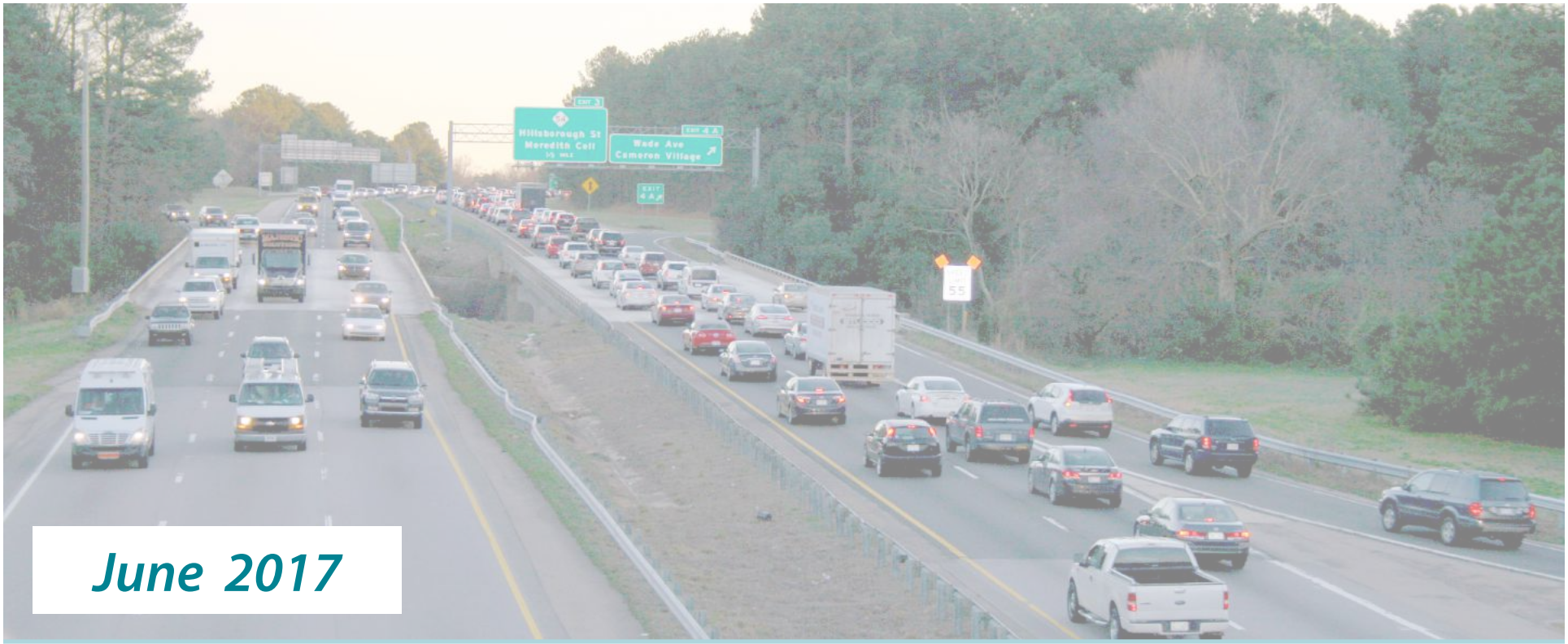
U.S. Department of Transportation
Federal Highway Administration

STIP Project No. U-2719

I-440 Improvement Project

From south of Walnut Street in Cary to east of Wade Avenue in Raleigh

ENVIRONMENTAL ASSESSMENT



June 2017

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June 2017

I-440 Improvement Project

From south of Walnut Street in Cary to east of Wade Avenue in Raleigh

Federal Aid Project No. IMSNHS-0440(10)
WBS No. 35869.1.2
STIP Project No. U-2719

Administrative Action

ENVIRONMENTAL ASSESSMENT

UNITED STATES DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION &
NC DEPARTMENT OF TRANSPORTATION

Submitted Pursuant to the National Environmental Policy Act 42 USC 4332(2)(c) and 49 USC 303

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June 2017

I-440 Improvement Project

From south of Walnut Street in Cary to east of Wade Avenue in Raleigh

Federal Aid Project No. IMSNHS-0440(10)

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NC DEPARTMENT OF TRANSPORTATION

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TC CHAPTER

Table of Contents

SUPPORTING DOCUMENTATION: A LIST OF SUPPORTING DOCUMENTATION IS INCLUDED AT THE END OF EACH CHAPTER.

TABLES

EXHIBITS

APPENDICES

NR CHAPTER

Note to the Reader

What's in this document?

The North Carolina Department of Transportation (NCDOT) prepared this environmental document in accordance with the requirements set forth in the National Environmental Policy Act (NEPA) of 1969, as amended. NCDOT and Federal Highway Administration (FHWA) are joint lead agencies for the proposed project.

This Environmental Assessment (EA) summarizes the potential environmental impacts and benefits of the proposed widening improvements for I-440/US 1-64 from south of Walnut Street to east of Wade Avenue in Wake County, North Carolina. This EA explains why the project is being proposed, the alternatives considered for the project, potential impacts and benefits, and proposed avoidance, minimization, and/or mitigation measures that would lessen impacts.

Supporting documentation for this EA includes many technical studies and analyses, which are listed at the end of each chapter. This EA uses plain language as much as possible, and includes definitions of technical terms where needed. Where there is a question of meaning, the reader should defer to the applicable technical studies.

NEPA encourages documents that "concentrate on the issues that are truly significant to the action in question, rather than amassing needless detail." (Title 40 of the Code of Federal Regulations, Part 1500.1). Therefore, this document is streamlined to address issues and resources present in the project area and relevant to the project decision making process. The following resources are not addressed in this document because they are not present in the project area: farmland, archaeological resources, mines and mineral resources, wild and scenic rivers, and coastal resources.

Tell us what you think

NCDOT would like to hear your comments about the project and this EA. NCDOT will hold a public hearing after publication of the document at a date and location to be advertised. Comments are welcome any time before and during the hearing, and through the comment period following the hearing.

Copies of this EA are available for review at the following locations and internet site. Supporting documents are available upon request, and the website also includes links to many of these.

Physical addresses where hard copies of the EA can be reviewed:

- **NCDOT Division 5 Office**
  2612 N. Duke Street
  Durham, NC 27704
- **NCDOT Div. 5 District 1 Office**
  4900 District Drive
  Raleigh, NC 27607
- **Athens Drive Community Library**
  1420 Athens Drive
  Raleigh, NC 27606
- **Method Community Park**
  514 Method Road
  Raleigh, NC 27607
- **Thomas Crowder Woodlands Center**
  5611 Jaguar Park Drive
  Raleigh, NC 27606

Website address where a pdf of the EA can be reviewed and downloaded:
https://www.ncdot.gov/projects/i-440improvements/

If you have any comments about the proposed project, please send your comments to:

John F. Sullivan, III, PE

Federal Highway Administration
310 New Bern Avenue, Suite #410
Raleigh, NC 27601-1418

Or

Beverly Robinson, CPM

NCDOT, Project Development Group Supervisor
1548 Mail Service Center
Raleigh, NC 27699-1548

Or

via email to **brobinson@ncdot.gov**.

What happens next?

After comments are received from the public and reviewing agencies, NCDOT and FHWA will consider the input received, as well as the technical studies and evaluation summarized in this EA, to identify the Selected Alternative. The decision, and responses to comments received, will be published in a final environmental document called a Finding of No Significant Impact (FONSI); unless additional environmental studies are determined to be required in an Environmental Impact Statement (EIS).

Upon completion of the FONSI, NCDOT will be authorized to continue into the final design, right of way acquisition, and construction phases of the project.

At this time, it is NCDOT's intention to advertise this project for construction as a design-build project. In the design-build process, construction contractors team up with design engineers to bid on the project. These teams review the preliminary design of the Selected Alternative and try to improve upon the design, lessen impacts, shorten construction times, and reduce costs. The teams' submissions are reviewed by NCDOT and the best value team is awarded the contract. The selected design-build team completes the final design, obtains required permits, and constructs the project.

PC CHAPTER

This chapter identifies the special commitments to avoid, minimize, or mitigate project impacts.

Project Commitments

I-440 Improvements
From south of Walnut Street to east of Wade Avenue
Wake County, North Carolina
STIP Project No. U-2719
Project WBS No. 35869.1.2
Federal Aid Project No. IMSNHS-0440(10)

This "Green Sheet" identifies the special commitments to avoid, minimize, or mitigate project impacts. The commitments are organized by the responsible NCDOT unit.

NCDOT Project Development Section and NCDOT Human Environment Section

- To maintain the "No Adverse Effect' determination for the historic Oak Grove Cemetery if the Ligon Street Build Bridge to North Alternative is selected, during final design NCDOT will conduct outreach with the Method Neighborhood and the City of Raleigh regarding potential aesthetic treatments for the new bridge.
- The Ligon Street Build Bridge to South Alternative would have an "Adverse Effect" on the historic Oak Grove Cemetery. If it is the selected alternative, additional coordination and consultation under Section 106 of the Historic Preservation Act between NCDOT, FHWA, NC Historic Preservation Office, and property owners must occur to explore ways to avoid and minimize impacts and include measures to mitigate adverse effects. Measures needed to resolve adverse effects would be documented in a Memorandum of Agreement.
- To maintain the "No Adverse Effect" determination for the Berry O'Kelly School Historic District, during final design NCDOT will conduct outreach with the Method Neighborhood and the Raleigh Parks and Recreation Department to discuss potential aesthetic treatments and/or a potential public art project for the community side of the wall adjacent to the historic site/Method Community Park.

NCDOT Hydraulics Unit

- Through final design and construction, NCDOT will continue coordination with the City of Raleigh regarding their planned project to relocate the White Oak Lake dam and to modify the lake.
- During final hydraulic design, NCDOT will coordinate with the City of Raleigh Stormwater Services for information on any ongoing stormwater studies being conducted by the City in the project area.
- NCDOT Hydraulics Unit will coordinate with FEMA/NC Floodplain Mapping Program and local authorities to ensure compliance with applicable floodplain management ordinances. Since this project involves construction on or adjacent to FEMA regulated streams at Walnut Creek and House Creek, the construction contractor shall submit sealed as-built construction plans to NCDOT Hydraulics Unit upon completion of project construction, certifying that

the drainage structures and roadway embankment that are located within the 100-year floodplain were built as shown in the construction plans, both horizontally and vertically.

NCDOT Roadway Design Unit and NCDOT Division 5

- NCDOT will coordinate with Raleigh and Cary regarding cost-sharing for sidewalks, multi-use paths, noise walls, median planters, and landscaping. Municipal Agreements will be prepared, as applicable, prior to project construction.
- In order to not adversely impact the Museum Park's activities, features, and attributes and to achieve a de minimis concurrence from the NC Museum of Art (NCMA), FHWA and NCDOT agreed to discuss additional mitigation measures, including potentially contributing to stream restoration projects NCMA is currently developing for stream segments on their property. A Memorandum of Understanding (MOU) will be developed between the parties to define FHWA and NCDOT participation. The MOU will be further discussed in the final environmental document.
- NCDOT will coordinate construction of the I-440 improvement project (U-2719) with construction of the Blue Ridge Road grade separation over the CSX/NCRR railroad tracks near the State Fairgrounds (Project U-4437).
- NCDOT will coordinate with Meredith College and the City of Raleigh on the final design of the relocated Reedy Creek Greenway to be constructed as part of Project U-2719. The design for the relocated greenway will include maintaining the culvert under Wade Avenue that connects Meredith College properties.
- During construction, NCDOT will coordinate with the NC State Fairgrounds (including NC Department of Agriculture and Consumer Services), Carter-Finley Stadium, NC State University, Wolfpack Club, PNC Arena, Gale Force Sports (Division of Carolina Hurricanes), NC State Highway Patrol, and City of Raleigh Police Department regarding traffic flow during construction for major events at these venues west of I-440 that generate major traffic on I-440.
- During construction, NCDOT will coordinate with the Wake County Public School System, transit agencies, and emergency response providers. NCDOT will coordinate with these service providers regarding detour routes and associated route changes that may be necessary during construction.
- During final design, NCDOT will coordinate with NC State University (NCSU) regarding lighting design along I-440 adjacent and near to NCSU greenhouses located between Western Boulevard and Hillsborough Street.

NCDOT Roadway Design Unit and Structure Design Unit

- During final design, NCDOT Roadway Design Unit and Structures Design Unit will coordinate with the NCDOT Rail Division and NCRR to ensure future planned tracks in the NCRR corridor are accounted for.

NCDOT Right of Way Unit and NCDOT Division 5

- NCDOT will coordinate with NC State University and the University Club during final design to explore potential minimization measures and options to address displacement of University Club facilities and the NC State Athletics golf practice facility.

NCDOT Natural Environment Analysis Unit

- NCDOT will conduct re-surveys of the project study area for Michaux's sumac in 2017, prior to the publication of the final environmental document.

1 CHAPTER

Purpose and Need for Project

This chapter describes the reasons why improvements are needed to I-440 in the project area and also describes the purpose of the project.

What's In This Chapter...

WANT MORE DETAILS?

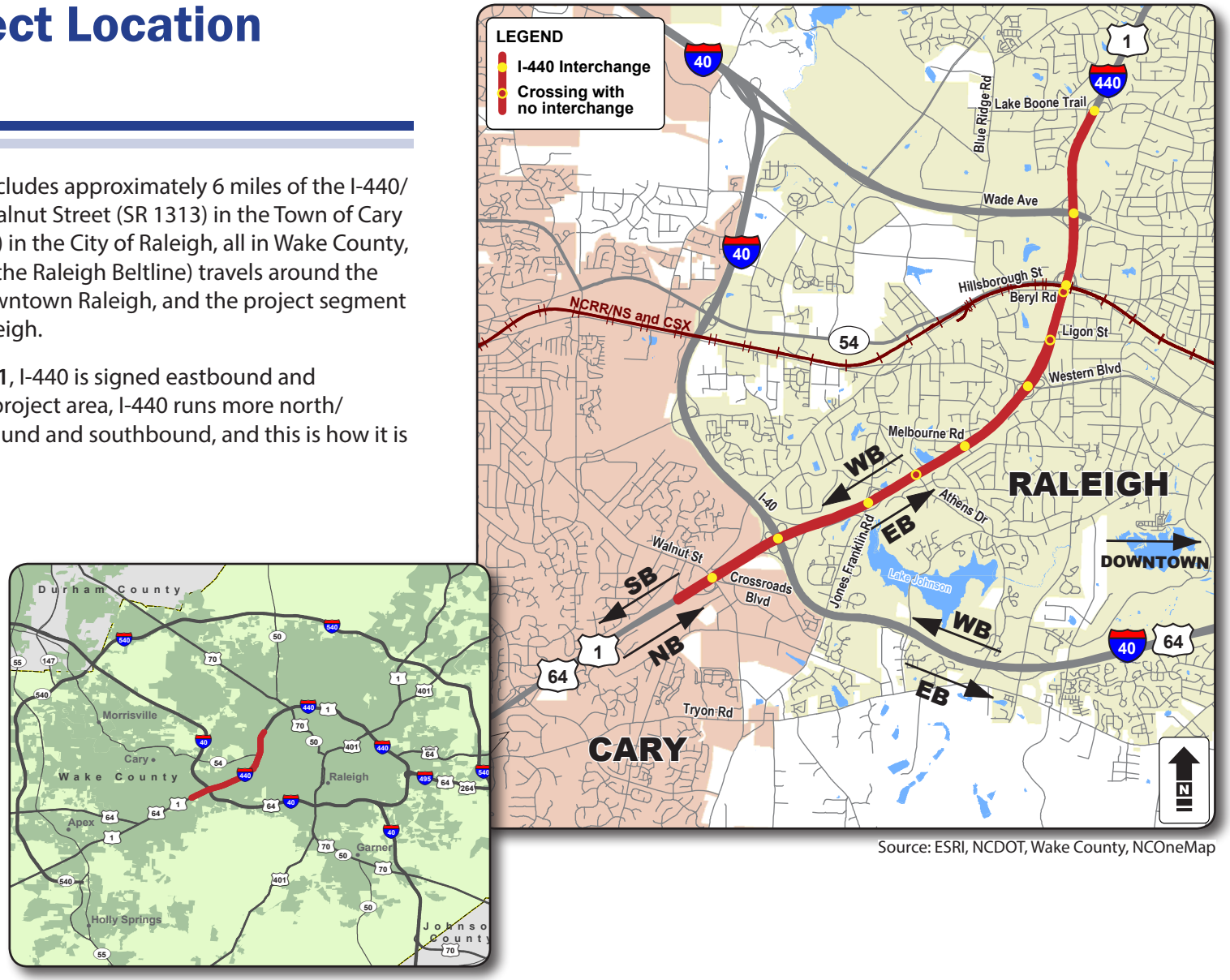
See the list of technical reports at the end of this chapter.

1.1 SECTION Project Location

The proposed project corridor includes approximately 6 miles of the I-440/ US 1-64 freeway from south of Walnut Street (SR 1313) in the Town of Cary to east of Wade Avenue (SR 1728) in the City of Raleigh, all in Wake County, North Carolina. I-440 (known as the Raleigh Beltline) travels around the west, north, and east sides of downtown Raleigh, and the project segment of I-440 is west of downtown Raleigh.

Note that as shown on **Exhibit 1.1**, I-440 is signed eastbound and westbound, even though in the project area, I-440 runs more north/ south. US 1-64 is signed northbound and southbound, and this is how it is oriented in the project area.

Exhibit 1.1: Project Location Map



Source: ESRI, NCDOT, Wake County, NCOneMap

1.2 SECTION Project Purpose and Proposed Action

The purpose of the project is to improve traffic flow, make the roadway operate more efficiently, and enhance mobility on this segment of I-440. The project will address the need to increase capacity, improve the layout of the roadway and interchanges, and fix poor conditions along this segment of I-440.

To fulfill the project's purpose, NCDOT proposes to widen I-440/US 1-64 in the project area from four lanes to six lanes and to eliminate bottlenecks at both ends of the project. The project also will reconstruct interchanges, replace structures, and repair pavement conditions.

The project is included as Project U-2719 in NCDOT's adopted *2016-2025 State Transportation Improvement Program (STIP)* and draft *2017-2027 STIP*. The project would be constructed as a design-build project beginning in 2018. Being a design-build project means the construction contractor will be responsible for the final design plans, right of way acquisition, and construction.

Want to know more about the State Transportation Improvement Program?

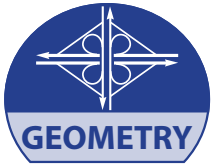
https://connect.ncdot.gov/projects/planning/Pages/State-Transportation-Improvement-Program.aspx

1.3 SECTION Need for Improvements to I-440

Existing and projected future conditions along the I-440 corridor demonstrate a need for improvements in the study area. A video tour of the project corridor that illustrates existing conditions and problems can be viewed at: https://www.ncdot.gov/projects/i-440improvements/.

There are three problem areas described below, relating to:

Capacity
The ability to handle the traffic demand



Geometry
The layout of the roadway and interchanges

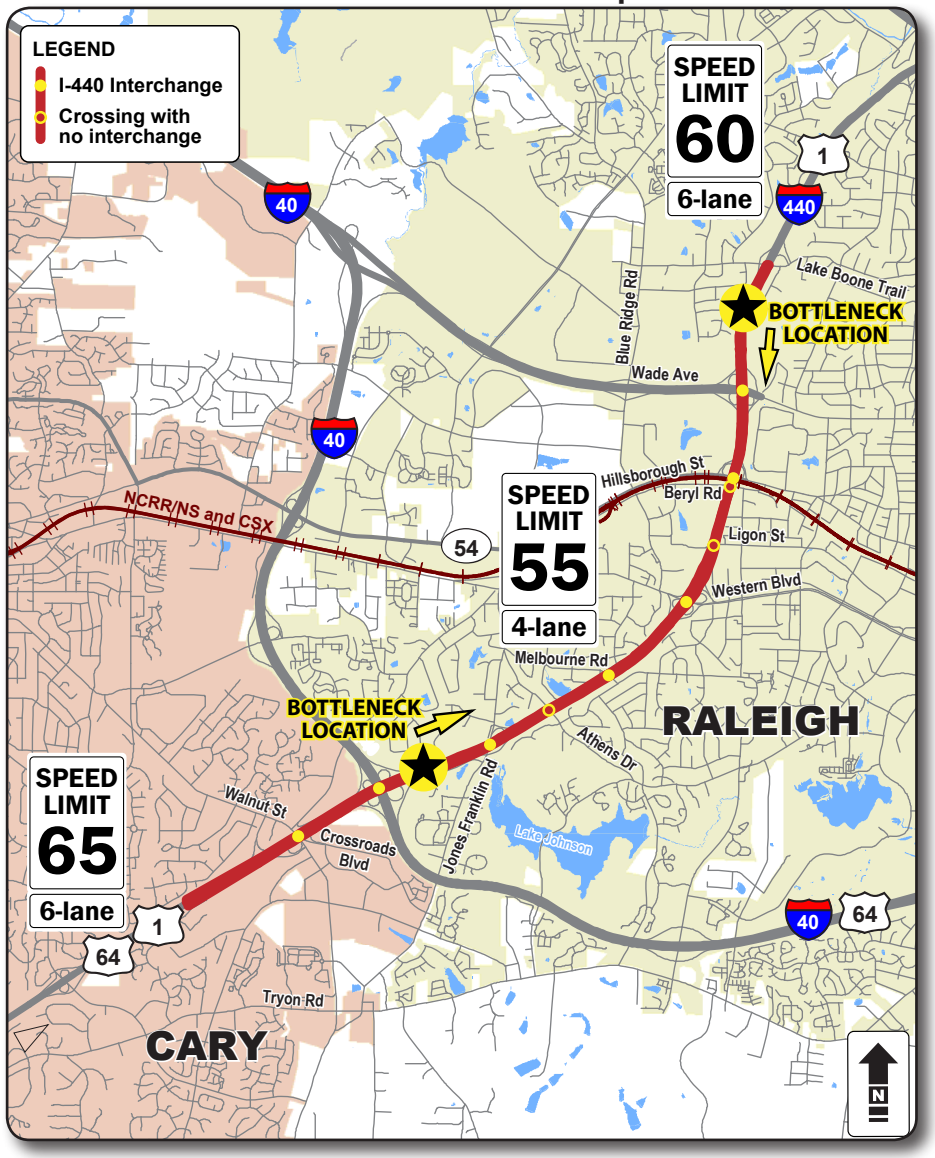
Condition
The state of the pavement and structures

Capacity Problems

- **Bottlenecks** - Bottlenecks are areas along a highway where backups and congestion regularly occur. Along I-440 in the project area, bottlenecks occur where the westbound and eastbound through lanes are reduced from three lanes to two lanes. In the westbound direction, this occurs near the Wade Avenue interchange and in the eastbound direction this occurs near the Jones Franklin Road interchange. The locations are shown in **Exhibit 1.2**.
- **Slower speed limit** - Currently, the speed limit is 55 mph on I-440 in the project area. It is 65 mph to the west and 60 mph to the east.
- **Congestion** - Travelers on I-440/US 1-64 in the project area regularly experience congestion, which is projected to worsen through 2035. Traffic volumes on I-440/US 1-64 in the project study area are projected to increase by 19 to 26 percent between 2012 and 2035. Existing and future estimated average travel speeds are well below the posted speed limit during peak hours.

Peak hour congestion at the eastbound I-440 bottleneck at Jones Franklin Road

Exhibit 1.2: I-440 Bottlenecks and Speed Limits



Source: ESRI, NCDOT, Wake County, NCOneMap

Geometry Problems

Congestion experienced along I-440/US 1-64 in the project study area is a function of geometric problems as well as capacity problems.

I-440 and its interchanges in the study area have elements that do not meet current-day design standards. These include poor sight lines, narrow shoulders and medians and short distances for acceleration/deceleration along interchange ramps.

Example: Narrow median and shoulder on westbound I-440

Example: No deceleration lane and inadequate shoulder at Western Boulevard exit

Condition Problems

I-440 in the project study area was constructed in the early 1960's and is the oldest section of the Raleigh Beltline. Due to the age of the facility, the pavement, structures, and interchanges are in need of rehabilitation or replacement.

Of the fifteen bridges along or over I-440 in the project area, six are functionally obsolete (meaning they do not meet current minimum federal roadway and bridge design standards) and three are structurally deficient (meaning they need maintenance and repair and eventual rehabilitation or replacement).

Rough pavement on I-440 near Western Boulevard

Athens Drive bridge - rated structurally deficient

Melbourne Road bridge - rated structurally deficient

1.4 SECTION Project Surroundings

1.4.1 Regional Roadway Network

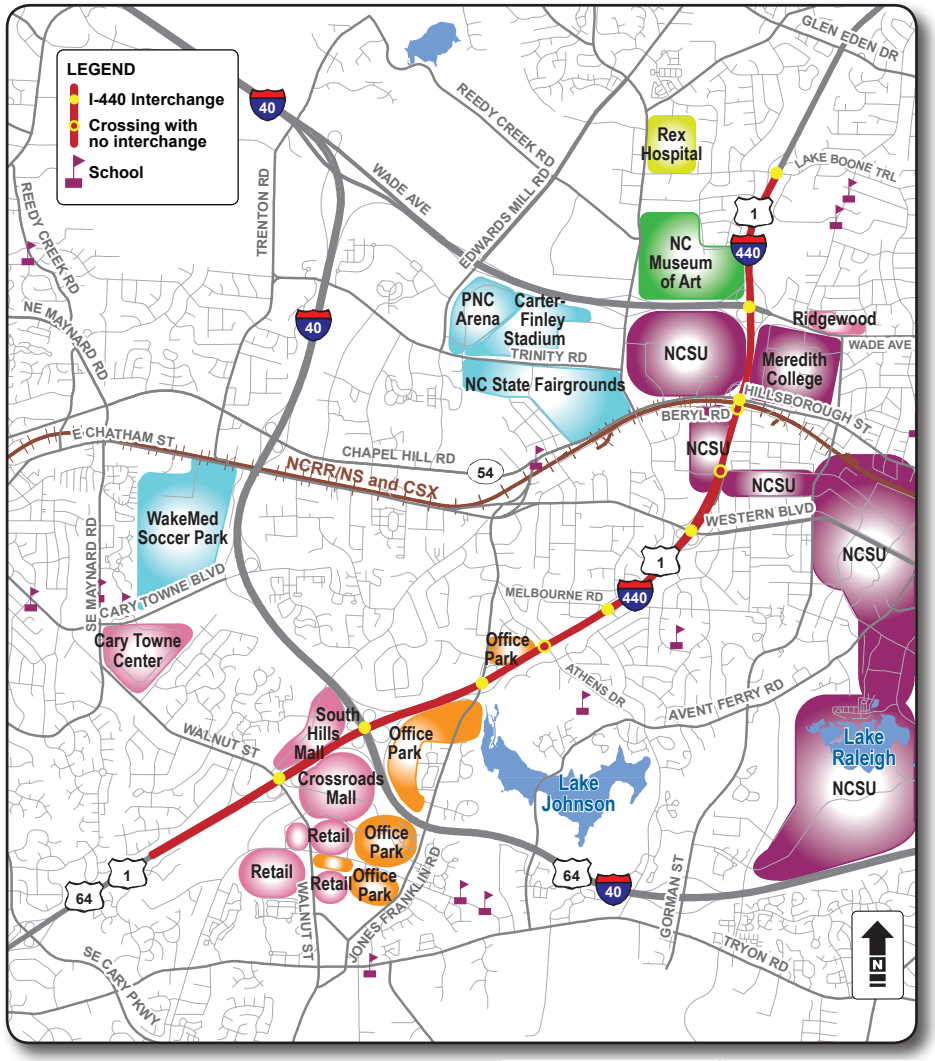
I-440 has statewide and regional importance and is a critical link in the roadway network of the Triangle region. In the project area, major roads include I-40, US 1, US 64, US 264, and several other US routes (**Exhibit 1.1**). As shown in **Exhibit 1.1**, the facility forms a partial loop around the north, east, and west of downtown Raleigh, with I-40 forming the southern part of the loop.

I-440 connects with I-40 near the western end of the project, and also at the eastern end of the project via Wade Avenue.

1.4.2 Land Uses in the Project Area

The project is located in an established mixed-use urban area approximately 3 miles west of downtown Raleigh. There are several residential neighborhoods, parks, and commercial areas along the corridor. I-440 provides a route to several major destinations (**Exhibit 1.3**) located in and around the project study area, including the North Carolina State Fairgrounds, Carter-Finley Stadium, PNC Arena, the North Carolina Museum of Art, Rex Hospital, North Carolina State University (NCSU), Meredith College, and Crossroads Mall.

Exhibit 1.3: Major Destinations in the Project Area



Source: ESRI, NCDOT, Wake County, NCOneMap

1.5 SECTION Existing I-440

In general, I-440 within the project study area is a four-lane median divided freeway facility. Between some interchanges there is an extra lane (called an auxiliary lane) to provide more space to enter and exit the freeway, but this is not a lane that continues through.

Typical I-440 in the project area

Westbound bottleneck at Wade Avenue

Bottlenecks occur on I-440 in the project area where I-440 reduces from three lanes to two lanes: westbound near the Wade Avenue interchange and eastbound near the Jones Franklin Road interchange. (**Exhibit 1-2**).

Near I-40 the freeway splits into through lanes and a separate southbound collector-distributor (C-D) road that provides access to/from I-40. The C-D road runs parallel to I-440/US 1-64 and keeps the lane-changing actions occurring at the I 40/I-440 ramps separated from the high-speed I-440/US 1-64 through traffic.

Collector-Distributor road to I-40 ramps

I-440/US 1-64 has the following interchanges in the project study area, listed from west to east:

- Walnut Street
- Crossroads Boulevard (partial interchange)
- Hillsborough Street (NC 54)
- Western Boulevard
- Melbourne Road (partial interchange)
- Jones Franklin Road
- I-40
- Wade Avenue
- Lake Boone Trail

There are three additional roadway crossings of I-440 that do not have interchanges:

- Beryl Road crosses under the I-440 bridge that also spans the railroad tracks and Hillsborough Street
- Ligon Street crosses through a one-lane tunnel under I-440
- Athens Drive is on a bridge over I-440

Ligon Street one-lane tunnel under I-440

I-440 bridge over Beryl Road, railroad, and Hillsborough Street

1.6 SECTION Other Transportation Modes in Corridor

The project study area includes bus routes, railroad tracks, sidewalks, greenways, and bicycle routes. **Exhibit 1.4** shows the railroad tracks, greenways, and bicycle routes. These modes, and bus routes, will be considered in the design of project alternatives.

Bus Routes. Transit service in the project area is provided by Capital Area Transit (CAT), Cary Transit (C-Tran), Triangle Transit (TT), and NCSU Wolfline. Every road that crosses I-440/US 1-64 in the project area, except for I-40 and Ligon Street, carries at least one bus route.

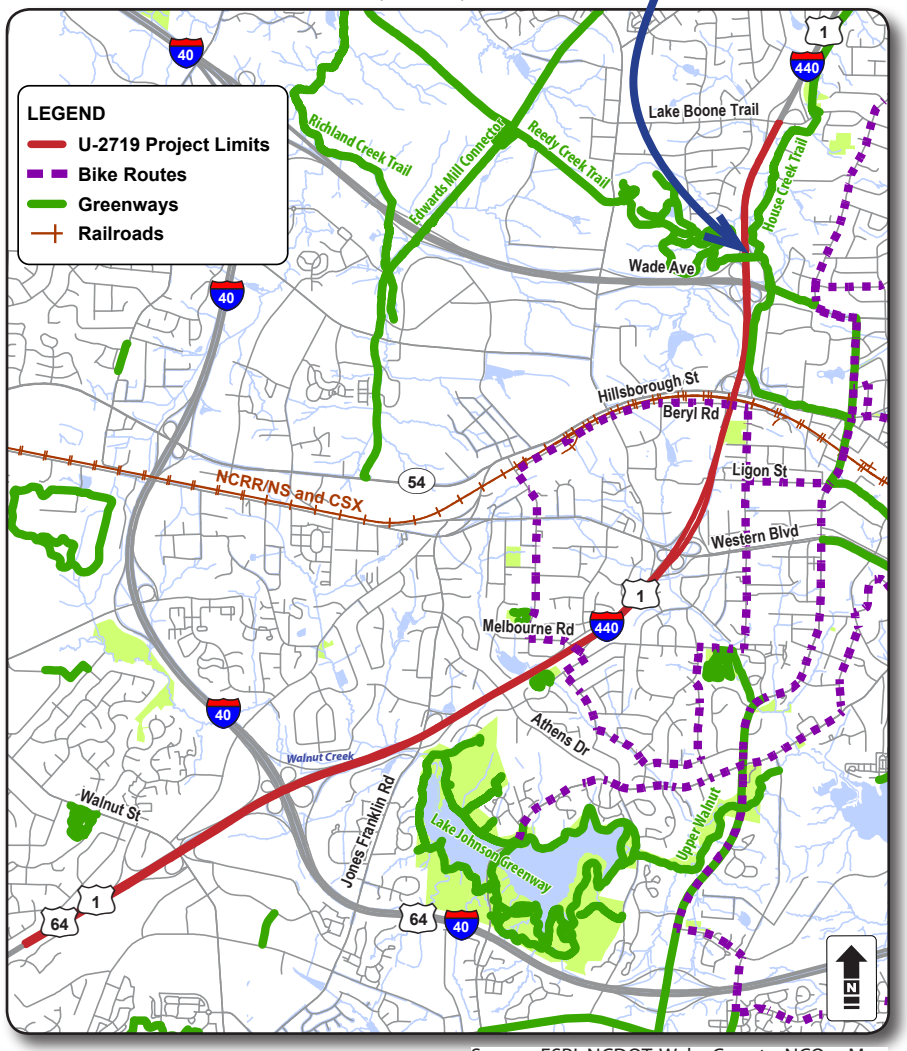
Railroad Tracks. Between Hillsborough Street and Beryl Road, two main tracks and a siding track cross under I-440. The tracks and property are owned by NC Railroad (NCRR) and used for freight transport and passenger trains. One track is operated/maintained by Norfolk Southern. CSX owns/operates the other track on the NCRR property. Three Amtrak passenger rail routes also use this corridor: the Piedmont, the Carolinian, and the Silver Star. In this area, NCRR has plans for two additional tracks in their corridor, as described in their *Future Track Infrastructure Planning Study*.

Sidewalks, Greenways and Bicycle Routes. Pedestrians and bicycles are prohibited on I-440/US 1-64, but there are pedestrian and bicycle facilities within the project study area crossing over or adjacent to I-440/US 1-64. Existing sidewalks cross I-440 on both sides of Melbourne Road and the north side of Western Boulevard. Signed bicycle routes cross I-440 on Beryl Road and Melbourne Road.

Greenways in the project area include Reedy Creek Trail, House Creek Trail, and Lake Johnson Greenway. The Reedy Creek Trail crosses I-440 on a signature pedestrian bridge. A future greenway is planned by Raleigh to extend from the Lake Johnson Greenway across I-440 on Jones Franklin Road then along Walnut Creek.

Reedy Creek Trail pedestrian bridge over I-440 north of Wade Avenue

Exhibit 1.4: Greenways, Bicycle Routes and Railroads



Source: ESRI, NCDOT, Wake County, NCOneMap

1.7 SECTION Existing and Future Traffic Conditions

This section presents traffic volumes along the corridor, evaluates existing and future congestion, and describes existing crash data.

1.7.1 Traffic Volumes

Traffic operations along a roadway are based on a roadway's design and the numbers and types of vehicles traveling the corridor. Estimates of existing and future average daily traffic volumes along a roadway are prepared by NCDOT using a variety of data such as existing traffic counts and a regional transportation computer model.

Average daily traffic volumes for 2012 and 2035 are shown in the schematic in **Table 1.1**. Year 2012 volumes on I-440 ranged from 79,200 to 134,200 vehicles per day (vpd). The highest traffic volumes occurred along the segment just south of the I-40 interchange. By 2035, with no changes to the project corridor, traffic volumes are projected to increase 19 to 26 percent, ranging from 96,400 to 169,600 vpd.

Table 1.1: 2012 and 2035 Traffic Volumes

I-440	2012 Average # Vehicles per Day	2035 Average # Vehicles per Day	Percent Change (2012-2035)
Lake Boone Trail (SR 1676)	109,200	138,000	26%
Wade Avenue (SR 1728)	94,800	117,600	24%
Hillsborough Street (NC 54)	88,200	105,100	19%
Western Boulevard (SR 2012)	85,000	105,500	24%
Melbourne Road (SR 1445) (partial interchange)	81,200	98,700	22%
Jones Franklin Road (SR 5039)	79,200	96,400	22%
I-40	134,200	169,600	26%
Crossroads Boulevard (partial interchange)	118,500	149,200	26%
Walnut Street (SR 1313)	118,000	145,600	23%
Cary Parkway			

Source: *Traffic Forecast for U-2719*, NCDOT, January 10, 2013

1.7.2 Traffic Congestion

Traffic operations during morning and evening rush hours were modeled for 2012 and 2035 to evaluate congestion along I-440 if no improvements are made (called the no-build condition).

In Chapter 2, the same models are used with the alternative designs so that the results can be compared between alternatives and compared to making no improvements along the road.

Traffic operations were assessed two ways – by modeling the level of service of individual corridor segments and by use of a model to simulate travel speeds along the entire corridor. All models show that I-440 has congestion problems, now and even more in the future.

Table 1.2 shows the results of the individual corridor segment models. For the individual segments, congestion levels are reported as Levels of Service (LOS). In Raleigh, it's the City's policy to try to maintain an overall LOS E or better on all roadways and intersections within the city.

What is Level of Service?

Level of Service (LOS) is a rating system that uses a letter grade from A (free flow conditions) to F (stop and go). LOS E defines the maximum capacity of the roadway.

As shown in the table, much of I-440 is at capacity or congested (LOS E and F) during peak hours, and congestion is projected to get worse through 2035. The peak (or rush) hours are the 2-hour periods on weekday mornings and evenings when traffic flow is the heaviest.

Currently, traffic flow is heaviest in the eastbound direction (Cary to Raleigh) in the mornings, switching to the westbound direction (Raleigh to Cary) in the evenings, with many segments operating at LOS E and F during these times. In the future, both directions of travel are projected to operate at mostly LOS F during the morning and evening rush hours. This can be seen in **Table 1.2** by the increased numbers of red boxes.

Table 1.2: Existing and Future Congestion Levels During Rush Hours without the Project

2012					2035				
AM		PM		I-440	AM		PM		
EB	WB	EB	WB		EB	WB	EB	WB	
D	F	D	F	Lake Boone Trail (SR 1676)	F	F	E	F	
F	E	E	E	Wade Avenue (SR 1728)	F	F	F	F	
F	E	E	F	Hillsborough Street (NC 54)	F	F	F	F	
F	C	E	E	Western Boulevard (SR 2012)	F	E	F	F	
F	D	D	F	Melbourne Road (SR 1445) (partial interchange)	F	F	F	F	
F	C	C	D	Jones Franklin Road (SR 5039)	F	D	F	E	
E	C	D	D	I-40	F	C	F	D	
D	C	C	D	Walnut Street (SR 1313)	F	D	D	F	
				Cary Parkway					

Source: *Traffic Operations Technical Memorandum for I-440 Improvements Project STIP Number U-2719*, Atkins, June 2014

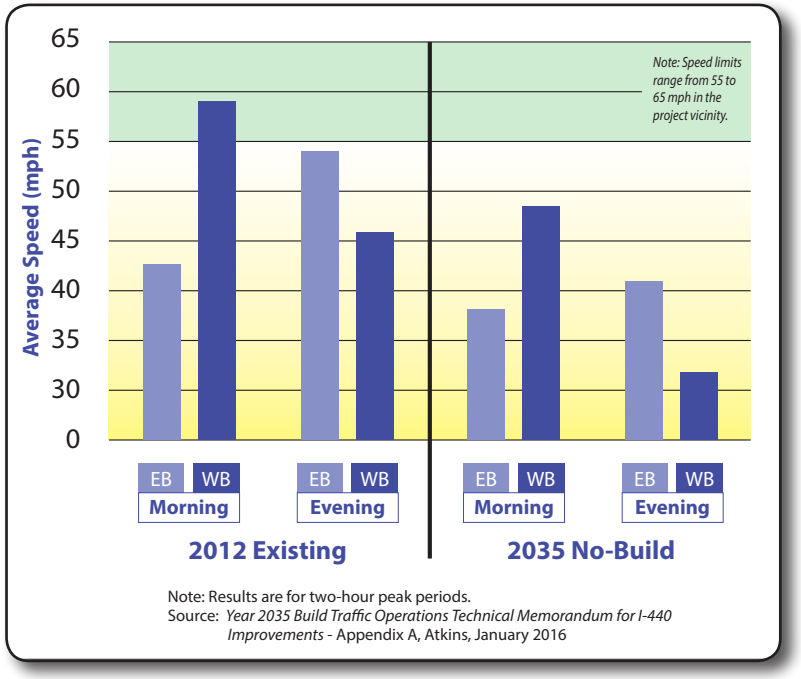
Note: The letters C through F are Levels of Service (LOS) for each direction of roadway segment in the morning and evening rush hours.

Average travel speeds through the corridor during the morning and evening rush hours were estimated using a computer model that simulates travel along the entire corridor. The modeled corridor extends from south of Walnut Street to north of Wade Avenue and includes the delays at both bottlenecks. **Exhibit 1.5** shows existing and future modeled average travel speeds during two hour peak periods in the morning and evening.

In the eastbound direction, where the posted speed limits are 55 to 65 miles per hour (mph), existing average travel speeds are 43 mph in the morning and 54 mph in the afternoon. This direction is the main commuting directing in the morning. These speeds are expected to slow further, to between 38 and 41 mph, by 2035.

In the westbound direction, the average morning speed is 59 mph and the afternoon speed is 46 mph. This is the main commuting direction for afternoon traffic. By 2035, the speeds are again expected to be much lower.

Exhibit 1.5: Average Speed on I-440 through the Project Corridor During Two-Hour Peak Periods



Note: Results are for two-hour peak periods.
Source: *Year 2035 Build Traffic Operations Technical Memorandum for I-440 Improvements* - Appendix A, Atkins, January 2016

1.7.3 Crash Data

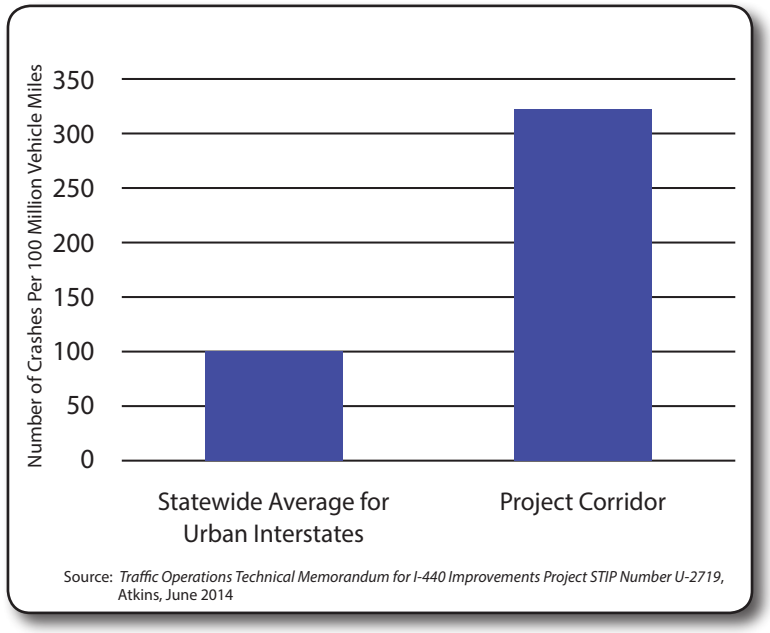
In addition to high traffic volumes creating congestion, incidents such as vehicle breakdowns or crashes occurring on I-440/US 1-64 can also cause back-ups.

NCDOT Traffic Survey Unit collects data on crashes. For the three year period August 2009 through July 2012, there were 1,166 reported crashes along the I-440/US 1-64 project corridor. This is an average of about one every day.

Crash rates (crashes per hundred million vehicle miles traveled) along the project corridor are approximately three times higher than the statewide average rate for urban interstates, as shown in **Exhibit 1.6**.

The three most common types of crashes are rear end, ran off road, and sideswipe, which together make up nearly 82 percent of the total crashes. Rear end crashes comprise more than half of the total crashes along the project corridor, and are typically caused by traffic slowing down due to congestion.

Exhibit 1.6: Crash Rate (per 100 million vehicle miles)



Source: *Traffic Operations Technical Memorandum for I-440 Improvements Project STIP Number U-2719*, Atkins, June 2014

1.8 SECTION Transportation Plans and Land Use Plans

Transportation Plans. There are several transportation plans that include the project or reference the importance of the project area, as listed below. These plans help guide the timing of improvements and elements to be included in the design of the project.

- *State Transportation Improvement Program* (March 2017)
- *Capital Area MPO Comprehensive Transportation Plan* (October 2010)
- *Capital Area MPO 2040 Long Range Transportation Plan* (April 2013) and as amended
- *Capital Area MPO Metropolitan Transportation Improvement Program 2012-2018* (September 2011)
- *City of Raleigh BikeRaleigh Plan* (2016)
- *Triangle Transit, Durham-Wake County Corridor Alternatives Analysis* (June 2011)

Land Use Plans. The following land use plans relate to the project or project study area. The proposed project is consistent with these plans.

- *City of Raleigh and Town of Cary Existing Zoning*
- *City of Raleigh 2030 Comprehensive Plan* (October 2009 and as amended)
- *Town of Cary Comprehensive Plan* (November 1996 and amended through August 2009)
- *North Carolina State University Physical Master Plan* (2007) and *Centennial Biomedical Campus Development and Design Guidelines* (July 2010)

Many of these plans can be found on the internet at the agencies' websites.

FOR MORE DETAILS ON THE INFORMATION IN THIS CHAPTER:

The following document is available on the project website at: https://www.ncdot.gov/projects/i-440improvements/.

- ***I-440 Improvements (STIP U-2719) Purpose and Need Statement***
(September 2014, Atkins)
Chapter 1 is a summary of this report.

The following documents are available upon request by contacting Beverly Robinson at NCDOT at brobinson@ncdot.gov.

- ***Traffic Forecast for U-2719 Memorandum***
(January 2013, NCDOT TPB)
This report provides the forecasts of annual average daily traffic volumes for project roadways for 2012 and 2035 under the no-build condition and 2035 for the build project condition. Traffic mixes (percents of cars and trucks) and other traffic volume information also is provided.
- ***I-440 Widening Project Existing Conditions and Deficiencies Report***
(July 2013, Atkins)
This report provides details on conditions of bridges and pavement, geometric conditions (alignments, sight distances, ramp design, etc.), and design operations (route continuity, lane balance, ramp sequences, crashes, congestion).
- ***I-440 Improvement Project (STIP U-2719) Year 2012 Existing & 2035 No-Build Traffic Operations Technical Memorandum***
(June 2014, Atkins)
This report documents the modeling of existing and future traffic operations along the corridor if no improvements are made. The report includes a crash analysis and corridor-level analyses of vehicle miles traveled and average corridor speeds. Analysis results are also provided for freeway segments and intersections.
- ***I-440 Improvement Project (STIP U-2719) Community Impact Assessment***
(Draft - April 2017, Atkins)
This report describes the community features and resources along the corridor, including land uses, plans, neighborhoods, parks, etc. and the impacts to residences, businesses, and community resources.

2 CHAPTER Alternatives

This chapter describes the range of alternatives considered for the project and those identified as the Detailed Study Alternatives. For the Detailed Study Alternatives, traffic information and preliminary designs are presented.

What's In This Chapter...

WANT MORE DETAILS?

See the list of technical reports at the end of this chapter.

2.1 SECTION The Process Used to Identify the Detailed Study Alternatives

2.1.1 Process Overview and First Screening

Process Overview

The flowchart in **Exhibit 2.1** summarizes the multi-step screening process used to identify the alternatives studied in detail in this EA. Each step in the process eliminated alternatives and allowed the project team to develop more details for the remaining alternatives.

The first screening evaluated the ability of general approaches to meet the project purpose based on a set of screening criteria. The project purpose is to improve traffic flow, make the roadway operate more efficiently, and enhance mobility on I-440 in the project area. For this project, only the Improve Existing Corridor approach made it through the first screening, along with the No-Build Alternative (required to always be an option).

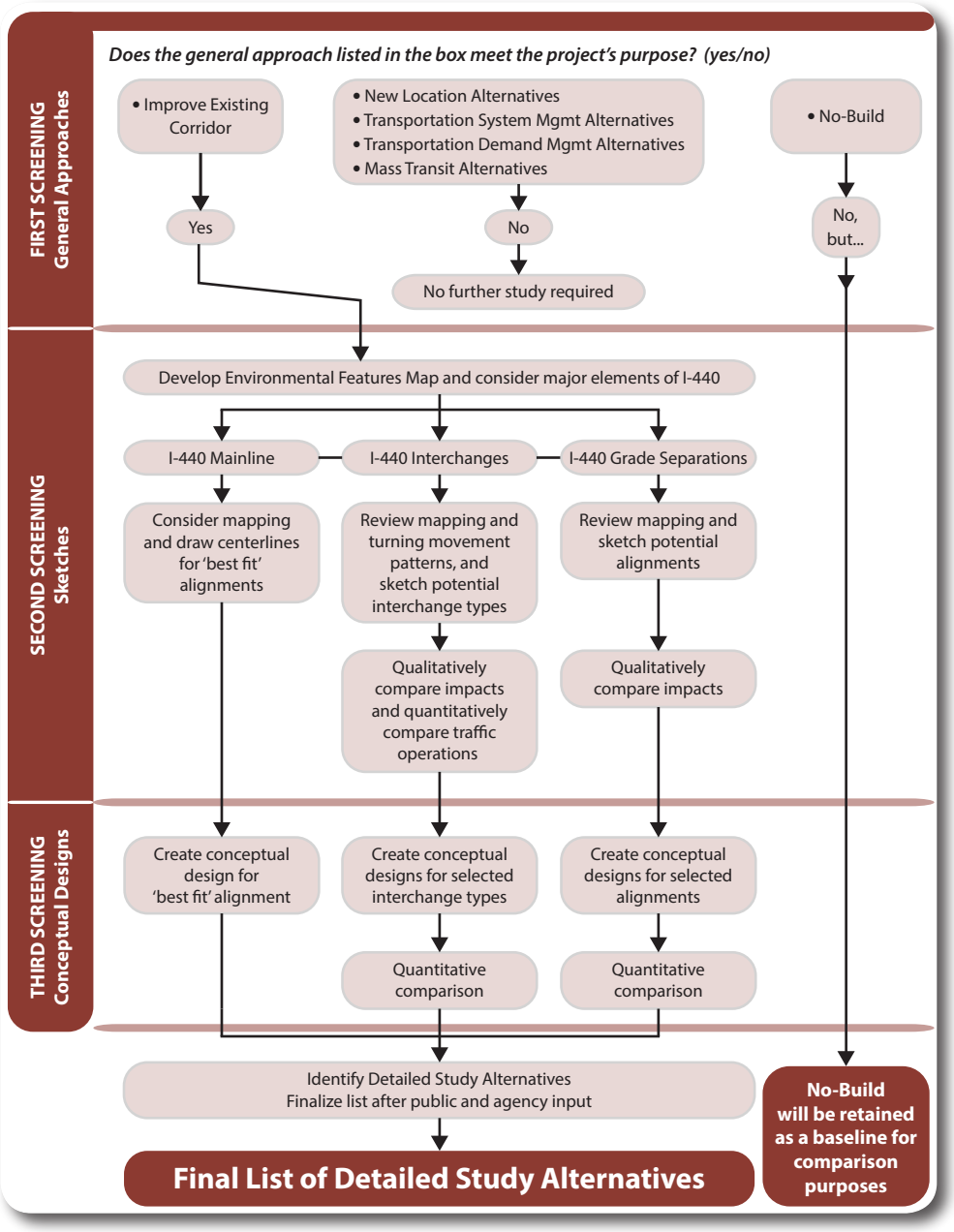
The second screening compared sketch designs for improving the I-440 mainline and crossings, and eliminated those that were unreasonable, impractical, and/or had higher impacts or less improvement to traffic flow.

The third screening developed more details in conceptual designs and compared the designs on how well they would operate and their potential impacts.

The conceptual designs and analysis results were presented for public and agency input, and the Detailed Study Alternatives were finalized after considering this input (**Section 2.2**).

Preliminary designs were then prepared for the Detailed Study Alternatives (**Section 2.4**). Preliminary designs include additional design details such as turn lanes at intersections, preliminary construction footprints, and right of way limits that are not included in the conceptual designs.

Exhibit 2.1: Process Used to Identify the Detailed Study Alternatives



First Screening Analysis

The alternatives development process started by considering a wide range of potential approaches for meeting the stated project purpose and need (see **Chapter 1**). This is the first screening step in **Exhibit 2.1**.

The **Improve Existing Corridor Alternative** would include widening the I-440 mainline as well as rehabilitating/reconstructing interchanges and grade separations (crossings of I-440 that are not interchanges).

The **New Location Highway Alternative** would involve building a new highway somewhere near the vicinity of I-440 or upgrading nearby roadways to freeways.

Transportation System Management (TSM) Alternatives typically consist of a combination of low-cost, minor improvements to increase capacity and enhance traffic flow. TSM measures could include intersection realignment and traffic signals, ramp metering, and minor improvements to ramp acceleration/deceleration lanes.

Transportation Demand Management (TDM) Alternatives include a combination of measures that change traveler behavior to reduce demand for additional highway capacity. TDM measures could include carpools/vanpools, electronic traveler information systems, or converting existing lanes to high-occupancy vehicle (HOV) lanes.

Mass Transit Alternatives can include expansion of existing bus and/or passenger rail transit. Four transit agencies operate in the project area: GoRaleigh (formerly Capital Area Transit System [CATS]), GoTriangle (formerly Triangle Transit), C-Tran (Town of Cary transit system), and NC State University Wolfline. Existing and planned transit routes currently cross over I-440 and do not use it as part of their systems.

The **No-Build Alternative** would make no improvements to I-440 as defined under Project U-2719. Other projects in the area included in the STIP or programmed by others were assumed to be implemented.

First Screening Criteria

To determine whether an approach would meet the project purpose, the following screening criteria were used:

- Can the alternative improve average travel speeds through the I-440 corridor during peak periods and increase the carrying capacity of the roadway? (**Section 1.3** - Capacity Problems)
- Does the alternative have the ability to improve the roadway and interchanges to better conform to current design standards? (**Section 1.3** - Geometry Problems)
- Can the alternative address pavement and structures that are in need of rehabilitation? (**Section 1.3** - Condition Problems)

First Screening Results

The Improve Existing Corridor approach could meet all three criteria and was carried forward to the second screening. The No-Build Alternative is always retained for detailed study to provide a comparison to the build alternatives.

The New Location Alternative was eliminated because it would not address geometric and condition problems along the I-440 corridor and it would have extremely high impacts to the surrounding densely developed area.

The TSM Alternatives, TDM Alternatives, and Mass Transit Alternatives were eliminated because they would neither improve geometry problems nor improve condition problems along the I-440 corridor.

Alternatives Making It Through First Screening

The **Improve Existing Corridor** approach would meet all screening criteria and fulfill the project's purpose. It would address capacity, geometry, and condition problems along I-440.

The **No-Build Alternative** also is retained to provide a comparison.

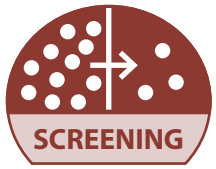
2.1.2 Second and Third Screenings of Alternatives

As shown in **Exhibit 2.1**, for the second and third screening of alternatives for improving the existing I-440 corridor, the project corridor was divided into its major elements. These are the mainline of I-440, the interchanges, and the grade separations crossing I-440. The elements were considered separately because the various alternatives for each element are not dependent on each other and can be mixed and matched.

The second screening evaluated several sketch-level designs for each corridor element. Sketch level designs are basic engineering line drawings of the mainline, interchange forms, and grade separations. The sketches for each element were compared to eliminate those that were unreasonable, impractical, and/or had higher impacts or less improvement to traffic flow. Existing resources and features considered in the impact analysis are shown on the map in **Appendix A**.

For those sketch designs carried forward to the third screening, conceptual designs were developed. These designs include more detail than sketches to provide a better comparison of potential impacts.

The following sections marked with the symbol below summarize the results of the second and third screening analyses. The sections start with the I-440 mainline. This is followed by the results for each interchange and grade separation area along the project corridor from west to east. All the preliminary alternatives considered at each interchange and grade separation location are shown on small maps, with accompanying text explaining why each preliminary alternative was either eliminated or retained for further study as a Detailed Study Alternative.



The I-440 Mainline

An additional through lane in each direction of I-440 is proposed. There would be a total of three through lanes in each direction with a grass or hard median in the center, depending on available space. This would match the three lanes in each direction that exist along the remainder of I-440 and would eliminate the bottlenecks located at either end of the project area.

The mainline can be widened entirely to one side or the other, or by widening symmetrically around the existing road centerline. Different options were applied up and down the corridor, considering existing resources and features, and a "best fit" option was developed.

Since there is one "best fit" option for widening the mainline that will be combined with the interchange alternatives, there was no need to complete a third screening.

Constraints considered in developing the "best fit" option for the mainline included:

- The Walnut Creek floodway and floodplain near the Jones Franklin Road interchange
- The power easement on the eastbound side of I-440
- Lake Johnson Park, Kaplan Park, Method Community Park, and Museum of Art Park
- White Oak Lake and dam south of Melbourne Road interchange
- Oak Grove Cemetery (also a historic site)
- Reedy Creek Greenway pedestrian bridge
- Surrounding neighborhoods, businesses, and land uses

SCREENING

The I-40 Interchange Area

LEGEND

- New or Improved Road/Ramp
- New Bridge
- Road/Ramp Removed
- Buildings
- Property Lines
- Streets
- Rail
- Major Power Towers
- Conservation/ Open Space
- Greenways
- Lakes
- Floodway
- 100 Year Floodplain

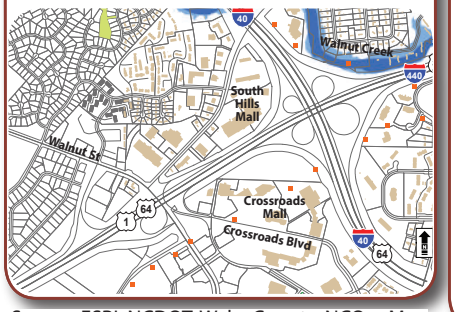
I-440 Project Area

- Wade Ave
- Hillsborough St
- Ligon St
- Western Blvd
- Melbourne Rd
- Athens Dr
- Jones Franklin Rd
- I-40
- Walnut St

Interchange

Grade Separation

EXISTING INTERCHANGE



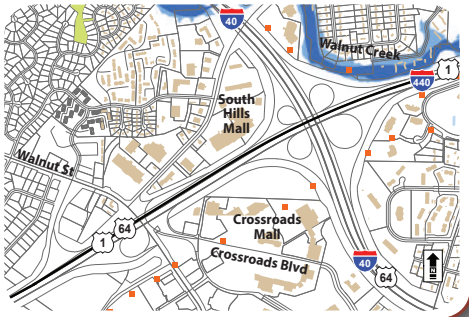
Source: ESRI, NCDOT, Wake County, NCOneMap

WIDEN I-440 ONLY

Retained for Detailed Study

This alternative retained for detailed study because it would have little to no impact on surrounding land uses and Walnut Creek, and it would provide some traffic flow improvement. It was the least expensive of the options studied.

It would provide the most flexibility for future projects programmed for I-40 in this area. These projects include STIP Project I-5703 to reconstruct the I-40/I-440 interchange, and STIP Project I-5704 to add lanes to I-40. Both projects are currently scheduled to begin construction in 2022.

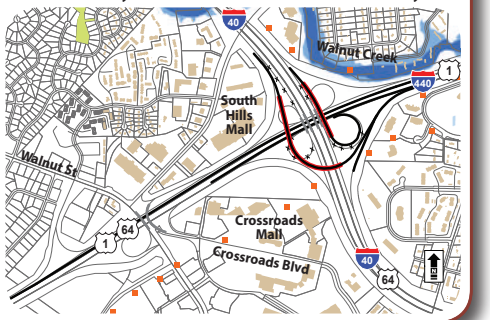


SOUTHWEST QUADRANT FLYOVER

Eliminated from Further Study

This alternative was initially recommended to be retained for detailed study. It had the most potential benefit to traffic flow, and was originally estimated to fit mostly within existing right of way.

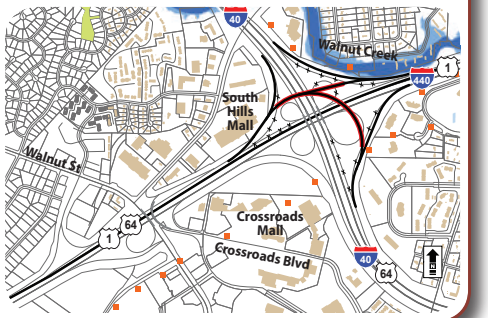
This alternative was eliminated during preliminary design. Projects on I-40 in this area (I-5701 and I-5703) are now programmed by NCDOT to begin construction in 2022. If the Southwest Quadrant Flyover was constructed, it would be in place before 2022 and may have to be torn out to make way for the I-40 projects. In addition, the footprint of this alternative got bigger in preliminary design, and impacts to Centerview office park increased.



NORTHEAST QUADRANT FLYOVER

Eliminated from Further Study

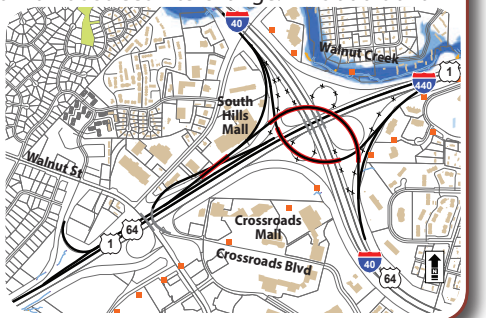
This alternative was eliminated because it would impact the sensitive Walnut Creek floodway and floodplain and the South Hills Mall. Land adjacent to Walnut Creek in this area frequently floods, and additional encroachment on the floodplain/floodway would worsen this condition.



FLYOVERS IN NE & SW QUADRANTS

Eliminated from Further Study

This alternative was eliminated because it would have the most impacts to surrounding development, including the South Hills Mall. It is also the most expensive. Although it improved traffic flow compared to a no-build condition, it was the lowest performing compared to the other alternatives. This concept would eliminate direct access from I-40 to Crossroads Boulevard, rerouting this traffic to the already congested Walnut Street interchange. This additional rerouted traffic reduces traffic flow in the area, canceling any other traffic flow improvement achieved by this concept.



SCREENING

The Jones Franklin Road Interchange

LEGEND

- New or Improved Road/Ramp
- New Bridge
- Road/Ramp Removed
- Buildings
- Property Lines
- Streets
- Rail
- Major Power Towers
- Conservation/ Open Space
- Greenways
- Lakes
- Floodway
- 100 Year Floodplain

I-440 Project Area

- Wade Ave
- Hillsborough St
- Ligon St
- Western Blvd
- Melbourne Rd
- Athens Dr
- **Jones Franklin Rd**
- I-40
- Walnut St

- Interchange
- Grade Separation

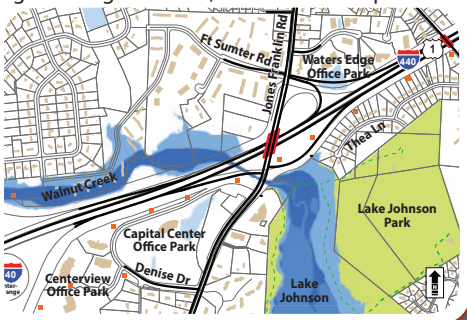
EXISTING INTERCHANGE

Source: ESRI, NCDOT, Wake County, NCOneMap

UPGRADE EXISTING PARTIAL CLOVER

Retained for Detailed Study

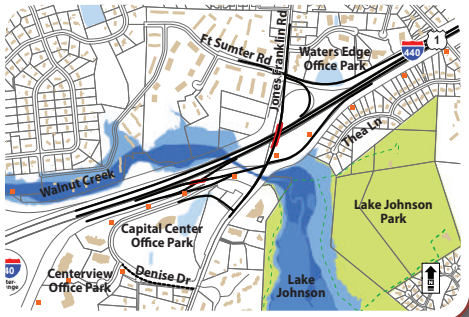
This alternative was developed during preliminary design to replace the Braided Partial Clover Alternative. It would provide the most flexibility for the separate projects now programmed for I-40 in this area because it would not require changes to I-40 or the I-40 interchange ramps. This alternative would retain the weaving area along eastbound I-440 but would extend an extra lane under the Jones Franklin Road bridge to increase merging/weaving distances, which would improve traffic flow in this direction. Impacts in the southeast quadrant of the interchange to the office parks and electric power towers would be less compared to the Braided Partial Clover.



BRAIDED PARTIAL CLOVER

Eliminated from Further Study

This alternative was originally retained because it would have the most improvements to traffic flow and would minimize impacts to Lake Johnson Park and homes on Thea Lane compared to the half clover options. The existing weaving area on I-440 eastbound between the I-40 on-ramp and the Jones Franklin Road off-ramp would be eliminated. However, the proposed ramp system in the eastbound direction would constrain options for newly programmed improvements to I-40. This alternative would impact the Capital Center/Centerview office parks and one or more major electric power towers (high cost to relocate).



HALF CLOVER

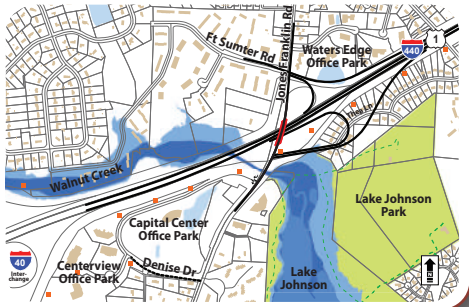
Eliminated from Further Study

This alternative lengthens the weaving area in the eastbound direction between the I-40 on-ramp and the Jones Franklin Road off-ramp, which improves traffic flow, but not as much as the Braided Partial Clover, which eliminates the weaving area altogether. This alternative was eliminated because it would impact homes on Thea Lane that the partial clover options avoid, and it would have the most impacts to Lake Johnson Park and a wetland, floodplain, and floodway area at the north end of the lake.

ELONGATED HALF CLOVER

Eliminated from Further Study

This alternative was developed to reduce the impacts of the Half Clover while retaining the same concept. This alternative was eliminated from detailed study because it would still have impacts to Lake Johnson Park and a wetland at the northern end of the lake, would have potential impacts to major electric power towers, and have the most impact to homes on Thea Lane. This alternative, like all the others, would have impacts to Waters Edge Office Park and pond.



SCREENING

The Athens Drive Bridge

LEGEND

- New or Improved Road/Ramp
- New Bridge
- Road/Ramp Removed
- Buildings
- Property Lines
- Streets
- Rail
- Major Power Towers
- Conservation/ Open Space
- Greenways
- Lakes
- Floodway
- 100 Year Floodplain

I-440 Project Area

- Wade Ave
- Hillsborough St
- Ligon St
- Western Blvd
- Melbourne Rd
- Athens Dr
- Jones Franklin Rd
- I-40
- Walnut St

- Interchange
- Grade Separation

EXISTING GRADE SEPARATION

Source: ESRI, NCDOT, Wake County, NCOneMap

REPLACE BRIDGE IN PLACE

Retained for Detailed Study

This alternative was retained for detailed study. It would have the least impacts to surrounding land uses and resources of the three preliminary alternatives. However, during construction, the existing bridge would be closed and a temporary off-site detour used for up to one year (see map below). This alternative would be the least expensive.

TEMPORARY CONSTRUCTION DETOUR FOR REPLACE BRIDGE IN PLACE

REPLACE BRIDGE TO NORTH

Retained for Detailed Study

This alternative was retained for detailed study to provide an option that would not need to close the existing bridge during construction (as required under Replace Bridge in Place). However, replacing the bridge to the north would require new right of way, which likely would impact homes on the north side of Athens Drive.

REPLACE BRIDGE TO SOUTH

Eliminated from Further Study

This alternative was eliminated from detailed study because it would have the most impacts. This alternative would require new right of way, which likely would impact homes on the south side of Athens Drive. It also would impact the electric power tower east of I-440 and south of Athens Drive, which would have a high cost to relocate.

SCREENING

The Melbourne Road Half Interchange

LEGEND

- New or Improved Road/Ramp
- New Bridge
- Road/Ramp Removed
- Buildings
- Property Lines
- Streets
- Rail
- Major Power Towers
- Conservation/ Open Space
- Greenways
- Lakes
- Floodway
- 100 Year Floodplain

I-440 Project Area

- Wade Ave
- Hillsborough St
- Ligon St
- Western Blvd
- **Melbourne Rd**
- Athens Dr
- Jones Franklin Rd
- I-40
- Walnut St

Interchange

Grade Separation

EXISTING INTERCHANGE

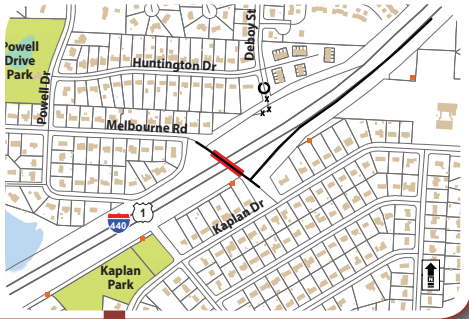
Source: ESRI, NCDOT, Wake County, NCOneMap

REPLACE BRIDGE IN PLACE

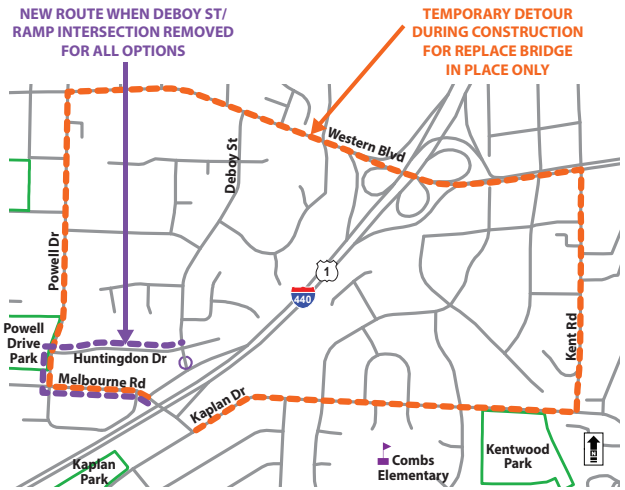
Retained for Detailed Study

This alternative was retained for detailed study. It would have the least impacts to surrounding land uses and resources of the three preliminary alternatives. However, during construction, the existing bridge would be closed and a temporary off-site detour used for up to one year (see map below). This alternative would be the least expensive.

All alternatives retain the half interchange configuration and would close the existing Deboy Street connection to the off ramp. Traffic could use Huntington Drive instead.



TEMPORARY CONSTRUCTION DETOURS FOR REPLACE BRIDGE IN PLACE

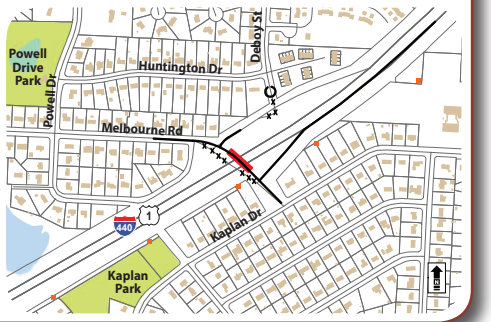


REPLACE BRIDGE TO NORTH

Retained for Detailed Study

This alternative was retained for detailed study to provide an option that would not need to close the existing bridge during construction (as required under Replace Bridge in Place). However, replacing the bridge to the north would require new right of way, which likely would impact homes on the north side of Melbourne Road.

All alternatives retain the half interchange configuration and would close the existing Deboy Street connection to the off ramp. Traffic could use Huntington Drive instead.

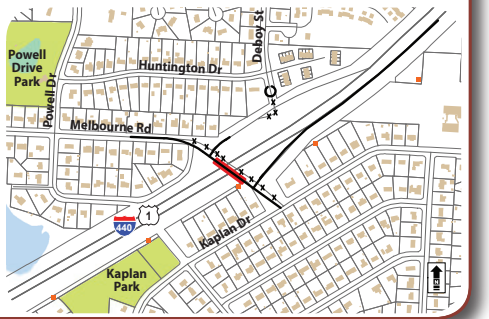


REPLACE BRIDGE TO SOUTH

Eliminated from Further Study

This alternative was eliminated from detailed study because it would have the most impacts. This alternative would require more new right of way than Replace Bridge to North and would likely impact homes on the south side of Melbourne Road. It also would impact the electric power tower east of I-440 and south of Melbourne Road, which would have a high cost to relocate.

All alternatives retain the half interchange configuration and would close the existing Deboy Street connection to the off ramp. Traffic could use Huntington Drive instead.



SCREENING

The Western Boulevard Interchange

LEGEND

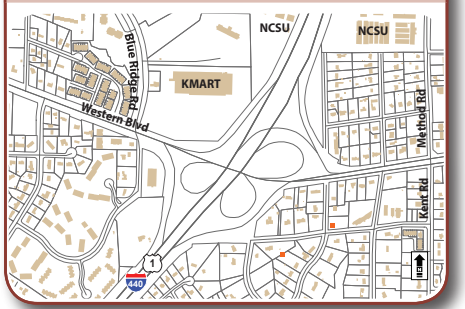
- New or Improved Road/Ramp
- New Bridge
- Road/Ramp Removed
- Buildings
- Property Lines
- Streets
- Rail
- Major Power Towers
- Conservation/ Open Space
- Greenways
- Lakes
- Floodway
- 100 Year Floodplain

I-440 Project Area

- Wade Ave
- Hillsborough St
- Ligon St
- Western Blvd
- Melbourne Rd
- Athens Dr
- Jones Franklin Rd
- I-40
- Walnut St

- Interchange
- Grade Separation

EXISTING INTERCHANGE



Source: ESRI, NCDOT, Wake County, NCOneMap

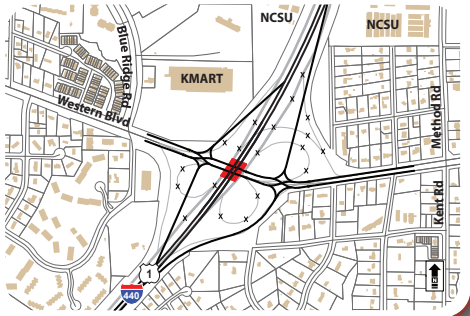
DOUBLE CROSSOVER DIAMOND

Retained for Detailed Study

This alternative was retained for detailed study because it would have the best traffic operations of the alternatives considered and it would accommodate bicyclists and pedestrians along Western Boulevard. Little new right of way is anticipated to be needed, so impacts to surrounding properties are expected to be minimal.

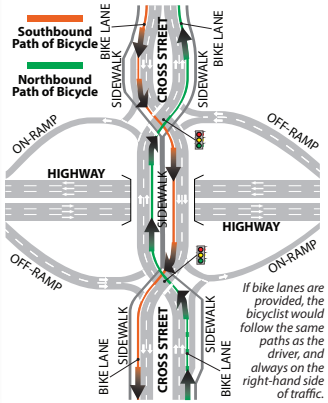
Western Boulevard is a primary route to NC State University and there is a multi-use path currently passing through the interchange, so accommodating bicyclists and pedestrians is important.

This interchange type is also known as a diverging diamond. It is not a common type of interchange, but there are a few in North Carolina.



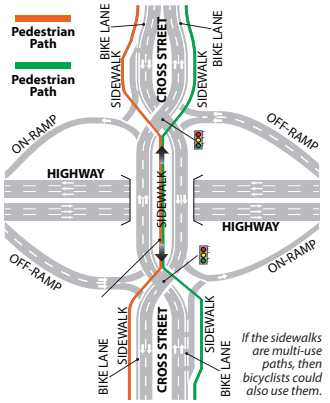
NAVIGATING A DOUBLE CROSSOVER DIAMOND INTERCHANGE

On a Bicycle



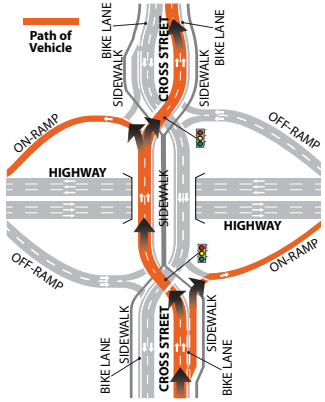
If bike lanes are provided, the bicyclist would follow the same paths as the driver, and always on the right-hand side of traffic.

As a Pedestrian

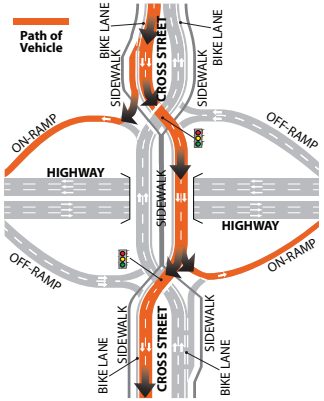


If the sidewalks are multi-use paths, then bicyclists could also use them.

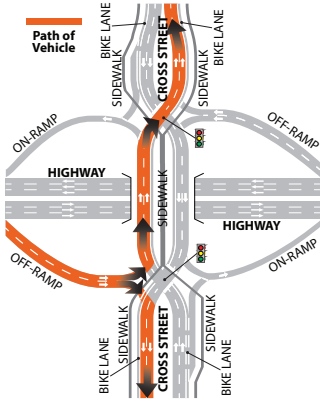
Northbound Cross Street Traffic



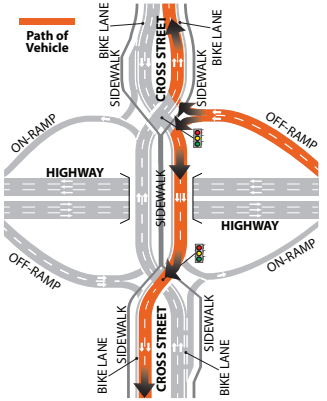
Southbound Cross Street Traffic



Eastbound Highway Traffic



Westbound Highway Traffic



Note: There are double crossover diamond interchanges at I-77/Catawba Avenue in Cornelius and I-85/NC 73 in Concord.

SCREENING

The Western Boulevard Interchange (continued)

LEGEND

- New or Improved Road/Ramp
- New Bridge
- Road/Ramp Removed
- Buildings
- Property Lines
- Streets
- Rail
- Major Power Towers
- Conservation/ Open Space
- Greenways
- Lakes
- Floodway
- 100 Year Floodplain

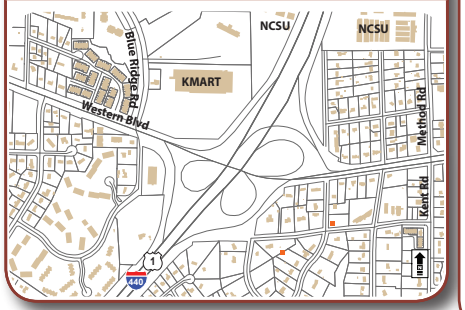
I-440 Project Area

- Wade Ave
- Hillsborough St
- Ligon St
- Western Blvd
- Melbourne Rd
- Athens Dr
- Jones Franklin Rd
- I-40
- Walnut St

Interchange

Grade Separation

EXISTING INTERCHANGE



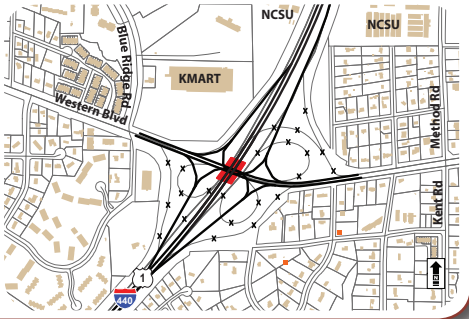
Source: ESRI, NCDOT, Wake County, NCOneMap

SINGLE POINT URBAN INTERCHANGE (SPUI)

Eliminated from Further Study

This alternative was eliminated from detailed study because traffic modeling showed that the westbound I-440 off ramp would require triple left turn lanes for adequate traffic operations and to prevent backups on I-440. However, there would not be enough lanes on Western Boulevard to receive triple left turn lanes.

This interchange type also is not common in North Carolina. There is an interchange of this type at I-540/Six Forks Road in Raleigh (with double left turn lanes).

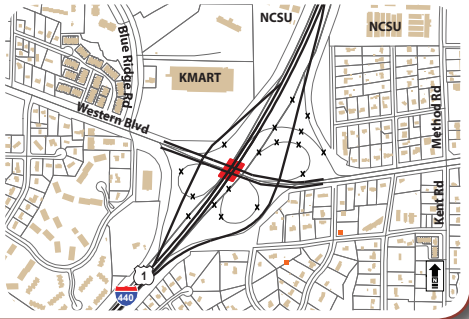


TRADITIONAL DIAMOND

Eliminated from Further Study

This alternative was eliminated from detailed study because traffic modeling showed that both the westbound and eastbound I-440 off ramps would require triple left turn lanes for adequate traffic operations and to prevent backups on I-440. However, there would not be enough lanes on Western Boulevard to receive triple left turn lanes.

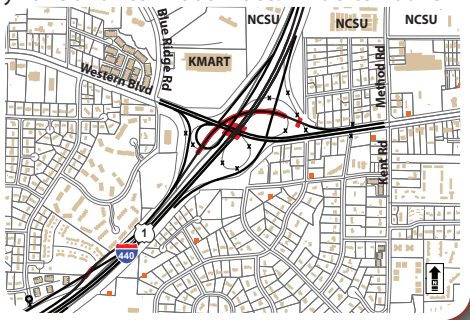
This interchange type is common, and a nearby one of this type is at I-40/Gorman Street in Raleigh.



MODERNIZE EXISTING INTERCHANGE FORM

Eliminated from Further Study

This alternative was eliminated from detailed study because it would have the most impacts and be substantially more expensive than the other alternatives. In addition, vehicles getting on westbound I-440 from Western Boulevard would not be able to get off at Melbourne Road due to not enough distance between the ramps. The new right of way needed for this alternative would likely impact homes on Wendy Lane and Teakwood Place. This alternative would be the least accommodating to bicyclists and pedestrians on Western Boulevard.

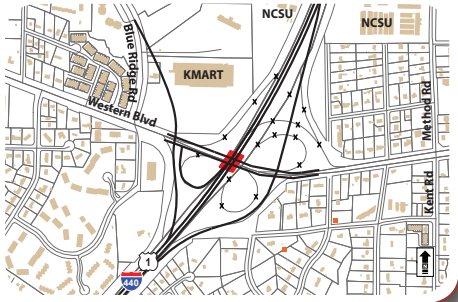


PARTIAL CLOVER

Eliminated from Further Study

This alternative was eliminated from detailed study because traffic modeling showed that the westbound I-440 off ramp would require triple left turn lanes for adequate traffic operations and to prevent backups on I-440. However, there would not be enough lanes on Western Boulevard to receive triple left turn lanes. This alternative also would require right of way from the K-mart in the northwest quadrant to realign Blue Ridge Road.

This alternative was added to the study as a result of comments received at Public Meeting #2 (held 11/12/14).



SCREENING

The Ligon Street Crossing

LEGEND

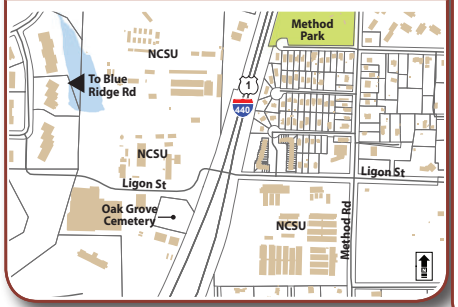
- New or Improved Road/Ramp
- New Bridge
- Road/Ramp Removed
- Buildings
- Property Lines
- Streets
- Rail
- Major Power Towers
- Conservation/ Open Space
- Greenways
- Lakes
- Floodway
- 100 Year Floodplain

I-440 Project Area

- Wade Ave
- Hillsborough St
- Ligon St
- Western Blvd
- Melbourne Rd
- Athens Dr
- Jones Franklin Rd
- I-40
- Walnut St

- Interchange
- Grade Separation

EXISTING GRADE SEPARATION



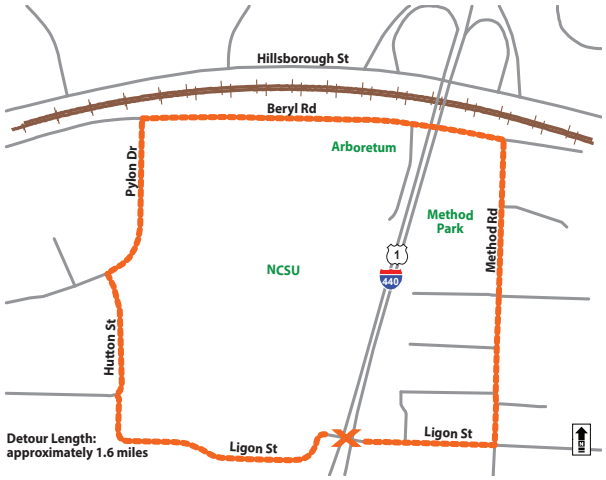
EXTEND TRAFFIC CULVERT UNDER I-440

Retained for Detailed Study

This alternative would extend the existing one-lane traffic culvert to be long enough to carry the widened I-440 above. The existing culvert was included in the original I-440 construction to retain connections between the historic Oak Grove Cemetery and the Method Neighborhood. Extending the culvert would allow it to continue serving its original purpose.

Replacing the one-lane culvert with a two-lane culvert or bridging I-440 over Ligon Street also was considered. However, it would not be feasible to construct while maintaining traffic flow on I-440 during construction.

TEMPORARY CONSTRUCTION DETOUR FOR ALL OPTIONS

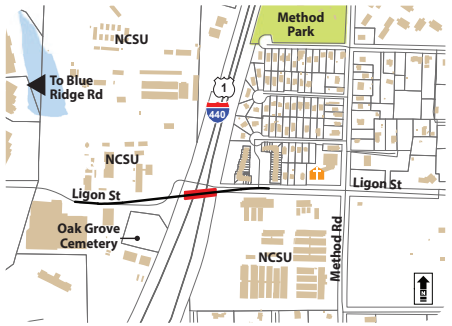


These two concepts would construct a two-lane bridge for Ligon St over I-440 to replace the culvert. NC State University and City of Raleigh are interested in upgrading the Ligon St crossing to a two-lane bridge to provide improved bus, pedestrian, and bicycle access along this road and because they have plans to extend Ligon St to Blue Ridge Rd in the future. Currently, buses cannot use the traffic culvert due to size.

The initial bridge concept showed the alignment south of the culvert. A second concept was developed during preliminary design on an alignment north of the culvert. Both are Detailed Study Alternatives. Each would have different impacts and costs, but both would avoid encroaching on the historic Oak Grove Cemetery and the Oak Grove Baptist Church (corner of Ligon St and Method Rd).

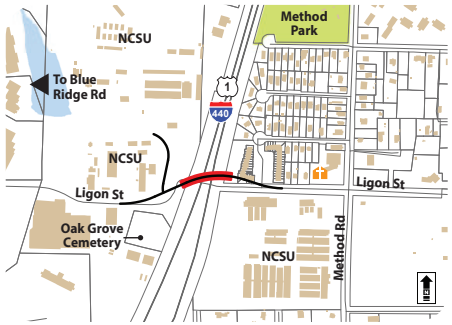
TWO-LANE BRIDGE TO SOUTH

Retained for Detailed Study



TWO-LANE BRIDGE TO NORTH

Retained for Detailed Study



Source: ESRI, NCDOT, Wake County, NCOneMap

SCREENING

The Hillsborough Street and Wade Avenue Interchange Area

LEGEND

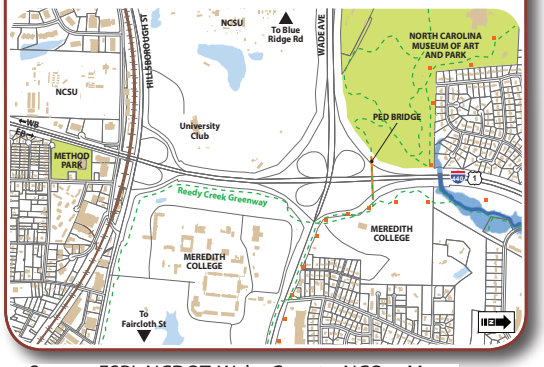
- New or Improved Road/Ramp
- New Bridge
- Road/Ramp Removed
- Buildings
- Property Lines
- Streets
- Rail
- Major Power Towers
- Conservation/ Open Space
- Greenways
- Lakes
- Floodway
- 100 Year Floodplain

I-440 Project Area

- Wade Ave
- Hillsborough St
- Ligon St
- Western Blvd
- Melbourne Rd
- Athens Dr
- Jones Franklin Rd
- I-40
- Walnut St

- Interchange
- Grade Separation

EXISTING INTERCHANGE



Source: ESRI, NCDOT, Wake County, NCOneMap

SCREENING RESULTS THAT APPLY TO ALL FIVE ALTERNATIVES

- **ONE FLYOVER**
- **TWO FLYOVERS**
- **SLIGHT DETOUR**
- **REDUCED ACCESS**
- **COLLECTOR-DISTRIBUTOR (C-D) WEAVE AND BRAID**

NOTE: NORTH IS TO THE RIGHT ON ALL FIVE MAPS OF THE HILLSBOROUGH ST AND WADE AVE INTERCHANGE AREA.

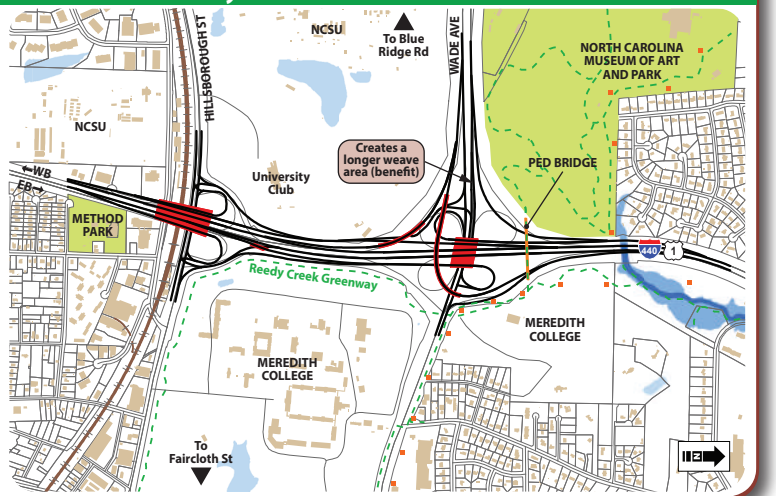
Screening Results for All Five Alternatives

- All alternatives would improve traffic operations.
- All alternatives avoid impacting the pedestrian bridge over I-440.
- All alternatives would impact the Reedy Creek Greenway section that runs through Meredith College.
- All alternatives need new right of way from NC State University and NC State University Club.
- All options need new right of way from Meredith College.

ONE FLYOVER

Retained for Detailed Study

This alternative was retained for detailed study because it was slightly better from a traffic operations perspective compared to the other alternatives. This option likely would need a two-lane loop ramp for the eastbound I-440 loop to westbound Wade Avenue. This second lane would not double the capacity, but it would add some capacity and would have the advantage of improving the weave area shown in the figure.



SCREENING

The Hillsborough Street and Wade Avenue Interchange Area (continued)

LEGEND

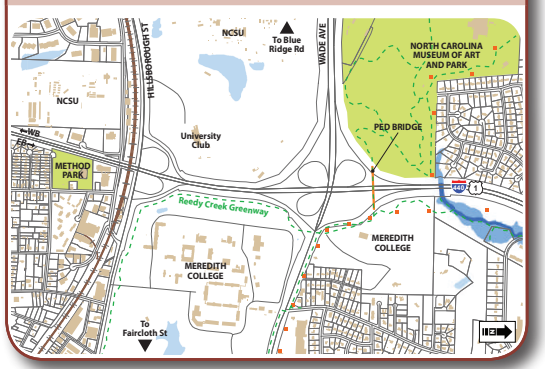
- New or Improved Road/Ramp
- New Bridge
- Road/Ramp Removed
- Buildings
- Property Lines
- Streets
- Rail
- Major Power Towers
- Conservation/ Open Space
- Greenways
- Lakes
- Floodway
- 100 Year Floodplain

I-440 Project Area

- Wade Ave
- Hillsborough St
- Ligon St
- Western Blvd
- Melbourne Rd
- Athens Dr
- Jones Franklin Rd
- I-440
- Walnut St

- Interchange
- Grade Separation

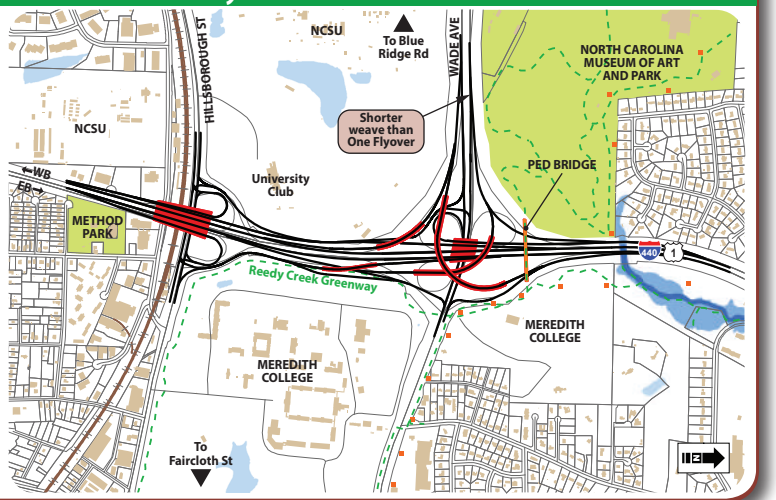
EXISTING INTERCHANGE



TWO FLYOVERS

Retained for Detailed Study

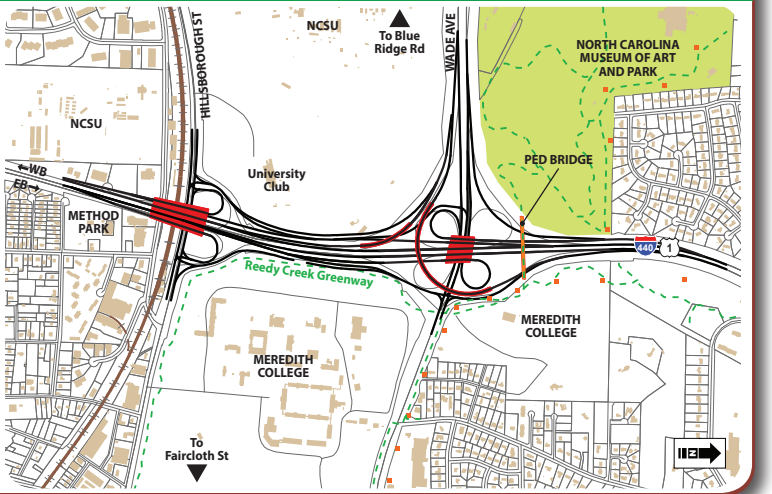
This alternative was retained for detailed study because it was one of the most effective from a traffic operations perspective and would have similar impacts to the other options.



SLIGHT DETOUR

Retained for Detailed Study

The main feature of this design that is different from the other alternatives is that traffic from Hillsborough Street that wants to get on eastbound I-440 must first pass through the traffic signal at Wade Avenue (the slight detour). This alternative was retained for detailed study because it would improve traffic operations and likely would have less impact to Meredith College than the One Flyover and Two Flyovers options.



Source: ESRI, NCDOT, Wake County, NCOneMap

SCREENING

The Hillsborough Street and Wade Avenue Interchange Area (continued)

LEGEND

- New or Improved Road/Ramp
- New Bridge
- Road/Ramp Removed
- Buildings
- Property Lines
- Streets
- Rail
- Major Power Towers
- Conservation/ Open Space
- Greenways
- Lakes
- Floodway
- 100 Year Floodplain

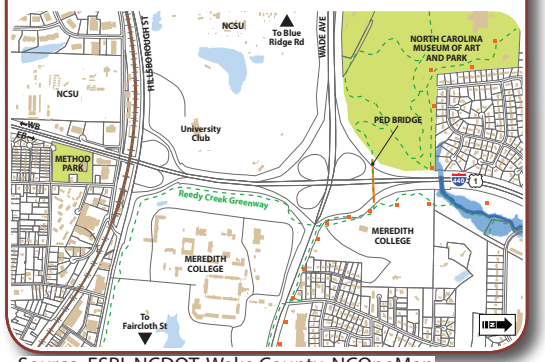
I-440 Project Area

- Wade Ave
- Hillsborough St
- Ligon St
- Western Blvd
- Melbourne Rd
- Athens Dr
- Jones Franklin Rd
- I-40
- Walnut St

Interchange

Grade Separation

EXISTING INTERCHANGE

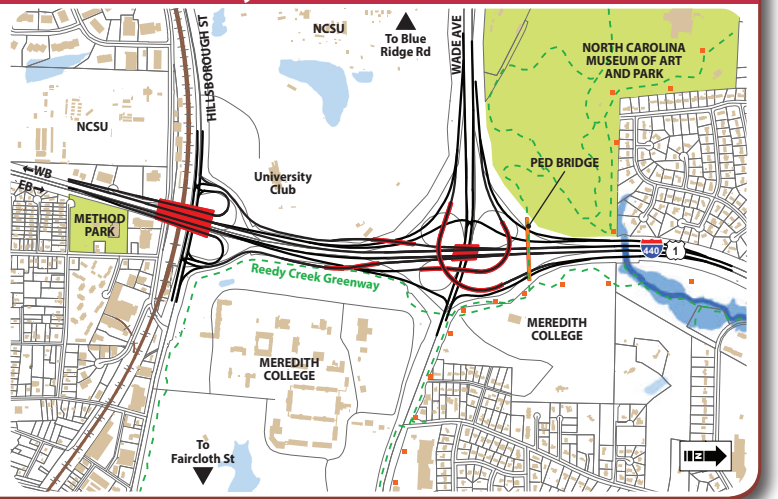


Source: ESRI, NCDOT, Wake County, NCOneMap

REDUCED ACCESS

Eliminated from Further Study

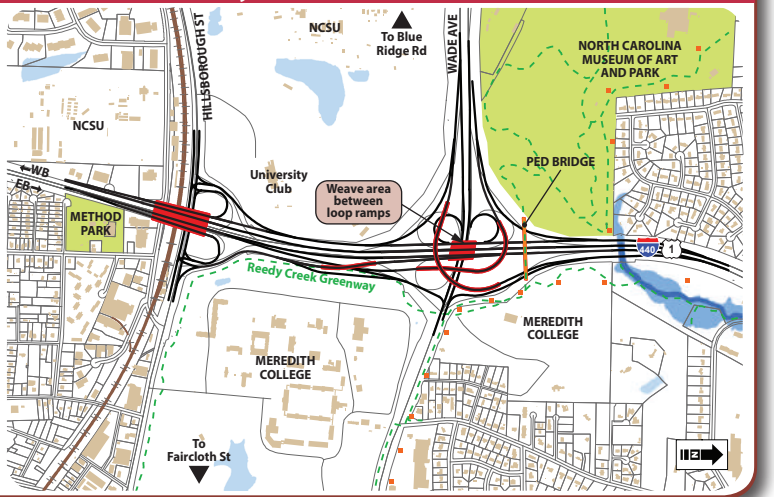
This alternative was eliminated from study because it removes the direct connection between Wade Avenue and Hillsborough Street at the interchange. Vehicles would use Blue Ridge Road to the west or Faircloth Road to the east to go between Wade Avenue and Hillsborough Street. This alternative would operate the best for through traffic on I-440, but other traffic would experience delays by rerouting onto Blue Ridge Road or Faircloth Street. This alternative also would reduce the ability of the roadway network to handle special event traffic by reducing access to the network.



COLLECTOR-DISTRIBUTOR (C-D) WEAVE AND BRAID

Eliminated from Further Study

This alternative was eliminated from detailed study because it was the least effective from a traffic operations perspective, and would retain a weave area between loop ramps that is not as desirable for traffic operations as the other alternatives. Also, this alternative would not have any advantages regarding impacts compared to the other alternatives.



2.2 SECTION The Detailed Study Alternatives

2.2.1 Summary - Putting the Pieces Together

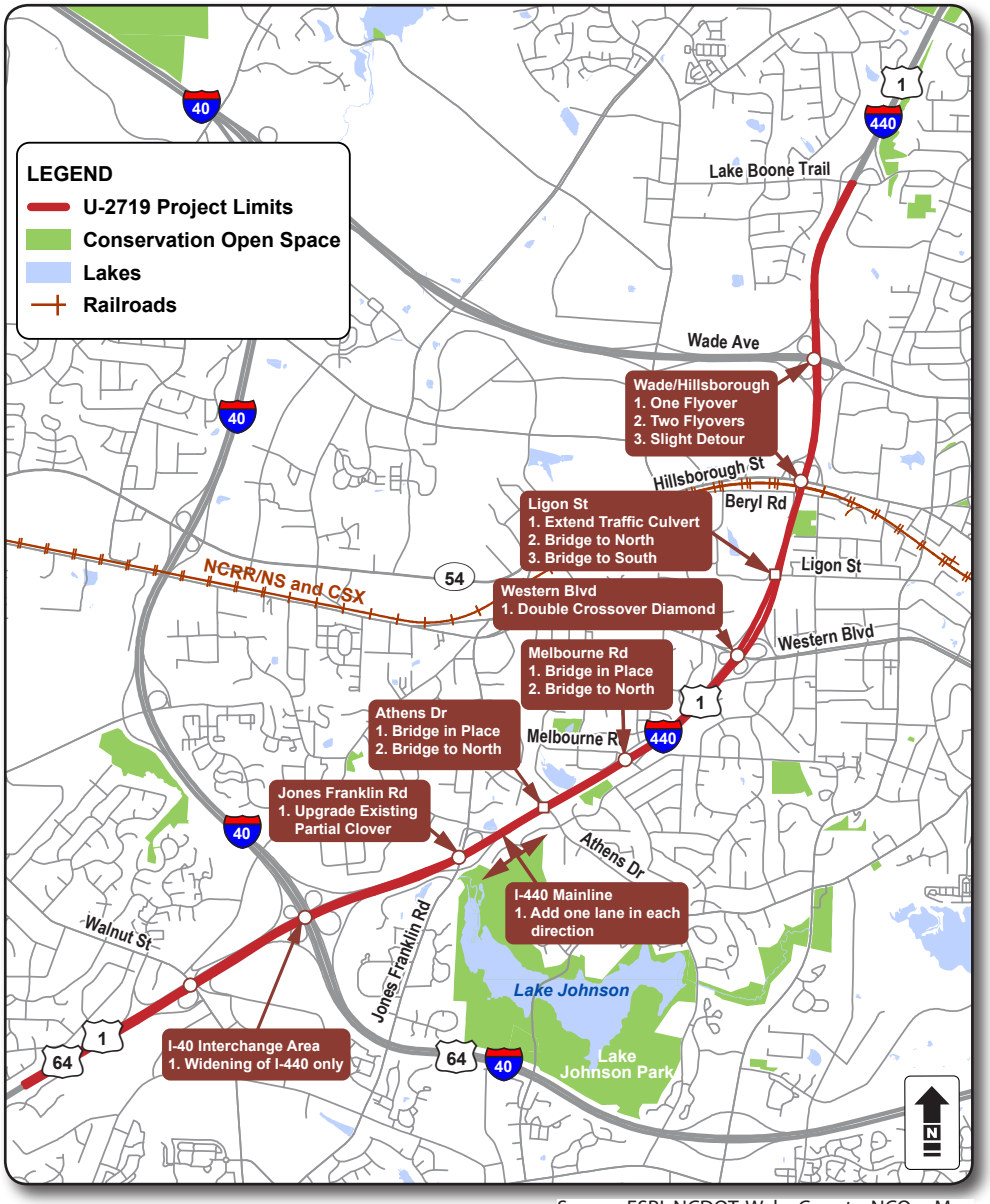
Exhibit 2.2 is an overview of the final Detailed Study Alternatives for each project element. The detailed designs, called preliminary designs, are discussed in **Section 2.4**. The impacts of the Detailed Study Alternatives are compared in **Chapter 3**.

Each of the Detailed Study Alternatives for a project element (interchange or grade separation) can be combined with any of the others, along with the mainline widening, to create the improvements for the entire corridor. There are 36 different possible combinations of the Detailed Study Alternatives to get from the beginning of the project south of Walnut Street to the end of the project near Lake Boone Trail.

It should be noted that none of the Detailed Study Alternatives include proposed changes along I-40. A comprehensive look at planned/programmed improvements along I-40, and the I-40/I-440 interchange, is outside the scope of this project, whose primary purpose is to improve operations along the I-440/US 1-64 corridor, not along I-40.

In addition, any improvements made as part of the I-440 project should not constrain options for the projects along I-40 or result in having to tear out new improvements made under the I-440 project (U-2719) to make way for improvements on I-40 (Projects I-5701 and I-5703). Therefore, it was prudent to limit alternatives for the I-440 project that would achieve the project's primary purpose without involving improvements on I-40 or the I-40 interchange ramps.

Exhibit 2.2: Detailed Study Alternatives



Source: ESRI, NCDOT, Wake County, NCOneMap

2.2.2 Public and Agency Input on the Alternatives

Public and agency input was important in developing, evaluating, and deciding upon the Detailed Study Alternatives to include in this EA. NCDOT sought input on alternatives through meetings with environmental resource and regulatory agencies, establishing a Stakeholder Advisory Committee, and holding public workshops and small group meetings. People could also provide input via the project website.

The ways in which public and agency input influenced the alternatives development process are numerous and are documented in meeting summaries (see **Chapter 4** for lists of meetings). Public comment specific to each project element is summarized in the *Alternatives Development Report for the I-440 Improvement Project* (April 2015).

Input used in developing the alternatives includes, but is not limited to, information on natural and human resources in the study area and their importance to stakeholders, needs and preferences regarding access across I-440 (pedestrian and bicycle use, transit plans, traffic patterns, etc.), and comments and feedback on interchange types. For example, public comments received at the November 2014 Public Meeting #2 resulted in the creation and evaluation of the Partial Clover Alternative for the Western Boulevard interchange.

Full house at Public Meeting #2

Displays of alternatives shown at Public Meeting #2

Front page of handout distributed at Public Meeting #2

I-440 Improvement Project
Walnut to Wade

Your Opinion Counts!

Please take a few moments to fill out this comment form and share your thoughts about the proposed alternatives. Thank you for being part of the process.

Place completed form in the comment box tonight, or
Mail to: Jill Gurak, Atkins, 1616 East Millbrook Rd, Suite 310, Raleigh, NC 27609
Email to jill.gurak@atkinsglobal.com.

Tell us about yourself

Please note that providing your contact information will allow us to respond to any questions or concerns you raise and provide you with updates on the project. Your information will not be shared for any other purpose. Please print.

Your Name: _____

Company/Organization/Neighborhood: _____

Address: _____

City: _____ State: _____ Zip Code: _____

Email Address:_____

Tell us what you think about the alternatives

See the box on the back for ways to view the alternatives after the public meeting.

Overall, do you agree with the recommendations of which alternatives should move forward for more study?

Yes ____ No____

Comments_____

If you do not agree with the recommendations, do you feel there are alternatives that should be eliminated and/or added?

Eliminate: _____for which area?_____

Add:_____for which area?_____

See back

2.3 SECTION Traffic Information

2.3.1 Traffic Volume Forecasts

The future year traffic volume forecasts with the project in place (build alternatives) are used to help size the roadways and interchange ramps so they will operate as efficiently as possible into the future. Forecasts of traffic patterns and turning movements also help determine the number and length of turn lanes at intersections and the interchange types that will process the forecasted traffic patterns most efficiently within the constraints of an area.

The year 2035 traffic volume forecasts with and without the project are compared in **Table 2.1**. Since the proposed project would add an additional through lane in each direction of I-440, the highway would be able to carry more vehicles. Therefore, the forecasted daily traffic volumes for I-440 in 2035 are greater with the project constructed. All proposed Detailed Study Alternatives are forecast to have the same traffic volumes since all propose adding the same number of through lanes (one in each direction) and retaining the same interchanges, with the differences being interchange types. The model and methodology used to create the forecasts are not sensitive to differences in interchange types (just the presence or absence of an interchange).

Table 2.1: Year 2035 Traffic Volume Forecasts

I-440	2035 Average Vehicles per Day without Project	2035 Average Vehicles per Day with Project	Percent Difference
Lake Boone Trail (SR 1676)	138,000	140,200	2%
Wade Avenue (SR 1728)	117,600	125,100	6%
Hillsborough Street (NC 54)	105,100	118,600	13%
Western Boulevard (SR 2012)	105,500	122,300	16%
Melbourne Road (SR 1445) (partial interchange)	98,700	113,400	15%
Jones Franklin Road (SR 5039)	96,400	105,900	10%
I-40	169,600	172,600	2%
Crossroads Boulevard (partial interchange)	149,200	150,000	1%
Walnut Street (SR 1313)	145,600	146,500	1%
Cary Parkway			

Source: *Traffic Forecast for U-2719*, NCDOT, January 10, 2013

2.3.2 Traffic Operations Along the Corridor

The overall ability of the Detailed Study Alternatives to improve capacity and traffic flow along the I-440 corridor in the project area was compared to the No-Build Alternative in three ways:

- Capacity and level of service along segments of I-440
- Average travel speeds through the I-440 corridor during peak periods
- Number of vehicles processed through the corridor during peak periods using total vehicle miles traveled as the measure (peak period hours x traffic volume x speed x distance along corridor)

All Detailed Study Alternatives would substantially improve traffic operations along the I-440 corridor in the study area compared to the No-Build Alternative.

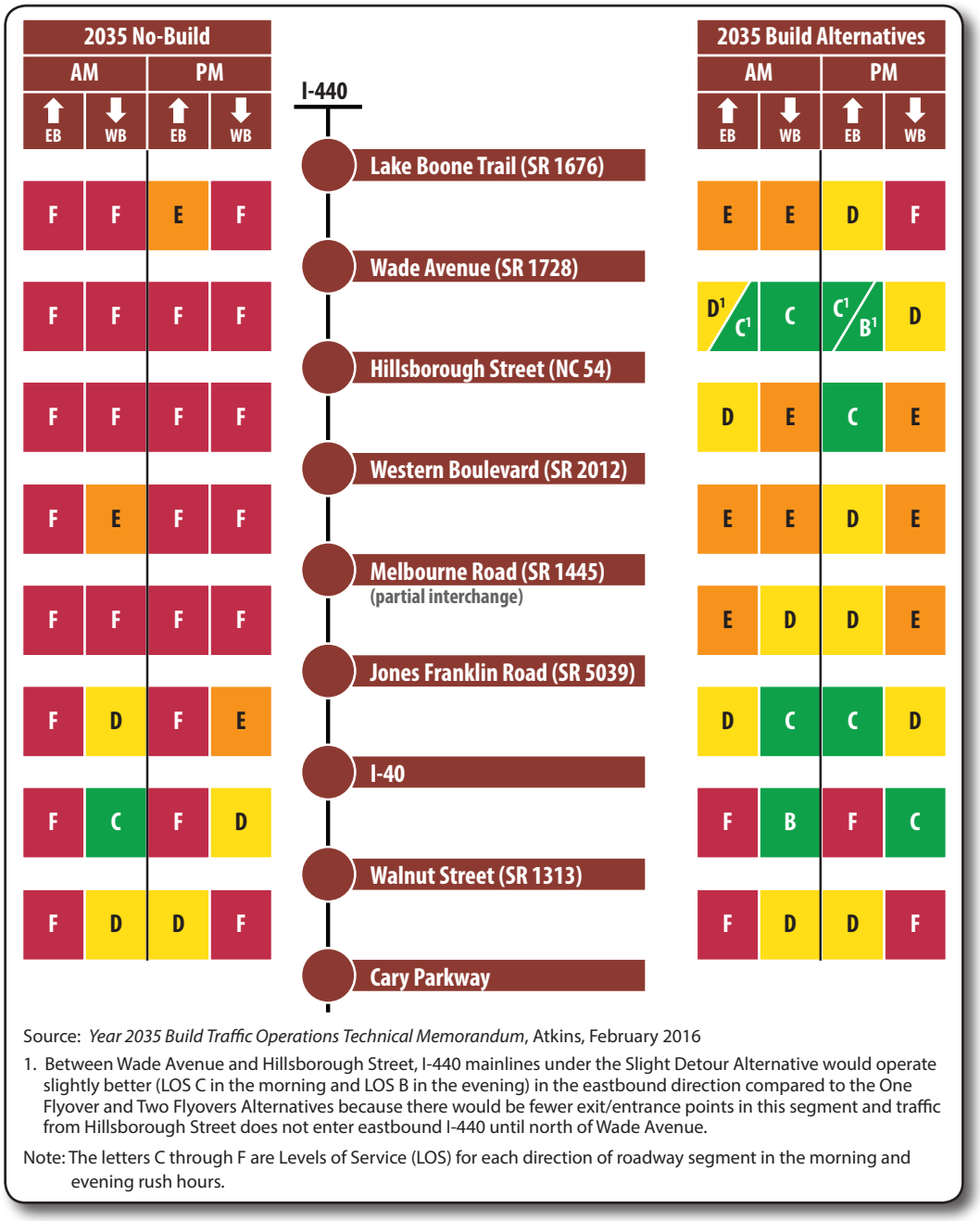
In addition, more detailed analysis was conducted of areas along I-440 where ramps would enter and exit and of ramp/cross-street intersections. This information was used in preparing the preliminary designs and for comparing the Detailed Study Alternatives.

Capacity and Levels of Service Along Segments of I-440

All Detailed Study Alternatives would improve capacity by adding one through lane in each direction and eliminating the bottlenecks on I-440 present at either end of the project corridor.

Table 2.2 shows the Year 2035 levels of service (LOS) for individual corridor segments under the Detailed Study Alternatives compared to the No-Build Alternative (see **Section 1.7.2** for a description of LOS). As shown in the table, all of the Detailed Study Alternatives would substantially improve year 2035 levels of service along I-440 in the project area during peak periods compared to the No-Build Alternative. There are only a couple of minor differences between the Detailed Study Alternatives, as described in the **Table 2.2** notes.

Table 2.2: 2035 Congestion Levels During Peak Hours With and Without the Project



Source: *Year 2035 Build Traffic Operations Technical Memorandum*, Atkins, February 2016

1. Between Wade Avenue and Hillsborough Street, I-440 mainlines under the Slight Detour Alternative would operate slightly better (LOS C in the morning and LOS B in the evening) in the eastbound direction compared to the One Flyover and Two Flyovers Alternatives because there would be fewer exit/entrance points in this segment and traffic from Hillsborough Street does not enter eastbound I-440 until north of Wade Avenue.

Note: The letters C through F are Levels of Service (LOS) for each direction of roadway segment in the morning and evening rush hours.

Average Travel Speeds and Vehicles Processed Along I-440

Average Travel Speeds. Year 2035 average travel speeds through the corridor during two-hour morning and evening peak periods with and without the Detailed Study Alternatives were compared. The speeds were estimated using a computer model (VISSIM) that simulates travel along the entire corridor from south of Walnut Street to north of Wade Avenue, including both bottleneck areas.

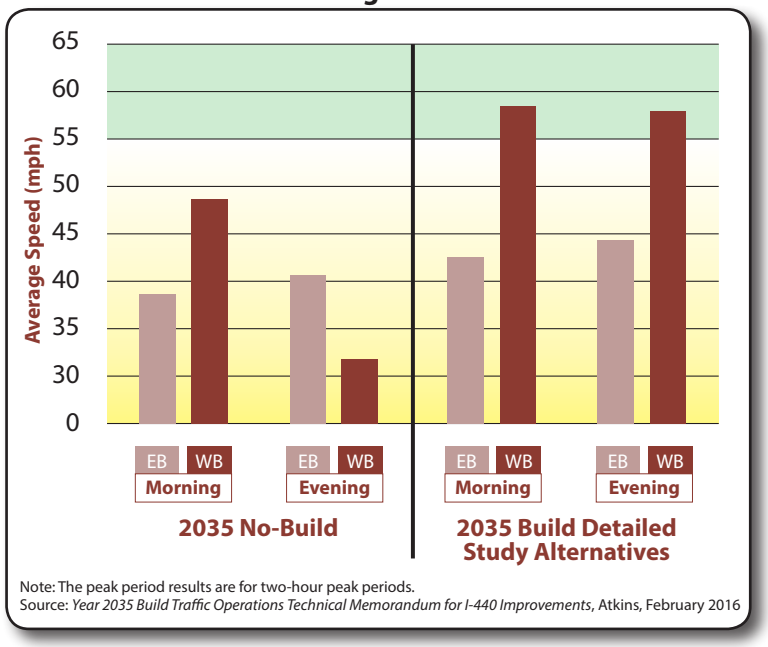
The VISSIM model can be affected by interchange types. Therefore, the Detailed Study Alternatives for each project element were reviewed to identify those that could affect the simulation. Only the three Detailed Study Alternatives at the Hillsborough Street/Wade Avenue interchange area would affect the simulation. Therefore, three corridor simulations were run for average travel speeds that represent the entire range of results for any end-to-end combination of Detailed Study Alternatives.

Exhibit 2.3 is a graph showing the substantial increases in 2035 travel speeds that would occur along the corridor under any of the Detailed Study Alternatives compared to the No-Build Alternative. The differences between Detailed Study Alternatives are small and are noted in the text below.

In the eastbound direction, future average travel speeds under the build alternatives would still be lower than the posted speed limit, but would be approximately 11 percent higher in the morning peak periods and 6 percent higher in the evening peak periods compared to the No-Build Alternative.

The eastbound direction is influenced most by the I-40 interchange area, where both the bottleneck and general congestion through the interchange slow down traffic. The Widen I-440 Only Alternative at the I-40 interchange area eliminates the bottleneck but does not make any other improvements to improve operations at the I-40 interchange area. Separate future I-40 projects are programmed in the Statewide Transportation Improvement Program (STIP) that will improve the operation of I-40 and the I-40 interchange in this area.

Exhibit 2.3: Average Speed on I-440 through the Project Corridor in 2035 During Two-Hour Peak Periods



Note: The peak period results are for two-hour peak periods.
Source: *Year 2035 Build Traffic Operations Technical Memorandum for I-440 Improvements*, Atkins, February 2016

In the westbound direction, future average travel speeds under the build alternatives would be approximately 21 percent higher in the morning peak periods and 77 percent higher in the evening peak periods compared to the No-Build Alternative. Average corridor speeds would be close to the proposed posted speed limit (60 to 65 mph) during these rush hours, a dramatic improvement over the No-Build Alternative.

The westbound direction is influenced mostly by the Wade Avenue interchange area, where both the bottleneck and general congestion at the interchange slow down traffic. All Detailed Study Alternatives in the I-440 westbound direction remove the bottleneck and improve the Wade Avenue interchange configuration; therefore they all have about the same average travel speeds.

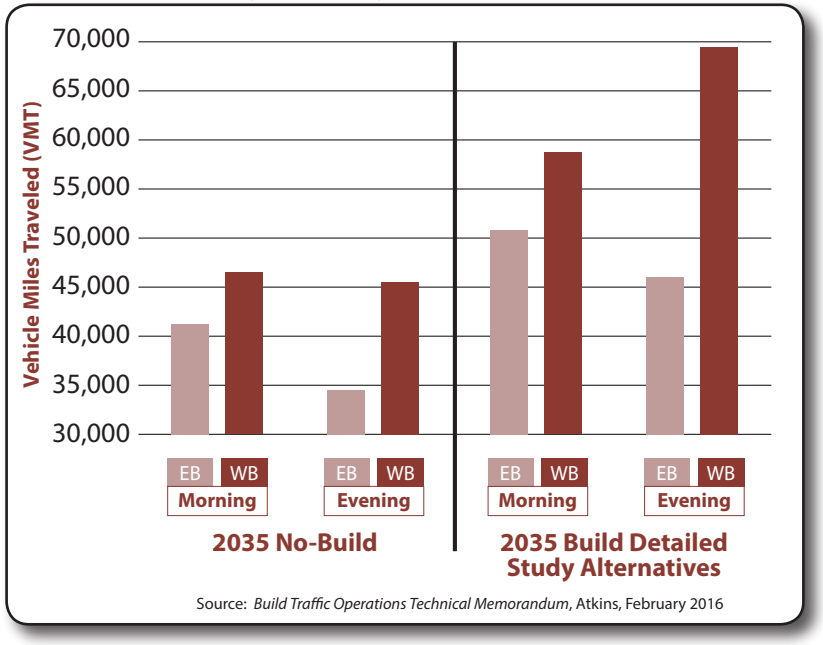
However, under the Two Flyovers Alternative, the ramp from westbound I-440 to westbound Wade has to be one lane to allow it to merge with the flyover ramp from eastbound I-440 before merging onto westbound Wade Avenue. Under the One Flyover Alternative and the Slight Detour Alternative, this ramp can be two lanes wide. The two-lane ramp helps traffic move more efficiently along the mainline of westbound I-440.

Vehicles Processed Along I-440. In addition to increasing average speeds along the corridor, building the project also would result in substantially more vehicles being able to get through the corridor during morning and evening two-hour peak periods, as shown in **Exhibit 2.4**.

In the eastbound direction, the Detailed Study Alternatives can process about 23 percent more traffic in the morning two-hour peak period and about 32 percent more traffic in the evening two-hour peak period compared to the No-Build Alternative.

In the westbound direction, the Detailed Study Alternatives can process about 27 percent more traffic in the morning two-hour peak period and about 53 percent more traffic in the evening two-hour peak period compared to the No-Build Alternative.

Exhibit 2.4: Peak Period Vehicle Miles Traveled on I-440 through the Project Corridor in 2035



Source: *Build Traffic Operations Technical Memorandum*, Atkins, February 2016

Other Operational Analyses Comparing the Detailed Study Alternatives

The traffic operations analysis also included evaluation of the signalized and stop-sign-controlled intersections at interchange ramps and other adjacent intersections for the year 2035 peak periods. The Detailed Study Alternatives were compared amongst themselves and also to the No-Build Alternative.

In general, the operations of the modeled signalized and stop-sign-controlled intersections are similar for all the Detailed Study Alternatives. Only the signalized intersection of Wade Avenue and the I-440 eastbound ramps would differ notably between the Detailed Study Alternatives. Additional delay would occur at this intersection under combinations that include the Slight Detour Alternative for the Wade Avenue interchange (approximately 25 second average delay versus 10 second average delay), although the delay is still considered to be in the acceptable range. The additional delay occurs under the Slight Detour Alternative because traffic from Hillsborough Street wanting to get on I-440 eastbound is routed through this intersection, increasing the volumes.

In addition, under all the Detailed Study Alternatives at the Jones Franklin Road interchange, the intersection with the westbound I-440 ramps/Ft Sumter Road would experience poor operations, although it would be improved over the No-Build Alternative. This area is highly constrained by office parks, apartments, a pond, and the Walnut Creek floodway/floodplain, so design options to maximize efficient traffic flow were limited.

For other intersections in the study area that are not at interchange ramps, a comparison of the Detailed Study Alternatives to the No-Build Alternative shows that intersections along Walnut Street near the highway would see some increased delays under the Detailed Study Alternatives even though none of the alternatives propose changes at the Walnut Street interchange. This is because the project would enable more vehicles to reach these already congested intersections during the peak hours.

At other already congested intersections near the highway, the project would decrease delays. These locations include Jones Franklin Road/Capital Center Drive, Melbourne Road/Kaplan Drive, Western Boulevard/Blue Ridge Road, Western Boulevard/Method Road, and Wade Avenue/Ridge Road.

2.4 SECTION Preliminary Designs of the Detailed Study Alternatives

2.4.1 Background on Design Stages

During the various steps of the project planning process, different levels of design are used to make decisions about the project. As the planning process narrows down alternatives, the level of detail increases. **Table 2.3** shows examples of the types of information included in each design process step and the associated planning process step.

For this project, sketch designs and conceptual designs were shown at Public Meeting #2 held in November 2014. Preliminary designs are presented in this EA and will be used to select an alternative. Final design of the selected alternative will be prepared by a design-build contractor team and will occur after the final environmental document is completed.

Table 2.3: Types of Information Included at Different Design Stages

INCREASING DETAIL

Sketch Design: Used to screen initial ideas

- Roadway centerlines

Conceptual Design: Used to compare preliminary alternatives

- All of the above
- Number of lanes needed
- Edge of pavement
- Potential right of way
- Spot checks for vertical clearance

Preliminary Design: Used to compare detailed study alternatives and select an alternative

- All of the above
- Final design criteria
- Intersection turn lanes
- Detailed road dimensions (width, shoulders, medians, etc.)
- Horizontal and vertical design of roadway
- Preliminary construction limits and right of way
- Noise wall feasibility study
- Preliminary drainage recommendations
- Constructability evaluation

Final Design: Used to construct selected alternative

- All of the above
- Final roadway horizontal and vertical design
- Final construction limits and right of way
- Final plan for temporary construction easements
- Final topographic survey
- Final noise wall design
- Final drainage design plan
- Final plan to maintain traffic during construction
- Utility relocation plan
- Signing plan

2.4.2 Design Criteria and Other Considerations

Design Criteria

Design criteria are the standards, specifications, and parameters that are followed when preparing engineering designs. For interstate projects such as the I-440 project, the criteria must follow the guidelines established by FHWA and NCDOT. Local preferences on items for cross streets, such as sidewalk widths or placement, can also be included where practicable.

The design criteria for the I-440 project include values for items such as number of lanes, lane widths, shoulder widths, maximum gradient (the steepness of the uphills and downhills), and minimum curve radius (the sharpness of a curve), and other elements. The values for each item depend on conditions such as roadway type (interstate, arterial, local street, etc.), desired posted speed limit, median type, and anticipated traffic volumes, among other things. For example, the allowable curve radius on a low-speed local street with few trucks will be tighter than the allowable curve radius on a high-speed highway with many trucks.

At the start of the preliminary design, design criteria were prepared for the mainline of I-440, interchange ramps, and all streets crossing I-440. **Appendix B** includes a table showing the basic design criteria for I-440 and the cross-streets in the project area. The proposed posted speed limit will be 60 to 65 mph.

NCDOT coordinated with the City of Raleigh and the Town of Cary to incorporate their preferences into the design criteria, where practicable, for the travel lanes, sidewalks, and bicycle accommodations on the roads crossing I-440.

Other Considerations

In addition to the design criteria, many other factors influenced the preliminary design. These included maintaining traffic during construction, and minimizing impacts. These are described below.

The ability to maintain traffic access through the corridor is important because I-440 is a critical regional link in the area's roadway network. Due to the importance of I-440, the goal is to maintain at least two lanes of traffic in each direction as consistently as possible during the construction phase. Because the project area is highly developed and right of way is narrow in places, the question of how traffic access would be maintained during construction could affect design choices and impacts.

The project team performed an initial review of the Detailed Study Alternatives in a maintenance-of-traffic feasibility study to determine if the designs could be constructed while maintaining traffic access and to identify areas of possible concern. As an example, the study helped determine the location and elevation of the mainline near Western Boulevard to optimize the ability to shift traffic flow during construction. The study concluded that all Detailed Study Alternatives were feasible to construct while maintaining traffic flow along I-440.

The timing and phasing of the I-440 project should be coordinated with a nearby project that will construct a grade separation of Blue Ridge Road under the NCRR/NS and CSX railroad tracks and Hillsborough Street near the State Fairgrounds (Project U-4437). Project U-4437 has completed the planning phase and is scheduled for right of way and utilities in 2022 and construction in 2024.

The preliminary designs also tried to minimize impacts to surrounding land uses and resources. For example, retaining walls are proposed at the Jones Franklin Road interchange to avoid impacting Walnut Creek.

2.4.3 The Preliminary Designs

Description

Preliminary engineering designs were prepared for all the Detailed Study Alternatives. Typical Sections and maps showing the designs are included in **Appendix B**. As explained in **Section 2.4.1**, the preliminary designs have more details than the conceptual designs used in the alternatives screening process.

The typical section for I-440 upon completion of the project is shown in **Exhibit 2.5**. In some sections between Jones Franklin Road and Ligon Street, the 2-foot hard median barrier shown in the center of the typical section could be replaced with a 10-foot planter similar to the median planters along other segments of I-440. The City of Raleigh has indicated that, depending on cost sharing requirements, they would be interested in including planters in the median where they are practicable. Cost sharing agreements would be prepared during the final design stage.

Notable Changes Between the Conceptual and Preliminary Designs

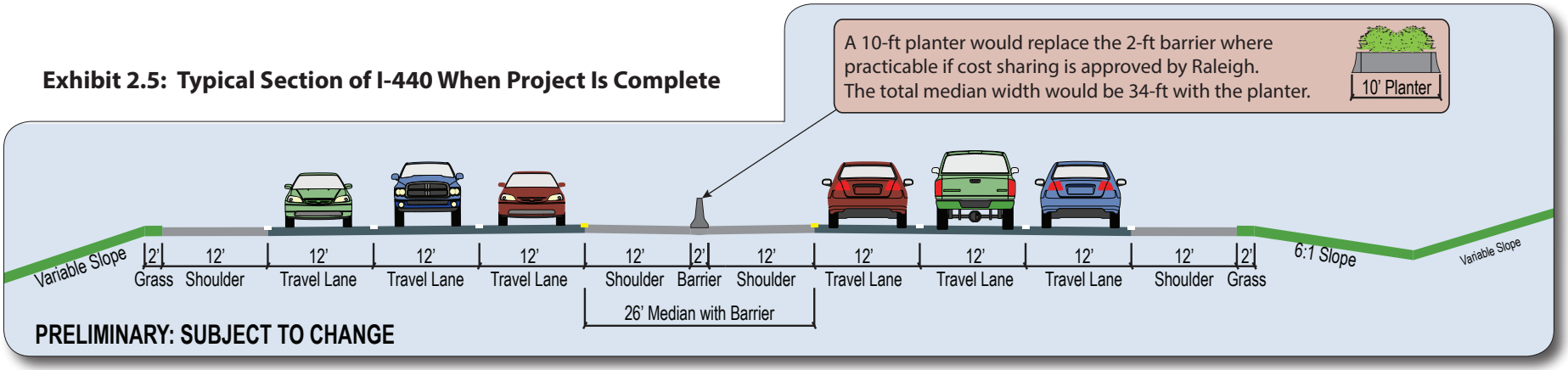
Designs often change between the design stages as more information becomes available, more details are added to the design, and design criteria are finalized. Notable changes from conceptual designs shown at the November 2014 public meeting to preliminary designs are described below.

General Interchange Design. For most interchanges, the changes from conceptual to preliminary design primarily are due to finalized design criteria and more detailed information on vertical elevations. For example, the area anticipated for right of way in the Hillsborough Street/Wade Avenue interchange area increased because the flyover ramps were determined to require a higher design speed and less steep gradients. Ramps also had to shift outward so vertical elevations for ramps joining together or crossing over/under each other could either meet at the proper elevation or be separated by an adequate vertical clearance.

Lake Boone Trail Interchange. During the corridor wide traffic simulation modeling (see **Section 2.3.2**), the simulation indicated that traffic on the westbound I-440 off ramp to Lake Boone Trail would back up onto I-440, which would also then slow down traffic on the mainline. As a result, a second right turn lane for storage on the ramp was included in the preliminary design for all Detailed Study Alternatives. This additional storage can be added to the ramp without needing additional right of way.

Ligon Street Bridge Options. The Detailed Study Alternatives for Ligon Street include extending the existing one-lane traffic culvert that carries existing Ligon Street under I-440, or constructing a two-lane bridge over I-440. As the two-lane bridge was studied, two different alignment options were developed, as shown in **Appendix B**. Both options are presented in the EA, as they have different merits and impacts.

Exhibit 2.5: Typical Section of I-440 When Project Is Complete



2.4.4 Cost Estimates

Costs for constructing the project, acquiring right of way, and relocating utilities in the corridor were estimated based upon the preliminary designs. Estimated costs will change during final design as more details of the design, right-of-way needs, and utility relocation are developed.

Total estimated costs by Detailed Study Alternative are shown in **Table 2.4**, along with the range of costs for combining the alternatives to build the entire project end to end.

For construction, right of way, and utilities, the project is estimated to cost a total of $450.4 million to $475.3 million (2017 dollars).

Construction costs range from $228.9 million to $239.2 million.

Right-of-way costs range from $213.3 million to $234.2 million.

Utility relocation costs range from $6.0 million to $6.4 million.

Costs programmed in the *State Transportation Improvement Program (STIP)* total $129.5 million. Therefore, additional funds will need to be programmed by NCDOT to complete this project.

Table 2.4: Estimated Costs for the Project U-2719 Detailed Study Alternatives

Interchange or Grade Separation Location Area (east to west)	TOTAL COSTS for each Detailed Study Alternative (Construction + Right of Way + Utilities) (2017 dollars)		
Hillsborough St / Wade Ave interchanges (incl greenway east of Wade Ave and Lake Boone Trail ramp)	**One Flyover**	**Two Flyovers**	**Slight Detour**
	$250.9	$251.7	$241.6
Ligon St grade separation	**Extend Culvert**	**Bridge South**	**Bridge North**
	$15.7	$27.1	$28.2
Western Blvd interchange	**Double Crossover Diamond**		
	$47.8		
Melbourne Rd interchange	**Bridge In Place**	**Bridge to North**	
	$8.9	$10.0	
Athens Dr grade separation	**Bridge In Place**	**Bridge to North**	
	$3.6	$4.9	
Jones Franklin Rd interchange	**Upgrade Existing Partial Clover**		
	$47.7		
I-40 interchange and west	**Widen I-440 Only**		
	$85.0 Includes mainline widening for entire project		
RANGE OF COSTS	$450.4 to $475.3		

Source: U-2719 Memo - Cost Estimate Summary - 4/14/2017

1. *Right of way costs for the greenway along One Flyover, Two Flyovers, and Slight Detour are included in the costs for the Hillsborough St/Wade Ave interchange.*

FOR MORE DETAILS ON THE INFORMATION IN THIS CHAPTER:

The following documents are available on the project website at: https://www.ncdot.gov/projects/i-440improvements/.

- ***Alternatives Development Report for the I-440 Improvement Project***
  (April 2015, Atkins)
  This document describes additions and deletions of Detailed Study Alternatives since the I-440 Improvement Project Alternatives Development Report (April 2015) at the I-440/I-40 interchange and the I-440/Jones Franklin Road interchange.
- ***Memorandum - Project U-2719 – Elimination and/or Addition of Detailed Study Alternatives at the I-440/I-40 Interchange and the I-440/Jones Franklin Road Interchange***
  (March 23, 2017, Atkins)
  This document describes additions and deletions of Detailed Study Alternatives since the *I-440 Improvement Project Alternatives Development Report* (April 2015) at the I-440/I-40 interchange and the I-440/Jones Franklin Road interchange.

The following documents are available upon request by contacting Beverly Robinson at NCDOT at brobinson@ncdot.gov.

- ***Traffic Forecast for U-2719 Memorandum***
  (January 2013, NCDOT Transportation Planning Branch)
  This report provides the forecasts of annual average daily traffic volumes for project roadways for 2012 and 2035 under the no-build condition and 2035 for the build project condition. Traffic mixes (percents of cars and trucks) and other traffic volume information also is provided.
- ***Minutes from Stakeholder Advisory Committee Meeting #2 - STIP U-2719 - I-440 Improvement Project***
  (October 2014, Atkins)
  Minutes form the Stakeholder Advisory Committee Meeting #2 held on October 1, 2014 to present and discuss the alternatives screening process and receive input on the recommended Detailed Study Alternatives.
- ***Summary of Public Meeting #2 - I-440 Improvement Project (STIP U-2719)***
  (December 2014, Atkins)
  Public Meeting #2 was held November 12, 2014 to present recommendations for the Detailed Study Alternatives. This report summarizes information presented at the meeting and the public input received.
- ***Traffic Forecast for U-2719 Addendum***
  (May 2015, NCDOT TPB)
  This addendum forecast is for the Ligon Street area to answer the question about the effects on traffic in the Method neighborhood from a 2-lane bridge for Ligon Street over I-440.
- ***U-2719 Proposed Design Criteria***
  (October 27, 2015, Atkins)
  These design criteria are the standards, specifications, and parameters that were followed to prepare the preliminary engineering designs.
- ***I-440 Improvement Project (STIP U-2719) Year 2035 Build Traffic Operations Technical Memorandum***
  (February 2016, Atkins)
  This report documents the modeling of future traffic operations with the project alternatives in place. The report includes corridor-level analyses of vehicle miles traveled and average corridor speeds, and analysis results for freeway segments and intersections.
- ***Raleigh-Cary Rail Crossing Study Recommendations***
  (March 2016, Kimley-Horn and Associates)
  This study evaluates potential improvement to the at-grade highway/rail crossings from NE Maynard Road in Cary to Gorman Street in Raleigh and studies how changes at the crossing will affect future land uses and the community.
- ***Memorandum - Maintenance of Traffic and Construction Phasing Concepts Feasibility Study for the U-2719 Detailed Study Alternatives***
  (January 19, 2017, Atkins)
  This report evaluates the feasibility of maintaining through traffic during construction. Several challenges were identified, but concepts for maintaining traffic and construction phasing were able to be developed for all the Detailed Study Alternatives.
- ***Supplemental to the Year 2035 Build Traffic Operations Technical Memorandum***
  (Draft - February 2017, Atkins)
  This report evaluates the traffic operations from design variations at the Wade Avenue and Hillsborough Street interchange area and at the Jones Franklin interchange.
- ***Cost Estimate Summary for U-2719 (I-440 Improvement Project) Detailed Study Alternatives Preliminary Designs***
  (May 2017, NCDOT and Atkins)
  This memorandum compiles the Detailed Study Alternatives' preliminary construction cost estimates prepared by NCDOT Contract Standards and Development Unit Preliminary Estimate Section, preliminary right of way cost estimates prepared by NCDOT Right of Way Appraisal Unit, and preliminary utility relocation estimates prepared by NCDOT Utilities Unit.

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3 CHAPTER Project Impacts

This chapter describes and compares how the Detailed Study Alternatives would impact the human and natural environments in the study area.

What's In This Chapter...

3 CHAPTER Project Impacts

WANT MORE DETAILS?

See the list of technical reports at the end of this chapter.

Introduction

There are many issues to consider when a large project is proposed in a densely developed area, and there are many laws and regulations protecting important resources that need to be addressed.

As shown in this chapter's table of contents, issues are organized by the following general categories: social resources, cultural resources, physical resources, natural resources, and an impact summary/ comparison. For each resource, existing conditions are described, followed by the potential impacts from each Detailed Study Alternative and ways to minimize those impacts. Teal boxes with the following icon explain how various laws and regulations apply to the project.

When developing the Detailed Study Alternatives' preliminary designs, great care was taken to first avoid impacts and then minimize impacts where reasonable and feasible, while conforming to the established design criteria (see **Section 2.4.2**). However, this section of I-440 was constructed in the early 1960s, and the right of way is narrow in many locations. Therefore, upgrading the roadway to modern standards will bring roadway elements closer to existing adjacent uses, and/or require acquisition of right of way in some locations.

To help the reader navigate this chapter, the following icons appear in the bottom center of each page, indicating the resource category being discussed.

3.1 SECTION Neighborhoods and Community Resources

3.1.1 Existing Community Characteristics

Community Context

The project is located in an established urban area approximately three miles west of downtown Raleigh in east central North Carolina.

Several regional destinations are located in and around the project study area, as shown on **Exhibit 1.3**. These include the North Carolina State Fairgrounds, Carter-Finley Stadium, PNC Arena, the North Carolina Museum of Art, Rex Hospital, North Carolina State University, Meredith College, and Crossroads Shopping Center. Many people use I-440 through the project study area to access these resources.

The university community is an important influence in the project area. Meredith College is located adjacent to I-440 between Hillsborough Street and Wade Avenue. The main campus of North Carolina State University is located to the east and several university facilities are located within the vicinity of I-440, including the Centennial Biomedical Campus (College of Veterinary Medicine), JC Raulston Arboretum, several NCSU research buildings, and a housing complex.

Because of the university and college, there is a large student population living in apartment complexes and homes in the project study area, which increases the demand for bicycle, pedestrian, and transit facilities.

There is also an active residential community in the area. Most of the homes were built between 1960 and 2000, so the neighborhoods are well established and the residents take pride in their community. This is evident in the creation of several local organizations aimed at empowering residents and business owners and maintaining their quality of life. These organizations include the Method Civic League in the Method Neighborhood, the City of Raleigh's West Citizen Advisory Council (CAC) and Wade CAC, Avent West Community Development Corporation, Blue Ridge Corridor Alliance, and Hillsborough Street Community Service Corporation.

Demographics

According to US Census data, between 2000 and 2010 the population of the study area grew more slowly compared to Raleigh and Wake County; likely because the study area includes built-out, well-established neighborhoods and limited vacant land.

The population of the study area is generally younger than the overall populations of Raleigh and Wake County due to the higher student population. The minority population of the study area is comparable to Wake County, with minorities comprising about 40 percent of the population.

The median income in the area is lower than in the city or county as a whole, and a high percentage of homes (58 percent) are occupied by renters, likely due to the higher student population. The percentage of low-income populations in the Census Block Groups surrounding the corridor are about 6 percent higher than the City of Raleigh average (16 percent). Low-income populations are present in all US Census block groups adjacent to the I-440 project corridor from Jones Franklin Road to Hillsborough Street.

3.1.2 Relocations and Property Acquisition

Because the project area is highly developed and the existing I-440 right of way is narrow in many places, permanent new right of way and temporary construction easements will be needed to construct any combination of Detailed Study Alternatives end to end. Estimates of the land areas needed to construct the Detailed Study Alternatives are shown on the preliminary designs in **Appendix B**. The relocation reports for each Detailed Study Alternative are included in **Appendix E**.

For some properties, only a portion of the property may be permanently or temporarily needed. For others, permanent relocation of the resident or business may be necessary.

NCDOT will follow their established process for acquiring property and assisting residents and businesses in relocating. This process is described in the information box on this page.

Table 3.1 lists the estimated numbers of residential and business relocations for the Detailed Study Alternatives. Based on the relocation reports, there are comparable replacement housing and suitable business sites in the area for displaced owners and tenants.

What is the highway right of way?

The is the land area dedicated to and maintained for the purpose of transportation use. Most often it is owned and/or controlled by a state or local government.

What is a temporary construction easement?

A temporary right acquired by one party to temporarily use or control real property belonging to another party for the purpose of construction. For this project, temporary construction easements may be needed for activities such as earthwork or drainage installation. Once construction is complete, the temporary easement reverts back to the property owner, who is compensated for the use.

NCDOT's Property Acquisition and Relocation Process

NCDOT's processes are administered in accordance with the Federal Uniform Relocation Assistance and Real Property Acquisition Policies Act and the North Carolina Relocation Assistance Act.

Private property in the path of the selected end-to-end combination of Detailed Study Alternatives will be purchased by NCDOT for right of way. NCDOT pays fair market value for all property purchased. NCDOT also pays a lesser amount for land temporarily needed for easements. Licensed real estate appraisers determine a fair market value at the time of purchase. This is the same type of appraisal that is required when selling, buying, or refinancing a property.

For renters and homeowners who are relocated by the project, NCDOT offers several programs to minimize the inconvenience of relocation: Relocation Assistance, Relocation Moving Payments, and Relocation Replacement Housing Payments or Rent Supplements. At least one relocation officer is assigned to each highway project. The relocation officer assists homeowners, renters, and owners of displaced businesses, non-profit organizations, and farm operations in searching for and moving to replacement property.

All relocation services and benefits are administered without regard to race, color, national origin, or sex in compliance with Title VI of the Civil Rights Act, per NCDOT's Title VI Policy Statement.

Want to know more? Go to the project website under the heading "Resources for Local Property Owners": https://www.ncdot.gov/projects/i-440improvements/

Table 3.1: Property Acquisition and Relocation Summary

Segment	Detailed Study Alternative		
Hillsborough St / Wade Ave Interchange	**One Flyover**	**Two Flyovers**	**Slight Detour**
	1 - residential relocation 1 - business relocation	0 - residential relocation 1 - business relocation	1 - residential relocation 1 - business relocation
Ligon St Grade Separation[1]	**Extend Culvert**	**Bridge South**	**Bridge North**
	0 - residential relocation 7 - business relocations	0 - residential relocation 8 - business relocations	10 - residential relocations 7 - business relocations
Western Blvd Interchange	**Double Crossover Diamond**		
	1 - residential relocation 0 - business relocation		
Melbourne Rd Interchange	**Bridge In Place**	**Bridge to North**	
	3 - residential relocations 0 - business relocation	6 - residential relocations 0 - business relocation	
Athens Dr Grade Separation	**Bridge In Place**	**Bridge to North**	
	No relocations	5 - residential relocations 0 - business relocation	
Jones Franklin Rd Interchange	**Upgrade Existing Partial Clover**		
	23 - residential relocations 7 - business relocations		
I-40 Interchange and South	**Widen I-440 Only**		
	No relocations		
RANGE OF TOTAL IMPACTS	**Residential Relocations** **Minimum - 27; Maximum - 46**	**Business Relocations** **Minimum - 15; Maximum - 16**	

1. This includes the 7 businesses on Brickhaven Road along westbound I-440 that are impacted by the widening of I-440.

As shown in the table, all end-to-end combinations of Detailed Study Alternatives are estimated to impact similar numbers of businesses (totaling 15 to 16).

Residential relocations (totaling 27 to 46) vary most at the Melbourne Road interchange, Athens Drive grade separation, and Ligon Street grade separation. The highest numbers would occur at the Jones Franklin Road interchange.

At Jones Franklin Road, the Upgrade Existing Partial Clover Alternative would displace 23 residences and 7 businesses. These would occur along Jones Franklin Road due to the need to widen Jones Franklin Road through the interchange area and to realign Ft Sumter Road and the westbound off-ramp so they are directly across from each other.

At the Melbourne Road interchange and Athens Drive grade separation, the Bridge to North Alternatives at each location would have higher residential relocations due to more land needed to realign the roadways to the new bridge locations.

At the Ligon Street grade separation, the Extend Existing Traffic Culvert Alternative and Bridge to South Alternative are anticipated to have no residential relocations, while the Bridge to North Alternative is estimated to have ten residential relocations in the Method Townes townhouse development on Ligon Street. The Method Townes are marketed as student rental housing.

For business relocations near the Ligon Street grade separation, all Detailed Study Alternatives would displace the office buildings on Brickhaven Road estimated to house seven businesses, including two non-profit organizations - 4-H Youth Development and NC FFA Association and Foundation.

3.1.3 Community Resources

Community resources in the project corridor are public and privately owned; and include facilities and lands such as parks, greenways, private recreation centers, JC Raulston Arboretum, public and private schools, libraries, places of worship, Oak Grove Cemetery, and large shopping centers. These are labeled on the maps in **Appendix B**. Public parks and greenways are not included in this section. They are discussed in **Section 3.4.2**.

Community resources that would be displaced or have functions adversely impacted by property acquisition are discussed below for each interchange and grade separation area. NCDOT will follow the established process for property acquisition and relocation of businesses and organizations, which is described in the information box on page 3-4 titled "NCDOT's Property Acquisition and Relocation Process".

Jones Franklin Road Interchange

The Upgrade Existing Partial Clover Alternative would displace the Learn With the Best private school for special needs children with pervasive developmental disorders. This school is located at 559 Jones Franklin Road, in the office building at the corner of Jones Franklin Road and Waters Edge Drive, as shown in **Appendix B – Figure 3**. This office building would be displaced by the project and the school would require relocation. The relocation reports included in **Appendix E** estimate there is an adequate supply of similar facilities available. NCDOT will work closely with the school to reduce the possibility of any lapse in availability of services to the community provided by this facility.

Athens Drive Grade Separation

There are no community resources directly impacted by the Bridge in Place Alternative or the Bridge to North Alternative.

Melbourne Road Interchange

There are no community resources directly impacted by the Bridge in Place Alternative or the Bridge to North Alternative.

Exhibit 3.1: Shopping Center at Western Boulevard interchange

Source: ESRI, NCDOT, Wake County, NCOneMap

Western Boulevard Interchange

The Double Crossover Diamond interchange would require a strip of land and some parking spaces from the parking lot of the K-Mart parcel located at the intersection of Western Boulevard and Blue Ridge Road, as shown in **Exhibit 3.1**. Adequate parking would remain available at the site.

The existing multi-use path through the current I-440/Western Boulevard interchange would be replaced as part of the project.

Ligon Street Grade Separation

There would be no direct impacts to community resources under the Extend Existing Traffic Culvert Alternative and the Bridge to North Alternatives.

Oak Grove Cemetery and Method Community Park, which are nearby, would not be directly impacted by any of the alternatives.

The Bridge to South Alternative would displace one of the large NC State University plant research buildings on Ligon Street on the eastbound side of I-440, as shown in **Exhibit 3.2**.

Exhibit 3.2: Research building at Ligon Street grade separation

Source: ESRI, NCDOT, Wake County, NCOneMap

Hillsborough Street and Wade Avenue Interchange Area

All the Detailed Study Alternatives would directly impact Meredith College, Reedy Creek Greenway, Museum Park, NC State University, the NC State University Club, and the NC State University Athletics golf practice facility. Existing right of way along I-440 in this area is not sufficient to construct the new interchange designs, and impacts to facilities adjacent to I-440 are unavoidable. For the discussion below, refer to **Appendix B – Figures 8a-c**. For discussions of Reedy Creek Greenway and Museum Park, see **Section 3.4**.

Meredith College. The Meredith College main campus is located east of I-440 between Hillsborough Street and Wade Avenue, with additional land north of Wade Avenue. It is a 210-acre private women's college with nearly 2,000 students. It was founded in 1891 and moved to its current location in 1926.

Right of way impacts to the main campus of Meredith College vary by Detailed Study Alternative. The One Flyover Alternative would require approximately 10.7 acres for new right of way, the Two Flyovers Alternative would require approximately 13.0 acres for new right of way and the Slight Detour Alternative would require approximately 8.2 acres of new right of way. In this area of campus, the College's commuter parking lot and a general athletic field would be partially impacted to varying degrees by each Detailed Study Alternative; with the Slight Detour Alternative having the least impact and the Two Flyovers Alternative the most.

North of Wade Avenue, the One Flyover Alternative would require approximately 6.2 acres of a combination of right of way and potential easement to construct the new roadway and to realign Reedy Creek Greenway. At this same location, the Two Flyovers Alternative would require approximately 0.5 acres, and the Slight Detour would require approximately 6.4 acres.

A residence on Meredith College property near Wade Avenue would be displaced with the One Flyover Alternative and the Slight Detour Alternative.

NC State University. All three Detailed Study Alternatives would require approximately 18.6 to 18.9 acres of right of way from the NC State University property between Hillsborough Street and Wade Avenue.

NC State University Club. The University Club is a private recreation facility located west of I-440 on Linda Murphy Drive. It is operated by the University Club Foundation. The Foundation leases approximately 41 acres of land from NC State University for the club site.

The University Club has a clubhouse, 9-hole golf course, tennis courts, and a swimming pool. The NC State University Athletics Department subleases land from the University Club for a golf practice facility near Wade Avenue.

The University Club tennis courts, parking area, and golf course would be directly impacted by all three Detailed Study Alternatives. Additional coordination with NC State University and University Club will be conducted by NCDOT to explore impact minimization measures and potential options for relocation and compensation.

NCSU Golf Practice Facility. All three Detailed Study Alternatives also unavoidably impact the NCSU golf practice facility and would require relocation of this facility.

3.1.4 Mobility and Access Changes

The purpose of the project is to improve traffic flow and operational efficiency, which would enhance mobility along this segment of I-440 and the local road network near the interchanges.

The proposed project would improve mobility and connectivity for pedestrians and bicyclists by providing sidewalks and bicycle lanes on cross streets. Sidewalks are proposed for all cross streets except Wade Avenue. Bicycle lanes are proposed for Jones Franklin Road, Athens Drive, and Melbourne Road. Potential additional enhancements such as wider sidewalks and sidewalk extensions would be coordinated with the City of Raleigh under a cost-sharing agreement.

During construction, there will be temporary impacts to mobility and access in the project area. A goal of the project construction will be to keep two lanes of traffic open in each direction on I-440 during the construction period to the extent feasible.

NCDOT will coordinate with the Wake County Public School System, transit agencies, and emergency response providers regarding detour routes and associated route changes that may be necessary during construction. NCDOT also will coordinate with the NC State Fairgrounds (including NC Department of Agriculture and Consumer Services), Carter-Finley Stadium, NC State University, Wolfpack Club, PNC Arena, Gale Force Sports (Division of Carolina Hurricanes), NC State Highway Patrol, and City of Raleigh Police Department regarding traffic flow during construction for major events at venues west of I-440 that generate major traffic on I-440.

Mobility and access effects specific to each interchange and grade separation area are described next.

Jones Franklin Road Interchange

- Jones Franklin Road through the interchange area from north of Barringer Drive to Centerview Drive would be widened to four lanes, improving mobility.
- The interchange ramps on the westbound side of I-440 would be realigned to meet Fort Sumter Road as one intersection, eliminating one traffic signal from this area.
- The existing Capital Center Drive/Jones Franklin Road intersection will be removed since it is too close to the interchange ramp. A new entrance road off Jones Franklin Road, with a traffic signal, will be provided at Denise Drive.

Athens Drive Grade Separation

- The Replace Bridge in Place Alternative would close the existing bridge during construction and require a temporary approximately 2.8-mile detour for 9 to 12 months. It should be noted that Athens Drive High School and community library is located on Athens Drive less than a mile east of I-440.
- The Replace Bridge to North Alternative would keep the existing bridge open during construction, with only potential short term closures to tie roadway approaches to the new bridge.

Melbourne Road Interchange

- The Replace Bridge in Place Alternative would close the existing bridge during construction and require a temporary approximately 3.2-mile detour for 9 to 12 months. It should be noted that AB Combs Magnet Elementary School is located less than a mile from the interchange.
- The Replace Bridge to North Alternative would keep the existing bridge open during construction, with only potential short term closures to tie roadway approaches to the new bridge.
- Both alternatives would close the Deboy Street intersection with the Melbourne Road off-ramp. Traffic would use Huntingdon Drive and Powell Street instead, which would be approximately 0.5 miles longer.

Western Boulevard Interchange

- The existing multi-use path along the north side of Western Boulevard would be replaced as part of the project.

Ligon Street Grade Separation

- The bridge alternatives would include sidewalks and would allow for buses to cross over I-440 at this location.
- Sidewalks would not be included with the Extend Existing Traffic Culvert, nor would buses be able to use the one-lane culvert due to clearance issues.

Wade Avenue and Hillsborough Street Interchange Area

- Under the Slight Detour Alternative, the access from Hillsborough Street to eastbound I-440 would change. These vehicles would be routed through a traffic signal at Wade Avenue before being able to get on eastbound I-440. This new routing will be longer, but traffic operations for the overall interchange system are similar to the One Flyover and Two Flyovers, and all are an improvement over the no-build scenario.

3.1.5 Environmental Justice

Federal laws and regulations require the evaluation of effects of transportation actions on minority and low-income populations, which in the past have been under-served in the decision-making process. These requirements are grouped under the term "environmental justice", as described in the information box.

Both minority and low-income populations that meet the Environmental Justice criteria were identified in the project vicinity, including the minority population in the Method Neighborhood, and low-income and minority populations disbursed within neighborhoods from Jones Franklin Road to Hillsborough Street.

Adverse community impacts are anticipated under any combination of Detailed Study Alternatives end to end, but these would affect all populations along the project corridor equivalently; thus impacts to minority and low-income populations do not appear to be disproportionately high and adverse. Benefits of the project, including improved safety and mobility, would be enjoyed by both regional travelers and local residents, including minority and low-income residents.

Benefits and burdens resulting from the project are anticipated to be equitably distributed throughout the community. No disparate impacts are anticipated under Title VI and related statutes.

Public involvement opportunities for all communities are described in **Sections 4.3 and 4.4**.

Environmental Justice

Title VI of the Civil Rights Act of 1964 protects individuals from discrimination on the grounds of race, age, color, religion, disability, sex, and national origin. Additional directives are included in Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority and Low-Income Populations".

The Executive Order "directs federal agencies to take appropriate and necessary steps to identify and address disproportionately high and adverse effects of Federal projects on the health or environment of minority and low-income populations to the greatest extent practicable and permitted by law." (*FHWA Guidance on Environmental Justice and NEPA*,12/16/11). The guidance directs FHWA to:

1. Ensure meaningful opportunities for all potentially affected communities in the transportation decision-making process;
2. Avoid, minimize or mitigate disproportionately high and adverse human health or environmental effects, including social and economic effects, on minority or low income populations; and
3. Fully evaluate the benefits and burdens of transportation programs, policies, and activities, upon low-income and minority populations.

A disproportionately high and adverse effect on minority and low-income populations means an adverse effect that:

1. Is predominantly borne by a minority population and/or a low-income population; or
2. Will be suffered by the minority population and/or low-income population and is appreciably more severe or greater in magnitude than the adverse effect that will be suffered by the non-minority population and/or non low-income population.

Want to know more? Go to FHWA website https://www.fhwa.dot.gov/environment/environmental_justice/

3.2 SECTION Visual Resources

3.2.1 Landscape Character of Project Area

The landscape along most of the I-440 project corridor is urban and suburban, with gently rolling topography. Trees line the right of way and limit views to and from I-440. Larger undeveloped forested areas are adjacent to the roadway at Lake Johnson, Kaplan Park, and Museum Park. Views open up slightly at interchanges and grade separations.

Typical forested boundaries of project corridor looking eastbound from Athens Drive bridge.

Between Hillsborough Street and Wade Avenue, open fields are located adjacent to I-440 on both sides – on the Meredith College main campus and NC State University. However, a vegetated buffer blocks most of the views from I-440 to these open areas.

3.2.2 Sensitive Visual Resources

There is one sensitive visual resource in the project corridor. The Reedy Creek pedestrian bridge over I-440 is a local landmark and prominent aesthetic feature located just east of the Wade Avenue interchange.

Reedy Creek Greenway pedestrian bridge over I-440

3.2.3 Visual Impacts

Along most of the project corridor, views would not change substantially since the view-shed already includes an interstate highway. The additional two lanes along I-440 and the proposed interchange and grade separation designs from south of Walnut Street through Western Boulevard will not substantially change the mass and scale of I-440 within the landscape.

Removal of vegetation within the existing and proposed new right of way may increase views to and from I-440 in some locations, but over time, vegetation will regrow and obscure views.

Views along I-440 at Ligon Street would change with the introduction of a new bridge over I-440 under the Bridge to North and Bridge to South Alternatives. However, the proposed two-lane bridge would be of similar mass and scale to the bridges at Melbourne Road and Athens Drive and would not look out of place.

The Ligon Street bridge may be enhanced with upgraded railings or other aesthetic treatments due to its proximity to historic Oak Grove Cemetery and Berry O'Kelly School historic district (see **Section 3.3.2**).

The greatest visual changes along I-440 would occur at the Wade Avenue interchange with the addition of the flyover ramp(s) and the ramp system between Wade Avenue and Hillsborough Street under any of the Detailed Study Alternatives. Views would change for Reedy Creek Greenway on the pedestrian bridge and for some areas at the University Club and at Meredith College. Views from Museum Park would not change noticeably because the forested buffer area would block views.

At the University Club, there would be a new view of a retaining wall along I-440 between the on/off ramps and the I-440 mainline. At Meredith College, the views on the western side of campus would be changed to include new fill slopes under all alternatives and the single flyover ramp structure under the One Flyover Alternative and Slight Detour Alternative and the two flyover ramp structures under the Two Flyovers Alternative.

Changes to views to and from the pedestrian bridge, a sensitive visual resource, were evaluated in detail for the nearby Wade Avenue interchange Detailed Study Alternatives (One Flyover, Two Flyovers and Slight Detour).

The new flyover ramps at the Wade Avenue interchange would have the most potential to impact views both to and from the pedestrian bridge. A 3D visualization model developed for this project was used to evaluate these potential effects.

Views from the pedestrian bridge are discussed first, followed by a discussion of views of the bridge from I-440.

Views from the Reedy Creek Greenway Pedestrian Bridge

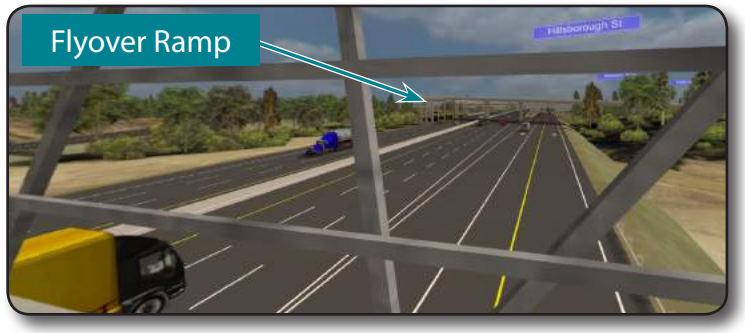
An existing typical view from the pedestrian bridge is shown in this photograph below on the left. The views from the bridge are partially obscured by the bridge supports and the protective chain link fencing.

Under the One Flyover or Slight Detour Alternatives, the single new flyover ramp associated with these alternatives would be almost one-quarter mile away and would be a very small addition to the landscape as viewed from the bridge.

There would be some change in the views under the Two Flyovers Alternative since the second flyover ramp would be approximately 370 feet away from the bridge. As shown in the simulation view below on the right, the Two Flyovers second flyover ramp would be a visible, but not dominant, addition to the landscape as viewed from the pedestrian bridge.

Under any of the Detailed Study Alternatives, the character of the views looking toward Wade Avenue from the bridge would not be adversely impacted since the view would continue to be of a major highway.

Existing view from pedestrian bridge west toward Wade Avenue



Simulated view from pedestrian bridge to the Two Flyovers alternative for Wade Avenue

Views to the Reedy Creek Greenway Pedestrian Bridge from I-440

Travelers along I-440 eastbound and westbound have an attractive view of the Reedy Creek Greenway pedestrian bridge as they travel toward the bridge.

In the eastbound I-440 direction, the bridge starts becoming a prominent feature in the landscape at about the eastern edge of the existing I-440 bridge over Wade Avenue, as shown in the photograph of the existing view on this page. Simulations of the same view under the three Detailed Study Alternatives are presented on this page for comparison.

There would be no notable changes in views of the pedestrian bridge with the One Flyover Alternative or Slight Detour Alternative since the single flyover ramp is well behind the I-440 traveler when they cross over Wade Avenue.

Under the Two Flyovers Alternative, the second flyover ramp would adversely change the views for a short time as travelers approach and pass under the flyover ramp.

View location and direction of views below

Existing view from I-440 north to pedestrian bridge

Simulated view of pedestrian bridge from One Flyover Alternative

Simulated view of pedestrian bridge from Two Flyovers Alternative

Simulated view of pedestrian bridge from Slight Detour Alternative

3.2.4 Other Aesthetic Considerations

There are two features that may be incorporated into the project that would enhance aesthetics along the I-440 project corridor.

These are the potential addition of planters in the median of I-440 and enhanced aesthetic treatments of any noise walls that may be constructed along the I-440 corridor.

Potential locations of median planters extend from Jones Franklin Road to Ligon Street and are shown on the preliminary designs in **Appendix B**. These planters would be similar to the existing median planters along other sections of I-440, but would be wider to facilitate plant growth and maintenance. The installation of median planters is dependent on cost-sharing participation by the City of Raleigh.

For noise walls determined feasible and reasonable during final design, the City of Raleigh has expressed an interest in participating in a cost-sharing agreement to provide noise walls similar to the existing brick noise walls along other segments of I-440.

All cost-sharing agreements with local municipalities would be finalized during the final design stage.

Existing view of I-440 median planter near Glenwood Avenue

Existing noise wall along I-440 west of Lake Boone Trail

3.3 SECTION Archaeological and Historic Architectural Resources

Historic and archaeological sites determined important enough to be eligible for the National Register of Historic Places are protected under the National Historic Preservation Act, as described in the information box titled "The National Historic Preservation Act."

3.3.1 Resources in the Project Area

Archaeological Resources

There are no archaeological resources in the project area that are on or eligible for listing on the National Register of Historic Places.

The NC Historic Preservation Office (NCHPO) stated that based on their knowledge of the area, "We, therefore, recommend that no archaeological investigation be conducted in connection with this project." (letter to NCDOT dated August 13, 2012, included in **Appendix D2**).

Historic Architectural Resources

Surveys by qualified historians were conducted in the project's Area of Potential Effect, as described in the supporting documentation at the end of this chapter. The five sites determined to be on or eligible for listing on the National Register of Historic Places are documented in letters from the NCHPO dated February 4, 2014, September 26, 2014, and May 21, 2015. These letters are included in **Appendix D2**.

These five sites are described below and shown on **Exhibit 3.3**. More detailed site boundaries are shown on the environmental features maps in **Appendix B**.

The National Historic Preservation Act

This Act, specifically Section 106 of the Act, requires federal agencies to take into account the effects of their actions on historic properties (which includes archaeological sites).

Properties protected under this Act includes districts, sites, buildings, structures, and objects that are on or determined eligible for listing on the National Register of Historic Places (https://www.nps.gov/Nr/index.htm).

What is the National Register of Historic Places? This is the official list maintained by the National Park Service of the nation's historic places worthy of preservation.

What makes a property eligible for the National Register of Historic Places? Properties that are generally 50 years old or older, and also fulfill one or more criteria related to American history, architecture, archaeology, engineering, and culture.

How does a project comply with Section 106 of the Act? A four step process is followed:

1. NCDOT and FHWA consult with the NC Historic Preservation Office (NCHPO) to determine whether Section 106 of the Act applies to a project. If the answer is "yes", then;
2. The Area of Potential Effect (APE) around a project is surveyed by qualified historians and/or archaeologists. Results are reviewed with NCHPO to identify properties on or eligible for listing on the National Register of Historic Places. For these identified properties, go to Step 3…
3. For the project's effect on each historic property identified in Step 2, a finding is made of No Effect, No Adverse Effect, or Adverse Effect. If there is an Adverse Effect, go to Step 4…
4. FHWA, NCDOT, NCHPO, and property owners work together to explore ways to avoid and minimize impacts, and/or include measures in the project to mitigate adverse effects.

Want to know more? Go to the US Advisory Council on Historic Preservation website http://www.achp.gov/nhpa.pdf or the National Park Service website https://www.nps.gov/Nr/index.htm

Exhibit 3.3: Location of Historic Sites in the Project Area

Source: ESRI, NCDOT, Wake County, NCOneMap

Oak Grove Cemetery. This 1.5-acre cemetery is located on Ligon Street on the westbound side of I-440. Although the total number of burials is not known, the cemetery contains approximately 100 grave markers; with approximately half of the markers being 50 years of age or older. The earliest marked grave, of Lafayette Ligon, is dated 1891. The cemetery is still being actively used and maintained by the churches in the Method community.

Oak Grove Community Cemetery

Oak Grove Cemetery was determined eligible for the National Register of Historic Places because it represents the area's early settlement and history of the Method community, it is a good example of African American folk burial practices, and is one of two known freedmen cemeteries in Raleigh.

Berry O'Kelly School Historic District. A prominent founder of the Method community was Berry O'Kelly, born in 1864. He was a successful mixed-race businessman with an interest in improving educational opportunities for rural black children. In 1895, a two-room frame community school was built on Method Road that became known as the Berry O'Kelly Training School. Facilities were improved over the years and in 1921, the Berry O'Kelly Training School was the first rural high school for African American children to be accredited in North Carolina. The last high school class graduated in 1958 and the school was closed in 1967.

Berry O'Kelly Grave Site

Today, the City of Raleigh Parks and Recreation Department operates Method Community Park and Community Center on a portion of the historic site. The remainder of the historic district includes the St James AME Church and the grave site of Berry O'Kelly.

The district was determined eligible for the National Register of Historic Places for its importance in the areas of education, ethnic heritage, and community development, its association with Berry O'Kelly, and its intact collection of buildings that are representative remnants of the old Method community.

Capitol City Lumber Company (portion). Capitol City Lumber Company on Beryl Road was incorporated in 1945 by James Anglin Nicholson (born in 1907, died 2002), and opened for business in 1947. The lumberyard opened just in time to coincide with an explosion of post-World War II commercial and residential development in the area. The company is still owned by the family and in operation today.

Capitol City Lumber

The portion of the property that includes structures from prior to 1950 is included in the 1.77-acre historic site boundary. The site was determined eligible for listing in the National Register of Historic Places for its strong historic associations with Raleigh's post-World War II growth and development.

Royal Baking Company. The Royal Baking Company was founded in 1916 by Bartholomew Streb. The company built the facility on Hillsborough Street in 1941 to accommodate their growing wholesale baking and distribution business. The building is now called "The Royal on Hillsborough" and houses a variety of retail and service shops and restaurants.

Royal Baking Company Building

The Royal Baking Company on Hillsborough Street was listed on the National Register of Historic Places in 1997 as an intact example of an International style building representing Raleigh's emerging industrial economy in the years immediately following World War II.

Meredith College (portion). The Baptist Female University was founded in 1891, initially at a site in downtown Raleigh on Edenton Street. The name was changed to Meredith College in 1909, and the campus was relocated to its current location on Hillsborough Street in 1926. The original campus included six brick buildings surrounding a central quadrangle. This core of the campus, the tree-lined entrance drive off Hillsborough Street, and the 1964 amphitheater and lake are included in the historic site boundary. This portion of Meredith College was determined eligible for the National Register of Historic Places for its role in the history of women's education in North Carolina and for design and landscape architecture.

Meredith College

3.3.2 Effects on Historic Architectural Sites

A meeting was held on May 2, 2017 with the North Carolina Historic Preservation Office to review the preliminary designs of the Detailed Study Alternatives and to determine their effects on the five resources listed in **Section 3.4.1**. Each resource is discussed below. The effects determination letter is included in **Appendix D2**.

Oak Grove Cemetery - No Adverse Effect or Adverse Effect - Depending on Alternative

The boundary of the Oak Grove Cemetery is shown on **Appendix B Figures 7a-c**. This site is near the Ligon Street grade separation Detailed Study Alternatives (Extend Existing Traffic Culvert Alternative, Build Bridge to South Alternative, and Build Bridge to North Alternative).

As shown on the figures in **Appendix B**, none of the preliminary designs for the Detailed Study Alternatives would directly encroach upon the Oak Grove Cemetery. Avoiding direct impacts to this resource was a factor in the designs of the Detailed Study Alternatives. All of the alternatives include a retaining wall between the cemetery and the I-440 mainline so that widening of the mainline does not encroach on the cemetery. The Build Bridge to North Alternative would be slightly farther from the cemetery than the Extend Existing Traffic Culvert Alternative and the Build Bridge to South Alternative.

The bridge alternatives would enhance access between the Method Neighborhood and the cemetery with the addition of sidewalks. Sidewalks cannot be constructed in the one-lane traffic culvert under the Extend Existing Traffic Culvert Alternative.

Under Section 106 of the Historic Preservation Act, the effect determination is "No Adverse Effect" for this resource under the Build Bridge to North Alternative and Extend Existing Traffic Culvert Alternative. If the Build Bridge to North Alternative is selected, NCDOT must coordinate with the Method Neighborhood and City of Raleigh regarding aesthetic treatments for the bridge.

Under Section 106 of the Historic Preservation Act, the effect determination is "Adverse Effect" for this resource under the Build Bridge to South Alternative due to proximity of proposed earthwork needed for the roadway approach to the Ligon Street bridge. If this alternative is selected, additional coordination and consultation between NCDOT, FHWA, NCHPO, and property owners must occur to explore ways to avoid and minimize impacts and include measures to mitigate adverse effects. Measures needed to resolve adverse effects would be documented in a Memorandum of Agreement.

Berry O'Kelly School Historic District - No Adverse Effect

The boundary of the Berry O'Kelly School historic district is shown in **Appendix B** on **Figures 7a-c**. This site is between Hillsborough Street and Ligon Street on the eastbound side of I-440.

As shown on the figures in **Appendix B**, none of the preliminary designs for the Detailed Study Alternatives would directly impact the Berry O'Kelly School historic district. Avoiding impacts to this resource was a factor in deciding to widen I-440 on the westbound side. The preliminary design also provides space between the roadway shoulder and the historic district boundaries estimated to be sufficient for drainage features and a potential noise wall.

Under Section 106 of the Historic Preservation Act, the effect determination is "No Adverse Effect" for this resource. Aesthetic treatments and/or a public art project for the community side of the noise wall should be considered with input from the City of Raleigh and the Method Neighborhood. The City of Raleigh has expressed an interest in participating in a cost-sharing agreement to provide noise walls similar to the existing brick noise walls along other segments of I-440.

Capitol City Lumber Company (portion) - No Effect

The boundary of the Capitol City Lumber Company historic resource is shown in **Appendix B** on **Figures 7a-c**. This site is near the Hillsborough Street and Wade Avenue interchange area Detailed Study Alternatives (One Flyover Alternative, Two Flyovers Alternative, and Slight Detour Alternative).

As shown on the figures in **Appendix B**, none of the preliminary designs for the Detailed Study Alternatives would directly impact the Capitol City Lumber site. Under Section 106 of the Historic Preservation Act, the effect determination is "No Effect" for this resource.

Royal Baking Company - No Effect

The boundary of the Royal Baking Company historic resource is shown in **Appendix B** on **Figure 11**. This site is near the Hillsborough Street and Wade Avenue interchange area Detailed Study Alternatives (One Flyover Alternative, Two Flyovers Alternative, and Slight Detour Alternative).

None of the preliminary designs for the Detailed Study Alternatives would directly impact the Royal Baking Company site. Under Section 106 of the Historic Preservation Act, the effect determination is "No Effect" for this resource.

Meredith College (portion) - No Effect

The boundary of the historic portion of Meredith College is shown in **Appendix B** on **Figures 8a-c** and **Figure 11**. This site is near the Hillsborough Street and Wade Avenue interchange area Detailed Study Alternatives (One Flyover Alternative, Two Flyovers Alternative, and Slight Detour Alternative).

None of the preliminary designs for the Detailed Study Alternatives would directly impact the historic portion of Meredith College. Under Section 106 of the Historic Preservation Act, the effect determination is "No Effect" for this resource.

3.4 SECTION Resources Protected Under Section 4(f) and Section 6(f)(3) Laws

3.4.1 Protected Resources in the Project Area

As described in the information box titled "Section 4(f)," resources that receive special protection under this law include publicly-owned parks, recreational lands, wildlife and waterfowl refuges; and publicly or privately-owned historic sites on or eligible for listing on the National Register of Historic Places.

Section 6(f) resources are those that have received grant funding under the Land and Water Conservation Fund (see information box titled "Section 6(f)(3)").

The following public parks and recreation areas (greenways) in the project area are afforded special protections under Section 4(f). Portions of Lake Johnson Park are also protected under Section 6(f)(3). These resources, described in **Section 3.2**, are listed from west to east.

- Lake Johnson (part also protected under Section 6(f)(3))
- Kaplan Park
- Method Community Park
- Reedy Creek Greenway
- Museum Park
- House Creek Greenway

The five historic architectural resources described in **Section 3.3** of this chapter also are protected under Section 4(f). These are listed below from west to east:

- Oak Grove Cemetery
- Berry O'Kelly School Historic District
- Capitol City Lumber Company (portion)
- Royal Baking Company
- Meredith College (portion)

There are no publicly-owned wildlife or waterfowl refuges in the project study area.

LAWS

Section 4(f)

Section 4(f) refers to the original section of law within the US Department of Transportation Act of 1966. The law is now codified in other locations, but it continues to be commonly known as Section 4(f).

- This law applies only to projects funded and/or approved by agencies of the US Department of Transportation, such as the Federal Highway Administration.
- The law provides extra protections for public parks, recreational lands, and wildlife and waterfowl refuges, and publicly or privately-owned historic sites when developing transportation projects.
- Transportation projects cannot use lands from protected resources unless it can be shown there is no feasible and prudent alternative that completely avoids the resource or the impact can be shown to not adversely affect the resource (i.e. a *de minimis* effect).

Want to know more? Go to FHWA website:
https://www.environment.fhwa.dot.gov/4f/4fAtGlance.asp

LAWS

Section 6(f)(3)

Section 6(f)(3) is a section of the Land and Water Conservation Fund Act.

- This Act provides matching grant funding to state and local governments for public outdoor recreation sites and facilities.
- Section 6(f)(3) of the Act prohibits converting properties funded under this Act to non-recreational uses without approval of the National Park Service.
- Any land that is converted must be replaced with land of equal or greater value, location, and usefulness.

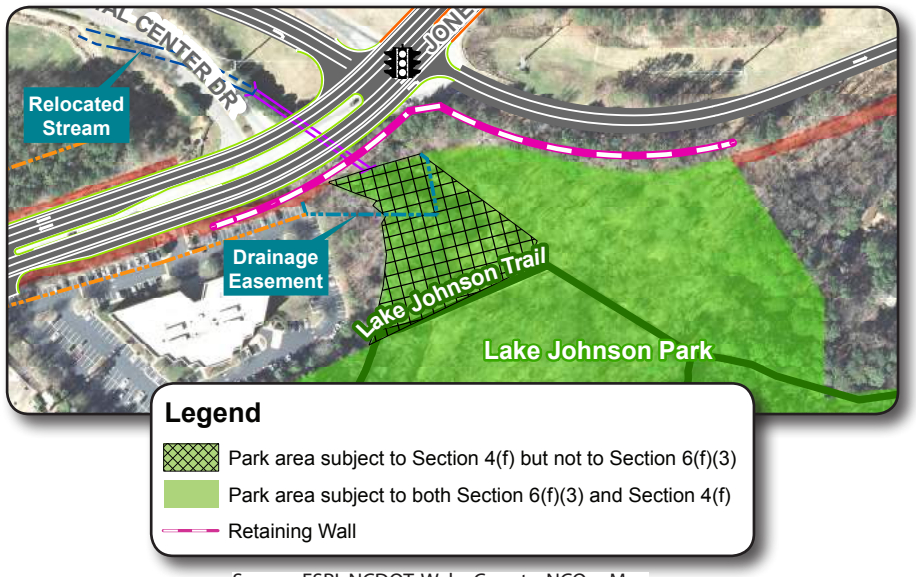
Want to know more? Go to FHWA website:
https://www.fhwa.dot.gov/wadiv/envir/section6f.cfm

3.4.2 Impacts to Section 6(f)(3) Resources

Lake Johnson Park is the only resource in the project area protected under Section 6(f)(3) of the Land and Water Conservation Fund Act. The parts of the park protected under this law are the areas that were park property at the time the funds were granted to the park. Near I-440, there is an area of the park not protected under Section 6(f)(3) because it was not park property when the Land and Water Conservation Fund grant was obtained. An excerpt from **Appendix B - Figure 3** that shows this area is presented in **Exhibit 3.4**.

As shown in **Exhibit 3.4**, the portion of the park protected under Section 6(f)(3) is not impacted by the preliminary project designs. Therefore, no further actions are required under the Land and Water Conservation Fund Act.

Exhibit 3.4: Preliminary Design of Jones Franklin Road Upgrade
Existing Partial Clover at Lake Johnson Park



Source: ESRI, NCDOT, Wake County, NCOneMap

3.4.3 Impacts to Section 4(f) Resources

"When a Federally funded transportation project will use Section 4(f) property, a Section 4(f) approval by FHWA is required. If the use would have a greater than *de minimis* impact on the property, a written evaluation must be prepared and submitted to FHWA for approval." (FHWA Website: https://www.environment.fhwa.dot.gov/section4f/evaluations.aspx) .

Some of the Detailed Study Alternatives for the proposed project would require use of Section 4(f)-protected property from Lake Johnson Park, Kaplan Park, Museum Park, and Reedy Creek Greenway. FHWA intends on making a *de minimis* finding for each of these uses, as described below. See information box on this page regarding the requirements for a *de minimis* finding under Section 4(f). None of the Detailed Study Alternatives would use lands within Method Community Park or House Creek Greenway.

By publishing this Environmental Assessment, FHWA is requesting comments on the proposed findings of *de minimis* impact for Lake Johnson Park, Kaplan Park, Museum Park, and Reedy Creek Greenway. The final determinations on findings regarding these properties will consider this public input. In addition, written concurrence on the *de minimis* findings from the entities with jurisdiction over the resources will be required. The findings and written concurrence will be included in the final environmental document.

LAWS

What are the requirements for a *de minimis* impact finding under Section 4(f)?

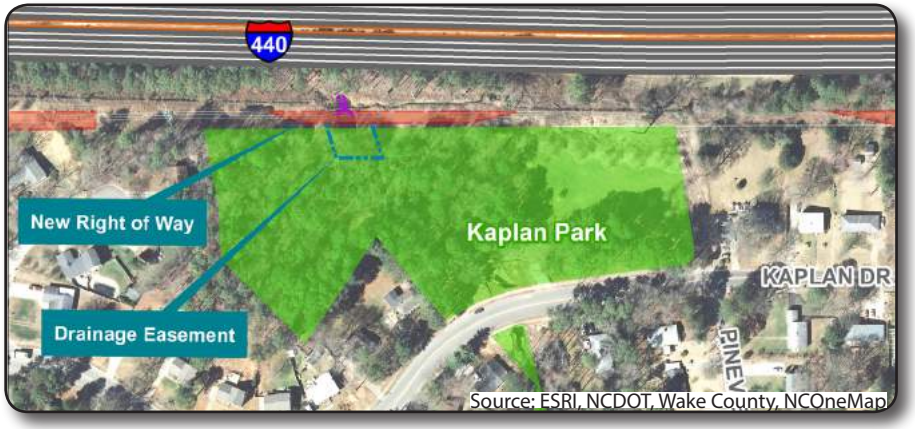
A *de minimis* finding regarding impacts on publicly-owned parks, recreation areas, and wildlife/waterfowl refuges can be made if a project would not "adversely affect the activities, features, and attributes" of the Section 4(f) resource. The officials having jurisdiction over the resource must concur with the *de minimis* impact determination and the public must be afforded an opportunity to comment.

For historic sites, a *de minimis* finding can be made if there is a determination of "No Adverse Effect" in accordance with Section 106 of the National Historic Preservation Act. Concurrence on the *de minimis* finding is required from the NC Historic Preservation Office and any other identified consulting parties.

If a *de minimis* finding is made, then a more detailed individual Section 4(f) evaluation is not needed. An individual Section 4(f) evaluation requires documentation that shows there is no feasible and prudent alternative that completely avoids the Section 4(f) property and that the project includes all possible planning to minimize harm to the Section 4(f) property.

Want to know more? Go to FHWA website:
https://www.environment.fhwa.dot.gov/4f/4fpolicy.asp

Exhibit 3.5: Preliminary Design at Kaplan Park



Parks and Greenways

NCDOT met with the City of Raleigh and NC Museum of Art regarding the parks and greenways for which they have jurisdiction to ask for their preliminary opinions on impacts to activities, features, and attributes of their resources from the Detailed Study Alternatives. Preliminary input from these entities regarding each resource is noted below.

Lake Johnson Park. Lake Johnson Park, which is over 300 acres in size, abuts the right of way for Jones Franklin Road and the I-440/Jones Franklin Road interchange. There are no active uses or trails near the right of way boundary. There is one Detailed Study Alternative for this interchange: Upgrade Existing Partial Clover Alternative. An excerpt from **Appendix B - Figure 3** showing this area is presented in **Exhibit 3.4**.

As shown in **Exhibit 3.4**, a small area (approximately 0.25 acres) for a permanent drainage easement is needed from Lake Johnson Park. A retaining wall (pink and white dashed line) is proposed to minimize additional encroachment into the park.

The proposed drainage easement will not adversely affect the activities, features and attributes of Lake Johnson Park, and therefore a *de minimis* impact finding is anticipated. The permanent drainage easement will allow for adequate maintenance of the culverts, which will benefit the park. The City of Raleigh preliminarily concurs with this determination.

Kaplan Park. The 5.2 acre Kaplan Park is near the I-440 right of way between Athens Drive and Melbourne Road. **Exhibit 3.5** is an excerpt from **Appendix B-Figure 5a** that shows the widening of I-440 in this area. The widening requires a permanent drainage easement within the park to extend the existing culvert that carries Simmons Branch under I-440. This impact is the same for all the Detailed Study Alternatives. The drainage easement is approximately 0.09 acres in size. There are no active park uses at this existing culvert location.

The proposed permanent drainage easement will not adversely affect the activities, features and attributes of Kaplan Park, and therefore a *de minimis* impact finding is anticipated. The permanent drainage easement will allow for adequate maintenance of the culvert, which will benefit the park. The City of Raleigh preliminarily concurs with this determination.

Method Community Park. The 8.3-acre Method Community Park abuts the I-440 right of way between Ligon Street and Hillsborough Street. It is also part of the Berry O'Kelly School historic district (see **Section 3.4**).

As shown in **Exhibit 3.6**, the preliminary designs for any of the Detailed Study Alternatives avoid direct impacts to Method Community Park. Avoiding impacts to this resource was a factor in deciding to widen I-440 on the westbound side. The preliminary design also provides space between the roadway shoulder and the historic district boundaries estimated to be sufficient for drainage features and a potential noise wall.

There are no impacts to this park, and no further actions are required under Section 4(f) regulations.

Museum Park. The NC Museum of Art's (NCMA) Museum Park abuts the rights of way along I-440 and Wade Avenue at the I-440/Wade Avenue interchange. The park and museum site is approximately 160 acres in size. Impacts are shown in **Appendix B – Figures 8a-c, 9a-c, and 10a-c**. The park area near the roadways is forested, and the uses in this vicinity include the Museum Park trails and Reedy Creek Greenway.

As described below, the areas of Museum Park impacted are adjacent to the existing I-440 and Wade Avenue right of way and would not affect the greenway/trail system in this area.

The One Flyover and Slight Detour Alternatives for the Wade Avenue and Hillsborough Street interchange area would have the same impact to the Museum Park. This impact would include a long narrow area of approximately 0.9 acres of new right of way needed along I-440. This new right of way is needed for a second lane on the off-ramp from westbound I-440 to westbound Wade Avenue. In this area, a retaining wall already is proposed to minimize the fill slope encroachment onto the NCMA property. In addition, the existing noise wall would be replaced with a new noise wall shifted to the new shoulder of I-440, and of approximately the same length as the existing wall.

The Two Flyovers Alternative for the Wade Avenue and Hillsborough Street interchange area also would have the same impact along I-440 as the One Flyover and Slight Detour. There would be an additional approximately 0.3 acres of new right of way needed and 0.2 acres of permanent drainage easement at the major culvert that carries House Creek under Wade Avenue just west of I-440 that outfalls onto NCMA property.

Exhibit 3.6: Preliminary Design at Method Community Park

The preliminary designs were discussed with the NCMA at a meeting on March 10, 2017. Another meeting was held with the NCMA and the NC Department of Cultural Resources on May 23, 2017. In order to not adversely impact the park's activities, features, and attributes and achieve a *de minimis* concurrence from the NCMA, FHWA and NCDOT agreed to discuss additional mitigation measures, including potentially contributing to stream restoration projects NCMA is currently developing for stream segments on their property. A Memorandum of Understanding (MOU) will be developed between the parties to define FHWA and NCDOT participation. The MOU will be further discussed in the final environmental document.

Reedy Creek Greenway. Impacts to the Reedy Creek Greenway are shown in **Appendix B – Figures 7a-c, 8a-c, 9a-c, and 10a-c**. The greenway is within the Hillsborough Street and Wade Avenue interchange area. The greenway runs from the Museum Park, on a pedestrian bridge over I-440, to an easement on Meredith College property. The greenway then runs near I-440 southward, crosses under Wade Avenue in a box culvert, then runs along the west and south sides of the main campus of Meredith College. On the west side of campus, the greenway is near the I-440 right of way.

Because the greenway is so close to I-440 on the west side of Meredith College property, this approximately 0.7-mile section of greenway from near the pedestrian bridge to Hillsborough Street would be impacted by any of the Detailed Study Alternatives in this area (One Flyover, Two Flyovers, and Slight Detour).

The preliminary designs for One Flyover, Two Flyovers, and Slight Detour all propose to replace the impacted section of Reedy Creek Greenway. The greenway would be reconstructed as close to the old alignment as possible. This is shown in **Appendix B – Figures 8a-c** for each of the Detailed Study Alternatives.

During construction, the reconstructed portion of greenway on the main campus of Meredith College could be constructed before tearing out the existing greenway to avoid temporary closures of this greenway segment. For the greenway segment from the pedestrian bridge to Wade Avenue, there may be short-term closures of the greenway needed to construct the new greenway segment and reconnect it to the greenway network. Every effort will be made to minimize the duration and number of short-term closures.

Since the greenway would be replaced and reconnected to the non-impacted greenway segments under any of the Detailed Study Alternatives, and only short-term closures during construction are anticipated, the proposed project would not adversely impact the greenway's activities, features, and attributes. Therefore, a *de minimis* impact finding is anticipated.

The entity having jurisdiction over this segment of the greenway is the City of Raleigh (who maintains the greenway). The City of Raleigh preliminarily concurs with the *de minimus* determination for impacts to Reedy Creek Greenway.

Meredith College also has an interest in this greenway since it is within an easement on their property. NCDOT will continue to coordinate with Meredith College regarding the Reedy Creek Greenway design on their property.

Historic Architectural Resources

The effects of the Detailed Study Alternatives on historic sites on or determined eligible for listing on the National Register of Historic Places is discussed in **Section 3.3.2**.

For all Detailed Study Alternatives, the NC Historic Preservation Office has made an effects determination of No Effect on Capitol City Lumber, Meredith College (historic portion), and Royal Baking Company, and no use of land is required from these sites. Therefore, there are no further actions required under Section 4(f) regulations.

The effect determination under and of the Detailed Study Alternatives for the Berry O'Kelly School Historic District is No Adverse Effect, and no use of land is required from this site. Therefore, there are no further actions required under Section 4(f) regulations.

The effect determination for the Oak Grove Cemetery is No Adverse Effect under the Ligon Street Extend Existing Traffic Culvert Alternative and the Bridge to North Alternative, and no use of land is required from this site. Therefore, there are no further actions required under Section 4(f) regulations.

Under the Ligon Street Build Bridge to South Alternative, the effect determination for the Oak Grove Cemetery is Adverse Effect due to proximity of earthwork needed for the Ligon Street bridge approaches, although no direct use of land is required from the cemetery. In accordance with FHWA Policy Paper on Section 4(f) (2012);

> "If a project does not permanently incorporate land from the historic property but results in an adverse effect, it will be necessary for FHWA to further assess the proximity impacts of the project in terms of the potential for constructive use…If there is no substantial impairment, notwithstanding an adverse effect determination, there is no constructive use and Section 4(f) does not apply."

As it relates to Section 4(f), the proximity of the earthwork associated with the bridge approaches under the Ligon Street Build Bridge to South Alternative would not substantially impair the activities, features, or attributes of Oak Grove Cemetery and Section 4(f) would not apply. The site would continue to function as a cemetery, access would be enhanced with the addition of sidewalks, and the low traffic volumes on Ligon Street (5,100 vehicles per day forecast for 2035) would not generate substantial increases in noise levels.

3.5 SECTION Traffic Noise

3.5.1 Criteria and Methods Used to Analyze Traffic Noise

Background Information About Traffic Noise

Highway traffic noise is composed of noise generated from engine exhaust, drive trains, and tire-roadway interaction and is a common noise source in urban and suburban environments.

Traffic noise is commonly described in units called decibels (dB). The A-weighted decibel scale is used when analyzing traffic noise because it emphasizes the frequency range in which the human ear is most sensitive and minimizes the frequencies to which human hearing is not as sensitive. Sound levels that are measured using the A weighted decibel scale are written as dB(A).

Typical noise levels for common situations include 30 to 40 dB(A) for a quiet suburban nighttime or a library, and 50 to 60 dB(A) for a quiet urban daytime or a large business office. A gas lawn mower might generate close to 100 dB(A) at three feet away.

Changes in noise levels of 3 dB(A) or less are considered barely perceptible to normal human hearing. A 5 dB(A) change is more readily noticeable, and a 10 dB(A) increase is judged by most people as sounding twice as loud.

NOISE REGULATIONS AND PROCEDURES

The Federal-Aid Highway Act of 1970 requires FHWA to develop noise standards for mitigating highway traffic noise. These standards are found in Title 23 Part 772 of the Code of Federal Regulations – Procedures for Abatement of Highway Traffic Noise and Construction Noise.

The regulations require the following during the planning and design of a highway project:

- Identification of traffic noise impacts and examination of potential noise abatement measures
- Incorporation of reasonable and feasible noise abatement measures into a project
- Coordination with local officials to provide helpful information on compatible land use planning and control

FHWA's procedures define when and how to analyze traffic noise impacts and evaluate noise abatement measures. They also provide criteria for when noise abatement should be considered.

NCDOT's Traffic Noise Policy (adopted October 2016) describes how FHWA's procedures are implemented for federal-aid and select state-funded highway projects in North Carolina.

The procedures contained in FHWA's regulations, NCDOT's policy, and supporting guidance documents are very detailed regarding how traffic and construction noise is evaluated, and how the reasonableness and feasibility of noise abatement is determined.

Want to know more? Go to the Federal Highway Administration website: https://www.fhwa.dot.gov/environment/noise/ and NCDOT website https://connect.ncdot.gov/resources/environmental/pages/Environmental-Compliance-Guides.aspx

Traffic Noise Impact Criteria

For transportation projects with FHWA involvement, regulations (Code of Federal Regulations, Title 23 Part 772) govern the analysis and abatement of traffic noise impacts, as described in the text box on page 3-25.

The regulations require that potential noise impacts in areas of frequent human use be identified during the planning and design of a highway project. Where impacts are predicted to occur, measures to reduce traffic noise (i.e. noise abatement) should be evaluated.

FHWA has established Noise Abatement Criteria and procedures to determine when noise abatement should be considered. The criteria are given in hourly average noise levels, written as dB(A) Leq. The Noise Abatement Criteria differ depending on the type of land use and its sensitivity to noise. For example, the criterion for residences (Category B) is an hourly average level of 67 dB(A) Leq for peak noise periods, which is lower than the criterion of 72 dB(A) for less sensitive commercial areas (Category E).

Noise impacts occur when future predicted traffic noise levels with the project either: 1) approach or exceed FHWA Noise Abatement Criteria, or 2) are a substantial increase over existing noise levels. NCDOT defines approach as being within 1 dB(A) of the Noise Abatement Criteria, and a substantial increase as an increase of at least 10 dB(A) from existing noise levels to predicted future noise levels with the project.

Traffic Noise Analysis Methods

There is a standard procedure for determining traffic noise impacts and evaluating the feasibility and reasonableness of potential noise reduction measures for noise-impacted areas (called receptors). The procedure is described in NCDOT's *Traffic Noise Manual* (2016) and FHWA's *Highway Traffic Noise: Analysis and Abatement Guidance* (2011).

FHWA's computer model, the Traffic Noise Model© (TNM) (Version 2.5), is used to predict the loudest hour for existing and future noise levels at all noise-sensitive areas surrounding a project. The TNM model is a 3D model that accounts for features that affect noise levels, such as traffic volumes and speeds, roadway alignments, receptor locations, and shielding provided by intervening terrain, barriers, and structures.

3.5.2 Existing Noise Environment

The existing ambient noise environment in a particular area is comprised of both natural and man-made events. It can include wind, rain, birds chirping, insects, air conditioning units, commercial operations, lawn mowers, airplanes, traffic noise, etc.

Existing traffic noise is a major part of the ambient noise environment along the I-440/US 1-64 project corridor. Traffic noise varies by time of day and proximity to major roadways.

Existing noise was measured for 20-minute daytime periods at eight representative locations along the corridor to help characterize the noise environment. Measurements ranged from 53 to 56 dBA Leq behind an existing noise wall at Charlotte Court at the eastern end of the project to 65 to 70 dBA Leq at Method Community Park, where the highway can be seen through a narrow buffer of vegetation.

These measurements, with traffic counts taken during the measurements, were input into TNM computer models to validate that the computer models can adequately predict traffic noise in the project corridor. These TNM computer models of the measurement areas showed the output results are within allowable tolerances (±3 db(A)) of the actual measurements. This validation provides a level of confidence in the noise model results when modeling the existing and future conditions at locations along the entire corridor.

Measuring noise at Method Park

Existing noise wall along I-440 west of Lake Boone Trail

3.5.3 Traffic Noise Impacts

All land uses within the corridor that might be sensitive to traffic noise were included as receptors in the TNM computer models. Due to the large number of receptors and the size of the project area, the project was divided into fourteen Noise Study Areas (NSAs) for modeling purposes. These NSAs are shown in **Exhibit 3.7**. Existing conditions and future conditions with and without the proposed project (also called the 'build' and 'no-build' conditions) were modeled for each NSA.

Across all the NSAs there were 1,383 residences modeled along with other noise sensitive land uses such as:

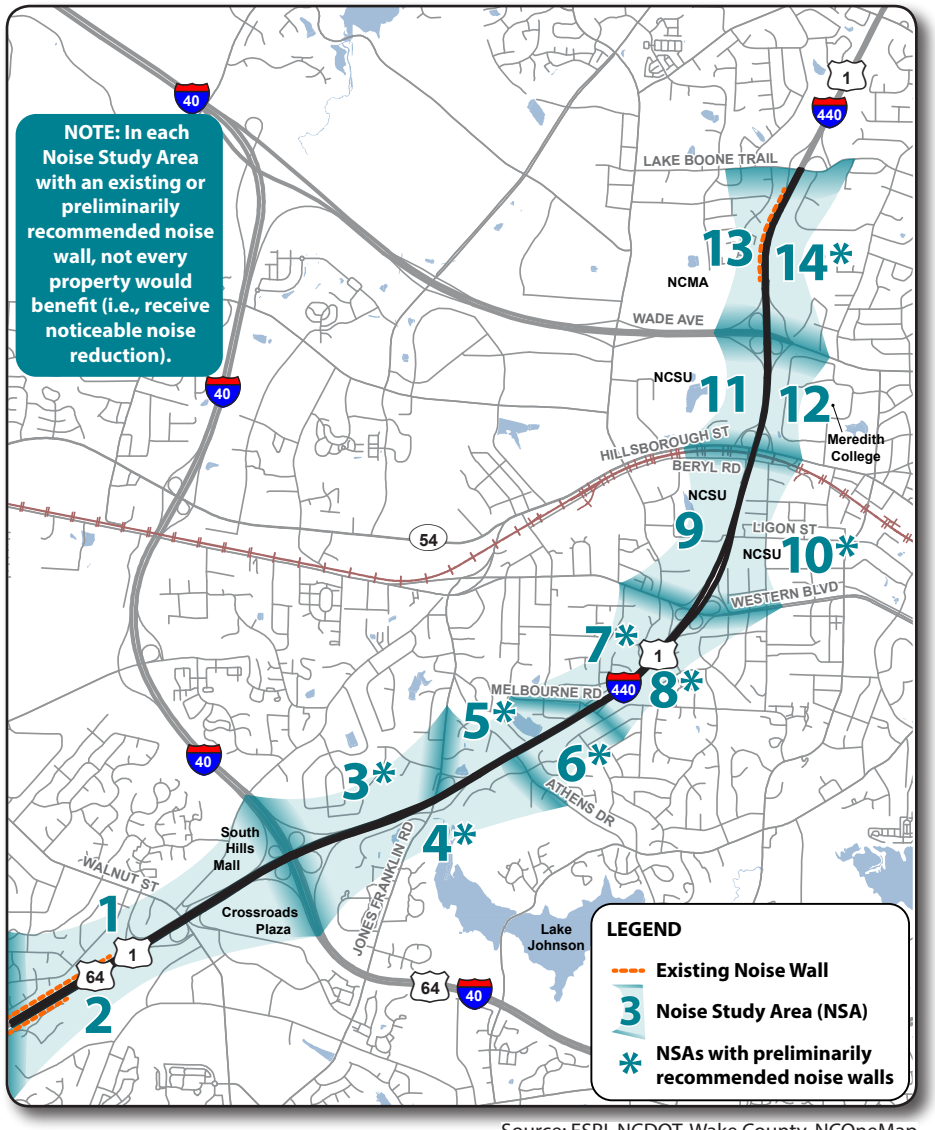
- Private community pools, playgrounds, tennis courts, and game courts
- Hotel pools and hotel and office complex outdoor use areas
- Parks and greenways, including Lake Johnson Park, Kaplan Park, Method Community Park, Museum Park Trails, Reedy Creek Trail, and House Creek Trail
- Churches, including Raleigh Church of Christ, Western Boulevard Presbyterian Church, Oak City Baptist Church, and St James AME Church
- University Club facilities, including the pool, tennis courts, golf course and picnic area
- Meredith College dormitory, academic buildings, and athletic fields
- NC State University golf practice facility
- Other uses, including Oak Grove Cemetery and JC Raulston Arboretum

There are also three existing noise walls in the project area that were included in the noise modeling. These walls, shown in **Exhibit 3.7**, are located in NSA 1, NSA 2, and NSA 13.

The TNM model results show existing noise levels approach or exceed the Noise Abatement Criteria at 326 receptors across all the NSAs. By 2035 without the project, it's predicted that 347 receptors would experience noise levels that exceed the Noise Abatement Criteria.

With the various Detailed Study Alternatives in place, Year 2035 predicted noise impacts would be similar amongst the alternatives, and are predicted to occur at 496 to 504 receptors, depending on the Detailed Study Alternative modeled.

Exhibit 3.7: Noise Study Areas and Noise Wall Recommendations



Source: ESRI, NCDOT, Wake County, NCOneMap

3.5.4 Measures to Reduce Traffic Noise

Measures for reducing or eliminating noise impacts were considered for all impacted receptors in each NSA. The primary measure considered was noise walls. In order to be considered for construction, noise walls must be both feasible and reasonable, as defined in NCDOT's *Traffic Noise Policy* (see text box this page).

Ten noise barriers are recommended as preliminarily feasible and reasonable for any combination of Detailed Study Alternatives. These barriers would benefit approximately 508 to 514 receptors. As indicated in **Exhibit 3.7** and described in **Table 3.2**, these include noise walls in NSA 3, NSA 4, NSA 5 (two walls), NSA 6, NSA 7, NSA 8, NSA 10, NSA 13, and NSA 14. The noise wall in NSA 13 is the existing wall plus the replacement of a segment of the existing wall that would be shifted to the new roadway shoulder.

After a Preferred Alternative is selected and final designs are prepared, NCDOT will complete additional noise studies to make final decisions about where noise walls would be constructed. The determination of whether a noise wall is feasible and reasonable may change as a result of these additional noise studies, changes in the project design, or the public involvement process.

Existing noise walls along I-440 are brick, which is an enhancement to NCDOT's standard noise wall. Similar brick noise walls can be constructed for this project if the City of Raleigh agrees to participate in cost-sharing.

Table 3.2: Recommended Preliminary Noise Walls

Noise Study Area[1]	Noise Wall Description	Approximate Length of Noise Wall (feet)	Approximate Number of Benefited Receptors
3	Along westbound I-440 adjacent to Brookhill Apartments on Dana Dr	1,600	43
4	Along Jones Franklin Rd on-ramp to eastbound I-440 and along eastbound I-440 to near Athens Dr	2,070	72
5[2]	Noise Wall 5a. Along westbound I-440 just west of Melbourne Rd, near Aukland St	1,290	9-10
	Noise Wall 5b. Along westbound I-440 just west of Athens Dr	420	3
6[3]	Along eastbound I-440 from Athens Dr to Melbourne Rd	2,200	28-29
7	Along westbound I-440 between Western Blvd and Melbourne Rd	2,920	68
8	Along eastbound I-440 near Fairway Ridge Rd	1,900	15
10[4]	Along eastbound I-440 from Ligon St to Hillsborough St	1,760	46-50
13	Along westbound I-440 between Lake Boone Trail and Wade Ave; replace a portion of the existing noise wall near Mesa Ct and Museum Park. Total noise wall length (w/replacement) is about 2,440 feet	800 For replaced segment	42
14	Along eastbound I-440 just west of Lake Boone Trail	2,760	182
TOTALS FOR PRELIMINARY NOISE WALLS		**17,720**	**508-514**

1. Exhibit 3-7 shows the locations of the Noise Study Areas
2. Noise Wall 5a would benefit 9 receptors under the Melbourne Rd Build Bridge in Place Alternative and 10 receptors under the Bridge to North Alternative
3. Noise Wall 6 would benefit 28 receptors under the Athens Dr Build Bridge to North Alternative and 29 receptors under Build Bridge in Place Alternative
4. Noise Wall 10 would benefit 46 receptors under the Ligon St Build Bridge to North Alternative and 50 receptors under the Build Traffic Culvert Alternative and Build Bridge to South Alternative

WHAT IS A FEASIBLE AND REASONABLE NOISE BARRIER?

Feasibility means a noise wall can be built that does not adversely impact property access, drainage, topography, utilities, safety, and maintenance requirements. A feasible noise wall also must provide at least 5 dB(A) of noise reduction for at least two impacted receptors.

Reasonableness involves social, economic, and environmental factors, including:

- The noise barrier falls within the allowable quantities of noise barrier per benefited receptor. The base allowance is 1,500 square feet of noise barrier per benefited receptor, with increases in this allowance for certain conditions. A benefited receptor is one that would experience a 5 dB(A) reduction in noise levels from a barrier.
- The barrier achieves a noise reduction goal of at least 7 dB(A) at one impacted receptor.
- Once a wall is determined feasible, meets the reasonableness criteria above, and a design-level noise study has been completed, property owners and tenants of all benefited receptor locations will be asked to state their preferences in a ballot process. Generally, if a simple majority expresses preference for the noise wall, it will be constructed. The ballot process typically occurs during the final design phase of a project.

3.5.5 Construction Noise Impacts

The predominant construction activities associated with this project are expected to be earth removal, hauling, grading, and paving. In addition, extremely loud construction activities such as use of pile drivers and jack hammers also would occur sporadically.

Noise-sensitive land uses, including residences, are near the I-440/US 1-64 right of way along most of the length of the project, and are anticipated to be temporarily impacted by construction noise.

During daytime hours, the predicted effects of these impacts would be temporary speech interference for passers-by and those individuals living or working near the project. During evening and nighttime hours, construction may temporarily disrupt sleep and impact the general peace and usage of noise-sensitive areas, particularly residences.

3.5.6 Measures to Reduce Construction Noise

Generally, low-cost and easily implemented construction noise control measures would be incorporated into the project plans and specifications to the extent possible. Provided that construction noise impact mitigation does not place an undue burden upon the financial cost of the project or the project construction schedule, NCDOT recommends that:

- Earth removal, grading, hauling, and paving activities in the vicinity of residences, which are located along most of the corridor, should be limited to weekday daytime hours when practicable.
- Earth removal, grading, hauling, and paving activities in the vicinity of Meredith College would be performed during daytime hours since student housing is located in the vicinity of I-440/US 1-64.
- If meeting the project schedule requires that earth removal, grading, hauling and / or paving must occur during evening, nighttime and/or weekend hours in the vicinity of residential neighborhoods, the Contractor shall notify NCDOT as soon as possible. In such instance(s), all reasonable attempts shall be made to notify and to make appropriate arrangements for the mitigation of the predicted construction noise impacts upon the affected property owners and/or residents.
- If construction noise activities must occur during context-sensitive hours in the vicinity of noise-sensitive areas, discrete construction noise abatement measures including, but not limited to portable noise barriers and/or other equipment-quieting devices shall be considered. Context sensitive hours for a land use are those hours the land use is especially sensitive to noise, such as nighttime hours in residential areas.

3.6 Air Quality

SECTION

3.6.1 Existing Conditions

Air pollution originates from various sources. Emissions from industry and internal combustion engines are the most common sources.

The Clean Air Act is the federal law that regulates air emissions from stationary and mobile sources. The US Environmental Protection Agency (EPA) is the federal agency charged with administering the Clean Air Act. See the information box titled "The Clean Air Act and Amendments" for more information.

National Ambient Air Quality Standards and Transportation Conformity

Under the Clean Air Act, EPA has developed air quality standards for six common air pollutants (called criteria pollutants), which are listed in the information box. These are monitored by region or county and EPA classifies regions/counties as either attaining or not attaining the standards. When areas do not attain the standards for a particular criteria pollutant, plans for reducing the pollutant's concentration in the air must be developed.

The proposed I-440 project is in Wake County, North Carolina, and this area currently is meeting the established standards for all criteria pollutants.

In the past, the region was not attaining the standards for ozone and carbon monoxide. In June 1994, the EPA determined the area was in attainment for ozone, provided a maintenance plan was followed for 20 years to maintain this designation. A similar determination for carbon monoxide was made by the EPA in September 1995. Since the Triangle area has maintained the ozone and carbon monoxide standards for over 20 years, the area is no longer subject to the Transportation Conformity Requirements.

LAWS

THE CLEAN AIR ACT AND AMENDMENTS

The Clean Air Act is the federal law that regulates air emissions from stationary and mobile sources. Three areas of the Act considered when analyzing the air quality impacts of a transportation project are described below.

National Ambient Air Quality Standards (NAAQS). The EPA has developed a set of standards for six common air pollutants (also known as criteria pollutants) to protect public health and welfare. These are:

- Sulfur dioxide (SO2)
- Particulate matter (PM) (less than 10 microns in size and less than 2.5 microns in size)
- Carbon monoxide (CO)
- Nitrogen dioxide (NO2)
- Ozone (O3)
- Lead (Pb)

Transportation Conformity. Section 176(c) of the Act requires, for areas not meeting the NAAQS, transportation plans, programs, and projects to conform to the intent of the applicable State Implementation Plan each state prepares to demonstrate how they will meet the NAAQS.

Mobile Source Air Toxics (MSATs). MSATs are a subset of 93 of the 188 air toxics regulated by the EPA identified in the 2007 Rule titled "Control of Hazardous Air Pollutants from Mobile Sources". These pollutants are emitted from fuel evaporation or fuel combustion by engines. Metal air toxics can also come from engine wear or oil and gasoline impurities.

Want to know more? Go to the EPA website:
https://www.epa.gov/laws-regulations/summary-clean-air-act

Mobile Source Air Toxics

As noted in the information box, EPA identified 93 air toxic compounds emitted from mobile sources in a 2007 Rule. The 2007 Rule also requires controls and sets standards that will dramatically decrease mobile source air toxics (MSATs) emissions through cleaner fuels and cleaner engines.

To evaluate overall trends in MSAT emissions from 2010 to 2050, FHWA used EPA's mobile source emission model (MOVES2010b) in 2012 to analyze the seven MSAT compounds with the most contribution from mobile sources. The model showed that even if vehicle miles traveled increases by 102 percent nationally, the required controls on fuel and engines will result in a combined reduction of 83 percent in total emissions of these seven MSAT compounds.

3.6.2 Air Quality Impacts

As described in the information box, three areas of the Clean Air Act are of concern when analyzing air quality impacts of a transportation project. These areas in relation to the I-440 project are discussed below, along with air quality considerations during construction. The analysis below applies to all the Detailed Study Alternatives.

National Ambient Air Quality Standards and Transportation Conformity

The I-440 project is in Wake County, which the EPA has determined is in attainment of the NAAQS for all criteria pollutants. Therefore, project-level analysis of the criteria pollutants is not required and no significant impacts related to criteria pollutants are anticipated.

Mobile Source Air Toxics

Although national trends indicate substantial decreases in MSAT emissions into the future, FHWA directs that this issue should still be addressed in assessing the impacts of transportation projects. FHWA provides guidance on what level of analysis should be conducted based on project characteristics.

Based upon FHWA guidance, a quantitative assessment of mobile source air toxics was conducted for the I-440 widening project. The project met the criteria for a quantitative assessment because it would add capacity to an urban interstate with future traffic volumes exceeding an average of 140,000 vehicles per day and there are adjacent populated areas.

The quantitative analysis considered forecasted traffic on roadways within 3,000 feet of the I-440/US 1-64 project corridor for the existing year 2012 and for the future year 2035 under two scenarios – with the project (Build scenario) and without the project (No-Build Scenario). The different interchange forms included in the Detailed Study Alternatives do not make a difference in this type of analysis, so one general Build Scenario was sufficient. The analysis used the most current EPA mobile source emissions model (MOVES2014a) and data from the Capital Area Metropolitan Planning Organization's (CAMPO) regional traffic model.

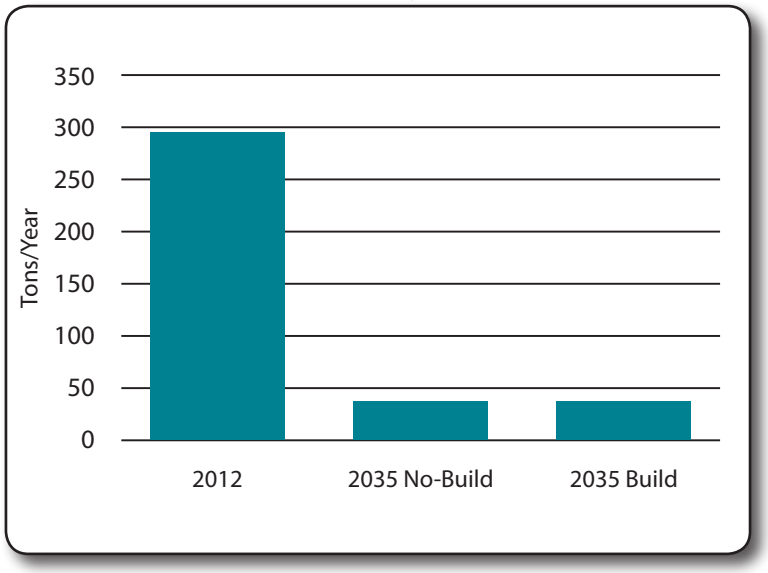
Based on the analysis, total vehicle miles traveled in the analyzed study area is forecasted to increase approximately 62 percent between 2012 existing conditions and the 2035 No-Build Scenario. Vehicle miles traveled in the 2035 Build Scenario are predicted to be about the same in the project study area as under the No-Build Scenario (only approximately 0.05 percent higher under the Build Scenario).

Overall, mobile source air toxics emissions are anticipated to decrease by approximately 88 percent in the project's analysis area between 2012 and 2035 under both the Build Scenario and the No-Build Scenario, as shown in **Exhibit 3.8**. MSAT levels could be higher or lower in some localized areas when comparing scenarios, but current modeling tools and science are not adequate to quantify them. However, in considering the project study area, EPA's vehicle and fuel regulations and the continuing replacement of older vehicles with newer models over the years will, over time, cause area-wide MSAT levels to be significantly lower than today, similar to the national trends described in **Section 3.7.1**.

While currently available tools allow us to reasonably predict relative MSAT emission changes between alternatives, in FHWA's view, information is incomplete or unavailable to credibly predict the project-specific health impacts due to the changes in MSAT emissions associated with a proposed set of highway alternatives. The outcome of such an assessment, adverse or not, would be influenced more by the uncertainty introduced into the process through assumption and speculation rather than any genuine insight into the actual human health impacts directly attributable to MSAT exposure associated with a proposed action. Because of these uncertainties, a quantitative assessment of the effects of air toxic emissions impacts on human health cannot be made at the project level.

The *Mobile Source Air Toxics Report* (August 2016) provides further discussion regarding the incomplete and unavailable information for project-specific MSAT health impact analysis.

Exhibit 3.8: Changes in Mobile Source Air Toxics Emissions within the Project Area



Air Quality During Construction

During project construction, materials generated by site clearing or demolition activities will be removed from the area, burned, or otherwise disposed of by the construction contractor. Any burning will be done in accordance with applicable local and state laws and ordinances. Care will be taken to ensure burning will be done at the greatest distance practical from dwellings and not when weather conditions would create a hazard to the public. Burning, if necessary, would be performed under constant monitoring.

Measures also will be taken during construction to reduce dust generated by construction when control of dust is necessary for the protection and comfort of motorists and area residents.

3.7 SECTION Utilities

3.7.1 Major Utilities in the Project Area

Utilities in the project study area include natural gas, electric, telephone, water/sewer, and fiber optics and cable.

There is an electric power easement with major power towers near the eastbound side of I-440 from I-40 to Western Boulevard. The major power towers are shown on the preliminary design map book in **Appendix B** as orange squares. At the Jones Franklin Road interchange, there are two electric power towers within the interchange, between the I-440 mainline and the on-ramp to eastbound I-440.

There also is an electric power easement with major power towers along the westbound side of Wade Avenue east of I-440. At the I-440/Wade Avenue interchange, this easement turns to follow eastbound I-440 east of Wade Avenue, then crosses to the westbound side of I-440 about halfway between Wade Avenue and Lake Boone Trail.

3.7.2 Impacts to Utilities

Construction of any of the Detailed Study Alternatives would impact existing utilities. The project would require relocation/replacement of gas, water, electric power, sewer, telephone, and cable television (CCTV).

NCDOT will coordinate with all utility providers during final design and construction to prevent damage to utility systems and to minimize disruption and degradation of utility service to local customers. Where impacts cannot be avoided, NCDOT will coordinate with utility owners and operators to identify construction requirements and financial responsibility for relocations based upon easements, license agreements, ownership, or other existing agreements covering the use of affected utilities.

Major electric power tower line at Jones Franklin Road and ramp to I-440

3.8 SECTION Hazardous Materials

3.8.1 Background Information

Hazardous materials, including hazardous substances and wastes, are regulated by many state and federal laws. Statutes govern the generation, treatment, storage and disposal of hazardous materials, substances, and waste, and also the investigation and mitigation of waste releases, air and water quality, human health and land use.

The GeoEnvironmental Section (GES) of NCDOT Geotechnical Engineering Unit investigated the project study area to identify hazardous material sites of concern. These include properties that are, or may be, contaminated and therefore may result in potentially increased project costs and future liability if acquired by NCDOT.

These properties may include active and abandoned underground storage tank (UST) sites, hazardous waste sites, regulated landfills and unregulated dump-sites. A search of appropriate environmental agencies' databases and field reconnaissance were used in evaluating sites identified during the hazardous materials investigation.

3.8.2 Hazardous Materials/Waste Sites in Project Area

Three sites of concern were identified in the project study area, as listed in the next section. There may be other sites in the project study area not recorded by regulatory agencies and not reasonably discernible during the field reconnaissance.

3.8.3 Impacts and Mitigation for Hazardous Materials/Waste Sites

The three sites identified in the project study area are listed below from west to east, along with a discussion of impacts.

A car repair and used car dealership in the southeast quadrant of the Walnut Street/Buck Jones Road intersection, on the north side of the southbound US 1-64 off ramp. This site was a gas station decades ago.

- Potential Risks to Costs and Schedule if Acquired. Low.
- Project Impacts. None of the Detailed Study Alternatives preliminary designs would require land from this property.

The former Cherokee Brick Raleigh Sales Office at 520 Brickhaven Drive. A 10,000-gallon underground storage tank was removed in 1994 and groundwater contamination was detected. The site was re-mediated under the direction of the NC Department of Environmental Quality.

- Potential Risks to Costs and Schedule if Acquired. Low.
- Project Impacts. All the Detailed Study Alternatives preliminary designs would require land from this property to widen I-440.

The former NC Foundation Seed Producers on Beryl Road adjacent to I-440 (now Surtronics). This site is a registered hazardous waste generator. There are no incident reports on file with the NC Department of Environmental Quality for this site.

- Potential Risks to Costs and Schedule if Acquired. Medium.
- Project Impacts. None of the Detailed Study Alternatives preliminary designs would require land from this property. A retaining wall is proposed along the I-440 mainline to avoid encroachment on this property.

Once a Preferred Alternative is selected, more detailed field reconnaissance for hazardous waste/material sites will be conducted by NCDOT. Soil and groundwater assessments will be conducted on each potentially contaminated property identified within the Preferred Alternative before right-of-way acquisition in order that the degree and extent of contamination can be assessed.

3.9 SECTION Floodplains, Floodways and Hydrology

3.9.1 Background Information

Floodways and floodplains are protected under federal and state laws, as summarized in the information box on this page. The Federal Emergency Management Agency (FEMA), in cooperation with other federal agencies and state and local governments, develops floodplain and floodway boundaries. Boundaries of the 100-year floodplains and floodways are shown on Flood Insurance Rate Maps (FIRMs).

The State of North Carolina has been designated by FEMA to assume primary ownership and responsibility of Flood Insurance Rate Maps (FIRMS) for all North Carolina communities participating in the National Flood Insurance Program. The North Carolina Floodplain Mapping Program administers the program for the State.

Wake County is a community participating in the National Flood Insurance Program. A detailed hydrologic analysis model of Wake County was completed by the NC Floodplain Mapping Program to estimate stormwater flows under various rainfall events and land use conditions. Some of the larger streams then have detailed studies conducted by FEMA/NC Floodplain Mapping Program to define floodplains and floodways. This information was used to evaluate impacts and recommend sizes for major culverts along the I-440 project.

Actions proposed along streams with delineated floodplains and floodways require additional coordination with and approval from FEMA/ NC Floodplain Mapping Program to ensure that the project does not cause adverse impacts to Base Flood Elevations (see information box on next page).

LAWS

Floodplain Management Laws and Regulations

Floodways and floodplains are protected under a number of federal and state laws. The most notable for transportation projects are federal Executive Order 11988 – Floodplain Management, and Title 23 of the Code of Federal Regulations Part 650 (23 CFR Part 650), Subpart A – Location and Hydraulic Design of Encroachments on Floodplains.

Executive Order 11988 requires federal agencies to avoid to the extent possible the long and short-term adverse impacts associated with occupying or modifying floodplains.

Subpart A of 23 CFR Part 650 addresses FHWA policies and procedures for the location and hydraulic design of highway encroachments on floodplains. FHWA's policy is to minimize impacts of highway agency actions on floodplains and floodways.

Want to know more? Go to the Federal Highway Administration website: https://www.environment.fhwa.dot.gov/guidebook/index.asp, Federal Emergency Management Agency (FEMA) website: https://www.fema.gov/laws-executive-orders, and the NC Floodplain Mapping website: http://www.ncfloodmaps.com/

3.9.2 Floodplains and Floodways in Project Area

Existing floodplains and floodways in the project area are shown in **Exhibit 3.9**. There are two streams in the project area that have defined 100-year floodplains and floodways. These are Walnut Creek and House Creek. **Exhibit 3.9** also shows other large streams in the project area and White Oak Lake (also known as Lake Powell), which has a dam.

Walnut Creek and House Creek both cross under I-440 in existing box culverts. The single box culvert for House Creek under I-440 is in good condition. The triple box culvert for Walnut Creek is in good condition but currently has accumulated silt in each box. An apartment complex along Dana Drive just upstream of this culvert is within the 100-year floodplain for Walnut Creek and some of the buildings are within the floodway. These buildings experience flooding during large storm events.

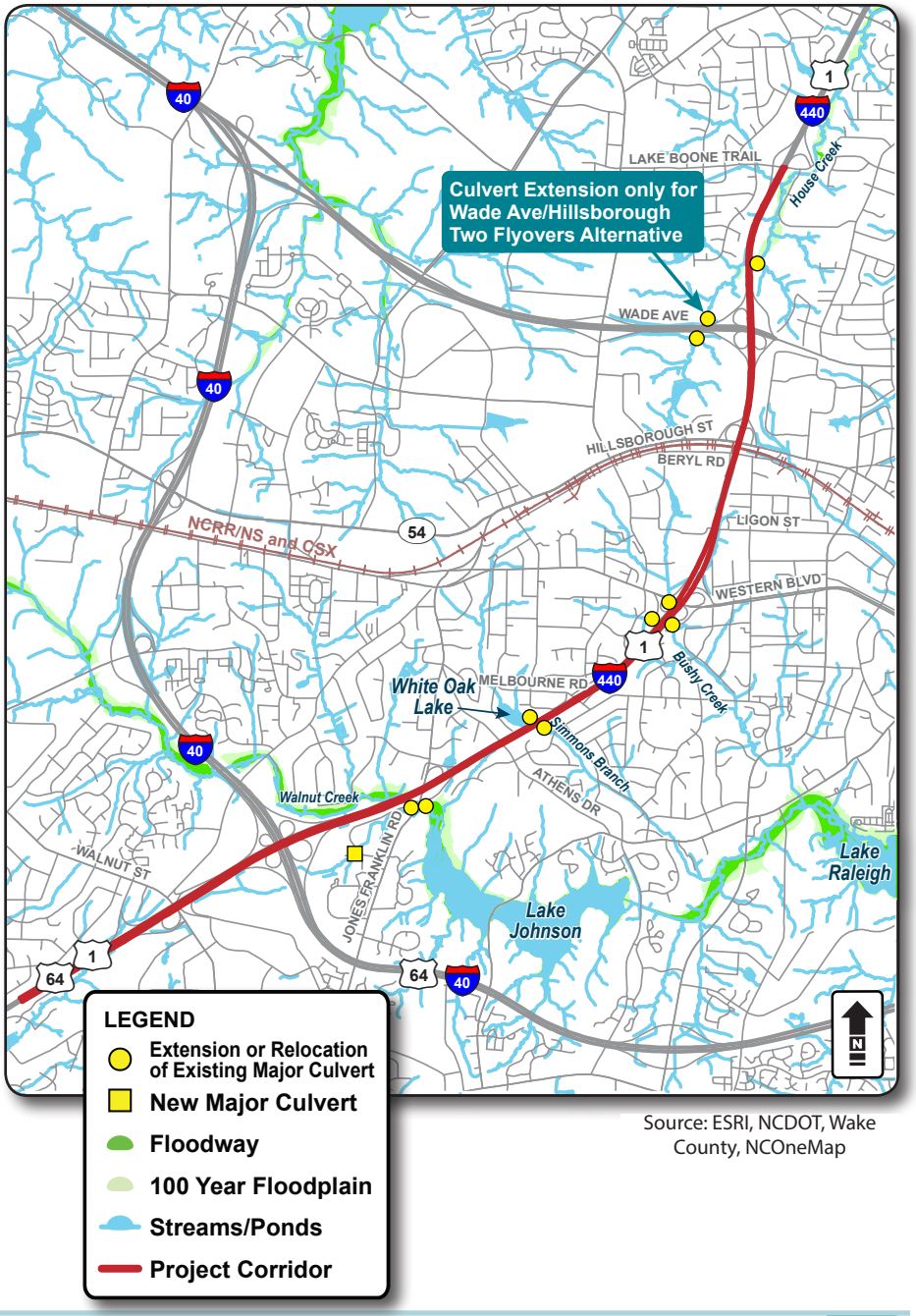
What's the Difference between a 100-Year Floodplain and a Floodway? What's a Base Flood Elevation?

Floodplain. The 100-year floodplain is the area that has a 1 percent chance in any given year of being covered by water during a flood event.

Floodway. The floodway is a smaller area within the floodplain. It is the channel area of a waterway that needs to be kept free of encroachment and blockage so the 100-year flood can be carried without substantially increasing the level and extent of the flooded area. The floodway is more highly regulated than the floodplain.

Base Flood Elevation. This is the elevation to which water is estimated to rise during a 100-year flood.

Exhibit 3.9: Floodplains/Floodways and Major Culvert Locations



Source: ESRI, NCDOT, Wake County, NCOneMap

3.9.3 Proposed Major Drainage Structures and Impacts to Floodplains and Floodways

A preliminary hydraulic study was completed for the I-440 project to evaluate potential impacts to floodways and floodplains and to identify the locations and sizes of major drainage structures that would be needed to adequately carry floodwaters. Major drainage structures are bridges, box culverts, or pipe culverts 72 inches in diameter or greater.

A final hydrologic study and hydraulic design of all drainage systems along the project will be conducted during the final design phase.

Exhibit 3.9 shows the locations of the eight recommended major drainage structures, which are clustered in four general areas – Jones Franklin Road interchange, I-440 mainline at White Oak Lake, Western Boulevard Interchange, and the Wade Avenue interchange. These eight structures are all box culverts. There are permanent drainage easements proposed for maintenance purposes for each inlet and outlet where new culverts or culvert extensions are proposed. The major drainage structures are described below and can be seen on the preliminary designs in **Appendix B**.

The outlet of the Walnut Creek triple-box culvert under I-440.

I-440/Jones Franklin Road Interchange Area

This area includes the floodplain/floodway of Walnut Creek. There are three major drainage structures proposed in this area (**Appendix B, Figure 3**) under any of the Detailed Study Alternatives.

There is an existing triple box culvert that carries Walnut Creek under I-440 and Jones Franklin Road to flow into Lake Johnson. This culvert is in a FEMA/NC Floodplain Mapping Program detailed flood study area and Walnut Creek has a defined floodplain and floodway.

The existing triple box culvert would remain, and the silt removed from the boxes. It should also be noted that the proposed retaining wall along the Jones Franklin Road on-ramp to eastbound I-440 runs near the 100-year floodplain boundary, based on the preliminary survey information. This area will be reviewed during final design when final survey information is available.

Another single box culvert carrying water from the Capital Center Office Park connects underground to the Walnut Creek triple box culvert. The preliminary hydraulics analysis recommends that the single box culvert should be removed and a new box culvert carry this unnamed stream under Jones Franklin Road to outlet directly to Walnut Creek. A portion of the stream would be relocated to align with the culvert inlet.

The proposed project cannot cause adverse impacts to the Base Flood Elevations in this area of Walnut Creek/Lake Johnson because of the existing apartment complex structures located just upstream in the floodway. Based upon the preliminary design, this is expected to be achievable. Additional coordination with FEMA/NC Floodplain Mapping Program will be required at this location during final design. Currently NCDOT and the NC Floodplain Mapping Program have a Memorandum of Agreement (MOA, dated 8/12/16) to streamline review of projects in defined floodplain/floodway areas.

The third box culvert in this area is a new single box culvert proposed under the Denise Drive extension that would carry an unnamed tributary to Walnut Creek. This area does not have a defined floodway/floodplain.

I-440 Mainline at White Oak Lake

Streams in this area do not have defined floodplains or floodways. White Oak Lake is a dammed lake on the westbound side of I-440 between the Athens Drive bridge and the Melbourne Road interchange (**Appendix B – Figures 5a and 5b**). Portions of the dam and lake are within the existing I-440 right of way. The City of Raleigh is currently planning to relocate the dam to increase flood storage capacity in the lake. NCDOT and City of Raleigh have been coordinating to ensure the lake and dam project will be outside the proposed I-440 right of way and coordination will continue through final design and construction of the I-440 project.

Simmons Branch flows out of White Oak Lake and under I-440 in a single box culvert. The preliminary hydraulic analysis recommends that this culvert be retained and extended to accommodate the widening of I-440 under any of the Detailed Study Alternatives.

White Oak Lake

I-440/Western Boulevard Interchange

Streams in this area do not have defined floodplains or floodways. There are three existing major drainage structures under the interchange area that would be relocated and replaced with larger structures under any of the Detailed Study Alternatives (**Appendix B Figure 6**). As shown in the figure, all would outfall to Brushy Creek in the same location near Onslow Road.

There are construction challenges associated with reconstructing this drainage system due to the requirement that two lanes of traffic in each direction of I-440 remain open during construction. The construction cost estimates (**Section 2.4.4**) include the higher costs associated with tunneling under the interchange area in order to install the drainage structures.

Outfall of existing drainage system into Brushy Creek at Western Boulevard interchange

I-440/Wade Avenue Interchange

In this area, House Creek crosses under Wade Avenue west of I-440, flows through the Museum Park, and then crosses under I-440 east of Wade Avenue (**Appendix B – Figures 8abc, 9abc, and 10abc**). There is a defined floodplain and floodway starting in the Museum Park and continuing downstream (**Exhibit 3-7**).

At the I-440 crossing of House Creek, it is recommended that the existing single box culvert be retained and extended on the downstream side to accommodate the widening of I-440 under any of the Detailed Study Alternatives.

Since House Creek has a delineated floodplain and floodway where it crosses under I-440, coordination with FEMA/NC Floodplain Mapping Program will be required under NCDOT's Memorandum of Agreement (8/12/16). In this location, if the Base Flood Elevations are predicted to change as a result of the proposed project, an MOA would be required to be approved by FEMA/NC Floodplain Mapping Program before project construction begins.

At the Wade Avenue crossing of House Creek, there is no defined floodplain/floodway. The hydraulic recommendations vary by Detailed Study Alternative for the Hillsborough Street/Wade Avenue interchange area. Under the One Flyover Alternative and the Slight Detour Alternative, it is recommended that the existing single box culvert be retained and extended on the upstream side to accommodate the new interchange ramps. Segments of House Creek and an unnamed tributary to House Creek would be realigned to flow into the extended culvert.

Under the Two Flyovers Alternative, the same culvert extension on the upstream side of the House Creek culvert under Wade Avenue would be needed to accommodate the interchange ramps. In addition, a culvert extension also would be needed on the downstream side to accommodate ramps in this quadrant that are of a different design than those for the One Flyover and Slight Detour Alternatives.

3.10 SECTION Water Resources and Water Quality

3.10.1 Background Information

This section on water resources and water quality and the following **Section 3.12** on streams, lakes/ponds and wetlands are related since these resources are all regulated under the Clean Water Act (see information box titled, "Clean Water Act").

3.10.2 Water Resources in Project Area

The entire project study area is within the Neuse River Basin.

Named streams in the corridor include Walnut Creek, Simmons Branch, Bushy Creek, and House Creek. There are also numerous unnamed tributaries to these streams in the project corridor (**Appendix B**).

There are two named lakes/ponds in the project area. Lake Johnson near the I-440/Jones Franklin Road interchange and White Oak Lake adjacent to I-440 between Athens Drive and Melbourne Road. There are also three small unnamed lakes/ponds in the project corridor (**Appendix B**).

Clean Water Act

The Clean Water Act is the primary federal law regulating water pollution and quality standards for surface waters. Four sections of the law relevant to transportation projects are described below.

Section 404. This section prohibits discharges of dredged or fill materials into Waters of the United States, except in accordance with a permit. Waters of the US has broad meaning and incorporates both wetlands and surface waters such as streams. The US Army Corps of Engineers (USACE) is responsible for issuing the permits. The EPA participates in the permit process and issues the regulations, known as Section 404(b)(1) Guidelines, that the USACE must follow.

Section 401 Water Quality Certification. This section requires that an applicant for a Section 404 permit obtains certification from the State that their project complies with State water quality standards. The NC Department of Environmental Quality (NCDEQ) Division of Water Resources issues these certifications.

Section 402 National Pollutant Discharge Elimination System (NPDES). This section established the NPDES permitting program to allow for and to regulate the discharge of pollutants into Waters of the United States. The NCDEQ administers this program in North Carolina. In 1998, NCDOT was issued its first NPDES permit (Permit #NCS000250) which authorizes NCDOT to discharge stormwater from its various types of transportation facilities statewide.

Section 303(d). This section requires states to develop a list of waters that are not meeting water quality standards or which have impaired uses. This is known as the 303 (d) list.

Want to know more? Go to the Environmental Protection Agency website: https://www.epa.gov/laws-regulations/summary-clean-water-act and the NCDEQ website https://deq.nc.gov/about/divisions/water-resources

3.10.3 Existing Water Quality

Streams west of the I-440/Walnut Street interchange in the project study area are in the Swift Creek watershed and are classified as Water Supply WS-III, which is defined as waters (or tributaries of waters) used as sources of water supply for drinking or food processing. The project corridor is approximately 2 miles from Swift Creek and outside the critical area for the Swift Creek water supply watershed.

All streams east of the I-440/Walnut Street interchange in the project study area are classified by the NC DEQ Division of Water Resources as Class C and Nutrient Sensitive Waters. Class C Waters are protected for uses such as secondary recreation (boating and other activities with incidental water contact), fishing, wildlife, fish consumption, aquatic life including propagation, survival and maintenance of biological integrity, and agriculture.

The Nutrient Sensitive Waters classification indicates the stream needs additional nutrient (e.g., fertilizers) management because there is excessive vegetative growth downstream in the Neuse River estuary.

To help address high levels of nutrients in areas of North Carolina, including the Neuse River Basin, the State has adopted riparian buffer rules that establish protected vegetated areas (or buffers) around streams. The Neuse River Buffer Rules are described in the information box titled "Neuse River Buffer Rules."

The North Carolina 2014 final 303(d) list and the 2016 draft 303(d) list of impaired waters (See information box titled "Clean Water Act") include Walnut Creek in the project study area. Walnut Creek is listed as impaired for fish consumption due to PCBs in fish tissue.

Along I-440 in the project area there are seven existing stormwater control devices that treat roadway stormwater runoff to improve water quality and control flow rates. Two are located in the I-440/I 40 interchange quadrant that includes Walnut Creek. Five are located at the I-440/Wade Avenue interchange west of I-440.

LAWS

Neuse River Buffer Rules

These rules are found in State law in Title 15A of the NC Administration Code Part 02B.0233. Their purpose is to protect and preserve existing riparian buffers in the Neuse River Basin to maintain their nutrient removal functions for water quality, stabilize stream banks, and provide shade and habitat for aquatic life. The NC Department of Environmental Quality (NCDEQ) Division of Water Resources administers these rules.

Riparian buffers are forested areas adjacent to surface waters, including streams, lakes, ponds, and estuaries. The protected buffer extends 50 feet from a water body and is divided into two zones. Zone 1 is the 30 feet nearest the water, and clearing and grading are not allowed except for certain uses. Zone 2 is the outer 20 feet and is allowed to be cleared and graded but must be re-vegetated to maintain diffuse stormwater flow that helps to remove pollutants.

Certain activities (including road construction) within riparian buffers may be allowable with mitigation but must first obtain written approval by NCDEQ Division of Water Resources. If it can be shown that there are "no practical alternatives" to the proposed activity, a variance may be granted with mitigation.

Want to know more? Go to the NC Department of Environmental Quality website https://deq.nc.gov/about/divisions/water-resources

This existing stormwater control structure at the I-440/Wade Avenue interchange controls runoff rates.

3.10.4 Water Quality Impacts and Mitigation Measures

Stormwater Runoff Impacts

Stormwater runoff from roadways can carry materials such as silt, heavy metals, petroleum products, nitrogen and phosphorous. These materials can potentially degrade water quality, impact recreational values, and affect aquatic organisms and their habitats.

Short-term impacts to water quality may be caused by soil erosion and sedimentation during construction. Long-term impacts can occur as pollutants from highway stormwater runoff flow into adjacent streams.

Potential impacts to water quality could occur with any of the Detailed Study Alternatives, and include:

- Increased sediments and erosion during construction
- Decreased light penetration in streams as water becomes cloudy from increased sediments
- Changes in water temperature if vegetation is removed that provides shading
- Increased concentrations of pollutants from highway runoff, construction activities, and construction equipment
- Temporary changes in water levels and flow rates resulting from construction-related interruptions and/or additions to water flow

National Pollutant Discharge Elimination System (NPDES) Stormwater Permit

As described in the information box titled "Clean Water Act", NCDOT has a statewide NPDES Stormwater permit (Permit # NCS000250) managed through NCDOT's Highway Stormwater Program. Two program areas are of particular relevance to the project are described below; the Construction Stormwater Management Program and the Post-Construction Stormwater Program.

Stormwater Management During Construction. To minimize siltation and erosion during construction of any of the Detailed Study Alternatives, an erosion and sedimentation control plan would be developed during final design. This plan would follow Design Standards in Sensitive Watersheds and Neuse River Riparian Buffer Rules in accordance with NC DEQ and NCDOT guidance and best management practices. NCDOT will require the construction contractor to take every reasonable precaution to prevent water pollution, soil erosion, and stream siltation. Examples of best management practices during construction include:

- Using properly maintained dikes, berms, and silt basins to control runoff during construction
- Avoiding placing construction staging areas in floodplains or adjacent to streams
- Re-seeding disturbed ground to control erosion
- Carefully managing use of herbicides, de-icing compounds or other chemicals
- Avoiding direct water discharges into streams through use of roadside vegetation or stormwater control structures

Stormwater Management After Construction. NCDOT's Post-Construction Stormwater Program manages long-term stormwater runoff from NCDOT projects to protect water quality. The requirements of the program apply to all of the Detailed Study Alternatives since they will increase the built-upon area. A Stormwater Management Plan will be prepared during final design of the project to direct the drainage design and manage long-term stormwater runoff. As part of the plan, NCDOT will implement new structural best management practices and non-structural pollution minimization measures. Examples of these best management practices after construction include:

- Non-structural - litter control and management of fertilizer application within the right of way.
- Structural - water detention basins, swales, and filters.

The existing stormwater control devices described in **Section 3.10.3** will be retained, modified, or replaced to provide the same or increased water quality treatment.

Neuse River Buffer Rules

All streams and lakes/ponds in the project area are subject to the Neuse River Buffer Rules to protect and maintain water quality. Any impacts to these streams also likely impact their riparian buffers.

Permanent impacts to riparian buffers for any combination of Detailed Study Alternatives end-to-end are estimated to be:

- Zone 1 – 5.9 to 6.6 acres
- Zone 2 - 3.7 to 4.1 acres
- Total buffer impacts – 9.5 to 10.7 acres

Buffer impacts differ amongst alternatives at the Ligon Street grade separation, at the Wade Avenue interchange area, and for the Reedy Creek Greenway options on the Meredith College main campus. At Ligon Street, the Bridge to South Alternative would have the most buffer impacts (about 1.0 acre), followed by the Bridge to North Alternative (about 0.7 acres) and the Extend Existing Traffic Culvert Alternative (about 0.4 acres).

At the Wade Avenue interchange, the Two Flyovers Alternative would have about one-half acre more buffer impacts than One Flyover and Slight Detour due to the need to extend the House Creek culvert farther where House Creek crosses under Wade Avenue.

The relocated Reedy Creek Greenway on Meredith College campus near the existing I-440 right of way would impact 0.1 to 0.2 acres of riparian buffer around the pond on campus near Hillsborough Street (**Appendix B – Figures 8a-c and 11**).

It cannot be determined at the preliminary design stage how much of the buffer impacts would be permanent and how much would be temporary and able to be re-vegetated, although it is expected most will be temporary. These impact details will be determined during final design.

Written authorization will be required from the NC DEQ Division of Water Resources for disturbance of riparian buffer areas prior to construction. Road crossings that impact less than or equal to one-third acre are allowable. Road crossings that impact greater than one-third acre are allowable with mitigation.

Best management practices must be used to minimize disturbance, preserve aquatic life and habitat, and protect water quality. Mitigation may include payment of a fee to the Riparian Buffer Restoration Fund, donation of property or restoration or enhancement of a riparian buffer area, or other mitigation as approved by the NCDEQ Division of Water Resources.

3.11 SECTION Streams, Lakes/Ponds, and Wetlands

3.11.1 Waters of the US Defined

Water resources defined as Waters of the US are subject to regulation under Section 404 of the Clean Water Act (see information box titled "Clean Water Act"). These are often termed "jurisdictional resources" since the US Army Corps of Engineers (USACE) has jurisdiction over impacts to these resources.

Jurisdictional resources in the project area include streams, lakes/ponds, and wetlands. Wetlands are defined in the Clean Water Act as areas that are sufficiently inundated or saturated by water so they support plants typically adapted to wet soil conditions. Swamps are an example of a wetland.

3.11.2 Resources in Project Area

Field surveys were conducted by qualified biologists to identify jurisdictional resources in the project study area. These streams, lakes/ponds, and wetlands are shown on the preliminary design maps in **Appendix B**.

Streams

Streams in the project corridor include Walnut Creek, Simmons Branch, Bushy Creek, House Creek and numerous unnamed perennial (constantly flowing) and intermittent (sometimes dry) tributaries to these streams. South of Walnut Street, there are several unnamed tributaries to Lynn Branch (which drains to Swift Creek).

Lakes/Ponds

Lake Johnson, White Oak Lake and three smaller unnamed lakes/ponds are in the project corridor. The smaller lakes/ponds include two at the I-440/ Jones Franklin Road interchange and one at the I-440/Hillsborough Street interchange on Meredith College's campus.

Wetlands

Most wetlands in the project corridor are very small (less than one-tenth acre) and located adjacent to streams. The two largest wetlands are located along Walnut Creek, on either side of I-440 (**Appendix B – Figure 3**). The wetland on the I-440 westbound side is near the Walnut Creek culvert inlet and is approximately 1.4 acres in size. The wetland on the I-440 eastbound side is in Lake Johnson Park and is approximately 0.9 acres in size.

House Creek looking upstream from crossing under I-440.

3.11.3 Impacts to Streams, Lakes/Ponds, and Wetlands

All of the Detailed Study Alternatives have unavoidable impacts to streams, Lakes/Ponds, and wetlands.

Permanent impacts were estimated to occur from the new construction limits and in areas where stream relocations are proposed to direct streams into new culverts. Temporary impacts were estimated to occur in the construction easement areas and the permanent drainage easement areas. An extra area of 25 feet was added to the construction limits and easement boundaries in accordance with NCDOT procedures for calculating impacts to jurisdictional resources at the preliminary design stage to ensure that impacts would not be underestimated as the project moves to final design.

General areas where impacts occur are shown on **Exhibit 3.10**. Impacts are summarized below. Most impacts occur at existing crossings of streams, where road widening requires stream culverts to be lengthened.

Stream Impacts

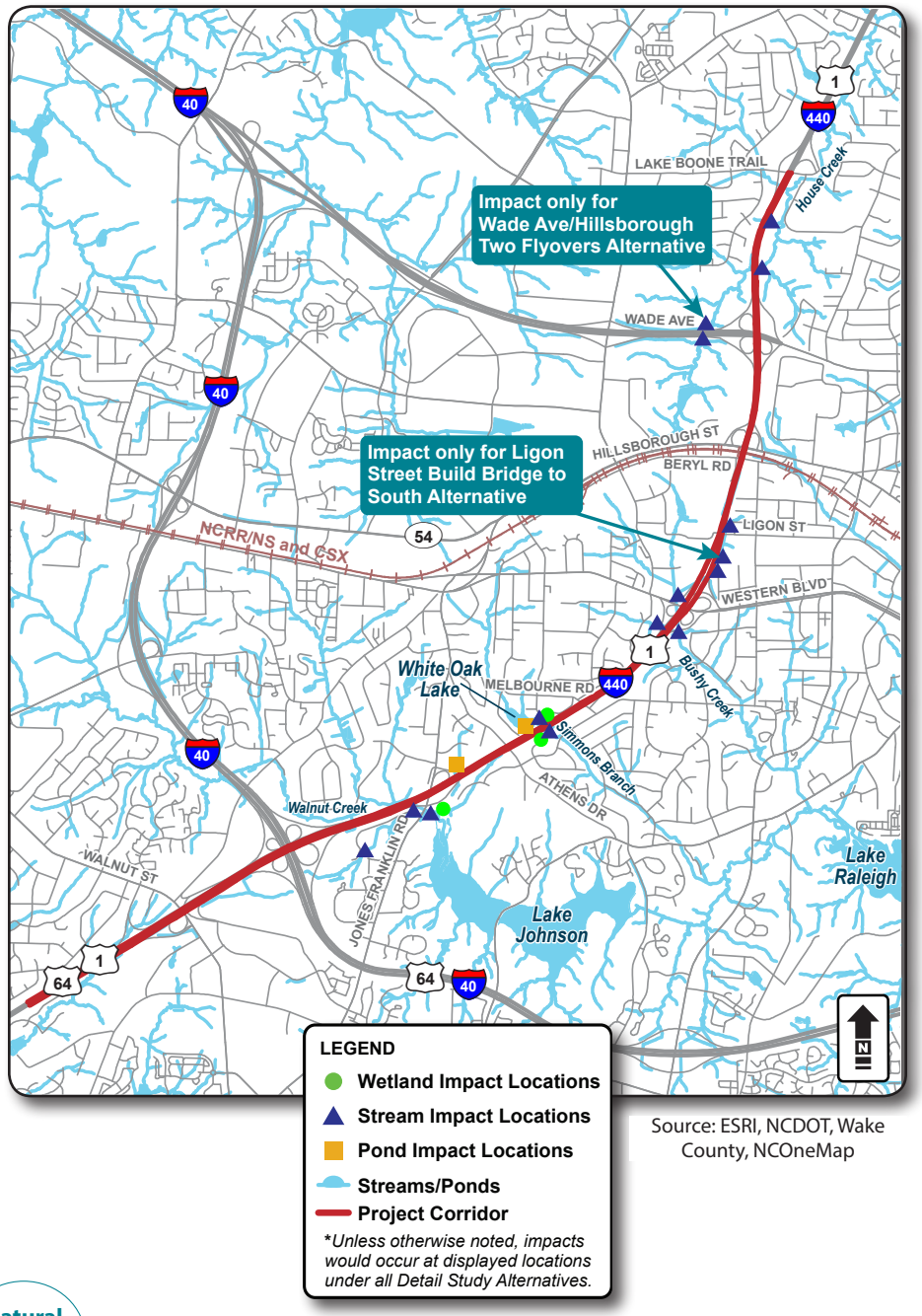
Permanent impacts to streams for any combination of Detailed Study Alternatives end-to-end range from 1,826 to 2,145 linear feet. Temporary impacts to streams range from 821 to 973 linear feet.

The longest permanent impacts at any one stream location are at an intermittent stream on the I-440 eastbound side across from White Oak Lake (approximately 251 linear feet) and a perennial stream on the I-440 eastbound side north and south of Ligon Street (approximately 236 linear feet). These streams are parallel to the roadway, so they have longer lengths of impacts from the roadway's expanded limits.

There are two locations where there are differences in stream impacts between Detailed Study Alternatives: I-440/Wade Avenue interchange and Ligon Street grade separation. These areas are described below.

At the Wade Avenue interchange, there are differences at the culvert crossing under Wade Avenue just west of I-440. On the NC Museum of Art property on the north side of Wade Avenue, a culvert extension is needed under the Two Flyovers Alternative that is not needed under the One Flyover or Slight Detour Alternatives. Under the Two Flyovers Alternative, the ramp from westbound I-440 to westbound Wade Avenue

Exhibit 3.10: Stream, Lake/Pond, and Wetland Impact Locations



Source: ESRI, NCDOT, Wake County, NCOneMap

needs to be shifted outward so that the flyover ramp from eastbound I-440 to westbound Wade Avenue can join with this ramp before joining Wade Avenue, creating a need to extend the House Creek culvert on the north side. This culvert extension would have approximately 85 linear feet of permanent impact and 87 linear feet of temporary impact.

At the Ligon Street grade separation, the Build Bridge to South Alternative would have approximately 85 more linear feet of permanent stream impacts and 64 linear feet more of temporary impacts compared to the Build Bridge to North and Extend Existing Traffic Culvert Alternatives.

Lake/Pond Impacts

Impacts to lakes/ponds would be the same for any combination of Detailed Study Alternatives end-to-end, since these pond impacts occur in areas where there is only one alternative currently under consideration.

The entire pond in the Waters Edge office park at the I-440/Jones Franklin Road interchange would be impacted. The pond (approximately 0.9 acres in size) would be temporarily drained during construction and part of the pond would be permanently filled.

Impacts may also occur at White Oak Lake. With the lake in its existing location, impacts would be approximately 0.08 acres. It should be noted that the City of Raleigh has a project to relocate the White Oak Lake dam outside the I-440 proposed right of way, and the timing of this City project with the I-440 project will need to be coordinated. Impacts from the I-440 project to White Oak Lake would be avoided with this City project.

Wetland Impacts

Wetland impact areas are very small and occur in two general locations as shown on **Exhibit 3.10**, near Lake Johnson at the Jones Franklin Road interchange and near White Oak Lake between Athens Drive and Melbourne Road. Total wetland impacts for any combination of Detailed Study Alternatives end-to-end would be approximately 0.09 acre of permanent impact and 0.01 acre of temporary impact.

Pond in Water's Edge Office Park

3.11.4 Permits and Measures to Reduce Impacts

Permits will be required from the USACE (Section 404 permit) and the NC DEQ Division of Water Resources (Section 401 Water Quality Certification) for roadway encroachment into jurisdictional surface waters and wetlands. The type of activity, the extent of the impacts, and the impacts by individual crossing will be considered by the USACE to determine the type of Section 404 permit needed.

Regardless of the Section 404 permit type issued by the USACE, any Section 404 permit will also require a 401 Water Quality Certification to be issued by the NC DEQ Division of Water Resources. Both the permit and the certification need to be obtained before construction can begin.

The permit process includes demonstrating that all practicable measures to avoid and minimize impacts to Waters of the US have been incorporated into the final design plans before addressing compensation for remaining impacts.

Some measures to avoid and minimize impacts to streams, lakes/ponds, and wetlands already have been incorporated into the preliminary designs. For example, retaining walls are proposed where Walnut Creek crosses under I-440 to avoid impacting this creek (see **Appendix B – Figure 3**). A retaining wall also is proposed to avoid a pond on the Meredith College campus (see **Appendix B – Figures 7a-c**).

During final design, NCDOT will continue to investigate ways to avoid and minimize impacts to streams, lakes/ponds, and wetlands. For remaining impacts, the permits from the USACE and the NCDEQ Division of Water Resources will identify the necessary mitigation measures needed to compensate for these impacts. NCDOT will coordinate with the NCDEQ Division of Mitigation Services to provide the required mitigation measures.

3.12 SECTION Protected Plant and Animal Species

Protected species are plants and animals afforded protections under the federal Endangered Species Act and the Bald and Golden Eagle Protection Act. The US Fish and Wildlife Service administers these acts. See the information box on this page.

3.12.1 Protected Species Listed for Wake County

The US Fish and Wildlife Service lists four species under federal protection through the Endangered Species Act that are considered to have ranges extending into Wake County. These are listed in **Table 3.3**, with brief descriptions following. The bald eagle, known to be present in Wake County, is protected under the Bald and Golden Eagle Protection Act.

Table 3.3: Protected Species in Wake County

Type	Common Name	Scientific Name	Status
Plant	Michaux's sumac	*Rhus michauxii*	Endangered
Mussel	Dwarf wedgemussel	*Alasmidonta heterodon*	Endangered
Bird	Red-cockaded woodpecker	*Picoides borealis*	Endangered
Bat	Northern long-eared bat	*Myotis septentrionalis*	Threatened

LAWS Endangered Species Act (ESA) and Bald and Golden Eagle Protection Act

ESA. The purpose of the ESA is to protect and recover imperiled species and the ecosystems upon which they depend. It is administered by the US Fish and Wildlife Service.

The ESA requires federal agencies to ensure that their actions are not likely to jeopardize the continued existence of endangered or threatened species, including the destruction or adverse modification of critical habitat (habitat essential to the conservation of a species).

The US Fish and Wildlife Service determines whether a species should be federally listed as threatened or endangered. **Endangered species** are those plants and animals in danger of extinction throughout all or a significant portion of their range. **Threatened species** are those likely to become endangered in the foreseeable future.

Any activity permitted, funded, or conducted by a federal agency that affects a listed species or designated critical habitat requires a consultation with the US Fish and Wildlife Service.

Eagle Protection Act. This act prohibits the take, disturbance, possession, sale, purchase, trade, or transport of any bald or golden eagle, alive or dead, including any part, nest, or egg, unless allowed by permit.

Want to know more? Go to the US Fish and Wildlife Service websites
For ESA: https://www.fws.gov/endangered/laws-policies/
For Eagles Protection Act: https://www.fws.gov/midwest/eagle/protect/laws.html

Credit: Susan Miller, USFWS

Michaux's sumac is a sun-loving plant that likes sandy soils and areas disturbed by mowing, clearing, grazing, or periodic fire that keeps their habitat open. There is potentially suitable habitat for this plant in the project corridor. The NC Natural Heritage Program records indicate no known occurrences within one mile of the study corridor.

Credit: NC Wildlife Resources Commission

In North Carolina, the dwarf wedgemussel habitat includes the Neuse and Tar River drainages. It inhabits streams with slow to moderate currents and firm bottoms. There is potentially suitable habitat for this mussel in streams in the project corridor. The NC Natural Heritage Program records indicate no known occurrences within one mile of the study corridor.

Credit: NC Wildlife Resources Commission

The red-cockaded woodpecker likes mature stands of southern pines, particularly longleaf pine, for foraging and nesting. They excavate nesting cavities in pines that are 60 years or older. Potentially suitable foraging habitat for the red-cockaded woodpecker is present in the project corridor, but the NC Heritage Program records show no known occurrences within one mile.

Credit: Al Hicks, USFWS

The northern long-eared bat occurs in the NC mountains, with scattered records of its presence in the Piedmont and coastal plain. During the summer, this bat roosts singly or in colonies in live and dead trees. White nose syndrome, a fungus, has severely impacted this bat. There may be potentially suitable habitat for this species in the project corridor.

Credit: Katherine Whitmore, USFWS

The bald eagle lives near rivers, lakes, and marshes where they can find fish, their primary food. Within the project corridor, Lake Johnson and three smaller unnamed ponds may provide food sources for the bald eagle. The NC Natural Heritage Program records indicate no known occurrences within one mile of the study corridor.

3.12.2 Impacts to Protected Species

Suitable habitat for the protected species listed in **Section 3.12.1** was surveyed for the actual presence of these species. Survey findings and conclusions are listed below.

Michaux's sumac

Surveys for this plant did not find any occurrences in the project corridor. Under Section 7 of the Endangered Species Act, the biological conclusion for Michaux's sumac is "No Effect" for any of the Detailed Study Alternatives. The project study area will be re-surveyed prior to the final environmental document to ensure there are no new occurrences of the plant in the project study area.

Dwarf Wedgemussel

For streams identified as having potentially suitable habitat via a desktop review, habitat assessments were conducted in the field. The streams in the project area are urbanized and do not provide habitat for sensitive mussels such as the dwarf wedgemussel. Under Section 7 of the Endangered Species Act, the biological conclusion for dwarf wedgemussel is "No Effect" for any of the Detailed Study Alternatives.

Red-Cockaded Woodpecker

All areas identified as suitable foraging habitat in the project corridor were field reviewed for the presence of red-cockaded woodpeckers or cavity trees. Neither birds nor cavity trees were observed. Under Section 7 of the Endangered Species Act, the biological conclusion for red-cockaded woodpecker is "No Effect" for any of the Detailed Study Alternatives.

Northern Long-Eared Bat

The US Fish and Wildlife Service has developed a programmatic biological opinion (PBO) in conjunction with FHWA, USACE, and NCDOT for the northern long-eared bat in eastern North Carolina (which includes Wake County). The PBO went into effect in 2016 and covers all NCDOT projects and activities in NCDOT Divisions 1 to 8. The programmatic determination for the bat is "May Affect, Likely to Adversely Affect".

The PBO involves a research and tracking program to establish conclusive information concerning the existence of the northern long-eared bat in the eastern part of North Carolina. The PBO also requires that upon completion of clearing activities for each project with federal funds, NCDOT will report on the estimated acres of clearing to the US Fish and Wildlife Service.

Bald Eagle

A survey of the project study area and the area within 660 feet of the project study area boundaries did not find any bald eagles or eagle nests. No impacts to bald eagles are anticipated from any of the Detailed Study Alternatives.

3.13 SECTION Impact Comparison Summary

The purpose of the project is to improve traffic flow, make the roadway operate more efficiently, and enhance mobility on this segment of I-440. The project will address the need to increase capacity, improve the layout of the road and interchanges, and fix poor conditions along this segment of I-440.

Any end-to-end combination of the Detailed Study Alternatives presented in this Environmental Assessment will meet the project's purpose and need. However, each potential end-to-end combination will have varying levels of costs, benefits, and impacts, as documented in the previous sections of **Chapter 3** and in an impact matrix included in **Appendix C**.

All of the end-to-end combinations of Detailed Study Alternatives would have adverse effects on the surrounding environment, but none of these impacts are anticipated to cause significant levels of adverse community, economic, or other environmental impacts that would warrant preparation of an Environmental Impact Statement.

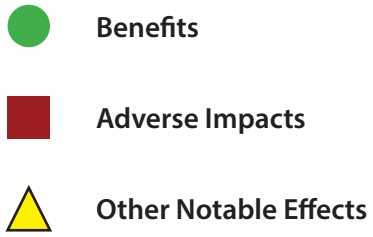
Therefore, unless significant impacts are identified during the public review period, a Finding of No Significant Impact (FONSI) for the Preferred Alternative is expected to be issued by NCDOT and FHWA.

NCDOT and FHWA will decide on the Preferred Alternative based upon the technical studies and evaluations summarized in this Environmental Assessment, and input received from the public and reviewing agencies.

The following sections compare the Detailed Study Alternatives for each interchange and grade separation area. Where there is more than one Detailed Study Alternative, notable benefits and impacts that are the same between alternatives are described, as well as marked differences between the alternatives. In some locations, there is only one Detailed Study Alternative. For these instances, notable features and impacts are listed.

Not all impacts or benefits described in **Chapter 3** are addressed below for each location, just those that are notable or vary markedly between alternatives. See **Sections 3.1 to 3.12** and the summary matrix in **Appendix C** for information on all effects analyzed.

Benefits are marked with a green dot, adverse impacts are marked with a red square, and other notable effects are marked with a yellow triangle.



Benefits

Adverse Impacts

Other Notable Effects

3.13.1 From South of Walnut Street to the I-40 Interchange

The Detailed Study Alternative in this location is the Widen I-440 Only Alternative. The table below lists notable impacts and benefits. See **Appendix C** for the complete impact matrix.

Widen I-440 Only Alternative	
●	Improvements in this area consist of widening I-440 and this can be done entirely within the existing right of way.
●	The improvements will connect the I-440 project (which would widen I-440 to six lanes) to the existing six-lane section of US 1-64, eliminating the bottleneck in this location.
●	There would be no impacts to surrounding resources.
●	The existing noise walls south of Walnut Street along both sides of US 1-64 would not be impacted by the project.

Benefits

Adverse Impacts

Other Notable Effects

3.13.2 Jones Franklin Road Interchange

There is one Detailed Study Alternative at this location: the Upgrade Existing Partial Clover Alternative. The table below lists notable impacts and benefits. See **Appendix C** for the complete impact matrix.

Upgrade Existing Partial Clover Alternative
Traffic flow on Jones Franklin Rd would be improved with widening Jones Franklin Rd to four lanes and realigning Ft Sumter Road to across from the interchange ramps. This alternative also would close the Capital Center Dr office park entrance at Jones Franklin Rd and relocate the entrance to a new Denise Drive extension with a traffic signal.
The widened Jones Franklin Rd segment would improve mobility with new sidewalks and bicycle lanes, and the bridge over I-440 would be wide enough to accommodate a future greenway planned by the City of Raleigh.
A permanent drainage easement at the Walnut Creek culvert in Lake Johnson Park (approximately 0.25 acres) would be required. The easement would not adversely affect the activities, features, or attributes of the park and a *de minimis* impact finding under Section 4(f) laws is proposed.
There would be 23 residential relocations and 7 business relocations. There is an adequate supply of replacement housing and suitable business sites in the area.
This alternative would require relocation of the Learn with the Best private school for special needs children located in the office building at the Waters Edge Drive/Jones Franklin Road intersection.
Natural resource impacts Streams - Approximately 367 linear ft of permanent impact and 231 linear ft of temporary impact Lakes/Ponds - Approximately 0.88 acres of pond at Waters Edge office park Wetlands - Approximately 0.02 acres Riparian Buffers - Approximately 3.3 acres of impact (Zone 1 + Zone 2)

Benefits

Adverse Impacts

Other Notable Effects

3.13.3 Athens Drive Grade Separation

There are two Detailed Study Alternatives in this location: Bridge in Place Alternative and Bridge to North Alternative. The table below lists notable impacts and benefits and those that vary markedly between alternatives. See **Appendix C** for the complete impact matrix.

Bridge in Place Alternative	Bridge to North Alternative
Sidewalks and bicycle lanes would be added to Athens Dr under both alternatives, improving mobility.	
During construction, bridge would be closed for 9 to 12 months with a 2.8-mile off-site detour.	Bridge would remain open during construction, with only brief closures.
Slightly less expensive ($3.6 million)	Slightly more expensive ($4.9 million)
No residential relocations	5 residential relocations

Benefits

Adverse Impacts

Other Notable Effects

3.13.4 Melbourne Road Interchange

There are two Detailed Study Alternatives in this location: Bridge in Place Alternative and Bridge to North Alternative. The table below lists notable impacts and benefits and those that vary markedly between alternatives. See **Appendix C** for the complete impact matrix.

Bridge in Place Alternative	Bridge to North Alternative
Sidewalks and bicycle lanes would be added to Melbourne Rd under both alternatives, improving mobility.	
A permanent drainage easement (Approximately 0.09 acres) needed from Kaplan park. This would not adversely affect the activities, features, or attributes of the park and a *de minimis* impact finding under Section 4(f) is anticipated.	
Natural resource impacts would be the same for each alternative. Streams - Approximately 418 linear ft of permanent impact and 137 linear ft of temporary impact Lakes/Ponds - Approximately 0.08 acres of White Oak Lake Wetlands - Approximately 0.07 acres Riparian Buffers - Approximately 1.7 acres of riparian buffer impacts (Zone 1 + Zone 2)	
During construction, bridge would be closed for 9 to 12 months with a 3.2-mile off-site detour.	Bridge would remain open during construction, with only brief closures.
Slightly less expensive ($8.9 million)	Slightly more expensive ($10.0 million)
3 residential relocations	6 residential relocations

Benefits

Adverse Impacts

Other Notable Effects

3.13.5 Western Boulevard Interchange

There is one Detailed Study Alternative in this location – Double Crossover Diamond Alternative (also known as a Diverging Diamond). The table below lists notable impacts and benefits. See **Appendix C** for the complete impact matrix.

Double Crossover Diamond Alternative
This alternative removes the existing flyover ramp from westbound Western Blvd to westbound I-440 that merges onto I-440 on the left side of the through lanes, which is not a desirable configuration.
This alternative would replace the existing multi-use path along the westbound side of Western Blvd.
This alternative has a high estimated construction cost ($43.9 million) due to challenges associated with installing adequate drainage structures through the interchange area. Existing drainage structures are deep (40+ ft) underground and tunneling methods will be needed.
1 residential relocation
Minor impact to the K-mart parking lot due to right of way needs.
Natural resource impacts: Streams - Approximately 376 linear ft of permanent impacts and 125 linear ft of temporary impact Riparian Buffers - Approximately 1.7 acres of riparian buffer impacts (Zone 1 + Zone 2)

Benefits

Adverse Impacts

Other Notable Effects

3.13.6 Ligon Street Grade Separation

There are three Detailed Study Alternatives in this location: Bridge to South Alternative, Bridge to North Alternative and Extend Existing Traffic Culvert Alternative. The table below lists notable impacts and benefits and those that vary markedly between alternatives. See **Appendix C** for the complete impact matrix.

Bridge to South Alternative	Bridge to North Alternative	Extend Existing Traffic Culvert Alternative
Improved mobility and accessibility along Ligon St since bridge would have sidewalks and the bridge would allow for buses to cross I-440 at this location.		No improvement in mobility or accessibility. No sidewalks in culvert. Buses prohibited due to clearance limits.
Bridge alternatives consistent with the City of Raleigh plans for a future connection of Ligon St to Blue Ridge Rd.		Culvert alternative not consistent with City's future plans for Ligon St.
Cost in the middle ($27.1 million)	Most expensive ($28.2 million)	Least expensive ($15.7 million)
Adverse Effect to historic Oak Grove Cemetery under Section 106 of the Historic Preservation Act	No Adverse Effect to historic Oak Grove Cemetery under Section 106 of the Historic Preservation Act	No Adverse Effect to historic Oak Grove Cemetery under Section 106 of the Historic Preservation Act
7 business relocations on Brickhaven Dr	7 business relocations on Brickhaven Dr	7 business relocations on Brickhaven Dr
1 displacement of an NCSU research facility	10 residential relocations	No residential or research facility relocations
Approximately 310 linear ft of permanent stream impacts, 64 linear ft of temporary stream impact, and 1.0 acre of riparian buffers (Zone 1 + Zone 2)	Approximately 174 linear ft of permanent stream impacts and 0.7 acres of riparian buffers (Zone 1 + Zone 2)	Approximately 125 linear ft of permanent stream impacts and 0.4 acres of riparian buffers (Zone 1 + Zone 2)

Benefits

Adverse Impacts

Other Notable Effects

3.13.7 Hillsborough Street and Wade Avenue Interchange Area

There are three Detailed Study Alternatives for the Hillsborough Street and Wade Avenue interchange area: One Flyover Alternative, Two Flyovers Alternative and Slight Detour Alternative. The table below lists notable impacts and benefits and those that vary markedly between alternatives. See **Appendix C** for the complete impact matrix.

One Flyover Alternative	Two Flyovers Alternative	Slight Detour Alternative
All alternatives would eliminate the back-to-back loop ramps in the Wade Ave interchange area which slow down traffic and make it more difficult to merge onto I-440 and Wade Ave		
Vehicles from Hillsborough St can access eastbound I-440 directly.	Vehicles from Hillsborough St can access eastbound I-440 directly.	The Slight Detour Alternative requires vehicles from Hillsborough St to travel through the Wade Ave traffic signal to get onto eastbound I-440.
Cost in the middle ($250.9 million)	Most expensive ($251.7 million)	Least expensive ($241.6 million)
1 residential relocation	No residential relocations	1 residential relocation
Displacement of the NCSU Golf Practice Facility and NC State University Club facilities. Approximately 19.6 to 19.8 acres of right of way needed from NC State University property.		
Approximately 16.9 acres of right of way needed from Meredith College, impacting commuter parking lot and general athletic field	Approximately 13.5 acres of right of way needed from Meredith College, impacting commuter parking lot and general athletic field	Approximately 14.5 acres of right of way needed from Meredith College, impacting commuter parking lot and general athletic field
Little change in views to/ from the Reedy Creek Greenway pedestrian bridge.	Most change in views to/ from the Reedy Creek Greenway pedestrian bridge	Little change in views to/ from the Reedy Creek Greenway pedestrian bridge.

Benefits

Adverse Impacts

Other Notable Effects

Hillsborough Street and Wade Avenue Interchange Area - Continued from previous page

One Flyover Alternative	Two Flyovers Alternative	Slight Detour Alternative
Approximately 0.9 acres of right of way needed from Museum Park along westbound I-440 under all alternatives. An additional 0.3 acres of right of way and 0.2 acres of permanent drainage easement are needed from Museum Park under Two Flyovers Alternative. This new right of way is not anticipated to adversely affect the activities, features, or attributes of the park and a *de minimis* impact finding under Section 4(f) is anticipated with mitigation. A Memorandum of Agreement will be signed with the NC Museum of Art to define appropriate mitigation.		
Reedy Creek Greenway would be impacted under any of the alternatives. The greenway would be relocated and reconnected to the unaffected greenway segments; and the activities, features, and attributes of the greenway would not be adversely affected and a *de minimis* impact finding under Section 4(f) is anticipated for any of the alternatives.		
Approximately 540 linear ft of permanent stream impacts, 328 linear ft of temporary stream impacts, and 2.0 acres of riparian buffers (Zone 1 + Zone 2)	Approximately 625 linear ft of permanent stream impacts, 416 linear ft of temporary stream impacts, and 2.5 acres of riparian buffers (Zone 1 + Zone 2)	Approximately 541 linear ft of permanent stream impacts, 329 linear ft of temporary stream impacts, and 2.0 acres of riparian buffers (Zone 1 + Zone 2)

FOR MORE DETAILS ON THE INFORMATION IN THIS CHAPTER:

Project Impacts - Social Resources

The following document is available on the project website at: https://www.ncdot.gov/projects/i-440improvements/.

- ***Community Impact Assessment for the I-440 Improvement Project (STIP U-2719)***
  (June 2017, Atkins)
  This document describes community demographics, community land use and transportation plans, and notable community resources (neighborhoods, parks, schools, community centers, etc.). Evaluation of project impacts includes direct physical impacts to residences, businesses, and other uses, mobility and access changes, effects on community cohesion, and environmental justice issues.

The following document is available upon request by contacting Beverly Robinson at NCDOT at brobinson@ncdot.gov.

- ***Final Indirect Screening Report – I-440 Improvements from South of Walnut Street to North of Wade Avenue***
  (March 5, 2015, Atkins) Document available upon request.
  This screening tool includes evaluation of issues such as demographics, utilities, notable features, development regulations, local area plans, available land, and growth trends. The screening results indicate a lower level of concern for indirect effects and recommends no further related studies.

Project Impacts - Cultural Resources

The following documents are available upon request by contacting Beverly Robinson at NCDOT at brobinson@ncdot.gov.

- ***Letter from the State Historic Preservation Office to NCDOT responding to request for scoping comments on Project U-32719***
  (August 13, 2012, State Historic Preservation Office)
  Letter states no archaeological resources surveys required for the project. Letter recommends a survey for historic architectural resources.
- ***Historic Architectural Resources report for I-440 Beltline Improvements from Walnut Street, Cary to Wade Avenue, Raleigh***
  (December 2013, New South Associates, Inc.)
  This report surveys the project Area of Potential Effect for resources potentially eligible for listing on the National Register of Historic Places (NRHP).
- ***Improvements to I-440 from Walnut Street to Wade Avenue, Cary and Raleigh – Addendum***
  (August 25, 2014, New South Associates, Inc.)
  This addendum provides additional information to determine eligibility for the NRHP for Capitol City Lumber, Hillsdale Forest neighborhood, and the NC State University Club.
- ***Historic Architectural Resources Survey Report Meredith College Campus Evaluation***
  (April 20, 2015, Fearnbach History Services, Inc.)
  This report evaluates Meredith College Campus and potential boundaries for the portion eligible for listing on the NRHP.
- ***Letter from the NC Historic Preservation Office listing resources eligible for listing on the NRHP***
  (February 2, 2014, State Historic Preservation Office) Document is in Appendices.
  Letters lists Royal Baking Company, Berry O'Kelly School Historic District and Oak Grove Cemetery and eligible for listing on the NRHP.
- ***Letter from the NC Historic Preservation Office listing resources eligible for listing on the NRHP***
  (September 26, 2014, NC Historic Preservation Office) Document is in Appendices.
  This letter lists Capitol City Lumber as eligible for listing on the NRHP. It determines Hillsdale Forest neighborhood and NC State University Club are not eligible for listing on the NRHP.
- ***Letter from the NC Historic Preservation Office listing resources eligible for listing on the NRHP***
  (May 21, 2015, NC Historic Preservation Office) Document is in Appendices.
  This letter states NCHPO agrees a portion of Meredith College campus is eligible for listing on the NRHP, but recommends a smaller boundary than included in the April 20, 2015 survey report.

- ***Letter from NCDOT clarifying the boundaries of the Meredith College historic resource***
  (May 28, 2015, NCDOT Human Environment Section) Document is in Appendices.
  This letter provides a map showing the agreed-upon boundary noted in NCHPO's May 21, 2015 letter for the portion of Meredith College campus eligible for listing on the NRHP
- ***Memo - Identification of Lake Johnson Park boundaries as they apply to Section 6(f) of the Land and Water Conservation Fund (LWCF)***
  (April 13, 2017, Atkins)
  This memo to file documents the boundaries of Lake Johnson Park that are protected under Section 6(f)(3) of the Land and Water Conservation Fund Act.
- ***Letter from the NC Historic Preservation Office regarding effects determinations***
  (May 2, 2017, State Historic Preservation Office) Document is in Appendices.
  This letter states the effects of the proposed Detailed Study Alternatives on resources in the project area that are on or eligible for listing on the National Register of Historic Places.

Project Impacts - Physical Resources

The following documents are available upon request by contacting Beverly Robinson at NCDOT at brobinson@ncdot.gov.

- ***Mobile Source Air Toxics Report I-440/US 1, From South of SR 1313 (Walnut Street) to North of SR 1728 (Wade Avenue)***
  (August 31, 2016, Kimley-Horn and Associates)
  This report is a quantitative assessment of mobile source air toxic emissions in the project area for 2012 and for the no-build and build conditions in 2035.
- ***Preliminary Hydraulics Study for Environmental Impact – NCDOT TIP No. U-2719***
  (Draft - January 19, 2017, Sungate Design Group)
  This report identifies existing major drainage structures and stormwater control structures in the project corridor and recommends the major drainage structures required for the Detailed Study Alternatives.
- ***Traffic Noise Report – I-440 Improvements from South of Walnut Street to East of Wade Avenue***
  (June 2017, Atkins)
  This report documents the modeling and analysis of existing (2012) and future (2035) traffic noise for the no-build condition and future traffic noise impacts under the Detailed Study Alternatives. This report also identifies noise walls determined preliminarily reasonable and feasible.
- ***Utilities Estimate Worksheet***
  (May 4, 2017, NCDOT Utilities Unit)
  This report lists the major utilities present in the project corridor and estimates the costs for relocating utilities.
- ***GeoEnvironmental Planning Report for Widening of I-440***
  (April 20, 2017, NCDOT Geoenvironmental Unit)
  This report identifies known potential hazardous waste sites in the project corridor and assesses the level of potential impact.

Project Impacts - Natural Resources

The following documents are available upon request by contacting Beverly Robinson at NCDOT at brobinson@ncdot.gov.

- ***Freshwater Mussel Survey Report for Proposed Widening of I-440 (Cliff Benson Beltline) from South of SR 1313 (Walnut Street) to North of SR 1728 (Wade Avenue)***
  (April 12, 2013, author)
  This report documents surveys for freshwater mussels in streams in the project study area.
- ***Red-Cockaded Woodpecker Survey Report – Widening of I-440 (Cliff Benson Beltline) from South of SR 1313 (Walnut Street) to North of SR 1728 (Wade Avenue)***
  (May 2013, NCDOT Natural Environment Section) (now called the Environmental Analysis Unit)
  This report documents the surveys for red-cockaded woodpecker in the project study area.
- ***Final Natural Resources Technical Report – I-440 Improvements Project – TIP U-2719***
  (January 17, 2014, Atkins)
  This report documents the surveys for streams, ponds, wetlands, and biotic communities in the project study area and summarizes surveys for protected species.
- ***Natural Resources Technical Report Addendum – Lake Boone Trail Stream/Wetland Survey – U-2719 I-440 Widening Project***
  (October 3, 2014, Atkins)
  This report documents the surveys streams, ponds, and wetlands in the project study area around the Lake Boone Trail interchange.
- ***Natural Resources Technical Report Addendum – Jones Franklin Road Stream/Wetland Survey and Michaux's Sumac Survey– U-2719 I-440 Widening Project***
  (May 17, 2016, Atkins)
  Additional project study area was added along Jones Franklin Road and this report documents the surveys for streams, wetlands, ponds, and protected species in this area.
- ***Preliminary Hydraulics Study for Environmental Impact – NCDOT TIP No. U-2719***
  (Draft - January 19, 2017, Sungate Design Group)
  This report identifies existing major drainage structures and stormwater control structures in the project corridor and recommends the major drainage structures required for the Detailed Study Alternatives.
- ***Methodology and Calculations for Impacts from the U-2719 Preliminary Designs to Jurisdictional Streams, Ponds, Wetlands, and Riparian Buffers***
  (April 13, 2017, Atkins)
  This report documents the calculation methodologies and impacts at each individual stream, pond, and wetland and riparian buffer and provides combined totals for the Detailed Study Alternatives.

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4

CHAPTER

Public and Agency Involvement

This chapter describes the opportunities for the general public, local groups, and governmental agencies to be involved in the project, and how input was considered in studies and decisions about the project.

What's In This Chapter...

WANT MORE DETAILS?

See the list of technical reports at the end of this chapter.

4.1 SECTION Input Opportunities Summary

NCDOT values public and agency input and considers all feedback when making decisions about the project. Opportunities for project input began early in the environmental planning process. A summary of events through completion of the planning process is provided in **Table 4.1**.

4.2 SECTION Project Website, Email, and Telephone

The website includes project information and links for downloading project documents and for submitting comments and questions.

https://www.ncdot.gov/projects/i-440improvements/

The project team also has been and is accessible via email and telephone for comments and questions. NCDOT Project Manager is Mr. John Williams (jlwilliams@ncdot.gov or 919-707-6178).

Table 4.1: Opportunities for Project Input

	Project Initiation	Purpose and Need	Alternatives for Detailed Study	Environmental Assessment	Final Decision Document
Public Meetings		Meeting 1 12/3/12	Meeting 2 11/12/14	Future Public Hearing Mid/Late 2017	Future Final Document Late 2017
Stakeholder Advisory Committee		Meeting 1 11/1/12	Meeting 2 10/1/14	Future Meeting 3 Mid/Late 2017	
Small Group Meetings		Various held upon request	Various held upon request	Future meetings as requested	Future meetings as requested
Agency Coordination	Letter 7/20/12	Meeting 1 8/22/12	Meeting 2 3/12/15	Future Meeting 3 Mid/Late 2017	Future Meeting 4 Late 2017
Website, Email, Phone	Continous				

4.3 SECTION Public Meetings and Public Hearing

4.3.1 Past Meetings

Two informal open-house public meetings were held to solicit input on the project. The first public meeting (December 3, 2012) focused on the project's purpose and need and scope of study. The second public meeting (November 12, 2014) focused on the alternatives recommended for detailed study. Both public meetings were held at the Method Community Park Pioneers Building. People could drop in anytime during the 4 to 7pm open house to review project materials (e.g. handouts, maps and displays), ask questions, and provide comments on the project. Spanish speaking team members were present at both open-house meetings.

The public meetings were advertised through a postcard mailing to communities adjacent to I-440 and to anyone who requested to be on the project mailing list. They were also advertised on the project website, the City of Raleigh website, and through ads and press releases sent to local English and Spanish newspapers and radio stations.

Public Meeting #1 - Start of Study and Purpose and Need

Attendees. Approximately 160 people signed in at the meeting.

Meeting Purpose. This meeting was held to seek early public input on the need for the project, opinion on whether to close the Melbourne Road partial interchange, and input on community resources and values in the project area.

Input Summary. Attendees overwhelmingly agreed that I-440 in the project area needs improvement.

The majority of the 84 commenters (62 percent) preferred to keep the Melbourne Road interchange open. Sixteen percent felt access was not important, with the remainder not offering an opinion. (This interchange is proposed to remain open as part of the project.)

The resources cited most frequently as important to consider were parks, lakes and streams, and noise/noise walls (around 30 percent each). Other concerns frequently cited included traffic congestion, right of way acquisition, and the need to redesign the Western Boulevard interchange.


Project need video shown at Public Meeting #1


Discussion around a map at Public Meeting #1


Discussion around a map at Public Meeting #1


Comment table at Public Meeting #1

Public Meeting #2 - Alternatives Recommended for Detailed Study

Attendees. Approximately 250 people signed in at the meeting.

Meeting Purpose. This meeting presented the initial project alternatives and sought public input on the alternatives NCDOT recommended for detailed study in the environmental assessment.

Input Summary. Based on a review of input received, the recommendations on which alternatives to study in detail in the environmental assessment did not change. The greatest number of comments received concerned the interchanges at Western Boulevard and Melbourne Road and the grade separation at Ligon Street.

At Western Boulevard, many commenters requested bicycle/pedestrian facilities, and these are planned to be included. One citizen suggested an alternative partial cloverleaf design (see **Chapter 2**). This was evaluated as described in **Chapter 2**, but was found not to be superior to the proposed double crossover diamond design.

At Melbourne Road, a petition signed by 129 people was submitted in support of keeping the partial interchange ramps. Some commenters wanted to keep the Deboy Street connection on the off ramp, but this does not meet current design standards and the connection will be severed as part of the project.

At Ligon Street, there were concerns that a two-lane bridge would generate increased traffic in the Method Neighborhood. As a result, a refined traffic forecast for this area was prepared, as discussed in detail in **Section 2.3.3**. This forecast and other evaluations show that the project and other planned transportation improvements in the area would help reduce traffic volumes through the heart of the neighborhood. Method Neighborhood residents also were concerned about impacts to residences and to Oak City Baptist Church. See **Section 3.1.2** for a discussion of relocations and right of way impacts.

4.3.2 Future Meetings

The third public meeting will be a Public Hearing to receive input on the Environmental Assessment (EA). A Public Hearing includes three segments: an open house segment, followed by a formal presentation by NCDOT, and then an opportunity for people to speak in front of attendees about the project. The presentation and comment segment of the Public Hearing are recorded.

The EA will be made available for review on the project website and in hard copy a minimum of 15 days before the Public Hearing (see **Section Note to Reader**). The public comment period will remain open for at least 30 days, unless NCDOT or FHWA determine, for good cause, that a different period is warranted. All comments received during the comment period will be considered before a final decision is made on which alternatives to implement. This decision will be announced in a final decision document, along with a summary of public comments and responses to comments. The final decision document will be posted on the project website.

Displays shown at Public Meeting #2

Full house at Public Meeting #2

4.4 SECTION Small Group Meetings

The project study team meets with local groups upon request to discuss the project, as listed below in **Table 4.2**. Input and actions based on this coordination are summarized after the table.

Table 4.2: Small Group Meetings

	2012 Quarters				2013 Quarters				2014 Quarters				2015 Quarters				2016 Quarters				2017 Quarters			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
A.B. Combs Elementary						5/14																		
Blue Ridge Corridor Alliance/ HSCSC												11/13		5/26 *							2/9			
Fairway Ridge Residents					3/20																	6/19		
Meredith College										6/18		11/5				11/12	2/1				2/10	5/16		
Method Rd Neighborhood									3/12		7/12					12/17								
NC Museum of Art																					3/10	5/23		
NCSU							8/6 *			5/30				5/26 *			3/23	4/12 *				6/1		
NCSU University Club							8/6 *							5/26 *	9/16			4/12 *				5/15		
Surtronics				12/12																				
West CAC			9/25													10/27					3/21			

HSCS = Hillsborough St Community Services Corp CAC= Citizens Advisory Council * Joint Meeting with multiple groups

AB Combs Elementary School PTA

AB Combs Elementary School is a magnet school located at 2001 Lorimer Road in Raleigh, in the Avent West neighborhood. The primary concern expressed by attendees was about retaining the Melbourne Road interchange. Because AB Combs is a magnet school, many families are from outside the immediate area and use the interchange to access the school. The proposed project will retain the Melbourne Road interchange.

Blue Ridge Corridor Alliance and Hillsborough Street Community Services Corporation (HSCSC)

The Blue Ridge Corridor Alliance (www.brcalliance.org) is a non-profit partnership between City of Raleigh, NCSU, property owners, businesses, and residents along an approximately three mile segment of Blue Ridge Road from Western Boulevard to Edwards Mill Road. The partnership promotes investment in the corridor and a mixed-use pedestrian friendly environment.

The HSCSC (www.hillboroughstreet.org) is a member of the Blue Ridge Corridor Alliance. It is a non-profit municipal service district in a three-mile segment of Hillsborough Street from I-440 to St. Mary's Street, similar to the Blue Ridge Road Alliance.

These groups generally prefer the bridge option at Ligon Street to provide more connectivity and pedestrian access in the area. Bridge options for the Ligon Street grade separation are Detailed Study Alternatives in this EA.

At the I-440 interchange with Hillsborough Street, the HSCSC is very supportive of maintaining the Hillsborough Street interchange. Of the Detailed Study Alternatives in this area, they did not prefer the Slight Detour option.

Fairway Ridge Road Residents

Fairway Ridge has 17 homes adjacent to the eastbound side of I-440 south of Western Boulevard in the Avent West neighborhood. The residents of this street asked for a small group meeting because they could not attend the December 2012 Public Meeting #1. The attendees were most concerned with understanding the right of way acquisition process, which was explained by NCDOT project team. They supported making improvements to the I-440 interchange at Western Boulevard and improving signing along I-440. The Western Boulevard interchange will be improved as part of the project and signing will be redone during the final design phase.

Meredith College

The main campus of Meredith College is located along the eastbound side of I-440 between Hillsborough Street and Wade Avenue. They also own a parcel north of Wade Avenue adjacent to I-440 that contains the President's house and maintenance facilities.

Meredith College representatives have expressed concern about right of way encroachment onto their property and impacts to their facilities and operations. During the alternative development process, they indicated a preference for the Slight Detour Alternative for the Wade Avenue and Hillsborough Street interchanges because this alternative had the least right of way encroachment based on the conceptual designs. To address their concerns, the Slight Detour option was retained as a Detailed Study Alternative and preliminary designs were developed, as discussed in this EA.

All of the Detailed Study Alternatives would impact the portion of Reedy Creek Greenway located on Meredith College property. The currently proposed option for mitigating this impact is to relocate the greenway along the new edge of the Meredith College/I-440 right of way. Another idea would be to relocate the greenway along the north and east sides of campus (Wade Avenue and Faircloth Street). Meredith College is supportive of this second concept.

Method Neighborhood

In addition to the small group meetings listed, Public Meeting #1 and Public Meeting #2 were both held in the Method Neighborhood at the Method Park Community Center Pioneers Building. The Method Neighborhood is shown in **Exhibit 4.1**. Several neighborhood residents and representatives of churches in the area attended these meetings and spoke with the project team.

The March 12, 2014 small group meeting was with the caretaker of the Oak Grove Cemetery and a member of the Method Civic League. The purpose of this meeting was to understand the history and relationship of the neighborhood and the cemetery. The attendees were concerned about impacts and access to the cemetery. All Detailed Study Alternatives retain access and avoid impacts to the cemetery.

The July 12, 2014 small group meeting was attended by approximately 37 neighborhood residents and property owners. Residents were supportive of retaining the Hillsborough Street interchange. They were concerned about impacts to Oak Grove Cemetery, Method Community Park, and residences.

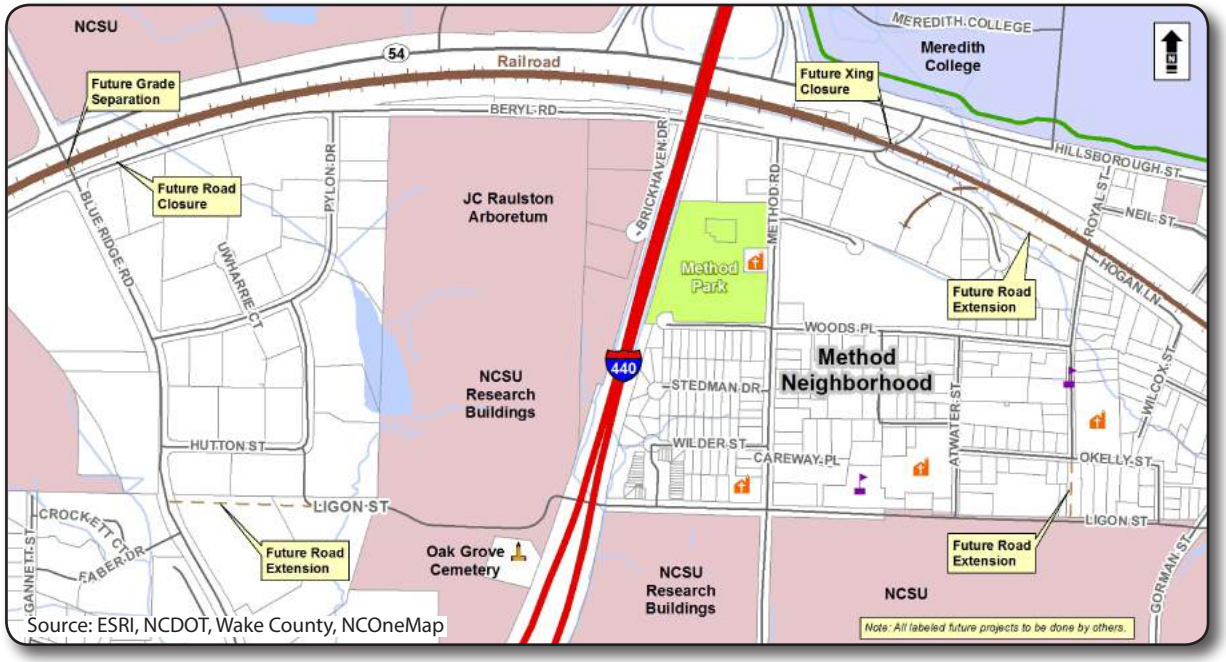
The proposed project will avoid direct impacts to the cemetery and park. A noise wall is preliminarily recommended as feasible and reasonable for the park and residences adjacent to I-440 in this area. There would be some impacts to the Method Townes town homes near the Ligon Street crossing of I-440 under the Bridge to North alternative, as discussed in **Section 3.1.2**.

Attendees also noted that there have been drainage issues at the end of Stedman Drive, and they did not want the project to worsen drainage issues. Drainage will be designed in accordance with NCDOT standards during the final design phase and is not expected to make any situation worse.

Additional discussions regarding the Ligon Street grade separation included concerns about retaining access to the Oak Grove Cemetery, increased traffic through the neighborhood if a two-lane bridge were constructed, and the appearance of the grade separation. Residents have said that Method Road and Woods Place in the neighborhood are often used as cut-through streets for travelers to/from Hillsborough Street. The concern for the I-440 widening project is that a two-lane Ligon

700 block of Method Road

Exhibit 4.1: Ligon Street /Method Neighborhood Area



Street bridge over I-440 would attract more traffic passing through the neighborhood, particularly on Method Road and Woods Place.

To explore these concerns, NCDOT prepared a small area traffic forecast for the Ligon Street/Method Road area (May 2015) to see how traffic volumes would change on these local streets if a two-lane bridge were constructed. The forecast also assumed that in the build condition, Ligon Street would be extended westward to connect directly with Blue Ridge Road, as planned for in the future by the City of Raleigh.

The traffic forecast was prepared for existing and future year 2035 for both the build condition (build the two-lane Ligon Street bridge and widen I-440) and the no-build condition (keep existing one-lane culvert only) to evaluate the potential traffic effects.

The new Ligon Street bridge and connection to Blue Ridge Road would change traffic patterns primarily along the boundaries of the Method Neighborhood rather than through the neighborhood, which is good news in relation to the neighborhood's concerns.

Along the southern neighborhood boundary, Ligon Street would experience increased traffic along its length from Blue Ridge Road to Gorman Street. From I-440 to Method Road, Ligon Street would carry about 1,700 vehicles per day without the project and 5,100 vehicles per day with the two-lane bridge. From Method Road to Gorman Street, Ligon Street would carry about 5,200 vehicles per day without the project and 8,100 vehicles per day with the two-lane bridge. All of these volumes are within the carrying capacity of a two-lane local road. As a comparison, Athens Drive over I-440 currently carries about 7,200 vehicles per day.

Traffic on Method Road through the neighborhood would be about the same with or without the project (about 9,300 to 9,500 vehicles per day in 2035) as any additional traffic that may be attracted to use Method Road as a cut-through is offset by traffic that would now stay on Ligon Street to/from Gorman Street as a more convenient route.

There are other transportation projects currently being planned in the area by the City of Raleigh and other agencies that were not accounted for in the traffic forecasts described above because they have not been fully funded or programmed. However, these improvements could provide additional reductions in traffic volumes through the Method Neighborhood when implemented.

The Raleigh-Cary Rail Crossing Study (March 2016) recommends closing the Beryl Road railroad crossing near Hillsborough Street, extending Beryl Road to Royal Street, and signalizing the Royal Road/Hillsborough Street intersection. The crossing study determined that these modifications to the street system "reduces travel time savings for cut-through traffic, therefore reducing traffic volumes through the neighborhood". As a related project, the City of Raleigh is recommending an extension of Royal Street one block south to Ligon Street, which would further draw traffic away from the heart of the neighborhood.

The City of Raleigh met with the Method Men's Group on February 17, 2016 at the Method Community Center to discuss the numerous transportation improvements planned in the Method Road area described above. The approximately 30 attendees expressed overall support for the planned transportation changes in their area.

Ligon Street one-lane tunnel under I-440

NC Museum of Art

The NC Museum of Art (NCMA) is located in the northwest quadrant of the I-440/Wade Avenue interchange. The Museum Park portion of NCMA abuts the I-440 and Wade Avenue rights of way. The Reedy Creek greenway goes through the Museum Park and over I-440 on a signature pedestrian bridge. The Museum Park trails run through Museum Park and connect to the Reedy Creek greenway.

The NCMA staff stated they had general concerns about drainage, erosion, and sedimentation from any construction activities along I-440 and Wade Avenue next to their site. They were also concerned about vegetation removal for the new right of way along westbound I-440.

NCMA staff noted that there are erosion problems and degraded streams within the Museum Park area, particularly House Creek, which runs under Wade Avenue just west of I-440 and would require the additional permanent drainage easement under the Two Flyovers Alternative. NCMA is conducting a study of streams on their property and are using funds from a grant from Duke Energy. NCMA is looking for other partners for this effort.

NC State University (NCSU)

NCSU School of Veterinary Medicine is located along the westbound side of I-440 between Hillsborough Street and Wade Avenue. Other NCSU property along the westbound side of I-440 includes buildings, research facilities, and the JC Raulston Arboretum south of Beryl Road. Research buildings are also located west of I-440 on the south side of Ligon Street.

NCSU property is owned by the State of North Carolina. Right of way acquisition and relocation will be complex due to the land ownership and the uses in the NCSU facilities. NCDOT understands this complexity and will continue to work with the University Club, NCSU, and the NC Department of Administration throughout the project planning and implementation processes.

Regarding alternatives, NCSU staff supports a two-lane bridge for the Ligon Street grade separation to enhance pedestrian, bicycle, and transit connectivity between their campus facilities. Of the Detailed Study Alternatives for the Hillsborough Street and Wade Avenue interchange area, NCSU staff least preferred the Slight Detour option.

NCSU staff also expressed concerns about other issues, including:

- Lighting near the horticultural research facilities. Lighting design will be addressed during the final design phase.
- Access to the JC Raulston Arboretum needs to be maintained during construction. Access is anticipated to be maintained to the arboretum.
- Traffic noise impacts. A traffic noise assessment was prepared as part of this EA, as summarized in **Section 3.6**.
- Pedestrian/bicycle accommodation should be provided along Western Boulevard. The preliminary design of the Western Boulevard interchange provides accommodation.

NC State University Club

The NC State University Club is a separate entity from NCSU. The University Club is located on NCSU property near the westbound I-440 right of way boundary between Hillsborough Street and Wade Avenue. They have a clubhouse, golfing, tennis, and a pool. The NCSU Foundation operates the club and leases the land where the club is located from NCSU. In addition, NCSU Athletics Department subleases land from the University Club for a golf practice facility located near the southwest quadrant of the I-440/ Wade Avenue interchange.

All of the Detailed Study Alternatives would unavoidably encroach upon and impact the University Club land and facilities (see **Section 3.1.2**). NCDOT understands that the right of way acquisition process is complex and will continue to work with the University Club, NCSU, and the NC Department of Administration throughout the project planning and implementation process.

Surtronics

Surtronics, located at 4001 Beryl Road in Raleigh, is an electroplating and anodizing business that has been at their location since approximately 1966. The eastbound I-440 right of way line is along a deliveries driveway. The company was concerned about having to be relocated for the project since they have a unique service line that could be challenging for finding a new site. The Surtronics property is not anticipated to require relocation for the project.

West Citizens Advisory Council (CAC)

The West CAC is a City of Raleigh sponsored group representing the neighborhoods on both side of I-440 in the vicinity of the I-440/Melbourne Road interchange. Raleigh has nineteen CACs representing different areas of the City that serve as non-partisan advisory boards to the City Council.

There were approximately 55 attendees at the 2012 meeting, 50 attendees at the 2015 meeting, and 25 attendees at the 2017 meeting. Primary areas of concern expressed during the meetings included:

- Retain or close the Melbourne Road interchange. Input from these meetings and the public meetings indicated majority (approximately 67%) support for retaining the Melbourne Road interchange. This interchange is included in the project.
- Deboy Street connection to the Melbourne Road interchange off ramp. There were some residents who wanted this connection to remain. However, this connection does not conform to current interchange design standards and is not included in the proposed project.
- Traffic noise impacts. A traffic noise assessment was prepared as part of this EA, as summarized in **Section 3.6**.
- Improvements to neighborhood streets. Some attendees wanted traffic calming measures, stop signs, and other improvements made to neighborhood streets. These would be separate City of Raleigh projects.
- Bicycle and pedestrian accommodations desired on the Athens Drive bridge and the Melbourne Road bridge over I-440. These accommodations will be provided, in coordination with the City of Raleigh.
- Impacts to property and relocations. Right of way and relocation issues are discussed in **Section 3.1.2**.
- Impacts to Lake Johnson Park. There will be a minor easement encroachment on Lake Johnson Park at the Jones Franklin Road interchange area to accommodate upgraded drainage structures. See **Section 3.10.3**.

4.5 SECTION Stakeholder Advisory Committee

The Stakeholder Advisory Committee, formed at the beginning of the planning study, is comprised of study-area groups. Members offer advice and local knowledge valuable in developing and evaluating project alternatives.

Committee members include representatives from:

- Cary, Town of (Engineering)
- Dilweg Companies (business park owner)
- Hillsborough Street Community Service Corporation
- NC Museum of Art
- NC State University (NCSU)
- NC State University Club
- NC Railroad
- Meredith College
- Raleigh, City of (Parks and Recreation, Stormwater, Transportation, Urban Design Center)
- Raleigh Historic Development Commission
- NC State Fairgrounds
- West Citizens Advisory Committee
- Capital Area Metropolitan Planning Organization (CAMPO) (added after second meeting)
- Oak City Baptist Church (added after second meeting)

Invited but chose to coordinate separately:

- Method Civic League
- JC Raulston Arboretum

Stakeholder Advisory Committee Meeting #1 - Start of Study and Purpose and Need

The committee agreed that improvements were needed along I-440 in the project area. Topics discussed at the meeting included:

- Landscaping should be included in the project and noise barrier appearance should be enhanced since this area is a gateway to Raleigh.
- Bicycle and pedestrian access across I-440 is important.
- Potential impacts to Lake Johnson Park and Walnut Creek are of concern.
- Maintaining traffic along I-440 during construction is essential and will be challenging.
- Oak Grove Cemetery is very important to the Method Neighborhood.
- There is a high level of interest regarding widening Ligon Street to two lanes across I-440.

Stakeholder Advisory Committee Meeting #2 - Alternatives Recommended for Detailed Study

The committee discussed the project alternatives and evaluation results and agreed with the alternatives recommended to be studied in detail in the environmental assessment.

Committee members stated that noise walls, lighting, and planters in the I-440 median should be evaluated.

For the Athens Drive grade separation, attendees recommended revising the proposed temporary detour route to use Powell Drive since it has a traffic signal at Western Boulevard. This recommendation was incorporated into the alternative.

4.6 SECTION Agency Coordination

Many federal, state, and local agencies have jurisdiction in the project area due to their geographic boundaries and/or regulatory responsibilities. Regular coordination and information sharing with these agencies in an agency coordination team helps with impact evaluation and applying for and receiving permits.

Coordination began at the start of the planning process by sending a letter to local, state, and federal agencies (called a scoping letter) asking for input on project concerns and for information on resources present in the project area. Responses assisted with defining the project and the scope of the environmental issues to be addressed.

Issues raised during this scoping process included potential impacts to: surrounding neighborhoods, streams with impaired water quality (Walnut Creek, Lake Johnson) and other streams, floodplains and floodways, structures of historical or architectural importance, greenways, and White Oak Lake dam. Agencies also noted there were issues such as archaeological resources, wildlife, and endangered species that were of less concern in this urbanized area. Consideration of the following was also requested: bicycle and pedestrian facilities on cross-streets, landscape planters in the I-440 median, noise walls, lighting, and interchange improvements.

The agency coordination team met on August 22, 2012 and concurred on the project's purpose and need. On March 12, 2015, the team met and concurred on the alternatives recommended for detailed study. The concurrence forms are included in **Appendix D1**. The team will meet several more times to discuss the EA, the selection of the preferred alternative, and permitting issues.

The agency coordination team includes members from the following agencies:

- Federal Highway Administration (FHWA)
  Lead federal agency for the project and responsible for the Environmental Assessment. Has jurisdiction over interstate facilities and is providing funding for the project
- US Army Corps of Engineers (USACE)
  Issues permits for impacts to wetlands, streams, and other water resources in accordance with the Clean Water Act
- US Environmental Protection Agency (EPA)
  Has jurisdiction under the National Environmental Policy Act (NEPA), the Clean Air Act, and other laws
- US Fish and Wildlife Service
  Has jurisdiction if there are any plant or animal species present that are listed as Endangered or Threatened under the Endangered Species Act or subject to the Migratory Bird Treaty Act
- NC Division of Water Resources
  Issues permits for impacts to wetlands, streams, and other water resources in accordance with the Clean Water Act and several state laws
- NC Wildlife Resources Commission
  Charged by the State with conserving and sustaining the state's fish and wildlife resources and responsible for regulating wildlife-associated recreation
- NC Historic Preservation Office (NCHPO)
  Has jurisdiction over resources on or eligible for listing on the National Register of Historic Places under the National Historic Preservation Act
- Capital Area Metropolitan Planning Organization (CAMPO)
  Sets transportation project and funding priorities for the region

FOR MORE DETAILS ON THE INFORMATION IN THIS CHAPTER:

The following documents as well as summaries from the small group meetings listed in **Section 4.4** are available upon request by contacting Beverly Robinson at NCDOT at brobinson@ncdot.gov.

Public Meetings

- ***Summary - Citizens Informational Workshop #1*** *held December 3, 2012 for I-440 Improvement Project (U-2719)*
  (February 13, 2013, Atkins)
- ***Summary - Public Meeting #2*** *held November 12, 2014 for I-440 Improvement Project (U-2719)*
  (December 12, 2014, Atkins)

Stakeholder Advisory Committee Meetings

- ***Minutes - Stakeholder Advisory Committee Meeting #1***
  held November 14, 2012
- ***Minutes - Stakeholder Advisory Committee Meeting #2***
  held October 30, 2014

Coordination with Environmental Resource and Regulatory Agencies

(Note: Concurrence forms are included in **Appendix D1**)

- ***Summary of Comments Received During the Project Scoping Process***
  (Atkins, October 5, 2012)
- ***Minutes - Agency Coordination Meeting #1 - Scoping and Purpose and Need (Concurrence Point 1)***
  held August 22, 2012
- ***Minutes - Agency Coordination Meeting #2 - Detailed Study Alternatives (Concurrence Point 2)***
  held March 12, 2015

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APPENDICES

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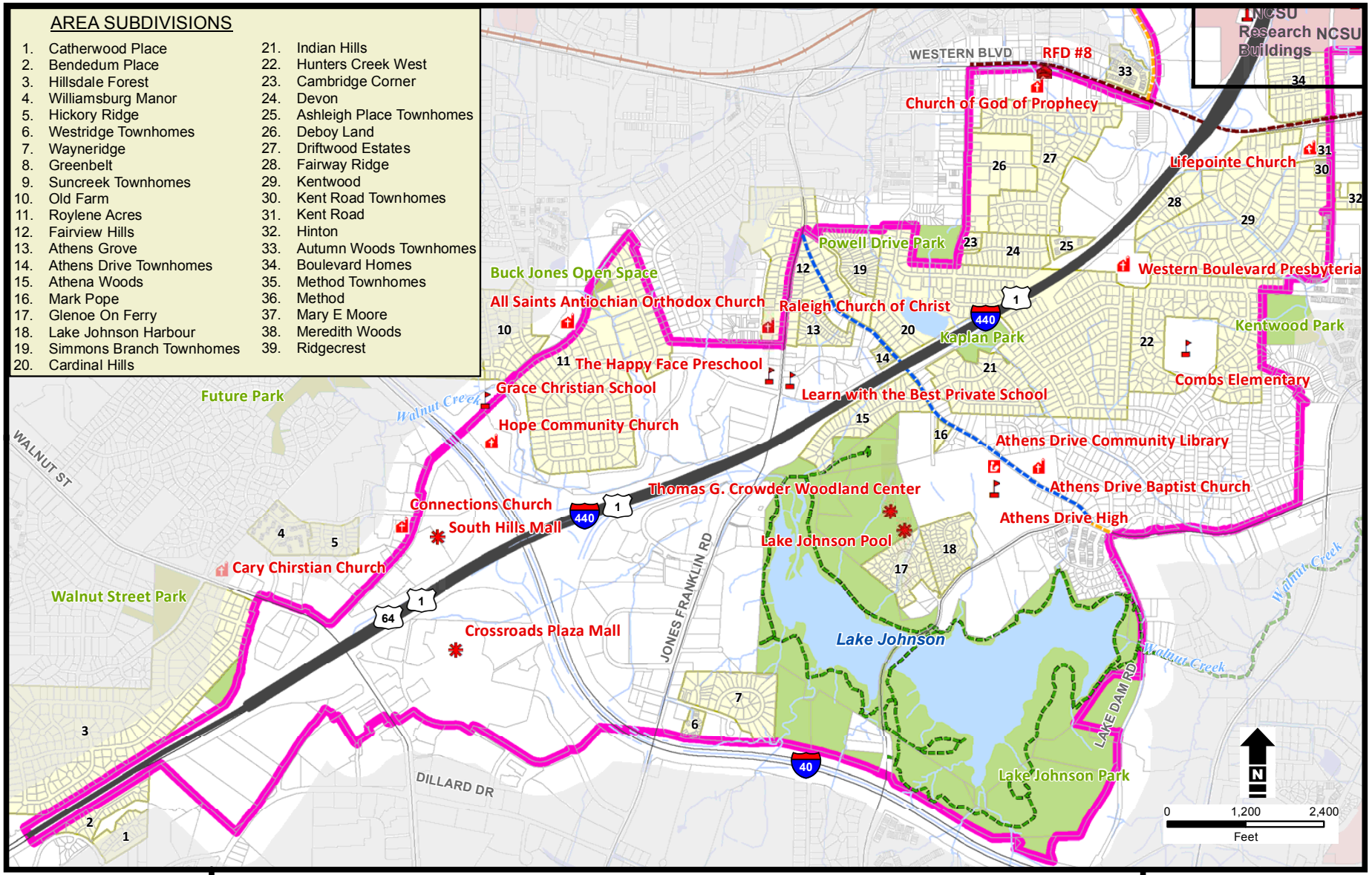
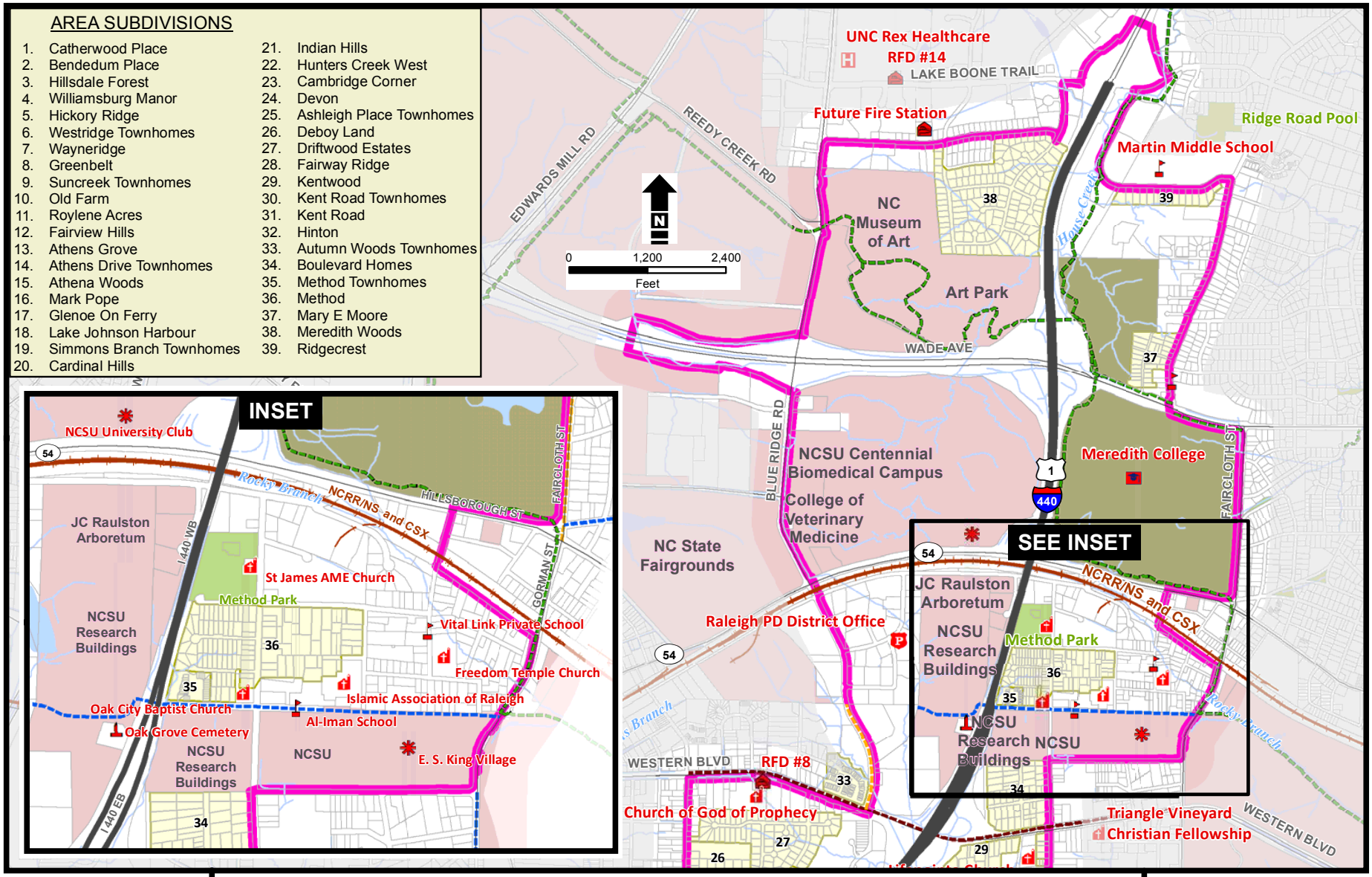
A

APPENDIX

NOTABLE FEATURES MAP


AREA SUBDIVISIONS
1. Catherwood Place
2. Bendedum Place
3. Hillsdale Forest
4. Williamsburg Manor
5. Hickory Ridge
6. Westridge Townhomes
7. Wayneridge
8. Greenbelt
9. Suncreek Townhomes
10. Old Farm
11. Roylene Acres
12. Fairview Hills
13. Athens Grove
14. Athens Drive Townhomes
15. Athena Woods
16. Mark Pope
17. Glenoe On Ferry
18. Lake Johnson Harbour
19. Simmons Branch Townhomes
20. Cardinal Hills
21. Indian Hills
22. Hunters Creek West
23. Cambridge Corner
24. Devon
25. Ashleigh Place Townhomes
26. Deboy Land
27. Driftwood Estates
28. Fairway Ridge
29. Kentwood
30. Kent Road Townhomes
31. Kent Road
32. Hinton
33. Autumn Woods Townhomes
34. Boulevard Homes
35. Method Townhomes
36. Method
37. Mary E Moore
38. Meredith Woods
39. Ridgecrest
NCSU Research NCSU Buildings
WESTERN BLVD
RFD #8
Church of God of Prophecy
Lifepointe Church
Powell Drive Park
Buck Jones Open Space
All Saints Antiochian Orthodox Church
Raleigh Church of Christ
Western Boulevard Presbyteria
Kaplan Park
Kentwood Park
The Happy Face Preschool
Grace Christian School
Learn with the Best Private School
Combs Elementary
Future Park
Walnut Creek
Hope Community Church
Athens Drive Community Library
WALNUT ST
Thomas G. Crowder Woodland Center
Athens Drive Baptist Church
Connections Church
South Hills Mall
Athens Drive High
Lake Johnson Pool
Cary Chirstian Church
JONES FRANKLIN RD
Walnut Street Park
Crossroads Plaza Mall
Lake Johnson
LAKE DAM RD
DILLARD DR
Lake Johnson Park
N
0
1,200
2,400
Feet
I-440 IMPROVEMENTS
STIP PROJECT NO. U-2719
Wake County, North Carolina
LEGEND
Study Limits
DCIA Boundary
Notable Features
Cemeteries
Colleges/Universities
Church
Fire Station
Police Station
Hospital
Schools
Libraries
Railroads
Rivers & Streams
Bike Lanes
Sharrows
Side Path
Greenways
Parcels
Parks and Open Space
State Owned Land
Subdivisions
Private University Land
Source: ESRI, NCDOT, Wake County, NCOneMap.
NOTABLE FEATURES
Figure A1a


AREA SUBDIVISIONS
1. Catherwood Place
2. Bendedum Place
3. Hillsdale Forest
4. Williamsburg Manor
5. Hickory Ridge
6. Westridge Townhomes
7. Wayneridge
8. Greenbelt
9. Suncreek Townhomes
10. Old Farm
11. Roylene Acres
12. Fairview Hills
13. Athens Grove
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15. Athena Woods
16. Mark Pope
17. Glenoe On Ferry
18. Lake Johnson Harbour
19. Simmons Branch Townhomes
20. Cardinal Hills
21. Indian Hills
22. Hunters Creek West
23. Cambridge Corner
24. Devon
25. Ashleigh Place Townhomes
26. Deboy Land
27. Driftwood Estates
28. Fairway Ridge
29. Kentwood
30. Kent Road Townhomes
31. Kent Road
32. Hinton
33. Autumn Woods Townhomes
34. Boulevard Homes
35. Method Townhomes
36. Method
37. Mary E Moore
38. Meredith Woods
39. Ridgecrest
INSET
SEE INSET
UNC Rex Healthcare
RFD #14
LAKE BOONE TRAIL
Future Fire Station
Ridge Road Pool
Martin Middle School
EDWARDS MILL RD
REEDY CREEK RD
NC Museum of Art
Art Park
WADE AVE
BLUE RIDGE RD
NCSU Centennial Biomedical Campus
College of Veterinary Medicine
NC State Fairgrounds
Meredith College
FAIRCLOTH ST
HILLSBOROUGH ST
GORMAN ST
NCSU University Club
JC Raulston Arboretum
I-440 WB
I-440 EB
NCRR/NS and CSX
Rocky Branch
St James AME Church
Method Park
NCSU Research Buildings
Vital Link Private School
Freedom Temple Church
Islamic Association of Raleigh
Al-Iman School
Oak City Baptist Church
Oak Grove Cemetery
NCSU
E. S. King Village
Raleigh PD District Office
WESTERN BLVD
RFD #8
Church of God of Prophecy
Triangle Vineyard Christian Fellowship
0
1,200
2,400
Feet
I-440 IMPROVEMENTS
STIP PROJECT NO. U-2719
Wake County, North Carolina
LEGEND
Study Limits
DCIA Boundary
Notable Features
Cemeteries
Colleges/Universities
Church
Fire Station
Police Station
Hospital
Schools
Libraries
Railroads
Rivers & Streams
Bike Lanes
Sharrows
Side Path
Greenways
Parcels
Parks and Open Space
State Owned Land
Subdivisions
Private University Land
Source: ESRI, NCDOT, Wake County, NCOneMap.
NOTABLE FEATURES
Figure A1b

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APPENDIX B

PRELIMINARY DESIGNS OF THE DETAILED STUDY ALTERNATIVES

B.1. Design Criteria and Typical Sections

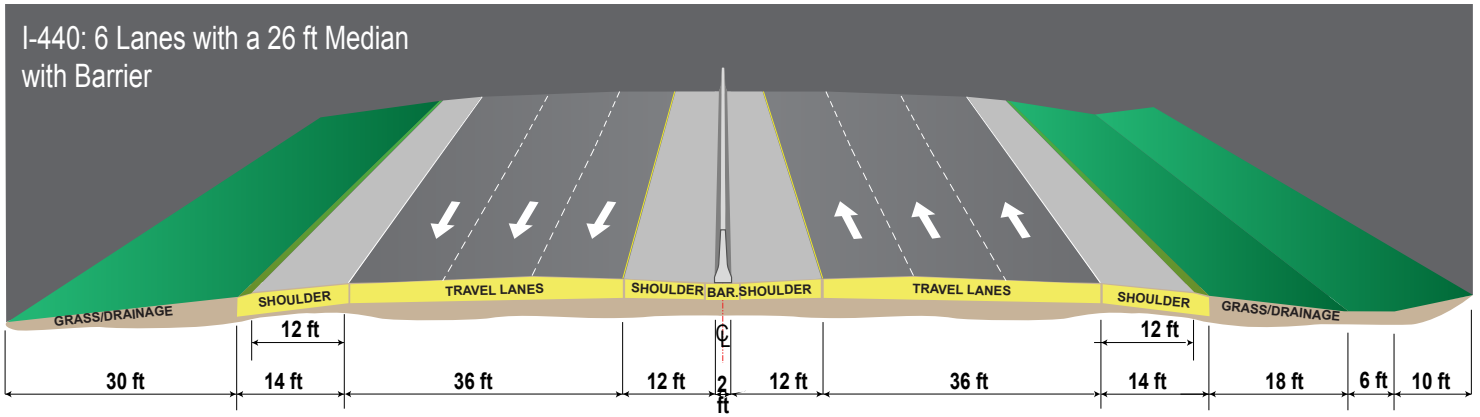
Table B1: Basic Design Criteria[1] for I-440 and Cross Streets

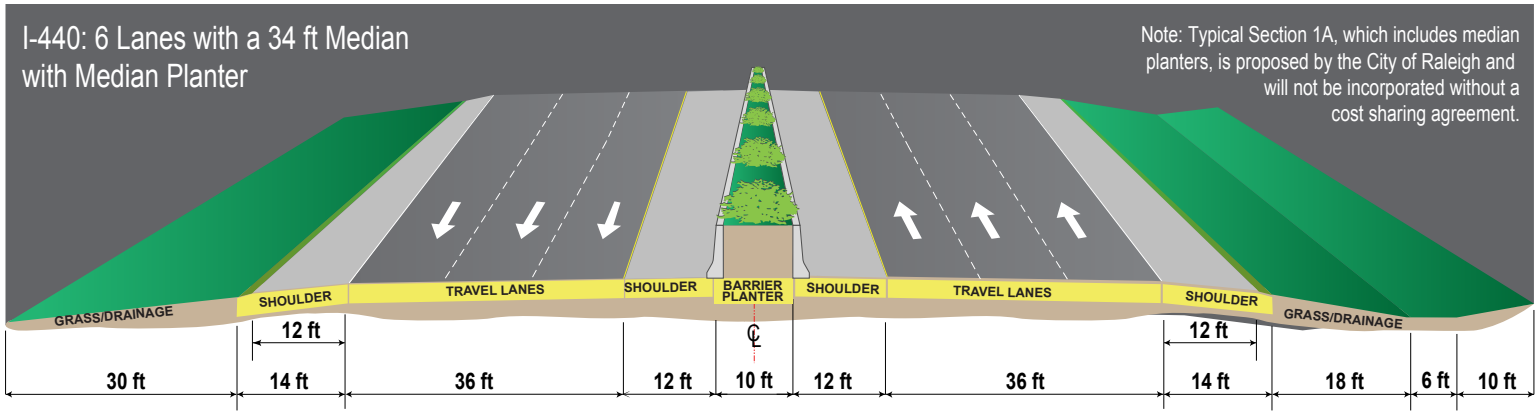
Roadway	I-440	Jones Franklin Rd	Ft Sumter Rd	Denise Dr Extension	Athens Dr	Melbourne Rd
Classification	Interstate	Major Collector	Local	Local	Major Collector	Local
Design Speed (mph)	70	50	40	40	40	40
Max Posted Speed (mph)[2]	65	45	35	35	35	35
Proposed Right of Way Width (ft)	Varies	95	70	70	70	70
Control of Access	Full control	Partial control[3]	None	None	None	None[3]
Rumble Strips (Y/N)	Yes	No	No	No	No	No
Typical Section Type	6-lane divided	4-lane curb & gutter	2-lane curb & gutter	2-lane curb & gutter	2-lane curb & gutter	2-lane curb & gutter
Lane Widths (ft)	12	12	12	12	11	11
Median Width (ft)	26	23	N/A	N/A	N/A	N/A
Sidewalks or Multi-Use Paths	No	Yes	Yes	Yes	Yes	Yes
Bicycle Lanes (Y/N)	No	Yes	No	No	Yes	Yes

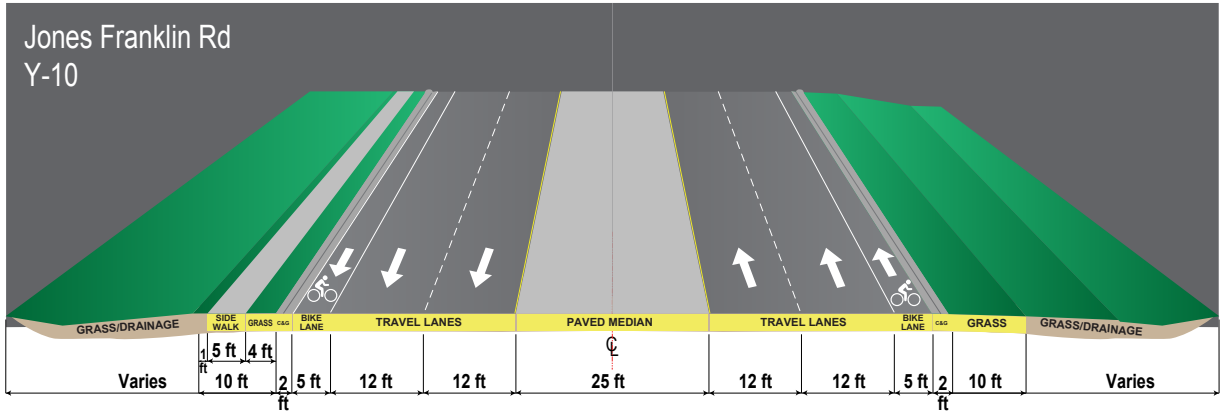
Roadway	Western Blvd	Ligon St	Hillsborough St	Wade Ave[4]	Lake Boone Trl
Classification	Major Arterial	Local	Minor Arterial	Major Arterial	Major Collector
Design Speed (mph)	50	40	50	50	50
Posted Speed (mph)	45	35	45	45	45
Proposed Right of Way Width (ft)	Varies	Varies	Varies	Varies	Varies
Control of Access	None[3]	None[3]	None[3]	Full control	None[3]
Rumble Strips (Y/N)	No	No	No	Yes	No
Typical Section Type	6-lane curb & gutter	2-lane curb & gutter	4-lane curb & gutter	4-lanes with shoulder	4-lane curb & gutter
Lane Widths (ft)	12	12	12	12	12
Median Width (ft)	Varies	N/A	12-ft raised	Varies	N/A
Sidewalks or Multi-Use Paths	Yes	Yes	Yes	No	Yes
Bicycle Lanes (Y/N)	No	No	No	No	No

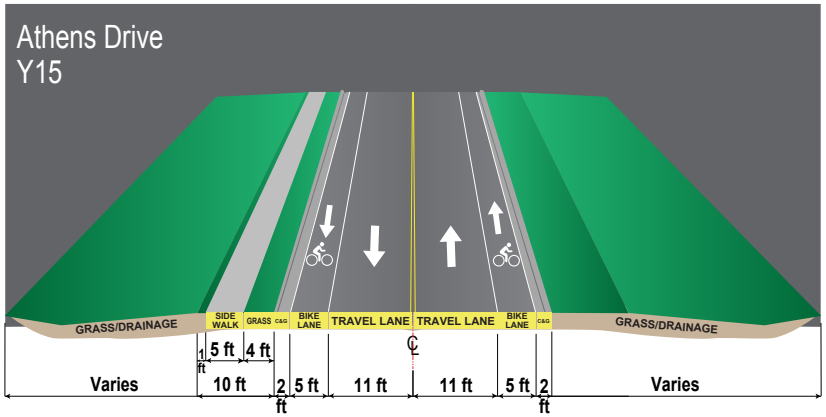
Notes:

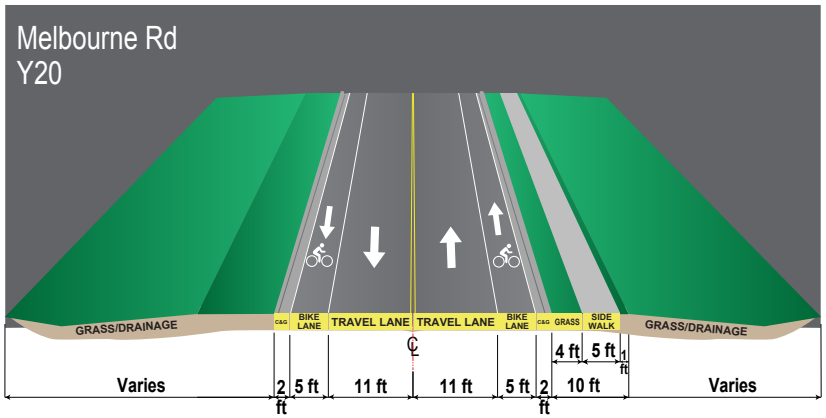
1. Design values were obtained from "The 2011 AASHTO A Policy on Geometric Design of Highways and Streets" (GB), the 2012 NCDOT Roadway Design Manual (RDM), and 2012 NCDOT Standard Drawings (STD).
2. Posted speed listed is the maximum posted speed. Actual posted speed limits may be set lower based upon coordination between NCDOT and the local municipality.
3. In all interchange areas, there will be control of access through the interchange.
4. This is the section of Wade Avenue from Ridge Road, under I-440, to the first set of Blue Ridge Road ramps.

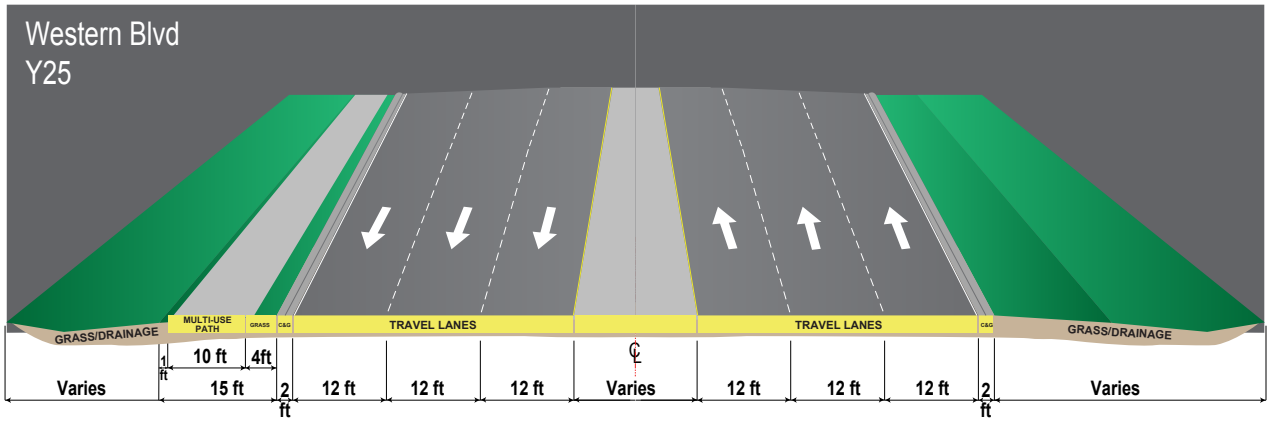

I-440: 6 Lanes with a 26 ft Median
with Barrier
GRASS/DRAINAGE
SHOULDER
TRAVEL LANES
SHOULDER
BAR
SHOULDER
TRAVEL LANES
SHOULDER
GRASS/DRAINAGE
12 ft
12 ft
30 ft
14 ft
36 ft
12 ft
2 ft
12 ft
36 ft
14 ft
18 ft
6 ft
10 ft

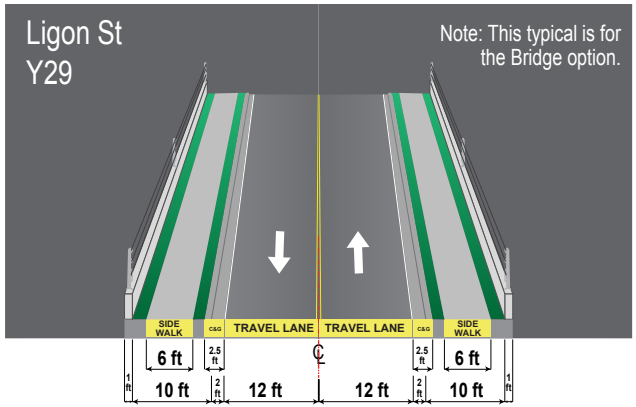

I-440: 6 Lanes with a 34 ft Median
with Median Planter
Note: Typical Section 1A, which includes median planters, is proposed by the City of Raleigh and will not be incorporated without a cost sharing agreement.
GRASS/DRAINAGE
SHOULDER
TRAVEL LANES
SHOULDER
BARRIER PLANTER
SHOULDER
TRAVEL LANES
SHOULDER
GRASS/DRAINAGE
12 ft
12 ft
30 ft
14 ft
36 ft
12 ft
10 ft
12 ft
36 ft
14 ft
18 ft
6 ft
10 ft

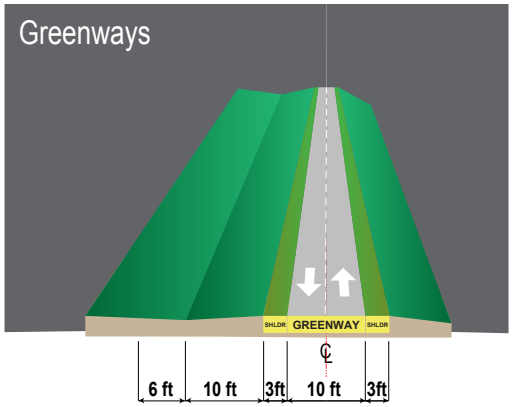

Jones Franklin Rd
Y-10
GRASS/DRAINAGE
SIDE WALK
GRASS
C&G
BIKE LANE
TRAVEL LANES
PAVED MEDIAN
TRAVEL LANES
BIKE LANE
C&G
GRASS
GRASS/DRAINAGE
1 ft
5 ft
4 ft
Varies
10 ft
2 ft
5 ft
12 ft
12 ft
25 ft
12 ft
12 ft
5 ft
2 ft
10 ft
Varies

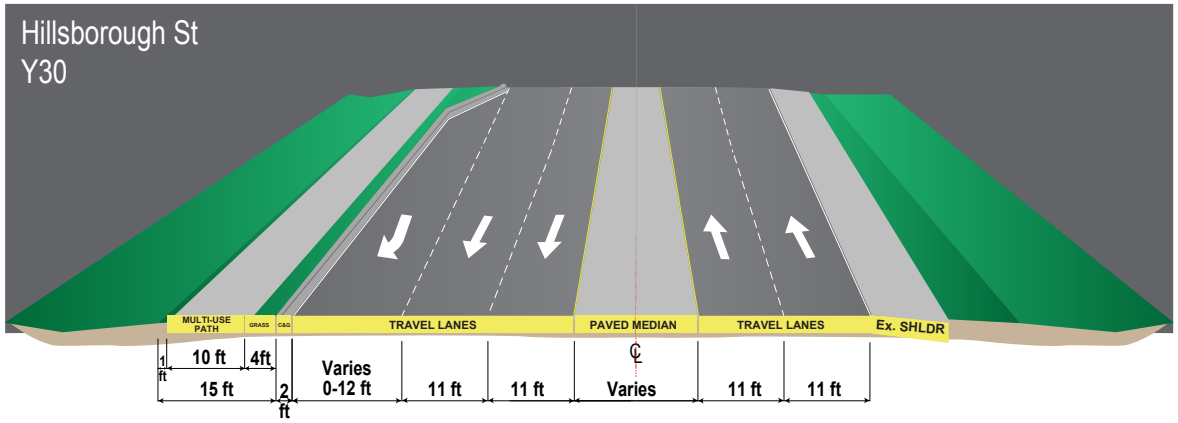

Athens Drive
Y15
GRASS/DRAINAGE
SIDE WALK
GRASS
C&G
BIKE LANE
TRAVEL LANE
TRAVEL LANE
BIKE LANE
C&G
GRASS/DRAINAGE
1 ft
5 ft
4 ft
Varies
10 ft
2 ft
5 ft
11 ft
11 ft
5 ft
2 ft
Varies

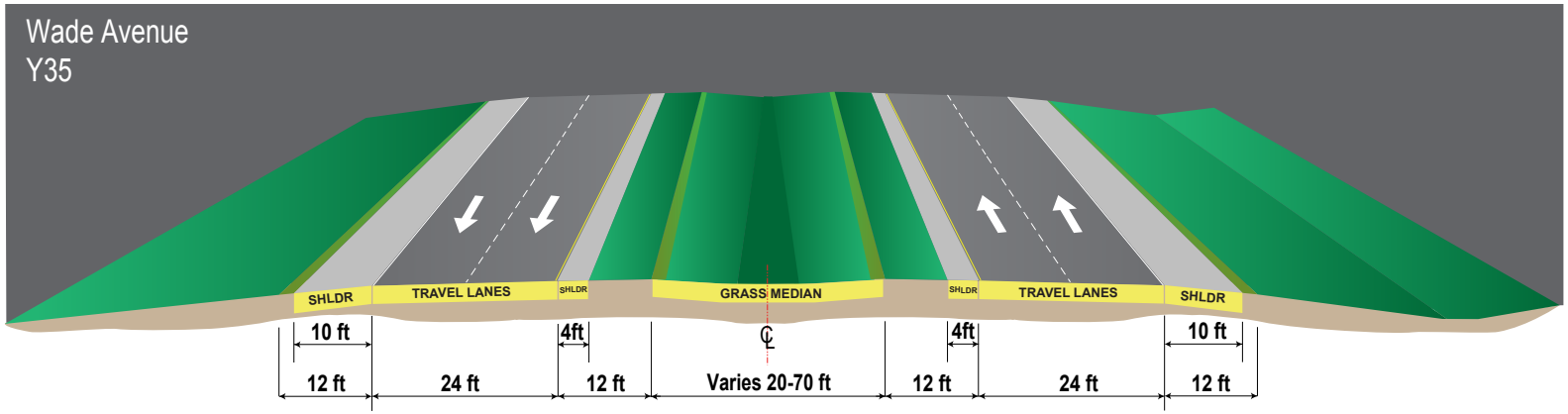

Melbourne Rd
Y20
GRASS/DRAINAGE
C&G
BIKE LANE
TRAVEL LANE
TRAVEL LANE
BIKE LANE
C&G
GRASS
SIDE WALK
GRASS/DRAINAGE
4 ft
5 ft
1 ft
Varies
2 ft
5 ft
11 ft
11 ft
5 ft
2 ft
10 ft
Varies


Western Blvd
Y25
GRASS/DRAINAGE
MULTI-USE PATH
GRASS
C&G
TRAVEL LANES
TRAVEL LANES
C&G
GRASS/DRAINAGE
1 ft
10 ft
4ft
Varies
15 ft
2 ft
12 ft
12 ft
12 ft
Varies
12 ft
12 ft
12 ft
2 ft
Varies


Ligon St
Y29
Note: This typical is for the Bridge option.
SIDE WALK
C&G
TRAVEL LANE
TRAVEL LANE
C&G
SIDE WALK
6 ft
2.5 ft
2.5 ft
6 ft
1 ft
10 ft
2 ft
12 ft
12 ft
2 ft
10 ft
1 ft


Greenways
SHLDR
GREENWAY
SHLDR
6 ft
10 ft
3ft
10 ft
3ft


Hillsborough St
Y30
MULTI-USE PATH
GRASS
C&G
TRAVEL LANES
PAVED MEDIAN
TRAVEL LANES
Ex. SHLDR
1 ft
10 ft
4ft
15 ft
2 ft
Varies 0-12 ft
11 ft
11 ft
Varies
11 ft
11 ft


Wade Avenue
Y35
SHLDR
TRAVEL LANES
SHLDR
GRASS MEDIAN
SHLDR
TRAVEL LANES
SHLDR
10 ft
12 ft
24 ft
4ft
12 ft
Varies 20-70 ft
4ft
12 ft
24 ft
10 ft
12 ft

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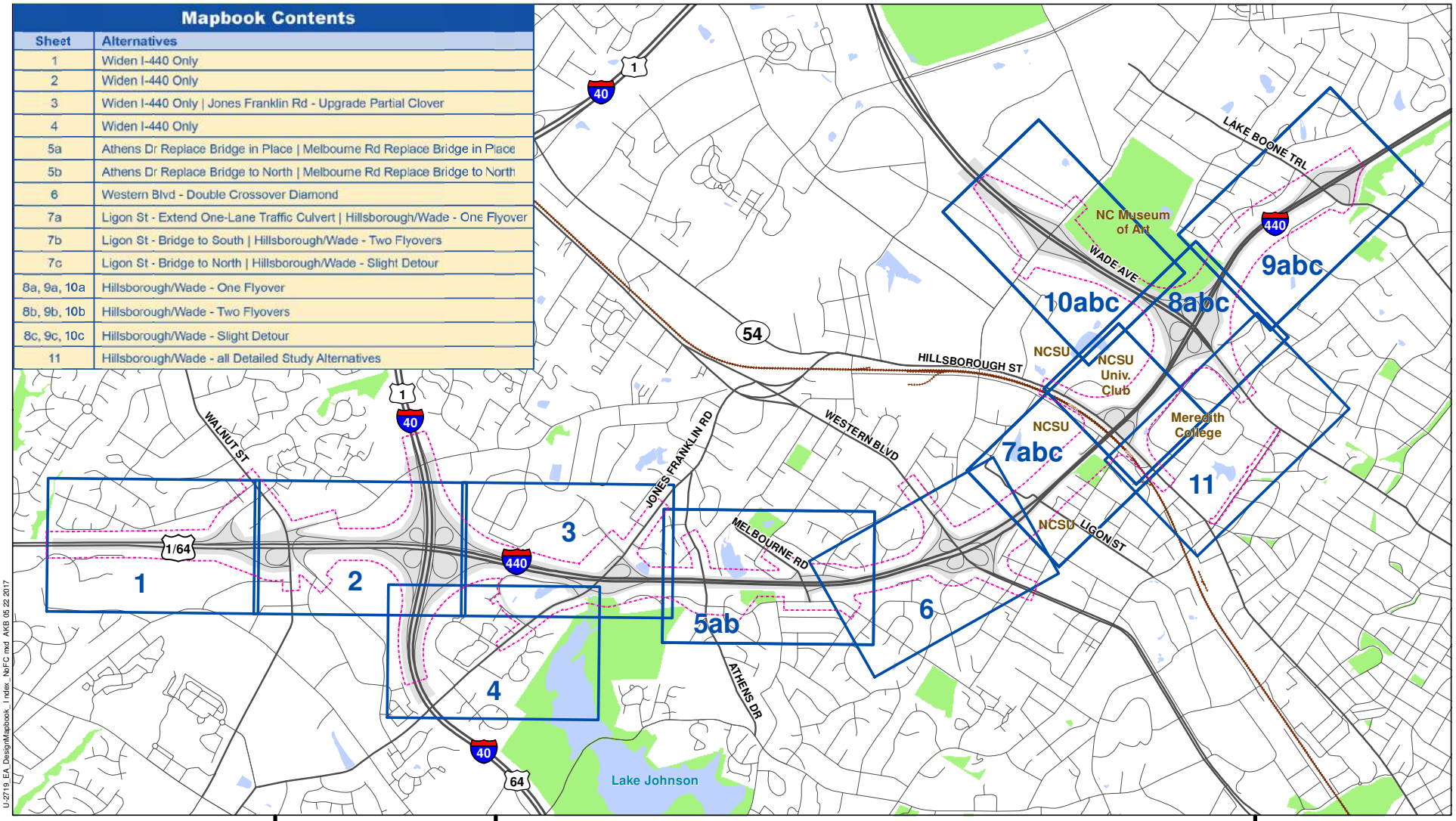
B APPENDIX

PRELIMINARY DESIGNS OF THE DETAILED STUDY ALTERNATIVES

B.2. Design Mapbook

Mapbook Contents	
Sheet	Alternatives
1	Widen I-440 Only
2	Widen I-440 Only
3	Widen I-440 Only | Jones Franklin Rd - Upgrade Partial Clover
4	Widen I-440 Only
5a	Athens Dr Replace Bridge in Place | Melbourne Rd Replace Bridge in Place
5b	Athens Dr Replace Bridge to North | Melbourne Rd Replace Bridge to North
6	Western Blvd - Double Crossover Diamond
7a	Ligon St - Extend One-Lane Traffic Culvert | Hillsborough/Wade - One Flyover
7b	Ligon St - Bridge to South | Hillsborough/Wade - Two Flyovers
7c	Ligon St - Bridge to North | Hillsborough/Wade - Slight Detour
8a, 9a, 10a	Hillsborough/Wade - One Flyover
8b, 9b, 10b	Hillsborough/Wade - Two Flyovers
8c, 9c, 10c	Hillsborough/Wade - Slight Detour
11	Hillsborough/Wade - all Detailed Study Alternatives



U-2719_EA_DesignMapbook_Index_NoFC.mxd AKB 05.22.2017

I-440 IMPROVEMENTS

STIP PROJECT NO. U-2719

Wake County, North Carolina

0 1,050 2,100 Feet

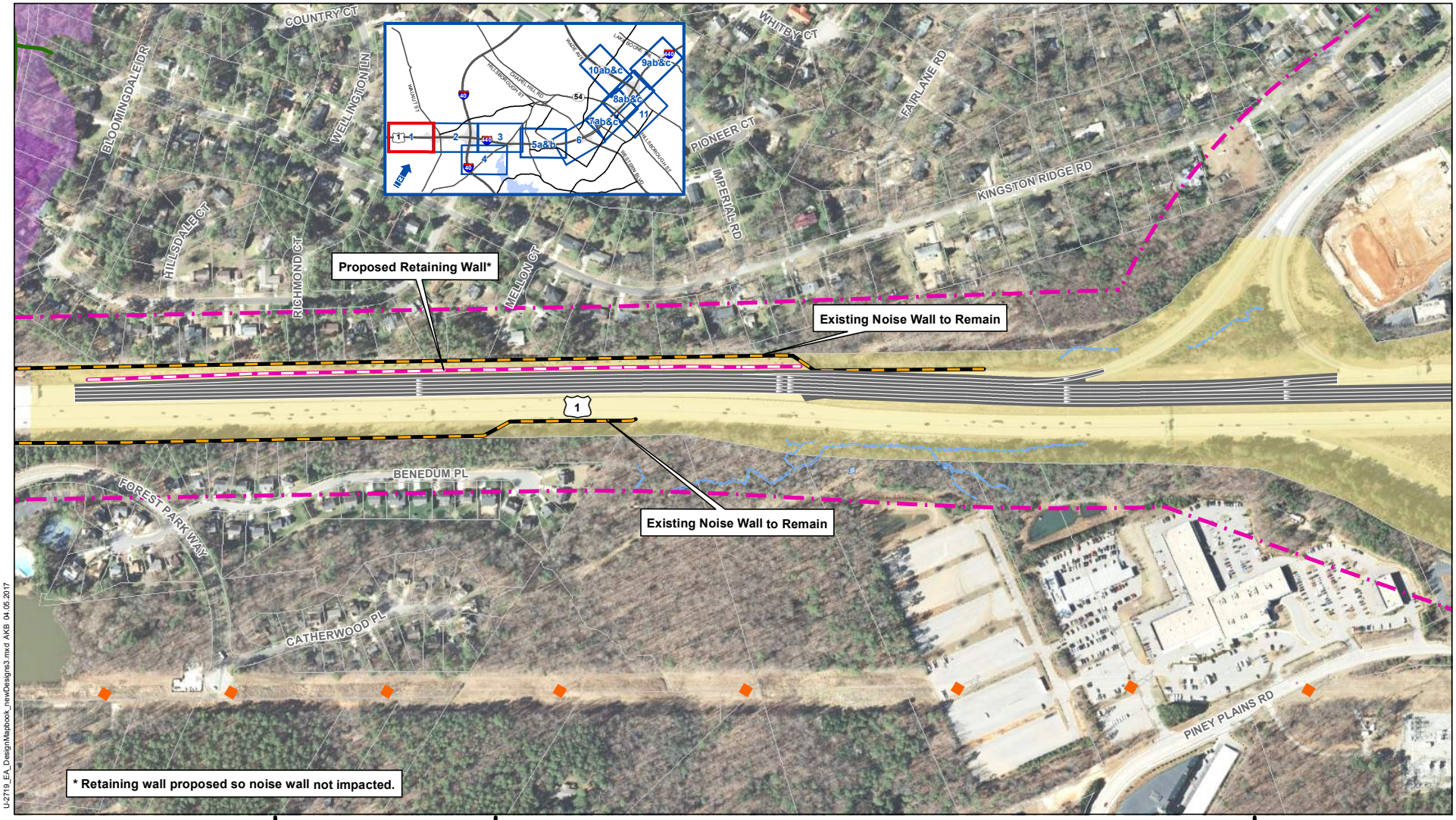
Source: Wake County, NCDOT, ESRI, NCONEMAP NC Statewide Orthoimagery

Legend

- Study Area Boundary
- Existing Right of Way
- Streets
- Railroads
- Water
- Parks

DETAILED STUDY ALTERNATIVES PRELIMINARY DESIGN

MAPBOOK INDEX



U-2719_EA_DesignMapbook_newDesigns3.mxd AKB 04.05.2017

I-440 IMPROVEMENTS

STIP PROJECT NO. U-2719

Wake County, North Carolina

0 150 300 Feet

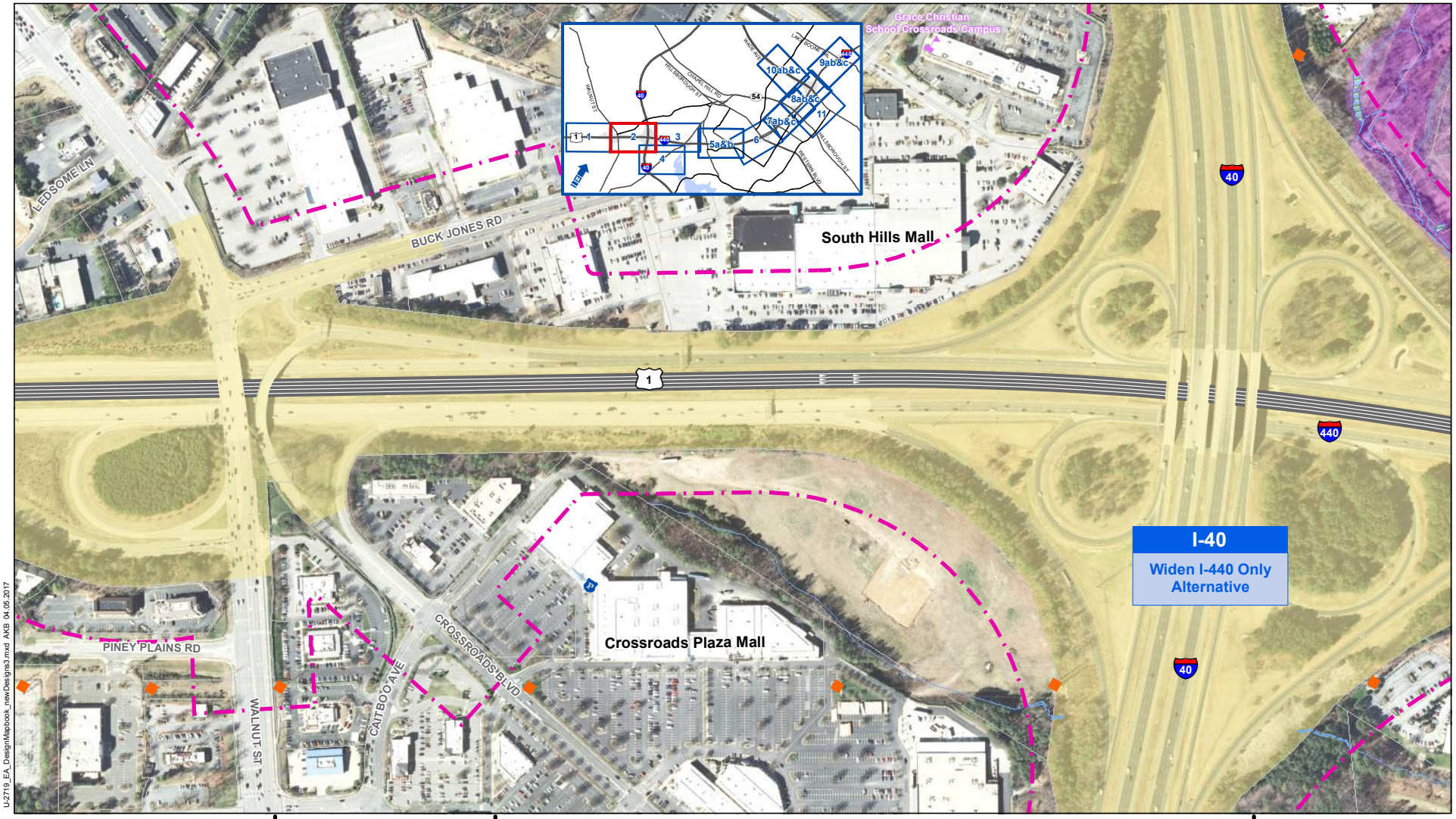
Source: Wake County, NCDOT, ESRI, NCONEMAP NC Statewide Orthoimagery

Legend

- Study Area Boundary
- Existing Noise Walls
- Existing Right of Way
- Proposed Right of Way
- Proposed Construction Easement
- Prop Easement Permanent Drainage
- Proposed Bridges
- Proposed Paved Area
- Proposed Lane Lines
- Proposed Median Barrier
- Proposed Curb and Gutter
- Proposed Retaining Wall
- Proposed Major Culverts
- Existing Power Towers
- Multi-Use Paths
- Potential Greenway Relocation
- Proposed Greenway Removal
- Existing Greenways
- Parks
- Parcels
- Railroads
- Historic Site
- Delineated Streams
- Other Streams
- Delineated Wetlands
- Delineated Ponds
- Floodway
- 100 Year Floodzone
- Stop Lights

DETAILED STUDY ALTERNATIVES PRELIMINARY DESIGN

Mapbook - Figure 1



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I-440 IMPROVEMENTS

STIP PROJECT NO. U-2719

Wake County, North Carolina

0 150 300 Feet

Source: Wake County, NCDOT, ESRI, NCONEMAP NC Statewide Orthoimagery

Legend

- Study Area Boundary
- Existing Noise Walls
- Existing Right of Way
- Proposed Right of Way
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- Parcels
- Railroads
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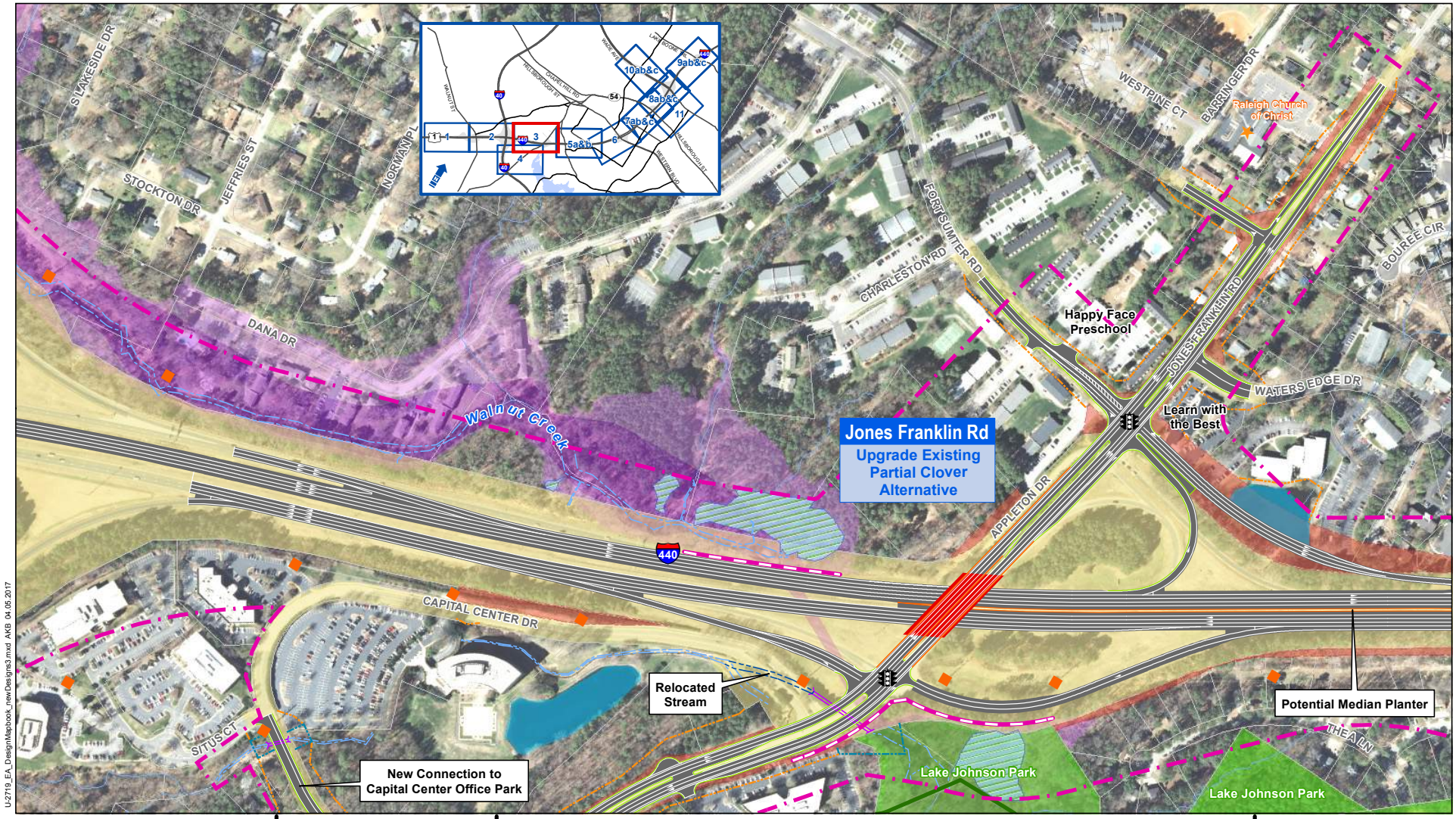
- Delineated Streams
- Other Streams
- Delineated Wetlands
- Delineated Ponds
- Floodway
- 100 Year Floodzone
- Stop Lights

DETAILED STUDY ALTERNATIVES PRELIMINARY DESIGN

Mapbook - Figure 2


Jones Franklin Rd
Upgrade Existing Partial Clover Alternative
Relocated Stream
New Connection to Capital Center Office Park
Potential Median Planter
Happy Face Preschool
Learn with the Best
Raleigh Church of Christ
Lake Johnson Park
Lake Johnson Park
Walnut Creek
DANA DR
STOCKTON DR
JEFFRIES ST
NORMAN PL
S LAKESIDE DR
CHARLESTON RD
FORT SUMTER RD
JONES FRANKLIN RD
WESTPINE CT
BARRINGER DR
BOUREE CIR
WATERS EDGE DR
APPLETON DR
CAPITAL CENTER DR
SITUS CT
THEA LN
440
I-440 IMPROVEMENTS
STIP PROJECT NO. U-2719
Wake County, North Carolina
0 150 300 Feet
Source: Wake County, NCDOT, ESRI, NCONEMAP NC Statewide Orthoimagery
Legend
Study Area Boundary
Existing Noise Walls
Existing Right of Way
Proposed Right of Way
Proposed Construction Easement
Prop Easement Permanent Drainage
Proposed Bridges
Proposed Paved Area
Proposed Lane Lines
Proposed Median Barrier
Proposed Curb and Gutter
Proposed Retaining Wall
Proposed Major Culverts
Existing Power Towers
Multi-Use Paths
Potential Greenway Relocation
Proposed Greenway Removal
Existing Greenways
Parks
Parcels
Railroads
Historic Site
Delineated Streams
Other Streams
Delineated Wetlands
Delineated Ponds
Floodway
100 Year Floodzone
Stop Lights
DETAILED STUDY ALTERNATIVES PRELIMINARY DESIGN
Mapbook - Figure 3
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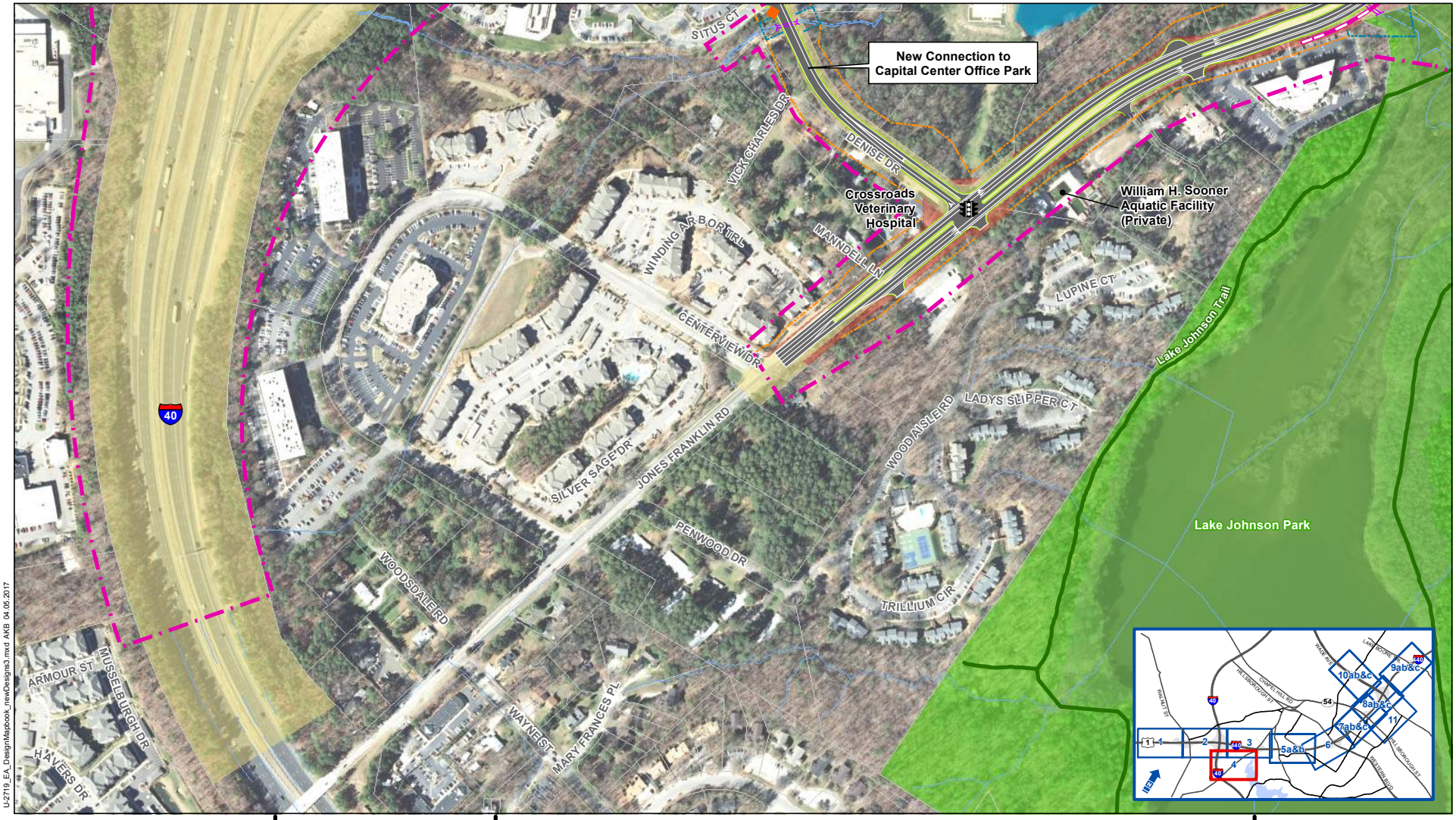

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I-440 IMPROVEMENTS

STIP PROJECT NO. U-2719

Wake County, North Carolina

0 150 300 Feet

Source: Wake County, NCDOT, ESRI, NCONEMAP NC Statewide Orthoimagery

Legend

- Study Area Boundary
- Existing Noise Walls
- Existing Right of Way
- Proposed Right of Way
- Proposed Construction Easement
- Prop Easement Permanent Drainage
- Proposed Bridges
- Proposed Paved Area
- Proposed Lane Lines
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- Proposed Retaining Wall
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- Existing Power Towers
- Multi-Use Paths
- Potential Greenway Relocation
- Proposed Greenway Removal
- Existing Greenways
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- Parcels
- Railroads
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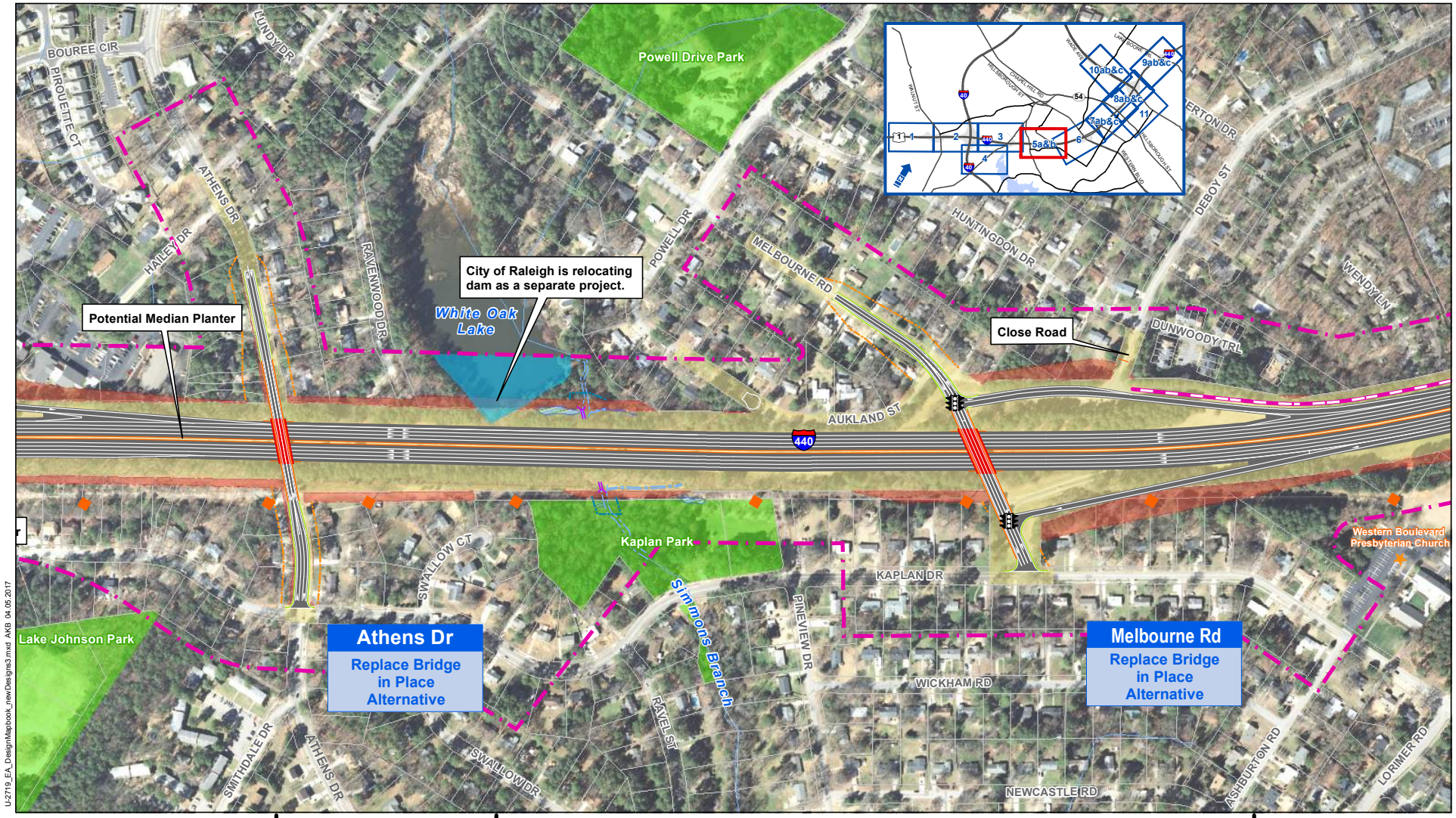
- Delineated Streams
- Other Streams
- Delineated Wetlands
- Delineated Ponds
- Floodway
- 100 Year Floodzone
- Stop Lights

DETAILED STUDY ALTERNATIVES PRELIMINARY DESIGN

Mapbook - Figure 4



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I-440 IMPROVEMENTS

STIP PROJECT NO. U-2719

Wake County, North Carolina

0 150 300 Feet

Source: Wake County, NCDOT, ESRI, NCONEMAP NC Statewide Orthoimagery

Legend

- Study Area Boundary
- Existing Noise Walls
- Existing Right of Way
- Proposed Right of Way
- Proposed Construction Easement
- Prop Easement Permanent Drainage
- Proposed Bridges
- Proposed Paved Area
- Proposed Lane Lines
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- Parcels
- Railroads
- Historic Site
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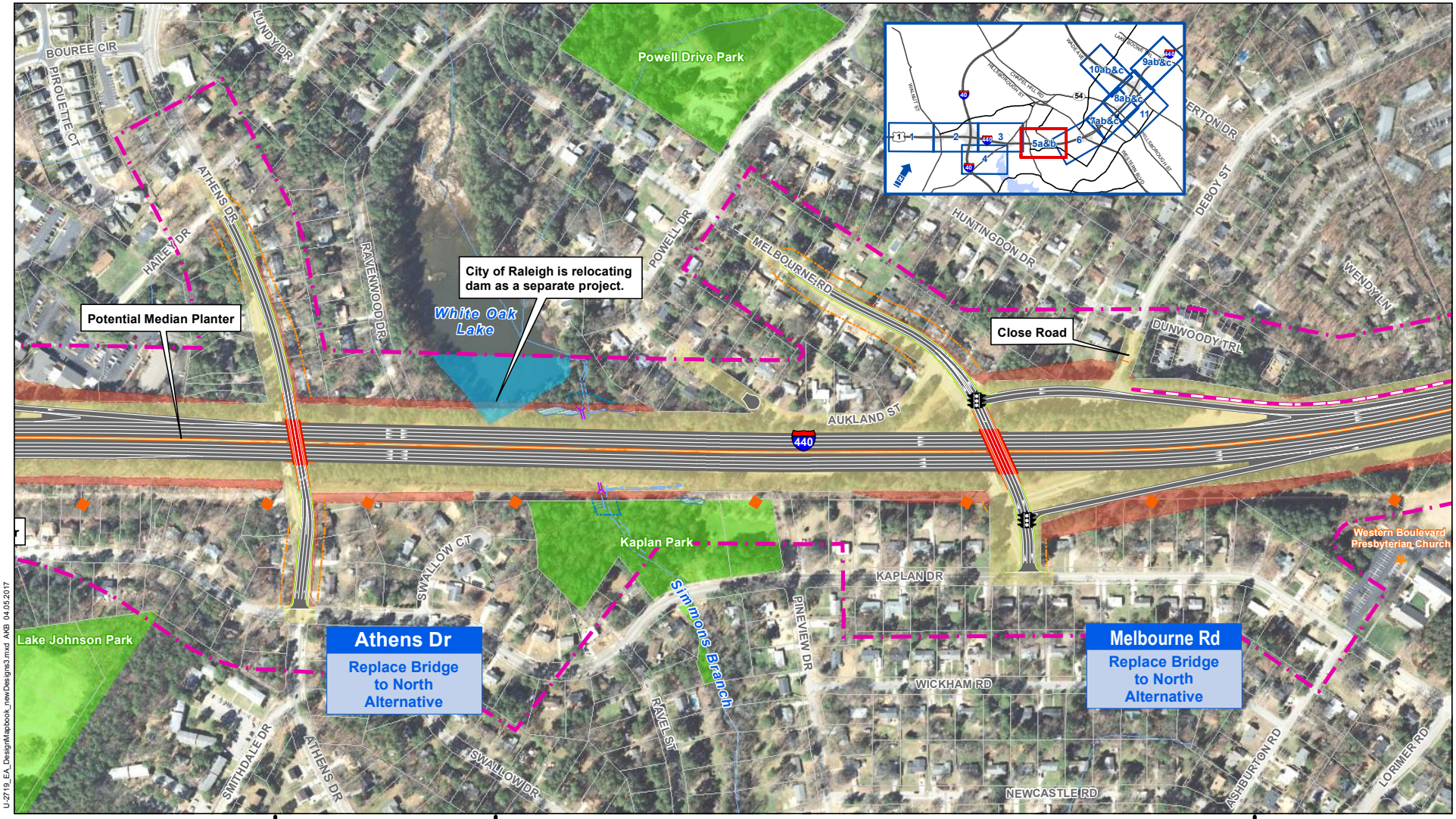
- Other Streams
- Delineated Wetlands
- Delineated Ponds
- Floodway
- 100 Year Floodzone
- Stop Lights

DETAILED STUDY ALTERNATIVES PRELIMINARY DESIGN

Mapbook - Figure 5a



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I-440 IMPROVEMENTS

STIP PROJECT NO. U-2719

Wake County, North Carolina

0 150 300 Feet

Source: Wake County, NCDOT, ESRI, NCONEMAP NC Statewide Orthoimagery

Legend

- Study Area Boundary
- Existing Noise Walls
- Existing Right of Way
- Proposed Right of Way
- Proposed Construction Easement
- Prop Easement Permanent Drainage
- Proposed Bridges
- Proposed Paved Area
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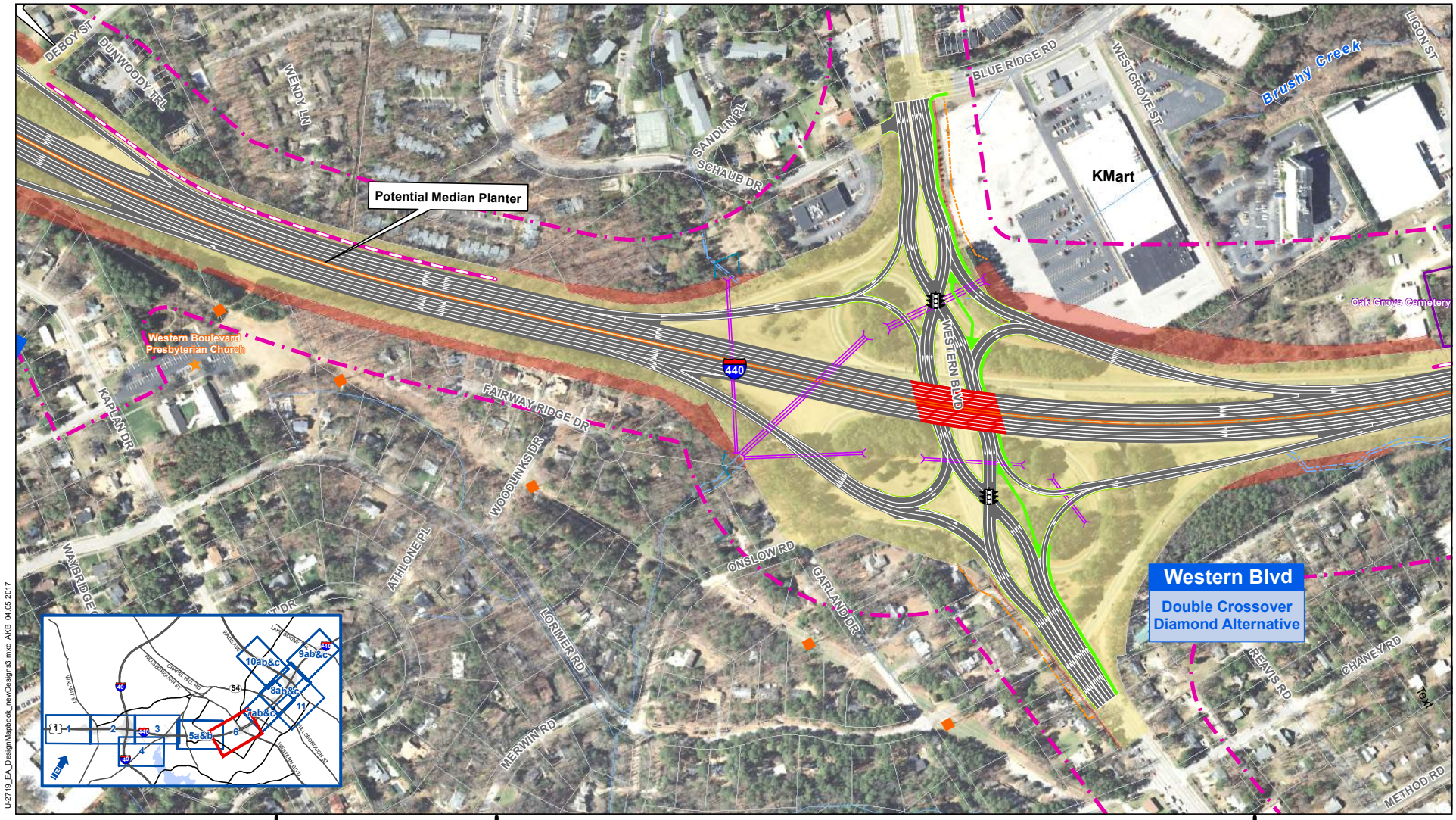
- Parcels
- Railroads
- Historic Site
- Delineated Streams
- Other Streams
- Delineated Wetlands
- Delineated Ponds
- Floodway
- 100 Year Floodzone
- Stop Lights

DETAILED STUDY ALTERNATIVES PRELIMINARY DESIGN

Mapbook - Figure 5b


DEBOY ST
DUNWOODY TRL
WENDY LN
SANDLIN PL
SCHAUB DR
BLUE RIDGE RD
WESTGROVE ST
Brushy Creek
LIGON ST
KMart
Potential Median Planter
Western Boulevard Presbyterian Church
Oak Grove Cemetery
440
WESTERN BLVD
KAPLAN DR
FAIRWAY RIDGE DR
WOODUNKS DR
ATHLONE PL
ONSLOW RD
GARLAND DR
LORIMER RD
MERWIN RD
REAVIS RD
CHANEY RD
METHOD RD
Text
Western Blvd
Double Crossover Diamond Alternative
10ab&c
9ab&c
8ab&c
7ab&c
5a&b
11
54
I-440 IMPROVEMENTS
STIP PROJECT NO. U-2719
Wake County, North Carolina
0 150 300 Feet
Source: Wake County, NCDOT, ESRI, NCONEMAP NC Statewide Orthoimagery
Legend
Study Area Boundary
Existing Noise Walls
Existing Right of Way
Proposed Right of Way
Proposed Construction Easement
Prop Easement Permanent Drainage
Proposed Bridges
Proposed Paved Area
Proposed Lane Lines
Proposed Median Barrier
Proposed Curb and Gutter
Proposed Retaining Wall
Proposed Major Culverts
Existing Power Towers
Multi-Use Paths
Potential Greenway Relocation
Proposed Greenway Removal
Existing Greenways
Parks
Parcels
Railroads
Historic Site
Delineated Streams
Other Streams
Delineated Wetlands
Delineated Ponds
Floodway
100 Year Floodzone
Stop Lights
DETAILED STUDY ALTERNATIVES PRELIMINARY DESIGN
Mapbook - Figure 6
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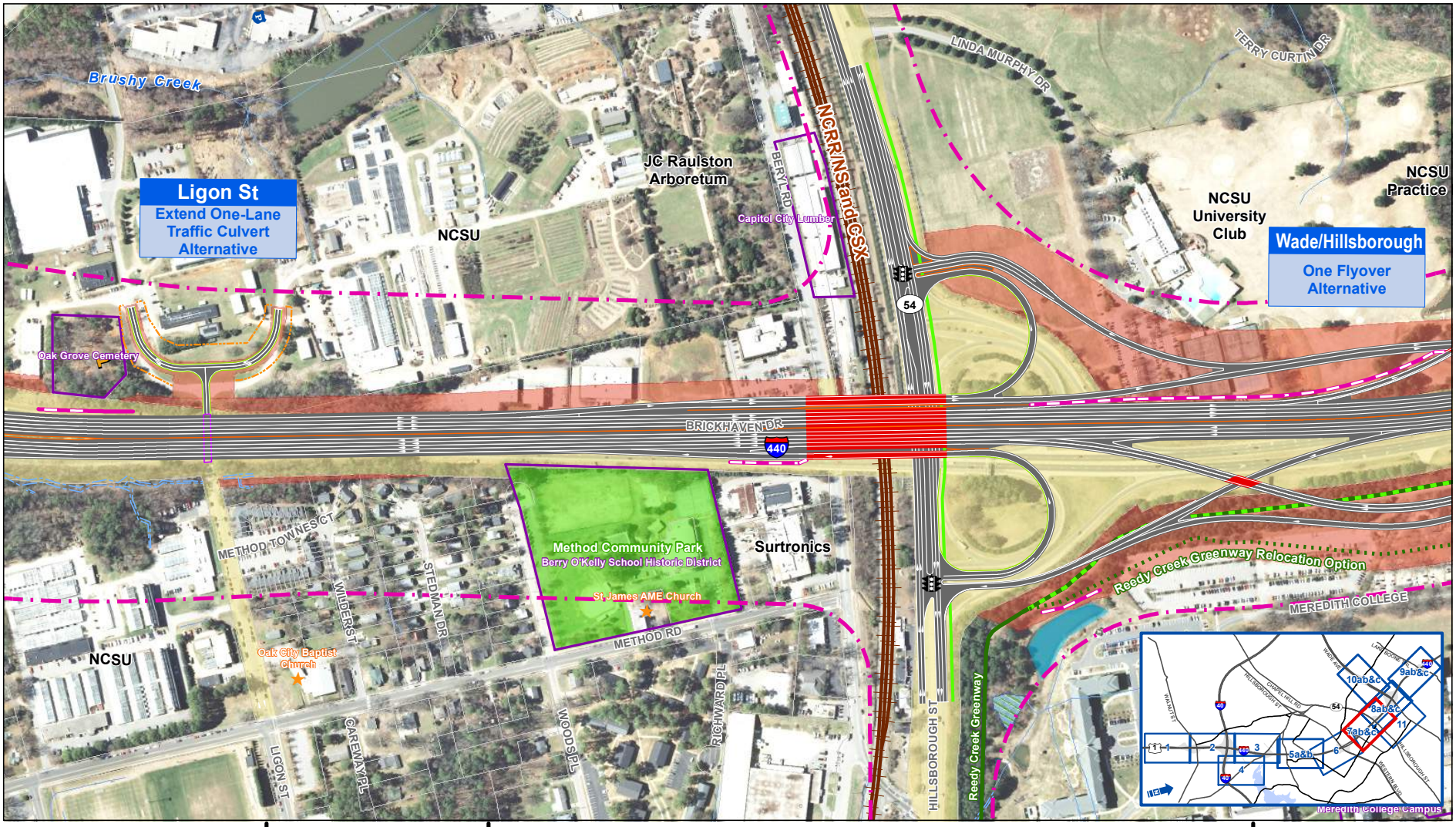

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I-440 IMPROVEMENTS

STIP PROJECT NO. U-2719

Wake County, North Carolina

0 150 300 Feet

Source: Wake County, NCDOT, ESRI, NCONEMAP NC Statewide Orthoimagery

Legend

- Study Area Boundary
- Existing Noise Walls
- Existing Right of Way
- Proposed Right of Way
- Proposed Construction Easement
- Prop Easement Permanent Drainage
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- Parcels
- Railroads
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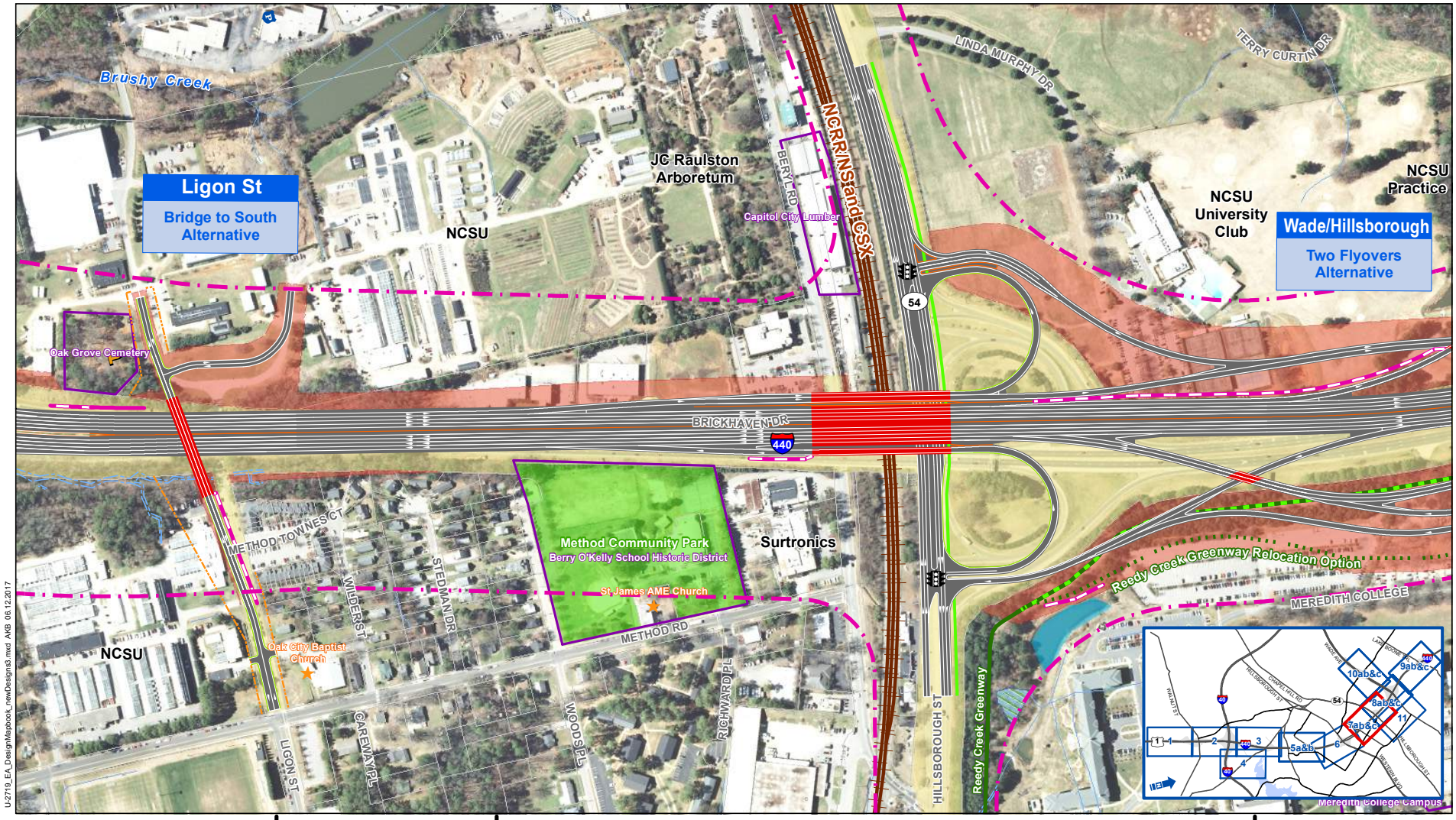
- Other Streams
- Delineated Wetlands
- Delineated Ponds
- Floodway
- 100 Year Floodzone
- Stop Lights

DETAILED STUDY ALTERNATIVES PRELIMINARY DESIGN

Mapbook - Figure 7a


Brushy Creek
Ligon St
Bridge to South Alternative
NCSU
JC Raulston Arboretum
Capitol City Lumber
NCRR/NS and CSX
LINDA MURPHY DR
TERRY CURTIN DR
NCSU University Club
NCSU Practice
Wade/Hillsborough
Two Flyovers Alternative
54
Oak Grove Cemetery
BRICKHAVEN DR
440
METHOD TOWNES CT
WILBERT ST
STEDMAN DR
Method Community Park
Berry O'Kelly School Historic District
St James AME Church
Surtronics
METHOD RD
Reedy Creek Greenway Relocation Option
MEREDITH COLLEGE
NCSU
Oak City Baptist Church
LIGON ST
CAREWAY PL
WOODS PL
RICHWARD PL
HILLSBOROUGH ST
Reedy Creek Greenway
Meredith College Campus
U-2719_EA_DesignMapbook_newDesigns3.mxd AKB 06.12.2017
I-440 IMPROVEMENTS
STIP PROJECT NO. U-2719
Wake County, North Carolina
0 150 300 Feet
Source: Wake County, NCDOT, ESRI, NCONEMAP NC Statewide Orthoimagery
Legend
Study Area Boundary
Existing Noise Walls
Existing Right of Way
Proposed Right of Way
Proposed Construction Easement
Prop Easement Permanent Drainage
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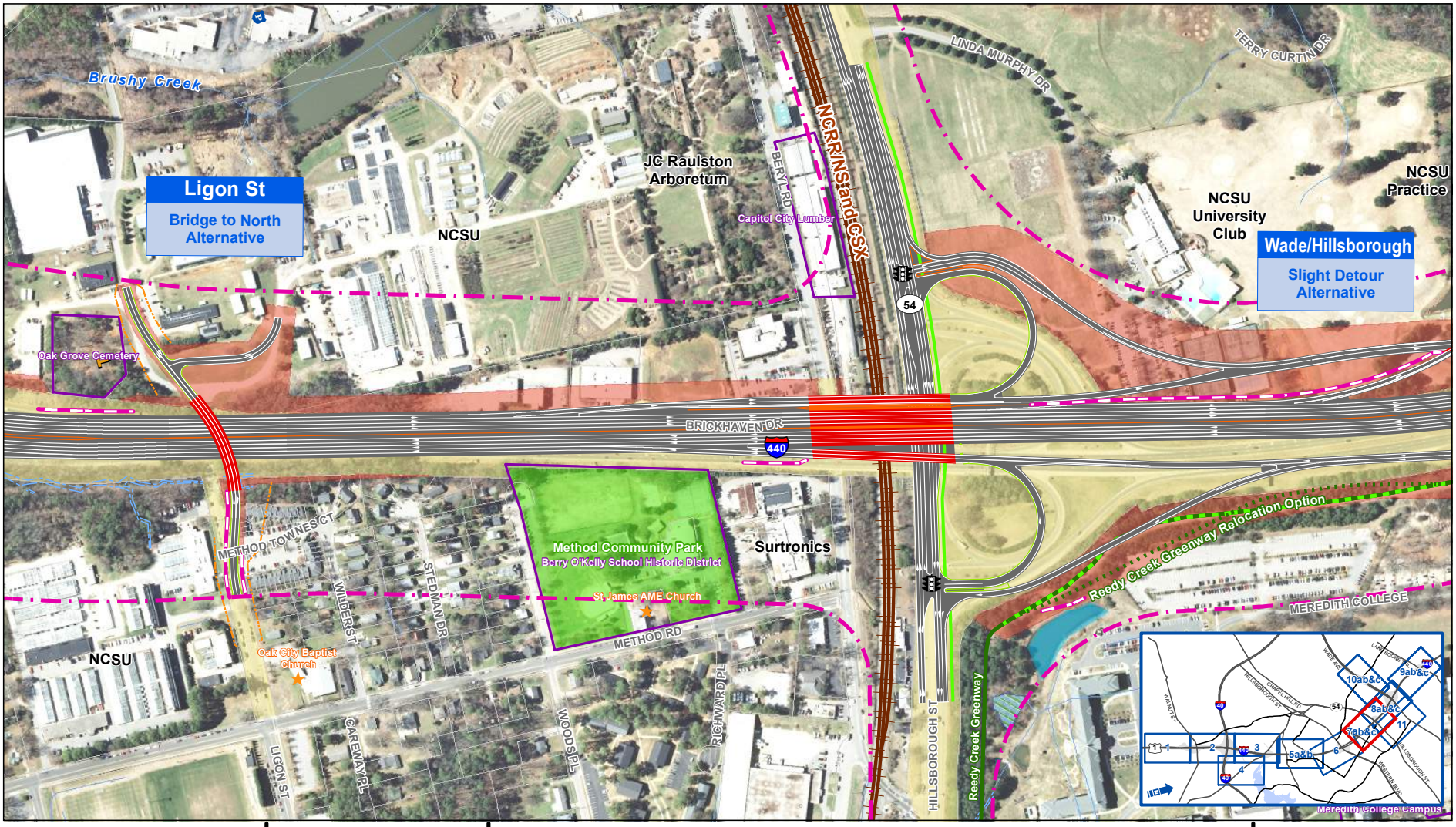
Railroads
Historic Site
Delineated Streams
Other Streams
Delineated Wetlands
Delineated Ponds
Floodway
100 Year Floodzone
Stop Lights
DETAILED STUDY ALTERNATIVES PRELIMINARY DESIGN
Mapbook - Figure 7b


Ligon St
Bridge to North Alternative
Wade/Hillsborough
Slight Detour Alternative
Brushy Creek
JC Raulston Arboretum
NCSU
NCSU University Club
NCSU Practice
NCRR/NS and CSX
BERY RD
Capitol City Lumber
LINDA MURPHY DR
TERRY CURTIN DR
54
Oak Grove Cemetery
BRICKHAVEN DR
440
METHOD TOWNES CT
WILDER ST
STEDMAN DR
Method Community Park
Berry O'Kelly School Historic District
St James AME Church
Surtronics
METHOD RD
Oak City Baptist Church
NCSU
GAREWAY PL
LIGON ST
WOODS PL
RICHWARD PL
HILLSBOROUGH ST
Reedy Creek Greenway
Reedy Creek Greenway Relocation Option
MEREDITH COLLEGE
Meredith College Campus
10ab&c
9ab&c
8ab&c
7ab&c
11
5a&b
6
3
2
1
4
I-440 IMPROVEMENTS
STIP PROJECT NO. U-2719
Wake County, North Carolina
0 150 300 Feet
Source: Wake County, NCDOT, ESRI, NCONEMAP NC Statewide Orthoimagery
Legend
Study Area Boundary
Existing Noise Walls
Existing Right of Way
Proposed Right of Way
Proposed Construction Easement
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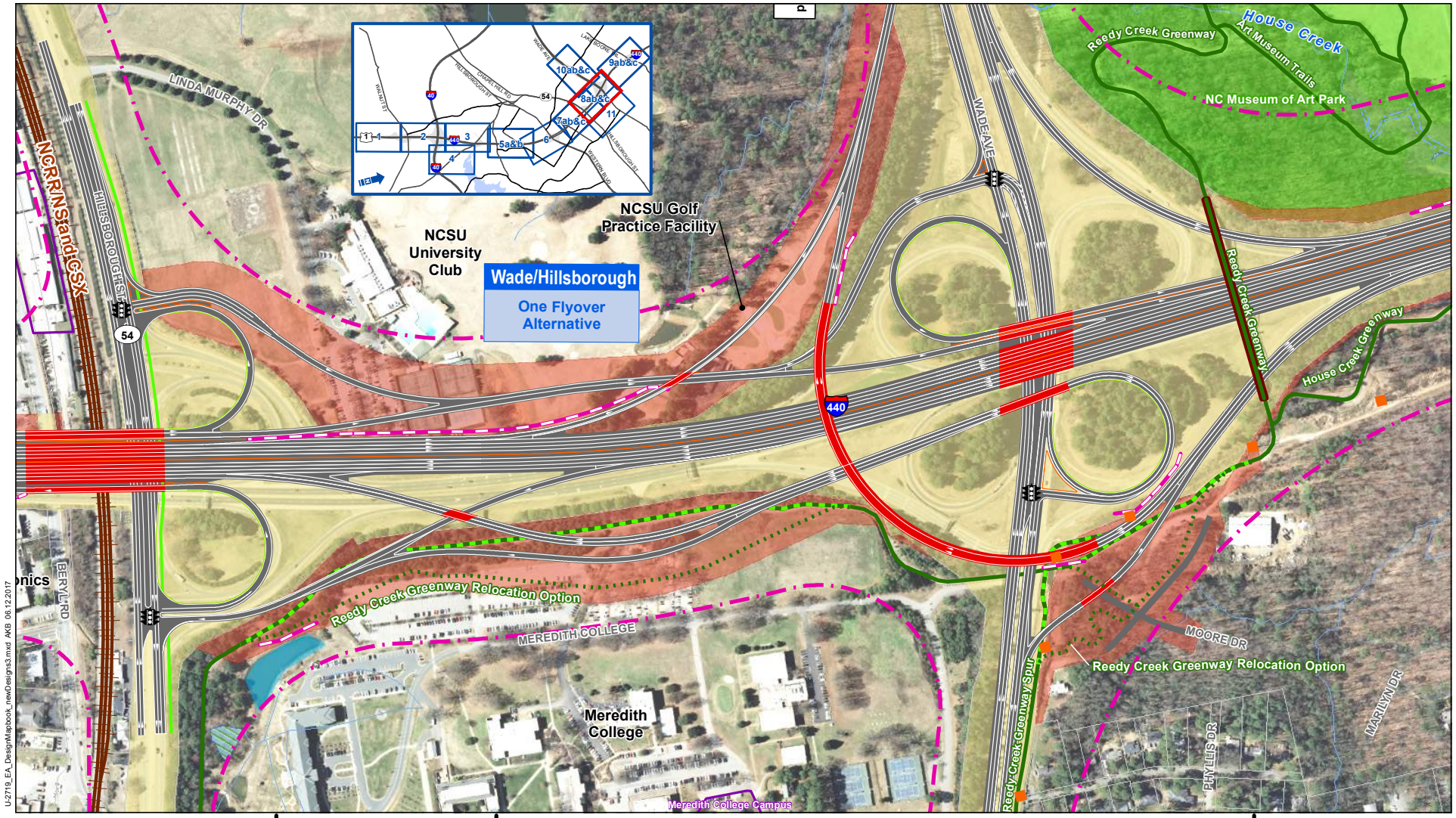
Other Streams
Delineated Wetlands
Delineated Ponds
Floodway
100 Year Floodzone
Stop Lights
DETAILED STUDY ALTERNATIVES PRELIMINARY DESIGN
Mapbook - Figure 7c
U-2719_EA_DesignMapbook_newDesigns3.mxd AKB 06.12.2017



I-440 IMPROVEMENTS

STIP PROJECT NO. U-2719

Wake County, North Carolina

0 150 300 Feet

Source: Wake County, NCDOT, ESRI, NCONEMAP NC Statewide Orthoimagery

Legend

- Study Area Boundary
- Existing Noise Walls
- Existing Right of Way
- Proposed Right of Way
- Proposed Construction Easement
- Prop Easement Permanent Drainage
- Proposed Bridges
- Proposed Paved Area
- Proposed Lane Lines
- Proposed Median Barrier
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- Potential Greenway Relocation
- Proposed Greenway Removal
- Existing Greenways
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- Parcels
- Railroads
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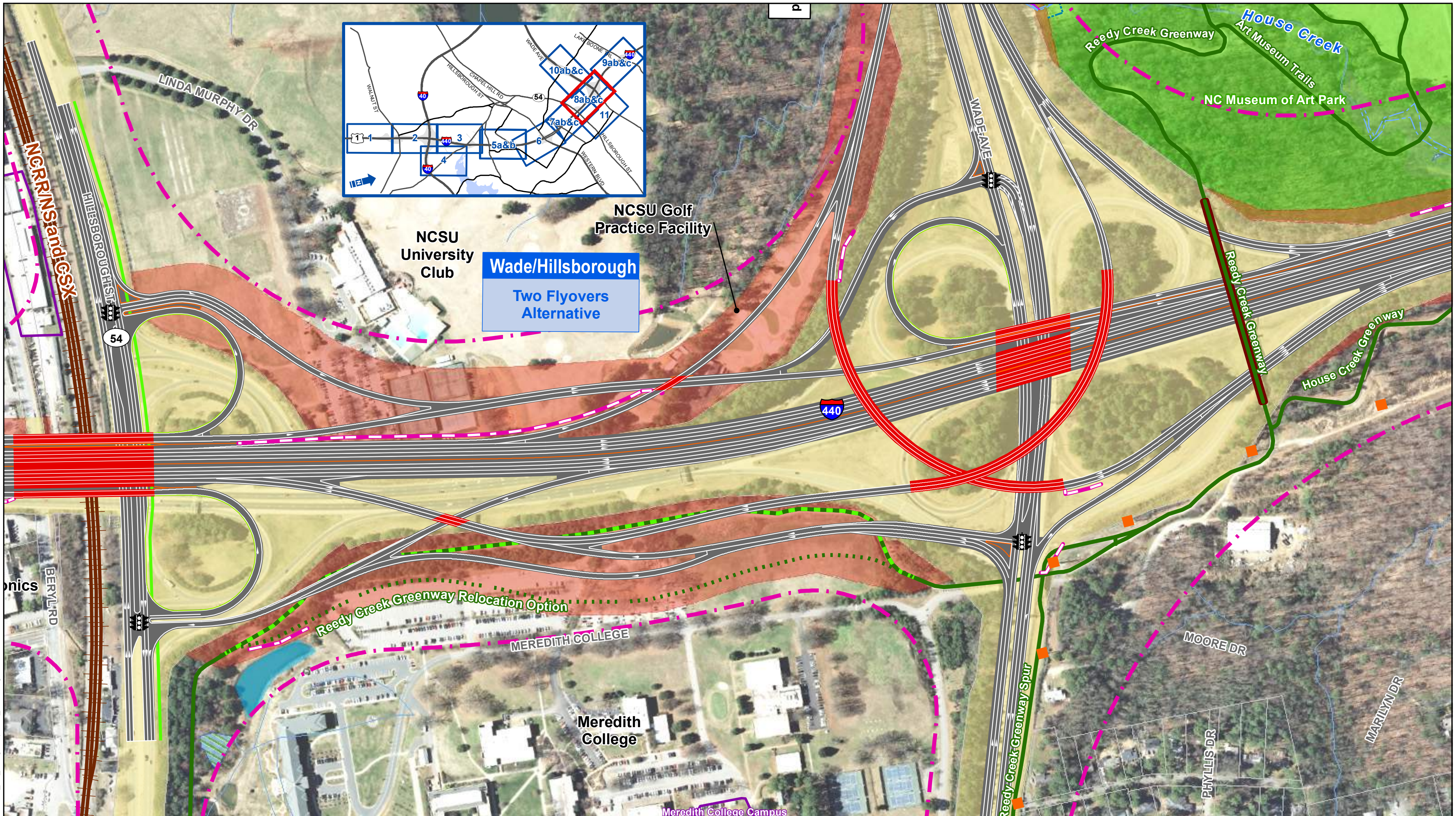
- Delineated Streams
- Other Streams
- Delineated Wetlands
- Delineated Ponds
- Floodway
- 100 Year Floodzone
- Stop Lights

DETAILED STUDY ALTERNATIVES PRELIMINARY DESIGN

Mapbook - Figure 8a



I-440 IMPROVEMENTS

STIP PROJECT NO. U-2719

Wake County, North Carolina

0 150 300 Feet

Source: Wake County, NCDOT, ESRI, NCONEMAP NC Statewide Orthoimagery

Legend

- Study Area Boundary
- Existing Noise Walls
- Existing Right of Way
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- Prop Easement Permanent Drainage
- Proposed Bridges
- Proposed Paved Area
- Proposed Lane Lines
- Proposed Median Barrier
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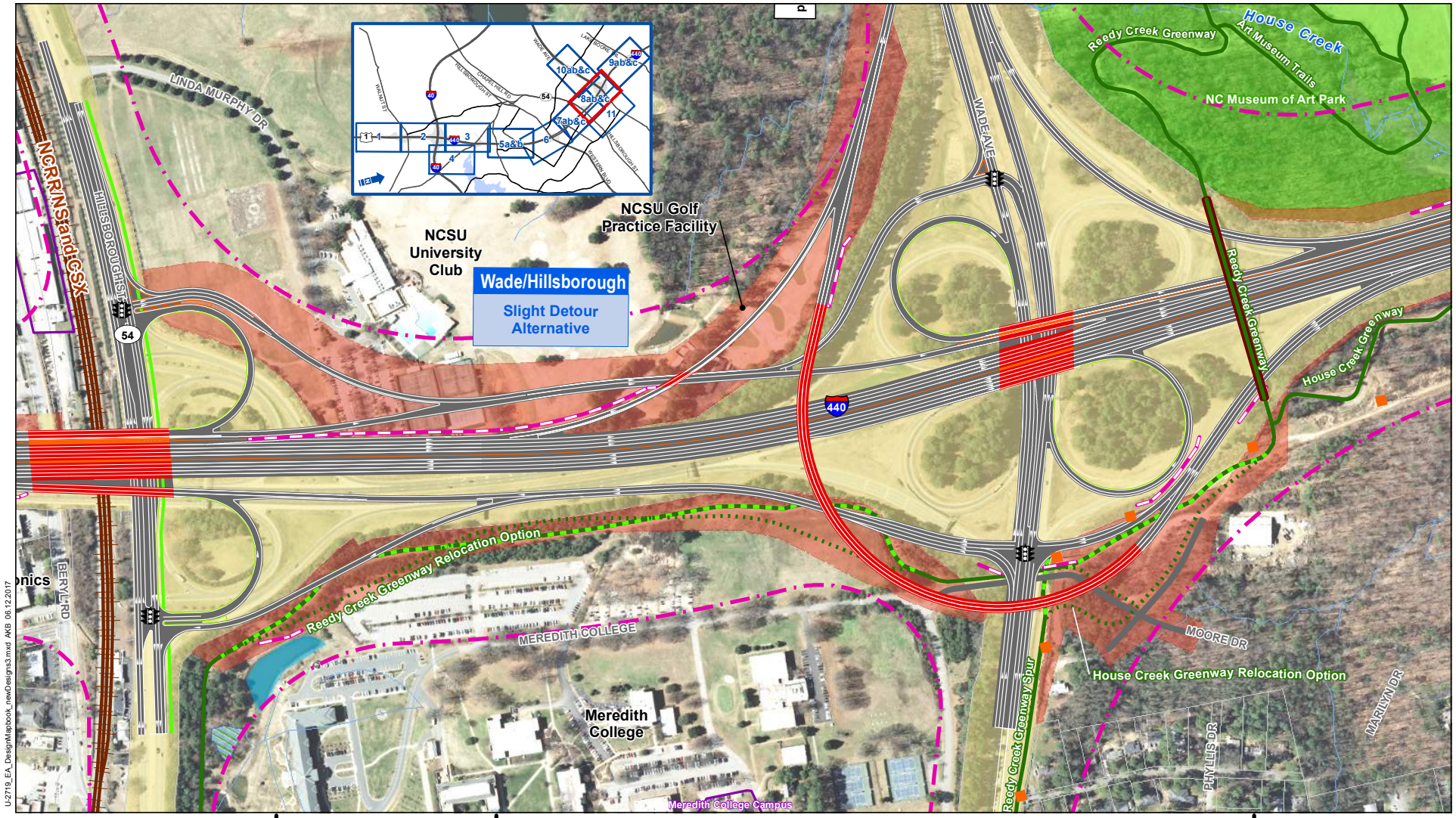
- Other Streams
- Delineated Wetlands
- Delineated Ponds
- Floodway
- 100 Year Floodzone
- Stop Lights

DETAILED STUDY ALTERNATIVES PRELIMINARY DESIGN

Mapbook - Figure 8b



U-2719_EA_DesignMapbook_newDesigns3.mxd AKB 06.12.2017

I-440 IMPROVEMENTS

STIP PROJECT NO. U-2719

Wake County, North Carolina

0 150 300 Feet

Source: Wake County, NCDOT, ESRI, NCONEMAP NC Statewide Orthoimagery

Legend

- Study Area Boundary
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- Existing Right of Way
- Proposed Right of Way
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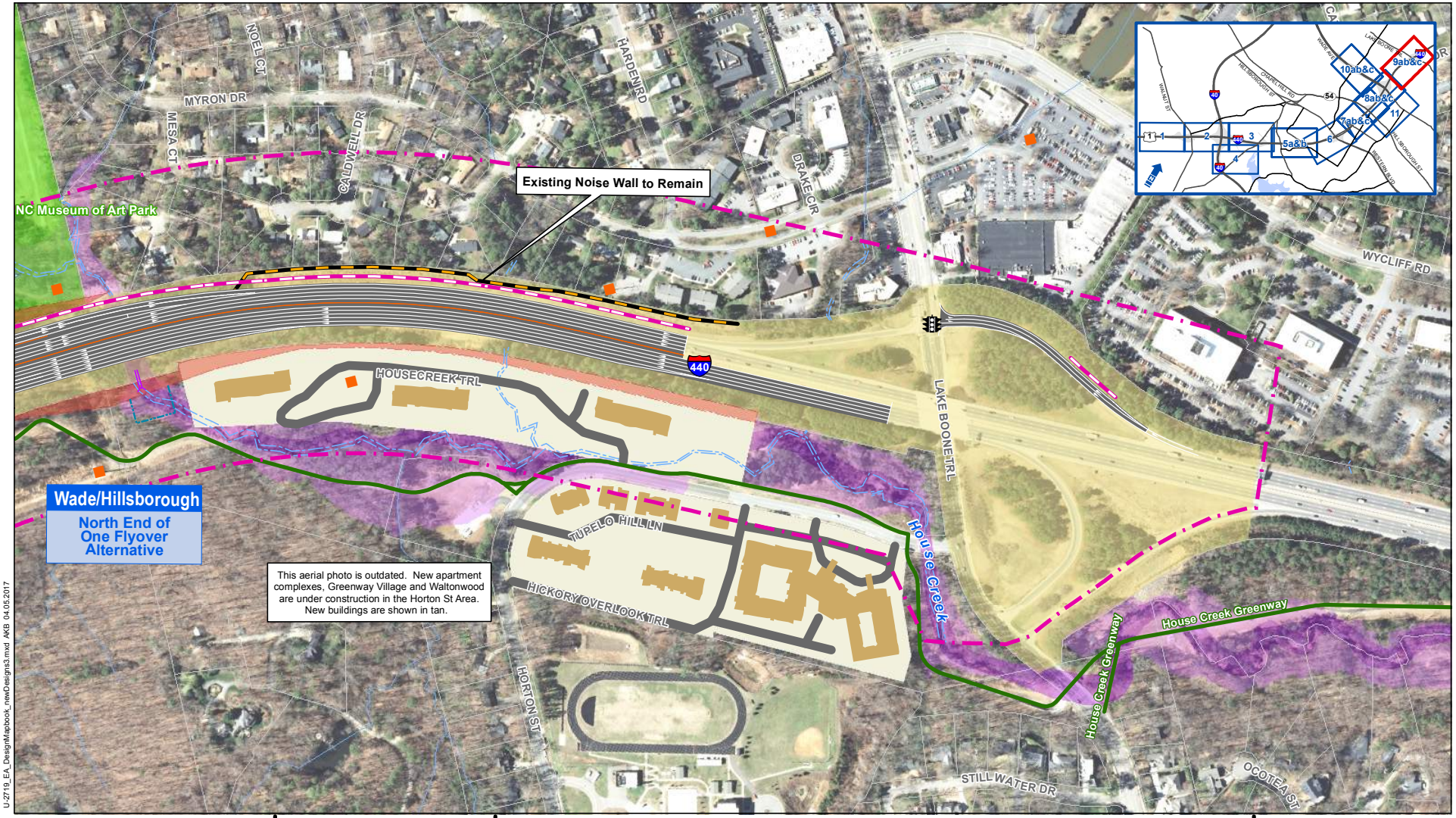
- Proposed Greenway Removal
- Existing Greenways
- Parks
- Parcels
- Railroads
- Historic Site
- Delineated Streams
- Other Streams
- Delineated Wetlands
- Delineated Ponds
- Floodway
- 100 Year Floodzone
- Stop Lights

DETAILED STUDY ALTERNATIVES PRELIMINARY DESIGN

Mapbook - Figure 8c



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I-440 IMPROVEMENTS

STIP PROJECT NO. U-2719

Wake County, North Carolina

0 150 300 Feet

Source: Wake County, NCDOT, ESRI, NCONEMAP NC Statewide Orthoimagery

Legend

- Study Area Boundary
- Existing Noise Walls
- Existing Right of Way
- Proposed Right of Way
- Proposed Construction Easement
- Prop Easement Permanent Drainage
- Proposed Bridges
- Proposed Paved Area
- Proposed Lane Lines
- Proposed Median Barrier
- Proposed Curb and Gutter
- Proposed Retaining Wall
- Proposed Major Culverts
- Existing Power Towers
- Multi-Use Paths
- Potential Greenway Relocation
- Proposed Greenway Removal
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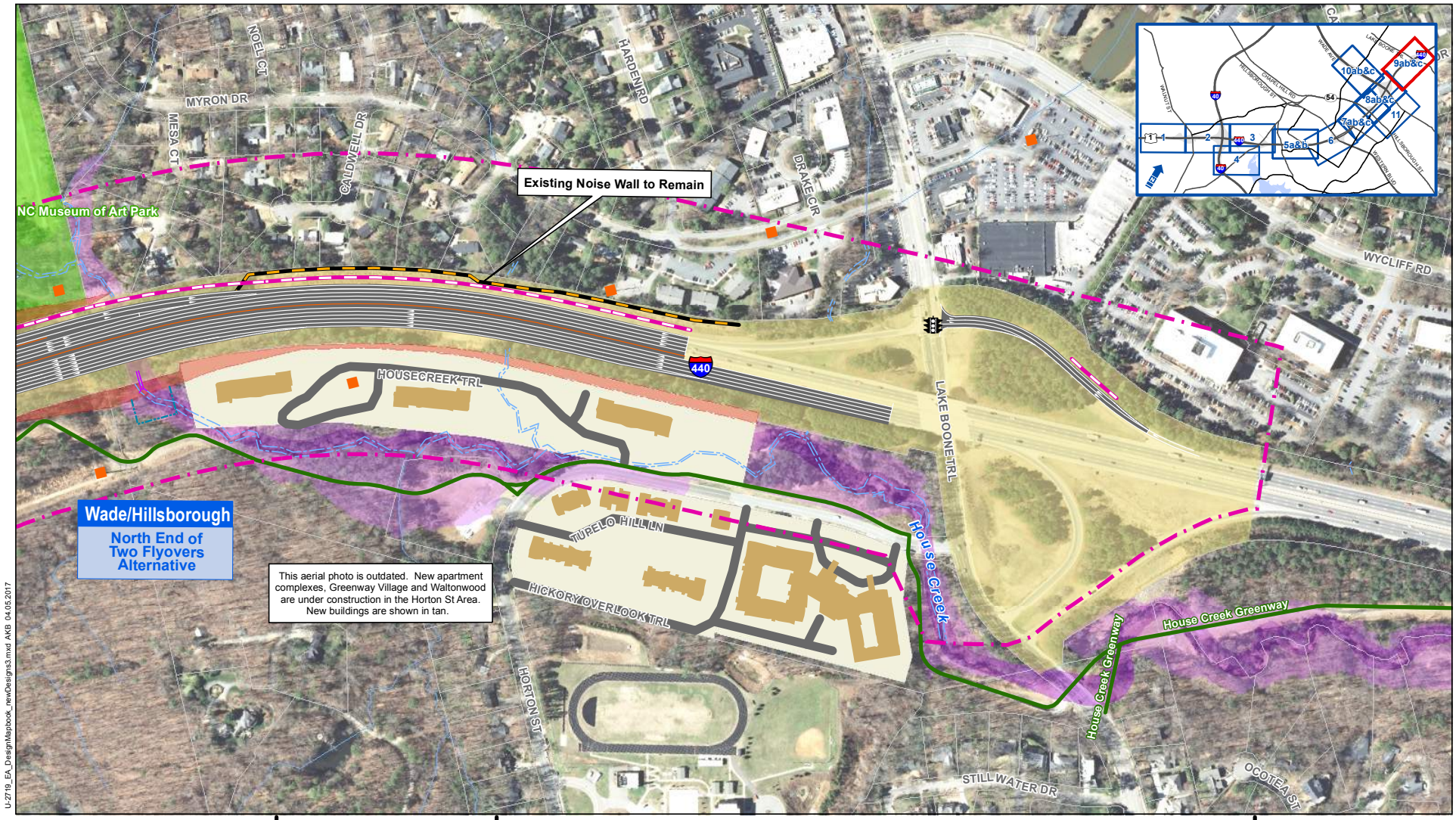
DETAILED STUDY ALTERNATIVES PRELIMINARY DESIGN

Mapbook - Figure 9a



I-440 IMPROVEMENTS

STIP PROJECT NO. U-2719

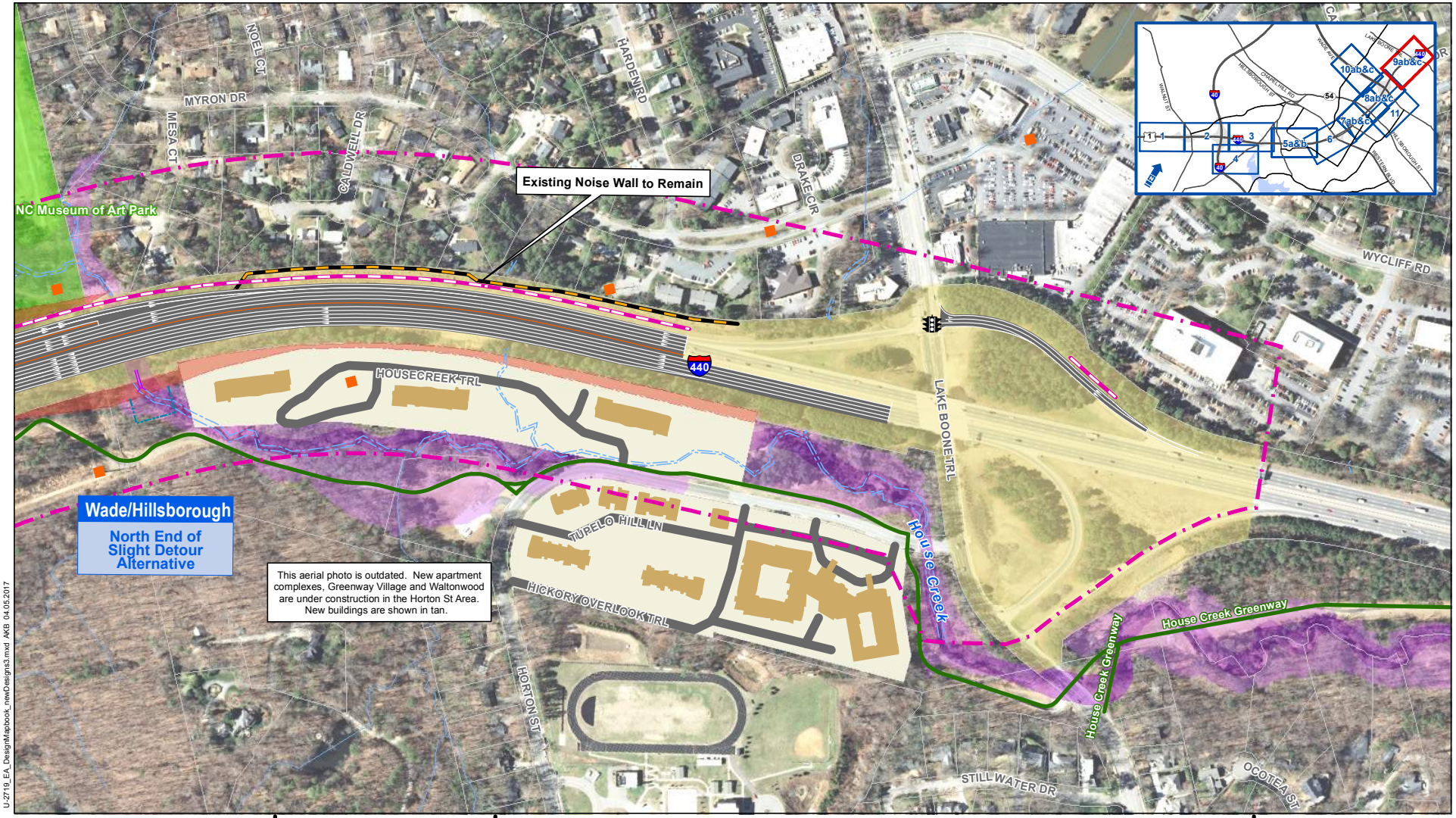
Wake County, North Carolina

0 150 300 Feet

Source: Wake County, NCDOT, ESRI, NCONEMAP NC Statewide Orthoimagery

DETAILED STUDY ALTERNATIVES PRELIMINARY DESIGN

Mapbook - Figure 9b


Existing Noise Wall to Remain
NC Museum of Art Park
NOEL CT
MYRON DR
MESA CT
CALDWELL DR
HARDEN RD
DRAKE CIR
WYCLIFF RD
440
HOUSECREEK TRL
LAKE BOONE TRL
Wade/Hillsborough
North End of Slight Detour Alternative
This aerial photo is outdated. New apartment complexes, Greenway Village and Waltonwood are under construction in the Horton St Area. New buildings are shown in tan.
TUPELO HILL LN
HICKORY OVERLOOK TRL
HORTON ST
House Creek
House Creek Greenway
House Creek Greenway
STILL WATER DR
OCOTEA ST
10ab&c
9ab&c
8ab&c
7ab&c
5a&b
1
2
3
4
6
11
54
I-440 IMPROVEMENTS
STIP PROJECT NO. U-2719
Wake County, North Carolina
0 150 300 Feet
Source: Wake County, NCDOT, ESRI, NCONEMAP
NC Statewide Orthoimagery
Legend
Study Area Boundary
Existing Noise Walls
Existing Right of Way
Proposed Right of Way
Proposed Construction Easement
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Multi-Use Paths
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Proposed Greenway Removal
Existing Greenways
Parks
Parcels
Railroads
Historic Site
Delineated Streams
Other Streams
Delineated Wetlands
Delineated Ponds
Floodway
100 Year Floodzone
Stop Lights
DETAILED STUDY ALTERNATIVES PRELIMINARY DESIGN
Mapbook - Figure 9c
U-2719_EA_DesignMapbook_newDesigns3.mxd AKB 04.05.2017

U-2719_EA_DesignMapbook_newDesigns3.mxd AKB 04.05.2017

I-440 IMPROVEMENTS

STIP PROJECT NO. U-2719

Wake County, North Carolina

0 150 300 Feet

Source: Wake County, NCDOT, ESRI, NCONEMAP NC Statewide Orthoimagery

Legend

- Study Area Boundary
- Existing Noise Walls
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DETAILED STUDY ALTERNATIVES PRELIMINARY DESIGN

Mapbook - Figure 10a

I-440 IMPROVEMENTS

STIP PROJECT NO. U-2719

Wake County, North Carolina

0 150 300 Feet

Source: Wake County, NCDOT, ESRI, NCONEMAP NC Statewide Orthoimagery

Legend

- Study Area Boundary
- Existing Noise Walls
- Existing Right of Way
- Proposed Right of Way
- Proposed Construction Easement
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DETAILED STUDY ALTERNATIVES PRELIMINARY DESIGN

Mapbook - Figure 10b

I-440 IMPROVEMENTS

STIP PROJECT NO. U-2719

Wake County, North Carolina

0 150 300 Feet

Source: Wake County, NCDOT, ESRI, NCONEMAP
NC Statewide Orthoimagery

Legend

- Study Area Boundary
- Existing Noise Walls
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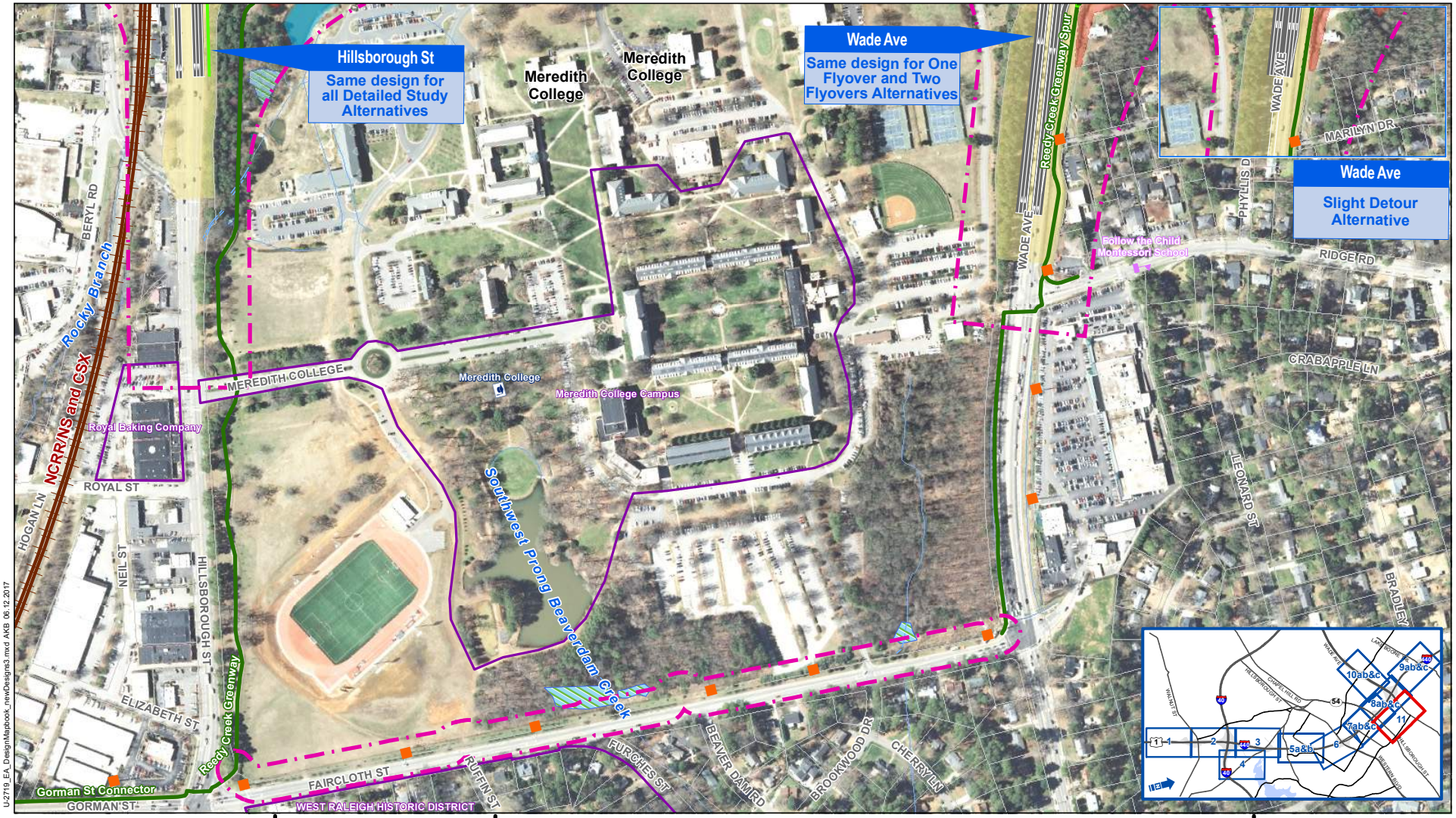
- Stop Lights

DETAILED STUDY ALTERNATIVES PRELIMINARY DESIGN

Mapbook - Figure 10c



I-440 IMPROVEMENTS

STIP PROJECT NO. U-2719

Wake County, North Carolina

0 150 300 Feet

Source: Wake County, NCDOT, ESRI, NCONEMAP NC Statewide Orthoimagery

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DETAILED STUDY ALTERNATIVES PRELIMINARY DESIGN

Mapbook - Figure 11

APPENDIX C

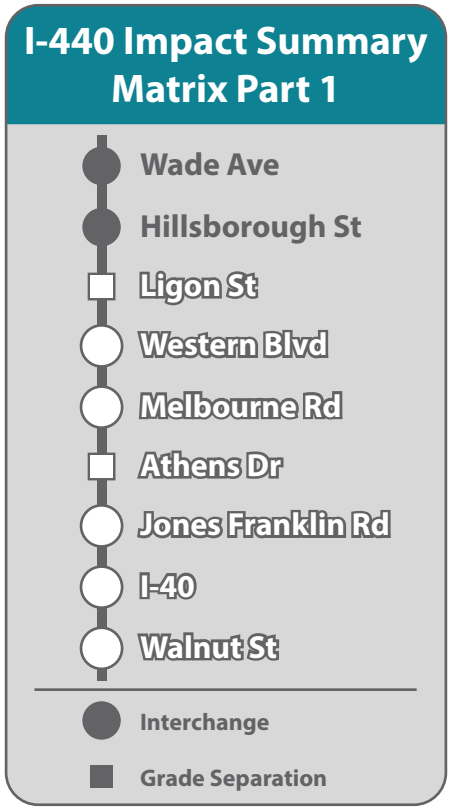
IMPACT SUMMARY MATRIX

HOW THIS IMPACT SUMMARY MATRIX IS ORGANIZED

Due to the number of Detailed Study Alternatives for the project end to end, they could not all fit across one sheet of paper. Therefore, the impact summary matrix table was divided into two parts, as shown on the right.

Part 1 covers the Detailed Study Alternatives from south of Walnut Street through Ligon Street.

Part 2 covers the Hillsborough Street and Wade Avenue interchange area and the relocation options for the Reedy Creek Greenway (which would be displaced with the Hillsborough Street and Wade Avenue interchange area Detailed Study Alternatives).



PART 1

U-2719 – I-440 Improvements Environmental Assessment

IMPACT SUMMARY TABLE – PART 1 – SOUTH OF WALNUT ST TO LIGON ST

Resource	DETAILED STUDY ALTERNATIVES – Alternatives from south of Walnut St to Ligon St									
	From south of Walnut St to I-40 Interchange	Jones Franklin Rd Interchange	Athens Dr Grade Separation		Melbourne Rd Interchange		Western Blvd Interchange	Ligon St Grade Separation		
		Upgrade Existing Partial Clover	Bridge in Place	Bridge to North	Bridge in Place	Bridge to North	Double Crossover Diamond	Bridge to North	Bridge to South	Extend Existing Traffic Culvert
COSTS (2017 dollars)										
Construction Costs (millions $)	$ 85.0[1]	$ 26.0	$ 2.4	$ 2.5	$ 6.6	$ 6.9	$ 43.9[2]	$ 4.7	$ 5.2	$ 0.8
Right-of-Way Costs (millions $)	$ 0.0	$ 19.3	$ 0.8	$ 2.0	$ 2.1	$ 2.8	$ 2.8	$ 23.4[3]	$ 21.7[3]	$ 14.9[3]
Utility Costs (millions $)	$ 0.0	$ 2.4	$ 0.5	$ 0.4	$ 0.3	$ 0.3	$ 1.1	$ 0.2	$ 0.2	$ 0.0
Total Costs (millions $)	$ 85.0	$ 47.7	$ 3.6	$ 4.9	$ 8.9	$ 10.0	$ 47.8	$28.2	$ 27.1	$ 15.7
RANGE OF TOTAL COSTS	The ranges below are for the project end to end (includes data from Summary Table Parts 1 and 2) $ 450.4 to $ 475.3									
LAND USE										
Compatible with Local Land Use and Transportation Plans	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No[4]
RELOCATIONS										
Residential Relocations	0	23	0	5	3	6	1	10	0	0
Business Relocations	0	7	0	0	0	0	0	7	8	7
RANGE OF IMPACTS	The ranges below are for the project end to end (includes data from Summary Table Parts 1 and 2) Residential relocations – 27 to 46 Business relocations – 15 to 16									
MITIGATION	NCDOT will conduct the property acquisition and relocation process in accordance with the Federal Uniform Relocation Assistance and Real Property Acquisition Policies Act and the North Carolina Relocation Assistance Act.									

PART 1

U-2719 – I-440 Improvements Environmental Assessment

IMPACT SUMMARY TABLE – PART 1 – SOUTH OF WALNUT ST TO LIGON ST

Resource	DETAILED STUDY ALTERNATIVES – Alternatives from south of Walnut St to Ligon St									
	From south of Walnut St to I-40 Interchange	Jones Franklin Rd Interchange	Athens Dr Grade Separation		Melbourne Rd Interchange		Western Blvd Interchange	Ligon St Grade Separation		
		Upgrade Existing Partial Clover	Bridge in Place	Bridge to North	Bridge in Place	Bridge to North	Double Crossover Diamond	Bridge to North	Bridge to South	Extend Existing Traffic Culvert
COMMUNITY RESOURCES										
Public Parks	0	Lake Johnson minor impact	0	0	Kaplan Park minor impact	Kaplan Park minor impact	0	0	0	0
Greenways	0	Future Walnut Ck greenway accommodated	0	0	0	0	Multi-use path replaced	0	0	0
Private Recreational Facilities	0	0	0	0	0	0	0	0	0	0
K-12 Schools	0	Learn with the Best Private School displaced	0	0	0	0	0	0	0	0
Universities and Colleges	0	0	0	0	0	0	0	0	NCSU research building displaced	0
Shopping Centers	0	0	0	0	0	0	K-Mart parking lot minor impact.	0	0	0
MITIGATION	NCDOT will conduct the property acquisition and relocation process in accordance with the Federal Uniform Relocation Assistance and Real Property Acquisition Policies Act and the North Carolina Relocation Assistance Act.									
MOBILITY AND ACCESS CHANGES										
Permanent Impacts	The proposed project end to end would enhance mobility along I-440 and the local road network near the interchanges. Pedestrian and bicycle mobility will be improved with proposed sidewalks and bicycle lanes on cross streets.									
Temporary Impacts	Project construction would temporarily impact mobility and access in the project area during the construction period. In addition, at Athens Dr and Melbourne Rd, the Bridge in Place Alternative at each location would require temporary bridge closure and detour route (9-12 months) during construction.									
MITIGATION	A goal of the project is to keep two lanes of traffic open in each direction on I-440 to the extent feasible during construction. NCDOT will coordinate with the Wake County Public School System, transit agencies, and emergency response providers regarding detour routes and associated route changes that may be necessary during construction. NCDOT also will coordinate with the NC State Fairgrounds (including NC Department of Agriculture and Consumer Services), Carter-Finley Stadium, NC State University, Wolfpack Club, PNC Arena, Gale Force Sports (Division of Carolina Hurricanes), NC State Highway Patrol, and City of Raleigh Police Department regarding traffic flow during construction for major events at venues west of I-440 that generate major traffic on I-440.									
VISUAL RESOURCES										
Visual Impacts	0	0	0	0	0	0	0	Minor change in views due to new bridge	Minor change in views due to new bridge	0
Other aesthetic considerations	Noise walls determined feasible and reasonable during final design will change views to/from the roadway. Noise walls constructed of brick, which is an enhancement to the NCDOT standard noise wall, are located along the other sections of I-440. Median planters, which also existing along other sections of I-440, could enhance the appearance of this section of I-440.									
MITIGATION	Enhanced noise wall treatments and installation of median planters are dependent on cost-sharing participation by the City of Raleigh. Cost-sharing agreements would be finalized during final design.									

PART 1

U-2719 – I-440 Improvements Environmental Assessment

IMPACT SUMMARY TABLE – PART 1 – SOUTH OF WALNUT ST TO LIGON ST

Resource	DETAILED STUDY ALTERNATIVES – Alternatives from south of Walnut St to Ligon St									
	From south of Walnut St to I-40 Interchange	Jones Franklin Rd Interchange	Athens Dr Grade Separation		Melbourne Rd Interchange		Western Blvd Interchange	Ligon St Grade Separation		
		Upgrade Existing Partial Clover	Bridge in Place	Bridge to North	Bridge in Place	Bridge to North	Double Crossover Diamond	Bridge to North	Bridge to South	Extend Existing Traffic Culvert
HISTORIC RESOURCES IMPACTS										
# of Historic Resources in Area	0	0	0	0	0	0	0	2		
Historic Resources with "No Effect"	0	0	0	0	0	0	0	0		
Historic Resources with "No Adverse Effect"	0	0	0	0	0	0	0	Oak Grove Cemetery & Berry O'Kelly School Historic District		
Historic Resources with "Adverse Effect"	0	0	0	0	0	0	0			
MITIGATION	During final design of the Selected Alternative, the design near Berry O'Kelly School Historic District will be reviewed to ensure any applicable conditions are met to maintain the No Adverse Effect determinations. If the Build Bridge to North Alternative or Existing Traffic Culvert Alternative is selected, during final design, the design near the Oak Grove Cemetery will be reviewed to ensure any applicable conditions are met to maintain the No Adverse Effect determination. If Build Bridge to South Alternative is selected, additional coordination and consultation between NCDOT, FHWA, NCHPO, and property owners must occur to explore ways to avoid and minimize impacts to Oak Grove Cemetery and include measures to mitigate adverse effects in a Memorandum of Agreement.									
SECTION 4(f)/6(f)(3) RESOURCES IMPACTS										
Section 4(f) Resources with anticipated *de minimis* Impact[5]	0	Lake Johnson Park	0	0	Kaplan Park	Kaplan Park	0	0		
Section 6(f) Resource Impacts	0	0	0	0	0	0	0	0	Oak Grove Cemetery	0
MITIGATION	Continue coordination with the City of Raleigh during final design for the areas at Lake Johnson Park and Kaplan Park. Continue coordination with City of Raleigh and Meredith College during final design for the Reedy Creek Greenway relocation. Continue coordination with the NC Museum of Art during final design for the area at Museum Park.									

PART 1

U-2719 – I-440 Improvements Environmental Assessment

IMPACT SUMMARY TABLE – PART 1 – SOUTH OF WALNUT ST TO LIGON ST

Resource	DETAILED STUDY ALTERNATIVES – Alternatives from south of Walnut St to Ligon St									
	From south of Walnut St to I-40 Interchange	Jones Franklin Rd Interchange	Athens Dr Grade Separation		Melbourne Rd Interchange		Western Blvd Interchange	Ligon St Grade Separation		
		Upgrade Existing Partial Clover	Bridge in Place	Bridge to North	Bridge in Place	Bridge to North	Double Crossover Diamond	Bridge to North	Bridge to South	Extend Existing Traffic Culvert
TRAFFIC NOISE										
Total # of Impacted Receptors	Noise impacts are predicted to occur at 496-504 receptors, depending on the combination of Detailed Study Alternatives end to end.									
TRAFFIC NOISE MITIGATION	Ten noise barriers are recommended as preliminarily feasible and reasonable for any combination of Detailed Study Alternatives end to end, which would benefit (ie, achieve 5 decibels or more of noise reduction) at approximately 508-514 receptors.									
Construction Noise Impacts	Temporary speech interference for passers-by and individuals living or working near the project. Temporary sleep disruption and impacts to general peace and usage of noise-sensitive areas.									
CONSTRUCTION NOISE MITIGATION	Low-cost and easily implemented construction noise control measures should be incorporated into the project plans and specification to the extent possible.									
AIR QUALITY IMPACTS										
Transportation Conformity	The I-440 project is in Wake County, which the EPA has determined is in attainment of the NAAQS for all criteria pollutants.									
Mobile Source Air Toxics (MSATs)	A quantitative assessment of MSATs for the project concluded MSATs are anticipated to decrease by approximately 88 percent in the project's analysis area between 2012 and 2035 under both the Build Scenario and the No-Build Scenario. Current tools and science are not adequate to quantify the health impacts from MSATs.									
UTILITIES IMPACTS										
Utility Relocation/ Replacement	None	Electric Telephone Gas Water Sewer	Electric Telephone Gas Sewer	Electric Telephone Gas Sewer	Electric Gas Water	Electric Gas Water	Electric Gas Water Sewer	Electric Gas	Electric Gas	None
Railroad Crossings	0	0	0	0	0	0	0	0	0	0
MITIGATION	Coordinate temporary and permanent changes in utility lines with each of the utility providers to minimize service disruptions.									
HAZARDOUS MATERIALS IMPACTS										
Hazardous Materials Sites Impacted	0	0	0	0	0	0	0	1 Low Risk	1 Low Risk	1 Low Risk
MITIGATION	A more detailed field reconnaissance will be conducted by NCDOT for the Selected Alternative.									

PART 1

U-2719 – I-440 Improvements Environmental Assessment

IMPACT SUMMARY TABLE – PART 1 – SOUTH OF WALNUT ST TO LIGON ST

Resource	DETAILED STUDY ALTERNATIVES – Alternatives from south of Walnut St to Ligon St									
	From south of Walnut St to I-40 Interchange	Jones Franklin Rd Interchange	Athens Dr Grade Separation		Melbourne Rd Interchange		Western Blvd Interchange	Ligon St Grade Separation		
		Upgrade Existing Partial Clover	Bridge in Place	Bridge to North	Bridge in Place	Bridge to North	Double Crossover Diamond	Bridge to North	Bridge to South	Extend Existing Traffic Culvert
FLOODPLAINS/FLOODWAYS AND WATER QUALITY IMPACTS										
Floodplain and Floodway Crossings	0	Walnut Creek	0	0	0	0	0	0	0	0
# of Major Culverts/Pipes (>72" diameter)	0	2	0	0	1	1	3	0	0	0
MITIGATION	The effect of all the Detailed Study Alternatives end to end can be mitigated through proper sizing and design of hydraulic structures (culverts, bridges, and channel stabilization). A detailed hydrologic and hydraulic analysis will be conducted for the Selected Alternative. An erosion and sedimentation control plan will be prepared during final design in accordance with NCDOT guidance and best management practices.									
JURISDICTIONAL RESOURCES IMPACTS[6]										
Lakes/Ponds (sq ft) (Perm & Temp)	0	38,333	0	0	3,311	3,311	0	0	0	0
Wetlands (sq ft) (Perm & Temp)	0	958	0	0	3,180	3,180	0	0	0	0
PERMANENT STREAM IMPACTS										
Perennial Streams (linear ft)	0	367	0	0	113	113	376	51	236	51
Intermittent Streams (linear ft)	0	0	0	0	305	305	0	123	74	74
Total Permanent Impacts (linear ft)	0	367	0	0	418	418	376	174	310	125
TEMPORARY STREAM IMPACTS										
Perennial Streams (linear ft)	0	66	0	0	137	137	125	0	64	0
Intermittent Streams (linear ft)	0	165	0	0	0	0	0	0	0	0
Total Temporary Impacts (linear ft)	0	231	0	0	137	137	125	0	64	0

PART 1

U-2719 – I-440 Improvements Environmental Assessment

IMPACT SUMMARY TABLE – PART 1 – SOUTH OF WALNUT ST TO LIGON ST

Resource	DETAILED STUDY ALTERNATIVES – Alternatives from south of Walnut St to Ligon St									
	From south of Walnut St to I-40 Interchange	Jones Franklin Rd Interchange	Athens Dr Grade Separation		Melbourne Rd Interchange		Western Blvd Interchange	Ligon St Grade Separation		
		Upgrade Existing Partial Clover	Bridge in Place	Bridge to North	Bridge in Place	Bridge to North	Double Crossover Diamond	Bridge to North	Bridge to South	Extend Existing Traffic Culvert
NEUSE RIVER RIPARIAN BUFFER IMPACTS (Zone 1 plus Zone 2)										
Zone 1 (sq ft)	0	101,763	0	0	47,922	47,922	47,056	14,490	26,246	9,698
Zone 2 (sq ft)	0	43,679	0	0	25,774	25,774	28,374	16,482	19,251	9,395
Total Zone 1 + Zone 2 (sq ft)	0	145,442	0	0	73,696	73,696	75,430	30,972	45,497	19,093
RANGE OF IMPACTS	The ranges below are for the project end to end (includes data from Summary Table Parts 1 and 2) Range of Wetland Impacts (acres) – 0.1 for all alternatives (Temporary + Permanent) Range of Lake/Pond Impacts (acres) - 0.97 for all alternatives (Temporary + Permanent) Range of Total Permanent Stream Impacts (linear ft) - 1,826 – 2,145 Range of Total Temporary Stream Impacts (linear ft) - 821 – 973 Range of Total Riparian Buffer Impacts (sq ft) - 415,193 – 466,045 (9.5 – 10.7 acres (Zone 1 + Zone 2))									
MITIGATION	Obtain a Section 404 permit from the US Army Corps of Engineers. Obtain a Section 401 Water Quality Certification and written authorization for buffer impacts from the NC Dept of Environmental Quality Division of Water Resources. Final design efforts will continue to examine ways to avoid and minimize impacts to Waters of the US and Neuse River Riparian Buffers. Strict adherence to Best Management Practices will assist in minimizing project impacts.									
PROTECTED SPECIES IMPACTS										
Michaux's sumac	No Effect	No Effect	No Effect	No Effect	No Effect	No Effect	No Effect	No Effect	No Effect	No Effect
Red-cockaded woodpecker	No Effect	No Effect	No Effect	No Effect	No Effect	No Effect	No Effect	No Effect	No Effect	No Effect
Northern long-eared bat	May Effect/ Likely to Adversely Effect	May Effect/ Likely to Adversely Effect	May Effect/ Likely to Adversely Effect	May Effect/ Likely to Adversely Effect	May Effect/ Likely to Adversely Effect	May Effect/ Likely to Adversely Effect	May Effect/ Likely to Adversely Effect	May Effect/ Likely to Adversely Effect	May Effect/ Likely to Adversely Effect	May Effect/ Likely to Adversely Effect
Bald eagle	No impact	No impact	No impact	No impact	No impact	No impact	No impact	No impact	No impact	No impact
MITIGATION	The US Fish and Wildlife Service has developed a programmatic biological opinion (PBO) in conjunction with the FHWA, USACE, and NCDOT for the northern long-eared bat in eastern North Carolina (which includes Wake County). NCDOT will coordinate with the US Fish and Wildlife Service in accordance with the PBO.									

1. This construction cost under the From South of Walnut Street to I-40 Interchange Alternative includes the mainline widening for the entire project.
2. Construction costs at Western Blvd include cost of tunneling to construct the culvert system under the interchange.
3. Right of way costs at Ligon St include the displacement of seven businesses in Brickhaven Rd under all the Detailed Study Alternatives.
4. Raleigh and NC State University want to extend Ligon St to Blue Ridge Road and allow buses to use Ligon St. The Extend Existing Traffic Culvert would not accommodate buses.
5. *De minimis* impacts to Lake Johnson Park and Kaplan Park are from a permanent drainage easement. *De minimis* impacts to Museum Park due to new right of way needed along I-440 for all Detailed Study Alternatives and a permanent drainage easement needed under the Hillsborough St and Wade Ave interchange Two Flyovers Alternative. Impacts to Reedy Creek Greenway are *de minimis* since the greenway would be replaced.
6. Impacts to jurisdictional resources calculated using a 25-foot buffer around the estimated construction limits. Lakes/ponds and wetlands impacts include permanent and temporary impacts together due to small areas of impact.

PART 2

U-2719 – I-440 Improvements Environmental Assessment

IMPACT SUMMARY TABLE – PART 2 – HILLSBOROUGH ST/WADE AVE INTERCHANGE AREA AND REEDY CREEK GREENWAY RELOCATION

Resource	DETAILED STUDY ALTERNATIVES – Alternatives from south of Walnut St to Ligon St					
	Hillsborough St/Wade Ave Interchange Area			Reedy Creek Greenway Relocation for Meredith College Main Campus		
	One Flyover	Two Flyovers	Slight Detour	Next to One Flyover	Next to Two Flyovers	Next to Slight Detour
COSTS (2017 dollars)						
Construction Costs (millions $)	$ 64.3	$ 68.7	$ 65.3	$ 0.9	$ 1.0	$ 1.0
Right-of-Way Costs (millions $)	$ 183.9	$ 180.3	$ 173.4	Included in One Flyover Cost	Included in Two Flyovers Cost	Included in Slight Detour Cost
Utility Costs (millions $)	$ 1.9	$ 1.8	$ 2.0	Included in One Flyover Cost	Included in Two Flyovers Cost	Included in Slight Detour Cost
Total Costs (millions $)	$ 250.0	$ 250.8	$ 240.6	$ 0.9	$ 1.0	$ 1.0
RANGE OF TOTAL COSTS	The ranges below are for the project end to end (includes data from Summary Table Parts 1 and 2) $ 450.4 to $ 475.3					
LAND USE						
Compatible with Local Land Use and Transportation Plans	Yes	Yes	Yes	Yes	Yes	Yes
RELOCATIONS						
Residential Relocations	1	0	1	0	0	0
Business Relocations	1 NCSU University Club	1 NCSU University Club	1 NCSU University Club	0	0	0
RANGE OF IMPACTS	The ranges below are for the project end to end (includes data from Summary Table Parts 1 and 2) Residential relocations – 27 to 46 Business relocations – 15 to 16					
MITIGATION	NCDOT will conduct the property acquisition and relocation process in accordance with the Federal Uniform Relocation Assistance and Real Property Acquisition Policies Act and the North Carolina Relocation Assistance Act.					
COMMUNITY RESOURCES						
Public Parks	Museum Park minor impact	Museum Park minor impact	Museum Park minor impact	0	0	0
Greenways	Reedy Creek Greenway minor impact	Reedy Creek Greenway minor impact	Reedy Creek Greenway minor impact	0	0	0
Private Recreational Facilities	Displacement of NCSU Golf Practice Facility and NC State University Club facilities	Displacement of NCSU Golf Practice Facility and NC State University Club facilities	Displacement of NCSU Golf Practice Facility and NC State University Club facilities	0	0	0
K-12 Schools	0	0	0	0	0	0

PART 2

U-2719 – I-440 Improvements Environmental Assessment

IMPACT SUMMARY TABLE – PART 2 – HILLSBOROUGH ST/WADE AVE INTERCHANGE AREA AND REEDY CREEK GREENWAY RELOCATION

Resource	DETAILED STUDY ALTERNATIVES – Alternatives from south of Walnut St to Ligon St					
	Hillsborough St/Wade Ave Interchange Area			Reedy Creek Greenway Relocation for Meredith College Main Campus		
	One Flyover	Two Flyovers	Slight Detour	Next to One Flyover	Next to Two Flyovers	Next to Slight Detour
Universities and Colleges	Substantial ROW needed from Meredith College and NC State University	Substantial ROW needed from Meredith College and NC State University	Substantial ROW needed from Meredith College and NC State University, but less than the other alternatives	0	0	0
Shopping Centers	0	0	0	0	0	0
MITIGATION	NCDOT will conduct the property acquisition and relocation process in accordance with the Federal Uniform Relocation Assistance and Real Property Acquisition Policies Act and the North Carolina Relocation Assistance Act.					
MOBILITY AND ACCESS CHANGES						
Permanent Impacts	The proposed project end to end would enhance mobility along I-440 and the local road network near the interchanges. Pedestrian and bicycle mobility will be improved with proposed sidewalks and bicycle lanes on cross streets (except Wade Ave).					
Temporary Impacts	Project construction would temporarily impact mobility and access in the project area during the construction period. In addition, at Athens Dr and Melbourne Rd, the Bridge in Place Alternative at each location would require temporary bridge closure and detour route (9-12 months) during construction.					
MITIGATION	A goal of the project is to keep two lanes of traffic open in each direction on I-440 to the extent feasible during construction. NCDOT will coordinate with the Wake County Public School System, transit agencies, and emergency response providers regarding detour routes and associated route changes that may be necessary during construction. NCDOT also will coordinate with the NC State Fairgrounds (including NC Department of Agriculture and Consumer Services), Carter-Finley Stadium, NC State University, Wolfpack Club, PNC Arena, Gale Force Sports (Division of Carolina Hurricanes), NC State Highway Patrol, and City of Raleigh Police Department regarding traffic flow during construction for major events at venues west of I-440 that generate major traffic on I-440.					
VISUAL RESOURCES						
Visual Impacts	Little change in views to/ from the pedestrian bridge	More change in views to/ from pedestrian bridge compared to other alternatives	Little change in views to/ from the pedestrian bridge	0	0	0
Other aesthetic considerations	Noise walls determined feasible and reasonable during final design will change views to/from the roadway. Noise walls constructed of brick, which is an enhancement to the NCDOT standard noise wall, are located along the other sections of I-440. Median planters, which also existing along other sections of I-440, could enhance the appearance of this section of I-440.					
MITIGATION	Enhanced noise wall treatments and installation of median planters are dependent on cost-sharing participation by the City of Raleigh. Cost-sharing agreements would be finalized during final design.					
HISTORIC RESOURCES IMPACTS						
# of Historic Resources in Area	3	3	3	1	1	1
Historic Resources with "No Effect"	Capital City Lumber Royal Baking Co. Meredith College	Capital City Lumber Royal Baking Co. Meredith College	Capital City Lumber Royal Baking Co. Meredith College	Meredith College	Meredith College	Meredith College
Historic Resources with "No Adverse Effect"	Meredith College	Meredith College	Meredith College	Meredith College	Meredith College	Meredith College
Historic Resources with "Adverse Effect"	0	0	0	0	0	0

PART 2

U-2719 – I-440 Improvements Environmental Assessment

IMPACT SUMMARY TABLE – PART 2 – HILLSBOROUGH ST/WADE AVE INTERCHANGE AREA AND REEDY CREEK GREENWAY RELOCATION

Resource	DETAILED STUDY ALTERNATIVES – Alternatives from south of Walnut St to Ligon St					
	Hillsborough St/Wade Ave Interchange Area			Reedy Creek Greenway Relocation for Meredith College Main Campus		
	One Flyover	Two Flyovers	Slight Detour	Next to One Flyover	Next to Two Flyovers	Next to Slight Detour
MITIGATION	During final design of the Selected Alternative, the designs near Oak Grove Cemetery, Berry O'Kelly Schools Historic District and Meredith College will be reviewed to ensure any applicable conditions are met to maintain the No Adverse Effect determinations.					
SECTION 4(F)/6(F)(3) RESOURCES IMPACTS						
Section 4(f) Resources with anticipated *de minimis* Impact[5]	Reedy Creek Greenway Museum Park	Reedy Creek Greenway Museum Park	Reedy Creek Greenway Museum Park	This is a replacement option for Reedy Creek Greenway impacts	This is a replacement option for Reedy Creek Greenway impacts	This is a replacement option for Reedy Creek Greenway impacts
Section 6(f) Resource Impacts	0	0	0	0	0	0
MITIGATION	Continue coordination with the City of Raleigh during final design for the areas at Lake Johnson Park and Kaplan Park. Continue coordination with City of Raleigh and Meredith College during final design for the Reedy Creek Greenway relocation. Continue coordination with the NC Museum of Art during final design for the area at Museum Park.					
TRAFFIC NOISE						
Total # of Impacted Receptors	Noise impacts are predicted to occur at 496-504 receptors, depending on the combination of Detailed Study Alternatives end to end.					
TRAFFIC NOISE MITIGATION	Ten noise barriers are recommended as preliminarily feasible and reasonable for any combination of Detailed Study Alternatives end to end, which would benefit (ie, achieve 5 decibels or more of noise reduction) at approximately 508-514 receptors.					
Construction Noise Impacts	Temporary speech interference for passers-by and individuals living or working near the project. Temporary sleep disruption and impacts to general peace and usage of noise-sensitive areas.					
CONSTRUCTION NOISE MITIGATION	Low-cost and easily implemented construction noise control measures should be incorporated into the project plans and specification to the extent possible.					
AIR QUALITY IMPACTS						
Transportation Conformity	The I-440 project is in Wake County, which the EPA has determined is in attainment of the NAAQS for all criteria pollutants.					
Mobile Source Air Toxics (MSATs)	A quantitative assessment of MSATs for the project concluded MSATs are anticipated to decrease by approximately 88 percent in the project's analysis area between 2012 and 2035 under both the Build Scenario and the No-Build Scenario. Current tools and science are not adequate to quantify the health impacts from MSATs.					
UTILITIES IMPACTS						
Utility Relocation/ Replacement	Electric Telephone Gas Water Sewer	Electric Telephone Gas Water Sewer	Electric Telephone Gas Water Sewer	Included in One Flyover Cost	Included in Two Flyovers Cost	Included in Slight Detour Cost
Railroad Crossings	1	1	1	0	0	0
MITIGATION	Coordinate temporary and permanent changes in utility lines with each of the utility providers to minimize service disruptions.					

PART 2

U-2719 – I-440 Improvements Environmental Assessment

IMPACT SUMMARY TABLE – PART 2 – HILLSBOROUGH ST/WADE AVE INTERCHANGE AREA AND REEDY CREEK GREENWAY RELOCATION

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	Hillsborough St/Wade Ave Interchange Area			Reedy Creek Greenway Relocation for Meredith College Main Campus		
	One Flyover	Two Flyovers	Slight Detour	Next to One Flyover	Next to Two Flyovers	Next to Slight Detour
HAZARDOUS MATERIALS IMPACTS						
Hazardous Materials Sites Impacted	0	0	0	0	0	0
MITIGATION	A more detailed field reconnaissance will be conducted by NCDOT for the Selected Alternative.					
FLOODPLAINS/FLOODWAYS AND WATER QUALITY IMPACTS						
Floodplain and Floodway Crossings	1	1	1	0	0	0
# of Major Culverts/ Pipes (>72" diameter)	2	3	2	0	0	0
MITIGATION	The effect of all the Detailed Study Alternatives end to end can be mitigated through proper sizing and design of hydraulic structures (culverts, bridges, and channel stabilization). A detailed hydrologic and hydraulic analysis will be conducted for the Selected Alternative. An erosion and sedimentation control plan will be prepared during final design in accordance with NCDOT guidance and best management practices.					
JURISDICTIONAL RESOURCES IMPACTS[6]						
Lakes/Ponds (sq ft) (Perm & Temp)	0	0	0	0	0	0
Wetlands (sq ft) (Perm & Temp)	0	0	0	0	0	0
PERMANENT STREAM IMPACTS						
Perennial Streams (linear ft)	465	550	466	0	0	0
Intermittent Streams (linear ft)	75	75	75	0	0	0
Total Permanent Impacts (linear ft)	540	625	541	0	0	0
TEMPORARY STREAM IMPACTS						
Perennial Streams (linear ft)	304	391	304	0	0	0
Intermittent Streams (linear ft)	24	25	25	0	0	0
Total Temporary Impacts (linear ft)	328	416	329	0	0	0
NEUSE RIVER RIPARIAN BUFFER IMPACTS (Zone 1 plus Zone 2)						
Zone 1 (sq ft)	48,628	62,098	48,839	1,030	779	2,851
Zone 2 (sq ft)	36,748	46,194	37,012	2,953	4,738	3,801

PART 2

U-2719 – I-440 Improvements Environmental Assessment

IMPACT SUMMARY TABLE – PART 2 – HILLSBOROUGH ST/WADE AVE INTERCHANGE AREA AND REEDY CREEK GREENWAY RELOCATION

Resource	DETAILED STUDY ALTERNATIVES – Alternatives from south of Walnut St to Ligon St					
	Hillsborough St/Wade Ave Interchange Area			Reedy Creek Greenway Relocation for Meredith College Main Campus		
	One Flyover	Two Flyovers	Slight Detour	Next to One Flyover	Next to Two Flyovers	Next to Slight Detour
Total Zone 1 + Zone 2 (sq ft)	85,376	108,292	85,851	3,983	5,517	6,652
RANGE OF IMPACTS	The ranges below are for the project end to end (includes data from Summary Table Parts 1 and 2) Range of Wetland Impacts (acres) – 0.1 for all alternatives (Temporary + Permanent) Range of Pond Impacts (acres) - 0.97 for all alternatives (Temporary + Permanent) Range of Total Permanent Stream Impacts (linear ft) - 1,826 – 2,145 Range of Total Temporary Stream Impacts (linear ft) - 821 – 973 Range of Total Riparian Buffer Impacts (sq ft) - 415,193 – 466,045 (9.5 – 10.7 acres) (Zone 1 + Zone 2)					
MITIGATION	Obtain a Section 404 permit from the US Army Corps of Engineers. Obtain a Section 401 Water Quality Certification and written authorization for buffer impacts from the NC Dept of Environmental Quality Division of Water Resources. Final design efforts will continue to examine ways to avoid and minimize impacts to Waters of the US and Neuse River Riparian Buffers. Strict adherence to Best Management Practices will assist in minimizing project impacts.					
PROTECTED SPECIES IMPACTS						
Michaux's sumac	No Effect	No Effect	No Effect	No Effect	No Effect	No Effect
Red-cockaded woodpecker	No Effect	No Effect	No Effect	No Effect	No Effect	No Effect
Northern long-eared bat	May Effect/ Likely to Adversely Effect	May Effect/ Likely to Adversely Effect	May Effect/ Likely to Adversely Effect	May Effect/ Likely to Adversely Effect	May Effect/ Likely to Adversely Effect	May Effect/ Likely to Adversely Effect
Bald eagle	No Effect	No Effect	No Effect	No Effect	No Effect	No Effect
MITIGATION	The US Fish and Wildlife Service has developed a programmatic biological opinion (PBO) in conjunction with the FHWA, USACE, and NCDOT for the northern long-eared bat in eastern North Carolina (which includes Wake County). NCDOT will coordinate with the US Fish and Wildlife Service in accordance with the PBO.					

1. This construction cost under the From South of Walnut Street to I-40 Interchange Alternative includes the mainline widening for the entire project.
2. Construction costs at Western Blvd include cost of tunneling to construct the culvert system under the interchange.
3. Right of way costs at Ligon St include the displacement of seven businesses in Brickhaven Rd under all the Detailed Study Alternatives.
4. Raleigh and NC State University want to extend Ligon St to Blue Ridge Road and allow buses to use Ligon St. The Extend Existing Traffic Culvert would not accommodate buses.
5. *De minimis* impacts to Lake Johnson Park and Kaplan Park are from a permanent drainage easement. *De minimis* impacts to Museum Park due to new right of way needed along I-440 for all Detailed Study Alternatives and a permanent drainage easement needed under the Hillsborough St and Wade Ave interchange Two Flyovers Alternative. Impacts to Reedy Creek Greenway are *de minimis* since the greenway would be replaced.
6. Impacts to jurisdictional resources calculated using a 25-foot buffer around the estimated construction limits. Ponds and Wetlands impacts include permanent and temporary impacts together due to small areas of impact.

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APPENDIX D

AGENCY CORRESPONDENCE

D.1. Merger Team Concurrence Forms

Section 404/NEPA Merger Project Team Meeting Agreement
Concurrence Point No. 1 - Purpose and Need

Project No./TIP No./Name/Description:

Federal Project Number: IMSNHS-0440(10); WBS Number 35869.1.2
TIP Number: U-2719
Description: I-440 Improvements from ~~US 1~~ south of Walnut Street (SR 1313) to north of Wade Avenue (SR 1728), Wake County

Purpose and Need of Proposed Project:

The purpose of the project is to improve traffic flow and operational efficiency and enhance mobility on this segment of I-440. The overall needs for the project are described below.

- The project section of I-440 consists of four through lanes, forming a "bottleneck," with six through lanes to the north and south. The four through lanes in the project section regularly experience congestion. Traffic volumes are forecasted to increase in the future.
- The roadway and interchanges in this section of I-440 have substandard design elements such as poor sight lines, narrow shoulders and medians, and short acceleration/deceleration lanes.
- Pavement, structures, and interchanges along the project segment are in need of rehabilitation.

The Project Team concurred on this date of 22 Aug 2012 with the purpose of and need for the proposed project as stated above.

USACE _____ NCDOT _____

USEPA _____ USFWS _____

NCDWQ _____ NCWRC _____

NCDCR _____ FHWA _____

CAMPO _____

Section 404/NEPA Merger Project Team Meeting Agreement
Concurrence Point No. 2 – Detailed Study Alternatives

Project No./TIP No./Name/Description:

Federal Project Number: IMSNHS-0440(10); WBS Number 35869.1.2
TIP Number: U-2719
Description: I-440 Improvements from US 1 south of Walnut Street (SR 1313) to north of Wade Avenue (SR 1728), Wake County

Detailed Study Alternatives for the Proposed Project:

The following are the Detailed Study Alternatives for the various elements of the project:

Mainline Best Fit Alignment I-40 interchange Widen I-440 Only Southwest Quadrant Flyover Jones Franklin Road interchange Braided Partial Clover Athens Drive grade separation Replace Bridge in Place Replace Bridge to North	Melbourne Road half interchange Replace Bridge in Place Replace Bridge to North Western Boulevard interchange Double Crossover Diamond Ligon Street grade separation Traffic Culvert Two-Lane Bridge Hillsborough Street/Wade Avenue interchanges One Flyover Two Flyovers Slight Detour

The Project Team concurred on this date of 3/12/15 with the Detailed Study Alternatives for the proposed project as stated above.

USACE _____ NCDOT _____

USEPA _____ Cynthia F. Van Der Wiele 2015.03.24 12:22:44 -04'00' USFWS _____

NCDWQ _____ NCWRC _____

NCDCR _____ FHWA _____

CAMPO _____

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APPENDIX D

AGENCY CORRESPONDENCE

D.2. Historic Resources Eligibility and Effects Determinations

North Carolina Department of Cultural Resources

State Historic Preservation Office

Ramona M. Bartos, Administrator

Beverly Eaves Perdue, Governor
Linda A. Carlisle, Secretary
Jeffrey J. Crow, Deputy Secretary

Office of Archives and History
Division of Historical Resources
David Brook, Director

August 13, 2012

MEMORANDUM

TO: Leza Mundt and Jill Gurak
Office of Human Environment
NCDOT Division of Highways

FROM: Ramona M. Bartos RMB for Ramona M. Bartos

SUBJECT: Proposed Widening of I-440/US 1 from South of SR 1313 (Walnut Street) to North of SR 1728 (Wade Avenue), U-2719, Wake County, ER 12-1317

On July 26, 2012, we received notification from the State Clearinghouse concerning the above project.

There are no known archaeological sites within the proposed project area. Based on our knowledge of the area, it is unlikely that any archaeological resources that may be eligible for inclusion in the National Register of Historic Places will be affected by the project. We, therefore, recommend that no archaeological investigation be conducted in connection with this project.

We have conducted a search of our maps and files and located the following structures of historical or architectural importance within the general area of this project:

- Meredith College Campus (WA 2502) Determined Eligible in 2004 and State Study List;
- Method Historic District (WA 4073), State Study List;
- Agricultural Building of the Berry O'Kelly School (WA 3481), Local Landmark; and,
- Saint James African Methodist Episcopal Church (WA 3482), Local Landmark.

We recommend that a qualified architectural historian identify and evaluate any structures over fifty (50) years of age within the project area, and report the findings to us. The last comprehensive architectural survey of Raleigh was completed in 1991, although more recent thematic and targeted area surveys may provide additional information.

The above comments are made pursuant to Section 106 of the National Historic Preservation Act and the Advisory Council on Historic Preservation's Regulations for Compliance with Section 106 codified at 36 CFR Part 800.

Location: 109 East Jones Street, Raleigh NC 27601 **Mailing Address**: 4617 Mail Service Center, Raleigh NC 27699-4617 **Telephone/Fax**: (919) 807-6570/807-6599

Thank you for your cooperation and consideration. If you have questions concerning the above comment, please contact Renee Gledhill-Earley, environmental review coordinator, at 919-807-6579. In all future communication concerning this project, please cite the above-referenced tracking number.

cc: Mary Pope Furr, NC DOT, mfurr@ncdot.gov
State Clearinghouse

North Carolina Department of Cultural Resources
State Historic Preservation Office
Ramona M. Bartos, Administrator

Governor Pat McCrory
Secretary Susan Kluttz

Office of Archives and History
Deputy Secretary Kevin Cherry

February 4, 2014

MEMORANDUM

TO: Megan Privett
Office of Human Environment
NCDOT Division of Highways

FROM: Ramona M. Bartos RMB for Ramona M. Bartos

SUBJECT: Historic Structures Survey Report, I-440 Beltline Improvements from Walnut Street to Wade Avenue, U-2719, Wake County, ER 12-1317

Thank you for your letter of December 20, 2013, transmitting the Historic Structures Survey Report for the above-referenced undertaking. We have reviewed the report and offer the following comments.

We concur that the **Royal Baking Company (WA2503) remains eligible for listing** in the National Register of Historic Places (NRHP) under Criterion A with the boundary as listed.

We concur that the **Berry O'Kelly School Historic District (WA6527)**, including the St. James AME Church (WA3482), Berry O'Kelly School Gymnasium (WA6479), Berry O'Kelly School Agricultural Building (WA3481) as contributing elements, **is eligible for listing** under Criterion A for its importance in the areas of education, ethnic heritage, and community development; Criterion C for the architecture of its surviving features, and under Criterion B for its association with Berry O'Kelly. The boundaries as shown appear appropriate.

We concur that the **Oak Grove Cemetery (WA6649) is eligible for listing** in the NRHP under Criteria A, C and D. A study of the cemetery could yield significant information concerning African-American mortuary customs and grave markers, especially if it was done in conjunction with the other African American cemeteries in Raleigh (Oberlin, City Cemetery, Mount Hope). Please note that the Table at the beginning of the description of Oak Grove Community Cemetery (page 54) shows the cemetery is eligible under criteria A, B & C, but the text says A, C and D. The boundaries appear appropriate.

We concur that the **Method Historic District (WA4073) is not eligible** for listing in the NRHP for the reasons outlined in the report.

Location: 109 East Jones Street, Raleigh NC 27601 **Mailing Address**: 4617 Mail Service Center, Raleigh NC 27699-4617 **Telephone/Fax**: (919) 807-6570/807-6599

We are unable to concur that **Capitol City Lumber Company (WA6450)** is not eligible for listing in the NRHP. Because the description does not explain physical changes to the pre-1964 buildings and give the dates of those changes, the discussion of integrity is incomplete. When were exterior materials replaced or covered with new? How was fenestration changed and when? To what degree was the interior altered? It seems that this information could be gleaned through interviews and examination of documentary photos. Without more information, the extent and effect of the changes to the historic buildings are not clear. Further, the limited history seems to support the significance of the operation (supported "the local boom in post-war constructions when buildings materials were in short supply"; is the only surviving locally-owned lumber yard), but the evaluation of potential eligibility under Criterion A states that the company's association with Raleigh's post-war growth and industry are unexceptional. This property needs further investigation to reconcile these discrepancies.

Given that the **NCSU University Club (WA4626)** is fifty years old, we wonder why it is evaluated under Criterion Consideration G. While we would agree that the property overall and particularly the clubhouse does not appear to have sufficient integrity for eligibility, the integrity discussion does not address the numerous positive aspects of this property and that it may be of significance under Criteria A and C. Without contexts for recreation and architecture, a proper evaluation of its eligibility is not possible.

There is not enough information for a proper evaluation of the **Hillsdale Forrest Neighborhood (WA6526)**, especially Phase I. Based on the few photos provided, Phase I of the neighborhood, begun in 1962, appears to be rather intact. Construction dates from Wake County tax records would indicate whether there are too many noncontributing resources for the area to be eligible for the National Register. Without a better historic context, the statement that Hillsdale Forrest is "one of many residential subdivisions in Cary developed in the 1960s and 1970s as a result of the expansion of RTP" has little meaning. How many such neighborhoods are there from the early 1960s and how many are largely intact? Being one of many does not make the area ineligible. How does Phase I of the neighborhood one stack up in comparison to the others? If there are many such neighborhoods in Cary, eligibility would depend on a very high degree of integrity. Minus an expanded context and the author's comparing and contrasting Phase I of Hillsdale Forrest to the other 1960s neighborhoods, there is not enough information to make a final determination.

We look forward to your consideration of our above comments and welcome discussion of any points needing clarification. We will await the separate report on Meredith College once the access issues are resolved.

The above comments are made pursuant to Section 106 of the National Historic Preservation Act and the Advisory Council on Historic Preservation's Regulations for Compliance with Section 106 codified at 36 CFR Part 800.

Thank you for your cooperation and consideration. If you have questions concerning the above comment, contact Renee Gledhill-Earley, environmental review coordinator, at 919-807-6579 or renee.gledhill-earley@ncdcr.gov. In all future communication concerning this project, please cite the above referenced tracking number.

cc: Mary Pope Furr, NCDOT

North Carolina Department of Cultural Resources
State Historic Preservation Office
Ramona M. Bartos, Administrator

Governor Pat McCrory
Secretary Susan Kluttz

Office of Archives and History
Deputy Secretary Kevin Cherry

September 26, 2014

MEMORANDUM

TO: Megan Privett
Human Environment Unit
NC Department of Transportation

FROM: Renee Gledhill-Earley
Environmental Review Coordinator

SUBJECT: Addendum to Historic Structures Survey Report, I-440 Beltline Improvements, U-2719, Raleigh, Wake County, ER 12-1317

Thank you for your August 26, 2014, letter transmitting the above referenced addendum to the Historic Structures Survey Report for the above-referenced undertaking. We have reviewed the addendum and offer the following comments.

We concur that the **Capital City Lumber Company (WA6461) is eligible for listing** in the National Register of Historic Places under Criterion A for it strong associations with the port-World War II growth and development of Raleigh. The boundary as described appears appropriate.

We also concur that the **Hillsdale Forest Neighborhood (WA6526) and North Carolina State University Club (WA4626) are not eligible for listing** in the National Register for the reasons outlined in the report.

The above comments are made pursuant to Section 106 of the National Historic Preservation Act and the Advisory Council on Historic Preservation's Regulations for Compliance codified at 36 CFR Part 800.

Thank you for your cooperation and consideration. If you have questions concerning the above comment, contact me at 919-807-6579 or renee.gledhill-earley@ncdcr.gov. In all future communication concerning this project, please site the above referenced tracking number.

cc: Mary Pope Furr, NCDOT mfurr@ncdot.gov

Location: 109 East Jones Street, Raleigh NC 27601 **Mailing Address**: 4617 Mail Service Center, Raleigh NC 27699-4617 **Telephone/Fax**: (919) 807-6570/807-6599

North Carolina Department of Cultural Resources
State Historic Preservation Office
Ramona M. Bartos, Administrator

Governor Pat McCrory
Secretary Susan Kluttz

Office of Archives and History
Deputy Secretary Kevin Cherry

May 21, 2015

MEMORANDUM

TO: Mary Pope Furr
Office of Human Environment
NCDOT Division of Highways

FROM: Renee Gledhill-Earley
Environmental Review Coordinator

SUBJECT: Historic Structures Architectural Report for Meredith College Campus, I-440Improvements from Walnut Street to Wade Avenue, U-2719, Wake County, ER 12-1317

Thank you for your letter of April 24, 2015, transmitting the above-referenced report. Having reviewed the evaluation of the Meredith College Campus, we offer the following comments.

Despite the abbreviated access provided to the author, the photographic coverage and detailed building entries are impressively thorough. There is also a good college history and education context. However, the institutional architecture and landscape architecture contexts do not appear to adequately support the National Register evaluation and proposed boundaries.

The proposed boundaries are large, encompassing approximately 115 acres containing 34 primary buildings, with 16 built between 1966 and 1997, yet no argument for eligibility under Criteria Consideration G is presented. We doubt that a case for eligibility under Criterion C for architectural significance could be made as none of the post-1965 buildings appears to be exceptionally significant.

It is possible that a case for such large boundaries could be made based on landscape architecture significance, without claiming Criteria Consideration G, if the master landscape plan was developed in 1964, but there is little information about that plan beyond statements that Bell orchestrated the campus's gradual expansion. (Note: A pre-1965 date for the master plan is implied in comments about the amphitheater and lake, but the history of the campus states that the new master plan was announced in 1968.) No evidence or documentation of the master plan and its implementation is cited. Was the plan created prior to 1966 and was the post-1965 campus expansion done according to that plan? There is a bigger question that also must be answered: Is the plan significant simply because it was designed by Richard C. Bell? If the plan was designed after 1965, Criteria Consideration G would have to be supported for this area of significance as well.

Unstated in the report, the boundaries delineate a discontiguous district, with the 1966 equine center occupying the separated area to the north, across Wade Avenue. The report makes no case for the significance of this area, beyond stating that Bell and architect Ligon B. Flynn collaborated on its development and that horseback riding was popular with students.

Location: 109 East Jones Street, Raleigh NC 27601 **Mailing Address**: 4617 Mail Service Center, Raleigh NC 27699-4617 **Telephone/Fax**: (919) 807-6570/807-6599

In light of these unanswered questions and the high number of unexceptional and large post-1965 buildings beyond the historic core of the campus, we concur that **Meredith College is eligible for listing in the National Register of Historic Places** under Criterion A for its role in the history of women's education in North Carolina and Criterion C for design/construction and landscape architecture, but that the appropriate boundaries should remain those of the 2004 determination of eligibility, with an extension to the south and southeast to pull in the entrance drive and the 1964 amphitheater and lake.

The above comments are made pursuant to Section 106 of the National Historic Preservation Act and the Advisory Council on Historic Preservation's Regulations for Compliance with Section 106 codified at 36 CFR Part 800.

Thank you for your cooperation and consideration. If you have questions concerning the above comment, contact Renee Gledhill-Earley, environmental review coordinator, at 919-807-6579 or environmental.review@ncdcr.gov. In all future communication concerning this project, please cite the above referenced tracking number.

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

PAT MCCRORY
GOVERNOR

ANTHONY J. TATA
SECRETARY

May 28, 2015

Ms. Renee Gledhill-Earley
Historic Preservation Office
Department of Cultural Resources
4617 Mail Service Center
Raleigh, NC 27699-4617

Dear Ms. Gledhill-Earley:

ER 12-1317, TIP # U-2719, Eligibility Evaluation for Meredith College Campus (WA2502), Wake County

Thank you for your letter of May 21, 2015 with your comments on the eligibility evaluation of the Meredith College Campus. While your office agrees with our consultant that the campus is eligible for the National Register of Historic Places under Criteria A and C, you did not concur with the boundaries recommended in the report. For planning purposes, I would like to clarify the boundaries you suggested in your response and ask that they be incorporated into your GIS system so that all parties are utilizing the appropriate boundaries. In your letter you proposed that the boundaries remain those of the 2004 determination of eligibility, with extensions to include the entrance drive, lake, and amphitheater. Currently on your GIS system, the 2004 boundaries bisect several campus buildings so I recommend the following boundary, derived from driving and walking paths to eliminate this confusion and incorporate only pre-1965 buildings in the campus core.

MAILING ADDRESS:
NC DEPARTMENT OF TRANSPORTATION
PROJECT DEVELOPMENT AND ENVIRONMENTAL ANALYSIS
1548 MAIL SERVICE CENTER
RALEIGH NC 27699-1548

TELEPHONE: 919-707-6000
FAX: 919-250-4224
WEBSITE:
HTTPS://CONNECT.NCDOT.GOV/RESOURCES/ENVIRONMENTAL/PAGES/DEFAULT.ASPX

LOCATION:
CENTURY CENTER, BUILDING A
1000 BIRCH RIDGE DRIVE
RALEIGH NC 27610

Please let me know if you have any further comments on this proposed boundary.

Sincerely,

Mary Pope Furr
NCDOT Historic Architecture

Cc: John Williams, NCDOT, PDEA
Derrick Weaver, NCDOT PDEA
Craig Barfield, Meredith College

Federal Aid #: **IMSNHS-044(10)** ***TIP#:*** **U-2719** ***County*:** **Wake**

CONCURRENCE FORM FOR ASSESSMENT OF EFFECTS

Project Description: I-440 Beltline Improvements from Walnut Street in Cary to Wade Avenue in Raleigh

On *5/2/2017* representatives of the

- ☒ North Carolina Department of Transportation (NCDOT)
- ☒ Federal Highway Administration (FHWA)
- ☒ North Carolina State Historic Preservation Office (HPO)
- ☐ Other

Reviewed the subject project and agreed on the effects findings listed within the table on the reverse of this signature page.

Signed:

Mary Pope Furr — 5/2/2017
Representative, NCDOT — Date

Michael C Dorn — 5/2/2017
FHWA, for the Division Administrator, or other Federal Agency — Date

Renee Gledhill-Earley — 5/2/17
Representative, HPO — Date

Federal Aid #: **IMSNHS-044(10)** *TIP#:* **U-2719** *County*: **Wake**

Property and Status	Alternative	Effect Finding	Reasons
Oak Grove Cemetery DE – Criteria A,C,D	Extended culvert	No adverse effect	Some earthwork required near the cemetery but no construction within the boundaries and does not alter the setting
	Bridge north	No adverse effect	Bridge would be farther north than existing culvert, some earthwork required near the cemetery but no construction within the boundaries and does not alter the setting, NCDOT would work with community and HPO on aesthetic treatments to bridge
	Bridge south	**Adverse Effect**	Visual impacts and potential noise impacts. Bridge closer to cemetery, some earthwork required near the cemetery but no construction within the boundaries, NCDOT would work with community and HPO on aesthetic treatments to bridge
Berry O'Kelly School HD NR - Criteria A,B,C	All alternatives	No adverse effect	Addition of lanes and increased height of I-440 over railroad requires retaining wall, noise wall, and drainage structures along boundary of property, but not within. Temporary construction easement required to build the structures but no impacts to eligible resources within district. Noise wall will reduce current noise levels by 10-12 db. NCDOT will coordinate with community on appearance of back of noise wall (possible public art installation)
Capitol City Lumber Company DE – Criterion A	All alternatives	No effect	No construction within the boundaries and does not alter the setting
Royal Baking Company NR – Criterion A	All alternatives	No effect	No construction within the boundaries and does not alter the setting
Meredith College Campus DE – Criteria A,C	All alternatives	No effect	Addition of lanes and greenway rerouting requires work along the edges of the campus property but does not require construction impacts within the historic boundary and does not alter the setting

Initialed: NCDOT MPJ FHWA _____ HPO _____

FHWA Intends to use the HPO's concurrence as a basis for a "de minimis" finding for the following properties, pursuant to Section 4(f): N/A

APPENDIX E

NCDOT RELOCATION REPORTS

EIS RELOCATION REPORT

North Carolina Department of Transportation
RELOCATION ASSISTANCE PROGRAM

☒ E.I.S. ☐ CORRIDOR ☐ DESIGN

WBS ELEMENT:	35869.1.2	**COUNTY**	Wake	**Alternate**	1	**of**	14	**Alternate**
T.I.P. No.:	U-2719		WIDEN I-440 ONLY					
DESCRIPTION OF PROJECT:	I-440 Widening							

ESTIMATED DISPLACEES

Type of Displacees	Owners	Tenants	Total	Minorities
Residential	0	0	0	0
Businesses	0	0	0	0
Farms	0	0	0	0
Non-Profit	0	0	0	0

INCOME LEVEL

0-15M	15-25M	25-35M	35-50M	50 UP
0	0	0	0	0

VALUE OF DWELLING				DSS DWELLING AVAILABLE			
Owners		Tenants		For Sale		For Rent	
0-20M	0	$ 0-150	0	0-20M	0	$ 0-150	0
20-40M	0	150-250	0	20-40M	0	150-250	0
40-70M	0	250-400	0	40-70M	4	250-400	0
70-100M	0	400-600	0	70-100M	14	400-600	2
100 UP	0	600 UP	0	100 UP	1242	600 UP	316
TOTAL	0		0		1260		318

ANSWER ALL QUESTIONS

Yes	No	*Explain all "YES" answers.*	
☐	x	1.	Will special relocation services be necessary?
☐	x	2.	Will schools or churches be affected by displacement?
x	☐	3.	Will business services still be available after project?
	x	4.	Will any business be displaced? If so, indicate size, type, estimated number of employees, minorities, etc.
☐	x	5.	Will relocation cause a housing shortage?
		6.	Source for available housing (list).
☐	x	7.	Will additional housing programs be needed?
x	☐	8.	Should Last Resort Housing be considered?
☐	x	9.	Are there large, disabled, elderly, etc. families?
☐	x	10.	Will public housing be needed for project?
x	☐	11.	Is public housing available?
x	☐	12.	Is it felt there will be adequate DSS housing housing available during relocation period?
☐	x	13.	Will there be a problem of housing within financial means?
x	☐	14.	Are suitable business sites available (list source).
		15.	Number months estimated to complete RELOCATION? 0

REMARKS (Respond by Number)

3. An ample supply of similar businesses will remain available.

6. MLS, Newspapers, private real estate market.
8. As required by law.
11. Wake County and Raleigh city public housing along with Section 8.
12. DSS housing will be available or built if necessary.
14. Same as #6 above.

NOTE: No Relocation involved. This is a negative EIS report.

	3/17/17		3/23/17
Right of Way Agent	Date	Relocation Coordinator	Date

FRM15-E

EIS RELOCATION REPORT

North Carolina Department of Transportation
RELOCATION ASSISTANCE PROGRAM

☒ E.I.S. ☐ CORRIDOR ☐ DESIGN

WBS ELEMENT:	35869.1.2	**COUNTY**	Wake	**Alternate** 2 **of** 14 **Alternate**	
T.I.P. No.:	U-2719		JONES FRANKLIN ROAD		
DESCRIPTION OF PROJECT:	I-440 Widening				

ESTIMATED DISPLACEES

Type of Displacees	Owners	Tenants	Total	Minorities
Residential	5	18	23	8
Businesses	2	5	7	1
Farms	0	0	0	0
Non-Profit	0	0	0	0

INCOME LEVEL

0-15M	15-25M	25-35M	35-50M	50 UP
0	0	0	5	18

VALUE OF DWELLING				DSS DWELLING AVAILABLE			
Owners		Tenants		For Sale		For Rent	
0-20M	0	$ 0-150	0	0-20M	0	$ 0-150	0
20-40M	0	150-250	0	20-40M	0	150-250	0
40-70M	0	250-400	0	40-70M	4	250-400	0
70-100M	0	400-600	0	70-100M	14	400-600	2
100 UP	5	600 UP	18	100 UP	1242	600 UP	316
TOTAL	5		18		1260		318

ANSWER ALL QUESTIONS

Yes	No	Explain all "YES" answers.
☐	X	1. Will special relocation services be necessary?
☐	X	2. Will schools or churches be affected by displacement?
X	☐	3. Will business services still be available after project?
X	☐	4. Will any business be displaced? If so, indicate size, type, estimated number of employees, minorities, etc.
☐	X	5. Will relocation cause a housing shortage?
		6. Source for available housing (list).
☐	X	7. Will additional housing programs be needed?
X	☐	8. Should Last Resort Housing be considered?
☐	X	9. Are there large, disabled, elderly, etc. families?
☐	X	10. Will public housing be needed for project?
X	☐	11. Is public housing available?
X	☐	12. Is it felt there will be adequate DSS housing housing available during relocation period?
☐	X	13. Will there be a problem of housing within financial means?
X	☐	14. Are suitable business sites available (list source).
		15. Number months estimated to complete RELOCATION? 18-24 months

REMARKS (Respond by Number)

3. An ample supply of similar businesses will remain available.

4 Crossroads Vet. Small, Vet 8 emp. 2 minorities
Triangle Center for Spiritual Living, Small, 6-8 emp. 3 minorities
Ecosystem Planning, Small 3-5 emp. 1 minority
Learn with Best Ed. Center, Small, 6-8 emp. 2 minorities
Dana McCall DDS, Small, 4-6 emp. 2 minorities
Triangle Strings, Small, 2-4 emp. 1 minority
Bojangles Corp., Ave. 12-20 emp. 6 minorities

6. MLS, Newspapers, private real estate market.

8. As required by law.

11. Wake County and Raleigh city public housing along with Section 8.

12. DSS housing will be available or built if necessary.

14. Same as #6 above.

	3/17/17		3/23/17
Right of Way Agent	Date	Relocation Coordinator	Date

EIS RELOCATION REPORT

North Carolina Department of Transportation
RELOCATION ASSISTANCE PROGRAM

☒ E.I.S. ☐ CORRIDOR ☐ DESIGN

WBS ELEMENT:	35869.1.2	COUNTY	Wake	Alternate 3 of 14 Alternate	
T.I.P. No.:	U-2719		ATHENS DRIVE BRIDGE IN PLACE		
DESCRIPTION OF PROJECT:	I-440 Widening				

ESTIMATED DISPLACEES

Type of Displacees	Owners	Tenants	Total	Minorities
Residential	0	0	0	0
Businesses	0	0	0	0
Farms	0	0	0	0
Non-Profit	0	0	0	0

INCOME LEVEL

0-15M	15-25M	25-35M	35-50M	50 UP
0	0	0	0	0

VALUE OF DWELLING				DSS DWELLING AVAILABLE			
Owners		Tenants		For Sale		For Rent	
0-20M	0	$ 0-150	0	0-20M	0	$ 0-150	0
20-40M	0	150-250	0	20-40M	0	150-250	0
40-70M	0	250-400	0	40-70M	4	250-400	0
70-100M	0	400-600	0	70-100M	14	400-600	2
100 UP	0	600 UP	0	100 UP	1242	600 UP	316
TOTAL	0		0		1260		318

ANSWER ALL QUESTIONS

Yes	No	Explain all "YES" answers.	
☐	x	1.	Will special relocation services be necessary?
☐	x	2.	Will schools or churches be affected by displacement?
x	☐	3.	Will business services still be available after project?
	x	4.	Will any business be displaced? If so, indicate size, type, estimated number of employees, minorities, etc.
☐	x	5.	Will relocation cause a housing shortage?
		6.	Source for available housing (list).
☐	x	7.	Will additional housing programs be needed?
x	☐	8.	Should Last Resort Housing be considered?
☐	x	9.	Are there large, disabled, elderly, etc. families?
☐	x	10.	Will public housing be needed for project?
x	☐	11.	Is public housing available?
x	☐	12.	Is it felt there will be adequate DSS housing housing available during relocation period?
☐	x	13.	Will there be a problem of housing within financial means?
x	☐	14.	Are suitable business sites available (list source).
		15.	Number months estimated to complete RELOCATION? 0

REMARKS (Respond by Number)

3. An ample supply of similar businesses will remain available.
4.
6. MLS, Newspapers, private real estate market.
8. As required by law.
11. Wake County and Raleigh city public housing along with Section 8.
12. DSS housing will be available or built if necessary.
14. Same as #6 above.

NOTE: No Relocation involved. This is a negative EIS report.

[signature]	3/17/17	[signature]	3/23/17
Right of Way Agent	Date	Relocation Coordinator	Date

FRM15-E

EIS RELOCATION REPORT

North Carolina Department of Transportation
RELOCATION ASSISTANCE PROGRAM

☒ E.I.S. ☐ CORRIDOR ☐ DESIGN

WBS ELEMENT:	35869.1.2	**COUNTY**	Wake	**Alternate** 4 **of** 14 **Alternate**	
T.I.P. No.:	U-2719		ATHENS DRIVE BRIDGE NORTH		
DESCRIPTION OF PROJECT:	I-440 Widening				

ESTIMATED DISPLACEES

Type of Displacees	Owners	Tenants	Total	Minorities
Residential	4	1	5	2
Businesses	0	0	0	0
Farms	0	0	0	0
Non-Profit	0	0	0	0

INCOME LEVEL

0-15M	15-25M	25-35M	35-50M	50 UP
			1	4

VALUE OF DWELLING				DSS DWELLING AVAILABLE			
Owners		Tenants		For Sale		For Rent	
0-20M	0	$ 0-150	0	0-20M	0	$ 0-150	0
20-40M	0	150-250	0	20-40M	0	150-250	0
40-70M	0	250-400	0	40-70M	4	250-400	0
70-100M	0	400-600	0	70-100M	14	400-600	2
100 UP	4	600 UP	1	100 UP	1242	600 UP	316
TOTAL	4		1		1260		318

ANSWER ALL QUESTIONS

Yes	No	Explain all "YES" answers.
☐	X	1. Will special relocation services be necessary?
☐	X	2. Will schools or churches be affected by displacement?
X	☐	3. Will business services still be available after project?
	X	4. Will any business be displaced? If so, indicate size, type, estimated number of employees, minorities, etc.
☐	X	5. Will relocation cause a housing shortage?
		6. Source for available housing (list).
☐	X	7. Will additional housing programs be needed?
X	☐	8. Should Last Resort Housing be considered?
☐	X	9. Are there large, disabled, elderly, etc. families?
☐	X	10. Will public housing be needed for project?
X	☐	11. Is public housing available?
X	☐	12. Is it felt there will be adequate DSS housing housing available during relocation period?
☐	X	13. Will there be a problem of housing within financial means?
X	☐	14. Are suitable business sites available (list source).
		15. Number months estimated to complete RELOCATION? 12-18

REMARKS (Respond by Number)

3. An ample supply of similar businesses will remain available.

6. MLS, Newspapers, private real estate market.
8. As required by law.
11. Wake County and Raleigh city public housing along with Section 8.
12. DSS housing will be available or built if necessary.
14. Same as #6 above.

Right of Way Agent	3/17/17 Date	Relocation Coordinator	3/23/17 Date

FRM15-E

EIS RELOCATION REPORT

North Carolina Department of Transportation
RELOCATION ASSISTANCE PROGRAM

☒ E.I.S. ☐ CORRIDOR ☐ DESIGN

WBS ELEMENT:	35869.1.2	COUNTY	Wake	Alternate 5 of 14 Alternate	
T.I.P. No.:	U-2719		MELBOURNE ROAD BRIDGE IN PLACE		
DESCRIPTION OF PROJECT:	I-440 Widening				

ESTIMATED DISPLACEES

Type of Displacees	Owners	Tenants	Total	Minorities
Residential	2	1	3	1
Businesses	0	0	0	0
Farms	0	0	0	0
Non-Profit	0	0	0	0

INCOME LEVEL

0-15M	15-25M	25-35M	35-50M	50 UP
0	0	0	1	2

ANSWER ALL QUESTIONS

Yes	No	Explain all "YES" answers.	
☐	x	1.	Will special relocation services be necessary?
☐	x	2.	Will schools or churches be affected by displacement?
x	☐	3.	Will business services still be available after project?
	x	4.	Will any business be displaced? If so, indicate size, type, estimated number of employees, minorities, etc.
☐	x	5.	Will relocation cause a housing shortage?
		6.	Source for available housing (list).
☐	x	7.	Will additional housing programs be needed?
x	☐	8.	Should Last Resort Housing be considered?
☐	x	9.	Are there large, disabled, elderly, etc. families?
☐	x	10.	Will public housing be needed for project?
x	☐	11.	Is public housing available?
x	☐	12.	Is it felt there will be adequate DSS housing housing available during relocation period?
☐	x	13.	Will there be a problem of housing within financial means?
x	☐	14.	Are suitable business sites available (list source).
		15.	Number months estimated to complete RELOCATION? 12-18

VALUE OF DWELLING

Owners		Tenants	
0-20M	0	$ 0-150	0
20-40M	0	150-250	0
40-70M	0	250-400	0
70-100M	0	400-600	0
100 UP	2	600 UP	1
TOTAL	2		1

DSS DWELLING AVAILABLE

For Sale		For Rent	
0-20M	0	$ 0-150	0
20-40M	0	150-250	0
40-70M	4	250-400	0
70-100M	14	400-600	2
100 UP	1242	600 UP	316
	1260		318

REMARKS (Respond by Number)

3. An ample supply of similar businesses will remain available.

6. MLS, Newspapers, private real estate market.
8. As required by law.
11. Wake County and Raleigh city public housing along with Section 8.
12. DSS housing will be available or built if necessary.
14. Same as #6 above.

[signature]	3/17/17	[signature]	3/23/17
Right of Way Agent	Date	Relocation Coordinator	Date

FRM15-E

EIS RELOCATION REPORT

North Carolina Department of Transportation
RELOCATION ASSISTANCE PROGRAM

☒ E.I.S. ☐ CORRIDOR ☐ DESIGN

WBS ELEMENT:	35869.1.2	**COUNTY**	Wake	**Alternate** 6 **of** 14 **Alternate**	
T.I.P. No.:	U-2719		MELBOURNE ROAD BRIDGE NORTH		
DESCRIPTION OF PROJECT:	I-440 Widening				

ESTIMATED DISPLACEES

Type of Displacees	Owners	Tenants	Total	Minorities
Residential	2	4	6	2
Businesses	0	0	0	0
Farms	0	0	0	0
Non-Profit	0	0	0	0

ANSWER ALL QUESTIONS

Yes	No	Explain all "YES" answers.	
☐	X	1.	Will special relocation services be necessary?
☐	X	2.	Will schools or churches be affected by displacement?
X	☐	3.	Will business services still be available after project?
	X	4.	Will any business be displaced? If so, indicate size, type, estimated number of employees, minorities, etc.
☐	X	5.	Will relocation cause a housing shortage?
		6.	Source for available housing (list).
☐	X	7.	Will additional housing programs be needed?
X	☐	8.	Should Last Resort Housing be considered?
☐	X	9.	Are there large, disabled, elderly, etc. families?
☐	X	10.	Will public housing be needed for project?
X	☐	11.	Is public housing available?
X	☐	12.	Is it felt there will be adequate DSS housing housing available during relocation period?
☐	X	13.	Will there be a problem of housing within financial means?
X	☐	14.	Are suitable business sites available (list source).
		15.	Number months estimated to complete RELOCATION? 12-18

INCOME LEVEL

0-15M	15-25M	25-35M	35-50M	50 UP
0	0	0	3	3

VALUE OF DWELLING / DSS DWELLING AVAILABLE

Owners		Tenants		For Sale		For Rent	
0-20M	0	$ 0-150	0	0-20M	0	$ 0-150	0
20-40M	0	150-250	0	20-40M	0	150-250	0
40-70M	0	250-400	0	40-70M	4	250-400	0
70-100M	0	400-600	0	70-100M	14	400-600	2
100 UP	2	600 UP	4	100 UP	1242	600 UP	316
TOTAL	2		4		1260		318

REMARKS (Respond by Number)

3. An ample supply of similar businesses will remain available.
4.
6. MLS, Newspapers, private real estate market.
8. As required by law.
11. Wake County and Raleigh city public housing along with Section 8.
12. DSS housing will be available or built if necessary.
14. Same as #6 above.

[signature]	3/17/17	[signature]	3/23/17
Right of Way Agent	Date	Relocation Coordinator	Date

FRM15-E

EIS RELOCATION REPORT

North Carolina Department of Transportation
RELOCATION ASSISTANCE PROGRAM

☒ E.I.S. ☐ CORRIDOR ☐ DESIGN

WBS ELEMENT:	35869.1.2	COUNTY	Wake	Alternate 7 of 14 Alternate	
T.I.P. No.:	U-2719		WESTERN BLVD. DOUBLE CROSS		
DESCRIPTION OF PROJECT:	I-440 Widening				

ESTIMATED DISPLACEES

Type of Displacees	Owners	Tenants	Total	Minorities
Residential	1	0	1	0
Businesses	0	0	0	0
Farms	0	0	0	0
Non-Profit	0	0	0	0

INCOME LEVEL

0-15M	15-25M	25-35M	35-50M	50 UP
0	0	0	0	1

ANSWER ALL QUESTIONS

Yes	No	Explain all "YES" answers.
☐	x	1. Will special relocation services be necessary?
☐	x	2. Will schools or churches be affected by displacement?
x	☐	3. Will business services still be available after project?
	x	4. Will any business be displaced? If so, indicate size, type, estimated number of employees, minorities, etc.
☐	x	5. Will relocation cause a housing shortage?
		6. Source for available housing (list).
☐	x	7. Will additional housing programs be needed?
x	☐	8. Should Last Resort Housing be considered?
☐	x	9. Are there large, disabled, elderly, etc. families?
☐	x	10. Will public housing be needed for project?
x	☐	11. Is public housing available?
x	☐	12. Is it felt there will be adequate DSS housing housing available during relocation period?
☐	x	13. Will there be a problem of housing within financial means?
x	☐	14. Are suitable business sites available (list source).
		15. Number months estimated to complete RELOCATION? 12-18

VALUE OF DWELLING

Owners		Tenants	
0-20M	0	$ 0-150	0
20-40M	0	150-250	0
40-70M	0	250-400	0
70-100M	0	400-600	0
100 UP	1	600 UP	0
TOTAL	1		0

DSS DWELLING AVAILABLE

For Sale		For Rent	
0-20M	0	$ 0-150	0
20-40M	0	150-250	0
40-70M	4	250-400	0
70-100M	14	400-600	2
100 UP	1242	600 UP	316
	1260		318

REMARKS (Respond by Number)

3. An ample supply of similar businesses will remain available.
4.
6. MLS, Newspapers, private real estate market.
8. As required by law.
11. Wake County and Raleigh city public housing along with Section 8.
12. DSS housing will be available or built if necessary.
14. Same as #6 above.

[signature]	3/17/17	[signature]	3/23/17
Right of Way Agent	Date	Relocation Coordinator	Date

FRM15-E

EIS RELOCATION REPORT

North Carolina Department of Transportation
RELOCATION ASSISTANCE PROGRAM

☒ E.I.S. ☐ CORRIDOR ☐ DESIGN

WBS ELEMENT:	35869.1.2	COUNTY	Wake	Alternate 8 of 14 Alternate
T.I.P. No.:	U-2719		LIGON STREET ONE LANE	
DESCRIPTION OF PROJECT:	I-440 Widening			

ESTIMATED DISPLACEES

Type of Displacees	Owners	Tenants	Total	Minorities
Residential	0	0	0	0
Businesses	1	6	7	0
Farms	0	0	0	0
Non-Profit	0	0	0	0

INCOME LEVEL

0-15M	15-25M	25-35M	35-50M	50 UP
0	0	0	0	0

VALUE OF DWELLING				DSS DWELLING AVAILABLE			
Owners		Tenants		For Sale		For Rent	
0-20M	0	$ 0-150	0	0-20M	0	$ 0-150	0
20-40M	0	150-250	0	20-40M	0	150-250	0
40-70M	0	250-400	0	40-70M	4	250-400	0
70-100M	0	400-600	0	70-100M	14	400-600	2
100 UP	0	600 UP	0	100 UP	1242	600 UP	316
TOTAL	0		0		1260		318

ANSWER ALL QUESTIONS

Yes	No	Explain all "YES" answers.
☐	X	1. Will special relocation services be necessary?
☐	X	2. Will schools or churches be affected by displacement?
X	☐	3. Will business services still be available after project?
X	☐	4. Will any business be displaced? If so, indicate size, type, estimated number of employees, minorities, etc.
☐	X	5. Will relocation cause a housing shortage?
		6. Source for available housing (list).
☐	X	7. Will additional housing programs be needed?
X	☐	8. Should Last Resort Housing be considered?
☐	X	9. Are there large, disabled, elderly, etc. families?
☐	X	10. Will public housing be needed for project?
X	☐	11. Is public housing available?
X	☐	12. Is it felt there will be adequate DSS housing housing available during relocation period?
☐	X	13. Will there be a problem of housing within financial means?
X	☐	14. Are suitable business sites available (list source).
		15. Number months estimated to complete RELOCATION? 18-24

REMARKS (Respond by Number)

3. An ample supply of similar businesses will remain available.

4 IR-4 Field Res. Ctr. Small, research, 4-8, 2 minorities
4-H Youth Devlopment, Small, Service, 8-10 emp. 4 minorities
NC FFA Assoc. Small, Service, 6-10 emp. 2 minorities
NC FFA Foundation, Small, Service, 4-6 emp. 2 minorities
NC Dept. of AG, Medium, Service, 12-20 emp. 8 minorities
Gregg Museum Office, Small Service 6-8 emp. 2 minorities
Research Annex, Small Research 6-8 emp. 2 minorities

6. MLS, Newspapers, private real estate market.

8. As required by law.

11. Wake County and Raleigh city public housing along with Section 8.

12. DSS housing will be available or built if necessary.

14. Same as #6 above.

Right of Way Agent	3/17/17 Date	Relocation Coordinator	3/23/17 Date

EIS RELOCATION REPORT

North Carolina Department of Transportation
RELOCATION ASSISTANCE PROGRAM

☒ E.I.S. ☐ CORRIDOR ☐ DESIGN

WBS ELEMENT:	35869.1.2	COUNTY	Wake	Alternate 9 of 14 Alternate	
T.I.P. NO.:	U-2719		LIGON STREET BRIDGE SOUTH		
DESCRIPTION OF PROJECT:	I-440 Widening				

ESTIMATED DISPLACEES

Type of Displacees	Owners	Tenants	Total	Minorities
Residential	0	0	0	0
Businesses	4	4	8	0
Farms	0	0	0	0
Non-Profit	0	0	0	0

INCOME LEVEL

0-15M	15-25M	25-35M	35-50M	50 UP
0	0	0	0	0

VALUE OF DWELLING				DSS DWELLING AVAILABLE			
Owners		Tenants		For Sale		For Rent	
0-20M	0	$ 0-150	0	0-20M	0	$ 0-150	0
20-40M	0	150-250	0	20-40M	0	150-250	0
40-70M	0	250-400	0	40-70M	4	250-400	0
70-100M	0	400-600	0	70-100M	14	400-600	2
100 UP	0	600 UP	0	100 UP	1242	600 UP	316
TOTAL	0		0		1260		318

ANSWER ALL QUESTIONS

Yes	No	Explain all "YES" answers.
☐	X	1. Will special relocation services be necessary?
☐	X	2. Will schools or churches be affected by displacement?
X	☐	3. Will business services still be available after project?
X	☐	4. Will any business be displaced? If so, indicate size, type, estimated number of employees, minorities, etc.
☐	X	5. Will relocation cause a housing shortage?
		6. Source for available housing (list).
☐	X	7. Will additional housing programs be needed?
X	☐	8. Should Last Resort Housing be considered?
☐	X	9. Are there large, disabled, elderly, etc. families?
☐	X	10. Will public housing be needed for project?
X	☐	11. Is public housing available?
X	☐	12. Is it felt there will be adequate DSS housing housing available during relocation period?
☐	X	13. Will there be a problem of housing within financial means?
X	☐	14. Are suitable business sites available (list source).
		15. Number months estimated to complete RELOCATION? 18-24

REMARKS (Respond by Number)

3. An ample supply of similar businesses will remain available.

4 IR-4 Field Res. Ctr. Small, research, 4-8, 2 minorities
4-H Youth Devlopment, Small, Service, 8-10 emp. 4 minorities
NC FFA Assoc. Small, Service, 6-10 emp. 2 minorities
NC FFA Foundation, Small, Service, 4-6 emp. 2 minorities
NC Dept. of AG, Medium, Service, 12-20 emp. 8 minorities
Gregg Museum Office, Small Service 6-8 emp. 2 minorities
Research Annex, Small Research 6-8 emp. 2 minorities
NCSU Plant Research, Medium Research 18-24 emp. 8 minorities

6. MLS, Newspapers, private real estate market.

8. As required by law.

11. Wake County and Raleigh city public housing along with Section 8.

12. DSS housing will be available or built if necessary.

14. Same as #6 above.

Right of Way Agent	3/17/17 Date	Relocation Coordinator	3/28/17 Date

FRM15-E

EIS RELOCATION REPORT

North Carolina Department of Transportation
RELOCATION ASSISTANCE PROGRAM

☒ E.I.S. ☐ CORRIDOR ☐ DESIGN

WBS ELEMENT:	35869.1.2	**COUNTY**	Wake	**Alternate** 10 **of** 14 **Alternate**	
T.I.P. No.:	U-2719		LIGON STREET BRIDGE NORTH		
DESCRIPTION OF PROJECT:	I-440 Widening				

ESTIMATED DISPLACEES

Type of Displacees	Owners	Tenants	Total	Minorities
Residential	0	10	10	5
Businesses	1	6	7	0
Farms	0	0	0	0
Non-Profit	0	0	0	0

INCOME LEVEL

0-15M	15-25M	25-35M	35-50M	50 UP
0	0	0	10	0

VALUE OF DWELLING				DSS DWELLING AVAILABLE			
Owners		Tenants		For Sale		For Rent	
0-20M	0	$ 0-150	0	0-20M	0	$ 0-150	0
20-40M	0	150-250	0	20-40M	0	150-250	0
40-70M	0	250-400	0	40-70M	4	250-400	0
70-100M	0	400-600	0	70-100M	14	400-600	2
100 UP	0	600 UP	10	100 UP	1242	600 UP	316
TOTAL	0		10		1260		318

ANSWER ALL QUESTIONS

Yes	No	Explain all "YES" answers.	
☐	X	1.	Will special relocation services be necessary?
☐	X	2.	Will schools or churches be affected by displacement?
X	☐	3.	Will business services still be available after project?
X	☐	4.	Will any business be displaced? If so, indicate size, type, estimated number of employees, minorities, etc.
☐	X	5.	Will relocation cause a housing shortage?
		6.	Source for available housing (list).
☐	X	7.	Will additional housing programs be needed?
X	☐	8.	Should Last Resort Housing be considered?
☐	X	9.	Are there large, disabled, elderly, etc. families?
☐	X	10.	Will public housing be needed for project?
X	☐	11.	Is public housing available?
X	☐	12.	Is it felt there will be adequate DSS housing housing available during relocation period?
☐	X	13.	Will there be a problem of housing within financial means?
X	☐	14.	Are suitable business sites available (list source).
		15.	Number months estimated to complete RELOCATION? 18-24

REMARKS (Respond by number)

3. An ample supply of similar businesses will remain available.

4 IR-4 Field Res. Ctr. Small, research, 4-8, 2 minorities
4-H Youth Devlopment, Small, Service, 8-10 emp. 4 minorities
NC FFA Assoc. Small, Service, 6-10 emp. 2 minorities
NC FFA Foundation, Small, Service, 4-6 emp. 2 minorities
NC Dept. of AG, Medium, Service, 12-20 emp. 8 minorities
Gregg Museum Office, Small Service 6-8 emp. 2 minorities
Research Annex, Small Research 6-8 emp. 2 minorities

6. MLS, Newspapers, private real estate market.

8. As required by law.

11. Wake County and Raleigh city public housing along with Section 8.

12. DSS housing will be available or built if necessary.

14. Same as #6 above.

Right of Way Agent	3/17/17 Date	Relocation Coordinator	3/23/17 Date

FRM15-E

EIS RELOCATION REPORT

North Carolina Department of Transportation
RELOCATION ASSISTANCE PROGRAM

☒ E.I.S. ☐ CORRIDOR ☐ DESIGN

WBS ELEMENT:	35869.1.2	COUNTY	Wake	Alternate 11 of 14 Alternate	
T.I.P. No.:	U-2719		WADE-HILLSBOROUGH ONE FLYOVER		
DESCRIPTION OF PROJECT:	I-440 Widening				

ESTIMATED DISPLACEES

Type of Displacees	Owners	Tenants	Total	Minorities
Residential	0	1	1	0
Businesses	1	0	1	0
Farms	0	0	0	0
Non-Profit	0	0	0	0

ANSWER ALL QUESTIONS

Yes	No	Explain all "YES" answers.	
☐	x	1.	Will special relocation services be necessary?
☐	x	2.	Will schools or churches be affected by displacement?
x	☐	3.	Will business services still be available after project?
x	☐	4.	Will any business be displaced? If so, indicate size, type, estimated number of employees, minorities, etc.
☐	x	5.	Will relocation cause a housing shortage?
		6.	Source for available housing (list).
☐	x	7.	Will additional housing programs be needed?
x	☐	8.	Should Last Resort Housing be considered?
☐	x	9.	Are there large, disabled, elderly, etc. families?
☐	x	10.	Will public housing be needed for project?
x	☐	11.	Is public housing available?
x	☐	12.	Is it felt there will be adequate DSS housing housing available during relocation period?
☐	x	13.	Will there be a problem of housing within financial means?
x	☐	14.	Are suitable business sites available (list source).
		15.	Number months estimated to complete RELOCATION? 12-18

INCOME LEVEL

0-15M	15-25M	25-35M	35-50M	50 UP
0	0	0	0	1

VALUE OF DWELLING

Owners		Tenants	
0-20M	0	$ 0-150	0
20-40M	0	150-250	0
40-70M	0	250-400	0
70-100M	0	400-600	0
100 UP	0	600 UP	1
TOTAL	0		1

DSS DWELLING AVAILABLE

For Sale		For Rent	
0-20M	0	$ 0-150	0
20-40M	0	150-250	0
40-70M	4	250-400	0
70-100M	14	400-600	2
100 UP	1242	600 UP	316
	1260		318

REMARKS (Respond by Number)

3. An ample supply of similar businesses will remain available.
4. N.C. State Faculty Club, Medium, Club, 12-20 emp. 8 minorities
6. MLS, Newspapers, private real estate market.
8. As required by law.
11. Wake County and Raleigh city public housing along with Section 8.
12. DSS housing will be available or built if necessary.
14. Same as #6 above.

[signature]	3/17/17	[signature]	3/23/17
Right of Way Agent	Date	Relocation Coordinator	Date

FRM15-E

EIS RELOCATION REPORT

North Carolina Department of Transportation
RELOCATION ASSISTANCE PROGRAM

☒ E.I.S. ☐ CORRIDOR ☐ DESIGN

WBS ELEMENT:	35869.1.2	**COUNTY**	Wake	**Alternate** 12 **of** 14	**Alternate**
T.I.P. No.:	U-2719		WADE-HILLSBOROUGH TWO FLYOVERS		
DESCRIPTION OF PROJECT:	I-440 Widening				

ESTIMATED DISPLACEES

Type of Displacees	Owners	Tenants	Total	Minorities
Residential	0	0	0	0
Businesses	1	0	1	0
Farms	0	0	0	0
Non-Profit	0	0	0	0
	0			

Yes	No	Explain all "YES" answers.
☐	x	1. Will special relocation services be necessary?
☐	x	2. Will schools or churches be affected by displacement?
x	☐	3. Will business services still be available after project?
x	☐	4. Will any business be displaced? If so, indicate size, type, estimated number of employees, minorities, etc.
☐	x	5. Will relocation cause a housing shortage?
		6. Source for available housing (list).
☐	x	7. Will additional housing programs be needed?
x	☐	8. Should Last Resort Housing be considered?
☐	x	9. Are there large, disabled, elderly, etc. families?
☐	x	10. Will public housing be needed for project?
x	☐	11. Is public housing available?
x	☐	12. Is it felt there will be adequate DSS housing housing available during relocation period?
☐	x	13. Will there be a problem of housing within financial means?
x	☐	14. Are suitable business sites available (list source).
		15. Number months estimated to complete RELOCATION? 12-18

INCOME LEVEL

0-15M	15-25M	25-35M	35-50M	50 UP
0	0	0	0	0

VALUE OF DWELLING				DSS DWELLING AVAILABLE			
Owners		Tenants		For Sale		For Rent	
0-20M	0	$ 0-150	0	0-20M	0	$ 0-150	0
20-40M	0	150-250	0	20-40M	0	150-250	0
40-70M	0	250-400	0	40-70M	4	250-400	0
70-100M	0	400-600	0	70-100M	14	400-600	2
100 UP	0	600 UP	0	100 UP	1242	600 UP	316
TOTAL	0		0		1260		318

REMARKS (Respond by Number)

3. An ample supply of similar businesses will remain available.
4. N.C. State Faculty Club, Medium, Club, 12-20 emp. 8 minorities
6. MLS, Newspapers, private real estate market.
8. As required by law.
11. Wake County and Raleigh city public housing along with Section 8.
12. DSS housing will be available or built if necessary.
14. Same as #6 above.

[signature]	3/17/17	[signature]	3/23/17
Right of Way Agent	Date	Relocation Coordinator	Date

FRM15-E

EIS RELOCATION REPORT

North Carolina Department of Transportation
RELOCATION ASSISTANCE PROGRAM

☒ E.I.S. ☐ CORRIDOR ☐ DESIGN

WBS ELEMENT:	35869.1.2	COUNTY	Wake	Alternate	13	of 14	Alternate
T.I.P. No.:	U-2719		WADE-HILLSBOROUGH DETOUR				
DESCRIPTION OF PROJECT:	I-440 Widening						

ESTIMATED DISPLACEES

Type of Displacees	Owners	Tenants	Total	Minorities
Residential	0	1	0	1
Businesses	1	0	1	0
Farms	0	0	0	0
Non-Profit	0	0	0	0

INCOME LEVEL

0-15M	15-25M	25-35M	35-50M	50 UP
0	0	0	0	1

VALUE OF DWELLING				DSS DWELLING AVAILABLE			
Owners		Tenants		For Sale		For Rent	
0-20M	0	$ 0-150	0	0-20M	0	$ 0-150	0
20-40M	0	150-250	0	20-40M	0	150-250	0
40-70M	0	250-400	0	40-70M	4	250-400	0
70-100M	0	400-600	0	70-100M	14	400-600	2
100 UP	0	600 UP	1	100 UP	1242	600 UP	316
TOTAL	0		1		1260		318

ANSWER ALL QUESTIONS

Yes	No	Explain all "YES" answers.
☐	x	1. Will special relocation services be necessary?
☐	x	2. Will schools or churches be affected by displacement?
x	☐	3. Will business services still be available after project?
x	☐	4. Will any business be displaced? If so, indicate size, type, estimated number of employees, minorities, etc.
☐	x	5. Will relocation cause a housing shortage?
		6. Source for available housing (list).
☐	x	7. Will additional housing programs be needed?
x	☐	8. Should Last Resort Housing be considered?
☐	x	9. Are there large, disabled, elderly, etc. families?
☐	x	10. Will public housing be needed for project?
x	☐	11. Is public housing available?
x	☐	12. Is it felt there will be adequate DSS housing housing available during relocation period?
☐	x	13. Will there be a problem of housing within financial means?
x	☐	14. Are suitable business sites available (list source).
		15. Number months estimated to complete RELOCATION? 12-18

REMARKS (Respond by Number)

3. An ample supply of similar businesses will remain available.
4. N.C. State Faculty Club, Medium, Club, 12-20 emp. 8 minorities
6. MLS, Newspapers, private real estate market.
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11. Wake County and Raleigh city public housing along with Section 8.
12. DSS housing will be available or built if necessary.
14. Same as #6 above.

[signature]	3/17/17	[signature]	3/23/17
Right of Way Agent	Date	Relocation Coordinator	Date

FRM15-E