Secondary and Cumulative Impacts Master Mitigation Plan

Apex, North Carolina

Michael Deaton
Environmental Programs Manager
PO Box 250
Apex, NC 27502
(919) 249-3427

Prepared by:

CH2MHILL
3125 Poplarwood Court
Suite 304
Raleigh, NC 27604

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Acronyms and Abbreviations

AQI	Air Quality Index
BMPs	best management practices
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CIP	Capital Improvements Plan
CGIA	North Carolina Center for Geographic Information and Analysis
CLG	Certified Local Government
CP&L	Carolina Power & Light
CWMTF	Clean Water Management Trust Fund
DDT	dichlorodiphenyltrichloroethane
DENR	North Carolina Department of Environment and Natural Resources
DLR	North Carolina Division of Land Resources
DWQ	North Carolina Division of Water Quality
EA	Environmental Assessment
EIS	Environmental Impact Statement
EMC	Environmental Management Commission
EPT	Ephemeroptera, Plecoptera, and Trichoptera
ESA	Endangered Species Act of 1973
ETJ	extraterritorial jurisdiction
FEMA	Federal Emergency Management Agency
FIRM	flood insurance rate map
FSC	Federal species of concern
GAP	Gap Analysis Program
GIS	Geographic Information System
gpm	gallons per minute
IBT	interbasin transfer
Kgal	1000 gallons
LDO	Land Development Ordinance
MG	million gallons
MGD	million gallons per day
MOA	Memorandum of Agreement
MS4s	Municipal separate storm sewer systems
NCAC	North Carolina Administrative Code

NCDOT	North Carolina Department of Transportation
NCEPA	North Carolina Environmental Policy Act
NCWRC	North Carolina Wildlife Resources Commission
NFIP	National Flood Insurance Program
NHEO	Natural Heritage Element Occurrence
NHP	North Carolina Natural Heritage Program
NPDES	National Pollutant Discharge Elimination System
NRHP	National Register of Historic Places
NSW	nutrient sensitive waters
NWI	National Wetlands Inventory
OSHRP	Open Space and Historic Resources Plan
PUD	Planned Unit Development
RCA	Resource Conservation Areas
RCRA	Resource Conservation and Recovery Act
RTP	Research Triangle Park
SAESH	Significant Aquatic Endangered Species Habitat
SCADA	supervisory control and data acquisition
SCI	Secondary and Cumulative Impacts
SEPA	(North Carolina) Environmental Policy Act
SHPO	State Historical Preservation Officer
SNHA	Significant Natural Heritage Area
SR	State Route
TMDL	total maximum daily load
TSS	total suspended solids
UDO	Unified Development Ordinance
UGB	urban growth boundary
USDA	United States Department of Agriculture
USA	urban service area
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
WRF	water reclamation facility
WSW	water supply watershed
WTP	water treatment plant
WWTP	wastewater treatment plant

Executive Summary

The North Carolina (State) Environmental Policy Act (SEPA) requires projects that involve public funding that 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, many 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 occur on numerous projects, consuming regulatory agency and local government time.
- **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's Board of Commissioners. 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 Apex developed a Secondary and Cumulative Impacts (SCI) Master Mitigation Plan to address the secondary and cumulative impacts for its planned infrastructure. Inclusion of all infrastructure plans in one document, the SCI Master Mitigation Plan, provides a holistic review of Apex's growth projections and infrastructure

Proposed SCI Master Mitigation 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 SCI Master Mitigation Plan.*
- *MOU addresses how the SCI Master Mitigation Plan document should be used, its period of standing, and circumstances under which it must be updated more frequently.*

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 Master Mitigation Plan for secondary and cumulative impacts, avoiding redundancy.

The Town has entered into an memorandum of agreement (MOA) with the North Carolina Department of Environment and Natural Resources (DENR) that outlines how the SCI Master Mitigation Plan document will be used, the time period during which it can be cited in individual EAs and EISs, and the circumstances under which it must be updated more frequently.

The study area for the SCI Master Mitigation Plan document consists of the Town's Planning Area. The Planning Area boundaries are based on a combination of the urban service area, extraterritorial jurisdiction (ETJ), and the Land Use Plan boundary, as well as recent boundary and urban service area agreements with the Town of Holly Springs and the Town of Cary. The Planning Area covers approximately 70 square miles and is located in the Neuse and Cape Fear River Basins.

Infrastructure – The Town of Apex has developed long-range plans for providing water, sewer, and transportation services to its citizens in a manner that will protect water quality, air quality, open space, and wildlife habitat. Currently, the Town of Apex Water Reclamation Facility (WRF) discharges to an unnamed tributary of Middle Creek. This plant includes state-of-the-art treatment with advanced nutrient removal capabilities due to the fact it discharges into the designated Nutrient Sensitive Waters (NSW) of the Neuse River Basin. The Town of Apex is reviewing regional treatment options with other communities in western Wake County to return wastewater to the Cape Fear River Basin to meet the Town's interbasin transfer requirements. The infrastructure that is built depends on the final regional WRF plans. The Town also has planned improvements to its water system and is examining opportunities for using reclaimed water.

The Town of Apex's Transportation Plan seeks to create a safe, convenient, and efficient multi-modal transportation system. This plan identifies both general and specific transportation system improvement recommendations and strategies to help accommodate the growth in travel demand. The Plan addresses potential solutions to improve pedestrian, bicycle, transit, and thoroughfare elements in Apex for the future.

Existing Conditions – Within the Planning Area, existing environmental conditions were assessed to facilitate the identification of potential SCI to the natural environment as growth occurs.

The presence or potential habitat of protected species within the Planning Area were considered. Within Wake County, Federally listed species include the bald eagle (*Haliaeetus leucocephalus*), dwarf wedgemussel (*Alasmidonta heterodon*), and Michaux's sumac (*Rhus michaux*). No current records for the bald eagle exist within the Planning Area. Michaux's sumac, according to the most recent version database provided by the Natural Heritage Program, is present near the Shearon Harris Longleaf Pine Forest Significant Natural Heritage Area. Of particular note is a survey of freshwater mussel species in the Middle Creek and Swift Creek Watersheds. No individuals, live or relic, of the Federally endangered mussel were found during the survey.

Secondary and Cumulative Impacts – Table ES-1 summarizes potential SCI to the Planning 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 balance the competing goals of growth 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 Town. Planning processes will guide development in appropriate areas. Ordinances protect open space, water supply watersheds (WSWs), stream buffers, floodplains, and wetlands; and require stormwater controls to limit water resources impacts. These efforts protect the Town's natural resources and quality of life for its citizens. A summary of these mitigation efforts and their applicability to each of the natural and cultural resources analyzed under SEPA guidelines is presented in Table ES-1.

TABLE ES-1

Areas of Potential Impacts to be Addressed by Permitting and Mitigation Programs

Environmental Resource	Potential for SCI	Types of SCIs	Mitigation Programs
Floodplains	LI	Some floodplain loss from commercial development Isolation of floodplain from stream by channel entrenchment; loss of nutrient exchange capabilities	Floodplain Protection – No residential development in floodplain Open Space Goals often preserve additional corridors along required riparian buffers Resource Conservation Areas – Floodplain protection is not counted toward RCA unless the floodplain is undisturbed
Soils	LI	Soil erosion and compaction	Erosion and sediment control Land Use Planning
Land Use	PI	Conversion of agricultural and forested land uses to mainly residential land uses	Land Use Planning encourages development around Town Center, selected corridors, and mixed use developments Comprehensive Plan Parks, Recreation, Greenways, and Open Space Planning Resource Conservation Areas – Protect environmentally important areas UDO Riparian buffer and floodplain protection
Wetlands	LI	Loss through development; subsequent loss of habitat and habitat fragmentation, reduction in genetic diversity, and loss of attenuation of flow Loss of wetland function through pollutant loading	Wetland Protection through Section 404 and Section 401 Majority of wetlands located in floodplain and riparian buffers which have local protection programs described above Resource Conservation Areas – Protect environmentally important areas Stormwater programs reduce pollutant loads to wetlands
Agricultural Land	PI	Conversion to other uses	Land Use Planning Comprehensive Plan Wake County Voluntary Agricultural Districts Wake County Tax Incentive Program
Scenic and Recreational Areas	LI	Possible conversion of adjacent land uses	Parks, Recreation, Greenways, and Open Space Planning Establishment of Nature Park
Archaeological and Historical Resources	LI	Possible conversion of adjacent land uses Structural damage due to acid rain and vibrations	Land Use Planning controls allowed uses

TABLE ES-1

Areas of Potential Impacts to be Addressed by Permitting and Mitigation Programs

Environmental Resource	Potential for SCI	Types of SCIs	Mitigation Programs
Air Quality	LI	Reduction in air quality due to increased vehicular traffic Negative impacts to human health (i.e., asthma); acid rain; reduced visibility	Transportation elements of bicycle planning and greenway planning Unified Development Ordinance (UDO) connectivity requirement Tree Protection Ordinance Wake County Air Quality Task Force
Noise	PI	Increase in overall noise level in Planning Area Negative impacts to human health	Transportation Planning Tree Protection and Landscape Buffer Ordinances
Surface Water Resources	PI	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	Wetland Protection through Section 404 and Section 401 Riparian Buffers – 100 feet on perennial streams, 50 feet on intermittent streams Floodplain Protection – No residential development in floodplain Stormwater – Impervious limited to 12 percent or stormwater controls required; outfall velocity requirements Erosion and Sediment Control – Plan review and pre-construction process Resource Conservation Areas – Protect environmentally important areas Clean Water Management Trust Fund (CWMTF) Funding
Groundwater Resources	LI	Reduction in use for drinking water; potential to become contaminated Groundwater inflow provides baseflow in streams, which supports life during droughts	Failing septic systems taken offline as infrastructure developed Town sponsoring LID workshop with Town of Cary; LID practices will help maintain infiltration and stream baseflow
Forest Resources	PI	Conversion to other uses Reduction in air quality; increase in near-surface air temperature; habitat fragmentation	Land Use Planning encourages development around Town Center, selected corridors, and mixed use developments Resource Conservation Areas – Protect environmentally important areas Parks, Recreation, Greenways, and Open Space Planning

TABLE ES-1

Areas of Potential Impacts to be Addressed by Permitting and Mitigation Programs

Environmental Resource	Potential for SCI	Types of SCIs	Mitigation Programs
Shellfish or Fish and their Habitats	PI	Possible aquatic habitat degradation	Wetland Protection through Section 404 and Section 401
		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	Riparian Buffers – 100 feet on perennial streams, 50 feet on intermittent streams
			Floodplain Protection – No residential development in floodplain
			Stormwater – Impervious limited to 12 percent or stormwater controls required; outfall velocity requirements
			Erosion and Sediment Control – Plan review and pre-construction process
			Resource Conservation Areas – Protect environmentally important areas
			Clean Water Management Trust Fund (CWMTF) Funding
Wildlife Resources	PI	Reduction in available habitat	Parks, Recreation, Greenways, and Open Space Planning – important habitat areas prioritized for protection
		Habitat fragmentation; reduction in genetic diversity; reduction in species tolerance; increased dispersal distance to suitable habitat; reduction in potential for long-term population sustainability	Endangered Species Act
			Establishment of Nature Park
Toxic Substances	LI	Increase in likelihood of contamination	Land Use Planning controls allowed uses
		Negative impacts to human health	Stormwater education programs

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

SECTION 1

Introduction

The North Carolina Environmental Policy Act (SEPA) requires projects that involve public funding that 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 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 (if applicable)

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. 0101(d)(4)). 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 1C. 0101(d)(2)). 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** – Often 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, many environmental documents contain secondary and cumulative impacts sections that are very similar.
- **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. Often similar comments and negotiation

occur on a number of projects which consumes regulatory agency and local government time.

- **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, they may not be able to be addressed by the Utility Department. For example, if requirements for ordinance changes are included in the permit conditions, these must be approved by the Town's Board of Commissioners. 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 regulated community. Thus, the Town of Apex developed this Secondary and Cumulative Impacts Master Mitigation Plan (SCI Master Mitigation Plan) to address the secondary and cumulative indirect impacts for its planned infrastructure. Including all planned infrastructure in one document provides a holistic review of Apex's growth projections and infrastructure being designed to support that growth. This SCI Master Mitigation Plan document will then be cited in individual EAs or EISs that are developed for individual projects that examine the direct impacts of the projects so each individual document will not include its own section on secondary and cumulative impacts.

Proposed SCI Master Mitigation 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 SCI Master Mitigation Plan.*
- *MOU addresses how the SCI Master Mitigation Plan document should be used, its period of standing, and circumstances under which it must be updated more frequently.*

The Town of Apex has entered into a Memorandum of Agreement (MOA) with the North Carolina Department of Environment and Natural Resources (DENR) that outlines how the SCI Master Mitigation Plan document 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. This document will be an attachment to the MOA.

1.1 SCI Master Mitigation Plan Process

This document was developed following an approach similar to an EIS. A scoping document was developed and submitted to the State Clearinghouse for review and comment. A meeting was also held during the scoping process to explain the purpose of this process and plan and get preliminary comments from the agencies. Based on the comments received at the meeting and through scoping, a draft SCI Master Mitigation Plan was prepared and submitted to DENR, the lead agency for review and comment. All agency comments 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 may occur. The 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, DENR may determine that the programs described in this document are insufficient to address the impacts of that given project. In this case, additional requirements will be placed in the permit conditions, but this document may still be used to meet SEPA requirements.

1.2 Project Study Area

The Study Area for the SCI Master Mitigation Plan document consists of the Town's Planning Area (Figure 1-1). The Planning Area boundaries are based on a combination of the urban service area (USA), extraterritorial jurisdiction (ETJ), and the Land Use Plan boundary, as well as boundary and urban service area agreements with the Town of Holly Springs and the Town of Cary,. The Town of Apex's Planning Area overlaps with the Town of Holly Springs Planning Area. This area has not been resolved between the two local governments. The Town of Apex would like to include it in its Planning Area and secondary and cumulative impacts mitigation plan to ensure that any area within the unresolved area that it later annexes is addressed within the mitigation document. A large portion of the unresolved area is owned by Progress Energy and the future plans for this area by Progress Energy are unknown. Both Towns anticipate similar low density residential development in this area if Progress Energy chooses to develop its lands, and do not include this area as mitigation measures within the SCI Master Mitigation Plan document. The Town's Planning Area is approximately 70 square miles.

The ETJ represents the area beyond the Town limits where the Town has zoning and regulatory authority. State law authorizes municipalities to have 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 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 - is it within the municipality's 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 sewer service within 5 years (Evidence the system is designed with adequate treatment capacity and required improvements are included in the capital improvements plan [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

USA represents 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 USA and a Town does not have the authority to make modifications to the boundaries. New development within the USA is 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 service at rates significantly higher than the typical rates. Because of these policies, the Town rarely provides utility service to areas outside their ETJs.

Annexation is a governing board decision. Areas outside a Town's ETJ may 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. On the rare occasion that annexation by the Town does not occur, Wake County policies described in the Appendix will apply for these areas.

The less dense development that typically occurs when annexation is not requested is usually served by onsite water and wastewater or small community wells and package plants, and is subject to County—rather than municipal—development requirements. Systems to treat wastewater generated by this growth do not have requirements for licensed operators to be onsite 24 hours, and there are no requirements for the operation and maintenance of septic systems. Additionally, small developments that occur outside municipal jurisdiction often fall below thresholds for stormwater, open space preservation, and erosion and sediment control as required by the state or county.

Because development outside a Town's ETJ will follow Wake County development requirements if annexation by the Town is not requested, a description of Wake County's programs that mitigate growth impacts is included in Appendix B. Wake County is an active participant in the process to develop this document. Wake County does not provide infrastructure; therefore, Wake County has decided not to prepare its own SCI Master Mitigation Plan. Within Wake County, the North Carolina Department of Transportation (NCDOT) provides transportation infrastructure and the municipalities provide water and sewer infrastructure. Wake County does have riparian buffer, stormwater and other mitigation programs in place which are described in Appendix B.

Land Use Planning serves as a basis for the SCI Master Mitigation Plan. Land use plans indicate how a Town would like development to occur if a landowner chooses to develop the property. A land use plan cannot limit a property owner's decision to develop their land. Zoning which is based on the land use plan can limit the type of development a property owner can execute.

The land use planning and infrastructure planning process is a dynamic process. 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 time frames of 25 to 30 years.

1.3 Organization of Document

This document contains the Town of Apex's SCI Master Mitigation Plan document. The remaining sections include:

Section	Description
2.	Background and description of infrastructure master plans for wastewater, water, reclaimed water, and transportation
3.	Purpose of and need for proposed infrastructure
4.	Existing environment in the Planning Area
5.	Secondary and cumulative impacts related to projected growth in the Planning Area
6.	Description of mitigation plan to address secondary and cumulative indirect impacts in the Planning Area
7.	Summary of secondary and cumulative impacts and mitigation programs

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Figure 1-1

Figure 1-1 Back

SECTION 2

Background and Description of Infrastructure Master Plans

The Town of Apex has developed long-range plans for providing water, sewer, and transportation services to its citizens in a manner that will protect water quality, air quality, open space, wildlife habitat, and other environmental characteristics. Long-range planning can provide the general sizing and location of facilities such as treatment plants, distribution/or transmission lines, force mains, pump stations, and water towers. An ongoing study will result in a regional plan for wastewater treatment and conveyance, and surface water disposal in western Wake County. The comprehensive transportation plan identifies future transportation corridors and roadway improvements.

2.1 Wastewater

2.1.1 Existing Wastewater System

The wastewater collection and treatment system for the Town of Apex consists of gravity lines, pumping stations, and force mains conveying flows to the Apex Water Reclamation Facility (WRF). The Apex WRF currently discharges approximately 2 million gallons per day (MGD) to an unnamed tributary of Middle Creek and has a permitted capacity of 3.6 MGD. This plant includes state-of-the-art treatment with advanced nutrient removal capabilities because it discharges into the designated Nutrient Sensitive Waters (NSW) of the Neuse River Basin. The facility provides biological assimilation to oxidize the wastewater, followed by settling, filtering, and disinfection by the use of ultraviolet high intensity lamps.

The system serves residential, commercial, institutional, and industrial customers. The Town's industrial community includes several major employers, such as Cooper Tools and Tipper Tie. Industrial discharges are monitored through the Town's pretreatment program. The Town issues specific permits to each industry, specifying maximum amounts of pollutants that may be discharged. The Town staff also conducts routine monitoring of industries and have implemented a grease trap inspection program for all restaurants and oil handling facilities.

Numerous drainage basins are located within the Town of Apex system. Sewer lines generally flow by gravity, following the natural drainage, until they reach a WRF or a point where they are pumped out of the basin to another drainage basin. Main sewer lines can receive flow from numerous tributary drainage basins and flows pumped from other drainage basins. Seven subbasins are served by gravity or pumped to the Apex WRF. Three subbasins are tributary to waters in the Cape Fear River Basin, two of which flow into Jordan Lake. Wastewater flows from these subbasins are presently pumped to the Apex WRF for treatment.

Apex's collection system consists of over 110 miles of gravity sewer and 36 miles of force mains, as well as 21 pumping stations. Pump stations are equipped with telemetry and

standby power. The Town's collection system operations are governed by Permit No. WQCS00064 issued by the State of North Carolina. The Town of Apex also maintains an agreement with the City of Raleigh to have the ability to purchase 1 MGD of capacity from their system. Figure 2-1 shows the existing wastewater infrastructure.

2.1.2 Future Wastewater System

One of the projects that will require an environmental document that references the SCI Master Mitigation Plan is a new WRF to treat wastewater and return reclaimed water to the Cape Fear River Basin. The Town of Apex is working with the Towns of Cary, Morrisville, and Holly Springs on this regional plant and its discharge line to the Cape Fear River below Buckhorn Dam to meet the Town's interbasin transfer requirements. The planned location of the proposed plant is in southwestern Wake County within the Cape Fear River Basin. The exact location will be identified in the EIS that examines the direct impacts of the proposed plant on environmental resources. Figure 2-2 shows the anticipated service area for the proposed Western Wake WRF and the Study Areas/Planning Areas of the four involved municipalities.

The Town of Apex does not currently have any specific wastewater improvement projects, as the Town is reviewing regional treatment options with other communities in western Wake County. The location of the WRF and associated pumping stations will influence the order in which major lines are developed.

Exact locations of the proposed wastewater facilities and infrastructure will be determined during development of the environmental documents that examine the direct impacts of the proposed infrastructure. The planned infrastructure needs are justified by the Land Use Plan and population projections; thus secondary and cumulative impacts can be identified at this time.

2.1.3 Reclaimed Water

According to the *Western Wake County Regional Wastewater Treatment Studies Project Phase 1* (CDM, 2004), Apex will have a reclaimed water demand of 2.03 MGD by year 2030. Apex identified a Planned Unit Development (PUD) near the Apex WRF as its first development to use reclaimed water. An industrial area to the south and east of the Apex WRF was also highlighted as an area likely to have reclaimed water in the near future. Larger parcels (greater than 30 acres) in the long-range USA present the best opportunity for other reclaimed water services.

2.2 Water

2.2.1 Existing Water System

The Town of Apex obtains its drinking water from Jordan Lake. The water is treated at the Cary/Apex Water Treatment Plant (WTP). 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 40 MGD. To distribute water to its citizens, the Town of Apex maintains approximately 140 miles of transmission lines with diameters ranging from 2 to 30 inches.

Figure 2-1

Figure 2-1 Back

Figure 2-2

Figure 2-2 Back

The distribution system consists of three elevated storage tanks: a 1.5-million gallon (MG) tank located at the intersection of South Salem Street and Tingen Road, a 1.0-MG tank on Hunter Street, and a 0.5-MG tank on Mason Street. The Highway 55 booster pump station provides emergency connection with the Town of Holly Springs, through which Apex can get water from the City of Raleigh and Harnett County. The Town of Apex also has connections to the Town of Cary at Lake Pine Drive and Penny Road. Figure 2-1 shows the existing water infrastructure.

2.2.2 Future Water System

Long-range planning issues such as utility infrastructure are discussed at the Apex Annual Retreat. The balance of growth and environmental stewardship is a challenge to obtain. According to the Apex 2004 Annual Retreat, the Town has three major water system improvements that receive first priority:

- Meter vault and pressure reducing valves (in progress)
- New 30-inch water transmission main along Kelly Road (completed)
- James Street/NC 55 waterline (did not install)

Additional projected water system improvements are:

- General water system improvements, including the looping of dead-end lines, installation of new gate valves for better isolation, and upgrade of supervisory control and data acquisition(SCADA) systems
- Western pressure zone (currently under study)
- Public Works building expansion
- Cary/Apex WTP sludge management facilities
- Cary/Apex WTP finish water pumping
- Cary/Apex WTP chemical feed facilities
- Cary/Apex WTP expansion to 56 MGD

The general location of future major water lines is known and complements the Land Use Plan and population projections. Exact locations of the proposed infrastructure will be determined during development of environmental documents that examine the direct impacts. However, general locations are known and are supported by the Land Use Plan and population projections; thus, secondary and cumulative impacts can be identified at this time.

2.3 Transportation

The Town of Apex's Transportation Plan was adopted by the Board of Commissioners in October 2002 (Kimley-Horn and Associates, 2002). This plan seeks to create a safe, convenient, and efficient multi-modal transportation system and identifies both general and specific transportation system improvement recommendations and strategies to help accommodate the growth in travel demand. The plan addresses potential solutions to improve pedestrian, bicycle, transit and thoroughfare elements in Apex for the future. While

the NCDOT is responsible for the major highway work that will be done in Apex, the Town's Transportation Plan includes specific recommendations for thoroughfare improvements. The purpose of the Transportation Plan is to update the Thoroughfare Plan that is used by local, regional, State, and Federal decisionmakers. The plan provides for land reservation for future transportation corridors and helps guide decisions on setbacks and roadway improvements as development occurs.

Figure 2-3 shows the existing and future major and minor thoroughfares and streets. Two of the major thoroughfare projects include the construction of Interstate 540, which will run from north to south on the western side of Town, and the Apex Peakway which will circle downtown. These projects will improve traffic flow and meet future travel demand. The Transportation Plan has a thoroughfare and collector street focus, a pedestrian and bicycle element focus, and a transit element focus. The Thoroughfare Focus shows the network of major and minor roadways that will improve traffic flow over existing conditions and begin to meet some of the anticipated future travel demands. The Pedestrian Focus shows the importance of a network of walkways that will include sidewalks and greenways, forming an interconnected system. The Bicycle Focus shows a network of on-street bikeways together with the adopted greenways plan. The Transit Focus shows how Apex can begin to look to enhanced regional bus service and a future regional rail system within Apex. Exact locations of the proposed infrastructure will be determined during development of the environmental documents, which examine the direct impacts. However, general locations are known and are supported by the Land Use Plan and population projections; thus, secondary and cumulative impacts can be identified at this time.

Figure 2-3

Figure 2-3 Back

SECTION 3

Purpose of and Need for Proposed Infrastructure

The purpose of and need for the proposed infrastructure is a function of the Town of Apex's commitment to its citizens. One of the missions of the Town of Apex is to provide infrastructure to meet its citizens' needs. Apex promotes orderly growth guidelines through development and implementation of the *Town Standard Specifications and Construction Details Manual* and the Town's Unified Development Ordinance (UDO). Through effective planning, the Town anticipates infrastructure problems and needs by developing cost-effective, viable solutions implemented as part of the Town's capital improvements budget. The Town of Apex plans for capital improvements in 10-year increments (Appendix C). By properly planning, the Town ensures that infrastructure meets the expectations and needs of its citizens.

The Town integrates infrastructure plans with its other planning processes. Infrastructure planning strategies must be formulated and implemented in a manner to balance the competing goals of growth and the environment. By integrating its growth management strategies, land use planning strategies, and infrastructure plans, the Town is able to preserve important ecological areas in the form of open space; ensure that its citizens have adequate recreational resources; and meet water, wastewater, and transportation demands. By integrating these processes, the Town ensures that infrastructure is being planned commensurate with the projected population of given sections within the Planning Area. In addition, proper planning ensures that Jordan Lake drinking water quality is protected and wastewater is treated to levels that protect surface water quality.

The Public Works and Utilities Department is responsible for the planning, design, and construction of capital improvements for the Town of Apex, including street improvements, right-of-way acquisitions, stormwater and utility system improvements, utility plant expansions, thoroughfare planning, and management of development contract and easement releases.

It is the goal of Apex to provide quality service resulting in the highest achievable levels of customer satisfaction and recognition for excellence.

The three main infrastructure elements are wastewater, water and reclaimed water, and transportation. The projects in each area are evaluated against the goals of the Town. The goals of wastewater projects are to:

- Provide adequate collection and treatment of wastewater produced by the system's customers to a level that meets the permit limits issued by regulatory authorities as cost-effectively as possible.
- Ensure that sufficient capacity and facilities for wastewater collection and treatment continue to exist, increasing along with customer needs.

- Discharge treated wastewater in a manner that protects the receiving streams from pollutants and contamination and groundwater supplies from improper land application of reclaimed water.

The goals of water projects are to:

- Provide the citizens of Apex with a safe, cost-effective, and adequate supply of treated water.
- Ensure that sufficient capacity and transmission of treated water continue to exist, increasing along with customer needs.
- Ensure that strict environmental and regulatory requirements are met in the design and construction of the Town's water system.

The objectives related to the Transportation Plan for the Town of Apex are to:

- Create a system of interconnected streets to improve mobility and distribute traffic efficiently and appropriately by purpose and function.
- Encourage streetscape and "built-in" traffic-calming roadway designs.
- Support "mixed use" development to encourage pedestrians and biking by promoting context-sensitive roadway design.
- Encourage the development of 2- and 3-lane roads with street trees and plantings between roadway and development.
- Promote a pedestrian-friendly environment by filling in gaps and improving interconnection in the sidewalk system.
- Implement roadway system improvements to accommodate growth and minimize roadway congestion.
- Develop a plan compatible with land use.
- Support more bike lanes and trails to parks and community activity centers.
- Encourage a rail system by supporting the Triangle Transit Authority's plans for passenger rail service.
- Support the use of roundabouts as gateway and traffic-calming devices in local street design standards.
- Minimize property impacts to existing homes and businesses by promoting context-sensitive roadway design.

To meet these infrastructure goals, the Town of Apex develops and implements infrastructure plans. These plans are based on the projected population numbers and the Land Use Plan to ensure adequate capacity exists for future residents at the proper locations. The Town's Land Use Plan is described in Section 6. The future land use projection year is 2025.

The Town of Apex grew rapidly in the 1990s, but growth has slowed in recent years. The population in Apex was 4,968 in 1990 and 20,212 in 2000 (U.S. Census,2000). The Town Planning Department estimated the population as of July 31, 2004, to be 28,974. Population projections for the Town of Apex (Table 3-1) show growth of about 500 percent between 2000 and 2030, resulting in about 100,400 residents by the year 2030. The increased population will be from a combination of new residents and annexations, and the Town cannot accurately predict each of these numbers. Apex's predicted population will live in the mixed use areas as well as areas surrounding the downtown area and near the Highway 55 corridor.

TABLE 3-1
Town of Apex Population Trends and Projections

Year	Population
2000	20,212 [1]
2015	43,470[2]
2025	86,210[2]
2030	100,400[2]

[1] U.S. Census, 2000
[2] CDM et al, 2005

The environmental documents that are developed for specific infrastructure projects will contain thorough justifications on 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 of Apex.

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SECTION 4

Description of Existing Environment in Planning Area

This section presents a description of the existing environment to facilitate the identification of potential secondary and cumulative impacts to the natural environment as growth occurs in the Planning Area. The data for this section were gathered through literature reviews, internet searches, geographic information system (GIS) queries, phone conversations, letters, and meetings with various resource agency personnel.

4.1 Topography and Floodplains

Apex is located in the North Carolina piedmont, near the edge of the costal plain, with gently sloping to moderately steep terrain. The topography divides the town into seven drainage basins.

Floodplains function as storage areas for surface water during large rainfall events. Within floodplains, microtopography 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 8.8 square miles of FEMA regulated floodplains are located inside the Planning Area; these floodplains represents 13 percent of the Planning Area.

Floodplains within watersheds greater than 1 square mile are regulated by the Federal Emergency Management Agency (FEMA). Flood Insurance Rate Maps (FIRMs) for the area are dated March 3, 1992 (FEMA, 2004). Regulatory floodplains total 13 percent of the Planning Area, as shown on Figure 4-1. A majority of regulated floodplain area is within the Town's 100-foot stream buffer zone. Preliminary FIRMs for the Cape Fear River Basin in Wake County are under an appeal period from April 20, 2005 to July 20, 2005. After all appeals and protests are resolved and the 6-month compliance period has ended final FIRM panels will be issued for the Cape Fear River Basin in Wake County. The appeal period for the preliminary FIRMs for the Neuse River Basin in Wake County was from July 15, 2004 to October 13, 2004. After all appeals and protests are resolved and the 6-month compliance period has ended final FIRM panels will be issued for the Neuse River Basin in Wake County.

4.2 Soils

The major soil type is Creedmoor sandy loam. The major soil type within the Harris Lake Watershed is Mayodan. Other soil types include Herndon and White Shore. Soil types within floodplains and adjacent to streams include Wehadkee, Worsham, and Augusta. Many of these soils, especially in the eastern portion of the Planning Area, have been impacted by development and other soil disturbances. These soils are gently sloping to moderately steep, and are well-drained to moderately well-drained.

4.3 Land Use

Figure 4-2 illustrates broad land use categories within the Planning Area. The map shows land that is available for development, land that is already developed, Progress Energy lands, and land that is protected as open space. The developed land is divided into residential and non-residential uses. The open space category includes protected open space, parks, and privately held open space. A portion of the parks and privately held open space have been developed for recreational purposes. The Town does not have the data needed to determine the percentage of open space that is in its natural state.

Table 4-1 provides detail on the acres within each broad land use category. Approximately 40 percent of the Planning Area is developed land; another 30 percent is currently undeveloped and represents forested, agricultural or vacant (no building on the parcel according to Wake County's parcel data). This category also includes parcels that are 10 acres or greater that have a residence on them as these lands could be subdivided in the future. Approximately 5 percent of the land is protected as open space.

TABLE 4-1

Town of Apex Existing Land Use

Land Use Type	Square Miles	Percent of Planning Area
Residential Developed	14.6	20.9
Non-residential Developed	10.4	14.9
Undeveloped*	21.6	30.9
Open Space	3.8	5.4
Open Water	3.9	5.6
Progress Energy		
Undeveloped	11.7	16.7
Gameland	4.0	5.7
Total	**70.0**	**100**

Source: Town of Apex GIS, 2005

Open space is underestimated; the riparian buffer and floodplain open space is actually counted in the other land use categories. Figure 4-2 illustrates the riparian buffers within the Town's ETJ, and these buffers account for 4.3 square miles (6.1 percent of the Planning Area). Streams outside the Town's ETJ fall within the County's jurisdiction and have protection strategies in place. However, the County does not have a riparian buffer data layer to include a buffer open space calculation. These streams will fall under the Town's jurisdiction once the ETJ is expanded. When this occurs, the Town will need to verify whether the streams are perennial, intermittent, or ephemeral, which will determine the actual size of the buffer as described in Section 6. From inspection of Figure 4.1, it appears that protected riparian buffers would be approximately double the current 4.3 square miles if existing riparian buffer regulations are translated to areas outside the ETJ.

The floodplain area inside the Planning Area is 8.8 square miles (12.6 percent of Planning Area). Because of the manner in which the data were created, it is difficult to distinguish the riparian buffer area or floodplain area from other land use categories due to technological complexities of the data layers used in the analysis. In addition, other areas within development areas such as perimeter buffers are actually open space.

The actual percentage of open space within the Planning Area is greater than the amount indicated by Table 4-1 and Figure 4-2 due to the following factors: 1) significant portions of the areas classified as residential are open space due to the large amount of low-density development; 2) the Town requires open space in residential and commercial developments (at least 20 percent through its Resource Conservation Area requirements outlined in Section

Figure 4-1

Figure 4-1 Back

Figure 4-2

Figure 4-2 Back

6); and 3) the Town requires the protection of 100-foot riparian buffers and floodplains. As land is developed, the Town requires open space to be provided with the developments. Therefore, although the park and open space uses are limited, there are many areas that are undeveloped open space within the various land use designations.

Table 4-2 breaks the consolidated land use categories out further as provided by the Town's GIS staff (received April 2005) and based on Wake County's parcel database and the Town's zoning classifications; Town's land use categories are described in Appendix D. Residential use (21 percent) is the current predominant land use within the Planning Area with the majority of residential use classified as low density (12 percent). Small amounts of clustered high- and medium-density residential developments exist. Residential development is primarily clustered around the Town Center NC 55 corridor, Olive Chapel Road, and Old Raleigh Road. Commercial, industrial, and institutional land use comprise 7 percent of the area. The most heavily urbanized areas lie along the NC 55 , US 1 , and US 64. The Shearon Harris Nuclear Plant is present within the Planning Area, creating industrial land use adjacent to Harris Lake.

TABLE 4-2
Town of Apex Detailed Existing Land Use

Land Use Type	Square Miles	Percent of Planning Area	Percent Impervious[2]	Impervious Square Miles
Agriculture	1.8	2.6%	2%	0.04
Undeveloped	19.8	28.3%	3%	0.59
Open Water	3.9	5.6%	N/A	n/a
Commercial	2.2	3.1%	82%	1.80
Industrial	2.1	3.0%	82%	1.72
Office and Institutional	0.9	1.3%	72%	0.65
Mixed Use	0.2	0.3%	72%	0.14
High-density Residential	2.2	3.1%	72%	1.58
Medium-density Residential	3.9	5.6%	44%	1.72
Low-density Residential	8.5	12.2%	21%	1.79
Very low density Residential	0.0	0.0%	6%	0.00
School	0.4	0.6%	72%[3]	0.29
Park/Open Space	3.8	5.4%	4%	0.15
Transportation[1]	4.6	6.6%	87%	4.00
Progress Energy				0.00
Undeveloped	11.7	16.7%	3%	0.35
Gameland	4.0	5.7%	2%	0.08
Total	**70.0**	**100%**		**14.91**

Source: Town of Apex, 2005 and CH2M HILL, 2002a

[1] Town of Apex Land Use Plan includes all neighborhood roads that do not appear on the scale in Figure 4-2.

[2] Impervious values most likely over estimate the percent impervious because reference categories contained slightly higher densities for residential classes than Apex designates.

[3]School was assumed to be represented as Institutional.

Table 4-2 also includes percentage imperviousness; the values listed were used in modeling analyses performed for the Town of Cary (CH2M HILL, 2002a). These values are based on

literature values. Based on these impervious values, an impervious area for each land use was estimated. These areas were then summed and divided by the total land area (with lakes subtracted from the total) to estimate the overall impervious value for existing land use conditions. This value is 22.5 percent.

4.4 Wetlands

For regulatory purposes under the Clean Water Act, the term wetlands means "those areas that are inundated or saturated by surface 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 Planning Area are primarily riparian or bottomland forest associated with streams and their floodplains (Table 4-3; Figure 4-3) (CGIA, 2004, which is based on the 1982 USFWS National Wetland Inventory). The majority of the NWI wetlands are forested and are part of bottomland communities adjacent to larger streams within the Planning Area. Analysis of the Wake County Soil Survey (U.S. Department of Agriculture [USDA], 1970) also shows that hydric soils are present primarily along stream channels, concurring with NWI data indicating that wetlands within the Planning Area are primarily located within riparian and floodplain areas. The widest areas of forested riparian wetlands are present along White Oak Creek and Beaver Creek in the Jordan Lake Watershed, according to NWI. Within the Harris Lake Watershed, riparian forested wetlands are present along the lengths of White Oak Creek, Little White Oak Creek, and Big Branch. Middle Creek also has associated forested and scrub-shrub wetlands. Open water ponds have been created along many of the streams within the Planning Area. Included in the open water calculation is Harris Lake, creating such a large open-water area when compared to other wetland types. These wetlands also can be compared to floodplains, shown on Figure 4-3, to indicate areas where stream valleys are wide. While the NWI does not map all jurisdictional wetlands, it is useful in terms of classifying types and approximate locations of wetlands within the Planning Area. It is important to note that many changes have occurred in the Planning Area since these data were reported.

TABLE 4-3
National Wetlands Inventory

NWI Type	Acres
Emergent	24
Forested	2,235
Scrub-Shrub	132
Open Water	2,247
Total	**4,638**

Source: USFWS, 1982

4.5 Prime or Unique Agricultural Lands

Less than 5 percent of the Planning Area remains in agricultural use, as discussed in Section 4.3. In addition to land use data provided by the Town, land cover data were also analyzed. These data provide a better understanding of the cultivated and pasture land present within the Planning Area. In the southwestern portion of the Planning Area, agricultural use is

Figure 4-3

Figure 4-3 Back

more prevalent, and several large farms operate there. Small patches of crops and pasture remain in the eastern portion of the Planning Area, but more residential land use is present.

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 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 0 and 8 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 farmlands. Factors include steepness of slope, susceptibility to erosion, and permeability (USDA, 1998).

Prime farmlands are present within the Planning Area. The major soil type is Creedmoor sandy loam. The major soil type within the Harris Lake Watershed is Mayodan. Other soil types include Herndon and White Shore. Soil types within floodplains and adjacent to streams include Wehadkee, Worsham, and Augusta. Of the major soil types within the Planning Area, Augusta, Creedmoor, and Herndon are listed as prime farmlands (USDA, 1998). Other soil types considered of statewide importance include these same soils but with steeper slopes, Mayodan thin silt loams, and White Store. Many of these soils, especially in the eastern portion of the Planning Area, have been impacted by development and other soil disturbances.

4.6 Public Lands and Scenic, Recreational, and State Natural Areas

This category includes Federal, State, and local parks, and other scenic and recreational areas. The Apex Parks, Recreation, and Cultural Resources Department operates nine parks within the Planning Area (Table 4-4). Of these, the largest is the 160-acre Apex Community Park. This facility includes sports facilities and a 50-acre lake, providing recreational and fitness opportunities such as fishing, boating, and hiking. Recreational activities also are scheduled using school facilities. Other small neighborhood parks provide playground equipment, picnic areas, and sports facilities.

Shearon Harris County Park, managed by Wake County on land leased from Progress Energy, is located adjacent to Harris Lake and provides opportunities for camping, hiking, mountain biking, picnicking, and a public launch site for canoes and kayaks. The Shearon Harris GameLands, also leased from Progress Energy, provide hunting opportunities.

To date, the Town has established 5 miles of greenways, with more planned. The plan was developed with other Wake County and neighboring towns' plans in mind, in an effort to provide connectivity. Wake County also maintains a section of the American Tobacco Trail, which is used for biking, walking, and horseback riding. When complete, the trail will connect western Wake County to downtown Durham.

In addition, scenic areas include Harris Lake and the Shearon Harris Longleaf Pine Forest Significant Natural Heritage Area (SNHA) discussed in Section 4.13. This SNHA is set aside by the State, protecting a scenic area of unique ecological value into the future.

TABLE 4-4
Public Parks within the Planning Area

Park	Total Acres	Acres within Planning Area	Owner
Apex Community Park	160	160	Town of Apex
West Street Park	1	1	Town of Apex
Clairmont Park	1	1	Town of Apex
Senior Citizens Park	2	2	Town of Apex
Sue Helton Memorial Park	1	1	Town of Apex
Apex Jaycee Park	23	23	Town of Apex
WHOPS Park	1	1	Town of Apex
Kelly Road Park	27	27	Town of Apex
Kelly Glen Park	1	1	Town of Apex
Shearon Harris County Park	592	592	Progress Energy
Shearon Harris Game Lands	138	138	Progress Energy
Total	**947**	**947**	

Source: Town of Apex, 2004

4.7 Areas of Archaeological or Historical Value

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. Places considered for listing include historic structures and districts, cemeteries, and archeological sites.

A comprehensive architectural survey of Wake County has identified approximately 1,500 prehistoric and historic archaeological sites within the County (North Carolina State Historic Preservation Office, 2004). According to data compiled by the Town of Apex, there are approximately 100 structures in the Apex National Register Historic District as well as several properties listed in the NRHP (NPS, 2004). Several properties are Wake County Historic Landmarks. The Town recently began the process to expand its National Register District. Recognized historic properties in the Planning Area include:

- Apex Historic District (National Register of Historic Properties)
- New Hill Historic District (National Register of Historic Properties)
- Former Apex Town Hall (National Register of Historic Properties – Contributing Buildings in Apex Historic District)
- Apex Union Depot (National Register of Historic Properties – Contributing Buildings in Apex Historic District)
- Thompson-Utley-Fletcher-Tunstall House (National Register of Historic Properties – Contributing Buildings in Apex Historic District)
- C.P. Sellars Building (National Register of Historic Properties – Contributing Buildings in Apex Historic District)

In an effort to support Federal efforts to protect historic places, the Town of Apex is a Certified Local Government (CLG). The responsibilities of a CLG include:

- Enforce appropriate 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.

To assess the general character of cultural resources associated with the Planning Area, background research was conducted using the NRHP website and data provided by the Town of Apex (obtained July 2004).

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 Apex, established by the adoption of a historic preservation ordinance.

4.8 Air Quality

The U.S. Environmental Protection Agency (USEPA) uses the Air Quality Index (AQI) to report ambient air quality conditions, and the AQI ranges from good, moderate, unhealthy for sensitive groups, unhealthy, to hazardous. In 2002, the median AQI in Wake County was 45, or good. Two days were considered unhealthful and 5 days were considered unhealthful for sensitive populations (DENR, 2004a).

A new, more stringent National Ambient Air Quality Standard for ozone was established by USEPA in 1997. The Raleigh-Durham-Chapel Hill region has had difficulty in meeting this new standard (USEPA, 2004). Ozone is not directly emitted, but is formed when sunlight reacts with volatile organic compounds and nitrogen oxides, and is a component of smog. The largest source of the precursors to the formation of ozone in the Planning Area is motor vehicles. Wake County is currently listed in nonattainment for the 8-hour ozone standard, but is listed as a maintenance area for the 1-hour standard. The County is also listed as a maintenance area for carbon monoxide, which is primarily emitted from transportation and industrial sources.

4.9 Noise Levels

Quiet is conducive to psychological and physiological well-being for humans. Just as excessive noise has been documented to negatively affect human health and welfare, elevated noise levels from human activities can disrupt the normal behavior patterns of wildlife, interfering with migration, breeding, hunting, and predator avoidance.

Within the Planning Area, noise is primarily created by residential traffic. Noise levels are highest 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. Noise is also associated with industrial

activities; however, industrial land uses only comprise 3 percent of land use, so this is not a major contributor of noise.

4.10 Water Resources

4.10.1 Surface Water

The Town's Planning Area is approximately 70 square miles. The Planning Area lies along the ridge between the Cape Fear and Neuse River Basins. Approximately 86 percent of the Planning Area is within the Cape Fear Basin and the remaining 14 percent is within the Neuse Basin (Figure 4-1).

Streams within the Cape Fear River Basin drain to Harris Lake or Jordan Lake (Table 4-5; Figure 4-4). Streams within the Harris Lake Watershed include White Oak Creek, Little White Oak Creek, Little Branch, Big Branch, and Thomas Creek. All streams within this watershed are classified as Class C. (Note: The North Carolina Division of Water Quality [DWQ] has not classified many of the unnamed tributaries shown on Figure 4-1; stream classifications of unnamed tributaries are equivalent to the stream to which they drain). Class C waters are suitable for aquatic life support, swimming, and fishing. In addition, the Harris Lake Watershed is considered WS-V. WS-V watersheds have no development restrictions.

Tributaries to Jordan Lake within the Planning Area include White Oak Creek, Reedy Branch, Beaver Creek, and Little Beaver Creek. The Jordan Lake Watershed is classified as WS-IV NSW, however, entire tributaries are not classified as WS-IV NSW because the DWQ classification stops at a certain distance above normal pool elevation.. Waters are classified as NSW in response to excessive growths of macroscopic and/or microscopic vegetation.

The major tributary to the Neuse River Basin within the Planning Area is Middle Creek (Table 4-5; Figure 4-4). Middle Creek within the Planning Area is classified as Class C NSW. Headwater tributaries to Swift Creek are also present within the Planning Area. The Swift Creek Watershed is classified as WS-III NSW. All waters within the Neuse River Basin are classified NSW.

TABLE 4-5
Planning Area Watersheds

River Basin	Watershed	DWQ Subbasin	DWQ Water Quality Classification	Watershed Description
Cape Fear River	Harris Lake	03-06-07	Class C; WS-V	Includes Little Branch, Big Branch, White Oak Creek, Little White Oak Creek, Big Branch, and Thomas Creek
	Jordan Lake	03-06-05	WS-IV NSW	Includes White Oak Creek, Reedy Branch, Beaver Creek, and Little Beaver Creek
Neuse River	Middle Creek	03-04-03	Class C NSW	Small unnamed tributaries also present
	Swift Creek	03-04-02	WS-III NSW	Small headwater tributaries

Source: DENR 2001; DENR 2004a

Figure 4-4

Figure 4-4 Back

Harris Lake is located partially in the southeastern corner of Wake County and is approximately 4,190 acres in size. This reservoir provides cooling water for the Harris Nuclear Power Plant owned by Progress Energy and is considered eutrophic. Aquatic macrophytes, including *Hydrilla* sp., have been observed throughout the reservoir.

At this time, DENR does not conduct benthic macroinvertebrate or fish community sampling within the Harris Lake Watershed (Figure 4-5). Within the Jordan Lake Watershed, low-flow conditions resulting from the drought made sampling for benthos in White Oak Creek impractical in 2003. Typically, White Oak Creek is dry during summer months.

4.10.1.1 303(d)-Listed Streams

Section 303(d) of the Clean Water Act requires that states develop a list of waters not meeting water quality standards or that have impaired uses. The State must prioritize these waterbodies and prepare a management strategy or total maximum daily load (TMDL).

Waterbodies within the Planning Area and listed on the Section 303(d) list include: Swift Creek, Middle Creek, and Williams Creek (Table 4-6) (DENR, 2004c). All are within the Neuse River Basin. These streams mainly have been impacted by growth activities including construction and the increase in urban runoff from storm sewers. Other factors contributing to impairment include agriculture and the Cary WRFs.

There are limited to data to determine whether water quality in these 303(d) listed streams is improving, degrading, or stable. Benthic data collected on Swift Creek show a slight increase in the presence of pollution intolerant species, but there is not sufficient data to determine whether this difference can be attributed to increased water quality or reductions in nonpoint sources due to low flows recorded in July 2000. Middle Creek below the Cary South Wastewater Treatment Plant (WWTP) appears to have improving water quality. Ephemeroptera, Plecoptera, and Trichoptera (EPT) taxa increased from 42 in 1995 to 89 in 2000. Williams Creek is not rated (DENR, 2001).

TABLE 4-6
Waterbodies Included on the 303(d) List

Waterbody	Impaired Use	Year Listed	Category and Reason for Listing	Potential Source(s)
Swift Creek	Overall & Aquatic Life	1998	Impaired biological integrity; stressor study complete	Land Development; Agriculture; Urban Runoff/Storm Sewers
Middle Creek	Aquatic Life	2004	Low DO Standard Violation	Urban Runoff/Storm Sewers
Williams Creek	Overall & Aquatic Life	1998	Impaired biological integrity; stressors no identified	Construction; Urban Runoff/Storm Sewers

Source: DWQ, 2004c

4.10.1.2 Wake County Watershed Assessment Summary

Wake County, in an effort to characterize the health of its streams and watersheds, completed a watershed assessment in 2001 (CH2M HILL, 2002b). The goal of these efforts was to assess the overall effects of land use changes on stream physical structure and

aquatic communities. In summary, three types of monitoring 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. Within the Planning Area, six sites were evaluated (Table 4-7; Figure 4-5). In general, streams exhibit slight to moderate entrenchment and have sandy substrates. Watershed classifications and bioclassifications based on benthic macroinvertebrate sampling are in line with the majority of streams in the County.

TABLE 4-7
Wake County Watershed Assessment Summary

Stream Name	Nearest Road Crossing	Habitat Condition	Bioclass	Watershed Classification	Entrenchment
Beaver Creek	Richardson Rd	Suboptimal	Fair	Good	Slight
White Oak Creek	Wimberly Rd	Suboptimal	Fair	Good	Moderate
White Oak Creek (Big Branch)	Holly Springs/New Hill Rd	Sub-optimal	Fair	Good	Slight
Speight Creek	SR 1385	Marginal	N/A	Fair	Slight
UT* Williams Creek	W. Sterlington Place	Marginal – Sub-optimal	N/A	Good-Fair	Slight
UT Swift Creek	Control Site	Marginal	N/A	Fair	Slight

*UT = Unnamed tributary Source: CH2M HILL, 2002b

4.10.2 Groundwater

The Planning Area is within the Triassic Basin of the Piedmont region of North Carolina and is characterized by a thin regolith layer that 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 Planning Area is located, approximately 6 percent of precipitation reaches the groundwater for recharge, contributing approximately 35 to 55 percent of stream baseflow during normal precipitation years. Groundwater within the Planning Area is generally free of contaminants and is used as a source of drinking water by individuals and community well systems (Wake County, 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.

Figure 4-5

Figure 4-5 Back

Some residents within the Planning Area currently obtain their water from wells and discharge waste to septic systems. These residents could request the Town to provide service when municipal water and sewer are available to them. New development will be served by the Cary/Apex WTP and the Western Wake WRF; initial flow to the proposed WRF will be from existing customers and new development will be provided service as it occurs.

Within the Planning Area, groundwater wells are used for water supply, both with individual and community wells (Wake County, 2003). In most cases, groundwater is safe to use as a drinking water source and is void of contaminants.

4.11 Forest Resources

The majority of the Planning Area is forested, as discussed in Section 4.5. In addition to land use data provided by the Town, land cover data developed by the North Carolina Gap Analysis Program (GAP) were also analyzed (USGS, 2003). These data provide a better understanding of the types of forest resources present within the Planning Area. It should be noted that this analysis is not based on land use data, which is limited by parcel boundaries.

Large areas of forested land are present in the western portion of the Planning Area, while the eastern portion is much more fragmented. The most dominant forest type is Coniferous Cultivated Plantation, both cultivated and planted. The areas surrounding Harris Lake were managed by CP&L for timber production until recently. Most planted pine are loblolly (*Pinus taeda*), but slash (*P. elliottii*) and longleaf (*P. palustris*) pines are also present. Other forested communities dominated by pine species include Piedmont Xeric Pine Forests and Piedmont Dry-Mesic Pine Forests. Drier xeric habitats tend to be dominated by Virginia pine (*P. virginiana*) or shortleaf pine (*P. echinata*), while others are dominated by loblolly pine, especially those that previously were cleared.

Hardwood and mixed forest communities include Piedmont Dry-Mesic Oak and Hardwood Forests, Xeric Pine-Hardwood Forests, Piedmont Dry Mesic Oak-Pine Forests, and Successional Deciduous Forests. In most communities dominated by oak species, white oak is the most common (*Q. alba*). 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*).

Along stream corridors, Piedmont Mixed Bottomland Hardwood Forest communities are present. Tag alders (*Alnus serrulata*) and button bush (*Cephalanthus occidentalis*) often dominate the shrub communities. Typical bottomland forest canopy species include sweetgum, red maple, sycamore (*Plantanus occidentalis*) and black gum (*Nyssa sylvatica*), which are all tolerant of wetter soils. Wide areas of bottomland forest are present along the tributaries to Jordan Lake. Narrower areas of bottomland forest are present along the other tributaries to Harris Lake.

4.12 Shellfish or Fish and their Habitats

Water resources within the Planning 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 Planning Area. Recreational fishing opportunities are available. Typical fishes caught within the streams and lakes include catfish, suckers, bass, crappie, and sunfish.

DENR does not maintain any fish community sampling sites within or near the Planning Area (DENR 2001; DENR 2004d). While DWQ has not extensively monitored streams in the Planning Area, it does rotate some of its monitoring sites on a 5-year cycle and may monitor other streams in the future. Harris Lake is being stocked with grass carp in an effort to control the aquatic macrophyte, *Hydrilla* sp. In general, many fishes within the area exhibit high levels of mercury due to atmospheric deposition of mercury and bioaccumulation of the heavy metal up the food chain (DENR, 2001).

North Carolina Wildlife Resources Commission (NCWRC) biologists conduct regular surveys for large mouth bass and crappie in Harris Lake and Progress Energy monitors this system as well. The Progress Energy data have been requested and have not been received. The 2004 progress report entitled Mechanisms of Reservoir Fish Community Dynamics performed by NCWRC examined the populations of largemouth bass, crappie, and striped bass in B.E. Jordan Reservoir. The report found that the reservoir supports a quality largemouth bass fishery with mean relative weight values near the optimum level for all size classes. The crappie fishery is also in good health and mean relative weight was the second highest value observed since 1999. The striped bass population showed a mix of age classes and above average growth rate. Also condition of fish was above average indicating a healthy fishery. Data received from NCWRC on fish catch statistics for Harris Lake (catch per unit effort) indicates that numbers of largemouth bass have generally increased since 1995. The proportional stock density of largemouth bass has stayed relatively constant for fish sized greater than 300 mm, and for fish sized greater than 400 mm the proportional stock density data show a general trend of increasing since 1992.

4.13 Wildlife and Natural Vegetation

Upland communities are home to Virginia opossum, raccoon, eastern cottontail, gray squirrel, red and gray foxes, and white-tailed deer, as well as the eastern mole and several species of shrews and mice. Amphibians and reptiles are abundant and diverse. Frogs, turtles and water snakes inhabit wetlands and the perimeter of ponds and streams.

Bird life in the Planning Area is typical of the Carolina Piedmont. Cardinals, American robins, Carolina chickadees, bluebirds, sparrows, warblers, rufous-sided towhees, and other songbirds make their homes in the backyard habitats and forests of the area. Hawks, such as the red-tailed hawk, as well as 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 Planning Area attract 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 herons and green-backed herons, may be encountered along lake

shallows in summer. A wading bird rookery is located along the Jim Burt Branch section of Harris Lake, which is outside the Planning Area. However, birds from this rookery most likely feed throughout the Harris Lake Watershed.

Following is a discussion of the more rare wildlife and wildlife habitats found within the Planning 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 (ESA) of 1973.

Information obtained from the North Carolina Natural Heritage Program's (NHP's) Natural Heritage Element Occurrence (NHEO) and Significant Natural Heritage Area (SNHA) databases, as supplied by CGIA, (updated Spring 2004), 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 Planning Area. Figure 4-1 shows the distribution of these areas and occurrences within and adjacent to the Planning Area.

A total of 15 species are Federally listed in Wake County (Table 4-8, data obtained from NHP, 2004); of these, 11 are listed as Federal Species of Concern (FSC). Three species are listed as endangered while one, the bald eagle (*Haliaeetus leucocephalus*), is listed as threatened. A full list of State- and Federally-listed species in Wake County is provided in Appendix E. Of these, Michaux's sumac is present within the Planning Area.

Michaux's sumac (*Rhus michaux*) is an upland terrestrial vascular plant and is considered endangered. This shrub grows to between 1 and 3 feet and flowers between June and July. Most plants are unisexual, which may partly explain the plant's rarity. Reproductive capacity is low. Typical habitat includes sandy or rocky open woods with basic soils. Repeated disturbance is necessary to provide open areas for this plant to be successful. Remaining populations are found along maintained roadway rights-of-way and areas managed with frequent fires. Threats to remaining populations include habitat loss due to development and fire suppression. Michaux's sumac, according to the most recent version of the NHEO database provided by NHP, is present near the Shearon Harris Longleaf Pine Forest SNHA.

The following is a brief discussion of the Federal Threatened and Endangered species that have recorded occurrences or near in the Planning Area (CGIA 2004, NHP 2004). The bald eagle is considered threatened, but is proposed for delisting because of recent recovery of the species (USFWS, 2003). The bald eagle is a large raptor and is recognized by the characteristic white head of an adult. Nests are often constructed near water and can measure up to six feet across. Nests are reused by the same pair year after year. Bald eagles primarily feed on fish, but can consume other small animals including frogs, smaller birds, and turtles. The recovery of this species is largely due to the banning of harmful pesticides including dichlorodiphenyltrichloroethane (DDT). No bald eagles are present within the Planning Area; nests exist around Lake Crabtree and Jordan Lake.

The dwarf wedgemussel (*Alasmidonta heterodon*), a freshwater mussel species, is considered endangered. This small mussel is less than 1.5 inches in length and can be identified by its

dentition pattern; the right valve possesses two lateral teeth, while the left valve has one tooth. Habitat preferences include a slow to moderate current and a sand, gravel, or muddy stream or river bottom. As with other freshwater mussel species, glochidia are released into the water by females after reproduction (NCWRC, 2004). These glochidia then attach to host fishes for further development. The success of the species also depends on the success of specific host fishes. Dwarf wedgemussels are thought to use the tessellated darter, Johnny darter, and mottled sculpin as host species (USFWS, 2003). The original range of this species stretched from New Brunswick, Canada, to North Carolina. This species has been found elsewhere in Middle Creek downstream of the Planning Area. According to the most recent version of the NHEO database provided by NHP (2004), no individuals of dwarf wedgemussel have been recorded within the Planning Area; however, the headwaters for this watershed are located in the Planning Area.

TABLE 4-8
Federally Listed Species within Wake County

Common Name	Scientific Name	State Status	Federal Status	County Status
Animals				
Aimophila aestivalis	Bachman's Sparrow	SC	FSC	Historic
Haliaeetus leucocephalus	Bald eagle	T	T (P/D)	Current
Heterodon simus	Southern hognose snake	SC	FSC	Obscure
Lythrurus matutinus	Pinewoods shiner	SR	FSC	Current
Myotis austroriparius	Southeastern Myotis	SC	FSC	Historic
Picoides borealis	Red-cockaded Woodpecker	E	E	Historic
Invertebrates				
Alasmidonta heterodon	Dwarf wedgemussel	E	E	Current
Fusconaia masoni	Atlantic pigtoe	E	FSC	Current
Elliptio lanceolata	Yellow lance	E	FSC	Current
Lasmigona subviridis	Green floater	E	FSC	Current
Insects				
Speyeria diana	Diana fritillary	SR	FSC	Obscure
Plants				
Lindera subcoriacea	Bog spicebush	T	FSC	Current
Monotropsis odorata	Sweet Pinesap	SR-T	FSC	Historic
Trillium pusillum var. *pusillum*	Carolina least trillium	E	FSC	Current
Rhus michauxii	Michaux's Sumac	E-SC	E	Current

State Status:
T = Threatened
E = Endangered
SC = Species of Concern
SR = State Rare

Federal Status:
T (P/D) = Threatened, Proposed for Delisting
E = Endangered
FSC = Federal Species of Concern

A complete list of state species within Wake County is provided in Appendix E.

A mussel survey was conducted in June and July 2004 to determine if any Federally listed mussel species are present within the area. Survey sites are depicted on Figure 4-5. The majority of the survey sites exhibited wide forested riparian buffers in subdivision developments and undeveloped woodlands (CZR, 2004). Three sites in the headwaters of Middle Creek are within the Planning Area. Three other sites are within the headwaters of the Swift Creek Watershed. Streams within the Swift Creek Watershed are classified as Significant Aquatic Endangered Species Habitat (SAESH; CGIA, 2004) (Figure 4-1) due to the presence of habitat for the dwarf wedgemussel.

Overall, the two dominant species of mussels found during the survey were eastern elliptio (*Elliptio complanata*) and variable spike (*Elliptio icterina*). Only small populations of these species were found within the Planning Area. These species are common and often abundant in the area. No other species were found. Most notable is that no individuals, live or relic, of the Federally listed endangered dwarf wedgemussel were found during the survey (CZR, 2004).

According to North Carolina Wildlife Resources Commission (2004), the Middle Creek Watershed provides suitable habitat for many State-listed mussel species including Roanoke slabshell (*Elliptio roanokensis*), eastern lampmussel, creeper, triangle floater (*Aslasmidonta undulata*), and notched rainbow. As previously mentioned, none of these were found within the Planning Area (CZR, 2004).

Historic red-cockaded woodpecker (*Picoides borealis*) records were present within the Planning Area along US 1. According to NHP (2004), these populations have been extirpated. No current populations of red-cockaded woodpecker are present not been observed in the Planning Area since before 1990. Its preferred habitat is open pine stands, greater than 30 years old, with mature live trees (60+ years old) being used for nesting cavities. Typically they do not forage more than 0.5 miles. Currently little habitat is available in the county and is not likely to increase due to the time required for trees to become suitable for roosting and nesting.

Populations of the State-listed rigid sedge (*Carex tetanica*) are present along NC 55 within the Planning Area (Figure 4-1). The State-listed rare eastern fox squirrel (*Sciurus niger*) has been observed along the US 1 corridor. Also, the State-listed rare Lemmer's pinion (*Lithophane lemmeri*) insect has been observed near Harris Lake.

4.13.1.1 Significant Natural Heritage Areas

One SNHA is present within the Planning Area (CGIA 2004). Shearon Harris Longleaf Pine Forest is 290 acres in size and provides longleaf pine savannah habitat, which is rare in this portion of the Piedmont. The area is a transition zone between the longleaf pine forest community and hardwood forest communities more typical of the Piedmont. This community is unique because its diversity is dependent upon periodic fires to maintain the savannah habitat. Progress Energy previously managed this land for timber. Now, the land is managed for habitat, research, and recreation.

4.13.2 Wildlife and Natural Vegetation

Within the Planning Area, natural vegetation is typical of Piedmont upland and bottomland communities. However, smaller unique ecosystems are also present. Following are

descriptions of natural communities, as described by Schafale and Weakley (1990), that are present within the Planning Area.

4.13.2.1 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 Middle Creek.

4.13.2.2 Mesic Mixed Hardwood Forest (Piedmont Subtype)

This upland 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*), red oak (*Quercus rubra*), and tuliptree (*Liriodendron tulipifera*). The absence of bottomland trees and base-loving plants separate this forest from other common community types.

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.

While there are no Superfund sites within the Planning Area, Shearon Harris Nuclear Plant is located adjacent to Harris Lake. This facility, while operating normally, presents no risk to the Planning Area. However, should a severe malfunction occur, toxic nuclear material could be released. Due to the risk associated with the facility, the immediate vicinity is planned for low density residential growth.

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

SECTION 5

Description of Secondary and Cumulative Impacts Related to Projected Growth in the Planning Area

This section outlines the SCI associated with the infrastructure needed to accommodate the growth in the Town of Apex. The area's transportation and utility infrastructure is being expanded and strengthened in response to its economic growth. In addition, the Environmental Management Commission (EMC) included a condition in Apex's interbasin transfer (IBT) certificate that requires them to return wastewater to the Cape Fear River Basin by January 1, 2011. Analysis of impacts considers all proposed water, wastewater, and local transportation infrastructure that is planned for full build-out as described in the Town's 2025 Land Use Plan. These proposed plans are based on the Town of Apex's Comprehensive Plan for providing water and sewer services to its citizens in a manner that will protect water quality, air quality, open space, wildlife habitat, and other environmental resources. Overall, the Town plans to manage growth in a sustainable way.

Growth in the Town of Apex will be facilitated by transportation facilities, including the NCDOT development of I-540, which will provide easy access to Research Triangle Park (RTP) and other communities within Wake County. Construction on the segment that extends from NC Highway 55 to the NC Highway 55 Bypass near Holly Springs is scheduled to begin in 2007. Direct and secondary and cumulative impacts of this roadway project have been addressed by the NCDOT. In general, the environmental documents indicate that the roadway and associated interchanges will not induce growth, but will influence 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 I-540 (Arcadis, 2003 and HNTB, 2003). Other roads are also being widened, some with projects undertaken by the Town, to help accommodate the growth (Figure 2-1).

The discussion provided in the following section reflects a general analysis of the potential for development to impact specific resources in the Planning Area, given current trends and literature records and input from State agencies via the scoping process. Agency correspondence is included in Appendix A. Mitigation efforts to limit these possible SCI are discussed in Section 6. As described in Section 1, direct impacts will be addressed in separate environmental documents that are prepared for infrastructure projects.

5.1 Topography and Floodplains

Clearing and grading of undeveloped lands will change the site's topography. The Town reviews erosion and sediment control plans to minimize grading in area of steeps slopes. The angle for graded slopes and fills is not permitted to be greater than the angle which can be retained by vegetative cover.

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 as corridors for wildlife movement. Impacts to floodplains will vary based on jurisdiction. Within the Town's urban growth area, impacts to floodplains will be limited due to the Town's UDO described in Section 6In areas outside the Town of Apex's current jurisdiction but within the Planning Area, impacts to floodplains are limited by Wake County's floodplain protection ordinances described in Appendix B.

5.2 Soils

As land is developed, clearing and grading will result in soil disturbance. During grading, soil will be moved; in some areas, it will be removed, while in other areas it will be replaced. Thus, the location of soil types may change. During clearing and grading, some soils will be eroded, but the impacts from this will be minimized by following an approved site plan in accordance with the Town's ordinance described in Section 6. By using heavy equipment on development sites, soils will be compacted.

5.3 Land Use

The Town's Land Use Plan was used to estimate future land use conditions. 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. Figure 5-1 illustrates broad land use categories within the Planning Area. Table 5-1 provides detail on the area (square miles) within each broad land use category. The pattern and rate of growth without infrastructure will be different with infrastructure; growth without infrastructure may be less dense than growth supported by infrastructure and the Land Use Plan, but it may be spread over a larger area. However, given the proximity of the area to RTP and a strong local economy, it is very unlikely that the current land use characterization would remain.

Figure 5-1

Figure 5-1Back

Table 5-2 provides detail on predicted future land use. Approximately 67 percent of the Planning Area will be developed land; another 23 percent is currently owned by Progress Energy. The future plans for the area owned by Progress Energy are unknown. Apex anticipates low density residential development in this area if Progress Energy chooses to develop its lands, which will include a minimum of 20 percent open space (3.2 acres). These lands are not included as mitigation measures within the SCI Master Mitigation Plan document.

TABLE 5-1
Town of Apex Future Land Use

Land Use Type	Square Miles	Percent of Planning Area
Residential Developed	33.4	47.7%
Non-residential Developed	13.2	18.9%
Undeveloped	0	0.0%
Open Space	3.8	5.4%
Open Water	3.9	5.6%
Progress Energy		
Undeveloped	11.7	16.7%
Gameland	4.0	5.7%
Total	**70**	**100%**

Source: Town of Apex GIS, 2005

Open spaces may become more fragmented near the Town Center, but impacts will be less in the Jordan Lake and Harris Lake Watersheds since lower density residential development is planned in these areas. The Land Use Plan represents full build-out conditions that are estimated to occur in 2025.

As shown in Table 4-2, currently residential use (21 percent) is the predominant land use within the Planning Area with the majority of residential use classified as low density (12 percent). Small amounts of clustered high- and medium-density residential developments exist. Residential development is primarily clustered around the Town Center and along the NC 55 corridor, Olive Chapel Road, and Old Raleigh Road. The most heavily urbanized areas lie along the NC 55, US 1, and US 64. As shown in Tables 4-2 and 5-2, the largest changes between existing and future land use will be in the reduction of undeveloped land. The largest increase in land use will be residential, particularly medium density residential.

Table 5-2 also includes percentage imperviousness; the values listed were used in modeling analyses performed for the Town of Cary (CH2M HILL, 2002a). These values are based on literature values. Based on these impervious values, an impervious area for each land use was estimated. These were then summed and divided by the total land area (with lakes subtracted from the total) to estimate the overall impervious value for future land use conditions. This value is 32.6 percent as compared to a current value of 22.5 percent.

If Progress Energy Lands are developed as low density residential (21 percent impervious) the overall impervious value would increase to approximately 36.9 percent. This represents a 14 percent increase in the impervious value from existing land use conditions to future land use conditions.

TABLE 5-2
Town of Apex Detailed Future Land Use

Land Use Type	Future (square miles)	Percent of Planning Area	Percent Impervious[1]	Impervious Square Miles
Agriculture	0	0.0%	2%	0.00
Undeveloped	0.0	0.0%	3%	0.00
Open Water	3.9	5.6%	N/A	n/a
Commercial	1.0	1.4%	82%	0.82
Industrial	1.4	2.0%	82%	1.15
Office and Institutional	2.0	2.9%	72%	1.44
Mixed Use	3.8	5.4%	72%	2.74
High-density Residential	1.5	2.1%	72%	1.08
Medium-density Residential	15.5	22.1%	44%	6.82
Low-density Residential	11.0	15.7%	21%	2.31
Very low density Residential	5.4	7.7%	6%	0.32
School	0.4	0.6%	72%	0.29
Park/Open Space	3.8	5.4%	4%	0.15
Transportation[2]	4.6	6.6%	87%	4.00
Progress Energy[3]				0.00
Undeveloped	11.7	16.7%	3%	0.35
Gameland	4.0	5.7%	2%	0.08
Total	**70**	**100%**		**21.6**

Source: Town of Apex, 2005 and CH2M HILL 2002a

[1] Impervious values most likely over estimate the percent impervious because reference categories contained slightly higher densities for residential classes than Apex designates; School was assumed to be represented as Institutional.
[2] Town of Apex Land Use Plan includes all neighborhood roads that do not appear on the scale provided in Figure 5-1.
[3]If Progress Energy Lands were developed the Low-density Residential category would increase by 15.7 square miles (22.4 percent of Planning Area)

5.3.1 Residential Land

The most heavily urbanized area is the Town Center, in the northeast portion of the Planning Area. Major transportation corridors also have associated residential and commercial development, including development along NC 55, US 64, and US 1.

The largest increases in land use types will be in the medium- and high-density residential categories. Mixed-use development is also encouraged with the Plan. Most development will surround the Town Center and the major highway corridors, as described in the Town's 2025 Land Use Plan. This will include growth patterns facilitated by the future I-540 corridor.

The most rural portions of the Town will be in the southwest, in the vicinity of Harris Lake, and in the most western portion of the Planning Area along Jordan Lake, which is slated for very low-density residential development and open space protection. The future plans for the area owned by Progress Energy are unknown. Apex anticipates low density residential development in this area if Progress Energy chooses to develop its lands. These lands are not included as mitigation measures within the SCI Master Mitigation Plan document.

5.3.2 Forested and Agricultural Land

The Land Use Plan does not include categories for forested and agricultural land. As described above, the land use plan is a guidance document that indicates the land use the Town prefers if land is developed. Agricultural land is allowed as a land use within the very low and low-density residential development categories. Similarly, currently forested land may remain as forest.

The largest changes between the existing and future land use will be the reductions in forested land and the increases in residential development. Forested and agricultural land will continue to decrease as low-density development served by wells and septic systems replace it. Even without the proposed infrastructure, growth is likely to occur in the Planning Area; however, the pattern and rate of growth will be different between these two scenarios.

5.3.3 Protection of Open Space

The Town has mechanisms in place to protect open space through the development process, as presented in Section 6. 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. Table 5-1 underestimates the amount of open space under future build-out conditions. Only one future planned park is shown on Figure 5-1 due to property owner sensitivities, the 2001 Parks, Recreation, Greenways and Open Space Master Plan Map (Appendix F) illustrates additional areas planned for preservation within the Town's ETJ as nodes that are not included in Figure 5-1.

Approximately 5 percent of the land within the Planning Area is protected as open space. This number is actually low; the riparian buffer and floodplain open space is actually counted in the other land use categories. Figure 4-2 illustrates the riparian buffers within the Town's ETJ, and these buffers account for 4.3 square miles (6.1 percent of Planning Area). Streams outside the Town's ETJ fall within the County's jurisdiction and have protection strategies in place. However, the County does not have a riparian buffer data layer to include a buffer open space calculation. These streams will fall under the Town's jurisdiction once the ETJ is expanded. When this occurs, the Town must verify whether the streams are perennial, intermittent, or ephemeral, which will determine the actual size of the buffer as described in Section 6. From inspection of the map, it appears that protected riparian buffers would be approximately double the current 4.3 square miles if existing riparian buffer regulations are translated to areas outside the ETJ. The floodplain area inside the Planning Area is 8.8 square miles (12.6 percent of the Planning Area). These areas are not separated from the land use categories listed in Table 5-2 due to technological complexities of the data layers used in the analysis. In addition, other areas within development areas such as perimeter buffers are actually open space.

The estimated open space would be at least two times the existing estimate, however, due to the lack of knowledge of specific development patterns and property owner sensitivities, it is difficult to map on a parcel by parcel basis. An additional 4 square miles of protected open space would be derived from the application of the Resource Conservation Area ordinance to the existing undeveloped lands. The Town of Apex anticipates low density residential development in the area of Progress Energy lands, which will include a minimum of 20 percent open space (3.2 acres). This calculation is separated because Progress Energy Lands are not included as mitigation measures within the SCI Master Mitigation Plan document. Table 5-2 summarizes the conditions that will occur if all land is developed, and does not show protected open space within developed land use categories.

If all land is developed, protected open space would increase to 11 square miles of the Planning Area (15.7 percent) excluding floodplains and riparian buffers. The actual percentage of open space within the Planning Area is greater due to the following factors: 1) significant portions of the areas classified as residential are open space due to the large amount of low-density development; 2) the Town requires open space in residential and commercial developments (at least 20 percent through its Resource Conservation Area requirements outlined in Section 6); and 3) the Town requires the protection of 100-foot riparian buffers and floodplains. In addition, as land is developed, the Town requires open space to be provided with the developments. Therefore, although the park and open space uses are limited, there are many areas that are undeveloped open space within the various land use designations.

While open spaces such as agricultural land and forests will still be lost to development, the impacts will be minimized by these efforts.

5.4 Wetlands

Wetlands within the Planning Area are primarily located 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 Planning Area. Wetland loss can result in habitat loss, habitat fragmentation, and reduction in species diversity. As discussed in Section 4, the majority of wetlands will be protected by existing floodplain and stream buffer regulations. Other programs which protect wetlands are described in Section 6.

Wetland functions also may be decreased if pollutant impacts occur. For example, sediment loading from stormwater runoff may impact hydrology and vegetation within a wetland. Nutrient enrichment and other surface water pollutants may impact aquatic and amphibious organisms inhabiting a wetland. In the long term, overall quality of wetlands may be decreased by SCI in upland portions of the Planning Area. However, these impacts will be minimized by stream buffers and other development controls.

While some wetland loss still occurs with this program, overall SCI to wetlands in the Planning Area will be minimized by the UDO's floodplain and stream buffer regulations.

5.5 Prime or Unique Agricultural Lands

The amount of agricultural lands will be significantly reduced in the Planning Area as lands are converted, mainly to residential uses. This includes the conversion of many acres of

prime farmland. However, recent growth has already converted many acres of agriculture and Prime Farmland within the Planning Area. This conversion would likely continue, even without the proposed infrastructure, as residential lots serviced by wells and septic systems increased in the area. While the pattern of growth may be different and the density may be lower, farmland will likely be converted. These impacts of land use changes could also include degradation of a land use type through the introduction of adjacent incompatible urban land uses. For example, the loss of viable farm income can occur when subdivisions are built adjacent to farmland. Because the value of the farmland rises as urbanization of the area occurs, farmers can be forced out of business due to increased property taxes. In addition, the new residential growth may cause associated farming businesses to move away, vandalism of crops begins to occur, and the use of farm equipment on public roads in the area becomes more dangerous with increased traffic.

While the 2025 Land Use Plan does not have an agriculture category (Table 5-2), agriculture is a permitted land use in the very low and low-density residential land use categories. It is likely that in the more rural areas of the Planning Area, to the west and south, agriculture will remain.

The Wake Soil and Water Conservation District works cooperatively with landowners to encourage farmland preservation and protection. This voluntary program was established in 1998 and includes efforts to provide farmers with proper estate planning, and protect farms through the purchase of development rights. The latter program has received limited funding, but has been successful in its limited applications. In addition, the County provides tax relief to qualifying farm owners to help offset tax burdens as property values rise in the County. Typically, as an area develops, property values rise and agricultural use of the land becomes economically unfeasible. The tax relief program was designed to address this issue.

5.6 Public Lands and Scenic, Recreational, and State Natural Areas

Growth in the Planning Area should have limited impact on scenic and recreational areas that are currently part of park systems. These areas may become more valued by the community as open spaces 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 which is outlined in Section 6. . With the continued implementation of the Town's Plans, scenic areas, open space, and parks will be a high priority for the Town to preserve to help offset the loss of undeveloped land that is currently acting as open space.

A large percentage of the open space in the Planning Area is the NCWRC gamelands as illustrated on Figure 5-1. Lowest density development is planned in areas directly adjacent to Jordan Lake gamelands.

5.7 Areas of Archaeological or Historical Value

Historical areas may be impacted directly by future projects, but secondary 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 due to its focus 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. A goal of Apex is to preserve historical landscapes that reflect the Town's rural heritage, including the protection of working farms. The UDO prohibits redevelopment for 48-months on demolished properties that fit the definition of "historic property" so historic structure are usually protected. Finally, some structural damage could occur due to vibrations from increased traffic or from acid rain that may occur from increased emissions to the atmosphere. It is likely that few SCI will occur to cultural and historical resources.

5.8 Air Quality

The cumulative impacts of a growing population may impact air quality in the Planning Area. As more vehicles travel within the Planning Area, levels of emitted air pollution may increase. Even without the proposed infrastructure, population within the Planning Area is likely to increase and contribute to higher levels of air pollution. While industrial emissions may also increase in the Planning Area, the primary source of air pollution is likely to remain as vehicles. Without improved roadways, it is likely that traffic problems would increase, exacerbating existing air quality problems. Smog, ozone, and carbon monoxide are the pollutants of concern within the Planning Area, and they are monitored. The area has struggled to meet the USEPA ozone standard, and this struggle is unlikely to improve as the area grows. As a result of this 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 researching and developing alternative modes of transportation as described in Section 6 and 7.. A regional light rail system is planned for the Triangle Area. Documents prepared for this project indicate that parking areas to serve the light rail system will not impact levels of carbon monoxide. The document also indicates that the light rail system will result in lower levels of vehicle pollutant emissions (U.S. Department of Transportation, 2002).

Wake County brought together an Air Quality Task Force whose goal was to eliminate Ozone Action Days by 2010 and to comply with National Ambient Air Quality Standards by 2007. This Task Force established 13 regional strategies to address air quality issues. Further information on this program is included in Section 7 and Appendix B.

5.9 Noise Levels

The predicted growth in the Planning 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 significant increase in number of vehicles using local roadways. The continued growth and development of the Planning 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 will also increase the base level of noise, potentially impacting wildlife behavior.

Efforts taken to improve air quality by promoting alternative forms of transportation will also limit SCI to noise levels in the Planning Area as described in Section 6 and 7.

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 Planning Area due to its proximity to RTP and the strong local economy. However, this growth would likely be less dense and would be serviced by wells and septic or community systems as the Town approached its water and sewer capacity, and travel times would increase without planned 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 within the Planning Area will increase (from an estimated 23 percent to 33 percent) resulting in an increase in stormwater runoff during rain event due to a decrease in pervious 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 rate of runoff may also impact stream channel stability and thus aquatic habitat. The increase in runoff may increase pollutant load, which will cause a decline in water quality and stream channel stability, and may create subsequent impacts on aquatic habitat, wetlands, and sensitive aquatic and amphibian species in the area. The increase in runoff may increase pollutant load causing a decline in water quality and creating 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 degraded aquatic habitat. Less rainfall will percolate to groundwater, which can reduce baseflow during dry weather. However, it should also be noted that the impacts on storm event and baseflow conditions are smaller in western Wake County than in other areas of the County due to the soil types found within the Planning Area. A groundwater study completed by Wake County in 2003 illustrates the highest percentage of hydrologic soils groups C and D (low infiltration capacity) in the Jordan Lake and Harris Lake watersheds. In addition, low flow recharge rates in streams were the lowest in western Wake County watersheds (0 gal/acre/day in Jordan Lake

watershed; 2 gal/acre/day in Swift Creek; 3 gal/acre/day in Middle Creek; 0 gal/acre/day in Harris Lake) (CDM, 2003).

Most waters within the Planning Area are classified as NSW in response to excessive growths 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. As agricultural land uses decrease in the Planning 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 impacts, but there is also a cumulative direct impact from previous crossings and other future crossings. The Town does not have the data to review this impact for its entire Planning Area, but will review it as a cumulative direct impact in future EAs and EISs.

Monitoring of both benthic macroinvertebrate and fish communities within the Planning Area by DENR will indicate if any water quality declines are impacting aquatic communities. The compositions of these aquatic communities provide insight into the effects of sediment loading, nutrient enrichment, and stream temperature changes, to name a few.

5.10.1.1 303(d)-Listed Streams

As previously discussed, land use changes may impact both water quality and quantity in the Planning 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, which are Williams Creek, Swift Creek, and Middle Creek. These waterbodies currently suffer from 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 in them, even with no future development. Increases in runoff may further degrade these waterbodies.

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 Planning Area by reducing the demand for groundwater as a source for drinking water and the public health risk of groundwater contamination 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, metals and nutrients from stormwater runoff, and volatile organic compounds.

A general increase in impervious surfaces may also 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 Jordan Lake watershed, groundwater recharge ranges from 2 to 4 inches per year (6 percent recharge as a percentage of precipitation). In the Harris Lake watershed, groundwater recharge ranges from 2-5 inches per year (8 percent recharge as a percentage of precipitation). As compared to the central and eastern portions of the County have recharge rates which range from 7 to 9 inches per year (CDM, 2003).

5.11 Forest Resources

According to Town land use planning data, much of the forested land within the Planning Area will be converted to other uses. Even without the planned infrastructure, forested land will likely be converted to low-density residential land that is serviced by wells and septic systems. The majority of the forested lands within the Planning Area are currently coniferous cultivated pines. While this change provides a one-time source of timber products, this land use conversion is not suitable for sustainable silviculture activities.

Forested communities are likely to remain mainly along stream channels. Overall, forested wildlife habitat will be reduced within the Planning Area and may become more fragmented.

Impacts to forested lands will be lower in the Jordan Lake Watershed because of WSW regulations limiting the amount of built-upon area. The existing Land Use Plan only includes low-density residential development in this watershed, protecting some forest resources, wildlife habitat, and the Town's drinking water supply.

Trees also filter air and their shade can cool air temperatures. Loss of forest resources may also impact their air 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 non-point source pollutants. These changes may affect a fish community by altering species diversity and/or the number of individuals within a community, which decreases the potential for long-term sustainable healthy fish community. Those species of fish 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 both may occur—a community may lose 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 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 impacts, but there is also a cumulative direct impact from previous crossings and other future crossings. The Town does not have the data to review this impact for its entire Planning Area. The Town knows the general location of its infrastructure lines, but the data are not detailed enough to review all line impacts throughout its Planning Area. This issue will be reviewedas 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 habitat 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 general 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.

Impacts to aquatic species and their habitats may also be pronounced without proper protective measures in place. These changes in land use lead to increased sedimentation and can deliver more stormwater pollutants to the system, reduce the stability of stream banks, and cause other significant channel modifications.

Following is a discussion of the potential impacts to more rare wildlife and wildlife habitats found within the Planning Area. Impacts to fish communities were discussed in Section 5.10. Forested areas and habitats were discussed in Section 5.11.

5.13.1 Rare, Threatened, or Endangered Species

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 5-3 presents a list of potentially present Federally listed species within the Planning Area and possible SCI to these species. This list is based on the presence of habitat and observations of the species at some time within Wake County.

Based on information gathered from NHP (2004) and CGIA (2004) and the freshwater mussel field survey conducted by CZR (2004), one Federally listed species is present within the Planning Area. Michaux's sumac is located near the Shearon Harris Longleaf Pine Forest SNHA. Many SNHAs also provide habitat to State-listed plant species. There is a potential

for impact to populations of Michaux's sumac due to fire suppression and habitat loss. It is likely that present populations will remain small. The area where this species is present is planned for low-density residential development only. 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. Thus, the Town will evaluate the potential for impacts to this species in all future environmental documents.

It is of note that no dwarf wedgemussel individuals were located within the Planning Area during the survey. In addition, no dwarf wedgemussels were found during a survey conducted in 2001 in downstream areas of Middle Creek from approximately 1,500 feet upstream of SR 1006 to SR 1330 in Johnston County (CZR, 2001). Since no dwarf wedgemussels were located in Middle Creek during either survey, and the impoundments on Swift Creek will protect any downstream specimen, the potential for the proposed infrastructure to impact this species is low. In addition, the entire Apex Planning Area is upstream of Sunset Lake on Middle Creek, which will help protect any downstream mussel populations there. Other State-listed mussel species are present within the Planning Area.

TABLE 5-3
Likelihood of SCI to Federally Listed Species within Wake County

Scientific Name	Common Name	Federal Status	County Status	Likelihood of SCI within Planning Area*
Haliaeetus leucocephalus	Bald eagle	T (P/D)	Current	Not likely to be impacted
Heterodon simus	Southern hognose snake	FSC	Obscure	Not likely to be impacted
Lythrurus matutinus	Pinewoods shiner	FSC	Current	Not likely to be impacted
Aimophila aestivalis	Bachman's Sparrow	FSC	Historic	Not likely to be impacted
Myotis austroriparius	Southeastern Myotis	FSC	Historic	Not likely to be impacted
Picoides borealis	Red-cockaded Woodpecker	E	Historic	Not likely to be impacted
Alasmidonta heterodon	Dwarf wedgemussel	E	Current	Possible Impact
Fusconaia masoni	Atlantic pigtoe	FSC	Current	Probable Impact
Elliptio lanceolata	Yellow lance	FSC	Current	Possible Impact
Lasmigona subviridis	Green floater	FSC	Current	Possible Impact
Speyeria diana	Diana fritillary	FSC	Obscure	Not likely to be impacted
Lindera subcoriacea	Bog spicebush	FSC	Current	Possible Impact
Trillium pusillum var. pusillum	Carolina least trillium	FSC	Current	Possible Impact
Rhus michauxii	Michaux's Sumac	E	Current	Not likely to be impacted
Monotropsis odorata	Sweet Pinesap	FSC	Historic	Not likely to be impacted

*A probable impact indicates that without proper mitigation policies and ordinances, an impact to the species is likely. With the mitigation programs summarized in Section 6, the likelihood of impacts will be reduced. A possible impact has a lower probability of impact than a probable impact without proper mitigation policies and ordinances in place.

No Federally listed species were found within the Planning Area, but the Federal species of concern *Fusconaia masoni*, was found downstream of the Planning Area on Middle Creek. For these aquatic species to survive, their aquatic habitats and associated host fish communities

must be preserved. Methods to address and mitigate SCI that may impact water quality and aquatic habitats of these species are presented in Section 6.0. 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. 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 impacts, but there is also a cumulative direct impact from previous crossings and other future crossings. The Town does not have the data to review this impact for its entire Planning Area, but will review it 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 addition, the Swift Creek Watershed in the eastern portion of the Planning Area is classified by the State as SAESH and has a land management plan in place to limit impacts to aquatic species (Appendix F).

5.13.2 Natural Vegetation

Within the Planning 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 Planning 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 is not afforded 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 residential land serviced by wells and septic systems. This conversion would likely result in many of the same impacts to natural vegetation and habitat described above.

Trees and vegetation are integral to habitat protection, air quality improvement, control of surface water runoff, and temperature moderation. The Town of Apex has a tree protection ordinance found in Section 8.1.3 of the UDO that is described in Section 6.

5.14 Introduction of Toxic Substances

As urbanization continues in the Planning 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 entering the sewer system and reaching the WRF. 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 increase, 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 into surface waters, this urban stormwater could impact the water quality and sensitive species living within the receiving basin.

The long-term impact of new toxic discharges to the surface water and groundwater from urban stormwater, landfill leachate, 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

Table 5-4 presents a summary of possible and anticipated SCI to natural resources as a result of current and future growth in the Planning Area. This table is meant as a summary and does not determine the level of significance of impacts to each of the natural resource categories. Mitigation efforts to limit environmental resource impacts are detailed in Section 6.

TABLE 5-4
Areas of Potential Impacts to be Addressed by Permitting and Mitigation

Environmental Resource	Potential for SCI	Types of SCIs
Floodplains	LI	Minimal loss of floodplain storage from commercial development; this could result in reduction in water storage capacity, habitat, surface water filtration, and infiltration
		Isolation of floodplain from stream by channel entrenchment;
Soils	LI	Soil erosion and compaction
Land Use	PI	Conversion of agricultural and forested land uses to mainly residential land uses
Wetlands	LI	Majority of wetlands within riparian zones are protected by buffers and floodplain regulations
		Wetlands loss results in loss of habitat, habitat fragmentation, reduction in genetic diversity, and loss of attenuation of flow
		Loss of wetland function through pollutant loading
Agricultural Land	PI	Conversion to other uses
Scenic and Recreational Areas	LI	Possibility of conversion of adjacent land uses
Archeological and Historical Resources	LI	Possibility of conversion of adjacent land uses
		Structural damage due to acid rain and vibrations
Air Quality	LI	Reduction in air quality due to increased vehicular traffic
		Negative impacts to human health (i.e. asthma);
		Acid rain
		Reduced visibility
Noise	PI	Increase in overall noise level in Planning Area
		Negative impacts to human health
Surface Water Resources	PI	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

TABLE 5-4
Areas of Potential Impacts to be Addressed by Permitting and Mitigation

Environmental Resource	Potential for SCI	Types of SCIs
Groundwater Resources	LI	Reduction in use for drinking water; potential to become contaminated
		Groundwater inflow provides baseflow in streams and supports life during droughts may be reduced
Forest Resources	PI	Conversion to other uses
		Reduction in air quality; increase in near-surface air temperature; habitat fragmentation
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
Wildlife Resources	PI	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
Toxic Substances	LI	Increase in likelihood of contamination
		Negative impacts to human health

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

SECTION 6

Mitigation for Secondary and Cumulative Impacts

The Town of Apex is growing rapidly as a result of the overall healthy economic conditions in the region and is specifically fueled by continued job growth in the Research Triangle area. As a result of higher wages brought on by this economic growth and the proximity to RTP, the Town of Apex has experienced a steady influx of new workers and residents. Continued population growth is anticipated. Apex places a high priority on preserving its character in order to maintain its unique identity. It contains a newly restored downtown, complete with specialty shops, family restaurants, and many historic buildings. Apex retains its small-town character through land use planning in a region that is experiencing rapid growth.

The mission of the Apex Planning Department is to provide coordinated guidance and regulation of the growth and development of the Town through the review of subdivision and site development plans; the creation and implementation of long-range land use, transportation, and hazard mitigation plans; and the enforcement of the Town's UDO. The Planning Department is committed to ensuring quality development within the Town of Apex that protects environmentally sensitive areas, provides for adequate transportation networks, promotes economic vitality, provides quality housing at affordable prices, and promotes a sense of community that is compatible with the small town character of Apex.

The Town is working to address environmental concerns related to open space, water, wastewater, transportation, and stormwater. Apex has implemented programs to direct growth to its Town Center, preserve open space, protect floodplain and riparian buffers, and maintain water quality through aggressive erosion and sediment control and stormwater programs. This section identifies and discusses these local programs and illustrates how they fit with Federal and State programs. These programs mitigate the potential SCI discussed in Section 5.

6.1 Summary of Federal and State Regulations and Programs

Several Federal and State regulations and programs will mitigate the impacts of growth. These include: the Endangered Species Act of 1973, the Clean Water Act, Clean Air Act, National Flood Insurance Program (NFIP), stormwater regulations, programs to reduce nutrient loading in the Neuse River Basin, archaeological protection through various laws and programs, the Sedimentation and Pollution Control Act, the WSW Program, Clean Water Management Trust Fund (CWMTF), and Ecosystem Enhancement Program. Table 6-1 summarizes these programs and indicates whether local involvement is needed to fully implement them. Where local programs are needed to implement the State and Federal regulations and/or programs, the program description is provided under the Town of Apex regulations.

TABLE 6-1
Summary of Existing State and Federal Programs and the Environmental Resources They Protect

Program or Regulation	Local Govt. Program Required	Wetlands	Land Use	Fish and Wildlife	Sensitive Species	Water Quality	Air Quality	Ground-water	Noise	Toxics
Endangered Species Act		X	X	X	X	X				
Fish and Wildlife Coordination Act				X	X					
Sect 303(d)		X		X		X	X			X
Sect. 404		X	X	X	X	X				
Sect. 401		X	X	X	X	X				
Protection of Wetlands		X	X	X	X	X				
Isolated Wetland Protection		X	X	X	X	X				
Safe Drinking Water Act		X	X			X		X		X
Clean Air Act							X			
Floodplain Management		X	X			X				
NFIP		X	X	X	X	X				X
NPDES Stormwater	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 and Enhancement of Cultural Environment			X							
Farmland Protection Policy Act			X							
Sediment and Erosion Control	X	X	X	X	X	X				
Sanitary Sewer Overflow Regulations.		X	X	X	X	X		X		X
CWMTF		(X)	(X)	(X)	(X)	(X)				
NC Ecosystem Enhancement Program		X		X	X	X				
Groundwater			X					X		X
Neuse NSW	X	X		X	X	X				
WSW	X	X	X	X	X	X				
Land Conserv. Incentives		(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)

6.1.1 Endangered Species Act

The 1973 Endangered Species Act 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 Act:

- Authorizes the determination and listing of species as endangered and threatened.
- Prohibits unauthorized taking, possession, sale, and 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 Act or regulations.
- Authorizes the payment of rewards to anyone furnishing information leading to arrest and conviction for any violation of the Act of any regulation issued there under.
- Requires Federal agencies to ensure that any action authorized, funded, or carried out by them is not likely to jeopardize the continued existence of listed species or modify their critical habitat.

6.1.2 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 due to 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 aforementioned wildlife protection agencies.

6.1.3 Section 303(d) of the Clean Water Act

Section 303(d) of the Clean Water Act requires states to identify waters that do not support their classified uses. These waters must be prioritized, and a TMDL must subsequently be developed. TMDLs are calculations that determine the maximum amount of a pollutant that a waterbody 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.

DWQ is currently developing a TMDL for the upper New Hope Creek arm of Jordan Lake and a nutrient management strategy for other portions of the lake. Although the TMDL and strategies are currently under development, it is likely that nonpoint source reductions of nitrogen and phosphorus will be required. If strategies are required that the Town of Apex is currently not implementing, the Town may be required to modify its development policies.

The Town will work with DWQ to implement other TMDLs as they are developed. In addition, the Town will work with DWQ on management strategies developed for impaired waters within its jurisdiction. For example, the Ecosystem Enhancement Program (EEP) recently developed a management plan for the Swift Creek watershed; the Town met with EEP to discuss the results of the plan and locations of planned BMPs. The Town will work with DWQ and EEP to implement that plan as funding becomes available.

6.1.4 Sections 404/401 of the Clean Water Act

Two main regulatory programs currently regulate impacts to jurisdictional waters, including streams and wetlands in the project area, both of which originate from the Federal Clean Water Act: Section 404, regulation of dredge and fill activities (which is 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 (which is administered by DWQ). All private and public construction activities over a specific acreage that affect jurisdictional waters are required to obtain certifications and permits from DWQ (Section 401 WQ Certification) and USACE (Section 404 Permits), respectively.

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

A common problem in the adequate protection of jurisdictional waters is inadequate personnel at both State and Federal levels to enforce the regulations. Effective March 1999, DWQ stepped up the enforcement of regulations for wetlands protection, particularly those related to hydrologic conditions necessary to support wetlands function (15A NCAC 2B.0231(b)(5)) and biological integrity (15A NCAC 2B.0231(b)(6)). DWQ is joined in this initiative by the North Carolina Division of Land Resources (DLR), which also will be looking at possible violations of the State Sedimentation Pollution Control Act.

6.1.5 Protection of Wetlands, Executive Order 11990

The Protection of Wetlands (Executive Order 11990) was set into place to avoid long- and short- term adverse impacts associated with the destruction or modification of wetlands. Every Federal agency must take action to minimize the destruction, loss, and degradation of wetlands, as well as working 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.

6.1.6 Isolated Wetland Protection

Isolated wetlands are those that have no visible connection to surface waters, and are therefore not regulated under Section 404 of the Clean Water Act. North Carolina's Division of Water Quality has jurisdiction over isolated wetlands within the state's boundaries. NC DWQ states that any activity that results in the loss of wetland function including filling, excavating, draining, and flooding shall be considered a wetland impact. Impacts to isolated wetlands are subject to the requirement of NC DWQ permitting and mitigative measures.

6.1.7 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.

6.1.8 Clean Air Act

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 the violation of the national 8-hour ozone standard. 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. Wake County is classified as a basic nonattainment area and, therefore, the County must meet an ozone attainment date of June 2009. As a result of this classification, local and state regulators must develop a plan to meet the 8-hour ozone standard.

The area will be subject to transportation conformity requirements that require local transportation and air officials to ensure that transportation projects do not affect the area's ability to reach its clean air goals. Conformity requirements may require alternative transportation methods to limit additional roads and vehicle miles traveled, as well as transportation control measures to offset the growth in vehicle miles traveled. For example, this could include the use of alternative fuel vehicles or the use of intelligent transportation systems that use detection loops and other systems to monitor traffic. The intelligent transportation system provides drivers with information concerning lane closures and other traffic delays so they can use alternative routes and reduce idling and emissions.

In North Carolina, the Division of Air Quality has implemented an aggressive Air Awareness Education Program that includes daily reports on the ozone forecasts by meteorologists, 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.

6.1.9 Floodplain Management, Executive Order 11988

Floodplain Management (Exec. Order 11988) 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 a floodplain. Federally supported projects that directly impact floodplains need to consider alternatives which avoid the floodplain.

6.1.10 National Flood Insurance Program

A Federal non-regulatory program that may afford some protection to stream riparian areas and wetlands, and also protect water quality by restricting floodplain development, is the NFIP. FEMA manages this program, which 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 it generally covers zoning, subdivision, or building requirements and special-purpose floodplain ordinances. Protection of wetlands and riparian areas is provided through restrictions on development within floodplains. Information on Apex's flood protection programs that exceed NFIP requirements are further discussed in the Local Regulations and Programs section.

6.1.11 NPDES Stormwater Regulations

NPDES stormwater discharges are controlled by Federal NPDES regulations, as enforced by DWQ. 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 six municipal separate storm sewer systems (MS4s) in North Carolina with populations exceeding 100,000. USEPA's Phase II rules were finalized on October 29, 1999, and published in the Federal Register on December 8, 1999. Under NPDES Phase II regulations, the Town of Apex is required to develop and implement a stormwater management program.

There are six minimum measures to the Phase II requirements:

- Illicit discharge detection and elimination
- Construction site runoff control for sites of one acre or more
- Post-construction runoff control
- Pollution prevention and good housekeeping
- Public education and outreach
- Public participation and involvement

For the post-construction runoff control, DWQ requires local governments subject to Phase II to require new developments where density exceeds 24 percent built-upon area to implement stormwater best management practices (BMPs). These BMPs must control and treat the difference in stormwater runoff volume leaving the project site between the pre- and post-development conditions for the 1-year, 24-hour storm. In addition, the BMPs must achieve 85 percent reduction in total suspended solids (TSS) loading.

The Town of Apex submitted its Phase II permit application, which exceeds the Federal requirements, in March 2003 (Appendix F). The Town received a draft NPDES permit (Appendix F).The Town's stormwater programs are discussed further under the Local Regulations and Programs section.

6.1.12 Wild and Scenic Rivers Act

The Wild and Scenic River Act charges the United States 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 should 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 policy. The classification of rivers under this Act fall into three different categories separated by different characters. These classifications include:

- Wild river areas: Rivers or sections of rivers that are free of impoundments and are generally inaccessible except by trail. Watershed 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 Wild and Scenic rivers exist in Wake County.

6.1.13 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. Unfortunately, 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 often catches some of these projects, since they require archaeological reviews for any project that needs a Section 404 (Federal wetlands) permit.

6.1.12.1 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 due to:

- Flooding
- Building of access roads
- Erection of workmen's 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.

6.1.12.2 National Historic Preservation Act

The National Historic Preservation Act 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 Act authorizes the Department of the Interior to establish, maintain, and expand the National Register of Historic Places. State Historic Preservation Officer (SHPO) responsibilities are established by the Act, and it levees them with the responsibility to develop a statewide plan for preservation, surveying historic properties, nominating properties to the National Register, providing technical assistance to Federal, State, and local agencies, as well as undertaking the review of Federal activities that affect historic properties.

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

This 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 for candidacy for the NRHP. All sites listed within the National Register 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 will take timely steps to make record of all data present in that property. That record is kept in the Library of Congress.

6.1.14 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. The Act assures that Federal programs will be administered in such a manner to not be incompatible with State and local governments, as well as private programs with policies to protect farmland. This Act is implemented by the USDA.

6.1.15 Sediment and Erosion Control

The DLR administers programs to control erosion and sedimentation caused by land-disturbing activities on one or more acres of land. Control measures must be planned, designed, and constructed to protect 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. The Town of Apex enforces its own erosion and sedimentation control program, which exceeds DLR requirements. This program is discussed further under the Local Regulations and Programs section.

6.1.16 Sanitary Sewer Overflows

The USEPA prohibits discharges to Waters of the United States from 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. In summary, each USEPA region is responsible for developing an enforcement response plan, which includes an inventory of sanitary sewer overflow violations and describes how 20 percent of the priority systems with sanitary sewer overflow violations

will be addressed each year (personal communication with Kevin Weisee, USEPA). Municipalities can now obtain guidance from the USEPA for their systems.

State regulations (15A NCAC 2B.05.06) 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. DWQ adopted policies that include strict fines and other enforcement programs to protect surface water quality from wastewater spills.

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. Apex currently operates its collection system under a DWQ System-Wide Wastewater Collection System Permit issued on October 17, 2003.

6.1.17 North Carolina Clean Water Management Trust Fund

The CWMTF was created by the 1996 Legislature to help finance projects that specifically address water pollution problems. 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. According to the enabling legislation, 6.5 percent of the unreserved credit balance remaining in the State's General Fund at the end of each fiscal year is allocated to the CWMTF for disbursement. The minimum amount available must be $30 million.

Possible use of CWMTF 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.

The Town of Apex partnered with the CWMTF and Wake County Open Space to acquire 45.8 acres of undisturbed land along a tributary of Beaver Creek. A conservation easement has been placed on the portion of the property along the tributary to protect water quality by protecting the riparian buffer and floodplain areas.

6.1.18 North Carolina Ecosystem Enhancement Program (formerly Wetlands Restoration Program)

The Ecosystem Enhancement Program was established as a non-regulatory program within DENR to:

- 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 Ecosystem Enhancement Program also provides a compensatory mitigation option for permit applicants other than the NCDOT, administers the Mitigation Program for Protection

and Maintenance of Existing Riparian Buffers in the Neuse, Tar-Pamlico, and Catawba River Basins, and provides a repository for nutrient offset payments in the Neuse River Basin.

The Town will work with EEP to implement plans EEP develops within its jurisdiction. For example, EEP recently developed a management plan for the Swift Creek watershed; the Town met with EEP to discuss the results of the plan and locations of planned BMPs. The Town will work with EEP to implement that plan as funding becomes available.

6.1.19 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 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 programs.

6.1.20 Neuse River Basin Nutrient Sensitive Waters Rules

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 phosphorous was considered the controlling nutrient.

Increasing algal blooms and fish kills in the estuarine portion of the Neuse River, attributed to nitrogen overenrichment, led to a revision of the NSW strategy to address nitrogen inputs to the estuary. The Neuse River NSW Strategy Rules became effective August 1, 1998. While this revised strategy places more stringent nutrient removal requirements on point-source dischargers, the strategy 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 watershed's ecological integrity. Rules specific to Apex are discussed further under the Local Regulations and Programs section.

6.1.21 Water Supply Watershed Protection Program

The Environmental Management Commission and DWQ have administered a Water Supply 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 WSWs.

In 1989, the North Carolina General Assembly ratified the WSW Protection Act, codified as General Statutes 143-214.5 and 143-214.6. This Act mandated the Environmental Management Commission to adopt minimum statewide water supply protection standards by January 1, 1991, and to reclassify all existing surface WSWs 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 Non-Point 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

DWQ manages the program through oversight of local planning ordinances and monitoring of land use activities. Local WSW programs must be approved by the Environmental Management Commission. The WSW program requires local governments to adopt the following land use controls and limitations based on watershed classifications:

- Limits impervious surfaces around water supplies unless stormwater controls are used
- Requires protection of riparian buffers (100-foot buffers in all development that exceeds the low-density option, or 30-foot 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 large portion of the Town of Apex is within the Jordan Lake and Swift Creek WSWs. These regulations are in line with the Swift Creek Land Management Plan developed by the County and local governments with jurisdiction in the Swift Creek watershed in 1988 (Appendix F). Apex has developed watershed protection overlays and restrictions associated with these areas that are described further under the Local Regulations and Programs section.

6.1.22 Conservation Reserve Enhancement Program

The USDA and DENR have launched the Conservation Reserve Enhancement Program, with the participation of the Natural Resources Conservation Service, the Farm Service Agency, the Ecosystem Enhancement Program, and the CWMTF, to create 5,000 acres of buffers and conservation areas in the Jordan Lake Watershed. The Conservation Reserve Enhancement Program is also available in the Neuse River Basin. This program uses financial incentives to encourage farmers to voluntarily remove sensitive land from agricultural use.

6.1.23 Miscellaneous 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.

6.2 Local Regulations and Programs

Environmental protection is a cornerstone value in Apex. The Town has developed several programs to meet its internal goals to provide a quality life for its citizens. To meet those goals, it has established a parks, recreation, greenways, and open space master plan with emphasis on protecting important habitat areas and water quality, a comprehensive plan, and land use plans that encourage growth in certain areas and discourage growth in other areas. Apex also has reviewed its ordinances to allow cluster development to encourage higher density in parts of a given development and greater preserved open space in other areas. These plans are implemented through the subdivision and/or site plan approval process. In addition, the Town has developed a riparian buffer protection program, floodplain program, erosion and sediment control program, and stormwater program to protect water quality and instream habitat. Table 6-2 summarizes the programs that impact development procedures, and Table 6-3 illustrates the environmental resources that various programs protect.

TABLE 6-2
Summary of Existing Local Programs

Program	Summary
Riparian Buffers (UDO 6.1.11)	Requirements greater than the State's requirements. The Town of Apex's UDO 6.1.11 requires 100-foot riparian buffers along perennial streams and 50-foot riparian buffers along intermittent streams. For each of these buffers, the inner 80 feet or inner 30 feet, respectively, is undisturbed forested buffer. The outer 20 feet must be re-vegetated. The perennial or intermittent stream classification is determined by the most recent version of a USGS quadrangle topographic map and/or Soil Survey for Wake County. In the event of discrepancy, the classification requiring the most stringent buffer would apply. In waters that are not classified as water supply, the Town allows the buffer width to be averaged. Under this scenario, the minimum width along any point on the stream is 60 feet, but the average buffer width must be 100 feet. Allowing buffer widths to be averaged may result in wider buffers along steep slopes or along floodplains. For lakes and ponds 100-foot vegetated buffers are required if the lake or pond joins with a perennial stream, otherwise, a 50-foot vegetated buffer is required if the lake or pond joins with an intermittent stream.
Floodplain Protection (UDO 6.2.16)	Requirements greater than the State's requirements. According to Section 6.2.16 of the UDO, the Town of Apex does not allow residential development in the 100-year floodplain. No encroachments, including fill, are permitted in the floodway. According to Section 6.2.16 of the UDO, the Town of Apex requires that the bottom floor be elevated 2 feet above base flood elevation on FEMA-mapped streams for commercial, industrial, or nonresidential structures. According to Section 6.2.17 of the UDO, where base flood elevations are unknown, Apex allows no encroachments, including fill, within 20 feet of the top of the stream bank or within a distance of 5 times the stream width, whichever is greater, unless a Professional Engineer certifies that the encroachment will not result in an increase in the base flood level.

TABLE 6-2
Summary of Existing Local Programs

Program	Summary
	When base flood elevation data or floodway data are unknown, a hydraulic report must be submitted that defines the base flood or floodway elevation. Apex's Section 6.2.18 of the UDO requires that all residential lots be platted outside of floodplains.
Erosion and Sediment Control Program (Chapter 5, Article X, Sec. 5-140 to 5-161)	Requirements greater than the State's requirements. The Town of Apex's sediment and erosion control practices support an overall stream protection plan by limiting in-stream suspended sediment and sediment deposition. The erosion and sediment control strategy is discussed at a pre-construction conference through the permit and plan approval process, which also allows for the review of stormwater controls. A permit is required for land-disturbing activity over 1 acre in surface area, and the Town is proposing to decrease this threshold to 20,000 square feet. The Town of Apex does not allow any land-disturbing activity in proximity to a lake or natural watercourse unless erosion and sedimentation control measures are present. An undisturbed buffer may be used, provided the undisturbed zone width is sufficient to confine visible siltation within the 25 percent of the undisturbed zone nearest the land disturbing activity. The Town of Apex requires tree protection fencing and silt fencing as erosion and sediment control measures, along with perimeter ditches or perimeter swales, if practical. The Town of Apex requires that sediment and erosion control plans use the proven latest technology related to erosion and sediment control practices and limit exposure time. Soils are stabilized as rapidly as possible by establishing a grass cover or mulching and tacking. The proposed ordinance would require this to occur in a maximum of 15 working days or 30 calendar days, while the current ordinance is 30 working days or 120 calendar days, whichever is shorter. Phased construction is reviewed in the Town of Apex sediment and erosion control plan submittal process on a site-specific basis. Site conditions, topography, soils, and type of construction determine the size of the phases. The largest phase size of 5 acres is recommended. The angle for graded slopes and fills shall be no greater than the angle, which can be retained by vegetative cover. The Town of Apex also encourages contractor education and training related to erosion and sediment control.
Stormwater Program and Impervious Surface Limitations (UDO 6.1.12 and UDO 6.1.7)	Requirements greater than the State's requirements. The Town maintains a strict policy of not allowing unnecessary piping of stormwater. Stormwater from residential lots and other pervious surfaces is made to flow by way of grass-lined swales instead of pipe where possible. The Town of Apex also requires that the pre-development peak runoff rate be maintained for the 1-year, 24-hour storm and the 10-year, 24-hour storm. Detention volumes stored to reduce peak flows shall drain within 72 hours to allow for subsequent storms. (UDO 6.1.7) The Town of Apex requires a stormwater impact statement showing the impacts of the proposed development to the confluence point downstream where the area of the proposed development is less than 10 percent of the total drainage area. The impact statement ensures the downstream hydrograph peaks do not increase for a given storm. If backwater from detention appears to be a problem, then the potential effects on upstream properties for the 100-year, 24-hour storm must be considered. (UDO 6.1.7) Apex has submitted a Phase II Federal NPDES Stormwater compliance application (Appendix F). The Phase II program will regulate discharges of stormwater to surface waters and will require control of suspended solids, fecal coliform and nutrients town-wide. DWQ's current Phase II regulations require that the overall runoff volume be controlled. The Town received a draft NPDES permit (Appendix F). The Town of Apex has impervious surface limitations that range from less than 12 percent (low density) to 70 percent. However, resource conservation areas are required. Under Phase II, any development that exceeds 24 percent will be required to implement stormwater BMPs and the Town's requirements exceed Phase II by requiring stormwater controls on any development that exceeds 12 percent. Apex has an active stormwater education program.

TABLE 6-3
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
Comprehensive Plan	X	X	X	X
Open Space Planning	X	X	X	X
Land Use Planning	X	X	X	X
UDO and Zoning Process	X	X	X	X
Parks, Recreation, Greenways, and Open Space Master Plans	X	X	X	X
Riparian Buffers and Floodplain Protection	X	X	X	X
WSW Protection	X	X	X	
Erosion and Sediment Control		X	X	
Stormwater and Impervious Surface Limitations		X	X	
Water Conservation		X	X	
Air Pollution Prevention				X
Tree Protection	X	X	X	X

The following summary addresses relevant regulations and programs from an environmental management and land use policy analysis perspective. These local initiatives prevent impacts to natural resources and will offset future impacts resulting from growth.

6.2.1 Town of Apex Comprehensive Plan

The Town of Apex's Comprehensive Plan lays the foundation for achieving many of its goals and objectives. The Board of Commissioners adopted this plan on April 20, 2004. The Comprehensive Plan seeks to identify the specific issues facing Apex and conveys a vision for its future. The Comprehensive Plan provides a framework for incorporating ongoing projects and new initiatives within a larger management strategy and serves as a guide for long-range planning, revision of local development regulations and review processes, and infrastructure investment. The Comprehensive Plan includes information on land use, growth management, economic development, capital facilities planning, transportation, open space, and historic resources.

The Town of Apex Comprehensive Plan establishes goals for the future of Apex. These goals were used to guide the development of the Comprehensive Plan:

- Preservation of Apex's character
- Improved economic health
- Compatibility between new development and existing development
- Affordable housing options

- Community schools that can accommodate all of Apex's school-age children
- Preservation of historic properties
- Employment centers
- Protection of natural resources
- Continuation and enhancement of the distinctive design of Apex's downtown properties, including buildings, and other features
- Infrastructure that helps achieve land use and growth management objectives
- Pedestrian and bicycle facilities throughout Apex
- Efficient traffic circulation

The Comprehensive Plan contains a section of recommendations and implementation issues related to seven areas: Growth Management, Land Use and Urban Design, Economic Development, Capital Facilities Planning, Transportation, Open Space, and Historic Resources.

Growth Management is critical to maintaining Apex's small-town character. In the Growth Management area, the key recommendations and implementation strategies are:

- Do not extend water and sewer service beyond USA.
- Accommodate development at higher densities in key areas of town to offset the growth restrictions.
- Engage in proactive initiatives with Wake County to coordinate the County's planning and permitting closely with Apex's plans for the area outside its current Planning Area.
- Seek County approval for the extension of the ETJ to the full extent allowed by statute.
- Develop and adopt an annexation strategy.

The balance of growth and environmental protection can be achieved through land use planning. In the Land Use and Urban Growth area, the key recommendations and implementation strategies are:

- Encourage a mixture of complementary uses, especially where contiguous, undeveloped parcels of land present opportunities for mixed-use development.
- Facilitate or require a concentration of uses at a scale that is conducive to walking or bicycling for maximum accessibility to the variety of uses in the activity centers. Establish minimum standards for design and density to achieve the desired character.
- Develop a set of community design guidelines.
- Encourage in-fill development.
- Promote clustering in residential developments.
- Promote commercial and residential compatibility.

- Within the Apex Peakway, establish standards for new development consistent with existing development to reinforce the small-town character.
- Conduct a land use and design study of the Apex Peakway corridor.
- Conduct and adopt detailed, special studies or small area plans for key activity centers.
- Protect the scenic quality of the properties adjacent to proposed I-540 as part of a coordinated effort with Wake County.
- Revise the UDO.
- Amend the Town of Apex Land Use Plan to reflect the proposed land use patterns depicted in the Comprehensive Plan Map.

6.2.2 Open Space Preservation

Open space helps maintain the level of perviousness 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 Apex, open space protection can provide wildlife corridors between these important habitat areas.

The Town of Apex has several programs to preserve open space. These include open space plans and initiatives, Land Use Plans, and a UDO. Each of these initiatives is described in greater detail below.

6.2.2.1 Town of Apex Parks, Recreation, Greenways, and Open Space Master Plan

The current Parks, Recreation, Greenways, and Open Space Master Plan was approved by the Parks, Recreation, and Cultural Resources Advisory Commission on October 10, 2001, and formally adopted by the Town Board of Commissioners on November 20, 2001. It sets forth a plan of action to identify and protect the Town'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. Implementation of the Master Plan will provide a framework for the eventual development of a "green infrastructure" for Apex. Only one future planned park is shown on Figure 5-1 due to property owner sensitivities, the 2001 Parks, Recreation, Greenways and Open Space Master Plan Map (Appendix F) illustrates additional areas planned for preservation within the Town's ETJ.

From a regional perspective, the plan was coordinated with surrounding municipalities and Wake County with regard to greenway connections. By working with other agencies, the Town was able to ensure that its plans would result in interconnected open space with other planned open space lands. Issues such as water quality, open space preservation, and environmental protection were also part of the adopted plan, as was the adoption of a clear set of goals and objectives for the Town in its provision of leisure services. Selected goals of the Master Plan are:

- Coordinate with the Apex Planning and Community Development Department to maximize the benefits of Resource Conservation Areas (RCAs), recreation dedications, and fees-in-lieu, which are the result of the development process.
- Utilize greenways as a means of linking together the neighborhoods, businesses, institutions. and recreation facilities within Apex and the surrounding region.
- Work with regional conservation trusts to seek other donations of land, as expressed in the Apex Parks, Recreation, Greenways, and Open Space Master Plan, emphasizing the tax benefits and positive legacy that such actions can bring to corporations, families and individuals.
- Seek the acquisition of environmentally and culturally significant tracts of land throughout the community as open space assets for the Town of Apex to assure quality of life for the future.

It was identified that through citizen surveys and recommendation from the Apex Parks, Recreation, and Cultural Resources Department, and the Parks Advisory Commission, the following are important to citizens (in priority order):

- Providing more parks
- Providing greenways and connectivity
- Preserving water quality
- Preserving air quality
- Acquiring open space
- Preserving scenic views/viewsheds
- Protecting upland forest
- Protecting riparian corridors
- Protecting geological resources

Final cost estimates to acquire the land to implement the Plan were developed. It was estimated that the open space program costs will 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. The Plan established immediate, near-term, and long-term needs in eight park zones throughout the Community. This allows specific projects to be identified within each zone for land acquisition and parks and greenways.

The Town of Apex Open Space System currently contains 213 acres of developed parkland which includes 9 parks ranging in size from 1 acre to 158 acres and over 6 miles of greenways. Recently, the Town partnered with the CWMTF and Wake County Parks, Recreation, and Open Space to acquire 45.8 acres of undisturbed land along a tributary of Beaver Creek. A conservation easement has been placed on the portion of the property along the tributary to protect water quality. The Town owns another160 acres of land adjacent to that property that will also be used for mainly passive recreation (Proposed Nature and Environmental Education Park) and will further protect the waters of Beaver Creek from the pressures of development. The Proposed Nature and Environmental Education Park site concept began with 56 acres; the Town acquired and additional 45 acres (Holleman Tract) in 2003, and recently acquired another 60 acres (Seymour Tract).The

emphasis of the park will be stormwater management, wildlife and nature education, and open space preservation. The site also will have a strong emphasis on preserving water quality due to the amount of protected wetlands and riparian buffers and protection of the Beaver Creek corridor. The funding for the additional acreage will be a joint effort between the Trust for Public Land, Wake County, and the CWMTF. Wake County, via its Open Space Preservation Program, will provide $712,500, and CWMTF will provide $766,751 toward the purchase price.

Greenways are defined as linear parks that may include trails and paths. Greenways can be included in the outer 20 feet of riparian buffers, along abandoned railways or within utility easements. The design standards for greenways are a function of topography and location. Typically, greenways are located in wooded areas or within utility easements and therefore have natural buffers. Greenways are 10 feet wide and can be gravel, concrete, asphalt, or boardwalk. Greenways are being planned to connect open space as illustrated in the Comprehensive Plan and the Town of Apex Parks, Recreation, Greenways and Open Space Master Plan. As part of the proposed Nature and Environmental Education Park, a trail connecting to the American Tobacco Trail will be added.

New development must dedicate a portion of the land being developed for the purpose of providing parks, recreation, or open space for the future residents of the area (1/20 to 1/35 acre per new lot or dwelling unit, UDO Section 7.3.5). If it is not feasible to dedicate land for this purpose within the development, the developer may in some cases dedicate land in another location or provide a fee-in-lieu. Further information on land development dedication requirements is found in the UDO below.

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

- Outright purchase by the Town of Apex
- Negotiation of a conservation easement or other agreement between the Town and the property owner
- Land dedication requirements, such as through the Town's stream buffer rules and RCAs
- Donation or bargain sale by property owners for Federal and State tax incentives
- Cooperative arrangements with other governmental agencies

This ordinance is written such that the Town may sell land that may have less net environmental benefit from an open space or recreational standpoint than other lands that they could purchase with money from the sale. There has not been a situation where this has occurred in the Town. The Town indicated there would have to be a mitigating factor to sell dedicated lands.

6.2.2.2 Bond Referendums

In 1996, citizens of the Town of Apex approved the Town's first Park Bond Referendum by almost 84 percent. As projected by the Town, no tax increase resulted from that referendum, and projects included the following:

- Miscellaneous improvements to Clairmont Neighborhood Park and West Street Neighborhood Park, including playgrounds, playing courts, and shelters
- Installation of athletic field lighting at Penny Road School Park, Apex High School , and A.V. Baucom Elementary School Park
- Completion of the Apex Community Park, including ball fields, tennis courts, picnic shelters, maintenance facilities, and trail improvements
- Renovation of the Apex Jaycee Park, to include soccer fields, ball field upgrades, and picnic shelter/comfort station
- Construction of Kelly Road Park, including ball field, tennis court, picnic shelter/comfort station and KidsTowne Community Built Playground

The Town of Apex passed with 87 percent approval a Parks Bond Referendum in November 2004 that will provide $13 million to assist with the implementation of the Master Plan. The Parks, Recreation, Greenways, and Open Space Master Plan and the Town's current plan for Downtown Revitalization determined the priorities. Six major potential projects are currently identified:

- Completion of the Beaver Creek Greenway, connecting downtown Apex to the American Tobacco Trail
- Completion and/or retrofitting of greenways in Haddon Hall and Beckett Crossing
- Construction of a 100+acre Nature Park and Environmental Education area
- Expansion of the current Community Center
- Land acquisition funds for a future athletic complex
- Funds to help complete the renovation of the original Town Hall into a Cultural and Performing Arts Center

Wake County passed a $26 million open space preservation referendum in November 2004. The focus of this referendum is open space preservation to continue efforts to protect water quality throughout the county. This will be the second such bond referendum for Wake County, with voters having approved a similar $15 million referendum in 2000. As a result of the 2000 referendum, the Town of Apex received approximately $805,000 to help purchase and preserve approximately 46 acres in southwestern Apex known as the Holleman Tract. Wake County provided a portion of the funding to purchase an additional 60 acres (Seymour Tract). This acreage, combined with adjacent acreage already owned by the Town, will be incorporated into the proposed 160-acre nature park dedicated to environmental education. With the help of the CWMTF and the Trust for Public Land, Town and County staff are continuing to pursue opportunities to add additional acres to this project.

6.2.2.3 Town of Apex Land Use Plan

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 guiding 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 mission of the Apex Planning Department is to:

- Provide coordinated guidance and regulation of the growth and development of the Town of Apex through the review of subdivision and site-development plans
- Create and implement long-range land use, transportation, and hazard mitigation plans
- Enforce the Town's UDO
- Provide professional advice and technical expertise to the citizens, elected officials, appointed boards and committees, and other departments of the Town of Apex

The Planning Department is committed to ensuring quality development within the Town of Apex that protects environmentally sensitive areas, provides for adequate transportation networks, promotes economic vitality, provides quality housing at affordable prices, and promotes a sense of community that is compatible with the small town character of Apex.

To achieve these goals, Apex has developed its Land Use Plan to direct growth to the Town Center and along other growth corridors. Lower-density development is planned in areas closer to Jordan Lake to protect the drinking water supply and important habitat areas. The policies help protect the drinking water supply and habitat, as well as help reduce air quality impacts by concentrating the population in areas near employment and commercial centers. Apex recently developed a 2025 Land Use Plan map to complement the text of the Comprehensive Plan.

6.2.2.4 Salem Street Corridor Plan

The goal of this plan is to ensure that the cultural and environmental resources that comprise the character of this primary entrance corridor into Apex are maintained. This plan establishes guidelines associated with the Salem Street Corridor in nine specific areas—from street width and alignment to buffers and the establishment of RCAs.

6.2.2.5 NC 55 Corridor Plan

Planning and development objectives were identified through the public participation process for this Plan. These objectives are related to the transportation network, land use arrangement, and streetscape improvements:

- Provide alternate routes to NC 55
- Improve traffic circulation in the NC 55 Corridor Plan area
- Supply facilities for alternative transportation modes (pedestrian, bicycle, and transit)
- Separate incompatible uses from one another
- Allow for a mix of compatible uses
- Provide an area that can be used for a major employment center
- Provide a commercial and community services node
- Allow some high-density residential uses
- Preserve existing low-density residential areas in Feltonville and Sunset Hills

- Provide recreational opportunities
- Improve the appearance and comfort level of NC 55 for pedestrians, bicyclists, and motorists

These improvements will be implemented through a series of action items that include developing the 2025 Land Use Plan (completed); amending the zoning map; creating an access management policy; developing a streetscape program; revising the thoroughfare plan; ensuring agreement with the recently approved Parks, Recreation, Greenways and Open Space Plan,; and obtaining funding for implementation.

6.2.2.6 Unified Development Ordinance

The Apex UDO consolidates development regulations into a single document that allows a jurisdiction to respond uniformly and consistently to development proposals while promoting the health, safety, and general welfare of its residents. This uniform application of policies and regulations can occur because a UDO combines ordinances, such as the Subdivision, Zoning, and Stormwater Management ordinances, into one document.

The UDO contains stringent environmental regulations such as a tree protection provision, recreation area land contributions (dedication, reservation, or payment to Apex), water supply watersheds regulations, and standards for open space development, including minimum land area.

Section 8.1 of the UDO establishes Resource Conservation Area (RCAs). The objective of the RCA is to protect the Town's natural and cultural resource and encourage site design that protects them. The RCA must be shown on the site Plan, are field inspected, recorded on the plat, and protected in perpetuity. The purposes of RCAs are to:

- Protect the Town’s existing natural and cultural resources to preserve the visual and aesthetic qualities of the Town.
- Encourage site design techniques that preserve the natural and cultural environment and enhance the developed environment.
- Control erosion, slippage, and sediment run-off into streams and waterways.
- Increase slope stability.
- Protect wildlife habitat and migration corridors.

The ordinance requires the total RCA area to be at least 20 percent to 30 percent of the site acreage for residential and non-residential development. RCAs allow for the preservation of undisturbed floodplains, undisturbed riparian buffers, wetlands, steep slopes, significant tree stands, important habitat elements and geological features. Environmental features must be undisturbed in order to count as RCA. Recreation space may be counted as an RCA, but 4 acres of recreation space count as 1 acre of RCA. The Town does not have explicit ordinances to protect the SNHAs. However, as development occurs in these areas, protection can be negotiated. The Town may be able to negotiate protection as part of the required RCAs.

6.2.3 Riparian Buffers and Floodplain Protection

Riparian buffers help protect water quality by filtering pollutants, stabilizing streambanks, and moderating stream temperature 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, providing food and habitat for aquatic and streamside organisms, and providing wildlife corridors. Finally, riparian buffers can help protect floodplains and downstream property.

The appropriate width of a buffer will vary dependent upon the purpose of the buffer. For example, Wenger (1999) indicates that 30 feet of forested buffer is sufficient to shade a stream and moderate instream temperatures for smaller streams that do not support cold water fisheries. Wider buffers are needed for wildlife corridors. In addition, characteristics of a given site impact buffer function.. In addition, characteristics of a given site impact buffer function. For example, steeper slopes along a stream require wider buffers to obtain the same level of pollutant removal as a site with gentler slopes. Wenger indicates that 30 meter buffers are the most efficient at filtering sediment and maintaining a healthy aquatic environment.

Buffer zones that include forested and grassed areas are considered desirable, because the grassed area helps maintain the buffer integrity by encouraging sheet flow and preventing rill/gully erosion and bypass of the buffer. DWQ has convened two workgroups that included representatives of the scientific community to review riparian buffer widths. These groups recommended a two-zone buffer with a total width of 50 feet to help reduce nutrient and sediment loading. The inner 30 feet is a forested zone, and the outer 20 feet is vegetated. Uses allowed within the zones are outlined in the DWQ's rules at 15A NCAC 2B. 0233, these include selective harvesting of the inner zone as well as the complete harvest, regrading and revegetation of the outer zone. NC DWQ approved construction activities can occur within the entire buffer as long as specific outlined precautions are taken to minimize impacts. Nutrients and sediment are the two most important pollutants to address within the Town's jurisdiction.

Floodplains carry water during storm events. Limiting development in the floodplain minimizes the amount of property damage that occurs during storms and can save lives. In addition, protecting the floodplain helps protect the riparian The Town does not allow residential development within the floodplain, and commercial development in the floodplain is rare. Thus, when the floodplain width exceeds the riparian buffer width, floodplain ordinances serve to protect a wider riparian area. The following sections supply more information on the Town's riparian buffer and floodplain protection programs.

6.2.3.1 Town of Apex Riparian Buffers

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 Natural Resources Conservation Service or the most recent version of USGS topographic maps (7.5 minute quadrangle). The rule provides a number of exemptions. Apex's riparian buffer program exceeds the Neuse River requirements.

The Town of Apex has established rules for protecting riparian buffers in Section 6.1.11 of the UDO. These rules require 100-foot-wide riparian buffers along perennial streams and 50-foot-wide riparian buffers along intermittent streams. For lakes and ponds, 100-foot vegetated buffers are required if the lake or pond joins with a perennial stream; otherwise, a 50-foot vegetated buffer is required if the lake or pond joins with an intermittent stream. For each of these buffers, the inner 80 feet or inner 30 feet, respectively, is undisturbed forested buffer. The outer 20 feet must be re-vegetated. Greenways are allowed in the outer zones of the riparian buffer but are designed and located to minimize disruption to the buffer and to protect the water quality and habitat functions of the buffer. The Town tries to limit the placement of greenways in the riparian buffer to the maximum extent practicable. The perennial or intermittent stream classification is determined by the most recent version of a USGS quadrangle topographic map and/or Soil Survey for Wake County. In the event of discrepancy, the classification requiring the most stringent buffer applies. Only an undisturbed riparian buffer can be counted as RCA. In waters that are not classified as water supply, the Town allows the buffer width to be averaged. Under this scenario, the minimum width along any point on the stream is 60 feet, but the average buffer width must be 100 feet. Allowing buffer widths to be averaged may result in wider buffers along steep slopes or along floodplains.

DWQ's methodology to determine whether a stream is present is followed if an appeal is made. In the Neuse River Basin, where conflicts exist between actual field conditions and USGS and Wake County Soil Survey maps, appeals are made to DWQ. In the Cape Fear portion of the Town, appeals may be made to the Town's Environmental Coordinator.

Developers are required to delineate streams, wetlands, and floodplains. The Neuse buffer rules and the riparian buffer ordinance do not require that riparian buffers be restored where they no longer exist. However, the Town's ordinance requires that when the land use is modified, the riparian buffer be restored to the maximum extent practicable.

6.2.3.2 Floodplain Development Regulations

Regulating development in floodplains serves two main purposes: 1) limiting damage from storms, and 2) preventing water quality degradation. The Town's ordinances that limit development within the floodplain exceed FEMA requirements.

Apex has established rules for protecting floodplains in Section 6.2.16 of the UDO; the Town does not allow residential development in the 100-year floodplain, and according to 6.2.18, residential lots must be platted outside floodplains. No encroachments, including fill, are permitted in the floodway. Within all inner buffer zones, no fill is allowed according the riparian buffer rules. Only an undisturbed floodplain can be counted as RCA. The Town of Apex requires that the bottom floor be elevated 2 feet above base flood elevation on FEMA-mapped streams for commercial, industrial, or nonresidential structures. While commercial development is allowed, Town staff recalled only one occasion of non-residential development (Beaver Creek Commons) where grading occurred in the floodplain. The development was required to obtain a Letter of Map Revisions.

According to Section 6.2.17 of the UDO, where base flood elevations (100-year flood) are unknown, Apex allows no encroachments, including fill within 20 feet of the top of the stream bank or within a distance of 5 times the stream width, whichever is greater, unless a

Professional Engineer certifies that the encroachment will not result in an increase in the base flood level. When base flood elevation data or floodway data are unknown, a hydraulic report must be submitted that defines the base flood or floodway elevation.

The Town's floodplain maps are currently being updated. The new maps will be based on full build-out conditions to reflect the change in hydrology that will occur as imperviousness increases. Although the floodplain maps have not yet been finalized, the Town has been using them to guide development away from newly designated floodplains.

6.2.4 Water Supply Watershed Protection Regulations

Approximately 42 percent of the Town of Apex is within the Jordan Lake and Swift Creek WSWs. The Town has similar protection rules for waters not classified as water supply by designating each of these waters as Secondary Watershed Protection Districts. The Town of Apex developed watershed protection overlays and limitations on impervious surface areas and densities associated with these areas, which are presented in Section 6.1 of the UDO. The Primary Watershed Protection District consists of lands classified as WSWs by DWQ, while the Secondary Watershed Protection District consists of the remainder of lands within the Town and its ETJ. There are three development options within the watershed protection overlay: low density, high density, and clustered development.

In the low-density option, any development that has 12 percent imperviousness or less is not required to include stormwater controls onsite. The high-density and cluster options have impervious surface limits that may approach 70 percent, although very few developments exhibit that level of imperviousness due to the RCA requirements described in the UDO Section. Under the high-density and cluster options, stormwater controls must be implemented that control the first inch of rainfall. In addition, pre- and post-development peak runoff rates must be equivalent. These options are in line with the Swift Creek Land Management Plan developed by the County and local governments with jurisdiction in the Swift Creek watershed in 1988 (Appendix F).

6.2.5 Erosion and Sediment Control

Sediment is the leading cause of stream degradation in North Carolina. Prevention of soil loss protects aquatic life habitat and maintains stream water quality. The State requirements for sediment and erosion control are summarized above, while this section presents the Town's erosion and sedimentation control requirements. Erosion and sediment control plans must be submitted for most properties that disturb over 1 acre; however, a proposed ordinance amendment would reduce this to 20,000 square feet that will be presented to the Town's Board in July 2005. State law excludes agricultural land from erosion and sediment control. In the Neuse River Basin, agriculture is required to implement BMPs for nitrogen control. The Jordan Lake watershed is a priority watershed to receive cost-share funds and CREP money. The Erosion and Sediment Control Program has eliminated a substantial amount of sediment transport to local streams. The erosion and sediment control process is regulated through Chapter 5, Article X, Section 5-140 to 5-161 of the Town's ordinance.

The six basic control objectives for Apex's Erosion and Sediment Control Program are listed in Table 6-4.

TABLE 6-4
Six Basic Control Objectives of Apex's Erosion and Sediment Control Program

Objective	Comments
Identify especially vulnerable areas that are subject to severe erosion and ensure they receive special attention	For example, avoid steep slope areas
Limit time of exposure	Proposed maximum time of exposure is 15 working days or 30 calendar days
Limit exposed area	Plan and conduct activities to minimize the size of the area to be exposed at any one time
Control surface water	Control surface water originating upgradient of exposed areas to reduce erosion and sediment loss during the exposure period
Control sedimentation	Prevent offsite damage from sedimentation
Manage stormwater runoff	Control the velocity at the point of discharge to minimize accelerated erosion of the site and increased sedimentation to the stream

The Town of Apex's sediment and erosion control practices support an overall stream protection plan by limiting in-stream suspended sediment and sediment deposition. The erosion and sediment control strategy is discussed at a pre-construction conference through the permit and plan approval process. This process also allows for the review of stormwater controls. The Town of Apex does not allow any land-disturbing activity near a lake or natural watercourse unless erosion and sedimentation control measures are present. An undisturbed buffer may be used, provided the undisturbed zone is of sufficient width to confine visible siltation within the 25 percent of the undisturbed zone nearest the land disturbing activity. The Town of Apex has established maximum permitted velocities for stormwater discharges.

The possibilities for phased construction are reviewed in the sediment and erosion control plan submittal process on a site-specific basis. Site conditions, topography, soils, and type of construction determine the size of the phases; in general, the Town encourages phases that are 5 acres or less. The Town requires that all land-disturbing activities be planned and conducted to limit exposure to the shortest feasible time. Soils are stabilized as rapidly as possible by establishing a grass cover and mulching and tacking. The proposed ordinance would require this to occur in a maximum of 15 working days or 30 calendar days, while the current ordinance is 30 working days or 120 calendar days, whichever is shorter.

The Town requires the identification of especially vulnerable areas in the development plan, and these areas receive special attention in the permit and plan approval process. Steep slope areas are discussed in a pre-construction conference and avoided to the maximum extent possible. The Town of Apex allows for steep slopes to be used to meet RCA and buffer requirements. The angle for graded slopes and fills cannot be greater than the angle that can be retained by vegetative cover.

The Town of Apex requires tree protection fencing and silt fencing as erosion and sediment control measures, along with perimeter ditches or perimeter swales, if practical. The tree protection policy outlined in Section 8.1.3 of the UDO applies only to Site Development

Plans. Section 2.3.15 of the UDO also protects trees and applies to most land, but single family residences are exempt. The Town of Apex requires sediment and erosion control plans to use the proven latest technology related to erosion and sediment control practices. The proposed ordinance also requires minimum erosion control measures for single-family residential lots, including a construction entrance and silt fence.

The Town of Apex also encourages contractor education and training related to erosion and sediment control. The purpose of this educational program is to ensure that contractors understand the erosion and sediment control requirements and work to minimize the sedimentation potential. Contractors are interested in attending this training as it provides them with an opportunity to develop a relationship with Town staff which helps with communication concerning their projects. In addition, contractors which attend training are allowed to advertise as Clear Water Contractors.

6.2.6 Stormwater Programs and Impervious Surface Limitations

Streams are impacted by changed hydrology as a result of increasing imperviousness from urban development. Without proper stormwater management, studies have shown that stream degradation occurs when impervious values approach 10 percent. However, requiring impervious values of 10 percent in all watersheds encourages sprawl and creates other environmental problems. The Center for Watershed Protection indicates that the best way to minimize the creation of impervious cover at a regional scale is to concentrate as much of it as possible in high density clusters with high levels of impervious cover of 25 percent to 100 percent in some watersheds, so as to prevent others from exceeding the 10 percent threshold (Schueler, 1995). Thus, Apex has developed a land use plan that includes lower levels of imperviousness in water supply watersheds and stormwater management programs to control the rate of stormwater runoff in all watersheds. In addition, the Phase II program regulates discharges of stormwater to surface waters and requires control of suspended solids, fecal coliform, and nutrients town-wide. Thus, Apex has developed stormwater management programs that use a combination of impervious cover and BMPs to control the rate of stormwater runoff.

The Town of Apex created an Environmental Program Division in 2003 to minimize the impacts of stormwater runoff. The staff is charged with upholding the local, State, and Federal regulations related to stormwater. These legal requirements include:

- Floodplain Management (1978)
- Sediment and Erosion Control (1985)
- WSW Protection (1993)
- NPDES Phase II Stormwater Regulations (2003)

The Town maintains a strict policy of prohibiting unnecessary piping of stormwater (Memorandum dated March 4, 2002, Appendix F). Stormwater from new development is made to flow by way of grass-lined swales instead of pipe where possible.

The Town also requires that the pre-development peak runoff rate be maintained for the 1-year, 24-hour storm and the 10-year, 24-hour storm; this exceeds State and Federal requirements. Detention volumes stored to reduce peak flows shall drain within 72 hours to allow for subsequent storms (UDO 6.1.7). Stormwater from non-residential development is

typically treated in ponds; stormwater is not directly transported to creeks or riparian areas, but to detention areas.

Apex requires a stormwater impact statement showing the impacts of the proposed development to the confluence point downstream where the area of the proposed development is less than 10 percent of the total drainage area. The impact statement verifies that downstream hydrograph peaks do not increase for a given storm. If backwater from detention appears to be a problem, then the potential effects on upstream properties for the 100-year, 24-hour storm must be considered (UDO 6.1.7). The stormwater impact statement must account for all existing development in the watershed. As part of the stormwater impact statement, the developer must show the peak flow calculations for existing conditions and the conditions with the proposed development. Since the purpose of this analysis is to prevent downstream flooding, it should be based on peak flow.

Apex submitted a Phase II Federal NPDES stormwater compliance application on March 11, 2003 (Appendix F). The Phase II program regulates discharges of stormwater to surface waters and requires control of suspended solids, fecal coliform, and nutrients town-wide. DWQ's existing Phase II regulations require that the overall runoff volume be controlled. The Town received its NPDES permit which became effective on July 1, 2005 (Appendix F).

The Town has impervious surface limitations that range from less than 12 percent for its low-density development option, to a maximum of 70 percent for its high-density development option. However, few developments result in 70 percent imperviousness due to the RCA requirements described under the UDO section. The Town requires stormwater controls on any development that exceeds 12 percent imperviousness, and most new development must implement stormwater controls; this exceeds State and Federal requirements.

The Town generally supports development practices which maintain the hydrograph and sponsored a LID workshop with Cary in June 2005. The Town would like better long-term data on the effectiveness of LID practices before requiring them throughout its jurisdiction. The Town of Cary is developing a pilot LID program, and researchers at NC State University are performing studies in this area. The Town will evaluate the results of these studies to determine whether it needs to update its stormwater ordinances.

The Town of Apex has an active stormwater education program. Elements of this program include utility bill inserts and other mailings, and the internet. The Town of Apex is part of the Clean Water Education Partnership, which is a cooperative nonpoint source pollution education and awareness program involving many different local governments and agencies in North Carolina. The program's education and awareness campaign includes four components: television, radio, print, and a website emphasizing the impacts of nonpoint pollution and the importance of the protection of water quality.

6.2.7 Water Conservation

In 1973 the Town of Apex recognized water as a valuable natural resource and adopted its first water conservation ordinance. As times changed, the Triangle grew, and in 1986, Apex updated this ordinance to recognize water as a limited natural resource. Recent advances in water-saving devices like the low-flow showerheads and toilet tanks can use up to a third less water than devices installed just a few years ago. Required by current building code, these two advances save millions of gallons per year.

The Water Conservation Ordinance, Division 5 of Section 12, details certain continuing water conservation measures. To prevent the unnecessary depletion the water supply, the following measures apply to all town water customers and town water users at all times, whether or not a water shortage exists. These measures are as follows:

- No person shall operate an irrigation system in a manner that allows water to fall on impervious surfaces, such as driveways, roads, sidewalks and/or the like.
- No person shall operate an irrigation system in a manner that allows water to accumulate to the extent that it runs off the property.
- Rain sensors are required on all automatic irrigation systems. Rain sensors are devices that measure rainfall and override the irrigation systems, thus shutting them off. To meet the requirements of this ordinance, meters should shut off irrigation systems when one-quarter inch or more of rain has fallen.

The Town of Apex has developed a five-stage conservation measurement system, shown in Table 6-5, with Stage I being voluntary conservation and Stage V being the most stringent conservation. **Note that each stage imposes the requirements of all preceding stages.** The Town is currently at Stage II – Moderate Mandatory Conservation.

The Town of Apex wants to ensure that simple measures become common knowledge and common practice through an active education program. The Town distributes a brochure that identifies several additional conservation ideas in the kitchen, the bathroom, and the yard to help conserve water.

6.2.8 Air Quality Protection

Apex's transportation plan includes pedestrian and bike elements that will reduce air pollution by reducing vehicular traffic. The Town of Apex has established over 5 miles of greenways and is working to provide connectivity within its jurisdiction and with neighboring jurisdiction greenways.

In Section 7.2.1 of the UDO, the connectivity requirements for the Town of Apex are presented. These standards reduce the overall times a motor vehicle is operating, which have positive impacts on air quality.

Trees and vegetation are integral to the improvement of air quality. The Town of Apex has a tree protection ordinance, found in Section 8.1 of the UDO. This requires preservation of existing healthy vegetation.

TABLE 6-5
Town of Apex Five-Stage Conservation Measurement System

Stage	Requirements
I – Voluntary Conservation	Implement odd/even watering. Properties with odd-numbered addresses are to be watered only on Tuesdays, Thursdays, and Saturdays. Properties with even numbered addresses are to be watered only on Wednesdays, Fridays, and Sundays.
	Water shrubbery the minimum required, reusing household water when possible
	Limit vehicle washing to the minimum
	Refrain from washing down outside areas such as sidewalks, patios, etc.
	Use shower for bathing rather than bathtub, and limit shower to no more than four minutes
	Limit flushing of toilets by multiple usages
	Refrain from leaving faucets running while shaving or while rinsing dishes
	Limit use of clothes washers and dishwashers and when used, operate fully loaded
	Install water-flow restrictive devices in showerheads
	Use disposable and biodegradable dishes
	Install water-saving devices such as bricks, plastics, bottles, or commercial units in toilet tanks
	Limit hours of operation of water-cooled air conditioners
II – Moderate Mandatory Conservation	Odd/even watering. Properties with odd-numbered addresses shall be watered only on Tuesdays, Thursdays, and Saturdays. Properties with even numbered addresses shall be watered only on Wednesdays, Fridays, and Sundays.
(Apex's Current Stage)	Filling of newly constructed or drained swimming or wading pools shall require the approval of the Public Works Director. Makeup water is allowed for maintaining the operation of swimming or wading pools.
	If so ordered by the Town Manager, the Town shall eliminate the provision of irrigation water to all irrigation metered customers except single-family and duplex residential customers.
	There shall be no washing down of outside areas such as streets, driveways, service station aprons, parking lots, office buildings, exteriors of existing or newly-constructed homes or apartments, sidewalks, or patios, or use of water for other similar purposes.
	Water shall not be introduced into any ornamental fountain, pool, pond, or other structure making similar use of water.
	Water shall not be used from public or private fire hydrants for any purposes other than fire suppression or other public emergency.
	Watering for dust control or compaction requires the approval of the public works director.
	Water shall not be intentionally wasted or used for any unnecessary purpose.
III – Severe Mandatory Conservation	No watering of lawns, grass, shrubbery, trees, flowers, or vegetable gardens
	No nonessential use of water for commercial or public use, and the use of single service plates and utensils is encouraged and recommended in restaurants
IV – Stringent Mandatory Conservation	No using water outside of structures for any use other than emergencies involving fire
	No operating evaporative air conditioning units that recycle water except during the operating hours of the business
	No introducing water into swimming pools
V – Rationing	All industrial uses of water are prohibited
	Fire protection will be maintained, but where possible, tank trucks shall use raw water
	All other uses of water will be limited to those uses necessary to meet essential health and safety needs of customers

6.2.9 Tree Protection Ordinance

Trees and vegetation are integral to habitat protection, air quality improvement, controlling surface water runoff, and moderating temperatures. The Town of Apex has a tree protection ordinance found in Section 8.1.3 of the UDO (Appendix F). Preserving existing healthy vegetation on a site during development enhances the visual character of the community. The Town requires a champion and specimen tree survey and landscape buffers in the plan review process. The removal of trees in a designated Resource Conservation Area (RCA) is prohibited. Areas outside designated RCA's must be preserved to the extent practical and reasonable. Tree protection fencing at construction sites is required as a measure in the erosion and sediment control sequence. Special care is to be taken when grading and filling in the vicinity of tree protection areas.

The Town recognizes the need to maintain and preserve the natural environment while allowing development and growth to occur, therefore developed a landscape ordinance (Section 8.2 of the LDO). The preservation and planting of vegetation, such as that required by the Town's buffer requirements, serves to protect the environment in numerous ways. The Town of Apex requires landscaped areas and perimeter buffers of varied width and type as a function of the site land use class and the adjacent property land use class. The ordinance includes minimum tree requirements for developments. Buffers provide aesthetic screens between land uses and also reduce noise and air pollution, prevent soil erosion, and slow and filter stormwater.

6.2.10 Sanitary Sewer Installation

Proper design and installation of wastewater infrastructure reduces spills. Town of Apex Standard Specifications and Construction Details adopted December 3, 2002 addresses the design of pump stations, gravity sewers, and force mains. The document lists the minimum design standards for construction of these facilities, including standards for separation distances, materials, installation techniques, and overall design. Apex operates its wastewater collection system under a Wastewater Collection and Maintenance permit issued by DWQ. As part of its riparian buffer program, Apex avoids installing sewer lines within riparian buffers and avoids 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.

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SECTION 7

Summary of Secondary and Cumulative Impacts and Mitigation

As described in Section 6, the Town of Apex is taking progressive steps to protect its environmental heritage. The Town has developed many programs to balance the competing goals of growth and environmental protection. This section summarizes the possible and anticipated SCI to natural resources and the mitigation programs in place to address them.

7.1 Topography and Floodplains

Clearing and grading of undeveloped lands will change the site's topography. The Town reviews erosion and sediment control plans to minimize grading in area of steeps slopes. The angle for graded slopes and fills is not permitted to be greater than the angle which can be retained by vegetative cover.

The current Town floodplain ordinance goes beyond FEMA regulations to protect floodplains and their functions, mitigating for any impacts associated with growth. As stated in the UDO, the Town of Apex does not allow residential development in the 100-year floodplain. No encroachments, including fill, are permitted in the floodway. In addition, the Town's riparian buffer rules prohibit fill in the inner buffer zone (80 or 30 feet). The Town of Apex requires that the bottom floor be elevated 2 feet above base flood elevation on FEMA-mapped streams for commercial, industrial, or nonresidential structures. While commercial development is allowed, Town staff recalled only one occasion of non-residential development (Beaver Creek Commons) where grading occurred in the floodplain. The development was required to obtain a Letter of Map Revisions.

Floodplains of smaller streams not under FEMA's jurisdiction are protected by the stream buffer ordinance. These rules require 100-foot-wide riparian buffers along perennial streams and 50-foot-wide riparian buffers along intermittent streams. For lakes and ponds, 100-foot vegetated buffers are required if the lake or pond joins with a perennial stream; otherwise, a 50-foot vegetated buffer is required if the lake or pond joins with an intermittent stream. For each of these buffers, the inner 80 feet or inner 30 feet, respectively, is undisturbed forested buffer. The outer 20 feet must be re-vegetated.

In areas outside the Town of Apex's jurisdiction but within the Planning Area, floodplains are also protected. Wake County recently adopted a new ordinance that prohibits development, including fill, in the floodplain. The County regulates streams outside FEMA's jurisdiction by prohibiting development in flood hazard soils and through buffer requirements. Thus, impacts to floodplains will be limited.

The floodplain maps within the Planning Area and County are being updated; these updated maps are based on build-out conditions and therefore more areas will be designated as floodplain and protected.

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

7.2 Soils

Soil loss will be minimized during development through the Town's erosion and sediment control program, which exceeds State requirements. Contractor education will also limit impacts on soils (Clear Water Contractor). Development of lands will result in higher levels of imperviousness, approximately 10 percent above existing level of imperviousness, but good land use planning practices can accommodate future populations while limiting impacts to imperviousness.

7.3 Land Use

As outlined in Sections 4 and 5, agricultural and forested land will be lost as development occurs within the Planning Area, and open space areas may become more fragmented. The Town has several programs in place to help minimize these impacts. Its Comprehensive Plan lays the foundation for preserving open space through open space planning, land use planning, and development ordinances.

The Town of Apex's prioritized areas for preservation are based in part on ecological significance of the land. Recently, the Town partnered with the CWMTF and Wake County Parks, Recreation, and Open Space to acquire 45.8 acres of undisturbed land along a tributary of Beaver Creek. A conservation easement has been placed on the portion of the property along the tributary to protect water quality. The Town owns another 160 acres of land adjacent to that property that will also be used for mainly passive recreation (Proposed Nature and Environmental Education Park) and will further protect the waters of Beaver Creek from the pressures of development. The Proposed Nature and Environmental Education Park site c acres concept began with 56 acres, the Town acquired and additional 45 acres (Holleman Tract) in 2003, and recently acquired another 60 acres (Seymour Tract). The emphasis of the park will be stormwater management, wildlife and nature education, and open space preservation. The site also will have a strong emphasis on preserving water quality due to the amount of protected wetlands and riparian buffers and protection of the Beaver Creek corridor.

The Land Use Plan focuses development in appropriate areas. The Town directs growth to its urban centers (inside Peakway) through its zoning where higher density development is currently zoned in areas where the Town would like to promote growth. UDO Section 6.3.1 for Residential Infill Overlay District provides incentives for infill within the designated area around downtown.

The UDO requires Resource Conservation Areas that protect at least 20 percent of all new development as open space. It also requires stream buffers and floodplains, open space in subdivisions, landscape buffers between different land uses, park lands, and greenways will limit the impacts to open space. Clustered development is allowed. While open spaces such

as agricultural land and forests will still be lost to development, the impacts will be limited by these efforts. The riparian buffer and floodplain corridors will be largely protected, which will provide habitat corridors and help limit impacts to habitat fragmentation.

7.4 Wetlands

Impacts to wetlands will be minimized by stream buffers and other development controls. As illustrated in Section 4, the majority of wetlands are located in riparian areas. While some wetland loss still occurs with permitting, overall SCI to wetlands in the Planning Area will be minimized to by limiting or prohibiting construction and fill according to the UDO's floodplain and stream buffer regulations. While the Town does not have a wetlands permitting program, it requires all USACE permits and certifications/authorizations from DWQ be obtained before it will allow a site to be developed. This minimizes impacts to wetlands within the Planning Area. The Town considers wetlands priority areas for Resource Conservation Area development. If riparian buffers or wetlands are disturbed, a developer does not get credit for that area as part of its RCA requirement. By protecting the wetlands, their habitat functions and associated species and genetic diversity functions are also protected.

As outlined in Section 5, increased pollutant loading that occurs with development can result in a decrease in a wetland's ability to filter pollutants. The Town of Apex currently has a stormwater program in place that is designed to control nitrogen loading. BMPs installed to reduce nitrogen loading will also address other pollutants. The Town's current stormwater program will be expanded under Phase II.

7.5 Prime or Unique Agricultural Lands

As development pressures increase in the area, agriculture will be lost, and remaining prime farmlands may be developed. The Town and County have programs in place to help minimize these impacts. A goal of the Town's Comprehensive Plan is to preserve Apex's character. Implementation of this plan will help offset some of the SCI associated with development in the Town.

The Land Use Plan also has directs highest density development to areas along major roads and in closest proximity to RTP and the City of Raleigh. Lowest density development is planned for areas in proximity to Jordan Lake. These land use planning practices will also help conserve farmland.

The Wake County Soil and Water Conservation District works cooperatively with landowners to encourage farmland preservation and protection. This voluntary program was established in 1998 and includes efforts to provide farmers with proper estate planning, and protect farms through the purchase of development rights. The latter program has received limited funding, but has been successful in its limited applications. In addition, the County provides tax relief to qualifying farm owners to help offset tax burdens as property values rise in the County. The County also has a Voluntary Agricultural District program to promote farming and its value to the community.

7.6 Public Lands and Scenic, Recreational, and State Natural Areas

The Town recognizes the values of open space and has developed and Open Space Plan and Parks and Greenways Master Plan. 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. These planned greenways and additions to the park system will offer recreational opportunities and wildlife habitat. For example, the Town has recently acquired lands along Beaver Creek to protect the stream from further development. The American Tobacco Trail Park will be expanded to provide a larger link between Durham and Wake Counties.

The Town does not have explicit ordinances to protect the SNHAs. However, as development occurs in these areas protection can be negotiated. The Town may be able to negotiate protection as part of the required RCAs.

7.7 Areas of Archaeological or Historical Value

Historical areas may be impacted directly by future projects, but indirect impacts are unlikely. It is likely that little SCI will occur to cultural and historical resources due to the permitting and review process established by the Town of Apex.

Increased traffic vibration and reduced air quality (through acid rain) could also impact historic structures. The Town is developing alternative modes of transportation and increasing the interconnections of sidewalks, trails, and bikelanes to promote alternatives to vehicle use. The Town's tree protection ordinance also helps address air quality issues since trees filter air.

7.8 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, trails, and bike lanes will also reduce the needs for vehicular use. Specifically, bike trails and lanes will connect many of the mixed-use development areas to the Town Center and the American Tobacco Trail, encouraging transportation alternatives for commuting. As growth occurs, these efforts to reduce vehicular use will curtail air pollution increases. A connectivity requirement is detailed in the UDO to assist in reducing air pollution. A tree ordinance is also in place to protect trees during construction, which also improves air quality, because trees are natural air filters. In addition, Wake County convened an Air Quality Task Force, whose goal is to eliminate Ozone Action Days by 2010 and to comply with the National Ambient Air Quality Standards by 2007. The Task Force developed an action list of 13 items to attain this goal. The Town's and County's actions will keep SCI to air quality in check.

A regional light rail system is planned for the Triangle Area. Documents prepared for this project indicate that parking areas to serve the light rail system will not impact levels of carbon monoxide. The document also indicates that the light rail system will result in lower levels of vehicle pollutant emissions (U.S. Department of Transportation, 2002).

7.9 Noise Levels

Efforts to improve air quality by promoting alternative forms of transportation will also limit SCI to noise levels in the Planning Area. As quieter alternative forms of transportation, such as bike lanes and trails to RTP and increased interconnections of sidewalks and trails promote more pedestrian activities, vehicular traffic noise levels will be kept in check. In addition, tree protection and buffers around different development types help reduce noise.

7.10 Water Resources

7.10.1 Surface Water

The Town has created regulations that exceed minimum State and Federal regulations. As growth occurs, impacts to water resources are and will be minimized by existing stream buffer regulations, the Town's Phase II stormwater program and nitrogen stormwater regulations, WSW management efforts, erosion and sediment control, and open space preservation. The greatest water quality and quantity protection will be achieved by preserving stream buffers and installing stormwater control measures during development. Stream buffers will limit changes in stream channel morphology, erosion, and other habitat degradation. Stormwater controls will limit sediment loading and hydrology changes. The Town is also sponsoring an LID workshop with the Town of Cary to provide developers with information about LID practices. Without these regulations and programs, SCI to water resources would be pronounced.

It should also be noted that as redevelopment occurs, the Town has opportunity to require stormwater controls and riparian buffer restoration to the maximum extent practicable. While the stormwater controls and riparian buffers may not be as extensive as those required for new development due to site constraints, it provides an opportunity to improve water quality and aquatic habitat. These practices may help improve water quality on 303(d) listed streams.

Most waters within the Planning Area are classified as NSW in response to excessive growths 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.

Specific watersheds also are subject to additional regulations designed to limit development impacts to water resources. Surface water impacts will be limited in the Swift Creek Watershed, due to its designation as a WSW and the Swift Creek Land Management Plan (Appendix F). This watershed has development density limits as well as BMP mandates to protect water quality. The Jordan Lake Watershed is also subject to WSW rules to limit impervious surfaces and development densities, in addition to stream buffers.

In addition to the Town ordinances and policies described in Section 6, the Town will also 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 Ecosystem Enhancement Program, Clean Water Management Trust Fund, Section 319 program, and other funding sources. The Town will also actively participate in the development of any TMDLs where activities in Town may be impacting 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 impacts, but there is also a cumulative direct impact from previous crossings and other future crossings. The Town does not have the data to review this impact for its entire Planning Area, but will review it as a cumulative direct impact in future EAs and EISs. To the maximum extent practicable, the Town will directionally bore sewer line crossings and use bridges and bottomless culverts for road crossings.

The Town also has a progressive reclaimed water program that reduces the water supply withdrawal from Jordan Lake during dry weather and increases baseflow in the receiving stream by a smaller amount. Thus, the use of reclaimed water minimizes impacts to natural flow regimes. In terms of stream flow, the use of reclaimed water will increase the 7Q10 in the receiving stream by a smaller amount than if there was no reclaimed water program. From the water supply source, less water is needed during dry months with a reclaimed water system.

Wake County also implements stormwater protection programs, WSW protection programs, riparian buffers, and open space preservation programs in areas outside Apex's jurisdiction. These programs are described in Appendix B.

The Wake County Watershed Management Plan recommended that the County develop an instream monitoring program. Implementing an instream monitoring program at the County-level is more efficient than implementing a monitoring program at the Town level. Wake County is working to find funds to develop a monitoring program.

7.10.2 Groundwater

As growth occurs, impacts to groundwater resources will be mitigated by stormwater programs. The amount of impervious surfaces generated in developments is limited, reducing the impacts to groundwater recharge rates. Positive impacts will occur as fewer residents rely on groundwater as a public water supply source. 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 tanks.

Stormwater from non-residential development is typically treated in ponds; stormwater is not directly transported to creeks or riparian areas, but to detention areas. The Town maintains a strict policy of prohibiting unnecessary piping of stormwater (Memorandum dated March 4, 2002, Appendix F). Stormwater from new development is made to flow by way of grass-lined swales instead of pipe where possible. The town is also sponsoring an LID workshop with Cary.

7.11 Forest Resources

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

Plan lays the foundation for preserving open space through open space planning, land use planning, and development ordinances.

The Town of Apex's prioritized areas for preservation are based in part on ecological significance of the land. Recently, the Town partnered with the CWMTF and Wake County Parks, Recreation, and Open Space to acquire 45.8 acres of undisturbed land along a tributary of Beaver Creek. A conservation easement has been placed on the portion of the property along the tributary to protect water quality. The Town owns another 160 acres of land adjacent to that property that will also be used for mainly passive recreation (Proposed Nature and Environmental Education Park) and will further protect the waters of Beaver Creek from the pressures of development. The Proposed Nature and Environmental Education Park site concept began with 56 acres. The Town acquired and additional 45 acres (Holleman Tract) in 2003, and recently acquired another 60 acres (Seymour Tract). The emphasis of the park will be stormwater management, wildlife and nature education, and open space preservation. The site also will have a strong emphasis on preserving water quality due to the amount of protected wetlands and riparian buffers and protection of the Beaver Creek corridor.

The UDO requires Resource Conservation Areas. It also requires stream buffers and floodplains, open space in subdivisions, landscape buffers between different land uses, park lands, and greenways will limit the impacts to open space. Clustered development is allowed. While open spaces such as agricultural land and forests will still be lost to development, the impacts will be limited by these efforts. The riparian buffer and floodplain corridors will be largely protected which will provide habitat corridors and help limit impacts to habitat fragmentation.

The Town's Land Use Planning polices also protect forest land. The majority of forestland within the Planning Area is located within the Jordan Lake Watershed. Impacts to forested lands will be lower in the Jordan Lake Watershed because of WSW regulations limiting the amount of built-upon area and the presence of 200-foot buffers along many of the streams. The existing Land Use Plan only includes low-density residential development in this watershed, protecting some forest resources, wildlife habitat, and the Town's drinking water supply. In addition, the Town has a tree protection ordinance.

7.12 Shellfish or Fish and their Habitats

Fishery impacts are and will be limited in the Planning Area by the Town's current mitigation measures and regulations. As discussed in the Water Resources section above, water quality and quantity impacts will be limited by stream buffers, floodplain protection, BMPs, and open space preservation. Protecting the habitats of fish communities will, in turn, protect the fishes themselves.

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. 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 impacts, but there is also a cumulative direct

impact from previous crossings and other future crossings. The Town does not have the data to review this impact for its entire Planning Area, but will review it 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. . To the maximum extent practicable, the Town will use directional boring for sewer line crossings and bridges or bottomless culverts for road crossings.

Therefore, SCI to fisheries will not be limited over time because of the protective measures already in place.

7.13 Wildlife and Natural Vegetation

The mitigation measures to protect wildlife resources include protecting habitat with riparian buffers, protecting open spaces, and limiting habitat degradation through control of erosion, sediment, and stormwater runoff. Wildlife habitat may be 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 of Apex has a tree protection ordinance, which is found in Section 8.1.3 of the UDO that is described in Section 6. The Town's required Resource Conservation Areas allows for some areas to be negotiated for preservation within the development process.

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. 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 impacts, but there is also a cumulative direct impact from previous crossings and other future crossings. The Town does not have the data to review this impact for its entire Planning Area, but will review it 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. To the maximum extent practicable, the Town will use directional boring for sewer line crossings and bridges or bottomless culverts for road crossings.

In the Swift Creek watershed, rare mussel species are located downstream of Lakes Benson and Wheeler. These impoundments will also help alleviate the impacts of increased stormwater runoff and pollutant loading to the rare mussels. The Swift Creek watershed is classified by the State as SAESH and Wake County and local governments with jurisdiction in the watershed developed land management plan to protect the Lake Wheeler drinking water supply (Appendix F). The components of this Plan will also limit impacts to aquatic species.

There are also rare mussel species in Middle Creek downstream of Sunset Lake. Again, the Town's current and planned stormwater programs, riparian buffer ordinance, and erosion and sediment control ordinance will help protect these species. In addition, Middle Creek has wider FEMA floodplain boundaries within the Town's jurisdiction than the required

riparian buffers. Since the Town does not allow development in the FEMA floodplains, impacts to the species will be minimized.

In addition to the Town ordinances and policies described in Section 6, the Town will also look for opportunities to improve aquatic habitat. For example, the Town will work with agencies to identify areas for stream restoration and other strategies and pursue funding through the Ecosystem Enhancement Program, Clean Water Management Trust Fund, Section 319 program, and other programs.

State-designated protected areas such as some state-owned SNHAs and the Swift Creek Watershed afford additional protection of wildlife habitats and vegetative communities. Many SNHAs also provide habitat to State-listed plant species. These areas afford species protection, limiting impacts of SCI. Michaux's sumac is listed as Federally endangered and has been located near the Shearon Harris Longleaf Pine Forest SNHA. It is likely that present populations will remain small. The area where this species is present is planned for low-density residential development only.

The Town does not have explicit ordinances to protect the SNHAs. Many of the SNHAs within the Planning Area are privately owned and not permanently protected. The Town will work with NHP and NCWRC to identify SNHAs and other important habitat areas and make efforts during the development process to negotiate their protection.

7.14 Introduction of Toxic Substances

Apex has programs to prevent toxic releases, and to treat them when they do occur. The Town also has an active stormwater education program that provides the public with valuable knowledge to increase awareness 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 of Apex Stormwater Program promotes the use of BMPs, which also reduces some of the toxic impacts.

TABLE 7-1

Areas of Potential Impacts to be Addressed by Permitting and Mitigation Programs

Environmental Resource	Potential for SCI	Types of SCIs	Mitigation Programs
Floodplains	LI	Some floodplain loss from commercial development Isolation of floodplain from stream by channel entrenchment; loss of nutrient exchange capabilities	Floodplain Protection – No residential development in floodplain Open Space Goals often preserve additional corridors along required riparian buffers Resource Conservation Areas – Floodplain protection is not counted toward RCA unless the floodplain is undisturbed
Soils	LI	Soil erosion and compaction	Erosion and sediment control Land Use Planning
Land Use	PI	Conversion of agricultural and forested land uses to mainly residential land uses	Land Use Planning encourages development around Town Center, selected corridors, and mixed use developments Comprehensive Plan Parks, Recreation, Greenways, and Open Space Planning Resource Conservation Areas – Protect environmentally important areas UDO Riparian buffer and floodplain protection
Wetlands	LI	Loss through development; subsequent loss of habitat and habitat fragmentation, reduction in genetic diversity and loss of attenuation of flow Loss of wetland function through pollutant loading	Wetland Protection through Section 404 and Section 401 Majority of wetlands located in floodplain and riparian buffers which have local protection programs described above Resource Conservation Areas – Protect environmentally important areas Stormwater programs reduce pollutant loads to wetlands
Agricultural Land	PI	Conversion to other uses	Land Use Planning Comprehensive Plan Wake County Voluntary Agricultural Districts Wake County Tax Incentive Program
Scenic and Recreational Areas	LI	Possible conversion of adjacent land uses	Parks, Recreation, Greenways, and Open Space Planning Establishment of Nature Park

TABLE 7-1

Areas of Potential Impacts to be Addressed by Permitting and Mitigation Programs

Environmental Resource	Potential for SCI	Types of SCIs	Mitigation Programs
Archaeological and Historical Resources	LI	Possible conversion of adjacent land uses Structural damage due to acid rain and vibrations	Land Use Planning controls allowed uses
Air Quality	LI	Reduction in air quality due to increased vehicular traffic Negative impacts to human health (i.e., asthma); acid rain; reduced visibility	Transportation elements of bicycle planning and greenway planning Unified Development Ordinance (UDO) connectivity requirement Tree Protection Ordinance Wake County Air Quality Task Force
Noise	PI	Increase in overall noise level in Planning Area Negative impacts to human health	Transportation Planning Tree Protection and Landscape Buffer Ordinances
Surface Water Resources	PI	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	Wetland Protection through Section 404 and Section 401 Riparian Buffers – 100 feet on perennial streams, 50 feet on intermittent streams Floodplain Protection – No residential development in floodplain Stormwater – Impervious limited to 12 percent or stormwater controls required; outfall velocity requirements Erosion and Sediment Control – Plan review and pre-construction process Resource Conservation Areas – Protect environmentally important areas Clean Water Management Trust Fund (CWMTF) Funding
Groundwater Resources	LI	Reduction in use for drinking water; potential to become contaminated Groundwater inflow provides baseflow in streams, which supports life during droughts	Failing septic systems taken offline as infrastructure developed Town sponsoring LID workshop with Town of Cary; LID practices will help maintain infiltration and stream baseflow
Forest Lands	PI	Conversion to other uses Reduction in air quality; increase in near-surface air temperature; habitat fragmentation	Land Use Planning encourages development around Town Center, selected corridors, and mixed use developments Resource Conservation Areas – Protect environmentally important areas Parks, Recreation, Greenways, and Open Space Planning

TABLE 7-1

Areas of Potential Impacts to be Addressed by Permitting and Mitigation Programs

Environmental Resource	Potential for SCI	Types of SCIs	Mitigation Programs
Fisheries	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 Section 404 and Section 401
			Riparian Buffers – 100 feet on perennial streams, 50 feet on intermittent streams
			Floodplain Protection – No residential development in floodplain
			Stormwater – Impervious limited to 12 percent or stormwater controls required; outfall velocity requirements
			Erosion and Sediment Control – Plan review and pre-construction process
			Resource Conservation Areas – Protect environmentally important areas
			Clean Water Management Trust Fund (CWMTF) Funding
Wildlife Resources	PI	Reduction in available habitat	Parks, Recreation, Greenways, and Open Space Planning – important habitat areas prioritized for protection
		Habitat fragmentation; reduction in genetic diversity; reduction in species tolerance; increased dispersal distance to suitable habitat; reduction in potential for long-term population sustainability	Endangered Species Act
			Establishment of Nature Park
Toxic Substances	LI	Increase in likelihood of contamination	Land Use Planning controls allowed uses
		Negative impacts to human health	Stormwater education programs

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

SECTION 8

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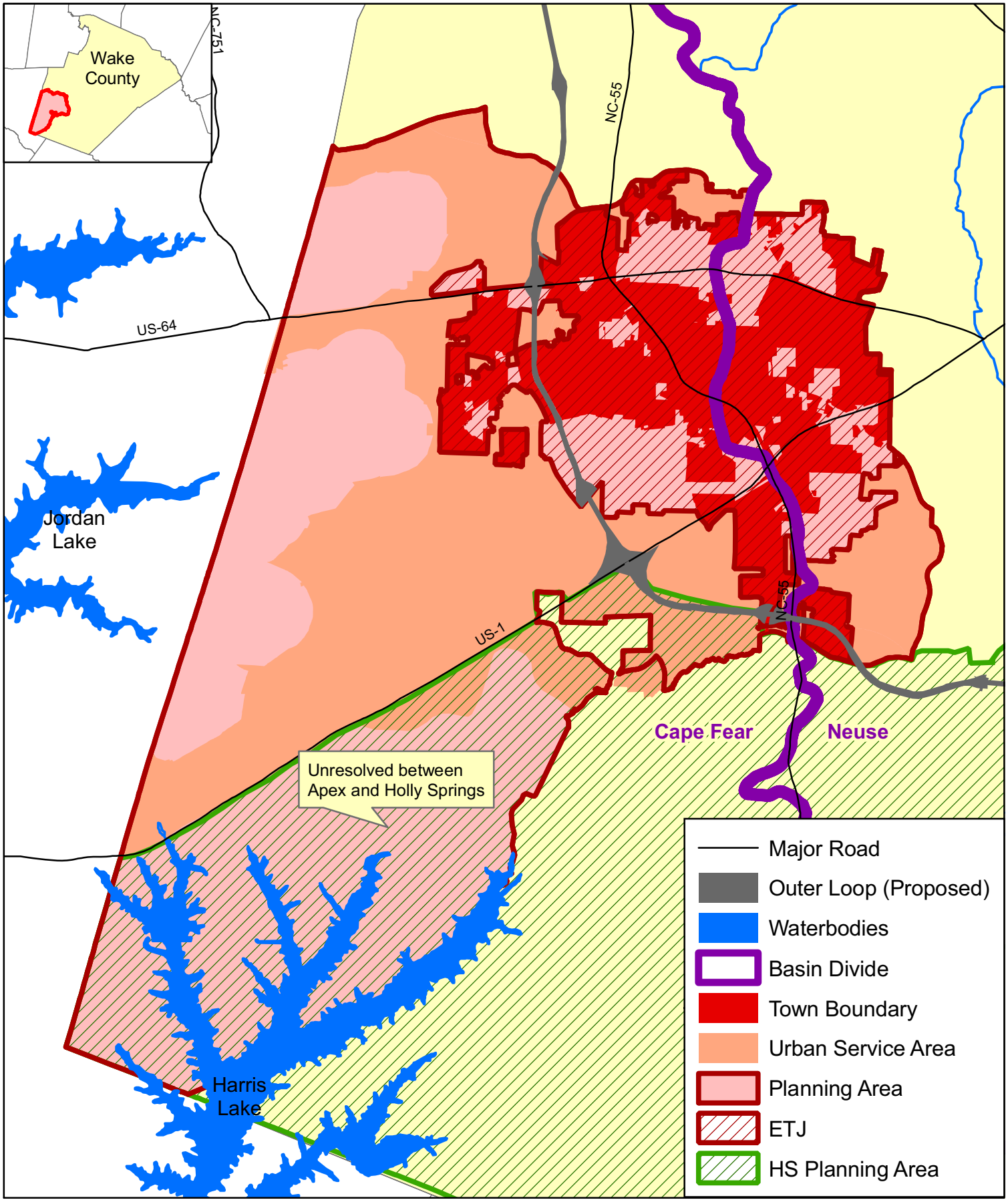

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Figure 1-1
Town of Apex - Planning Area
Secondary and Cumulative Impacts Master Mitigation Plan

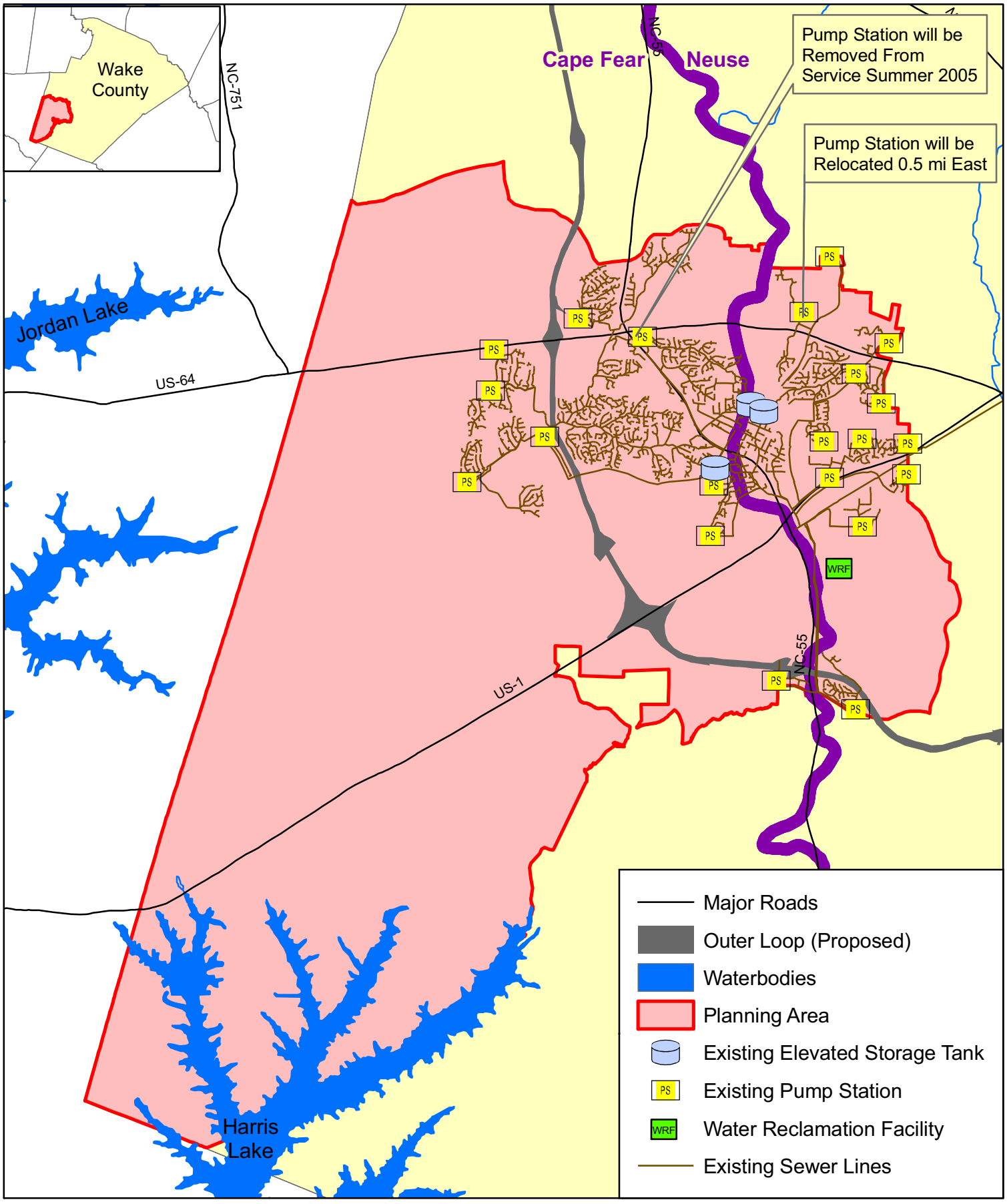

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Figure 2-1
Town of Apex - Existing Wastewater Infrastructure
Secondary and Cumulative Impacts Master Mitigation Plan

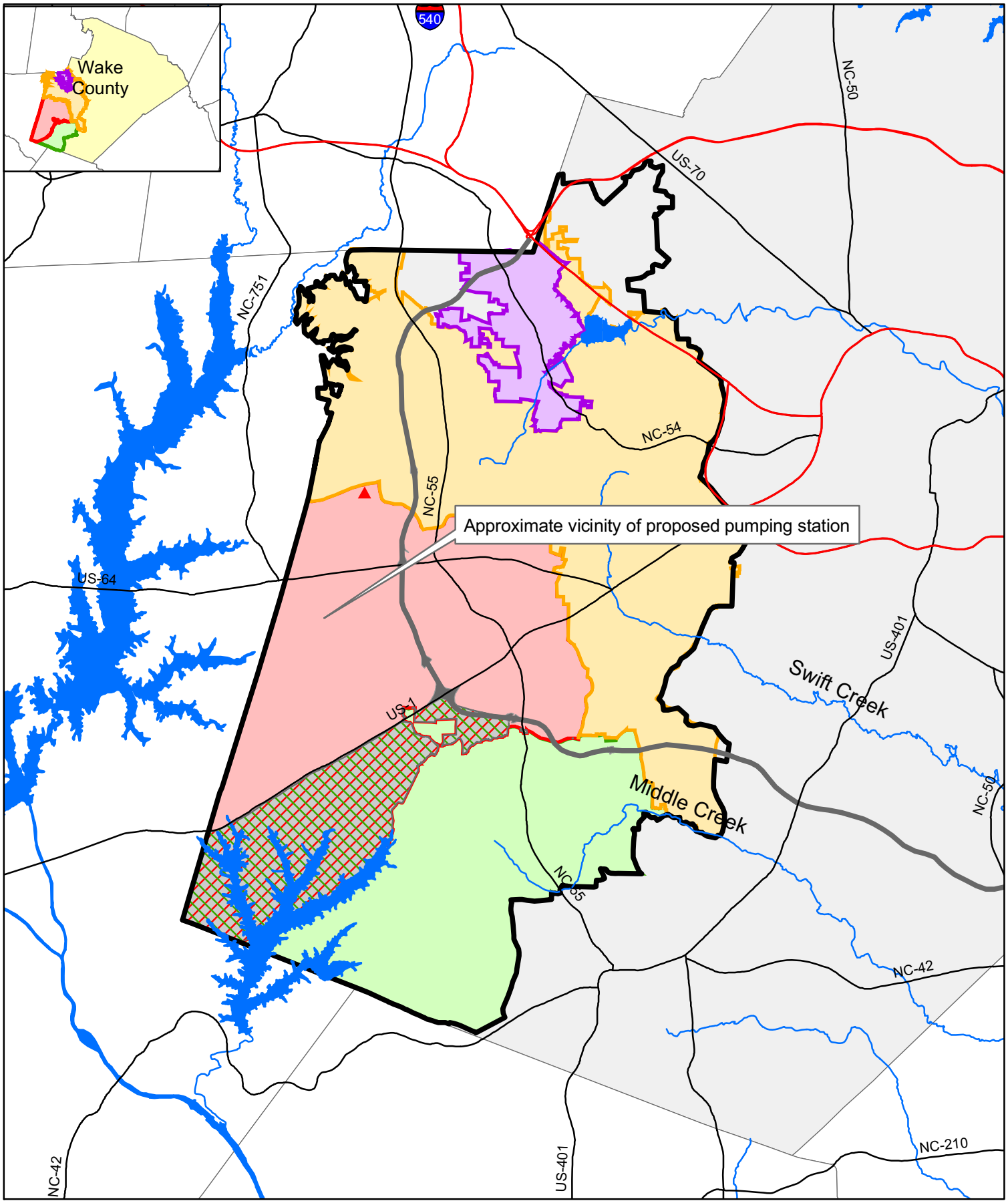
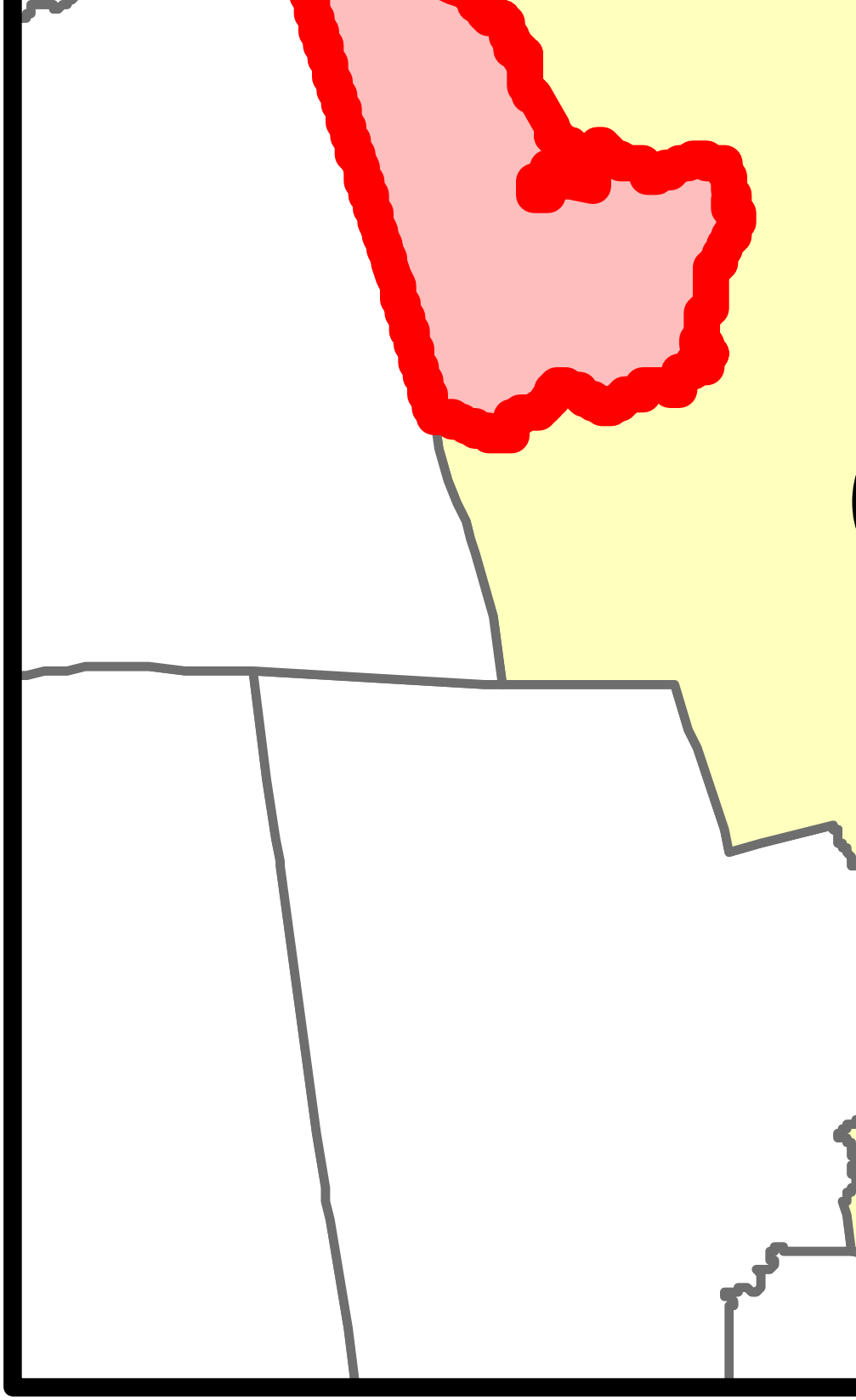


Figure 2-2
Western Wake Proposed WRF Service Area
Secondary and Cumulative Impacts Master Mitigation Plan



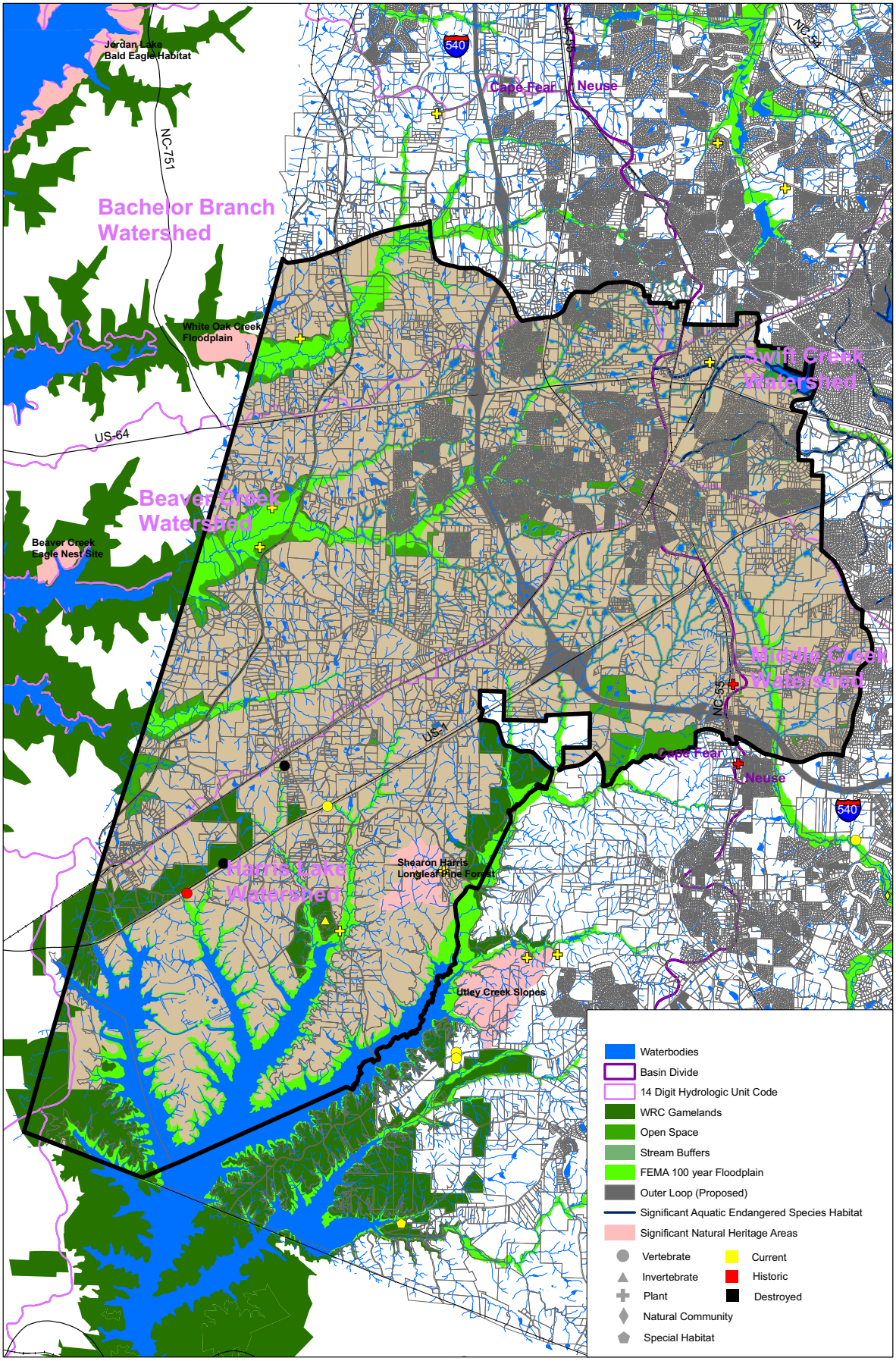


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Figure 4-1
Town of Apex - Environmental Features
Secondary and Cumulative Impacts Master Mitigation Plan

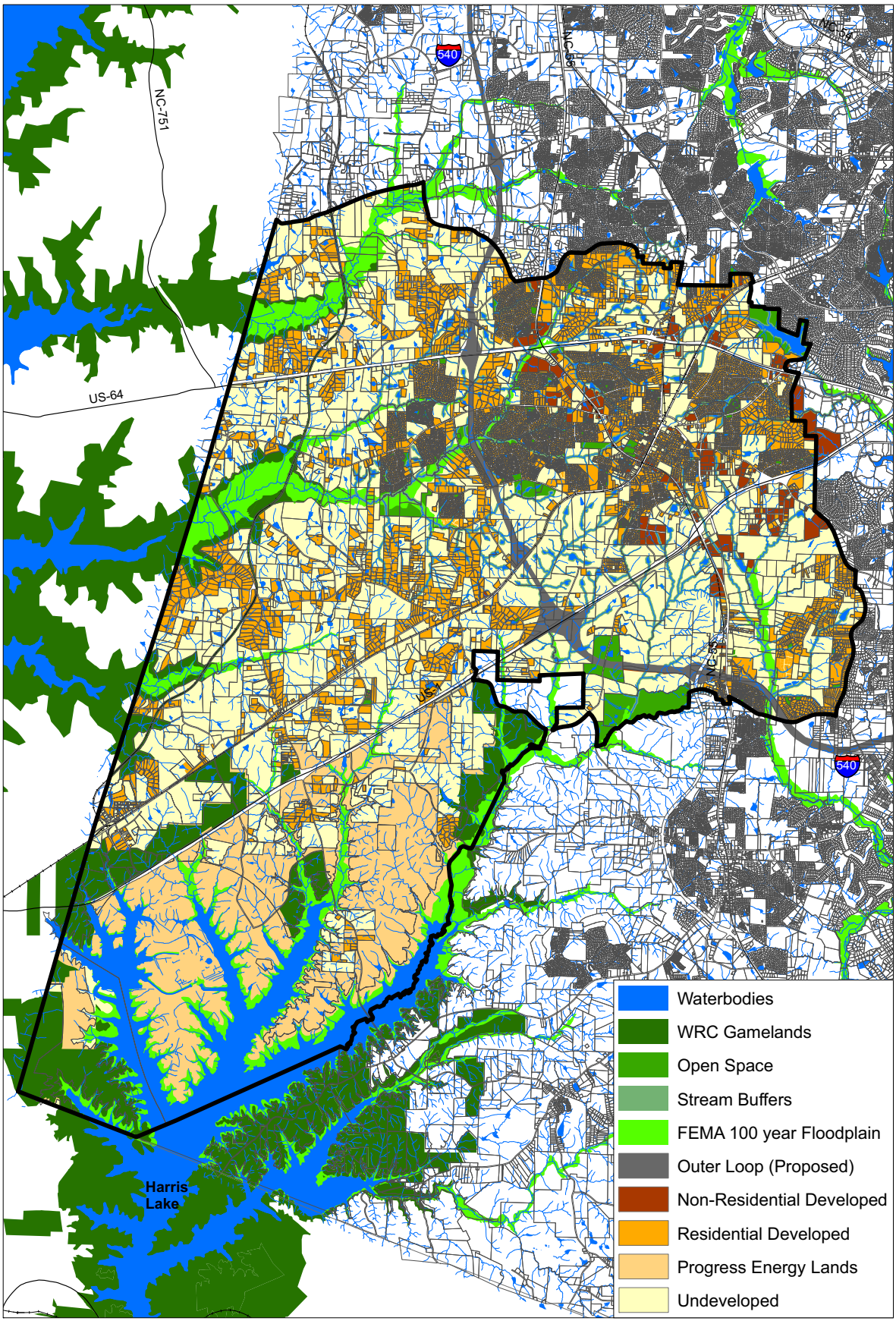

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Figure 4-2
Town of Apex - Existing Land Use
Secondary and Cumulative Impacts Master Mitigation Plan

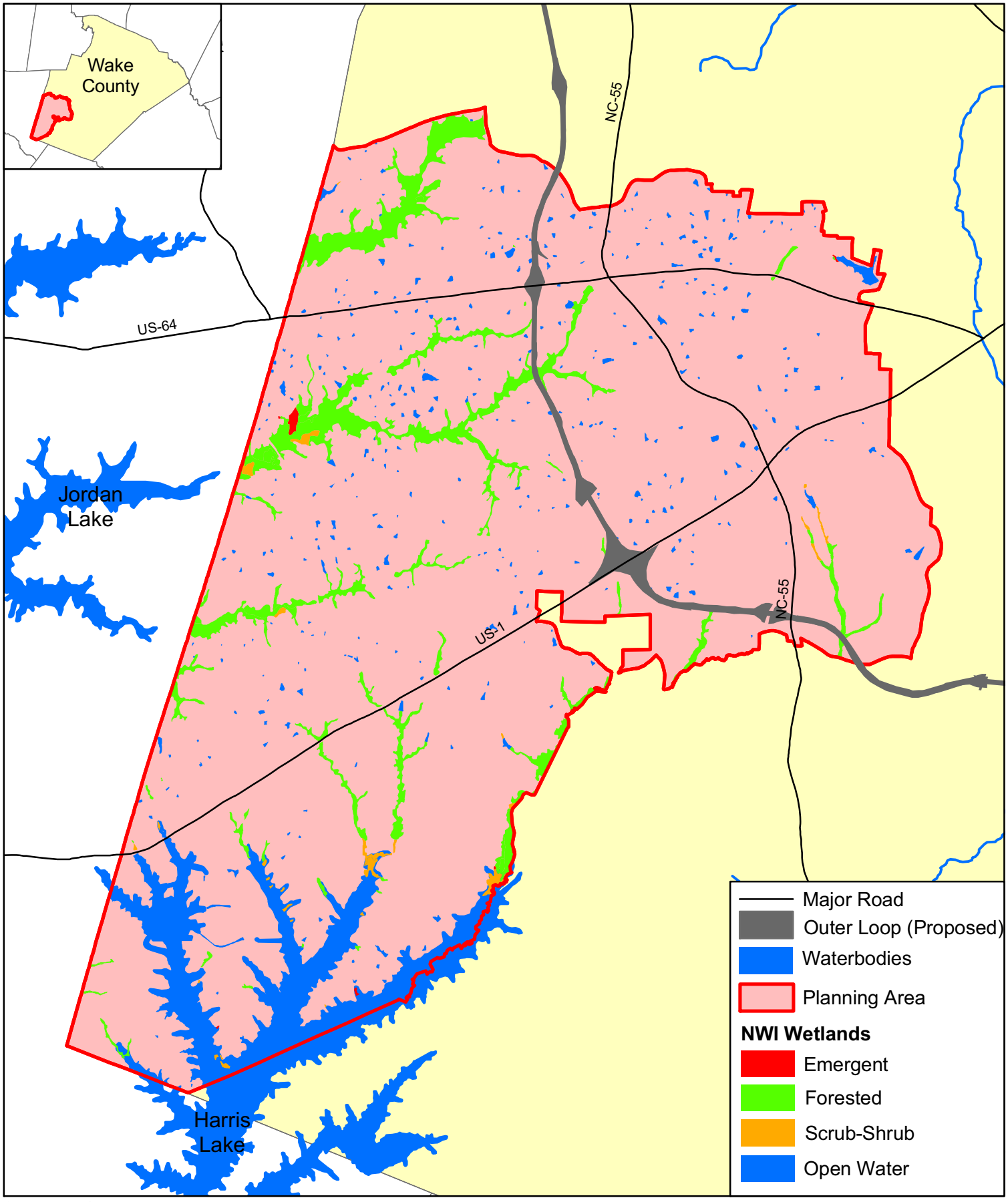

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Figure 4-3
Town of Apex - National Wetlands Inventory
Secondary and Cumulative Impacts Master Mitigation Plan

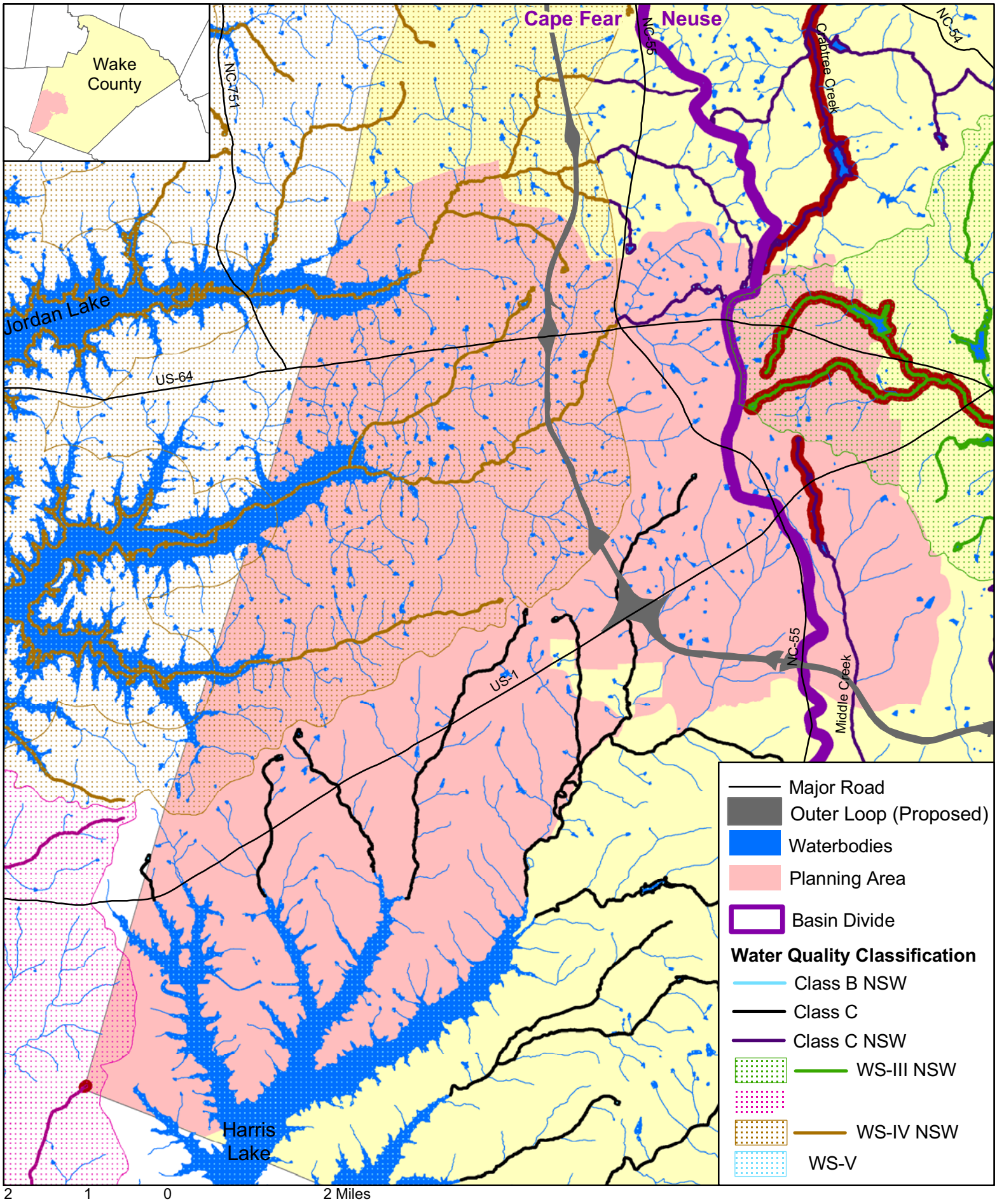

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Figure 4-4
Town of Apex - Water Resources
Secondary and Cumulative Impacts Master Mitigation Plan

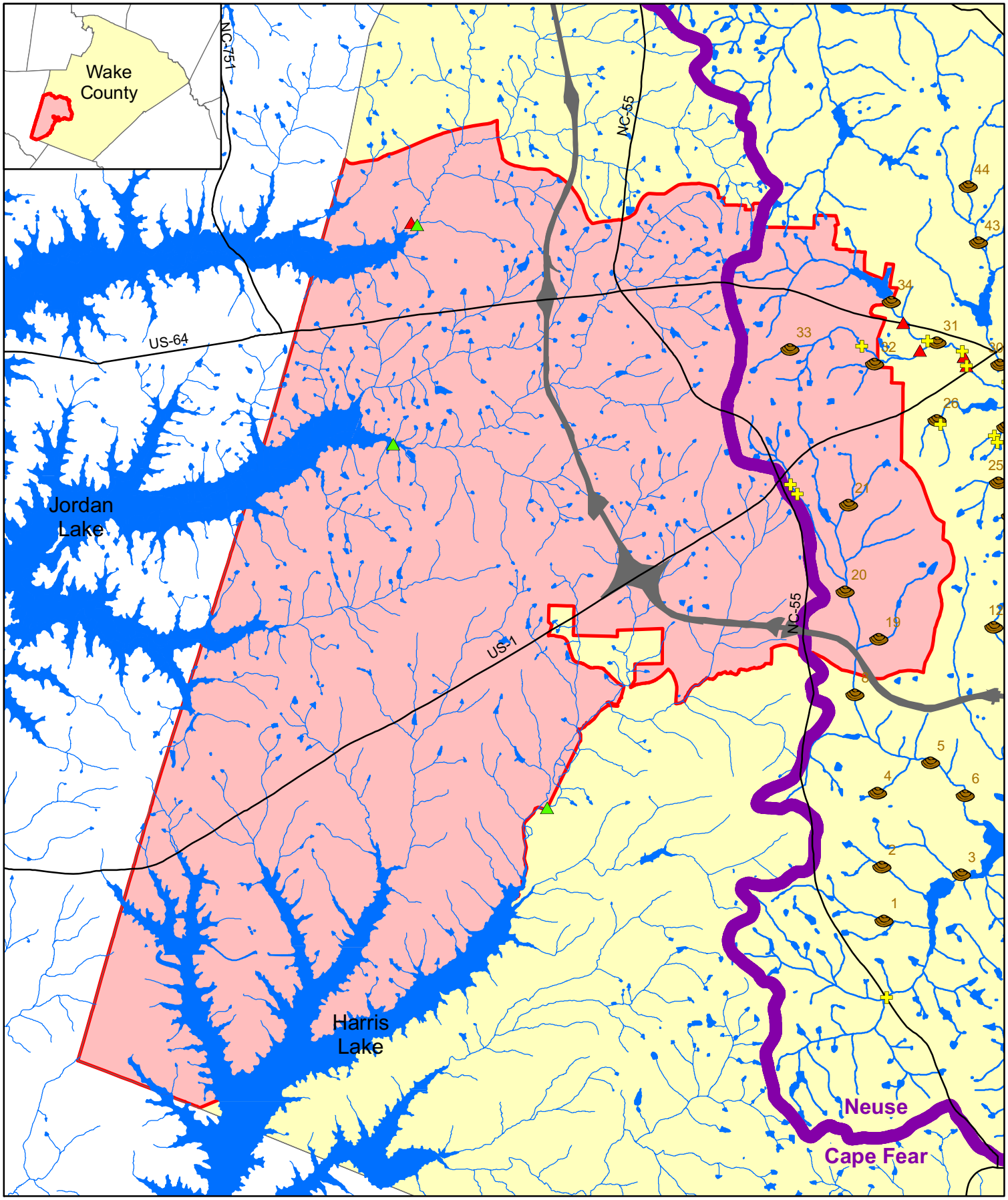

Figure 4-5
Town of Apex - Biological Sampling Sites
Secondary and Cumulative Impacts Master Mitigation Plan