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.

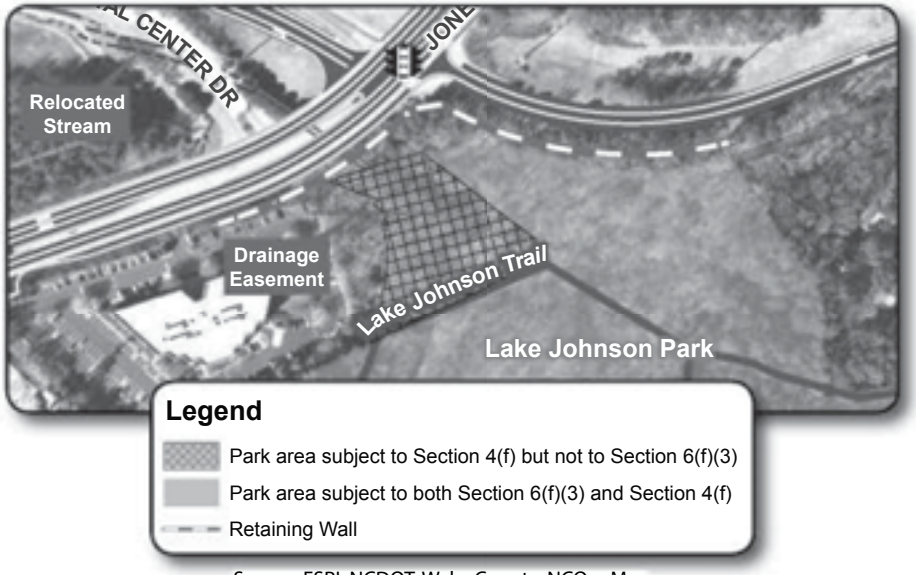
Want to know more? Go to FHWA website:
https://www.fhwa.dot.gov/wadiv/envir/section6f.cfm

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

Source: ESRI, NCDOT, Wake County, NCOneMap

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:

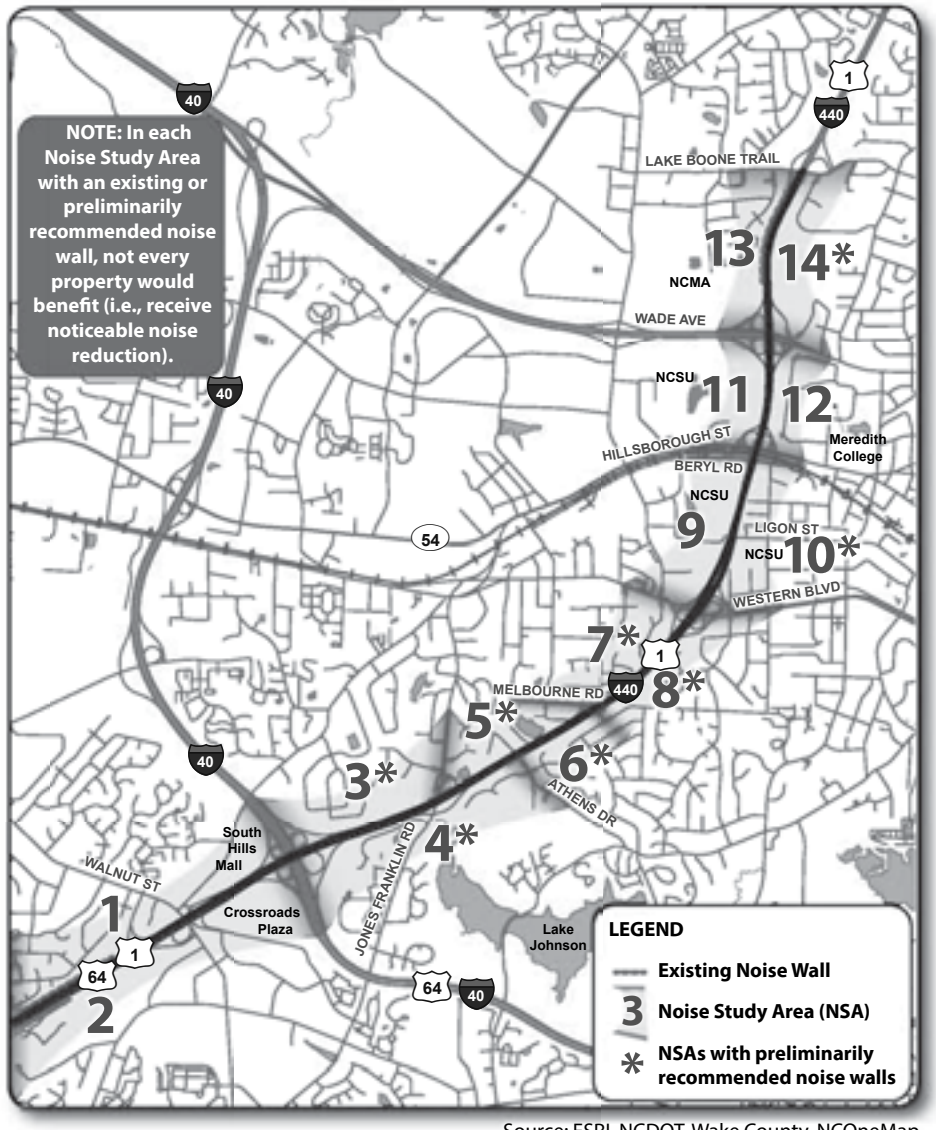
- Private community pools, playgrounds, tennis courts, and game courts
- Hotel pools and hotel and office complex outdoor use areas
- Parks and greenways, including Lake Johnson Park, Kaplan Park, Method Community Park, Museum Park Trails, Reedy Creek Trail, and House Creek Trail
- Churches, including 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 SECTION Air Quality

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.

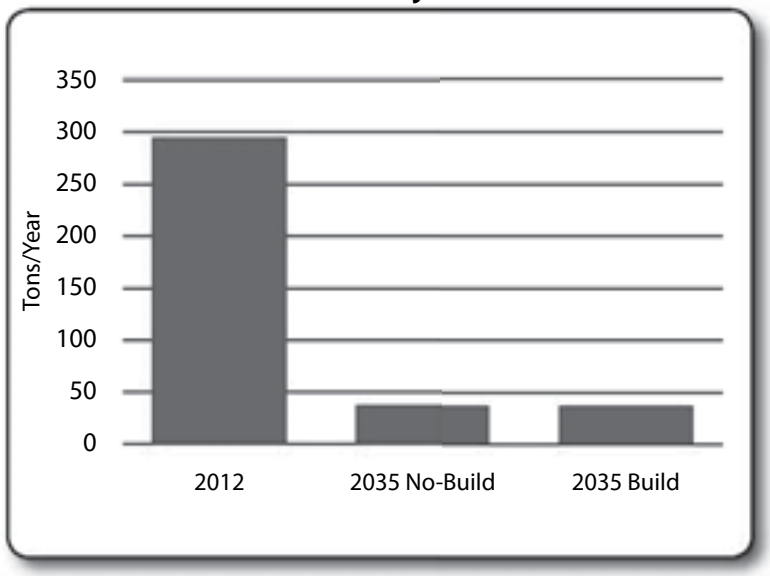
Based on the analysis, total vehicle miles traveled in the analyzed study area is forecasted to increase approximately 62 percent between 2012 existing conditions and the 2035 No-Build Scenario. Vehicle miles traveled in the 2035 Build Scenario are predicted to be about the same in the project study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

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.

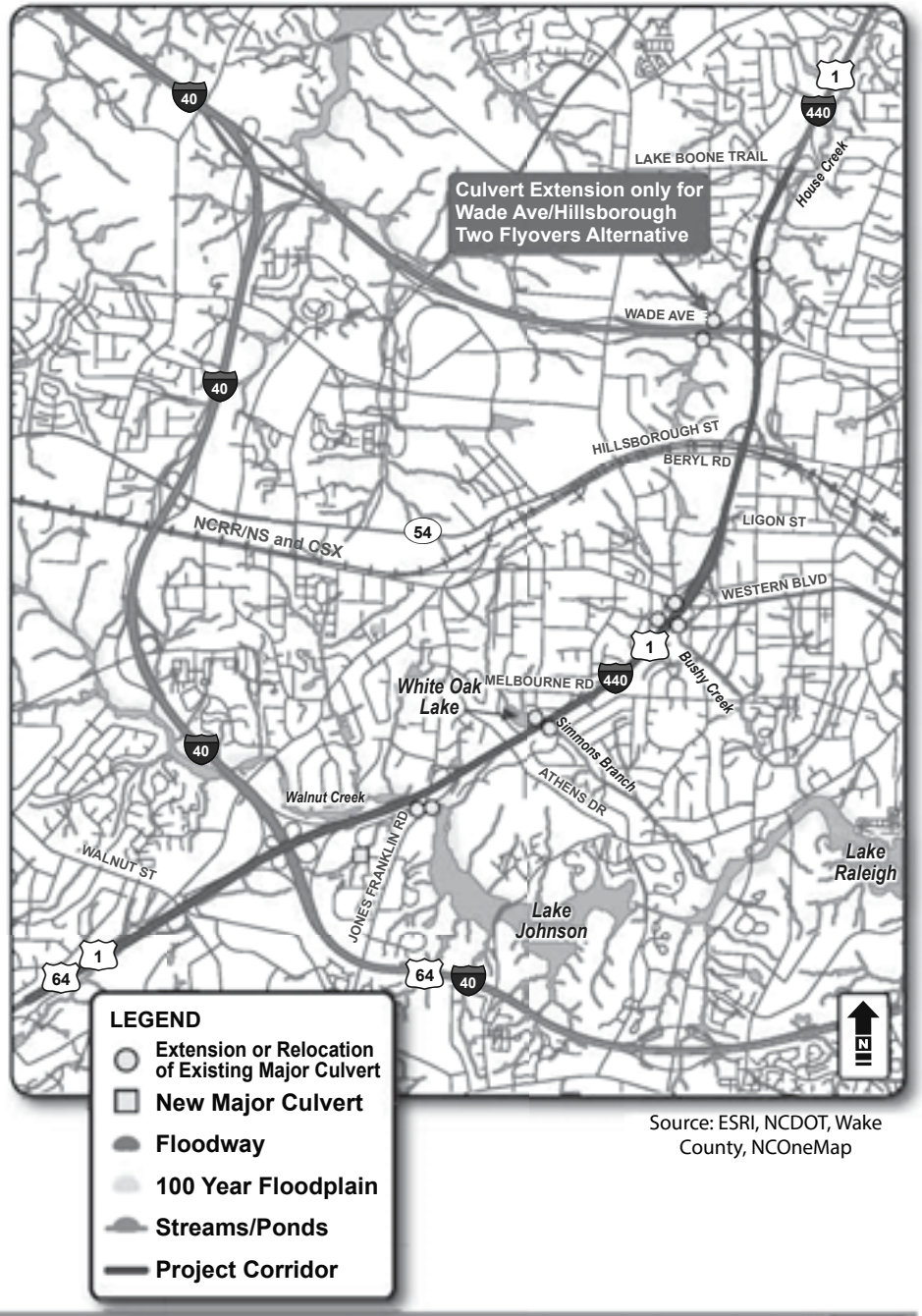
What's the Difference between a 100-Year Floodplain and a Floodway? What's a Base Flood Elevation?

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



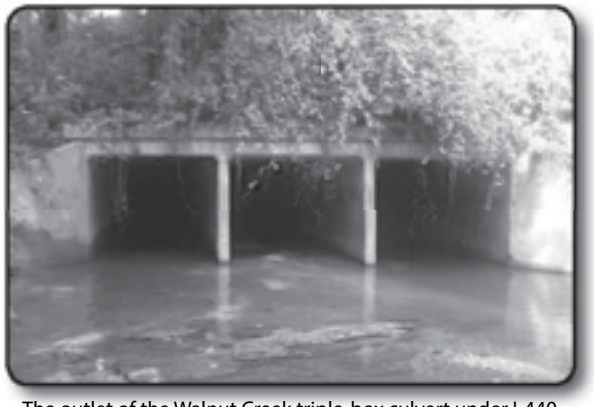
Source: ESRI, NCDOT, Wake County, NCOneMap

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.