Extra Copy

ENGINEER'S REPORT

US 31 Road Rehabilitation

From US 50 to CR 50 N, 3.0 miles North of SR 9
Jackson and Bartholomew Counties
Des. No.: 0014820

Prepared By:

CONSULTANTS, INC.
Engineers • Surveyors

Prepared For:

Engineering Assessment Section
Division of Environment, Planning and Engineering
Indiana Department of Transportation

November 11, 2002

MEMORANDUM

To: Brad L. Steckler, P.E., Manager
Engineering Assessment Section
Division of Environment, Planning and Engineering

Attention: Tarlochan S. Bansi, P.E.

Thru: Ross E. Snider, P.E., Vice-President
USI Consultants, Inc.

From: Gregory R. Wendling, P.E.
USI Consultants, Inc.

Subject: **Engineer's Report**
Des. No. 0014820
Road Rehabilitation
US 31 from US 50 to CR 50 N, 3.0 miles North of SR 9
Jackson and Bartholomew Counties

A. PURPOSE OF REPORT:

This Engineer's Report documents the engineering assessment phase, including an outline of the proposal (scope-of-work) for improvements to US 31. This report includes the relevant background data and provides conclusions and recommendations that will guide the ongoing environmental and ensuing survey and design phases. (This Engineer's Report is a pre-decisional and deliberative document, pending completion of the environmental study.)

B. PROJECT LOCATION:

This project begins within the City of Seymour at the intersection of US 31 with US 50 at RP 50+42. The project continues along US 31 to the intersection of Bartholomew CR 50 N, 3.0 miles north of SR 9, RP 68+25. Gross project length: 17.83 miles. The first 7.23 miles of the project are in Jackson County, and the last 10.60 miles are in Bartholomew County. The project is located in the Seymour District of INDOT.

The location maps of Appendices A-1 and A-2 depict the project location.

C. PROJECT'S NEED AND PURPOSE:

Need for the improvement is based on the facility's substandard vertical alignment, intersection sight distance (ISD), narrow shoulders and crash history. Existing levels of service (LOS) have fallen to substandard levels along the north end of the corridor. Lack of auxiliary lanes at intersections is adding to the congestion during peak hours. Several of the small drainage structures along the corridor are hydraulically inadequate, and some bridges along the corridor have substandard clear roadway width and are deteriorating.

The purpose of this project is to improve the traffic flow/mobility and safety of US 31 by improving geometrics along the corridor.

D. EXISTING CONDITIONS:

See the ground level photographs, pages A-3 through A-17 of the Appendix and the aerial photographs in Appendix A-18 to A-35 for existing conditions.

US 31, within the Seymour city limits is classified as an *Urban Minor Arterial.* The project lies within the Seymour city limits from US 50 north 0.84 mile. From the city limits to the north end of the project, US 31 is classified as a *Rural Major Collector.* This portion of US 31 is not part of the National Highway System (NHS), nor is it included on the National Truck Network. It is on Indiana's 3R system.

CROSS SECTION

The existing US 31 typical cross section consists of two 12' lanes bordered by 1' paved shoulders (4' total usable width). Drainage is via shallow V-ditches. The existing right-of-way is typically 50'each side of centerline.

ROAD HISTORY

Road Life Data shows that in 1938 and 1942 the roadway was constructed as a 22' wide concrete pavement. South from SR 7, RP 64+86, the roadway was resurfaced in 1948, 1961, and 1976. North from SR 7, the roadway was resurfaced in 1948, 1956, and 1975. The roadway (for entire length of the project) was widened to 24' and resurfaced in 1986 under Contract RS 16085. The last resurface project for the entire corridor took place in 1998, under Contract RS-23321.

Road plans for this corridor are available at INDOT's central office. Existing road plans for the corridor from US 50 to Sand Creek (7.2 miles north of US 50) are available under Project No. F.A.-87 Sec. A. Existing road plans for the corridor from Sand Creek to SR 7 are available under Project No. F.A.-87 Sec. B, and for the corridor from SR 7 to the north end of the project limits are available under Project No. F.A. 722 (Columbus By-Pass).

PAVEMENT CONDITION

The INDOT's 2000 Pavement Surface Report – reflecting the recent, 1998 overlay - indicates that this section of roadway has a Pavement Condition Rating (PCR) of 99 (excellent condition), average rut depth of 0.13 inch, and a International Roughness Index (IRI) of 45 (excellent condition).

HORIZONTAL AND VERTICAL ALIGNMENTS

The posted speed limit along the corridor is 55 mph from the beginning of the project to approximately 800' north of CR 1000N, near the Town of Reddington. From 800' north of CR 1000N to 200' north of CR 1050N the posted speed limit is 45 mph. From 200' north of CR 1050N to the north end of the project, the posted speed limit is 55 mph.

The corridor runs generally in a northerly direction. The horizontal alignment can be seen in the aerial photographs, page A-18 to A-35 of the Appendix. Assuming suitable superelevation is in place, all horizontal curves have a CEDS of 55 mph or higher.

The prevailing vertical terrain along the US 31 corridor is considered level, with the vertical grades ranging from –4.06% to +4.60%. There are 14 locations with vertical curvature for stopping sight distance (SSD) substandard with respect to minimum 3R K-values for sag curves and 4R K-values for crest curves. The adjacent table contains minimum values for the rate of curvature, K.

K values				
Design Speed	4R Crest		3R Sag	
	Des.	Min.	Min.	Comfort
45 mph	86	56	75	43
55 mph	171	128	125	69

The following summarizes existing vertical curves with K values below minimum values.

Existing vertical curves			
Type	Station	Existing K value	CEDS
Crest	46+26.13	109.59	53 mph
Sag	51+75	41.24	29 mph
Sag	54+75	63.49	36 mph
Sag	108+25	86.96	47 mph
Crest	112+00	79.96	49 mph
Crest	129+00	122.7	54 mph
Crest	173+00	87.93	50 mph
Sag	179+50	93.04	49 mph
Crest	188+50	99.26	52 mph
Sag	303+00	118.98	54 mph
Crest	315+50	90.60	51 mph
Sag	340+50	116.67	54 mph
Sag	533+11	97.22	50 mph
Sag	952+84	92.41	49 mph

INTERSECTING ROADWAYS

There are 31 public road intersections with US 31 within the project limits. The intersection of US 31 and US 50 is signalized, as well as the intersection of US 31 and SR 7. All other intersections within the project limits have stop control on the intersecting roadway. Intersecting roadways within the project limits are summarized in the following table:

Intersecting Roadway	RP (Sta.)	Intersect-ing Angle	Intersection Sight Distance (ISD)	ISD CEDS (3R)	Cross-road Leg Width	Posted Speed Limit
US 50 (signalized)	RP 50+42 (Sta. 9+14)	124°	> 625 ft	>55 mph	60 ft	Not posted (55 mph)
CR 560 N	RP 50+80 (Sta. 29+00)	84°	> 625 ft	>55 mph	20 ft	Not posted (55 mph)
CR 700 N	RP 52+12 (Sta. 100+11)	89°	> 625 ft	>55 mph	18 ft	Not posted (55 mph)
CR 800 N	RP 53+02 (Sta. 151+21)	90°	> 625 ft	>55 mph	18 ft	Not posted (55 mph)
CR 860 N (Rt.)	RP 53+61 (Sta. 181+52)	90° (with small radius connector)	> 625 ft	>55 mph	15 ft	Not posted (55 mph)
CR 900 N	RP 54+03 (Sta. 204+26)	91°	> 625 ft	>55 mph	18 ft	Not posted (55 mph)
CR 975 N (Lt.)	RP 54+79 (Sta. 243+37)	90°	> 625 ft	>55 mph	18 ft	Not posted (55 mph)
CR 1000 N (Rt.)	RP 55+04 (Sta. 256+63)	90°	> 625 ft	>55 mph	20 ft	Not posted (55 mph)
CR 1025 N (Lt.)	RP 55+25 (Sta. 268+72)	90°	> 500 ft	>45 mph	18 ft	Not posted (55 mph)
CR 1040 N (Rt.)	RP 55+47 (Sta. 280+00)	98°	> 500 ft	>45 mph	20 ft	Not posted (55 mph)
CR 1050 N (Lt.)	RP 55+61 (Sta. 287+54)	101°	>625 ft North >500 ft South	>55 mph >45 mph	18 ft	Not posted (55 mph)
CR 1100 N	RP 56+12 (Sta. 314+36)	91°	142 ft North >625 ft South	15 mph >55 mph	18 ft	Not posted (55 mph)
CR 1125 N (Rt.)	RP 56+41 (Sta. 330+69)	108°	> 625 ft	>55 mph	18 ft	Not posted (55 mph)
CR 1150 N (Rt.)	RP 56+59 (Sta. 340+35)	140°	> 625 ft	>55 mph	12 ft	Not posted (55 mph)
CR 1200 N	RP 57+11 (Sta. 367+31)	90°	> 625 ft	>55 mph	18 ft	Not posted (55 mph)
CR 900 S	RP 58+20 (Sta. 423+56)	90°	> 625 ft	>55 mph	18 ft	Not posted (55 mph)
CR 850 S	RP 58+70 (Sta. 450+24)	92°	> 625 ft	>55 mph	16 ft	Not posted (55 mph)
CR 800 S	RP 59+20 (Sta. 476+62)	95°	> 625 ft	>55 mph	18 ft	Not posted (55 mph)
CR 750 S	RP 59+71 (Sta. 502+72)	92°	> 625 ft	>55 mph	18 ft	Not posted on east leg, 35 mph on west. leg
CR 650 S	RP 60+72 (Sta. 555+56)	90°	>625 ft North 200 ft South	>55 mph 20 mph	18 ft	Not posted (55 mph)
CR 600 S	RP 61+22 (Sta. 582+79)	86°	> 625 ft	>55 mph	18 ft	Not posted (55 mph)
CR 500 S (Lt.)	RP 62+23 (Sta. 635+95)	90°	> 625 ft	>55 mph	18 ft	Not posted (55 mph)

Intersecting Roadway	RP (Sta.)	Intersect-ing Angle	Intersection Sight Distance (ISD)	ISD CEDS (3R)	Cross-road Leg Width	Posted Speed Limit
CR 475 S (Rt.)	RP 62+47 (Sta. 648+19)	90°	> 625 ft	>55 mph	18 ft	40 mph
CR 400 S	RP 63+26 (Sta. 690+63)	76°	> 625 ft	>55 mph	18 ft	Not posted on east leg, 55 mph on west. leg
SR 7 (signalized)	RP 64+86 (Sta. 775+67)	57°	> 755 ft	>55 mph	36 ft	Not posted (55 mph)
SR 9/SR 46 CR 200 S (to be signalized by Des. No. 9244355)	RP 65+28 (Sta. 797+95)	77°	> 755 ft	>55 mph	36 ft	Not posted (55 mph)
CR 150 S	RP 65+84 (Sta. 826+06)	63°	> 625 ft	>55 mph	14 ft	Not posted (55 mph)
CR 100 S	RP 66+40 (Sta. 855+50)	64°	> 625 ft	>55 mph	18 ft	Not posted (55 mph)
CR 300 E	RP 67+05 (Sta. 891+24)	124°	> 625 ft	>55 mph	18 ft	Not posted (55 mph)
Base Line Rd	RP 67+58 (Sta. 921+62)	52°	> 625 ft	>55 mph	36 ft	Not posted (55 mph)
CR 50 N	RP 68+25 (Sta. 953+70)	82°	> 625 ft	>55 mph	30 ft	Not posted (55 mph)

SMALL DRAINAGE STRUCTURES

Seventy-five culverts (small drainage structures, less than 20 feet span length) have been identified within the project limits. Thirty-four of these were hydraulically analyzed in the report prepared by the INDOT Hydraulics Unit titled *Preliminary Hydraulic Review, US 31, Des. No.: 0014820, US 50 to Clifty Creek.* Details of the structures can be found in the *Review*, located in the Appendix pages C-4 to C-24. The following table summarizes the existing cross structures:

Structure Station	Existing Size & Type Rise x Span	Proposed Size & type Rise x Span
Sta. 28+19	48' of 18" RCP	Not analyzed
Sta. 37+00	4' x 4' Std. RC Box Culvert	5' x 5' RC Box Culvert with Wingwalls
Sta. 43+03	52' of 15" RCP	Not analyzed
Sta. 49+81	2.5' x 8' Std. RC Box Culvert	5' x 11' RC Box Culvert with Wingwalls
Sta. 57+49	2.5' x 3' Std. RC Box Culvert	3' x 6' RC Box Culvert with Wingwalls
Sta. 93+00	74' of 24" RCP	Not analyzed
Sta. 118+00	72' of 15" RCP	Not analyzed
Sta. 121+81	74' of 15" RCP	Not analyzed
Sta. 135+00	63' of 15" RCP	Not analyzed
Sta. 140+55	2' x 3' Std. RC Box Culvert	3' x 4' RC Box Culvert with Wingwalls
Sta. 145+78	6' x 15' Std. RC Box Culvert	8' x 18' RC Box Culvert with Wingwalls
Sta. 153+52	58' of 24" RCP	Not analyzed
Sta. 163+16	48' of 24" RCP	Not analyzed

Sta. 176+00	94' of 15" RCP	Not analyzed
Sta. 178+25	7' x 11' Std. RC Box Culvert	8' x 16' RC Box Culvert with Wingwalls
Sta. 198+77	7' x 8' Std. RC Box Culvert	7.5' x 12' RC Box Culvert with Wingwalls
Sta. 207+04	3' x 3' Std. RC Box Culvert	3' x 5' RC Box Culvert with Wingwalls
Sta. 222+27	5' x 5' Std. RC Box Culvert	4' x 8' RC Box Culvert with Wingwalls
Sta. 227+14	3' x 4' Std. RC Box Culvert	4' x 7' RC Box Culvert with Wingwalls
Sta. 262+42	52' of 24" RCP	Not analyzed
Sta. 268+12	48' of 15" RCP	Not analyzed
Sta. 273+70	4' x 4' Std. RC Box Culvert	3' x 6' RC Box Culvert with Wingwalls
Sta. 279+05	15" of 56' RCP with Conc. Catch Basin & Inlet	Not analyzed
Sta. 296+53	64' of 18" RCP	Not analyzed
Sta. 302+93	3' x 3' Std. RC Box Culvert	4' x 4' RC Box Culvert with Wingwalls
Sta. 331+91	3' x 4' Std. RC Box Culvert	3' x 5' RC Box Culvert with Wingwalls
Sta. 363+88	12' x 19.5' Concrete Slab on Vertical Abutments	To be removed and drainage redirected through Sand Creek Bridge
Sta. 372+23	3' x 2' Std. RC Culvert	Not analyzed
Sta. 379+12	3' x 2' Std. RC Culvert	Not analyzed
Sta. 400+61	8' x 8' Std. RC Culvert	To be removed and drainage redirected through Sand Creek Bridge
Sta. 450+69	2' x 3' Std. RC Box Culvert	3' x 5' RC Box Culvert with Wingwalls
Sta. 473+47	50' of 18" RCP	Not analyzed
Sta. 478+60	48' of 15" RCP	Not analyzed
Sta. 486+50	3' x 6' Std. RC Box Culvert	3' x 6' RC Box Culvert with Wingwalls
Sta. 500+79	50' of 15" VCP	Not analyzed
Sta. 502+72 (under west leg of CR 750S)	2' x 3' Std. RC Box Culvert	2.75' x 4.08' Corrugated Metal Arch Pipe
Sta. 503+62	48' of 36" CMP	2.75' x 4.08' Corrugated Metal Arch Pipe
Sta. 517+79	2' x 3' Std. RC Box Culvert	2' x 3' RC Box Culvert with Wingwalls
Sta. 530+58	80' of 24" RCP	Not analyzed
Sta. 531+48	70' of 24" RCP	Not analyzed
Sta. 539+24	54' of 15" RCP	Not analyzed
Sta. 559+03	52' of 15" RCP	Not analyzed
Sta. 571+06	50' of 24" RCP	Not analyzed
Sta. 580+42	4' x 6' Std. RC Box Culvert	4' x 6' RC Box Culvert with Wingwalls
Sta. 610+24	2' x 3' Std. RC Box Culvert	3.92' x 5.92' Corrugated Metal Arch Pipe
Sta. 623+99	62' of 24" RCP	Not analyzed
Sta. 638+75	46' of 15" RCP	Not analyzed
Sta. 651+80	3' x 5' Std. RC Box Culvert	4' x 7' RC Box Culvert with Wingwalls
Sta. 663+66	2' x 3' Std. RC Box Culvert	3' x 5' RC Box Culvert with Wingwalls
Sta. 730+16	4' x 5' Std. RC Box Culvert	4' x 6' RC Box Culvert with Wingwalls
Sta. 749+40	2' x 6' Std. RC Box Culvert	4' x 10' RC Box Culvert with Wingwalls
Sta. 756+71	2' x 4' Std. RC Box Culvert	4' x 5' RC Box Culvert with Wingwalls
Sta. 785+85	50' of 24" RCP	Not analyzed
Sta. 790+43	60' of 18" RCP	Not analyzed
Sta. 796+16	3' x 3' Std. RC Culvert	Not analyzed
Sta. 808+74	7' x 8' Std. RC Box Culvert	7' x 8' RC Box Culvert with Wingwalls
Sta. 812+93	48' of 15" RCP	Not analyzed
Sta. 816+71	5' x 6' Std. RC Box Culvert	4' x 8' RC Box Culvert with Wingwalls
Sta. 825+62	3' x 4' Std. RC Box Culvert	3' x 5' RC Box Culvert with Wingwalls
Sta. 850+48	6' x 8' Std. RC Box Culvert	7' x 10' RC Box Culvert with Wingwalls

Sta. 854+89	48' of 15" RCP	Not analyzed
Sta. 857+48	48' of 15" RCP	Not analyzed
Sta. 860+33	48' of 18" RCP	Not analyzed
Sta. 863+29	52' of 30" RCP	Not analyzed
Sta. 870+51	52' of 24" RCP	Not analyzed
Sta. 876+10	5' x 4' Std. RC Box Culvert	4' x 9' RC Box Culvert with Wingwalls
Sta. 881+34	48' of 24" RCP	Not analyzed
Sta. 886+46	3' x 4' Std. RC Box Culvert	3' x 4' RC Box Culvert with Wingwalls
Sta. 896+55	48' of 24" RCP	Not analyzed
Sta. 897+58	52' of 24" RCP	Not analyzed
Sta. 898+63	56' of 24" RCP	Not analyzed
Sta. 905+97	48' of 15" RCP	Not analyzed
Sta. 915+19	6' x 3' Std. RC Box Culvert	3' x 4' RC Box Culvert with Wingwalls
Sta. 917+16	64' of 18" RCP	Not analyzed
Sta. 917+31	56' of 15" RCP	Not analyzed

BRIDGE STRUCTURES

There are 8 bridge structures within the project limits. The following table summarizes their type, age, clear roadway, and whether or not the structure will be a part of this project. Bridges included in this project will either be replaced, or widened to accommodate proposed auxiliary lanes.

Structure #	Description	Condition Ratings (deck, superstructure, substructure)	Size & Type	Clear Roadway	Year Constructed/ Last Repaired	Included in Project ?
31-36-2028	US 31 under CSX railroad	Not available	Steel Girder: 1@32'	29.8'	1936	Yes (Replacement)
31-36-7165	US 31 over Sandy Branch	8, 8, 8	Conc. I Beam: 1@78'	45.3'	1991	Yes (Widening)
31-36-1773	US 31 over Quade Ditch	6, 6, 7	Conc. Girder: 1@ 32'	36.2'	1936	Yes (Replacement)
31-36-1775C	US 31 over Sand Creek	7, 5, 6	Steel Truss: 2@175'	24.0'	1936/1995	Yes (Replacement)
31-03-7821	US 31 over Morton Hall Ditch	9, 9, 9	Conc. Slab: 26.9', 35.5', 26.9'	42.7'	1996	Yes (Widening)
31-03-6062A	US 31 over Little Sand Creek	7, 7, 7	Conc. I Beam: 34.3', 35.0', 34.3'	43.2'	1972/1988	Project Exception
31-03-1779B	US 31 over Fishers Fork	7, 7, 7	Conc. I Beam: 1@55.0'	43.5'	1936/1988	Yes (Widening)
31-03-3359A	US 31 over Brush Creek	7, 7, 6	Conc. I Beam: 1@40.0'	44.0'	1941/1973	Part of Des. No. 9244355

The following summarizes the existing conditions for each structure.

Existing Bridge No. 31-36-2028, US 31 under CSX Railroad

Structure Type:	Steel beam subway, single span concrete reinforced with I-beams on full depth concrete abutments, consisting of one railroad track.
Structure Size:	Single 33'-4" span, Clear Roadway Width = 30'-0", Out-to-Out Deck Width= 20'-0". Ref Post = 53+26.35
Structure History:	Built in 1936, no rehabilitations.
Structure Condition:	Widespread cracking and spalling of the concrete slab.
Safety features:	Existing clear roadway width and vertical clearance is not adequate. Existing roadway profile has substandard Stopping Sight Distance.

Photographs of this structure can be found on pages A-5 through A-6 of the Appendix.

Existing Bridge No. 31-36-7165, US 31 over Sandy Branch

Structure Type:	Single span prestressed concrete type IV I-beams.
Structure Size:	Single span at 78'-0", Clear Roadway Width = 45'-4" ft, and Out-to-Out Deck Width= 48'-4" ft. Ref. Post = 52+23
Structure History:	Built in 1991, no rehabilitations.
Structure Condition:	Overall this structure is in very good condition. Sufficiency rating = 98.2
Safety features:	Bridge rail and approach guardrail are in good condition.

Existing Bridge No. 31-36-1773, US 31 over Quade Ditch

Structure Type:	Single span reinforced concrete on full depth concrete abutments.
Structure Size:	Single 32'-0" clear span, Clear Roadway Width = 36'-2", Out-to-Out Deck Width= 39'-0". Ref Post = 56+78
Structure History:	Built in 1936, no rehabilitations.
Structure Condition:	Widespread cracking and spalling of the composite concrete slab. Severe deterioration of the exterior reinforced concrete girders and ends of all girders. Abutment footings exposed due to scour. Sufficiency rating 1999 = 94.60.
Safety features:	Guardrail is not to current INDOT standards, and existing clear roadway width is not adequate.

Photographs of this structure can be found on page A-12 of the Appendix.

Existing Bridge No. 31-36-1775C, US 31 over Sand Creek

Structure Type:	Two span steel through truss with reinforced concrete deck (301 tons of steel estimated).
Structure Size:	Two spans each at 175 ft, Clear Roadway Width = 24 ft, and Out-to-Out Deck = 25 ft. Minimum vertical clearance = 14'-7". Ref. Post = 57+65
Structure History:	Built in 1936, rehabilitated in 1977 and 1995. Last painted in 1988.
Structure Condition:	Widespread rusting of the truss members and moderate deterioration of the concrete slab. Collision damage present. Inventory rating = HS 16.6. Sufficiency rating 1999 = 57.30.
Safety features:	Guardrail is not to current INDOT standards, and existing clear roadway width is not adequate.

Photographs of this structure can be found on pages A-13 and A-14 of the Appendix.

Existing Bridge No. 31-03-7821, US 31 over Morton Hall Ditch

Structure Type:	Three span continuous reinforced concrete slab.
Structure Size:	Three spans at 26'-11, 35'-5", 26'-11", Clear Roadway Width = 42''-8", and Out-to-Out Deck = 45'-7". Ref. Post = 58+61
Structure History:	Built in 1996, no rehabilitations.
Structure Condition:	Overall this structure is in very good condition. Sufficiency rating 1999 = 99.6.
Safety features:	Bridge rail and approach guardrail is in good condition.

Existing Bridge No. 31-03-1779B, US 31 over Fishers Fork

Structure Type:	Single span composite prestressed concrete type II I-beams.
Structure Size:	Single spans at 55'-0". Clear Roadway Width = 43-5", and Out-to-Out Deck = 46'-6". Ref Post = 52+23
Structure History:	Built in 1936. Superstucture replaced in 1972. Rehabilitated in 1988.
Structure Condition:	Overall this structure is in very good condition. Sufficiency Rating 1999 = 96.5.
Safety features:	Bridge rail and approach guardrail is in good condition.

UTILITIES

Various utilities are located within the study limits of this project. Overhead power, cable and telephone lines are located along US 31 on both sides of the road (intermittently). Underground gas, water, sanitary sewer and telephone lines (GTE and Ameritech) exist at certain locations throughout the project.

LAND USE

Land use is primarily agricultural, with some residential and commercial mixed in. See the ground level photos in pages A-3 to A-17 of the Appendix and the aerial photographs in pages A-18 to A-35 of the Appendix for lane use throughout the project.

E. TRAFFIC DATA and CAPACITY ANALYSIS:

An outside consultant for the Traffic Statistics Unit of INDOT prepared a traffic forecast for this project. The results were presented in a report titled *Traffic Volume Forecast; US 31 from US 50 to CR 50 N, Jackson and Bartholomew Counties, Des. No. 0014820*, dated July 2001. Forecast summaries were provided for each of the intersections for both the AM and PM peak hours. The report shows traffic forecasts (full intersection movements), given no capacity constraints, for the following intersections, for the years 2001, 2005, 2010, 2015, and 2025.

1. US 31 at US 50
2. US 31 at CR 800 N
3. US 31 at CR 900 N
4. US 31 at CR 800 S
5. US 31 at CR 750 S
6. US 31 at CR 500 S
7. US 31 at CR 475 S
8. US 31 at CR 400 S
9. US 31 at SR7/ SR 46
10. US 31 at CR 200 S/ SR 46
11. US 31 at Base Line Rd
12. US 31 at CR 50 N

A copy of the summaries is located in Appendix B-1 to B-24.

Projected Average Annual Daily Traffic (AADT) is summarized in the adjacent table. A capacity analysis on the two-lane highway section was performed for the anticipated construction year (2005) and the design year (2025), and is summarized in the adjacent table. The rural highway analysis was carried out for this section, since there are no intermediate traffic signals along the corridor. Four-foot shoulders were used for analysis, with 20% no passing zones for all scenarios except north of US 50 and north of Base Line Road, where 50% no passing zones were used. Under 3R standards, the desirable LOS is B and the minimum is D.

Existing Configuration						
Roadway Segment	AADT		2005 LOS		2025 LOS	
	2005	2025	AM	PM	AM	PM
North US 50	8350	11760	C	C	C	D
North of CR 900 N	7700	10880	C	C	C	D
North of CR 900 S	9490	13390	C	D	D	D
North of CR 400 S	10870	15320	C	D	D	D
North of SR 7/SR 46	15920	22470	D	D	D	E
North of Base Line Rd.	15160	21380	D	D	D	E

INTERSECTION LOS

A capacity analysis was performed at the intersections along US 31 that will be a part of this project and that had traffic counts performed, pursuant to the Highway Capacity Manual's (year 2000) methodology for intersections to determine level of service (LOS) and delay during the construction year (2005) and the design year (2025). The following table summarizes the findings. The intersection of US 31 with US 50 is signalized, as well as the intersection of US 31 with SR 7/SR 46. All of the other intersections are unsignalized.

INTERSECTION LOS SUMMARY								
US 31 @	Existing Configuration				Proposed Configuration			
	2005		2025		2005		2025	
	AM	PM	AM	PM	AM	PM	AM	PM
US 50 (Signalized)	B(19 s)	C(30 s)	D(37 s)	F(86 s)	B(11 s)	B(13 s)	B(16 s)	D(36 s)
CR 800 N	B/B (A/A)	B/C (A/A)	C/C (A/A)	B/D (A/A)	B/B (A/A)	B/C (A/A)	C/C (A/A)	B/D (A/A)
CR 900 N	B/B (A/A)	B/C (A/A)	C/C (A/A)	C/D (A/A)	B/B (A/A)	B/C (A/A)	C/C (A/A)	C/D (A/A)
CR 800 S	B/B (A/A)	B/C (A/A)	C/C (A/A)	C/E (A/A)	B/B (A/A)	B/C (A/A)	C/C (A/A)	C/D (A/A)
CR 750 S	B/B (A/A)	B/C (A/A)	C/C (A/A)	C/D (A/A)	B/B (A/A)	B/C (A/A)	C/C (A/A)	C/D (A/A)
CR 500 S	B (A)	B (A)	C (A)	C (A)	B (A)	B (A)	C (A)	C (A)
CR 475 S	C (A)	C (A)	F (A)	E (A)	C (A)	C (A)	F (A)	E (A)
CR 400 S	Project Exception (Des. No. 0014750)							
SR 7/ SR 46 (signalized)	B(19 s)	B(17 s)	F(93 s)	E(71 s)	B(13 s)	B(14 s)	D(40 s)	D(46 s)
CR 200 S	Project Exception (Des. No. 9244355)							
Base Line Rd	Project Exception (Des. No. 9902620)							
CR 50 N	Beyond Project Limits (Des. No. 9700230)							

Note: LOS shown as West approach LOS/East approach LOS
(South Approach (LT) LOS/North approach (LT) LOS)

Auxiliary lane improvements at the 2 signalized intersections do show an improvement in LOS. The majority of the intersections operate at an acceptable LOS in the base and design years (all except CR 800 S and CR 475 S). At the intersection with CR 800 S, the addition of an auxiliary lane on the side street does improve the intersection LOS, but adding an auxiliary lane on CR 475 S still causes the intersection to operate at a poor LOS. A capacity analysis was performed at this intersection to determine the LOS as a signalized intersection with the proposed geometrics. The adjacent table summarizes the results. As can be seen in the table, the LOS if the proposed intersection were signalized is acceptable. The designer is instructed to contact the District Traffic Engineer near the time of the Preliminary Field Check to determine if signals are warranted at any of the presently unsignalized intersections.

LOS AS SIGNALIZED INTERSECTIONS		
INTERSECTION	2025 AM PEAK	2025 PM PEAK
CR 475 S	A (6 s)	A (4 s)

TURN LANE WARRANT ANALYSIS

A turn lane warrant analysis was performed at each of the 2-way stop-controlled intersections for which traffic count data was obtained. The following turn lanes were warranted along US 31 under the INDOT Design Manual, section 46-4.01, for the design year.

TURN LANE WARRANT SUMMARY				
US 31 @	NB left	SB left	NB right	SB right
CR 800 N	N	Y	N	N
CR 900 N	Y	Y	N	N
CR 800 S	Y	Y	N	Y
CR 750 S	Y	Y	N	N
CR 500 S	Y	N/A	N/A	N
CR 475 S	N/A	Y	Y	N/A

As can be seen in the table, left turn lanes are warranted at each intersection examined. In part for this reason, it is determined that left turn lanes are appropriate at every 4-legged intersection along the highway for uniformity of intersection design in order to satisfy driver expectancy. Passing blisters will be utilized for 3-legged intersections due to AADT over 5000, and other warrants outline in Chapter 46 of the Indiana Design Manual (IDM).

CSX TRAIN TRAFFIC

The CSX railroad over US 31 (Bridge No. 31-36-2028) carries approximately 16 trains per day, traveling at a speed of 60 mph.

F. CRASH DATA:

The INDOT database shows 303 recorded crashes (accidents) from the intersection of US 50 to CR 50 N during the 4 year period from January 1995 to December 1998.

The following table describes the distribution of crash events by intersection, with the number of crashes shown, followed by the number of crashes resulting in personal injury in parentheses.

Location	Type of Crash										Comments
	Rear end	Head On	Sideswipe	Right Angle	Off Road	Left Turn	Right Turn	Animal	Undetermined	Totals	
@ US 50	14 (2)	0 (0)	0 (0)	3 (1)	2 (1)	5 (3)	0 (0)	3 (0)	0 (0)	27 (7)	No SB Lt. Turn auxiliary lane may be a contributing factor
@ CR 560 N	12 (5)	1 (1)	0 (0)	0 (0)	5 (1)	2 (2)	0 (0)	5 (1)	0 (0)	25 (10)	Only 4 crashes were @ int., remainder were mid-block
@ CR 700 N	3 (2)	0 (0)	1 (1)	1 (0)	5 (2)	1 (1)	0 (0)	0 (0)	0 (0)	11 (6)	Only 2 crashes were @ int., remainder were mid-block
@ CR 800 N	2 (1)	1 (1)	2 (1)	1 (1)	2 (1)	1 (1)	0 (0)	1 (0)	0 (0)	10 (6)	Only 1 crash was @ int., remainder were mid-block
@ CR 860 N (Rt.)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	No apparent problem
CR 900 N	1 (1)	1 (1)	1 (0)	2 (2)	4 (3)	1 (0)	0 (0)	4 (0)	0 (0)	14 (7)	Only 2 crashes were @ int., remainder were mid-block
CR 975 N (Lt.)	1 (0)	1 (1)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	2 (1)	No apparent problem
CR 1000 N (Rt.)	2 (1)	0 (0)	0 (0)	0 (0)	1 (0)	0 (0)	0 (0)	1 (0)	0 (0)	4 (1)	No apparent problem
CR 1025 N (Lt.)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	No apparent problem
CR 1040 N (Rt.)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	No apparent problem
CR 1050 N (Lt.)	0 (0)	0 (0)	0 (0)	0 (0)	1 (1)	0 (0)	0 (0)	0 (0)	0 (0)	1 (1)	No apparent problem
CR 1100 N	1 (0)	0 (0)	0 (0)	0 (0)	2 (1)	0 (0)	0 (0)	4 (0)	0 (0)	7 (1)	No apparent problem
CR 1125 N (Rt.)	1 (1)	0 (0)	1 (0)	0 (0)	2 (0)	0 (0)	0 (0)	0 (0)	0 (0)	4 (1)	No apparent problem
CR 1150 N (Rt.)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	2 (0)	0 (0)	2 (0)	No apparent problem
CR 1200 N	3 (1)	0 (0)	0 (0)	0 (0)	3 (1)	0 (0)	0 (0)	2 (0)	0 (0)	8 (2)	No apparent problem
CR 950 S	0 (0)	0 (0)	0 (0)	0 (0)	1 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0)	No apparent problem
CR 900 S	1 (0)	0 (0)	0 (0)	0 (0)	4 (3)	0 (0)	0 (0)	1 (0)	0 (0)	6 (3)	No apparent problem
CR 850 S	1 (0)	0 (0)	0 (0)	0 (0)	2 (0)	0 (0)	0 (0)	1 (0)	0 (0)	4 (0)	No apparent problem
CR 800 S	0 (0)	1 (1)	1 (0)	1 (1)	1 (0)	0 (0)	0 (0)	1 (0)	0 (0)	5 (1)	No apparent problem
CR 750 S	2 (0)	0 (0)	0 (0)	1 (1)	3 (2)	0 (0)	1 (0)	1 (0)	0 (0)	8 (3)	No apparent problem
CR 650 S	2 (1)	0 (0)	0 (0)	0 (0)	2 (0)	0 (0)	0 (0)	1 (0)	0 (0)	5 (1)	No apparent problem
CR 600 S	2 (0)	0 (0)	0 (0)	2 (0)	0 (0)	0 (0)	0 (0)	1 (0)	0 (0)	5 (0)	No apparent problem
CR 500 S (Lt.)	1 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	3 (0)	0 (0)	4 (0)	No apparent problem
CR 475 S (Rt.)	0 (0)	0 (0)	0 (0)	1 (1)	0 (0)	0 (0)	0 (0)	1 (0)	0 (0)	2 (1)	No apparent problem
CR 400 S	0 (0)	0 (0)	2 (1)	15 (11)	1 (0)	1 (0)	0 (0)	1 (0)	0 (0)	20 (13)	Improvements part of Des. No. 0014750
SR 7	9 (5)	0 (0)	4 (1)	6 (0)	1 (0)	4 (3)	1 (0)	1 (0)	0 (0)	26 (9)	19 crashes were @ int., remainder were mid-block
SR 9/SR 46 CR 200 S	19 (4)	0 (0)	2 (2)	16 (9)	2 (1)	7 (3)	0 (0)	1 (0)	0 (0)	47 (19)	Improvements part of Des. No. 9244355
CR 150 S	1 (0)	0 (0)	0 (0)	0 (0)	1 (0)	0 (0)	0 (0)	0 (0)	0 (0)	2 (0)	No apparent problem

Location	Type of Crash										Comments
	Rear end	Head On	Sideswipe	Right Angle	Off Road	Left Turn	Right Turn	Animal	Undetermined	Totals	
CR 100 S	7 (4)	0 (0)	0 (0)	6 (3)	3 (0)	0 (0)	1 (1)	1 (0)	0 (0)	18 (8)	Improvements part of Des. No. 9902720
CR 300 E	7 (4)	0 (0)	0 (0)	5 (4)	1 (1)	2 (0)	0 (0)	0 (0)	0 (0)	15 (9)	Only 3 crashes were @ int., remainder were mid-block
Base Rd	10 (4)	3 (3)	2 (0)	3 (2)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	18 (9)	Improvements part of Des. No. 9902620
CR 50 N	1 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0)	0 (0)	2 (0)	Improvements part of Des. No. 9700230
Totals	**103 (36)**	**8 (8)**	**16 (6)**	**63 (36)**	**49 (18)**	**24 (13)**	**3 (1)**	**37 (1)**	**0 (0)**	**303 (119)**	

# of crashes (# of crashes resulting in personal injury)

Left turn auxiliary lane and passing blister construction at the intersections is expected to reduce the number of rear end, left-turn and right angle crashes. Improvements to the vertical alignment, a widened shoulder, and more forgiving roadside ditches are expected to reduce the number of rear end (mid-block) and off road crashes.

G. PROJECT ALTERNATES AND RECOMMENDATIONS:

In assessing suitable measures to address needs (deficiencies) of US 31, several alternates were considered and are briefly described below.

Four alternates were considered for this project; they are as follows:

ALTERNATE A — Construct a 2-lane rural section with paved shoulders.

ALTERNATE B — Construct a 3-lane rural section with paved shoulders (2-lane with continuous median/left-turn lane).

ALTERNATE C (Preferred) — Construct a 2-lane section with paved shoulders from US 50 to SR 7. Construct a 3-lane section with paved shoulders from SR 7 to CR 50N (2-lane with continuous median/left-turn lane).

ALTERNATE D — No Build

Alternate A proposes to construct a 2-lane section with paved shoulders throughout the project length. Road cross section, vertical alignment improvements, (ISD and SSD) and various intersection improvements would be constructed as a part of this project. However, this alternate does not address the capacity deficiencies that exist at the north end of the project (LOS E), and therefore is not preferred.

Alternate B proposes to construct a 3-lane section (2-lane with continuous median/left-turn lane) with paved shoulders throughout the project length. This alternate does

address all alignment, ISD and capacity issues, however it has more significant right of way impacts, and hence is not the preferred alternate.

Alternate C proposes to construct a 2-lane section with paved shoulders to SR 7, and a 3-lane section (2-lane with continuous median/left-turn lane) with paved shoulders to CR 50 N. This alternate addresses all of the deficiencies that exist along the corridor, and provides the right-of-way required to build a 5-lane urban section north of SR 7 if additional capacity is ever warranted. **This alternate will be further developed in this report.**

Alternate D, the No-Build option, does not address operational and geometric deficiencies that exist along the corridor; therefore it is not a preferred alternate.

All discussion from this point on refers to the Alternate C, the preferred alternate. Pages A-18 to A-35 of the Appendix show Alternate C superimposed on an aerial base map.

This project proposes constructing an additional continuous median/left-turn lane from SR 7 to CR 50 N, widening shoulders, making vertical alignment improvements, and improving intersections from US 50 (Sta. 9+14) for a distance of 17.67 miles to CR 50 N (Sta. 942+24).

Construction of the proposed roadway should be designed as a 3R project. All existing signs along the corridor shall be replaced. The addition of a continuous median/left-turn lane at the north end of the project is aimed at improving traffic operation by removing left-turn traffic from mainline through lanes in this stretch of US 31 having relatively high travel demand from SR 7 to CR 50 N. At the designer's discretion, the median/left-turn lane area may take on various specific forms, section to section, consistent with land use and access patterns. Although the corridor still functions at an LOS E in the design year with these improvements, it does provide the right-of-way required to build a "5-lane" urban section if ever warranted. In addition, the number of rear end and left turn crashes is expected to be reduced as a result of this added median/left-turn lane.

The following table summarizes essential elements of the proposal:

Functional Classification:	Urban Minor Arterial (within Seymour City Limits) Rural Major Collector (from Seymour City Limits to end of project)
Design Class: (sta. 29+00 to sta. 268+00) (sta. 290+00 to sta. 776+00) (begin project to sta. 29+00) (sta. 268+00 to sta. 290+00) (sta. 776+00 to end project)	 3R, State Rural Collector – 2-lane; AADT over 5000 (Table 55-3B) 3R, Two Lane Urban Arterials; Suburban (Table 55-3F)
Terrain:	Level
Cross Section:	See Proposed Typical Sections (A-36)
Design Speed:	45 mph (from 800' north of CR 1000N to 200' north of CR 1050N) 55 mph (remainder of corridor)
Access Control:	None
FHWA Oversight:	Not required

TYPICAL CROSS SECTIONS

The proposed typical section along US 31 includes 2-12' through lanes with 8' paved shoulders (9' usable width) from station 29+00 to station 268+00, and station 290+00 to station 776+00. From station 776+00 to the end of the project, the proposed typical section includes the addition of a 16' continuous left turn lane, with 6' paved shoulders (7' usable width). From the beginning of the project to station 29+00 and from station 268+00 to station 290+00 (suburban areas) the typical section includes 2-12' through lanes with 6' paved shoulders (7' usable width). Standard 3R compatible roadside ditches of prevailing 3:1 or 4:1 side slopes shall be constructed along the entire length of the corridor. Typical sections can be seen on page A-36 of the Appendix.

PAVEMENT RECOMMENDATION

The INDOT preliminary pavement recommendation is to construct new shoulders as per chapter 52 of the INDOT Design Manual. Where horizontal or vertical alignment improvements aren't required, the existing mainline will be milled (25mm) and resurfaced with 38 mm of HMA. For turn lanes at various intersections use 12 inches of HMA over 7 inches of compacted aggregate type O. The complete pavement recommendation can be found on page C-25 of the Appendix.

HORIZONTAL AND VERTICAL ALIGNMENTS
(See Plan & Profile Sheets A-18 to A-35)

The existing horizontal alignment is satisfactory, assuming suitable superelevation is in place. The designer is instructed to verify adequate superelvation and make suitable improvements to the superelevation if needed.

The proposed vertical alignment corrects numerous vertical curves along the corridor whose K values are below minimum. Eight of the fourteen substandard vertical curves have a CEDS value within 5 mph of the design speed. As shown in the profile the new vertical alignment will meet standards for stopping sight distance and ISD. (Note: The designer is instructed to make suitable refinements to these conceptual vertical alignments.)

The following summarizes the proposed improvements for the vertical curves with K values less than minimum.

Existing vertical curves				
Type	Station	Existing K value	Existing CEDS	Comments
Crest	46+26.13	109.59	53 mph	New vertical alignment for railroad bridge to meet criteria for minimum K values
Sag	51+75	41.24	29 mph	New vertical alignment for railroad bridge to meet criteria for minimum K values
Sag	54+75	63.49	36 mph	New vertical alignment for railroad bridge to meet criteria for minimum K values
Sag	108+25	86.96	47 mph	New vertical alignment to meet criteria for minimum K values
Crest	112+00	79.96	49 mph	New vertical alignment to meet criteria for minimum K values
Crest	129+00	122.7	54 mph	No improvements proposed because CEDS is within 5 mph of design speed
Crest	173+00	87.93	50 mph	New vertical alignment for CR 860 N ISD to meet criteria for minimum K values

Sag	179+50	93.04	49 mph	New vertical alignment for CR 860 N ISD to meet criteria for minimum K values
Crest	188+50	99.26	52 mph	New vertical alignment for CR 860 N ISD to meet criteria for minimum K values
Sag	303+00	118.98	54 mph	No improvements proposed because CEDS is within 5 mph of design speed
Crest	315+50	90.60	51 mph	New vertical alignment for CR 1100 N ISD to meet criteria for minimum K values
Sag	340+50	116.67	54 mph	No improvements proposed because CEDS is within 5 mph of design speed
Sag	555+60	97.22	50 mph	New vertical alignment for CR 650 S ISD to meet criteria for minimum K values
Sag	952+84	92.41	49 mph	No improvements proposed; outside project limits

HYDRAULIC RECOMMENDATIONS

The INDOT's preliminary hydraulics report for this project indicates that 29 of the 34 listed culvert crossing are hydraulically inadequate. Therefore, it is proposed to replace all of the culverts. The proposed culvert (small drainage structure) sizes are shown in a table in the "Existing Conditions" section of this report. Additionally the INDOT Hydraulics report for this project can be found in the Appendix of this report, pages C-4 to C-24.

BRIDGE STRUCTURES

The following summarizes existing bridge structures along the corridor that are to be replaced or widened. Refer to the tables in "Existing Conditions" of this report for summaries of the existing bridge characteristics.

Existing Bridge No. 31-36-2028, US 31 under CSX Railroad
Proposed Bridge No. 31-36-8544

Three alternates were analyzed for this structure. The alternatives are as follows:

Alternate 1: Construct US 31 over the CSX railroad tracks, maintain railroad traffic on the current alignment (no changes proposed to railroad).

Alternate 2: Lower US 31 for sufficient vertical separation, construct new structure for railroad to provide sufficient clear width of the roadway and a temporary run-around for railroad traffic along the north side of the existing railroad.

Alternate 3: Construct a new structure for railroad, raising tracks to provide sufficient separation, and a temporary run-around for railroad traffic along the north side of the existing track.

Alternate 1 is recommended. Alternate 1 allows for the railroad track to remain on its existing alignment, and hence no runaround would be necessary.

This bridge replacement project shall be designed in compliance with the Indiana Design Manual, chapter 53, "Geometric Design Tables (4R)", and all other applicable standards (due to this being a new bridge construction, and a relatively "long life" element, 4R design criteria for this bridge is appropriate). Coordination with CSX Transportation concerning its requirements for this overhead grade separation has determined that the proposed structure must be in accordance with the requirements contained in CSX's *Criteria for Overhead Bridges*, a copy of which is provided in Appendix pages C-26 through C-34.

Additional coordination has taken place as to the feasibility of leaving the existing track in place and maintaining railroad traffic while constructing US 31 over the tracks. It is desirable to leave the existing bridge in place and to fill/compact the bridge area as high as possible. The areas under the bridge that could not be reached for compaction shall then be filled with flowable fill. CSX was informed of all three alternates, and Alternate 1 is the one that it preferred. See Appendix C-35 for an email correspondence from CSX concerning this issue.

In order to minimize impacts to the houses in the southwest quadrant, it is proposed to install a single span structure with retaining walls. The proposed structure's typical opening and cross section are shown on Appendix page A-37. Prestressed concrete box beams have been shown on the typical section in order to reduce the required grade raise to the greatest extent possible. Utilizing Type III I-beams would require an additional 1' grade raise (vs. box beams). The 25' horizontal clearance shown will eliminate the need for a crash wall and allow for trackside drainage and possible future rail line additions. The designer shall carry on in consultation with CSX and refine the details shown in this report during the structure size and type stage of project development.

Alternate 2 would require constructing a new bridge for the railroad to allow for horizontal clearance of the roadway, and a temporary run-around for railroad traffic along the north side of the existing track. Construction of the temporary tracks would include a temporary railroad bridge. The estimated cost of the temporary runaround is approximately $800,000. Due to the cost of the temporary runaround, this alternate is not preferred. Additionally, Alternate 2 would require mechanical pumps to drain the sunken roadway area, creating long-term maintenance costs. Alternate 3 would require the railroad tracks to be raised at a rate of 1 inch per 100 linear feet, resulting in a grade change of 3 feet, and over 7200 linear feet of track being affected. In addition, a new railroad bridge would need to be constructed to address the horizontal clearance. The cost of the temporary runaround would result in an estimated cost of over $1,500,000, and hence this alternate is not preferred.

Existing Bridge No. 31-36-7165, US 31 over Sandy Branch
Proposed Bridge No. 31-36-7165A

Due to the good condition of this structure, its replacement is not recommended. Instead, widen and rehabilitate the existing bridge. This bridge rehabilitation project shall be designed in compliance with the Indiana Design Manual, chapter 55, "Geometric Design of Existing Non-Freeways (3R)", and all other applicable standards.

The existing structure shall be widened to provide a clear roadway width of 55'-4". This additional clear roadway is necessary to accommodate the proposed left turn lane to County Road 700 North. The structure can be widened by adding one additional type IV I-beams to each side, at a 4'-0" spacing from the existing exterior I-beams.

The designer shall determine at the preliminary field check if integral construction and/or a concrete deck overlay is warranted at this time. Current Standard Bridge and approach railing shall be installed.

Existing Bridge No. 31-36-1773, US 31 over Quade Ditch
Proposed Bridge No. 31-36-8545

Due to the existing superstructure's deterioration and scouring of the substructure, complete replacement is recommended. This bridge replacement project shall be designed in compliance with the Indiana Design Manual, chapter 55, "Geometric Design of Existing Non-Freeways (3R)", and all other applicable standards.

According to the hydraulic recommendation provided by INDOT's Hydraulics Unit, this structure shall be replaced "in kind". The existing structure, approximately station 350+25, is hydraulically adequate. The designer has two options that will hydraulically satisfy this criterion. A similar structure to the existing, a 9 ft high by 32 ft clear span structure on vertical abutments, or a single span spill through structure approximately 68 ft in length. All options shall provide a minimum of 2 ft of freeboard and a 43'-4" clear roadway.

In order to maintain the existing profile grade, the 32 ft structure option would utilize spread composite 12" prestressed concrete box beams on full-depth concrete abutments. The designer shall compare the economics of this structure verses a single span spread 33" composite concrete box beam structure with spill-through slopes with an estimated 1.6 ft grade raise. All options shall utilize integral end bent construction and provide adequate scour protection measures, to account for the erodible soil types found at this site. Multiple span structures shall not be considered due to the debris potential. A conceptual bridge section for both of these scenarios can be found on page A-38 of the Appendix.

The designer shall consider all possible alternative structure types during the structure size and type stage of project development to determine the most economical structure configuration for this site.

Existing Bridge No. 31-36-1775C, US 31 over Sand Creek
Proposed Bridge No. 31-36-8546

Due to the substandard vertical and horizontal clearances, extent of deterioration, age and inability to economically widen this structure, replacement is recommended. This bridge replacement project shall be designed in compliance with the Indiana Design Manual, chapter 55, "Geometric Design of Existing Non-Freeways (3R)", and all other applicable standards.

According to the hydraulic recommendation provided by INDOT's Hydraulics Unit, this structure shall be replaced with a structure that has an additional length of approximately 150 ft, in order to accommodate the removal of two overflow structures. The 12 ft by 19.5 ft concrete slab structure located south of this structure and the 8 ft by 8 ft concrete box culvert to the north of the bridge, shall be removed.

A 500 ft – 5 span, continuous prestressed concrete bulb tee beam structure with 2:1 spill through slopes has been estimated. This proposed structure would raise the profile grade of the road approximately 3.4 ft in order to maintain 2 ft of freeboard. Various bulb-tee concrete beams were investigated with the 5 $^1/_2$ ft deep beam appearing to be most economical at approximate 9.0 ft beam spacing. A clear roadway width of 43'-4" shall be provided. A conceptual bridge section for this structure can be found on page A-38 of the Appendix.

The designer shall consider other possible alternative structure types, such as continuous steel girder and post-tensioned structures, during the structure size and type stage of the project development to determine the most economical structure type and configuration for this site based on the detailed hydraulic model to be provided by INDOT.

Existing Bridge No. 31-03-7821, US 31 over Morton Hall Ditch
Proposed Bridge No. 31-03-7821A

Due to the very good condition of this structure, its replacement is not recommended. Instead, widen and rehabilitate the existing bridge. This bridge rehabilitation project shall be designed in compliance with the Indiana Design Manual, chapter 55, "Geometric Design of Existing Non-Freeways (3R)", and all other applicable standards.

The existing structure shall be widened to provide a clear roadway width of 55'-4". This additional clear roadway is necessary to accommodate a left turn lane to County Road 850 South. Extending the existing reinforced concrete slab and replacing the concrete barrier rail can accommodate the clear roadway width for the additional lane.

The designer shall determine at the preliminary field check if additional rehabilitation work is necessary to the existing structure.

Existing Bridge No. 31-03-1779B, US 31 over Fishers Fork
Proposed Bridge No. 31-03-1779C

Due to the good condition of this structure, its replacement is not recommended. Instead, widen and rehabilitate the existing bridge. This bridge rehabilitation project shall be designed in compliance with the Indiana Design Manual, chapter 55, "Geometric Design of Existing Non-Freeways (3R)", and all other applicable standards.

The existing structure shall be widened to provide a clear roadway width of 61'-4". This additional clear roadway is necessary to accommodate the proposed lanes at SR 7. The existing abutments shall be widened to accommodate one-type II I-beams at a 5'-0" spacing on the west side of the abutment and two-type II I-beams at a 5'-5" spacing on the opposing side. The beams will need to be designed for the new girder spacing from the existing beams to the proposed and the overhang.

The designer shall consider other possible alternatives during the structure size and type stage of project development to determine the most economical rehabilitation and configuration for this site.

INTERSECTION TREATMENT

All auxiliary lanes along US 31 should include adequate deceleration length plus storage length for the design speed.

US 50 (A-18, 19)

The north approach (of north leg) should be widened to include an exclusive left turn auxiliary lane. A northbound right turn lane will be added to the south approach (of south leg). A signal modernization should be included as a part of this project.

CR 800 N (A-21)

A southbound left turn auxiliary lane is warranted along US 31. The northbound left turn auxiliary lane should also be constructed.

CR 900 N (A-22)

Both northbound and southbound left turn auxiliary lanes are warranted along US 31.

CR 800 S (A-26)

Both northbound and southbound left turn auxiliary lanes are warranted along US 31. A southbound right turn auxiliary lane is warranted on the north approach. A westbound left turn lane with 100' storage length plus a 100' taper should be constructed along the east approach. An eastbound left turn lane with 100' storage length plus a 100' taper should be constructed along the west approach.

CR 750 S (A-27)

Both northbound and southbound left turn auxiliary lanes are warranted along US 31.

CR 500 S (A-29)

A northbound left turn auxiliary lane is warranted along US 31. However, because this is a "T" intersection, a northbound passing blister would be more cost effective and should be constructed along the east side of US 31 at the intersection.

CR 475 S (A-29)

At this "T" intersection, a northbound right turn auxiliary lane is warranted along the south approach. A southbound left turn auxiliary lane is warranted along the north approach. In lieu of the left turn lane, a southbound passing blister should be constructed along the west side of US 31 at the intersection. A westbound left turn auxiliary lane should be constructed along the east approach with 100' storage length and a 100' taper.

SR 7/SR 46 (A-31, 35)

All approaches should have a through lane, left turn auxiliary lane and right turn auxiliary lane. A signal replacement should be included as a part of this project.

Other Intersections

All other 4-way intersections within the project limits are to be constructed with left turn auxiliary lanes along US 31 (for uniformity of intersection design along the corridor, per IDM chapter 46-4.01(02)). Other "T" intersections are to be constructed with a passing blister along US 31 opposite the minor leg of the intersection.

SURVEY REQUIREMENTS

The mainline survey should extend from Station –5+00 to Station 944+27.490, a minimum of 500 feet to the south and 1000 feet to the north of the project limits shown on the aerial photographs, A-15 to A-32. The survey should also extend a minimum distance of 30 feet to the east and west past the proposed right-of-way, or farther if additional survey is necessary to encompass other information needed to complete the design. The adjacent table summarizes the survey quantities.

Survey Line	Feet of Survey
US 31 (mainline)	96500 ft
US 50	800 ft east & west
CR 800 S	300 ft east & west
CR 475 S	300 ft east
CR 7/SR 46	1500 ft east & west
Other intersections (23 total)	200 ft beyond edge of US 31 travel lane
Total length of survey	**109,000 ft**

TRAFFIC MAINTENANCE

Through traffic will be detoured. The anticipated official state detour would utilize US 50 and I-65. The total detour length is approximately 26.66 miles, however the detour route is 0.31 mile shorter than the traveled distance along US 31. This will result in no additional user cost. Local traffic is expected to use various county roads as unofficial detours throughout the project limits. Traffic maintenance will be refined during the design phase, to ensure access to all properties during construction.

RIGHT OF WAY SUMMARY

The existing typical right-of-way along US 31 is 100', 50' per side. The widening of US 31 will require continuous strip right-of-way acquisition on the east and west sides. For the purposes of this report (i.e. displays, quantities and costs) the grading for side slopes is included in the permanent right-of-way. The proposed prevailing right-of-way will be 60' on each side, widening where necessary to allow for auxiliary lanes and other improvements. The following table summarizes the amount and type of right-of-way required. Temporary right-of-way will be required for construction of some driveways. Exact location of temporary right-of-way requirements will be determined during the design phase.

Land Use (Approximate No. Of Parcels)	**Amount of Permanent R/W Required**
Residential (151)	12.09 acres
Commercial (39)	5.28 acres
Agricultural/Wooded (82)	28.36 acres
Total (272)	45.73 acres

One residential relocation is anticipated as a part of this project, located approximately at station 47+00. This relocation is due to the proposed improvements at the CSX railroad, and can be seen on page A-19 of the Appendix.

ESTIMATED COSTS (Year 2002)

Road Rehabilitation	$18,800,000
Bridge Replacement (at CSX Railroad)	$ 240,800
Bridge Replacement (at Quade Ditch)	$ 239,000
Bridge Replacement (at Sand Creek)	$ 1,612,500
Bridge Rehabilitation (at Sandy Branch)	$ 210,200
Bridge Rehabilitation (at Morton Hall Ditch)	$ 156,400
Bridge Rehabilitation (at Fishers Fork)	$ 117,000
Traffic Maintenance:	$ 200,000
CONSTRUCTION TOTAL	$21,590,000
Right-of-Way Services *	$ 1,370,000
Right-of-Way	$ 820,000
Right-of-Way Total	$ 2,190,000
Engineering (Includes Survey):	$ 780,000
PROJECT TOTAL	$24,560,000

- Estimated at $5,000 / parcel for Engineering, abstracting appraising and buying

H. ENVIRONMENTAL ISSUES:

The primary environmental considerations on this project involve the additional right-of-way requirement and anticipated residential relocation. Also, historical significance of the existing steel truss bridge over Sand Creek shall be investigated during the preliminary stages of project development. The INDOT Environmental Assessment Section is preparing the project's environmental document that will address the project's social economic, and environmental consequences. The designer shall coordinate with the environmental scientist in the Environmental Assessment Section as soon as possible after determining precise impacts to any sensitive sites.

I. RELATED PROJECTS AND LONG RANGE PLAN:

The subject project is scheduled as ready for letting (RFL) in January 2005, though the scale of work may delay the schedule. The kin number assigned is 4128. According to the *2000 Directory of INDOT Highway Projects* and the INDOT Project Database (as of 09/25/01), there are several future projects scheduled which may affect this subject project. The projects are as follows:

Des. Number	Project Description	Comments
0014690	US 50 Road Reconstruction, from US 31 to SR 7 (RP 105+60 to 117+84), Jennings and Jackson Counties	RFL date: 11/2005. Project is at the south end of the subject project. Subject project will tie into this project. Coordinate to ensure traffic maintenance and project compatibility.
0014810	SR 7 Road Reconstruction, from SR 3 to US 31 (RP 21+389 to RP 40+19), Bartholomew and Jennings Counties	RFL date: 4/2005. Project is at the north end of the subject project. Coordinate to ensure traffic maintenance and project compatibility.
0100359	Bridge Replacement, US 31 over Quade Ditch, 6.36 miles N. of US 50 (RP 56+78), Jackson County	RFL date: 12/2006. This project is within the limits of the subject project. This project will be included in (as a "baby" to) the subject project. Kin # 4128
0014750	Intersection Improvements, US 31 at CR 400 S, 1.6 miles S. of SR 7 (RP 63+26), Bartholomew County	RFL date: 5/2006. This project is within the limits of the subject project. This project will be included in (a "baby" to) the subject project. Kin # 4128
0200816	Bridge Replacement, US 31 over CSX Railroad, 0.8 mile N. of US 50 (RP 51+23), Jackson County	RFL date: 2/2007. This project is within the limits of the subject project. This project will be included in (a "baby" to) the subject project. Kin # 4128
0200817	Bridge Rehabilitation, US 31 over Sandy Branch, 1.8 miles N. of US 50 (RP 52+23), Jackson County	RFL date: 2/2007. This project is within the limits of the subject project. This project will be included in (a "baby" to) the subject project. Kin # 4128
0200818	Bridge Replacement, US 31 over Big Sand Creek, 7.2 miles S. of SR 7, (RP 57+65), Jackson/Bartholomew County Line	RFL date: 2/2007. This project is within the limits of the subject project. This project will be included in (a "baby" to) the subject project. Kin # 4128
0200819	Bridge Rehabilitation, US 31 over Morton Hall Ditch, 0.96 mile N. of Jackson/Bartholomew County line (RP 58+61), Bartholomew County	RFL date: 2/2007. This project is within the limits of the subject project. This project will be included in (a "baby" to) the subject project. Kin # 4128
0200820	Bridge Rehabilitation, US 31 over Fishers Fork, .01 mile S. of SR 7 (RP 64+77), Bartholomew County	RFL date: 2/2007. This project is within the limits of the subject project. This project will be included in (a "baby" to) the subject project. Kin # 4128

Des. Number	Project Description	Comments
9244355	Road Reconstruction, CR 200 S (re-routed SR 46) from SR 7 to US 31, Bartholomew County	RFL date: 10/2002. This project is within the limits of the subject project. This project will be a project exception to the subject project. Coordinate to ensure traffic maintenance and project compatibility.
9902720	Intersection Improvements, US 31 at CR 100 S., (RP 66+41), Bartholomew County	RFL date: 11/2004. This project is within the limits of the subject project. This project will be a project exception to the subject project. Coordinate to ensure traffic maintenance and project compatibility.
9902620	Intersection Improvements, US 31 at Base Rd., (RP 67+58), Bartholomew County	RFL date: 1/2005. This project is within the limits of the subject project. This project will be a project exception to the subject project. Coordinate to ensure traffic maintenance and project compatibility.
9700230	Added Travel Lanes, US 31 from CR 50 N to 2.46 miles N of Old SR 46 (RP 68+25 to 72+19), Bartholomew County	RFL date: 5/2004. Project is at the north end of the subject project. Subject project will tie into this project. Coordinate to ensure traffic maintenance and project compatibility.

The designer shall check for any new projects posted after this date prior to final plan submittal for compatibility with the proposed work. Soon after this Engineer's Report is published, INDOT will program remaining "baby" projects that are to be kinned to this Road Rehabilitation "mother" project, including bridge replacements, bridge rehabilitations, traffic signals and signs.

INDOT's recently released 2000-2025 Long Range Plan shows no expansion (added travel lanes) to US 31 within the subject project area though 2025. The Plan includes an element ("placeholder") to expand SR 7 from existing 2 to 4 lanes in 2019.

J. COORDINATION, MEETINGS, CONCURRENCE:

This project has involved coordination with the following individuals, among others:

Mike Hoffman	INDOT, Seymour District, Traffic Engineering
David Dye	INDOT, Seymour District, Development
Henry Brown	INDOT, Central Office, Design Division

These individuals attended the field check meeting held on April 24, 2001 and provided their input into this project. The Environmental Assessment Section was invited. The major issues relative to the field investigation are detailed in the Field Check Minutes, located in Appendix C-1 through C-3. Photographs of the project site are located on page A-3 of the Appendix.

Draft copies of this Engineer's Report were sent to David Dye, Seymour District Program Development Engineer; and Henry Brown, Design.

Coordination was carried out with INDOT's Railroad Section Manager in the Multimodal Division, and Bridge Management Engineer in the Program Development Division.

Additional coordination has taken place with Brad Steckler and Tarlochan Bansi from INDOT's Engineering Assessment Section.

K. CHANGES TO PROPOSAL:

The Engineering Assessment Section shall be consulted if deviation from the proposal (scope of work) is determined to be necessary during a later phase of project development. The person initiating the change should send a memo to the Engineering Assessment Section Manager for concurrence. The designer should route the memo through the Design Division Section Manager. The memo should include justification for the change and the estimated cost difference.

CONCUR: _____ **DATE:** 12-12-02

Brad L. Steckler, Manager
Engineering Assessment Section

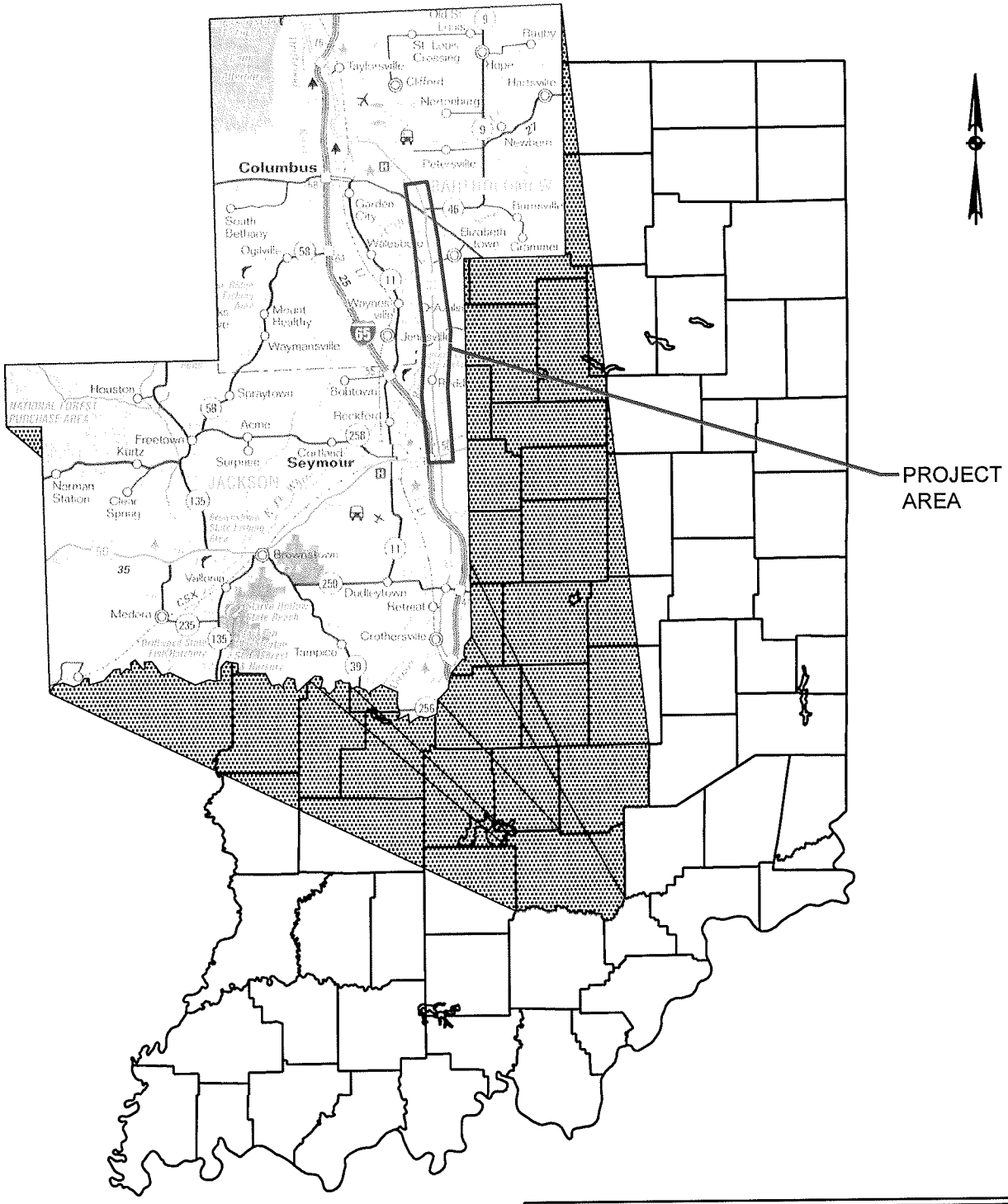
cc:

Sally Chesney (3), INDOT Project Coordinator
Gary Mroczka, INDOT Specialty Group
Matt Thomas, INDOT, Design, Utilities Engineer
William Schmidt, INDOT Design-Location Survey Section
Jim Juricic, INDOT Environmental Assessment Section
Athar Khan, INDOT Materials & Test, Design
Roberta Johnson, INDOT, Land Acquisition
Mike Scime, INDOT, Railroad Section Manager
J. Ude/M. Hoffman, INDOT, Seymour District
B. Steckler/T. Bansi/Engineering Assessment Section File

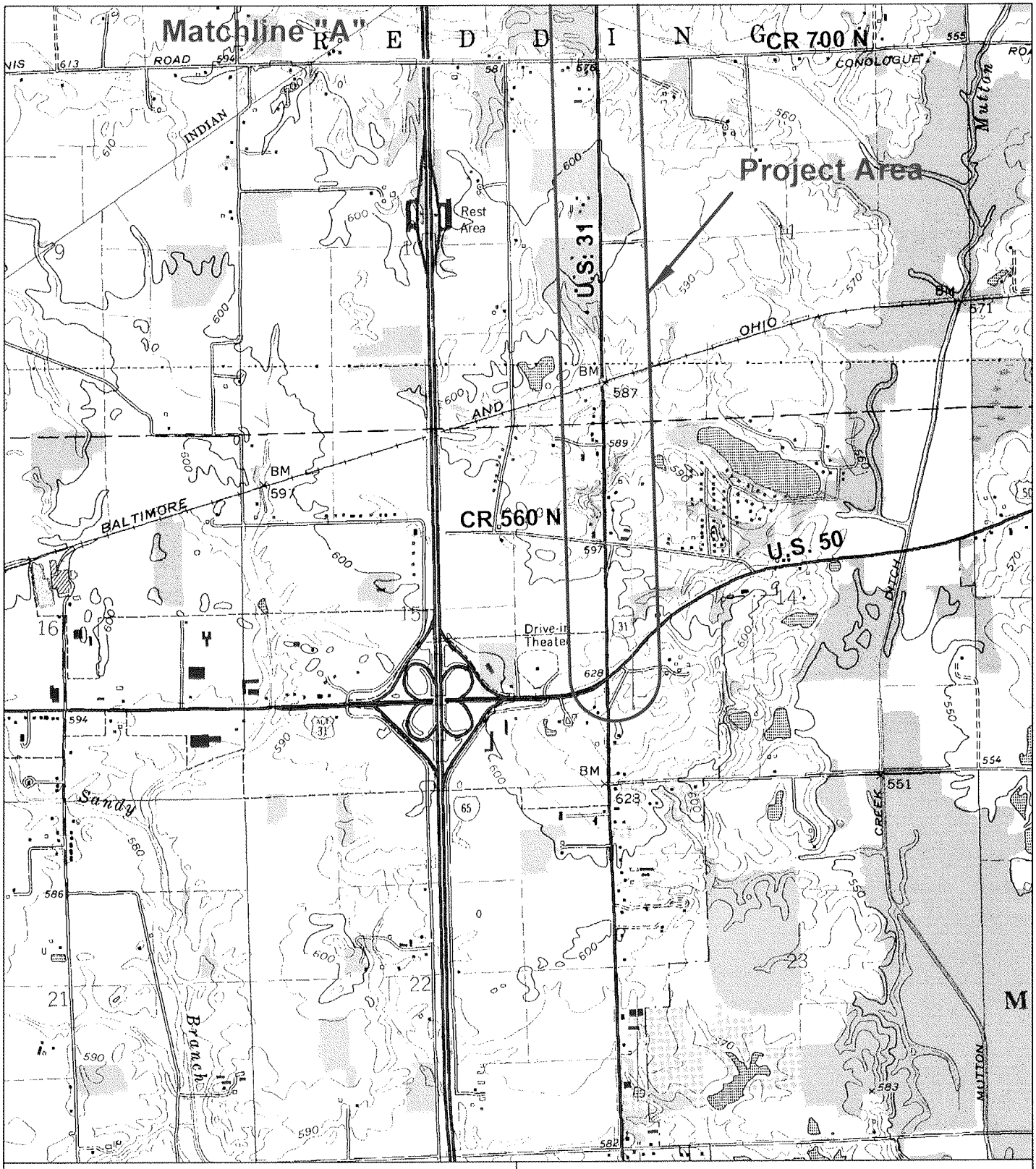
USI File 2000-922

APPENDIX

ITEM	PAGE
Section A Graphics	
LOCATION MAPS	A-1,2a-2f
PROJECT AREA PHOTOS	A-3-17
AERIAL PHOTOGRAPH/ PLAN SHEET	A-17-35
TYPICAL CROSS SECTIONS	A-36-38
Section B Data and Analysis	
TRAFFIC DATA	B-1-24
Other Items	
FIELD CHECK MINUTES	C-1-3
HYDRAULIC RECOMMENDATION	C-4-24
PAVEMENT RECOMMENDATION	C-25
CSX *CRITERIA FOR OVERHEAD BRIDGES*	C-26-34
COORESPONDENCE WITH CSX	C-35

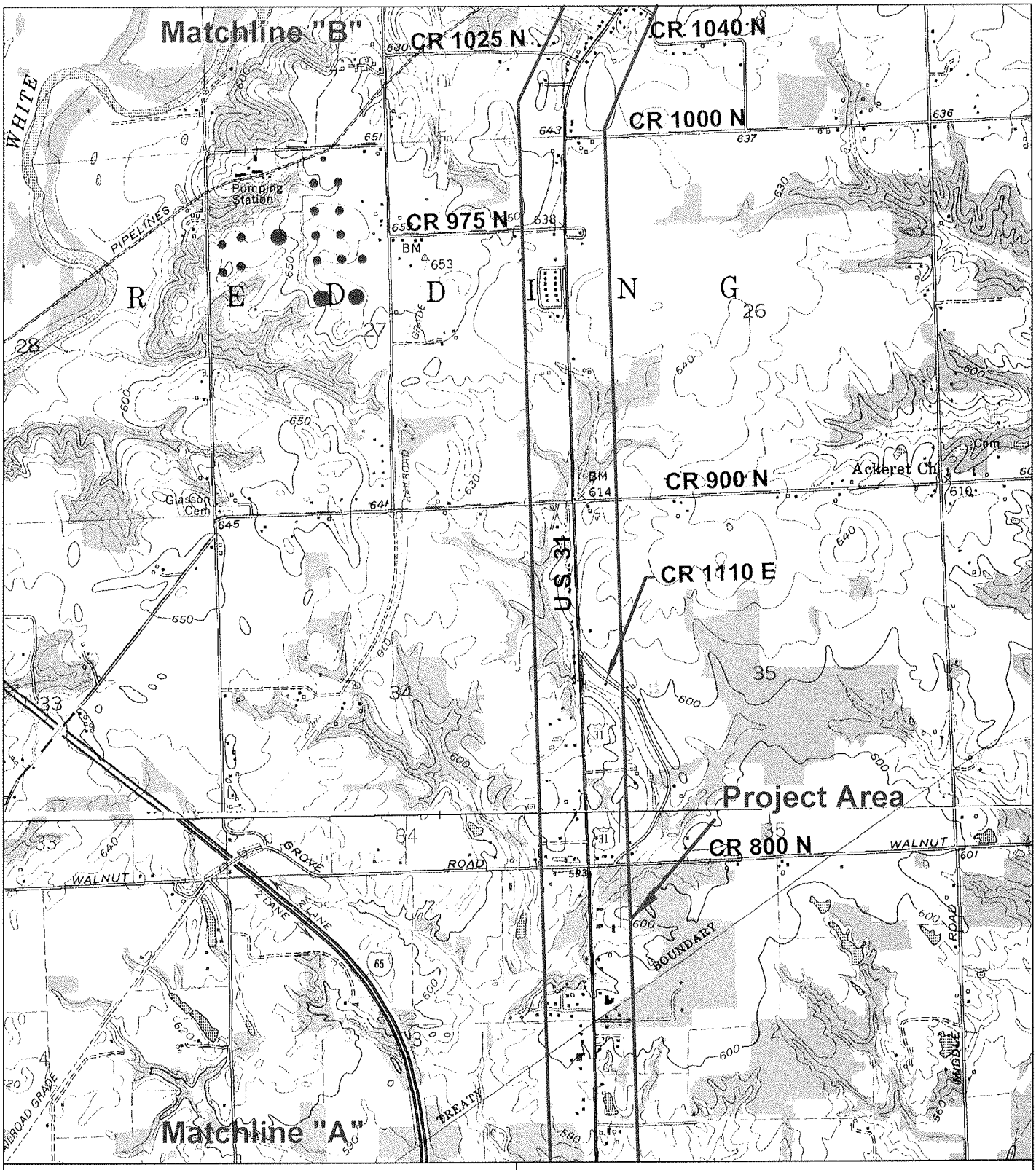


Des. No. 0014820
US 31 from US 50 to CR 50 W
Jackson & Bartholomew Counties



Columbus, Azalia, Elizabeth
Town and Chestnut Ridge
Indiana Quadrangle
Scale = 1:24,000

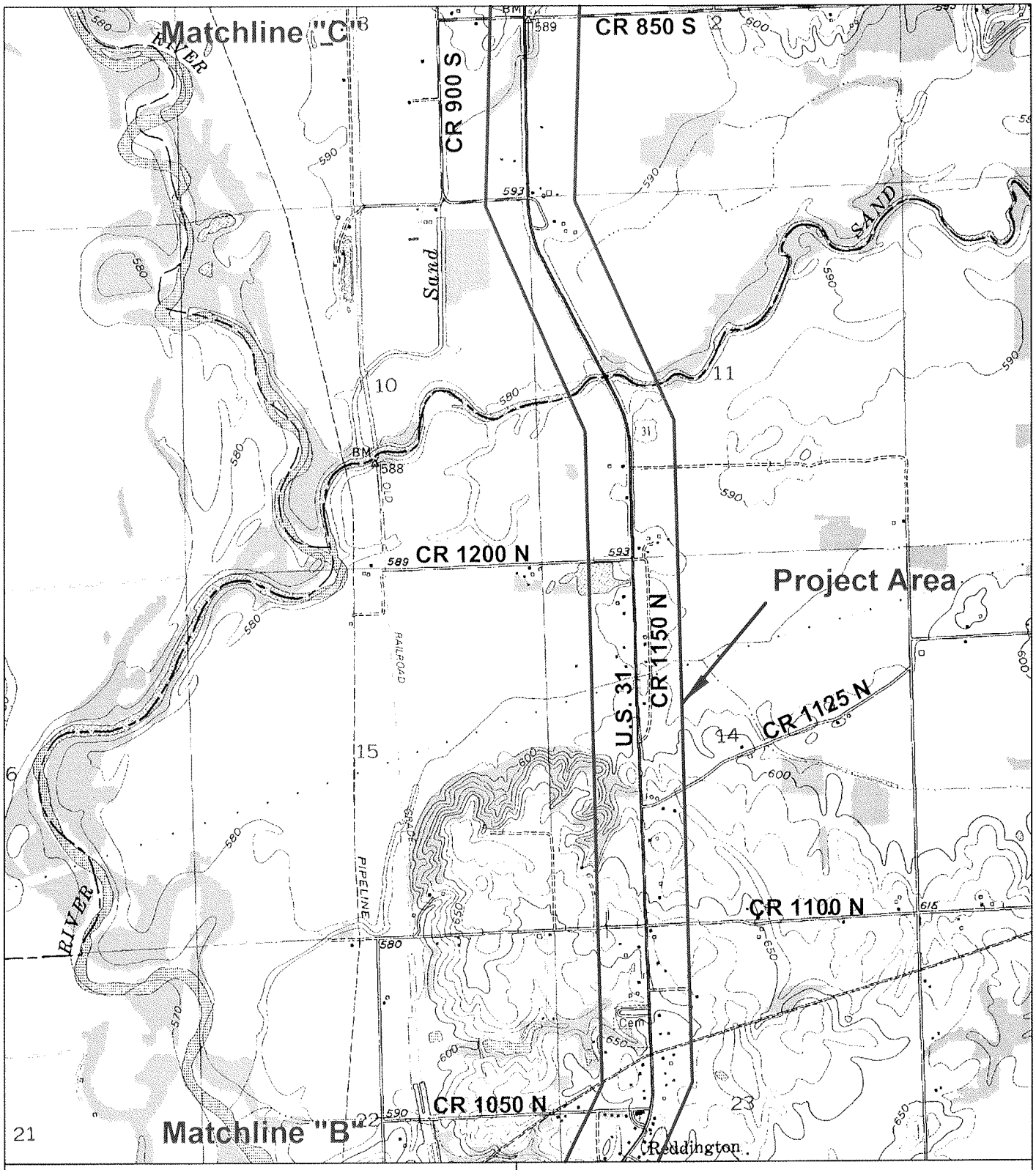
Des. No. 0014820
U.S. 31 From U.S. 50 To C.R. 50 N.
Road Rehabilitation
Jackson and
Bartholomew Counties



Columbus, Azalia, Elizabeth
Town and Chestnut Ridge
Indiana Quadrangle
Scale = 1:24,000

Des. No. 0014820
U.S. 31 From U.S. 50 To C.R. 50 N.
Road Rehabilitation
Jackson and
Bartholomew Counties

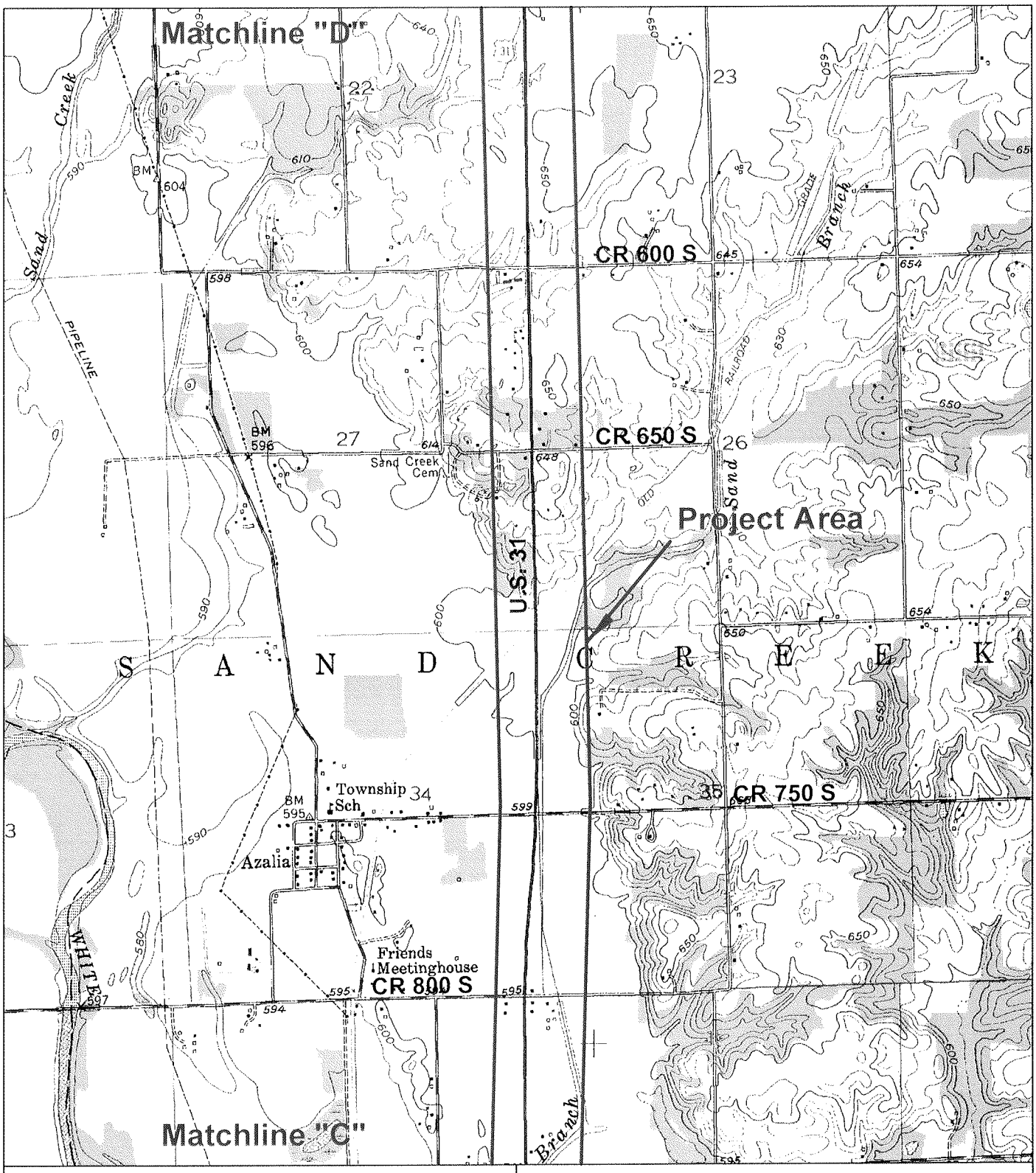
A-2b



Columbus, Azalia, Elizabeth
Town and Chestnut Ridge
Indiana Quadrangle
Scale = 1:24,000

Des. No. 0014820
U.S. 31 From U.S. 50 To C.R. 50 N.
Road Rehabilitation
Jackson and
Bartholomew Counties

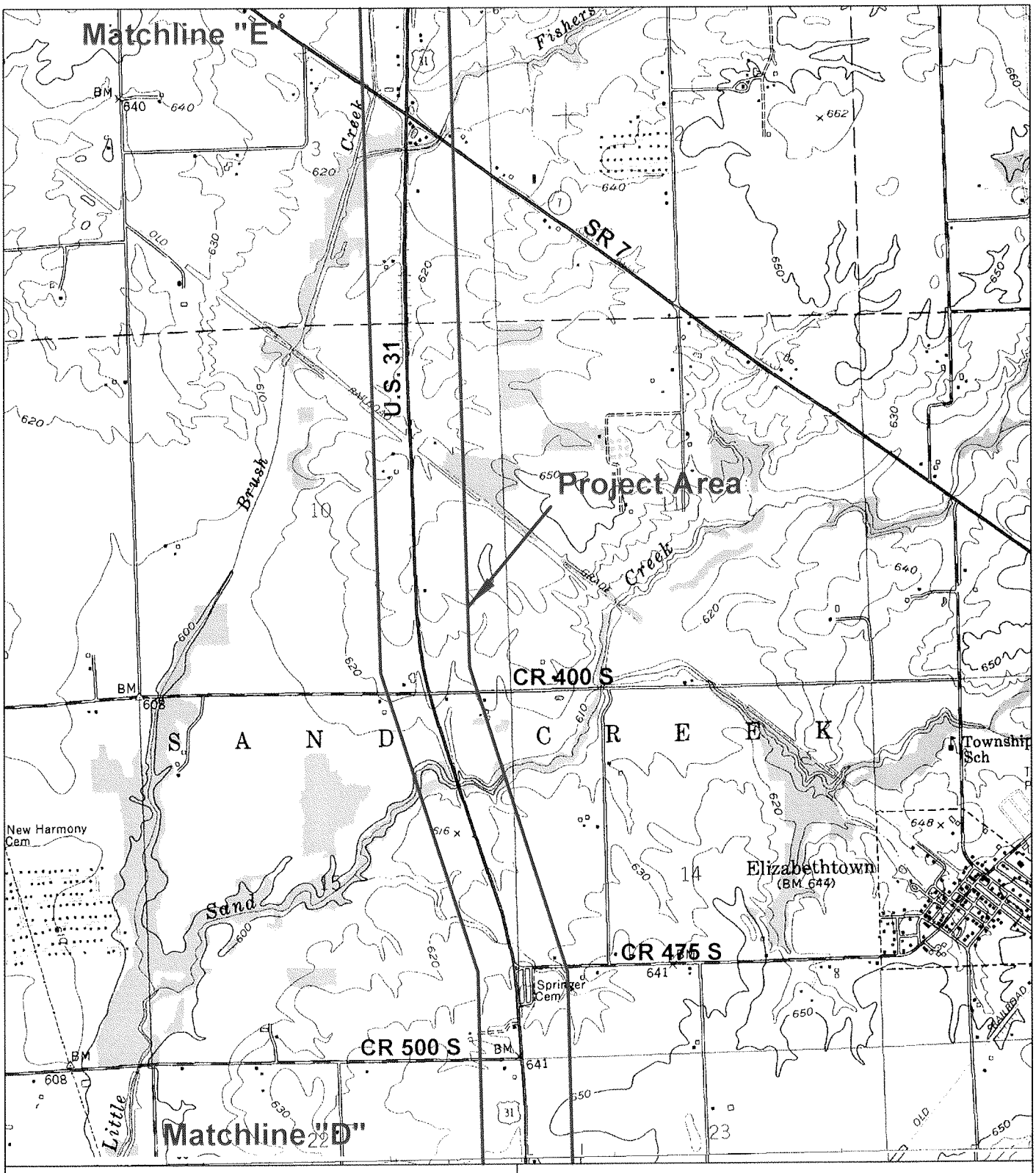
A-2c



Columbus, Azalia, Elizabeth Town and Chestnut Ridge Indiana Quadrangle
Scale = 1:24,000

Des. No. 0014820
U.S. 31 From U.S. 50 To C.R. 50 N.
Road Rehabilitation
Jackson and
Bartholomew Counties

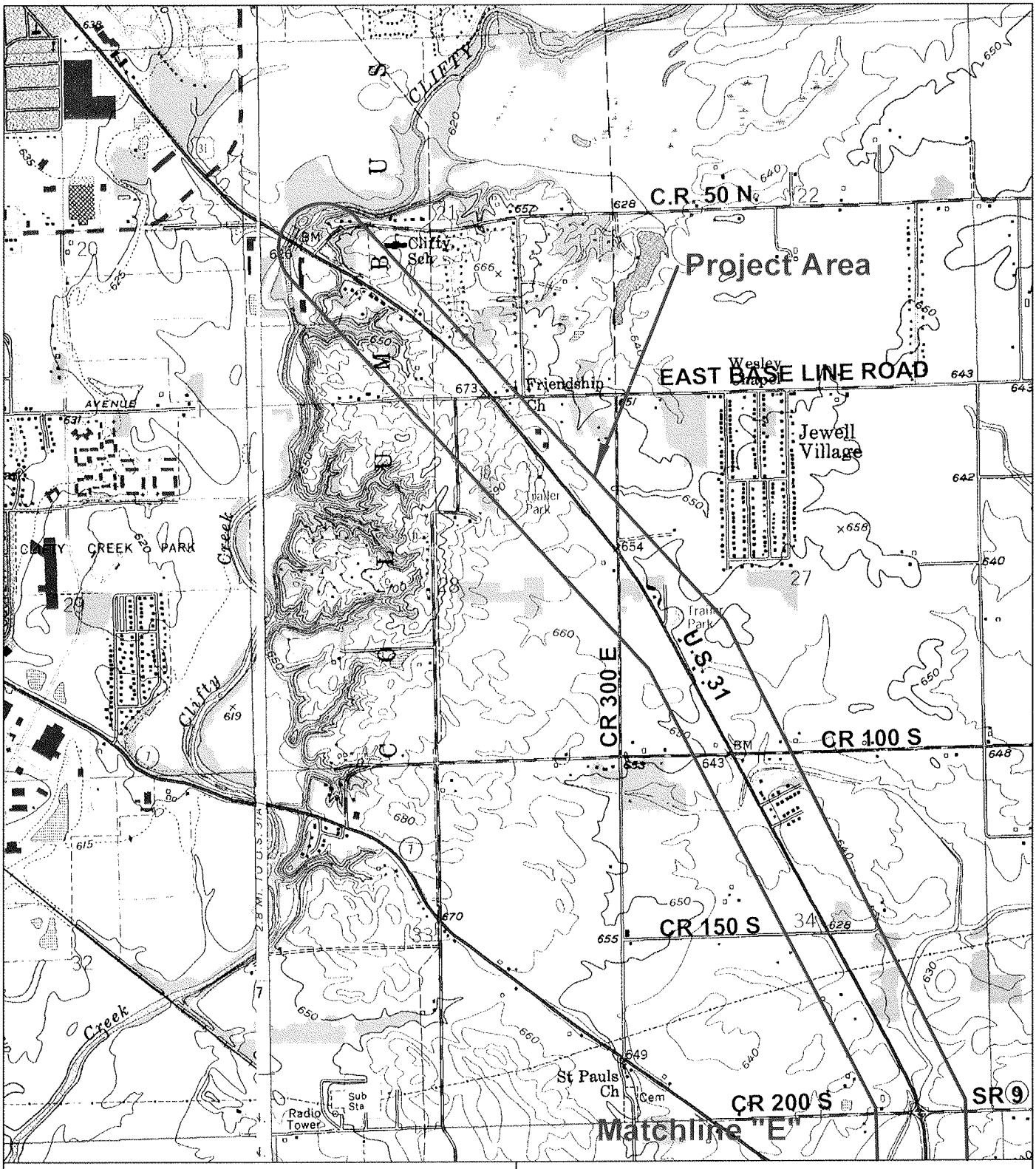
A-2d



Columbus, Azalia, Elizabeth Town and Chestnut Ridge Indiana Quadrangle
Scale = 1:24,000

Des. No. 0014820
U.S. 31 From U.S. 50 To C.R. 50 N.
Road Rehabilitation
Jackson and
Bartholomew Counties

A-2e



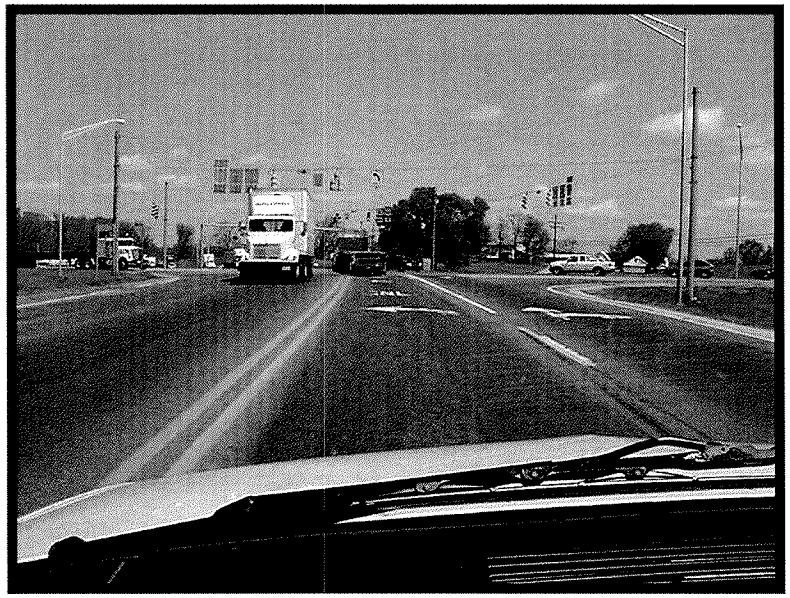
Columbus, Azalia, Elizabeth
Town and Chestnut Ridge
Indiana Quadrangle
Scale = 1:24,000

Des. No. 0014820
U.S. 31 From U.S. 50 To C.R. 50 N.
Road Rehabilitation
Jackson and
Bartholomew Counties

FACING NORTH ALONG US 31 (SOUTH OF INTERSECTION)

FACING SOUTH ALONG US 31(NORTH OF INTERSECTION)

FACING WEST ALONG US 50 (EAST OF INTERSECTION)

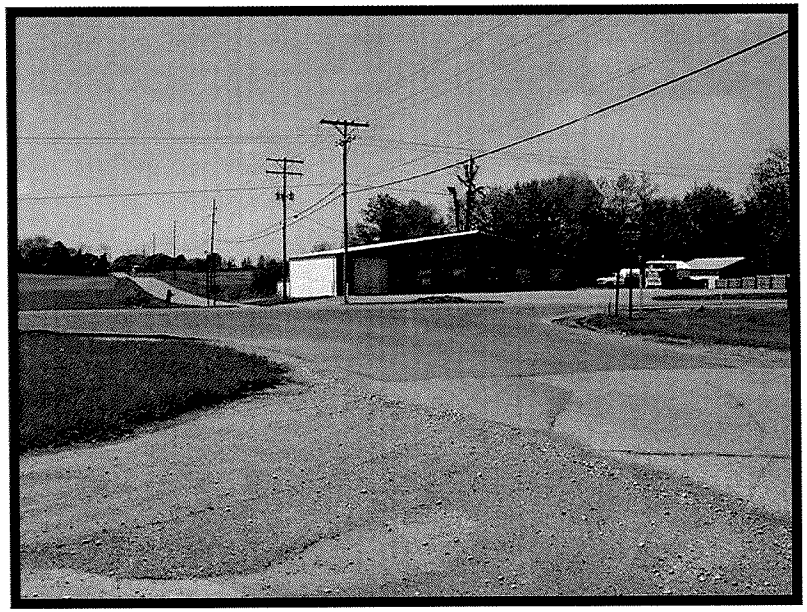


FACING EAST ALONG US 50(WEST OF INTERSECTION)

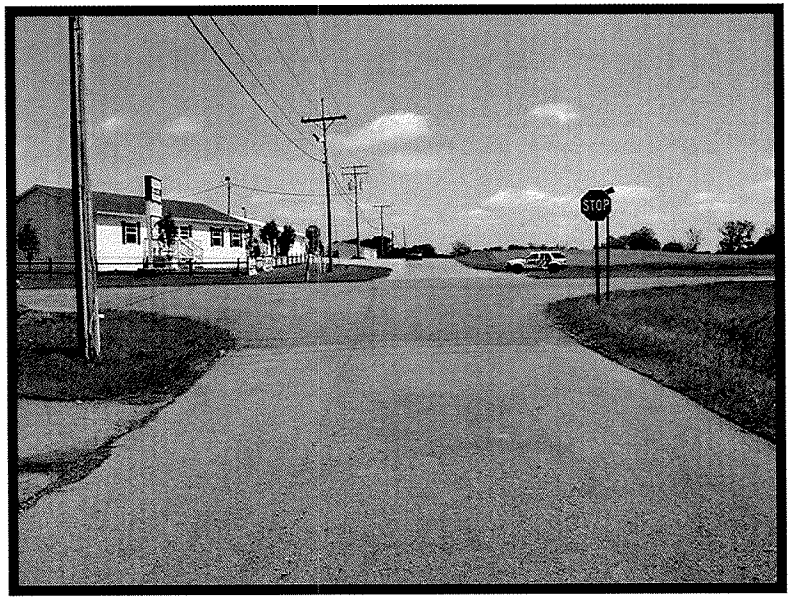
US 31 at US 50

FACING NORTH ALONG US 31 (STA. 20+00)

FACING SOUTH ALONG US 31(STA. 30+50)



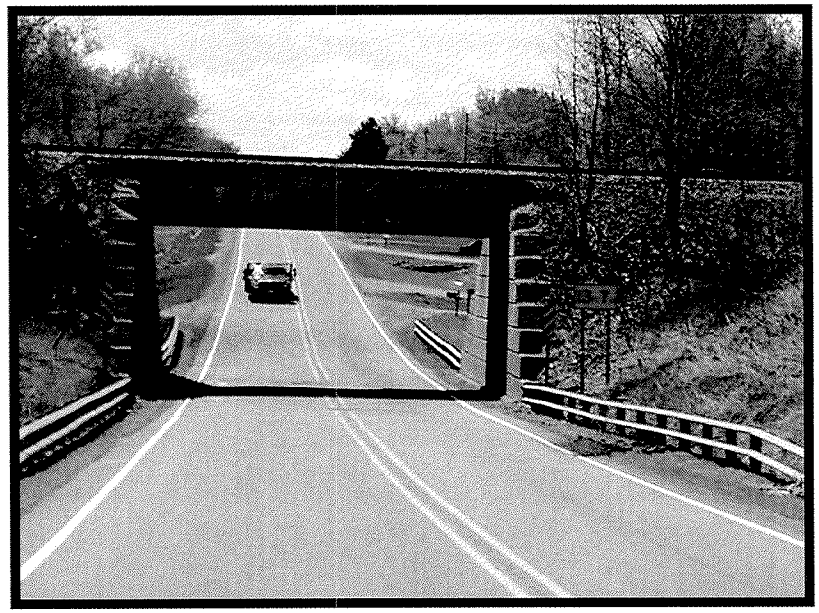
FACING WEST ALONG CR 560 N (EAST OF INTERSECTION)



FACING EAST ALONG CR 560 N (WEST OF INTERSECTION)

US 31 Road Rehabilitation

FACING NORTH ALONG US 31 (STA. 50+00)

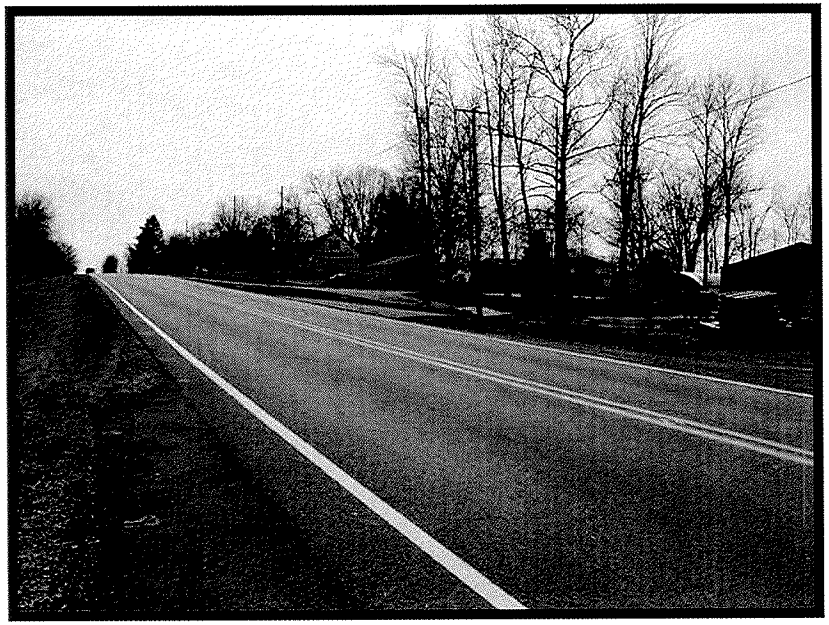


FACING SOUTH ALONG US 31(STA.54+00)

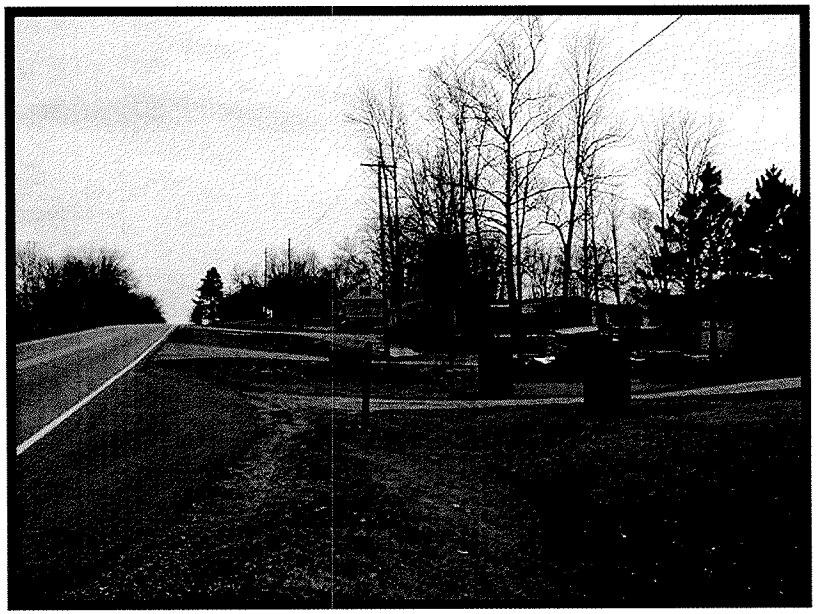
FACING WEST ALONG RR TRACK (WEST OF US 31)

FACING EAST ALONG RR TRACK (EAST OF US 31)

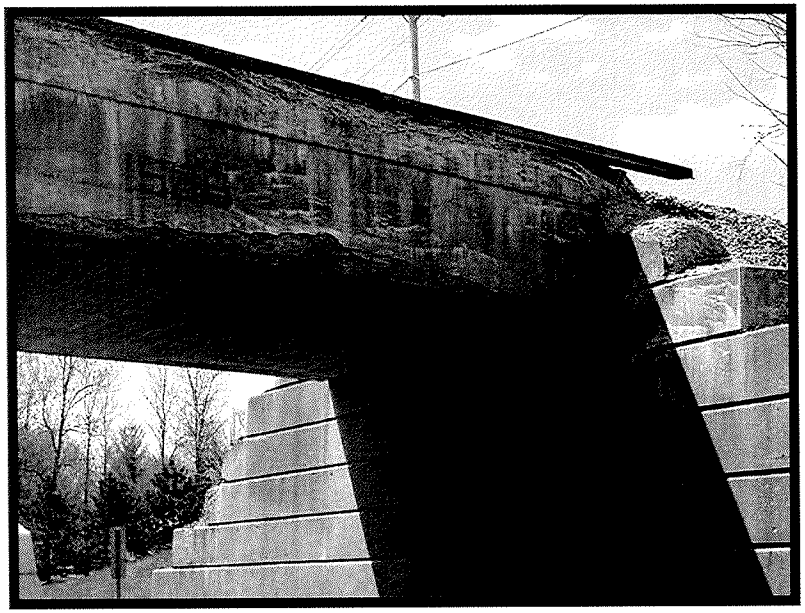
US 31 @ CSX Railroad (Sta. 52+50)



FACING SOUTH ALONG US 31 (STA. 52+00)



LAND USE AT RAILROAD BRIDGE



SUBSTRUCTURE (STRUCTURE # 31-36-2028)

SUBSTRUCTURE (STRUCTURE # 31-36-2028)

US 31 @ CSX Railroad (Sta. 52+50)

FACING NORTH ALONG US 31 (STA. 97+00)

FACING SOUTH ALONG US 31(STA.102+00)

FACING WEST ALONG CR 700 N (EAST OF US 31)

FACING EAST ALONG CR 700 N (WEST OF US 31)

US 31 Road Rehabilitation (@ CR 700 N)

FACING SOUTH ALONG US 31 (STA. 131+00)

FACING NORTH ALONG US 31(STA.149+00)

FACING SOUTH ALONG US 31 (STA. 154+00)

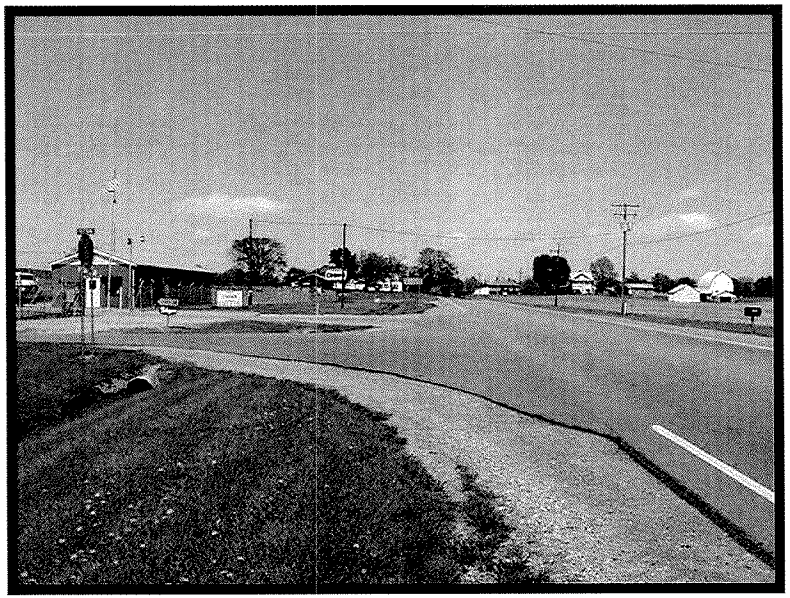
FACING SOUTH ALONG US 31 (STA. 183+00)

US 31 Road Rehabilitation

FACING SOUTH ALONG US 31 (STA. 207+00)

FACING NORTH ALONG US 31(STA.201+00)

FACING EAST ALONG CR 900 N (STA. 204+00)



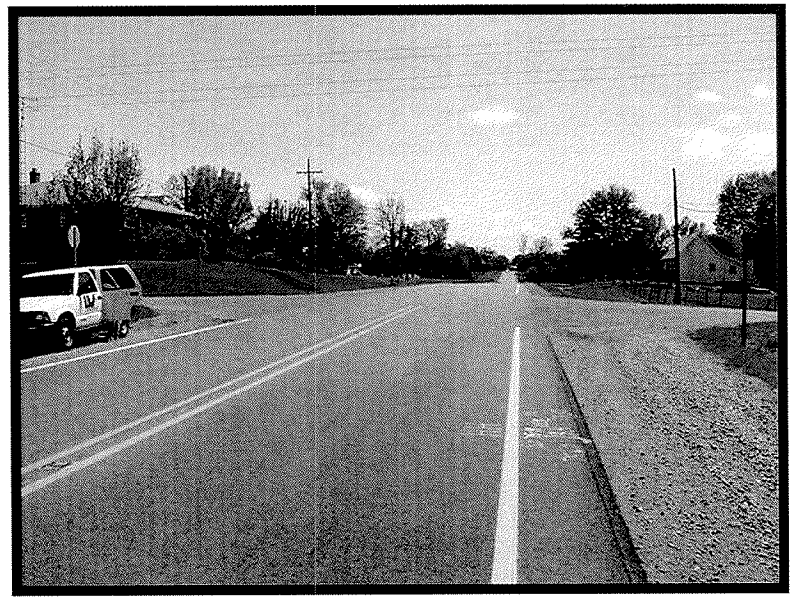
FACING NORTH ALONG US 31 (STA. 242+50)

US 31 Road Rehabilitation

FACING SOUTH ALONG US 31 (STA. 259+50)

FACING SOUTH ALONG US 31(STA.275+00)

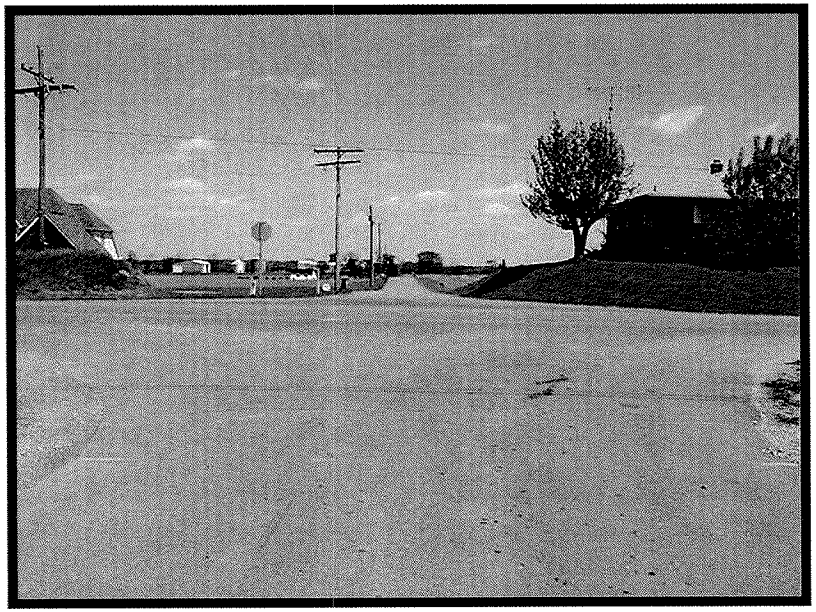
FACING NORTH ALONG US 31 (STA. 278+00)



FACING SOUTH ALONG US 31 (STA. 316+00)

US 31 Road Rehabilitation

FACING NORTH ALONG US 31 (STA. 312+00)



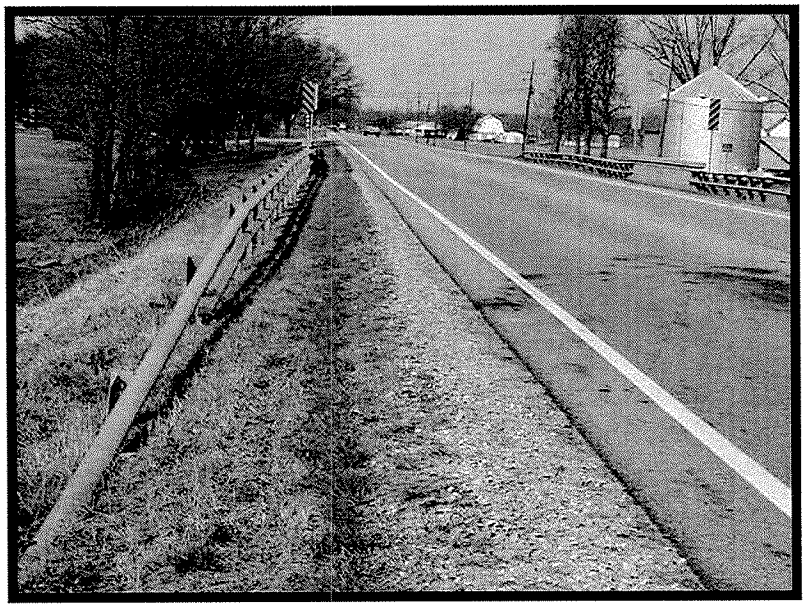
FACING EAST ALONG CR 1100 N(STA.314+50)

FACING NORTH ALONG US 31 (STA. 328+00)

FACING NORTH ALONG US 31 (STA. 338+00)

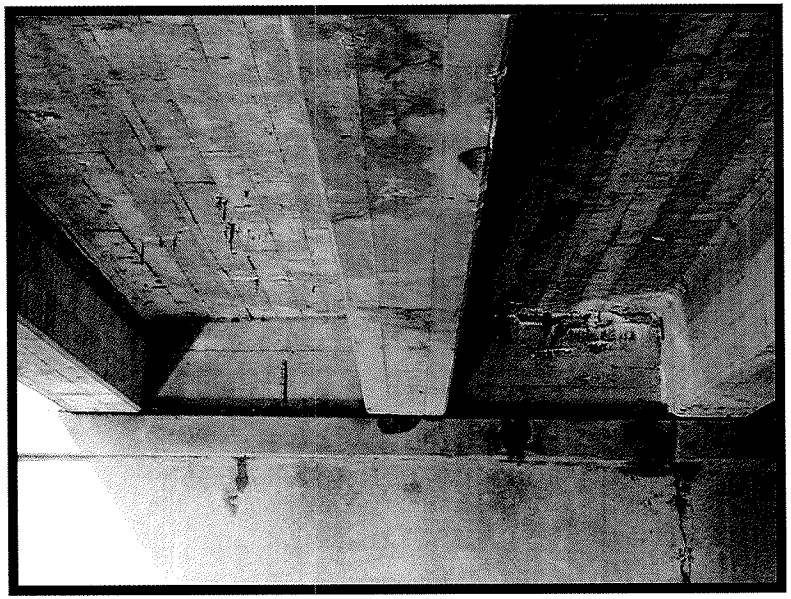
US 31 Road Rehabilitation

STR. # 31-36-1773 AT QUADE DITCH (STA. 350+25)



FACING NORTH ALONG US 31 (STA.350+25)

GIRDER DETERIORATION

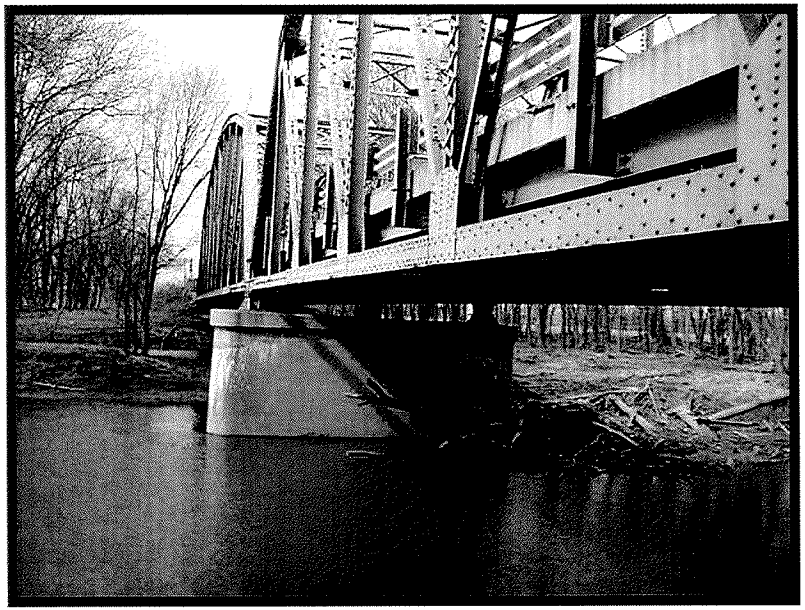


SUBSTRUCTURE

US 31 Road Rehabilitaton (At Quade Ditch)

FACING NORTH ALONG US 31 (STA. 390+00)

FACING NORTH ALONG US 31 (STA. 393+00)



STRUTURE # 31-36-1775 C AT SAND CREEK

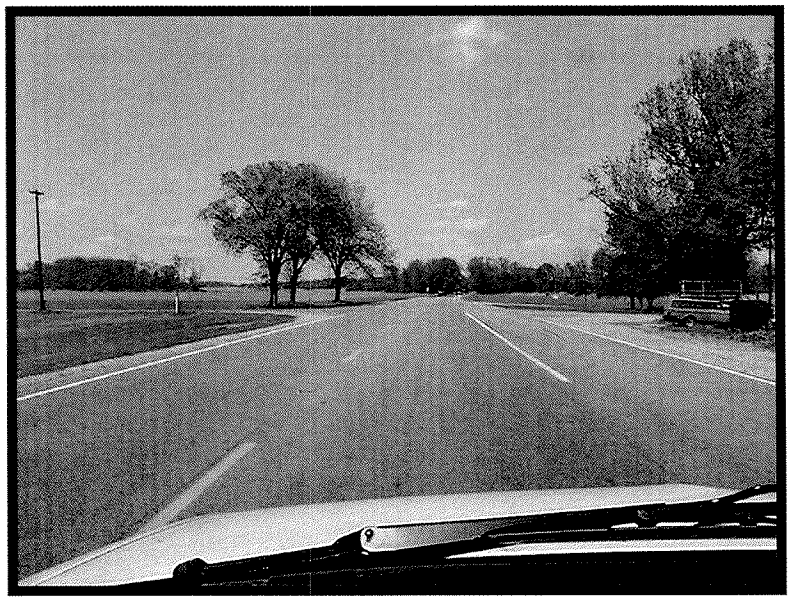
TYPICAL TRUSS DETERIORATION

US 31 Road Rehabilitation (At Sand Creek)

STRUTURE # 31-36-1775 C AT SAND CREEK

FACING SOUTH ALONG US 31 (STA. 400+00)

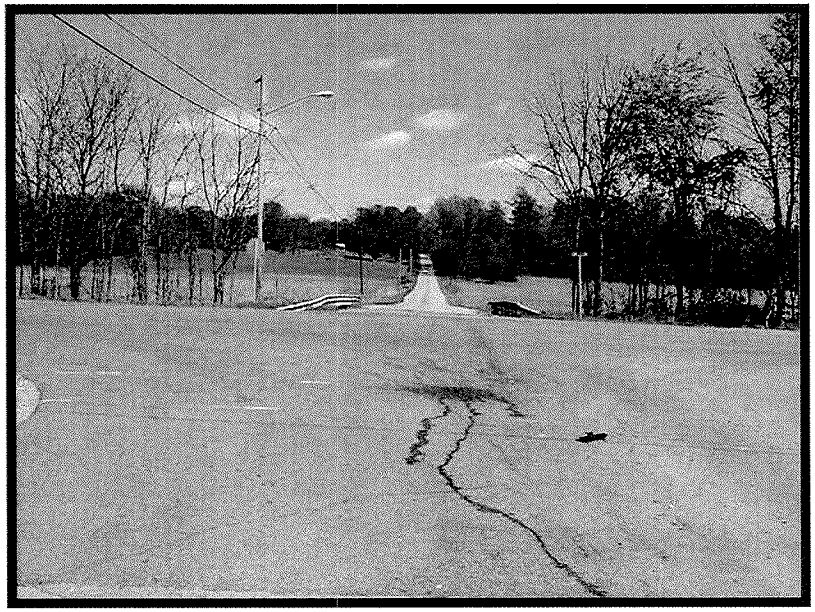
FACING SOUTH ALONG US 31 (STA. 452+00)



FACING NORTH ALONG US 31 (STA. 474+00)

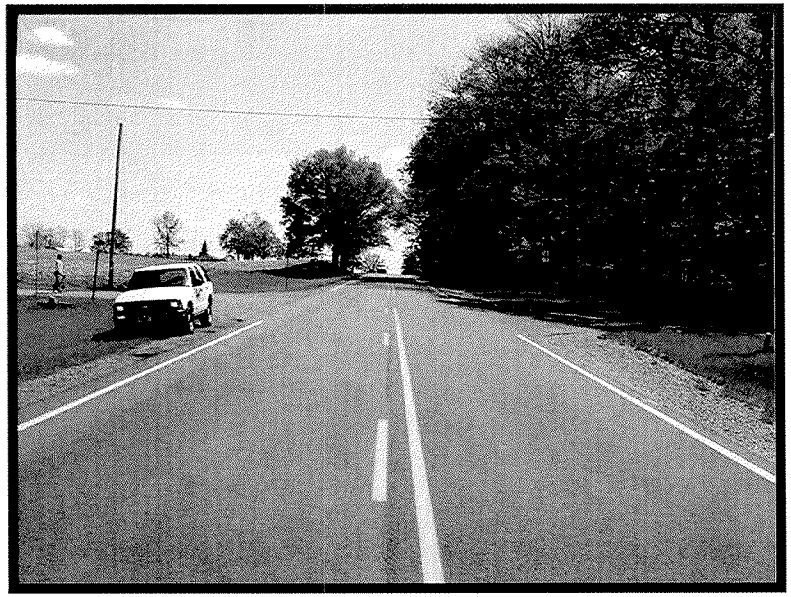
US 31 Road Rehabilitation

FACING NORTH ALONG US 31 (STA. 497+00)



FACING EAST ALONG CR 750 S (STA. 502+50)

FACING NORTH ALONG US 31 (STA. 539+00)

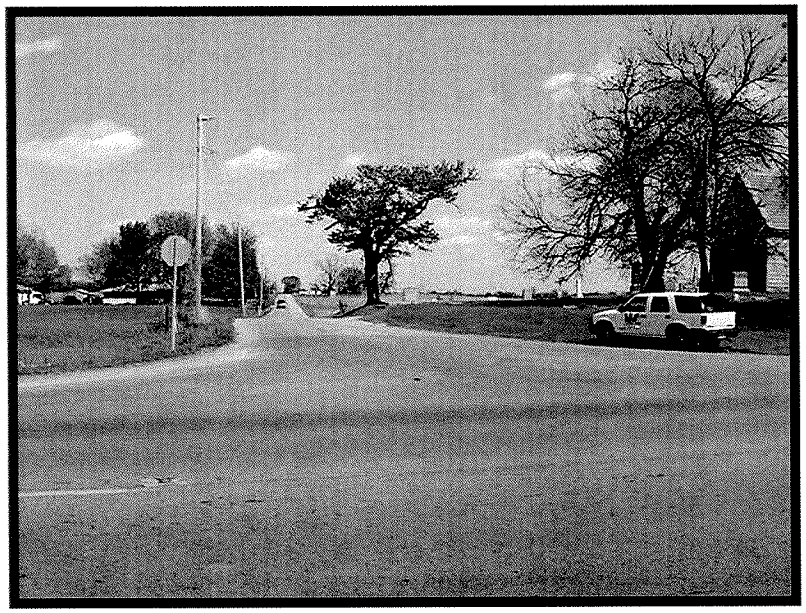


FACING SOUTH ALONG US 31 (STA. 552+00)

US 31 Road Rehabilitaton

FACING NORTH ALONG US 31 (STA. 580+00)

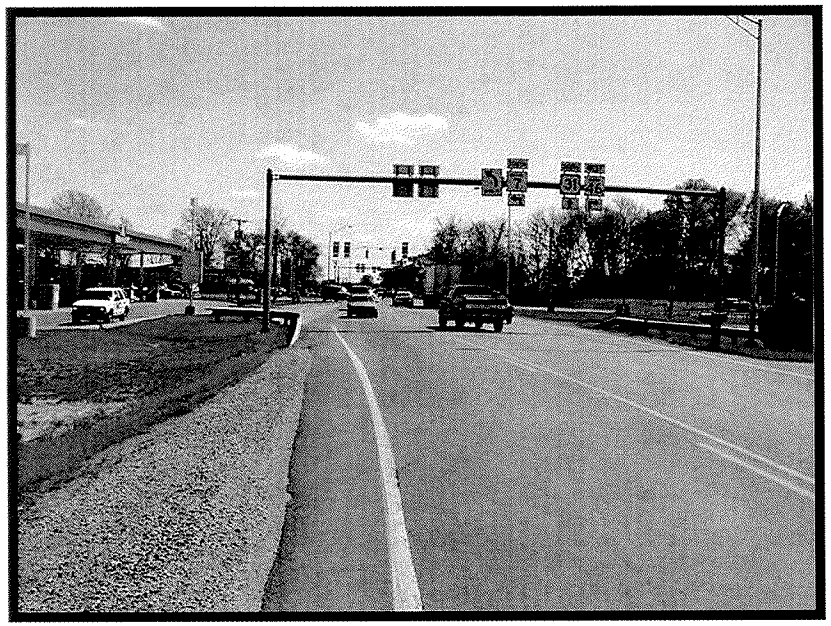
FACING NORTH ALONG US 31 (STA. 646+00)



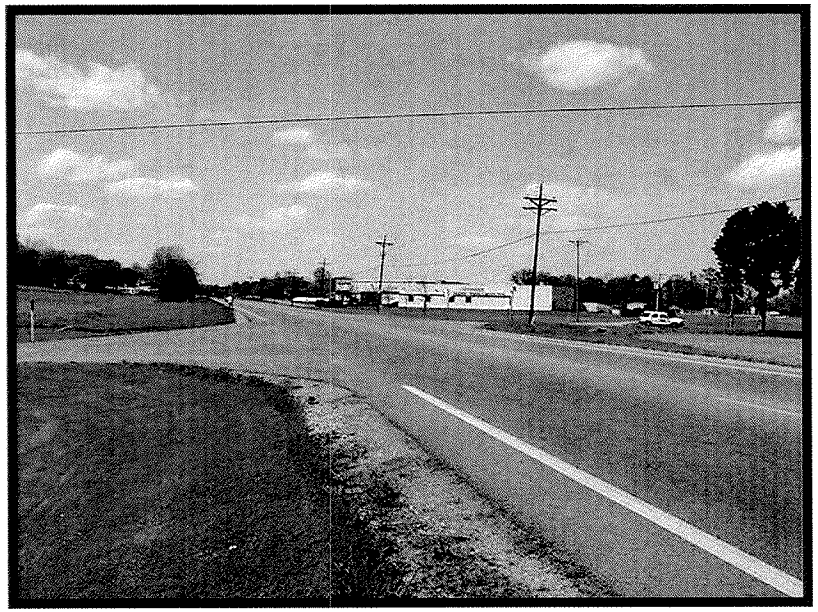
FACING EAST ALONG CR 475 S (STA. 648+00)

FACING NORTH ALONG US 31 (STA. 769+00)

US 31 Road Rehabilitation



FACING SOUTH ALONG US 31 (STA. 780+00)

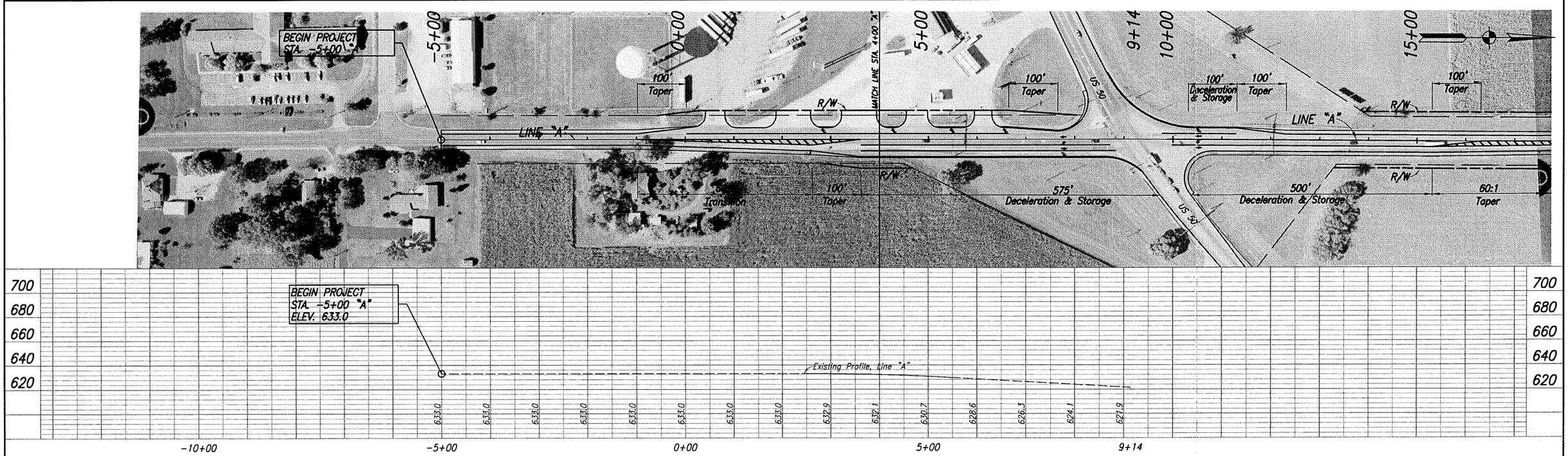


FACING NORTH ALONG US 31 (STA. 888+00)

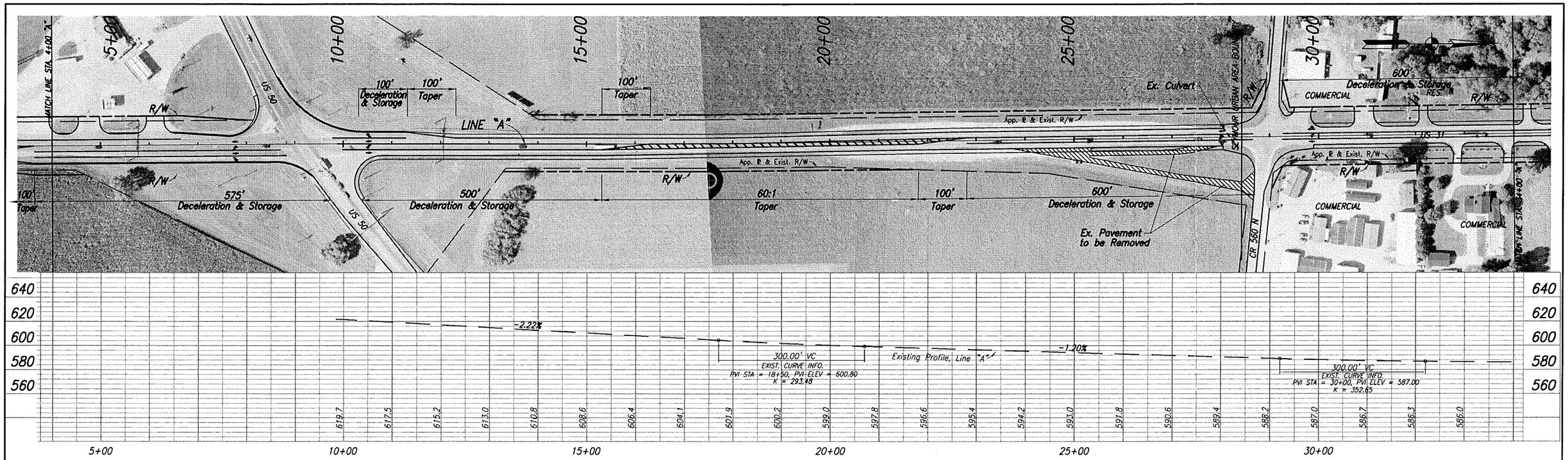
FACING SOUTH ALONG US 31 (STA. 893+00)

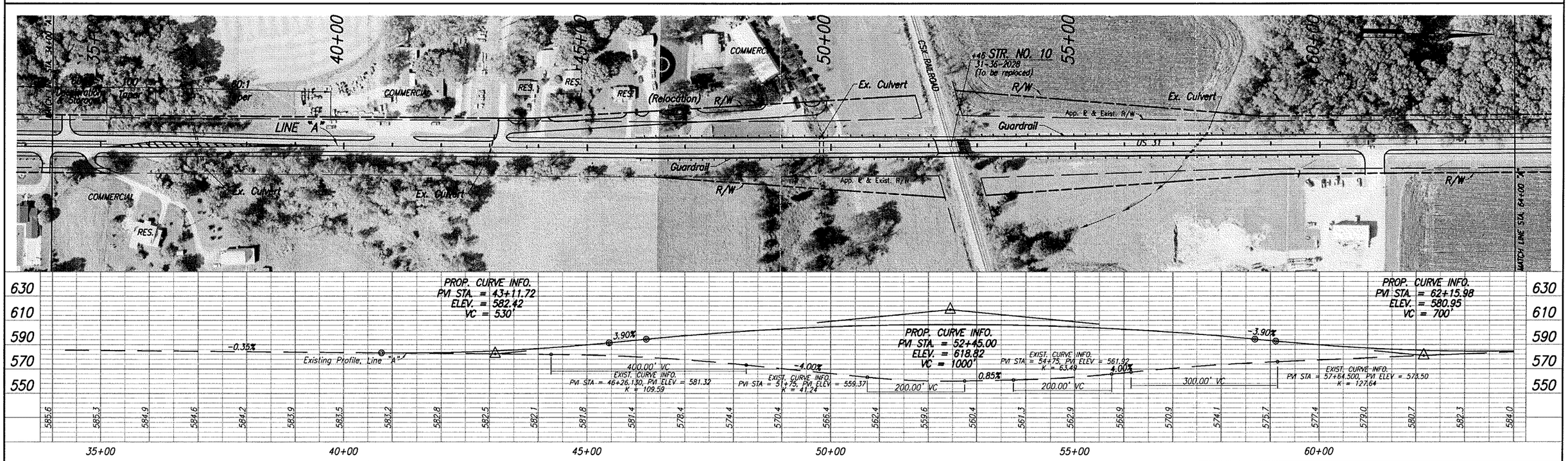
FACING NORTH ALONG US 31 (STA. 948+00)

US 31 Road Rehabilitation

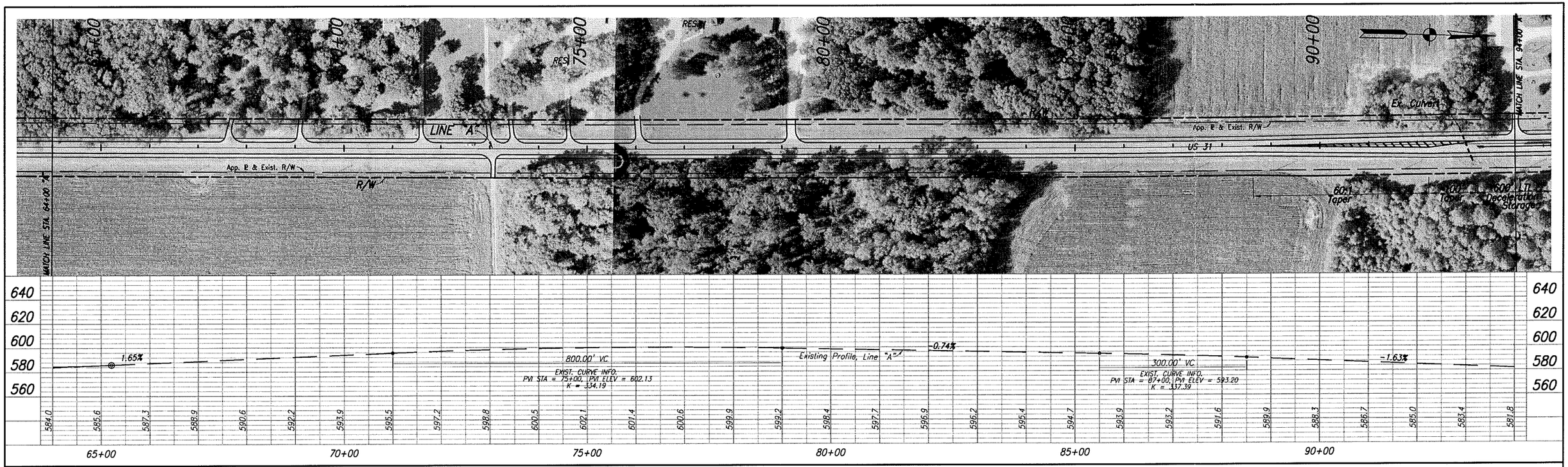


ALTERNATIVE C (PREFERRED)		INDIANA DEPARTMENT OF TRANSPORTATION	HORIZONTAL SCALE 1" = 200'	VERTICAL SCALE 1" = 80'	BRIDGE FILE / DESIGNATION 0014820
DESIGNED: GRW	DRAWN: NLC	US 31 – PLAN & PROFILE STA. -5+00 TO STA. 9+14 "A"	SURVEY BOOK	SHEETS A-18 of	
CHECKED: DPF	CHECKED: GRW		CONTRACT	PROJECT	

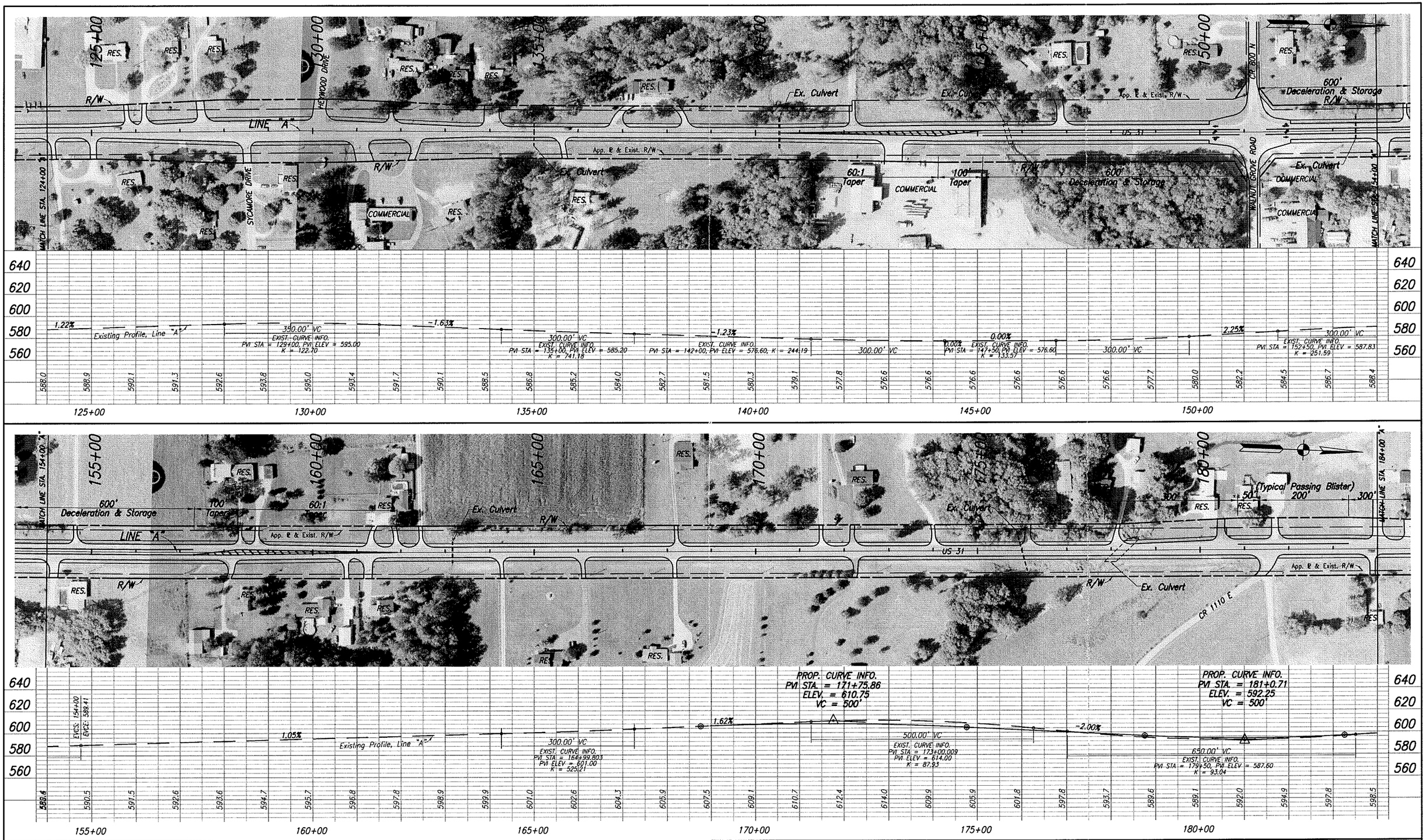




ALTERNATIVE C (PREFERRED)	INDIANA DEPARTMENT OF TRANSPORTATION	HORIZONTAL SCALE 1" = 200'	BRIDGE FILE
		VERTICAL SCALE 1" = 80'	DESIGNATION 0014820
DESIGNED: GRW / DRAWN: NLC	US 31 – PLAN & PROFILE BEGIN "A" TO STA. 64+00 "A"	SURVEY BOOK	SHEETS A-19 of
CHECKED: DPF / CHECKED: GRW		CONTRACT	PROJECT

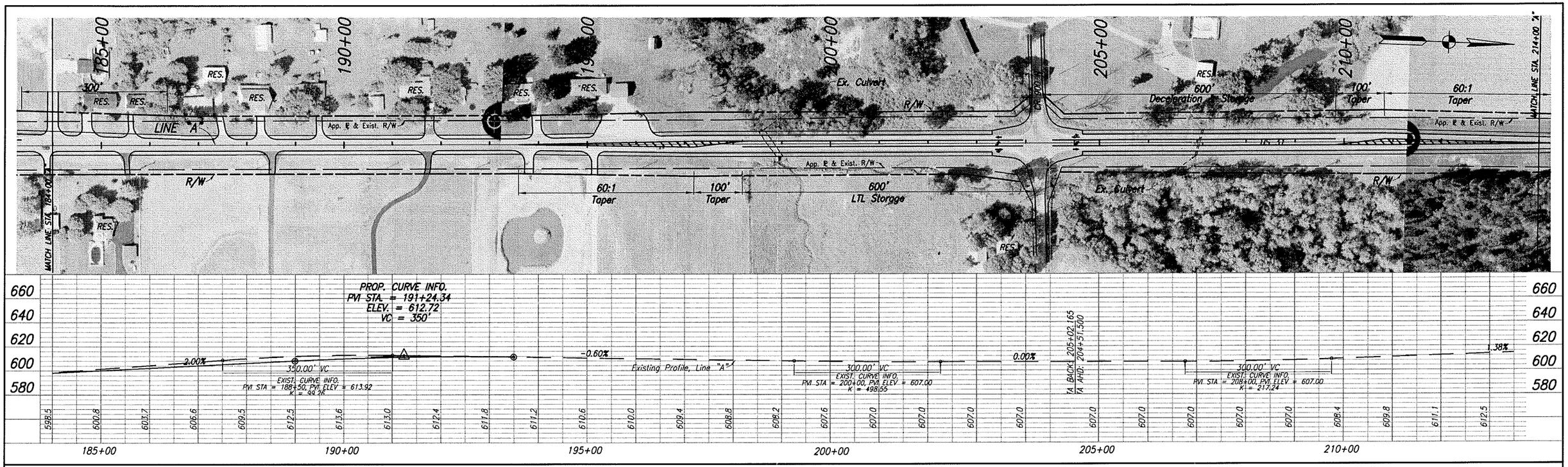


ALTERNATIVE C (PREFERRED)	INDIANA DEPARTMENT OF TRANSPORTATION	HORIZONTAL SCALE 1" = 200'	BRIDGE FILE
		VERTICAL SCALE 1" = 80'	DESIGNATION 0014820
DESIGNED: GRW / DRAWN: NLC	US 31 – PLAN & PROFILE STA. 64+00 TO STA. 124+00 "A"	SURVEY BOOK	SHEETS A-20 of
CHECKED: DPF / CHECKED: GRW		CONTRACT	PROJECT

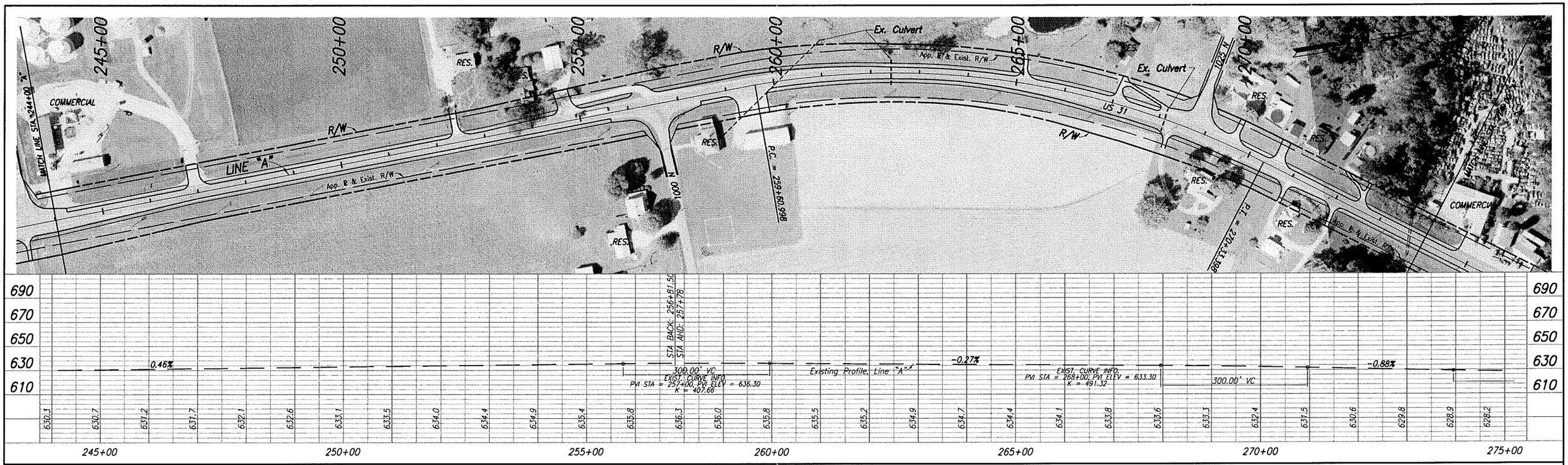


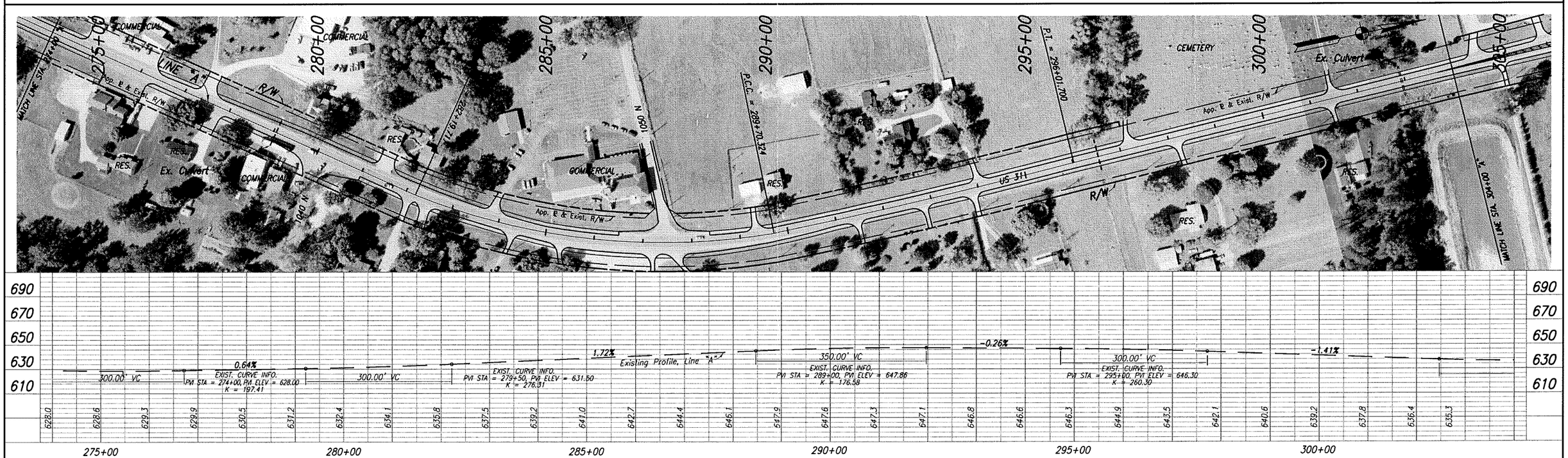
ALTERNATIVE C (PREFERRED)	INDIANA DEPARTMENT OF TRANSPORTATION
DESIGNED: GRW / DRAWN: NLC	US 31 – PLAN & PROFILE
CHECKED: DPF / CHECKED: GRW	STA. 124+00 TO STA. 184+00 "A"

HORIZONTAL SCALE 1" = 200'	BRIDGE FILE
VERTICAL SCALE 1" = 80'	DESIGNATION 0014820
SURVEY BOOK	SHEETS A-21 of
CONTRACT	PROJECT

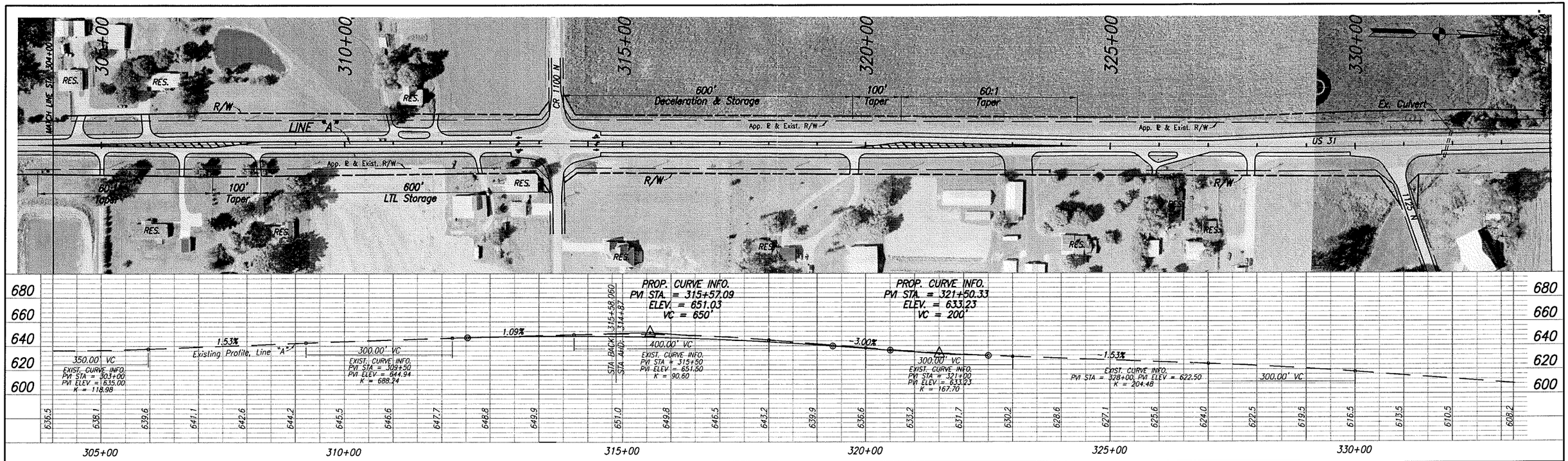


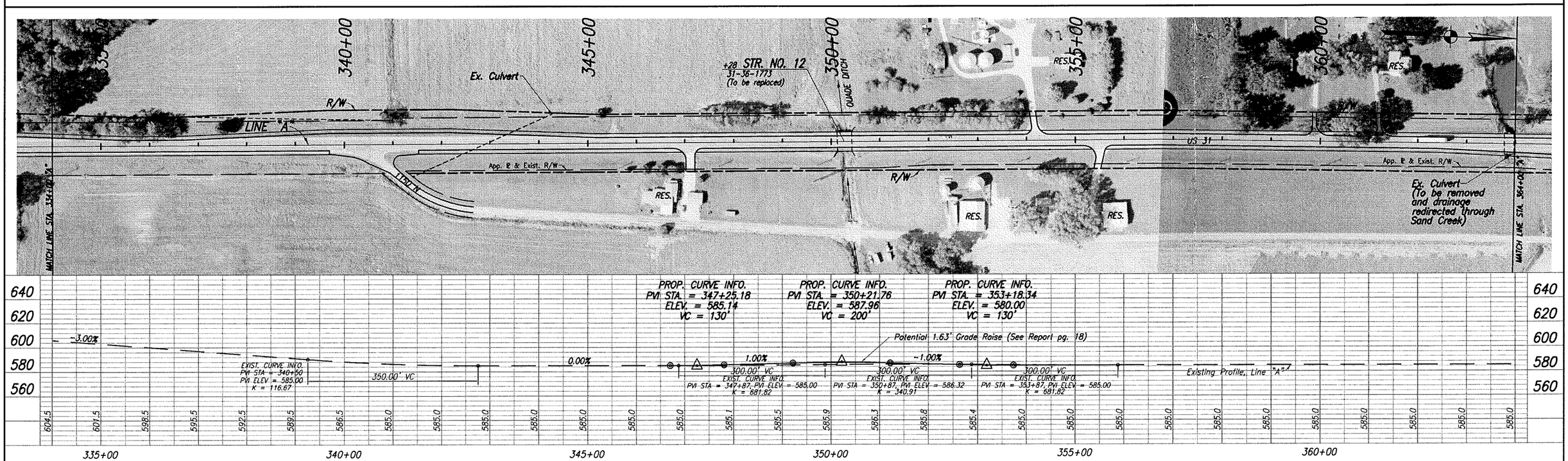
ALTERNATIVE C (PREFERRED)	INDIANA DEPARTMENT OF TRANSPORTATION	HORIZONTAL SCALE 1" = 200'	BRIDGE FILE
		VERTICAL SCALE 1" = 80'	DESIGNATION 0014820
DESIGNED: GRW / DRAWN: NLC	US 31 – PLAN & PROFILE STA. 184+00 TO STA. 244+00 "A"	SURVEY BOOK	SHEETS A-22 of
CHECKED: DPF / CHECKED: GRW		CONTRACT	PROJECT



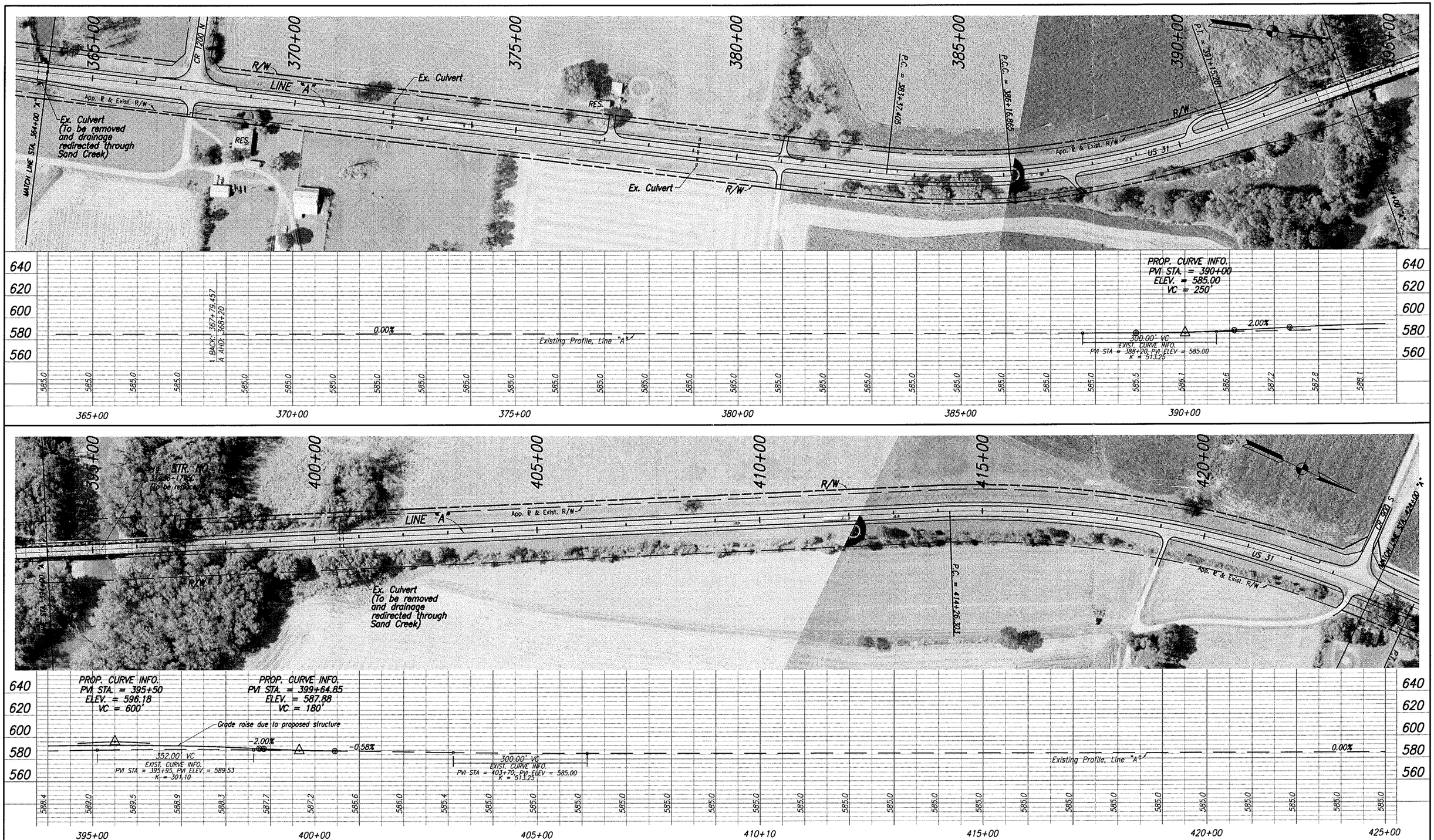


ALTERNATIVE C (PREFERRED)	INDIANA DEPARTMENT OF TRANSPORTATION	HORIZONTAL SCALE 1" = 200'	BRIDGE FILE		
		VERTICAL SCALE 1" = 80'	DESIGNATION 0014820		
DESIGNED: GRW	DRAWN: NLC	US 31 – PLAN & PROFILE STA. 244+00 TO STA. 304+00 "A"	SURVEY BOOK	SHEETS A-23 of	
CHECKED: DPF	CHECKED: GRW		CONTRACT	PROJECT	



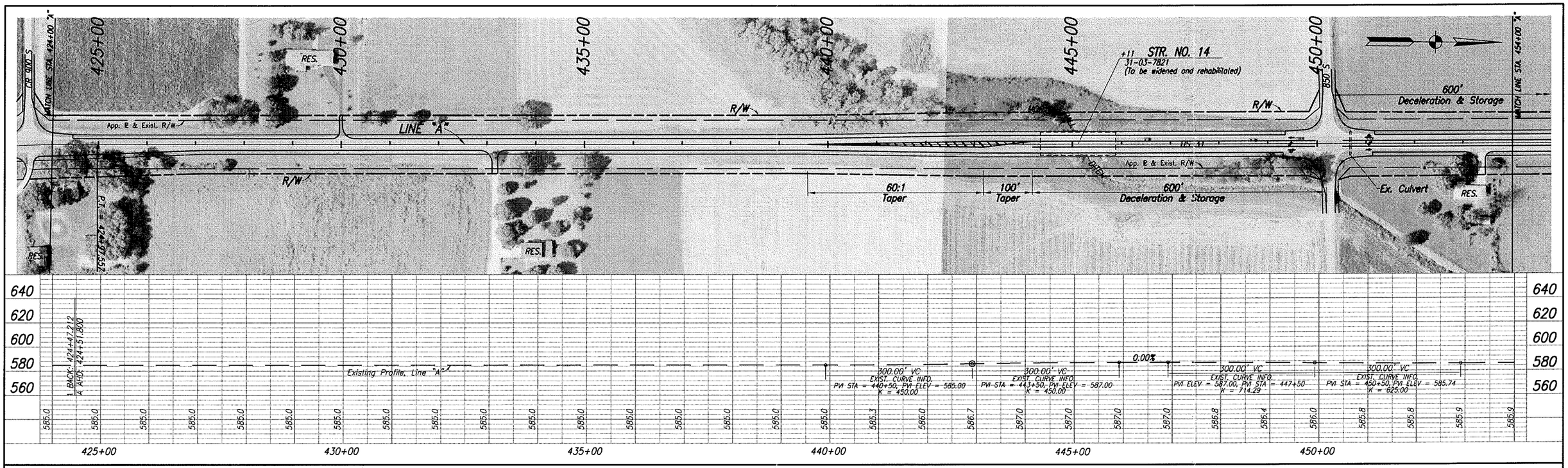


ALTERNATIVE C (PREFERRED)		INDIANA DEPARTMENT OF TRANSPORTATION	HORIZONTAL SCALE 1" = 200' / VERTICAL SCALE 1" = 80' / BRIDGE FILE / DESIGNATION 0014820
DESIGNED: GRW	DRAWN: NLC	US 31 – PLAN & PROFILE STA. 304+00 TO STA. 364+00 "A"	SURVEY BOOK / SHEETS A-24 of
CHECKED: DPF	CHECKED: GRW		CONTRACT / PROJECT



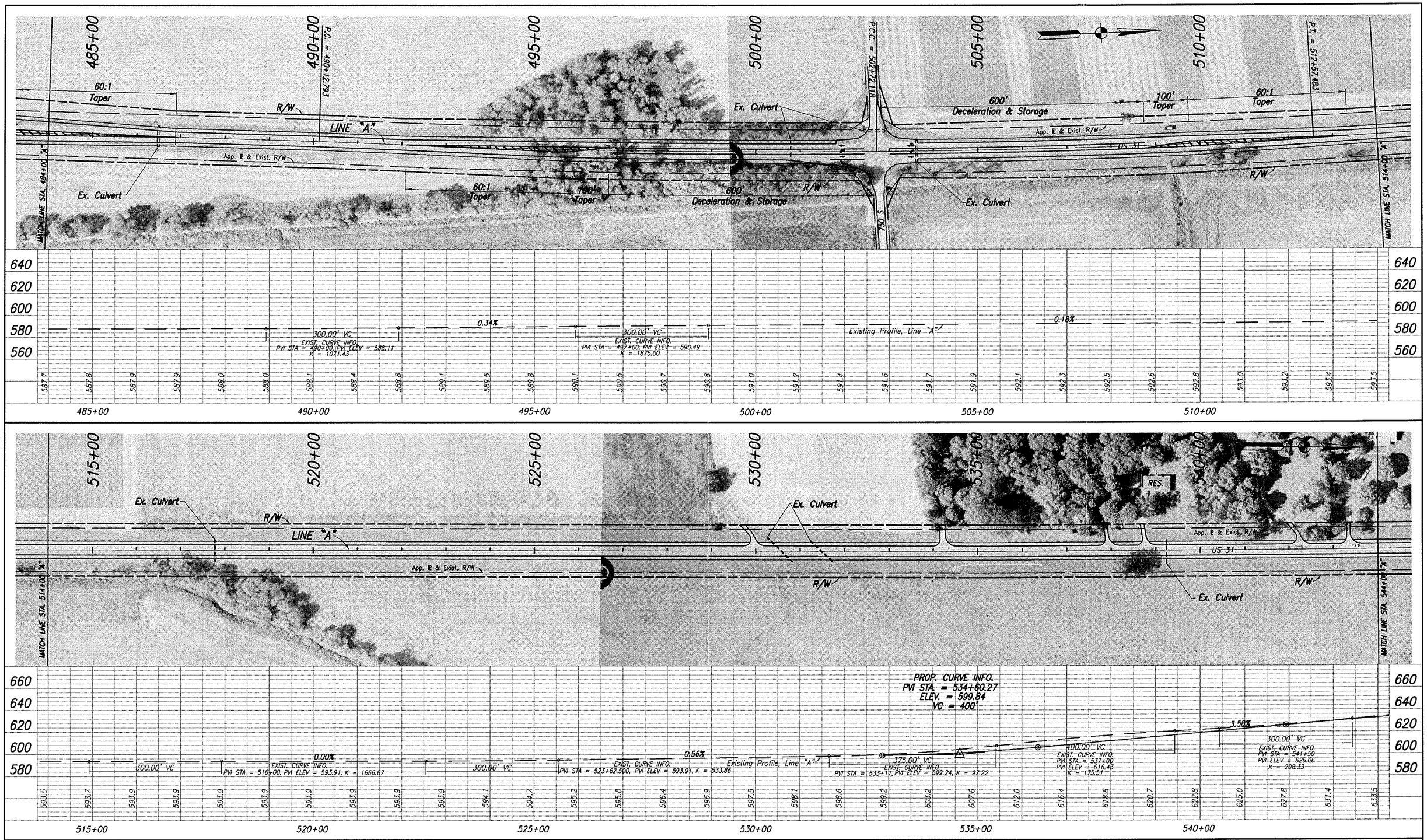
ALTERNATIVE C (PREFERRED)	INDIANA DEPARTMENT OF TRANSPORTATION
DESIGNED: GRW / DRAWN: NLC	US 31 – PLAN & PROFILE
CHECKED: DPF / CHECKED: GRW	STA. 364+00 TO STA. 424+00 "A"

HORIZONTAL SCALE	BRIDGE FILE
1" = 200'	
VERTICAL SCALE	DESIGNATION
1" = 80'	0014820
SURVEY BOOK	SHEETS
	A-25 of
CONTRACT	PROJECT

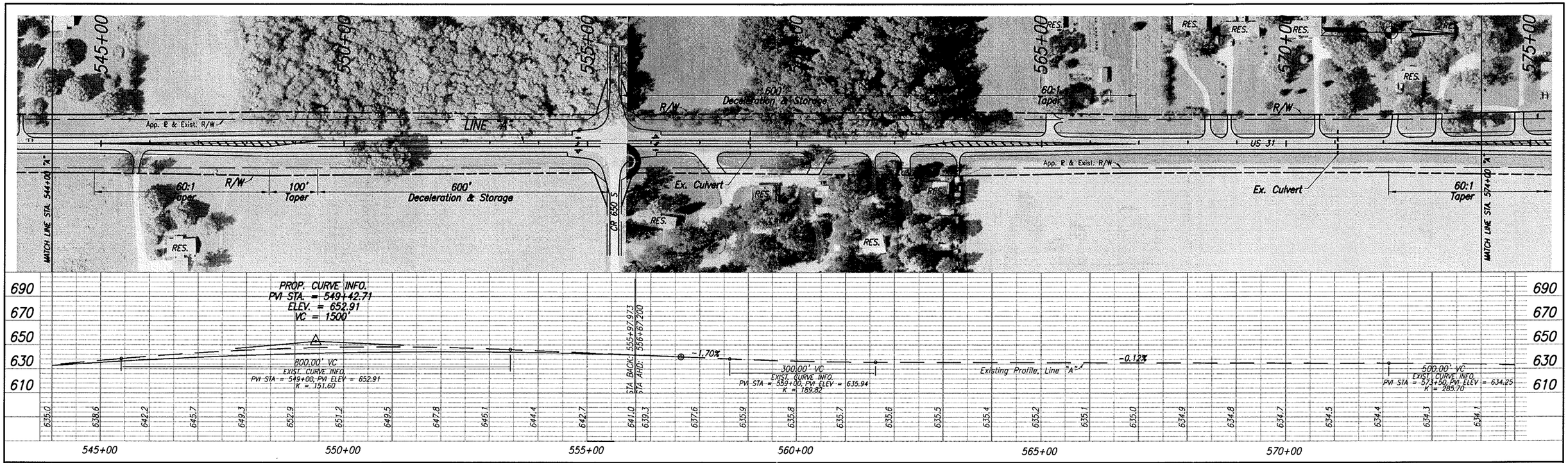


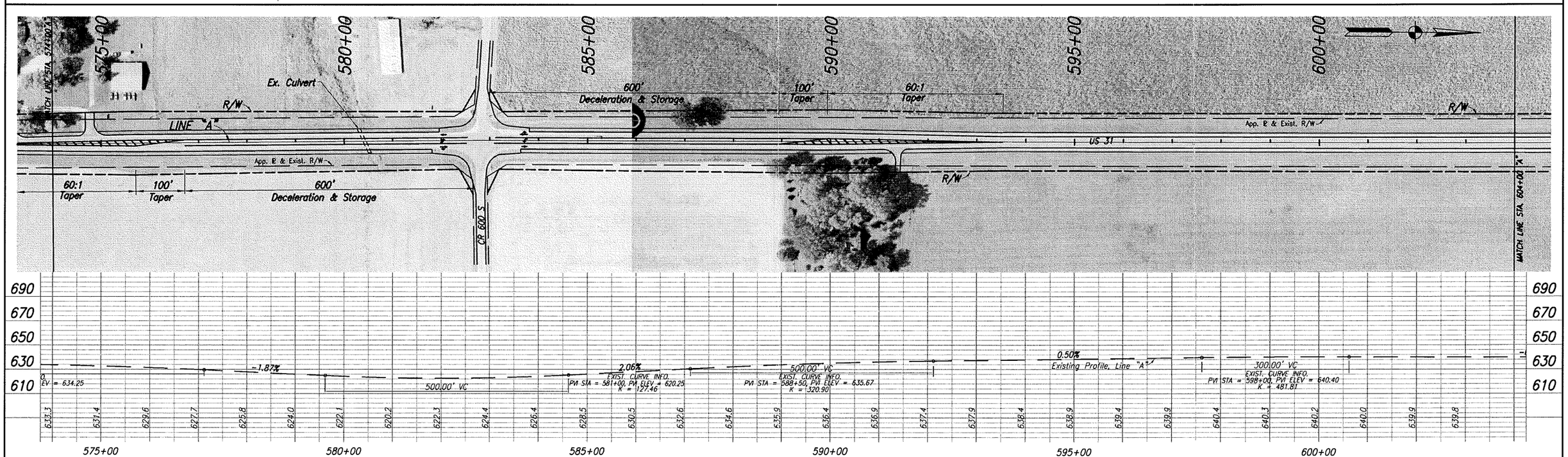
ALTERNATIVE C (PREFERRED)	INDIANA DEPARTMENT OF TRANSPORTATION
DESIGNED: GRW / DRAWN: NLC	US 31 – PLAN & PROFILE
CHECKED: DPF / CHECKED: GRW	STA. 424+00 TO STA. 484+00 "A"

HORIZONTAL SCALE 1" = 200'	BRIDGE FILE
VERTICAL SCALE 1" = 80'	DESIGNATION 0014B20
SURVEY BOOK	SHEETS A-26 of
CONTRACT	PROJECT



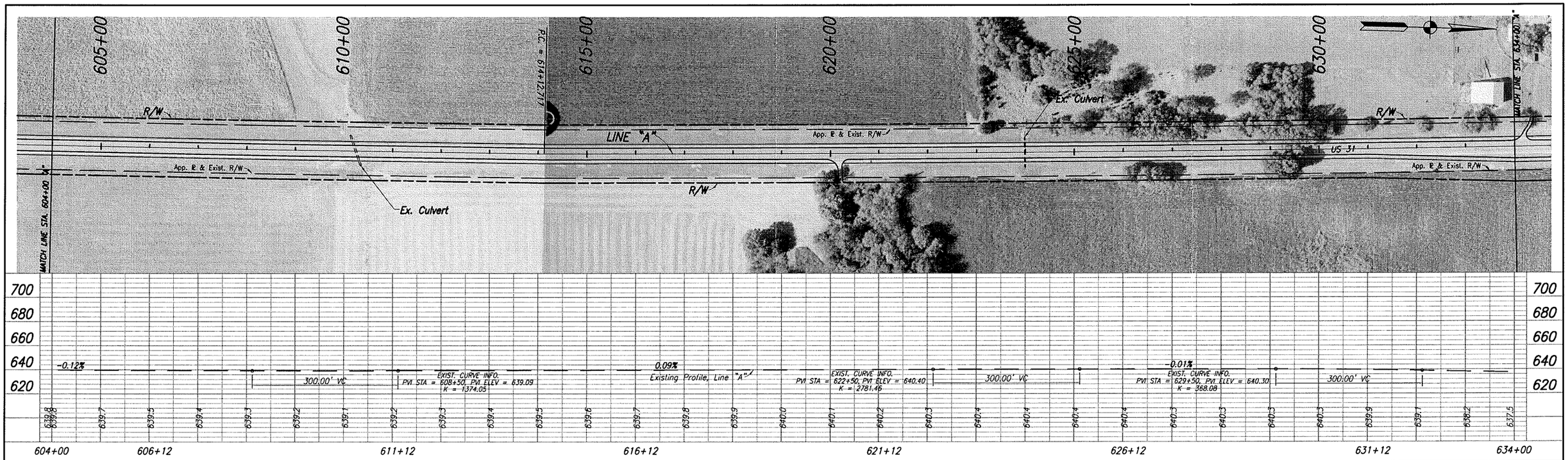
ALTERNATIVE C (PREFERRED)	INDIANA DEPARTMENT OF TRANSPORTATION	HORIZONTAL SCALE 1" = 200'	BRIDGE FILE
		VERTICAL SCALE 1" = 80'	DESIGNATION 0014820
DESIGNED: GRW / DRAWN: NLC	US 31 – PLAN & PROFILE STA. 484+00 TO STA. 544+00 "A"	SURVEY BOOK	SHEETS A-27 of
CHECKED: DPF / CHECKED: GRW		CONTRACT	PROJECT

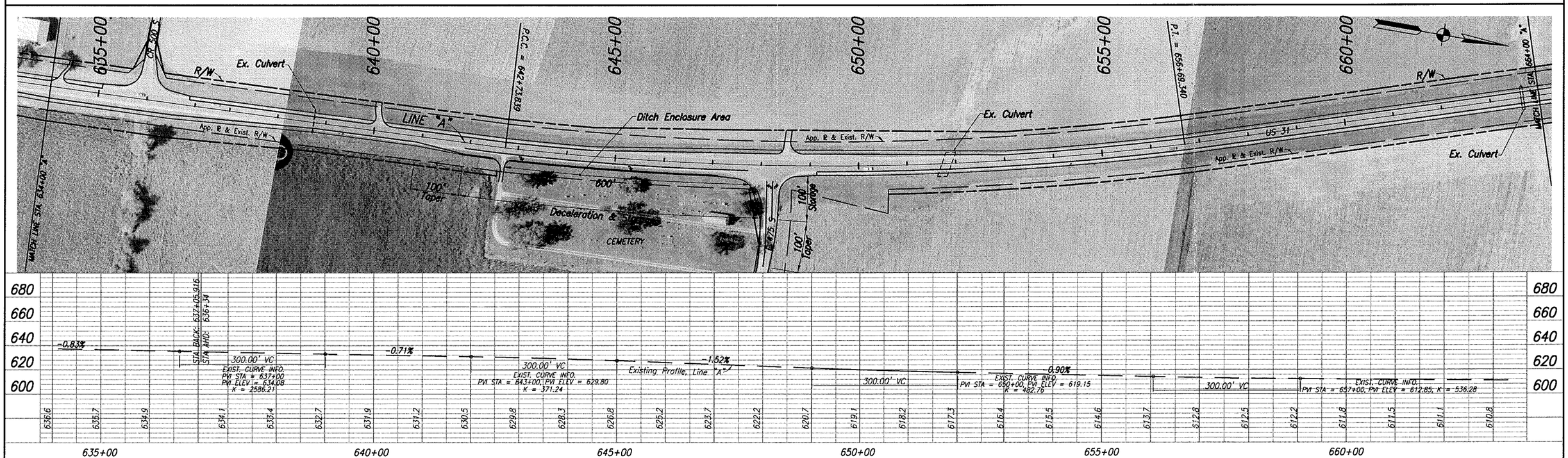




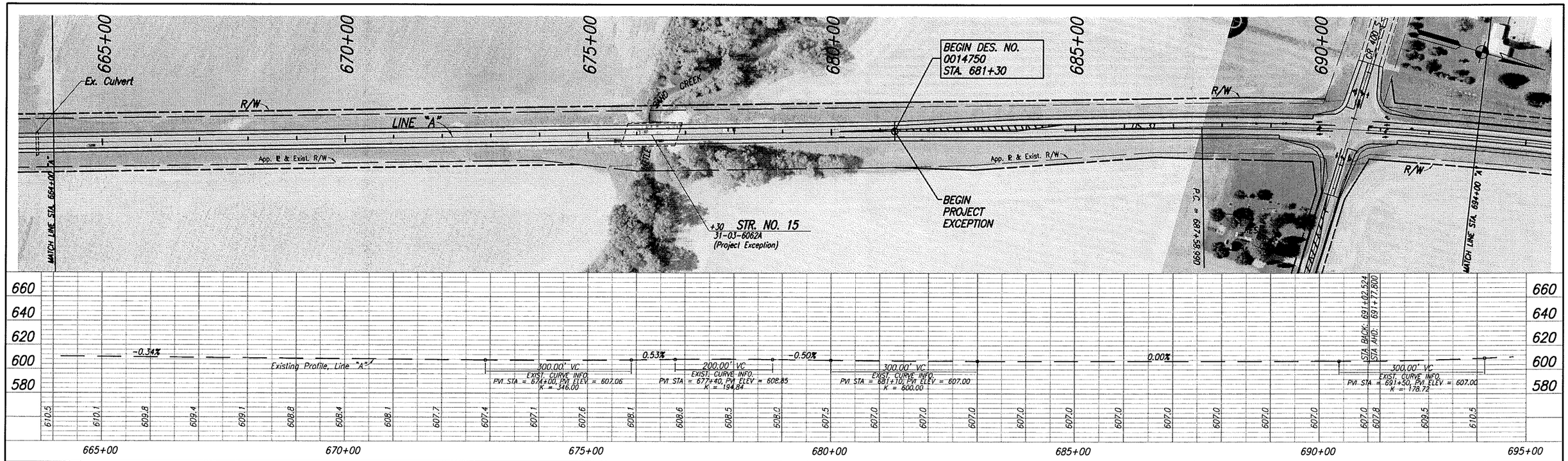
ALTERNATIVE C (PREFERRED)	INDIANA DEPARTMENT OF TRANSPORTATION	HORIZONTAL SCALE 1" = 200'	BRIDGE FILE
		VERTICAL SCALE 1" = 80'	DESIGNATION 0014820
DESIGNED: GRW	DRAWN: NLC	SURVEY BOOK	SHEETS A-28 of
CHECKED: DPF	CHECKED: GRW	CONTRACT	PROJECT

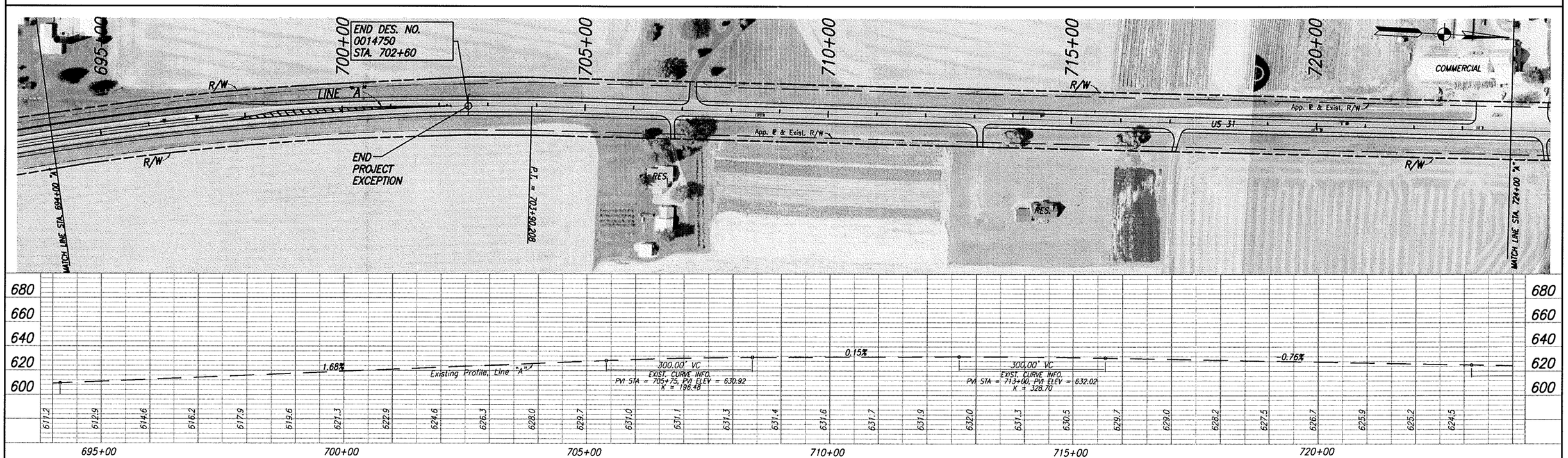
US 31 – PLAN & PROFILE
STA. 544+00 TO STA. 604+00 "A"



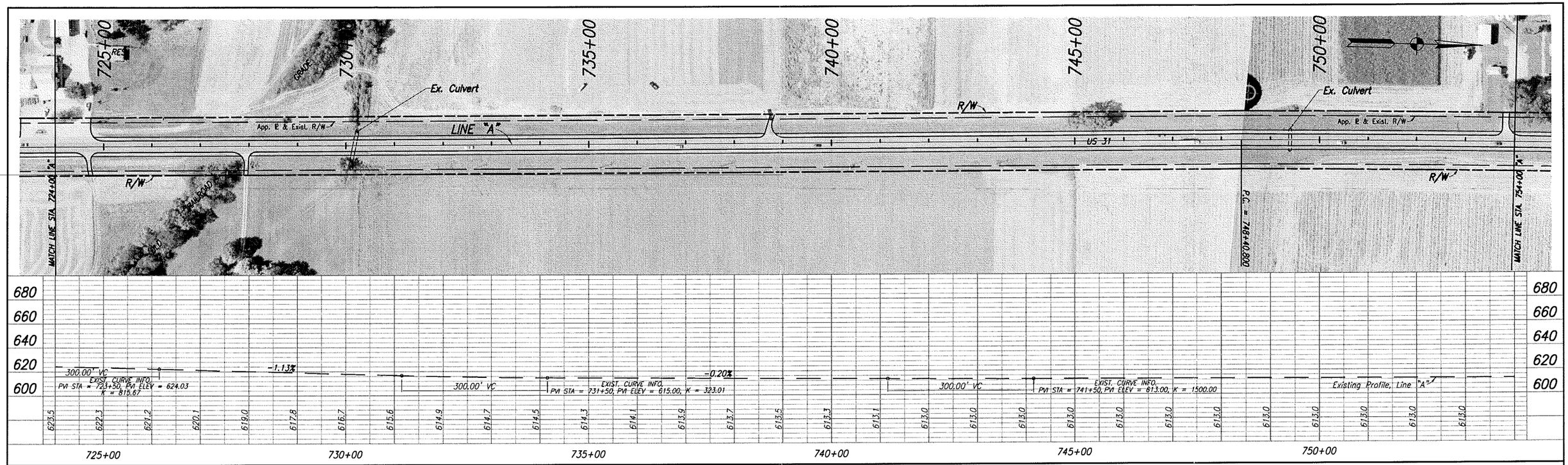


ALTERNATIVE C (PREFERRED)		INDIANA DEPARTMENT OF TRANSPORTATION	HORIZONTAL SCALE 1" = 200'	BRIDGE FILE	
			VERTICAL SCALE 1" = 80'	DESIGNATION 0014820	
DESIGNED: GRW	DRAWN: NLC	US 31 – PLAN & PROFILE STA. 604+00 TO STA. 664+00 "A"	SURVEY BOOK	SHEETS A-29 of	
CHECKED: DPF	CHECKED: GRW		CONTRACT	PROJECT	





ALTERNATIVE C (PREFERRED)	INDIANA DEPARTMENT OF TRANSPORTATION	HORIZONTAL SCALE 1" = 200'	BRIDGE FILE
		VERTICAL SCALE 1" = 80'	DESIGNATION 0014820
DESIGNED: GRW / DRAWN: NLC	US 31 – PLAN & PROFILE STA. 664+00 TO STA. 724+00 "A"	SURVEY BOOK	SHEETS A-30 of
CHECKED: DPF / CHECKED: GRW		CONTRACT	PROJECT



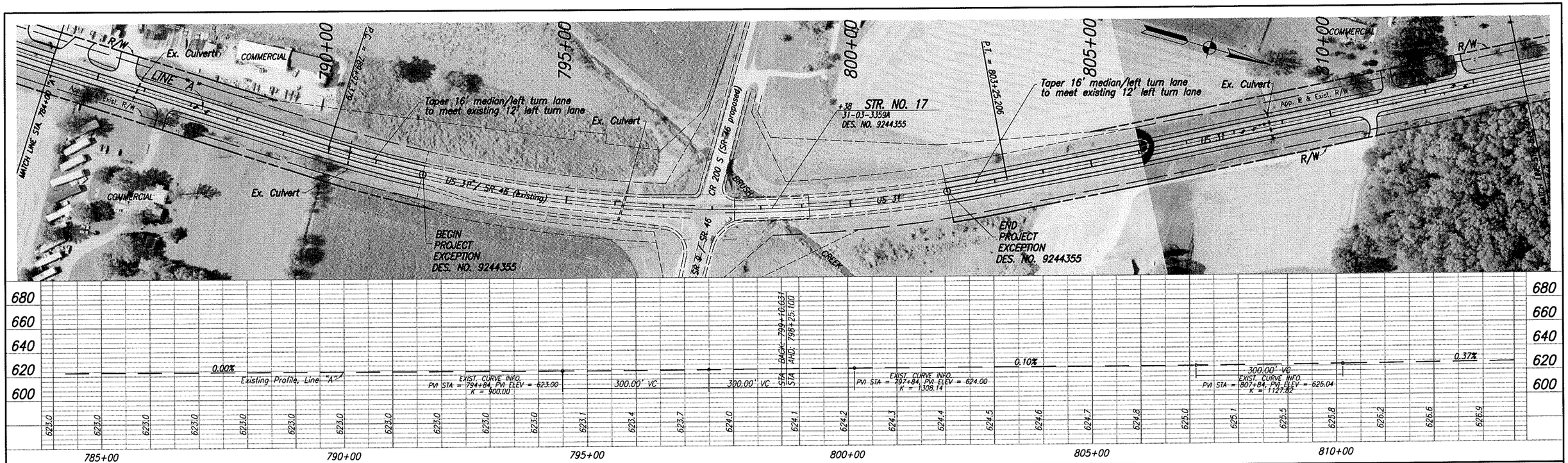
ALTERNATIVE C
(PREFERRED)

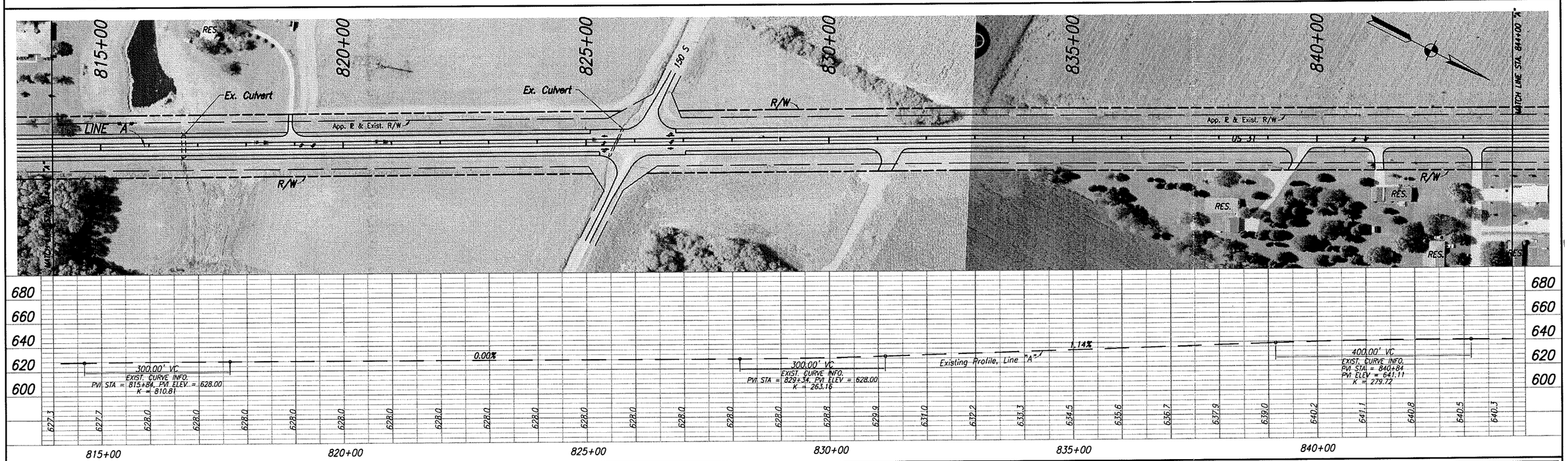
DESIGNED: GRW
DRAWN: NLC
CHECKED: DPF
CHECKED: GRW

INDIANA
DEPARTMENT OF TRANSPORTATION

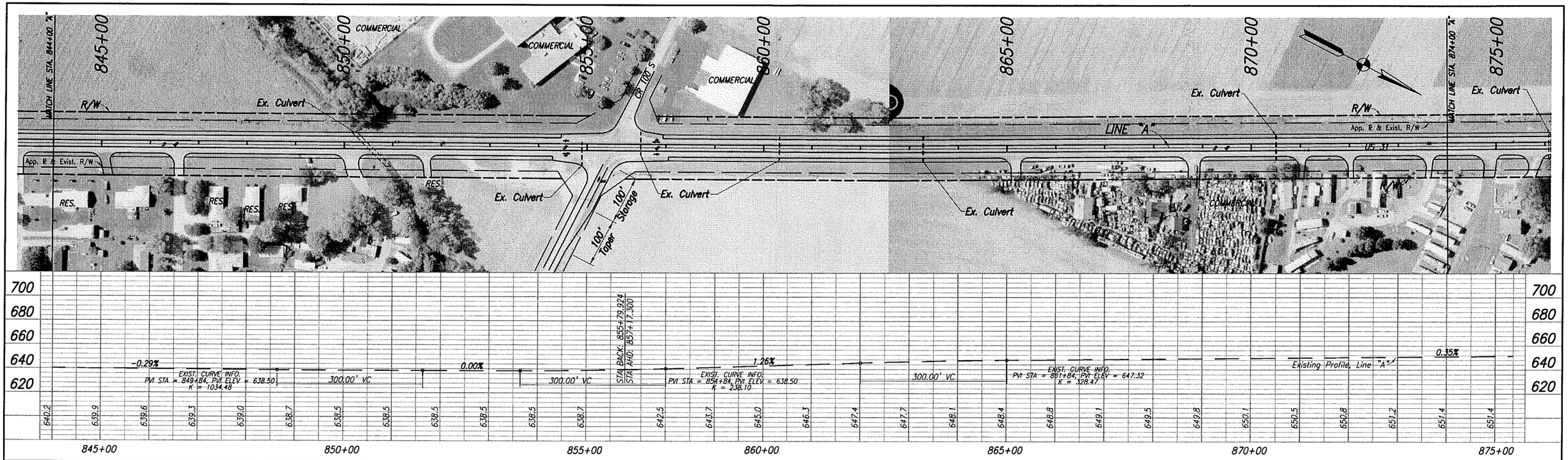
US 31 – PLAN & PROFILE
STA. 724+00 TO STA. 784+00 "A"

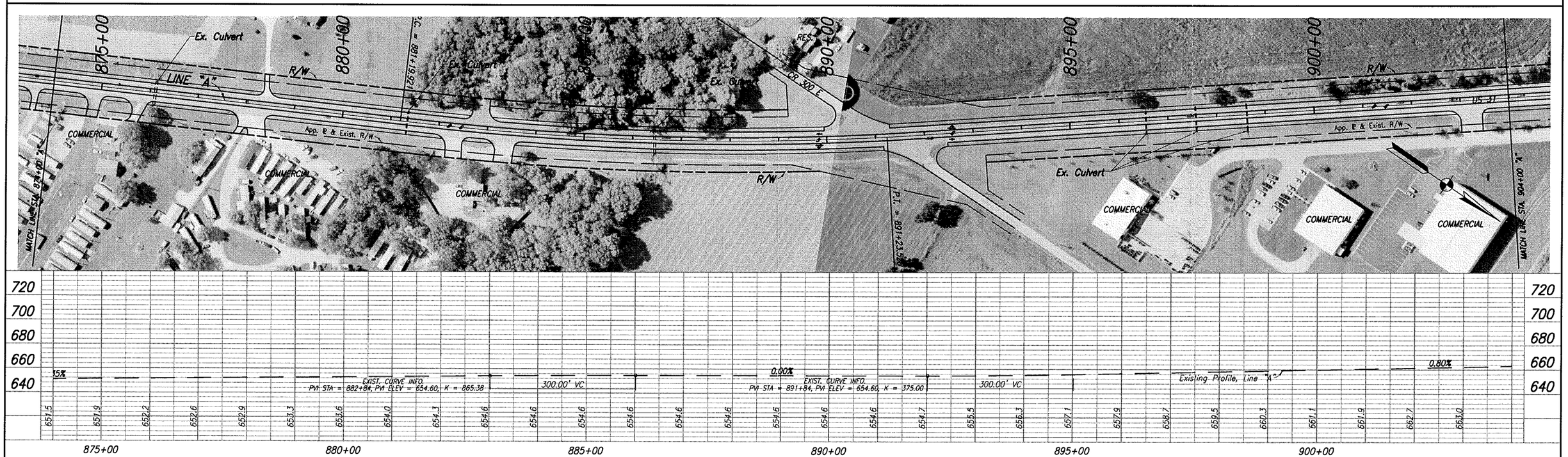
HORIZONTAL SCALE	BRIDGE FILE
1" = 200'	
VERTICAL SCALE	DESIGNATION
1" = 80'	0014820
SURVEY BOOK	SHEETS
	A-31 of
CONTRACT	PROJECT



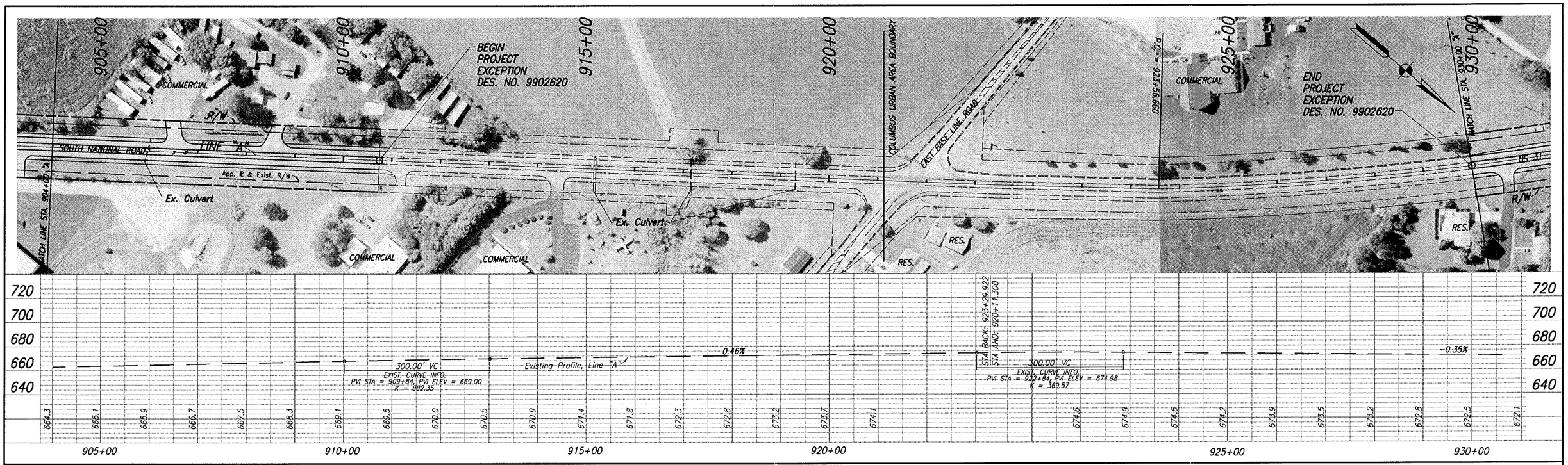


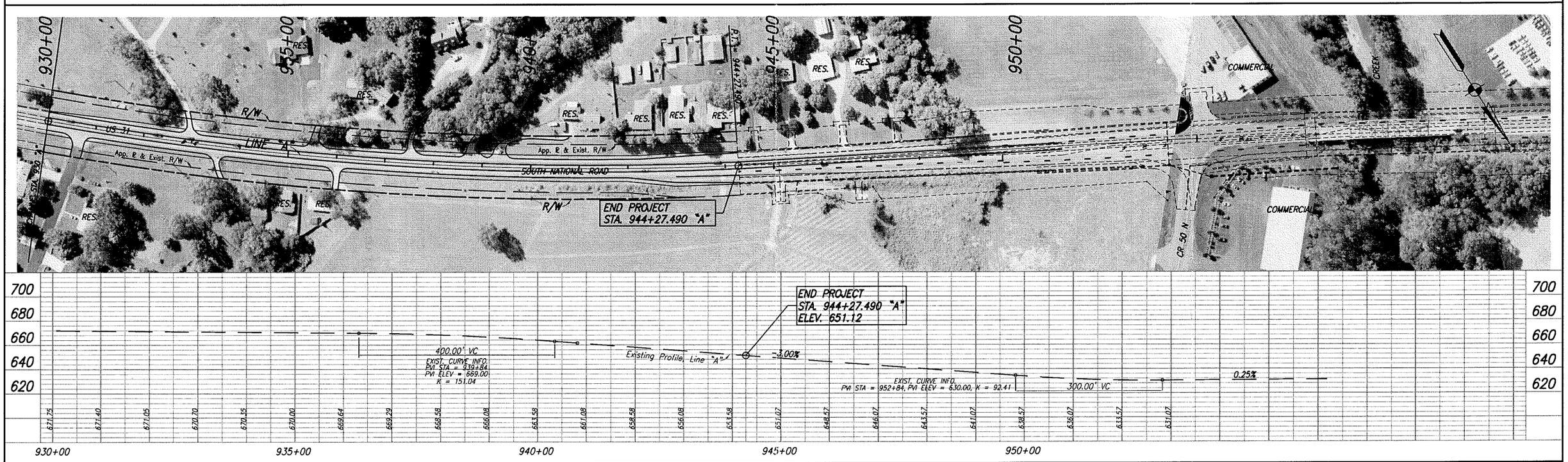
ALTERNATIVE C (PREFERRED)	INDIANA DEPARTMENT OF TRANSPORTATION	HORIZONTAL SCALE 1" = 200'	BRIDGE FILE
		VERTICAL SCALE 1" = 80'	DESIGNATION 0014820
DESIGNED: GRW / DRAWN: NLC	US 31 – PLAN & PROFILE STA. 784+00 TO STA. 844+00 "A"	SURVEY BOOK	SHEETS A-32 of
CHECKED: DPF / CHECKED: GRW		CONTRACT	PROJECT



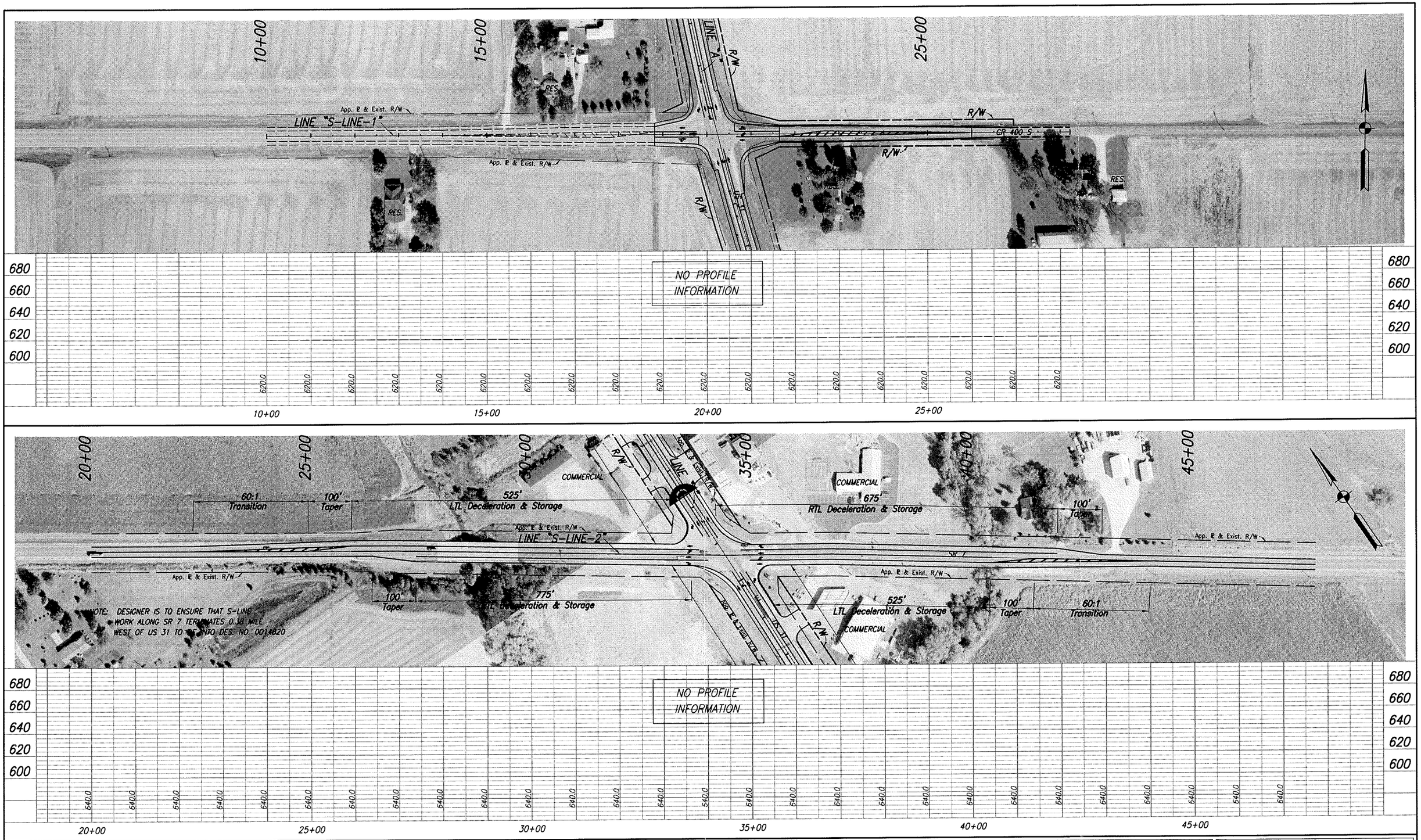


ALTERNATIVE C (PREFERRED)	INDIANA DEPARTMENT OF TRANSPORTATION	HORIZONTAL SCALE 1" = 200'	BRIDGE FILE
		VERTICAL SCALE 1" = 80'	DESIGNATION 0014820
DESIGNED: GRW / DRAWN: NLC	US 31 – PLAN & PROFILE STA. 844+00 TO STA. 904+00 "A"	SURVEY BOOK	SHEETS A-33 of
CHECKED: DPF / CHECKED: GRW		CONTRACT	PROJECT

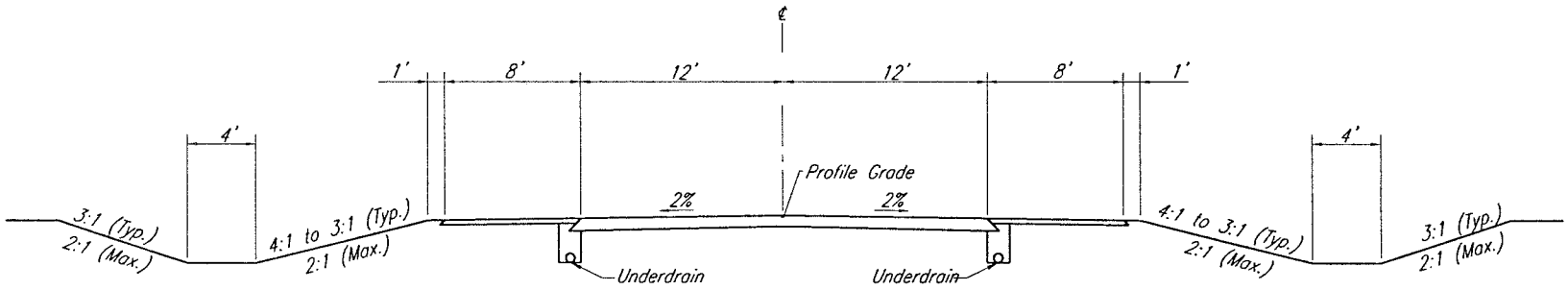




ALTERNATIVE C (PREFERRED)		INDIANA DEPARTMENT OF TRANSPORTATION	HORIZONTAL SCALE 1" = 200'	BRIDGE FILE	
			VERTICAL SCALE 1" = 80'	DESIGNATION 0014820	
DESIGNED: GRW	DRAWN: NLC	US 31 – PLAN & PROFILE STA. 904+00 TO END LINE "A"	SURVEY BOOK	SHEETS A-34 of	
CHECKED: DPF	CHECKED: GRW		CONTRACT	PROJECT	

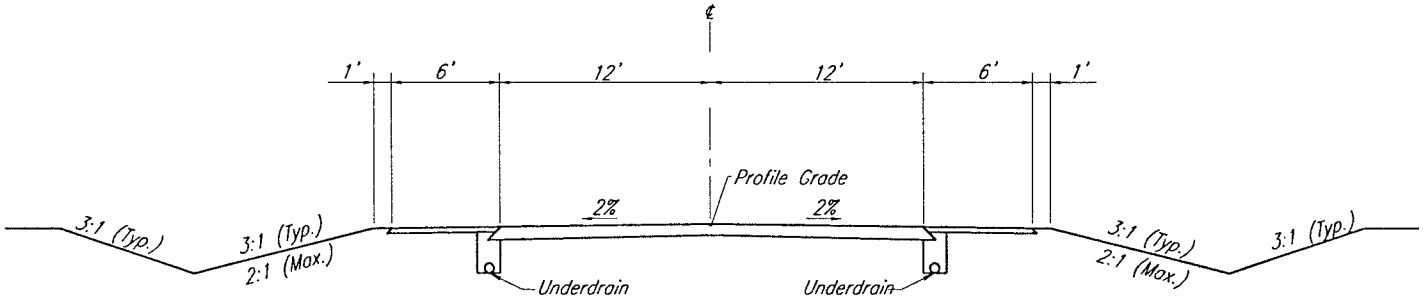


ALTERNATIVE C (PREFERRED)	INDIANA DEPARTMENT OF TRANSPORTATION	HORIZONTAL SCALE 1" = 200'	BRIDGE FILE
		VERTICAL SCALE 1" = 80'	DESIGNATION 0014820
DESIGNED: GRW / DRAWN: NLC	S-LINE-1 & 2 – PLAN & PROFILE CR 400 S & SR 7	SURVEY BOOK	SHEETS A-35 of
CHECKED: DPF / CHECKED: GRW		CONTRACT	PROJECT



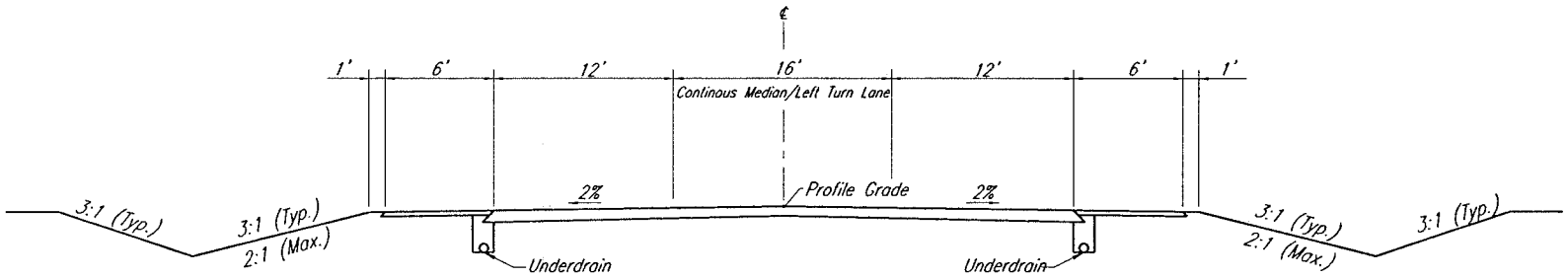
PROPOSED US 31 TYPICAL CROSS SECTION

(Sta. 29+00 to Sta. 268+00)
(Sta. 290+00 to Sta. 776+00)



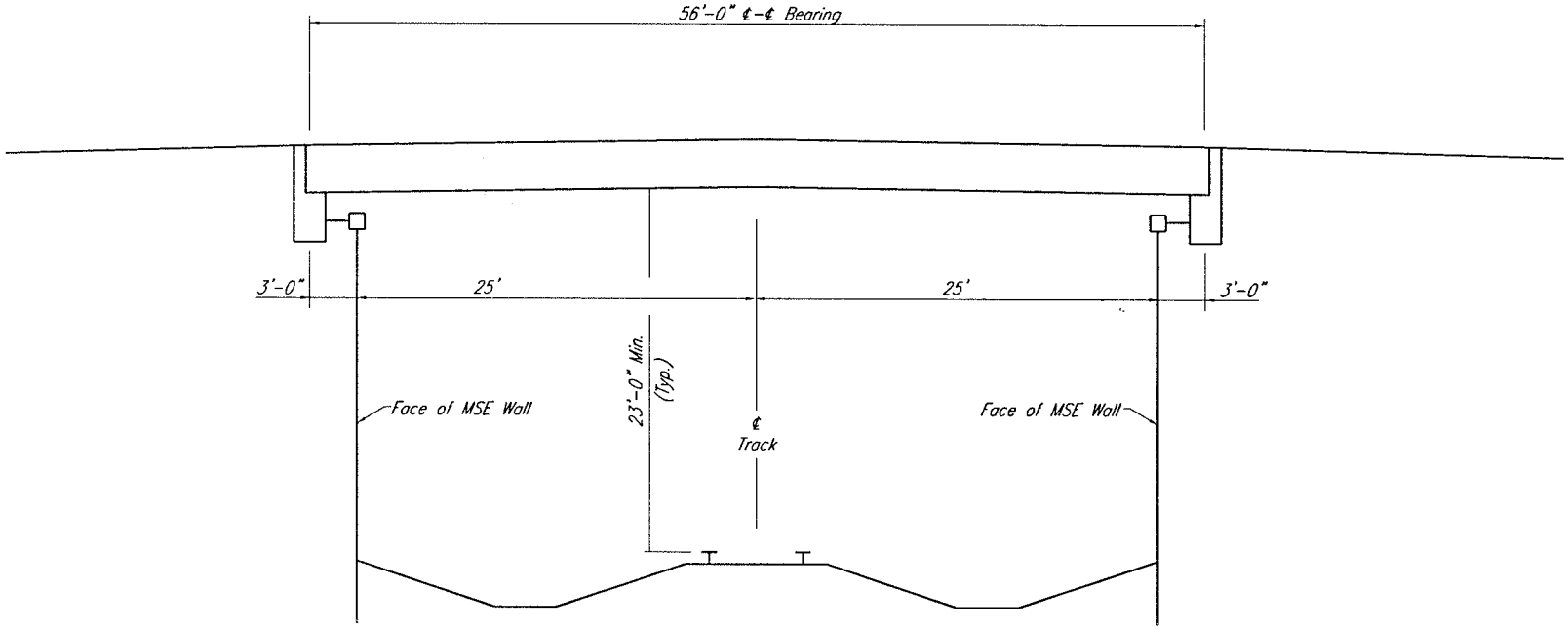
PROPOSED US 31 TYPICAL CROSS SECTION

(Begin Project to Sta. 29+00)
(Sta. 268+00 to Sta. 290+00)



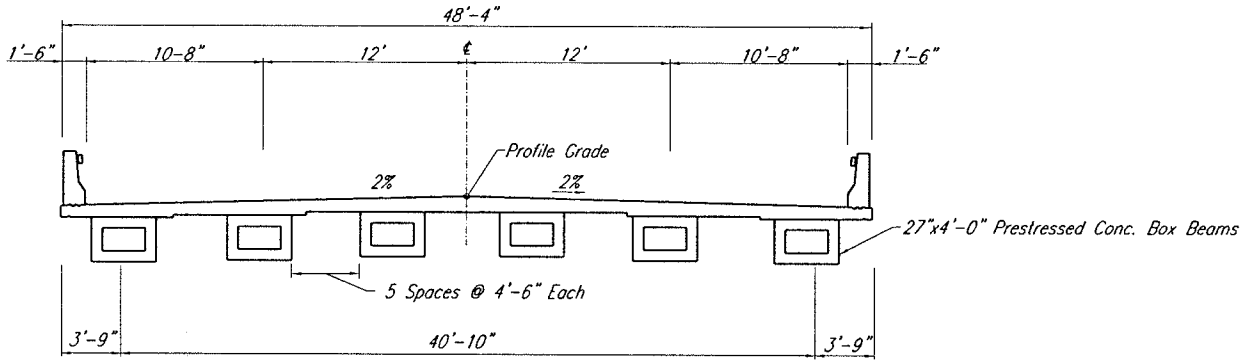
PROPOSED US 31 TYPICAL CROSS SECTION

(Sta. 776+00 to Sta. End Project)



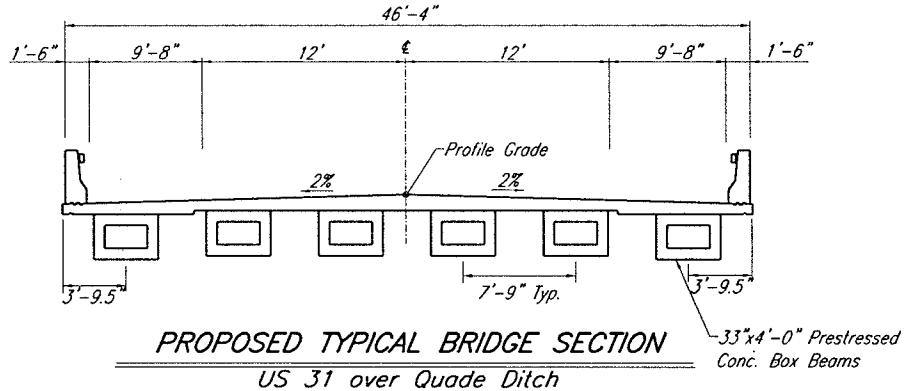
PROPOSED BRIDGE OPENING

US 31 @ CSX railroad



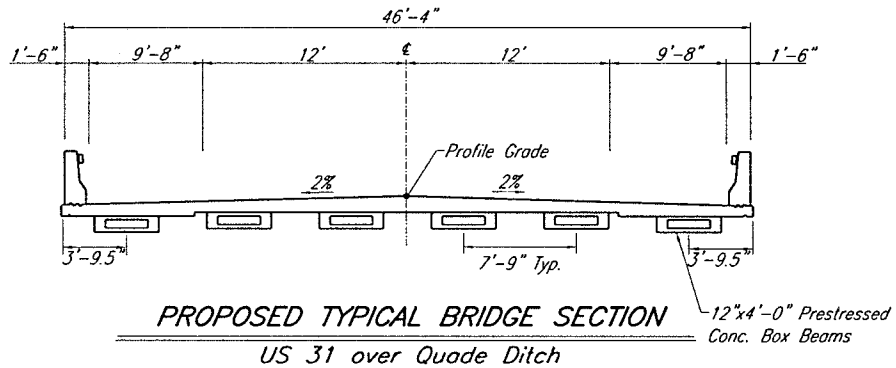
PROPOSED TYPICAL BRIDGE SECTION

US 31 @ CSX railroad



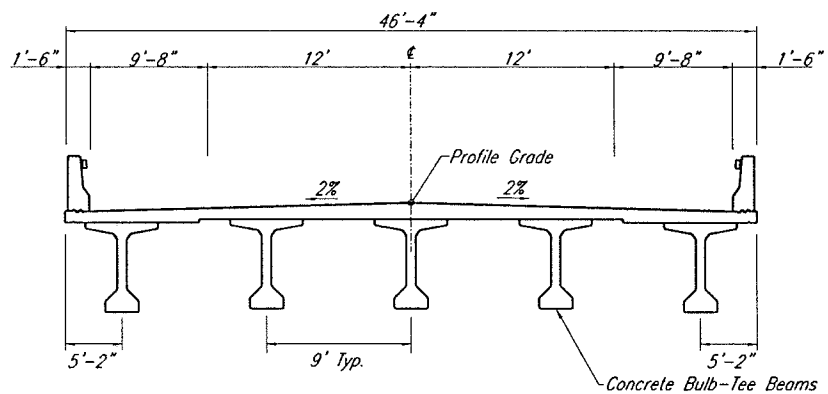
PROPOSED TYPICAL BRIDGE SECTION

US 31 over Quade Ditch
(with grade raise)



PROPOSED TYPICAL BRIDGE SECTION

US 31 over Quade Ditch
(maintaining existing grade)



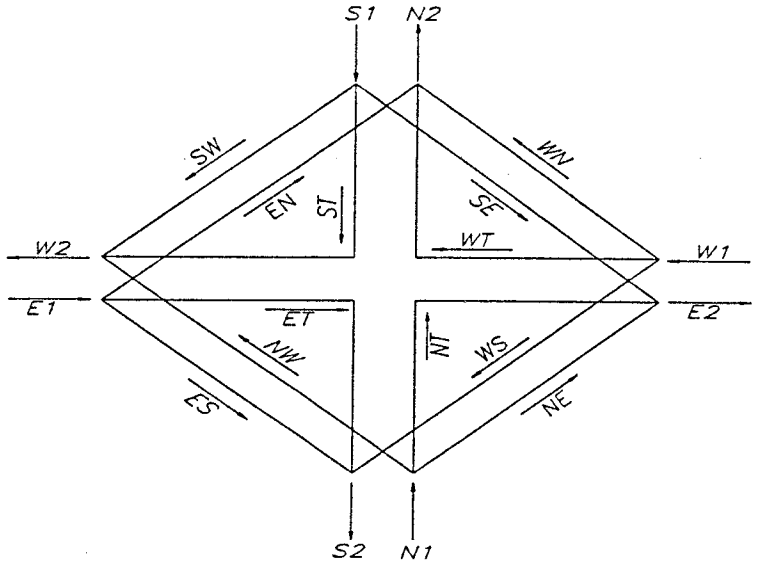
PROPOSED TYPICAL BRIDGE SECTION

US 31 over Sand Creek

TRAFFIC VOLUME FORECAST FOR INTERSECTIONS

Date: July 2001
Project: Des. No. 0014820
Route: US Route 31 at US Route 50
County: Jackson and Bartholomew Counties
Other Info: AM-DHV

US 31



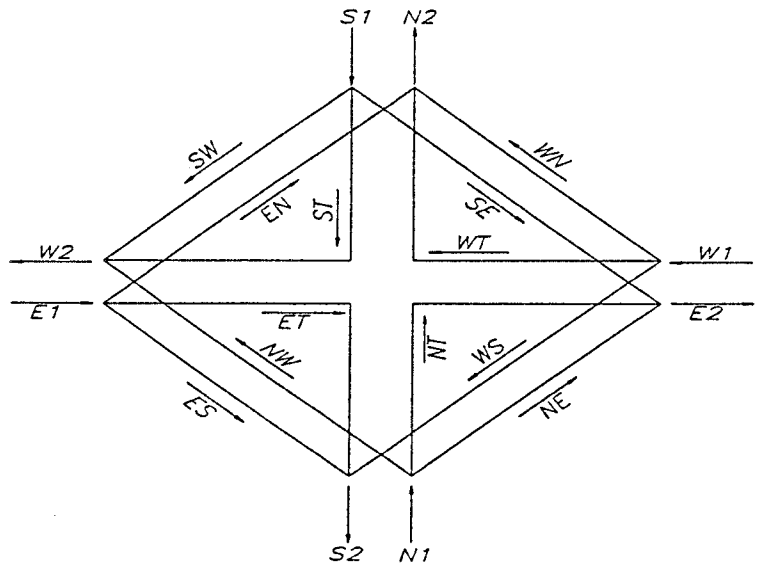
US 50

Turning Movements	AADT 2001	2005	2010	2015	2025	DHV %	COMMERCIAL VEHICLES % AADT	% DHV
NE	800	870	960	1050	1230	8	16	15
NW	3540	3860	4260	4650	5440	5	15	14
NT	960	1050	1150	1260	1480	7	21	16
SE	20	20	20	30	30	10	18	15
SW	3280	3580	3940	4310	5040	7	18	17
ST	730	800	880	960	1120	7	10	11
ES	2170	2370	2610	2850	3340	3	12	12
EN	2640	2880	3170	3470	4060	4	11	11
ET	5660	6170	6800	7440	8710	4	12	21
WN	20	20	20	30	30	10	9	9
WS	480	520	580	630	740	8	10	10
WT	5630	6140	6770	7400	8660	7	23	20
N1	5300	5780	6370	6960	8150	6	16	15
S2	3380	3690	4070	4440	5200	4	11	12
S1	4030	4400	4840	5300	6190	7	17	16
N2	3620	3950	4340	4760	5570	5	14	12
E1	10470	11420	12580	13760	16110	4	12	17
W2	12450	13580	14970	16360	19140	7	19	18
W1	6130	6680	7370	8060	9430	7	22	19
E2	6480	7060	7780	8520	9970	5	13	20

TRAFFIC VOLUME FORECAST FOR INTERSECTIONS

Date: July 2001
Project: Des. No. 0014820
Route: US Route 31 at US Route 50
County: Jackson and Bartholomew Counties
Other Info: PM-DHV

US 31

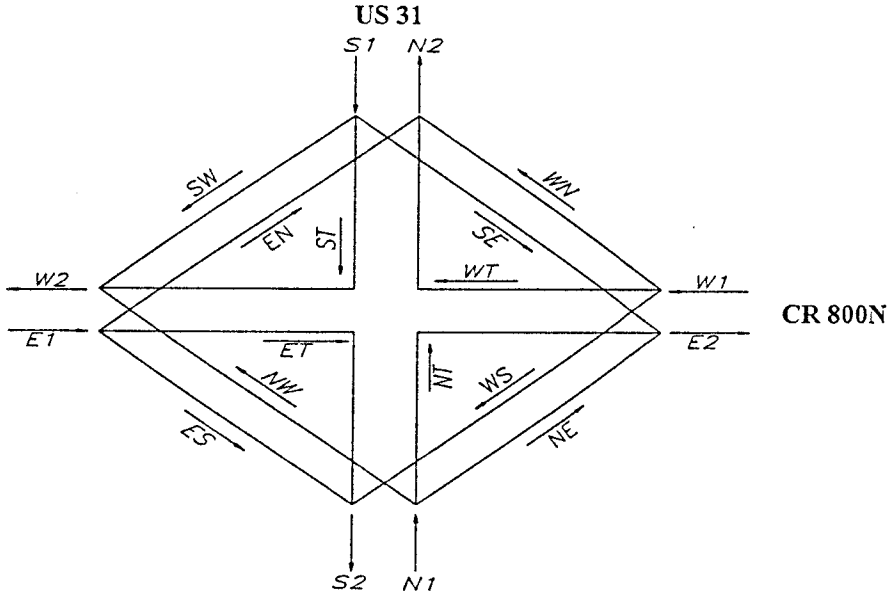


US 50

Turning Movements	AADT 2001	2005	2010	2015	2025	DHV %	COMMERCIAL VEHICLES % AADT	% DHV
NE	800	870	960	1050	1230	10	16	16
NW	3540	3860	4260	4650	5440	6	15	15
NT	960	1050	1150	1260	1480	8	21	21
SE	20	20	20	30	30	15	18	16
SW	3280	3580	3940	4310	5040	8	18	18
ST	730	800	880	960	1120	12	10	9
ES	2170	2370	2610	2850	3340	8	12	11
EN	2640	2880	3170	3470	4060	7	11	10
ET	5660	6170	6800	7440	8710	9	12	9
WN	20	20	20	30	30	10	9	10
WS	480	520	580	630	740	11	10	9
WT	5630	6140	6770	7400	8660	7	23	23
N1	5300	5780	6370	6960	8150	7	16	16
S2	3380	3690	4070	4440	5200	9	11	10
S1	4030	4400	4840	5300	6190	9	17	16
N2	3620	3950	4340	4760	5570	7	14	13
E1	10470	11420	12580	13760	16110	8	12	10
W2	12450	13580	14970	16360	19140	7	19	19
W1	6130	6680	7370	8060	9430	7	22	22
E2	6480	7060	7780	8520	9970	9	13	10

TRAFFIC VOLUME FORECAST FOR INTERSECTIONS

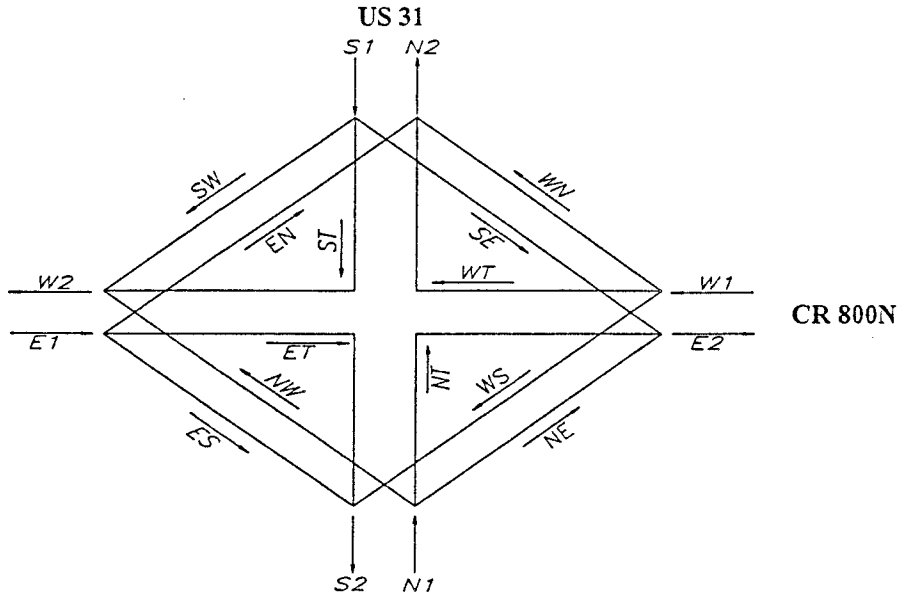
Date: July 2001
Project: Des. No. 0014820
Route: US Route 31 at County Road 800 North
County: Jackson and Bartholomew Counties
Other Info: AM-DHV



Turning Movements	AADT 2001	2005	2010	2015	2025	DHV %	COMMERCIAL VEHICLES % AADT	% DHV
NE	70	80	80	90	110	6	11	11
NW	30	30	40	40	50	27	15	16
NT	3000	3270	3610	3940	4610	7	26	19
SE	240	260	290	320	370	2	12	11
SW	100	110	120	130	150	9	14	13
ST	3410	3720	4100	4480	5240	7	12	11
ES	40	40	50	50	60	15	15	18
EN	120	130	140	160	180	4	11	10
ET	30	30	40	40	50	3	8	8
WN	330	360	400	430	510	4	11	10
WS	100	110	120	130	150	14	12	11
WT	30	30	40	40	50	17	10	8
N1	3100	3380	3730	4070	4770	7	26	19
S2	3550	3870	4270	4660	5450	8	12	11
S1	3750	4090	4510	4930	5760	7	12	11
N2	3450	3760	4150	4530	5300	6	24	18
E1	190	200	230	250	290	6	11	11
W2	160	170	200	210	250	14	14	13
W1	460	500	560	600	710	7	11	10
E2	340	370	410	450	530	3	12	11

TRAFFIC VOLUME FORECAST FOR INTERSECTIONS

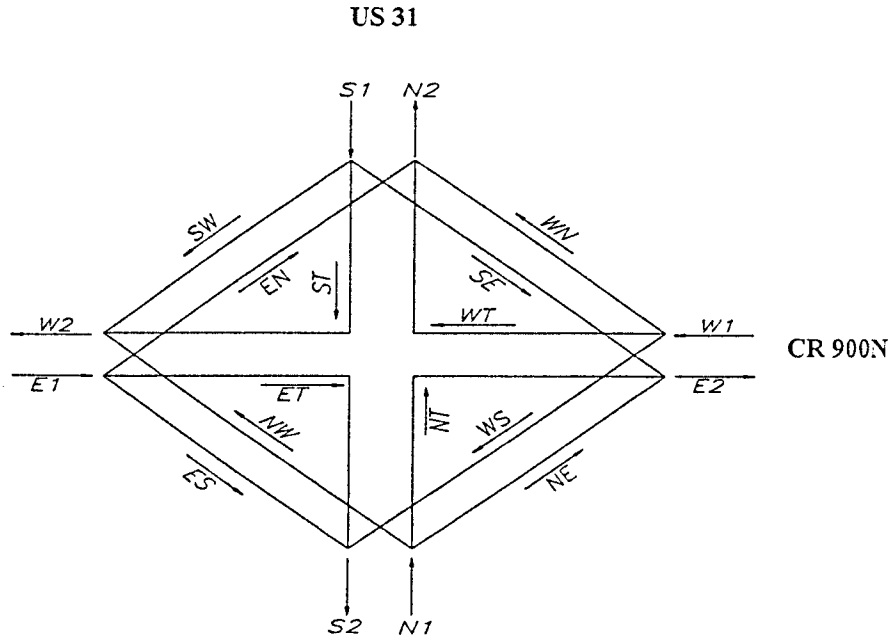
Date: July 2001
Project: Des. No. 0014820
Route: US Route 31 at County Road 800 North
County: Jackson and Bartholomew Counties
Other Info: PM-DHV



Turning Movements	AADT 2001	2005	2010	2015	2025	DHV %	COMMERCIAL VEHICLES % AADT	% DHV
NE	70	80	80	90	110	3	11	12
NW	30	30	40	40	50	3	15	13
NT	3000	3270	3610	3940	4610	7	26	21
SE	240	260	290	320	370	14	12	12
SW	100	110	120	130	150	8	14	14
ST	3410	3720	4100	4480	5240	10	12	8
ES	40	40	50	50	60	5	15	25
EN	120	130	140	160	180	16	11	11
ET	30	30	40	40	50	7	8	9
WN	330	360	400	430	510	8	11	11
WS	100	110	120	130	150	2	12	12
WT	30	30	40	40	50	3	10	9
N1	3100	3380	3730	4070	4770	7	26	21
S2	3550	3870	4270	4660	5450	9	12	8
S1	3750	4090	4510	4930	5760	10	12	8
N2	3450	3760	4150	4530	5300	8	24	20
E1	190	200	230	250	290	12	11	14
W2	160	170	200	210	250	6	14	13
W1	460	500	560	600	710	6	11	11
E2	340	370	410	450	530	11	12	12

TRAFFIC VOLUME FORECAST FOR INTERSECTIONS

Date: July 2001
Project: Des. No. 0014820
Route: US Route 31 at County Road 900 North
County: Jackson and Bartholomew Counties
Other Info: AM-DHV

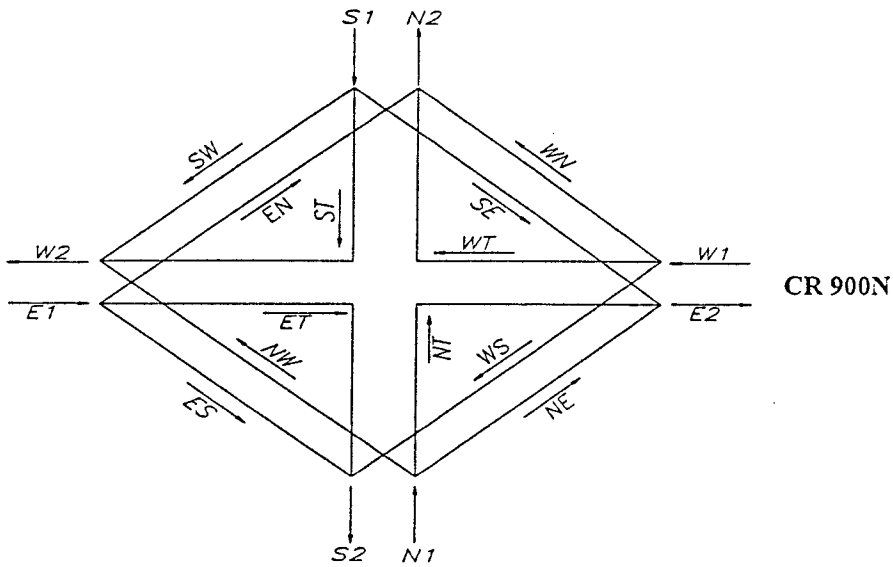


Turning Movements	AADT 2001	2005	2010	2015	2025	DHV %	COMMERCIAL VEHICLES % AADT	% DHV
NE	110	120	130	140	170	5	8	7
NW	140	150	170	180	220	11	8	7
NT	3090	3370	3710	4060	4750	6	19	14
SE	140	150	170	180	220	4	8	7
SW	180	200	220	240	280	9	8	7
ST	3270	3560	3930	4300	5030	7	12	11
ES	210	230	250	280	320	8	9	8
EN	250	270	300	330	380	5	9	8
ET	90	100	110	120	140	4	8	7
WN	140	150	170	180	220	9	11	10
WS	110	120	130	140	170	15	11	10
WT	70	80	80	90	110	19	9	8
N1	3340	3640	4010	4380	5140	6	18	13
S2	3590	3910	4310	4720	5520	7	12	11
S1	3590	3910	4320	4720	5530	7	12	11
N2	3480	3790	4180	4570	5350	6	18	13
E1	550	600	660	730	840	6	9	8
W2	390	430	470	510	610	12	8	7
W1	320	350	380	410	500	13	10	10
E2	340	370	410	440	530	4	8	7

TRAFFIC VOLUME FORECAST FOR INTERSECTIONS

Date: July 2001
Project: Des. No. 0014820
Route: US Route 31 at County Road 900 North
County: Jackson and Bartholomew Counties
Other Info: PM-DHV

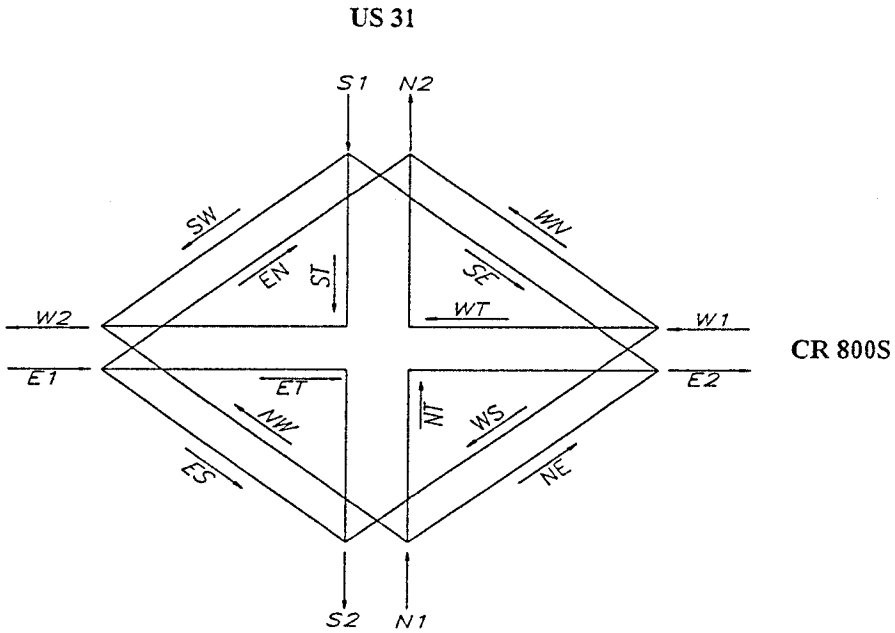
US 31



Turning Movements	AADT 2001	2005	2010	2015	2025	DHV %	COMMERCIAL VEHICLES % AADT	% DHV
NE	110	120	130	140	170	9	8	8
NW	140	150	170	180	220	8	8	8
NT	3090	3370	3710	4060	4750	7	19	13
SE	140	150	170	180	220	11	8	8
SW	180	200	220	240	280	9	8	8
ST	3270	3560	3930	4300	5030	10	12	6
ES	210	230	250	280	320	7	9	9
EN	250	270	300	330	380	7	9	9
ET	90	100	110	120	140	9	8	8
WN	140	150	170	180	220	6	11	11
WS	110	120	130	140	170	7	11	11
WT	70	80	80	90	110	6	9	9
N1	3340	3640	4010	4380	5140	7	18	13
S2	3590	3910	4310	4720	5520	10	12	6
S1	3590	3910	4320	4720	5530	10	12	6
N2	3480	3790	4180	4570	5350	7	18	13
E1	550	600	660	730	840	7	9	9
W2	390	430	470	510	610	8	8	8
W1	320	350	380	410	500	7	10	11
E2	340	370	410	440	530	10	8	8

TRAFFIC VOLUME FORECAST FOR INTERSECTIONS

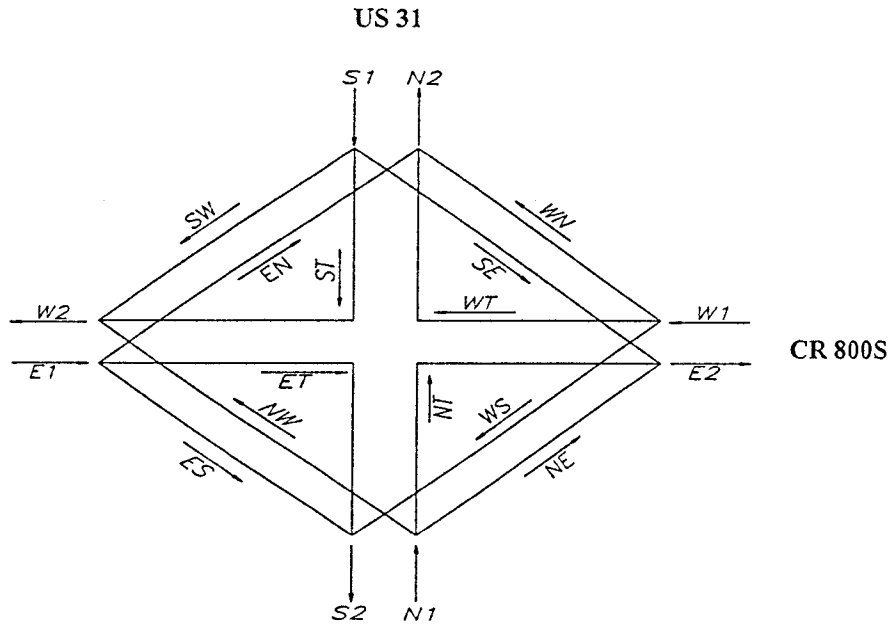
Date: July 2001
Project: Des. No. 0014820
Route: US Route 31 at County Road 800 South
County: Jackson and Bartholomew Counties
Other Info: AM-DHV



Turning Movements	AADT 2001	2005	2010	2015	2025	DHV %	COMMERCIAL VEHICLES % AADT	% DHV
NE	20	20	20	30	30	5	9	7
NW	300	330	360	390	460	4	8	7
NT	3290	3590	3950	4320	5060	8	19	14
SE	30	30	40	40	50	3	8	7
SW	400	440	480	530	620	7	8	7
ST	3390	3700	4070	4450	5210	5	12	10
ES	390	430	470	510	600	4	9	8
EN	500	550	600	660	770	11	9	8
ET	40	40	50	50	60	3	5	5
WN	30	30	40	40	50	3	8	8
WS	20	20	20	30	30	5	9	8
WT	20	20	20	30	30	5	7	5
N1	3610	3940	4330	4740	5550	7	18	13
S2	3800	4150	4560	4990	5840	5	12	10
S1	3820	4170	4590	5020	5880	5	12	10
N2	3820	4170	4590	5020	5880	8	18	13
E1	930	1020	1120	1220	1430	8	9	8
W2	720	790	860	950	1110	5	8	7
W1	70	70	80	100	110	4	8	7
E2	90	90	110	120	140	3	7	6

TRAFFIC VOLUME FORECAST FOR INTERSECTIONS

Date: July 2001
Project: Des. No. 0014820
Route: US Route 31 at County Road 800 South
County: Jackson and Bartholomew Counties
Other Info: PM-DHV

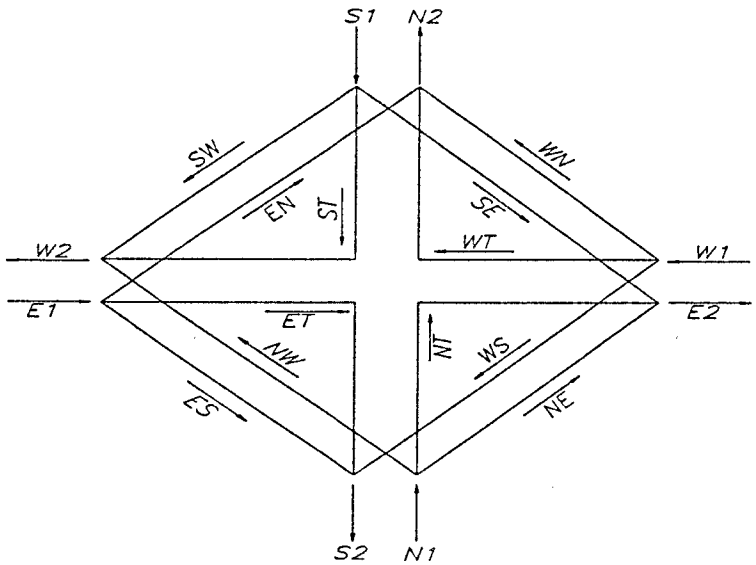


Turning Movements	AADT 2001	2005	2010	2015	2025	DHV %	COMMERCIAL VEHICLES % AADT	% DHV
NE	20	20	20	30	30	10	9	8
NW	300	330	360	390	460	5	8	8
NT	3290	3590	3950	4320	5060	6	19	13
SE	30	30	40	40	50	20	8	8
SW	400	440	480	530	620	12	8	8
ST	3390	3700	4070	4450	5210	11	12	5
ES	390	430	470	510	600	8	9	9
EN	500	550	600	660	770	10	9	9
ET	40	40	50	50	60	15	5	6
WN	30	30	40	40	50	13	8	9
WS	20	20	20	30	30	10	9	9
WT	20	20	20	30	30	15	7	6
N1	3610	3940	4330	4740	5550	6	18	13
S2	3800	4150	4560	4990	5840	10	12	5
S1	3820	4170	4590	5020	5880	11	12	5
N2	3820	4170	4590	5020	5880	7	18	12
E1	930	1020	1120	1220	1430	9	9	9
W2	720	790	860	950	1110	9	8	8
W1	70	70	80	100	110	13	8	8
E2	90	90	110	120	140	16	7	7

TRAFFIC VOLUME FORECAST FOR INTERSECTIONS

Date: July 2001
Project: Des. No. 0014820
Route: US Route 31 at County Road 750 South
County: Jackson and Bartholomew Counties
Other Info: AM-DHV

US 31



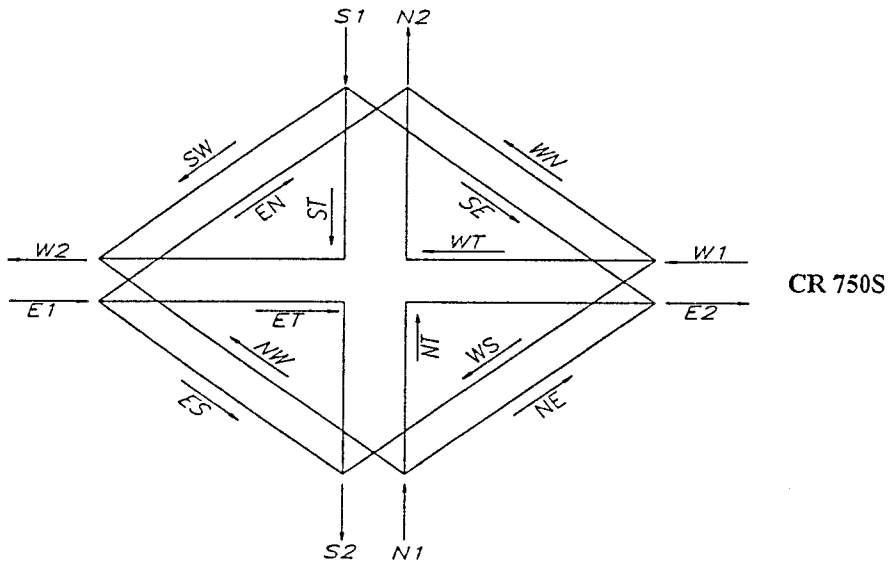
CR 750S

Turning Movements	AADT 2001	2005	2010	2015	2025	DHV %	COMMERCIAL VEHICLES % AADT	% DHV
NE	130	140	160	170	200	5	2	1
NW	100	110	120	130	150	4	2	1
NT	3570	3890	4290	4690	5490	9	13	10
SE	150	160	180	200	230	5	2	1
SW	110	120	130	140	170	5	2	1
ST	3670	4000	4410	4820	5640	5	14	14
ES	70	80	80	90	110	4	2	1
EN	80	90	100	110	120	8	2	1
ET	30	30	40	40	50	3	1	1
WN	120	130	140	160	180	13	2	1
WS	100	110	120	130	150	8	2	1
WT	30	30	40	40	50	7	1	1
N1	3800	4140	4570	4990	5840	8	12	9
S2	3840	4190	4610	5040	5900	5	13	13
S1	3930	4280	4720	5160	6040	5	13	13
N2	3770	4110	4530	4960	5790	9	12	10
E1	180	200	220	240	280	6	2	1
W2	240	260	290	310	370	5	2	1
W1	250	270	300	330	380	10	2	1
E2	310	330	380	410	480	5	2	1

TRAFFIC VOLUME FORECAST FOR INTERSECTIONS

Date: July 2001
Project: Des. No. 0014820
Route: US Route 31 at County Road 750 South
County: Jackson and Bartholomew Counties
Other Info: PM-DHV

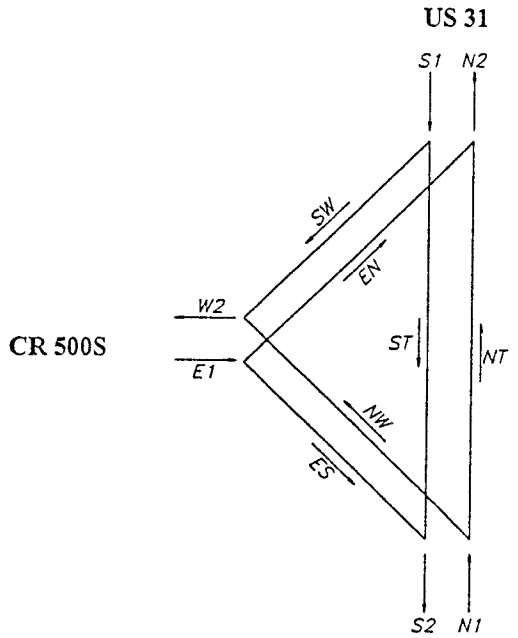
US 31



Turning Movements	AADT 2001	2005	2010	2015	2025	DHV %	COMMERCIAL VEHICLES % AADT	% DHV
NE	130	140	160	170	200	2	2	2
NW	100	110	120	130	150	2	2	2
NT	3570	3890	4290	4690	5490	7	13	9
SE	150	160	180	200	230	18	2	2
SW	110	120	130	140	170	20	2	2
ST	3670	4000	4410	4820	5640	11	14	6
ES	70	80	80	90	110	3	2	2
EN	80	90	100	110	120	15	2	2
ET	30	30	40	40	50	3	1	1
WN	120	130	140	160	180	8	2	2
WS	100	110	120	130	150	2	2	2
WT	30	30	40	40	50	3	1	1
N1	3800	4140	4570	4990	5840	7	12	9
S2	3840	4190	4610	5040	5900	11	13	6
S1	3930	4280	4720	5160	6040	12	13	6
N2	3770	4110	4530	4960	5790	7	12	9
E1	180	200	220	240	280	8	2	2
W2	240	260	290	310	370	10	2	2
W1	250	270	300	330	380	5	2	2
E2	310	330	380	410	480	10	2	2

TRAFFIC VOLUME FORECAST FOR INTERSECTIONS

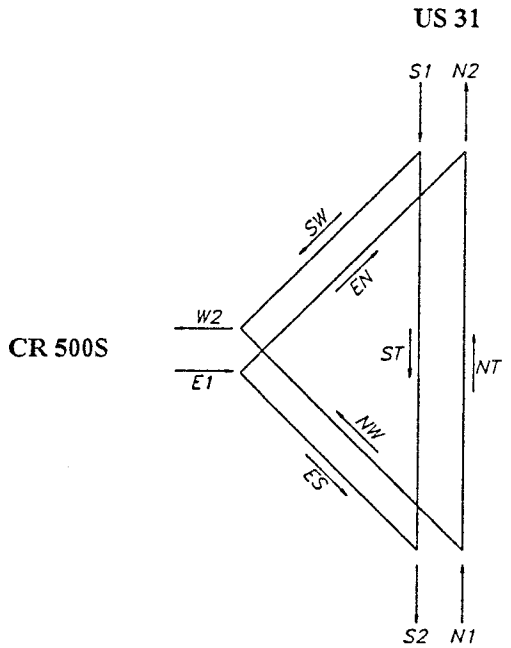
Date: July 2001
Project: Des. No. 0014820
Route: US Route 31 at County Road 500 South
County: Jackson and Bartholomew Counties
Other Info: AM-DHV



Turning Movements	AADT 2001	2005	2010	2015	2025	DHV %	COMMERCIAL VEHICLES % AADT	% DHV
NE								
NW	20	20	20	30	30	5	2	1
NT	4340	4730	5220	5700	6670	9	12	10
SE								
SW	60	70	70	80	90	2	2	1
ST	4520	4930	5430	5940	6950	5	13	13
ES	30	30	40	40	50	7	3	1
EN	90	100	110	120	140	7	3	1
ET								
WN								
WS								
WT								
N1	4360	4750	5240	5730	6700	9	12	10
S2	4550	4960	5470	5980	7000	5	13	13
S1	4580	5000	5500	6020	7040	5	13	13
N2	4430	4830	5330	5820	6810	9	12	10
E1	120	130	150	160	190	7	3	1
W2	80	90	90	110	120	3	2	1
W1								
E2								

TRAFFIC VOLUME FORECAST FOR INTERSECTIONS

Date: July 2001
Project: Des. No. 0014820
Route: US Route 31 at County Road 500 South
County: Jackson and Bartholomew Counties
Other Info: PM-DHV

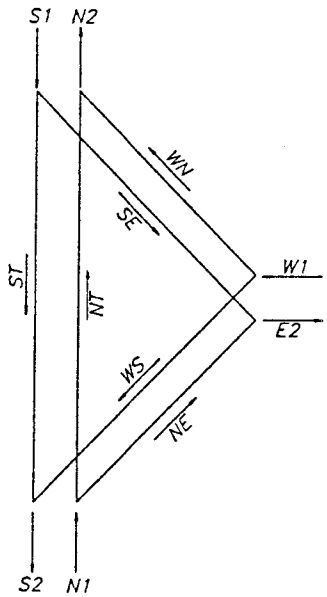


Turning Movements	AADT 2001	2005	2010	2015	2025	DHV %	COMMERCIAL VEHICLES % AADT	% DHV
NE								
NW	20	20	20	30	30	5	2	2
NT	4340	4730	5220	5700	6670	6	12	12
SE								
SW	60	70	70	80	90	7	2	2
ST	4520	4930	5430	5940	6950	11	13	6
ES	30	30	40	40	50	7	3	1
EN	90	100	110	120	140	6	3	1
ET								
WN								
WS								
WT								
N1	4360	4750	5240	5730	6700	6	12	12
S2	4550	4960	5470	5980	7000	11	13	6
S1	4580	5000	5500	6020	7040	11	13	6
N2	4430	4830	5330	5820	6810	6	12	12
E1	120	130	150	160	190	6	3	1
W2	80	90	90	110	120	6	2	2
W1								
E2								

TRAFFIC VOLUME FORECAST FOR INTERSECTIONS

Date: July 2001
Project: Des. No. 0014820
Route: US Route 31 at County Road 475 South
County: Jackson and Bartholomew Counties
Other Info: AM-DHV

US 31



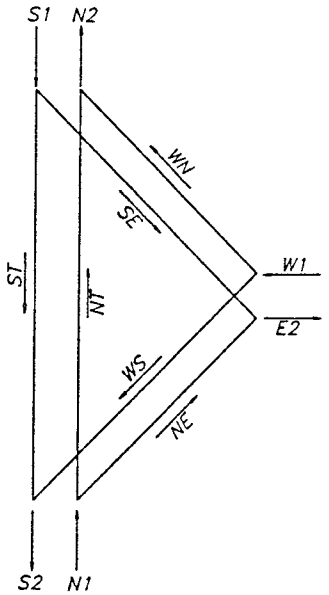
CR 475S

Turning Movements	AADT 2001	2005	2010	2015	2025	DHV %	COMMERCIAL VEHICLES % AADT	% DHV
NE	350	380	420	460	540	6	11	10
NW								
NT	4080	4450	4900	5360	6280	10	12	10
SE	220	240	260	290	340	2	11	10
SW								
ST	4170	4550	5010	5480	6410	4	12	12
ES								
EN								
ET								
WN	240	260	290	320	370	11	9	2
WS	400	440	480	530	620	13	9	2
WT								
N1	4430	4830	5320	5820	6820	9	12	10
S2	4570	4990	5490	6010	7030	5	12	11
S1	4390	4790	5270	5770	6750	4	12	12
N2	4320	4710	5190	5680	6650	10	12	10
E1								
W2								
W1	640	700	770	850	990	12	9	2
E2	570	620	680	750	880	5	11	10

TRAFFIC VOLUME FORECAST FOR INTERSECTIONS

Date: July 2001
Project: Des. No. 0014820
Route: US Route 31 at County Road 475 South
County: Jackson and Bartholomew Counties
Other Info: PM-DHV

US 31



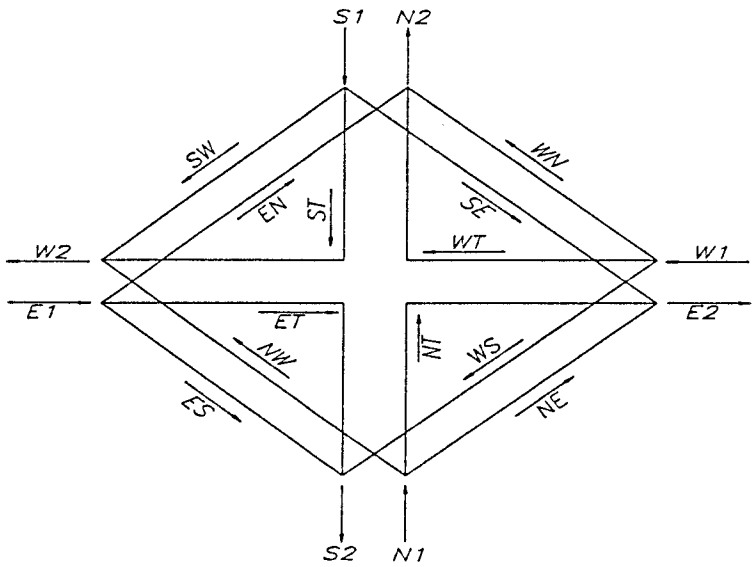
CR 475S

Turning Movements	AADT 2001	2005	2010	2015	2025	DHV %	COMMERCIAL VEHICLES % AADT	% DHV
NE	350	380	420	460	540	13	11	11
NW								
NT	4080	4450	4900	5360	6280	6	12	12
SE	220	240	260	290	340	33	11	11
SW								
ST	4170	4550	5010	5480	6410	12	12	6
ES								
EN								
ET								
WN	240	260	290	320	370	8	9	9
WS	400	440	480	530	620	6	9	9
WT								
N1	4430	4830	5320	5820	6820	6	12	12
S2	4570	4990	5490	6010	7030	11	12	6
S1	4390	4790	5270	5770	6750	13	12	6
N2	4320	4710	5190	5680	6650	6	12	12
E1								
W2								
W1	640	700	770	850	990	6	9	9
E2	570	620	680	750	880	20	11	11

TRAFFIC VOLUME FORECAST FOR INTERSECTIONS

Date: July 2001
Project: Des. No. 0014820
Route: US Route 31 at County Road 400 South
County: Jackson and Bartholomew Counties
Other Info: AM-DHV

US 31

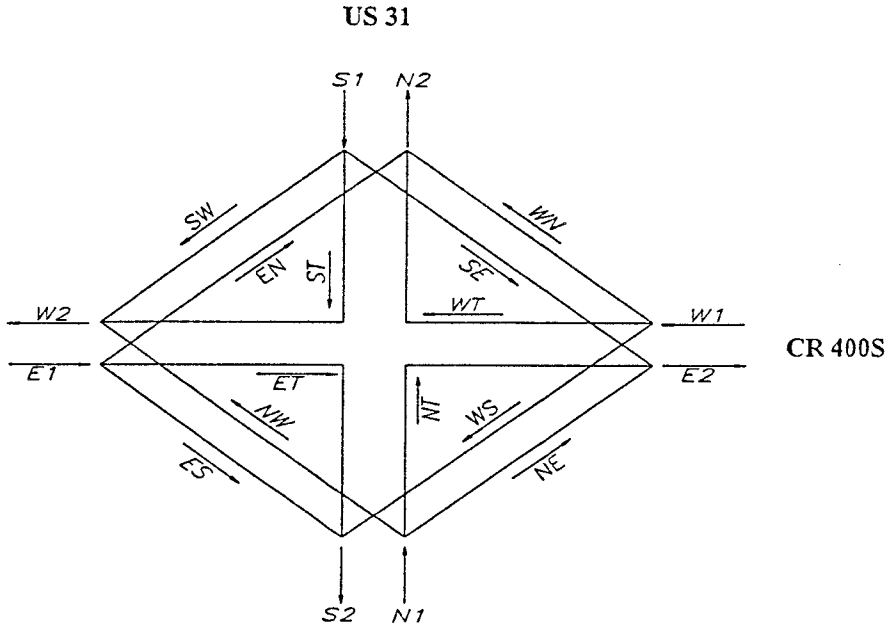


CR 400S

Turning Movements	AADT 2001	2005	2010	2015	2025	DHV %	COMMERCIAL VEHICLES % AADT	% DHV
NE	20	20	20	30	30	5	9	8
NW	520	570	630	680	800	9	8	8
NT	3780	4120	4540	4970	5810	10	12	12
SE	70	80	80	90	110	6	10	8
SW	990	1080	1190	1300	1520	8	8	8
ST	4000	4360	4810	5260	6150	4	11	18
ES	360	390	430	470	550	5	9	9
EN	1010	1100	1210	1330	1550	8	3	9
ET	530	580	640	700	820	5	4	3
WN	120	130	140	160	180	6	9	7
WS	30	30	40	40	50	7	11	9
WT	400	440	480	530	620	7	9	9
N1	4320	4710	5190	5680	6640	10	11	12
S2	4390	4780	5280	5770	6750	4	11	17
S1	5060	5520	6080	6650	7780	5	10	16
N2	4910	5350	5890	6460	7540	9	10	11
E1	1900	2070	2280	2500	2920	7	4	7
W2	1910	2090	2300	2510	2940	8	8	8
W1	550	600	660	730	850	7	9	9
E2	620	680	740	820	960	5	5	4

TRAFFIC VOLUME FORECAST FOR INTERSECTIONS

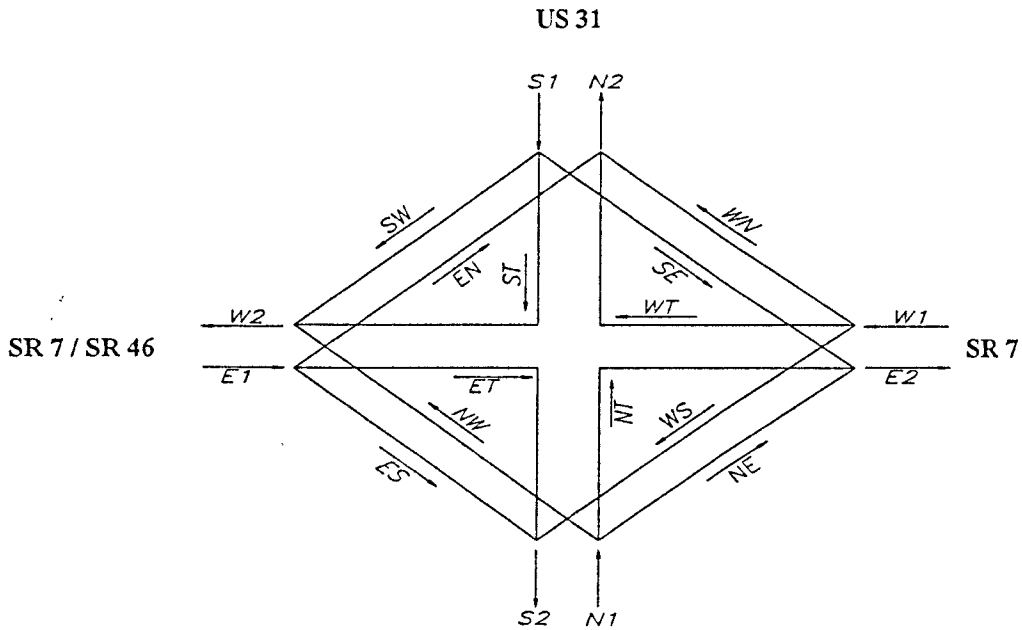
Date: July 2001
Project: Des. No. 0014820
Route: US Route 31 at County Road 400 South
County: Jackson and Bartholomew Counties
Other Info: PM-DHV



Turning Movements	AADT 2001	2005	2010	2015	2025	DHV %	COMMERCIAL VEHICLES % AADT	% DHV
NE	20	20	20	30	30	10	9	8
NW	520	570	630	680	800	7	8	8
NT	3780	4120	4540	4970	5810	6	12	11
SE	70	80	80	90	110	9	10	8
SW	990	1080	1190	1300	1520	6	8	8
ST	4000	4360	4810	5260	6150	12	11	8
ES	360	390	430	470	550	24	9	4
EN	1010	1100	1210	1330	1550	11	3	4
ET	530	580	640	700	820	18	4	4
WN	120	130	140	160	180	4	9	7
WS	30	30	40	40	50	7	11	9
WT	400	440	480	530	620	4	9	9
N1	4320	4710	5190	5680	6640	6	11	11
S2	4390	4780	5280	5770	6750	13	11	8
S1	5060	5520	6080	6650	7780	10	10	8
N2	4910	5350	5890	6460	7540	7	10	9
E1	1900	2070	2280	2500	2920	16	4	4
W2	1910	2090	2300	2510	2940	6	8	8
W1	550	600	660	730	850	4	9	9
E2	620	680	740	820	960	17	5	5

TRAFFIC VOLUME FORECAST FOR INTERSECTIONS

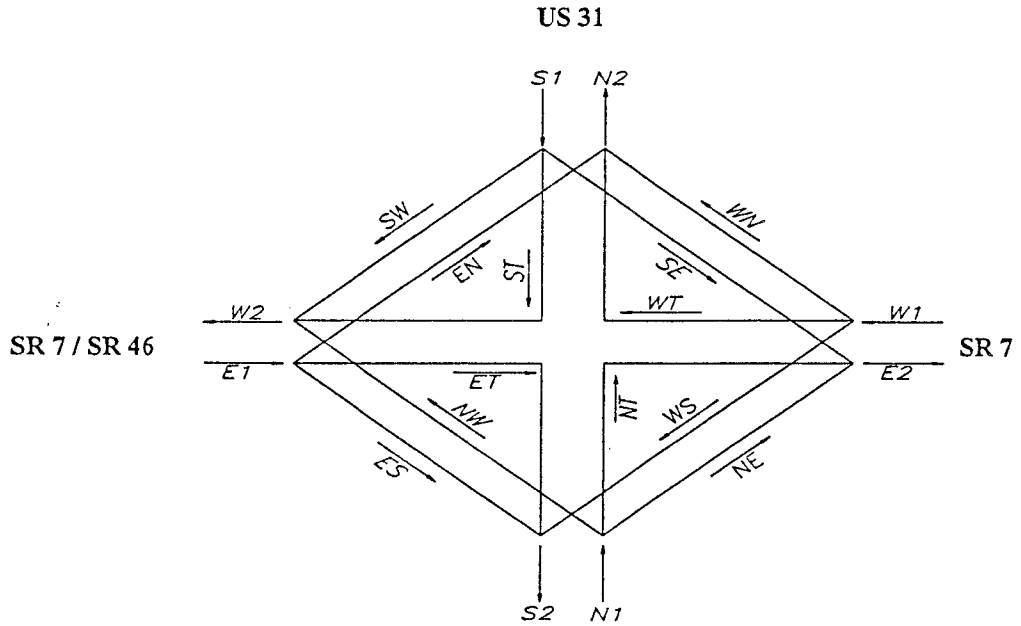
Date: July 2001
Project: Des. No. 0014820
Route: US Route 31 at State Road 7 / State Road 46
County: Jackson and Bartholomew Counties
Other Info: AM-DHV



Turning Movements	AADT 2001	2005	2010	2015	2025	DHV %	COMMERCIAL VEHICLES % AADT	% DHV
NE	90	100	110	120	140	12	6	7
NW	1690	1840	2030	2220	2600	7	11	10
NT	3110	3390	3740	4090	4780	11	10	7
SE	3020	3290	3630	3970	4640	6	8	9
SW	1240	1350	1490	1630	1910	4	10	9
ST	3340	3640	4010	4390	5140	4	9	9
ES	1630	1780	1960	2140	2510	7	11	7
EN	1110	1210	1330	1460	1710	11	7	6
ET	3460	3770	4160	4550	5320	12	6	5
WN	2790	3040	3350	3670	4290	5	5	6
WS	90	100	110	120	140	3	6	5
WT	3560	3880	4280	4680	5480	3	7	6
N1	4890	5330	5880	6430	7520	10	10	8
S2	5060	5520	6080	6650	7790	5	10	8
S1	7600	8280	9130	9990	11690	5	9	9
N2	7010	7640	8420	9220	10780	8	8	6
E1	6200	6760	7450	8150	9540	10	7	6
W2	6490	7070	7800	8530	9990	4	9	8
W1	6440	7020	7740	8470	9910	4	6	6
E2	6570	7160	7900	8640	10100	9	7	7

TRAFFIC VOLUME FORECAST FOR INTERSECTIONS

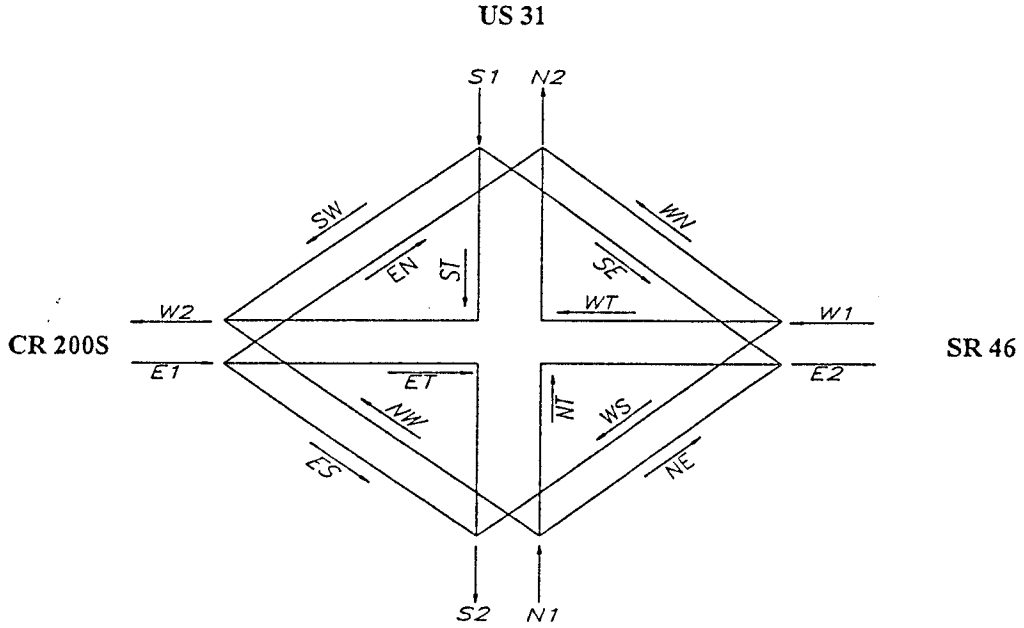
Date: July 2001
Project: Des. No. 0014820
Route: US Route 31 at State Road 7 / State Road 46
County: Jackson and Bartholomew Counties
Other Info: PM-DHV



Turning Movements	AADT 2001	2005	2010	2015	2025	DHV %	COMMERCIAL VEHICLES % AADT	% DHV
NE	90	100	110	120	140	11	6	6
NW	1690	1840	2030	2220	2600	7	11	11
NT	3110	3390	3740	4090	4780	6	10	9
SE	3020	3290	3630	3970	4640	7	8	8
SW	1240	1350	1490	1630	1910	5	10	10
ST	3340	3640	4010	4390	5140	12	9	6
ES	1630	1780	1960	2140	2510	6	11	10
EN	1110	1210	1330	1460	1710	2	7	7
ET	3460	3770	4160	4550	5320	4	6	6
WN	2790	3040	3350	3670	4290	11	5	5
WS	90	100	110	120	140	31	6	6
WT	3560	3880	4280	4680	5480	13	7	7
N1	4890	5330	5880	6430	7520	7	10	10
S2	5060	5520	6080	6650	7790	10	10	7
S1	7600	8280	9130	9990	11690	9	9	7
N2	7010	7640	8420	9220	10780	8	8	7
E1	6200	6760	7450	8150	9540	4	7	7
W2	6490	7070	7800	8530	9990	10	9	9
W1	6440	7020	7740	8470	9910	12	6	6
E2	6570	7160	7900	8640	10100	6	7	7

TRAFFIC VOLUME FORECAST FOR INTERSECTIONS

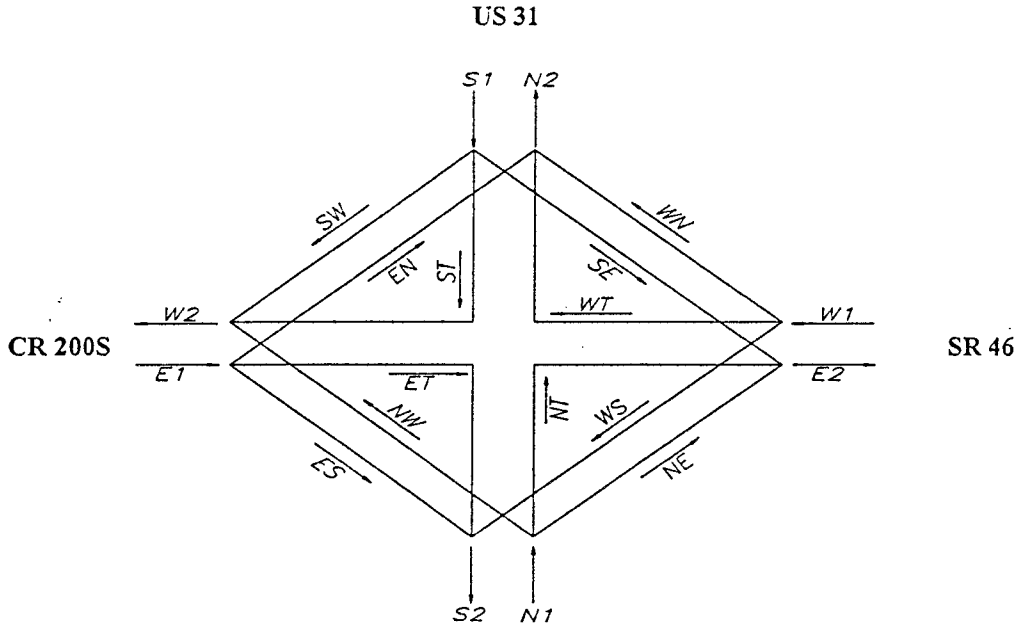
Date: July 2001
Project: Des. No. 0014820
Route: US Route 31 at State Road 46 / County Road 200 South
County: Jackson and Bartholomew Counties
Other Info: AM-DHV



Turning Movements	AADT 2001	2005	2010	2015	2025	DHV %	COMMERCIAL VEHICLES % AADT	% DHV
NE	1190	1300	1430	1560	1830	7	11	10
NW	360	390	430	470	550	11	9	9
NT	5550	6050	6670	7290	8540	8	9	9
SE	1100	1200	1320	1450	1690	5	10	9
SW	80	90	100	110	120	8	7	7
ST	6010	6550	7220	7900	9240	3	6	6
ES	340	370	410	450	520	5	8	7
EN	70	80	80	90	110	7	6	5
ET	340	370	410	450	520	6	7	7
WN	1090	1190	1310	1430	1680	12	7	6
WS	1270	1380	1530	1670	1950	7	14	10
WT	380	410	460	500	580	15	8	8
N1	7100	7740	8530	9320	10920	8	9	9
S2	7620	8300	9160	10020	11710	4	7	7
S1	7190	7840	8640	9460	11050	4	7	6
N2	6710	7320	8060	8810	10330	9	9	8
E1	750	820	900	990	1150	6	7	7
W2	820	890	990	1080	1250	13	8	8
W1	2740	2980	3300	3600	4210	10	10	8
E2	2630	2870	3160	3460	4040	6	10	9

TRAFFIC VOLUME FORECAST FOR INTERSECTIONS

Date: July 2001
Project: Des. No. 0014820
Route: US Route 31 at State Road 46 / County Road 200 South
County: Jackson and Bartholomew Counties
Other Info: PM-DHV

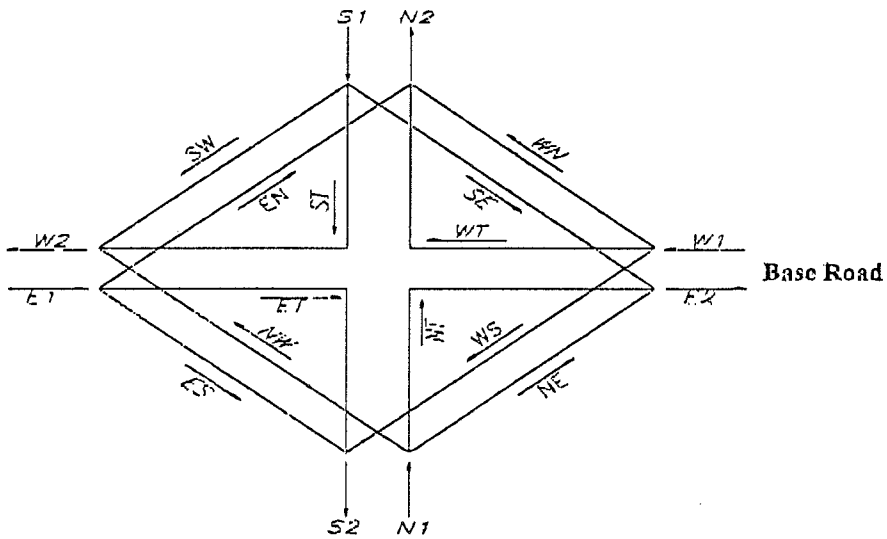


Turning Movements	AADT 2001	2005	2010	2015	2025	DHV %	COMMERCIAL VEHICLES % AADT	% DHV
NE	1190	1300	1430	1560	1830	8	11	11
NW	360	390	430	470	550	6	9	8
NT	5550	6050	6670	7290	8540	6	9	8
SE	1100	1200	1320	1450	1690	12	10	10
SW	80	90	100	110	120	8	7	6
ST	6010	6550	7220	7900	9240	10	6	5
ES	340	370	410	450	520	13	8	8
EN	70	80	80	90	110	11	6	6
ET	340	370	410	450	520	16	7	7
WN	1090	1190	1310	1430	1680	6	7	7
WS	1270	1380	1530	1670	1950	6	14	7
WT	380	410	460	500	580	6	8	7
N1	7100	7740	8530	9320	10920	7	9	9
S2	7620	8300	9160	10020	11710	9	7	5
S1	7190	7840	8640	9460	11050	10	7	6
N2	6710	7320	8060	8810	10330	6	9	8
E1	750	820	900	990	1150	14	7	7
W2	820	890	990	1080	1250	6	8	7
W1	2740	2980	3300	3600	4210	6	10	7
E2	2630	2870	3160	3460	4040	11	10	10

TRAFFIC VOLUME FORECAST FOR INTERSECTIONS

Date: July 2001
Project: Des. No. 0014820
Route: US Route 31 at Base Road
County: Jackson and Bartholomew Counties
Other Info: AM-DHV

US 31

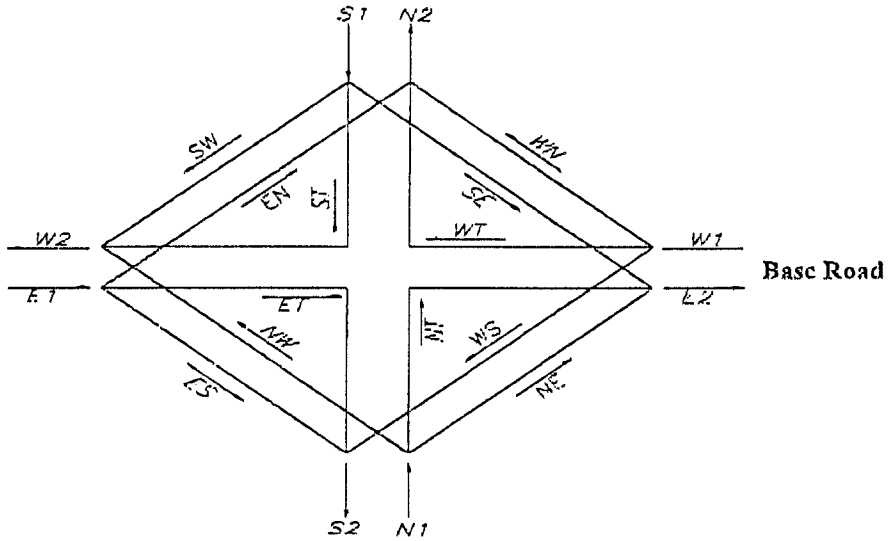


Turning Movements	AADT 2001	2005	2010	2015	2025	DHV %	COMMERCIAL VEHICLES % AADT	% DHV
NE	20	20	20	30	30	10	6	5
NW	30	30	40	40	50	23	5	5
NT	7250	7900	8710	9530	11150	9	7	6
SE	900	980	1080	1180	1380	5	6	5
SW	580	630	700	760	890	9	6	5
ST	7390	8060	8880	9710	11370	4	7	7
ES	30	30	40	40	50	10	5	6
EN	710	770	850	930	1090	9	5	6
ET	60	70	70	80	90	12	4	3
WN	890	970	1070	1170	1370	4	5	6
WS	10	10	10	10	20	10	6	6
WT	60	70	70	80	90	13	4	3
N1	7300	7950	8770	9600	11230	9	7	6
S2	7430	8100	8930	9760	11440	4	7	7
S1	8870	9670	10660	11650	13640	4	7	7
N2	8850	9640	10630	11630	13610	9	7	6
E1	800	870	960	1050	1230	9	5	6
W2	670	730	810	880	1030	10	6	5
W1	960	1050	1150	1260	1480	5	5	6
E2	980	1070	1170	1290	1500	5	6	5

TRAFFIC VOLUME FORECAST FOR INTERSECTIONS

Date: July 2001
Project: Des. No. 0014820
Route: US Route 31 at Base Road
County: Jackson and Bartholomew Counties
Other Info: PM-DHV

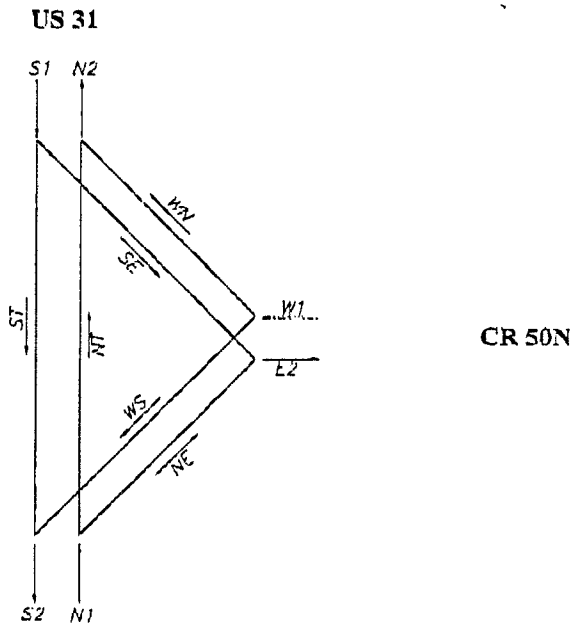
US 31



Turning Movements	AADT 2001	AADT 2005	AADT 2010	AADT 2015	AADT 2025	DHV %	COMMERCIAL VEHICLES % AADT	COMMERCIAL VEHICLES % DHV
NE	20	20	20	30	30	10	6	6
NW	30	30	40	40	50	7	5	6
NT	7250	7900	8710	9530	11150	6	7	5
SE	900	980	1080	1180	1380	8	6	6
SW	580	630	700	760	890	8	6	6
ST	7390	8060	8880	9710	11370	10	7	5
ES	30	30	40	40	50	10	5	5
EN	710	770	850	930	1090	7	5	5
ET	60	70	70	80	90	10	4	4
WN	890	970	1070	1170	1370	9	5	5
WS	10	10	10	10	20	20	6	5
WT	60	70	70	80	90	8	4	4
N1	7300	7950	8770	9600	11230	6	7	5
S2	7430	8100	8930	9760	11440	10	7	5
S1	8870	9670	10660	11650	13640	10	7	5
N2	8850	9640	10630	11630	13610	7	7	5
E1	800	870	960	1050	1230	7	5	5
W2	670	730	810	880	1030	8	6	6
W1	960	1050	1150	1260	1480	9	5	5
E2	980	1070	1170	1290	1500	8	6	6

TRAFFIC VOLUME FORECAST FOR INTERSECTIONS

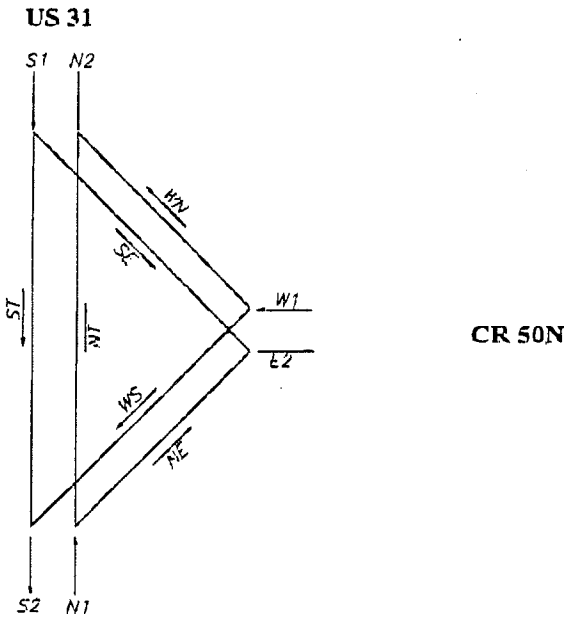
Date: July 2001
Project: Des. No. 0014820
Route: US Route 31 at County Road 50 North
County: Jackson and Bartholomew Counties
Other Info: AM-DHV



Turning Movements	AADT 2001	2005	2010	2015	2025	DHV %	COMMERCIAL VEHICLES % AADT	% DHV
NE	40	40	50	50	60	58	2	1
NW								
NT	8760	9550	10530	11510	13470	9	4	2
SE	1620	1770	1950	2130	2490	9	2	2
SW								
ST	8920	9720	10720	11720	13720	4	3	3
ES								
EN								
ET								
WN	1340	1460	1610	1760	2060	11	6	6
WS	30	30	40	40	50	33	4	2
WT								
N1	8800	9590	10580	11560	13530	9	4	2
S2	8950	9750	10760	11760	13770	4	3	3
S1	10540	11490	12670	13850	16210	5	3	3
N2	10100	11010	12140	13270	15530	9	4	3
E1								
W2								
W1	1370	1490	1650	1800	2110	11	6	6
E2	1660	1810	2000	2180	2550	10	2	2

TRAFFIC VOLUME FORECAST FOR INTERSECTIONS

Date: July 2001
Project: Des. No. 0014820
Route: US Route 31 at County Road 50 North
County: Jackson and Bartholomew Counties
Other Info: PM-DHV



Turning Movements	AADT 2001	2005	2010	2015	2025	DHV %	COMMERCIAL VEHICLES % AADT	% DHV
NE	40	40	50	50	60	13	2	1
NW								
NT	8760	9550	10530	11510	13470	6	4	4
SE	1620	1770	1950	2130	2490	11	2	2
SW								
ST	8920	9720	10720	11720	13720	10	3	1
ES								
EN								
ET								
WN	1340	1460	1610	1760	2060	7	6	5
WS	30	30	40	40	50	13	4	4
WT								
N1	8800	9590	10580	11560	13530	7	4	4
S2	8950	9750	10760	11760	13770	10	3	1
S1	10540	11490	12670	13850	16210	10	3	1
N2	10100	11010	12140	13270	15530	6	4	4
E1								
W2								
W1	1370	1490	1650	1800	2110	7	6	5
E2	1660	1810	2000	2180	2550	12	2	2

CONSULTANTS, INC.
Engineers • Land Surveyors

OFFICERS
Daniel R. Woo, PLS, President
Philip D. Beer II, PE, PLS, Vice-President
Alejandro L. de Gortari, CPA, Treasurer
Ross E. Snider, PE, Vice-President
Kathy M. Hall, Secretary

PROFESSIONALS
Lyle D. Branson, PLS
Robert M. Coop, PE
Michael J. Obergfell, PE
Mark A. Schepers, PLS
James D. Smale, PLS
Brent L. Smith, PLS
Gregory R. Wendling, PE
Donald R. West, PLS

April 26, 2001

MEMORANDUM

To: Mr. Brad Steckler, PE,
INDOT Engineering Assessment Manager

From: Gregory R. Wendling, PE
Project Engineer
USI Consultants, Inc.

Re: **Minutes of Field Check**

Des. No.:	**0014820 & 0014750**
Project No.:	**STP-4703 ( )**
Route No.:	**US 31**
Location:	**From US 50 to CR 50 N**
County:	**Jackson and Bartholomew**
Work Type:	**Road Rehabilitation & Intersection improvement**

This memorandum is a summary of the observations and recommendations made at a field check held at the project on Tuesday, April 24, 2001. The field check was held to review the existing conditions and determine the scope of work for this engineering assessment. The following individuals were in attendance:

David Dye	INDOT, Seymour Dist., Development	812-522-5649
Mike Hoffman	INDOT, Seymour Dist., Traffic	812-522-5649
Henry Brown	INDOT, Central Office, Design	317-232-5153
Dennis Fitzgerald	USI Consultants, Inc.	317-544-4996
Greg Wendling	USI Consultants, Inc.	317-544-4996

The following issues were discussed at the field check:

1. This portion of US 31 is a two lane rural major collector. It is not on the National Highway System (NHS), nor is it on the National Truck Network. The posted speed limit is 55 mph for the majority of the project.

2. It is being proposed to bring US 31 up to RRR standards from US 50(RP 50+42) to CR 50 N (RP 68+25). Over 300 recorded crashes have occurred within the corridor during the four year period studied. Average Annual Daily Traffic varies from 6000 vpd to 16,000 vpd (1997 AADT). The existing cross section primarily consists of 2-3.6 m travel lanes bordered by a 1.2 m usable shoulder (0.3 m paved) and open drainage ditches. The existing pavement is in good condition. Substandard vertical stopping sight distance and substandard Intersection Sight Distance exist at a few locations within the corridor. USI will investigate all of the intersections for turn lane warrants.

OFFICE
8415 East 56th Street
Indianapolis, Indiana 46216-2200
Phone: 317-544-4996
Fax: 317-544-4997
Web Address: www.usiconsultants.com
E-mail: postoffice@usiconsultants.com

"An Equal Opportunity Employer"

3. The district desires to have two bridge replacements accompany this project. The structures to be replace are Str. No. 31-36-2028, CSX Railroad over US 31(this structure is 65 years old and has substandard horizontal and vertical clearances and is showing signs of deterioration), and Str. No. 31-36-1775, US 31 over Sand Creek (this structure is 65 years old and has substandard horizontal clearance, it was rehabilitated in 1995). The other bridge structures within the project limits have had rehabilitations within the last 12 years and appear in good condition. USI will coordinate with the Engineering Assessment Section to determine if any additional program steps are required.

4. There are several other projects along this corridor that are further along than the subject road rehabilitation project. The following table summarizes the other projects:

Des. No.	Project Description	Comments
9244355	SR 46 Road Reconstruction from SR 7 to US 31	This project is in design, and will include improvements at the intersection of US 31 and SR 46 East (CR 200 S). This will be a project exception for the subject project.
9902620	US 31 Intersection Improvement at Base Road	This project is beginning the design phase. This project will develop separately. This will be a project exception for the subject project.
9902720	US 31 Intersection Improvement at CR 100 S.	The Engineer's Report for this project is nearly complete. This project will develop separately. This will be a project exception for the subject project.

5. The District would like the subject road rehabilitation project to remove the abandoned weigh scale area that is located just north of US 50. The area is unsightly and is often used by loiterers.

6. **Des. No. 0014750** CR 400 S (Bartholomew Co.) (RP 63+26) exists within the project limits of the Road Rehabilitation project. This intersection is programmed as a separate intersection improvement project (Des. No. 0014750). CR 400 S is known as the southern crossing, and acts as a southern bypass of Columbus. It is proposed to analyze this intersection for turn lane warrants, construct radii improvement and construct other intersection improvements as needed. This project should develop separately, and if it can develop faster than the larger road

rehabilitation project (Des. No. 0014820), construction of this project could occur prior to the larger project.

7. The following utilities were noted in the area:

- GTE Telephone (buried and overhead
- Buried Gas lines
- Overhead Electric
- Fiber Optic cable
- Water

This completed the items discussed. If there are any questions, additions, or revisions necessary concerning the items listed above, please contact the author.

GRW:gw

cc: Attendees

File 2000-922 & 2000-923

INDIANA DEPARTMENT OF TRANSPORTATION
INDIANAPOLIS, INDIANA 46204-2249
INTER-DEPARTMENT COMMUNICATION

April 26, 2001

TO: Mr. Brad Steckler
Supervisor, Pre-Engineering Studies

FROM: Mr. Bill Schmidt
Hydraulics Engineer

SUBJECT: Preliminary Hydraulic Review
Structure: US 31 Jackson/Bartholomew Counties
Des. No.: 0014820
Contract No.:
Location: U.S. 50 to Clifty Creek, Bartholomew County.
Consultant:

The project discussed above involves hydraulic structures along the U.S. 31 road project from U.S. 50 to Clifty Creek. There are 42 hydraulic sites shown on the attached Quadrangle map. The following is preliminary hydraulic information pertaining to each site.

Pipes smaller than 900 mm. (3 ft.) diameter should be considered as 900 mm. pipes for preliminary economical purposes. These very small structures should be designed during final design if replacement is needed.

Outlet velocity for each structure should be determined for a 50-year storm during final design. Any preliminary proposed structure found to have an outlet velocity above 4 m/s. is shown on the following sheets. These high velocity structures will likely require an energy dissipater.

Survey for final design should include an area far enough upstream and downstream of each structure so that it is beyond the effects of embankments from the road.

Allowable backwater should be determined during final design using the INDOT standards from Design Manual chapter 31-3 for culverts and chapter 32-2&3 for bridges. Q100 depth is the tailwater depth of the stream. Skew of the proposed structures should be set to best fit their channel.

A DNR permit for 'construction in a floodway' may be required for the following sites: 17,19,29,33, and 34.

Site #1

Approximate Drainage Area	=	0.28 sq.km.
Approximate Q100 Discharge	=	4.67 cms
Approximate Q100 Depth	=	1.75 m.
Required Minimum Wet Area Below Q100	=	see below
Approximate Grade Raise	=	0.0 m.
Minimum Freeboard	=	0.0 m.

Discussion of Structure Sizing and Survey Requirements

The project discussed above involves the U.S. 31 structure over tributary to Mutton Creek. The current structure is a 1200 mm. high by 1200 mm. span (4 ft. by 4 ft.) concrete box culvert. The existing structure is not hydraulically adequate. The proposed structure is a 1500 mm. high by 1500 mm. span (5 ft. by 5 ft.) concrete box culvert with wingwalls, if replacement is needed. The proposed structure reduces backwater and outlet velocity at this site.

Site #2

Approximate Drainage Area	=	0.73 sq.km.
Approximate Q100 Discharge	=	10.48 cms
Approximate Q100 Depth	=	1.62 m.
Required Minimum Wet Area Below Q100	=	see below
Approximate Grade Raise	=	0.09 m.
Minimum Freeboard	=	0.0 m.

Discussion of Structure Sizing and Survey Requirements

The project discussed above involves the U.S. 31 structure over tributary to Mutton Creek. The current structure is a 750 mm. high by 2400 mm. span (2.5 ft. by 8 ft.) concrete box culvert. The existing structure is not hydraulically adequate. Road overflow may occur during a 100-year storm event. The proposed structure is a 1500 mm. high by 3300 mm. span (5 ft. by 11 ft.) concrete box culvert (three or four sided) with wingwalls, if replacement is needed. The proposed structure prevents road overflow, reduces backwater and outlet velocity at this site.

Site #3

Approximate Drainage Area	=	0.15 sq.km.
Approximate Q100 Discharge	=	1.84 cms
Approximate Q100 Depth	=	0.42 m.
Required Minimum Wet Area Below Q100	=	see below
Approximate Grade Raise	=	0.0 m.
Minimum Freeboard	=	0.0 m.

Discussion of Structure Sizing and Survey Requirements

The project discussed above involves the U.S. 31 structure over tributary to Mutton Creek. The current structure is a 750 mm. high by 900 mm. span (2.5 ft. by 3 ft.) concrete box culvert. The existing structure is not hydraulically adequate. The proposed structure is a 900 mm. high by 1800 mm. span (3 ft. by 6 ft.) concrete box culvert with wingwalls, if replacement is needed. The proposed structure reduces backwater and outlet velocity at this site.

Site #4

The project discussed above involves the U.S. 31 structure over tributary to Mutton Creek. The current structure is a single span prestressed concrete I-beam bridge built in 1991. This structure is considered too new to be replaced. If replacement is still desired, contact the INDOT hydraulics unit.

Site #5

Approximate Drainage Area	=	0.14 sq.km.
Approximate Q100 Discharge	=	1.98 cms
Approximate Q100 Depth	=	0.82 m.
Required Minimum Wet Area Below Q100	=	see below
Approximate Grade Raise	=	0.0 m.
Minimum Freeboard	=	0.0 m.

Discussion of Structure Sizing and Survey Requirements

The project discussed above involves the U.S. 31 structure over tributary to Mutton Creek. The current structure is a 600 mm. high by 900 mm. span (2 ft. by 3 ft.) concrete box culvert. The existing structure is not hydraulically adequate. The proposed structure is a 900 mm. high by 1200 mm. span (3 ft. by 4 ft.) concrete box culvert with wingwalls, if replacement is needed. The proposed structure reduces backwater and outlet velocity at this site.

Site #6

Approximate Drainage Area	=	3.91 sq.km.
Approximate Q100 Discharge	=	27.61 cms
Approximate Q100 Depth	=	2.40 m.
Required Minimum Wet Area Below Q100	=	see below
Approximate Grade Raise	=	0.18 m.
Minimum Freeboard	=	no pressure flow

Discussion of Structure Sizing and Survey Requirements

The project discussed above involves the U.S. 31 structure over tributary to Mutton Creek. The current structure is a 1800 mm. high by 4500 mm. span (6 ft. by 15 ft.) concrete box culvert. The existing structure is not hydraulically adequate. Road overflow may occur during a 100-year storm event. The proposed structure is a 2400 mm. high by 5400 mm. span (8 ft. by 18 ft.) concrete box culvert (three or four-sided) with wingwalls, if replacement is needed. The proposed structure prevents road overflow, reduces backwater and outlet velocity at this site.

Site #7

Approximate Drainage Area	=	2.31 sq.km.
Approximate Q100 Discharge	=	21.52 cms
Approximate Q100 Depth	=	2.12 m.
Required Minimum Wet Area Below Q100	=	see below
Approximate Grade Raise	=	0.0 m.
Minimum Freeboard	=	0.3 m.

Discussion of Structure Sizing and Survey Requirements

The project discussed above involves the U.S. 31 structure over tributary to Mutton Creek. The current structure is a 2100 mm. high by 3300 mm. span (7 ft. by 11 ft.) concrete box culvert. The existing structure is not hydraulically adequate. The proposed structure is a 2400 mm. high by 4800 mm. span (8 ft. by 16 ft.) concrete box culvert (three or four-sided) with wingwalls, if replacement is needed. The proposed structure reduces backwater and outlet velocity at this site.

Site #8

Approximate Drainage Area	=	1.55 sq.km.
Approximate Q100 Discharge	=	17.56 cms
Approximate Q100 Depth	=	1.94 m.
Required Minimum Wet Area Below Q100	=	see below
Approximate Grade Raise	=	0.0 m.
Minimum Freeboard	=	0.3 m.

Discussion of Structure Sizing and Survey Requirements

The project discussed above involves the U.S. 31 structure over tributary to Mutton Creek. The current structure is a 2100 mm. high by 2400 mm. span (7 ft. by 8 ft.) concrete box culvert. The existing structure is not hydraulically adequate. The proposed structure is a 2250 mm. high by 3600 mm. span (7.5 ft. by 12 ft.) concrete box culvert (three or four-sided) with wingwalls, if replacement is needed. The proposed structure reduces backwater and outlet velocity at this site.

There is an existing large scour hole at the outlet of this site. The hydraulics model has high outlet velocity at this site. An energy dissipater or large riprap may be necessary.

Site #9

Approximate Drainage Area	=	0.25 sq.km.
Approximate Q100 Discharge	=	2.83 cms
Approximate Q100 Depth	=	0.97 m.
Required Minimum Wet Area Below Q100	=	see below
Approximate Grade Raise	=	0.0 m.
Minimum Freeboard	=	0.0 m.

Discussion of Structure Sizing and Survey Requirements

The project discussed above involves the U.S. 31 structure over tributary to Mutton Creek. The current structure is a 900 mm. high by 900 mm. span (3 ft. by 3 ft.) concrete box culvert. The existing structure is not hydraulically adequate. Road overflow may occur during a 100-year storm event. The proposed structure is a 900 mm. high by 1500 mm. span (3 ft. by 5 ft.) concrete box culvert with wingwalls, if replacement is needed. The proposed structure prevents road overflow, reduces backwater and outlet velocity at this site.

Site #10

Approximate Drainage Area	=	0.75 sq.km.
Approximate Q100 Discharge	=	7.08 cms
Approximate Q100 Depth	=	1.30 m.
Required Minimum Wet Area Below Q100	=	see below
Approximate Grade Raise	=	0.0 m.
Minimum Freeboard	=	0.0 m.

Discussion of Structure Sizing and Survey Requirements

The project discussed above involves the U.S. 31 structure over tributary to Mutton Creek. The current structure is a 1500 mm. high by 1500 mm. span (5 ft. by 5 ft.) concrete box culvert. The existing structure is not hydraulically adequate. The proposed structure is a 1200 mm. high by 2400 mm. span (4 ft. by 8 ft.) concrete box culvert with wingwalls, if replacement is needed. The proposed structure reduces backwater and outlet velocity at this site.

Site #11

Approximate Drainage Area	=	0.40 sq.km.
Approximate Q100 Discharge	=	4.25 cms
Approximate Q100 Depth	=	0.88 m.
Required Minimum Wet Area Below Q100	=	see below
Approximate Grade Raise	=	0.0 m.
Minimum Freeboard	=	0.0 m.

Discussion of Structure Sizing and Survey Requirements

The project discussed above involves the U.S. 31 structure over tributary to Mutton Creek. The current structure is a 900 mm. high by 1200 mm. span (3 ft. by 4 ft.) concrete box culvert. The existing structure is not hydraulically adequate. Road overflow may occur during a 100-year storm event. The proposed structure is a 1200 mm. high by 2100 mm. span (4 ft. by 7 ft.) concrete box culvert with wingwalls, if replacement is needed. The proposed structure prevents road overflow, reduces backwater and outlet velocity at this site.

Site #12

Approximate Drainage Area	=	0.20 sq.km.
Approximate Q100 Discharge	=	2.41 cms
Approximate Q100 Depth	=	0.62 m.
Required Minimum Wet Area Below Q100	=	see below
Approximate Grade Raise	=	0.0 m.
Minimum Freeboard	=	0.0 m.

Discussion of Structure Sizing and Survey Requirements

The project discussed above involves the U.S. 31 structure over tributary to East Fork White River. The current structure is a 1200 mm. high by 1200 mm. span (4 ft. by 4 ft.) concrete box culvert. The existing structure is not hydraulically adequate. The proposed structure is a 900 mm. high by 1800 mm. span (3 ft. by 6 ft.) concrete box culvert with wingwalls, if replacement is needed. The proposed structure reduces backwater and outlet velocity at this site.

Site #13

Approximate Drainage Area	=	0.18 sq.km.
Approximate Q100 Discharge	=	2.27 cms
Approximate Q100 Depth	=	0.78 m.
Required Minimum Wet Area Below Q100	=	see below
Approximate Grade Raise	=	0.0 m.
Minimum Freeboard	=	0.0 m.

Discussion of Structure Sizing and Survey Requirements

The project discussed above involves the U.S. 31 structure over tributary to East Fork White River. The current structure is a 900 mm. high by 900 mm. span (3 ft. by 3 ft.) concrete box culvert. The existing structure is not hydraulically adequate. The proposed structure is a 1200 mm. high by 1200 mm. span (4 ft. by 4 ft.) concrete box culvert with wingwalls, if replacement is needed. The proposed structure reduces backwater and outlet velocity at this site.

Site #14

Approximate Drainage Area	=	0.23 sq.km.
Approximate Q100 Discharge	=	2.78 cms
Approximate Q100 Depth	=	0.79 m.
Required Minimum Wet Area Below Q100	=	see below
Approximate Grade Raise	=	0.0 m.
Minimum Freeboard	=	0.0 m.

Discussion of Structure Sizing and Survey Requirements

The project discussed above involves the U.S. 31 structure over tributary to East Fork White River. The current structure is a 900 mm. high by 1200 mm. span (3 ft. by 4 ft.) concrete box culvert. The existing structure is not hydraulically adequate. The proposed structure is a 900 mm. high by 1500 mm. span (3 ft. by 5 ft.) concrete box culvert with wingwalls, if replacement is needed. The proposed structure reduces backwater and outlet velocity at this site.

Site #15

Approximate Drainage Area	=	8.81 sq.km.
Approximate Q100 Discharge	=	41.06 cms
Approximate Q100 Depth	=	1.92 m. (tributary)
(depth will be higher due to E.F. White River and Sand Creek)		
Required Minimum Wet Area Below Q100	=	see below
Approximate Grade Raise	=	0.0 m.
Minimum Freeboard	=	0.6 m. (tributary)

Discussion of Structure Sizing and Survey Requirements

The project discussed above involves the U.S. 31 structure over tributary to East Fork White River. The current structure is a 2700 mm. high by 9600 mm. span (9 ft. by 32 ft.) concrete slab on vertical abutments. The existing structure is hydraulically adequate. 'Replacement in kind' with a similar structure is recommended if needed. As an alternative, an approximate 20.7 m. (68 ft.) span spill through bridge with 2:1 sideslopes may be used as well.

The concern at this site is scour. Currently the existing footings are exposed. The soils are highly erodible; therefore the appropriate scour protection should be used. If a spill-though bridge is used, it should be single span.

Sites #16-18 (Sand Creek and overflows)

The project discussed above involves the U.S. 31 structure over Sand Creek including its overflow structures. Sites 16 and 18 are Sand Creek overflow structures. Site 16 being a 3600 mm high by 5850 mm. span (12 ft. by 19.5 ft.) concrete slab on vertical abutments. Site 18 is a 2400 mm. high by 2400 mm. span (8 ft. by 8 ft.) concrete box culvert. Both overflow structures show signs of high scour problems including large downstream scour holes. Site 17 is a 108.3 m. (355 ft.) truss bridge over Sand Creek. Historical profiles show an approximate existing backwater of 1 ft.

It is recommended that the overflow structures be removed, and the drainage from these sites be redirected through the Sand Creek Bridge. To help prevent scour at the bridge, guide banks should be built. Regular scour protection should be used as well. To accommodate the extra flow into the Sand Creek Bridge, the water area opening will need to be increased until the backwater requirements are met. It is estimated that this will require an additional 45.7 m. (150 ft.) of bridge length. However, this cannot be accurately determined until survey is acquired at this site, and a more precise hydraulic model is made during final design. See attached sketch.

Site #19

The project discussed above involves the U.S. 31 structure over Sandy Branch. The preliminary hydraulics for this structure was completed in January of 1992 as Des. 25995. See attached sheet.

Site #20

Approximate Drainage Area	=	0.32 sq.km.
Approximate Q100 Discharge	=	1.84 cms
Approximate Q100 Depth	=	0.42 m.
Required Minimum Wet Area Below Q100	=	see below
Approximate Grade Raise	=	0.06 m.
Minimum Freeboard	=	0.0 m.

Discussion of Structure Sizing and Survey Requirements

The project discussed above involves the U.S. 31 structure over tributary to Sand Branch. The current structure is a 600 mm. high by 900 mm. span (2 ft. by 3 ft.) concrete box culvert. The existing structure is not hydraulically adequate. Road overflow may occur during a 100-year storm event. The proposed structure is a 900 mm. high by 1500 mm. span (3 ft. by 5 ft.) concrete box culvert with wingwalls, if replacement is needed. The proposed structure prevents road overflow, reduces backwater and outlet velocity at this site.

Site #21

Approximate Drainage Area	=	0.22 sq.km.
Approximate Q100 Discharge	=	1.70 cms
Approximate Q100 Depth	=	0.44 m.
Required Minimum Wet Area Below Q100	=	see below
Approximate Grade Raise	=	0.0 m.
Minimum Freeboard	=	0.0 m.

Discussion of Structure Sizing and Survey Requirements

The project discussed above involves the U.S. 31 structure over tributary to Sand Branch. The current structure is a 900 mm. high by 1800 mm. span (3 ft. by 6 ft.) concrete box culvert. The existing structure is hydraulically adequate. 'Replacement in Kind' should be used if replacement is needed.

Sites #22-23

Approximate Drainage Area	=	0.22 sq.km.
Approximate Q100 Discharge	=	1.27 cms
Approximate Q100 Depth	=	0.76 m.
Required Minimum Wet Area Below Q100	=	see below
Approximate Grade Raise	=	0.0 m.
Minimum Freeboard	=	0.0 m.

Discussion of Structure Sizing and Survey Requirements

The project discussed above involves the U.S. 31 structures over tributary to Sand Creek. The existing site #22 structure is a 900 mm. diameter (3 ft.) corrugated metal pipe with headwall. The existing site #23 structure is a 600 mm. high by 900 mm. span (2 ft. by 3 ft.) concrete box culvert. The existing structures are not hydraulically adequate. The proposed replacement structure for both sites is a 838 mm. high by 1244 mm. span (2.75 ft. by 4.08 ft.) corrugated metal arch pipe, if replacement is needed. The proposed structures reduce backwater and outlet velocity at this site.

Site #24

The existing structure is a 600 mm. high by 900 mm. span (2 ft. by 3 ft.) concrete box that appears to be used as an equalizer culvert. 'Replacement in Kind' should be used if replacement is needed.

Site #25

Approximate Drainage Area	=	0.68 sq.km.
Approximate Q100 Discharge	=	3.40 cms
Approximate Q100 Depth	=	0.99 m.
Required Minimum Wet Area Below Q100	=	see below
Approximate Grade Raise	=	0.0 m.
Minimum Freeboard	=	0.0 m.

Discussion of Structure Sizing and Survey Requirements

The project discussed above involves the U.S. 31 structure over tributary to East Fork of White River. The current structure is a 1200 mm. high by 1800 mm. span (4 ft. by 6 ft.) concrete box culvert. The existing structure is hydraulically adequate. 'Replacement in Kind' should be used if replacement is needed.

Site #26

Approximate Drainage Area	=	0.53 sq.km.
Approximate Q100 Discharge	=	3.11 cms
Approximate Q100 Depth	=	0.73 m.
Required Minimum Wet Area Below Q100	=	see below
Approximate Grade Raise	=	0.0 m.
Minimum Freeboard	=	0.0 m.

Discussion of Structure Sizing and Survey Requirements

The project discussed above involves the U.S. 31 structure over tributary to East Fork of White River. The current structure is a 600 mm. high by 900 mm. span (2 ft. by 3 ft.) concrete box culvert. The existing structure is not hydraulically adequate. Road overflow may occur during a 100-year storm event. The proposed structure is a 1195 mm. high by 1804 mm. span (3.92 ft. by 5.92 ft.) corrugated metal arch pipe, if replacement is needed. The proposed structure prevents road overflow, reduces backwater and outlet velocity at this site. As an alternate a 1200 mm. high by 1200 mm. span (4 ft. by 4 ft.) concrete box culvert with wingwalls may be used, however due to higher outlet velocity, a larger riprap size will be required.

Site #27

Approximate Drainage Area	=	0.59 sq.km.
Approximate Q100 Discharge	=	4.81 cms
Approximate Q100 Depth	=	0.92 m.
Required Minimum Wet Area Below Q100	=	see below
Approximate Grade Raise	=	0.21 m.
Minimum Freeboard	=	0.0 m.

Discussion of Structure Sizing and Survey Requirements

The project discussed above involves the U.S. 31 structure over tributary to Little Sand Creek. The current structure is a 900 mm. high by 1500 mm. span (3 ft. by 5 ft.) concrete box culvert. The existing structure is not hydraulically adequate. Road overflow may occur during a 100-year storm event. The proposed structure is a 1200 mm. high by 2100 mm. span (4 ft. by 7 ft.) concrete box culvert with wingwalls, if replacement is needed. The proposed structure prevents road overflow, reduces backwater and outlet velocity at this site.

Site #28

Approximate Drainage Area	=	0.18 sq.km.
Approximate Q100 Discharge	=	1.98 cms
Approximate Q100 Depth	=	0.61 m.
Required Minimum Wet Area Below Q100	=	see below
Approximate Grade Raise	=	0.0 m.
Minimum Freeboard	=	0.0 m.

Discussion of Structure Sizing and Survey Requirements

The project discussed above involves the U.S. 31 structure over tributary to Little Sand Creek. The current structure is a 600 mm. high by 900 mm. span (2 ft. by 3 ft.) concrete box culvert. The existing structure is not hydraulically adequate. Road overflow may occur during a 100-year storm event. The proposed structure is a 900 mm. high by 1500 mm. span (3 ft. by 5 ft.) concrete box culvert with wingwalls, if replacement is needed. The proposed structure prevents road overflow, reduces backwater and outlet velocity at this site.

Site #29 (Little Sand Creek)

Approximate Drainage Area	=	63.20 sq.km.
Approximate Q100 Discharge	=	155.74 cms
Approximate Q100 Depth	=	3.59 m.
Required Minimum Wet Area Below Q100	=	77.10 sq.m.
Approximate Grade Raise	=	0.0 m.
Minimum Freeboard	=	0.6 m.

Discussion of Structure Sizing and Survey Requirements

The project discussed above involves the U.S. 31 structure over Little Sand Creek. The current structure is a three-span spill-through bridge. The existing structure is not hydraulically adequate. The recommended replacement is a three-span spill-through bridge of approximate 30.5 m. span (100 ft.) in the direction of flow if needed. The actual bridge length would need to be increased to account for the skew (15 degrees) of the structure. The waterway area provided is in the direction of flow. The structure became adequate mainly due to reducing the pier width from 3 ft. to 2 ft. and increasing the structure opening slightly.

Site #30

Approximate Drainage Area	=	0.59 sq.km.
Approximate Q100 Discharge	=	5.10 cms
Approximate Q100 Depth	=	1.16 m.
Required Minimum Wet Area Below Q100	=	see below
Approximate Grade Raise	=	0.0 m.
Minimum Freeboard	=	0.0 m.

Discussion of Structure Sizing and Survey Requirements

The project discussed above involves the U.S. 31 structure over tributary to Brush Creek. The current structure is a 1200 mm. high by 1500 mm. span (4 ft. by 5 ft.) concrete box culvert. The existing structure is not hydraulically adequate. The proposed structure is a 1200 mm. high by 1800 mm. span (4 ft. by 6 ft.) concrete box culvert with wingwalls, if replacement is needed. The proposed structure reduces backwater and outlet velocity at this site.

Site #31

Approximate Drainage Area	=	0.72 sq.km.
Approximate Q100 Discharge	=	7.36 cms
Approximate Q100 Depth	=	0.84 m.
Required Minimum Wet Area Below Q100	=	see below
Approximate Grade Raise	=	0.09 m.
Minimum Freeboard	=	0.0 m.

Discussion of Structure Sizing and Survey Requirements

The project discussed above involves the U.S. 31 structure over tributary to Brush Creek. The current structure is a 600 mm. high by 900 mm. span (2 ft. by 3 ft.) concrete box culvert. The existing structure is not hydraulically adequate. Road overflow may occur during a 100-year storm event. The proposed structure is a 1200 mm. high by 3000 mm. span (4 ft. by 10 ft.) concrete box culvert (three or four-sided) with wingwalls, if replacement is needed. The proposed structure prevents road overflow and reduces backwater at this site.

Site #32

Approximate Drainage Area	=	0.38 sq.km.
Approximate Q100 Discharge	=	3.60 cms
Approximate Q100 Depth	=	0.83 m.
Required Minimum Wet Area Below Q100	=	see below
Approximate Grade Raise	=	0.0 m.
Minimum Freeboard	=	0.0 m.

Discussion of Structure Sizing and Survey Requirements

The project discussed above involves the U.S. 31 structure over tributary to Brush Creek. The current structure is a 600 mm. high by 1200 mm. span (2 ft. by 4 ft.) concrete box culvert. The existing structure is not hydraulically adequate. Road overflow may occur during a 100-year storm event. The proposed structure is a 1200 mm. high by 1500 mm. span (4 ft. by 5 ft.) concrete box culvert with wingwalls, if replacement is needed. The proposed structure prevents road overflow, reduces backwater and outlet velocity at this site.

Site #33 (Fishers Fork)

Approximate Drainage Area	=	18.86 sq.km.
Approximate Q100 Discharge	=	76.46 cms
Approximate Q100 Depth	=	3.29 m.
Required Minimum Wet Area Below Q100	=	36.87 sq.m.
Approximate Grade Raise	=	0.0 m.
Minimum Freeboard	=	0.6 m.

Discussion of Structure Sizing and Survey Requirements

The project discussed above involves the U.S. 31 structure over Fishers Fork. The current structure is a single-span spill-through bridge. The existing structure is not hydraulically adequate. The recommended replacement is a three-span spill-through bridge of approximate 21.5 m. span (70.6 ft.) in the direction of flow if needed. The proposed bridge should basically match the proposed bridge directly upstream on S.R. 7 Site #1 of Des. 0014810. See attached sheet for hydraulics of the S.R. 7 site.

Site #34 (Brush Creek)

The project discussed above involves the U.S. 31 structure over Brush Creek. The preliminary hydraulics for this structure was completed in July of 1993 as Des. 9244355. See attached sheet.

Site #35

Approximate Drainage Area	=	0.07 sq.km.
Approximate Q100 Discharge	=	1.27 cms
Approximate Q100 Depth	=	1.68 m.
Required Minimum Wet Area Below Q100	=	see below
Approximate Grade Raise	=	0.0 m.
Minimum Freeboard	=	0.0 m.

Discussion of Structure Sizing and Survey Requirements

The project discussed above involves the U.S. 31 structure over tributary to Brush Creek. The current structure is a 2100 mm. high by 2400 mm. span (7 ft. by 8 ft.) concrete box culvert. The existing structure is hydraulically adequate. 'Replacement in Kind' should be used if replacement is needed.

Site #36

Approximate Drainage Area	=	0.40 sq.km.
Approximate Q100 Discharge	=	4.96 cms
Approximate Q100 Depth	=	0.97 m.
Required Minimum Wet Area Below Q100	=	see below
Approximate Grade Raise	=	0.0 m.
Minimum Freeboard	=	0.0 m.

Discussion of Structure Sizing and Survey Requirements

The project discussed above involves the U.S. 31 structure over tributary to Brush Creek. The current structure is a 1500 mm. high by 1800 mm. span (5 ft. by 6 ft.) concrete box culvert. The existing structure is not hydraulically adequate. The proposed structure is a 1200 mm. high by 2400 mm. span (4 ft. by 8 ft.) concrete box culvert with wingwalls, if replacement is needed. The proposed structure reduces backwater and outlet velocity at this site.

Site #37

Approximate Drainage Area	=	0.19 sq.km.
Approximate Q100 Discharge	=	2.41 cms
Approximate Q100 Depth	=	0.74 m.
Required Minimum Wet Area Below Q100	=	see below
Approximate Grade Raise	=	0.0 m.
Minimum Freeboard	=	0.0 m.

Discussion of Structure Sizing and Survey Requirements

The project discussed above involves the U.S. 31 structure over tributary to Brush Creek. The current structure is a 900 mm. high by 1200 mm. span (3 ft. by 4 ft.) concrete box culvert. The existing structure is not hydraulically adequate. The proposed structure is a 900 mm. high by 1500 mm. span (3 ft. by 5 ft.) concrete box culvert with wingwalls, if replacement is needed. The proposed structure reduces backwater and outlet velocity at this site.

Site #38

The project discussed above involves the U.S. 31 structure over tributary to Brush Creek. The preliminary hydraulics for this structure was completed in October of 2000 as Des. 9902720. See attached sheet.

Site #39

Approximate Drainage Area	=	0.46 sq.km.
Approximate Q100 Discharge	=	5.24 cms
Approximate Q100 Depth	=	0.84 m.
Required Minimum Wet Area Below Q100	=	see below
Approximate Grade Raise	=	0.0 m.
Minimum Freeboard	=	0.0 m.

Discussion of Structure Sizing and Survey Requirements

The project discussed above involves the U.S. 31 structure over tributary to Brush Creek. The current structure is a 1500 mm. high by 1200 mm. span (5 ft. by 4 ft.) concrete box culvert. The existing structure is not hydraulically adequate. The proposed structure is a 1200 mm. high by 2700 mm. span (4 ft. by 9 ft.) concrete box culvert with wingwalls, if replacement is needed. The proposed structure reduces backwater and outlet velocity at this site.

Site #40

Approximate Drainage Area	=	0.18 sq.km.
Approximate Q100 Discharge	=	2.12 cms
Approximate Q100 Depth	=	0.99 m.
Required Minimum Wet Area Below Q100	=	see below
Approximate Grade Raise	=	0.0 m.
Minimum Freeboard	=	0.0 m.

Discussion of Structure Sizing and Survey Requirements

The project discussed above involves the U.S. 31 structure over tributary to Brush Creek. The current structure is a 900 mm. high by 1200 mm. span (3 ft. by 84 ft.) concrete box culvert. The existing structure is hydraulically adequate. 'Replacement in Kind' should be used if replacement is needed.

Site #41

The project discussed above involves the U.S. 31 structure over tributary to Clifty Creek. The preliminary hydraulics for this structure was completed in March of 2000 as Des. 9902620. See attached sheet.

Site #42 (Clifty Creek)

The project discussed above involves the U.S. 31 structure over Clifty Creek and overflow structure. The final design hydraulics for this structure was completed in May of 2000 as Des. 9800231/9800232. See attached sheet.

If you have any questions or comments, please contact me at
(317) 232-5332.

WPS

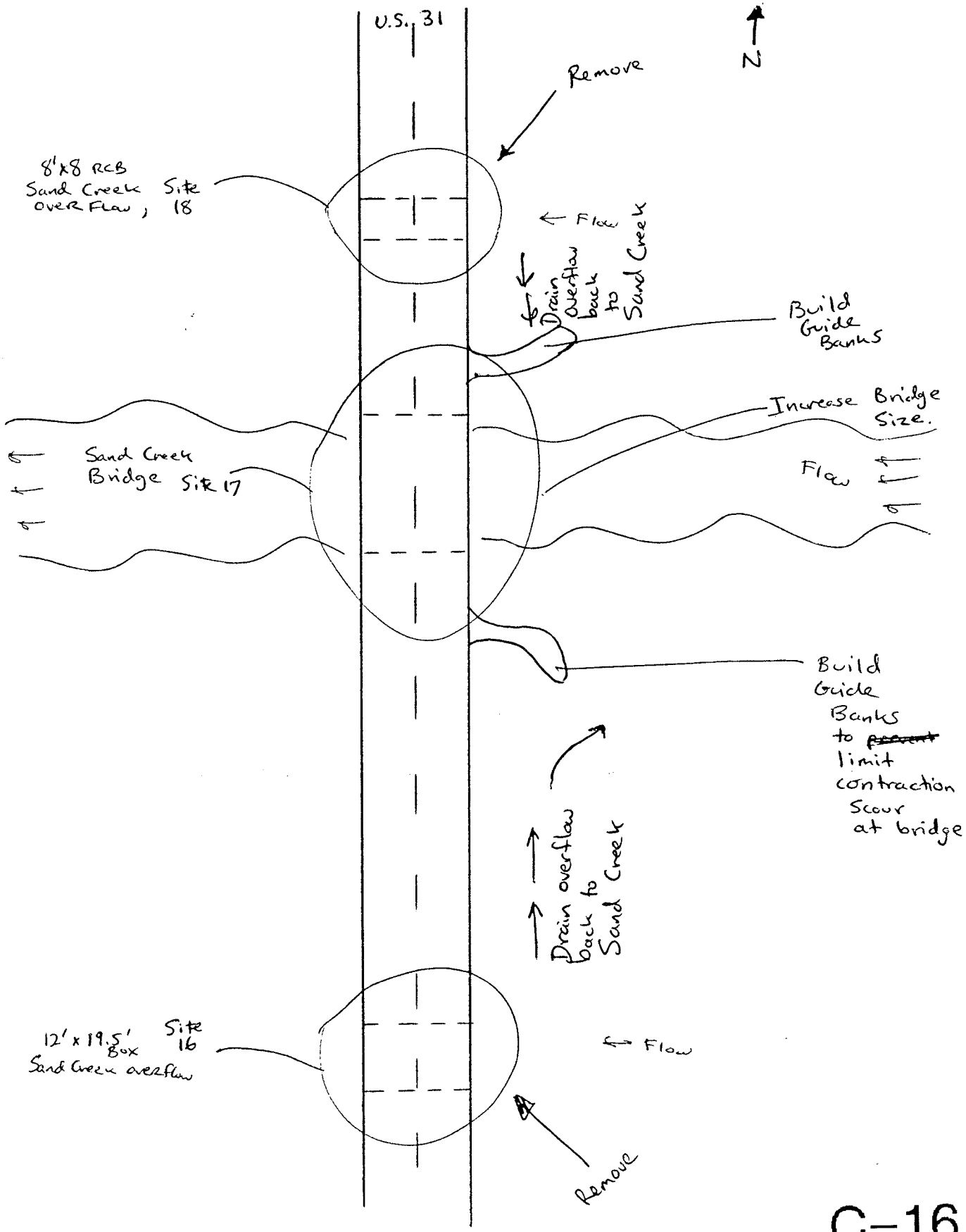
cc: Hydraulic file (1)

INDIANA DEPARTMENT OF TRANSPORTATION

Page _____

Structure/Project No. U.S. 31 sites 16 to 18

Design Computations for: Sand Creek & OVER FLOWS



State Form 4247 (R/8-91)

Computed by: C-16

Checked by:

SITE # 19

INDIANA DEPARTMENT OF TRANSPORTATION
INDIANAPOLIS, INDIANA 46204-2249
INTER-DEPARTMENT COMMUNICATION

01-17-92

TO: Mr. Tarlochan S. Bansi
Supervisor, Preliminary Engineering Studies

FROM: Mr. Louis E. Feagans LEF
Hydraulics Unit Engineer

SUBJECT: Preliminary Hydraulic Review
Structure: 31-03
Project: ST-4288
Crossing: Sand Branch
Des. No.: 25995

After review of the above noted project, the following hydraulic sizing parameters are recommended:

Approximate Drainage Area	= 4.55	sq. mi.
Approximate Q100 Discharge	= 1200	CFS
Approximate Q50 Discharge	= n.a	cfs
Approximate Q100 Elevation	= 7.5 ft.	above FL
Maximum Allowable Backwater	= P.G.	ft.
Approximate Bridge Length	= 40	ft.
Skew	= 30	deg.
Approximate Grade Raise	= 0.0	ft.

Discussion of Structure Sizing and Survey Requirements

The approximate Structure size will be the following

1. 34 to 38 foot HySpan
2. Spill-thru bridge 35 to 40 ft.

This structure size could vary due to collected survey and if an DNR permit is required. We will need a normal bridge survey plus we will need to have the houses approximately 1000' feet upstream surveyed for the finished floor elevation. If you have any questions or comments, please contact me.

LEF

cc: Hydraulic file

Des. 0017810 Site 33

Site #1 Fishers Fork

Approximate Drainage Area	=	18.67 sq.km.
Approximate Q100 Discharge	=	77.87 cms
Approximate Q100 Depth	=	3.29 m.
Maximum Allowable Backwater Q100	=	0.31 m.
Required Minimum Wet Area Below Q100	=	36.87 sm.
Approximate Grade Raise	=	0.0 m.
Minimum Freeboard	=	0.61 m.

Use as Site # 33 for U.S. 31 also

Discussion of Structure Sizing and Survey Requirements

The project discussed above involves the S.R. 7 bridge over Fishers Fork Creek. The current structure is a 20.73 meter (68 ft.) three-span spill-through bridge. The existing structure is not hydraulically adequate. If replacement is desired, the recommended replacement is a 21.52 meter (70.6 ft.) three-span spill-through bridge.

Site #2

Approximate Drainage Area	=	0.08 sq.km.
Approximate Q100 Discharge	=	1.56 cms
Approximate Q100 Depth	=	0.63 m.
Maximum Allowable Backwater Q100	=	0.31 m.
Required Minimum Wet Area Below Q100	=	see below
Approximate Grade Raise	=	0.31 m.
Minimum Freeboard	=	0.0 m.

Discussion of Structure Sizing and Survey Requirements

The project discussed above involves the S.R. 7 culvert over drain into Fishers Fork. The current structure is a 600 mm. high by 600 mm. span (2 ft. by 2 ft.) concrete box culvert. The existing structure is not hydraulically adequate. Road overflow may occur during a 100-year storm. If replacement is desired, the recommended replacement is a 900 mm. high by 1200 mm. span (3 ft. by 4 ft.) four-sided concrete box culvert with wingwalls.

Site #3

Approximate Drainage Area	=	0.06 sq.km.
Approximate Q100 Discharge	=	1.08 cms
Approximate Q100 Depth	=	0.61 m.
Maximum Allowable Backwater Q100	=	0.31 m.
Required Minimum Wet Area Below Q100	=	see below
Approximate Grade Raise	=	0.0 m.
Minimum Freeboard	=	0.0 m.

Discussion of Structure Sizing and Survey Requirements

The project discussed above involves the S.R. 7 culvert over drain into Brush Creek. The current structure is a 600 mm. high by 600 mm. span (2 ft. by 2 ft.) concrete box culvert. The existing structure is not hydraulically adequate. Road overflow may occur during a 100-year storm. If replacement is desired, the recommended replacement is a 600 mm. high by 900 mm. span (2 ft. by 3 ft.) four-sided concrete box culvert with wingwalls.

Site 34

A. D. 114

INDIANA DEPARTMENT OF TRANSPORTATION

INDIANAPOLIS, INDIANA 46204-2249

INTER-DEPARTMENT COMMUNICATION

July 30, 1993

MEMORANDUM

TO: Mr. Tarlochan S. Bansi, Supervisor
Preliminary Engineering Studies

FROM: Mr. Merril E. Dougherty MED
Hydraulics Engineer

SUBJECT: Hydraulic Review
Structure: 31-03-3359A & 46-03-XXXX
DES #: 9244355
Project: ST-206-7( )
Stream: Brush Creek

After review of the above noted project, the following preliminary hydraulic sizing parameters are recommended:

Drainage Area	= 7.64	sq. mi.
Q100	= 1,716	cfs
Water Depth @ Q100	= 10.5	MSL
Proposed Bridge Length (US31)	= 40 *	ft.
Existing Bridge Length (US31)	= 40 *	ft.
Proposed Bridge Length (SR46)	= 35 *	ft.
Existing Bridge Length (SR46)	= 35 *	ft.
Grade Raise Required	= NONE	ft.

Discussion:

* The existing bridges are hydraulically adaquate, so they may be widened if necessary for this project.

A standard bridge survey should be adaquate for this site.

These sizes may vary when actual survey data is obtained.

If you have any questions or comments, please contact me at (317) 232-5332.

MED

CC: File (2)

Site 38

INDIANA DEPARTMENT OF TRANSPORTATION
INDIANAPOLIS, INDIANA 46204-2249
INTER-DEPARTMENT COMMUNICATION

October 31, 2000

TO: Mr. Tarlochan Bansi
Supervisor, Pre-Engineering Studies

FROM: Mr. Bill Schmidt WS
Hydraulics Engineer

SUBJECT: Preliminary Hydraulic Review
Structure: US 31 intersection improvement
Des. No.: 9902720
Contract No.: STP-4703()
Location: Bartholomew County (southeast of Columbus) at intersection with C.R. 100 S.
Consultant: N/A

The area consists of two replacement structures with hydraulic information shown below. One is east of the intersection on C.R. 100 South. The other is south of the intersection on U.S. 31. There are also some small pipes around the intersection. These should be replaced with 900 mm. corrugated or concrete pipes.

C.R. 100 South Structure

After review of the above noted project, the following hydraulic sizing parameters are recommended:

Approximate Drainage Area	=	1.606	sq.km.
Approximate Q100 Discharge	=	14.158	cms
Approximate Q100 Depth	=	2.146	m.
Maximum Allowable Backwater Q100	=	0.305	m.
Required Minimum Wet Area Below Q100	=	6.503	sm.
Approximate Grade Raise	=	0.0	m.
Minimum Freeboard	=	0.0	m.
Outlet Velocity	=	2.18	m/s.

Discussion of Structure Sizing and Survey Requirements

The project discussed above involves the C.R. 100 South structure just east of the U.S. 31 intersection. The current structure is 1800 mm. high by 2400 mm. span (6 ft. by 8 ft.) concrete box culvert with headwall. At the outlet is a 150 mm. (0.5 ft.) drop to the flowline of the channel. The existing structure is not hydraulically adequate. The following is recommended if replacement is needed.

1. **Four-sided precast concrete box culvert with wingwalls.** The recommended structure size for this option is 2100 mm. high by 3000 mm. span (7 ft. by 10 ft.) culvert. This structure can be placed 150 mm. (0.5 ft.) lower than its current invert elevations to better fit the flowline of the channel. That way the low structure elevation is only raised 150 mm. (0.5 ft.). If the creek is a legal drain and the county surveyor requires the structure to be sumped, the structure height should be increased to accommodate the difference.

U.S. 31 Structure

After review of the above noted project, the following hydraulic sizing parameters are recommended:

Approximate Drainage Area	=	1.217	sq.km.
Approximate Q100 Discharge	=	13.451	cms
Approximate Q100 Depth	=	2.067	m.
Maximum Allowable Backwater Q100	=	0.305	m.
Required Minimum Wet Area Below Q100	=	6.299	sm.
Approximate Grade Raise	=	0.0	m.
Minimum Freeboard	=	0.0	m.
Outlet Velocity	=	2.14	m/s.

Sik

Discussion of Structure Sizing and Survey Requirements

The project discussed above involves the U.S. 31 structure just south of the U.S. 31 intersection. The current structure is 1615 mm. high by 2400 mm. span (5.3 ft. by 8 ft.) concrete box culvert with headwall. The existing structure is not hydraulically adequate. The following is recommended if replacement is needed.

1. **Four-sided precast concrete box culvert with wingwalls.** The recommended structure size for this option is 2100 mm. high by 3000 mm. span (7 ft. by 10 ft.) culvert. If the creek is a legal drain and the county surveyor requires the structure to be sumped, the structure height should be increased to accommodate the difference.

If you have any questions or comments, please contact me at (317) 232-5332.

WPS

cc: Hydraulic file (1)

Site 41

INDIANA DEPARTMENT OF TRANSPORTATION
INDIANAPOLIS, INDIANA 46204-2249
INTER-DEPARTMENT COMMUNICATION

March 20, 2000

TO: Mr. Brad Steckler
Supervisor, Pre-Engineering Studies

FROM: Mr. Bill Schmidt WS
Hydraulics Engineer

SUBJECT: Hydraulic Review
Structure: U.S. 31 over tributary into Clifty Creek
Des. No.: 9902620
Contract No.: STP-4703()
Location: 2.25 miles northwest of S.R. 9
Consultant: N/A

After review of the above noted project, the following hydraulic sizing parameters are recommended:

Approximate Drainage Area	=	0.142	sq.km.
Approximate Q100 Discharge	=	1.133	cms
Approximate Q100 Depth	=	0.978	m.
Maximum Allowable Backwater Q100	=	0.040	m.
Required Minimum Wet Area Below Q100	=	1.193	sm.
Approximate Grade Raise	=	0.0	m.
Minimum Freeboard	=	0.0	m.

Discussion of Structure Sizing and Survey Requirements

The project discussed above involves the U.S. 31 structure over tributary to Clifty Creek. The current structure is a 1800 mm. high by 900 mm. span (6 ft. by 3 ft.) concrete box culvert. The existing structure is hydraulically adequate. The following is recommended if replacement is needed.

1. **Four-sided precast concrete box culvert with wingwalls.** The recommended structure size for this option is a 900 mm. high by 1200 mm. span (3 ft. by 4 ft.) culvert.

If you have any questions or comments, please contact me at (317) 232-5332.

WPS

cc: Hydraulic file (1)

Site 42

INDIANA DEPARTMENT OF TRANSPORTATION
INDIANAPOLIS, INDIANA 46204-2249
INTER-DEPARTMENT COMMUNICATION

May 16, 2000

MEMORANDUM

TO: Mrs. Nancy Strain
Project Coordinator

FROM: Mr. Bill Schmidt BNS
Hydraulics Engineer

SUBJECT: HYDRAULIC REVIEW
Structure: 31-03-8283/8284
Des. #: 9800231/9800232
Stream: Clifty Creek and overflow structure
Consultant: First Group
Location: 1.18 miles south of S.R. 46

After review of the above noted project, the following hydraulic sizing parameters are recommended:

FOR BRIDGE 31-3-8283

Drainage Area	= 518.0	sq. km.
Q100	= 580.5	cms
Elevation @ Q100	= 190.34	m.
Backwater	= 0.293	m.
Velocity @ Q100	= 2.11	m./sec.
Gross Waterway Opening Req'd Below Q100 Elevation (Str.)	= 275.7	sq. m.
Road Overflow Waterway Area	= 0.0	sq. m.
Minimum Low Structure Elevation	= 191.05	m.
Skew	= 5 to 10	deg.
Existing Waterway Opening Below Q100 Elevation (Str.)	= 265.7	sq. m.
Existing Road Overflow Waterway Area	= 0.0	sq. m.
Existing Low Structure Elevation	= 121.20	m.
Existing Backwater	= 0.326	m.

(Site 42 continued)

Discussion of Structure Sizing:

The above data is for structure # 31-3-8283.

The recommended opening is a spill-through bridge with 2:1 sideslopes. The bridge was modeled as a three-span structure (2 piers). The backwater at this site seems to be sensitive to the number of piers in the channel. Therefore, if more than a three-span structure is desired, the hydraulics unit should be contacted for redesign. The waterway opening area is normal to the direction of flow. INDOT standards for rip-rap based on velocity should be used.

The overflow structure #31-3-8284 for U.S. 31 at Clifty Creek appears to allow passage of ineffective flow as its main hydraulic function. Therefore, replacement in kind is recommended for the overflow structure.

If you have any questions or comments, please contact me at (317) 232-5332.

WPS

cc: Hydraulic file (1)

Indiana Department of Transportation

Materials and Tests Division
120 South Shortridge Road P.O. Box 19389
Indianapolis, Indiana 46219-0389
Phone: (317) 232-5280 Fax: (317) 356-9351

January 4, 2002

MEMORANDUM

RECEIVED
FEB 19 2002
USI CONSULTANTS, INC.
Ag
Dan
KMG
PDB
Ross
Return To

TO : Mr. Greg Wendling
USI Consultants, Inc
8514 East 56th Street
Indianapolis, IN 46216

THRU: Mr. David H. Andrewski
Materials Engineer

FROM: Mr. Kumar P. Dave KPD
Pavement Design Engineer

RE : Preliminary Pavement Design
Des No : 0014820 & 0014750
District : Seymour
Route : US 31 from US 50 to CR 50 N in Jackson and Bartholomew County.

The scope of this project is road rehabilitation & Intersection improvement. This portion of US 31 is a two lane rural major collector. It is not on the National Highway System (NHS), nor on the National Truck Network. This is about 18-mile section. Average Annual Daily traffic varies from 6000 vpd to 16,000 vpd. The existing cross section consists of 2-3.6 m travel lanes bordered by a 1.2 m usable shoulder (0.3 m paved). The original road was built in 1938/42 as 22 feet wide concrete pavement, widened with HMA to 24 feet in 1986 and last resurfaced in 1998. The existing pavement consists of approximately 9 to 12 inches of HMA over 7 inches of concrete. The pavement is in good condition.

The scope of the project as described in the minutes of field check is to bring US 31 up to RRR standards from US 50 (RP 50+42) to CR 50 N (RP 68+25). It is proposed to add wider shoulders and turn lanes at the intersections. Additionally there are a few areas of substandard vertical alignment (approximately 10% of the project). The pavement committee recommends constructing new shoulder as per chapter 52 of INDOT Design Manual. The existing mainline will be milled (25 mm) and resurfaced with 38 mm of HMA. The project is scheduled to be completed in 2007. For turn lanes at various intersections use 12 inches of HMA over 7 inches of compacted aggregate type O.

KPD
cc: Mr. Klika
File

C-25

CSX TRANSPORTATION

CRITERIA FOR OVERHEAD BRIDGES

Post-it® Fax Note 7671	Date 4/9/2002	# of pages ▶ 21
To Greg Wendling	From J.W. McIntosh	
Co./Dept. USI	Co. INDOT/Design/R.R. Unit	
Phone # 544-4996X3066	Phone # 232-5302	
Fax # 544-4997	Fax # 233-4929	

Office of Director Bridge Design
Jacksonville, Florida
Date: November 1, 1993

Current as of 1/24/97 LJS

OVERHEAD BRIDGE CROSSING DATA

1. Location: _____ City _____ County _____ State
2. Railroad Division: _____
3. Railroad Valuation Station at Centerline of Bridge: _____
4. Distance from nearest Mile Post to Centerline of Bridge: _____
5. DOT Crossing Number: _____
6. State Project Number: _____
7. Description of Project: _____

8. Minimum Horizontal Clearance from Centerline of nearest Track:

   A. Proposed: _____ B. Existing (if applicable): _____

9. Minimum Vertical Clearance above top of high rail:

   A. Proposed: _____ B. Existing (if applicable): _____

10. List piers where crashwalls are provided:

Pier:	Distance from centerline of track:

11. Describe how drainage from bridge is handled: _____

12. List piers where shoring is required to protect track: _____

13. Plan Submittal: Preliminary _____ Final _____

NOTE: CSX Criteria for Overhead Bridges apply to Items 8 through 12.

November 1, 1993

CRITERIA FOR OVERHEAD BRIDGES

New or reconstructed bridges over CSX Railroad tracks shall meet the following requirements:

I. Clearances:

a. Horizontal Clearances: Abutments and/or piers for overhead bridge structures shall be located to clear the ditches of a typical track roadbed section. See Sketches 1 and 2 for typical roadbed sections and clearance requirement. On curved track, horizontal clearance shall be increased 1½ inch per degree of curvature. When track is superelevated clearances on inside of the curve shall be increased by 3½ inch per each 1 inch of superelevation. Edges of footing shall not be closer than 11'-0" from centerline of the track to provide adequate room for sheeting.

b. Vertical Clearance: A standard vertical clearance of 23'-0" shall be provided, measured from top of high rail to lowest point of structure in the* horizontal clearance area.

c. Temporary Construction clearances may be less if approved by the Railroad.

d. The Railroad shall be furnished as built drawings showing actual clearances as constructed.

e. Horizontal clearances may need to be increased if a maintenance roadway is required by the Railroad.

f. Clearances shall be adjusted to provide for any planned changes in the trackage, including the change in track centers and raising of the tracks. The Railroad shall be contacted to obtain information on planned track changes. If the track is in a sag at the proposed overhead crossing location, it should be anticipated that the track may be raised to improve the condition. Clearances shall be increased to provide for this track raise.

II. Crash Walls:

A.R.E.A. Manual for Railway Engineering, Chapter 8, Article 2.1.5 Pier Protection, covers the requirements for the crash walls. Crash walls are required when face of the pier is closer than 25'-0" from centerline of the track, measured perpendicular to the track, unless the size of the pier satisfies the criteria for piers of heavy construction as listed in Article II(d).

* HORIZONTAL CLEARANCE AREA INCLUDES 6' EITHER SIDE OF TRACK CENTERLINE

Crash walls shall meet the following requirements:

a. Crash walls for piers from 12 feet to 25 feet clear from the centerline of the track shall have a minimum height of 6 feet above the top of rail. Piers less than 12 feet clear from the centerline of the track shall have a minimum crash wall height of 12 feet above the top of rail. Crash walls shall be at least 2'-6" thick and at least 12 feet long.

b. For multi-column piers, the crash wall shall connect the columns and extend at least 1 foot beyond the outermost columns parallel to the track.

c. Crash walls shall be anchored to the footings and columns as applicable and shall extend to at least four (4) feet below the lowest surrounding grade.

d. A pier shall be considered of heavy construction if it has a cross-sectional area equal to or greater than that required for the crash wall and the larger of its dimensions is parallel to the track.

e. Consideration may be given to providing protection for bridge piers located more than 25 feet from the centerline of track as conditions warrant. In making this determination, account shall be taken of such factors as horizontal and vertical alignment of the track, embankment height, and an assessment of the consequences of serious damage in the case of a collision.

III. Drainage

It is very important to maintain good drainage of railroad right-of-way during construction and provide for good drainage after construction of the overhead crossing. The following guidelines shall be followed:

a. Piers and end slopes shall be located such that they do not interfere with railroad drainage ditches.

b. Drainage from the section of the bridge above railroad right-of-way shall be collected with drain pipes and drained away from the railroad right-of-way. When open scuppers are provided on the bridge, none shall be closer than 25'-0" from the centerline of the nearest track. Drainage from the scuppers shall be drained away from the railroad right-of-way.

c. After completion of construction, Railroad drainage ditches shall be cleaned of all debris to the satisfaction of the Railroad representatives.

d. During construction, silt fences shall be provided to prevent silting of the ditches.

e. If the project will alter drainage characteristics at the site of the crossing, three sets of the drainage calculations and plans shall be submitted to the Railroad for approval. Approval of the drainage plans shall not relieve the submitting agency of responsibility for the drainage design.

f. All disturbed areas on the railroad right-of-way shall be properly seeded and mulched to the satisfaction of the railroad.

IV. Structure Excavation and Shoring

Shoring or sheeting protection shall be provided when excavating adjacent to an active railroad track, except as noted below.

Shoring will not be required by the railroad to support railroad tracks if both the following conditions are satisfied:

1. Excavation does not encroach upon a 1½ horizontal: 1 vertical theoretical slope line starting 1'-6" below top of rail and at 12'-0" minimum from centerline of the track.

2. Track is on a level ground or in a cut section.

If both the above conditions are satisfied and shoring is not required to support the railroad track, contractor shall provide shoring as necessary to conform to State, Federal and local safety regulations.

When track is on embankment, excavating the toe of embankment without shoring may affect the stability of the embankment. Therefore, excavation of embankment toe without shoring will not be permitted.

Preferred protection is the cofferdam type that completely encloses the excavation. Where dictated by conditions, partial cofferdam with open sides away from the track may be used. Shoring shall be constructed using steel sheet piling. Steel soldier beams and lagging may be used in dry stable soil, or if adequate penetration for sheet piling can not be achieved due to shallow rock line. Wales and struts shall be provided as needed. The following shall be considered when designing cofferdams:

a. Sheeting shall be designed to resist a vertical live load surcharge of 1800 lbs. per square foot in addition to active earth pressure. The surcharge shall be assumed to act on a continuous strip, 8'-6" wide. Lateral pressures due to surcharge shall be computed using the strip load formula shown in A.R.E.A. specifications, Chapter 8, Part 20.

b. Allowable bending stresses in materials shall be as follows:

Timber: 1800 PSI
Steel ASTM A36-20,000 PSI
Steel Sheeting ASTM A328-24,000 PSI

c. A construction procedure for temporary shoring shall be shown on the drawing.

d. Safety railing meeting OSHA requirements shall be installed when temporary shoring is within 12 feet of track. When shoring is further than 12 feet from centerline of track, railing shall be provided if necessary for safety of workers and railroad personnel.

e. A minimum distance of 10 feet from centerline of the track to face of sheeting shall be maintained.

The contractor shall submit the following drawings and calculations for Railroad review and approval. Details shall be submitted a minimum of six weeks prior to the start of construction.

1. Three (3) sets of detailed drawings of the shoring systems showing sizes of all structural members, details of connections, and distance from centerline of track to face of shoring. Drawing shall provide a section showing height of sheeting and top of rail elevation in relation to bottom of excavation.

2. One set of calculations of the shoring design.

The drawings and calculations shall be prepared by a Registered Professional Engineer experienced in design of shoring and cofferdams and shall bear his seal and signature. The submitting agency shall review the plans and calculations and certify them to be complete and satisfactory prior to submitting them to the Railroad for approval. Excavation and shoring plans shall require approval by Director Bridge Design. Work shall not begin until such written approval has been obtained.

V. General Requirements:

a. Railroad Valuation Station and distance from the nearest milepost at intersection of centerline of the track and centerline of the bridge shall be shown on the General Plan.

b. Horizontal and vertical clearances shall be marked clearly on the General Plan and Elevation.

c. Soil parameters used in designing the shoring shall be based on soil data obtained from at least one core boring made in the vicinity of the proposed shoring.

VI. Demolition of Existing Structures

Railroad tracks shall be protected from damage during demolition of existing structure or replacement of deck slab. Either of the following methods may be used:

a. During demolition of the decks, a protection shield shall be erected over the track to catch falling debris. The protection shield shall be supported from girders or beams and shall not be lower than allowed temporary clearance. The deck shall be removed by cutting it in sections and lifting out. Large pieces of deck shall not be allowed to fall on protection shield.

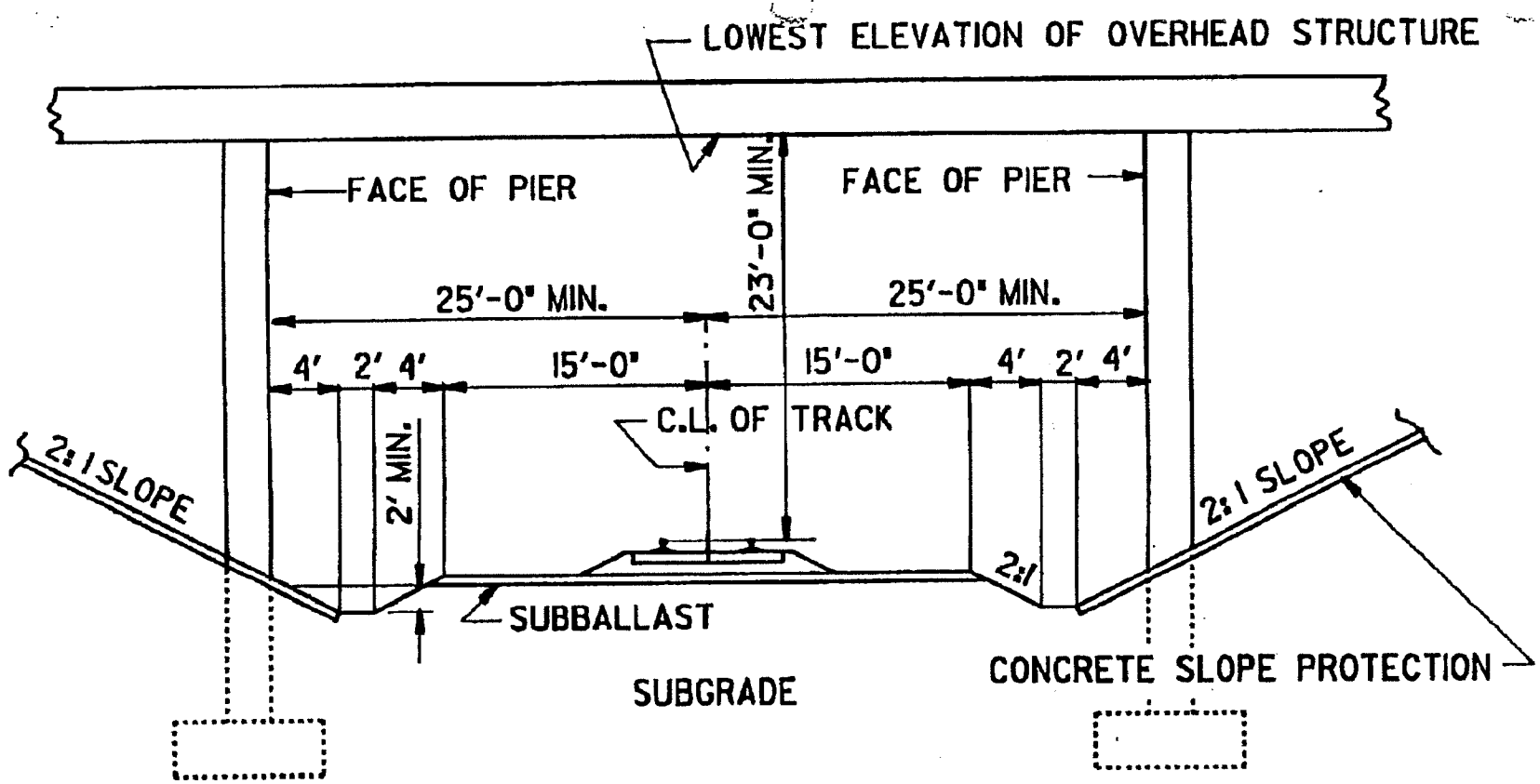
b. On light traffic density lines or when overhead protection shield cannot be installed due to limited clearance or type of superstructure, track may be protected by timber mats placed over the track structure, subject to approval by the Railroad. Timber mats shall be made in sections such that they may be lifted in and out quickly. Mats shall not rest on ties or rails. Geo-fabric or canvas shall be placed over the track structure to keep the ballast clean.

The contractor shall submit detailed plans of the protection shield or the timber mats to the Division Engineer for approval prior to the start of demolition. The plans shall be prepared by a Registered Professional Engineer and shall bear his seal and signature.

Blasting will not be permitted to demolish a structure over or within railroad right-of-way.

VII. Erection Procedure

The contractor shall submit a detailed procedure for erecting the spans over Railroad tracks. The procedure shall indicate the capacity of cranes, location of cranes with respect to the tracks and estimated lifting loads. The erection procedure must be approved by the Railroad.



CLEARANCES REQUIRED FOR OVERHEAD STRUCTURES

TYPICAL ROADBED SECTION WITH STANDARD DITCHES

NOTE: FOR MULTIPLE TRACKS, STANDARD TRACK CENTERS IS 15'-0".

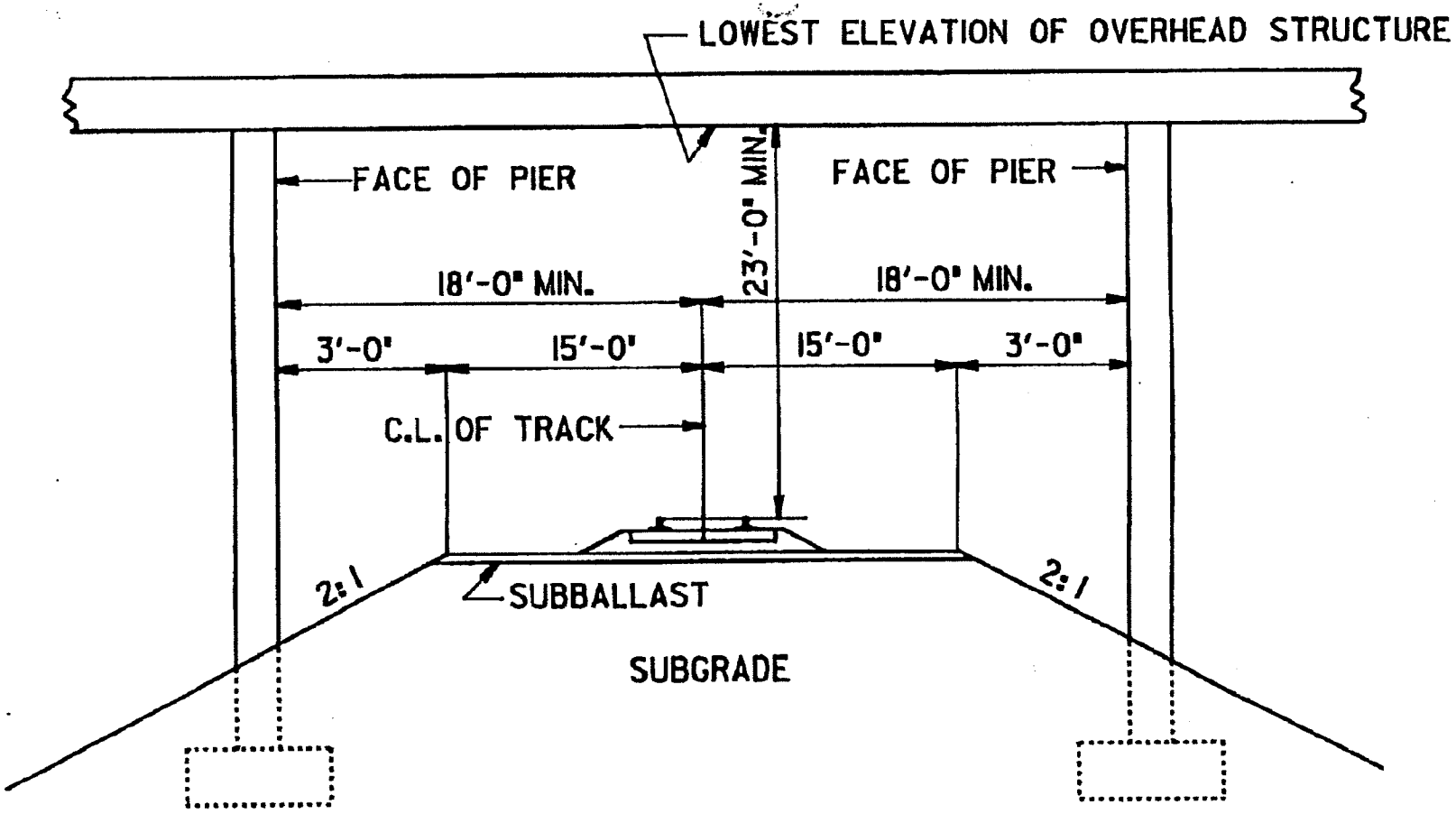
CSX TRANSPORTATION

ENGINEERING DEPARTMENT

STANDARD CLEARANCES FOR OVERHEAD STRUCTURES

NOVEMBER 1, 1993 SHEET 1 OF 2

SENT BY:INDOT ; 4- 9- 4 ; 10:43 ; DESIGN→ 317 544 4997/# 8



CLEARANCES REQUIRED FOR OVERHEAD STRUCTURES

TYPICAL SECTION FOR ROADBED IN FILL

(WHERE NO DEFINED DITCHES ARE NEEDED)

NOTE: FOR MULTIPLE TRACKS, STANDARD TRACK CENTERS IS 15'-0".

CSX TRANSPORTATION

ENGINEERING DEPARTMENT

STANDARD CLEARANCES FOR OVERHEAD STRUCTURES

NOVEMBER 1, 1993 SHEET 2 OF 2

SENT BY: INDOT : 4- 9- 2 : 16:44 : DESIGN→ 317 544 4997:# 9

Nicole Woodward

From: Caines, Mike <Mike_Caines@csx.com>
To: 'Nicole Woodward' <nwoodward@usiconsultants.com>
Cc: <gwendling@usiconsultants.com>; Fette, Dave <Dave_Fette@csx.com>
Sent: Tuesday, April 09, 2002 3:24 PM
Subject: US 31/CSX railroad crossing

Nicole: The message below is from our bridge department in Jacksonville. As you can see, they recommend Alt. 3 constructing an overhead bridge and filling in the current underpass.
The bridge area can be filled and compacted as high as possible and then the areas that could not be reached for compaction could be filled with flowable fill.
I hope this is the information that you were looking for. If you have any questions or need additional information, please call me at 859-344-8331.
****
****
Mike:
Theresa, Rick and I have discussed the photographs you sent us at the grade separation with US 31 and CSX. We have the following comments:
Alternate 1: Raising the CSX tracks over US 31 to provide proper clearance appears not feasible due to existing overhead bridge shown in the photo. This will also require reconstruction of bridge and rerouting of traffic on runaround tracks.
Alternate 2: Lowering of roadway seems not feasible. The roadway is depressed under the bridge and further lowering will create drainage problems under the bridge and require pump station. Standing water will create hazard in winter time. Also, depending on the current depth of footing and if any road widening is needed, the bridge may need to be reconstructed. Runaround track may be required to handle traffic during construction.
Alternate 3: Constructing an overhead bridge leaving track in same place is the recommended alternate. This will cause the least disruption to railroad traffic. Existing bridge can be left in place. Parapet walls and curb walls shall be removed to permit unimpeded track maintenance operations. Entire bridge area shall be filled and well compacted.
Further plans for the bridge shall be submitted to Chuck Gullakson for his handling with various departments.
C. J. Shah