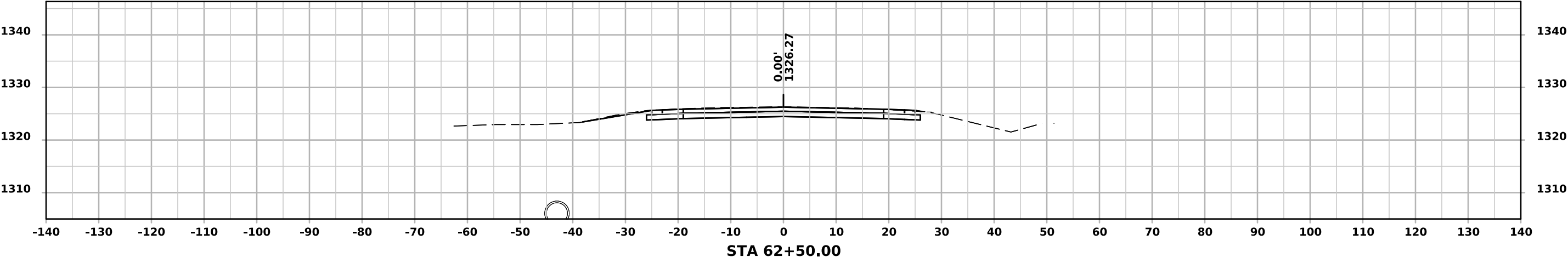
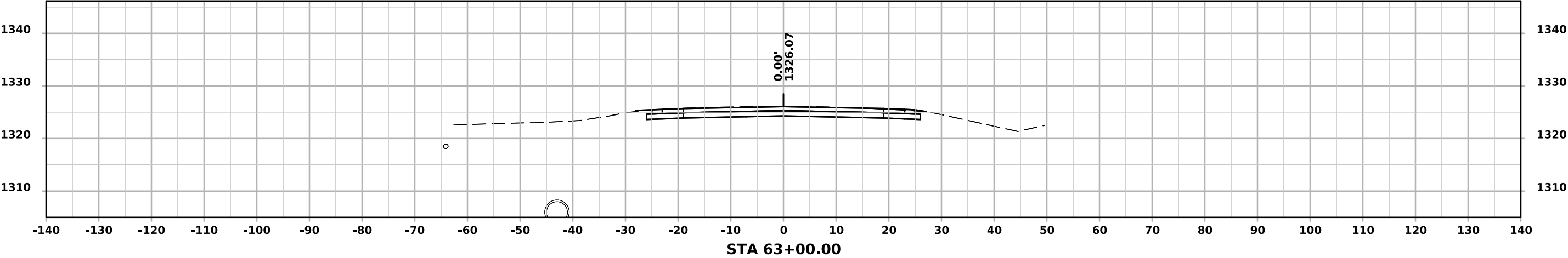
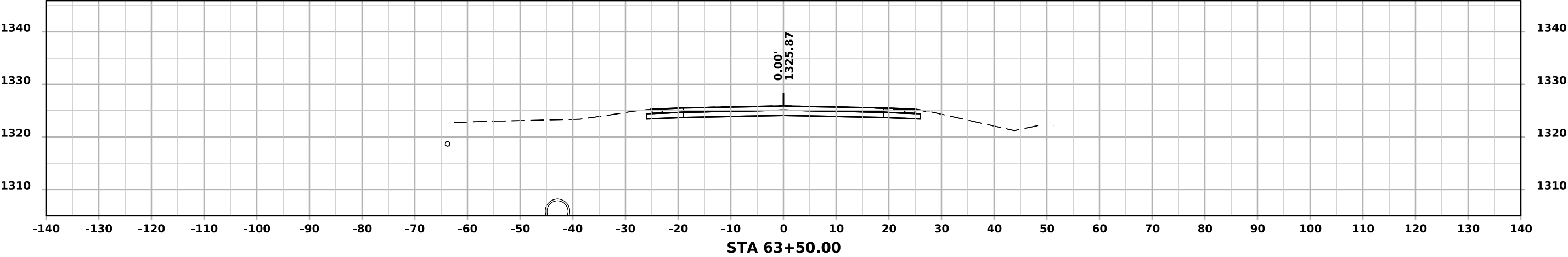
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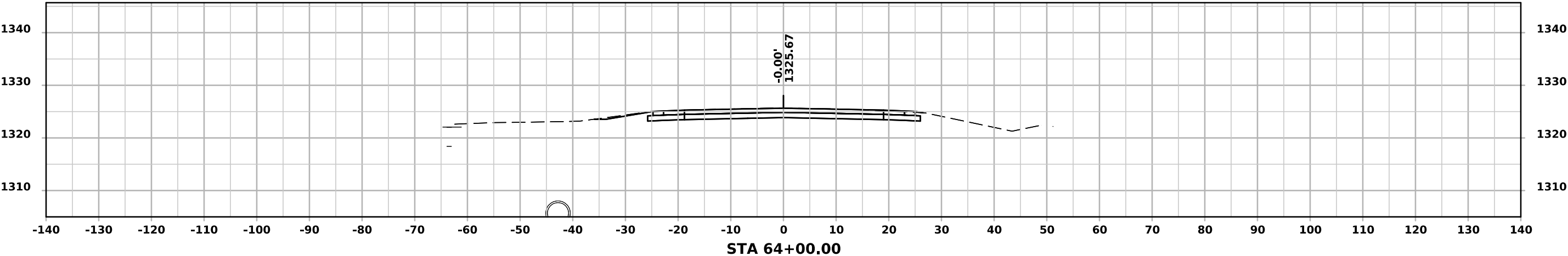
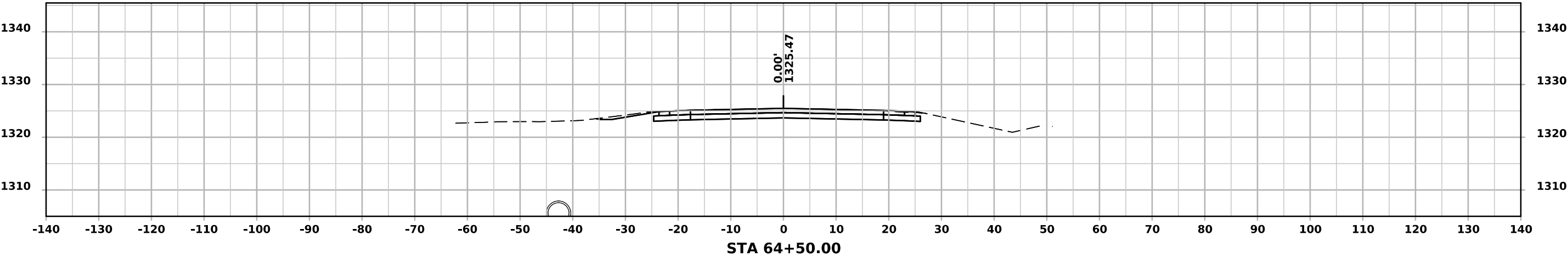
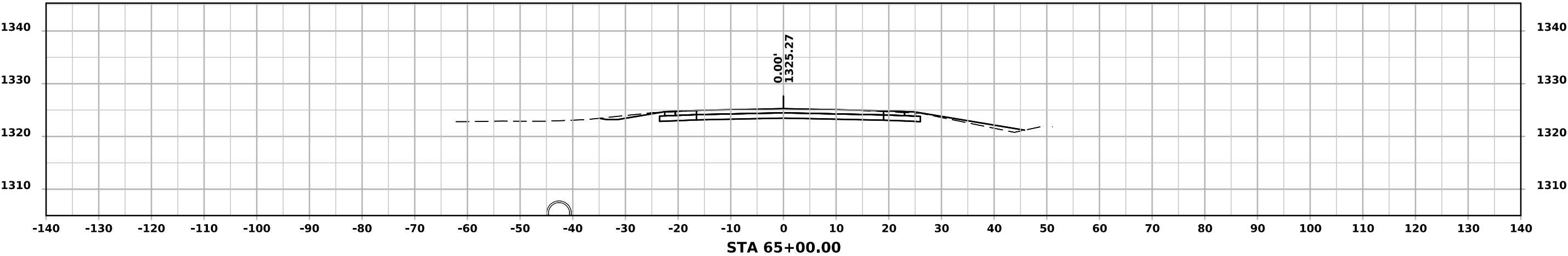
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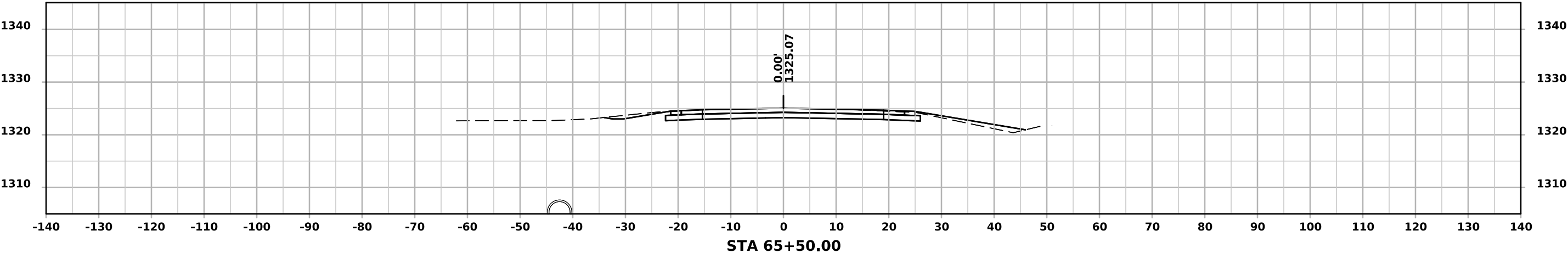
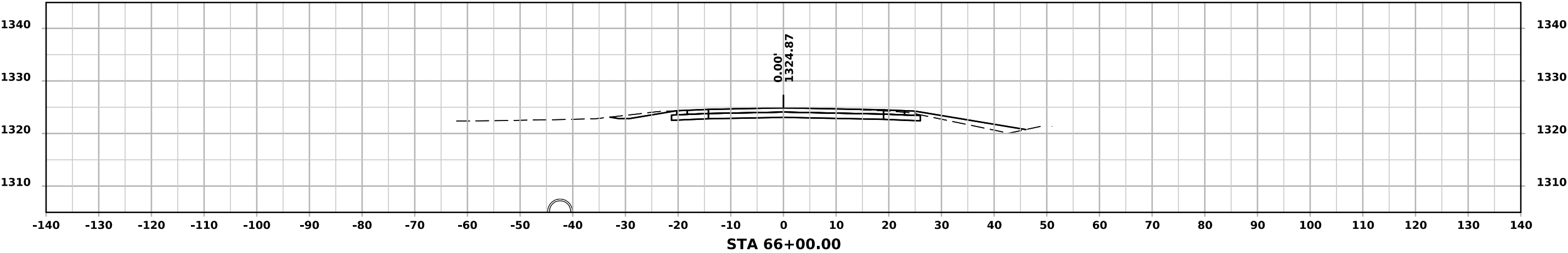
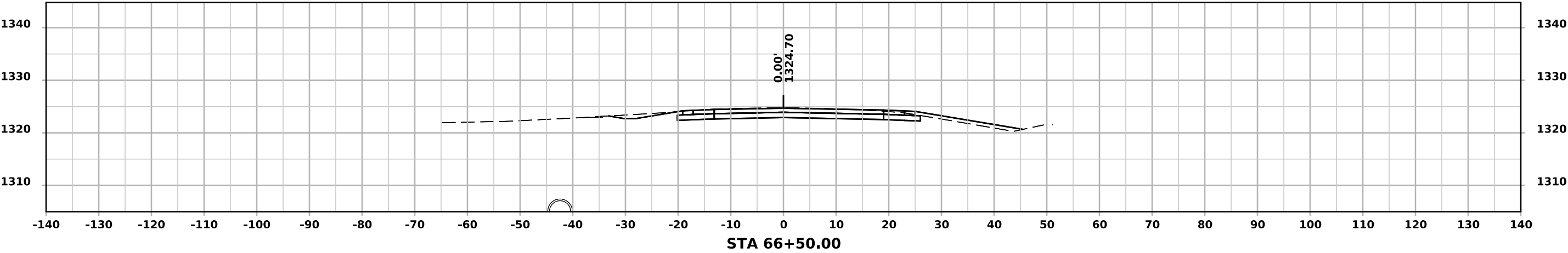
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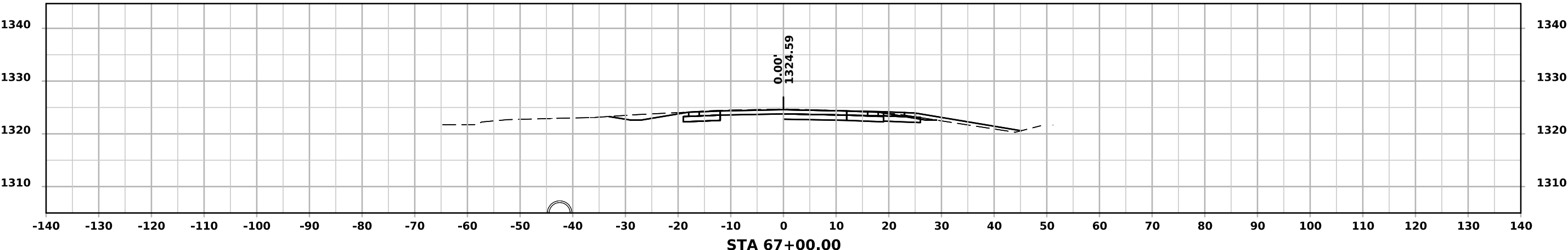
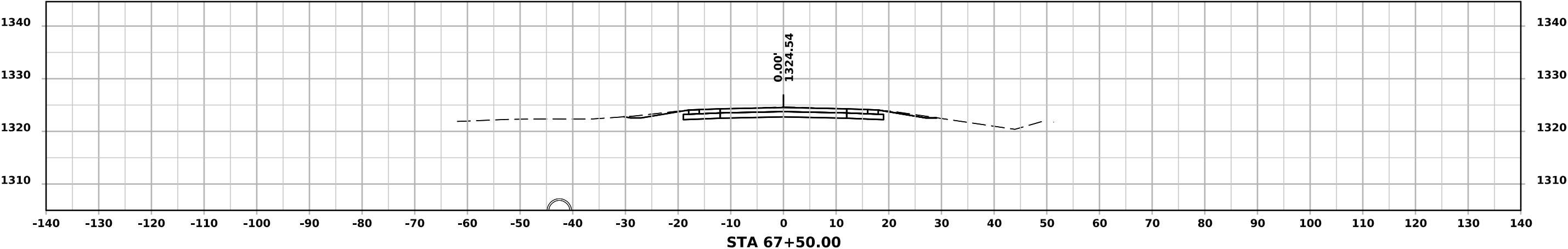
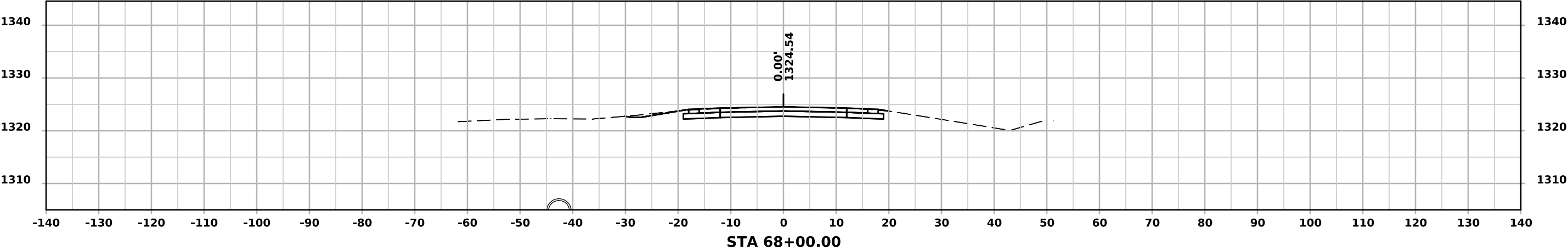
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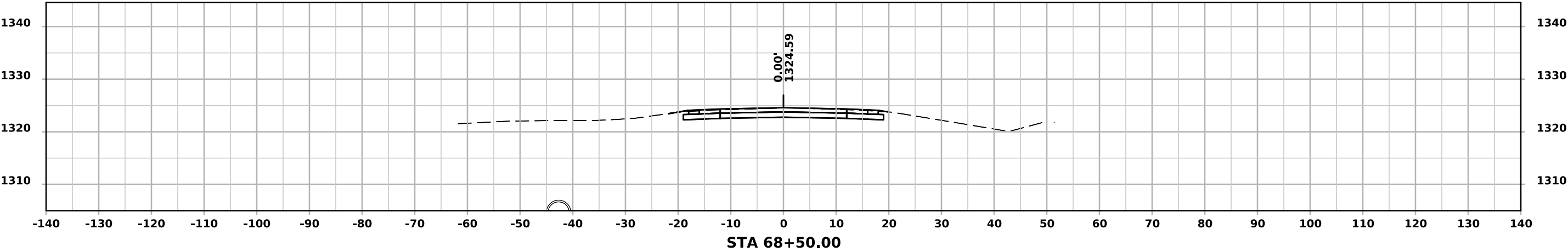
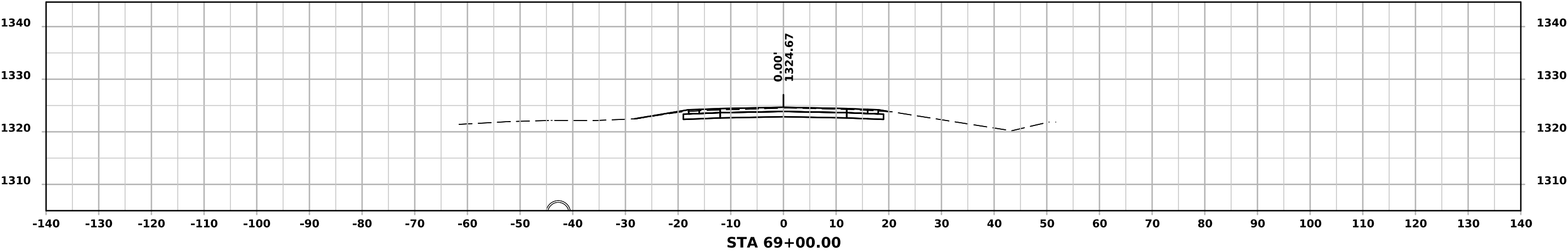
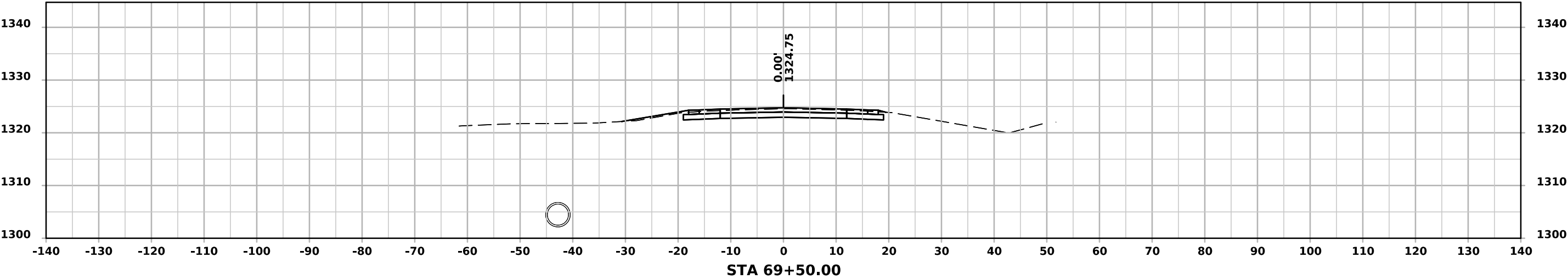
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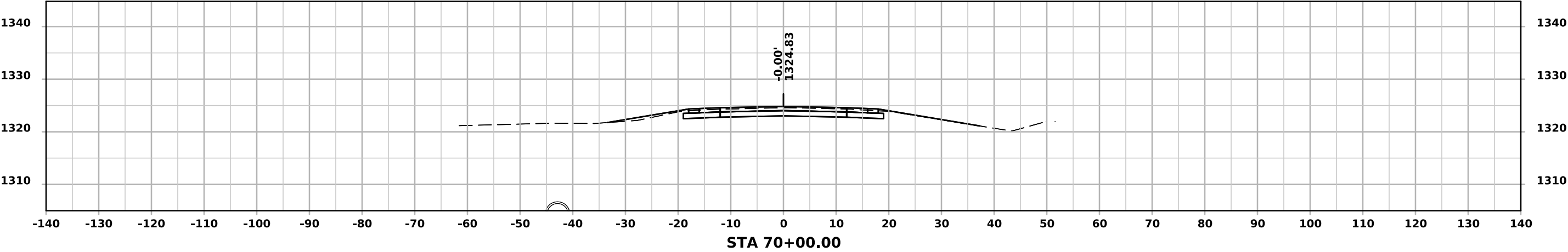
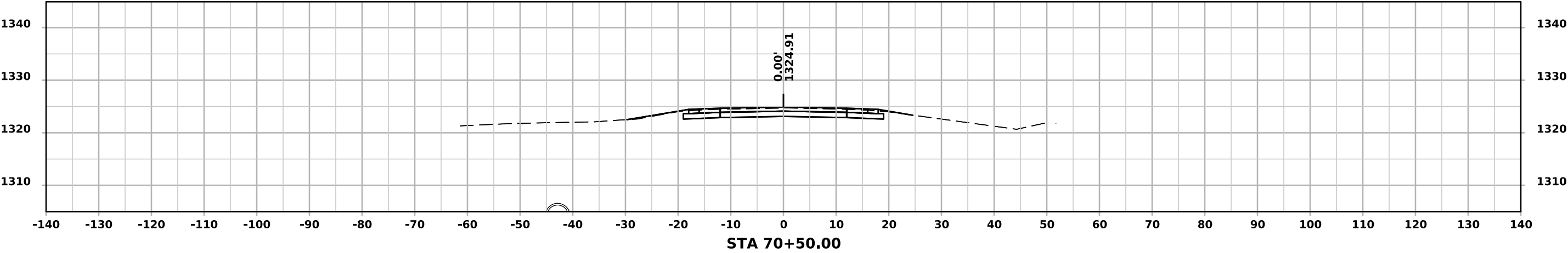
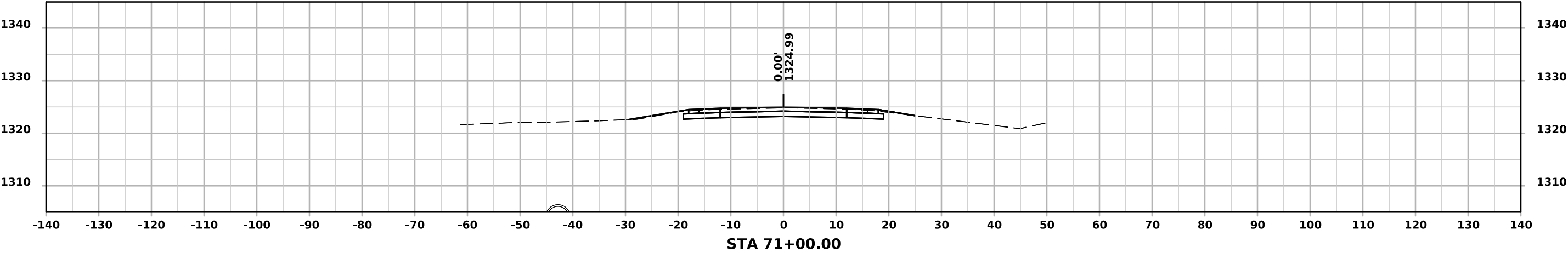
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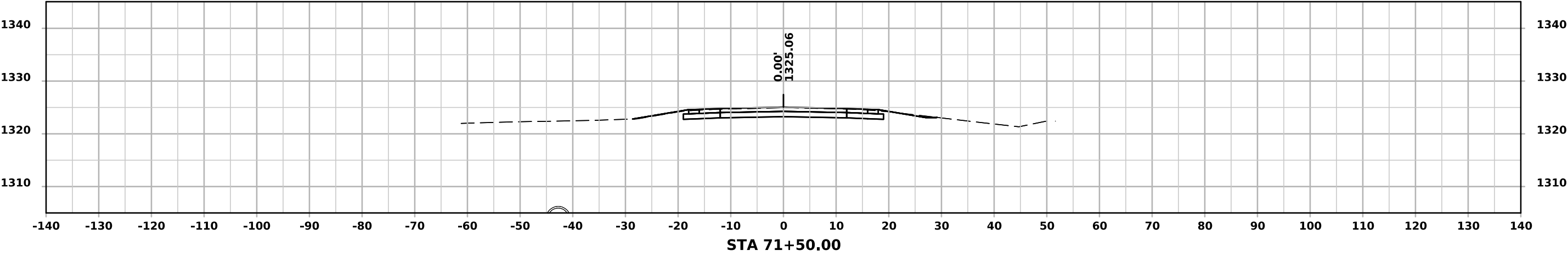
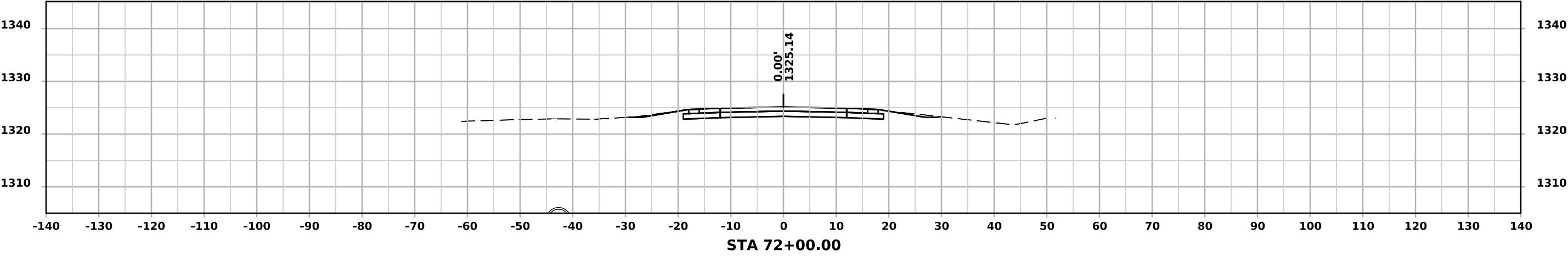
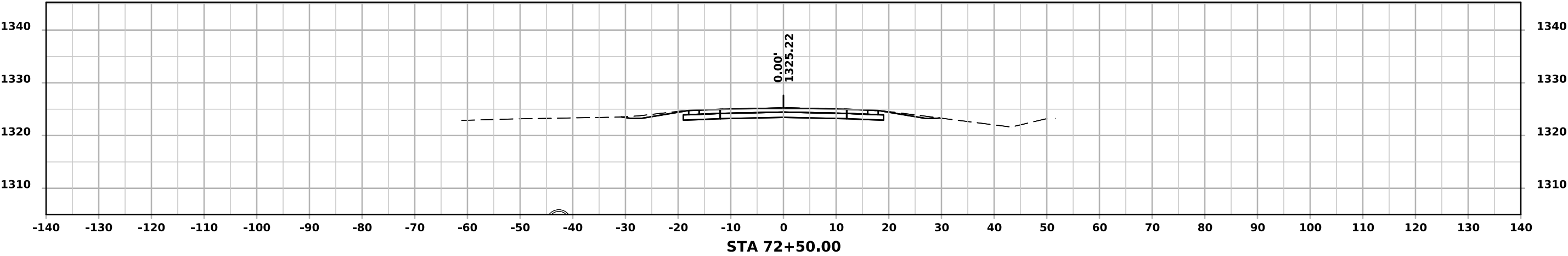
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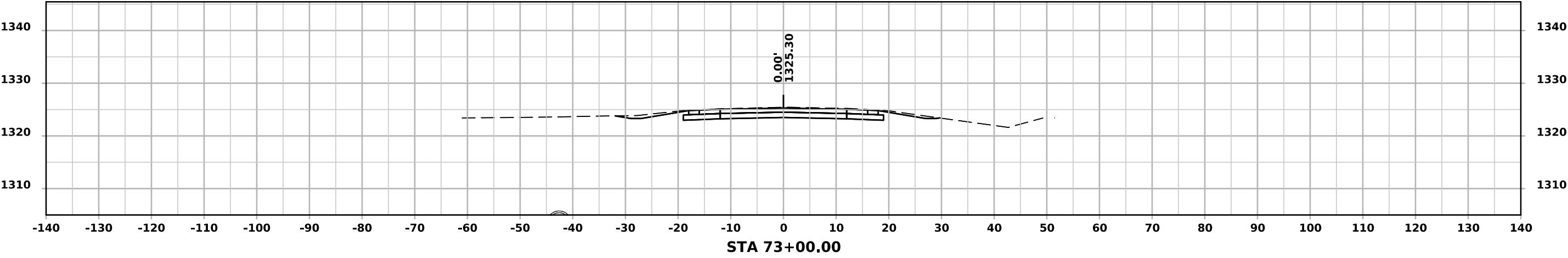
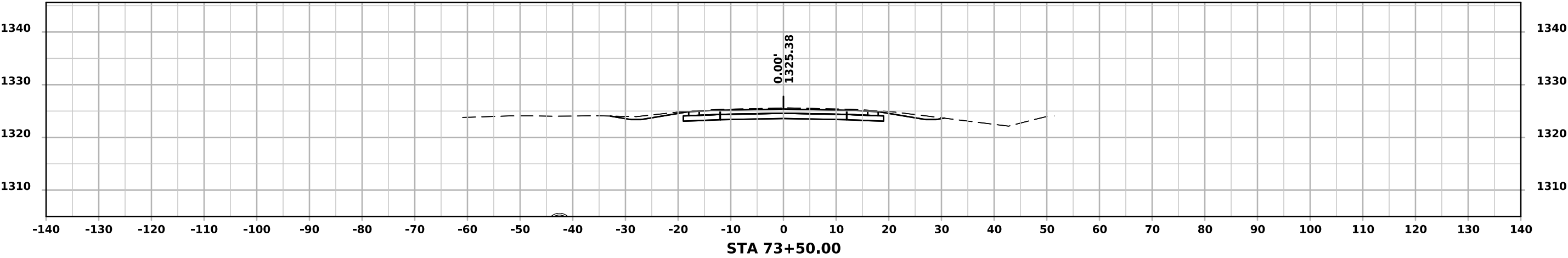
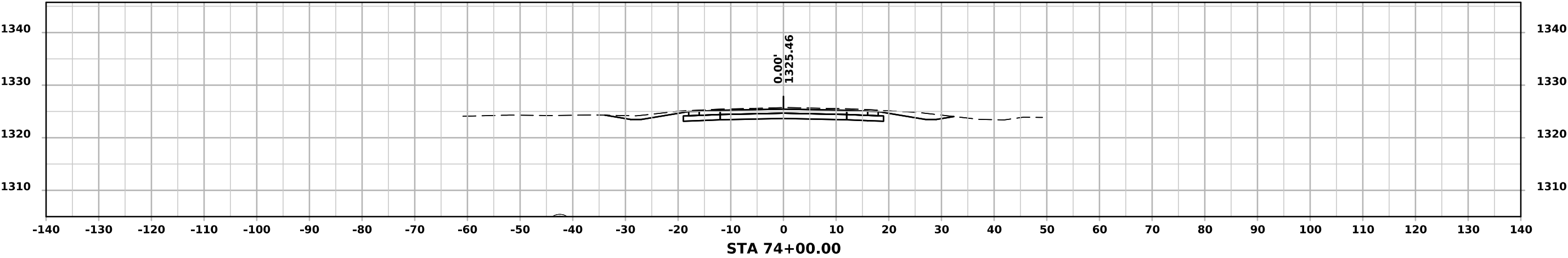
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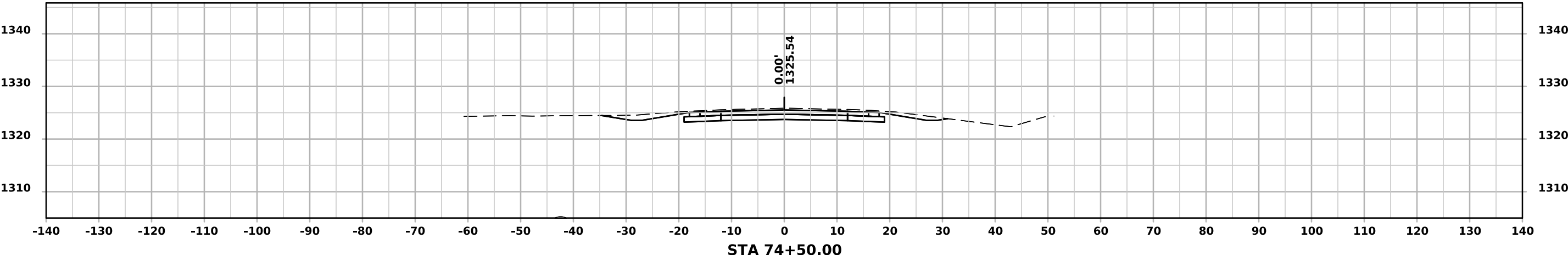
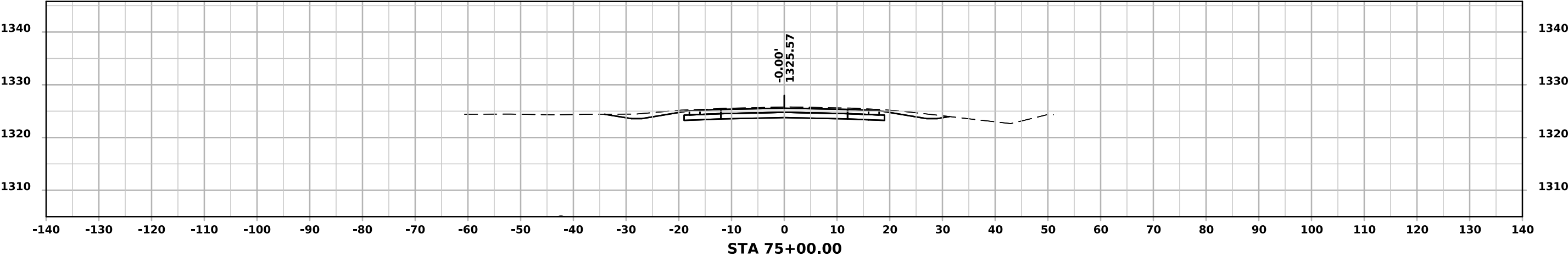
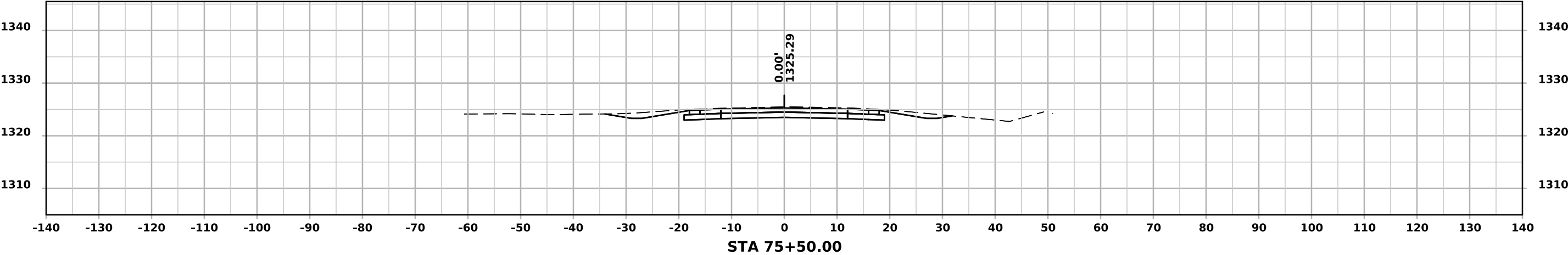
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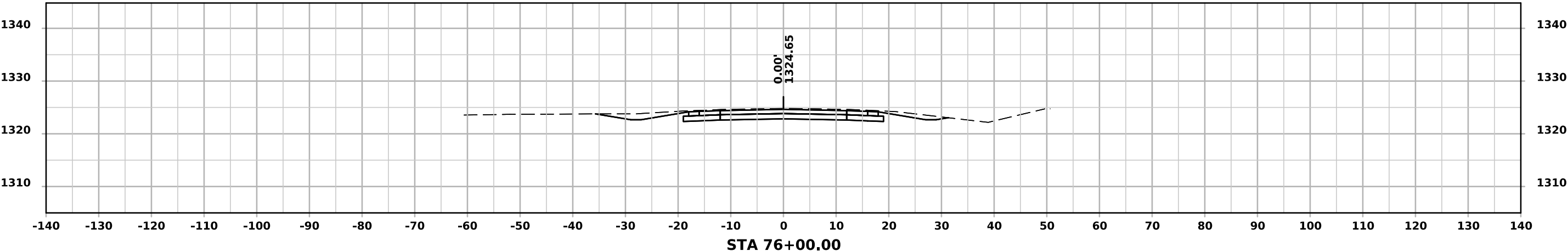
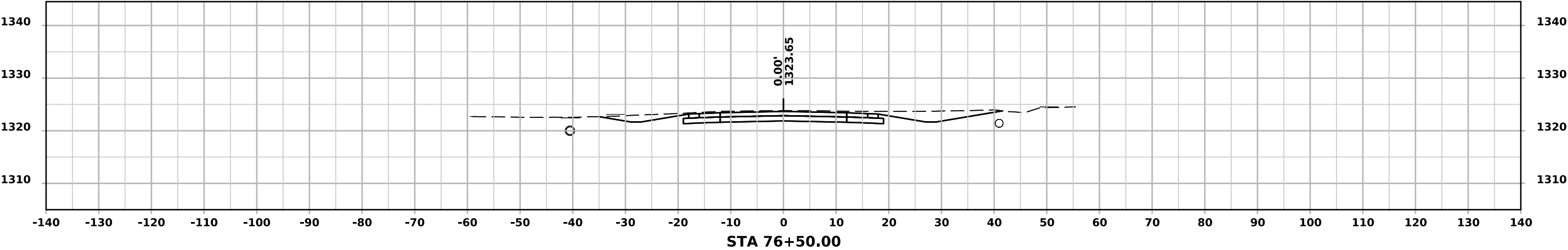
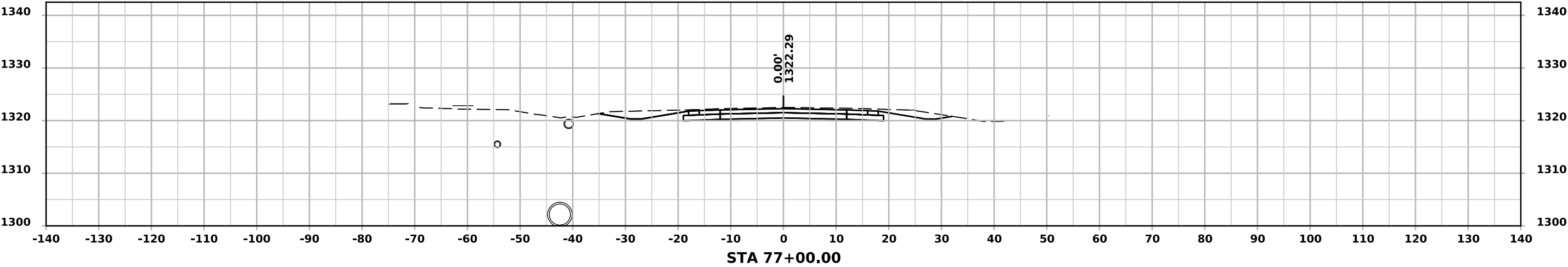
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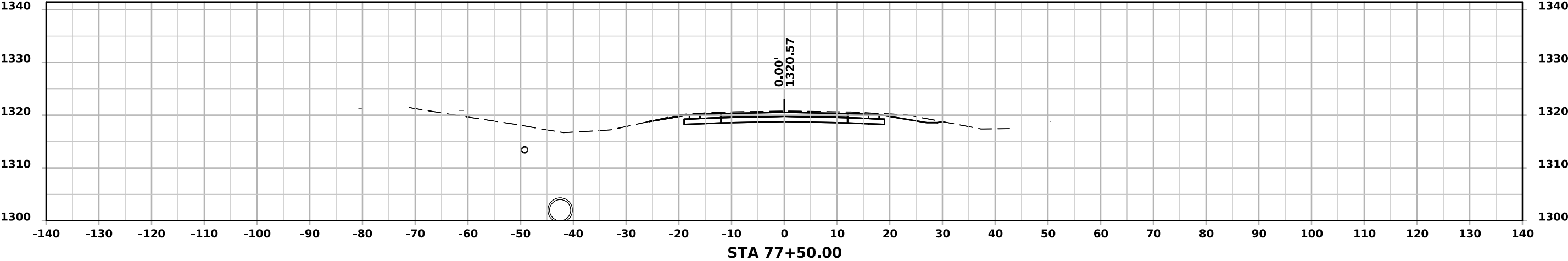
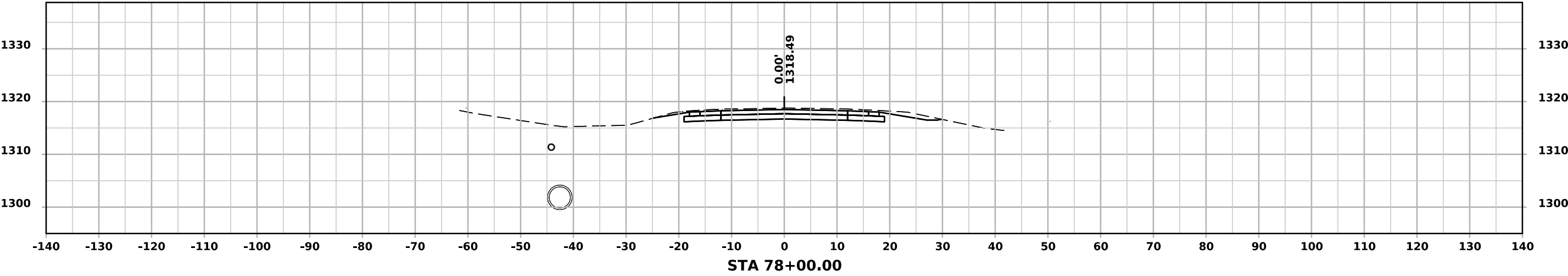
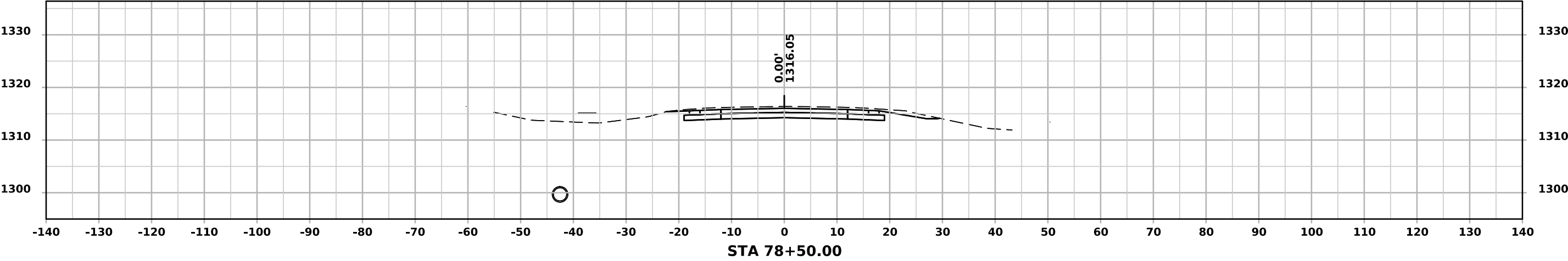
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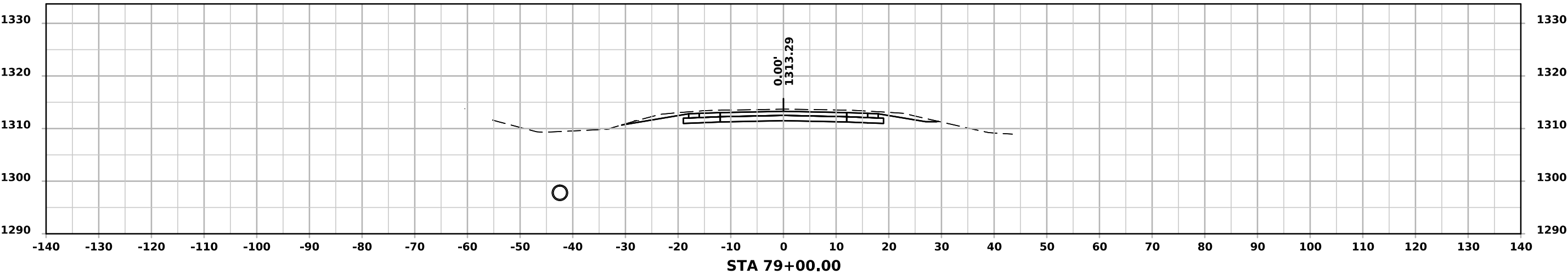
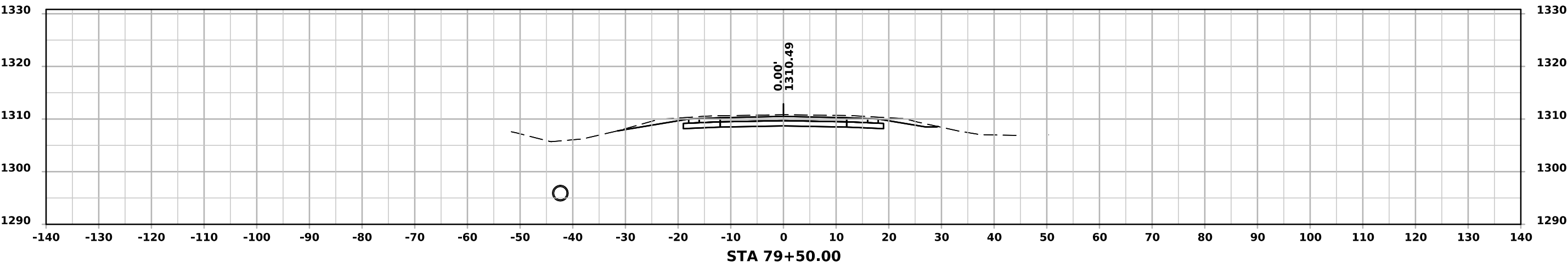
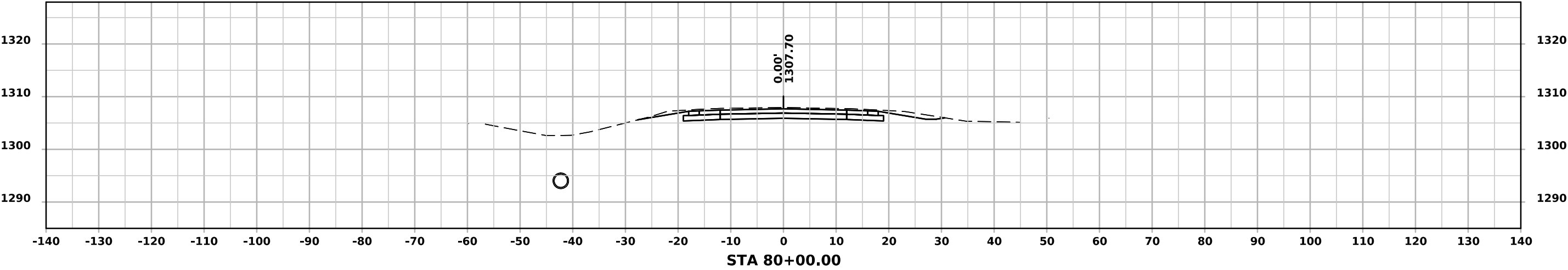
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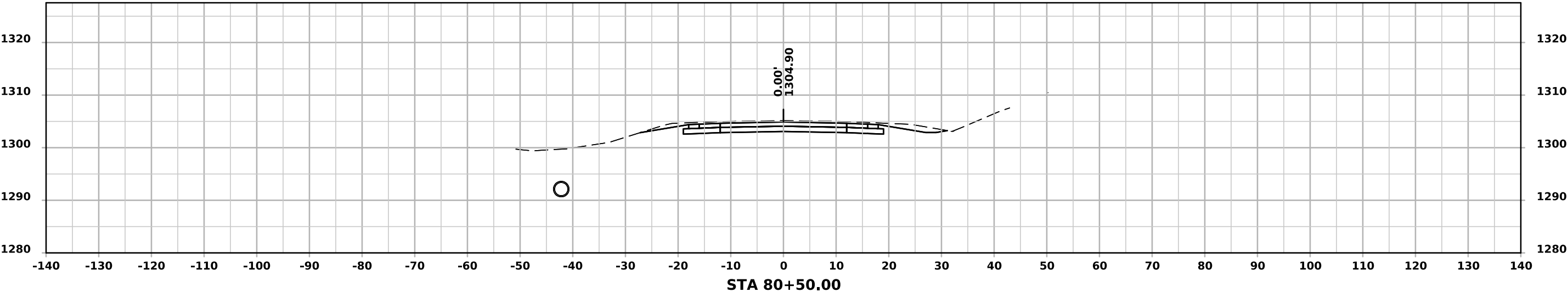
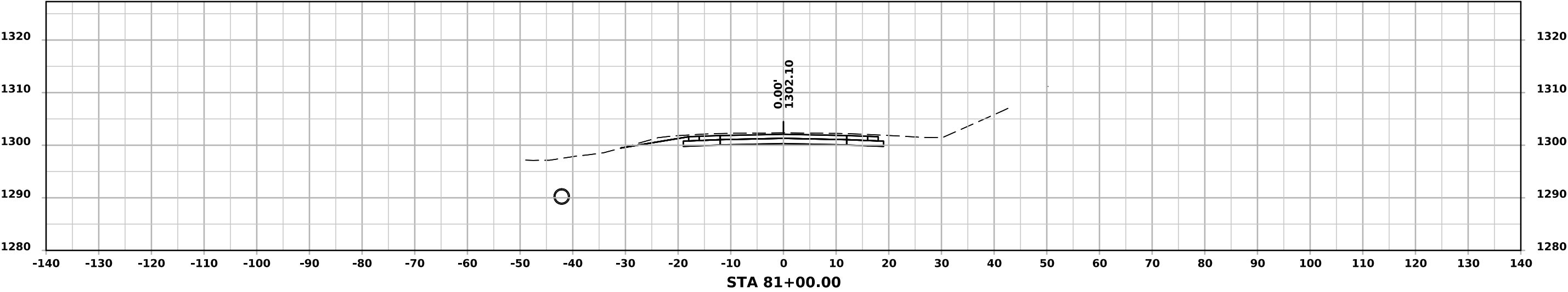


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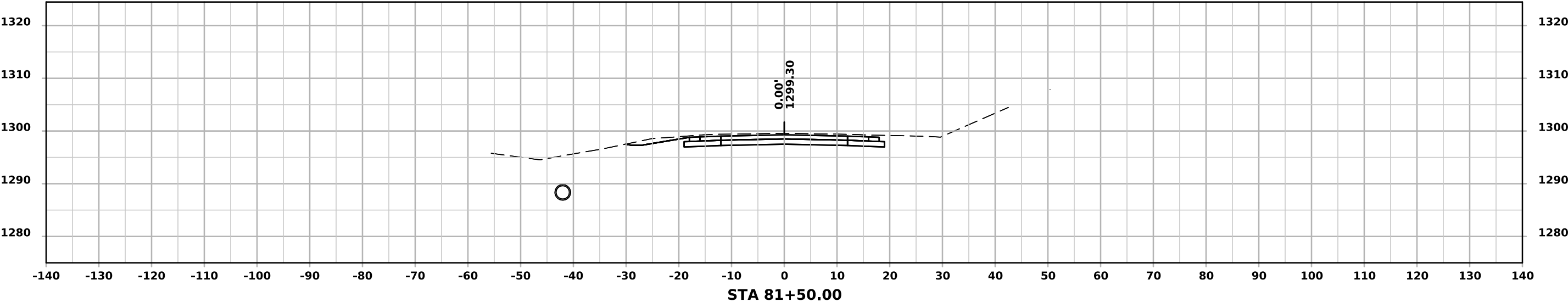
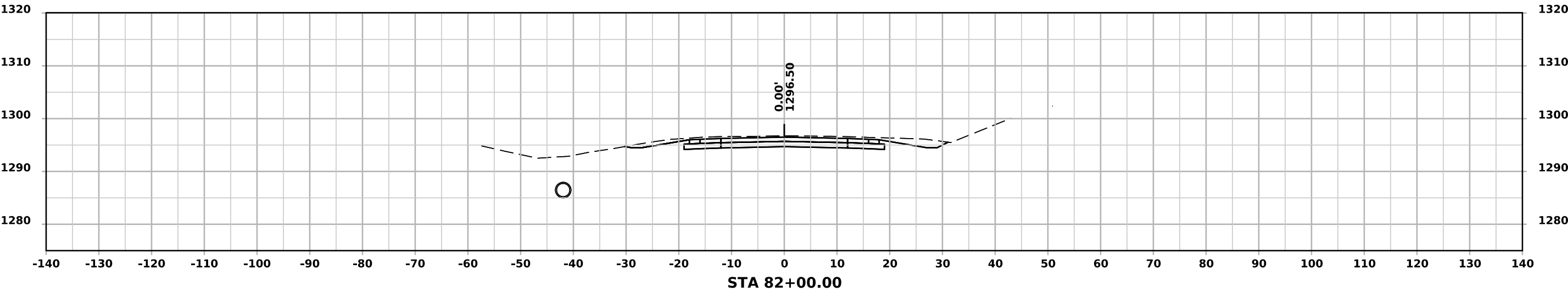
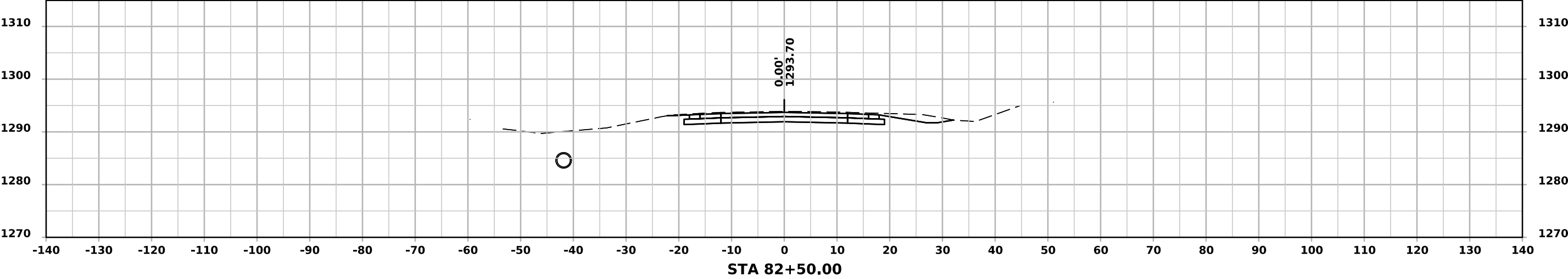


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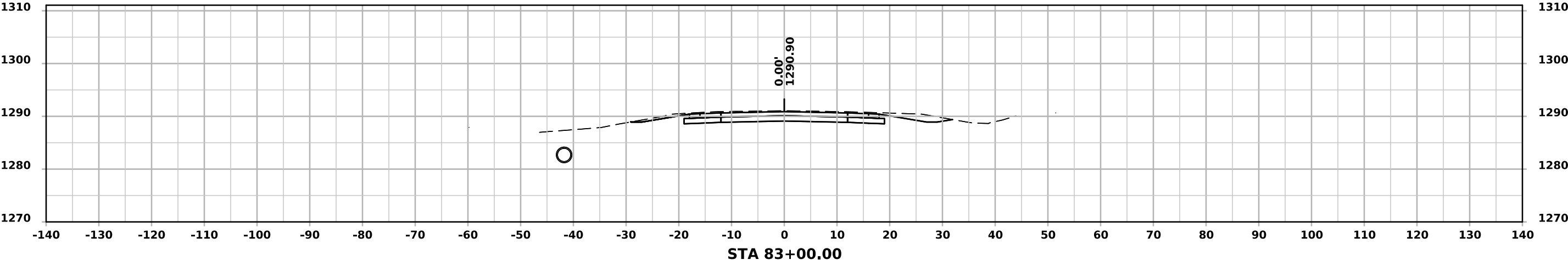
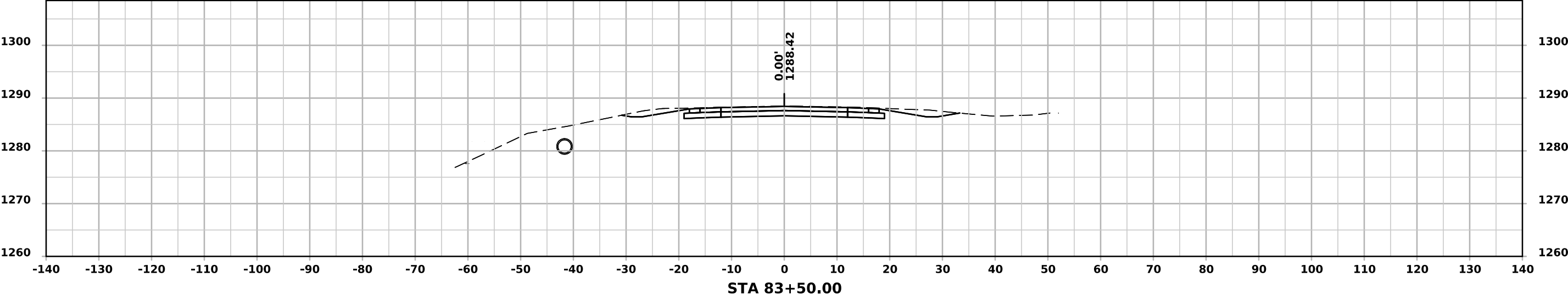
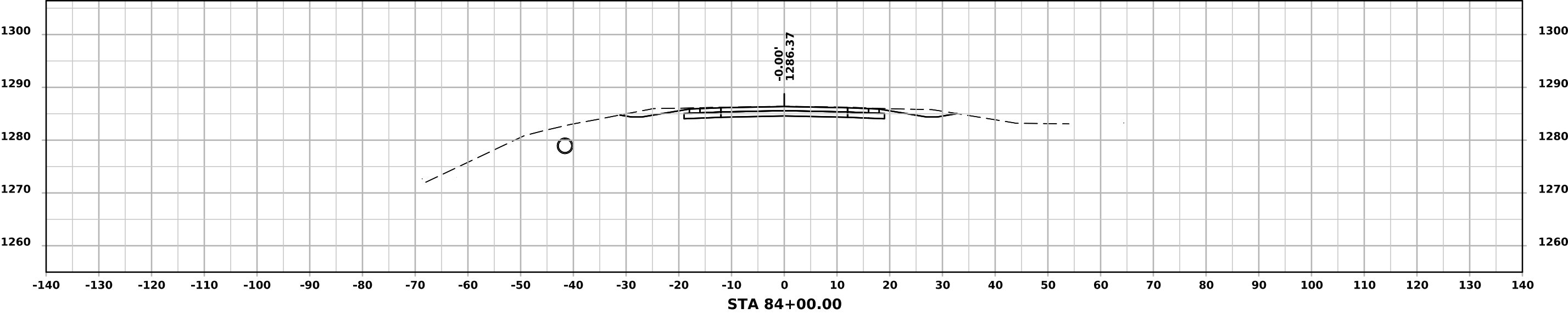




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