SECTION II

PURPOSE AND NEED FOR PROJECT

BUILDING THE FUTURE

Winston-Salem

BUSINESS 40

II. PURPOSE AND NEED FOR PROJECT

A. PURPOSE OF PROJECT

The purpose of the project is to improve traffic flow, operations and safety on US 421/I-40 Business from west of Fourth Street to east of Church Street.

B. NEED FOR PROJECT

There are six (6) interchanges within the 1.2 mile corridor between West Fourth Street and Church Street. This does not meet current FHWA design standards, which calls for one-mile spacing between interchanges. The distance between interchanges in this segment ranges from 0.28 miles (from Marshall Street to Broad Street) to 0.13 miles (from Cherry Street to Liberty Street). This results in short weave sections: the existing weaving sections between Marshall Street to Broad Street are 300 feet eastbound and westbound, and the weaving section between Cherry Street and Liberty Street is 250 feet eastbound and 150 feet westbound. The current recommended minimum spacing for a weaving section between ramps for similar interchanges is 2,000 feet.[R2] This project will reduce the number of interchanges and eliminate and/or lengthen weaving sections between ramps, therefore improving traffic flow, operations and safety of the facility.

The potential problems with close interchange spacing can be illustrated with "conflict points." A conflict point is the location where the travel paths of two different vehicles may cross. For example, at an interchange, conflict points are located at the end of on-ramps, the beginning of off-ramps, and in weave sections. There are 20 existing conflict points in the 1.2 mile project corridor between West Fourth Street and Church Street as shown in Figure 4. This project will reduce the number of conflict points, therefore improving traffic flow, operations and safety of the facility.

There are eleven (11) structures/bridges within the project study area. Ten of the bridges are "Structurally Deficient" based on the most recent Bridge Inspection Reports. All of the bridges have insufficient vertical clearance. The clearance deficits range from eight (8) inches to three (3) foot, see Sections II. C. 2. g. [Structures] of this document. This project will improve vertical clearance of the bridges, therefore improving the operations and safety of the facility.

The existing concrete pavement with asphalt overlay has deteriorated and is in very poor condition, which is evident in a poor rideability and spalling, i.e. chipping, fragmenting, and/or flaking of pavement joints. This project will replace the pavement, therefore improving the safety of the facility.

C. DESCRIPTION OF EXISTING CONDITIONS

1. Functional Classification

Based on the North Carolina Functional Classification System, the classifications of the roadways within the project study area are stated in Table 3.

Table 3. Functional Classification of Roadways

Roadway	Classification
US 421/I-40 Business	Freeway
W. Fourth Street	Local
NC 150 (Peters Creek Parkway)	Collector north of US 421/I-40 Business and Minor Arterial south of US 421/I-40 Business
Green Street	Private north of US 421/I-40 Business and Local south of US 421/I-40 Business
Broad Street	Local
Brookstown Avenue	Local
Spruce Street	Local
Marshall Street	Other Principal Arterial north of US 421/I-40 Business and Local south of US 421/I-40 Business
Cherry Street	Other Principal Arterial north of US 421/I-40 Business and Local south of US 421/I-40 Business
Liberty Street	Collector north of US 421/I-40 Business and Local south of US 421/I-40 Business
Main Street	Collector
Church Street	Local

2. Physical Description of Existing Facility

a. Roadway Cross-sections The existing cross-section varies for each roadway in the project limits, as noted in Table 4. The existing shoulders along US 421/ I-40 Business consist of: inside shoulders varying from one (1) to two (2) foot wide with standard curb and gutter, and double guardrail and outside shoulders varying from one (1) to ten (10) foot wide with standard curb and gutter, and guardrail.

Table 4. Existing Cross-sections and Right-of-Way of Roadways

Roadway	Number of Travel Lanes*	Width of Travel Lanes*,[1]	Right-of-Way Width[1]
US 421/I-40 Business	2 EB Lanes and 2 WB Lanes	EB & WB Lanes = 12 ft	Varies - 92 ft minimum[2]
W. Fourth Street	1 NB Lane and 1 SB Lane	NB & SB Lanes = 15 ft	50 ft[3]
NC 150 (Peters Creek Parkway)	2 NB Lanes and 2 SB Lanes	NB & SB Lanes = 10 ft	Varies - 59 ft minimum[2]
Green Street	1 NB Lane and 1 SB Lane	NB & SB Lanes = 13 ft	45 ft[3]

Table 4. Existing Cross-sections and Right-of-Way of Roadways (Cont.)

Roadway	Number of Travel Lanes*	Width of Travel Lanes*,[1]	Right-of-Way Width[1]
Broad Street	2 NB Lanes, 1 NB Left Turn Lane, 1 SB Lane and 1 SB Left Turn Lane	NB & SB Lanes = 10 ft	68 ft[3]
Brookstown Avenue	1 NB Lane and 1 SB Lane	NB & SB Lanes = 12 ft	40 ft[3]
Spruce Street	1 NB Lane and 1 SB Lane	NB & SB Lanes = 12 ft	Varies - 40 ft minimum[2]
Marshall Street	3 SB Lanes	Out** Lanes = 12 ft Center Lane = 14 ft	60 ft[3]
Cherry Street	3 NB Lanes	West Out Lane = 14 ft Center and East Out Lanes = 11 ft	60 ft[3]
Liberty Street	3 SB Lanes	West Out and Center Lanes = 12 ft East Out Lane = 14 ft	Varies - 54 ft minimum[2]
Main Street	3 NB Lanes	Outside Lanes = 11 ft Center Lanes = 12 ft	Varies - 57 ft minimum[2]
Church Street	1 NB Lanes and 2 SB Lanes	NB & SB Lanes = 12 ft	Varies - 50 ft minimum[2]

* Eastbound (EB), Westbound (WB), Northbound (NB) and Southbound (SB)
** Outside (Out)
1 Scaled dimension
2 Asymmetrical about Centerline
3 Symmetrical about Centerline

b. **Horizontal and Vertical Alignment** US 421/I-40 Business horizontal and vertical alignments do not meet current design standards. Design deficiencies include but are not limited to the following:

- Substandard curve radii, too tight, on existing ramps and loops;
- Substandard length, too short, of existing ramps and loops;
- Substandard sight distance on existing ramps and loops;
- Substandard weave distance between ramps;
- Non-standard ramp configuration, and;
- Existing vertical alignment of US 421/I-40 Business does not provide for sufficient vertical clearances for structures, see Section II.C.2.g [Structures].

c. **Right-of-Way and Access Control** The right-of-way widths vary for each roadway in the project limits, are noted in Table 4 above. Within the project study area US 421/I-40 Business is a full control of access facility all other roadways have no control of access.

d. **Speed Limit** US 421/I-40 Business and NC 150 (Peters Creek Parkway) have posted speed limits of 45 MPH within the project study area. All other roadways (W. Fourth, Green, Broad, Spruce, Marshall, Cherry, Liberty and Main Streets and Brookstown

Avenue) are not posted, however being in the municipal limits of Winston-Salem they are restricted to 35 MPH.

e. **<u>Interchanges/Grade Separated Crossings</u>** Existing interchanges within the project limits are located at:

- **NC 150 (Peters Creek Parkway)** – a partial cloverleaf (consisting of three ramps and one loop in three quadrants) providing full access movements with NC 150 (Peters Creek Parkway) bridged over US 421/I-40 Business.
- **Broad Street** – a partial cloverleaf (consisting of two ramps and two loops with the loops located in parallel quadrants) providing full access movements with Broad Street bridged over US 421/I-40 Business.
- **Marshall Street** – a partial diamond (consisting of three ramps in three quadrants) providing partial access movements from Marshall Street to US 421/I-40 Business (east and westbound) and from US 421/I-40 Business to Marshall and Cherry Streets.
- **Cherry Street** – a partial diamond (consisting of one ramp) providing partial access movement from US 421/I-40 Business to Cherry Street.
- **Liberty Street** – a partial diamond (consisting of two ramps in three quadrants) providing partial access movements from Liberty Street to US 421/I-40 Business (westbound) and from US 421/I-40 Business to Liberty and Main Streets.
- **Main Street** – a partial diamond (consisting of two ramps in parallel quadrants) providing partial access movements from Main Street to US 421/I-40 Business (eastbound) and from US 421/I-40 Business to Main Street.

Grade separated crossings within the project limits include:

- **W. Fourth Street Overpass of US 421/I-40 Business;**
- **Green Street Overpass of US 421/I-40 Business (closed to vehicular traffic July 2007 after structure was struck by a truck);**
- **US 421/I-40 Business Overpass of Brookstown Avenue;**
- **Spruce Street Overpass of US 421/I-40 Business and;**
- **Church Street Overpass of US 421/I-40 Business;**

As a part of a 2007 re-zoning request by Brookstown Development Partners, LLC –Case Number W-2936, a portion of Green Street from US 421/I-40 Business to W. First Street was closed. This request was approved in August 2007 after the Green Street Bridge was closed after being struck by a truck. Currently, Green Street is a private path north of US 421/Business 40 and a public street south of US 421/Business 40.

f. **Railroad Crossings** There are no railroad crossings in the project study area.

g. **Structures** There are eleven (11) existing structures within the project study area, as noted in Table 5a.

Table 5a. Existing Bridges

Bridge No.	Carries / Crosses	Width[1]	Length	Year Built	Sufficiency Rating[2]
269	W. Fourth Street / US 421/ I-40 Business	33.83 ft (Clear Roadway Width)	124 ft	1956	63.0*
278	NC 150(Peters Creek Parkway) / US 421/I-40 Business	44 ft (Clear Roadway Width)	218 ft	1956	47.0*
286	Green Street[3] / US 421/ I-40 Business	26 ft (Clear Roadway Width)	132 ft	1956	22.0*
178	Broad Street / US 421/ I-40 Business	52 ft (Clear Roadway Width)	152 ft	1955	41.5*
288	US 421/I-40 Business / Brookstown Avenue	26 ft (Horizontal Clearance Under)	222 ft	1955[4]	82.0
291	Spruce Street / US 421/ I-40 Business	40 ft (Clear Roadway Width)	110 ft	1955	63.0*
293	Marshall Street / US 421/ I-40 Business	40 ft (Clear Roadway Width)	88 ft	1955	83.6
305	Cherry Street / US 421/ I-40 Business	36 ft (Clear Roadway Width)	135 ft	1955[4]	47.6*
312	US 421/I-40 Business / Liberty Street	40 ft (Horizontal Clearance Under)	462 ft	1955[5]	17.0*
313	Main Street / US 421/ I-40 Business	40 ft (Clear Roadway Width)	115 ft	1958	48.0*
336	Church Street / US 421/ I-40 Business	40 ft (Clear Roadway Width)	215 ft	1958	22.0*

1 Clear Roadway Width or Minimum Horizontal Clearance under Structure
2 Sufficiency Rating (out of a possible 100 rating points)
3 Bridge is Closed
4 Reconstructed in 1996
5 Reconstructed in 1986
* Structurally Deficient

The vertical clearance for the eleven (11) existing structures within the project study area, as noted in Table 5b.

Table 5b. Existing Bridges - Vertical Clearance

Bridge No.	Carries /Crosses	Vertical Clearance		
		Existing	Minimum Required	Deficiency
269	W. Fourth Street / US 421/I-40 Business	15'-9" (East Bound Lane)	17'-0"	1'-3"
278	NC 150(Peters Creek Parkway) / US 421/I-40 Business	15'-8" (East Bound Lane)	17'-0"	1'-4"
286	Green Street* / US 421/ I-40 Business	14'-3" (East Bound Lane)	17'-0"	2'-9"
178	Broad Street / US 421/ I-40 Business	14'-10" (East Bound Lane)	17'-0"	2'-2"
288	US 421/I-40 Business / Brookstown Avenue	14'-3" (Both Lanes)	15'-0"	0'-9"
291	Spruce Street / US 421/ I-40 Business	14'-8" (East Bound Lane)	17'-0"	2'-4"
293	Marshall Street / US 421/ I-40 Business	16'-4" (East Bound Lane)	17'-0"	0'-8"
305	Cherry Street / US 421/Business 40	14'-4" (East Bound Ramp)	17'-0"	2'-8"
312	US 421/Business 40 / Liberty Street	13'-7" (Both Lanes)	15'-0"	1'-5"
313	Main Street / US 421/Business 40	14'-0" (West Bound Lane)	17'-0"	3'-0"
336	Church Street / US 421/Business 40	14'-9" (West Bound Ramp)	17'-0"	2'-3"

* Bridge is Closed

h. <u>Bicycle and Pedestrian Facilities/Greenways</u> There are no existing accommodations for pedestrian and bicycle facilities along the mainline but there are provisions for pedestrian and bicycle facilities along the existing bridges as noted in Table 6.

Table 6. Pedestrian and Bicycle Facilities on Existing Bridges

Bridge No.	Carries /Crosses	Sidewalk		Bicycle Accommodations	
		Left	Right	Left	Right
269	W. Fourth Street / US 421/ I-40 Business	8 ft[1]	8 ft[2]	Wide Lane[1]	Wide Lane[2]
278	NC 150(Peters Creek Parkway) / US 421/I-40 Business	5 ft[1]	5 ft[2]	None[1]	None[2]
286	Green Street[3] / US 421/ I-40 Business	5 ft[1]	5 ft[2]	None[1]	None[2]
178	Broad Street / US 421/ I-40 Business	8 ft[1]	8 ft[2]	None[1]	None[2]
288	US 421/I-40 Business / Brookstown Avenue	0 ft[4]	0 ft[5]	None[4]	None[5]
291	Spruce Street / US 421/ I-40 Business	10 ft[1]	10 ft[2]	Wide Lane[1]	Wide Lane[2]

Table 6. Pedestrian and Bicycle Facilities on Existing Bridges (Cont.)

Bridge No.	Carries /Crosses	Sidewalk		Bicycle Accommodations	
		Left	Right	Left	Right
293	Marshall Street / US 421/ I-40 Business	10 ft[1]	10 ft[2]	Wide Lane[1]	None[1]
305	Cherry Street / US 421/ I-40 Business	10 ft[1]	10 ft[2]	Wide Lane[2]	None[2]
312	Main Street / US 421/ I-40 Business	0 ft[4]	0 ft[5]	None[4]	None[5]
313	Church Street / US 421/ I-40 Business	5 ft[1]	5 ft[2]	None[2]	Wide Lane[2]
336	W. Fourth Street / US 421/ I-40 Business	5 ft[1]	5 ft[2]	Wide Lane[1]	Wide Lane[2]

1 Southbound, 2 Northbound, 3 Bridge is Closed, 4 Westbound, 5 Eastbound

Brookstown Avenue has five (5) foot sidewalk on both sides of the roadway which is overpassed by US 421/I-40 Business. Liberty Street has five (5) foot sidewalk and wide outside lanes which can accommodate bicycles on both sides of the roadway which is overpassed by US 421/I-40 Business. The Strollway passes under US 421/I-40 Business at the Liberty Street Bridge.

i. Utilities Utilities within the project area include telephone, power, cable television, natural gas, water, and sewer.

j. Lighting When US 421/I-40 Business was originally constructed lighting was installed along the mainline facility. Currently, the lighting is inoperative due the deterioration of the wiring. None of the existing structures are currently lit.

3. School Bus Usage

Winston-Salem/Forsyth County Schools Transportation staff indicates 113 buses travel within the project study area making 191 trips per day.

4. Traffic Carrying Capacity

The following is a synopsis of the Traffic Forecast Report for the proposed project. A copy of the unabridged version of the Project Level Traffic Forecast Report, dated June, 2013, can be viewed at the Project Development & Environmental Analysis Unit, Century Center Building A, 1000 Birch Ridge Drive, Raleigh N.C.

a. Existing Traffic Volumes The 2011 Existing Conditions traffic forecasts were primarily developed using the project specific counts and historic Annual Average Daily Traffic (AADT) data. It should be noted that the study area is located in an urban area and is not influenced by heavy recreational traffic. Using applicable NCDOT seasonal factors;

project specific traffic count data was adjusted to develop AADT volumes. The 2011 Existing Conditions Traffic Forecasts data is listed below in Table 8.

The 2011 Existing Conditions AADT volumes with design hourly volume, directional splits and truck percentages are shown in Figure 5.

b. **Interim Traffic Volumes** The 2021 No-Build Conditions traffic forecast was estimated by linearly extrapolating the 2011 Existing Conditions traffic forecast using the growth rates calculated based on the Piedmont Triad Regional Model (PTRM) runs and are presented in Table 8. The interim year volumes illustrate the worst case conditions for the construction year and/or the opening year for the project.

c. **Future Traffic Volumes** The 2040 No-Build Conditions traffic forecast was estimated by linearly extrapolating the 2011 Existing Conditions traffic forecast using the growth rates calculated based on the Piedmont Triad Regional Model (PTRM) runs. Table 7 summarizes the growth rates used on the study area roads to compute the 2040 No-Build Conditions Traffic Forecast.

Table 7. 2040 No-Build Conditions Annual Growth Rates

Road	Annual Growth Rate
Cherry St and Marshall St	0.5%
I-40 Business, US 52, Broad St, Wachovia St, High St, Brookstown Ave, Lowery St, Martin Luther King, Jr. Dr. north of First St to south of Lowery St, and First St near Martin Luther King, Jr. Dr.	1.0%
Peters Creek Pkwy	1.5%
First St, Second St, Third St, Fourth St, Fifth St, Cemetery St, Liberty St, Main St, Trade St, Martin Luther King, Jr. Dr. west of Marshall St to east of US 52, Patterson Ave, and Linden St	2.5%

The 2021 and the 2040 No-Build Conditions traffic forecast for the study area roads are presented in Table 8.

Table 8. 2011 Existing Conditions, 2021 and 2040 No-Build Conditions Traffic Forecasts

Major Roadway	Location	2011 Existing Conditions Traffic Forecasts*	2021 No-Build Future Year Traffic Forecasts*	2040 No-Build Future Year Traffic Forecasts*
Peters Creek Pkwy	south of Academy St	22,000	25,300	31,600
Peters Creek Pkwy	north of Academy St	22,000	25,300	31,600
Peters Creek Pkwy	south of US 421/I-40 Business	20,000	22,900	28,500
Peters Creek Pkwy	north of US 421/I-40 Business	8,400	10,200	13,500
Peters Creek Pkwy	north of First St	7,100	8,400	10,900

Table 8. 2011 Existing Conditions, 2021 and 2040 No-Build Conditions Traffic Forecasts (Cont.)

Major Roadway	Location	2011 Existing Conditions Traffic Forecasts*	2021 No-Build Future Year Traffic Forecasts*	2040 No-Build Future Year Traffic Forecasts*
Broad St	south of Wachovia Ave	7,900	8,700	10,200
Broad St	south of US 421/I-40 Business	8,900	9,800	11,500
Broad St	north of US 421/I-40 Business	14,500	15,900	18,700
Broad St	north of First St	14,700	16,600	20,100
Broad St	south of Second St	13,800	15,600	18,900
Broad St	north of Second St	15,600	17,500	21,000
Marshall St	south of Brookstown Ave	2,100	2,200	2,500
Marshall St	south of High St	2,600	2,700	3,000
Marshall St	south of US 421/I-40 Business	1,600	1,700	1,800
Marshall St	between US 421 /I-40 Business Ramps	4,900	5,300	6,100
Marshall St	south of First St	8,400	9,200	10,600
Marshall St	south of Second St	7,700	8,600	10,400
Marshall St	north of Second St	8,000	8,700	9,900
Marshall St	north of Fourth St	8,000	8,700	9,900
Marshall St	north of Fifth St	7,900	8,600	9,800
Marshall St /Cherry St	south of Martin Luther King, Jr. Dr.	15,800	17,400	20,300
Marshall St /Cherry St	north of Martin Luther King, Jr. Dr.	18,300	19,600	22,100
Cherry St	south of High St	600	600	600
Cherry St	south of US 421/I-40 Business	3,700	4,000	4,700
Cherry St	south of First St	6,400	7,000	8,200
Cherry St	south of Second St	6,500	7,200	8,600
Cherry St	south of Third St	7,000	7,800	9,200
Cherry St	south of Fourth St	8,300	9,500	11,900
Cherry St	south of Fifth St	7,200	8,100	9,900
Cherry St	north of Fifth St	6,700	7,500	9,100
Trade St	south of Fifth St	2,800	3,500	4,800
Trade St	north of Fifth St	2,700	3,400	4,600
Trade St	south of Martin Luther King, Jr. Dr.	2,000	2,500	3,500
Trade St	north of Martin Luther King, Jr. Dr.	2,600	3,300	4,500
Liberty St	south of Cemetery St	2,900	3,600	5,000
Liberty St	south of US 421/I-40 Business	4,000	5,000	6,900
Liberty St	between US 421/I-40 Business Ramps	3,400	4,300	6,100

Table 8. 2011 Existing Conditions, 2021 and 2040 No-Build Conditions Traffic Forecasts (Cont.)

Major Roadway	Location	2011 Existing Conditions Traffic Forecasts*	2021 No-Build Future Year Traffic Forecasts*	2040 No-Build Future Year Traffic Forecasts*
Liberty St	north of US 421/I-40 Business	6,800	8,100	10,500
Liberty St	north of First St	6,600	8,200	11,200
Liberty St	north of Second St	7,700	9,200	12,100
Liberty St	south of Third St	6,000	7,200	9,400
Liberty St	north of Third St	5,000	5,900	7,700
Liberty St	north of Fourth St	5,600	6,700	8,700
Liberty St	north of Fifth St	3,500	4,100	5,100
Liberty St	south of Martin Luther King, Jr. Dr.	4,100	5,100	7,100
Main St	south of Cemetery St	4,200	5,200	7,200
Main St	south of US 421/I-40 Business	6,500	8,100	11,200
Main St	between US 421/I-40 Business Ramps	6,000	7,600	10,500
Main St	north of US 421/I-40 Business	9,900	11,800	15,500
Main St	north of First St	6,200	9,200	14,800
Main St	north of Second St	8,900	10,600	13,700
Main St	north of Third St	6,400	7,500	9,500
Main St	north of Fourth St	4,700	5,400	6,600
Main St	north of Fifth St	3,500	3,800	4,500
Patterson Ave	south of Martin Luther King, Jr. Dr.	1,600	2,000	2,800
Patterson Ave	north of Martin Luther King, Jr. Dr.	4,400	5,500	7,600
Linden St	south of Martin Luther King, Jr. Dr.	2,100	2,600	3,600
US 52	south of US 421/I-40 Business	60,400	68,000	82,500
US 52	north of US 421/I-40 Business	79,400	88,900	107,000
US 52	south of Martin Luther King, Jr. Dr.	79,400	88,900	107,000
US 52	north of Martin Luther King, Jr. Dr.	77,000	86,200	103,800
Martin Luther King, Jr. Dr.	south of Lowery St	15,700	17,300	20,400
Martin Luther King, Jr. Dr.	south of US 421/I-40 Business	15,800	17,400	20,400
Martin Luther King, Jr. Dr.	south of First St	16,800	18,500	21,800
Martin Luther King, Jr. Dr.	north of First St	15,000	16,500	19,400
Academy St	west of Peters Creek Pkwy	8,000	9,200	11,400

Table 8. 2011 Existing Conditions, 2021 and 2040 No-Build Conditions Traffic Forecasts (Cont.)

Major Roadway	Location	2011 Existing Conditions Traffic Forecasts*	2021 No-Build Future Year Traffic Forecasts*	2040 No-Build Future Year Traffic Forecasts*
Academy St	east of Peters Creek Pkwy	5,600	6,400	8,000
Wachovia St	west of Broad St	800	900	1,100
Wachovia St	east of Broad St	1,000	1,100	1,400
Brookstown Ave	west of Marshall St	1,000	1,100	1,300
Brookstown Ave	east of Marshall St	1,300	1,500	1,800
Brookstown Ave	west of Cherry St	2,200	2,400	2,800
Brookstown Ave	east of Cherry St	2,000	2,200	2,600
High St	west of I-40 Business EB Off Ramp	600	700	800
High St	west of Marshall St	4,100	4,500	5,300
High St	west of Cherry St	4,300	4,600	5,300
Cemetery St	east of Liberty St	2,100	2,700	3,700
Cemetery St	east of Main St	1,800	2,200	3,100
Lowery St	west of Martin Luther King, Jr. Dr.	300	300	400
US 421/I-40 Business	west of Peters Creek Pkwy	70,000	77,000	90,200
US 421/I-40 Business	west of Broad St	74,800	82,200	96,400
US 421/I-40 Business	east of Broad St	74,800	82,200	96,400
US 421/I-40 Business EB Off Ramp	north of High St	3,500	3,800	4,500
US 421/I-40 Business WB On Ramp	at Marshall St	3,500	3,800	4,500
US 421/I-40 Business EB	between Marshall St ramps	33,900	37,300	43,700
US 421/I-40 Business WB	between Marshall St ramps	33,900	37,300	43,700
US 421/I-40 Business EB On Ramp	from Marshall St	3,300	3,600	4,300
US 421/I-40 Business WB Off Ramp	at Cherry St	2,700	3,000	3,500
US 421/I-40 Business EB	west of Liberty St	37,200	40,900	48,000
US 421/I-40 Business WB	west of Liberty St	36,600	40,300	47,200
US 421/I-40 Business WB On Ramp	at Liberty St	3,400	3,700	4,400
US 421/I-40 Business EB Off Ramp	at Liberty St/Main St	3,400	3,700	4,400
US 421/I-40 Business EB Off Ramp	at Liberty St	600	700	800
US 421/I-40 Business EB Off Ramp	at Main St	2,800	3,100	3,600
US 421/I-40 Business EB	between Main St ramps	33,800	37,200	43,600
US 421/I-40 Business WB	between Main St ramps	33,200	36,500	42,800

Table 8. 2011 Existing Conditions, 2021 and 2040 No-Build Conditions Traffic Forecasts (Cont.)

Major Roadway	Location	2011 Existing Conditions Traffic Forecasts*	2021 No-Build Future Year Traffic Forecasts*	2040 No-Build Future Year Traffic Forecasts*
US 421/I-40 Business EB On Ramp	at Liberty St/Main St	3,300	3,600	4,300
US 421/I-40 Business WB Off Ramp	at Main St	3,900	4,300	5,000
US 421/I-40 Business	west of US 52	74,200	81,600	95,700
US 421/I-40 Business	east of US 52	78,200	86,100	101,000
US 421/I-40 Business	east of Martin Luther King, Jr. Dr.	74,800	82,300	96,600
First St	west of Peters Creek Pkwy	3,700	4,600	6,200
First St	west of Broad St	4,000	5,100	7,200
First St	east of Broad St	3,800	4,400	5,600
First St	west of Marshall St	3,900	4,800	6,500
First St	west of Cherry St	4,600	5,500	7,100
First St	west of Liberty St	4,700	5,500	6,900
First St	west of Main St	4,900	5,900	7,800
First St	east of Main St	3,600	4,200	5,300
First St	west of Martin Luther King, Jr. Dr.	1,000	1,100	1,300
First St	east of Martin Luther King, Jr. Dr.	3,800	4,200	4,900
Second St	west of Broad St	6,500	8,000	10,900
Second St	east of Broad St	4,300	5,700	8,400
Second St	west of Marshall St	5,400	6,900	9,700
Second St	west of Cherry St	5,700	7,500	10,800
Second St	east of Cherry St	5,200	6,900	10,200
Second St	west of Liberty St	5,200	6,900	10,200
Second St	west of Main St	6,300	8,100	11,500
Second St	east of Main St	4,000	5,300	7,800
Third St	east of Cherry St	1,900	2,400	3,300
Third St	west of Liberty St	1,900	2,400	3,300
Third St	west of Main St	2,900	3,600	5,000
Third St	east of Main St	3,000	3,700	5,000
Fourth St	west of Marshall St	7,000	8,900	12,500
Fourth St	west of Cherry St	6,800	8,600	12,100
Fourth St	west of Trade St	6,100	7,800	10,900
Fourth St	west of Liberty St	5,100	6,400	8,900
Fourth St	west of Main St	4,700	5,900	8,100
Fourth St	east of Main St	4,200	5,200	7,200
Fifth St	west of Marshall St	5,600	7,100	10,000
Fifth St	west of Cherry St	5,700	7,200	10,100
Fifth St	west of Trade St	6,200	7,800	10,900
Fifth St	west of Liberty St	5,900	7,400	10,300
Fifth St	west of Main St	6,000	7,600	10,500

Table 8. 2011 Existing Conditions, 2021 and 2040 No-Build Conditions Traffic Forecasts (Cont.)

Major Roadway	Location	2011 Existing Conditions Traffic Forecasts*	2021 No-Build Future Year Traffic Forecasts*	2040 No-Build Future Year Traffic Forecasts*
Fifth St	east of Main St	5,200	6,500	9,000
Martin Luther King, Jr. Dr.	west of Marshall St	300	300	15,600
Martin Luther King, Jr. Dr.	east of Cherry St	7,600	12,600	22,200
Martin Luther King, Jr. Dr.	west of Liberty St	9,600	15,100	25,600
Martin Luther King, Jr. Dr.	west of Patterson Ave	11,100	17,000	28,300
Martin Luther King, Jr. Dr.	west of Linden St	12,700	19,000	31,100
Martin Luther King, Jr. Dr.	west of US 52	11,600	17,600	29,100
Martin Luther King, Jr. Dr.	east of US 52	11,200	14,100	19,500

* Traffic forecast volumes are Annual Average Daily Traffic (AADT)

d. **Existing Levels of Service** Within the project study area in 2011 US 421/I-40 Business operates at a level of service (LOS) "D" from the Peters Creek Parkway interchange to the Broad Street interchange and LOS "F" west of the Peters Creek Parkway interchange and east of the Broad Street interchange. All other roadways operate at a LOS of "A-C" as shown in Figure 6. The six (6) levels of service for a roadway are depicted in Figure 7.

e. **Future Levels of Service ("No-Build")** Within the project study area in 2040 US 421/I-40 Business will operate at a LOS "F". Broad Street will operate at a LOS "D" between the Broad Street interchange and Wachovia Street. Second Street will operate at a LOS "D" between the Liberty Street and Main Street. All other roadways will operate at a LOS of "A-C" as shown in Figure 8.

5. Airports

There are no airports or other aviation facilities in the project study area.

6. Other Modes of Transportation

Other modes of transportation include transit, rail, motor freight service and non-motorized (pedestrian and bicycle).

a. Transit

1) Winston-Salem Transit Authority

Winston-Salem Transit Authority (WSTA) provides daily fixed route service for passengers traveling in the City of Winston-Salem.[R3] Within the project study area (PSA); WSTA operates eleven (11) bus routes, as listed in Table 9 below:

Table 9. WSTA Routes within the Project Study Area

Route Number	Route Name	Crossing of US 421 / I-40 Business at	Streets Traveled within PSA	Trips per day*
Day				
12	Country Club to Downtown/ Downtown to Country Club	Cloverdale Avenue	Liberty and First	26
13	Peters Creek/Parkway Plaza to Downtown/ Downtown to Peters Creek/Wal-Mart	Peter's Creek Parkway	Liberty, First and Second	26/22**
14	Stoney Glen to Downtown/ Downtown to Royal Cake/ Stoney Glen	Main and Liberty Streets	Liberty and Main	26
20	Hanes Mall/Thruway to Downtown/ Downtown to Thruway/Hanes Mall	Hawthorne Road	Liberty, First and Second	39/20**
23	Forsyth Tech-West Campus to Downtown/ Downtown to Forsyth Tech/Salem Crest	Broad Street	Liberty, First, Peters Creek Parkway, Broad and Second	35/21**
29	Plaza South Apts./Waughtown to Downtown/ Downtown to / Waughtown/Plaza South Apts.	Marshall and Cherry Streets	Liberty, First, Marshall and Cherry	29/26**
30	Autumn Oaks to Downtown/ Downtown to Autumn Oaks	E. Salem Avenue	Second, Church, First and Main	27
19	Stratford Industrial Park to Downtown	Stratford Road	Liberty, First and Second	10
40	West End Trolley/Shuttle	N/A	Second	31
2020	Downtown to Thruway/Hanes Mall/ Hanes Mall/Thruway to Downtown	Hawthorne Road	Liberty, First and Second	10***
2323	Salem Crest Apt/Wal-Mart to Downtown/ Downtown to FTCC/ Salem Crest Apt/Wal-Mart	Peter's Creek Parkway	Liberty, First, Peters Creek Parkway, Broad and Second	10***

*Total trips (arrivals and departures)
**Second value denotes Saturday Service
***Monday thru Saturday Service

2) Piedmont Authority for Regional Transportation

Piedmont Authority for Regional Transportation (PART) provides daily fixed route service for passengers traveling within the 10 county area that encompasses the Triad Region of North Carolina.[R4] Within the study area, PART operates five (5) bus routes, as listed in Table 10 below:

Table 10. PART Routes within the Project Study Area

Route Number	Route Name	Usage or Crossing of US 421/ I-40 Business	Trips per day*
1	Winston-Salem Express	Yes[1]	40
6	Surry County Express	Yes[2]	4
8	Davidson County	Yes[3]	2
12	North Forsyth County	Yes[2]	2
13	Yadkin County	Yes[4]	2
14	Davie County	Yes[4]	2

*Total trips (arrivals and departures)

1 Arrives into Winston-Salem westbound on US 421/ I-40 Business exiting at Main Street to access the Clark Campbell Multimodal Transportation Center. Departs the Transportation Center via Fourth Street.

2 Arrives into Winston-Salem southbound on US 52 exiting at N. Martin Luther King Jr. Blvd. to Liberty Street to access the Clark Campbell Multimodal Transportation Center. Departs the Transportation Center via Liberty Street entering onto westbound US 421/ I-40 Business.

3 Arrives into Winston-Salem northbound on US 52 exiting at N. Martin Luther King Jr. Blvd. to Liberty Street to access the Clark Campbell Multimodal Transportation Center. Departs the Transportation Center via Liberty Street entering onto westbound US 421/ I-40 Business.

4 Arrives eastbound on US 421/ I-40 Business exiting at Liberty/Main Street to access the Clark Campbell Multimodal Transportation Center via Main Street. Departs the Transportation Center via Liberty Street entering onto westbound US 421/ I-40 Business.

PART operates two (2) bus routes, Route 4 (Medical Connections) and 5 (NC Amtrak Connector), outside the project study area which may be affected during construction of the project due to detoured traffic.

See Section V.G. [Transit] for potential effects to transit services during project construction.

b. Rail There are no freight or passenger rail service providers in the project study area.

c. Motor Freight Service Forsyth County and the Piedmont Triad is a major transfer point for motor freight service. Over 100 common carriers provide scheduled route service to the Piedmont Triad area and about 55 freight terminals in Forsyth County are available. Numerous freight operators are located in the Triad region and substantial truck traffic uses I-40, Future I-74 and US 52, both for local access to freight facilities and for through travel trips to the Eastern U.S.[R5] There are no freight facilities in the project study area.

d. Non-Motorized Transportation Neither pedestrian nor bicycle facilities are allowed on a freeway type facility.

1) Pedestrian Facilities

All of the cross streets have accommodations for pedestrians, refer to Table 6 as to location and width of sidewalks provided. The referenced sidewalks connect to existing sidewalk systems.

The City of Winston-Salem Parks and Recreation Department manages a greenway system which is comprised of eleven (11) greenways. Of the eleven (11) greenways only one (1), the Strollway, crosses the project study area. The Strollway is a 1.2 mile, eight (8) foot wide paved and/or pea gravel greenway which connects the Downtown, beginning at Fourth Street, to Old Salem, ending at Salem Avenue. The Strollway passes under US 421/I-40 Business at the Liberty Street Bridge.

2) Bicycle Facilities

The City of Winston-Salem has two (2) bicycle routes that cross the project, as listed in Table 11 below:

Table 11. City of Winston-Salem Bike Routes within the Project Study Area

Route Number	Route Name	Crossing of US 421/ I-40 Business at
8	Downtown Loop	Crafton and Broad Streets
11	Old Salem Connector	Liberty and Main Streets

7. Crash Data

A crash analysis was conducted for US 421/I-40 Business and NC 150 (Peters Creek Parkway) in the project study area for a five year time period, from March 1, 2008 through February 28, 2013. The roadway segments were compared to the 2009-2011 statewide crash rates for a comparable road type and configuration and are depicted in the tables below.

The crash analysis on US 421/I-40 Business was conducted from 400 feet west of W. Fourth Street Overpass to 1200 feet east of Church Street Overpass for a length of 1.24 miles. The annual average daily traffic (AADT) for this section equates to a total vehicle exposure rate of 162.50 million vehicle miles traveled (MVMT). There were 361 reported crashes along this segment. The most frequent type of crash (68%) consisted of rear-end, slow or stopped, followed by sideswipe – same direction (11%) and fixed object (4%). Table 12a shows the comparison of the crash rates for the analyzed section of US 421/I-40 Business. **Current crashes rates exceed the statewide crash rates and the critical rates in all categories except the Fatal category only.**

Table 12a. Crash Rate Comparisons (US 421/I-40 Business)

Rate	Crashes	Crash Rate per 100MVM[1]	Statewide Rate[1,2]	Critical Rate[1]
Total	361	222.15	91.97	104.66
Fatal	0	0.00	0.42	1.56
Non-Fatal Injury	97	59.69	26.34	33.27
Night	59	36.31	22.93	29.42
Wet	80	49.23	20.61	26.78

1 Million Vehicle Miles

2 2009-2011 Statewide Crash Rates for 4 or more Lanes Divided with Full Control Access Urban United States Routes in North Carolina

Denotes Crash Rate per 100MVM exceeds Statewide and/or Critical Rate

The crash analysis on NC 150 (Peters Creek Parkway) was conducted from 150 feet south of Fourth Street to 150 feet north of W. First Street for a length of 0.60 miles. The annual average daily traffic (AADT) for this section equates to a total vehicle exposure rate of 6.84 million vehicle miles traveled (MVMT). There were 63 reported crashes along this segment. The most frequent type of crash (40%) consisted of rear-end, slow or stopped, followed by angle (32%) and sideswipe, same direction (13%). Table 12b shows the comparison of the crash rates for the analyzed section of NC 150 (Peters Creek Parkway). **Current total crash rate exceeds the statewide crash rate and the critical rate. Non-Fatal injury crash rate exceeds the statewide crash rate and the critical rate. Night and wet crash rates exceed the statewide crash rate.**

Table 12b. Crash Rate Comparisons (NC 150 (Peters Creek Parkway))

Rate	Crashes	Crash Rate per 100MVM[1]	Statewide Rate[1,2]	Critical Rate[1]
Total	63	921.32	428.23	565.76
Fatal	0	0.00	0.93	14.31
Non-Fatal Injury	20	292.48	139.91	221.66
Night	10	146.24	83.79	148.71
Wet	5	73.12	68.47	127.85

1 Million Vehicle Miles

2 2009-2011 Statewide Crash Rates for 4 or more Lanes Undivided Urban North Carolina Routes in North Carolina

Denotes Crash Rate per 100MVM exceeds Statewide and/or Critical Rate

8. Other Highway Projects in the Area

Currently, there are ten (10) projects included in the Draft 2013-2023 State Transportation Improvement Program (STIP) located in or near the project study area.

STIP Project U-2826B - US 52 from I-40 to the proposed Northern Beltway, involves widening and improving the existing US 52 roadway, shoulders, and interchanges. Construction began in fiscal year (FY) 2011. Construction completed December 2013.

STIP Project U-2925 – Salem Creek Connector from SR 4326 (Rams Drive) to SR 4325 (Martin Luther King Drive), constructing a new location roadway and other transportation improvements. Design-Build project let in fiscal year 2012. Construction began in FY 2013. Construction completion anticipated December 2015.

STIP Project U-4741 – Various Bicycle, Greenway and Sidewalk Projects within MPO Area. This project is Locally Administered. Construction began in fiscal year 2013.

STIP Project U-4917 – Transportation Improvements for Peter Creek Parkway, First Street, Second Street and Brookstown Avenue. This project is Locally Administered. Programmed for Planning and Environmental Studies only.

STIP Project U-4918 - Research Park Boulevard from SR 4326 (Rams Drive (formerly Stadium Drive)) to Third Street, involves constructing a new location roadway and other transportation improvements within the proposed Wake Forest Innovation Quarter. This project is an economic development program project. Construction completed October 2013.

STIP Project U-5020 – Winston-Salem Interim Signal System Improvements. This project is Locally Administered. Planned, Designed and Constructed by the City of Winston-Salem. Construction completed in 2009.

STIP Project EB-5601 – Wake Forest Innovation Quarter Rail/Trail - Phase I, Third Street to SR 4325 (Martin Luther King, Jr. Boulevard) in Winston-Salem. Construct Multi-use Path along NCDOT Rail Corridor through Wake Forest Innovation Quarter. This project is Locally Administered. Planning - Design and Construction by the City of Winston-Salem. Construction scheduled to begin in fiscal year 2014.

STIP Project C-4981 – Install Intelligent Transportation System (ITS) Devices at Selected Locations in Winston-Salem. Under Construction - administered by City of Winston-Salem. Construction completion anticipated FY 2015.

STIP Project C-5142 – Interim Winston-Salem Traffic Signal System Upgrades In Two Phases. Project administered by the City of Winston-Salem. Construction completed January 2013.

STIP Project C-5224 – Upgrade City of Winston-Salem Signal System. This project is Locally Administered. Planning / Design by the City of Winston-Salem - In Progress. Construction scheduled in fiscal year 2013. Construction completion anticipated FY 2016.

D. TRANSPORTATION AND COMPREHENSIVE/LAND USE PLANS AND OTHER TRANSPORTATION DOCUMENTS

1. Transportation Plans

a. Winston-Salem Urban Area 2035 Long Range Transportation Plan Update and Air Quality Conformity Analysis Report. The proposed project is consistent with the Winston-Salem Urban Area 2035 Transportation Plan Update and the Air Quality Conformity Analysis Report was adopted by the Winston-Salem Urban Area Transportation Advisory Committee (TAC) on January 17, 2013 and approved by FHWA on March 6, 2013. The 2035 Transportation Plan Update includes a fiscally constrained plan that identifies projects and priorities for the Winston-Salem Metropolitan Planning Organization (MPO). This project is the first listed project on the 2016-2021 Street and Highway Project List of the 2035 Winston-Salem Urban Area 2035 Transportation Plan Update.

b. Winston-Salem Urban Area Comprehensive Transportation Plan 2012 (CTP). The Winston-Salem Urban Area Comprehensive Transportation Plan 2012 (CTP) Street and Highway Map was adopted by the TAC in May 17, 2012. NCDOT adopted the final CTP on December 6, 2012 This project is listed in Chapter 2 - Recommendations in the Other Major Projects: Long-Term section and on the Highway Inset Map H – Downtown Winston-Salem of the CTP this project is listed as a Freeway that "needs Improvement".

2. Local Thoroughfare Plans

Winston-Salem Urban Area Collector Street Plan 2007. In 2002, the MPO Thoroughfare Plan was updated and expanded to include the newly identified urban area and was jointly adopted by both the MPO and the North Carolina Department of Transportation. The Thoroughfare Plan classifies roads into freeway/expressways and major and minor thoroughfares. To identify a finer grain street and highway system for local planning purposes, an additional classification of road type needs to be included – Collector Streets. This plan denotes US 421/I-40Business as a freeway. The plan does not explicitly reference STIP Project U-2827B. The CTP has replaced the MPO Thoroughfare Plan.

3. Land Use Plans

The Legacy 2030 Update (August 2013). Legacy, adopted 2001, is the City of Winston-Salem comprehensive plan. The Legacy Comprehensive Plan was summarized in the Community Characteristics Report (CCR). The Legacy 2030 Update only made changes to small portions of the Legacy Comprehensive Plan. The adopted Legacy 2030 Update – Chapter 5 Transportation, primarily discusses the link between transportation and land use. Though the Legacy 2030 Update does not reference many specific projects, however it does reference improvements to US 421/I-40 Business and all of the MPO documents listed in this document.

4. Other Transportation Documents

1. **NCDOT State Transportation Improvement Program (STIP).** The NCDOT 2012-2020 STIP provides funding for this project. The STIP identifies funds for the U-2827B project to be available in Fiscal Year (FY) 2018 for right-of-way, and in FY 2018-2020 for construction.

   The Draft NCDOT 2013-2023 STIP provides funding for this project. The Draft STIP identifies funds for the U-2827B project to be available in Fiscal Year (FY) 2015 for right-of-way, and in FY 2016-2020 for construction.

2. **Winston-Salem Urban Area MPO 2012-2018 Metropolitan Transportation Improvement Program (MTIP).** The Winston-Salem Urban Area MPO's *Metropolitan Transportation Improvement Program* (MTIP) was last updated in February 2014. The Winston-Salem Urban Area MPO 2012-2018 MTIP lists this project in the "Street and Highway, Bridge, Bicycle, Pedestrian and Enhancements Program". The MTIP identifies funds for the U-2827B project to be available in 2015 for right-of-way, and in 2016-2020 for construction.

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