# NCDOT STIP #U-5774
# NC 54 Corridor Improvements
# Concurrence Point 2A

## Concurrence Point 2A
## Bridging and Alignment Review

April **23,** 2019

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# ATTACHMENTS

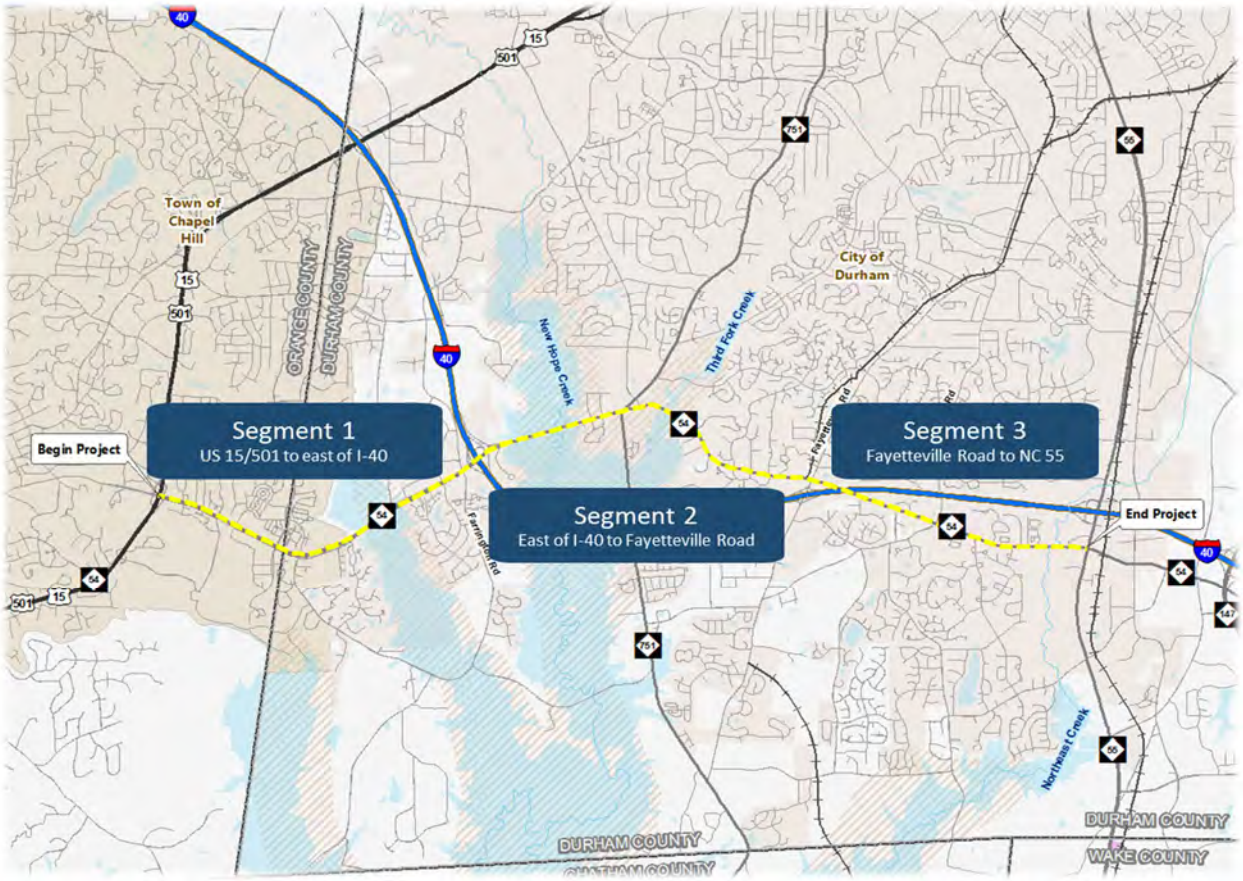
Attachment 1: Table 2: Preliminary Hydraulic Recommendations for Major Crossings
Attachment 2: Natural Resources Technical Report (January 2018) Excerpts:
Section 3.2 Water Resources
Section 5.0 Jurisdictional Issues
Jurisdictional Features Map (Figure 3-1 thru 3-21)

# 1. INTRODUCTION

## 1.1 PROJECT DESCRIPTION

The North Carolina Department of Transportation (NCDOT) proposes to improve the NC 54 corridor from US 15/US 501 in Chapel Hill to NC 55 in Durham. The project is approximately 9.2 miles long (see Figure 1). Improvement strategies may include, but not limited to, widening of portions of the existing roadway facility, multimodal accommodations, traffic control, access management, intersection improvements, grade separations, interchange upgrades, and signal timing modifications. The project study area is located mostly in Durham County, with the western part of the project study area in Orange County.

Figure 1. Project Location




## 1.2 PURPOSE AND NEED

The purpose of and need for the proposed action is documented in detail in the Purpose and Need Report (2017) for this project.

The purpose of the proposed project is to improve traffic operations along NC 54 between US 15/US 501 (Fordham Boulevard) and NC 55 (Apex Highway) by reducing congestion, while improving mobility and accessibility for all users of the NC 54 corridor.

The needs to improve the NC 54 corridor, from US 15/US 501 in Chapel Hill to NC 55 in Durham, are as follows:

- Decreased Mobility in the NC 54 Corridor
- Increased Congestion due to Roadway Capacity Deficiencies
- Critical Crash Rate Exceeding State Average

Other desirable outcomes include:

- Vehicular Safety
- Multimodal Accessibility and Safety

## 1.3 DETAILED STUDY ALTERNATIVES

Alternatives for the Upgrade Existing NC 54 Alternative were developed based on a range of factors, including projected traffic demand, human and natural environmental constraints, and local plans. For purposes of developing alternatives, the NC 54 study corridor was divided into three segments (see Figure 1) based on existing roadway conditions and land use:

- Segment 1: US 15/501 (Fordham Boulevard) to east of I-40
- Segment 2: East of I-40 to Fayetteville Road (SR 1118)
- Segment 3: Fayetteville Road (SR 1118) to NC 55 (Apex Highway)

Two alternatives for detailed study with some design options are being evaluated. The differences between the alternatives are at the US 15/501 interchange, the intersections of Friday Center Drive/Meadowmont Drive and Barbee Chapel Road, and along NC 54 from George King Road to I-40. These alternatives were selected for detailed study at the CP2 meeting held on October 18, 2018.

Table 1. Detailed Study Alternatives

| STIP | Segment Element | Alternative 1 | Alternative 2 |
|---|---|---|---|
| Segment 1: US 15/501 (Fordham Boulevard) to East of I-40 | | | |
| U-5774A | US 15/501 Interchange | Half partial cloverleaf/half synchronized street interchange | Contraflow interchange |
| U-5774B | Hamilton Road to W. Barbee Chapel Road (SR 1110) | Six-lane synchronized street | Six-lane synchronized street |
| U-5774B | W. Barbee Chapel Road to E. Barbee Chapel Road (SR 1110) | Full Continuous-flow intersection (Two-leg) | Full Continuous-flow intersection (Four-leg) |
| U-5774C | E. Barbee Chapel Road (SR 1110) to George King Road | Six-lane synchronized street | Six-lane synchronized street |
| U-5774F* | George King Road to I-40 | Six-lane depressed roadway with frontage roads | Eight-lane synchronized street |
| U-5774F* | I-40 Interchange | Partial cloverleaf interchange | Partial cloverleaf interchange |
| Segment 2: East of I-40 to Fayetteville Road (SR 1118) | | | |
| U-5774G | USACE Property (East of I-40 to NC 751) | Four-lane divided with 17-foot raised median | |
| U-5774H | Non-USACE Property (NC 751 to Fayetteville Road) | Four-lane divided with 23-foot raised median and partial control of access | |
| Segment 3: Fayetteville Road (SR 1118) to NC 55 (Apex Highway) | | | |
| U-5774I | Fayetteville Road to Barbee Road (SR 1106) | Four-lane divided with 23-foot raised median and partial control of access | |
| U-5774J | Barbee Road (SR 1106) to NC 55 | Four-lane divided with 23-foot raised median and partial control of access | |

*U-5774F includes U-5774 D & E

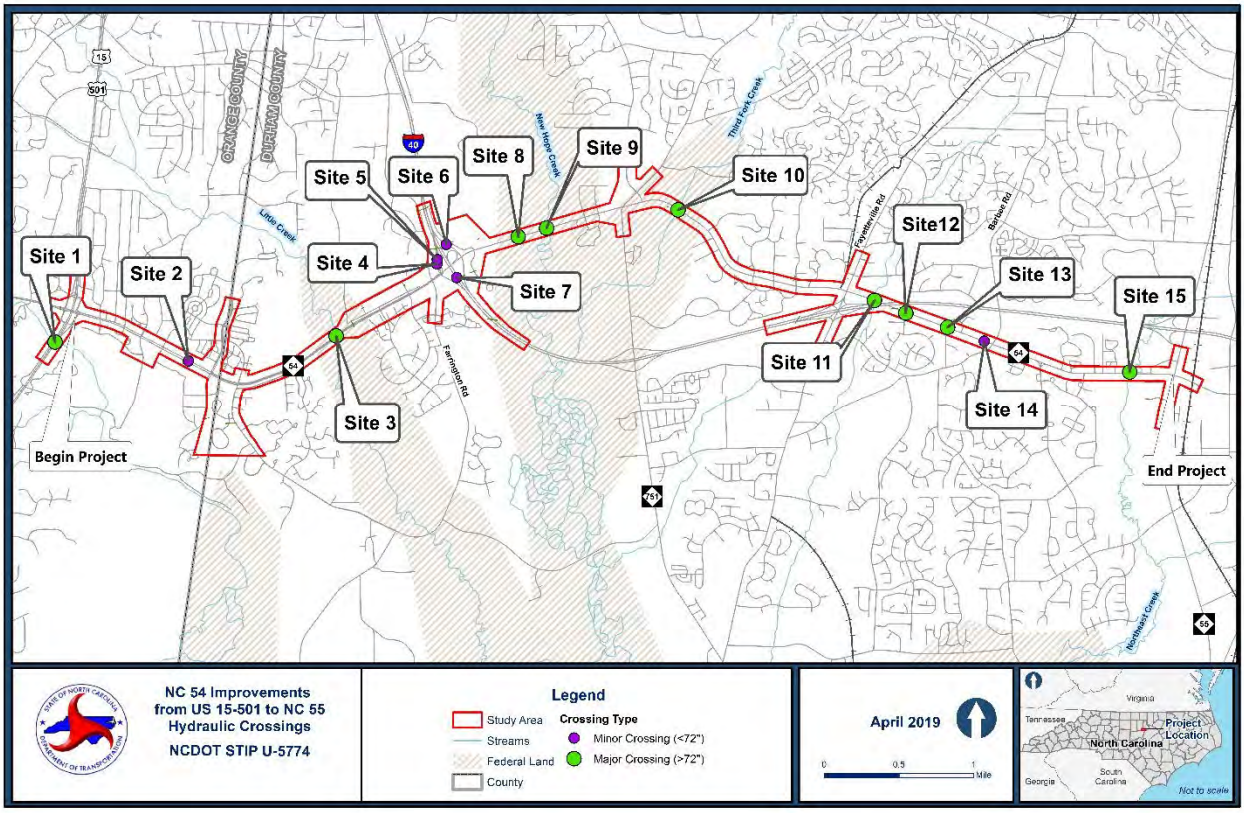
# 2. BRIDGING AND ALIGNMENT REVIEW

A Preliminary Hydraulics Study (draft, March 2019) completed for the proposed project identified 15 hydraulic crossings, which are all within the Cape Fear River Basin. Of the 15 crossings, 9 major crossings were identified. Detailed flood studies have been completed for Third Fork Creek, Northeast Creek and Crooked Creek. There are no designated anadromous fish waters, trout waters, or primary nursery areas present in the study area. No streams within the study area are classified as high quality water, outstanding resource waters, WS-I or WS-II water supply watershed, or identified in the North Carolina final 2016 Category 5 Water Quality Assessments – 303(d) List. There are no streams in or within 1 mile downstream of the study area listed as impaired due to sedimentation turbidity.

The study includes recommendations for the existing stream crossing structures, as shown on Figure 2 and summarized in Table 2 (see Attachment 1). All stream crossings are jurisdictional streams; therefore, the culvert and pipe recommendations are oversized to account for the buried depth of the structures to maintain depth requirements for hydraulic performance.

Agency representatives from USACE and NCDWR conducted a site visit on November 1, 2018, and a preliminary jurisdictional determination was issued by USACE on February 25, 2019.

Figure 2.



## 2.1 SITE 1

Site 1 is located at Chapel Creek, which flows to Morgan Creek and is classified as WS-IV, NSW. The site crosses under Fordham Boulevard (US 15/501) (see Figure 3-2 in Attachment 2). The surrounding area consists of mainly low density residential and commercial land uses. The stream banks are vegetated with signs of erosion. There is a current FEMA Limited Detail Flood Study on this segment of Chapel Creek.

| | |
|---|---|
| Drainage Area: | 0.44 square miles |
| Existing Structure: | 7'x7' RCBC |
| Recommended Structure | Extend existing 7'x7' RCBC by 60' upstream |
| Stream Index Number: | 16-41-2-8 |

Because the existing culvert is in good condition, it is recommended to retain and extend the upstream end of the culvert 60 feet to accommodate improvements on US 15/501.

Site 1 – looking upstream

Site 1 – upstream face

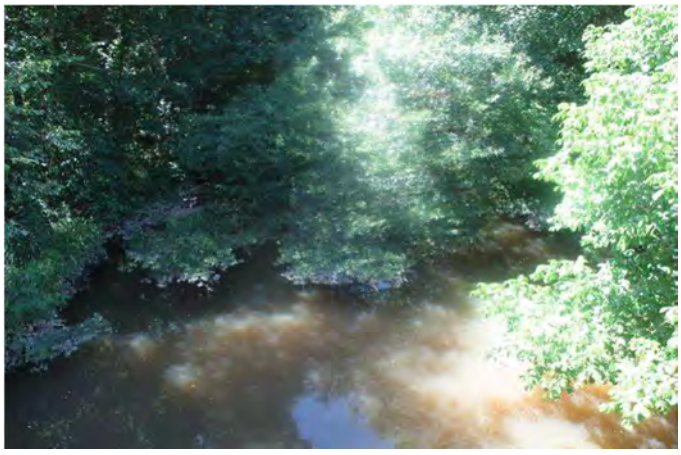
Site 1 – downstream face

## 2.2 SITE 3

Site 3 is located on Little Creek and is classified as WS-IV, NSW. This site carries NC 54 over Little Creek (see Figure 3-5 in Attachment 2). The stream banks are heavily vegetated, and land surrounding this crossing is part of property owned by the U.S Army Corps of Engineers (USACE) and used for watershed protection for Jordan Lake. There is a FEMA Limited Flood Study on this segment of Little Creek.

| | |
|---|---|
| Drainage Area: | 21.7 square miles |
| Existing Structure: | Dual 3-span bridges (182‘ long) |
| Recommended Structure: | Widen WB bridge 20’ upstream and EB bridge 20’ downstream |
| Stream Index Number: | 16-41-1-15-(0.5) |

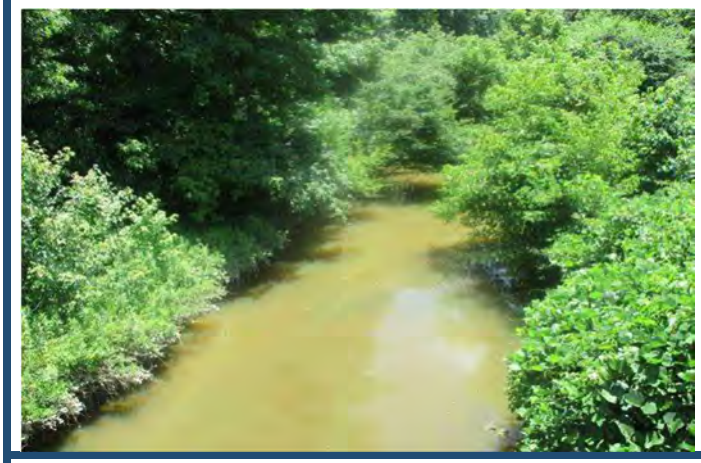
The two existing structures are 3-span bridges on a reinforced concrete floor on pre-stressed concrete girders. The bridges were built in 1987 and have sufficiency ratings above 90. The bottom of the girder is 4 feet above the 100-year flood elevation. It is recommended to widen the westbound bridge about 20 feet on the upstream side and widen the eastbound bridge about 20 feet on the downstream side. Pedestrian accommodations, either on the existing bridges or a separate facility, are being discussed with the local government.



Site 3 – looking upstream

Site 3 – upstream face

-



Site 3 – looking downstream

Site 3 – downstream face

## 2.3 SITE 8

Site 8 is located on New Hope Creek and is classified as WS-IV, NSW. NC 54 crosses over this site (see Figure 3-10 in Attachment 2). There is a FEMA Limited Flood Study on the stream. Land surrounding this site is within USACE Jordan Lake property. The existing crossing and road is located in a 60 foot easement.

| | |
|---|---|
| Drainage Area: | 0.73 square miles |
| Existing Structure: | 4@ 8'x11' RCBC |
| Recommended Structure: | Extend existing RCBC by 110' downstream |
| Stream Index Number: | 16-41-1-(11.5) |

The existing RCBC was installed in 1928 but does not show signs of deficiency and has a sufficiency rating of 77.11. It is recommended to extend the structure 110' downstream to accommodate widening of NC 54. In addition, pedestrian accommodations may be included; details of the pedestrian accommodations are subject to further discussion with the local government.

Site 8 – looking upstream

Site 8 – upstream face

Site 8 – looking downstream

Site 8– downstream face

## 2.4 SITE 9

Site 9 is located on New Hope Creek and carries NC 54 (see Figure 3-10 in Attachment 2). New Hope Creek is classified as WS-IV and NSW. There is a FEMA Limited Flood Study on this segment of New Hope Creek. Land surrounding this site is USACE property. The banks are vegetated with dense brush and trees.

| | |
|---|---|
| Drainage Area: | 56.1 square miles |
| Existing Structure: | 3-span bridge (166' long) |
| Recommended Structure: | Widen existing bridge 10'; add new parallel bridge (166' long) |
| Stream Index Number: | 16-41-1-(11.5) |

The existing bridge was built in 1979 and is in good condition with a sufficiency rating of 89.44. It is recommended that the existing structure be widened 10 feet on the downstream side. A new parallel bridge of 166 feet would be added on the south side of the existing lanes to carry eastbound NC 54 traffic. In addition, pedestrian accommodations may be included; details of the pedestrian accommodations are subject to further discussion with the local government.

Site 9 – looking upstream

Site 9 – upstream face

Site 9 – looking downstream

Site 9 – downstream face

## 2.5 SITE 10

Site 10 is located on Third Fork Creek and crosses under NC 54 (see Figure 3-13 in Attachment 2). Third Fork Creek is classified as WS-IV and NSW. The banks are vegetated with some erosion. There is a FEMA Detail Flood Study on Third Fork Creek. The surrounding land is part of USACE property.

| | |
|---|---|
| Drainage Area: | 15.9 square miles |
| Existing Structure: | 5@ 9'x13' RCBC |
| Recommended Structure: | Replace with dual bridges (160') |
| Stream Index Number: | 16-41-1-12(2) |

The existing RCBC was installed in 1928 and has a sufficiency rating of 81.68. Due to the size of the existing structure and the length of extension that would be required, it is recommended to remove this structure and bridge the area with dual bridges 160 feet long. In addition, pedestrian accommodations may be included; details of the pedestrian accommodations are subject to further discussion with the local government.

Site 10 – looking upstream

Site 10 – upstream face

Site 10 – looking downstream

Site 10 – downstream face

## 2.6 SITE 11

This crossing spans Crooked Creek. The stream is classified as WS-IV and NSW. NC 54 crosses this site (see Figure 3-17 in Attachment 2). There is a FEMA Detail Flood Study on this creek.

| | |
|---|---|
| Drainage Area: | 1.22 square miles |
| Existing Structure: | 2@ 7'x7' RCBC |
| Recommended Structure: | Extend existing RCBC by 28' upstream |
| Stream Index Number: | 16-41-1-16-(1) |

The existing RCBC does not show signs of deficiency, and it is recommended to retain and extend the existing structure about 28 feet upstream to accommodate widening on NC 54.

Site 11 – upstream face

## 2.7 SITE 12

Site 12 carries an unnamed tributary to Crooked Creek and crosses under NC 54 (see Figure 3-17 in Attachment 2). The stream is classified as WS-IV and NSW. There is no FEMA study on this tributary.

| | |
|---|---|
| Drainage Area: | 0.47 square miles |
| Existing Structure: | 2@ 54" CMP Elliptical |
| Recommended Structure: | Replace with 1@ 8'x8' RCBC (268') |
| Stream Index Number: | 16-41-1-16-(1) |

The existing structure does not show signs of deficiency; however, its capacity is insufficient to handle the 50-year storm event. It is recommended to replace the two 54-inch CMPs in the same location with a culvert (1 @ 8'x8' RCBC, buried one foot, 268 feet long).

Site 12 – upstream face

Site 12 – downstream face

## 2.8 SITE 13

Site 13 is located on an unnamed tributary to Crooked Creek and crosses under NC 54 (see Figure 3-17 in Attachment 2). There is no FEMA study on the tributary. This stream is classified as WS-IV, NSW.

| | |
|---|---|
| Drainage Area: | 0.29 square miles |
| Existing Structure: | 1@ 60" CMP |
| Recommended Structure: | Replace with 1@ 7'x6' RCBC (190') |
| Stream Index Number: | 16-41-1-16-(1) |

The existing structure does not show signs of deficiency; however, its capacity is insufficient to handle the 50-year storm event. It is recommended to replace the 60-inch CMP with one 7'x6' box culvert (190 feet long) and relocate the stream channel approximately 200 feet on the downstream end.

Site 13 – looking upstream

Site 13 – downstream face

## 2.9 SITE 15

Site 15 carries Northeast Creek under NC 54 (see Figure 3-20 in Attachment 2). There is a FEMA Detail Flood Study on the stream. The stream is classified as WS-IV and NSW.

| | |
|---|---|
| Drainage Area: | 11.8 square miles |
| Existing Structure: | 4@ 11'x12' RCBC |
| Recommended Structure: | Extend existing RCBC by 155' (80' downstream and 75' upstream) |
| Stream Index Number: | 16-41-1-17-(0.7) |

The existing RCBC was installed in 1974 and is in good condition with a sufficiency rating of 87.02. It is recommended to extend the existing RCBC by 80 feet on the downstream end and 75 feet on the upstream end to accommodate widening of NC 54.

Site 15 – looking upstream

Site 15 – upstream face

Site 15 – looking downstream

Site 15 – downstream face

# Attachment 1
## Table 2
## Preliminary Hydraulic Recommendations

# PRELIMINARY HYDRAULIC RECOMMENDATIONS FOR MAJOR(1) CROSSINGS

DATE: 4/23/2019
PROJECT NUMBER: U-5774
WBS ELEMENT #: 54037.1.1
PROJECT DESCRIPTION: NC 54 Highway Improvements from US 15/501 in Chapel Hill to NC 55. (Orange and Durham Counties)
NAME: Crossing Summary Table

| SITE NUMBER | ALT ID | ROUTE | NRTR FIGURE | LAT | LONG | STREAM/ WETLAND ID | STREAM CLASSIFICATION | FEMA STUDY TYPE | DRAINAGE AREA (Mi^2) | WIDTH (FT) | EXISTING STRUCTURE | MINIMUM RECOMMENDED STRUCTURE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | Number, Size, Structure Type | Number, Size, Structure Type |
| 1 | Chapel Creek | US 15/501 (Fordham Blvd) | 3-2 | 35.90578 | -79.02910 | (16-41-2-8) | WS-IV, NSW | Limited Detail | 0.44 | 8 | 1 @ 7'x7' RCBC | Retain and extend 1 @ 7'x7' RCBC (60' upstream) |
| 3 | Little Creek | NC 54 | 3-5 | 35.90659 | -78.99533 | 16-41-1-15-(0.5) | WS-IV, NSW | Limited | 21.7 | 10-40 | Dual bridges (180' long) Reinforced Conc Floor on Prestressed Conc Girders (3 Spans: 1@ 60' 2-3/8"; 1@59' 7-1/4"; 1 @ 60' 2-3/8") | Widen existing structures (widen WB Bridge about 20' on the upstream side and widen the EB Bridge about 20' on the downstream side)^ |
| 8 | New Hope Creek | NC 54 | 3-10 | 35.91596 | -78.97374 | 16-41-1-(11.5) | WS-IV, NSW | Limited | 0.73 | 20-40 | 4 @ 8'x11' RCBC | Retain and extend 4@ 8' X 11' RCBC (110' downstream)^ |
| 9 | New Hope Creek | NC 54 | 3-10 | 35.91673 | -78.97051 | 16-41-1-(11.5) | WS-IV, NSW | Limited | 56.1 | 20-40 | Bridge (166' long) Reinforced Conc Floor on Prestressed Conc Girders (3 Spans: 1@ 55'5.5; 1@55'; 1 @ 55'5.5) | Widen existing structure (10' on the downstream side); Add new bridge for EB lanes (166')^ |
| 10 | Third Fork Creek | NC 54 | 3-15 | 35.91861 | -78.95477 | 16-41-1-12(2) | WS-IV, NSW | Detail | 15.9 | 20-30 | 5 @ 9'x13' RCBC | Replace with dual bridges (160')^ |
| 11 | Crooked Creek | NC 54 | 3-17 | 35.90980 | -78.93138 | 16-41-1-16(1) | WS-IV, NSW | Detail | 1.22 | 10-15 | 2 @ 7'X7' RCBC | Retain and extend 2@ 7'x7' RCBC (28' upstream) |
| 12 | UT to Crooked Creek (SMM) | NC 54 | 3-17 | 35.90917 | -78.92937 | | WS-IV, NSW | No Study | 0.47 | 10 | 2 @ 54" CMP ELLIPTICAL | Replace with 1@ 8'x8' RCBC (268') |
| 13 | UT to Crooked Creek (SMM) | NC 54 | 3-17 | 35.90850 | -78.92713 | | WS-IV, NSW | No Study | 0.29 | 10 | 1 @ 60" CMP | Replace with 1@ 7'x 6' RCBC (190') and stream relocation (200' at the downstream end) |
| 15 | Northeast Creek | NC 54 | 3-20 | 35.90266 | -78.90098 | 16-41-1-17-(0.7) | WS-IV, NSW | Detail | 11.80 | 30-40 | 4 @ 11'X12' RCBC | Retain and extend 4@ 11' X 12' RCBC (80' downstream/75 feet upstream) |

NOTES:
(1) Major Crossings - flow conveyance area greater than 30 square feet (This table should be used for Merger CP2A concurrence.)
^ Pedestrian accommodations are also being evaluated at these locations.

# Attachment 2
## Natural Resources Technical Report (January 2018)
## Section 3.2 Water Resources
## Section 5.0 Jurisdictional Issues
## Figure 3 Jurisdictional Resources

## 3.2 Water Resources

Water resources in the study area are part of the Cape Fear River basin (U.S. Geological Survey Hydrologic Unit 03030002). Forty streams were identified in the study area (Table 2). The location of each water resource is shown on Figure 3. The physical characteristics of these resources are provided in Table 3.

**Table 2. Water resources in the study area**

| Stream Name | Map ID | Figure | NCDWR Index Number | Best Usage Classification |
|---|---|---|---|---|
| Chapel Creek | Chapel Creek | Figure 3-2 | 16-41-2-8 | WS-IV |
| Crooked Creek | Crooked Creek | Figure 3-17 | 16-41-1-16-(1) | WS-V |
| Little Creek | Little Creek | Figure 3-5 | 16-41-1-15-(0.5) | WS-IV |
| New Hope Creek | New Hope Creek | Figure 3-8 | 16-41-1-(11.5) | WS-IV |
| Northeast Creek | Northeast Creek | Figure 3-15 | 16-41-1-17-(0.7) | WS-IV |
| UT to Chapel Creek | SA | Figure 3-2 | 16-41-2-8 | WS-IV |
| UT to New Hope Creek | SAA | Figure 3-7 | 16-41-1-(11.5) | WS-IV |
| UT to Chapel Creek | SB | Figure 3-2 | 16-41-2-8 | WS-IV |
| UT to Third Forth Creek | SBB | Figure 3-11 | 16-41-1-12-(2) | WS-IV |
| UT to Chapel Creek | SD | Figure 3-3 | 16-41-2-8 | WS-IV |
| UT to Third Forth Creek | SDD | Figure 3-13 | 16-41-1-12-(2) | WS-IV |
| UT to Chapel Creek | SE | Figure 3-3 | 16-41-2-8 | WS-IV |
| UT to Third Forth Creek | SEE | Figure 3-14 | 16-41-1-12-(2) | WS-IV |
| UT to Gum Creek | SFF | Figure 3-14 | 16-41-1-13 | WS-IV |
| UT to Little Creek | SG | Figure 3-5 | 16-41-1-15-(0.5) | WS-IV |
| UT to Third Forth Creek | SGG | Figure 3-15 | 16-41-1-12-(2) | WS-IV |
| UT to Chapel Creek | SH | Figure 3-4 | 16-41-2-8 | WS-IV |
| UT to Third Forth Creek | SHH | Figure 3-15 | 16-41-1-12-(2) | WS-IV |
| UT to Gum Creek | SII | Figure 3-16 | 16-41-1-13 | WS-IV |
| UT to Crooked Creek | SKK | Figure 3-17 | 16-41-1-16-(1) | WS-V |
| UT to Little Creek | SL | Figure 3-5 | 16-41-1-15-(0.5) | WS-IV |
| UT to Little Creek | SM | Figure 3-6 | 16-41-1-15-(0.5) | WS-IV |
| UT to Crooked Creek | SMM | Figure 3-17 | 16-41-1-16-(1) | WS-V |
| UT to Little Creek | SN | Figure 3-6 | 16-41-1-15-(0.5) | WS-IV |

| Stream Name | Map ID | Figure | NCDWR Index Number | Best Usage Classification |
|---|---|---|---|---|
| UT to Crooked Creek | SNN | Figure 3-17 | 16-41-1-16-(1) | WS-V |
| UT to New Hope Creek | SO | Figure 3-8 | 16-41-1-(11.5) | WS-IV |
| UT to Crooked Creek | SOO | Figure 3-17 | 16-41-1-16-(1) | WS-V |
| UT to New Hope Creek | SP | Figure 3-8 | 16-41-1-(11.5) | WS-IV |
| UT to Crooked Creek | SPP | Figure 3-18 | 16-41-1-16-(1) | WS-V |
| UT to New Hope Creek | SQ | Figure 3-7 | 16-41-1-(11.5) | WS-IV |
| UT to Northeast Creek | SQQ | Figure 3-20 | 16-41-1-17-(0.7) | WS-IV |
| UT to New Hope Creek | SR | Figure 3-7 | 16-41-1-(11.5) | WS-IV |
| UT to Crooked Creek | SRR | Figure 3-21 | 16-41-1-17-(0.7) | WS-IV |
| UT to New Hope Creek | SS | Figure 3-9 | 16-41-1-(11.5) | WS-IV |
| UT to Northeast Creek | SSS | Figure 3-20 | 16-41-1-17-(0.7) | WS-IV |
| UT to New Hope Creek | ST | Figure 3-8 | 16-41-1-(11.5) | WS-IV |
| UT to Northeast Creek | STT | Figure 3-20 | 16-41-1-17-(0.7) | WS-IV |
| UT to New Hope Creek | SY | Figure 3-10 | 16-41-1-(11.5) | WS-IV |
| UT to New Hope Creek | SZ | Figure 3-7 | 16-41-1-(11.5) | WS-IV |
| Third Fork Creek | Third Fork Creek | Figure 3-9 | 16-41-1-12-(2) | WS-IV |

**Table 3. Physical characteristics of water resources in the study area**

| Map ID | Bank Height (ft) | Bank Width (ft) | Water Depth (in) | Channel Substrate | Velocity | Clarity |
|---|---|---|---|---|---|---|
| Chapel Creek | 1 | 8 | 2 | Sand/silt/gravel | Moderate | Clear |
| Crooked Creek | 5 | 10-15 | 6 | Sand/silt/gravel | Moderate | Clear |
| Little Creek | 2-4 | 10-40 | 12-36 | Silt/sand | Slow | Turbid |
| New Hope Creek | 6-8 | 20-40 | 24-48 | Sand/silt/gravel | Moderate | Slightly turbid |
| Northeast Creek | 6-8 | 30-40 | 12-36 | Sand/silt/gravel | Moderate | Slightly turbid |
| SA | 3 | 3 | 6 | Sand/gravel/silt | Moderate | Clear |
| SAA | 1 | 2 | 0 | Silt/sand/gravel | No Flow | No Flow |
| SB | 1 | 3 | 2 | Sand/silt/gravel | Moderate | Clear |
| SBB | 1 | 1 | 0 | Sand/silt/gravel | No Flow | No Flow |

| Map ID | Bank Height (ft) | Bank Width (ft) | Water Depth (in) | Channel Substrate | Velocity | Clarity |
|---|---|---|---|---|---|---|
| SD | 5 | 6 | 6 | Silt/sand/gravel | Moderate | Clear |
| SDD | 2-5 | 3-6 | 0-4 | Silt/sand | Slow | Slightly turbid |
| SE | 3 | 4 | 3 | Silt/sand/gravel | No Flow | No Flow |
| SEE | 1 | 2 | 0 | Sand/silt/gravel | No Flow | No Flow |
| SFF | 1 | 1 | 1 | Sand/silt/gravel | Slow | Clear |
| SG | 2 | 4 | 0 | Silt/sand/gravel | No Flow | No Flow |
| SGG | 1 | 1 | 2 | Silt/sand/rip-rap | Moderate | Clear |
| SH | 2 | 3 | 0 | Silt/sand/gravel | No Flow | No Flow |
| SHH | 1 | 3 | 6-12 | Silt/sand | Slow | Clear |
| SII | 1 | 3 | 0 | Silt/sand | No Flow | No Flow |
| SKK | 1 | 3 | 0 | Silt/sand/cobble | No Flow | No Flow |
| SL | 2 | 3-6 | 3 | Silt/sand/rip-rap | Moderate | Slightly turbid |
| SM | 1-2 | 2-5 | 6 | Silt/sand/rip-rap | Slow | Turbid |
| SMM | 4-5 | 10 | 3-6 | Sand/silt | Moderate | Clear |
| SN | 1-3 | 2-6 | 2 | Silt/sand/rip-rap | Moderate | Slightly turbid |
| SNN | 1-2 | 3-4 | 0 | Silt/sand | No Flow | No Flow |
| SO | 1 | 2-3 | 0-1 | Silt/sand/rip-rap | Moderate | Clear |
| SOO | 4-6 | 6-8 | 0-18 | Silt/sand | Slow | Slightly turbid |
| SP | 1 | 3 | 0-1 | Silt/sand/gravel | Moderate | Slightly turbid |
| SPP | 1 | 2-4 | 0 | Silt/sand | No Flow | No Flow |
| SQ | 1-3 | 3-5 | 1-2 | Silt/sand/gravel | Moderate | Clear |
| SQQ | 1-15 | 3-15 | 2-6 | Silt/sand | Slow | Clear |
| SR | 1-2 | 3-6 | 2-3 | Silt/sand | Slow | Slightly turbid |
| SRR | 2-3 | 4-6 | 2-4 | Sand/silt | Slow | Clear |
| SS | 1 | 3 | 0 | Silt/sand/gravel | No Flow | No Flow |
| ST | 1 | 4 | 3 | Silt/sand | Moderate | Turbid |
| STT | 1-2 | 1-6 | 2-4 | Silt/sand | Moderate | Slightly turbid |
| SX | 6-8 | 20-40 | 0-48+ | Silt/sand | Slow | Turbid |
| SY | 2-3 | 3-6 | 0 | Sand/silt | No Flow | No Flow |
| SZ | 1 | 1-2 | 0 | Silt/sand/gravel | No Flow | No Flow |
| Third Fork Creek | 5-6 | 20-30 | 24-36 | Sand/silt/gravel | Moderate | Turbid |

Four small ponds were located in the study area, (Figures 3-3, 3-14, and 3-18 ). Two ponds are stormwater control/treatment structures associated with a residential development and a mixed-use development and are located on the north side of NC Highway 54 at the end of Pinehurst Drive and between Barbee Chapel Road and Meadowmont Lane. The third pond is an amenity

perennial creeks found in the study area include bluegill, green sunfish, redbreast sunfish, common carp*, and redear sunfish.

### 4.4 Invasive Species

Eight species from the NCDOT Invasive Exotic Plant List for North Carolina were found to occur in the study area. The species identified were English ivy (moderate threat), sericea (threat), Chinese privet (threat), Japanese honeysuckle (moderate threat), kudzu (threat), mimosa (moderate threat), autumn olive (moderate threat) and Japanese stilt grass (threat). NCDOT will manage invasive plant species associated with the project as appropriate.

## 5.0 JURISDICTIONAL ISSUES

### 5.1 Clean Water Act Waters of the U.S.

Forty jurisdictional streams were identified in the study area (Table 5). The locations of these streams are shown on Figure 3. USACE and NCDWR stream delineation forms are included in Appendix C. All of the jurisdictional streams in the study area have been designated as warm water streams for the purposes of stream mitigation.

**Table 5. Jurisdictional characteristics of water resources in the study area**

| Map ID | Length (ft) | Classification | Compensatory Mitigation Required[1] | River Basin Buffer |
|---|---|---|---|---|
| Chapel Creek | 407 | Perennial | Yes | Yes |
| Crooked Creek | 249 | Perennial | Yes | Yes |
| Little Creek | 943 | Perennial | Yes | Yes |
| New Hope Creek | 764 | Perennial | Yes | Yes |
| Northeast Creek | 918 | Perennial | Yes | Yes |
| SA | 648 | Intermittent | Yes | No |
| SAA | 34 | Intermittent | Yes | No |
| SB | 112 | Perennial | Yes | No |
| SBB | 49 | Intermittent | Yes | Yes |
| SD | 198 | Perennial | Yes | No |
| SDD | 135 | Intermittent | Yes | Yes |
| SDD | 91 | Perennial | Yes | Yes |
| SE | 259 | Perennial | Yes | Yes |
| SEE | 305 | Intermittent | Yes | Yes |
| SFF | 15 | Intermittent | Yes | Yes |
| SG | 228 | Intermittent | Yes | Yes |
| SGG | 182 | Intermittent | Yes | Yes |
| SH | 58 | Intermittent | Yes | No |
| SHH | 152 | Perennial | Yes | Yes |
| SII | 111 | Intermittent | Yes | Yes |
| SKK | 341 | Intermittent | Yes | Yes |
| SL | 1,085 | Perennial | Yes | Yes |
| SM | 181 | Perennial | Yes | Yes |
| SMM | 1,928 | Perennial | Yes | Yes |
| SN | 2,250 | Perennial | Yes | Yes |

| Map ID | Length (ft) | Classification | Compensatory Mitigation Required[1] | River Basin Buffer |
|---|---|---|---|---|
| SNN | 213 | Intermittent | Yes | Yes |
| SO | 285 | Intermittent | Yes | Yes |
| SOO | 1,519 | Perennial | Yes | Yes |
| SP | 35 | Intermittent | Yes | Yes |
| SP | 348 | Perennial | Yes | Yes |
| SPP | 602 | Intermittent | Yes | Yes |
| SQ | 328 | Perennial | Yes | No |
| SQQ | 150 | Intermittent | Yes | No |
| SR | 128 | Perennial | Yes | Yes |
| SRR | 170 | Intermittent | Yes | No |
| SS | 270 | Intermittent | Yes | Yes |
| ST | 122 | Intermittent | Yes | Yes |
| STT | 124 | Intermittent | Yes | Yes |
| SY | 300 | Intermittent | Yes | Yes |
| SZ | 188 | Perennial | Yes | Yes |
| Third Fork Creek | 562 | Perennial | Yes | Yes |
| **Total:** | **16,987** | | | |

Note: [1] Assumes permanent impacts to jurisdictional features

Fifteen jurisdictional wetlands were identified within the study area. The locations of these wetlands are shown on Figure 3. Wetland classification and quality rating data are presented in Table 6. All wetlands in the study area are within the Cape Fear River watershed (USGS Hydrologic Unit 03030002).

USACE wetland delineation forms for each wetland are included in Appendix C. Descriptions of the terrestrial communities at each wetland site are presented in section 4.1 and Table 6.

**Table 6. Jurisdictional characteristics of wetlands in the study area**

| Map ID | NCWAM Classification | Hydrologic Classification | Area (acres) |
|---|---|---|---|
| WA | Headwater forest | Riparian | 0.3 |
| WB | Headwater forest | Riparian | 0.4 |
| WC | Basin wetland | Non-riparian | < 0.1 |
| WD | Bottomland hardwood forest | Riparian | 13.0 |
| WE | Headwater forest | Riparian | 0.2 |
| WF | Headwater forest | Riparian | 1.8 |
| WG | Headwater forest | Riparian | 0.3 |
| WH | Bottomland hardwood forest | Riparian | 26.2 |
| WI | Bottomland hardwood forest | Riparian | 7.5 |
| WJ | Headwater forest | Riparian | 0.2 |
| WK | Headwater forest | Riparian | < 0.1 |
| WM | Basin wetland | Non-riparian | 0.2 |
| WN | Headwater forest | Riparian | 0.1 |
| WO | Headwater forest | Riparian | < 0.1 |

| Map ID | NCWAM Classification | Hydrologic Classification | Area (acres) |
|---|---|---|---|
| WP | Bottomland hardwood forest | Riparian | 5.0 |
| | | **Total:** | **55.5** |

## 5.2 Clean Water Act Permits

Several extensive wetland areas are present with the project area. Impacts to these areas are likely to be unavoidable. As a result, an Individual 404 Permit will likely be applicable for impacts to wetlands and streams from the construction of the project. The USACE holds the final discretion as to what permit will be required to authorize project construction. If a Section 404 permit is required then a Section 401 Water Quality Certification from the NCDWR will be needed.

## 5.3 Coastal Area Management Act Areas of Environmental Concern

There are no areas of environmental concern in the study area that fall under the jurisdiction of the Coastal Area Management Act.

## 5.4 Construction Moratoria

The North Carolina Wildlife Resource Commission (NCWRC) was contacted regarding potential construction moratoria. No construction moratoria will apply to any streams or waters in the study area, per email from the NCWRC received January 10, 2018.

## 5.5 N.C. River Basin Buffer Rules

Streamside riparian zones within the study area are protected under provisions of the Jordan Lake River Buffer Rules administered by NCDWR. Table 5 indicates which streams are subject to buffer rule protection. Potential impacts to protected stream buffers will be determined once a final alignment and design have been determined.

## 5.6 Rivers and Harbors Act Section 10 Navigable Waters

No surface waters have been designated as Section 10 navigable waters within the study area.

## 5.7 Wetlands and Stream Mitigation

### 5.7.1 Avoidance and Minimization of Impacts

The NCDOT will attempt to avoid and minimize impacts to streams and wetlands to the greatest extent practicable in choosing a preferred alternative and during project design. At this time, no final decisions have been made with regard to the location or design of the preferred alternative.

### 5.7.2 Compensatory Mitigation of Impacts

The NCDOT will investigate potential on-site stream and wetland mitigation opportunities once a final decision has been rendered on the location of the preferred alternative. If on-site mitigation is not feasible, mitigation will be provided by North Carolina Department of Environmental Quality, Division of Mitigation Services.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# JURISDICTIONAL FEATURES MAP

**Widening of NC 54 from US 15/501 to NC 55 in Orange and Durham Counties**

TIP Project U-5774

**Legend**

- Study Area
- Culvert
- Pond
- Ephemeral Channel
- Intermittent Stream
- Perennial Stream
- Palustrine Emergent Wetland (PEM)
- Palustrine Forested Wetland (PFO)

**Haw River**
**HUC 03030002**

0 100 200 Feet

N

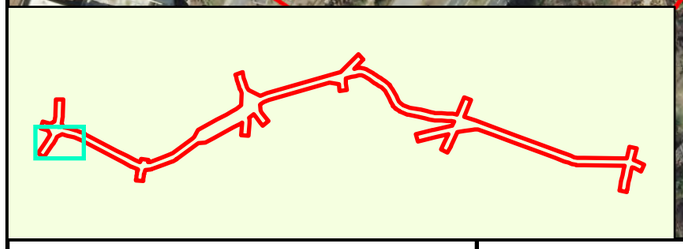
| Div: | TIP# |
|---|---|
| 5 & 7 | U-5774 |

Date: November 2017

**Figure 3-1**

Site 1 Chapel Creek
Existing: 1@7'x7' RCBC
Proposed: Extend existing (60' downstream)

Raleigh Rd
SA
WB
SA
SB
WA
US 15/501
Chapel Creek
WC
Carmichael Rd
Highland Woods Rd
Hamilton Rd
Audley Ln
NC-54
Oakwood Dr
Rogerson Dr
Prestwick Rd



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- Palustrine Forested Wetland (PFO)
- Pond
- Perennial Stream

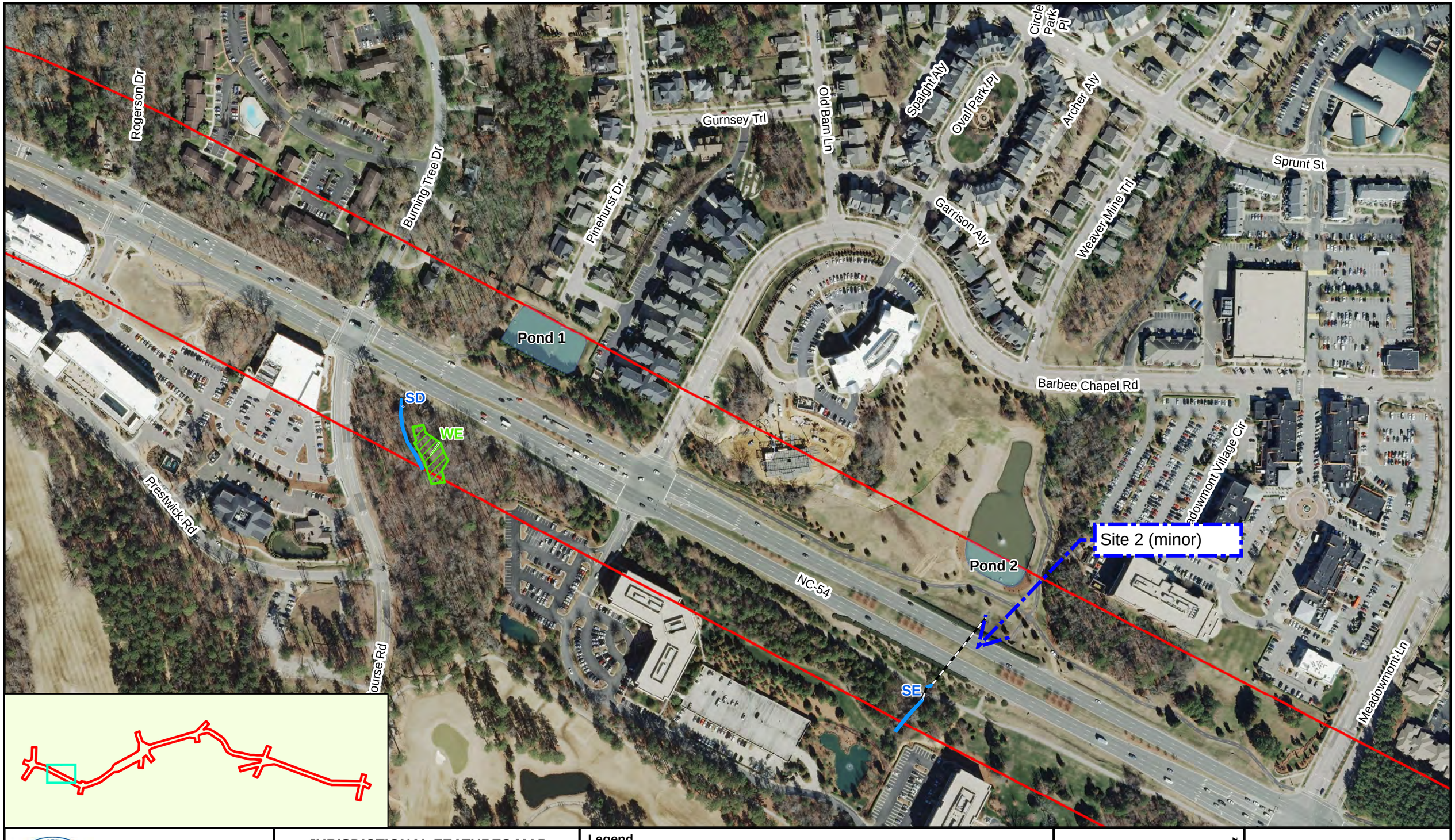
**Haw River**
**HUC 03030002**

Feet
0 100 200

| Div: | TIP# |
|---|---|
| 5 & 7 | U-5774 |

Date: November 2017

**Figure 3-2**

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# JURISDICTIONAL FEATURES MAP

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**Haw River**
**HUC 03030002**

0 100 200 Feet

| Div: | TIP# |
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**Figure 3-3**




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**Haw River**
**HUC 03030002**

0 100 200 Feet

N

| Div: | TIP# |
|---|---|
| 5 & 7 | U-5774 |

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**Figure 3-4**

Site 3 Little Creek
Existing: Dual Bridges @ 182'
Proposed: Widen WB bridge (20' upstream)
and widen EB bridge( 20' downstream)

WD
WD
WD
WD
WD
WD
SM
SL
SG
Little Creek
W Hwy-54
Kingswood Dr
Downing Creek Pkwy
Delander Way
Cranebridge D

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# JURISDICTIONAL FEATURES MAP

**Widening of NC 54 from US 15/501 to NC 55 in Orange and Durham Counties**

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- Culvert
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**Haw River**
**HUC 03030002**

0 100 200 Feet

| Div: | TIP# |
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**Figure 3-5**


NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
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**Haw River**
**HUC 03030002**

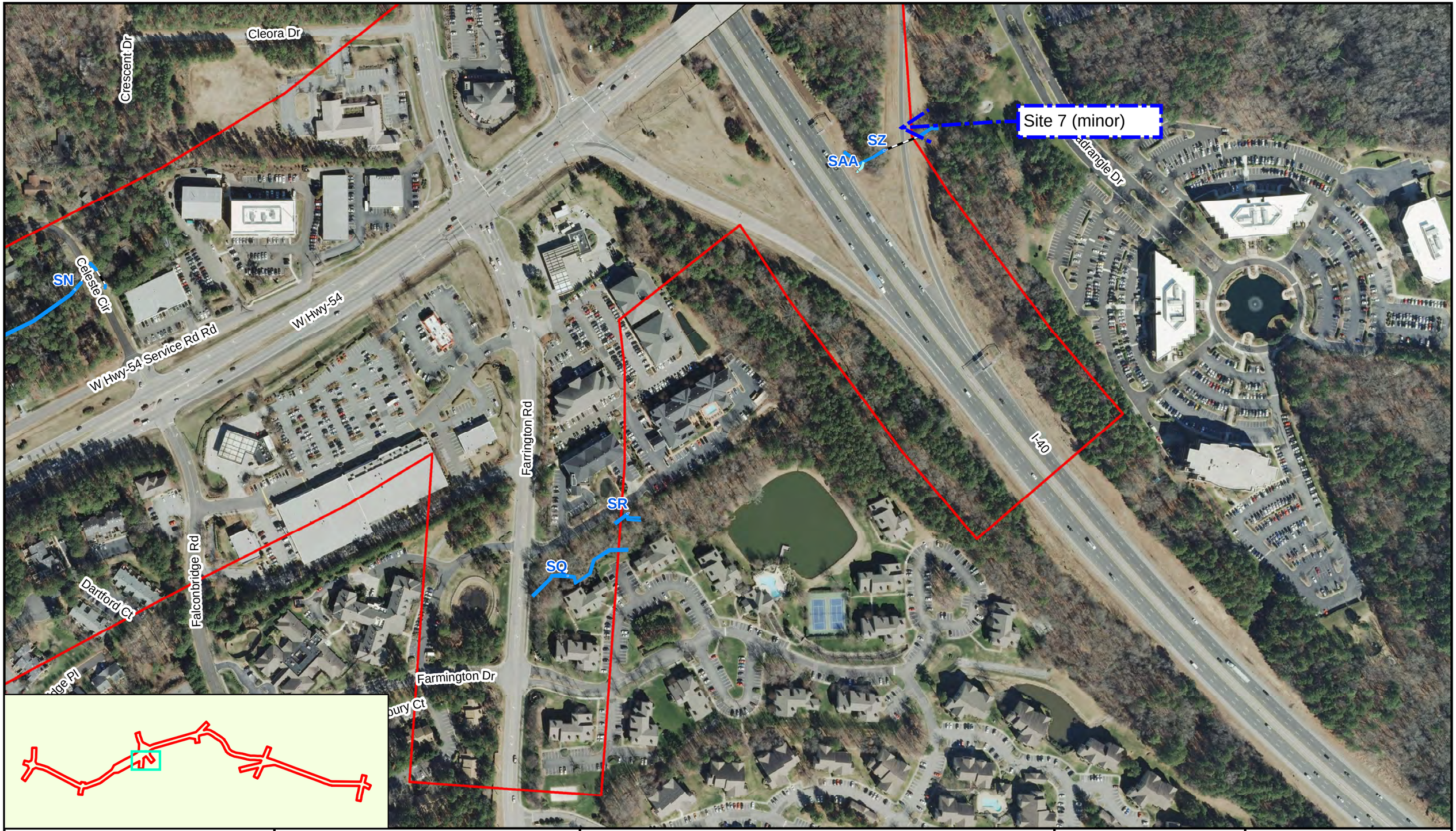
0 100 200 Feet

N

| Div: | TIP# |
|---|---|
| 5 & 7 | U-5774 |

Date: November 2017

**Figure 3-6**



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**Haw River**
**HUC 03030002**

0 100 200 Feet

N

| Div: | TIP# |
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**Figure 3-7**


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**JURISDICTIONAL FEATURES MAP**

**Widening of NC 54 from US 15/501 to NC 55 in Orange and Durham Counties**

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**Haw River**
**HUC 03030002**

0 100 200 Feet

| Div: | TIP# |
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**Figure 3-8**


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# JURISDICTIONAL FEATURES MAP

**Widening of NC 54 from US 15/501 to NC 55 in Orange and Durham Counties**

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**Haw River**
**HUC 03030002**

0 100 200 Feet

N

| Div: | TIP# |
|---|---|
| 5 & 7 | U-5774 |

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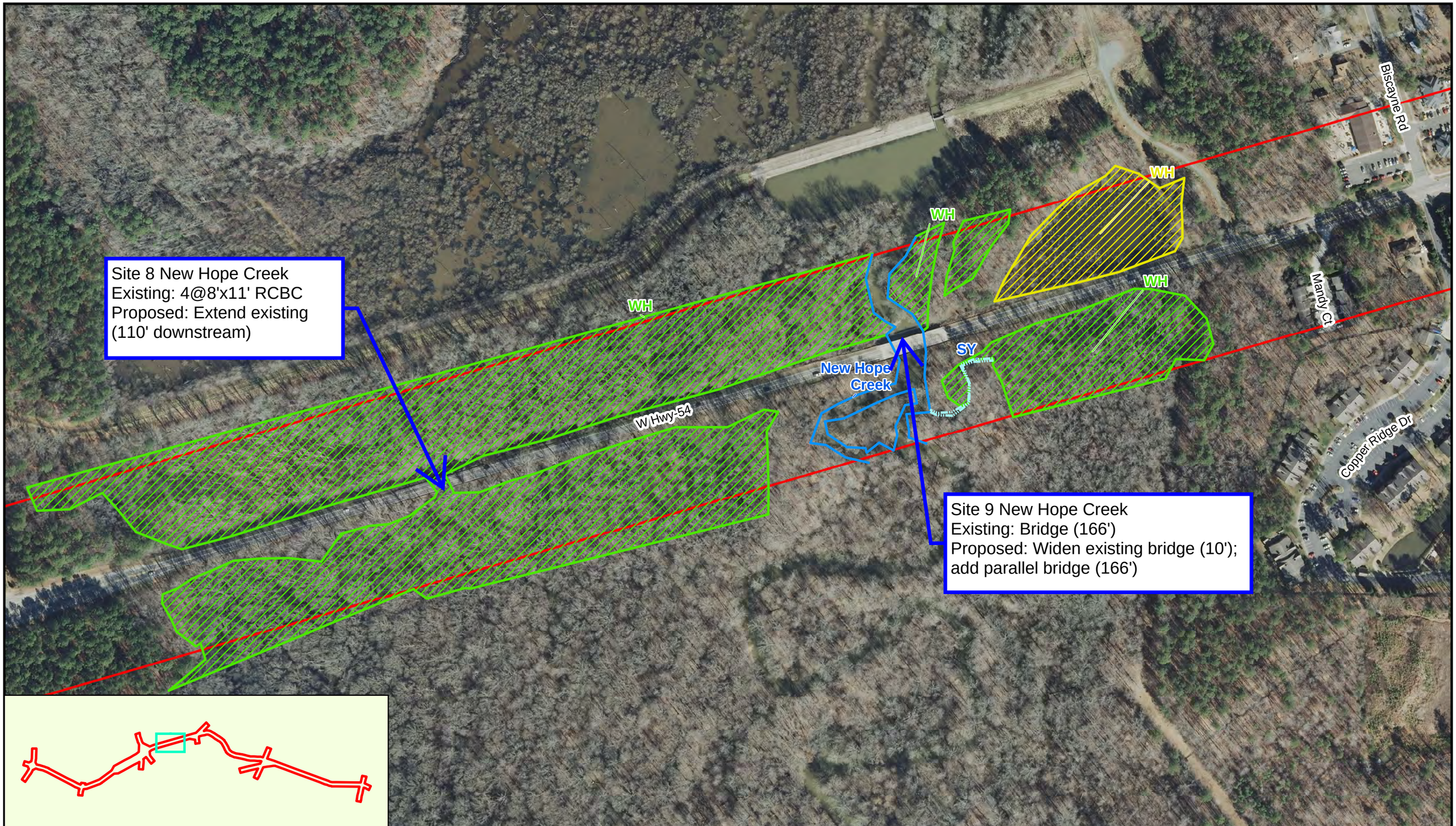
**Figure 3-9**



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**JURISDICTIONAL FEATURES MAP**

**Widening of NC 54 from US 15/501 to NC 55 in Orange and Durham Counties**

TIP Project U-5774

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**Haw River**
**HUC 03030002**

0 100 200 Feet

| Div: 5 & 7 | TIP# U-5774 | **Figure 3-10** |
|---|---|---|
| Date: November 2017 | | |


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**Haw River**
**HUC 03030002**

0 100 200 Feet

| Div: 5 & 7 | TIP# U-5774 | Figure 3-11 |
|---|---|---|
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# JURISDICTIONAL FEATURES MAP

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**Haw River**
**HUC 03030002**

0 100 200 Feet

N

| Div: | TIP# |
|---|---|
| 5 & 7 | U-5774 |

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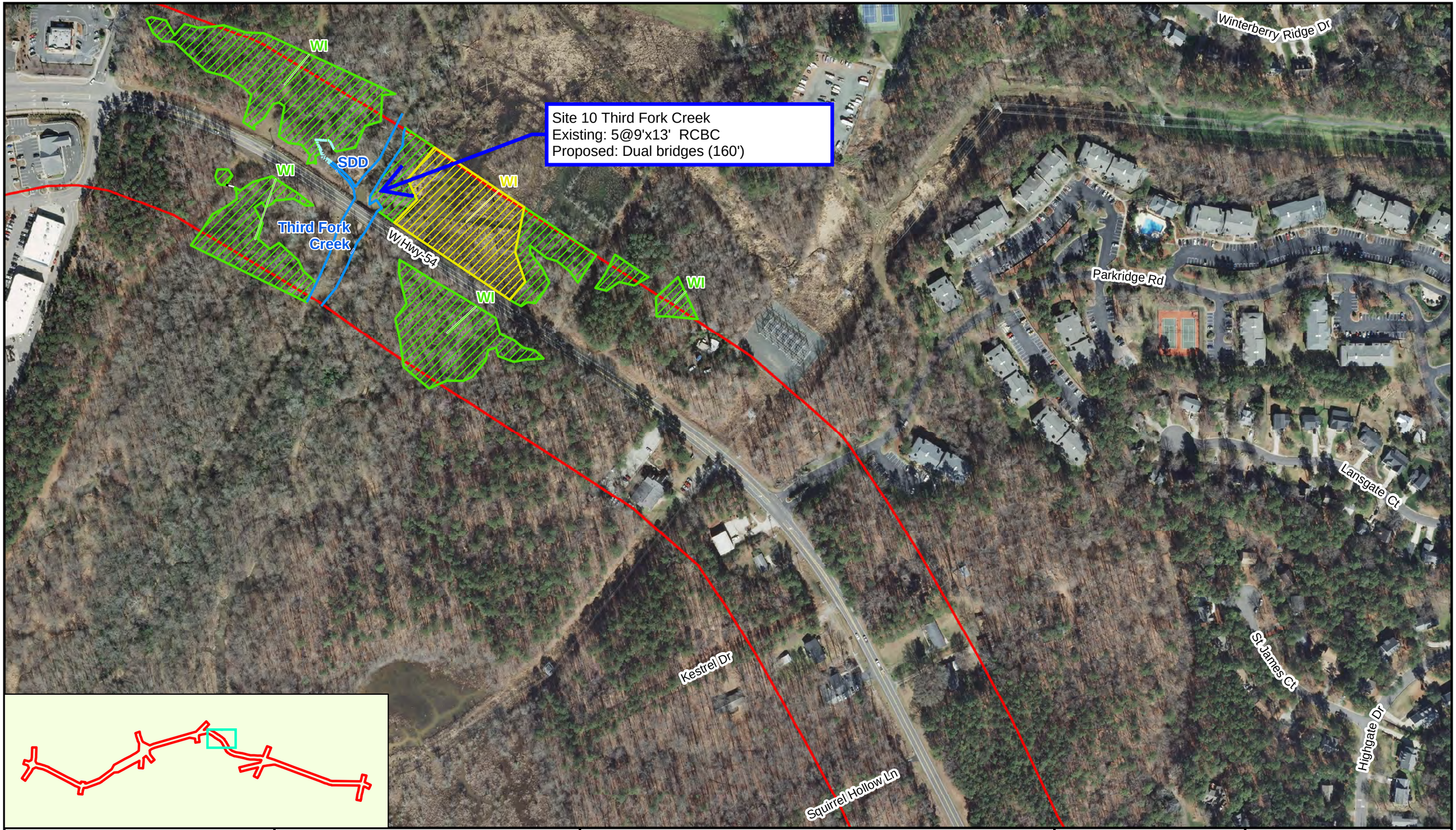
**Figure 3-12**



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# JURISDICTIONAL FEATURES MAP

**Widening of NC 54 from US 15/501 to NC 55 in Orange and Durham Counties**

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**Haw River**
**HUC 03030002**

0 100 200 Feet

N

| Div: | TIP# |
|---|---|
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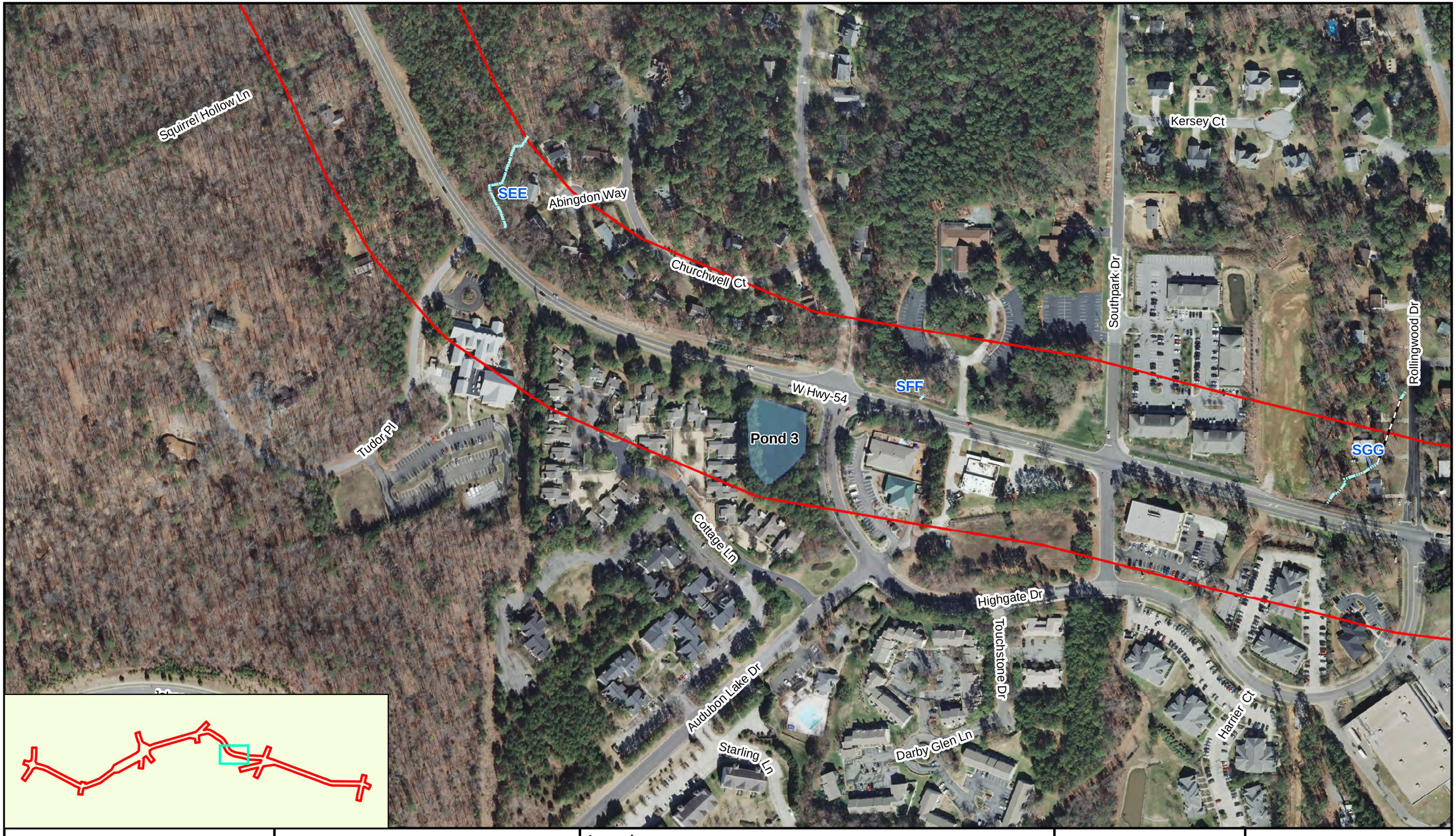
**Figure 3-13**



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# JURISDICTIONAL FEATURES MAP

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**Haw River**
**HUC 03030002**

0 100 200 Feet

N

| Div: | TIP# |
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**Figure 3-14**


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# JURISDICTIONAL FEATURES MAP

**Widening of NC 54 from US 15/501 to NC 55 in Orange and Durham Counties**

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**Haw River**
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0 100 200 Feet

N

| Div: 5 & 7 | TIP# U-5774 | Figure 3-15 |
|---|---|---|
| Date: November 2017 | | |




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**Haw River**
**HUC 03030002**

0 100 200 Feet

N

| Div: 5 & 7 | TIP# U-5774 | Figure 3-16 |
|---|---|---|
| Date: November 2017 | | |

Site 11 Crooked Creek
Existing: 2@7'x7' RCBC
Proposed: Extend existing (28' upstream)

Site 12 UT to Crooked Creek
Existing: 2@54"CMP (elliptical)
Proposed: 1@8'x8' RCBC (268')

Site 13 UT to Crooked Creek
Existing: 1@60" CMP
Proposed: 1@7'x6' RCBC (190' plus 200' stream relocation)

Crooked Creek Pkwy
W Hwy-54
Fayetteville St
Windcrest Rd
Wheeling Cir
Castell Dr
Forge Rd
I-40
E Hwy-54
Flint Ln
Boulder Rd
Clarksdale Ln
Wellingham Dr
WJ
WK
WM
SKK
SMM
SNN
SOO
Crooked Creek

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**Widening of NC 54 from US 15/501 to NC 55 in Orange and Durham Counties**

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**Haw River**
**HUC 03030002**

0 100 200 Feet

| Div: 5 & 7 | TIP# U-5774 | Figure 3-17 |
|---|---|---|
| Date: November 2017 | | |

Site 14 (minor)

SOO

SOO

SPP

WN

Pond 4

I-40

Pine Glen Trl

Greens Hollow Ln

Hidcote Cir

Wellingham Dr

E Hwy-54

Oxboro Cir

Canadian Ct

Amhurst Rd

Barbee Rd

Grenfell Dr

Hardwick Dr

Hunters Ln

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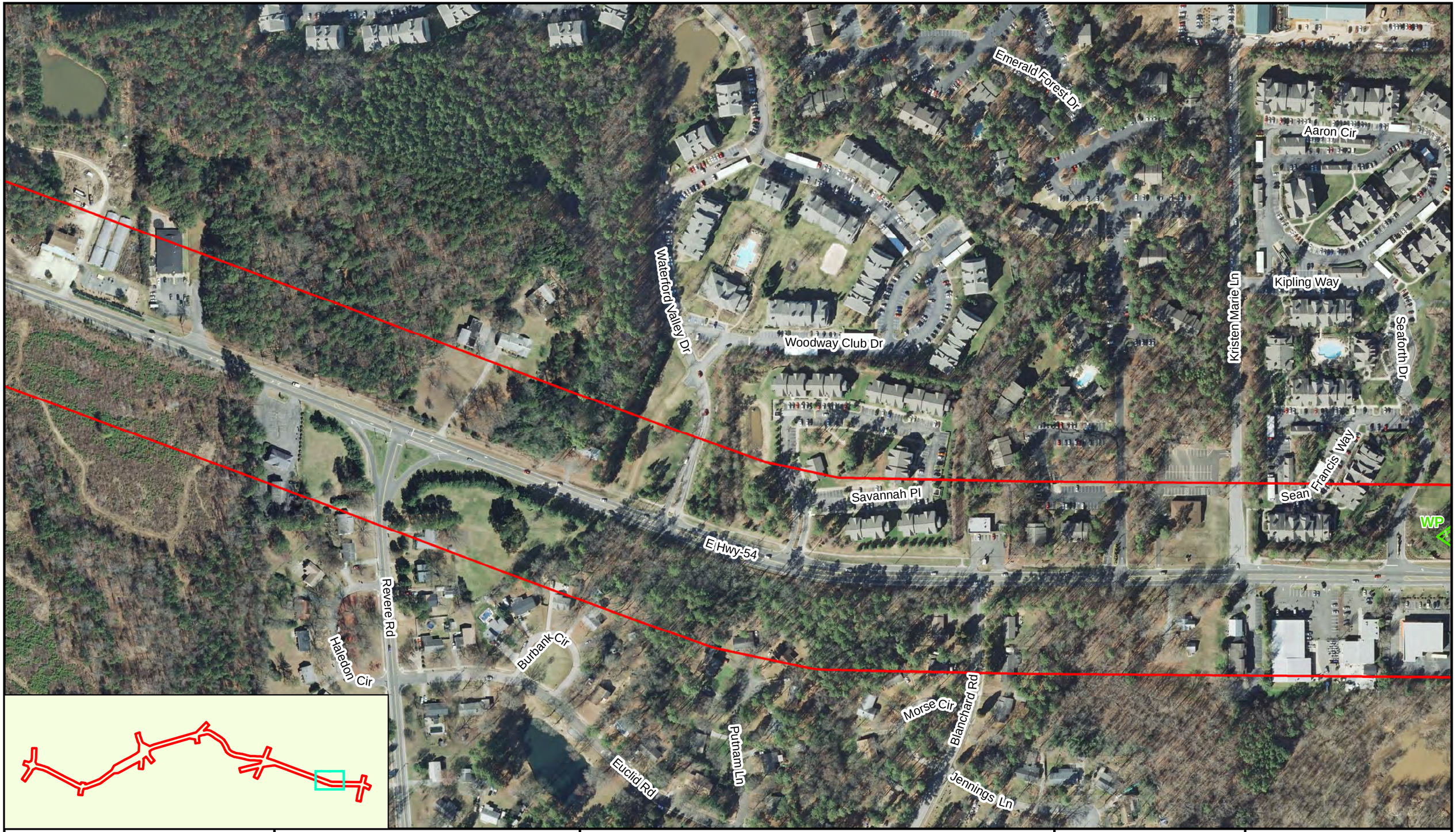
**Haw River**
**HUC 03030002**

0 100 200 Feet

| Div: | TIP# |
|---|---|
| 5 & 7 | U-5774 |

Date: November 2017

**Figure 3-18**

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# JURISDICTIONAL FEATURES MAP

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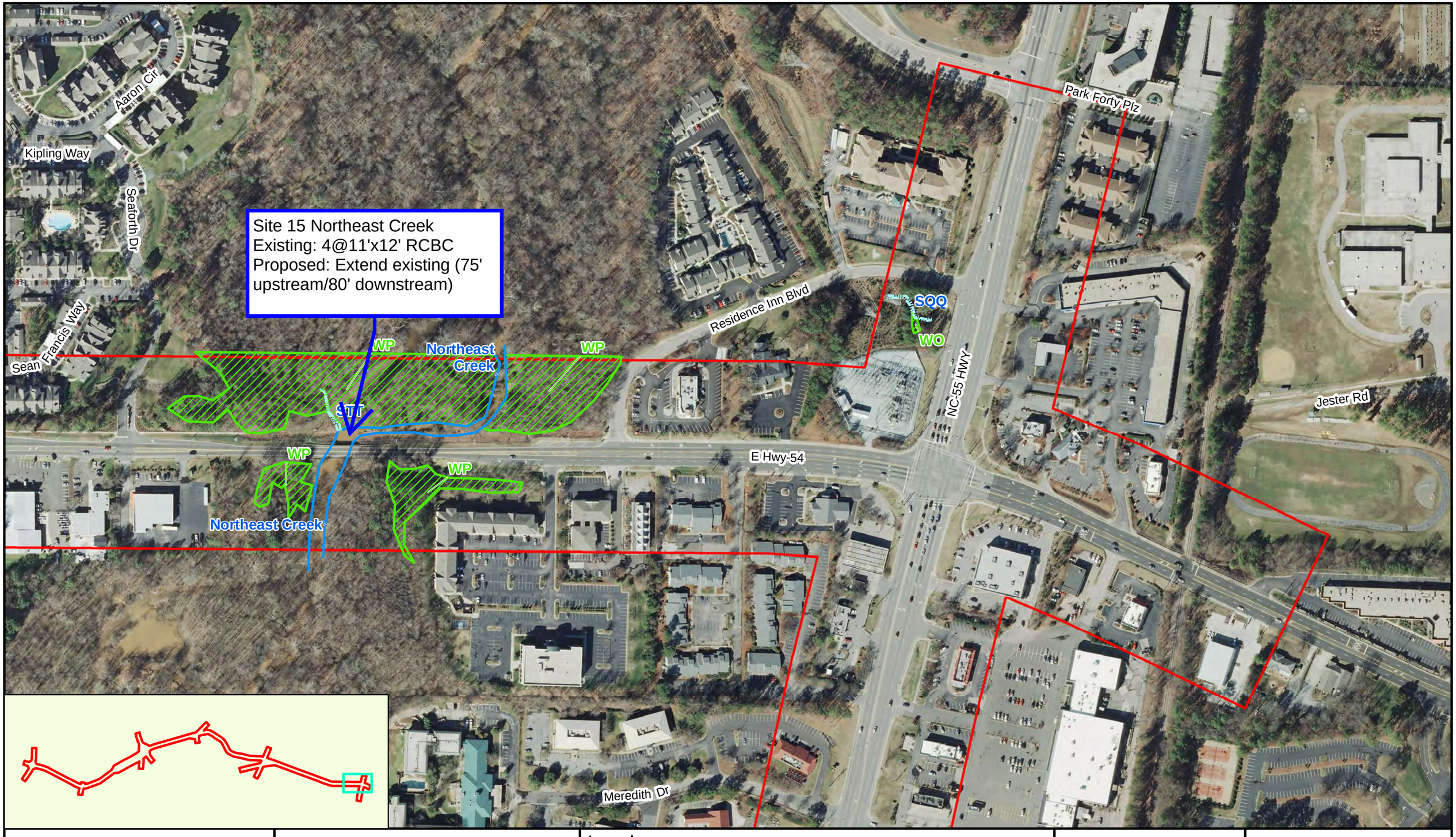
**Haw River**
**HUC 03030002**

Feet
0 100 200

| Div: | TIP# |
|---|---|
| 5 & 7 | U-5774 |

Date: November 2017

**Figure 3-19**



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- Palustrine Emergent Wetland (PEM)
- Palustrine Forested Wetland (PFO)

**Haw River**
**HUC 03030002**

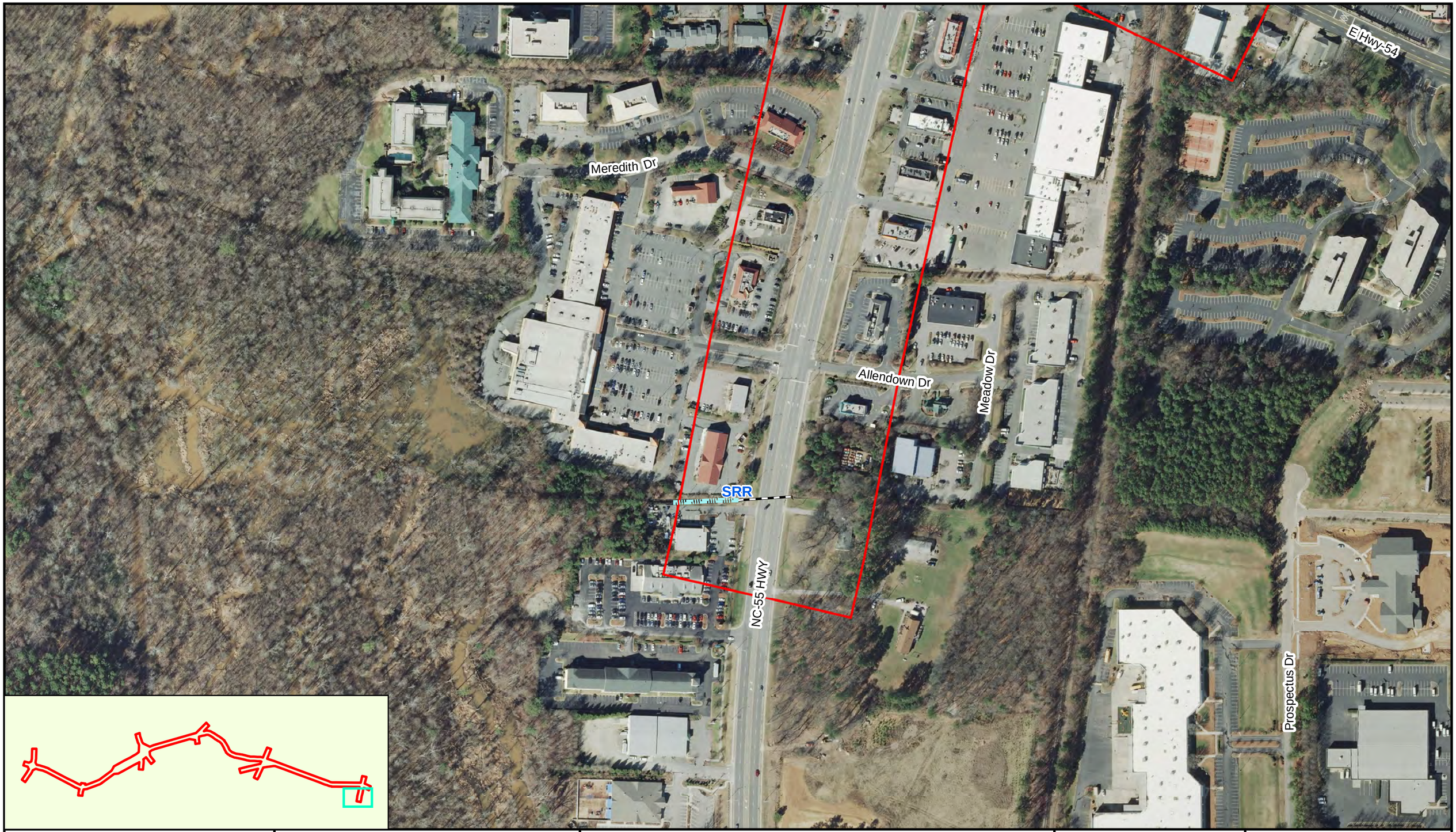
0 100 200 Feet

N

| Div: | TIP# |
|---|---|
| 5 & 7 | U-5774 |

Date: November 2017

**Figure 3-20**




NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
PROJECT DEVELOPMENT AND ENVIRONMENTAL ANALYSIS UNIT

# JURISDICTIONAL FEATURES MAP

**Widening of NC 54 from US 15/501 to NC 55 in Orange and Durham Counties**

TIP Project U-5774

**Legend**

- Study Area
- Culvert
- Pond
- Ephemeral Channel
- Intermittent Stream
- Perennial Stream
- Palustrine Emergent Wetland (PEM)
- Palustrine Forested Wetland (PFO)

**Haw River**
**HUC 03030002**

0 100 200 Feet

N

| Div: 5 & 7 | TIP# U-5774 | Figure 3-21 |
|---|---|---|
| Date: November 2017 | | |