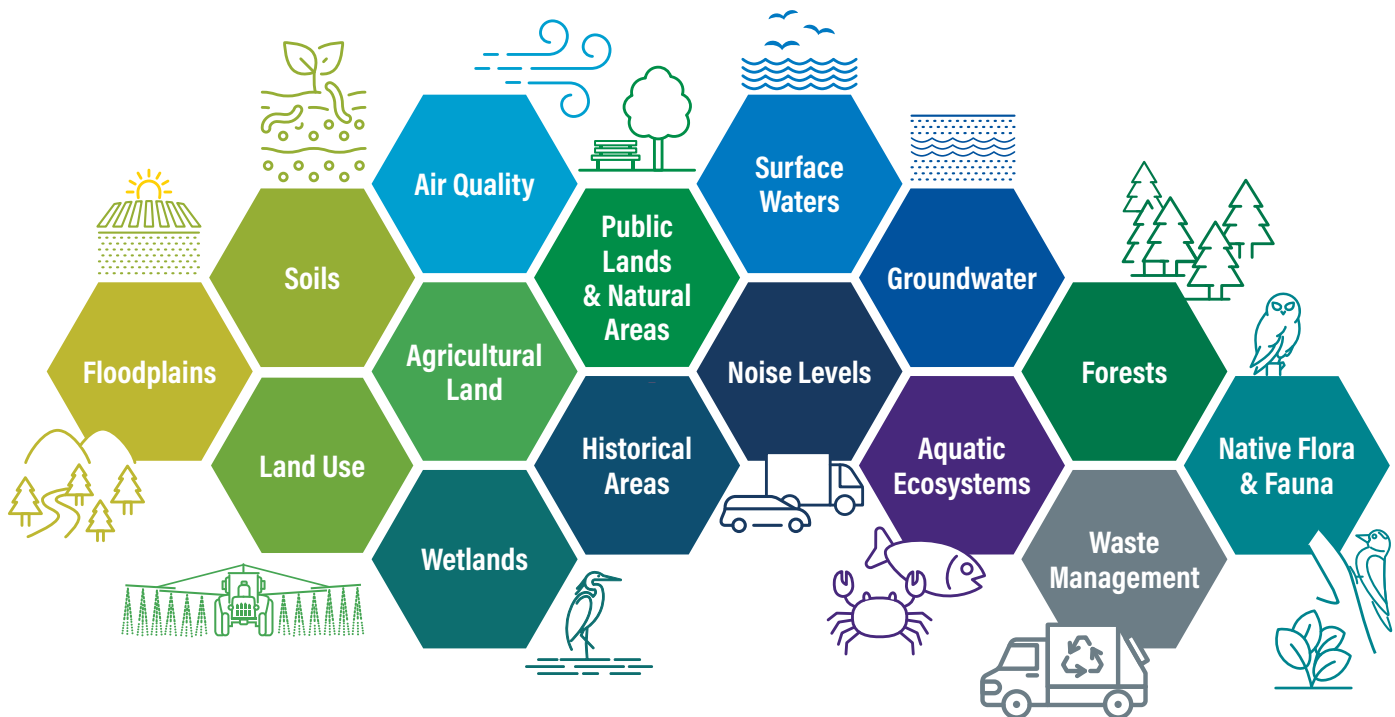




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Secondary and Cumulative Impacts Mitigation Management Plan

December 2024



Prepared for



Prepared by



Contact: Morrisville Engineering Department
Morrisville, North Carolina

919-463-6204 | departmentengineering@morrisvillenc.gov

Secondary and Cumulative Impacts Mitigation Management Plan

Morrisville, North Carolina

Prepared by:



TETRA TECH

DECEMBER, 2024

EXECUTIVE SUMMARY

The North Carolina (State) Environmental Policy Act (SEPA) requires projects that involve public funding and exceed certain minimum criteria include the preparation of an environmental document (environmental assessment [EA] or environmental impact statement [EIS]). These environmental documents must outline the direct, indirect (or secondary), and cumulative impacts to natural, cultural, and historical resources.

Typically, EAs or EISs are developed for a given infrastructure project. Each individual EA or EIS includes summaries of the direct, secondary, and cumulative impacts. Inefficiencies from developing documents in this manner include the following:

Project Area - Frequently the project area for a given infrastructure project includes a small portion of a given municipality. Thus, a holistic view of the growth-related impacts throughout the jurisdiction may not be included in the document.

Documentation Inefficiencies - Often the secondary and cumulative impacts of various infrastructure projects are similar. Thus, multiple environmental documents contain secondary and cumulative impacts sections that are largely redundant.

Review Inefficiencies - Regulatory agencies review similar information on secondary and cumulative impacts and the local programs in place to mitigate them for various infrastructure projects for a given municipality. Consequently, numerous individual projects require similar comments and negotiations, consuming regulatory agency and local government time.

Governing Board and Capital Planning - Typically, utility or public works departments develop environmental documents to support permitting decisions, and the permitting authority may include conditions in the permit to address project impacts. Conditions related to secondary and cumulative impacts sometimes require ordinance changes or jurisdiction-wide policy changes. The municipal department typically does not have authority to implement such requirements, which require City or Town Council actions. Reviewing secondary and cumulative impacts in one holistic document will help streamline this process as well.

These inefficiencies result in frustration for both the regulatory agencies and the regulated community. Thus, the Town of Morrisville has developed a Secondary and Cumulative Impacts (SCI) Management Plan to address the secondary and cumulative impacts for planned infrastructure. Inclusion of all infrastructure plans in one document provides a holistic review of the Town's growth projections for the service area and infrastructure being designed to support that growth. While EAs or EISs are developed for individual projects to examine the direct impacts of the projects, these documents will reference the SCI Management Plan for secondary and cumulative impacts, avoiding redundancy.

SCI Management Plan Process

- *EAs or EISs for individual infrastructure projects will be developed to address direct impacts.*
- *Secondary and cumulative indirect impacts will not be addressed in each individual EA or EIS; these documents will reference the SCI Management Plan.*
- *The MOA addresses how the SCI Management Plan document should be used, its period of standing, and circumstances under which it must be updated more frequently.*

The Town entered into a Memorandum of Agreement (MOA) with the Department of Environment and Natural Resources (NCDENR), now the Department of Environmental Quality (NCDEQ) in 2005 that outlines how the SCIMMP will be used, the time period during which it can be cited in individual EAs and EISs, and under what circumstances it must be updated more frequently. An amendment to the MOA clarified the reporting dates, specifying the submittal timeframe for biennial reports. An updated MOA agreement is included in Appendix A.

According to the MOA the period of standing for the SCIMMP is 10 years. For this reason, the original SCIMMP was drafted for the period of 2005 – 2015, and this update has been developed to take effect in 2025 for the period of 2025 – 2035. The next decadal update for the SCIMMP is scheduled to occur for 2035.

The study area for the SCIMMP consists of the Town's study area as seen in Figure ES-1. The study area boundaries are based on a combination of the urban service area, extraterritorial jurisdiction (ETJ), and the Town's land use planning boundary, as well as boundary and urban service area agreements with the Town of Morrisville and Wake and Chatham Counties. The study area covers approximately 80 square miles and is located in the Neuse and Cape Fear River basins.

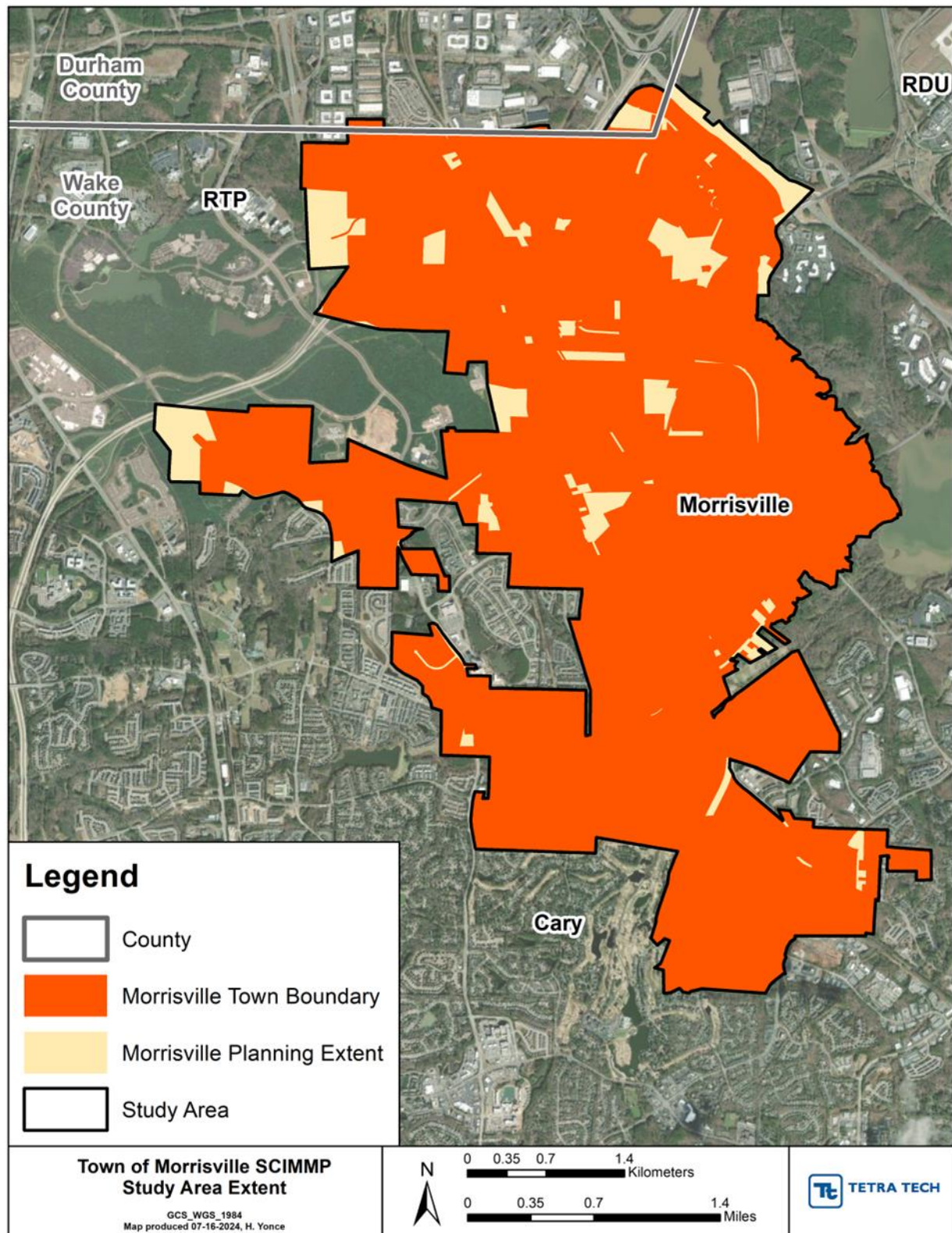


Figure ES-1. Project study area for the Town of Morrisville.

Infrastructure – As of April 3, 2006, the Town of Cary owns and operates the water and wastewater infrastructure assets within the Town of Morrisville’s jurisdiction. As such, the Town of Morrisville has adopted the Town of Cary’s water and sanitary sewer standards. The Town promotes orderly growth through development and implementation of the Town’s Land Development Ordinance (LDO), zoning, and the Standard Specifications and Details Manual. The Town also has developed a comprehensive transportation plan and master plans for providing water, reclaimed water, and sewer services to its residents in a manner that will protect the natural environment.

The Town integrates its infrastructure plans with its other planning processes and understands that infrastructure planning strategies must be formulated and implemented in a manner to pursue the goals of service provision and environmental protection. By integrating its growth management strategies, land use planning strategies, and infrastructure plans, the Town preserves important ecological areas in the form of open space; ensures that its residents have adequate recreational resources; and meets water, wastewater, and transportation demands.

Existing Conditions – Within the study area, existing environmental conditions were assessed to facilitate the identification of potential SCI to the natural environment as growth occurs. Of particular concern is the potential for impact to federally listed threatened or endangered species. The bald eagle (*Haliaeetus leucocephalus*) is present within the study area near Jordan Lake and Lake Crabtree and is protected by the Bald and Golden Eagle Protection Act (BGPA). A survey of freshwater mussel species in the Middle Creek and Swift Creek watersheds did not yield any individuals, live or relic, of the federally endangered dwarf wedgemussel (*Alasmidonta heterodon*) in the study area. Michaux’s sumac (*Rhus michaux*) is not present in the study area. There are no new federally listed species in Wake County. The status of the Northern long-eared bat (*Myotis septentrionalis*) has changed from Proposed Endangered to Threatened with a 4(d) Rule. State listed species in Wake County are identified in Section 4.13.1.

Secondary and Cumulative Impacts - Table ES-1 summarizes potential SCI to the study area, the likelihood of impacts, and the mitigation measures in place to address them. These mitigation measures will offset environmental impacts associated with growth that are likely to occur with or without planned infrastructure projects. The Town is taking progressive steps to protect its environmental heritage by developing many programs to pursue the goals of service provision and environmental protection.

Main SCI concerns include the loss of open space (including forests and agricultural lands) and the potential for impacts to water resources, aquatic habitats, and associated aquatic species, including freshwater mussels.

Mitigation - Many measures are currently in place to limit SCI as growth occurs in the Study Area as summarized in Table ES-2. These mitigation measures will offset environmental impacts associated with growth that is likely to occur with or without planned infrastructure projects. The Town continues to take progressive steps to protect the environmental heritage of the Study Area by developing and implementing programs to balance the competing goals of growth and environmental protection. Planning processes will guide development in appropriate areas. Ordinances protect open space, water supply watersheds, stream buffers, floodplains, and wetlands; and require stormwater controls to limit water resources impacts.

These measures protect the area's natural resources and quality of life for the municipality's citizens.

Table ES-1. Potential impacts to resources to be addressed by permitting and mitigation.

Environmental Resource	Potential for SCI	Types of SCIs
Topography and Floodplains	Potential Impact	Loss of floodplain water storage could occur in areas outside riparian buffers; this could result in reduction of water storage capacity, habitat, surface water filtration, and infiltration. Isolation of floodplain from stream by channel entrenchment
Soils	Potential Impact	Soil removal, erosion and compaction from new development
Land Use	Potential Impact	Conversion of agricultural and forested land uses to mainly residential land uses
Wetlands	Limited Impact	Wetland loss results in loss of habitat, habitat fragmentation, and loss of attenuation of flood flows. Loss of wetland function through pollutant loading
Prime or Unique Agricultural Land	Potential Impact	Conversion to other uses
Public Lands and Scenic Recreational Areas, and State Natural Areas	Limited Impact	Possibility of conversion of adjacent land uses
Areas of Archaeological, Cultural or Historical Value	Limited Impact	Possibility of conversion of adjacent land uses. Structural damage due to acid rain and vibrations
Air Quality	Potential Impact	Reduction in air quality due to increased vehicular traffic. Negative impacts to human health (i.e., asthma). Acid rain. Reduced visibility
Noise Levels	Potential Impact	Increase in overall noise level in study area. Negative impacts to human health
Surface Water Resources	Potential Impact	Water quality degradation; increase in stormwater runoff. Alteration of natural hydrograph (i.e. magnitude, timing, frequency, duration, rate of change); lower and more frequent low-flow conditions; alteration of channel morphology
Groundwater Resources	Potential Impact	Reduction in groundwater inflow which provides baseflow in streams and supports aquatic life during droughts. Reduction in groundwater inflow which provides baseflow in streams and supports aquatic life during droughts
Forest Resources	Potential Impact	Conversion to other uses. Reduction in air quality; increase in near-surface air temperature; habitat fragmentation
Shellfish or Fish and their Habitats	Potential Impact	Possible aquatic habitat degradation. Disruption of food chain; reduction in aquatic insect number and diversity through loss of riffle habitat by increased siltation and increased low-flow conditions; reduction in potential for long-term population sustainability
Wildlife and Natural Vegetation	Potential Impact	Reduction in available habitat. Habitat fragmentation; reduction in genetic diversity; reduction in species tolerance; increased dispersal distance to suitable habitat; reduction in potential for long-term population sustainability
Introduction of Toxic Substances	Limited Impact	Increase in likelihood of contamination. Negative impacts to human health

Potential Impact = major relevance in SEPA documents and permitting applications

Limited Impact = minor relevance in SEPA documents and permitting applications

Table ES-2. Mitigation programs and regulations based on environmental resource category.

Environmental Resource	Wake County	Morrisville
Topography and Floodplains	Flood Hazard Areas (UDO Article 14), 2010 Hazard Mitigation Plan, Riparian Buffer Protection Program, Environmental Standards (UDO Article 11)	Unified Development Ordinance (UDO) Open Space Preservation and Land Use Plans often preserve additional corridors along required riparian buffers Floodplain Protection - no development or fill in floodway; development in floodplain must obtain special use permit which limits development in floodplain; Hazard Mitigation Plan Stormwater Programs and Impervious Surface Limitations Sanitary Sewer Installation – avoids laying sewer lines in riparian buffers Floodplain Overlay District - prohibits development without a floodplain development permit Erosion and Sediment Control Program administered by Wake County
Soils	Voluntary Agricultural District Program	Land Use Plans – encourages more intense development in Town Center, activity centers, and growth corridors to limit areas of disturbance Parks and Recreation Master Plan Erosion and Sediment Control Program administered by Wake County UDO Riparian Buffers and Floodplain Protection Stormwater Programs and Impervious Surface Limitations Open Space Preservation
Land Use	Wake County Agriculture Economic Development Plan, Community Conservation Assistance Program, Land Use Plan, State Nutrient Management Strategy Rules (UDO Section 9), Consolidated Open Space Plan	UDO Open Space Preservation Riparian Buffers and Floodplain Protection – restricts development in riparian buffer zones and prohibits nearly all floodplain encroachment Stormwater Programs Land Use Plans to encourage development around Town Center and Activity Center Districts Parks and Recreation Master Plans
Wetlands	Consolidated Open Space Plan, Environmental Standards (UDO Article 11), Zoning Districts (UDO Article 3), Stormwater Management (UDO Article 9)	Wetland Protection through CWA Section 404 and Section 401 UDO Open Space Preservation Stormwater Programs to reduce pollutant loads and limit stormwater impacts to wetlands Riparian Buffers and Floodplain Protection Land Use Plans to set aside natural open space and encourages development around Town Center, selected corridors, and mixed-use developments Parks and Recreation Master Plan Erosion and Sediment Control Program, administered by Wake County
Prime or Unique Agricultural Land	Voluntary Agricultural District Program, Wake County Agriculture Economic Development Plan, Jordan and Falls Lake Rules	Land Use Planning – Note no agriculture activity at this time Supports regional farms by encouraging demand for products through the Western Wake Farmers Market.
Public Lands and Scenic Recreational Areas, and	Greenway System Plan, Land Use Plan, Wake County Consolidated Open Space Plan,	UDO Open Space Preservation Conservation Zoning District - protects environmentally important areas

Environmental Resource	Wake County	Morrisville
State Natural Areas	Natural Heritage Program, Parks and Recreation Master Plan	Land use planning Parks and Recreation Master Plan
Areas of Archaeological, Cultural or Historical Value	Wake County Historic Preservation Commission	Land use planning to control uses allowed UDO Open space preservation Town Center Districts, including Historic Crossroads Village and Conservation/Buffer zones
Air Quality	Wake County Air Quality Task Force, GoTriangle, Wake County Transit Plan	Transportation Plan elements of bicycle and pedestrian planning, road reconnections to alleviate congestion and enhancements for decreasing idle time Wake County Sustainability Task Force Planning for regional connectivity, including a future regional rail system UDO Connectivity requirement Open space preservation Riparian Buffers Protection Tree Protection Land Use Plan - Activity Center Districts and Town Center Districts Parks and Recreation Master Plan Tree Protection Ordinance
Noise Levels	Wake County Voluntary Agricultural Program, Wake County Air Quality Task Force, Wake County Transit Plan	Land use planning UDO Airport overlay district Open Space Preservation Riparian Buffers Protection – development buffers Tree Protection Parks and Recreation Master Plan Increase in grade separation projects for transportation corridors (reduce train whistle noises) NCDOT Traffic Noise Abatement Policy
Surface Water Resources	Nutrient Loading Accounting Tool, Riparian Buffer Protection Program, Environmental Standards (UDO Article 11), Zoning Districts (UDO Article 3), Stormwater Management (UDO Article 9), Comprehensive Watershed Management Plan	UDO Stormwater Programs Sanitary Sewer Installation – stream crossings with directional borings Water Conservation Riparian Buffers and Floodplain Protection – no residential development or fill in floodplain Land Use Plans and open space preservation Parks and Recreation Master Plan Erosion and Sediment Control Program administered by Wake County
Groundwater Resources	Wake County Comprehensive Groundwater Study, Comprehensive Plan	Land use planning UDO Open Space Preservation Riparian Buffers and Floodplain Protection – allow for natural infiltration Stormwater Programs, including promotion of LID Water Conservation Programs
Forest Resources	Tree and Vegetation Protection (Code of Ordinances, Chapter 2-4)	Land Use Planning - encourage development in Town Center and growth corridors, as well as tree and urban forest preservation Parks and Recreation Master Plan UDO

Environmental Resource	Wake County	Morrisville
		Conservation/Buffer District – promotes preservation of forest resources Open Space Preservation Riparian Buffers and Floodplain Protection
Shellfish or Fish and their Habitats	Comprehensive Watershed Management Plan, Greenway System Plan, Land Use Plan	Wetland Protection through CWA Section 404 and Section 401 Endangered Species Act Land Use Planning Parks and Recreation Master Plan Erosion and Sediment Control Program– plan view and pre-construction process; monitoring UDO Conservation/Buffer District – protect environmentally important areas and open space preservation Riparian Buffers and Floodplain Protection Stormwater Programs - Phase II requires runoff volume be controlled Sanitary Sewer Installation – stream crossings with directional borings
Wildlife and Natural Vegetation	Greenway System Plan, Land Use Plan, Comprehensive Watershed Management Plan, Jordan Lake Rules and Falls Lake Rules	Endangered Species Act Parks and Recreation Master Plan - important habitat areas prioritized for protection Land Use Plan– encourage development in Town Center, tree protection Erosion and Sediment Control Program administered by Wake County UDO Open Space Preservation Conservation/Buffer District Riparian Buffers and Floodplain Protection – Habitat protection and maintenance of habitat corridors Stormwater Programs
Introduction of Toxic Substances	2010 Hazard Mitigation Plan, Land Use Plan, Wake County Air Quality Task Force	Land Use Planning to control uses and likely exposure Stormwater Programs and Impervious Surface Limitations, including education programs Sanitary Sewer Installation – design standards to limit spills Grade separation programs to reduce rail and vehicular traffic interaction

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ACRONYMS AND ABBREVIATIONS

Acronym/Abbreviation	Definition
AQI	Air Quality Index
ATT	American Tobacco Trail
BGPA	Bald and Golden Eagle Protection Act
BMP	best management practices
CAA	Clean Air Act
CAMPO	Capital Area Metropolitan Planning Organization
CDBG	Community Development Block Grant
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CIP	Capital Improvement Plan
CPRC	Central Pines Regional Council (formerly TJCOG)
CLG	Certified Local Government
CMAQ	Congestion Mitigation and Air Quality
CO	Certificate of Occupancy
CORE	Center for Regional Enterprise
CWA	Clean Water Act
CWEP	Clean Water Education Partnership
DDT	dichlorodiphenyltrichloroethane
DMS	Division of Mitigation Services
DO	dissolved oxygen
DWM	Division of Waste Management
E&SC	Erosion & Sediment Control
EA	environmental assessment
EDCM	Engineering, Design, and Construction Manual
EIS	Environmental Impact Statement
EMC	Environmental Management Commission
EPT	ephemeroptera, plecoptera, and trichoptera
ESA	Endangered Species Act of 1973
ETJ	extraterritorial jurisdiction
FAA	Federal Aviation Administration
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Map
FSC	Federal species of concern
GAP	Gap Analysis Program
GIS	geographic information system

Acronym/Abbreviation	Definition
IDDE	illicit discharge detection and elimination
LI	limited impact
LID	Low Impact Development
LMP	Land Management Plan
LRUSA	Long Range Urban Service Area
MG	million gallons
MGD	million gallons per day
MOA	Memorandum of Agreement
MPO	Metropolitan Planning Organization
MS4	municipal separate storm sewer system
MSC	Map Service Center
MTP	Metropolitan Transportation Plan
NAAQS	National Ambient Air Quality Standard
NCAC	North Carolina Administrative Code
NCCGIA	North Carolina Center for Geographic Information and Analysis
NCDAQ	North Carolina Division of Air Quality
NCDCR	North Carolina Department of Cultural Resources
NCDNCR	North Carolina Department of Natural and Cultural Resources (formerly NCDCR)
NCDWR	North Carolina Division of Water Resources
NCDLR	North Carolina Division of Land Resources
NCDEMLR	North Carolina Division of Energy, Mineral, and Land Resources
NCDENR	North Carolina Department of Environment and Natural Resources (obsolete, see NCDEQ)
NCDEQ	North Carolina Department of Environmental Quality (formerly NCDENR)
NCDOT	North Carolina Department of Transportation
NCGAP	North Carolina Gap Analysis Program
NCLWF	North Carolina Land and Water Fund
NCNHP	North Carolina Natural Heritage Program
NCSHPO	North Carolina State Historic Preservation Office
NCWRC	North Carolina Wildlife Resources Commission
NEPA	National Environmental Policy Act
NFIP	National Flood Insurance Program
NHP	Natural Heritage Program
NHPA	National Historic Preservation Act
NHEO	Natural Heritage Element Occurrence
NOV	Notice of Violation

Acronym/Abbreviation	Definition
NOx	nitrogen oxide
NPDES	National Pollutant Discharge Elimination System
NPS	National Park Service
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NSW	Nutrient Sensitive Waters
NWI	National Wetlands Inventory
PI	potential impact
ppb	parts per billion
ppm	parts per million
PUD	planned unit development
RCRA	Resource Conservation and Recovery Act
RPW	relatively permanent water
RTA	Regional Transportation Alliance
RTP	Research Triangle Park
SAESH	Significant Aquatic Endangered Species Habitat
SCI	secondary and cumulative impacts
SCIMMP	Secondary and Cumulative Impacts Master Management Plan
SDWA	Safe Drinking Water Act
SEHSR	Southeast High Speed Rail
SEPA	State (North Carolina) Environmental Policy Act
SHPO	State Historic Preservation Office
SNHA	Significant Natural Heritage Area
SR	state route
SRF	State Revolving Fund
SSO	sanitary sewer overflow
TCCC	Triangle Clean Cities Coalition
TDM	Transportation Demand Management
TJCOG	Triangle J Council of Governments (obsolete, see CPRC)
TMDL	total maximum daily load
TNW	traditional navigable waters
Town	Town of Morrisville
TSS	total suspended solids
UDO	Unified Development Ordinance
USA	urban service area
USACE	United States Army Corps of Engineers

Acronym/Abbreviation	Definition
USDA	United States Department of Agriculture
USDOT	United States Department of Transportation
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
VMT	vehicle miles traveled
WRF	water reclamation facility
WSW	water supply watershed
WTP	water treatment plant
WWRWRF	Western Wake Regional Water Reclamation Facility

1.0 INTRODUCTION

The purpose of this document is to present the Secondary and Cumulative Impacts Master Management Plan (SCIMMP) for the Town of Morrisville (Town). This plan is an update of a Plan approved by the North Carolina Department of Environmental Quality (NCDEQ), formerly known as the NC Department of Environment and Natural Resources (NCDENR) in 2015 for use as part of the North Carolina (State) Environmental Policy Act (SEPA) review process. The following sections provide information regarding the background, previous plan, and use of this document.

1.1 BACKGROUND

For projects that involve public funding and that exceed certain minimum criteria, SEPA requires that they include the preparation of an environmental document (environmental assessment [EA] or environmental impact statement [EIS]). These environmental documents must outline the direct, indirect (or secondary), and cumulative impacts to the following resources:

- Topography and floodplains
- Soils
- Land use
- Wetlands
- Agricultural land
- Public lands and scenic and recreational areas
- Cultural/historical resources
- Air quality
- Noise
- Surface and groundwater resources
- Forest resources
- Shellfish and fish
- Wildlife and natural vegetation
- Toxic substances

Direct impacts are those impacts that are caused by the construction and operation of the given project. Indirect or secondary impacts are “caused by and result from the proposed activity although they are later in time or further removed in distance, but they are still reasonably foreseeable” (15A North Carolina Administrative Code [NCAC] 1C. 0103(20)). Thus, secondary impacts include the impacts of growth that a given project may help support.

Cumulative effects or impacts are defined as “resulting from the incremental impact of the proposed activity when added to other past, present, and reasonably foreseeable future activities regardless of what entities undertake such other activities” (15A NCAC 01C. 0103(3)).

Cumulative impacts include the direct and secondary impacts that occur when examined in conjunction with other proposed infrastructure projects. This document focuses on secondary impacts and cumulative indirect impacts. Cumulative direct impacts will be addressed in individual EAs or EISs.

Typically, EAs or EISs are developed for a given infrastructure project. Each individual EA or EIS includes summaries of the direct, secondary, and cumulative impacts. Developing documents in this manner has several inefficiencies, including the following:

- **Project Area** – Frequently the project area for a given infrastructure project includes a small portion of a given municipality. Thus, a holistic view of the growth-related impacts throughout the jurisdiction may not be included in the document.
- **Documentation Inefficiencies** – Often the secondary and cumulative impacts (SCI) of various infrastructure projects are similar. As a result, many environmental documents contain SCI sections that are largely redundant.
- **Review Inefficiencies** – Regulatory agencies review similar information on SCI and the local programs in place to mitigate them for various infrastructure projects for a given municipality. Those agencies and local government officials therefore often have to devote considerable time to similar comments and negotiations on a number of projects.
- **Governing Board and Capital Planning** – Typically, utility departments develop environmental documents to support permitting decisions. If the permitting authority includes specific permit conditions to address impacts from a given project, the utility department may be precluded from addressing these impacts. For example, if requirements for ordinance changes are included in the permit conditions, these must be approved by the Town Council. Reviewing SCI in one holistic document helps streamline this process.

These inefficiencies result in frustration for both the regulatory agencies and regulated community. The Town, therefore, worked with NCDENR to develop an SCIMMP process to address the SCI for its planned infrastructure. Evaluation of the SCI from all planned infrastructure in one document provides a holistic review of the Town's growth projections and infrastructure being designed to support that growth. While EAs or EISs are developed for individual projects to examine the direct impacts of the projects, these documents will reference the SCIMMP for SCI, avoiding redundancy.

The Town entered into a Memorandum of Agreement (MOA) in 2005 with NCDEQ that outlines how the SCIMMP will be used, for what time period it can be cited in individual EAs and EISs, reporting requirements, and under what circumstances it must be updated on a more frequent basis. An amendment to the MOA clarified the reporting dates. In accordance with the MOA, the period of standing is 30 years with a SCIMMP update required every 10 years. For this reason, this updated SCIMMP has been developed to take effect in 2025.

SCI Master Management Plan Process

- *Develop EA or EIS for individual infrastructure projects that address direct impacts.*
- *Secondary and cumulative indirect impacts will not be addressed in each individual EA or EIS; these documents will reference this SCIMMP.*
- *The MOA with NCDEQ addresses how the SCI Master Management Plan should be used, its period of standing, and circumstances under which it must be updated more frequently.*

1.2 SCI MASTER MANAGEMENT PLAN PROCESS

This living document was originally developed in 2004 following an approach similar to an EIS and has since undergone several updates, the most recent being in 2015. A scoping document was developed and submitted to the State Clearinghouse for review and comment. Based on the comments received through scoping, a draft SCI Management Plan was prepared and submitted to DEQ, the lead agency for review and comment. Agency comments and Town responses are included in Appendix A. An EIS does not require a determination of whether impacts are significant. Thus, this document uses qualitative analyses of available data and literature to determine whether impacts to a given resource have the potential to occur. This document also outlines the mitigation strategies in place to address those impacts. However, no quantitative analysis was performed to determine the level of significance of the impacts.

It should also be noted that for a given infrastructure project, NCDEQ may determine that the mitigation strategies described in this document are insufficient to address the impacts of that given project. In that case, this document would still be used to meet SEPA requirements, but additional requirements could be placed in the permit.

1.3 LAND USE PLANNING DEFINITIONS AND PROCESSES

Figure 1-1 shows the current municipal boundaries and extraterritorial jurisdiction (ETJ) and urban services area (USA) for Morrisville. The ETJ represents the area beyond the Town limits where the Town has zoning and regulatory authority. State law authorizes municipalities to have an ETJ to allow control of development in areas that are expected to extend within their corporate limits in the near future. This enables municipalities to ensure that development patterns and associated infrastructure will allow the efficient provision of urban services.

The Wake County Board of Commissioners evaluates the following criteria when they consider expansions of a Town's ETJ:

- Location of land within the municipality's long-range USA
- Demonstration of a commitment to comprehensive planning through official action of a governing body
- Adoption of any required special regulations (e.g., water supply watershed, special transportation corridors)
- Provision of water and wastewater service within 5 years (evidence the system is designed with adequate treatment capacity and required improvements included in the Capital Improvement Program [CIP])
- Evidence of feasibility for urban density development
- Anticipation of annexation within 10 years
- Demonstration of progress in annexing and supplying municipal services throughout the entirety of its existing ETJ

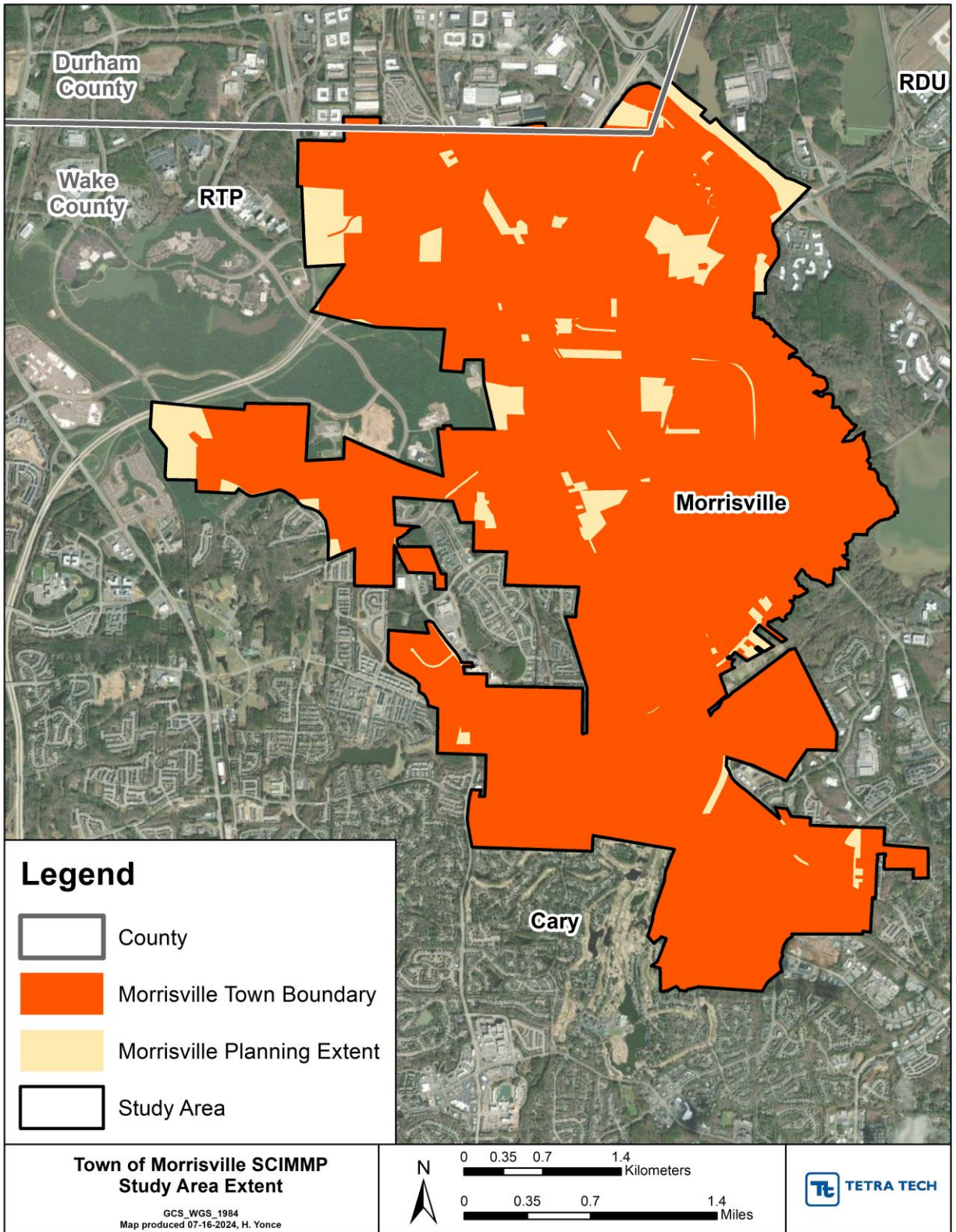


Figure 1-1. Project study area for the town of Morrisville.

The long-range USA includes areas where the County envisions that the Town will ultimately provide utility service. The Town does not have zoning authority outside the ETJ even in areas within the USA. Wake County determines the LRUSA and a municipality does not have the authority to make modifications to the boundaries. New development within the USA is to occur according to Town standards if annexation is requested and to Wake County standards if annexation is not requested. In order for the Town to provide utility services to new development, it typically requires annexation or will provide utility service at rates significantly higher than the typical rates. Because of these policies, the Town rarely provides utility services to areas outside its ETJ.

Annexation is a governing board decision. Recent changes in State annexation laws no longer make town-initiated annexation an effective tool to provide for an orderly and predictable extension of town boundaries. Areas outside a Town's ETJ may still request annexation, which often occurs when these areas desire utility service. For areas previously developed under Wake County development standards, a situation (e.g., septic failures) may occur that could cause areas currently outside the Town limits to come into compliance with Town standards when requesting utility services or annexation. If annexation by the Town does not occur, Wake County policies described in Section 7.0 will apply.

Wake County was an active participant in the process to develop this document. Wake County does not provide utility services; therefore, it has decided not to prepare its own SCIMMP. Within Wake County, the North Carolina Department of Transportation (NCDOT) provides major transportation infrastructure, and the municipalities provide water and wastewater infrastructure. Wake County does have riparian buffer, stormwater, and other mitigation programs in place which are described in Section 7.0.

Land use planning serves as a basis for the SCIMMP. Land use plans indicate how a town would like development to occur if a landowner chooses to develop his or her property. A land use plan cannot limit a property owner's decision to develop his or her land. However, zoning is based on the land use plan and can limit the type of development a property owner can execute.

The land use planning and infrastructure planning processes are dynamic. The future land use plan and proposed infrastructure plan are linked to population projections and reassessed as elements change over time. As a future land use plan is modified, the proposed infrastructure plan is modified to ensure adequate infrastructure for future population predictions. Zoning, which is guided by the land use plan, may be modified. Future land use plans typically coincide with planned infrastructure.

1.4 PROJECT STUDY AREA

The study area for the SCIMMP consists of the Town's corporate limits (Figure 1-1). The Town is bounded by Research Triangle Park (RTP), Cary, and the Raleigh-Durham (RDU) International Airport. These boundaries form the study area, which is approximately 9.8 square miles. The Town's study area is equivalent to its extraterritorial jurisdiction (ETJ). The study area is located entirely within Wake County. The ETJ represents the area beyond the Town limits where the Town has zoning and regulatory authority. State law authorizes municipalities to have an ETJ to allow control of development in areas that are expected to come within their

corporate limits in the near future. This enables municipalities to ensure that development patterns and associated infrastructure will allow for the efficient provision of urban services.

In 2006, the Town completed a utility merger with Cary. As a result of the utility merger, the Cary owns and operates all of the Town's water and wastewater infrastructure and bills the Town of Morrisville's residents directly for water and wastewater services. The Town works with the Cary in implementing a sustainable, long-range vision for utility service in the region.

1.5 ORGANIZATION OF DOCUMENT

This document is the Town's 2025 SCIMMP. The remaining sections include:

Section	Description
2.	Purpose of and Need for Proposed Infrastructure
3.	Background and Description of Infrastructure Master Plans
4.	Description of Existing Environment in Study Area
5.	Description of Secondary and Cumulative Impacts Related to Projected Growth in the Study Area
6.	Mitigation for Secondary and Cumulative Impacts
7.	Summary of Mitigation to Address Secondary and Cumulative Impacts
8.	References

Appendices

A	Agency Comments and Town Responses
B	Memorandum of Agreement
C	Capital Improvement Plans
D	Endangered Species Information
E	County and Local Government Ordinance and Planning Department Websites

2.0 PURPOSE OF AND NEED FOR PROPOSED INFRASTRUCTURE

The purpose of and need for proposed infrastructure is a function of the Town of Morrisville's commitment to its residents. The Town wants to ensure that its infrastructure plans are commensurate with the projected population of given sections within the study area. The three main infrastructure elements are wastewater, water, and transportation. The projects in each area are evaluated against the goals of the Town.

In 2006, the Town completed a water and wastewater system utility merger with the Town of Cary. To ensure an orderly expansion of the utility system, the Town will follow the Town of Cary's Standard Specifications and Details Manual for water and wastewater infrastructure (<https://www.carync.gov/business-development/developing-in-cary/standard-specifications-and-details>). The Town of Morrisville has developed an Engineering Design Construction Manual (<https://www.morrisvillenc.gov/government/departments-services/engineering/development-support>) to guide expansion of the Town's stormwater infrastructure and development process. To ensure that adequate future capacity exists at the proper locations, the Town has developed a Land Use Plan that serves as the basis for infrastructure planning (Houseal Lavigne, 2021). The Town's land use planning is described in Sections 5 and 6.

The Town grew rapidly in the 1980s, 1990s and 2000s, but growth slowed until recently. The Town's growth rate has accelerated again, as has the growth rate of Wake County as a whole. The population was estimated to be 251 in 1980, 5,208 in 2000, 18,576 in 2010, and 29,630 in 2020 (U.S. Census Bureau, 2020). The North Carolina Office of State Budget and Management produced a certified population estimate of 32,248 as of July 1, 2022. This represents an 8.1% population increase since April 1, 2020 decennial census count by the US Census Bureau. Population projections shown in Table 2-1 and Figure 2-1 include about 52,000 residents by the year 2050. The population projections presented in Table 2-1 are for the study area and correspond with the Town's land use plan and the the Institute for Transportation Research and Education's (ITRE) latest Triangle Regional Model (TRM). The 2022 TRM was developed as part of the Capital Area Metropolitan Planning Organization (CAMPO) and Durham-Chapel Hill-Carrboro Metropolitan Planning Organization's (DCHC MPO) Connect 2050 Metropolitan Transportation Plan (2022).

Table 2-1. Town of Morrisville population projections.

Year	Population ^{1, 2, 3}
2010	18,576
2020	29,630
2022	32,248
2030	47,000
2050	52,000

¹ Populations 2010-2020 are sourced from the U.S. Census Bureau (2022)

² Population from 2022 is sourced from the North Carolina Office of State Budget and Management

³ Populations 2030-2050 are based on 2050 CAMPO data included in 2022 ITRE TRM Model

To best meet the needs of residents, protect the environment, and conduct these efforts in a cost-effective way, the Town of Morrisville is working with the Town of Cary in implementing a long-range vision for the region. This effort will give the Town a measure with which to guide development and infrastructure improvements in coordination with its land use planning, described in Sections 5 and 6.

The Town integrates its transportation and land use plan with its other planning processes. By integrating its growth management strategies, land use planning strategies, and transportation plans, and coordinating infrastructure planning with the Cary, the Town is able to preserve important ecological areas in the form of open space; ensure that its residents have adequate recreational resources; and meet water, wastewater, and transportation demands. In addition, proper planning helps ensure that Jordan Lake drinking water quality is protected. The primary goals of transportation projects are to:

- Provide capacity to improve level of service on existing roadways and provide additional capacity in advance of future growth.
- Maintain efficient and safe traffic patterns.
- Offer a variety of means to move people, goods, and information.
- Provide for the maintenance of infrastructure and prepare for projects in advance to reduce cost and provide better community acceptance as individual decisions can be made with plans in mind.

The environmental documents that are developed for specific infrastructure projects will contain thorough justifications of why the project is needed to support the Town's growing demands. The balance of growth and environmental protection is of critical importance to the Town.

The Town's Engineering Department is responsible for planning, design, and construction of the capital improvements, including street improvements, right-of-way acquisition, stormwater improvements, thoroughfare planning, and management of development contract and easement releases. Under the 2006 utility merger agreement, the Town of Cary is responsible for improvements to the water and wastewater systems, including those needed for new development. The environmental documents that are developed for specific infrastructure projects will contain thorough justifications for why the project is needed to support the Town's growing demands. The balance of growth and environmental protection is of critical importance to the Town.

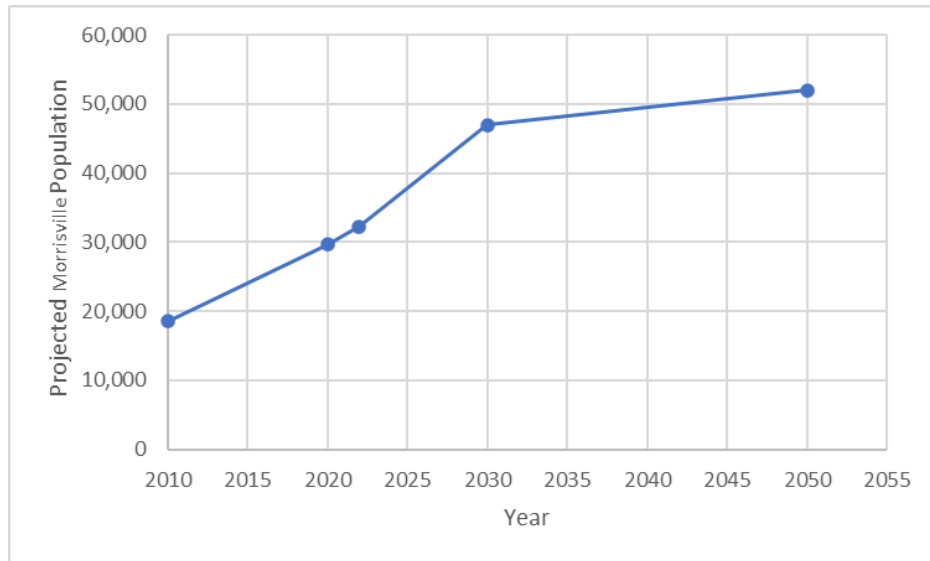


Figure 2-1. Town of Morrisville population projections.

3.0 BACKGROUND AND DESCRIPTION OF INFRASTRUCTURE MASTER PLANS

3.1 INTRODUCTION

3.1.1 Overview of Infrastructure Plans

As of April 3, 2006, Cary owns and operates the water and wastewater infrastructure assets within the Town of Morrisville’s jurisdiction. As such, the Town of Morrisville has adopted Cary’s water and wastewater standards. The Town of Morrisville in partnership with Cary has developed the following recent master plans for providing water and wastewater services to its customers in a manner that will protect water quality and public health. These and the other documents listed are referenced in the ensuing description of the City’s infrastructure plans, and cited and referenced in the document. For up-to-date planning documents and maps refer to the Town of Morrisville website (<https://www.morrisvillenc.gov/government/town-projects>) or the Cary website (<https://www.carync.gov/services-publications/plans-publications-reports>).

- Cary Long Range Water Resources Plan Update (Jacobs, 2018)
- Cary Reclaimed Water System Master Plan Update (CDM Smith, 2021)
- Town of Morrisville Comprehensive Transportation Plan (Town of Morrisville, 2019)
- Town of Morrisville Land Use Plan (Town of Morrisville, 2021)
- Transit Oriented Development Small Area Plan (Town of Morrisville, 2024)
- Cary Water Distribution System Master Plan (CDM Smith, 2024)

Other relevant supporting documents include the following:

- Interbasin Transfer Certificate (NCDEQ, 2015)
- Parks and Recreation Master Plan (McAdams, 2018)
- Wake County Transit Plan Update (Wake County, 2021)
- Unified Development Ordinance (Morrisville, 2024)

Documents that are in-progress and expected to be released in upcoming years include:

- Long Range Water Resources Plan update (HDR, Expected 2024)
- 2025 Wastewater Master Plan Update (Freese and Nichols, Expected 2025)

Additionally, the Town of Morrisville updates their Capital Improvement Plan (CIP) annually. The CIP is a plan through which financial resources are allocated to implement long-term objectives outlined in various planning documents over five fiscal years (FY). The CIP aims to align the Town’s financial capacity with capital requirements including land acquisition, public facility construction or renovation, transportation infrastructure, and utility system enhancements. The CIP development process uses a formal vetting and prioritization methodology to evaluate existing and proposed projects using input from senior staff, the Town

Council, and the mayor. The results from this process are presented to the Town Council before approval of the CIP, which is used as a basis for planning and budgeting in the following fiscal year following approval.

The Town of Morrisville’s most recent CIP (provided in Appendix C) was approved in December 2022 and covers FY2019 through FY2023. The utility system plans to invest a total of \$84,621,000 in capital needs over the next five years (Town of Morrisville, 2024).

The CIP includes the following types of projects:

- Roadway widening and improvement;
- Building and improving parks, athletic facilities, and open space;
- Stormwater management system construction and maintenance; and
- Building projects for operations.

The Town completed several important projects during FY2023 including those listed below.

- Wolfsnare Lane Stormwater Project
- Shiloh Park
- Morrisville-Carpenter Road Improvements

3.1.2 Interconnect Status

Morrisville has interconnections and contract agreements (interlocal agreements) with neighboring utility systems as summarized in Table 3-1. Some agreements are for regularly supplied water resource services, while others are Mutual Aid Agreements in the event of a potable water supply emergency. Current records of interlocal agreements may be obtained from the Town.

Table 3-1. Utility interconnectedness between Morrisville and surrounding municipalities.

Town or Entity	Relationship with Morrisville
Town of Cary	Utility Merger Agreement to receive potable water and reclaimed water from the Cary/Apex WTF, with potable water and wastewater treatment provided by Cary infrastructure. Western Wake Wastewater Management Agreement between Cary and Apex, which includes Morrisville via Cary and Chatham County via Tri-Party Annexation Agreement
Town of Holly Springs	Mutual Aid Agreement for potable water
City of Durham	Mutual Aid Agreement for potable water
City of Raleigh	Mutual Aid Agreement for potable water

3.2 WASTEWATER

3.2.1 Existing Wastewater System

The wastewater collection and treatment system for the Town is owned and operated by Cary and consists of more than 86 miles of gravity mains, 12 pumping stations, and 4 miles of force mains conveying flows to the North Cary Water Reclamation Facility (WRF), which discharges to Crabtree Creek; and the Western Wake Regional WRF (WWRWRF), which discharges to the Cape Fear River. The permit details for these facilities are summarized in Table 3-2. There are 21 subbasins served by gravity or pump stations.

The system serves residential, commercial, industrial, and institutional customers. The Town's industrial community includes several major employers, including Lenovo, Tekalec, and other business and manufacturing uses in Perimeter Park and Southpark business parks. There are also several shopping centers. Institutional customers include several schools (two public elementary schools, private elementary schools, vocational schools, the Town of Morrisville municipal facilities located at several sites, and a major campus of Wake Technical Community College completed in 2018.

As part of this collaborative effort associated with the WWRWRF, the Towns of Cary, Apex, and Morrisville are also addressing a mandate regarding their interbasin transfer (IBT) certificate, which requires the towns to return water to the Haw River or Cape Fear River basins after 2010. The operation of the WWRWRF meets this condition. The IBT certificate issued in 2001, allowed transfers of up to 24 million gallons per day (MGD), on a maximum day basis, from the Haw River subbasin (for which Jordan Lake is the water supply source) to the Neuse River subbasin. In 2013, the maximum daily IBT amount for the Towns of Cary, Apex, Morrisville, and RTP South was 19.2 MGD, while the annual average IBT amount was 13.8 MGD (Town of Cary, 2014a). On September 20, 2013, the Towns of Cary, Apex, and Morrisville, and Wake County notified the Environmental Management Commission (EMC) that they are requesting a modification of the IBT certificate to address water needs through 2045. One objective that would be accomplished by this modification is a shift from a maximum-day IBT calculation to IBT calculated as the daily average of a calendar month, according to the changes to NCGS 143-215.22L (regulation of surface water transfers) based on Session Law 2013-388. The modification for the IBT Certificate for the Towns of Cary, Apex, and Morrisville and Wake County was issued by the EMC on March 12, 2015. This modification included a 33 MGD transfer, calculated as the average day transfer in a calendar month.

Table 3-2. Summary of Town of Cary wastewater permits servicing the Town of Morrisville.

Permit No.	System	Type	MMDF ¹	Exp. Date
NC0048879	North Cary Water Reclamation Facility	NPDES	12.0	2/28/2028
NC0088846	Western Wake Water Reclamation Facility	NPDES	18.0	7/31/2028

¹ MMDF = Permitted Maximum Month Average Daily Flow; MGD = million gallons per day

3.2.2 Future Wastewater System

The Cary Wastewater Collection Master Pan was prepared in 2013 with an update for Chatham County in 2015. The Plan recommended increasing the delivery capacity in the York Interceptor and at the Aviation Parkway Pump Station, as well as making other recommendations for outside of the Town of Morrisville to ultimately improve system efficiency (Hazen and Sawyer, 2013). The proposed wastewater infrastructure from 2015 is presented in Figure 3-1. Since that time, Cary has completed the following guidance documents:

- The Cary Community Plan provided a framework for structuring future growth and redevelopment (2017).
- The Long Range Water Resources Plan update provided a strategic planning roadmap to meet the Town's water resource needs through development of a Water Resources Portfolio, including reclaimed water (2018).
- In 2021, the Town completed an expedited basin planning study for the Walnut Creek Pump Station Basin.

Several projects are being pursued by Cary, in the service area previously owned by the Town of Morrisville, to unify, streamline, and optimize collection system operations by abandoning surplus lift stations and merging or redirecting wastewater flows to Cary's system, thereby enhancing system reliability and minimizing operational costs. Cary will also build wastewater mains and pump stations to convey additional wastewater to the North Cary WRF and Western Wake Regional WRF, as population growth and development occur. Exact locations of mains and supporting infrastructure are not known at this time; however, knowledge of the general location of the main wastewater mains and population projections that are consistent with planned infrastructure and land use planning will enable SCI to be examined. Exact locations will be determined during development of the environmental documents that examine alternatives and direct environmental impacts of the alternatives.

The 2025 Wastewater Master Plan Update effort will kick off in Spring 2024 and is anticipated to be completed in 2025. This update will reflect the revised assumptions for future wastewater flows, as adjusted from the LRWRP forecast by Town staff to apply specific insight for future development and to incorporate updates to the Chatham County Basin Planning as part of a comprehensive master plan.

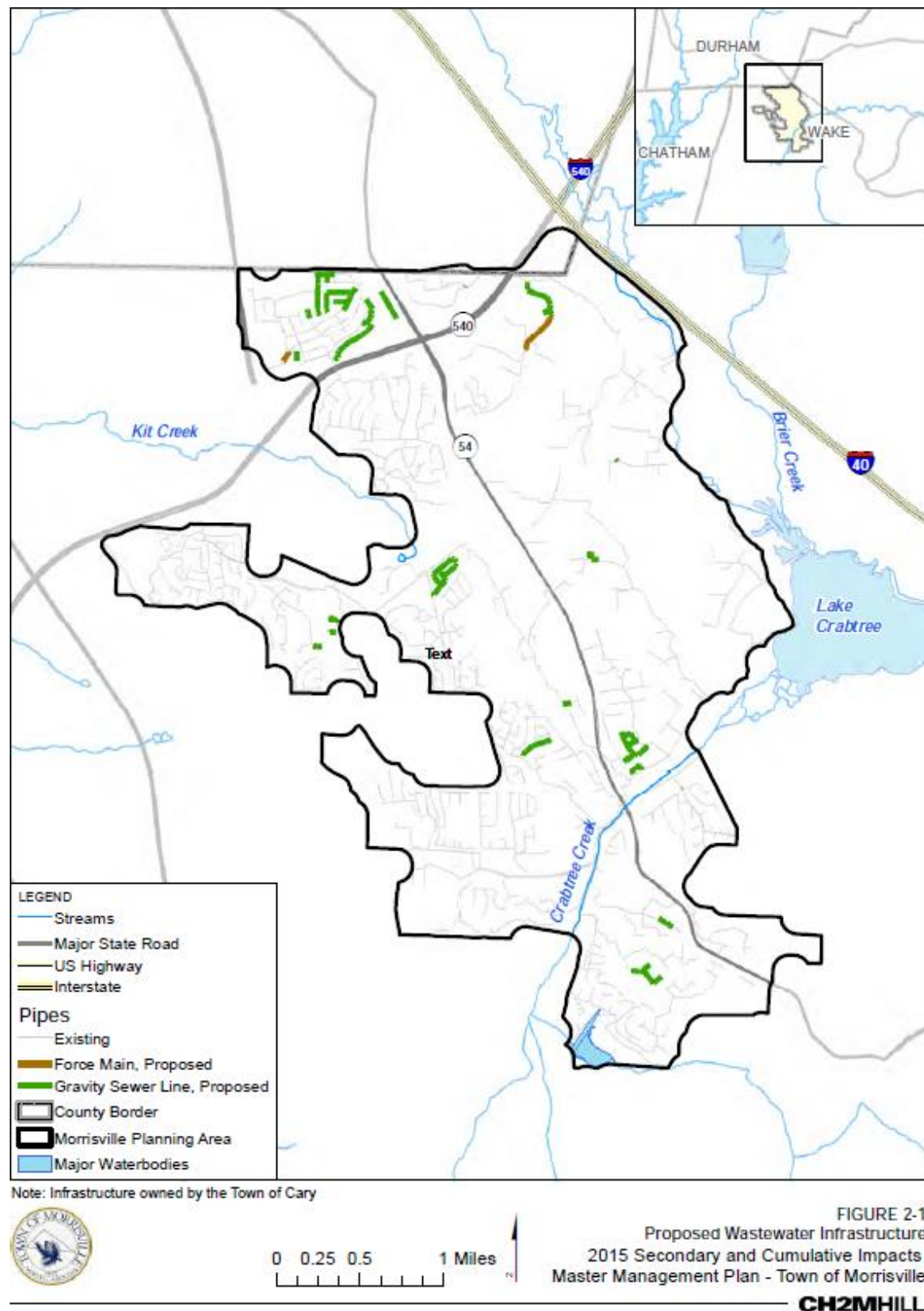


Figure 3-1. Proposed Morrisville wastewater infrastructure from 2015¹ (CH2M Hill, 2015).

¹ To be updated as part of the ongoing Town of Cary Wastewater Master Plan update as of 2024

3.2.3 Reclaimed Water

The Town of Morrisville will continue to work with Cary to identify potential reclaimed water opportunities. The existing and proposed reclaimed water service areas are pictured in Figure 3-2. Cary is in the process of designing a connector pipeline that will bring reclaimed water from the North Cary WRF to the West Service Area. This line will pass directly through the Town, providing the opportunity for reclaimed water service in its jurisdiction. Cary's Effective Utilization of Reclaimed Water System policy states that residents and businesses use the Town's reclaimed water system for secondary plumbing to the maximum extent possible, and that new development within the designated service areas connect to the reclaimed water system. More specific details regarding service areas and proposed infrastructure are found in Cary's Reclaimed Water Master Plan Update (CDM, 2021).

Water conservation is a benefit to the environment and community which can be achieved, in part, through water reclamation. Locations of proposed reclaimed water infrastructure will be determined during environmental studies that examine direct impacts of the proposed infrastructure. In general, unlike other types of infrastructure, water reclamation does not support additional growth, and therefore does not have SCI associated with it. For direct growth, using reclaimed water will help extend the viability of the water supply source, reduce withdrawals from the source, and reduce the amount of treated effluent to the receiving stream, which is a goal of the Clean Water Act under the National Pollutant Discharge Elimination System (NPDES) program.

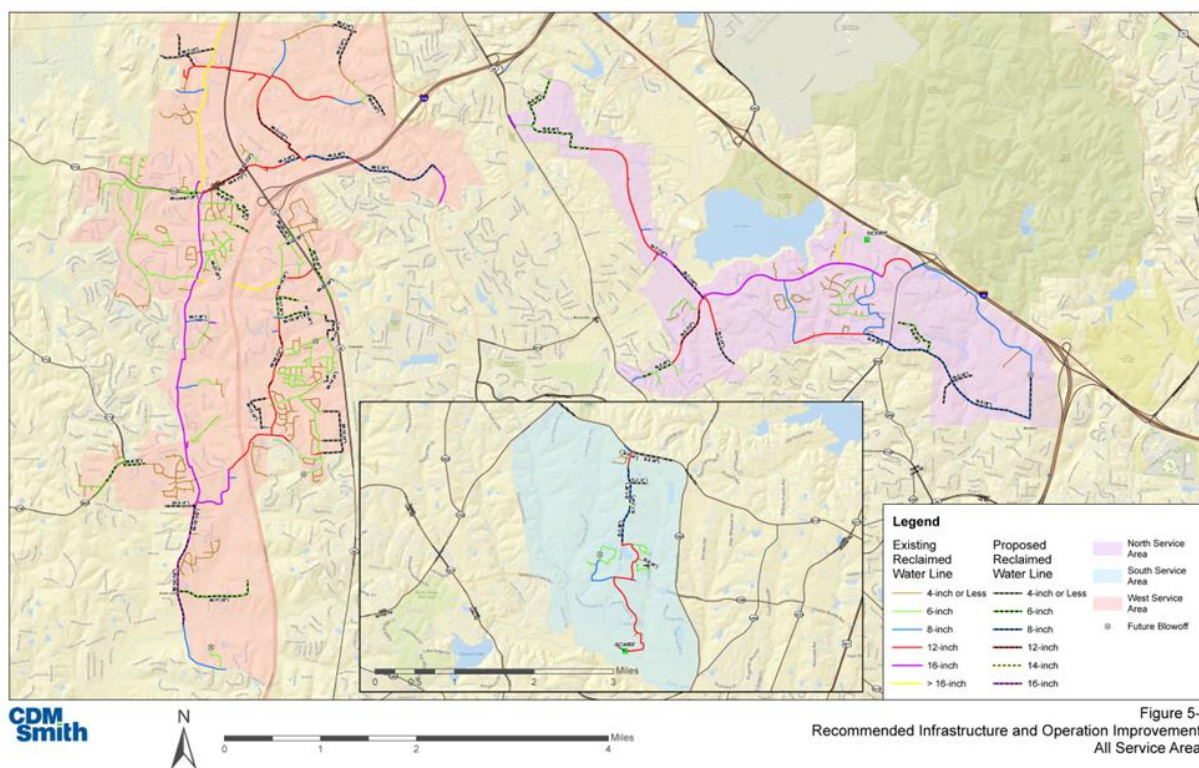


Figure 3-2. Existing and proposed reclaimed water service area and infrastructure for SCWRF, NCWRF, and WWRWF (CDM Smith, 2021). The North Service Area services Morrisville.

3.2.4 Biosolids

The Town of Morrisville contributes to the biosolids program operated by Cary. Cary operates a regional biosolids program using heat dryer systems at the SCWRF and WWRWRF which treat solids generated at the NCWRF, SCWRF, and the Town of Apex's wastewater treatment facility. The biosolids program generates nutrient-rich organic byproducts which are treated with the heat dryer systems to produce dry, nutrient-rich fertilizer pellets. The systems have been approved by the USEPA and NCDEQ as producing Class A Exceptional Quality biosolids, meaning the byproducts are free of pathogens, can be distributed to the public, and can be beneficially reused without site restrictions. The fertilizer pellets are then marketed for agricultural applications, allowing the biosolid nutrients to be beneficially recycled.

3.3 POTABLE WATER

3.3.1 Existing Water System

The Town obtains its drinking water from Jordan Lake. The water is treated at the Cary/Apex Water Treatment Facility (WTF), which is located in the Town of Apex's jurisdiction (Figure 3-3). Raw water from Jordan Lake is conveyed approximately 4 miles to the WTP, which is located on Wimberly Road (State Route [SR] 1603). The WTP has a current capacity of 56 MGD. To distribute water, Cary maintains approximately 103 miles of transmission mains, with diameters ranging from 2 to 42 inches within the Town of Morrisville. Major water infrastructure installed September 2019 includes an interconnection pump station with the City of Raleigh in the Crossroads area. Additionally, approximately 5,000 feet of 24-inch pipeline along Holt Road was completed to help provide a secondary feed into the southern portion of the central pressure zone (CPZ). This feed will reinforce the distribution system's reliability in this area of Cary. No pump stations or storage tanks are present in the Town (CH2M HILL, 2009).

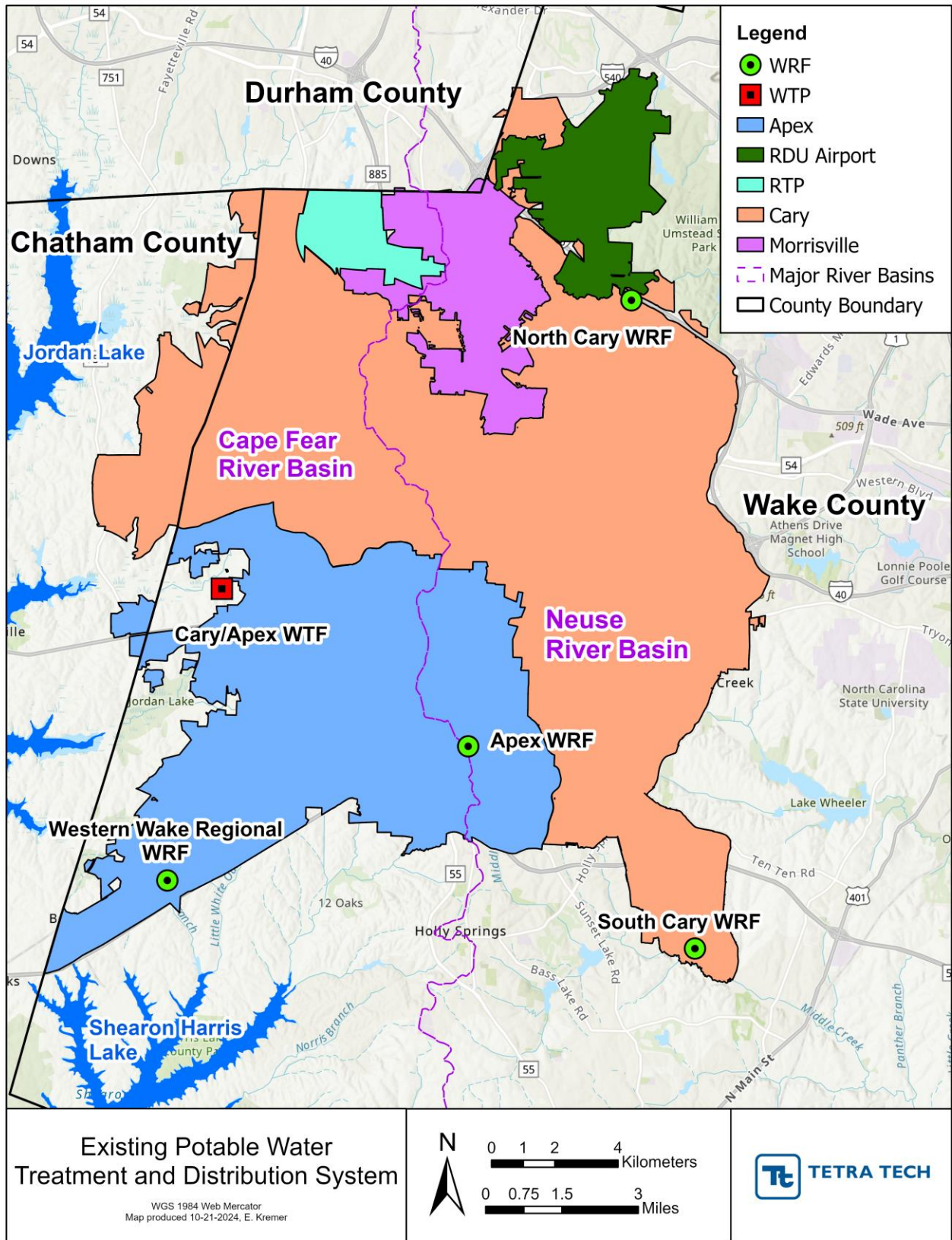


Figure 3-3. Existing potable water treatment and distribution system.

3.3.2 Future Water System

Cary completed its most recent Water Distribution System Master Plan (Water Plan) in February 2024 (CDM Smith, 2024). The Water Plan evaluated the existing WTP finished water pumping capacity, pressure zones, pumping systems, distribution system, and storage facilities and outlines recommended improvements (Figure 3-4).

Major water infrastructure updates since September 2021 includes replacement of the ozone generators at the Cary Apex Water Treatment Facility (CAWTF). Also, at CAWTF, biofiltration conversion is currently underway which will provide enhanced removal of organic compounds, such as those that contribute to taste and odor, while the water is being filtered. The first phase of the project is expected to be completed in Fall 2023.

Construction will begin in October 2023 on a new 24" water line extending 3,300 feet along NW Maynard Road. This project will create redundancy and improve service in the Town's existing utility service area, specifically downtown. Future water mains are shown on Figure 2-3. Any future construction would occur under the direction of Cary. A detailed explanation of proposed capital improvements is presented in Appendix C. Exact locations of the proposed infrastructure will be determined during development of the environmental documents, which will examine the direct impacts of the infrastructure. However, general locations for the infrastructure are known and supported by land use planning and population projections; therefore, SCI are identifiable at this time.

The Cary/Apex WTF was expanded in 2019 to 56 MGD and a portion of the generated potable water will serve Town of Morrisville's residents.

In 2018, Cary completed a Long-Range Water Resources Plan update (LRWRP), which will guide the development of water supply and resource management solutions that are financially responsible and maintain a high quality of service for Cary's customers, which include the Town of Morrisville. The LRWRP takes a strategic long view, through 2065, to meet the Town's water resources challenges in a dynamic and holistic way, through development of a Water Resources Portfolio. The Portfolio provides a mix of practical strategies that the Town can apply to meet its water resources responsibilities by implementing the right actions at the right time (Jacobs and CH2M HILL, 2018). The LRWRP identifies water supply and resource management options for implementation. Another update to the LRWRP began in January 2024 which will forecast community water needs for the next 50 years.

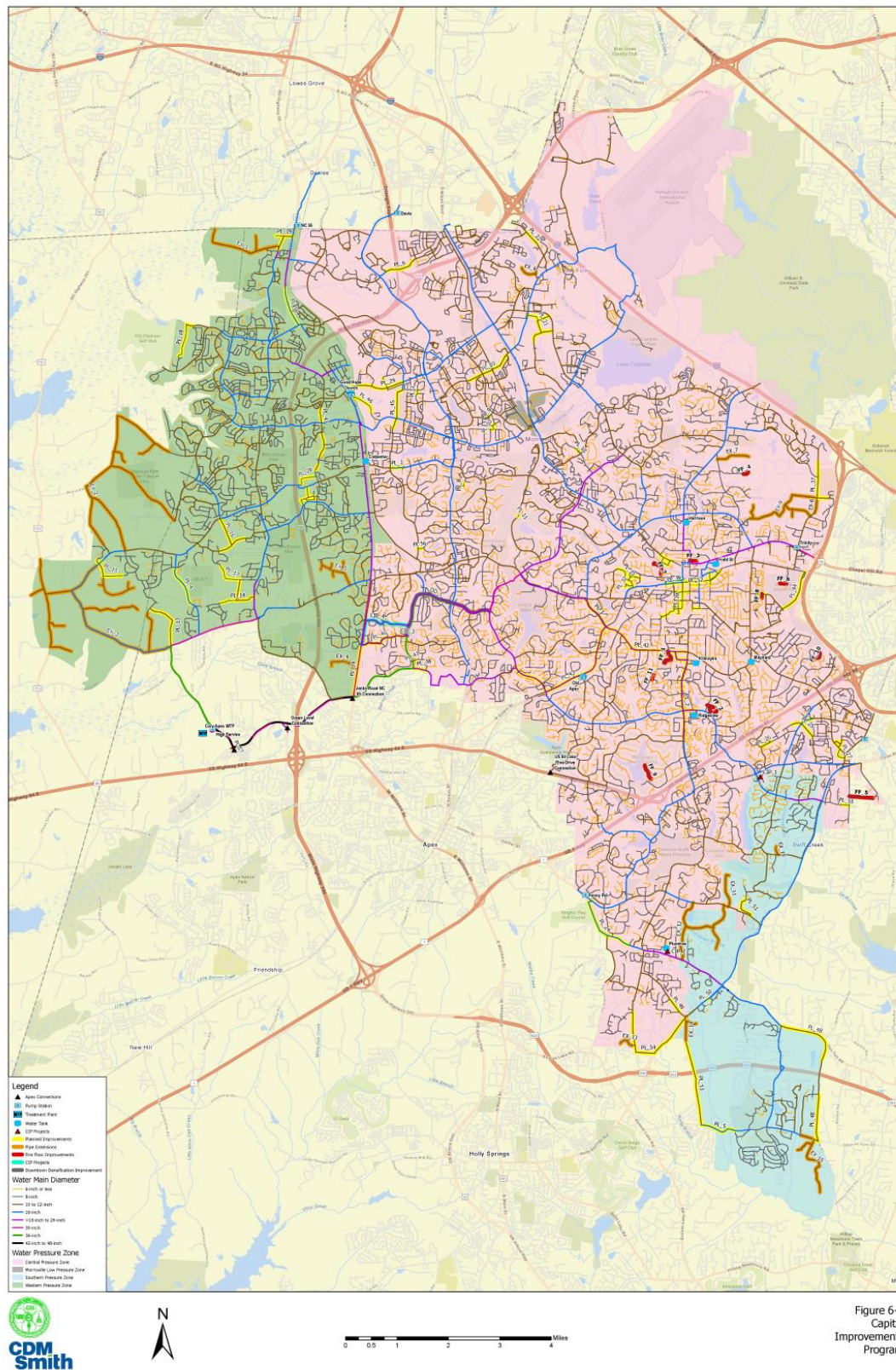


Figure 3-4. Major CIP projects through 2040 for potable water treatment and distribution system (CDM Smith, 2021).

3.4 TRANSPORTATION

The Town's Comprehensive Transportation Plan (CTP) was updated in 2019. The CTP serves as the Town's transportation vision, addressing current and future transportation needs through the year 2040. The Town's transportation plan shows how the Town can begin to anticipate enhanced regional bus service and a future regional rail system. A Public Transportation Study was conducted in 2019, following the release of the CTP, to analyze the demand for public transit in Morrisville (Nelson Nygaard, 2019). The Town also has developed a network of sidewalks, greenways, and bikeways (Figure 3-5, Figure 3-6).

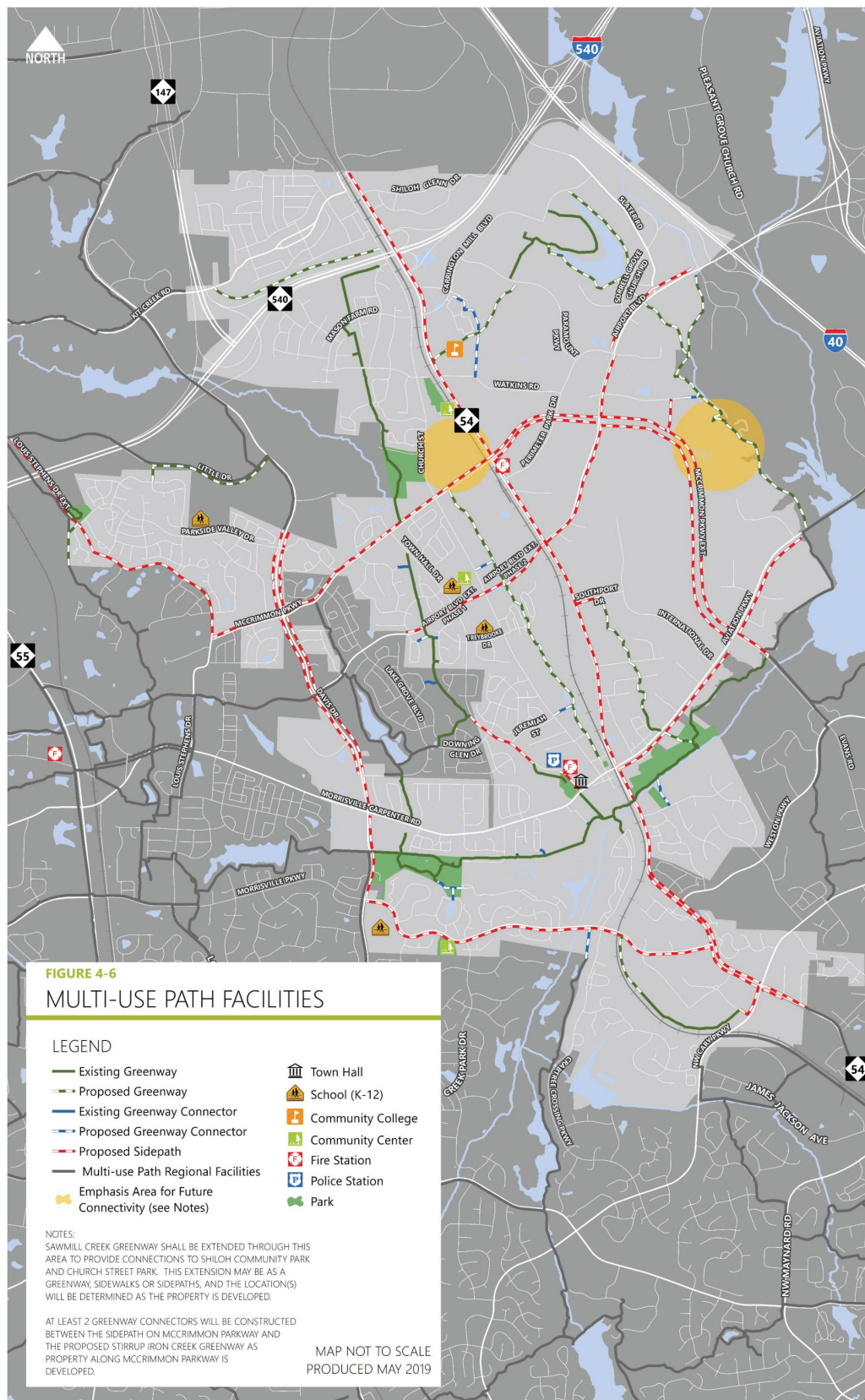


Figure 3-5. Existing and proposed greenways in the Town of Morrisville (Morrisville, 2019).

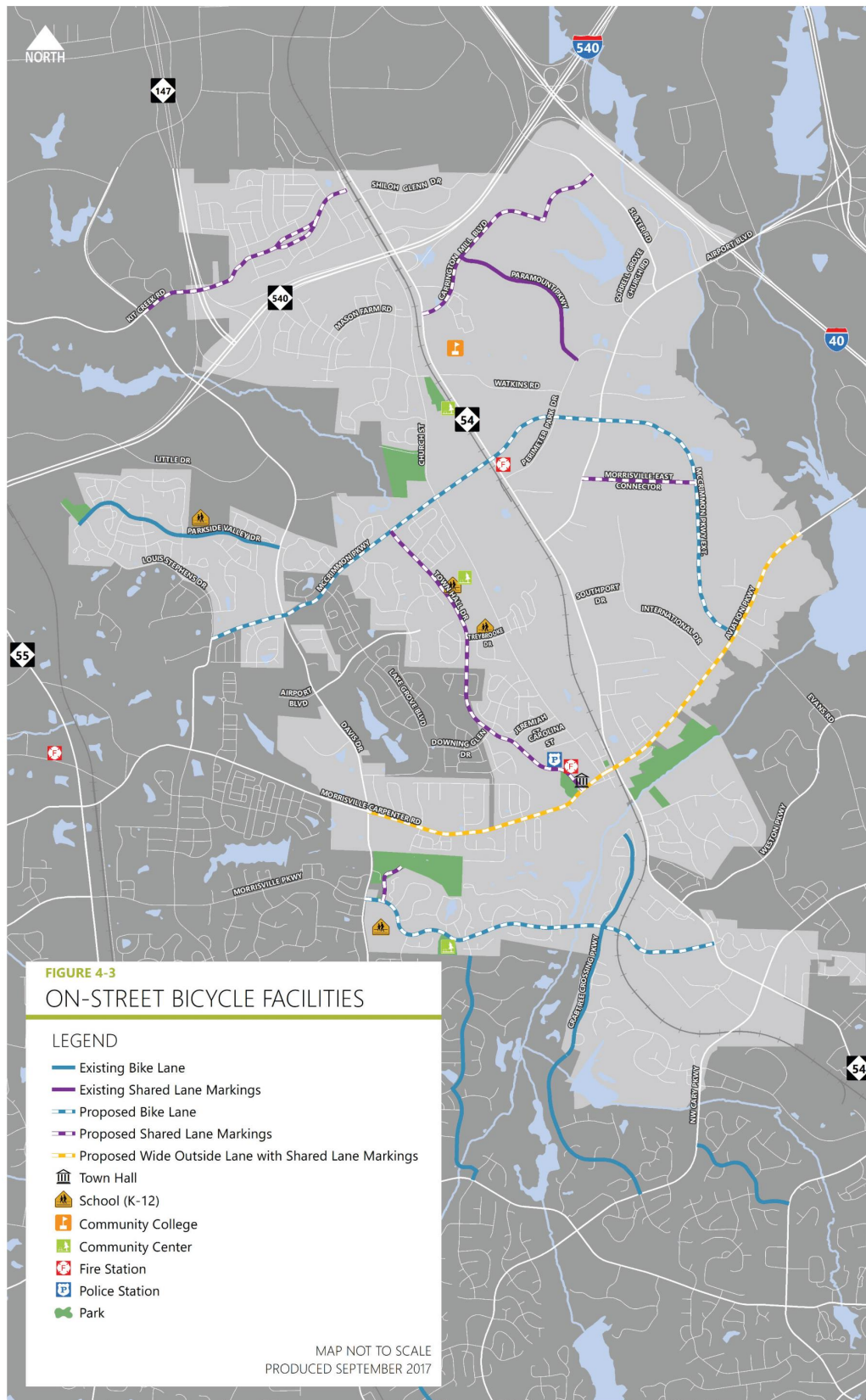


Figure 3-6. Existing and proposed bike lanes in the Town of Morrisville (Morrisville, 2019).

In 2012, the Town approved a \$14.3 million street improvement bond, to be used to construct the NC 54 Bypass, a new roadway extending McCrimmon Parkway at NC 54 to Aviation Parkway. The McCrimmon Parkway Extension was completed in 2021. In 2021 Morrisville voters approved a bond referendum to fund a variety of projects, including nearly \$12 million for streets, sidewalk, and connectivity improvements. The roadway plan for the International Drive extension is expected to be completed by the end of 2024. Morrisville-Carpenter road widening was completed in the Spring of 2023 bringing forth a four-lane median divided road to ease congestion. In 2022, the extension of Louis Stephens Drive from Poplar Pike Lane to Little Drive was opened, providing additional connectivity. The town has installed several pedestrian safety improvements providing safe crossings in critical high impact areas in the Town. The Town also completed several sidewalk gaps projects. In addition, the Town implemented a shuttle service and installed shuttle stops at 10 locations throughout town offering this free service to area users. More information on these projects can be found on the Town Projects page (<https://www.morrisvillenc.gov/government/town-projects>) or in the Town's CIP in Appendix C.

Several roads within the Town limits are maintained by the North Carolina Department of Transportation (NCDOT). Projects that have been identified by NCDOT's State Transportation Improvement Program include widening of NC 54 and extensions of Airport Boulevard, Louis Stephens Drive, and NC-147. The Airport Boulevard Extension Phase 1 will extend Airport Boulevard from Garden Square Lane to Church Street. The project includes a new four-lane roadway with median, a five-foot sidewalk on the north side of the roadway, and a 10- foot multi-use path on the south side of the roadway. Phase 2 of the Extension will be from Church Street to NC 54. Phase 1 is 100% funded and is expected to begin construction late 2024 or early 2025. Phase 2 is currently unfunded. More information on NCDOT projects can be found on their Projects page (<https://www.ncdot.gov/projects/Pages/default.aspx>).

Figure 3-7 summarizes thoroughfares recommended in the Transportation Plan. Exact locations of the proposed infrastructure will be determined during the development of environmental documents, which will examine the direct impacts of infrastructure.

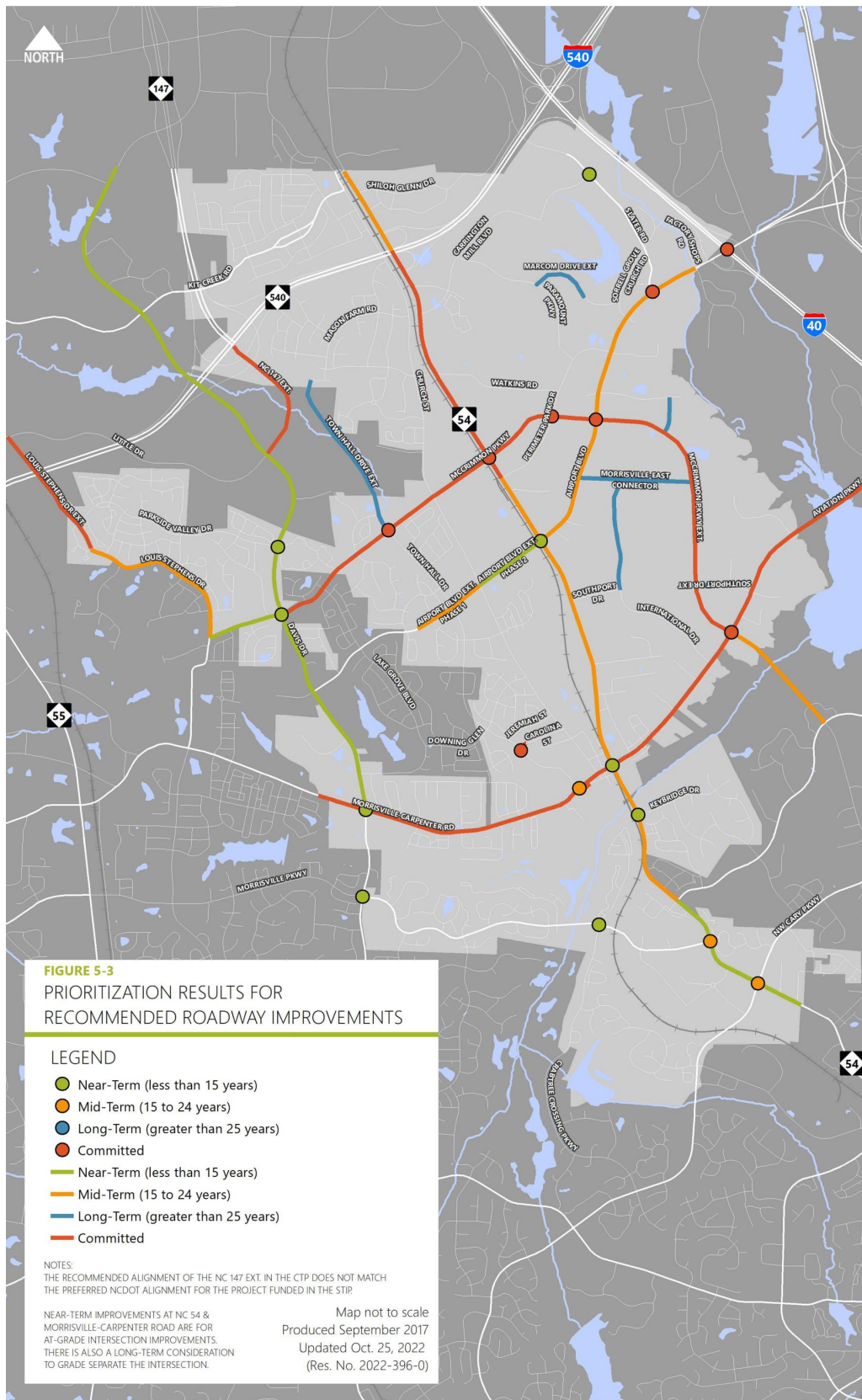


Figure 3-7. Proposed roadway project prioritization in the Town of Morrisville (Morrisville, 2019).

However, general locations are known and supported by land use planning and population projections; therefore, SCI can be identified at this time. More information on these plans can be found in the Town’s CIP in Appendix C.

In the 2016 general election, Wake County voters approved a half-cent local sales tax to partially fund the public transportation system throughout Wake County. The 2015 Wake County Transit Plan supersedes previous efforts including the 2012 draft plan which was previously pending action from the Wake County Commissioners but was not carried forward. Cary will play an integral part in the implementation of the Wake County Transit Plan and will receive support for all transportation strategies presented. The CCP proposes a combination of strategies including bus rapid transit, expansion of local and regional routes, and commuter rail service during peak hours. The Plan was developed in cooperation with several partners, including the Capital Area Metropolitan Planning Organization (CAMPO), GoTriangle (then Triangle Transit), the Regional Transportation Alliance (RTA), and GoRaleigh (formerly City of Raleigh’s Capital Area Transit). The Plan provides a dual approach to meet expanding transportation demands as the County continues to grow: (1) a core transit plan that broadens local and commuter bus service and includes rush-hour commuter rail service from Garner to Durham; and (2) an enhanced transit plan that includes a regional light rail service (<https://www.readyforrailnc.com/>). More information on regional transportation plans is found in Section 7.0.

3.5 ELECTRICITY

Electricity is provided to the Town of Morrisville by Duke Energy Progress, a subsidiary of Duke Energy (Town of Morrisville, 2024). Duke Energy owns and operates four nuclear plants sites within North Carolina including the Shearon Harris Nuclear Plant in Wake County. The Shearon Harris Nuclear Plant is located 10 miles outside of Cary town limits. More information about Duke Progress can be found at progress-energy.com.

The Town of Morrisville has also been identified as a SolSmart “GOLD” designee through the U.S. Department of Energy Solar Energy Technologies Office, of which only nine North Carolina municipalities have achieved designation to date. The Town has begun adding solar energy to all of its facilities with plans to increase over time. In 2021, the Town added its first solar panel arrays to Fire Station No. 1, providing 40 percent of the station’s energy needs. This photovoltaic array is projected to save the Town some \$300,000 in energy costs over the next 30 years. In 2023, the Town added solar arrays to various public services buildings, with more planned. Residents are also encouraged to engage in the Residential Consumer Guide to Solar Power, providing ease of reference for solar permitting requirements, Statewide inspection procedures, solar potential calculators, how to find a contractor and various financing sources. The Town’s solar power initiatives are an important feature of the Town’s sustainability master planning effort which is detailed further in Section 8.

4.0 DESCRIPTION OF EXISTING ENVIRONMENT IN STUDY AREA

This section describes the existing environment in order to facilitate the identification of potential SCI to the natural environment as growth occurs in the study area. The data for this section were gathered through literature reviews, geographic information system (GIS) analysis; and phone conversations, letters, and meetings with various agency personnel.

Note that the Town of Morrisville study area includes land area primarily in Wake County, with additional land in Durham County. The Town of Morrisville study area falls across two significant river basins in North Carolina, the Cape Fear River basin to the west, and the Neuse River basin to the east. Within the Cape Fear River basin, the town is all included within the Jordan Lake watershed drainage area. Within the Neuse River basin, the town study area boundaries fall within the Crabtree Creek watershed drainage area. These key boundaries and major waterbodies are shown in Figure 4-1.

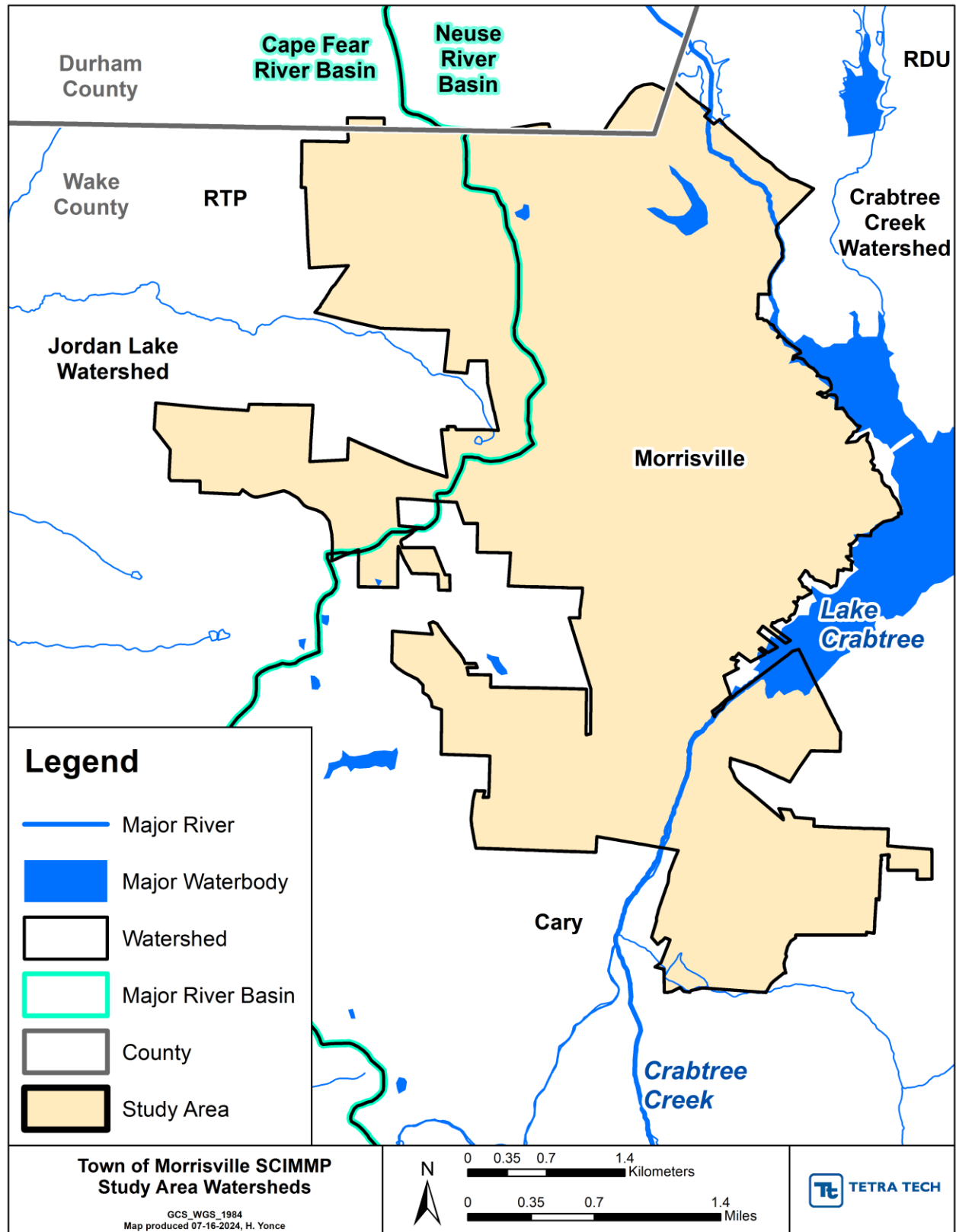


Figure 4-1. Counties, watersheds, and river basins across the Morrisville study area.

4.1 TOPOGRAPHY AND FLOODPLAINS

The Town is located in the North Carolina piedmont physiographic region with gently sloping to moderately steep terrain. Floodplains function as storage areas for surface water during large rainfall events. Within floodplains, micro-topographical variations often create pockets of riparian wetlands. These riparian areas provide multiple functions, including: flood storage, wildlife habitat, corridors for wildlife movement, and water quality functions, such as infiltration zones and surface water filtering.

Approximately 0.8 square miles of Federal Emergency Management Agency (FEMA) regulated floodplains are located inside the study area (FEMA, 2006). These floodplains represent 8% of the total study area (Figure 4-2).

A majority of the regulated floodplain area is within the Town's stream buffer zone. Floodplains within watersheds greater than 1 square mile are regulated by FEMA. Spatial coverages for FEMA floodplains and online flood map services are continually updated through a variety of processes, so the best available floodplain data is available through their FEMA Flood Map Service Center (MSC) website (<http://msc.fema.gov>). These updates will likely increase the floodplain information available to the Town. The floodplains may change in the future based on the revisions reflected in the updated FIRMs.

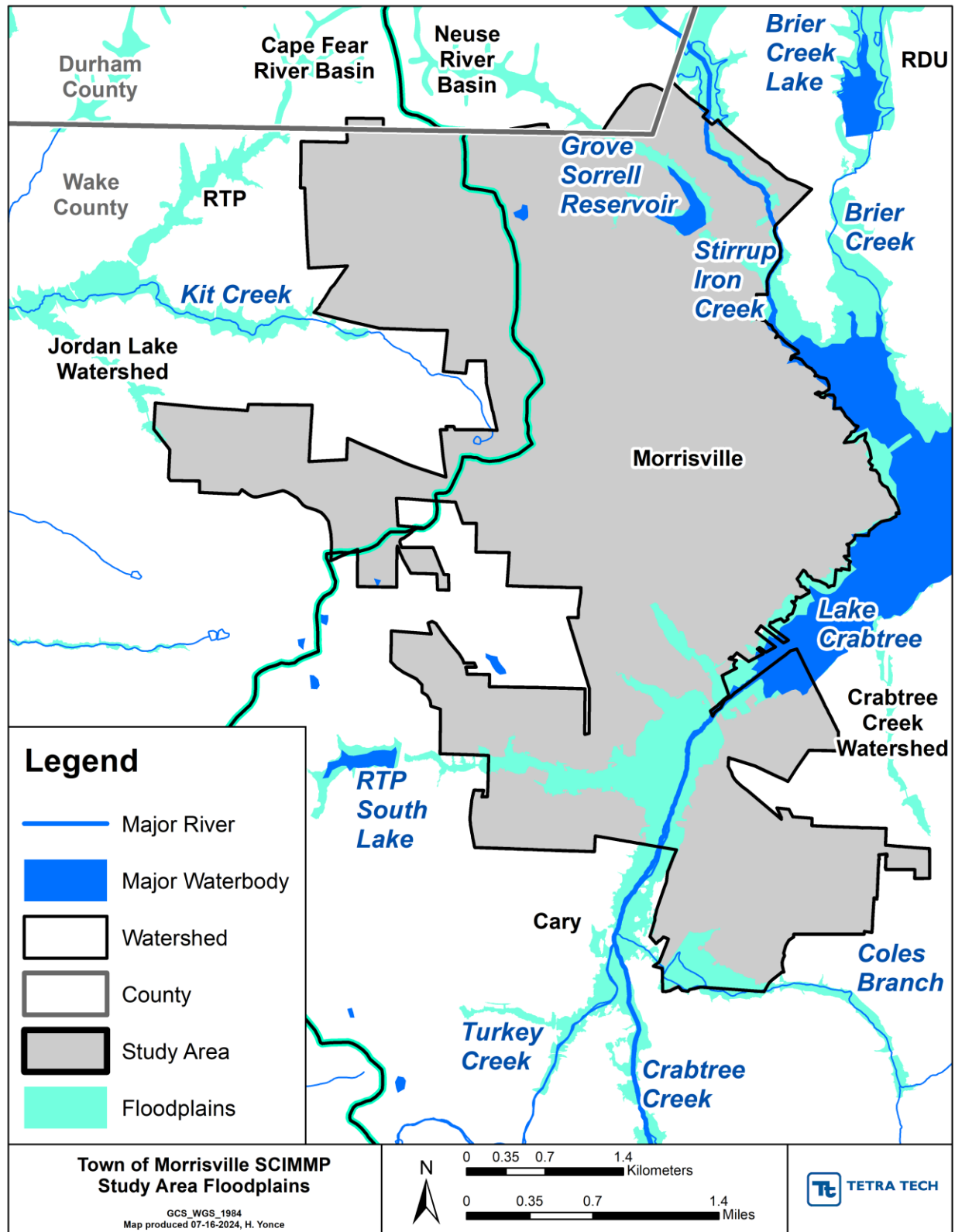


Figure 4-2. FEMA floodplains in the Morrisville study area.

4.2 SOILS

The major soil types are the White Store and Creedmoor series. These upland soils are usually gently sloping to hilly, and moderately well drained. Triassic soils are found throughout much of the Town, resulting in a very firm clay subsoil type. These soils are derived from sandstone, shale, and mudstone.

A typical methodology of predicting wetland presence and estimating wetland acreage is the utilization of a soil survey to identify hydric soils. Hydric soils are defined as “soils that have formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part” (USDA, 2018). Soil types within floodplains and adjacent to streams include Chewacla, Mayodan, Creedmoor, and Congaree. These soils are silt or sandy loams.

4.3 LAND USE

Table 4-1 provides detail on land cover across the area within each general land use category. The general land use categories are: undeveloped, open water, transportation corridors, agricultural and forest, protected open space, and developed. The developed land is divided into residential and non-residential uses. The open space category includes protected open space, floodplains, parks, and privately held open space. As shown in the table, 35% of the study area is residential developed, 34% is non-residential developed, 15% is undeveloped, 11% is protected open space, 17% is transportation, and less than 1% is currently agriculture, forested and open water.

Table 4-1. Study area generalized existing land use.

Land Use Type ¹	Area (square miles)	Percent of Study Area	Impervious (square miles)	Percent Impervious
Residential Developed ¹	3.3	35%	1.3	38%
Non-Residential Developed ¹	2.9	34%	1.5	54%
Protected Open Space ²	0.5	11%	0.1	17%
Open Water ³	0.1	1%	<0.1	<1%
Transportation ⁴	1.6	17%	0.8	47%
Agriculture and Forest ¹	<0.1	<1%	<0.1	3%
Undeveloped ¹	1.5	15%	0.2	13%
Total	9.9	100%	3.9	39%

Sources:

1. 2024 parcel shapefiles from NC One Map as baseline, then aggregated based on description.
2. Parcels were assigned current land use based on Wake County “open space” GIS dataset.
3. Water features from the Wake County “water bodies” dataset were overlaid across all parcels.
4. Transportation corridors were identified as the negative space between all parcel boundaries.

Figure 4-3 illustrates the general land use categories within the study area. The map shows land available for development, developed land, and open space. The generalized land use categorization was developed using the 2024 parcel shapefiles for the study area, with an

overlay of hydrologic polygon features to indicate open water. The negative space between parcels was classified as a transportation corridor.

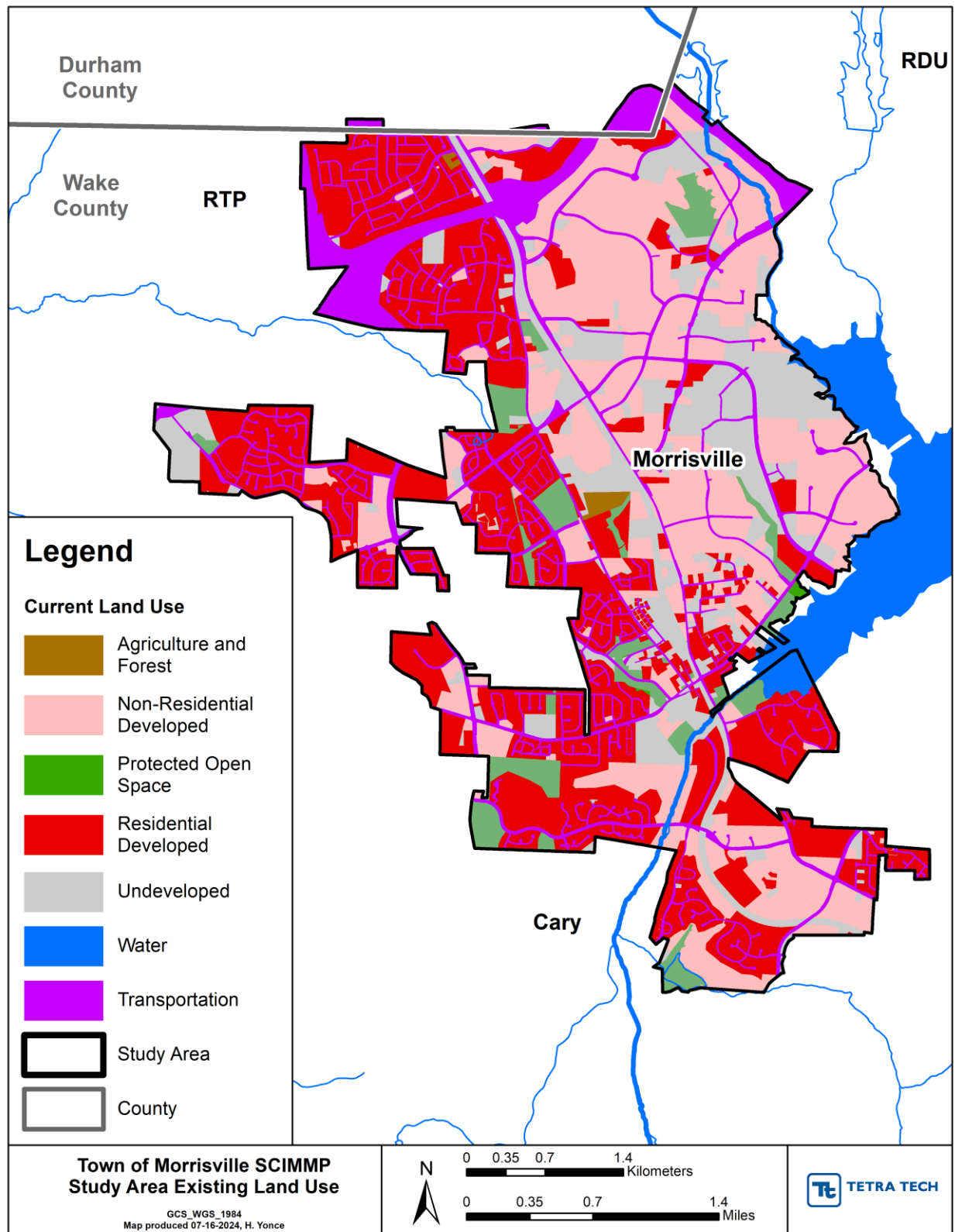


Figure 4-3. Generalized existing land use in Morrisville study area.

Parcel land uses were determined using the “parcel use code” attribute which allowed for the vast majority of land across the study area to be classified for dominant land uses:

- Residential Developed (e.g., single family homes, apartments, mobile home parks)
- Non-Residential Developed (e.g., commercial, industrial, historic, schools)
- Agriculture and Forest (e.g., agriculture, horticulture, forestry)
- Undeveloped (e.g., vacant)

Remaining parcel uses classified as “exempt”, “state assessed”, “part exempt”, “special”, and “water/sewer system” were reviewed for aggregation based on apparent primary land cover, for example: exempt parcels identified as churches by owner name were classified as non-residential developed, partial-exempt parcels identified as home owners association were classified as undeveloped, and large parcels owned by energy companies were classified as undeveloped due to the majority prevalence of forested lands across the parcel footprints. Special classified parcels were largely undeveloped privately owned parcels; however, some were non-residential developed when identified as churches, waste disposal areas, etc.

Because the Morrisville study area includes a wide range of residential development types, the NLCD 2021 land cover raster was also included to provide additional perspective across the study area (Table 4-2 and Figure 4-4).

Table 4-2. Detailed existing land use/ land cover from NLCD 2021.

Land Use Type	Area (square miles)	Area (acres)	Percent of Study Area
Open Water	0.1	40	1%
Developed, Open Space	1.8	1,120	18%
Developed, Low Intensity	2.0	1,290	20%
Developed, Medium Intensity	3.3	2,112	33%
Developed, High Intensity	1.1	682	11%
Barren Land	<0.1	11	<1%
Deciduous Forest	0.3	197	3%
Evergreen Forest	0.6	359	6%
Mixed Forest	0.4	235	4%
Shrub/Scrub	0.1	80	1%
Herbaceous	0.1	89	1%
Hay/Pasture	0.1	76	1%
Cultivated Crops	<0.1	0	<1%
Woody Wetlands	0.1	68	1%
Emergent Herbaceous Wetlands	<0.1	2	<1%
Total	9.9	6,361	100%

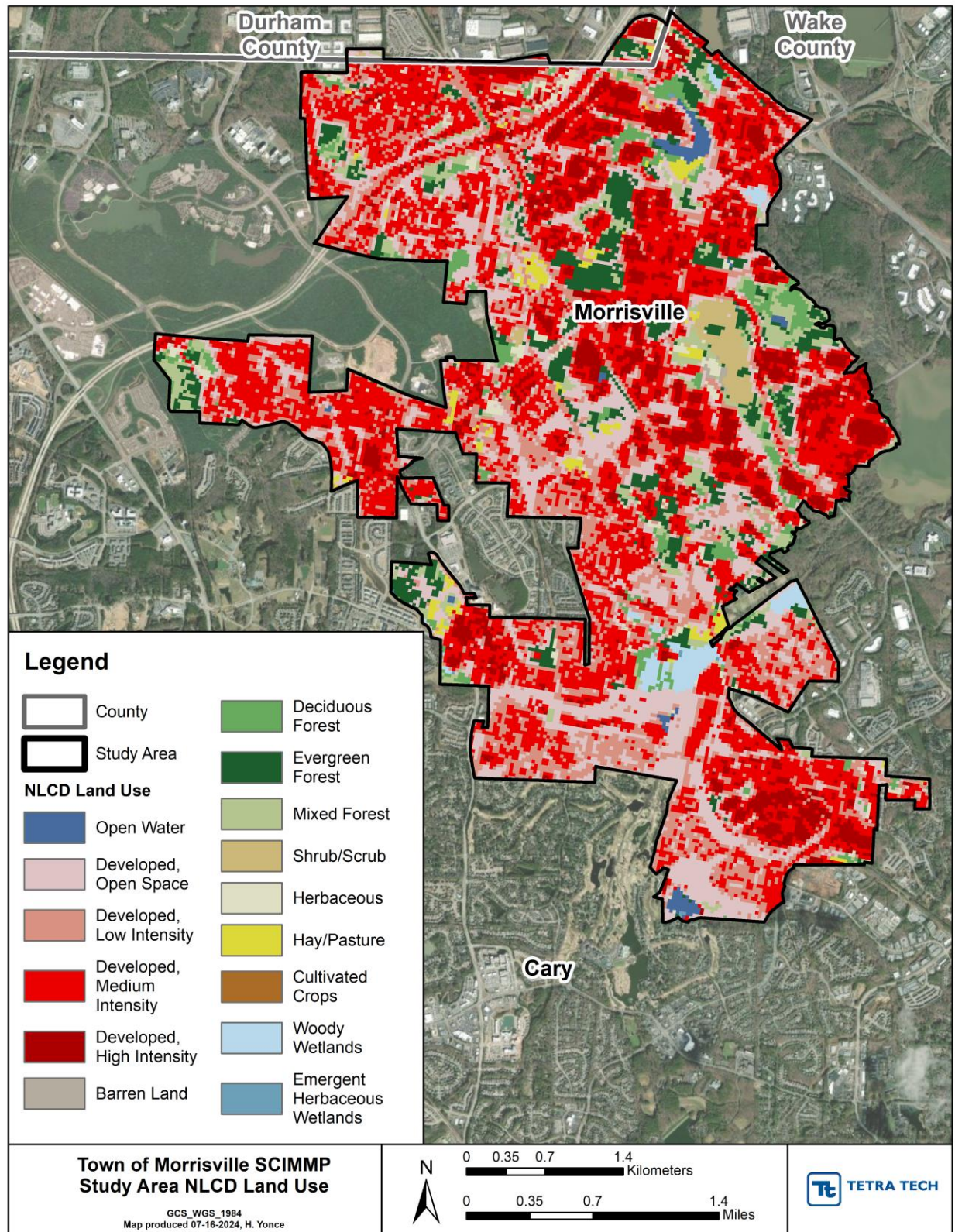


Figure 4-4. Detailed existing land use/land cover from NLCD 2021.

Table 4-2 provides a detailed breakdown of existing land use in the study area. From Table 4-1 it is shown that residential developed land is currently the predominant land use as 35% of the study area, while data from Table 4-2 indicates that developed medium intensity and developed low intensity dominate the four developed land use classes (sum of 53% of the study area), as opposed to developed open space and high intensity which represent 29% of the study area. Clustered high- and medium-density residential developments are present in the heavily urbanized areas along the transportation corridors of Interstate-540, Interstate-40, and near RTP.

The actual percentage of open space within the study area is likely greater than the amount indicated by Table 4-2 and Figure 4-3 due to the following factors: (1) large portions of the areas classified as residential are open space because of the large amount of low-density development; (2) the Town requires open space in residential and commercial developments, and (3) the Town requires the use of buffers for protection of riparian areas and floodplains. In addition, the Town requires open space to be provided with the new developments. As a result, there are many areas that are undeveloped open space within the various general land use categories.

Table 4-1 also includes estimates of percent imperviousness by land use, as evaluated relative to the NLCD 2021 imperviousness raster. These values are based on literature values. The percentage impervious per land class was used to estimate the impervious area for the 2024 land use data. These were then summed and divided by the total land area to estimate the overall impervious value for existing land use conditions. The total estimated percent impervious is approximately 39%.

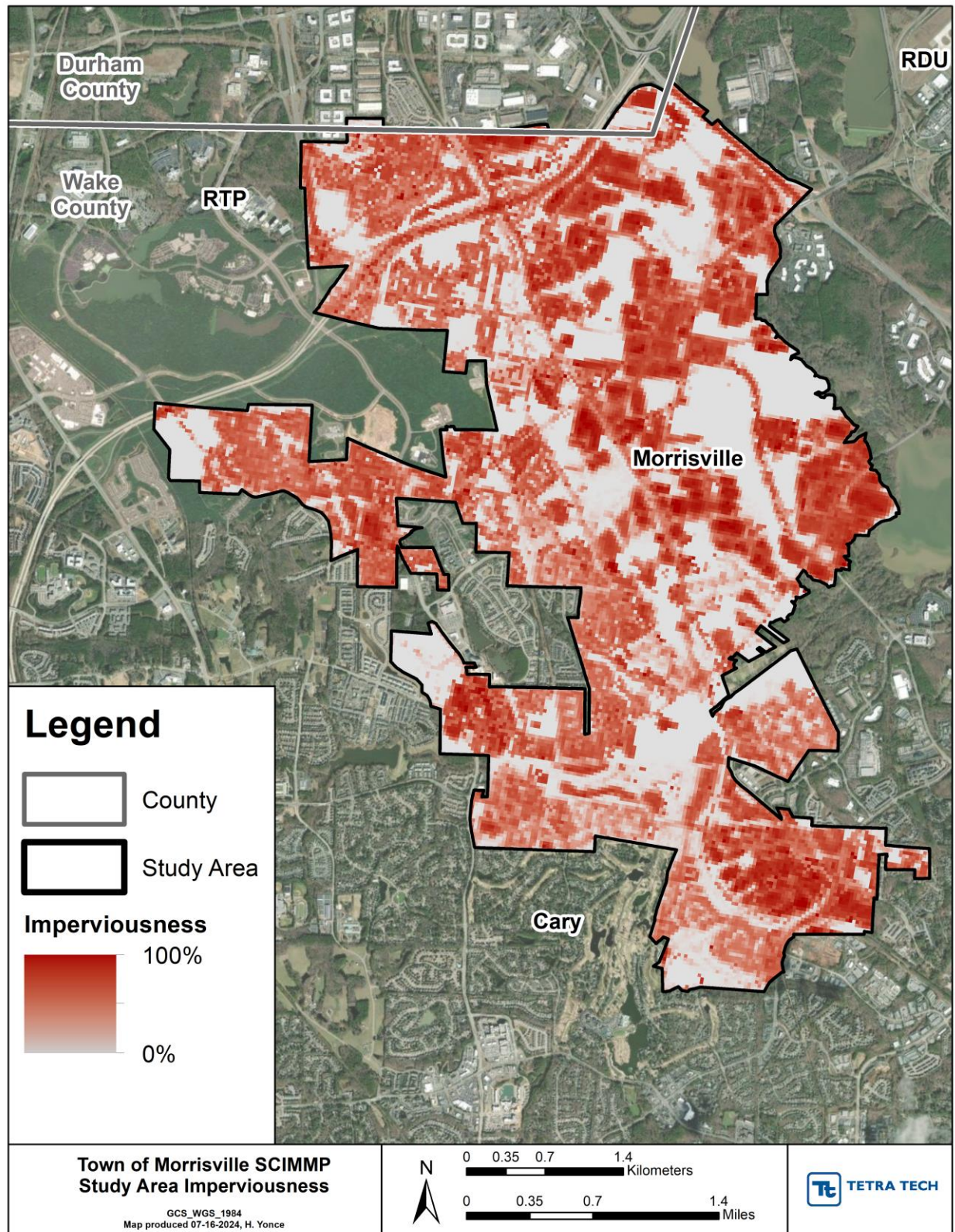


Figure 4-5. Imperviousness from NLCD 2021 across the study area.

4.4 WETLANDS

For regulatory purposes under the Clean Water Act (CWA), the term wetlands means “those areas that are inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions.” In general, wetlands share three key characteristics: wetland hydrology, hydric soils, and hydrophytic vegetation.

Wetlands and vegetated riparian areas are valuable because they are among the most biologically productive natural ecosystems in the world. They also protect wildlife, provide natural open spaces, protect water quality, control erosion, and limit flood damage.

Wetlands, as classified in the U.S. Fish and Wildlife Service (USFWS) National Wetlands Inventory (NWI), within the study area are primarily riparian or bottomland forest associated with streams and their floodplains (Table 4-3, Figure 4-6) (NCCGIA, 2013, which is based on the 1982 USFWS NWI). The majority of the NWI wetlands are forested or scrub- shrub and are part of bottomland communities adjacent to larger streams within the study area (Figure 4-6). Analysis of the Wake County Soil Survey (USDA, 1970) also shows hydric soils, primarily along stream channels, concurring with NWI data indicating that wetlands within the study area are primarily located within riparian and floodplain areas. Small areas of emergent wetlands are present along ponds. Open water ponds occur along many of the streams within the study area. While the NWI does not map all jurisdictional wetlands, it is useful in terms of classifying types of wetlands and their approximate locations within the study area. It is important to note that many changes have taken place within the study area since these data were compiled.

Table 4-3. National Wetlands Inventory within the study area.

NWI Type	Area (acres)
Freshwater Emergent Wetland	8
Freshwater Forested/Shrub Wetland	167
Freshwater Pond	48
Riverine	39
Lake	26
Total	288

Source: USFWS NWI mapper 1982, updated 2023

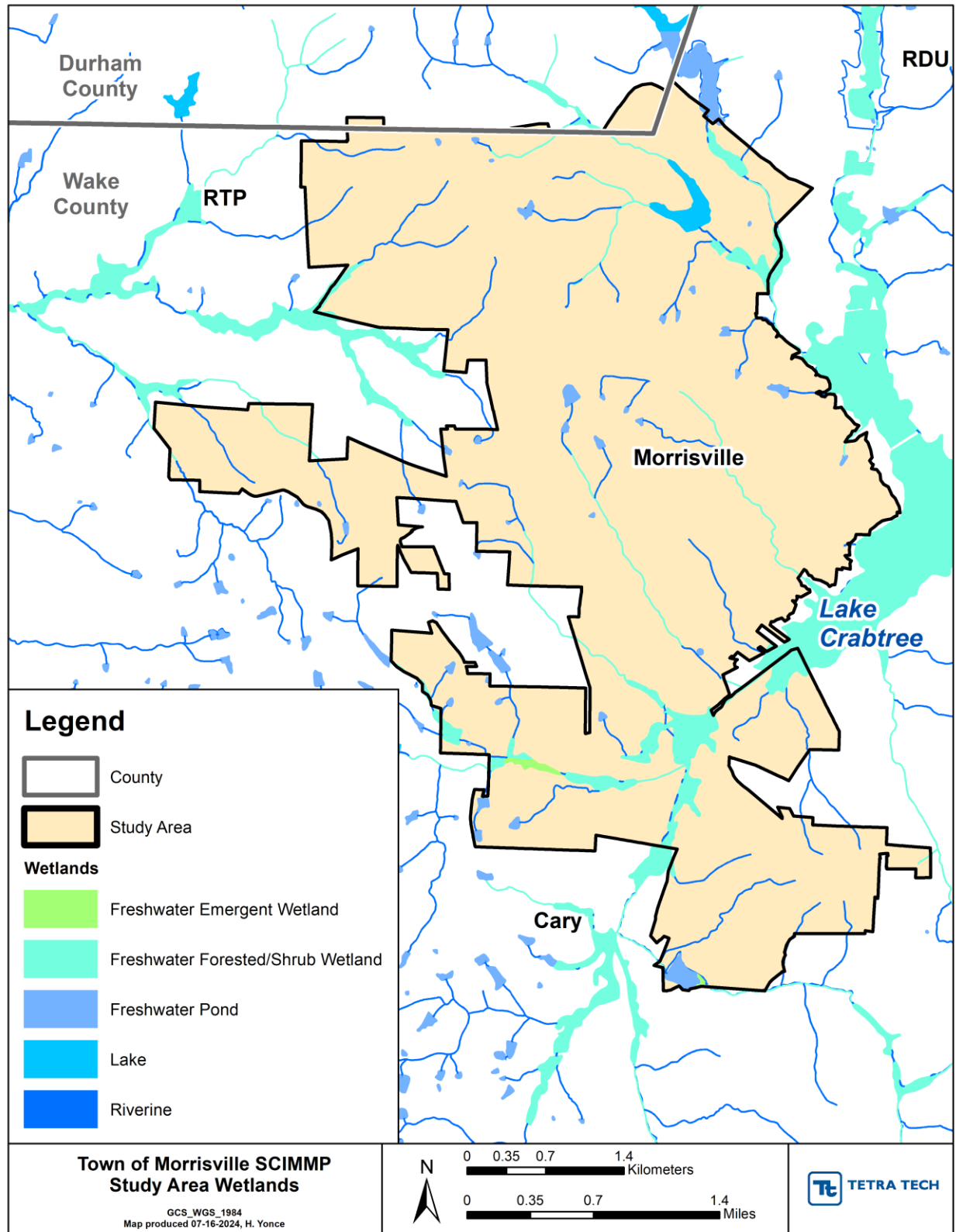


Figure 4-6. National Wetlands Inventory lands in the Morrisville study area.

4.5 PRIME OR UNIQUE AGRICULTURE LANDS

North Carolina Executive Order 96 charges all State agencies to minimize the loss of prime agricultural and forested lands as defined in the Federal Farmland Protection Policy Act. The United States Department of Agriculture (USDA) Natural Resources Conservation Service has classified lands into three categories based on suitability for agricultural uses. These classifications incorporate soil type, slope, and water capacity. Prime farmlands are those soils with slopes between zero and eight percent in capability classes I and II, and some in capability class III. Unique farmlands are recognized for having a certain set of parameters necessary to produce certain high-value crops. The third category, farmland of statewide importance, includes those soils that do not quite qualify as prime farmland. Factors include steepness of slope, susceptibility to erosion, and permeability (USDA, 1998).

Soils being defined as prime farmland are present within the study area. Of the major soil types within the study area, Congaree, Creedmoor, and Chewacla are listed as prime farmlands (USDA, 1998). Chewacla soils must be drained to be of use for agricultural purposes. Other soil types considered of statewide importance include Mayodan and White Store. While soils may be classified as prime farmland, such classification does not mean that these areas are currently under tillage because many of these soils have been affected by previous development and other soil disturbances. Town staff has indicated that there are no farms within the study area.

4.6 PUBLIC LANDS AND SCENIC, RECREATIONAL, AND STATE NATURAL AREAS

This category includes public or conservation lands, federal, state, and local parks, and other scenic and recreational areas. Some major parks present within the study area are Morrisville Community Park, Shiloh Park and Cedar Fork District Park (Table 4-4), the latter of which stretches across the study area boundary into Cary. Figure 4-7 show the parks as open space. Open spaces provide both scenic and recreational opportunities for residents, as well as the protection of valuable natural resources.

Significant open spaces in the study area and surrounding region not owned by Morrisville include:

- Crabtree Park (Wake County)
- William B Umstead State Park (State of North Carolina)

The major parks and recreation areas within the study area are listed in Table 4-4.

Table 4-4. Significant parks in the Morrisville study area.

Park Name	Area (acres)
Morrisville Community Park	34.85
Cedar Fork District Park	34.45
Church Street Park	24.8
Shiloh Park & Luther Green Center	8.07

Park Name	Area (acres)
Indian Trailhead and Open Space	4.73
Cedar Fork Community Center Outdoors Space	6.2
Northwest Park	5.07
Morrisville Aquatics & Fitness Center	4.91
Crabtree Creek Nature Park	2.4
Historic Christian Church	1.24
Ruritan Park	0.41
Sarah Woody Jenkins Park	0.25
Addison Place Open Space	3.38
Town Open Space (Formerly TTA Property)	10
Morrisville Square Open Space	10.32
Waterford Open Space	8.6
Crabtree Creek Nature Park	34.5
Indian Creek Greenway	12.65

Source: Morrisville 2018 Parks and Recreation Master Plan Update

Scenic areas also provide passive recreational opportunities such as hiking and bird watching when located on public land and include Significant Natural Heritage Areas (SNHAs). These areas are discussed in Section 4.13.2. Private conservation lands held by non-profit organizations such as the Triangle Land Conservancy also provide scenic and recreational value to the community.

Another nearby resource for the Town is Umstead State Park, which is located adjacent to the study area and provides many types of recreational activities, including hiking, bird- watching, picnicking, camping, fishing, and boating. This 5,599-acre park also provides environmental education activities and is home to many rare species and their habitats.

The Town has 79 acres of undeveloped and open space. The undeveloped park space includes 37 acres set aside for the future Crabtree Creek Nature Center, which is adjacent to the Cedar Fork District Park and is planned for 2040. Site plan design was completed in 2023 and includes a large picnic shelter, restrooms, ADA accessible playground, meadow, constructed wetland, and walking trails with boardwalks through the woods. The project will also retain the existing connection to Crabtree Creek Greenway and allow for pedestrian access from the wider Morrisville/Cary area. Currently, the project is on hold and is being reevaluated due to recent cost increases in materials and labor.

A detailed inventory of the parks and greenway system is found in the Town's 2018 Parks and Recreation Master Plan. Privately held recreational open space totals 585 acres, primarily including the Prestonwood Golf Course (Town of Morrisville, 2011). There are no gamelands within the study area (NCWRC, 2013a).

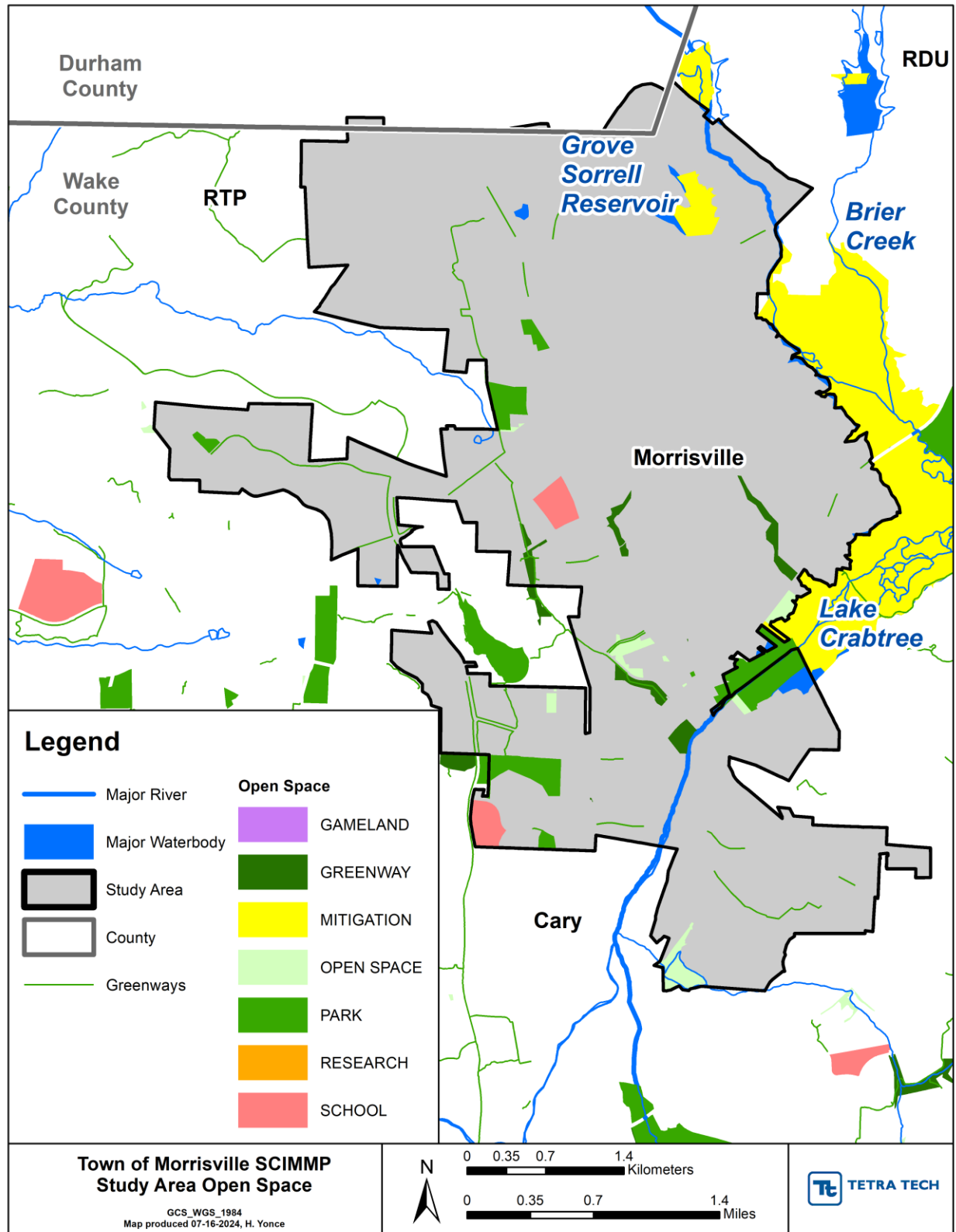


Figure 4-7. Open space areas in and around the Morrisville study area.

4.7 AREAS OF ARCHAEOLOGICAL OR HISTORICAL VALUE

The State Environmental Policy Act (SEPA) requires the conservation and protection of the State's natural resources and preservation of "the important historic and cultural elements of our common inheritance." The National Register of Historic Places (NRHP) is the formal repository of information pertaining to historic structures and districts; it is maintained by the National Park Service (NPS). Places considered for listing include historic structures and districts, cemeteries, and archaeological sites. To assess the general character of cultural resources associated with the study area, background research was conducted using the NRHP website (NPS, 2024). The Town has three structures identified in the NRHP:

- Morrisville Christian Church
- Williamson Page house
- James M. Pugh House

As of 2024, there have been approximately 3,000 archaeological sites identified across Wake County, ranging from Paleo-Indian (10,000 BC) to 19th century industrial sites (personal communication with NCDCCR, 2024). The Wake County Historic Site Study list contains an inventory of sites that are under review and have been nominated to the National Register which is updated annually and can be accessed on through the consolidated meeting notes for the National Register Advisory Committee Meetings (http://www.hpo.ncdcr.gov/NRACAgendas/NRAC_Meeting_History.pdf). It should be noted that electronic databases such as NOneMap do not include archaeological resources in order to prevent looting. The Office of State Archaeology should be contacted regarding future projects that require SEPA documentation to avoid impacts to these resources. To support federal efforts to protect historic places, the Town is part of Wake County's Certified Local Government (CLG) (NCDCCR, 2014b). The responsibilities of a CLG are to:

- Enforce state or local legislation for the designation and protection of historic properties.
- Establish a historic preservation review commission.
- Maintain a system for the survey and inventory of historic properties compatible with the statewide survey.
- Provide opportunities for public participation in the local program.

As a CLG, the Town is eligible for grant money and can provide local expertise during the nomination process for the NRHP. The Wake County Historic Preservation Commission has jurisdiction over Morrisville (NCDCCR, 2014b).

The Town has actively worked to preserve history as development has occurred. The Town created a History Center, located in Town Hall to educate residents of the various phases of the Town's history and encourage appreciation of the Town's historically significant sites. The Morrisville Christian Church was renovated as a Town project in 2011 and approved for listing on the NRHP in 2012. It currently serves as a community center. The James M. Pugh House was added to the Register in 2003. Because of the improvements at the intersection of NC 54 and Morrisville-Carpenter Road, the Pugh House was relocated to a nearby site that is visually prominent in the Town Center area. The house relocation was coordinated with the State

Historic Preservation Office (SHPO). Town-funded renovation of the exterior of the Pugh House occurred in 2012, and Wake County Landmark designation was obtained in 2013.

Town staff also worked with the developer of a shopping center site to relocate, before construction took place, two tobacco barns that would have threatened the structures. One of the barns was relocated to a Town-owned property for future site enhancement.

Looking to the future, the Town Center Plan creates a vision for the original center of Morrisville, identifies historic neighborhoods to preserve and enhance, and proposes preparation of Historic Preservation Guidelines for the area. The plan also identifies significant open space areas, including a historic civil war battlefield.

4.8 AIR QUALITY

The U.S. Environmental Protection Agency (USEPA) uses the Air Quality Index (AQI) to report ambient air quality conditions. The AQI range includes good, moderate, unhealthy for sensitive groups, unhealthy, and hazardous. In 2023, the median AQI in Wake County was 49, or “good.” No days were considered unhealthy and 5 days were considered unhealthy for sensitive populations (USEPA, 2023).

A new, more stringent National Ambient Air Quality Standard for ozone was established by USEPA in 1997. As of June 2005, Wake County, which was identified as a maintenance area, was no longer subject to the 1-hour standard. In March 2008, USEPA further strengthened the national standards for 8-hour ozone levels. Since 2006, the County has been listed as a maintenance area for the 8-hour ozone standard. Ozone is not directly emitted, but is formed when sunlight reacts with volatile organic compounds and nitrogen oxides (NO_x) and is a component of smog. The largest source of the precursors to the formation of ozone in the study area is exhaust from motor vehicles. The Raleigh and Durham area was listed as a limited maintenance area for carbon monoxide, which is primarily emitted from transportation and industrial sources, as of 2015 (USEPA, 2015).

Between 2018-2020, North Carolina had its lowest 3-year average ozone levels on record since air monitoring began in the early 1970s. The declining ozone levels coincided with lower emissions from the state's power plants. A report by the North Carolina Division of Air Quality (NCDAQ) shows that the state's coal-fired power plants have cut their NO_x emissions, a primary industrial contributor to ozone pollution, by more than 80% since the General Assembly enacted the Clean Smokestacks Act in 2002 (NCDAQ, 2023). Only one ozone exceedance has been logged in the area since 2018. The exceedance occurred June 2022 (US EPA, 2023).

Wake County is also designated to a sulfur dioxide standard to a 1-hour standard level of 75 parts per billion (ppb) (<https://deq.nc.gov/about/divisions/airquality/air-quality-data/data-archives-statistical-summaries/sulfur-dioxide/so2-averagevalues-2011-2013-in-nc-counties>). Wake County is listed as a maintenance area for carbon monoxide, which is primarily emitted from transportation and industrial sources (USEPA, 2013).

4.9 NOISE LEVELS

Within the study area, noise is primarily created by transportation sources: RDU Airport, North Carolina Railroad (NCRR), and vehicular traffic. Typical flight patterns for the airport cross the northern edge of the study area. The NCRR rail lines run approximately two miles through town in a north-south direction (roughly paralleling NC 54) through both residential and non-residential areas. Train traffic occurs throughout the day on an intermittent basis. Noise is generated by the movement of engines and cars over the track, as well as train whistles near at-grade rail crossings. Noise levels are highest near the airport and along traffic corridors, with lower noise levels in residential areas. Typical residential noises include lawn mowers, leaf blowers, and barking dogs. This noise is generally concentrated during daylight hours. Construction activities, which occur with development, are also present within the study area and are temporary. Noise is also associated with industrial activities, and with 16% of land use consisting of industrial land uses; this land use is a likely contributor to noise in the study area.

4.10 WATER RESOURCES

4.10.1 Surface Water

The Town lies on the ridge between the Neuse and Cape Fear River basins. Approximately 81% of the study area lies in the Neuse River basin (HU 03020201) and 19% lies in the Cape Fear River basin (HU 03030002) (Figure 4-8). Within the study area, many ponds are present along the smaller tributaries. The major tributary to the Neuse River basin within the study area is Crabtree Creek (Table 4-5). Its tributaries include Coles Branch, Stirrup Iron Creek, and many unnamed streams. The Environmental Management Commission (EMC) classifies all water bodies within the State based on best usage, and each classification represents certain designated uses. All of the streams in the study area are classified as Class C (waters protected for uses such as aquatic life, biological integrity, wildlife, secondary contact recreation, and agriculture).

(Note: The EMC has not classified many of the unnamed tributaries; stream classifications of unnamed tributaries are equivalent to the stream into which they drain). The designated uses of Class C waters are aquatic life support, swimming, and fishing. In addition to the assigned classifications, all waters within the study area are classified as Nutrient Sensitive Waters (NSW) in response to excessive growths of macroscopic and/or microscopic vegetation.

Within the Cape Fear River basin, the major tributary is Kit Creek. Kit Creek drains to Northeast Creek before it enters Jordan Lake, which is the Town's water supply and a highly used recreational area. The headwaters of Kit Creek are just within the study area and are classified as WS-V, NSW waters. Outside the study area, near NC 55 the stream changes to WS-IV (water supply) classification. WS-IV designated areas have development density limits, mandates related to best management practices (BMPs), and landfill construction limitations. Approximately one percent of the Town's study area lies within a water supply watershed (WSW) (NCDENR, 2012a).

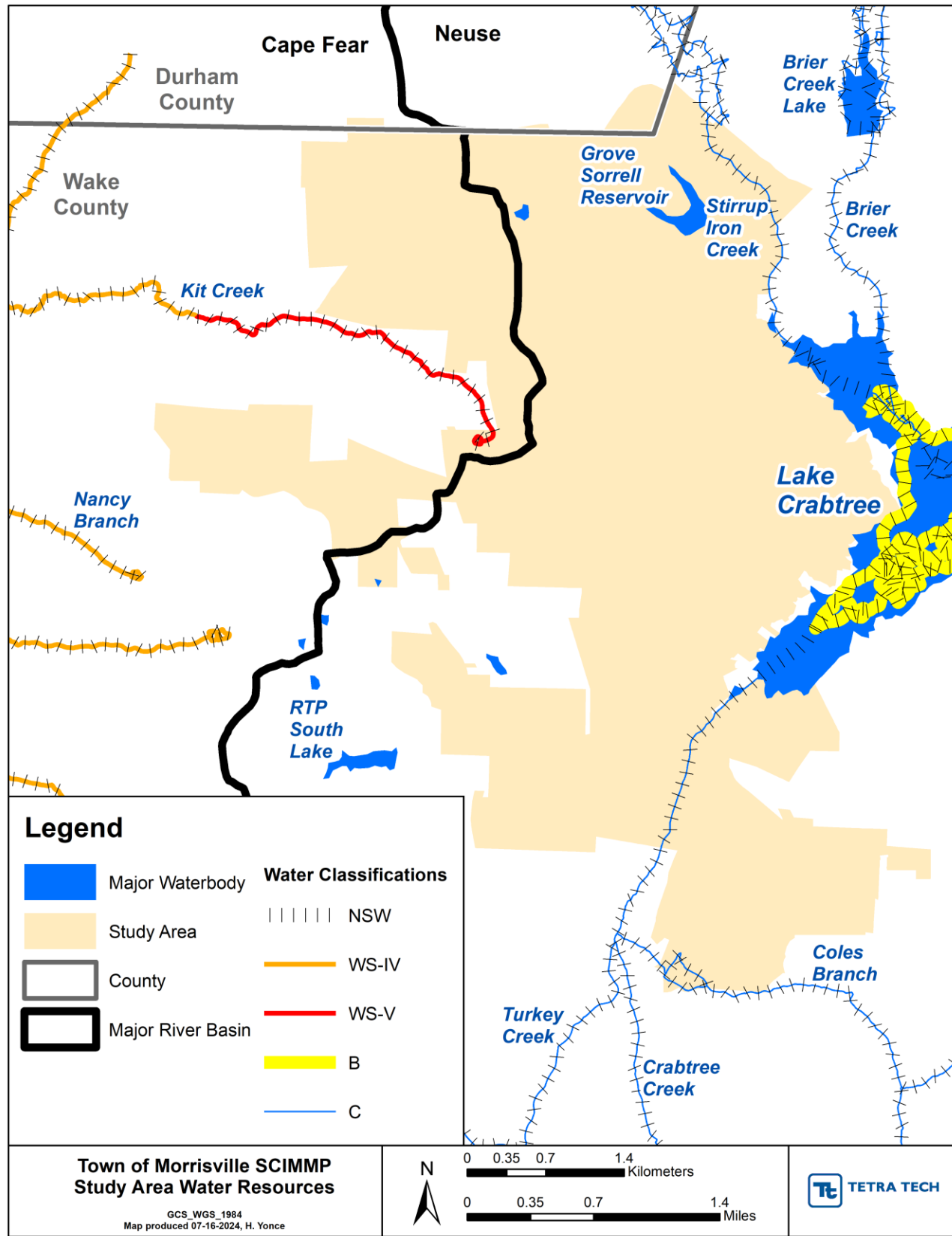


Figure 4-8. Water resources in the Morrisville study area.

In 2013, the Town had an assessment performed for Kit Creek watershed. Streams, buffers, and outfalls were evaluated, in order to determine potential mitigation opportunities. The stream assessment found that in general streams were in stable condition with low bank erosion, but some reaches are incised with indications of sediment deposition and poor water quality and aquatic habitat. The buffer assessment indicated that a majority of the buffers were 50 feet wide. In general, invasive species were observed in upland utility line right of ways. Twelve of the 38 outfalls evaluated were classified as being in poor condition due to active erosion, unstable channel conditions, head cutting and undercut outlet structures (Stantec, 2013).

Within the Neuse River Basin, benthic macroinvertebrate communities are sampled to analyze water quality and habitat conditions at one site within the study area. Crabtree Creek is sampled at NC 54 near the border of the study area with Cary. At this site, the benthic macroinvertebrate community rating was “Poor” in 1995, 2000, 2005, and 2013. The low rating resulted from many factors affecting habitat, including sediment loading and siltation, low dissolved oxygen (DO) levels, and high conductivity (NCDENR, 2012b). In addition, the North Carolina Department of Water Resources (NCDWR) may perform biological monitoring at other locations periodically, within the Town's study area on the basin rotation schedule.

No benthic macroinvertebrate community sampling locations are present within the Cape Fear River basin in Wake County (NCDENR, 2004). Also, there are no fish community sampling sites in the study area (NCDEQ, 2023).

Table 4-5. Watersheds in the study area.

Watershed	14-Digit Hydrologic Unit Code	EMC Water Quality Classification	Watershed Description
Neuse River Basin			
Crabtree Creek	03020201080010	C; NSW	Tributaries include Coles Branch, Richlands Creek, Reedy Creek, Stirrup Iron Creek, and Brier Creek
Cape Fear River Basin			
Kit Creek	03030002060140	WS-V; NSW	Long Branch meets with Kit Creek, which eventually discharges to Jordan Lake

4.10.1.1 303 (d) Listed Streams

Section 303(d) of the CWA requires that states develop a list of waters not meeting water quality standards or that have impaired uses. The State must prioritize these water bodies and prepare a management strategy or total maximum daily load (TMDL). Within the study area, Crabtree Creek is the only stream listed on the 303(d) list (Table 4-6; Figure 4-9). With impaired biological integrity, this stream has been listed since 1998. Potential issues also include chlorophyll-a and turbidity levels. Identified potential sources of impairment include urban runoff and storm sewers (NCDENR, 2012a).

Limited data exist to determine whether water quality in Crabtree Creek is improving, degrading, or stable. Data collected in Crabtree Creek downstream of the North Cary WRF indicate that the stream is stable. Benthic data collected in 2005 showed decreases from previous years in scores for ephemeroptera, plecoptera, and tricoptera (EPT), but the scores increased in 2010 (NCDENR, 2012b). Benthic samples have not been collected from the downstream portion

of Crabtree Creek since April 17, 2013. The 2013 samples resulted in a rating of poor (NCDWR, 2013).

Table 4-6. Study area water bodies included in the 2024 draft 303(d) list, IR Category 5.

Waterbody and AU Number	AU Number	Extent	Parameter	Year Listed
Neuse River Basin				
Crabtree Creek	27-33-(1)	From source to backwards of Crabtree Lake	Benthos (Nar, AL, FW)	1998



4.10.1.2 Wake County Watershed Assessment Summary

In an effort to characterize the health of its streams and watersheds, Wake County completed a watershed assessment in 2001 to assess the overall effects of land use changes on stream physical structure and aquatic communities. An update to this watershed assessment has not been undertaken since 2001.

In summary, three types of assessments were conducted in streams and watersheds county-wide:

- **Biological assessment** – Benthic organisms were collected and identified, providing an estimate of long-term effects of water quality on the aquatic community.
- **Habitat assessment** – The effects of land use changes on streams were assessed to help differentiate the impacts of water quality pollutants versus habitat degradation on the stream environment.
- **Stream geomorphology** – Characteristics, such as channel shape, channel slope, sediment load, and sediment size, were assessed to help determine stream bank erodibility and other potential areas of stream degradation.

This evaluation concluded that many of the streams within the County were degraded. Influencing factors include agricultural practices and urbanization, with the effects of urbanization on the biotic community structure more pronounced than agricultural effects. In general, these sites upstream of Crabtree Lake exhibit moderate to severe entrenchment. Crabtree Creek had a Fair bioclassification, while Stirrup Iron Creek had a Poor bioclassification based on very low macroinvertebrate diversity. Watershed classifications are in line with the majority of streams in the County.

4.10.2 Groundwater

The study area is within the Triassic Basin of the Piedmont region of North Carolina and is characterized by a thin regolith layer, which limits groundwater storage capacity. As a result, well yields tend to be low (around 5 to 25 gallons per minute[gpm]). Within the western portion of Wake County, where the study area is located, approximately 6% of precipitation reaches the groundwater for recharge, contributing approximately 35 to 55% of stream baseflow during normal precipitation years (CDM, 2003).

Groundwater within the study area is generally free of contaminants and is used as a source of drinking water by individuals and community well systems (CDM, 2003). Because of the prevalence of Triassic soils in the area, septic systems may not percolate well, and could provide a public health hazard if not properly designed, installed, and maintained.

Some residents within the study area currently obtain their water from wells and discharge waste to septic systems. These residents could request that the Town provide service when municipal water and sewer are available to them. New development will be served by current treatment facilities.

4.11 FOREST RESOURCES

This section further describes those lands within the vacant and open space land use categories that are forested. In addition to land use data provided by the Town, land cover data from by the North Carolina Gap Analysis Program (NCGAP) were also analyzed and are described below (NCGAP, 2006). The NCGAP land cover data are based on a land use analysis performed by U.S. Geological Survey (USGS), using 1992 satellite imagery. These data provide a better understanding of the types of forest resources present within the study area. Much of the land classified as vacant by the Town is currently forested.

The most dominant forest type within the study area is Piedmont/Mountains Dry-Mesic Oak and Hardwood Forest. These forests are primarily oak dominated forests with white oak (*Quercus alba*) often dominant. Habitats with drier conditions are dominated by southern red (*Q. falcata*), post (*Q. stella*), and chestnut oaks (*Q. prinus*). Sweetgum (*Liquidambar styraciflua*) and yellow poplar (*Liriodendron tulipifera*) are the other main canopy species. Sites with basic soils may also provide habitat for eastern red cedar (*Juniperus virginiana*).

Other natural communities in the study area include the Piedmont Dry-Mesic Pine Forests, which are dominated by loblolly pine (*Pinus taeda*), especially those that previously were cleared. Communities with drier xeric habitats tend to be dominated by Virginia pine (*P. virginiana*) or shortleaf pine (*P. echinata*). Also present in the study area are Dry-Mesic Oak and Pine Forests, which include loblolly pine with several oak species, such as white, post, and southern red oak.

Another common forest type includes the Coniferous Cultivated Pine Plantations (natural and planted), with dominant pine species including loblolly, slash (*P. elliottii*), and longleaf (*P. palustris*).

Because of the fragmented nature of forested parcels of land in the study area, smaller areas of forest are not suitable for continued silviculture use. However, forested areas being converted to other land uses do provide a one-time source of wood products.

In 2022 Wake County conducted a Tree Canopy Assessment (Figure 4-10). It found that Morrisville's canopy covers a total of 2,123 acres with 66.4% being deciduous, while 33.6% is coniferous. The canopy health was determined to be Good or Very Good for the majority of trees, however canopy cover has decreased by 22.7% between 2010 and 2020, equivalent to 623 acres (Wake County, 2023).

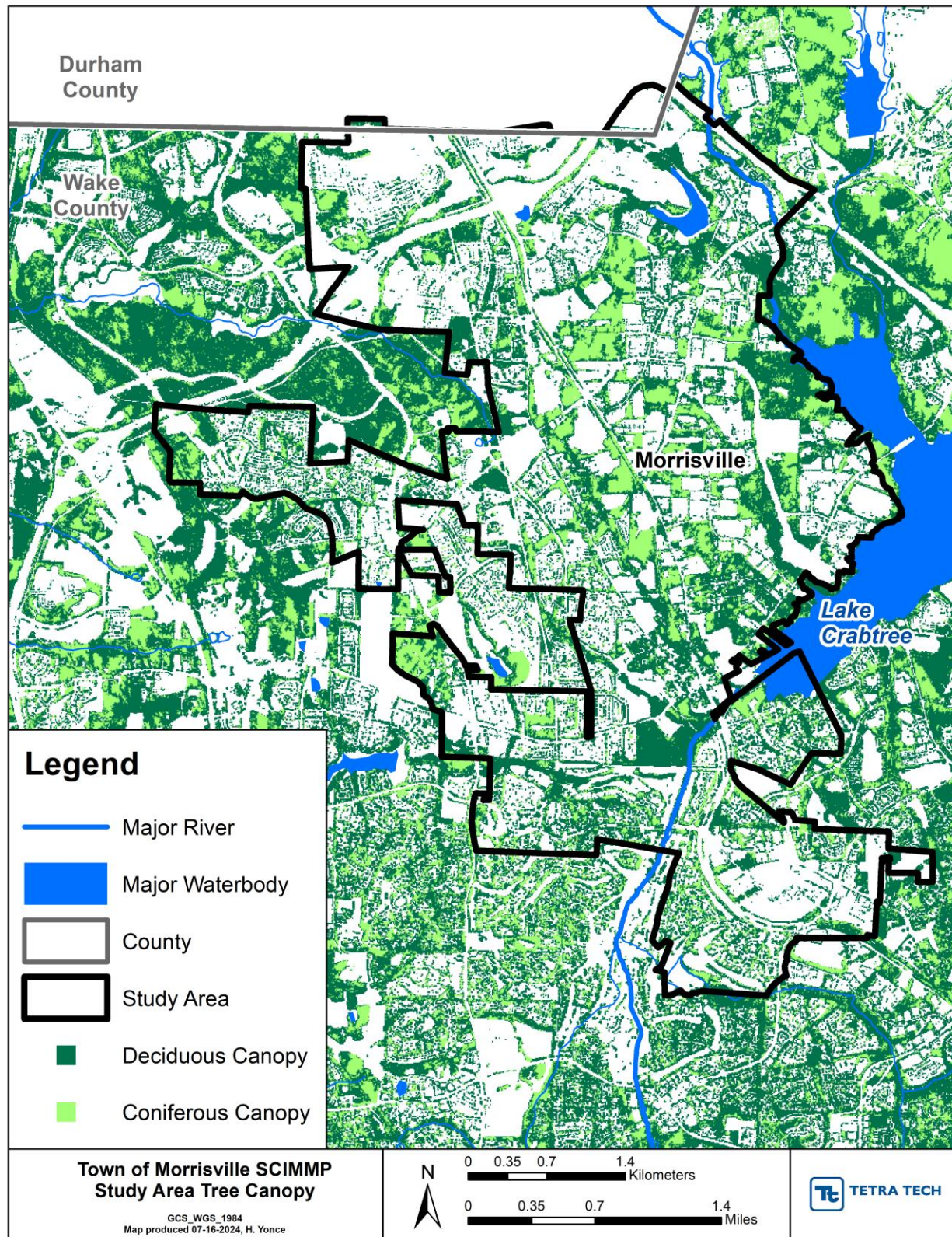


Figure 4-10. Wake County canopy cover for 2020 (Wake County, 2023).

4.12 SHELLFISH OR FISH AND THEIR HABITATS

Water resources within the study area provide aquatic habitat for various species of fishes and other aquatic organisms. These streams provide free-flowing, warm-water habitats with moderate gradient, generally alternating pools and riffle-runs, and substrates consisting mainly of rocks, gravel, sand, and mud. Many ponds also provide warm-water habitat within the study area. Recreational fishing opportunities are available. Typical fishes caught within the streams and ponds include catfish, suckers, bass, crappie, and sunfish.

As of 2024, there are no fish community sampling sites are maintained by NCDENR within in the study area (NCDENR, 2005 and 2012b). No additional benthic monitoring has been collected in Morrisville since 2013 based on the NC DWR Biological Assessment Branch website. The sampling site locations in the study area are presented in Figure 4-11.

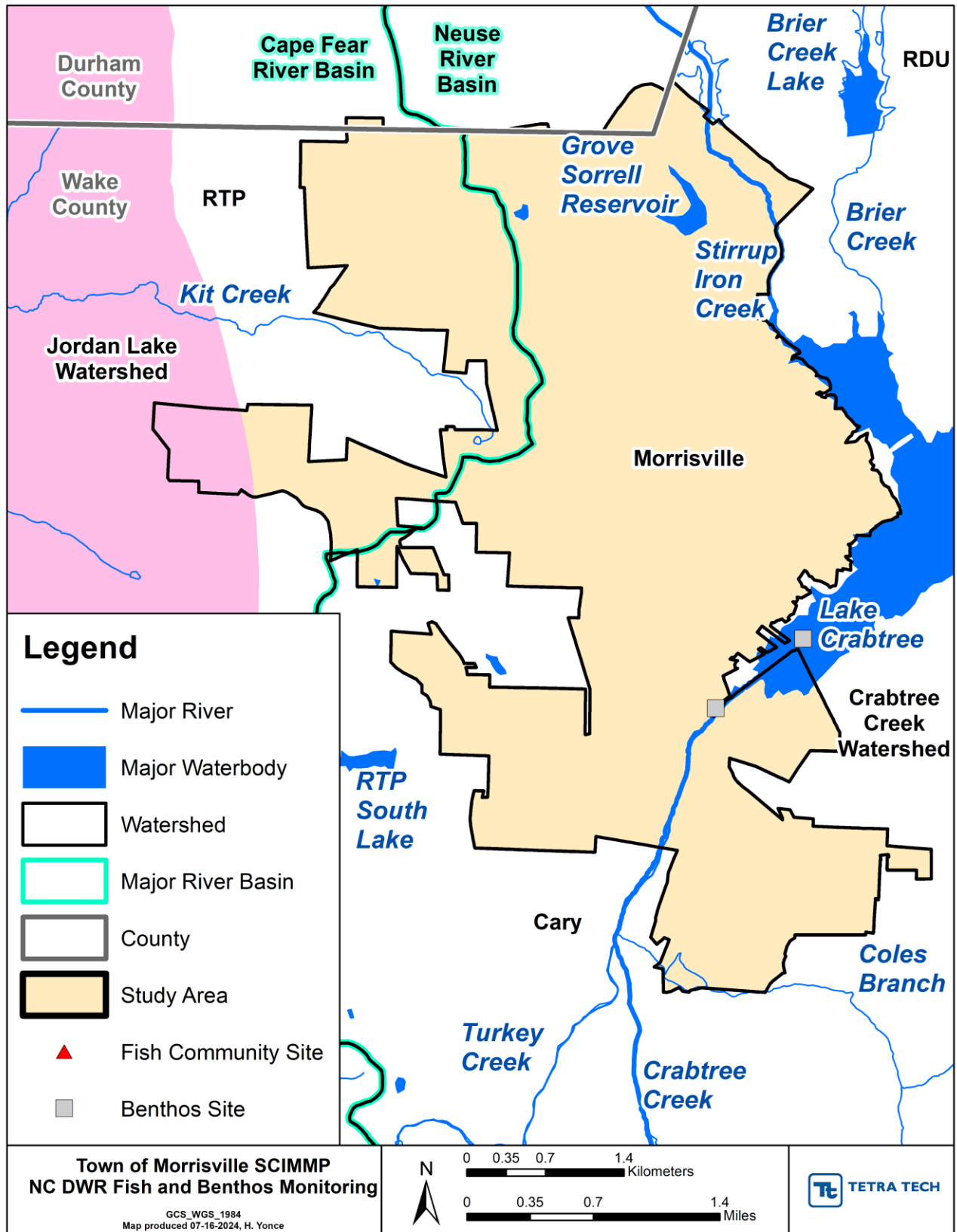


Figure 4-11. Benthic macroinvertebrate and fish community monitoring in the vicinity of the study area.

4.13 WILDLIFE AND NATURAL VEGETATION

Upland wildlife communities are home to Virginia opossum (*Didelphis virginiana*), raccoon (*Procyon lotor*), eastern cottontail (*Sylvilagus floridanus*), gray squirrel (*Sciurus carolinensis*), red (*Vulpes vulpes*) and gray foxes (*Urocyon cinereoargenteus*), and white-tailed deer (*Odocoileus virginianus*), eastern mole (*Scalopus aquaticus*), and several species of shrews and mice.

Amphibians and reptiles are abundant and diverse. Frogs, turtles, and water snakes inhabit wetlands and the perimeters of ponds and streams.

Bird life in the study area is typical of the Carolina Piedmont. The Northern cardinal (*Cardinalis cardinalis*), American robin (*Turdus migratorius*), Carolina chickadee (*Poecile carolinensis*), Eastern bluebird (*Sialia sialis*), Eastern towhee (*Pipilo erythrophthalmus*), various sparrow and warbler species, and other songbirds make their homes in the backyard habitats and forests of the area. Hawks, such as the red-tailed hawk (*Buteo jamaicensis*), owls, and vultures, are predator and scavenger species known to inhabit the area. The open waters of Harris Lake and the many ponds in the study area attract the Bald eagle (*Haliaeetus leucocephalus*) and a variety of waterfowl, including migratory species. Mallards, wood ducks, teal, and other ducks, as well as geese, may be seen during certain seasons. Wading birds, including great blue heron (*Ardea herodias*) and green heron (*Butorides virescens*), may be encountered along lake shallows.

Following is a discussion of the rare wildlife and wildlife habitats found within the study area. Forested areas and habitats were discussed in Section 4.11.

4.13.1 Rare, Threatened, or Endangered Species

Specific regulations exist at the state and federal levels to protect endangered and threatened species and their habitats from impacts due to public or private projects and land-disturbing activities. The primary law that protects sensitive wildlife species is the federal Endangered Species Act of 1973 (ESA).

Information obtained from the North Carolina Natural Heritage Program's (NHP) Natural Heritage Element Occurrence (NHEO) and significant natural heritage area (SNHA) databases were analyzed to identify locations of rare and endangered species populations and occurrences of exemplary or unique natural ecosystems (terrestrial and aquatic) and special wildlife habitats in the Study Area. Distribution of these areas and occurrences within the Study Area as well as detailed descriptions of all species can be found on the data website for the Natural Heritage Program (<https://www.ncnhp.org/data>).

As documented by the US Fish and Wildlife Service (updated 03/01/2024), ten species are federally listed as part of the “endangered species, threatened species, federal species of concern, and candidate species” in the Study Area; of these, six are listed as “at risk species”, and five species are listed as “endangered”. There are 163 state-listed species identified by the NHP to have current or historic populations within Wake County. A condensed list of federally listed species is provided below (Table 4-7), the full list can be found in Appendix D. Appendix D includes records for rare species, important natural communities, natural areas, and conservation/managed areas within

Wake County provided by the NHP. Table 4-7. Federally listed species in Wake County (some observed within the study area), abridged from Table E-2 (NCNHP, updated 05/08/2024).

Scientific Name	Common Name	Observed in Study Area	EPA Listing Status	Group	Recovery Plan Status
<i>Necturus lewisi</i>	Neuse River waterdog	-	Threatened	Amphibians	Recovery Plan Implementation
<i>Haliaeetus leucocephalus</i>	Bald Eagle	Yes	Protected	Birds	Bald and Golden Eagle Protection Act
<i>Picoides borealis</i>	Red-cockaded woodpecker	-	Endangered	Birds	Recovery Plan Implementation
<i>Alasmodonta heterodon</i>	Dwarf wedgemussel	-	Endangered	Clams	Recovery Plan Implementation
<i>Elliptio lanceolata</i>	Yellow lance	-	Threatened	Clams	Recovery Plan Implementation
<i>Fusconaia masoni</i>	Atlantic pigtoe	-	Threatened	Clams	Recovery Plan Implementation
<i>Lasmigona subviridis</i>	Green floater	Yes	Proposed Threatened	Clams	-
<i>Notropis mekistocholas</i>	Cape Fear shiner	-	Endangered	Fishes	Recovery Plan Implementation
<i>Noturus furiosus</i>	Carolina madtom	-	Endangered	Fishes	Recovery Plan Implementation
<i>Echinacea laevigata</i>	Smooth coneflower	-	Threatened	Flowering Plants	Recovery Plan Implementation
<i>Lysimachia asperulaefolia</i>	Rough-leaved loosestrife	-	Endangered	Flowering Plants	Recovery Plan Implementation
<i>Ptilimnium nodosum</i>	Harperella	-	Endangered	Flowering Plants	Recovery Plan Implementation
<i>Rhus michauxii</i>	Michaux's sumac	-	Endangered	Flowering Plants	Recovery Plan Implementation
<i>Danaus plexippus</i>	Monarch butterfly	-	Candidate	Insects	-
<i>Myotis lucifugus</i>	Little brown bat	-	Under Review	Mammals	-
<i>Perimyotis subflavus</i>	Tricolored bat	Yes	Proposed Endangered	Mammals	-
<i>Alligator mississippiensis</i>	American alligator	-	Similarity of Appearance (Threatened)	Reptiles	-

The NHEO database includes both state and federally listed species and populations, as well as natural communities. Appendix D includes a complete list of species occurrences from the NHEO database within Wake County as well as within the study area. Other sources of information regarding the presence of species or habitat include special surveys and the NCWRC.

According to NCWRC, the Crabtree Creek watershed provides suitable habitat for many State-listed mussel species, including the creeper (*Strophitus undulatus*), triangle floater (*Alasmodonta*

undulata), and notched rainbow (*Villosa constricta*) mussel species (NCWRC, 2014). However, there are no rare mussel species in the study area (NCNHP, 2024).

4.13.2 Significant Natural Heritage Areas

Many of the listed species within Wake County and the Study area are found within SNHAs. These state-designated areas are sites with special biodiversity significance and may include habitat for rare species, exemplary or unique natural communities, important animal assemblages, or other important ecological features. The SNHA database identifies exemplary or unique natural ecosystems (terrestrial and aquatic). There are no SNHAs within the Town's study area (NCNHP, 2024).

4.13.3 Natural Vegetation

Within the study area, natural vegetation is typical of piedmont upland and bottomland communities. However, smaller unique ecosystems are also present. The following sections include descriptions of natural communities, from Schafale (2012), which are present within or near the study area, according to the NHEO database (NCNHP, 2024).

Piedmont/Coastal Plain Heath Bluff

Located along Crabtree Creek in Umstead State Park bordering the Study area, this community type is characterized as a rare shrub-dominated upland, which is situated on steep north-facing slopes or bluffs in dry, acidic, rocky soils. The dry soils combined with the cool, moist microclimate found on north slopes above a floodplain create the conditions necessary for the heaths to exist. Rhododendrons (*Rhododendron spp.*) and mountain laurel (*Kalmia latifolia*) are the dominant shrubs.

Piedmont/Coastal Plain Acidic Cliff

Cliff communities are distinguished from other communities by their lack of trees and shrubs and are known for their moss-covered or bare substrates on rocky slopes. Cliff communities can have highly variable vegetation regimens, contingent on variables such as elevation, aspect (north- or south-facing), slope, and soil depth. An example of this community type is Hemlock Bluffs SNHA on Swift Creek, where the microclimate along a north-facing cliff supports a relict population of eastern hemlock and a population of sweet pinesap (*Monotropsis odorata*).

Piedmont Monadnock Forest

The presence of monadnocks, or rocky masses like quartzite that resist erosion, is a characteristic feature of the unusual topography where this forest type is found. The exposed, elevated positions of monadnocks make their forests susceptible to lightning and wind disturbance. The topography and substrate create an environment of dry, acidic soils with low plant diversity. It is dominated by chestnut oak (*Quercus montana*), with pines such as shortleaf (*Pinus echinata*) and Virginia (*P. virginiana*) filling in the potentially closed canopy. This specialized forest type can be found at Hemlock Bluffs SNHA.

Piedmont Bottomland Forest (High Subtype)

These sites occur on terraces, on the higher parts of depositional ridge and swale systems, and on some wide flat floodplains. Natural vegetation is a mix of bottomland oaks and poplars. The

High Subtype is distinguished from the two low subtypes by having an appreciable component of upland oaks and hickories. An example of this forest type can be found at Middle Creek Bluffs.

Piedmont/Low Mountain Alluvial Forest

Piedmont/Low Mountain Alluvial Forests are located in river and stream floodplains where flooding deposits nutrient-laden sediment. Alluvial species such as sycamore (*Platanus occidentalis*), river birch (*Betula nigra*), and box elder (*Acer negundo*), along with a lack of defined depositional fluvial landforms, distinguish this natural community type. This forest type can be found along Swift and Middle Creeks.

Mesic Mixed Hardwood Forest (Piedmont Subtype)

The upland Mesic Mixed Hardwood Forest community is usually found on lower, steep, and/or north-facing slopes with well-drained acidic soils, such as the Middle Creek Bluffs. It is categorized by its mesophytic tree canopy, which includes beech (*Fagus grandifolia*), Southern red oak (*Quercus falcata*), and tulip poplar (*Liriodendron tulipifera*). The absence of bottomland trees and base-loving plants separate this forest from other common community types.

Basic Mesic Forest (Piedmont Subtype)

Similar to the Mesic Mixed Hardwood Forest, this community is found on lower, north-facing slopes, but differs by having higher pH, or basic, soil types. The dominant canopy is characterized by beech, red oak, and tulip poplar, with the potential for some bottomland species such as black walnut (*Juglans nigra*) and southern sugar maple (*Acer floridanum*). The overall diversity of this community, with mesophytic, bottomland, and base-loving vegetation, sets it apart from other forest types.

Piedmont/Mountain Semipermanent Impoundment

This community type is best described as either an old, undisturbed, man-made or beaver pond in a floodplain such as that found on Middle Creek and others within the Triassic basin of the Piedmont. Being in a floodplain, these impoundments are subject to sudden flooding and draining, sedimentation, and other damaging events. Pond depth determines the vegetation type; in shallow areas, flood-tolerant trees such as red maple and willow oak (*Q. phellos*) populate the ponds. Deeper ponds support small duckweed (*Lemna perpusilla*) and green arrow-*arum* (*Peltandra virginica*). Wetland shrubs and herbs fill out the pond fringe.

4.14 INTRODUCTION OF TOXIC SUBSTANCES

Toxic substances and their cleanup are regulated by the Resource Conservation and Recovery Act (RCRA) and the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). The goals of these programs are to eliminate or reduce toxic waste; clean up waste that has been leaked, spilled, or improperly disposed; and protect people from harmful waste.

One Federal Superfund cleanup site is present within the study area. Koppers Company, Inc., operated a wood treatment process that ceased operation in 1975 (USEPA, 2014). Pentachlorophenol and isopropyl ether were used in the process. Wastewater lagoons were present at the site, leading to groundwater, surface water, and soil contamination. A

groundwater treatment system is currently operating and will continue to do so until cleanup standards are met. Surface water and soil cleanup has been completed. This site is important because groundwater in the area was a source of drinking water for approximately 2,200 residents. In 1989, public water supply lines were installed in the area and use of groundwater as a public drinking water supply was halted. The most recent Five Year Review was published in September 2022. The remedy at the Site currently protects human health and the environment because contaminated soil and surface water have been addressed and there are no complete exposure pathways for contaminated groundwater. However, in order for the remedy to be protective in the long term, the following actions need to be taken to ensure long-term protectiveness:

- Implement groundwater and land use institutional controls. Record the need for land use restrictions in a decision document.
- Determine if dioxin soil concentrations across the Site are protective for industrial land use. Additional sampling might be needed in areas where sampling has not occurred or where historical data are not available.
- Address unacceptable dioxin risk in soil in the former lagoon and process area. Record the selection action in a decision document.
- Additional sampling might be needed in areas where sampling has not occurred or where historical data are not available.

The site's ground water pump-and-treat system continues to operate. EPA plans to issue an ESD to change cleanup activities for ground water contamination and to explain the approach used to address additional source contamination (EPA, 2024).

A potential transportation-related source of toxic substances is industrial freight and/or chemicals carried on the NCR lines through town.

The NC Superfund Section identifies nine areas of interest within one mile of the study area (Figure 4-12). Additional details for all areas of interest are included in Appendix A.

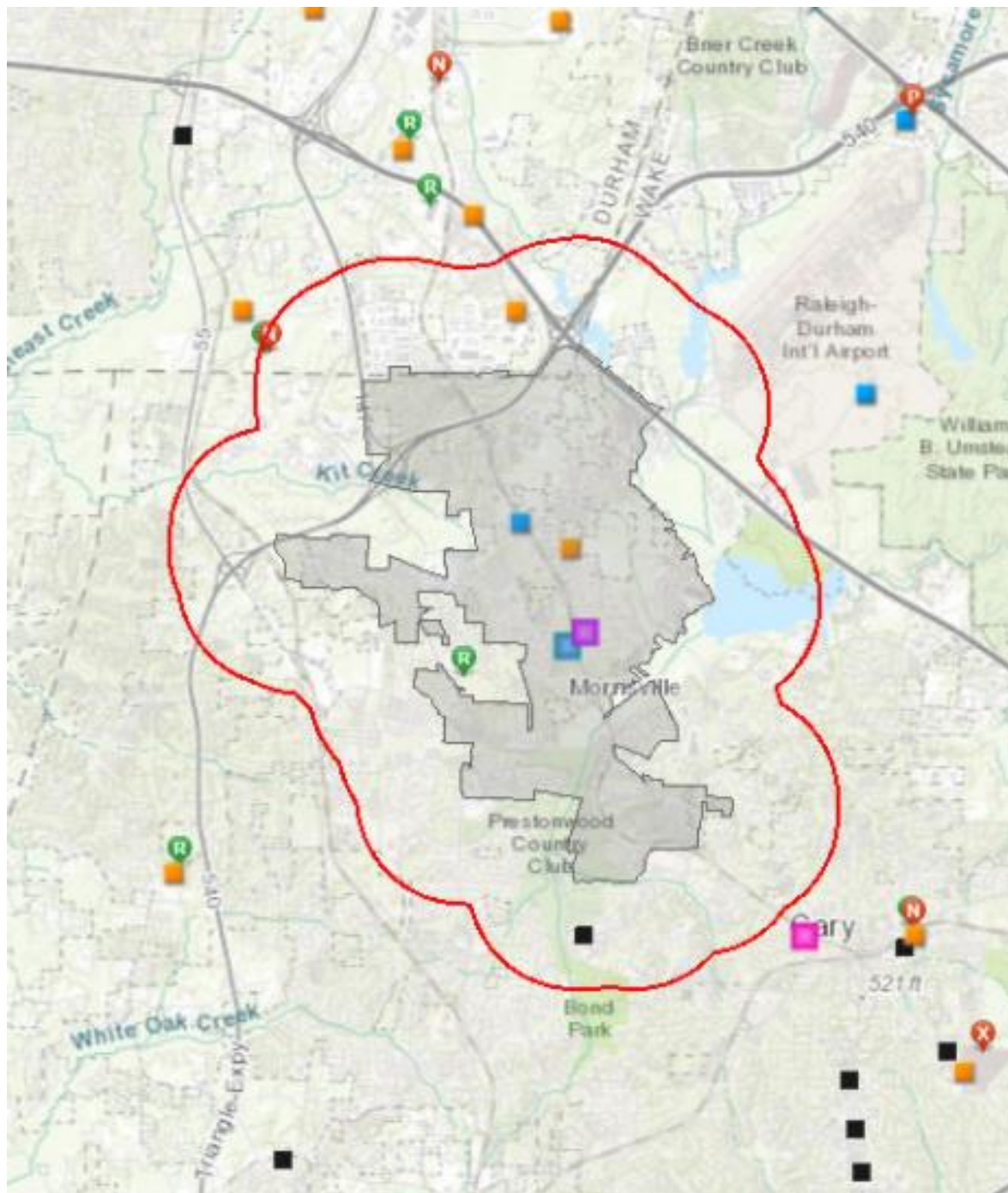


Figure 4-12. Superfund Section areas of interest within the study area and surrounding region. The red border represents a one-mile buffer around the Town.

Other potential sources of toxic substances present in the study area are common landscape applications, such as fertilizers, herbicides, and pesticides. Other common toxic substances, such as glues, solvents, and paints are employed in the construction of homes and commercial buildings. Typical household hazardous wastes include oils, cleaners, solvents, paints, herbicides, and fertilizers.

On the topic of toxic and harmful substances, it is relevant to include information about the Town's existing waste management programming. The Town offers services a variety of solid waste management, primarily contracted out to GFL Environmental which has proven to be more economical than providing services in-house. Household garbage and recycling are collected curbside weekly. Yard waste is collected twice monthly, and GFL also collects bagged leaves and Christmas trees. Bulky item pick-up occurs twice annually, with additional white goods collection every three months. Morrisville directs its citizens to utilize Wake County facilities for any drop-off needs of solid waste and/or household hazardous waste materials. Morrisville allows its citizens to conduct backyard composting through the Wake County Compost Bin Program.

5.0 DESCRIPTION OF SECONDARY AND CUMULATIVE IMPACTS RELATED TO PROJECTED GROWTH IN THE STUDY AREA

This section outlines the secondary and cumulative impact (SCI) associated with the infrastructure needed to accommodate the growth in the Town. The area's transportation and utility infrastructure are being expanded and strengthened in response to its economic growth. In addition, the Environmental Management Commission (EMC) included a condition in the Town's IBT certificate that required the return of wastewater effluent to the Cape Fear River Basin by January 1, 2011. The WWRWRF became operational in 2014 and discharges into the Cape Fear River, meeting this condition.

Analysis of impacts includes all proposed water, wastewater, and local transportation infrastructure planned for full build-out. These proposed plans are based on future land use conditions as identified in the Connect 2050 project; the Research Triangle Region's Metropolitan Transportation Plan and the Town of Cary's developed master plans for providing water and sewer services to its residents in a manner that will protect the environment. Connect 2050 was conducted by the Central Pines Regional Council Triangle (formerly Triangle J Council of Governments). Overall, the Town of Morrisville is managing growth in a sustainable way.

Growth in the Town will be facilitated by transportation facilities, including the NCDOT development of NC-540, which improves access to RTP and other communities within Wake County. The section of this roadway that extends from I-40 to NC Highway 55 in the Town was completed in 2012. NCDOT has addressed direct and secondary and cumulative impacts of this roadway project. In general, the environmental documents indicate that the roadway and associated interchanges will not induce growth but may change the location of growth. More intensive development is anticipated around the interchanges, but local governments already anticipate higher rates of growth in the project area of NC-540 (Arcadis, 2003; HNTB, 2003). NCDOT is widening other roads to help accommodate future growth.

All activities completed by the RDU airport are under the jurisdiction of the Federal Aviation Administration (FAA) and are subject to the National Environmental Policy Act (NEPA). All projects planned at the airport must analyze the secondary impacts of each impact category, such as changes in population movement, growth, public service demands, or other changes in business and economic activity resulting from shifts in noise, land use, or direct social impacts of airport development. In 2017 RDU received approval from the FAA for its 2040 Master Plan guiding several major construction projects. Major ongoing projects include replacement of the primary runway, which is anticipated to open in 2027, and an expansion of Terminal 2.

Development continues in the Town; build-out of most vacant land is expected before 2045. The 2015 Special Census revealed that the Town is growing faster than the Town's projections. As the Town nears build-out, redevelopment is expected to increase. To address continued growth and meet Town priorities for open space and reduction of traffic congestion, the Town regularly updates master plans.

The discussion provided in the following sections reflects a general analysis of the potential for development to affect specific resources in the study area, given current trends, literature

records, and input from state agencies. Agency correspondence is included in Appendix A. The Comprehensive Transportation Plan and the Parks and Recreation Master Plan have been updated in 2021 and are included in the appendices. Mitigation efforts to limit possible SCI are discussed in Sections 6-8. As described in Section 1, direct impacts will be addressed in separate environmental documents that are prepared for individual infrastructure projects.

5.1 TOPOGRAPHY AND FLOODPLAINS

Clearing and grading of undeveloped lands change a site's topography. The Town reviews erosion and sediment control plans to minimize grading in areas of steep slopes.

If development within a floodplain occurs, the function of that floodplain is reduced. Water storage capacity is lessened by any structure constructed in a floodplain. Floodplains, if left undisturbed, provide other functions including wildlife habitat, surface water filtration, infiltration, and corridors for wildlife movement.

Within the Town's urban growth area, impacts to floodplains are limited due to the Town's floodplain protection and riparian buffer ordinances described in Section 6.0. In areas outside the Town's current jurisdiction but within the study area, impacts to floodplains also are limited by Wake County's floodplain protection ordinances which are also covered in Section 6.0.

5.2 SOILS

As land is developed, clearing and grading result in soil disturbance. When heavy equipment is used on development sites, soils become compacted. During grading, soil is moved; in some areas, it is removed, while in other areas it is replaced. Thus, the locations of soil types may change. During clearing and grading, some soils are eroded, but the resulting impacts can be minimized by following an approved site plan in accordance with the Town's ordinances described in Section 8.

5.3 LAND USE

Future land use conditions across the Town of Morrisville's study area were developed using the existing generalized land use (see Section 4.0) in tandem with on a generalized regional level using the CAMPO Connect 2050 land use data. Future land use as described within the parcel database generated by the Connect 2050 project (Town of Morrisville, 2018a) was used in estimating the development that could occur within the Study Area between 2024 and 2045. This does not mean that all land in a given area will be developed; however, it does provide the total planned land use changes. Figure 5-1 illustrates general land use categories within the study area. Table 5-1 provides details on the area (square miles) within each general land use category.

The Town adopted a new Land Use Plan on February 23, 2021. A land use plan is a guidance document that illustrates the land use the Town would like to see in a given area if development occurs. This does not mean that all land in a given area will be developed. This plan establishes preferred uses and development of land in Morrisville over the next 10 to 20 years and will be implemented over the next several years. The Land Use Plan is a

portion of the Town's Comprehensive Plan, which also includes: The Connect Morrisville Strategic Plan, the Parks and Recreation Master Plan, the Comprehensive Transportation Plan, the Active Kids Strategic Plan, and the Telecommunications Facility Master Plan.

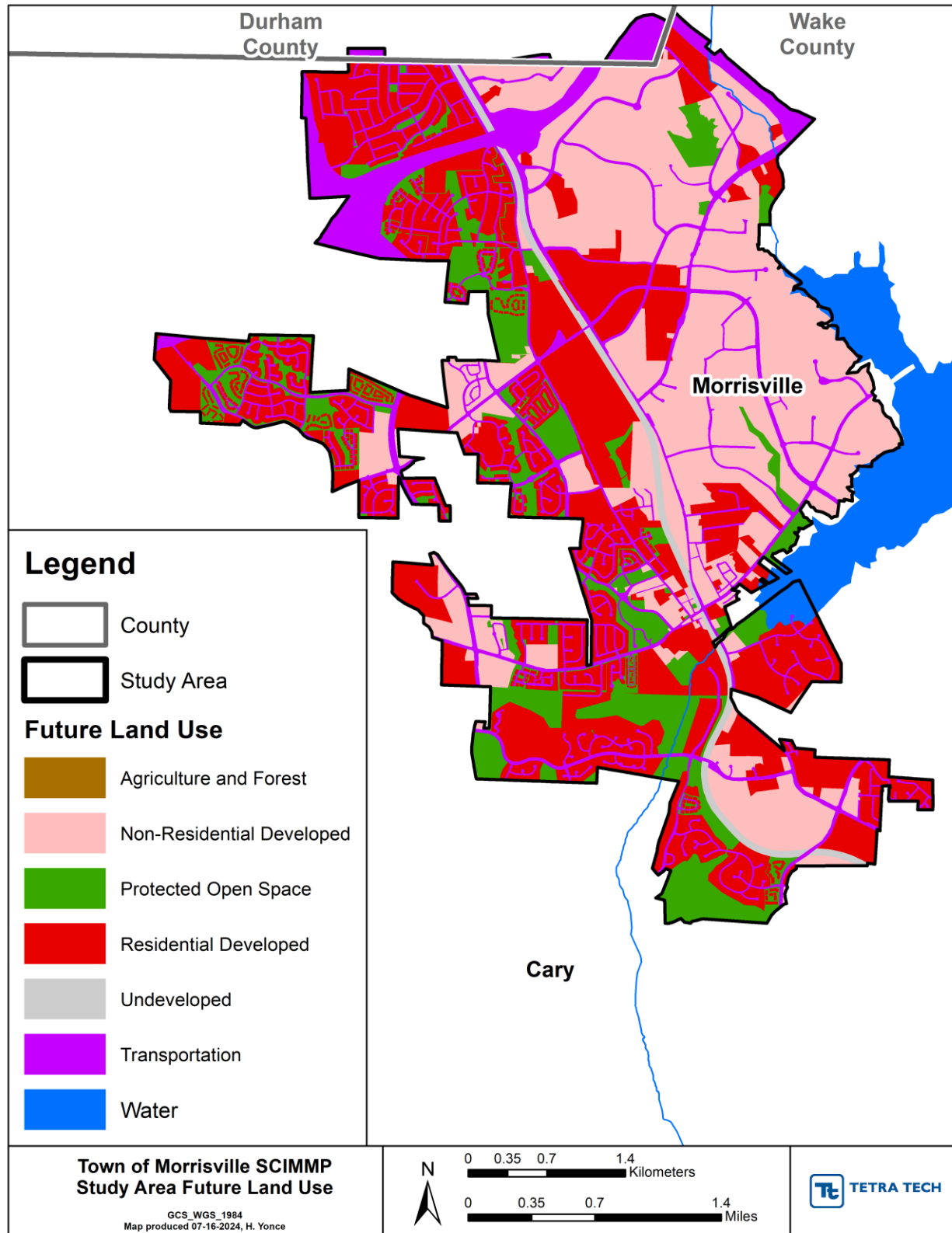


Figure 5-1. Study area generalized future land use map.

Table 5-1. Study area generalized future land use.

Land Use Type ¹	Existing Area (square miles)	Existing Percent of Study Area	Future Area (square miles)	Future Percent of Study Area
Residential Developed ¹	3.3	33.5%	3.5	35.1%
Non-Residential Developed ¹	2.9	28.9%	3.4	34.4%
Protected Open Space ¹	0.5	4.5%	1.1	10.9%
Open Water ²	0.1	1.2%	0.1	1.2%
Transportation ³	1.6	16.6%	1.6	16.6%
Agriculture and Forest ¹	<0.1	<1%	<0.1	<1%
Undeveloped ¹	1.5	15.0%	0.2	1.9%
Total	9.9	100%	9.9	100%

Sources:

1. 2024 parcel shapefiles from NC One Map were assigned generalized land use categories based on the CAMPO Connect 2050 land use build out scenario.
2. Parcels were assigned current land use based on Wake County "open space" GIS dataset.
3. Water features from the Wake County "water bodies" dataset was overlaid across all parcels.
4. Transportation corridors were identified as the negative space between all parcel boundaries.

Predicted future land use as generalized in Figure 5-1 and Table 5-1 indicate a future build-out condition from 2024 to 2045. By 2045, population and growth models indicate that residential development in Morrisville will increase by 1%, and non-residential development will increase by 5%. Undeveloped land will decrease by 13%. Agricultural lands are predicted to be negligible at less than 1% each of the study area. Protected open space is expected to grow by 6% due to dedicated plans for preservation both regionally and locally. Note that there is no calculated difference between transportation and water land use areas between the existing and future land conditions, but that is because the sources for those datasets were based on existing conditions. It is likely however, that the footprint of transportation will increase, and the footprint of open water is likely to stay the same.

The current land use patterns and trends are anticipated to be consistent. The most heavily urbanized areas in the Town will continue to be in the vicinity of RTP and other Destination Centers centered around major intersections throughout the Town, and adjacent to the major highway corridors.

Conversion of vacant land to low-density residential land is likely to occur in the study area. Undeveloped land may be forested or cleared. The most heavily urbanized areas lie along the NC-54 corridor. Commercial and industrial growth is planned for the area between NC-54 and I-40, while low- and medium- density residential growth is planned for the western portion of the study area closer to RTP, as described in the Town's 2045 Land Use Plan. This will also include growth facilitated by NC-540.

As development occurs and land uses change, open space will be preserved by a number of measures. A public open space requirement is part of the Town's UDO and is described in Section 8.0. Open spaces, such as forests, will potentially be lost to development; these impacts will be minimized by the development requirements in the UDO. Open spaces still may become fragmented, except along stream channels where riparian buffers and floodplains will serve as habitat corridors. The Town has mechanisms in place to protect open space through the development process, as presented in Section 8. Stream buffers, required open space in

subdivisions along with clustered development, landscape buffers between different land uses, park lands, and greenways will limit the impacts to open space. For these reasons, Table 5-1 underestimates the amount of open space under future conditions.

As the land use within the study area changes, the amount of impervious surface will increase, which also impacts surface and groundwater flow, as described in Section 5.10. The increase in impervious area between existing land use and future land use is indicative of the Town's commitment to concentrate growth, thus reducing sprawl development.

The most recent future land use map developed by the Town as part of its 2021 Land Use Plan is also included (Figure 5-2).

Future Land Use Map

The Future Land Use Map establishes the foundation for the use and development of land within the Town of Morrisville over the next 10 to 20 years. All land parcels within the Town's planning jurisdiction are assigned one of 13 future land use designations, each defining preferred uses, a desired density and character of development. Elements such as future streets, landscape buffers, private open spaces, tree preservation areas and other important considerations, though not illustrated here, are discussed in this and subsequent chapters.

- | | |
|--|--|
| <p>Low Density Residential
Low Density Residential includes neighborhoods of single-family detached homes, typically 4.5 or less dwelling units per acre. These areas are characterized by large lots and the lowest residential density in Morrisville.</p> <p>Medium Density Residential
Medium Density Residential includes neighborhoods of single-family attached and detached homes, typically between 4.5 and 7.5 dwelling units per acre. These areas are characterized by medium-sized lots and a moderate density of development.</p> <p>High Density Residential
High Density Residential includes neighborhoods of single-family attached and detached homes as well as multi-family developments, typically 7.5 or greater dwelling units per acre. These areas are characterized by small lots and the highest residential density in Morrisville.</p> <p>Neighborhood Activity Center
Neighborhood Activity Center features a mix of uses that provide convenient, walkable retail and service options for adjacent neighborhoods. These areas include commercial, residential, and office uses that are compatible with the scale and intensity of adjacent areas.</p> <p>Business Activity Center
Business Activity Center features a mix of uses that provide convenient, walkable retail and service options for adjacent offices and employment centers. These areas include concentrations of large regional employers, commercial, entertainment, and office uses in mixed-use centers that are compatible with the scale and intensity of adjacent areas.</p> <p>Regional Activity Center
Regional Activity Center features a mix of uses that create regional destinations, typically located at key intersections along major transportation corridors. These areas include concentrations of large regional employers, commercial, entertainment, and high density residential along with education and healthcare facilities.</p> | <p>General Commercial
General Commercial includes commercial centers that provide a variety of goods and services to meet local and regional needs, typically located along primary transportation corridors.</p> <p>Town Center
Town Center features a vibrant mix of uses near Morrisville's historic crossroads that create a destination and focal point for the community. This includes a dense, urban concentration of uses, including residential, commercial, office, entertainment, cultural, and institutional uses with a focus on mixed-use development.</p> <p>Office
Office includes a broad spectrum of local and regional employment centers in high quality and desirable environments.</p> <p>Industrial
Industrial includes light- and heavy-industrial uses that contribute to employment opportunities and Morrisville's tax base. Location, visibility, and compatibility with adjacent areas are critical to industrial uses.</p> <p>Institutional
Institutional accommodates public and semi-public activities such as government buildings, schools, and places of worship.</p> <p>Parks & Open Space
Parks, Greenways, and Open Space includes all parcels of land exclusively used for outdoor green spaces, recreational areas, and environmental amenities. These provide recreational opportunities to residents and enhance the Town's character. This category does not include private parks and open spaces that are incorporated as supporting uses on larger properties or developments or greenways.</p> <p>Transit Oriented Development
Transit Oriented Development features a critical mass of development and mix of uses necessary to support nearby transit options. Uses include commercial, residential, institutional, and employment concentrated in pedestrian-scaled environments, with a focus on mixed-use development.</p> |
|--|--|

Morrisville Land Use Plan | Chapter 4 - Future Land Use

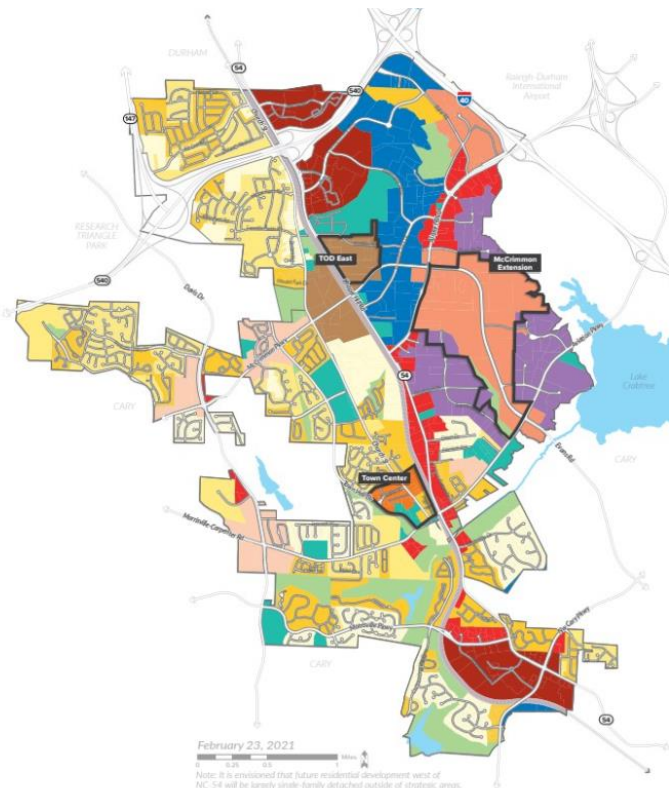


Figure 5-2. Future land use map developed by Morrisville (Morrisville Land Use Plan, 2021).

5.4 WETLANDS

Wetlands in the study area are located primarily within the riparian zones or floodplains of streams and lakes. Wetland losses may occur as land use changes occur and population density increases in the study area. Wetland loss can result in habitat loss, habitat fragmentation, and reduction in species diversity. As discussed in Section 4.0 and Section 8.0, the majority of wetlands will be protected by existing floodplain regulations. Other programs that protect wetlands are described in Sections 6-8.

Wetland functions also may be decreased if pollutant impacts occur. For example, sediment loading from stormwater runoff may affect hydrology and vegetation within a wetland.

Nutrient enrichment and other surface water pollutants may affect amphibians and aquatic organisms inhabiting a wetland. In the long term, overall quality and total acreage of wetlands may be decreased by SCI in upland portions of the study area. However, these impacts will be minimized by stream buffers, floodplain protection, and other development controls.

5.5 PRIME OR UNIQUE AGRICULTURAL LAND

As land is developed, prime farmland soils will be disturbed. However, recent growth has already converted many acres of agriculture and prime farmland soils within the study area to other land uses, and no active agriculture lands are present in the study area. This conversion and disturbance of soils would likely continue, even without the proposed infrastructure, because of the proximity to RTP and other development in the area, while the pattern of growth may be different than predicted and the density may be lower, prime farmland soils would still likely be converted and/or disturbed.

5.6 PUBLIC LANDS AND SCENIC, RECREATIONAL, AND STATE NATURAL AREAS

Growth in the study area should have limited impacts on scenic and recreational areas that are currently part of the park systems. These areas may become more valued by the community as forested areas are converted to other land uses. The Town recognizes the value of these spaces and has a plan of action to protect natural resources and open space, documented in the UDO and Parks and Recreation Master Plan. These plans are further discussed in Section 8.0. With the continued implementation of the Town's plans, scenic areas, open space, and parks will be a high priority for the Town and will provide mitigation for losses of open space as the Town grows.

5.7 AREAS OF ARCHAEOLOGICAL OR HISTORICAL VALUE

Historical areas may be impacted directly by future projects, but indirect impacts are unlikely. Direct impacts to historic resources will be assessed individually during project planning processes. Assessing historical properties is beyond the scope of this document, because this document focuses on SCI.

Some loss of historic resources could inadvertently occur with development. For example, an unknown cemetery could be destroyed. Where historic resources are known, they should be protected over time. The Town has three properties on the NRHP: the Morrisville Christian Church, the Williamson Page house, and the James M. Pugh House. Some structural damage could occur to historical structures, if they exist near future developments, as a result of vibrations from increased traffic or acid rain that may occur from increased emissions to the atmosphere. The Town has proactively relocated the James M. Pugh House, as well as two historic tobacco barns to prevent potential impact. The Town's Historic Crossroads Village zoning district as well as the Town Center Plan encourage preservation of historic resources. It is likely that few SCI will occur to cultural and historical resources.

Since archaeological resources are not readily visible, it is more likely that impacts would occur to them than at historic structures. The Town of Morrisville would consult with the Office of State Archaeology on any project that would require a State Environmental Policy Act (SEPA) document, so they could avoid archaeological sites. Local governments would also rely on their plan review processes to minimize impacts from development projects; they could require a development project to avoid those areas when the local government is aware of the location of these resources.

5.8 AIR QUALITY

The cumulative impacts of a growing population may impact air quality in the study area. As more vehicles travel within the study area, levels of emitted air pollution may increase. Even without the proposed infrastructure, population within the study area is likely to increase and contribute to higher levels of air pollution. While industrial emissions also may increase in the study area, vehicles are likely to remain the primary source of air pollution. Without improved roadways, traffic problems are likely to increase, which would exacerbate existing air quality problems. Smog, ozone, and carbon monoxide are the pollutants of concern within the study area, and they are monitored.

As a result of air pollution, the area may see an increase in the number of Ozone Action Days, which are tracked as a measure of air quality by the USEPA. Increased ozone levels can impact human health; on Ozone Action Days, outdoor activity should be limited for health reasons and at-risk populations should remain inside. Smog can decrease visibility, and increased nitrogen and sulfur emissions can lead to acid rain.

To address the impacts of growth on air quality, the Town is actively pursuing alternative modes of transportation and has developed a Transportation Plan and Transit-Oriented Development zoning district, as described in Section 8. A regional light rail system is planned for the Triangle area (Wake County, 2021). Despite regional efforts, SCI to air quality have the potential to occur because of increased amount of traffic.

5.9 NOISE LEVELS

The predicted growth in the study area will produce greater amounts of noise from a greater density of land uses, more people living in the study area, more businesses and industries operating in the area, and a large increase in the number of vehicles using local roadways. The continued growth and development of the study area will impact the community noise levels through the introduction of additional domestic and commercial traffic and intensification of industry. High noise levels can also impact human health. Urbanization also increases the base level of noise, potentially impacting wildlife behavior.

Efforts taken to improve air quality by promoting alternative forms of transportation will limit SCI to noise levels in the study area, as described in Sections 6-8.

5.10 WATER RESOURCES

5.10.1 Surface Water

SCI to surface water resources have the potential to occur in both the Neuse and Cape Fear River basins. With the addition of planned infrastructure improvements, population density will rise. Even without the planned infrastructure, population would increase in the study area because of its proximity to RTP and the strong local economy. However, this growth would likely be less dense, would be serviced by wells and septic or community systems, and travel times would increase without road improvements. It should also be noted that there are no requirements for maintenance of septic systems, and small community systems are not required to have an operator onsite 24 hours a day. In addition, growth without infrastructure may fall below thresholds established for stormwater controls or for erosion and sediment control plans.

As a result of the increase in population and associated development, the impervious area will increase, which will result in an increase in stormwater runoff during rain events from an increase in impervious areas. Damage, such as increased pollution and scouring, will increase without practices to control runoff rates. Without adequate controls, typical urban stormwater pollutants include sediment, nutrients (nitrogen, phosphorus), bacteria (fecal coliform as indicators), and potential toxicants (metals, oil and grease, hydrocarbons, and pesticides). Modifications to the runoff rate also may impact stream channel stability and, thus, aquatic habitat. The increase in runoff may cause an increased pollutant load, which will lead to a decline in water quality and stream channel stability, and create subsequent impacts on aquatic habitat, wetlands, and sensitive aquatic and amphibian species in the area.

Increases in impervious surface will increase the rate of runoff, which also may impact fluvial system stability, stream channel sinuosity, streambank slopes, floodplain dynamics, and hydrologic flow rates, and, thus, aquatic and riverine habitats. For example, during storms, a larger volume of rainfall will run directly to streams, causing higher storm event flows, which may cause streambank erosion and a degraded aquatic habitat. Less rainfall will percolate to groundwater, which can reduce baseflow during dry weather. It should also be noted that the impact on storm event and baseflow conditions are smaller in western Wake County than in other areas of the County because of the soil types found within the study area. A groundwater study completed by Wake County in 2003 identifies the presence of a high percentage of hydrologic soils groups C and D (low infiltration capacity) in the Jordan Lake watersheds. Low-flow recharge rates in streams were the lowest in western Wake County watersheds, at 0 gallons per acre per day in the Jordan Lake watershed (CDM, 2003).

Most waters within the study area are classified as NSW in response to excessive growths of macroscopic and/or microscopic vegetation in both the Jordan Lake watershed and the Neuse River basin. Current strategies to limit nutrient loading will help protect water quality; however, as runoff volumes increase, nutrient loading could continue to impact water quality. As agricultural land uses decrease in the study area, impacts from this land use type may decrease in the watershed.

The construction of sewer lines, water lines, and roads may also impact water quality, particularly where they cross streams. There are sediment impacts from construction, although the use of proper erosion and sediment controls help minimize this impact. In general, these

impacts are direct, but there is also a cumulative direct impact from previous crossings and other future crossings. The Town will review stream crossings as a cumulative direct impact in future EAs and EISs.

NCDEQ monitoring of both benthic macroinvertebrate and fish communities within the study area will indicate if any water quality declines are impacting aquatic communities. The composition of these aquatic communities provide insight into the effects of sediment loading, nutrient enrichment, and stream temperature changes, among others.

5.10.1.1 303(d)-Listed Streams

Land use changes may impact both water quality and quantity in the study area. These impacts may limit or impede the ability of the State to prepare and effectively implement management strategies to improve water quality in Section 303(d)-listed waterbodies, discussed in detail in Section 4.0. These waterbodies are currently subject to water quality or aquatic habitat stresses, primarily from stormwater and urban runoff. Since these waterbodies are located in areas that are already urbanized, it will likely be difficult to attain a healthy aquatic community there, even with no future development. Increases in runoff may further degrade these waterbodies within the Town's study area.

5.10.2 Groundwater

As water and sewer services are expanded, fewer residents will rely on groundwater as a public water supply source. Also, a number of septic tank/ground absorption systems serving residences may be eliminated. These are positive secondary impacts to the groundwater resources of the study area by reducing the demand for groundwater as a source for drinking water and the public health risk of groundwater contamination in the study area from leaking or failing septic tanks.

Future development may degrade groundwater quality if contaminants common to urban activities reach the groundwater. These include fertilizers, petroleum products, semi-volatile and volatile organic compounds, and metals and nutrients from stormwater runoff.

A general increase in impervious surfaces also may affect groundwater recharge and groundwater's ability to maintain baseflow during drought conditions. However, Wake County's groundwater study illustrates the lowest recharge rates in the western part of the County. In the Town's study area, groundwater recharge is approximately 2 to 3 inches per year, as compared to central and eastern portions of the County, which have recharge rates of 7 to 9 inches per year (CDM, 2003). A groundwater study was published in 2022 confirming low soil infiltration rates in western Wake County (Figure 5-3).

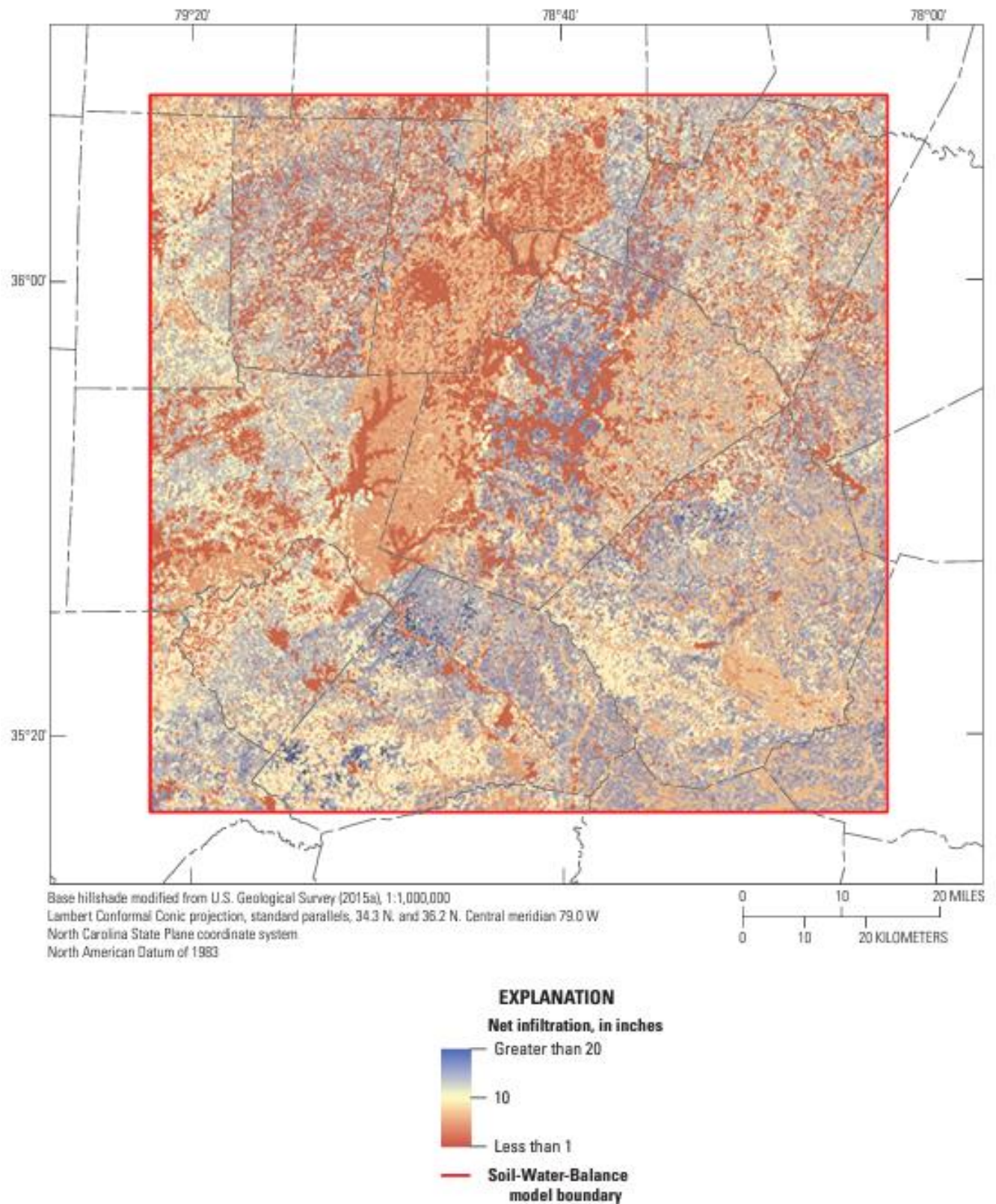


Figure 5-3. Mean annual net infiltration rates across Wake County (USGS, 2022).

5.11 FOREST RESOURCES

According to Town land use planning data, much of the undeveloped land, including forests, within the study area will be converted to other uses. Even without the proposed infrastructure, forested lands will likely be converted to low-density residential lots. The majority of the forested lands within the study area are currently coniferous cultivated pines.

Forested communities are likely to remain along stream channels. Overall, forested wildlife habitat will be reduced within the study area and may become more fragmented. Trees also filter air, and their shade can cool air temperatures. Loss of forest resources may also impact air quality and temperature.

5.12 SHELLFISH OR FISH AND THEIR HABITATS

Degradation of water quality and aquatic habitats may, in turn, impact aquatic resources and fish communities. Sources of degradation include increasing erosion of stream channels, sedimentation from construction activities, changed hydrology from increased impervious surfaces, and increased stormwater runoff containing high levels of nonpoint source pollutants. These changes may affect fish communities by altering species diversity and/or the number of individuals within a community, which decreases the potential for a long-term sustainable healthy fish community. Those fish species that are less tolerant of habitat stress and pollutants may disappear from a community, causing a decrease in species diversity. This may occur without the overall quantity of fish present changing, or a community may lose both diversity and population.

Changes that may impact the community include sedimentation of channel substrate. Insectivorous fish species dependent on healthy benthic macroinvertebrate communities may be impacted by a loss or change in their food source. Darters and other fish species that are dependent on riffle habitats may disappear with habitat impacts. Other factors that may change a fish community include the replacement of sensitive fish species by pollutant-tolerant exotic species.

The construction of sewer lines, water lines, and roads may also impact water quality and aquatic habitat, particularly where they cross streams. There are sediment impacts from construction, although the use of proper erosion and sediment controls help minimize this impact. In addition, where culverts are used for road crossings and not sufficiently buried, a natural substrate will no longer exist to provide aquatic habitat. In general, these impacts are direct, but there is also a cumulative direct impact from previous crossings and other future crossings. The Town will review crossings as a cumulative direct impact in future EAs and EISs.

5.13 WILDLIFE AND NATURAL VEGETATION

Wildlife resources are primarily impacted by habitat impacts. Further urbanization of the region may impact wildlife resources through the continued loss, fragmentation, or degradation of sensitive and non-sensitive aquatic and terrestrial species and their habitats through conversion of land and wetland areas and filling or piping of streams for residential, business, or public

facility uses. The loss of habitat may also increase distances between suitable habitats for a given species.

- Degradation of air resources through increased automobile usage and traffic congestion.
- Loss of species diversity through the combined impacts listed above.

Terrestrial species are impacted by loss of habitat as land use changes occur. Cumulatively, land use changes fragment the landscape. Habitat fragmentation makes wildlife movement more difficult. Over time, a loss in the number of wildlife individuals may occur as fewer and fewer acres of suitable habitat remain. This impacts the sustainability of a given species and may decrease species and genetic diversity.

To offset SCI, the Town created a park/greenway/open space and a floodplain overlay zoning district, which guides development away from sensitive areas largely along Crabtree Creek. This protects both terrestrial and aquatic habitats and associated wildlife.

Aquatic species may be more affected by habitat changes and losses without proper protective measures in place. Changes in land use may lead to increased sedimentation and can deliver more stormwater pollutants to the system, reduce the stability of stream banks, and cause other channel modifications.

Fish communities are discussed in Section 5.12, and forested areas and habitats are in Section 5.11.

5.13.1 Rare, Threatened, or Endangered Species

Scientific Name	Common Name	EPA Listing Status	Group	Recovery Plan Status
<i>Haliaeetus leucocephalus</i>	Bald Eagle	Protected	Birds	Bald and Golden Eagle Protection Act
<i>Lasmigona subviridis</i>	Green floater	Proposed Threatened	Clams	-
<i>Perimyotis subflavus</i>	Tricolored bat	Proposed Endangered	Mammals	-

While the ESA protects threatened and endangered species from takings, SCI to a species' habitat may, over the long term, reduce the number of individuals of a species. Table 4-9 in Section 4.0 presents a list of federally listed species in Wake County and Chatham County, and a subset of those which have been specifically observed within the study area.

Federally listed species include primarily those which are endangered, threatened, or are potentially to be included to either list (candidate, under review, proposed threatened, or threatened because of similarity in appearance to another species). Copies of Federal and State-listed species can be accessed in Appendix D.

The federally listed species that have been observed in the study area include a proposed threatened clam (green floater), a proposed endangered mammal (tricolored bat), and a protected bird (bald eagle).

In Wake County, the tricolored bat is under consideration for official listing due to declining populations documented over the past 20 years. The tricolored bat is a wide-ranging species

that is listed as Under Review with a list of other bat species in an effort to protect all bat species from the primary threat of a deadly fungal disease called white-nose syndrome.

Michaux's sumac is listed as federally endangered and has been located elsewhere in Wake County; no known occurrences of the plant have been recorded within the study area (NCNHP, 2024). Therefore, it is unlikely that this species will be impacted by SCI within the study area. However, since it is located in the County, the potential for direct impacts from all future infrastructure projects will be evaluated. The plant prefers habitat that is disturbed periodically, such as that found along utility lines.

Methods to address and mitigate SCI are presented in Sections 6-8. The Town evaluates the potential for impacts to all species of concern during environmental evaluations for potential development.

5.13.2 Natural Vegetation

Within the study area, natural vegetation is typical of Piedmont upland and bottomland communities. However, smaller unique ecosystems are also present. These communities have the potential to be impacted by SCI resulting from growth in the study area. As forested lands are converted to other uses, natural communities will decrease in size. Rare communities may run the risk of being lost if adequate protection has not been afforded to them.

Loss of natural vegetation also occurs in disturbed areas, as non-native exotic species may begin to out-compete native vegetation and alter community structure. As naturally vegetated areas are converted to other uses, wildlife habitat is lost and/or fragmented. SCI may limit the locations of major tracts of natural vegetation to locations along stream channels currently protected by undisturbed buffer zones. Even without the proposed infrastructure, forested land may be converted to low-density residential land. This conversion would likely result in many of the same impacts to natural vegetation and habitat described above.

5.14 INTRODUCTION OF TOXIC SUBSTANCES

As urbanization continues in the study area, the potential for release of toxic substances from residential and commercial sources increases. The improper disposal of these substances could have adverse impacts on the environment by entering the groundwater system through landfill leachate or by entering the sewer system and reaching the WWTPs. Improper disposal could impact groundwater and surface water quality and potentially impact human health through drinking water supplies, fish consumption, and other means.

As the amount of traffic and urban uses in the receiving basin increases, stormwater runoff will contain increasing levels of water pollutants, some of them toxic. Typical urban stormwater pollutants include sediment and silt, nitrogen and phosphorus from lawn fertilizers, oils and greases, rubber deposits, toxic chemicals, pesticides and herbicides, and road salts. Unless contained and treated before entering surface waters, this urban stormwater could impact the water quality and sensitive species living within the receiving basin.

The expected increase in rail traffic in the future may increase the likelihood of spills of industrial chemicals associated with accidents.

Ongoing remediation actions at the Koppers Company, INC, Superfund site is detailed in Section 4.14.

The long-term impact of new toxic discharges to the surface water and groundwater from urban stormwater, and accidental and/or intentional spill of household and industrial chemicals in the receiving basin could lead to declines in water quality without proper protective measures in place. This could contribute to the potential loss of wildlife and their habitats.

5.15 SUMMARY OF SECONDARY AND CUMULATIVE IMPACTS

A summary of possible and anticipated SCI to natural resources as a result of current and future growth within the Study Area are summarized in depth in Section 7.0.

In general, potential impacts are anticipated for the following environmental resources:

- Soils
- Land Use
- Prime of Unique Agricultural Land
- Air Quality
- Noise
- Surface Water Resources
- Forest Resources
- Shellfish or Fish and their Habitats
- Wildlife Resources and Natural Vegetation

In general, limited impacts are anticipated for the following environmental resources:

- Topography and Floodplains
- Wetlands
- Public Lands and Scenic, Recreational Areas, and State Natural Areas
- Archeological and Historical Resources
- Groundwater Resources
- Toxic Substances

Mitigation efforts to limit environmental resource impacts are detailed in Sections 6-8.

6.0 FEDERAL AND STATE REGULATIONS FOR MITIGATION OF SECONDARY AND CUMULATIVE IMPACTS

The Town of Morrisville is an emerging community in western Wake County adjacent to RDU International Airport and RTP. The Town of Cary is its immediate neighbor to the south and west. The Triangle area has repeatedly ranked among the top regions in the country in which to live or work, find a home, start a business, raise a family, or retire. This section identifies and discusses the federal and state programs that mitigate the potential SCI discussed in Section 5. Where regional or local programs are needed to implement the state and federal regulations/programs, the program description is provided under Wake County or Morrisville regulations and programs discussion in Section 7 and 8 respectively.

There are several Federal and State regulations and programs that will mitigate the impacts related to growth. These include, but are not limited to; the National Environmental Policy Act (NEPA), the Endangered Species Act (ESA), the Clean Water Act (CWA), the Clean Air Act (CAA), the National Flood Insurance Program (NFIP), stormwater regulations, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations (Executive Order 12898), Protection and Enhancement of Environmental Quality (Executive Order 11514), programs to reduce nutrient loading in the Neuse River basin and Jordan Lake watershed, archaeological protection through various laws and programs, the Sedimentation and Pollution Control Act, the North Carolina Land and Water Fund (NCLWF), formerly known as Clean Water Management Trust Fund, Water Supply Watershed Program, the State Revolving Fund (SRF), and the Division of Mitigation Services (DMS), formerly known as the Ecosystem Enhancement Program. Table 6-1 summarizes these programs and indicates whether local involvement is needed to implement them fully. Where local programs are needed to implement the State and Federal regulations and programs, the program description is provided under the Town regulations and programs discussion in this section.

Table 6-1. Summary of existing state and federal programs and the environmental resources they protect.

Program	Local Govt. Program Required	Wetlands	Land Use	Fish and Wildlife	Sensitive Species	Water Quality and/or Quantity	Air Quality	Ground-water	Noise	Toxics
Endangered Species Act		X	X	X	X	X				
Fish and Wildlife Coordination Act				X	X					
Clean Water Act - Section 303(d)		X		X		X	X			X
Clean Water Act - Section 404		X	X	X	X	X				
Clean Water Act - Section 401		X	X	X	X	X				
Clean Water Act - Sanitary Sewer		X	X	X	X	X		X		X
Overflow Regulations										
Clean Water Act - NPDES	X	X		X	X	X				X
NPDES Regulations	X	X		X	X	X				X
Protection of Wetlands E.O. 11990*		X	X	X	X	X				
Safe Drinking Water Act	X					X		X		X
Clean Air Act							X			
Floodplain Management E.O 11988*		X	X			X				
National Flood Insurance Program		X	X	X	X	X				X
Environmental Justice E.O. 12898*			X							
Environmental Quality E.O. 11514*		X	X	X	X	X	X	X	X	X
Wild and Scenic Rivers Act			X	X	X	X				
Archaeological Protection			X							
Archaeological and Historic Preservation Act			X							
National Historic Preservation Act			X							
Protection & Enhancement of the Cultural Environment			X							
Farmland Protection Policy Act			X							
Sediment and Erosion Control	X	X	X	X	X	X				
NC Clean Water Management Trust Fund/ State Revolving Fund (SRF)		(X)	(X)	(X)	(X)	(X)				
Division of Mitigation Services (DMS)		X		X	X	X				
Groundwater			X					X		X
Neuse Nutrient Sensitive Water (NSW)	X	X		X	X	X				
Jordan Lake Nutrient Management Strategy	X	X		X	X	X				

Program	Local Govt. Program Required	Wetlands	Land Use	Fish and Wildlife	Sensitive Species	Water Quality and/or Quantity	Air Quality	Ground-water	Noise	Toxics
Water Supply Watershed (WSW)	X	X	X	X	X	X				
Land Conservation Incentives		(X)	(X)	(X)	(X)	(X)				
National Environmental Policy Act		X	X	X	X	X	X	X	X	X

X= Demonstrates clear environmental benefits

(X) = Shows potential for environmental benefits (policy only, program not mandatory, or regulation not yet adopted)

* = Name change has occurred

6.1 NATIONAL ENVIRONMENTAL POLICY ACT

The National Environmental Policy Act (NEPA) was enacted in 1970 and declared a national policy to cover the following umbrella goals:

- Encourage productive and enjoyable harmony between humans and the environment;
- Promote efforts which prevent or eliminate damage to the environment and biosphere and stimulate the health and welfare of man;
- Enrich the understanding of the ecological systems and natural resources important to the country;
- Establish a Council of Environmental Quality.

NEPA is the basic national charter and framework for the protection of the environment, and it is bolstered by a suite of executive orders and policies. More information about NEPA and additional laws and regulations of-interest, visit their website (<https://ceq.doe.gov/index.html>).

6.2 ENDANGERED SPECIES ACT

The ESA, enacted in 1973, conserves ecosystems upon which threatened and endangered species of fish, wildlife, and plants depend, through Federal action and State programs (16 U.S.C. 1531-1544, 87 Stat. 884). The ESA:

- Authorizes the determination and listing of species as endangered and threatened;
- Prohibits unauthorized taking, possession, sale, or transport of endangered species;
- Provides authority to acquire land for the conservation of listed species, using land and water conservation funds;
- Authorizes establishment of cooperative agreements and grants-in-aid to States that establish and maintain active and adequate programs for endangered and threatened wildlife and plants;
- Authorizes the assessment of civil and criminal penalties for violating the ESA or regulations;
- Authorizes the payment of rewards to anyone furnishing information leading to arrest and conviction for any violation of the ESA of any regulation issued thereunder;
- Requires Federal agencies to ensure that any action authorized, funded, or connected by them is not likely to jeopardize the continued existence of listed species or modify their critical habitat.

6.3 FISH AND WILDLIFE COORDINATION ACT

The Fish and Wildlife Coordination Act states that whenever the waters or channel of a body of water are modified by a department or agency of the U.S., the department must first consult the USFWS, the National Marine Fisheries Service, and the lead state wildlife agency. The purpose of this act is to prevent or minimize impacts to wildlife resources and habitat resulting from

water or land alterations. When modifications occur, provisions must be made for the conservation, maintenance, and management of wildlife resources and habitat in accordance with a plan developed with the wildlife protection agencies listed above.

6.4 CLEAN WATER ACT

In 1972, the CWA (33 U.S.C. 1251 et seq.) was enacted to “restore and maintain the chemical, physical, and biological integrity of the Nation’s water.” The CWA includes a number of sections that are relevant to the SCI study.

- Section 303(d) of the CWA established a program to identify waters that do not support their designated uses and develop plans to address the impairments of these waters.
- Section 404 of the CWA established a program to regulate the discharge of dredged and fill material into waters of the United States, including wetlands.
- Section 401 of the CWA requires certification that a project does not violate the State’s water quality standards as administered by NCDEQ.

Additionally, the CWA provides the regulatory authority for sanitary sewer overflows and NPDES stormwater programs.

6.4.1 Section 303(d) of the Clean Water Act

Section 303(d) of the CWA requires states to identify waters that do not support their classified uses. These waters must be prioritized, and a total maximum daily load (TMDL) must subsequently be developed. TMDLs are calculations that determine the maximum amount of a pollutant that a water body can assimilate and still meet water quality standards, and an allocation of that amount to the pollutant’s sources. As part of the TMDL development process, the sources of the pollutant must be identified, and the allowable amount of pollutant must be allocated among the various sources within the watershed.

NCDEQ will develop TMDLs or management strategies for the waters identified in Section 4.10. In addition, NCDEQ developed a TMDL for the upper New Hope Creek arm of Jordan Lake and a nutrient management strategy for other portions of the lake. The TMDL and strategies require nonpoint source reductions of nitrogen and phosphorus, as discussed later in this section.

The Town will continue to work with NCDEQ to implement TMDLs as they are developed. In addition, the Town will work with NCDEQ on management strategies developed for impaired waters within its jurisdiction.

6.4.2 Sections 404 and 401 of the Clean Water Act

Two main regulatory programs that regulate impacts to jurisdictional waters, including streams and wetlands in the project area, both of which originate from CWA-Section 404, regulation of dredged and fill activities (administered by the U.S. Army Corps of Engineers [USACE]) and Section 401, certification that a project does not violate the State’s water quality standards (administered by NCDEQ). All private and public construction activities over a specific acreage or stream length that affect jurisdictional waters are required to obtain certifications and

permits from NCDEQ (Section 401 Water Quality Certification) and from the USACE (Section 404 Permits).

Although the State's 401 Water Quality Certification Program and the Federal 404 Wetlands Protection Program protect jurisdictional waters by requiring avoidance and mitigation for wetlands and streams across the State, permits can be issued under both the State and Federal programs, which allow small impacts to jurisdictional waters.

Section 401 of the CWA (33 U.S.C. 1341) requires any applicant for a federal license or permit that conducts any activity that may result in a discharge of a pollutant into waters of the United States to obtain a certification from the state in which the discharge originates or would originate, or, if appropriate, from the interstate water pollution control agency having jurisdiction over the affected waters. The jurisdiction is determined at the point where the discharge originates or would originate, and the discharge is required to comply with the applicable effluent limitations and water quality standards.

In 2006, the Supreme Court addressed the jurisdictional scope of Section 404 of the CWA specifically in terms of the scope of "the waters of the U.S." statement, in *Rapanos v. U.S.* and in *Carabell v. U.S.* The rulings of each case provide analytical standards for the determination of jurisdiction of water bodies that are not traditional navigable waters (TNW) or wetlands adjacent to TNWs. Wetlands adjacent to non-TNWs are subject to jurisdiction of the CWA if: (1) the water body is a relatively permanent water (RPW), i.e. flows year-round or at least 3 months of the year, or is a wetland that directly abuts an RPW; or (2) a water body including adjacent wetlands that have a significant nexus based on the biological, physical, or chemical integrity with TNWs.

6.4.3 Sanitary Sewer Overflows

The USEPA prohibits discharges to waters of the United States from municipal separate storm sewer systems (MS4s), unless authorized by an NPDES permit. In April 2000, the USEPA released the Compliance and Enforcement Strategy Addressing Combined Sewer Overflows and Sanitary Sewer Overflows (USEPA, 2000). In summary, each USEPA region is responsible for developing an enforcement response plan, which includes an inventory of sanitary sewer overflow (SSO) violations. State regulations (15A NCAC 2B.0506) require municipalities and other wastewater treatment operators to report wastewater spills from discharges of raw sewage from broken sewer lines and malfunctioning pump stations within 24 hours. NCDEQ adopted policies, which include strict fines and other enforcement programs, to protect surface water quality from wastewater spills.

For public health, environmental, and regulatory reasons, eliminating SSOs is a high priority for the Town of Cary including the portion of its service area in the Town of Morrisville, as it is for the State of North Carolina. The Town of Cary seeks not only to comply with the minimum requirements regulating its operations, but also to eliminate SSOs in the Town system to the maximum extent feasible.

The North Carolina Clean Water Bill of 1999 provides for the development of permits for collection systems that include requirements for inspections, sewer maintenance, and other operational items. The Town's infrastructure is operated by the Town of Cary.

6.4.4 NPDES Stormwater Regulations

NPDES stormwater discharges are controlled by the Federal NPDES regulations and enforced by NCDEMLR. The program regulates all major discharges of stormwater to surface waters. NPDES permits are designed to require the development and implementation of stormwater management measures. These measures reduce or eliminate pollutants in stormwater runoff from certain municipal storm sewer systems and industrial activities.

The NPDES stormwater permitting system is being implemented in two phases. Phase I was implemented in 1991 and applied to 6 MS4s in North Carolina with populations greater than 100,000 people at that time (and thus, did not include the Town). USEPA's Phase II rules were finalized on October 29, 1999, and published in the Federal Register on December 8, 1999. The Town was required to develop and implement a stormwater management program.

In 2006, the North Carolina General Assembly enacted Session Law 2006-246 to provide for the implementation of Phase II stormwater management requirements. Session Law 2006- 246 is related to, but is not a part of, the NPDES stormwater program and recognizes that urban development can impact surface waters regardless of whether the NPDES stormwater requirements apply. The Session Law established post-construction stormwater management requirements for development activities in areas outside of municipalities that operate municipal separate storm sewer systems (permitted MS4s). The act requires that new development and redevelopment in these areas meet the post-construction requirements of the Phase II NPDES stormwater management program as of July 1, 2007. Permits under this program are issued by NCDEMLR. This law is applicable to new development and redevelopment activities that will result in a cumulative disturbance of 1 acre or more of land.

Under Session Law 2006-246, all unincorporated and incorporated areas within Wake County must meet the post-construction requirements of the Phase II NPDES stormwater management program beginning on July 1, 2007. The post-construction stormwater permit conditions, included in permits issued by NCDEMLR or other delegated programs, regulate the design, construction, operation, and maintenance of the post-construction stormwater control measures implemented by regulated developments.

An operation and maintenance plan that ensures the adequate long-term operation of the program's structural BMPs is required. The operation and maintenance plan requires the owner of each structural BMP to submit a maintenance inspection report on each structural BMP annually to the local jurisdiction.

Because the Town is located in the Cape Fear and Neuse River basins, additional rules apply. These include the Neuse River Basin- Nutrient Sensitive Water Management Strategy and the Jordan Lake Water Supply Nutrient Strategy, as discussed in more detail later in this section.

The Town Council renewed its NPDES Phase II permit in 2023. The Town's stormwater programs are further discussed under Section 8.

6.5 PROTECTION OF WETLANDS, EXECUTIVE ORDER 11990

The Protection of Wetlands (Executive Order 11990) was set in place to avoid long- and short-term adverse impacts associated with the destruction or modification of wetlands. Every

Federal agency must minimize the destruction, loss, and degradation of wetlands, as well as work to preserve and enhance the natural and beneficial values of wetlands. Federal projects must avoid wetland impacts and, where avoidance is not possible, minimize impacts to wetlands.

6.6 SAFE DRINKING WATER ACT

The Safe Drinking Water Act (SDWA) provides protection of public health by regulating the nation's drinking water supply. The SDWA authorizes the USEPA to set national health standards for drinking water to protect against natural and man-made contaminants that may be found in public drinking water. The USEPA is charged with the responsibility of assessing and protecting drinking water sources, as well as ensuring the appropriate treatment of water by qualified operators. The USEPA is also to ensure the integrity of water delivery systems and inform the public of the quality of their drinking water supply.

6.7 CLEAN AIR ACT

The CAA (42 U.S.C. 7401 et seq.) is intended to “protect and enhance the quality of the Nation's air resources so as to promote the public health and welfare and the productive capacity of its population.” Section 118 of the CAA (42 U.S.C. 7418) requires that each federal agency with jurisdiction over any property or facility engaged in any activity that might result in the discharge of air pollutants comply with “all Federal, state, interstate, and local requirements” with regard to the control and abatement of air pollution.

On April 15, 2004, the USEPA designated ozone nonattainment areas. These nonattainment areas have either violated the national 8-hour ozone standard or have contributed to its violation. The USEPA categorized these nonattainment areas into five groups, ranging from basic to severe, with basic having the least stringent requirements and severe having the most stringent requirements. As of June 2005, Wake County, which is identified as a maintenance area, is no longer subject to the 1-hour standard (USEPA, 2017).

On March 12, 2008, EPA revised the 8-hour ozone NAAQS from 84 ppb to 75 ppb; however, the EPA did not finalize the designations under this new standard until 2012. States wishing to revise their nonattainment boundary were required to submit recommendations by October 28, 2011. North Carolina made its revised boundary recommendations based on the 2009-2011 data. These data did not show nonattainment of the ozone standard for the Triangle area. On December 8, 2011, the USEPA sent North Carolina its response, stating that the agency intends to support North Carolina's recommended area designations and boundaries for all areas (NCDENR, 2013a). On October 26, 2015, EPA revised the 8-hour ozone NAAQS (<http://www.federalregister.gov/d/2015-26594>) from 75 ppb to 70 ppb, effective December 28, 2015. Area designations and/or boundaries were revised effective July 14, 2021 (USEPA, 2024).

The North Carolina Division of Air Quality (NCDAQ) has implemented an aggressive Air Awareness Education Program that encompasses daily reports on the ozone forecasts by meteorologists reported using media, such as the internet, television, newspapers, and radio. The public has become very informed of ozone issues and steps they can take to reduce ozone

emissions, which include combining errands into one trip, maintaining automobiles and lawn equipment, and using lawn equipment in the evening.

The Clean Smokestacks Act of 2002 requires coal-fired power plants to achieve a 77-percent reduction in nitrogen oxide (NO_x) emissions by 2009. NO_x is the main cause of ozone, one of North Carolina's biggest air quality problems, and it contributes to haze and acid rain.

Under the act, utility companies must achieve these goals through actual reductions –and not by buying or trading emissions credits from utilities in other states, as allowed under federal regulations. The utilities also cannot sell credits for their emissions reductions (NCDENR, 2009).

In 2020, North Carolina had its lowest ozone level on record since air monitoring began in the early 1970s (EPA, 2024). The declining ozone levels were generally concurrent with lower emissions from the State's power plants. A recent report by NCDAQ shows that the State's coal-fired power plants have cut their NO_x emissions, a primary industrial contributor to ozone pollution, by more than 80 percent since the General Assembly enacted the Clean Smokestacks Act in 2002 (NCDENR, 2013a).

In addition to the effects on transportation, new and expanding industries in the County are subject to emission control requirements.

6.8 FLOODPLAIN MANAGEMENT, EXECUTIVE ORDER 11988

Executive Order 11988, Floodplain Management, addresses the long- and short-term adverse impacts associated with the occupancy and modification of floodplains. Federal agencies must take action to reduce the risk of flood loss and flood impacts on human safety, health, and welfare. Agencies are also charged with the responsibility to restore and preserve the natural and beneficial values of floodplains. Federally supported projects that directly impact floodplains need to consider alternatives that avoid floodplains.

6.9 NATIONAL FLOOD INSURANCE PROGRAM

The NFIP, managed by FEMA, was created in the 1960s in response to the rising cost of taxpayer-funded disaster relief for flood victims and the increasing amount of damage caused by floods. Floodplain management under the NFIP is an overall program of corrective and preventive measures for reducing flood damage. It includes, but is not limited to, emergency preparedness plans, flood control works, and floodplain management regulations; and generally covers zoning, subdivision, or building requirements and special- purpose floodplain ordinances. One aspect of the program is that it aids in the protection of stream riparian areas and wetlands and serves to protect water quality by restricting development in the floodplain. Information on the Town's flood protection programs are further discussed in Section 8.

6.10 FEDERAL ACTIONS TO ADDRESS ENVIRONMENTAL JUSTICE IN MINORITY POPULATIONS AND LOW-INCOME POPULATIONS, EXECUTIVE ORDER 12898

This executive order on the environmental justice was passed in February 1994. The purpose of this E.O. was to focus federal attention on the environmental and human health effects of federal actions on minority and low-income populations with the goal of achieving environmental protection for all communities. The order directs the identification of disproportionately high and adverse human health and environmental effects on minority and low-income populations and requires development of strategies to implement environmental justice. The E.O. also established an Interagency Working Group on environmental justice chaired by the EPA Administrator and comprised of the heads of 11 departments or agencies and several White House offices.

6.11 PROTECTION AND ENHANCEMENT OF ENVIRONMENTAL QUALITY, EXECUTIVE ORDER 11514

This executive order on the protection of environmental quality was passed in March 1970, and further amended in May 1977 to aid in furthering the purpose and policies of the NEPA. This E.O. states that the federal government shall provide leadership in protecting and enhancing the quality of the environment to sustain and enrich human life. Federal agencies shall initiate measures needed to direct their policies, plans, and programs to meet the national environmental goals.

6.12 WILD AND SCENIC RIVERS ACT

The Wild and Scenic Rivers Act charges the regulatory agencies with the protection of selected rivers of the nation. These rivers include those that possess remarkable scenic, recreational, geologic, fish and wildlife, historic, cultural, or other similar values. These rivers shall be preserved for the benefit and enjoyment of future generations. The act prescribes the method for designating standards for selection of rivers to be protected under this act. Rivers under this act are classified into one of three categories, depending on their characteristics.

- Wild river areas: Rivers or sections of rivers that are free of impoundments and are generally inaccessible except by trail. Watersheds and shorelines surrounding this river class are essentially primitive and waters are unpolluted.
- Scenic river areas: Rivers or sections of rivers are similar in character to wild river areas but can be accessed in places by roads.
- Recreational river areas: Rivers or sections of rivers that are readily accessible by road or railroad and may have development along their shorelines. These rivers may have undergone some impoundment or diversion in the past.

No rivers protected by the Wild and Scenic Rivers Act exist in Wake County.

6.13 ARCHAEOLOGICAL PROTECTION

Archaeological resources are protected on private and public lands through the North Carolina Archaeological Resources Protection Act, the Unmarked Human Burial and Human Skeletal Remains Protection Act, the North Carolina Archaeological Record Program, SEPA, and various Federal laws. These laws are only applicable to projects that are State or Federally approved, permitted or funded, or exist on State or Federal lands. Although this often exempts many private development projects, the USACE does require archaeological reviews for any project that needs a CWA Section 404 permit.

6.13.1 Archaeological and Historic Preservation Act

The Archaeological and Historic Preservation Act of 1974 provides protection of historical American sites, buildings, objects, and antiquities of national significance. The act protects all historical and archaeological data that could potentially be lost as a result of:

- Flooding
- Building of access roads
- Erection of laborer communities
- Relocation of highways and railroads
- Alteration of terrain caused by the construction of dams (by the U.S. government and private corporations)
- Any alteration of terrain as a result of any federal construction project or any federally licensed project

If any federal agency finds that a federally supported project may cause irreparable loss or destruction of scientific, prehistorical, historical, or archaeological data, the agency must notify the Department of the Interior so it may undertake recovery, protection, and preservation of the data.

6.13.2 National Historic Preservation Act

The National Historic Preservation Act (NHPA) is the central act that establishes historic preservation law. The act sets the policy for the U.S. government to promote conditions in which historic properties can be preserved in harmony with modern society. The NHPA authorizes the Department of the Interior to establish, maintain, and expand the National Register of Historic Places (NRHP). State Historic Preservation Officer (SHPO) responsibilities are established by this act, which charges the SHPO with the responsibility of developing a statewide plan for preservation, surveying historic properties, nominating properties to the NRHP, providing technical assistance to federal, State, and local agencies, and undertaking the review of federal activities that affect historic properties.

6.13.3 Protection and Enhancement of the Cultural Environment, Executive Order 11593

This Executive Order requires the federal government to provide leadership in preserving, restoring, and maintaining the historic and cultural environment of the nation. Federal agencies,

in cooperation with state historic preservation agencies, are to locate, inventory, and nominate sites, buildings, districts, and objects as candidates for the NRPH. All sites listed in the NRHP will be maintained to professional standards set by the Secretary of the Interior. Federal agencies that are directly or indirectly involved with the alteration or destruction of property listed on the NRHP shall take timely steps to make a record of all data present in that property. That record is kept in the Library of Congress.

6.14 FARMLAND PROTECTION POLICY ACT

The purpose of the Farmland Protection Policy Act is to minimize the extent to which Federal programs contribute unnecessary and irreversible conversion of farmland to non- agricultural uses. This act, enforced by the U.S. Department of Agriculture (USDA), assures that Federal programs will be administered in such a manner that they are not incompatible with State and local governments, as well as private programs with policies to protect farmland.

6.15 SEDIMENT AND EROSION CONTROL

The North Carolina Division of Energy, Mineral, and Land Resources (NCDEMLR) administers programs to control erosion and sedimentation caused by land-disturbing activities on 1 or more acres of land. Control measures must be planned, designed, and constructed to provide protection from the calculated peak rate of runoff from a 10-year storm.

Enforcement of the program is at the State level but can be delegated to local governments with certified erosion control programs. Wake County enforces the Town's erosion and sedimentation control program, which is discussed further in Section 7.0.

6.16 NORTH CAROLINA CLEAN WATER MANAGEMENT TRUST FUND

The NCLWF, formerly known as Clean Water Management Trust Fund was created by the 1996 Legislature to help finance projects that specifically address water pollution problems. Its purpose was modified through the passage of the 2013-2014 North Carolina budget. It is a non-regulatory program that focuses its efforts on upgrading surface waters in distress, eliminating pollution, protecting and conserving unpolluted surface waters, and establishing a network of riparian buffers and greenways for environmental, educational, and recreational benefits, as well as acquiring lands of cultural and historic significance.

Possible use of NCLWF monies could be for wetland and/or riparian corridor identification and preservation (through acquisition and easement techniques) to allow comprehensive protection of wetlands and riparian buffers in the project area to protect water quality and sensitive aquatic species. To date, the Town has not received NCLWF monies to implement projects.

6.17 STATE REVOLVING FUND

In previous years, the NCLWF had been used to fund wastewater improvements and conventional stormwater projects, as well as the acquisition of lands. As part of Session Law 2013-360, the funding of wastewater improvements and conventional stormwater projects is now handled through the State Revolving Fund (SRF) and is administered by the Division of Water Infrastructure and State Water Infrastructure Authority.

6.18 NORTH CAROLINA DIVISION OF MITIGATION SERVICES

The DMS (formerly the Ecosystem Enhancement Program) was established as a non-regulatory program within NCDEQ to:

- Develop North Carolina's Flood Resiliency Blueprint
- Provide a systematic approach for meeting NCDOT's compensatory mitigation requirements
- Maximize the ecological benefit of compensatory mitigation projects
- Reduce delays in the construction of transportation improvement projects associated with compensatory mitigation requirements

The DMS also provides a compensatory mitigation option for permit applicants other than the NCDOT; administers the Riparian Buffer Mitigation Program in the Neuse, Tar-Pamlico, and Catawba River basins; and provides a repository for nutrient offset payments in the Neuse River basin.

6.19 GROUNDWATER PROTECTION

Several regulations and programs exist at the State and local levels that protect groundwater from urban growth:

- Wellhead Protection Program
- Regulation of potential contamination sources
- Management of groundwater contamination incidents
- Ambient groundwater monitoring
- Regulation of well construction

These regulations and programs may afford some protection to groundwater wells from the most common forms of groundwater pollution – point sources, such as chemical manufacturing facilities, underground storage tanks and accidental spills. However, more diffuse and evasive groundwater pollutants from agricultural uses (livestock facilities and chemical application on crops) and urban land uses (over-application of fertilizers and improper use of toxic household chemicals) may not be well managed under these regulations and programs.

6.20 NC DEQ BASINWIDE ASSESSMENTS

Because the Town of Morrisville is bisected by the watershed boundaries of the Cape Fear River to the west and the Neuse River to the east, the conditions and regulatory landscapes for both large river basins are relevant to the Town.

6.20.1 Cape Fear River Basin Water Resources Plan

The Cape Fear River Basin has been the subject of large-scale NCDEQ Basin Plans in 1996, 2000, and 2005, and a new Water Resources Plan for the basin is due for completion 2024/2025. A predecessor Water Supply Plan for the basin was developed in 2009 by NCDEQ. Existing separate Cape Fear and Neuse River basin hydrologic models developed in 2004 and 2008 respectively were combined into a consolidated joint model in 2014 to best capture the complexities and interconnectedness between these two basins using the OASIS modeling platform.

6.20.2 Neuse River Basin Water Resources Plan and Nutrient Sensitive Waters (NSW) Rules

Water Quality Plans for the Neuse River basin have been developed and revisited in 1993, 1998, 2002, and 2009. In 2010, a Water Resources Plan (water quantity) was developed for the Neuse. The updated Cape Fear/Neuse River OASIS model represents the latest completed modeling effort for these basins.

The Neuse River basin is also subject to watershed-specific Nutrient Strategy Rules which represent the culmination of five years (2015-2020) of work across State and local entities.

The entire Neuse River basin was classified as NSW in 1988. As a result of the NSW classification, a nutrient management strategy was initially developed to manage phosphorus from point source dischargers, and nitrogen and phosphorus from nonpoint sources. At that time, most of the nutrient problems were occurring in the lower freshwater portion of the river, and phosphorus was considered the controlling nutrient.

Increasing algal blooms and fish kills in the estuarine portion of the Neuse River, attributed to nitrogen over-enrichment, led to a revision of the NSW strategy to address nitrogen inputs to the estuary. The Neuse River NSW Strategy Rules became effective on August 1, 1998. New development and redevelopment that drains, in whole or in part, to NSW must implement stormwater BMPs that reduce nutrient loading. NCDEQ has specified basinwide stormwater requirements for the Neuse River basin, as described in 15A NCAC 02B.0235. The Neuse Rules were re-adopted in April 2020 and codified in 15A NCAC 2B .0700. As part of the changes, 15 additional local governments have included for compliance. These include Morrisville, Knightdale, Wendell and Rolesville. Wake County provides stormwater plan review for Wendell and Rolesville in support of these rules. Wake County submitted a local stormwater management plan to the State in early 2022 and it is now being administered.

The Neuse River NSW rules require that existing riparian buffer areas be protected and maintained on both sides of intermittent and perennial surface waters. A 50-foot buffer, consisting of 30 feet of undisturbed forest and 20 feet of grassed/vegetated area, must be maintained. The rule does not require restoration of buffers that no longer exist. Perennial and

intermittent stream determinations are to be based on soil survey maps prepared by the National Resources Conservation Service (NRCS) or the most recent version of U.S. Geological Survey (USGS) topographic maps (7.5-minute quadrangle).

While this revised strategy places more stringent nutrient removal requirements on point source dischargers, it also addresses other sources of nutrients, including urban stormwater, agricultural sources, and nutrient application management. In addition, the strategy includes special provisions to protect stream buffers to prevent further degradation of the ecological integrity of the watershed.

The Neuse River NSW Rules were designed by the State and stakeholders to:

- Hold nitrogen loading from new development at 70 percent of that contributed by 1995 land uses in the non-urban areas of the Neuse River basin (using an export coefficient of 3.6 pounds per acre per year [lb/ac/yr]).
- Offset total nitrogen loads by funding wetland or riparian area restoration projects through payments to the DMS.
- Hold the increase in peak flow leaving the site during the 1-year, 24-hour storm to its levels under predevelopment conditions.

As part of this program, developers must determine the nitrogen loading attributed to the new development and must meet a target of 3.6 lb/ac/yr through site design and BMPs. In the Neuse River basin, residential development may achieve 6 lb/ac/yr and buy down the difference. Commercial development may buy down after achieving 10 lb/ac/yr.

The Town was not named a community for stormwater controls in the Neuse Basin Rules but does implement these nitrogen control performance standards. The Town's riparian buffer requirements are compliant with Neuse Basin Rules.

Rules specific to the Town are discussed further under the Local Regulations and Programs discussion in Section 8.

6.21 JORDAN LAKE NUTRIENT MANAGEMENT STRATEGY

The Jordan Lake Nutrient Management Strategy (Jordan Rules) were implemented to restore and maintain nutrient-related water quality standards in B. Everett Jordan Reservoir and are described in 15A NCAC 02B.0262 through 02B.0311. The Jordan Lake TMDL was developed by NCDEQ to identify the causes of impairment and strategies to meet the reservoirs designated uses. To meet the requirements of the TMDL, the Jordan Rules splits the reservoir and its drainage into three discrete areas:

- Haw River Arm - the watershed draining to the Haw River and the reservoir area immediately upstream of the Jordan Dam
- Upper New Hope Arm - the upper end of the reservoir (above Hwy 1088) and the watershed draining to it
- Lower New Hope Arm - the part of the reservoir below Hwy 1088 and above the Jordan Dam (excluding the Haw River Arm) and the watershed draining to it

Specific nutrient reduction targets for each of these arms are expressed as loading targets and percent reductions compared to the estimated annual average load from 1997 through 2001. A portion of the Town falls within the Upper New Hope Jordan, which has the following percent reduction requirements:

- Upper New Hope Arm – 35 percent reduction of nitrogen and a 5 percent reduction in phosphorus compared to the baseline 1997 through 2001 levels

The Jordan Rules also have specific guidance for both point and nonpoint sources, including agriculture existing development and new development. In general, the agriculture and existing development guidance requires achievement of the percent reductions as an aggregate from that source, for example, existing development in the Upper New Hope Arm watershed as a whole must reduce nitrogen load by 35 percent. New development has specific loading targets similar to those in the Neuse NSW Rules. They are as follows:

- Upper New Hope Arm - limit nitrogen unit area mass loading from new development to 2.2 lb/ac/yr and limit phosphorus unit area mass loading from new development to 0.82 lb/ac/yr

Developers have the option to offset their nitrogen loads by funding offsite management measures. Single Family residential development must first achieve 6 lb/ac/yr onsite and then developers can buy down the difference. Other developments (commercial, multi- family, industrial, etc.) may buy down after achieving 10 lb/ac/yr onsite. Implementation of the Jordan Rules regarding nutrient management have been delayed by the State until 2016 to allow for the completion of a pilot in situ nutrient management study. The existing development portion of the rules was also further delayed by the legislature. In February 2012 the Town voluntarily began implementing the Jordan Rules applying to new development throughout the Town's jurisdiction (including the Neuse Basins areas).

The Jordan Rules also require the preservation of a 50-foot-wide riparian buffer on all surface waters in the watershed, including intermittent and perennial streams, lakes, ponds and reservoirs. The portion of the regulation relating to buffers was not put on hold. The buffer component of the Jordan Rules are applied by the Town in the Cape Fear River basin as well as Neuse River basin, as discussed in Section 8. Session Law 2015-241, Section 14.5(c) temporarily delays the implementation of the Jordan Lake nutrient management rules, including the Jordan new development rules. As of 2021 personal contact with NCDWR indicated that no work has yet begun on revisions to the Jordan Lake riparian buffer rule.

6.22 WATER SUPPLY WATERSHED PROTECTION PROGRAM

The Environmental Management Commission EMC, NCDEMLR, and NCDEQ have administered a WSW Protection Program since 1986. Initially, the program was administered voluntarily by counties and municipalities pursuing protective measures for their water supply watersheds. The measures included limitations on the number and type of wastewater discharges that were allowed in the water supply watersheds. In 2023 the Updated Water Supply Watershed Protection Model Ordinance was published which included wording changes for clarity, modernized definitions, and content additions to Article 400 Development Regulations (NCDEQ, 2021).

In 1989, the North Carolina General Assembly ratified the WSW Protection Act, codified as General Statutes 143-214.5 and 143-214.6. The WSW Protection Act mandated the EMC to adopt minimum statewide water supply protection standards by January 1, 1991, and to reclassify all existing surface water supply watersheds to the appropriate classification by January 1, 1992. The goals of the WSW Protection Program include:

- Protection of surface drinking water supplies in North Carolina from nonpoint source and point source pollution from urban runoff and wastewater discharges
- Provision of a cooperative program of watershed management and protection that is administered by local governments consistent with minimum statewide standards

The NCDEMLR and NCDEQ Water Quality Program manages the WSW program through oversight of local planning ordinances and monitoring of land use activities. Local WSW programs must be approved by the EMC. The WSW program requires local governments to adopt the following land use controls and limitations based on watershed classifications:

- Requires limitation of impervious surfaces around water supplies unless stormwater controls are used
- Requires protection of riparian buffers (100-foot-wide buffers in all development that exceeds the low-density option, or 30-foot-wide buffers otherwise along perennial waters)
- Limits some land uses
- Limits dischargers (NPDES permits in certain situations)
- Allows the use of clustering and density averaging to meet overall development density limits

Watersheds that are protected under the WSW Program have a classification of WS-I through WS-V, where WS-I has the most restrictive controls.

A portion of the Town (0.11 square mile) is within the Jordan Lake WSW. The State has developed special rules, under 15A NCAC 02B .0263 through .0273 and .0311(p), designed to restore and maintain nutrient-related water quality standards in B. Everett Jordan Reservoir. The reservoir's classified uses are set out in 15A NCAC 02B .0216, including use as a source of water supply for drinking water, and culinary and food processing purposes. Rules specific to the Town are discussed in Section 8.

6.23 CONSERVATION RESERVE ENHANCEMENT PROGRAM

The USDA and NCDEQ manage the Conservation Reserve Enhancement Program. USDA and NCDEQ, with the participation of the Natural Resources Conservation Service (NRCS), the Farm Service Agency, the DMS, and the NCLWF have protected 5,000 acres of buffers and conservation areas in the Jordan Lake watershed. Conservation Reserve Enhancement Program funds are also available in the Neuse River basin. This program uses financial incentives to encourage farmers voluntarily to remove sensitive land from agricultural use or implement BMPs. Currently, no lands in the study area are farmed and, thus, this program is not currently applicable to the Town.

6.24 NCDEQ SOLID WASTE MANAGEMENT PROTOCOLS

For any planned or proposed projects, it is recommended that during any land clearing, demolition and construction, contractors make every feasible effort to minimize the generation of waste, to recycle materials for which viable markets exist, and to use recycled products and materials in the development of projects where suitable. Any waste generated by and of a project that cannot be beneficially reused or recycled must be disposed of at a solid waste management facility permitted by the NCDEQ Division of Waste Management (DWM). The Solid Waste Section of DWM strongly recommends that those overseeing projects within the SCIMMP study area maintain proof of proper disposal for all generated waste to permitted facilities. Permitted solid waste management facilities are listed on the DWM portal site (<https://www.deq.nc.gov/about/divisions/waste-management/solid-waste-section/solid-waste-permitted-facility-information-and-guidance/solid-waste-facility-lists>).

6.25 MISCELLANEOUS LAND CONSERVATION INCENTIVE PROGRAMS

Other, voluntary strategies exist at the Federal and State levels that provide incentives to protect natural lands, wetlands, agricultural lands, and sensitive species habitat and forest lands from development. These non-regulatory approaches include providing tax credits for donating lands to specific organizations (usually land trusts) and providing funding for various grants and trust funds to purchase or protect undeveloped lands. Note that there are no existing agricultural use areas within the Town.

7.0 WAKE COUNTY REGULATIONS AND PROGRAMS TO MITIGATE SECONDARY AND CUMULATIVE IMPACTS

Wake County is located centrally in North Carolina, flanked on the north by Granville and Franklin Counties, Nash and Johnston Counties to the east, Harnett County to the south, and Durham and Chatham Counties to the west. Wake County has jurisdiction over incorporated lands between merger communities (Figure 7-1). These programs mitigate the potential SCI discussed in Section 5.

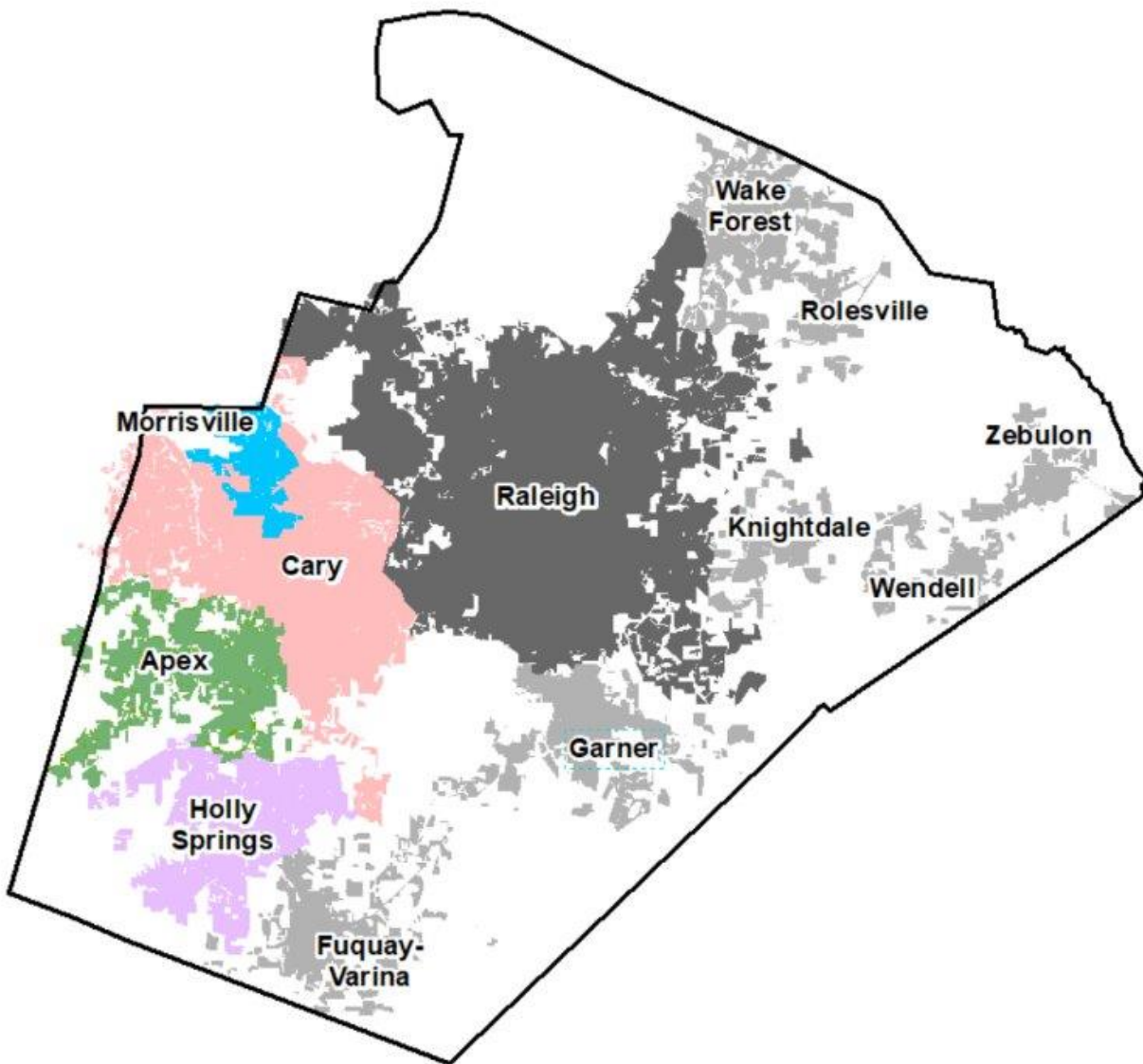


Figure 7-1. The Wake County area with Morrisville and surrounding municipalities highlighted.

Wake County recently completed a series of planning documents to ensure that growth occurs in a manner that will protect environmental resources and meet the needs of its citizens. These Wake County documents include:

- Wake County Unified Development Ordinance (see Appendix E for more information)
- Comprehensive Watershed Management Plan (CH2M Hill, 2003)
- Land Use Plan, Consolidated Open Space Plan (CH2M Hill, 2006)
- Growth Management Strategy (Wake County, 2008)
- Transportation Plan (Kimley-Horn, 2003; to be updated in 2019)
- Comprehensive Groundwater Investigation (CDM, 2019)
- Stormwater Management Task Force Reports (CDM, 2007)
- Air Quality Task Force Report (Wake County, 2011a)
- Parks and Recreation Master Plan (Bucher, Willis, and Ratliff Corporation, 2008)
- Park Facility Master Plan Updates (Alta, 2017)
- Wake County Transit Plan (Jarrett Walker et al., 2021)
- Trails and Greenways of Wake County: Pocket Guide and Community Resource (Wake County, 2018c)
- Sustainability Task Force Report (Wake County, 2011b)
- “PLANWake” Comprehensive Plan (Wake County, 2021)
- Wake County 2024-2025 Action Plan (Wake County, 2024)

This section identifies and discusses these County programs in detail. In addition, an overview summary of erosion and sediment control, stormwater management, air quality, historic preservation, and the Little River Reservoir Water Supply Watershed Interlocal Agreement is provided in this section since these programs are administered by the County for many of the merger communities.

7.1 GROWTH MANAGEMENT

Population growth projections for Wake County were developed by The North Carolina Office of Budget and Management (September 2017), and 2017 intra-census population estimates were reported by the Census Factfinder online report as of July 1, 2017:

- 2017 population: 1,072,203
- 2030 population: 1,348,745
- 2040 population (2037 according to NC Office of Budget and Management): 1,511,392

The County has a strategic location in the Research Triangle area, an excellent quality of life that consistently ranks high in national surveys, and an exciting mix of urban, small town, and rural lifestyles. The Research Triangle Park (RTP) and the Raleigh-Durham International Airport (RDU) act as major growth engines not only for the County, but also for the surrounding region. The County had grown to over 1,129,000 residents in 2020 (U.S. Census Bureau, 2020).

By early 2000, the County and the 12 municipalities were facing significant challenges because of rapid growth. These challenges included mobility issues, overcrowded schools, and loss of open space and natural areas. Communities grew closer to their neighbors as sprawling development extended across the County. Increasingly, County and municipal officials saw the need for a more comprehensive effort to address growth concerns in the County. The Wake County Growth Management Task Force was created consensus for growth management. Building on existing collaborative approaches, the task force sought to develop a new, comprehensive growth management strategy that recognized both the interdependence and uniqueness of each of the communities. Local officials realized that effective regional solutions would only occur through the cooperation of all the governments working together in an open and participatory process.

Wake County's Growth Management Strategy, which was drafted in 2002, laid the foundation for achieving many of the County's goals and objectives. The County periodically reconvenes the Growth Management Task Force, now the Growth Issues Task Force, to evaluate progress on the Strategy's goals. In 2008, the Growth Issues Task Force met and asked each participating entity to identify the most pressing growth and development issues facing the County. The top three issues were:

- A high-quality educational system
- Increased mass transit opportunities
- Local government joint planning and cooperation

Other goals identified included utility collaboration, economic stability, sustainable development and environmental protection, land use planning, and water supply security (Wake County, 2008).

In 2021, the county adopted the PLANWake Comprehensive Plan which is intended to guide development in the county over the next ten years. PLANWake identifies the best areas for new development and strives to organize that development so it is equitable and sustainable.

7.1.1 “Complete 540”

NCDOT and the Federal Highway Administration (FHWA) are proposing to build a new, limited-access highway from NC 55 Bypass in Apex to US 64/US 264 Bypass in Knightdale. Majority of this route falls within the Wake County boundaries, with a small portion touching the Johnston County and Wake County borders. A qualitative indirect and cumulative effects analysis was completed to summarize differences in future land use and effects on water quality under 2040 No-Build and 2040 Build land use scenarios. The construction of Complete 540 is anticipated to encourage higher land use densities, more commercial and industrial development, and a greater mix of uses in the areas surrounding the proposed interchanges. A No-Build scenario would have reduced densities in the areas along the proposed alignment of the Complete 540 project and more widespread residential development rather than mixed-use.

A collaboration across CAMPO, the Durham-Chapel Hill-Carrboro Metropolitan Planning Organization (DCHC MPO), and CPRC determined future land use scenarios. The CommunityViz software was used to model growth.

Water quality scenarios indicate that the project would fall within the Neuse River Basin, specifically White Oak Creek and Little Creek. Several streams in the project area are listed as 303(d) impaired waters including portions of Swift Creek, Middle Creek, Crabtree Creek, Terrible Creek, Walnut Creek, Beddingfield Creek, and the Neuse River. Differences in streamflow, runoff, and overland contaminant loading of nitrogen, phosphorus, total suspended solids, and copper were also small between the Build and No-Build scenarios.

7.1.2 Wake County Sustainability Task Force Report (2011)

The purpose of the Sustainability Task Force was to identify environmental priorities for the county that focus on solid waste reduction and management, water resources conservation and management, and energy conservation and management. Members of this Task Force agreed that Wake County needs to maintain creativity and innovation to attract new industries to the area.

7.1.3 Wake County Transit Plan (2016, updated 2021)

The Wake County Transit Plan and its 2021 update were developed to address the county's growing population outpacing the capacity of its infrastructure, which was resulting in worsening congestion, increasing demand for public transit, and growing inequities between certain segments of Wake County's population. The plan lays out strategies to expand travel choices and diversify the region's transportation investments.

The Wake County Transit Plan is built around four "Big Moves" that will connect the region across county lines:

- Connect the Region
- Connect All Wake County Communities
- Create Frequent, Reliable Urban Mobility
- Enhance Access to Transit

7.1.4 Environmental Justice and Economic Development

The CPRC assesses equity across the region in terms of environmental justice and economic distress. This group works to support research on areas facing environmental hazards and how to direct funding (CPRC, 2023). They also have pursued reevaluating how the state designates tiers of economic distress, which influence funding for certain government programs, from county to sub county level. This change would highlight how communities in distress can be hidden by larger metropolitan areas on the county level (TJCOG, 2018). This research ensures policy-makers have the information necessary to promote equitable growth and development in the region, while protecting environmental resources.

7.2 COMPREHENSIVE PLAN AND UDO

The PLANWake Comprehensive Plan was adopted by the Wake County Board of Commissioners in April of 2021. Major growth is happening in the county, causing changes in neighborhoods and economic corridors. The new Comprehensive Plan was developed to guide Wake County's vision of responsible growth. PLANWake is a process to assess the big

community questions, renew the community's vision and goals on a range of issues, and outline a path to success for the coming decade. Seven key principles guide the PLANWake process:

- Our Regional and Local Assets, Particularly Our Quality of Life, Will Continue to Drive Growth in Wake
- Wake County Has a History of Working with Municipalities to Plan for Change
- PLANWake is an Opportunity to Renew the Vision for Wake County
- PLANWake Will Be Wake County's Policy and Action Guide for Decision-Makers
- Resident Responses to Critical Community Questions Will Be the Foundation for PLANWake
- PLANWake Will Build on Recent Planning Efforts and Focus on Potential Areas of Change
- PLANWake Will Consider the Long-Term and Focus on Achievable Actions for the Next 10 Years

7.2.1 Wake County Unified Development Ordinance

The Unified Development Ordinance (UDO) was adopted in April 2006 and is updated as-needed. The UDO combines ordinances related to zoning, subdivisions, land use, grading, stormwater management, and historic preservation. The key goals of the UDO include:

- promote the health, safety and general welfare of the citizens of Wake County;
- provide a guide for the physical development of the county;
- implement and ensure consistency with officially adopted plans;
- preserve and enhance the overall quality of life of residents, employees and visitors;
- regulate the use of buildings, structures and land;
- control the bulk and scale of buildings and structures;
- ensure adequate light, air, privacy, and access to property;
- maintain orderly and compatible land use and development patterns;
- protect the integrity of watersheds within the county;
- encourage environmentally responsible development practices;
- maintain economically vibrant as well as attractive business and commercial areas;
- retain and expand the county's employment base;
- provide attractive and effective signage that is compatible with the surrounding environment;
- accommodate and promote pedestrian, bicycle and transit use;
- ensure a range of housing choices and options for all segments of the population;
- establish clear and efficient development review procedures; and
- provide appropriate penalties and enforcement mechanisms.

In 2012, Wake County added the New Stormwater Rules for New Development in the Falls and Jordan Lake Basins to the UDO. These rules require local governments to adopt stormwater

standards for new development. Wake County is addressing the two programs in one set of regulations within its UDO, Section 9-21 State Nutrient Management Strategy Rules.

In 2019, The Wake County UDO was amended to specify general standards for landscaping which exclude non-native species and require research be conducted by the designer.

In 2020, Wake County Commissioners approved an amendment to Article 16 Landscaping and Tree Protection, which pertains to enforcing permissible encroachments into the Tree & Vegetation Protection Zone regulations. In 2022, the UDO was updated to include policies and goals stated in PLANWake as follows: modifying subdivision development options; recognizing agricultural resources and incorporating standards for off-road trails in the development process; and amending various sections to align PLANWake.

7.2.2 Wake County One Water

The Wake County Water Partnership is pursuing a 50-year water study using a One Water approach to improve the community's understanding of how water needs can be met based on projected population growth. While this collaborative study is still a work in progress, Wake County anticipates that the product will be an informative resource to address potential water risks due to growth. This 50-year plan integrates water management across various sectors including water supply, wastewater treatment, stormwater and flood management, and groundwater protection.

The One Water Plan aims to combine these efforts with county and municipal development and transportation planning, ensuring that all aspects of growth are supported equitably while preserving limited natural resources. Guided by principles that emphasize the value of water in all its forms and seek solutions that deliver economic, environmental, and social benefits, the plan also prioritizes regional collaboration and equitable access to clean water for all residents.

The project will include three key phases:

- **Visioning:** During this phase, planners will assess current county and municipal water management operations and policies.
- **Assessment:** Scientists will evaluate the resilience of groundwater, stormwater, surface water, and wastewater systems under the pressures of growth and climate variability. This phase will involve gathering data on water sources, including private wells and municipal systems, to identify existing issues and test scenarios that simulate drought, development, and climate changes.
- **Plan Development:** Wake County will collaborate with the community to develop strategies for long-term water security and sustainability. This includes actions to protect groundwater, mitigate flood risks, and prepare for climate impacts.
- Wake County aims not only to address current water challenges but also to foster resilience and sustainable development for future generations, ensuring that water resources remain abundant and accessible for all residents.

7.3 OPEN SPACE PRESERVATION

Open space helps minimize the overall level of imperviousness within a watershed. Open space that preserves wetlands and riparian areas also serves to filter pollutants from upland (upstream and draining to the open space) developed areas within a watershed. Open space can serve other ecological and human functions, such as providing high quality habitat to allow for greater species diversity, and passive and active recreation opportunities for the area's citizens. In Wake County, open space protection can provide additional land around the municipalities that serves as wildlife corridors between important habitat areas within the municipal boundaries.

Wake County has several mechanisms to preserve open space. These include open space plans and initiatives, land use plans, and unified development ordinance (UDO) provisions. In addition, programs such as the Voluntary Agricultural Districts help preserve the County's rural character. Each of these initiatives is described in greater detail below.

7.3.1 Wake County Consolidated Open Space Plan

The purpose of the Wake County Consolidated Open Space Plan accepted by the Board of Commissioners on March 17, 2003 and revised in June 2006 is to protect and conserve County land and water for current residents and future generations. Open space is defined as protected lands and waters that are owned and managed by the County, its public-sector partners, the municipal governments of Wake County, State of North Carolina, the United States government, and the County's private-sector partners, including non-profit land trusts. Open space consists of any parcel or area of land and water that is devoted to:

- Preservation of natural resources
- Managed production of resources (forest and farmland)
- Outdoor recreation
- Preservation of historic and cultural property
- Protection of scenic landscapes

The Wake County Consolidated Open Space Plan sets forth a plan of action to identify and protect the County's natural resources, historic areas, and other special environmental and cultural features. The purpose of the Plan is to identify, evaluate, and prioritize resources; establish preservation goals; and guide the implementation of an open space program. One goal of the Plan is to eventually protect a minimum of 30 percent of the county's land area, or roughly 165,000 acres. The County has partnered with each of its 12 municipalities to support open space planning. Since the 2006 revision of the plan, over 60,000 acres were protected, including federal lands around Falls and Jordan Lakes, Umstead State Park, County-owned parks, and open space and municipal parks. The County awarded monetary grants and asked that each municipal government devise and adopt a local open space plan. The County used these municipal plans as the basis for a consolidated county-wide open space plan, knitting together the recommendations of each to form an interconnected green print. There are four important and interrelated activities for open space conservation:

- Identify key parcels of land and corridors that should be acquired and protected as open space;

- Recommend new regulatory programs that improve the protection of resources that safeguard public health, safety and welfare;
- Establish a new program of land stewardship to manage open space resources;
- Define recurring sources of revenue that support open space conservation.

One of the main goals established for the Open Space Plan prior to its development was the protection of water quality and important ecological features. The open space planning process was integrated with the watershed planning process at the inception of both plans. The county is in the process of developing watershed management plans for all 12 major watersheds.

Final cost estimates to acquire the land to implement the Open Space Plan were developed estimating that costs of the Open Space Program would vary as a function of the methods of preservation (outright purchase, conservation easements, stream buffers, etc.). Outright acquisition of all parcels would cost hundreds of millions of dollars. Voters passed a \$120 million Parks, Greenways Recreation and Open Space bond in 2018, allowing for additional implementation of the open space system priorities. Since 2019 \$11.9 million has been used to acquire 1,330 acres of open space.

Open space will be acquired through various means. Some examples of acquisition methods include:

- Outright purchase by Wake County
- Negotiation of a conservation easement or other agreement between Wake County and the property owner
- Land dedication requirements, such as the County's stream buffer rules
- Donation or bargain sale by property owners for Federal and State tax incentives
- Cooperative arrangements with other governmental agencies Fee simple acquisition is the most common method for open space preservation

7.3.2 Wake County Land Use Plan

Wake County land use is guided by the PLANWake report which takes a comprehensive approach to guiding growth. This report was published with the PLANWake Development Framework map which outlines focus areas for community, community reserve, rural, transit, or walkable. Goals of the development plan include increasing non-automotive trips, protecting open space, and increasing intentional development with specific goals for growth based on the focus area type. Specific land use planning goals established by the County relate to managing growth to prevent urban sprawl, protecting natural resources, and preventing environmental degradation. These goals accomplish the following:

- Guide quality growth throughout the County in conjunction with affected local governments.
- Encourage growth close to municipalities to take advantage of existing and planned infrastructure, such as transportation, water, and sewer facilities.
- Encourage the development of communities that provide adequate land for anticipated demands, in a pattern that allows a mixture of uses.

- Encourage maintenance of open space, scenic aspects of rural areas, entranceways to urban areas, and transition areas between urban areas.
- Encourage the conservation of environmentally significant areas and important natural and cultural resources.
- Allow owners of significant farmlands and forest lands the opportunity to maintain the productivity of their land.
- Ensure that the land use plan and transportation plan mutually support each other.
- Ensure that the County always protects the property rights of landowners.
- Maintain the quality and develop the capacity of surface water resources, using them for recreation sites, when appropriate.
- Prevent the contamination and maintain the capacity of groundwater resources.
- Ensure that local governments provide adequate, properly located land for recreational and leisure opportunities.

Updates to the land use area plans are ongoing. As new area plans are adopted, they will be added to PLANWake Subsection 2 – Wake County Area Plans. As of 2024, three Area plans have been adopted, for Lower Swift Creek, Middle Creek, and the Lower Neuse. For up-to-date information on area plans refer to the Wake County website (<https://www.wake.gov/departments-government/planning-development-inspections/planning/area-plans>). The UDO is also being amended as needed to support the new land use plans.

7.3.3 Greenway System Plan

In 2017, Wake County adopted the Wake County Greenway System Plan, which focuses on establishing several greenway trail connections across natural corridors and man-made corridors. The goals of this program are to:

- Improve access to outdoor recreation for health and wellness;
- Increase connectivity for multi-modal transportation;
- Support economic development and capitalize on trail-based tourism;
- Protect waterways, wildlife habitat, and natural areas along greenways;

This plan is based primarily upon the connections between existing trails and the ability to connect to destinations such as parks, lakes, and downtown/town centers accounting for growth in the local cities and desire for alternative transportation. There is at least one greenway project in each of Wake County's municipalities to fill critical gaps within the existing network of trails. In 2000, there were less than 10 miles of on-road bike lanes in the Triangle, but by 2015, bike lanes had grown to 93 miles. In Wake County, there are now over 300 miles of existing greenway trails.

Increasing the number of greenways will help protect essential functions performed by natural ecosystems, including carbon sequestration, oxygen generation, and surface water filtration and infiltration. The natural open spaces around the greenway trails create a buffer zone around water resources, preventing soil erosion and filtering pollution. These greenways also provide opportunities to protect plant and animal species biodiversity. Additionally, greenways protect

the rural heritage of natural land within the undeveloped areas. This aligns with the County's Natural Heritage Program to preserve lands.

Wake County has requirements for pedestrian, bicycle, and trail facilities that vary between Short-Range Urban Service Areas, Long-Range Urban Service Areas, and Non-Urban Areas. In the Short-Range Urban Service Areas, off-road trail improvements are required when:

- Improvements are shown on a Transportation Plan and/or the Consolidated Open Space Plan;
- Subject subdivision has access to or is adjacent to existing or designated greenway corridors; or,
- The subject subdivision is adjacent to another development that includes off-road trail improvements.

Long-Range Urban Service Areas and Non-Urban Areas may require off-road trail improvements under the circumstances described for the Short-Range Urban Service Areas but must be authorized by the Planning Director or Planning Board.

Wake County also made suggestions for greenway-related policy considerations that could be followed county-wide and throughout its municipalities:

- Use native plants in the greenway landscaping
- Have wildlife-friendly landscaping and maintenance
- Implement Complete Street policies that would address on-street connections, trail crossings, and side paths
- Require additional bicycle/pedestrian friendly features in development to encourage more walking and bicycling such as street connectivity, strong bike/pedestrian connectivity from the subdivision/development to surrounding destinations and greenways, minimization of cul-de-sac streets, pedestrian/bicyclist cut-through path connections, and greenway connections to adjacent existing and proposed greenways

It is expected that there will be a cooperative maintenance management program of the trail systems based on expected trail use. The program recommends that municipalities play the largest role in maintaining the trails to expand upon their existing operations and resources. Wake County could play an assisting role in financial support.

Several policy action steps are written in this program to be implemented for the success of the greenway system plan. These include, but are not limited to:

- Present the plan to elected officials
- Meet with NCDOT to coordinate on key recommendations
- Amend county and local development ordinances to ensure that recommended greenway trail corridors are protected
- Revise sewer, stormwater and utility easement policies so they are compatible with the trail corridor plans
- Develop a corporate sponsorship policy
- Develop a coordinated operations and maintenance plan

- Host a semi-annual Countywide Greenway Trails Workshop
- Coordinate with the school system on greenway issues
- Identify and secure funding sources for trail corridors
- Make improvements to existing trails and expand marketing efforts for existing trails

7.3.4 Voluntary Agricultural Districts

The Wake Soil and Water Conservation District Board of Supervisors has created a Voluntary Agricultural District Program in Wake County. This creates additional open space within the County. The purpose of this program is to:

- Increase the visibility of farm communities in the county;
- Focus more attention on the importance of these communities to the county;
- Work with the county to make it easier for those who wish to stay in farming to continue doing so;
- Advise the county on issues affecting agriculture;
- Give farm owners a greater voice in local government decisions affecting their communities;
- Reduce conflicts between farm and non-farm land uses;

The guidelines for this program are covered by State Statute (NCGS 106-735 through 106-743, Farmland Preservation Enabling Act). Key components of the Wake County Voluntary Agricultural program are:

- A seven-member Agricultural Advisory Board appointed by the County Board of Commissioners manages the program: five farm owners, one agribusiness representative, and one Soil and Water Conservation District Supervisor.
- The Advisory Board considers applications from landowners to form agricultural districts, conduct hearings on public projects (roads, schools, etc.) that might negatively affect agriculture in a district, and advise the county on other issues affecting local agriculture.
- Farmers wishing to participate in the program sign a simple application indicating that they plan to remain in farming for the next 10 years. They may withdraw from the program at any time.
- Signs are erected along the roads in Agricultural Districts identifying them as such.
- Participants in the program are exempt from paying assessments for water/sewer lines extended past their property.
- All purchasers of land near agricultural districts are notified that they should expect dust, machinery noise, animal waste/chemical odors, and other similar elements associated with living in a farming area.

7.3.4.1 Farmland Preservation Program

The Wake Soil and Water Conservation District Board of Supervisors works cooperatively with landowners to encourage farmland preservation and protection.

In 2012, Wake Soil and Water Conservation District received its first donated easement for 47 acres for permanent farmland protection. In 2022, the new Farmland Preservation Program Ordinance was approved to replace the “Wake County Voluntary Agricultural District Ordinance. The goals of the program are:

- Promote agricultural values and the general welfare of Wake County
- Promote agriculture as an integral part of the county’s economy
- Increase identity and pride in the agricultural community and its way of life
- Encourage the economic and financial health of agriculture, horticulture and forestry
- Decrease the likelihood of legal disputes, such as nuisance actions between farm owners and their neighbors, and other negative impacts on properly managed farms

Place permanent protections on agricultural land to preserve precious resources for future generations.

In addition, under NCGS State Statute 105-277.4, the County provides the “Present Use Value” tax exemption to qualifying farm owners. Typically, as an area develops property values rise and agricultural use of the land becomes economically unfeasible. The present use value tax exemption program helps address this issue.

7.3.5 UDO Open Space Development Provisions

A number of amendments have been added to the Wake County UDO to further mitigation strategies related to open space preservation.

The Wake County UDO proposes regulations to promote subdivision designs that are both efficient and environmentally friendly. By encouraging open space subdivision designs, the goal is to create more compact developments that are less costly to build and maintain. These designs help reduce stormwater runoff and pollutant loading, preserving the rural character of an area. Open space subdivisions aim to provide necessary open space and recreational amenities for residents while also safeguarding natural, agricultural, and historic resources (Wake County UDO 5-12 Open Space Development).

7.4 WATERSHED PROTECTION AND ZONING

Wake County implements programs and policies in the UDO that support watershed protection. Article 3 - Zoning Districts, Article 5 – Lot and Building Standards, and Article 8 – Subdivision Design and Improvements in Wake County’s UDO summarizes the County’s watershed protection policies by zone. Additional efforts are referenced in this section.

7.4.1 Community Conservation Assistance Program (CCAP)

The Soil and Water Conservation District has established a voluntary, incentive-based cost share program designed to improve water quality through the installation of various best management practices on urban, suburban and rural lands not directly involved with agriculture production. Eligible landowners may include homeowners, businesses, schools, parks and publicly owned lands. Practices eligible for cost share include: streambank

stabilization, stormwater wetlands, grassed swales, bioretention areas, rain gardens, backyard wetlands, critical area plantings, diversions, and cisterns.

7.4.2 Water Quality Protection

Wake County's Recreational Waters Program, involves weekly water sampling (bacteriological) at public beaches end of May through Labor Day.

7.4.3 Nutrient Loading Accounting Tool

Wake County has created a hybrid design tool based on the Falls Lake accounting tool, which was modified to address the Wake County's local stormwater requirements and the nutrient management strategies applicable in Wake County: Neuse, Falls, and Jordan. The purpose of this tool is to improve a developer's understanding of pre- and post-development conditions for the watershed they are building in and reports the pollutant concentration expected in the watershed.

7.4.4 Swift Creek Land Management Plan

Swift Creek watershed was identified as an area of high interest for development and high need for ecological protection. In the late 1980s and early 1990s Cary joined with Wake County and other municipalities to adopt a land management plan for this area. The Plan protects water quality in existing and potential water supply reservoirs, sets requirements for riparian buffers, and imposes impervious area restrictions (Wake County, 1998).

7.4.5 Jordan and Falls Lake Rules

In 2012, Wake County implemented new development rules for the Jordan and Falls Lake Watersheds as required by the Jordan Lake Nutrient Management Strategy and Falls Lake Nutrient Management Strategy created by State legislation (Table 7-1). These strategies focus on volume control and establishing target export rates for total nitrogen and total phosphorous. The existing countywide standards are compared to the new development standards in the Falls Lake and Jordan Lake Watersheds. Currently the Jordan Lake Watershed is divided into two regulatory jurisdictions – Upper New Hope (UNH) and Lower New Hope (LNH).

Table 7-1. Nutrient Management Strategies for the Neuse, Falls, and Jordan Lake Watersheds

Standard	Wake County	Existing Neuse NMS*	Falls Lake NMS	Jordan Lake NMS
Nitrogen Export Limit lbs/ac/yr	N/A	3.6	2.2	2.2 (UNH) 4.4 (LNH)
Phosphorous Export Limit lbs/ac/yr	N/A	N/A	0.33	0.82 (UNH) 0.78 (LNH)
Stormwater Management Land Disturbance Threshold	Residential = All Regular Subdivisions and Minor Subdivisions > 15% Impervious	Residential = 1 Acre Non-residential = ½-Acre	Residential = ½-Acre Non-Residential = 12,000 SF	Residential = 1 Acre Non-Residential = ½-Acre

Standard	Wake County	Existing Neuse NMS*	Falls Lake NMS	Jordan Lake NMS
	Nonresidential = ½-Acre			

*The Neuse Rules are currently applied county-wide. All developments must meet state, local and federal regulations. If these regulations are inconsistent, the more restrictive standard governs.

Pursuant to North Carolina Session Law 2015-246, local governments, including Wake County, are prohibited from requiring or enforcing compliance with the Jordan new development rules until the delay by the North Carolina General Assembly ends. The Jordan new development rules shall become effective and enforceable upon the end of all applicable legislative delays.

The Jordan Lake Rules are a nutrient management strategy designed to restore water quality in the lake by reducing upstream pollutants. These rules became effective in 2009 and affect a small portion of Wake County. Local governments are required to develop stormwater programs for new development, staged programs for existing development, and are provided options for offsetting nutrient loads. In 2017, Wake County UDO, Section 9-21 was amended to reference the delay of the State mandated stormwater rules for new development for the Falls Lake and Jordan Lake Nutrient Management Strategies. The 2016 Agricultural Progress Report indicates that improvements have been made in the Jordan Lake watershed (NCDA&CS, 2018).

The Falls Lake Rules were established in 2010 (15A NCAC 02B .0275). The Falls of the Neuse Reservoir and all waters draining to it was classified as Nutrient Sensitive waters. There are two stages for the implantation of these rules as established by the Commission:

Stage 1: At a minimum, the objective is to achieve and maintain nutrient-related water quality standards in the Lower Falls Reservoir as soon as possible but no later than 2012 and to improve water quality in the Upper Falls Reservoir.

Stage 2: To achieve and maintain nutrient-related water quality standards throughout Falls Reservoir. This requires a reduction in average annual mass loads of nitrogen and phosphorous by 40 and 77 percent, respectively, from a baseline of 2006. There are cumulative allowable loads of 658,000 pounds of nitrogen per year and 35,000 pounds of phosphorous per year from the watersheds of Ellerbe Creek, Eno River, Little River, Flat River, and Knap of Reeds Creek.

Developers also have the option to offset part of the nitrogen and phosphorous load by implementing or funding offsite management measures. The offsetting measures should achieve at least equivalent reductions in nitrogen and phosphorous loading to the remaining reduction needed onsite to comply with the loading rate targets. Stormwater systems shall be designed to control and treat at a minimum the runoff generated from all surfaces in the project area by one inch of rainfall. To ensure the integrity and nutrient processing functions of receiving waters and associated riparian buffers, at a minimum, the new development shall not result in a net increase in peak flow leaving the site from pre-development conditions for the one-year, 24-hour storm event.

Existing development shall implement a staged and adaptive load-reducing programs for submission and approval by the Commission to meet associated minimum standards:

Stage 1: A local government subject to this Rule shall implement a load reduction program that provides estimates of and plans for offsetting within 10 years of the effective date of the Rule,

nutrient load increases from lands developed subsequent to the baseline period and not subject to the requirements of the local government's Falls Lake new development stormwater program. The current loading rate shall be compared to the loading rate for these lands prior to development for the acres involved, and the difference shall constitute the load reduction need in annual mass load in pounds per year. Alternatively, the local government can assume uniform pre-development loading rates of 2.89 lbs/ac/yr in nitrogen and 0.63 lbs/ac/yr in phosphorous for these lands. This shall be achieved within 10 years of the effective date of the rule.

Stage 2: 10 years after the effective date of the rule and every five years thereafter, a local government located in the Upper Falls Watershed shall submit and implement a Stage II load reduction that meets the following requirements:

- The local government should implement a program that includes an annual expenditure that equals or exceeds the average annual amount spent in the last seven years of Stage I to achieve nutrient reductions unless the expenditures are demonstrated to not be cost-effective.
- If Stage I reduction objectives are not met, then the local government needs to set aside an annual expenditure that equals or exceeds the average annual amount the local government has spent to achieve nutrient reductions from existing development during the highest three years of Stage I implementation.

Five-year programs shall be designed to achieve the Stage II percent load reduction goals from existing developed lands and include the timeframes for achieving these goals.

In addition to these requirements, the Falls Lake Rules required the NC DEQ to develop a New Development Model Program to assist local governments in developing their local stormwater management programs. The North Carolina Environmental Management Commission approved the DWQ's Model Program on March 10, 2011. The Model Program contained a model ordinance and a nutrient loading accounting tool which estimated nutrient loading from new development and loading changes due to best management practices (BMP) implementation.

In 2016, a Falls Lake Nutrient Strategy Status Report was published by the NC Division of Water Resources. Currently, Wake County implements the illicit discharge and elimination (IDDE) Program for the Falls watershed. The Upper Neuse River Basin Association (UNRBA) is also investing \$800,000 per year to conduct monitoring studies and enhanced water quality assessments in the watershed and tributaries feeding the lake (NCDWR, 2016). In addition, special studies are being done to address the contributions from nutrient loading that come from lake sediments and large storm events. The report indicates that the lower part of the lake has improved nutrient loads for chlorophyll a. Since the Falls rules were implemented, Stage I included an objective to reduce chlorophyll a in the lower lake. The standard throughout the entire Falls Lake for chlorophyll a is set for attainment by 2041. Reports will be published of progress in the Falls Lake watershed every five years from here on out.

Several tools have been published since the Rules were established. The Jordan/Falls Stormwater Nutrient Load Accounting Tool is a site-level runoff load estimator used by developers to determine site load reduction needs and demonstrate compliance with the New Development rule (NCDWR, 2016). The Storm-EZ Tool is another site-level runoff estimator

that focuses entirely on hydrology and used by developers to demonstrate compliance with Low Impact Development criteria. This tool can be used to report how closely the project matches the pre-development runoff volumes. The UNRBA Credit Tool is based off a modified version of the Watershed Treatment Model (WTM). The tool is spreadsheet-based and facilitates existing development rule compliance. The Nitrogen Loss Estimation Worksheet is used by the agricultural sector to track progress in nitrogen reductions. This spreadsheet estimates nitrogen loss from the edge-of-field that captures changes in loss from changed application rates, changes to crop acres and BMP implementation.

7.4.6 Groundwater Protection Program

Wake County Groundwater Protection Program permits and inspects every new private drinking water well, irrigation well, or utility well. Well repairs and well abandonments also require a permit and inspection. Bacteriological, Inorganic, and Nitrate/Nitrite sample analysis must be obtained and meet water quality standards as described in "Regulations Governing Well Construction and Groundwater Protection in Wake County" before the Certificate of Occupancy (CO) is issued. Depending upon prior land usage additional samples will be scheduled as well if deemed necessary by the Wake County Division of Environmental Services or if required by state regulation. The Groundwater Program has noted that there are naturally and manmade contaminants that occur throughout the county in private wells and the Wake County Groundwater Education and Outreach Program locates and identifies contaminated wells and assists well owners with solutions with well problems. Certain geographic areas of county have higher incidence of contaminants that can be identified.

7.4.7 Orphan Roads

Wake County is actively addressing the issue of "Orphan Roads." These are roads that developers fail to transfer to the North Carolina Department of Transportation (NCDOT) upon completion, leaving them without a responsible entity. NCDOT is responsible for maintaining all public roads in unincorporated Wake County, but they only accept roads meeting their standards. Orphan roads pose several concerns, including lack of maintenance leading to run-off due to a lack of street cleaning. Efforts are underway to mitigate these challenges and ensure the proper management and maintenance of all roads within Wake County.

7.5 RIPARIAN BUFFERS AND FLOODPLAIN PROTECTION

This section describes the County's riparian buffer and floodplain protection programs, including its 2019 Hazard Mitigation Plan (Wake County, 2019).

7.5.1 Riparian Buffers

Wake County's Riparian Buffer Protection Program meets or exceeds the Neuse River Nutrient Sensitive Waters (NSW) rules (15A North Carolina Administrative Code [NCAC] 2B.0233) and Jordan Lake Rules, which require that existing riparian buffer areas be protected and maintained on both sides of intermittent and perennial surface waters.

Article 11 of the UDO requires that all riparian surface waters in the County's jurisdiction have a 50-foot-wide if the feature is present on either the most recent version of the USDA Soils Map

or 7.5-minute quadrangle topographic map prepared by the USGS. Wider riparian buffers are required in water supply watersheds (WSWs) and Resource Conservation Overlay Districts, as described below:

- 100 feet from the flood pool elevation of a water supply impoundment (measured perpendicular to the shoreline)
- 50 feet from the normal pool elevation of a non-water supply impoundment with a drainage area of 25 acres or more
- 100 feet along perennial streams on the most recent edition of USGS topographic maps. Inner 50 feet (Zone 1) is undisturbed vegetated. Outer 50 feet (Zone 2) is stable vegetated.
- 50 feet along non-perennial watercourse, channel, ditch, or similar physiographic feature with a drainage area of 25 acres or more
- 30 feet from the normal pool elevation of the water impoundment with a drainage area of at least 5 acres but less than 25 acres
- 30 feet along each side of a watercourse, channel, ditch, or similar physiographic feature with a drainage area of at least 5 acres but less than 25 acres
- Minimum building setback from all buffers is 20 feet, except the 100-foot perennial stream buffer, which has no required setback.
- The inner 50 feet (Zone 1) of the 100-foot buffer required along perennial streams must either be platted as part of a development lot and included within a conservation easement or set aside as a reserved conservation parcel.

Lower Swift Creek Basin (Lake Benson to Johnston County line) and Robertson's Pond are located within the Raleigh SCI study area and within the County's Resource Conservation Overlay districts. According to the Article 11 of the UDO in a Resource Conservation Overlay district, the following buffers apply:

- 100 feet required around special water impoundment (Special watershed: a watershed area in Wake County zoning jurisdiction that contains a special water impoundment[s] that provide[s] significant wildlife habitat, characteristics unique to Wake County, public recreation, or potential for future recreation).
- 50 feet along each side of a stream or impoundment draining 25 or more acres of land
- 25 feet along each side of a stream or impoundment that drains between 5 and 25 acres
- Vegetation within buffers will be undisturbed except for specific uses (i.e., boat docks, greenways, drainage facilities, or utilities, among others).
- Minimum building setback from buffer is 20 feet.

7.5.2 Floodplain Development Regulations

The County's UDO Article 14 limits development in the floodplain. Regulating development in floodplains serves two main purposes:

- Limiting damage from storms

- Preventing water quality degradation

The County's ordinances that limit development within the floodplain exceed FEMA requirements. In recognition that flood hazard areas are subject to periodic inundation (flooding), which may result in the loss of life or damage to property as well as other adverse effects, these areas are subject to regulations designed to:

- Restrict or prohibit uses dangerous to public health, safety, and property when flooded
- Require that uses vulnerable to floods be protected against flood damages at the time of initial construction
- Preserve the flood-carrying capacity of floodplains
- Control filling, grading, dredging and other obstructions that may increase flood damages
- Prevent or regulate the construction of flood barriers that will divert floodwaters and/or increase flood hazards elsewhere
- Protect individuals from purchasing lands that are unsuitable for their intended purposes because of flood hazards
- In floodways and the floodway fringe, which are the two elements that compose the 100-year floodplain:
 - No new structures shall be constructed or placed in the 100-year floodplain, with few exceptions (i.e., water-dependent structures)
 - No fill shall be placed in the 100-year floodplain with few exceptions (i.e., onsite cut and fill balance), and no-rise certification is required
 - Encroachments in floodway shall be limited (roads, bridges, culverts or water dependent structures, etc.), must be flood-proofed, and cannot raise the base flood elevation above the elevation with floodway as established by the Floodway Data Tables

Wake County regulates additional areas outside the 100-year floodplain that still have potential for flooding. Special Flood Hazard Areas identified on Flood Insurance Rate Maps (FIRMs) provided by the National Flood Insurance Program arm of FEMA, as well as Flood Hazard Soils Areas identified in the Wake County GIS, are regulated by Wake County. Encroachments (fill material, roads, buildings, etc.) in these areas are discouraged, and when allowed, must meet rigorous design standards. In addition, it must be proven (usually through a flood study) that the encroachment does not adversely affect existing or proposed onsite structures or offsite properties.

In FEMA-identified Special Flood Hazard Areas where a detailed flood study has already been performed, 100-year flood limits and elevations as well as the floodway have been delineated; therefore, an additional flood study is not needed. Where FEMA has not performed a detailed flood study, the entire floodplain area is a floodway until a flood study is performed at the applicant's expense.

In new, detailed study areas and limited, detailed study areas (which are unnumbered A Zones), FEMA mapping will illustrate the 100-year floodplain under existing and future (buildout) conditions throughout Wake County. As a result, more than half of the river miles and associated floodplains in the Wake County jurisdiction will be mapped with future

conditions (100-year floodplain noted). Upon completion of this process, a change to the UDO will occur that will restrict uses (i.e., solid waste disposal facilities, hazardous waste management facilities, salvage yards, and chemical storage facilities, etc.) in the future floodplain areas and require structures to be elevated above future floodplain elevations. In 2021, Wake County Commissioners approved an amendment to Wake County UDO Article 14, Flood Hazard Areas. The update ensures the County's use of the current Flood Insurance Rate Maps (FIRMS) in compliance with the national Flood Insurance Program. The amendments are required to maintain Wake County's participation in the National Floodplain Insurance Program (NFIP). Additionally, in April of 2022, a text amendment was proposed to clarify regulations and include necessary updates to FEMA mapped areas of special flood hazard.

7.5.3 Hazard Mitigation Plan

The County's 2004 Hazard Mitigation Plan and its 2009 update were developed to be eligible to receive federal and State disaster relief funds if a natural disaster occurred. The plan includes hazard mitigation strategies, including for flooding-related natural disasters. An implementation schedule is also included, and the County is working through the implementation activities (Atkins, 2014). The Wake County Environmental Services Department is the lead contact for implementing and updating the plan. According to the Hazard Mitigation Plan (Atkins, 2014), the County added the following Capital Improvement Programs:

- Equipment replacements and upgrades for the 800-megahertz emergency communication system (all hazards)
- Emergency medical facilities to implement the EMS facilities plan (all hazards)
- Fire and rescue projects (all hazards)
- Reclaimed water projects (drought)

A new Hazard Mitigation Plan for Wake County was completed in 2019 and updated in 2020 and acts as a comprehensive strategy developed in coordination with municipalities to mitigate the impacts of natural and human-caused hazards.

The plan outlines a structured approach to hazard mitigation, aligning with federal requirements under the Disaster Mitigation Act of 2000. It ensures eligibility for FEMA-administered grant programs such as the Hazard Mitigation Grant Program (HMGP), Pre-Disaster Mitigation (PDM) program, and Flood Mitigation Assistance (FMA) Program. These funds support mitigation efforts before and after disasters, enabling communities to prepare more effectively.

Wake County's Hazard Mitigation Plan prioritizes hazards based on risk and vulnerability assessments conducted by a Hazard Mitigation Planning Committee (HMPC). Identified high and moderate priority hazards include:

- Dam failure
- Drought
- Earthquakes
- Extreme heat
- Flood

- Hurricanes and tropical storms
- Landslides
- Severe winter storms
- Tornadoes
- Wildfires
- Hazardous materials incidents

These hazards guide the development of specific mitigation actions tailored to reduce vulnerabilities across the planning area.

The County plans to review its action list on an annual basis and update it to account for changes in the annual Capital Improvement Plan and other Board of Commissioner plans. All items will be subject to annual budget approval. An overall plan update will be performed every five years to maintain the County's eligibility for Federal and State funds that address hazard recovery. The 2024 Hazard Mitigation plan is expected to be complete by the end of the year.

7.6 STORMWATER PROGRAMS AND IMPERVIOUS SURFACE LIMITATIONS

Wake County administers its own stormwater ordinance for unincorporated areas of Wake County in addition to a different urban stormwater ordinance for three municipalities in eastern Wake County (Wendell, Rolesville and Zebulon). For the unincorporated areas, Wake County uses a volume-control stormwater ordinance with Target Curve Number (TCN) runoff volume limits for residential development. Both residential and commercial developments adhere to the Neuse Rules stormwater requirements for peak flow, nutrient management, and riparian buffer rules. Wake County also adopted the Neuse regulations countywide (including within the Cape Fear Basin). In 2012, Article 9, Part 2 of their UDO was amended to incorporate, by reference, the State mandated stormwater rules for new development for the Falls Lake and Jordan Lake Nutrient Management Strategies.

The County has developed stormwater management programs that address the adverse effects of stormwater runoff associated with new development as well as limit nutrient enrichment in the Jordan Lake and the Neuse River Nutrient Sensitive Waters (NSW) rules.

Wake County created a Stormwater Management Section within its Environmental Services Department, whose goal is to minimize the impacts of stormwater runoff. The staff is charged with upholding the local, state, and federal regulations related to stormwater, including:

- Floodplain Management
- Sediment and Erosion Control
- Water Supply Watershed Protection
- Neuse River Basin NSW Stormwater Rules
- NPDES Phase II Stormwater Regulations

As of 2010, Wake County was no longer required to obtain a General Stormwater Discharge Permit because it does not operate a Municipal Separate Storm Sewer System. However, stormwater management permits are required. The County requires the use of the Wake County Stormwater Hybrid Design Tool for all stormwater management submittals. Its purpose is to streamline the many different stormwater requirements and facilitate a timelier review and approval of stormwater management plans. Complete stormwater requirements can be found in the 2014 Wake County Stormwater Manual: Submittal and Design Guidance. The purpose of this document is to provide guidance for the management of stormwater runoff resulting from development in the County's jurisdiction. It provides support to Article 9 of the UDO and applicable State regulations, which establish minimum requirements to address impacts of stormwater runoff associated with new development and expansions.

Wake County is required to implement the Neuse River NSW stormwater rules as previously described. In 2001, the County adopted its Stormwater Management Program for Nitrogen Control to meet the requirements of the Neuse River Basin rules. The County applies the program throughout its jurisdiction.

Wake County requires that the pre-development peak runoff rate be maintained. If the difference between pre- and post- runoff exceeds 10 percent for the 1-year, 24-hour storm, the developer must mitigate peak flow within the drainage area. Nitrogen export must not exceed 3.6 pounds per acre per year in the Neuse River. The County additionally requires that residential post-development curve number not exceed target curve numbers.

Wake County requires that post-development runoff not exceed curve numbers contained in Article 9, Part 2 of their UDO for a 3-inch rainfall over a 24-hour period.

Wake County has established a stormwater credit system that provides incentives for better site design and locating new development that causes less impact to aquatic resources. Approved methods to receive credit include: disconnected impervious surfaces, reforestation, and cluster and open space subdivisions. These stormwater practices reduce generation of stormwater, reduce size and cost of stormwater storage and provide partial removal of pollutants.

Wake County has impervious surface limitations in its water supply watersheds. The impervious surface limitations range from 6 percent to 30 percent for non-residential areas and up to 30 percent for residential areas. Under Phase II, development that exceeds 24 percent is required to implement stormwater BMPs. Stormwater permits are required for non-residential projects which cumulatively disturb more than 1/2 acre.

Wake County is required to implement the Neuse River and Jordan Lake NSW stormwater rules, as previously described, and stormwater program submittals are required for developments to ensure compliance with the rules. These rules supersede the Neuse Rules within the Jordan Lake watershed portion of the Cape Fear River Basin.

Nitrogen and phosphorous limits have been set, with a nitrogen export limit of 2.2 pounds per acre per year in the Neuse River (Falls Lake) area and 2.2 and 4.4 pounds per acre per year for the Upper and Lower New Hope Creek watersheds respectively of the Jordan Lake watershed. Phosphorous exports limits are 0.33 pounds per acre per year in the Neuse River watershed and 0.82 and 0.78 pounds per acre per year in the Upper and Lower New Hope Creek watersheds.

In 2008, a BMP Excel database was established to track all BMPs dating back to 2001 (implementation of the Neuse Rules). This database is used by all stormwater staff and is a resource to generate ad hoc reports.

7.6.1 Onsite Wastewater Program

Wake County Water Quality Division, Onsite Wastewater Section is responsible for all permitting activities that require a septic tank system for wastewater disposal. In addition, The Wastewater Management Section provides technical assistance to those designing septic and wastewater systems. The Operation and Maintenance Team within the Wastewater Management Section conducts inspections required under 15A NCAC 18A .1961 Table V(a) for existing Type III B, IV, V, or VI per the frequency required by this rule, to ensure the system is adhering to the permit requirements, and that it is functioning properly to protect public health, and the environment.

7.7 WATER CONSERVATION AND RECLAIMED WATER

The Wake County Soil and Water Conservation Department has a goal to protect Wake County's natural resources and implement conservation services. The Department implements environmental education programs that address surface water and watershed issues such as Watershed Stewardship Schools, Resource Conservation Workshop, and Service Learning Projects.

7.8 AIR QUALITY PROTECTION

In 2016, the County released the third and final installment of the Wake County Transit Plan. This Plan was developed in cooperation with several partners, including CAMPO, GoTriangle, the Regional Transportation Alliance (RTA), and GoRaleigh. Wake County and its affiliated partners recognized that there is a need to provide a high-quality transit service that links the economically, socially, and demographically diverse population. To do this, the County is visioning the resource allocation that municipalities can share in this network. These communities will have to revisit their transportation plans and consider incorporating transit into their local transportation network. The municipalities could look for ways to include transit costs into their capital improvement projects and address zoning related land issues along the transit corridor to minimize restrictions.

7.8.1 Regional Efforts

Further, GoTriangle is expanding bus and shuttle services that link Chapel Hill, Durham, and Raleigh with Research Triangle Park (RTP) and the Raleigh-Durham (RDU) airport. GoTriangle is working to develop plans to expand the system to include rail transit operations. GoTriangle also coordinates a ride-sharing program for regional commuters and is exploring the possibility of running some of its van-pool vehicles on compressed natural gas.

In 1999, the Greater Raleigh Chamber of Commerce organized the RTA, a group of government and business leaders, to consider ways to address the region's traffic problems. Today the RTA counts as members more than 100 businesses, along with two metropolitan planning

organizations (MPOs) for transportation, GoTriangle, and RDU. The group serves as a regional business voice for transportation initiatives and continues to focus on advancing multimodal solutions needed to sustain prosperity and enhance quality of life (RTA, 2013). The Triangle Clean Cities Coalition was also founded in 1999, and brings together fleet managers, local and state government officials, fuel and vehicle providers, and interested citizen groups, to reduce dependence on petroleum by promoting alternative transportation fuels (TCCC, 2010).

The CAMPO produces a document detailing the transportation needs of its service area, which includes all of Wake County and all 12 government jurisdictions therein. The document is submitted to the NCDOT and includes a prioritized, financially constrained list of local transportation needs.

CAMPO and the Durham-Chapel Hill-Carrboro MPO, in collaboration with the CPRC, have advanced their planning efforts with the development of a 2045 Metropolitan Development Plan and a 2050 Metropolitan Transportation Plan. These plans build upon the foundation laid by the 2040 Metropolitan Transportation Plan (MTP), which included an air quality conformity analysis spanning from 2012 to 2018. The 2040 MTP integrated recommendations from CAMPO's 2035 Long Range Transit Plan, focusing on expanding and enhancing bus services and proposing a light rail system connecting Raleigh and Durham with RTP, Cary, and Morrisville. This initiative thoroughly explored various regional growth scenarios to assess their impacts and trade-offs on the transportation network. The plans also informed the North Carolina Department of Transportation's (NCDOT's) Transportation Improvement Program, ensuring alignment with the region's evolving transportation needs (TJCOG, 2013).

Destination 2055 is a long range MTP for the Triangle Region of NC. The plan is being developed cooperatively by The Durham-Chapel Hill-Carrboro MPO and CAMPO. This plan will identify recommended transportation projects over the next 30 years. The first stage of development for Destination 2055 included conducting analyses of what-if scenarios that may have occurred without the MTP to help understand the impacts of the MTP report. The full report is expected to be released in 2025 (Wake County, 2024).

Air Quality Task Force
Wake County appointed an Air Quality Task Force whose goal was to eliminate ozone action days by 2010 and to comply with the National Ambient Air Quality Standards. The Task Force established 13 strategies:

- Develop regional partnerships
- Promote commuter choice and e-business
- Improve transportation
- Promote cleaner fuels and alternative fuel vehicles
- Reduce emissions from existing vehicles
- Promote land use planning that promotes cleaner air
- Promote energy conservation
- Reduce emissions from diesel engines
- Reduce emissions from non-road gasoline engines
- Establish Airport Clean Air Program
- Expand Ozone Action Day Programs

- Expand Outreach/Education Program
- Promote efficient freight and delivery transport

Wake County also has updated air quality standards (15A NCAC 02D .0401) in 2018 for air pollutants, including sulfur oxides, carbon monoxide, ozone, nitrogen dioxide, lead, PM10 particulate matter, and PM2.5 particulate matter. Wake County was found in attainment with the 8-hour ozone NAAQS in 2017. Further discussion can be found in Section 6.1.8.

7.8.2 Energy Conservation

There are several recommendations for energy conservation in Wake County. The first one is to achieve and maintain the EPA's national ambient air quality standards by reducing ozone and particulate matter. The Task Force also recommends that cities, businesses and governments minimize the adverse impacts to water, land, and air caused by the production and consumption of fuel and energy. In addition, Wake County desires the creation of a clean technology industry and the reduction of dependence on foreign fuel sources. In 2007, the State of North Carolina signed Senate Bill 3 (i.e., Renewable Energy and Efficiency Portfolio Standard), which requires all investor-owned utilities to meet 12.5 percent of their energy needs through renewable energy resources or energy efficiency measures by the year 2021. As of 2021 all utilities were found to be on track to meet this goal (North Carolina Utilities Commission, 2021).

7.9 TREE PROTECTION

Wake County includes Tree and Vegetation protection in its Code of Ordinances, Chapter 3-4 Required Improvements and Minimum Design Standards. The ordinances protect the perimeters of development sites to preserve and enhance the visual character of the County, control surface water runoff, and moderate temperatures.

7.9.1 Wake County Tree Canopy Assessment

With significant ongoing development expected over the next several years, Wake County communities must prioritize tree canopy management and understand its impacts on the environment.

In 2022, Wake County partnered with Davey Resource Group (DRG) to complete a Land Cover Analysis with Supporting Tree Canopy Assessment. The analysis, completed in the summer of 2023, comprised the total 857 square miles of Wake County, including and segmenting our 12 core municipalities.

The goals of the Wake County Land Cover Analysis and Tree Canopy Assessment are to:

- Support a higher quality of life for vulnerable residents and communities
- Preserve and enhance the County residents' quality of life through coordinated land use planning.
- Preserve and protect clean water supply.
- Preserve open space and expand access to parks, recreation resources, and greenways.

- Promote sustainability and address issues related to climate change.

7.10 HISTORIC PRESERVATION

Wake County has a Historic Preservation Commission which has jurisdiction in Apex, Cary, Fuquay-Varina, Garner, Holly Springs, Knightdale, Morrisville, Raleigh's extraterritorial jurisdiction, Rolesville, Wendell, Zebulon and the unincorporated areas of the county. The Wake County Historic Preservation Commission is staffed by Capital Area Preservation (CAP), a non-profit organization which focuses on the security of historic resources.

The Raleigh Historic Districts Commission presides over properties within the Raleigh corporate limits, and the Town of Wake Forest implements its own program.

The goals of the Wake County Historic Preservation Commission are to:

- Safeguard the heritage of the county by preserving districts and landmarks that embody important elements of its culture, history, architectural history or prehistory
- Promote the use and conservation of such districts and landmarks for the education, pleasure, and enrichment of the residents of the county and state
- Promote preservation concepts in the county and participating municipal planning programs
- The Commission's primary responsibilities are to:
 - Initiate and recommend properties for designation as historic landmarks
 - Review Certificates of Appropriateness
 - Keep the historic architecture survey up-to-date and maintain the historic resources database
 - Initiate National Register listing and comment on National Register nominations
 - Develop a historic preservation plan and ensure that historic resources are recognized in county and municipal plans
 - Provide information to the public about the county's preservation program and historic resources

8.0 LOCAL REGULATIONS AND PROGRAMS FOR MITIGATION OF SECONDARY AND CUMULATIVE IMPACTS

Morrisville embraces the best of city life and small-town environment and boasts that the Town provides everything needed to live, work, and play in the “Heart of the Triangle.” Because of Morrisville’s proximity to RTP and the center of the region, growth is expected to continue.

As the Town continues to grow, to ensure the quality of life for its residents and continue to make it an attractive place to live and raise a family, Town leaders are taking a proactive approach to protecting the environment, preserving open space, and protecting habitat. Environmental protection is a cornerstone value for the Town. The Town is working to address environmental concerns related to open space, water and wastewater infrastructure, transportation, and stormwater. The Town has implemented programs to direct growth to a planned central core village, preserve open space, protect riparian buffers, and maintain water quality through zoning ordinances and stormwater programs. The following summary addresses relevant regulations and programs from environmental management and land use policy analysis perspectives. These local initiatives to prevent impacts to natural resources will offset future impacts resulting from growth. These measures to protect and preserve the natural environment are implemented through the Town’s UDO, adopted December 10, 2013 and updated February 2024. recently developed UDO.

This section identifies and discusses the local programs and illustrates how they complement federal and state or regional programs. These programs mitigate the potential SCI discussed in Section 5. Table 8-1 illustrates the environmental resources protected by the various Town programs. Sections following the tables provide additional detail on each program.

Table 8-1: Summary of existing local programs and the environmental resources they protect.

Program	Terrestrial Habitat Protection	Aquatic Habitat Protection	Water Quality and/or Quantity Protection	Air Quality Protection	Noise Prevention
Growth Management Plan	X	X	X		
Open Space Preservation and Greenway Master Planning	X	X	X	X	X
Land Use Planning	X	X	X	X	X
UDO and Zoning process	X	X	X	X	
Parks, Greenways, and Pathways in Comprehensive Transportation Plan	X	X	X	X	X
Transportation Planning				X	X
Riparian Buffers and Floodplain Protection	X	X	X	X	X
Erosion and Sediment Control		X	X		
Stormwater Program		X	X		
Water Conservation		X	X		
Solid Waste Disposal and Recycling	X	X	X		

Program	Terrestrial Habitat Protection	Aquatic Habitat Protection	Water Quality and/or Quantity Protection	Air Quality Protection	Noise Prevention
Air Pollution Prevention				X	X
Tree Protection	X	X	X	X	X

8.1 GROWTH MANAGEMENT

8.1.1 Growth Management Plan

The Town is focusing on managing continued growth within its boundaries to ensure that the Town can continue to provide needed services to its residents, while protecting water quality, air quality, open space, and wildlife habitat. One of the Town's continuing goals is to further develop districts that will contain some existing and planned concentrations of housing, shopping, and recreational opportunities. The recent creation of Activity Center Districts as well as the Town Center Districts will help maintain residents' travel and activities in centralized areas. Additionally, the portion of the Town that is within the airport's 65-decibel noise zone cannot be developed for residential use, which should aid in easing development pressures in some of the Town's outlying areas. Thus, environmental impacts from everyday living and activities will be reduced in the Town's outlying areas.

8.1.2 Land Use Planning

Land use plans contain a Town's official policy on the form and pattern of future development within its jurisdiction. These plans are used to direct growth by serving as a reference to guide Town staff and official boards when developing new standards and ordinances and when considering rezoning, annexation, subdivisions, and site plans. The plans are also used to direct public infrastructure and aid decisions for private sector investment.

The Town's most recent Land Use Plan was adopted on February 23, 2021. The Land Use Plan is administered by the Town's Planning Department and a Town Planning Board. The Planning Department administers the Land Use Plan and existing development policies and regulations. The Planning Department also makes recommendations to advisory boards and the Town Planning Board to promote long-range growth and development policies to enhance the quality of life for those living and working in the community (Louis Berger Group, 2009). The Land Use Plan is enforced through Morrisville's UDO. Specific land use planning objectives relate to managing growth to prevent urban sprawl, protect natural resources, and prevent environmental degradation. They include:

- Preserve open space and conservation buffers.
- Prevent the overcrowding of land.
- Protect and preserve park lands, open space, floodplains, scenic areas, and historic sites.
- Conserve fish and wildlife.
- Promote forestry and grazing lands.
- Provide natural buffers between different zoning districts.

- Promote and preserve trees and urban forests during development.
- Preserve and maintain water quality and resources by protecting natural stream corridors and watersheds.
- Effectively manage long-term growth through a comprehensive and proactive planning process.
- Support effective zoning, land use, and development regulations and enforcement.

To achieve these goals, Morrisville has developed its Land Use Plan and UDO to direct growth within its boundaries in a manner that will protect streams, habitat, and other natural resources. A town center zoning district is planned. Higher-density residential and nonresidential development is focused in this preferred, already developed growth area. By concentrating urban development and living into a central area near shopping districts, the development of this town center will help protect local water resources as well as reduce air quality impacts. Open space will be protected with conservation and buffer districts throughout the southern portion of the Town.

Office/institutional and industrial development will be encouraged in the northeastern portion of the Town, which is adjacent to the RDU International Airport. Mixed office and institutional use will be encouraged in the north-central portion of the Town to serve as a transitional land use between commercial and industrial uses in the northeast and the low- density and agricultural uses in the northwestern areas of the Town. An historic crossroads village zone is among the Town Center Districts. The mixed-use and low-density residential areas are in close proximity to RTP. Commercial, residential, and agricultural mixed uses are planned for the west-central and southwestern areas of the Town.

8.1.3 Small Area Land Use Plans

Specific small area plans further detail open space preservation plans. The Town Center Plan, developed in 2007, creates a vision for the original center of the Town and identifies more concentrated residential and mixed-use development in this Town Center District, and significant open space areas, including an historic Civil War battlefield and a “village green” or gathering place. In 2013, the Town developed a McCrimmon Transit small area plan that proposes a future activity center focused on transit service, linked with pedestrian walkways, concentrating on higher-density, mixed-use integrated with central public open space and parks. To address transportation needs through the year 2040, The Town of Morrisville developed the 2019 Comprehensive Transportation Plan further detailing ongoing and anticipated transportation projects.

8.2 OPEN SPACE PRESERVATION

The Town has several programs to preserve open space. These include setting priorities for open space through the Town’s UDO as well as the Comprehensive Greenway Plan. These initiatives are described in greater detail below. The land use plans discussed above also serve to protect open space.

8.2.1 Unified Development Ordinance

The Town updated its UDO in February 2024. Through the UDO, the Town's Board of Adjustments and Planning and Zoning Board are established to enforce the ordinance and direct future community development and growth. Some of the purposes of the ordinance include:

- Prevent the overcrowding of land (not exceed amount supported by infrastructure)
- Avoid undue concentration of population
- Facilitate the adequate provision of transportation, water, sewerage, schools, parks, and other public requirements

Article 3 of the UDO defines 26 districts, within five base zoning districts, and one conditional, planned development, and overlay district for the Town. A zoning map was adopted as part of the UDO. The ordinance is enforceable in the incorporated boundaries of the Town and in the ETJ of the Town. New construction, the continuation of existing conforming uses, and the continuation of non-conforming uses are subject to the provisions of the ordinance.

Some of the residential use districts defined by the Town encourage infill development to prevent sprawl and allow for innovation, such as cluster development, in the arrangement of buildings. The use districts defined in the ordinance that are designed to aid in the preservation and protection of the natural environment are as presented in Table 8-2.

Table 8-2: Town of Morrisville use districts defined by UDO Article 3

Use District	Code	Purpose
Conservation/Buffer District	CB	In accordance with the Comprehensive Plan, the Park/Greenway/Open Space District provides for passive and active recreational uses, the protection and conservation (and restoration) of natural open space areas, and landscaped buffers. Active recreational open space should be readily accessible. Existing vegetation should be retained, reforestation or revegetation of open areas with native plants is encouraged, and degraded landscapes and wildlife habitats should be restored or enhanced.
Residential Districts include: Very Low Density, Low Density, Medium Density, and High Density Residential	VLDR LDR MDR HDR	To provide a comfortable, healthy, safe, and pleasant environment in which to live and recreate
Commercial and Industrial Districts include: Corridor Commercial, Office/Institutional, and Industrial Management	CC OI IM	the Corridor Commercial District along the Town's primary transportation corridors and gateways accommodates retail, office and service, small scale business park, institutional, cultural/public, and entertainment developments that meet local and regional needs and are sensitively designed to reflect a positive image of the Town
Activity Center Districts include: Neighborhood Activity, Business Activity, Community Activity, Regional Activity, and Transit-Oriented Development	NACBAC CAC RAC TOD	In accordance with the Comprehensive Plan, the Neighborhood Activity Center District provides for moderate scale, mixed-use activity centers that serve as convenient, walkable service and retail destinations for surrounding neighborhoods. It is intended to support a mix of residential, retail, cultural, entertainment, and office opportunities in a mixed-use village center, with street-level uses that generate pedestrian activity and upper-story uses that provide complementary residential and employment uses to "keep the street level active." Land uses should include a mix of uses,

Use District	Code	Purpose
		such as housing, commercial and office uses, restaurants, entertainment, personal and household service uses, institutional uses, public facilities and parks, and similar uses meeting the needs of occupants of the district and adjoining neighborhoods.
Town Center Districts include: Historic Crossroads Village, Main Street, Town Center Commercial, Town Center Residential, Residential Transition, Residential Neighborhood Preservation	HCV, MS, TCC, TCR, RT, RNP	To encourage the development of a central retail and residential center. The location of residential areas near the areas people shop helps to reduce travel, thus reducing air and noise pollution.
Planned Development	MUPD MSPD	The Planned Development districts are established and intended to encourage innovative land planning and site design concepts that support a high quality of life and achieve a high quality of development, environmental sensitivity, energy efficiency, and other Town goals and objectives
Overlay Districts include: Airport Overlay, Floodplain Overlay, and Gateway Overlay	AO-A AO-B FO GO	Overlay zoning districts are superimposed over portions of one or more underlying base, conditional, or planned development zoning districts with the intent of supplementing generally applicable development regulations with additional development regulations that address special area-specific conditions, features, or plans while maintaining the character and purposes of the underlying districts. Some overlay districts include standards that modify or supersede standards applied by the underlying district.
Conditional District	C-NAC	One parallel to each Base District above

The Town Center Districts are areas where the Town envisions a high-density mixture of retail and residential uses. To provide development incentives for this area and reduce sprawl in other areas, the Town provides flexibility in designs. Designs must still meet environmental ordinances, but the flexibility expedites the permitting process. In the Town Center Districts, the Town is also planning a train station, which will provide easy access to RTP and other areas within the Triangle.

The key growth management and environmental protection regulations included in the Town's UDO are as follows:

- Required open space regulations for both residential and non-residential land uses, ranging from 5 to 20 percent, depending on the land use type and district
- Requirements of 50-foot-wide undisturbed stream buffers on all intermittent and perennial streams
- Open space and recreational requirements for planned development to preserve natural resources
- Flexible design options to allow for pedestrian and vehicular connectivity between sites
- Landscape buffer requirements based on adjoining land uses, with varied densities based on width
- Standards to reduce noise pollution

The dimensional requirements for development also offer environmental benefits. The Town does not require a minimum lot size, except for with single-family residences and duplexes.

Section 5.5.2 of the Town's UDO requires that 1/35 acre be set aside as recreation or open space for each dwelling unit in a development. The Town may accept a fee in lieu of that set-aside space. The land may include recreation areas (tennis courts or ball fields) but may not include lakes. No more than 25 percent of the area may be in the floodplain.

Sections 5.4 and 5.12 of the UDO address tree protection and landscaping. The preservation and planting of vegetation serves to protect the environment in numerous ways. Vegetation prevents erosion and filters air, water, and noise pollution.

8.2.2 Parks and Recreation Master Plan

The Town of Morrisville, the Town of Cary, and Wake County have been working together with the Triangle Land Conservancy, the Triangle Greenways Council, and the North Carolina Division of Parks and Recreation (Trails) to ensure connectivity of their greenways and other trails regionally.

In 2002, the Town adopted the first Comprehensive Parks, Recreation, Greenways and Open Space Plan. In 2006 the plan was updated and combined with the Parks, Recreation, Greenways and Open Space Comprehensive Master Plan. Due to the rapid growth and changing demographics in Morrisville, the comprehensive plan was updated again in 2011 and most recently in 2018 as the Parks and Recreation Comprehensive Master Plan.

Since the last update, the Town has purchased over 6 acres of new parkland and is working with Wake County on the development of a new lake front park that would incorporate an additional 45 acres of County owned land to provide a passive park setting in the NE side of Morrisville that is currently underserved for park land. The master plan includes existing and proposed greenways and multi-use paths (Town of Morrisville, 2018b). The Town's greenways are 10-foot-wide paved paths. There are no design standards for private greenways, but each must be 8 to 10 feet wide, if it is along a road. Most greenways are along creeks, including Crabtree Creek, Indian Creek, and Cedar Creek, and provide interconnectivity to the parks. The Town views its 2018 Parks and Recreation Master Plan as an extension of its transportation plan and is striving for a reputation as a walkable and bikeable community. Therefore, the Town is working with surrounding communities to connect its greenways to other transportation corridors, as shown in the 2018 Parks and Recreation Master Plan map, by proposing greenways that connect with RTP and Town of Cary. More information regarding greenways is presented later in this section.

The Town has planned an extensive greenway network totaling over 58 miles. Much of the planned multi-use paths are tied to major roadway improvements or construction of new roads. As of March 2024, 8.6 miles of greenway and multi-use paths have been completed. Other greenway projects include:

- Installation of Indian Creek Greenway
- Connection to Shiloh Greenway via Church Street Park; over 10 percent of Town residents live within 0.5 miles of this trail
- A Congestion Mitigation and Air Quality (CMAQ) grant with the Town of Cary to construct 1.2 miles of Crabtree Creek Greenway, running from Lake Crabtree Park to the Town Center area of Morrisville

- Hatcher Creek Greenway, completed in 2018 totaling 1.4 miles.

The Town's Parks, Recreation, and Cultural Resources Department strives to enhance the quality of life for residents while working to acquire, develop, vitalize, beautify, and conserve a system of parks, greenways, open spaces, and recreational areas. The Town's 2018 Comprehensive Parks and Recreation Master Plan aims to identify and preserve undeveloped areas as open space (Town of Morrisville, 2018b).

In support of open space preservation, Town residents have approved two separate bond referendums. In November 2004, Town residents approved a referendum for issuing a \$4 million bond, part of which was used to acquire land for the development of active recreational park facilities. In November 2012, a \$5.7 million bond was approved for various projects including a greenway extension at the Morrisville Community Park. The Morrisville Community park was completed in May 2023. This project was funded through the 2021 Morrisville Bond Referendum. As shown in Section 4.6, the Town has a total of 127 acres of community and neighborhood parks as well as multiple special use and pocket parks. Morrisville will need to add a total of 40,587 square feet of facilities space by 2027 to keep the desired level of service and meet future demand (Town of Morrisville, 2024)

8.3 COMPREHENSIVE TRANSPORTATION PLAN

Morrisville's 2019 Comprehensive Transportation Plan lays out concepts for future transportation corridors. The plan aims to minimize environmental impacts and includes corridors for bike and walking paths. The development of safe, non-vehicular pathways encourages travel by foot and bicycle. Currently, the Town is developing a non-vehicular transportation network that includes both pedestrian and bicycle components.

A pedestrian network will provide mobility for residents through sidewalks and pathways that connect neighborhoods and people with places. Implementing measures defined in the Transportation Plan will aid the Town in the development of its Town Center and provide pathways for local residents to have more convenient access to local attractions, such as Lake Crabtree County Park. In some cases, multi-use pathways will be developed for non-motorized travelers. In other cases, single-use pathways will be developed for either pedestrians or bicyclists.

The Town applied for and obtained Community Development Block Grant (CDBG) funds through Wake County to construct sidewalks along Church Street, and along Barbee Road and Fiona Circle. Other public funded road projects include widening with sidewalks along Morrisville-Carpenter Road completed in February 2023, and installation of sidewalks along NC 54 near NC 540 with an anticipated completion of July 2024.

The Town's annual budget continues to fund capital improvements to roadways and the park system. The FY 2023 5-year program budget includes funding for:

- Town Center Phase I
- Airport Blvd. Extension Phase I
- Crabtree Creek Nature Park

- NC-54 Widening Betterments
- McCrimmon Parkway Widening Betterments
- Public Works Facility
- Intersection Improvements Phase II
- Intersection Improvements Phase III
- Future Parkland Acquisitions
- Cedar Fork Elementary Athletic Facilities
- Sidewalks
- FS 2 Construction and Relocation
- Existing FS 2 Widening Impacts
- Watkins Road Park (Wake Tech Site)
- Marcom Drive Parkland

The bicycle network also will connect people with places, and the Town's focus is on a regional network. Bicycle lane recommendations, presented in the 2019 Transportation Plan, are likely to occur along with planned road widening. The Town is also working with NCDOT to incorporate 2-foot-wide bicycle lanes along future roadways. New developments are constructed with bike lanes, where appropriate, as occurred along Crabtree Crossing Parkway, Preston Village Way, and Upchurch Meadow Road. In some instances, restriping can provide bicycle lanes without widening the road, as occurred in Parkside Valley Drive in 2007; this process is recommended in the Transportation Plan for Morrisville Parkway, Perimeter Park Drive, and Paramount Parkway.

Another example of regional cooperation is the Center for Regional Enterprise (CORE) Pedestrian-Bicycle-Green Space plan, sponsored by the Central Pines Regional Council, formerly Triangle J Council of Governments. As part of this effort, the connectivity of greenways and open space is discussed on a regional basis. The Towns of Morrisville and Cary, as well as the Cities of Raleigh and Durham, participated in this effort. The plan was initially adopted in 2005 and updated in 2009 and 2012. The 2012 update notes Davis Drive, a portion of which lies within Morrisville, as a top priority bicycle corridor.

An important component of the development of a non-vehicular transportation network is landscaping and vegetation. The vegetation planted along walkways and bicycle paths provides security for users. The Town's Transportation Plan recommends that the vegetated area for pathways be a minimum of 3 to 8 feet wide, depending on the road type. Street trees also are recommended to provide shade, protection, and shelter for walkers and bikers (Louis Berger Group, 2009a).

8.4 REGIONAL PLANS

There are a number of regional plans that organize sustainable development across municipalities. The CPRC has focus areas for Community and Economic Development, Environment & Resilience, Mobility & Transportation, and more which guide a coordinated approach across communities (CPRC, 2024). CAMPO also conducts studies focused on transit including air quality studies. These organizations provide connections between Morrisville and the surrounding area to ensure that the entire region plans for growth and mitigation.

8.5 RIPARIAN BUFFERS AND FLOODPLAIN PROTECTION

8.5.1 Riparian Buffers

Riparian buffers help protect water quality by filtering pollutants, stabilizing streambanks, and moderating stream temperatures through shading provided by mature vegetation. Thus, they are effective in helping to control sediment loading as well as stormwater runoff volume. In addition, buffers can provide ecological functions by protecting wetlands, supplying food and habitat for aquatic and streamside organisms and offering wildlife corridors. Finally, riparian buffers can help protect floodplains and downstream property.

The Neuse River NSW rules and Jordan Lake Rules require that existing riparian buffer areas be protected and maintained on both sides of intermittent and perennial surface waters. These rules are incorporated into the Town's UDO. This ordinance requires 50-foot- wide, undisturbed riparian buffers on all perennial and intermittent streams, lakes, and ponds that are indicated on the most recent version of a USGS quadrangle topographic map or the County soil survey map. USGS topographic maps do not always include accurate depictions of streams. As a delegated authority for buffers, the Engineering Department is responsible for stream origin determinations and implementation of the riparian buffer ordinance; NCDEQ's methodology to determine whether a stream is present is followed.

The Town requires that developers identify the location of streams on their site plans; a developer must delineate the top of bank of streams through field surveys in order to accurately show the 50-foot buffer extents. The Town and other municipalities recognize that the maps contain more streams than exist; therefore, where conflicts exist between actual field conditions and USGS maps, the Town will perform a stream determination to verify the existence of the surface water. To ensure buffers are protected, the Town requires developers to show streams and buffers on their site plans.

The Town strives for undisturbed riparian corridors, as outlined in its UDO. However, where alternatives are not practicable, the UDO allows for some allowable uses, such as utility lines and roads, in the buffer. The exact location of allowable uses and their proximity to streams is determined during the design and permitting stages. Where practicable, utility lines are directionally bored, and roads are bridged. As another example, greenways are allowed within the riparian corridor provided disturbance is minimized and water quality is protected to the maximum extent practicable. Some allowable uses also require buffer mitigation. Mitigation may include a combination of onsite or offsite buffer enhancement, restoration, or preservation; payment of a compensatory mitigation fee; and/or donation of property. The amount of mitigation required ranges from 1.5:1 to 3:1, depending on the buffer zone impacted.

For Crabtree Creek, the Town protects a wider riparian corridor through its conservation/buffer zoning district, described in this section. This zoning district was developed to keep development out of the floodplain.

8.5.2 Stream and Riparian Buffer Restoration

The Town funded and completed a stream restoration project on the Hatchet's Grove Stream segment, which parallels Morrisville Parkway. This Priority II stream restoration project is located within the Prestonwood Golf Course and consists of the relocation and restoration of 3,800 linear feet of stream and the creation of over 6 acres of vegetative riparian buffer. The objective of this project was to take a historically channelized stream and restore the natural channel pattern, profile, and functionality by isolating present golf course activities. As a result of the final restoration, the number of fairways crossing the creek was reduced from 6 to 3, and 3 of the 6 existing cart bridges were removed. This project increased the stream length by approximately 500 linear feet. The Town preformed this project within Town limits in order to ensure that the benefit of the potential mitigation credit would remain local.

The Town is proactively seeking restoration opportunities to improve its watersheds. The Town contracted to complete a watershed assessment for tributaries of Kit Creek. This included all the area of the Town within the Jordan Lake watershed. The assessment includes field investigations of stream stability, restoration opportunity, stream buffer integrity, invasive plant species, and stormwater outfall stability. The outcome of the assessment is to plan for and define potential restoration and retrofit projects. The Town conducted a similar assessment of the Neuse River Basin, encompassing a three-phase assessment completed in 2016.

8.5.3 Hazard Mitigation Plan

The Town adopted the Wake County Hazard Mitigation Plan in 2019. The plan includes the jurisdiction of Morrisville, as well as Wake County, Apex, Cary, Fuquay-Varina, Garner, Holly Springs, Knightdale, Raleigh, Rolesville, Wake Forest, Wendell, and Zebulon. The plan identifies hazards, their possible effects, likeliness to occur, and how to best prepare and mitigate damage. Hazards identified as likely in Morrisville included flooding and wildfire damage. For more information, refer to the Hazard Mitigation Plan section in the Regional Regulations and Programs (Morrisville, 2020).

8.5.4 Floodplain Development Regulations

The Town complies with FEMA regulations. No fill or development is allowed in the floodway, and for any development within the floodplain, the lowest floor elevation must be at least 2 feet above the 100-year flood level. For streams that are not mapped by FEMA, there can be no encroachments within 20 feet of the top of stream bank or within a distance of 3 times the stream width, if no base flood elevation or floodway information is available, unless a professional engineer certifies that encroachment will not result in increase in base flood level. These regulations are summarized in Section 5.6 of the UDO, Floodplain Management.

The Town's zoning ordinance includes a Floodplain Overlay District, which supersedes standards applied by the underlying district, to keep development out of the floodplain. Within the Floodplain Overlay District, no structure shall be located, extended, converted, or altered, and no development activity shall occur, in any way except after approval of a Floodplain

Development Permit, detailed in Section 2.5.9 of the Town's UDO. Although there are provisions in the UDO, floodplain development has not occurred in recent years. The Town also has established a conservation zoning district, which includes parks, greenways, and open space. The zoning map shows that Crabtree Creek and its floodplain is effectively protected with a wide riparian buffer through these zoning districts.

FIRMs for the Neuse River basin and Cape Fear River basin in Wake County were updated in July 2022 and are available for public view/ download. The updated maps are based on full build-out conditions to reflect changes in hydrology that occur as imperviousness increases. The Flood Damage Prevention Overlay zoning districts are modified as necessary to reflect changes in flood elevations.

8.6 EROSION AND SEDIMENT CONTROL

Wake County implements the Town's Erosion and Sediment Control Program. The County's program requires a plan when 1 acre or more of land is disturbed. The Town proactively inspects erosion and sediment control measures to verify that measures are in compliance and provides non-compliance reports to the County. The County's program is described in more detail in Section 7.0.

The Town has various policies for controlling sedimentation and erosion. The Town's sediment and erosion control practices support an overall stream protection plan by limiting in-stream suspended sediment and sediment deposition. Policies in place include performance guarantee requirements, and maintenance guarantee requirements. These policies help the Town to ensure that soils are controlled on development sites and that sites are stabilized with vegetative cover as rapidly as possible.

General performance guarantees must be 150 percent of all required public improvements on a site plan, including: roads, sidewalks, and greenways; site grading; erosion control measures; seeding and stabilization; water mains, valves, hydrants, and other infrastructure related to water service; sanitary sewers and related infrastructure; storm sewers and stormwater management facilities; retaining walls; landscaping, such as buffer vegetation and street trees; and traffic control devices.

Another sediment and erosion control strategy used by the Town is to ensure the timely restoration of disturbed soils. The NPDES Stormwater General Permit (NCG 010000) for construction activities requires that stabilization occurs within 7 calendar days of the last land-disturbing activity for slopes steeper than 3 horizontal to 1 vertical (3: 1) and within 14 calendar days for non-slopes.

To ensure the continued function of stormwater BMPs, Section 7.4 of the UDO specifies performance securities for stormwater BMPs. An installation performance security deposit is required, equal to the total estimated construction cost, plus 50 percent. A maintenance performance security is also required, equal to 30 percent of the total estimated construction cost.

The Town recently developed and adopted a new Engineering, Design, and Construction Manual (EDCM) containing updated stormwater quantity and quality measures. The EDCM also provides clarifications of the BMP manual.

8.7 STORMWATER PROGRAMS

The Town is only 9.8 square miles and is surrounded by the airport, RTP, and the Town of Cary, so it has limited potential to expand beyond its current ETJ. Given the proximity of the Town to employment opportunities in RTP and access to the airport, the Town has planned for higher-density development in much of its study area. The Town has developed a stormwater management program to control the rate of stormwater runoff from high-density areas. The Town's stormwater program is administered by its Engineering Department. The staff is charged with upholding the local, State, and Federal regulations related to stormwater. These legal requirements include:

- Floodplain Management
- WSW Protection
- NPDES Phase II Stormwater Regulations
- Neuse River Basin Buffer Rules
- Jordan Lake Buffer & Stormwater Rules

The Town has assumed responsibility for administering the BMP program for quality from NCDEQ. On February 28, 2012, the Town Council approved a stormwater funding resolution that gave the ability to establish a stormwater utility fee for developed property containing impervious surface within the Town. The fees collected will assist in the costs involved in administering the stormwater program.

8.7.1 Stormwater Regulations

In January 2012, the Town adopted a new Stormwater Management Ordinance, which substantially expanded the Town's stormwater management efforts. This ordinance is summarized in Article 7 of the Town's UDO. The ordinance establishes minimum requirements and procedures to control the adverse effects of stormwater runoff associated with increased development. The ordinance also prohibits any person from developing land without having proper stormwater control measures in place. The ordinance effectively implements the Jordan Lake rules for new development throughout the entire Town. The minimum requirements of the ordinance include that developers must also meet all other State and federal rules. Stormwater BMPs must be implemented to control and treat the runoff volume generated from 1.5 inches of rainfall. In addition, pre- and post-development peak runoff rates must be equivalent for the 1-year, 24-hour; 2-year, 24-hour; and 10-year, 24-hour storms.

Stormwater control is accomplished through the installation of best management practices (BMPs) with designs approved by the Stormwater Administrator. Before being approved, BMP design plans must include a determination that no facility will cause flooding or drainage problems for adjacent structures, a designation of easements needed for inspection and maintenance of facilities, and a plan for maintenance. Control facilities may include both structural and nonstructural elements, such as dry basins; wet ponds; detention swales; underground pipe storage; and facilities to encourage overland flow, slow flow, and flow through buffer zones. At a minimum, stormwater facilities must be able to manage the 1, 2, and 10-year design storms, and BMPs must be designed to safely pass the 100-year storm.

All BMPs must also be designed to meet the minimum requirements of the NCDEQ Stormwater BMP Manual.

To ensure long-term maintenance of stormwater facilities, all privately owned facilities must develop maintenance agreements with the Town. As part of the agreement, the Town is allowed access to inspect facilities and ensure that they are being maintained in working order. Maintenance agreements are recorded in the Wake County Register of Deeds and are binding on all subsequent owners of private discharge facilities. The Town maintains publicly owned, regional discharge control facilities.

The Town requires both a performance guarantee and maintenance security requirement for BMPs, in the amount of 150 percent and 30 percent, respectively, of the engineer's estimate cost of the BMP. The performance guarantee runs until the Town gives final approval of the required BMP (UDO Section 7.4 and Section 8). The maintenance security remains in escrow with the Town in perpetuity. The owner of each stormwater control structure will submit a Maintenance Inspection Report annually, conducted by a qualified professional, licensed in the state of North Carolina. All private and Town BMPs are inspected at least once a year by the Town's Stormwater Inspector.

8.7.2 NPDES Phase II Stormwater Program

The Town received a renewal of its NPDES permit in 2023 (Appendix E). The Phase II Permit requires that any new development that exceeds the 24 percent built-upon area must implement stormwater BMPs. The Town requires that all development, regardless of percent BUA, must provide stormwater BMPs. These BMPs are required to treat the runoff from the first 1.0 inches of rain, remove 85 percent average annual total suspended solids (TSS) and draw down the treatment volume no faster than 48 hours, but no slower than 120 hours. The Town requires treatment of the runoff from the first 1.5 inches of rain. The pre-development and post-development peak flows must be equivalent, regardless of the level of imperviousness in a given development.

Section 5.5 of the Town's UDO outlines required open space regulations for both residential and non-residential land uses, ranging from 5 to 20 percent, depending on the land use type and district. Article 3 of the UDO, regarding zoning, specifies the maximum lot coverage allowed, per zoning category, although open space and buffer requirements may further limit lot coverage.

The Town has an Illicit Discharge Detection and Elimination (IDDE) program, as part of its NPDES Phase II permit (UDO Section 7. 6). The program prohibits illicit discharges, connections, and dumping to the stormwater conveyance system, and includes a provision for assessing civil penalties on violators. As a part of good housekeeping and pollution preventions, the Town contracts a street sweeper to sweep all Town owned roads and parking lots 4 to 6 times per year.

Morrisville also has an active stormwater education program. The Town has teamed with other municipalities to provide outreach and education to help reduce stormwater pollution and nutrient loading from homeowners and businesses as part of the Clear Water Education Partnership (CWEP). This may include radio and television advertisements, handouts, website, etc. Other elements of the stormwater education program include the Town's monthly

newsletter and other mailings, newspaper advertisements, workshops, and the internet. The Town also distributes stormwater materials to Cedar Fork and Morrisville Elementary Schools and displays information in the lobby of Town Hall, as well as at community events, including National Night Out, Green Day, and various homeowner association meetings. Town presence at these events sometimes includes a staff member dressed in costume as a fish character, for enhanced public involvement and engagement.

Town staff also provides stormwater educational “giveaways” at these events and around Town. Giveaways includes pens, water bottles, rain gauges, reusable bags, pet waste bag dispensers, stickers, and temporary tattoos for the kids.

The Town has installed educational signs along greenways and at Town-owned BMPs. In addition to education, the Town seeks opportunities for involvement and participation. The Town is currently collecting responses to a stormwater survey that will allow the program to better target educational activities. The Town also oversees a resident advisory committee known as RAIN (Residents Active in Improving the eNvironment), whose purpose is to review and recommend stormwater improvement opportunities, as well as help facilitate public involvement and education. The RAIN committee plans to do a pilot stream clean event to determine if a formal stream clean program will be implemented in the Town.

Public participation also is solicited for storm drain making. The Town sells rain barrels at cost, providing free delivery, and periodically holds a rain-water barrel workshop free of cost to the public.

The Town maintains a watershed map depicting the location and type of all of the storm drainage system and structural BMPs currently in place. Having data on a single map is required by the Town’s Phase II permit and is also beneficial in Town stormwater education, good housekeeping, and IDDE efforts.

8.7.3 Stormwater Capital Improvement Plan

Several stormwater capital improvement projects are in process, including outfall retrofits, stream restoration, and BMP retrofits. These projects will improve both water quality and water quantity at each site. The Town stormwater program includes a BMP retrofit at Fire Station 2 site, located within the Crabtree Creek Watershed. The retrofit includes a rain garden installed, as well as a 5,000-gallon cistern. The Town recently purchased property adjacent to a stream with plans to perform a stream restoration and/or BMP retrofits. A feasibility study is currently being performed for this stream project.

8.7.4 Water Supply Watershed

WSW rules apply to new development in the Jordan Lake watershed. These rules, similar to those of the NPDES Phase II permit, require most new development to control the runoff that results from the first inch of precipitation from storm events, and to remove 85 percent of TSS from stormwater runoff using approved BMPs. These rules are addressed in the UDO’s stormwater Section 7. All new impervious areas within the Town are being tracked for future analysis.

8.7.5 Nutrient Sensitive Waters Management Strategy (Neuse Basin Rules)

The buffer requirements of the Neuse Basin Rules are met through the Town's UDO. The Town was not named a community for stormwater controls in the Neuse Basin Rules but does implement these nitrogen control performance standards. The buffer component of the Neuse Basin Rules does apply though and is met by the Town's buffer requirements discussed previously in Section 6.2. Morrisville is one of only a few municipalities that has obtained delegation from NCDWR to locally implement the buffer rules.

Cooperative efforts in the Neuse River Basin include the Regional Watershed Plan in the upper Neuse River Basin. This project, managed by DMS, encompasses 580 square miles across Wake and Johnston Counties, including the upper Middle Creek and Swift Creek Watersheds. The goal of this project is to identify and prioritize potential DMS mitigation projects in the Neuse 01 subwatershed. These projects may include traditional stream and wetland mitigation as well as buffer restoration; nutrient offset; urban stormwater and agricultural BMPs; regenerative stormwater conveyances; fish and aquatic organism passage; aquatic habitat improvements; removal of flow obstructions; and species habitats preservation or enhancement (NCDENR, 2013b)

8.7.6 Jordan Water Supply Nutrient Strategy (Jordan Lake Rules)

The Town is subject to the Jordan Lake Rules, as required by the North Carolina General Assembly. Nitrogen and phosphorus loads contributed by the proposed new development will not exceed the following unit-area mass loading rates: 2.2 and 0.82 pounds per acre per year for nitrogen and phosphorus, respectively. The State delayed implementation of the Jordan Rules regarding nutrient management until 2016. However, the Town voluntarily began implementing the Jordan new development stormwater rules in February 2012 throughout the Town's entire jurisdiction. This is discussed in the UDO (Section 7.3). The portion of the regulation relating to buffers was not put on hold and application of this portion has been voluntarily expanded Town-wide. Morrisville is one of only a few municipalities that has obtained delegation from NCDWR to locally implement the buffer rules.

As part of the Jordan Lake Rules, the Town initiated the Jordan Lake Stage I Adaptive Management Strategy Program to address nutrient loading from existing development. In addition to the measures already in place as a result of the Town's NPDES Phase II permit, the Town is required annually to identify one potential stormwater BMP retrofit location in an existing development. NCDWR will determine in the future if the Town will be required to construct the BMP retrofits that were previously identified.

The Town conducted an assessment for Kit Creek watershed in 2013 and the Neuse River Basin in 2016 in order to determine potential mitigation opportunities. The assessment considered streams, buffers, and outfalls, with metrics evaluated including bank stability, sediment deposition, aquatic habitat, water quality and presence of invasive species (Stantec, 2013, 2016).

8.8 SANITARY SEWER INSTALLATION AND MAINTENANCE AND ROAD CROSSINGS

Proper design and installation of wastewater infrastructure reduces spills. The Town of Cary operates the wastewater collection system for the Town of Morrisville under a Wastewater Collection and Maintenance permit, issued by the NCDWR. To make sure that flow is not exceeded, the Town uses a reconciliation process for new development. Through this process, estimated flows from new developments are added to the actual sewer flow. When the development is complete, the new flow is added to the system.

The Town of Cary's Standard Specifications and Details (most recently amended July 2024), address the design of pump stations, gravity sewers, and force mains to ensure proper design and installation while limiting spills. The document lists the minimum design standards for construction of these facilities, including standards for separation distances, materials, installation techniques, and overall design.

As part of its riparian buffer program, the Town avoids laying sewer lines within riparian buffers and avoids installing sewer line stream crossings, where practical. If stream crossings are necessary, the Town strives to minimize impacts by evaluating options, such as stream boring instead of above-ground crossings. Directional boring is used to the maximum extent practicable. Final location and design are determined during the permitting process.

8.9 WATER CONSERVATION

The Town of Cary is responsible for the water and sewer systems for the Town of Morrisville. In 1996, the Town of Cary Council established a goal to reduce per capita water consumption by 20 percent by 2015. The weather-adjusted trend data indicate that the per capita consumption values have reduced approximately 24 percent for the single-family residential customer class since 1996, and approximately 20 percent for the combined residential and non-residential consumption over the same time period (CH2M HILL and Brown & Caldwell, 2013). Figure 8-1 presents the trend in overall combined residential and non-residential gallons per capita day from 2001 to 2016.

The Town of Cary's Water Conservation Program has a threefold approach to achieving water conservation by Town residents and businesses – voluntary, regulatory, and incentive mechanisms. This section provides a summary of the water conservation programs being implemented by the Town; a comprehensive description of each individual program is in the Town's LRWRP (CH2M HILL and Brown and Caldwell, 2013).

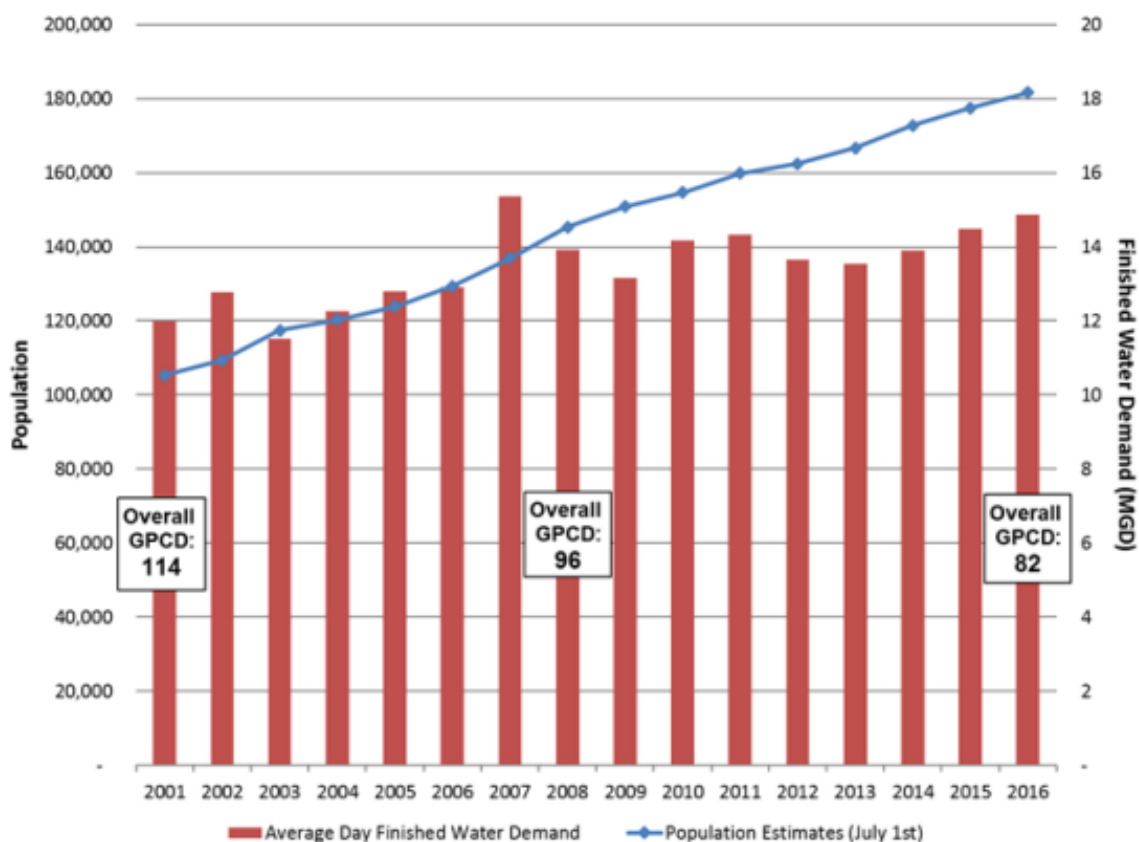


Figure 2-2. Comparison of Annual Population and Water Demand Growth—2001–2016
Includes the Towns of Cary and Morrisville; RTP South; and RDU

Figure 8-1. Annual average day finished water demand and gallon per capita per day and population change since 2001 (Town of Cary, 2018).

8.9.1 Voluntary Water Conservation

The Towns of Cary and Morrisville focus their voluntary water conservation programs on education. The Water Conservation team has developed a broad spectrum of initiatives to educate the public about water and water conservation issues. This team employs numerous educational programs designed to reach individuals, families, neighborhoods, and schools. These programs include direct mailings, community newsletters, general newspaper and utility bill inserts, television ads, flyers, yearly distribution of Annual Drinking Water Quality reports to all residents, and web site information. Other educational activities include: offering workshops on water-efficient landscaping, giving presentations to local civic groups, organizing and developing elementary school activities involving water conservation lessons, distributing low-flow showerheads and aerators at community functions, and conducting indoor water use audits for residents on request.

To address the special needs of the Town's automatic irrigation customers and the landscaping/ irrigation industry, the Water Conservation Program team sponsors workshops

targeted at improving irrigation techniques and practices. The Irrigation Association conducts some of these workshops in conjunction with Town staff.

8.9.2 Regulatory Water Conservation

The Town of Cary requires alternate-day watering for all its customers, including those within the Town. Odd-numbered addresses may water on Tuesdays, Thursdays, and Saturdays, while even-numbered addresses may water on Wednesdays, Fridays, and Sundays. However, watering by hand (with cans, wands, or hand-held hoses) is allowed any day of the week. The Town modified its alternate-day watering standard procedure in April 2012 to allow residents who are reseeding or installing sod to obtain an alternate-day watering exception permit one time per year, regardless of turf type. Those who violate the alternate-day watering rule receive an oral or written notice. Repeat violations can lead to civil penalties of \$100 for the first citation, \$250 for the second, and \$500 for the third.

The Town of Cary requires rain sensors on new automatic irrigation systems that receive town water (Ordinance 97-032, Section 19-48, August 14, 1997). Once 0.25 inch of rainfall has occurred, the irrigation system must automatically shut off. Cary's land development ordinance also requires the use of drought-tolerant native plants in commercial landscaping. In 2003, the Town of Cary began requiring permits for all new customers installing automatic irrigation systems. Additionally, the Town of Cary requires the installation of separate irrigation meters for in-ground irrigation systems (Code of Ordinances, Article III, Division I, Chapter 36, Section 36-76).

The Town of Cary's Town Manager is authorized, by ordinance, to invoke water use reduction or rationing measures and to develop and enforce those conservation measures when a water emergency exists. Those within the Town also must follow these measures. The Town has a Water Shortage Response Plan that outlines policies to implement water use reductions.

Voluntary, mandatory, and water-shortage-emergency measures may be imposed on all Town water customers for the duration of the water emergency.

If restrictions or bans are placed on certain types of water use, the Water Conservation Program team and other Town employees enforce the restrictions or bans. The first violation results in a written notice ordering that the violation be corrected within a specified time. If the violation is not corrected, any of the following penalties may apply: civil penalties, criminal penalties, termination of water service, injunctive relief, or any appropriately equitable remedy issuing from a court of competent jurisdiction.

8.9.3 Incentives for Water Conservation

The Town of Cary's Water Conservation Program team provides rebates for water conservation devices, such as early-closing toilet flappers that reduce water consumption from toilet use. They also provide rain barrels at cost to residents, as well as lower-cost kits for residents to build their own rain barrel. The Town has provided warm season grass incentives for new development, as well as a turf buy-back program, encouraging residents to replace their turf with natural area or warm season grass.

The Town of Cary has a tiered-rate system to provide incentives to use less water. The highest-rate tiers are based on a "water budget," which takes into account the amount of water needed

for landscape irrigation. The residential water budgets (23,000 gallons per month) are based on a typical lot size, while non-residential water budgets are developed on a site-specific basis. An example is presented in Table 8-3. The Town also charges the lowest rate for use of reclaimed water for non-potable uses, where applicable. Rates are higher for customers outside the Town limits (Town of Cary, 2014c).

Table 8-3. 2024 Single-Family Residential Customers Inside Cary, Morrisville, or RTP Corporate Limits

Tier	Cost per Kgal
Tier 1 (usage: 0 – 5,000 gallons)	\$5.10
Tier 2 (usage: 5,001 – 8,000 gallons)	\$5.72
Tier 3 (usage: > 8,001 gallons) or up to water budget amount	\$7.22

Source: Town of Cary, 2024

8.10 SOLID WASTE DISPOSAL AND RECYCLING

The Town's Public Works Department is responsible for overseeing the contract with Waste Industries to provide solid waste collection and disposal for Town residents. To prevent littering and dumping, solid waste from residents is collected each week and large, recyclable bulk items, such as furniture, scrap metal, stoves, and cardboard, are collected twice per year. The Town encourages recycling, and the solid waste contract includes weekly collection of recyclables. The Town's UDO requires that provisions for the collection of recyclables be made at apartment and condominium developments. Newspapers, glass, aluminum beverage cans, plastic milk and soda containers, and corrugated cardboard may be recycled through the Town's contract.

8.11 AIR QUALITY PROTECTION

8.11.1 Town of Morrisville Air Quality Efforts

The Town's 2019 Comprehensive Transportation Plan encourages the Town to support the development of a regional transportation network. The plan also includes pedestrian and bike elements, which will reduce air pollution by reducing vehicular traffic (Town of Morrisville, 2019). The Town also passed a bond in 2012 to complete the McCrimmon Parkway Extension, which serves as a bypass to NC54 and alleviate congestion. The Town has already reconnected Kit Creek Road and has plans to reconnect Airport Boulevard in the future. These reconnection projects increase connectivity and decrease idle time. These efforts are intended to be further enhanced by synchronized signals, most of which are operated either through the Town of Cary or NCDOT. The purpose of the McCrimmon Transit small area plan is to prepare for expanded bus service and rail transit service, both of which will decrease air pollution by reducing vehicular traffic, discussed in more detail below.

The development of sidewalk, greenway, and bike trails encourages alternative forms of transportation, further decreasing air pollution. The Town also participated in an international

walk-to-school day in 2013, with over 200 students participating. Other transportation planning efforts to improve pedestrian walkways and bikeways include installation of Indian Creek Greenway, grants for sidewalks along NC 54 in the vicinity of NC 540, the sidewalk development project along Church Street creating a “pedestrian loop” around the heart of the Town Center, and a CMAQ grant with the Town of Cary to construct Crabtree Creek Greenway.

Trees and vegetation are integral to the improvement of air quality. The Town has tree requirements for developments, as described in UDO Section 5.4. This section requires preservation of some existing healthy vegetation and planting of new vegetation to meet tree and vegetation requirements for development. The requirements for retaining existing tree canopy vary inversely with the percentage of existing tree canopy.

Additionally, the Town adopted its first Master Sustainability Plan on June 28, 2022 in efforts to organize and expand the Town’s energy and resource conservation efforts. The plan includes current and proposed measures for the following focus areas: buildings, transportation, water systems, land use, solid waste, and Town operations. Efforts to conserve energy indirectly contribute to improve air quality. (Energy and Sustainability Solutions, 2022).

The Town is partnered with the Town of Cary to install a major regional greenway link originating at Lake Crabtree County Park in Cary’s jurisdiction, running along Aviation Parkway to Morrisville near the Crabtree Crossing bridge on NC 54, and linking the Indian Creek Greenway in the Town Center area of Morrisville.

8.11.2 Cooperative Efforts

There are several regional activities and planning efforts related to transportation that have the potential to improve air quality by reducing traffic congestion. In addition to local transportation activities, the Town continues to be active in regional planning through NCDOT, the Capital Area Metropolitan Planning Organization (CAMPO), the Turnpike Authority for the Western Wake Freeway and the Southeast Connector, which refers to the extension of the Triangle Expressway for the completion of the 540 Outer Loop around the greater Raleigh area. The Triangle Expressway has already improved commuter mobility, accessibility, and connectivity to western Wake County and RTP on the existing north-south routes that serve the Triangle Region, primarily NC 55 and NC 54 (NCDOT, 2013). These regional efforts allow for decreased congestion and alternative transportation. This improved connectivity improves air quality.

A number of Triangle organizations were working on and/or funding Transportation Demand Management (TDM) projects in 2006 and 2007 to create a long-term plan for improving TDM initiatives. During that period, Go Triangle, formerly Triangle Transit Authority, brought together those organizations and one result was the Triangle Region 7- Year Long Range Travel Demand Management Plan. The purpose of the Triangle TDM Program is to reduce regional growth in Vehicle Miles Traveled (VMT) by 25 percent between 2007 and 2015 through a moderate package of TDM strategies that encourage alternative modes of transportation. The Central Pines Regional Council (CPRC), formerly TJCOG is now coordinating the marketing and evaluation of this effort through a grant program, and promoting commute alternatives, such as mass transit, carpooling, biking, teleworking, and vanpooling (CPRC, 2024).

CPRC coordinated with CAMPO (of which the Town is a member) and other stakeholders to develop a 2040 Metropolitan Transportation Plan (MTP), which involved an air quality conformity analysis for 2012 to 2018. Currently, an update to 2040 MTP known as Destination 2055 is in progress. Final adoption of Destination 2055 is anticipated by early 2026. More information detailing Destination 2055 can be found at <https://www.camponc.us/transportation-plan/in-development-2055-mtp> (CAMPO et al, 2022). The 2040 MTP incorporates the recommendations of the 2035 Long Range Transit Plan released by CAMPO, including proposed bus service expansion and enhancement, as well as a light rail system linking the Cities of Raleigh and Durham with the Towns of Cary, Morrisville, and RTP. The project explored and analyzed regional growth scenarios for associated trade-offs and impacts on the transportation network. The recommendations in these plans for appropriate sizing of roads are incorporated into the State's Transportation Improvement Program as well as the Town's 2019 Comprehensive Transportation Plan (Town of Morrisville, 2019). Triangle Transit also coordinates a ride-sharing program for regional commuters.

Wake County released an updated draft of the Wake County Transit Plan in September 2012 and May 2016. As of June 2024, the Wake County Transit Plan 2035 is in the process of being updated. The update extends the Wake Transit Planning horizon out through FY2030. The Plan was developed in cooperation with several partners, including CAMPO, Triangle Transit, the RTA, and the City of Raleigh's Capital Area Transit. The Plan provides a dual approach to meet expanding transportation demands as the County continues to grow: (1) a core transit plan that broadens local and commuter bus service and includes a rush-hour commuter rail service from Garner to Durham; and (2) an enhanced transit plan that includes a regional light rail service (Wake County, 2012).

The EIS prepared for the regional light rail project indicates that parking areas to serve the light rail system will not impact levels of carbon monoxide. The EIS also indicates that the light rail system will result in lower levels of vehicle pollutant emissions (USDOT et al, 2002).

NCDOT is also in the process of planning for a southeast high-speed rail service that will connect Washington, D.C., to Charlotte. The project will be developed incrementally based on available funding. NCDOT has used federal stimulus funding to add commuter routes between Charlotte and Raleigh (SEHSR, 2012). Improved alternative transportation options have the potential to improve air quality by reducing traffic congestion.

The Regional Transportation Alliance (RTA), founded by the Cary, Chapel Hill-Carrboro, Durham, and Raleigh Chambers of Commerce in 1999, serves as a regional business voice for transportation initiatives.

Currently, the RTA's members include more than 100 businesses, two metropolitan planning organizations (MPOs), Triangle Transit, and RDU. The Town is an active member of this group, which continues to focus on advancing multi-modal solutions needed to sustain prosperity and enhance quality of life (RTA, 2013). The Triangle Clean Cities Coalition was also founded in 1999, and brings together fleet managers, local and state government officials, fuel and vehicle providers, and interested resident groups, to reduce dependence on petroleum by promoting alternative transportation fuels (TCCC, 2010).

In 2009, Wake County appointed a sustainability task force to address conservation and reduction goals for solid waste, water, and energy which are related to improved air quality

within the region. The 2011 sustainability task force report identified several strategies and performance measures for each of those goals related to air quality (Wake County, 2011).

8.12 TREE PROTECTION

Tree protection and planting is addressed in the Town's UDO, Transportation Plan, and other policies. The Town recognizes that preserving existing healthy vegetation on a site during development enhances the visual character of the community and provides environmental benefits, such as habitat and temperature control.

Sections 5.4, 5.12, and 8.1 of the UDO address tree protection and landscaping. Some of the specific provisions of ordinances related to protecting the natural environment include:

- Retention of existing trees and shrubs within required buffer areas, unless a plan is approved to replace all or part of the existing vegetation
- Requirement for a letter of credit or certified check in an amount equal to 150 percent of the cost of the planting and a signed statement from the developer to ensure compliance
- Imposition of fines on the property owner if required landscaping is not complete within the allotted timeframe
- Requirements for landscaping areas to be stabilized to prevent soil erosion

Requirements for protective fencing to be placed around trees that will not be disturbed before development.

The UDO includes minimum tree requirements for developments in Section 5.4, as well as requirements for retaining existing tree canopy, which varies inversely with the percentage of existing tree canopy. In addition, other types of vegetation are required by this ordinance. The Town provides specifications for planting in vehicle use areas, such as parking lots. For example, for interior vehicle use areas, every parking space will be located within 50 feet from the trunk of a shade tree. In addition, to provide spatial separation between differing uses, the Town requires buffers. While buffers provide aesthetic screens between land uses, they also can reduce noise and air pollution, prevent soil erosion, and slow and filter stormwater. To assist developers in selecting vegetation that is hardy and suitable for the area, the Town includes recommendations regarding the types of trees and shrubs that developers should plant to meet these requirements.

9.0 SUMMARY OF MITIGATION TO ADDRESS SECONDARY AND CUMULATIVE IMPACTS

As described in Section 8, the Town of Morrisville is taking progressive steps to protect the environment. The Town is experiencing substantial growth and has developed many programs to balance the competing goals of this growth and environmental protection. In addition, the Town is working with NCWRC and NCNHP to ensure important habitat areas are protected. Table 9-1 summarizes the potential SCI to natural resources and the mitigation in place to address them.

Table 9-1. Summary of potential SCI and relevant mitigation programs.

Environmental Resources	Potential for SCI	Types of SCIs	Mitigation Programs
Topography and Floodplains	LI	Some floodplain loss from commercial development, although floodway protected. Isolation of floodplain from stream by channel entrenchment; loss of nutrient exchange capabilities	Unified Development Ordinance (UDO) Open Space Preservation and Land Use Plans often preserve additional corridors along required riparian buffers Floodplain Protection - no development or fill in floodway; development in floodplain must obtain special use permit which limits development in floodplain; Hazard Mitigation Plan Stormwater Programs and Impervious Surface Limitations Sanitary Sewer Installation – avoids laying sewer lines in riparian buffers Floodplain Overlay District - prohibits development without a floodplain development permit Erosion and Sediment Control Program administered by Wake County
Soils	PI	Soil erosion and compaction from new development	Land Use Plans – encourages more intense development in Town Center, activity centers, and growth corridors to limit areas of disturbance Parks and Recreation Master Plan Erosion and Sediment Control Program administered by Wake County UDO Riparian Buffers and Floodplain Protection Stormwater Programs and Impervious Surface Limitations Open Space Preservation
Land Use	PI	Conversion of agricultural and forested land uses to mainly residential land uses	UDO Open Space Preservation Riparian Buffers and Floodplain Protection – restricts development in riparian buffer zones and prohibits nearly all floodplain encroachment Stormwater Programs Land Use Plans to encourage development around Town Center and Activity Center Districts Parks and Recreation Master Plans
Wetlands	LI	Loss through development; subsequent loss of habitat and habitat fragmentation, reduced	Wetland Protection through CWA Section 404 and Section 401 UDO Open Space Preservation

Environmental Resources	Potential for SCI	Types of SCIs	Mitigation Programs
		flow attenuation and genetic diversity Loss of wetland function through pollutant loading	Stormwater Programs to reduce pollutant loads and limit stormwater impacts to wetlands Riparian Buffers and Floodplain Protection Land Use Plans to set aside natural open space and encourages development around Town Center, selected corridors, and mixed-use developments Parks and Recreation Master Plan Erosion and Sediment Control Program, administered by Wake County
Prime or Unique Agricultural Land	PI	Possibility of conversion to other uses	Land Use Planning – Note no agriculture activity at this time Supports regional farms by encouraging demand for products through the Western Wake Farmers Market.
Public Lands and Scenic, Recreational, and State Natural Areas	LI	Possibility of conversion of adjacent land uses	UDO Open Space Preservation Conservation Zoning District - protects environmentally important areas Land use planning Parks and Recreation Master Plan
Areas of Archaeological or Historical Value	LI	Possibility of conversion of adjacent land uses Structural damage due to acid rain and vibrations	Land use planning to control uses allowed UDO Open space preservation Town Center Districts, including Historic Crossroads Village and Conservation/Buffer zones
Air Quality	PI	Reduction in air quality due to increased vehicular traffic. Reduction in air quality benefits of trees Negative impacts to human health (such as asthma); acid rain; reduced visibility	Transportation Plan elements of bicycle and pedestrian planning, road reconnections to alleviate congestion and enhancements for decreasing idle time Wake County Sustainability Task Force Planning for regional connectivity, including a future regional rail system UDO Connectivity requirement Open space preservation Riparian Buffers Protection Tree Protection Land Use Plan - Activity Center Districts and Town Center Districts Parks and Recreation Master Plan Tree Protection Ordinance
Noise Levels	PI	Increase in overall noise level in study area. Negative impacts to human health	Land use planning UDO Airport overlay district Open Space Preservation Riparian Buffers Protection – development buffers Tree Protection Parks and Recreation Master Plan Increase in grade separation projects for transportation corridors (reduce train whistle noises) NCDOT Traffic Noise Abatement Policy
Surface Water Resources	PI	Water quality degradation; increase in stormwater runoff. Alteration of natural hydrograph (e.g., magnitude, timing,	UDO Stormwater Programs Sanitary Sewer Installation – stream crossings with directional borings Water Conservation

Environmental Resources	Potential for SCI	Types of SCIs	Mitigation Programs
		frequency, duration, rate of change); lower and more frequent low-flow conditions; alteration of channel morphology	Riparian Buffers and Floodplain Protection – no residential development or fill in floodplain Land Use Plans and open space preservation Parks and Recreation Master Plan Erosion and Sediment Control Program administered by Wake County
Groundwater Resources	LI	Reduction in use for drinking water; potential to become contaminated. Groundwater inflow provides base flow in streams, which supports life during droughts	Land use planning UDO Open Space Preservation Riparian Buffers and Floodplain Protection – allow for natural infiltration Stormwater Programs, including promotion of LID Water Conservation Programs
Forest Resources	PI	Possibility of conversion to other uses Reduction in air quality; increase in near-surface air temperature; habitat fragmentation	Land Use Planning - encourage development in Town Center and growth corridors, as well as tree and urban forest preservation Parks and Recreation Master Plan UDO Conservation/Buffer District – promotes preservation of forest resources Open Space Preservation Riparian Buffers and Floodplain Protection
Shellfish or Fish and their Habitats	PI	Possible aquatic habitat degradation Disruption of food chain; reduction in aquatic insect number and diversity through loss of riffle habitat; dispersal distance to suitable habitat; reduction in potential for long-term population sustainability	Wetland Protection through CWA Section 404 and Section 401 Endangered Species Act Land Use Planning Parks and Recreation Master Plan Erosion and Sediment Control Program– plan view and pre-construction process; monitoring UDO Conservation/Buffer District – protect environmentally important areas and open space preservation Riparian Buffers and Floodplain Protection Stormwater Programs - Phase II requires runoff volume be controlled Sanitary Sewer Installation – stream crossings with directional borings
Wildlife and Natural Vegetation	PI	Reduction in available habitat Habitat fragmentation; reduction in genetic diversity; reduction of pollution-intolerant species; increased dispersal distance to suitable habitat; reduction in potential for long-term population sustainability	Endangered Species Act Parks and Recreation Master Plan - important habitat areas prioritized for protection Land Use Plan– encourage development in Town Center, tree protection Erosion and Sediment Control Program administered by Wake County UDO Open Space Preservation Conservation/Buffer District Riparian Buffers and Floodplain Protection – Habitat protection and maintenance of habitat corridors Stormwater Programs
Introduction of Toxic Substances	LI	Increase in likelihood of contamination Negative impacts to human health	Land Use Planning to control uses and likely exposure Stormwater Programs and Impervious Surface Limitations, including education programs Sanitary Sewer Installation – design standards to limit spills Grade separation programs to reduce rail and vehicular traffic interaction

PI = Potential Impact (major relevance in SEPA documents and permitting applications)
LI = Limited Impact (minor relevance in SEPA documents and permitting applications)

9.1 TOPOGRAPHY AND FLOODPLAINS

Clearing and grading undeveloped lands changes a development site's topography. Wake County reviews erosion and sediment control plans on behalf of the Town to minimize grading in areas with steep slopes. The current Town floodplain ordinance protects FEMA-regulated floodplains and their functions, mitigating for any impacts associated with growth. Structures may be constructed outside the floodway, but base floor elevations must be at least two foot above the 100-year flood level. Floodplains of smaller streams that are not under FEMA's jurisdiction are protected by the stream buffer ordinance. No structures can be placed within the 50-foot-wide undisturbed stream buffer. The Town's floodplain overlay zoning district was also developed to keep development out of the floodplain. Additionally, the Wake County multi-jurisdictional Hazard Mitigation Plan guides policy to preserve and restore natural areas, including floodplains. The floodplain maps for the study area and County have been updated as of 2022.

Impacts to wetlands will be minimized by stream buffers, floodplain protection, and other development controls. While some wetland loss still occurs with permitting, overall SCI to wetlands in the study area will be minimized by limiting or prohibiting construction and fill according to the Town's floodplain and stream buffer regulations. By preserving floodplains, their water storage capacity, habitat, filtration, and infiltration functions will also be preserved.

9.2 SOILS

The major soil series within the Study are the White Store and the Creedmoor series. The major threat to soils within the Study Area is from development-related activities, including compaction, the relocation of soil types, and the loss of soils due to erosion. Soil loss will be minimized during development through the implementation of the Town's Erosion and Sediment Control (E&SC) program, which is implemented by Wake County. Wake County administers, inspects, and enforces all aspects of the County's E&SC ordinance requirements. The County's E&SC program operates above the state standards based on its requirement for pre-construction conferences and requiring silt fences on development sites which do not meet the one-acre threshold for a plan.

9.3 LAND USE

As outlined in Sections 4 and 5, forested land will be lost as development occurs within the study area, and open space areas may become more fragmented. The Town has several programs in place to help minimize these impacts.

The Town is mitigating for land use changes by focusing development in appropriate areas. The Town encourages development within its Town Center and Activity Center Districts by allowing more flexibility in development design. This results in faster permitting and provides an incentive for development near planned high-density areas, as defined in the 2035 Land Use Plan. Stream buffers, required open space in subdivisions along with clustered development,

landscape buffers between different land uses, park lands, and greenways will limit the impacts to open space. A public open space requirement is part of the UDO, as described in Section 8. While open space, such as forests, will still be lost to development, the impacts will be minimized by these efforts.

9.4 WETLANDS

Impacts to wetlands will be minimized by stream buffers, floodplain development limitations, and other development controls as well as State and Federal regulations. As described in Section 4.4, the majority of wetlands are located in riparian areas. While some wetland loss still occurs with permitting, the Town requires that all Federal and State wetland permits be obtained prior to final site approval. Overall SCI to wetlands in the study area will be minimized by limiting or prohibiting construction and fill within 50 feet of the stream, as required by the stream buffer regulations in the UDO.

9.5 PRIME OR UNIQUE AGRICULTURAL LAND

The Town has no active farms, so impacts to agricultural land will be minimal. Agricultural land is allowed as a land use within the very low-density residential zoning category. However, as development occurs, prime farmland soils with potential for farming will be lost. The Town encourages development within its Town Center and Activity Center Districts by allowing more flexibility in development design. This results in faster permitting and provides an incentive for development near planned high-density areas defined on the Land Use Plan. By encouraging development in these areas, preservation of prime farmland soils is promoted.

9.6 PUBLIC LANDS AND SCENIC, RECREATIONAL, AND STATE NATURAL AREAS

With the continued implementation of the Town's Parks and Recreation Master Plan, 2035 Land Use Plan, and UDO, scenic areas, open space, and parks will be a high priority for the Town, providing mitigation for losses of open space as the Town grows. These planned greenways and additions to the park system will provide recreational opportunities and wildlife habitat. Lands adjacent to Lake Crabtree are also planned for preservation, protecting large areas of scenic and recreational areas.

9.7 AREAS OF ARCHAEOLOGICAL OR HISTORICAL VALUE

The Town has three properties on the NRHP: the Morrisville Christian Church, the Williamson Page house, and the James M. Pugh House; the Town has taken steps to preserve these sites. The Town has proactively relocated the James M. Pugh House, as well as two historic tobacco barns, to prevent potential impact. Other historical areas may be impacted directly by future projects, but indirect impacts are unlikely. Other measures that will mitigate impacts include the Town's Historic Crossroads Village zoning district, which will further protect areas of historical value. The Town Center Plan, developed in 2007, creates a vision for the original center of Morrisville and identifies more concentrated residential and mixed-use development.

The plan also identifies significant open space areas, including an historic Civil War battlefield. The Town's Historic Crossroads Village zoning district, as well as the Town Center Plan, encourage preservation of historic resources. Minimal SCI is likely to occur to cultural and historical resources because of the permitting and review process established by the Town.

9.8 AIR QUALITY

To address the impacts of growth on air quality, the Town is researching and developing alternative modes of transportation. Increasing the interconnections of sidewalks, greenways, trails, and bike lanes will also reduce the needs for vehicle use. Specifically, Central Pines Regional Council is working with Triangle area agencies to plan a 17-mile, shared-use path linking Raleigh, Cary, Morrisville, Research Triangle Park (RTP), Durham, and Chapel Hill. More information about this project can be found at Triangle Council of Governments Site <http://trianglebikeway.com/> (CAMPO, 2024). As growth occurs, these efforts to reduce vehicular use will curtail increases in air pollution. Additional efforts by the Town to extend streets will improve traffic flow and decrease congestion and air pollution. A tree ordinance is also in place to protect trees during construction. Because trees are natural air filters, this ordinance also helps to protect air quality. In addition, Wake County convened a sustainability task force, which have both identified several strategies and performance measures for goals relating to air quality (Wake County, 2011). The Town's and County's actions will keep SCI to air quality in check and limit impacts.

A regional rail system is planned for the Triangle Area (Wake County, 2023). The Town's transit-oriented development zoning district and its Transportation Plan show a commitment to alternative transportation.

In 2020, North Carolina had its lowest ozone levels on record since air monitoring began in the early 1970s. The declining ozone levels were generally concurrent with lower emissions from the State's power plants. A recent report by the NCDAQ shows that the State's coal-fired power plants have cut their NO_x emissions, a primary industrial contributor to ozone pollution, by more than 80 percent since the General Assembly enacted the Clean Smokestacks Act in 2002 (NCDENR, 2013).

State legislation to decrease NO_x emissions from power plants has significantly reduced ozone pollution, as discussed above and in Section 6. Additionally, the Town's actions and regional efforts will keep SCI to air quality in check.

9.9 NOISE LEVELS

Efforts taken to improve air quality by promoting alternative forms of transportation will also limit SCI to noise levels in the study area. As more quiet, alternative forms of transportation (such as bike lanes and greenways) and increased interconnections of sidewalks and greenways promote more pedestrian activities, vehicular traffic noise levels will potentially be reduced. In addition, landscape buffers and tree protection around different development types are required in the UDO. These buffers will help reduce noise.

Increase in grade separation projects for transportation corridors will limit the impact of noise levels from trains, including whistle noises. Additionally, NCDOT's noise abatement policy will mitigate noise on state-owned roads.

9.10 WATER RESOURCES

9.10.1 Surface Water

As growth occurs, impacts to water resources are and will be minimized by existing stream buffer regulations, the Town's existing Phase II stormwater program, erosion and sediment control, and open space preservation. The greatest water quality and quantity protection will be achieved by stream buffers preserved and stormwater control measures installed during development. Stream buffers will limit changes in stream channel morphology, erosion, and other habitat degradation. Buffers also filter water and provide shading. Stormwater controls will limit sediment loading and hydrology changes. The Town requires that stormwater volume be controlled for the 1-year, 24-hour storm to maintain the natural hydrograph and protect the channel morphology. The Town annually sponsors an LID workshop with the Town of Cary for residents as well as contractors and developers. Without these regulations and programs, SCI to water resources would be more pronounced.

It should also be noted that as redevelopment occurs, the Town has the opportunity to require stormwater controls and riparian buffer restoration to the maximum extent practicable. While the stormwater controls and riparian buffers for redevelopment may not be as extensive as those required for new development because of site constraints, they provide an opportunity to improve water quality and aquatic habitat. These practices may help improve water quality in Crabtree Creek, a 303(d) listed stream, and the Town's NSW waters.

All waters within the study area are classified as NSW in response to excessive growth of macroscopic and/or microscopic vegetation in Jordan Lake and the Neuse River Estuary. Current strategies to limit nutrient loading will help protect water quality; however, as runoff volumes increase, nutrient loading could continue to impact water quality. The Jordan Lake watershed is subject to WSW rules, which limit impervious surfaces and development densities, and the Jordan Lake Rules, which limit nutrient loading for both nitrogen and phosphorus from new and existing development. In addition to the Town ordinances and policies described in Section 8, the Town will look for opportunities to improve water quality. For example, the Town has worked with State agencies to identify areas for stream restoration and other water quality improvement strategies, and pursue funding through the DMS, Section 319 program and other sources. The Town also actively participates in the development of any TMDLs where activities in Town may be affecting water quality.

The construction of sewer lines, water lines, and roads may also impact water quality, particularly where they cross streams. There are sediment impacts from construction, although the use of proper erosion and sediment controls help minimize this impact. In general, these impacts are direct, but there is also a cumulative direct impact from previous crossings and other future crossings. The Town will review crossings as a cumulative direct impact in future EAs and EISs.

The Wake County Watershed Management Plan recommended that the County develop an in-stream monitoring program. Implementing an in-stream monitoring program at a regional level is more efficient than implementing a monitoring program at the Town level. Wake County is performing targeted in-stream monitoring.

9.10.2 Groundwater

As growth occurs, impacts to groundwater resources will be mitigated by stormwater programs. The amount of impervious surface generated in developments is restricting, limiting the impacts to groundwater recharge rates. Stormwater programs also address potential impacts to groundwater quality through improper disposal of wastes.

A reduction in public health-related concerns related to contaminated groundwater will be a result of fewer residents relying on groundwater as a water supply source. This reduction in groundwater use will be a positive impact of the extension of water infrastructure. Also, a number of septic tank/ground absorption systems serving residences may be eliminated. This is a positive impact also, reducing the public health risk of groundwater contamination from leaking or failing septic systems.

9.11 FOREST RESOURCES

The majority of the forested lands in the study area are currently coniferous cultivated pines and will likely be converted. While this change provides a one-time source of timber products, this land use conversion is not suitable for sustainable silviculture activities. The main efforts to protect forest resources include stream buffers and open space requirements in residential developments. Bottomland forest communities will be preserved by the riparian buffer requirements, which will provide habitat corridors. The Town has a tree protection ordinance and recognizes that preserving healthy vegetation during development provides environmental benefits, such as habitat and temperature control, as well as enhances the visual character of the community.

9.12 SHELLFISH OR FISH AND THEIR HABITATS

Fishery impacts are and will be limited in the study area by the Town's current mitigation measures and regulations. As discussed in Section 7.10, water quality and quantity impacts will be limited by stream buffers, floodplain protection, stormwater BMPs, and open space preservation. Protecting the habitats of aquatic communities will, in turn, protect the aquatic species themselves.

There are sediment impacts from construction, although the use of proper erosion and sediment controls help minimize this impact. In addition, where culverts are used for road crossings and not sufficiently buried, a natural substrate will no longer exist to provide aquatic habitat. In general, these impacts are direct, but there is also a cumulative direct impact from previous crossings and other future crossings. The Town will review crossings as a cumulative direct impact in future EAs and EISs. For future infrastructure projects that may impact rare species, the Town will work with USFWS to determine whether surveys are needed to evaluate potential impacts.

In summary, SCI to fisheries will be limited over time because of the protective measures already in place.

9.13 WILDLIFE AND NATURAL VEGETATION

The mitigation measures to protect wildlife resources include protecting habitat through riparian buffer protection and open space requirements, and limiting habitat degradation through erosion and sediment control, and stormwater runoff control. Wildlife habitat may become more fragmented, but the Town's riparian buffer and floodplain protection ordinances will help maintain wildlife corridors. Trees and vegetation are integral to habitat protection, air quality improvement, control of surface water runoff, and temperature moderation. The Town has a tree protection ordinance, which is found in Section 5 of the UDO described in Section 8. The Town's required RCAs allows for some areas to be negotiated for preservation within the development process.

The Crabtree Creek watershed provides suitable habitat for many State-listed mussel species, including the creeper (*Strophitus undulatus*), triangle floater (*Aslasmidonta undulata*), and notched rainbow (*Villosa constricta*) mussel species (NCWRC, 2014). Based on data received in 2024 from the NCNHP, there are no rare mussel species in the study area (NCNHP, 2024).

Impacts to the bald eagle population are not likely to occur. Lake Crabtree is in a park, and nearby Jordan Lake is on USACE-managed land; neither area should be impacted by surrounding development. The Town's stormwater and riparian buffer ordinances and the County's erosion and sediment control program will help protect Crabtree Lake, which supplies the bald eagle's food source.

The Northern long-eared bat is listed as endangered by the USFWS and is known to occur in Wake County. However, this bat has not been observed within the study area (NCNHP, 2024). Therefore, this species is unlikely to be impacted by SCI within the study area.

The Tricolored bat (*Perimyotis subflavus*) is State-listed as endangered and was observed in the area in 2023.

The dwarf wedgemussel is not thought to inhabit streams within the study area. Any freshwater mussel species that may inhabit streams within the study area may be impacted, but regulations currently in place will minimize impacts. The construction of sewer lines, water lines, and roads may also impact water quality and the aquatic habitat of these rare mussels, particularly where they cross streams. The current established stream buffers will help to protect stream channel stability, limit sediment loading, and regulate water temperature. Overall, stream buffers and stormwater controls will continue to limit SCI to aquatic habitats and freshwater mussel communities.

In addition to the Town ordinances and policies described in Section 8, the Town will look for opportunities to improve water quality, particularly in 303(d) listed waters. For example, the Town will work with agencies to identify areas for stream restoration and other strategies, and pursue funding through the EEP, Section 319 program, and other programs. The Town will also actively participate in the development of any TMDLs where activities in Town may be impacting water quality.

A plant, Michaux's sumac, is listed as federally endangered and has been located elsewhere in Wake County; however, this plant has not been observed within the study area (NCNHP, 2024). Therefore, this species is unlikely to be impacted by SCI within the study area.

9.14 INTRODUCTION OF TOXIC SUBSTANCES

The Town has programs to prevent toxic releases and to treat them when they occur. The Town has an active stormwater education program that provides the public with valuable knowledge to make residents aware of the impacts of toxins reaching the stormwater system. The education program encourages the public to limit the use of common toxins, such as lawn pesticides and herbicides, to help prevent the problem. The Town's Stormwater Program also promotes the use of BMPs and LID, which also reduce some of the toxic substance impacts.

Grade separation programs to reduce rail and vehicular traffic interaction will limit the potential for contamination of toxic substances.

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APPENDIX A: AGENCY COMMENTS AND TOWN RESPONSES

The following show comments provided by North Carolina Department of Environmental Quality (NCDEQ) on the draft SCIMMP document. The SCIMMP document was provided to NCDEQ on September 3, 2024, and comments were received on October 12, 2024. Following the comment responses is a copy of the comments themselves as received by NC DEQ. Responses below are included following each comment, and responses reflect revisions made to the document as needed.

ROY COOPER
Governor

MARY PENNY KELLEY
Secretary

JAMIE RAGAN
Director



October 12, 2024

Hillary Yonce, PH, Professional Hydrologist, Environmental Scientist
Tetra Tech, Leading with Science
PO Box 14409
4000 Sancar Way Suite 200
Research Triangle Park, NC 27709

Re: Draft 2025 Secondary Cumulative Impacts Master Management (SCIMM) Plan
Town of Morrisville
Wake County

Dear Mrs. Yonce,

Thank you for providing the 2025 Draft SCIMM Plan for the Town. This plan's submission is in accordance with the approved Memorandum of Agreement (MOA) timeline. The plan's purpose is to address Secondary Cumulative Impacts related to the Town's future growth and development, including capital projects concerning water, sewer, and transportation, along with any proposed mitigation measures for these impacts. Most DEQ agencies have reviewed the draft Plan and provided some suggestions. The attached comments are for your and the Town's review and consideration.

Once I receive additional comments from NC Natural Heritage, I will send them to you.

Thank you for the opportunity to respond to the Town of Morrisville's draft 2025 SCIMM Plan. We will need to discuss the MOA and the schedule for the next ten (10) years further.

If you have any questions please let me know.

Sincerely,

A. Lyn Biles

Lyn Biles (*she/her/hers*)
Permitting Assistance Supervisor
North Carolina Department of Environmental Quality
Environmental Assistance Section
Office: 252.948-3800; Direct: 919-707-8489
Lyn.biles@deq.nc.gov



ROY COOPER
Governor

MARY PENNY KELLEY
Secretary

RICHARD E. ROGERS, JR.
Director



October 10, 2024

MEMORANDUM

To: Lyn Hardison
Department of Environmental Quality

From: David Wainwright *DW*
SEPA Coordinator, North Carolina Division of Water Resources

Subject: Project #1894 – Town of Morrisville 2025 Secondary Impacts and Mitigation Master
Plan Update
Wake County

The Division of Water Resources' (DWR) Central Office staff have reviewed the 2025 Secondary and Cumulative Impacts Master Mitigation Plan (SCIMMP) for the Town of Morrisville. Staff provides the following comments:

Basin Planning Branch (Nora Deamer, nora.deamer@deq.nc.gov or 919-707-9116):

- In Section 4.10, Subsection 4.10.1 Surface Water, the classification information is not completely accurate. Paragraph three indicates that Kit Creek is Class C waters. The headwaters of Kit Creek in the town of Morrisville are classified as WS-V, NSW. The information included in table 4-5 is accurate. All waters in the Jordan Lake watershed are minimally WS-V, NSW.

Surface water classifications can be verified using the information available at:

<https://ncdenr.maps.arcgis.com/home/item.html?id=689283d17bf342c2a96364fbab09a5d8>

- In Section 6.0 Mitigation for Secondary and Cumulative Impacts, the EEP and CWMTF are used in the text of this section and in table 6-1. These need to be updated with the correct names (also, in section 8.7.5 Nutrient Sensitive Waters Management Strategy (Neuse Basin Rules).
- In Section 6.4, Subsection 6.4.1.3 Sanitary Sewer Overflows, the text reads (15A NCAC 2B.05.06) and should be 15A NCAC 2B .0506; for additional information, see: <http://reports.oah.state.nc.us/ncac/title%2015a%20-%20environmental%20quality/chapter%2002%20-%20environmental%20management/subchapter%20b/15a%20ncac%2002b%20.0506.pdf>.
- In Section 9.10.1, it states that, *"In addition to the Town ordinances and policies described in Section 6, the Town will look for opportunities to improve water quality.*



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919.707.9000

For example, the Town has worked with State agencies to identify areas for stream restoration and other water quality improvement strategies, and pursue funding through the EEP, Section 319 program and other sources."

It appears they are referring to the DWR Section 319 program. The 319 program is not administered by EEP/DMS. It may be the case that many years ago EEP received some 319 funds to do stream restoration in some of these jurisdictions, but typically that is no longer the case.

Water Supply Planning Branch (Louis Murray, Louis.Murray@deq.nc.gov or 919-707-9017):

- On page 3-36, Fig. 3-3, consider changing 'Haw River Basin' label to 'Cape Fear River Basin' as shown in later maps in Section 4. Nowhere in the text was a reference to the Haw River Basin seen.
- On page 5-80, Table 5-1, the 'Existing Percent of Study Area' adds to **101%** and not 100%.
- On page 5-85, Groundwater section, suggest editing the last sentence to read, 'A groundwater study was published **by USGS** in 2022 confirming low soil infiltration rates in western Wake County (Figure 5-3) to link its reference in Fig.5-3.
- On page 10-37, References section, the USGS study referenced in the previous comment is not included in the list of references.

401 and Buffer Permitting Branch

- No comment

401 Transportation Permitting Unit

- No comment

NPDES Municipal Permitting Unit

- No comment

NPDES Industrial Permitting Unit

- No comment

The Division of Water Resources, Central Office, thanks you for the opportunity to comment. Should you have questions regarding any of the above comments, please contact the listed staff. I can be reached at either David.Wainwright@deq.nc.gov or 919-707-9045.



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512 North Salisbury Street | 1611 Mail Service Center | Raleigh, North Carolina 27699-1611
919.707.9000

ROY COOPER

Governor

MARY PENNY KELLEY

Secretary

MICHAEL SCOTT

Director



NORTH CAROLINA
Environmental Quality

Date: September 24, 2024

To: Michael Scott, Director
Division of Waste Management

Through: Janet Macdonald
Inactive Hazardous Sites Branch

From: Katie C Tatum
Inactive Hazardous Sites Branch

Subject: DEQ Project # 1894 DEQ/Town of Morrisville, Wake County North Carolina

The Superfund Section has reviewed the proximity of sites under its jurisdiction to the DEQ/Town of Morrisville project. Proposed project is the Town of Morrisville's 2024 Secondary and Cumulative Impact Master Mitigation Plan.

Six (6) Superfund Section sites and three (3) Brownfields Program Sites were identified within one mile of the project as shown on the attached report. The Superfund Section recommends that site files be reviewed to ensure that appropriate precautions are incorporated into any construction activities that encounter potentially contaminated soil or groundwater. Superfund Section files can be viewed at: <http://deq.nc.gov/waste-management-laserfiche>.

Please contact Janet Macdonald at 919.707.8349 if you have any questions concerning the Superfund Section review portion of this SEPA/NEPA inquiry.



North Carolina Department of Environmental Quality | Division of Waste Management
217 West Jones Street | 1646 Mail Service Center | Raleigh, North Carolina 27699-1646
919.707.8200

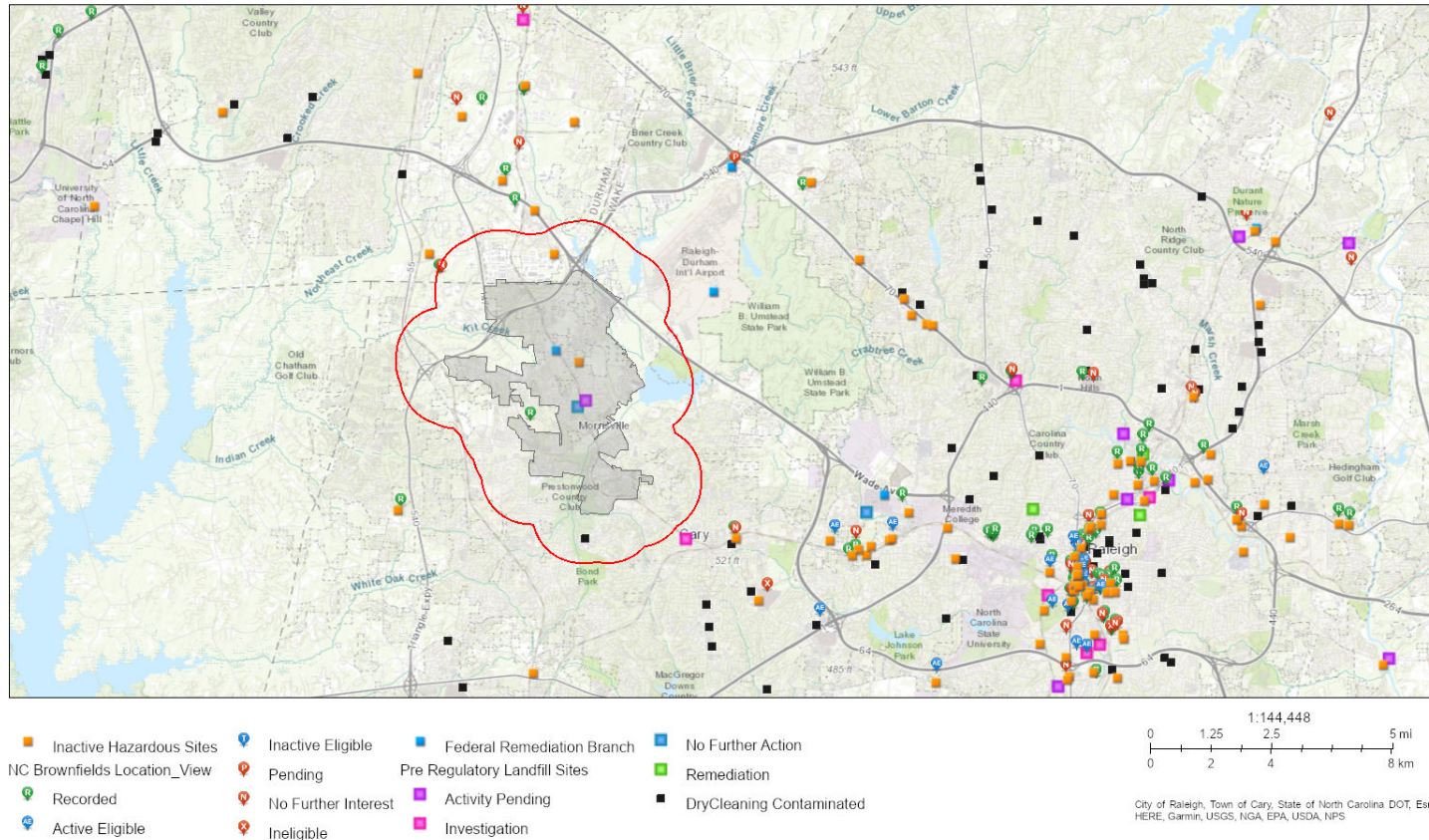
Superfund & Brownfield Sites SEPA/NEPA Review Report

Area of Interest (AOI) Information

Wake County DEQ project #1894

Area : 20,155.96 acres

Sep 24 2024 10:27:04 Eastern Daylight Time



Summary

Name	Count	Area(acres)	Length(mi)
Certified DSCA Sites	1	N/A	N/A
Federal Remediation Branch Sites	1	N/A	N/A
Inactive Hazardous Sites	2	N/A	N/A
Pre-Regulatory Landfill Sites	2	N/A	N/A
Brownfields Program Sites	3	N/A	N/A

Certified DSCA Sites

#	Site_ID	Site_Name	Count
1	DC920041	Martinizing Dry Cleaners	1

Federal Remediation Branch Sites

#	SITE_ID	SITE_NAME	Count
1	NCD003200383	Koppers Co. (Morrisville Plant)	1

Inactive Hazardous Sites

#	EPAID	SITENAME	Count
1	NONCD0001598	DEHAVEN	1
2	NONCD0002219	NORTHERN TELECOM-CEM.TANK SOLV	1

Pre-Regulatory Landfill Sites

#	EPAID	SITENAME	Count
1	NONCD0000696	WALTON'S SANITATION SERVICE DUMP	1
2	NONCD0000753	Old Walton's Dump	1

Brownfields Program Sites

#	BF_ID	BF_Name	Count
1	2000716032	RTP 8 (RN)	1
2	2200218092	Overture Cary	1
3	1901715032	NZRTP Cardinal (RN)	1

ROY COOPER

Governor

MARY PENNY KELLEY

Secretary

MICHAEL SCOTT

Director



NORTH CAROLINA
Environmental Quality

MEMORANDUM

TO: Michael Scott, Division Director through Sharon Brinkley

FROM: Amanda Thompson, Environmental Senior Specialist – Solid Waste Section

DATE: September 19, 2024

SUBJECT: Review: SW DEQ#1894 – Wake County (Environmental Review – DEQ/Town of Morrisville – Town of Morrisville 2024 Draft Secondary and Cumulative Impacts Master Mitigation Plan.)

The Division of Waste Management, Solid Waste Section (Section) has reviewed the documents submitted for the subject project in Wake County, NC. Based on the information provided in this document, the Section at this time does not see an adverse impact on the surrounding communities and likewise knows of no situations in the communities which would affect this project.

For any planned or proposed projects, it is recommended that during any land clearing, demolition, and construction, the Town of Morrisville and/or its contractors would make every feasible effort to minimize the generation of waste, to recycle materials for which viable markets exist, and to use recycled products and materials in the development of this project where suitable. **Any waste generated by and of the planned or proposed projects, that cannot be beneficially reused or recycled as described, may require disposal of at a solid waste management facility permitted by the Division. The Section strongly recommends that the Town of Morrisville require all contractors to provide proof of proper disposal for all generated waste to permitted facilities.**

Permitted solid waste management facilities are listed on the Division of Waste Management, Solid Waste Section portal site at: <https://deq.nc.gov/about/divisions/waste-management/waste-management-rules-data/solid-waste-management-annual-reports/solid-waste-permitted-facility-list>

And the site locator tool at:

<https://ncdenr.maps.arcgis.com/apps/webappviewer/index.html?id=7dd59be2750b40bebebf49fc383f688>

Questions regarding solid waste management for this project should be directed to Mr. Tim Davis, Environmental Senior Specialist, Solid Waste Section, at (919) 707-8290.

cc: Tim Davis, Environmental Senior Specialist



North Carolina Department of Environmental Quality | Division of Waste Management
Fayetteville Regional Office | 225 Green Street, Suite 714 | Fayetteville, North Carolina 28301
910.433.3300

State of North Carolina Department of Environmental Quality
INTERGOVERNMENTAL REVIEW PROJECT COMMENTS

Reviewing Regional Office: Raleigh
Project Number: DEQ#-1894 Due Date: 10/4/2024
County: Wake

After review of this project, it has been determined that the DEQ permit(s) and/or approvals indicated may need to be obtained for this project to comply with North Carolina Law. Questions regarding these permits should be addressed to the Regional Office indicated on the reverse of the form. All applications, information and guidelines relative to these plans and permits are available from the same Regional Office.

	PERMITS	SPECIAL APPLICATION PROCEDURES or REQUIREMENTS	Normal Process Time (Statutory time limit)
☐	Permit to construct & operate wastewater treatment facilities, non-standard sewer system extensions & sewer systems that do not discharge into state surface waters.	Application 90 days before begins construction or award of construction contracts. On-site inspection may be required. Post-application technical conference usual.	30 days (90 days)
☐	Permit to construct & operate, sewer extensions involving gravity sewers, pump stations and force mains discharging into a sewer collection system	Fast-Track Permitting program consists of the submittal of an application and an engineer's certification that the project meets all applicable State rules and Division Minimum Design Criteria.	30 days (N/A)
☐	NPDES - permit to discharge into surface water and/or permit to operate and construct wastewater facilities discharging into state surface waters.	Application 180 days before begins activity. On-site inspection. Pre-application conference usual. Additionally, obtain permit to construct wastewater treatment facility granted after NPDES. Reply time, 30 days after receipt of plans or issue of NPDES permit-whichever is later.	90-120 days (N/A)
☐	Water Use Permit	Pre-application technical conference usually necessary.	30 days (N/A)
☐	Well Construction Permit	Complete application must be received, and permit issued prior to the installation of a groundwater monitoring well located on property not owned by the applicant, and for a large capacity (>100,000 gallons per day) water supply well.	7 days (15 days)
☐	Dredge and Fill Permit	Application copy must be served on each adjacent riparian property owner. On-site inspection. Pre-application conference usual. Filling may require Easement to Fill from N.C. Department of Administration and Federal Dredge and Fill Permit.	55 days (90 days)
☐	Permit to construct & operate Air Pollution Abatement facilities and/or Emission Sources as per 15 A NCAC (2Q.O100 thru 2Q.O300)	Application must be submitted, and permit received prior to construction and operation of the source. If a permit is required in an area without local zoning, then there are additional requirements and timelines (2Q.O113).	90 days
☐	Any open burning associated with subject proposal must be in compliance with 15 A NCAC 2D.1900	N/A	60 days (90 days)
☐	Demolition or renovations of structures containing asbestos material must be in compliance with 15 A NCAC 20.1110 (a) (1) which requires notification and removal prior to demolition. Contact Asbestos Control Group 919-707-5950	Please Note - The Health Hazards Control Unit (HHCU) of the N.C. Department of Health and Human Services, must be notified of plans to demolish a building, including residences for commercial or industrial expansion, even if no asbestos is present in the building.	60 days (90 days)
☐	The Sedimentation Pollution Control Act of 1973 must be properly addressed for any land disturbing activity. An erosion & sedimentation control plan will be required if one or more acres are to be disturbed. Plan must be filed with and approved by applicable Regional Office (Land Quality Section) at least 30 days before beginning activity. A NPDES Construction Stormwater permit (NCG010000) is also usually issued should design features meet minimum requirements. A fee of \$100 for the first acre or any part of an acre. An express review option is available with additional fees.		20 days (30 days)
☐	Sedimentation and erosion control must be addressed in accordance with NCDOT's approved program. Particular attention should be given to design and installation of appropriate perimeter sediment trapping devices as well as stable Stormwater conveyances and outlets.		(30 days)
☐	Sedimentation and erosion control must be addressed in accordance with _____ Local Government's approved program. Particular attention should be given to design and installation of appropriate perimeter sediment trapping devices as well as stable Stormwater conveyances and outlets.		Based on Local Program
☐	Compliance with 15A NCAC 04B .0125 – Buffers Zones for Trout Waters shall have an undisturbed buffer zone 25 feet wide or of sufficient width to confine visible siltation within the twenty-five percent (25%) of the buffer zone nearest the land-disturbing activity, whichever is greater.		
☐	Compliance with 15A NCAC 2H .0126 - NPDES Stormwater Program which regulates three types of activities: Industrial, Municipal Separate Storm Sewer System & Construction activities that disturb ≥1 acre.		30-60 days (90 days)
☐	Compliance with 15A NCAC 2H 1000 -State Stormwater Permitting Programs regulate site development and post-construction stormwater runoff control. Areas subject to these permit programs include all 20 coastal counties, and various other counties and watersheds throughout the state.		45 days (90 days)

State of North Carolina Department of Environmental Quality
INTERGOVERNMENTAL REVIEW PROJECT COMMENTS

Reviewing Regional Office: Raleigh
Project Number: DEQ#-1894 Due Date: 10/4/2024
County: Wake

	PERMITS	SPECIAL APPLICATION PROCEDURES or REQUIREMENTS	Normal Process Time (Statutory time limit)
☐	Mining Permit	On-site inspection usual. Surety bond filed with DEQ Bond amount varies with type mine and number of acres of affected land. Affected area greater than one acre must be permitted. The appropriate bond must be received before the permit can be issued.	30 days (60 days)
☐	Dam Safety Permit	If permit required, application 60 days before begin construction. Applicant must hire N.C. qualified engineer to prepare plans, inspect construction, and certify construction is according to DEQ approved plans. May also require a permit under mosquito control program. And a 404 permit from Corps of Engineers. An inspection of site is necessary to verify Hazard Classification. A minimum fee of \$200.00 must accompany the application. An additional processing fee based on a percentage, or the total project cost will be required upon completion.	30 days (60 days)
☐	Oil Refining Facilities	N/A	90-120 days (N/A)
☐	Permit to drill exploratory oil or gas well	File surety bond of \$5,000 with DEQ running to State of NC conditional that any well opened by drill operator shall, upon abandonment, be plugged according to DEQ rules and regulations.	10 days N/A
☐	Geophysical Exploration Permit	Application filed with DEQ at least 10 days prior to issue of permit. Application by letter. No standard application forms.	10 days N/A
☐	State Lakes Construction Permit	Application fee based on structure size is charged. Must include descriptions & drawings of structure & proof of ownership of riparian property	15-20 days N/A
☒	401 Water Quality Certification	Compliance with the T15A 02H .0500 Certifications are required whenever construction or operation of facilities will result in a discharge into navigable water as described in 33 CFR part 323.	60 days (130 days)
☒	Compliance with Catawba, Goose Creek, Jordan Lake, Randleman, Tar Pamlico or Neuse Riparian Buffer Rules is required. Buffer requirements: http://deq.nc.gov/about/divisions/water-resources/water-resources-permits/wastewater-branch/401-wetlands-buffer-permits/401-riparian-buffer-protection-program		
☒	Nutrient Offset: Loading requirements for nitrogen and phosphorus in the Neuse and Tar-Pamlico River basins, and in the Jordan and Falls Lake watersheds, as part of the nutrient-management strategies in these areas. DWR nutrient offset information: http://deq.nc.gov/about/divisions/water-resources/planning/nonpoint-source-management/nutrient-offset-information		
☐	CAMA Permit for MAJOR development	\$250.00 - \$475.00 fee must accompany application	75 days (150 days)
☐	CAMA Permit for MINOR development	\$100.00 fee must accompany application	22 days (25 days)
☐	Abandonment of any wells, if required must be in accordance with Title 15A. Subchapter 2C.0100.		
☐	Notification of the proper regional office is requested if "orphan" underground storage tanks (USTS) are discovered during any excavation operation.		
☒	Plans and specifications for the construction, expansion, or alteration of a public water system must be approved by the Division of Water Resources/Public Water Supply Section prior to the award of a contract or the initiation of construction as per 15A NCAC 18C .0300 et. seq., Plans and specifications should be submitted to 1634 Mail Service Center, Raleigh, North Carolina 27699-1634. All public water supply systems must comply with state and federal drinking water monitoring requirements. For more information, contact the Public Water Supply Section, (919) 707-9100.		30 days
☒	If existing water lines will be relocated during the construction, plans for the water line relocation must be submitted to the Division of Water Resources/Public Water Supply Section at 1634 Mail Service Center, Raleigh, North Carolina 27699-1634. For more information, contact the Public Water Supply Section, (919) 707-9100.		30 days
☐	Plans and specifications for the construction, expansion, or alteration of the _____ water system must be approved through the _____ delegated plan approval authority. Please contact them at _____ for further information.		

State of North Carolina Department of Environmental Quality
INTERGOVERNMENTAL REVIEW PROJECT COMMENTS

Reviewing Regional Office: Raleigh
Project Number: DEQ#-1894 Due Date: 10/4/2024
County: Wake

Other Comments (attach additional pages as necessary, being certain to comment authority)

Division	Initials	No comment	Comments	Date Review
DAQ	DLR	☐	No AQ applicable requirements at this time	9/23/2024
DWR-WQROS (Aquifer & Surface)	&KM	☐	& See checked boxes above. The town planning area includes land in both the Neuse and Cape Fear River basins (including the Jordan Lake Watershed). Activities that occur in the riparian buffer may require DWR authorization. Activities that impact surface waters may require 401/404 approval.	10/2/2024
DWR-PWS	TP	☐	See checked boxes.	9/27/2024
DEMLR (LQ & SW)	WHD	☒		9/24/2024
DWM – UST		☐		/ /
Other Comments		☐		/ /

REGIONAL OFFICES

Questions regarding these permits should be addressed to the Regional Office marked below.

- | | | |
|--|---|--|
| ☐ Asheville Regional Office
2090 U.S. 70 Highway
Swannanoa, NC 28778-8211
Phone: 828-296-4500
Fax: 828-299-7043 | ☐ Fayetteville Regional Office
225 Green Street, Suite 714,
Fayetteville, NC 28301-5043
Phone: 910-433-3300
Fax: 910-486-0707 | ☐ Mooreville Regional Office
610 East Center Avenue, Suite 301,
Mooreville, NC 28115
Phone: 704-663-1699
Fax: 704-663-6040 |
| ☒ Raleigh Regional Office
3800 Barrett Drive,
Raleigh, NC 27609
Phone: 919-791-4200
Fax: 919-571-4718 | ☐ Washington Regional Office
943 Washington Square Mall,
Washington, NC 27889
Phone: 252-946-6481
Fax: 252-975-3716 | ☐ Wilmington Regional Office
127 Cardinal Drive Ext.,
Wilmington, NC 28405
Phone: 910-796-7215
Fax: 910-350-2004 |
| | ☐ Winston-Salem Regional Office
450 Hanes Mill Road, Suite 300,
Winston-Salem, NC 27105
Phone: 336-776-9800
Fax: 336-776-9797 | |

Department of Environmental Quality

Project Internal Review

Project Number: DEQ#1894

County: Wake

Date Received: 9-13-2024

Due Date: 10-4-2024

Project Description: *Environmental Review - Town of Morrisville - 2025 Draft Secondary and Cumulative Impacts Master Management Plan (SCIMMP)*

This Project is being reviewed as indicated below:

Regional Office	Regional Office Area	In-House Review	
Asheville	Air	Air Quality	Coastal Management
Fayetteville	DWR	Waste Mgmt	Marine Fisheries
Mooreville	DWR - Public Water	Water Resources Mgmt (Public	CC & PS Div. of
Raleigh	DEMLR (LQ & SW)	Water, Planning & Water	Emergency Mgmt
Washington	DWM	Quality Program)	Environmental Justice
Wilmington		DWR-Transportation Unit	Wildlife <u>Gabriela</u>
Winston Salem			Wildlife/DOT

Manager Sign-Off/Region:	Date:	In-House Reviewer/Agency: Gabriela Garrison/NCWRC
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Response (check all applicable)

☒ No objection to project as proposed.

☒ No Comment

☐ Insufficient information to complete review

☐ Other (specify or attach comments)

Department of Environmental Quality

Project Internal Review

Project Number: DEQ#1894

County: Wake

Date Received: 9-13-2024

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Project Description: *Environmental Review - Town of Morrisville - 2025 Draft Secondary and Cumulative Impacts Master Management Plan (SCIMMP)*

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Fayetteville	DWR	Waste Mgmt	Marine Fisheries
Mooresville	DWR - Public Water	Water Resources Mgmt (Public	CC & PS Div. of
Raleigh	DEMLR (LQ & SW)	Water, Planning & Water	Emergency Mgmt
Washington	DWM	Quality Program)	Environmental Justice
Wilmington		DWR-Transportation Unit	Wildlife <u>Gabriela</u>
Winston Salem			Wildlife/DOT

Manager Sign-Off/Region:	Date:	In-House Reviewer/Agency: J. Wen / NCEM
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Response (check all applicable)

☒ No objection to project as proposed.

☒ No Comment

☐ Insufficient information to complete review

☐ Other (specify or attach comments)

Department of Environmental Quality

Project Internal Review

Project Number: DEQ#1894

County: Wake

Date Received: 9-13-2024

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Raleigh	DEMLR (LQ & SW)	Water, Planning & Water	Emergency Mgmt
Washington	DWM	Quality Program)	Environmental Justice
Wilmington		DWR-Transportation Unit	Wildlife <u>Gabriela</u>
Winston Salem			Wildlife/DOT

Manager Sign-Off/Region:	Date: 10/4/24	In-House Reviewer/Agency: Melodi Deaver, DWM Hazardous Waste
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Response (check all applicable)

☐ No objection to project as proposed. ☒ No Comment

☐ Insufficient information to complete review ☐ Other (specify or attach comments)

MEMORANDUM

To: Lyn Biles (NC DEQ)

CC: Mark Spanioli, Jennifer Bullock
(Town of Morrisville)

From: Hillary Yonce (Tetra Tech)

Date: December 18, 2024

Subject: Response to NC DEQ Review of
Town of Morrisville SCIMMP

On behalf of the Town of Morrisville, Tetra Tech submitted to the North Carolina Department of Environmental Quality (NC DEQ) on September 4, 2024 the "2025 Secondary and Cumulative Impacts Mitigation Management Plan (SCIMMP)". All necessary subgroups of NC DEQ reviewed the SCIMMP and provided comments in response on October 12, 2024. Through their review, NC DEQ indicated that the submittal covered all basic information required but did have several specific comments regarding the plan. Several of these comments recommended straightforward edits or additional provided information and these comments were addressed directly in the text by editing as suggested. Remaining substantive comments are included below, followed by responses on behalf of the Town.

Comments and Responses:

1. In Section 4.10, Subsection 4.10.1 Surface Water, the classification information is not completely accurate. Paragraph three indicates that Kit Creek is Class C waters. The headwaters of Kit Creek in the town of Morrisville are classified as WS-V, NSW. The information included in table 4-5 is accurate. All waters in the Jordan Lake watershed are minimally WS-V, NSW. (Response addresses all comments related to water quality classification)

Response: Water quality classifications were reviewed and corrections made as suggested in this comment. The corresponding figure (Figure 4-8) has also been corrected to show WS-V waters.

2. On page 5-80, Table 5-1, the 'Existing Percent of Study Area' adds to 101% and not 100%.

Response: This was an artifact of rounding and has been corrected by adding another decimal place to the existing and future land use tables as necessary.

3. The Section strongly recommends that the Town of Morrisville require all contractors to provide proof of proper disposal for all generated waste to permitted facilities.

Response: The Town appreciates the recommendation and will pass the information on to the proper channels for waste management policy. As the SCIMMP focuses on existing mitigation policy this recommendation will be included if it is formalized in Morrisville policies.

APPENDIX B: MEMORANDUM OF AGREEMENT

The following pages are the most up-to-date Memorandum of Agreement (MOA) addendum between the North Carolina Department of Environmental Quality and the Town regarding the use of this Secondary and Cumulative Impacts Mitigation Management Plan for public utility infrastructure planning and development. This MOA addendum was signed by both parties in December, 2024 (included in the following pages).

MEMORANDUM

To: North Carolina State
Environmental Review
Clearinghouse

CC: Lyn Biles (NCDEQ)

From: Hillary Yonce (Tetra Tech)

Date: January 1, 2025

Subject: 2025 Secondary and Cumulative
Impacts Master Management Plan
for Morrisville, North Carolina

Dear Lyn and Clearinghouse staff,

Enclosed is digital copy of the 2025 Secondary and Cumulative Impacts Master Management Plan (SCIMMP) for the Town of Morrisville. A copy of correspondence from Lyn Biles indicating approval of this SCIMMP from the North Carolina Department of Environmental Quality (NCDEQ) for submittal to the State Environmental Review Clearinghouse is found in Appendix A and attached for reference.

Morrisville initially developed SCIMMP documentation with NCDEQ in 2005 and completed its first ten-year update in 2015. This documentation represents the second ten-year update for 2025. The SCIMMP process provides an overview of Morrisville's planned infrastructure and land use changes, any foreseeable potential secondary and cumulative impacts, and the growth management plans in place to address and mitigate these potential environmental impacts.

The existing Memorandum of Agreement (MOA) remains in effect until December 31, 2035, with recognition that any reference to "NCDENR" being obsolete in place of the updated department title of "NCDEQ". The updated SCIMMP was developed to take effect January 1, 2025. Morrisville will submit Biennial Reports to NCDEQ on the following updated schedule.

Document	Date
2025 SCIMMP Report	January 1, 2025
2027 Biennial Update	January 1, 2027
2029 Biennial Update	January 1, 2029
2031 Biennial Update	January 1, 2031
2033 Biennial Update	January 1, 2033
2035 SCIMMP Report	January 1, 2035

Please ensure the enclosed SCIMMP is distributed and published appropriately. If you have any questions, please contact Morrisville.



Lyn Biles, NCDEQ SEPA Program Manager



Mark Spanioli, Director of Engineering

APPENDIX C: CAPITAL IMPROVEMENT PLAN

The following pages are the Budget Summary and Capital Improvement Program (2024), the Stormwater Capital Investment Program (2024), and Capital Investment Program Policy (2022) for the Town of Morrisville.



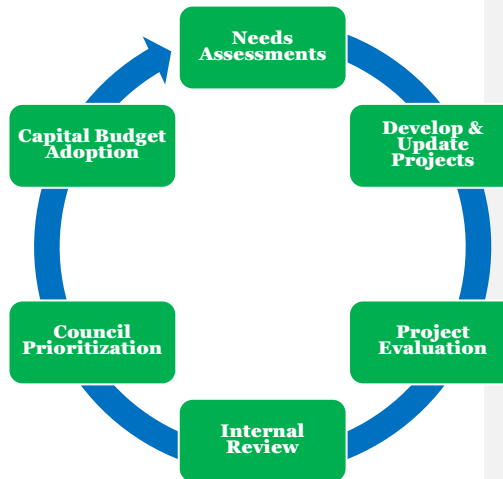
Morrisville
Live connected. Live well.

Capital Investment Program Policy
Adopted 12.13.22

CAPITAL INVESTMENT PROGRAM POLICY

OVERVIEW

The Capital Investment Program (CIP) outlines the Town's plan for achieving the goals, objectives, and service delivery levels desired by the Town Council on behalf of the community. Capital Investment planning is a dynamic process; flexibility is necessary to maximize opportunities and adapt to changing elements that may occur year to year. These large financial investments are required to maintain and expand public facilities and public infrastructure. Ongoing service delivery can be ensured only if adequate consideration is given to capital needs through the capital budget process. A Capital Investment Program is an important management tool that strengthens the linkages between community infrastructure needs and the financial capacity of the Town to ensure decisions on capital projects and funding are made wisely producing tangible, affordable outcomes that maximize the investment.



PURPOSE

Capital investment programming is a long-range strategy to forecast and match projected revenues and major capital needs over a multi-year planning period. The main purpose is to establish investment expectations and provide direction to staff to create a usable funding plan that delivers results. Capital project planning includes projects that acquire, construct, maintain, or improve the Town's fixed assets. The Town is primarily responsible for the care and maintenance of the Town's assets to meet service delivery expectations. The goals and advantages of this process are included below:

Goals:

- Support Town goals, objectives, and initiatives
- Maintain and improve the Town's public infrastructure
- Promote and sustain economic development within the Town
- Increase efficiency and productivity of Town operations
- Plan for large, non-routine expenditures and allow time to arrange financing

Advantages:

- Builds public consensus for projects and improves community awareness
- Improves inter/intragovernmental cooperation and communication
- Avoids waste of resources
- Helps ensure financial stability

TERM LENGTH

The CIP will span a 5-year planning period.

DIFFERENTIATING CAPITAL BUDGET FROM OPERATING BUDGET

The CIP should not be confused with the Capital Budget. A capital budget represents the first year of the CIP planning cycle that parallels the Annual Operating Budget planning cycle and intersects at adoption to appropriate funds for capital spending. The outlying years of the CIP serve as long-range planning years, but do not establish appropriations.

Annual, recurring items such as salaries, office supplies, routine maintenance, and service contracts are typical operating expenses and therefore are not appropriate for capital expenses. The Town of Morrisville separately funds fire apparatus and equipment through a dedicated Capital Reserve Fund, so these items are not included in the Town's CIP.

PROJECT TYPES AND CATEGORIES

Capital project types included within the CIP and not within the Annual Operating Budget typically are large, non-recurring expenditures that would otherwise distort the Annual Operating Budget. Typical criteria utilized to distinguish the difference between the types of expenditures are cost and useful life. Cost is a value limit placed on the expense. Useful life is defined as projects having a long service life and with a non-recurring nature.

Commented [DK1]: Is this specific budget terminology? Wondering if there is a better way of saying this?

The following are key benchmarks used to determine items to include within the CIP:

1. Useful life greater than 5-years
2. Value greater than \$100,000
 - a. Acquisition, renovation/improvement, and/or construction of a single fixed public asset
 - b. Land purchases not associated with or included in another CIP project
 - c. Major equipment for any public facility when first constructed or acquired
 - d. Road construction, or large, non-routine maintenance projects considered capital in nature – excluding recurring or routine maintenance projects
 - e. State roadway projects deemed important to advance within the State Transportation Improvement Program (STIP), that would decrease congestion along major routes, or may contribute to improving public safety or economic development
 - f. Projects included in other adopted plans
3. Typically require use of debt, or reserve funds

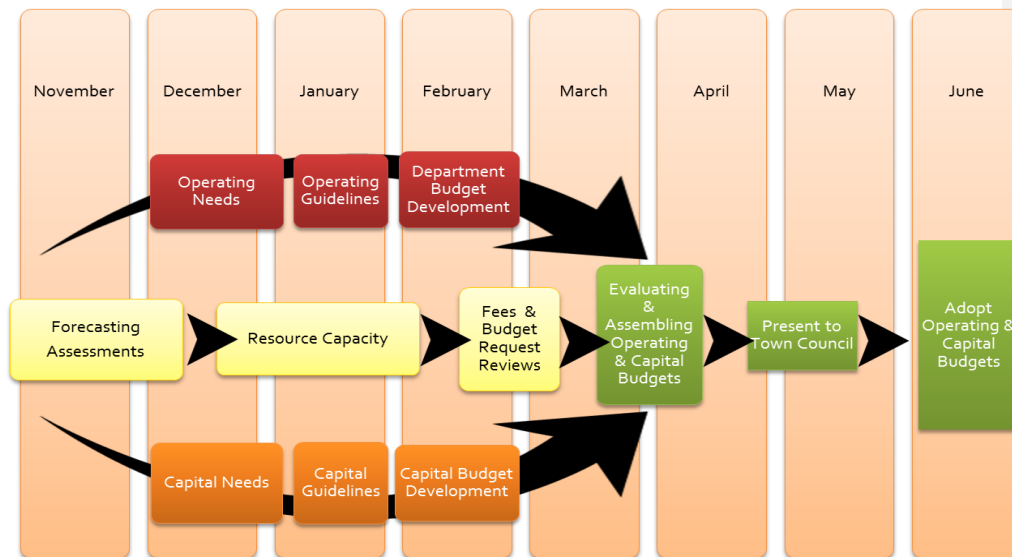
Commented [MTJ2]: Ask Jeanne about CTP

Capital projects are organized within the CIP by the following major categories:

- Public Facilities
- Public Safety
- Parks/Recreational
- Environmental/Stormwater
- Bicycle/Pedestrian
- Public Roadways/Transportation
- State Roadways (design, grant match funds, or mitigating improvements)

CAPITAL INVESTMENTS PROGRAM PLANNING CALENDAR

The basic CIP Calendar typically coincides with the Annual Operating Budget Planning Calendar, while remaining flexible. An outline of the typical calendar is included below:



COMMUNITY ENGAGEMENT

Public input is a critical step in establishing capital project priorities. Involving the community in the process can generate support for the capital plan and budget, and for funding options, such as issuance of bonds that require voter approval and may require a tax rate increase for funding. Public input is a critical tool in Council's decision making toolbox. The primary forms of community engagement include, but are not limited to:

- Comprehensive Survey on Strategic Values and Service Needs assessment every 4-years – gauges community feedback on areas where the Town is performing well and identifies areas for improvement.
- Annual Budget Portal Feedback – provides key input during the planning stages in addition to offering feedback on the recommended capital budget once presented to Council.
- Annual Formal Public Hearings – provides an open mic for input in a formal setting on the recommended capital budget as presented to Council.
- Other Media – The Town uses various media outlets to support two-way communication between the community and the Town. This is another avenue for the community to share their priorities and interests with the Town.

As in all community matters, it is recognized that the public engages in providing input in a number of ways by actively communicating their opinions on service needs or key issues facing the community to Town Council via email, letters, and phone calls.

KEY INFLUENCES ON PROJECT CREATION

A number of factors contribute to the creation of project concepts. The primary factors originate from the community needs assessment data obtained through the Comprehensive Survey on Strategic Values and Service Needs, Town Goals, adopted plans, and legal mandates. Other influences include department specific satisfaction surveys or

department need assessments, public assets replacement/improvement needs, informal communications and other data collection efforts.

Professional staff evaluate this data to craft realistic project concepts with detailed scopes, sound cost estimates, clear community benefits, and key location targets when applicable. The project concepts also consider potential funding sources and operating cost impacts. Projects should generally be foreseen ahead of time (preferably 2 + years) to allow adequate planning and due diligence to occur.

INTERNAL REVIEW

The internal review of the CIP will consist of the following:

Project Evaluation Criteria

The Project Evaluation Criterion is established by Council and applied by staff to evaluate the merits of a project and its overall alignment with the Town's strategic goals and initiatives. The criteria produce a unique rating for each project Council uses in conjunction with other tools to prioritize projects and develop a five-year funding plan. The project concept and its corresponding evaluation criteria rating are evaluated by the Executive CIP Review Team (defined below) for relevance.

Evaluation Criteria (listed in order of Council's weighted significance)

1. **Safety** – Degree a project eliminates, prevents, or reduces an immediate hazard to safety
2. **Mandates** – Project addresses a federal, state, or local mandate, including previous Town actions and associated commitments
3. **Continuity of Service** – Necessity of project to maintain existing levels of service and/or prevent service interruptions
4. **Strategic Goal Alignment** - Extent to which a project advances the Town's adopted plans, strategic goals, initiatives, and objectives
5. **Emerging Service Demand** – Responsiveness to public demand for new programs and services
6. **Economic Impact** – How a project enhances economic development in Town, directly or indirectly adds to the tax base, or enables revenue generation through user fees or similar charges
7. **Fiscal Efficiencies** – How a project contributes to savings in Town's operational and/or capital spending
8. **Availability of Funding** - Level of external funding sources available to support the project
9. **Improvement of Public Fixed Asset(s)** – Project improves an existing Town asset
10. **Project Readiness** – Degree of shovel readiness

Project Cost, Affordability, and Staff Capacity

The project evaluation criteria is the primary tool used by Council to establish priority rankings for capital projects, and it guides the development of the Five-Year Capital Investment Program. Each year during the annual budget process, Town staff works to develop a funding plan that meets Council's top priorities, while remaining within the bounds of the Town's available financial resources, policy guidelines, and staff capacity to manage the projects.

Executive CIP Review Team

A critical assessment team will consist of the Town Manager and the Manager's selected key staff members. The team will review CIP project concepts for:

- Complete and accurate information
- Project benefits and alignment with Town Goals
- Feasibility of cost and practicality of project

Additionally, the Team will recommend a list of the top five projects considered by staff as the highest priority projects for Council consideration as they work through their prioritization action. Professional staff knowledge and expertise is instrumental in safeguarding against important, but less appealing projects such as facility improvement needs receiving a diminished consideration.

COUNCIL PRIORITIZATION

Council will produce a prioritized list of projects using key information tools provided within the scope of the CIP including, but not limited to:

1. Project concept profiles
2. Project evaluation criteria
3. Executive CIP Review Team's recommended priorities
4. Comprehensive Survey Data on Strategic Values and Service Needs as it relates to community support for certain types of projects
5. Professional knowledge and expertise

The prioritized list will be updated by Council on a 4-year cycle to allow staff adequate consistency in direction and guidance to develop a funding strategy and begin work to plan for the execution of projects.

ALIGNMENT OF RESOURCES

At the conclusion of Council's prioritized list, staff will develop a funding model for the **Top 5 projects** across the 5-year plan. The Town Manager will present a recommended plan to Council for adoption. This will provide staff annually with the guidance and expectation to responsibly plan for good capital investments for the community.

Commented [MTJ3]: Why 5?

FUNDING SOURCES

The primary funding sources considered by Morrisville are defined as follows:

Debt Methods:

Typically used for large, expensive projects with a useful life that exceeds 5-years and the length of the financing period.

- **Installment Purchase** – capital item used for a public facility or equipment that is a public good and may or may not have revenue-producing capability. These asset-backed loans involve an installment purchase or financing agreement and perhaps a trust indenture.
- **General Obligation (GO) Bonds** – capital item used for a public facility or equipment that is a public good and that has no revenue producing capability (e.g., streets and municipal buildings or structures). Generally, GO Bonds are used for major projects. Growth in tax based could be leveraged when a project is in response to community demands.
- **Revenue Bonds** – capital item used for a non-public good, in which a revenue stream is associated with the capital item (e.g., airport, water, wastewater, and electric systems capital items).

Non-Debt Methods (also referred to as Pay-As-You-Go, "Paygo", or Cash)

Typically used for less expensive items with a shorter useful life like vehicles and equipment, matching funds for grants, or similar items that may possess phasing potential.

- **General Fund** – the capital item may require advanced funding from the General Fund to begin design work. The financing instrument reimburses funding provided for by the General Fund prior to the close of the capital project.
- **Unassigned Fund Balance** – the capital item can be acquired through existing fund balance without drawing balances below policy limits.
- **Capital Reserve Fund** – the capital item may be funded from a Council designated tax or revenue streams that are set aside in a separate fund.
- **Special District Tax or Special Assessment** – the capital item may be funded from charges to benefiting property owners for major infrastructure with local act.

Other Methods

Typically, these methods are oriented more toward parks, sidewalks, greenways, and transportation related type projects. **Grants can be assets qualifying and possess reporting requirements.**

Commented [MTJ4]: What does this mean?

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- **Grants** – funding of the capital item was secured upon application of a governmental grant (e.g., CDBG, Law Enforcement Grants, EPA Water Quality, Fire Safety Grants, CAMPO, Wake County Park Grants). The capital item is used for a public facility or equipment that is a public good and may or may not have a revenue producing capability (e.g., streets, municipal buildings, structures, or parks). Typically, grant funds are designed to be seed money and are a one-time financing source.
- **State Funding** – capital items specifically related to STIP projects that are included within the CIP are preferred to be funded directly by the North Carolina Department of Transportation. The Town recognizes it may need to invest planning funds to improve the scoring of key projects at the State level, but it does not intend to fully fund the construction.
- **Developer** – transportation and park improvement projects may be constructed by developers as new development occurs. The Town is authorized to collect payments from developers in lieu of requiring the developers to provide open space and recreation areas or make certain public street improvements. The Town can then use the funds to make the improvements. Additional details are included below.

Payment in Lieu of Providing Required Public Recreation Areas

The Town may collect payments from developers in lieu of providing required public recreation areas. Payments are collected in accordance with standards and procedures outlined in section 5.5.3 of the Town's Unified Development Ordinance (UDO). Upon collection, funds are deposited into the Parkland Payment in Lieu Fund in accordance with section 5.5.3(C)(2) of the UDO.

Use of Funds

Funds shall be used only for the acquisition or development of parks, greenways, and other open space areas that will serve occupants and users of the development. Such areas may also serve other developments in the immediate area.

Payment In-Lieu of Public Street Improvements

The Town may collect payments from developers in lieu of required public street improvements as authorized by NCGS 160D-804. Payments are collected in accordance with standards and procedures outlined in section 8.1.3 of the Town's Unified Development Ordinance (UDO). Upon collection, funds are deposited into the Roadway and Transportation Capital Reserve Fund in accordance with Section 8.1.3(F) of the UDO.

Payments are collected for the following types of public street improvements:

- Road Improvements
- Bike Improvements
- Driveway Stubs
- Landscaped Medians
- Pedestrian Improvements
- Streetlights
- Traffic Lights
- Greenway Improvements

Use of Funds

Funds shall be used only for the design and construction of street improvements, including associated land acquisition, that serve the occupants, residents, or invitees of the subdivision or development for which the in-lieu payment is made.

The Town will, when practicable and expeditious, spend funds on the specific improvement for which the in-lieu payment was initially collected. The Town may leverage the funds for other street improvements in close proximity to benefit the general community area as initially intended if one or more of the following conditions exists:

- Payments received for specific improvement have been retained in reserve for a period greater than five years.
- The specific improvement is not likely to occur as originally expected and funds were not collected as a refundable improvement.
- The final Certificate of Occupancy has been issued for the development that originally made the payment in lieu.

This ensures funds received are effectively and efficiently utilized for street improvements and not held idle, maximizing community benefit of the investment paid by the original subdivision or development.

FREQUENCY OF CIP UPDATES

It is important that a CIP be updated in a reasonable and predictable timeframe. The CIP must remain flexible and responsive to opportunities and urgent matters that may surface from time to time. The Town will commit to a Major Update of the CIP Policy, Projects, and Prioritization on a 4-year cycle, with a 2-year Mini Update occurring to adjust for necessary project modifications, and a simple cursory review by staff annually with the Capital Budget to adapt to urgent circumstances.

This allows for consistency in direction so staff can effectively plan for, fund, and realize tangible improvements for the community.

Stormwater Capital Investment Program (CIP)

The Stormwater CIP (SWCIP) is based on the Stormwater Master Plan Study completed in FY2021 and is supported by a proposed increase in the ERU Fee to largely apply a Pay-Go funding strategy. While the SWCIP illustrated here shows 5-years, the study proposed a 10-year plan that is reflected in the Future column. The SWCIP will actively address ten identified stormwater area of concerns outlined in the study.

Stormwater Fund CIP Projects	Submitted Estimate Escalator	FY2024	FY2025	FY2026	FY2027	FY2028	Future	TOTAL
		1.05	1.1	1.15	1.2	1.25	1.30	
Phase 1 Projects								
McCrimmon Pkwy #1	180,000							\$ -
Wolfsnare Ln #4 (funded in FY23)	220,000							\$ -
Sawmill Creek Tributary Stream Restoration #10	1,900,000	527,100	1,025,000	1,025,000			-	\$ 2,577,100
Phase 2 Projects								
Savannah Subdivision & MCR Culvert #8	1,340,000				314,000	714,000	714,000	\$ 1,742,000
Garden Sq. Lane & Greenway #2	880,000					214,000	974,000	\$ 1,188,000
MCR (West of Millet Dr) #6	890,000						1,202,000	\$ 1,202,000
Chessway Dr Culvert #7	1,720,000						2,322,000	\$ 2,322,000
Phase 3 Projects								
Town Hall Drive Culvert #3	1,340,000						1,809,000	\$ 1,809,000
Morrisville Carpenter Road West/Davis Dr #5	\$ 500,000						\$ 675,000	\$ 675,000
Morrisville Carpenter Road West/Madres Ln #9	\$ 1,050,000						\$ 1,418,000	\$ 1,418,000
Total Capital Investment Program	\$ 10,020,000	\$ 527,100	\$ 1,025,000	\$ 1,025,000	\$ 314,000	\$ 928,000	\$ 9,114,000	\$ 12,933,100

Stormwater Fund Projected Funding Sources	FY2024	FY2025	FY2026	FY2027	FY2028	Future	TOTAL
Transfers from SW Operating Fund	527,100	534,000	514,000	314,000	470,000		\$ 2,359,100
Appropriation of SW Fund Fund Balance		491,000	511,000		458,000		\$ 1,460,000
Unfunded (Future CIP Planning Window)						\$ 9,114,000	\$ 9,114,000
Total Sources	\$ 527,100	\$ 1,025,000	\$ 1,025,000	\$ 314,000	\$ 928,000	\$ 9,114,000	\$ 12,933,100

Note: Sawmill Creek Tributary Stream Restoration project was elevated to create a shovel ready project that would be eligible for future grants. The Savannah Subdivision & MCR culvert project was shifted out a few years. The recent improvements on Morrisville Carpenter Road will allow for evaluation of those changes to the specific drainage area with no significant concerns.

Assumptions:

- ✓ Reserve allocation = 2% annual growth.
- ✓ Cost escalators = 4% annual growth.
- ✓ Grant items = department has plans to apply for grants to offset funding sources.

Top Prioritized SWCIP Projects in 5-Year Planning Period

The project concepts are shown by in alphabetical order. More information may be provided during the CIP work session.

Project	Chessway Drive Culvert
Estimated Cost	\$2.3 million
Location	Located within the Town maintained ROW of Chessway Drive approximately 150 feet south of the intersection with Chessridge Way (Just off of Davis Drive).
Scope	Construction of a meandering channel incised approximately 2' deeper than the existing channel at the upstream end while maintaining the current culvert inlet invert at Chessway Drive. In addition to the deeper channel, the conceptual design includes the excavation of a relatively flat floodplain 50' on either side of the new channel.
Project	Garden Square Lane Culvert and Greenway
Estimated Cost	\$1.2 million
Location	Located approximately 150 feet west of the intersection of Garden Square Lane and Councilman Court and includes stormwater infrastructure within the Town maintained ROW of Garden Square Lane and the Town maintained easement along Indian Creek Greenway.
Scope	Replacement and upgrades to existing pipe and culvert infrastructure to mitigate road overtopping and flooding to adjacent residential structures.
Project	Morrisville Carpenter Road Culvert (West of Davis Drive)
Estimated Cost	\$675,000
Location	Located within the NCDOT maintained ROW of Morrisville Carpenter Road approximately 1,300 feet west of the intersection with Davis Drive.
Scope	Upsizing of the existing infrastructure to larger aluminum box culvert.
Project	Morrisville Carpenter Road Culvert (West of Madres Lane)
Estimated Cost	\$1.4 million
Location	Located within the NCDOT maintained right of way of Morrisville Carpenter Road approximately 230 feet west of the intersection with Madres Lane.
Scope	Includes upsizing of the existing culvert system to mitigate flood risks.
Project	Morrisville Carpenter Road Culvert (West of Millet Drive)
Estimated Cost	\$1.2 million
Location	Located within the NCDOT maintained ROW of Morrisville Carpenter Road approximately 235 feet west of the intersection with Millet Drive.
Scope	Includes upsizing of the existing culvert system to mitigate flood risks.

Project	Morrisville Tributary Stream Restoration (Sawmill Creek)
Estimated Cost	\$2.5 million
Location	Behind Page Street and running parallel with the railroad tracks and Church Street. The project is located along the planned Sawmill Creek Greenway.
Scope	The project is water quality focused and will tackle an unstable stream and poor habitat conditions. The work would include stabilizing the eroding stream, enhancing the riparian buffer by removing invasive species and adding native plantings, and incorporating pocket wetlands to help improve water quality and habitat conditions.
Project	Savannah Subdivision and Morrisville Carpenter Road Culvert
Estimated Cost	\$1.7 million
Location	Located within the NCDOT maintained right-of-way of Morrisville Carpenter Road and within Town maintained rights-of-way of Star Magnolia Drive and Low Country Court within the Savannah subdivision on either side of Morrisville Carpenter Road.
Scope	Upsizing and replacement of existing pipe infrastructure to mitigate road overtopping and flooding to adjacent residential structures.
Project	Town Hall Drive Culvert
Estimated Cost	\$1.8 million
Location	Located within the Town maintained ROW of Town Hall Drive approximately 200 feet north of its intersection with Singer Way.
Scope	Upsizing of the existing culvert system to mitigate flood risks.

Note: McCrimmon Culvert Project will be completed by NCDOT as part of McCrimmon Parkway flyover projects. Wolfsnare Lane project is active and funding provided in FY2023.

Capital Investment Program (CIP)

The CIP is a long-range planning tool that provides strategic guidance to effectively align potential resources and financing illustrating how priority projects may be implemented within a 5-year period. The tables shown are abbreviated and will be expanded in final budget report.

General Fund CIP Projects	Submitted Estimate Escalator	FY2024	FY2025	FY2026	FY2027	FY2028	Future	TOTAL
		1.05	1.1	1.15	1.2	1.25	1.3	
Airport Blvd. Extension Phase I	6,900,000	2,000,000	-	-	-	-		\$ 2,000,000
Cedar Fork Elementary Athletic Facilities	700,000	-	-	805,000	-	-		\$ 805,000
Crabtree Creek Nature Park	5,500,000	5,775,000	-	-	-	-		\$ 5,775,000
Existing FS 2 Widening Impacts	285,000	-	-	345,000	-	-		\$ 345,000
FS 2 Construction and Relocation	10,000,000	-	-	-	-	1,000,000	\$ 12,000,000	\$ 13,000,000
Future Parkland Acquisitions	8,300,000	1,700,000	-	-	6,600,000	-		\$ 8,300,000
Intersection Improvements Phase II	3,100,000	3,255,000	-	-	-	-		\$ 3,255,000
Intersection Improvements Phase III	1,800,000	-	-	-	2,160,000	-		\$ 2,160,000
Marcom Drive Parkland	4,050,000	-	-	-	-	625,000	\$ 4,640,000	\$ 5,265,000
McCrimmon Parkway Widening Betterments	900,000	-	-	1,035,000	-	-		\$ 1,035,000
NC-54 Widening Betterments	875,000	-	-	1,006,000	-	-		\$ 1,006,000
Public Works Facility	21,200,000	-	25,000,000	-	-	-		\$ 25,000,000
Sidewalks	2,000,000	-	2,200,000	-	-	-		\$ 2,200,000
Town Center Phase I	9,700,000	9,700,000	-	-	-	-		\$ 9,700,000
Watkins Road Park (Wake Tech Site)	3,425,000	-	-	575,000	4,200,000	-		\$ 4,775,000
Total Capital Investment Program	\$78,735,000	\$ 22,430,000	\$ 27,200,000	\$ 3,766,000	\$ 12,960,000	\$ 1,625,000	\$ 16,640,000	\$84,621,000

General Fund CIP Projected Funding Sources	FY2024	FY2025	FY2026	FY2027	FY2028	Future	TOTAL
GO Bonds (Transportation)	7,500,000						\$ 7,500,000
GO Bonds Parks and Recreation	6,400,000			6,600,000			\$ 13,000,000
Transportation Reserve	1,255,000	2,200,000	1,296,000	800,000			\$ 5,551,000
P & R Reserve	465,000		1,380,000	1,600,000	625,000		\$ 4,070,000
CIP Reserve	200,000			1,000,000			\$ 1,200,000
Cash Reserves (Fund Balance)				860,000	1,000,000		\$ 1,860,000
Other (Land Sale)	1,070,000						\$ 1,070,000
Streets Payment in Lieu			745,000				\$ 745,000
FS2 ROW NCDOT Payment			345,000				\$ 345,000
Parkland Payment in Lieu	4,000,000			2,100,000			\$ 6,100,000
PARTF Grant	500,000						\$ 500,000
ARPA	1,040,000						\$ 1,040,000
Installment Financing		25,000,000					\$ 25,000,000
Unfunded (Future CIP Planning Window)						\$ 16,640,000	\$ 16,640,000
Total Sources	\$ 22,430,000	\$ 27,200,000	\$ 3,766,000	\$ 12,960,000	\$ 1,625,000	\$ 67,981,000	\$84,621,000

Assumptions:

- ✓ Submitted cost estimates include a 25% contingency modifier on projected cost.
- ✓ Inflationary adjustments are applied at 5% annual increments depending on the start date.
- ✓ Funding plan anticipates continued annual allocations and projected restricted source receipts in long-range assumptions. Any change or discontinuation of these anticipated annual allocations/receipts will have significant impacts to the long-range projected plan.
- ✓ ARPA requires that projects can be obligated by end of calendar year 2024 and then must spend money by end of calendar year 2026.
- ✓ Shifted Bond funding for CCNP to Town Center Green in lieu of timing of issuance of bonds.

Top Prioritized CIP Projects in 5-Year Planning Period

The project concepts are shown by major category in alphabetical order. Estimated project costs reflect amounts anticipated to be funded within the FY24 – FY28 CIP planning period. Some projects have received prior year funding or may require funding beyond FY28 for completion. More information will be provided during work session for CIP.

Bicycle & Pedestrian

Project	Sidewalk Connectivity-Future Projects
Estimated Cost	\$2.2 million
Scope	Completion of missing sidewalk segments along with projects on NCDOT rights-of-way. The Comprehensive Transportation Plan has identified sidewalks as a key component at all Town corridors. The future projects list includes segments of Louis Stephens Drive, various segments on NC54, Sorrell Grove Church Road and two segments of International Drive.

Parks & Recreation

Project	Cedar Fork Elementary Athletic Facilities
Estimated Cost	\$805,000
Scope	Lighting to support athletic facilities that will be constructed by the Wake County Public School System in conjunction with construction of the new Wake County Public High School. Planned facilities include: • 1 Softball Field • 6 Tennis Courts.

Project	Crabtree Creek Nature Park
Estimated Cost	\$5.75 million
Scope	To provide a passive recreation facility with nature park to include a parking lot, a picnic shelter with restrooms, a playground, an open play green space, and walking trails through wetland and forested areas. Educational interpretive signage would be installed throughout the site to describe the different wildlife and environmental aspects of the park. The Parks Master Plan supports this type of park amenity; could serve as trailhead with commuters for Crabtree Hatcher Creek Greenway, town owned property - providing a needed playground amenity in that service area. The Town has been awarded a \$500,000 Parks and Recreation Trust Fund Grant to reimburse funds paid during construction of Crabtree Creek Nature Park.

Project	Future Town Parks & Open Space
Estimated Cost	\$8.3 million
Scope	To protect limited open space through the acquisition of parkland as identified in the Parks Master Plan (over the next 10 years) with a variety of park classifications. This could include focus areas within the Town Center, historic preservation, and open green space. The purpose is to develop a robust park system with adequate acreage and various park types equitably distributed throughout Town. This would only include land for future public purpose of parks and open space aligning with the Town's Land Acquisition Policy Goals.

Project	NEW - Marcom Drive (Marcom Properties) Parkland Concept
Estimated Cost	\$625,000 Design
Scope	Design to plan for construction of recreation amenities on recently acquired parcels along Marcom Drive, Wake County property, and Sorrell Grove Church Road.

Project	NEW - Wake Tech Parkland Concept
Estimated Cost	\$4.8 million
Scope	Develop approximately 18 acres of leased land adjacent to the Wake Tech Research Triangle Park (RTP) Campus into parkland to accommodate a variety of recreational uses.

Transportation

Project	Airport Boulevard Extension Phase I
Estimated Cost	\$2.0 million
Scope	Specifically, to address cost overages related to the design & construct phase I (0.435 miles) from current terminus near Garden Square Lane to Church Street to include engineering, ROW purchase and roadway construction. Design involves 4-lane cross section divided with a 17.5-31-foot median, 10-foot side path on the south side and 5-foot sidewalk on the north side.

Project	Intersection Improvements Phase II
Estimated Cost	\$3.3 million
Scope	Improvements at intersections at several intersections with current level of service (LOS) deficiencies identified as part of the 2021 Intersection Improvements Study. Intersections include: • Slater Road and Sorrell Grove Church Road/Copley Parkway • NC-54 at Keybridge Drive • Morrisville Parkway at Back Ridge Street/Creek Park Drive • NC-54 at Morrisville Parkway • Morrisville Parkway at Davis Drive Types of improvements include: new turn lanes, modified medians, upgrade of existing crosswalks to high-visibility patterns, and construction of new signalized intersections.

Project	Intersection Improvements Phase III
Estimated Cost	\$2.2 million
Scope	Improvements at intersections at several intersections with projected future level of service (LOS) deficiencies identified as part of the 2021 Intersection Improvements Study. Intersections include: • Downing Glen Drive at Town Hall Drive ○ New roundabout and high visibility crosswalks • Church Street at Jeremiah Street ○ New roundabout and sidewalks along both sides of Church St.

Project	McCrimmon Parkway Widening Betterments
Estimated Cost	\$1.0 million
Scope	Includes betterments associated with the widening of McCrimmon Parkway from Davis Drive to NC-54. Betterments include: • Increased sidewalk width on North side • Streetlight conduit • Davis Dr. and Parkside Valley Dr. Intersection Improvements • Flyover/Aesthetics.

Project	NC-54 Widening Betterments
Estimated Cost	\$1 million
Scope	Includes betterments associated with the widening of NC-54 between Perimeter Park Drive and Shiloh Glen Drive. Betterments include: • 10 ft. wide multi-use path on North side • Streetlight conduit • Extension of median along Perimeter Park Drive • Upgraded traffic light at Carrington Mill Blvd. and Lichtin Blvd from wood poles to mast poles and added pedestrian crossing • Irrigation to landscape medians.

Town Center

Project	Town Center Phase I
Estimated Cost	\$9.7 million
Scope	Includes Town responsibilities for the first phase of Town Center based on the anticipated future Development Services Agreement including: • Town green and plazas • Public infrastructure to support the development including: ○ Roadway improvements ○ Water/sewer infrastructure.

Public Facilities & Public Safety

Project	NEW - Existing Fire Station 2: NC-54 Widening Impacts
Project Amount	\$345,000
Scope	NCDOT has a road widening project planned for NC-54 starting in 2023 & is scheduled for completion in 2025. NCDOT will be acquiring ROW for the project including a portion of the land adjacent to the fire station building entrance. This requires building and site modifications to accommodate the new ROW. This includes a new walkway, parking lot modifications and adjustments to the building entrance and covered exterior entryway.
Project	Fire Station 2 Relocation and Construction
Project Amount	\$1.0 million
Scope	Design cost to beginning planning for the relocate and construct Fire Station 2 on the Wake Tech site with a 12,000 to 15,000 Sq foot, two bay station with an EMS option to meet growing community needs within the service area.
Project	Public Works Facility
Project Amount	\$25.0 million
Scope	Design and construct a new public works facility on existing site to include an administration/fleet building, workshop/ storage building and vehicle/equipment storage building. Includes road frontage improvements. In partnership with Wake County Convenience Center #3 Expansion.

Other Information

Active:

- Church Street Park Expansion
- Dog Park
- Fire Station 3-Harris Mill
- MAFC Phase II Repairs
- Morrisville Community Park Phase III
- Shiloh Park Improvements
- Sidewalk Connectivity & NCDOT Betterments
- PSMS Renovations

Removed Projects:

- Church Street North Bypass
- Crabtree Creek Greenway South Loop
- International Drive Extension
- Multipurpose Center
- Page Historic Homesite
- Town Center Parking Deck
- Town Green
- Train Depot

Future & Beyond:

- Sawmill Creek Greenway
- Aviation Parkway Widening Betterments
- Cedar Fork District Park Improvements
- Future Town Center Land Acquisitions
- Future Basketball Courts
- Municipal Town Hall
- Pugh House Renovations
- Recreation and Multipurpose Center
- Senior Center Expansion
- Triangle Bikeway

APPENDIX D: ENDANGERED SPECIES INFORMATION

The following are a representative series of lists of species or ecological systems known to be at risk in the study area and within Wake County. These lists are sourced from the NC Natural Heritage Program and the U.S. Fish and Wildlife Service in order to guarantee all species are accounted for despite differences in listing or rating between sources.

- Natural Heritage Element Occurrences in Wake County (updated 3/1/2024)
- Natural Heritage Element Occurrences in Cary Study Area (updated 5/8/2024)
- Species Listing by Current Range in Wake County (Updated 8/30/2024)
- Species Listing by Current Range in Chatham County (Updated 8/30/2024)

D.1 ENDANGERED SPECIES TABLES

Table D-1. Wake County listed species (NC NHP, 2024)

Scientific Name	Common Name	State Status	Federal Status	State Rank	Global Rank	County Status
Amphibian						
<i>Ambystoma talpoideum</i>	Mole Salamander	SC	none	S2S3	G5	Historical
<i>Ambystoma tigrinum</i>	Eastern Tiger Salamander	T	none	S2	G5	Current
<i>Eurycea quadridigitata</i>	Dwarf Salamander	SC	none	S1	G5	Historical
<i>Hemidactylium scutatum</i>	Four-toed Salamander	SC	none	S3	G5	Current
<i>Necturus lewisi</i>	Neuse River Waterdog	T	T	S2	G2	Current
<i>Pseudacris nigrita</i>	Southern Chorus Frog	SC	none	S2	G5	Historical
<i>Siren lacertina</i>	Greater Siren	W3	none	S3	G5	Current
Animal Assemblage						
<i>Waterbird Colony</i>	Waterbird Colony		none	S3	GNR	Current
Bird						
<i>Ammodramus henslowii</i>	Henslow's Sparrow	E	none	S1B,S1N	G4	Historical
<i>Ammodramus savannarum</i>	Grasshopper Sparrow	W1,W5	none	S3B,S1N	G5	Current
<i>Dryobates borealis</i>	Red-cockaded Woodpecker	E	E	S2	G3	Historical
<i>Empidonax traillii</i>	Willow Flycatcher	W2	none	S3B	G5	Historical
<i>Falco peregrinus anatum</i>	American Peregrine Falcon	E	none	S1B,S2N	G4T4	Current
<i>Haliaeetus leucocephalus</i>	Bald Eagle	T	BGPA	S3B,S3N	G5	Current
<i>Ixobrychus exilis</i>	Least Bittern	SC	none	S3B	G4	Current
<i>Lanius ludovicianus</i>	Loggerhead Shrike	SC, W2	none	S2S3B,S3N	G4	Current
<i>Lophodytes cucullatus</i>	Hooded Merganser	W3	none	S1B,S4N	G5	Current
<i>Loxia curvirostra</i>	Red Crossbill	SC	none	S2	G5	Historical
<i>Peucaea aestivalis</i>	Bachman's Sparrow	SC	none	S3B,S2N	G3	Historical
<i>Rallus elegans</i>	King Rail	W1,W3	none	S3B,S3N	G4	Current
<i>Vireo gilvus</i>	Warbling Vireo	SR	none	S2B	G5	Current
Butterfly						
<i>Amblyscirtes carolina</i>	Carolina Roadside-Skipper	W2	none	S3S4	G3G4	Current
<i>Erynnis martialis</i>	Mottled Duskywing	SR	none	S2	G3	Historical
<i>Heraclides cresphontes</i>	Eastern Giant Swallowtail	SR	none	S2	G5	Historical
<i>Hesperia leonardus</i>	Leonard's Skipper	W2	none	S2S3	G4	Current

Scientific Name	Common Name	State Status	Federal Status	State Rank	Global Rank	County Status
<i>Hesperia metea</i>	Cobweb Skipper	SR	none	S2	G4	Historical
<i>Pontia protodice</i>	Checkered White	SR	none	S1S2	G4	Current
<i>Speyeria diana</i>	Diana Fritillary	W2	none	S3S4	G2G3	Historical
<i>Thorybes confusus</i> (syn. <i>Thorybes confusus</i> , <i>Cecropterus confusus</i>)	Confused Cloudywing	W3	none	S3S4	G4	Current
Caddisfly						
<i>Dibusa angata</i>	Angulated Microcaddisfly	SR	none	S2	G5	Historical
Crustacean						
<i>Cambarus davidi</i>	Carolina Ladle Crayfish	SR	none	S3	G3	Current
<i>Faxonius carolinensis</i>	North Carolina Spiny Crayfish	SC	none	S3	G3	Current
Dragonfly or Damselfly						
<i>Coryphaeschna ingens</i>	Regal Darner	SR	none	S2?	G5	Historical
<i>Gomphurus septima</i>	Septima's Clubtail	SR	none	S3	G3	Current
<i>Gomphurus ventricosus</i>	Skillet Clubtail	SR	none	S1	G3	Current
<i>Hylogomphus apomyius</i> (syn. <i>Gomphus apomyius</i>)	Banner Clubtail	W3	none	S3	G3G4	Current
<i>Hylogomphus parvidens</i> (syn. <i>Gomphus parvidens</i>)	Piedmont Clubtail	W2	none	S3	G4	Current
<i>Neurocordulia alabamensis</i>	Alabama Shadowdragon	W3	none	S3?	G5	Current
<i>Neurocordulia molesta</i>	Smoky Shadowdragon	W3	none	S3?	G4	Current
<i>Neurocordulia virginensis</i>	Cinnamon Shadowdragon	W3	none	S2?	G4	Current
<i>Somatochlora provocans</i>	Treetop Emerald	W3	none	S3?	G4	Current
<i>Stylurus amnicola</i>	Riverine Clubtail	W3	none	S3	G4	Current
<i>Stylurus laurae</i>	Laura's Clubtail	W1	none	S2S3	G4	Historical
Freshwater Bivalve						
<i>Alasmodonta heterodon</i>	Dwarf Wedgemussel	E	E	S1	G1G2	Current
<i>Alasmodonta undulata</i>	Triangle Floater	T	none	S3	G4	Current
<i>Elliptio cistellaeformis</i>	Box Spike	W3,W5	none	SU	G4	Current
<i>Elliptio congaraea</i> (syn. <i>Elliptio waccamawensis</i>)	Carolina Slabshell	W2,W5	none	S3	G3	Current
<i>Elliptio fisheriana</i>	Northern Lance	SR	none	S3	G4	Current
<i>Elliptio lanceolata</i>	Yellow Lance	T	T	S2	G2	Current
<i>Elliptio producta</i>	Atlantic Spike	W3,W5	none	SU	G3	Current

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<i>Elliptio roanokensis</i>	Roanoke Slabshell	SC	none	S3	G3	Current
<i>Fusconaia masoni</i>	Atlantic Pigtoe	T	T	S3	G1	Current
<i>Lampsilis radiata</i>	Eastern Lampmussel	T	none	S3	G5	Current
<i>Lasmigona subviridis</i>	Green Floater	E	PT	S2	G2G3	Current
<i>Strophitus undulatus</i>	Creeper	T	none	S3	G5	Current
<i>Toxolasma pullus</i>	Savannah Lilliput	E	none	S2	G2	Current
<i>Villosa constricta</i>	Notched Rainbow	T	none	S3	G3	Current
Freshwater Fish						
<i>Enneacanthus obesus</i>	Banded Sunfish	SR	none	S3	G5	Historical
<i>Etheostoma flabellare</i>	Fantail Darter	W5	none	S3	G5	Current
<i>Etheostoma vitreum</i>	Glassy Darter	W5	none	S3	G4G5	Current
<i>Fundulus sp. cf. diaphanus</i>	Lake Phelps Killifish	SR	none	S1	G1Q	Current
<i>Lampetra aepyptera</i>	Least Brook Lamprey	T	none	S2	G5	Current
<i>Lythrurus matutinus</i>	Pinewoods Shiner	W5	none	S3	G3G4	Current
<i>Notropis chalybaeus</i>	Ironcolor Shiner	T	none	S2S3	G4	Current
<i>Notropis volucellus</i>	Mimic Shiner	T	none	S2	G5	Historical
<i>Noturus furiosus</i>	Carolina Madtom	E	E	S2	G2	Historical
Grasshopper or Katydid						
<i>Hubbellia marginifera</i>	Pine Katydid	W3	none	S3?	GNR	Current
<i>Montezumina modesta</i>	Modest Katydid	W3	none	SU	GU	Historical
Lichen						
<i>Fellhanera hybrida</i>	Piedmont Crustose Lichen	W7	none	S2?	G2?	Current
<i>Porpidia macrocarpa</i>	Big-fruited Boulder Lichen	W7	none	S3	G4	Current
<i>Sporodophoron americanum</i>	White Spot Lichen	W7	none	S3S4	GNR	Current
Liverwort						
<i>Pellia appalachiana</i>	A Liverwort	W7	none	S1	G4	Historical
Mammal						
<i>Condylura cristata pop. 1</i>	Star-nosed Mole - Coastal Plain population	SC	none	S2	G5T2Q	Historical
<i>Lasiurus seminolus</i>	Seminole Bat	W2	none	S3	G5	Current
<i>Myotis austroriparius</i>	Southeastern Bat	SC	none	S2	G4	Current
<i>Myotis lucifugus</i>	Little Brown Bat	E	none	S2	G3G4	Historical

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<i>Neogale frenata</i> (syn. <i>Mustela frenata</i>)	Long-tailed Weasel	W3	none	S3	G5	Current
<i>Perimyotis subflavus</i>	Tricolored Bat	E	PE	S3	G3G4	Current
<i>Sciurus niger</i>	Eastern Fox Squirrel	W2	none	S3	G5	Current
<i>Zapus hudsonius</i>	Meadow Jumping Mouse	SR	none	S1	G5	Historical
Moss						
<i>Archidium donnellii</i>	Donnell's Archidium	SR-O	none	S1	G3G5	Current
<i>Bruchia ravenelii</i>	A Pygmy Moss	W7	none	SH	G3?	Historical
<i>Campylopus oerstedianus</i>	Oersted's Campylopus	SR-D	none	S1	G2G3	Historical
<i>Cleistocarpidium palustre</i>	Phascum moss	SR-D	none	S1	G5?	Current
<i>Fontinalis flaccida</i>	A Water Moss	W7	none	S1S2	G4G5	Historical
<i>Hygroamblystegium fluviatile</i> (syn. <i>Amblystegium fluviatile</i>)	Brookside Feather Moss	W7	none	S2?	G5	Current
<i>Sphagnum subsecundum</i>	Orange Peatmoss	SR-P	none	S1	G5	Current
<i>Tortula plinthobia</i>	A Chain-teeth Moss	SR-O	none	S1?	G4G5	Historical
<i>Weissia muhlenbergiana</i> (syn. <i>Weissia muehlenbergiana</i>)	A Moss	W7	none	S2?	G5	Current
Moth						
<i>Acrapex relict</i>	Relict Cane Moth	W3	none	S3	G4	Current
<i>Acronicta albarufa</i>	Barrens Dagger Moth	SR	none	S1S2	G3G4	Historical
<i>Anicla lubricans</i>	Slippery Dart	W3	none	S3?	G4G5	Current
<i>Arugisa latiorella</i>	Watson's Arugisa Moth	W3	none	S3?	G4	Current
<i>Catocala marmorata</i>	Marbled Underwing	SR	none	S1S3	G3?	Current
<i>Cisthene kentuckiensis</i>	Kentucky Lichen Moth	W3	none	SU	GU	Current
<i>Grammia doris</i>	Doris Tiger Moth	SR	none	S1S3	G4?	Current
<i>Grammia phyllira</i>	Phyllira Tiger Moth	W2	none	S3	G3G5	Current
<i>Heliomata infulata</i>	Rare Spring Moth	W3	none	S2S3	G3G4	Current
<i>Hydriomena divisaria</i>	Black-dashed Hydriomena Moth	W3	none	S2S3	G5	Current
<i>Idaea scintillularia</i>	Diminutive Wave	W3	none	SU	GNR	Current
<i>Lithophane lemmeri</i>	Lemmer's Pinion	W3	none	S1S3	G3G4	Current
<i>Schizura matheri</i>	a new Prominent Moth	SR	none	S1S2	GU	Current
<i>Sphingicampa bicolor</i>	Honey Locust Moth	W3	none	S3?	G5	Current

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Natural Community						
Basic Mesic Forest (Piedmont Subtype)	N/A	N/A	none	S3S4	G3G4	Current
Coastal Plain Semipermanent Impoundment (Cypress-Gum Subtype)	N/A	N/A	none	S4	G4G5	Current
Coastal Plain Semipermanent Impoundment (Open Water Subtype)	N/A	N/A	none	S4	G5	Current
Coastal Plain Semipermanent Impoundment (Typic Marsh Subtype)	N/A	N/A	none	S4	G4?	Current
Coastal Plain Small Stream Swamp	N/A	N/A	none	S4	G4?	Current
Dry Basic Oak--Hickory Forest	N/A	N/A	none	S2S3	G2G3	Current
Dry Oak--Hickory Forest (Piedmont Subtype)	N/A	N/A	none	S4	G4G5	Current
Dry Piedmont Longleaf Pine Forest	N/A	N/A	none	S2	G2	Current
Dry-Mesic Oak--Hickory Forest (Piedmont Subtype)	N/A	N/A	none	S4	G4G5	Current
Floodplain Pool	N/A	N/A	none	S2	G3	Current
Granitic Flatrock (Annual Herb Subtype)	N/A	N/A	none	S2	G3	Current
Granitic Flatrock (Perennial Herb Subtype)	N/A	N/A	none	S2	G3	Current
Granitic Flatrock Border Woodland	N/A	N/A	none	S2	G3?	Current
Low Elevation Seep (Floodplain Subtype)	N/A	N/A	none	S2	G4	Current
Low Elevation Seep (Typic Subtype)	N/A	N/A	none	S3	G3?	Current
Mesic Mixed Hardwood Forest (Piedmont Subtype)	N/A	N/A	none	S4	G3G4	Current
Piedmont Alluvial Forest	N/A	N/A	none	S4	G4	Current
Piedmont Boggy Streamhead	N/A	N/A	none	S2	G2G3	Current
Piedmont Bottomland Forest (High Subtype)	N/A	N/A	none	S2	G3G4	Current
Piedmont Bottomland Forest (Typic Low Subtype)	N/A	N/A	none	S2	G2?	Current
Piedmont Cliff (Acidic Subtype)	N/A	N/A	none	S2	G2?	Current

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Piedmont Levee Forest (Typic Subtype)	N/A	N/A	none	S3S4	G3G4	Current
Piedmont Monadnock Forest (Typic Subtype)	N/A	N/A	none	S3	G3G4	Current
Piedmont/Coastal Plain Heath Bluff	N/A	N/A	none	S3	G3	Current
Piedmont/Mountain Semipermanent Impoundment (Open Water Subtype)	N/A	N/A	none	S4	G4G5	Current
Piedmont/Mountain Semipermanent Impoundment (Piedmont Marsh Subtype)	N/A	N/A	none	S4	G4?	Current
Piedmont/Mountain Semipermanent Impoundment (Shrub Subtype)	N/A	N/A	none	S4	G4	Current
Ultramafic Outcrop Barren (Piedmont Subtype)	N/A	N/A	none	S1	G1	Current
Reptile						
<i>Cemophora coccinea</i>	Scarlet Snake	W1,W5	none	S3	G5	Current
<i>Clemmys guttata</i>	Spotted Turtle	W1	none	S4	G5	Current
<i>Crotalus horridus</i>	Timber Rattlesnake	SC	none	S3	G4	Historical
<i>Heterodon simus</i>	Southern Hognose Snake	T	none	S1S2	G2	Historical
<i>Kinosternon baurii</i>	Striped Mud Turtle	W3	none	S3S4	G4G5	Current
<i>Ophisaurus attenuatus longicaudus</i>	Eastern Slender Glass Lizard	SC	none	S1	G5T5	Current
<i>Virginia valeriae</i>	Smooth Earthsnake	W2	none	S3	G5	Current
Sawfly, Wasp, Bee, or Ant						
<i>Andrena arabis</i>	Mustard Miner Bee	W3	none	SH	GNR	Historical
<i>Andrena carolinensis</i>	an andrenid bee	W3	none	SH	GNR	Historical
<i>Andrena rudbeckiae</i>	an andrenid bee	W3	none	SH	GNR	Historical
<i>Bombus affinis</i>	Rusty-patched Bumble Bee	SR	E	S1	G2	Historical
<i>Bombus fraternus</i>	Southern Plains Bumble Bee	W3	none	S2S3	G3G4	Current
<i>Bombus variabilis</i>	Variable Cuckoo Bumble Bee	SR	none	SH	G1G2	Historical
<i>Megachile ingenua</i>	a leafcutter bee	SR	none	SH	G2?	Historical
<i>Megachile integra</i>	a leafcutter bee	SR	none	SH	G2G3	Historical
<i>Megachile oenotherae</i>	a leafcutter bee	SR	none	SH	G1G3	Historical

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<i>Megachile rubi</i>	a leafcutter bee	W3	none	S2S3	G3	Historical
<i>Nomada indusata</i>	a cuckoo bee	W3	none	SH	GNR	Historical
<i>Nomada minima</i>	a cuckoo bee	W3	none	SH	GNR	Historical
<i>Nomada tyrrellensis</i>	a cuckoo bee	SR	none	SH	GNR	Historical
Vascular Plant						
<i>Acmella repens</i>	Creeping Spotflower	SR-D	none	S1	G5T5	Current
<i>Acmispon helleri</i>	Carolina Birdfoot-trefoil	T	none	S3	G5T3	Current
<i>Actaea pachypoda</i>	White Baneberry		none	S4	G5	Current
<i>Agalinis decemloba</i> (syn. <i>Agalinis acuta</i>)	Piedmont Gerardia	W1	none	S3	G3G4	Current
<i>Agastache nepetoides</i>	Yellow Giant-hyssop	SR-P	none	S1	G5	Historical
<i>Ampelopsis cordata</i>	Heartleaf Peppervine	W7	none	S2	G5	Current
<i>Bartonia paniculata</i> ssp. <i>paniculata</i>	Twining Screwstem	W1	none	S2S3	G5T5	Historical
<i>Buchnera americana</i>	American Bluehearts	E	none	S1	GNR	Historical
<i>Cardamine douglassii</i>	Douglass's Bittercress	SR-P	none	S2	G5	Current
<i>Carex jamesii</i>	James's Sedge	SC-V	none	S2	G5	Current
<i>Carex meadii</i>	Mead's Sedge	E	none	S1	G4G5	Historical
<i>Carex reniformis</i>	Kidney Sedge	T	none	S1	G4?	Historical
<i>Celtis occidentalis</i>	Mountain Hackberry	W7	none	S2	G5	Current
<i>Cirsium carolinianum</i>	Carolina Thistle	E	none	S1	G5	Historical
<i>Clematis catesbyana</i>	Coastal Virgin's-bower	SR-P	none	S2	G5	Historical
<i>Comptonia peregrina</i>	Sweet Fern	W1	none	S3	G5	Historical
<i>Crataegus munda</i> var. <i>munda</i>	Batesburg Hawthorn	SR-T	none	S2?	G4G5TNR	Current
<i>Cyperus granitophilus</i>	Granite Flatsedge	T	none	S2	G3G4	Current
<i>Cyperus virens</i>	Green Flatsedge	SC-V	none	S1	G5	Historical
<i>Diamorpha smallii</i>	Elf Orpine	W1	none	S3	G4	Current
<i>Dichanthelium annulum</i>	Ringed Witch Grass	E	none	S1	G4	Historical
<i>Dichanthelium cryptanthum</i>	Hidden-flowered Witchgrass	SR-T	none	S2	G3Q	Historical
<i>Didiplis diandra</i>	Water Purslane	SR-P	none	S1	G3G4	Current
<i>Diphasiastrum tristachyum</i>	Deep-root Clubmoss		none	S3	G5	Historical
<i>Dirca palustris</i>	Leatherwood	W1	none	S3	G4	Current

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<i>Dryopteris cristata</i>	Crested Woodfern	W1	none	S3	G5	Current
<i>Eleocharis equisetoides</i>	Horsetail Spikerush	W1	none	S3	G4	Current
<i>Eleocharis microcarpa</i> var. <i>filiculmis</i> (syn. <i>Eleocharis microcarpa</i>)	Small-fruited Spike-rush		none	S5	G5TNR	Historical
<i>Elodea canadensis</i>	Canada Waterweed	W7	none	S1?	G5	Historical
<i>Elodea nuttallii</i>	Nuttall's Elodea	W7	none	S2?	G5	Historical
<i>Eriocaulon compressum</i>	Flattened Pipewort		none	S3?	G5	Historical
<i>Eupatorium altissimum</i>	Tall Boneset	W1	none	S2	GNR	Historical
<i>Eupatorium godfreyanum</i>	Godfrey's Thoroughwort	W1	none	S3	G4	Historical
<i>Fallopia cristata</i>	Crested Climbing Buckwheat	W7	none	S2?	G5T5	Historical
<i>Fothergilla major</i>	Large Witch-alder	SR-T	none	S3	G3	Current
<i>Gillenia stipulata</i>	Indian Physic	T	none	S2	G5	Historical
<i>Helenium brevifolium</i>	Littleleaf Sneezeweed	E	none	S1	G4	Historical
<i>Heteranthera pauciflora</i>	Atlantic Mud-plantain	SR-P	none	S1	G3	Current
<i>Heteranthera reniformis</i>	Kidneyleaf Mud-plantain	W7	none	S2?	G5	Current
<i>Hexastylis lewisii</i>	Lewis's Heartleaf	W1	none	S3	G3	Current
<i>Humulus lupulus</i> var. <i>lupuloides</i>	Hops	W7	none	S1?	G5T5	Historical
<i>Hydrophyllum canadense</i>	Blunt-leaf Waterleaf		none	S4	G5	Historical
<i>Hydrophyllum virginianum</i>	John's Cabbage		none	S4	G5	Historical
<i>Isoetes melanopoda</i> ssp. <i>silvatica</i>	Eastern Blackfoot Quillwort	W7	none	S1S3	G5TNR	Historical
<i>Isoetes piedmontana</i>	Piedmont Quillwort	T	none	S2	G4	Current
<i>Juncus brachycarpus</i>	Whiteroot Rush	W7	none	S2?	G4G5	Historical
<i>Juncus secundus</i>	Nodding Rush	W7	none	S1S2	G5?	Historical
<i>Lachnocaulon anceps</i>	Bog-buttons		none	S4	G5	Historical
<i>Lathyrus venosus</i>	Smooth Peavine	W1	none	S3	G5	Historical
<i>Liatris secunda</i>	Sandhill Blazing-star	W7	none	S2	G4	Current
<i>Liatris squarrulosa</i>	Earle's Blazing-star	SR-P	none	S2	G4G5	Current
<i>Lindera subcoriacea</i>	Bog Spicebush	SC-V	none	S2	G3	Current
<i>Lindernia monticola</i>	Flatrock Pimpernel	W1	none	S2	GNR	Current
<i>Lithospermum virginianum</i>	Virginia Marbleseed	W1	none	S3	G4	Historical

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<i>Magnolia macrophylla</i>	Bigleaf Magnolia	SC-V	none	S2	G5	Current
<i>Matelea decipiens</i>	Glade Milkvine	W1	none	S3	G5	Current
<i>Micranthes pensylvanica</i>	Swamp Saxifrage	E	none	S1	G5	Historical
<i>Monotropa uniflora</i>	Indian-pipe	W7	none	S2S4	GNR	Current
<i>Monotropsis odorata</i>	Sweet Pinesap	SR-O	none	S3	G3	Current
<i>Najas gracillima</i>	Slender Waternymph	W7	none	S2	G5?	Historical
<i>Nanopanax trifolius</i>	Dwarf Ginseng	W1	none	S3	G5	Current
<i>Nelumbo lutea</i>	American Lotus	W7	none	S2	G4	Current
<i>Neottia bifolia</i>	Southern Twayblade	W1	none	S3	G4	Current
<i>Panax quinquefolius</i>	Ginseng	W1	none	S3S4	G3G4	Current
<i>Parthenium integrifolium</i> var. <i>mabryanum</i>	Mabry's Wild Quinine	W1	none	S3	G5T3	Historical
<i>Paspalum fluitans</i>	Horsetail Crown Grass	SR-P	none	S1	G5	Current
<i>Pellaea atropurpurea</i>	Purple-stem Cliff-brake	W1	none	S3	G5	Historical
<i>Persicaria densiflora</i> (syn. <i>Persicaria glabra</i>)	Dense-flower Smartweed	W1	none	S3	G5	Current
<i>Platanthera blephariglottis</i>	Small White-fringed Orchid	W7	none	S2	G5T4T5	Historical
<i>Pogonia ophioglossoides</i>	Rose Pogonia		none	S3	G5	Historical
<i>Polygala senega</i>	Seneca Snakeroot	SC-V	none	S2	G4G5	Current
<i>Polygonum erectum</i>	Erect Knotweed	W7	none	S1S2	G5	Historical
<i>Portulaca smallii</i>	Small's Portulaca	T	none	S2	G3	Current
<i>Pseudognaphalium helleri</i>	Heller's Rabbit-Tobacco	E	none	S2S3	G4G5T3T4	Current
<i>Pycnanthemum virginianum</i>	Virginia Mountain-mint	SR-P	none	S1?	G5	Current
<i>Pyrola americana</i>	American Shinleaf	W1	none	S2S3	G5	Historical
<i>Quercus bicolor</i>	Swamp White Oak	W1	none	S2	G5	Historical
<i>Quercus muehlenbergii</i>	Chinquapin Oak	W1	none	S2	G5	Current
<i>Rhododendron catawbiense</i>	Catawba Rhododendron		none	S5	G5	Historical
<i>Rhus michauxii</i>	Michaux's Sumac	E	E	S2	G2G3	Current
<i>Ruellia humilis</i>	Low Wild-petunia	T	none	S1	G5	Current
<i>Ruellia purshiana</i>	Pursh's Wild-petunia	SC-V	none	S2	G3	Historical
<i>Rumex altissimus</i>	Pale Dock	W7	none	S2?	G5	Historical
<i>Sabatia quadrangula</i>	Four-angle Sabatia	W7	none	S2	G4G5	Current

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<i>Sagittaria weatherbiana</i>	Grassleaf Arrowhead	E	none	S2	G3G4	Historical
<i>Salix humilis</i>	Tall Prairie Willow		none	S3	G5	Historical
<i>Scutellaria leonardii</i>	Shale-barren Skullcap	E	none	S1	G4T4	Historical
<i>Scutellaria nervosa</i>	Veined Skullcap	E	none	S1	G5	Current
<i>Scutellaria ovata</i> ssp. <i>bracteata</i>	A Heartleaf Skullcap	W7	none	S2?	G5TNR	Current
<i>Scutellaria serrata</i>	Showy Skullcap	W1	none	S2S3	G4G5	Current
<i>Silene caroliniana</i> var. <i>pennsylvanica</i>	Sticky Catchfly	W7	none	S1S2	G5T4T5	Current
<i>Silphium terebinthinaceum</i>	Prairie Dock	SR-P	none	S2	G4G5	Historical
<i>Smilax laurifolia</i>	Laurel-leaf Greenbrier		none	S5	G5	Historical
<i>Solidago radula</i>	Western Rough Goldenrod	E	none	S1	G5?	Historical
<i>Solidago salicina</i> (syn. <i>Solidago patula</i> var. <i>strictula</i>)	Round-leaved Goldenrod	W1	none	S2?	G5T5	Current
<i>Swida alternifolia</i>	Alternate-leaf Dogwood		none	S4	G5	Historical
<i>Symphyotrichum concinnum</i>	Narrow-leaved Smooth Aster	E	none	S2	G5T4	Historical
<i>Thermopsis mollis</i>	Appalachian Golden-banner	SR-T	none	S2	G3G4	Current
<i>Tilia americana</i> var. <i>americana</i>	American Basswood	W7	none	S1?	G5T5	Historical
<i>Toxicodendron vernix</i>	Poison Sumac		none	S4	G5	Current
<i>Tradescantia hirsuticaulis</i>	Hairy Spiderwort	W7	none	S2	G5	Current
<i>Tradescantia virginiana</i>	Virginia Spiderwort	SR-O	none	S2S3	G5	Current
<i>Trichostema setaceum</i>	Narrowleaf Bluecurls	SR-T	none	S2	G5	Current
<i>Trifolium reflexum</i>	Buffalo Clover	T	none	S1S2	G3G4	Current
<i>Trillium pusillum</i> var. 4	Carolina Least Trillium	SR-T	none	S1	G4TNR	Current
<i>Tsuga canadensis</i>	Eastern Hemlock	W5	none	S4S5	G4G5	Current
<i>Vaccinium virgatum</i>	Small-flower Blueberry	W7	none	S1S2	G4	Current
<i>Verbena hastata</i>	Blue Vervain	W7	none	S2S3	G5	Current
<i>Verbesina virginica</i> var. <i>virginica</i> (syn. <i>Verbesina virginica</i>)	Frostweed	W7	none	S2?	G5?T5?	Current
<i>Veronicastrum virginicum</i>	Culver's-root	W7	none	S2?	G4	Current

Wake County Listed Species are provided by the North Carolina Natural Heritage Program (NCNHP) database. A key for the NCNHP data is included below.

Table D-2. Natural Heritage Element Occurrences Near the Town of Morrisville study area.

Scientific Name	Common Name	Last Observation Date	Element Occurrence Rank	State Status	Federal Status	Global Rank	State Rank
Bird							
<i>Haliaeetus leucocephalus</i>	Bald Eagle	2009	H	T	BGPA	G5	S3B,S3N
Dragonfly or Damselfly							
<i>Coryphaeschna ingens</i>	Regal Darner	2004-Pre	H?	SR	-	G5	S2?
Freshwater Bivalve							
<i>Lasmigona subviridis</i>	Green Floater	1960-pre?	H	E	PT	G2G3	S2
<i>Toxolasma pullus</i>	Savannah Lilliput	2021-09-21	E	E	-	G2	S2
Mammal							
<i>Perimyotis subflavus</i>	Tricolored Bat	2023-02-21	E	E	PE	G3G4	S3
Natural Community							
Piedmont/Mountain Semipermanent Impoundment (Piedmont Marsh Subtype)	---	2010	E	-	-	G4?	S4
Piedmont/Mountain Semipermanent Impoundment (Shrub Subtype)	---	2010	E	-	-	G4	S4
Sawfly, Wasp, Bee, or Ant							
<i>Megachile oenotherae</i>	a leafcutter bee	1937-06-10	H	SR	-	G1G3	SH
Vascular Plant							
<i>Buchnera americana</i>	American Bluehearts	1949-07-13	H	E	-	GNR	S1
<i>Dichanthelium annulum</i>	Ringed Witch Grass	1937-06-01	H	E	-	G4	S1
<i>Gillenia stipulata</i>	Indian Physic	1985-05-25	H	T	-	G5	S2
<i>Gillenia stipulata</i>	Indian Physic	1985-05-25	H	T	-	G5	S2
<i>Liatris squarrulosa</i>	Earle's Blazing-star	2022-20-09	F	SR-P	-	G4G5	S2

Natural Heritage Element Occurrences are provided by the North Carolina Natural Heritage Program (NCNHP) database. A key for the NCNHP data is included below.

Table D-3. Listed species in Wake County (US FWS, 2024).

Scientific Name	Common Name	Where Listed	ESA Listing Status	Lead Office
<i>Perimyotis subflavus</i>	Tricolored bat	Wherever found	Proposed Endangered	Mammals
<i>Lysimachia asperulaefolia</i>	Rough-leaved loosestrife	Wherever found	Endangered	Flowering Plants
<i>Ptilimnium nodosum</i>	Harperella	Wherever found	Endangered	Flowering Plants
<i>Echinacea laevigata</i>	Smooth coneflower	Wherever found	Threatened	Flowering Plants
<i>Alligator mississippiensis</i>	American alligator	Wherever found	Similarity of Appearance (Threatened)	Reptiles
<i>Danaus plexippus</i>	Monarch butterfly	Wherever found	Candidate	Insects
<i>Myotis lucifugus</i>	Little brown bat	Wherever found	Under Review	Mammals
<i>Picoides borealis</i>	Red-cockaded woodpecker	Wherever found	Endangered	Birds
<i>Lasmigona subviridis</i>	Green floater	Wherever found	Proposed Threatened	Clams
<i>Alasmidonta heterodon</i>	Dwarf wedgemussel	Wherever found	Endangered	Clams
<i>Noturus furiosus</i>	Carolina madtom	Wherever found	Endangered	Fishes
<i>Elliptio lanceolata</i>	Yellow lance	Wherever found	Threatened	Clams
<i>Elliptio lanceolata</i>	Yellow lance	Wherever found	Threatened	Clams
<i>Notropis mekistocholas</i>	Cape Fear shiner	Wherever found	Endangered	Fishes
<i>Fusconaia masoni</i>	Atlantic pigtoe	Wherever found	Threatened	Clams
<i>Rhus michauxii</i>	Michaux's sumac	Wherever found	Endangered	Flowering Plants
<i>Necturus lewisi</i>	Neuse River waterdog	Wherever found	Threatened	Amphibians

Listed Species list by County provided by the US Fish and Wildlife Service (<https://ecos.fws.gov/ecp/>)

D.2. NATURAL HERITAGE PROGRAM KEY

The Element Occurrence Status is assigned by NCNHP and summarizes what is known about the status of the record. Possible values are as follows:

Current	The occurrence was observed recently.
Historical	Either the element has not been found in recent surveys; or it has not been surveyed recently enough to be confident they are still present; or the occurrence is thought to be destroyed.
Obscure	The date the element was last observed is uncertain.

The Element Occurrence Rank is an estimate of the viability of the occurrence. Possible value are as follows:

A	The occurrence has excellent estimated viability/ecological integrity.
B	The occurrence has good estimated viability/ecological integrity.
C	The occurrence has fair estimated viability/ecological integrity.
D	The occurrence has poor estimated viability/ecological integrity.
E	The occurrence has recently been verified to still exist, but there is insufficient information to estimate its viability/ecological integrity.
F	Recent surveys failed to relocate an occurrence previously reported, but there is no evidence the occurrence has been destroyed.
H	The occurrence has not been recently verified but there is no evidence the occurrence has been destroyed.
NR	The occurrence has not yet been assigned a rank. U The occurrence cannot be assigned a rank because of insufficient information.
X	The occurrence has been destroyed.
i	The occurrence was introduced. (Used as a qualifier of the above ranks.)
r	The occurrence was reintroduced or restored. (Used as a qualifier of the above ranks.)
?	There is uncertainty about the rank. (Used as a qualifier of the above ranks.)

The State Status is the protection status of the element in the State of North Carolina. Definitions of the protection statuses for plants and animals differ.

Animal protection statuses are designated by the Wildlife Resources Commission and the Natural Heritage Program (NC Department of Natural and Cultural Resources). Endangered, Threatened, and Special Concern species of mammals, birds, reptiles, amphibians, freshwater fishes, and freshwater and terrestrial mollusks have legal protection status in North Carolina (Wildlife Resources Commission). Significantly Rare designations indicate rarity and the need for population monitoring and conservation action. However, it is a non-regulatory NC Natural Heritage Program designation.

CODE	STATUS	DEFINITION
E	Endangered	"Any native or once-native species of wild animal whose continued existence as a viable component of the State's fauna is determined by the Wildlife Resources Commission to be in jeopardy or any species of wild animal

		determined to be an 'endangered species' pursuant to the Endangered Species Act" (Article 25 of Chapter 113 of the General Statutes; 1987).
T	Threatened	"Any native or once-native species of wild animal which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range, or one that is designated as a threatened species pursuant to the Endangered Species Act" (Article 25 of Chapter 113 of the General Statutes; 1987).
SC	Special Concern	"Any species of wild animal native or once-native to North Carolina which is determined by the Wildlife Resources Commission to require monitoring but which may be taken under regulations adopted under the provisions of this Article" (Article 25 of Chapter 113 of the General Statutes; 1987).
SR	Significantly Rare	This is an NCNHP designation. Any species which has not been listed as an Endangered, Threatened, or Special Concern species, but which exists in the state (or recently occurred in the state) in small numbers (generally fewer than 100 statewide populations) and has been determined by the NCNHP to need monitoring. Significantly Rare species include species of historical occurrence with some likelihood of rediscovery in the state and species substantially reduced in numbers by habitat destruction, direct exploitation, or disease. Species considered extirpated in the state, with little likelihood of re-discovery, are given no N.C. Status (unless already listed by the N.C. Wildlife Resources Commission as E, T, or SC).
SR-G	Game Animal	Species is a game animal or a furbearer, and therefore (by law) cannot be listed for State protection as E, T, or SC.

Plant protection statuses are determined by the Plant Conservation Program (NC Department of Agriculture) and the Natural Heritage Program (NC Department of Natural and Cultural Resources). Endangered, Threatened, and Special Concern species are protected by state law (Plant Protection and Conservation Act, 1979). Significantly Rare designations indicate rarity and the need for population monitoring and conservation action. However, it is a non-regulatory NC Natural Heritage Program designation.

CODE	STATUS	DEFINITION
E	Endangered	"Any native or once-native species or higher taxon of plant whose continued existence as a viable component of the State's flora is determined to be in an Endangered." (GS 19B 106: 202.12). (Information on permitting regulations for NC Endangered, Threatened, and Special Concern species can be found at www.ncplant.com).
T	Threatened	"Any native or once-native resident species of plant which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range or one that is designated as a Threatened species pursuant to the Endangered Species Act." (GS 19B 106:202.12).
SC-V	Special Concern-Vulnerable	"Any species or higher taxon of plant which is likely to become a threatened species within the foreseeable future." (NCAC 02 NCAC 48F .0401).
SC-H	Special Concern-Historical	"Any species or higher taxon of plant that occurred in North Carolina at one time, but for which all known populations are currently considered to be either historical or extirpated." (NCAC 02 NCAC 48F .0401).

SR	Significantly Rare	This is an NCNHP designation. Any species not listed by the N.C. Plant Conservation Program as Endangered, Threatened, or Candidate, which is rare in North Carolina, generally with 1-100 populations in the state, frequently substantially reduced in numbers by habitat destruction (and sometimes also by direct exploitation or disease).
SR-L	Limited	The range of the species is limited to North Carolina and adjacent states (endemic or near endemic). These are species that may have 20-50 populations in North Carolina, but fewer than 100 populations rangewide. The preponderance of their distribution is in North Carolina and their fate depends largely on conservation here.
SR-T	Throughout	The species is rare throughout its range (fewer than 100 populations total).
SR-D	Disjunct	The species is disjunct to North Carolina from a main range in a different part of the country or world.
SR-P	Peripheral	The species is at the periphery of its range in North Carolina. These species are generally more common somewhere else in their ranges, occurring in North Carolina peripherally to their main ranges, mostly in habitats which are unusual in North Carolina.
SR-O	Other	The range of the species is sporadic or cannot be described by the other Significantly Rare categories.
W	Watch List	Any other species believed to be rare and of conservation concern in the state but not warranting active monitoring at this time.

The Federal Status of an element is designated by the U.S. Fish and Wildlife Service (USFWS) and the U.S. National Marine Fisheries Service (USNMFS) in accordance with the Endangered Species Act of 1973, as amended through the 108th Congress.

CODE	STATUS	DEFINITION
E	Endangered	A taxon "which is in danger of extinction throughout all or a significant portion of its range" (Endangered Species Act, Section 3).
T	Threatened	A taxon "which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range" (Endangered Species Act, Section 3).
T(S/A)	Threatened due to Similarity of Appearance	Section 4 (e) of the [Endangered Species] Act authorizes the treatment of a species (subspecies or population segment) as endangered or threatened even though it is not otherwise listed as endangered or threatened if -- (a) the species so closely resembles in appearance an endangered or threatened species that enforcement personnel would have substantial difficulty in differentiating between the listed and unlisted species; (b) the effect of this substantial difficulty is an additional threat to an endangered or threatened species; and (c) such treatment of an unlisted species will substantially facilitate the enforcement and further the policy of the Act. (Endangered Species Act, Section 4).
C	Candidate	"Taxa for which the [Fish and Wildlife] Service has on file enough substantial information on biological vulnerability and threat(s) to support proposals to list them as endangered or threatened. Proposed rules have not yet been issued because this action is precluded at present by other listing activity. Development and publication of proposed rules on these

		taxa are anticipated. The Service encourages State and other Federal agencies as well as other affected parties to give consideration to these taxa in environmental planning." (Federal Register, February 28, 1996).
BGPA	Bald and Golden Eagle Protection Act	Bald Eagles were removed from the federal list of threatened and endangered species on August 9, 2007, and are no longer protected under the Endangered Species Act. However, Bald Eagles remain protected under the Bald and Golden Eagle Protection Act and the Migratory Bird Treaty Act. The Bald and Golden Eagle Act prohibits anyone from taking, possessing, or transporting a Bald Eagle (<i>Haliaeetus leucocephalus</i>) or Golden Eagle (<i>Aquila chrysaetos</i>), or the parts, nests, or eggs of such birds without prior authorization. This includes inactive nests as well as active nests. Take means to pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, destroy, molest, or disturb. Activities that directly or indirectly lead to take are prohibited without a permit. For more information, see the Code of the Federal Register: 50 Part 22 or visit: http://www.fws.gov/midwest/MidwestBird/EaglePermits/index.html
XN	Nonessential Experimental Population	The Endangered Species Act permits the reintroduction of endangered animals as "nonessential experimental" populations. Such populations, considered nonessential to the survival of the species, are managed with fewer restrictions than populations listed as endangered. Section 10 (j) of the Endangered Species Act of 1973, as amended, provides for the designation of introduced populations of federally listed species as nonessential experimental. This designation allows for greater flexibility in the management of these populations by local, state, and Federal agencies. Specifically, the requirement for Federal agencies to avoid jeopardizing these populations by their actions is eliminated and allowances for taking the species are broadened.
P	Proposed	A species which has been formally proposed in the Federal Register for listing as Endangered or Threatened. The status would therefore be PE or PT, respectively.

The State Rank is a measure of the relative imperilment of both species and ecological communities in the State of North Carolina. For plant and animal species these ranks provide an estimate of extinction risk. This information has been developed by the NC Natural Heritage Program, NatureServe, and a large number of collaborators in government agencies, universities, natural history museums and botanical gardens, and other conservation organizations. These ranks have been developed primarily to help in guiding conservation and to inform environmental planning and management. State ranks are based on a one to five scale, ranging from critically imperiled (S1) to demonstrably secure (S5). These status assessments are based on the best available information, considering a variety of factors such as abundance, distribution, population trends, and threats.

CODE	RANK	DESCRIPTION
S1	Critically Imperiled	Critically imperiled in North Carolina due to extreme rarity or some factor(s) making it especially vulnerable to extirpation (local extinction) from the state. Typically, 5 or fewer occurrences or very few remaining individuals (<1,000), or less than 2,000 acres occupied in the state.
S2	Imperiled	Imperiled in North Carolina due to rarity or some factor(s) making it very vulnerable to extirpation from the state. Typically, 6 to 20

		occurrences or few remaining individuals (1,000 to 3,000) or 2,000-10,000 acres occupied in the state.
S3	Vulnerable	Vulnerable to extinction in North Carolina either because rare or uncommon, or found only in a restricted range (even if abundant at some locations), or due to other factors making it vulnerable to extirpation. Typically, 21 to 100 occurrences or between 3,000 and 10,000 individuals or 10,000- 50,000 acres occupied in the state.
S4	Apparently Secure	Apparently secure and widespread in North Carolina, usually with more than 100 occurrences and more than 10,000 individuals.
S5	Secure	Common, widespread, and abundant in North Carolina. Essentially ineradicable under present conditions. Typically, with considerably more than 100 occurrences and more than 10,000 individuals.
S#S#	Range Rank	A numeric range rank (e.g., S2S3) is used to indicate uncertainty about the exact status of the element.
SH	Historical	Occurred in North Carolina historically, with some expectation that it may be rediscovered. Its presence may not have been verified in the past 20 years. Upon verification of an extant occurrence, SH-ranked elements would typically receive an S1 rank.
SX	Presumed Extirpated	Believed to be extirpated in North Carolina and has not been located despite intensive searches of historical sites and other appropriate habitat.
SU	Unrankable	Currently cannot be assigned a rank in North Carolina due to lack of information or substantially conflicting information about status or trends. Need more information.
SNR	Not Ranked	Rank in North Carolina not yet assessed.
SNA	Not Applicable	A conservation status rank is not applicable because the element is not a suitable target for conservation because it is (1) an interspecific hybrid without conservation value, (2) not native to North Carolina, (3) outside its usual range and not regularly found in North Carolina, (4) never confidently documented as present in North Carolina, or (5) a taxon not confidently documented as present in North Carolina.
S_B	Breeding	Rank of breeding population in North Carolina. Used for migratory species only. (Used as qualifier of above ranks, e.g., S5B.)
S_N	Nonbreeding	Rank of non-breeding population in North Carolina. Used for migratory species only. (Used as qualifier of above ranks, e.g., S3N.)
S_?	Uncertain	Indicates an inexact or uncertain numeric rank. (Used as qualifier of above ranks, e.g., "S2?".)

The Global Rank is a measure of the relative imperilment of both species and ecological communities globally. Global ranks are assigned by NatureServe staff and contract biologists, based on a consensus of scientific experts, individual natural heritage programs, and the Natural Heritage Network. They apply to the status of a species throughout its range. This system is widely used by other agencies and organizations, as the best available scientific and objective assessment of a species' rarity throughout its range.

CODE	RANK	DESCRIPTION
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G1	Critically Imperiled	Critically imperiled globally because of extreme rarity or because of some factor(s) making it especially vulnerable to extinction. Typically, five or fewer occurrences or very few remaining individuals (<1000), acres (<2,000), or linear miles (<10) globally.
G2	Imperiled	Imperiled globally because of rarity or because of some factor(s) making it very vulnerable to extinction. Typically, 6 to 20 occurrences, or few remaining individuals (1,000 to 3,000), acres (2,000 to 10,000), or linear miles (10 to 50) globally.
G3	Vulnerable	Vulnerable globally either because very rare throughout its range found only in a restricted range (even if abundant at some locations), or because of other factors making it vulnerable to extinction. Typically, 21 to 100 occurrences, between 3,000 and 10,000 individuals, or 10,000-50,000 acres occupied globally.
G4	Apparently Secure	Uncommon but not rare (although it may be rare in parts of its range, particularly on the periphery) and usually widespread. Apparently not vulnerable in most of its range, but possibly cause for long-term concern. Typically, more than 100 occurrences and more than 10,000 individuals.
G5	Secure	Common, widespread, and abundant (although it may be rare in parts of its range, particularly on the periphery). Not vulnerable in most of its range. Typically, with considerably more than 100 occurrences and more than 10,000 individuals.
G#G#	Range Rank	A rank involving two numbers indicates uncertainty of rank. For example, a G2G3 rank indicates that the species may be a G2 or a G3, but that existing data do not allow that determination to be made.
GH	Historical	Known from only historical occurrences, but with some expectation that it may be rediscovered. May still be extant; further searching is needed.
GX	Presumed Extinct	Believed to be extinct throughout its range with virtually no likelihood that it will be rediscovered. Not located despite intensive searches of historical sites and other appropriate habitat.
GU	Uncertain	Currently cannot be assigned a rank due to lack of information or due to substantially conflicting information about status or trends; need more information.
GNR	Not Ranked	Global rank not yet assessed.
GNA	Not Applicable	A conservation status rank is not applicable because the Element is not a suitable target of conservation activities. A rank is not assigned either because it is (1) an interspecific hybrid without conservation value; or (2) the element is a product of domestication or cultivation.
G_T#	Intraspecific Taxon	The rank of a subspecies or variety. As an example, G4T1 would apply to a subspecies of a species with an overall rank of G4, but the subspecies warranting a rank of G1.
G_?	Inexact or Uncertain	Denotes inexact or uncertain numeric rank. Used as qualifier of above ranks.
G_Q	Questionable Taxonomy	Questionable taxonomy that may reduce conservation priority. Distinctiveness of this entity as a taxon at the current level is questionable. Resolution of this uncertainty may result in change from a species to a subspecies or inclusion of this taxon in another taxon, with the resulting species having a lower-priority conservation status rank. Used as qualifier of above ranks.

APPENDIX E: COUNTY AND LOCAL GOVERNMENT ORDINANCE AND PLANNING DEPARTMENT WEBSITES

Key planning and ordinance documents identified in the SCIMMP can generally be found on the Planning Department website for that town (links provided below). Planning documents are amended with relative frequency, so it is best to access the most recent documents on each community website. A Unified Development Ordinance (UDO) is typically housed digitally and includes some of the most relevant and detailed policies, therefore the location for each town's UDO is also provided. While Cary, Apex, Morrisville, and Holly Springs are unique municipalities with town-specific regulations and procedures, there are ways in which the communities coordinate and navigate to grow together, so they are all included below.

Wake County

UDO: <http://www.wakegov.com/planning/zoning/Pages/udo.aspx>

Planning, Development & Inspections: <https://www.wake.gov/departments-government/planning-development-inspections>

Town of Holly Springs

UDO: <https://www.hollyspringsnc.gov/418/Unified-Development-Ordinance-UDO>

Development Services: <https://www.hollyspringsnc.gov/2170/Development-Services>

Town of Cary

UDO: <https://www.carync.gov/business-development/developing-in-cary/development-regulations/land-development-ordinance>

Planning and Development Services: <https://www.carync.gov/connect-engage/town-departments-offices/planning-department>

NPDES Regulations: <https://www.carync.gov/services-publications/water-sewer/stormwater-management/npdes-phase-ii-regulations>

Town of Morrisville

UDO: <https://www.morrisvillenc.gov/government/departments-services/planning/udo>

Planning Department: <https://www.morrisvillenc.gov/government/departments-services/planning>

NPDES Regulations: <https://www.morrisvillenc.gov/government/departments-services/engineering/stormwater/stormwater-resources>

Town of Apex

UDO: <https://www.apexnc.org/233/Unified-Development-Ordinance>

Planning Department: <https://www.apexnc.org/180/Planning>