Environmental Impact Statement
for
Charlotte-Mecklenburg Utilities / City of Mount Holly
Regional Wastewater Treatment

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Abbreviations

A&E	American & Efird
ACOE	(United States) Army Corps of Engineers
BAR	Basinwide Assessment Report
BFE	Base Flood Elevation
BMI	Benthic Macroinvertebrates
BMP	Best Management Practice
BNR	Biological Nutrient Removal
BOD	Biochemical Oxygen Demand
BUA	Built Upon Area
CA	Critical Area
CBOD	Carbonaceous Biochemical Oxygen Demand
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFS	Cubic Feet per Second
CMMA	Charlotte-Mecklenburg Metropolitan Area
CWA	Clean Water Act
DENR	(North Carolina) Department of Environment and Natural Resources
DAQ	(North Carolina DENR) Division of Air Quality
DFIRM	Digital Flood Insurance Rate Map
DWR	(North Carolina DENR) Division of Water Resources
DO	Dissolved Oxygen
DWQ	(North Carolina DENR) Division of Water Quality
EAA	Engineering Alternatives Analysis
EIS	Environmental Impact Statement
EPA	(United States) Environmental Protection Agency
ESRI	Environmental Systems Research Institute
ESA	Endangered Species Act
ETJ	Extra Territorial Jurisdiction
FACW	Facultative Wet
FEMA	Federal Emergency Management Agency
FERC	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Map
FM	Force Main
FOG	Fats, Oil and Grease
FWS	Fish and Wildlife Services
Gal	Gallon
GDP	General Development Policies
GIS	Geographic Information Systems
gpcd	Gallons per Capita per Day
gpd	Gallons per Day
GS	General Statutes
HQW	High Quality Waters

HUC	Hydrologic Unit Code
IBI	Index of Biotic Integrity
lbs	Pounds
LEED	Leadership in Energy and Environmental Design
LID	Low Impact Development
LUESA	(Charlotte-Mecklenburg) Land Use and Environmental Services Agency
LWWS-CA	Lake Wylie Watershed Critical Area
LWWS-PA	Lake Wylie Watershed Protected Area
mg/L	Milligrams per Liter
mgd	Million Gallons per Day
MEP	Maximum Extent Practicable
MIL	Mountain Island Lake
MILWS-CA	Mountain Island Lake Critical Area
MILWS-PA	Mountain Island Lake Protected Area
MRLC	Multi-Resolution Land Characteristics (Consortium)
MS4	Municipal Separate Storm Sewer System
NACWA	National Association of Clean Water Agencies
NC	North Carolina
NCAC	North Carolina Administrative Code
NCBI	North Carolina Biotic Index
NCGS	North Carolina Geologic Survey
NCNRCS	North Carolina Natural Resources Conservation Service
NFIP	National Flood Insurance Program
NH_3-N	Ammonia as nitrogen
NHID	Natural Heritage Inventory Database
NHP	Natural Heritage Program
NLCD	National Land Cover Dataset
NOAA	National Oceanographic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NPW	Non-Potable Water
NRCS	Natural Resources Conservation Service
NTU	Nephelomethric Turbidity Units
NWI	National Wetlands Inventory
NWP	Nationwide Program
O&M	Operations & Maintenance
OBL	Obligate Wet
PA	Protected Area
pH	Concentration of hydrogen ions
RCRA	Resource Conservation and Recovery Act
ROD	Record of Decision
ROW	Right of Way
SCDHEC	South Carolina Department of Health and Environmental Control
SEPA	State Environmental Policy Act

SHPO	State Historic Preservation Office
SIU	Significant Industrial Use
SMP	Shoreline Management Plan
SSO	Sanitary Sewer Overflow
SUSI	Stream Use-Support Index
SWIM	Surface Water Improvement and Management
TAZ	Traffic Analysis Zone
TMDL	Total Maximum Daily Load
TN	Total Nitrogen
TP	Total Phosphorus
TSS	Total Suspended Solids
UDO	Unified Development Ordinance
µg/L	Microgram per Liter
UV	Ultraviolet
USACE	United States Army Corp of Engineers
USDA	United States Department of Agriculture
USFWS	United States Fish and Wildlife Service
USGS	United States Geologic Survey
USFS	United States Forest Service
USNWC	United States National Whitewater Center
Utilities	Charlotte-Mecklenburg Utilities
WWMF	Wastewater Management Facility
WWTP	Wastewater Treatment Plant
WQ	Water Quality

Section 1. Executive Summary

Charlotte-Mecklenburg Utilities (Utilities) provides wastewater services to more than 750,000 customers in the City of Charlotte and surrounding areas in Mecklenburg County, including the towns of Matthews, Mint Hill, Pineville, Huntersville and Cornelius. As part of a coordinated effort to proactively plan for and accommodate future growth in the region, Utilities undertook a comprehensive evaluation of their current and anticipated future wastewater treatment needs, focusing in particular on the Sugar Creek and Long Creek Basins.

Population within the Sugar Creek Basin was 685,000 in 2010, increasing to approximately 923,000 in 2030. While population in the Long Creek Basin along the Catawba River was 43,400 by 2010 and 116,000 by 2030.

These basins are currently serviced by three main wastewater treatment plants (WWTPs): the Irwin Creek WWTP, Sugar Creek WWTP and McAlpine Creek Wastewater Management Facility (WWMF). Combined, these facilities have a total maximum month rated treatment capacity of 99 million gallons per day (mgd). The primary goal of the Wastewater Treatment Plant Expansion Study (Expansion Study, CH2M Hill, 2007) was to evaluate alternatives for accommodating increasing wastewater flow rates while considering the most efficient uses of existing infrastructure and possible future expansions. Charlotte-Mecklenburg Utilities owns two additional plants that provide wastewater treatment to the City of Charlotte, including the McDowell Creek WWTP and Mallard Creek WRF – however, they were not included as part of the Expansion Study.

The Expansion Study, which included extensive coordination with North Carolina and South Carolina regulatory agencies, determined that the best approach toward meeting future wastewater capacity needs would include construction of a new WWTP to provide wastewater service to the Long Creek Basin, major expansion of the Sugar Creek WWTP, and moderate expansion of the McAlpine Creek WWMF. The Irwin Creek WWTP would also need to be rehabilitated. These improvements would increase the wastewater capacity from the current level of 99 mgd to 144 mgd by 2030.

The service areas for the Sugar Creek and Irwin Creek WWTPs are closer to uptown Charlotte than the McAlpine Creek WWMF, and are experiencing in-fill development, and may be closer to build-out. Since most development is in-fill, secondary and cumulative impacts in these service areas are not expected to be significant. The fastest growing basins are those along the Catawba River, including the Long Creek Basin. Wastewater in this basin is pumped relatively long distances (approximately 20 miles) and treated at the McAlpine Creek WWMF. Because the Long Creek basin has relatively low density development compared to other areas serviced by Utilities, it may experience greater challenges and impacts associated with new development.

A Feasibility and Preliminary Planning Study for Regional Wastewater Treatment (Black & Veatch, 2006) was conducted to provide long-range planning for wastewater treatment for the City of Mount Holly and the Long Creek Basin in Mecklenburg County. This high level feasibility study focused on developing an innovative regional solution to meet the needs of this growing area. Six alternatives were identified to provide treatment capacity through the year 2030. These alternatives are further evaluated in this Environmental Impact Statement (EIS). Based on this analysis, the preferred alternative is a new regional treatment plant constructed in northwestern Mecklenburg County.

Mt Holly and Belmont have expressed a desire to participate in the regional treatment facility. The alternatives presented in Section 2 assume that one or both of these entities will be a part of the regional facility.

The proposed project would provide wastewater service to the City of Mount Holly (which also accepts a small portion of flow from a southeastern section of the Town of Stanley), the City of Charlotte, a small southern section of the Town of Huntersville Mecklenburg County, Clariant facility adjacent to the proposed plant site, and City of Belmont. Future service may also include areas in Gaston County as they become annexed by the City of Mount Holly. The new regional wastewater treatment plant was selected to minimize environmental impacts and meet the planning goals of the region. Specifically the preferred alternative will include:

- Comparatively fewer natural resource and environmental impact issues at the building site;
- Fewer construction and operational constraints;
- Greater public recreation and open space benefits;
- Reduced energy use for pumping to south plants;
- Increased water volume in Lake Wylie for local uses such as power generation, cooling water, low flow supplementation, and drinking water;
- Concurrence with the planning goals of the affected local governments. Eliminate the NPDES permit discharge from the Clariant, Belmont, and/or Mt Holly facility.

Water quality modeling of Lake Wylie revealed that the impacts from the new proposed wastewater treatment plant would be minor and confined to the upper reaches of the lake. During an average flow year, predicted concentrations of total nitrogen (TN), total phosphorus (TP) and chlorophyll-*a* were below the water quality criteria (South Carolina criteria for TN = 1.5 mg/L and TP = 0.06 mg/L, North Carolina and South Carolina criteria for chlorophyll-*a* = 40 µg/L).

Mitigation efforts developed in coordination with state and local agencies will minimize secondary and cumulative impacts related to growth. Measures currently in place, including smart growth land use planning, stream buffers and stormwater BMPs, are anticipated to minimize impacts to water quality and water resources in the service areas as development occurs.

The proposed project would require the following federal and state permits:

- NPDES Permit
- FERC Permit
- Air Quality Permit
- Dam Permit (for Equalization Basin embankment)
- 401/404 Water Quality Certification Permit
- Erosion Control Permit
- Mecklenburg County Building Permit
- Authorization to Construct

Section 2. Project Description

2.1 Introduction

Population growth and increased land development in the Charlotte region have resulted in increased need for wastewater collection and treatment. A Feasibility and Preliminary Planning Study for Regional Wastewater Treatment (Black & Veatch, 2006) was conducted to provide long-range planning for wastewater treatment for the City of Mount Holly and the Long Creek Basin in Mecklenburg County. The high level feasibility study focused on developing an innovative regional solution to meet the needs of this growing region. Six alternatives were identified to provide treatment capacity through the year 2030 and are further evaluated in this Environmental Impact Statement (EIS).

The North Carolina Environmental Policy Act of 1971 requires state agencies to review the potential environmental effects associated with any activity that involves an action by a state agency (such as issuance of a permit), an expenditure of public monies (or private use of public land) or has the potential for negative environmental impacts on natural resources, public health and safety, natural beauty, or historical and cultural elements of the state. According to this statute, this EIS has been prepared to assess the possible direct and secondary/cumulative environmental impacts associated with the proposed new wastewater treatment plant (WWTP) construction and operation.

2.2 Existing Wastewater Facilities

The sections below discuss the other existing wastewater treatment facilities in the general vicinity of the service area. Figure 2.1 shows the location of the project area and the other dischargers in the basin.

2.2.1 City of Charlotte and Mecklenburg County

Charlotte-Mecklenburg Utilities (Utilities) provides wastewater services to more than 750,000 customers in the City of Charlotte and surrounding areas in Mecklenburg County, including the towns of Matthews, Mint Hill, Pineville, Huntersville, and Cornelius. The Utilities wastewater collection system in this project area currently serves a population of over 25,000 people and collects flow from four basins: Gar Creek, Lower Mountain Island Lake, Paw Creek, and Long Creek. Wastewater flow from these basins is currently treated at the McAlpine Creek wastewater management facility (WWMF), located in southern Mecklenburg County. Charlotte-Mecklenburg Utilities owns four additional plants that provide wastewater treatment throughout the City of Charlotte and Mecklenburg County including Irwin Creek WWTP, Sugar Creek WWTP, McDowell Creek WWTP and Mallard Creek WRF. In addition to the McAlpine Creek WWMF, the Irwin Creek WWTP was identified as a feasible location to treat flows from the Long Creek Basin.

The McDowell Creek WWTP is located within the Town of Huntersville limits, and therefore is required to comply with the Huntersville Water Quality Ordinance. The goal of this ordinance is to establish stormwater management requirements and controls to prevent surface water quality degradation in the streams and lakes within the Town limits. Low Impact Development (LID) techniques combined with conventional stormwater retention and detention structures are the primary mechanisms for meeting this ordinance. The goal of the LID is to implement best management practices to store, infiltrate, evaporate, retain, and detain runoff on site to replicate the pre-development runoff conditions and prevent an increase in pollutant loads above pre-development conditions. Storm pipes and surface channels on the plant site were sized to direct stormwater flows from impervious areas to

level spreaders, bioretention areas, and storm ponds. In total, 24 bioretention areas and 3 stormwater detention ponds were installed during the expansion project. A new sustainably designed LEED certified building that includes treatment laboratories for water, wastewater and stormwater, office space and meetings rooms was recently constructed on land adjacent to the Irwin Creek WWTP. Together with the innovative stormwater BMPs at McDowell, this building will also provide educational opportunities for students and the community.

Charlotte-Mecklenburg Utilities strives to maintain a high standard of treatment at all of their facilities. Mallard Creek WRF and McDowell Creek WWTP have received Platinum Awards; McAlpine Creek WWMF, and Sugar Creek WWTP have received Gold Awards; and Irwin Creek WWTP has received Silver Award from the National Association of Clean Water Agencies (NACWA). A summary of the treatment provided at each facility is described in the following sections. Table 2-1 summarizes the capacity and key permit limits for each of the five Utilities plants.

Table 2-1 Permit Summaries for the Five WWTPS in the Utilities Service Area

	Flow (mgd)	CBOD (mg/L)	TSS (mg/L)	NH3-N (mg/L)	TN (lb/d)	TP (lb/d)
McAlpine Creek WWMF	64.0	4.0 (S) 8.0 (W)	15.0	1.0 (S) 1.9 (W)	Monitor	1067**
Irwin Creek WWTP	15.0	5.0 (S) 10.0 (W)	30.0	1.2 (S) 2.3 (W)	Monitor	**
Sugar Creek WWTP	20.0	5.0 (S) 10.0 (W)	30.0	1.0 (S) 2.0 (W)	Monitor	**
McDowell Creek WWTP	12.0	4.2 (S) 8.3 (W)	12.0	1.0	450 (S) 500 (W)	22 (S) 27 (W)
Mallard Creek WRF	12.0	4.2 (S) 8.3 (W)	30.0	1.0 (S) 2.0 (W)	- -	- -
Mallard Creek WRF Reuse	4.0		5.0	4.0		

*(S) Summer; (W) Winter

**Combined 12-month rolling average limit of 823 lb/d

2.2.1.1 McAlpine Creek WWMF

The McAlpine Creek WWMF is the largest of all the Charlotte-Mecklenburg Utilities treatment plants with a daily capacity of 64 million gallons per day (mgd). The plant is currently designed to provide advanced wastewater treatment for the southern portion of Mecklenburg County. The plant discharges into McAlpine Creek which ultimately drains to the Catawba River south of Lake Wylie. The treatment plant consists of activated sludge treatment, clarification, and filtration for carbonaceous biochemical oxygen demand (CBOD) and total suspended solids (TSS) removal, advanced anaerobic/oxic biological nutrient removal (BNR) to reduce effluent concentrations of total phosphorus (TP), flow equalization for use during storm events, hypochlorite disinfection and dechlorination. A combined limit for TP is in place for three of the Utilities plants: McAlpine Creek WWMF, Irwin Creek WWTP and Sugar Creek WWTP. This limit specifies that the 12-month rolling average TP load from the three plants combined must not exceed 823 lb/d.

2.2.1.2 Sugar Creek WWTP

The Sugar Creek WWTP was built in 1927 to treat wastewater for the City of Charlotte. Since then numerous expansions, upgrades and modifications have occurred. The plant is currently designed to treat a flow of 20 mgd and provides advanced wastewater treatment for the central portion of the city. It is located in a highly urbanized area with business, commercial and residential development. In 1999, the plant completed a highly successful odor control project with help and participation from the surrounding community. The plant utilizes the following treatment processes: screening, primary clarification, trickling filters, activated sludge biological treatment, tertiary filtration and ultraviolet disinfection. Treated effluent is discharged into Little Sugar Creek which discharges to the Catawba River. The Sugar Creek WWTP is currently in the design phase of an expansion project that will meet the demands of the increasing wastewater flows being experienced at the plant. The project will include sustainable design methods and nutrient removal capabilities.

2.2.1.3 Irwin Creek WWTP

The Irwin Creek WWTP was built in 1927 as a twin plant to Sugar Creek WWTP. Since then numerous expansions, upgrades and modifications have occurred. The plant is designed to treat a flow of 15 mgd and currently provides wastewater treatment for the western portion of the city. The plant utilizes the following treatment processes: screening, primary clarification, trickling filters, activated sludge biological treatment, tertiary filtration and ultraviolet disinfection. Treated wastewater is discharged into Irwin Creek which also discharges to the Catawba River. A rehabilitation and upgrade project is currently under design for the Irwin Creek WWTP that will ensure the facility can continue to reliably treat its permitted capacity.

2.2.1.4 McDowell Creek WWTP

Wastewater treatment for the Towns of Huntersville and Cornelius is provided by Utilities at the McDowell Creek WWTP in northern Mecklenburg County. The plant discharges into McDowell Creek less than 0.5 miles upstream of Mountain Island Lake, which is the primary water supply for the Cities of Charlotte, Gastonia and Mount Holly. The plant was recently expanded from 6 mgd to 12 mgd to accommodate a growing population in the area. To protect water quality in Mountain Island Lake, several key treatment technologies were incorporated into the expansion, including membrane filtration to remove turbidity, particles and microbial contaminants, five-stage biological nutrient removal and denitrification filters to meet stringent nitrogen and phosphorus limits, and a reuse system to recycle reclaimed water to irrigation customers within the service area.

2.2.1.5 Mallard Creek WRF

The Mallard Creek WRF was built in 1979 to meet increased demand as the area northeast of Charlotte grew and has since been upgraded and expanded to allow for greater treatment capacity (combined capacity of 12 mgd with up to 4 mgd permitted for reuse). The plant provides activated sludge biological treatment and treated effluent is discharged to Mallard Creek, which is part of the Rocky River Basin. In 1998, the plant began operation of Charlotte-Mecklenburg Utilities' first reclaimed water system permitted for 3 mgd, which safely and effectively highly treated wastewater for irrigation at The Tradition Golf Links. Mallard Creek WRF is certified to the ISO 14001:2004 Environmental Management Systems standard. The ISO 14001 standard specifies requirements for establishing an environmental policy, determining environmental aspects and impacts, planning objectives, setting measurable targets, implementation and operation of programs to meet objectives and targets, corrective and preventive action analysis, and management review.

2.2.2 City of Mount Holly

The City of Mount Holly provides wastewater collection and treatment for a population of nearly 11,000 people, and provides regional treatment for a portion of the flow from the Town of Stanley. The Mount Holly WWTP is located on the Catawba River to the southeast of the City. The plant was originally constructed in 1965 and was expanded to 4 million gallons per day (mgd) in the 1970s. The Mount Holly WWTP consists of screening, equalization, extended aeration, secondary clarifiers, chlorine disinfection and dechlorination.

The Mount Holly WWTP is an extended aeration facility with permit limits for both BOD and TSS of 30 mg/L. Although the plant does not currently have limits for ammonia-nitrogen (NH_3-N), total nitrogen (TN) or total phosphorus (TP), it is required to monitor these parameters on a monthly basis.

2.2.3 City of Belmont

The City of Belmont provides wastewater collection and treatment for a population of nearly 9,000 people. The 5-mgd WWTP discharges to the Catawba River, downstream of the existing Mount Holly WWTP. It is an extended aeration treatment process with chlorine disinfection and dechlorination with sulfur dioxide. Solids are aerobically digested and sludge is land applied. The WWTP has permit limits for BOD and TSS similar to Mount Holly (30 mg/L limits for both parameters). In addition, the plant has daily monitoring in place for ammonia, dissolved oxygen (DO) and temperature, and twice monthly monitoring for TN and TP.

The intake for the City of Belmont water treatment plant is also located on the Catawba River. Protection of water quality is particularly important in this watershed because of the close proximity of this water supply intake and the proposed WWTP. To provide additional supply and diversify their water supply sources, Belmont has initiated construction of a new potable water interconnection with the City of Mount Holly.

2.2.4 Town of Stanley

The Town of Stanley serves a population of 3,000 people and treats approximately half of its wastewater (160,000 gal/d) at a 0.5 mgd treatment plant that discharges to Mauney Creek, which ultimately drains to the South Fork of the Catawba River. It is an extended aeration facility with permit limits for both BOD and TSS of 30 mg/L. The remainder of Stanley's wastewater (currently 180,000 gal/d) is sent for treatment at the Mount Holly WWTP. The agreement between the two Utilities capped treatment of additional flows at 200,000 gal/d.

2.2.5 Clariant Corporation

Clariant Corporation operates a specialty organic chemical manufacturing facility immediately north of the Long Creek Pumping Station in Mecklenburg County. Process and sanitary wastewater are treated at an onsite WWTP which consists of neutralization, primary clarification, activated sludge treatment, final settling and post aeration. The 3.9 mgd capacity WWTP is also used to treat wastewater associated with a groundwater remediation facility.

2.3 Regional Wastewater Treatment Planning Study

Charlotte-Mecklenburg Utilities and the City of Mount Holly cooperated in a feasibility and preliminary planning study which evaluated the growing wastewater demands in both service areas and identified a number of alternatives that would meet future wastewater projections (Black & Veatch, 2006). The study found that several regional treatment scenarios were conceptually feasible and favored the construction of a new facility. Scenarios identified in the study included a new regional WWTP adjacent to the existing Long Creek Pumping Station in

western Mecklenburg County as well as combinations of expansion and new construction on the Gaston County side of the Catawba River. Key elements of the six alternatives reviewed in the study are summarized below. Mount Holly and Belmont have expressed a desire to participate in the regional treatment facility. The alternatives assume that one or both of these entities will be a part of the regional facility.

- **No Action** – Continue to operate the existing systems at the current rates without providing additional wastewater treatment for an expanding population. Additional treatment needs could be met through a combination of septic systems and neighborhood package treatment plants. The state has informed Mount Holly and Belmont that their NPDES permit will be modified to include nutrient limits. Those upgrades have not been made at this time but will be included in the No Action Alternative.
- **Alternative 1: Operate separately with existing and upgraded facilities** – Continue to operate separately and with existing facilities. This scenario requires Mount Holly to upgrade and expand their existing plant. Belmont flows pumped across Catawba River. Utilities to provide conveyance and treatment capacity at McAlpine Creek WWMF and/or at Irwin Creek WWTP. Wastewater from Clariant would continue to be treated by Clariant and discharged to the river.
- **Alternative 2: Operate separately with additional and upgraded facilities** – Continue to operate separately with additional facilities. This scenario requires Mount Holly to upgrade and expand their existing plant. Belmont flows pumped across Catawba River, and Utilities to construct a new 17 mgd plant located at Long Creek to treat wastewater from within Mecklenburg County, Belmont, and Clariant.
- **Alternative 3: Operate jointly at upgraded and expanded regional Mount Holly WWTP** – Provide treatment for Mount Holly, Clariant, and Utilities flows at the Mount Holly WWTP site by upgrading and expanding the existing plant to 25 mgd. Utilities flows would be pumped across the Catawba River. Belmont flows pumped across Catawba River.
- **Alternative 4: Operate jointly at new regional WWTP (Gaston side)** – Provide treatment for Mount Holly, Clariant, and Utilities flows in Mount Holly by constructing a new 25 mgd WWTP on land adjacent to the existing Mount Holly WWTP. Utilities flows would be pumped across the Catawba River. Belmont flows pumped across Catawba River.
- **Alternative 5: Operate jointly at new regional WWTP (Mecklenburg County side)** – Provide treatment for Mount Holly and/or Belmont, Clariant, and Utilities flows on the Mecklenburg side of the Catawba River by constructing a new 25 mgd WWTP on vacant land near the Long Creek Pumping Station. Mount Holly and Belmont flows would be pumped across the Catawba River.
- **Alternative 6: Combination of new and existing facilities** – Continue to operate the Mount Holly WWTP at 4 mgd. Mt Holly would upgrade their existing facility. Provide treatment for Mount Holly, Belmont, Clariant, and Utilities flows on the Mecklenburg side of the Catawba River by constructing a new 21 mgd WWTP on vacant land near the Long Creek Pumping Station. Mount Holly flows exceeding 4 mgd and Belmont flows would be pumped across the Catawba River.
- **Non-Discharge / Land Application** – This scenario would apply to Alternatives 2 –6 and would involve only spray irrigation of treated effluent instead of direct discharge to a surface water body.

Section 3. Purpose and Need

3.1 Project Purpose

As stated previously, proposed regional wastewater treatment is required to respond to continued growth in northwestern Mecklenburg County and Eastern Gaston County. In 2006, Charlotte-Mecklenburg Utilities and the City of Mount Holly conducted a Feasibility and Preliminary Planning Study for Regional Wastewater Treatment (Black & Veatch, 2006). The objectives for this study included the following:

- Evaluate population projections
- Project wastewater flows that may be produced based on growth projections
- Identify and evaluate wastewater treatment alternatives – both separate and regional solutions
- High-level evaluation of environmental impacts associated with each alternative

Population projections for Mecklenburg County were obtained from the Wastewater Treatment Plant Expansion Study for the McAlpine Creek WWMF, Sugar Creek WWTP, and Irwin Creek WWTP (CH2M Hill, 2007). Population projections were developed for Mount Holly utilizing the 2001 Mount Holly Land Development Plan Update and discussions with Mount Holly planning staff to project populations through 2030. Population projections for Belmont were obtained from the Unified Utilities Feasibility Study – Phase II (Black & Veatch, 2009) Projections developed for 2010, 2020, and 2030 planning years were used to generate estimates of future wastewater flows.

3.2 Population Projections

3.2.1 City of Mount Holly

In order to project service area growth and expansion, consideration was given to existing population projections prepared by other agencies as well as historical data and planned growth. Within Mount Holly political boundaries (including unincorporated portions of the county to which the City does and will provide future service), population projections were developed on a percent growth basis for each planning year from the data provided. The desired 2010, 2020, and 2030 planning years were linearly interpolated between the future years' projections provided. Population projections through 2030 for City of Mount Holly service area are shown in Table 3-1.

Table 3-1 Mount Holly Service Area Population Projections

Year	Population
2000	9,618
2010	14,515
2020	24,382
2030	39,322

3.2.2 Charlotte-Mecklenburg Utilities

Population projections for the wastewater service areas in western Mecklenburg County were developed as part of the Wastewater Treatment Plant Expansion Study for the McAlpine Creek WWMF, Sugar Creek WWTP, and Irwin Creek WWTP (CH2M Hill, 2007). Population projections developed for 2010, 2020, and 2030 planning

years were used to generate estimates of future wastewater flows. Population projections through 2030 for the Charlotte-Mecklenburg service area are shown in Table 3-2.

Table 3-2 Charlotte-Mecklenburg Service Area Population Projections

	2000	2010	2020	2030
Long Creek Basin	9,170	21,150	38,453	61,233
Paw Creek Basin	13,134	18,027	24,826	32,767
Catawba Creek Basin	0	1,085	3,572	7,853
Gar Creek Basin	386	1,241	2,852	5,381
Lower Mountain Island Lake Basin	607	1,868	4,395	8,346
Total	**23,297**	**43,371**	**74,098**	**115,580**

3.2.2 City of Belmont

Population projections for Belmont were taken from the Unified Utilities Feasibility Study – Phase II (Black & Veatch, 2009). The projections shown in Table 3-3 include the entire City however only a portion of the wastewater flow is included for this project.

Table 3-3 Belmont Population Projections

Year	Population
2007	9,218
2010	10,671
2020	17,382
2030	28,313

3.3 Wastewater Flow Projections

3.3.1 City of Mount Holly: Wastewater Flow Projections

As discussed in Section 2, the City of Mount Holly provides wastewater treatment service to a portion of the Town of Stanley as well as its own industrial and residential users. Current and future wastewater flow projections discussed throughout this section for the City of Mount Holly include 0.2 mgd allocation from the Town of Stanley.

Significant industrial use (SIU) permit holders are metered for billing purposes. The existing SIU wastewater flows to the Mount Holly WWTP are identified in Table 3-4.

Table 3-4 Significant Industrial Users in Mount Holly

	Actual Average Flow (mgd)[1]	Allocated Flow (mgd)
American & Efird	0.82	1.50
Buckeye	0.10	0.20
Clariant	0.10	0.16
Freightliner	0.12	0.34
Total	1.14	2.20

Source: City of Mount Holly

[1] September 2004 – June 2007 average flows

Influent wastewater flow data for Mount Holly WWTP were provided for January 1999 through June 2007. There have been many influences on the flow data over that period, including the prolonged drought impact as well as extremely wet conditions in 2003 on the groundwater infiltration and infiltration/inflow components of the total wastewater flow. Because of the significance of these factors, only data from January 2004 through June 2007 was used for this analysis. The SIU wastewater flows were subtracted from the average combined wastewater treatment plant influent flows. The remaining flows represent the Mount Holly residential component (served). This result is divided by the current population to derive the average Mount Holly residential water use in gallons per capita per day (gpcd) as shown in Table 3-5.

Table 3-5 Mount Holly Residential Flow per Capita (2004-2005)

	Wastewater Flow
Total Wastewater Flows	2.40 mgd
SIU Flows (from Table 3.3)	(1.14) mgd
Net Residential Flow	1.26 mgd
Residential Population Served	10,644
Residential Flow Per Capita	118 gpcd

Source: City of Mount Holly

The resulting 118 gpcd is a relatively conservative projection which includes the infiltration component present during the plant flows recorded. Projections were made for the domestic flow component by applying the average 118 gallons per capita per day to the population projections for the service area. An allowance for SIU flows was then added to obtain total wastewater flow projections for Mount Holly. Population and wastewater flow projections are presented in Table 3-6.

Table 3-6 Mount Holly Service Area Wastewater Flow Projections

	Population Served				Wastewater Flows (mgd)			
	2000	**2010**	**2020**	**2030**	**2000**	**2010**	**2020**	**2030**
City of Mount Holly	9,618	14,515	24,382	39,322	1.36	2.06	3.46	5.57
Mount Holly SIU's					2.20	2.20	2.20	2.20
Total	9,618	14,515	24,382	39,322	3.56	4.26	5.66	7.77

Note 1: Maximum Month wastewater flow projections

Note 2: Population growth projected as 3% annual growth rate.

Note 3: Wastewater service was estimated as 50% of population for 2000, 60% for 2010, 75% for 2020, and 90% for 2030.

Note 4: SIU flow represents the wastewater flow currently allocated to industries (from Table 3-3).

3.3.2 Charlotte-Mecklenburg Utilities: Average Flow Projections

Population and wastewater flow projections for the western Mecklenburg County wastewater service area are presented in Table 3-7.

Table 3-7 Mecklenburg County Service Area Wastewater Flow Projections

	Population Served				Wastewater Flows (mgd)			
	2000	2010	2020	2030	2000	2010	2020	2030
Long Creek Basin	9,170	21,150	38,453	61,233	1.57	3.00	5.45	7.68
Paw Creek Basin	13,134	18,027	24,826	32,767	2.26	2.56	3.52	3.64
Catawba Creek Basin	0	1,085	3,572	7,853	0.00	0.16	0.51	1.12
Gar Creek Basin	386	1,241	2,852	5,381	0.07	0.18	0.41	0.76
Lower Mtn Island Lake Basin	607	1,868	4,395	8,346	0.11	0.26	0.62	1.18
SIU's	-	-	-	-	0.00	0.28	0.32	0.36
Total	23,297	43,371	74,098	115,580	4.00	6.44	10.83	14.74

Note 1: Maximum Month wastewater flow projections

As discussed in Section 2, Charlotte-Mecklenburg Utilities provides wastewater service in the service area to the Town of Huntersville and the City of Charlotte. The flow projections listed in Table 3-6 include both municipalities.

The flow projections were used as the basis of evaluation for collection system and wastewater treatment plant capacity needs. It is noted that these flows represent maximum month projections, and that appropriate peaking factors were applied to monthly average flows to define the wastewater treatment capacity as required by the State of North Carolina. Mount Holly's wastewater flows are increasing, and are projected to reach maximum month flows of 5.7 mgd in 2020 and 7.8 mgd by 2030. Mecklenburg County's wastewater flows are also increasing, and are projected to reach maximum month flows of 10.9 mgd in 2020 and 16.8 mgd by 2030.

3.3.3 City of Belmont

The existing Belmont wastewater treatment plant is permitted for a capacity of 5 mgd. Belmont intends to send up to 2 mgd of flow to be treated at the proposed regional wastewater treatment facility.

3.3.4 Clariant

The flow from Clariant to be treated at the regional wastewater treatment facility will be 0.2 mgd.

3.4 Development of Load Projections and Future Influent Characteristics

In addition to wastewater flows, an estimate of pollutant loads was developed for each service area.

3.4.1 Projection of Annual Average Influent Loads

Wastewater pollutant loads were also projected by developing per capita unit loading factors for each parameter from the existing Mount Holly WWTP data and applying them to the population projections. The average industrial loads were subtracted from the total plant influent loads to estimate the domestic load (includes residential and employment/light commercial). For Mecklenburg County, unit loading factors were obtained from the Phosphorus Reduction Feasibility Study (Black & Veatch, 2001). These loading factors were developed from data from the McAlpine Creek WWMF, Sugar Creek WWTP, and Irwin Creek WWTP using the same methodology. Domestic loads for 2030 were estimated using the unit load factors and projections of served population. The industrial loads were added to the projected domestic loads to obtain total plant influent loads.

3.4.2 Projected Influent Wastewater Characteristics

The State of North Carolina defines wastewater treatment plant capacity as the monthly average condition. For planning and design purposes it is therefore necessary to develop influent characteristics representing the maximum month average associated with the 12-month average conditions projected. Maximum month to annual average flow and load peaking factors were developed from the Mount Holly and Utilities historical data and were assumed to coincide. The 2030 influent wastewater criteria for Belmont, Mount Holly, Utilities and the combined system are summarized in Table 3-8. The flow and load

Table 3-8 Combined Mount Holly and Utilities Projected 2030 Wastewater Characteristics

	Belmont	**Mount Holly**	**Utilities**	**Total**	
Flow (max month)	2.0mgd	7.8 mgd	14.9 mgd	24.7 mgd	N/A
		lbs / d	**lbs / d**	**lbs / d**	**mg / L**
BOD_5	3,679	14,349	31,185	49,213	240
TSS	3,776	14,728	46,880	65,384	320
NH_3-N	329	1,284	2,868	4,481	22
TP	73	283	791	1,147	5.6

Section 4. Alternatives Analysis

This section presents a summary of the Stakeholder process that was initiated as an important part of this project as well as initial project scoping. The primary focus of this section is detailed descriptions of the alternatives that were originally developed during the Feasibility and Planning Study (Black & Veatch, 2006) and those added after the study was completed. Each alternative is compared to the No Action and Non-Discharge / Land Application alternatives as part of the Engineering Alternatives Analysis. Economic, environmental, and community impacts are summarized and compared for each alternative. Finally, this chapter identifies the preferred alternative based on the project's purpose and need, environmental impact analysis, cost and engineering considerations and mitigation.

4.1 Project Scoping and Stakeholder Involvement

A detailed feasibility study was developed by Charlotte-Mecklenburg Utilities and the City of Mount Holly in 2006 to identify potential alternatives to meet the needs of the growing populations in these areas (Black & Veatch, 2006). The study recommended a regional solution that would provide the most beneficial use of resources while minimizing environmental impacts. As the project team moved forward with the analysis, the EIS process was initiated and the Scoping Document submitted in July 2007 (Appendix A). Throughout the preparation of the EIS, meetings have been held with DWQ to gain feedback and allow any comments and concerns to be addressed from project initiation.

Because of the regional nature of the proposed project, the importance of community involvement was identified early on. Recognizing that many diverse groups and interests may be impacted by decisions being made, a Stakeholder Group was formed. The Stakeholder Group included volunteer participants with strong community participation; local residents, property owners, and government representatives from the City of Belmont, the Town of Stanley, the City of Rock Hill, Gaston County and York County, SC; community groups including Mount Holly Citizen's Group, Mount Holly Community Development Foundation, Quality of Natural Resources Commission (Gaston County) and Gaston County Chamber of Commerce; environmental regulators including North Carolina Department of Environment and Natural Resources (NC DENR), South Carolina Department of Health & Environment Control (SC DHEC), Mecklenburg County Land Use & Environmental Services Agency (LUESA) and Mecklenburg County Parks and Recreation; the Lake Wylie Marine Commission; the NC Wildlife Resources Commission (WRC); American & Efird (A&E); Clariant; land developers; industry representatives; and private environmental groups including the Sierra Club, the Catawba River Keeper Foundation, and the Catawba Lands Conservancy. In addition to the stakeholder process, additional meetings were conducted with Duke Energy, Lake Wylie Marine Commission, SC DHEC, US National Whitewater Center, developers, and the Lake Wateree Homeowners Association to address specific concerns.

The Stakeholder Group was formed to offer ideas to improve the project and allow the project team to work together with the community to achieve common goals. The project team included members from Utilities, the City of Mount Holly and project consultants, Black & Veatch and Cardno ENTRIX. By better understanding the proposed action and alternatives, stakeholders were given an opportunity to identify and discuss issues of concern, advise the team about important community issues, and provide feedback on the range of alternatives and issues of greatest concern.

The Stakeholder Group met monthly from August 2007 through February 2008. In addition the Stakeholder Group met again in October 2011 for an update on the project status. The project team presented the goals of the regionalization project and key aspects of each phase of the project including regional land use and development patterns and projections, estimates of projected wastewater flow increases corresponding to this growth and development in the area, the different wastewater treatment alternatives to be considered, the potential environmental impacts associated with each alternative, sustainable design features that would be incorporated into the plant design and general findings from the water quality modeling effort. Copies of meeting minutes can be found in Appendix B.

One issue of concern was how the proposed facility could impact water quality in Lake Wylie which has been identified as impaired by eutrophication. An additional meeting was attended by stakeholders with specific interests and questions regarding water quality modeling of Lake Wylie. In this meeting, more detailed results were presented including the monitoring data collected to support model development, various model assumptions and results from the different scenarios that were simulated. Other significant issues of concern for the community identified by the stakeholders group included:

- Design the proposed facility to protect water quality in Lake Wylie, including advanced treatment for nutrients;
- Protect drinking water quality for downstream water supply intakes;
- Include sustainable design and low impact development (LID) at the proposed site to increase infiltration and limit runoff generation; and
- Implement a reuse water system to reduce the amount of water discharged from the wastewater treatment plant and to reduce the amount of potable water used for irrigation.

4.2 Engineering Alternatives Analysis

Basic sizing of treatment and conveyance facilities was developed for each alternative, site layouts were prepared and potential force main routes were evaluated. Maps showing conceptual design and layouts for each alternative are included at the end of this section. Specific requirements for each alternative are discussed in Sections 4.2.1 through 4.2.9.

It is anticipated that the future wastewater treatment facilities will have stringent nutrient limits. Speculative limits were provided in 2004 for the existing 4 mgd Mount Holly WWTP to expand to 6 mgd and consisted of summer total nitrogen (TN) limit of 6 mg/L and total phosphorus (TP) limit of 1 mg/L year round. Mt Holly and Belmont were notified by NC DENR that nutrient limits would be included in their 2015 NPDES permit. The Lake Wylie TMDL established waste load allocations for Mt Holly and Belmont. All alternative analysis assumed the mass loading established in the TMDL. Speculative limits received for the regional wastewater treatment plant consisted of TN limit of 4.36 mg/L and TP limit of 0.63 mg/L at 17 mgd and TN limit of 2.97 mg/L and TP limit of 0.43 mg/L at 25 mgd and are based on the mass loadings included in the TMDL. Therefore, the treatment processes that were considered incorporate the ability to meet moderate nutrient limits at the outset, as well as a plan for meeting more stringent limits in the future as required by the Speculative Limits.

4.2.1 No Action Alternative

Mt Holly and Belmont were notified that nutrient limits would be included in their NPDES permit. Even though upgrades to those facilities are not in place at this time, we have included those improvements in the No Action Alternative. The No Action Alternative (NAA) would not involve the construction of a new treatment facility on either side of the Catawba River; however it would include upgrading the existing Mount Holly WWTP and Belmont WWTP according the requirement from NC DENR. Providing no additional municipal wastewater treatment would force new development to utilize onsite septic systems or package wastewater treatment plants. Development densities and community planning are limited under these conditions, which can promote urban sprawl. The Mount Holly WWTP is close to reaching its maximum treatment capacity. By not providing municipal wastewater treatment, growth in this area would be especially affected. In the Utilities service area, wastewater from the Long Creek basin is currently pumped over 20 miles for treatment at McAlpine Creek WWMF and could continue in the future but only with the construction of additional conveyance facilities and expanded treatment capacity at the McAlpine Creek WWMF which would require a separate permitting and environmental assessment process.

Under the NAA scenario, future population expansion could still proceed, however not in a way consistent with regional planning efforts. Individual and community systems (septic tank systems on individual lots and package treatment plants in larger neighborhoods or office parks) would be installed to accommodate future growth and provide wastewater treatment. Septic systems that have been properly designed, constructed, and maintained can provide completely self-contained wastewater collection, treatment, and disposal. However, septic system performance may be impacted by inadequate tank and disposal field size, high groundwater table elevations, excessively low or high soil conductivity, or inadequate installation and maintenance. Septic system failure causes the discharge of incompletely treated or untreated wastewater which can lead to substantial groundwater and surface water pollution, including contamination of drinking water supplies. The use of package plants introduces new discharges to the watershed that are difficult to regulate. This scenario also provides less control of effluent quality than the operation of one or two well managed facilities. If designed properly, both septic systems and package treatment plants can be implemented to achieve adequate water quality treatment and cost effective for removal of BOD and TSS, but are much less efficient at nutrient removal.

The NAA would not require temporary or permanent disturbance to lands and changes in land cover associated with the construction and maintenance of a regional wastewater facility and sewer lines. However, it is important to note that under the NAA, both Utilities and Mount Holly would still need to find methods for meeting their projected future wastewater treatment needs.

4.2.2 Alternative 1: Operate Separately with Existing and Upgraded Facilities

- Existing Mount Holly WWTP would be expanded and upgraded.
- Wastewater flow from Belmont would be pumped across the Catawba River.
- Wastewater from the Long Creek Basin in Mecklenburg County would continue to be pumped and treated at the McAlpine Creek WWMF and/or at Irwin Creek WWTP.
- Wastewater from Clariant would continue to be treated by Clariant and discharged to the River.

Under Alternative 1, Mount Holly and CMU would continue to operate separately and with existing and upgraded facilities (Figure 4.1). This scenario requires Mount Holly to upgrade and expand their existing WWTP to accommodate projected future growth and development.

As part of Alternative 1, a forcemain is proposed to be routed from the Belmont WWTP to the Paw Creek Lift Station off Old Dowd Road in Mecklenburg County. The exact pipeline alignment has not been selected but will minimize impact to the public and the environment. A general corridor alignment is shown in Figure 4.7. The proposed forcemain alignment then crosses Lake Wylie using directional drilling techniques and emerges alongside a residential property that abuts the lake. By crossing the river through directionally drilling techniques, direct impacts to riparian areas during construction would be eliminated and no impacts to aquatic communities or water quality during construction or operation.

Additional wastewater from growth and development in the Long Creek Basin would be met at the McAlpine Creek WMF and/or at Irwin Creek WWTP. This would require additional treatment and conveyance capacity by Utilities. Wastewater from Clariant would continue to be treated by Clariant and discharged to the River. The existing Mount Holly WWTP would be expanded to 8 mgd and upgraded for nutrient removal by modifying the existing aeration basins. Two primary options exist to accomplish this: 1) modify and re-rate the existing basins for imultaneous nitrification and denitrification by cycling the mechanical aerators to encourage denitrification under anaerobic conditions; or 2) modify the existing basins to create a 3 or 5-stage biological nutrient removal (BNR) process. Both options would require significant modifications to the existing facility, including additional equalization, basin modifications, addition of diffusers and mixers, additional clarifiers and expanded disinfection, filters, slides handling and headwork facilities. The existing structures are currently in the 100-year floodplain, so construction activities would be completed in the 100-yr floodplain and new structures would have to be constructed on the property west of the existing plant property. This would require purchase of approximately 5 acres of forested land that is currently owned by A&E.

The Belmont WWTP would be decommissioned. A new pump station would be constructed on the existing Belmont WWTP site to pump flow to CMU. On the Mecklenburg County side, the Long Creek pumping station would continue to transfer flows to the Paw Creek pumping station. Flow equalization and pumping capacity at the Long Creek pumping station would be expanded on approximately 3.5 acres of partially disturbed residential property near Long Creek. Existing wastewater from this basin is pumped to the McAlpine Creek WWMF for treatment. The Utilities collection and treatment system has interconnections between basins to allow treatment flexibility if needs arise do to maintenance issues or problems. Future collection system upgrades would be made to also enable transfer of projected future flows to Irwin Creek WWTP via the Taggart Creek interceptor.

4.2.3 Alternative 2: Operate Separately with Additional and Upgraded Facilities

- Existing Mount Holly WWTP would be expanded and upgraded.
- Wastewater flow from Belmont would be pumped across the Catawba River.
- A new WWTP constructed near the existing Long Creek Pumping Station would treat wastewater from the Long Creek Basin in Mecklenburg County.
- Wastewater from Clariant would be treated at the new WWTP and the existing Clariant NPDES permit discharge would be eliminated.

Under Alternative 2, Utilities and Mount Holly would continue to operate separately with upgraded facilities and additional facilities would be constructed to accommodate growing wastewater needs (Figure 4.2). This scenario would require Mount Holly to upgrade and expand their existing WWTP and Utilities to construct a new WWTP located at Long Creek to treat wastewater from within Mecklenburg County and flow from Clariant. The Belmont WWTP would be decommissioned. A new pump station would be constructed on the existing Belmont WWTP site to pump flow to CMU.

As part of Alternative 2, a forcemain is proposed to be routed from the Belmont WWTP to the Paw Creek Lift Station off Old Dowd Road in Mecklenburg County. The exact pipeline alignment has not been selected but will minimize impact to the public and the environment. A general corridor alignment is shown in Figure 4.7. The proposed forcemain alignment then crosses Lake Wylie using directional drilling techniques and emerges alongside a residential property that abuts the lake. By crossing the river through directional drilling techniques, direct impacts to riparian areas during construction would be eliminated and no impacts to aquatic communities or water quality during construction or operation.

The existing Mount Holly WWTP would be expanded to 8 mgd and upgraded for nutrient removal by modifying the existing aeration basins. Two primary options exist to accomplish this: 1) modify and re-rate the existing basins for simultaneous nitrification and denitrification by cycling the mechanical aerators to encourage denitrification under anaerobic conditions; or 2) modify the existing basins to create a 3 or 5-stage biological nutrient removal (BNR) process. Both options would require significant modifications to the existing facility, including additional equalization, basin modifications, addition of diffusers and mixers, additional clarifiers and expanded disinfection, filters, solids handling and headwork facilities. The existing structures are currently in the 100-year floodplain, so construction activities would be completed in the 100-yr floodplain and new structures would have to be constructed on the property west of the existing plant property. This land is currently owned by A&E and would need to be purchased.

Utilities currently treats wastewater generated in the Long Creek basin by pumping to the Paw Creek pumping station then to the McAlpine Creek WWMF. The total distance is over 20 miles. Instead of continuing to pump wastewater over long distances to an existing plant, a new facility would be constructed in Mecklenburg County on vacant land near the existing Long Creek pumping station. This land is currently owned by Clariant Corporation and construction of the new plant would require purchasing this land. Clariant Corporation has been identified as a willing seller. The new WWTP would likely have a nominal treatment capacity of 17 mgd to meet the 2030 projected flows, and would include screening, grit removal, storm flow equalization, day tanks, primary clarification, advanced nutrient removal, secondary clarification, filtration, ultraviolet disinfection, reaeration and solids handling facilities. Effluent would be discharged to the mainstem of the Catawba River.

The plant would be built in phases by first constructing an initial phase and later expanding. The first phase of construction would begin after issuance of the Record of Decision (ROD), issuance of all required permits, completed WWTP design and purchase of required land. The Mount Holly plant would be expanded and upgraded to 6 mgd and the new plant on the Mecklenburg County side constructed to meet existing demands and future needs through 2020 with a capacity of 10 mgd. The Mount Holly plant would be upgraded and expanded to 8 mgd in phases and the new plant would be expanded to 17 mgd in phases to treat anticipated flows through 2030.

The existing Long Creek pumping station would be modified to serve as the influent pumping station for the new plant. The new WWTP would discharge to the Catawba River through a new outfall, ultimately providing approximately 17 mgd (26 cfs) to Lake Wylie that would otherwise be pumped to McAlpine Creek WWMF, discharged to Sugar Creek and ultimately to the Catawba River downstream of Lake Wylie.

During the second phase of construction, the Paw Creek pumping station would be modified to enable flows to be transferred to the new WWTP rather than routing flows to McAlpine Creek WWMF. This is advantageous for Utilities because wastewater generated in the Long Creek basin currently must be pumped over 20 miles to be treated at McAlpine Creek WWMF.

Charlotte-Mecklenburg Utilities and the City of Mount Holly plan to produce reclaimed water for reuse and recycle of wastewater effluent. Utilities currently operates a reuse pumping station and pipeline at its Mallard Creek WRF, and recently constructed a similar system at the McDowell Creek WWTP with tertiary membrane microfiltration. Wastewater from the proposed regional WWTP would be treated to reclaimed water quality standards by similar tertiary filtration.

A reuse pumping station would be constructed as part of the project to take advantage of reclaimed water for a portion of the treated wastewater. The reclaimed water could be used for irrigation and other authorized uses in conformance with applicable regulations. Reclaimed water would be used on-site in place of potable water where applicable. Other users in the area are currently being identified, such as industries, residential developments, and parks. Future expansion of the reclaimed water system would depend on identification of additional users.

Reuse water would be continuously monitored to assure conformance with NPDES permit. Building a reuse pumping station as part of this project provides an opportunity to implement a non-discharge option favored and encouraged by the State and to recover its capital costs over time from fees collected from reclaimed water customers. Further, Utilities and the City of Mount Holly concur with the State's position on the use of reclaimed water:

> *"It is the intent of the Commission to encourage the beneficial use of the State's water resources concurrent with the protection of public health and the environment." (From 15A NCAC 2H.0219(k) 02/24/00.)*

4.2.4 Alternative 3: Operate Jointly at Upgraded and Expanded Regional Mount Holly WWTP

- Existing Mount Holly WWTP would be expanded and upgraded.
- Wastewater flow from Belmont would be pumped across the Catawba River.
- Wastewater flows from the Long Creek Basin in Mecklenburg County would be pumped across the Catawba River.
- Wastewater from Clariant would be treated at the new WWTP and the existing Clariant NPDES permit discharge would be eliminated.

Under Alternative 3, treatment would be provided for growing populations in both Mount Holly and Utilities at the Mount Holly WWTP site by upgrading and expanding the existing WWTP (Figure 4.3). All flow generated in the service area would be treated at regional WWTP in Mount Holly. The Belmont WWTP would be

decommissioned. A new pump station would be constructed on the existing Belmont WWTP site to pump flow to CMU.

As part of Alternative 3, a forcemain is proposed to be routed from the Belmont WWTP to the Paw Creek Lift Station off Old Dowd Road in Mecklenburg County. The exact pipeline alignment has not been selected but will minimize impact to the public and the environment. A general corridor alignment is shown in Figure 4.7. The proposed forcemain alignment then crosses Lake Wylie using directional drilling techniques and emerges alongside a residential property that abuts the lake. By crossing the river through directionally drilling techniques, direct impacts to riparian areas during construction would be eliminated and no impacts to aquatic communities or water quality during construction or operation.

The existing Mount Holly WWTP would be expanded to 8 mgd and upgraded for nutrient removal by modifying the existing aeration basins. Two primary options exist to accomplish this: 1) modify and re-rate the existing basins for simultaneous nitrification and denitrification by cycling the mechanical aerators to encourage denitrification under anaerobic conditions; or 2) modify the existing basins to create a 3 or 5-stage biological nutrient removal (BNR) process. Both options would require significant modifications to the existing facility, including additional equalization, basin modifications, addition of diffusers and mixers, additional clarifiers and expanded disinfection, filters, solids handling and headwork facilities. The existing structures are currently in the 100-year floodplain, so construction activities would be completed in the 100-yr floodplain.

Additional facilities capable of treating the 2030 anticipated flows of 17 mgd would be constructed on land to the north and west of the existing site. Approximately 30 acres of primarily forested land would need to be purchased from A&E. Facility construction would remove the vegetated buffer between the A&E facility, the adjacent river front park, and the Catawba River.

The new WWTP would include screening, grit removal, storm flow equalization, day tanks, primary clarification, advanced nutrient removal, secondary clarification, filtration, ultraviolet disinfection, reaeration and solids handling facilities. Wastewater flows from the Long Creek Basin in Mecklenburg County would be pumped across the river to be treated at the combined Mount Holly facility with flexibility and redundancy built in to allow treatment through either the upgraded Mount Holly WWTP or the new treatment train on the A&E property. The river crossing would be completed by directionally drilling and installing a force main under the river bed. By crossing the river through directionally drilling techniques, direct impacts to riparian areas during construction would be eliminated and no impacts to aquatic communities or water quality during construction or operation. Effluent would be discharged to the mainstem of the Catawba River in a combined outfall at the existing Mount Holly site. This alternative would provide a total of 25 mgd (39 cfs) to Lake Wylie that would otherwise be pumped to McAlpine Creek WWMF, discharged to Sugar Creek and ultimately to the Catawba River downstream of Lake Wylie.

This alternative would be completed in phases with the first phase of construction beginning after issuance of the ROD, issuance of all required permits, completed WWTP design and purchase of required land. The existing Mount Holly plant would be expanded and upgraded to 6 mgd and the new plant on the A&E property would be constructed to meet existing demands and future needs through 2020 with a capacity of 10 mgd. The Mount Holly plant would be upgraded and expanded in phases to 8 mgd and the new plant would be expanded to 17 mgd in phases to treat anticipated flows through 2030.

During the second phase of construction, the Paw Creek pumping station would be modified to enable flows to be transferred to regional facility rather than routing flows to McAlpine Creek WWMF. Paw Creek flows would be transferred to the Long Creek pumping station, combined with Long Creek flows and pumped across the river for treatment.

Charlotte-Mecklenburg Utilities and the City of Mount Holly plan to produce reclaimed water for reuse and recycle of wastewater effluent. Utilities currently operates a reuse pumping station and pipeline at its Mallard Creek WRF, and recently constructed a similar system at the McDowell Creek WWTP with tertiary membrane microfiltration. Wastewater from the proposed regional WWTP would be treated to reclaimed water quality standards by similar tertiary filtration. Charlotte-Mecklenburg Utilities and the City of Mount Holly plan to produce reclaimed water for reuse and recycle of wastewater effluent. Utilities currently operates a reuse pumping station and pipeline at its Mallard Creek WRF, and recently constructed a similar system at the McDowell Creek WWTP with tertiary membrane microfiltration. Wastewater from the proposed regional WWTP would be treated to reclaimed water quality standards by similar tertiary filtration.

A reuse pumping station would be constructed as part of the project to take advantage of reclaimed water for a portion of the treated wastewater. The reclaimed water could be used for irrigation and other authorized uses in conformance with applicable regulations. Reclaimed water would be used on-site in place of potable water where applicable. Other users in the area are currently being identified, such as industries, residential developments, and parks. Future expansion of the reclaimed water system would depend on identification of additional users.

Reuse water would be continuously monitored to assure conformance with NPDES permit. Building a reuse pumping station as part of this project provides an opportunity to implement a non-discharge option favored and encouraged by the State and to recover its capital costs over time from fees collected from reclaimed water customers. Further, Utilities and the City of Mount Holly concur with the State's position on the use of reclaimed water:

> *"It is the intent of the Commission to encourage the beneficial use of the State's water resources concurrent with the protection of public health and the environment." (From 15A NCAC 2H.0219(k) 02/24/00.)*

4.2.5 Alternative 4: Operate Jointly at New Regional WWTP (in Mount Holly)

- A new regional WWTP would be constructed adjacent to the existing Mount Holly WWTP site to treat wastewater from both Mount Holly and Mecklenburg County.
- Wastewater flow from Belmont would be pumped across the Catawba River.
- Wastewater flows from the Long Creek Basin in Mecklenburg County would be pumped across the Catawba River.
- Wastewater from Clariant would be treated at the new WWTP and the existing Clariant NPDES permit discharge would be eliminated.

Under Alternative 4, treatment would be provided for both Mount Holly and Utilities flows on at a new regional WWTP on land adjacent to the existing Mount Holly WWTP (Figure 4.4). With this alternative, Utilities flows would be pumped across the river The Belmont WWTP would be decommissioned. A new pump station would be constructed on the existing Belmont WWTP site to pump flow to CMU.

As part of Alternative 4, a forcemain is proposed to be routed from the Belmont WWTP to the Paw Creek Lift Station off Old Dowd Road in Mecklenburg County. The exact pipeline alignment has not been selected but will minimize impact to the public and the environment. A general corridor alignment is shown in Figure 4.7. The proposed forcemain alignment then crosses Lake Wylie using directional drilling techniques and emerges alongside a residential property that abuts the lake. By crossing the river through directionally drilling techniques, direct impacts to riparian areas during construction would be eliminated and no impacts to aquatic communities or water quality during construction or operation.

A new 25 mgd WWTP capable of accommodating all of the projected wastewater treatment needs for both Mount Holly and the Long Creek Basin in Mecklenburg County would be constructed on the property to the north and west of the existing Mount Holly WWTP. Approximately 40 acres of predominately forested land would need to be purchased from A&E. Facility construction would remove the vegetated buffer between the A&E facility, the adjacent river front park, and the Catawba River. The treatment components for a new 25 mgd plant would include screening, grit removal, storm flow equalization, day tanks, primary clarification, advanced nutrient removal, secondary clarification, filtration, ultraviolet disinfection, reaeration and solids handling facilities. Effluent from the regional facility would be discharged in a single outfall to the Catawba River.

Flows from the Long Creek pumping station would be pumped across the river to be treated at the new regional facility. Expansion of the pumping station and equalization basin would be done on partially wooded and partially cleared land immediately adjacent to the existing Long Creek pumping station. The river crossing would be directionally drilled and a force main installed under the river bed. By crossing the river through directionally drilling techniques, direct impacts to riparian areas during construction would be eliminated and no impacts to aquatic communities or water quality during construction or operation. Effluent from the regional facility would be discharged in a single outfall to the Catawba River. This alternative would providing approximately 25 mgd (39 cfs) to Lake Wylie that is currently pumped to McAlpine Creek WWMF, discharged to Sugar Creek and ultimately to the Catawba River downstream of Lake Wylie.

The regional plant would be built in phases by first constructing an initial phase and later expanding. The first phase of construction would begin after acceptance of the ROD, issuance of all required permits, completed WWTP design and purchase of required land. The Mount Holly plant would be demolished and the property converted to a river front park. During the first phase, the new plant on the A&E property would be constructed to meet existing demands and future needs through 2014 with a capacity of 10 mgd. The second phase of construction would be built during which time the plant would be expanded to 17 mgd to treat anticipated flows through 2020. The final phase of construction would occur to meet 2030 needs of 25 mgd.

During the third phase of construction, the Paw Creek pumping station would be modified to enable flows to be transferred to regional facility rather than routing flows to McAlpine Creek WWMF. Paw Creek flows would be transferred to the Long Creek pumping station, combined with Long Creek flows and pumped across the river for treatment.

Charlotte-Mecklenburg Utilities and the City of Mount Holly plan to produce reclaimed water for reuse and recycle of wastewater effluent. Utilities currently operates a reuse pumping station and pipeline at its Mallard Creek WRF, and recently constructed a similar system at the McDowell Creek WWTP with tertiary membrane microfiltration. Wastewater from the proposed regional WWTP would be treated to reclaimed water quality

standards by similar tertiary filtration. Charlotte-Mecklenburg Utilities and the City of Mount Holly plan to produce reclaimed water for reuse and recycle of wastewater effluent. Utilities currently operate a reuse pumping station and pipeline at its Mallard Creek WRF, and recently constructed a similar system at the McDowell Creek WWTP with tertiary membrane microfiltration. Wastewater from the proposed regional WWTP would be treated to reclaimed water quality standards by similar tertiary filtration.

A reuse pumping station would be constructed as part of the project to take advantage of reclaimed water for a portion of the treated wastewater. The reclaimed water could be used for irrigation and other authorized uses in conformance with applicable regulations. Reclaimed water would be used on-site in place of potable water where applicable. Other users in the area are currently being identified, such as industries, residential developments, and parks. Future expansion of the reclaimed water system would depend on identification of additional users.

Reuse water would be continuously monitored to assure conformance with NPDES permit. Building a reuse pumping station as part of this project provides an opportunity to implement a non-discharge option favored and encouraged by the State and to recover its capital costs over time from fees collected from reclaimed water customers. Further, Utilities and the City of Mount Holly concur with the State's position on the use of reclaimed water:

> *"It is the intent of the Commission to encourage the beneficial use of the State's water resources concurrent with the protection of public health and the environment." (From 15A NCAC 2H.0219(k) 02/24/00.)*

4.2.6 Alternative 5: Operate Jointly at New Regional WWTP (on Mecklenburg County side)

- A new regional WWTP would be constructed near the existing Long Creek pumping station to treat wastewater from Mount Holly and/or Belmont and Mecklenburg County.
- Wastewater flows from Mount Holly and/or Belmont would be pumped across the Catawba River.
- Wastewater from Clariant would be treated at the new WWTP and the existing Clariant NPDES permit discharge would be eliminated.

Under Alternative 5, treatment would be provided for both Mount Holly and Utilities flows on the Mecklenburg side of the Catawba River by constructing a new WWTP on vacant land to the west of Long Creek (Figure 4.5). With this alternative, Mount Holly and/or Belmont flows would be pumped across the Catawba River.

As part of Alternative 5, a forcemain is proposed to be routed from the Belmont WWTP to the Paw Creek Lift Station off Old Dowd Road in Mecklenburg County. The exact pipeline alignment has not been selected but will minimize impact to the public and the environment. A general corridor alignment is shown in Figure 4.7. The proposed forcemain alignment then crosses Lake Wylie using directional drilling techniques and emerges alongside a residential property that abuts the lake. By crossing the river through directional drilling techniques, direct impacts to riparian areas during construction would be eliminated and no impacts to aquatic communities or water quality during construction or operation.

A new 25 mgd WWTP capable of treating all of projected wastewater flows from both Mount Holly, Belmont, and the Long Creek basin would be constructed on the property near the Long Creek pumping station. The treatment components would include screening, grit removal, storm flow equalization, day tanks, primary clarification,

advanced nutrient removal, secondary clarification, filtration, ultraviolet disinfection, reaeration and solids handling facilities. The existing Long Creek pumping station would be modified to serve as the influent pumping station for the new plant. The new regional facility would be constructed in Mecklenburg County on vacant land that is currently owned by Clariant Corporation and would require purchasing this land. Clariant Corporation has been identified as a willing seller. The new regional WWTP would be constructed on 22 acres of previously disturbed land which would result in minimal direct and secondary and cumulative impacts compared to construction on a pristine site. Effluent from the regional facility would be discharged in a single outfall to the Catawba River.

The new WWTP would have a nominal treatment capacity of 25 mgd to meet the 2030 projected flows. The plant would be built in phases by first constructing an initial phase and later expanding. The first phase of construction would begin after issuance of the ROD, completed WWTP design, issuance of all required permits and purchase of required land. The regional facility would be constructed to meet existing demands and initial future needs through 2014 with a capacity of 10 mgd. The second phase of construction would be built during which time the plant would be expanded to 17 mgd to treat anticipated flows through 2020. The final phase of construction would occur to meet 2030 needs of 25 mgd.

On the Mecklenburg County side, flow from the Long Creek basin would be directed to the new plant. During the final phase of construction to meet 2030 flow needs, flow from the Paw Creek pumping station would be transferred to Long Creek pumping station and treated at the new plant. This alternative would provide approximately 25 mgd (39 cfs) to Lake Wylie that is currently pumped to McAlpine Creek WWMF, discharged to Sugar Creek and ultimately to the Catawba River downstream of Lake Wylie.

A new pumping station and force main would be constructed on existing property owned by the City of Mount Holly to convey Mount Holly flows across the Catawba to the new Long Creek WWTP site. The river crossing would be directionally drilled and the force main installed under the river bed. Existing equalization basins on the Long Creek pumping station site would be used for Mount Holly's flow as well. The existing Mount Holly WWTP would be demolished. Input from stakeholders suggested that a potential beneficial use of this property would be to decommission the remaining existing facilities and construct a park. This recreation area could then be connected to other greenways and open spaces already existing along both sides of the Catawba River.

Under Alternative 5, Mount Holly and Utilities will operate jointly, treating wastewater on the Mecklenburg County side of the Catawba River. A new regional WWTP would be constructed on 22 acres of a previously cleared site with little existing vegetation. The use of this property for a WWTP would preserve almost 80 acres of forest adjacent to the National Whitewater Center. One acre of infrastructure would be constructed on the Mount Holly site on previously disturbed land adjacent to the current WWTP location. By crossing the river through directionally drilling techniques, direct impacts to riparian areas during construction would be eliminated and no impacts to aquatic communities or water quality during construction or operation.

Charlotte-Mecklenburg Utilities and the City of Mount Holly plan to produce reclaimed water for reuse and recycle of wastewater effluent. Utilities currently operate a reuse pumping station and pipeline at its Mallard Creek WRF, and recently constructed a similar system at the McDowell Creek WWTP with tertiary membrane microfiltration. Wastewater from the proposed regional WWTP would be treated to reclaimed water quality standards by similar tertiary filtration.

A reuse pumping station would be constructed as part of the project to take advantage of reclaimed water for a portion of the treated wastewater. The reclaimed water could be used for irrigation and other authorized uses in conformance with applicable regulations. Reclaimed water would be used on-site in place of potable water where applicable. Other users in the area are currently being identified, such as industries, residential developments, and parks. Future expansion of the reclaimed water system would depend on identification of additional users.

Reuse water would be continuously monitored to assure conformance with NPDES permit. Building a reuse pumping station as part of this project provides an opportunity to implement a non-discharge option favored and encouraged by the State and to recover its capital costs over time from fees collected from reclaimed water customers. Further, Utilities and the City of Mount Holly concur with the State's position on the use of reclaimed water:

> *"It is the intent of the Commission to encourage the beneficial use of the State's water resources concurrent with the protection of public health and the environment." (From 15A NCAC 2H.0219(k) 02/24/00.)*

4.2.7 Alternative 6: Combination of new and existing facilities

- Existing Mount Holly WWTP would continue to operate at 4 mgd to treat current wastewater flow and would be upgraded.
- Wastewater from the existing Belmont WWTP would be pumped across the River and connect to the CMU system.
- A new regional WWTP would be constructed near the existing Long Creek pumping station to treat wastewater from the Long Creek Basin in Mecklenburg County and Mount Holly flows in excess of 4 mgd as the population expanded.
- Wastewater from Clariant would be treated at the new WWTP and the existing Clariant NPDES permit discharge would be eliminated.

Under Alternative 6, the Mount Holly WWTP would continue to operate at their current capacity of 4 mgd and would be upgraded to meet nutrient permit limits (Figure 4.6). Treatment would be provided for additional Mount Holly flows and Utilities flows on the Mecklenburg side of the Catawba River by constructing a new 21 mgd WWTP on the previously disturbed site west of the existing Long Creek pumping station.

As part of Alternative 6, a forcemain is proposed to be routed from the Belmont WWTP to the Paw Creek Lift Station off Old Dowd Road in Mecklenburg County. The exact pipeline alignment has not been selected but will minimize impact to the public and the environment. A general corridor alignment is shown in Figure 4.7. The proposed forcemain alignment then crosses Lake Wylie using directional drilling techniques and emerges alongside a residential property that abuts the lake. By crossing the river through directional drilling techniques, direct impacts to riparian areas during construction would be eliminated and no impacts to aquatic communities or water quality during construction or operation.

Under Alternative 6, the existing Mount Holly WWTP would remain in service to treat existing flows in Mount Holly. A new 21 mgd WWTP capable of treating future wastewater flows from Mount Holly in excess of 4 mgd, Belmont, and the Long Creek basin would be constructed on the property near the Long Creek pumping station. The treatment components of the new facility would include screening, grit removal, storm flow equalization, day

tanks, primary clarification, advanced nutrient removal, secondary clarification, filtration, ultraviolet disinfection, reaeration and solids handling facilities. The existing Long Creek pumping station would be modified to serve as the influent pumping station for the new plant. Effluent from the regional facility would be discharged in a single outfall to the Catawba River. The new regional facility would be constructed in Mecklenburg County on vacant land that is currently owned by Clariant Corporation and would require purchasing this land. Clariant Corporation has been identified as a willing seller. The necessary parcel would be purchased after issuance of the ROD and successful negotiations of the sale of the property.

On the existing Mount Holly site, one acre of land would be required for additional infrastructure (pumping station and possible equalization) to transfer future loads to the new facility on the Mecklenburg County side of the Catawba River. This would be constructed on previously disturbed land adjacent to the current WWTP location. The new regional WWTP would be constructed on 22 acres of previously disturbed land which would result in minimal direct and secondary and cumulative impacts compared to construction on a pristine site. Additionally, the use of this property for a WWTP will preserve almost 80 acres of forest adjacent to the National Whitewater Center which would be purchased by Utilities.

The new plant would be built in phases by first constructing a 12 mgd component and later expanding to 21 mgd. As the development proceeds and wastewater flows increase, the additional Mount Holly flow above 4 mgd would be pumped across the Catawba River. The river crossing would be directionally drilled and a force main installed under the river bed. By crossing the river through directionally drilling techniques, direct impacts to riparian areas during construction would be eliminated and no impacts to aquatic communities or water quality during construction or operation. The first phase of construction would begin after issuance of the ROD, issuance of all required permits, completed WWTP design and purchase of required land. The Mount Holly plant would remain in service and the new plant on the Mecklenburg County side would be constructed to meet existing demands and future needs through 2020 with a capacity of 12 mgd. The Mount Holly plant would continue to remain in service at 4 mgd and the new plant would be expanded to 21 mgd to treat anticipated flows through 2030.

Wastewater in the Long Creek basin would be treated at the new facility with flow from the Paw Creek pumping station in the southern portion of the basin redirected to the new facility as well during the second phase of construction. This alternative would providing approximately 21 mgd (32 cfs) to Lake Wylie that is currently pumped to McAlpine Creek WWMF, discharged to Sugar Creek and ultimately to the Catawba River downstream of Lake Wylie.

Charlotte-Mecklenburg Utilities and the City of Mount Holly plan to produce reclaimed water for reuse and recycle of wastewater effluent. Utilities currently operates a reuse pumping station and pipeline at its Mallard Creek WRF, and recently constructed a similar system at the McDowell Creek WWTP with tertiary membrane microfiltration. Wastewater from the proposed regional WWTP would be treated to reclaimed water quality standards by similar tertiary filtration.

A reuse pumping station would be constructed as part of the project to take advantage of reclaimed water for a portion of the treated wastewater. The reclaimed water would be used for irrigation and other authorized uses in conformance with applicable regulations. Reclaimed water would be used on-site in place of potable water where applicable. Other users in the area are currently being identified, such as industries, residential developments, and parks. Future expansion of the reclaimed water system would depend on identification of additional users.

Reuse water would be continuously monitored to assure conformance with NPDES permit. Building a reuse pumping station as part of this project provides an opportunity to implement a non-discharge option favored and encouraged by the State and to recover its capital costs over time from fees collected from reclaimed water customers. Further, Utilities and the City of Mount Holly concur with the State's position on the use of reclaimed water:

> *"It is the intent of the Commission to encourage the beneficial use of the State's water resources concurrent with the protection of public health and the environment." (From 15A NCAC 2H.0219(k) 02/24/00.)*

4.2.8 Non-Discharge / Land Application Alternative

State law requires land application to be considered as part of the Engineering Alternatives Analysis for any WWTP. This option was investigated and found to be technically and economically infeasible due to the large land requirements and the lack of land available for this use. Calculations were performed assuming the range of additional water volume required for storage and land application. Based on regulation governing water reuse facilities (Section 15A NCAC 02T), on-site storage capacity for 30 days is required. The lowest daily flows (Alternative 1) would require storage of 120 million gallons and the largest flow would require 750 million gallons (Alternatives 2-6). At an average depth of 10 feet, this would require a surface area of 37 acres (Alternative 1) and 230 acres (Alternatives 2-6).

Area required for spray irrigation was also calculated for the lowest (Alternative 1) and highest (Alternatives 2-6) quantities of treated effluent. For Alternative 1, approximately 1,000 to 2,000 acres of land would be required, assuming 4 mgd would be applied at a rate of 0.5 to 1 inches per week. For Alternatives 2-7, approximately 6,500 to 13,000 acres of land would be required for spray irrigation of 25 mgd.

Since the proposed facility is located in an urban region, no such contiguous sites were available. The analysis was performed assuming that land would be attainable for both storage ponds and land application through purchase of multiple sites. Land cost for irrigation alone was estimated at $20,000 per acre which results in a total cost of $160 to $240 million dollars. The high cost of land and quantity of storage capacity and application area make this alternative unrealistic. As such it was eliminated from further consideration.

4.3 Siting Modifications

The Feasibility Study located the new treatment plant on vacant land immediately adjacent to the Long Creek pumping station that is owned by Clariant (Black & Veatch, 2006). This forested land would need to be cleared to some extent for construction of the new facility. Preservation of open spaces and existing wildlife habitats are important to the stakeholders and the project team as well. As such, a previously cleared parcel of land west of Long Creek was identified as an alternative location. This would require transfer of flows from the pumping station across Long Creek, but would allow the forested area to remain undisturbed. The forested land is located immediately north of the U.S. Whitewater Center and opportunities exist for connection with other forested land on this site that has recreational uses, including biking and walking trails. Placing the facility on the disturbed site also has advantages for simplifying the effluent discharge to the Catawba River rather than Long Creek. This effectively eliminates potential direct impacts from nutrient loads and bed scouring on aquatic and benthic communities in the creek.

4.4 Effluent Outfall Locations

Original evaluations considered both Long Creek and the mainstem of the Catawba River as outfall locations. After discussions with DWQ Modeling and TMDL Unit and NPDES Unit, it was decided to route the WWTP effluent outfall directly to the mainstem of the Catawba River. Lower flows in Long Creek would provide limited mixing and dilution conditions. Discharging directly to the Catawba River effectively eliminates the potential direct impacts of nutrient loads and bed scouring on aquatic and benthic communities in the creek. By preserving the forested land adjacent to Long Creek, water quality impacts from stormwater runoff associated with development of the site were also minimized.

4.5 Alternatives Analysis Summary

An evaluation was conducted of the alternatives for a planning period through 2030. For each alternative, an economic evaluation was conducted with consideration of capital costs, operations and maintenance costs, and overall present worth costs. The environmental impacts (including both direct impacts and secondary/cumulative impacts) were summarized for each alternative as well with a complete discussion of these impacts presented in Section 6. Non-economic considerations were evaluated and included regulatory requirements, impacts to the hydroelectric plants and public health and safety.

4.5.1 Capital Costs

An evaluation was conducted of the six different alternatives for a planning period through 2030. For each alternative, an economic evaluation was conducted with consideration of capital costs, operations and maintenance costs, and overall present worth costs. Non-economic considerations were also included.

In general, capital costs were evaluated for a two or three phased construction approach. The phasing is summarized in each alternative description. Operation and maintenance costs were estimated for an average flow for the year 2020, considered as an equal annual cost over the 20 year period from 2010 to 2030. A present worth analysis was then conducted, equalizing all the costs to 2010 for comparison. All costs shown are in 2010 dollars.

Capital costs for each alternative included the following:

- Construction costs for treatment facilities.
    - Construction costs were estimated based on 2010 construction costs, and escalated 5% per year for the respective phase of construction.
    - A 20% contingency was included for each option.
- Pumping facilities and force mains for alternatives where appropriate.
- Land acquisition costs at $16,000 per acre.
- Engineering costs, assumed to be 15% of construction costs.

A summary of capital costs for all six alternatives are included in Table 4-1. The costs have been updated from the previous study (Black & Veatch, 2006). As part of the EIS, the following should be noted as additional cost differential not included in the tables:

- The costs were based on revising/modifying existing Mount Holly and Belmont facilities.
- Layout and costs of facilities will likely increase due to changes in 100-year floodplain elevation. This will require additional land acquisition cost.

- Additional costs for pumping flows from the existing Long Creek PS to new plant site across Long Creek.
- Costs are based on speculative limits.

4.5.2 Operations and Maintenance Costs

Operations and maintenance costs were developed based on a baseline cost of approximately $2.5 million per year. This baseline was estimated from the total annual operating budgets for Charlotte-Mecklenburg Utilities McDowell Creek WWTP, Sugar Creek WWTP, and Irwin Creek WWTP, scaled to the capacity for the new treatment plants. From this baseline, adjustments were made for each alternative to reflect differences in O&M costs. The O&M costs were broken down to include separate line items for blower or aerator power differences, operator labor costs, and laboratory costs, with the balance of the baseline costs reflected in a line item called maintenance costs.

Operations and maintenance cost differences reflect the following:

- Additional manpower will be required for two separate facilities compared to one combined facility. Hourly rates were assumed at $30/hour for general operators and maintenance personnel, and $45/hour for supervisors. These rates are intended to include full payroll costs, including salary, insurance, vacations, holidays, and other benefits.
- Power costs of $0.05/kw-hr were assumed for blower and aerator power differences.
- Laboratory costs are reflective of the level of sampling and analyses required for a plant with nutrient limits in addition to other parameters. Laboratory costs for two separate plants are higher than for one combined plant because of the duplication of efforts for permit compliance/reporting.

A summary of O&M costs are included in Table 4-2.

4.5.3 Present Worth Cost Analysis

The present worth analysis was made based on the following:

- All costs adjusted to 2010 costs.
- Period for evaluation is 20 years from 2010 to 2030.
- Interest rate of 5% was used.
- O&M costs were assumed constant for the period of evaluation.
- No salvage value was included for the end of the period.

A summary of present worth costs are included in Table 4-3.

Table 4-1 Summary of Capital Costs- Based on Total Flow of 25 mgd (8 mgd Mt Holly; 17 mgd CMU)

	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 6
Modifications at Exist CMU WWTP (Irwin or McAlpine)	$136,000,000	$0	$0	$0	$0	$0
Construction at Long Creek site	$2,000,000	$170,000,000	$1,500,000	$1,500,000	$250,000,000	$210,000,000
Land Acquisition at Long Creek PS site	$0	$2,000,000	$0	$0	$2,000,000	$2,000,000
Construction at Mt Holly WWTP site	$56,000,000	$56,000,000	$234,000,000	$250,000,000	$2,000,000	$24,000,000
Land Acquisition at Mt Holly WWTP site	$0	$0	$500,000	$500,000	$0	$0
Force Main Cost from Long Creek to/from Mt Holly	$0	$0	$2,500,000	$2,500,000	$1,700,000	$1,100,000
Force Main Cost - 24" from Paw Creek to Long Creek	$0	$5,200,000	$5,200,000	$5,200,000	$5,200,000	$5,200,000
Force Main Cost from Paw Creek to Irwin or McAlpine	$28,000,000	$0	$0	$0	$0	$0
Pump Station @ Belmont WWTP	$2,000,000	$2,000,000	$2,000,000	$2,000,000	$2,000,000	$2,000,000
Force Main from Belmont to CMU	$6,800,000	$6,800,000	$6,800,000	$6,800,000	$6,800,000	$6,800,000
Subtotal	$230,800,000	$242,000,000	$252,500,000	$268,500,000	$269,700,000	$251,100,000
Engineering (15% of Construction Costs)	$34,700,000	$36,300,000	$37,900,000	$40,300,000	$40,500,000	$37,700,000
Total Capital Costs	**$265,500,000**	**$278,300,000**	**$290,400,000**	**$308,800,000**	**$310,200,000**	**$288,800,000**

Table 4-2 Summary of Operating and Maintenance Costs

	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 6
Blower/Aerator Power Costs	$238,000	$238,000	$238,000	$224,000	$224,000	$268,000
Labor (Manpower) Costs	$1,404,000	$1,685,000	$1,498,000	$1,310,000	$1,310,000	$1,622,000
Laboratory Costs	$500,000	$500,000	$250,000	$250,000	$250,000	$500,000
Maintenance Costs	$400,000	$500,000	$500,000	$400,000	$400,000	$500,000
Total Annual O&M Costs	**$2,542,000**	**$2,923,000**	**$2,486,000**	**$2,184,000**	**$2,184,000**	**$2,890,000**

Table 4-3 Present Worth Cost Evaluation

	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 6
Capital Costs[1]	**$265,500,000**	**$278,300,000**	**$290,400,000**	**$308,800,000**	**$310,200,000**	**$288,800,000**
Annual Costs Carried to Year 2010 PW	$31,700,000	$36, 500,000	$31,000,000	$27, 500,000	$27, 500,000	$36, 000,000
Total Present Worth Cost	**$297,200,000**	**$314,800,000**	**$321,400,000**	**$336,300,000**	**$337,700,000**	**$324,800,000**

[1]All Costs in 2010 Dollars

4.5.4 Direct Environmental Impacts

Environmental impacts of all alternatives are compared in detail in Section 6. The main factors that differentiate the level of direct environmental impacts of each alternative are primarily related to:

- Size of facility footprint
- Use of previously disturbed property
- Preservation of forested land
- Efficiency of the site layout including the need for intermediate pump stations and placement of treatment processes

The direct impacts of the proposed project alternatives are compared in further detail in Table 4-4. In addition to illustrating a relative positive or negative impact, mitigation of these impacts is also shown in this table. Impacts are considered to be mitigated if they are diminished or eliminated through compliance with local, state, or federal regulatory programs.

Table 4-4 Comparison of the Direct Impacts of the Regional WWTP Alternatives

	Direct Impact	Alternative						
		NA	1	2	3	4	5	6
Environmental	Minimize total land disturbance at facility site	●	+	+	--	--	+	+
	Facility footprints minimize disturbance to forested land	●	-	++	--	--	++	++
	Facility footprints minimize disturbance to wetlands	●	+	+	+	+	+	+
	Stream crossings minimized	+	(-)	(-)	(-)	(-)	(-)	(-)
	Increased nutrient discharge to Lake Wylie	-	(-)	(-)	(-)	(-)	(-)	(-)
	Additional water supplied to Lake Wylie	-	●	+	+	+	+	+
	Stormwater quality and quantity from site	-	(-)	(-)	(-)	(-)	(-)	(-)
	Potential groundwater quality impacts from septic	-	+	+	+	+	+	+
	Potential groundwater recharge impacts from impervious development	●	-	-	-	-	-	-
	Terrestrial habitat benefits	-	●	++	--	--	++	++
	Water reuse opportunities	●	●	+	+	+	+	+
	Avoid disturbance to endangered species	●	●	+	-	-	+	+
	Air Quality	●	●	+	+	++	++	+
Community	Utilizes previously disturbed sites	-	-	+	-	-	+	+
	Provides adequate WWTP capacity for projected growth	--	-	+	+	+	+	+
	Minimizes total land disturbance at facility site	●	●	+	-	-	+	+
	Land use compatibility	●	●	(-)	(-)	(-)	(-)	(-)
	Increased public recreation opportunities	-	●	+	-	-	+	+
	Energy savings from reduced wastewater pumping distance	●	●	+	●	●	+	+
	Energy efficient structures	●	●	+	+	++	++	++
	Open space preserved	●	●	+	+	+	+	+
	Consistency with long range planning	--	-	+	+	+	+	+
	Visual buffer maintained between public land and facility	-	-	+	--	--	++	+

++Very positive

+ Positive

● Neutral

- Negative

-- Very negative

( ) Mitigated: impacts would be reduced by compliance with regulations and/or additional measures.

Additionally, the operation of a regional wastewater facility would provide beneficial direct impacts, including increased water availability in Lake Wylie and decreased energy consumption. The proposed regional facility would be consistent with current long range planning goals for all affected local governments. The proposed regional facility would eliminate the Clariant discharge to the River. The eventual discontinuation of the pumping of wastewater over 20 miles to the McAlpine Creek WWMF would result in energy savings. Increased water would be available in Lake Wylie for power generation, cooling water and water supply. The proposed regional

wastewater facility, which would produce high quality effluent with low nutrient concentrations, could also increase the amount of water available in Lake Wylie to support water quality, aquatic life, drinking water, and recreation. The effluent would also provide reclaimed water for industrial or landscape applications, which could reduce the amount of water removed from the Lake Wylie system for irrigation. These potential reductions in Lake Wylie water use for industrial or landscape applications in conjunction with the introduction of treated effluent would help to preserve drinking water supplies, particularly under drought conditions. These beneficial impacts would not be achieved under the No Action Alternative.

4.5.5 Secondary and Cumulative Impacts

Section 6 includes the detailed analysis of the secondary and cumulative impacts associated with each of the different alternatives. Secondary and cumulative impacts associated with any of the Action Alternatives would generally be related to continued urban growth and land use changes associated with population increases in the service area. Growth within the service area is anticipated regardless of the alternative selected including the No Action Alternative. Very little difference in the level of secondary and cumulative impacts is expected among the alternatives.

The selection of an alternative that provides regional wastewater treatment would help reduce sprawl by facilitating higher density development in areas that are proactively planning for and regulating continued development. The proposed regional wastewater facility is part of a long term planning effort conducted by Utilities and the City of Mount Holly to provide cost-effective high quality wastewater treatment for their citizens while being protective of the environment. This project has been proposed in response to an anticipated increase in wastewater generated within the service area; the facility itself would not produce this population growth. Any secondary and cumulative impacts would be significantly reduced through the implementation of environmental controls required by regulatory programs. Many regulations in place within the service area meet or are more stringent than State and/or Federal requirements.

Overall, the construction of a regional wastewater facility would provide a number of beneficial secondary and cumulative impacts, including increased water volume in Lake Wylie and the Catawba River and decreased energy consumption associated with the eventual discontinuation of the pumping of wastewater over 20 miles to the McAlpine Creek WWMF. Increased water volume would be available in Lake Wylie for power generation, cooling water, and water supply. The proposed regional wastewater facility, which would produce high quality wastewater effluent with low nutrient concentrations, could also increase the amount of water available in Lake Wylie to protect water quality, support aquatic life and provide recreational opportunities. The existing discharges from Clariant, Belmont, and/or Mt Holly would be eliminated. Highly treated wastewater effluent would also provide a source of reclaimed water for industrial or landscape applications. The utilization of reuse water for irrigation could reduce the demand for potable water during summer peak water use periods. These potential reductions in Lake Wylie water use for industrial or landscape applications, in conjunction with the introduction of treated wastewater effluent, would help to preserve drinking water supplies, particularly under drought conditions. These beneficial impacts would not be achieved under the No Action Alternative.

4.5.6 Regulatory Impact Minimization and Mitigation

Some direct and secondary and cumulative impacts would occur as a result of any of the Action Alternatives or the No Action Alternative. The potential direct environmental consequences of the proposed action at the project sites

have been considerably reduced as a result of avoidance and minimization during the site selection process discussed above, and would be further reduced during the design and construction of the proposed facilities. A substantial number of programs currently in place would further serve to minimize, and mitigate direct impacts on the site as well as secondary and cumulative impacts throughout the service area. Regulations and guidance that will provide mitigation for any of the Action Alternatives (1-6) include local Erosion and Sediment Control Ordinances, Zoning and Subdivision Ordinances, Stormwater Ordinances, Flood Damage Prevention Ordinances, and stream buffer ordinances, as well as State and Federal programs.

4.5.7 Impacts to Lake Wylie Hydroelectric Generation and Power Plant Cooling Water

Wastewater generated within the Long Creek basin is currently pumped over 20 miles for treatment at the McAlpine Creek WWMF in southern Mecklenburg County. The treated effluent is discharged to the Catawba River below Lake Wylie. The proposed alternatives that treat the wastewater generated in this basin at a regional WWTP located near the existing pump station or in Mount Holly near the existing WWTP (Alternatives 2-6) would increase the quantity of water that is discharged to the lake. These alternatives would be considered a benefit for the hydroelectric power plant on Lake Wylie. This increased quantity of water would also be beneficial for industrial facilities utilizing Lake Wylie water in their cooling processes.

4.5.8 Public Health

A new or upgraded wastewater treatment plant would be designed to achieve high level treatment and overflow prevention to protect public health. Waterbodies present in the vicinity of the potential regional project sites include the Catawba River downstream of the Mountain Island Lake Dam, and Long Creek near its confluence with the Catawba River. In these areas, both waterbodies are classified as critical areas (CA) within WS-IV water supply waters (WS-IV; CA) (DWQ BIMS Database, May 14, 2007). Water supplies in moderately to highly developed watersheds are classified as WS-IV waters. Watershed areas within one-half mile of a water supply and waters within one-half mile of a water supply intake are designated as critical areas. Discharges are allowed in WS-IV; CA areas, but effluent must meet standards established by NC DWQ in consultation with the NC Department of Environmental Health (DEH). Expanded wastewater discharges to water supply waters must be approved by DEH. Within water supply watersheds, the DENR also requires minimum buffer widths as well as control of non-point sources and stormwater discharges.

4.6 Preferred Alternative

Alternative 5 was identified as the preferred alternative because it meets the developing region's need for additional wastewater treatment capacity and results in a combination of fewer negative environmental consequences. These include comparatively fewer natural resource and environmental impacts at the building site; fewer construction and operational constraints; greater public recreation and open space benefits; reduced energy use; increased water volume in Lake Wylie for local uses such as power generation, cooling water, low flow supplementation, and drinking water; and concurrence with the planning goals of the affected local governments. Alternative 5 also has the potential to minimize direct impacts, including:

- Placement of a single WWTP is preferable to other alternatives in terms of compatibility with existing and future land uses, protection of riparian buffers, and reduced impacts to critical areas such as streams and

wetlands. Advanced treatment at a new facility would produce high quality effluent with low nutrient concentrations and provide additional water into Lake Wylie for many beneficial uses.

- The Preferred Alternative provides regional wastewater treatment with a single discharge that promotes efficient planning, design, and permitting; minimizes shoreline and wetland impacts; and cost-effectively achieves project goals. It will also eliminate potentially three existing discharges.
- The Preferred Alternative reduces risk of overflows by reducing wastewater pumping distance.

This alternative meets the developing region's need for expanded wastewater treatment capacity with a single wastewater treatment plant, a single discharge, and a single permitting and SEPA process. The effluent would also provide reclaimed water for industrial or landscape applications. As such, it appears more favorable from an environmental and regulatory process perspective and will likely have a less complex permitting process than the other alternatives. Regionalization will result in considerable savings of time, effort, and finances during the permitting and design phases as well as during operation of the facility.

Under the Preferred Alternative, future wastewater treatment needs to accommodate projected development through 2030 would be provided for both Mount Holly and Utilities on the Mecklenburg County side of the Catawba River by constructing a new 25 mgd wastewater plant. With this alternative, Mount Holly, and Belmont flows would be pumped across the Catawba River.

The Long Creek pumping station located on the Mecklenburg County side of the Catawba River was also designed to be converted into an influent pumping station for a nearby wastewater plant at some point in the future. The proposed facility will be located on a parcel of land currently owned by Clariant Corporation that was previously cleared of vegetation. This allows the forested area adjacent to the Long Creek pumping station to be preserved. By limiting the plant footprint and incorporating low impact development (LID) techniques in site design, the impact from non-point source runoff will also be minimized. To further protect water quality, no plant facilities will be constructed in the 100-year floodplain or surrounding wetlands and disturbances to the riparian buffer will be minimized to the greatest extent possible.

The new plant would be built in phases and the effluent from this combined facility would be discharged in a single outfall to the Catawba River. Discharging to the Catawba River rather than Long Creek will minimize impacts associated with higher flow velocities (streambed scouring) and quality of effluent (nutrient enrichment) to the creek. The wastewater would be treated to reclaimed water quality standards, so the effluent would also provide reclaimed water for industrial or landscape applications.

4.7 Lake Wylie Water Quality Modeling

Water quality modeling of Lake Wylie was performed to evaluate the potential impacts that increased wastewater discharge would have on the lake and to support the development of speculative NPDES limits by DWQ for the plant discharge into Lake Wylie. A CE-QUAL-W2 model of the lake was previously developed and calibrated by Duke Energy (Cole and Wells 2002, Ruane and Hauser 2006, Sawyer and Ruane 2006). This model was updated with flow and concentration data collected during 2007 as part of this project. LUESA has 5 permanent monitoring stations in Lake Wylie that are monitored on a monthly basis for biological and physio-chemical parameters. These stations are primarily located in shallow water coves and at the mouths of tributaries. Starting in May 2007, LUESA began conducting additional water quality sampling at 4 stations in the mainstem of the lake adjacent to

the existing tributary station. These samples were collected to support water quality modeling efforts associated with the proposed project. A description of the model, including calibration and results of future scenario simulations are summarized in this section. A comprehensive modeling report is included in Appendix C.

Existing conditions and several future scenarios were simulated to determine the potential water quality impacts from the proposed regional WWTP. The existing condition, which is similar to Alternative 1, was modeled assuming that the Mount Holly plant discharged at the current permitted flow of 4 mgd and at their existing nutrient concentrations. From a modeling perspective, Alternatives 2 through 6 were the same assuming similar treatment levels at the combined or separate facilities. The No Action and Non Discharge alternatives do not contribute additional discharges into Lake Wylie and therefore were not explicitly modeled.

For both existing and future conditions, both normal operating conditions and permit conditions were simulated. The model included non-point source inputs as measured values from monitored tributaries, while ungaged tributaries were estimated based on loads from nearby creeks scaled by contributing watershed area. Anticipated changes in non-point sources loadings as a result of future population growth were also included in the model using an export coefficient approach. Wastewater treatment plant point sources to Lake Wylie included the Mount Holly WWTP, and the Belmont WWTP, and Clariant.

The water quality parameters that were simulated in the model included phosphorus, ammonia, nitrate, BOD, and DO. For normal operating conditions, the concentrations used represented the highest loads that could be discharged without exceeding any permit limits. Water quality concentrations for the proposed regional WWTP under permit limit conditions were calculated based on assumed permit limits for TN, TP, and BOD5 based on plant capacity. The fourteen scenarios simulated represent variations in effluent flow and quality as well as river conditions.

Model results indicated the following conditions would occur:

- Dissolved oxygen concentrations under the future scenario of a new WWTP would not vary greatly from existing conditions. In the area downstream of the junction with the South Fork Branch, the different scenarios exhibited virtually no differences in DO concentrations throughout the water column. In the lower section of the lake, concentrations would be slightly reduced in the upper portions of the water column in the future scenarios.
- During an average flow year, low DO concentrations would likely occur about 0.5 - 1 meter higher in the water column downstream of the Belmont WWTP. Only minor differences in DO concentrations were predicted to occur in the area downstream of the South Fork Branch while virtually no differences were expected in the lower section of the lake.
- Predicted TP concentrations would be higher in the upper reaches of the lake under the future condition with a new WWTP discharge.
- There were virtually no differences in TP concentrations between existing and future conditions in the lower section of the lake. Differences were further reduced during the average flow year.
- Predicted TP concentrations in the South Carolina portion of the lake would be below the instream water quality criteria of 0.06 mg/L throughout the average flow year. However, during a dry low year, under all

existing and future conditions, it was estimated that the TP criteria would be exceeded for a few days early in the year.

- Predicted TN concentrations would be higher in the upper reaches of the lake under the future conditions scenario. There were virtually no differences in TN concentrations between existing and future conditions in the lower section of the lake. Differences were further reduced during the average flow year.
- Total nitrogen concentrations in the South Carolina portion of the lake would be below the instream water quality criteria of 1.5 mg/L for all conditions modeled.
- Chlorophyll-*a* concentrations were very low in the upper section of the reservoir and generally increase in a downstream direction under both existing and future conditions scenarios.
- Only minor differences between the scenarios were apparent downstream of the junction with the South Fork Branch. Virtually no differences in chlorophyll-*a* concentrations were seen between scenarios run using average flow conditions.
- In all cases the predicted chlorophyll-*a* concentrations were well below the water quality criteria of 40 µg/L.
- The largest source of nutrients for both the existing and future cases was estimated to be the South Fork Branch.
- Under the future scenario, the new Regional Long Creek WWTP could contribute a slightly higher load than the Belmont WWTP although the flow would be five times greater. Similar patterns were shown in the comparison of TN load contributions.

Overall, the modeling shows that the effects of the new regional Long Creek WWTP would have minor impacts on water quality in Lake Wylie. Effects would be mostly confined to the upper reaches of the lake. Water quality criteria for TN and chlorophyll-*a* would be met under all conditions. Criteria for TP could be exceeded for a few days during a low flow year under both existing and future conditions.

Speculative limits have been requested by NC DWQ and are included in Appendix K. The speculative limits are consistent with and comply with the existing TMDL for Lake Wylie.

Section 5. Existing Environment

5.1 Physiography, Topography, Hydrology, Soils

5.1.1 Physiography, Topography, and Relief

The service area is within North Carolina's Southern Piedmont Physiographic Province. This province consists of generally rolling, well-rounded hills and ridges with a few hundred feet of elevation difference between hills and valleys. Elevations in the Southern Piedmont generally range from 500 to 900 feet above sea level. Resistant knobs and hills occur in the Southern Piedmont Province. According to the North Carolina Geological Survey, the service area consists mainly of late Proterozoic to middle Paleozoic intrusive geologic formations (NCGS, 1994). Lithology of the service area is illustrated in Figure 5.1a.

The service area is characterized by moderate topography, with elevations ranging from approximately 580 to 840 feet above mean sea level. A 20-foot interval contour map for the service area is provided as Figure 5.1b. In the vicinity of the proposed facility, elevations range from 575 to 625 feet above mean sea level on the Gaston County side and 575 to 635 feet on the Mecklenburg County side. For the proposed Belmont pump station and forcemain elevations range from 560 to 590 feet near the Belmont WWTP and 550 to 650 feet on the Mecklenburg County side along the forcemain route.

5.1.2 Hydrology

5.1.2.1 Service Area Hydrology

The proposed service area is adjacent to two major water bodies, Mountain Island Lake and Lake Wylie, along a 14.9 mile stretch of the Catawba River system. The service area includes 5.2 miles along Mountain Island Lake (surface area = 3,234 acres) and 9.7 miles along the northern portion of Lake Wylie (surface area = 12,450 acres). These lakes are managed by Duke Energy as part of the Catawba-Wateree project. Water levels are controlled primarily for hydroelectric power generation, but also managed for water supply and aquatic habitat protection. Mountain Island Lake was built in 1924 to support the Mountain Island Hydroelectric Station and serves as the water supply for the City of Mount Holly, the City of Gastonia, and the City of Charlotte. Lake Wylie was constructed in 1904, is the oldest lake on the Catawba River, and supports the Wylie Hydroelectric Station, the Allen Steam Station, and the Catawba Nuclear Station. Lake Wylie serves as a drinking water supply for the towns of Belmont, NC and Rock Hill, SC. The main sub-basins within the service area are Long, Paw, Gar, Catawba and Dutchmans (Figure 5.1c). Long, Paw, and Dutchmans sub-basins drain to the Lake Wylie section of the Catawba River system and the Gar sub-basin flows into Mountain Island Lake. Most streams in the service area are classified as WS-IV or Class C waters. Class WS-IV waters are protected for drinking water use. Class C waters are protected for secondary recreation, fishing, and for the support of aquatic life.

The service area includes all or portions of six 14-digit hydrologic units and two DWQ sub-basins (Figure 5.1c). Table 5-1 identifies the DWQ sub-basins and associated USGS Hydrologic Unit Codes (HUC) within the service area.

Table 5-1 Sub-basins within the Service Area

Sub-basin Name	DWQ Sub-basin	USGS HUC Code
Mecklenburg County		
Mountain Island Lake	03-08-33	03050101170015
Gar Creek	03-08-33	03050101170015
Long Creek	03-08-34	03050101170020
Catawba	03-08-34	03050101170020
Paw Creek	03-08-34	03050101170030
Gaston County		
Dutchmans Creek	03-08-33	03050101160040
Catawba	03-08-34	03050101160050

The proposed service area contains many tributaries that flow in a dendritic pattern into the Catawba River. Major tributaries in the Mecklenburg County side of the service area include Long Creek, Paw Creek, Thomas Pond, Gum Branch, Gutter Branch, McIntyre Creek, Dixon Branch, and Gar Creek. Major tributaries on the Gaston County side of the service area include Fites Creek, Dutchmans Creek, South Stanley Creek, and Taylors Creek (Figure 5.1d).

5.1.2.2 Project Area Hydrology

All of the potential alternatives are located adjacent to the Catawba River in the upper sections of Lake Wylie. Alternatives five and six include wastewater from the City of Belmont crossing under the Catawba River (Lake
Wylie downstream of Interstate 85) and under Paw Creek to the existing Paw Creek pump station.
The sub-basins associated with the proposed project sites are identified in Table 5-2.

Table 5-2 Proposed Alternative Site Locations

Sub-basin Name	DWQ Sub-basin	USGS HUC Code
Mecklenburg County		
Long Creek	03-08-34	03050101170020
Paw Creek	03-08-34	03050101170030
Gaston County		
Catawba	03-08-34	03050101160050

Figures 5.1e and 5.1f identify the field survey boundaries and the general project location . The specific layouts for the six identified alternatives are provided in Figures 4.1 through 4.7 in Section 4. Table 5-3 identifies the tributaries on or immediately adjacent to the project area.

Table 5-3 Waterbodies Associated With the Proposed Alternative Site Locations

Waterbody	Location	Length within Project Area (ft)
WWTP in Mecklenburg County		
Catawba River (Lake Wylie)	Runs along western edge of property	1,459
Long Creek	Runs through middle of property	4,902
Unnamed Tributary to Long Creek	Along northern property boundary	1,425
Unnamed Tributary to Long Creek	Along southern property boundary	1,668
WWTP in Gaston County		
Catawba River (Lake Wylie)	Runs along eastern edge of property	3,655
Fites Creek	Runs through SE portion of property	976
Belmont Pump Station in Gaston Co.		
Catawba River (Lake Wylie)	Runs along southern and eastern edge of property	5,386 (1,380 crossing of Catawba)
Belmont Forcemain in Mecklenburg Co.		
Unnamed Ephemeral Stream	Forcemain crosses stream along Amos Smith Road near Dowd Road	2
Unnamed Perennial Tributary	Forcemain crosses tributary along River Walk Way	10
Paw Creek	Forcemain crosses creek near Paw Creek pump station	50

5.1.3 Soils

Soils data were obtained from the NRCS Soil Conservation Service, and calculations of the area extents of soil units within the service area were conducted in GIS using ESRI Spatial Analyst.

5.1.3.1 Service Area Soils

Soils found within the service area are primarily within the Cecil and Cecil-Urban associations, with others in the Iredell-Mecklenburg; Wilkes-Enon; Enon, Helena, Vance; and Monacan associations. These associations are described as follows:

- **Cecil** – Gently sloping to strongly sloping, well drained soils that have predominantly clayey subsoil. Formed in residuum from acid igneous and metamorphic rock.
- **Cecil-Urban land** – Nearly level to strongly sloping urban areas on well drained soils that have predominantly clayey subsoil. Formed in residuum from acid igneous and metamorphic rock.
- **Iredell-Mecklenburg** – Nearly level to strongly sloping, moderately well drained and well drained soils that have predominantly clayey subsoil. Formed in residuum from diorite, gabbro, and other rock high in ferromagnesian minerals.
- **Wilkes-Enon** – Gently sloping to steep, well drained soils that have predominantly clayey subsoil. Formed in residuum from diorite, hornblende schist, and other basic rock, or from mixed acidic and basic rock.

- **Enon, Helena, Vance** – Gently sloping to strongly sloping, well drained and moderately well drained soils that have predominantly clayey subsoil. Formed in residuum from mixed acidic and basic igneous and metamorphic rock.
- **Monanan** – Nearly level, somewhat poorly drained soils that have predominantly loamy subsoil. Formed in fluvial sediment on floodplains.

All soils found in the service area are listed in Table 5.1g in Appendix D.

The most common soils in the service area are Cecil sandy clay loams CeB2 and CeD2, which collectively make up 30.5% of the project area. The next most common soils are Pacolet sandy loam PaE, which make up 8.4% of the project area. These soils are described in Appendix D.

5.1.3.2 Project Area Soils

Soil classifications in the project area are illustrated in Figure 5.1g. The most common soils on the Gaston County side of the project area are Wilkes Loam (WkE 34% and WkF 12%).

In Mecklenburg County, soils on the project area are Cecil sandy loam (CeD2 2%), Helena sandy loam (HeB 20%), Helena-Urban land complex (HuB 7%), and Mecklenburg fine sandy loam (MeB 20%). These soil types are described in Appendix D.

Figure 5.1h identifies the soils found on the City of Belmont WWTP site as well as along the proposed forcemain route. The predominant soils on the WWTP site are Gaston sandy clay loams (GaB2 and GaE) and the soils along the forcemain are primarily Cecil sandy loam (CeB2).

5.2 Land Cover and Land Use

This section discusses land cover and land use in the proposed service area.

5.2.1 Land Cover

Land cover describes the status and type of vegetation and/or other ground cover in an area. Land cover is the result of natural processes and vegetation combined with current and historical land use practices. Land cover presented in this report describes the most recently available (2001) condition of the proposed service areas, and indicates the general land cover types (trees, grasses, houses, etc.) that characterize the landscape. Although these data include structures and vegetation existing in 2001, they do not indicate current or planned activities or how the area will be managed.

Land cover in the service area is illustrated in Figure 5.2a. This land cover dataset was obtained from the National Land Cover Database 2001 (NLCD 2001) and is interpreted primarily from 2001 LANDSAT Enhanced Thematic Mapper satellite images with 30 meter resolution (MLRC, 2001; http://www.mrlc.gov/). As such, this land cover data provides an understanding of overall distribution in the service area in 2001, but is not expected to be accurate at a small scale.

Land cover from the NLCD 2001 is summarized into nine categories for the purposes of this report. These categories are defined as follows:

- **Open Water** – All areas of open water, generally with less than 25% cover of vegetation or soil.

- **Developed, Open Space** – Includes areas with a mixture of some constructed materials, but mostly vegetation in the form of lawn grasses. Impervious surfaces account for less than 20% of total cover in these pixels. These areas most commonly include large-lot single family housing units, parks, golf courses, and vegetation planted in developed settings for recreation, erosion control, or aesthetic purposes.
- **Developed, Low Intensity** – Includes areas with a mixture of constructed materials and vegetation. Impervious surfaces account for 20% – 49% of total cover. These areas most commonly include single-family housing units.
- **Developed, Medium Intensity** – Includes areas with a mixture of constructed materials and vegetation. Impervious surfaces account for 50% – 79% of the total cover. These areas most commonly include single-family housing units.
- **Developed, High Intensity** – Includes highly developed areas where people reside or work in high numbers. Examples include apartment complexes, row houses and commercial/industrial. Impervious surfaces account for 80% – 100% of the total cover.
- **Forest (Including Deciduous, Evergreen, and Mixed)** – Includes areas dominated by deciduous, evergreen, or mixed deciduous and evergreen trees generally greater than five meters tall and greater than 20% total vegetation cover. These forested land cover types are described separately in the NLCD dataset, and are discussed individually and collectively in this report.
- **Shrub/Scrub** – Areas dominated by shrubs; less than 5 meters tall with shrub canopy typically greater than 20% of total vegetation. This class includes true shrubs, young trees in an early successional stage or trees stunted from environmental conditions.
- **Grassland/Herbaceous** – Areas dominated by grammanoid or herbaceous vegetation, generally greater than 80% of total vegetation. These areas are not subject to intensive management such as tilling, but can be utilized for grazing.
- **Pasture/Hay and Cultivated Crops** – Includes two land cover types: 1) Areas of grasses, legumes, or grass-legume mixtures planted for livestock grazing or the production of seed or hay crops, typically on a perennial cycle. Pasture/hay vegetation accounts for greater than 20% of total vegetation. 2) Areas used for the production of annual crops, such as corn, soybeans, vegetables, tobacco, and cotton, and also perennial woody crops such as orchards and vineyards. Crop vegetation accounts for greater than 20% of total vegetation. This class also includes all land being actively tilled.
- **Wetlands** – Includes areas where the soil or substrate is periodically saturated or covered with water.

The land cover data for the service area is summarized in Figure 5.2b and separated by county in Figure 5.2c.

According to the NLCD , and as illustrated in Figures 5.2a and 5.2b, the approximately 54,000 acre service area is made up primarily of developed land cover classes (46%), including open space, low intensity, medium intensity, and high intensity development. The largest amount of this developed land cover is open space and low intensity development, comprising 25 and 15% of the service area land cover respectively. Forested land cover accounts for 37% of the service area, including deciduous (29% of the service area), evergreen forest (7%), and mixed forest

(0.8%). The remaining 17% of the service area is composed primarily of pasture and hay (8%), grasslands (3%), open water (3%), and wetlands (1%).

Figure 5.2c illustrates land cover as a percentage of each County's land within the service area. This figure shows that a higher proportion of the Mecklenburg County portion of the service area exhibits a forested land cover (38%) than the Gaston County portion of the service area (28%). Low Intensity Development and Open Space Development comprise a greater proportion of the land cover in Gaston County (24% and 30% respectively) than in Mecklenburg County (14% and 25% respectively). When land cover distribution is compared across subbasins, a higher proportion of the Gar (59%), Catawba-Mecklenburg (46%) and Lower Mountain Island (40%) sub-basins have forested land cover than other sub-basins.

5.2.2 Impervious Land Cover

Impervious land cover data is available from for the NLCD 2001 study areas. These data were obtained from the Multi-Resolution Land Characteristics Consortium (MRLC; http://www.mrlc.gov/). The method employed to map percent imperviousness for NLCD 2001 consists of three key steps: deriving reference data of imperviousness from the high spatial resolution images, calibrating density prediction models using reference data and LANDSAT spectral bands; and extrapolating the developed models spatially to map per-pixel (30 m^2) imperviousness.

Figure 5.2d illustrates percent imperviousness per pixel within the service area. Darker red pixels indicate a greater percentage of impervious land cover in that area. The figure shows the highest concentration of impervious surface to the east of the service area, in the City of Charlotte. Within the Mecklenburg County portion of the service area, concentrations of impervious surface exist along major thoroughfares connecting to Charlotte, particularly Interstate 77, Interstate 85, US Route 29, NC Route 17, and NC Route 27. The Gaston County side of the service area had a higher percentage of impervious surfaces in 2001 than the Mecklenburg County side. The greatest concentration of impervious surface in the Gaston County portion of the service area in 2001 was along the NC Route 27 corridor.

5.2.3 Land Use

Tax parcel data was used to determine land use classifications in both Mecklenburg and Gaston Counties in the proposed service area. This information was available in GIS format and obtained in July 2007 (Goretti, pers. Comm., 2007). Parcel layers provided by each county contained specific land use code attributes representing the current land use of each parcel. The two data sets were compared and land use codes were grouped according to similar characteristics. ArcMap GIS analysis and data management tools (ESRI, 2006) were used to develop a single, general land use layer covering the entire proposed service area in the two counties. Thirteen distinct land use types were created based on the parcel data codes and recommendations from Mecklenburg County (Isley, pers. Comm., 2007).

The land use codes used to describe land uses in this report are as follows:

- **Industrial** – Industrial land uses such as manufacturing.
- **Commercial and Services** – Land that is used for commercial and service enterprises such as offices and retail stores.
- **Institutional** – Includes land that is used for government, church, and educational institutions.

- **Transportation** – Transportation infrastructure such as parking lots and roadway corridors.
- **Residential land uses** – High density residential, medium density residential, and low density residential. These include single family residential land uses of varying densities.
- **Multi-Family Residential** – Includes multi-family residential uses such as townhomes and apartment homes.
- **Transitional/Construction** – Includes lands upon which there is construction in progress.
- **Open Space** – Includes lands whose current use is open space such as vacant land, unimproved lots, and greenways.
- **Forest** – Includes land either used for commercial forest production or as forested buffer strips.
- **Cropland and Pasture** – Includes lands used for production of agriculture.
- **Water** – Lands defined as being covered by water in the county parcel records.
- **Wetland** – Lands defined as wetlands in the county parcel records.

Land use data for the service area is illustrated in Figure 5.2e. Distribution of land use as a proportion of the service area is shown in Figure 5.2f and within each county in Figure 5.2g.

According to Gaston and Mecklenburg parcel records, and as illustrated by the figures referenced above, the predominant land use in the service area is medium density residential (57%) followed by industrial (12.5%) and commercial and services (9%) land. Parcels specifically used for open space account for 8% of the proposed service area. No other land use types accounts for more than 4% of the service area.

According to the county parcel data, of the seven land use categories that comprise developed lands, medium density residential is the most predominant, making up 60% of the proposed service area. It comprises 41% of land use on the Gaston County side and 62.5% on the Mecklenburg County side of the proposed service area.

In the service area as a whole, industrial (12.8%), commercial and services (8.4%) and open space (7.8%) are the next most dominant developed land uses. Open space is the second dominant land use on the Gaston County side, accounting for 17% of the service area there. In Gaston County, industrial and commercial/services land uses are also common (10% and 8% respectively). In Mecklenburg County, open space land uses account for only 7% of the proposed service area. Industrial and commercial/services are the second and third most dominant developed land uses, at 13% and 8% respectively.

Land used as cropland and pasture is comprised of land use codes such as “agricultural” and “farms general” and accounts for 5% of the Gaston County side of the proposed service area, but only 1% of the Mecklenburg County side. The area with the highest percentage (7%) land use associated with cropland and pasture is located in the Gar Creek sub-basin.

5.2.4 Alignment of I-485

The Charlotte outer beltline, I-485, is a partially complete interstate highway circumnavigating the city. A portion of this interstate was recently constructed through the proposed service area on the Mecklenburg County side.

Growth and development are expected to occur as a result of the construction of this major transportation corridor. The interstate passes through both the Long Creek and Paw Creek sub-basins, which may result in significant changes to the land use in these areas. Currently, the majority of this highway corridor is was already paved or cleared land with little or no vegetative cover.

Currently, the majority of this highway corridor is was already paved or cleared land with little or no vegetative cover.

5.2.5 Project Area Land Use and Land Cover Summary

Land cover and land use at and adjacent to the proposed WWTP alternate sites and Belmont pump station and forcemain route were interpreted from 2005 aerial photography and county parcel records. This information is illustrated in Figures 5.2h and 5.2i. Land cover and use of the numbered parcels are described in the following sections.

Land use and land cover at the proposed WWTP alternate sites:

1. Currently classified as industrial land according to parcel land use codes; active groundwater remediation area.
2. Waters of the State.
3. Classified as industrial land according to parcel land use codes, but is currently forested land cover.
4. Currently classified as privately-owned open space according to County parcel data, but a residential development is planned.
5. This land is currently used by the Whitewater Center as mountain bike trails, but is classified as single family residential according to parcel land use codes.
6. This land is used as privately-owned open space according to County parcel data. It is currently forested land cover.
7. City of Mount Holly-owned land is part of a planned riverfront park and greenway. It is currently forested land cover.
8. Land used for manufacturing.
9. Land owned by the City of Mount Holly. It is currently used as a park and ball field.
10. City of Mount Holly WWTP location.
11. Privately-owned open space.
12. The larger parcel to the west is used as multi-family residential. The five smaller adjacent parcels to the east are single-family residential.
13. Categorized as industrial by county parcel data and currently used for textile manufacturing. Land cover is a mixture of forested, herbaceous, and impervious areas.

Land use and land cover at the City of Belmont WWTP and along the proposed forcemain route:

1. Currently classified as industrial land according to parcel land use codes.
2. Classified as industrial land according to parcel land use codes, but is currently forested land cover.
3. Waters of the State.
4. Forested private residential
5. Powerline right of way
6. Forested
7. Residential development, single family homes
8. Road right of way
9. Classified as open space and railroad corridor
10. Classified as high density residential
11. Paw Creek open space
12. Industrial

5.3 Wetlands and Floodplains

5.3.1 Service Area Wetland Conditions

The most common types of natural wetland communities likely to exist within the study area are Piedmont Bottomland Forest, Piedmont Alluvial Forest, and Piedmont Swamp Forest (Shafale and Weakley, 1990). The vegetation in these systems is dominated by mixtures of flood-tolerant, deciduous tree species such as sweet gum (Liquidambar styraciflua), American elm (Ulmus americana), red maple (Acer rubrum), black willow (Salix nigra), swamp cottonwood (Populus heterophylla), and green ash (Fraxinus pennsylvanica).

National Wetlands Inventory (NWI) GIS layer data (USFS 1999) and a hydric soils GIS layer (NRCS 2007) were used to characterize existing wetland conditions throughout the proposed service area (Figure 5.3a). There are 2,611 acres of NWI wetlands within the service area (Table 5-4). Of these, the largest proportion is lacustrine limnetic (60.7%), which are permanently flooded impoundments located along Mountain Island Lake and the Catawba River/Upper Lake Wylie. Palustrine forested wetlands are the next largest type of NWI wetland in the service area (21.9%), which are vegetated with broad-leafed deciduous trees. Another 14% of the wetlands in the proposed service area are classified as palustrine, unconsolidated bottom and 1.8% is palustrine shrub-scrub. In total, palustrine systems account for 38.9% of all wetlands in the proposed service area and constitute the vast majority of wetland areas that are not a permanently flooded portion of the Catawba River. These wetlands are primarily located adjacent to stream channels in the floodplain or ponds at the heads of streams.

Table 5-4 NWI Wetland Areas in the Service Area

System	Subsystem	Class	Area (ac)	Area (%)
Lacustrine	Limnetic	Unconsolidated Bottom	1584.6	60.7%
Lacustrine	Littoral	Unconsolidated Shore	9.4	0.4%
Palustrine	N/A	Aquatic Bed	0.9	<0.1%
Palustrine	N/A	Emergent	30.0	1.2%
Palustrine	N/A	Forested	572.9	21.9%
Palustrine	N/A	Shrub-Scrub	46.9	1.8%
Palustrine	N/A	Unconsolidated Bottom	365.9	14.0%
Riverine	Lower Perennial	Unconsolidated Shore	0.6	<0.1%
Total			**2611.2**	**100.0%**

Hydric soils are common in low-lying areas and typically run along stream valleys (Figure 5.3b). Soils within the service area that are defined as hydric by the NRCS include Helena, Iredell, Monacan, and Chewacla soil units. Table 5-5 summarizes areas of hydric soils for each sub-basin within the service area. The Long Creek sub-basin has a significantly higher percentage of hydric soils than other sub-basins within the service area as evidenced by Helena and Iredell units found between low-order streams in the middle portion of this sub-basin. Based on a contour analysis, these soils are found in low slope areas and the lack of efficient drainage may contribute to the presence of these soils. Monacan soils are present along the stream valleys of Long Creek and in the other Mecklenburg County sub-basins. Hydric soils along stream valleys in Gaston County are mapped as Chewacla. The Lower Mountain Island Lake sub-basins and the service area portion of the Dutchmans Creek sub-basin have the next highest percentages of hydric soils (11.6% and 8.0% respectively) within the service area.

Table 5-5 Hydric Soils by Sub-basin

Sub-basin	Area (acres)	Percent of Sub-basin
Gar Creek	408.8	7.7%
Long Creek	4083.1	17.6%
Paw Creek	699.3	5.5%
Lower MI Lake	494.8	11.6%
Catawba River (Mecklenburg Co.)	110.2	5.6%
Catawba River (Gaston Co.)	158.6	7.8%
Dutchmans Creek	354.8	8.0%

A much smaller portion of the service area is covered by NWI wetland sites than hydric soil types, either due to the minimum 5 acre spatial resolution used to identify NWI wetlands, discrepancies in NWI aerial wetland analysis, or the absence of wetlands where hydric soil types are defined. Hydrologic changes over time, natural history succession, or differences in agency determinations of wetlands, among other reasons may explain the absence of wetlands where there are hydric soils. The NWI areas are almost exclusively located along stream and river channels.

5.3.2 Project Area Wetland Conditions

Field visits were conducted in August 2007 and April 2011 to determine the extent and type of wetland habitat within the proposed alternative sites. No jurisdictional determinations were conducted as part of these field visits; however, preliminary wetland boundaries were field delineated within the CMU-Mt Holly proposed WWTP project areas (Figure 5.3c). Wetlands were not delineated at the Belmont WWTP, the Paw Creek pump station, or along the proposed forcemain alignment, but were field identified during a site visit in April 2011. Wetlands along the Belmont forcemain alignment are presented in Figure 5.3d. Wetlands were identified along the edges of the Catawba River and on the floodplains of tributary streams, including Long Creek, Fites Creek, Paw Creek, and two unnamed tributaries. These wetlands provide benefits such as flood control/stormwater retention, stormwater filtration, groundwater recharge, nutrient uptake, and wildlife habitat.

Wetland communities on the Gaston County side near the City of Mount Holly WWTP were either adjacent to streams that flow into the Catawba River or floodplain wetlands adjacent to the Catawba River. Evidence of wetland hydrology included riverine floodplain, drift lines, moss collars, and the presence of a canopy of 80 to 90% facultative wet (FACW) and an obligate wet (OBL) tree species. Hydric soils in these wetlands are mapped as Chewacla loam. The plant community as described in Section 5.7 of this document is Piedmont/Low Mountain Alluvial Forest (Schafale and Weakley 1990). Wetland communities near the City of Belmont WWTP were associated with the Catawba River floodplain.

Wetland communities on the Mecklenburg County side near the proposed WWTP are mostly associated with the Long Creek floodplain which is at the same elevation and contiguous with the Catawba River floodplain. One small wetland area was identified along an unnamed tributary that drains to Long Creek in the northern portion of the proposed project area. Evidence of wetland hydrology included riverine floodplain, drift lines, rack lines, moss collars, a FACW and OBL canopy of 80 to 100%, and evidence of ponding. Hydric soils in these wetlands are mapped as Monacan loam. The plant community as described in Section 5.7 of this document is Piedmont/Low Mountain Alluvial Forest (Schafale and Weakley 1990). Wetland communities near the proposed forcemain route are mostly associated with the Catawba River and Paw Creek floodplains and are predominantly Piedmont Alluvial Forest and Piedmont Semi-Permanent Impoundment (Figure 5.3d). Small wetland areas are also present adjacent to the unnamed streams that are crossed by the proposed forcemain alignment (Piedmont Alluvial Forest).

5.4 Surface Water and Water Quality

5.4.1 Surface Water Classifications

Surface waters in North Carolina are classified by the DWQ based on their designated use. All surface water bodies are minimally classified as Class C (secondary recreation) waters with water quality standards established to protect aquatic life. Additional classifications are associated with more stringent water quality requirements for protection of primary recreation (Class B) and drinking water supplies (Classes WS-I through WS-V) (DWQ, 2007a). Several water bodies within the proposed service area are classified as WS-IV waters indicating that the water bodies must be protected as a human water supply but that classification as WS-I, II, or III is not feasible (DWQ, 2007b). Some of these water bodies have additional primary classifications such as “critical area” or CA. The classification CA is applied to watershed areas within one-half mile of a water supply and waters within one-half mile of a water supply intake. All other water bodies within the service area are classified as Class C except for an unnamed tributary to Little Paw Creek that is classified from its source to Little Paw Creek as Class B. All

waterbodies near the proposed WWTP alternative sites are designated WS-IV; CA. Waters adjacent to the Belmont WWTP are designated WS-IV, B; CA and C where the proposed forcemain crosses Paw Creek.

Figure 5.1d shows the classification of surface water bodies within the proposed service area and their classifications, along with water supply intakes and wastewater discharge locations. Many smaller streams have not been explicitly classified and carry the same classification as the downstream waterbody (Figure 5.1d). Compliance with water quality standards is assessed by the DWQ based on comparison of water quality data to the specific water body's classification.

5.4.2 Water Quality Monitoring

5.4.2.1 DWQ Monitoring

The DWQ collects biological, chemical, and physical data to characterize water quality conditions in all of the river basins throughout the state. This information is published every five years in a Basinwide Assessment Report (BAR) for each basin and used in the basinwide planning process. The DWQ monitoring program includes on-going ambient water quality, fish, and benthic macroinvertebrates (BMI) sampling program. Figure 5.4a shows the locations of DWQ's ambient and biological monitoring stations within the proposed service area.

DWQ's ambient monitoring system is a network of surface water monitoring stations where routine physical, chemical, and bacterial pathogen samples are collected. Parameters measured at each station include temperature, pH, specific conductance, turbidity, total suspended residue, dissolved oxygen (DO), various metals, fecal coliform, and weather conditions. Other parameters may be measured depending on site specific concerns or suspected water quality issues.

Fish and benthic macroinvertebrate communities are rated based on the NC Biotic Index (NCBI), a North Carolina-specific version of the IBI method (Karr, 1981). The NCBI scores are a measure of the ecological health of the waterbody and reflect water quality conditions and the effects of watershed disturbances. The DWQ uses the NCBI scores for water quality assessment and review of compliance with water quality standards. Stream BMI or fish populations are rated as "Excellent", "Good", "Good-Fair", "Fair", or "Poor" based on parameters related to the NCBI scores at each stream sampling site.

5.4.2.2 Mecklenburg County Monitoring

Charlotte-Mecklenburg's LUESA monitors 3 stations within the service area on a monthly basis for a variety of parameters including fecal coliform bacteria, turbidity, metals, nutrients, and physio-chemical parameters such as dissolved oxygen, temperature, conductivity and pH (Figure 5.4a). A number of other sites are monitored by LUESA for benthic macroinvertebrates, fish and instream habitat conditions. Benthic macroinvertebrate monitoring results are analyzed using the NCBI metrics used by the DWQ for benthic macroinvertebrates (DENR 2006). A rating of "Excellent", "Good", "Good-Fair", "Fair", or "Poor" is assigned for each sampling site based on BMI assemblages.

In August of 2007, LUESA produced its first index of water quality conditions called the "Stream Use-Support Index" (SUSI) (LUESA 2007). Ratings were developed for the three LUESA SUSI monitoring stations within the proposed service area, including MC50 on Gar Creek, MC14A on Long Creek, and MC17 on Paw Creek (See Figure 5.4b). All water quality data are used to generate a SUSI score for each sub-basin based on monthly chemical monitoring as well as annual BMI monitoring. The scores are grouped into categories to indicate whether

the water bodies are meeting their designated uses. The categories include "degraded" (score of 0 to 50), "impaired" (score of 50 – 70), "partially supporting" (score of 70 – 90), and "fully supporting" (score of 90 – 100).

Currently, LUESA has 11 permanent monitoring stations in Lake Wylie that are monitored every other month for biological and physio-chemical parameters. These stations are primarily located in shallow water coves and at the mouths of tributaries. There are an additional 7 Lake Wylie stations that are monitored in the summer months for fecal coliform bacteria. Starting in May 2007LUESA conducted additional water quality sampling at 4 stations in the mainstem of the lake conducted existing tributary station. These samples were collected to support water quality modeling efforts associated with the proposed project. A description of the model, including calibration and results of future scenario simulations are summarized in Section 4.9 and presented in detail in Appendix C.

5.4.3 Water Quality Status

The latest Catawba River BAR (DWQ, 2008) documented fish, benthic macroinvertebrate, and ambient water quality monitoring results for the service area from 2002 through 2007. The Catawba River Basin Plan (BP) (DWQ, 2010) identified the impairment status of waters within the service area. These reports provided information regarding the water quality status of surface waters within the service area (Table 5-6). Table 5-7 summarizes the results of DWQ and LUESA biological monitoring at stations within service area.

Table 5-6 Water Quality Status of Waterbodies within the Service Area Based on DWQ Water Quality Monitoring and LUESA SUSI Results

Monitoring Station	Data Collected	Status or Rating	Source
DWQ Stations			
Long Creek at SR 2042 near Paw Creek	Water quality (monthly)	Generally meets WQ standards except for turbidity , TSS, and copper	DWQ 2008 BAR
Dutchmans Creek at SR 1918 near Mountain Island	Water quality (monthly)	Elevated turbidity	DWQ 2010 BP
Mountain Island Lake	Water quality at 18 stations in 8/2002. No sampling in 2007.	Oligotrophic	DWQ 2003 BAR
Lake Wylie	Water quality at 7 stations sampled 10 times May through September 2007	Eutrophic; no criteria were exceeded	DWQ 2008 BAR
LUESA SUSI Stations*			
Paw Creek (MC17)	Water quality, BMI, Fish	Partially Supporting	8/2007
Paw Creek (MC17)	Water quality, BMI, Fish	Impaired	9/2007
Paw Creek (MC17)	Water quality, BMI, Fish	Partially Supporting	2/2010
Long Creek (MC14A)	Water quality, BMI, Fish	Partially Supporting	8/2007
Long Creek (MC14A)	Water quality, BMI, Fish	Partially Supporting	9/2007
Long Creek (MC14A)	Water quality, BMI, Fish	Partially Supporting	2/2010
Gar Creek (MC50)	Water quality, BMI, Fish	Partially Supporting	8/2007
Gar Creek (MC50)	Water quality, BMI, Fish	Partially Supporting	9/2007
Gar Creek (MC50)	Water quality, BMI, Fish	Partially Supporting	2/2010

*LUESA fish sampling occurs once every 5 years and is not included in the SUSI rating calculation

Table 5-7 Biological Ratings for Streams Within the Service Area

Stream	County	Sample Type	Organization	Date	Rating
Dutchmans Creek at SR 2128	Gaston	NCBI BMI	DWQ	1997	Good
Dutchmans Creek at SR 2128	Gaston	NCBI BMI	DWQ	2002	Good-Fair
Dutchmans Creek at SR 1918	Gaston	NCBI BMI	DWQ	2007	Good-Fair
Gar Creek at SR 2074	Meck	NCBI BMI	DWQ	2007	Good-Fair
Paw Creek at Hwy 74	Meck.	NCBI BMI	LUESA	2006	Poor
Long Creek at Pine Island Dr.	Meck.	NCBI BMI	LUESA	2006	Fair
Gar Creek	Meck.	NCBI BMI	LUESA	2006	Fair-Good
Gum Branch at Gum Branch Rd.	Meck.	Fish IBI	LUESA	2002	Fair
Long Creek at Oakdale Rd.	Meck.	Fish IBI	LUESA	2002	Fair
Long Creek at Pine Island Dr.	Meck.	Fish IBI	LUESA	2002	Fair
Long Creek at Pine Island Dr.	Meck.	Fish IBI	LUESA	2003	Fair
Paw Creek at Wilkinson Blvd.	Meck.	Fish IBI	LUESA	2003	Poor-Fair
Gar Creek at Beatties Ford Rd.	Meck.	Fish IBI	LUESA	2004	Fair-Good
Long Creek at SR 2042 nr Paw Creek	Meck.	NCIBI Fish	DWQ	2004	Good

The interpretations of biological sampling results from the DWQ 2008 BAR were complicated by the drought conditions that were present when samples were obtained in 2002 and 2007. Water quality may have declined due to hydrologic constraints (i.e. low water levels or the absence of water) or due to deteriorating conditions within the watershed. The Gar Creek site could not be sampled in 2002 due to a lack of flow and in 2007 biological sampling indicated reduction from good in1997 to good-fair. The 2003 Catawba BAR indicated that the lower Dutchmans Creek NCBI scores in 2002 may have been related to drought conditions. Benthic indices within the Dutchmans Creek watershed in 2007 ranged from fair to good-fair. According to LUESA, Long Creek benthic macroinvertebrate populations were negatively impacted in 2002, likely due to the severe drought, but have recovered to the current Fair rating (LUESA, 2007). In August 2007, each of the three sub-basins within the proposed service area monitored by LUESA were rated "partially supporting" according to SUSI ratings (LUESA, 2007). In August 2010 these three sub-basins are still rated by LUESA as partially supporting (LUESA, 2010).

In September 2007, the Paw Creek sub-basin was downgraded to impaired, but results from 2010 indicate that it has recovered to partially supporting. Based on the results of biological surveys conducted over the past several years at the Paw Creek monitoring station, water quality appears to be deteriorating and is likely attributed to development and unknown sediment sources upstream (Roux personal communication, Dec. 2007). Gar Creek is a rural stream that is used by LUESA as a reference site because of good water quality throughout the Gar Creek watershed. Much of the Gar Creek watershed is within a water supply protection area where development density is limited. Paw Creek is located within a heavily developed watershed and receives a variety of point and non-point source pollutants. Stormwater flows have negatively impacted aquatic habitats in Paw Creek. The Mecklenburg County Water Quality Program's Bioassessment Report concluded that Charlotte streams are experiencing habitat impairment associated with stream bank erosion, point and non-point source pollution including, industrial discharges, sewer line leaks, treated wastewater effluent, and stormwater pollutants (Roux 2007).

5.4.3.1 Impaired Waterbodies within the Service Area

According to the 2010 Catawba River Basinwide Water Quality Plan (DWQ, 2010), a few water bodies within the proposed service area are not meeting water quality standards and their designated uses. Dutchmans Creek and Stanley Creek were added to the list of impaired waters (303d list) in 2010 due to elevated turbidity and low dissolved oxygen levels respectively. Two additions to the 2008 303d list occurred in the service area due to elevated copper levels in Long Creek and low pH values in the Catawba River downstream of Mountain Island Lake. Long Creek and Lake Wylie are considered impaired by DWQ (Figure 5.4c and Table 5-8, but these waters are no longer on the 303d list due to the existing total maximum daily loads (TMDLs).

Table 5-8 Impaired Waterbodies within the Service Area

Waterbody	Impairment	Current Status
Dutchman's Creek	turbidity	Added to the 303d list in 2010
Stanley Creek	low dissolved oxygen	Added to the 303d list in 2010
Long Creek	copper	Added to the 303d list in 2008
Long Creek	turbidity	TMDL established in 2/2005 for turbidity & TSS
Catawba River	low pH	Added to the 303d list in 2008
Lake Wylie	chlorophyll-*a*	TMDL established in Feb/1996 for TN, TP and chlorophyll-*a*

Long Creek was included on the 303d list of impaired waters in 2002 and 2004 due to exceedances of the turbidity water quality standard (DWQ, 2003). A total maximum daily load (TMDL), the amount of pollutant that can be assimilated without violating water quality standards, was developed and approved for turbidity in Long Creek in 2005. The TMDL identified non-point sources as the major contributors of sediment to Long Creek (DWQ, 2004). Sediment controls throughout the watershed are currently being implemented to meet the water quality standard of 50 NTU (DWQ, 2004). The municipal separate storm sewer system (MS4) waste load allocation was calculated to be 1000 lbs/day of total suspended solids (TSS), a surrogate for turbidity. For non-point sources, the Long Creek TMDL assigned load allocations of TSS by land cover type as follows: 226.2 lbs/day for forest, 65.7 lbs/day for residential, 2.9 lbs/day for agricultural, and 1.1 lbs/day for other land covers. The total allowable TSS load from all combined sources is 1,290 lbs/day.

In the past Lake Wylie exhibited signs of eutrophication, including exceedances of the chlorophyll-*a* standard (40 µg/L), elevated surface dissolved oxygen levels, and the presence of algal blooms (DWQ, 2004). As a result, Lake Wylie was placed on the 303d list in 1992 and a TMDL for chlorophyll-*a* was approved in February1996. It was among the first TMDLs completed in North Carolina and was fully implemented by 2001. To reduce the frequency of algal blooms and decrease chlorophyll-*a* concentrations, nutrient (nitrogen and phosphorus) reduction targets were established for point and non-point sources. Documentation for the TMDL is contained in the 1995 Catawba River basin plan. The point source allocations for total phosphorous and total nitrogen are 825 lbs/day and 8,885 lbs/day respectively. The most recent assessment by DWQ indicates that water quality standards are now

being met in Lake Wylie (DWQ, 2010). Under this TMDL the cities of Mount Holly and Belmont will receive lower wastewater nutrient limits during the next NPDES permitting cycle.

5.4.3.2 Water Quality in South Carolina Portion of the Catawba River downstream of Lake Wylie

The State of South Carolina is currently developing a TMDL for phosphorus, pH and chlorophyll-*a* for Lake Wateree. Lake Wateree is located just downstream of Lake Wylie. The TMDL is being developed in partnership with the North Carolina Department of Environment and Natural Resources, stakeholders in the Lake Wateree basin, and with the Environmental Protection Agency's Region 4. South Carolina is concerned about nutrient loading coming from North Carolina.

In the summer of 2001, SC DHEC filed a Petition for a Contested Case in the North Carolina Office of Administrative Hearings regarding the renewal of the NPDES permit for McAlpine Creek WWMF which is operated by Charlotte-Mecklenburg Utilities. The primary complaint on the part of SC DHEC was that the permit was renewed without a phosphorus limit. Nearly all of South Carolina's municipal dischargers to the mainstem Catawba River upstream of Lake Wateree have phosphorus limits, generally equivalent to 2 mg/L of total phosphorus.

In January 2002, SC DHEC, DWQ and Utilities reached an agreement regarding phosphorus limits at the McAlpine Creek WWMF and expanded the permitting strategy to include the WWTPs on Sugar and Irwin Creeks. The final agreement included phosphorus limits at all three Utilities facilities (McAlpine Creek WWMF, Sugar Creek WWTP and Irwin Creek WWTP) in the form of a bubble limit and a mass cap.

5.5 Groundwater Quality

The project area is within North Carolina's Piedmont physiographic area. This area is generally underlain by consolidated rocks, such as granite, gneiss, schist, and slate. Groundwater here occurs in the fractures of the consolidated rocks, in pore spaces of the residual weathered rock (saprolite), and in the alluvium of the stream valleys where water occurs in pore spaces. North Carolina's groundwater, while generally abundant, is not inexhaustible and is not evenly distributed (DWR, 2007).

The North Carolina Department of Environment and Natural Resources Division of Water Resources (DWR) maintains a network of groundwater resources monitoring wells to assess North Carolina's groundwater supply. None of these wells have been installed in Mecklenburg or Gaston Counties.

A combination of public water supplies and groundwater wells are used for individual water supplies within the project area. In most cases, groundwater is safe to use as a drinking water source.

5.6 Water Supply

5.6.1 Water Supply Areas within the Service Area

There are a number of water bodies within the service area that supply drinking water to municipalities around the Charlotte Mecklenburg Metropolitan Area. Mountain Island Lake is the source of drinking water for the City of Charlotte, the City of Gastonia, the City of Mount Holly, the Town of Huntersville, and Mecklenburg County. Lake Wylie is the source of drinking water for the City of Belmont and downstream communities, including the Cities of York and Rock Hill, South Carolina.

The lower sections of all tributaries within the service area that flow into Lake Wylie and Mountain Island Lake have been classified as water supply waters. Figure 5.1d identifies the location of water bodies within the service area that have a water supply designation. Figure 5.6a indentifies the water supply watersheds in the project area. A list of the water supply waters within the service area is provided in Table 5-9. The service area is approximately 54,070 acres, 62% of which is within a water supply watershed (57% of the 47,163 acre Mecklenburg County service area and 100% of the 6,864 acre Gaston County service area). Water supply protection rules (discussed in Section 7) limit the density and types of development that can occur within these portions of the proposed service area.

Table 5-9 Water Supply Waters within the Service Area

Water Body and Section	Water Supply Classification
Catawba River (Mountain Island Lake) from Cowan's Ford Dam to water intake at River Bend Steam Station	WS-IV; CA
Catawba River (Mountain Island Lake) from intake at River Bend Steam Station to Mountain Island Dam	WS-IV, B; CA
Catawba River (Lake Wylie) from Mountain Island Dam to Interstate	WS-IV; CA
Catawba River (Lake Wylie) from Interstate 85 to upstream side of Paw Creek arm of Lake Wylie	WS-IV; CA
Catawba River (Lake Wylie) from upstream side of Paw Creek arm of Lake Wylie to South Carolina State Line	WS-IV, B
Gar Creek from source to 0.6 miles upstream of mouth	WS-IV
Gar Creek from 0.6 miles upstream of mouth to Catawba River/Mountain Island Lake	WS-IV;CA
Long Creek from 0.6 miles downstream of Mecklenburg County SR 2074 to 0.4 miles upstream of Mecklenburg County SR 1606	WS-IV
Long Creek from 0.4 miles upstream of Mecklenburg County SR 1606 to Catawba River (Lake Wylie)	WS-IV;CA
Gum Branch from source to Long Creek	WS-IV
Dutchmans Creek from source to a point 0.8 miles upstream of Taylor's Creek	WS-IV
Dutchmans Creek from a point 0.8 miles upstream of Taylor's Creek to Catawba River/Lake Wylie	WS-IV
Stanley Creek from 1 mile upstream of Gaston County SR 1918 to Dutchmans Creek	WS-IV
South Stanley Creek from source to Dutchmans Creek	WS-IV
Taylor's Creek from source to Dutchmans Creek	WS-IV
Fites Creek from source to 0.3 miles downstream of NC 273	WS-IV
Fites Creek from 0.3 miles downstream of NC 273 to Catawba River/Lake Wylie	WS-IV;CA

5.6.2 Water Supply Areas near the Project Area

Lake Wylie and the streams adjacent to the project area are all classified as water supply waters. The City of Belmont's water supply intake is located in Lake Wylie approximately 2.0 miles downstream of the proposed outfall locations. The proposed WWTP alternate sites are all located within the critical area associated with the City of Belmont's water supply intake. Figure 5.1d identifies the general location of water supply intakes and the

water supply classifications of waters within the service area. Figure 5.1d also identifies the location of all permitted discharges near the proposed alternate sites and within the entire service area.

Table 5-10 identifies the water quality standards that have been established for drinking water supplies. The permit for any proposed WWTP will require that the instream concentrations do not exceed these standards.

Table 5-10 Instream Water Quality Standards for Drinking Water

Water Quality Parameter	Maximum Concentration[1]
Nitrate	10 mg/L
Solids	500 mg/L
Sulfates	250 mg/L
Nickel	25 µg/L
Arsenic	10 µg/L
Manganese	200 µg/L

[1]DWQ "Redbook" Surface Water and Wetland Standards (May 2007)

5.7 Wildlife and Aquatic Resources and Habitats

5.7.1 Terrestrial Communities

The natural communities found within the service area and the proposed alternative sites are described in the following sub-sections. Descriptions of the terrestrial systems are presented in the context of plant community classifications. These classifications follow Schafale and Weakley (1990) where possible. This publication is the standard used throughout North Carolina for classifying natural communities. Representative faunal species that are likely to occur in these habitats (based on published range distributions) are also cited.

5.7.1.1 Terrestrial Communities within the Proposed Service Area

There are six identified plant community types within the service area (Natural Heritage Program). These include basic oak-hickory forest, dry-mesic oak-hickory forest, mesic mixed hardwood forest (Piedmont subtype), Piedmont/low mountain alluvial forest, basic mesic forest (Piedmont subtype) and dry oak-hickory forest:

- Dry-mesic oak-hickory forests occur on mid-slopes, upland flats, and low ridges on acidic soils;
- Mesic mixed hardwood forests are transitional forests between alluvial or bottomland forests and upland communities such as dry-mesic oak-hickory forests;
- Basic mesic forests occupy lower slopes, north facing slopes, ravines, and occasionally well drained stream bottoms with basic soils;
- Basic oak-hickory forests typically occupy slopes, ridges, upland flats, and other dry to dry-mesic sites with basic or circumneutral soils;
- Dry oak-hickory forests typically occupy ridge tops, upper slopes, steep south facing slopes, and other upland areas with acidic soils.

These forest types and the predominant plant species found there are described in greater detail in Appendix E. The distribution and composition of these plant communities throughout the service area reflects landscape-level

variations in topography, soils, hydrology, and past and present land use practices. Agriculture, development, and forestry practices have also greatly influenced the present vegetative patterns.

Successional and Piedmont Prairie remnant areas can also be found scattered throughout the service area. The presence of Schweinitz's sunflower at the Mount Holly proposed alternative site indicates the presence of plants associated with relic Piedmont prairie ecosystems. There is a fringe alluvial forest along Lake Wylie and Long Creek. Intermittent flooding during high flow periods drives the hydrology of the alluvial forest. Periodic flooding provides nutrient input through sediment deposition, making this system very productive. Several wetland areas were observed at the proposed project alternative sites within this forest type. These wetland areas are discussed in Section 5.3.

5.7.1.2 Terrestrial Communities in the Project Area

The following terrestrial community descriptions are based on field visits conducted at the proposed WWTP alternative sites. The entire 140 acre parcel on the Mecklenburg County side adjacent to Long Creek was surveyed to identify the plant communities. On the Mount Holly side of Lake Wylie, the plant communities present on 133 acres including and surrounding the existing Mount Holly treatment plant were surveyed. Figure 5.7a identifies the physical boundaries of the field surveys at the proposed alternate sites and identifies the types of plant communities present.

Four main plant communities occur within the proposed WWTP alternative sites: dry-mesic oak-hickory forest; mesic mixed hardwood forest (Piedmont subtype); Piedmont/Low Mountain alluvial forest; and disturbed or successional areas. Disturbed areas include maintained residential and commercial areas, lawns, park land and landscaped areas surrounding businesses. Native vegetation is present in the transition zones between residential/commercial and natural areas. Dry-mesic oak-hickory forest and mesic mixed hardwood forest are found on all of the proposed alternative sites. Piedmont/Low Mountain alluvial forest is present on the Mecklenburg site along the Catawba River and Long Creek and on the Gaston site along the Catawba River and tributaries that flow into the river. Successional areas are found on the soil borrow area on the Mecklenburg site between the Catawba River and Long Creek and within the power line right-of-ways at both locations. These successional areas are visible on Figure 5.7a. One small patch (4 stems) of the federally endangered Schweinitz's sunflower (*Helianthus schweinitzii*) was located in a power line right-of-way near the Mount Holly WWTP (Figure 5.7a). Appendix E contains descriptions of the predominant plant species found at the proposed project sites.

Figure 5.7b identifies the main plant communities at the Belmont WWTP and along the proposed forcemain route. The main plant communities that occur within the proposed Belmont pump station area and forcemain alignment are: dry-mesic oak-hickory forest; mesic mixed hardwood forest (Piedmont subtype); Piedmont bottomland forest, and maintained open space. Maintained open space includes existing road right-of-ways, lawns and landscaping in residential and commercial areas. Patches of dry-mesic oak-hickory forest and mesic mixed hardwood forest are found along portions of the proposed alignment outside of the road right -of-way. Piedmont bottomland forests are present where the proposed forcemain crosses two perennial streams. Appendix E contains descriptions of the predominant plant species found at the proposed project sites.

5.7.1.3 Terrestrial Wildlife within the Service Area

This section identifies the types of wildlife that can be expected to be found in the predominantly disturbed or successional and forested environments that make up the majority of the project locations and the service area.

Species that prefer open areas to feed and nest can be found in the disturbed communities. The faunal species present in these disturbed habitats are opportunistic and capable of surviving on a variety of resources. The European starling (*Sturnus vulgaris*), northern mockingbird (*Mimus polyglottos*) and American robin (*Turdus migratorius*) are common birds that use these habitats to find insects, seeds, or worms. Mourning doves (*Zenaida macroura)* and red-tailed hawks (*Buteo jamaicensis*) may be found perching on overhead power lines. The American crow (*Corvus brachyrhynchos*) and the Virginia opossum (*Didelphis virginiana*) are true opportunists and will eat virtually any edible items including vegetation, fruits, seeds, insects, and carrion.

Many species are highly adaptive and may utilize the edges of forests and clearings or prefer a mixture of habitat types. The Eastern cottontail (*Sylvilagus floridanus*) prefers a mix of herbaceous and woody vegetation and may be found in the dense shrub vegetation or out in the roadside and residential areas. White-tailed deer (*Odocoileus virginianus*) will utilize the forested areas as well as the adjacent open areas. The black rat snake (*Elaphe guttata*) will come out of forested habitat to forage on rodents in open areas. Indigo bunting (*Passerina cyanea*), brown thrasher (*Toxostoma rufum*), and common yellowthroat (*Geothlypis trichas*) are Neotropical migrants that inhabit dense, shrubby vegetation along transitional areas. The blue jay (*Cyanocitta cristata*), song sparrow (*Melospiza melodia*), and cardinal (*Cardinalis cardinalis*) can be seen utilizing edge habitat all year round.

Forested areas are important habitat for many wildlife species, providing crucial foraging, nesting, and/or denning areas. Raccoons (*Procyon lotor*) are generally associated with swamps and streamside forests, and their tracks are often seen along stream banks. Beavers (*Castor canadensis*) are semiaquatic mammals that live along small wooded streams, which they often dam to form shallow impoundments. The barred owl (*Strix varia*) utilizes river bottoms and moist woodlands for nesting as well as feeding. Neotropical migratory birds, in particular, are dependent on these areas. Species such as the yellow-throated warbler (*Dendroica dominica*), prothonotary warbler (Protonotaria citrea), and the Louisiana waterthrush (*Seiurus motacilla*) thrive in wooded riparian areas, while the summer tanager (*Piranga olivacea*), and the red-eyed vireo (*Vireo olivaceus*) prefer the upland woods. Species such as the downy woodpecker (*Picoides pubescens*), red-bellied woodpecker (*Melanerpes carolinus*), Carolina wren (*Thryothorus ludovicianus*), Carolina chickadee (*Parus carolinensis*), and the tufted titmouse (*Parus bicolor*) are found in wooded areas throughout the year. Other species that live in forested areas but are seldom seen include the gray fox (*Urocyon cinereoargenteus*), and bobcat (*Felis rufus*).

Forested areas dominated by pine are especially appealing to the pine warbler (*Dendroica pinus*), ruby-crowned kinglet (*Regulus calendula*), prairie warbler (*Dendroica discolor*), and brown-headed nuthatch (*Sitta pusilla*).

5.7.1.4 Terrestrial Wildlife in the Project Area

Although a specific survey for terrestrial wildlife species was not performed, the presence of wildlife species was noted at the WWTP project sites and the Belmont pump station and forcemain route. Species were determined to be present based on direct observation, tracks found, or identified by sound and are identified in Table 5-11.

Table 5-11 Terrestrial Wildlife Species Present in the Project Area

Common Name	Scientific Name	Mecklenburg County	Gaston County
American Crow	*Corvus brachyrhynchos*	X	
Black Racer	*Coluber constrictor priapus*	X	X
Blue Jay	*Cyanocitta cristata*	X	X
Box Turtle	*Terrapene carolina*	X	X
Carolina Chickadee	*Poecile carolinensis*	X	X
Coyote	*Canis latrans*	X	X
Crayfish	*Cambarus sp.*	X	X
Great Blue Heron	*Ardea Herodias*	X	X
Great Heron	*Butorides virescens*		X
Hermit Thrush	*Catharus guttatus*	X	X
Northern Cardinal	*Cardialis cardinalis*	X	X
Osprey	*Pandion haliaetus*		X
Raccoon	*Procyon lotor*	X	X
Whitetail Deer	*Odocoileus virginianus*	X	X
Wood Duck	*Aix sponsa*	X	
Wood Thrush	*Hylocichla mustelina*	X	

5.7.2 Aquatic Resources

5.7.2.1 Fish Community within the Service Area and Adjacent to the Proposed Alternative Sites

The Catawba River basin is host to 93 fish species and supports both cold water fish communities in the mountains, and warmer water communities in the southern Piedmont. Sport fishing is an important industry in both Lake Wylie and Mountain Island Lake. These lakes support populations of popular sport fish such as largemouth bass (*Micropterus salmoides*), crappie (*Pomoxis sp.*), striped bass (*Morone saxatilis*), various sunfish (*Lepomis sp.*), white bass (*Morone chrysops*), and white perch (*Morone americana*).

Fish community data were compiled by Duke Energy as part of the Catawba-Wateree Hydro Project Aquatic-01 report (Coughlan 2005). Sites included the Mountain Island Lake tailrace, the Mountain Island Lake bypass reach, and Long Creek upstream of the project site (Figure 5. 7c). A combined total of 26 species were collected in the tailrace site and in the Lake Wylie site. Fish community data has also been compiled by the DWQ Biological Assessment Unit for Long Creek in Mecklenburg County and Dutchman's Creek in Gaston County (DWQ 2008). Seventeen species were collected in Long Creek in July 2004 and fifteen species were collected in Dutchman's Creek in June of 1993. The specific species found at each location are provided in Appendix F.

Mecklenburg County also collected fish community data and IBI scores, (which are included in Appendix F), for Gar Creek (STA MC50 2004 and 2009), Paw Creek (STA MC17 2003 and 2007), Long Creek (STA MC14 2002 and 2007) (MC10 2002), and Gum Branch (MC13 2002). Biological habitat in several creeks along the I-485 corridor is being negatively impacted by road construction and urbanization (Roux Pers. Comm.). These impacts may negatively affect the current fish community in these tributaries. Table 5-12 summarizes the locations and dates of recent fish surveys within the service area.

Table 5-12 Previous Fish Surveys Conducted Within the Service Area

Stream	Collectors	Date
Mt. Island Lake Tailrace	Duke Energy	4/22/2004
Mt. Island Lake Bypass Reach	Duke Energy	8/3/2004
Long Creek	Duke Energy	6/29/2004
Lake Wylie	Duke Energy	6/7/2004
Gar Creek MC50	Mecklenburg LUESA	4/22/2004
Paw Creek MC17	Mecklenburg LUESA	8/3/2004
Long Creek MC14A	Mecklenburg LUESA	9/22/2004
Long Creek MC10	Mecklenburg LUESA	10/15/2003
Gum Branch MC13	Mecklenburg LUESA	10/15/2002
Long Creek	DWQ	7/3/2004

In November of 2007, the WRC requested that additional fish surveys be performed in order to better determine the status of fish communities within the service area. Fish surveys were conducted by The Catena Group at ten locations in early 2008 (Figure 5. 7d). All of the streams surveyed contained a community of common fish species typical of similar sized water bodies in this portion of the Catawba River Basin. Table 5-13 identifies the sites sampled, the number of fish species found and the number of fish found per unit of effort which provides an idea of relative abundance of fish at that site. The individual fish species present and site descriptions are included in Appendix F.

5.7.2.2 Mussel Community

There are sixteen species of mussels known to inhabit the Catawba River Basin in North Carolina. The majority of these species are listed as threatened or endangered by either state or federal law. Six species not included in the sixteen are thought to be extirpated from the Catawba-Wateree Basin in both North and South Carolina (Alderman 2005). Mussel species were once abundant throughout most of the Atlantic slope but now, due to habitat degradation, only inhabit small isolated portions of streams, rivers, and lakes. Surveys conducted over the past 20 years in 500 reaches in the Catawba-Wateree River Basin reveal evidence of mussel populations in only 40% of the locations (Alderman 2005). The proposed service area has experienced similar aquatic habitat degradation due to Catawba River impoundments and urbanization associated with the growth of the Charlotte and Gastonia metropolitan areas.

Table 5-13 2008 Fish Sampling Locations

Station	Station Description	Number of Species	Number of Fish	Catch per Unit Effort (# of fish found/min)	Most Common Species
1	Long Creek upstream of Beatties Ford Rd.	14	105	7.37	rosyside dace
2	McIntyre Creek nr Oakdale golf course	12	112	15.34	swallowtail shiner
3	Gutter Branch upstream of Kelly Rd.	8	72	10.03	rosyside dace
4	Gum Branch upstream of Gum Branch Rd.	13	187	25.69	swallowtail shiner
5	Ticer Branch off Old Dowd Rd.	9	26	3.36	tessellated darter
6	Fites Creek downstream of NC 273	11	128	14.07	rosyside dace
7	South Stanley Creek upstream of Woodlawn Rd.	10	71	9.16	rosyside dace
8	Long Creek downstream of Mount Holly Rd.	19	104	5.99	greenfin shiner
9	Gar Creek upstream of Beatties Ford Rd.	4	14	0.97	creek chub
10	Little Paw Creek downstream of Mount Olive Church Rd.	7	60	8.61	creek chub

In 2004, mussel surveys were conducted for Duke Energy at several locations in Mountain Island Lake, the Mountain Island tailrace and the Mountain Island bypassed reach, as part of the Catawba-Wateree FERC relicensing process (Figure 5.7c). Surveys conducted in Lake Wylie as part of this effort were outside of the proposed service area. Paper pondshell (*Utterbackia imbecillis*) was the only species collected from the Mountain Island Lake site. Three species were collected in the tailrace including Carolina lance (*Elliptio angustata*), paper pondshell, and a pondhorn species (*Unimerus sp*). Nine mussel species were collected in the bypass reach. These included Eastern elliptio (*E. complanata*), variable spike (*E. icterina*), Carolina lance, Atlantic spike (*E. producta*), a pondhorn species, paper pondshell, Eastern floater (*Pyganodo cataracta*), creeper (*Strophitus undulates*), and Eastern creekshell (*Villosa delumbis*) (Table 5-14). The creeper is listed as state threatened and the Eastern creekshell is listed as a state species of special concern by North Carolina.

Additional survey data from 2002 in the proposed service area was received from the NHP for Long Creek, Gum Branch, and Gutter Branch, and no mussels were found in these tributaries (Figure 5.7e). The NHP data from 1993 for Long Creek revealed no mussels collected. The NHP 1987 data for Long Creek, Gar Creek, Dixon Branch, Gutter Branch, Gum Branch, McIntyre Creek, and Paw Creek identified the presence of one mussel type at one location; eastern elliptio in Dixon Branch. Eastern elliptio is one of the most hearty mussel species in the Catawba basin (Alderman 2005). More information about the Carolina heelsplitter is provided in Section 5.8.

Table 5-14 Mussel Species Collected in the Service Area During 2004 Surveys By Duke Energy

Mussel Species	Mountain Island Lake	Mt. Island Lake Bypass Reach	Mt. Island Lake Tailrace
Utterbackia imbecillis	X	X	X
Elliptio angustata		X	X
Unimerus sp		X	X
Elliptio complanata		X	
Elliptio icterina		X	
Elliptio producta		X	
Pyganodo cataracta		X	
Strophitus undulates		X	
Villosa delumbis		X	

In November of 2007, the WRC requested that mussel surveys be conducted to obtain recent community information and to determine if there is any evidence of the federally endangered Carolina heelsplitter in streams within the service area. In early 2008 mussel surveys were conducted by The Catena Group at twenty locations throughout the service area (Figure 5.7d). An approximate survey length of 500 meters was sampled at each site. All habitat types (riffle, run, pool, slack-water etc.) were sampled with a two person team. The survey began at the downstream end of the survey reach and proceeded upstream, with the team spread across the stream into survey lanes. A combination of visual, bathyscope (glass-bottom viewing buckets) and tactile methodologies were employed where appropriate. Timed searches were employed in each reach and searches were conducted for relict shells. Sampling locations were selected throughout the service area on all main tributaries and on smaller streams throughout the service area. Exact sampling locations were adjusted so that sampling occurred in areas where appropriate habitat was present for the target species, the Carolina heelsplitter. No native mussels were found at any of the monitoring locations. The non-native invasive Asian clam (*Corbicula fluminea*) was present at many of the sampling locations. Table 5-15 identifies the monitoring locations, species found and survey time spent at each location. The freshwater mussel and fish survey report is included in Appendix F.

5.7.2.3 Benthic Macroinvertebrate Community

The Catawba River basin supports a diverse array of aquatic invertebrate species. Regular surveys for macroinvertebrates are conducted by Mecklenburg County Biologists in all major tributaries to the Catawba River on the Mecklenburg County side of the service area. The DWQ conducts surveys at two locations in the service area, Dutchmans Creek in Gaston County and Gar Creek in Mecklenburg County. These surveys are conducted to assess stream health. A score relating stream health is reported for each sampling location. These stream health scores are reflective of the overall invertebrate community composition. Figure 5.7f shows the locations for both Mecklenburg County and the DWQ benthic monitoring sites. More information about water quality is provided in Section 5.4. Mecklenburg County BMI data is provided in Appendix G for Gar Creek (MC50 2002-2009), Gum Branch (MC13 2002, 2004, 2005), Long Creek (MC10 2003-2005), Long Creek (MC14A 2002-2009) and Paw Creek (MC17 2002-2009).

Table 5-15 2008 Mussel Survey Locations

Site	Station Description	Native Mussels	Other Species in the Phylum Mollusca	Sampling Effort (hr)
1	Paw Creek upstream of I-85	0	Asian clam uncommon	1.5
2	Unnamed Tributary to Long Creek near U.S. Whitewater Center	0	Asian clam abundant	1.0
3	Long Creek upstream of NC 27	0	Asian clam common and physid snail (Physella sp.) uncommon	2.0
4	Dutchmans Creek upstream of Sandy Ford Rd.	0	Asian clam common	2.0
5	Stanley Creek upstream of Lowland Dairy Rd.	0	Asian clam common	1.5
6	Gar Creek near River Circle Rd.	0	Asian clam abundant	1.33
7	Gar Creek upstream of McCoy Rd.	0	none	1.17
8	Gum Branch upstream of Valley Dale Rd.	0	Asian clam uncommon	1.17
9	Unnamed Tributary to Catawba River near Riverside Dr.	0	none	1.17
10	Long Creek near Bellhaven Blvd.	0	Asian clam uncommon	1.83
11	Unnamed Tributary to Dixon Branch	0	none	1.17
12	Long Creek upstream of Beatties Ford Rd.	0	Asian clam common	2.0
13	Fites Creek upstream of Catawba River	0	Asian clam and physid snail common	1.67
14	Taylors Creek upstream of Dutchmans Creek	0	Asian clam uncommon	1.0
15	Unnamed Tributary to Paw Creek upstream of Paw Creek	0	none	1.0
16	Paw Creek downstream of Toddville Rd.	0	Asian clam common	1.83
17	McIntyre Creek upstream of Beatties Ford Rd.	0	Asian clam uncommon	1.83
18	Gutter Branch downstream of Oakdale Rd.	0	Asian clam common	1.83
19	Unnamed Tributary to Long Creek upstream of US 21	0	none	1.0
20	Little Paw Creek	0	Asian clam uncommon	1.83

5.8 Rare and Protected Species and Habitats

5.8.1 Federally Protected Species

The United States Fish and Wildlife Service (USFWS) maintains a list of species that qualify for protection under the Endangered Species Act (ESA). According to the DENR Natural Heritage Inventory Database (NHID), November 2007, there are six federally endangered, threatened, federal species of concern, or candidate species for listing, currently within the USGS 7.5' quadrangle maps of Mountain Island Lake and Mount Holly near the proposed regional facility locations (Table 5-16). These two maps cover the entire proposed service area. All federally listed species are state protected species as well. Federally listed endangered species include Smooth

coneflower (*Echinacea laevigata*), Schweinitz's sunflower (*Helianthus schweinitzii*), Michaux's sumac (*Rhus michauxii*) and the Carolina heelsplitter (*Lasmigona decorata*). The Georgia aster (*Symphyotrichum georgianum*), is a candidate species for federal listing and is currently listed by North Carolina as threatened. The Carolina birdfoot-trefoil (*Lotus helleri*) is a federal species of concern and listed by North Carolina as significantly rare and threatened. Descriptions of these species and their current and historic ranges can be found in Appendix H. Figure 5.8a illustrates current and historic occurrences of rare and endangered species included in the Natural Heritage Program's database.

Table 5-16 Federally Listed Species under the ESA within the Service Area

Major Group	Scientific Name	Common Name	State Status	Federal Status	Project Area*	Service Area**
Invertebrate Animal	Lasmigona decorata	Carolina Heelsplitter	E	E	No Record	No Record
Vascular Plant	*Helianthus schweinitzii*	Schweinitz's Sunflower	E	E	Yes	Yes
Vascular Plant	*Rhus michauxii*	Michaux's Sumac	E-SC	E	No Record	Yes
Vascular Plant	*Echinacea laevigata*	Smooth Coneflower	E-SC	E	No Record	Yes
Vascular Plant	*Symphyotrichum georgianum*	Georgia aster	T	C	No Record	Yes
Vascular Plant	*Lotus helleri*	Carolina Birdfoot-trefoil	SR-T	FSC	No Record	Yes

E = Endangered; T = Threatened; FSC = Federal Species of Concern; C = Candidate for listing;
SC = Special Concern; SR= Significantly Rare
* Record the Result of Field Surveys and NHP Data
** Record the Result of NHP Data Only

5.8.2 State Listed Species

There are seven state listed species that are not federally protected (Table 5-17). State significantly rare-proposed species include the Virginia stickseed (*Hackelia virginiana*), bigleaf magnolia (*Magnolia macrophylla*), glade milkvine (*Matelea decipiens*) and Heller's rabbit-tobacco (*Pseudognaphalium helleri*). A plume moss (*Fissidens scalaris*) is state listed as a significantly rare-other, meaning that the range is sporadic and cannot be described by other significantly rare categories. The glade wild quinine (*Parthenium auriculatum*) is state listed as significantly rare-threatened. The loggerhead shrike (*Lanius ludoricianus*) is a state listed species of special concern. In 2007 there were no Natural Heritage occurrence records for any state listed species within the WWTP project alternative areas including the Belmont WWTP and forcemain route (Figure 5.8a). The NHP data base now includes the vegetation survey that was performed for this project in 2007, that found a few Schweinitz's sunflowers As mentioned previously in Section 5.4, Schweinitz's sunflower which is both federally and state endangered was found in one location within the WWTP alternative project areas (Figure 5.4a).

Table 5-17 State Listed Species in Mountain Island Lake and Mount Holly USGS Quads

Major Group	Scientific Name	Common Name	State Status	Federal Status	Project Area*	Service Area**
Vascular Plant	*Hackelia virginiana*	Virginia Stickseed	SR-P	None	No Record	No Record
Vascular Plant	*Matelea decipiens*	Glade Milkvine	SR-P	None	No Record	Yes
Vascular Plant	*Parthenium auriculatum*	Glade Wild Quinine	SR-T	None	No Record	No Record
Vascular Plant	*Pseudognaphalium helleri*	Heller's Rabbit-Tobacco	SR-P	None	No Record	Yes
Vertebrate Animal	*Lanius ludovicianus*	Loggerhead Shrike	SC	None	No Record	No Record
Vascular Plant	*Magnolia macrophylla*	Bigleaf Magnolia	SR-P	None	No Record	No Record

SR= Significantly Rare; P = Proposed for listing; T = Threatened; SC = Special Concern
* Record the Result of Field Surveys and NHP Data ** Record the Result of NHP Data Only

5.8.3 Other Significant Species

According to the USFWS list for Gaston County (http://ecos.fws.gov/tess_public/StartTESS.do), additional protected species include the bald eagle (*Haliaeetus leucocephalus*) and the bog turtle (*Clemmys muhlenbergii*). For Mecklenburg County the USFWS list includes the bald eagle, also as threatened and Michaux's sumac, as endangered. The bald eagle has since been removed from the Endangered Species Act list of endangered species but is still protected under the Bald and Golden Eagle Protection Act and Migratory Bird Treaty Act. There is one active bald eagle nest within approximately 2,000 feet of the Belmont WWTP. The nest is situated in a tree on a residential property within a densely populated neighborhood in Belmont. The Carolina elktoe (*Alasmidonta robusta*), previously found in Mecklenburg County in Long Creek, is thought to be extirpated from North Carolina. The southern bog turtle, a federally threatened species, has not been found within the proposed service area but it has been found in Gaston County.

5.9 Public Lands, Scenic, and Recreational Areas

There are a number of areas within Mecklenburg and Gaston County that are being preserved as open space. Many areas were established to protect certain plant communities or other natural features. There are a number of locations that were created to provide recreational opportunities for the public. Figure 5.9a identifies the locations of preserved open space within the service area. Table 5-18 identifies the amount of public recreational or nature preserve lands within the service area.

Table 5-18 Significant Conservation Lands in the Service Area

Public Lands	County	Area (Acres)
Latta Plantation Nature Preserve	Mecklenburg	1,343
Mt. Island Lake Initiative	Mecklenburg/Gaston	2,361
Gar Creek Nature Preserve	Mecklenburg	353
Shuffletown Nature Preserve	Mecklenburg	23
Hornet's Nest Park	Mecklenburg	102
River Street Park	Gaston	10
Woodlawn Park	Gaston	4
Tuckaseege Park	Gaston	33

5.9.1 Latta Plantation Nature Preserve

Latta Plantation is Mecklenburg County's largest nature preserve with 1,343 acres committed for the preservation of natural communities. The preserve is located at the northern end of the service area and is directly adjacent to Mountain Island Lake. Latta Plantation preserves habitat for 97 species of bird, 17 species of mammals, 14 species of reptiles, and nine species of amphibians. There are currently two federally endangered plants on the preserve, Schweinitz's sunflower and Michaux's sumac, and one federal candidate species, the Georgia aster. The preserve's location along the northeastern banks of Mountain Island Lake helps to protect the water quality of the lake.

There are many recreational and educational opportunities offered in Latta Plantation. There are 16 miles of hiking and horseback riding trails throughout the park. The preserve's nature center provides opportunities to view live animals, a habitat garden, bird feeding stations, butterfly gardens, and other nature oriented demonstration areas. Other facilities within the preserve include the Carolina Raptor Center, Latta Plantation Equestrian Center, and the Historic Latta Plantation home site.

5.9.2 Gar Creek Nature Preserve

Located one mile east of the Latta Plantation Preserve, the Gar Creek Nature Preserve is 353 acres in size. Upland forest is the dominant habitat on the preserve, accounting for 76% of the land area. This nature preserve is located within the Gar Creek watershed and provides significant water quality protection for Gar Creek. According to Mecklenburg County Biologists, Gar Creek has the best water quality of any tributary within the Mecklenburg portion of the service area. Strict zoning laws are in place within the Gar Creek watershed to protect drinking water supplies in Mountain Island Lake.

5.9.3 Shuffletown Prairie Nature Preserve

The Shuffletown Prairie Nature Preserve is a 23 acre site just west of downtown Charlotte. This site is a remnant piedmont prairie that hosts several endangered plant species including Schweinitz's sunflower and smooth coneflower. The Trust for Public Land and Mecklenburg County worked together in acquiring the property. The land has been set aside for use as an environmental education site for Mecklenburg County's environmental education program. Shuffletown Prairie is designated as a Natural Heritage Site of National Significance.

5.9.4 Hornet's Nest Park

Hornet's Nest Park is a 102 acre park within the proposed service area in Mecklenburg County. The park is located in the eastern portion of the service area in the McIntyre Creek subwatershed. McIntyre Creek is a tributary to Long Creek. The park features many recreational opportunities including a softball complex, an 18 hole disc golf course, tennis courts, picnic shelters, basketball courts, volleyball courts and a lake fishing pier. A unique feature of the park is the 1,150 foot regulated BMX bicycle track where bicycle motocross competitions occur every Saturday.

5.9.5 Gaston County Parks

There are four local parks in Gaston County that are within the proposed service area. River Street Park is a 10 acre facility that offers traditional park facilities along with a canoe launch on Dutchmans Creek. Smaller traditional neighborhood parks within the proposed service area include Woodlawn Park and Veteran's Park. Tuckaseege Park is a new riverside park currently under construction. The 33 acre park design includes the construction of a greenway adjacent to the Catawba River, a dog park, an 18 hole disc golf course, a riverfront promenade, and boat launches among many other amenities. Mount Holly has acquired 220 acres to construct 4 miles of greenway trails from downtown to the Mountain Island Lake Dam and connect to the new Tuckaseege Park. This property will be placed into a conservation easement.

5.9.6 Mountain Island Lake Initiative

The Mountain Island Lake Initiative is a coalition of non-profit organizations and state and county agencies, dedicated to the preservation of lands adjacent to the lake and the protection of water quality in the lake. Partners include the Catawba Lands Conservancy, the Community Foundation of Gaston County, the Foundation for the Carolinas, the Trust for Public Lands, Gaston County, Lincoln County, and Mecklenburg County. Land acquisition began in 1998 with a $6.15 million dollar grant from the Clean Water Management Trust Fund. A total of 1,231 acres and 6 miles of shoreline were purchased along the western shore of the lake. A second approximately 300 acre acquisition was made on what was supposed to become a 400 home development known as Water's Edges, through revenue bonds secured by the City of Gastonia. The Initiative has since preserved 2,361 acres of the lake's watershed, including 9 miles of shoreline and 15 miles of stream bank.

5.9.7 Rare Plant Sites

The proposed service area contains many areas where rare plant communities are being actively preserved through the cooperative efforts of Mecklenburg County and land conservancy groups. The Mountain Island Lake Rare Plant Site (21 acres) and the Catawba Wildflower Glen (6 acres) are located close to the Catawba River in Mecklenburg County. A significant portion of these areas is owned by the Catawba Lands Conservancy. These sites provide habitat for the federally endangered Schweinitz's sunflower and the candidate listing species, Georgia aster. Other areas owned by the Catawba Land Conservancy within the service area include Long Creek Bluffs (16 acres) and the Gar Creek Brandemaier (14 acres). Other rare plant sites include the Gar Creek, McCoy Road Prairie (20 acres), and Shuffletown Prairies (18 acres) in Mecklenburg County which provide critical habitat for several endangered plants and the rare piedmont prairie plant community.

5.9.8 US National Whitewater Center Inc.

The USNWC is an extensive whitewater and mountain bike recreational facility located in the southern portion of the proposed regional WWTP service area. The whitewater facility encompasses over 300 acres of land. Mecklenburg County has provided a long term lease of 270 acres along the Catawba River for the facility and Duke Energy provides an additional 37 acre lease on Sadler Island. This is a unique facility that houses the world's only multi-channel recirculating whitewater river. The facility offers adventure trips and instruction in climbing, whitewater sports, and mountain biking. There has been discussion among the stakeholder's group about potential plans for the expansion of mountain bike trails from the whitewater facility, into forested areas of the Mecklenburg County proposed alternative site. Other plans that were discussed include a bridge over the Catawba River from the whitewater facility to a proposed park along the Mount Holly riverfront.

5.10 Archeological or Historical Resources

The North Carolina Environmental Policy Act requires the conservation and protection of North Carolina's natural resources and preservation of "the important historic and cultural elements of our common inheritance." Historic designations are provided for structures through State and Federal programs. Properties with State and Federal historic designation within the service area are illustrated in Figure 5.10a. Two properties within the service area have federal historic designation (shown in red). Fourteen properties within the service area have state historic designation (shown in orange).

Archeological surveys have not been conducted within the proposed project area, however archeological sites have been found to the south of the Mecklenburg alternate project areas. State Historic Preservation Office was formally asked for comments on the proposed project. The consultant met with SHPO staff twice to discuss the project and review SHPO maps. Documented archaeological sites exist just south of the proposed alternate locations on the Mecklenburg side of the Catawba River and SHPO would require archaeological surveys to be conducted on previously undisturbed areas outside of the 100-year floodplain prior to initiation of any construction activities. Due to the existing level of disturbance on the Gaston portion of the proposed alternate sites, SHPO would not require archeological surveys. The proposed Belmont pump station would be located on property that has already been disturbed and the forcemain route is almost entirely within existing road right of ways.

5.11 Prime Agricultural Lands

Three categories of important farmlands are recognized in North Carolina: prime, unique, and statewide. Only prime and statewide are found within the service area. Criteria describing prime farmlands were defined by the U.S. Department of Agriculture in 1978 and amended in 1994. Criteria describing farmland of statewide significance were developed by the North Carolina Natural Resources Conservation Service (NCNRCS) in 1988. Important farmlands within the service area are depicted in Figure 5.11a.

Soils that flood and are somewhat poorly drained, poorly drained, and very poorly drained meet the requirement for prime farmland under the following conditions:

1. The soils are drained and the drainage system is adequate to maintain the water table at a sufficient depth during the growing season to allow cultivated crops common to the area to be grown, and
2. The soils are protected or not frequently flooded during the growing season.

Soils that do not quite meet the requirements for prime farmland are generally classified as Farmlands of Statewide Importance. This could be due to steepness of slopes, reduced permeability, susceptibility to erosion, low available water capacity, or some other non-optimal soil property.

Figure 5.11a illustrates that many of the soils found within the service area are included in the prime farmland and farmland of statewide importance categories. However, as was discussed in the land use section, agricultural land uses make up 5% of the land use within the Gaston County portion of the service area and 1% of the Mecklenburg County portion. Agricultural lands throughout the service area currently support a range of developed land uses, primarily medium density residential. The soils with farmland designations in the service area are listed in Table 5.11a in Appendix I.

5.12 Air Quality

5.12.1.1 Air Quality within the Service Area

The Environmental Protection Agency (EPA) has established air quality standards for six primary pollutants. The Charlotte-Mecklenburg Metropolitan Area (CMMA) does not currently meet the Federal air quality standard for 8-hour ozone exposure. Within the CMMA, ozone concentrations tend to increase during the day and are usually highest between 12 p.m. and 6 p.m. The highest ozone levels are formed during hot, sunny weather, particularly when wind speeds are low. The North Carolina Division of Air Quality (DAQ) develops ozone forecasts that can be viewed at: http://daq.state.nc.us/airaware/ozone/. Mecklenburg County provides additional information on air quality within the County, which is updated hourly, and can be obtained by calling the SMOGLINE (704-333-7664).

The CMMA does meet air quality standards for carbon monoxide, sulfur dioxide, nitrogen dioxide, particulate matter, and lead. Local and regional programs have been established to maintain and improve air quality and reduce ozone formation within the CMMA. There are eight different air quality monitoring stations within the CMMA. Data from these stations and others within the CMMA are used to assess compliance with EPA's air quality standards. Air quality within the service area has been improving but has not yet achieved compliance with the 2008 ozone standard (DAQ, 2009).

5.13 Nuisance Conditions (Noise, Odors, Dust)

Nuisance conditions are not a current concern at the existing Mount Holly WWTP or Long Creek Pumping Station. Potential nuisance conditions may be periodically present in the service area on construction sites, such as new home developments and roadway construction.

5.14 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). Toxic substances are not a current concern at the existing Mount Holly WWTP, Long Creek Pumping Station, or the proposed forcemain route. Potential sources of toxic substances present in the service area are agriculture-related substances such as fertilizers, herbicides, and pesticides. Other common toxic substances are used in the construction of homes and commercial buildings such as glues, solvents, and paints.

Clariant Corporation operates a specialty organic chemical manufacturing facility immediately adjacent to the location for the proposed WWTP. Clariant has a NPDES permit to discharge treated wastewater from

manufacturing processes, on-site sanitary wastewater and a groundwater remediation system. The NPDES discharge permit would be eliminated under all proposed alternatives except no action and Alternative 1.

Section 6. Environmental Consequences

This section describes potential environmental consequences (direct, secondary and cumulative) associated with the six alternatives for the proposed Regional Wastewater Facility as well as the No Action Alternative. This analysis includes evaluation of impacts to the following resource areas:

- Topography and Soils
- Land Cover and Land Use
- Wetlands and Floodplains
- Water Quality
- Groundwater Quality
- Water Supply
- Wildlife and Aquatic Resources and Habitats
- Rare and Protected Species and Habitats
- Public, Scenic and Recreational Areas
- Energy Resources
- Archeological and Historical Resources
- Prime Agricultural Lands
- Air Quality
- Nuisance Conditions
- Toxic Substances.

Information used for this assessment was gathered from a variety of sources including the City of Charlotte, Mecklenburg County, the City of Mount Holly, Town of Stanley, City of Belmont, Gaston County, State and Federal agencies, interviews, and field visits and surveys.

In an effort to avoid and minimize impacts on natural and cultural resources to the extent possible, this EIS evaluates several alternatives including No Action. The direct, secondary, and cumulative environmental consequences for all alternatives are discussed in this section. Alternative 7 (Non-discharge Alternative) was deemed impractical in Section 4 due to the amount of land required for spray irrigation of the plant effluent, so it is not included in the Environmental Consequences analysis.

6.1 Direct Impacts

Impacts from alternatives are considered to be direct if they occur at the same time and place as the alternative. Those impacts that may occur at another time or place are considered to be secondary and cumulative and are discussed in Section 6.2. As a baseline for the direct impacts discussion, Table 6-1 identifies the amount of land occupied by existing wastewater treatment infrastructure, which provides the context for the new direct impacts listed in the table such as the amount of new land disturbance for each alternative in both Mecklenburg and Gaston Counties and the number of stream crossings and new outfalls required. Direct impacts would occur for all of the alternatives and are discussed in this section. The project's potential direct impacts on specific resource areas are also discussed in this section. Table 6-2 lists the potential impacts of construction, operation and maintenance on each resource area by alternative. The resource area impact type and magnitude would vary between each of the alternatives considered.

Table 6-1 Existing and Proposed Facilities by Alternative

	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 6	No Action
Existing Facilities* (Gaston acres/Mecklenburg acres)	22.2/3.5	22.2/3.5	22.2/3.5	22.2/3.5	22.2/3.5	22.2/3.5	22.2/3.5
New Facilities* (Gaston acres/Mecklenburg acres)	3.5/3.5	3.5/22.0	33.0/3.5	43.0/3.5	5.0/22.0	5.0/22.0	0
New Pumping Stations	1	1	2	2	2	2	0
Lake Wylie Outfall	Mount Holly outfall expanded and Belmont abandoned	Mount Holly outfall expanded, new outfall on Mecklenburg side, and Clariant and Belmont outfalls abandoned	Mount Holly outfall expanded and Clariant and Belmont outfalls abandoned	New outfall on Mount Holly side. Old Mount Holly, Belmont, and/or Clariant outfall abandoned	New outfall on Mecklenburg side. Mount Holly, Belmont, and Clariant outfalls abandoned	Mount Holly outfall expanded. New outfall on Mecklenburg side and Clariant and Belmont outfalls abandoned	0
River and Stream Crossings	2 (Catawba R & Paw Creek)	3 (Catawba R., Paw Ck, & Long Ck.)	4 (2 Catawba R., Paw Ck, & Long Ck.)	4 (2 Catawba R., Paw Creek, & Long Ck.)	5 (2 Catawba R., Long Ck., & Paw Ck., & unnamed tributary to Catawba River)	5 (2 Catawba R., Long Ck., & Paw Ck.,& unnamed tributary to Catawba River)	1 Catawba R

* The acreages provided include facility footprint, roads and parking associated with each facility.

Table 6-2 Summary of Possible Direct Impacts by Resource Area

Resource Area	Construction	Operation and Maintenance	Minimization Measure
Topography/Soils	Minor changes in topography and soils for all alternatives. Minor erosion and soil loss would occur due to excavation, grading, and compaction for all alternatives.	No ongoing impacts.	Erosion and soil loss would be minimized through the implementation of erosion control BMPs (including LID BMPs) outlined in the Erosion and Sediment Control Plan.
Land Cover/Land Use	Depending on alternative chosen between 9 and 45 acres of new facility footprint would result in the conversion of land use and land cover. Existing land cover ranges from previously cleared land to lawns and forest. Alternatives 2, 5, and 6 preserve forest cover and habitat. Alternatives 3 and 4 result in the most loss of forest cover. Land use compatibility issues are possible due to proximity of the National Whitewater Center, Mount Holly river front park expansion, and residential areas.	No ongoing impacts.	Alternative chosen would also determine the extent of previously-disturbed land to be used, the amount of disturbed land to be reused, and land compatibility. Facilities associated with Alternatives 2, 5, and 6 have been relocated to reduce or eliminate impacts to forested land (are located on previously disturbed land).
Wetlands	No alternatives impact wetlands.	No ongoing impacts.	Facilities associated with Alternatives 2-6 have been relocated to reduce or eliminate impacts to wetlands. Directional borings would be used to cross the Catawba River and Long Creek and Paw Creek to prevent wetland impacts.

Resource Area	Construction	Operation and Maintenance	Minimization Measure
Floodplains	Impacts to 100-year or Community floodplains are not anticipated in Mecklenburg Co. Impacts to 100-year floodplain are not anticipated in Gaston County. Modifications to existing Mount Holly facilities would occur within the 100-year floodplain (Alternatives 1, 2, 3, and 6). Modifications to existing Belmont facilities would occur outside the 100-year floodplain (Alternatives 1, 2, 3, and 4)	No ongoing impacts.	Any work, including substantial improvements, within regulatory 100-year floodplain must be done in compliance with Gaston County/Mount Holly Floodplain Ordinance and would require elevating or floodproofing structures.
Water Quality	Minor temporary impacts to surface water during construction (runoff and erosion) and after construction (increased impervious surfaces and urban runoff).	Additional discharge of treated wastewater to Lake Wylie under Alternatives 2-6. Minor increase in site stormwater runoff. Minor changes to water quality in Lake Wylie associated with increased nutrients, but no violations of State water quality standards would occur.	Post-construction controls are in place to reduce impact of increased impervious surfaces by requiring stormwater treatment and detention and total suspended solids removal. Post-construction regulations in Charlotte/Mecklenburg are stricter than required by the State. LID and other Stormwater best management practices would be used at project site under Alternatives 1-6. Alternatives 5 and 6 provide the most opportunity for LID utilization. Compliance with nutrient limits in NPDES permit would minimize impacts to water quality in Lake Wylie. Location of new facilities decreases the potential for wastewater spills and sanitary sewer overflows (SSOs). Implementation of Fats, Oil and Grease (FOG) reduction programs reduce number of SSOs.
Groundwater Quality	No direct impacts.	No ongoing impacts.	None required

Resource Area	Construction	Operation and Maintenance	Minimization Measure
Water Supply	No direct impacts.	No ongoing impacts.	Advanced treatment processes at new WWTP will maintain high quality effluent, which will prevent impact to water supplies in Lake Wylie. New facilities designed to minimize wastewater spills and SSOs.
Aquatic Resources	No direct impacts.	No ongoing impacts.	Impacts would be minimized through adherence to requirements of USACE Nationwide Permit 12 and CWA Section 401 WQ permit and use of directional boring.
Wildlife Resources	Most loss of wildlife habitat (mixed mesic hardwood forest) under Alternatives 3 and 4.	No ongoing impacts.	Open space preservation opportunities possible for Alternatives 2, 5, and 6 would provide wildlife resource benefits.
Rare and Protected Species	Alternatives 3 and 4 would impact individual Schweinitz's sunflowers.	Schweinitz's sunflower habitat could be both produced and impacted under all alternatives.	Relocation of individual plants and development of a mitigation plan in consultation with the USFWS. Alternatives 2, 5, and 6 would not impact individual Schweinitz's sunflowers.
Public, Scenic, and Recreation Lands	Alternatives 2, 5, and 6 would create opportunities for additional public lands and a possible new canoe access to Long Creek. Alternatives 2, 5, and 6 could allow a partnership with National Whitewater Center to expand its trail network. Visual impacts at the Mount Holly site for all alternatives due to minimal vegetated buffer surrounding the existing WWTP site, but greatest impacts are associated with Alts. 3 and 4. Visual buffer can be maintained for Alternatives 2, 5, and 6	Odors associated with the operation of WWTP and/or associated infrastructure such as pump stations or equalization basins. SSO or wastewater spill could temporarily impact recreation in Long Creek, Paw Creek, or Catawba River.	Odor control will be installed. Equalization facilities, backup generators, and redundant facilities (Alternatives 2-6) would minimize probability of spills. Under Alternatives 2-6, the eventual elimination of over 20 miles of force main and multiple pumping stations would reduce the potential for SSOs in Mecklenburg County. Emergency response plans would be developed to manage any wastewater spills and alert the public to any increased recreational risk.

Resource Area	Construction	Operation and Maintenance	Minimization Measure
Archeological or Historical Resources	Any NRHP archeological resources found in the archeological survey would be avoided. No historical resources have been identified within proposed construction areas.	No ongoing impacts.	.An archeological survey would be conducted prior to construction if the selected alternative includes any areas identified by SHPO as requiring investigation. For any alternative if construction activities uncover evidence of historical or archaeological resources, site activity would stop in that area while the appropriate investigation is performed.
Prime Agricultural Lands	No impacts to agricultural lands are anticipated.	No ongoing impacts.	None required.
Energy Resources	Temporary increased energy utilization associated with construction activities for all Alternatives.	Energy usage to operate a new WWTP and/or expanded facilities will increase under all alternatives. Power usage associated with pumping wastewater from Long Creek pumping station to McAlpine Creek WWMF will be eliminated under Alternatives 2-6. Under alternatives 3 and 4 Belmont wastewater would be pumped about 9 miles to regional facility. Under alternatives 5 and 6 Belmont wastewater would be pumped about 8 miles to the regional facility (still a net decrease in power use). Increased power generation associated with additional water volume in Lake Wylie (Alternatives 2-6).	If fuel products such as methane gas are generated at new WWTP, its use for power generation (Alternatives 2-6) will be evaluated. Utilization of LEED principles, possibly resulting in LEED certification for all or portions of new wastewater facilities (Alts. 2-6).
Air Quality	Temporary, minor impacts associated with construction activities such as dust and engine exhaust would occur (Alternatives 2-6).	Minimal impacts to air quality may result from operation of diesel generators for backup power. Other plant operations would have a negligible impact on air quality. Minimal impacts due to odors generated from the wastewater treatment process would occur.	Control measures for construction-related air pollution will be included in the construction specifications and will be enforced. Air quality permit for operation of generators. Odor control measures will be used at the plant and pumping stations.

Resource Area	Construction	Operation and Maintenance	Minimization Measure
Nuisance Conditions	Temporary nuisance conditions such as odor, noise and dust may occur with construction (Alternatives 1-6).	All alternatives (including the No Action Alternative) would occasionally produce detectable odors due to operation of existing facilities (pump stations and WWTP). All alternatives will have lighting associated with the plant	Odor control measures (such as carbon adsorption, removable grating, and plate covers) would be employed to control odors at all new facilities (Alternatives 2-6). Equipment will be enclosed in buildings which will reduce noise pollution (Alternatives. 2-6). Buildings that enclose blowers, pumps or other noise generating equipment will be constructed with noise attenuation features (Alternatives 2-6). The vegetated buffer around Alternatives 2, 5, and 6 will minimize noise impacts and lighting associated with construction and normal operation.
Toxic Substances	Construction vehicles may release small amounts of oils or grease into the area (Alternatives 1-6).	Chemical storage and feed facilities will be provided for chemicals used in the treatment process (Alternatives 1-6). Diesel storage tanks will be located on the plant site for standby generators, boilers, and fuel dispensing (Alternatives 1-6).	All chemical storage and feed areas will be provided with secondary containment (Alternatives 2-6) and comply with all safety features required by NC building codes. Diesel tanks would be provided with secondary containment and leak detection systems (Alternatives 2-6).

6.1.1 Topography and Soils

Under all of the action alternatives, the project would not have a significant long-term, direct effect on topography in the project area. Leveling, grading, and excavation associated with construction may create minor, temporary impacts on topography. Soil loss and erosion may occur due to the excavation, leveling, and grading activities associated with construction. Excavated soil would be reused as backfill on-site during construction to the greatest extent practical. Any excess soil would be moved offsite at the direction of the contractor who would be responsible for determining where it would be utilized. Impacts to the site topography and soils would be the greatest under alternatives with the largest construction footprint (Alternative 4) and those requiring the most disturbance to forest land (Alternatives 3 and 4). Project construction would least impact soils and topography where limited new construction is required (Alternative 1). Construction would occur on disturbed and previously graded property for Alternatives 2, 5, and 6. Table 6-1 provides new and existing footprint areas for each alternative. Soil loss during the construction phase of the project would be minimized with the implementation of erosion control best management practices (BMPs) as outlined in the project's Erosion and Sediment Control Plan, which would be filed in accordance with the NC Sediment Pollution Control Act. Silt fencing would enclose the construction work areas, and all construction corridors would be seeded with herbaceous, native seed mixes within 5 to 10 days of ground disturbance activities. After completion of construction activities, any continuing erosion would be minimized through revegetation and implementation of post-construction stormwater BMPs and other controls as discussed in Section 6.1.4.

6.1.2 Land Cover and Land Use

The alternatives vary considerably in terms of: the amount of land disturbance required, the type of land disturbed, impacts on adjacent land uses, consistency with shoreline classification and zoning, and compatibility with existing and future land uses. Under the No Action Alternative, the plant sites on the Mecklenburg and Gaston sides are available for sale and development, consistent with their zoned designations. The approximate locations of new facility construction associated with each proposed Action Alternative are illustrated in Figure 6.1a, along with aerial photography and current or planned land use categories for the surrounding parcels. The quantity of new land disturbance associated with each alternative is provided in Table 6-1. Proposed new facilities under any alternative would be constructed on industrial lands, except the addition to the Long Creek pump station under Alternatives 1, 3, or 4, which would be on residential land. Under alternatives 1- 6 the Belmont pump station and forcemain would be constructed on previously disturbed land, road right-of –ways, and directional drilling used to avoid buffer and wetland impacts (Figure 6.1b). Under any alternative, including the No Action Alternative, wastewater facilities are located upstream of the U.S. National Whitewater Center, an outdoor recreational resource located on the Catawba River, and the 33 acre Mount Holly Tuckaseegee Park expansion, as shown on Figure 6.1a. Both recreational resources include canoe/kayak access points to the Catawba River. Possible Carolina Thread trail locations pass through all the proposed alternative sites. Crosland Homes is planning a residential development called "Whitewater" on residential property adjacent to the Whitewater Center and the facilities developed under Alternatives 2, 5, and 6.

Proposed new WWTP facilities under Alternatives 2, 5, and 6 would utilize previously-disturbed land to the maximum extent possible. These facilities would be located approximately 1.2 miles upstream of the National Whitewater Center and approximately one-half mile from the Mount Holly Tuckaseegee Park. There would be dense vegetated buffers on all sides of the new WWTP and pump station facilities. Long Creek flows between the

Long Creek Pump Station and the proposed facility location for Alternatives 2, 5, and 6; therefore, a wastewater conveyance across the creek would be needed. The approximately 80 acres of forested land protected under Alternatives 2, 5, and 6 could be used for greenways or other public recreation.

Figures 6.1c and 6.1d illustrate the Duke Shoreline Management Plan Shoreline Classifications (August 2006) for the area adjacent to the proposed facilities. Long Creek is classified as Environmental and Natural. The area adjacent to facilities proposed in Alternatives 2, 5, and 6 on the Mecklenburg Side of the Catawba River is classified as Future Residential Marina. The area adjacent to the existing Mount Holly WWTP is classified as Business/Industrial. New facilities proposed under Alternatives 3 and 4 would be adjacent to shoreline classified as Environmental, Business/Industrial, and Natural: Isolated Berm. The shoreline near the Belmont WWTP is classified as public infrastructure and future residential marina. The shoreline is classified as residential and future residential on the Mecklenburg County side at the proposed forcemain crossing.

Proposed new facilities at the Mt Holly WWTP would disturb forested lands under Alternatives 2, 3 and 4. Parcels adjacent to any proposed facilities are zoned industrial, single family, park, and undeveloped. These facilities would be located approximately 1.3 miles upstream of the National Whitewater Center and approximately 0.1 mile from the Mount Holly Riverfront Park. There would be a minimal vegetated buffer between the proposed site, the Catawba River, and the adjacent park to the south. Proposed construction of a pump station and force main on existing Belmont WWTP property and decommissioning of the facility would not disturb forested lands under Alternatives 1-6. Under Alternatives 1 -6 the proposed forcemain would be located primarily in existing road right of ways. Forested buffer areas along the Catawba River would be avoided through the use of directional drilling. Parcels adjacent to proposed facilities are zoned industrial, single family, and undeveloped.

Under Alternative 1, the proposed upgrade and expansion of the Mount Holly WWTP would take place on the cleared, disturbed site currently in use by the WWTP, plus a small disturbance to forested land (≤1 acre) adjacent to the plant site. The proposed pump station construction and decommissioning of the Belmont WWTP would take place on the cleared, disturbed site currently in use by the WWTP. On the Mecklenburg County side, the City of Belmont forcemain would be constructed within existing road right of ways to the existing Paw Creek pump station. The Paw Creek pump station would move the Belmont wastewater to McAlpine or Irwin WWTPs. The existing Long Creek pump station would be expanded and additional equalization capacity constructed resulting in a 3.5 acre increase in facility footprint. Long Creek is classified by the Duke SMP as Environmental and Natural. The new 3.5 acre facility footprint on the Mecklenburg County site would involve minimal clearing (≤1 acre) of forested land. This site is privately owned and zoned R-3, residential.

Under Alternative 2, the proposed facilities expansion at the Mount Holly WWTP and construction at the Belmont WWTP and forcemain would result in the same land use impacts as described for Alternative 1. On the Mecklenburg County side of the project area, 22.0 acres of new construction would be required for the new 17 mgd WWTP. This parcel is zoned I-2, general industrial, and the proposed construction work area is already disturbed with very little vegetative cover. The parcel is currently owned by Clariant Corporation, who is a willing seller. The parcel would be purchased after issuance of the Record of Decision and successful negotiations of the sale of the property. This site is adjacent to a groundwater mitigation effort being conducted by Clariant to remove contaminants including chlorinated compounds from the groundwater, which may make this parcel less attractive

for residential development. The adjacent Catawba River is classified as Future Residential Marina and Long Creek is classified as Environmental and Natural.

Under Alternative 3, the 3.5 acre pump station expansion on the Mecklenburg County side of the project area would be the same as discussed under Alternative 1. The construction at the Belmont WWTP and forcemain addition would be the same as discussed under Alternatives 1 and 2, but the Paw Creek pump station would be reconfigured to move wastewater to the Long Creek pump station where the Belmont wastewater would be pumped across Lake Wylie to the regional facility in Mount Holly. The upgrade and expansion of the Mount Holly WWTP would be constructed on 30 acres of forested land, which would have to be cleared. This land is owned by American & Efird (A&E) who operates a textile manufacturing facility on a portion of the property. This land is zoned industrial. The adjacent Catawba River is classified as Environmental, Natural: Isolated Berm, and Business/Industrial at this location.

Under Alternative 4, land use impacts associated with the 3.5 acre expansion of the Long Creek pump station would be the same as those described in Alternatives 1 and 3. Land use impacts associated with construction at the Belmont WWTP and forcemain addition would be the same as for Alternative 3. Forty acres of forested land would be cleared for construction of new facilities near the existing Mount Holly WWTP. This land is currently adjacent to and owned by A&E.

Alternative 5 is the preferred alternative, in part because it would allow for increased regional wastewater capacity while minimizing land use impacts. Under Alternative 5, a new pump station would be constructed on disturbed land adjacent to the current Mount Holly WWTP location. This land is currently owned by the City of Mount Holly. The 22-acre expansion on the Mecklenburg County site would occur on a previously cleared area of an industrial parcel owned by Clariant Corporation, who is a willing seller. The parcel would be purchased after issuance of the Record of Decision and successful negotiations of the sale of the property. This site is adjacent to a groundwater mitigation effort being conducted by Clariant to remove contaminants including chlorinated compounds from the groundwater, which may make this parcel less attractive for residential development. The City of Belmont would participate in Alternative 5 by installing a pump station on previously disturbed areas within its existing WWTP property and use existing road right of ways and the Paw Creek pump station to move wastewater to the proposed regional facility.

Alternative 6 involves the same amount of construction and land use change as Alternative 5. Under this alternative, Mount Holly would continue to operate their existing WWTP and send additional wastewater to the new regional WWTP in Mecklenburg County. The City of Belmont actions would be the same under Alternatives 5 and 6.

The selection of Alternatives 2, 5 and 6 would provide the opportunity to protect almost 80 acres of forest compared to Alternatives 1, 3, or 4 or No Action. This forest would continue to provide habitat, water quality and hydrology benefits and would be a buffer between the regional wastewater facility and adjacent residential and recreational land uses.

6.1.3 Wetlands and Floodplains

FEMA regulates 100-year floodplains across the United States and requires compliance with federal and/or more stringent local floodplain ordinances for construction within the 100-year (regulatory) floodplain. Mecklenburg

was the first county in the nation to include future conditions (community) floodplains on its floodmaps. Community 100-year floodplains are delineated based on future, potential built-out conditions of the watershed, while the regulatory floodplains are based on current land use conditions. Mecklenburg County requires compliance with floodplain ordinances for any new construction or substantial improvements to existing construction, within both the regulatory and the community floodplain. FEMA Floodplains are illustrated in Figures 6.1e and 6.1f.

Force mains would cross the Catawba River, Paw Creek, and/or Long Creek under all Alternatives, and wastewater outfall structures on the Catawba River under Alternatives 2 and 6 would be constructed within the floodway. The floodway is that portion of the flow area that cannot be obstructed without causing an increase in the water-surface elevations resulting from a flood with a 100-year average return period and is the portion of the floodplain most restrictive to development. The use of directional drilling would allow the force mains and outfall structure corridors to be under the river and stream beds and would not result in an increase in the 100-year flood base flood elevation (BFE).

Jurisdictional wetlands under CWA Section 404 would not be impacted by the construction or operation of new or expanded WWTP facilities under any of the proposed alternatives; however, force main and discharge line construction would cross wetlands. Wetland disturbances would be eliminated or minimized through use of directional drilling, implementation of BMPs, and adherence to regulatory permitting requirements (CWA Section 401 and 404). There would be no direct impacts associated with the operation of facilities proposed under all alternatives.

6.1.4 Water Quality

Direct impacts to surface water and water quality may include stormwater runoff, stream buffer impacts, and wastewater effluent.

Stormwater Quality and Volume

Stormwater impacts are anticipated during and after construction for all alternatives. The total areas of new construction under each alternative are presented in Table 6-1. During construction, cleared land is more prone to erosion. Soil disturbance during construction may cause temporary sediment loadings into the Catawba River, Long Creek, and smaller streams at project sites. However, required sediment and erosion control measures would be implemented and would reduce impacts to water quality.

Under the No Action Alternative, properties would be available for development pursuant to current stormwater regulations. The use of stormwater controls such as low impact development practices (LID) would be explored for any of the action alternatives in order to minimize increases in stormwater volume.

New wastewater facilities would increase impervious cover on the sites, causing additional stormwater runoff. This increased runoff would potentially erode stream channels and carry more pollutants compared to pre-development conditions. However, regulatory requirements would limit impacts. Both Mount Holly and Charlotte Mecklenburg municipalities are required by EPA to obtain a permit for discharge of stormwater into Waters of the State (NPDES Stormwater Permit). The NPDES Stormwater permit requires that a Stormwater Pollution Prevention Plan (SWPPP) be developed and implemented. The steps to develop a Plan have been grouped into five general phases, which are (1) planning and organization; (2) assessment; (3) BMP identification; (4) implementation; (5)

evaluation of the Plan. The objectives are to minimize the number and amounts of pollutants in storm water runoff leaving the site. In response to potential water quality problems, several BMPs would be implemented to control potential pollutant runoff from plant site. These BMPs will include source reduction controls as well as containment and diversion structures.

Mount Holly meets most post-construction stormwater discharge requirements through its Water Supply Watershed Protection ordinance. Charlotte-Mecklenburg Stormwater Services maintains one of the most stringent stormwater quality programs in the State, with requirements that exceed the State's minimum standards. Charlotte-Mecklenburg Utilities would require that State stormwater quality and quantity requirements be met through the use of low impact development practices (LID) at the wastewater treatment plant sites (Alternatives 2-6). LID practices provide for post-development hydrology that mimics pre-development conditions through implementation of specialized BMPs. These BMPs could include practices such as the use of green roofs, rain gardens, and infiltration devices.

While every effort would be made to minimize impervious surface runoff from new facilities through the use of BMPs, increased runoff may result in direct impacts to aquatic resources. These direct impacts could arise from minor increases in stormwater pollutants such as nutrients, total suspended solids, hydrocarbons, and bacteria.

Stream Buffer Impacts

Under the No Action Alternative, streams would not be crossed or otherwise impacted. All action alternatives (Alternatives 1 -6) have been planned to minimize impacts to waterways and riparian buffers. Although pipelines would cross perennial waterways at up to five locations, the use of directional drilling would eliminate impacts to instream and riparian habitat and water quality. A road bridge crossing of Long Creek will be required under Alternatives 2, 5, and 6 to provide access between the new WWTP and the existing Long Creek Pump Station. Proposed facilities for all WWTP alternatives are located 100 feet or more from all perennial streams. This meets minimum buffer requirements for the Catawba River in Mecklenburg County and exceeds required buffer widths for Long Creek (50 ft) and the Gaston County side of the Catawba River (50 ft).

Lake Wylie Water Quality and Wastewater Effluent

All alternatives, except for the No Action Alternative, would increase the discharge of treated wastewater effluent into Lake Wylie. As described in Section 5.4 and in Section 6.2.4, Lake Wylie has exceeded water quality standards for chlorophyll-*a* concentrations in the past. Nitrogen and phosphorus levels in wastewater could contribute to algal growth, which could produce higher chlorophyll-*a* concentrations in Lake Wylie. Compliance with NPDES permits, which would limit the discharge of nitrogen and phosphorus, would reduce the impact of the increased wastewater discharge. Alternatives 3-6 would involve the construction of a regional wastewater facility that would be designed to achieve significant nutrient removal from wastewater. Alternatives 1-3 would involve an expansion and upgrade of the existing Mount Holly WWTP and would include nutrient removal. No capacity expansion is included for the Belmont facility under any Alternative. The existing Belmont WWTP would be decommissioned under Alternatives 1-6 and upgraded under the No Action Alternative. Water quality modeling conducted for this project indicates that the nutrient loading produced by Alternatives 2-6 (the largest volume of wastewater) would not produce conditions in Lake Wylie that would cause chlorophyll-*a* concentrations to exceed the water quality standard. The water quality modeling results are discussed in Section 4.9 and in greater detail in Appendix C.

Currently, wastewater generated in the Long Creek basin on the Mecklenburg County side of the service area is pumped over 20 miles to McAlpine Creek WWMF for treatment. Alternatives 2 – 6 would treat existing and future flows at a new regional facility and eliminate this need for pumping long distances. The McAlpine Creek WWMF is currently permitted for a capacity of 64 mgd with the Long Creek basin contributing approximately 2-3 mgd, which is less than 5% of the total flow. Taking typical diurnal and wet weather variations into account, removing flow from the Long Creek basin would not have a significant impact on the water quality or quantity of discharge from McAlpine Creek WWMF.

Effluent Reclaimed Water

Charlotte-Mecklenburg Utilities and the City of Mount Holly plan to produce reclaimed water for reuse and recycle of wastewater effluent for industrial or landscape applications (Alternatives 2-6). The wastewater will be treated to reclaimed water quality standards. A reuse pumping station would be constructed as part of the project to take advantage of reclaimed water for a portion of the treated wastewater. Reclaimed water will be used on-site in place of potable water where applicable. Other users in the area are currently being identified, such as industries, residential developments, and parks. Future expansion of the reclaimed water system will depend on identification of additional users.

6.1.5 Groundwater Quality

No direct impacts to groundwater quality are expected as a result of the construction and operation of new facilities under any of the action alternatives.

6.1.6 Water Supply

All alternatives except the No Action Alternative will increase the quantity of treated wastewater effluent and associated nutrients discharged to Lake Wylie. Water quality modeling (see Sections 5.7, 5.8 and Appendix C for further details) indicates that the increased discharge under all alternatives will not create water quality conditions in Lake Wylie that violate drinking water standards in North Carolina or South Carolina. Any new discharge will be required to obtain an NPDES permit which would establish minimum effluent quality standards that are protective of the quality of drinking water in Lake Wylie.

6.1.7 Wildlife and Aquatic Resources and Habitats

Under the No Action Alternative, there would be no direct impacts to wildlife and aquatic resources and habitats. Direct impacts to wildlife and terrestrial habitats for all action alternatives are summarized in Table 6-3. Terrestrial habitats impacted by the proposed facilities are illustrated for each of the alternatives in Figures 6.1g-6.1l. Impacts to habitat associated with the proposed Belmont Forcemain are illustrated in Figures 5.7b. Direct impacts to terrestrial wildlife species are expected to be associated with habitat loss and/or creation. As discussed in Section 5.7.1.4 and listed in Table 5-11, any alternatives that require clearing of areas that are currently forested may cause direct impacts to the terrestrial species that use this habitat. No forest clearing would be associated with the Belmont Forcemain under Alternatives 1-6 because it would be located in existing road right-of-ways in both Gaston and Mecklenburg Counties. Direct impacts to aquatic organisms are expected to be minimal due to stormwater controls and stringent effluent discharge limits. Minor increases of instream pollutant concentrations, such as nutrients, total suspended solids, hydrocarbons, and bacteria, may occur from increased stormwater runoff. Increased nutrient loadings may lead to lower dissolved oxygen concentrations. Stringent nutrient discharge limits

would be established for Alternatives 2-6 that would limit the effect of the discharge on dissolved oxygen levels in the Catawba River and Lake Wylie.

Table 6-3 Direct Wildlife and Terrestrial Habitat Impacts

Alt	Gaston Co	Mecklenburg Co.
1	Minor direct impacts. New construction on 4.5 acres of land on previously cleared and forested land. About 2 of the acres to be disturbed are currently forested. Loss of 2 acres of forested habitat and the associated wildlife community.	Minor direct impacts. Minimal clearing (≤one acre) of mature mixed mesic hardwood forests and dry-mesic oak-hickory forest are expected. Very limited wildlife impacts. Impacted individuals may be able to move into adjacent forested area.
2	Minor direct impacts. New construction on 4.5 acres of land on previously cleared and forested land. About 2 of the acres to be disturbed are currently forested. Loss of 2 acres of forested habitat and the associated wildlife community.	No direct impacts. New construction on 22 acres of previously cleared land would allow forest areas to remain undisturbed. Very limited wildlife impacts. Impacted individuals may be able to move into adjacent forested area.
3	Significant direct impacts. New construction would require the clearing of approximately 30 acres of mature mixed mesic hardwood forest. This forest area is surrounded by disturbed areas, but it serves as a wildlife corridor that connects other forested areas to the Catawba River. Clearing this land would result in permanent irreversible impacts to wildlife habitat and the species that currently inhabit the area.	Minor direct impacts. Minimal clearing (about one acre) of mature mixed mesic hardwood forests and dry-mesic oak-hickory forest are expected. Very limited wildlife impacts. Impacted individuals may be able to move into adjacent forested area.
4	Significant direct impacts. New construction would require the clearing of approximately 40 acres of mature mesic hardwood forest. This area serves as a wildlife corridor to the Catawba River. Clearing this land would result in permanent irreversible impacts to wildlife habitat and the species that currently inhabit the area.	Minor direct impacts. Minimal clearing (about one acre) of mature mixed mesic hardwood forests and dry-mesic oak-hickory forest are expected. Very limited wildlife impacts. Impacted individuals may be able to move into adjacent forested area.
5	Minor direct impacts. New construction would require the clearing of 1 acre of forested area. Very limited wildlife impacts. Impacted individuals may be able to move into adjacent forested area.	No direct impacts. New construction on 22 acres of previously cleared land, which would allow forest areas to remain undisturbed. Few wildlife impacts due to poor quality habitat at the proposed WWTP and FM construction locations.
6	Minor direct impacts. New construction would require the clearing of 1 acre of forested area. Very limited wildlife impacts. Impacted individuals may be able to move into adjacent forested area.	No direct impacts. New construction on 22 acres of previously cleared area, which would allow forest areas to remain undisturbed. Few wildlife impacts due to poor quality habitat at the proposed WWTP and FM construction locations.

6.1.8 Rare and Protected Species and Habitats

During field surveys of the proposed alternatives locations, six stems of Schweinitz's sunflower were observed east of the existing Mount Holly WWTP in a power line ROW. The population is within the proposed footprint for Alternatives 3 and 4 and (Figure 6.1j and Figure 6.1i). Any clearing or new construction near this existing population would require consultation with the USFWS and a plan for relocation. This has been done for other

projects in the area, and a relocation site for Schweinitz's sunflower has already been established. Any vegetation clearing during construction would result in temporary habitat losses, and new facility construction would result in permanent habitat losses. No other endangered species exist within the proposed sites, and no other direct impacts to endangered species are anticipated.

6.1.9 Public, Scenic, and Recreational Areas

The proximity of the National Whitewater Center and the City of Mount Holly's 33 acre river front park expansion (Tuckaseegee Park) to all proposed alternatives (Figure 6.1a) provides the potential for both positive and negative direct impacts to recreational lands. Potential negative direct impacts associated with all alternatives, including the No Action Alternative, could be odors and possible wastewater spills, which could result in the disruption on recreational activities and/or access to recreational sites. Alternatives 2, 5, and 6 would create positive direct impacts by protecting about 80 acres of forested land from future development. If Alternative 2, 5, or 6 is not chosen, these forested acres, zoned industrial and residential, may be converted to another use. Alternatives 2, 5, and 6 facilitate the potential expansion of hiking and biking trails from the U.S. National Whitewater Center and may also allow the addition of a new canoe launch on Long Creek. Members of the Stakeholder Group indicated that Long Creek is often used by recreational boaters and that additional access would be a valuable community asset. Alternatives 1, 3, and 4 would be constructed immediately adjacent to the Mount Holly river front park. Construction of Alternatives 3 and 4 would remove forest from areas that currently provide a visual buffer between the industrial American & Efird (A&E) property and the adjacent park and residential properties. Direct impacts would also occur under the No Action Alternative due to the existing Mount Holly wastewater treatment plant and the existing Long Creek pumping station.

To protect public health, particularly the health of people involved in water-based recreation such as boating or swimming, all new facilities (Alternatives 2-6) would be designed to prevent storm flow bypasses and sanitary sewer overflows (SSOs) by installing equalization facilities, backup generators, and redundant facilities. The increased capacity provided by any of the action alternatives would reduce the likelihood of sanitary sewer overflows. Further, odor control technology would be incorporated into the WWTP facility design (Alternatives 2-6) and Belmont pump station design (Alternatives 1 to 6). These design strategies would reduce the impact of new wastewater facilities on the enjoyment of adjacent public recreation areas.

6.1.10 Energy Resources

The energy usage associated with operating a new WWTP and/or expanded facilities will increase under all alternatives. The power usage associated with pumping wastewater from Long Creek pumping station to McAlpine Creek WWMF would eventually be eliminated under Alternatives 2-6. Slightly less energy would be saved under Alternatives 3 and 4 that would involve pumping Belmont's wastewater across Lake Wylie twice. The additional water volume in Lake Wylie associated with Alternatives 2-6 can be used for additional power generation. Under Alternatives 2-6, if produced, Utilities and Mount Holly would evaluate whether it is economically feasible to utilize methane gas generated at the facility to provide energy to the facility and reduce natural gas use.

6.1.11 Archeological or Historical Resources

There are no properties registered on the National or State Register of Historic Places present on any of the project sites; therefore, there would be no direct impacts on historical resources. The State Historic Preservation Office

(SHPO) was formally asked for comments on the proposed project. The consultant met with SHPO staff twice to discuss the project and review SHPO maps. Documented archaeological sites exist just south of the proposed alternative locations on the Mecklenburg side of the Catawba River and SHPO would require archaeological surveys to be conducted on previously undisturbed areas outside of the 100-year floodplain prior to initiation of any construction activities. Due to the previous level of disturbance on the Gaston portion of the proposed alternative sites, (Mount Holly and Belmont WWTP locations), SHPO would not require archeological surveys.

6.1.12 Prime Agricultural Lands

There would be no direct impacts to agricultural lands as a result of the proposed project. Prime agricultural soils do not exist on any of the Gaston County sites. On the Mecklenburg County side, prime agricultural soils are not currently used for agricultural purposes.

6.1.13 Air Quality

Minor and temporary impacts to air quality may occur during construction activities due to increased amounts of dust or engine exhaust. Dust control measures would be employed to limit dust exposure during the construction phase. Operation of the plant would not produce any regulated air quality contaminants, and nearby residents and public access areas would be buffered from facility-generated odors by surrounding and undeveloped wooded lands. Odor control facilities would be installed at the headworks, preliminary treatment, and pumping stations. These odor control facilities would minimize any odors that might be generated from untreated wastewater through the initial screening, grit removal, and pumping operations. The plant would have diesel generators on-site that could be run in the case of a power failure. An air quality permit would be obtained from LUESA to operate the generators. Methane gas generated at the regional WWTP facility would be used to offset energy consumption by using the gas to heat the anaerobic digesters. Direct impacts to air quality under any of the action alternatives would be temporary and minor.

6.1.14 Nuisance Conditions (Noise, Odors, Dust)

Temporary nuisance conditions such as odor, noise, and dust may occur with construction. Construction would typically occur only during normal daylight working hours. Equipment that could generate significant noise levels would be enclosed in buildings, which reduces noise pollution. Buildings that enclose blowers, pumps, or other noise-generating equipment would contain installed noise attenuation. A buffer around the plant site would aid in minimizing plant construction and normal operation noise. Minimal impacts due to odors generated from the wastewater treatment process may occur. Odor control measures would be used at the plant and pumping station.

6.1.15 Toxic Substances

Toxic substances would not be introduced to the environment during construction of the proposed facilities. Chemical storage and feed facilities would be provided for chemicals used in the treatment process. Diesel storage tanks would be located on the plant site for standby diesel generators, boilers, and fuel dispensing. All chemical storage and feed areas at the plant would be provided with secondary containment. These areas would be provided with all safety features required by the NC building codes. Diesel tanks are provided with secondary containment and leak detection systems.

6.2 Secondary and Cumulative Impacts

The secondary and cumulative impacts associated with a new regional wastewater facility would generally be related to continued urban growth and land use changes associated with population increases in the service area. Growth within the service area is anticipated regardless of the alternative selected including the No Action Alternative. The selection of an alternative that provides regional wastewater treatment capacity would help reduce sprawl by facilitating higher density development in areas that are proactively planning for and regulating continued development. This regional wastewater facility has been proposed in response to an anticipated increase in wastewater generated within the service area; the facility itself would not produce this population growth. The proposed regional wastewater facility is part of a long term planning effort conducted by Utilities and the City of Mount Holly to provide cost-effective high quality wastewater treatment for their citizens while being protective of the environment.

None of the alternatives considered include an expansion in the capacity of the Belmont WWTP. Since no expansion is occurring that facilitates growth within Belmont, no secondary and cumulative impacts associated with this proposed project will occur within the City of Belmont service area. All alternatives would involve a reduction in nutrients discharged to Lake Wylie from the City of Belmont.

The No Action Alternative would limit continued growth in the Mount Holly portion of the service area. Much of the existing Mount Holly WWTP capacity has been committed to known development projects. Under the No Action Alternative, Mount Holly would be forced to limit construction within its portion of the service area or find another way to increase wastewater treatment capacity.

In the Mecklenburg portion of the service area, under the No Action Alternative, wastewater would continue to be treated at the McAlpine Creek WWMF. Although growth would continue to occur in the Mecklenburg portion of the service area, densities in areas that currently do not receive centralized wastewater services would be limited by septic system space requirements and watershed overlay restrictions on new private package WWTPs in critical watershed areas. These areas without centralized wastewater services are illustrated in Figure 6.2a and are generally located in the Mecklenburg portion of the Catawba Sub-basin, the Gar Sub-basin, and a small portion of the Lower Mountain Island Subbasin. The Mecklenburg County portion of the project service area is part of a much larger service area managed by Utilities. Figure 6.2b identifies the existing Utility facilities and service areas within the entire Utility service area. If the No Action Alternative is chosen, wastewater from the Mecklenburg side of the service area would continue to be treated at the McAlpine Creek WWMF and would continue to be unavailable for use in Lake Wylie. In the future, the McAlpine Creek WWMF or other wastewater facilities within the greater Charlotte-Mecklenburg area might be expanded to meet the growing wastewater demands, which would result in similar secondary and cumulative effects as those under the proposed project.

Overall, the construction of a regional wastewater facility would provide a number of beneficial secondary and cumulative impacts. Discharging the treated wastewater generated in the Long Creek basin into Lake Wylie as opposed to pumping wastewater over 20 miles to the McAlpine Creek WWMF and discharging south of the lake would increase the water volume in the lake and decrease energy used for pumping. Increased water volume would be available in Lake Wylie for power generation, cooling water, and water supply. The proposed regional wastewater facility, which would produce high quality treated wastewater effluent with low nutrient concentrations, could also increase the amount of water available in Lake Wylie to protect water quality, support

aquatic life and provide recreational opportunities. Highly treated wastewater effluent would also provide a source of reclaimed water for industrial or landscape applications. The utilization of reuse water for irrigation could reduce the demand for potable water during summer peak water use periods. These potential reductions in Lake Wylie water use for industrial or landscape applications, in conjunction with the introduction of treated wastewater, would help to preserve drinking water supplies, particularly under drought conditions. These beneficial impacts would not be achieved under the No Action Alternative.

Portions of the proposed project service area currently without public sewer service (Gar and Catawba Sub-basins and portions of Mountain Island Lake Sub-basin) have lower land use densities than other portions of the service area. Density in these areas is currently limited by minimum lot size requirements for septic systems. The availability of public sewer service would make it possible to develop these areas more densely than is possible with septic systems. Therefore, these areas could experience relatively more secondary and cumulative impacts from land development than portions of the project service area with public sewer service that are already more densely developed. Areas currently without public sewer service are depicted in Figure 6.2a.

Several local and State regulations are in place throughout the project service area that will minimize secondary and cumulative impacts. Public sewer extension projects would be required to apply for and obtain the necessary permits and evaluate, avoid, and minimize environmental impacts. Water supply watershed protection rules, which limit land use densities and apply other development restrictions to protect water quality, apply to a large portion of the project service area in both Gaston and Mecklenburg Counties. These areas include the limits of the City of Mount Holly and a large portion of the project service area that is not currently serviced by public wastewater treatment service. Figure 6.2c identifies water supply watershed protection areas within the entire project service area. In addition to the water supply watershed protection areas, a number of local policies and ordinances are in place (discussed in Section 7) that would further limit secondary and cumulative impacts from any of the alternatives within the service area.

Land use changes associated with continued growth and development are discussed specifically in Section 6.2.2 and are the basis for most assumptions made in this secondary and cumulative impacts analysis. This discussion considers the development patterns anticipated by the Charlotte Mecklenburg Planning Department's 2015 Plan and associated GIS data and by the City of Mount Holly's 2001 Future Land Use Plan.

Secondary and Cumulative Impacts: Comparison of Alternatives

Many of the action alternatives would generate almost identical indirect and secondary and cumulative impacts within the service area. As such, secondary and cumulative impacts associated with Alternatives 2-6 will be summarized together and compared to Alternative 1 and to the No Action Alternative. Depending on the alternative chosen, secondary and cumulative impacts could occur as one of three general scenarios:

1. A new wastewater facility would be built at the proposed location, as discussed in Alternatives 2, 3, 4, 5, or 6 (Section 2.3).
2. Alternative 1 is chosen. Mount Holly WWTP expands to meet its growing demand at its current location. Additional wastewater treatment needs would still exist in Utilities service area.
3. The No Action Alternative is chosen. Under the No Action Alternative, both Mount Holly and Belmont's WWTP's are upgraded to meet nutrient limits however wastewater services are not expanded for the City

of Mount Holly or Utilities. If this were to occur, Utilities would be forced to explore other options for its increasing wastewater treatment demands. Additional wastewater could be treated at either the McAlpine Creek WWMF or Irwin Creek WWTP since the Charlotte-Mecklenburg Utilities collection system has interconnections to maintain flexibility and ensure high levels of treatment. Mount Holly would not expand and additional wastewater needs would be met through septic systems or smaller package WWTPs, where allowed by zoning and overlay districts.

The expected secondary and cumulative impacts associated with these three scenarios are compared generally in Table 6-4.

Table 6-4 General Secondary and Cumulative Impacts Associated with Grouped Alternatives

Alternative	Secondary and Cumulative Impacts
New Wastewater Facility Alternatives (Alternatives 2-6)	Where allowed by existing rules and ordinances, enables more dense development patterns, along with associated impervious surface, which may have negative impacts on surface water quality, groundwater recharge, wildlife habitat, and wetlands. Proximity of facility to the National Whitewater Center may have positive (increased access, additional preserved areas) effects on recreation. Consistent with land use master plans. Consistent with regional wastewater study for entire Charlotte-Mecklenburg area. Reduces energy use and greenhouse gas generation by ultimately eliminating long-distance wastewater pumping to the McAlpine Creek WWMF. Increases power production capability at Lake Wylie dam. Provides additional water volume to supplement low flows in Lake Wylie. Continuing growth and development is facilitated within both Utilities' and Mount Holly's service areas. Eliminates existing Belmont, Mt Holly, and/or Clariant NPDES permitted discharge to the River.
Separate Mount Holly WWTP expansion (Alternative 1)	Accelerated expansion schedule for McAlpine Creek WWMF and/or Irwin Creek WWTP. Water from Mecklenburg side of service area and Belmont bypasses Lake Wylie further reducing the water available for water supply, energy production and low flow supplementation during droughts. Continuing growth and development is facilitated in Mount Holly's service area. New development density may be limited in Utilities service area if wastewater needs are not met by another WWTP, promoting sprawl. Facility upgrades occur within the 100-year regulatory floodplain.
No Action	Inconsistent with land use master plans. New development density would be limited, promoting sprawl inside and outside of service area. Additional growth serviced by utilizing septic systems and package WWTPs. Multiple wastewater discharges with less regulatory control of effluent quality or consistency. Potential Mount Holly and Utilities expansion at other locations.

Most of the potential secondary and cumulative impacts that would occur under Alternatives 2-6 (which includes the preferred Alternative 5) would also be expected to occur with Alternatives 1 and No Action. Differences will be seen primarily in the geographic distribution of secondary and cumulative impacts and in the location where the treated wastewater enters the Catawba River system.

Under Alternatives 1 and No Action, a large quantity of water will be introduced back into the Catawba system in South Carolina downstream of Lake Wylie. Under Alternatives 2-6, this water will be introduced to Lake Wylie where it could be used for power generation, recreational use, cooling water, reuse, and low flow supplementation.

New septic systems and package WWTPs would be utilized less frequently under Alternatives 2-6 than under the No Action Alternative. In Gaston County, the Unified Development Ordinance (effective data July 1, 2008) requires new subdivisions in areas with sewer service to connect to the collection system and prohibits the installation of septic systems (Gaston County, 2008). In Mecklenburg County, the Public Health Department has jurisdiction over new septic systems. In Alternatives 2-6, the service area would not be extended but wastewater collection services could be provided to currently unsewered areas. This would reduce the potential for secondary and cumulative impacts to stream and groundwater quality from failing septic systems. Under the No Action Alternative, additional capacity needs due to continued growth would be met by the use of package WWTPs or septic systems.

6.2.1 Topography and Soils

Continued growth and development patterns associated with the addition of public wastewater infrastructure and continued residential and commercial development would result in localized changes to topography and soils. Grading and clearing activities would disturb and compact local soils and increase the potential for soil erosion. Further, development would cover soils with impervious surfaces. These effects would be mitigated by enforcement of local and state regulations.

Soil erosion and disturbance impacts are limited by current local and state sedimentation and erosion control rules and inspection programs. Construction and stormwater BMPs would control stormwater runoff and the resulting soil erosion during and after construction. All municipalities within the service area have a construction inspection program and require stormwater BMP implementation as part of their NPDES stormwater discharge permit. Section 7 identifies the specific development restrictions, programs, and ordinances in place within the service area.

6.2.2 Land Cover and Land Use

Given the proximity of the service area to the City of Charlotte, current and future land use plans and comprehensive plans anticipate significant additional growth throughout the entire service area. In order to accommodate this growth, public infrastructure improvements, such as the I-485 loop and planning for a regional wastewater facility, are currently being implemented within the service area. The construction of a regional wastewater facility would be required to meet increased wastewater treatment demands associated with the expected population growth.

Alternatives 2-6 would facilitate denser growth than what might occur if the area were forced to utilize only septic systems or package plant wastewater treatment options as would occur under the No Action Alternative. Most indirect impacts associated with continued population growth within the service area would be related to the

addition of higher density developed land uses. This higher density growth is consistent with planned growth within the greater Charlotte-Mecklenburg area and may protect areas outside of the service area from unplanned, less desirable forms of development.

Information about anticipated future land use is found in comprehensive planning, land use planning, zoning, and other documents. Figure 6.2d illustrates the urban development and denser land uses included in future land use projections for the Charlotte-Mecklenburg Planning Department (2015 Plan, associated district plans, and future land use GIS data) and the Town of Huntersville (zoning ordinance). Figure 6.2e illustrates future land use projections in the City of Mount Holly (Land Development Plan Update 2001). Zoning information from the Town of Stanley provides the best available information about future land use projections. Zoning within the Town of Stanley portion of the service area is illustrated on Figure 6.2f. The currently unserviced areas within the proposed service area are included in these long term plans. The Charlotte-Mecklenburg 2015 Plan cites major development expansion for the Mount Holly Road/NC 16 area, as well as other parts of the service area. The plan states that "much of this development is spurred by the construction of the I-485 Outer Loop." Growth and development are expected to occur as a result of the construction of this major transportation corridor, which passes through the Long Creek and Paw Creek Sub-basins. Figure 6.2a illustrates the planned future alignment of I-485 and 2001 land densities. The highest density future development is projected to occur close to the I-485 corridor.

The portions of the service area that currently receive public sewer service are illustrated in Figure 6.2a. In Gaston County, the minimum lot size for septic systems is 30,000 square feet (ft^2) (0.7 acre). In Mecklenburg County, specific minimum lot sizes are not established; on-site wastewater treatment system permits are issued based on site suitability. However, it is generally not feasible to install a traditional on-site wastewater treatment system and associated dwelling unit on a parcel smaller than 0.25 acre (Pers comm., Kelly Randall, Charlotte Mecklenburg Environmental Health Department, Jan.15, 2007).

The Water Supply Watershed Protection area overlay districts within the service area (Figure 6.2c) impose certain limitations on development. Cluster development (allowed in Mount Holly with specific restrictions) and privately-owned wastewater treatment facilities are prohibited in critical areas. In currently unsewered areas, the prohibition of privately-owned wastewater treatment facilities requiring a NPDES permit is one of many factors limiting development density under the No Action Alternative. Within the service area, unsewered areas exist only in Mecklenburg County and are located in portions of the Catawba, Long, Lower Mountain Island, and Gar Sub-basins (Figure 6.2g). In all overlay zoning districts, other applicable development restrictions still apply.

With the availability of public sewer, the largest anticipated change in land use would be an increase in the amount of land with residential densities of more than four units per acre. Planned future land use for the portion of the project service area that currently does not receive public sewer services is illustrated in Figure 6.2c and 6.2g. Figure 6.2h illustrates the customer density served by Utilities and Mount Holly in 2000, as well as the projected customer density to be served in 2010, 2020, and 2030 in each sub-basin. (These population predictions were introduced in Section 3 of this document). These data indicate that each sub-basin will experience an increase in population served. The largest increases in customer density should be anticipated in the Long Sub-basin, followed by the Lower Mountain Island Sub-basin, then the Mount Holly portion of the service area. Customer density in the Paw, Catawba (Mecklenburg County portion) and Gar Sub-basins by 2030 is anticipated to be similar to that in the Long Sub-basin in 2000. Densities in the Town of Stanley portion of the service area could be relatively higher

because of the Town's policy to require new development to connect to a public sewer system. In addition, the Town of Stanley's portion of the service area is not located within a water supply watershed protection area.

Projected 2015 land use data for the Catawba Sub-basin categorizes it as primarily single family residential (42%) and industrial (19 percent) land uses, followed by open water (15%), park and open space (9%), mixed residential (8%), and mixed non-residential (8%) in 2015 (Charlotte Mecklenburg Planning Department GIS, 2007).

About 64% of the Gar Sub-basin is within the Town of Huntersville and is primarily rural land use. Town of Huntersville rural districts "encourage the development of neighborhoods and rural compounds that set aside significant natural vistas and landscape features for permanent conservation" (Huntersville Planning Department, 2008). As these land uses are possible without central WWTP services, the land use changes in the Huntersville portion of the Gar Sub-basin would be expected to be the same with any alternative. The second most predominant future land uses in the Gar Sub-basin are single family residential (17%), open water (10%), and park (7%) as determined by Charlotte future land use data.

6.2.3 Wetlands and Floodplains

Continued growth would result in secondary and cumulative impacts to wetlands and floodplains under all alternatives. The secondary and cumulative impacts to wetlands and floodplains are potentially higher under Alternatives 2-6 due to the higher development densities that would be supported by these alternatives.

Urban stormwater flows can physically degrade stream and wetland habitats, alter wetland hydrology, and disturb wetland vegetation. During construction, as land is cleared, erosion and sediment can increase the sediment load in runoff and can have an adverse effect on wetlands and streams. All local governments within the service area enforce riparian buffer protection rules and inspect construction sites for compliance with erosion control and stormwater BMP requirements. All municipalities have also implemented post-construction stormwater ordinances. Implementation of these programs would significantly reduce the impacts associated with stormwater runoff on wetlands, floodplains and streams. Section 7 of this document provides detailed descriptions of the programs that are being implemented to minimize secondary and cumulative impacts to floodplains, wetlands, and streams.

The majority of wetlands within the service area are located within riparian zones and floodplains which are currently protected under buffer ordinances and floodplain building regulations. Wetland loss may occur as land use changes; however, ordinances that protect riparian buffers and regulate floodplain development would restrict the direct loss of riparian wetland habitat. It is unlikely that any development would result in the loss of regulated wetlands without the implementation of mitigation required under Federal wetland protection rules (See Section 7).

6.2.4 Water Quality

Stream Conditions and Stormwater

As discussed in Section 6.2.3, sediment loads in runoff can increase due to construction activities. This could degrade water quality and stream habitats. Sediment control ordinances are currently in place within the entire service area. These ordinances require permitting and inspection of sediment and erosion control measures during construction (See Section 7). These programs can reduce the amount of sediment entering waterways during future construction activity associated with increased development.

Future increases in land use development and density increases within the service area were discussed in Section 6.2.2. As the amount of impervious surface area within a sub-basin increases, the water quality and aquatic habitat quality generally decline due to changes in the source, volume, frequency, and duration of stormwater flows. Pollutants associated with stormwater runoff from impervious surfaces that may enter surface waters include total suspended solids (TSS), total nitrogen (TN), total phosphorus (TP), fecal coliforms, hydrocarbons, and heavy metals. Other effects of increased watershed impervious area include alteration of the natural hydrograph (particularly increased stream flows and velocities during storm events), increased frequency of high storm flows, and lower and more frequent low flow conditions. Altered hydrographs produce changes in channel morphology (channel straightening, bed scouring and stream back erosion) and subsequent degradation of instream and floodplain habitat.

Without the implementation of stormwater BMPs, researchers have suggested that watersheds with impervious cover greater than 12% generally results in declines in water quality, habitat quality, and aquatic organism diversity and abundance (Schueler 1994). Post-construction stormwater detention and stormwater treatment requirements would be implemented throughout the service area as required by post-construction ordinances and water supply watershed protection requirements to help minimize these impacts. Measures such as stream buffer requirements and stormwater detention BMPs would be utilized to minimize impacts to water quality and water resources within the service area. These measures protect natural stream hydrology and riparian buffers, which in turn minimize streambank erosion, water quality impairments, and aquatic habitat degradation.

Most water bodies and streams within the service area are meeting water quality standards and designated uses, but current biological sampling results indicate that development has adversely impacted streams. Post-construction stormwater BMP requirements were adopted in 2007 by almost all municipalities within the service area. These new rules, along with the other programs discussed in 6.2.3 and Section 7 would help minimize impacts associated with continued development. All municipalities within the project service area enforce minimum riparian buffer widths along perennial streams. The Mecklenburg County and City of Charlotte portions of the service area adopted riparian protection rules that require wider riparian buffers for both perennial and intermittent streams than what is required by the State.

All Alternatives would result in some adverse secondary and cumulative impacts to surface water and water quality within the service area. Continued growth and development would occur under the No Action Alternative as well causing impacts to surface water and water quality. The secondary and cumulative impacts to surface waters are potentially greater under Alternatives 2-6 due to the higher land use densities supported by these alternatives. These adverse impacts to water quality would be minimized through riparian protection, erosion control, and stormwater management requirements already established in the service area.

Reservoir Conditions

Lake Wylie has had problems in the past with excess nutrients and eutrophication (1992 303d list) which resulted in the development of a TMDL for chlorophyll-*a* that was approved in 1996 and fully implemented in 2001. This TMDL established point and non-point source limits for total nitrogen and total phosphorus entering the lake. Water quality data indicate that conditions in Lake Wylie have been improving since implementation of the TMDL. Current water quality modeling indicates that all of the alternatives, even those with the highest capacity that would result in the greatest quantity of effluent discharged, would support continued compliance with water

quality standards in Lake Wylie. A description of the water quality modeling process and results are included in Appendix C.

6.2.5 Groundwater Quality

Alternatives 2-6 would allow future development to utilize public sewer systems rather than septic systems or package wastewater treatment plants. The use of public sewer systems would reduce the probability of groundwater contamination from leaking or failing septic systems, which would be a beneficial secondary impact.

Under Alternatives 2-6, future development facilitated by the existence of public sewer systems may degrade groundwater quality if contaminants common to urban activities (such as fertilizers, petroleum products, metals and bacteria) reach groundwater. The increase in impervious surfaces associated with development may slow the rate of groundwater infiltration and recharge, which could reduce the yield of existing groundwater wells and stream recharge rates. Impervious surfaces would be limited by the water supply watershed protection rules in place in the Mount Holly portion of the service area, as well as in a large percentage of the Gar, Lower Mountain Island, Paw, and Catawba, and portions of the Long Sub-basins (Figures 5.6a and 6.2c).

6.2.6 Water Supply

As discussed in Section 5.6, Lake Wylie and Mountain Island Lake supply drinking water to municipalities around the Charlotte-Mecklenburg Metropolitan area. Mountain Island Lake is the source of drinking water for the City of Charlotte, the City of Gastonia, the City of Mount Holly, and much of Mecklenburg County. Lake Wylie is the source of drinking water for the City of Belmont and downstream communities, including the Cities of York and Rock Hill, South Carolina.

Water supply watershed protection rules in place within the service area would reduce the secondary and cumulative impacts to water supply quality associated with continued growth. The rules include limitations on the percentage impervious surface within the watershed, the establishment of minimum buffer requirements and density restrictions. Approximately 62% of the service area falls within water supply watershed protection areas, as illustrated in Figures 5.6a and 6.2c. Land within critical water supply areas on the Mecklenburg side of the service area is subject to a 100 foot water supply watershed protection riparian buffer. The State's Catawba buffer rules require the protection of a 50 foot riparian buffer along the mainstem of the Catawba River (Lake Wylie and Mountain Island Lake are included).

As the population in the service area and the region grows, additional water would be removed from Lake Wylie to supply the increasing water demand. Larger water withdrawals from Mountain Island Lake could reduce the volume of water released to Lake Wylie under the all alternatives including the No Action Alternative. Alternatives 2-6 would re-introduce water into Lake Wylie instead of continuing to remove almost all of this water entirely from the Lake. Alternatives 2-6 would increase the amount of water available in Lake Wylie and supplement low flows during future drought conditions. Water reuse possibilities associated with Alternatives 2-6 may also increase the quantity of water available in Lake Wylie for recreation, water supply, cooling water supply, and power generation purposes. Under drought conditions and current Low Inflow Protocols (LIP), additional water in Lake Wylie would increase the number of days that a minimum release of 700 cfs could be maintained at the Lake Wylie Dam (Table 6-5), providing additional water supply volume to communities utilizing Lake Wylie. The

approximate annual power generation increases at the Wylie Hydroelectric Station associated with each alternative are provided in Table 6-5.

Table 6-5 Additional Power Generation and Annual Lake Wylie Storage Associated with Each Alternative

Alternative	Flow Increase (mgd)	Approximate Annual Increase in Power Generation (megawatt hours and equivalent time)	Additional Annual Storage in Lake Wylie Under LIP
No Action	0	0 mwh (0 hours)	0 days
Alternative 1	4	271 mwh (5 hours)	3.2 days
Alternative 2	17	1150 mwh (20 hours)	13.6 days
Alternatives 3, 4, 5, and 6	21	1421 mwh (24 hours)	16.8 days

These beneficial secondary and cumulative impacts would not occur under the No Action Alternative. Fewer beneficial secondary and cumulative impacts would be produced by Alternative 1 with the greatest benefits occurring under Alternatives 3-6. Current water quality modeling indicates that the WWTP discharge associated with Alternatives 2-6, even at the highest capacity, would not produce conditions that violate NC or SC drinking water standards at any point in Lake Wylie (Appendix C).

6.2.7 Wildlife and Aquatic Resources and Habitats

Increased development within the service area would adversely impact wildlife and habitat resources. It is unlikely that impacts would be avoided regardless of which alternative, including the No Action Alternative, is implemented. Areas of open space could be lost or decrease in size, which would likely result in increased habitat fragmentation. A loss of mature forests and increased habitat fragmentation due to development would result in the loss of animal species assemblages that use these habitats and require large undisturbed areas. Species that tolerate fragmented habitat (edge species) such as cow birds and deer, plant species that rely on disturbance, and invasive, non-native plants, would likely continue to inhabit the service area and their populations may even increase.

Cumulatively, land use changes would fragment the landscape and make wildlife movement more difficult. Over time, a decrease in wildlife species abundance may occur as suitable habitat declines. This impacts the sustainability of wildlife populations and may decrease species and genetic diversity. An increase in edge habitats and subsequent loss of refuge habitat can result in an increase in wildlife fatalities.

Increases in stormwater runoff from developing areas typically results in a significant decrease in water quality, stream habitat, and a subsequent decrease in diversity and abundance of aquatic organisms. Septic system failure can result in excess nutrient and bacterial loadings in streams. Alternatives 2-6 may reduce impacts associated with septic systems in areas that are not currently serviced by a public sewer system. Figure 6.2a identifies the portions of the service area that are currently not served by public sewer. Approximately 80% of the service area is currently served by public sewer service and the remainder would be expected to obtain public sewer service according to future land use plans. As described in Section 6.2.3, stormwater ordinances and/or buffer requirements adopted by all municipalities within the service area should reduce secondary and cumulative impacts to aquatic habitats.

6.2.8 Rare and Protected Species and Habitats

All of the five federally listed plant species that currently exist within the service area inhabit disturbed and maintained areas such as road and utility right of ways (ROWs). These are: Schweinitz's sunflower, Michaux's sumac, smooth coneflower, Georgia aster, and Carolina Birdsfoot-trefoil. As development increases the amount of early successional habitat would increase in ROWs and more habitat would potentially be created for these plant species.

There is no recent evidence that Carolina elktoe or Carolina heelsplitter continue to occur within the service area. Fish and mussel surveys conducted in early 2008 did not find evidence of any endangered fish or mussels in streams within the service area. No critical habitat has been designated for the Carolina elktoe or Carolina heelsplitter within the service area. Continued development would not impact these species.

Other sensitive species within the service area that are not federally listed but are listed as State Species of Concern could be adversely impacted by future development through the loss and degradation of critical habitat. These impacts are expected to be minimized or mitigated by open space preservation actions and existing development regulations described in Section 7.

6.2.9 Public, Scenic, and Recreational Areas

Mecklenburg and Gaston Counties are making considerable efforts to preserve public land and develop recreational facilities along the Catawba River and throughout the service area, which is reflected in their future land use plans. Alternatives 2, 5, and 6 would create almost 80 acres of additional preserved open space with opportunities for hiking or biking trails and possibly a new canoe launch on Long Creek. Alternatives 2, 5, and 6 could also provide new public meeting space at the WWTP. The City of Mount Holly is building a greenway along the Catawba River/Lake Wylie from its river front property near the existing WWTP all the way up to Mountain Island Lake. The City of Mount Holly also has plans to significantly expand and enhance their river front park. The stakeholder group discussed the possibility of building a foot bridge across the Catawba to connect Mount Holly's river front park and greenway with the Whitewater Center. Mecklenburg County strategic land use planning for the southern portion of the service area has identified additional public resources for recreation and conservation. In addition, two non-profit groups, the Catawba Lands Conservancy and the Trust for Public Lands, continue to engage in land conservation efforts that would result in the obtainment of easements that protect valuable ecological resources in the area. Communities throughout the service area are implementing open space and park planning projects and comprehensive land use planning that should reduce the secondary and cumulative impacts associated with all alternatives, including the No Action Alternative.

Lake Wylie is an excellent recreational fishery that draws large numbers of people throughout the year and has hosted Major Bassmaster and other fishing tournaments, which provide economic benefits to the region. Water supply watershed protection programs and riparian buffer requirements should serve to minimize secondary and cumulative impacts to Lake Wylie's fishery by protecting water quality. New post construction stormwater requirements will further protect aquatic habitat within the lake. Alternatives 2-6 would provide additional treated water to the lake throughout the year, which would help improve aquatic habitat during periods of drought. Current water quality modeling shows that the additional nutrient load associated with Alternatives 2-6 would not produce any violations of water quality standards (Appendix C). The No Action Alternative would not discharge additional water to Lake Wylie; Alternative 1 would provide significantly less water to Lake Wylie than Alternatives 2-6.

6.2.10 Energy Resources

Any new facility constructed for Alternatives 2-6 would incorporate elements of Leadership and Energy and Environmental Design (LEED) in order to conserve energy and water and utilize local sustainable products and materials. Under the No Action Alternative wastewater would continue to be pumped over 20 miles to the McAlpine Creek WWMF. The energy consumed for this purpose would be conserved under Alternatives 2-6. Alternatives 2-6 would also provide additional water to the Lake Wylie system that could be used for hydroelectric power generation or as cooling water. Table 6-5 includes Duke Energy's estimates of the approximate amount of power that could be generated due to additional flow associated with the different alternatives. In addition, Lake Wylie provides cooling water to the Wylie Hydroelectric Station, Allen Steam Station, and Catawba Nuclear Station. The No Action Alternative would not result in energy savings, additional electricity production, or additional cooling water supplies. Alternative 1 would produce fewer beneficial secondary and cumulative impacts, than those produced under Alternative 2 with the greatest benefits produced by Alternatives 3-6.

6.2.11 Archeological or Historical Resources

Existing State and Federal policies should sufficiently protect areas of archaeological or historical value from secondary and cumulative impacts. Any large-scale development activity in the service area would likely require an archeological and historical investigation, in accordance with current regulations (discussed in Section 7). Direct impacts to historic resources would be assessed individually during the planning of future projects in the service area. There is some chance that historic resources could be inadvertently lost or impaired during development activities such as the destruction of an unknown cemetery but there are regulations in place to reduce the likelihood of this occurring. The low density of cultural and historic resources within the service area (Figure 5.10a) suggests few secondary and cumulative impacts to these resources would occur under any alternative (no difference in secondary and cumulative impacts between alternatives).

6.2.12 Prime Agricultural Lands

Future land use planning data indicates that only a very small amount of farmland will remain within the service area under future development scenarios. As discussed in Section 5, few areas of agriculture currently remain with the Gaston or Mecklenburg County portions of the service area. Most prime farmlands have already been converted to other land uses, including residential, institutional, industrial, and open spaces. As discussed in Section 5.11, a small amount of agricultural land use currently exists in the service area, amounting to approximately 725 acres (1.3% of the service area).

Development and reduction in prime agricultural lands would occur under any of the alternatives, including the No Action Alternative. Impacts to prime farmland could include degradation of agricultural uses through the introduction of adjacent incompatible residential or commercial land uses. Because of the small amount of land currently being used for agricultural purposes in the service area and the lack of future planning for agricultural land use, few if any secondary and cumulative impacts to prime agricultural lands are anticipated under any Action Alternative.

6.2.13 Air Quality

As development increases and the I-485 expansion is completed, traffic volumes would increase within the service area. The additional vehicle miles traveled would result in increased air pollutant emissions such as carbon

monoxide, fine particulates, and ozone producing compounds, such as nitrogen and sulfur oxides. The secondary and cumulative impacts to air quality would likely be the same under all alternatives including the No Action Alternative. The lower density development associated with the No Action Alternative could create sprawled development patterns, which would increase vehicle travel distances and associated increases in air emissions. Existing Federal and State air quality protection programs and efforts to bring the area into compliance with the eight-hour ozone standard would continue to be implemented and are anticipated to result in improved air quality with Gaston and Mecklenburg Counties (*DAQ, 2007).*

6.2.14 Nuisance Conditions (Noise, Odors, Dust)

Development within the service area would increase noise levels through the introduction of additional domestic and commercial traffic. Noise would be generated from new residences, businesses, and industries in the area. The increased noises associated with development would increase ambient noise levels, which could impact wildlife behavior. Local noise ordinances would be in effect to limit extreme noise producing activities.

6.2.15 Toxic Substances

Toxic substances can be introduced into the environment through agricultural activities, new construction, households, vehicles and machinery use. Typical agricultural substances used include fertilizers and pesticides. Construction activities can introduce glues, solvents, and paints into the area. Typical household wastes include oils, cleaners, solvents, paints, herbicides, and fertilizers. The operation of vehicles and machinery can result in the release of fluids such as hydrocarbons and cooling fluid that would be contained within soils or could be conveyed through stormwater runoff.

Section 7. Impact Minimization and Mitigation

Some direct and secondary and cumulative impacts would occur as a result of any of the Action Alternatives or the No Action Alternative. The potential direct environmental consequences of the proposed action at the project sites have been considerably reduced as a result of avoidance and minimization during the site selection process. A substantial number of programs (local, state, and federal) currently in place would further serve to minimize and mitigate direct impacts on the site as well as secondary and cumulative impacts throughout the service area. A summary of these programs, policies, and regulations is provided by resource area in Table 7-1. Impact minimization and mitigation measures are discussed in detail in this Section. A list of the individual ordinances and policies referred to in this chapter are presented in Appendix J, which contains web links to the specific ordinance texts that were available online. A CD of all ordinances is also included in Appendix J.

7.1 Site/Facility Minimization and Mitigation Measures

Utilities and Mount Holly would use site and facility construction techniques and compliance with local regulations to ensure that direct and secondary impacts at the site would be minimized to the extent practicable. Enhancements to site design, construction, and operation that would minimize impacts include:

- **Leadership in Energy and Environmental Design (LEED)** – A new WWTP would be designed, constructed and maintained using LEED standards for sustainability, water efficiency, energy and emissions, materials and resources, indoor environmental quality, and innovation in the design process where feasible.
- **Low Impact Development (LID)** – Any new facility would use LID methods to control and treat stormwater by using innovative techniques. The project team is considering green roofs, rain gardens, and/or infiltration trenches.
- **Landscaping** – Native plants would be used as much as practicable in facility landscaping to provide habitat.
- **Site Recreational Enhancements and Opportunities** – A regional WWTP would capitalize on its proximity to the U.S. National Whitewater Center, existing open space, and plans for development of a regional greenway to provide complementary open space and recreational opportunities.
- **Advanced Wastewater Treatment** – Any new facility would be designed to provide advanced wastewater treatment including nutrient removal, ultraviolet light (UV) disinfection (reduces the use of chlorine), spill prevention and containment features, odor control, noise and lighting reduction components.

7.2 Minimization and Mitigation of Direct and Secondary Impacts

The resource areas that would experience direct impacts at the site and secondary and cumulative impacts in the service area include land use and land cover, water quality, wetlands, floodplains, and recreational lands. Impacts associated with land use and land cover, generally expressed as changes in stormwater quality and volume, and water quality, would be minimized and mitigated through compliance with National Pollutant Discharge Elimination System (NPDES) municipal separate storm sewer systems (MS4) permit requirements, riparian buffer rules, floodplain protection ordinances, stormwater ordinances, permitting and inspection programs, and local

planning programs. Local planning processes seek to preserve existing open space and direct the development of new recreational areas. Zoning and subdivision ordinances and local planning efforts establish complementary land uses, control impacts, and direct growth. Direct impacts to water quality associated with the nutrients in discharged wastewater would be minimized through adherence with NPDES permitting requirements established by DWQ in consultation with DEH.

Impacts to wetlands and floodplains in the service area would be minimized by compliance with programs, policies, and rules established by the DWQ, the Duke Energy Shoreline Management Plan, Mecklenburg County Stormwater Services, Gaston County, the City of Mount Holly, and the United States Army Corps of Engineers (ACOE). Water supply protection and stormwater ordinances protect riparian buffers on waterways throughout the service area. The widths of riparian buffers required within the service area vary depending on factors including agency jurisdiction, watershed size, water supply classification, and development density. Mecklenburg County and City of Charlotte buffer rules are more stringent than required by the State and include wider buffers and protection of intermittent streams. Wetlands within the service area are regulated by the ACOE and the DWQ and any impacts to jurisdictional wetlands would be mitigated under current Federal and State laws.

Table 7-1 Summary of Minimization and Mitigation Measures

Resource Area	Minimization of Direct Impacts	Minimization of Secondary and Cumulative Impacts	Regulation/Guidance
Topography and Soils	Avoid areas with high erosion potential; implement erosion control BMPs; use onsite backfill; prompt re-seeding of construction areas.	Use of silt fencing, reseeding, and other erosion and sediment control techniques. Compliance with Erosion and Sediment Control Ordinances.	Mecklenburg Co. and Gaston Co. Erosion and Sediment Control Ordinances (permits and inspection required).
Land Cover and Land Use	The site selection and alternatives evaluation process maximizes the use of previously disturbed areas and/or reuse of existing industrial and municipal infrastructure sites.	Counties and cities have land use plans that direct development into compatible areas and protect other areas.	Zoning and Subdivision Ordinances. Mount Holly Future Land Use Plan 2001 Mecklenburg 2015 Plan and Charlotte-Mecklenburg Future Land Use GIS data. Duke Shoreline Management Plan.
Wetlands	The potential minor direct impacts to wetlands are not anticipated, but would be avoided through construction practices.	Impacts avoided as wetlands are protected by State and Federal programs.	Section 404 of Clean Water Act. Riparian buffer protections established by stormwater ordinances and watershed overlay districts.

Resource Area	Minimization of Direct Impacts	Minimization of Secondary and Cumulative Impacts	Regulation/Guidance
Floodplains	No 100-year regulatory or community floodplain impacts by preferred alternative. Community floodplain (Mecklenburg Co. is more stringent than state or federal requirements.)	Mecklenburg County communities' Flood Damage Prevention Ordinances that are more stringent than state standards control and minimize development in floodplains. Future conditions floodplain maps provide protection at estimated build out of watershed. Gaston County and Mount Holly also manage floodplain development for NFIP compliance.	Participation in National Flood Insurance Program. Flood Damage Prevention Ordinances: Gaston Co., Mount Holly, Mecklenburg Co., Charlotte, Huntersville. Future Conditions floodplain maps in Mecklenburg County.
Water Quality	Use of directional boring to cross Catawba River, Long Creek, and Paw Creek. Preservation of riparian buffers; re-seeding of all disturbed areas.	NPDES Phase II Post-Construction stormwater ordinances in all local areas are compliant with or more stringent than State requirements.	USACE NWP 12; CWA 401/404 WQ Permit; Erosion and Sediment Control Plan; DENR guidance; USFWS guidance. Riparian buffer protections established by stormwater ordinances and watershed overlay districts.
Stormwater Quality and Quantity	Regional facility would use low impact development (LID) practices to treat and retain stormwater on site such as rain gardens and green roofs.	Stormwater treatment and detention required. LID required in Huntersville and encouraged throughout the service area. NPDES Phase II post-construction stormwater ordinances in all local areas are compliant with or more stringent than State requirements.	MS4 NPDES Phase II post-construction stormwater ordinances.
Riparian Buffer	Maximize width of riparian buffers to minimize impacts to aquatic habitat and water quality.	Riparian buffer protections established. Charlotte-Mecklenburg requires greater buffer protection than required by the State.	State, local and Duke Energy Shoreline Management Plan buffer protection requirements and Watershed Overlay Districts.
Lake Wylie Water Quality	Low nutrient limits (nitrogen and phosphorus) in NPDES discharge permit.	Water supply watershed protection rules apply to 62% of the service area.	DWQ NPDES permitting program.

Resource Area	Minimization of Direct Impacts	Minimization of Secondary and Cumulative Impacts	Regulation/Guidance
Groundwater Quality	No impacts expected.	Density limitations and buffer requirement create opportunities for stormwater infiltration. Minimal use of onsite wastewater treatment and private wastewater facilities.	Stormwater ordinances and watershed overlay districts.
Water Supply	Riparian buffer protection and intensive stormwater treatment and detention. Water conservation and reclaimed water production associated with regional wastewater facility.	Density limitations and buffer requirements.	Protections established by stormwater ordinances and watershed overlay districts. Catawba-Wateree Water Management Group developing initiatives to improve water and energy conservation, drought management, and water quality (Charlotte-Mecklenburg Utilities is a member).
Wildlife and Aquatic Resources and Habitats	Minimize forest disturbance and implement stormwater control measures.	Minimize open space and forest disturbances. Implement stormwater control measures. Open space preservation requirements.	USACE NWP 12; CWA 401/404 WQ Permit; Sediment and Erosion Control Plan; DENR guidance; USFWS guidance.
Rare and Protected Species and Habitats	Surveys were completed and known occurrences of endangered species would be avoided and/or managed in compliance with the Endangered Species Act and in consultation with state and federal agencies.	Surveys of representative streams in the service area were completed to ensure that federally listed mussel and fish populations would be protected. No occurrences of federally listed species were found.	Endangered Species Act of 1973; DENR; NHP, and USFWS guidance; Watershed Overlays; Zoning and Subdivision Ordinances.
Public, Scenic and Recreational Areas	The new regional wastewater facility would cooperate with local plans for trails, greenways, and recreational facilities. Facility location is compatible with Duke Shoreline Management Plan classifications. Odor control measures installed; visual vegetative buffer surrounding the facility.	Counties and cities have land use plans that direct development into compatible areas and protect other areas. Open space preservation requirements.	Zoning, Subdivision, and Stormwater Ordinances and Watershed Overlays.

Resource Area	Minimization of Direct Impacts	Minimization of Secondary and Cumulative Impacts	Regulation/Guidance
Energy Resources	Energy efficient design, LEED principles and possible certification. If produced, use of methane gas produced at plant to heat anaerobic digesters.	Reduction in energy used to pump wastewater. Increased water available for power generation at Duke's Wylie Dam and powerhouse and for cooling water use at multiple energy generation facilities.	None identified.
Archeological or Historical Resources	Maximize use of previously disturbed lands minimizes potential for impacts to cultural resources. No known archaeological or historical resources on project sites. Depending on alternative chosen, archaeological survey would be conducted prior to construction.	Avoidance of NHRP-listed historic sites, archeological sites, or structures.	State Historic Preservation Office Guidance, Section 106 National Historic Preservation Act.
Prime Agricultural Lands	None in project site.	Avoid prime farmlands as much as practical.	NRCS list of Prime Farmlands.
Air Quality	If produced, possible use of methane gas to produce energy at plant instead of flaring the gas. Operation of diesel generators to occur only in cases of emergency or power outages.	Continue to enforce existing State and Federal air pollution control measures. Continue to implement local measures such as high occupancy vehicle lane on I-77 in Mecklenburg County, express bus routes, pedestrian and bikeway projects.	NC Emergency Generator General Air Permit. Federal vehicle emission and fuel standards. State emissions testing and vehicle inspection program
Nuisance Conditions (Noise, Odors, Dust)	Construction would typically occur only during normal daylight working hours. Incorporate odor control measures into design of facilities.	Sanitary sewer overflow (SSO) abatement programs. Increased wastewater treatment capacity could reduce potential for SSOs.	Collection System Design Rules. Existing Utilities Wastewater Collection System Permit (#WQCS00001)
Toxic Substances	Prevention of fresh concrete from coming into contact with waterways.	Application of herbicide conducted by a certified applicator. Stormwater pollution prevention plans.	USACE NWP 12; Sediment and Erosion Control Plan; MS4 Permit.

7.3 Federal Programs

Several Federal regulations and programs would minimize and mitigate the impacts of the expected growth that the proposed wastewater facility would be constructed to serve. Those most likely to minimize impacts associated with

the proposed regional wastewater facility include the Clean Water Act, Endangered Species Act, and National Flood Insurance Program.

7.3.1 Clean Water Act

The Clean Water Act (CWA) is the primary federal law in the United States governing water pollution and protection of water quality. In North Carolina, the Clean Water Act is administered primarily by DWQ, except Section 404, which is administered by the Army Corps of Engineers (ACOE). Sections of this law and associated programs that would influence development within the service area are discussed in this section.

National Pollutant Discharge Elimination System (NPDES) Stormwater and Individual Discharge Permits

The National Pollutant Discharge Elimination System (NPDES) permit program was established by the Environmental Protection Agency (EPA), as authorized by the Clean Water Act (CWA), to track and control point source discharges of pollutants. The EPA has delegated authority to states (DWQ) to issue permits controlling the discharge of pollutants. The NPDES program was expanded to permit municipal stormwater discharge (municipal separate storm sewer systems; MS4) in 1990 (Phase I) and was further expanded in 1999 (Phase II). Large and medium municipalities with populations over 100,000 are covered under the NPDES Phase I stormwater program. Smaller communities are permitted under the NPDES Phase II stormwater program. The local MS4 program specifics are described in Section 7.3.1 of this Section.

Section 303(d)

Section 303(d) of the CWA requires that states develop a list of all waters not meeting water quality standards. This is done in North Carolina by the Division of Water Quality (DWQ). Water quality standards are established to protect different designated uses such as drinking water supply, contact recreation, and aquatic life support. Waters listed as not meeting their designated use and/or the associated water quality standards require the development of a total maximum daily load (TMDL). A TMDL specifies the maximum amount of pollutant (from both point and non-point sources) that a waterway can assimilate while still meeting water quality standards. Further, the TMDL includes an allocation of specified pollutants to each contributing source identified within the watershed. TMDLs that provide additional controls on development have been implemented in the service area for Long Creek and Lake Wylie. Improvements to treatment technologies and implementation of non-point source controls within the Lake Wylie watershed have resulted in improved water quality. Phosphorus concentrations have decreased significantly. Compliance with post-construction stormwater rules, sediment and erosion control requirements, and State and local rules that protect the riparian buffers along Lake Wylie and the Catawba River and limit development densities in critical and protected areas of the watershed would further improve water quality and help achieve compliance with TMDLs.

Sections 401/404

Sections 401 and 404 regulate the discharge of dredged or fill material into waters of the United States, including wetlands. Activities in waters of the United States regulated under this program include fill for development, water resource projects (such as dams and levees), infrastructure development (such as highways and airports), and mining projects. Under Section 401, states are delegated authority to issue 401 Water Quality Certificates for all activities requiring a federal Section 404 permit. This is done in North Carolina by the DWQ. Under Section 404, the US Army Corps of Engineers (ACOE) has regulatory permitting authority over the dredging or filling of these waters. Nationwide permits that identify predetermined minimization and mitigation activities are available for

utility line construction (Nationwide permit 12). Section 404 permits and Section 401 certification are typically processed by the ACOE and DWQ at the same time and stipulate general impact avoidance, minimization, and mitigation measures. Jurisdictional waters must be identified and avoided when possible. Unavoidable impacts are permitted but must be minimized to the extent possible. Remaining impacts require compensatory mitigation at approved ratios. Mitigation is accomplished by restoring, enhancing, and preserving streams and wetlands off site.

7.3.2 Endangered Species Act

The Endangered Species Act (ESA) of 1973 provides federal protection for species of fish, wildlife, and plants listed as federally threatened or endangered and for the protection of the ecosystems on which they depend. The United States Fish and Wildlife Service (USFWS) and National Oceanic and Atmospheric Administration (NOAA) Fisheries share joint responsibility for implementing measures outlined in the ESA. Under this act, provisions are made for listings, species recovery and habitat conservation planning, designation of listed species critical habitat, and federal interagency and state cooperation and consultation.

7.3.3 National Flood Insurance Program

The Federal Emergency Management Agency (FEMA) regulates 100-year floodplains and floodways across the United States through community participation in the National Flood Insurance Program (NFIP). To participate in the NFIP, communities are required to comply with federal and/or more stringent local floodplain ordinances, providing protections within the floodway and the 100-year (or "regulatory") floodplain. Floodways and floodplains are delineated and recorded on Flood Insurance Rate Maps (FIRMs). The most recent revisions to FIRMs in North Carolina include a digital version (DFIRMs). The participation in the NFIP by communities within the service area is discussed in Section 7.5.3.

7.3.4 Clean Air Act

A number of Federal programs have been implemented under the Clean Air Act to control and reduce the emission of air quality pollutants from mobile sources: Tier 1 and 2 Vehicle Standards, Large Non-road Diesel Engines Rule, Non-road Spark-Ignition Engines and Recreational Engines Standard, and Clean Air Interstate Rule. The Tier 1 and 2 vehicle standards require new passenger vehicles, light-duty trucks, larger pickup trucks, and sport utility vehicles (SUVs) to meet more stringent emission control standards. Tier 2 also reduces the allowed sulfur content of gasoline in order to reduce NOx emissions. The Large Non-road Diesel Engines rule were phased in starting in 2008 and establish sulfur content limits for diesel fuel and sets emissions standards for non-road diesel engines, such as those used in construction. The Non-road Spark-ignition Engines and Recreational Engines standard, effective in 2003, regulates NOx, hydrocarbon (HC) and CO for previously unregulated non-road engines such as all terrain vehicles, marine diesel engines, and forklifts. The Clean Air Interstate Rule establishes state caps for NOx and sulfur dioxide (SO2) starting in 2009 and will impact stationary fossil-fuel-fired boilers and combustion turbines such as Duke's Allen Steam Station and Riverbend facilities in Gaston County. These facilities have already reduced their NOx emissions (DAQ, April 2007).

7.4 State Programs

In response to Federal and State initiatives a number of programs have been established that result in reduced impacts to the environment.

7.4.1 Water Supply Watershed Protection Rules

The State has established water supply protection classifications and associated water quality criteria and management strategies (51A NCAC 02B .0104) within water supply watersheds. Management strategies include limiting development density, requiring stormwater BMP implementation, and riparian buffer preservation. The State required all local governments having land use jurisdiction within water supply watersheds to adopt and implement water supply watershed protection ordinances, maps, and a management plan by January 1, 1994. Local governments may adopt the State Model Ordinance or their own more stringent water supply protection rules. State water supply watershed requirements allow up to 10% of each jurisdiction's portion of WS-II, WS-III, and WS-IV watersheds outside of the critical area to develop new projects and expansions to existing development at up to 70% built-upon surface area (10%-70% or Special Intensity Allocation (SIA) option).

The City of Mount Holly has adopted a number of watershed overlay districts under their Zoning Ordinance: Lake Wylie Watershed Critical Area (LWWS-CA), Lake Wylie Watershed Protected Area (LWWS-PA), Mountain Island Lake Watershed Critical Area (MILWS-CA), and Mountain Island Lake Watershed Protected Area (MILWS-PA). Development restrictions within these watershed overlay districts meet the State's water supply watershed protection requirements. In August 2005, the Mount Holly adopted the High Density option which allows for greater development density within LWWS-CA (24-50%) and LWWS-PA (24-70%). This option requires BMP implementation to manage stormwater runoff when an Erosion and Sediment Control Plan is required (development $\geq$1 acre). The SIA option was removed from the zoning ordinance thereby limiting development densities to a maximum of 50%. Mount Holly uses the low density option as well which limits development o 24% and does not require stormwater BMP implementation.

Gaston County adopted a Watershed Protection Ordinance that applies to the portions of the service area within unincorporated areas of Gaston County and within the Town of Stanley and its extra territorial jurisdiction (ETJ). Within the service area the unincorporated areas of the County and a small portion within the Town of Stanley are classified as Catawba River WS-IV-PA. Gaston County also issued a Unified Development Ordinance which specifies development density requirements, buffer widths and stormwater controls in water supply watersheds as well as open space and floodplain protection requirements.

The City of Charlotte and Mecklenburg County have adopted three different watershed overlay zones within the service area: Mountain Island Lake, Catawba River/Lake Wylie, and Lower Lake Wylie. These watershed overlay districts place more stringent control on development (lower development densities and wider riparian buffers) than the State rules require.

Table 7-2 describes the development restrictions associated with the critical areas (CA) and protected areas (PA) within all jurisdictions in the service area. All of the waters within the service area are WS-IV, WS-IV CA, or WS-IV B CA. For comparison purposes the state minimum water supply watershed protection rule's development restrictions and buffer requirements are included in Table 7-2. Figure 6.2c identifies the state and local watershed overlays in place in the service area.

Table 7-2 Development Restrictions and Buffer Requirements in Watershed Overlay Districts and State Rules for Water Supply IV Waters

Overlay District	Maximum Residential Density (dwelling units/acre)	Minimum Lot Size (acres)	Maximum Built Upon Area	Buffer Width (feet)
State Water Supply Watershed Protection Rules				
Class IV CA Low Density	2 or meet BUA%	0.5	24%	30
Class IV CA High Density	2 or meet BUA%		50%	100
Class IV PA Low Density	2 or meet BUA%	0.5 or 0.33 if no curb and gutter	24%	30
Class IV PA High Density	2 or meet BUA%		70%	100
Charlotte-Mecklenburg Mountain Island Lake				
CA 1 Low Density	0.5	2	6%	100
CA 1 High Density	No high density allowed			
CA 2 Low Density	1.0	1	12%	100
CA 2 High Density	No high density allowed			
Charlotte-Mecklenburg Catawba River/Lake Wylie				
CA Low Density			24%	100
CA High Density			50%	100
PA Low Density			24%	40
PA High Density			70%	100
Charlotte-Mecklenburg Lower Lake Wylie				
CA Low Density			20%	50
CA High Density			50%	100
PA Low Density			24%	40
PA High Density			70%	100
City of Mount Holly				
MILWS-CA	2 or meet BUA%		24%	30
MILWS-PA	2 or meet BUA%		24% or 36% if no curb and gutter with option for 10% of watershed overlay area to be developed at 70%	30
LWWSA-CA	2 or meet BUA%		24%	30
LWWSA-PA	2 or meet BUA%		24% or 36% if no curb and gutter with option for 10% of watershed overlay area to be developed at 70%	30
Gaston County Catawba River				
Catawba WS IV PA	2 or meet BUA%	0.5 or 0.33 if no curb and gutter	24% or 36% if no curb and gutter	30/100 (high density)

7.4.2 Catawba River Riparian Buffer Protection Rules

The Catawba River Basin riparian buffer protection rules (15A NCAC 02B .0243) were established to maintain and protect existing buffers on the Catawba River mainstem from Lake James to the South Carolina border. The rule establishes a minimum buffer width of 50 feet and identifies actions allowed within the buffer such as greenways and archaeological activities. The buffer has two zones. Zone 1 is adjacent to the river and 30 feet wide and zone 2 is 20 feet wide. Different activities are allowed in each zone, but zone 1 is intended to be an undisturbed forested area. Mitigation is required if the buffer is impacted (15A NCAC 02B .0243) more than allowed under the rule. Mitigation would be required if installation of the force main under the Catawba River impacts greater than 40 linear feet of riparian buffer and has a maintenance corridor greater than 10 feet in width or impacts greater than 150 linear feet. Mitigation involves buffer restoration, and/or enhancement or the payment of a fee. Impacts to riparian buffers are allowable, but must receive prior written authorization from DENR and/or Mecklenburg County prior to disturbance (15A NCAC 02B .0243 (7) (b)).

7.4.3 Historic Preservation and Archaeological Resources

Protection of historic properties is provided through the National Historic Preservation Act as well as North Carolina State Law (GS 121-12(a)). The State law is patterned after the Federal Act, which creates a register of historic places and encourages planning for preservation of these places. While these do not provide absolute protection for historic properties, they do provide a means for eliminating or minimizing the effects of State or Federal actions on properties that are either listed on the National or State Register of Historic Places. The Federal law also provides some protections for properties that are eligible for, but have not actually been listed, in the National Register of Historic Places.

Protection of archaeological resources is provided under a variety of Federal and State regulations and programs. Federal protections include the Federal Archaeological Resources Protection Act and Executive Order 11593 Protection and Enhancement of the Cultural Environment. State protections include the Archaeological Resources Protection Act, the North Carolina Archaeological Record Program, and Executive Order XVI Protection and Enhancement of the Historical and Cultural Heritage of North Carolina. Under these laws, the State Historic Preservation Officer is responsible for the review of development projects funded, licensed, or permitted by federal or state governments to ensure that archaeological sites are considered during the planning stages of these projects. Since only a small fraction of the State has been systematically surveyed for archaeological sites, the review generally includes a prediction of whether sites are likely to occur in a project area.

7.4.4 Non-discharge Program – Sanitary Sewer Overflow Reduction Program

Minimum design criteria have been established for wastewater collection systems including pump stations and force mains. The implementation of these rules (15A NCAC 2T .305(h)(1)(D)) would reduce the potential occurrences of sanitary sewer overflows (SSOs). The rules require pump stations and force mains to install backup power equipment. Stations managing over 15,000 gallons per day would install a permanent generator and those serving less flow would be fitted with a portable generator receptacle. In order to quickly detect problems or spills, all pump stations would install an automatic alert system and audible and visual alarms. These increased design requirements would serve to reduce SSOs within the service area. A new regional treatment plant will include flow equalization facilities that allow the storage of high wastewater flows for later treatment and backup generators.

The construction of a new regional treatment plant would also lower the probability of SSOs by reducing wastewater flow in about 20 miles of force mains and sewers.

According to DENR Division of Pollution Prevention and Environmental Assistance about 20% of SSOs in 1998 were due to pipes being blocked by fats, oil, and/or grease. Fats oil and grease reduction programs are in place throughout the service area that provide public education, training for commercial operations, inspection and cleaning programs. Charlotte-Mecklenburg Utilities has developed its own Sewer Use Ordinance which provides legal authority to enforce compliance with oil and grease reduction requirements. The City of Mount Holly has passed a Sewer Ordinance that requires all new and existing food service establishments that discharge fats, oils, and grease into the sewer system to permit and install a grease trap or grease interceptor.

7.4.5 1999 NC Clean Air Bill – Air Pollution Control Programs

The State of North Carolina is implementing a number of measures to reduce the air pollution generated by mobile sources (cars, trucks, buses, etc.) within Gaston and Mecklenburg Counties. Vehicles registered in Gaston and Mecklenburg County are subject to the State's annual emissions testing and maintenance inspection program. This program evaluates vehicle carbon monoxide (CO), volatile organic compound (VOC) and nitrogen oxide (NOx) emissions and requires repairs for vehicles that do not meet emissions standards for these chemicals. The North Carolina Environmental Management Commission has revised the open burning regulation to prohibit open burning in Gaston and Mecklenburg Counties on days when the air quality is forecasted to be poor (code orange and higher action days).

7.5 Local Programs

The communities within the service area have implemented multiple ordinances, policies, agreements, and plans that would minimize the impacts of future development. Tables 7-3 through 7-8 identify the specific local requirements for stormwater treatment, stormwater detention, riparian buffer protection, floodplain protection, sediment and erosion control, and open space preservation. These and other local programs are also described in the following sections and in Appendix J.

Table 7-3 Post-Construction Stormwater Control Requirements – Structural BMP Performance

Municipality	Threshold for BMP Implementation	Required Treatment	Treatment Volume	Legal Authority
Town of Huntersville	>20,000 ft^2 redevelopment >6% Built Upon Area (BUA), >1 acre of residential dev., >1/2 acre of non-residential dev.	LID[1] Required	Runoff from first inch of rainfall Use vegetated stormwater conveyance to MEP.	Post-Construction Ordinance applies to all land within City limits and ETJ[2]. Effective June 30, 2007, revised January 10, 2008.
Mecklenburg County	>24% BUA	85% TSS removal with optional LID	Runoff from first inch of rainfall	Post-Construction Ordinance applies to all unincorporated areas. Effective June 30, 2007, revised January 10, 2008.
City of Charlotte	Residential development and redevelopment ≥1 acre and >12% BUA or lot size ≥20,000 ft^2; non-residential dev. and redev. ≥1 acre and creates >20,000 ft^2 BUA.	85% TSS[3] 70% TP[4] (Zone I-1 and I-2 developments exempt) Optional LID	Runoff from entire 1-yr storm volume and first inch of rainfall for development >12% BUA. Use of vegetated conveyances encouraged for development <12% BUA.	Post-Construction Ordinance, November, 2007 Applies to all land within City limits and ETJ.
City of Mount Holly	Residential development ≥ 1 acre and ≥24% BUA or 1 dwelling unit per 20,000 ft^2; non-residential development ≥1 acre and ≥24% BUA.		Water supply watershed Low density option: no detention or treatment High density option: runoff from first inch of rainfall	Chapter 20 Zoning Ordinance, Watershed Overlay District.
Town of Stanley	Stormwater management and permitting provided by Gaston County	Same as Gaston County	Same as Gaston County	Adopted Gaston County stormwater ordinance and have inter-local agreement with Gaston Co.
Gaston County	≥1 acre Residential or Commercial development and redevelopment	85% TSS	Treat the first inch of runoff (48 to120 hour drawdown time) BMPs cannot be located within 30 ft of any perennial or intermittent surface waters.	Gaston County Stormwater Ordinance, July 26, 2007. Applies to all portions of County except those within water supply watersheds or city limits of municipalities in Gaston County.

1. LID – Low Impact Development
2. ETJ – Extra Territorial Jurisdiction
3. TSS – Total suspended solids
4. TP – Total Phosphorus

Table 7-4 Stormwater Detention Requirements

Municipality	BUA Threshold	Detention Volume	Peak Control	Legal Authority
Town of Huntersville	>12%	Increase in volume for 1-year 24-hour storm or 2-year 24-hour storm based on zoning district	Peak storm runoff controlled for development >12% impervious; peak release not to exceed 2-year and 10-year 24 hour storm events.	Post-Construction Ordinance, June 30, 2007, revised January 10, 2008.
Mecklenburg County	>24%	Entire volume for 1-year, 24-hour storm; Volume drawdown time will be between 24 and 120 hours.	Residential: 10-yr & 25-yr, 6-hr storms or conduct downstream analysis Commercial: 10-yr & 25-yr, 6-hr storms or 10-yr, 6 hr storm and perform downstream analysis	Post-Construction Ordinance, June 30, 2007, revised January 10, 2008.
City of Charlotte	>12%	Post-development 1 year, 24-hour storm. Volume drawdown time shall be between 48 and 120 hours. I-1[1] and I-2[2] developments are exempt but shall prepare pesticide and nutrient management plans.	>12% BUA[3]: 10 and 25 yr, 6hr storms or appropriate storm frequency as determined by downstream flood analysis.	Post-Construction Ordinance, July, 2008.
City of Mount Holly		Development density limited to 24% BUA or 36% BUA with vegetative stormwater conveyances within water supply areas (entire Mount Holly jurisdiction).	Development within water supply watersheds using the low density option does not require stormwater treatment or detention.	Chapter 20 Zoning Ordinance, Watershed Overlay District.
Town of Stanley	≥1 acre	Same as Gaston County	Same as Gaston County	Has adopted Gaston Co.'s stormwater ordinance.
Gaston County	≥1 acre	Discharge associated with 1 year 24 hour storm prior to development. For redevelopment detention of any additional stormwater flow is required.	None	Gaston County Stormwater Ordinance, July 26, 2007.

1. I-1 – Light Industrial
2. I-2. – General Industrial
3. BUA – Built Upon Area

Table 7-5 Riparian Buffer Requirements

Municipality	Total Buffer Width (in feet)	Stream Zone (ft)	Managed Zone (ft)	Upland Zone (ft)	Perennial and/or Intermittent	Buffer Delineation Method	Legal Authority
Town of Huntersville	Specific Buffer widths by Watershed size: <50 acres = 30 ft ≥50 and <300 acres = 35 ft ≥300 and <640 acres = 50 ft ≥640 acres = 100 ft or entire floodplain, whichever is greater	10 20 20 30	NA NA 20 45	20 15 10 25	Both	GIS – Mecklenburg County System (currently POLARIS)	Post Construction Stormwater Ordinance, June 30, 2007, revised January 10, 2008 and Charlotte-Mecklenburg Zoning Ordinances: Watershed Overlay Districts.
	For additional Buffer requirements see Mountain Island Lake Watershed Overlay requirements for Mecklenburg County				Perennial		
Mecklenburg County	Specific Buffer widths by Watershed size: <50 acres = 30 ft ≥50 and <300 acres = 35 ft ≥300 and <640 acres = 50 ft ≥640 acres = 100 ft or entire floodplain, whichever is greater	10 20 20 30	NA NA 20 45	20 15 10 25	Both	GIS – Mecklenburg County System (currently POLARIS)	Post Construction Stormwater Ordinance, June 30, 2007, revised January 10, 2008 and Charlotte-Mecklenburg Zoning Ordinances: Watershed Overlay Districts.
	Mountain Island Lake Watershed Overlay CAs:100 ft along MIL and perennial streams Catawba River/Lake Wylie Watershed Overlay CAs: 100 ft Catawba River/Lake Wylie Watershed Overlay PAs: 40 ft low density, 100 ft high density				Perennial		

Municipality	Total Buffer Width (in feet)	Stream Zone (ft)	Managed Zone (ft)	Upland Zone (ft)	Perennial and/or Intermittent	Buffer Delineation Method	Legal Authority
City of Charlotte	Specific buffer widths by watershed size and watershed district. Western Catawba District, high and low density development (≤12% BUA[1]): <50 acres = 30 ft ≥50 and <300 acres = 35 ft ≥300 and <640 acres = 50 ft ≥640 acres = 100 ft plus 50% of flood fringe area beyond 100 ft.	10 20 20 30	NA NA 20 45	20 15 10 25	Both	Professional delineation using ACOE[2] and DWQ[3] methodology.	Post-Construction Stormwater Ordinance, November, 2007 and Charlotte-Mecklenburg Zoning Ordinances: Watershed Overlay Districts
	Catawba River/Lake Wylie Watershed Overlay CAs[4] and PAs[5]: same requirements as Mecklenburg County Lower Lake Wylie Watershed Overlay CAs: 50 ft low density and 100 ft high density Lower Lake Wylie Watershed Overlay PAs: 40 ft low density, 100 ft high density				Perennial		
City of Mount Holly	≥30 ft for low density development and ≥100 ft under high density option in watershed overlay districts. Any buffer disturbance activity must provide pre-construction notice to DWQ. Ordinance encourages utilization of BMPs[6] to minimize water quality impacts.				Perennial	Most recent USGS Map 1:24,000 scale	Chapter 20 Zoning Ordinance – Watershed Overlay Districts
	100 ft undisturbed buffer for residential annexation ≥ 5 lot subdivision				Not specified		Design Guidelines: Addendum to the existing Annexation Policy, adopted April 2007

Municipality	Total Buffer Width (in feet)	Stream Zone (ft)	Managed Zone (ft)	Upland Zone (ft)	Perennial and/or Intermittent	Buffer Delineation Method	Legal Authority
Town of Stanley	Same as Gaston County						Interlocal agreement in place for Gaston County to enforce Soil Erosion and Sedimentation Control Ordinance and enforce Watershed Protection Ordinance
Gaston County	≥10 ft Allow no visible siltation discharge through buffer zone. Wider buffer required when steep slopes are present. 25% of the buffer strip closest to land-disturbing activity can include natural or artificial siltation control				Not specified	Not specified	Soil Erosion and Sedimentation Control Ordinance (revised 6/28/07)
	Catawba River WS-IV-PA 30 ft within WS-IV Protected Areas for low density and 100 ft for high density				Perennial	Most recent version of USGS1:24,000 scale topographic maps or as determined by local government studies	Watershed Protection Ordinance

1. BUA – Built upon area or amount of impervious surface
2. ACOE – Army Corps of Engineers
3. DWQ – North Carolina Division of Water Quality
4. CA Critical Area
5. PA Protected Area
6. BMP – Best Management Practice

Table 7-6 Floodplain Protection

Municipality	Protected Areas	Development Limitations	Legal Authority
Town of Huntersville	Special Flood Hazard Areas (FEMA and future conditions 100-year floodplain, including the FEMA floodway and Community Encroachment area.) 500-year floodplain also receives some protections.	Floodlands development permit required. 1-foot of freeboard required (2-feet along the Catawba River including Lake Wylie and Mountain Island Lake). Nonresidential structures may floodproof in lieu of elevation. No encroachment or fill in the floodway is allowed that would result in a rise in flood elevation without a letter of map revision from FEMA.	Floodplain Regulations of Huntersville North Carolina. The Town of Huntersville designated Mecklenburg County as Floodplain Administrator to implement its floodplain ordinance.
Mecklenburg County	Special Flood Hazard Areas (FEMA and future conditions 100-year floodplain, including the FEMA floodway and Community Encroachment area.) 500-year floodplain also receives some protections.	Floodlands Development Permit required. 1-foot of freeboard required (2-feet along the Catawba River including Lake Wylie and Mountain Island Lake). Nonresidential structures may floodproof in lieu of elevation. No encroachment or fill in the floodway is allowed that would result in a rise in flood elevation without a letter of map revision from FEMA.	Mecklenburg County Floodplain Regulations, December 19, 2000

Municipality	Protected Areas	Development Limitations	Legal Authority
City of Charlotte	Special Flood Hazard Areas (FEMA and future conditions 100-year floodplain, including the FEMA floodway and Community Encroachment area.) 500-year floodplain also receives some protections.	Floodplain Development Permit and FEMA elevation or floodproofing certificate required. The City has a General Floodplain Development Permit and an Individual Floodplain Development Permit. 1-foot of freeboard required (2-feet along the Catawba River including Lake Wylie and Mountain Island Lake). Nonresidential structures may floodproof in lieu of elevation. In areas where no BFE is established, must elevate to 2-feet above highest adjacent grade. Flood hazard reduction required in special flood hazard areas. No encroachment or fill in the floodway is allowed that would result in a rise in flood elevation without a letter of map revision from FEMA.	Code of the City of Charlotte, Chapter 9 Floodplain Regulations, July 1, 2007 Mecklenburg County reviews all floodplain development permits and inspects construction.
City of Mount Holly	Special flood hazard areas (100-year floodplain and floodway)	New construction or substantial improvements must be elevated to 2 feet above the BFE or highest adjacent grade where there is no BFE. Floodproofing is allowed in lieu of elevation for non-residential structures. No encroachment or fill in the floodway is allowed that would result in a rise in flood elevation without a letter of map revision from FEMA.	Article XVI Flood Plain Management of Chapter 20 Zoning Ordinance
Town of Stanley	See Gaston County Floodplain Ordinance.	See Gaston County Floodplain Ordinance.	See Gaston County Floodplain Ordinance.

Municipality	Protected Areas	Development Limitations	Legal Authority
Gaston County	Special Flood Hazard Areas established by FEMA (100-year floodplain)	New construction or substantial improvements must be elevated to 3 feet above the BFE. Floodproofing is allowed in lieu of elevation for nonresidential structures. No encroachment or fill in the floodway is allowed that would result in a rise in flood elevation without a letter of map revision from FEMA.	Flood Damage Prevention Regulations (effective 01/22/09), Chapter 16 of Gaston County Unified Development Ordinance; Unincorporated areas of the County and areas where the municipality is not providing review.

Table 7-7 Soil Erosion and Sedimentation Control Ordinances

Municipality	Plan Required	Standards	Applicability and Legal Authority
Town of Huntersville	Same as Mecklenburg Co.	Same as Mecklenburg Co.	Adopted Mecklenburg County's Soil Erosion and Sedimentation Control Ordinance. Mecklenburg County provides plan review and inspection services.
Mecklenburg County	≥ 1 acre but all land disturbing activities required to provide adequate erosion control measures	Design protection for 10 year storm. Wetland and buffer protection Establish permanent ground cover 21 days after completion of construction; Weekly monitoring record Pre-construction conference; Encourage keeping uncovered area to <20 acres	Soil Erosion and Sedimentation Control Ordinance, amended October 2008. Unincorporated areas of County with exemptions for agriculture and forestry.
City of Charlotte	Same as Mecklenburg Co.	Same as Mecklenburg Co.	Soil Erosion and Sedimentation Control Ordinance applies to City of Charlotte, unincorporated Mecklenburg Co., and Charlotte's ETJ.

Municipality	Plan Required	Standards	Applicability and Legal Authority
City of Mount Holly	Same as Gaston Co.	Same as Gaston Co.	Gaston County enforces the County's Soil Erosion and Sedimentation Control Ordinance within Mount Holly.
Town of Stanley	Same as Gaston Co.	Same as Gaston Co.	Gaston County enforces the County's Soil Erosion and Sedimentation Control Ordinance within Stanley.
Gaston County	≥1 acre	Lake and watercourse buffers of at least 10 feet; visible siltation must not discharge through the buffer zone. Design protection for 10 year storm High Quality Water Zones (15A NCAC 2B.0101(e)(5): uncovered areas limited to 20 acres; design protection for the 25 year storm; additional sediment basin settling requirements; slope restrictions on open channels; permanent land cover established within 60 days of completion.	Soil Erosion and Sedimentation Control Ordinance (revised 6/28/07). Applies to unincorporated areas of the County with exemptions for agriculture and forestry.

Table 7-8 Open Space Requirements

Municipality	Undisturbed Open Space Requirements	Exemptions	Legal Authority
Town of Huntersville	Contiguous open space maintenance and preservation is encouraged and evaluated during subdivision plan review. Planned urban open space is required for all major subdivisions and multi-building developments not in districts zoned rural. The ordinance identifies conservation of interconnected areas with productive soils for continued agricultural and forestry use, maintenance and enhancement of wildlife habitat, and protection of unique and sensitive environmental and historic features. All these areas required by the Town to be maintained as open space would be protected with a permanent conservation easement.		Zoning Ordinance, amended July 18, 2007
Mecklenburg County	<24% BUA[1] then 25% of site set aside >24% and <50% BUA then 17.5% of project site set aside >50% BUA then 10% of site set aside Mountain Island Lake (MIL) and Upper Lake Wylie (ULW) Watershed Overlays: MIL Critical Areas (CA) 1 – 4: CA1 BUA ≤6%, CA2 BUA ≤12%, CA4 BUA ≤24%(no CA3 areas within service area)	Mitigation allowed	Post-Construction Ordinance, June 30, 2007; Revised January 10, 2008 and Charlotte-Mecklenburg Zoning Ordinances: Watershed Overlays
City of Charlotte	Natural Area Criteria: <24% BUA then 25% of site set aside ≥24% and <50% BUA then 17.5% of project site set aside >50% BUA then 10% of site set aside Upper Lake Wylie Watershed Overlay: same requirements as Mecklenburg County Lower Lake Wylie Watershed Overlay: CA low density BUA ≤20%, CA high density BUA ≤50% PA low density BUA ≤24%, PA high density BUA ≤70%	Mitigation allowed I-1[2] and I-2[3] Development and redevelopment exempt from Natural Area requirement	Post-Construction Ordinance, effective July 1, 2008 And Charlotte- Mecklenburg Zoning Ordinances: Watershed Overlays

Municipality	Undisturbed Open Space Requirements	Exemptions	Legal Authority
City of Mount Holly	• Zoning is in place that slows conversion of agricultural and low density residential land to other uses. • Development within Mount Holly is limited by the State's water supply protection rules that limit development to 2 dwelling units per acre or a maximum of 24% BUA in critical watershed areas and a maximum of 36% BUA in protected watershed areas if curb and gutter are not used. • High Density Option within the Lake Wylie and Mountain Island Lake Watershed Protected Area Overlay Districts requires 100-foot undisturbed buffers along all perennial streams • For cluster developments, non-built upon areas are to be kept in a vegetated or natural state		Chapter 20 Zoning Ordinance, Watershed Overlay District
	• Provide 1 acre of usable open space (recreational) for every 20 homes • If wooded: retain 10% of the entire site in pre-construction condition; if open fields, plant 16 additional 3" or larger trees on the site per acre developed • Preserve at least 1/3 of mature trees (18" caliber or greater) • No clear cutting allowed	Applies to voluntary residential annexation only	Design Guidelines: Addendum to the existing Annexation Policy, adopted April 2007
Town of Stanley	See Gaston County		Gaston County Watershed Protection Ordinance
Gaston County	Within service area development is limited to 2 dwelling units per acre or a maximum of 24% BUA in critical watershed areas and a maximum of 36% BUA in protected watershed areas if curb and gutter are not used. In protected watershed areas up to a maximum of 3 dwelling units per acre or 36% BUA is allowed if curb and gutter are not used.		Gaston County Watershed Protection Ordinance

1. BUA – Built Upon Area
2. I-1 – Light Industrial
3. I-2 – General Industrial

7.5.1 NPDES Municipal Separate Storm Sewer System Stormwater Discharge Permits

Owners of Municipal Separate Storm Sewer Systems (MS4s) are required by the Clean Water Act to obtain NPDES permits for the discharge of stormwater into Waters of the State. All MS4s within the service area have either a Phase I or Phase II MS4 stormwater discharge NPDES permit. Phase I stormwater programs were initiated in 1990 for cities with populations greater than 100,000; Phase II was initiated in 2003 for communities with populations from 10,000 and 100,000. The City of Charlotte has a Phase I permit. Mecklenburg County, Gaston County, City of Mount Holly, Town of Stanley, and Town of Huntersville fall under the Phase II requirements. Compliance with these stormwater discharge permits includes six minimum measures: public education and outreach, public participation and involvement, illicit discharge detection and elimination, construction site runoff control, post-construction runoff control, and pollution prevention/good housekeeping.

Post-construction stormwater minimum measure programs are intended to mitigate the effects of continuing development. These requirements are met in the service area through a combination of ordinances, local permitting and inspection programs, and use of BMP Design Manuals. The goal of post-construction programs is to produce effective stormwater management that reduces stormwater volume and velocity, minimizes pollutant inputs, and attenuates downstream flooding.

In North Carolina, MS4 stormwater discharge permit holders have the option of adopting the State Post-Construction Model Ordinance, adopting their own equivalent or more stringent ordinance, or meeting the post-construction requirements by compliance with another approved regulatory program with similar requirements. The communities in the service area comply with their MS4 post-construction stormwater requirements as follows:

- **Mecklenburg County** and the **Towns of Cornelius, Huntersville, Matthews, Mint Hill**, and **Pineville** worked together to adopt a Post-Construction Ordinance that applies to all these communities, effective June 1, 2007, and revised January 10, 2008.
- The **City of Charlotte** adopted its Post-Construction Stormwater Ordinance November 26, 2007 which took effect July 1, 2008.
- The **Gaston County** Stormwater Ordinance, effective July 2007, was also adopted by the **Town of Stanley**.
- The **City of Mount Holly** is using its compliance with State Water Supply Watershed Protection rules and agreements with Gaston County to meet its MS4 Post-Construction stormwater control requirements.

The Post-Construction Model Ordinance prescribes post-construction standards for low density and high density developments. The State minimum standards are:

- For low density projects, vegetated stormwater conveyances must be used.
- For high density projects, the first inch of runoff from the 1-year, 24-hour storm must be controlled and treated and stormwater must be treated for 85% TSS removal.
- For all projects, a minimum of 30-foot buffers around intermittent and perennial streams are required and stormwater development restrictions must run with the deed of the property. Streams are deemed present if

they are approximately shown on either the most recent version of the USDA soil survey map or USGS topographic quadrangle map, unless proven otherwise by field delineation.

Specific BMP requirements, development thresholds, and treatment volume requirements for each MS4 in the service area are described in Table 7-3 and 7-4 Buffer requirements for perennial and intermittent streams established by the post-construction or other ordinances and are described in Table 7-5. Post-construction programs for each MS4 in the service area are also described in greater detail as follows.

Mecklenburg County, City of Charlotte, and Town of Huntersville

The City of Charlotte, Mecklenburg County, and the Town of Huntersville adopted post-construction stormwater control ordinances that are more stringent than State requirements with the goal of creating positive environmental benefits. Additional requirements include increased stream buffer widths, buffers on more streams, enhanced volume and peak discharge controls, and low impact development options. As a minimum standard the State requires that streams be protected (intermittent and perennial) if they are shown on the USGS topographic quadrangle or USDA soil survey map, unless proven otherwise by field delineation. Mecklenburg County, Huntersville, and Charlotte post-construction ordinances require that streams be delineated using ACOE and DWQ methodology, regardless of whether they are shown on a USDA or USGS map. This could potentially include more streams, and therefore require more riparian buffer protection. According to the Mecklenburg County BMP Design Manual, July 2007, the objectives of the post-construction ordinances are:

- Achieve compliance with the Phase I and Phase II NPDES Stormwater Permit requirements for post-construction pollution control, as applied to the respective jurisdictions
- Satisfactorily address the guidelines to mitigate the cumulative and secondary impacts to aquatic and terrestrial wildlife resources and water quality specified by the N.C. Wildlife Resources Commission and the U.S. Fish and Wildlife Service for Goose Creek and the Yadkin River Watershed.
- Satisfactorily address the causes of impairment identified in the N.C. 2002 Integrated 305(b) and 303(d) Report for surface waters in Mecklenburg County when the potential sources of water quality impairment are identified as urban runoff/storm sewers.
- Satisfactorily address detention measures for the control of stormwater volumes and peaks associated with new construction.

The Town of Huntersville's post-construction ordinance and the Huntersville Water Quality Design Manual require the use of Low Impact Development (LID) practices in order to further reduce the environmental impact of development. LID practices use BMPs such as green roofs, rain gardens, and infiltration trenches, to maintain pre-development hydrologic conditions after development. Huntersville was one of the first municipalities in the State to require LID practices. Minimizing stormwater quantity significantly reduces pollutant loadings and decreases the magnitude of peak storm flows which can damage stream and river systems.

Gaston County and Town of Stanley

Gaston County adopted a Stormwater Ordinance July 26, 2007 in compliance with Federal requirements. Additionally, this ordinance requires that residential high density development within unincorporated parts of the County cannot be approved until a variance is received from the Gaston County Planning Board. The stormwater permit requirement applies to all development and redevelopment that disturbs more than one acre. Land

disturbance or development cannot be initiated until a written stormwater control permit is issued. The Town of Stanley has adopted Gaston County's Stormwater Ordinance and entered into an inter-local agreement with Gaston County to provide stormwater inspection services within their jurisdictional area.

City of Mount Holly

The City of Mount Holly is using its compliance with State Water Supply Watershed Protection rules and agreements with Gaston County to meet its NPDES Phase II post-construction requirements.

7.5.2 Riparian Buffer Rules

Mecklenburg County Portion of Service Area

The post-construction stormwater ordinances for Mecklenburg County, City of Charlotte and Town of Huntersville identify the minimum riparian buffer requirements for their jurisdictional areas. Riparian buffers are required for streams with drainage areas as small as 50 acres. This protects more intermittent streams than the older SWIM buffers. Table 7-5 identifies the riparian buffer sizes that would be required for development occurring within the City of Charlotte and Mecklenburg County. These ordinances require field verification of the presence or absence of intermittent streams on the property where development has been proposed. More intermittent streams would be identified and protected with riparian buffers in the Mecklenburg County portion of service area under the post-construction buffer rules than required by State policy.

Even wider riparian buffers are required within certain portions of watershed overlays. Three different watershed overlays are present in the Mecklenburg County portion of the service area: Mountain Island Lake, Upper Lake Wylie, and Lower Lake Wylie. Figure 6.2c illustrates the different watershed overlays present in the service area. Each watershed overlay district contains critical areas (CA) and protected areas (PA). CA and PA districts have specific development density restrictions and riparian buffer preservation requirements. The Mountain Island Lake (MIL) watershed overlay district contains four different critical areas (CA) and three different protected areas (PA). The MIL CAs present within the service area include: CA1, CA2, and CA4. No MIL PAs are present in the service area. The Upper Lake Wylie and Lower Lake Wylie watershed overlay district is divided into critical and protected areas. The State water supply watershed protection rules do not address the Lower Lake Wylie because no communities in North Carolina withdraw drinking water from this area. Charlotte-Mecklenburg stormwater services adopted a watershed overlay district in this area to provide additional protection to water supplies used by communities in South Carolina.

Gaston County Portion of Service Area

The minimum riparian buffer width (10 ft) for development within unincorporated Gaston County is specified in their Erosion and Sedimentation Control Ordinance. The Gaston County Watershed Protection Ordinance establishes riparian buffer requirements of 30 to 100 ft (see Table 7-5). The Town of Stanley has an inter-local agreement with Gaston County to enforce erosion and sedimentation control rules within the limits of the Town of Stanley. The City of Mount Holly's Watershed Overlay Districts in their Zoning Ordinance specify the minimum riparian buffer widths (30 ft) to be used within their jurisdictional area. Table 7-5 identifies the specific buffer widths required by these ordinances.

7.5.3 Floodplain Protection

Mecklenburg County Portion of Service Area

Local floodplain ordinances within the City of Charlotte and Mecklenburg County are more stringent than required by FEMA for participation in the NFIP. Specific areas where federal standards are exceeded by these communities' ordinances include:

- Wider floodways are protected under the Mecklenburg County ordinance. Digital Flood Insurance Rate Maps (DFIRMs) for Mecklenburg County communities include both a standard FEMA floodway and a "community encroachment area." The standard FEMA floodway allows 1 foot of rise above the Base Flood Elevation (BFE); the community encroachment area allows only 0.2 feet of rise. Floodway regulations are applied to the wider area encompassed by the community encroachment area.
- Mecklenburg County was the first county in the nation to include future conditions (or "community") 100-year floodplains on its floodmaps. Community 100-year floodplains are delineated based on the future, potential built-out conditions of the watershed; standard regulatory floodplains are based on current land use conditions. Mecklenburg County requires compliance with floodplain ordinances for any new construction and/or substantial improvements to existing construction within both the 100-year regulatory and the 100-year community floodplain. Studies completed in 2000 showed that if only existing conditions land use was used in Mecklenburg County (as required minimally by FEMA), BFEs would be under-predicted by an average of about 2.2 feet.
- Dryland access during flood conditions to habitable buildings is required.
- Substantial damages and improvements are calculated cumulatively over a 10-year period.
- The lowest space in any new parking lot is required to be 6 inches below the Community BFE or higher.
- Two feet of freeboard above the base flood elevation (BFE) is required for development in both the regulatory and community floodplains along the Catawba River. In all other locations, one foot of freeboard above the BFE or Community BFE is required. In all locations within the special flood hazard area where a BFE is not established, structures must be elevated 2 feet above the highest adjacent grade.
- Levee standards are required.

Gaston County Portion of Service Area

The Gaston County Flood Damage Prevention Ordinance (Adopted January 22, 2009 as Chapter 16 of the UDO) adopted current DFIRMs as the County's flood maps and established floodplain development standards that are more restrictive than required by FEMA. The County requires three feet of freeboard above the 100 year BFE, or for structures to be elevated 3 feet above the highest adjacent grade in 100 year floodplains without BFEs. This may be achieved by elevation for residential structures or floodproofing in lieu of elevation for non-residential structures. Additionally, no hazardous chemical or waste sites or variances for them are allowed in the 100 year floodplain.

The City of Mount Holly's Floodplain Management Ordinance (Section XVI of Zoning Ordinance) also provides protections in addition to minimum NFIP requirements. The City requires two feet of freeboard above the 100 year BFE. This may be achieved by elevation for residential structures or floodproofing in lieu of elevation for non-

residential structures. Gaston County provides flood damage prevention administration for the County and the Town of Stanley.

7.5.4 Erosion and Sediment Control

Mecklenburg County Portion of Service Area

Soil Erosion and Sediment control ordinances in Charlotte and Mecklenburg County require that a certified individual be on-site to conduct weekly site inspections when land is being disturbed or developed. These ordinances specify that any activity disturbing more than one acre of land must have an erosion and sediment control plan and take all reasonable measures to protect all public and private property from damage caused by disturbance activities and associated sedimentation. Mandatory standards to which land-disturbing activities must comply include:

- Wetland protection, and
- Graded slopes and fills must be at an angle that can be retained by vegetated cover and must be planted within 15 working days or 30 calendar days.

Gaston County Portion of Service Area

Gaston County provides erosion and sediment control permitting and inspection services for the City of Mount Holly, the Town of Stanley and unincorporated areas within the County. Gaston County's Soil Erosion and Sedimentation Control Ordinance (adopted April 2003 and revised June 28, 2007) specifies minimum stream buffer widths, erosion control practices, and sediment and erosion control plan requirements. An Erosion and Sediment Control Plan is required for all activities that disturb one or more acres of land. Erosion and sediment control measures are designed to provide protection from the ten year storm. Additional controls are required in high quality water zones (HQW); however, there are no HQWs within the service area.

7.5.5 Land Use Planning and Development Policy

Charlotte-Mecklenburg 2015 Plan

The 2015 Plan, "Planning for Our Future" was adopted by the Charlotte-Mecklenburg Planning Commission in 1997. Unlike its precursor (the 2005 Plan), the 2015 Plan is not a land use plan. Instead, the 2015 Plan establishes a number of priority areas on which focus is placed to ensure that Charlotte-Mecklenburg remains economically viable and continues to offer a high quality of life. Future land use GIS data for the Charlotte-Mecklenburg area was developed by the Mecklenburg Planning department using multiple planning documents.

Growth is anticipated by the 2015 Plan. It predicts that between 1998 and 2015, Charlotte-Mecklenburg will be home to 250,000 more people, have 250,000 more cars on its roadways, 120,000 more housing units, and will host 200,000 more jobs.

The 2015 Plan applies to the entire Mecklenburg County side of the service area. Two key goals of the 2015 Plan are directly facilitated by the regional wastewater treatment plant. These are to:

- "Provide the infrastructure and facilities that support economic growth," and
- "Build regional and local concurrence to coordinate land use, transportation, utility and environmental planning, and public service delivery in the metro region."

The 2015 Plan has the following objectives:

- Assess growth assumptions set forth in 2005 Plan and extend projections into 2015.
- Identify and clarify key community issues.
- Establish goals to achieve Charlotte-Mecklenburg's long-term vision of a successful community.
- Provide direction for staff in developing work programs and identifying priority projects.
- Link City and County initiatives to the community's long term goals and objectives.

Charlotte – Mecklenburg General Development Policies

Charlotte-Mecklenburg's General Development Policies (GDP) provide guidance regarding the location, intensity, and form of future development and redevelopment throughout the area. The GDP are broad policies used when updating zoning and subdivision ordinances, as well as integrating land use planning with capital facilities planning, particularly transportation planning. The Environment and Infrastructure chapters of the GDP are most relevant to the Regional Wastewater Treatment Plant project.

GDP Environmental Chapter

The Environmental Chapter of the GDP identifies a key development focus: encourage a more compact, multi-use development pattern, including appropriate infill and redevelopment, to enable people to live, work and shop in close proximity. This type of a development pattern is only possible with the availability of off-site wastewater treatment.

GDP strategies for reducing the impact of non-point pollution on water quality include:

- Minimizing impervious surface area.
- Improving the quality of stormwater run-off.
- Reducing erosion and sedimentation.

The GDP establishes the following principles to guide future growth and development:

- Make the protection of our natural environment a priority in land use and development decisions.
- Facilitate a land use pattern that accommodates growth while respecting the natural environment.
- Promote and enable environmentally sensitive site designs.
- Consider the environmental impacts of land use and development comprehensively.
- Strive to reconcile various environmental concerns with each other and balance them with other land and economic development considerations.

GDP Infrastructure Chapter

The purpose of the GDP Infrastructure Chapter, adopted November 2007, is to more closely link land development decisions to the availability of the public infrastructure needed to serve them. This Chapter is intended to help guide the consideration of potential environmental impacts of the development of infrastructure, including water and wastewater facilities.

Key goals of the Infrastructure Chapter are to:

- Create well-designed communities that… are appropriately served by public infrastructure.
- Ensure that the availability of public infrastructure is considered when making land use and development decisions.

Many policies in the Infrastructure Chapter are relevant to the proposed Regional Wastewater Treatment Plant, particularly Policy 6a, which states, "Encourage regional partners to be engaged in collaborative problem-solving to identify creative regional solutions to infrastructure issues. Infrastructure solutions might be found in the development of partnerships with organizations beyond the boundaries of the City of Charlotte. Many transportation, stormwater and utilities infrastructure issues can be more effectively addressed with regional infrastructure investment solutions. Additionally, it is important to ensure that local decisions do not have unintended impacts regionally. Enhanced communication on infrastructure issues with regional partners is one means of achieving this."

Gaston County Planning

Long range planning in Gaston County is conducted by the Planning Department. The planning department completes special area plans and has developed a unified development ordinance (UDO), and comprehensive plans for Gaston County. The most recent Gaston County Comprehensive Plan (2002) is currently being updated by the County. This document is used as a decision-making tool for the Planning Department and the community, and provides a means to prioritize the timing and placement of public infrastructure. In terms of public utilities, the plan encourages regional coordination with water and sewer provisions to maximize investments, allow for flexibility in the provision of services, and for better preparedness for growth in the long term.

Gaston County's Natural Resources Department is actively pursuing stream restoration and open space preservation. For example, one project within the proposed service area established a 60 acre conservation easement along Stanley Creek which flows into Dutchman's Creek. The County uses programs such as the North Carolina Wildlife Partners Project, Wildlife Habitat Incentives Program, Environmental Quality Incentives Program, and others to encourage stream, wetland, and riparian restoration and open space preservation.

City of Mount Holly Planning

The City of Mount Holly's Zoning Ordinance and Land Use Plans including lot size specifications were based on the assumption that adequate water supply and wastewater treatment would be available to each lot. The City of Mount Holly's Subdivision Ordinance and Zoning Ordinance identify the following general development guidelines:

- Provide for the dedication or reservation of adequate spaces for open space, public lands, and buildings.
- Protect and enhance environmental quality.
- Provide for the dedication or provision of facilities for adequate storm drainage.
- Subdivision Plans shall be drawn in consideration of the suitability of the land and its capability to support and maintain the proposed development. Due consideration shall be given to such factors as water supply, watershed requirements, topography, rock outcrops, flood damage prevention, erosion control, wetland

preservation, stormwater management, solar energy, tree preservation, noise and pollution control, habitat for endangered species, areas of historical, archaeological, or architectural significance, and land use relationships.

- Lot boundaries shall be made to coincide with natural and preexisting man-made drainage ways to the extent practicable to avoid the creation of lots that can be built upon only by altering such drainage ways.
- Lot arrangements shall be made with due consideration given to not disturbing wetlands and other such natural features.

The City's policy is to preserve about twenty (20) acres per one thousand people (1,000) for use as open space and or recreation. Subdivisions are required to donate land that can be used for parks, natural areas, or recreation. The Subdivision Ordinance notes that the preferred land would be centrally located relative to the subdivision and neighborhood and/or is in conformance with the Land Development Plan. The preferred land would have easy, direct access to the public street system and be accessible by both vehicular and pedestrian traffic. Lakes or ponds may count as meeting the requirement provided such areas do not exceed 25% of the overall requirement.

The City of Mount Holly recently adopted Design Guidelines for Voluntary Residential Annexations as an amendment to their Annexation Policy. The policy includes the follow requirements for all new development:

- Reflect Mt Holly's neighborhood DNA by including specific architectural guidelines such as front porches, crawl spaces, no aluminum or vinyl siding.
- Protect and preserve Mount Holly's natural amenities while also providing usable open space.
- Built around great streets that have trees, sidewalks, underground utilities and garages that are not visible from the street.
- Connect with Mount Holly's existing street and trail network.

As part of a strategy to preserve and connect the City's parks and open spaces, the Mount Holly Community Development Foundation (MHCDF) developed a citywide greenprint. Mount Holly's Community Greenprint is a plan to promote activities that emphasize land conservation to ensure quality of life, clean air and water, recreation, and economic health. It identifies potential types of greenspace to be protected, as well as strategies to enhance the city's overall sustainability. The MHCDF also developed a master plan for a Catawba River Greenway, which would span an eight-mile stretch from Mountain Island Lake along the Catawba River to Mount Holly. With community input, the City developed a greenway plan that provided a vision for the trail design, funding and construction information and implementation strategies to make the greenway a reality.

Section 8. List of Preparers

The following Black & Veatch International Company staff members were responsible for the preparation of this Environmental Impact Statement:

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Section 9. Literature Cited

Alderman, J. M. 2005, Catawba Wateree Hydro Project: Mussel surveys for Catawba-Wateree relicensing. Aquatics 02 report. Duke Energy. FERC Project No. 2232 (http://www.duke-energy.com/pdfs/Aquatics_06_Report.pdf).

Barden, L. S., 1997, Historic prairies in the Piedmont of North and South Carolina, USA, Natural Areas Journal 17. pp. 149-152.

Burke, Jim. North Carolina State Extension Service, Personal Communication, 23 October, 2007.

Charlotte Mecklenburg Planning Department GIS, 2007, Future Land Use GIS Data.

Coughlan, D. J. Barwick, D. H. Baker, B. K. Rash, W. M. Garner, A. B., and Doby W.R. 2005. Catawba-Wateree Hydro Project: Fish community and assessment in the Catawba and Wateree Rivers: results for the Aquatics 01 study plan. Duke Energy. FERC Project No. 2232 (http://www.duke-energy.com/pdfs/Aquatics_01_Report.pdf).

(DAQ) North Carolina Division of Air Quality, 2007, Pre-Hearing Draft – The North Carolina 8-Hour Ozone Attainment Demonstration for the Charlotte-Gastonia-Rock Hill, NC-SC 8-hour Ozone Nonattainment Area (Cabarrus, Gaston, Lincoln, Mecklenburg, Rowan, Union Counties and Coddle Creek and Davidson Townships in Iredell County).

(DWQ) North Carolina Division of Water Quality, 2003, Basinwide Assessment Report – Catawba River Basin, 2003.

(DWQ) North Carolina Division of Water Quality, 2008, Basinwide Assessment Report – Catawba River Basin, 2008.

(DWQ) North Carolina Division of Water Quality, 2004, Catawba River Basinwide Water Quality Plan, accessed October 16, 2007 at: http://h2o.enr.state.nc.us/basinwide/Draft2004CatawbaRiverBasinWaterQualityPlan.htm.

(DWQ) North Carolina Division of water Quality, 2006, Standard Operating Procedures for Benthic Macroinvertebrates, accessed December 6, 2007 at http://h2o.enr.state.nc.us/esb/BAUwww/benthossop.pdf.

(DWQ) North Carolina Division of Water Quality, 2010, Catawba River Basin Plan, accessed at: http://portal.ncdenr.org/web/wq/ps/bpu/basin/catawba.

(DWQ) North Carolina Division of Water Quality, 2007a, DWQ Primary Surface Water Classifications, accessed October 16, 2007 at: http://h2o.enr.state.nc.us/csu/swc.html.

(DWQ) North Carolina Division of Water Quality, 2007b, Basinwide Information Management System (BIMS), accessed October 16, 2007 at: http://h2o.enr.state.nc.us/bims/.

(DWQ) North Carolina Division of Water Quality, 2007c, Catawba River Fish Data compiled by the NCDWQ Biological Assessment Unit. Viewed on December 3, 2007.

(DWR) North Carolina Division of Water Resources website, 2007, www.ncwater.org, (Accessed 14 December 2007).

(ESRI) Environmental Systems Research Institute, 2006, ArcMap (Version 9.2), Redlands, CA.

EPA Region 4 Water Management Division, 1996, TMDL Approval, Lake Wylie Nutrient Management Strategy.

Gaston County Planning Department, 2008. Unified Development Ordinance. Effective July 1, 2008. http://www.co.gaston.nc.us/Planning/UDO/UDO.htm.

Goretti, Andy. Mecklenburg County GIS, Personal Communication, 14 September, 2007.

Huntersville Planning Department, 2008, Town of Huntersville, North Carolina Zoning Ordinance. Amended July 18, 2007.

Isley, Karen. Mecklenburg County GIS, Personal Communication, 25 September, 2007.

Karr, J. R, 1981. Assessment of biotic integrity using fish communities. Fisheries. 6: 21 - 27.

(LUESA) Land Use and Environmental Services Agency, Charlotte-Mecklenburg Storm Water Services Stream Use Support Index, Accessed December 16, 2007, http://www.charmeck.org/Departments/Stormwater/Report+Pollution/Stream+Use-Support+Index+%28SUSI%29.htm.

Masson, R. N., and Stucky, J. M. 2007, *Lotus unifoliatus* var. *helleri* phenology and response to simulated mowing, In press. Jour. NC Acad. Sci.

(MRLC) Multi-Resolution Land Characteristics Consortium, 2001, National Land Cover Dataset 2001, Available online at: www.mrlc.gov. (Accessed December 6, 2007).

(NHID) Natural Heritage Inventory Database, 2007, North Carolina Natural Heritage Program, Accessed December 19, 2007 at http://www.ncnhp.org/.

(NCGS) North Carolina Geological Survey, 1994, Geology of North Carolina Map, Available online at: www.geology.enr.state.nc.us (Accessed 11 December 2007).

(NRCS) Natural Resources conservation Service, 2007, Soil Survey Geographic Database for Mecklenburg County, Fort Worth, Texas.

Radford, A. E., H.E. Ahles, and C.R. Bell, 1968, Manual of the Vascular Flora of the Carolinas, The University of North Carolina Press, Chapel Hill, NC.

Randall, Kelly. 2008. Director, Charlotte Mecklenburg Environmental Health Department, Personal Communication, 15 January 2008.

Roux, T. 2007, 2006 Bioassessment Report: Biological Monitoring, Mecklenburg County Water Quality Program, Program Element IC-S (1.3).

Roux, Tony. Mecklenburg County; Land Use and Environmental Services Agency, Personal Communication, 03 December, 2007.

Schafale, M. P. and A. S. Weakley, 1990, Classification of the Natural Communities of North Carolina: Third Approximation, Natural Heritage Program, Division of Parks and Recreation, N.C. Department of Environment, Health, and Natural Resources. Raleigh.

Schueler, Thomas, 1994, "The Importance of Imperviousness", Watershed Protection Techniques 1 (Fall 1994): 100.

Stecker, Kathy, North Carolina Division of Water Quality, Personal Communication, 19 October, 2007.

Stecker, Kathy, North Carolina Division of Water Quality, Personal Communication, 19 October, 2007.

(USFS) United States Fish and Wildlife Service, 1999. National Wetlands Inventory, Onemap_prod.SDEADMIN.nwi_poly, Vector Digital Data, St. Petersburg, Florida.

(USFWS) United States Fish and Wildlife Service, 2005, Schweinitz's sunflower (Helianthus schweinitzii), http://ecos.fws.gov/speciesProfile/SpeciesReport.do?spcode=Q2B7, viewed on October 9, 2007.