COUNTY DEPARTMENT AGENDA REQUEST

Department:	Public Works / SPLOST	Presenter(s):	Phil Mallon & David Jaeger
Meeting Date:	Wednesday, January 5, 2011	Type of Request:	New Business

Wording for the Agenda:

Discussion of the East Fayetteville Bypass Project (SPLOST Project No. R-8) and its project scope, status and options.

Background/History/Details:

A Corridor Configuration Study was completed in August 2010 for the East Fayetteville Bypass Project. The purpose of the study was to evaluate the traffic impacts associated with three possible road configurations. The study was performed as a result of modeling work from the 2010 Comprehensive Transportation Plan which indicated that the on-going economic and housing slowdown, and corresponding revised population projections warrant re-evaluation of a four lane (two thru lanes in each direction) versus two-lane (one thru lane in each direction) roadway. A third option that maximizes use of existing roads was also included in the study. A re-evaluation of project scope was further justified due to funding concerns at both the local and state/federal level.

The attached "presentation agenda" lists the topics to be discussed during the meeting. A copy of the August 2010 Corridor Configuration Study is provided as back-up material to this agenda request.

What action are you seeking from the Board of Commissioners?

No action. The presentation is for informational purposes only.

If this item requires funding, please describe:

NA

Has this issue come before the Commissioners in the past?	No	If so, when?	
Do you need audio-visual for the presentation?	Yes	Back-up Material Submitted?	Yes

STAFF USE ONLY

Approved by Finance	Not Applicable	Reviewed by Legal	Yes
Approved by Purchasing	Not Applicable	Approved by County Clerk	Yes
Administrator's Approval	Yes		

Staff Notes:

East Fayetteville Bypass (SPLOST R-8)
Board of Commissioners 1-5-2011 Workshop

Presentation Agenda

I. Introduction

- Purpose of Presentation - Commitment to GDOT/ARC
- Need and Purpose Statement
- Map - Project Overview on County Road Map, Phase I & II
- History of Project - Work to Date, Issues
- Latest Traffic Study

II. No Build Condition

- Level of Service Definition
- LOS - 2015 & 2035, with and w/o Hwy 54 widening

III. Design Option No. 1

- Original Alignment - 2 thru lanes each direction
- Area of New Alignment (map)
- Signalized Intersections at S. Jeff Davis, McDonough, SR 54, and SR 85 (existing)
- Right of Way - 120', # parcels, acreage, cost
- Bridge at Morning Creek - 4 lanes, cost
- Environmental Issues
- Overall Cost
- Overall LOS - Considered 'Optimum'
- Access Management
- Schedule

IV. Design Option No. 2

- Original Alignment - 1 thru lanes each direction
- Area of New Alignment (map)
- Widening and Signalized Intersections at S. Jeff Davis, McDonough, SR 54, SR 85 (existing)
- Right of Way - 100', wider at intersections, # parcels, acreage, cost
- Bridge at Morning Creek - 2 lanes, cost
- Environmental Issues
- Overall Cost
- Overall LOS - Near 'Optimum'
- Access Management
- Schedule

V. Design Option No. 3

- Follows Existing Alignments - 1 thru lane each direction
- Alignment (map)
- Widening and Signalized Intersections at S. Jeff Davis, McDonough, SR 54, SR 85 (existing)
- Widening of SR 54
- Right of Way - 100', wider at intersections, # parcels, acreage, cost
- Bridge at Morning Creek - Not Required
- Environmental Issues
- Overall Cost
- Overall LOS - Near 'Optimum', Individual Intersections Lower

- Access Management
- Schedule

VI. Summary

- Major Factors For/Against each Design Option
- Funding Options

CORRIDOR CONFIGURATION STUDY

for

East Fayetteville Bypass

Fayette County, Georgia

Prepared for:

Mallett Consulting, Inc.

August 2010

3160 Main Street • Suite 100
Duluth, Georgia 30096
T: 770.813.0882
F: 770.813.0688
www.streetsmarts.us

TABLE OF CONTENTS

EXECUTIVE SUMMARY ..... A
1. INTRODUCTION 1
2. EXISTING TRAFFIC CONDITIONS 3
    Existing Roadway Conditions 3
    Existing Volumes 5
3. FUTURE TRAFFIC CONDITIONS 6
    Programmed Roadway Improvements 6
    Future Volumes 6
    Capacity Analysis: No Build Conditions 6
    Capacity Analysis: Build Conditions 6
    Roadway Capacity Analysis: 6
    Traffic Signal Warrant Analyses for New Signals 13
    Turn Lane Requirements 13
GLOSSARY OF TERMS
EXPLANATION OF LEVEL OF SERVICE
EXPLANATION OF SIGNAL WARRANT METHODOLOGY
APPENDIX

LIST OF TABLES

Overall Bypass Peak Hour LOS C
Table 1. No Build Conditions Intersection Levels of Service 7
Table 2. 2015 Build Intersection Levels of Service 8
Table 3. 2035 Build Intersection Levels of Service 9
Table 4. 2015 Build with SR 54 4-Lanes Intersection LOS 10
Table 5. 2035 Build with SR 54 4-Lanes Intersection LOS 10
Table 6. Existing Route Roundabouts with Bypasses LOS 10
Table 7. New Location Roundabouts with Bypasses LOS 11
Table 8. Overall Bypass Peak Hour LOS 11
Table 9. Left Turn Lane Storage Lengths 14
Highway Capacity Manual Road Segment Level of Service Criteria 17

LIST OF FIGURES

Figure 1. Site Location Map 2
Figure 2. Existing Lane Configurations and Traffic Controls 4
Figure 3. Build Lane Configurations and Traffic Controls 12

The purpose of this Study is to provide a comparison of the future adequacy of operations for three (3) different configurations of the East Fayetteville Bypass in the opening (2015) and design (2035) years. The East Fayetteville Bypass will be considered a Suburban Minor Arterial (Class II based on function and design categories for analyses) located the northeast corner of Fayette County near the Fayette/Clayton County line. The bypass will run from SR 85 (at the existing Corinth Road intersection) to Inman Road/South Jeff Davis Drive/North Bridge Road along County Line Road and Corinth Road for the southern and northern portions of the route, respectively. The speed limit on the Bypass is assumed to be 45 miles per hour and turning lanes are expected to be provided at all intersection streets and major commercial driveways.

The projected weekday peak hour traffic volumes were developed using the existing counted traffic volumes and the Atlanta Regional Commission (ARC) Annual Average Daily Traffic (AADT) volumes for approaches to the study intersections for the years 2010, 2020, and 2030 from their traffic model. The capacity analyses of the intersections identified the configurations and traffic control necessary for adequate design year operation (2035), the average delays expected. For this type of roadway, the operating conditions are determined by the effect of the intersection delays on the travel time through the corridor. The total through movement delays at each intersection in each direction for each peak hour were included with the running time between the intersections to determine the average speeds through the corridor from Inman Road to/from SR 85. Levels of Service were determined from the average speeds. All of the analyses include dual southbound left-turn lanes from SR 85 to the Bypass to provide adequate operating conditions at this intersection.

The number of through lanes on the Bypass between the controlled intersections is not a critical factor in determining the operating conditions of a roadway. This assumes adequate length left-turn storage lanes and right-turn deceleration lanes are provided to safely remove turning vehicles from the traffic flow, especially at intersections and driveways with stop-sign controlled side streets. The hourly vehicular capacity of a single through lane is 1,900 vehicles per hour. The 2035 peak-hour volumes for any section of the East Fayetteville Bypass do not exceed 1,400 vehicles per hour in any direction; except for the segments on SR 54 and on the existing McElroy Road segments for the existing route design option. On SR 54, the maximum hourly volume westbound is expected to exceed 2,600 and eastbound to exceed 2,250. If SR 54 is not widened to provide two (2) through lanes in each direction (and adequate turning lanes) on this segment, the average speeds through the corridor would be reduced further. On McElroy Road, for the existing route design option, the highest peak hourly volume is expected to exceed 1,560 southbound from SR 54 in the PM by 2035. The other expected 2035 hourly peak hour volumes on McElroy Road (as the East Fayetteville Bypass) range from 920 to 1,302 in a single direction. If adequate length left-turn storage lanes and right-turn deceleration lanes are provided to remove turning vehicles

from the traffic flow on the McElroy Road segment of the Bypass, a single through lane in each direction would be sufficient.

For one of the design options, the bypass will have two through lanes in each direction and will follow a new location route from approximately County Line Circle north to State Route 54 (SR 54) at the intersection with Corinth Road. This design is expected to provide adequate overall operations in both directions with roundabouts (single lane with bypass lanes at Inman Road, 2-lane with bypasses at McDonough Road and at SR 54) or traffic signals (2015 traffic should meet minimum warrant volume requirements for all design options) at the South Jeff Davis Drive, McDonough Road, and SR 54 intersections for 2035 volumes. The overall corridor 2035 Levels of Service (LOS) would be expected to be A or B (with the exception of the use of NCHRP-572 rather than the GDOT UK roundabout methodology to determine delays for the 2035 PM analyses.)

A second design option will follow the same route, but consist of only one through lane in each direction. This design would provide adequate overall operations in both directions for 2035 peak period volumes; however, a second northbound and southbound through lane will be required at the McDonough Road and SR 54 intersections to provide adequate signalized intersection operations and the same roundabout configurations identified for the 4-lane option would be required. If SR 54 is widened to two through lanes in each direction at the Bypass intersection, the 2035 LOS would improved from C and D (for 2035 PM northbound signalized only) to A and B.

The third design option will follow County Line Road to McDonough Road and continue along McElroy Road to SR 54, follow SR 54 east to turn left and follow Corinth Road. The third design option will consist of one through lane in each direction. This design could provide adequate overall LOS with either roundabouts or signals installed at South Jeff Davis Drive and at the existing Corinth Road intersection at SR 54. In addition, dual left turn lanes from SR 54 to the Bypass at both intersections and additional receiving lanes for these and for dedicated free-right turn movements from the northbound and southbound Bypass to SR 54 would be required with signalized intersections. Additional approach and receiving lanes would be required for the 2-lane roundabout with bypass lanes at the Corinth intersection. Although adequate overall operations would be expected, by 2035 the McDonough Road, McElroy Road and Corinth Road at SR 54 intersections, even with the identified configurations would be expected to operate individually inadequately during peak periods.

For these analyses of the roundabout capacities, the Georgia Department of Transportation (GDOT) Roundabout Analysis Tool was used. The tool uses two different methodologies (NCHRP-572 and UK) are used to determine delays. The NCHRP-572 methodology provides more conservative results based on treating the approaches as uncontrolled side streets. The UK methodology is based on observed data from roundabouts that have been in operation for some time. Generally, the UK methodology is considered to predict more accurately the operating conditions in the future when local drivers are more familiar with roundabout operations.

The results of the analyses are shown in the following table:

Overall Bypass Peak Hour LOS

Design/ Conditions	Direc-tion of Travel	with Roundabouts								with Traffic Signals			
		UK Methodology				NCHRP-572				Optimized+New			
		2015		2035		2015		2035		2015		2035	
		AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
No Build	NB	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	C	B	D	B
	SB	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	E	F	F	F
No Build SR 54 4-lanes	NB	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	B	A	C	B
	SB	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	C	E	E	E
Build Existing Route	NB	A	B	A	C	A	B	B	D	A	B	B	C
	SB	A	A	A	B	A	A	B	C	A	A	A	B
Existing Route SR 54 4-lanes	NB	A	A	A	A	A	B	B	D	A	A	A	B
	SB	A	A	A	A	A	A	B	C	A	A	A	B
Build 2-Lane New Route	NB	A	A	A	A	A	C	B	F	B	C	C	D
	SB	A	A	A	A	A	B	C	E	B	B	C	C
Build 2-Lane SR 54 4-lanes	NB	A	A	A	A	A	C	B	F	A	B	A	B
	SB	A	A	A	A	A	B	C	E	A	A	B	B
Build 4-Lane New Route	NB	A	A	A	A	A	C	B	F	A	A	B	B
	SB	A	A	A	A	A	B	C	E	A	B	B	B
Build 4-Lane SR 54 4-lanes	NB	A	A	A	A	A	C	B	F	A	A	A	A
	SB	A	A	A	A	A	B	C	E	A	A	A	A

When roundabouts are used rather than traffic signals at intersections where peak hour volumes require more control than stop signs, the average through movement delays may be higher. However, this is balanced by the side-street traffic being afforded safer, and usually less delayed, access to the roadway than traffic signals provide. In addition, the lower traffic volumes in off-peak hours are not delayed by the traffic signal operations. Roundabouts have been shown to reduce the intensity and number of crashes compared to the use of traffic signals.

The lengths of the full-width turning bay lanes are provided based on the longer of the distances based on the expected 95th percentile vehicular queuing at the intersections or the minimum lengths provided in the GDOT *Driveway Manual*.

1. INTRODUCTION

The East Fayetteville Bypass will be located the northeast corner of Fayette County near the Fayette/Clayton County line. The bypass will run from SR 85 (at the existing Corinth Road intersection) to Inman Road/South Jeff Davis Drive/North Bridge Road along County Line Road and Corinth Road for the southern and northern portions of the route, respectively.

This Study provides a comparison of the future adequacy of operations for three (3) different configurations of the East Fayetteville Bypass in the opening (2015) and design (2035) years.

For one of the design options, the bypass will have two through lanes in each direction and will follow a new location route from approximately County Line Circle north to State Route 54 (SR 54) at the intersection with Corinth Road.

A second design option will follow the same route, but consist of only one through lane in each direction. The third design option will follow County Line Road to McDonough Road and continue along McElroy Road to SR 54, follow SR 54 east to turn left and follow Corinth Road.

The third design option will consist of one through lane in each direction. All three of the design options may include the widening of SR 54 to two through lanes in each direction.

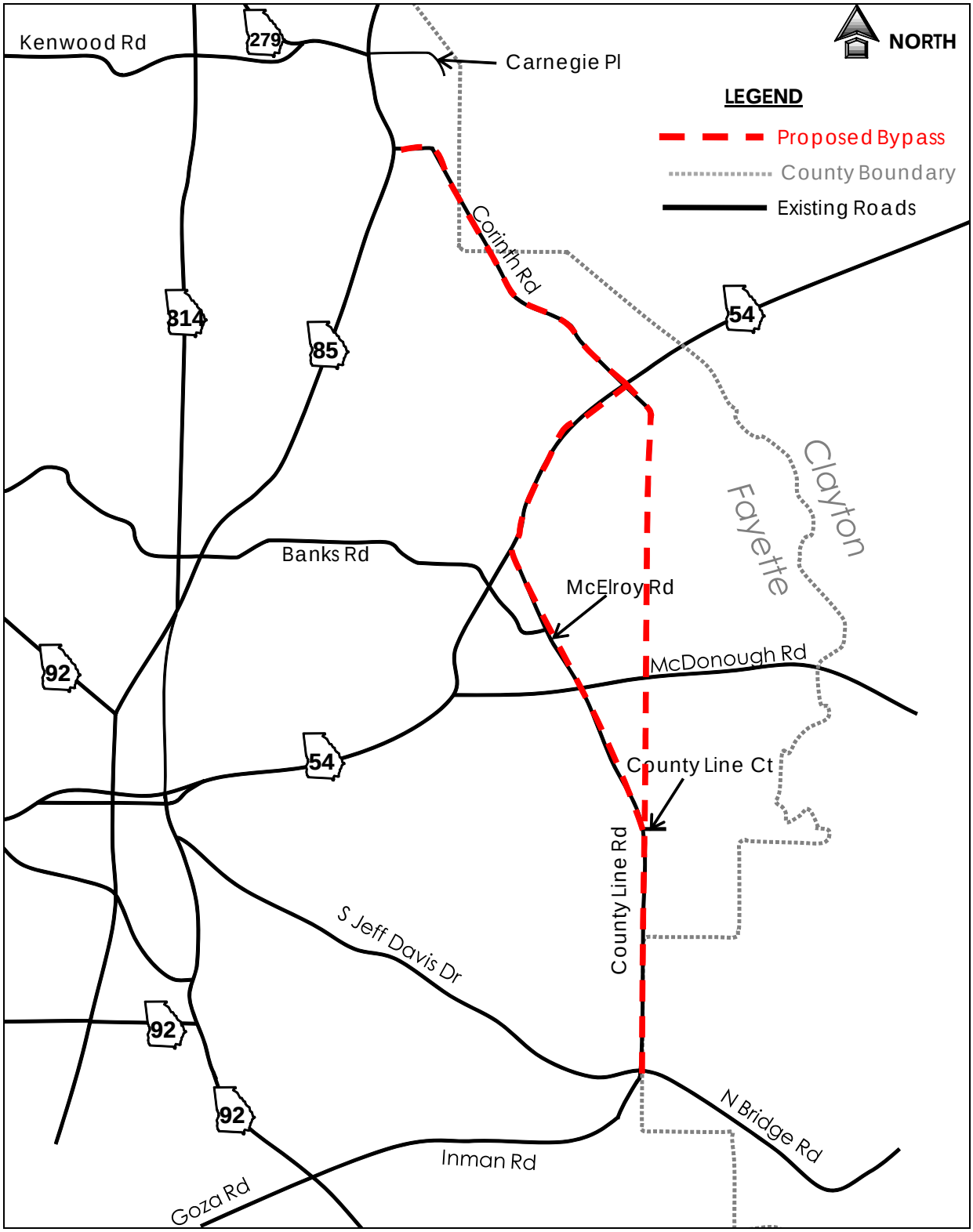
The speed limit on the Bypass is assumed to be 45 miles per hour and turning lanes are expected to be provided at all intersection streets and major commercial driveways. The lengths of the full-width turning bay lanes will be identified based on the longer of the distances based on the expected 95th percentile vehicular queuing at the intersections or the minimum lengths provided in the Georgia Department of Transportation (GDOT) *Driveway Manual*.

The analyses will include existing intersection controls and identify minimum traffic controls and lane configurations required to provide adequate operations in the 2035 design year.

The projected weekday peak hour traffic volumes have been developed using the existing counted traffic volumes and the Atlanta Regional Commission (ARC) Annual Average Daily Traffic (AADT) volumes for approaches to the study intersections for the years 2010, 2020, and 2030 from their traffic model.

Figure 1 shows the location of the East Fayetteville Bypass.

Figure 1. Site Location Map



Existing Roadway Conditions

A field review of several roadways was conducted to identify the key factors that influence traffic flow and the capacity of the system. The following roadways comprise the primary road network near the proposed bypass:

SR 279 is an urban minor arterial roadway. It runs west from SR 85 and then turns north to the Fayette/Fulton County line and beyond to just inside of I-285. In the project study area,

SR 85 is a four-lane, north-south oriented, median divided Urban Principal Arterial roadway. Turn lanes are provided at intersections.

Corinth Road is a two-lane urban collector roadway. It runs south from SR 85 to SR 54.

SR 54 is classified as an urban principal arterial. It runs east-west between I-85 and US Hwy 41 and through downtown Fayetteville. On the west side of Fayetteville SR 54 is four-lane divided, in downtown Fayetteville SR 54 becomes two, one-way roadways, and on the east side of Fayetteville SR 54 becomes a four-lane divided roadway until just north of McDonough Road where it continues as a two-lane roadway.

McElroy Road is a two-lane rural local road from SR 54 to McDonough Road.

McDonough Road is a two-lane urban minor arterial that runs east from SR 54 to the Fayette/Clayton County line and beyond to the city of McDonough.

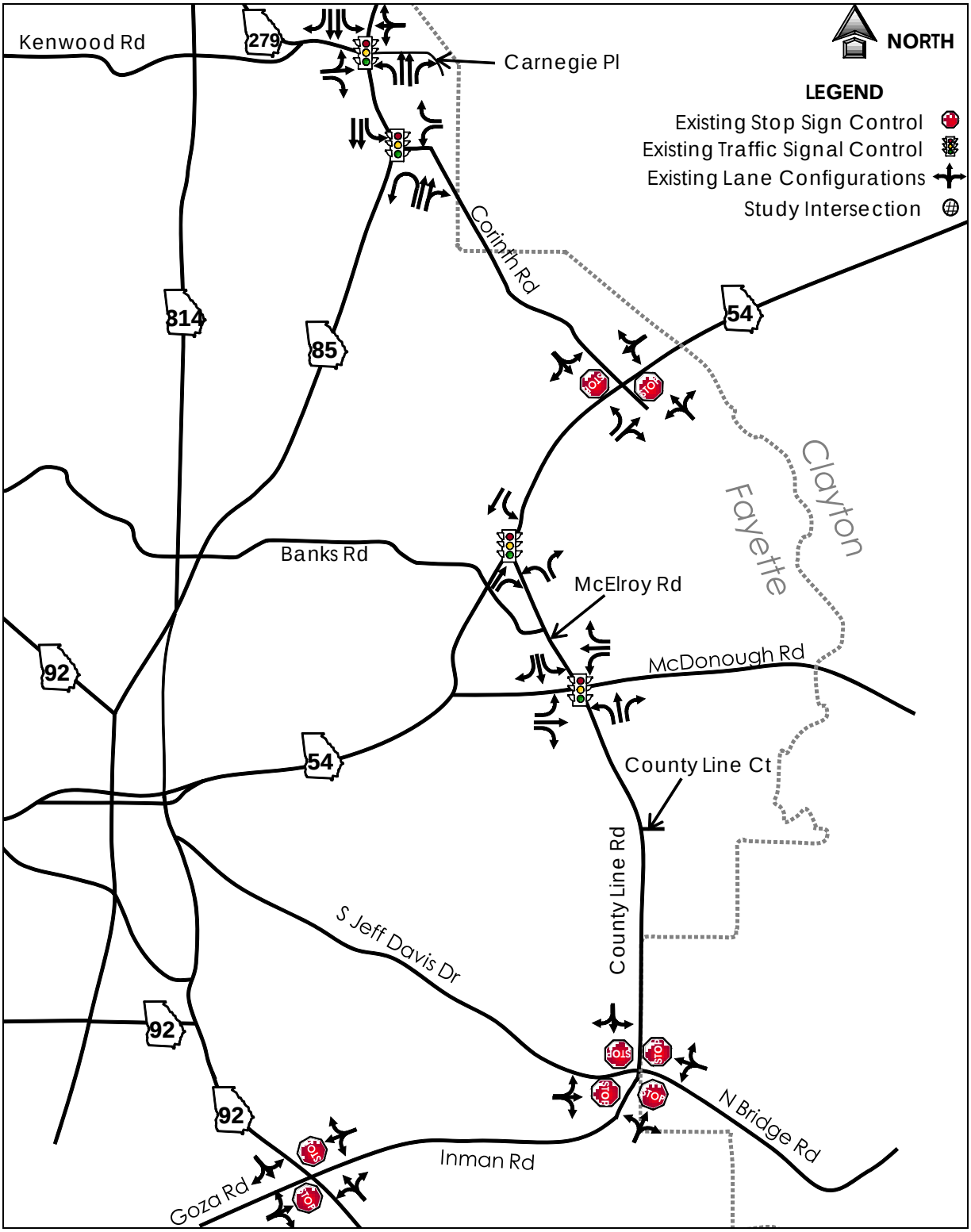
County Line Road is a two-lane urban minor arterial. It aligns with McElroy Road at the intersection of McDonough Road and aligns with Inman Road at the intersection of Jeff Davis Road.

South Jeff Davis Road is a two-lane urban minor arterial. It runs southeast from downtown Fayetteville to the Fayette/Clayton county line, where it aligns with North Bridge Road.

Inman Road, from South Jeff Davis Drive/North Bridge Road to SR 92, is a two-lane, north-south oriented Urban Minor Arterial roadway.

The existing lane configurations and traffic controls are shown in Figure 2.

Figure 2. Existing Lane Configurations and Traffic Controls



Existing Volumes

Previously, weekday AM and PM peak hour turning movement counts were collected on November 2, 2006 at the following locations:

- SR 279 and SR 85
- Corinth Road and SR 85
- Corinth Road and SR 54
- McElroy Road and SR 54
- County Line Road/McElroy Road and McDonough Road
- County Line Road and South Jeff Davis Drive/Inman Road/North Bridge Road
- Inman Road/Goza Road and SR 92

Weekday 24-hour directional volume, speed and vehicle classification counts were also collected at the following locations:

- SR 85 north of SR 279
- SR 54 east of Corinth Road
- SR 54 west of Corinth Road
- McDonough Road east of County Line Road
- County Line Road north of S Jeff Davis Drive
- S Jeff Davis Drive west of County Line Road
- Inman Road south of S Jeff Davis Drive/Northridge Road
- SR 92 south of Inman Road and Goza Road

Figures showing the existing daily volumes and peak period hourly turning movement volumes are included in the Appendix.

Programmed Roadway Improvements

A roadway improvement project for the intersection of SR 92 at Inman Road and Goza Road is in the current Fayette County SPLOST Program. The project will include the re-alignment of Inman Road opposite Goza Road. Turn lanes will also be installed on the Inman Road and Goza Road approaches. Completion is estimated in 2010.

A roadway improvement project for SR 54 (GDOT PI 721440) will include the widening of SR 54 to a four-lane median divided roadway with dedicated left and right turn lanes. Construction completion is estimated in 2015.

Future Volumes

An annual growth rate was developed by comparing the 2010, 2020, and 2030 projected daily volumes from the ARC model. This growth rate was applied to the existing turning movement counts for five (5) years and twenty five (25) years to estimate the traffic volumes at the study intersections in 2015 and 2035, with and without the East Fayetteville Bypass. The 2015 opening year and 2035 design year weekday peak period traffic volumes are included in the Appendix.

Capacity Analysis: No Build Conditions

Using the methodologies described in the EXPLANATION OF LEVEL OF SERVICE Section, the Levels of Service (LOS) at the existing study intersections and roadway segments were determined given the existing traffic volumes and roadway conditions. The intersection LOS results are shown in Table 1. The capacity analysis and volumes are provided in the Appendix.

Capacity Analysis: Build Conditions

The intersection LOS results are shown in Tables 2, 3, 4, 5, 6, and 7. The capacity analyses are provided in the Appendix. Figure 3 shows the intersection configurations.

Roadway Capacity Analysis:

For a Class II roadway, the operating conditions are determined by average speed through the entire corridor. To determine this, the through movement delays at each intersection were included with the running time between the intersections to determine the average speeds through the corridor and used to identify the LOS, as identified in the EXPLANATION OF LEVEL OF SERVICE Section. The results are shown in Table 8.

Table 1. No Build Conditions Intersection Levels of Service

Intersection	Control	Movement	Existing LOS		2015 LOS		2035 LOS	
			AM	PM	AM	PM	AM	PM
Corinth Rd & SR 85	Signal	Overall	B	A	B	B	D	C
Corinth Rd & SR 54	Side Street STOP Signs	NB	A	B	A	B	A	C
		SB	F	F	F	F	F	F
		EB	B	B	B	B	C	C
		WB	A	A	A	A	A	A
McElroy Rd & SR 54	Signal	Overall	C	D	C	E	F	E
McElroy Rd & McDonough Rd	Signal	Overall	B	B	C	B	C	C
County Line/ Inman Rd & S Jeff Davis Dr/ North Bridge Rd	All Way STOP Control	NB	C	B	C	C	F	E
		SB	C	C	C	E	F	F
		EB	B	C	B	F	C	F
		WB	D	B	C	C	F	C
Inman/Goza Rds & SR 92	Side Street STOP Signs	NB	A	A	A	A	A	A
		SB	A	A	A	A	A	A
		EB	D	C	F	F	F	F
		WB	F	F	F	F	F	F
SR 279 & SR 85	Signal	Overall	B	C	C	C	C	E

Table 2. 2015 Build Intersection Levels of Service

Intersection	Control	Movement	Existing Route		New 2-lanes		New 4-lanes	
			AM	PM	AM	PM	AM	PM
EFB & SR 85	Signal	Overall	B	B	B	B	B	B
EFB/ Corinth Rd & SR 54	Side Street STOP Signs	NB	F	F	F	F	F	F
		SB	F	F	F	F	F	F
		EB	F	F	B	B	B	B
		WB	A	A	B	A	B	A
	Signal	Overall	C	F	E	F	D	F
EFB/McElroy Rd & SR 54	Signal	Overall	B	B	B	B	B	B
McElroy Rd & McDonough Rd	Signal	Overall	B	E	A	A	A	A
EFB & County Line Rd/County line Ct	Side Street STOP Signs	NB	A	A	A	A	A	A
		SB	A	A	A	A	A	A
		EB	F	F	F	F	F	F
		WB	F	F	F	F	F	F
	Signal	Overall	A	A	A	A	A	A
McDonough Rd & EFB	Side Street STOP Signs	NB	N/A	N/A	A	A	A	A
		SB	N/A	N/A	A	B	A	B
		EB	N/A	N/A	F	F	F	F
		WB	N/A	N/A	F	F	F	F
	Signal	Overall	N/A	N/A	C	D	B	C
EFB/ Inman Rd & S Jeff Davis Dr/ North Bridge Rd	Side Street STOP Signs	NB	A	A	B	B	B	B
		SB	A	A	A	B	A	B
		EB	F	F	D	F	C	C
		WB	F	F	F	F	F	F
	AWSC	Overall	D	E	D	E	D	E
	Signal	Overall	A	A	A	B	A	A
Inman/Goza Rds & SR 92	Side Street STOP Signs	NB	A	A	A	A	A	A
		SB	A	A	A	A	A	A
		EB	F	F	F	F	F	F
		WB	F	F	F	F	F	F
	Signal	Overall	A	B	A	B	B	B
SR 279 & SR 85	Signal	Overall	B	C	D	C	B	C

Table 3. 2035 Build Intersection Levels of Service

Intersection	Control	Movement	Existing Route		New 2-lanes		New 4-lanes	
			AM	PM	AM	PM	AM	PM
EFB & SR 85	Signal	Overall	B	C	B	C	B	C
EFB/ Corinth Rd & SR 54	Side Street STOP Signs	NB	F	F	F	F	F	F
		SB	F	F	F	F	F	F
		EB	F	F	B	C	B	C
		WB	A	A	B	B	B	B
	Signal	Overall	D	F	F	F	F	F
EFB/McElroy Rd & SR 54	Signal	Overall	D	D	C	D	C	D
McElroy Rd & McDonough Rd	Signal	Overall	C	F	A	A	A	A
EFB & County Line Rd /County line Ct	Side Street STOP Signs	NB	N/A	N/A	B	B	B	B
		SB	N/A	N/A	B	B	B	B
		EB	N/A	N/A	F	F	F	F
		WB	N/A	N/A	F	F	F	F
	Signal	Overall	N/A	N/A	B	C	A	A
McDonough Rd & EFB	Side Street STOP Signs	NB	N/A	N/A	B	C	B	B
		SB	N/A	N/A	B	B	B	C
		EB	N/A	N/A	F	F	F	F
		WB	N/A	N/A	F	F	F	F
	Signal	Overall	N/A	N/A	C	F	B	B
EFB/ Inman Rd & S Jeff Davis Dr/ North Bridge Rd	Side Street STOP Signs	NB	B	A	B	A	B	A
		SB	A	A	A	A	A	A
		EB	F	F	F	F	F	F
		WB	F	F	F	F	F	F
	AWSC	Overall	F	F	F	F	F	F
	Signal	Overall	A	B	A	B	A	B
Inman/Goza Rds & SR 92	Side Street STOP Signs	NB	B	A	B	A	B	A
		SB	A	B	A	B	A	B
		EB	F	F	F	F	F	F
		WB	F	F	F	F	F	F
	Signal	Overall	B	C	B	C	B	C
SR 279 & SR 85	Signal	Overall	C	E	C	E	C	E

Table 4. 2015 Build with SR 54 4-Lanes Intersection LOS

Intersection	Control	Move-ment	Existing Route		New 2-lanes		New 4-lanes	
			AM	PM	AM	PM	AM	PM
EFB/Corinth Rd	Side Street STOP Signs	NB	F	F	F	F	F	F
		SB	F	F	F	F	F	F
		EB	F	F	B	B	B	B
		WB	B	A	B	A	B	A
	Signal	Overall	B	C	C	F	B	C
EFB/McElroy Rd	Signal	Overall	B	B	A	A	A	A

Table 5. 2035 Build with SR 54 4-Lanes Intersection LOS

Intersection	Control	Move-ment	Existing Route		New 2-lanes		New 4-lanes	
			AM	PM	AM	PM	AM	PM
EFB/Corinth Rd	Side Street STOP Signs	NB	F	F	F	F	F	F
		SB	F	F	F	F	F	F
		EB	F	F	C	C	C	C
		WB	B	B	B	B	B	B
	Signal	Overall	B	D	E	F	C	D
EFB/McElroy Rd	Signal	Overall	B	C	B	A	B	A

Table 6. Existing Route Roundabouts with Bypasses LOS

Intersection	Approach	NCHRP-572 Model LOS				UK Model LOS			
		2015		2035		2015		2035	
Name		AM	PM	AM	PM	AM	PM	AM	PM
EFB/Corinth Rd & SR 54 (2-lane)	NB	B	B	C	B	A	A	A	A
	SB	A*	B*	A*	C*	A*	A*	A*	A*
	EB	C	F	F	F	A	A	E	F
	WB	C	F	F	F	A	B	A	E
EFB/Inman Rd & S Jeff Davis Dr/N Bridge Rd (Single)	NB	A	A	C	F	A	A	A	D
	SB	A	A	E	F	A	A	B	B
	EB	A	A	A	F	A	A	A	C
	WB	A	A	C	D	A	A	A	A

* Receiving lane for free-flow southbound right-turns from the bypass lane required

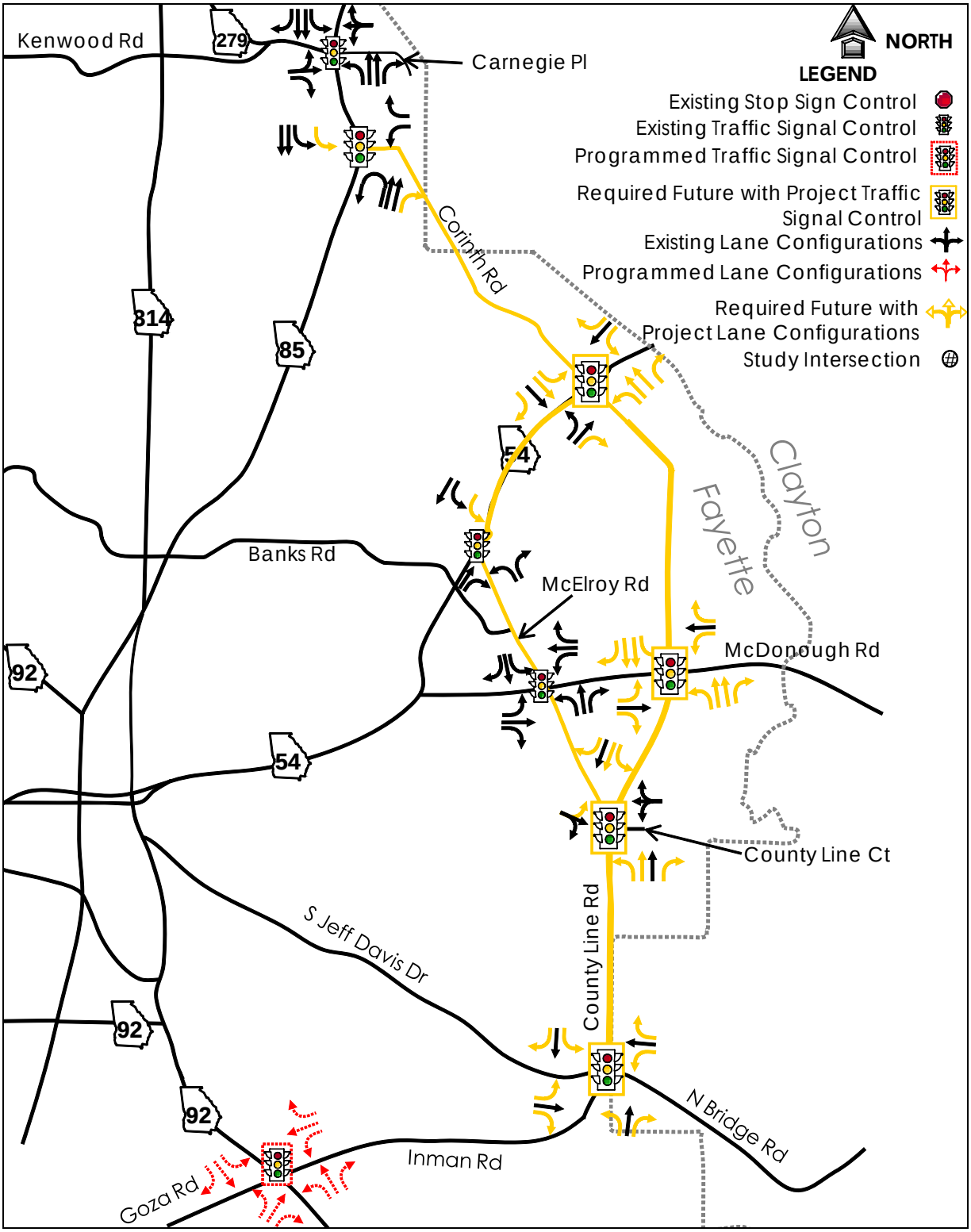
Table 7. New Location Roundabouts with Bypasses LOS

Intersection	Approach	NCHRP-572 Model LOS				UK Model LOS			
		2015		2035		2015		2035	
Name		AM	PM	AM	PM	AM	PM	AM	PM
EFB/Corinth Rd & SR 54 (2-lane)	NB	C	D	F	F	A	A	A	C
	SB	C	F	F	F	A	A	A	F
	EB	D	C	F	F	A	A	B	B
	WB	C	F	F	F	A	B	A	F
EFB New Route & McDonough Rd (2-lane)	NB	B	F	D	F	A	A	A	B
	SB	E	E	F	F	A	A	A	A
	EB	B	F	C	F	A	A	A	A
	WB	B	C	C	E	A	A	A	A
EFB/Inman Rd & S Jeff Davis Dr/N Bridge Rd (Single)	NB	A	A	C	F	A	A	A	D
	SB	A	A	E	F	A	A	B	B
	EB	A	A	A	F	A	A	A	C
	WB	A	A	C	D	A	A	A	A

Table 8. Overall Bypass Peak Hour LOS

Design/ Conditions	Direc-tion of Travel	with Roundabouts								with Traffic Signals			
		UK Methodology				NCHRP-572				Optimized+New			
		2015		2035		2015		2035		2015		2035	
		AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
No Build	NB	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	C	B	D	B
	SB	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	E	F	F	F
No Build SR 54 4-lanes	NB	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	B	A	C	B
	SB	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	C	E	E	E
Build Existing Route	NB	A	B	A	C	A	B	B	D	A	B	B	C
	SB	A	A	A	B	A	A	B	C	A	A	A	B
Existing Route SR 54 4-lanes	NB	A	A	A	A	A	B	B	D	A	A	A	B
	SB	A	A	A	A	A	A	B	C	A	A	A	B
Build 2-Lane New Route	NB	A	A	A	A	A	C	B	F	B	C	C	D
	SB	A	A	A	A	A	B	C	E	B	B	C	C
Build 2-Lane SR 54 4-lanes	NB	A	A	A	A	A	C	B	F	A	B	A	B
	SB	A	A	A	A	A	B	C	E	A	A	B	B
Build 4-Lane New Route	NB	A	A	A	A	A	C	B	F	A	A	B	B
	SB	A	A	A	A	A	B	C	E	A	B	B	B
Build 4-Lane SR 54 4-lanes	NB	A	A	A	A	A	C	B	F	A	A	A	A
	SB	A	A	A	A	A	B	C	E	A	A	A	A

Figure 3. Build Lane Configurations and Traffic Controls



Traffic Signal Warrant Analyses for New Signals

At intersections where the existing stop sign controls are insufficient for expected operating conditions, preliminary analyses were performed to determine if it is likely that the minimum volume requirements to meet the signal warrants will be met in the opening year, 2015. The criteria are described in the EXPLANATION OF SIGNAL WARRANT METHODOLOGY. To estimate the eighth highest turning movement volumes of the day from the peak hour volumes used in the capacity analyses, it was assumed that the 2015 opening year highest peak hour volume will be 10% of the daily volume (K-factor). Using standard GDOT procedures, the eighth highest hourly volume was calculated as 5.6% of the daily volume.

The 2015 opening year hourly turning movement volumes at the East Fayetteville Bypass intersections at SR 54, McDonough Road (new route), and at South Jeff Davis Drive/Inman Road/North Bridge Road are expected to meet the Warrant 1 minimum requirements. The intersection of County Line Road/Circle at the Bypass is not expected to have sufficient left-turning volumes to meet any of the Warrants in either the opening or design years. During peak hours, side street left-turning vehicles will be expected to have difficulty locating sufficient gaps in the through traffic to enter the traffic flow.

Turn Lane Requirements

The minimum turn lane configurations likely to be required for year 2035 traffic volumes were identified for the study intersections based on capacity analyses and identified in previous sections. The requirement to provide turning lanes at other cross streets and at median openings are based on the daily through and turning vehicular traffic volumes, number of lanes on the through street, and vehicular speeds. The GDOT *Regulations* require construction of left-turn lanes if the through volume (ADT) exceeds 10,000 vehicles per day for speeds between 40 and 50 mph with two or more lanes in each direction and the daily left-turning volumes exceed 250 vehicles. The GDOT *Regulations* require right-turn deceleration lanes for the same conditions when there are more than 75 right-turning vehicles per day.

The projected ADT on all segments of the East Fayetteville Bypass are expected to exceed 10,000 vehicles per day by 2035. The bypass is assumed to have a posted speed limit of 45 mph and is planned to consist of two lanes in each direction. The number of trips generated by single family residential dwelling units (using ITE *Trip Generation* rates) and the existing directional distribution patterns of vehicular trips on the bypass were used to estimate the number of left-turning vehicles per day from the bypass to the cross streets or as u-turns. It is estimated that a median break servicing approximately 30 or more homes on the east side of the bypass or approximately 100 or more homes on the west side of the bypass, by the year 2035, would require a left-turn storage lane. Left turn storage lanes should be installed at all median openings on the

East Fayetteville Bypass. Similarly, right-turn deceleration lanes should be constructed at most cross-street intersections with the bypass. Most commercial driveways will also generate right-turning volumes sufficient to require right-turn deceleration lanes.

For speeds of 45 mph and greater, 100 feet long approach tapers to 235 feet long full width left-turn storage lanes and 175 feet long right-turn deceleration lanes are specified by the GDOT *Regulations,* unless longer lengths are required to store the number of left-turning vehicles expected to arrive during a two-minute interval for unsignalized intersections or one and one-half (1½) cycle lengths at signalized intersections. For speeds of 40 mph or less, 50 feet long tapers are required.

Table 9 shows the minimum left-turn storage lane lengths at the study intersections based on the GDOT *Regulations*, the storage lengths to accommodate the 2035 peak hour volumes, the 95th percentile storage length, and the storage length to be provided (the longer of the minimum storage lengths).

Table 9. Left Turn Lane Storage Lengths

Intersection	Approach	GDOT Regulations Minimum Storage (ft)	95th Percentile Queue Storage Length (ft)	Minimum Required Storage Length (ft)
E Fayetteville Bypass & SR 85	NBU	235	43	200
	SBL	235	243	235-dual
	WBL	235	436	450
S Jeff Davis Rd & E Fayetteville Bypass	NBL	235	145	235
	SBL	235	218	235
	EBL	160	210	210
	WBL	160	37	160
SR 54 & New Location East Fayetteville Bypass	NBL	235	207	235
	SBL	235	354	360
	EBL	310	436	450
	WBL	310	173	310
County Line Ct & E Fayetteville Bypass	NBL	235	9	235
	SBL	235	210	235
McDonough Rd & New Location E Fayetteville Bypass	NBL	235	137	235
	SBL	235	274	275
	EBL	235	6	235
	WBL	235	125	235

GLOSSARY OF TERMS

Annual Average Daily Traffic (AADT): The total volume of traffic on a highway segment for one-year, divided by 365.

Capacity: The maximum traffic flow designation for a segment of roadway or a lane, within the control conditions for that particular segment of roadway or lane, usually expressed in persons per hour or vehicles per hour.

Congestion: Highway congestion results when traffic demand approaches or exceeds the available capacity of the transportation facility(ies).

Impacts: The effects of a transportation project, including (a) direct (primary) effects; (b) indirection (secondary) effects; and (c) cumulative effects.

Internal Capture: Trips occurring within the subject site thereby reducing the number of new trips on the external roadway system.

K-Factor: The percentage of daily traffic volume traveling during the peak hour or design hour.

LOS (Level of Service): A qualitative assessment of a road's operating conditions, expressed in terms of A through F – 'A' being the best LOS.

Pass-by trips: Some of the trips are by people who would have been on the road anyway on their way to/from someplace else who stop by and visit the commercial establishment.

Peak Hour: The consecutive sixty minutes within a 24-hour period with the highest traffic volume. A peak hour is generally designated for both A.M. and P.M. traffic conditions.

Peak Hour Factor (PHF): The ratio of total traffic occurring during the peak hour to the peak 15-minute flow rate (4 times the maximum 15 minute volume) within the peak hour.

Volume: The number of persons or vehicles passing a point on a lane, roadway or other trafficway during some time interval, often taken to be one hour, expressed in vehicles.

Volume-to-Capacity ratio (v/c): The ratio of volume (v) to capacity (c) for a traffic facility.

EXPLANATION OF LEVEL OF SERVICE

Capacity analyses of the study intersections were completed using procedures in the Transportation Research Board's *Highway Capacity Manual (HCM), 2000*. This is the usual methodology for the analysis of traffic conditions. The software programs *Synchro 6* and *HCS* (nationally recognized computer software packages for analyzing capacities and Levels of Service) were used to perform the actual capacity analyses for the key intersections and roadway segments.

Intersection Analysis Methodology

Operating conditions at intersections are evaluated in terms of Levels of Service (LOS). LOS A through D are generally considered to be adequate peak hour operations. LOS E and F are caused by longer vehicular delays and may be considered inadequate.

Levels of Service for signalized intersections are reported in composite fashion, i.e., one LOS for the entire intersection, and are based on average control delay. Individual turning movements at a signalized intersection may experience inadequate LOS, particularly where those volumes are relatively low, while the intersection as a whole has an adequate LOS. This is because the major movements on the major roadway are given priority in assigning signal green time.

Traffic conditions at unsignalized intersections, with STOP sign control on the minor street only, are evaluated for the minor street approach(es) and for the left turns from the major street. This is because the major street traffic is assumed to have no delay since there is no control (no STOP sign). Inadequate Levels of Service for minor street approaches to unsignalized intersections are not uncommon, as the continuous flow traffic will always get the priority.

For two-way STOP controlled intersections, the *HCM* does not calculate a composite Level of Service for the entire intersection. For this reason, the Intersection Capacity Utilization (ICU) method is used to show the intersection LOS. The ICU output is analogous to the intersection volume-to-capacity ratio. This is different from the methodology used for the HCM LOS. The ICU LOS provides a valuable measure of the difference in LOS expected under different traffic volume and lane configuration scenarios for the entire intersection under unsignalized conditions.

Levels of Service for all-way STOP controlled intersections are reported both for key intersection movements, and in composite fashion, i.e., one LOS for the entire intersection, and are based on average control delay.

The *HCM* Level of Service criteria for signalized and unsignalized intersections are shown in the following table:

Highway Capacity Manual Intersection Level of Service Criteria

LOS	Control Delay (seconds per vehicle)	
	Signalized Intersection	Unsignalized Intersection
A	≤ 10	≤ 10
B	>10 and ≤20	>10 and ≤15
C	>20 and ≤35	>15 and ≤25
D	>35 and ≤55	>25 and ≤35
E	>55 and ≤80	>35 and ≤50
F	> 80	> 50

Source: Highway Capacity Manual

Roadway Segment Analysis Methodology

Operating conditions along roadway segments are evaluated in terms of LOS. The LOS is assigned to a roadway segment based on the average running speed for one of four specific classes of arterial roadway. The arterial roadway is designated as Class I through IV dependent on the distances between intersections and the speeds of the roadway segments between intersections. Similar to intersection analysis, LOS A through D are typically considered desirable. LOS E is sometimes considered adequate and LOS F is generally considered an inadequate condition. The *Highway Capacity Manual* Level of Service criteria for roadway segments is shown in the following table:

Highway Capacity Manual Road Segment Level of Service Criteria

Level of Service	Average Travel Speed (mph)			
	Class I	Class II	Class III	Class IV
A	>42	>35	>30	>25
B	>34 and ≤42	>28 and ≤35	>24 and ≤30	>19 and ≤25
C	>27 and ≤34	>22 and ≤28	>18 and ≤24	>13 and ≤19
D	>21 and ≤27	>17 and ≤22	>14 and ≤18	>9 and ≤13
E	>16 and ≤21	>13 and ≤17	>10 and ≤14	>7 and ≤9
F	≤16	≤13	≤10	≤7

Source: *Highway Capacity Manual*, 2000 Edition.

Roundabout Analysis Methodology

The effectiveness and operations analysis of a roundabout is measured differently than for a STOP sign controlled intersection. The analysis methodology for roundabouts utilized for this project was based on information provided in the *NCHRP Report 572: Roundabouts in the United States*, information presented at the Federal Highway Administration's (FHWA's) "Roundabouts Workshop – Planning and Designing Intersections for Safety", and the FHWA's year 2000 *Roundabouts: An Informational Guide*. Specifically, capacity equations from the *NCHRP Report 572* and delay and queue equations from the *Roundabouts: An Informational Guide* were referenced to develop the roundabout operational analysis. The roundabout analysis methodology provides delays, volume-to-capacity (v/c) ratios, and queues for each approach to the roundabout dependent upon the geometric elements of the roundabout, the entry flow on each approach to the roundabout, and the circulating flow within the roundabout that conflicts with the entry flow from the subject approach. Based on empirical data, FHWA identified at the "Roundabouts Workshop – Planning and Designing Intersections for Safety" that roundabout locations with approaches anticipated to operate at more than 85% of their estimated capacity should be considered for multilane entries. Therefore, a single lane approach or the critical lane approach at a multilane entry with a v/c ratio of 0.85 or less is considered satisfactory (i.e., not needing additional lanes).

Based on the approach delay from the roundabout methodology, a Level of Service (LOS) for each approach, as well as the overall intersection, is provided based on the unsignalized Level of Service criteria presented in the Transportation Research Board's *Highway Capacity Manual (HCM), 2003*.

EXPLANATION OF SIGNAL WARRANT METHODOLOGY

The Manual on Uniform Traffic Control Devices (MUTCD), 2003 Edition, Federal Highway Administration (FHWA), provides methodology for consideration of installation of traffic signals

Warrant 1 - Eight-Hour Vehicular Volume

Warrant 1, Eight-Hour Vehicular Volume, has three (3) Conditions. The Conditions give traffic volume thresholds for the major street combination of both approaches and for the minor street with the higher volume approach. The thresholds must be met for at least eight (8) hours throughout an average day to meet the Condition. At least one of the following Conditions must be met to meet the warrant.

- Condition A, Minimum Vehicular Volume, "is intended for application where a large volume of intersecting traffic is the principal reason to consider installing a traffic control signal."
- Condition B, Interruption of Continuous Traffic, "is intended for application where the traffic volume on a major street is so heavy that traffic on a minor intersecting street suffers excessive delay or conflict in entering or crossing the major street."
- Condition C, Combination of Condition A and B, reduces the traffic volumes thresholds required for Conditions A and B by 80%, however, both Conditions A and B must be met with the reduced volume.

Warrant 2 - Four-Hour Vehicular Volume

Warrant 2, Four-Hour Vehicular Volume, is "intended to be applied where the volume of intersecting traffic is the principal reason to consider installing a traffic control signal." Warrant 2 is based on the volume of both main street approaches combined and the side street approach with the higher volume. These volumes are compared to a curve based on the number of lanes on the approaches. Warrant 2 must be met for four (4) hours throughout an average day to meet the warrant.

Warrant 3 – Peak Hour

Warrant 3 is applied only in unusual cases, including office complexes, manufacturing plants, industrial complexes, or high-occupancy vehicle facilities that attract or discharge large numbers of vehicles over a short time."

Warrants 4, 5, 6, 7, and 8

Warrants 4 (Pedestrian Volume), 5 (School Crossing), 6 (Coordinated Signal System), 7 (Crash Experience) and 8 (Roadway Network) are additional MUTCD warrants.

APPENDIX

(Available upon request)