



US 1/US 1A/FALLS OF NEUSE ROAD INTERSECTION ANALYSIS

EXECUTIVE SUMMARY





Executive Summary Table of Contents

EXECUTIVE SUMMARY	1
ES.1 INTRODUCTION	1
ES.3 INTERIM IMPROVEMENTS	3
ES.3 INTERCHANGE ALTERNATIVES ANALYSIS	3
ES.3.1 Development of Alternatives	3
ES.3.2 Traffic Operations	4
ES.3.2 Comparison of Conceptual Alternatives	5
ES.4 Recommended Improvements from Study	8
<i>Selection of Locally Preferred Interchange Alternative</i>	8
ES.4.1 Diverging Diamond Interchange Costs and Impacts	8

EXECUTIVE SUMMARY

ES.1 INTRODUCTION

The Capitol Area Metropolitan Planning Organization (CAMPO) initiated the US 1/US 1A/ Falls of Neuse Road Intersection Transportation Feasibility and Impact Analysis as part of their FY 2014 “Hot Spot” Projects. This “hot spot” analysis builds upon CAMPO’s 2006 US 1 North Corridor Phase I Study which calls for the US 1 Corridor to be upgraded to a freeway facility by 2030, and to convert the US 1/ US 1A/Falls of Neuse intersection will be converted from an at grade intersection to a grade separated interchange.

The STV study team collaborated with the US 1 Council of Planning which acted as an Executive Steering Committee (ESC). The study team developed, analyzed, and compared three separate interchange alternatives and presented the findings to the ESC. Based on the analysis, the ESC selected the Locally Preferred Alternative.

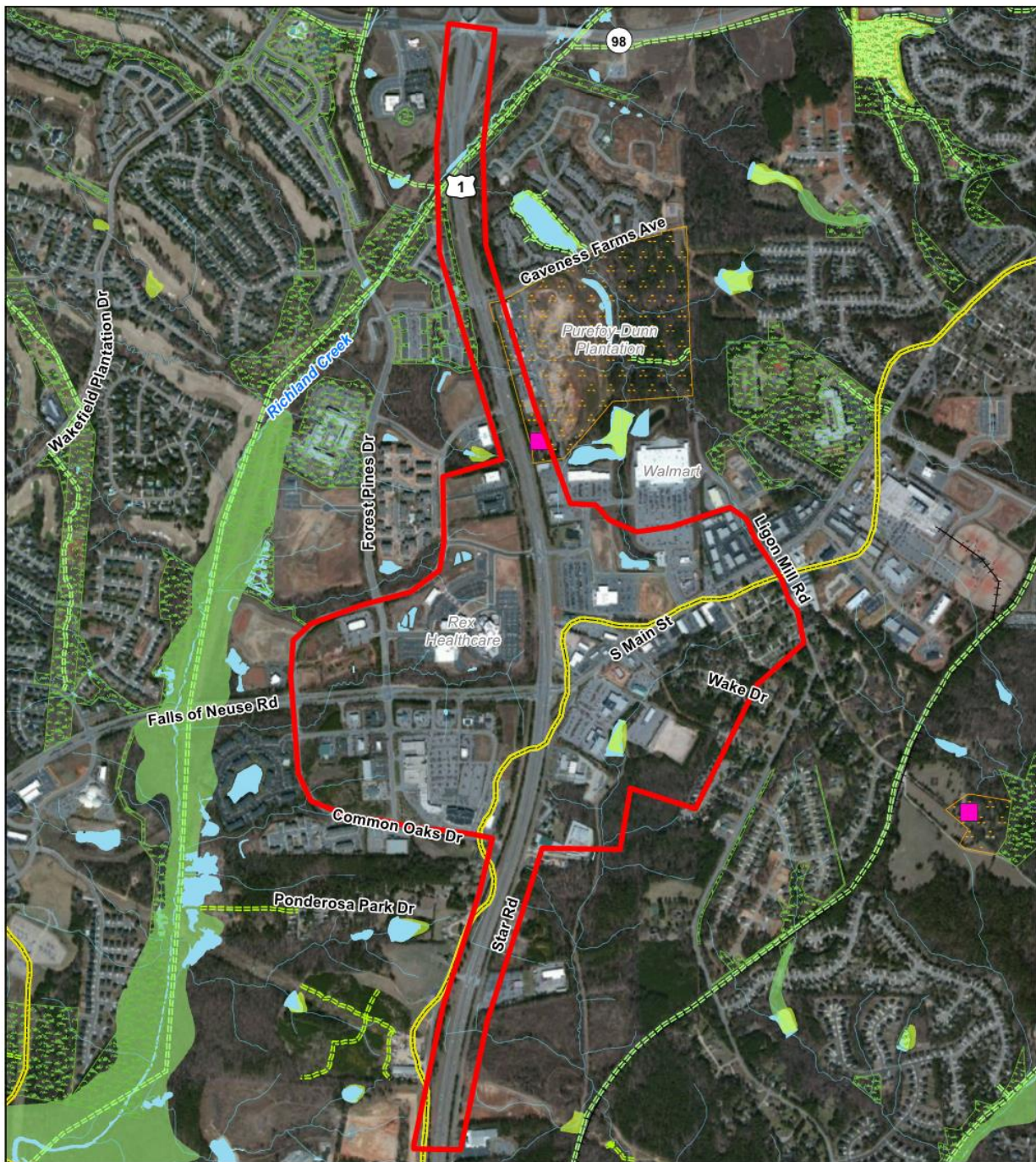
The primary elements of the study included:

- Documenting existing roadway conditions, traffic operations, and land use
- Gathering data to include GIS information, turning movement counts, signal timing information, NCDOT crash history, any proposed roadway improvement plans, and development/site plans
- Identifying and analyzing interim safety and operational improvements
- Developing sketch level conceptual designs for three interchanges
- Comparison of interchange alternatives
- Selection of a locally preferred interchange alternative

ES.2 STUDY AREA

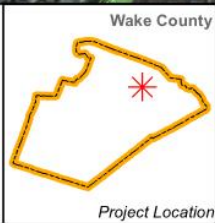
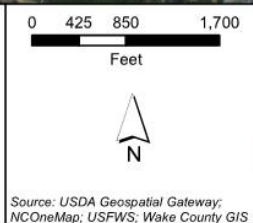
The study area is location in Wake County and is within the City of Raleigh and the Town of Wake Forest limits. This study is focused in the immediate vicinity of the US 1/US 1A/Falls of Neuse Road at grade intersection. The project study area (Figure 1) was defined to be a 500 foot corridor centered on the US 1 and Falls of Neuse/South Main Street corridors and includes the following intersections:

- US 1/US 1A/ Falls of Neuse Road
- US 1 and Directional Crossover (approximately 1,500 feet north of US 1A/South Main Street/Falls of Neuse Road)
- Falls of Neuse Road and Directional Crossover (approximately 870 feet west of US1)
- US 1A (South Main Street) and Star Road
- US 1A (South Main Street) and Wake Drive
- US 1A (South Main Street) and Walmart entrance



Study Area Limits	Watershed Boundary
Rail	Honeycutt Creek-Neuse River
Wetlands	Horse Creek
Freshwater Emergent Wetland	Perry Creek-Neuse River
Freshwater Forested/Shrub Wetland	Richland Creek
Freshwater Pond	Smith Creek
Lake	Trails
Riverine	Open Space
Stream	Historic Properties
Water Body	Historic Points
Conservation Easement	

Figure 1
Study Area
US-1 / US-1A /
Falls of Neuse Blvd.
Feasibility Study
 June 2014



Source: USDA Geospatial Gateway; NCOneMap; USFWS; Wake County GIS

ES.3 INTERIM IMPROVEMENTS

NCDOT Division 5 has two projects under development which serve as interim safety and operational improvements at the intersection and along the US 1 corridor. The widening of US 1 from the US 1A/Falls of Neuse intersection to the interchange with NC 98 Bypass (Project Number 13097) will provide an additional lane in the northbound and southbound directions. In addition will provide right turn lanes, a signalized crossover to include additional left turn lane at Caveness Farms, and the removal of the southbound left turns at the shopping center entrance just south of Caveness Farms.

NCDOT Division 5 Engineers are also considering improvements at the US 1A at the intersection with US 1. In its current configuration, Falls of Neuse has 2 westbound lanes, but US 1A only has one westbound through lane. NCDOT recommends a slight widening along the north side US 1A to allow for a second westbound through lane and still provide a right turn lane (Figure 2).

Figure 2: Additional WB Through Lane on US 1A



ES.3 INTERCHANGE ALTERNATIVES ANALYSIS

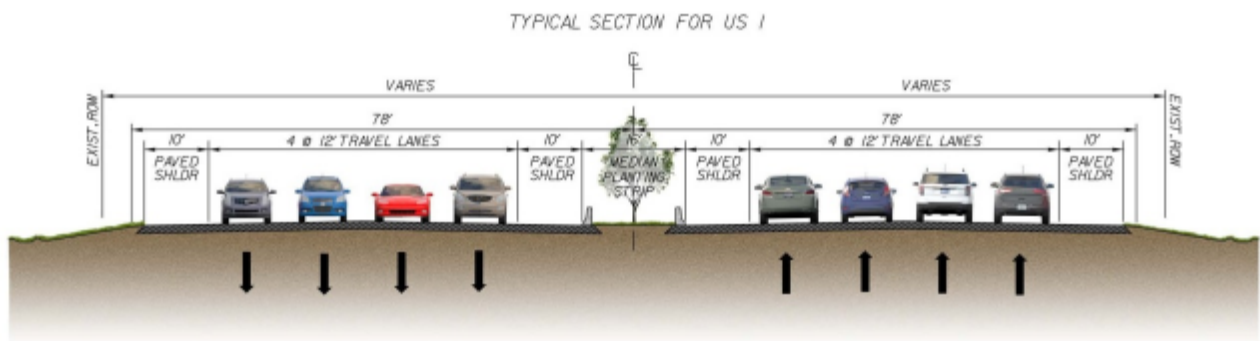
ES.3.1 Development of Alternatives

In collaboration with the US 1 Council of Planning and CAMPO, STV identified the three interchange alternatives to be considered for the study: a Single Point Urban Interchange (SPUI), Diverging Diamond Interchange (DDI), and a Compressed Diamond Interchange.

Sketch level conceptual designs were developed for the three alternatives using the following assumptions:

- US 1 Alignment was shifted slightly to the east to reduce environmental impacts
- US 1A alignment was shifted to the south to provide more desirable crossing with US 1
- US 1 would travel over US 1A/ Falls of Neuse
- US 1 as a freeway facility with the US Corridor Phase 1 recommended 8-lane typical section
- US 1A and Falls of Neuse as a 4-lane curb and gutter section with raised median
- No vertical element to this study

Figure 3: US 1 Typical Section



ES.3.2 Traffic Operations

A planning level 2040 level of service traffic analysis was developed. Turning movement data was obtained from the TransCAD model for the main intersection of US 1/US 1A. Growth rates of 3.0-4.0% were determined from the model and were applied to the side street volumes. The through volumes from the US 1/US 1A intersection were then distributed throughout the US 1/Capital Boulevard and US 1A/Falls of Neuse Road/South Main Street corridors. These traffic volumes were input into the Synchro models and the following models were developed:

- 2040 No Build (Existing Conditions with Interim Improvements)
- 2040 Build – CDI (Existing Conditions with Interim Improvements, with US 1/US 1A Diamond Interchange)
- 2040 Build – SPUI (Existing Conditions with Interim Improvements, with US 1/US 1A SPUI Interchange)
- 2040 Build – DDI (Existing Conditions with Interim Improvements, with US 1/US 1A DDI Interchange)

Synchro/SimTraffic 8.0 was used to analyze the intersections in the study area and obtain a LOS and delay per vehicle for the unsignalized and signalized intersections. SimTraffic was again used to simulate the traffic during each peak hour and observe how each of the interchange models affected the intersections in the project vicinity.

The results of the 2040 No Build Conditions Level of Service analysis indicate each of the intersections during the PM peak hour; operate at a failing LOS F. Four of these intersections operate at a LOS F during the AM peak hour. The key study intersection, US 1 (Capital Boulevard) and US 1A (Falls of Neuse Road/South Main Street), operates at a LOS F during both the AM and PM peak hours, with all four of the approaches operating deficiently during both of the morning and afternoon commute.

Both the SPUI and the DDI Interchange scenario resulted in an acceptable LOS operation at the main intersection of US 1/US 1A during both of the peak periods. However, the Compressed Diamond Interchange scenario resulted in a LOS F operation for all approaches at the main intersection of US 1/US 1A.

Table 1: 2040 No Build and Interchange Conditions LOS

Level of Service																					
Intersection	Type	Intersection				Northbound				Southbound				Eastbound				Westbound			
		AM		PM		AM		PM		AM		PM		AM		PM		AM		PM	
		LOS	DELAY	LOS	DELAY	LOS	DELAY	LOS	DELAY	LOS	DELAY	LOS	DELAY	LOS	DELAY	LOS	DELAY	LOS	DELAY	LOS	DELAY
2A. Capital Boulevard & Falls of Neuse Road/South Main Street	No Build	F	376.4	F	494.6	F	200.4	F	590.4	F	424.2	F	365.3	F	303.6	F	410.5	F	582.3	F	574.5
2B. Capital Boulevard & Falls of Neuse Road/South Main Street - SB RAMP	Diamond Interchange	F	115.4	F	219.0	-	-	-	-	F	277.5	F	177.7	F	147.9	F	372.6	C	34.7	C	26.4
2B. Capital Boulevard & Falls of Neuse Road/South Main Street - NB RAMP		F	212.0	F	325.7	E	61.5	F	591.8	-	-	-	-	D	42.1	C	29.2	F	352.5	F	363.9
2C. Capital Boulevard & Falls of Neuse Road/South Main Street	SPUI Interchange	C	27.0	C	28.0	E	58.7	E	61.9	D	46.9	D	49.2	C	31.4	C	22.6	B	14.6	B	17.4
2D. Capital Boulevard & Falls of Neuse Road/South Main Street - SB RAMP	DDI Interchange	C	29.1	C	22.7	-	-	-	-	B	14.8	C	31.8	C	35.6	B	11.2	C	34.1	D	54.0
2D. Capital Boulevard & Falls of Neuse Road/South Main Street - NB RAMP		D	47.4	C	26.2	D	41.1	D	36.5	-	-	-	-	D	44.7	F	212.1	E	76.1	A	8.7

A - No Build Signalized Intersection

B - Intersection converted to a Compressed Diamond Interchange

C - Intersection converted to a Single Point Urban Interchange

D - Intersection converted to a Diverging Diamond Interchange

ES.3.2 Comparison of Conceptual Alternatives

Each alternative was analyzed and evaluated on the following criteria:

- Cost
- Environmental, Cultural, Right of Way, and Development Access Impacts
- Traffic Operations
- Bicycle, Pedestrian, and Transit Considerations
- Additional Advantages and Disadvantages



US 1/US 1A/Falls of Neuse Road Intersection Transportation Feasibility and Impact Analysis

It was assumed that Starr Road, which serves as a frontage road in the southeast quadrant of the intersection, would be relocated as shown in the 2006 US 1 Phase I Report. Table 2 presents a comparative impact table for the CDI, SPUI and DDI. Right of way costs and impacts associated with the frontage and backage roads were excluded from the analysis.

Table 2: US 1/US 1A/Falls of Neuse Road Comparison of Conceptual Alternatives						
Option	Cost	Impacts	Traffic Operations: LOS AM/PM	Bicycle/Pedestrian/Transit Considerations	Other Advantages	Disadvantages
Single Point Urban Interchange (SPUI)	\$35.0M FY 2014	<i>Environmental:</i> More <i>Cultural:</i> Most <i># Driveways:</i> 12 <i>Right of Way:</i> 8.5 Acres 10 Parcels	C / C	<i>Bicycle and Pedestrian:</i> Loss of some sidewalk in NE quadrant of intersection near dealership <i>Transit:</i> Improved LOS and Delay on US 1 / Capital Boulevard	<ul style="list-style-type: none"> Free flowing US 1 Smooth progression along US 1A Fewer conflict points than a traditional intersection Driver familiarity with interchange configuration Single signalized intersection Reduction of driveways in vicinity of intersection reduces number of crashes 	<ul style="list-style-type: none"> Less conducive to accommodating bicyclists and pedestrians crossing Capital Boulevard Large area of uncontrolled pavement which could leave to safety concerns
Diverging Diamond Interchange (DDI)	\$32.5M FY 2014	<i>Environmental:</i> More <i>Cultural:</i> More <i># Driveways:</i> 9 <i>Right of Way:</i> 8 acres 13 parcels	SB Ramp: C/C NB Ramp: D/D	<i>Bicycle and Pedestrian:</i> Loss of sidewalk in NE quadrant of intersection near dealership <i>Transit:</i> Improved LOS and Delay on US 1 / Capital Boulevard	<ul style="list-style-type: none"> Free flowing US 1 Fewer conflict points Less phases than traditional interchange (2-phase) More conducive to accommodating bicyclists and pedestrians crossing US 1 	<ul style="list-style-type: none"> Unconventional interchange configuration
Compressed Diamond Interchange (CDI)	\$27.8 M FY 2014	<i>Environmental:</i> Least <i>Cultural:</i> Least <i># Driveways:</i> 9 <i>Right of Way:</i> 8 acres 14 parcels	SB Ramp: F/F NB Ramp: F/F	<i>Bicycle and Pedestrian:</i> Loss of sidewalk in NE quadrant of intersection near dealership <i>Transit:</i> Improved LOS and Delay on US 1 / Capital Boulevard	<ul style="list-style-type: none"> Free flowing US 1 	<ul style="list-style-type: none"> Intersection still experiences queuing Substantial left turn volumes onto US 1 and not enough storage on the bridge deck

NOTES: For the purpose of comparison, costs and ROW impacts do not include frontage and backage roads.

ES.4 Recommended Improvements from Study

Signal Timing

Signal timing plans were obtained from the City of Raleigh and reviewed. Using Synchro and SimTraffic, STV optimized the intersection splits and cycle length for the intersection. The signal timing adjustments of this study takes into account the additional roadway improvements along US 1 north of the intersection and the addition of a through lane for WB US 1A.

With the implementation of the signal timing adjustments at the Capital Boulevard and Falls of Neuse Road/South Main Street intersection and capacity improvements on US 1A (South Main Street), the level of service of the intersection increased from an LOS E in the AM and PM peak hours to an LOS D with a reduction in delay. In addition the LOS improved with a decrease in delay in all intersection approaches.

Access Management

The reduction of driveway access in the close proximity of intersection will improve vehicular safety and help ease congestion along US 1A. Currently US 1A has closely spaced driveways and access points to commercial development. Potential safety improvements could include limiting access points by monolithic islands or delineators which would limit leftovers. An access management plan should be considered along US 1A particularly with additional development in progress.

Selection of Locally Preferred Interchange Alternative

The three alternatives were presented along with analysis results. Because of the operational deficiencies the Compressed Diamond Interchange was dismissed. Although the SPUI and DDI had distinct advantages, the Diverging Diamond Interchange was selected and endorsed by the US1 Council of Planning as the preferred alternative, based on cost, traffic operation and the benefits of bicycle and pedestrian safety.

ES.4.1 Diverging Diamond Interchange Costs and Impacts

A planning level cost analysis was completed for the Locally Preferred Alternative, the DDI Interchange as well as for the frontage and backage roads. The costs associated with each item came from data sources such as recent bid tabulations, NCDOT's 2014 Revised Cost per Mile spreadsheet, and previous cost estimating experiences. The widening along US 1 for the purpose of this study assumes 2000 feet of widening along US 1 to the south and north of the interchange location. The widening would consist of widening from a 4-lane section to an 8-lane section to the south of the interchange, and widening from a 6-lane section to an 8-lane section to the north. The widening takes into account the planned widening along US 1 as part of the Caveness Farms development. Constructing the DDI would require acquisition of 5 parcels and 16.76 acres of right of way. The construction costs do not include the acquisition of the parcels or the acreage required for the interchange. The total construction costs for the locally preferred alternative is approximately \$40.1 Million (FY 2014) which includes a 30% Miscellaneous and Mobilization cost and a 15% Engineering and Contingencies cost. The costs are also shown for 2030 which uses a 2.5% growth rate which is compounded annually. Table 2 shows the detailed breakdown of costs for the preferred alternative.

Table 2: Cost Estimate for the Locally Preferred Alternative

Functional Diverging Diamond Interchange Cost Estimate					
Description	Quantity		Unit Price	Amount (2014)	Amount (2030) ¹
US 1					
Widen Existing 4-Lane w/ Median to 8-Lane Interstate (US 1 - 2000' South of Interchange)	0.38	miles	\$12,000,000	\$4,560,000	\$6,769,346
Widen Existing 6-Lane w/ Median to 8-Lane Interstate (US1 - 2000' North of Interchange)	0.38	miles	\$7,600,000	\$2,888,000	\$4,287,252
Interchange					
Dual Bridges along US 1 over DDI	23,500	SF	\$200	\$4,700,000	\$6,977,176
Approach Slabs (4 @ 72' x 25')	7200	SF	\$45	\$324,000	\$480,980
Ramp Connections from US 1 to DDI	4	EA	\$900,000	\$3,600,000	\$5,344,220
Spur ramps	4	EA	\$375,000	\$1,500,000	\$2,226,758
US 1A/Falls of Neuse Road					
New Location 4-Lane Curb & Gutter w/ Raised Median + Bike Lanes and Sidewalk (Falls of Neuse through Interchange Ramps) ²	0.45	miles	\$5,233,000	\$2,354,850	\$3,495,788
Widening US 1A + Bike Lanes and Sidewalk (From Ramp Termini to Walmart Entrance)	0.27	miles	\$5,033,000	\$1,358,910	\$2,017,310
Frontage and Backage Roads³					
New Location 3-Lane w/ Curb & Gutter and Sidewalk on Both Sides (Backage Road from Starr Road to US 1A)	0.77	miles	\$3,820,000	\$2,941,400	\$4,366,525
New Location 3-Lane w/ Curb & Gutter and Sidewalk on One Side (Frontage Road from US 1A to Caveness Farms)	0.7	miles	\$3,710,000	\$2,597,000	\$3,855,261
Subtotal				\$26,824,160	\$39,820,616
Misc & Mobilization (30%)				\$8,047,248.00	\$11,946,184.89
CONTRACT COST				\$34,871,408	\$51,766,801
Engineering & Contingencies (15%)				\$5,230,711	\$7,765,020
CONSTRUCTION COST				\$40,102,119	\$59,531,821
TOTAL				\$40,102,119	\$59,531,821
Notes:					
Costs are based on 2014 NCDOT Cost per Mile and reasonable bid estimates					
¹ Assumes a 2.5% growth rate per year compounded annually					
² No vertical element to this study, so assume this section is entirely new location					
³ Assumes same general alignment as 2006 Phase I Report					