

## 3. Existing Conditions and Environmental Consequences

### 3.15 Indirect and Cumulative Effects

The Federal Highway Administration (FHWA) and other federal agencies' responsibility to address and consider direct, indirect, and cumulative impacts in the National Environmental Policy Act (NEPA) process was established in the Council on Environmental Quality (CEQ) Regulations for Implementing the Procedural Provisions of NEPA (40 CFR 1500-1508). This chapter assesses the indirect (secondary) and cumulative (incremental) effects of the proposed Carolina Crossroads when added to past, present, and reasonably foreseeable future actions of related projects in the study area. This chapter also includes a discussion of mitigation measures. The no-build alternative is not included in this assessment since there would not be any actions that would result in indirect or cumulative effects as a result of the no-build alternative.

#### 3.15.1 INDIRECT EFFECTS

According to the CEQ, indirect impacts are caused by the proposed action(s) or project and occur later or farther away (off site) but are still reasonably foreseeable (40 CFR 1508.8). Indirect effects may also include growth-inducing effects and other effects related to changes in land use patterns, population density or growth rates, and effects on the natural environment, such as air quality, water quality, and natural ecosystems.

##### Indirect Effects:

Effect(s) caused by the proposed action(s) or project that may occur later or off site, but are reasonably foreseeable.

An example of an indirect effect would be when a new roadway is built and commercial development occurs along that roadway that would not have otherwise occurred without the construction of the roadway. The commercial development would be an indirect effect of the construction of the roadway.

##### 3.15.1.1 How are indirect effects analyzed?

Indirect effects are analyzed using the eight-step process outlined in the National Cooperative Highway Research Program (NCHRP) Report 466: *Desk Reference for Estimating the Indirect Effects of Proposed Transportation Projects*.<sup>1</sup> The eight step process includes:

- Step 1: Initial Scoping for Indirect Effects Analysis
- Step 2: Identify the Study Area Direction and Goals
- Step 3: Inventory Notable Features
- Step 4: Identify Impact-Causing Activities of Proposed Action and Alternatives
- Step 5: Identify Potentially Significant Indirect Effects for Analysis
- Step 6: Analyze Indirect Effects
- Step 7: Evaluate Analysis Results
- Step 8: Assess Consequences and Develop Mitigation

<sup>1</sup> NCHRP. 2002. Desk Reference for Estimating the Indirect Effects of Proposed Transportation Projects. Report 466. Washington, DC.

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#### 3.15.1.2 Step 1: Scoping

Scoping entails collaboration with the public, agencies, and other stakeholders to identify significant issues that should be studied in the indirect effects analysis. The proposed project was introduced to the public in May 2015 during an initial community kickoff meeting that resulted in a variety of citizen comments/questions about alternatives development, cost, environmental impacts, and agency and public involvement. In September 2015, a public scoping meeting was held to collect feedback on the purpose and need of the project. Citizen feedback included issues such as:

- safety as a primary purpose and need;
- accommodating future traffic and population growth;
- commuting patterns;
- flooding;
- evacuation routes;
- protection of the Saluda River Greenway;
- addressing noise impacts; and
- accommodating increased economic traffic from the Upstate.

The issues brought up during scoping were further investigated during environmental data collection and impact analysis for the proposed project. Some of the issues (i.e., safety, accommodating future local and regional traffic, commuting patterns) were also considered during the development of alternatives. From this, potential resources of concern were identified for further evaluation for indirect and cumulative effects. These potential resources of concern include communities, streams, wetlands, water quality, and Federal Emergency Management Agency (FEMA) regulated floodplains.

As described in Chapter 1 (Purpose and Need) and Chapter 2 (Alternatives), the proposed improvements would be largely limited to the existing transportation corridor defined as the project study area (PSA) (Figure 3.15-1), with the exception of several realignment options at interchanges. Indirect effects can occur in areas beyond the direct footprint of the improvements. Moreover, areas within which indirect effects may occur vary by resource type. To some degree, some resources have the ability to move, migrate, or experience conversion over space and time (e.g. air, water, and/or land use), while other resources have explicit boundaries that can be surveyed (e.g. cultural resources) and are set in space in time.

The project study area for the indirect effects analysis includes additional area beyond the PSA containing these resources that are in some way connected to the area of direct effects of the PSA (Figure 3.15-1). The following study areas have been defined for the indirect effects analysis:

##### 3.15.1.2.1 Communities Indirect Effects Study Area

The proposed project intersects seven communities (Figure 3.15-2). These community boundaries were previously developed in the 2016 Community Characterization Report<sup>2</sup> and the overall boundary provides a reasonable constraint for the indirect effects analysis. These constraints generally follow visible natural or man-made features such as streams, rivers, or major roadways and were developed in conjunction with US Census

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<sup>2</sup> South Carolina Department of Transportation (SCDOT). 2016. Carolina Crossroads I-20/26/126 Corridor Improvement Project: Community Characterization Report. Prepared by STV Incorporated, in association with HDR.

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Bureau (Census Bureau) tract/block Group boundaries and Transportation Analysis Zone (TAZ) boundaries. Therefore, the indirect effects study area for the community resource consists of the overall boundary containing the seven defined communities (Figure 3.15-2):

- Columbiana
- Seven Oaks
- Saluda
- Riverbanks
- Harbison
- St. Andrews
- Broad

#### 3.15.1.2.2 Streams, Wetlands, Water Quality, and FEMA Floodplains Indirect Effects Study Area

The proposed project is located within two watersheds, the Broad River Watershed and the Lower Saluda River Watershed (Figure 3.15-3). The Broad River Watershed encompasses the northern portion of US 176 (Broad River Road) interchange with I-26, and the portion of I-20 located east of the interchange of US 176 (Broad River Road). The Lower Saluda River Watershed encompasses the area south of US 176 (Broad River Road) at I-26, and the area west of US 176 (Broad River Road) at I-20. These large river basins are broken into smaller drainages known as hydrologic unit codes (HUCs).

There are two, 12-digit HUCs that encompass the proposed project, namely: HUC 030501091403 (Outlet Saluda River) and HUC 030501060708 (Nicholas Creek – Broad River). The indirect effects study area for streams, wetlands, water quality, and FEMA regulated floodplains is defined as the Outlet Saluda River HUC and the Nicholas Creek – Broad River HUC (Figure 3.15-3). The HUC boundaries provide natural demarcated lines based on topography for analyzing indirect effects for streams, wetlands, water quality, and FEMA regulated floodplains in the area.

#### 3.15.1.3 Step 2: Identify Study Area Direction and Goals

As previously discussed in Section 3.1.5, the Central Midlands Council of Governments (CMCOG) plays a major role in land use and transportation planning in the greater Columbia area. In addition, Lexington and Richland Counties, as well as the City of Columbia, City of West Columbia, Town of Irmo, and Town of Lexington have land use plans and zoning in place to guide development within their jurisdictions. Consistent amongst these plans is the revitalization of existing corridors and encouraging infill development (both residential and commercial), where possible.

Within the communities indirect study area (refer to Figure 3.15-2), the Harbison area is expected to see the most growth between now and 2040, while the Saluda and Broad River communities will see some growth, albeit at a slower pace. The other communities (Columbiana, Seven Oaks, Riverbanks, and St. Andrews) is expected to see a decline in population between now and 2040. This is primarily because most of the study area is developed and the remaining undevelopable land is located in the Harbison community. Due to this, future

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infill development and redevelopment of existing properties is likely to be the trend for the other communities in the indirect study area for communities. For further information, please refer to Section 3.1.6.1 of this DEIS.

The Outlet Saluda River is a sub-watershed located within Saluda River Watershed 03050109-14. SCDHEC has prepared a watershed assessment for the Saluda River Watershed, which encompasses over 65,000 acres in Lexington and Richland Counties.<sup>3</sup> Current land use cover is approximately 41.6% urban land, 32.5% forested land, 19.2% agricultural land, 4.0% forested wetland (swamp), 1.7% water, 0.7% barren land, and 0.3% non-forested wetland (marsh).<sup>4</sup> According to the watershed assessment prepared by South Carolina Department of Health and Environmental Control (SCDHEC), there is a high potential for future residential and industrial development in this watershed,<sup>5</sup> which is evidenced by the amount of new development already occurring in the Town of Lexington and its surrounding areas. The potential for development is spurred by the current and future extensions of water and sewer infrastructure, as well as the existing roadway infrastructure, including I-20, SC 6, US 1, and US 378. Within the Outlet Saluda River sub-watershed, much of the development has already occurred as shown on Figure 3.15-3, and would be limited to more infill development or redevelopment of previously disturbed properties.

The Nicholas Creek – Broad River is a sub-watershed located within the Broad River Watershed 03050106-07. SCDHEC has prepared a watershed assessment for the Broad River Watershed, which encompasses over 148,000 acres in Newberry, Fairfield, and Richland Counties.<sup>6</sup> Existing land use cover in the watershed includes 59.4% forested land, 21.4% urban land, 13.0% agricultural land, 3.0% forested wetland (swamp), 2.0% water, 0.8% barren land, and 0.4% scrub-shrub land.<sup>7</sup> According to the watershed assessment, there is a high potential for growth in this watershed, which contains the northwest portion of the Greater Columbia Metropolitan Area. This is spurred by the ample availability of water and sewer infrastructure. This growth is already evidenced by large amount of residential growth occurring northwest of the project study area. However, within the boundaries of Nicholas Creek sub-watershed, much of the land is already developed as shown on Figure 3.15-3, in protection (i.e. Harbison Environmental Education Forest), or being used for government uses, such as the three correctional institutions and law enforcement agencies' locations as noted in Section 3.2. Some undeveloped land is present near the Broad River Road interchange in the Harbison Community.

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<sup>3</sup> SCDHEC. 2011. Watershed Water Quality Assessment: Saluda River Basin: Technical Report No.9C21-11. Bureau of Water, Columbia, S.C.

<sup>4</sup> *Ibid.*

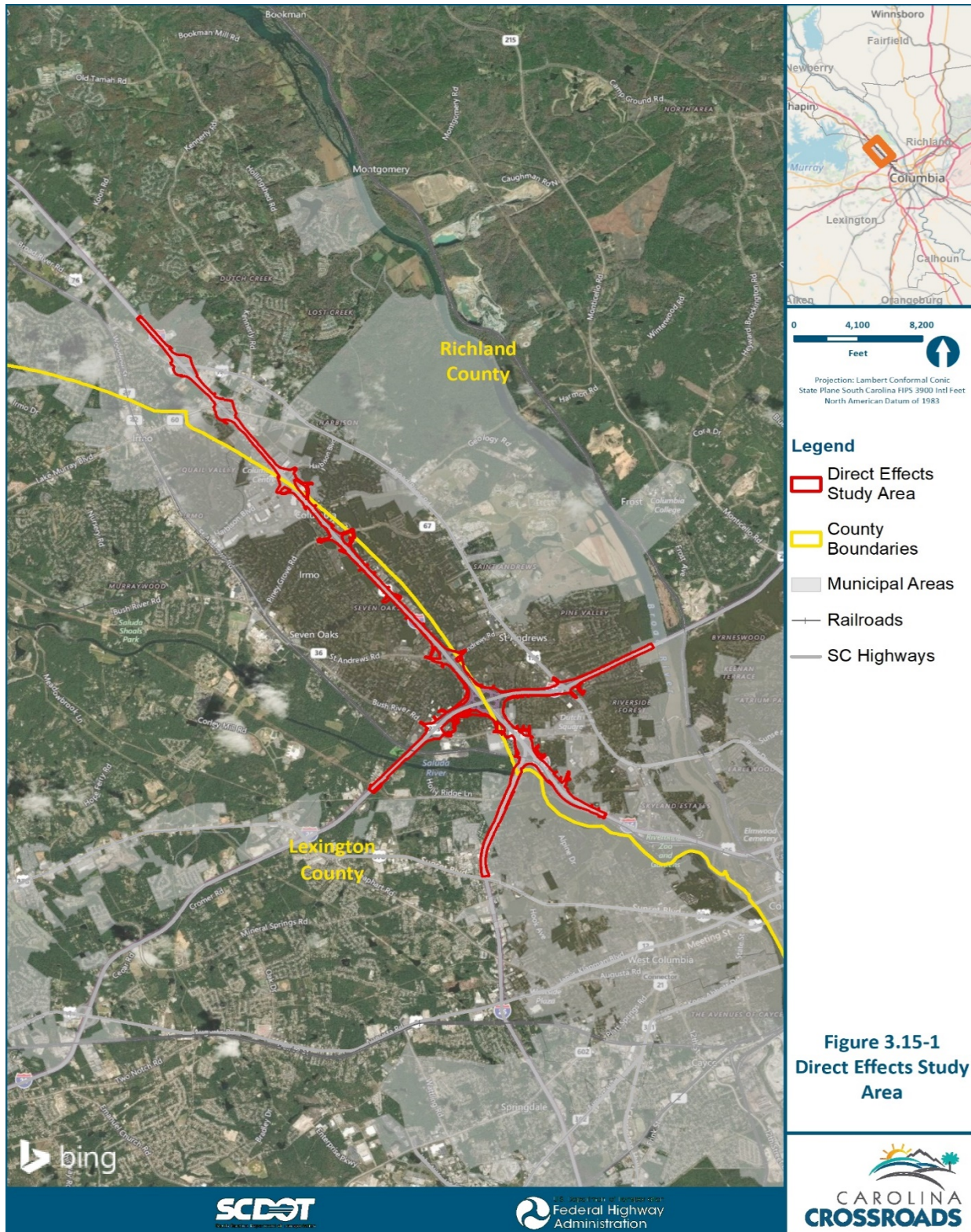
<sup>5</sup> *Ibid.*

<sup>6</sup> SCDHEC. 2007 Watershed Water Quality Assessment: Broad River Basin. Technical Report No. 006-07. Bureau of Water, Columbia, S.C.

<sup>7</sup> *Ibid.*

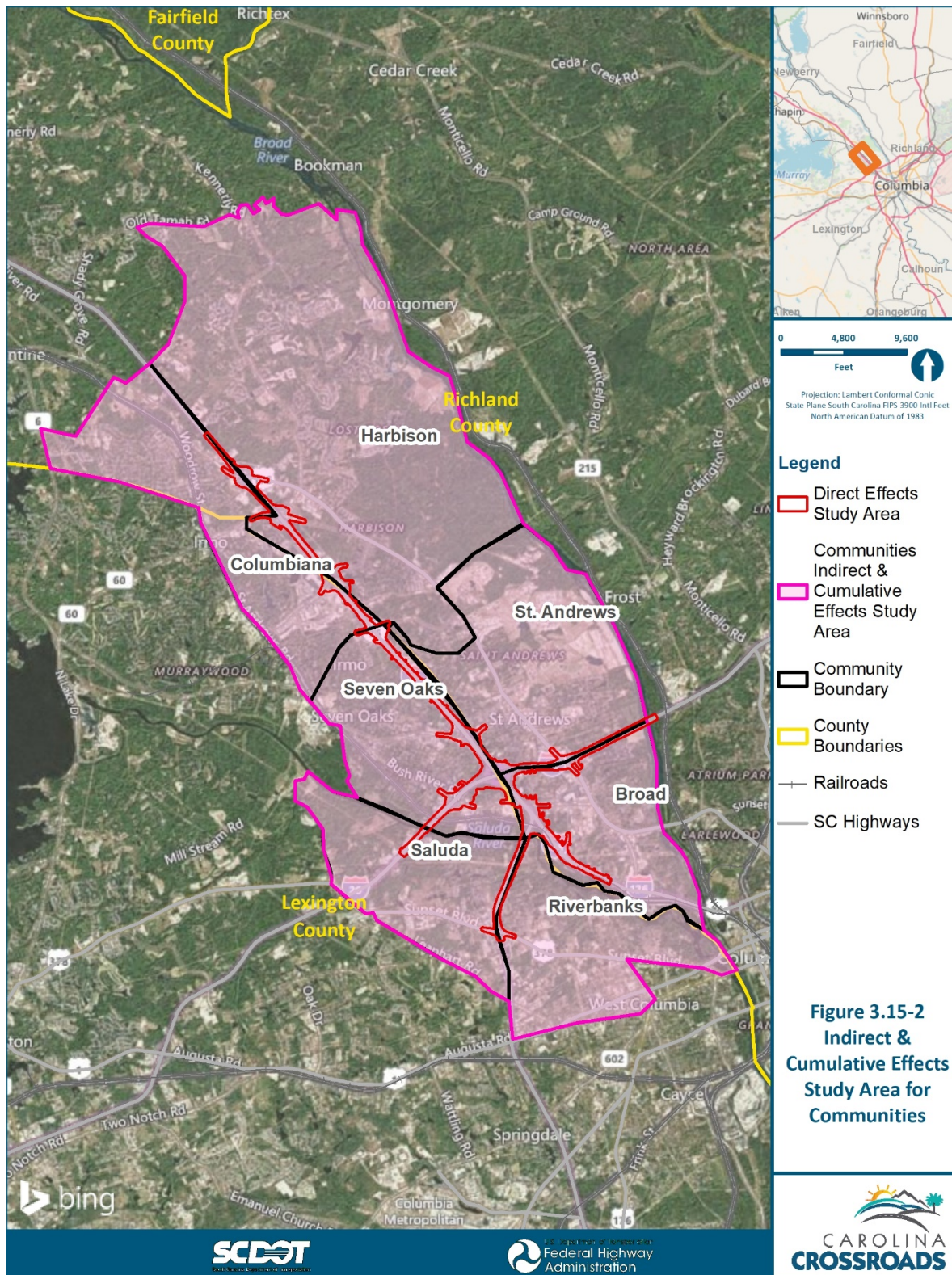


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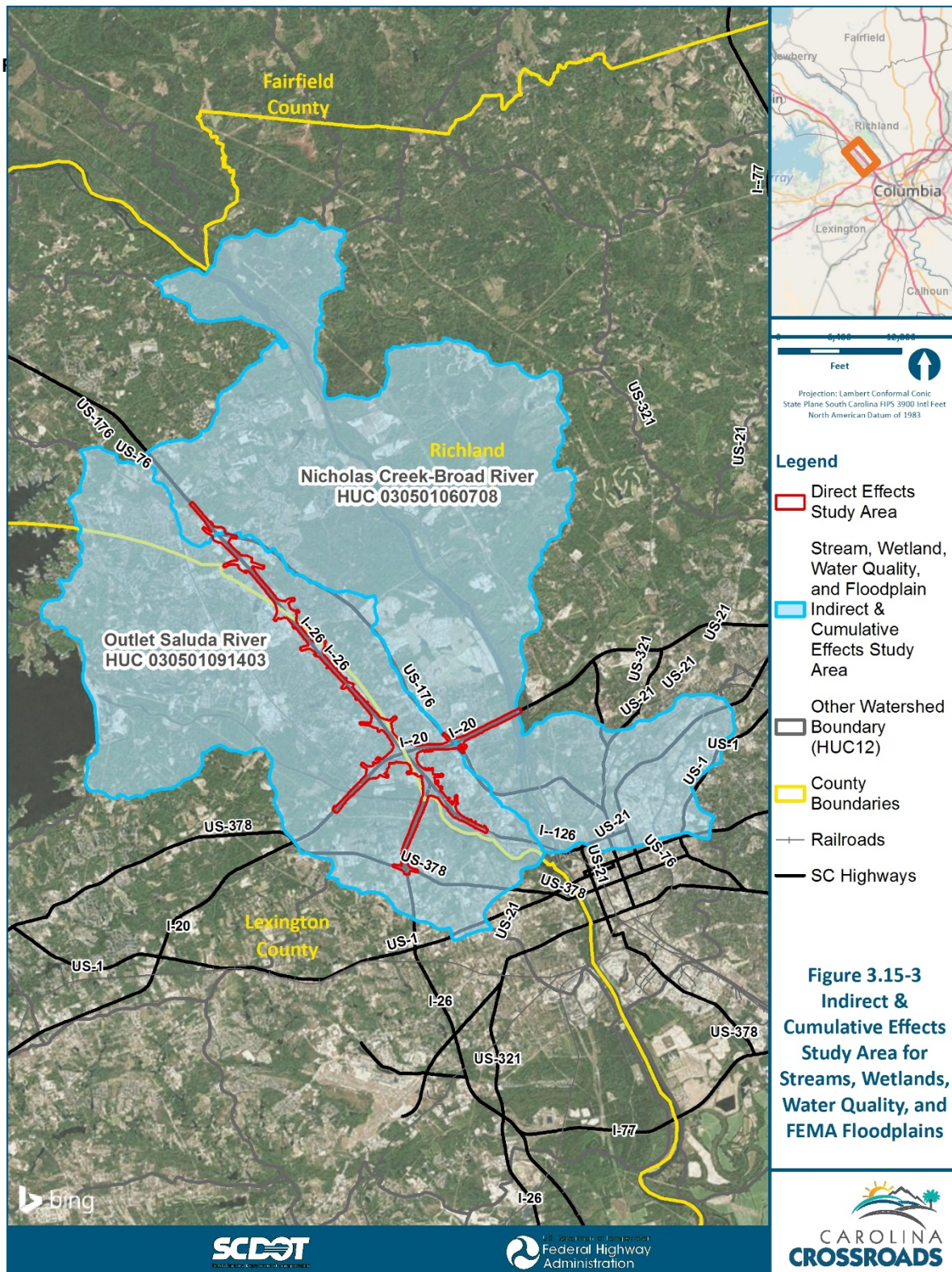


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#### 3.15.1.4 Step 3: Inventory Notable Features in the Indirect Effects Study Area

Ecosystem and socioeconomic conditions were evaluated to determine the notable features within the indirect effects study areas. It should be noted, in order to have an indirect or cumulative effect, the proposed project would need to have a direct effect on that resource.

**Section 4(f) Resources.** Section 4(f) resources and NRHP-eligible historic properties exist within the indirect effects study areas, most notably the following:

- Harbison Environmental Education Forest;
- Three Rivers Greenway (Saluda Riverwalk is part of this trail system, refer to Section 3.11); and
- Saluda Shoals Park; and,
- Saluda River Canal (refer to Section 3.10).

Of these Section 4(f) resources, there would be only a temporary use of the Saluda Riverwalk extension of the Three Rivers Greenway, as discussed in Section 3.11. None of the other Section 4(f) resources would be directly impacted by the proposed project.

**Saluda River and Broad River.** The Saluda River is designated as a state scenic river, and is discussed in detail in Section 3.7. It is valued for its recreational uses (i.e. kayaking and canoeing), as well as its trout fishing. The proposed project would replace the I-20 and I-26 bridges over the Saluda River in the existing bridge locations and at least the same height or greater, which would not be in conflict with the state scenic river designation or recreational uses. Additionally, there would be no surface



Saluda River

water losses of the Saluda River as the bridges are anticipated to be replaced in the existing bridge footprints (including bridge pilings) over the Saluda River; however, use of this section of the river may be temporarily limited during demolition and reconstruction of the bridges for safety reasons, but would not affect use upstream or downstream.

The Broad River is also valued for its recreational uses, as well as water supply. However, the proposed project would not directly impact the Broad River.

**Floodplains, Wetlands, and Streams.** Major floodplains and floodways are adjacent to the Saluda and Broad Rivers in the indirect effects study areas. These are important for water storage during major flood events, as well as secondarily provide habitat for wildlife. In addition, wetlands in the project area provide areas for water storage and retention during flood events. Flooding concerns became a major issue for the public after the major flood that occurred in late 2015 in the Columbia area. The Saluda River was dammed to form Lake Murray, and controlled releases of water occur on the Saluda River during at the discretion of SCE&G Utilities.

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Direct impacts are anticipated to the Saluda River, floodplains, floodways, streams and wetlands within the project study area, as noted in Sections 3.6 to 3.8.

**Socioeconomic Resources.** Notable socioeconomic features include the large commercial corridor along Harbison Boulevard; the Lexington Medical Center Hospital at the interchange of US 378 with I-26; and the Palmetto Health Baptist Parkridge Hospital, located off the interchange of Lake Murray Boulevard with I-26. Other notable features include the Riverbanks Zoo, located off the interchange of Greystone Boulevard and I-126, as well as the Riverbanks Botanical Garden, located adjacent to the Zoo on the opposite side of the Saluda River. In addition, there are numerous public schools, community facilities, and places of worship in the indirect effects study areas. However, none of these notable features would be impacted by the proposed project with exception of some commercial development at the interchange of Harbison Boulevard with I-26, which would be acquired for the reconstruction of the interchange. This would not affect the overall commercial development along Harbison Boulevard, as most of it is located west of the interchange.

Communities within the project study area would have potential relocation impacts, increased noise impacts, and visual impacts during and after construction due to the proposed project. As discussed in Section 3.3, these would be minimized to the fullest extent possible.

**Relative Uniqueness, Recovery Time, Unusual Landscape Features.** The remaining landscape within the indirect effects study areas do not contain any unique landscape elements other than the aforementioned Harbison Environmental Education Forest and the Saluda Canal when compared to similarly situated landscapes; nor does the indirect effects study areas represent a rare landscape in general, as it is mostly developed. As previously mentioned, the Harbison Environmental Education Forest and Saluda Canal would not be directly impacted by the project; thus indirect and cumulative impacts are not anticipated for these unusual landscape features.

**Vulnerable Elements of the Population.** Vulnerable populations, including the elderly, children, disabled, or environmental justice (EJ) populations could be located within the indirect effects study areas, given the socioeconomic data for the communities (refer to Section 3.3). However, no highly adverse and disproportionate impacts are anticipated to EJ communities from the proposed project. Impacts from the proposed project could occur to vulnerable populations, but project commitments would be in place to minimize impacts to those vulnerable populations during the right-of-way, construction, and operational phases of the projects. These are noted on the Environmental Commitment Form at the beginning the DEIS as well as in Section 3.3.

In summary, notable features of the indirect effects study areas include the Saluda River, floodplains, wetlands and streams (including water quality), and communities. These will be further evaluated to determine if any of the impact-causing activities of the proposed project would have an indirect effect on these resources.

#### 3.15.1.5 Step 4: Identify Impact-Causing Activities of the Reasonable Alternatives

Step 4 identifies the impact-causing activities of the proposed project so that they may be compared with the goals and trends identified in Step 2 and the notable features identified in Step 3 to assess whether a potential for indirect effects exists (Step 5). Impact causing activities include all of the activities involved in the project from clearing to maintenance of vegetation once the project is finished. Generally, the proposed project

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involves road widening, inclusion of collector-distributor roads, reconstruction of interchanges, and addition of overpasses, which requires general types of project impact-causing activities like earthwork (clearing, excavation, and filling), landscaping, erosion control, remediation, changes in travel patterns, and changes in access. Direct effects that may result from the proposed project may potentially trigger indirect effects through encroachment and alteration of the environment farther in distance or time. Both reasonable alternative footprints are spatially similar and are within the general footprint of the existing transportation infrastructure; therefore, impact-causing activities are the same for both reasonable alternatives. Impact-causing activities for the reasonable alternatives are summarized in Table 3.15-1 and will be evaluated to identify the potential indirect effects from activities that need to be analyzed in the next step (Section 3.15.1.6).

**Table 3.15-1 Impact-Causing Activities for the Proposed Project**

Impact-causing activity	Project specific activity	Relevant details
<b>Communities</b>		
<b>Access alteration</b>	Changes in access, circulation patterns, travel times	Corridor improvements may spur infill development
<b>Changes in traffic</b>	Changes in access, circulation patterns, travel times	Interchange improvements would improve circulation patterns, access, and travel times
<b>Access alteration</b>	Traffic patterns on traffic and transportation facilities	Traffic patterns would change with the elimination of one interchange and improvements at identified interchanges
<b>Land transformation and construction</b>	Expanded and improved transportation facility	Existing transportation corridor would be widened in some areas; temporary construction disturbance
<b>Modification of regime</b>	Expanded and improved transportation facility	Increased noise impacts in communities as roadway and interchange improvements would move roadway closer to communities
<b>Right-of-way acquisition</b>	Expanded and improved transportation facility	Existing transportation corridor would be widened, interchange improvements may increase footprint of project, resulting in ROW acquisition and displacements at the edges of communities



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Impact-causing activity	Project specific activity	Relevant details
<b>Streams, Wetlands, and Water Quality</b>		
<b>Modification of regime</b>	Alteration of drainage; flow moderation	Widening of the transportation corridor would increase impervious surface drainage; pump around systems to work in the dry in stream channels
<b>Modification of regime</b>	Reduced water quality	Reduced quality of streams and wetlands due to reduced water quality
<b>Modification of regime</b>	Alteration of ground cover	Conversion of pervious surfaces to impervious surfaces would increase runoff
<b>Land alteration</b>	Wetland fill, stream fill	New fill would be placed in wetlands for road-widening embankments; culverts placed in streams for access and drainage
<b>FEMA Floodplains</b>		
<b>Modification of regime</b>	Modification of FEMA floodplains	Loss or alteration of FEMA floodplains; attenuation of flood storage areas

#### 3.15.1.6 Step 5: Identify Indirect Effects for Analysis

Per the NCHRP 466 report, not every identified indirect effect warrants further analysis. Some effects that may be reasonably foreseeable, would not be considered significant within the project study area. Other effects that may be potentially significant, may not be considered reasonably foreseeable or cannot be analyzed with any specificity that would help in the decision making process. The analysis compares the list of project impact-causing actions (Step 4) with the lists of goals (Step 2) and notable features (Step 3) to establish which indirect effects are potentially significant and need detailed analysis (or, which effects are not potentially significant and require no further analysis). The context of the indirect effects study area and the intensity of the impact were considered when determining if an impact may be substantial.

Indirect effects are analyzed for significance by grouping them into broad categories that include encroachment-alteration effects and induced growth effects. Alteration of the behavior and functioning of the impacted environment can be either ecological or socioeconomic in nature. Induced growth effects are effects from projects that plan to serve specific land development, effects that will likely stimulate complementary development, and effects that influence intraregional land development. The following sections lists the potential indirect effects that could occur to the notable features in the indirect effects study areas.

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According to the NCHRP Report 466, encroachment by transportation projects can directly affect the physical nature of a neighborhood (community) in two major ways which may have indirect effects to communities: (1) alteration of traffic patterns and access; and (2) relocation of homes and business, or relocation or alteration of public facilities.

#### 3.15.1.6.1 Potential Alteration-Encroachment Indirect Effects for Communities

- Minor visual and aesthetic impacts would occur due to the larger footprint as well as the potential addition of noise barriers in certain locations along the project corridor.
- The closure of the Bush River Road interchange at I-26 and reconstruction of the Colonial Life Boulevard interchange to a full interchange could indirectly impact businesses near the interchange. (This was evaluated in detail in Section 3.3.4.8.1).
- Improved travel times would occur within the limits of the proposed project (refer to Section 2.1.9).
- Impact-causing activities of reconfiguring interchanges, addition of collector-distributor roads and widening of the existing I-26 corridor would result in the direct displacement of residences, businesses, as well as some parking lots of businesses in locations along the corridor (refer to Section 3.3). However, no community facilities or places of worship would be relocated as a part of the proposed project.

#### Encroachment-Alteration Effects:

The alteration of the behavior and functioning of the affected environment caused by project encroachment

#### Induced Growth Effects:

Effects caused by growth stimulated by a project

#### 3.15.1.6.2 Potential Induced Growth Indirect Effects for Communities

In addition, with the proposed roadway improvements, there is always a potential for induced growth within the indirect effects study areas. The improvements made to the interstate and interchanges would provide better access to undeveloped properties in the indirect effects study areas or properties available for redevelopment, as noted in Table 3.15-1.

#### 3.15.1.6.3 Potential Alteration-Encroachment Effects for Wetlands, Streams, Water Quality, Saluda River, and Floodplains

- Construction in and near Waters of the U.S. and the Saluda River could result in temporary siltation at that site (without the use of BMPs), as noted in Section 3.6.
- The acceleration of infill development or new development in the Harbison Community could increase the amount of impervious surface in the indirect effects study areas (refer to Section 3.2).
- Encroachment into floodplains and floodways could result in less land being available for water storage (refer to Section 3.7).

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#### 3.15.1.7 Steps 6 and 7: Analyze Indirect Effects and Evaluate Analysis Results

##### Communities

Both reasonable alternatives propose noise barrier walls in the Columbiana, Seven Oaks, Saluda, Riverbanks, Harbison, St. Andrews, and Broad communities that may indirectly affect aesthetics within the communities. None of the communities would indirectly experience physical barriers or divisions that would affect community cohesion.

Within the Broad and Seven Oaks communities, both reasonable alternatives propose the relocation of the I-26/Bush River Road interchange and would affect direct access to Bush River Road from I-26. As such, direct access from I-26 to commercial businesses on Bush River Road near the current interchange may experience an indirect effect of less pass-by traffic than currently exists today. This was evaluated in detail in Section 3.3.4.8.1. Origin-destination was used to determine the amount of traffic using the Bush River Road/I-26 interchange to access Bush River Road. It was found that though the majority of trips on Bush River Road are local trips that are not coming from or going to I-26 via the I-25/Bush River Road interchange, the projected reduction in traffic volumes on Bush River Road in the vicinity of the I-26 interchange could result in an impact to business and revenue of the surrounding businesses, with the most negative impact relating to businesses (listed in Table 3.3-26) that are dependent on pass by traffic. Nonetheless, these businesses would still be easily accessible via the interchange relocation to Colonial Life Boulevard and the I-20/Bush River Road interchange. Additionally, the corridor improvements propose to provide wayfinding signage to Bush River Road from I-26. These effects are relatively small in the context of the entire corridor as well as the localized impact sites.

Improved travel times would allow those living within indirect effects study area to travel to and from their destinations, which would result in lower fuel usage by those using the corridor and better convenience. For both reasonable alternatives, Tram Road will connect to Beatty Road via an overpass of I-26 that will provide a connection between the Seven Oaks and St. Andrews communities. The Tram Road overpass has the potential to increase pass-by traffic, but as traffic data for Tram Road is incomplete at this time, indirect effects caused by increased pass-by traffic to these communities cannot be accurately assessed, per CEQ guidance (40 CFR § 1502.22).

Impact-causing activities of reconfiguring interchanges, addition of collector-distributor roads and widening of the existing I-26 corridor would result in the direct displacement of residences, businesses, as well as some parking lots of businesses in locations along the corridor (refer to Section 3.3). Relocations would be completed in accordance with the Uniform Relocation and Real Properties Assistance Act, as noted in Section 3.3. Detailed relocation information can be found in Appendix H. There is no planned disruption to communities in the indirect effects study area, as no communities would be divided, no community facilities or places of worship would be relocated, and while there may be temporary disruptions to travel patterns, there would be no long-term disruptions to access as a part of the proposed project. Emergency and fire services would be coordinated with to ensure that emergency routes are adequate during and after construction.

The improvements made to the interstate and interchanges would provide better access to undeveloped properties in the indirect effects study areas or properties available for redevelopment, as noted in Table 3.15-1.

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This could accelerate the pace of infill development, redevelopment, and new development in the Harbison community. However, this would be in conformance with the land use planning forecasts for the indirect effects study areas. Thus, no new induced growth is anticipated for the indirect effects study areas.

As mentioned in Chapter 1, the Columbia metropolitan area is growing. Growth-inducing impacts are generally the result of other market factors (under others' control), like the provision of urban services and/or the extension of infrastructure to undeveloped areas. Indirect effects also include growth due to additional demand for housing, jobs, and goods and services associated with population increases caused by, or attached to, new development. SCDOT, as part of this project, would not construct new roads or interchanges in locations that do not currently have these features.

Over the next 20 to 25 years, either of the reasonable alternatives would help to support the planned amount, density, and/or distribution of housing and jobs in the communities within the indirect effects study area. Congestion would decrease within the indirect effects study area as a result of the proposed project, which would facilitate a number of important traffic functions, including easier access to downtown Columbia, adjacent employment areas and neighborhoods, and regional activity centers.

Because most of the indirect effects study area is already developed, growth within the communities is expected to occur as redevelopment or infill development. The Harbison community appears to have the most undeveloped land which may explain why population and employment is projected to increase the most in this portion of the indirect effects study area through 2040.

For both reasonable alternatives, the areas surrounding the interchanges at I-20/Bush River Road, I-26/Lake Murray Boulevard, I-26/Harbison Boulevard, I-26/St. Andrews Road, and I-26/Sunset Boulevard have largely been developed. Development occurring at these interchanges would likely be infill or revitalization of existing development with or without the proposed roadway improvements. Substantial indirect effects to communities at these interchanges are not anticipated.

Enhanced access resulting from the improved interchanges at I-20/Broad River Road, I-26/Bush River Road, and I-26/Piney Grove Road may accelerate development of commercial or industrial uses in the undeveloped areas surrounding the interchanges. However, since there are already existing interchanges at these locations, changes to land use types, patterns of land use and development and density are not likely to be affected. For both reasonable alternatives, the northeast quadrant of the Colonial Life Boulevard interchange at I-126 within the Broad community may be viewed as more attractive for development as the new location on- and off-ramps would be surrounded by lower density residential uses which could be converted to higher intensity uses, but undeveloped land on the western side of the interstate would not be attractive due to the location of the Saluda River and floodplains, as well as, the railroad track, utility corridor and the Saluda Riverwalk.

However, at the I-26/St. Andrews Road interchange, there is potential for some residential land uses, specifically east of the interchange, to be converted to commercial uses as this area has high visibility that appeals to commercial and retail-type businesses.

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#### Streams, Wetlands, and Water Quality

As existing streams and wetlands exhibit qualities that indicate past degradation and/or impact from development in the area, these resources are considered to be at risk. Project specific activities such as alteration or drainage of streams and/or wetlands, flow moderation, and reduced water quality are regime modifications that would cause indirect effects later or off site to existing streams and wetlands in the reasonably foreseeable future. A list of major streams in the indirect effects study area is provided in Table 3.15-2 and Figure 3.15-4. Some of these major streams are monitored by SCDHEC for water quality impairment. Wetlands are not named or monitored by SCDHEC. While indirect impacts to streams, wetlands, and water quality cannot be accurately quantitatively assessed and the extent of downstream impacts to water quality can be difficult to measure due to the varying degree of surrounding land use and stream dynamics, the current state of water quality impairment as compared to the near future may be a reflection of how the proposed project may indirectly impact downstream waters.

**Table 3.15-2 Summary of Major Streams within the Indirect Effects Study Area**

Watershed unit hydrological unit code (HUC)	Major stream names	
<b>Outlet Saluda River (030501091403)</b>	Saluda River*	Kinley Creek*
	Yost Creek	Senn Branch
	Rawls Creek*	Double Branch
	Koon Branch	Stoop Creek
	Lorick Branch*	
<b>Nicholas Creek-Broad River (030501060708)</b>	Broad River*	Slatestone Creek
	Moccasin Branch	Burgess Creek
	Swygert Branch	Smith Branch*
	Nicholas Creek	

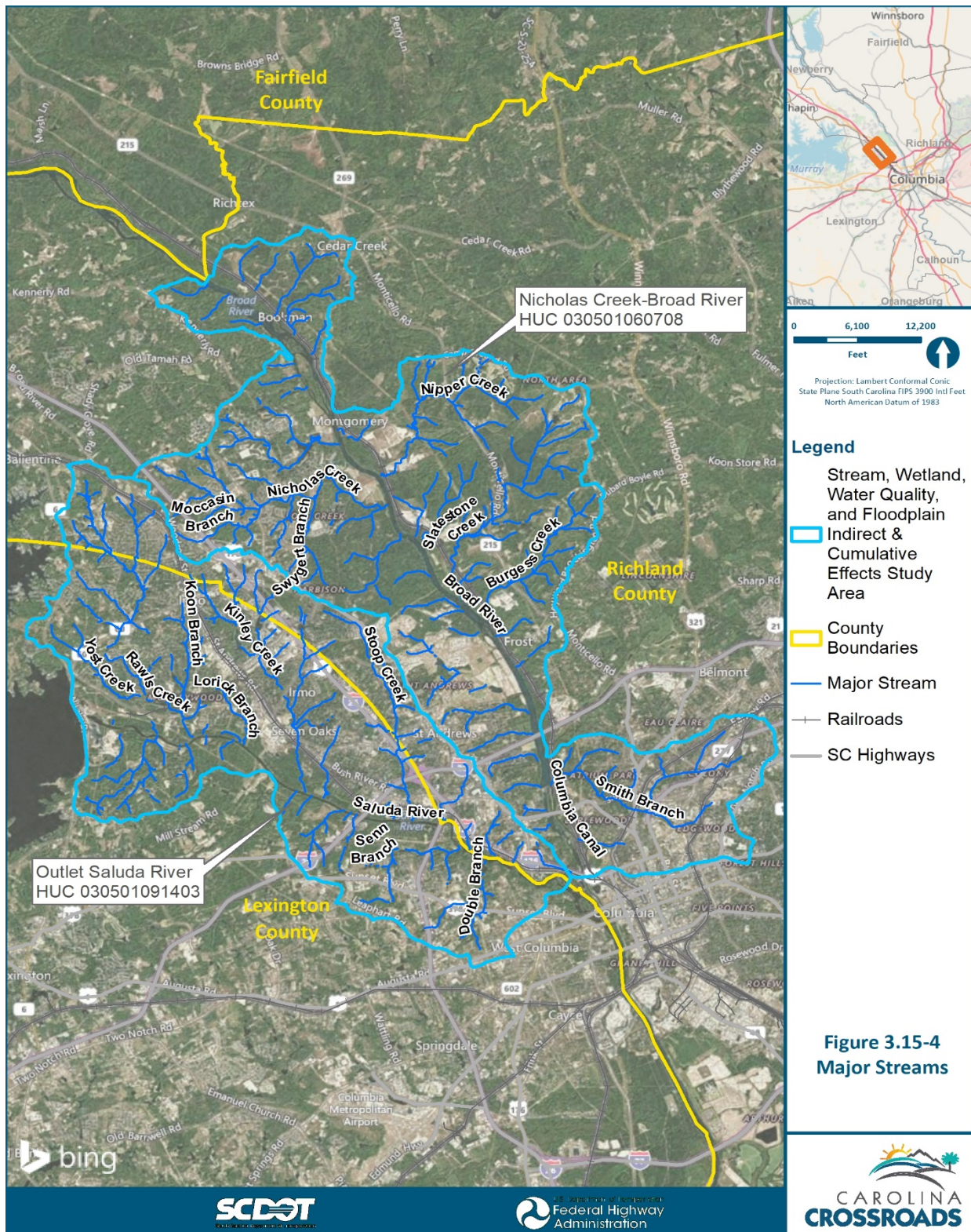
\* Major streams that are monitored by SCDHEC

The project specific activity of alternating the natural drainage regimes or moderating natural flows of streams and wetlands during construction may cause increased flows causing more permanent flooding downstream or off site and/or loss or disruption of ecological function. Flooding of streams can also cause permanent flooding of riparian wetlands. Alternatively, the alteration of natural drainage regimes may cause reduced stream flows, which may cause the opposite effect by reducing the hydrologic function of streams and wetlands downstream or off site. The reduction of stream flows would also cause the loss or disruption of ecological function. The alteration of drainage of streams and wetlands that occur during construction would continue to indirectly effect hydrologic function downstream and off site once construction is complete. Due to non-project input variables, adequate information needed to accurately quantify the increase or reduction in hydrologic function and/or change in ecological function of streams and wetlands is not available.<sup>8</sup>

<sup>8</sup> 40 CFR 1502.22



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Indirect impacts of both reasonable alternatives during project construction would also include reduced water quality off-site due to increased downstream sedimentation and turbidity from on-site, in-stream work and possible spills or non-point source pollutants entering surface waters from stormwater runoff. Even though each reasonable alternative would utilize the existing roadway infrastructure footprint, increases of impervious surfaces for each alternative are expected, which would result in an increase of sediments and roadway contaminants to streams and/or wetlands that are within the drainage area of the project in the indirect effects study area. As streams and wetlands are connected, the runoff sediment and pollutants would be transported farther downstream into other streams and wetlands. SCDHEC does maintain multiple water quality monitoring stations within and downstream of the indirect effects study area that can be used to monitor pollutants and turbidity pre- and post-construction; however, due to multiple non-project input variables, there is no way to adequately correlate water quality measurements to project specific activities. Quantifying sediment, pollutant levels, and extent of downstream impacts to water quality can be difficult due to the varying degree of surrounding land use and stream dynamics; therefore, adequate information needed to accurately quantify indirect effects to water quality is not available.

Generally, as the extent of indirect impacts to existing streams and wetlands is difficult to assess accurately, the best predictor of degree of indirect impacts to existing streams and wetlands is relative to the amount of increase in impervious surfaces for each reasonable alternative and relative to direct impacts to streams and wetlands as discussed in Chapter 3.7. Both reasonable alternative footprints have substantial overlap, and as such the new impervious surface areas and direct impacts to streams and wetlands that would occur are relatively similar. RA1 would have slightly less direct impacts to streams (less 850 linear feet) and wetlands (less 0.34 acre), and would have slightly greater new impervious surface area (greater 1.8 acres) than RA5 Modified. Therefore, due to the overlap in the reasonable alternatives footprints and similar direct impacts to streams and wetlands and increase in impervious surface area, indirect impacts to streams, wetlands, and water would be similar. Adequate information is not available to accurately quantify all indirect impacts to streams, wetlands, and water quality due to regime modification.

Indirect effects caused by land alteration during construction (fill of streams and wetlands) would ultimately cause regime modification of streams and wetlands as discussed above. The placement of fill (soil material, culverts, rip rap, etc.) in streams and/or wetlands would indirectly result in regime modification of increased or reduced flows which causes hydrological changes and ultimately leads to loss or alteration of ecological function. Additionally, land alteration of streams and wetlands is a source of sediment input to these resources which is a contributing factor in downstream sedimentation and turbidity, ultimately affecting water quality as well.

Final design is not complete and the amount of fill material (soil, culverts, rip rap, etc.) required for the proposed project is unknown. There is not enough information at this time to accurately quantify indirect impacts to streams, wetlands, and water quality due to land alteration activities.

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#### FEMA Floodplains

As discussed in Chapter 3.8, the FEMA floodplains adjacent to the Saluda and Broad Rivers are the largest floodplain areas within the indirect effects study area. There are also FEMA floodplains adjacent to Stoop Creek, Senn Branch, a tributary to Kinley Creek, and Moccasin Branch that intersect the proposed project, and FEMA floodplains adjacent to Yost Creek, Rawls Creek, Koon Branch, Lorick Branch, Double Branch, Nicholas Creek, Swygert Branch, Slatestone Creek, Burgess Creek, Nipper Creek, and Smith Branch within the indirect effects study area.

While flooding encroachments are not anticipated due to FEMA design standards (discussed in Chapter 3.8), including indirect flooding encroachments downstream or off-site, the floodplains would be incrementally indirectly affected by the project due to increased surface water runoff and land alteration encroachment effects. Additionally, as streams and wetlands experience an increase or reduction in flow moderation, those floodplains adjacent or containing those streams and wetlands, would be indirectly affected by the same measure, though unknown. This would ultimately cause a modification of regime of flood storage as a function of floodplain function.

Executive Order (EO) 11988, Floodplain Management, and county and local ordinances would minimize floodplain encroachment to the extent allowable within the regulations, thereby preserving the majority of a floodplain's natural values. The floodplain preservation includes retention of riparian vegetation buffers, which preserve wildlife habitat and provide natural filtration for improved water quality. EO 11988 protects all FEMA floodplains in the indirect effects study area. The extent of indirect impacts to FEMA floodplains is difficult to assess accurately and the best predictor of degree of indirect impacts to floodplains is relative the amount of increase in impervious surfaces for each reasonable alternative as discussed in Chapter 3.8. Both reasonable alternative footprints have substantial overlap and the new impervious surface areas are relatively similar. RA1 would have slightly greater new impervious surface area (greater 1.8 acres) than RA5 Modified. The regime modification of floodplain storage cannot be accurately assessed at this time.

After the indirect effects have been analyzed and the results have been assessed for the community, streams, wetlands, water quality, and FEMA floodplain resources, the next step is to assess the consequences of those indirect effects and develop strategies to mitigate for those effects.

#### 3.15.1.8 Step 8: Assess Consequences and Develop Mitigation

Although the identification of potential indirect effects can be made through planning development, insufficient data exist to fully assess the consequences of these indirect effects. For example, while it is reasonable to predict that direct impacts to water resources would indirectly affect water quality, there is not enough information to determine how far downstream such impacts would persist or if such impacts are related to project specific activities. The consequences of indirect effects related to both reasonable alternatives would be limited because:

- The proposed project would improve an existing transportation corridor within which potential induced development within each community is limited due to already prevalent development. In addition, land

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use plans and zoning would dictate the location and type of development. Building and development permits would be required by the local jurisdictions for development or redevelopment of properties. This, along with regulatory mechanisms such as EO 11988 to prevent development in floodplains, Section 404 of the CWA requiring that wetland/stream impacts be avoided and minimized, and a Section 401 Water Quality Certification to protect water quality, also limit the potential for expansive indirect impacts due to new encroachment and alteration.

- Any induced development within the communities that may occur would be compatible with existing development and consistent with local development plans, trends, and goals.
- Both reasonable alternatives are largely in the same footprint of the existing transportation corridor and impacts are less than they would be if the proposed project were to occur in a more forested or undeveloped setting.
- Impacts of the project can be minimized and mitigated in many ways, including:
  - Addition of wayfinding signage from I-26 to the new access at Colonial Life Boulevard to route traffic to Bush River Road;
  - Obtaining a Section 402 Land Disturbance Permit from SCDHEC requiring measure to contain/pre-treat stormwater runoff prior to discharging into receiving waters;
  - Implementation of a Stormwater Prevention Plan;
  - Implementation of temporary and permanent stormwater management, erosion, and sediment controls;
  - Hydraulic analysis of floodplain crossings to meet the requirements of a FEMA “No-Rise” condition and SCDOT requirement of floodplain crossings to be analyzed for the 100-year flood; and
  - Compensatory mitigation for unavoidable stream and wetland impacts.

**“No-Rise” Condition:**  
FEMA requirement of no more than a 0.1 foot change from the established 100-year flood elevation for project encroachment on the 100-year floodplain.

#### 3.15.2 CUMULATIVE EFFECTS

Also addressed by CEQ (40 CFR 1508.7), cumulative impacts are a total result, including both direct and indirect impacts, of a proposed project and/or action(s) when added to other past, present, and reasonably foreseeable future actions, regardless of funding source. The goal of a cumulative effects analysis is to evaluate potential changes in characteristics and/or trends of an area that may result from the combination of a series of actions. Cumulative effects analysis is evaluated no matter who (federal, nonfederal, or private) conducted the action(s).

An example of a cumulative effect would be when a stream is impacted by one project, such as a roadway improvement; and

**Cumulative Effects:**  
Effect(s) caused by the proposed action(s) or project in combination with all other impacts in the past, present, and foreseeable future.

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then is impacted again by another, such as an adjacent commercial development.

#### 3.15.2.1 How are cumulative effects analyzed?

CEQ's guidance, *Considering Cumulative Effects under the National Environmental Policy Act*<sup>9</sup> and the CalTrans' *Guidance for Preparers of Cumulative Impact Analysis*<sup>10</sup>, was utilized for the cumulative effects analysis. An eight-step process was used to identify and evaluate cumulative impacts, similar to the indirect effects analysis. The eight steps for assessing cumulative effects include:

- Step 1: Identify the Resources to Consider in the Analysis
- Step 2: Define the Study Area for Each Resource
- Step 3: Describe Historical Context and Current Health of Each Resource
- Step 4: Identify Direct and/or Indirect Impacts of the Proposed Project that Might Contribute to a Cumulative Impact
- Step 5: Identify Other Reasonable Foreseeable Actions that May Affect Each Resource
- Step 6: Assess Potential Cumulative Impacts to Each Resource
- Step 7: Report Results
- Step 8: Assess and Discuss Mitigation Issues for all Adverse Impacts

Cumulative effects analysis is resource specific and generally performed for the environmental resources directly and indirectly affected by the proposed project. Therefore, if the proposed project would not directly or indirectly impact a particular resource, it was not included in the cumulative impacts analysis. The analysis focuses on 1) resources *significantly* affected by the project; or 2) resources currently in poor or declining health or at risk even if project impacts are relatively small (less than significant).

The first step in this process is to consider which resources warrant a cumulative effects analysis and is discussed in the next section.

#### 3.15.2.2 Step 1: What resources were considered in the analysis?

The proposed project may have potential cumulative impacts on the following resources and are the same as those discussed for the indirect effects analysis.

- Communities
- Streams and Wetlands
- Water Quality
- FEMA Floodplains

The following sections identify a resource study area (Step 2), provide an overview of the current health and historical context of each resource (Step 3), discuss potential impacts associated with the proposed project (Step 4), identify reasonably foreseeable future actions that could affect the resource (Step 5), and an assessment of

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<sup>9</sup> CEQ. 1997. *Considering Cumulative Effects under the National Environmental Policy Act*. January 1997.

<sup>10</sup> CalTrans. 2005. *Guidance for Preparers of Cumulative Impact Analysis: Approach and Guidance*. July 2005.

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the potential cumulative effects (Step 6). Table 3.15-3 is a qualitative summary of resources in the indirect and cumulative effects analysis that would either be substantially impacted, at risk, or in poor/declining health.

**Table 3.15-3 Qualitative Summary Checklist for Identifying Cumulative Effects**

Potential impact area	Proposed action			Past actions	Other present actions	Future actions	Cumulative impact
	Construction	Operation	Mitigation				
<b>Communities, including</b> Columbiana Seven Oaks Saluda Riverbanks Harbison St. Andrews Broad	*	+	+	*	*	*	+
<b>Streams and wetlands</b>	***	NE	+	***	*	*	**
<b>Water quality</b>	*	NE	+	*	**	*	NE
<b>Floodplains</b>	*	NE	NE	*	NE	*	NE

\* Low adverse effect

\*\* Moderate adverse effect

\*\*\* High adverse effect

+ Beneficial effect

NE No effect

#### 3.15.2.3 Step 2: Define the Study Area for Each Resource

The geographic limits of the resource-specific study areas used for the cumulative effects analysis are the same as those used for the indirect effects analysis. The time span for this analysis is from 1993 (when the last major improvements to the corridor were made to widen I-26 to six lanes) to 2040, which is the design year for the project.

Once the cumulative effects study area for each resource is identified, the next step is to consider the historical context and discuss the current health of each resource.

#### 3.15.2.4 Step 3: Historical Context and Current Health of Each Resource

##### Communities

**General Past Development.** The Carolina Crossroads corridor was initially developed in the 1950s and 1960s and improved during the 1970s and 1980s. Past actions, including the development of the I-20/26/126 corridor, have changed the landscape dramatically and converted natural habitats to human uses. Likewise, many areas along the I-20/26/126 Corridor experienced rapid growth since the development of I-26 and the subsequent development of I-20 and I-126. Prior to 1993, much of the cumulative effects study area has been developed for residential land uses that has led to the loss, alteration, and/or fragmentation of natural habitats including upland forests and wetlands and streams. Therefore, as discussed in Chapter 3.1, the study area has been, and is

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currently majority residential (43.1%); however, residential development is located throughout the study area and the undeveloped land (20%) uses are highly fragmented. In addition, many residential subdivisions have been constructed in areas adjacent to the corridor including Columbiana, Seven Oaks, Saluda, Riverbanks, Harbison, St. Andrews, and Broad, along with other retail areas concentrated around the interchange locations. With the exception of Harbison State Forest, the cumulative effects study area had already largely been developed by the completion of the I-26 widening in 1993. There have been a few large developments since 1993 such as Costco Wholesale, Palmetto Health Baptist Parkridge hospital, Bower Parkway and associated retail, Richland County Utilities Department expansion, and Riverland Hills Baptist Church. Overall, past actions from 1993 until now have resulted in little change to the communities within the cumulative effects study area due to the already developed landscape of the area.

Additionally, Richland Pennies for Progress program began in 2006 and funds roadway and bike/pedestrian/greenway projects through the Richland County Transportation Penny Sales Tax. This program came about through citizen interest in creating and improving failing roads and sidewalks, and adding greenway infrastructures. Projects recently completed include intersection improvements, greenways, sidewalks, and a special project (Table 3.15-4 and Figure 3.15-5). There were also 53 resurfacing projects within the cumulative study area that have been completed under this program. These projects occurred regardless of the proposed project.

The SCDOT's Statewide Transportation Improvement Plan (STIP) is the State's six-year transportation improvement program for all projects or program areas receiving state or federal funding, including among others, bridge replacements, congestion mitigation, interstate maintenance and upgrades, transportation alternatives, and roadway resurfacing. This program, like Richland Pennies for Progress, also helps support transportation projects in the study area. Past or currently ongoing projects include a bridge replacement, preservation, and the rehabilitation and resurfacing of various road segments within the cumulative study area (Table 3.15-4 and Figure 3.15-6). These projects have occurred regardless of the proposed project.

**Table 3.15-4 Past Richland Pennies for Progress Projects within the Cumulative Effects Study Area.**

Project name	Limits	Community	Status
<b>Intersection improvements</b>			
Kennerly Rd. & Coogler Rd. /Steeple Ridge Rd. Intersection	N/A	Harbison	Complete
Broad River Rd. & Rushmore Rd. Intersection	N/A	St. Andrews	Complete
Broad River Rd. & Bush River Rd. Pedestrian Improvements	N/A	St. Andrews	Complete
<b>Greenways</b>			
Three Rivers Greenway Extension Ph. 1	Lexington and Richland County line at the I-26 overpass to the confluence of the Saluda and Broad River	Riverbanks	Construction



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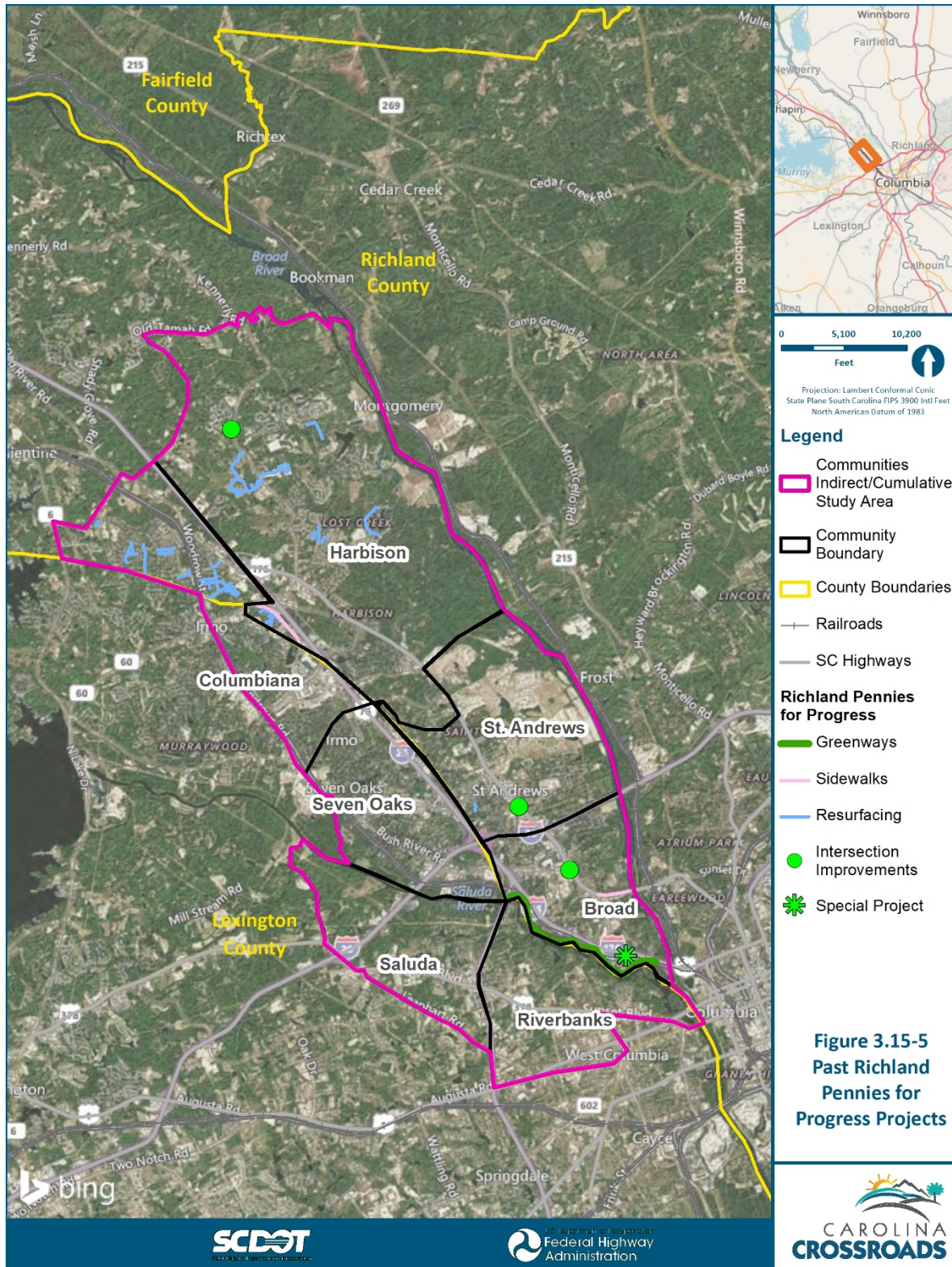


Project name	Limits	Community	Status
<b>Special projects</b>			
Riverbanks Zoo Phase I	Riverbanks Zoo new parking location	Riverbanks	Complete
<b>Sidewalks</b>			
Broad River Rd. Sidewalk	Greystone Blvd. to Broad River Bridge	Riverbanks	Complete
Columbiana Dr. Sidewalk	Lake Murray Blvd to Lexington County line	Harbison, Columbiana	Complete

**Table 3.15-5 Past or Ongoing STIP Projects within the Cumulative Effects Study Area**

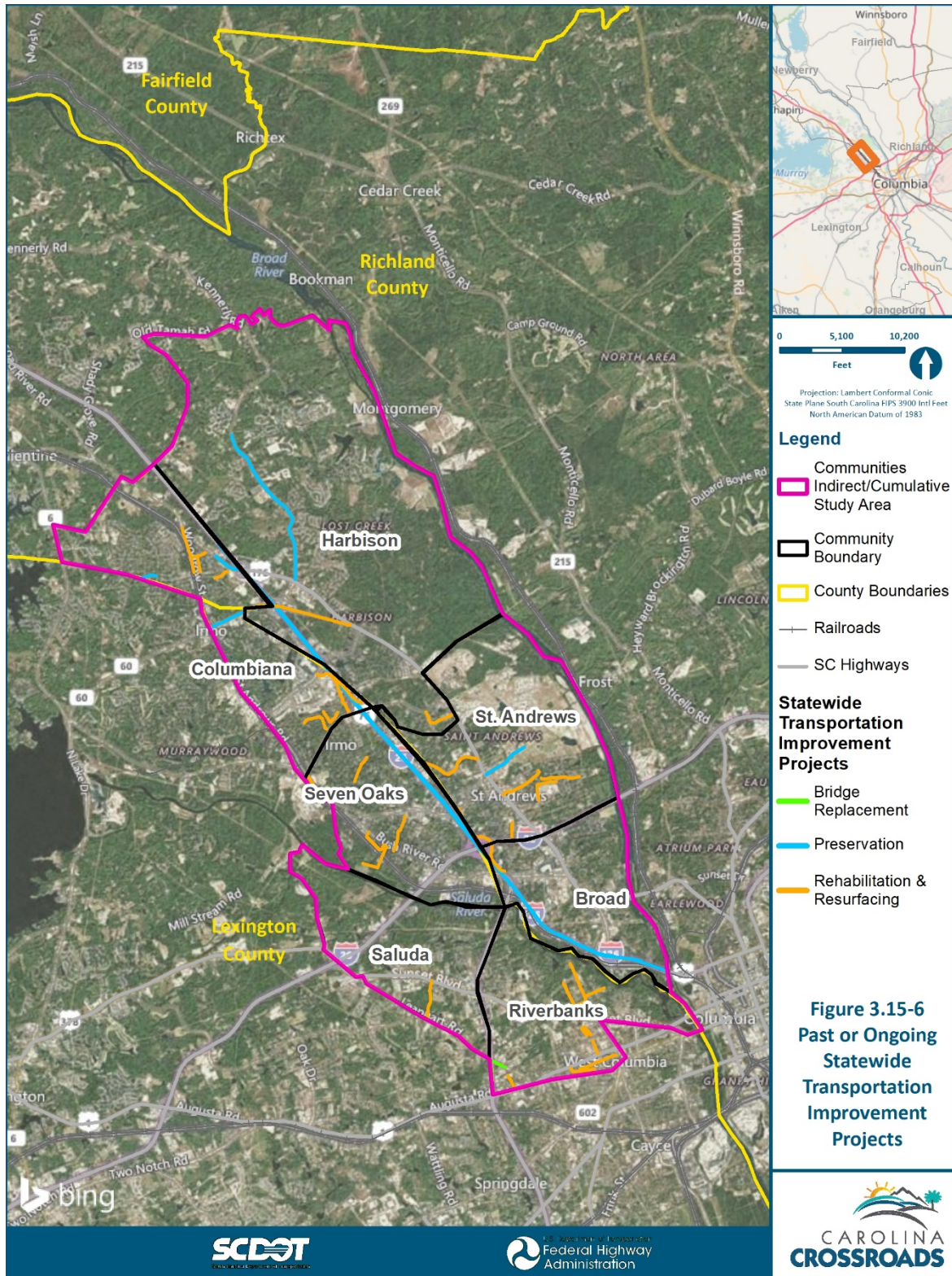
Project name	Description	Community	Status
<b>Bridge replacement</b>			
I-26 (MM 110 to MM 115)	Replace Leaphart Road (S-30) bridge	Riverbanks	Construction
<b>Preservation</b>			
I-26 Interstate Preservation	From I-20 to mile marker 108	Harbison, Broad, Seven Oaks	Construction
I-126 Interstate Preservation	Mile marker 0 to mile marker 4	Columbiana, Seven Oaks, Broad	Construction
Shivers Road	From Broad River Road to end	St. Andrews	Construction
Kennerly Road	From Broad River Road to Steeple Ridge Road	Harbison	Construction
Broad River Road	From near Lowman Road to I-26	Columbiana	Construction
Lake Murray Boulevard	From College Street to Gibbes Street	Harbison, Columbiana	Construction
N. Royal Tower Road	From Chadford Road to Chapelwhite Road	Columbiana	Construction
<b>Rehabilitation &amp; resurfacing</b>			
	42 road segments	All	Construction

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**Current Health.** Prior to 1993, much of the cumulative effects study area had been developed for residential land uses that led to the loss, alteration, and/or fragmentation of natural habitats including upland forests and wetlands and streams. As discussed in Chapter 3.1, the study area has been, and is currently majority residential (43.1%); however, residential development is located throughout the study area and the undeveloped land (20%) uses are highly fragmented.

As discussed in the Community Characterization Report<sup>11</sup> evaluating demographic trends of the communities, patterns became apparent in the study area. Based on the 2010 Census Bureau data (most recent), many of the communities have higher percentages of non-white and low-income populations than the respective county averages. The St. Andrews community has the highest percentage of non-whites in the study area (at 73.8 percent). All of the Lexington County communities except Saluda have a higher percentage of non-whites when compared to Lexington County. Two of the three of the Richland County communities have a higher percentage of non-whites than in Richland County as a whole, and both the St. Andrews and Broad communities had a majority non-white population. Communities with the highest percent minority are St. Andrews (81.1 percent) and Broad (65.1 percent), and the community with the lowest percent minority is still Saluda (24.2 percent). The St. Andrews and Broad communities also have the highest percentage of low-income populations in the study area (at 44.1 and 40.5 percent, respectively). All of the Lexington County communities except Riverbanks and all of the Richland County communities except Harbison have a lower percentage of low-income populations when compared to Lexington County and Richland County as a whole, respectively. The Harbison community also has a lower percentage of low-income populations than in Richland County as a whole. Overall, all communities were similar in demographics and economic profiles and it is interesting to note that the cumulative effects study area as a whole is a majority minority, at 50.4 percent minority.

#### Streams, Wetlands, and Water Quality

**General Past Development.** As discussed in Chapters 3.6 and 3.7, U.S. Executive Order 11990, *Protection for Wetlands*, 1977 (EO 11990), unavoidable impacts to streams and wetlands should be compensated through a process known as compensatory mitigation. Moreover, a ‘no net loss of wetlands’ policy was first adopted as a national goal under George H. W. Bush’s administration in 1988. This policy aimed to balance wetland losses due to development with wetlands preservation and restoration efforts. This policy was further refined and endorsed by subsequent administrations, eventually resulting in the 2008 Final Compensatory Mitigation Rule (Mitigation Rule) regulations promulgated jointly by the USEPA and the USACE, which was adopted locally by the USACE Charleston Regulatory District. In 2010, the USACE Charleston District provided the 2010 Guidelines for Preparing a Compensatory Mitigation Plan as an update to the local mitigation guidelines based on the 2008 national Mitigation Rule. Any Impacts to streams and wetlands within the cumulative effects area since 1993 will have been subject this regulatory framework.

The Multi-Resolution Land Characteristics Consortium (MRLC) National Land Cover Database (NLCD) is a national land cover project that provides national land changes and trends using Landsat satellite data across the United States from 2001 to 2011. Datasets are available for 2001, 2006, and 2011; the most updated dataset is

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<sup>11</sup> SCDOT. 2016. Carolina Crossroads 1-20/26/126 Corridor Improvements Community Characterization. Prepared by STV and HDR Engineering. Charlotte.

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expected to be released at the end of 2018. This dataset also classifies percent developed imperviousness of a pixel that represents 30 square meters. Utilizing these datasets, the percent imperviousness within the cumulative effects study area indicates an increase in imperviousness between 2001 and 2011. While the imperviousness dataset only covers a 10 year period, it can be assumed that increases in imperviousness have continued to date as development continues (Figure 3.15-7 and Figure 3.15-8) graphically the percent imperviousness from 2001 to 2011 and Figure 3.15-9, Figure 3.15-10, and Figure 3.15-11 depict the NLCD imperviousness over that same time frame, respectively. Based on this data, it can be assumed that with imperviousness increased in the past, impacts to streams and wetlands have also occurred, although the amount of exact impacts to streams and wetlands are unknown.

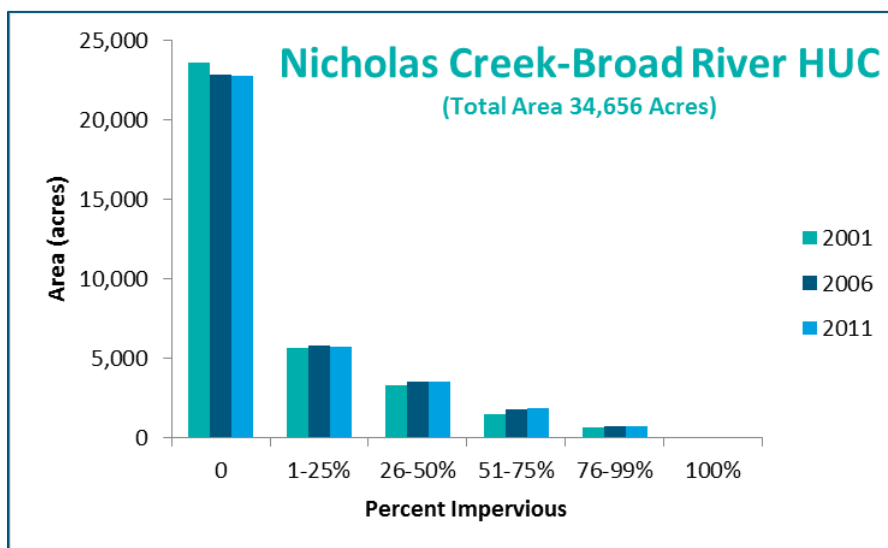


Figure 3.15-7 Percent imperviousness in the Nicholas Creek-Broad River HUC

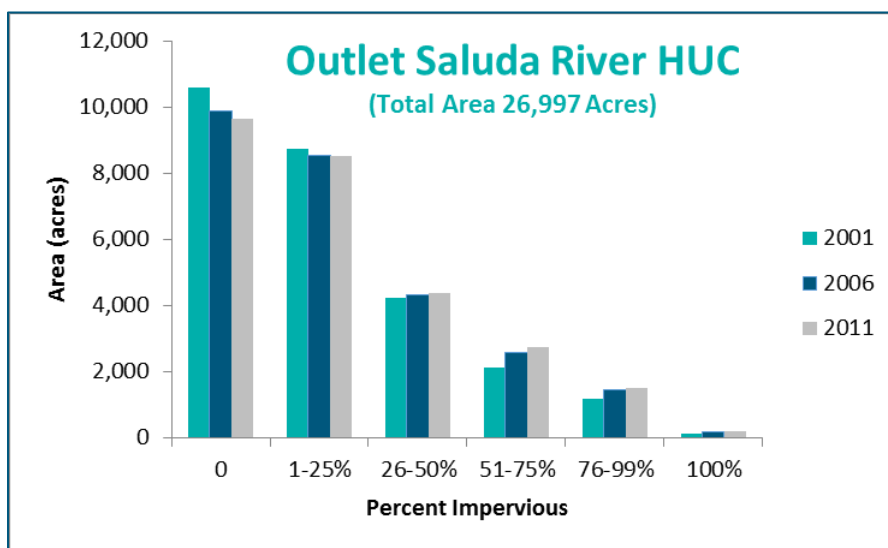
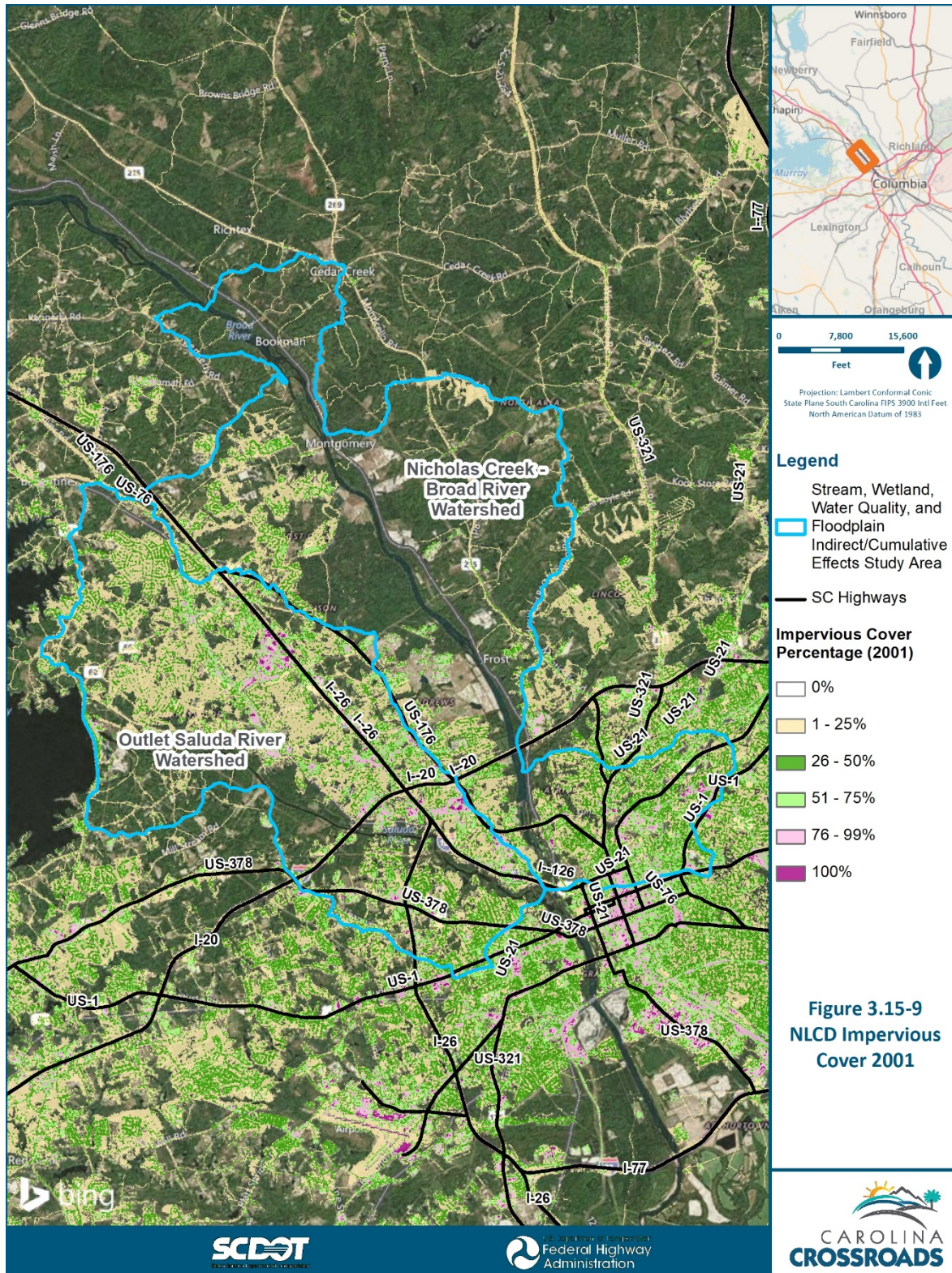


Figure 3.15-8 Percent imperviousness in the Nicholas Creek-Broad River HUC

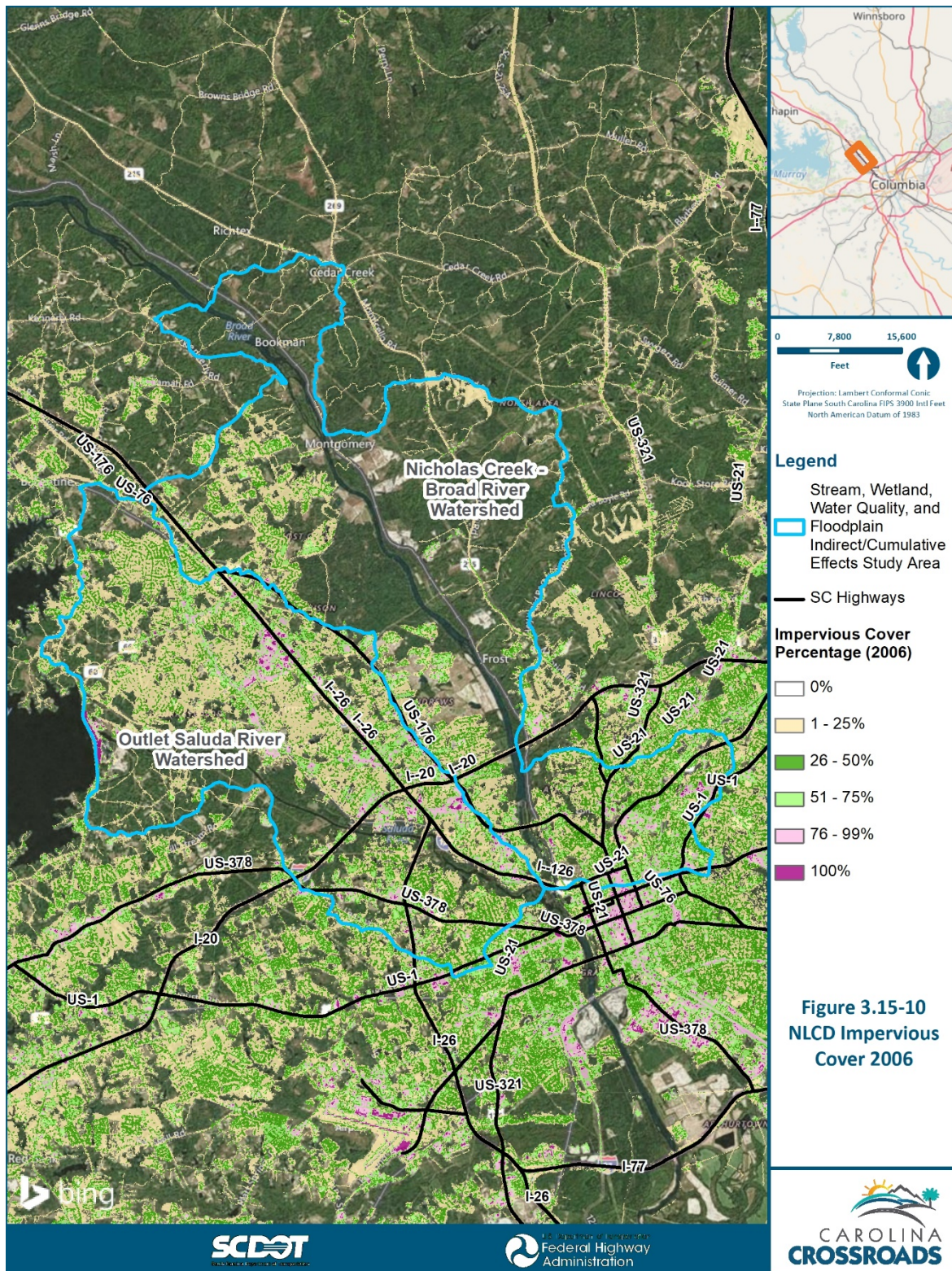


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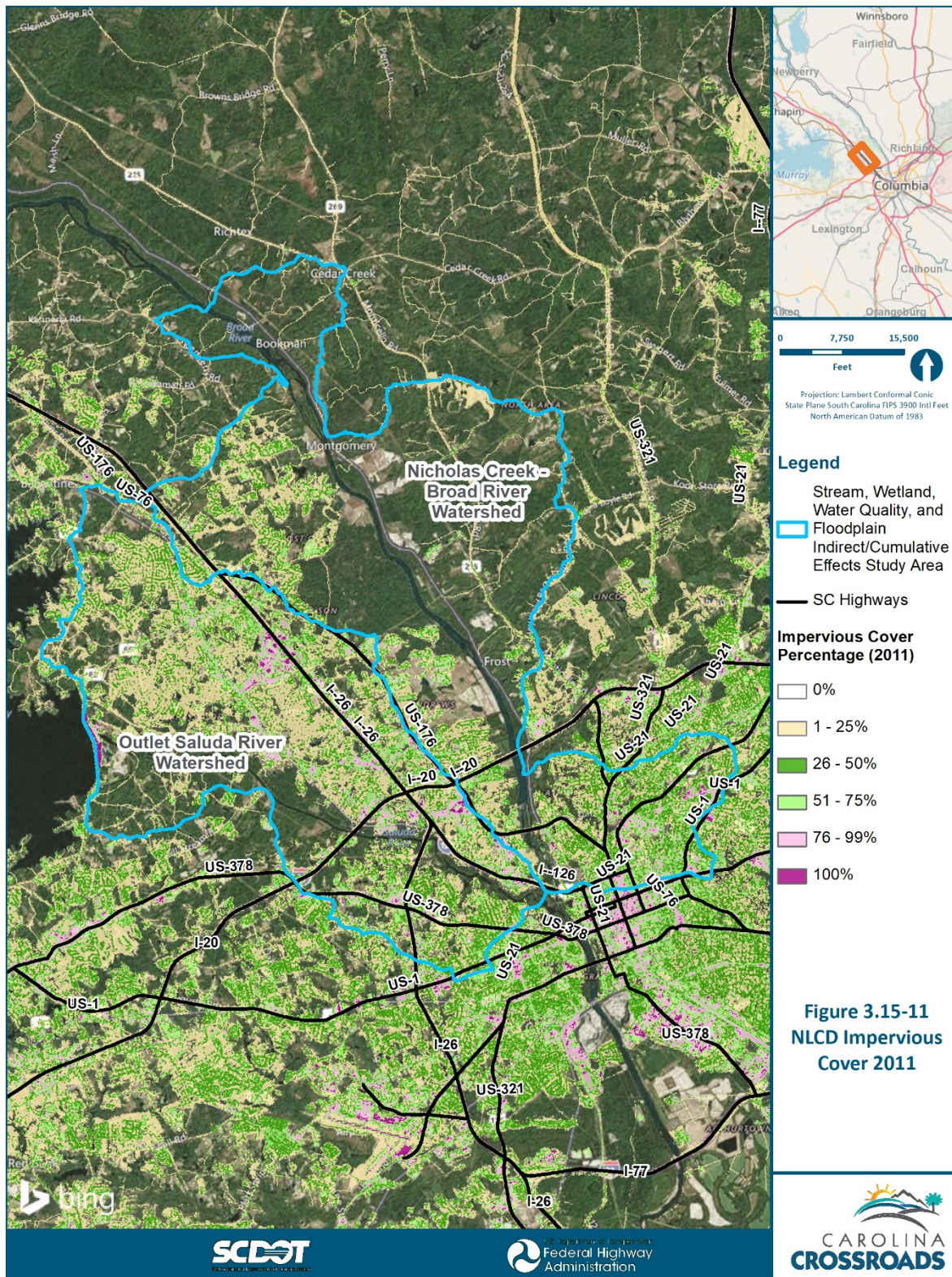


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A review of aerial photography from Google Earth every five years since 1993 (1993, 1998, 2003, 2008, and 2013), including the most recent available in 2016, also indicates an increase in development. Generally, areas of past development include the corridor along the proposed project, the area between the Saluda River and I-26, the area north of Lake Murray Boulevard, west Columbia which is south of the Saluda River and I-20, and northern Columbia which is between I-126 and south of I-20. Another area of development is north of Harbison State Forest. Generally, the areas of least development in the past include areas west of the Saluda River and south of I-20 and the areas east of the Broad River and north of I-20. Harbison State Forest will remain undeveloped. Table 3.15-6 summarizes general development as viewed by aerial photography from 1993 to 2016.

**Table 3.15-6 Summary of Past Development Based on Aerial Photography from 1993 to 2016**

1993 to 1998	1998 to 2003	2003 to 2008	2008-2013	2013 to 2016
Majority of developed areas are along the proposed project corridor, west Columbia in southwest area of cumulative effects study area, and east of Broad River south of I-20 New development occurring north of Harbison State Forest Least developed areas west of Saluda River north of I-20 and east of the Broad River north of I-20	Infill development occurring between Saluda River and I-26, north of Lake Murray Blvd, and north of Harbison State Forest Least developed areas are still west of Saluda River north of I-20 and east side of Broad River north of I-20	Some new development along Monticello Rd. and west of Saluda River north of I-20; however, the least developed areas are still west side of Saluda River north of I-20 and east side of the Broad River north of I-20 Infill development occurring between Saluda River and I-26, north of Lake Murray Blvd, and north of Harbison State Forest	Most development appears to be infill development in areas already noted in previous years Some small development west of Saluda River north of I-20	Some small development between the Broad River and along Monticello Rd. Most development in this time frame appears to be infill development in areas previously noted
<b>Communities with development <u>prior</u> to this timeframe:</b>				
<ul style="list-style-type: none"> <li>• Seven Oaks</li> <li>• Riverbanks</li> <li>• Broad</li> <li>• St. Andrews</li> </ul>	<ul style="list-style-type: none"> <li>• Seven Oaks</li> <li>• Riverbanks</li> <li>• Broad</li> <li>• St. Andrews</li> <li>• Harbison</li> </ul>	<ul style="list-style-type: none"> <li>• Seven Oaks</li> <li>• Riverbanks</li> <li>• Broad</li> <li>• St. Andrews</li> <li>• Harbison</li> </ul>	<ul style="list-style-type: none"> <li>• Seven Oaks</li> <li>• Riverbanks</li> <li>• Broad</li> <li>• St. Andrews</li> <li>• Harbison</li> </ul>	<ul style="list-style-type: none"> <li>• Seven Oaks</li> <li>• Riverbanks</li> <li>• Broad</li> <li>• St. Andrews</li> <li>• Harbison</li> <li>• Saluda</li> </ul>
<b>Communities with <u>new</u> development during this timeframe:</b>				
<ul style="list-style-type: none"> <li>• Harbison</li> </ul>	<ul style="list-style-type: none"> <li>• Seven Oaks</li> <li>• Harbison</li> </ul>	<ul style="list-style-type: none"> <li>• Seven Oaks</li> <li>• Harbison</li> </ul>	<ul style="list-style-type: none"> <li>• Seven Oaks</li> <li>• Saluda</li> </ul>	<ul style="list-style-type: none"> <li>• N/A</li> </ul>



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1993 to 1998	1998 to 2003	2003 to 2008	2008-2013	2013 to 2016
<b>Communities with <u>little/no development</u> during this timeframe:</b>				
• Saluda	• Saluda	• Saluda	• N/A	• N/A

Additionally, as discussed in the Communities section, the Richland Pennies for Progress program began in 2006 and funds roadway and bike/pedestrian/greenway projects through the Richland County Transportation Penny Sales Tax. Additional projects have been completed in the past that are also within the cumulative effects study area for wetlands, streams, and water quality. Projects recently completed include a roadway widening, intersection improvements, greenways, bikeways sidewalks, and a special project (Table 3.15-7 and Figure 3.15-12). There were also 39 resurfacing projects within the cumulative study area that have been completed or that are under construction under this program. These projects occurred regardless of the proposed project.

Also discussed in Section 3.15.2.4, the STIP program is the State's six-year transportation improvement program for all projects or program areas receiving state or federal funding, including among others, bridge replacements, congestion mitigation, interstate maintenance and upgrades, transportation alternatives, and roadway resurfacing. See Table 3.15-8 and Figure 3.15-13 summarizing past or currently ongoing STIP projects in the cumulative effects study area. These projects have occurred regardless of the proposed project.

**Table 3.15-7 Past Richland Pennies for Progress Projects within the Cumulative Effects Study Area**

Project name	Limits	Status
N. Main Street widening	Anthony Ave. to Fuller Ave.	Construction
Kennerly Rd. & Coogler Rd. /Steeple Ridge Rd. intersection	N/A	Complete
Broad River Rd. & Rushmore Rd. intersection	N/A	Complete
Broad River Rd. & Bush River Rd. pedestrian improvements	N/A	Complete
Elmwood Ave. & Bull St. pedestrian improvements	N/A	Complete
Main St. & Elmwood Ave. pedestrian improvements	N/A	Complete
N. Main St. & Monticello Rd. intersection	N/A	Construction
Main St. bikeways	Elmwood Ave. to Sunset Dr.	Complete
Three Rivers Greenway extension Ph. 1	Lexington and Richland County line at the I-26 overpass to the confluence of the Saluda and Broad River	Construction
<b>Special Projects</b>		
Riverbanks Zoo Phase I	Riverbanks Zoo new parking location	Complete
Broad River Rd. Sidewalk	Greystone Blvd. to Broad River Bridge	Complete

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Project name	Limits	Status
Colonial St. Sidewalk	Harden St. to Academy St.	Complete
Columbiana Dr. Sidewalk	Lake Murray Blvd to Lexington County line	Complete
Franklin St. Sidewalk	Bull St. to N. Main St.	Complete
Jefferson St. Sidewalk	Bull St. to Marion St	Complete
Mildred Ave. Sidewalk	Duke Ave. to Westwood Ave.	Complete
Wildwood Ave. Sidewalk	Monticello Rd. to Ridgewood Ave.	Complete
Windover St. Sidewalk	Two Notch Rd. to Belvedere Dr.	Complete

**Table 3.15-8 Past or Ongoing STIP projects within the Cumulative Effects Study Area**

Project name	Description	Status
<b>Bridge replacement</b>		
I-26 (MM 110 to MM 115)	Replace Leaphart Road (S-30) bridge	Construction
<b>Preservation</b>		
I-26 interstate preservation	From I-20 to mile marker 108	Construction
I-126 interstate preservation	Mile marker 0 to mile marker 4	Construction
Shivers Road	From Broad River Road to end	Construction
Kennerly Road	From Broad River Road to Steeple Ridge Road	Construction
Broad River Road	From near Lowman Road to I-26	Construction
Lake Murray Boulevard	From College Street to Gibbes Street	Construction
North Royal Tower Road	From Chadford Road to Chapelwhite Road	Construction
North Lake Drive	From near River Road to near Farming Creek Road	Construction
Irmo Drive	From North Lake Drive to Lake Murray Boulevard	Construction
Nursery Road	Form Conrad Circle to Lake Murray Boulevard	Construction
Wescott Road	From Bush River Road to St. Andrews Road	Construction
Farrow Road	From US 277 to near Walter Bell Lane	Construction
Hatten Road	From Frost Mill Road to end	Construction
Caughman Road North	From	Construction
<b>Rehabilitation &amp; resurfacing</b>		
	61 road segments	Construction
<b>Safety improvements</b>		
Burton Pack Elementary safe routes to schools	Infrastructure improvements along the school driveway	Construction



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Based on the NLCD imperviousness data sets, the review of aerial photography, past Richland Pennies for Progress projects, and past or ongoing STIP projects, it can be assumed that impacts to streams and wetlands have occurred, although the exact amount of impacts to streams and wetlands are unknown.

In South Carolina, the SCDHEC is responsible for monitoring and regulating water quality for the USEPA.

While past actions that have impacted streams and wetlands are unknown, those impacts may be reflected in the water quality in the cumulative effects study area. Under the CWA, states are required to record the condition of their surface waters with 305(b) and 303(d) documentation. The 305(b) documentation serves to evaluate the extent to which surface waters are support their designated uses for categories such as drinking water supply, aquatic life, recreational use, and fish consumption. The 303(d) documentation is a comprehensive list of impaired water bodies that each state must develop under the CWA to identify water bodies that do

not support their designated use classifications for certain pollutants. Moreover, waters that do not meet their designated uses are required to develop total maximum daily loads (TMDLs) under section 303 of the CWA, which is a calculation of the of the total amount of a pollutant a water body can accept from point and nonpoint sources and still meet water quality standards. Past support use designations of specific water bodies in the cumulative effects study area can reflect the effects of these unknown past actions. For example, if a water body did not meet its support use designation, then something occurred that impacted that water body for a specific pollutant resulting in an impairment that modified its support use. Wetlands are not specifically monitored by SCDHEC; therefore, due to unavailable information for wetlands, only the major streams identified in the cumulative effects study area are discussed.

SCDHEC descriptions of support use designations are summarized in Table 3.15-9, put forth by SC Regulations 61-68, Water Classifications and Standards<sup>12</sup> as promulgated by SCDHEC pursuant to the South Carolina Pollution Control Act (48-1-10, et seq, S.C. Code of Laws, 1976). These support use classifications are determined by the impairment resulting from certain pollutants entering waters (Table 3.15-10).

**Table 3.15-9 SCDHEC Support Use Designations for Water Bodies in the Cumulative Effects Study Area**

Type of use support	Description
<b>Aquatic life support (AL)</b>	Evaluation of a water body's ability to provide an environment in which native plant and animal communities can survive and reproduce
<b>Recreational use support (REC)</b>	Evaluation of a water body's suitability for whole body contact recreational activities such as swimming
<b>Fish consumption (FISH)</b>	Evaluation of digestible fish in the water body to determine if safe fish consumption by humans is possible

<sup>12</sup> SCDHEC. R.61-69, Classified Waters. 2012. (<http://www.scdhec.gov/Agency/docs/water-regs/R.61-68.pdf>)



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**Table 3.15-10 Pollutants that Cause Impaired Support Use Classifications**

Pollutant	
Mercury (HG)	Hydrogen ion concentration (PH)
Copper (CU)	Escherichia coli (ECOLI)
Dissolved oxygen (DO)	Macroinvertebrate (BIO)
Fecal coliform bacteria (FC)	Turbidity (TURBIDITY)

The earliest 303(d) list<sup>13</sup> readily available from SCDHEC was completed in 1998 and lists 303(b) impairment of support use designations for certain major streams within the cumulative effects study area.

Table 3.15-11 summarizes the major streams *not* in attainment of their support use designations within the cumulative effects study area from 1998 to 2014; current designations are on the 2016 list and discussed in Current Health. These support use designation impairments indicate that these major streams were not in attainment for those uses because of certain pollutants entering the waters (Table 3.15-12). Figure 3.15-14 depicts 2008 (to 2014) 303(d) list monitoring stations. The current 2016 303(d) list monitoring stations are the same.

**Table 3.15-11 Past Impaired Support Use Designations for Major Streams**

Major stream	1998	2000	2002	2004	2006	2008	2010	2012	2014
Saluda River	REC, AL	REC, AL	REC, AL	REC, AL	AL	AL, FISH	REC, AL, FISH	AL, FISH	AL, FISH
Rawls Creek	REC	REC, AL	REC, AL	REC, AL	AL	AL	AL	AL	AL
Lorick Branch	REC	REC	REC	REC	NL	AL	AL	AL	AL
Kinley Creek	REC	REC, AL	REC, AL	REC, AL	AL	AL	AL	AL	AL
Broad River	AL	AL	REC	REC	AL	AL	AL	AL	AL
Smith Branch	NL	REC, AL	REC, AL	REC, AL	AL	AL	AL	AL	AL

NL – Not listed for particular year

**Table 3.15-12 Summary of Pollutants for Major Streams that Cause Impaired Support Use Designations**

Major stream	2006	2008	2010	2012	2014
Saluda River	PH	HG, TURBIDITY	FC, HG, TURBIDITY	HG, TURBIDITY	HG, TURBIDITY
Rawls Creek	BIO, DO	BIO, TURBIDITY	BIO, TURBIDITY	BIO, TURBIDITY	BIO
Lorick Branch	NL	DO	DO	DO	DO
Kinley Creek	DO	BIO	BIO	BIO	BIO
Broad River	NL	CU	CU	NL	NL
Smith Branch	BIO	BIO	BIO	BIO	BIO

NL – Not listed for particular year

<sup>13</sup> SCDHEC. 2018. Impaired Waters and Contaminant Limits – 303(d), TMDL.  
<http://www.scdhec.gov/HomeAndEnvironment/Water/ImpairedWaters/Overview/#2>



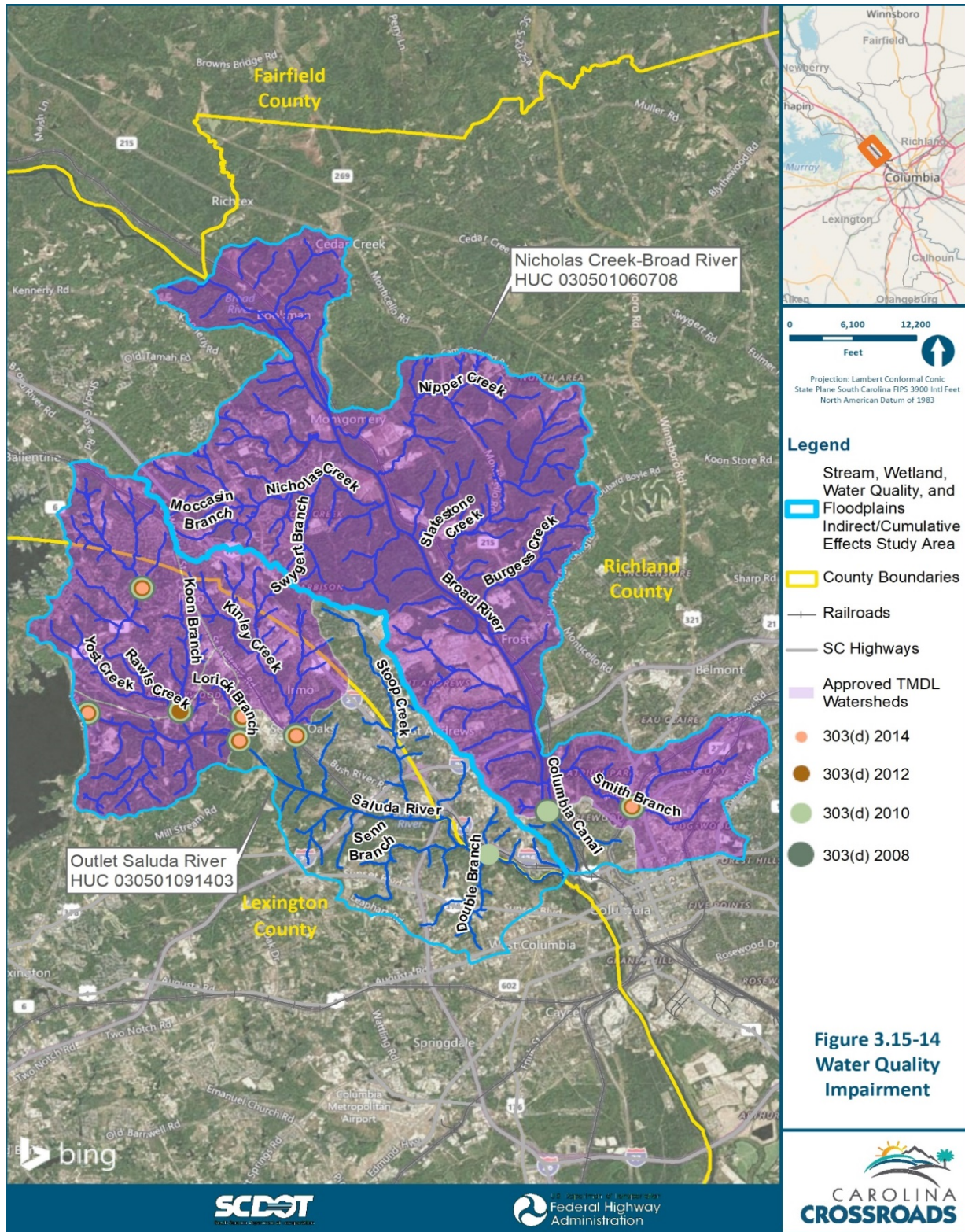
### 3. Existing Conditions and Environmental Consequences

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Based on the 303 (b) listings from 1998 until 2014 and 303 (d) listings for pollutants from 2006 to 2015, the trend in water quality for the cumulative effects study area appears to be impairment for multiple support use designations. It can be inferred that the past actions within the study area have resulted in stream impairment although those past actions are specifically unknown.

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Moreover, TMDLs were developed for fecal coliform for Rawls Creek in 2001, and for Kinley Creek, Lorick Branch, and the Saluda River in 2004. In 2005, fecal coliform TMDLs were also introduced for Smith Branch and the Broad River. This means that a certain amount of fecal coliform can enter these waters on a daily basis and still adhere to water quality standards for fecal coliform set by the state. The creation of TMDLs for these waters within the recent past indicates that water quality standards for fecal coliform were not meeting state standards, and under the TMDL, it then became required to reduce fecal coliform sources and how to do so.

Together with the 303(b) and 303(d) listings and de-listings for support use designations because of pollutants entering the waters and the implementation of the TMDLS located in the study area, it can be assumed that past actions within the cumulative effects study area have negatively impacted streams in the past, and reflected in their water quality.

**Current Health.** The current (2016) SCDHEC 303(d)<sup>14</sup> lists those major streams that are *not* in attainment of their support use classifications (Table 3.15-13) and the pollutants causing those impairments (Table 3.15-14)

**Table 3.15-13 Current (2016) Impaired Support Use Designations for Major Streams**

Major stream	Type of use support
Saluda River	AL, REC, FISH
Rawls Creek	AL, REC
Lorick Branch	AL, REC
Kinley Creek	AL, REC
Broad River	REC
Smith Branch	AL, REC

**Table 3.15-14 Current Pollutants (2016) for Major Streams that Cause Impaired Support Use Designations**

Major stream	Pollutant
Saluda River	FC, HG, TURBIDITY
Rawls Creek	BIO
Lorick Branch	DO
Kinley Creek	BIO
Broad River	FC
Smith Branch	BIO

The TMDLs developed in the past are still currently enforced for fecal coliform. Approximately three-quarters of the cumulative effects study area is in a designated TMDL approved watersheds for fecal coliform. This is a snapshot of the current status of stream health within the cumulative effects study area. From past trends such

<sup>14</sup> SCDHEC. 2016. State of South Carolina Integrated Report for 2016 Part I: *Section 303(d) List of Impaired Waters*. May 2016.  
[http://www.scdhec.gov/HomeAndEnvironment/Docs/tmdl\\_16-303d.pdf](http://www.scdhec.gov/HomeAndEnvironment/Docs/tmdl_16-303d.pdf)



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as development that has increased imperviousness, it can be assumed that water quality impairment is an indication of impacts although impacts to streams and wetland cannot be quantified.

#### FEMA Floodplains

**General Past Development.** Past actions in the cumulative effects study area to FEMA floodplains since 1993 are unknown. As EO 11988 protects all FEMA floodplains in the cumulative effects study area it can be assumed that past FEMA floodplain crossings and/or encroachments are in compliance with the 100-year flood event design standards, as regulated by FEMA since the EO was enacted in 1977.

**Current Health.** Currently, the FEMA regulated floodplains within the cumulative effects study area are protected from development by EO 11988. It can be assumed that all new crossings and/or encroachments are in compliance with the FEMA 100-year flood event design standards. Given that floodplain development is regulated at the federal and local level, these FEMA floodplain areas have escaped major development and support some of the last remaining forested areas in the cumulative effects study area. These floodplains provide areas for flood attenuation as illustrated by the large floodplain wetlands identified during field surveys.

The community, streams, wetlands, water quality, and FEMA floodplain resources have been discussed for their historical context and current health. The next step is to analyze the direct and indirect impacts to these resources that may contribute to a cumulative effect when considered together.

#### 3.15.2.5 Step 4: Identify Direct/Indirect Impacts that Might Contribute to a Cumulative Impact

##### Communities

SCDOT, as part of this project, would not be constructing new roads or interchanges in locations that do not currently have access; therefore, indirect effects to communities are expected to be minimal due to the proposed project. Congestion may decrease within the indirect effects study area as a result of the project, which could facilitate a number of important traffic functions, including easier access to downtown Columbia, adjacent employment areas and neighborhoods, and regional activity centers. Indirect impacts would most likely be concentrated at the interchanges, the proposed project would indirectly affect communities through increased cohesion and accessibility within the indirect effects study area.

Because most of the indirect effects study area is already developed, growth is expected to occur as redevelopment or infill development and changes to land use types, patterns of land use and development and density within each community are not likely to be affected.

For both reasonable alternatives, Tram Road will connect to Beatty Road via an overpass of I-26 that will provide a connection between the Seven Oaks and St. Andrews communities. The Tram Road overpass has the potential to increase pass-by traffic, but as traffic data for Tram Road is incomplete at this time, indirect effects caused by increased pass-by traffic to these communities cannot be accurately assessed, per CEQ guidance (40 CFR § 1502.22).

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Additionally, with the relocation of the I-26/Bush River Road interchange, direct access to Bush River Road from I-26 would be affected. As such, direct access from I-26 to commercial businesses on Bush River Road near the current interchange may experience less pass-by traffic than currently exists today. These businesses would still be easily accessible via the interchange relocation to Colonial Life Boulevard and the I-20/Bush River Road interchange.

#### Streams, Wetlands, and Water Quality

Both reasonable alternatives would adversely affect streams, wetlands, and water quality through direct loss of streams and wetlands (Table 3.15-15). Potential temporary indirect impacts of both reasonable alternatives during project construction would include increased downstream sedimentation and turbidity from in-stream work and possible spills or non-point source pollutants entering groundwater or surface water from storm runoff. Incremental increases of impervious surfaces for both reasonable alternatives are expected which would result in an incremental increase of sediments and roadway contaminants to streams and/or wetlands that are within the drainage area of the project (Table 3.15-16). Quantifying sediment, pollutant levels, and extent of downstream impacts can be difficult due to the varying degree of surrounding land use and stream dynamics.

**Table 3.15-15 Potentially Jurisdictional Waters of the US Direct Impact Comparison of Reasonable Alternatives**

Alternative	Potentially jurisdictional streams	Potentially jurisdictional wetlands	Potentially jurisdictional ponds
<b>RA1</b>	15,750 lf	6.55 acres	0.02 acre
<b>RA5 Modified</b>	16,600 lf	6.89 acres	0.02 acre

**Table 3.15-16 Increase of Impervious Surface by Reasonable Alternative**

Alternative	Existing (ac.)	Impervious to pervious (ac.)	Pervious to impervious (ac.)	New impervious surface (ac.)
<b>RA1</b>	330.6	35.3	164.4	459.7
<b>RA5 Modified</b>	330.6	37.0	164.3	457.9

As the extent of indirect impacts to water quality and resources is difficult to assess accurately, a good predictor of degree of indirect impacts on water quality is relative to direct impacts on streams and wetlands and amount of increase in impervious surfaces for each reasonable alternative. As each of the reasonable alternatives' footprints have substantial overlap, indirect impacts to streams, wetlands, and water quality are anticipated to be similar and would contribute to cumulative impacts to these resources.

#### FEMA Floodplains

Construction activities associated with the reasonable alternatives are anticipated to directly impact FEMA floodplains and floodways. Both reasonable alternative designs would utilize the existing footprint of the FEMA floodplain crossings to minimize encroachment into the floodplains but culvert extensions and/or additional bridge ramps would lead to minor floodplain impacts. Through hydraulic studies, areas would be identified for

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design changes to avoid/minimize floodplain impacts as much as practicable. All FEMA floodplain crossings would be designed to pass the 100-year storm event, as required by FEMA, and a No-Rise condition would be the objective of the final design of the recommended preferred alternative.

While flooding encroachments are not anticipated due to FEMA design standards (discussed in Chapter 3.8), including indirect flooding encroachments downstream or off site, the floodplains may be indirectly affected by the project due to increased surface water runoff and land alteration encroachment effects. Additionally, as streams and wetlands experience an increase or reduction in flow moderation, those floodplains adjacent or containing those streams and wetlands, may be indirectly affected by the same measure.

The extent of indirect impacts to FEMA floodplains is difficult to assess accurately and the best predictor of degree of indirect impacts to floodplains is relative the amount of increase in impervious surfaces for each reasonable alternative as discussed in Chapter 3.8. Both reasonable alternative footprints have substantial overlap and the new impervious surface areas are relatively similar. RA1 would have slightly greater new impervious surface area (greater 1.8 acres) than RA5 Modified. Per CEQ guidance (40 CFR § 1502.22), indirect effects to floodplains cannot be accurately assessed.

Once the cumulative impacts are identified, which are those direct and indirect effects that may cumulatively have an effect, the next step is to identify any other reasonable foreseeable actions in the near future that may also contribute to the overall cumulative effects on the identified resources.

#### 3.15.2.6 Step 5: Identify Other Reasonable Foreseeable Actions

Table 3.15-17 (below) summarizes each resource analyzed and the past, present, and future actions potentially affecting those resources. Discussed in this section are those actions that are reasonably foreseeable within the cumulative effects study areas.

**Table 3.15-17 Summary of Potential Effects on Resources Identified within the Project Study Area**

Resource	Past actions	Present actions	Proposed action	Future actions	Cumulative effect
<b>Communities including:</b>	Developed and built out since 1993	Growth occurring at anticipated trends	Infill or redevelopment; relocation of I-26/Bush River Road (Broad, Seven Oaks)	Continued infill/refill development in the study area; future transportation projects	No adverse cumulative effect on communities; positive benefits are anticipated
Harbison					
Columbiana					
St. Andrews					
Seven Oaks					
Saluda					
Broad					
Riverbanks					



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Resource	Past actions	Present actions	Proposed action	Future actions	Cumulative effect
<b>Streams and Wetlands</b>	Large reduction in streams and wetlands; development and increased imperviousness; which should have been mitigated by the no net loss rule	Loss of small amount of streams and wetlands annually; unknown quantity; which be mitigated by the no net loss rule	15,750 lf streams, 6.55 ac. wetlands, 16,600 lf streams, 6.89 ac. Wetlands; which will be mitigated by the no net loss rule	Continued loss of streams and wetlands; stream/wetland mitigation banks; unknown quantity	Continued stream and wetland impacts with a beneficial effect with banks coming on-line and the no-loss rule
<b>Water Quality</b>	Impairment designations and TMDLs	Current impairment designations and TMDLs	Incremental increase in adverse effects to water quality	Continued impairment of water quality with a beneficial effect with banks coming on-line that may improve water quality within HUCs	No adverse cumulative effect on water quality
<b>FEMA Floodplains</b>	Some reduction in acreage of FEMA floodplains	Loss of insignificant amount of FEMA Floodplains annually	No loss of FEMA floodplains under the No-Rise Condition	Insignificant loss of FEMA floodplains	No cumulative loss of FEMA floodplains

#### Communities

Under the No-Build Alternative, numerous local and regional land use plans would still guide future development, based on a shared local vision and development goals (See Chapter 3.1 Land Use). Because as most of the study area is already developed, growth is expected to occur in most areas as redevelopment or infill development while development and redevelopment may occur along the corridor, this redevelopment would not necessarily occur as a result of the proposed Carolina Crossroads project. One example is the proposed “start center,” included in the Richland Renaissance Plan; this redevelopment is planned between the I-20/Broad River Road and I-26/Bush River Road interchanges within the Broad Community and may include a business incubator and transit hub.

The Richland Pennies for Progress program began in 2006 and funds roadway and bike/pedestrian/greenway projects through the Richland County Transportation Penny Sales Tax. This program helps support future

### 3. Existing Conditions and Environmental Consequences

transportation projects in the study area (Table 3.15-18 and Figure 3.15-15). While these projects would not necessarily occur as a result of the proposed project, they would promote cohesion within and between communities in the reasonably foreseeable future. The alternate modes of transportation (bikeways, greenways, sidewalks) will promote less vehicular traffic and more active recreation opportunities, which also would not necessarily occur as a result of the proposed project. There are also 14 resurfacing projects within the cumulative study area that are either in procurement or planning phases. Richland Pennies for Progress projects would occur regardless of the project and are subject to change based on impacts and/or public input.

As discussed in Section 3.15.2.4, the STIP program helps support future transportation projects in the study area. Table 3.15-19 and Figure 3.15-16 summarize future STIP projects in the cumulative effects study area, including the Carolina Crossroads project, which is receiving funding through the STIP program. While STIP projects other than Carolina Crossroads would not necessarily occur as a result of the proposed project, they would promote cohesion within and between communities in the reasonably foreseeable future. STIP projects would occur regardless of the project and are subject to change based on impacts and/or public input.

**Table 3.15-18 Future Richland Pennies for Progress Projects within the Cumulative Effects Study Area.**

Project name	Limits	Community	Status
<b>Road widening</b>			
Broad River Rd. widening	N. Royal Tower Rd. to I-26*	Columbiana	Design
<b>Greenways</b>			
Dutchman Blvd Greenway	Broad River Rd to Lake Murray Blvd.	Harbison	Not started
<b>Bikeways</b>			
Broad River Rd. Woodrow Rd. to I-26 bikeways	Woodrow Rd. to I-26*	Columbiana	Design
Broad River Rd. bikeways	Lake Murray Blvd. to Western Ln.*	Columbiana	Design
	Harbison Blvd. to Bush River Rd.	Harbison, St. Andrews, Broad	Not started
	Bush River Rd. to Greystone Blvd.	Broad	Design
	Greystone Blvd. to the Broad River Bridge	Broad	Design
Broad River Rd./ Lake Murray Blvd. bikeways	I-26 to Harbison Blvd.	Harbison	Not started
Dutchman Blvd. bikeways	Broad River Rd. to Lake Murray Blvd.	Harbison	Not started
Columbiana Dr. bikeways	Lake Murray Blvd. to Lexington County Line	Columbiana	Design
<b>Sidewalks</b>			
Broad River Rd. sidewalk	N. Royal Rd. to Woodrow St.*	Columbiana	Design
	I-26 to Harbison Blvd.	Harbison	Not started
	Harbison Blvd. to Bush River Rd.	Harbison, St. Andrews, Broad	Not started

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Project name	Limits	Community	Status
<b>Neighborhood improvement projects</b>			
Broad River Corridor Neighborhood		St. Andrews, Broad	Not Started

\*To be completed as part of the Broad River Road Widening (US 176 project)

**Table 3.15-19 Future STIP Projects within the Cumulative Effects Study Area**

Project name	Description	Community	Status
<b>Interchange improvement</b>			
I-20/I-26/I-126 corridor improvement project	I-20/I-26 interchange and corridor along I-26 from US 378 to US 176 and I-20 from Saluda River to Broad River	All	Design/development
I-20 at US-378 ramp terminal	I-20 Westbound exit ramp improvements	Saluda	Design/development
<b>Rehabilitation &amp; resurfacing</b>			
Bush River Road	From Zimalcrest Drive to Broad River Road	Seven Oaks, Broad	Pre-award
Columbiana Drive	From Broad River Road to Lake Murray Boulevard	Columbiana	Pre-award
Fernandina Road	Woodcross Drive to Home Depot	Harbison, Columbiana	Pre-award
<b>Enhancement</b>			
Richland Co. schools	3 Sidewalk installations near Columbia High and Sandel Elementary	St. Andrews	Design/development
<b>Safety improvement</b>			
CSXT Crossing No. 843292C on S-2889	Upgrade railroad warning devices	Broad	Design/development
Piney Woods Road Sidewalk	Sidewalk extension from Woodcross Drive to Costco sidewalk	Harbison	Design/development
US 176 Section/corridor improvements	From St. Andrews Road to Atlantic Drive	St. Andrews, Broad	Design/development
<b>Widening</b>			
I-26 widening	Near SC 202 to near US 176	Columbiana	Design/development
Broad River Road widening	From Royal Tower Road to I-126	Columbiana	Design/development

The Central Midlands Council of Government (CMCOG) is responsible for developing a Long Range Transportation Plan (LRTP)<sup>15</sup>, which is, at a minimum, a 25-year transportation vision for the Columbia metropolitan area. There are four roadways in the 2035 LRTP located within the cumulative effects study area that were identified as

<sup>15</sup> Columbia Area Transportation Study (COATS). 2008. "Midlands Tomorrow, 2035 Long Range Transportation Plan." Adopted December 18, 2008; Amended February 26, 2009; April 23, 2009; June 25, 2009; October 22, 2009; December 10, 2009



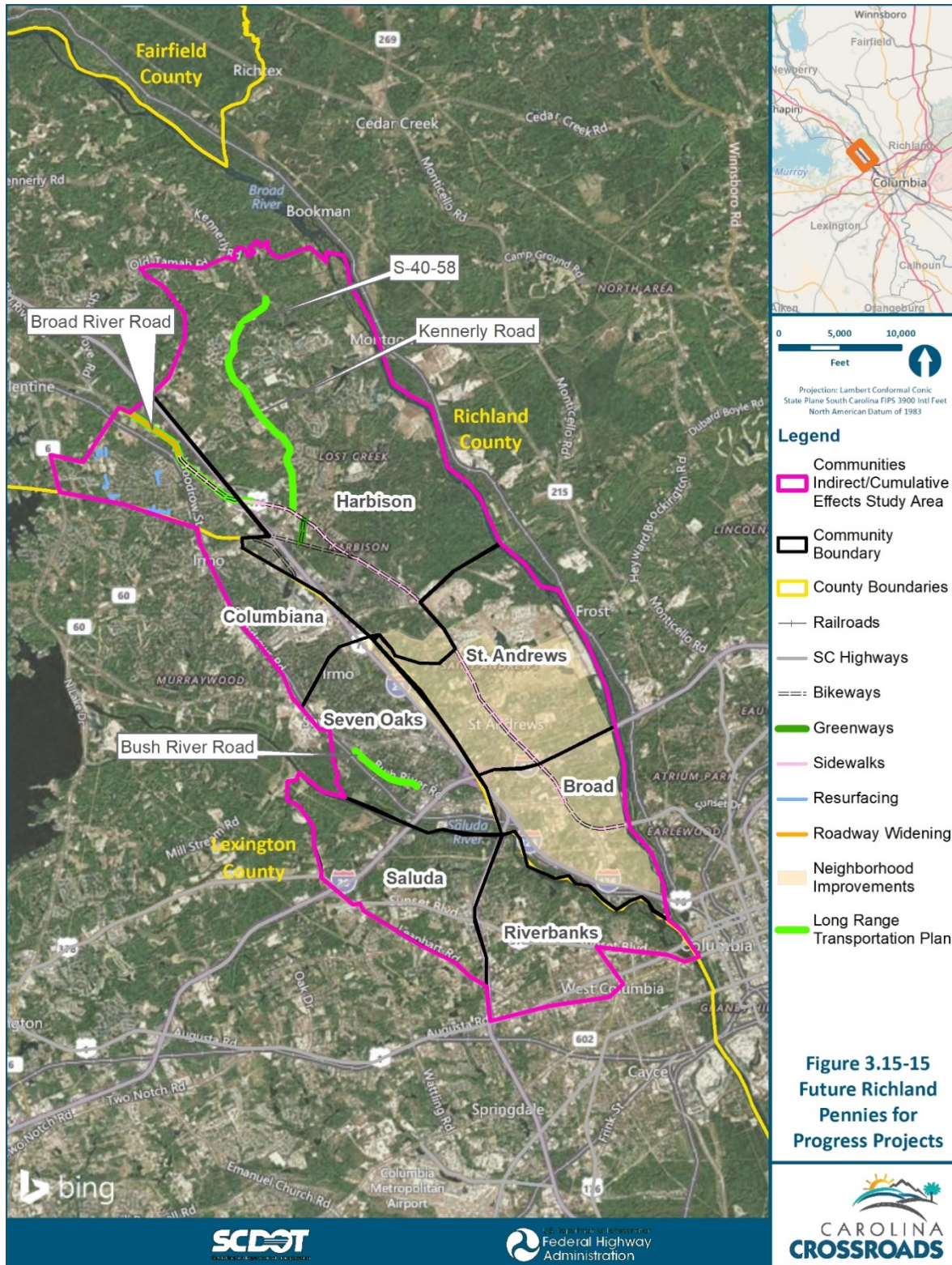
### 3. Existing Conditions and Environmental Consequences

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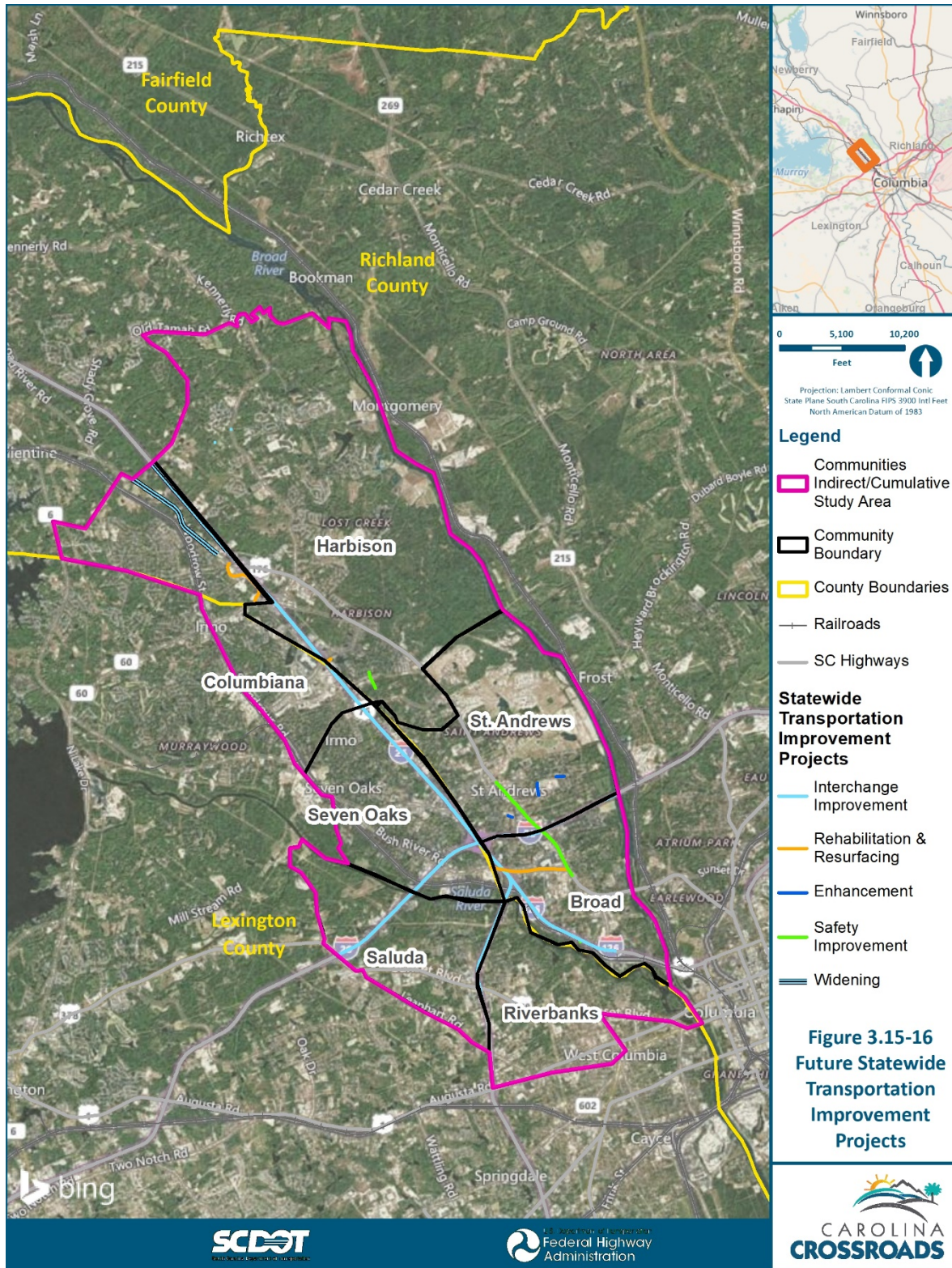
needing improvements or upgrades in the foreseeable future. These roadways include Bush River Road, Broad River Road, Kennerly Road, and S-40-58 (Figure 3.15-15).

### 3. Existing Conditions and Environmental Consequences





### 3. Existing Conditions and Environmental Consequences





### 3. Existing Conditions and Environmental Consequences

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Projections show that development/redevelopment trends will continue through the foreseeable future. Land uses around the interchanges are already established, with limited opportunities for new unplanned large-scale development; though there is a potential for small-scale direct impacts to land use as a result of property acquisition. The location, timing, and level of future growth occurring at the interchanges would depend on the availability of infrastructure and public services. Plans for critical future infrastructure are addressed by the individual jurisdictions and agencies providing these services to accommodate future development, regardless of the proposed project. Additionally, the redevelopment that could occur as a result of the interchange improvements would be subject zoning regulations associated with the interchange land use and would be compatible with existing uses. The I-20/26/126 Corridor Improvement Project is in alignment with these area plans.

**Broad and Seven Oaks communities:** The existing I-26/Bush River Road interchange is a service interchange that is in close proximity to the major system to system interchange of I-26 and I-20. This is not only a safety concern, but a cause of traffic congestion. Relocating this interchange to Colonial Life Boulevard would provide a benefit to vehicular mobility and safety of the corridor. However, the relocation of the interchange may encourage infill development or redevelopment elsewhere such as Colonial Life Boulevard instead of encouraging development in the immediate vicinity of this interchange. Businesses close to the existing I-26/Bush River Road interchange may experience a decrease in customers due to the decreased pass-by traffic discussed in the indirect effects section and communities section.

Alternatively, businesses at this interchange may see an increase in customers with the addition of wayfinding signage once the interchange is relocated. Along with potential of increase in customers, the Broad River Road Corridor and Community Master Plan preliminary plans to extend Longcreek Drive at Broad River Road to connect at Colonial Life Boulevard, thus creating a corridor directly connecting I-26 to Broad River Road via Colonial Life Boulevard. Moreover, the Richland Renaissance Master Plan<sup>16</sup>, a countywide plan that promotes preparedness for future growth and development, proposes a “start center” at the corner of Colonial Life Boulevard at Bush River Road, which connects the Richland Renaissance Master Plan to the Broad River Road Corridor and Community Master Plan. The “start center” is planned to be a business incubator and transit hub. The relocation of the I-26/Bush River Road interchange would support and blend both of these plans and may provide a positive benefit to businesses at this interchange. The Richland Renaissance Master plans also includes a project known as Revivify Richland.<sup>17</sup> The Revivify Richland attempts to define areas that have become areas of decline and wishes to incentivize economic development in those areas. This interchange area was classified to be one of those areas. Between both plans, the addition of wayfinding signage, increased safety, and the direct access to Bush River road via the I-126/Colonial Life Boulevard, the effects of the relocation of the I-26/Bush River Road interchange are expected to create a positive benefit to the area.

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<sup>16</sup> Richland County. Richland Renaissance. (<http://www.richlandcountysc.gov/Richland-Next>)

<sup>17</sup> Richland County. Richland Renaissance: Revivify Richland. April 30, 2018.

([http://www.richlandcountysc.gov/Portals/0/Departments/PublicInformationOffice/RR/Revivify%20Richland\\_Web\\_04\\_30\\_2018.pdf](http://www.richlandcountysc.gov/Portals/0/Departments/PublicInformationOffice/RR/Revivify%20Richland_Web_04_30_2018.pdf))

### 3. Existing Conditions and Environmental Consequences

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#### Streams, Wetlands, and Water Quality

Under the No-build Alternative, the streams and wetlands impacts of the reasonable alternatives would not occur, but water quality impacts would still occur as the existing amount of impervious surfaces would remain and storm water runoff and sedimentation affecting downstream water quality would continue. After the Selected Alternative is chosen, if improvements (i.e. road widening) of the project corridor are warranted in the future, additional analysis of water resources and water quality to avoid and minimize impacts would be required as part of the Section 404 permit process. Future impacts to water resources would also require CWA Section 404 and 401 permits and compensatory mitigation of unavoidable impacts. While there are compensatory mitigation banks within the watershed, there are no existing mitigation banks that have readily available credits to fulfill all of the estimated stream mitigation need of the proposed project. Therefore, it is anticipated that compensatory mitigation for permanent project impacts associated with this project would be obtained through a combination of mitigation bank credit purchases and permittee-responsible mitigation. The cumulative effect of this approach may mean that there would be no available compensatory mitigation banks within the watershed for the use of other projects. However, a section 404 permit cannot be issued unless suitable mitigation is acquired for the project, per the 2008 Compensatory Mitigation Rule.

Researched through the Regulatory In-Lieu Fee and Bank Information Tracking System (RIBITS)<sup>18</sup>, there are no banks within the cumulative effects study area. Some banks are being proposed and are under review by the IRT for the watershed. However, stream and wetland mitigation banks may be developed within the cumulative effects study area as a response to the need for stream and wetland mitigation for the proposed project. There are banks being proposed and are currently under review by the IRT.

The Richland Pennies for Progress program began in 2006 and funds roadway and bike/pedestrian/greenway projects through the Richland County Transportation Penny Sales Tax. This program came about through citizen interest in creating and improving failing roads and sidewalks, and adding greenway infrastructures. Reasonably foreseeable projects include bikeways, greenways, intersection improvements, a neighborhood improvement, sidewalks, road resurfacing, and road widenings (Table 3.15-20 and Figure 3.15-17). While these projects would not necessarily occur as a result of the proposed project, they would promote cohesion within and between communities in the reasonably foreseeable future. The alternate modes of transportation (bikeways, greenways, sidewalks) will promote less vehicular traffic and more active recreation opportunities, which also would not necessary occur as a result of the proposed project. There are also 21 resurfacing projects within the cumulative study area that are either in procurement or planning phases. Richland Pennies for Progress projects would occur regardless of the project and are subject to change based on impacts and/or public input.

As discussed in Section 3.15.2.4, the STIP program helps support future transportation projects in the study area. Table 3.15-21 and Figure 3.15-18 summarize future STIP projects in the cumulative effects study area, including the Carolina Crossroads project, which is receiving funding through the STIP program. While STIP projects other than Carolina Crossroads would not necessarily occur as a result of the proposed project, they

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<sup>18</sup> USACE. Regulatory In-Lieu Fee and Bank Information Tracking System ([https://ribits.usace.army.mil/ribits\\_apex/f?p=107:158:32174658348395::NO:RP:](https://ribits.usace.army.mil/ribits_apex/f?p=107:158:32174658348395::NO:RP:))

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would promote cohesion within and between communities in the reasonably foreseeable future. STIP projects would occur regardless of the project and are subject to change based on impacts and/or public input.

**Table 3.15-20 Future Richland Pennies for Progress Projects within the cumulative Effects Study Area**

Project name	Limits	Status
<b>Road widening</b>		
Broad River Rd. widening	N. Royal Tower Rd. to I-26*	Design
<b>Intersection improvements</b>		
Assembly St. & Calhoun St. pedestrian improvements	N/A	Design
Bull St. & Elmwood Ave. intersection	N/A	Design
Elmwood Ave. & Park St. pedestrian improvements	N/A	Design
Main St. & Calhoun St. pedestrian improvements	N/A	Design
<b>Greenways</b>		
Crane Creek B Greenway	Crane Creek A to Smith Branch	Not started
Dutchman Blvd Greenway	Broad River Rd to Lake Murray Blvd.	Not started
Smith/ Rocky Branch A Greenway	Northern Three Rivers to Clement Rd.	Not started
Smith/ Rocky Branch B Greenway	Clement Rd. to Colonial Drive	Not started
<b>Bikeways</b>		
Beltline Blvd./ Colonial Dr./ Farrow Rd. bikeways	Harden St. to Academy St.	Design
Broad River Rd. Woodrow Rd. to I-26 bikeways	Woodrow Rd. to I-26*	Design
Broad River Rd. bikeways	Lake Murray Blvd. to Western Ln.*	Design
	Harbison Blvd. to Bush River Rd.	Not started
	Bush River Rd. to Greystone Blvd.	Design
	Greystone Blvd. to the Broad River Bridge	Design
Broad River Rd./ Lake Murray Blvd. bikeways	I-26 to Harbison Blvd.	Not started
Bull St. bikeways	Victoria St. to Elmwood Ave.	Design
Dutchman Blvd. bikeways	Broad River Rd. to Lake Murray Blvd.	Not started
Columbiana Dr. bikeways	Lake Murray Blvd. to Lexington County Line	Design
Colonial Dr. bikeways	Bull St. to Slighs Ave.	Not started
Main St. bikeways	Elmwood Ave to Sunset Dr.	Completed
<b>Sidewalks</b>		
Broad River Rd. sidewalk	N. Royal Rd. to Woodrow St.*	Design
	I-26 to Harbison Blvd.	Not started
	Harbison Blvd. to Bush River Rd.	Not started



### 3. Existing Conditions and Environmental Consequences

Project name	Limits	Status
Grand St. sidewalk	Shealy St. to Hydrick St.	Design
Sunset Dr. sidewalk	Elmhurst Rd. to River Dr.	Design
<b>Neighborhood improvement projects</b>		
Broad River Corridor neighborhood	N/A	Not started
Broad River	N/A	Procurement

\*To be completed as part of the Broad River Road Widening (US 176 project)

**Table 3.15-21 Future STIP Projects within the Cumulative Effects Study Area**

Project name	Description	Status
<b>Bridge replacement</b>		
US 176	Bridge replacement over SCL railroad	Design/development
I-126	Bridge replacement over SCL railroad	Design/development
<b>Interchange improvement</b>		
I-20/I-26/I-126 corridor improvement project	I-20/I-26 Interchange and corridor along I-26 from US 378 to US 176 and I-20 from Saluda River to Broad River	Design/development
I-20 at US-378 ramp terminal	I-20 Westbound exit ramp improvements	Design/development
Bull Street/Elmwood Avenue	Intersection improvement at Bull Street and Elmwood Avenue intersection	Design/development
<b>Rehabilitation &amp; resurfacing</b>		
Bush River Road	From Zimalcrest Drive to Broad River Road	Pre-award
Columbiana Drive	From Broad River Road to Lake Murray Boulevard	Pre-award
Fernandina Road	Woodcross Drive to Home Depot	Pre-award
<b>Enhancement</b>		
Richland Co. schools	3 Sidewalk installations near Columbia High and Sandel Elementary	Design/development
Bush River Road sidewalks	From Wood Pine Drive to St. Andrews Road	Design/development
East Broad River neighborhood improvements	Streetscaping and sidewalks	Design/development
Magnolia Street sidewalks	From Two Notch Road to Pinehurst Road	Design/development
Sunset Drive sidewalks	From River Drive to Elmhurst Road	Design/development
School House Road	From Two Notch Road to Ervin Street	Design/development
City of Columbia sidewalks	Various locations- Macy Street, Sulton Street, Mildred Avenue	Design/development
Seamless City revitalization project	North Main Street Streetscaping Improvements from Anthony Avenue to Fuller Avenue	Pre-award
<b>Safety improvement</b>		
CSXT Crossing No 843292C on S-2889	Upgrade railroad warning devices	Design/development

### 3. Existing Conditions and Environmental Consequences



Project name	Description	Status
Piney Woods Road sidewalk	Sidewalk extension from Woodcross Drive to Costco sidewalk	Design/development
US 176 section/corridor improvements	From St. Andrews Road to Atlantic Drive	Design/development
<b>Widening</b>		
I-26 widening	Near SC 202 to near US 176	Design/development
Broad River Road widening	From Royal Tower Road to I-126	Design/development

### 3. Existing Conditions and Environmental Consequences





### 3. Existing Conditions and Environmental Consequences



### 3. Existing Conditions and Environmental Consequences

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The Central Midlands Council of Government (CMCOG) is responsible for developing a Long Range Transportation Plan (LRTP)<sup>19</sup>, which is, at a minimum, a 25-year transportation vision for the Columbia metropolitan area. There are four roadways in the 2035 LRTP located within the cumulative effects study area that were identified as needing improvements or upgrades in the foreseeable future. These roadways include Bush River Road, Broad River Road, Kennerly Road, and S-40-58 (Figure 3.15-17). Per correspondence with SCDOT, the anticipated impacts associated with these future LRTP projects are estimated to be 0.99 acre of wetlands and 700 linear feet of streams. Any impacts to jurisdictional features would require a Section 404 permit from the USACE.

Any growth-induced impacts, such as infill development, would also contribute to incremental increases in impervious surfaces and storm water runoff with subsequent increases in sediment and pollutants to downstream waters. Regulatory mechanisms in place to prevent and reduce impacts to water quality and water resources would limit the potential cumulative effects of the proposed project on these resources when added to the potential effects of growth-induced impacts.

#### FEMA Floodplains

Under the No-build alternative, FEMA floodplain impacts would occur as a result of the project, but would only have minor contribution to overall cumulative impacts. If transportation improvements (i.e. road widening) of the project corridor are necessary in the future, additional hydraulic studies and floodplain impact analysis would be required. This, along with regulatory mechanisms such as EO 11988 and EO 11990 are in place to prevent development in floodplains and wetlands and also limits the potential for cumulative impacts due to new encroachment and alteration.

These reasonably foreseeable actions, together with the direct and indirect impacts, can now be analyzed cumulatively for each resource.

#### 3.15.2.7 Step 6: Assess Potential Cumulative Impacts to Each Resource

##### Communities

Under the No-build alternative, direct impacts to communities would not occur, but the developed and built nature of the landscape within the cumulative effects study area would remain the same. Land use and population growth would continue, most likely by anticipated trends discussed in Chapters 3.1 and 3.3.

##### Streams, Wetlands, and Water Quality

Even the absence of the project, adverse effects on streams, wetlands, and water quality would continue. Impacts of the proposed project and any other resulting infill development would not all be occurring simultaneously due to construction phasing over a period of years. These impacts would be largely disbursed over many streams and wetlands, the majority of which occur in the Saluda River Basin. The direct impact of the project at each stream and wetland would be localized and the extent of the project's indirect impacts is not expected to be extensive given the urban setting of the proposed project and existing transportation corridor

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<sup>19</sup> Columbia Area Transportation Study (COATS). 2008. "Midlands Tomorrow, 2035 Long Range Transportation Plan." Adopted December 18, 2008; Amended February 26, 2009; April 23, 2009; June 25, 2009; October 22, 2009; December 10, 2009



### 3. Existing Conditions and Environmental Consequences

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footprint. During construction activities, erosion and sediment runoff would be minimized through the implementation of construction best management practices, reflecting policies contained in 23 CFR 650 B<sup>20</sup> and S.C. Code of Regulations 72-400.<sup>21</sup>

Existing land cover is relatively impervious and the potential for increased runoff and diminished water quality is less than it would be if the proposed project were to occur in a more forested setting. Stormwater generated through new impervious surfaces would be treated through stormwater management facilities. Implementation of compensatory mitigation would offset the adverse direct and indirect impacts for the proposed project. SCDHEC does maintain multiple water quality monitoring stations within and downstream of the project that can be used to monitor pollutants and turbidity pre- and post-construction; however, due to multiple non-project input variables, there is no way to adequately correlate water quality measurements to project specific activities. Moreover, given that established TMDL watersheds are within the cumulative effects study area and encompasses waters listed for impairment designations on the SCDHEC 2-16 303(d) list, it can be determined that streams, wetlands, and water quality within the cumulatively effects study area have already been adversely affected prior to the anticipated construction of this project.

#### FEMA Floodplains

The contribution of the reasonable alternatives to FEMA floodplain loss beyond the no-rise condition will be minimized as required by EO 11988. As EO 11988 protects all FEMA floodplains in the cumulative effects study area any future projects that may impact FEMA floodplain or floodway crossings and/or encroachments are required to comply with the 100-year flood event design standards, as regulated by FEMA since the EO was enacted in 1977.

Cumulative impacts for each rehouse have now been assessed and the results are discussed in the next step.

#### 3.15.2.8 Step 7: Report Results

Previously constructed road projects, commercial development, and housing development have all contributed to cumulative impacts to communities, streams, wetlands, water quality, and FEMA floodplains; however, the specific activities are unknown. Reasonably foreseeable future actions would also contribute to cumulative effects to these resources.

Overall, the No-build Alternative reflects the absence of the incremental direct and indirect impacts of the reasonable alternatives relative to accrual of adverse effects; however, the existing traffic issues in the I-20/I-26/I-126 transportation corridor would continue to degrade and the quality of transportation in the area would be worsened over time. Under both reasonable alternatives, there are only insignificant and incremental direct and indirect impacts to communities, streams, wetlands, water quality, and FEMA floodplains, given appropriate best management practices are employed during construction.

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<sup>20</sup> USDOT FHWA. 2014. Federal Aid Policy Guide: Subchapter G – Engineering and Traffic Operations, Part 650 – Bridges, Structures, and Hydraulics, Subpart B – Erosion and Sediment Control on Highway Construction Projects. December 1994.

<sup>21</sup> SCDHEC. 1976. SC Code of State Regulations, Chapter 72 – DHEC Land Resources and Conservation Districts Division, Article 4 – Standards for Stormwater Management and Sediment Reduction.



### 3. Existing Conditions and Environmental Consequences

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In summary, the proposed project would incrementally increase environmental effects (streams, wetlands, water quality, and FEMA floodplains) while providing much needed transportation benefits.

**Communities:** Communities are anticipated to experience reduced travel times, better transportation mobility through the corridor, are increased vehicular safety throughout the improved transportation corridor. Other positive benefits are anticipated through future greenways, sidewalks, and updated road infrastructure, all which may increase community cohesion overall.

Within the Broad and Seven Oaks communities, the relocation of the I-26/Bush River Road interchange would affect direct access to Bush River Road from I-26. As such, direct access from I-26 to commercial businesses on Bush River Road near the current interchange may experience less pass-by traffic than currently exists today. However, these businesses would still be easily accessible via the interchange relocation to Colonial Life Boulevard and the I-20/Bush River Road interchange. Additionally, the corridor improvements propose to provide wayfinding signage to these businesses from I-26, of which is not currently available.

These effects are relatively small in the context of the entire corridor as well as the localized impact sites.

The next step is assessing mitigation options for all adverse impacts.

#### 3.15.2.9 Step 8: Assess and Discuss Mitigation Issues for all Adverse Impacts

As noted, the development and/or redevelopment that could occur as a result of the proposed project, or independent of the proposed project, would be subject to land use plans, zoning regulations, and regulatory mechanisms in place to prevent and reduce cumulative impacts to resources in the respective study areas. These regulations and regulatory mechanisms would limit the potential cumulative effects of the proposed project on these resources. For example, if a new development were proposed that would impact jurisdictional waters of the U.S., a Section 404 permit would be required from the U.S. Army Corps of Engineers. As part of the permit application, the permittee would be required to demonstrate that the preferred alternative would be the least environmentally damaging, that impacts were reduced to the extent practicable, and how impacts would be mitigated. In addition to regulatory mechanisms, other mitigation measures would be applied as a result of impacts of the proposed Carolina Crossroads that would not only mitigate the direct impacts but would also mitigate the proposed project's cumulative effect on resources when added to past, present, and reasonably foreseeable future actions. For example, SCDOT would mitigate stormwater runoff by discharging stormwater into detention basins and/or vegetated swales before it is released into receiving waters. This practice would reduce cumulative water quality impacts to streams by reducing peak-flow discharge and by allowing particulates and sediment in stormwater to settle in the basin to reduce the amount of pollutants discharged to the receiving water. SCDOT and FHWA best management practices guidelines<sup>22</sup> would also be followed during design and construction to minimize the amount of runoff pollution from streams to reduce both the direct impact and the cumulative impact of runoff pollution.

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<sup>22</sup> South Carolina Highway Department Standard Specifications for Highway Construction

## 3. Existing Conditions and Environmental Consequences



### 3.15.3 CONCLUSION

Overall, the No-build Alternative reflects the absence of the incremental direct and indirect impacts of the reasonable alternatives relative to accrual of adverse effects; however, the existing traffic issues in the I-20/I-26/I-126 transportation corridor would continue to degrade and the quality of transportation in the area would be worsened over time. Under both reasonable alternatives, there are only incremental indirect and cumulative impacts to communities, water quality, and FEMA floodplain, given appropriate best management practices are employed during construction. Both reasonable alternatives would incrementally increase environmental effects while providing much needed transportation benefits. These effects are relatively small in the context of the entire corridor as well as the localized impact sites. Moreover, the cumulative effects (effect of the proposed project paired with transportation projects would also provide a positive benefit to communities.

In summary, current regulatory requirements and planning practices are helping avoid or minimize the contribution of present and future actions to adverse indirect and cumulative effects. When considered in the context of the project setting, the scale and intensity of the stream and wetland impacts for each reasonable alternative generally would not have substantial cumulative effects, particularly considering the efforts to minimize adverse impacts through design iterations and implementation of mitigation measures. Direct impacts to streams and wetlands would be mitigated through compensatory mitigation for those impacts relative to the loss of quality function of those resources. RA5 Modified may be perceived as having a more substantial cumulative effect, given the greater amount of streams and wetlands directly affected, while RA1 may be perceived as having a less cumulative effect, given the least amount of streams and wetlands directly affected.