FED. ROAD REG. NO.	DIVISION	PROJ. NO.	SHEET NO.	TOTAL SHEETS
9	COLO.	C51-0091-10	1	

INDEX OF SHEETS

COLORADO
DEPARTMENT OF HIGHWAYS

PLAN AND PROFILE OF PROPOSED
STATE PROJECT NO. C51-0091-10
STATE HIGHWAY NO. 91
CLEAR CREEK COUNTY

SCALES OF ORIGINAL TRACINGS
ON PLAN, 1 IN. - 100 FT.
ON PROFILE 1 IN. - 100 FT. HORIZONTAL; 1 IN. - 10 FT. VERTICAL
GRADE LINES ON PROFILE ARE SHOWN AS GRADES OF FINISHED ROAD
GROSS LENGTH OF PROJECT / NET LENGTH OF PROJECT } 53,369.7 Ft. = 10.108 Mi.

CONVENTIONAL SIGNS

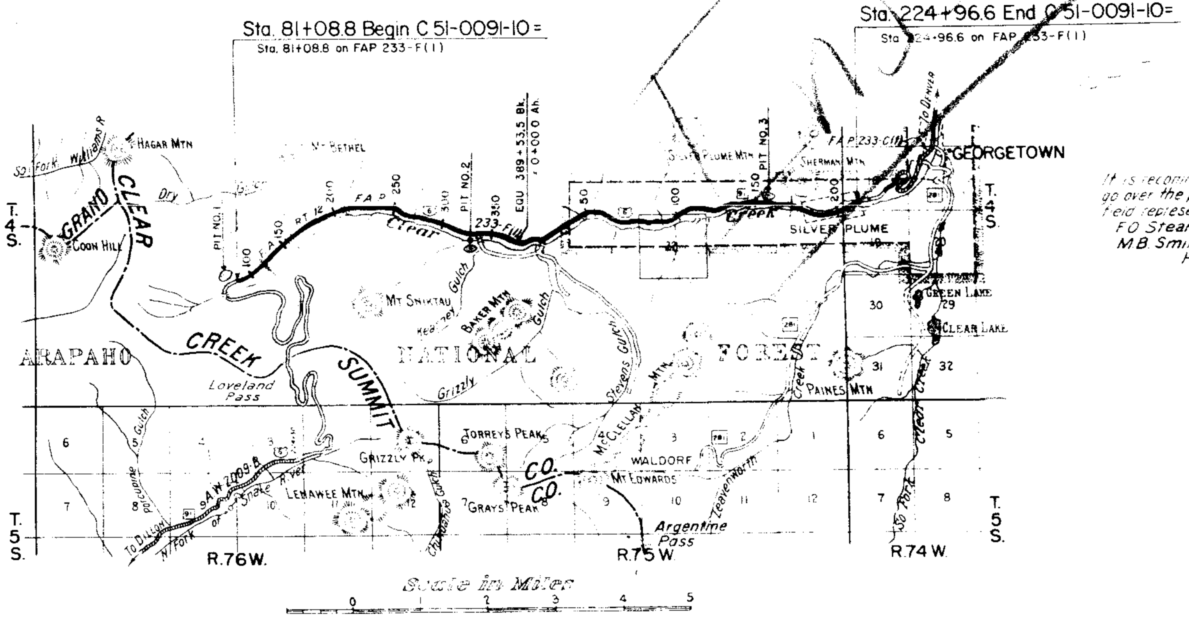
CENTER LINE OF SURVEY
RIGHT OF WAY LINES
COUNTY LINES
SECTION LINES
ONE QUARTER SECTION LINES
TOWNSHIP OR RANGE LINES

TABULATION OF LENGTH

Station	Roadway Lin. Ft. 24' Width	Roadway Lin. Ft. 36' Width	Bridges Lin. ft.
Sta. 81+08.8 Begin C51-0091-10 = Sta. 81+08.8 on FAP 233-F(1)			
	8,283.0		
163+91.8 ~ Bridge ~ 164+17.8			26.0
	1,736.0		
Eq. 181+53.8 Bk. = 181+46.0 Ah.			
	3,764.3		
219+12.3 ~ Bridge ~ 219+37.0			24.7
	6,257.7		
Eq. 281+94.7 Bk. = 282+00 Ah.			
	2,600.0		
308+00.0			
		2,400.0	
332+00.0			
	2,136.0		
Eq. 353+36.0 Bk. = 353+29.0 Ah.			
	3,624.5		
Eq. 389+53.5 Bk. = 0+00.0 Ah.			
	3,179.6		
Eq. 31+79.6 Bk. = 31+89.1 Ah.			
	220.4		
34+09.5			
		2,990.5	
64+00.0			
	3,400.0		
98+00.0			
		2,300.0	
121+00.0			
	4939.0		
Eq. 170+39.0 Bk. = 169+96.1 Ah.			
	1,498.2		
184+94.3 ~ Bridge ~ 185+48.9			54.6
	2,494.0		
Eq. 210+42.9 Bk. = 210+55.4 Ah.			
	1,398.0		
224+53.4 ~ Bridge ~ 224+96.6			43.2
Sta. 224+96.6 End C51-0091-1(10) = Sta. 224+96.6 on FAP 233-F(1)			
Total	45,530.7	7,690.5	148.5

SUMMARY

C 51-0091-10	24' Width Roadway	45,530.7 ft. = 8.623 mi.
	36' Width Roadway	7,690.5 ft. = 1.457 mi.
	Bridges	148.5 ft. = 0.028 mi.
	Total Length	53,369.7 ft. = 10.108 mi.



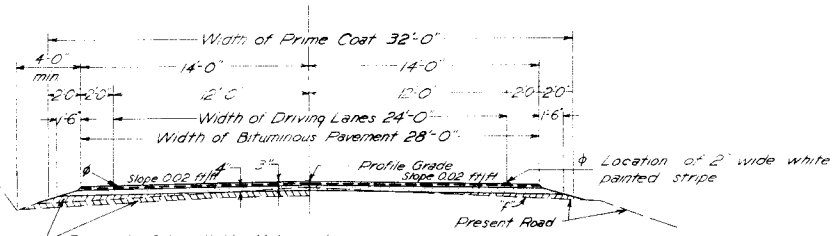
It is recommended that bidders on this Project go over the plan details with one of the following field representatives of this Department.
F.O. Stearns, Construction Engineer, Denver, Colo.
M.B. Smith, Resident Engineer, Denver, Colo.
Home Phone, Be 3-6010

COLORADO
DEPARTMENT OF HIGHWAYS

APPROVED
Mark U. Watrous — CHIEF ENGINEER — 7-26-57 DATE
By [signature] Asst. Chief Engineer

FEDERAL ROAD DIVISION NO.	DISTRICT	PROJ. NO.	SHEET NO.	TOTAL SHEETS
4	COLORADO	C51-0091-10	2	

TYPICAL SECTION "A"



No excavation permitted on backslope.

Existing ditch to be cleaned where necessary to allow for drainage and entrance to drainage structures. Included in Item 119x

Removal of Unsuitable Material to be replaced with Unclassified Borrow.

"f" - Fill material for Blading & Shaping (Item 119X) - See Special Provisions.

Approximate 7" compacted thickness of Gravel or Crushed Rock Surfacing shall be placed in separate courses at the following rates per 100 lin ft of roadway:

Top Course (Plant Mix to be laid in two layers 1½" thick) 52 tons

Bottom Course, Grading "C" Surfacing 66 tons

Note: Bottom Layer of Asphaltic Surfacing shall be completed for full width before Top Layer of Asphaltic Surfacing is placed. Paving joints in Top Layer will overlap min 1'ft over joints in Bottom Layer.

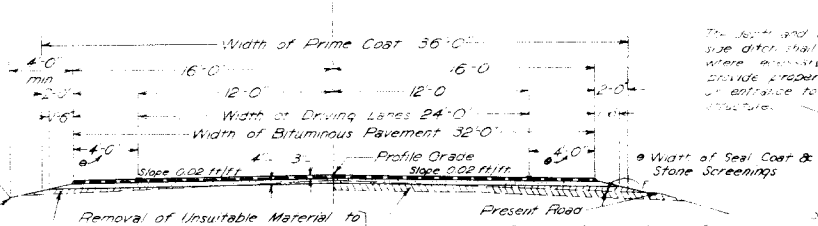
℄ Location of 2" wide white painted stripe

All Roadway, shown under 24' width in tabulation of length on sheet No. 1 is to be constructed under Item 119x, Blading & Shaping Roadway.

NOTE:

...is estimated that 70 % of this ...oject, except that portion of 36' width (Section 2'), ...be built from Typical Section "A" and 30% from ...ical Section "B".

TYPICAL SECTION "B"



No excavation permitted on backslope.

Existing ditch to be cleaned where necessary to allow for drainage and entrance to drainage structures. Included in Item 119x

℄ Width of Seal Coat & Stone Screenings

The depth and width of this side ditch shall be varied where necessary in order to provide proper drainage and entrance to drainage structures.

Removal of Unsuitable Material to be replaced with Unclassified Borrow.

"f" - Fill material for Blading & Shaping (Item 119X) - See Special Provisions

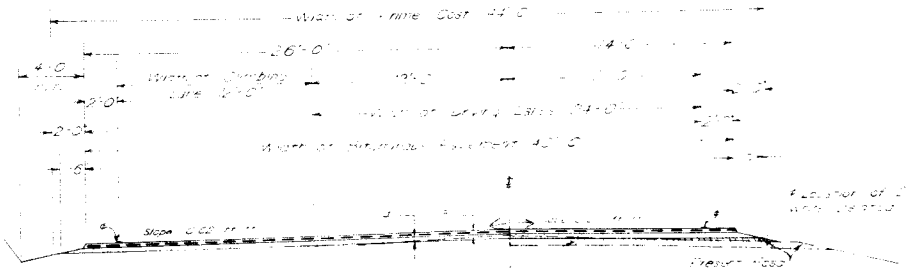
Approximate 7" Compacted thickness of Gravel or Crushed Rock Surfacing shall be placed in separate courses at the following rates per 100 lin ft of roadway:

Top Course (Plant Mix to be laid in two layers 1½" thick) 60 tons

Bottom Course, Grading "C" Surfacing 75 tons

TYPICAL SECTION "C"

Sta. 308+ to 332+
Sta. 34+ to 64+
Sta. 98+ to 121+



Slope to suit

Removal of Unsuitable Material to be replaced with Unclassified Borrow.

Approximate 7" Compacted thickness of Gravel or Crushed Rock Surfacing shall be placed in separate courses at the following rates per 100 lin ft of roadway:

Top Course (Plant Mix to be laid in two layers 1½" thick)

Bottom Course, Grading "C" Surfacing 93 Tons

GENERAL NOTES

This project is to constructed in conformity with the Standard Specifications of the Colorado Department of Highways, adopted June 1, 1952.

All quantities on preliminary plans are to be considered approximate only.

All curves are to be superelevated as provided by the Standard Superelevation sheet included with these plans. The maximum superelevation for all curves above 6° shall not exceed that used for a 6° curve.

Payment for overhaul of Surfacing Material and plant Mix shall be based on measurement along the centerline of the project and from the geometric center of the pit to the stations on the project as designated on the pit sheet.

For preliminary plan quantities of Asphaltic Road Materials and Stone Screenings, the following rates of Application have been used

Prime Coat M.C. @ 0.40 Gal. per Sq. Yd. (Roadway)
Prime Coat M.C. @ 0.10 Gal. per Sq. Yd. (Bridge)
Paving Asphalt (200 - 300 Pen.) 5.7% per ton, by Weight
Seal Coat R.C. @ .02 Gal. per Sq. Yd.
Stone Screenings (Type 1) @ 15 lbs. per Sq. Yd.

Rate of application and grade of Asphaltic Material shall be as determined by the Engineer at time of application.

Guard Posts encroaching on Construction will be removed by State Forces.

The prime coat and the Plant Mix Asphaltic Surfacing shall be placed over the curbed width of the following bridges:

163+91.8 to 164+17.8 Preceding major equation
219+12.3 to 219+37.0 Preceding major equation
154+94.3 to 185+48.9 Following major equation
224+53.4 to 224+96.6 Following major equation

The thickness of the paving to be laid on the above listed bridges shall be 1½".

FED. ROAD REG. NO.	DIVISION	PROJECT NO.	SHEET NO.	TOTAL SHEETS
6	COLORADO	[illegible]	3	

SURFACING PLAN

[illegible] ESTIMATED THAT MATERIAL FOR GRAVEL SURFACING FOR THIS PROJECT IS AVAILABLE IN THE VICINITY OF THE [illegible] IN THE FOLLOWING TABULATION. ESTIMATED QUANTITIES INVOLVED IN THIS OPERATION ARE SHOWN BELOW.

[illegible] OF THE SURFACING PLAN, [illegible] DEPARTMENT.

MATERIAL TO BE [illegible]	SOURCE, QUANTITY AND [illegible]	[illegible] PIT NO. 1 BASE COURSE SURFACING	PIT NO. 2 BASE COURSE SURFACING	PIT NO. 2 [illegible]	PIT NO. 3 BASE COURSE SURFACING	PIT NO. [illegible] BASE COURSE [illegible]	PIT NO. [illegible] BASE COURSE [illegible]	PIT NO. [illegible] PLANT MIX PAVING	PIT NO. [illegible] BASE COURSE SURFACING
[illegible] BRIDGE [illegible]	[illegible]	[illegible]		[illegible]		[illegible]		[illegible]	
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]		[illegible]	
[illegible]			[illegible]	[illegible]			[illegible]	[illegible]	
[illegible]	[illegible]			[illegible]	[illegible]		[illegible]	[illegible]	[illegible]
[illegible]	[illegible]			[illegible]	[illegible]			[illegible]	[illegible]
[illegible]				[illegible]				[illegible]	[illegible]
[illegible]	[illegible]			[illegible]	[illegible]			[illegible]	[illegible]
[illegible]	[illegible]			[illegible]	[illegible]			[illegible]	
[illegible]					[illegible]			[illegible]	[illegible]
[illegible]		[illegible]	[illegible]		[illegible]		[illegible]		[illegible]
[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]			[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]

* [illegible] ROADWAY QUANTITIES.

SUMMARY OF APPROXIMATE QUANTITIES

ITEM NO.	ITEM	UNIT	[illegible] ROADWAY		[illegible] ROADWAY		PROJECT TOTALS
[illegible]	[illegible] & GRUBBING ENTIRE PROJECT	LUMP SUM	[illegible]		[illegible]		•
[illegible]	REMOVAL OF [illegible] FROM BRIDGES, [illegible] & STA. [illegible]	[illegible]	•		-		•
[illegible]	[illegible]	[illegible]	•				•
[illegible]	R[illegible] STRUCTURES	LUMP SUM			•		•
[illegible]	[illegible] EXCAVATION	[illegible]	[illegible]		[illegible]		[illegible]
[illegible]	[illegible] EXCAVATION	[illegible]	[illegible]		[illegible]		[illegible]
[illegible]	[illegible] STRUCTURAL EXCAVATION	[illegible]	[illegible]		[illegible]		[illegible]
[illegible]	[illegible]	[illegible]	[illegible]				[illegible]
[illegible]	MECHANICAL [illegible]	[illegible]			[illegible]		[illegible]
[illegible]	[illegible] ROLLER [illegible]	[illegible]					[illegible]
[illegible]	ROLLING WITH TAMPING ROLLER [illegible]	[illegible]			[illegible]		[illegible]
[illegible]	[illegible] WHEELED ROLLER [illegible]	[illegible]	[illegible]				[illegible]
[illegible]	ROLLING WITH [illegible] WHEELED ROLLER [illegible]	[illegible]	[illegible]				[illegible]
[illegible]	[illegible]	[illegible]	[illegible]		[illegible]		[illegible]
[illegible]	[illegible]	[illegible]					[illegible]
[illegible]	[illegible]	[illegible]			[illegible]		
[illegible]	[illegible]	[illegible]			[illegible]		
[illegible]	[illegible]	[illegible]	[illegible]		[illegible]		
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[illegible]	[illegible]	[illegible]	[illegible]		[illegible]		[illegible]
[illegible]	[illegible]	[illegible]			[illegible]		[illegible]
[illegible]	[illegible]	[illegible]	[illegible]		[illegible]		[illegible]
[illegible]	[illegible]	[illegible]	[illegible]		[illegible]		[illegible]
[illegible]	[illegible]	[illegible]			-		[illegible]
[illegible]	[illegible]	[illegible]	[illegible]		[illegible]		[illegible]
[illegible]	[illegible] METAL CULVERT PIPE	[illegible]	[illegible]		[illegible]		[illegible]
[illegible]	[illegible] METAL CULVERT PIPE	[illegible]	[illegible]		[illegible]		[illegible]
[illegible]	[illegible] METAL CULVERT PIPE	[illegible]	[illegible]		[illegible]		[illegible]
[illegible]	[illegible] CORRUGATED METAL CULVERT PIPE	[illegible]	[illegible]		-		[illegible]
• [illegible]	[illegible]	[illegible]	[illegible]		[illegible]		[illegible]
▲ [illegible]	[illegible]	[illegible]	[illegible]		-		[illegible]
[illegible]	PROJECT MARKER [illegible]	EACH	2		-		2
	[illegible] ENTIRE PROJECT [illegible]	[illegible]					•

• [illegible]

▲ [illegible]

FEDERAL ROAD DIVISION NO.	DISTRICT	PROJ. NO.	SHEET	TOTAL SHEETS
	COLORADO	C 51-0091-10	4	

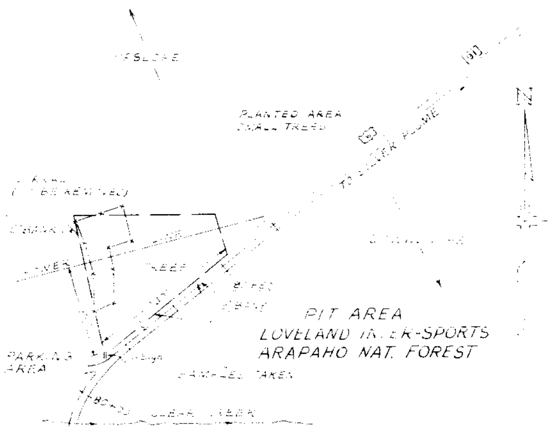
PIT NO. 1

BASE COURSE SURFACING

SAMPLE NO. 2323

LOCATION: Unsurveyed Area — Arapaho Nat. Forest
OWNER: Arapaho National Forest (U.S.)
AMOUNT AVAILABLE: 15,000 Cu. Yds.

Distance from Center of Pit to Sta. [illegible] of Project over route of haul is 500'.



Log of Field Sample from Pit No. 1 (Sample No. 2323)

Test No.	Depth in Feet	Description of Test Hole Material
1	0 - 8 +	Disintegrated Granite, rock mix, 2 sacks combined, bank samples. Pit is in a slide area, glacial deposit containing some 3' boulders.

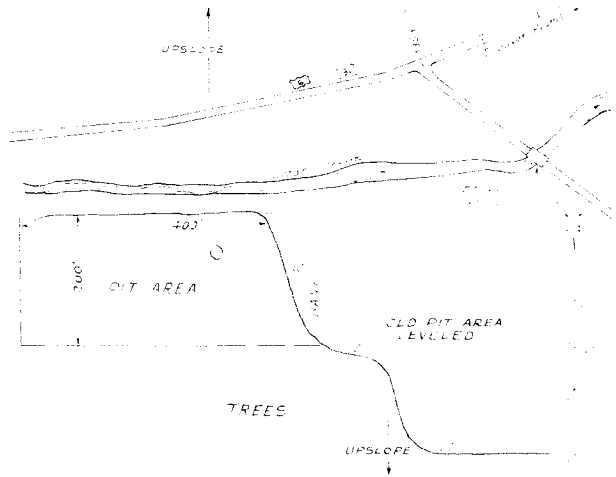
PIT NO. 2

STR. BACKFILL, STONE SCREENINGS, BASE COURSE SURFACING & PLANT MIX AGGREGATE

SAMPLE NO. 2325

LOCATION: Unsurveyed Area — Arapaho Nat. Forest
OWNER: Arapaho National Forest (U.S.)
AMOUNT AVAILABLE: 40,000 Cu. Yds.

Distance from Center of Pit to Sta. 335+[illegible] of Project over route of haul is [illegible] mile via Bakerville Bridge.



Log of Field Sample from Pit No. 2 (Sample No. 2325)

Test No.	Depth in Feet	Description of Test Hole Material
1	[illegible] +	Disintegrated Granite, rock, sand [illegible] glacial drift. Two sacks, combined, bank samples [illegible]

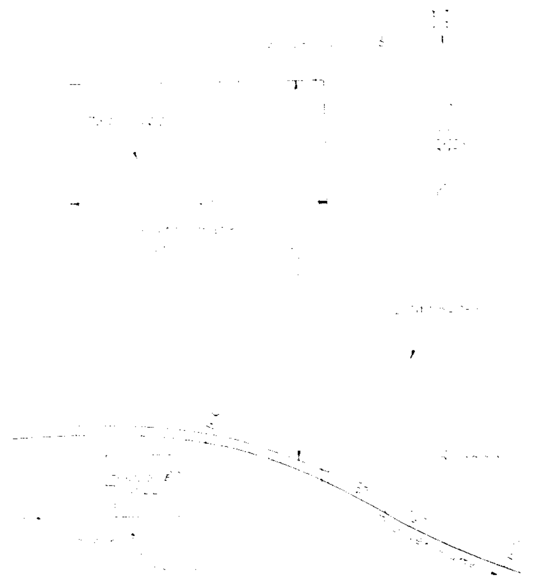
PIT NO. 3

BASE COURSE SURFACING & STR. BACKFILL

SAMPLE NO. 2329

LOCATION: SE ¼, SE ¼ Sec 14, T 4 S., R. 75 W.
OWNER: H. S. Bushnel (Estate), Sherman Bushnel, 971 So. Gilpin, Denver
AMOUNT AVAILABLE: 130,000 Cu. Yds.

[illegible]



[illegible]

LIST OF STRUCTURES

FEDERAL ROAD REGION NO.	DIVISION	PROJ. NO.	SHEET NO.	TOTAL SHEETS
9	COLORADO	C51-0091-10	5	

LOCATION	DESCRIPTION	REMOVE STRUCTURE NO.	REMOVE STRUCTURE KIND	EXCAVATION CUBIC YARDS UNCL.	EXCAVATION CUBIC YARDS EMB.	EXCAVATION CUBIC YARDS [illegible]	UNCLASSIFIED STRUCTURAL EXCAVATION CUBIC YARDS	STRUCTURE BACKFILL CUBIC YARDS	MECH. TAMPING HOURS	GRAVEL OR CRUSHED ROCK SURFACING TONS	CONCRETE CUBIC YARDS CL. A	CONCRETE CUBIC YARDS CL. B	REINFORCING STEEL LBS.	CORRUGATED METAL CULVERT PIPE LINEAR FEET 18"	24"	30"	78"	METAL APRONS FOR C.M.P. CULVERTS NO.	MISCELLANEOUS
80+08.8																			1-Project Marker (Placed by State Forces)
156+60										5									
168+46										5									
184+90										5									
215+66										5									
221+79										5									
226+77										5									
241+87										5									
307+60		1	Hdwl.			5	3	4							θ12+1				
309+12		1	Hdwl.	▲		10	11	8						θ26+1					
314+83		1	Hdwl.	▲		15	5	5						θ16+1					
317+49		1	Hdwl.	▲		10	3	4						θ14+1					
320+00		1	Hdwl.	▲		10	3	4						θ14+1					
322+39		1	Hdwl.	▲		10	4	5							θ14+1				
327+50		1	Hdwl.	▲		15	3	4						θ14+1					
332+52		1	Hdwl.	▲		15	2	5						{θ8+1 θ8+1					
335+26										5									
370+00										5									
379+76										5									
380+ to 382+										5									
4+00 Ah										5									
4+33										5									
41+05		1	Hdwl.	▲		10	3	4						θ14+1					
48+16		1	Hdwl.				3	5						θ18+1					
57+38		1	C.M.P.	25			3	7		20				30					
60+30		1	Hdwl.			5	3	4						θ14+1					
61+72		1	Hdwl.				3	5						θ16+1					
64+16		1	Hdwl.	▲		10	4	6							θ16+1				
74+82										5									
75+10										5									
95+00										5									
95+79										5									
99+68		1	Hdwl.			5	3	5							θ14+1				
111+06		1	Hdwl.	▲		15	4	4						θ14+1					
		1	Dry Rubble Catch Basin																
115+00		1	Hdwl.	▲		10	3	4						θ12+1					
116+63		1	C.M.P.	10			2	5		20				20					
121+78		1	Hdwl.				2	3						θ10+1					
122+69										5									
129+54										5									
142+33										5									
155+27										5									
159+25										5									
161+00										5									
166+91		1	Hdwl.				10	20									*16+2		
169+36										5									
170+39.0 Bk.=169+96.1 Ah.										5									
177+28										5									
178+16										5									

FEDERAL ROAD REGION NO.	DIVISION	PROJ. NO	SHEET NO.	TOTAL SHEETS
	COLORADO	C 51-0091-10	5a	

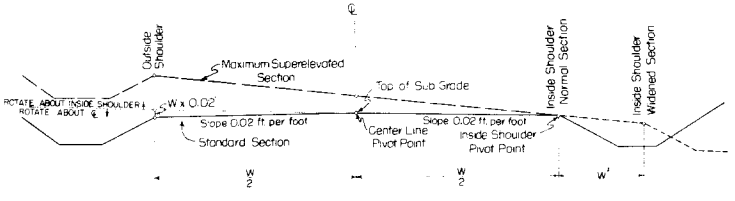
LIST OF STRUCTURES

LOCATION	DESCRIPTION	REMOVE STRUCTURE NO.	REMOVE STRUCTURE KIND	EXCAVATION CUBIC YARDS UNCL	EXCAVATION CUBIC YARDS EMB	EXCAVATION CUBIC YARDS UNCL	UNCLASSIFIED STRUCTURAL EXCAVATION CUBIC YARDS	STRUCTURE BACKFILL CUBIC YARDS CL	MECH TAMPING HOURS	GRAVEL OR CRUSHED ROCK SURFACING TONS	CONCRETE CUBIC YARDS CL A	CONCRETE CUBIC YARDS CL B	REINFORCING STEEL LBS	CORRUGATED METAL CULVERT PIPE LINEAR FEET 18"	24"	30"	78"	METAL APRONS FOR C.M.P. CULVERTS NO.	MISCELLANEOUS
182+87										5									
183+41										5									
187+00										5									
201+16										5									
207+00										5									
210+00										5									
211+40.6										10									
221+49										10									
224+96.6																			1-Project Marker (Placed by State Forces)
	Estimated for Mechanical Tamping (24' Roadway)								6										
	Estimated for Mechanical Tamping (36' Roadway)								11										
	TOTAL - 24' Roadway	5				30	21	38	6	185					29	30	8		
	TOTAL - 36' Roadway	16		35		115	56	73	11	40				50	[illegible]	[illegible]			

⊖ 1 Ft. Extra for Connecting Band
▲ Included in Profile Quantities
* 2 Ft. Extra for Connecting Band

STANDARD M-I-C

FED. ROAD DIV. NO.	DISTRICT	SHEET	TOTAL SHEETS
9	COLO.	6	

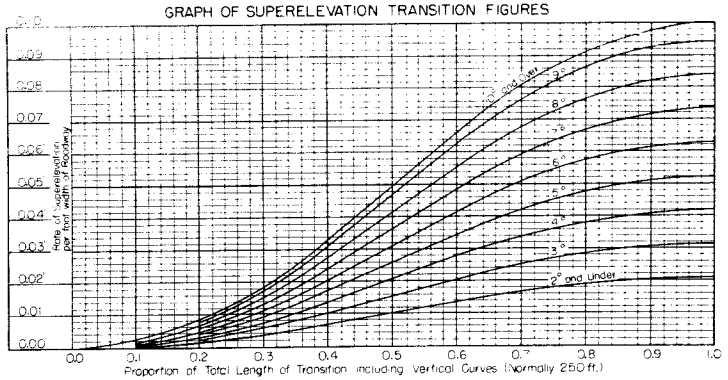


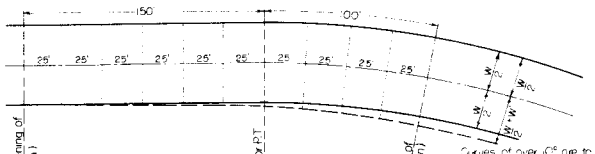
GRADED OR SURFACED SECTION

SUPERELEVATION AND WIDENING TABLES

DISTANCE FROM B.T. (PROPORTION)	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	Max 1.0
Degree of Curvature	RATE OF SUPERELEVATION (IN FEET) PER FOOT WIDTH OF ROADWAY									
2° and Under	0.00044	0.00175	0.00394	0.00700	0.01050	0.01400	0.01706	0.01925	0.02056	0.02100
3°	0.00066	0.00263	0.00591	0.01050	0.01575	0.02100	0.02559	0.02888	0.03084	0.03150
4°	0.00088	0.00350	0.00788	0.01400	0.02100	0.02800	0.03413	0.03850	0.04113	0.04200
5°	0.00109	0.00438	0.00984	0.01750	0.02625	0.03500	0.04266	0.04813	0.05141	0.05250
6°	0.00131	0.00525	0.01181	0.02100	0.03150	0.04200	0.05119	0.05775	0.06169	0.06300
7°	0.00153	0.00613	0.01378	0.02450	0.03675	0.04900	0.05972	0.06738	0.07197	0.07350
8°	0.00175	0.00700	0.01575	0.02800	0.04200	0.05600	0.06825	0.07700	0.08225	0.08400
9°	0.00197	0.00788	0.01772	0.03150	0.04725	0.06300	0.07678	0.08663	0.09253	0.09450
0° and Over	0.00208	0.00833	0.01875	0.03333	0.05000	0.06667	0.08125	0.09166	0.09792	0.10000
	OFFSETS FOR WIDENING - W' - (IN FEET)									
Over 10° - Under 12°	0.03	0.12	0.27	0.48	0.75	1.08	1.47	1.92	2.43	3.00
12° 15°	0.04	0.16	0.36	0.64	1.00	1.44	1.96	2.56	3.24	4.00
15° 20°	0.05	0.20	0.45	0.80	1.25	1.80	2.45	3.20	4.05	5.00
20° and Over	0.06	0.24	0.54	0.96	1.50	2.16	2.94	3.84	4.86	6.00

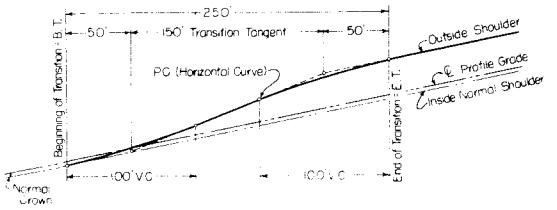
GRAPH OF SUPERELEVATION TRANSITION FIGURES





GENERAL PLAN OF WIDENING

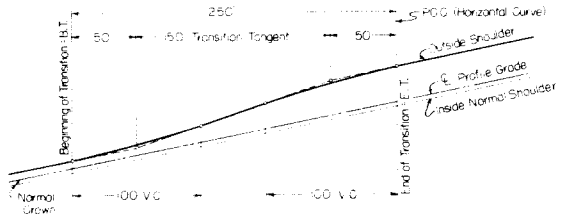
Curves of over 10° are to have the inside portion of the asphaltic mat and shoulder, or the inside portion and shoulder in a graded or surfaced section, widened in accordance with the plan, offsets for widening, and cross sections.



CASE I. SIMPLE CURVE WITH UNLIMITED TANGENT APPROACH

NOTE CASE I

The transition in this case, from crowned section to superelevated section, shall proceed by raising the outside shoulder, over a distance of 250 ft as shown, beginning at a point on the tangent 150 ft from the end of the curve and acquiring full superelevation at a point 100 ft inside the curve.



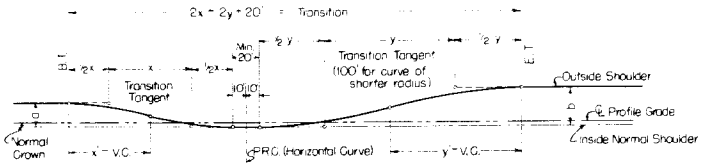
CASE II. COMPOUND CURVE

NOTE CASE II

Superelevation transitions at the outside ends of compound curves shall be constructed in accordance with rules given under CASE I.

Superelevation transition between the ares of different radii shall be made as in CASE I, except that the entire transition shall be within the limits of the curve of the larger radius.

In cases where curves in the same direction have a tangent distance of less than 300 ft between points of curve, the intervening tangent shall be superelevated an amount equal to that of the curve of greater radius and the transition shall be made as in the case of a true compound curve.



CASE III : REVERSE CURVES

NOTE CASE III

Transitions between true reverse curves shall be accomplished as shown on the above diagram.

Transition tangents shall be directly proportional to the amount of superelevation of the respective curves.

EXAMPLE: Let a represent the amount of superelevation on 1st curve;
" b " " " " " 2nd " ;
" x " " " " " transition tangent - 1st " ;
" y " " " " " 2nd " ;

then, a:b = x:y.

The transition tangent of the curve having the shorter radius shall be set at 100 ft.

A normal crowned section 20 ft long, 10 ft on each side of the P.R.C. shall be used.

In cases where curves in opposite directions are in such proximity that a standard transition can not be had, the practice outlined for true reversing curves shall be used.

The total distance between the P.T. of the first curve and the P.C. of the succeeding curve shall be prorated into the transition distance of the respective curves until a maximum of 150 ft of transition tangent for each curve is achieved.

GENERAL NOTES

Curves on projects using the Section shown are to be superelevated and widened as indicated in the accompanying drawings and tables.

The normal inside edge of the Graded or Surfaced Section is to remain at the standard elevation of 0.02 ft per foot width of roadway, below the profile grade, or as shown on the Typical Section for the Project. The centerline pivot point is to be used until the superelevation equals 0.02 ft per foot width of roadway. When this elevation is exceeded the normal inside shoulder pivot point is to be used.

When the degree of curvature exceeds 0°, the inside edge of the Asphaltic Mat or the inside shoulder of the Graded or Surfaced Section is to be widened from the normal inside edge or shoulder, respectively, as shown by the table and plan or by cross-sections. Curves of 10° or less are not to be widened.

The slope of the shoulders and widened sections shall conform to the rate per foot width of roadway required, except that the inside shoulder shall maintain the Typical Section slope until this slope is exceeded by the required superelevation slope.

The outside ditch on superelevated sections is to be modified, where necessary, to provide proper drainage. Otherwise, this ditch shall conform to normal ditch section shown for Project.

The rate of superelevation per foot width of roadway to be applied at the outside shoulder of the roadway is computed as follows:

The full superelevation per foot width of roadway rate for a given degree of curvature is 0.0105 ft x Degree of Curvature.

The maximum superelevation of 0.10 ft per foot width, applying to curves of 10° and over, is not to be exceeded.

Where spiral curves are used, the transition from normal crowned section to full superelevation and widening shall take place over the full length of spiral curve.

Special transition problems not covered by this standard sheet shall be covered by appropriate notes included with curve data on plans.

COLORADO
DEPARTMENT OF HIGHWAYS
STANDARD METHODS FOR SUPERELEVATION & WIDENING OF CURVES

Designed by R.E.L.	Approved by L. Julian
Made by S.J.M.	
Checked by C.R.S.	Date: November 1, 1953

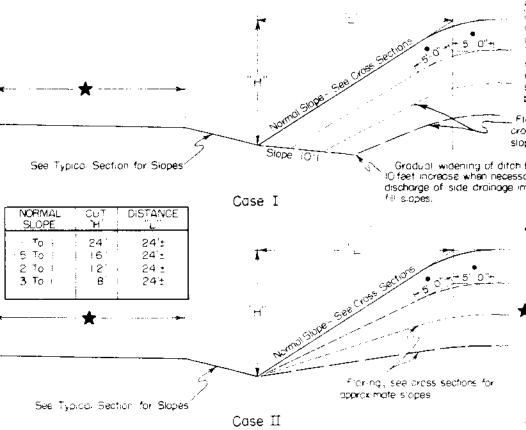
STANDARD SIDE APPROACH ROADS, FLARING, CUT SLOPE TREATMENT & WIDENING AT BRIDGES AND AT CREST OF GRADES

STANDARD M-2-EM

FED. ROAD DIV NO	DISTRICT	651-	SHEET NO.	TOTAL SHEETS
9	COLO.	0091-10	7	

Rev. 12-9-53, Details of Road Approaches, J.C.R
Rev 10-28-55, Widening at Bridge Approaches Note, S.J.M

GENERAL DETAILS FOR FLARING OF EARTH CUTS, CUT SLOPE TREATMENT & WIDENING AT BRIDGES



NORMAL SLOPE	CUT "H"	DISTANCE "L"
1 To 1	24'	24'±
1.5 To 1	16'	24'±
2 To 1	12'	24±
3 To 1	8'	24±

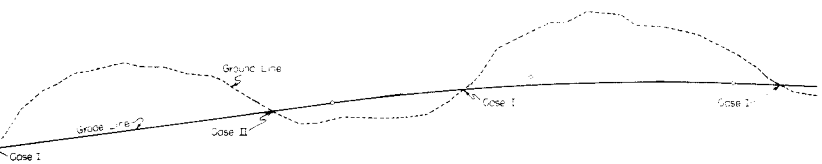
FLARING OF EARTH CUTS: The backslopes at ends of all earth cuts shall be flattened & where necessary the ditch shall be widened gradually to discharge side ditch drainage away from the base of adjacent fill slopes in order to avoid erosion & to improve appearance. The transition of flattened backslopes & widened ditch shall be constructed in such a manner that a uniform appearance of slope & ditch results. Backslopes shall be flared to the approximate "L" distance shown on Slope Table included with this detail. Rock cuts shall not be flared.

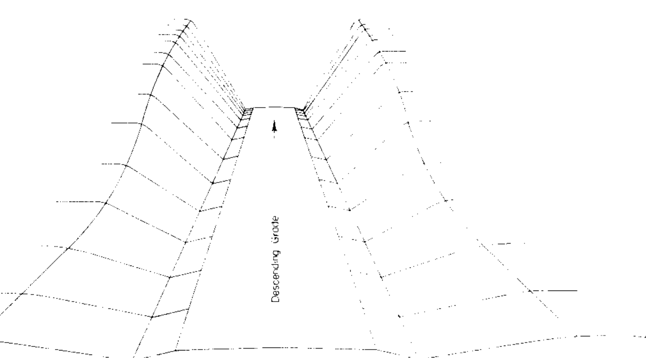
• CUT SLOPE TREATMENT IN EARTH CUTS: The intersection of cut slopes with the existing ground shall be rounded in earth cuts, beginning 5 ft outside the slope stake and extending 5 ft down the cut slope. Where the cut slope is less than 5 ft reduce each of the above widths of slope treatment to the actual slope distance. Quantities shall be included in "Unclassified Excavation".

★ WIDENING AT BRIDGE APPROACHES: Roadway embankment of bridge approaches shall be so constructed that base of surfacing at shoulder point is a Min of 2 ft beyond the outside edge of bridge deck. Where widening of the section is necessary to achieve this result it shall take place gradually over a distance of 300 ft. This is done to accomodate guard fence and/or guard posts at bridge approaches. (See additional requirements for Guard Fences below.)

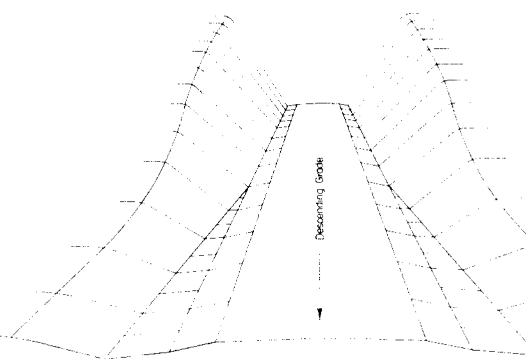
WIDENING TO ACCOMODATE GUARD FENCES: At all locations on the project (except as provided above for bridge approaches) where guard fence is to be constructed the shoulders shall be widened 2 ft to provide additional lateral support for guard fence posts.

PLAN OF FLARING IN EARTH CUTS



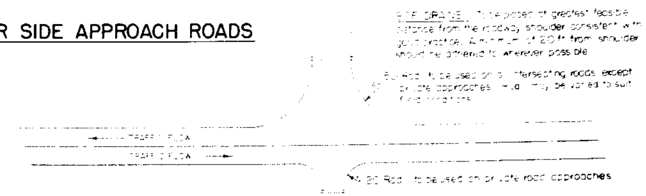


Case II

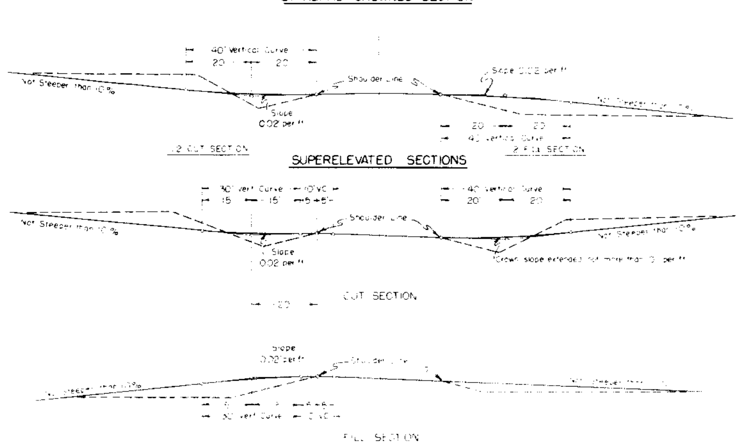


Case I

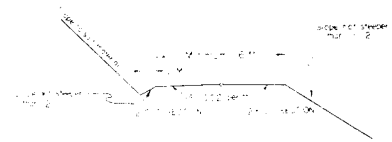
TYPICAL PLANS FOR SIDE APPROACH ROADS



STANDARD CROWNED SECTION

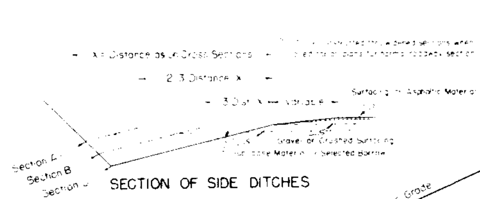


TYPICAL SECTION FOR APPROACH



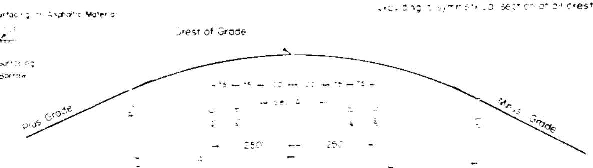
NOTE

DETAILS FOR DITCH & WIDENED SHOULDERS AT CREST OF GRADES



SECTION OF SIDE DITCHES

Section A is a shallow ditch section.
Section C is normal ditch section.
Section B shall be on a uniform transition between Sections A and C.
The modification of the ditch indicated shall be used only at the crest of grades from which drainage breaks both ways.



PROFILE VIEW SHOWING DISTANCES AND RELATIVE POSITIONS OF DITCH-TREATMENT SECTIONS

GENERAL NOTES

All work shall be done in accordance with the Standard Specifications of the Colorado Department of Highways applicable to the Project.

All side approach roads to the Project shall be gravel surfaced with a four (4) inch thickness of Gravel or Crushed Rock Surfacing extending approximately to the Right of Way Line. Estimated mileage & type of material required for this operation are shown in the Surfacing Plan.

The maximum grades shown are to be the limiting grades for all road approaches. Modifications of grades will be permitted where adherence to the grades as shown would cause damage to [illegible] grades less than the maximum shown are to be used wherever feasible.

COLORADO
DEPARTMENT OF HIGHWAYS
STANDARD
SIDE APPROACH ROADS, FLARING, CUT SLOPE TREATMENT, AND WIDENING AT BRIDGES AND AT CREST OF GRADES

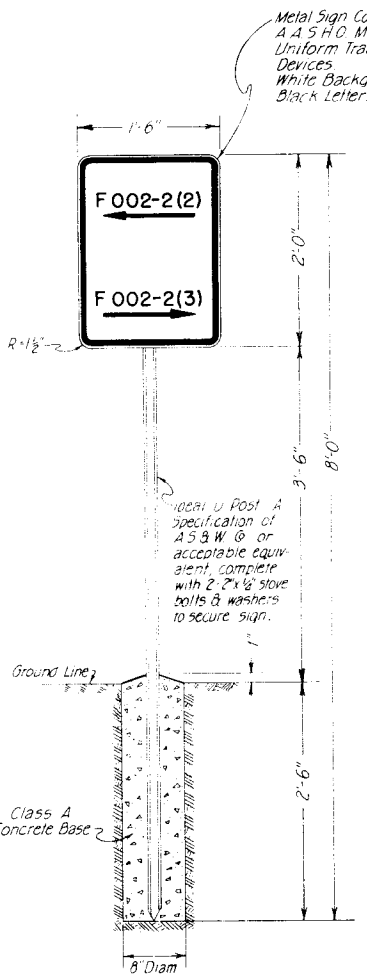
Designed by
Made by S.M.S.
Checked by T.R.S.
Approved by [signature]
Date: November 1953

FEDERAL ROAD DIVISION NO.	DISTRICT	PROJ. NO.	SHEET NO.	TOTAL SHEETS
9	COLORADO	851-0071-10	8	

Rev 4-4-56, Added Bridge Bench Mark, J.C.R.

STANDARD M-7-C

PROJECT MARKER POST



NOTES FOR PROJECT MARKER POSTS

All work shall be done in accordance with the Standard Specifications of the Colorado Department of Highways applicable to this project

Numbers and arrows shall show the proper numbers and directions of the projects each way from where the post is placed. Post is to be set with sign facing the road at the end of the project, two feet inside the R.O.W. line or at a point amply protected from traffic in such a position that the sign will indicate properly the projects to which it refers.

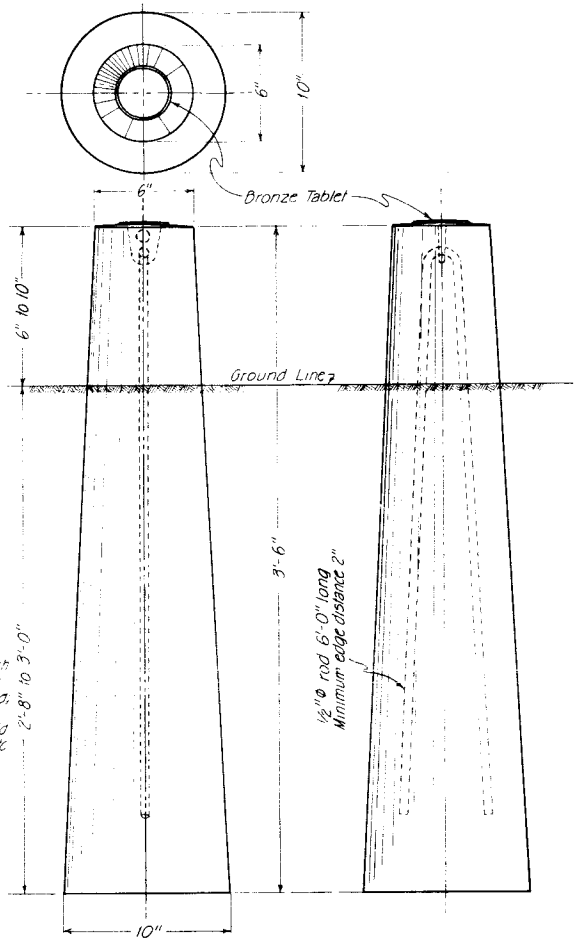
NOTES FOR R.O.W. MARKER POSTS

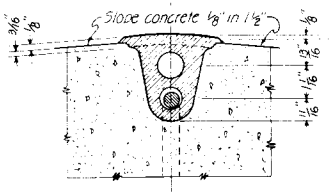
All work shall be done in accordance with the Standard Specifications of the Colorado Department of Highways applicable to the project

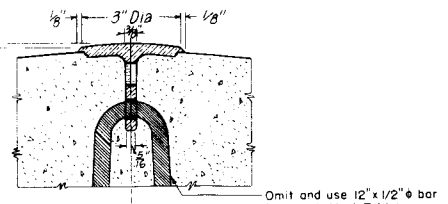
Posts shall be made of Class A Concrete. The upper 12 inches of marker posts shall be rubbed free of form marks and the top surface of the post must be constructed to drain thoroughly.

All exposed surfaces of the bronze tablet are to be ground to a smooth surface. All letters are to be depressed a minimum of ⅛ inch. Information on the bronze tablet indicated by pin lines is to be stamped in field by the engineering party after post is placed, 3/16 inch letters and figures to be used. Project designations on tablets shall be properly shown (i.e., I for Fed. Aid Interstate, F for Fed. Aid Primary, S for Fed. Aid Secondary, etc. & C for State Projects. see detail below.)

RIGHT OF WAY MARKER POST







Omit and use 12"x 1/2"ø bar for Bench Mark Tablet.

DETAIL OF BRONZE TABLET
FOR RIGHT OF WAY MARKER POST AND BENCH MARK

BENCH MARK

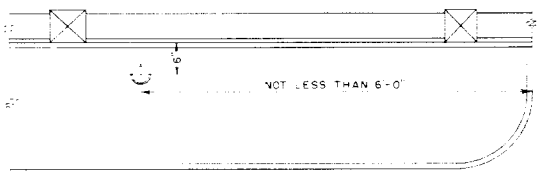
All work shall be done in accordance with Standard Specifications of the Colorado Department of Highways applicable to the project.

All exposed surfaces of the bronze tablet are to be ground to a smooth surface. All letters are to be depressed a minimum of 1/16 inch. Information on the bronze tablet indicated by pin lines is to be stamped in field by the engineering party after marker is placed. 3/16 inch letters and figures to be used. Project designation on tablets shall be properly shown (i.e., I for Fed. Aid Interstate, F for Fed. Aid Primary, S for Fed. Aid Secondary, etc. & C for State Projects. See details below).

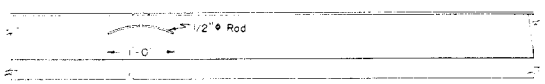
Bronze Bench Mark Tablets will be furnished by the Department at no expense to the Contractor.

Installation of Bronze Bench Mark Tablets will not be paid for directly, but shall be included in the price bid for Concrete.

Note: Where 2'-0" safety curbs are not used place marker in center of curb



PLAN



ELEVATION

One marker to be placed on Bridges as shown. The station shown on marker shall be the centerline stationing directly opposite the marker.

COLORADO
DEPARTMENT OF HIGHWAYS
STANDARD
MARKER POSTS
AND
BENCH MARKS

Designed by R.E.L. Mode by E.E.O. Checked by R.E.L.	Approved by: S. Sullivan Date: Nov. 12, 1953

FED. ROAD DIVISION NO.	DISTRICT	SHEET NO.	TOTAL SHEETS
9	COLO.	0041-10	9

STANDARD TIMBER GUARD POSTS

STANDARD M-19-D

SPECIFICATIONS

(Work By Contractor)

Rev. 5-13-53, Specifications, J.C.R.
Rev. 12-4-53, Date Nails Deleted, D.L.V.
Rev. 2-1-54, Delineation by State Forces, J.C.R.

POSTS - Lodgepole Pine, Southern Yellow Pine or West Coast Douglas Fir, not less than six (6) inches in diameter. All posts shall be pressure treated with Pentachlorophenol as provided under paragraph 42.2.20 of the specifications, after being peeled and shaved in accordance with specifications.

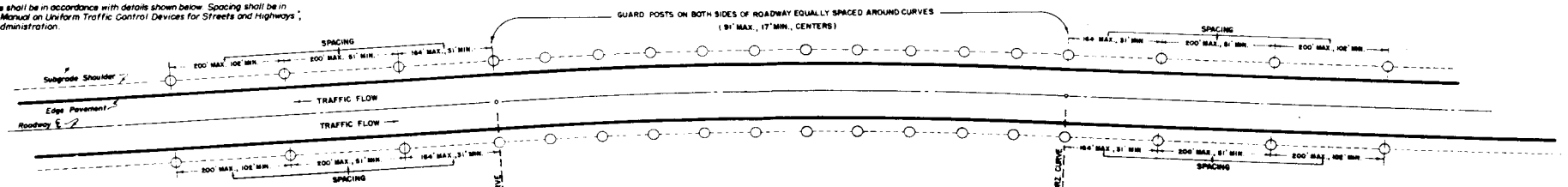
PAINTING - Posts shall be painted with aluminum paint and a black band placed around each post as per details on this sheet. Number of coats and type of paint applied shall be in accordance with specifications.

(Work By State Forces)

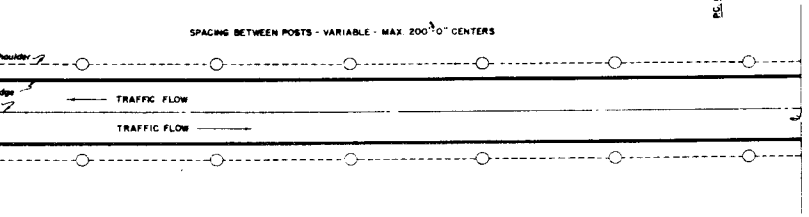
REFLECTIVE SHEETING - In accordance with the details hereon, State Forces will furnish and place the required 2"x 6" smooth surfaced reflective delineators fabricated from 3s - H14 aluminum alloy, minimum thickness 0.025", reflectorized with reflective sheeting strips or other approved reflective materials. Strips shall be suitable for placement around a curved surface.

Typical Installation on Curves

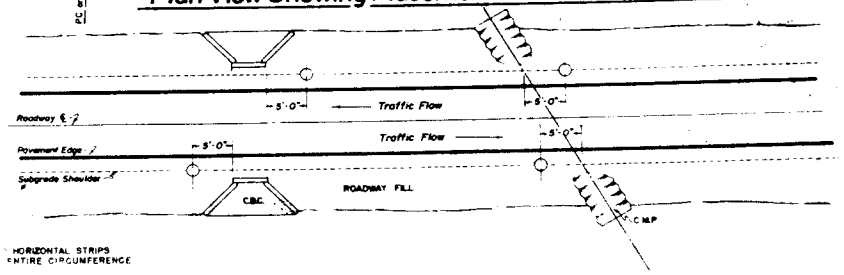
ON of guard posts on curves shall be in accordance with details shown below. Spacing shall be in Section 157, Table I of "Manual on Uniform Traffic Control Devices for Streets and Highways", 48 by the Public Roads Administration.



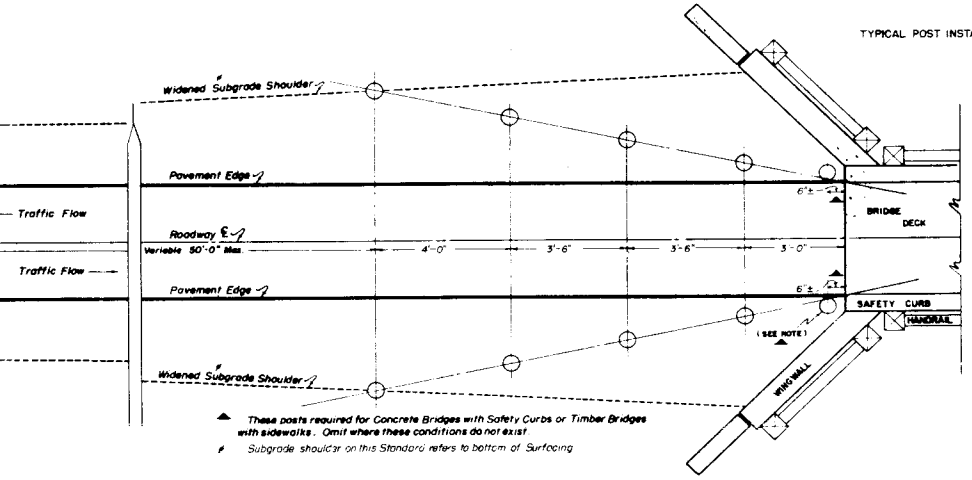
Method of Placement on Tangents



Plan View Showing Placement at Isolated Minor Structures

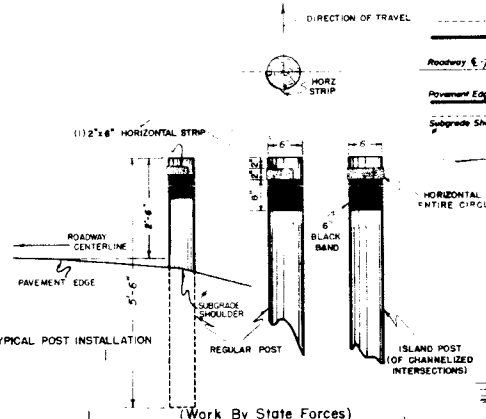


Typical Installation at Bridge Approaches



▲ These posts required for Concrete Bridges with Safety Curbs or Timber Bridges with sidewalks. Omit where these conditions do not exist.

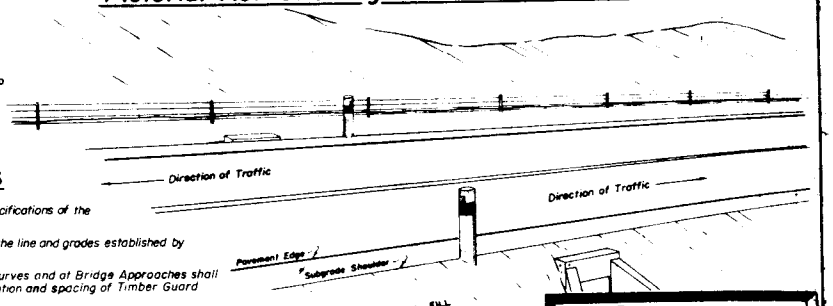
Subgrade shoulder on this Standard refers to bottom of Surfacing



(Work By State Forces)

INSTALLATION DETAILS OF REFLECTORIZED STRIPS

Pictorial View Showing Location at Isolated Minor Structures



GENERAL NOTES

(Work By Contractor)

All work shall be done in accordance with the Standard Specifications of the Colorado Department of Highways applicable to the project.

All posts shall be set and tamped in, plumb and firm, to the line and grades established by the Engineer.

INSTALLATION of Timber Guard Posts on Tangents, Curves and at Bridge Approaches shall be in conformity with details on this sheet. The number, location and spacing of Timber Guard Posts is shown on plans.

(Work By State Forces)

Reflective delineators shall be furnished and installed by State Forces after the Contractor has finished his operations.

Installation of reflective delineators shall be in accordance with the following: Wrap Around Reflective Sheeting Strips shall be installed horizontally one (1) sheet on all posts. Island posts shall have Wrap Around Reflective Sheeting Strips placed horizontally to cover entire circumference of Post.

On Divided Highways and Islands, Reflective Sheeting Strips shall be placed in a manner to obtain maximum visibility for the primary direction of travel. In all instances tests shall be made to insure the maximum effectiveness of reflective delineators.

All Traffic Islands shall be marked with Island Posts as indicated hereon.

COLORADO DEPARTMENT OF HIGHWAYS

STANDARD TIMBER GUARD POSTS

Designed by	Approved by C. Julian
Made by	Engineer of Surveys & Plans
Checked by	Date: March 25, 1953

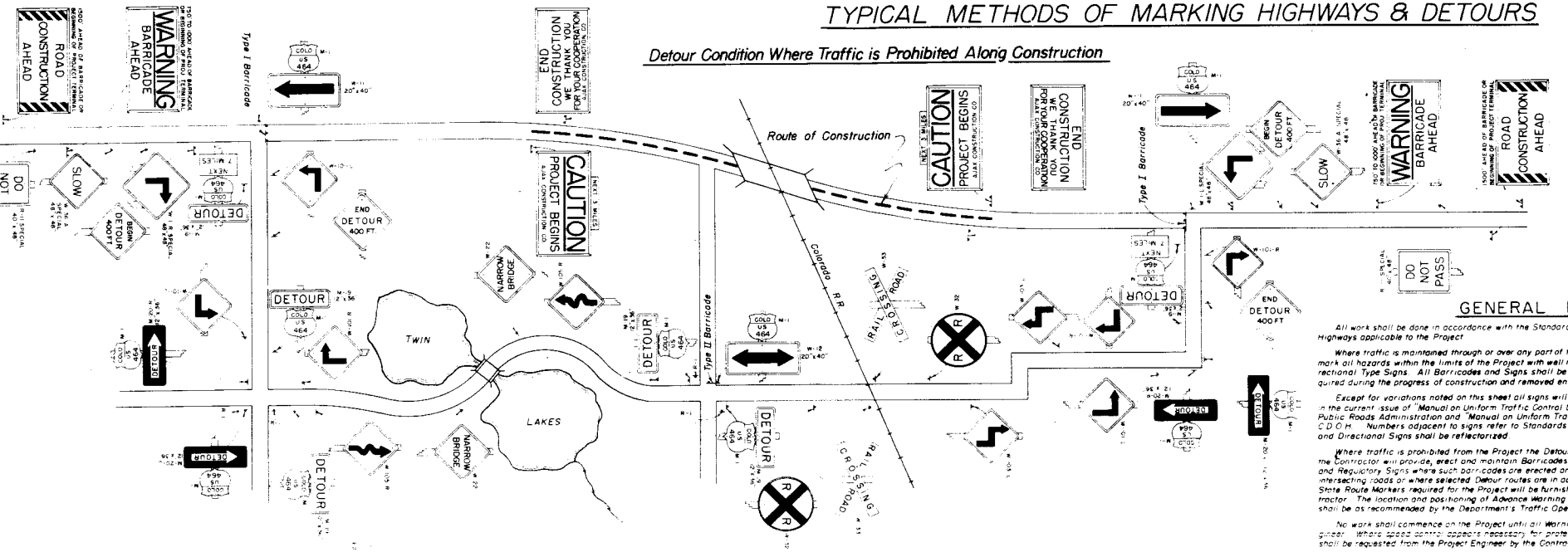
STANDARD ROADWAY CONSTRUCTION TRAFFIC SIGNS

STANDARD M-29-B
(SHEET 1 OF 2 SHEETS)

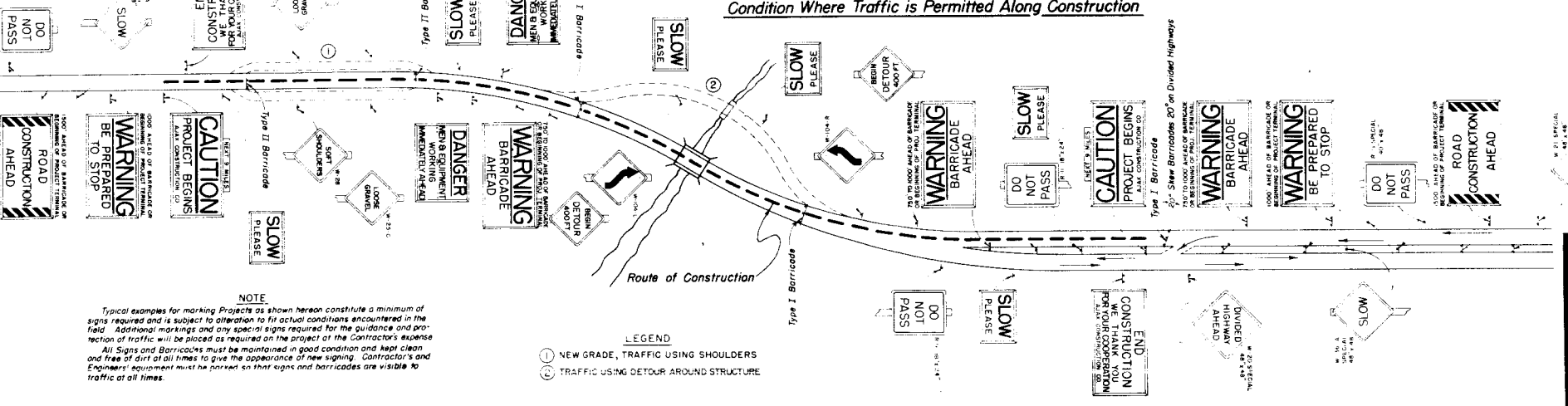
FED. ROAD DIV. NO.	DISTRICT	SHEET NO.	TOTAL SHEETS
9	COLO. 0091-10	10	

TYPICAL METHODS OF MARKING HIGHWAYS & DETOURS

Detour Condition Where Traffic is Prohibited Along Construction



Condition Where Traffic is Permitted Along Construction



NOTE

Typical examples for marking Projects as shown hereon constitute a minimum of signs required and is subject to alteration to fit actual conditions encountered in the field. Additional markings and any special signs required for the guidance and protection of traffic will be placed as required on the project at the Contractor's expense.

All Signs and Barricades must be maintained in good condition and kept clean and free of dirt at all times to give the appearance of new signing. Contractor's and Engineers' equipment must be parked so that signs and barricades are visible to traffic at all times.

LEGEND

(1) NEW GRADE, TRAFFIC USING SHOULDERS
(2) TRAFFIC USING DETOUR AROUND STRUCTURE

GENERAL NOTES

All work shall be done in accordance with the Standard Specifications of the Colorado Department of Highways applicable to the Project.

Where traffic is maintained through or over any part of the Project, the Contractor will be required to mark all hazards within the limits of the Project with well maintained Barricades, Warning Signs and Directional Type Signs. All Barricades and Signs shall be moved, added to, changed or removed as required during the progress of construction and removed entirely when project is completed.

Except for variations noted on this sheet all signs will be in conformity with the specification outlined in the current issue of "Manual on Uniform Traffic Control Devices for Streets & Highways" by the U.S. Public Roads Administration and "Manual on Uniform Traffic Control Devices for Streets and Highways," C.D.O.H. Numbers adjacent to signs refer to Standards in the manual "Standard Warning, Regulatory and Directional Signs shall be reflectorized.

Where traffic is prohibited from the Project the Detour will be marked by the Department except that the Contractor will provide, erect and maintain Barricades complete with approved Directional Arrows and Regulatory Signs where such barricades are erected and maintained at the ends of the Project and intersecting roads or where selected Detour routes are in advance of the actual project terminal. U.S. or a State Route Markers required for the Project will be furnished by the Department and installed by the Contractor. The location and positioning of Advance Warning Signs, Barricades and Speed Control Signs shall be as recommended by the Department's Traffic Operations Section.

No work shall commence on the Project until all Warning Signs are in place and approved by the Engineer. Where speed control appears necessary for protection of the travelling public, such speed control shall be requested from the Project Engineer by the Contractor.

All signs are to be in clear view of traffic and are not to be obstructed by equipment, weeds or otherwise.

Where two similar type signs are used, they shall be placed approximately 75 feet apart to avoid a tunneling effect.

SEE SHEET 2 OF 2 THIS STANDARD FOR ADDITIONAL NOTES AND DETAILS.

COLORADO
DEPARTMENT OF HIGHWAYS

Standard Roadway Construction Traffic Signs

Designed by J.C.R.	Approved by A. Julian
Made by J.C.R.	Engineer, Surveys & Plans
Checked by	Date: July 22, 1955

STANDARD ROADWAY CONSTRUCTION TRAFFIC SIGNS

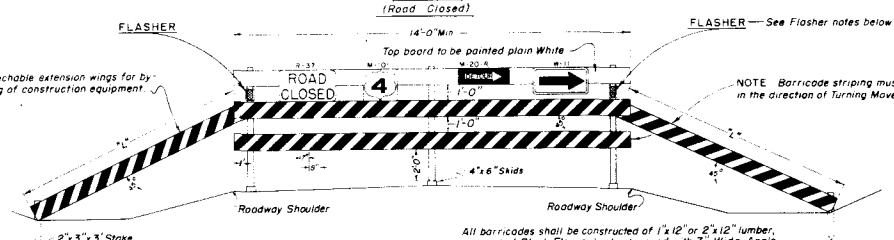
STANDARD M-29-B
(SHEET 2 OF 2 SHEETS)

FED. ROAD DIV. NO. 8 | DISTRICT 8 51- | COLO. 0091-10 | SHEET NO. 11 | TOTAL SHEETS

Rev. 7-10-56, Reflective Materials, L.N.P.

DETAILS OF BARRICADES

Type I
(Road Closed)



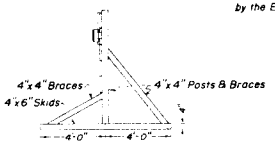
"L" Variable, length to be adequate to provide closing of borrow pit and shoulder.

All barricades shall be constructed of 1"x12" or 2"x12" lumber, spray painted Black Flex-o-lin background with 7" Wide Angle White Reflective Sheeting acceptable to the Department. Boards may be painted on reverse side with opposite slant on reflective stripes for opposite direction use.

Barricades may be either portable as shown or fixed with posts set into the ground.

All skids, braces & posts to be painted White & nailed together with No. 20d nails.

Bases to be weighted where necessary to provide stability.

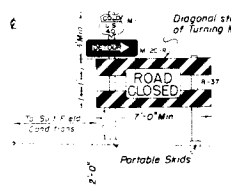


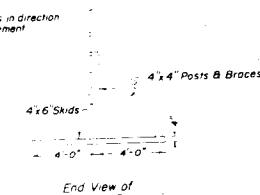
End View of Type I Portable Barricade
(Optional)

NOTE

The various types & combinations of approved signs for barricades required for each project will be governed by field conditions and subject to approval by the Engineer.

Type II
(Beg. of Detour, By-Pass Areas within Proj., Extreme Hazards, etc.)





End View of Type II Portable Barricade
(Optional)

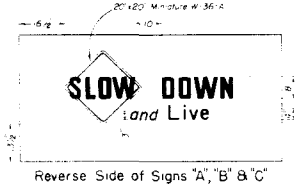
NOTE: Alternate materials or other reflecting elements on Construction Traffic Signs and Barricades will be permitted only after approval of such material by the Department.

DETAILS OF CONSTRUCTION SIGNS

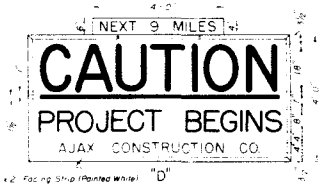
"A"

"B"

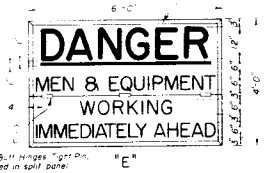
"C"



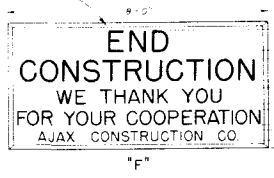
Reverse Side of Signs "A", "B" & "C"



"D"

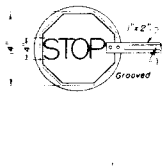


"E"

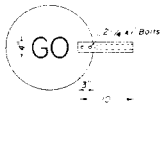


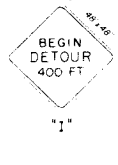
"F"

"G"



"H"





"I"

"J"

SIGN MARKINGS

Construction Signs "A" through and including "G" shall be made of 3/4" Plywood or other material after approval by the Department, and as per details above. Signs shall be reflectorized with reflective sheeting or other reflective materials of types approved by the Department.

CONSTRUCTION SIGN "A" - Wide Angle White background with painted Black lettering. Barricade stripes of 4" Wide Angle White placed over Black painted vertical stripe spaced as shown above. This sign is the First advance warning sign and shall be placed 1500 feet ahead of barricade or beginning of project terminal and on both sides of the travelled way in all cases.

CONSTRUCTION SIGN "B" - The word "WARNING" and "I" underline shall be painted White on a 23" strip of Wide Angle Flat Top Red. Balance of lettering painted Black on a 22" strip of Wide Angle White. This sign is the Second advance warning sign and shall be placed 1000 feet ahead of barricade or beginning of project terminal and on both sides of the travelled way on divided highways and singly on two-lane highways.

CONSTRUCTION SIGN "C" - The word "WARNING" and "I" underline shall be painted White on a 23" strip of Wide Angle Flat Top Red. Balance of lettering painted Black on a 22" strip of Wide Angle White. This sign is the Third advance warning sign in cases where barricades are used and shall be placed 750 to 1000 feet ahead of barricade or beginning of project terminal and on both sides of the travelled way on divided highways and singly on two-lane highways.

REVERSE SIDES OF SIGNS "A", "B" and "C" - The word "SLOW" shall be painted Black and superimposed over a Yellow miniature W-36-A background panel. Balance of lettering shall be painted Black on a White background.

CONSTRUCTION SIGN "D" - The word "CAUTION" and 1 1/2" underline shall be painted White on a 24 1/2" strip of Wide Angle Flat Top Red. Balance of lettering painted Black on a 20 1/2" strip of Wide Angle White. This sign will be provided with a detachable 1" material board mounted on back of sign with 2-1/4"x2" bolts. This board shall be painted White with Black lettering. (Indicate to the nearest Mile). This sign shall be placed to mark the Beginning of the Project. To be placed singly and may be placed opposite barricade if desirable.

CONSTRUCTION SIGN "E" - The word "DANGER" and 1" underline shall be painted White on a 17 1/2" strip of Wide Angle Flat Top Red. Balance of lettering painted Black on a 27 1/2" strip of Wide Angle White. The sign is of the hinged and fold type to facilitate the closing down of sign when the need is not prevalent. This sign shall be placed 500 feet ahead of the situation on hand.

CONSTRUCTION SIGN "F" - The words "END CONSTRUCTION" and "CONTRACTORS NAME" shall be painted Black on strips 22" and 6 1/2" respectively of Wide Angle White. Balance of lettering shall be painted White on a 16 1/2" strip of Wide Angle Flat Top Red. This sign shall be placed to mark the Ending of the Project. To be placed singly and may be placed opposite barricade if desirable.

CONSTRUCTION SIGN "G" - The words "SLOW" and "PLEASE" shall be painted Black on a background of Wide Angle Yellow. This sign shall be used frequently within the limits of the Project.

All of the preceding signs shall be fastened to 2-4"x4" posts set 4 feet in the ground with a minimum of 3-1"x4" nailing strips on the back. Bottom of sign to be not less than 36" above ground.

FLAGMAN WARNING SIGN "H" - This sign shall be made of Plastic or other light-weight material, painted Red background with White lettering on the "STOP" side and painted Green background with White lettering on the "GO" side. Handle to be grooved on one side to indicate reading of sign to flagman. This sign will be used whenever flagmen are necessary. Sign to be reflectorized if used to stop traffic at night.

DETOUR WARNING SIGN "I" - To be of 3/8" (Minimum) plywood or No. 16 (Minimum) gauge metal with Black painted letters on a Wide Angle Yellow background.

CONSTRUCTION SIGN "J" - 3/4"x9" metal slides to be placed between "NEXT" — MILES", spaced so as to accommodate appropriate size numerals. Required numerals to be furnished by the Department and to be installed by the Contractor. Numerals calculated to the nearest Mile.

All material shall be sound and durable. Barricades, signs, symbols and lettering conforming to styles noted hereon will be of good workmanship and well maintained. Uneven lettering will not be accepted.

Flares and Torches shall be of the oil burning type approved by the Department and shall be placed 3 feet to 5 feet ahead of the object to be illuminated. Particular care shall be taken to protect all signs and barricades from smoke and smudge arising from the use thereof.

Flashers used on Type I Barricade shall be of the Battery or Electrical Type. The illuminating element in a flashing amber beacon or signal shall be flashed continuously at a rate between 50 or 60 flashes per minute which will be clearly distinguishable to traffic. The duration in which Flashers will be left in operation will be governed by field conditions and subject to approval by the Engineer.

Alternate methods of processing signs or the substitution of pressure sensitive symbols or other reflecting elements for painted symbols will be permitted only after approval of such methods or materials by the Department.

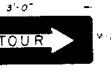
The Department shall furnish and install the following as required outside the limits of the Project:

1	"ROAD CONSTRUCTION AHEAD"	Minimum 4
2	"WARNING BE PREPARED TO STOP"	Minimum 2
3	"WARNING BARRICADE AHEAD"	As Required
4	Standard Warning & Directional Signs	As Required

The Contractor shall furnish and install the following as required within the limits of the Project:

1	All Barricades	As Required
2	"CAUTION PROJECT BEGINS"	Minimum 2
3	"DANGER MEN & EQUIPMENT WORKING IMMEDIATELY AHEAD"	As Required
4	"END CONSTRUCTION WE THANK YOU FOR YOUR COOPERATION"	Minimum 2
5	"SLOW PLEASE"	As Required
6	Standard Warning & Directional Signs	As Required
7	Approved Directional Arrows & Regulatory Signs for Barricades	As Required
8	Torches and Flares as follows: Type I Barricade	Minimum 3
	Type II Barricade	Minimum 1
9	Flashers - Type I Barricade	2 Required

Details of Reflectorized Arrows



MARKINGS - A Wide Angle White Reflectorized Arrow of Reflective Sheeting acceptable to the Department to be placed on a Black background. Letters to be 4" in height.

MARKINGS - A Black Arrow on a Wide Angle Yellow background of Reflective Sheeting acceptable to the Department.

Position of Signs Relative to Roadbed & Hazards

Top View
(Showing angle of sign in relation to roadway)

NOTE

Warning Signs to be made of 3/8" (Min.) plywood or No. 16 Gauge (Min.) metal and shall be reflectorized.

Location to be governed by field conditions. Exact location to be staked by the Engineer. In all cases warning signs are to be placed well in advance of hazard, the distance depending on topography, and existing approach speeds.

COLORADO
DEPARTMENT OF HIGHWAYS

Standard Roadway Construction Traffic Signs

Designed by	J.C.R.	Approved by	Engineer, Surveys & Plans
Made by	J.C.R.	Date:	July 22, 1955
Checked by			

REVISIONS

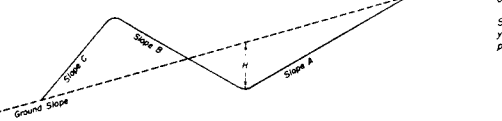
STANDARD TYPES of DITCHES and CONSTRUCTION METHODS

STANDARD M-107-C

FED. ROAD DIVISION NO.	DISTRICT		SHEET NO.	TOTAL SHEETS
9.	COLO	651-0091-10	12	

DETAILS for CONTOUR INTERCEPTING DITCHES

ical Section for Contour Intercepting Ditches



PURPOSE & USE OF THE TABLE

The primary purpose of the information for Contour and Intercepting Ditches shown on this sheet is to serve as a guide in construction and to readily arrive at yardages of excavation involved.

Foremost consideration in constructing these ditches is given first to the natural ground line slope confronted in construction, thence to the other values shown on the Typical Section.

By properly arriving at the combination of values shown on the Typical Section and in the Table for a specified condition, the number of cubic yards of excavation per 100 lin. ft. of ditch may be read under the appropriate column for this item.

Typical Construction Layouts

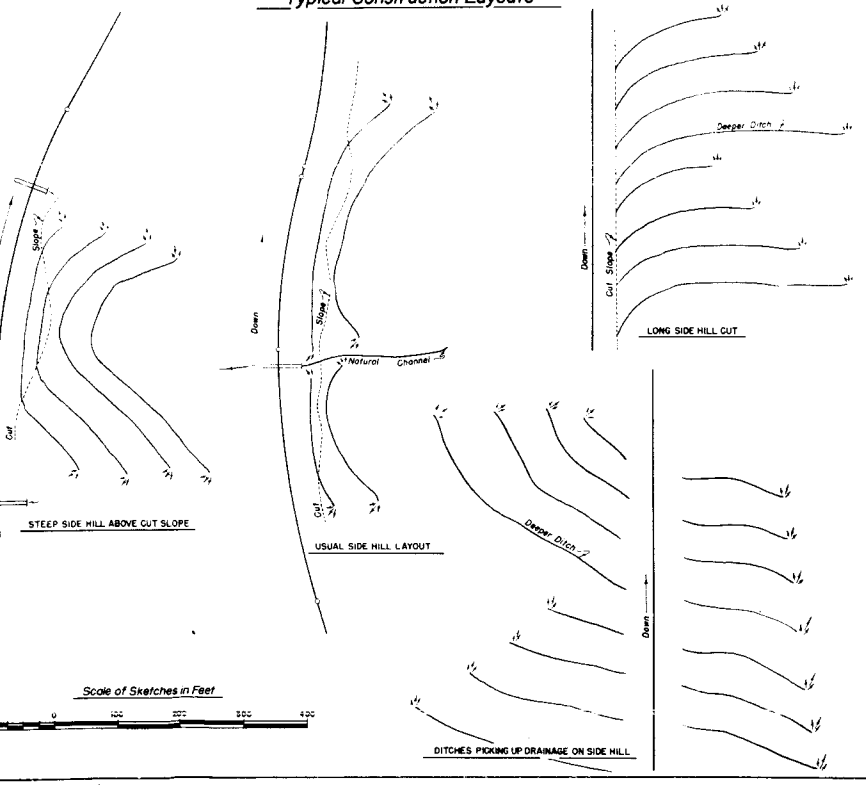
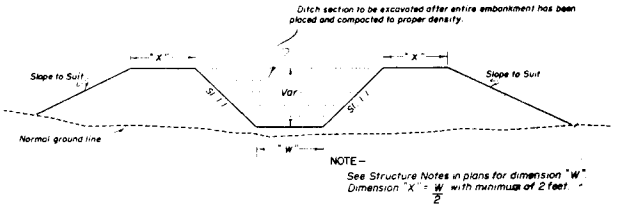


Table of Slopes and Yardages

SLOPES Ground	A	B	C	H	Cubic Yards per 100 lin ft of Ditch
5:1 Or Flatter	2:1	4:1	2:1	15"	16
				18"	23
				21"	32
		3:1		15"	15
				18"	22
				21"	30
		2:1		15"	14
				18"	20
				21"	27
		1-1/2:1		15"	13
				18"	19
				21"	25
	1-1/2:1	4:1	1-1/2:1	15"	12
				18"	18
				21"	25
		3:1		15"	12
				18"	17
				21"	23
		2:1		15"	10
				18"	15
				21"	20
		1-1/2:1		15"	10
				18"	14
				21"	19
4:1	2:1	4:1	2:1	15"	17
				18"	25
				21"	34
		3:1		15"	17
				18"	24
				21"	32
		2:1		15"	15
				18"	22
				21"	30
		1-1/2:1		15"	15
				18"	21
				21"	29
	1-1/2:1	4:1	1-1/2:1	15"	13
				18"	18
				21"	25
		3:1		15"	12
				18"	17
				21"	23
		2:1		15"	11
				18"	16
				21"	21
		1-1/2:1		15"	10
				18"	14
				21"	20
3:1	2:1	3:1	2:1	15"	22
				18"	31
				21"	43
		2:1		15"	21
				18"	30
				21"	41
		1-1/2:1		15"	20
				18"	29
				21"	40
	1-1/2:1	3:1	1-1/2:1	15"	13
				18"	19
				21"	26
		2:1		15"	12
				18"	17
				21"	24
		1-1/2:1		15"	12
				18"	17
				21"	23
2:1	1-1/2:1	2:1	1-1/2:1	15"	20
				18"	29
				21"	40
		1-1/2:1		15"	20
				18"	28
				21"	39
	1:1	2:1	1:1	15"	9
				18"	13
				21"	17
		1-1/2:1		15"	8
				18"	12
				21"	16
1-1/2:1	1:1	1-1/2:1	1:1	15"	11
				18"	16
				21"	21

▲ *Slopes are approximate and may be varied to suit conditions encountered during construction.*

TYPICAL SECTIONS for DRAINAGE, IRRIGATION DITCHES and CHANNEL CHANGES



NOTE –
See Structure Notes in plans for dimension "W"
Dimension "X" = $\frac{W}{2}$ with minimum of 2 feet.

For Embankment Sections

(Generally for use in Irrigation Ditches & Channel Changes)

NOTE –
Unless otherwise shown in Structure Notes of plans, dimension "W" = 1 foot

For Cut Sections

GENERAL NOTES

All work shall be done in accordance with the Standard Specifications of the Colorado State Highway Department applicable to the Project

All ditches are to be constructed to lines and grades as staked by the Engineer using the ditch section shown on plans or as ordered by the Engineer.

CONTOUR INTERCEPTING DITCHES: *Ditches are to be laid out along the ground contour on a grade of not over 1% (Type of soil shall govern the grade).*

Ends of ditches are to be lined up so that concentration of flow from a higher contour ditch into one of lower contour is, as far as possible avoided. The use of a deeper ditch is recommended where this condition is encountered.

The following horizontal spacing of ditches is recommended

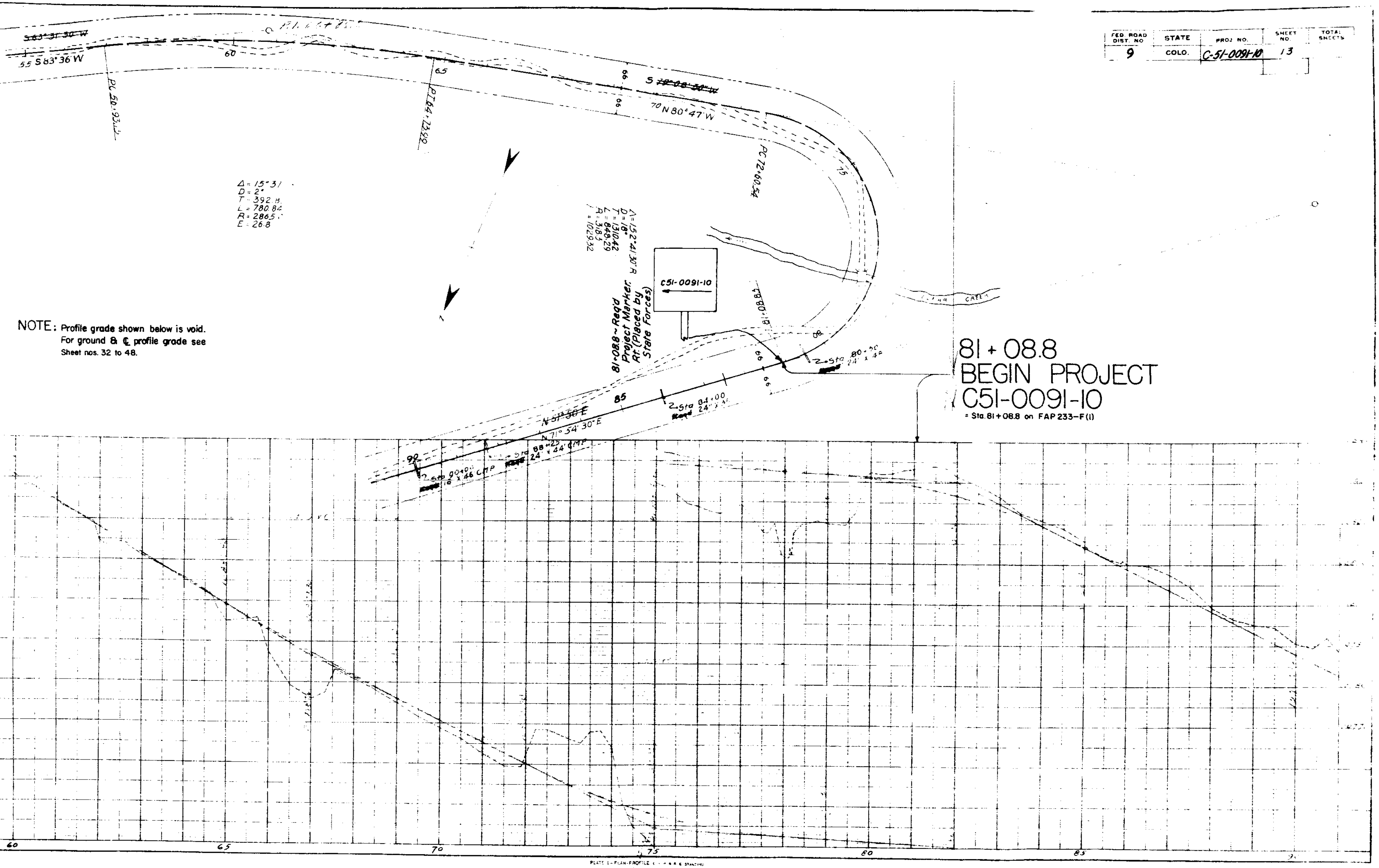
4% to 6%	Approximately 70' Centers
8% to 10%	Approximately 60' Centers
20% to 4:1 Slope	Approximately 55' Centers
30% to 1-1/2:1 Slope	Approximately 50' Centers

Where ditch checks are required the intervening ditch between one set of ditch checks shall not exceed a grade of 1.0%. Details of checks will be shown on plans when required.

COLORADO STATE HIGHWAY DEPARTMENT

Standard Types of Ditches and Construction Methods

Designed by C.G.M.	Approved by H. Marshall
Made by C.G.M.	Engineer, Surveys & Plans
Checked by	Date: Aug. 18, 1950



FED. ROAD DIST. NO.
9
STATE
COLO.
PROJ. NO.
C-51-0091-10
SHEET NO.
13
TOTAL SHEETS
NOTE: Profile grade shown below is void.
For ground & ℄ profile grade see
Sheet nos. 32 to 48.
81 + 08.8
BEGIN PROJECT
C51-0091-10
= Sta. 81+08.8 on FAP 233-F(1)
C51-0091-10
81+08.8 ~ Reqd
Project Marker,
Rt. (Placed by
State Forces)
S 83° 36' W
N 80°47' W
N 71° 54' 30" E
PC 72+80.54
60
65
70
75
80
85

FED. ROAD DIST. NO.	STATE	PROJ NO	SHEET NO	TOTAL SHEETS
9	COLO.	C-51-0091-10	14	

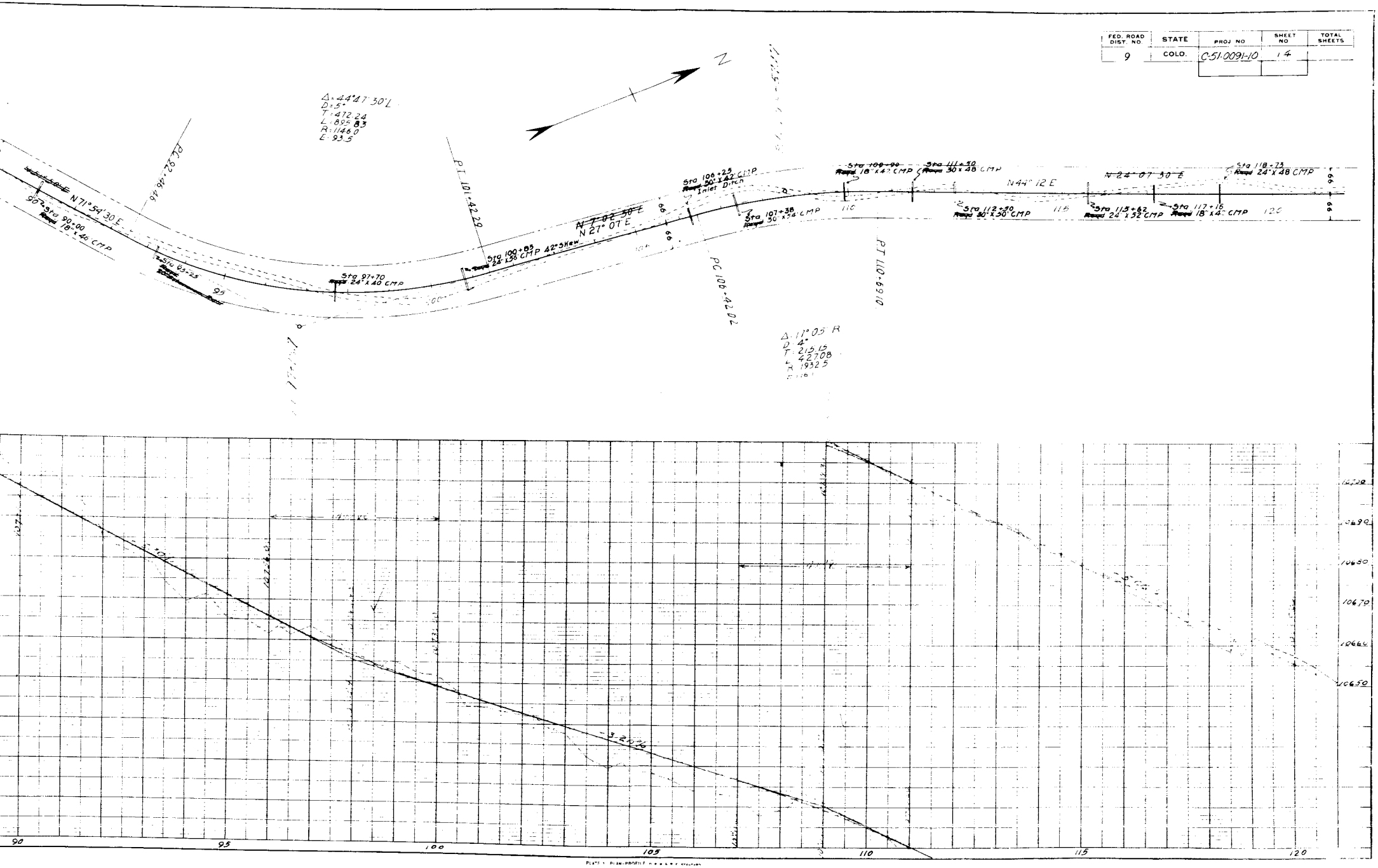
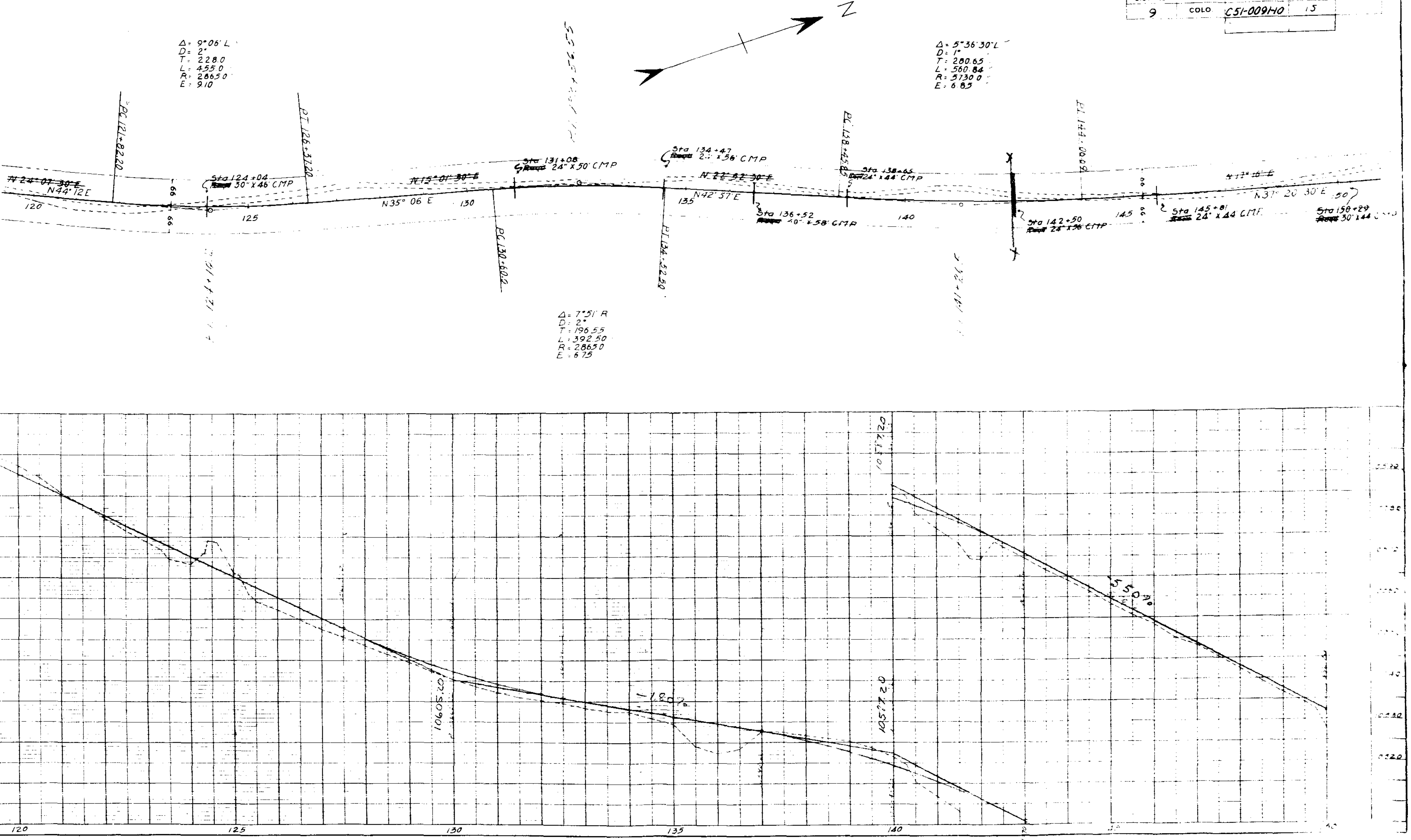


PLATE 1 PLAN-PROFILE

FED. ROAD DIST. NO.	STATE	PROJ. NO.	SHEET NO.	TOTAL SHEETS
9	COLO.	C51-009H0	15	



FED. ROAD DIST. NO.	STATE	PROJ. NO.	SHEET NO.	TOTAL SHEETS
9	COLO.	C51-0091-10	15	

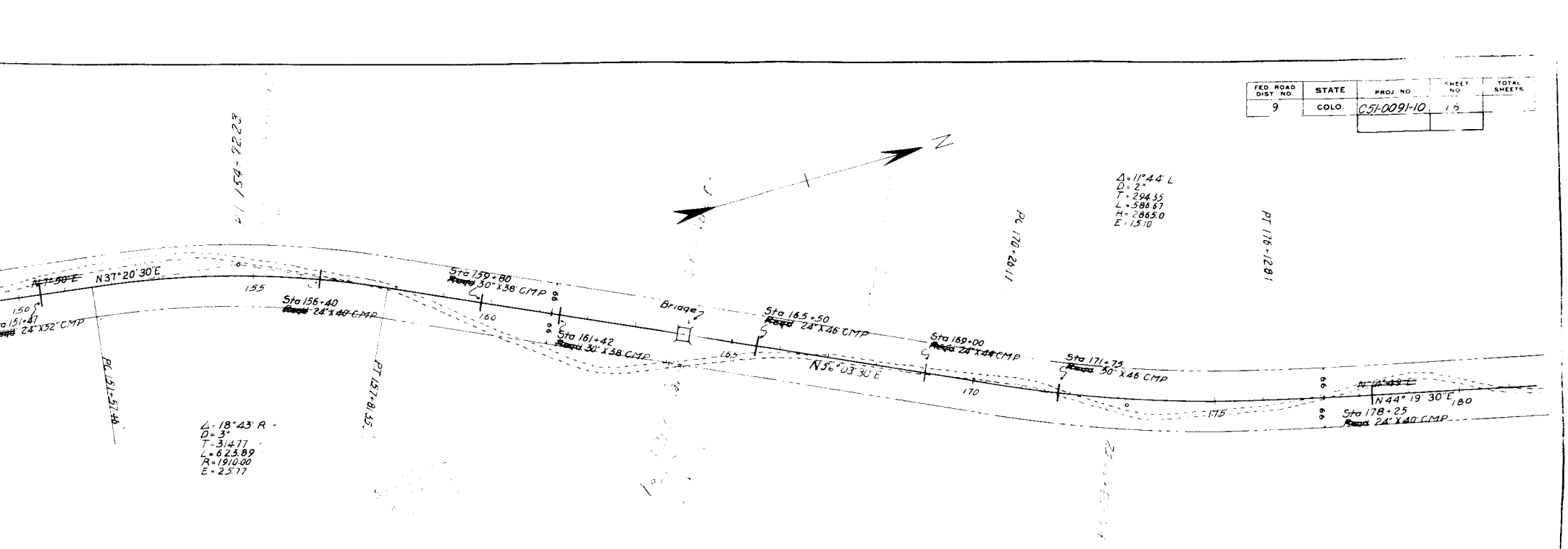
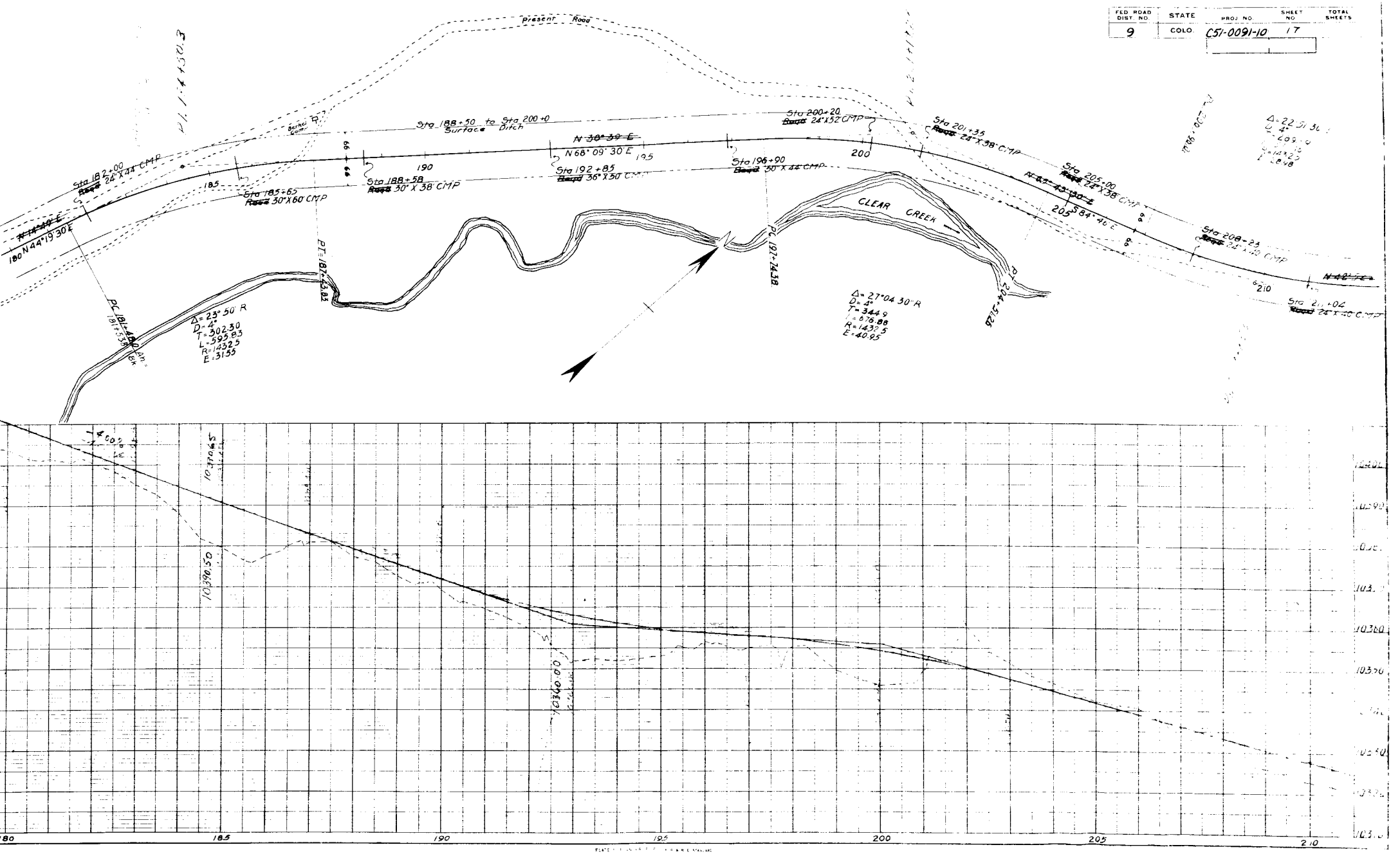
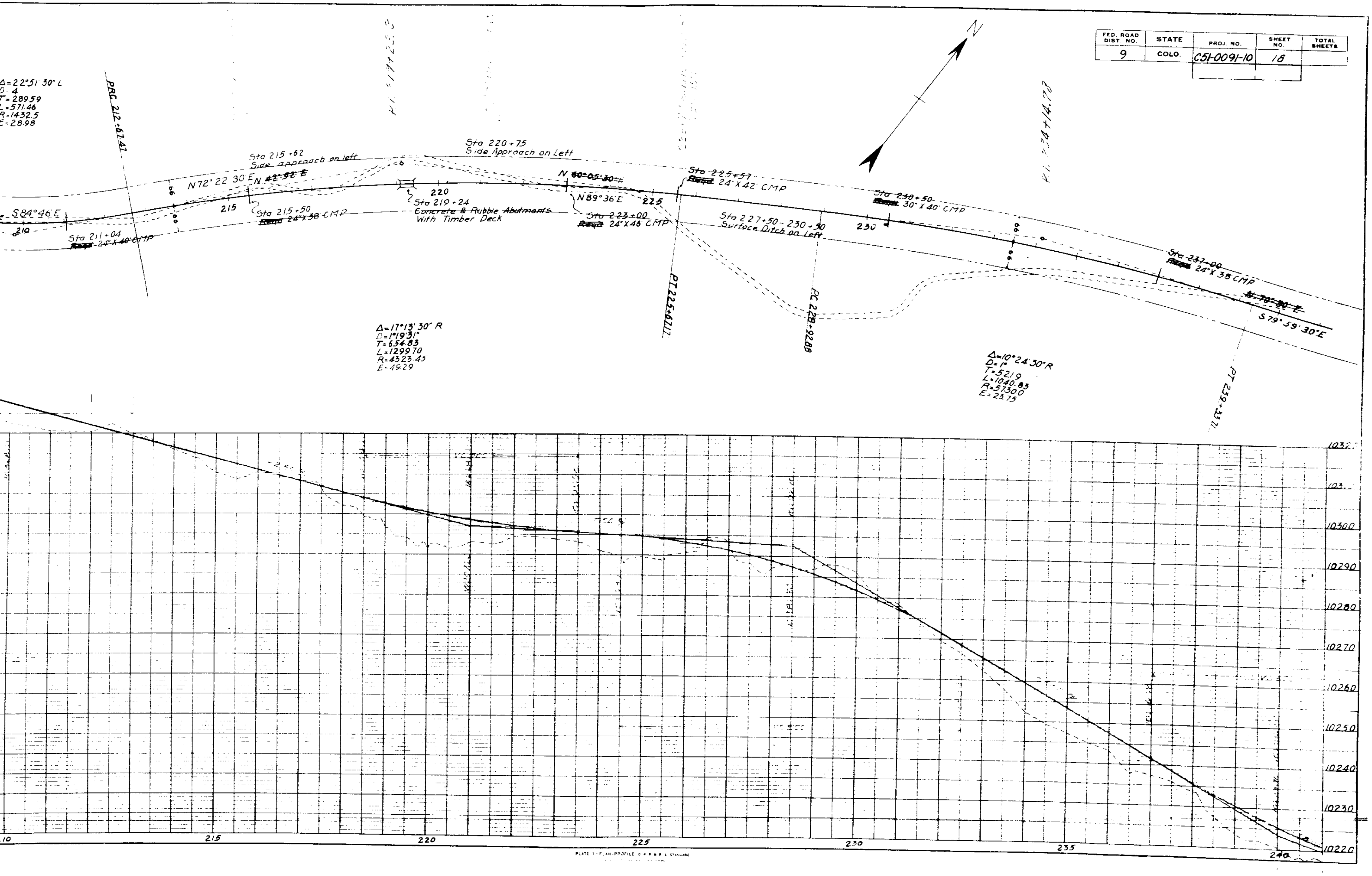


PLATE 1 – PLAN-PROFILE D P W & R E STANDARD

FED. ROAD DIST. NO.	STATE	PROJ. NO.	SHEET NO.	TOTAL SHEETS
9	COLO.	C51-0091-10	17	



FED. ROAD DIST. NO.	STATE	PROJ. NO.	SHEET NO.	TOTAL SHEETS
9	COLO.	C51-0091-10	18	



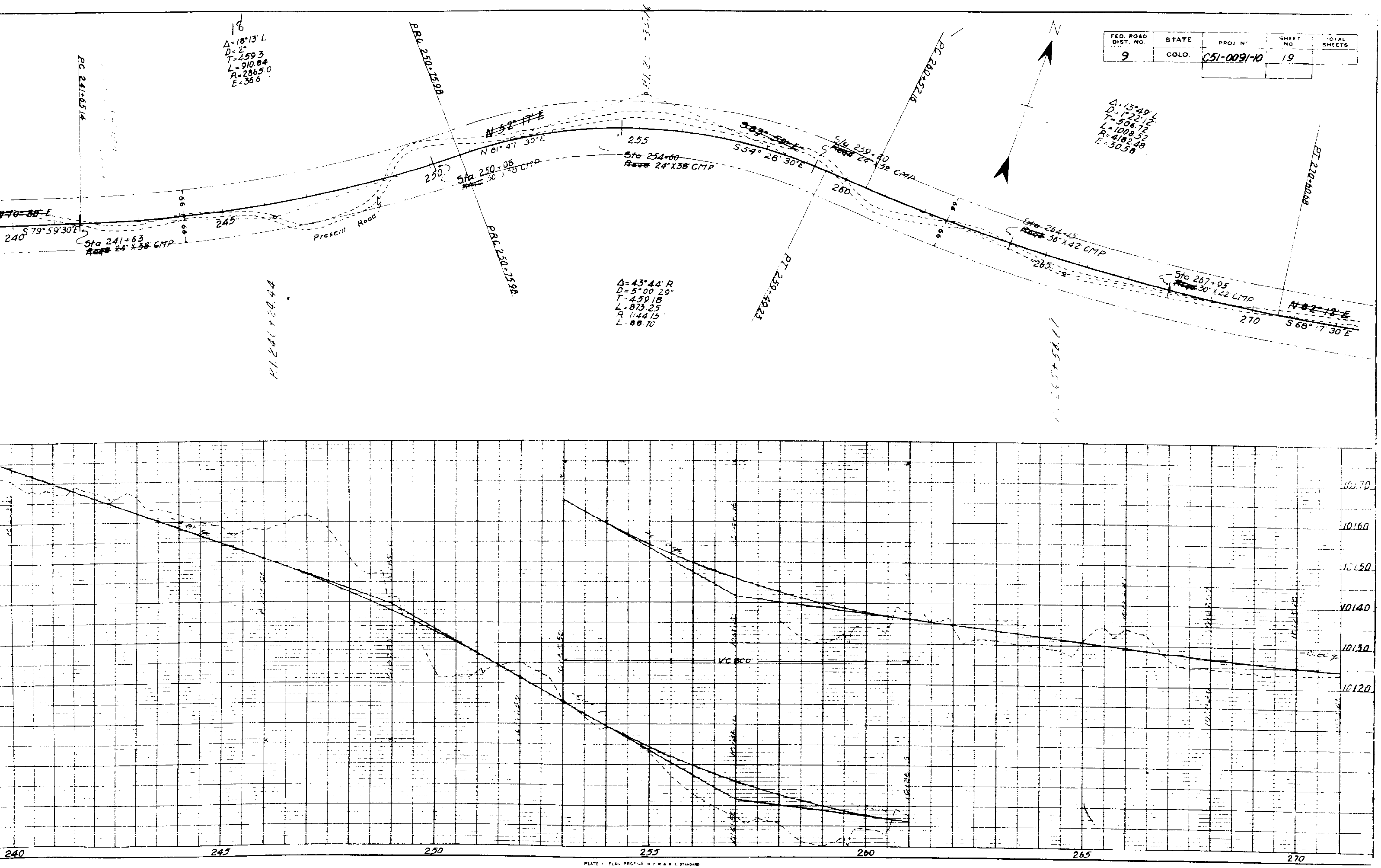
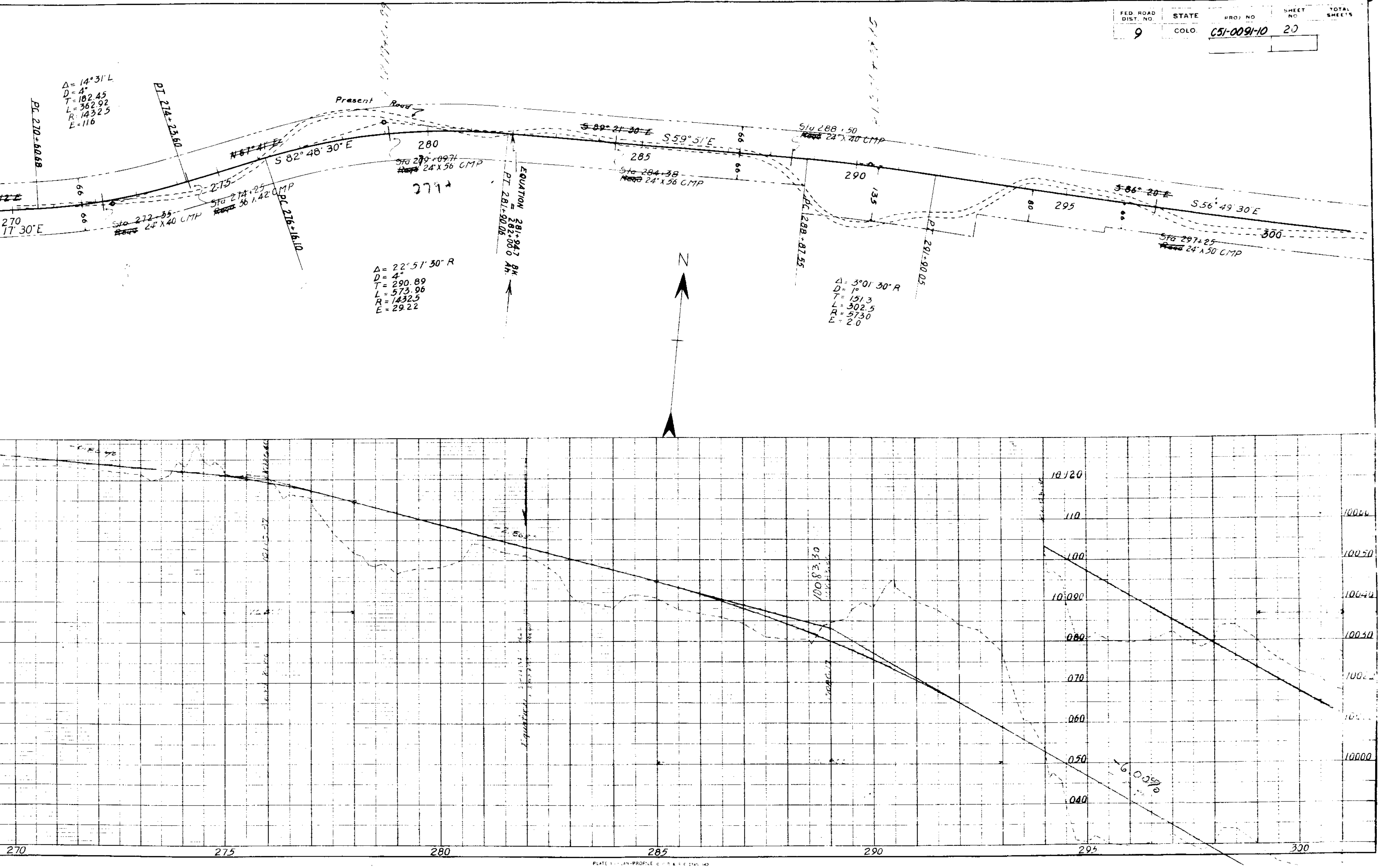


PLATE 1 - PLAN-PROFILE O P R & R E STANDARD

FED. ROAD DIST. NO.	STATE	PROJ. NO.	SHEET NO.	TOTAL SHEETS
9	COLO.	C51-0091-10	20	



FED. ROAD DIST. NO.	STATE	PROJ. NO.	SHEET NO.	TOTAL SHEETS
9	COLO.	C51-0091-10	21	

N

Δ = 18°41' L
D = 3°
T = 314.2'
L = 622.78'
R = 1910'
E = 25.67'

PC 315+78.55

PT 321+97.33

P.I. 318+92.75

S 56° 49' 30" E

S 75° 30' 30" E

N 74° 59' E

Sta 307+ Remove 30" x 80' CMP

Sta 309+12 Remove 24" x 66' CMP

Sta 305+79 Place 24" x 80' CMP

Present Road

Sta 314+83 Remove 24" x 50' CMP

Sta 317+47 Remove 24" x 40' CMP

Sta 320+00 Remove 24" x 46' CMP

Sta 322+3 Remove 30" x 50' CMP

Sta 327+50 Remove 24" x 50' CMP

300 305 310 315 320 325 330

VC 600

VC 600

9960 9950 9940 9930 9920 9910 9900 9890 9880 9870

PLATE 1 - PLAN-PROFILE U. P. R. & R. E. STANDARD

FED. ROAD DIST NO	STATE	PROJ NO	SHEET NO	TOTAL SHEETS
9	COLO	CSI-0091-10	22	

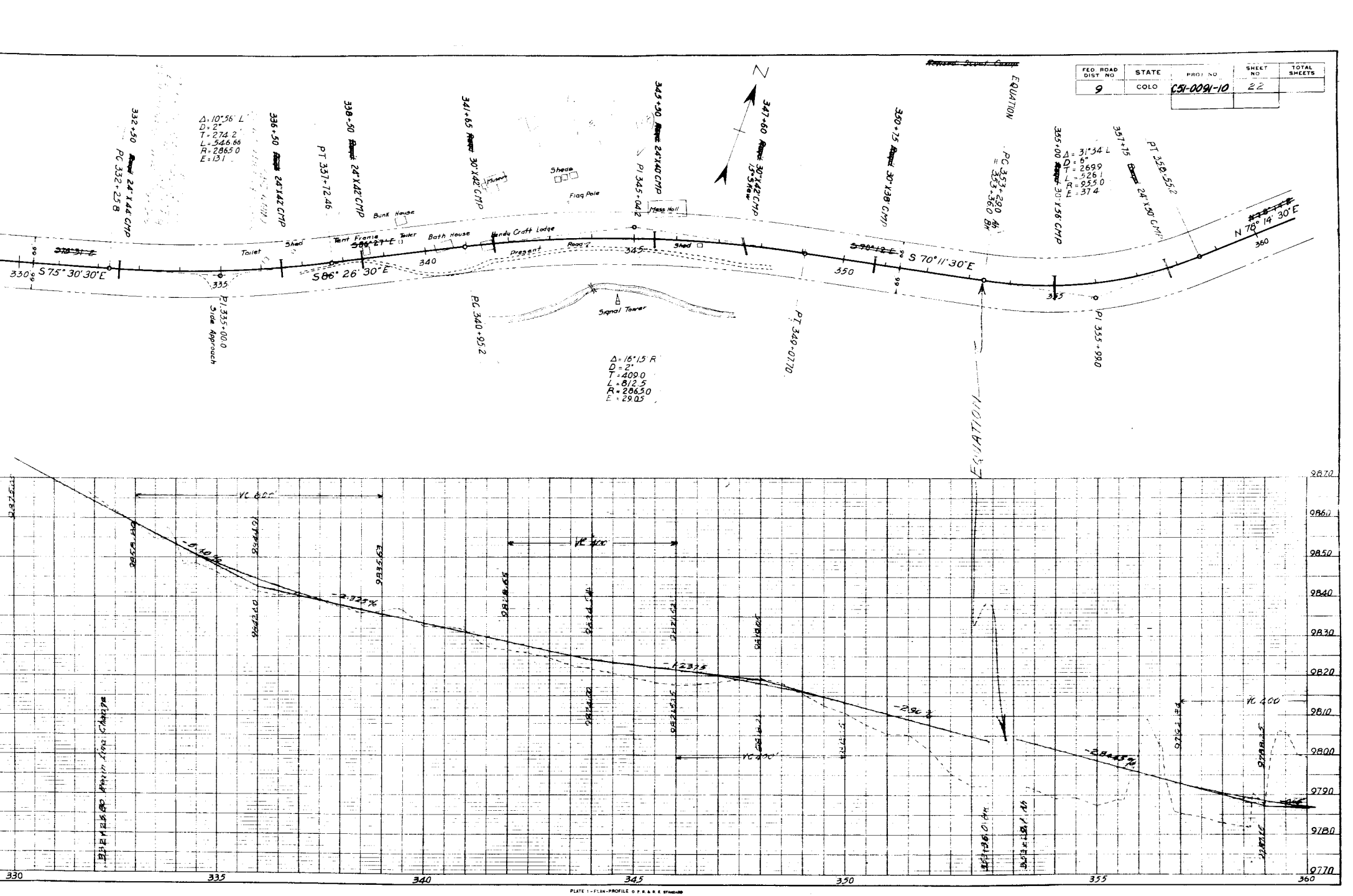
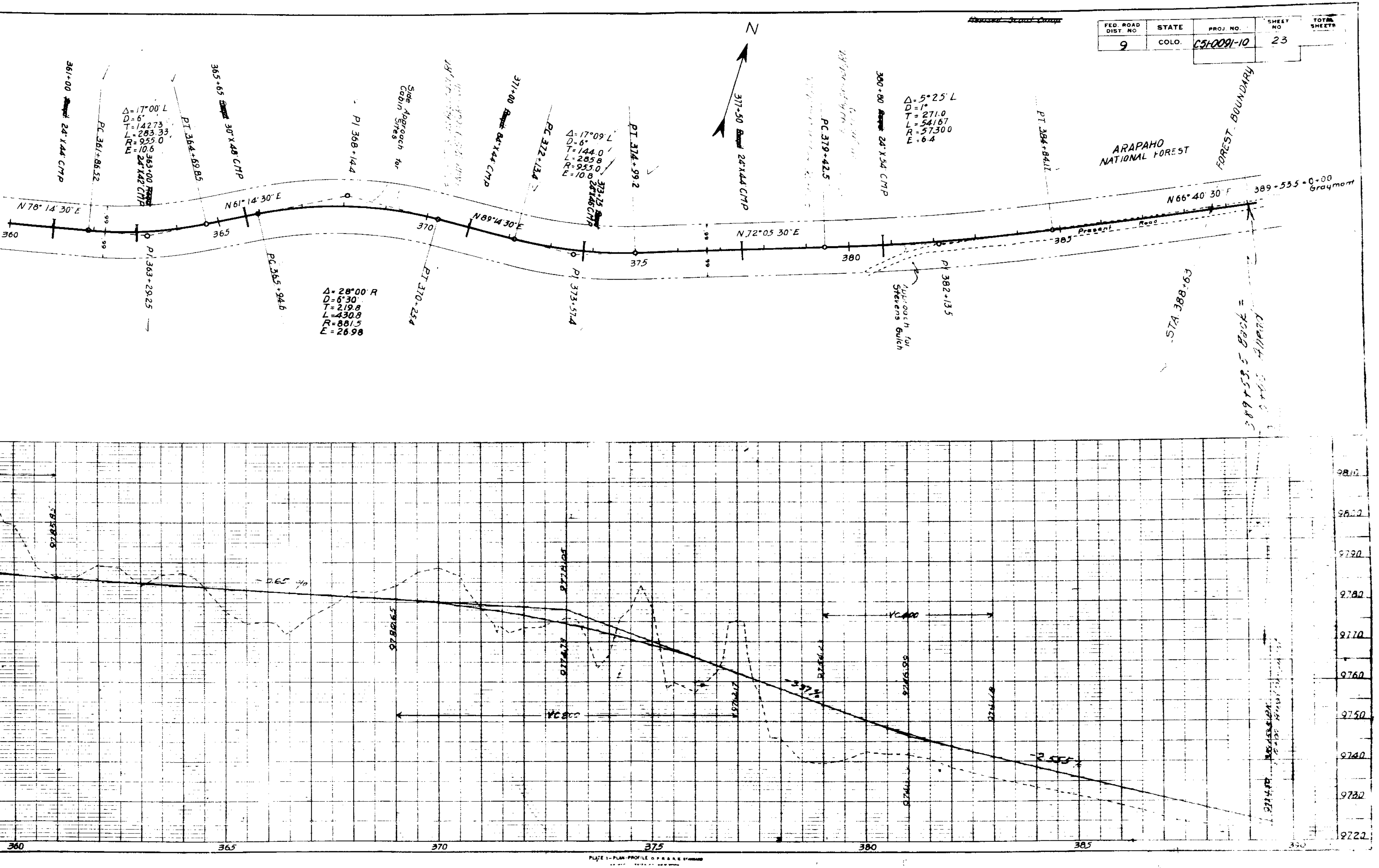


PLATE 1 - PLAN-PROFILE O.P.R.R.R.E. STANDARD



FED. ROAD DIST. NO. 9
STATE COLO.
PROJ. NO. C5I-0091-10
SHEET NO. 23
TOTAL SHEETS
N
361+00 24"X44" CMP
PC 361+86.52
Δ=17°00' L
D=6°
T=142.73
L=283.33
R=955.0
E=10.6
363+00 24"X42" CMP
PI 363+29.25
PT 364+69.85
365+65 30"X48" CMP
PC 365+94.6
PI 368+14.4
Side Approach for Cabin Sites
Δ=28°00' R
D=6°30'
T=219.8
L=430.8
R=881.5
E=26.98
PT 370+25.4
371+00 24"X44" CMP
PC 372+13.4
Δ=17°09' L
D=6°
T=144.0
L=285.8
R=955.0
E=10.8
373+25 24"X46" CMP
PI 373+57.4
PT 374+99.2
377+50 24"X44" CMP
PC 379+42.5
380+80 24"X54" CMP
Δ=5°25' L
D=1°
T=271.0
L=541.67
R=5730.0
E=6.4
PI 382+13.5
Approach for Stevens Gulch
PT 384+84.1
ARAPAHO NATIONAL FOREST
FOREST BOUNDARY
STA 388+63
389+53.5=0+00 Graymont
389+53.5 Back =
N 78° 14' 30" E
N 61° 14' 30" E
N 89° 14' 30" E
N 72° 05' 30" E
N 66° 40' 30" E
Present Road
360
365
370
375
380
385
-0.65%
VC 800
VC 400
-3.37%
-2.535%
9810
9800
9790
9780
9770
9760
9750
9740
9730
9720
360
365
370
375
380
385
390
PLATE 1 - PLAN-PROFILE

FED. ROAD DIST. NO.	STATE	PROJ. NO.	SHEET NO.	TOTAL SHEETS
9	COLO.	C51 0091-10	24	

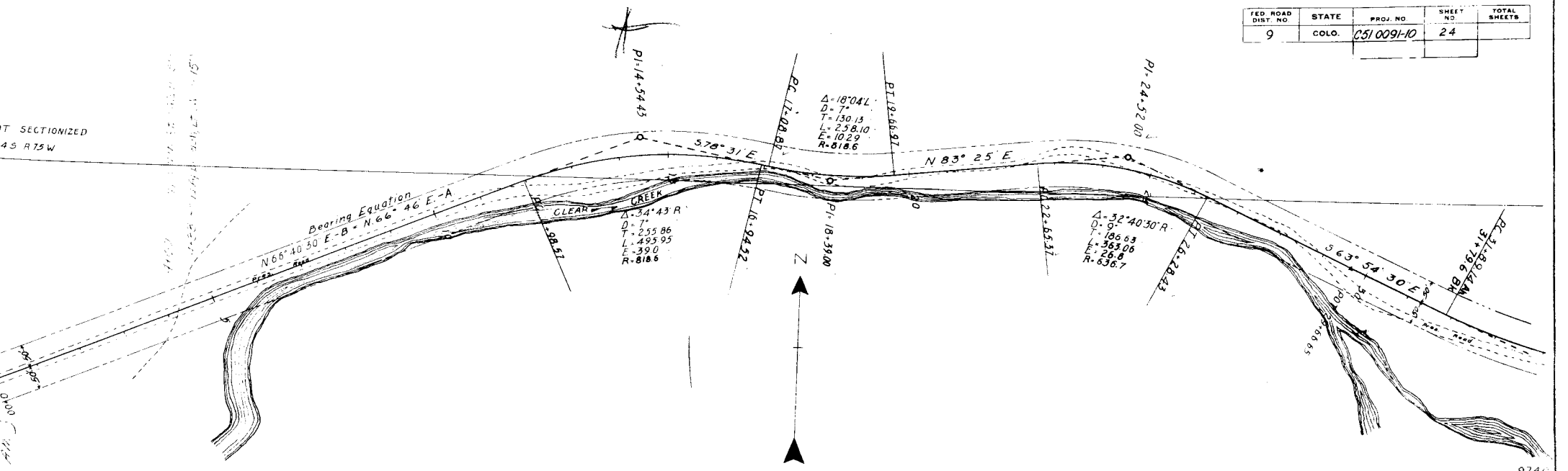


PLATE 1—PLAN-PROFILE O. P. R. & B. E. STANDARD
KEUFFEL & ESSER CO., NEW YORK

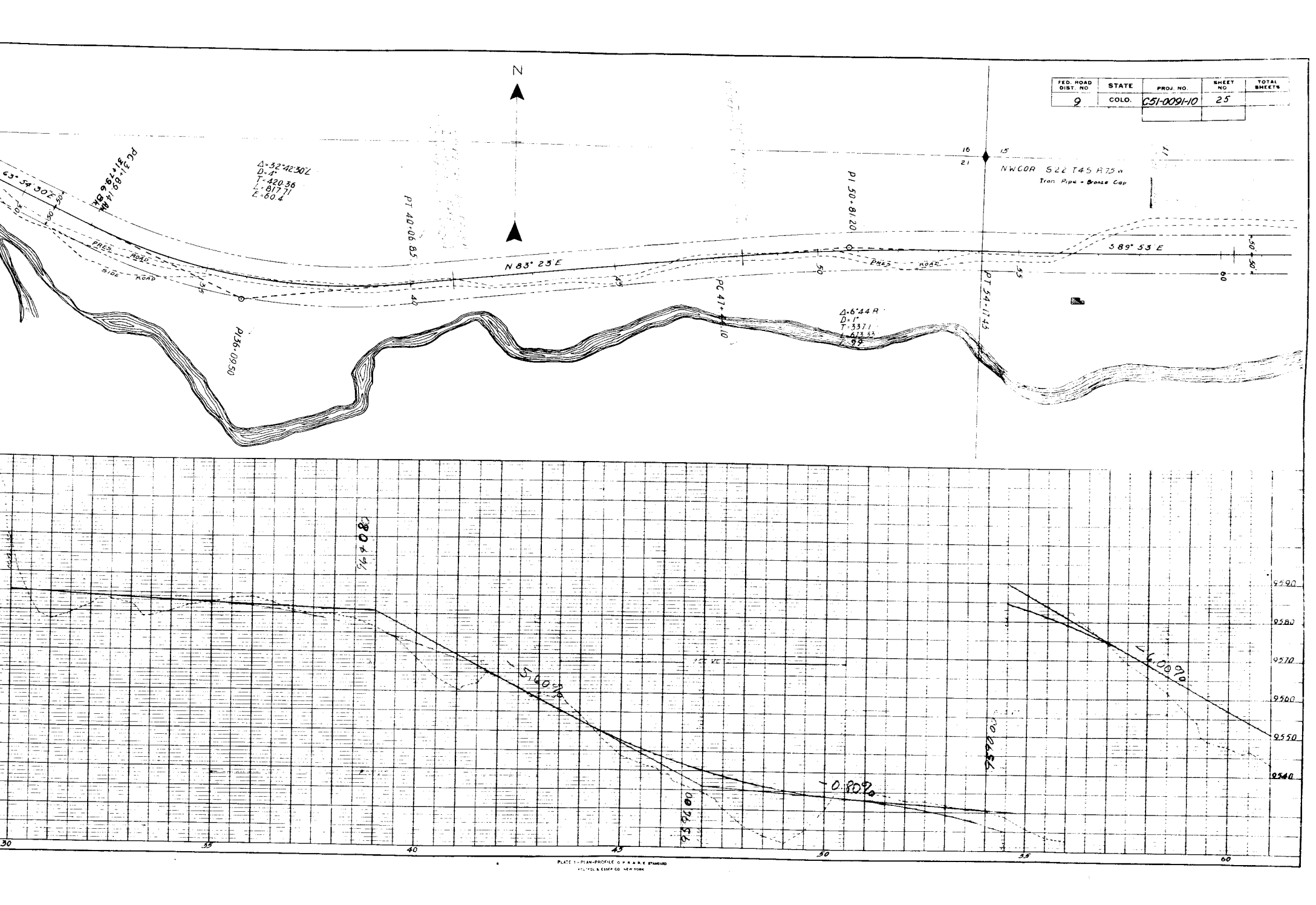
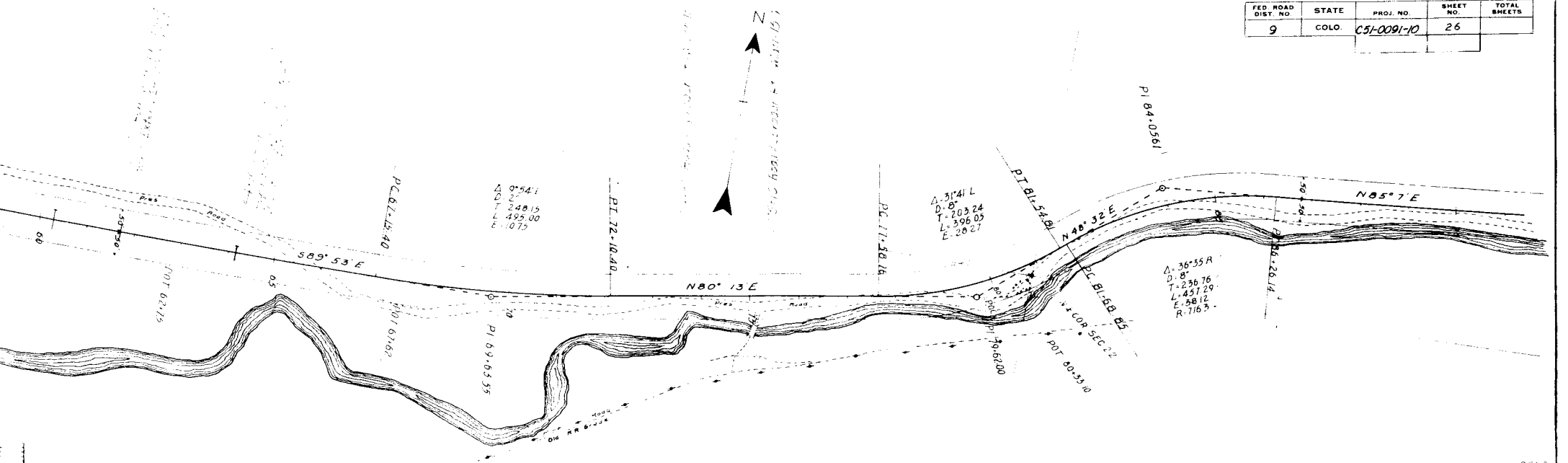
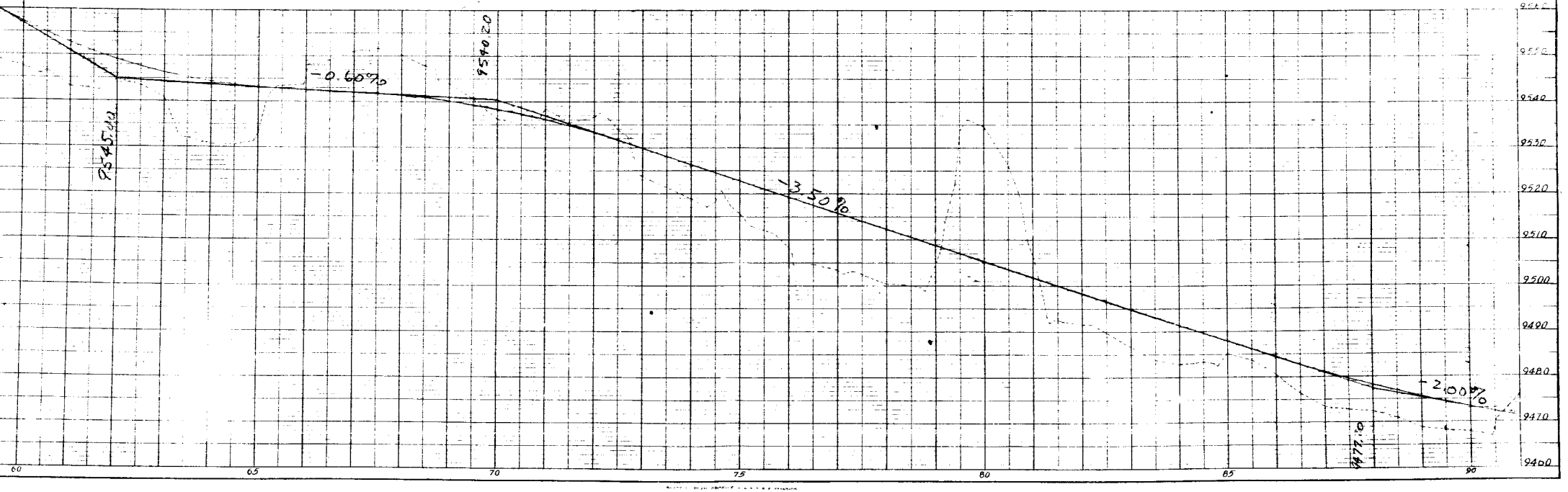
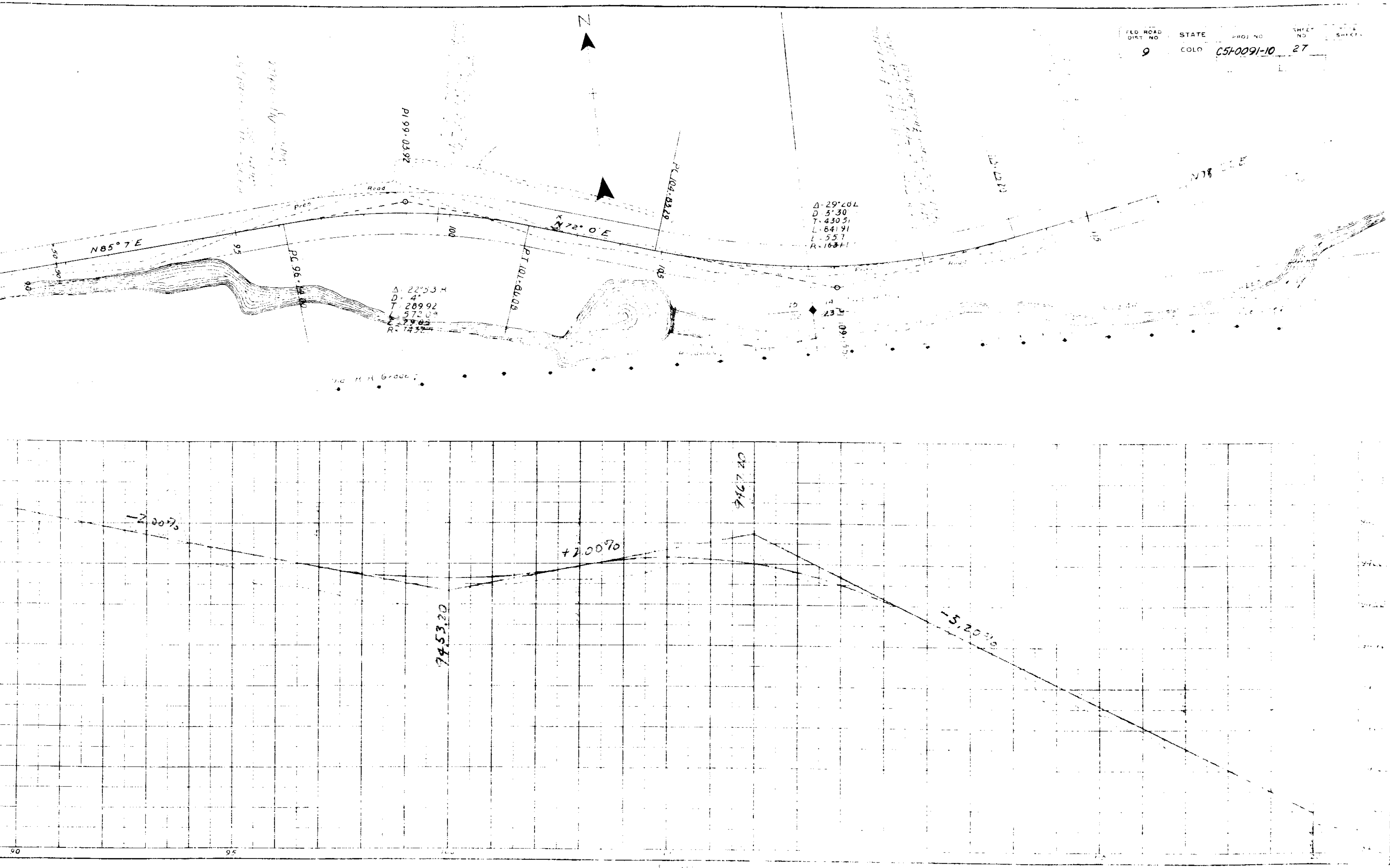


PLATE 1 - PLAN-PROFILE O P R A R E STANDARD
HOLTZEL & ESSER CO. NEW YORK

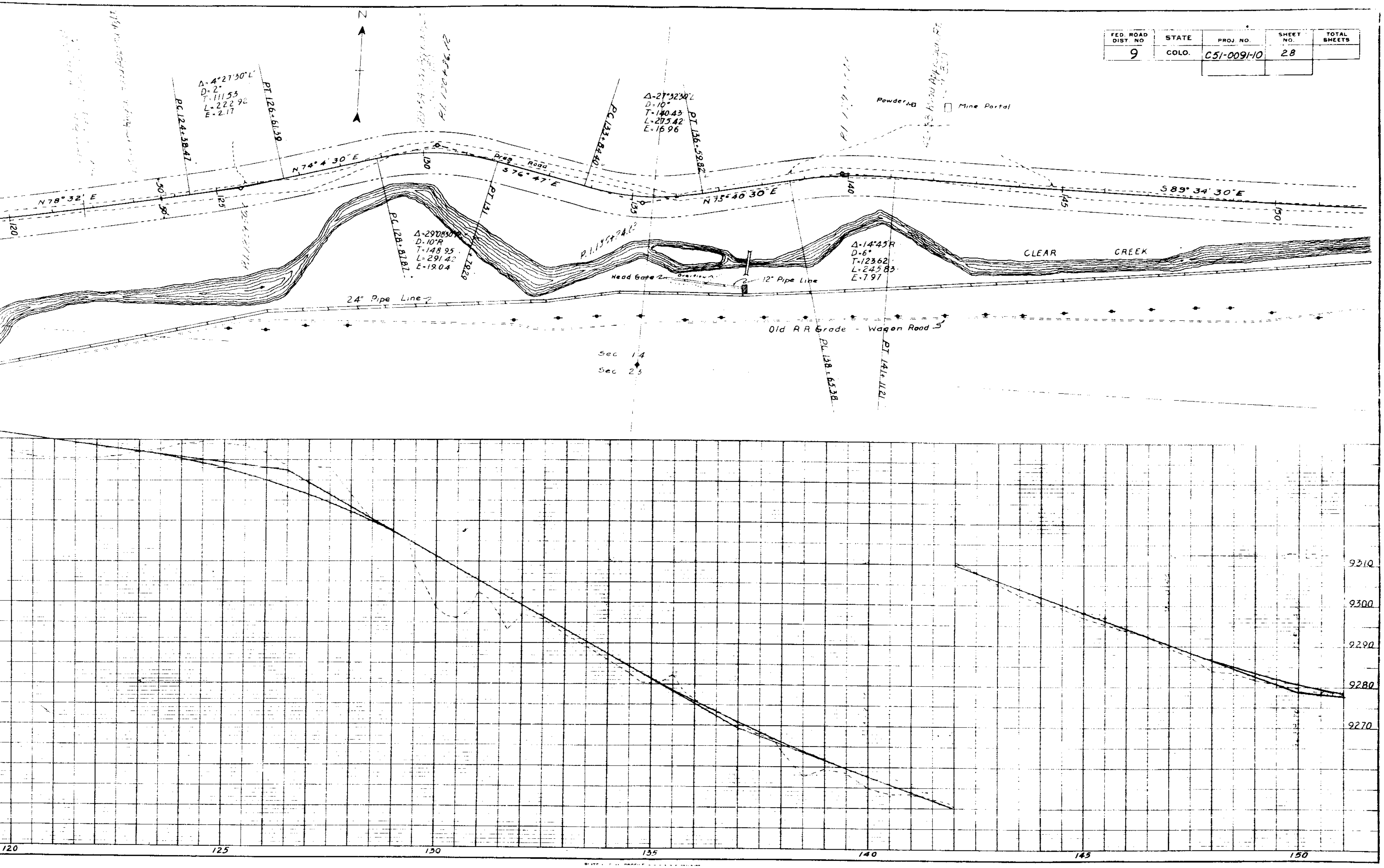
FED. ROAD DIST. NO.	STATE	PROJ. NO.	SHEET NO.	TOTAL SHEETS
9	COLO.	C51-0091-10	26	



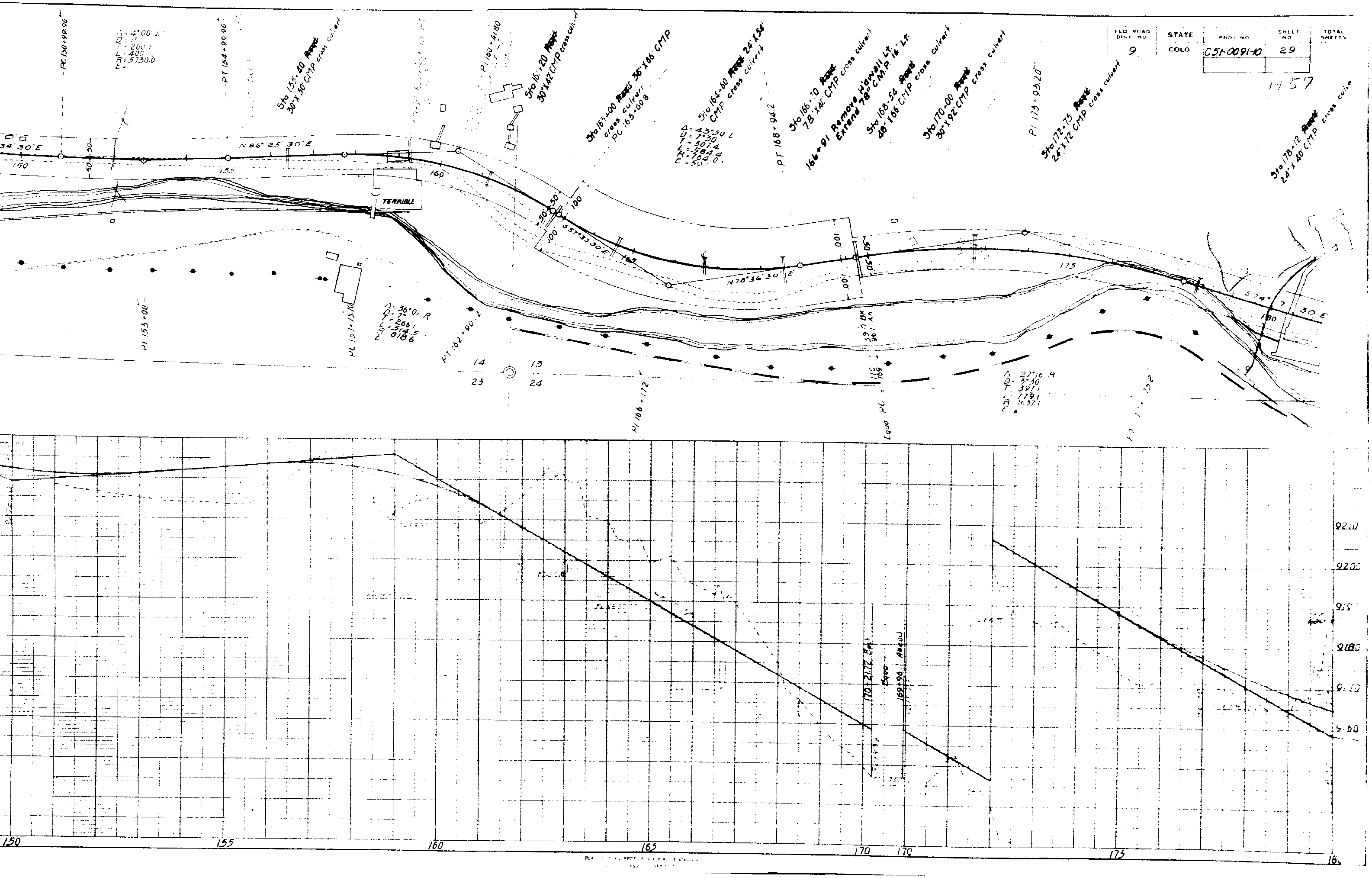


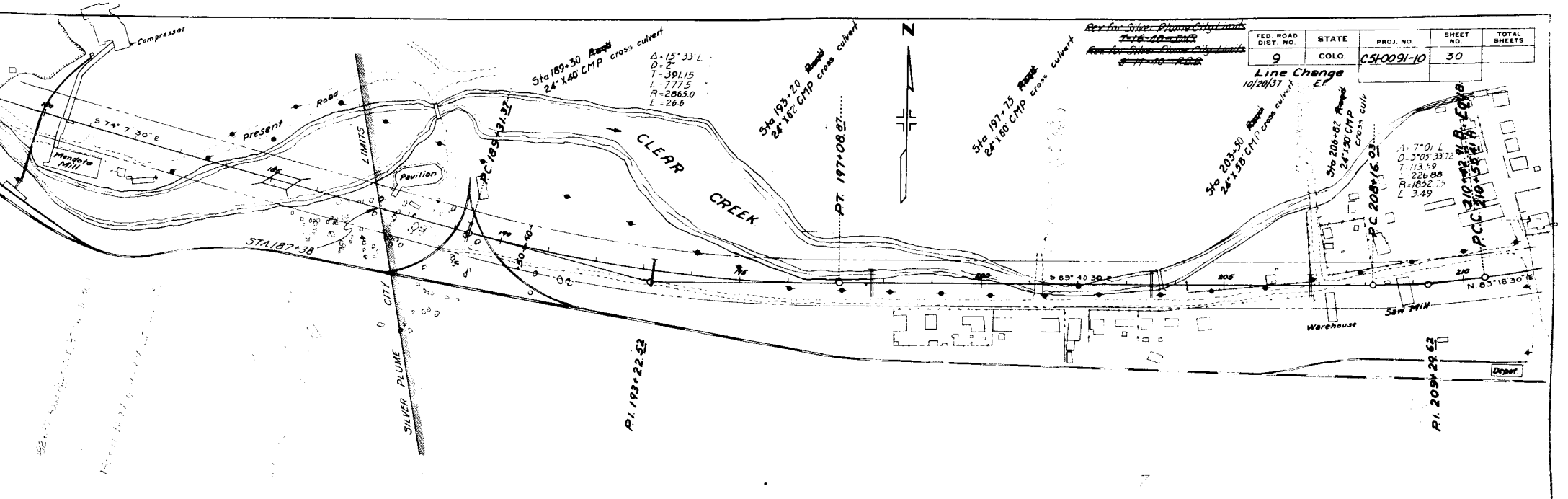
 FED ROAD DIST NO
9
STATE
COLO
PROJ NO
C51-0091-10
SHEET NO
27
N
PI 99+03.92
PC 104+83.29
Road
N85°7'E
N72° 0'E
PC 96+11.00
PT 101+84.08
Δ 22°53' R
D 4°
T 289.92
Δ 29°26' L
D 5°30'
T 430.51
L 841.91
-2.00%
+2.00%
-5.20%
7453.20
7467.40
90
95

FED. ROAD DIST. NO	STATE	PROJ. NO.	SHEET NO.	TOTAL SHEETS
9	COLO.	C51-0091-10	28	



FED. ROAD DIST. NO.	STATE	PROJ. NO.	SHEET NO.	TOTAL SHEETS
9	COLO.	C51-0091-10	29	





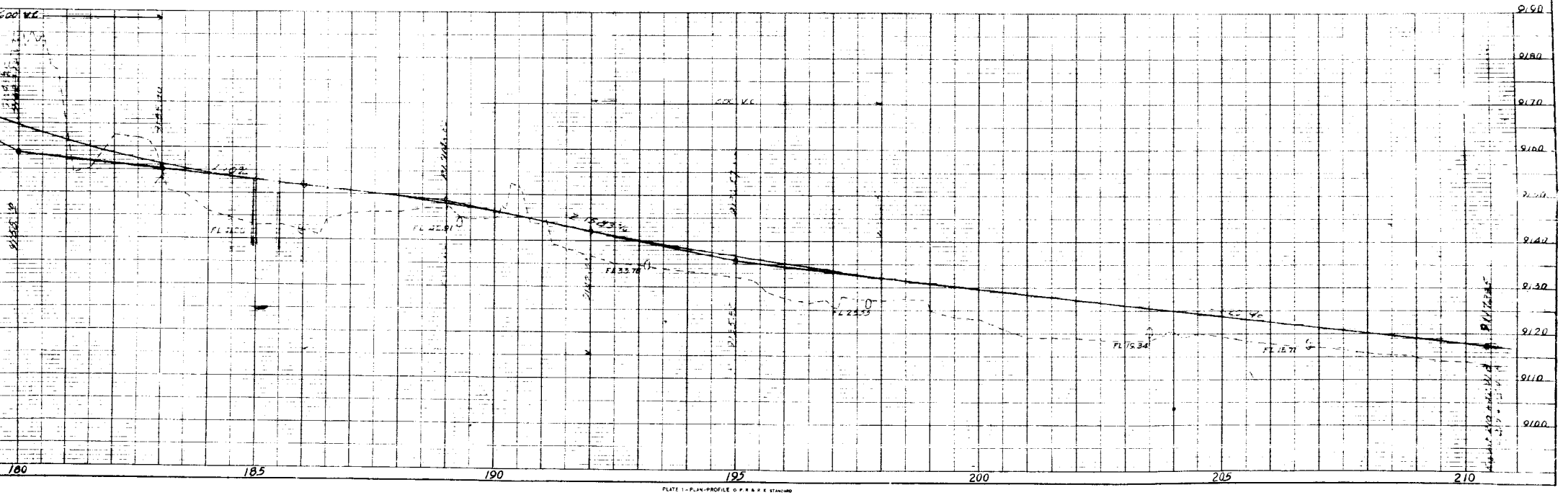


PLATE 1 - PLAN-PROFILE O. P. R. & P. R. STANDARD
BY HYCL. J. ESSER CO., NEW YORK

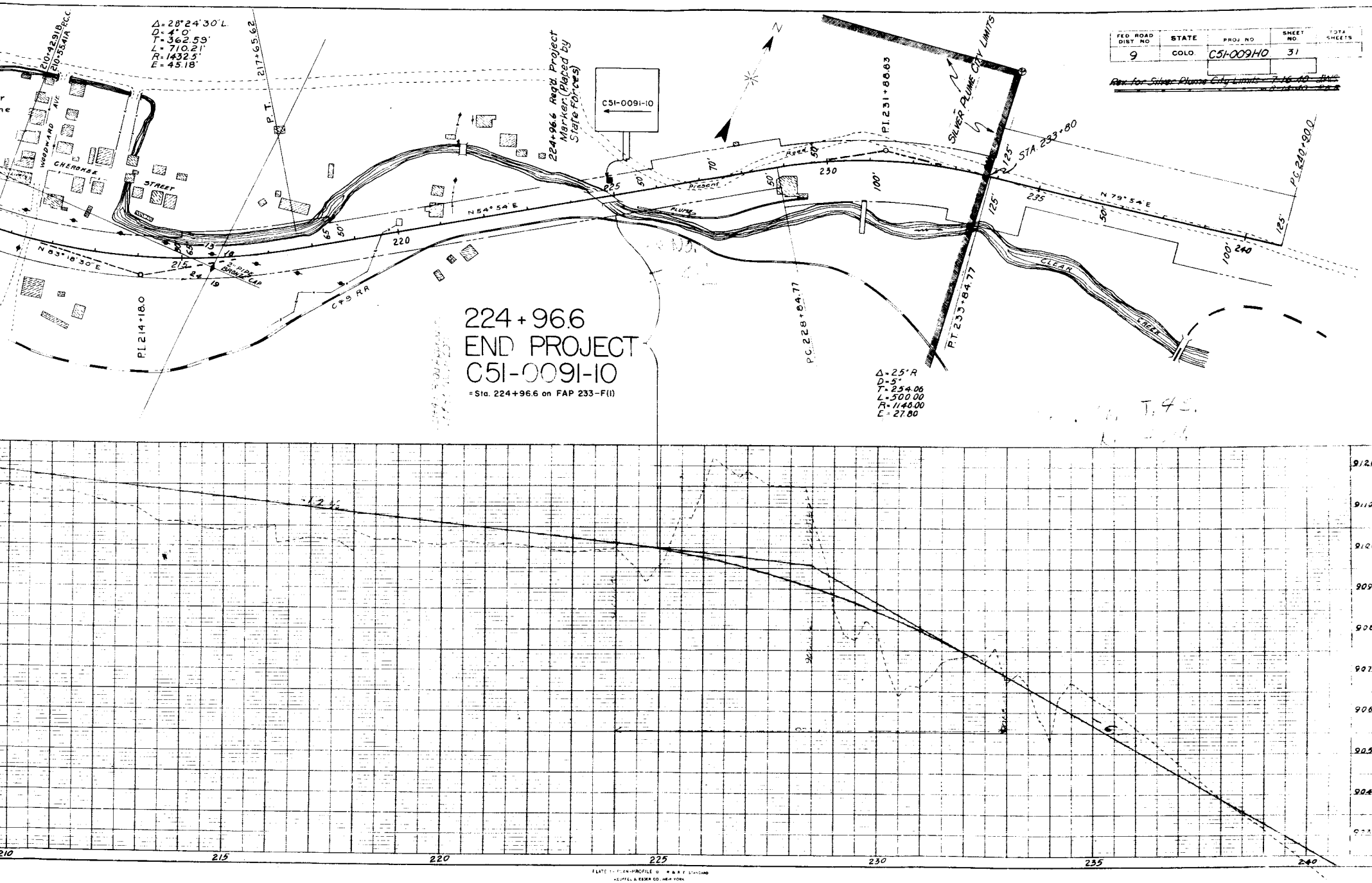
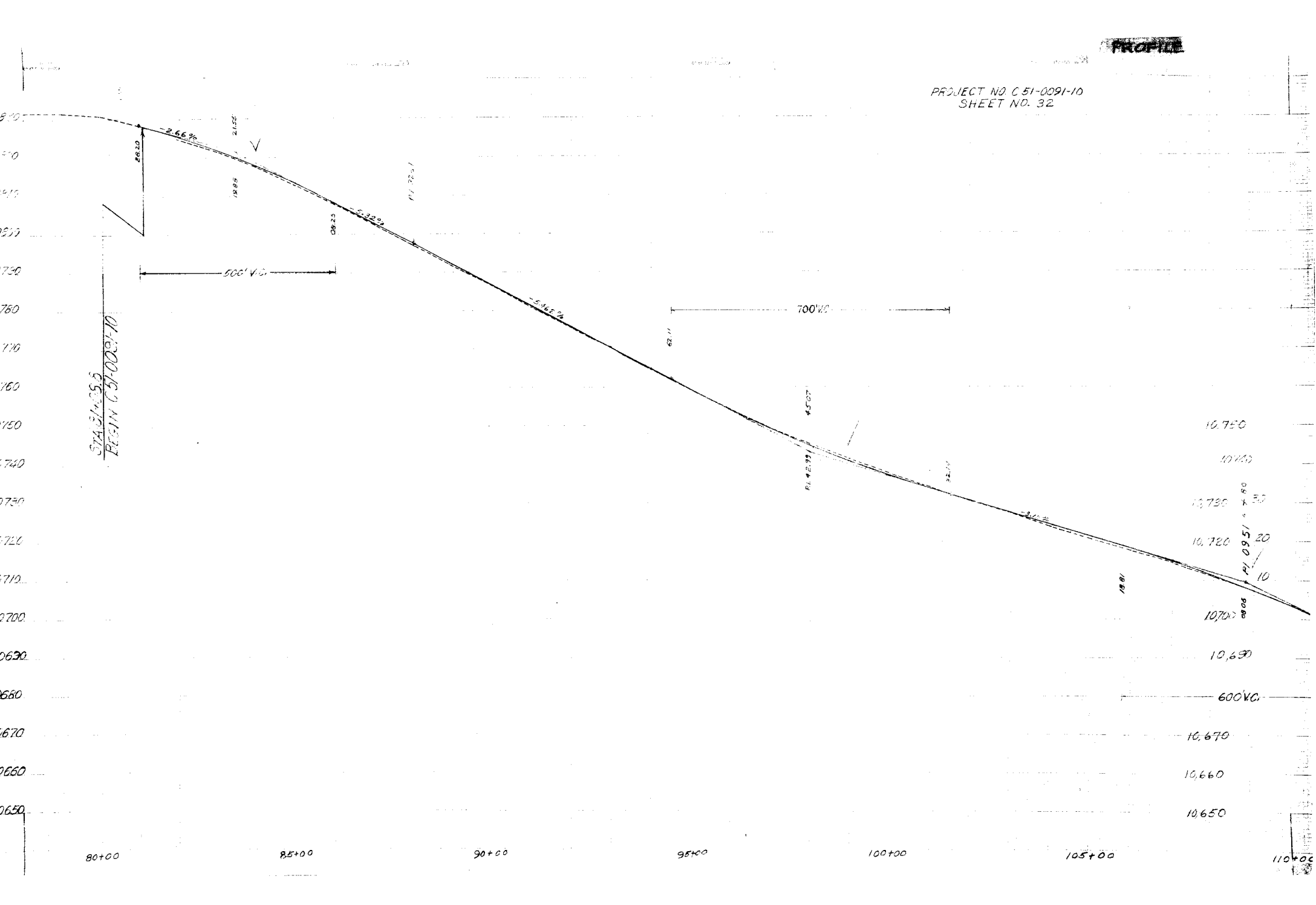
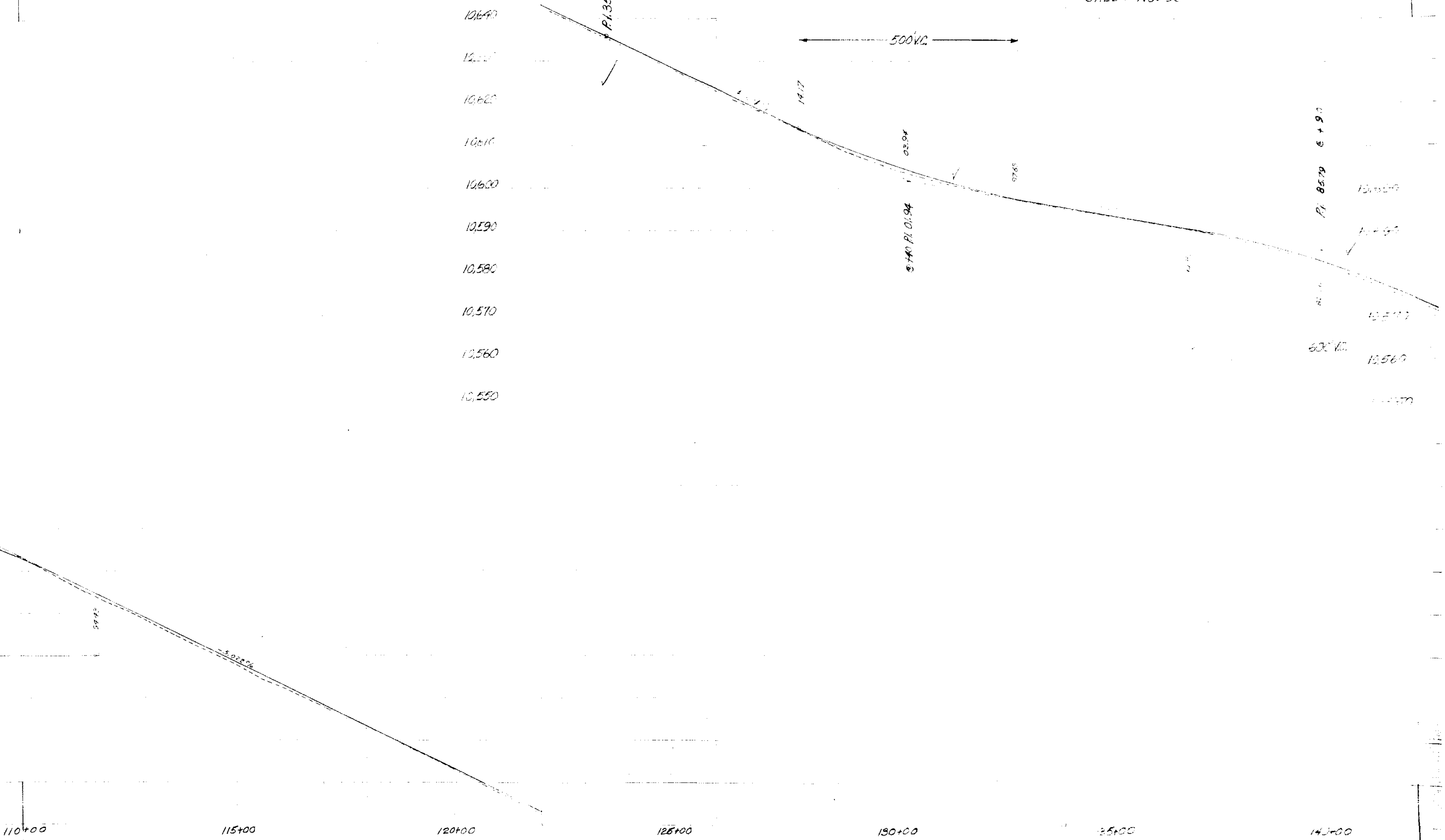


PLATE 1 - PLAN-PROFILE
HEUFFEL & ESSER CO., NEW YORK

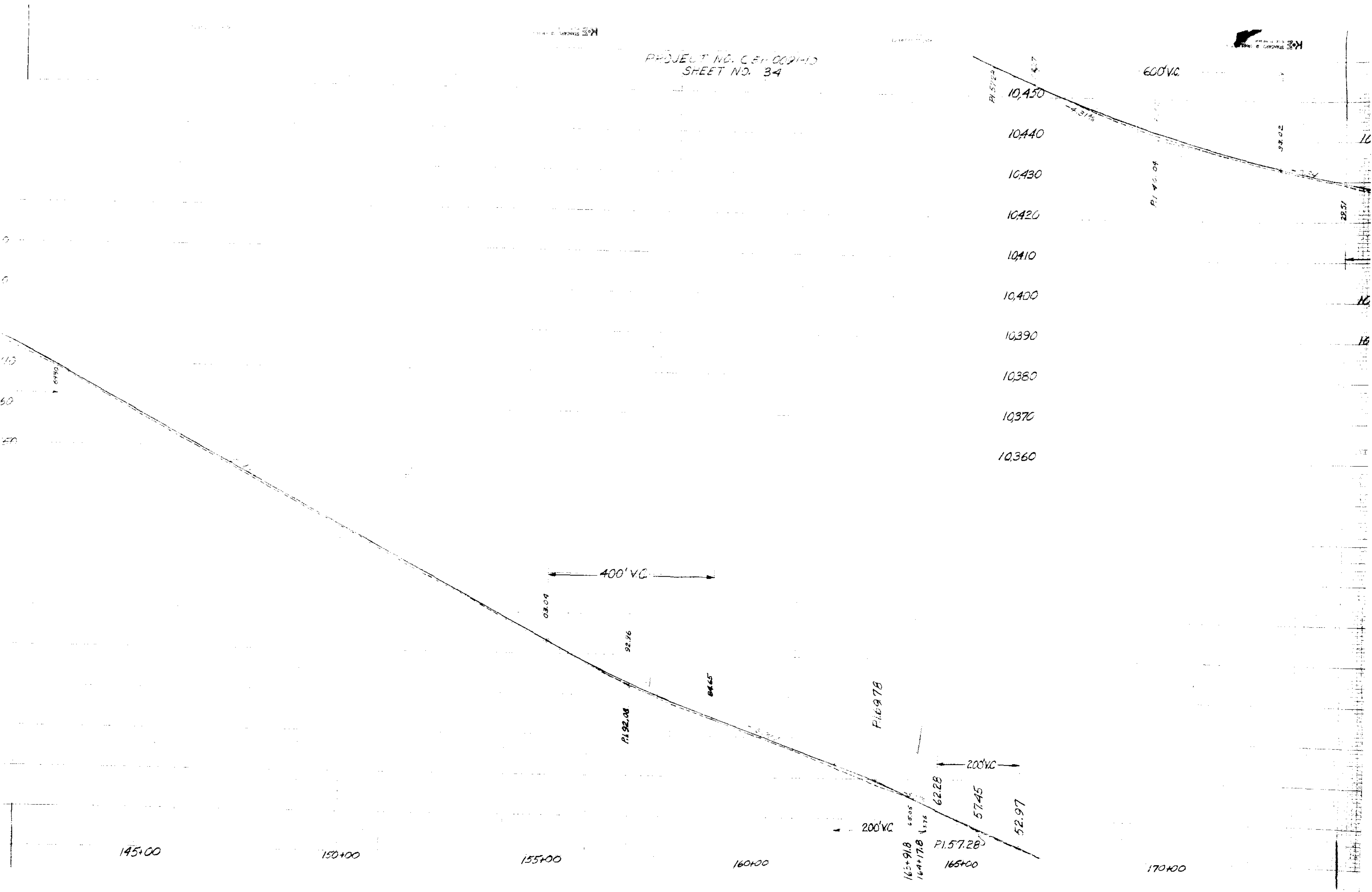
PROFILE

PROJECT NO. C 51-0091-10
SHEET NO. 32

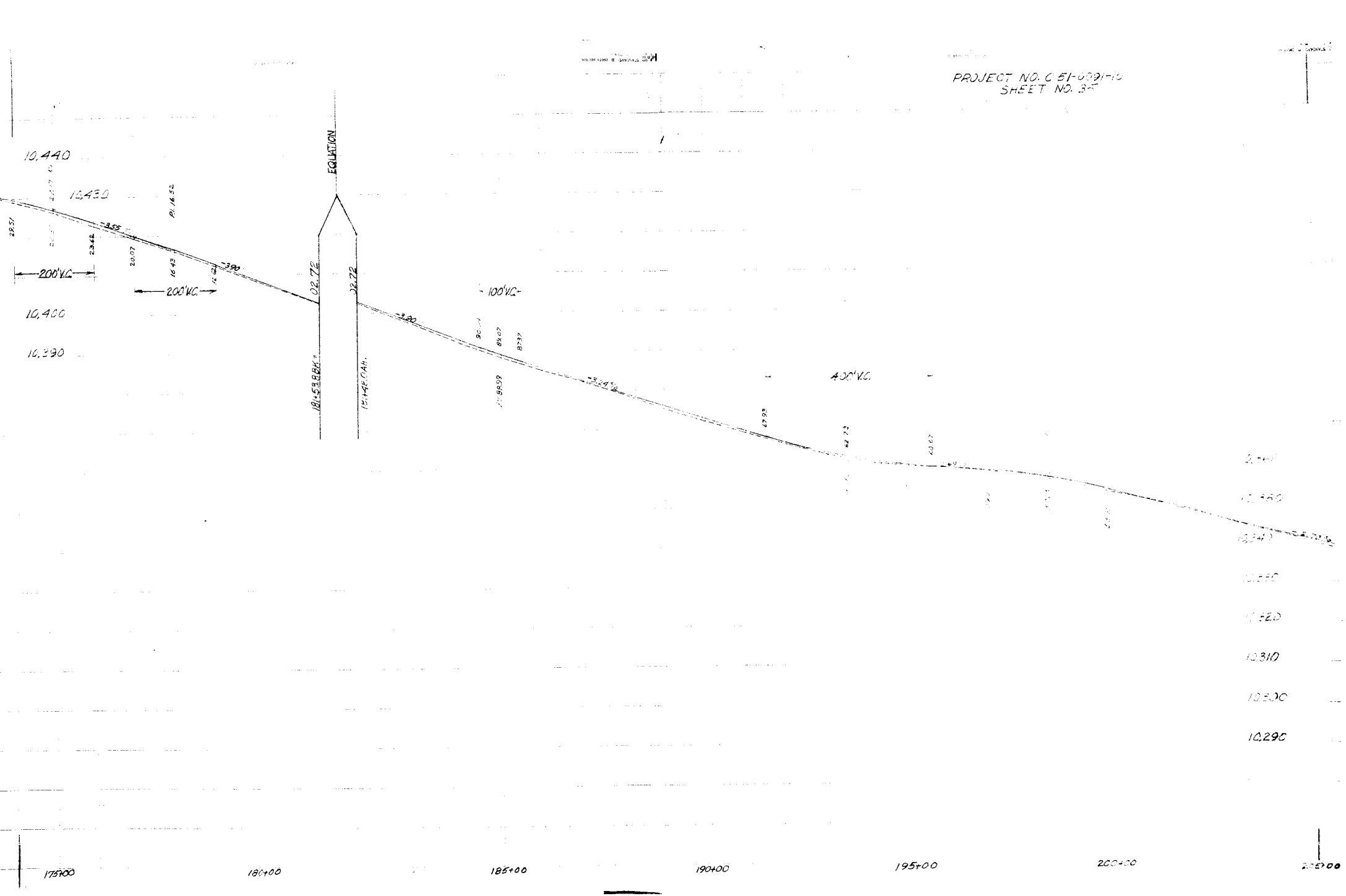



P.I. 35.69
500' V.C.
14.17
P.I. 01.94
P.I. 85.79
600' V.C.
10,640
10,620
10,610
10,600
10,590
10,580
10,570
10,560
10,550
110+00
115+00
120+00
125+00
130+00
135+00
140+00

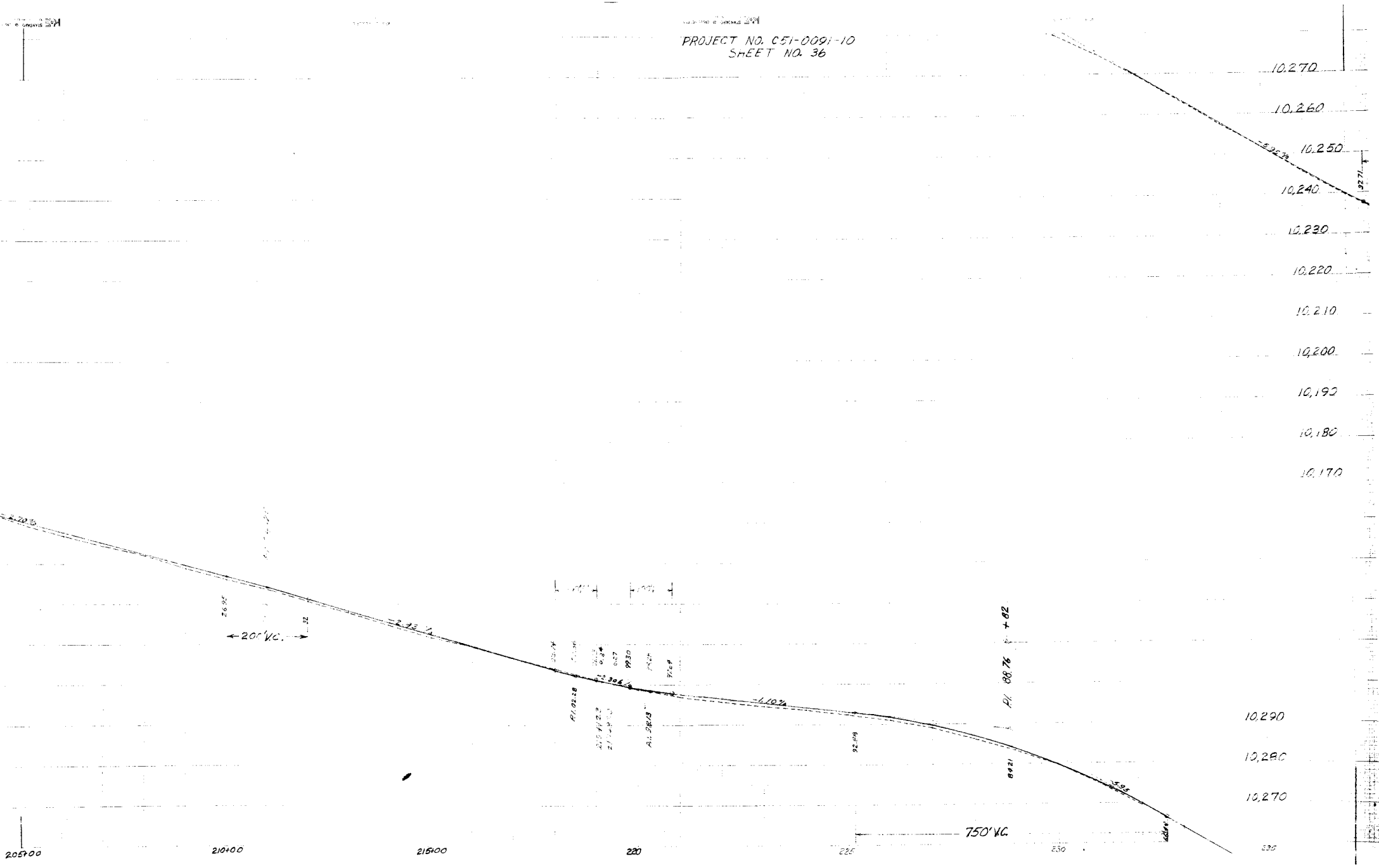
PROJECT NO. C EH-009[illegible]
SHEET NO. 34



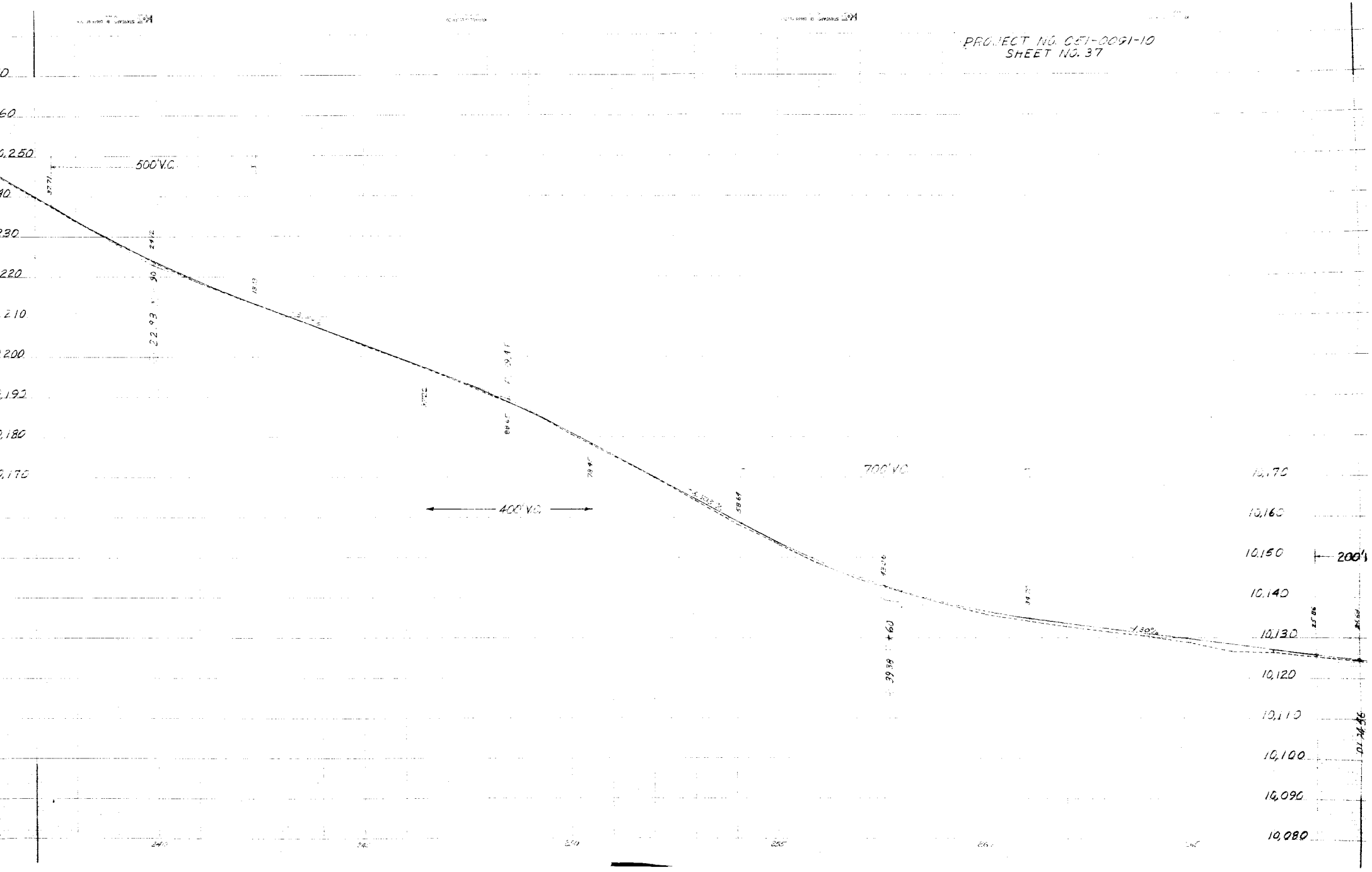
PROJECT NO. C 51-0391-10
SHEET NO. 3F

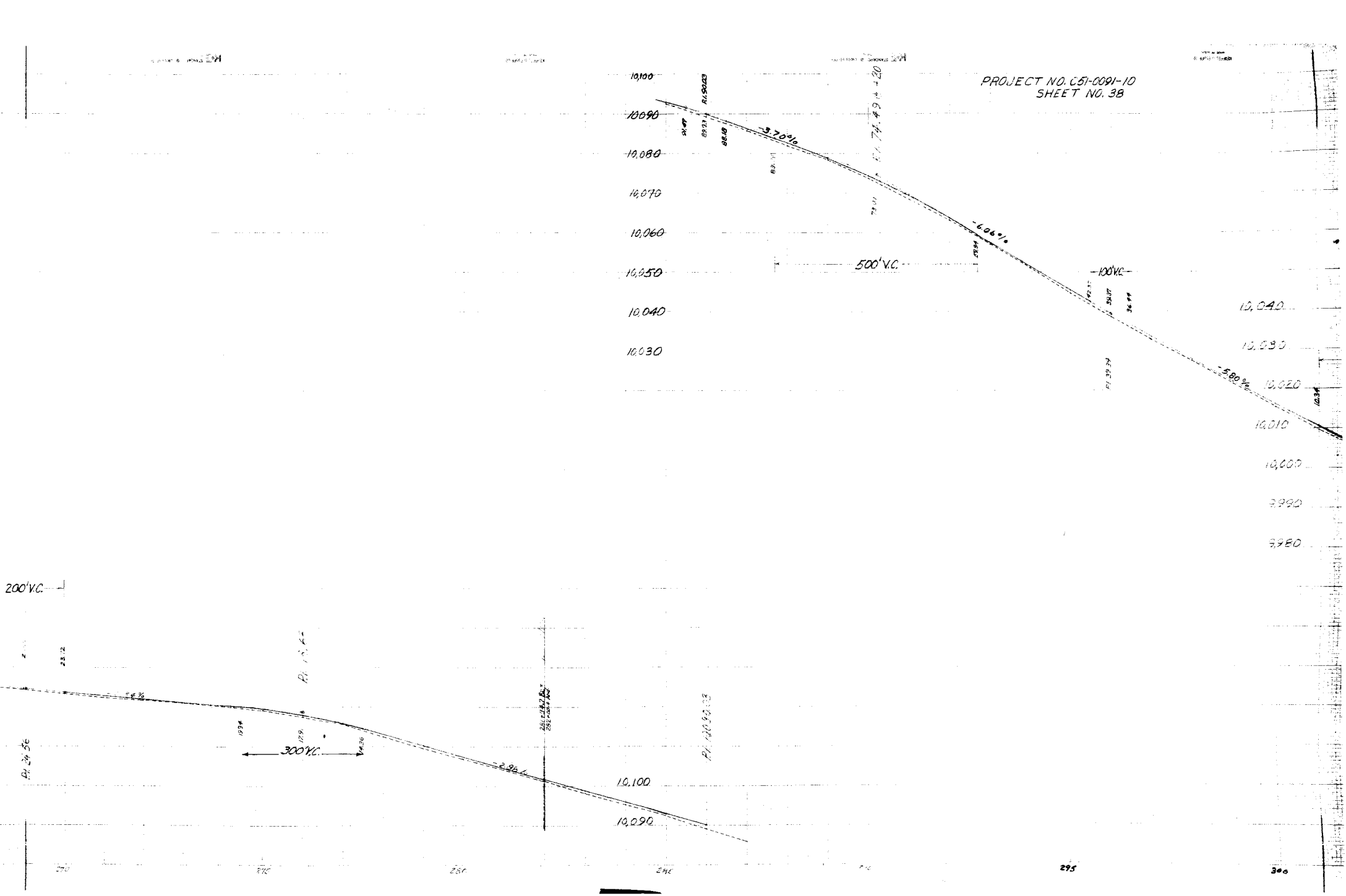


PROJECT NO. C51-009I-10
SHEET NO. 36

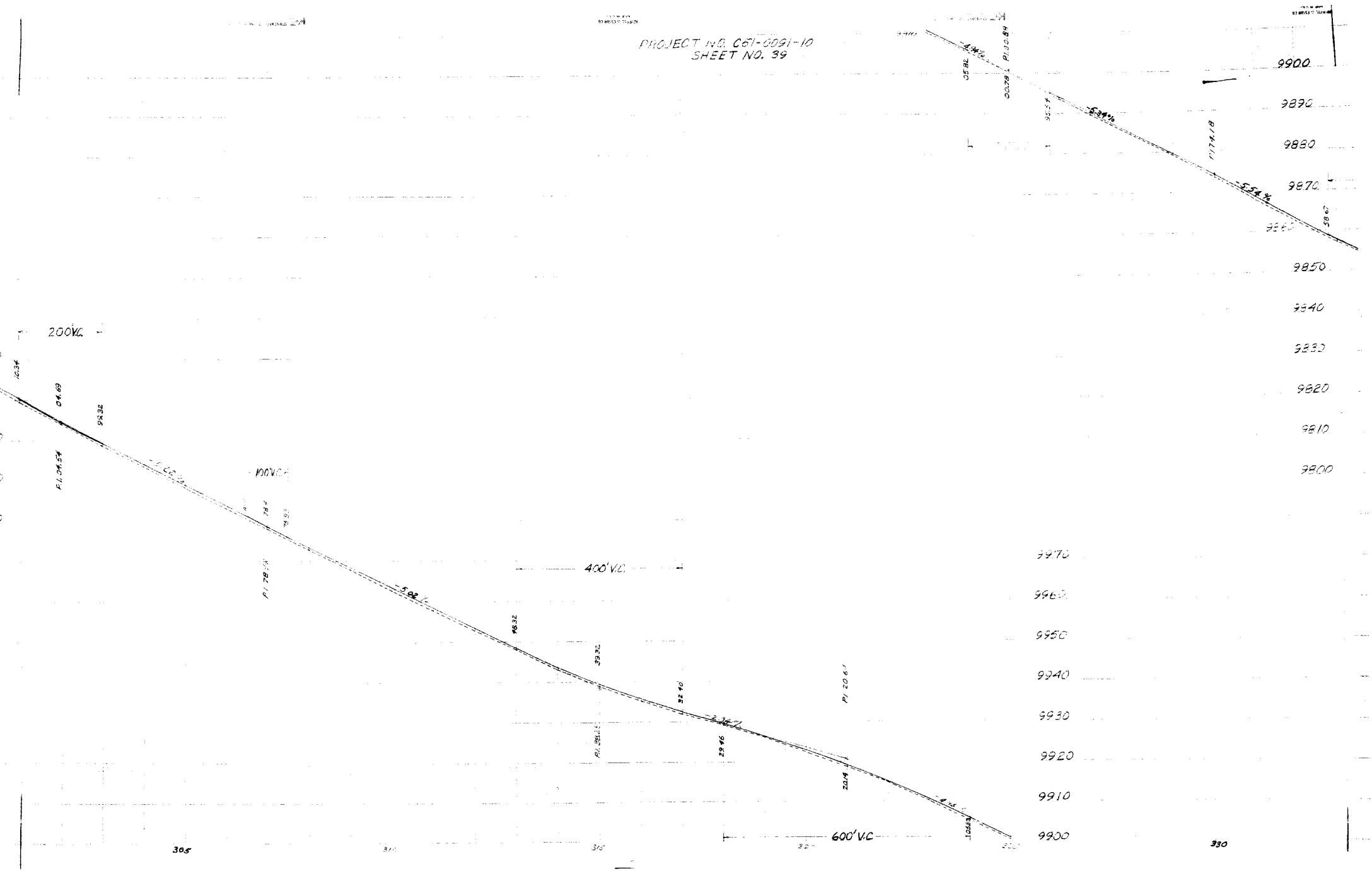


PROJECT NO. 051-0091-10
SHEET NO. 37



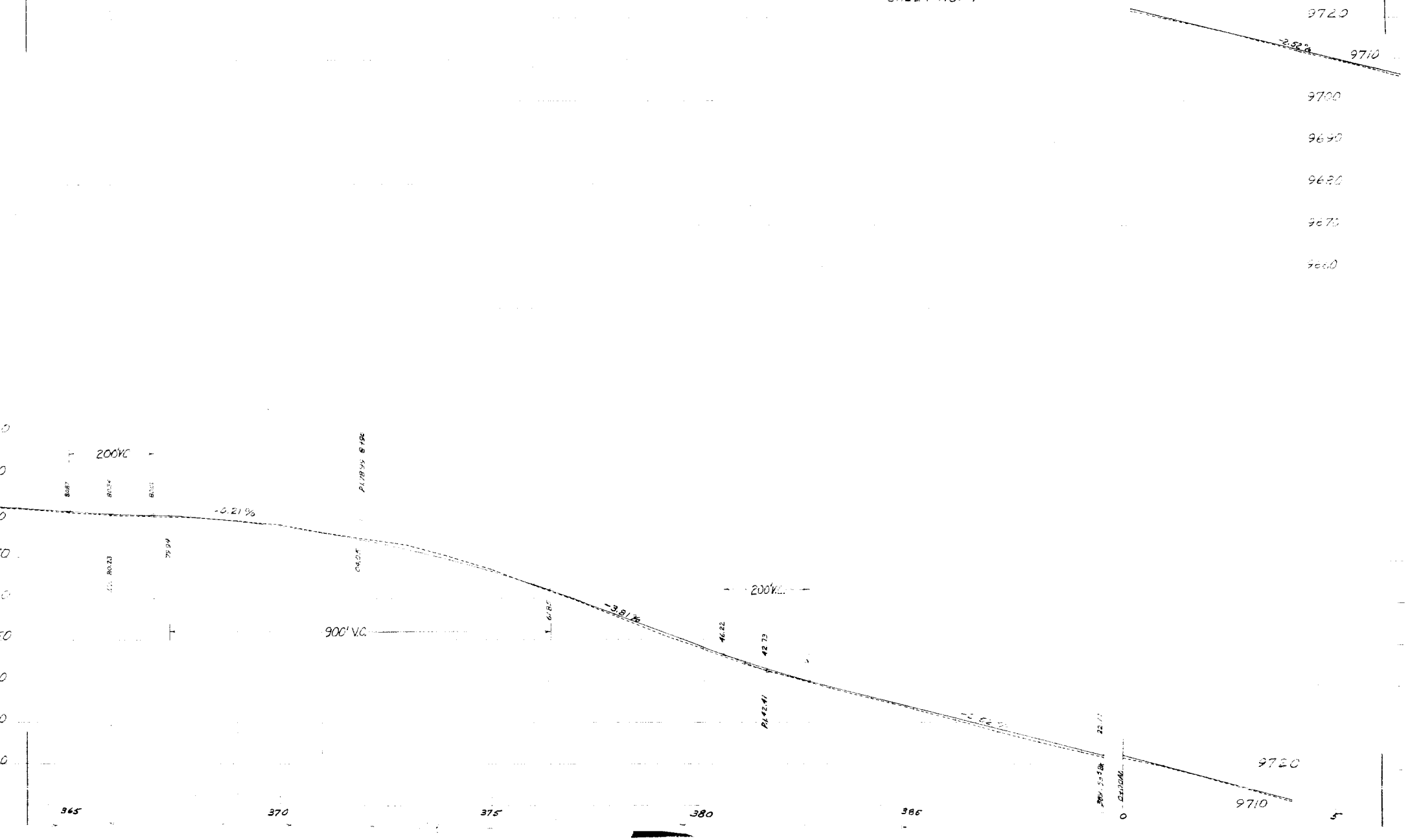

PROJECT NO. C51-0091-10
SHEET NO. 38
10,100
10,090
10,080
10,070
10,060
10,050
10,040
10,030
10,040
10,030
10,020
10,010
10,000
9990
9980
-3.70%
-6.06%
-5.80%
500' V.C.
100' V.C.
200' V.C.
300' V.C.
-2.96%
10,100
10,090
295
300

PROJECT NO. C61-0091-10
SHEET NO. 39

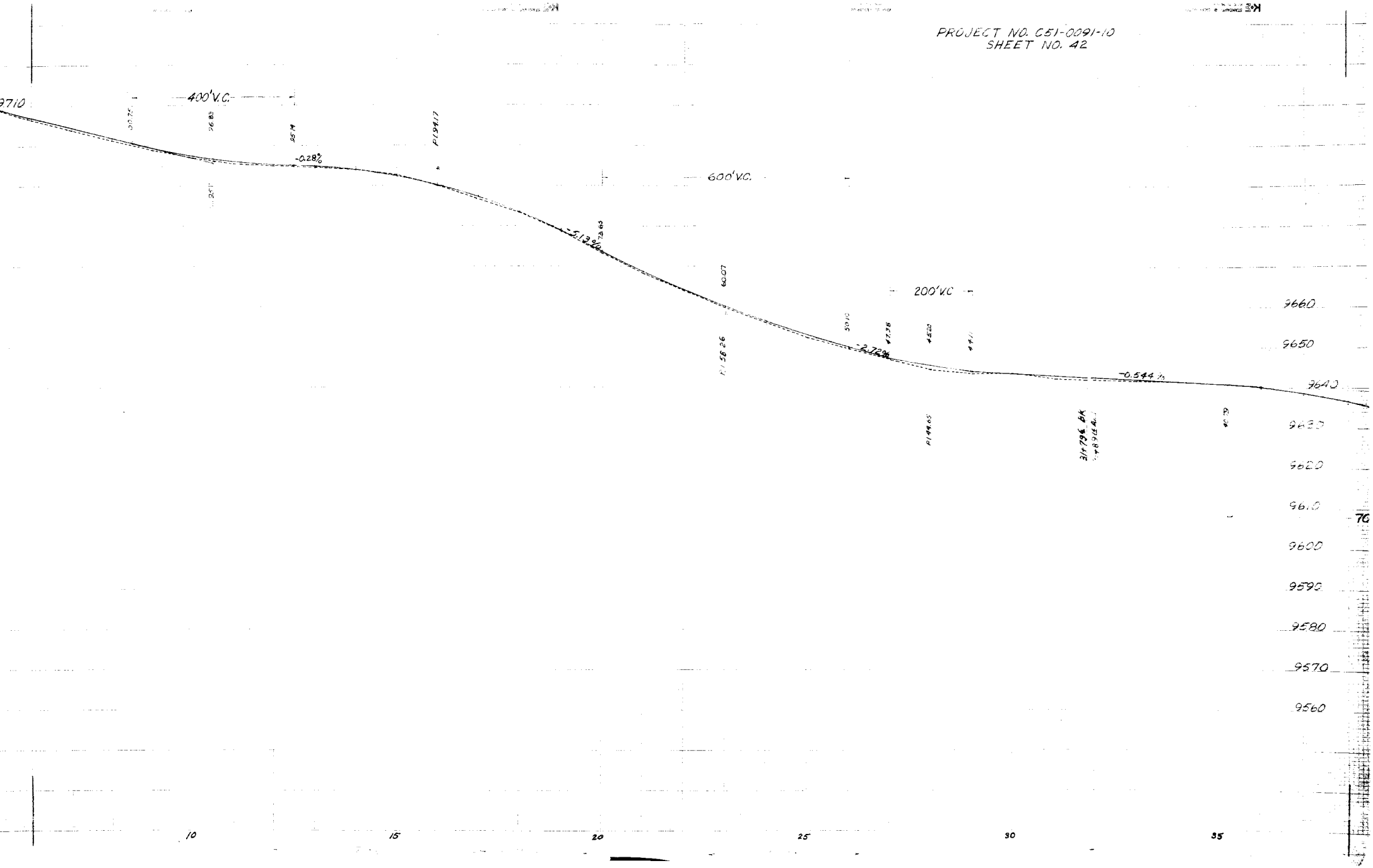



PROJECT NO. C51-0091-10
SHEET NO. 40
600' V.C.
300' V.C.
600' V.C.
200' V.C.
-2.30%
-1.66%
-3.10%
-2.70%
-0.69%
9800
9790
9780
9770
9760
9750
9740
9730
360
355
350

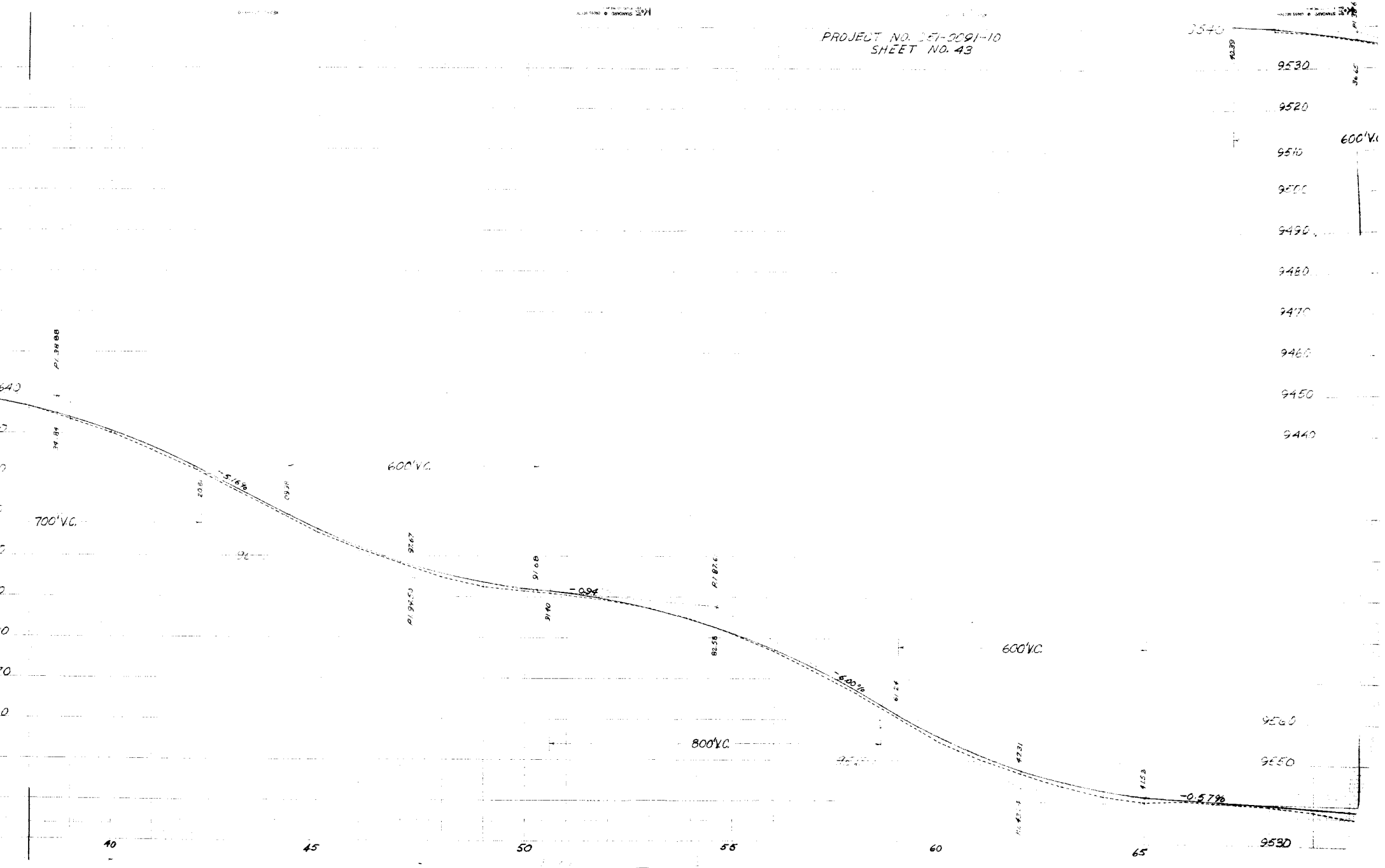
PROJECT NO. CEI-0091-10
SHEET NO. 41



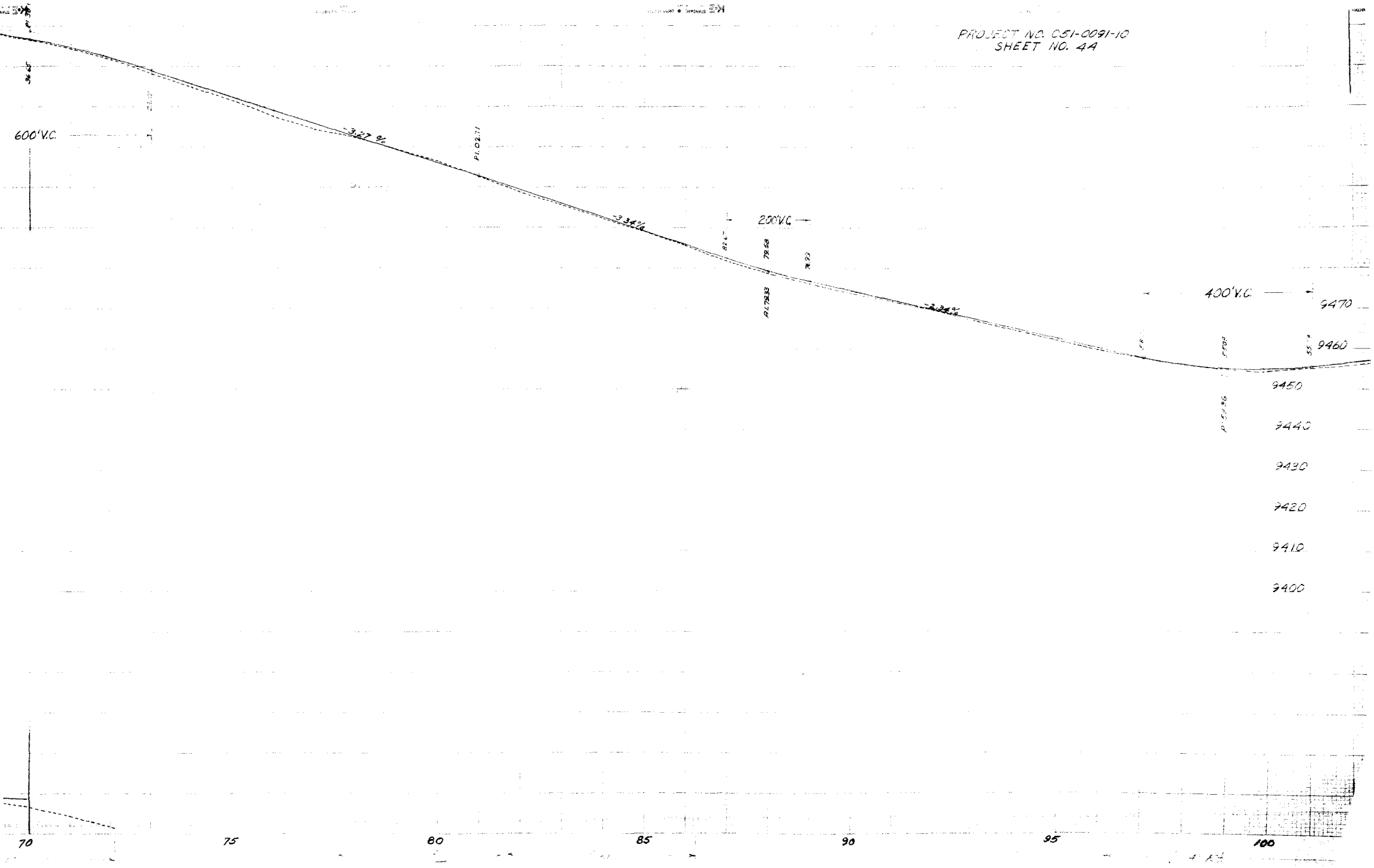
PROJECT NO. C51-0091-10
SHEET NO. 42



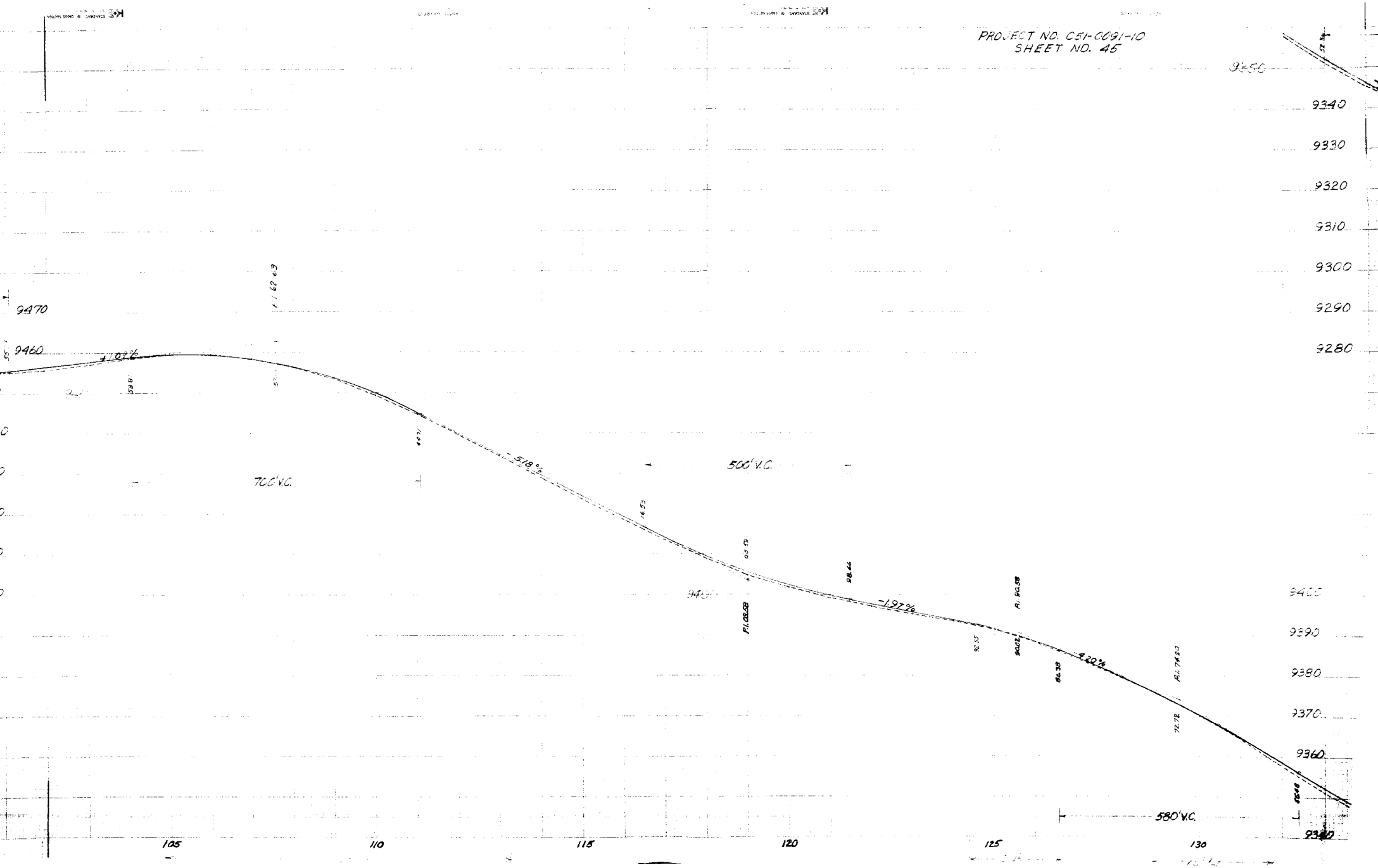
PROJECT NO. 151-2091-10
SHEET NO. 43

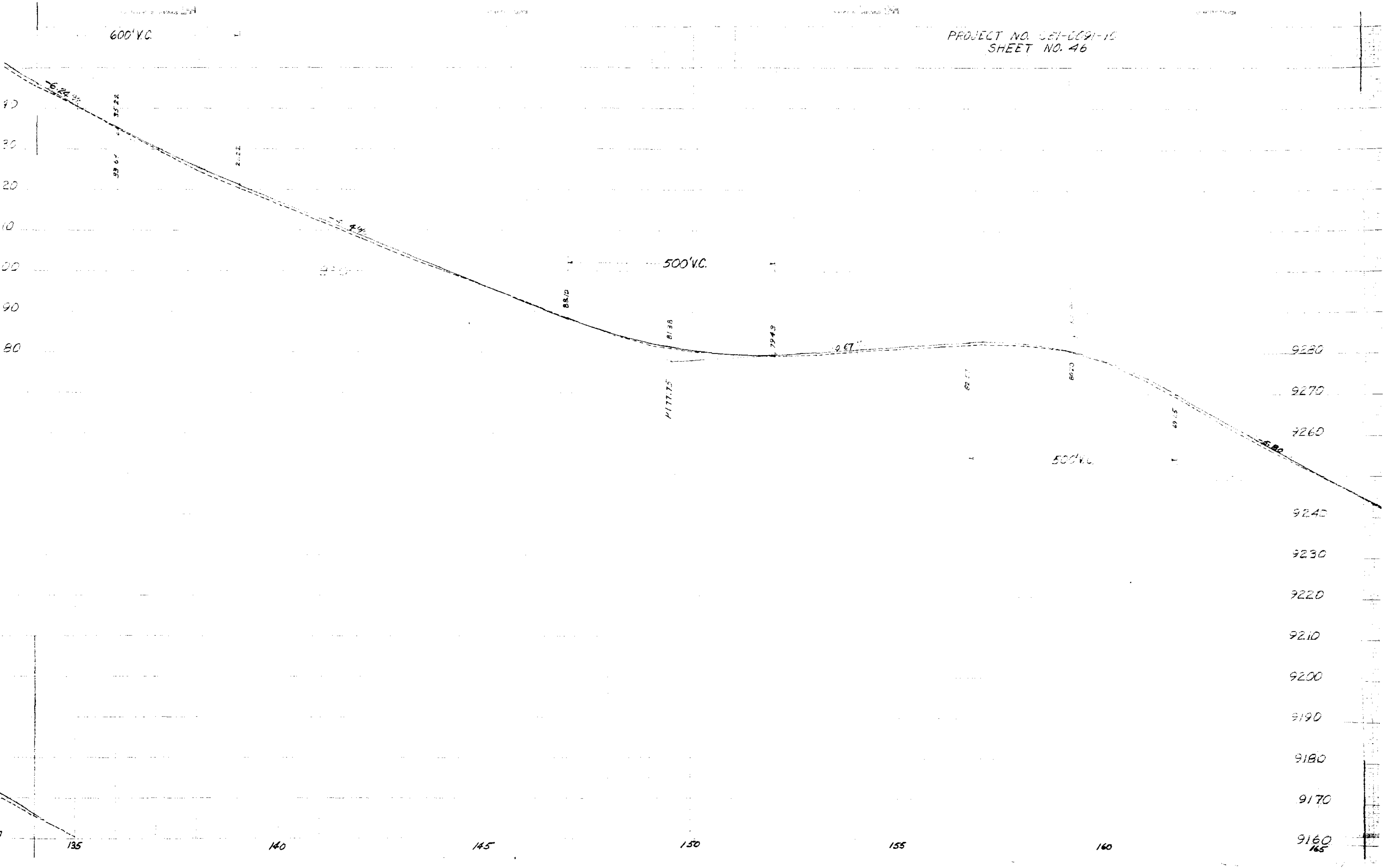


PROJECT NO. 051-0091-10
SHEET NO. 44



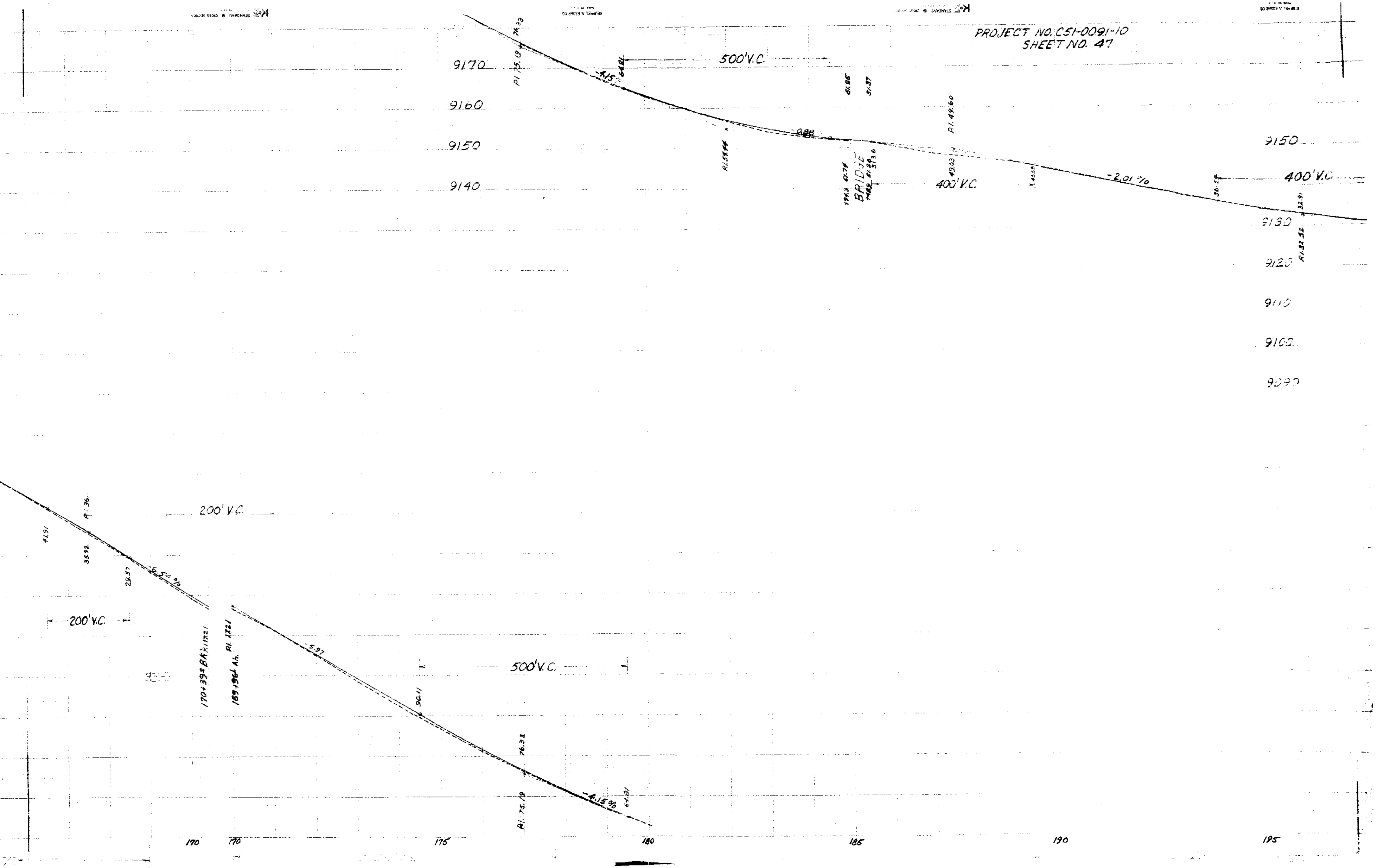
PROJECT NO. C51-0091-10
SHEET NO. 45

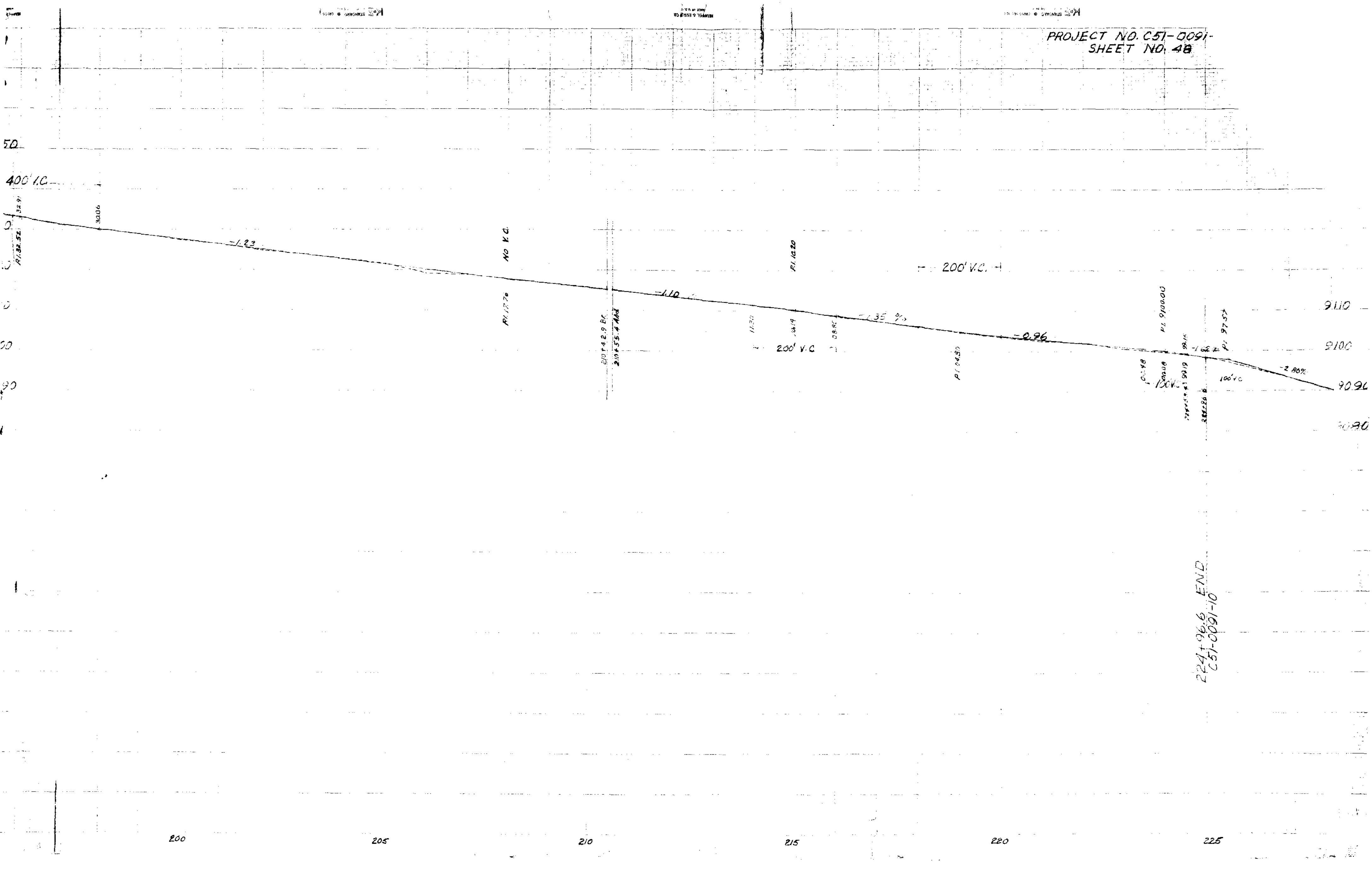




PROJECT NO. [illegible]
SHEET NO. 46

PROJECT NO. C51-0091-10
SHEET NO. 47

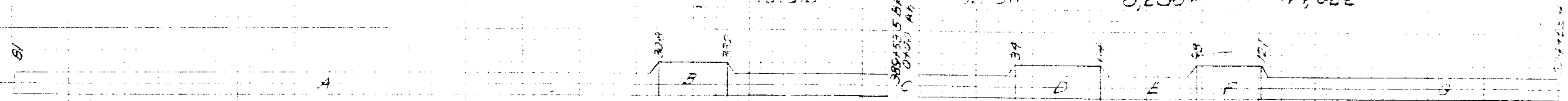



400' V.C.
-1.23
NO V.C.
P.I. 17.70
210+42.9 Bk.
210+55.4 Ahd
-1.10
P.I. 10.20
200' V.C.
-1.35 %
200' V.C.
-0.96
P.I. 9100.00
P.I. 97.57
100' V.C.
-2.86%
9110
9100
9090
9080
224+96.6 END
C51-0091-10
200
205
210
215
220
225

Excavation Cu. Yds.	Excavation Area	Embankment Area	Embankment Cu. Yds.	Excavation Cu. Yds.	Excavation Area	Embankment Area	Embankment Cu. Yds.

Summary of Earthwork Quantities

	24' Roadway Cu. Yds.	36' Roadway Cu. Yds.	Project Totals Cu. Yds.
Excavation			
From Cross Sections			
Sta. 308 to 332		1,424	1,424
Sta. 34 to 64		2,257	2,257
Sta. 99 to 121		2,958	2,958
Borrow			
Sta. 308 to 332		5,503	5,503
Sta. 34 to 64		3,714	3,714
Sta. 99 to 121		2,868	2,868
Estimated to remove unsuitable material	1,700	300	2,000
Estimated for subsidence (5% Exc. + Bor.)		936	936
From List of Structures as Excavation		35	35
From List of Structures as Embankment		0	0
Estimated for Cut Slope Treatment		300	300
Estimated for covering ends of culverts	20	30	50
Totals	1,720	20,325	22,045
Embankment			
From Cross Sections			
Sta. 308 to 332		2,200	2,200
Sta. 34 to 64		3,346	3,346
Sta. 99 to 121		1,310	1,310
To accomplish uniform grade and proper super elevation			
Sta. 81 to 308	2,243		2,243
Sta. 332 to 34	1,482		1,482
Sta. 64 to 99	1,375		1,375
Sta. 121 to 224	1,966		1,966
Estimated to replace unsuitable material	1,700	300	2,000
Totals	8,766	8,256	17,022



		Borrow			Yd. Mi. Computation		Sta. Yd.	Computation
A	[illegible]	2462	[illegible]	[illegible]	[illegible]	5175 Yd. Mi.	11 x 2462	= 27137
B	330+00	996	320+00					
C	354+89	815	320+00	2489'	815 x (3489 - 1600) ÷ 5280 =	292	11 x 815	= 8965
C	11+12	815	42+00	3788'	815 x (3788 - 1600) ÷ 5280 =	338	11 x 815	= 8965
D	47+00	1874	43+00					
E	72+50	542	43+00	2350'	542 x (2350 - 1600) ÷ 5280 =	77	11 x 542	= 5962
F	83+50	970	103+50	2000'	970 x (2000 - 1600) ÷ 5280 =	73	11 x 970	= 10670
G	175+77	2163	103+50	6327'	2163 x (6327 - 1600) ÷ 5280 =	1936	11 x 2163	= 23793
*		2200		5,280	2200 x (5280 - 1600) ÷ 5280 =	1533	11 x 2200	24200
						9365		109692
	Estimated [illegible]					60		590
					Total [illegible]	9425 Yd. Mi.		110 282 Sta. Yd.

OVERHAUL			
Station Yards	106,563	3,719	110,282
Yard Mi.	9,186	239	9,425

*Overhaul to Replace Unsuitable Material Computed on Uniform Basis.

SHEET TOTALS: EXCAVATION CU. YDS. / EXCAVATION CU. YDS. / EMBANKMENT CU. YDS.