

***INTERCHANGE  
JUSTIFICATION STUDY  
INTERSTATE 40 AT  
STATE ROUTE 196 (HICKORY WITHE ROAD)  
FAYETTE COUNTY***



*Prepared by  
PALMER*

*ENGINEERING*

FOR THE  
TENNESSEE DEPARTMENT OF  
TRANSPORTATION  
PLANNING DIVISION

December 2004

# TABLE OF CONTENTS

		<u>Page</u>
Chapter 1	Introduction	
	A. Purpose of Study	1
	B. Description of Project Location	1
	C. Background	1
	D. Relationship To Previous Planning Studies	1
	Project Vicinity Map	2
	Project Location Map	3
Chapter 2	Preliminary Planning Data	
	A. Land Use	4
	B. Proposed Improvement	4
Chapter 3	Engineering Investigations	
	A. Traffic Operations	5
	B. Access Analysis	5 - 8
	C. Cost	8
	D. Environmental Concerns	8
	E. Bicycle & Pedestrian Considerations	9
	Alternate 1 Cost Estimate	10
	Alternate 2 Cost Estimate	11
Chapter 4	Summary and Conclusions	12



## **APPENDICES**

Appendix A	Projected Traffic Volumes	A1 - 8
Appendix B	Functional Layouts	B1 - 5
Appendix C	Minutes of Meetings	C1 - 2
Appendix D	Alternate Interchange Considered	D1 - 2
Appendix E	Traffic Analysis Data	E1 - 8

# CHAPTER 1

## INTRODUCTION

### **A. Purpose of the Study**

The purpose of this study is to determine the need and justification of providing an interchange where SR-196 (Hickory Withe Road) currently crosses over I-40 in Fayette County. The study will determine the current and future needed improvements, analyze traffic conditions, develop functional layouts for the project, calculate construction costs for the alternates, and identify potential environmental, historical, and cultural concerns.

### **B. Description of Project Location**

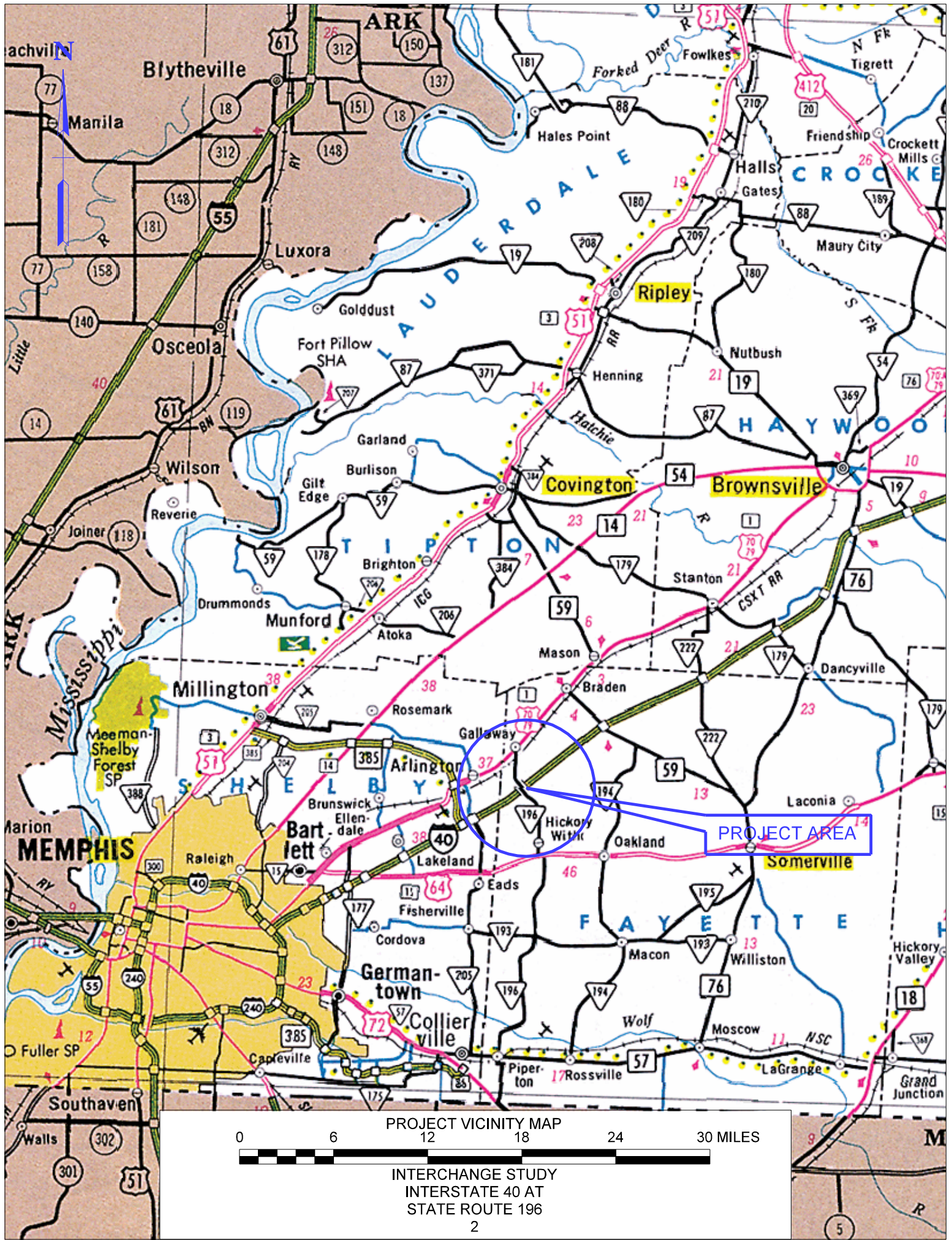
The proposed project is located in a rural area of Fayette County where SR-196 (Hickory Withe Road) currently crosses over I-40. The adjacent interchange to the west is at New Airline Road in Shelby County at a distance of two miles. The adjacent interchange to the east is at SR-59 at a distance of approximately five miles. The closest urban development, Arlington, is located 4.5 miles northwest of the proposed project. A small rural community, Gallaway, is located 2.0 miles north of the proposed interchange location. I-40 currently consists of a rural four lane, controlled access facility with a grass median and approximately 300 feet of right-of-way. SR-196 (Hickory Withe Road) is currently a non-access controlled rural two-lane road with a pavement width of 22 feet and approximately 60 feet of right-of-way. The construction of this project will make this the first Fayette County access point east of the Memphis Area.

### **C. Background**

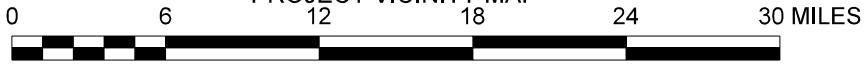
The provision of an interchange at this location would allow access to I-40 from the developments along both US-64 and US-70/79. This would provide direct interstate access to Gallaway and an additional route to Arlington and Somerville. Ultimately, I-40 will be widened to 8 lanes, and the areas immediately adjacent to the proposed interchange site will be developed.

### **D. Relationship To Previous Planning Studies**

The *Fayette County Growth Plan* was adopted in August 2003. Gallaway and a portion of a Fayette County Planned Growth Area (old Hickory Withe) are within the planning area of the MPO. The entire area surrounding the proposed interchange is contained within the Fayette County Planned Growth Area. The construction of an interchange is consistent with the long-range plans of the Memphis Metropolitan Planning Organization and will also be included in the current update of the MPO's plan.

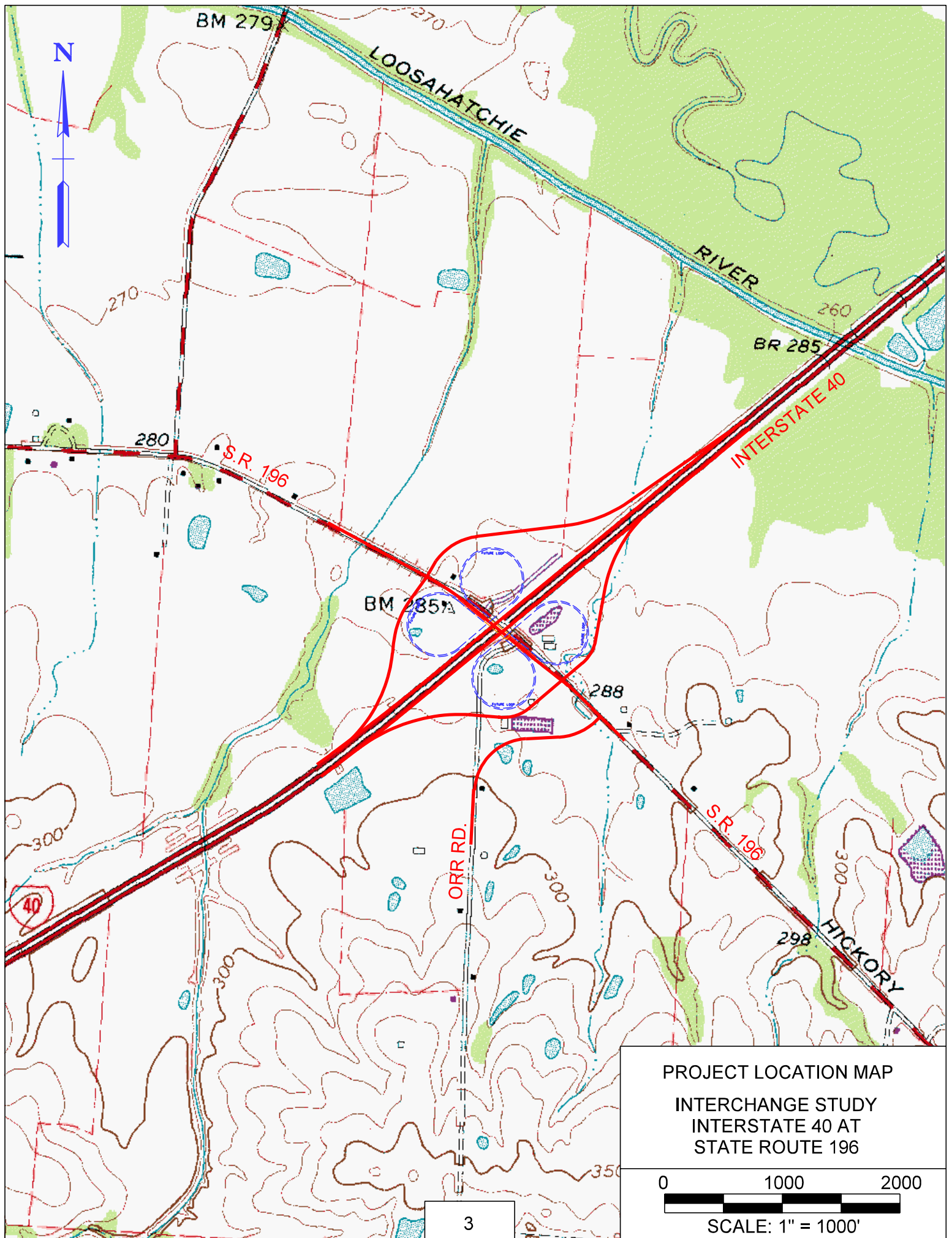


PROJECT VICINITY MAP

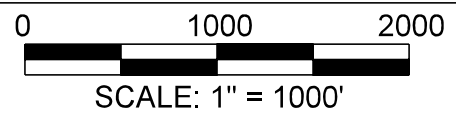


INTERCHANGE STUDY  
 INTERSTATE 40 AT  
 STATE ROUTE 196





PROJECT LOCATION MAP  
INTERCHANGE STUDY  
INTERSTATE 40 AT  
STATE ROUTE 196



3

## CHAPTER 2

### PRELIMINARY PLANNING DATA

#### A. Land Use

Land use in the project area is primarily rural with cotton fields and a sod farm immediately adjacent to the proposed interchange site. The area contains scattered residential and commercial developments along SR-196 to the north and south of Interstate 40.

The fact that the land adjacent to the project site is located within a Fayette County Planned Growth Area as detailed in the *Fayette County Growth Plan* ensures that future residential and commercial development will occur in the immediate area if the interchange is constructed. It is most likely that development will first occur north of I-40 due to the relative ease of extending utilities from Arlington and Gallaway.

Highway commercial development, to include service stations, fast food restaurants, and motels, would most likely be the initial types of development. Local officials are anticipating residential development and the possibility of a shopping mall in the immediate surrounding area as well.

#### B. Proposed Improvement

Two alternates were initially presented for the proposed interchange. The first alternate was a standard diamond interchange that permits future construction of loop ramps in all four quadrants. The cross section will be three-lanes within the interchange having 12-foot traveling lanes, 12-foot continuous left-turn lane and 10-foot shoulders. All interchange ramps would have 16-foot lanes and 6-foot shoulders. Orr Road, which currently intersects SR-196 immediately south of the interstate, would need to be relocated 960 feet south of its present location to allow for the construction of the ramp in the southwest quadrant of the proposed interchange. The realignment of Orr Road will be designed to meet minimum standards. It is anticipated that a frontage road cost figure will need to be compared to the cost of the loss of access to the sod farm.

The second alternate was a modified diamond with a three-lane cross section, 12-foot traveling lanes, 12-foot continuous left-turn lane and 10-foot shoulders. It would have standard diamond ramps in the southwest and southeast quadrants with a loop ramp and a standard diamond ramp in the northeast quadrant. The loop ramp has a design speed of 30 MPH, and an acceleration lane will provide vehicles adequate distance to reach interstate traveling speed before being required to merge. The loop ramp would eliminate the heavy left-turn movement for vehicles traveling from northbound SR-196 to westbound I-40. As with the standard diamond alternate, all ramp lanes would be 16-foot wide with 6-foot shoulders, and Orr Road would need to be relocated to intersect SR-196 south of its present location.

The preferred alternate, Alternate 1, plan sheets and typical can be found in Appendix B, while the other alternate originally presented, Alternate 2, can be found in Appendix D.

# CHAPTER 3

## ENGINEERING INVESTIGATIONS

### A. Traffic Operation

A level of service analysis was conducted to determine the relative performance of each alternate in 2008 and in 2028, during the AM and PM Peak periods. The findings of the analysis reveal that for either alternate, the level-of-service within the project area is no worse than D. The following tables contain the level-of-service findings for 2008 and 2028. The left turn movements are represented in the top chart and show no worse than a level-of-service of D. This indicates that a signal may need to be installed at the intersection before 2028. The information shown in the bottom chart represents the level-of-service outside the interchange footprint for I-40 and SR-196. The level-of-service on SR-196 has a slight decline to the north and south of the interstate as the design year is reached.

**Chart 1. Level Of Service Charts**

Location Description	Movement Type	Build Year (2008) AM		Design Year (2028) AM			Build Year (2008) PM		Design Year (2028) PM		
		DHV Volume	LOS	DHV Volume	ALT 1 LOS	ALT 2 LOS	DHV Volume	LOS	DHV Volume	ALT 1 LOS	ALT 2 LOS
SB SR 196 to EB I-40 RAMP	Left Turn	72	A	120		A	48	A	80	A	A
NB SR 196 to WB I-40 RAMP	Left Turn	156	A	252	A	-	104	A	168	A	-
SB SR 196 to WB I-40 RAMP	Left Turn	120	-	152	-	A	80	-	108	-	A
EB I-40 RAMP to NB SR 196	Left Turn	80	B	108	C	C	120	B	152	C	C
WB I-40 RAMP to SB SR 196	Left Turn	60	B	96	D	C	40	B	64	C	C
Location Description	Movement Type	Build Year (2008) AM		Design Year (2028) AM			Build Year (2008) PM		Design Year (2028) PM		
		DHV Volume	LOS	DHV Volume	ALT 1 LOS	ALT 2 LOS	DHV Volume	LOS	DHV Volume	ALT 1 LOS	ALT 2 LOS
NB SR 196 SOUTH OF I-40	Thru	212	C	336	D	D	188	C	304	D	D
NB SR 196 NORTH OF I-40	Thru	144	C	208	C	C	216	C	312	C	C
SB SR 196 NORTH OF I-40	Thru	216	C	312	C	C	144	C	208	C	C
SB SR 196 SOUTH OF I-40	Thru	188	C	304	D	D	212	C	336	D	D
EB I-40 WEST OF SR 196	Thru	1816	B **	2784	B *	B *	2724	D **	4176	D *	D *
EB I-40 EAST OF SR 196	Thru	1744	B **	2692	B *	B *	2556	C **	3948	C *	C *
WB I-40 EAST OF SR 196	Thru	2556	C **	3948	C *	C *	1744	B **	2692	B *	B *
WB I-40 WEST OF SR-196	Thru	2724	D **	4176	D *	D *	1816	B **	2784	B *	B *

\* Assumes an 6-lane section for Interstate 40

\*\* Assumes an 4-lane section for Interstate 40

### B. Access Analysis

This study has been undertaken in accordance with the Federal Highway Administration's (FHWA) policy for granting new or modified interstate access. The FHWA policy, as described in FHWA Docket No. 89-23, "Additional Interchanges to the Interstate System" (Federal Register 55, No. 204, October 22,

1990), is provided in the following paragraphs along with comments for consideration.

***It is in the national interest to maintain the Interstate System to provide the highest level of service in terms of safety and mobility. Adequate control of access is critical to providing such service. Therefore, new or revised access points to the existing Interstate System will be considered for approval only if:***

- 1. It is demonstrated that the existing interchanges and/or local roads and streets in the corridor can neither provide the necessary access nor be improved to satisfactorily accommodate the design year traffic demands while at the same time providing the access intended by the proposal.***

According to the *Fayette County Growth Plan*, adopted in August 2003, the land in the area immediately adjacent to the proposed interchange is within a “Fayette County Planned Growth Area”. Local officials are anticipating residential and commercial development with the possibility of a shopping mall in the immediate vicinity. The construction of a new interchange is also consistent with the Memphis Metropolitan Planning Organization’s Long Range Transportation Plan.

There will be growth pressure upon this location, which will be amplified due to the fact that it will become the first interchange located in Fayette County east of Memphis. Without an interchange, access to the land in the immediate vicinity will be via circuitous routes, increasing VMT and vehicle emissions.

- 2. All reasonable alternatives for design options, location and transportation system management type improvements (such as ramp metering, mass transit, and HOV facilities) have been assessed and provided for if currently justified, or provisions are included for accommodating such facilities if a future need is identified.***

During earlier planning stages, two design alternates were proposed. These alternates were reviewed and evaluated during meetings with representatives from TDOT’s Design Division and TDOT’s Planning Division. Both alternates accommodated existing and future traffic sufficiently to warrant the selection of a standard diamond design. Public transit is not available in Fayette County. While there are no HOV lanes currently proposed for I-40 in this location, there was discussion concerning the ultimate number of lanes needed for the interstate facility. In addition, there was discussion among the participants in the Field Review and Coordination Meeting concerning the possibility of establishing an informal park-n-ride lot in conjunction with the anticipated commercial development, even though the MPO plan currently does not call for this measure. The results of the traffic analysis do not warrant the use of ramp metering. The issues surrounding the proposed project location relate more to access issues than to Transportation System Management.

3. ***The proposed access point does not have a significant adverse impact on the safety and operation of the interstate facility based on analysis of current and future traffic. The operational analysis for existing conditions shall, particularly in urbanized areas, include an analysis of sections of interstate to and including at least the first adjacent existing or proposed interchange on either side. Crossroads and other roads and streets shall be included in the analysis to the extent necessary to assure their ability to collect and distribute traffic to and from the interchange with new or revised access points.***

An operational analysis of current and future traffic was made for all ramps and ramp termini within the limits of the interchange area. The proposed project site is currently located in a predominantly rural area. The interchange nearest the proposed new interchange site is approximately 2 miles to the west. The next closest existing interchange is located approximately 5 miles to the east. TDOT officials indicated that in the future I-40 should be widened to 6 or 8 lanes in the vicinity of the proposed project. The traffic analysis indicated an acceptable level-of-service for all ramps. With the proposed improvements in place, no adverse effects due to the proposed interchange are expected to impact I-40 mainline traffic. The left-turn movements at the interchange ramps show no less than a level-of-service C for the eastbound ramp onto northbound SR-196 and D for the westbound ramp onto southbound SR-196. SR-196 provides level-of-service C north and south of the interchange for build year conditions.

4. ***The proposed access connects to a public road only and will provide for all turning movements. Less than “full interchanges” for special purpose access for transit vehicles, for HOV’s or onto park and ride lots may be considered on a case-by-case basis. The proposed access will be designed to meet or exceed current standards for Federal-Aid projects on the interstate system.***

The proposed interchange is a full diamond type interchange and will provide for all traffic movements. The recommended interchange design will meet or exceed all American Association of State Highway and Transportation Officials (AASHTO) criteria.

5. ***The proposal considers and is consistent with local and regional land use and transportation plans. Prior to final approval, all requests for new revised access must be consistent with the metropolitan and/or statewide transportation plan, as appropriate, the applicable provisions of 23 CFR part 450 and the transportation conformity requirements of 40 CFR parts 51 and 93.***

The proposed interchange is located within the Memphis Metropolitan Planning Organization’s boundary and is consistent with the Long-Range Transportation Plan. The *Fayette County Growth Plan*, adopted in August 2003, shows the area immediately adjacent to the proposed interchange to be within a “Fayette County Planned Growth Area”.



6. *In areas where the potential exists for future multiple interchange additions, all requests for new or revised access are supported by a comprehensive Interstate network study with recommendations that address all proposed and desired access within the context of a long term plan.*

Implementation of the proposed interchange at or near SR-196 will place three interchanges within Fayette County. This proposed interchange would become the first Fayette County interchange east of the Memphis area. Interchanges are currently located at I-40 and SR-59 and I-40 at SR-222, approximately 7 miles apart. The proposed interchange would provide access to the western portion of Fayette County, the towns of Arlington, Galloway, and several communities located along US-64.

7. *The request for a new or revised access generated by new or expanded development demonstrates appropriate coordination between the development and related or otherwise required transportation system improvements.*

The primary objective of the proposed interchange is to provide safe and adequate transportation facilities for traffic projected to be generated by the anticipated residential and commercial development that will come as a result of the area being identified in the *Fayette County Growth Plan*, as a “Fayette County Planned Growth Area”.

8. *The request for a new or revised access contains information relative to the planning requirements and the status of the environmental processing of the proposal.*

Construction of this interchange is not expected to require the acquisition of any residences or other improvements. Acquisition of some acreage now being used for agricultural operations would be necessary. There may be some involvement of a small unnamed stream located north of the project, but it is not expected to impact any environmentally sensitive areas. The pond located in the southeast quadrant is not expected to be impacted by the construction of the interchange ramps.

#### C. Cost

The total estimated construction cost for each alternate is detailed on pages 10 & 11. The cost for the standard diamond interchange (Alternate #1) is estimated at \$6,785,300. Alternate 2, the interchange with the loop in the northeast quadrant, is estimated at \$5,422,800.

#### D. Environmental Concerns

Formal environmental studies have not been conducted for this study. However, it was noted that a borrow pit, serving as a pond in the southeast quadrant of the proposed interchange, would be encompassed by the ramp construction. There are minor streams in the area, which may need to be mitigated. Further studies will be necessary to

determine any historic, archaeological, or ecological impacts of constructing an interchange.

**E. Bicycle and Pedestrian Considerations**

US-64, located south of the proposed project, is a designated state bicycle route. The new bridge and approaches will be constructed with 10-foot shoulders, thereby providing pedestrian and bicycle accommodations and allowing additional bicycle and pedestrian connectivity and continuity.

**COST DATA SHEET (Itemized Cost Estimates)**

7/23/2004

PROJECT: Fayette County TN - Alt. 1

<u>Right-of-Way</u>		Number	Rate	Costs
	Land, Improvements, and Damages	Acres= 55.7	N/A	\$1,115,000
	Incidentals	Tracts= 8		\$24,000
	Relocation Payments	Residences= 0		\$0
		Businesses= 0		\$0
		Non-Profits= 0		\$0
	Contingences		Additional 20%	\$227,800
			Total Right-of-Way Costs	<b>\$1,366,800</b>
<u>Utility Relocation</u>				
	Reimbursable			\$12,000
	Non-Reimbursable			\$130,200
	Contingences (20%)			\$28,440
	Total Adjustment Cost			<b>\$170,640</b>
<u>Construction</u>				
	Clear and Grubbing			\$88,000
	Earthwork			\$1,288,800
	Pavement Removal			\$2,000
	Drainage (Includes Erosion Control)			\$100,000
	Structures			\$1,000,000
	Railroad Crossing or Separation			\$0
	Paving			\$950,000
	Retaining Walls			\$0
	Maintenance of Traffic			\$150,000
	Topsoil			\$70,000
	Seeding			\$44,000
	Sodding			\$0
	Signing			\$75,000
	Lighting			\$75,000
	Signalization			\$0
	Fence			\$41,000
	Guardrail			\$45,000
	Rip Rap of Slope Protection			\$0
	Other Construction Items (8.5%)			\$249,000
	Mobilization			\$194,000
	10% Eng. And Const.			\$438,000
	Total Construction Cost			\$4,809,800
	Preliminary Engineering (10%)			<b>\$438,000</b>
	TOTAL COST			<b>\$6,785,240</b>

**COST DATA SHEET (Itemized Cost Estimates)**

7/23/2004

PROJECT: Fayette County TN - Alt. 2

<u>Right-of-Way</u>		Number	Rate	Costs
Land, Improvements, and Damages	Acres=	23.7	N/A	\$480,000
Incidentals	Tracts=	6		\$18,000
Relocation Payments	Residences=	0		\$0
	Businesses=	0		\$0
	Non-Profits=	0		\$0
Contingences	Additional 20%			\$99,600
	<b>Total Right-of-Way Costs</b>			<b>\$597,600</b>

<u>Utility Relocation</u>				
	Reimbursable			\$0
	Non-Reimbursable			\$101,000
	Contingences (20%)			\$20,200
	<b>Total Adjustment Cost</b>			<b>\$121,200</b>

<u>Construction</u>				
	Clear and Grubbing			\$43,000
	Earthwork			\$985,000
	Pavement Removal			\$5,000
	Drainage (Includes Erosion Control)			\$100,000
	Structures			\$1,000,000
	Railroad Crossing or Separation			\$0
	Paving			\$950,000
	Retaining Walls			\$0
	Maintenance of Traffic			\$150,000
	Topsoil			\$60,000
	Seeding			\$30,000
	Sodding			\$0
	Signing			\$75,000
	Lighting			\$75,000
	Signalization			\$0
	Fence			\$25,500
	Guardrail			\$31,500
	Rip Rap of Slope Protection			\$0
	Other Construction Items (8.5%)			\$216,000
	Mobilization			\$174,000
	10% Eng. And Const.			\$392,000
	<b>Total Construction Cost</b>			<b>\$4,312,000</b>

Preliminary Engineering (10%) **\$392,000**

**TOTAL COST** **\$5,422,800**

## **CHAPTER 4**

### **SUMMARY AND CONCLUSIONS**

The preceding study was conducted to evaluate future traffic operations of a proposed new interchange on I-40 where the SR-196 (Hickory Withe Road) Bridge currently crosses. Traffic forecasts were generated by the Tennessee Department of Transportation using counts and traffic volume information readily available from the Memphis Metropolitan Planning Organization.

Two alternate designs were considered. Alternate #1 is a standard diamond interchange that permits future construction of loop ramps in all four quadrants, and Alternate #2 is a partial diamond interchange with a loop ramp in the northeast quadrant. Traffic and level of service analysis based upon the available traffic volume information revealed that there is was a slight advantage to Alternate #2 but this did not occur until the design year (2028) and could be incorporated into Alternate 1 when it becomes needed.

Therefore, since Alternate #1 provides for future growth, it is the recommended alternate. A new three-lane structure should be constructed immediately west of the existing SR-196 structure and designed to accommodate an additional two lanes for a future widening to five lanes.

# **APPENDIX A**

## **PROJECTED TRAFFIC VOLUMES**

**TENNESSEE DEPARTMENT OF TRANSPORTATION  
MAPPING AND STATISTICS OFFICE  
TRAFFIC PLANNING AND SURVEYS SECTION**

(REV. 10/20/03)

PROJECT NO.: \_\_\_\_\_ ROUTE: I-40 @ SR-196 (Hickory Withe Rd.)  
 COUNTY: Fayette CITY: \_\_\_\_\_  
 PROJECT PIN NUMBER: \_\_\_\_\_  
 PROJECT DESCRIPTION: Interchange Justification Study

**DIVISION REQUESTING:**

MAINTENANCE  STRUCTURES   
 PLANNING  SURVEY & DESIGN   
 PROG. DEVELOPMENT & ADM.  TRAFFIC SIGNAL DESIGN   
 PUBLIC TRANS. & AERO.  OTHER   
 YEAR PROJECT PROGRAMMED FOR CONSTRUCTION: \_\_\_\_\_  
 PROJECTED LETTING DATE: \_\_\_\_\_

**TRAFFIC ASSIGNMENT:**

BASE YEAR		2028					DESIGN ROADWAY % TRUCKS		DESIGN AVERAGE DAILY LOADS	
ADT	YEAR	ADT	DHV	%	YEAR	DIR.DIST.	DHV	ADT	FLEX	RIGID
44,200	2008	68,000	6,800	10	2028	60:40	26	39		

REQUESTED BY: NAME Mike Updike DATE 11/19/04  
 DIVISION Planning Division  
 ADDRESS Suite 900, James K. Polk Bldg.  
Nashville, TN 37243

REVIEWED BY: TONY ARMSTRONG Tony Armstrong DATE 12-6-04  
 TRANSPORTATION MANAGER 1  
 SUITE 1000, JAMES K. POLK BUILDING

APPROVED BY: STEVE ALLEN Steve Allen DATE 12-6-04  
 TRANSPORTATION MANAGER 2  
 SUITE 1000, JAMES K. POLK BUILDING

**COMMENTS:**

BASE YEAR AND DESIGN YEAR TRAFFIC IS BASED ON 2003 CYCLE COUNT, GROWTH TREND AND MEMPHIS LONG RANGE TRANSPORTATION PLAN COMPUTER MODEL.

THIS PROJECT SUPERSEDES AND VOIDS THE PREVIOUS PROJECT DATED 12/01/03

**DHV'S ARE NOT REQUIRED FOR SIDE ROADS LESS THAN 1000 ADT.**  
 NOTE: FOR BRIDGE REPLACEMENT PROJECTS, ADTs ARE NOT REQUIRED FOR ADTs OF 1000 OR LESS AND PERCENTAGE OF TRUCKS OF 7% OR LESS.  
 SEE ATTACHMENTS FOR TURNING MOVEMENTS AND/OR OTHER DETAILS.

# PROJECT LOCATION MAP

County: Fayette

City:

Route: I-40 Interchange @ SR-196

Date: 12/06/2004

Initials: MK

PROJECT LOCATION

TRAFFIC PLANNING AND STATISTICS OFFICE



HWY 70

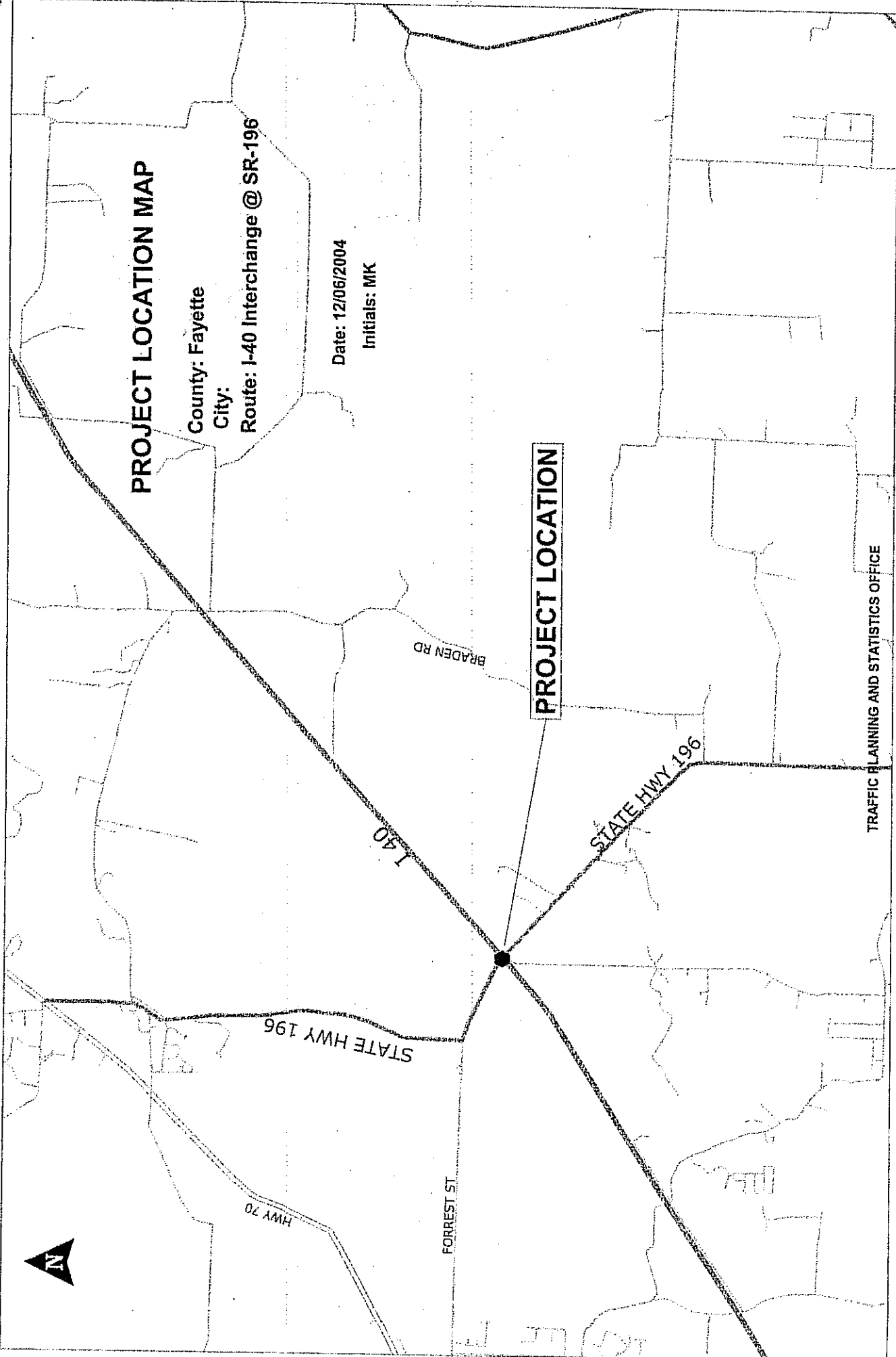
FORREST ST

STATE HWY 196

I 40

BRADEN RD

STATE HWY 196



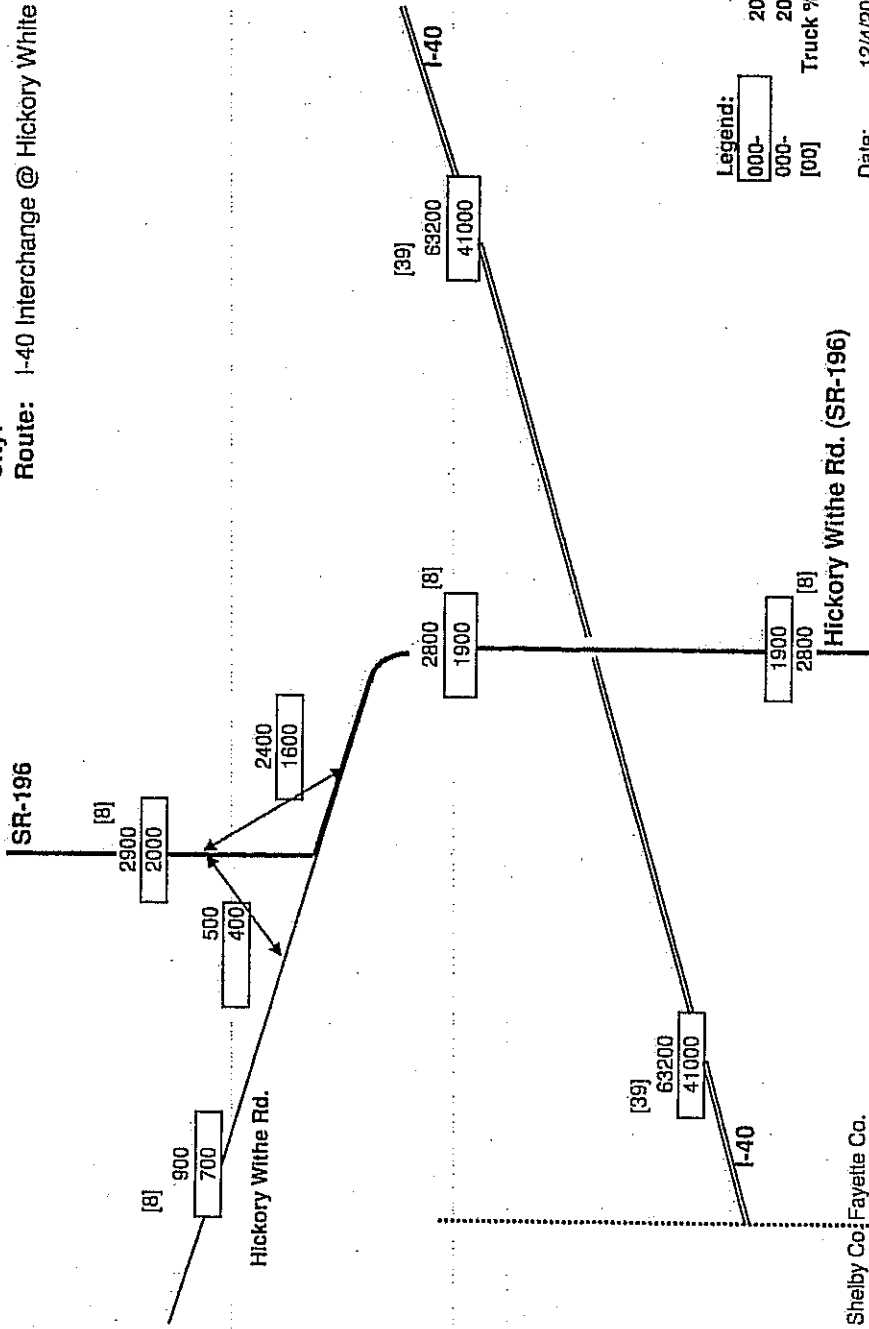


ADT EXISTING SYSTEM

County: Fayette

City:

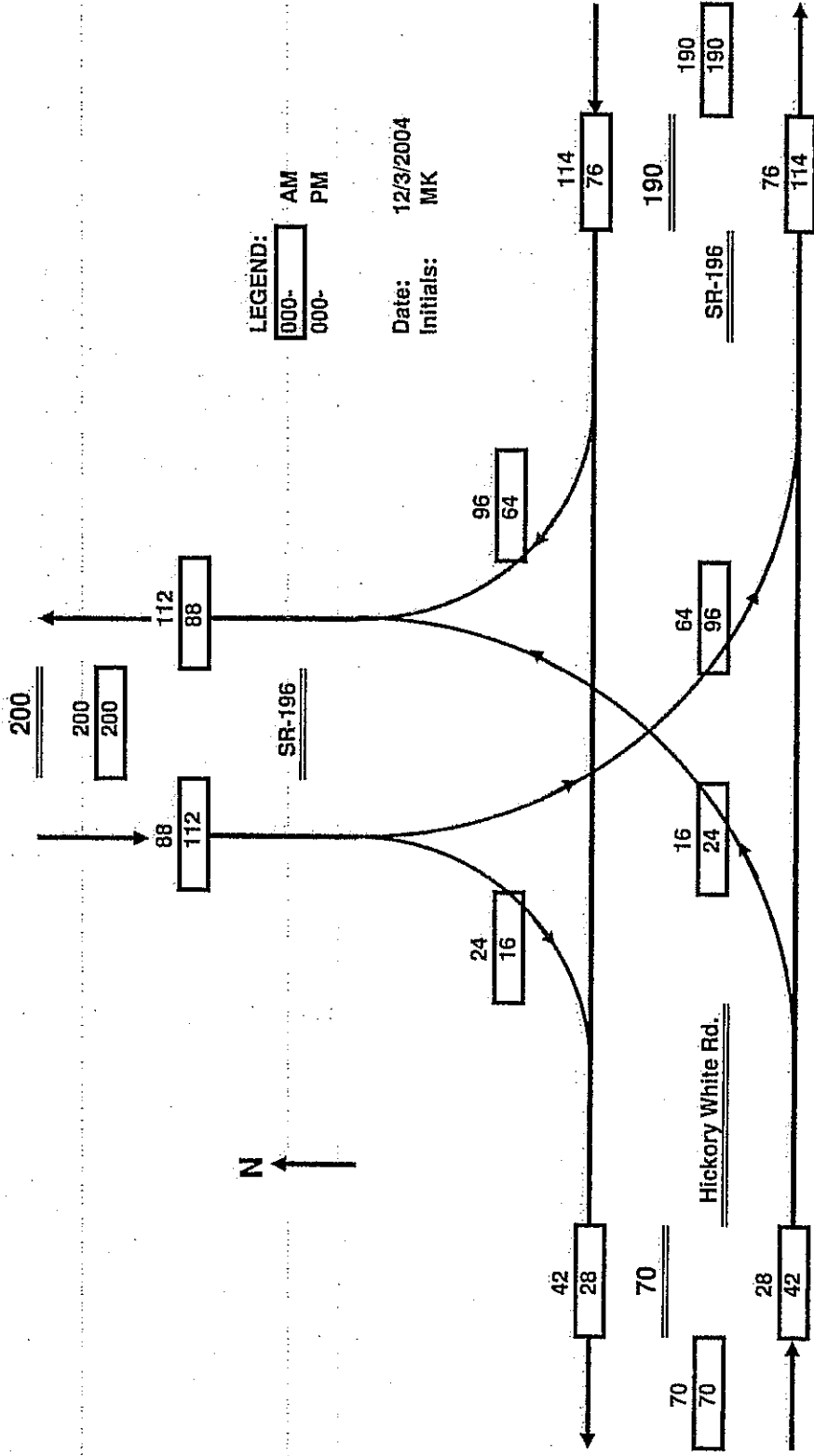
Route: I-40 Interchange @ Hickory White Rd.



Legend:  
 000- 2008  
 000- 2028  
 [00] Truck %  
 Date: 12/4/2004  
 Initials: MK

2008 DHV EXISTING SYSTEM

County: Fayette  
 City:  
 Route: SR-196

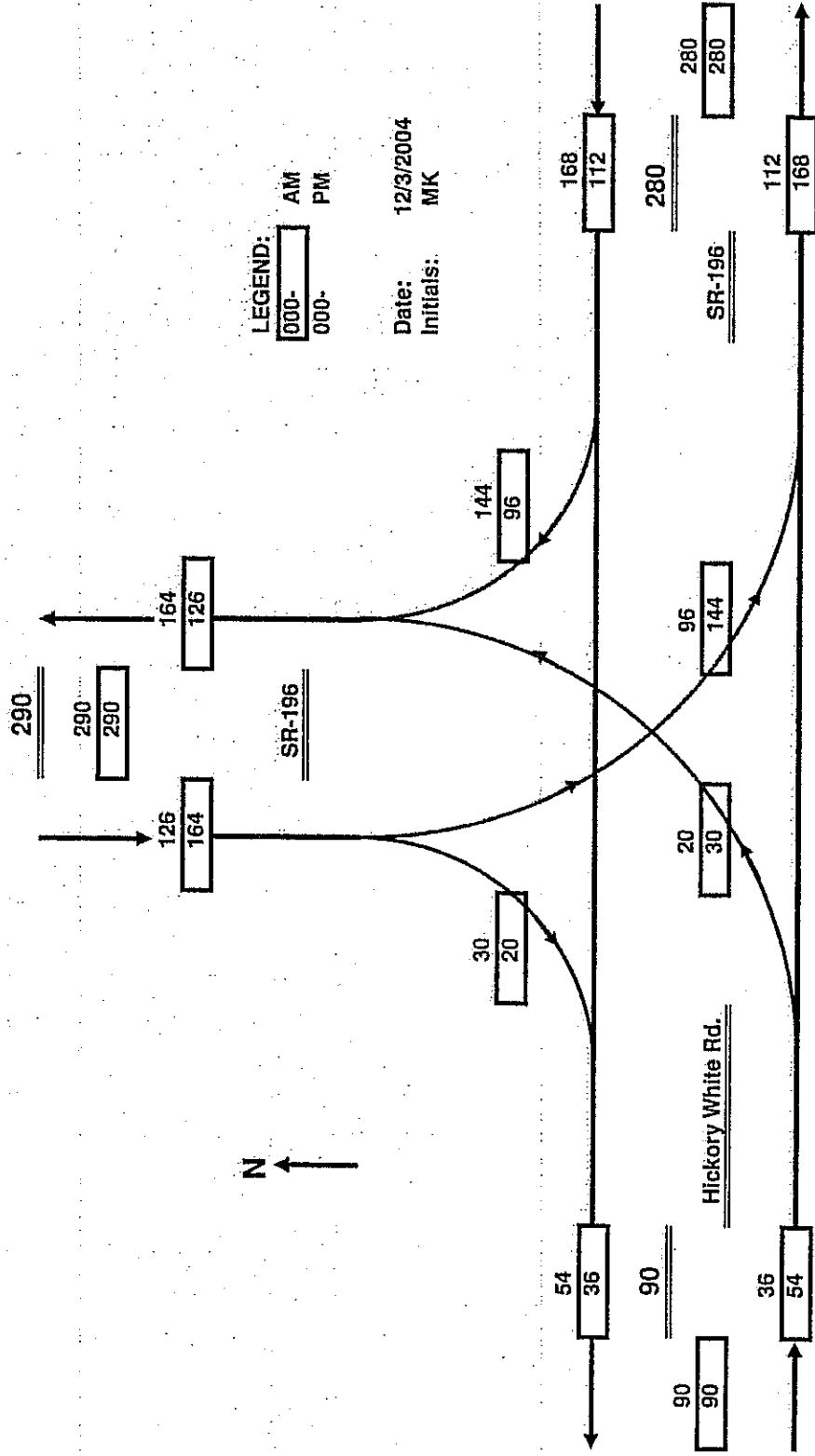


LEGEND:  
 000- AM  
 000- PM

Date: 12/3/2004  
 Initials: MK

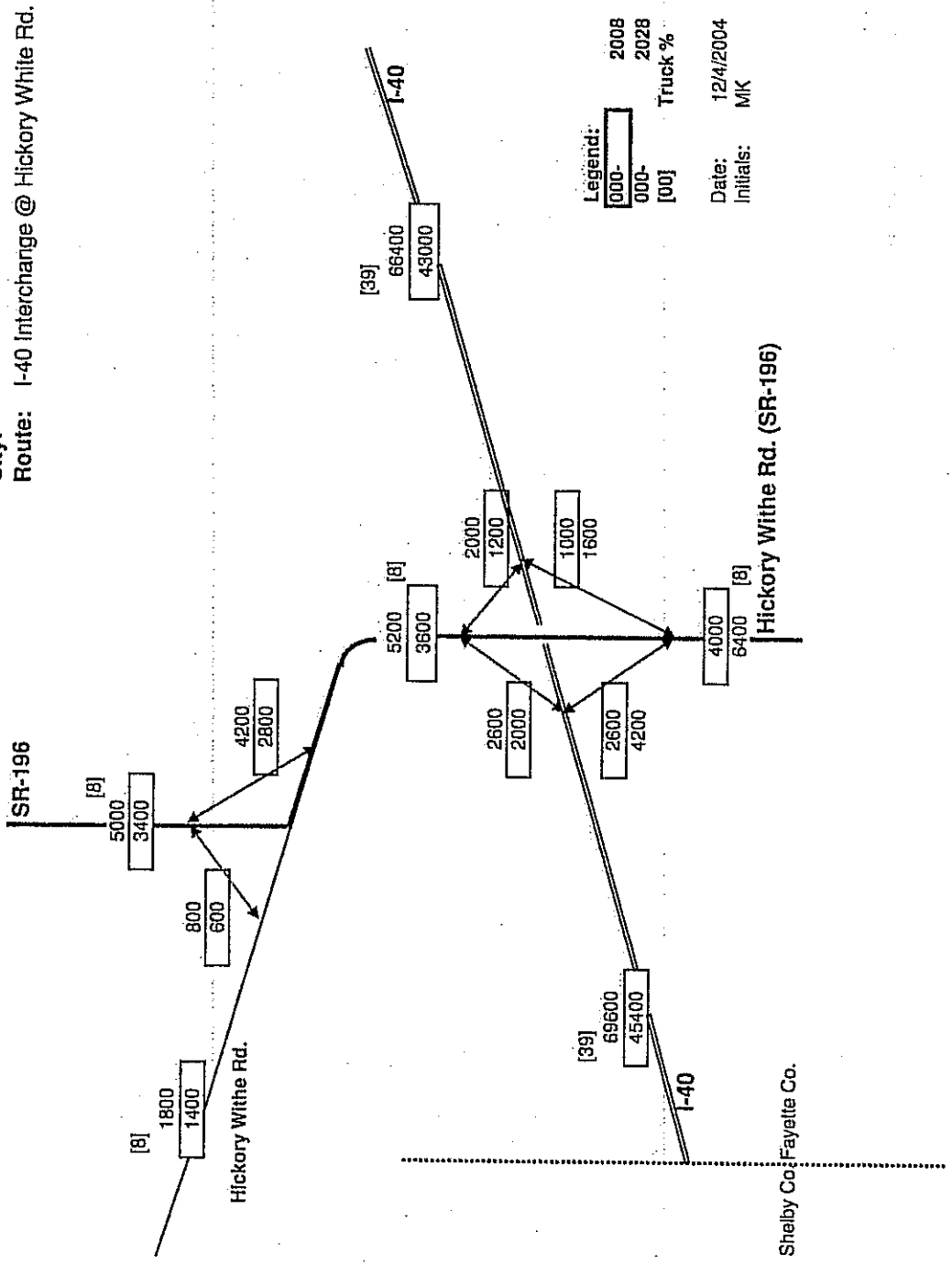
2028 DHV EXISTING SYSTEM

County: Fayette  
 City:  
 Route: SR-196



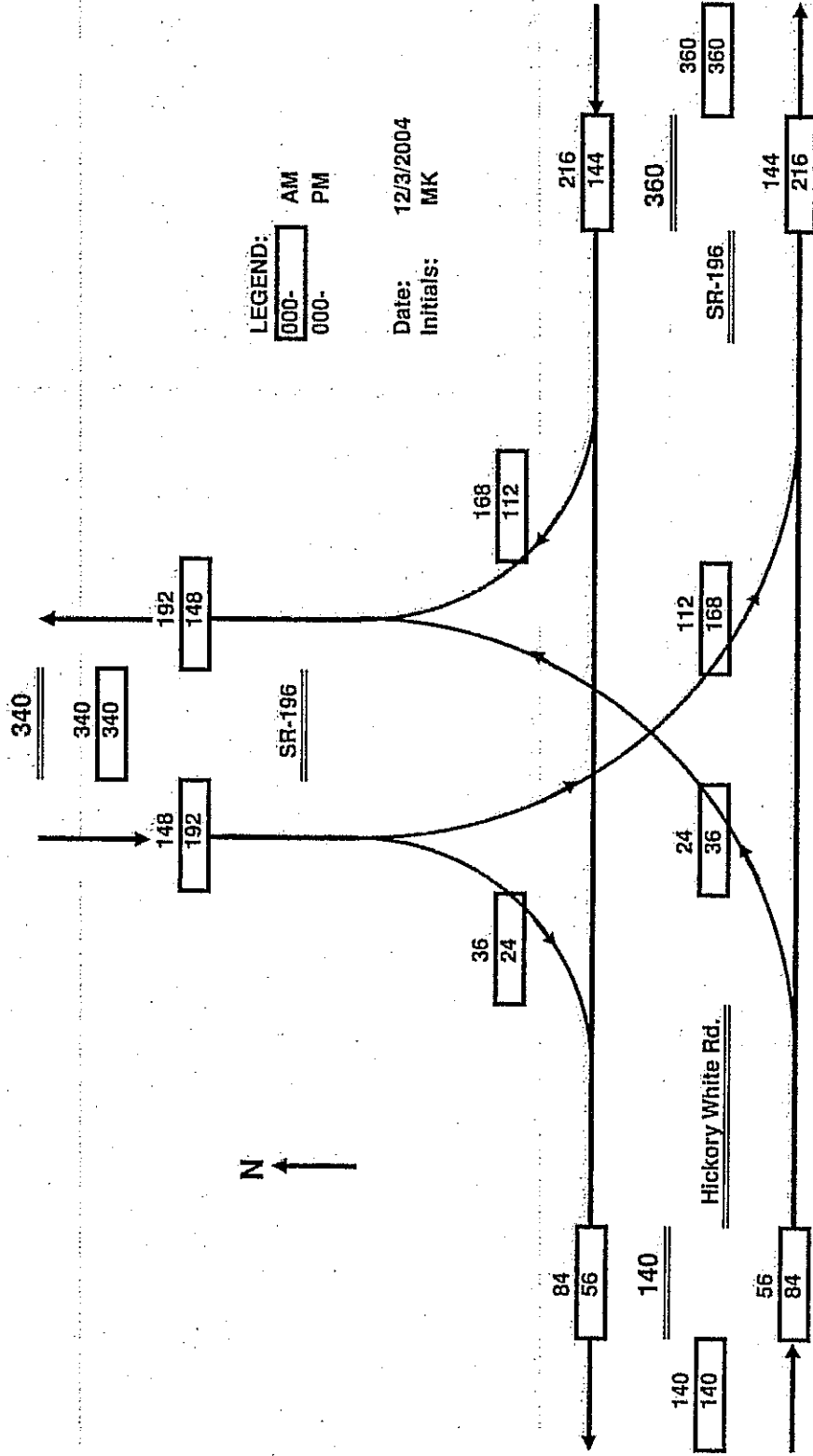
# ADT PROPOSED SYSTEM

County: Fayette  
 City:  
 Route: I-40 Interchange @ Hickory White Rd.



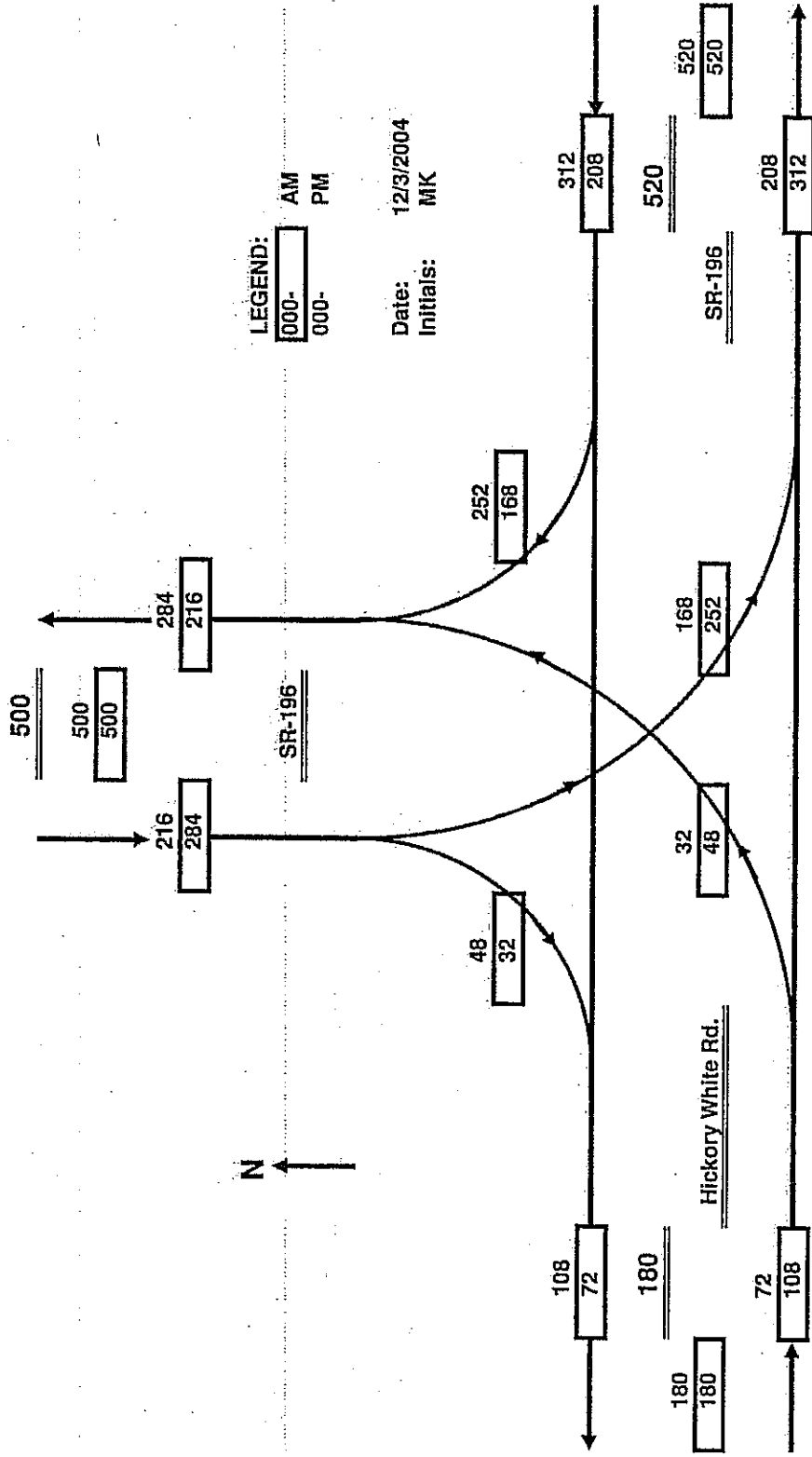
2008 DHV PROPOSED SYSTEM

County: Fayette  
 City:  
 Route: SR-196



2028 DHV PROPOSED SYSTEM

County: Fayette  
 City:  
 Route: SR-196

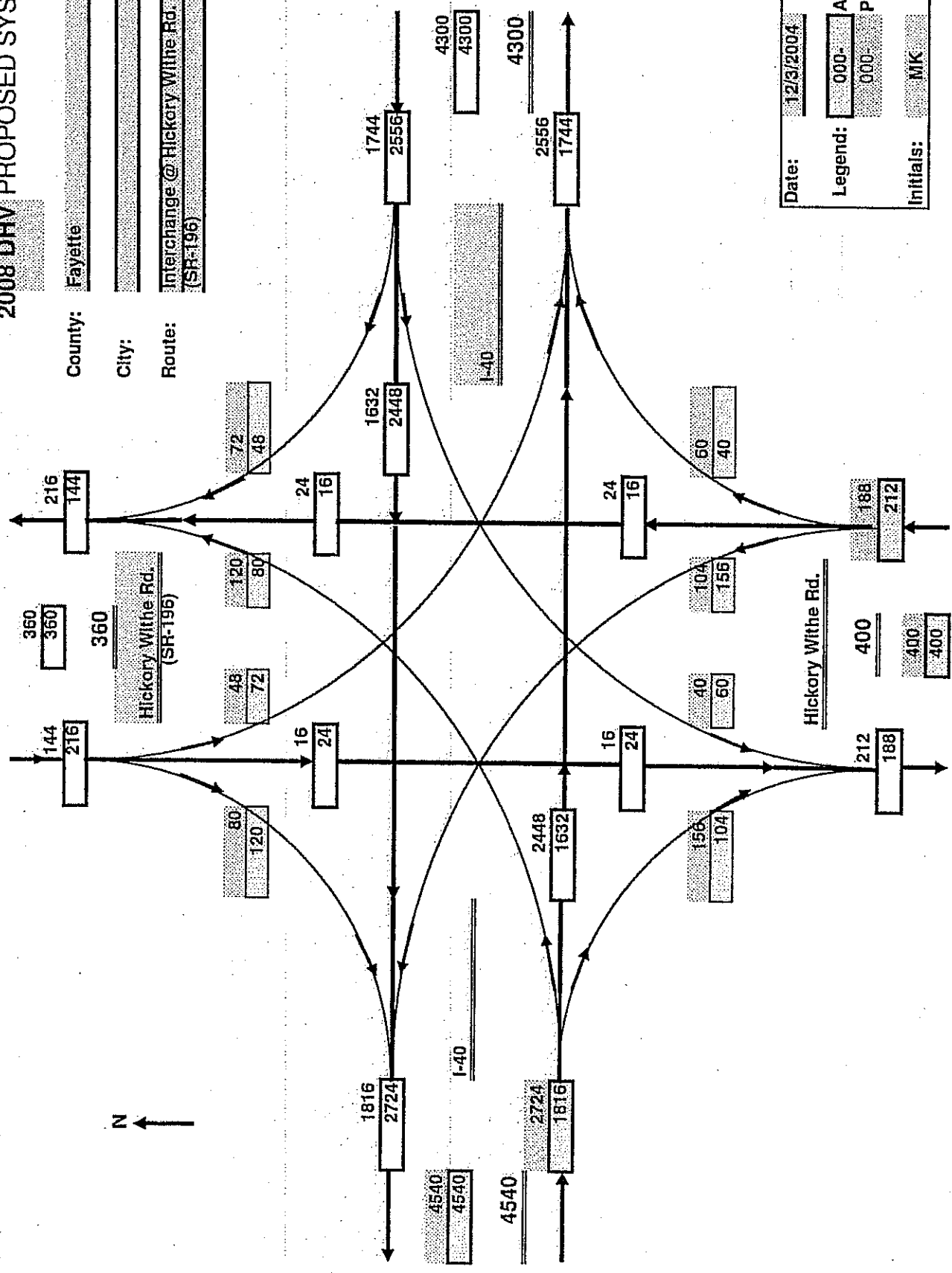


LEGEND:  
 000- AM  
 000- PM

Date: 12/3/2004  
 Initials: MK

# 2008 DHV PROPOSED SYSTEM

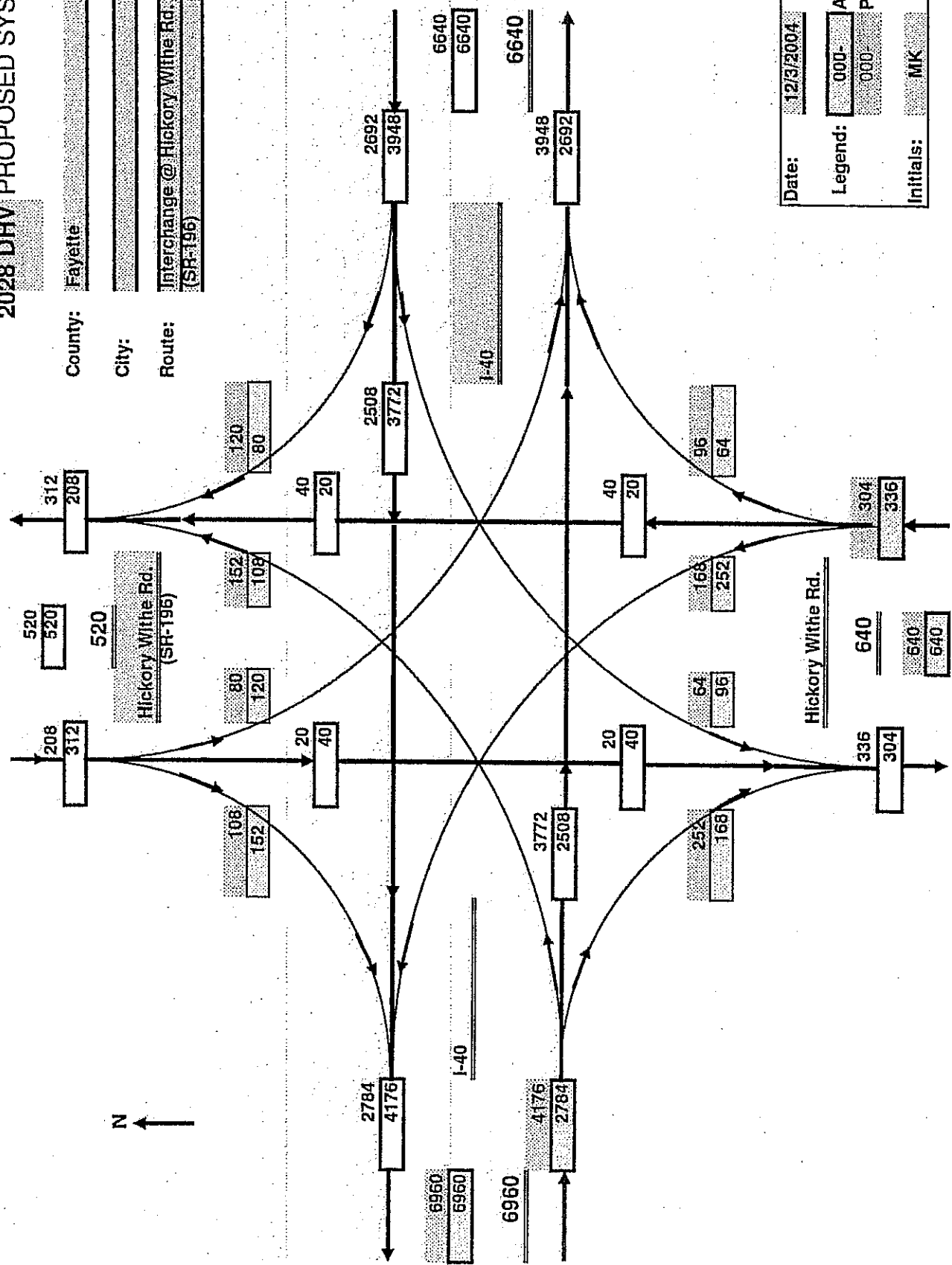
County: Fayette  
 City:  
 Route: Interchange @ Hickory Withe Rd. (SR-196)



Date: 12/3/2004  
 Legend: 000- AM, 000- PM  
 Initials: MK

# 2028 DHV PROPOSED SYSTEM

County: Fayette  
 City: Hickory Withe Rd.  
 Route: Interchange @ Hickory Withe Rd. (SR-196)



Date: 12/3/2004  
 Legend: 000 AM  
           000 PM  
 Initials: MK



# **APPENDIX B**

## **FUNCTIONAL LAYOUTS**

Index Of Sheets

SHEET NO.	DESCRIPTION
1	..... TITLE SHEET
2	..... TYPICAL SECTION
3-6	..... PROPOSED LAYOUTS

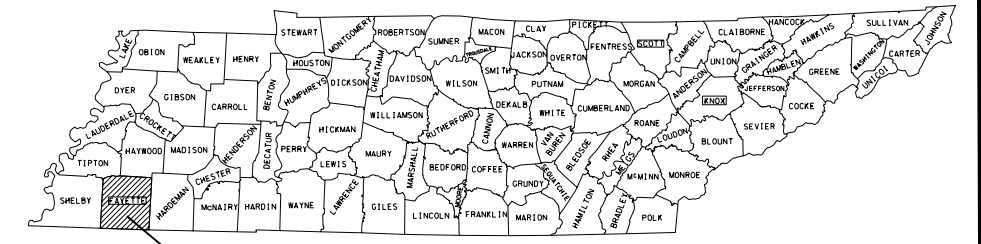
STATE OF TENNESSEE  
DEPARTMENT OF TRANSPORTATION  
BUREAU OF PLANNING AND DEVELOPMENT

TENN.	YEAR	SHEET NO.
	2003	B-1
FED. AID PROJ. NO.		
STATE PROJ. NO.		

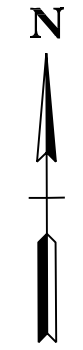
**FAYETTE COUNTY**

INTERCHANGE JUSTIFICATION STUDY  
I-40 @ S.R. 196  
(HICKORY WITHE RD.)

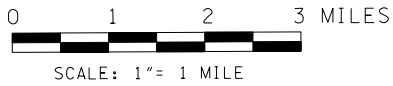
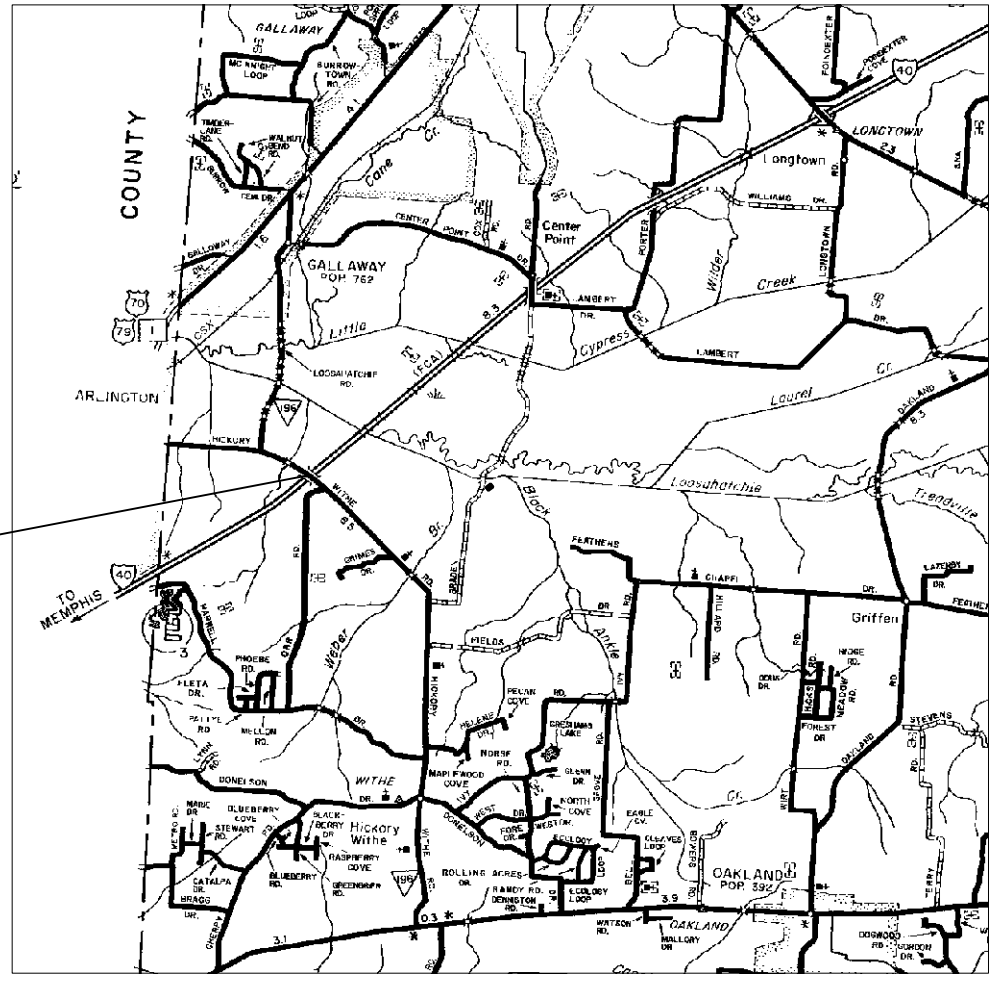
STATE HIGHWAY NO. 29 F.A.H.S. NO.



PROJECT LOCATION



PROJECT LOCATION



**SPECIAL NOTES**

PROPOSALS MAY BE REJECTED BY THE COMMISSIONER IF ANY OF THE UNIT PRICES CONTAINED THEREIN ARE OBVIOUSLY UNBALANCED, EITHER EXCESSIVE OR BELOW THE REASONABLE COST ANALYSIS VALUE.

THIS PROJECT TO BE CONSTRUCTED UNDER THE STANDARD SPECIFICATIONS OF THE TENNESSEE DEPARTMENT OF TRANSPORTATION DATED MARCH 1, 1995 AND ADDITIONAL SPECIFICATIONS AND SPECIAL PROVISIONS CONTAINED IN THE PLANS AND IN THE PROPOSAL CONTRACT

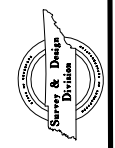
TDOT ROAD SP. SV. 2 \_\_\_\_\_  
DESIGNER \_\_\_\_\_ CHECKED BY \_\_\_\_\_  
P.E. NO. \_\_\_\_\_

APPROVED: \_\_\_\_\_  
DIRECTOR, DESIGN DIVISION  
DATE: \_\_\_\_\_  
APPROVED: \_\_\_\_\_  
COMMISSIONER

U.S. DEPARTMENT OF TRANSPORTATION  
FEDERAL HIGHWAY ADMINISTRATION

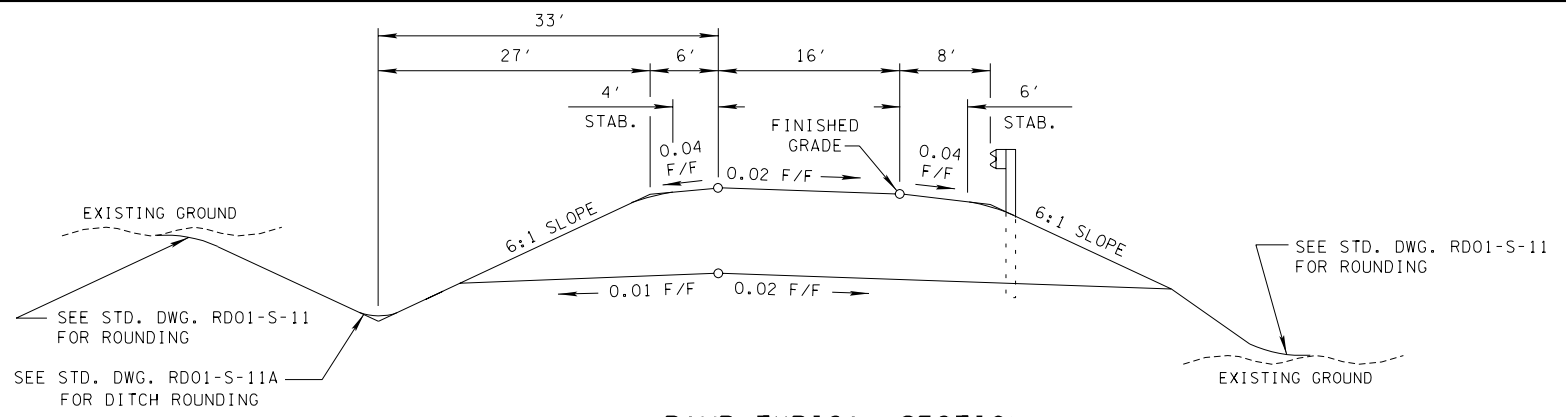
TRAFFIC DATA	
ADT ( )	
ADT (20 )	
DHV (20 )	
D	-
T (ADT)	%
T (DHV)	%
V	MPH

APPROVED: \_\_\_\_\_  
DIVISION ADMINISTRATOR DATE

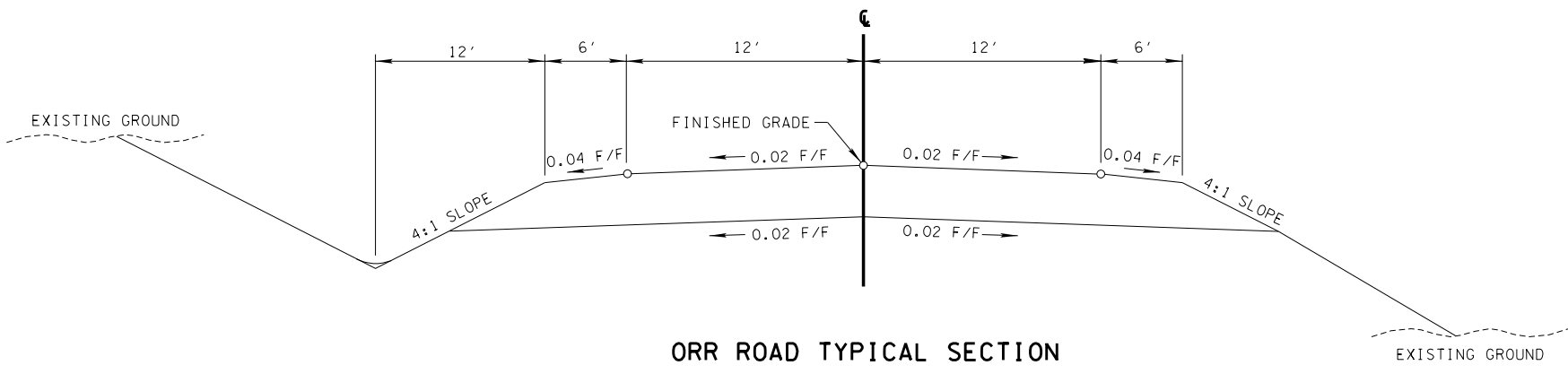


TYPE	YEAR	PROJECT NO.	SHEET NO.
			B-2

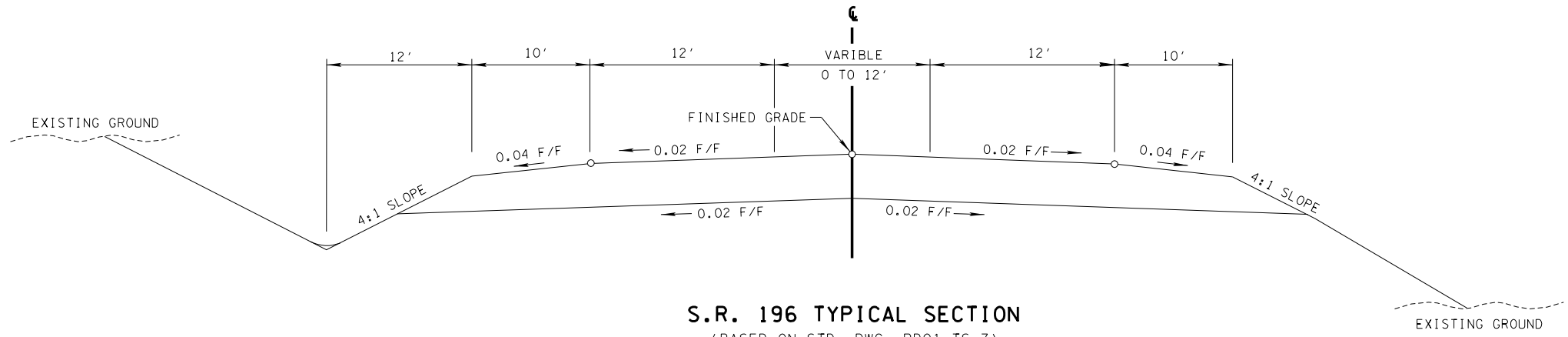
TENNESSEE D.O.T.  
DESIGN DIVISION  
FILE NO.



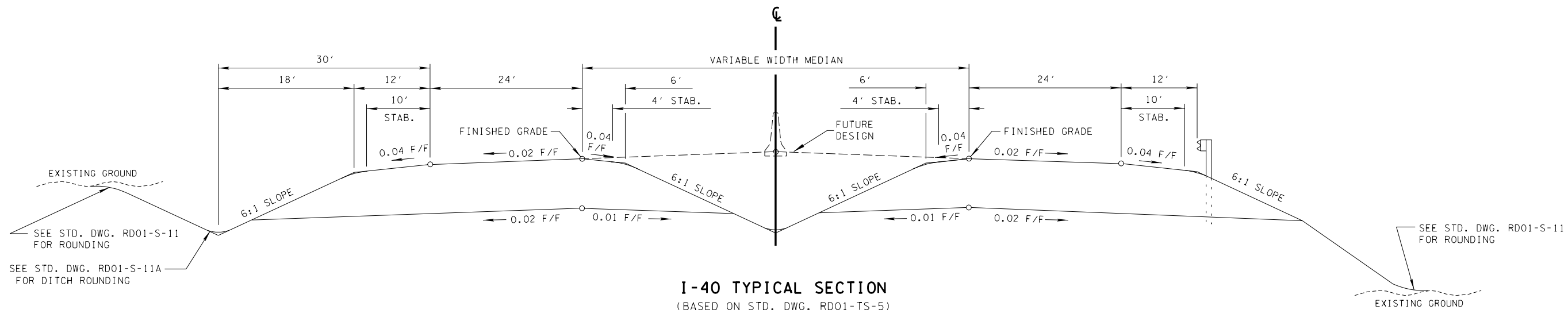
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(BASED ON STD. DWG. RD01-TS-4)



**ORR ROAD TYPICAL SECTION**  
(BASED ON STD. DWG. RD01-TS-1)



**S.R. 196 TYPICAL SECTION**  
(BASED ON STD. DWG. RD01-TS-7)



**I-40 TYPICAL SECTION**  
(BASED ON STD. DWG. RD01-TS-5)

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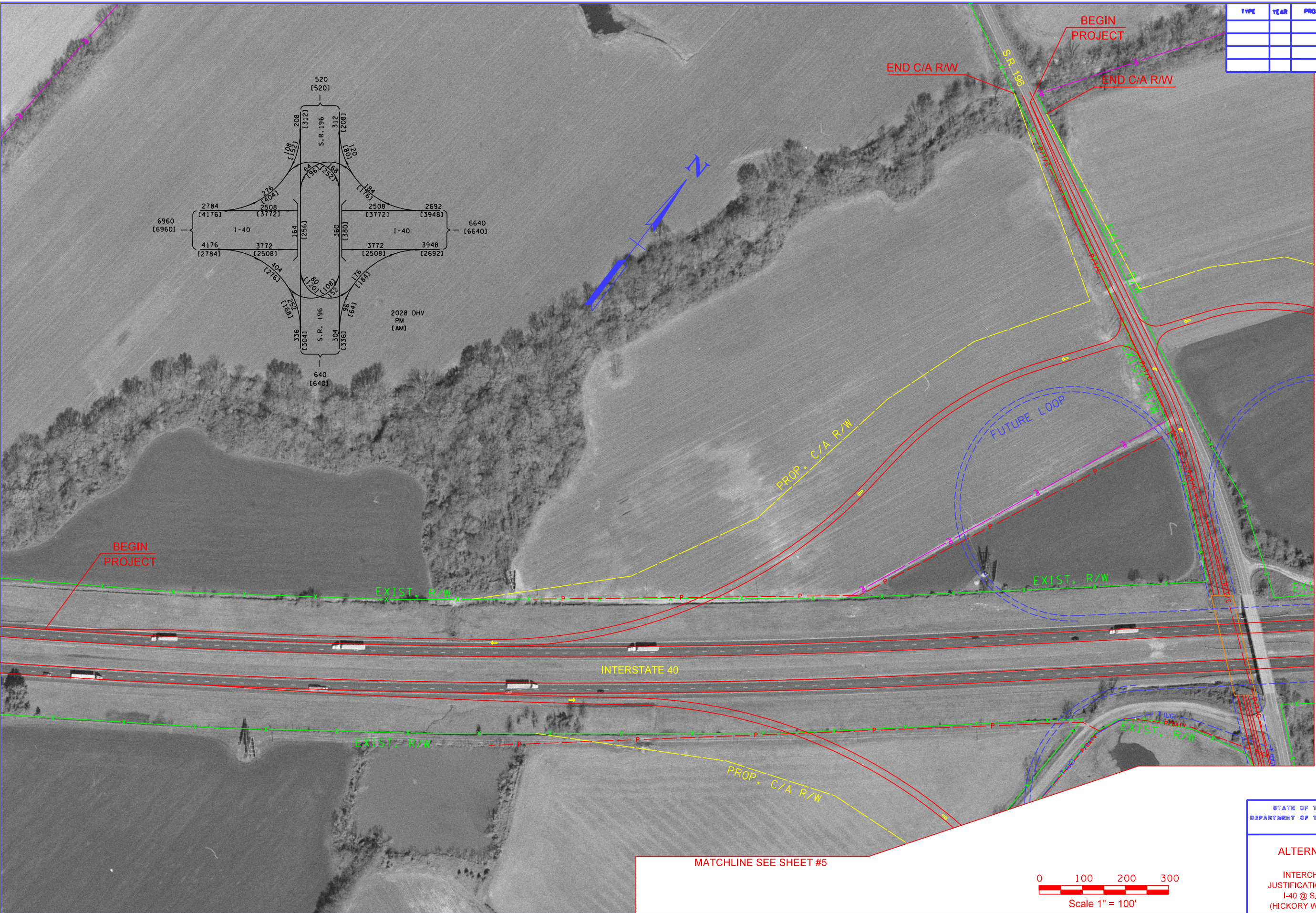
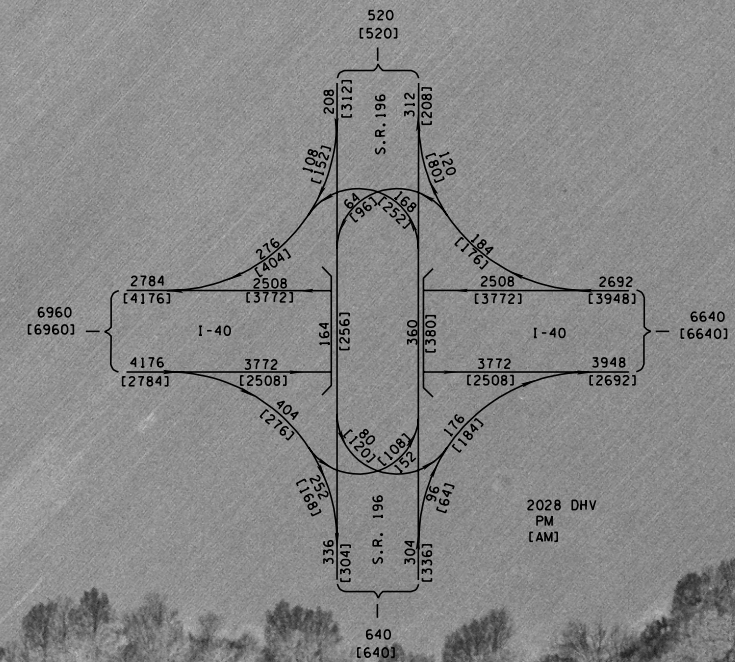
STATE OF TENNESSEE  
DEPARTMENT OF TRANSPORTATION

**TYPICAL**  
INTERCHANGE  
JUSTIFICATION STUDY  
I-40 @ S.R. 196  
(HICKORY WITHE RD.)



TENNESSEE D. O. T.  
 DESIGN DIVISION  
 FILE NO.

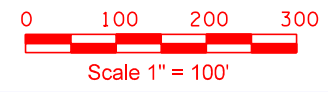
TYPE	YEAR	PROJECT NO.	SHEET NO.
			B-3



MATCHLINE SEE SHEET #4

7/17/2005  
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MATCHLINE SEE SHEET #5



STATE OF TENNESSEE  
 DEPARTMENT OF TRANSPORTATION

**ALTERNATE 1**  
 INTERCHANGE  
 JUSTIFICATION STUDY  
 I-40 @ S.R. 196  
 (HICKORY WITHE RD.)



TYPE	YEAR	PROJECT NO.	SHEET NO.
			B-4

MATCHLINE SEE SHEET #3



MATCHLINE SEE SHEET #5

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STATE OF TENNESSEE  
 DEPARTMENT OF TRANSPORTATION

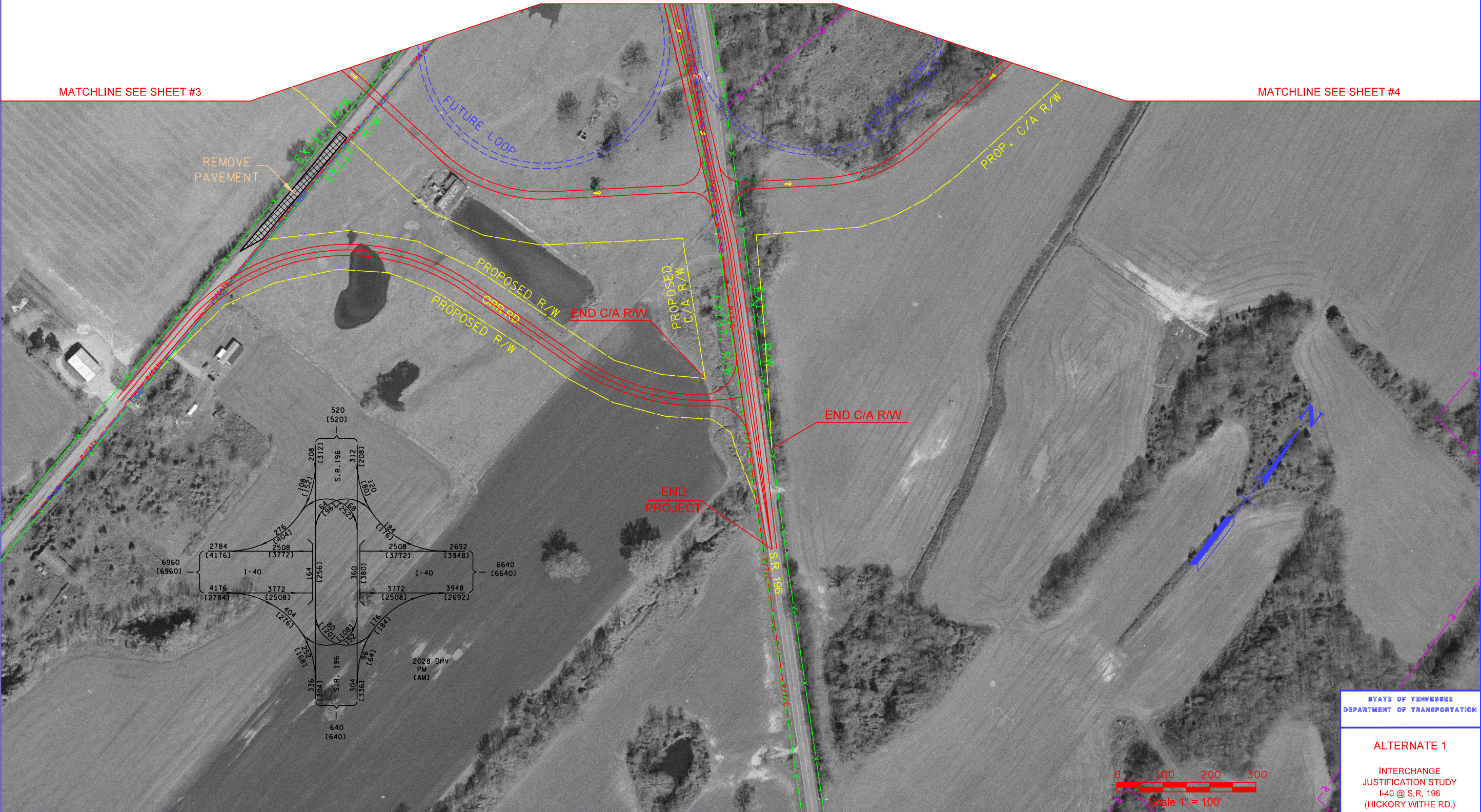
ALTERNATE 1  
 INTERCHANGE  
 JUSTIFICATION STUDY  
 I-40 @ S.R. 196  
 (HICKORY WITHE RD.)



TYPE	YEAR	PROJECT NO.	SHEET NO.
			B-5

MATCHLINE SEE SHEET #3

MATCHLINE SEE SHEET #4



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STATE OF TENNESSEE  
 DEPARTMENT OF TRANSPORTATION

**ALTERNATE 1**  
 INTERCHANGE  
 JUSTIFICATION STUDY  
 I-40 @ S.R. 196  
 (HICKORY WITHE RD.)



# **APPENDIX C**

## **MINUTES OF MEETINGS**

# Field Review and Coordination Meeting

## (Interchange Justification Study, I-40 @ SR-196)

A field review and coordination meeting was held at the Career Center located across the street from the Fayette County Courthouse in Somerville, Tennessee beginning at 11:00 AM Central Time on January 7, 2004.

The following persons were in attendance:

John Steele		FHWA	(615) 781-5777
Dudley E. Daniel	Functional Design	TDOT	(615) 741-7458
Mike Updike	Planning	TDOT	(615) 253-4007
Ron Baker	Planning	TDOT	(615) 741-6743
Joe Warren	Region 4 Traffic	TDOT	(731) 935-0190
Ronnie Moore	Region 4 Traffic	TDOT	(731) 935-0191
Richard D. Marcus	Region 4 Survey	TDOT	(731) 935-0240
Burt Hutchins	Region 4 Design	TDOT	(731) 935-0142
Dennis Lowder	Region 4 Maintenance	TDOT	(731) 934-7291
Dolores Gresham	State Representative District 94		(615) 741-6890
Jim Smith	Fayette County Public Works		(901) 465-5232
Kevin Perk	Fayette County Development Office		(901) 465-5650
J Carter Gray	Memphis MPO		(901) 379-7845
David Lindeman	Principal in Charge	Palmer Engineering	(859) 744-1218
Bob Kennedy	Planning Manager	Palmer Engineering	(859) 744-1218

1. The consensus was that the interchange should be designed to accommodate I-40 with eight lanes.
2. The bridge structure should be designed for five or six lanes. The existing two-lane configuration of SR-196 may become obsolete very quickly due to increased development opportunities, when the interchange is constructed. However, the traffic figures supplied by TDOT were based upon MPO traffic forecasts. Based upon the traffic figures, if the interchange is built as a diamond, dual left turns may be needed, requiring the bridge to accommodate six lanes. The construction of a loop in the northeast quadrant will eliminate the need to accommodate future dual left turns and the bridge can be designed for five lanes. This interchange would become the first exit in Fayette County, east of Memphis. TDOT Planning representatives will ask for clarification on the traffic volumes and what growth assumptions were used before proceeding with revisions to the plans.
3. The bridge structure should be completely replaced with the new structure being built immediately to the west of the existing structure. This will maintain traffic via the old structure during construction.



4. The general consensus was that the interchange should be built with five lanes across the bridge with a loop ramp in the northeast quadrant. A triangular plot of land, for Right of Way, should be purchased in the northwest quadrant to accommodate a future on-ramp. This consensus on a preferred alternate is pending the results of a public meeting showing both alternates.
5. A frontage road may need to be constructed to allow access to the sod farm and the next adjacent property to the east in conjunction with the interchange construction. The FHWA interstate highway policy is that frontage roads need to be constructed with a two lane cross section. However, experience has proven that, in many cases, it may be cheaper to purchase the land rather than build a frontage road. A comparison of costs for these two options should be performed during the preparation of Right of Way Plans.
6. The construction of an interchange is consistent with MPO plans and programs although funding for this project may be distant. The MPO plan is currently undergoing an update. In addition, the area surrounding the interchange is a designated growth area according to local Fayette County plans.
7. While the MPO currently does not have any plans for a Park-n-Ride facility at this location, a privately provided, informal lot might be a good possibility. In addition, SR-64 is a designated State Bicycle Route that provides a connection to SR-196. The new project will be constructed with 10' shoulders, which should adequately accommodate bicycles and pedestrians.
8. The cost estimates need to be revised to reflect constructing the new bridge to the west of the existing structure and the realignment of the adjacent portion of the roadway, the purchase of additional right-of-way for a future ramp and other inherent changes. In addition, right-of-way costs will be reviewed to determine whether or not the average cost per acre is appropriate.
9. An open format style public meeting should be held in Fayette County, in the near future. The notice should be disseminated via the two county newspapers. A presentation will be given at some point in the meeting to explain the project particulars. A follow-up email from TDOT Planning indicated that a public meeting will not be held until funding sources have been identified.

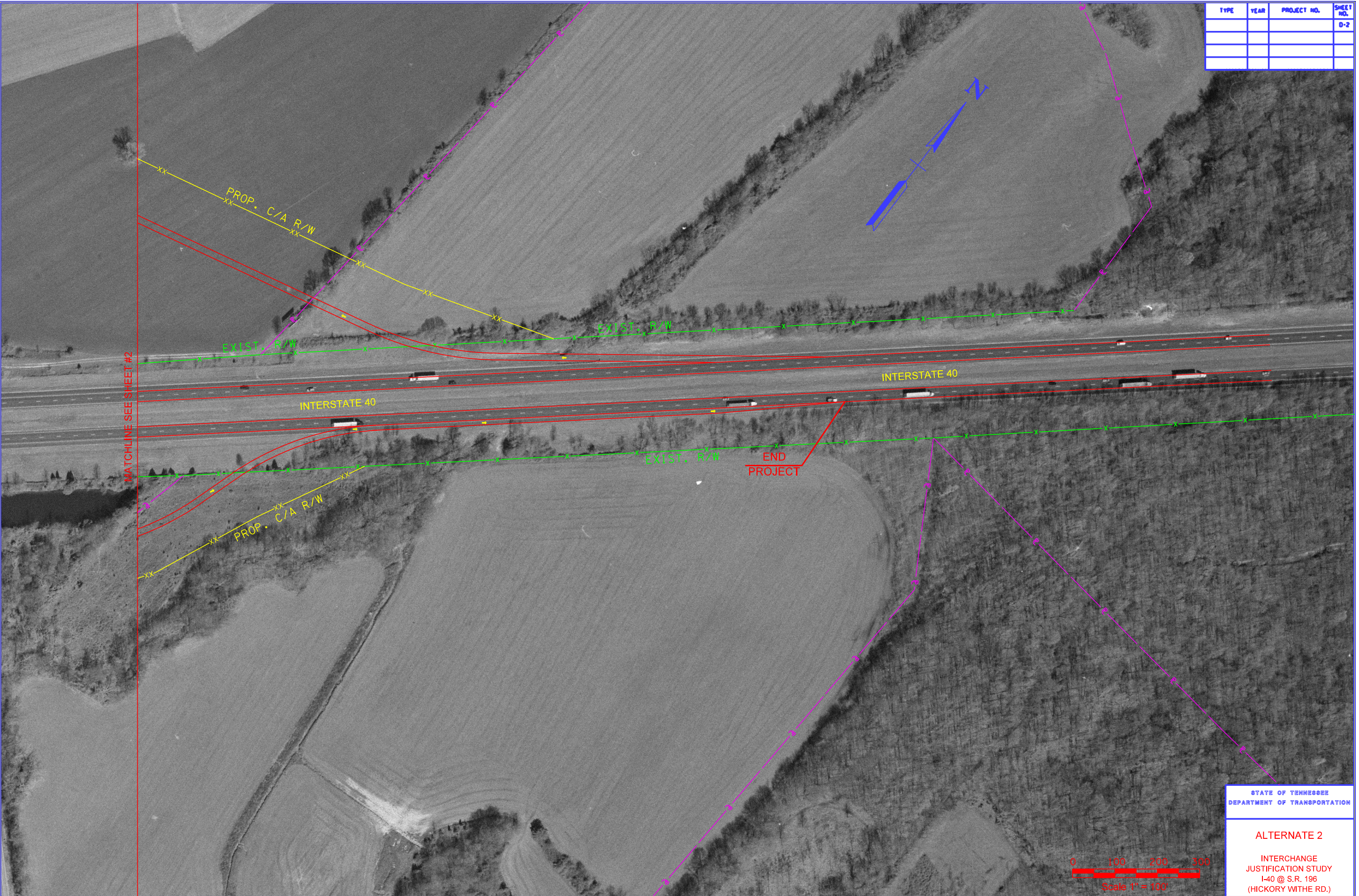
# **APPENDIX D**

## **ALTERNATE INTERCHANGE CONSIDERED**

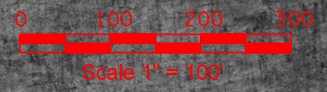


TENNESSEE D. O. T.  
 DESIGN DIVISION  
 FILE NO.

TYPE	YEAR	PROJECT NO.	SHEET NO.
			D-2



7/17/2005  
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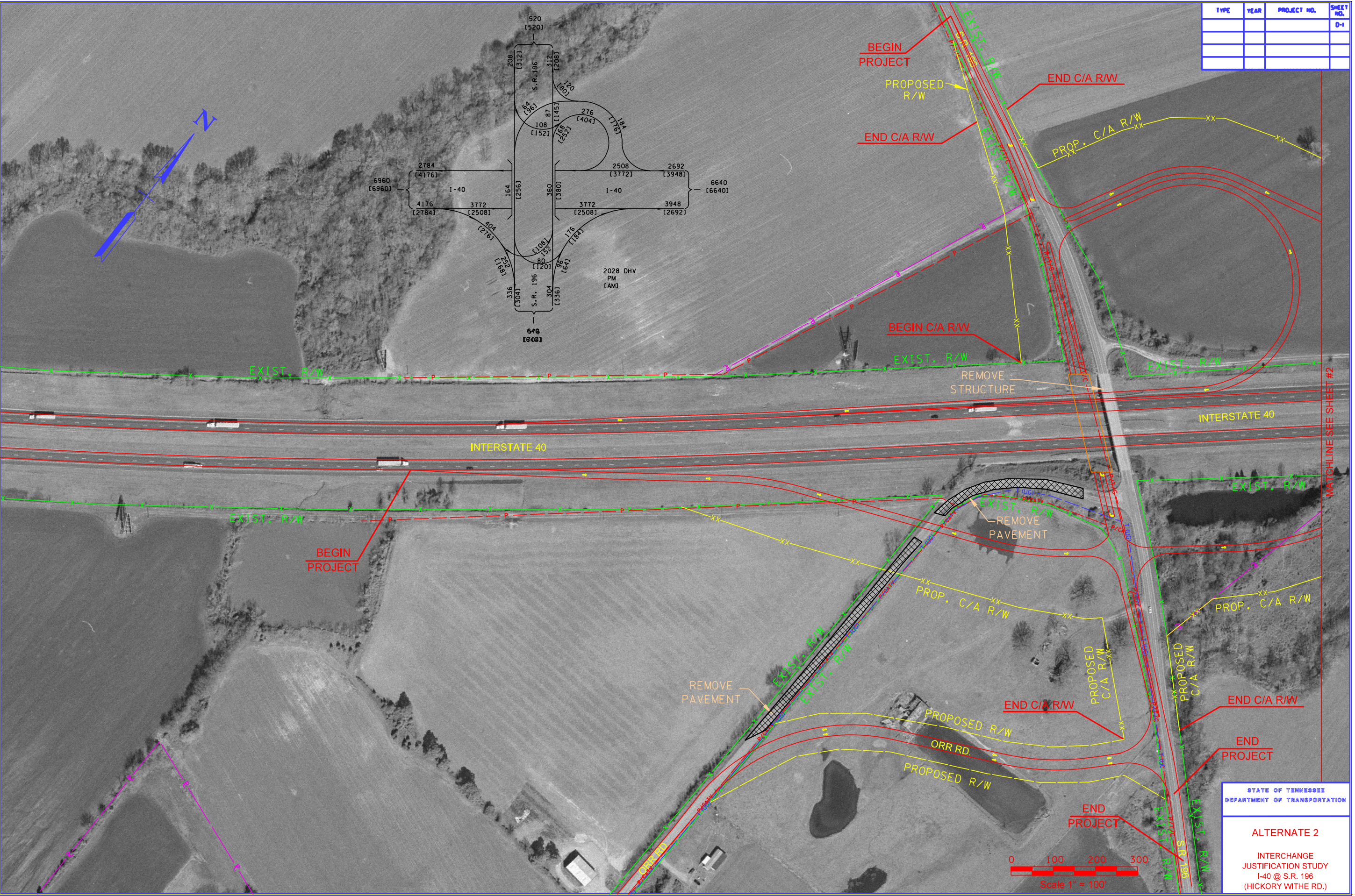


STATE OF TENNESSEE  
 DEPARTMENT OF TRANSPORTATION

**ALTERNATE 2**  
 INTERCHANGE  
 JUSTIFICATION STUDY  
 I-40 @ S.R. 196  
 (HICKORY WITHE RD.)



TYPE	YEAR	PROJECT NO.	SHEET NO.
			D-1



7/17/2005  
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STATE OF TENNESSEE  
 DEPARTMENT OF TRANSPORTATION

**ALTERNATE 2**

INTERCHANGE  
 JUSTIFICATION STUDY  
 I-40 @ S.R. 196  
 (HICKORY WITHE RD.)



# **APPENDIX E**

## **TRAFFIC ANALYSIS DATA**

TWO-WAY STOP CONTROL SUMMARY								
<b>General Information</b>				<b>Site Information</b>				
Analyst	Stephen Sewell			Intersection	Off Ramp Eastbound & Hickory W			
Agency/Co.	Palmer Engineering			Jurisdiction				
Date Performed	12/10/2004			Analysis Year	2008			
Analysis Time Period	AM							
Project Description Eastbound Ramps with SR 196								
East/West Street: I-40 Ramps				North/South Street: SR 196 (Hickory Withe Road)				
Intersection Orientation: North-South				Study Period (hrs): 0.25				
<b>Vehicle Volumes and Adjustments</b>								
<b>Major Street</b>	Northbound			Southbound				
Movement	1	2	3	4	5	6		
	L	T	R	L	T	R		
Volume	0	172	40	72	84	0		
Peak-Hour Factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92		
Hourly Flow Rate, HFR	0	186	43	78	91	0		
Percent Heavy Vehicles	2	--	--	10	--	--		
Median Type	Undivided							
RT Channelized			0			0		
Lanes	0	1	0	1	1	0		
Configuration			TR	L	T			
Upstream Signal		0			0			
<b>Minor Street</b>	Westbound			Eastbound				
Movement	7	8	9	10	11	12		
	L	T	R	L	T	R		
Volume	0	0	0	80	0	104		
Peak-Hour Factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92		
Hourly Flow Rate, HFR	0	0	0	86	0	113		
Percent Heavy Vehicles	2	2	2	10	10	10		
Percent Grade (%)	0			0				
Flared Approach		N			N			
Storage		0			0			
RT Channelized			0			0		
Lanes	0	0	0	0	1	0		
Configuration					LTR			
<b>Delay, Queue Length, and Level of Service</b>								
Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		L					LTR	
v (vph)		78					199	
C (m) (vph)		1293					695	
v/c		0.06					0.29	
95% queue length		0.19					1.18	
Control Delay		8.0					12.2	
LOS		A					B	
Approach Delay	--	--					12.2	
Approach LOS	--	--					B	

TWO-WAY STOP CONTROL SUMMARY								
<b>General Information</b>				<b>Site Information</b>				
Analyst	Stephen Sewell			Intersection	On Ramp Westbound & Hickory WI			
Agency/Co.	Palmer Engineering			Jurisdiction				
Date Performed	12/10/2004			Analysis Year	2008			
Analysis Time Period	AM							
Project Description Westbound Ramps with SR 196								
East/West Street: I-40 Ramps				North/South Street: SR 196 (Hickory Withe Road)				
Intersection Orientation: North-South				Study Period (hrs): 0.25				
<b>Vehicle Volumes and Adjustments</b>								
<b>Major Street</b>	Northbound			Southbound				
Movement	1	2	3	4	5	6		
	L	T	R	L	T	R		
Volume	156	96	0	0	96	120		
Peak-Hour Factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92		
Hourly Flow Rate, HFR	169	104	0	0	104	130		
Percent Heavy Vehicles	10	--	--	2	--	--		
Median Type	Undivided							
RT Channelized			0				0	
Lanes	1	1	0	0	1	0		
Configuration	L	T					TR	
Upstream Signal		0			0			
<b>Minor Street</b>	Westbound			Eastbound				
Movement	7	8	9	10	11	12		
	L	T	R	L	T	R		
Volume	60	0	48	0	0	0		
Peak-Hour Factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92		
Hourly Flow Rate, HFR	65	0	52	0	0	0		
Percent Heavy Vehicles	10	10	10	2	2	2		
Percent Grade (%)	0			0				
Flared Approach		N			N			
Storage		0			0			
RT Channelized			0			0		
Lanes	0	1	0	0	0	0		
Configuration		LTR						
<b>Delay, Queue Length, and Level of Service</b>								
Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	L		LTR					
v (vph)	169		117					
C (m) (vph)	1288		521					
v/c	0.13		0.22					
95% queue length	0.45		0.85					
Control Delay	8.2		13.9					
LOS	A		B					
Approach Delay	--	--	13.9					
Approach LOS	--	--	B					

TWO-WAY STOP CONTROL SUMMARY								
General Information				Site Information				
Analyst	Stephen Sewell			Intersection	Off Ramp Eastbound & Hickory W			
Agency/Co.	Palmer Engineering			Jurisdiction				
Date Performed	12/10/2004			Analysis Year	2008			
Analysis Time Period	PM							
Project Description Eastbound Ramps with SR 196								
East/West Street: I-40 Ramps				North/South Street: SR 196 (Hickory Withe Road)				
Intersection Orientation: North-South				Study Period (hrs): 0.25				
Vehicle Volumes and Adjustments								
Major Street	Northbound			Southbound				
Movement	1	2	3	4	5	6		
	L	T	R	L	T	R		
Volume	0	128	60	48	56	0		
Peak-Hour Factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92		
Hourly Flow Rate, HFR	0	139	65	52	60	0		
Percent Heavy Vehicles	2	--	--	10	--	--		
Median Type	Undivided							
RT Channelized			0			0		
Lanes	0	1	0	1	1	0		
Configuration			TR	L	T			
Upstream Signal		0			0			
Minor Street	Westbound			Eastbound				
Movement	7	8	9	10	11	12		
	L	T	R	L	T	R		
Volume	0	0	0	120	0	156		
Peak-Hour Factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92		
Hourly Flow Rate, HFR	0	0	0	130	0	169		
Percent Heavy Vehicles	2	2	2	10	10	10		
Percent Grade (%)	0			0				
Flared Approach		N			N			
Storage		0			0			
RT Channelized			0			0		
Lanes	0	0	0	0	1	0		
Configuration					LTR			
Delay, Queue Length, and Level of Service								
Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		L					LTR	
v (vph)		52					299	
C (m) (vph)		1321					782	
v/c		0.04					0.38	
95% queue length		0.12					1.80	
Control Delay		7.8					12.4	
LOS		A					B	
Approach Delay	--	--					12.4	
Approach LOS	--	--					B	



TWO-WAY STOP CONTROL SUMMARY								
<b>General Information</b>				<b>Site Information</b>				
Analyst	Stephen Sewell			Intersection	On Ramp Westbound & Hickory WI			
Agency/Co.	Palmer Engineering			Jurisdiction				
Date Performed	12/10/2004			Analysis Year	2008			
Analysis Time Period	PM							
Project Description Westbound Ramps with SR 196								
East/West Street: I-40 Ramps				North/South Street: SR 196 (Hickory Withe Road)				
Intersection Orientation: North-South				Study Period (hrs): 0.25				
<b>Vehicle Volumes and Adjustments</b>								
<b>Major Street</b>	Northbound			Southbound				
Movement	1	2	3	4	5	6		
	L	T	R	L	T	R		
Volume	104	144	0	0	64	80		
Peak-Hour Factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92		
Hourly Flow Rate, HFR	113	156	0	0	69	86		
Percent Heavy Vehicles	10	--	--	2	--	--		
Median Type	Undivided							
RT Channelized			0				0	
Lanes	1	1	0	0	1	0		
Configuration	L	T					TR	
Upstream Signal		0			0			
<b>Minor Street</b>	Westbound			Eastbound				
Movement	7	8	9	10	11	12		
	L	T	R	L	T	R		
Volume	40	0	72	0	0	0		
Peak-Hour Factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92		
Hourly Flow Rate, HFR	43	0	78	0	0	0		
Percent Heavy Vehicles	10	10	10	2	2	2		
Percent Grade (%)	0			0				
Flared Approach		N			N			
Storage		0			0			
RT Channelized			0				0	
Lanes	0	1	0	0	0	0		
Configuration		LTR						
<b>Delay, Queue Length, and Level of Service</b>								
Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	L		LTR					
v (vph)	113		121					
C (m) (vph)	1378		673					
v/c	0.08		0.18					
95% queue length	0.27		0.65					
Control Delay	7.8		11.5					
LOS	A		B					
Approach Delay	--	--	11.5					
Approach LOS	--	--	B					

TWO-WAY STOP CONTROL SUMMARY								
General Information				Site Information				
Analyst	Stephen Sewell			Intersection	Off Ramp Eastbound & Hickory W			
Agency/Co.	Palmer Engineering			Jurisdiction				
Date Performed	12/10/2004			Analysis Year	2028			
Analysis Time Period	AM							
Project Description Eastbound Ramps with SR 196								
East/West Street: I-40 Ramps				North/South Street: SR 196 (Hickory Withe Road)				
Intersection Orientation: North-South				Study Period (hrs): 0.25				
Vehicle Volumes and Adjustments								
Major Street	Northbound			Southbound				
Movement	1	2	3	4	5	6		
	L	T	R	L	T	R		
Volume	0	272	64	120	136	0		
Peak-Hour Factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92		
Hourly Flow Rate, HFR	0	295	69	130	147	0		
Percent Heavy Vehicles	2	--	--	10	--	--		
Median Type	Undivided							
RT Channelized			0				0	
Lanes	0	1	0	1	1	0		
Configuration			TR	L	T			
Upstream Signal		0			0			
Minor Street	Westbound			Eastbound				
Movement	7	8	9	10	11	12		
	L	T	R	L	T	R		
Volume	0	0	0	108	0	168		
Peak-Hour Factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92		
Hourly Flow Rate, HFR	0	0	0	117	0	182		
Percent Heavy Vehicles	2	2	2	10	10	10		
Percent Grade (%)	0			0				
Flared Approach		N			N			
Storage		0			0			
RT Channelized			0			0		
Lanes	0	0	0	0	1	0		
Configuration					LTR			
Delay, Queue Length, and Level of Service								
Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		L					LTR	
v (vph)		130					299	
C (m) (vph)		1152					534	
v/c		0.11					0.56	
95% queue length		0.38					3.42	
Control Delay		8.5					20.0	
LOS		A					C	
Approach Delay	--	--					20.0	
Approach LOS	--	--					C	

## TWO-WAY STOP CONTROL SUMMARY

General Information			Site Information				
Analyst	Stephen Sewell		Intersection	On Ramp Westbound & Hickory WI			
Agency/Co.	Palmer Engineering		Jurisdiction				
Date Performed	12/10/2004		Analysis Year	2028			
Analysis Time Period	AM						
Project Description <i>Westbound Ramps with SR 196</i>							
East/West Street: <i>I-40 Ramps</i>			North/South Street: <i>SR 196 (Hickory Withe Road)</i>				
Intersection Orientation: <i>North-South</i>			Study Period (hrs): <i>0.25</i>				
Vehicle Volumes and Adjustments							
Major Street	Northbound			Southbound			
Movement	1	2	3	4	5	6	
	L	T	R	L	T	R	
Volume	252	128	0	0	160	152	
Peak-Hour Factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	
Hourly Flow Rate, HFR	273	139	0	0	173	165	
Percent Heavy Vehicles	8	--	--	2	--	--	
Median Type	<i>Undivided</i>						
RT Channelized			0			0	
Lanes	1	1	0	0	1	0	
Configuration	L	T				TR	
Upstream Signal		0			0		
Minor Street	Westbound			Eastbound			
Movement	7	8	9	10	11	12	
	L	T	R	L	T	R	
Volume	96	0	80	0	0	0	
Peak-Hour Factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	
Hourly Flow Rate, HFR	104	0	86	0	0	0	
Percent Heavy Vehicles	8	8	8	2	2	2	
Percent Grade (%)	0			0			
Flared Approach		N			N		
Storage		0			0		
RT Channelized			0			0	
Lanes	0	1	0	0	0	0	
Configuration		LTR					
Delay, Queue Length, and Level of Service							
Approach	NB	SB	Westbound			Eastbound	
Movement	1	4	7	8	9	10	11
Lane Configuration	L			LTR			
v (vph)	273			190			
C (m) (vph)	1188			334			
v/c	0.23			0.57			
95% queue length	0.89			3.34			
Control Delay	8.9			29.1			
LOS	A			D			
Approach Delay	--	--		29.1			
Approach LOS	--	--		D			

TWO-WAY STOP CONTROL SUMMARY								
General Information				Site Information				
Analyst	Stephen Sewell			Intersection	Off Ramp Eastbound & Hickory W			
Agency/Co.	Palmer Engineering			Jurisdiction				
Date Performed	12/10/2004			Analysis Year	2028			
Analysis Time Period	PM							
Project Description Eastbound Ramps with SR 196								
East/West Street: I-40 Ramps				North/South Street: SR 196 (Hickory Withe Road)				
Intersection Orientation: North-South				Study Period (hrs): 0.25				
Vehicle Volumes and Adjustments								
Major Street	Northbound			Southbound				
Movement	1	2	3	4	5	6		
	L	T	R	L	T	R		
Volume	0	208	96	80	84	0		
Peak-Hour Factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92		
Hourly Flow Rate, HFR	0	226	104	86	91	0		
Percent Heavy Vehicles	2	--	--	10	--	--		
Median Type	Undivided							
RT Channelized			0				0	
Lanes	0	1	0	1	1	0		
Configuration			TR	L	T			
Upstream Signal		0			0			
Minor Street	Westbound			Eastbound				
Movement	7	8	9	10	11	12		
	L	T	R	L	T	R		
Volume	0	0	0	152	0	252		
Peak-Hour Factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92		
Hourly Flow Rate, HFR	0	0	0	165	0	273		
Percent Heavy Vehicles	2	2	2	10	10	10		
Percent Grade (%)	0			0				
Flared Approach		N			N			
Storage		0			0			
RT Channelized			0			0		
Lanes	0	0	0	0	1	0		
Configuration					LTR			
Delay, Queue Length, and Level of Service								
Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		L					LTR	
v (vph)		86					438	
C (m) (vph)		1186					671	
v/c		0.07					0.65	
95% queue length		0.23					4.84	
Control Delay		8.3					19.9	
LOS		A					C	
Approach Delay	--	--					19.9	
Approach LOS	--	--					C	

TWO-WAY STOP CONTROL SUMMARY								
<b>General Information</b>				<b>Site Information</b>				
Analyst	Stephen Sewell			Intersection	On Ramp Westbound & Hickory WI			
Agency/Co.	Palmer Engineering			Jurisdiction				
Date Performed	12/10/2004			Analysis Year	2028			
Analysis Time Period	PM							
Project Description Westbound Ramps with SR 196								
East/West Street: I-40 Ramps				North/South Street: SR 196 (Hickory Withe Road)				
Intersection Orientation: North-South				Study Period (hrs): 0.25				
<b>Vehicle Volumes and Adjustments</b>								
<b>Major Street</b>	Northbound			Southbound				
Movement	1	2	3	4	5	6		
	L	T	R	L	T	R		
Volume	168	192	0	0	100	108		
Peak-Hour Factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92		
Hourly Flow Rate, HFR	182	208	0	0	108	117		
Percent Heavy Vehicles	10	--	--	2	--	--		
Median Type	Undivided							
RT Channelized			0				0	
Lanes	1	1	0	0	1	0		
Configuration	L	T					TR	
Upstream Signal		0			0			
<b>Minor Street</b>	Westbound			Eastbound				
Movement	7	8	9	10	11	12		
	L	T	R	L	T	R		
Volume	64	0	120	0	0	0		
Peak-Hour Factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92		
Hourly Flow Rate, HFR	69	0	130	0	0	0		
Percent Heavy Vehicles	10	10	10	2	2	2		
Percent Grade (%)	0			0				
Flared Approach		N			N			
Storage		0			0			
RT Channelized			0				0	
Lanes	0	1	0	0	0	0		
Configuration		LTR						
<b>Delay, Queue Length, and Level of Service</b>								
Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	L			LTR				
v (vph)	182			199				
C (m) (vph)	1298			532				
v/c	0.14			0.37				
95% queue length	0.49			1.72				
Control Delay	8.2			15.8				
LOS	A			C				
Approach Delay	--	--	15.8					
Approach LOS	--	--	C					