

Purpose and Need and Study Area Defined Detailed Study Alternatives

NC 55/NC 42 in Fuquay-Varina
Improve US 401 Intersection with NC 55/NC 42.
Project Will Include Improvements to NC 55 Intersection
with NC 42, and Construction of Connector from NC 55 to
Judd Parkway

Fuquay-Varina, Wake County
STIP Project No. U-5751

North Carolina Department of Transportation
Division 5



Merger Concurrence Points 1 and 2

February 20, 2020

**NC 55/NC 42 IN FUQUAY-VARINA
IMPROVE US 401 INTERSECTION WITH NC 55/NC 42. PROJECT WILL INCLUDE
IMPROVEMENTS TO NC 55 INTERSECTION WITH NC 42, AND
CONSTRUCTION OF CONNECTOR FROM NC 55 TO JUDD PARKWAY
FUQUAY-VARINA, WAKE COUNTY
STIP PROJECT NO. U-5751**

FEBRUARY 20, 2020

PURPOSE OF TODAY'S MEETING

The purpose of today's meeting is to discuss the purpose and need and study area (Concurrence Point 1) and alternatives for detailed study (Concurrence Point 2) for the proposed project. Concurrence on both Concurrence Points will be requested today. The project team's intent is to pull the project out of the Merger process due to a lack of competing resources.

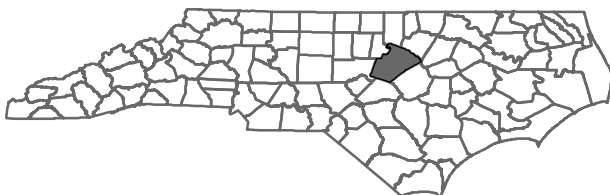
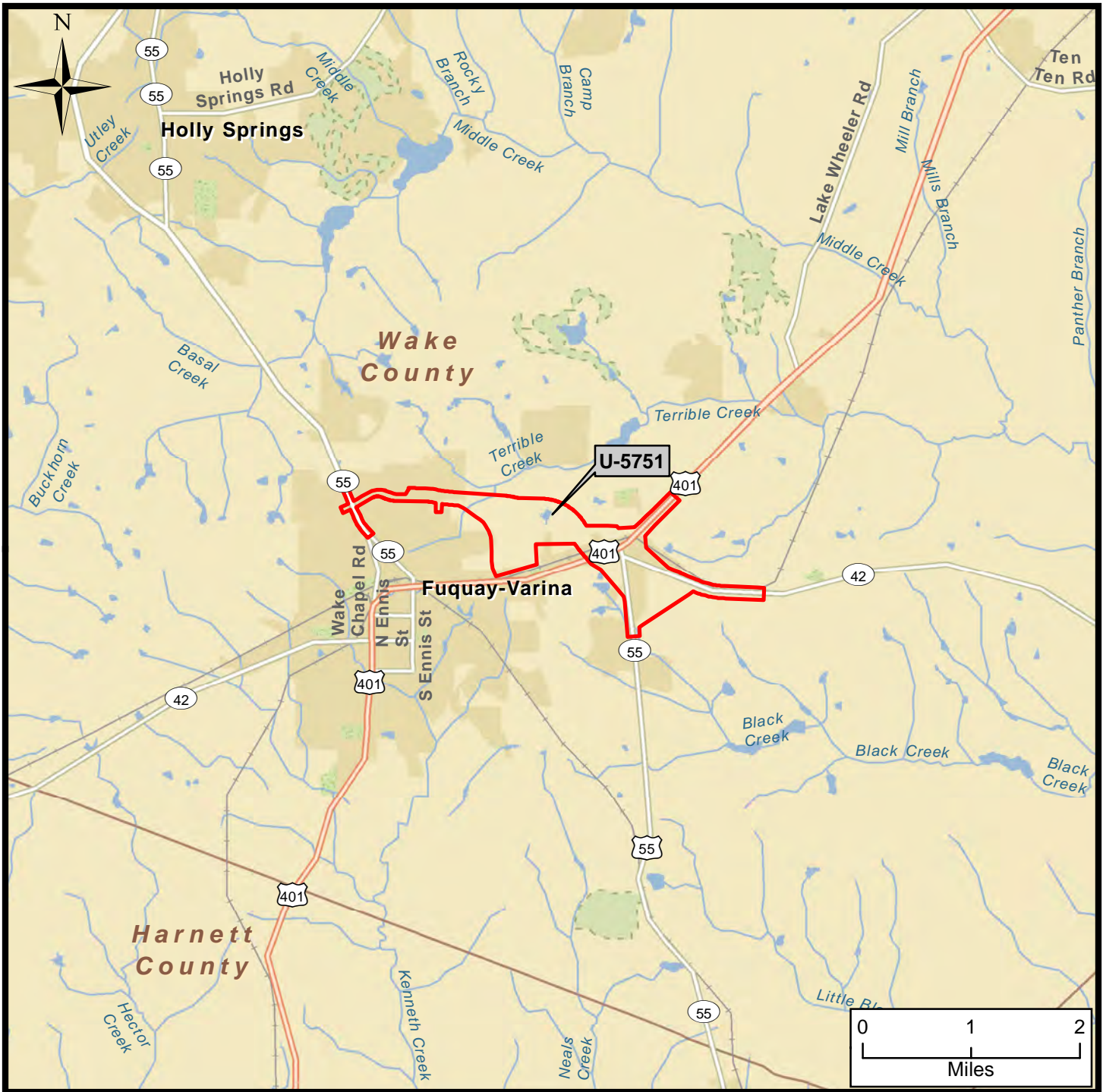
INTRODUCTION

STIP Project No. U-5751 consists of improving the US 401 intersection with NC 55/NC 42. The project will also include improvements to the NC 55 intersection with NC 42 and the construction of a connector road from NC 55 to Judd Parkway in Fuquay-Varina, Wake County. This project is currently state-funded, and the anticipated environmental document for this project is an Environmental Assessment (EA). A federal document is being completed to allow for additional funding options for the project. The project location is shown on **Figure 1**.

PROJECT SETTING

Within the project study area, US 401 is both a four-lane divided and a five-lane undivided roadway that leads into downtown Fuquay-Varina. US 401 is functionally classified as a principal arterial and both NC 42 and NC 55 are currently minor arterials. Local officials have stated that the area around the US 401/NC 42-55 intersection is viewed as part of Fuquay-Varina's downtown core and US 401 is the main gateway into downtown. NC 42 and NC 55 are currently two-lane and three-lane roadways, respectively.

Development along US 401 in the study area is primarily commercial in nature and is densely situated against the existing right of way. The nature of the development becomes denser towards the interior of the Town. Residential development exists outside of the primary transportation corridors in the study area. There are numerous large tracts of undeveloped land east of Judd Parkway and north of US 401. New development and infill development is ongoing in the study area, and is projected to continue into the foreseeable future according to Town officials and staff.

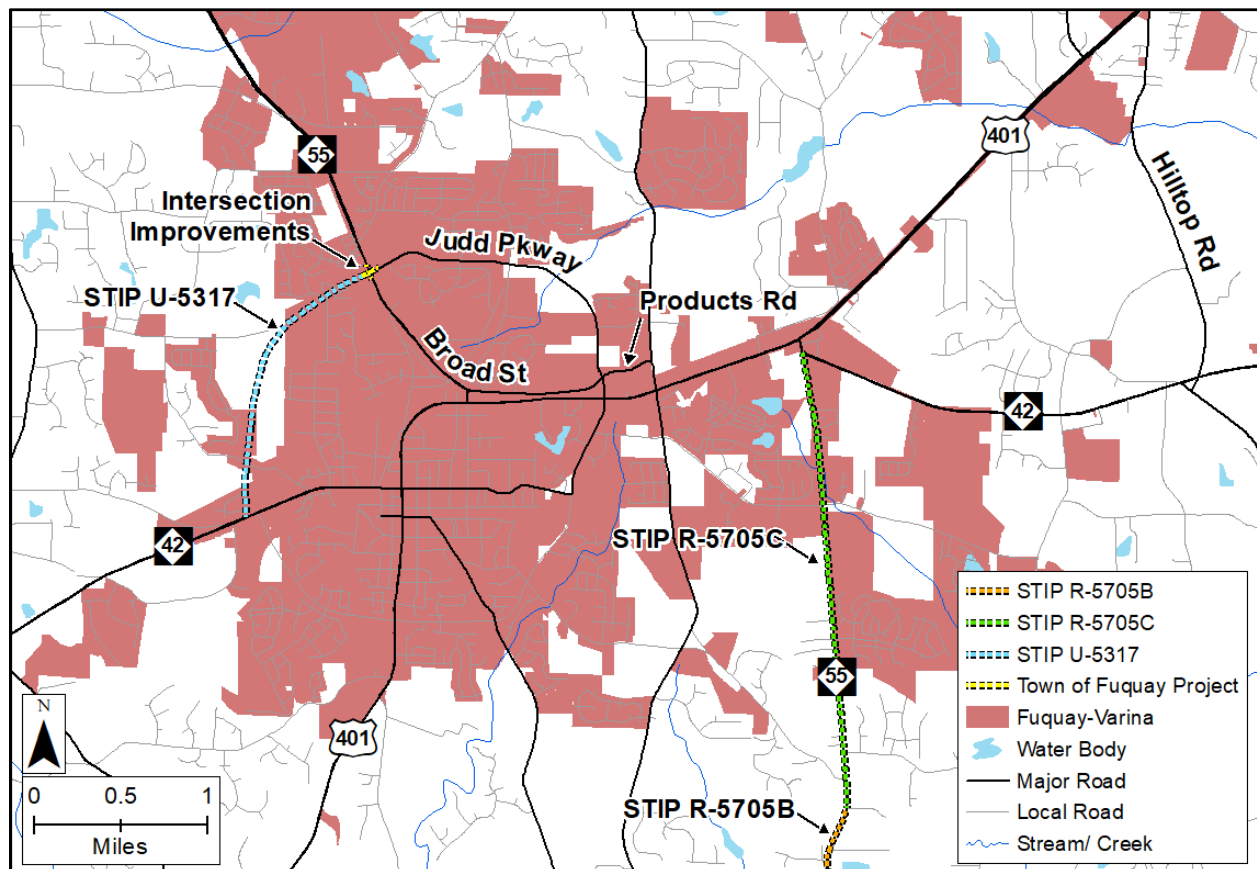


	<p>NORTH CAROLINA DEPARTMENT OF TRANSPORTATION PROJECT MANAGEMENT UNIT</p>
<p>STIP PROJECT U-5751 INTERSECTIONS OF US 401 WITH NC 55 AND NC 55 WITH NC 42 FUQUAY-VARINA, WAKE COUNTY NCDOT DIVISION 5</p>	
<p>Vicinity Map</p>	<p>Figure 1</p>

OTHER NEARBY PROJECTS

Other nearby transportation projects include:

- NCDOT
 - R-5705
 - R-5705A – Widen NC 55 from south of SR 1532 (Oak Grove Church Road) to NC 210. Construction Let is scheduled for October 2022.
 - R-5705B – Widen NC 55 from NC 210 to SR 4809 (Jicarilla Lane). Construction Let is scheduled for October 2022.
 - R-5705C – Widen NC 55 from SR 4809 (Jicarilla Lane) to NC 42 in Fuquay-Varina. This project is immediately adjacent to U-5751. Construction Let is scheduled in 2040. Right of way acquisition and construction for R-5705C (immediately adjacent to U-5751) are currently unfunded in the 2020-2029 STIP.
 - U-5317 – Construct North Judd Parkway on new location from NC 55 (North Broad Street) to NC 42 (West Academy Street) in Fuquay-Varina. This project is currently under construction by the Town of Fuquay-Varina and will complete the Judd Parkway loop. According to the Town’s website the project is expected to be completed in 2020.
- Town of Fuquay-Varina
 - Add dedicated right turn lanes at the intersection of NC 55 and NE Judd Parkway. Construction is expected to begin by fall 2020.



PROJECT BACKGROUND & DEVELOPMENT

Project Background

The project is in the 2020-2029 STIP. Based on the 2020-2029 STIP, State Highway Trust Funds are anticipated to be utilized for this project and the class of action is an Environmental Assessment (EA) to keep funding options open. The Federal Highway Administration (FHWA) is the lead federal agency. The project is consistent with the Capital Area Metropolitan Planning Organization's (CAMPO) 2045 approved Metropolitan Transportation Plan (MTP) in addition to the 2019 Southwest Area Study.

According to the 2020-2029 STIP, right of way and construction funding are scheduled for Fiscal Year (FY) 2021 and 2024, respectively. The proposed STIP funding is in **Table 1**.

Table 1. 2020-2029 STIP Cost Estimate

Phase	Cost Estimate*
Right of Way	\$34,695,000
Utilities	\$624,000
Construction	\$18,500,000
Total Cost	\$53,819,000

**Note: Cost estimates are subject to change.*

During a July 2019 Merger screening meeting, representatives from the US Army Corps of Engineers (USACE), NC Division of Water Resources (NCDWR), FHWA, and NCDOT met to discuss the project. At the time the project team was evaluating options of a connector road from NC 55 to Judd Parkway. However, the STIP description focused more closely on the US 401 intersection with NC 42/NC 55 and the NC 55 intersection with NC 42. One primary reason the agency representatives recommended the project should remain in the Merger process was due to this difference. In September 2019 the STIP description was amended to include the connector road for consistency.

Proposed Project Schedule

The proposed project schedule is provided in **Table 2**.

Table 2. Project Schedule

Milestone	Anticipated Schedule
CP 1/CP 2 Merger Meeting	February 2020
Public Meeting	Summer 2020
Begin Right of Way	Late 2021
Begin Construction	Summer 2023

CONCURRENCE POINT 1 – PURPOSE AND NEED AND PROJECT STUDY AREA

PROPOSED PROJECT PURPOSE STATEMENT

The purpose of the proposed project is to improve traffic flow at and near the intersections of US 401 with NC 42-55 and NC 55 with NC 42. The purpose is also to provide a roadway connection between NC 55 and Judd Parkway in Fuquay-Varina. Measures of effectiveness (MOE) may include travel delay and queue lengths.

NEED FOR PROJECT

Based on a number of local and regional transportation studies, the local community needs relief from the existing and future congestion at the US 401/NC 42-55 and NC 42/NC 55 intersections. They also need a more efficient connection to Judd Parkway for the northwest to southeast traffic that passes through the project vicinity.

The traffic forecast, dated June 2019, indicates a marked increase in traffic from 2018 through the design year 2045. No Build traffic volumes are presented in **Table 3**.

Table 3. No Build Traffic Volumes in 2018 and 2045

Roadway Segment	2018 (vpd)	2045 (vpd)	Percent Increase
US 401	28,800-32,800	36,000-39,200	20-25%
NC 42	11,600	15,200	31%
NC 55	14,800	18,400	24%
NC 42-55	23,600	29,600	25%

The No Build Capacity Analysis, dated July 2019, concludes the intersections of US 401/NC 42-55 and NC 42/NC 55 are anticipated to experience a substantial increase in delay between 2018 and 2045 with no improvements. **Table 4** presents the No Build delay for 2018 and 2045 at the US 401/NC 42-55 and NC 42/NC 55 intersections.

Table 4. No Build Delay (Seconds/Vehicle)

Intersection	AM Peak Hour 2018 (2045)	AM Peak Hour Increase	PM Peak Hour 2018 (2045)	PM Peak Hour Increase
US 401-NC 42/NC 55	72.7 (109)	50%	125.1 (160)	28%
NC 42/NC 55 (Southbound Left-Turn)	79.3 (>300)	> 278%	48 (220.3)	359%

Supplemental information supporting the need for the project is provided below:

- US 401, NC 42, and NC 55 are arterial roadways and regional routes that serve both commuter and local traffic. The existing close proximity of the two subject intersections and anticipated future volumes cause and would continue to result in poor operations. The two existing intersections are approximately 450 feet apart.
- The Town of Fuquay-Varina has designated two Preferred Growth Areas (PGA) in the vicinity of the proposed project. PGAs are identified areas to attract development and help steer development interest. Near the project study area, these PGAs are located:
 - The 55 South-42 East PGA is generally located to the south of both US 401 and the Norfolk Southern Railway.
 - The Hilltop-Rowland PGA is generally located to the north of the Norfolk Southern Railway and includes areas on either side of Johnson Pond Road north of US 401.
- Areas to the east of NC 55 and on both sides of NC 42 south of US 401 have been designated as Urban Centers in the Town's Community Vision Land Use Plan.
- In addition to long-term growth plans near the proposed project, the Town of Fuquay-Varina is experiencing rapid commercial, residential, and mixed-use growth.

PROPOSED PROJECT STUDY AREA STATEMENT

The proposed study area is shown on **Figure 2**. The study area extends along US 401, NC 42, and NC 55. It also encompasses the area north and west of the US 401/NC 42-55 intersection to the NC 55/Judd Parkway intersection, which allows for the consideration of a range of possible alternatives to meet the Purpose and Need of the project.

The project team developed the study area in a manner to fully evaluate options for improving the US 401/NC 42-55 and NC 42-55 intersections and providing a connector. The limits of the study area are described below.

- West of the US 401/NC 42-55 intersection and north of US 401/NC 42/NC 55 to Broad Street, and north to Judd Parkway in Fuquay-Varina.
- Approximately 0.75 miles along NC 55 south from its intersection with NC 42.
- Approximately 1.4 miles along NC 42 east from its intersection with NC 55.
- Approximately 0.7 miles along US 401 north from its intersection with NC 42-55.

The scope of this study area allows for opportunities to spread out and more efficiently route traffic along US 401, NC 42, and NC 55. Existing US 401 through the Town of Fuquay-Varina is not included in the study area due to previous studies concluding that the extra capacity required for the roadway to operate acceptably would result in substantial commercial impacts, which include the taking of parking areas and potential relocations. Additionally, the Varina Commercial Historic District is listed on the National Register and is located on both sides of NC 55 in the heart of Fuquay-Varina.

Hot Spot Study (US 401 at Sunset Lake Road/Purfoy Road)

A hot-spot study was prepared for CAMPO in September 2015 as another means to further evaluate the potential benefits and impacts of improvements along existing US 401. The study evaluated the US 401 and Sunset Lake Road/Purfoy Road intersection which is located approximately 0.9 miles west of the US 401/NC 42-55 intersection.

Improvement alternatives were recommended for short-term (2025) and long-term (2045) scenarios based on volume projections, environmental features, and local planning efforts.

2025 Improvements

The short-term improvements in the vicinity of the US 401/Sunset Lake Road/Purfoy Road intersection included reconfiguring the intersection to provide dual left-turn lanes. Due to the crash patterns in the area, the study also recommended access management in the form of a raised concrete median along US 401 from Bonburn Drive to the Food Lion/Tractor Supply and Aldi/Zaxby's parking lots.

These improvements do not propose to widen the roadway and therefore do not impact adjacent businesses and establishments. However, these improvements do not address the congestion issue and still result in failing traffic operations at the intersection.

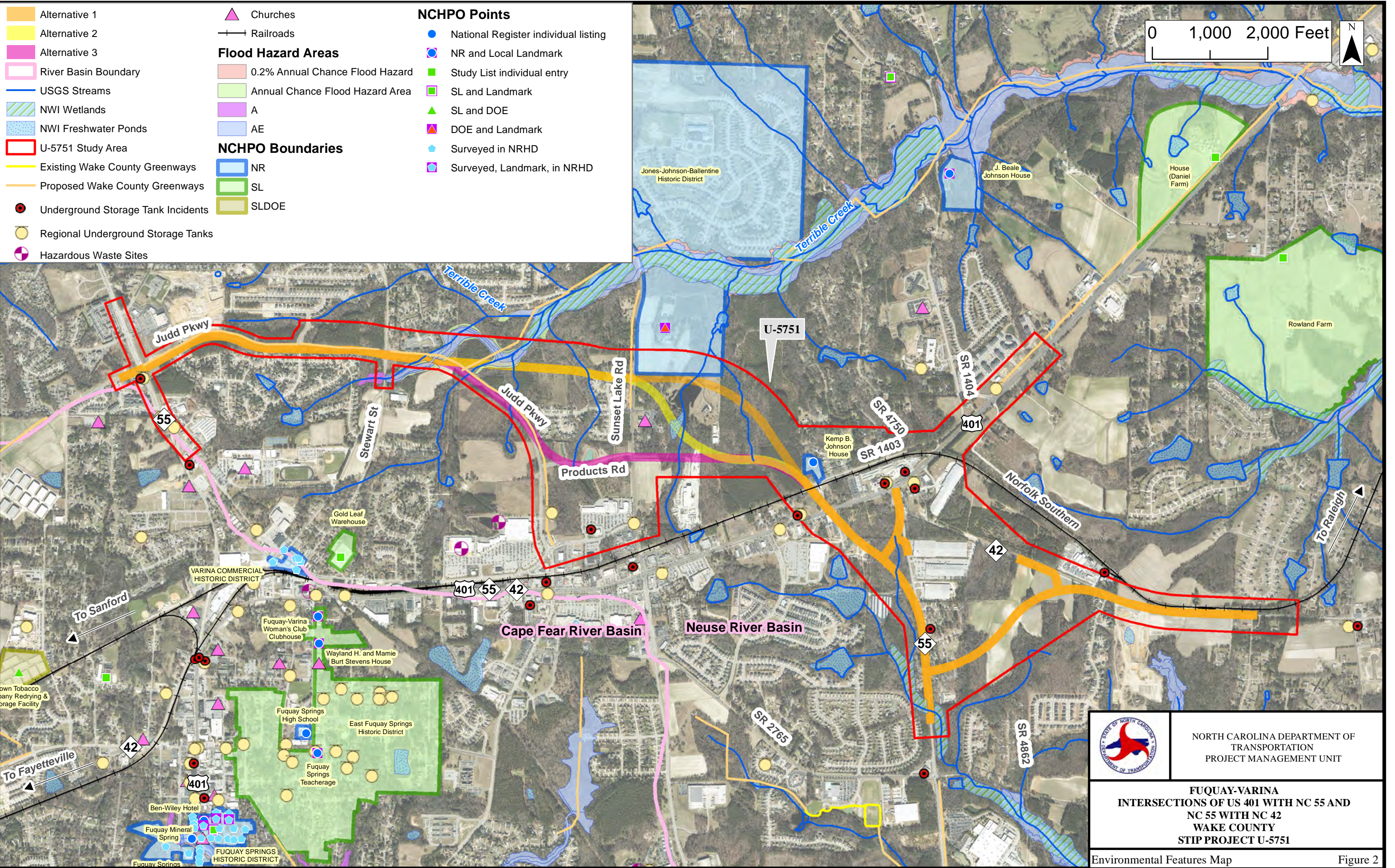
2045 Improvements

Several alternatives were considered for the 2045 scenario. A four-quadrant concept provided the most congestion relief. Under this concept all left-turning movements are rerouted to adjacent signals as right-turns. This concept utilizes as much existing pavement as possible but does result in additional impacts. The study notes that access management is a key element to this option.

While the concept described above notably improves traffic operations, the study notes that it does not fully address the congestion issues and other mobility needs in a manner that meets the locally-desired vision for this transportation gateway. According to the study, the better the improvements alleviate congestion, the higher the cost of those improvements rise in terms of financial, community character, quality of life, and political perspectives.

Conclusion

The study team concluded that the area beyond the immediate vicinity of the intersection be studied to comprehensively address congestion in the roadway network. Addressing delays and congestion solely at the intersections of US 401 with NC 42/NC 55 and NC 55 with NC 42 will simply shift the deficient traffic operations to other parts of the network.



- Alternative 1
- Alternative 2
- Alternative 3
- River Basin Boundary
- USGS Streams
- NWI Wetlands
- NWI Freshwater Ponds
- U-5751 Study Area
- Existing Wake County Greenways
- Proposed Wake County Greenways
- Underground Storage Tank Incidents
- Regional Underground Storage Tanks
- Hazardous Waste Sites

- Churches
- Railroads
- Flood Hazard Areas**
- 0.2% Annual Chance Flood Hazard
- Annual Chance Flood Hazard Area
- A
- AE
- NCHPO Boundaries**
- NR
- SL
- SLDOE

- NCHPO Points**
- National Register individual listing
- NR and Local Landmark
- Study List individual entry
- SL and Landmark
- SL and DOE
- DOE and Landmark
- Surveyed in NRHD
- Surveyed, Landmark, in NRHD

NORTH CAROLINA DEPARTMENT OF
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PROJECT MANAGEMENT UNIT

**FUQUAY-VARINA
INTERSECTIONS OF US 401 WITH NC 55 AND
NC 55 WITH NC 42
WAKE COUNTY
STIP PROJECT U-5751**

Environmental Features Map

Figure 2

No Build Capacity Analysis (July 2019)

The No Build Capacity Analysis shows considerable increases in delay are anticipated at the US 401 intersection at Sunset Lake Road/Purfoy Road between the years of 2018 and 2045. In the AM peak hour, the delay increases from 36.5 s/veh in 2018 to 64.4 s/veh in the design year 2045. This represents an increase of approximately 76 percent. The delay in the PM peak hour increases from 32.2 s/veh in 2018 to 72.3 s/veh in the design year, an increase of approximately 125 percent.

This data supports the CAMPO Hot Spot Study conclusions, which both lead to the notion that additional through lane capacity along the existing five-lane section of US 401 would be required. At a minimum the existing US 401 facility would likely need to be widened to a six-lane divided facility from US 401/NC 42-55 west to Judd Parkway.

Based on an assumed six-lane median divided typical section, a 130-foot corridor representing proposed minimum right of way was overlaid on US 401 between the intersections of NC 42-55 and Judd Parkway. Increasing the right of way by any more than 130 feet along existing US 401 would substantially increase impacts given the development closely located to the roadway. The exhibit below is a representative example of this urban typical section. **Figure 3** illustrates the minimum right of way needed for the six-lane median divided roadway and the potential impacts on adjacent properties. A summary of those potential impacts is listed below:

- A total of 56 affected parcels.
- Of those 56 affected parcels, based on an aerial review roughly 50 percent are commercial properties that would likely experience substantial impacts to parking, ingress/egress, and internal flow.
- Using Wake County parcel data, the 130-foot corridor would require an additional 4.4 acres of additional right of way along US 401 between the two intersections noted above.

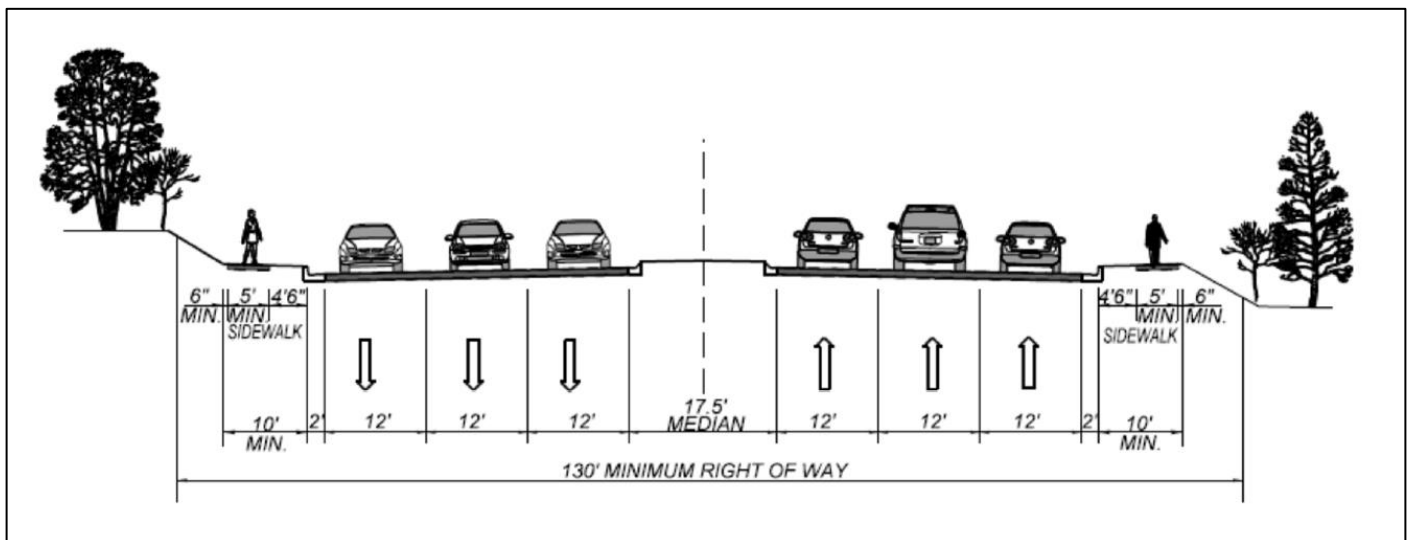


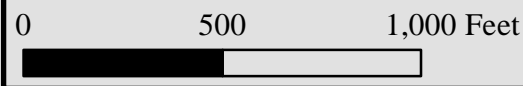
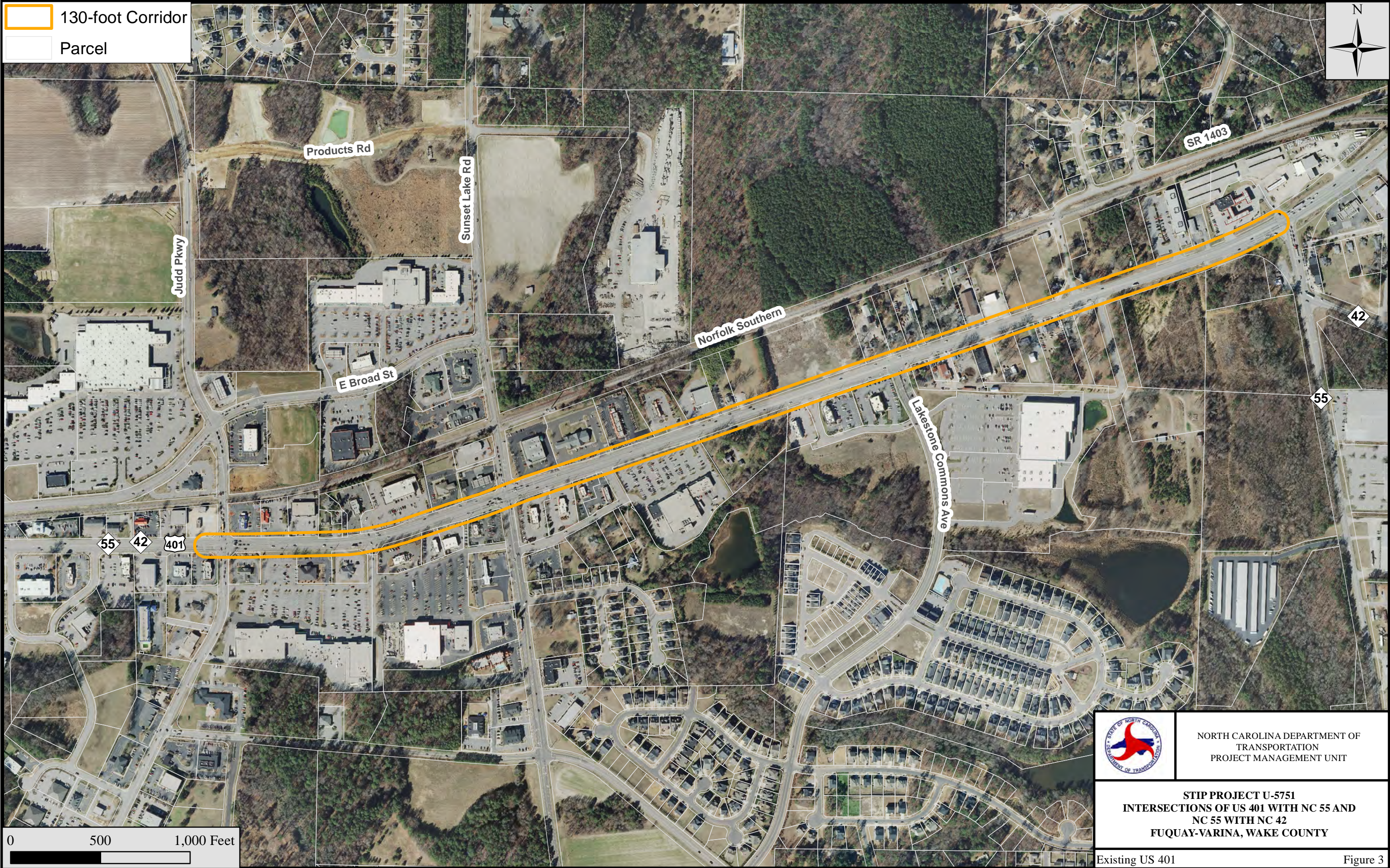


Exhibit: Typical Section – Widening Existing US 401 – Six-lane Median Divided

 130-foot Corridor
 Parcel



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STIP PROJECT U-5751
INTERSECTIONS OF US 401 WITH NC 55 AND
NC 55 WITH NC 42
FUQUAY-VARINA, WAKE COUNTY

Existing US 401

Figure 3

CONCURRENCE POINT 2 – DETAILED STUDY ALTERNATIVES

Build Alternatives

Three build alternatives have been developed that satisfy the purpose and need for the project. These alternatives are shown on **Figure 4**. All three alternatives propose to realign NC 42 which intersects NC 55 approximately 2,800 feet to the south of the existing NC 42/NC 55 intersection. The proposed connector diverges from existing NC 55 to the west and grade separates over US 401 and the Norfolk Southern Railway. The three alternatives then begin to diverge from one another north of the proposed bridge over the railroad. All three alternatives converge back together on existing Judd Parkway east of Stewart Street and follow Judd Parkway to intersect NC 55. All alternatives assume a four-lane median divided facility which would be contained within a 150-foot right of way corridor. Differences between the three alternatives are outlined below.

Alternative 1

Alternative 1 crosses US 401 and the railroad the same as the other two alignments but continues on the common northwest heading for a longer distance before curving to the west to intersect Sunset Lake Road. It is just south of the Jones-Johnson Ballentine Historic District and impacts to the historic resource are anticipated to be avoided. Alternatives 1 and 2 are the same west of Sunset Lake Road.

Alternative 2

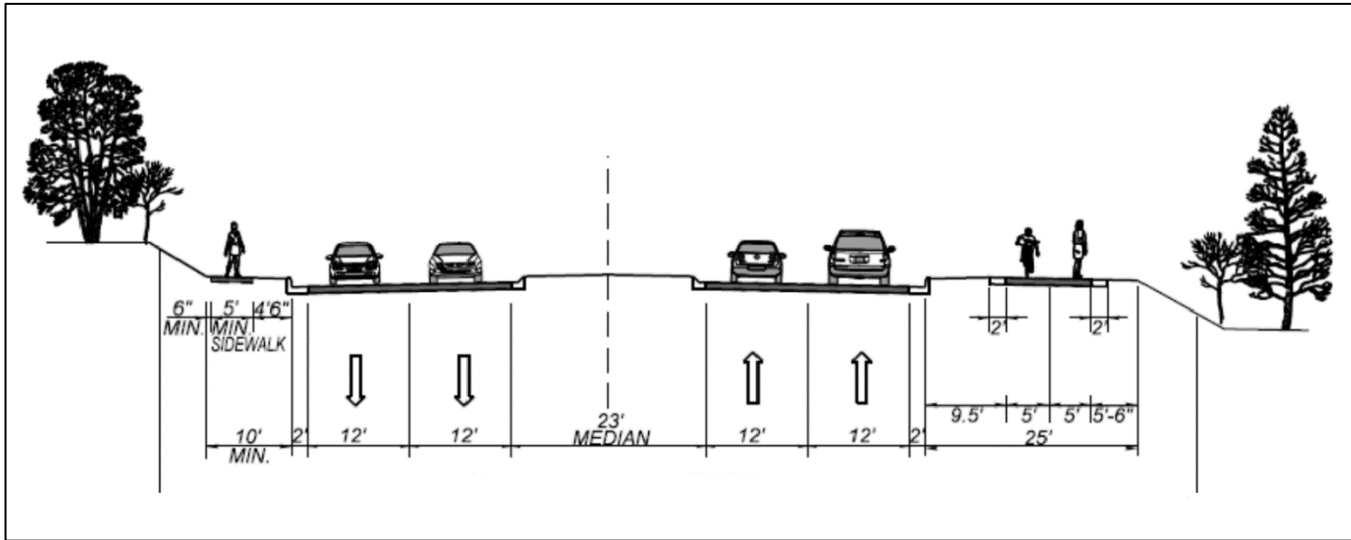
Alternative 2 passes on the north side of the Abiding Presence Lutheran Church property and curves around to the north of the residential area that is located on the west side of Sunset Lake Road. It ties into Judd Parkway just to the east of Stewart Street.

Alternative 3

Alternative 3 is the southernmost alignment of the three. It intersects Sunset Lake Road at Products Road, utilizes a portion of existing Products Road, and ties into existing Judd Parkway.

Potential Project Impacts

An Environmental Features Map displaying natural and human resources within the study area is attached earlier in this packet as **Figure 2**. **Table 5** summarizes anticipated impacts to environmental features with an assumed 150-foot wide corridor width for each alignment. A 150-foot corridor was conservatively selected based on the right of way that may be required to contain a four-lane median divided facility with the potential for bicycle/pedestrian accommodations along the connector road. Actual impacts are anticipated to be much lower based on a narrower project footprint/construction limit. See exhibit of example typical section below.



**Exhibit: Typical Section – New Location Roadway – 4-Lane Median Divided
Assumed 150-foot Right of Way**

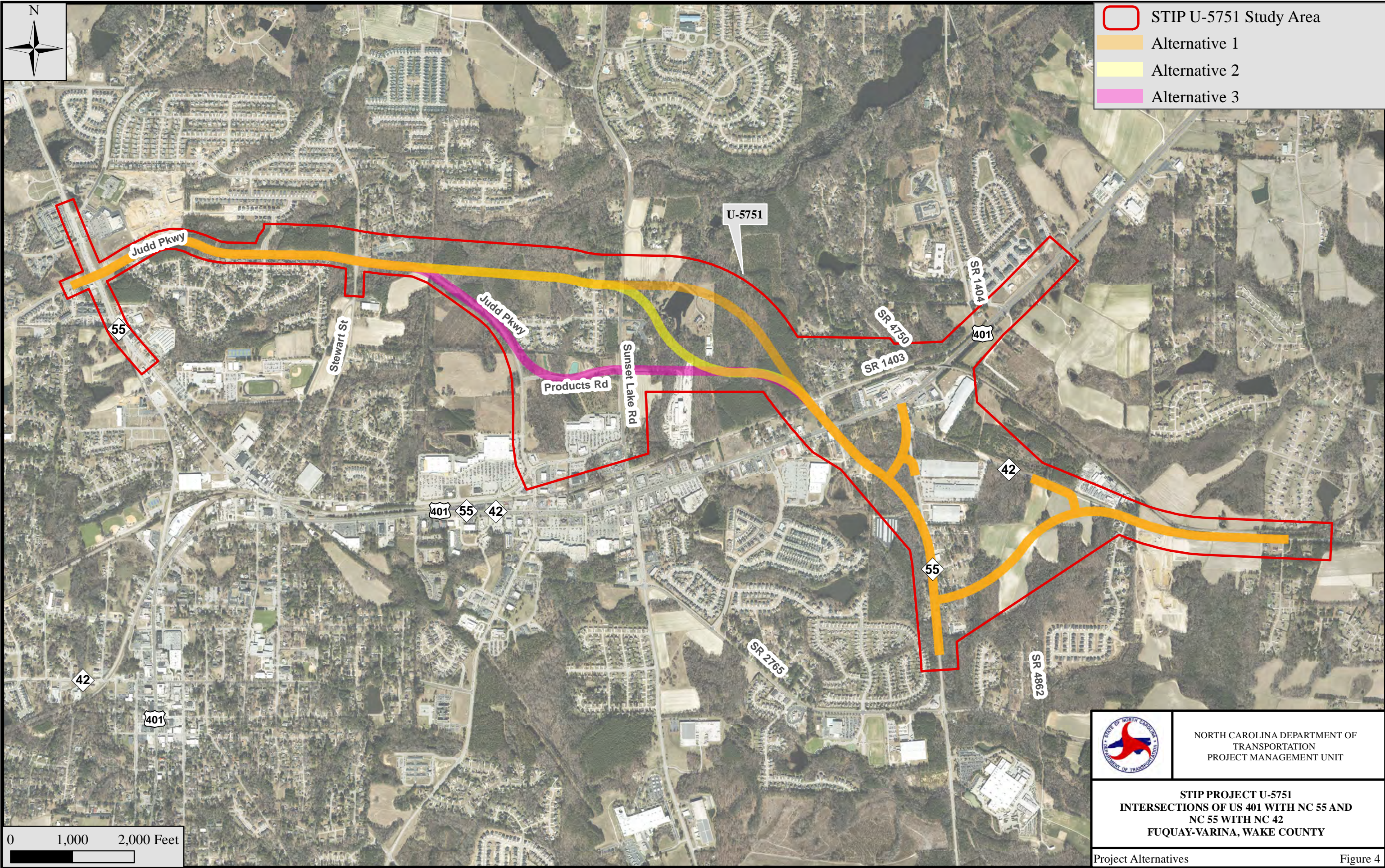


STIP U-5751 Study Area

Alternative 1

Alternative 2

Alternative 3



NORTH CAROLINA DEPARTMENT OF
TRANSPORTATION
PROJECT MANAGEMENT UNIT

STIP PROJECT U-5751
INTERSECTIONS OF US 401 WITH NC 55 AND
NC 55 WITH NC 42
FUQUAY-VARINA, WAKE COUNTY

Table 5. Environmental Features

Resource/Affected Environment	Alternative 1	Alternative 2	Alternative 3
Cultural Resources			
Historic Properties	No Impacts Anticipated		
Human Environment			
Churches/Cemetery (#)	N/A	Abiding Presence Lutheran Church*	N/A
Railroads	One proposed grade-separated crossing of the Northern Southern Railroad		
Greenways, Recreational Resources, etc.	Proposed Wake County Greenway along Terrible Creek and Judd Parkway		
High % Special Populations	Comparable		
Traffic Noise Impacts	Comparable		
Relocations	Comparable		
Natural Environment			
Threatened or Endangered Species	Comparable		
Identified Critical Habitat (# known)	Comparable		
Streams (linear feet) ¹	1,700	2,000	1,000
Wetlands (acres) ²	2.6	3.3	1.8
Riparian Buffer Rules	Neuse River Basin		
Physical Environment			
Hazardous Materials (# suspected/known sites)	Comparable		
Utilities	Water, sewer, electric, telephone		

*Alternative 2 clips the northeast corner of the church's property (approximately 0.5 ac), but is not anticipated to impact church facilities or operations.

¹ Streams are based on the project's .WEX file.

² Wetlands are based on the project's .WEX file.

In an effort to facilitate a more understandable review of the potential stream and wetland impacts, various impact areas within the study area have been designated. These impact areas itemize the potential impacts to the individual streams and wetlands. **Figure 5** displays these impact areas and **Table 6** itemizes the individual impacts. Stream impacts contained in Impact Areas 1 and 2 are to Unnamed Tributaries of Black Creek. Stream impacts contained in Impact Areas 3 through 10 are to Unnamed Tributaries of Terrible Creek.

Table 6. Stream and Wetland Impacts*

Impacted Resource	Alternative 1	Alternative 2	Alternative 3
Stream (feet)			
Impact Area 1	270 ¹	270 ¹	270 ¹
Impact Area 2	50 ²	50 ²	50 ²
Impact Area 4	0	300 ²	140 ¹
Impact Area 5	180 ²	180 ²	80 ¹
Impact Area 6	820 ²	820 ²	80 ¹
Impact Area 7	210 ¹	210 ¹	210 ¹
Impact Area 9	170 ²	170 ²	170 ²
Total	1,700	2,000	1,000
Wetland (acres)			
Impact Area 1	0.5 ¹	0.5 ¹	0.5 ¹
Impact Area 3	0.5 ²	0.7 ²	0.7 ²
Impact Area 4	0.0 ²	0.5 ^{2,3}	<0.1 ²
Impact Area 5	<0.1 ²	<0.1 ²	0.2 ¹
Impact Area 6	1.2 ²	1.2 ²	<0.1 ¹
Impact Area 8	<0.1 ¹	<0.1 ¹	<0.1 ¹
Impact Area 9	0.2 ²	0.2 ²	0.2 ²
Impact Area 10	0.2 ²	0.2 ²	0.2 ²
Total	2.6	3.3	1.8

* Stream and wetland impacts are based on a 150-foot corridor and rounded to the nearest 10 feet and 0.1 acre, respectively.

¹ Widen existing roadway

² New location roadway

³ Freshwater pond

Based on a high level hydraulic analysis, it would not be recommended hydraulically to construct bridges at any of the stream crossing locations. Culverts would likely be the warranted structure for all stream crossings for each of the three alignments. The impacts provided in **Tables 5 and 6** are based on these associated direct impacts.

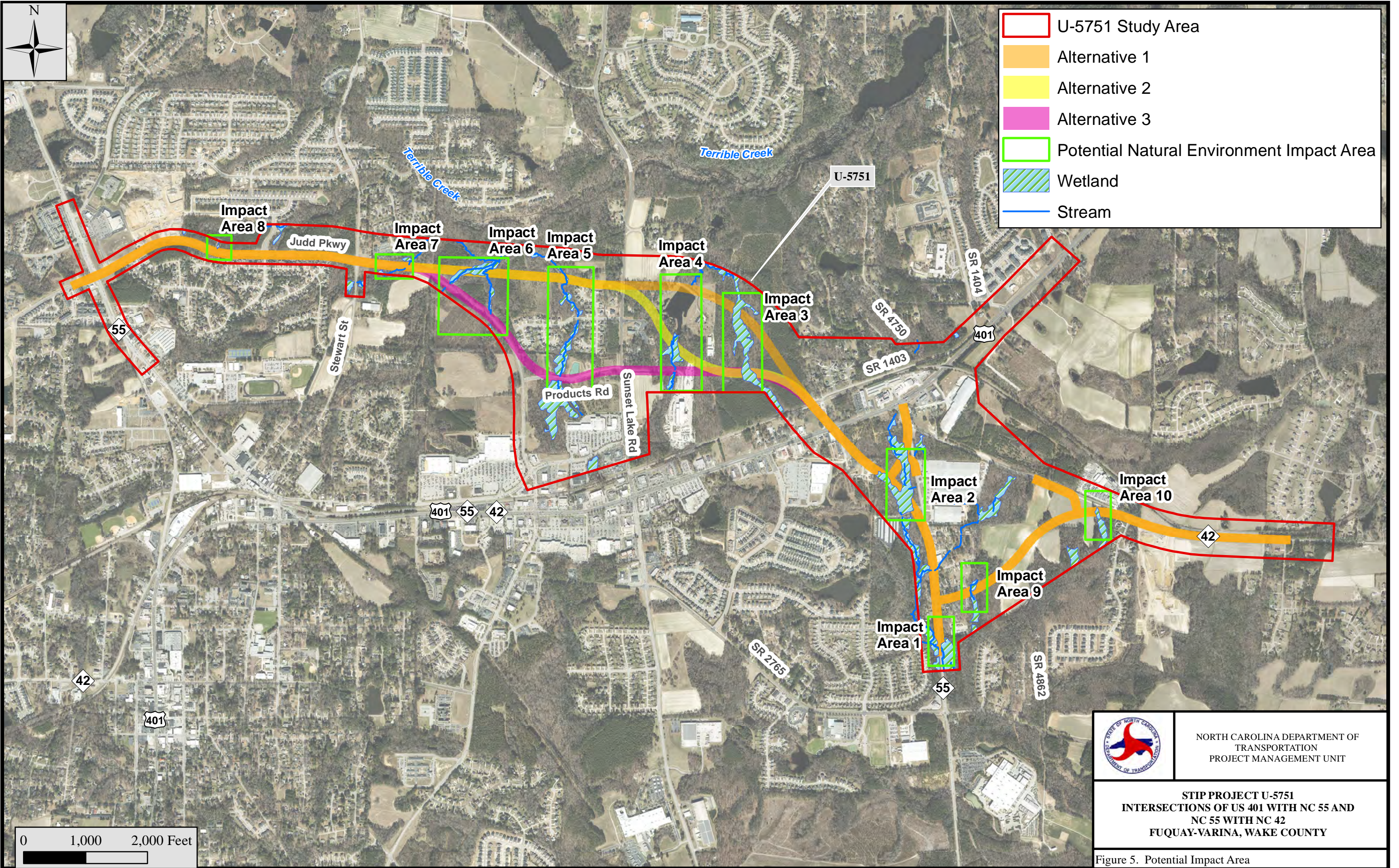


Figure 5. Potential Impact Area