

## ENVIRONMENTAL MANAGEMENT COMMISSION

### Certificate Authorizing the Charlotte-Mecklenburg Utilities to Increase Their Transfer of Water from the Catawba River basin to the Rocky River basin under the Provisions of G.S. 143-215.22I

In August 2001, the Charlotte-Mecklenburg Utilities (CMU) petitioned the Environmental Management Commission (EMC) for an increase in interbasin transfer (IBT) from the Catawba River Basin to the Rocky River Basin. CMU requested an increase from the grandfathered IBT of 16.1 million gallons per day (mgd) to 33 mgd (maximum day basis). The proposed IBT is based on additional water withdrawals from Lake Norman and Mountain Island Lake in the source basin (Catawba River Basin). The IBT will increase due to transfer of the water to the receiving basin (Rocky River Basin) via consumptive use in eastern Mecklenburg County and existing discharges at Mallard Creek Wastewater Treatment Plant [WWTP] and Water and Sewer Authority of Cabarrus County's [WSACC] Rocky River Regional (RRR) WWTP. CMU requested an increase to 33 mgd, will allow CMUD to meet projected water supply demands through the year 2030 in eastern Mecklenburg County. *This IBT does not include transfers associated with water or wastewater service provided to the Goose Creek watershed in the Town of Mint Hill in Mecklenburg County.* Public hearings on the proposed transfer increase were held in Huntersville on December 11, 2001 pursuant to G.S. 143-215.22I.

The EMC considered the petitioner's request at its regular meeting on March 14, 2002. According to G.S. 143-215.22I (g), the EMC shall issue a transfer certificate only if the benefits of the proposed transfer outweigh the detriments of the proposed transfer, and the detriments have been or will be mitigated to a reasonable degree.

The EMC may grant the petition in whole or in part, or deny it, and may require mitigation measures to minimize detrimental effects. In making this determination, the EMC shall specifically consider:

1. The necessity, reasonableness, and beneficial effects of the transfer.
2. Detrimental effects on the source river basin.
- 2a. The cumulative effect on the source major river basin of any water transfer or consumptive water use.
3. Detrimental effects on the receiving basin.
4. Reasonable alternatives to the proposed transfer.
5. Use of impounded storage.
6. Purposes and water storage allocations in a US Army Corps of Engineers multi-purpose reservoir.
7. Any other facts or circumstances necessary to carry out the law.

In addition, the certificate may require a drought management plan. The plan will describe the actions a certificate holder will take to protect the source basin during drought conditions.

The members of the EMC reviewed and considered the complete record which included the hearing officer's report, staff recommendations, the applicant's petition, the Final Environmental Assessment, the public comments relating to the proposed interbasin transfer, and all of the criteria specified above. Based on that record, the Commission makes the following findings of fact.

### **Finding of Fact**

#### **THE COMMISSION FINDS:**

(1) **Necessity, Reasonableness, and Benefits of the Transfer**

The proposed transfer will provide water to Mecklenburg County, City of Charlotte, and other communities in the county. The current population served is about 636,000 with a maximum day water use of about 154 million gallons per day (mgd). Projections assume a 2.6 percent annual increase through 2010 decreasing to 1.3 percent by 2030. The projected 2030 serve population is 1,101,000 with a maximum day water use of about 245 mgd.

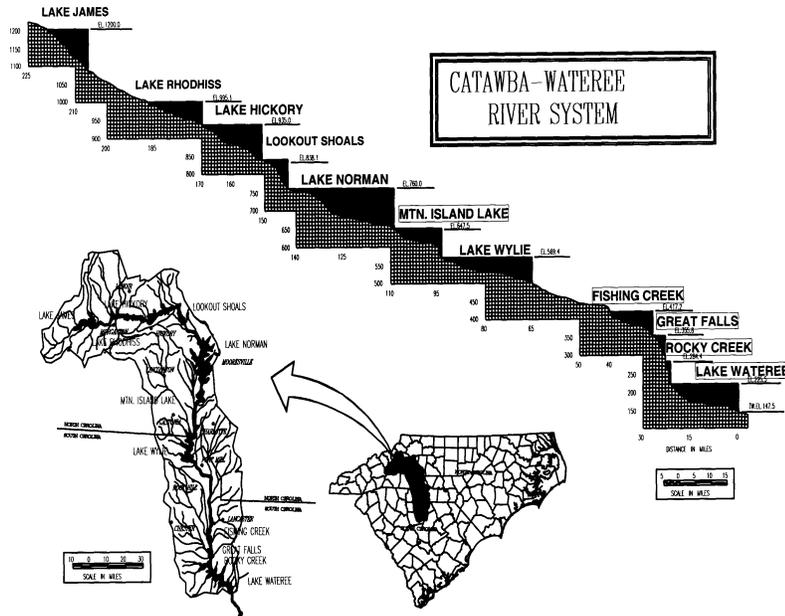
The western boundary of Mecklenburg county includes Lake Norman and Mountain Island Lake which are CMU's two water sources. CMU's current combined withdrawal capacity from both lakes is adequate to meet average day demands until about 2020. CMU has requested an increase from the Federal Energy Regulatory Commission (FERC) to increase their Mountain Island Lake withdrawal capacity. The requested increase from 165 mgd to 330 mgd (instantaneous maximum) will meet projected 2030 demands and add pumping flexibility.

The transfer of water will benefit the Mecklenburg County region by guaranteeing water to support the economic development and associated population growth that has occurred and projected to occur in this region of the State.

*Based on the record the Commission finds the transfer is necessary to supply water to the growing communities of this area. Water from the source basin is readily available and within a short distance from the service area. Therefore the transfer is a reasonable allocation to these communities. The transfer will greatly benefit these communities by providing raw water of high quality for residential and industrial purposes.*

(2) **Detrimental Effects on the Source Basin**

In order to assess the direct impacts of the proposed transfer on the source basin, the petitioners utilized Duke Energy's Hydro-Electric Operations and Planning Model of the Catawba-Wateree Project. The Catawba-Wateree model simulates reservoir operations and withdrawals from Lake James in North Carolina to Lake Wateree in South Carolina (see the following figure the *Catawba-Wateree River System*). Details of the modeling analysis are included in this report Part V Applicant Supplemental Information.



As required under G.S. 143-215.22I(f)(2), local water supply plans were considered in developing the model. In addition, industrial and agricultural withdrawals were model inputs. Model runs were evaluated for present conditions, 2030 CMU water demands, and cumulative 2030 water demands.

As seen in the following table, a summary of daily releases from Lake Wylie, the transfer will have minimal impact on low flows. Similarly the model results show minimal impacts to both lake levels and hydropower generation.

Percent of Time that Daily Flow Releases from Lake Wylie Would Equal or Exceed Selected Average Daily Flow Thresholds During the Entire Year							
	400 cfs	500 cfs	700 cfs	1,000 cfs	1,250 cfs	1,500 cfs	2,00 cfs
<b>Average Year</b>							
Existing 2000	100%	100%	97%	87%	82%	82%	79%
CMU 2030	100%	100%	96%	87%	82%	82%	78%
Cumulative 2030	100%	100%	96%	87%	82%	82%	79%
<b>Dry Year</b>							
Existing 2000	100%	95%	88%	81%	76%	73%	61%
CMU 2030	100%	95%	88%	81%	76%	72%	60%
Cumulative 2030	100%	95%	88%	81%	75%	70%	59%
<b>Drought Year</b>							
Existing 2000	100%	85%	82%	70%	52%	39%	29%
CMU 2030	100%	84%	82%	62%	44%	35%	28%
Cumulative 2030	100%	84%	79%	55%	41%	32%	26%

*Based on the modeling results the Commission finds that the detrimental effects on the source basin described in G.S. §143-215.22I(f)(2) will be insignificant.*

(2a) **Cumulative effect on Source Basin of any transfers or consumptive water use projected in local water supply plans**

Local water supply plan data, including current and projected water use and water transfers, were used to develop the input data sets for the model discussed in Finding Number 2. The model was used to evaluate current and future scenarios of basin water use.

The safe yield of the reservoir system has not been determined. Duke Power does not have a policy on reallocation of power pool storage to water supply, for example unlike the Corps of Engineers. However, based on two 2030 model scenarios and current drought operations, the safe yield is at least as large or larger than the cumulative 2030 scenario of 624 mgd.

*Based on the modeling discussed in Finding No. 2, the Commission finds the cumulative effects of this and other future water transfers or consumptive uses as described in G.S. §143-215.22I(f)(2a) will be insignificant.*

(3) **Detrimental Effects on the Receiving Basin**

The proposed transfer will utilize existing permitted wastewater discharges to the Rocky River basins; therefore no additional permitted capacities will be required. Previous studies for the existing plant indicated no significant direct water quality or wastewater assimilation on the receiving stream. Additional growth and development in the receiving basin may impact water quality, stormwater runoff, frequency and intensity of flooding, and land use.

The Goose Creek watershed in Mecklenburg County was removed from the area to be served by this transfer certificate until the impacts of additional urban growth on Federally listed endangered mussel species are fully evaluated.

*Based on the record the Commission finds the transfer will support continued population growth and the attendant impacts of that growth. These impacts include effects on wastewater assimilation, fish and wildlife habitat, and water quality. However, these impacts will be minimal. Reasonable mitigation includes:*

1. *Require the County to evaluate the feasibility of each element of the Surface Water Improvement and Management Program (SWIM) on an annual basis.*
2. *Require the County and the Town of Mint Hill to consider the conclusions of Wildlife Resources Commission's Goose Creek watershed study when complete.*
3. *Require Mecklenburg County and the City of Charlotte to continue the stakeholder process to investigate water quantity control from single-family development and water quality control for all development.*
4. *The Goose Creek subbasin in Mecklenburg County is removed from the area to be served by the IBT. A moratorium on the installation of new IBT water lines into Goose Creek subbasin is in effect until the impacts of additional growth urban growth on the endangered species are fully evaluated.*

(4) **Alternatives to Proposed Transfer**

The petitioners evaluated three alternatives to the proposed transfer. The alternatives considered included:

1. No Action – Growth would be served by individual wells and septic tanks. The region is already experiencing water quality problems related septic tanks and package sewage plants. Also, a number of individual wells in this region have both low yields and poor water quality.
2. Obtain Water from the Rocky River – New reservoir project. Development of new impoundments for water supply in rapidly developing urban area face significant regulatory requirements and considerable public controversy.
3. Return wastewater discharge to the Catawba – Return wastewater to the McAlpine WWTP. Returning water to the Catawba would increase McAlpine’s discharge by 17 mgd. SC DHEC considers the McAlpine plant to be a significant contributor to phosphorus in the Catawba basin already at it’s current discharge level.
4. Proposed Action. The proposed action of using the Mallard Creek WTP and the Rocky Regional WTP increases the existing discharge of 8 mgd to 18 mgd by 2030 into the Rocky River.

*Based on the information provided in the EA and the petition, the Commission finds that the proposed alternative is the most feasible means of meeting the petitioners’ long-term water supply needs while minimizing overall impacts and cost.*

(5) **Impoundment Storage**

This criterion is not applicable, as the petitioners do not have an impoundment.

(6) **The water to be withdrawn or transferred is stored in a multipurpose reservoir constructed by the United States Army Corps of Engineers**

This criterion is not applicable, as the petitioners are using storage in Duke Power reservoirs.

(7) **Other Considerations**

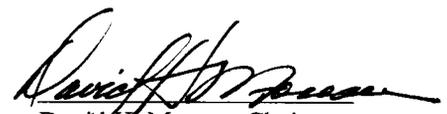
*The Commission finds that to protect the source basin during drought conditions, to mitigate the future need for allocations of the limited resources of this basin, and as authorized by G.S. § 143-215.22I(h), a drought management plan is appropriate. The plan should describe the actions that the Charlotte-Mecklenburg Utilities will take to protect the Catawba River Basin during drought conditions.*

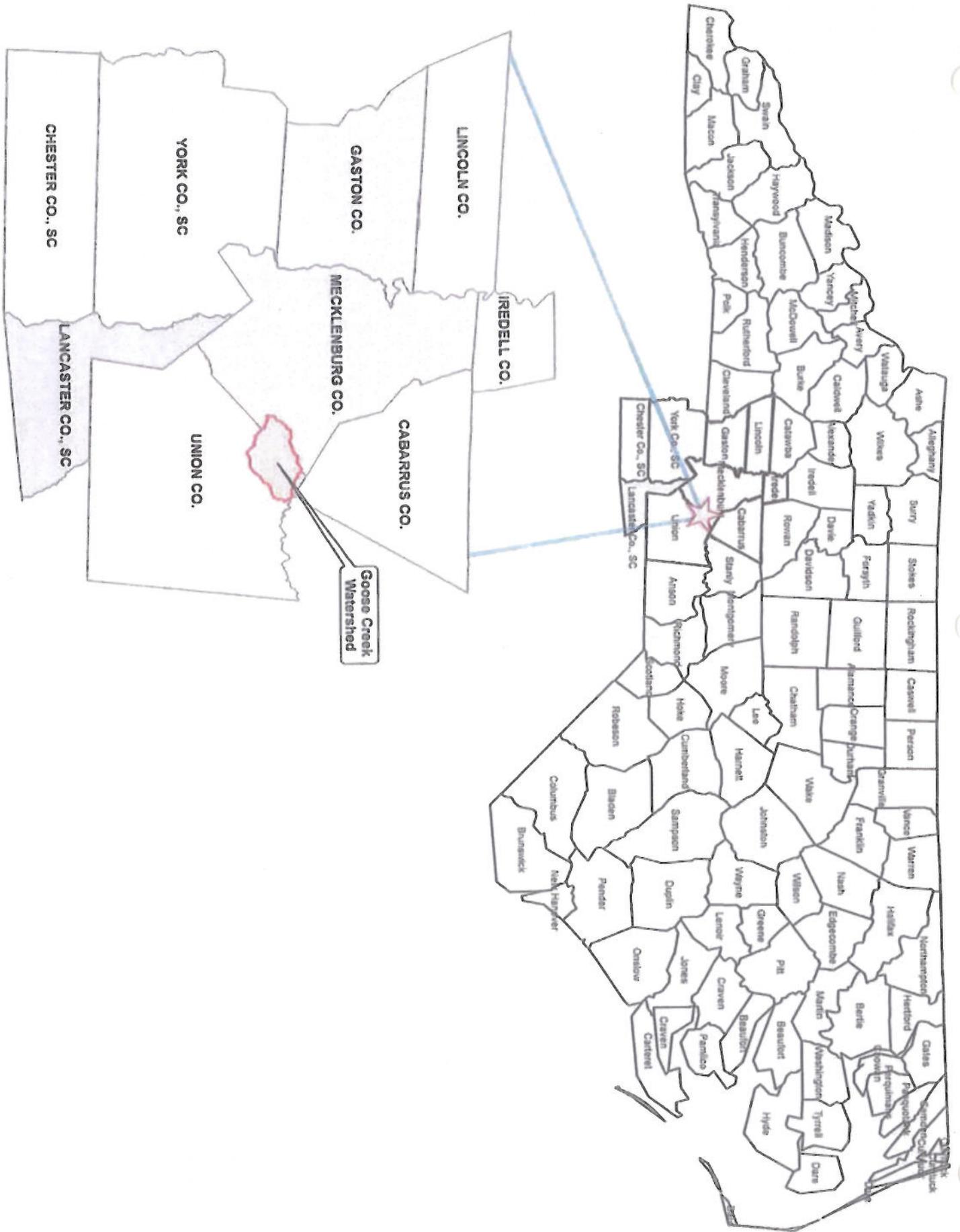
*The Commission notes that future developments may prove the projections and predictions in the EIS to be incorrect and new information may become available that shows that there are substantial environmental impacts associated with this transfer. Therefore, to protect water quality and availability and associated benefits, modification of the terms and conditions of the certificate may be necessary at a later date.*

Based on the hearing record and the recommendation of the hearing officers, the Commission, on March 14, 2002 by duly made motions concludes that by a preponderance of the evidence based upon the Findings of Fact stated above that (1) the benefits of the proposed transfer outweigh the detriments of the proposed transfer, and (2) the detriments of the proposed transfer will be mitigated to a reasonable degree. Therefore, and by duly made motions, the Commission grants the petition of the Charlotte-Mecklenburg Utilities (with conditions) to increase their transfer of water from the Catawba River basin to the Rocky River basin. The permitted transfer amount shall be 33 million gallons per day (mgd) on a maximum day basis from the effective date. This certificate is effective immediately. The certificate is subject to the following conditions, imposed under the authority of G.S. § 143-215.22I:

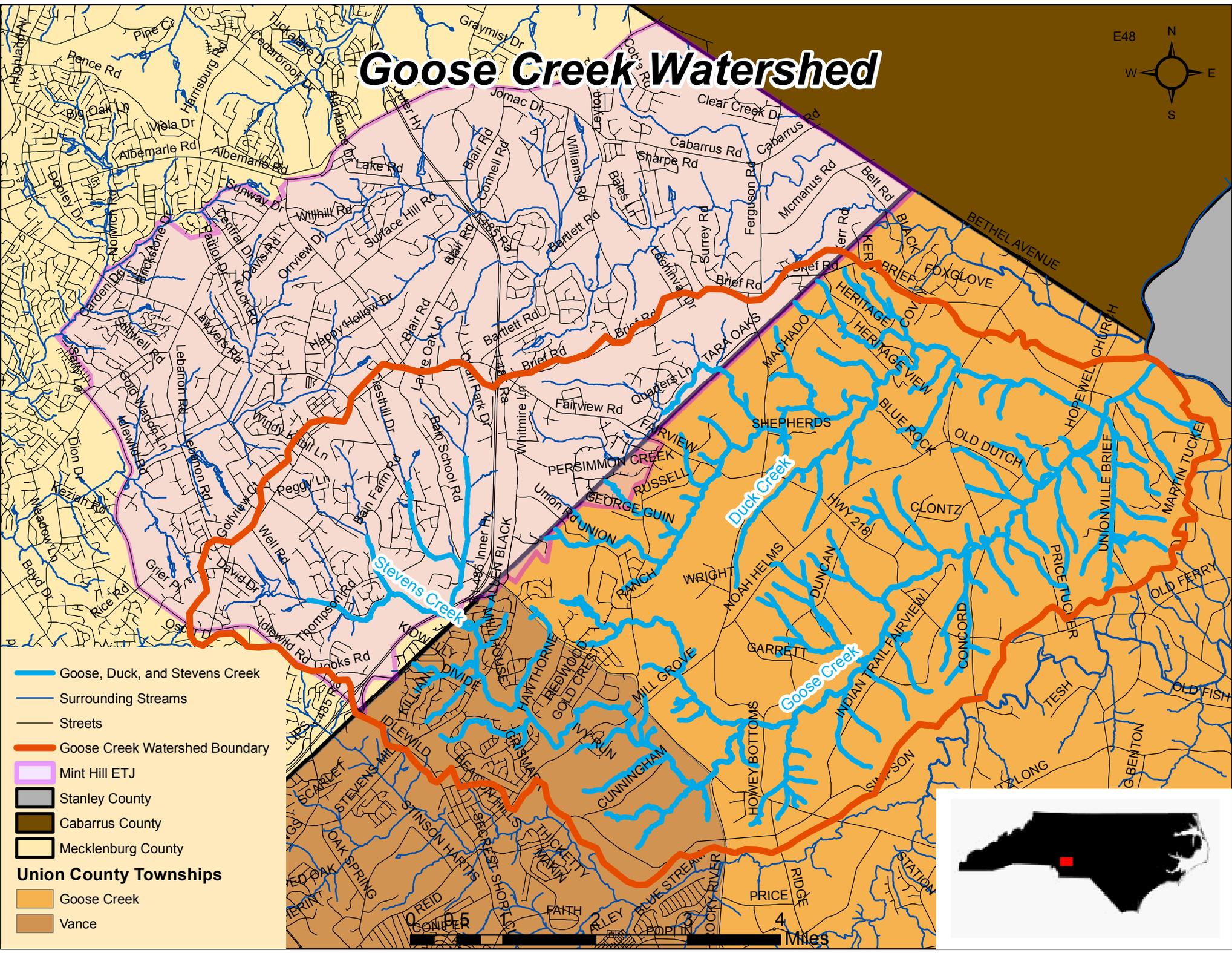
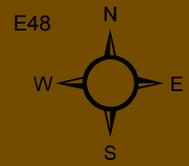
1. Require Mecklenburg County to summarize progress in implementation of watershed management approaches of the Surface Water Improvement and Management Program (SWIM) on an annual basis. The Division of Water Resources shall have the authority to approve modifications to and need for continued reporting as necessary.
2. Require Mecklenburg County and the City of Charlotte to continue the stakeholder process to investigate water quantity control from single-family development and water quality control for all development until completed. To accomplish this end, the stakeholder group should consider evaluating the feasibility of single-family detention and recommending ordinance revisions based on technical, political, long-term maintenance, cost, and benefits related to the proposed ordinance changes.
3. The Goose Creek subbasin in Mecklenburg County is removed from the area to be served by the IBT. A moratorium on the installation of new interbasin transfer water lines (water lines crossing the ridgeline) into Goose Creek subbasin is in effect until the impacts of additional growth urban growth on the endangered species are fully evaluated. This moratorium will not impact Charlotte-Mecklenburg Utility's ability to fully utilize existing water lines. The Division of Water Resources shall have the authority to grant exemptions for reasons of public health and safety for dwellings existing on or before March 14, 2002.
4. If either the EA is found at a later date to be incorrect or new information becomes available such that the environmental impacts associated with this transfer are substantially different from those projected impacts that formed the basis for the above Findings of Fact and this certificate, the Commission may reopen the certificate to adjust the existing conditions or require new conditions to ensure that the detriments continue to be mitigated to a reasonable degree.
5. Require the applicant to develop a compliance and monitoring plan for reporting maximum daily transfer amounts, compliance with certificate conditions, progress on mitigation measures, and drought management activities. The Division of Water Resources shall have the authority to approve modifications to the compliance and monitoring plan and drought management plan as necessary.

This is the 14<sup>th</sup> day of March, 2002.

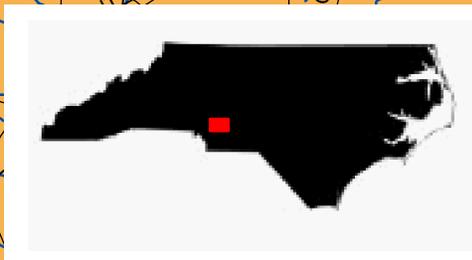
  
David H. Moreau, Chairman



# Goose Creek Watershed



- Goose, Duck, and Stevens Creek
- Surrounding Streams
- Streets
- Goose Creek Watershed Boundary
- Mint Hill ETJ
- Stanley County
- Cabarrus County
- Mecklenburg County
- Union County Townships**
- Goose Creek
- Vance



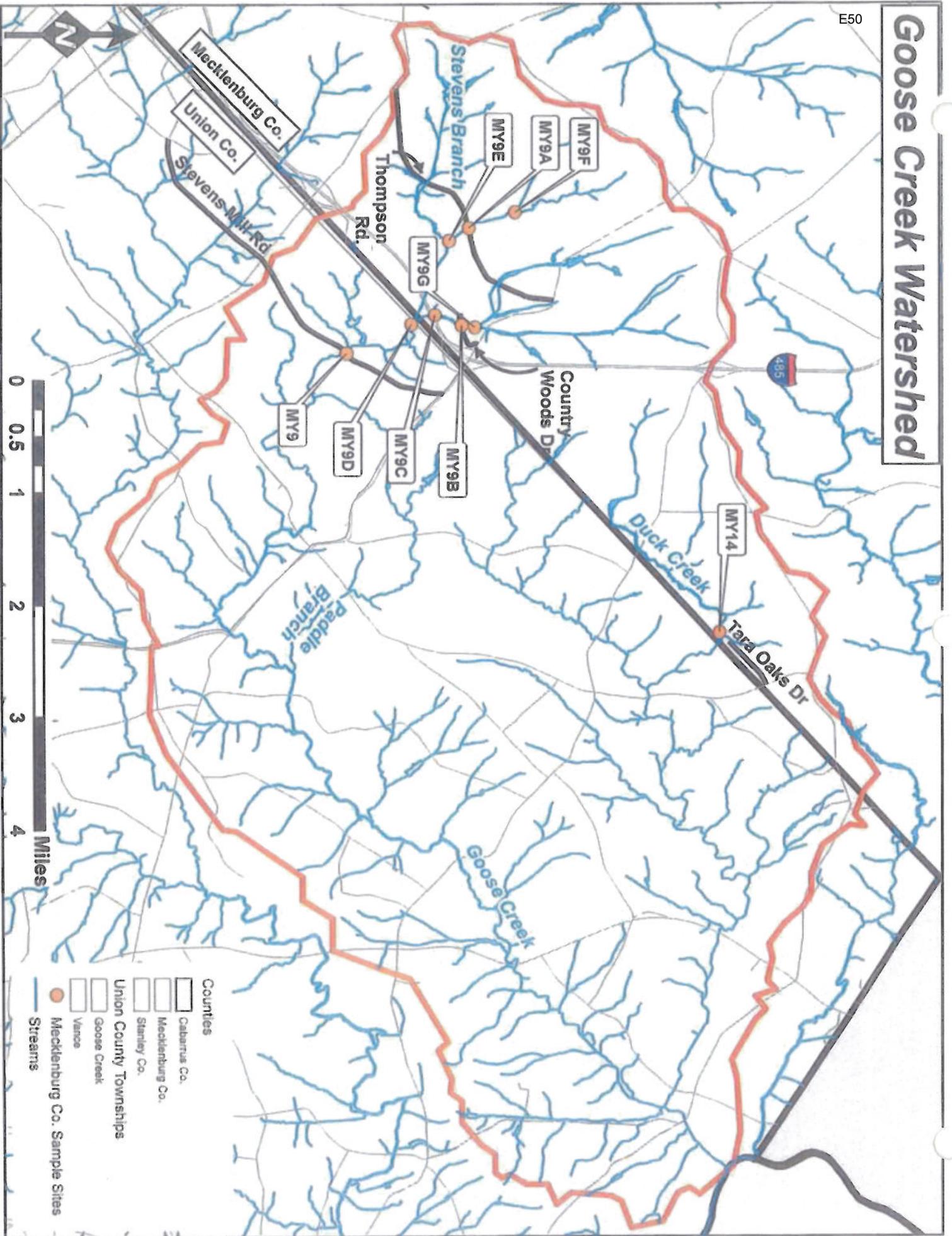
0 1 2 3 4 Miles

# CMU Water Mains within the Goose Creek Watershed

E49



# Goose Creek Watershed



- Countries**
- Cabarrus Co.
  - Mecklenburg Co.
  - Stanley Co.
- Union County Townships**
- Goose Creek
  - Vance
- Mecklenburg Co. Sample Sites**
- Mecklenburg Co. Sample Sites
  - Streams



**STATE OF NORTH CAROLINA  
DEPARTMENT OF ENVIRONMENT  
& NATURAL RESOURCES**

Site Specific Water Quality Management Plan for the  
**Goose Creek Watershed**

*Yadkin Pee-Dee River Basin*



Reprint from North Carolina  
Administrative Code:  
**15A NCAC 2B .0600-.0609**

Last Amended: February 1, 2009

<http://h2o.enr.state.nc.us/csu/GooseCreek.html>





**SECTION .0600 - WATER QUALITY MANAGEMENT PLANS****15A NCAC 02B .0601 SITE SPECIFIC WATER QUALITY MANAGEMENT PLAN FOR THE GOOSE CREEK WATERSHED (YADKIN PEE-DEE RIVER BASIN): PURPOSE**

The Goose Creek watershed in the Yadkin Pee-Dee River Basin provides habitat for an aquatic animal species that is listed as federally endangered by the U.S. Fish and Wildlife Service under the provisions of the Endangered Species Act, 16 U.S.C. 1531-1544. Maintenance and recovery of the water quality conditions required to sustain and recover the federally-listed endangered species thereby protects the biological integrity of the waters. The Goose Creek watershed, which includes Goose Creek (Index # 13-17-18), Stevens Creek (Index # 13-17-18-1), Paddle Branch (Index # 13-17-18-2), Duck Creek (Index # 13-17-18-3) and all tributaries, shall be protected by the site-specific management strategy described in Rules .0601 through .0609 of this Section.

The purpose of the actions required by this site-specific management strategy is for the maintenance and recovery of the water quality conditions required to sustain and recover the federally endangered Carolina heelsplitter (*Lasmigona decorata*) species. Management of the streamside zones to stabilize streambanks and prevent sedimentation are critical measures to restore water quality to sustain and enable recovery of the federally endangered Carolina heelsplitter. Site-specific management strategies shall be implemented to:

- (1) control stormwater for projects disturbing one acre or more of land as described in Rule .0602,
- (2) control wastewater discharges as described in Rule .0603,
- (3) control toxicity to streams supporting the Carolina heelsplitter as described in Rule .0604, and
- (4) maintain riparian buffers as described in Rules .0605 through .0609.

*History Note:* Authority G.S. 143-214.1; 143-215.3(a)(1); 143-215.8A;  
Eff. January 1, 2009.

**15A NCAC 02B .0602 SITE SPECIFIC WATER QUALITY MANAGEMENT PLAN FOR THE GOOSE CREEK WATERSHED (YADKIN PEE-DEE RIVER BASIN): STORMWATER CONTROL REQUIREMENTS**

(a) Any new development activity that disturbs one acre or more of land within the Goose Creek watershed and will result in addition of impervious surface shall control and treat the difference in the stormwater runoff from the predevelopment and post-development conditions for the one-year, 24-hour storm, with structural stormwater controls, with the exception of NC Department of Transportation and NC Turnpike Authority activities that shall be regulated in accordance with provisions of that agency's NPDES Stormwater Permit. Development and redevelopment shall implement stormwater management measures that promote infiltration of flows and groundwater recharge for the purpose of maintaining stream base flow or the delegated local government shall maintain a written explanation when it is not practical to use infiltration methods.

(b) Structural stormwater controls shall meet the following requirements:

- (1) Remove an 85 percent average annual amount of Total Suspended Solids;
- (2) Draw down the treatment volume no faster than 48 hours, but no slower than 120 hours, for detention ponds;
- (3) Discharge the storage volume at a rate equal or less than the pre-development discharge rate for the one-year, 24-hour storm; and
- (4) Meet Design of Stormwater Management Measures set forth in 15A NCAC 02H .1008.

(c) Local governments may submit a written request to the Commission for authority to implement and enforce the state's stormwater protection requirements of G.S. 143-214.7 and S.L. 2006-246 within their jurisdiction. The written request shall be accompanied by information that shows:

- (1) The local government has land use jurisdiction for the riparian buffer demonstrated by delineating the local land use jurisdictional boundary on USGS 1:24,000 topographical map(s) or other finer scale map(s);
- (2) The local government has the administrative organization, staff, legal authority, financial and other resources necessary to implement and enforce the state's stormwater requirements based on its size and projected amount of development;
- (3) The local government has adopted ordinances, resolutions, or regulations necessary to establish and maintain the state's stormwater requirements; and
- (4) The local government has provided a plan to address violations with civil or criminal remedies and actions as well as remedies that shall restore buffer functions on violation sites and provide a deterrent against the occurrence of future violations.

(d) Within 90 days after the Commission has received the request for delegation, the Commission shall notify the local government based on standards as set out in Paragraph (c) of this Rule whether it has been approved, approved with modifications, or denied.

(e) The Commission, upon determination that a delegated local authority is failing to implement or enforce the requirements in keeping with a delegation, shall notify the delegated local authority in writing of the local program's inadequacies. If the delegated local authority has not corrected the deficiencies within 90 days of receipt of the written notification, then the Commission shall rescind the delegation of authority to the local government and shall implement and enforce the state's stormwater requirements.

(f) Limits of delegated local authority are as follows: The Commission shall have jurisdiction to the exclusion of local governments to implement the state's stormwater protection requirements for the following types of activities:

- (1) Activities undertaken by the State;
- (2) Activities undertaken by the United States;
- (3) Activities undertaken by multiple jurisdictions; and
- (4) Activities undertaken by local units of government.

(g) Recordkeeping requirements are as follows: Delegated local authorities shall maintain on-site records for a minimum of five years. Delegated local authorities must furnish a copy of these records to the Director within 30 days of receipt of a written request for the records. The Division of Water Quality shall inspect local stormwater programs to ensure that the programs are being implemented and enforced in keeping with an approved delegation.

*History Note:* Authority G.S. 143-214.1; 143-215.3(a)(1); 143-215.8A; 143-214.7, S.L. 2006-246; Eff. February 1, 2009.

**15A NCAC 02B .0603 SITE SPECIFIC WATER QUALITY MANAGEMENT PLAN FOR THE GOOSE CREEK WATERSHED (YADKIN PEE-DEE RIVER BASIN): WASTEWATER CONTROL REQUIREMENTS**

No new National Pollution Discharge Elimination System "NPDES" wastewater discharges or expansions to existing discharges shall be permitted.

*History Note: Authority G.S. 143-214.1; 143-215.3(a)(1); 143-215.8A;  
Eff. January 1, 2009.*

**15A NCAC 02B .0604 SITE SPECIFIC WATER QUALITY MANAGEMENT PLAN FOR THE GOOSE CREEK WATERSHED (YADKIN PEE-DEE RIVER BASIN): CONTROL TOXICITY INCLUDING AMMONIA**

No activity that results in direct or indirect discharge is allowed if it causes toxicity to the Carolina heelsplitter (*Lasmigona decorata*) endangered mussel. For any direct or indirect discharge that may cause ammonia toxicity to the Carolina heelsplitter freshwater mussel, action shall be taken to reduce ammonia (NH<sub>3</sub>-N) inputs to achieve 0.5 milligrams per liter or less of total ammonia based on chronic toxicity defined in 15A NCAC 02B .0202. This level of total ammonia is based on ambient water temperature equal to or greater than 25 degrees Celsius.

*History Note:* Authority G.S. 143-214.1; 143-215.3(a)(1); 143-215.8A;  
Eff. February 1, 2009.

**15A NCAC 02B .0605 SITE SPECIFIC WATER QUALITY MANAGEMENT PLAN FOR THE GOOSE CREEK WATERSHED (YADKIN PEE-DEE RIVER BASIN): RIPARIAN BUFFER WIDTHS**

In this watershed, undisturbed riparian buffers are required within 200 feet of waterbodies within the 100-Year Floodplain and within 100 feet of waterbodies that are not within the 100-Year Floodplain. The 100-Year Floodplain is the one percent Annual Chance Floodplain as delineated by the North Carolina Floodplain Mapping Program in the Division of Emergency Management. Within the buffer areas that are regulated by this Rule, redevelopment is allowed for residential structures and redevelopment of non-residential structures is allowed provided that less than an additional half acre is disturbed during the redevelopment activity for non-residential structures. Redevelopment is defined in 15A NCAC 02H .1002(14). Exceptions to undisturbed forested riparian buffer requirements are set forth in Rule .0607 of this Section. Activities shall require stormwater control as required by Rule .0602 of this Section.

*History Note:* Authority G.S. 143-214.1; 143-215.3(a)(1); 143-215.8A;  
Eff. January 1, 2009.

**15A NCAC 02B .0606 SITE SPECIFIC WATER QUALITY MANAGEMENT PLAN FOR THE GOOSE CREEK WATERSHED (YADKIN PEE-DEE RIVER BASIN): VARIANCE FOR ACTIVITIES WITHIN RIPARIAN BUFFERS**

Persons who wish to undertake uses designated as prohibited within the protected riparian buffer area may pursue a variance. Persons who wish to undertake forest harvesting beyond the requirements set forth in 15A NCAC 02B .0608 may pursue a variance. The variance request procedure shall be as follows:

- (1) For any variance request, the Division of Water Quality shall make a finding of fact as to whether the following requirements have been met:
  - (a) There are practical difficulties or unnecessary hardships that prevent compliance with the strict letter of the riparian buffer protection requirements. Practical difficulties or unnecessary hardships shall be evaluated in accordance with the following:
    - (i) If the applicant complies with the provisions of the buffer requirements, he/she can secure no reasonable return from, nor make reasonable use of, his/her property. Merely proving that the variance would permit a greater profit from the property is not adequate justification for a variance. Moreover, the Division of Water Quality shall consider whether the variance is the minimum possible deviation from the terms of the buffer requirements that will make reasonable use of the property possible.
    - (ii) The hardship results from application of the buffer requirements to the property rather than from other factors such as deed restrictions or other hardship.
    - (iii) The hardship is due to the physical nature of the applicant's property and is unique to the applicant's property, such as its size, shape, or topography, such that compliance with provision of this Rule would not allow reasonable use of the property.
    - (iv) The applicant did not cause the hardship by knowingly or unknowingly violating the buffer requirements.
    - (v) The applicant did not purchase the property after the effective date of this Rule, and then request a variance.
  - (b) The variance is in harmony with the general purpose and intent of the State's riparian buffer protection requirements and preserves its spirit; and
  - (c) In granting the variance, the public safety and welfare have been assured, water quality has been protected, and substantial justice has been done.
- (2) A variance request pertains to any activity that is proposed to impact any portion of the riparian buffer. If the Division of Water Quality has determined that a major variance request meets the requirements in Item (1) of this Rule, then it shall prepare a preliminary finding and submit it to the Environmental Management Commission. Preliminary findings on variance requests shall be reviewed by the Commission within 90 days after receipt by the Director. Requests for appeals of determinations that the requirements of Item (1) of this Rule have not been met shall be made to the Office of Administrative Hearings for determinations made by the Division of Water Quality or the appropriate Board of Adjustments under G.S. 160A-388 or G.S. 153A-345 for determinations made by the delegated local authority. The purpose of the Commission's review is to determine if it agrees that the requirements in Item (1) of this Rule have been met. Requests for appeals of decisions made by the Commission shall be made to the Office of Administrative Hearings. The following actions shall be taken depending on the Commission's decision on the major variance request:
  - (a) Upon the Commission's approval, the Division of Water Quality shall issue a final decision granting the variance.
  - (b) Upon the Commission's approval with conditions or stipulations, the Division of Water Quality shall issue a final decision, which includes these conditions or stipulations.
  - (c) Upon the Commission's denial, the Division of Water Quality shall issue a final decision denying the variance.

*History Note:* Authority G.S. 143-214.1; 143-215.3(a)(1); 143-215.8A;  
Eff. February 1, 2009.

**15A NCAC 02B .0607 SITE SPECIFIC WATER QUALITY MANAGEMENT PLAN FOR THE GOOSE CREEK WATERSHED (YADKIN PEE-DEE RIVER BASIN): BUFFER TYPES AND MANAGING ACTIVITIES WITHIN RIPARIAN BUFFERS**

(a) **RIPARIAN BUFFER.** The protected riparian buffer shall consist of an area that is undisturbed except for uses provided for in the table in this Rule. A waterbody shall be considered to be present if the feature is shown as described in the applicability paragraph of 15A NCAC 02B .0233 (3) and 02B .0233(3)(a)(i)-(iii). The location of the riparian buffer shall be as follows:

- (1) For streams, the riparian buffer shall begin at the most landward limit of the top of bank or the rooted herbaceous vegetation and extend landward on all sides of the surface water, measured horizontally on a line perpendicular to the surface water.
- (2) For ponds, lakes and reservoirs located within a natural drainage way, the riparian buffer shall begin at the most landward limit of the normal water level or the rooted herbaceous vegetation and extend landward, measured horizontally on a line perpendicular to the surface water.

(b) **EXEMPTION WHEN USES ARE PRESENT AND ONGOING.** The buffer requirements in this Rule do not apply to portions of the riparian buffer where a use is existing and ongoing. Only the portion of the riparian buffer that contains the footprint of the existing and ongoing use is exempt. The determination of whether a use is existing and ongoing shall be made by the Division of Water Quality. A use is existing and ongoing when it is a completed and maintained activity, an activity with appropriate valid permits, or an activity with documentation for unexpired vested rights, as described below:

- (1) A use that was present within the riparian buffer as of the effective date of this Rule and has continued since that time. Existing uses shall include agriculture, buildings, industrial facilities, commercial areas, transportation facilities, maintained lawns, utility lines and on-site sanitary sewage systems. Change of ownership through purchase or inheritance is not a change of use. Activities necessary to maintain uses are allowed provided that the site remains similarly vegetated, no impervious surface is added within the buffer area where it did not exist as of the effective date of this Rule and existing diffuse flow is maintained.
- (2) A use that can be documented to the Division of Water Quality that meets at least one of the following criteria:
  - (A) Project requires a 401 Certification/404 Permit, issued prior to the effective date of this Rule and are still valid;
  - (B) Project requires a state permit, such as a landfill, NPDES wastewater discharge, land application residuals and road construction activities, and has begun construction or is under contract to begin construction and has received all required state permits prior to the effective date of this Rule;
  - (C) Project is being reviewed through the Clean Water Act Section 404/National Environmental Policy Act Merger 01 Process or Safe Accountable Flexible Efficient Transportation Equity Act; a Legacy for Users (published by the US Army Corps of Engineers and Federal Highway Administration, 2003) or its immediate successor and that have reached agreement with Department of Environment and Natural Resources on avoidance and minimization by the effective date of this Rule; or
  - (D) Project is not required to be reviewed by the Clean Water Act Section 404/National Environmental Policy Act Merger 01 Process or Safe Accountable Flexible Efficient Transportation Equity Act; a Legacy for Users (published by the US Army Corps of Engineers and Federal Highway Administration, 2003) or its immediate successor if a Finding of No Significant Impact has been issued for the project and the project has the written approval of the Division of Water Quality prior to the effective date of this Rule.
- (3) At the time an existing use is changed to another use, the buffer requirement of this Rule shall apply. Change of use includes the following:
  - (A) To add impervious surface within the riparian buffer;
  - (B) An agricultural operation within the riparian buffer is converted to a non-agricultural; or
  - (C) a lawn within the riparian buffer ceases to be maintained.

(c) **DIFFUSE FLOW REQUIREMENT.** Diffuse flow of runoff shall be maintained in the riparian buffer by dispersing concentrated flow and reestablishing vegetation, as follows:

- (1) Concentrated runoff from new ditches or manmade conveyances shall be converted to diffuse flow before the runoff enters the riparian buffer; and
- (2) Periodic corrective action to restore diffuse flow shall be taken if necessary to impede the formation of erosion gullies.

(d) **REQUIREMENTS FOR CATEGORIES OF USES AND MITIGATION.** Uses designated as exempt, potentially allowable, and prohibited location in the chart of uses in this Rule shall have the following requirements:

- (1) **EXEMPT.** Uses designated as exempt are allowed within the riparian buffer. Exempt uses shall be designed, constructed and maintained to minimize soil disturbance and to provide the maximum water quality protection practicable. In addition, exempt uses shall meet requirements listed in the table of this Rule for the specific use.
- (2) **POTENTIALLY ALLOWABLE.** Uses designated as potentially allowable may proceed within the riparian buffer provided that there are no practical alternatives to the requested use pursuant to this Rule. These uses require written authorization from the Division of Water Quality. Some of these uses require mitigation, as indicated in the chart in this Rule.

- (3) PROHIBITED. Uses designated as prohibited or not included in this table may not proceed within the riparian buffer unless a variance is granted pursuant to Rule .0606. Site-specific mitigation may be required as one condition of a variance approval.
  - (4) MITIGATION. Persons who wish to undertake uses designated as allowable with mitigation shall obtain approval for a mitigation proposal pursuant to 15A NCAC 02B .0609.
- (e) DETERMINATION OF "NO PRACTICAL ALTERNATIVES." Persons who wish to undertake uses designated as potentially allowable shall submit a request for a "no practical alternatives" determination to the Division of Water Quality. The applicant shall certify that the criteria identified in Subparagraph (e)(1) of this Rule are met. The Division shall grant an Authorization Certificate upon a "no practical alternatives" determination. The procedure for making an Authorization Certificate shall be as follows:
- (1) For any request for an Authorization Certificate, the Division shall review the entire project and make a finding of fact as to whether the following requirements have been met in support of a "no practical alternatives" determination:
    - (A) The basic project purpose cannot be practically accomplished in a manner that would better minimize disturbance, preserve aquatic life and habitat, and protect water quality.
    - (B) The use cannot practically be reduced in size or density, reconfigured or redesigned to better minimize disturbance, preserve aquatic life and habitat, and protect water quality.
    - (C) Plans for practices shall be used if necessary to minimize disturbance, preserve aquatic life and habitat, and protect water quality.
    - (D) The Division of Water Quality must consider the impacts that may affect conditions required to sustain and recover the federally endangered Carolin heelsplitter (*Lasmigona decorata*).
  - (2) Requests for an Authorization Certificate shall be either approved or denied within 60 days of receipt of a complete submission based on the criteria in Subparagraph (e)(1) of this Rule by the Division. Failure to issue an approval or denial within 60 days shall constitute that the applicant has demonstrated "no practical alternatives." The Division of Water Quality may attach conditions to the Authorization Certificate that support the purpose, spirit and intent of the riparian buffer protection program. Complete submissions shall include the following:
    - (A) The name, address and phone number of the applicant;
    - (B) The nature of the activity to be conducted by the applicant;
    - (C) The location of the activity, including the jurisdiction;
    - (D) A map of sufficient detail to accurately delineate the boundaries of the land to be utilized in carrying out the activity, the location and dimensions of any disturbance in riparian buffers associated with the activity, and the extent of riparian buffers on the land;
    - (E) An explanation of why this plan for the activity cannot be practically accomplished, reduced or reconfigured to better minimize disturbance to the riparian buffer, preserve aquatic life and habitat and protect water quality; and
    - (F) Plans for any practices proposed to be used to control the impacts associated with the activity.
  - (3) Any disputes over determinations regarding Authorization Certificates shall be referred to the Director for a decision. The Director's decision is subject to review as provided in Articles 3 and 4 of G.S. 150B.
- (f) DELEGATION OF AUTHORITY FOR THE PROTECTION AND MAINTENANCE OF EXISTING RIPARIAN BUFFERS. The Commission shall grant and rescind local government delegation of the Riparian Buffer Protection requirements according to the following procedures:
- (1) Local governments within the Goose Creek Watershed may submit a written request to the Commission for authority to implement and enforce the State's riparian buffer protection requirements within their jurisdiction. The written request shall be accompanied by information that shows:
    - (A) The local government has land use jurisdiction for the riparian buffer demonstrated by delineating the local land use jurisdictional boundary on USGS 1:24,000 topographical map(s) or other finer scale map(s);
    - (B) The local government has the administrative organization, staff, legal authority, financial and other resources necessary to implement and enforce the State's riparian buffer protection requirements based on its size and projected amount of development;
    - (C) The local government has adopted ordinances, resolutions, or regulations necessary to establish and maintain the State's riparian buffer protection requirements; and
    - (D) The local government has provided a plan to address violations with civil or criminal remedies and actions as well as remedies that shall restore buffer functions on violation sites and provide a deterrent against the occurrence of future violations.
  - (2) Within 90 days after the Commission has received the request for delegation, the Commission shall approve the request if the local government has complied with all of Subparagraph (f)(1) of this Rule and notify the local government whether it has been approved, approved with modifications, or denied.
  - (3) The Commission, upon determination that a delegated local authority is failing to implement or enforce the riparian buffer protection requirements in keeping with an approved delegation, shall notify the delegated local authority in writing of the local program's inadequacies. If the delegated local authority has not corrected the deficiencies within 90 days of receipt of the written notification, then the Commission shall rescind the delegation of authority to the local government and shall implement and enforce the State's riparian buffer protection requirements.

(g) APPOINTMENT OF A RIPARIAN BUFFER PROTECTION ADMINISTRATOR. Upon receiving delegation, local governments shall appoint a Riparian Buffer Protection Administrator who shall coordinate the implementation and enforcement of the program. The Administrator shall attend an initial training session by the Division of Water Quality and subsequent annual training sessions. The Administrator shall ensure that local government staffs working directly with the program receive training to understand, implement and enforce the program.

(h) PROCEDURES FOR USES WITHIN RIPARIAN BUFFERS THAT ARE ALLOWABLE AND ALLOWABLE WITH MITIGATION.

- (1) Upon receiving delegation, local authorities shall review proposed uses within the riparian buffer and issue approvals if the uses meet the riparian buffer protection requirements.
- (2) Delegated local authorities shall issue an Authorization Certificate for uses if the proposed use meets the requirements including provisions for mitigation set forth in Rule .0609.
- (3) The Division of Water Quality may challenge a decision made by a delegated local authority for a period of 30 days after the Authorization Certificate is issued. If the Division of Water Quality does not challenge an Authorization Certificate within 30 days of issuance, then the delegated local authority's decision shall stand.

(i) VARIANCES. After receiving delegation, local governments shall review variance requests and make recommendations to the Commission for approval.

(j) LIMITS OF DELEGATED LOCAL AUTHORITY. The Commission has jurisdiction to the exclusion of local governments to implement the requirements of this Rule for the following types of activities:

- (1) Activities undertaken by the State;
- (2) Activities undertaken by the United States;
- (3) Activities undertaken by multiple jurisdictions; and
- (4) Activities undertaken by local units of government.

(k) RECORD-KEEPING REQUIREMENTS. Delegated local authorities shall maintain on-site records for a minimum of five years. Delegated local authorities must furnish a copy of these records to the Director within 30 days of receipt of a written request for the records. The Division of the Water Quality shall inspect local riparian buffer protection programs to ensure that the programs are being implemented and enforced. Each delegated local authority's records shall include the following:

- (1) A copy of variance requests;
- (2) The variance request's finding of fact;
- (3) The result of the variance proceedings;
- (4) A record of complaints and action taken as a result of the complaint;
- (5) Records for stream origin calls and stream ratings; and
- (6) Copies of request for authorization, records approving authorization and Authorization Certificates.

(l) Riparian buffers along surface waters in this watershed shall be maintained. Some uses within riparian buffers are exempt and some uses are potentially allowable. Any exempt or potentially allowed use shall require stormwater control as outlined in Rule .0602 if the one acre threshold is met. The following chart sets out the uses and their designation under this Rule as exempt, potentially allowable requiring DWQ approval or potentially allowable requiring both DWQ approval and mitigation, or prohibited as described above. The United States Environmental Protection Agency Endangered Species Protection Program at [www.epa.gov/espp](http://www.epa.gov/espp) and NC Pesticide Board regulates pesticide application (see rules at 02 NCAC 09L .2201 through .2203).

	Exempt	Potentially allowable requiring DWQ approval or Potentially allowable requiring both DWQ approval and mitigation* Note: the asterisk (X*) identifies those uses that require both DWQ approval and mitigation.	Prohibited
Airport facilities that impact equal to or less than 150 linear feet or one-third of an acre of riparian buffer		X	
Airport facilities that impact greater than 150 linear feet or one-third of an acre of riparian buffer		X*	
Archaeological activities	X		
Bridges		X	
Dam maintenance activities	X		
Drainage ditches, roadside ditches and stormwater outfalls			

<p>through riparian buffers:</p> <ul style="list-style-type: none"> <li>Existing drainage ditches, roadside ditches, and stormwater outfalls provided that they are managed to minimize the sediment, nutrients including ammonia and other pollution that convey to waterbodies</li> <li>New drainage ditches, roadside ditches and stormwater outfalls provided that a stormwater management facility is installed to minimize the sediment, nutrients including ammonia and other pollution and attenuate flow before the conveyance discharges through the riparian buffer</li> <li>New drainage ditches, roadside ditches and stormwater outfalls that do not minimize the sediment, nutrients including ammonia and other pollution and attenuate flow before discharging through the riparian buffer</li> <li>Excavation of the streambed in order to bring it to the same elevation as the invert of a ditch</li> </ul>	X	X	X
Drainage of a pond in a natural drainage way provided that a new riparian buffer that meets the diffuse flow requirements of this Rule is established adjacent to the new channel	X		
<p>Driveway crossings of streams and other surface waters subject to this Rule:</p> <ul style="list-style-type: none"> <li>Driveway crossings on single family residential lots that disturb equal to or less than 25 linear feet in width and are perpendicular<sup>3</sup></li> <li>Driveway crossings on single family residential lots that disturb greater than 25 linear feet in width and are perpendicular<sup>3</sup></li> <li>In a subdivision that cumulatively disturbs equal to or less than 150 linear feet in width and are perpendicular</li> <li>In a subdivision that cumulatively disturbs greater than 150 linear feet in width and are perpendicular</li> </ul>	X	X  X X*	
Fences provided that disturbance is minimized and installation does not result in removal of forest vegetation	X		
Forest harvesting – see Rule .0608			
<p>Fertilizer application:</p> <ul style="list-style-type: none"> <li>One-time fertilizer application at agronomic rates to establish replanted vegetation</li> <li>Ongoing fertilizer application</li> </ul>	X		X
Greenway/hiking trails		X	
Historic preservation	X		
Landfills as defined by G.S. 130A-290			X
<p>Mining activities:</p> <ul style="list-style-type: none"> <li>Mining activities that are covered by the Mining Act provided that new riparian buffers that meet the diffuse flow requirements of this Rule are established adjacent to the relocated channels</li> <li>Mining activities that are not covered by the Mining Act OR where new riparian buffers that meet the diffuse flow requirements of this Rule are not established adjacent to the relocated channels</li> <li>Wastewater or mining dewatering wells with approved NPDES permit</li> </ul>		X  X*	X
Non-electric utility lines with impacts other than perpendicular crossings <sup>3</sup>			

<ul style="list-style-type: none"> <li>• If activity is within 50 feet of the stream</li> <li>• If activity is outside of the inner 50 feet nearest the stream</li> <li>• Wastewater collection system utility lines and lift station lines may impact the riparian zone if both gravity and force main collections systems are made of ductile iron and 50% of the collection system is cleaned annually.</li> <li>• Lift Stations require Supervisory Control and Data Acquisition System (SCADA), telemetry, audio and visual alarms, signage with emergency contact, daily visitation (365 days/year), and documentation must be maintained for 3 years of all of the above and available upon request [note: this requirement also applies to collection system perpendicular crossings, detailed below.]</li> </ul>		<p>X*</p> <p>X</p> <p>X*</p> <p>X*</p>	
<p>Non-electric utility line perpendicular crossing of streams and other surface waters subject to this Rule that are not collection systems<sup>3</sup>:</p> <ul style="list-style-type: none"> <li>• Perpendicular crossings that disturb equal to or less than 40 linear feet of riparian buffer with a maintenance corridor equal to or less than 10 feet in width</li> <li>• Perpendicular crossings that disturb equal to or less than 40 linear feet of riparian buffer with a maintenance corridor greater than 10 feet in width</li> <li>• Perpendicular crossings that disturb greater than 40 linear feet but equal to or less than 150 linear feet of riparian buffer with a maintenance corridor equal to or less than 10 feet in width</li> <li>• Perpendicular crossings that disturb greater than 40 linear feet but equal to or less than 150 linear feet of riparian buffer with a maintenance corridor greater than 10 feet in width</li> <li>• Perpendicular crossings that disturb greater than 150 linear feet of riparian buffer</li> </ul> <p>Non-electric perpendicular utility line crossings that are collections systems as defined in Rule 15A NCAC 02T .0300 (note: must follow constraints listed under wastewater collection system utility lines and lift stations, above):</p> <ul style="list-style-type: none"> <li>• That use any of the following installation methods to minimize the sediment, nutrient and other pollution through the riparian buffer: underground directional boring methods, bore-and-jack techniques or another appropriate microtunnelling method.</li> <li>• That does not minimize the sediment, nutrient and other pollution through the riparian buffer by the most appropriate exempt method.</li> </ul>	<p>X</p>	<p>X</p> <p>X</p> <p>X*</p> <p>X*</p> <p>X</p>	<p>X</p>
<p>On-site sanitary sewage systems - new ones that use ground absorption</p>			<p>X</p>
<p>Overhead electric utility lines<sup>1,2,3</sup>:</p> <ul style="list-style-type: none"> <li>• Stream crossings that disturb equal to or less than 150 linear feet of riparian buffer</li> <li>• Stream crossings that disturb greater than 150 linear feet of riparian buffer</li> </ul>	<p>X</p>	<p>X*</p>	
<p>Periodic maintenance of modified natural streams such as canals and a grassed travelway on one side of the surface water when alternative forms of maintenance access are not practical.</p>		<p>X</p>	

Playground equipment: <ul style="list-style-type: none"> <li>Playground equipment on single family lots provided that installation and use does not result in removal of vegetation</li> <li>Playground equipment installed on lands other than single-family lots or that requires removal of vegetation</li> </ul>	X	X	
Ponds in natural drainage ways, excluding dry ponds: <ul style="list-style-type: none"> <li>New ponds provided that a riparian buffer that meets the diffuse flow requirements of this Rule is established adjacent to the pond</li> <li>New ponds where a riparian buffer that meets the diffuse flow requirements of this Rule is NOT established adjacent to the pond</li> </ul>		X	X
Protection of existing structures, facilities and streambanks when this requires additional disturbance of the riparian buffer or the stream channel		X	
Railroad impacts other than crossings of streams and other surface waters subject to this Rule			X
Railroad crossings of streams and other surface waters subject to this Rule: <ul style="list-style-type: none"> <li>Railroad crossings that impact equal to or less than 40 linear feet of riparian buffer</li> <li>Railroad crossings that impact greater than 40 linear feet but equal to or less than 150 linear feet of riparian buffer</li> <li>Railroad crossings that impact greater than 150 linear feet of riparian buffer</li> </ul>	X	X	X
Removal of previous fill or debris provided that diffuse flow is maintained and any vegetation removed is restored	X		
Road impacts other than crossings of streams and other surface waters subject to this Rule		X*	
Road crossings of streams and other surface waters subject to this Rule: <ul style="list-style-type: none"> <li>Road crossings that impact equal to or less than 40 linear feet of riparian buffer and is perpendicular</li> <li>Road crossings that impact greater than 40 linear feet but equal to or less than 150 linear feet and is perpendicular</li> <li>Road crossings that impact greater than 150 linear feet of riparian buffer</li> </ul>	X	X X*	
Scientific studies and stream gauging	X		
Stormwater management ponds excluding dry ponds: <ul style="list-style-type: none"> <li>New stormwater management ponds provided that a riparian buffer that meets the diffuse flow requirements of this Rule is established adjacent to the pond</li> <li>New stormwater management ponds where a riparian buffer that meets the diffuse flow requirements of this Rule is NOT established adjacent to the pond</li> </ul>		X	X
Stream restoration	X		
Streambank stabilization		X	
Temporary roads: <ul style="list-style-type: none"> <li>Temporary roads that disturb less than or equal to 2,500 square feet provided that vegetation is restored within six months of initial disturbance</li> <li>Temporary roads that disturb greater than 2,500 square feet provided that vegetation is restored within six months of initial disturbance</li> </ul>	X	X	

<ul style="list-style-type: none"> <li>Temporary roads used for bridge construction or replacement provided that restoration activities, such as soil stabilization and revegetation, are conducted immediately after construction</li> </ul>		X	
Temporary sediment and erosion control devices: <ul style="list-style-type: none"> <li>To control impacts associated with uses approved by the Division or that have received a variance provided that sediment and erosion control for upland areas is addressed to the maximum extent practical outside the buffer</li> <li>In-stream temporary erosion and sediment control measures for work within a stream channel</li> </ul>	X	X	
Underground electric utility lines: <ul style="list-style-type: none"> <li>Impacts other than perpendicular crossings<sup>3,4</sup></li> </ul>	X		
Underground electric utility line perpendicular crossings of streams and other surface waters subject to this Rule: <ul style="list-style-type: none"> <li>Perpendicular crossings that disturb less than or equal to 40 linear feet of riparian buffer<sup>3,4</sup></li> <li>Perpendicular crossings that disturb greater than 40 linear feet of riparian buffer<sup>3,4</sup></li> </ul>	X	X	
Vegetation management: <ul style="list-style-type: none"> <li>Emergency fire control measures provided that topography is restored</li> <li>Planting vegetation to enhance the riparian buffer</li> <li>Pruning forest vegetation provided that the health and function of the forest vegetation is not compromised</li> <li>Removal of individual trees which are in danger of causing damage to dwellings, other structures or human life</li> <li>Removal of poison ivy</li> <li>Removal of understory nuisance vegetation as defined in: Smith, Cheri L. 1998. Exotic Plant Guidelines. Department of Environment and Natural Resources. Division of Parks and Recreation. Raleigh, NC. Guideline #30</li> </ul>	X X X X X X		
Water dependent structures as defined in 15A NCAC 02B .0202		X	
Water wells	X		
Wetland restoration	X		

<sup>1</sup> Provided that all of the following BMPs for overhead utility lines are used. If all of these BMPs are not used, then the overhead utility lines shall require a no practical alternatives evaluation by the Division of Water Quality.

- A minimum zone of 10 feet wide immediately adjacent to the water body shall be managed such that only vegetation that poses a hazard or has the potential to grow tall enough to interfere with the line is removed.
- Woody vegetation shall be cleared by hand. No land grubbing or grading is allowed.
- Vegetative root systems shall be left intact to maintain the integrity of the soil. Stumps shall remain where trees are cut.
- Rip rap shall not be used unless it is necessary to stabilize a tower.
- No fertilizer shall be used other than a one-time application to re-establish vegetation.
- Construction activities shall minimize the removal of woody vegetation, the extent of the disturbed area, and the time in which areas remain in a disturbed state.
- Active measures shall be taken after construction and during routine maintenance to ensure diffuse flow of stormwater through the buffer.
- In wetlands, mats shall be utilized to minimize soil disturbance.

<sup>2</sup> Provided that poles or towers shall not be installed within 10 feet of a water body unless the Division of Water Quality completes a no practical alternatives evaluation.

<sup>3</sup> Perpendicular crossings are those that intersect the surface water at an angle between 75 degrees and 105 degrees.

<sup>4</sup> Provided that all of the following BMPs for underground utility lines are used. If all of these BMPs are not used, then the underground utility line shall require a no practical alternatives evaluation by the Division of Water Quality.

- Woody vegetation shall be cleared by hand. No land grubbing or grading is allowed.
- Vegetative root systems shall be left intact to maintain the integrity of the soil. Stumps shall remain, except in the trench, where trees are cut.
- Underground cables shall be installed by vibratory plow or trenching.
- The trench shall be backfilled with the excavated soil material immediately following cable installation.
- No fertilizer shall be used other than a one-time application to re-establish vegetation.
- Construction activities shall minimize the removal of woody vegetation, the extent of the disturbed area, and the time in which areas remain in a disturbed state.
- Active measures shall be taken after construction and during routine maintenance to ensure diffuse flow of stormwater through the buffer.
- In wetlands, mats shall be utilized to minimize soil disturbance.

*History Note:* Authority G.S. 143-214.1; 143-215.8A; 143-214.7;  
Eff. February 1, 2009.

**15A NCAC 02B .0608 SITE SPECIFIC WATER QUALITY MANAGEMENT PLAN FOR THE GOOSE CREEK WATERSHED (YADKIN PEE-DEE RIVER BASIN): MANAGE ACTIVITIES WITHIN RIPARIAN BUFFERS: FOREST HARVESTING REQUIREMENTS**

- (a) The following requirements shall apply for forest harvesting operations and practices in the riparian areas.
- (1) Logging decks and sawmill sites shall not be placed in the riparian buffer.
  - (2) Access roads and skid trails are prohibited except for temporary and permanent stream crossings established in accordance with 15A NCAC 01I .0203. Temporary stream crossings shall be permanently stabilized after any site disturbing activity is completed.
  - (3) Timber felling shall be directed away from the stream or water body.
  - (4) Skidding shall be directed away from the stream or water body and shall be done in a manner that minimizes soil disturbance and prevents the creation of channels or ruts.
  - (5) Individual trees may be treated to maintain or improve their health, form or vigor.
  - (6) Harvesting of dead or infected trees or application of pesticides necessary to prevent or control extensive tree pest and disease infestation is allowed, when approved by the Division of Forest Resources for a specific site in accordance with G.S. 113-60.4. A copy of the Division of Forest Resources approval must be provided to the Division of Water Quality in accordance with Session Law 2001-404.
  - (7) Removal of individual trees that are in danger of causing damage to structures or human life is allowed.
  - (8) Natural regeneration of forest vegetation and planting of trees, shrubs, or ground cover plants to enhance the riparian buffer is allowed provided that soil disturbance is minimized. Plantings shall consist primarily of native species.
  - (9) High intensity prescribed burns shall not be allowed.
  - (10) Application of fertilizer is not allowed except as necessary for permanent stabilization. Broadcast application of fertilizer or herbicides to the adjacent forest stand shall be conducted so that the chemicals are not applied directly to or allowed to drift into the riparian buffer.
- (b) In the riparian buffer, forest vegetation shall be protected and maintained. Selective harvest as provided for below is allowed on forest lands that have a deferment for use value under forestry in accordance with G.S. 105-277.2 through G.S. 277.6 or on forest lands that have a forest management plan prepared or approved by a registered professional forester. Copies of either the approval of the deferment for use value under forestry or the forest management plan shall be produced upon request. For such forest lands, selective harvest is allowed in accordance with the following:
- (1) Tracked or wheeled vehicles are not permitted within the first 50 feet the riparian buffer top of bank landward except at stream crossings designed, constructed and maintained in accordance with 15A NCAC 01I .0203.
  - (2) Soil disturbing site preparation activities are not allowed.
  - (3) Trees shall be removed with the minimum disturbance to the soil and residual vegetation.
  - (4) The first 10 feet of the riparian buffer directly adjacent to the stream or waterbody shall be undisturbed.
  - (5) In the zone from 10 feet to 50 feet of the riparian buffer, a maximum of 50 percent of the trees greater than five inches diameter breast height (dbh) may be cut and removed. The reentry time for harvest shall be no more frequent than every 15 years, except on forest plantations as defined in 15A NCAC 02B .0233(e) where the reentry time shall be no more frequent than every five years. In either case, the trees remaining after harvest shall be as evenly spaced as possible.
  - (6) In the outer riparian buffer (landward of 50 feet), harvesting and regeneration of the forest stand is allowed provided that sufficient ground cover is maintained to provide for diffusion and infiltration of surface runoff.

*History Note: Authority G.S. 143-214.1; 143-215.3(a)(1); 143-215.8A; Eff. February 1, 2009.*

**15A NCAC 02B .0609 SITE SPECIFIC WATER QUALITY MANAGEMENT PLAN FOR THE GOOSE CREEK WATERSHED (YADKIN PEE-DEE RIVER BASIN): MANAGE ACTIVITIES WITHIN RIPARIAN BUFFERS: MITIGATION REQUIREMENTS FOR BUFFER IMPACTS**

- (a) **PURPOSE.** The purpose of this Rule is to set forth the mitigation requirements that apply to the Goose Creek Watershed existing riparian buffer protection program, as described in 15A NCAC 02B .0605, .0606, and .0607.
- (b) **APPLICABILITY.** This Rule applies to persons who wish to impact a riparian buffer in the Goose Creek Watershed when one of the following applies:
- (1) A person has received an Authorization Certificate pursuant to 15A NCAC 02B .0607 for a proposed use that is designated as potentially allowable requiring both DWQ approval and mitigation.
  - (2) A person has received a variance pursuant to 15A NCAC 02B .0606 and is required to perform mitigation as a condition of a variance approval.
- (c) **THE AREA OF MITIGATION.** The required area of mitigation shall be determined by either the Division of Water Quality or the delegated local authority according to the following:
- (1) The impacts in square feet to the riparian buffer shall be determined by the Division of Water Quality or the delegated local authority by adding the following:
    - (A) The area of the footprint of the use causing the impact to the riparian buffer.
    - (B) The area of the boundary of any clearing and grading activities within the riparian buffer necessary to accommodate the use.
    - (C) The area of any ongoing maintenance corridors within the riparian buffer associated with the use.
  - (2) The required area of mitigation shall be determined by applying the following multipliers to the impacts determined in Subparagraph (c)(1) of this Rule to each zone of the riparian buffer:
    - (A) Impacts to the riparian buffer shall be multiplied by three.
    - (B) Impacts to wetlands within the riparian buffer that are subject to mitigation under 15A NCAC 02H .0506 shall comply with the mitigation ratios in 15A NCAC 02H .0506.
- (d) **THE LOCATION OF MITIGATION.** The mitigation effort shall be within the Goose Creek Watershed, as close to the location of the impact as feasible.
- (e) **ISSUANCE OF THE MITIGATION DETERMINATION.** The Division of Water Quality or the delegated local authority shall issue a mitigation determination that specifies the required area and location of mitigation pursuant to Paragraph (c) of this Rule.
- (f) **OPTIONS FOR MEETING THE MITIGATION DETERMINATION.** The mitigation determination made pursuant to Paragraph (e) of this Rule may be met through one of the following options:
- (1) Payment of a compensatory mitigation fee to the Riparian Buffer Restoration Fund pursuant to Paragraph (g) of this Rule.
  - (2) Donation of real property or of an interest in real property pursuant to Paragraph (h) of this Rule.
  - (3) Restoration or enhancement of a non-forested riparian buffer. This shall be accomplished by the applicant after submittal and approval of a restoration plan pursuant to Paragraph (i) of this Rule.
- (g) **PAYMENT TO THE RIPARIAN BUFFER RESTORATION FUND.** Persons who choose to satisfy their mitigation determination by paying a compensatory mitigation fee to the Riparian Buffer Restoration Fund shall meet the following requirements:
- (1) **SCHEDULE OF FEES:** The amount of payment into the Fund shall be determined by multiplying the acres or square feet of mitigation determination made pursuant to Paragraph (e) of this Rule by ninety-six cents (\$.96) per square foot or forty-one thousand, six hundred and twenty-five dollars (\$41,625) per acre.
  - (2) The required fee shall be submitted to the [North Carolina Ecosystem Enhancement Program, 1652 Mail Service Center, Raleigh, NC 27699-1652] prior to any activity that results in the removal or degradation of the protected riparian buffer for which a "no practical alternatives" determination has been made.
  - (3) The payment of a compensatory mitigation fee may be fully or partially satisfied by donation of real property interests pursuant to Paragraph (h) of this Rule.
  - (4) The Division of Water Quality shall review the fee outlined in Subparagraph (g)(1) of this Rule every two years and compare it to the actual cost of restoration activities conducted by the Department, including site identification, planning, implementation, monitoring and maintenance costs. Based upon this biennial review, the Division of Water Quality shall recommend revisions to Subparagraph (g)(1) of this Rule when adjustments to this Schedule of Fees are deemed necessary.
- (h) **DONATION OF PROPERTY.** Persons who choose to satisfy their mitigation determination by donating real property or an interest in real property shall meet the following requirements:
- (1) The donation of real property interests may be used to either partially or fully satisfy the payment of a compensatory mitigation fee to the Riparian Buffer Restoration Fund pursuant to Paragraph (g) of this Rule. The value of the property interest shall be determined by an appraisal performed in accordance with Part (h)(4)(D) of this Rule. The donation shall satisfy the mitigation determination if the appraised value of the donated property interest is equal to or greater than the required fee. If the appraised value of the donated property interest is less than the required fee calculated pursuant to Subparagraph (g)(1) of this Rule, the applicant shall pay the remaining balance due.
  - (2) The donation of conservation easements to satisfy compensatory mitigation requirements shall be accepted only if the conservation easement is granted in perpetuity.

- (3) Donation of real property interests to satisfy the mitigation determination shall be accepted only if such property meets all of the following requirements:
- (A) The property shall be located within an area that is identified as a priority for restoration in the Basinwide Wetlands and Riparian Restoration Plan developed by the Department pursuant to G.S. 143-214.10 or shall be located at a site that is otherwise consistent with the goals outlined in the Basinwide Wetlands and Riparian Restoration Plan;
  - (B) The property shall contain riparian areas for restoration, defined in 15A NCAC 02B .0243, not currently protected by the State's riparian buffer protection program that merit restoration;
  - (C) The size of the restorable riparian buffer on the property to be donated shall equal or exceed the acreage of riparian buffer required to be mitigated under the mitigation responsibility determined pursuant to Paragraph (c) of this Rule;
  - (D) The property shall not require excessive measures for successful restoration, such as removal of structures or infrastructure. Restoration of the property shall be capable of fully offsetting the adverse impacts of the requested use;
  - (E) The property shall be suitable to be successfully restored, based on existing hydrology, soils, and vegetation;
  - (F) The estimated cost of restoring and maintaining the property shall not exceed the value of the property minus site identification and land acquisition costs;
  - (G) The property shall not contain any building, structure, object, site, or district that is listed in the National Register of Historic Places established pursuant to Public Law 89-665, 16 U.S.C. 470 as amended;
  - (H) The property shall not contain any hazardous substance or solid waste;
  - (I) The property shall not contain structures or materials that present health or safety problems to the general public. If wells, septic, water or sewer connections exist, they shall be filled, remediated or closed at owner's expense in accordance with state and local health and safety regulations;
  - (J) The property and adjacent properties shall not have prior, current, and known future land use that would inhibit the function of the restoration effort;
  - (K) The property shall not have any encumbrances or conditions on the transfer of the property interests.
- (4) At the expense of the applicant or donor, the following information shall be submitted to the Division of Water Quality with any proposal for donations or dedications of interest in real property:
- (A) Documentation that the property meets the requirements laid out in Subparagraph (h)(3) of this Rule.
  - (B) US Geological Survey 1:24,000 (7.5 minute) scale topographic map, county tax map, USDA Natural Resource Conservation Service County Soil Survey Map, and county road map showing the location of the property to be donated along with information on existing site conditions, vegetation types, presence of existing structures and easements.
  - (C) A current property survey performed in accordance with the procedures of the North Carolina Department of Administration, State Property Office as identified by the State Board of Registration for Professional Engineers and Land Surveyors in "Standards of Practice for Land Surveying in North Carolina." Copies may be obtained from the North Carolina State Board of Registration for Professional Engineers and Land Surveyors, 3620 Six Forks Road, Suite 300, Raleigh, North Carolina 27609.
  - (D) A current appraisal of the value of the property performed in accordance with the procedures of the North Carolina Department of Administration, State Property Office as identified by the Appraisal Board in the "Uniform Standards of Professional North Carolina Appraisal Practice." Copies may be obtained from the Appraisal Foundation, Publications Department, P.O. Box 96734, Washington, D.C. 20090-6734.
  - (E) A title certificate.
- (i) **RIPARIAN BUFFER RESTORATION OR ENHANCEMENT.** Persons who choose to meet their mitigation requirement through riparian buffer restoration or enhancement shall meet the following requirements:
- (1) The applicant may restore or enhance riparian buffer defined in 15A NCAC 02B .0243 if either of the following applies:
    - (A) The area of riparian buffer restoration is equal to the required area of mitigation determined pursuant to Paragraph (c) of this Rule; or
    - (B) The area of riparian buffer enhancement is three times larger than the required area of mitigation determined pursuant to Paragraph (c) of this Rule.
  - (2) The location of the riparian buffer restoration or enhancement shall comply with the requirements in Paragraph (d) of this Rule.
  - (3) The riparian buffer restoration or enhancement site shall have a minimum width of 50 feet as measured horizontally on a line perpendicular to the surface water and may include the following:
    - (A) Restoration/enhancement of existing riparian areas.
    - (B) Restoration/enhancement and respective preservation of streamside areas when the stream is not depicted on USGS map or Soil Survey.
    - (C) Preservation of streamside areas when the stream is not depicted on USGS map or Soil Survey.

- (D) Restoration/enhancement and respective preservation of streamside areas along first order ephemeral streams that discharge/outlet into intermittent or perennial streams.
- (E) Preservation of the streamside area along first order ephemeral streams that discharge/outlet intermittent or perennial stream.
- (4) Other individual/innovative mitigation projects may be approved by the Division of Water Quality that meet the purpose of this Rule.
- (5) The applicant shall first receive an Authorization Certificate for the proposed use according to the requirements of 15A NCAC 02B .0607. After receiving this determination, the applicant shall submit a restoration or enhancement plan for approval by the Division of Water Quality. The Division of Water Quality shall approve plans that meet the requirements of this Rule. The restoration or enhancement plan shall contain the following.
  - (A) A map of the proposed restoration or enhancement site.
  - (B) A vegetation plan. The vegetation plan shall include a minimum of two native hardwood tree species planted at a density sufficient to provide 320 trees per acre at maturity.
  - (C) A grading plan. The site shall be graded in a manner to ensure diffuse flow through the riparian buffer.
  - (D) A fertilization plan.
  - (E) A schedule for implementation.
- (6) Within one year after the Division of Water Quality has approved the restoration or enhancement plan, the applicant shall present proof to the Division of Water Quality that the riparian buffer has been restored or enhanced. If proof is not presented within this timeframe, then the person shall be in violation of the State's or the delegated local authority's riparian buffer protection program.
- (7) The mitigation area shall be placed under a perpetual conservation easement that will provide for protection of the property's nutrient removal functions.
- (8) The applicant shall submit annual reports for a period of five years after the restoration or enhancement showing that the trees planted have survived and that diffuse flow through the riparian buffer has been maintained. The applicant shall replace trees that do not survive and restore diffuse flow if needed during that five-year period.

*History Note:* Authority G.S. 143-214.1; 143-215.3(a)(1); 143-215.8A;  
Eff. February 1, 2009.



# MECKLENBURG COUNTY

## Land Use and Environmental Services Agency Water Quality Program

### MEMORANDUM

**TO:** Bill Duiguid, North Carolina Division of Water Quality – Storm Water Unit  
Amy Chapman, North Carolina Division of Water Quality – 401 Permitting Unit

**FROM:** Rusty Rozzelle, Mecklenburg County Water Quality Program

**DATE:** April 13, 2009

**SUBJECT:** Submittal of the Draft Post Construction and Goose Creek Management Ordinance for the Town of Mint Hill

Mecklenburg County Water Quality Program (MCWQP) is submitting this draft ordinance for your review on behalf of the Town of Mint Hill with the intent of ultimately requesting delegation of authority to implement the Site Specific Water Quality Management Plan for the Goose Creek Watershed (SSWQMP) in accordance with 15A NCAC 2B.0602(c) and 15A NCAC 2B.0607(f). Attached is a draft ordinance (which is a modification of the Mint Hill Post Construction Storm Water Ordinance) that includes provisions to implement the SSWQMP. The majority of the SSWQMP provisions are included in Section 3.5 of the attached draft ordinance.

Because the ordinance is used to meet multiple goals, several elements of the draft ordinance are a departure from the requirements of our permit. MCWQP believes these departures, on the whole, exceed the minimum storm water management and water quality protection requirements of the SSWQMP. MCWQP requests that NCDWQ review this draft ordinance and provide preliminary input that the ordinance meets or exceeds the storm water management and water quality protection provided in SSWQMP. To assist with NCDWQ's review of the draft ordinance, the following list highlights and discusses these departures:

**1. Applicability**

The applicability requirements in the draft ordinance are somewhat unusual due to our decision to combine the SSWMP into the post-construction ordinance for the Town of Mint Hill. A lot of this language is not contained in the SSWMP.

**2. Delegation of Authority**

It is our intent to obtain local delegation to apply the SSWMP; however, the ordinance must

be written so that it applies whether or not local delegation is awarded. The wording in Sections 305(A)(1) and 305(C)(1) attempt to describe this requirement.

3. **Volume Control from Structural BMPs**

The SSWMP requires that structural BMPs be designed to control the difference between the pre-development and post-development volume for a 1-yr 24-hr storm and requires the drawdown time to be a minimum of 48 hours, but not more than 120 hours. The draft ordinance specifies control of the full post-development volume for the 1-yr 24-hr storm with the drawdown requirements of a minimum of 24 hours, but not more than 120 hours, which is consistent with our Phase II Permit and Charlotte-Mecklenburg BMP Design Manual (which has been approved by NCDWQ). This draft ordinance requirement exceeds the storm water protection required by the SSWQMP because the full post-development volume for the 1-yr 24-hr storm will always be greater than the difference between the pre-development and post development volume. Thus control of a larger volume of storm water will further increase water quality benefit by protecting the downstream channel stability of streams from larger erosive flows.

4. **Peak Control**

The SSWQMP requires peak control for the 1-yr 24-hr storm. The attached draft ordinance includes this requirement; however, control requirements for development exceeding ten percent built-upon area were added for peak control of the 10-yr 6-hr and the 25-yr 6-hr storms to be consistent with the current Mint Hill Post Construction Storm Water Ordinance.

5. **Wastewater Control Requirements**

MCWQP has not included the wastewater control requirements of 15A NCAC 2B.0603 as part of the draft ordinance and does not request delegation of this regulation. Since MCWQP does not have the authority to issue NPDES permits, MCWQP does not request delegation of this regulation.

6. **Riparian Buffer Protection Administrator**

Under 15A NCAC 2B.0607(g), the SSWQMP requires the appointment of a Riparian Buffer Protection Administrator. Mint Hill already has designated a Storm Water Administrator to implement the Post Construction Storm Water Ordinance and proposes that the Storm Water Administrator serve as the Riparian Buffer Protection Administrator as well; therefore this title has been changed to Storm Water Administrator in the draft ordinance.

7. **Variations to Riparian Buffer Requirements**

The SSWQMP uses the term “major variance” under 15A NCAC 02B.0606(2), but does not define the term. We assume that the State’s intent is to require all buffer variances to go through the EMC; therefore, this is the way the draft ordinance was written.

8. **Local Mitigation Program**

Under 15A NCAC 02B.0609, the SSWQMP requires that mitigation fees and / or property donations be managed by the North Carolina Ecosystem Enhancement Program. In the attached draft ordinance, the Town of Mint Hill will manage mitigation activities locally.

It is our desire to obtain your comments by May 15, 2009. You can provide your comments by

Bill Duiguid and Amy Chapman  
Submittal of the Draft Post Construction and Goose Creek Management Ordinance for the Town of Mint Hill  
Page 3 of 3

giving me a call at 704-336-5449 or sending me an email at [rusty.rozzelle@mecklenburgcountync.gov](mailto:rusty.rozzelle@mecklenburgcountync.gov) . If you would like a Word version of the document for “Tracking” your changes, please let me know and I will gladly make it available to you. After you provide your preliminary comments on the draft ordinance, this ordinance will be modified accordingly and presented to the Mint Hill Town Council for consideration for adoption. The adopted ordinance, as well the other information required for formal delegation will be submitted to your Office for formal review and approval.

Please contact me at (704) 336-5449 if you have any questions.

Thank you very much for agreeing to review this draft ordinance.

Enclosures: Town of Mint Hill Draft Post Construction and Goose Creek Management Ordinance



## ENVIRONMENTAL MANAGEMENT COMMISSION

E74

Stephen T. Smith  
Chairman  
Charles Peterson  
Vice Chairman

### NORTH CAROLINA DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES

Beverly Eaves Perdue, Governor  
Dee Freeman, Secretary

Yvonne C. Bailey  
Donnie Brewer  
Thomas F. Cecich  
Stan L. Crowe  
John S. Curry  
Marion Deerhake  
Tom Ellis  
William L. Hall, Jr.

Ernest W. Larkin  
Kevin Martin  
David H. Moreau  
Jeffrey V. Morse  
Darryl D. Moss  
David B. Peden  
Dickson Phillips III  
Forrest R. Westall, Sr.

February 3, 2010

Mecklenburg County Water Quality Program Manager  
Attention: Rusty Rozelle  
700 North Tryon Street  
Charlotte, North Carolina 28202

RE: Delegation of Authority  
Goose Creek Water Quality Management Plan  
Mecklenburg County, N.C.

On January 14, 2010, the N.C. Environmental Management Commission (EMC) heard a request presented by NCDENR's Division of Water Quality (DWQ) recommending delegation to Mecklenburg County of implementation of portions of the Site Specific Water Quality Management Plan for the Goose Creek Watershed within the Town of Mint Hill. The EMC's delegation authority is found in 15A NCAC 02B .0602(d) and 02B .0607(f).

The EMC granted Mecklenburg County's request for delegation of 15A NCAC 02B .0602 (Stormwater Controls), .0605 (Riparian Buffer Widths), .0606 (Variance Activities within Riparian Buffers), .0607 (Buffer Types and Managing Activities within Riparian Buffers) and .0609 (Mitigation Requirements for Buffer Activities). In addition, the EMC required DWQ to perform an audit of Mecklenburg County's delegated responsibilities a minimum of once every five years.

Mecklenburg County

This letter serves as notification of this delegation approval. Should you have any questions concerning this approval please contact Coleen Sullins, the Director of the Division of Water Quality at 919-807-6300.

Sincerely,

A handwritten signature in black ink that reads "Stephen T. Smith". The signature is written in a cursive, somewhat stylized font.

Stephen T. Smith  
Chairman

Cc: Honorable Ted H. Biggers, Mayor, Town of Mint Hill  
Frank Crawley, Attorney General's Office  
Coleen Sullins, DWQ  
Amy Chapman, DWQ  
Mooresville Regional Office – SWP



# LAWYERS ROAD AND I-485 SMALL AREA PLAN

## MINT HILL, NORTH CAROLINA

May, 2011



**HNTB**



# Table of Contents



---

Mint Hill: Lawyers Road and I-485 Small Area Plan

## CHAPTER 1: Introduction

- Context
- Purpose Of The Small Area Plan
- Geography And Study Area

## CHAPTER 2: Public Participation

## CHAPTER 3: Existing Conditions

- Natural Environment
- Land Use
- Transportation
- Utilities
- Market Analysis

## CHAPTER 4: Process and Analysis

- Fiscal Impact Analysis
- Traffic Impact Analysis
- Land Use Impact Analysis
- Summary

## CHAPTER 5: Small Area Plan

- Goals
- Plan Description

## CHAPTER 6: Recommendations

- Business Recruitment Recommendations
- Natural Environment Recommendations
- Land Use Recommendations
- Urban Design Recommendations
- Transportation Recommendations
- Utilities Recommendations

APPENDIX A: Demographic Market Analysis

APPENDIX B: Real Estate Market Analysis

APPENDIX C: Demand Potential Market Analysis

APPENDIX D: Fiscal Impact Analysis

APPENDIX E: Traffic Impact Analysis



# Figure Index



Mint Hill: Lawyers Road and I-485 Small Area Plan

## CHAPTER 1: Introduction

- Figure 1: Study Area Boundary .....page 5
- Figure 2: Aerial Map of Study Area .....page 6

## CHAPTER 2: Public Participation

## CHAPTER 3: Existing Conditions

- Figure 3: Environmental Features Map .....page 14
- Figure 4: Existing Land Use Map.....page 16
- Figure 5: Existing Zoning Map .....page 17
- Figure 6: Transportation Base Map .....page 23
- Figure 7: Major River Basins Map .....page 27

## CHAPTER 4: Process and Analysis

- Figure 8: Charrette Option 1 Sketch .....page 50
- Figure 9: Charrette Option 2 Sketch .....page 50
- Figure 10: Charrette Option 3 Sketch .....page 50
- Figure 11: Charrette Preferred Concept Master Plan.....page 52
- Figure 12: Charrette Preferred Land Use Map .....page 53
- Figure 13: Impacts on Tax Base Graph .....page 54
- Figure 14: Annual Net Fiscal Impact Graph .....page 54
- Figure 15: Traffic Impact Graph .....page 55

## CHAPTER 5: Small Area Plan

## CHAPTER 6: Recommendations



# Acknowledgements

Mint Hill: Lawyers Road and I-485 Small Area Plan

## Town of Mint Hill - Board of Commissioners

Ted H. Biggers, Mayor  
Lloyd Austin, Mayor Pro-Tem  
Carl M. Ellington  
Brenda McRae  
Katrina “Tina” Ross

## Town of Mint Hill - Planning Board Members

William A. “Tony” Long, Chairman  
Roy Fielding  
Joseph Earl (Jef) Freeman  
Richard Newton  
Donnie Walters  
**ETJ Member:**  
Thomas (Tom) Gatz  
Roger Hendrix

## Lawyers Road and I-485 Small Area Plan Advisory Committee Members

Robert Brisley  
Brenda Frazier Dills  
Kenny Draffen  
Dixie Helms  
Kenneth Horn  
Richard Newton  
Dwarkadas V. Shah

## Town of Mint Hill – Planning Staff

Brian L. Welch, Town Manager  
Lee Bailey, Deputy Town Manager & Planning Director  
Dana Clukey, Planner  
John Hoard, Planner

## Consultant Team

Padam Singh, HNTB  
Donal Simpson  
Kevin Walsh, HNTB  
Greg Boulanger, HNTB  
Susan Paschal, HNTB  
Ed Delara, HNTB  
Mac Nichols, AECOM  
Alisa Cohen, AECOM  
Emily Henke



# Chapter 1: Introduction



---

Mint Hill: Lawyers Road and I-485 Small Area Plan



# Chapter 1: Introduction

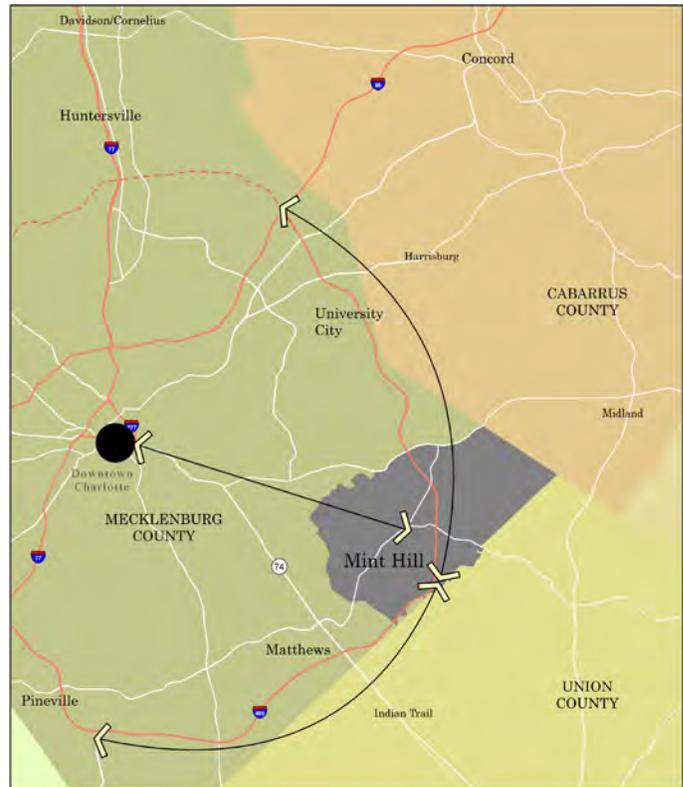
## CONTEXT

The Town of Mint Hill is one of the fastest growing towns in the burgeoning metropolitan area of Charlotte and prides itself on its small town feel. Located in the eastern portion of Mecklenburg County, Mint Hill is roughly 15 miles east of downtown Charlotte. The Lawyers Road and I-485 Interchange Small Area Plan (SAP) study area is located in the southeastern portion of the Town of Mint Hill. This portion of the town is relatively less developed than the northeastern part of Mint Hill, with large portions of the area owned by a few land owners. The study area is conveniently linked to other municipalities in the region via I-485, which is a major interstate facility that connects to the Town of Matthews and Town of Pineville in the south, and the University City Area and City of Concord in the north. With the planned completion of the I-485 loop, which will connect I-85 to I-77 in the north, Mint Hill and the study area will be further connected to the northern Mecklenburg Towns of Cornelius, Huntersville, and Davidson. The study area also borders Union County to the east, which was the seventh (7th) fastest growing county in the United States according to the U.S. Census Bureau News in 2008.

U.S. Census Bureau News, released March 20, 2008 (<http://www.census.gov/Press-Release/www/releases/archives/population/011635.html>)

## PURPOSE OF THE SMALL AREA PLAN

Due to its attractive location, availability of land, and regional connectivity, the interchange of Lawyers Road with I-485 has long been seen as a potential location for a regional destination. In 2003, General



Map: Mint Hill is located near Charlotte, North Carolina and has excellent regional connections to University City, Concord, Matthews, and Pineville.

Growth Properties (GGP) partnered with Childress Klein Properties to propose a regional mall – The Bridges at Mint Hill - that will cater to the eastern portion of Mecklenburg County, southern Cabarrus County, and the western portion of growing Union County. The mall is expected to also draw shoppers from the University City area in Mecklenburg County and from Lancaster County, South Carolina. Although a good location for a regional shopping center, this development prompted town residents and town leadership to think about the area surrounding the potential mall. They want to be proactive in deciding what development could occur around the mall. The initial timeline for the opening of the mall was in

## CHAPTER 1 Introduction

2009, but with the downturn in the real estate market and overall economy, the plans to build the mall have been shelved until 2013-2014. The commitment from tenants is still strong, and although it is hard to predict the length of this downturn, the need for a regional mall in this area has not disappeared. This delay gives the Town the necessary time to plan the area around the mall, and to maximize the opportunity presented by the development of this scale without letting the area develop with undesirable uses. The Town hired a national urban planning and engineering consulting firm, HNTB, to assist it in developing a Small Area Plan for the study area. HNTB's team is comprised of professionals with various expertise ranging from land use planning, urban design, architecture, natural environment, market analysis, traffic, and transportation.

## GEOGRAPHY AND STUDY AREA

The study area is centered around the Bridges at Mint Hill mall. During the first advisory committee meeting, the project team drafted a study area boundary that extended from Hwy 218 (Fairview Road) in the north, to east of Allen Black Road in the east, to the future Stevens Creek Nature Preserve in the south, and to Stevens Creek Tributary in the west. Please see the study area boundary in Fig 1. The study area is 1,992 acres, of which roughly 300 acres is in transportation right-of-way. This leaves 1,694 acres of land to be planned.

Although most of the study area falls within Mint Hill's town limits, some portion of it is in the unincorporated portion of Mecklenburg County as well. Additionally, a very small portion of the study area falls inside Union County. Downtown Mint Hill is roughly 1.5 miles from the intersection of Lawyers Road and Bain School Road, which is basically the center of the study area. Most of the study area is relatively undeveloped, but there are a few single family residential neighborhoods and a few civic uses such as churches and an elementary school.

For a general understanding of the study area, please see Figure 2: Aerial map on page 6.

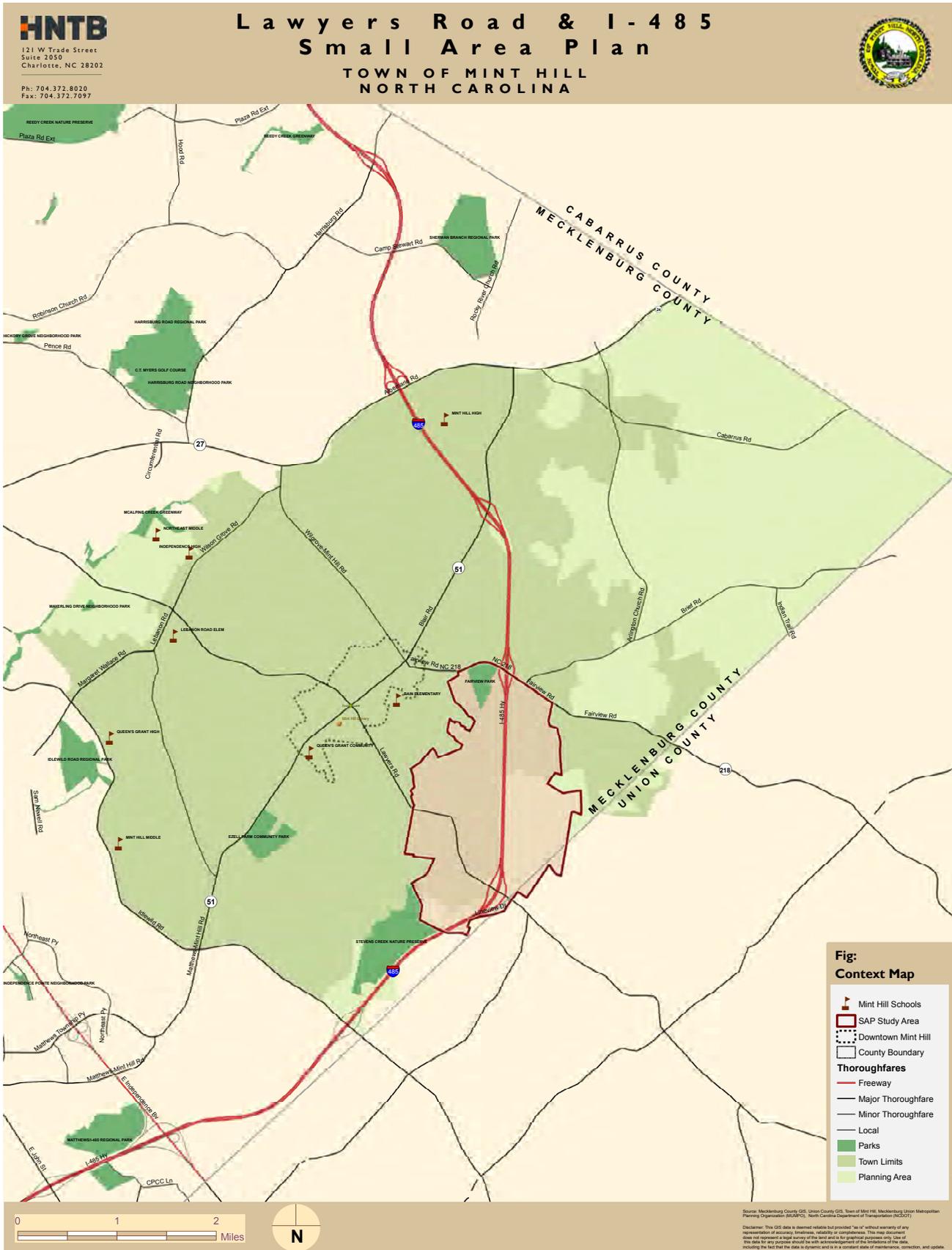


Figure 1: Study Area Boundary.

CHAPTER 1 Introduction

AERIAL BASE MAP

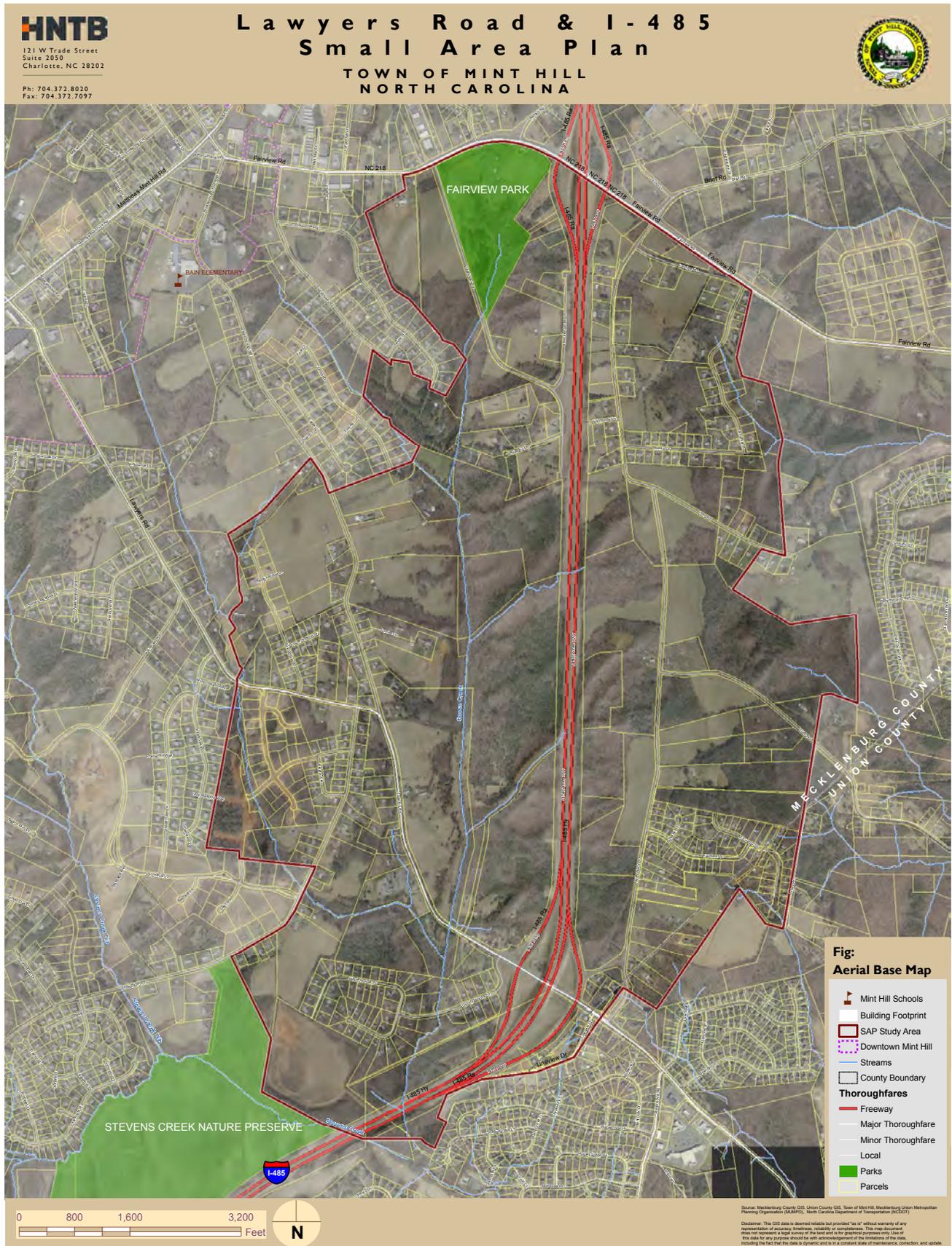


Figure 2: Aerial Map of Study Area.

## Chapter 2: Public Participation



---

Mint Hill: Lawyers Road and I-485 Small Area Plan



## Chapter 2: Public Participation



Photo: Town's elected officials picked seven members from the community to serve on the Advisory Committee and guide the planning process.



Photo: A three-day public charrette was organized in February of 2010, and three additional public meetings were organized to seek community input at various stages of plan development.

### PUBLIC PARTICIPATION

Public involvement is extremely important to ensure that all community members – those who live within the study area, those who live in the town, and those who will be visiting this area – have an opportunity to voice their concerns and opinions during the Small Area Plan development process. The Town appointed seven (7) advisory committee members to provide guidance to the project team and direction for this plan. In addition, elected officials, planning board members, and town staff were an integral part of plan development.

In order to gain wider community support, a three-day design charrette was organized in the Assembly Room of the Town Hall on Feb 2-4, 2010. This all-day three-day event was open to the public on all three days, and there was a public meeting at the end of each day. Many residents, stakeholders, and interested citizens came during the three day event and provided valuable input.

In addition to the three-day public charrette, three public meetings were also organized to seek additional input at various stages as the plan was refined and shaped into a final document.

The Town also created other ways for the public to provide feedback into the process. A Facebook page was created to not only share the progress made on the plan, but also to provide comments and feedback, and engage the community in online dialog regarding the plan. The page was available at [www.facebook.com](http://www.facebook.com) after searching for Lawyers Road and Interstate 485 Small Area Plan (SAP) under groups. The Town also created a link on the Town's website – [www.minthill.com](http://www.minthill.com) – for the Small Area Plan.

Traditional means of public outreach such as newsletters, postcards for meeting invitations, and newspaper announcements were also used to engage the public.



# Chapter 3: Existing Conditions



---

Mint Hill: Lawyers Road and I-485 Small Area Plan

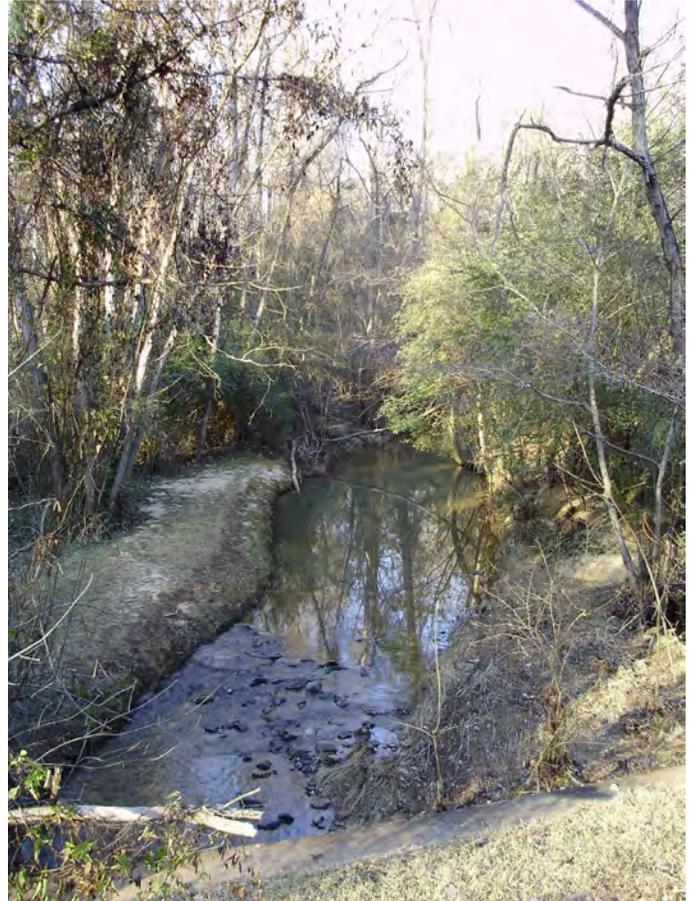


## Chapter 3: Existing Conditions

### NATURAL ENVIRONMENT

One of the striking aspects of the study area is the presence of an environmentally sensitive system of creeks and streams. Figure 3 on page 14 shows all the environmental features within the study area. Goose Creek, along with its tributaries, is one of the major streams that runs north-south through the entire study area. Stevens Creek is another major creek that flows south of the study area along with its tributaries. Floodplains along Goose Creek and Stevens Creek cover roughly 170 acres of the study area.

The entire study area falls within the Goose Creek watershed, which contains federal, state, and local development restrictions aimed at protecting the environmentally sensitive habitat of the endangered Carolina Heelsplitter mussel. Although there are some restrictions on development in this watershed, development is not entirely prohibited. As long as buffer requirements are maintained (as described previously) and a sufficient amount of a proposed development is preserved as open space, parts of this watershed could be developed. According to



NATURAL ENVIRONMENT

Photo: Floodplains along Goose Creek and Stevens Creek cover roughly 170 acres of the study area. Post construction ordinance requires 200 feet un-disturbed buffer on each side of the perennial streams.

Mecklenburg County Land Use & Environmental Services (LUESA), which oversees the environmental permitting process for the Town of Mint Hill, if the Built- Upon- Area (BUA) is less than 20%, then no open space requirements are necessary. If the BUA is between 20% and 50%, then 15% of open space is required. If the BUA is greater than 50%, then 10% of open space is required.

Post Construction Ordinance buffer requirements limit the area that can be developed. The buffer requirement on perennial streams in the Goose Creek watershed is 200 feet on either side of the stream



Photo: Site of the planned mall - Bridges at Mint Hill.

CHAPTER 3 Existing Conditions

ENVIRONMENTAL FEATURES MAP

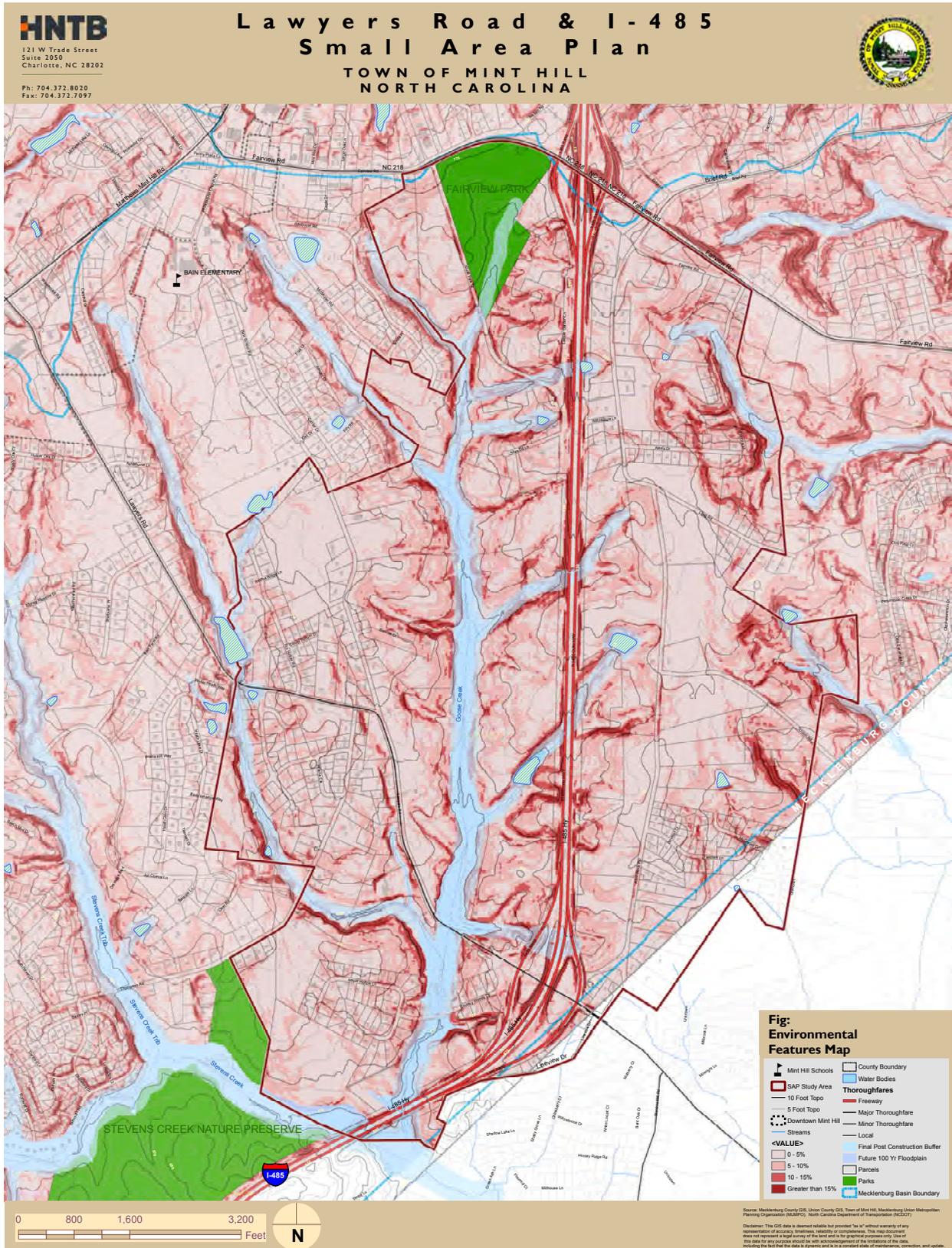


Figure 3: Environmental Features Map.

## CHAPTER 3 Existing Conditions

centerline or 400 feet total. On intermittent streams, these requirements are 100 feet on either side of the stream centerline or 200 feet total. Both Goose Creek and Stevens Creek are perennial streams and therefore are subject to higher buffer requirements. These buffers cover 244 acres of the study area. Since most of the floodplain area falls within the post construction buffer area, the area impacted by the floodplain and the post-construction buffer requirements is still around 250 acres. This means that roughly 12% of the study area is impacted by the floodplain and post-construction buffer requirements combined.

In addition to creeks and streams, there are a few small ponds and wetlands within the study area. Post construction buffer requirements also cover 100 feet of area around these ponds and wetlands, and are included in the area calculations shown on page 19.

The overall landscape of the study area is characterized by gentle rolling hills with some steep slopes along major creeks and streams. Fig 3 shows areas of steep slopes. The area with slopes between 0% and 5% is generally considered very suitable for development. The area with slopes between 5% and 10% is generally considered suitable for development, while the area with slopes between 10% and 15% is considered moderately suitable for development. Even though the area with slopes above 15% can be developed, the cost of development starts to go up with an increase in slope. The distribution of slope acres within the study area is shown below:

Development Conditions	Slope Percentage	Acres	Percent of Study Area
Very Suitable for Development	Less than 5 Percent	1007 acres	52%
Suitable for Development	Between 5 – 10 Percent	700 acres	36%
Moderately Suitable for Development	Between 10-15 Percent	165 acres	8.4%
Less Suitable for Development	More than 15 Percent	75 acres	3.6%
	Total	1947 acres	100%

The table suggests that 88% of the study area is within the slope percentage that lends itself for development, and only 3.6% of the study area could be considered constrained for development because of slopes. After reviewing the Environmental Features Map, it is also observed that the vast majority of areas with slopes greater than 15% are adjacent to major creeks and streams, and within floodplains or the post construction buffer limits. Major roads such as Lawyers Road, Bain School Road, Highway 218, and Allen Black Road are along the ridge lines for the most part.

### Summary of Issues and Opportunities:

- The presence of creeks and streams provides opportunities for open space preservation, greenways, and trails.
- The buffer requirements along perennial and intermittent streams provide opportunities to preserve habitat that is unique to this area, but also pose challenges for stream crossings and development potential.
- Floodplains along Goose Creek and Stevens Creek provide opportunities for preservation of open space, but also limit the development potential of the study area.
- The availability of land with relatively gentle topography provides opportunities for a variety of development.
- Open space requirements within the Goose Creek watershed provide opportunities for open space preservation, but also limit the amount of development.

CHAPTER 3 Existing Conditions

EXISTING LAND USE MAP

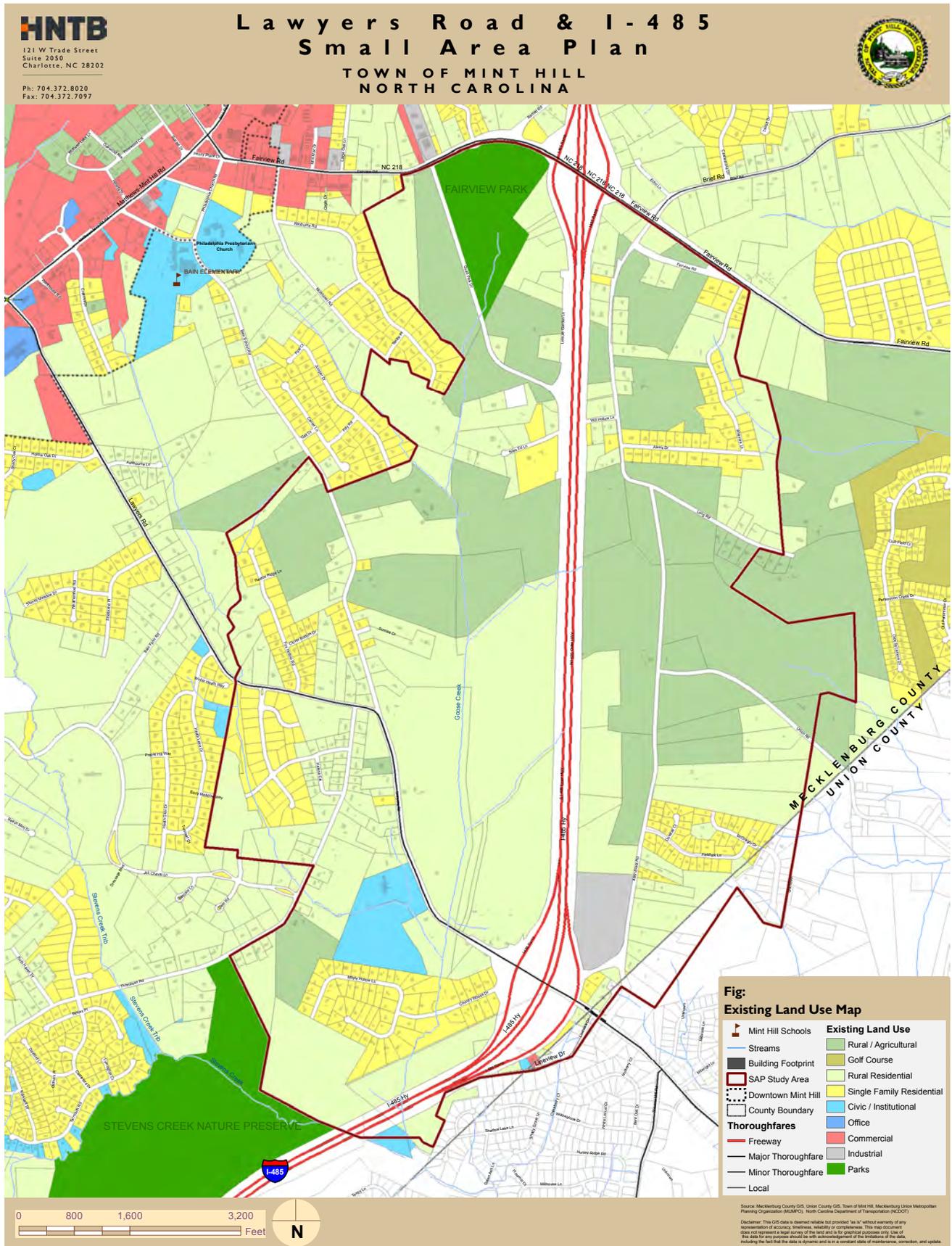
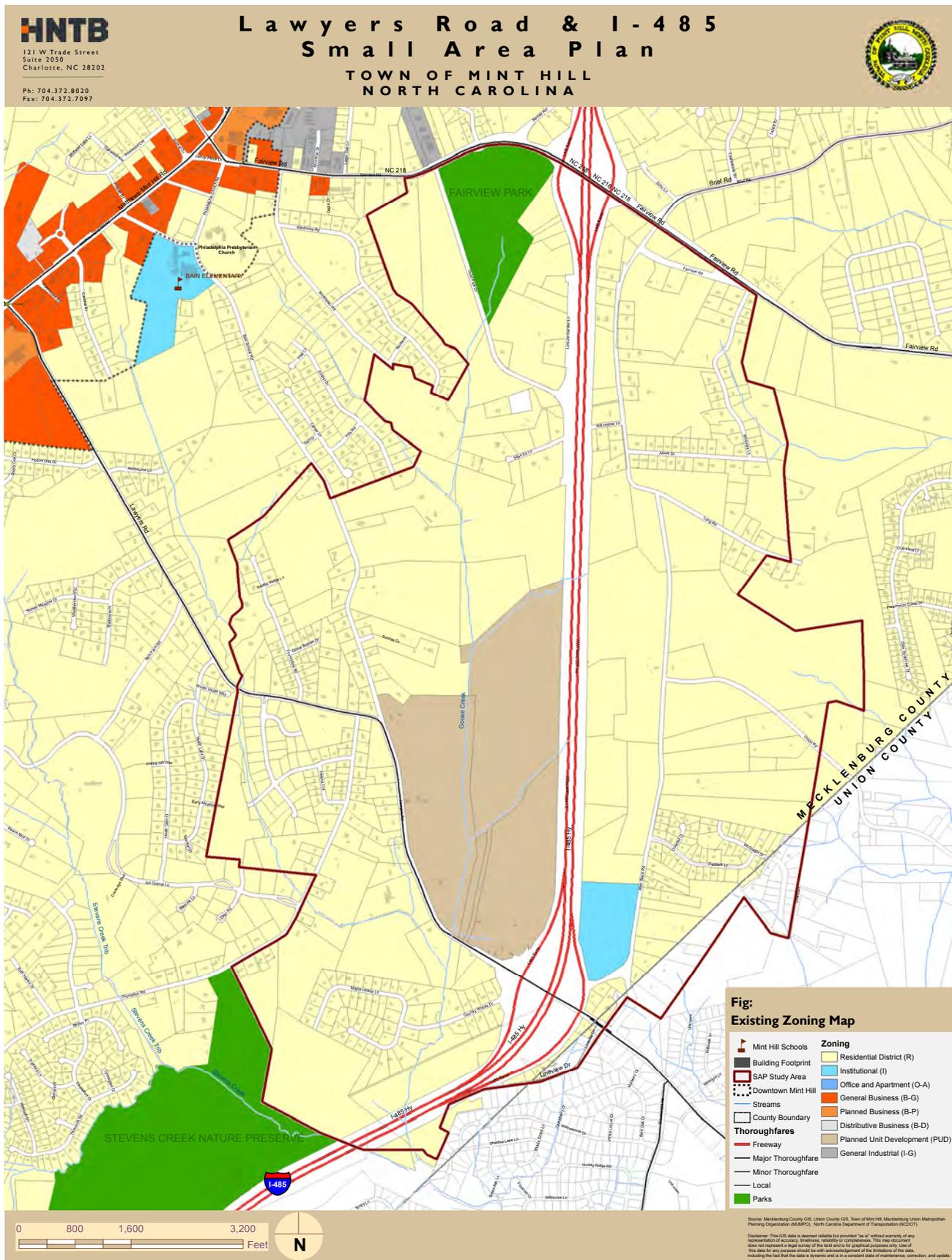


Figure 4: Existing Land Use Map.

CHAPTER 3 Existing Conditions



EXISTING ZONING MAP

Figure 5: Existing Zoning Map.

## CHAPTER 3 Existing Conditions

### LAND USE

EXISTING LAND USE

Land use is perhaps the one common element that impacts all other major components - such as transportation, economic development, environmental features, and utilities - of any plan. Land use also addresses some of the larger issues in a community such as quality of life and future vision for growth. With the arrival of the Bridges at Mint Hill mall, there will be substantial pressure on surrounding areas for land use change. The adjoining Fig. 4 details existing land uses.

Currently, a considerable part of the study area is undeveloped, with about 32% being either rural/agriculture or open space. This is evident along Bain School Road and Allen Black Road, where one can see active farms. Rural residential uses, which make up over 50% of the study area, are predominant. Some large parcels of property are currently used as rural residential; in fact, Mecklenburg County tax data shows all of the Bridges at Mint Hill Mall parcels as rural residential. There are a few single-family residential neighborhoods in the study area; Country Woods subdivision at the southwest corner of Lawyers Road interchange is one of the largest neighborhoods. A few smaller neighborhoods exist along the periphery of the study area – along Thompson Road, Lawyers Road, and Allen Black Road.

There are a few civic uses, such as churches, within the study area. St. Luke's Catholic Church is on Lawyers Road and Church of God is on Bain School Road. Although Bain School Elementary School and Philadelphia Presbyterian Church are two of the oldest civic institutions in the Town, both of them being on the Town's seal, they are just outside the study area. The Park at Fairview, one of the recreational facilities that is owned and maintained by the Town of Mint Hill, is located in the northern



Photo: SAP study area is primarily rural.



Photo: New residential development, such as equestrian themed Cheval, provides variety in the study area.



Photo: Some local landmarks, such as Philadelphia Presbyterian Church, are also in close proximity of the study area .

CHAPTER 3 Existing Conditions



Photo: New subdivisions, such as Meadows of Mint Hill along Bain School Road, are recent addition to the study area.

portion of the study area. A major Mecklenburg County park facility, Stevens Creek Nature Preserve, is being planned on the southern edge of the study area, southwest of Country Woods subdivision. Its planned entrance is on Thompson Road.

Currently, the land uses in the study area are low-density, which does not lend itself for a walkable environment. However, this could change with the arrival of the planned mall. A detailed breakdown of various land uses in the study area is shown in the table below.

Land Use	Acres	Percent of Study Area
Rural / Agriculture	542 acres	28%
Rural Residential	909 acres	47%
Single Family Residential	208 acres	11%
Civic / Institutional	13 acres	0.67%
Commercial	0.6 acres	0.03%
Industrial	21.6 acres	1.11%
Right of Way	252.8 acres	13%
<b>Total (does not include ROW)</b>	<b>1947 acres</b>	<b>100%</b>

Although the study area is primarily rural with some residential and civic uses, the zoning is mostly Residential (R). The Bridges at Mint Hill Mall site is zoned Planned Unit Development (PUD), which is a type of zoning district “that is established to accommodate, in areas outside of the downtown, commercial projects of innovative design and layout that would not be otherwise be permitted under the Town’s ordinance because of the strict application of zoning district or general development standards” . Please see the adjoining zoning map for detail.



Photo: Park on Fairview Road provides numerous recreational opportunities such as nature trails, ball fields, picnic areas, kids’ playground area etc.

## CHAPTER 3 Existing Conditions



Photo: Some older houses on large lots, such as this one on Bain School Road, dot the rural landscape of the study area.



Photo: Bain Elementary School is one of the oldest schools in the CMS system and is a local landmark.



Photo: Rural Area West of Lawyers Road.

### Summary of Land Use Issues and Opportunities:

- The presence of recreational facilities, both existing and planned, provides tremendous opportunities to link the study area with surrounding neighborhoods and destinations.
- The planned mall provides tremendous opportunities to create a destination in the Town of Mint Hill that currently does not exist.
- Existing rural and agricultural uses present opportunities for non-residential uses that are compatible with surrounding neighborhoods.
- The planned mall will create development and redevelopment pressure on neighboring properties. It will also affect some of the low-density residential uses around it.

## TRANSPORTATION

The Small Area Plan (SAP) study area is located within a transportation infrastructure that consists of an interstate freeway, arterials, collectors, and local roadways making up the transportation network. One of the most important elements of the network is the Charlotte Outer Loop (I-485). I-485 is an interstate freeway that provides high speed access around Charlotte’s perimeter to neighboring communities and counties, as well as to other interstates. Conveniently, two access points to I-485 are located within the SAP study area. These are the Lawyers Road and Fairview Road (Highway 218) interchanges. These interchanges are also the only locations that bridge the east and west sides of the SAP study area over I-485. As a result, both Lawyers Road and Fairview Road arterials provide east-west regional connectivity for the community. Bain School Road and Thompson Road provide north-south connectivity west of I-485, while Allen Black Road provides north-south connectivity east of I-485. Since Union Road terminates at Allen Black Road, its east-west connection is limited to the east side of I-485 into Union County. For a detailed map of the transportation network please see Fig 6 on page 23.

Traffic operations are generally described by “Level of Service” (LOS) measures. In accordance with the most recent Transportation Research Board Highway Capacity Manual 2000, LOS describes the quality of traffic flow and is defined as a measure describing operational conditions on a given freeway, arterial, or

intersection. LOS is a function of delay. LOS measures are reported using letter designations from A through F. As described in the Highway Capacity Manual 2000, LOS A represents the best operating condition (free traffic flow), and LOS F designates the worst operating condition. LOS A through D is considered to be operating at an acceptable condition, while a facility operating at an LOS E or F is considered to be operating at a deficient LOS. The LOS for major roadways in Mint Hill was determined in the Mint Hill Comprehensive Transportation Plan (CTP), developed in 2008. It should be noted that the LOS cited in the CTP represents conditions experienced in the year 2000.



Photo: Allen Black Road is a two-lane country road that provides north-south access between Hwy 218 and Lawyers Road.



Photo: Intersection of Lawyers Road and Bain School Road is the location of the planned roundabout with the mall.

Roadway Name	2000 Level of Service
Lawyers Road	C - D
Fairview Road (Hwy 218)	C - D
Allen Black Road	A - B
Bain School Road	A - B
Thompson Road	A - B

Table: LOS (Level of service) analysis for SAP area roads.

### CHAPTER 3 Existing Conditions

EXISTING TRANSPORTATION

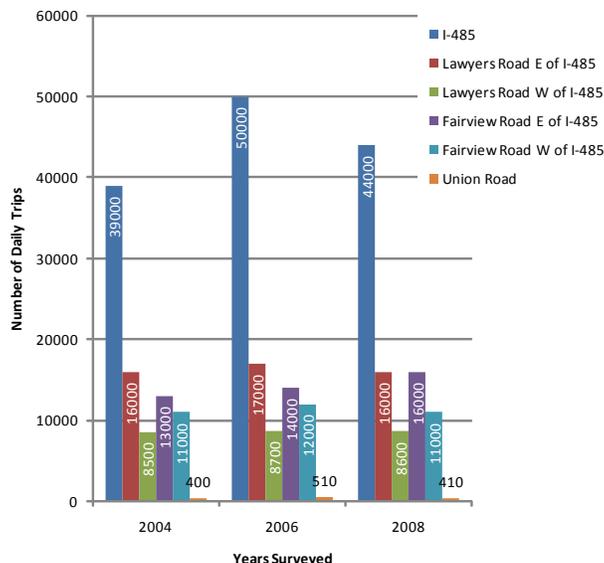
The CTP illustrated 2000 LOS for all major roadways within the town. However, the LOS for roadways within the SAP study area ranged from A through D, which is considered acceptable, and thus provided sufficient capacity for the traffic demand at that time. It should be noted that I-485 did not exist in the SAP study area in the year 2000. The addition of I-485 had a great effect on the traffic patterns in the area and thus affected the LOS in future years.

The CTP also summarized the crash data provided by the NCDOT for segments of facilities with a classification higher than a collector street from January 1, 2004 to December 31, 2006. Of the eleven locations analyzed, two were located within the SAP study area. These locations were the intersection of Fairview Road and I-485, which experienced 20 crashes during the three year study, and the intersection of Lawyers Road and Bain School Road, which experienced 10 crashes.

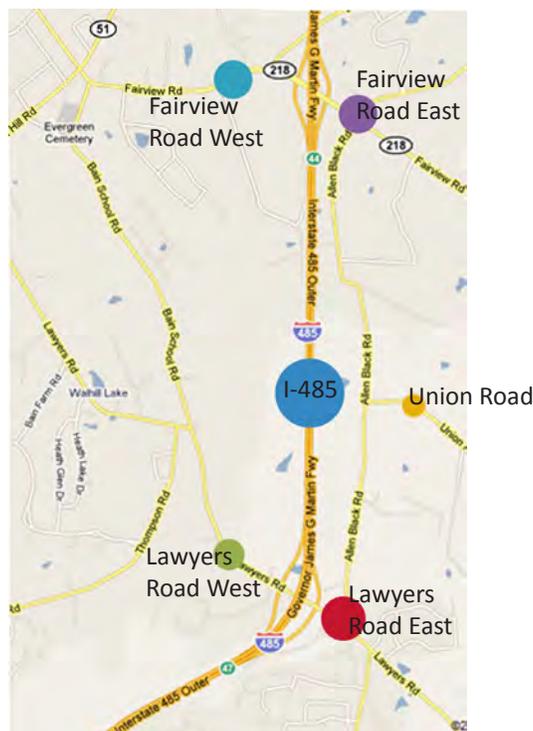
Average Annual Daily Traffic (AADT) volumes determined by the North Carolina Department of Transportation (NCDOT) in 2004, 2006, and 2008 for roadways within the SAP study area are shown below. These years are shown to demonstrate traffic volume trends after the completion of I-485 within the SAP study area.

As is evident from the graph and map to the right, daily traffic has been trending upward despite the peak that occurred in 2006 on all but one of the roadways shown. Therefore, it can be expected that traffic will increase over the next 10 years.

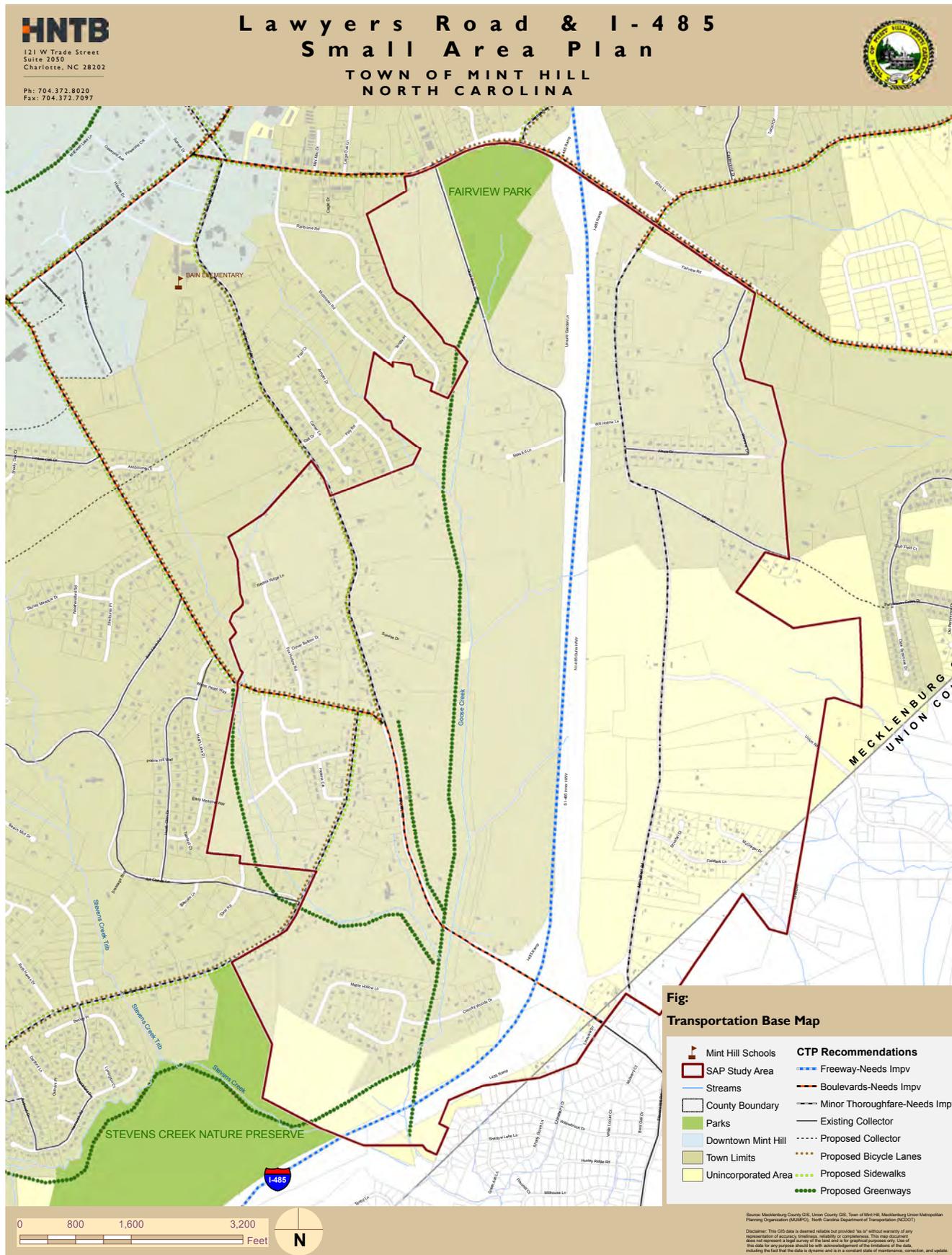
**Annual Average Daily Trips for Years 2004, 2006, and 2008 on select roads near Mint Hill, NC**



Graph and Map: Graph of Annual Average Daily Trips (AADT) for six locations in the Study Area. Traffic counts show a daily average throughout each year identified. Locations are identified in the map below.



CHAPTER 3 Existing Conditions



TRANSPORTATION BASE MAP

Figure 6: Transportation Base Map.

## CHAPTER 3 Existing Conditions

Further reason to assume that traffic will increase in the SAP study is due to the planned construction of “The Bridges at Mint Hill”. A traffic study finalized in 2006, prepared by Kubilins Transportation Group, anticipates that the full build-out of the shopping mall will generate approximately 34,000 additional daily trips to the SAP study area. As a result of the projected increase in traffic, improvements to Lawyers Road are required prior to the shopping mall’s planned completion. These improvements consist of roadway widening, adding traffic signals at intersections, constructing a roundabout, and dividing the roadway with a raised center median. This raised center median will control access along the roadway, which will change travel patterns for those who typically use Lawyers Road for access to neighborhoods and developments whose driveways are not controlled by traffic signals or will not have breaks in the median.

Although no transit services are currently available in the SAP study area, Charlotte Area Transit System (CATS) plans for a bus stop at the future shopping mall location. This bus service is expected to marginally reduce the traffic volume in the SAP study area. Similarly, while there are currently no pedestrian and bicycle connections that exist in the study area, the CTP recommends future bike and pedestrian connections throughout the SAP study area. The plan also recommends vehicular improvements to existing roadways such as Lawyers Road, Bain School Road, and Allen Black Road.



Photo: Traffic on Bain School Road becomes congested during school hours.



Photo: Thompson Road near Lawyers Road.

### Summary of Transportation Issues and Opportunities:

- Residents have noted concerns about the increase in traffic that the planned mall is anticipated to generate in the area.
- Residents currently living in neighborhoods and developments along Lawyers Road, such as Country Woods, are concerned about future access to their development.
- The planned mall will provide an opportunity to connect surrounding land uses via a network of bikeways and greenways, allowing for more transportation choices.
- The planned mall will provide additional transit opportunities that will be served by Charlotte Area Transit System.
- The CTP prioritized two intersections that experienced accidents in the study area. There may be opportunities to potentially improve these intersections.
- The planned improvements on Lawyers Road will provide more roadway capacity opportunity for the SAP study area.
- The planned improvements to bike, pedestrian, and transit amenities coinciding with the mall development will provide more opportunities for transportation choices within the SAP study area.

## CHAPTER 3 Existing Conditions

### UTILITIES

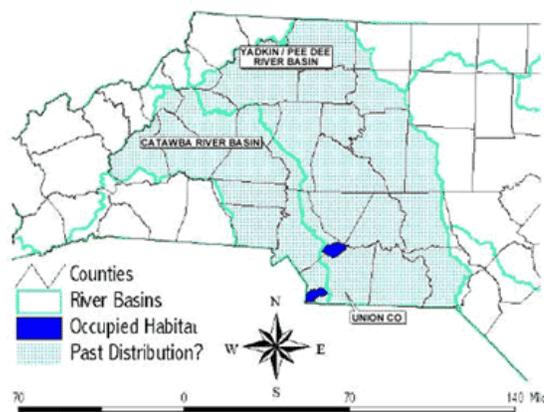
The Town of Mint Hill has a unique location related to the major river basins. It is located on the ridgeline of two major river basins – the Catawba River basin and the Yadkin-Pee Dee River basin. The SAP study area falls within the Goose Creek basin, which is part of the Yadkin-Pee Dee River basin. Charlotte-Mecklenburg Utilities Department (CMUD) provides water and sewer services to the Town of Mint Hill, but not all areas in the Town are currently served by CMUD for their water and sewer needs. In fact, in the Goose Creek basin very few areas are served by public water and sewer infrastructure. CMUD can only serve those properties within the Goose Creek basin that were grandfathered before the North Carolina Department of Natural Resources (NCDNR) adopted more stringent rules for this basin. The Bridges at Mint Hill mall site is one of those grandfathered properties that is scheduled to be served by CMUD with water and sewer. The Mall will have to provide its own private lift station to pump sewer into the Catawba River basin. This lift station will be allowed to serve the Mall site only.

Most of the existing low-density development within the SAP study area is currently served by private wells and septic systems. This type of development can continue to be served in future by private wells and septic systems without the extension of water and sanitary sewer lines as long as groundwater levels and water quality remains constant. However, recent development proposals such as The Bridges at Mint Hill mall will put more pressure on this area to become more than low-density development. Moreover, many new residents will desire public water and sewer services because of its reliability, convenience, and reasonable cost. Another benefit of installation of public water mains and fire hydrants would be lower insurance costs due to improved fire protection.

To accommodate the increasing demand for water and sewer in additional areas of the Goose Creek basin, an Inter Basin Transfer (IBT) agreement between the two affected basins is currently under review by the North Carolina Department of Water Quality as part of an Environmental Assessment. Inter Basin Transfer agreements allow the transfer of water from one river basin to another; water that falls as rain on one watershed is transferred to an adjacent watershed to be used or treated. Currently, water transfer from the Yadkin to the Catawba River basin is allowed, but the Goose Creek basin

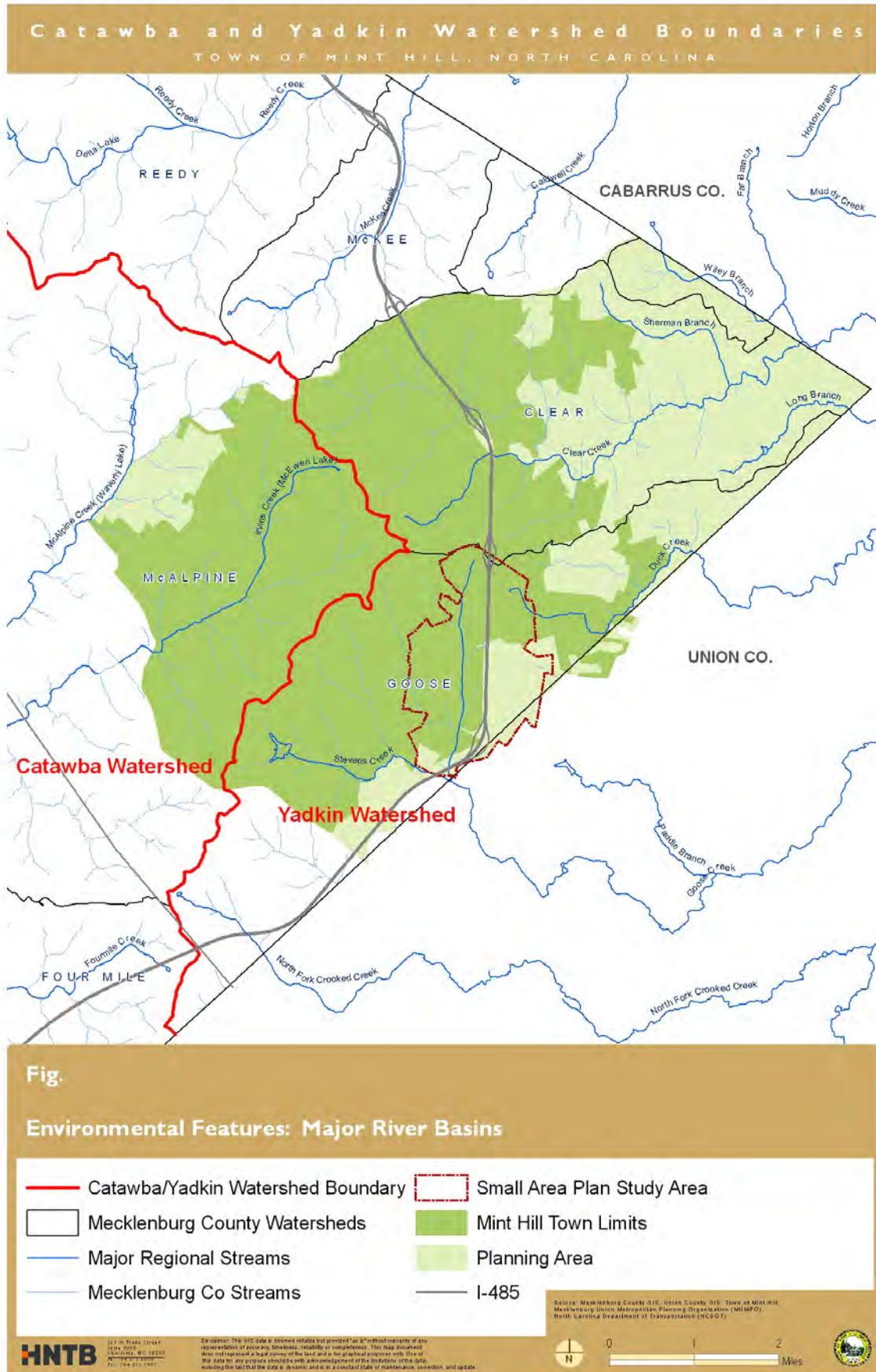


Photo: Image of endangered native species Carolina Heelsplitter Mussel. Image from Town of Indian Trail website.



Map: Location of endangered native species Carolina Heelsplitter Mussel habitat in dark blue. Past distribution could have been as large as the light blue Catawba and Yadkin Watersheds. Image from [www.NCWildlife.org](http://www.NCWildlife.org).

CHAPTER 3 Existing Conditions



EXISTING UTILITIES

Figure 7: Major River Basins Map.

## CHAPTER 3 Existing Conditions

in excluded from the current IBT ruling due to the presence of the Carolina Heelsplitter Mussel habitat in Union County. This means that CMUD cannot pump any wastewater from the Goose Creek basin into the Catawba basin for its treatment at the McAlpine Wastewater treatment plant near Pineville, NC, nor can they pump any water into the Goose Creek basin from the Catawba basin. If the exclusion of Goose Creek basin from the IBT ruling is lifted, CMUD could serve areas other than just the mall site with water and sewer. This water would be discharged into the Catawba River; ultimately reaching the Atlantic Ocean from the Catawba/Santee River system instead of the Yadkin/Pee Dee River system.

Another issue that may impact future growth and development, not only for the Small Area Plan study area but also for the entire Town, is a bottleneck in the sewer line along Irwin Creek near the US-74 highway. The pipe size of the sewer line through the US-74 highway and north of US-74 is smaller than the pipe size in the southern side. This means that even though McAlpine Creek Waste Water Treatment Plant (WWTP) has sufficient capacity, the pipe size on the northern side could become a restrictive factor. To overcome this, CMUD is planning to upgrade the pipe size through the US-74 highway. This planned improvement is in the Capital Improvement Plan (CIP) of CMUD, and is planned to be completed in the 2013 to 2015 timeframe.

Currently, the mall site is grandfathered from the exclusion of Goose Creek basin from the Inter Basin Transfer agreement. The mall developer, therefore, is allowed to build a lift station to serve the mall development. However, should the Goose Creek basin exclusion be lifted, CMUD would need their own lift station at, or near close vicinity of, Stevens Creek Nature Preserve. To avoid potential redundancy in infrastructure, CMUD's lift station could be built

instead of a lift station at the mall site. This new lift station could then serve the Goose Creek basin by connecting to the east side of I-485 along Stevens Creek to the mall site or along an existing sleeve between Allen Black Road and the mall site.

Once the US-74 bottleneck is fixed, and the exclusion of Goose Creek from the IBT process is lifted, the Small Area Plan study area will be open for future development that could be served by public water and sewer.

### Summary of Utilities Issues and Opportunities

- The Bridges at Mint Hill Mall has the water and sewer capacity for its operations; grandfathered in before the adoption of more stringent rules for the Goose Creek watershed by the NCDNR.
- Most of the area surrounding the mall site is not serviced by CMUD water and sewer because the Goose Creek basin is currently excluded from the Inter Basin Transfer (IBT) certificate. It currently handles its water via private wells and septic systems.
- There will be increased desirability for a public water and sewer system due to its convenience, reliability, reasonable cost, and benefits related to lower insurance cost.
- There is a sewer line bottleneck along Irwin Creek; the creek flows north to south and the pipe size on the north side of US-74 is larger than the pipe size on the south side. CMUD has plans to upgrade the south side pipe in its Capital Improvement Plan, and will occur around 2013-2015.

## CHAPTER 3 Existing Conditions

### MARKET ANALYSIS

ERA, a division of AECOM, is part of HNTB team that assisted the Town in analyzing, evaluating, and projecting the economic and market potential for this Small Area Plan. HNTB team, along with ERA, is also assisting the Town of Mint Hill with the development of the Town's Comprehensive Land Use Plan (CLUP) and market analysis for both the projects are done simultaneously. This joint effort has helped in data collection effort, its analysis and understanding key trends that will affect the SAP study area and CLUP study area.

Two levels of analysis are conducted during the Issues and Opportunities phase of the SAP process - Demographic and Economic Analysis, and Real Estate Market Analysis.

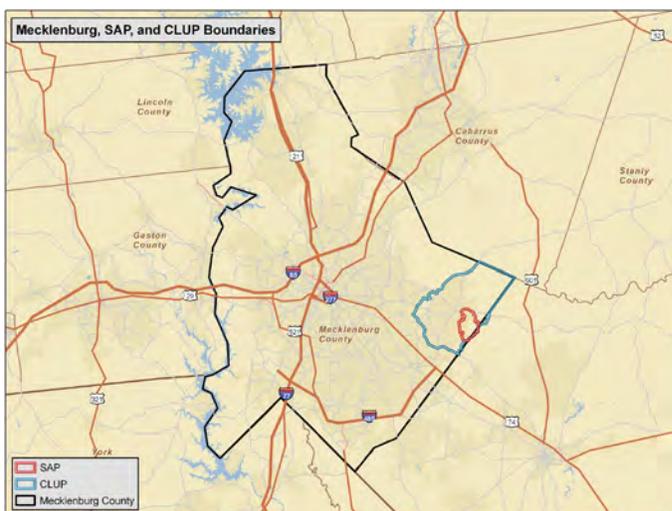
#### Demographic and Economic Analysis (Appendix A Tables 1-23 and Figures 1-15)

Demographic and Economic Analysis is conducted to understand the long-term drivers of growth such as population and household projections, current and future employment projections, retail spending and household income, and presence of various industries in Mint Hill. This analysis will partly inform the future demand for various types of uses within the SAP study area. ERA examined demographic and economic conditions across a range of indices, focusing on those factors that fuel demand for real estate. To better understand these demographic and economic conditions, ERA utilized a number of public and private data sources in their research, including the US Census Bureau; the US Bureau of Labor Statistics; Woods and Poole; Claritas; the Employment Security Commission of North Carolina; ESRI Business Analyst; Charlotte Regional Visitors Authority; and Mecklenburg-Union Metropolitan Planning Organization (MUMPO).

The Demographic and Economic Profile analyzes four geographic areas as shown in the graphic below:

- SAP Study Area
- Comprehensive Land Use Plan (CLUP Study Area – Town's jurisdiction and Extra Territorial Jurisdiction (ETJ) combined
- Mecklenburg County
- Charlotte Metropolitan Statistical Area (MSA)

Key findings from the Demographic and Economic market analysis are summarized in the following pages and relevant data is detailed in the tables in Appendix A.



Appendix A Figure 1. Market Sectors analyzed in the Demographic and Economic Market Analysis performed by ERA, a division of AECOM.

## CHAPTER 3 Existing Conditions

### Population & Households (Appendix A Tables 1-5 and Figures 1-10)

- According to the MPO, the Small Area Plan study area's current population is almost 1,480 residents. ESRI Business Analyst estimates the SAP study area's population to be lower at almost 1,180 residents. Between 2009 and 2030, the MPO estimates that the SAP study area's population will increase by over 2,100 residents, which is a compounded annual growth rate of over four percent. The SAP study area's population is projected to grow at a faster rate than the CLUP study area and the County, with a projected annual growth rate of 3.3 percent and 1.6 percent, respectively, during this same time period.
- The SAP study area's population accounts for 5.4 percent of the CLUP study area's total population; this is considered the "fair share." Notably, the SAP study area's share of CLUP study area's population is projected to increase, and is likely to increase to 6.6 percent by 2030.
- Within the CLUP study area, the number of owner-occupied housing units is expected to increase almost 13 percent over the next five years. Within the SAP study area, owner-occupied housing units are expected to increase much more quickly at over 19 percent during this same time period. The increase in rental-occupied housing units in the CLUP study area is consistent with the rate of increase within the County and the MSA, averaging approximately 14 percent over the next five years.
- Almost 21 percent of residents within the SAP study area are under 14 years old. Demographic forecasts suggest that within the SAP study area, those aged

65-74 years will increase over 44 percent over the next five years, which is consistent with projected demographic forecasts throughout the County.

- Within the SAP study area, almost 26 percent of residents have either a Bachelor's or Graduate/Professional Degree. Comparatively, 39 percent of residents in the County and 30 percent of residents in the MSA and hold one of these two degrees.

This data indicates that the SAP study area has the potential for more dense development than it currently contains. With appropriate design guidelines and managed through a planned-unit development (PUD) process, the CLUP study area may benefit from the forecasted population increases in the SAP study area by implementing guidelines that urge development in a well-planned manner. With an increase of owner-occupied housing units and large increase in residents age 65-74 years old, these forecasts suggest opportunities for potential market support for new housing oriented to new, high-quality residential development and age-target housing.

## CHAPTER 3 Existing Conditions

### *Retail Spending & Household Incomes (Appendix A Tables 6-8)*

- The SAP study area’s median household income—a key measure in understanding disposable income available for discretionary retail spending—is expected to increase over the next five years to over \$84,500. In the CLUP study area, the median household income is expected to grow almost eight percent over the next five years to over \$75,000.

- Within the SAP study area, over the next five years, the number of households earning between \$75,000 and \$99,999 will increase over 59 percent (51 households). In the CLUP study area, the number of households earning over \$100,000 is expected to jump by over 13 percent (368 additional households), which could be expected to enhance retail goods and services spending potentials.

- SAP study area households spend on average over \$85,000 per year on household expenditures, which is approximately \$10,000 more than annual average household expenditures in the CLUP study area. The highest expenditure category for households is retail goods, which accounts for over 37 percent of total household expenditures.

- Sales among CLUP study area retailers in 2009 totaled \$181.5 million across various retail categories. CLUP study area residents spent \$214.8 million in 2009 on the same retail categories. This suggests CLUP study area residents are leaving the CLUP study area to shop, indicating a loss of approximately \$33.3 million in retail sales.

- The five retail sectors in the CLUP study area that are experiencing leakage (i.e., household spending is being spent at retailers outside the study area) are Apparel & Accessories (i.e., clothing, footwear, jewelry, etc), Furniture and Home Furnishings

(i.e., furniture, home furnishings, home centers, etc), Food & Beverage (i.e., eating places, drinking places), Leisure and Entertainment (i.e., books, sporting goods, toys), and General Merchandise (i.e., department stores, etc). This suggests that household spending (demand) by CLUP study area households is greater than sales (supply) in these sectors. CLUP study area residents are underserved in these core retail categories.

This data indicates that per household retail support within the SAP study area is greater than in the CLUP study area, with a forecasted median household income in the SAP study area almost 13 percent greater than within the CLUP study area. Throughout the CLUP study area, household spending patterns indicate that there is a lack of retail establishments, with CLUP study area household spending leaking to neighboring areas. This information implies that there is a demand for additional retail within the CLUP study area.

These data do not include projected retail sales from planned, but not constructed or completed, retail spaces such as the Bridges project.

## CHAPTER 3 Existing Conditions

### Employment

(Appendix A Tables 9-12 and Figures 11-15)

Another critical factor informing demand for commercial “workplace” real estate such as office buildings, retail centers and industrial parks, is employment growth. Key findings are highlighted below.

- According to the Mecklenburg-Union MPO, the CLUP study area has a current job base of over 6,800. Forecasts suggest that the CLUP study area will add over 2,650 new jobs by 2015 and over 7,800 additional new jobs between 2015 and 2030. The SAP study area is expected to add almost 1,200 new jobs by 2030.
- The CLUP study area jobs-to-household ratio is 0.64. This ratio is expected to increase to 0.68 by 2015. Based on data provided by the Mecklenburg-Union MPO, the jobs-to-household ratios in neighboring areas in 2015 are expected to be significantly higher, with a ratio of 1.78 in Davidson, 1.83 in Matthews, and 3.46 in Pineville.
- Countywide, the largest gains in employment are expected in Services, which includes occupations in lodging/hospitality, education, medical, and professional and business services such as legal and engineering; State and Local Government; and Finance, Insurance, and Real Estate.
- According to ESRI Business Analyst, the unemployment rate in the SAP study area is 10.7 percent, up from 2.3 percent in 2000. This percentage is expected to decrease by 2014 to 7.3 percent. This spike in unemployment from 2000 is consistent with the unemployment increases countrywide.

This data indicates that with an increase in an employment, there is demand for additional office space within the CLUP study area. A portion of this demand may be met in the SAP study area.

### Location Quotient

(Appendix A Tables 13-15)

A location quotient is an economic indicator that indicates the relative concentration, based on employment, of an “industry cluster” in a particular geography. Location quotients greater than one suggest that the industry is more highly concentrated in the area as compared to national averages. This analysis compares the relative strengths of specific sectors in Mecklenburg County, Charlotte MSA, and the State of North Carolina against the national averages.

- On average, industries in Mecklenburg County vary in their performance versus industries nationwide and statewide, with a low of 0.14 in Natural Resources and Mining to a high of 1.76 in Financial Activities. Mecklenburg County also exhibited strength in Professional and Business Services (1.40), Information (1.38), and Construction (1.06) in 2008.
- Between 2001 and 2008, Mecklenburg County strengthened its competitive position in a number of industries, most notably Financial Activities (+0.40), Leisure and Hospitality (+0.07), and Education and Health Services (+0.05). By contrast, its competitive position declined in Professional and Business Services (-0.15), Manufacturing (-0.08), and Trade, Transportation, and Utilities (-0.06).

## CHAPTER 3 Existing Conditions

### Visitor Trends

(Appendix A Tables 16-23)

The Charlotte Regional Visitors Authority tracks visitor data and behavior/spending patterns for the Charlotte MSA. Relevant findings are summarized below.

- In 2008, the Charlotte MSA welcomed 18.05 million visitors, of which almost 39 percent stayed in a hotel/motel. Though the number of visitors has increased since 2001, the number of visitors declined by almost four percent between 2007 and 2008, with visitor spending during this same time period declining by over nine percent.
- In 2008, almost 6.6 million roomnights were occupied by visitors, of which almost 47 percent were occupied by business travelers and 29 percent were occupied by leisure travelers. However, 53 percent of total visitor spending was from leisure travelers, with only 18 percent from business travelers.
- In 2008, 77 percent of visitors stated “leisure” as the primary purpose of their trip while 18 percent of visitors stated business meeting. An additional five percent of visitors stated “conference/convention” as the purpose of the trip.
- Visitors to the Charlotte MSA in 2008 spent \$3.4 billion on expenditures. The average visitor spending was \$463. Almost one-third of visitor spending was on lodging and approximately one-quarter was on eating and drinking.
- Almost 23 percent of visitors to the Charlotte MSA are from North Carolina. Approximately 12 percent and nine percent, respectively, are from South Carolina and Florida.
- Visitors to the Charlotte MSA participate in a variety

of activities. Most popular are visiting relatives (26 percent of visitors), visiting friends (23 percent of visitors), and shopping (19 percent of visitors).

Visitor data suggests that the CLUP study area may have potential for lodging in the future. Hotel development may be concentrated at interstate interchanges to appeal to highway-oriented business travelers and families.

## CHAPTER 3 Existing Conditions

### Real Estate Market Analysis (Appendix B Tables 1-17 and Figures 1-7)

MARKET ANALYSIS

Real Estate Market Analysis includes a review of recent and current market conditions across a range of real estate sectors. This analysis examines market characteristics across for-sale and for-rent housing, office, retail, industrial, and hotel uses to understand recent and current market conditions and trends. This analysis will also inform the future demand for various types of uses within the SAP study area.

ERA analyzed various indices, such as building permit activity, for-sale and for-rent residential comparables, commercial leasing/absorption activity and rents, and other appropriate market characteristics and supply and demand factors as they affect the SAP study area, the Comprehensive Land Use Plan (CLUP) study area, and countywide development potentials for various uses as a means of guiding specific initiatives and strategies for the SAP.

#### *Real Estate Market Characteristics*

To estimate the depth of market support for specific sectors in the SAP study area, ERA examined recent and current market conditions, focusing on those factors that fuel demand for real estate.

Current real estate conditions may seem to be in conflict with long term demographic and economic trends in the area. The reader should take into account that the data collected reflects recent real estate market conditions and that the demographic and economic trends reflect growth over a longer period of time. Current local, regional and national real estate conditions have been negatively impacted by the economic downturn (which was, in a large part, real estate-driven) and have resulted in reduced absorption of spaces for a variety of land uses. These conditions should be considered short-term. Longer term demographic and economic projections suggest that Mint Hill's real estate surplus will be absorbed early in the planning time horizon as the

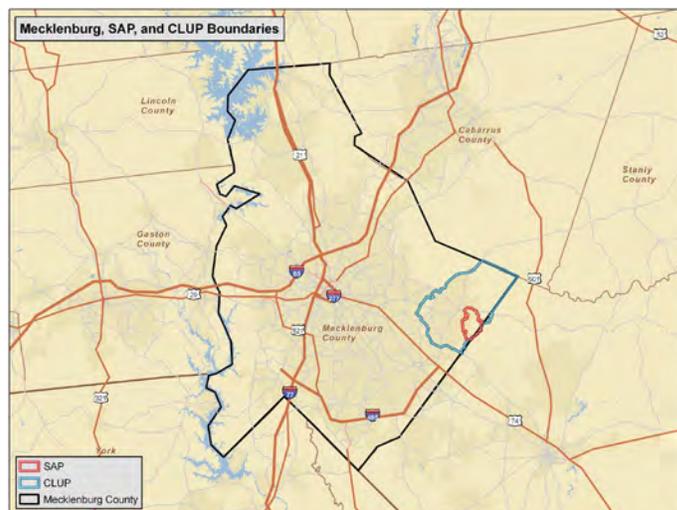
economic recovery builds. As conditions return to "normal" and local growth patterns resume, Mint Hill should continue to be positioned for real estate development and redevelopment opportunities.

ERA utilized a number of public and private data sources in our research, including the U.S. Department of Housing and Urban Development; ESRI Business Analyst; Town of Mint Hill Planning and Zoning; CoStar Property; and Smith Travel Research. The Real Estate Market Overview analyzes four geographic areas:

- SAP study area
- CLUP study area
- Mecklenburg County
- Charlotte MSA

Note that CoStar Property does not track any reporting office, retail, or industrial uses within the SAP study area. Therefore, the analysis of these land uses will primarily focus on the CLUP study area.

Key findings are summarized in the following pages and relevant data is detailed in Appendix B.



Appendix B Figure 1. Market Sectors analyzed in the Real Estate Market Analysis performed by ERA, a division of AECOM.

## CHAPTER 3 Existing Conditions

### Housing Overview

(Appendix B Tables 1-5 and Figures 1-3)

- Reported building permits indicate that Mecklenburg County issues an average, since 2000, of over 8,550 single-family and almost 4,200 urban-residential permits annually.
- In 2008, 64 percent of Countywide permits were issued for urban-residential units. Between 2000 and 2007 however, only 31 percent of permits in Mecklenburg County were issued for urban-residential units. There has been a general decline in single-family permits issued since 2006.
- The number of building permits issued countywide has decreased almost 50 percent since peaking in 2006.
- In 2000, over 97 percent of housing units in the SAP study area were single-family detached structures. Within the CLUP study area, more than 84 percent of housing units were single-family detached structures.
- Based on 12 selected comparables, the average asking sale prices for single-family units within the CLUP study area is \$224,000, with an average cost of \$82.20 per square foot.
- Based on seven selected comparables, average asking for-sale prices for urban-residential units within the CLUP study area is \$183,000, with an average cost of \$102.78 per square foot, over 25 percent more than the single-family per square foot cost. This may be attributed to the fact that several of the urban-residential units in the sample were delivered in 2009, and therefore have a higher per square foot cost than some of the older properties.

Based on selected comparables, the average rent for a one-bedroom unit ranges from \$490 per month to \$750 per month, resulting in an average of a \$0.70 per square foot to \$1.05 per square foot rent. Average rent for a two-bedroom ranges from \$695 per month to \$820 per month, resulting in an average of a \$0.70 per square foot to \$1.20 per square foot rent. Average rent for a unit larger than two-bedrooms range from \$865 per month to \$1,030 per month, resulting in an average of \$0.65 per square foot to \$1.10 per square foot rent. The selected urban-residential rental comparables are located outside the CLUP study area boundaries.

Based on these available data, it may be assumed that there is a shortage of new urban-residential housing units available within the CLUP and SAP study area. With the countywide shift in the increase in urban-residential permits issued, this could indicate a demand for smaller, less expensive units.

Data from the Demographic and Economic Profile indicates that the SAP study area has the potential for more dense development than it currently contains. With appropriate design guidelines and managed through a planned-unit development (PUD) process, the Town of Mint Hill may benefit from the forecasted population increases in the SAP study area by implementing guidelines that urge development in a well-planned manner. With an increase of owner-occupied housing units and large increase in residents age 65-74 years old, these forecasts suggest opportunities for potential market support for new housing oriented to new, high-quality residential development and age-restricted housing.

## CHAPTER 3 Existing Conditions

### Commercial Overview (Appendix B Table 6)

The Commercial Overview includes office, retail, and industrial/flex uses within the CLUP study area.

- The CLUP study area contains over 370,000 square feet of office space, 847,000 square feet of retail space, and 431,000 square feet of industrial/flex space.
- Within the CLUP study area, absorption has been positive in 2009, with over 16,500 square feet for office space, 8,400 square feet for retail space, and 1,700 square feet for industrial/flex space. Absorption is defined as the integration of space into the market, with space that has been leased or occupied “absorbed.” A positive absorption indicates positive leasing activity.
- Current vacancy rates for office, retail, and industrial/flex space within the CLUP study area are 10.3 percent vacancy in office space, 11 percent vacancy in retail space, and a 6.7 percent vacancy in industrial/flex space.
- Current rental rates for office space average \$25.56 per square foot, significantly decreasing to \$10.52 per square foot for retail space and \$8.73 per square foot for industrial/flex space.

Data in the Demographic and Economic Profile indicate that retail support within the SAP study area is greater than within the CLUP study area on a per household basis, with a forecasted median household income in the SAP study area almost 13 percent greater than within the CLUP study area.

Throughout the CLUP study area, household spending patterns indicate that there is a lack

of retail establishments, with CLUP study area household spending leaking to neighboring areas. This information implies that there is a demand for additional retail within the SAP study area. Based on the large amount of existing retail space and current high retail vacancy rates within the CLUP study area, this appears that the available space is not being utilized to its highest and best use and may provide a good redevelopment opportunity.

This data does not include projected retail sales from planned, but not constructed or completed, retail spaces such as the Bridges project.

### Office Overview (Appendix B Tables 7-8 and Figures 4-5)

- The CLUP study area contains 370,000 square feet of office space in 36 office buildings—comprising less than one percent of the county total of 72.9 million square feet of office space.
- CLUP study area office leasing activity (“net absorption”)—a barometer of the overall health of an office market—has averaged 11,300 square feet per year since 2004. Leasing activity countywide has averaged 1.4 million square feet per year.
- Average annual office vacancy rates since 2004 in the CLUP study area (13.7 percent) are higher than average annual vacancy rates during this same period countywide and in the MSA, where vacancy rates averaged 11.6 percent and 10.8 percent, respectively.
- Average office rents in the CLUP study area (\$22.03 per square foot) are higher than rents countywide and in the MSA, where rental rates averaged \$18.80

## CHAPTER 3 Existing Conditions

and \$18.54, respectively, since 2004. Office rents in the CLUP study area have increased \$6.81 per square foot since 2004.

- Based on seven selected comparables, the average rental price for office space within the CLUP study area is \$11 per square foot, with an average vacancy rate of nine percent. The difference in rental prices for the selected comparables and CoStar Property data could be attributed to the class of office space and the year of delivery of the properties surveyed for the comparable properties. Almost 20 percent of properties surveyed by CoStar Property were delivered in the last two years, therefore resulting in a higher rent.

The small amount of office space inventory and the high office vacancy rate within the CLUP study area may indicate that under current conditions there is limited office demand. With an increase in density and development of the areas surrounding the interchanges, there may be an increase in future office demand within the SAP study area.

### *Retail Overview*

*(Appendix B Tables 9-10 and Figures 6-7)*

- The CLUP study area contains 847,000 square feet of retail space in 89 properties—comprising 1.4 percent of the county total of 61.4 million square feet of retail space.
- CLUP study area retail leasing activity (“net absorption”) has averaged 7,400 square feet per year since 2004. Leasing activity countywide has averaged 1.1 million square feet per year.
- Average annual retail vacancy rates since 2004 in the CLUP study area (9.9 percent) are higher than average annual vacancy rates during this same period countywide and in the MSA, where vacancy rates averaged 6.9 percent and 5.6 percent, respectively.
- Average retail rents in the CLUP study area (\$11.33 per square foot) are lower than rents countywide and in the MSA, where rental rates averaged \$13.90 and \$13.51, respectively, since 2004. Retail rents in the CLUP study area have increased \$2.51 per square foot since 2006.
- Based on seven selected comparables, the average rental price for retail space is \$15 per square foot. This average includes Mint Hill Village, where retail rents average \$20 per square foot.

Based on the large amount of retail space and high retail vacancy rates within the CLUP study area, this appears that the available space is not being utilized to its highest and best use and may provide a good redevelopment opportunity.

## CHAPTER 3 Existing Conditions

### Industrial/Flex Overview (Appendix B Table 11)

- The CLUP study area contains 431,000 square feet of industrial/flex space in 22 properties—comprising 0.3 percent of the county total of 144.1 million square feet of industrial/flex space.
- CLUP study area industrial/flex leasing activity (“net absorption”) has averaged only 310 square feet per year since 2004. Leasing activity countywide has averaged 1.2 million square feet per year.
- Average annual industrial/flex vacancy rates since 2004 in the CLUP study area (7.4 percent) are lower than average annual vacancy rates during this same period countywide and in the MSA, where vacancy rates averaged 8.8 percent and ten percent, respectively.
- In 2009, the only reported year, industrial/flex rents in the CLUP study area (\$8.73 per square foot) are lower than rents countywide and in the MSA, where rental rates averaged \$4.68 and \$4.27, respectively, since 2004

### Hotel Overview (Appendix B Tables 12-17)

ERA examined trends in the hotel/lodging market for selected properties near the CLUP study area in Mecklenburg, York County, and Union County by analyzing market performance data provided by Smith Travel Research (STR), which tracks hotel market trends across the United States.

ERA analyzed market performance for 33 properties containing 3,440 hotel rooms within Mecklenburg, York, and Union County. Note that not all hotel properties within these counties were included in the study, rather just the properties in areas that are comparable to the CLUP study area.

Relevant findings are summarized below.

- Market performance of selected properties has fluctuated over the last six years. While supply (i.e., number of rooms) has increased because of new construction, occupancy has been uneven—ranging from a low of 58 percent in 2003 to a high of 69 percent in 2007.
- Current annual occupancies of 62.7 percent are below the threshold to support new hotel development, as the capital markets seek minimum sustained annual occupancies of 70 to 72 percent before providing financing for new hotel construction. (Financing agreements for recent new construction were secured several years ago when the market was stronger).
- Other key barometers of market performance include average daily rate (ADR) and revenue per available room (REVPAR). ADRs have increased at an average pace of 6.6 percent per year, and revenue per

## CHAPTER 3 Existing Conditions

available room, which is the best measure of year-to-year growth because it considers simultaneous changes in both room rate and annual occupancy levels, has increased 8.4 percent per year since 2003.

As noted previously in the visitor section of the Demographic and Economic Profile, visitor data suggests that Mint Hill may have potential for lodging in the future if tourism increases. Hotel development may be concentrated at interstate interchanges to appeal to highway-oriented business travelers and families. New hotel development financing may be contingent on improved sustained occupancy levels or large-scale development, such as a regional mall or large office development that would serve as a driver of room demand to the hotel market. Area hotel occupancies were rising prior to the recent economic downturn and, upon recovery, may be able to continue to increase. Timing of any new hotel development will likely be influenced by improved business conditions in the area and national hotel trends.

### Summary of Issues and Opportunities:

- Small Area Plan (SAP) study area forecasts suggest opportunities for potential market support for new housing oriented to new, high-quality residential development and age-restricted housing.
- Per household retail support within the SAP study area is greater than the CLUP study area. In the CLUP study area, household spending patterns indicate that there is a lack of retail establishments, with CLUP study area household spending leaking to neighboring areas. This information implies that there is a demand for additional retail within the CLUP study area.
- Among all Mecklenburg County small towns, Mint Hill has the lowest jobs-to-household ratio. However, future demand for employment appears to be strong with an additional 10,450 jobs projected for the CLUP study area. A portion of this demand may be met in the SAP study area.
- Visitor data suggests that the CLUP study area may have potential for lodging in the future. Hotel development may be concentrated at interstate interchanges to appeal to highway-oriented business travelers and families.

## CHAPTER 3 Existing Conditions

### Demand Potential Market Analysis (Appendix C Tables 1-16 and Figure 1)

MARKET ANALYSIS

The Demand Potentials Memo incorporates data gathered in the Demographic and Economic Profile and the Real Estate Market Overview. This section examines demand potentials for for-sale and for-rent housing, office, retail, and industrial uses to understand absorption potential and supportable square footage. The focus of the Demand Potentials analysis is to determine the depth of market support for a mix of additional real estate development in the SAP Study Area.

#### *Demand Potentials*

Current real estate conditions may seem to be in conflict with long term demographic and economic trends in the area. The reader should take into account that the data collected reflects recent real estate market conditions and that the demographic and economic trends reflect growth over a longer period of time. Current local, regional and national real estate conditions have been negatively impacted by the economic downturn (which was, in a large part, real estate-driven) and have resulted in reduced absorption of spaces for a variety of land uses. These conditions should be considered short-term. Longer term demographic and economic projections suggest that Mint Hill's real estate surplus will be absorbed early in the planning time horizon as the economic recovery builds. As conditions return to "normal" and local growth patterns resume, Mint Hill should continue to be positioned for real estate development and redevelopment opportunities.

Based on our analysis of demographics and market conditions, these findings and recommendations indicate what may reasonably occur in the SAP Study Area. Demand forecasts are intended as reasonable, third-party estimates of the overall redevelopment potential in light of current and forecast market conditions as well as AECOM's experience in redevelopment projects.

AECOM utilized a number of public and private data sources in our research, including the ESRI Business Analyst; Town of Mint Hill Planning and Zoning; Woods & Poole; Claritas; Mecklenburg-Union MPO; and CoStar Property.

Key findings are summarized in the following pages and relevant data is detailed in Appendix C.

## CHAPTER 3 Existing Conditions

### *Residential* (Appendix C Tables 1-3)

The residential analysis presents market potentials for three types of housing—for-sale single-family, for-sale urban residential (condominiums and townhomes), and for-rent urban residential. From a developer’s perspective, adding a mix of housing (potentially over multiple phases) serves to distribute investment risks across more than one product type. The planning horizon for the residential analysis is to 2015.

#### *For-Sale (Single-Family and Urban Residential)*

To calculate for-sale residential demand potentials, three segments were identified: demand from new households, demand from converting renter households, and turnover from existing owner-occupied households. AECOM defines target-market, income-qualified households as those earning more than \$75,000 per year for single-family and \$50,000 for urban residential, indicating an affordability range of roughly \$225,000-\$300,000 per unit for single-family and \$150,000-\$200,000 for urban residential. AECOM measured demand from households in two target trade areas: the CLUP Study Area and remaining areas of Mecklenburg County. This methodology is detailed below:

#### *1. New Household Demand*

A key source of potential demand for residential is generated by new or relocating households. To determine this factor, annual new households (as forecasted by ESRI Business Analyst for 2009-2014) were qualified by three factors: 1) income; 2) lifestyle characteristics that indicate a preference for this type of housing, and 3) a propensity/preference to purchase a home.

#### *2. Conversion of Existing Renter Households*

Each year, a certain proportion of renter households will move and, of those, some will decide to purchase. To evaluate demand potentials from converting renter households, a similar approach was used with slight modification. First, total households in the two geographies were qualified by income and renter status. Second, an estimated annual turnover rate of ten percent for single-family and 20 percent for urban-residential was applied to those renter households. Third, a household’s propensity to buy (estimated at ten percent) served as an additional qualifier in this analysis.

#### *3. Turnover of Existing Owner-Occupied HHs*

Similar qualifiers of income, tenure and propensity to purchase an urban-residential or single-family home were applied to this segment. The additional qualifier includes turnover of existing households in the two geographies. An estimated five percent of owner-occupied households will turnover their current home and buy a new home in a given year.

AECOM estimates approximately 6,100 households qualify for single-family for-sale units and approximately 5,000 households qualify for urban-residential for-sale units on an annual basis from these trade areas. The next step in this analysis is to identify the SAP Study Area’s capture of these target households. AECOM estimates that the SAP Study Area could capture up to eight percent for single-family and 33 percent for urban-residential of the CLUP Study Area’s target market total annual demand and 0.25 percent for single-family and urban-residential for the rest of Mecklenburg County’s target market total annual demand, indicating a potential SAP Study Area annual absorption of 30-45 single-family for-sale units and 30-45 urban-residential for-sale units.

## CHAPTER 3 Existing Conditions

### *For-Rent (urban-residential)*

Another means of enhancing housing market potentials (and to reduce the risk of participating developers), is to introduce a variety of both for-sale as well as rental product into the development mix. The following examines market potentials for rental housing in the SAP Study Area.

AECOM defines target-market, income-qualified households for rental residential product as those earning more than \$35,000 per year. These households include young working professionals as well as households seeking an alternative housing product, including those that are downsizing.

Similar to the for-sale analysis, AECOM measured demand from two trade area geographies—the CLUP Study Area and the remaining area in Mecklenburg County. Two general renter groups were identified to estimate demand potentials: 1) demand generated from new households in each of these geographies and 2) demand generated by existing renter households (i.e., turnover). The following methodology was used to identify potential target demand:

#### *1. New Household Demand*

A key source of potential demand for rental units is generated by new or relocating households. To determine this demand, annual new households as forecast by ESRI Business Analyst for 2009 to 2014 were qualified by three factors: 1) income; 2) propensity to rent as determined by tenure data from ESRI Business Analyst; and 3) lifestyle preference. In combination, these qualifying factors identified potential market support from new households in both target geographies.

#### *2. Relocations of Existing Renter Households*

Similar qualifiers of income, tenure, and lifestyle were applied to this segment. The fourth qualifier includes the annual turnover rate of existing households, identified as 20 percent. This would include, for example, empty nester households in the study area considering downsizing and making a conscious decision to rent in a more upscale property.

AECOM estimates almost 13,300 households from these two trade areas would qualify on an annual basis. The next step in this analysis is to identify the SAP Study Area's capture of these target households. If the SAP Study Area successfully captures 20 percent of households within the CLUP Study Area and 0.20 percent of households within the rest of Mecklenburg County, AECOM estimates that target households could generate annual absorption in the range of 30 to 45 rental units per year or two to three units per month.

## CHAPTER 3 Existing Conditions

*Retail**(Appendix C Tables 4-13 and Figure 1)*

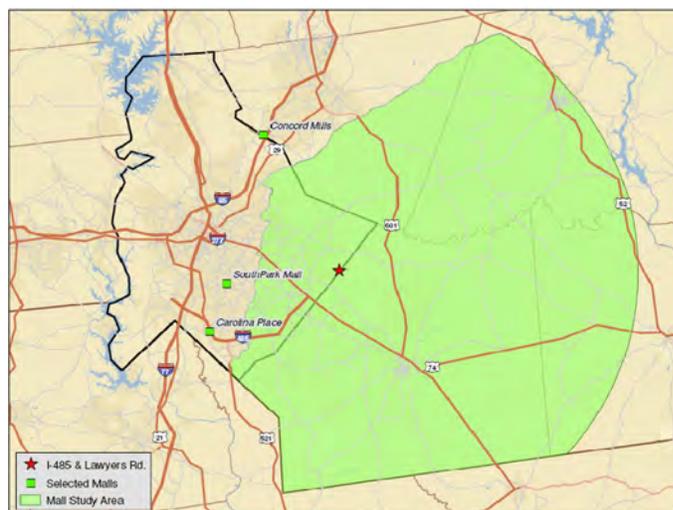
Retail uses require a concentration of disposable income (from nearby residents, employees), strong visibility and extensive frontage, adequate parking, a clear competitive role, and market identity. Moreover, supporting tenants oftentimes require an anchor tenant—such as a grocery store—to generate traffic. The most successful urban lifestyle/mixed-use retail projects across the U.S. contain a mix of merchandise categories—including apparel & accessories, home furnishings, food & beverage, leisure & entertainment, and general merchandise.

As part of the retail demand potentials, AECOM examined two retail scenarios:

- Retail demand generated from the CLUP Study Area residents and employees
- Retail demand generated by a larger study area that AECOM estimates is in a reasonable drive time from the proposed Mall site and consistent with industry standards for regional retail centers. This study area is referred to as the Mall Study Area.

The CLUP Study Area is experiencing an outflow of retail spending, i.e. current household spending on consumer goods by residents within the CLUP Study Area is greater than sales receipts of these same goods from stores within the CLUP Study Area. This indicates that CLUP Study Area residents are leaving the CLUP Study Area to shop, and that the CLUP Study Area can benefit from additional retail establishments.

Current demand from households in the CLUP Study Area is for almost 846,000 square feet of retail space, but only the equivalent of 480,000 square feet in



Appendix C Figure 1. Mall Study Area analyzed in the Demand Potential Market Analysis performed by ERA, a division of AECOM.

sales is being captured within the CLUP Study Area. As a result, CLUP Study Area residents could support approximately 350,000 square feet of additional retail space if all spending that occurs outside the CLUP Study Area is recaptured. Current CLUP Study Area retail leakage could support the following amounts:

- Apparel & Accessories: 36,000 Square Feet
- Furniture & Home Furnishings:  
169,000 Square Feet
- Food & Beverage: 54,000 Square Feet
- Leisure and Entertainment:  
47,000 Square Feet
- General Merchandise (Dept. Stores):  
193,000 Square Feet

## CHAPTER 3 Existing Conditions

AECOM estimates that the SAP Study Area could capture five percent of CLUP retail leakage. As a result, SAP Study Area residents could support approximately 18,200 square feet of additional retail space if all spending that occurs outside the SAP Study Area is recaptured.

Based on current household spending patterns and forecasted growth in average household income, AECOM estimates that by 2015, SAP Study Area resident household spending will support over 30,000 square feet of retail space. By 2020, SAP Study Area household spending could support an additional 2,600 square feet of new retail space and by 2030, SAP Study Area household spending could support an additional 2,500 square feet of new retail space. In addition, employees working within the CLUP Study Area provide additional spending to support retail space. In total, between 2009 and 2030, resident and employee spending in the SAP Study Area can support an additional 17,300 square feet of net new retail space. Based on household and employee spending, the SAP Study Area can support approximately a total of 43,000 sq. ft. of retail by 2030.

Current demand from households in the Mall Study Area is for 16.5 million square feet of retail space, but only the equivalent of 13.7 million square feet in sales is being captured within the Mall Study Area. As a result, Mall Study Area residents could support approximately 2.8 million square feet of additional retail space if all spending that occurs outside the Mall Study Area is recaptured. Mall Study Area retail leakage could support the following amounts:

Apparel & Accessories: 315,000 Square Feet  
 Furniture & Home Furnishings:  
     647,000 Square Feet  
 Food & Beverage: 709,000 Square Feet  
 Groceries: 128,000 Square Feet  
 Leisure and Entertainment:  
     398,000 Square Feet  
 Convenience & Service: 58,000 Square Feet  
 General Merchandise (Dept. Stores):  
     543,000 Square Feet

Based on current household spending patterns and forecasted growth in average household income, AECOM estimates that between 2009 and 2030, Mall Study Area household spending will support over 2.2 million square feet of additional retail space.

## CHAPTER 3 Existing Conditions

### Office

(Appendix C Table 14)

Demand for commercial office development is driven by employment patterns and growth in those job sectors that occupy office space. Office workers use a variety of space depending on local market characteristics and the type of business. For example, some office tenants are small and choose to locate in retail centers that command more foot traffic; others telecommute from home or work in industrial settings as part of “flex-tech” buildings that provide front-end office and back-end warehouse or light industrial.

To determine market demand for commercial office development in the SAP Study Area, long-term trends in employment were measured to estimate how growth in office-using jobs is most likely to translate into new office buildings.

AECOM examined two office demand potentials:

- Office demand generated from forecasted employment growth in Mecklenburg County based on the growth of specific industries.
- Office demand growth based on total employment growth forecasted for the CLUP Study Area.

Mecklenburg County is forecast to add 351,200 new jobs between 2009 and 2030. The increase in employment may translate into Countywide demand for over 32.6 million square feet of office space between 2009 and 2030. AECOM notes that this may not necessarily require all new office construction, as some office-using jobs can be accommodated in existing (viable) vacant space across Mecklenburg County (currently estimated at 9.7 million square feet).

Using the CLUP Study Area’s fair share of 0.5 percent (the CLUP Study Area’s current capture rate), this analysis suggests that demand for new office space in the CLUP Study Area will total approximately 163,000 square feet by 2030. AECOM estimates that the SAP Study Area could capture up to 50 percent of the CLUP office demand, resulting in a total demand of 81,500 square feet of new office space by 2030 in the SAP Study Area.

The Mecklenburg-Union MPO estimates that there will be 10,496 new jobs in the CLUP Study Area between 2009 and 2030. This translates into over 3,300 new office-using employees by 2030, which would require almost 672,000 square feet of additional office space in the CLUP study area. AECOM notes that this may not necessarily require all new office construction, as some office-using jobs can be accommodated in existing (viable) vacant space across the CLUP Study Area (currently estimated at 38,000 square feet).

AECOM estimates that the SAP Study Area could capture up to 33 percent of the CLUP office demand, resulting in a total demand of 222,000 square feet of new office space by 2030 in the SAP Study Area.

## CHAPTER 3 Existing Conditions

Variations on office demand potential occur due to the methodology used and potential capture geographies and percentage of capture applied. In most growth scenarios for the CLUP Study Area, 672,000 is likely to be an over-aggressive projection. Due to land area limitations, current restricted access to sufficient water and sewer capacity, height restrictions and density limitations and traffic circulation needs, it is doubtful that the CLUP Study Area could accommodate, let alone absorb, so much space. To capture a greater amount of square feet, zoning would have to be relaxed, a more complex traffic grid would be needed, and one or more major economic drivers will need to be in place. A major corporate, educational, government or institutional office space user located in Mint Hill could create demand for additional office space than would normally locate in the town. As there are two primary areas that could receive large office campuses, the downtown and SAP Study Area are the likely locations for office expansion. By setting the SAP Study Area capture of total office demand at 33 percent, AECOM has conservatively estimated 222,000 square feet.

The lower numbers of 163,000 square feet by 2030 for the CLUP Study Area and 81,500 square feet of new office space by 2030 in the SAP Study Area should be easily accommodated within a low growth scenario that does not expand office zoning or encourage much additional growth beyond what would naturally occur. These smaller office space amounts should be achieved within current zoning and economic trends.

### *Industrial/Flex (Appendix C Table 16)*

Demand for industrial development is driven by employment patterns and growth in those job sectors that occupy industrial/flex space. To determine market demand for industrial/flex development in the CLUP Study Area, long-term trends in employment were measured to estimate how growth in jobs needing industrial space are most likely to translate into new industrial space.

Mecklenburg County is forecast to add 351,200 new jobs between 2009 and 2030. The increase in employment may translate into Countywide demand for almost 26.2 million square feet of industrial/flex space between 2009 and 2030. AECOM notes that this may not necessarily require all new construction, as some industrial/flex-using jobs can be accommodated in existing (viable) vacant space across Mecklenburg County (currently estimated at 13.2 million square feet).

Using the CLUP Study Area's fair share of 0.3 percent (the CLUP Study Area's current capture rate), this analysis suggests that demand for new industrial/flex space in the CLUP Study Area will total approximately 78,500 square feet by 2030.

AECOM estimates that the SAP Study Area could capture up to one percent of the CLUP industrial/flex demand, resulting in a total demand of almost 1,000 square feet of new industrial/flex space by 2030 in the SAP Study Area.

# Chapter 4: Process and Analysis



---

Mint Hill: Lawyers Road and I-485 Small Area Plan



## Chapter 4: Process and Analysis

### CHARRETTE

As mentioned in the Public Participation section, an intense three-day design workshop called a “charrette” was organized at the beginning of the planning process after initial data about the study area was collected, analyzed, and mapped. The purpose of this charrette was to engage the public in the planning process and create a plan with them. Getting the buy-in from town-residents, especially those living within the study area, right from the beginning of the process was critical for the overall success of the plan.

To initiate discussions, and to have a meaningful dialog at the start of the design charrette, three distinct framework ideas were deliberated. These framework ideas evolved into three distinct scenarios (see next page for graphics) ranging from –

- Primarily low-density residential development around the planned mall
- Mix of civic and institutional uses, with some residential development, around the planned mall
- Mix of major employment (primarily office), civic, mix of residential (ranging from urban to single family residential) around the planned mall

Over 200 residents, who participated in the three-day charrette, created more scenarios, which were different renditions of those discussed above. They finally settled on the one that had a set of intense uses, in the form of office, civic, institutional, more retail, and mix of residential, around the planned mall. There was an extraordinary level of consensus behind this ‘preferred concept’, and almost everybody supported it.



Photo: The three day charrette began with the presentation of three different scenarios to the project advisory committee



Photo: These scenarios were then discussed, altered, and refined in a public workshop setting with the Town residents

CHAPTER 4 Process and Analysis

CHARRETTE CONCEPTS

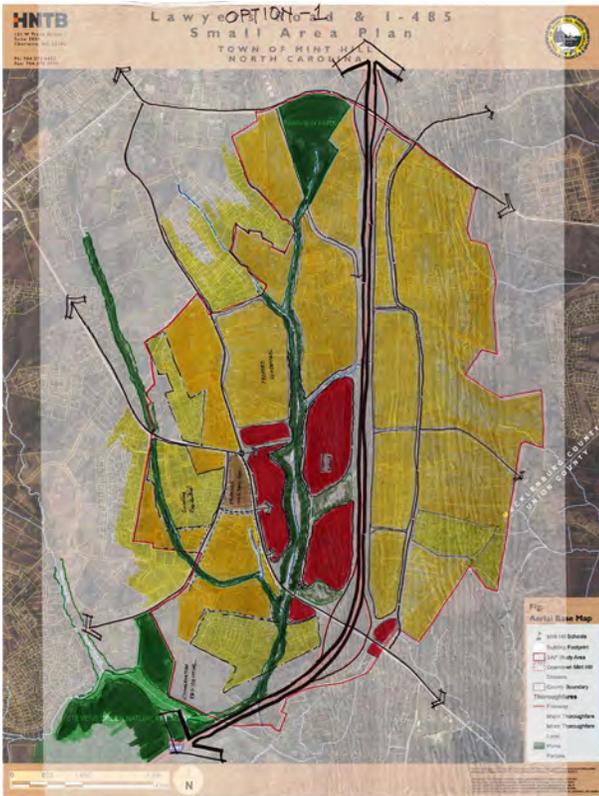


Figure 8: Option 1 Graphic: Primarily low-density residential development around the planned mall

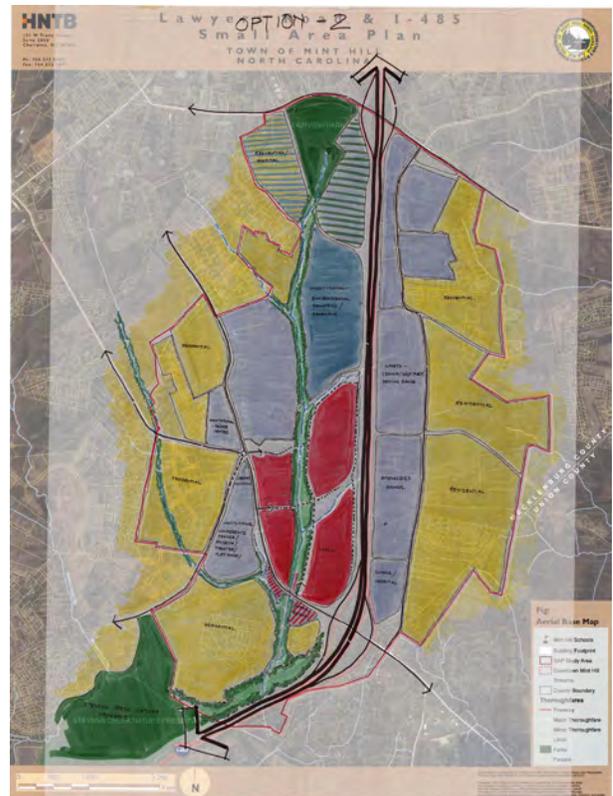


Figure 9: Option 2 Graphic: Mix of civic and institutional uses, with some residential development, around the planned mall

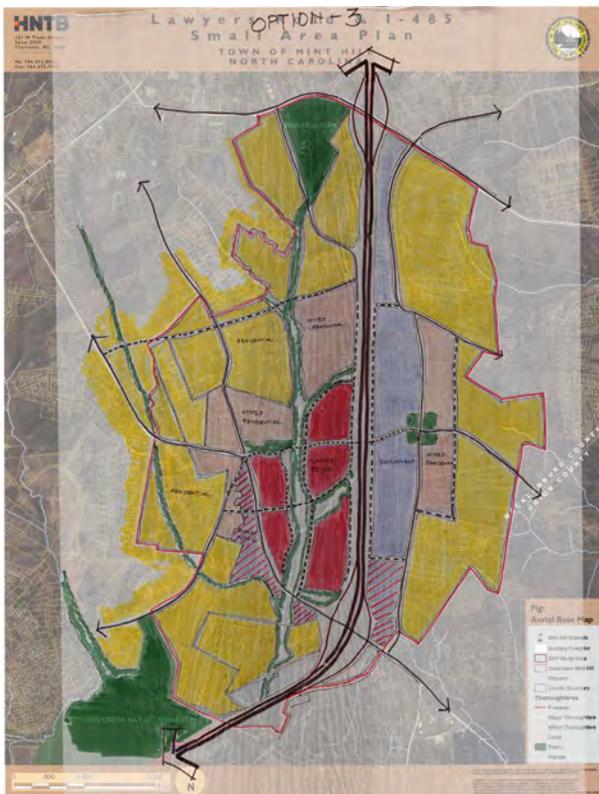


Figure 10: Option 3 Graphic: Mix of major employment (primarily office), civic, mix of residential (ranging from urban to single family residential) around the planned mall

## CHAPTER 4 Process and Analysis

Figure 11 on page 52 shows the preferred concept that came out of the 3-day charrette. Figure 12 on page 53 shows the arrangement of land uses for this concept.

Having a clear and well supported vision is important for any plan, but it needs to be appraised against the reality of market demand and the desire of the community to work towards its realization. To understand the demand over the next 20 years for the various types of uses, a detailed market analysis was conducted. A detailed description of this market demand is located in the preceding section and in Appendix C. The results of this market demand analysis were assessed against the preferred concept plan that emerged from the three-day design charrette. It became clear that the SAP study area can reasonably expect to receive some residential, some additional retail, and some employment based on past trends. However, to realize the vision created in the preferred concept, the Town will need to take a proactive approach in marketing and recruiting a major employer. This choice – to accommodate moderate growth as espoused by the market demand versus proactively recruiting a major employer into the study area - was presented to the Town leadership and the advisory committee.

After getting agreement from the advisory committee and town leadership, and providing a rational basis for decision making, a detailed set of analyses was conducted to understand the impact of the preferred concept on various aspects such as fiscal, traffic, and land use. The preferred concept was also refined to ensure the accuracy of the above mentioned analysis.



CHARRETTE

Photo: Hands on exercises were conducted where town residents voiced their opinions about nature, scale, and design of growth and development



Photo: Three consecutive public workshops were conducted on the evening each day to discuss progress and seek input from the public

CHAPTER 4 Process and Analysis

PREFERRED CONCEPT MASTER PLAN



Figure 11: After three public workshops on each day of charrette and constant refinement of initial scenarios, a preferred concept emerged

CHAPTER 4 Process and Analysis



PREFERRED CONCEPT LAND USE PLAN

Figure 12: Land Use distribution of the preferred concept.

## CHAPTER 4 Process and Analysis

Furthermore, in order to compare the fiscal, traffic, and land use impact of the preferred concept on the SAP study area, two other profiles were considered. It is important to note that the public support and consensus was behind the preferred concept, and that use of other profiles was purely to provide rational basis for comparison. All three profiles, including the preferred concept, were –

- Current state – This scenario assumed roughly 770 residential units
- Market Demand - This scenario assumed roughly 1500 residential units, the planned mall, roughly 43,000 sq ft of additional retail, and roughly 82,000 sq ft of office
- Employment Center (Preferred Concept) – This scenario assumed roughly 1500 residential units, planned mall, roughly 200,000 sq ft of additional retail, and 1,250,000 sq ft of office

### FISCAL IMPACT ANALYSIS

The purpose of conducting a detailed Fiscal Impact Analysis was to understand how much facilities and growth patterns in the preferred concept plan will affect the cost of public facilities and personnel and impact the Town revenues. The fiscal impact assessment addressed the cost of public facilities to serve current and projected demands, analyze costs associated with staffing and operating new facilities, and analyze the revenue generating potential from development of planned uses under a build-out scenario. A detailed description of the Fiscal Impact Analysis can be found in Appendix D. A summary of this analysis is outlined in this section.

In 2010, approximately 91% of the town’s real property tax base is residential. Increasing commercial and office properties eases the town’s dependence

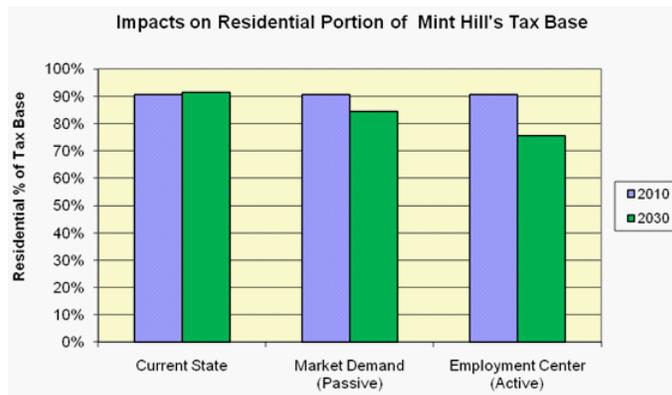


Figure 13: This graph shows expected percentage of residential portion of Mint Hill’s tax base for the three scenarios. The green bar shows percent residential tax base of all three profiles in 2030. As per the graph, tax burden on residential uses is least for “employment center” profile.

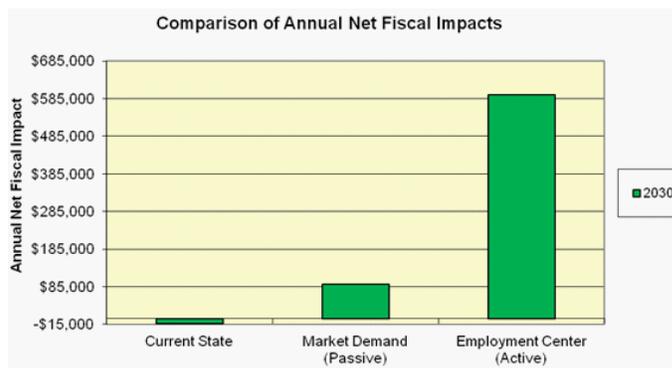


Figure 14: A comparison of annual net fiscal impact for the three profiles. As per the graph, the Town will have slightly negative net fiscal impact for the “current state”, and roughly \$600,000 of positive net fiscal impact for the “employment center” profile. Net fiscal is the difference between the revenue generated by the proposed uses and the expenses incurred to serve those uses.

on residential property taxes. As shown in Figure 13, the Employment Center profile (Preferred Concept) provides the greatest diversification of the tax base and decreases the residential portion from 91% to 76%.

The Employment Center (Preferred Concept) also creates the most significant net annual fiscal benefit. Whereas the Current State produces a breakeven net annual impact, the Market Demand profile generates an annual net positive impact of \$91,000 while the Employment Center (Preferred Concept) generates an annual net positive impact of \$596,000.

## TRAFFIC IMPACT ANALYSIS

The purpose of the traffic impact analysis was to understand the impact on future traffic patterns due to the set of uses proposed in the preferred concept. It is important to keep in mind that growth and development is expected to happen within the SAP study area and beyond. This expectation is supported by the Regional Travel Demand model, which is created and maintained by Mecklenburg Union Metropolitan Planning Organization (MUMPO). This Regional Travel Demand Model assigns future vehicular trips based on recent trends, zoning and land use regulations, upcoming developments that are in the pipeline, modal-splits, and long term growth based on census trends.

Since the SAP study area borders one of the fastest growing counties in the state, and is part of a growing area itself, the traffic through the study area is expected to increase due to the overall growth of the area surrounding the SAP study area. This growth means that the existing roadway system will be burdened with additional trips in the future, even without any significant development around the planned mall site. The preferred concept will add more trips on the existing roads, but these additional trips will be only slightly more than the additional trips on these roadways due to the natural growth in the surrounding areas. This is illustrated in the two graphs for the two major roads in the study area – Lawyers Road and Fairview Road (Hwy 218).

Figure 15 shows the projected traffic on the two roads for different profiles discussed before. Number of vehicles per hour for Current State is shown in blue. Increase in number of vehicles per hour for

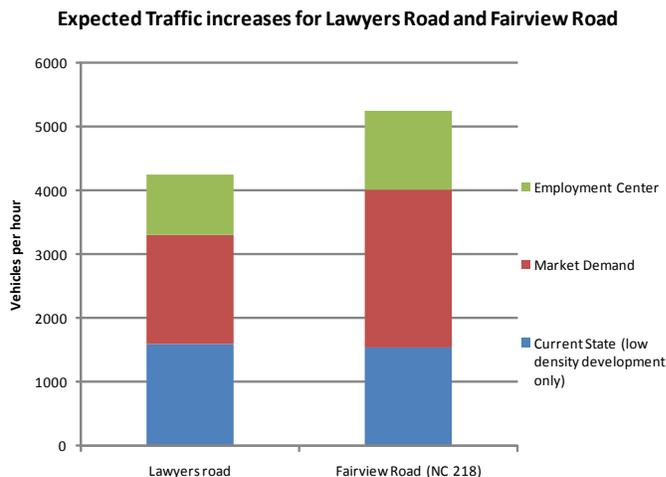


Figure 15. Expected traffic increases at two locations for each of the three scenarios.

Market Demand profile is shown in red, and, increase in vehicles per hour due to Employment Center profile is shown in green. This figure illustrates that even though the Employment Center profile will increase the number of vehicles on both of these major thoroughfares, it is only marginally more than increase in traffic due to the overall growth in the SAP study area.

For a detailed description of the Traffic Impact Analysis, please see Appendix E.

## CHAPTER 4 Process and Analysis

### LAND USE IMPACT ANALYSIS

As discussed before, proposed land uses for all three profiles were markedly different. The Current State profile assumed roughly 770 residential units around the planned mall. The Market Demand profile assumed 1,500 residential units, 43,000 sq ft of retail in addition to the planned mall area, and office space of roughly 82,000 sq ft. The Employment Center profile, which is also the preferred concept, assumed 1,500 residential units, 200,000 sq ft of retail in addition to the planned mall area, and 1.25 million sq ft of office space. Clearly, the intensity of uses will increase from the Current State profile to the Employment Center profile.

This increase in intensity will have an impact on the fiscal make up of the Town and future traffic conditions, as discussed above. However, it will also shape quality of life for current and future town residents. Having primarily residential development around the planned mall, as assumed in the Current State profile, will not provide opportunities for future employment, any mix of uses, civic amenities, nor an ability to live, work, and play in close proximity to each other. On the other hand, a mix of uses, especially employment opportunities close to the mall, as discussed in the Employment Center profile, will provide opportunities to live and work in close proximity and enjoy the shopping experience offered by the planned mall.

One of the concerns expressed by many during the SAP planning process was how the preferred concept (Employment Center profile) will affect the growth and development of downtown Mint Hill. Many viewed downtown Mint Hill as being in its infancy, but growing in the right direction. The Town, during the entitlement process of approving the planned mall, made sure that none of the uses proposed in the mall will directly compete with future uses that

could come to the downtown. This was done to protect the vibrancy and viability of downtown Mint Hill. The layout of the Preferred Concept is based on the same premise that downtown Mint Hill should not be adversely affected by any new development in the Town. To ensure such balance is maintained, proposed uses in the Preferred Concept are selected that will typically not come to downtown settings. Office parks, public schools, a conference center, and a YMCA type facility are all suited for the area adjacent to the planned mall and should not affect the growth of downtown Mint Hill. In many ways, having a significant regional destination near downtown Mint Hill can provide more exposure to the town center.

## PROCESS AND ANALYSIS SUMMARY

After analyzing the impacts on fiscal composition, traffic conditions, and land use, the advisory committee and residents of the Town decided to move ahead with the Preferred Concept. The Preferred Concept provided the balance between attracting jobs and employment to the Town without attracting the excessive retail development that typically follows a major retail destination such as a regional mall.

The Preferred Concept also provided an opportunity to diversify the Town's tax base by taking some of the tax burden from residential development and distributing it over proposed office and non-residential development.

The next section will describe the Final Small Area Plan that emerged from the Preferred Concept along with the specific recommendations and implementation strategies to bring the plan to fruition.



# Chapter 5: Small Area Plan



---

Mint Hill: Lawyers Road and I-485 Small Area Plan



# Chapter 5: Small Area Plan

## GOALS

Based on the input received during stakeholder interviews, advisory committee meetings, the three-day charrette, and a detailed investigation of issues and opportunities following goals were developed for the Lawyers Road & I-485 Small Area Plan:

- Integrate the Mall with surrounding uses - do not let it become an island
- The development in the SAP study area should complement downtown and should not compete with it
- Retail uses in the Small Area Plan study area should not be designed as strip malls, with large parking lots in the front and buildings in the back
- Development along Hwy 218 should be managed to complement the future vision for the Small Area Plan
- Recognize environmental barriers and challenges and work within the framework of existing regulations to protect these resources
- Manage uses around the mall to reduce the impact on the environment
- Connect the Mall to parks via bike trails and greenways, connect to the Carolina Thread Trail (CTT)
- Separate destination traffic from local traffic

## SMALL AREA PLAN DESCRIPTION

The initial premise of the Small Area Plan was to anticipate future development patterns around the proposed mall and to manage this growth so that it does not get out of control. This reaction was understandable. It has happened in many municipalities, especially small towns, that when a big regional attraction such as a retail mall is planned, other retail uses are attracted to the area and flood the landscape.

However, as the planning process went through a series of public involvement steps, including 3-day design workshops, public meetings, and a series of advisory committee meeting, a different vision started to emerge for the study area. The planning process of the plan development, as described in the previous section, was truly collaborative and informed the final outcome of the plan. Many residents started to see the potential of this area beyond just a regional retail center. There was an extraordinary level of consensus about the vision of the SAP study area, which led to the final plan discussed in this section. The following pages describe major components of the SAP in words and pictures.



Photo: Low Density Residential is integrated with the surrounding development through appropriate transition of use and form.

## CHAPTER 5 Small Area Plan



Photo: Greenways are heavily used when they connect destinations - whether residential, retail, or civil land uses - and when they connect to regional networks. They can help reduce habitat fragmentation when designed inside the required environmental buffers and corridors.



Photo: Open Spaces can come in variety of form. These spaces can be a neighborhood park, a urban plaza, a trailhead, etc, and provide a safe gathering spot along car, bike, and pedestrian transportation corridors.



Bird's eye view rendering of the Small Area Plan



The planned mall in the SAP study area could be complemented by a major employment center, which will fill the gap for such use between Ballantyne and the University City area. The SAP study area enjoys good connectivity to the regional interstate system, and has available land resources to accommodate a regional mixed use center. This regional mixed use center will complement downtown Mint Hill, which is transitioning into a Town Center. However, for it to become a true regional center, it demands careful thought about the form and design of future development. Future retail in the form of strip development (parking in the front, with isolated buildings at the back) should be discouraged, and development should be integrated with surrounding uses through continuity of form, scale, and design features.

Source: Mecklenburg County GIS, Union County GIS, Town of Mint Hill, Mecklenburg Union Metropolitan Planning Organization (MUPO), North Carolina Department of Transportation (NCDOT).  
 Disclaimer: This GIS data is deemed reliable but provided "as is" without warranty of any kind, express or implied, including but not limited to accuracy, completeness, and suitability for any purpose. The user assumes all liability for any use of this data for any purpose should be with acknowledgment of the limitations of the data, including the fact that the data is dynamic and is in a constant state of maintenance, correction, and update.

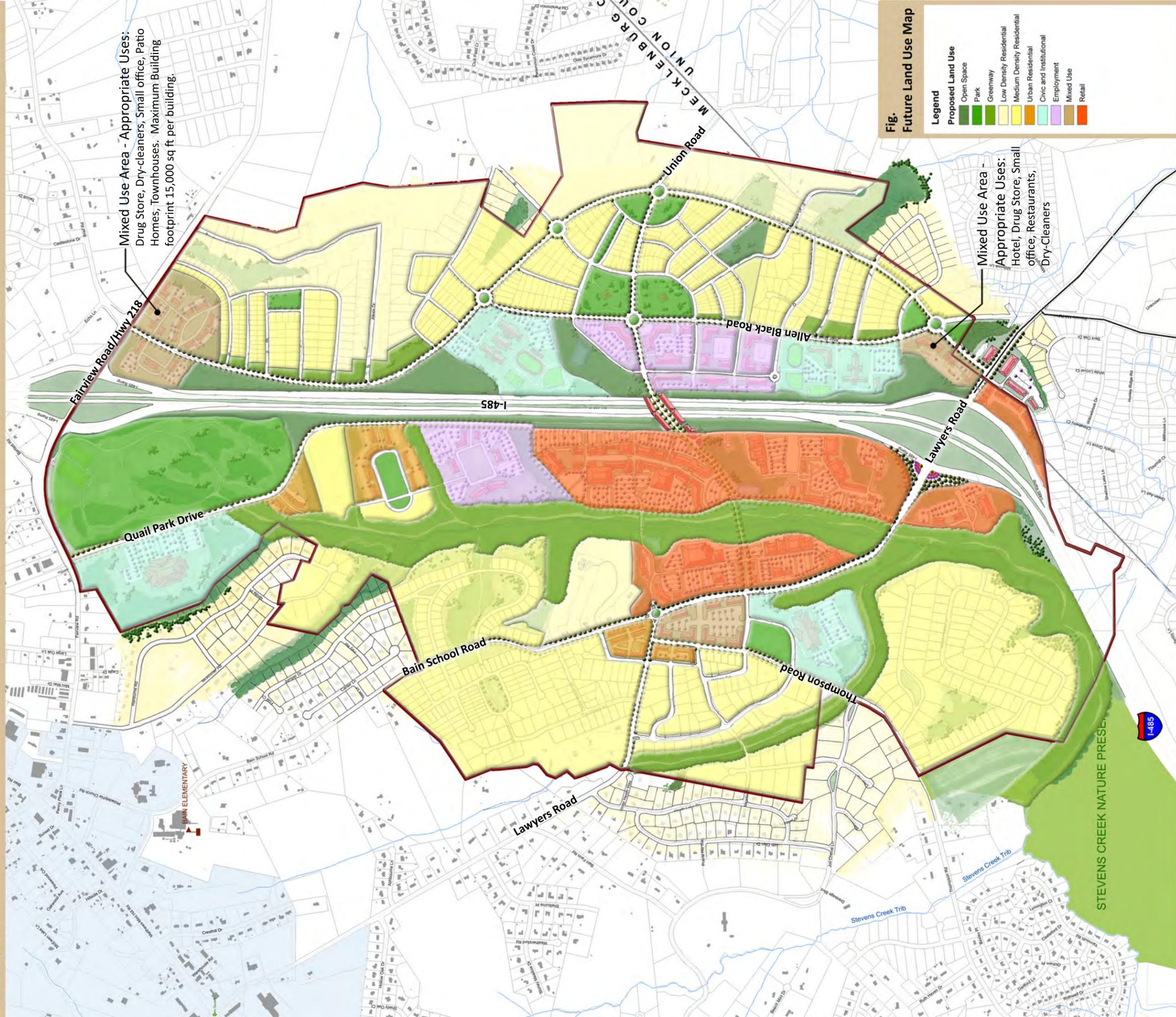


# Lawyers Road & I-485 Small Area Plan

TOWN OF MINT HILL  
NORTH CAROLINA

**HNTB**  
121 W Trade Street  
Suite 2050  
Charlotte, NC 28202

Ph: 704.372.8020  
Fax: 704.372.7097



Source: Mecklenburg County GIS, Union County GIS, Town of Mint Hill, Mecklenburg Union Metropolitan Planning Organization (MUPCO), North Carolina Department of Transportation (NCDOT)  
Disclaimer: This GIS data is deemed reliable but provided "as is" without warranty of any kind, express or implied, including but not limited to accuracy, completeness, or timeliness. This information does not represent a final survey of the land and is for general informational purposes only. Use of this data for any purpose should be with acknowledgment of the limitations of the data, including the fact that the data is dynamic and is in a constant state of maintenance, correction, and update.

## A STRONG REGIONAL CENTER

Strategically located between two major suburban employment centers – Ballantyne in south Charlotte and University City in northeast Charlotte – the SAP study area also adjoins the fastest growing County in the state – Union County. Most of the residents of Mint Hill and Union County currently commute to one of the many employment centers in Mecklenburg County – Ballantyne, South Park area, University City area, or Charlotte Center City. It is therefore no surprise that a regional retail mall is proposed for this area because an increase in retail opportunities will be the foundation for another employment center for the residents of Mint Hill and Union County to the east.

Good regional access through the I-485 beltway and availability of land, coupled with the arrival of a regional mall and major employment center will position the SAP study area to become a mixed use center that will be unique in the region. It will place Mint Hill as one of the major destinations in the Charlotte region. By creating a regional mixed use center, rather than just a regional retail use center, this plan addresses one of the goals of the study – integrate the planned mall with its surrounding uses, and not let it become an island.

It is therefore envisioned that the SAP study area could complement the future retail mall with a major employment center that fills the gap for such use between Ballantyne and the University City area, enjoys good connectivity to the regional interstate system, and is mindful of available land resources. Since the SAP study area is envisioned as a regional mixed use center, it will complement downtown Mint Hill, which is envisioned as the Town Center. This will address another goal of the study - development in the SAP study area should complement downtown and should not compete with it.

However, for it to become a true regional center, it

demands careful thought about the form and design of future development. Future retail in the form of strip development (parking in the front, with isolated buildings at the back) should be discouraged, and development should be integrated with surrounding uses through continuity of form, scale, and design features.



Photo: Employment Center such as Coliseum Center in Charlotte could be appropriate for the location of office use shown east of I-485 and connected to the mall through Union Road extension



Photo: Employment Center such as Morrocroft Village in South Park area of Charlotte could be appropriate for the location of office use shown west of I-485 and north of the Mall

## CHAPTER 5 Small Area Plan

### PRESERVATION OF NATURAL RESOURCES USING STORMWATER UTILITIES

The SAP study area falls within one of the most environmentally sensitive basins in the region – Goose Creek basin. Preservation of natural resources that will sustain the life forms within the network of creeks and streams is therefore important. All creeks and streams within the study area are protected with a Mecklenburg County mandated buffer of 200 feet on either side of perennial streams and 100 feet on either side of intermittent streams. Open space is further protected in the form of parks and greenways. One of the goals identified during the plan process was to connect the planned mall to parks, downtown, and other destination uses via a network of greenways and trails. The plan identifies such connections and creates more opportunities for recreational uses by providing for additional neighborhood and community parks.

However, buffers and open space alone may not be enough to control stormwater runoff to the creek. Goose Creek is already a very flashy creek, rising quickly during storm events in the vicinity of 8-9 feet above normal flow (as measured downstream of the study area by the USGS gauging station 02124692 at Fairview - see “Surface Water, Daily Data, Search by Site Number” at <http://waterdata.usgs.gov>). This sharp rise and fast decline of river levels indicate that most of the stormwater from rain events is running off directly into creeks and streams (instead of filtering into the ground), taking with it pollutants in the form of phosphorus, nitrogen, heavy metals, etc. The addition of impervious area associated with urban development will adversely affect the discharge during storm events, increasing the volume and degrading the quality of stormwater running off from the impervious areas in the study area.

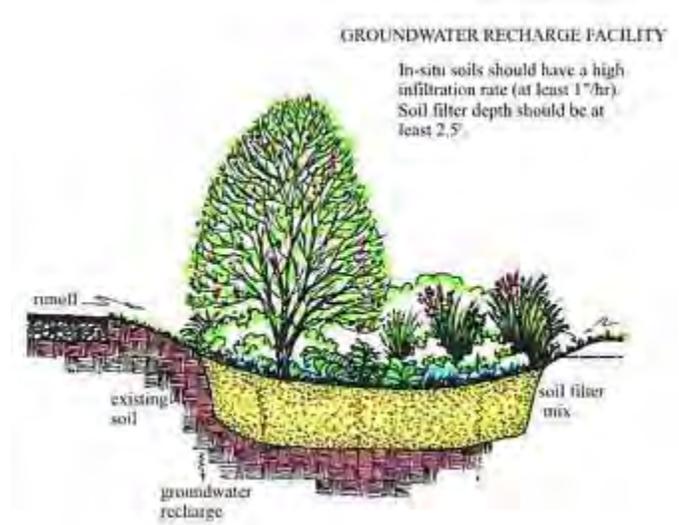


Diagram: Bioretention cells can either filter or filter and capture stormwater runoff. They use plants and layers of porous media to reduce quantity and improve the quality of stormwater runoff; connecting directly to existing stormwater structures. Low Impact Development Center, Inc., Beltsville, MD.

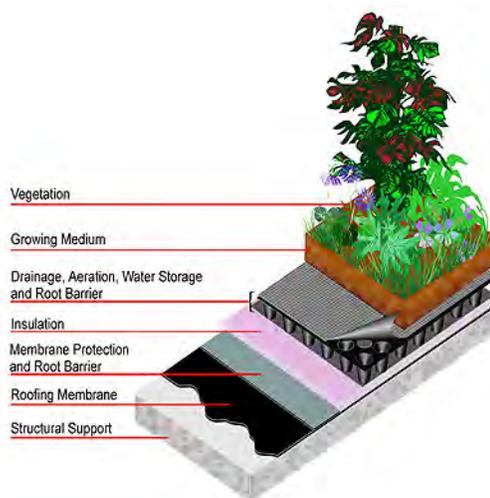


Photo: Bioretention cells look like simple, aesthetically pleasing plantings from the casual observer, however, they are only the visible topping of a 2-3 foot porous medium installed directly below. The exact size and capacity of these structures are engineered based on the intensity and duration of rain events in the study area. Low Impact Development Center, Inc.

## CHAPTER 5 Small Area Plan

To mitigate the effects of urban development, Low-Impact Development should be encouraged. LID is a term used to refer to the use of on-site, small scale natural features to manage stormwater runoff. When water quality or quantity standards are not met, these structures are used in conjunction with traditional Stormwater Best Management Practices (BMPs) like detention ponds. LIDs are engineered to capture and store volumes of water using clusters of water-tolerant plants. The collected water improves infiltration and permeability of the existing soil and augments storage capacity of a rain event. Plants use the water detained in these structures to grow, thereby reducing the volume of stormwater and pre-treating it before it is discharged into traditional stormwater infrastructure. Since plants can be selected in various heights, colors and textures, and additional plantings can be used to disguise necessary concrete structures, the LIDs improve urban design aesthetics when they are integrated into the areas reserved for required shade trees and around streets, sidewalks, bike lanes, and parking lots.

Typical structures include bioretention cells or “rain gardens”; bioswales, green roofs, and pervious concrete. Bioretention cells simply retain water in strategic locations around a building or in low lying areas that would have standing water. Bioswales can be grassed or planted with a variety of shrubs and trees and slow water traveling in a linear direction towards drain inlets. Bioswales can function well along streets, bike lanes, sidewalks, and between rows of parking. Green roofs can capture an enormous amount of stormwater simply because flat roofs take up a lot of area. They can provide additional open space to building occupants and are most successfully accomplished by planning for additional soil weight during building design and construction. Pervious pavement can be used for parking lots to cut down on the high volume of stormwater generated during a rain event.



Green roof diagram: green roofs can capture and treat a large amount of stormwater in an area, especially on flat roofs on commercial buildings that take up a lot of real estate. Green roofs are most successful when they are specified early in a building’s construction, to make sure the additional weight from soil and plant material is accounted for in building loads. Square footage in a green roof can be added to open space requirements for LEED certified projects. Low Impact Development Center, Inc.



Photo: Pervious concrete can infiltrate large amounts of water. Parking lot in Charlotte, NC, first of its kind in the Piedmont of North Carolina. Designed by Estes Design, Inc., researched and monitored jointly by Estes Design Inc. and UNC Charlotte.

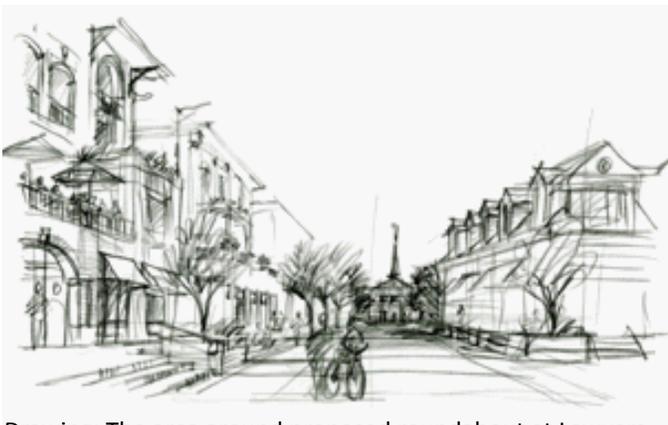
## CHAPTER 5 Small Area Plan

### INTERCONNECTED TRANSPORTATION SYSTEM

The SAP envisions multiple means of study area ingress and egress for all modes of transportation. The plan suggests two major connections to the proposed mall site:

1. Extension of Union Road from Union County to the mall, connecting the two sides of I-485 via a vehicular bridge over I-485
2. Extension of Quail Park Drive, connecting Hwy 218 to the mall and to Lawyers Road

These two major connections, in addition to access from Lawyers Road, will provide alternate regional access to the proposed mall from other directions. Other small connections will help distribute local traffic and provide alternate ways to access future uses in the SAP study area. These include extension of one of the mall entrances from Lawyers Road to Thompson Road, re-alignment of Allen Black Road, and extension of Stevens Mill Road from Lawyers Road to Fairview Road/Hwy 218. Other transportation improvements proposed for the SAP are the interconnected systems of streets that form a grid, and a network of greenways, which will allow travelling through the SAP study area conveniently for non-motorists.



Drawing: The area around proposed roundabout at Lawyers Road and Bain School Road could develop into a mix of residential (townhomes), live work units, and small scale offices

### VIBRANT RESIDENTIAL NEIGHBORHOODS

According to the Demographic and Economic Profile, the SAP study area has the potential for more dense development than it currently contains. These forecasts suggest that an increase in owner-occupied housing units, along with the increase in residents between ages 65-74 years old, will provide opportunities for potential market support for new housing oriented to new, high-quality residential development and age-restricted housing. This mixed housing type will not only provide easy access to amenities such as shopping, parks, and open space for aging and young residents living in close proximity, but also provide great access to employment opportunities for working residents.

This influx of various types of residential households (retired, young, singles, and families with kids) within and surrounding the SAP study area is critical to creating vibrant residential neighborhoods. Such increase in population demands a careful thought about the form and character of new residential neighborhoods. Future residential neighborhoods therefore need to respond to the concept of total livability, where residential units are woven with parks and public spaces; are within walking distance from shopping and employment destinations; are diverse and accommodate various demographic groups; and are connected with each other instead of isolated pods of development.

## CHAPTER 5 Small Area Plan



VIBRANT RESIDENTIAL NEIGHBORHOODS

Drawing: Design of residential uses in the Small Area Plan will be important to reinforce a true mixed-use destination. Mixed residential units should be promoted within residential uses, connected to surrounding uses via a network of sidewalks and greenways.



Photo: Providing variety of housing choices such as townhomes and patio homes at key locations will provide good transition between non-residential uses such as planned mall and low density single-family residential.



Photo: Residential development that provides ample open space create amenities for its residents and preserve environmentally sensitive areas.

## CHAPTER 5 Small Area Plan

### FISCAL DIVERSITY

FISCAL DIVERSITY

As discussed under the Process section, one of the considerations in developing a detailed SAP was to understand the fiscal impact of the proposed plan. After a detailed estimate of cost of services (fire, police, schools, etc) and public facilities to serve current and projected demand, and analysis of revenue generation from proposed development, it was observed that the Town will have a net income of roughly \$600,000/yr (in 2010 dollars). This diversity in tax base will not only help Town's budget, but also provide employment opportunities to the Town's residents. Many older and younger residents voiced a concern that they have to leave the Town due to lack of opportunities that will allow them to stay close to their families. Creating a regional mixed use center will boost Town's Jobs-to-Housing ratio and bring it more in line with other small towns in Mecklenburg County.

# Chapter 6: Recommendations and Implementation Strategies



---

Mint Hill: Lawyers Road and I-485 Small Area Plan



# Chapter 6: Recommendations and Implementation Strategies

Creating a plan is the first step towards implementation, but a longer commitment is needed to bring this plan to fruition. Moreover, this plan, like all other plans, needs constant monitoring. Since demographic, economic, and physical conditions are constantly changing, this plan should adapt to such changes and position this area to fulfill the aspirations of the community. This section will outline specific recommendations and associated implementation strategies, which will be the vehicle to move this plan forward.

## BUSINESS RECRUITMENT RECOMMENDATIONS

Recommendation 1: Create an Economic Development department in the Town of Mint Hill to seek a major employer for the SAP study area

Recommendations 2: Partner with regional agencies such as Charlotte Regional Partnership to promote the study area as a future location of a major corporate employer

## NATURAL ENVIRONMENT RECOMMENDATIONS

Recommendation 1: Continue to enforce mandatory buffer requirements along perennial and intermittent creeks and streams

Recommendation 2: Continue to adhere to Mecklenburg County Land Use and Environmental Services (LUESA) requirements of open space based on Built Upon Area (BUA)

Recommendation 3: Encourage private development to adopt Best Management Practices (BMPs) and promote Low Impact Developments (LIDs) to protect the environmentally sensitive Goose Creek watershed. Encourage the integration of these structures with stormwater utilities and also with desirable urban design aesthetics.

## LAND USE RECOMMENDATIONS

Recommendation 1: Use the Small Area Plan's future land use designations to respond to zoning change requests

Recommendation 2: Keep residential zoning around the mall where indicated in the Small Area Plan

Recommendation 3: Promote cluster residential development as an alternate to traditional subdivision development

Implementation Strategy 1: Provide incentives in the form of density bonuses to promote cluster residential development

Recommendation 4: Promote mixed residential development

Implementation Strategy 1: Provide flexibility in residential uses by allowing a mix of residential types by varying lot sizes etc.

Recommendation 5: Future land uses should account for public and civic uses, such as parks, churches, schools and other recreational facilities, such as a YMCA

Recommendation 6: Update the plan every five years to respond to changing economic conditions

## CHAPTER 6 Recommendations and Implementation Strategies

### URBAN DESIGN RECOMMENDATIONS

#### Recommendation 1: Identify opportunities for aesthetic enhancements

Implementation Strategy 1: The following locations are identified for aesthetic improvements. These locations are either potential gateways into the Small Area Plan study area, or places within the study area that require emphasis on placemaking.

- Lawyers Road interchange with I-485
- Fairview Road interchange with I-485
- Intersection of re-aligned Allen Black Road and Union Road



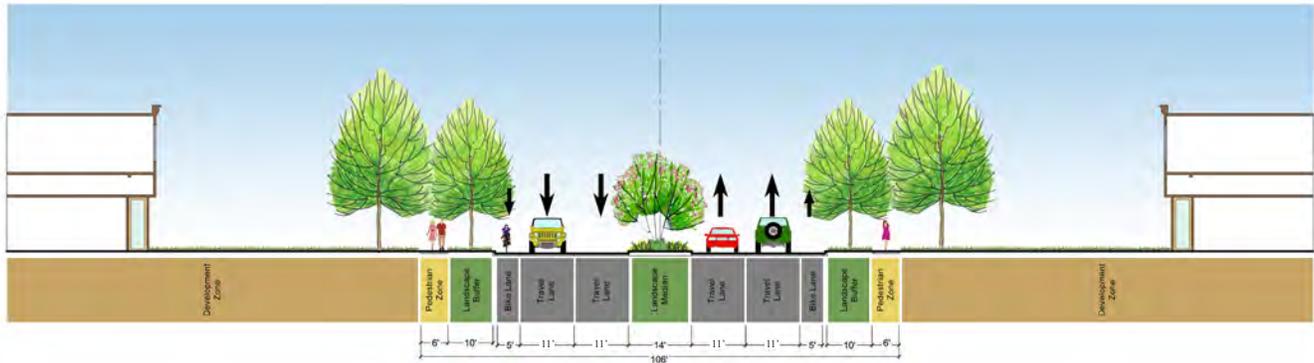
Drawing: Landscaping improvements, such as shown for Greenville Interchange on I-30, will help define Lawyers Road interchange area as a gateway to the community.



Photo: Architectural improvements to the bridge at Lawyers Road interchange will also help define it as a gateway to the community.

CHAPTER 6 Recommendations and Implementation Strategies

Recommendation 2: Coordinate with private developers, NCDOT, and MUMPO to build roadways with enhanced streetscape (refer to suggested street cross-sections)



URBAN DESIGN RECOMMENDATIONS

A boulevard’s primary function is to maintain vehicular movement, connecting to key destinations in an area, and providing access to lower level streets. Development and Land Use along these streets can be mixed and should be set back from the street. There are two lanes in each direction which are 11 feet wide. Bike lanes, medians, bus lanes, and turn lanes are recommended. Sidewalk minimum width is 6 feet. On street parking, sidewalk amenity zone, shoulders, and curb extensions are all inappropriate in this context. Green infrastructure is encouraged in the median and on the roadside.

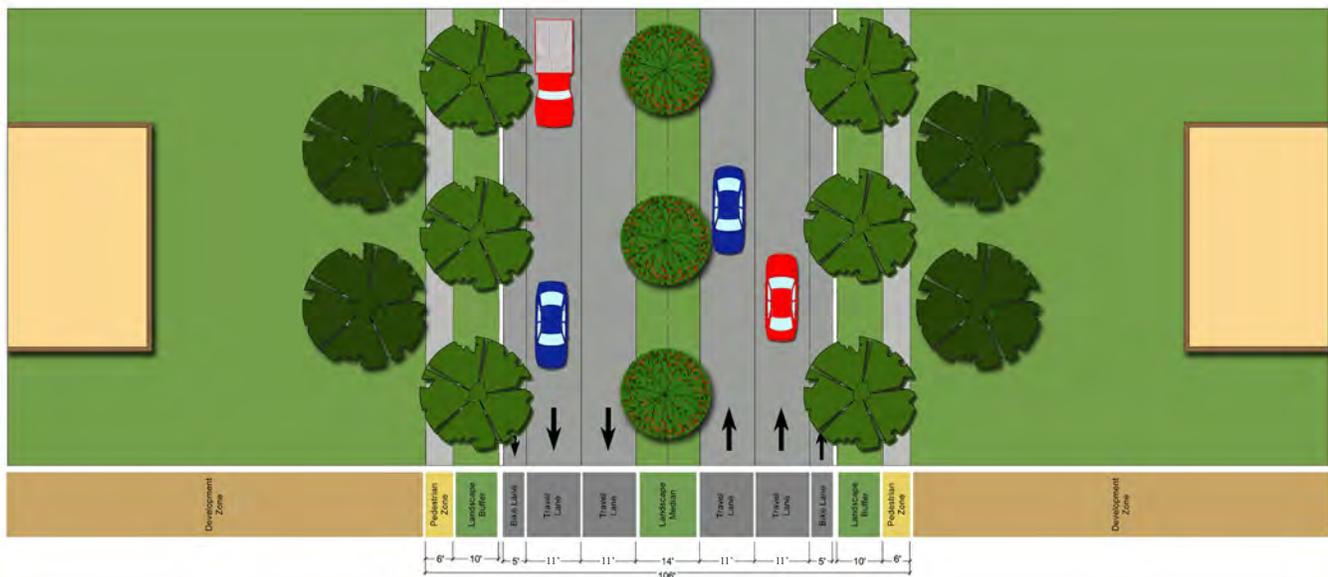
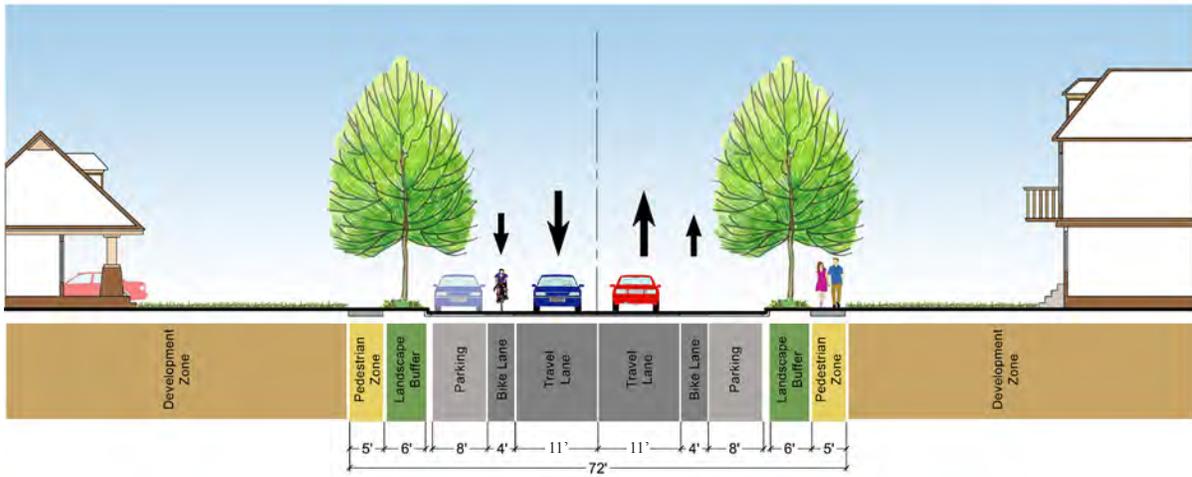


Diagram: Boulevards - typical plan and section.  
 Example roads: Lawyers Road, Fairview Road

CHAPTER 6 Recommendations and Implementation Strategies

URBAN DESIGN RECOMMENDATIONS



The primary function of a minor collector is to collect residential traffic. These streets are the primary access to neighborhoods. Development is oriented along adjacent street types. Land Use is single or urban residential. These streets post 25 miles per hour speed limits and utilize traffic calming elements. There are typically two 11 foot lanes in a minor collector, one in each direction, and also a minimum four foot wide bike lane on each side. Medians can also be used to separate travel lanes; Colony Road in Charlotte is an example. Outside of the bike lane there can be 8 foot parallel parking lane and a minimum 5 foot sidewalk on at least one side. Transit routes like bus stops are encouraged. Shoulders are inappropriate in this context. Green infrastructure is recommended in the roadside and as pervious pavement in the parallel parking area.

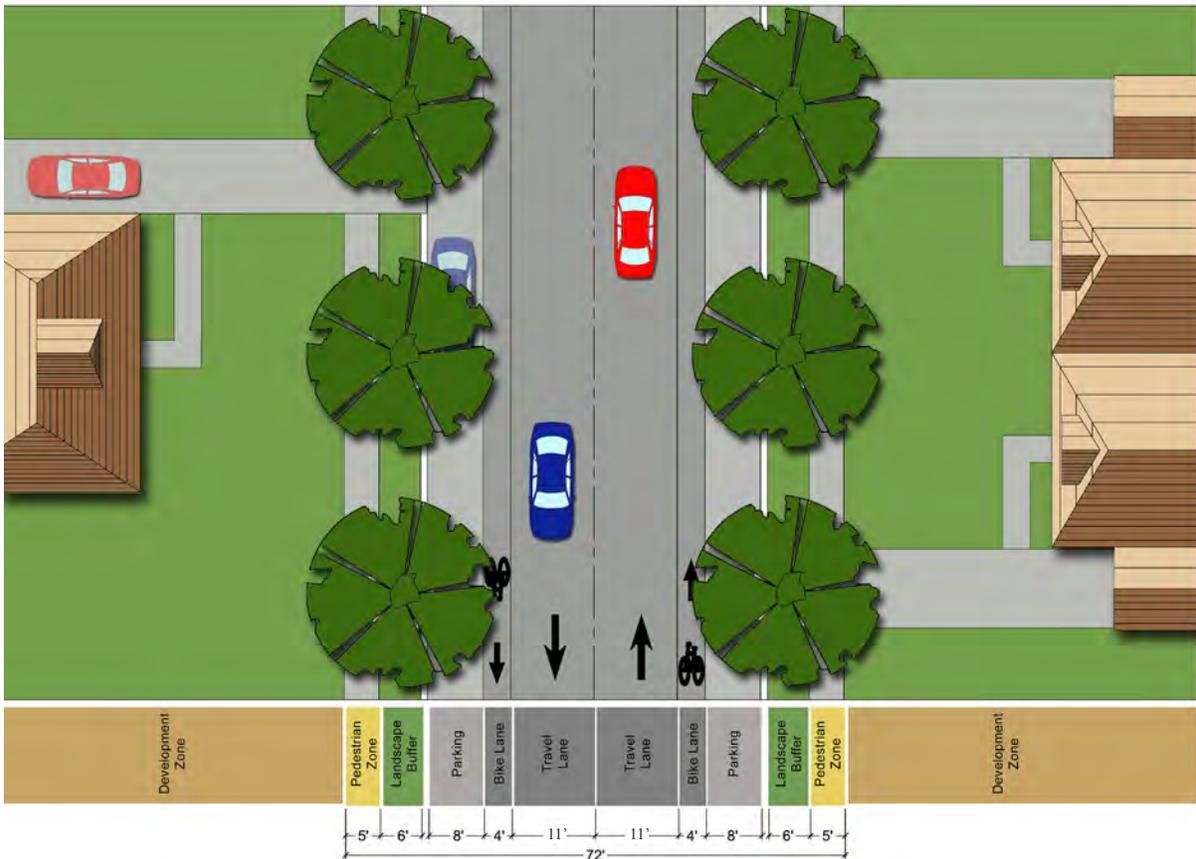
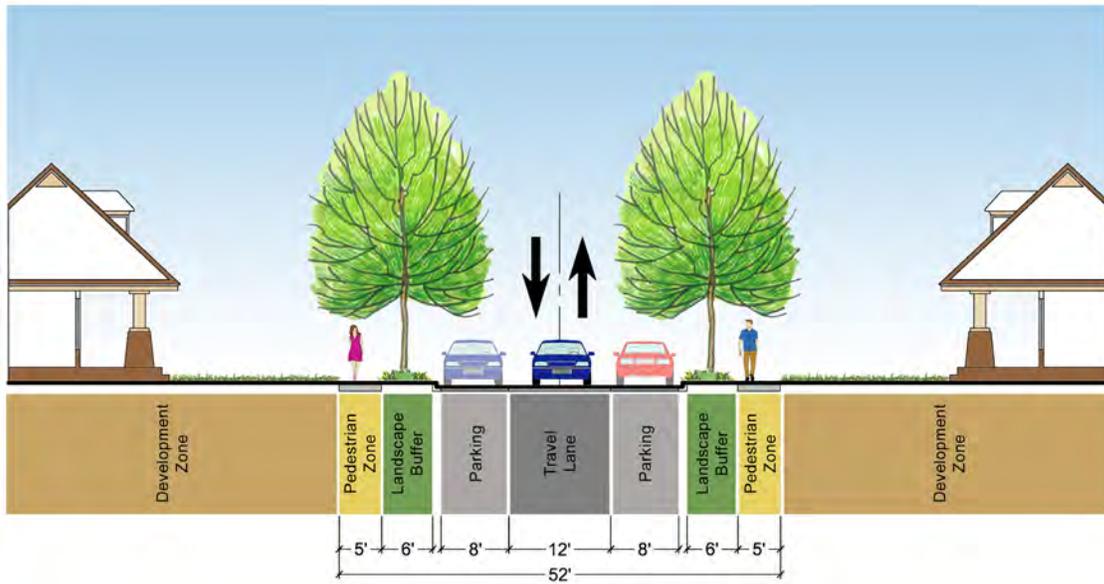


Diagram: Minor Collector - typical plan and section.  
 Example roads: New Collector Road proposed at east of Allen Black Road

CHAPTER 6 Recommendations and Implementation Strategies



A Neighborhood Yield street is appropriate for local roads within a neighborhood where less than 50 houses front the street. These streets provide neighborhood circulation and are appropriate for subdivision type development. Land Use on a neighborhood yield street is single or urban residential. One lane at 12 feet wide and two 8 foot wide lanes of parallel, on-street parking is recommended. Sidewalks should be a minimum of 5 feet on both sides and a 5 feet minimum landscape buffer. Traffic calming elements such as pedestrian activities spilling over into the street will keep this road at the posted 25 miles per hour. Inappropriate elements include mass transit, pedestrian refuge, curb extensions, shoulders, bicycle lanes, mid block pedestrian crossings, or medians. Green infrastructure can include pervious pavement in the parking zone or sidewalks, private yard or development-wide bioretention cells and landscaping.

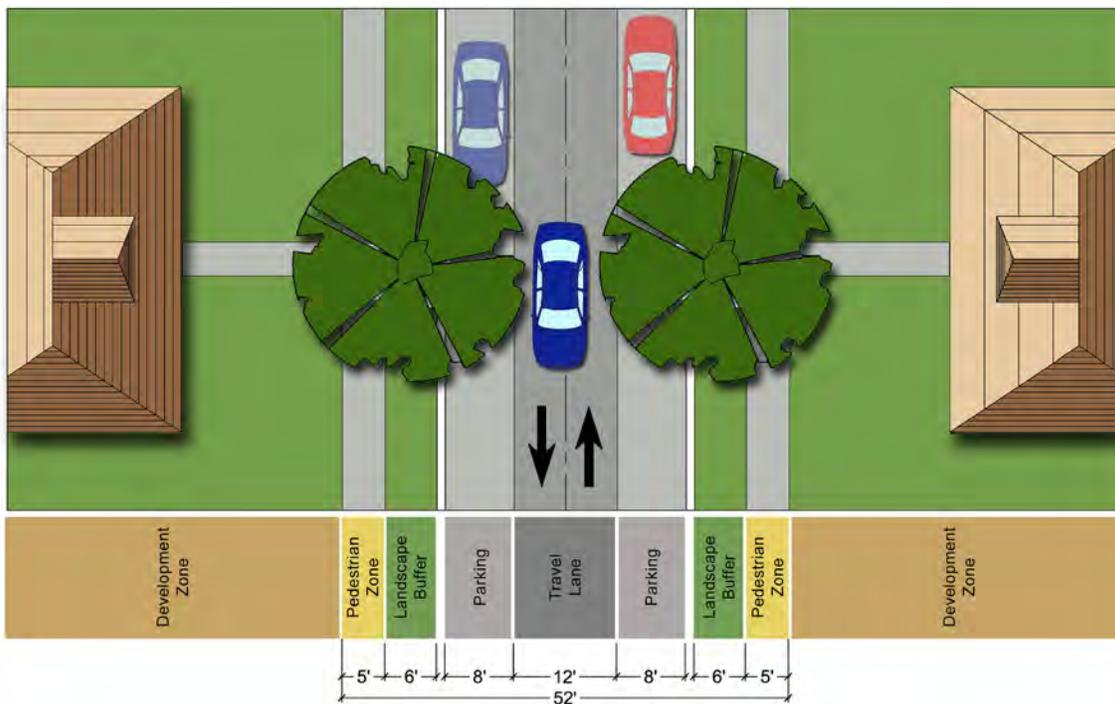
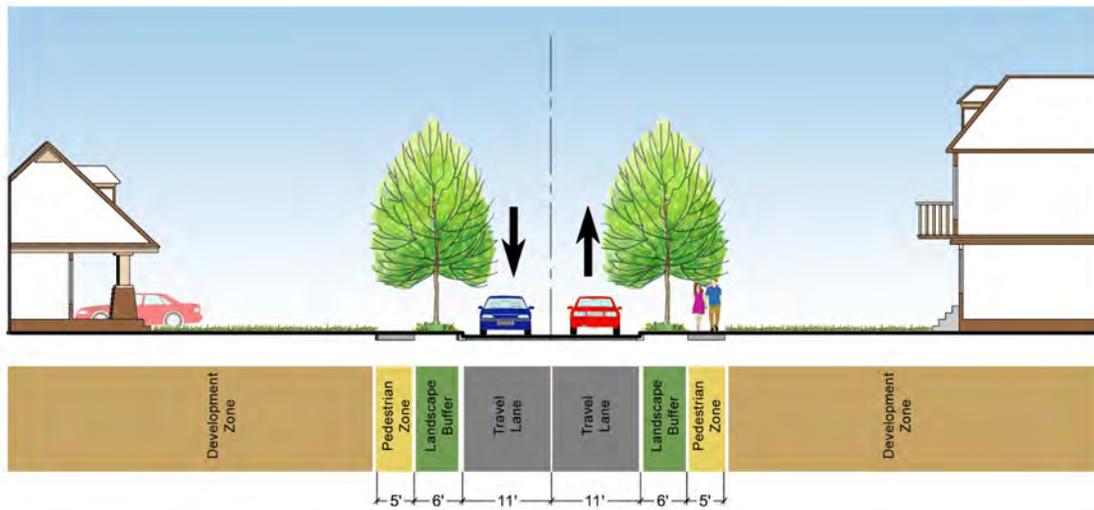


Diagram: Neighborhood Yield Street - typical plan and section.  
 Example roads: Residential Development east of Allen Black Road.

CHAPTER 6 Recommendations and Implementation Strategies

TRANSPORTATION RECOMMENDATIONS



A Local Road is an alternate for the Neighborhood Yield Street, appropriate for roads within a neighborhood where less than 50 houses front the street. These streets provide neighborhood circulation and are appropriate for subdivision type development. Land Use on a neighborhood yield street is single or urban residential. Two lanes at 11 feet wide is recommended. Sidewalks should be a minimum of 5 feet on both sides and a 5 feet minimum landscape buffer. Traffic calming elements such as pedestrian activities spilling over into the street will keep this road at the posted 25 miles per hour. Inappropriate elements include mass transit, pedestrian refuge, curb extensions, shoulders, bicycle lanes, mid block pedestrian crossings, or medians. Green infrastructure can include pervious pavement in the driveways or sidewalks, private yard or development-wide bioretention cells and landscaping.

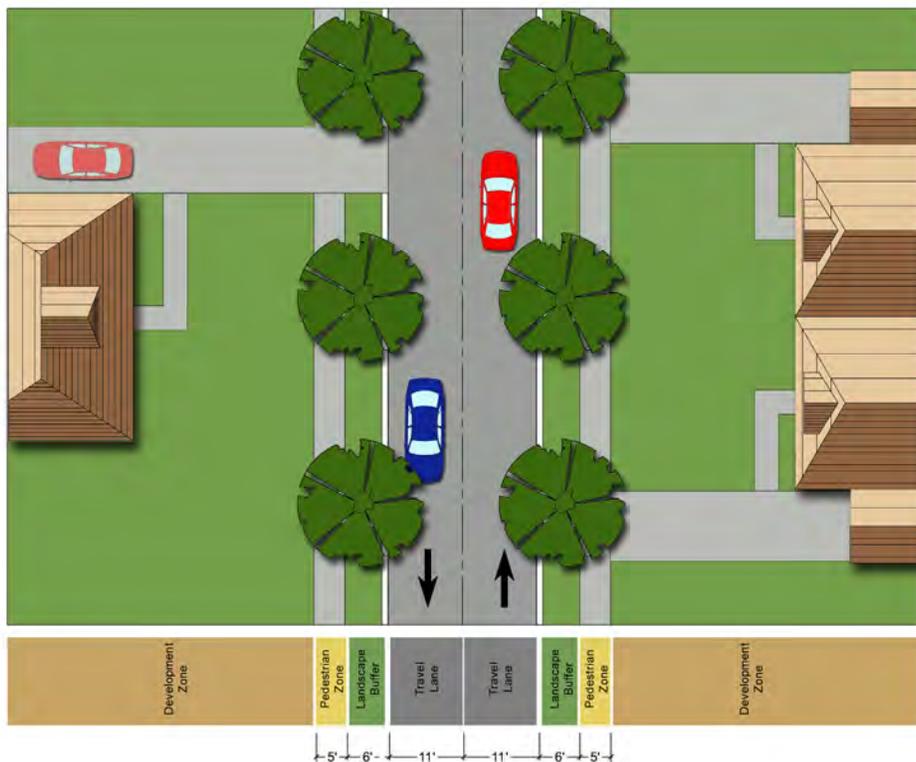


Diagram: Local Road - typical plan and section.  
 Example roads: Residential Development east of Allen Black Road.

## CHAPTER 6 Recommendations and Implementation Strategies

### TRANSPORTATION RECOMMENDATIONS

Recommendation 1: Enhance connectivity by providing multiple points of ingress and egress for the study area.

Implementation Strategy 1: The following roadway connections will assist in regional connectivity to the planned mall:

- An extension of Union Road over I-485 via a bridge into the planned mall will allow traffic from Union County to take an alternate route to Lawyers Road

*o Note: Extension of Union Road over I-485 and into the planned mall will require coordination with MUMPO, NCDOT, FHWA, property owners, and the mall developer.*

- An extension of Quail Park Drive that will connect Hwy 218 to the planned mall will allow traffic from north of Mint Hill and Cabarrus County to take the Fairview Road exit from I-485

Implementation Strategy 2: The following roadway connections will assist local connectivity within the study area:

- Realignment of Allen Black Road will not only create better parcel depth for development, but also allow other local connections, which could be further enhanced through the extension of Stevens Mill Road
- A new road parallel to I-485, east of Allen Black Road, will connect Lawyers Road and Fairview Road and relieve traffic pressure at the intersection of Allen Black Road and 218

- An alternate connection to Countrywood Subdivision from Thompson Road and the subsequent closure of the entrance to the Subdivision from Lawyers Road will provide more convenient access for subdivision traffic.

- A new roadway connection between Thompson Road and Lawyers Road will relieve traffic pressure on the proposed roundabout at Lawyers and Bain School Road, and will provide more convenient access for Thompson Road traffic.

Recommendation 2: Promote alternative modes of transportation

Implementation Strategy 1: Connect Fairview Park to the proposed Stevens Creek Nature Preserve via a greenway along Goose Creek. This greenway will connect parks, residential neighborhoods, offices, mall and shopping destinations, and civic uses.

Implementation Strategy 2: Coordinate with Carolina Thread Trail (CTT) to provide an additional greenway connection - from the mall entrance at Lawyers Road near Goose Creek and along a Goose Creek Tributary to downtown Mint Hill.

Implementation Strategy 3: Provide sidewalks, bike lanes, and multiuse paths along realigned Allen Black Road to promote bike and pedestrian connectivity between employment, residential, civic, and retail uses.

Recommendation 3: Coordinate with MUMPO and NCDOT regarding improvements to some of the key Hwy 218 and Lawyers Road corridors to accommodate additional traffic generated by new uses proposed in the SAP Study area.

## CHAPTER 6 Recommendations and Implementation Strategies

### UTILITIES RECOMMENDATIONS

Recommendation 1: Coordinate with Charlotte Mecklenburg Utilities Department (CMUD) on a potential Stevens Creek pump station

Recommendation 2: Encourage the mall developer's participation in a regional solution to the wastewater pump station issue

Recommendation 3: Investigate the location of water/sewer line sleeve under I-485 between Hwy 218 and Lawyers Road to allow for the possibility of a regional lift station at Stevens Creek Nature Preserve instead of a lift station that will service the mall site only; pending the inclusion of Goose Creek basin on the IBT certificate

Recommendation 4: Continue to support the inclusion of the Goose Creek basin in the Inter Basin Transfer (IBT) Act by coordinating with CMUD. This will enable the Town to use McAlpine Wastewater Treatment plant's (WWTP) capacity.

Recommendation 5: Encourage future development and re-development to include Low Impact Development strategies for stormwater management.

*CHAPTER 6 Recommendations and Implementation Strategies*

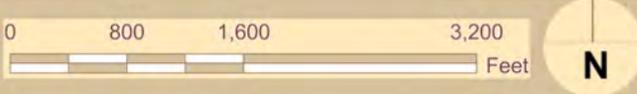


121 W Trade Street  
Suite 2050  
Charlotte, NC 28202

Ph: 704.372.8020  
Fax: 704.372.7097

# Lawyers Road & I-485 Small Area Plan

TOWN OF MINT HILL  
NORTH CAROLINA



Source: Mecklenburg County GIS, Union County GIS, Town of Mint Hill, Mecklenburg Union Metropolitan Planning Organization (MUMPO), North Carolina Department of Transportation (NCDOT)

Disclaimer: This GIS data is deemed reliable but provided "as is" without warranty of any representation of accuracy, timeliness, reliability or completeness. This map document does not represent a legal survey of the land and is for graphical purposes only. Use of this data for any purpose should be with acknowledgement of the limitations of the data, including the fact that the data is dynamic and is in a constant state of maintenance, correction, and update.

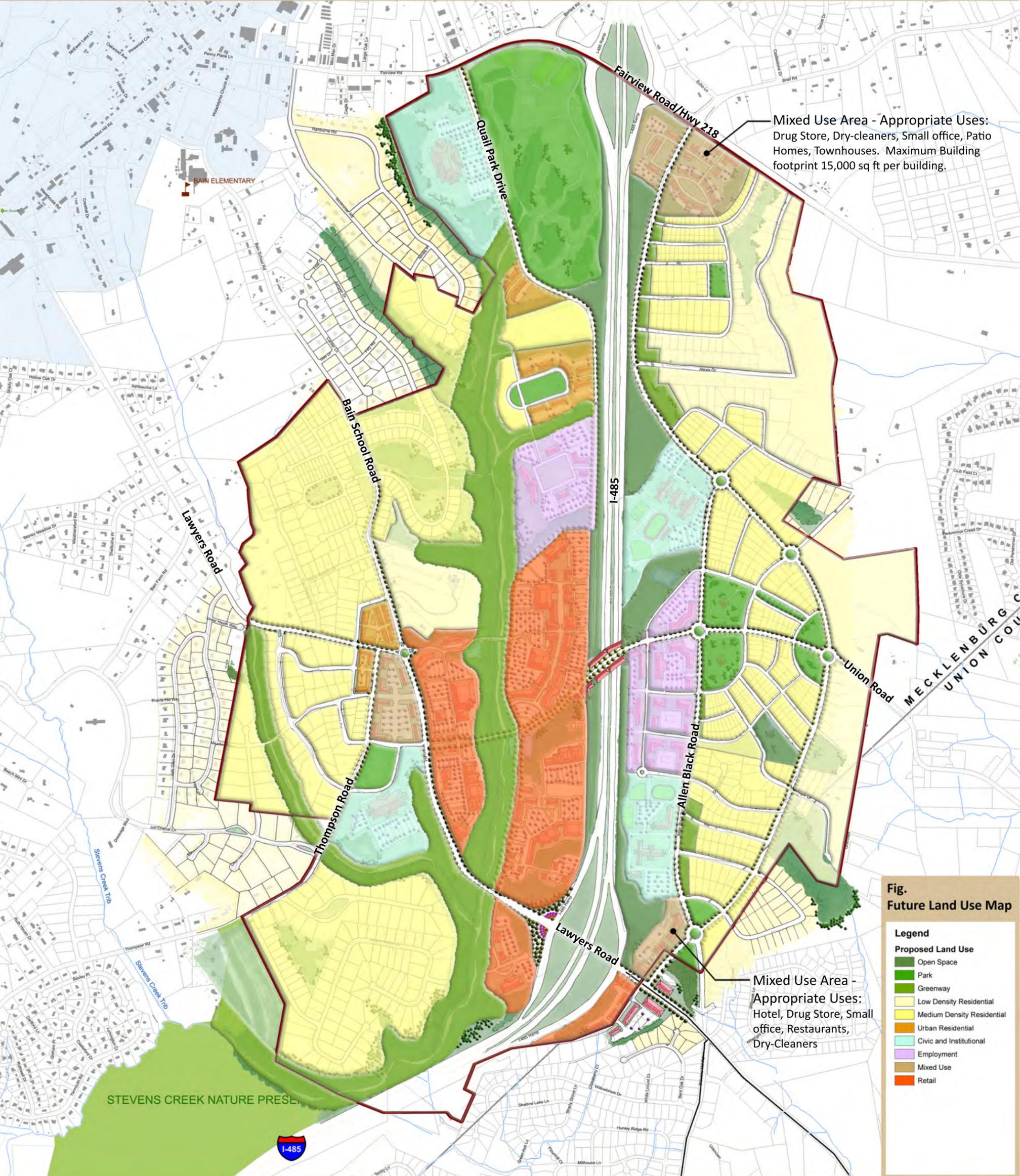
The planned mall in the SAP study area could be complemented by a major employment center, which will fill the gap for such use between Ballantyne and the University City area. The SAP study area enjoys good connectivity to the regional interstate system, and has available land resources to accommodate a regional mixed use center. This regional mixed use center will complement downtown Mint Hill, which is transitioning into a Town Center. However, for it to become a true regional center, it demands careful thought about the form and design of future development. Future retail in the form of strip development (parking in the front, with isolated buildings at the back) should be discouraged, and development should be integrated with surrounding uses through continuity of form, scale, and design features.

# Lawyers Road & I-485 Small Area Plan

TOWN OF MINT HILL  
NORTH CAROLINA



Ph: 704.372.8020  
Fax: 704.372.7097



**Fig.**  
**Future Land Use Map**

**Legend**

- Proposed Land Use**
- Open Space
  - Park
  - Greenway
  - Low Density Residential
  - Medium Density Residential
  - Urban Residential
  - Civic and Institutional
  - Employment
  - Mixed Use
  - Retail



Source: Mecklenburg County GIS, Union County GIS, Town of Mint Hill, Mecklenburg Union Metropolitan Planning Organization (MUMPO), North Carolina Department of Transportation (NCDOT)

Disclaimer: This GIS data is deemed reliable but provided "as is" without warranty of any representation of accuracy, timeliness, reliability or completeness. This map document does not represent a legal survey of the land and is for graphical purposes only. Use of this data for any purpose should be with acknowledgement of the limitations of the data, including the fact that the data is dynamic and is in a constant state of maintenance, correction, and update.

# **Goose Creek Watershed Management Plan**

**Completed by: Charlotte-Mecklenburg Storm Water Services  
Version 1  
October 31, 2009**

# **Goose Creek Watershed Management Plan Version 1**

**Completed by:  
Charlotte-Mecklenburg Storm Water Services  
Water Quality Program Staff**

**Date Completed:  
October 31, 2009**

## *Table of Contents*

<b>Executive Summary .....</b>	<b>1</b>
<b>Section 1 Introduction.....</b>	<b>2</b>
1.1 Purpose.....	2
1.2 Background.....	2
<b>Section 2 Current and Historical Conditions.....</b>	<b>8</b>
2.1 Previous Work .....	8
2.1.1 Fecal Coliform TMDL.....	9
2.1.2 Water Quality Recovery Program.....	9
2.1.3 NC DOT.....	9
2.1.4 Charlotte Mecklenburg Utilities .....	9
2.1.5 North Carolina Ecosystem Enhancement Program.....	10
2.2 Existing Conditions.....	11
2.2.1 Water Chemistry .....	10
2.2.2 Biological.....	11
2.2.3 Physical.....	14
2.2.4 Stream Flow .....	13
2.2.5 Land Use/Land Cover .....	13
2.2.6 Soils.....	15
2.3 Current Watershed Protection Efforts.....	16
2.3.1 S.W.I.M. Buffer Ordinance.....	16
2.3.2 Post Construction Buffers.....	17
2.3.3 Goose Creek Watershed Site Specific Management Plan .....	18
2.3.4 BMP Retrofits and Land Acquisition .....	19
2.3.5 Existing NPDES Permitted WWTPs .....	20
<b>Section 3 Watershed Indicators and Goals.....</b>	<b>21</b>
3.1 Upland.....	21
3.1.1 Upland Water Quality Indicators .....	21
3.1.2 Upland Water Quality Goals.....	21
3.2 In-Stream.....	22
3.2.1 In-Stream Water Quality Indicators.....	22
3.2.2 In-Stream Water Quality Goals .....	22
3.3 Channel .....	28
3.3.1 Stream Channel Indicators.....	29
3.3.2 Stream Channel Goals.....	30
<b>Section 4 Watershed Assessment .....</b>	<b>24</b>
4.1 Upland Characterization .....	24
4.1.1 Methodology.....	24
4.1.2 Results.....	29
4.2 Stream Channel Characterization .....	36
4.2.1 Methodology.....	36
4.2.2 Results.....	39

4.3	Fecal Coliform Assessment .....	41
<b>Section 5</b>	<b>Candidate Restoration, Retrofit &amp; Preservation Sites .....</b>	<b>42</b>
5.1	Upland BMP Retrofit Sites .....	42
5.1.1	Priority Basins.....	42
5.1.2	Public Parcels.....	45
5.2	Stream Channel Management Opportunities .....	52
5.3	Stream Buffer Restoration Areas .....	51
5.4	Master Planning for Restoration, Retrofit and Preservation Projects .....	61
<b>Section 6</b>	<b>Measuring Success and Adaptive Management.....</b>	<b>62</b>
6.1	Establishing an Ongoing Water Quality Monitoring Program .....	62
6.2	Annual Status Report .....	62
6.3	Adaptive Management .....	62
<b>Section 7</b>	<b>Conclusion .....</b>	<b>63</b>

### **List of Tables:**

Table 1	General Goose Creek Watershed Statistics.....	1
Table 2	Goose Creek Stream Class Descriptions.....	7
Table 3	Goose Creek Water Quality Standards .....	8
Table 4	Baseflow Water Chemistry Statistics.....	10
Table 5	NCDENR Macroinvertebrate Sample Results.....	12
Table 6	Goose Creek Land Use Categories .....	14
Table 7	Hydrologic Soil Groups Found Within Goose Creek Watershed .....	15
Table 8	S.W.I.M. Buffer Requirements for the Goose Creek Watershed.....	17
Table 9	NPDES Permitted Dischargers in the Goose Creek Watershed .....	20
Table 10	Upland Pollutant Loading Rate Goals .....	21
Table 11	In-Stream Water Quality Goals .....	23
Table 12	Goose Creek Land Use Categories and Abbreviations.....	25
Table 13	Upland Pollutant Loading Rates by Land Use.....	27
Table 14	Catchment Loading Rates .....	27
Table 15	Catchment Area, Impervious Area and Impervious Percentages .....	28
Table 16	Results of the Upland Characterization .....	29
Table 17	Results of Stream Channel Characterization .....	40
Table 18	Public Parcels Meeting BMP Criteria and Priority.....	49
Table 19	Highest Priority Goose Creek Stream Reaches .....	53
Table 20	Results of the Stream Buffer Tree Canopy Analysis.....	60

### **List of Figures:**

Figure 1	Mecklenburg County Watershed and Jurisdictional Boundaries.....	3
Figure 2	Special Features within the Goose Creek Watershed .....	4
Figure 3	Typical Residential Development in the Goose Creek Watershed.....	5
Figure 4	Typical New Residential Development in the Goose Creek Watershed .....	6
Figure 5	Percent Exceeding Graph for Goose Creek Samples.....	11

Figure 6	Historical SUSI Scores for Goose Creek.....	11
Figure 7	Goose Creek Benthic Macroinvertebrate Scores.....	12
Figure 8	Distribution of Land Uses in the Goose Creek Watershed.....	15
Figure 9	Distribution of Hydrologic Soil Groups in the Goose Creek Watershed.....	16
Figure 10	Approximate Extent of the Goose Creek Watershed S.W.I.M. Buffers.....	17
Figure 11	Approximate Extent of the Goose Creek Post Construction Buffers.....	18
Figure 12	Public Property in the Goose Creek Watershed.....	19
Figure 13	Goose Creek Watershed Catchments.....	26
Figure 14	Distribution of Buffers in the Goose Creek Watershed.....	28
Figure 15	Fecal Coliform Rank.....	30
Figure 16	TN Ranking.....	31
Figure 17	TP Ranking.....	32
Figure 18	TSS Ranking.....	33
Figure 19	NH4 Ranking.....	34
Figure 20	Cu Ranking.....	35
Figure 21	Overall Impairment.....	36
Figure 22	Goose Creek Stream Channel Characterization Reaches.....	39
Figure 23	Focus Basins with the Goose Creek Watershed.....	42
Figure 24	Focus Basin 1.....	43
Figure 25	Focus Basin 2.....	44
Figure 26	Focus Basin 5.....	45
Figure 27	Focus Basin 4.....	46
Figure 28	Focus Basin 6.....	47
Figure 29	Goose Creek Watershed Public Parcels.....	49
Figure 30	Aerial Photo of Parcels 19514219, 19514129 and 19514208.....	50
Figure 31	Aerial Photo of Parcel 19701146.....	51
Figure 32	Aerial Photo of Parcels 19720111 and 19720106.....	52
Figure 33	Reach DSTOUS296 Area Map.....	54
Figure 34	Reach DSTOUS329 Area Map.....	55
Figure 35	Reach DSTOUS357 Area Map.....	56
Figure 36	Reach DSTOUS299 Area Map.....	57
Figure 37	Reach DSTOUS142 Area Map.....	58
Figure 38	Reach DSTOUS184 Area Map.....	59
Figure 39	Results of the Tree Canopy Analysis.....	60

## Appendices

Appendix A: References.....	64
-----------------------------	----

## Executive Summary

The Goose Creek Watershed is located in southeastern Mecklenburg County and is almost entirely within the town limits or extraterritorial jurisdiction of Mint Hill. The watershed has been designated as habitat for the federally listed endangered Carolina Heelsplitter Mussel. This designation has brought about the implementation of a Site Specific Management Plan for new development in the watershed. In addition to the issues surrounding the Carolina Heelsplitter, the municipalities within the Watershed were required to develop a Water Quality Recovery Program for Fecal Coliform, which was the result of a Fecal Coliform TMDL. In addition to Fecal Coliform, the watershed is also identified on the NC 303(d) list for impaired biological integrity, likely a result of hydro-modification of the stream channel. Table 1 presents general statistics for the Goose Creek Watershed.

**Table 1: General Goose Creek Watershed Statistics (portion of Goose Creek within Mecklenburg County).**

Estimated Goose Creek Watershed Population	5616	
Goose Creek Watershed Area	6975 acres	
Stream Miles (Draining > 50 acres)	28 miles	
Dominant Land Uses	Rural Residential	34%
	Vacant	31%
	Low Density Residential	11%
	Medium/Low Density Residential	9%
	Transportation	8%
Major Political Jurisdictions	Town of Mint Hill	
Major Streams in the Goose Creek Watershed	Goose Creek	
	Duck Creek	
	Stevens Creek	

## **SECTION 1. INTRODUCTION**

### **1.1 Purpose**

The purpose of this Watershed Management Plan is to guide restoration, retrofit and preservation efforts aimed at achieving specific goals for improving water quality conditions in the Goose Creek Watershed in Mecklenburg County such that these waters meet or exceed their State designated uses and are no longer rated as impaired on 303(d) lists. Moreover, the plan seeks to restore the population of *Lasmigona Decorata* (Carolina Heelsplitter), a federally endangered freshwater mussel, in the watershed.

This Watershed Management Plan seeks to:

1. Summarize important information regarding the Goose Creek Watershed relative to water quality.
2. Describe current and historical water quality conditions in the watershed.
3. Describe current and previous efforts in the watershed to protect and restore water quality.
4. Describe water quality goals for the watershed.
5. Prioritize areas for restoration, retrofit and preservation efforts aimed at achieving water quality goals.
6. Describe the process forward for implementing water quality efforts.

The ultimate goal after complete implementation of this Watershed Management Plan is a fully functioning and supporting stream ecosystem in Goose Creek.

### **1.2 Background**

The headwaters of the Goose Creek Watershed (including Goose, Duck and Stevens Creeks) are located in the southeastern portion of Mecklenburg County and lies within Mint Hill's jurisdiction. The creek flows from Mecklenburg County to the southeast into Union County and subsequently enters the Yadkin River in Union County. Figure 1 shows the location of the Goose Creek Watershed in Mecklenburg County along with its jurisdictional boundaries. Figure 2 presents a close up view of the Goose Creek Watershed.

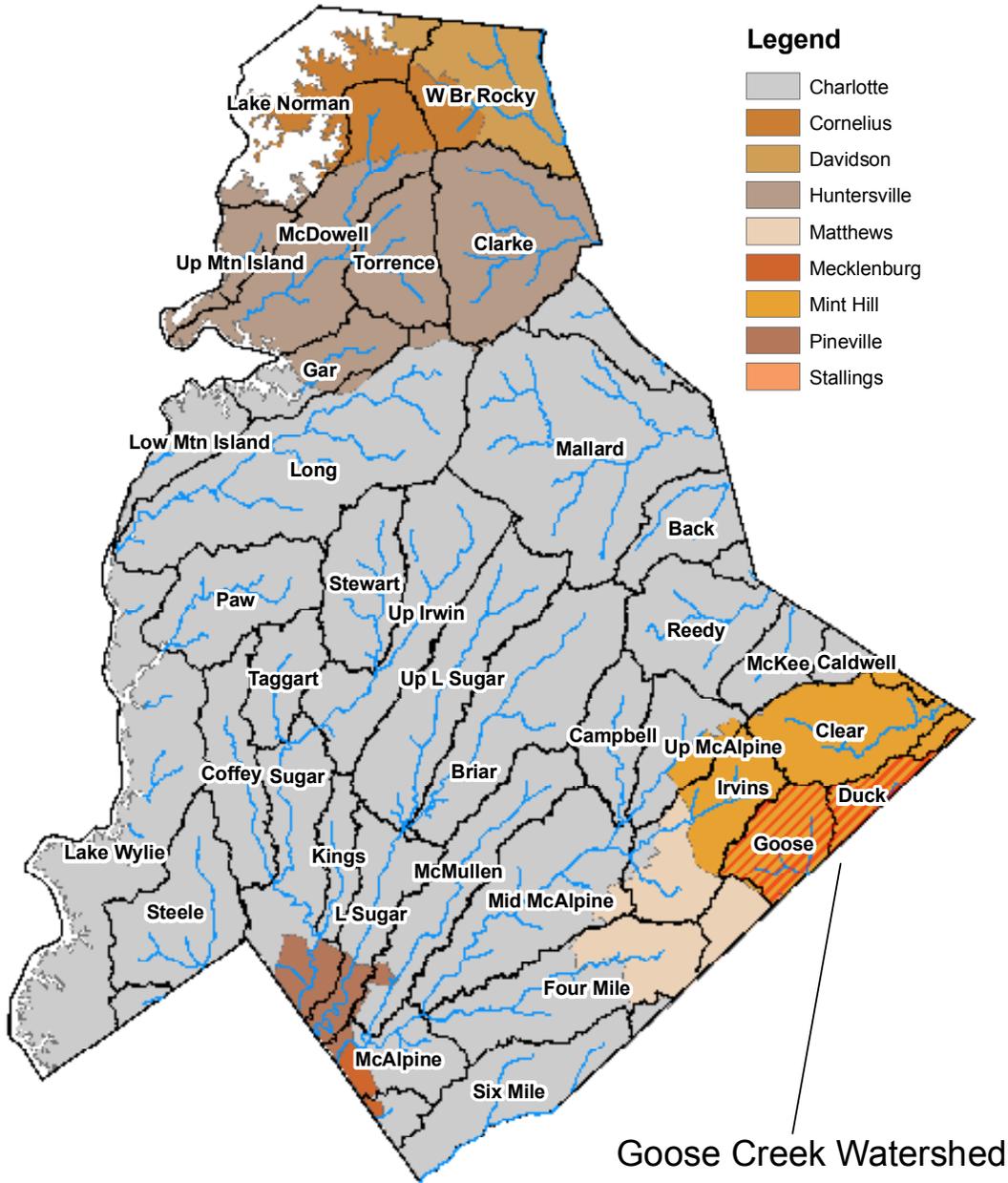


Figure 1: Mecklenburg County Watersheds and Jurisdictional Boundaries.

**Figure 2: Special Features within the Goose Creek Watershed. Note: MY9, MY9A, MY9B denote Mecklenburg County water quality monitoring sites.**

Historically, land in the Goose Creek Watershed was used for agriculture. However, within the past 20-30 years the population of the watershed has increased. Figure 3 shows a typical older residential development in the Watershed and Figure 4 shows more recent development. In addition to agricultural land-use, large lot residential and some commercial/institutional centered around Highway 51 and Lawyers Road are now notable. The relatively recent construction of 485 is expected to attract dense development at the Idlewild Road, Lawyers Road and Fairview Road exits. In fact, at the northeast corner of Lawyers Road and 485 a new mall (The Bridges) is under construction (currently on hold). In addition to the recent changes brought about by urbanization, drastic changes to the stream system have occurred in the last century. At some point in the past, the portions of Goose Creek were straightened either to prevent flooding or to improve the land for agricultural uses (Charlotte-Mecklenburg Storm Water Services, 1997).



**Figure 3: Typical Residential Development in the Goose Creek Watershed.**



**Figure 4: Typical New Residential Development in the Goose Creek Watershed.**

Goose Creek is listed in the 2006 North Carolina 303(d) list (North Carolina, 2004) as being impaired for fecal coliform . A total of 16.3 miles of Goose Creek are identified in the list, which includes the entire stream from its source to the Rocky River. Typically streams are listed on the 303(d) list dependant upon their intended uses. Intended uses are generally determined through the stream class. Goose Creek is a Class C Stream (see Table 2). In North Carolina, surface water quality regulations are defined for particular classes of use support. For instance, Class C waters must support aquatic life and secondary recreation (infrequent human body contact), while Class B waters must support aquatic life and primary recreation (frequent human body contact or swimming). Individual streams, lakes, and reservoirs (or portions of each) are assigned one or more classes. All of the contributing streams to a body of water receive the same designation when they are not specifically defined. Each class has a set of regulations, including water quality standards associated with it. If chemical/physical water quality monitoring reveals that a stream is not meeting a water quality standard, then it is considered “Impaired.” If biological monitoring indicates a lack of abundance and/or diversity of aquatic life in a stream, then it is considered as having “Impaired biological integrity.” Impaired streams are placed on the 303(d) list and a restoration method is specified such as the development of a total maximum daily load or TMDL.

A TMDL was written by the Mecklenburg County Water Quality Program (now know as Charlotte/Mecklenburg Storm Water Services (CMSWS)) in April 2005 and subsequently approved by the USEPA on July 8, 2005. The TMDL will be discussed at length in the next section of this document (Section 2).

**Table 2: Goose Creek Stream Class Descriptions.**

<b>Stream Class</b>	<b>Description</b>
C	Freshwaters protected for secondary recreation, fishing, aquatic life including propagation and survival, and wildlife. All freshwaters shall be classified to protect these uses at a minimum.

## SECTION 2. CURRENT AND HISTORICAL CONDITIONS

### 2.1 Previous Work

Approximate Event Timeline for the Goose Creek Watershed

June 30, 1993: Carolina Heelsplitter included on the Endangered Species list. Goose Creek named as habitat for a small population.

January 17, 1997: Completion of the Recovery Plan for the Carolina Heelsplitter.

August 20, 2001: Mitigated Finding of No Significant Impact – Charlotte- Mecklenburg Utilities Proposed Increase in Interbasin Transfer from the Catawba River Basin to the Rocky River Basin.

March 14, 2000: EMC decision to approve the IBT with conditions. Condition #3 placed a "...moratorium on the installation of new interbasin transfer water lines... into the Goose Creek subbasin...until the impacts of additional urban growth on the (Carolina heelsplitter) are fully evaluated." This ruling effectively halted expansion of the supply of public water in the Goose Creek Watershed.

April, 2005: Final Goose Creek TMDL Submitted to USEPA

July 8, 2005: USEPA Approval of Goose Creek Fecal Coliform TMDL

August 10, 2006: Letter from NCDENR to Mecklenburg County, Mint Hill, Stallings and Indian Trail requiring the development of a Water Quality Recovery Program for implementation of the Goose Creek Fecal Coliform TMDL.

September 15, 2006: NC Court Decision (Filed October 13, 2006) requiring, among other things, that the NPDES permits for Stallings, Indian Trail, Mint Hill and Mecklenburg County be reopened and amended to include measures to protect the Carolina Heelsplitter. Among these are water quality standards for ammonia, copper, nitrate-nitrite and phosphorus. The document identifies standards presented in Table 3.

**Table 3: Goose Creek Water Quality Standards**

Constituent	Chronic Standard	Acute Standard
Phosphorus	0.1 mg/L	
Nitrate-nitrite	0.4 mg/L	
Copper	2.2 ug/L	3.6 ug/L
Ammonia	0.5 mg/L	1.75 mg/L

June 30, 2007: Implementation of Mint Hill's Post Construction Ordinances, which currently guide land development in the Goose Creek Watershed.

February 1, 2009: Implementation of the Site Specific Management Plan for the Goose Creek Watershed. This Plan guides all development in the watershed, eliminating the Mint Hill Post Construction Ordinance.

#### 2.1.1 Goose Creek Fecal Coliform TMDL

In April 2005, Mecklenburg County, under contract with the State of North Carolina, completed a TMDL for fecal coliform for Goose Creek, North Carolina. The TMDL was subsequently approved by the USEPA on July 8, 2005. A copy of the TMDL is available at the following website:

<http://h2o.enr.state.nc.us/tmdl/documents/GooseCk.FCTMDLApprovedbyEPAJuly0805.pdf>

The TMDL specified fecal coliform load reductions to both permitted MS4s in the watershed and non-point sources of pollution. Essentially, the TMDL specifies load reductions of 92.5% for all sources of fecal coliform with the exception of WWTPs, whose allocation remained unchanged at permitted levels (200 c.f.u./100 ml).

#### 2.1.2 Water Quality Recovery Program

On August 10, 2006 NC DENR submitted a letter to the permitted MS4s in the Goose Creek Watershed requiring them to develop a Water Quality Program (WQRP) for Fecal Coliform in the Goose Creek Watershed. Mecklenburg County partnered with the towns of Mint Hill, NC, Stallings, NC and Indian Trail, NC to develop the WQRP. The WQRP document, which describes each of the components of the program is included with this document as Appendix XX.

#### 2.1.3 NC DOT

In September, 2004 Craig Allan (Department of Geography and Earth Sciences, UNC Charlotte) completed a report entitled Water Quality and Stream Stability Monitoring for Goose Creek Mecklenburg and Union Counties, North Carolina 2001-2003. The study was funded by the United States Department of Transportation to study the impacts of the construction of I-485 through the Goose Creek Watershed in Mecklenburg County. Allan cites hydromodification of the stream channel itself as a primary source of elevated TSS and turbidity levels measured during storm events. Similarly, Allan (2004) cited increased levels of phosphorus and nitrogen in storm flow.

#### 2.1.4 Charlotte-Mecklenburg Utilities

Charlotte Mecklenburg Utilities initiated a study with the goal of establishing a Finding of No Significant Impact (FONSI) for the construction of a regional WWTP in the Goose Creek Watershed. The study was never completed because of the requirements put in

place to protect the Carolina Heelsplitter Mussel essentially prohibited construction of the plant.

### 2.1.5 North Carolina Ecosystem Enhancement Program

The North Carolina Ecosystem Enhancement Program (EEP) is currently conducting a study in the Goose Creek Watershed to establish a Local Area Watershed Plan (LAWP) to identify mitigation opportunities in the Watershed. In the past, EEP LAWPs have not met the needs of local governments in Mecklenburg County however the process has been modified and may provide useful information. No completion date was available at the time of preparation of this document. EEP has established a stakeholder group of technical resources that is participating in their process. They intend for the stakeholder group to assume the role of implementing the findings of the LAWP that are not pertinent to EEP goals. These findings may include ordinance modification, BMP construction, stream enhancement or restoration and education efforts.

#### 2.2.1 Water Chemistry

Goose Creek baseflow samples are collected from MY9A, MY9B and MY9 (Figure 2). Table 4 presents a condensed set of information from the historical data collected at these sites. TN exceedances were detected 27% of the time and TP exceedances were detected 8% of the time. Fecal coliform concentrations in excess of 200 c.f.u./100 ml were detected approximately 82% of the time. Additionally, copper exceedances were recorded in 68% of the samples and ammonia in 7% of the samples. Figure 5 shows the percentages of these exceedances. Stream Use Support Index (SUSI) values have tended to oscillate since 2007 but have remained below threshold values, which is a strong indicator of a non-supporting watershed (Figure 6). The most notable reason for the lowest values is the extreme drought that has occurred in the piedmont of North Carolina in the past several years.

**Table 4: Baseflow Water Chemistry Statistics.**

All Goose Creek Monitoring Sites	Total N	Total P	TSS	Fecal Coliform	Copper	Ammonia
Action Level:	1.5 ppm	0.4 ppm	50	200 cfu/100MI	2.2 ug/L	0.5
Sample size	186	202	48	463	121	204
MIN	0.35	0.02	2	1	2	0.05
MAX	10.5	2.1	43	58000	36	2.5
MEAN	1.5	0.2	5.2	2398	6.2	0.22
MEDIAN	1.1	0.13	2.8	500	3.6	0.10
% samples over Action Level	27%	8%	0%	82%	68%	7%

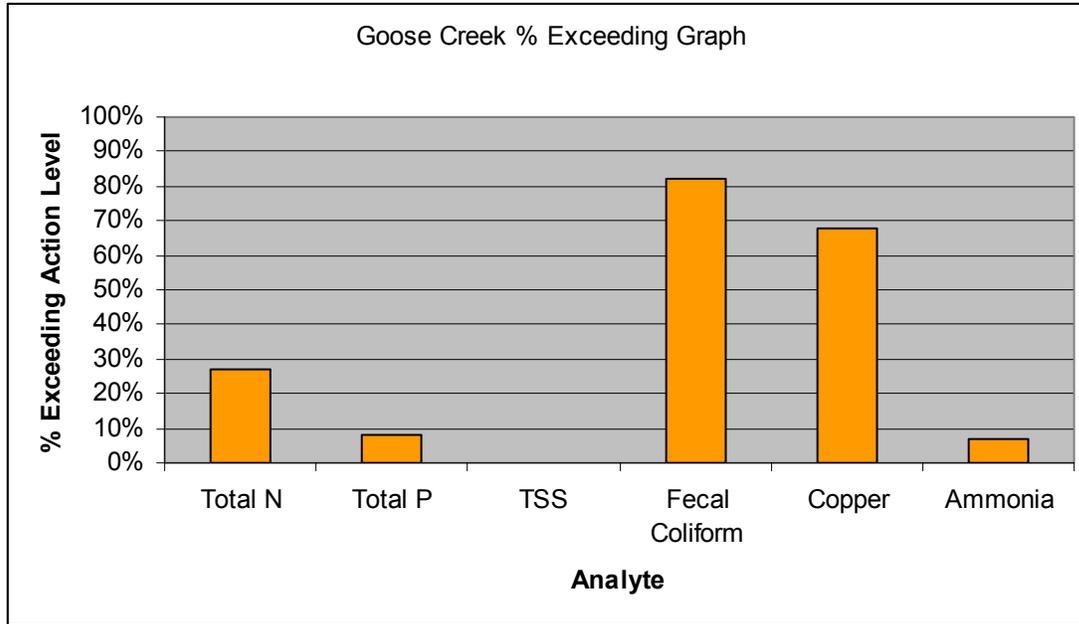


Figure 5: Percent Exceeding Graph for Goose Creek Samples.

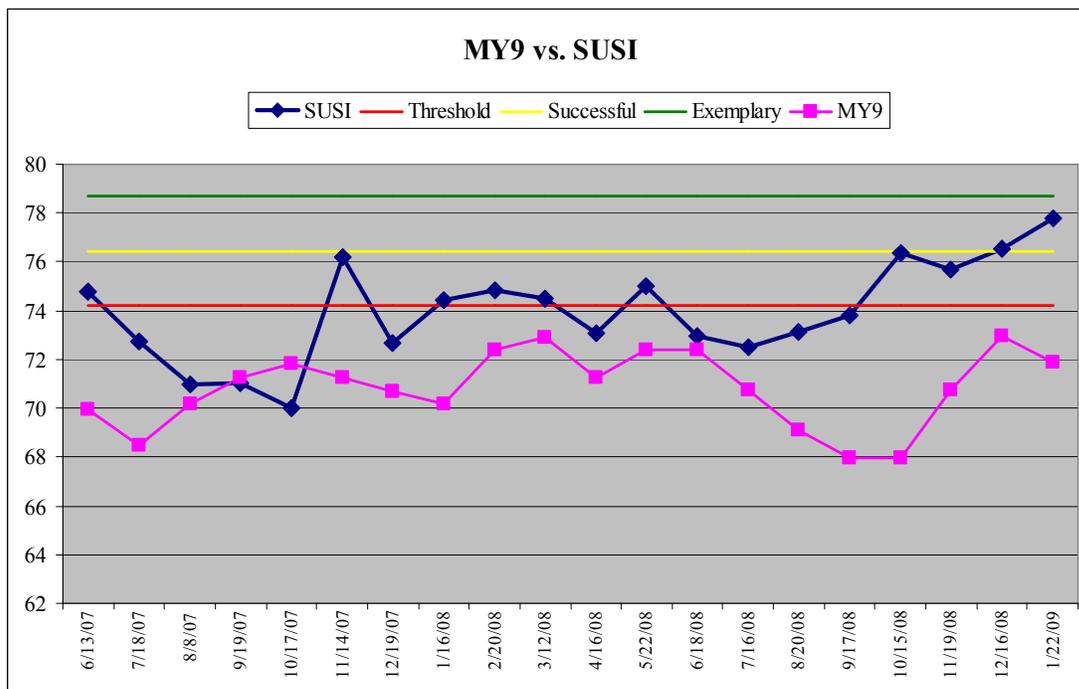
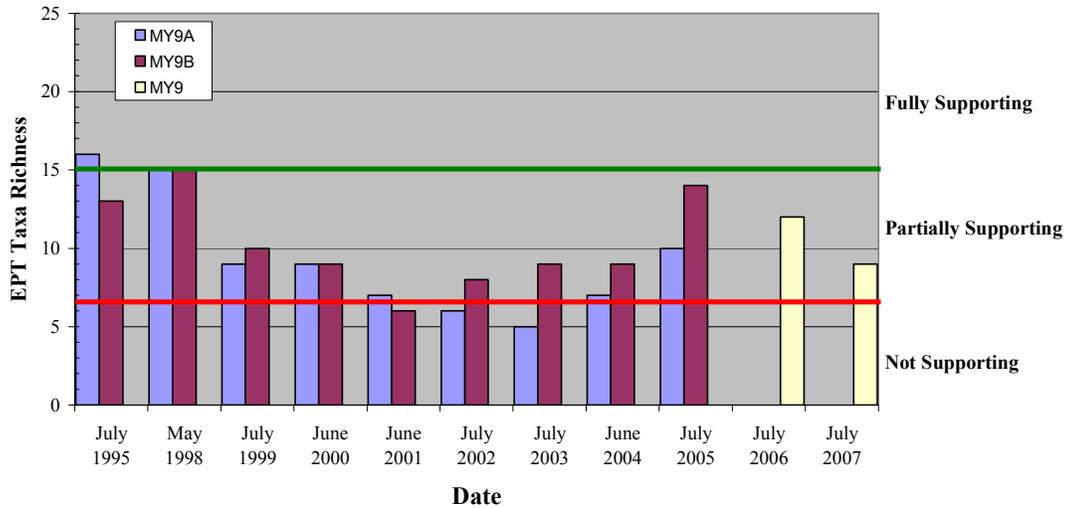


Figure 6: Historical SUSI Scores for Goose Creek

2.2.2 Biological

Currently, the benthic macroinvertebrate community in Goose Creek is monitored annually by Mecklenburg County at Stevens Mill Road in Union County (site MY9). Previously, samples were collected at MY9A and MY9B, which are just upstream of I-

485 on Goose and Stevens Creeks respectively (Figure 2). The EPT taxa richness was generally below 10 species for all samples taken since 1999 in Goose Creek. Figure 7 presents the benthic macroinvertebrate scores for Goose Creek since 1995. As can be discerned from the graph, Goose Creek has exhibited a general decline in its macroinvertebrate population. However, it is important to note that the macroinvertebrate populations in Goose Creek are very sensitive to drought as Goose Creek tends to dry up more readily than other creeks with a similar drainage area. This is likely due to the drainage area being partially within the Carolina Slate Belt



**Figure 7: Goose Creek Benthic Macroinvertebrate Scores.**

The N.C. Department of Environment and Natural Resources (NCDENR) performs monitoring for macroinvertebrates and the Carolina Heelsplitter in Goose Creek. The macroinvertebrate sample results are presented in Table 5.

**Table 5: NCDENR Macroinvertebrate Sample Results**

Site	Stream	County	Road	Bioclassification
SSB-3	Goose Creek	Mecklenburg	SR 1004	Good
SSB-4	Goose Creek	Union	Glamorgan Rd.	Good
SSB-5	Goose Creek	Union	SR 1524	Good
SSB-6	Goose Creek	Union	Below Fairfield	Fair
SSB-7	Goose Creek	Union	SR 1525	Poor
SSB-8	Goose Creek	Union	SR 1533	Fair
B-5	Goose Creek	Union	US 601	Poor
SSB-9	Goose Creek	Union	SR 1547	Fair
SSB-1	Stevens Creek	Mecklenburg	Maple Hollow Rd.	Good
SSB-2	Stevens Creek	Mecklenburg	Thompson Rd	Not Impaired
SSB-10	Duck Creek	Union	US 601	Fair

The distribution of the population within the watershed is currently unknown; however it is likely that no supporting populations of the mussel are in Mecklenburg County because

of the high likelihood of Goose Creek going dry within the County. Specific information about the Carolina Heelsplitter can be found at the following website:

<http://www.natureserve.org/explorer/servlet/NatureServe?searchName=Lasmigona+decorata>

#### 2.2.4 Stream Flow

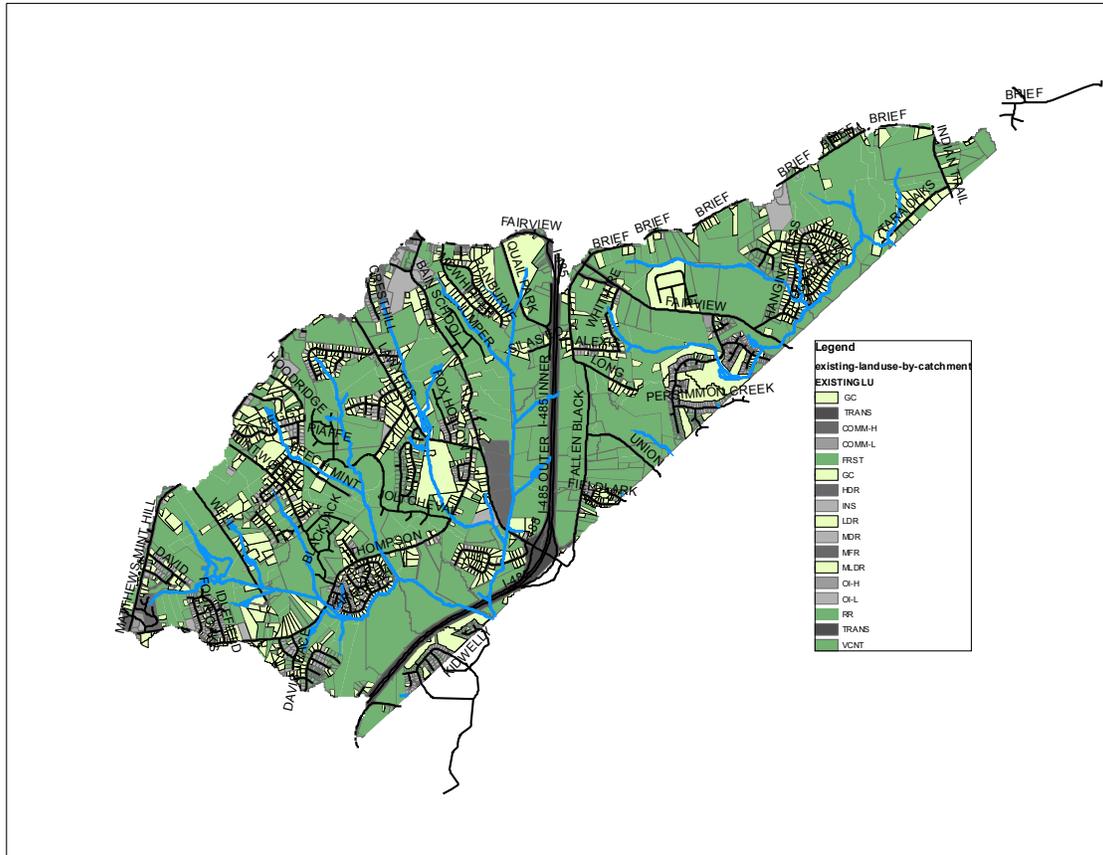
A watershed will generate larger volumes of storm water runoff and discharge this runoff at higher rates as the amount of imperviousness increases as a result of development. The stream channels that receive the additional runoff are exposed to increased hydraulic forces that can lead to morphologic instabilities through erosion – a process that reduces the availability and quality of aquatic habitat. Aquatic species are dependent upon the channel boundary for shelter, foraging, reproduction, and rest. When boundary materials regularly erode, the aquatic habitat is impacted and unlikely to support a diverse, healthy aquatic community. Therefore, addressing the source of the habitat degradation, additional storm water runoff in this case, will help reduce impairment to in-stream biological communities (Tetra Tech, 2004)

#### 2.2.5 Land Use/Land Cover

The land-use/land-cover data set used for this Watershed Management Plan was developed by Tetra Tech Inc. (2004) for the Post Construction Ordinance development process. The data set was developed through interpretation of a combination of parcel information, aerial photographs, and tree canopy data. The process is more thoroughly described in Tetra Tech Inc. (2004). The land-use data set provides a distribution and classification of all land-uses in the Goose Creek Watershed. The land-use categories represented in the Goose Creek Watershed are presented in Table 6 and the distribution of the land-uses for the Goose Creek Watershed is shown in Figure 8.

**Table 6: Goose Creek Land Use Categories.**

<b>Land Use Class</b>	<b>Abbreviation</b>
Agriculture	AG
Heavy Commercial	COMM-H
Light Commercial	COMM-L
Forest	FRST
Golf Course	GC
High Density Residential	HDR
High Density Multifamily Residential	HMFR
High Density Mixed Urban	HMX
Heavy Industrial	IND
Institutional	INS
Interstate Corridor	INTERSTATE
Low Density Residential	LDR
Medium Density Residential	MDR
Meadow	MEADOW
Multi Family Residential	MFR
Medium Low Density Residential	MLDR
Mixed Urban	MX
Office/Industrial	OI-H
Light Office/Light Industrial	OI-L
Park	PARK
Rural Residential	RR
Ultra High Density Mixed Urban	UHMX



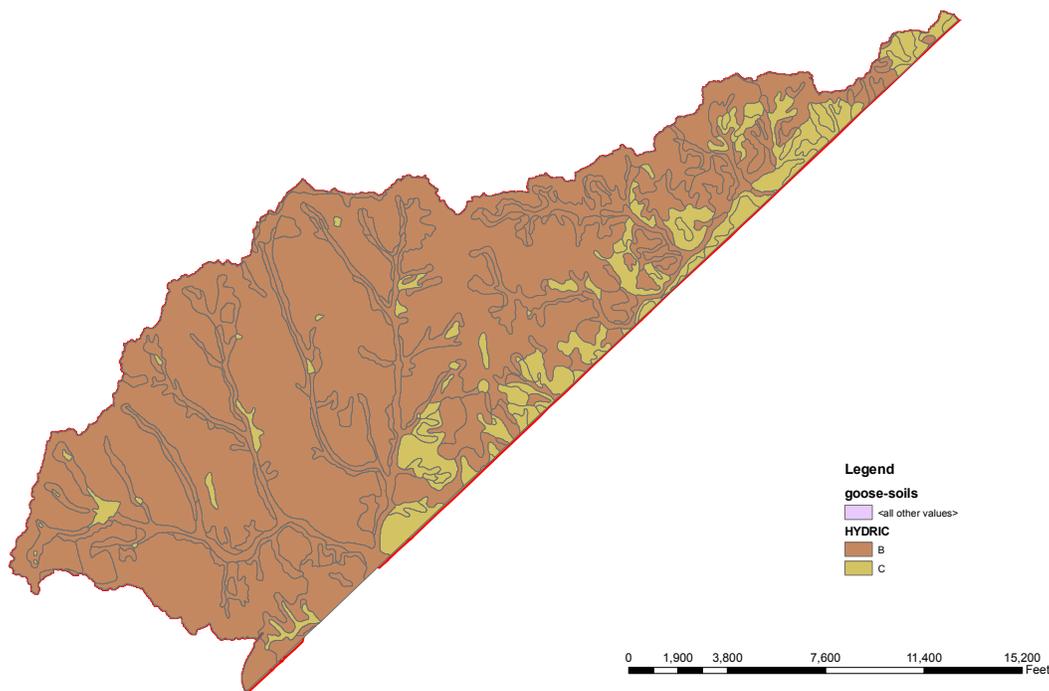
**Figure 8: Distribution of Land Uses in the Goose Creek Watershed.**

2.2.6 Soils

The distribution of soils within the Goose Creek Watershed was determined through the Soil Survey of Mecklenburg County (USDOA – SCS, 1980). The hydrologic soil types found in the Goose Creek Watershed are B and C. A description of each soil type and distribution within the watershed are shown in Table 7. Figure 9 shows the location of the hydrologic soil groups in the Goose Creek Watershed.

**Table 7: Hydrologic Soil Groups Found Within the Goose Creek Watershed.**

Hydrologic Soil Group	Description (USDOA –SCS, 1980)	Distribution with Goose Creek Watershed
B	Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission	6314 Acres (88% of watershed)
C	Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils that have a layer that impedes the downward movement of water of soils that have moderately fine texture or fine texture. These soils have a slow rate of water transmission.	856 acres (12% of watershed)



**Figure 9: Distribution of Hydrologic Soil Groups in the Goose Creek Watershed.**

### 2.3 Current Watershed Protection Efforts

#### 2.3.1 S.W.I.M. Buffer Ordinance

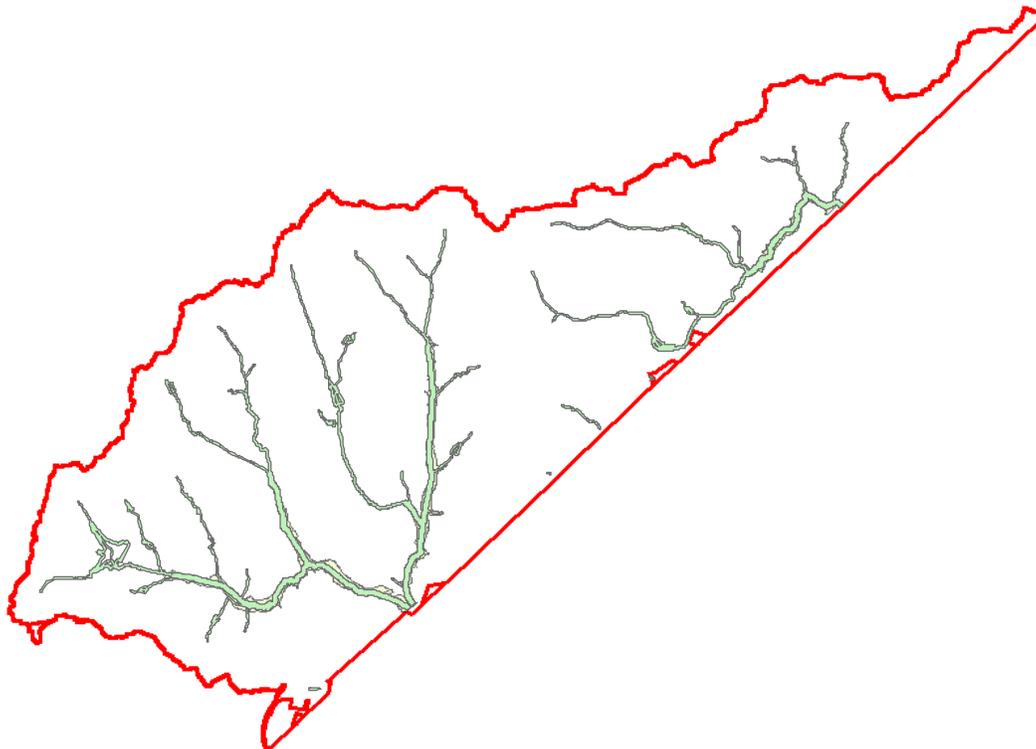
A countywide stream buffer system was established in 1999 as part of the Surface Water Improvement and Management (S.W.I.M.) strategy, otherwise known as S.W.I.M. buffers. According to S.W.I.M., streams have the primary natural function of conveying storm and ground water, storing floodwaters and supporting aquatic and other wildlife. The buffer is the vegetated land adjacent to the stream channel, which functions to protect water quality by filtering pollutants and to provide both storage for floodwaters and suitable habitat for wildlife. The ordinance was in effect until Mint Hill’s Post Construction ordinance took effect on June 30, 2007. However, property developed under the S.W.I.M. buffer ordinance will remain subject to it.

Required stream buffer widths vary from 35 to 100 feet or the entire 100 year floodplain, whichever is greater, based on the size of the upstream drainage basin. In Mint Hill, S.W.I.M. buffer requirements begin at a point where the stream drains 50 acres. Table 8 presents the S.W.I.M. buffer requirements for Mint Hill. Figure 10 shows the extent of the S.W.I.M. buffers in the Goose Creek Watershed.

**Table 8: S.W.I.M. Buffer Requirements for the Goose Creek Watershed.**

Jurisdiction	Date Ordinance Adopted	Total Buffer Widths		
		≥ 640 acres	≥ 300 acres	≥ 50 acres
Mint Hill	October, 1999	total = floodway + 100% of floodfringe but no less than 100 ft streamside = 30ft managed use = 45 ft upland = remainder	total = 50 feet streamside = 20ft managed use = 20ft. upland = 10ft	total = 35 ft streamside = 20ft managed = none upland = 15ft

All buffers are measure horizontally on a line perpendicular to the surface water, landward from the top of the bank on each side of the stream.

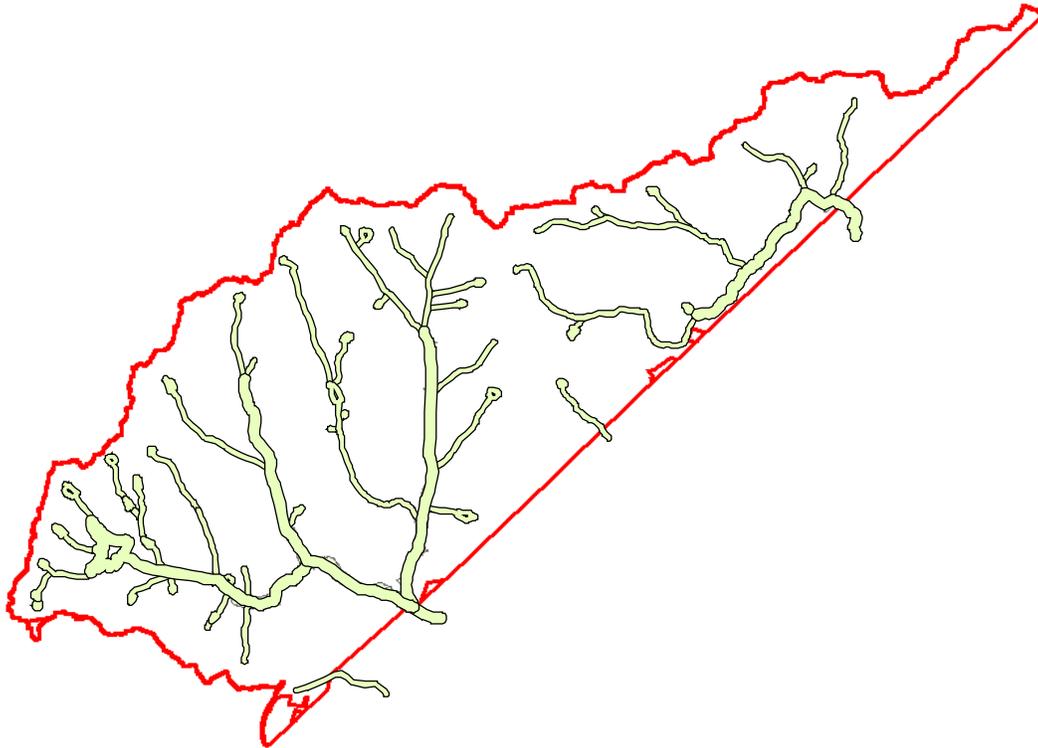


**Figure10: Approximate Extent of the Goose Creek Watershed S.W.I.M. Buffers.**

2.3.2 Post Construction Buffers

On June 30, 2007, Mint Hill implemented the Post Construction Ordinance that required 100-foot buffers on all dashed streams on USGS topographic maps and 200-foot buffers on all solid streams on USGS topographic maps. The Post Construction Ordinance was replaced by the Site Specific Management Plan (developed by NCDENR) for the Goose

Creek Watershed on February 1, 2009. Both ordinances apply but the more stringent requirement must be met. Properties developed from June 30, 2007 through February 1, 2009 are required to conform to the Post Construction Buffers. Figure 11 shows the approximate extent of the Goose Creek Watershed Post Construction Buffers.



**Figure 11: Approximate Extent of the Goose Creek Watershed Post Construction Buffers.**

### 2.3.3 Goose Creek Watershed Site Specific Management Plan.

The Goose Creek Site Specific Management Plan was adopted on February 1, 2009 and applies to the entire Goose Creek Watershed. The expressed purpose of the ordinance is to protect the endangered Carolina Heelsplitter Mussel. The ordinance places specific controls on all new development in the watershed including the following:

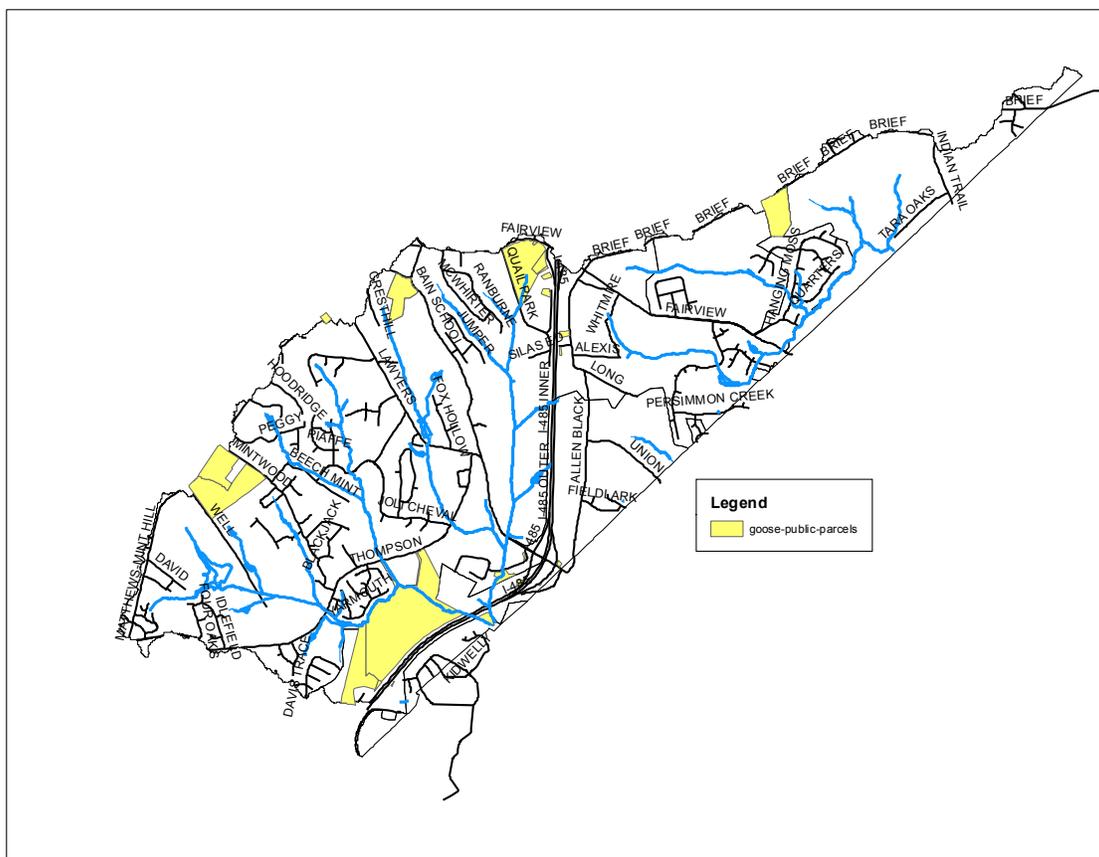
1. Controls stormwater for all projects disturbing more than one acre. These requirements include the removal of 85% TSS and control and release of the 1 year 24 hour storm at pre-development rates.
2. Controls discharges from WWTPs. No new WWTP discharges will be permitted.
3. Controls toxicity to streams for specific parameters. Ammonia is to be reduced to 0.5 mg/L from all discharges to Goose Creek.
4. Maintains riparian buffers. All waterbodies within the 100-Year Floodplain will have

a 200 foot buffer, other waterbodies will have a 100 foot buffer. These buffers are essentially the same as the Post Construction Buffers.

For the purpose of this Watershed Management Plan, it is assumed that the Site Specific Management Plan for the Goose Creek Watershed will mitigate future impacts to water quality from new development. For this reason, the remainder of the Plan and the recommendations listed are focused upon reducing pollution sources from existing development where limited or no water quality mitigation efforts have been required.

### 2.3.4 BMP Retrofits and Land Acquisition

Public property in the Goose Creek Watershed is limited. Figure 12 shows the distribution of these properties.



**Figure 12: Public Property in the Goose Creek Watershed.**

### Goose Creek Raingarden Project

A grant was obtained by CMSWS with the goal of reducing the discharge of non-point source pollutants from land development activities and improving water quality conditions in Goose Creek. Specifically, the grant seeks to protect habitat for the Carolina heelsplitter through the completion of retrofitting LID structures into existing

developments within the Goose Creek watershed in Mint Hill. These structures also serve as demonstration projects for the use of LID techniques. Educational signage was incorporated into the demonstration projects to promote the proper implementation of LID.

The first of the project sites is located at the Mint Hill Park on Fairview Road. The 52-acre park located in the headwaters of the Goose Creek watershed has approximately 3 acres of impervious surface, including a large parking area. It has soccer and baseball fields, tennis and handball courts, a playground, and nature trails. Prior to the project, a curb and gutter system conveyed storm water from parking lots, trails and outbuildings to a detention basin before discharging into Goose Creek. The project re-routed storm water from 4.9 acres through LID BMPs. The other LID demonstration project is located at the Bain Elementary School in the Goose Creek watershed within the Town of Mint Hill. This project treated previously untreated runoff from approximately 1 acre of parking lot with a raingarden.

### 2.3.5 Existing NPDES Permitted WWTPs

At the time of writing of the Goose Creek Fecal Coliform TMDL there were six permitted WWTPs. Since that time the Hunley Creek and Fairview Elementary facilities have been taken off line. Table 9 presents the remaining permitted dischargers.

**Table 9: NPDES Permitted Dischargers in the Goose Creek Watershed**

Facility Name	Address	NPDES ID	Permitted Flow (cfs)
Oxford Glen	15349 Bexley Place	NC0063584	0.075
Ashe Plantation	Quarters Lane	NC0065749	0.154
Country Woods	Country Woods Dr	NC0065684	1.036
Fairfield Plantation	Stoney Ridge Rd	NC0034762	0.108

## SECTION 3. WATERSHED INDICATORS AND GOALS

### 3.1 Upland

#### 3.1.1 Upland Water Quality Indicators

Upland water quality is associated with pollutants in storm water runoff from the watershed draining to Goose Creek. The upland water quality indicators selected for this Watershed Management Plan are Total Suspended Sediment (TSS), Total Phosphorus (TP) and Total Nitrogen (TN). These pollutants are indicative of the impact that contaminated storm water runoff has on water quality. Moreover, they are capable of being accurately simulated with relatively simple methods (unlike temperature or fecal coliform) and are indicators of other parameters of concern.

#### 3.1.2 Upland Water Quality Goals

Tetra Tech (2004) conducted an analysis of watershed scale upland loading rates for existing conditions for all watersheds in Mecklenburg County for TSS, TN and TP. They correlated the loading rates back to biological health and scored each watershed based upon the results. They were able to determine that watersheds capable of sustaining a fully supporting biological community displayed very similar upland pollutant loading rates for TSS, TN and TP. Similarly, the Goose Creek Fecal Coliform TMDL (MCWQP and NCDENR, 2005) presented a necessary reduction in upland fecal coliform of 92.5% to attain the in-stream standard. Upland fecal coliform reductions of 92.5% are essentially unattainable using currently available technology and techniques. Treatment for fecal coliform will be optimized to the maximum extent practicable using existing technology and techniques and working with site specific constraints. The upland goals for ammonia and copper were developed through the estimated loading rates from the rural residential land uses. The upland loading rate goals and percent reductions are presented in Table 10.

**Table 10: Upland Pollutant Loading Rate Goals.**

<b>Upland Pollutant Loading Rate Goals</b>
1. TN $\leq$ 4 lbs/ac/year
2. Ammonia $\leq$ 0.2 lbs/ac/year and End of Pipe concentrations $<$ 0.5 mg/l
3. TP $\leq$ 0.6 lbs/ac/year
4. TSS $\leq$ 0.22 tons/ac/year
5. Fecal Coliform: 92.5% reduction in upland fecal coliform.
6. Copper $\leq$ 0.01 lbs/ac/year

In addition to the loading rate goals, a specific concentration goal for ammonia of 0.5 mg/L has been adopted for new development. It is estimated that attaining the TN goal listed in Table 10 for existing development will result in attainment of the 0.5 mg/L goal listed in the Site Specific Management Plan as well. The TN goal of  $\leq$  4 lbs/ac/year equates to a loading rate of a forested tract. Forested tracts have proven to be the most sustainable land-cover for the Carolina Heelsplitter, indicating this goal will be effective.

Similarly, a 92.5% reduction in fecal coliform bacteria in the watershed was established in the TMDL. To attain this goal, all stormwater originating from built upon areas will need to be treated using either a bioretention cell or infiltration trench. These BMPs are the only ones capable of removing 90% of fecal coliform from stormwater runoff.

The goals presented in Table 10 are appropriate to be applied to retrofit BMP projects as a catchment wide design standard. In other words, retrofit BMP projects in a particular catchment should strive to meet the goals in Table 10; however, it is recognized that each individual project may not meet the goals.

## **3.2 In-Stream**

### **3.2.1 In-Stream Water Quality Indicators**

In-stream water quality is associated with pollutants in the stream channel. The in-stream water quality indicator selected for this Watershed Management Plan is TSS. This indicator will provide an indication of the TSS pollutant load conveyed by the channel.

### **3.2.2 In-Stream Water Quality Goals**

Tetra Tech, Inc. (2002) summarized several reports pertaining to sediment production and biological health. Simmons (1993) summarized sediment characteristics of 152 North Carolina streams and rivers (including 100 within the Piedmont region) from data taken during the 1970s. Crawford and Lenat (1989) provide estimates of annual sediment yield from three (3) Piedmont watersheds near Raleigh, N.C., including 0.13 ton/acre for a predominantly forested watershed, 0.31 ton/acre from an agricultural watershed, and 0.59 ton/acre from an urban watershed. In both studies, sediment yield was estimated from in-stream suspended sediment concentrations, so the annual areal sediment yields reflect not only sediment from the land surface but also in-stream sediment transport and sediment from bank erosion/collapse. Crawford and Lenat (1989) performed extensive biological sampling in the three watersheds they studied and calculated metrics for taxa richness, abundance, and pollution tolerance for invertebrates and fish. In summarizing their biological data, they rated the forested watershed as having high measures of biotic characteristics, the agricultural watershed as having medium to high measures, and the urban watershed as having low measures. Under North Carolina water quality regulations, streams and lakes must be able to support aquatic life. A rating of Fair or Poor for Benthic Invertebrate Bioclassification or Fish Community Structure prevents a water body from being rated as “fully supporting” under Section 305(b) of the Clean Water Act. Based on the two studies investigated by Tetra Tech, Inc., an approximate in-stream sediment load goal of 0.30 ton/acre/year is recommended as a goal.

Currently, in-stream data allowing assessment of the sediment load goal of 0.30 tons/acre/year is not available in the Goose Creek Watershed. In order to determine progress toward the goal, it is proposed that two (2) long term sediment monitoring stations be installed in the Goose Creek Watershed. These sites should coincide with long term monitoring sites established for assessing channel properties (permanent cross

sections, etc.). One site should be established on Duck Creek near Tara Oaks and the other site should be established upstream of The Bridges Mall Site. Data collected at these sites will allow the development of an annual sediment versus time flow curve. Each year will be compared against previous years to determine if the sediment carrying characteristics of Goose Creek (and hence the sediment loads) are improving. Also, the data collected will be used to estimate progress toward attaining the overall goal of 0.30 tons/acre/year. Table 11 presents the in-stream water quality goals.

**Table 11: In-Stream Water Quality Goals.**

<b>In-Stream Water Quality Goals</b>
1. TSS $\leq$ 0.3 tons/ac/year
2. Benthic Macroinvertebrates = Fully Supporting
3. Fish = Fully Supporting
4. Attainment of fecal coliform standard (200 c.f.u./100 ml)
5. Attainment of ammonia end of pipe goal of 0.5 mg/L

Monitoring to determine compliance with these goals is presented in Appendix A.

## **SECTION 4. WATERSHED ASSESSMENT**

### **4.1 Upland Characterization**

In order to prioritize areas of the Goose Creek Watershed, an upland characterization methodology was developed based upon work completed by Tetra Tech, Inc. (2004) for the Post Construction Ordinance Stakeholder Group. The resulting prioritization will be used to guide property acquisition for installation of water quality BMPs and to focus efforts on voluntary retrofitting of existing upland sources of pollution.

The upland characterization was completed through an evaluation of existing levels of pollutant loading, impervious cover and buffer impacts. Specifically, the indicators used were Total Phosphorus (TP), Total Nitrogen (TN), Total Suspended Sediment (TSS), Fecal Coliform, ammonia, Copper and percent of the stream buffer currently un-forested. The information presented in this Section of the Watershed Management Plan deals only with existing sources of pollution in the Goose Creek Watershed. For the purpose of this document, it was assumed that future sources of pollution will be attenuated through implementation of the Site Specific Management Plan, which is presented in Section 2.3.3.

#### **4.1.1 Methodology**

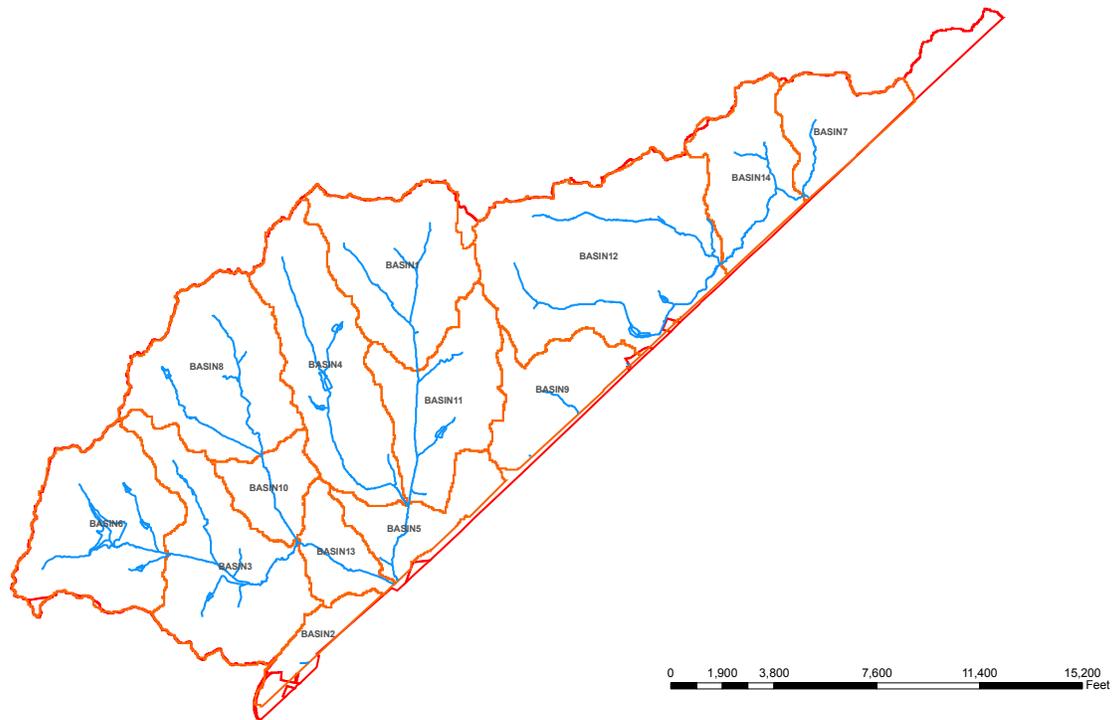
The basis for the upland characterization presented herein is an updated existing land-use dataset developed by Tetra Tech Inc. (2004). The land-use data set was developed through interpretation of a combination of parcel information, aerial photographs, and tree canopy data. The process is more thoroughly described in Tetra Tech Inc. (2004). Development in the watershed that has occurred since 2004 was manually entered into the data set. The land-use data set provides a distribution and classification of all land-uses in the Goose Creek Watershed. The land-use categories, along with abbreviations and typical impervious percentages seen in the Goose Creek watershed are presented in Table 12.

**Table 12: Goose Creek Land Use Categories and Abbreviations.**

Land Use Class	Typical Lot Size	Percent Impervious	Abbreviation
Heavy Commercial	Variable	85	COMM-H
Light Commercial	Variable	45	COMM-L
Forest	NA	0	FRST
Golf Course	NA	8	GC
High Density Residential	0.125 – 0.25 ac	41	HDR
High Density Multifamily Residential	Variable	70	HMFR
High Density Mixed Urban	Variable	70	HMX
Heavy Industrial	Variable	66	IND
Institutional	Variable	40	INS
Interstate Corridor	NA	36	INTERSTATE
Low Density Residential	2 – 5 ac	9	LDR
Medium Density Residential	0.25 – 0.5 ac	30	MDR
Meadow	NA	0	MEADOW
Multi Family Residential	<0.125	60	MFR
Medium Low Density Residential	0.5 – 2 ac	19	MLDR
Mixed Urban	Variable	60	MX
Office/Industrial	Variable	72	OI-H
Light Office/Light Industrial	Variable	30	OI-L
Park	NA	9	PARK
Rural Residential	>5 ac	4	RR
Ultra High Density Mixed Urban	Variable	90	UHMx

The distribution of the land-uses for the Goose Creek watershed is shown in Figure 8.

The land-use data for the Goose Creek Watershed was sub-divided into catchments using GIS software. The catchments were delineated using the Watershed Information System (WISe) with an approximate drainage area of 1 square mile per catchment. Catchments with very small drainage areas were merged into nearby catchments to reduce the number of reporting units. A total of 14 catchments were delineated for the Goose Creek Watershed. Figure 13 shows the distribution of the catchments in the Goose Creek Watershed.



**Figure 13: Goose Creek Watershed Catchments.**

The upland pollutant loading rates by land-use for TP, TN and TSS were adopted from Tetra Tech Inc. (2004) and are listed in Table 13. Loading rates for ammonia and fecal coliform were calculated using annual runoff estimates and concentrations within the Site Evaluation Tool (Tetra Tech, Inc., 2005). Catchment loading rates were determined by multiplying the area of each land-use in the catchment by the appropriate loading rate and summing the total for all land-uses within the catchment. Catchment scale loading rates for the Goose Creek Basins are provided in Table 14.

**Table 13: Upland Pollutant Loading Rates by Land-Use.**

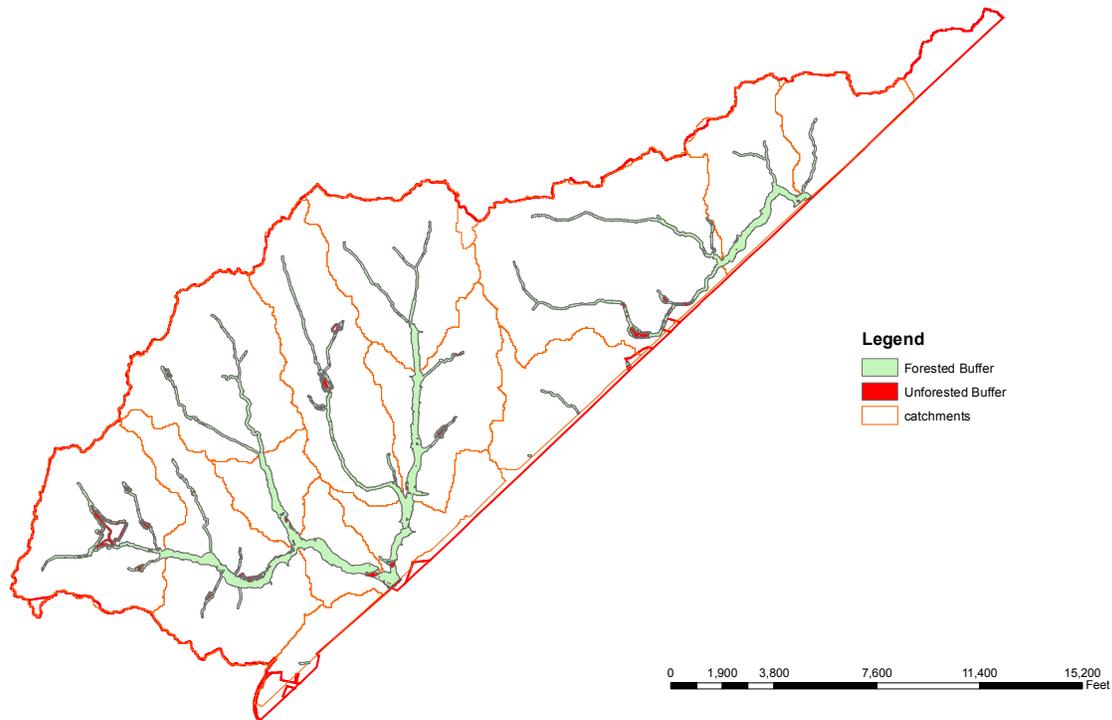
LAND-USE	TN (lbs/ac/year)	TP (lbs/ac/year)	TSS (tons/ac/year)	Ammonia (lbs/ac/year)	Fecal Coliform (c.f.u./year x 10 <sup>10</sup> )	Copper (lbs/ac/year)
COMM-H	19.44	2.85	0.76	4.38	38	0.124
COMM-L	12.44	1.88	0.69	2.05	20	0.070
GC	5.17	0.83	0.47	0.22	4	0.012
HDR	8.73	1.4	0.47	1.14	18	0.064
INS	8.63	1.39	0.48	1.15	18	0.063
INTERSTATE	7.81	1.25	0.4	3.65	16	0.118
LDR	4.1	0.66	0.28	0.39	4	0.016
MDR	7.61	1.24	0.52	0.87	13	0.035
MEADOW	2.39	0.38	0.13	0.11	0.3	0.006
MFR	10.65	1.68	0.39	2.65	27	0.090
MLDR	6.5	1.07	0.57	0.61	9	0.024
OI-H	11.87	1.86	0.34	1.94	32	0.106
OI-L	7.61	1.24	0.52	0.90	13	0.035
RR	3.59	0.59	0.3	0.16	2	0.009

Note: See Table 12 for abbreviation descriptions.

**Table 14: Catchment Loading Rates**

Basin ID	Fecal Coliform (cfu/year)	TN (lbs/year)	TP (lbs/year)	TSS (tons/year)	Ammonia (lbs/year)	Copper (lbs/year)
BASIN1	3.0E+13	2762	444	191	405	15.4
BASIN2	8.6E+12	663	107	46	122	4.5
BASIN3	3.1E+13	3030	490	216	374	14.5
BASIN4	4.6E+13	3637	585	252	468	18.3
BASIN5	1.7E+13	1250	201	80	308	10.6
BASIN6	3.8E+13	3194	513	221	426	16.3
BASIN7	7.6E+12	1055	170	77	92	3.9
BASIN8	3.1E+13	2974	481	215	338	13.5
BASIN9	1.1E+13	1338	216	98	128	5.4
BASIN10	6.1E+12	783	126	58	75	3.1
BASIN11	3.9E+13	2952	459	168	573	18.9
BASIN12	4.5E+13	4723	763	346	503	20.3
BASIN13	5.8E+12	713	114	46	106	4.0
BASIN14	1.6E+13	1718	279	134	166	6.8

The percent of impacted buffer in the Goose Creek Watershed was also characterized. The characterization was completed using tree canopy data for Mecklenburg County intersected with the FEMA floodplain delineation and the S.W.I.M. and Watershed buffer coverages. The resulting GIS dataset, which depicts the presence or absence of tree canopy within stream buffers, was intersected with the catchment coverage to determine the percent of un-forested buffer within each catchment. Figure 14 shows the distribution of forested and un-forested buffer within the Goose Creek Watershed.



**Figure 14: Distribution of Forested and Un-forested Stream Buffers within the Goose Creek Watershed.**

Levels of impervious area, which are indicative of level of development, for the Goose Creek Watershed were characterized by catchment. Impervious percentages by catchment were determined by multiplying the area of each land-use within the catchment by the appropriate impervious percentage (Table 12) and summing the resulting impervious areas for the entire catchment. Catchment area, impervious area and impervious percentage information is presented in Table 15.

**Table 15: Catchment Area, Impervious Area and Impervious Percentages**

Basin ID	Total Area (ac)	Impervious Area (ac)	Impervious Percentage
BASIN1	637.5	70.2	11%
BASIN2	127.9	20.0	16%
BASIN3	726.0	76.6	11%
BASIN4	713.5	106.6	15%
BASIN5	254.9	40.3	16%
BASIN6	681.7	85.8	13%
BASIN7	297.5	19.3	6%
BASIN8	694.0	73.1	11%
BASIN9	341.2	29.3	9%
BASIN10	210.7	15.6	7%
BASIN11	523.6	92.8	18%
BASIN12	1137.9	111.2	10%
BASIN13	201.8	16.9	8%
BASIN14	403.6	36.4	9%

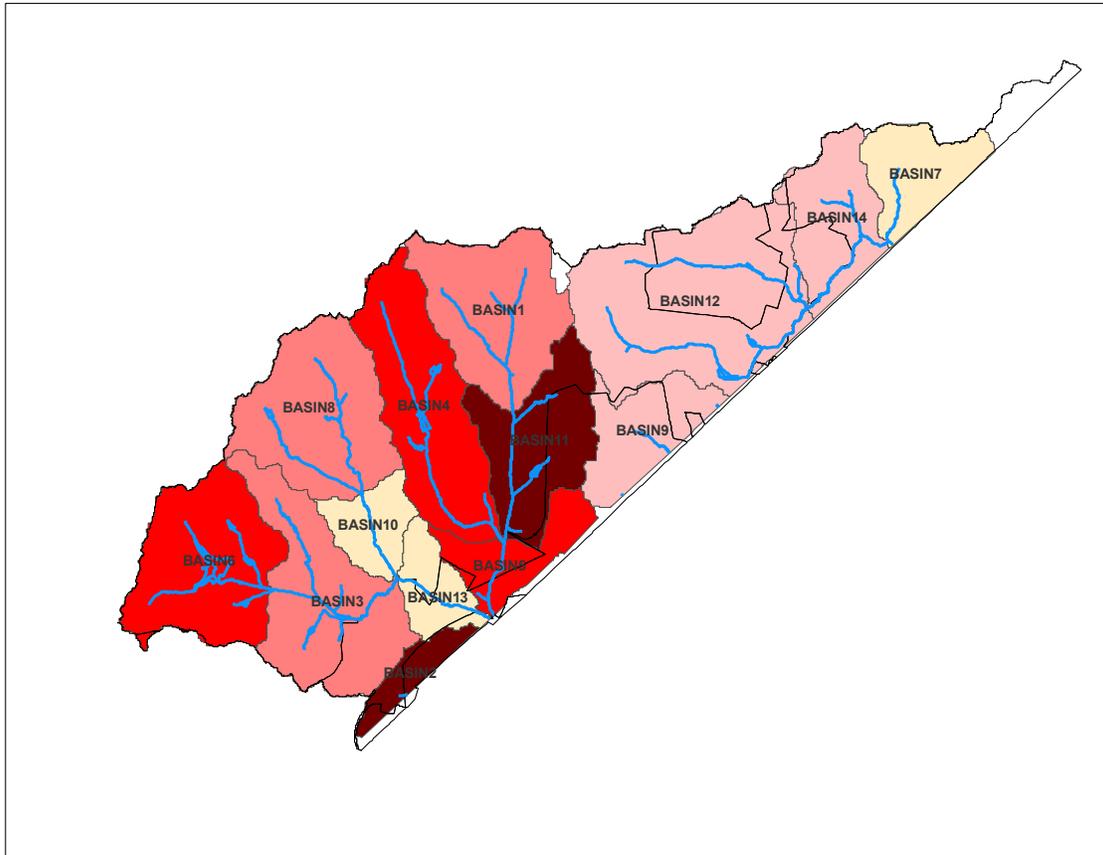
#### 4.1.2 Results

Results for each of the basins for each indicator evaluated were ranked to determine the basins with the highest level of impairment. Table 16 presents the ranks for all 14 Goose Creek Basins.

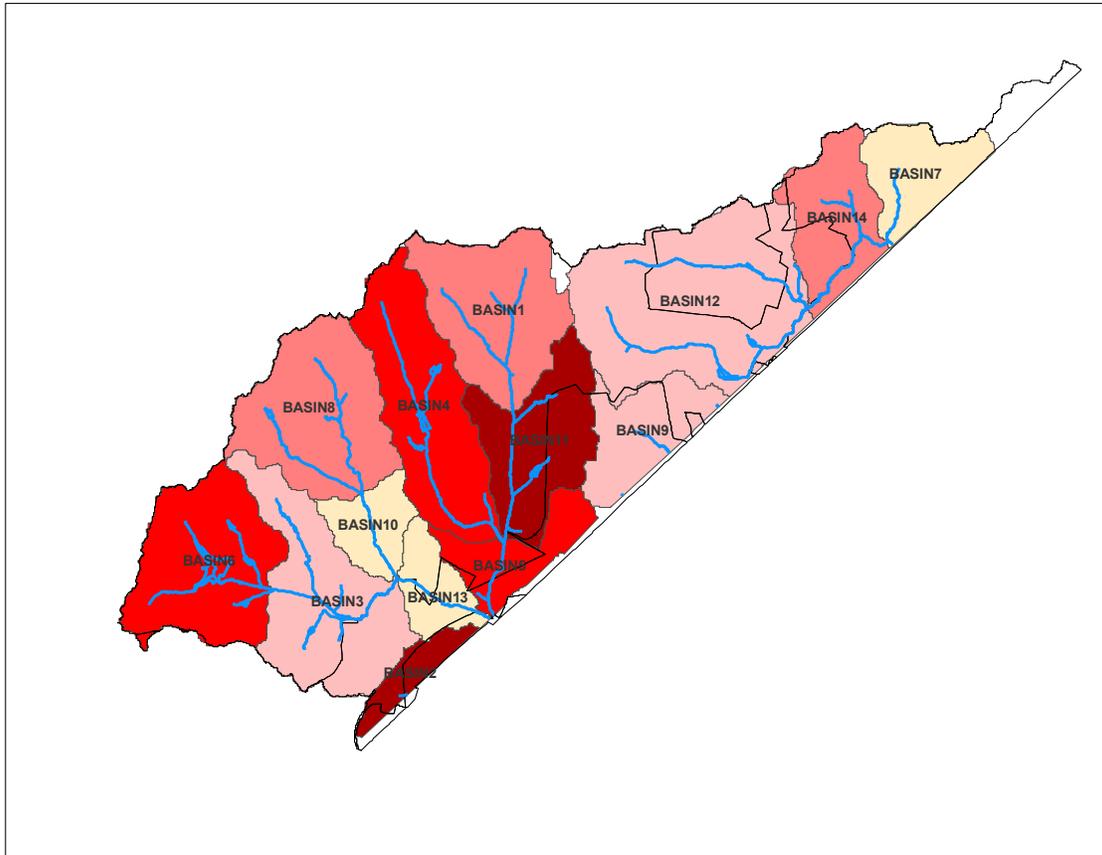
**Table 16: Results of Upland Impairment Characterization. Note: Higher rank indicates increasing level of impairment (Basin 11 most impaired).**

Basin ID	Fecal Rank	TN Rank	TP Rank	TSS Rank	NH4 Rank	Cu Rank	Average Rank	Overall Rank
BASIN11	1	1	1	5	2	2	2	1
BASIN2	2	2	2	1	3	3	2	2
BASIN5	3	4	4	6	1	1	3	3
BASIN4	4	3	3	2	4	4	3	4
BASIN6	5	5	5	4	6	6	5	5
BASIN1	6	6	6	9	5	5	6	6
BASIN8	7	7	7	7	9	9	8	7
BASIN14	9	8	8	3	11	11	8	8
BASIN3	8	9	9	10	8	7	9	9
BASIN12	10	10	10	8	10	10	10	10
BASIN9	11	11	11	11	12	12	11	11
BASIN13	13	14	14	14	7	8	12	12
BASIN10	12	12	12	12	13	13	12	13
BASIN7	14	13	13	13	14	14	14	14

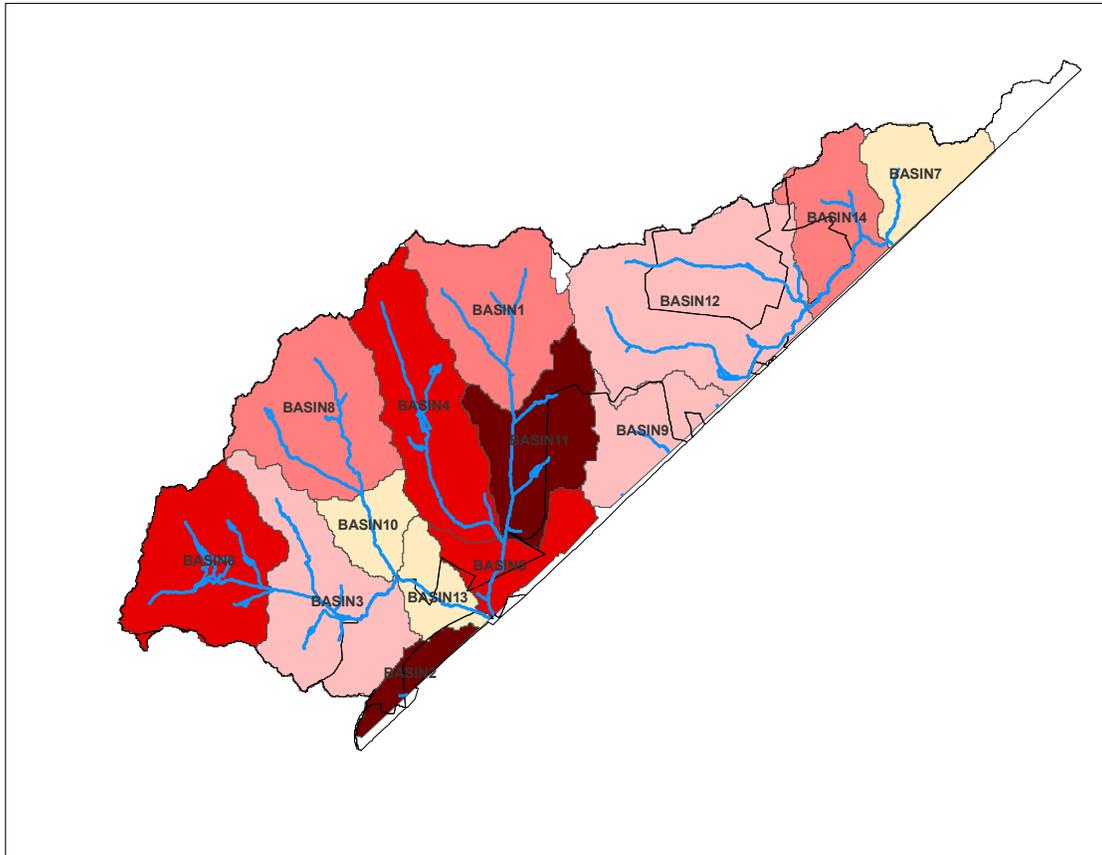
Figures 15 – 21 present the overall ranking based upon the results of the upland characterization for Fecal Coliform, TN, TP, TSS, NH4, Cu and Overall Impairment respectively. Note that darker colors indicate increased levels of impairment.



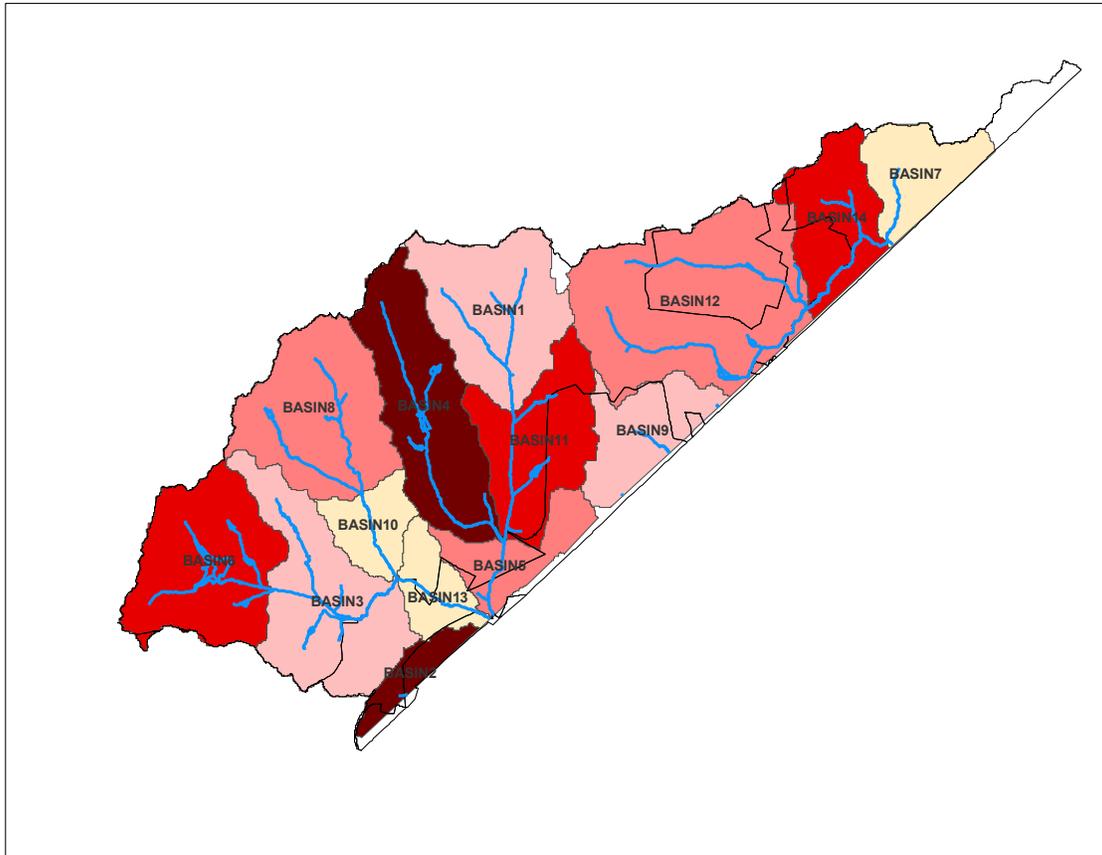
**Figure 15: Fecal Coliform Rank.**



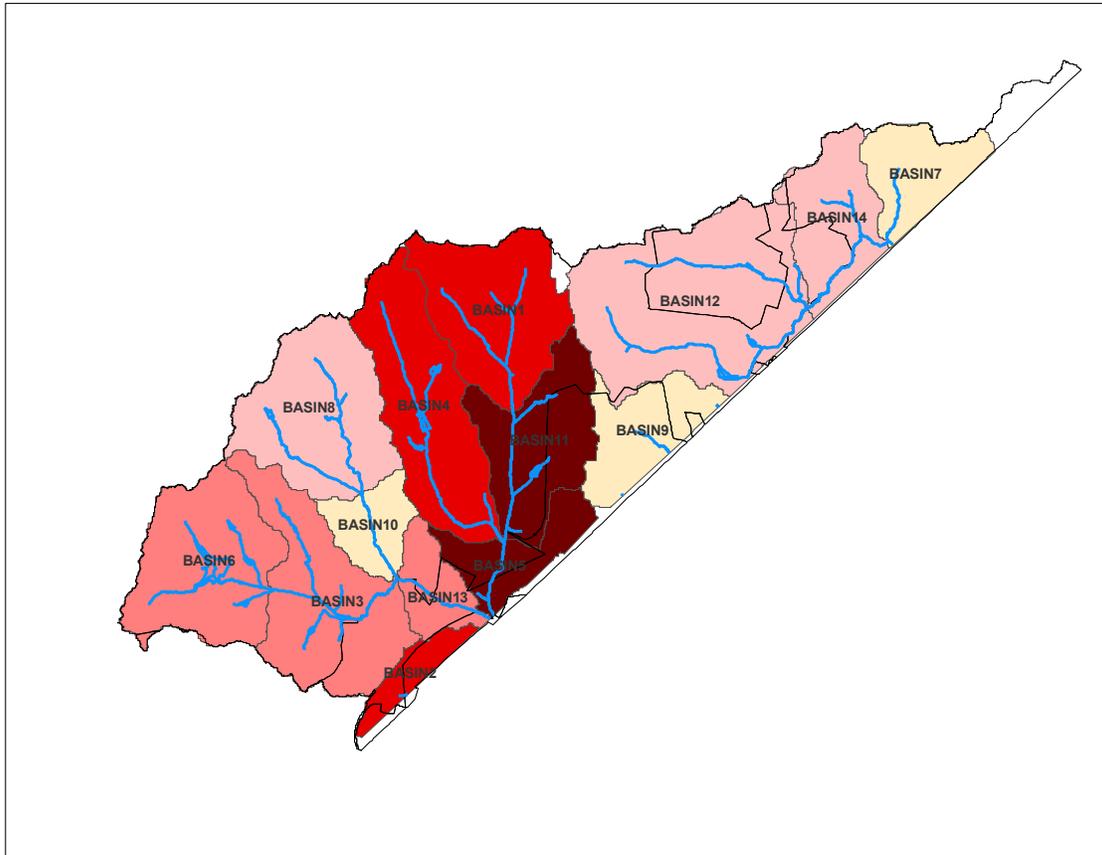
**Figure 16: TN Ranking.**



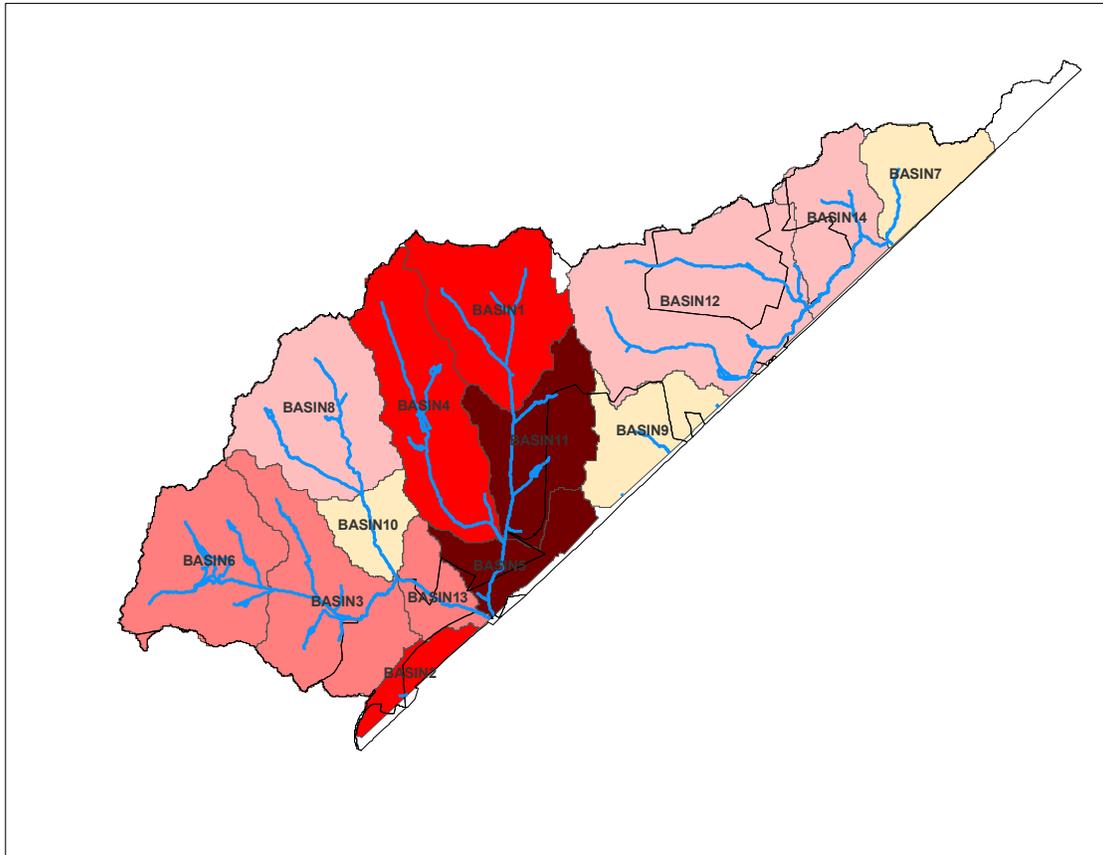
**Figure 17: TP Ranking.**



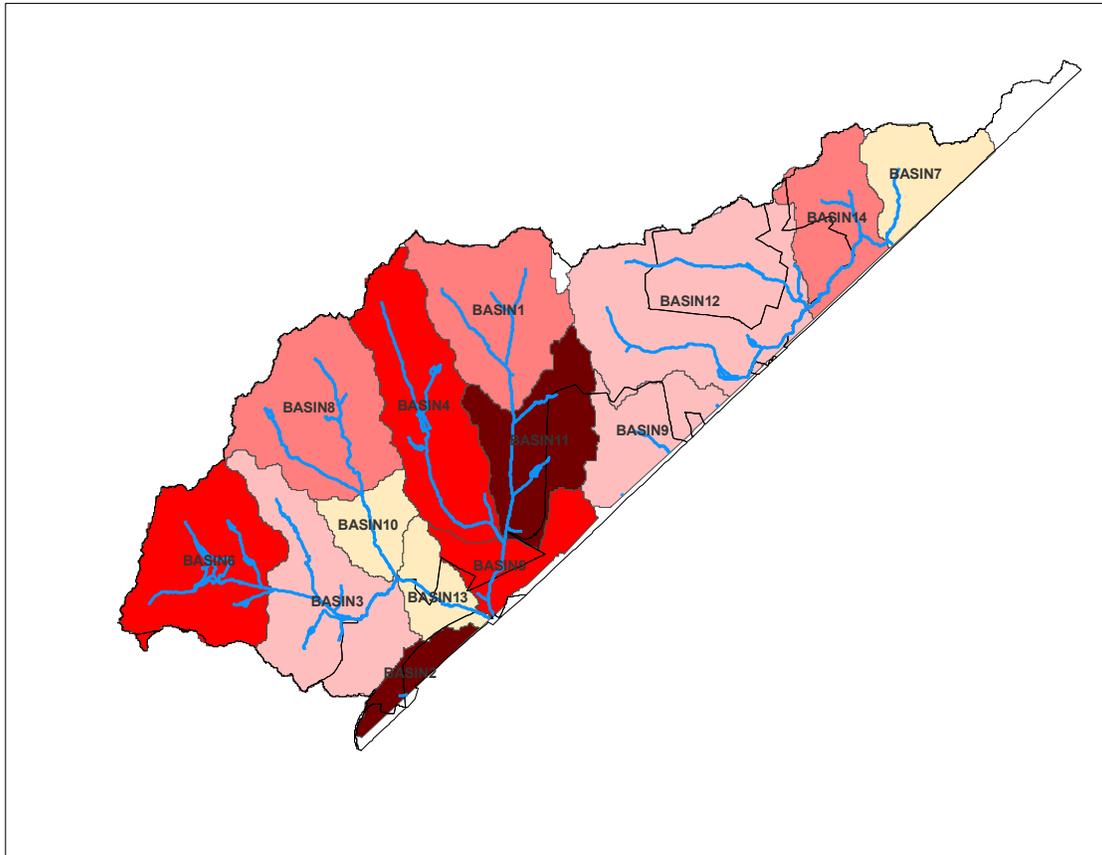
**Figure 18: TSS Ranking.**



**Figure 19: NH4 Ranking.**



**Figure 20: Cu Ranking.**



**Figure 21: Overall Impairment (based upon upland pollutant load).**

## 4.2 Stream Channel Characterization

In order to prioritize areas of the Goose Creek Watershed for stream channel restoration, enhancement and preservation, a characterization methodology was developed by MCSWS. The characterization was completed through an evaluation of existing stream channel conditions that allowed reach-level prioritization based on biological integrity and geomorphic stability, as well as predicted bank erosion rates.

### 4.2.1 Methodology

MCSWS utilized base data in GIS format, including recent aerial photography, stream locations, roads and parcel boundaries. Using GIS, the Goose Creek Watershed was divided into 30 separate reaches (Figure 22). For the purposes of this study, Buck defines a reach as a discrete segment of stream that consistently exhibits a set of physical features that appear to be significantly different from its contiguous upstream and downstream segments. Twelve basins were chosen for assessment that appeared to represent a range of stream conditions and land uses found throughout the watershed. Because perennial streams were to be assessed, only streams receiving 100 acres or greater of drainage were

chosen, which resulted in 30 individual reaches approximating 30 miles of stream for direct assessment.

### Stream Classification

Each reach was visually classified according to the Rosgen classification system (Rosgen, 1994). This hierarchical methodology categorizes streams based on geomorphic features that describe channel geometry in the three dimensions of planform, cross-section and longitudinal profile. Most of these parameters are expressed as dimensionless ratios such as width/depth. The use of dimensionless ratios allows categorization and comparison of streams of varying sizes.

### Bank Erosion

Streambank erosion rates were determined by measuring the Bank Erosion Hazard Index (BEHI) and Near Bank Stress (NBS) (Rosgen, 2001) throughout each study reach. This semi-quantitative method is widely used in North Carolina and is based on measured values and visual estimates made at discrete sections of streambank. BEHI provides results in adjective ratings, ranging from very low to extreme. BEHI is based on the following:

- bank height/bankfull height
- root depth/bank height
- root density (%)
- bank angle
- surface protection (%)
- bank materials and stratification

NBS provides a measurement of the distribution of flow through a cross section. The near bank region is that third of stream cross section nearest a bank being studied. Rosgen (1996) correlated the ratio of shear stress in the near bank region to mean shear stress and developed an adjective rating system for reporting. Reasonably accurate estimates of NBS can be made quickly using professional judgment.

Erosion rates have been associated with the adjective ratings for bank erodibility and near-bank stress based on data collected from Colorado. Data collected at the Mitchell River in North Carolina supports the use of the Colorado data (Rosgen, 2001). The erosion rate was then multiplied by the height and length of the streambank. Rates are expressed as cubic feet of sediment eroded annually per linear foot of streambank. Total tons per year were also calculated for each study reach.

### Channel Evolution

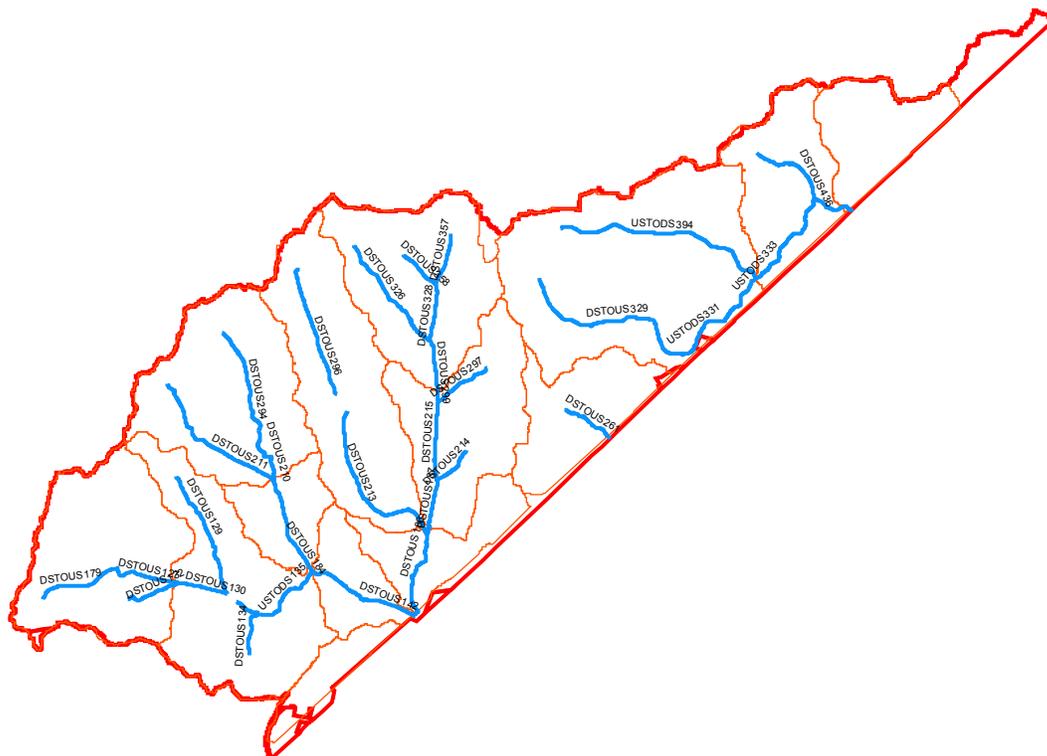
Simon's Channel Evolution Model (1989) was used to assign one of the six stages listed below to each reach based on field observations.

- Stage I: The waterway is a stable, undisturbed natural channel.
- Stage II: The channel is disturbed by some drastic change such as forest clearing, urbanization, dam construction, or channel dredging.

- Stage III: Instability sets in with scouring of the bed.
- Stage IV: Destructive bank erosion and channel widening occur by collapse of bank sections.
- Stage V: The banks continue to cave into the stream, widening the channel. The stream also begins to aggrade, or fill in, with sediment from eroding channel sections upstream.
- Stage VI: Aggradation continues to fill the channel, re-equilibrium occurs, and bank erosion ceases. Riparian vegetation once again becomes established.

### Habitat Assessment

Mecklenburg County Habitat Assessment Protocol forms were completed by field staff and assigned a score per parameter with a total possible score of 200 being the best. The parameters of the habitat assessment are broken into primary, secondary, and tertiary categories. Primary parameters describe those instream physical characteristics that directly affect the biological community. Primary conditions evaluate substrate and available cover, embeddedness, epifaunal substrate, velocity and depth regimes, and pool variability. Secondary parameters (channel alteration, bottom scouring and deposition, channel shape, and channel sinuosity) relate to channel morphology, which controls the behavior of stream flow and the sediment deposits the stream collects. The tertiary parameters in the habitat assessment matrix include bank stability, bank vegetative protection, and the riparian vegetative zone. Each stream reach was photographed using a digital camera so that all aspects of the study area were photo-documented.



**Figure 22: Goose Creek Stream Characterization Reaches.**

4.2.2 Results

A total of 30 study reaches were delineated and assessed. Reach lengths varied from several hundred feet to over 7000 feet. The number of reaches per basin ranged from three to seventeen. Once in the field the predetermined reach lengths (based on drainage) were sometimes broken into smaller reaches or combined into larger reaches based on field observations. For example, if the land use adjacent to the stream channel changed significantly (e.g., forest to industrial) a new reach would begin. Due to the large number of study reaches, data was also compiled and presented per basin (Table 17) to aid in management efforts.

**Table 17: Results of Stream Channel Characterization.**

Reach	Erosion Rate (ft <sup>3</sup> /year/ft)	Sediment Production (Tons/Year)	MHAP Score	Rank
DSTOUS127	0.13	16	144	16
DSTOUS129	0.55	158	143	25
DSTOUS130	0.66	0.03	157	21
DSTOUS132	0.53	54	149	19
DSTOUS134	0.57	49	138	15
DSTOUS142	1.0030	214	121	5
DSTOUS179	0.10	15	144	27
DSTOUS184	1.85	335	122	6
DSTOUS186	1.12	221	130	8
DSTOUS187	0.80	55	137	13
DSTOUS210	1.22	136	125	7
DSTOUS211	0.62	172	131	30
DSTOUS213	0.59	189	132	24
DSTOUS214	0.19	15	146	17
DSTOUS215	0.60	83	134	10
DSTOUS261	1.02	106	146	18
DSTOUS294	0.60	123	115	23
DSTOUS296	0.55	135	95	1
DSTOUS297	0.55	61	136	12
DSTOUS299	1.48	162	109	4
DSTOUS326	0.78	179	111	22
DSTOUS328	0.39	39	136	11
DSTOUS329	0.85	212	108	2
DSTOUS357	0.42	40	109	3
DSTOUS358	1.14	91	92	14
DSTOUS436	0.690	102	131	9
USTODS135	1.45	210	124	29
USTODS331	0.21	46	108	26
USTODS333	1.19	450	117	28
USTODS394	0.86	339	154	20

Note: Decreasing MHAP score indicates greater impact.

A single erosion rate was calculated for each of the 30 reaches based on BEHI/NBS. Based on correspondence with D. Rosgen (2008), categories of erosion rates are best assigned adjectives by orders of magnitude; therefore, rates of 0.01 feet/year are assigned the adjective ‘Low’, 0.1 feet/year are “Moderate”, and greater than or equal to 1.0 feet/year are “High.”

### **4.3 Fecal Coliform Assessment**

As described earlier in this document, a WQRP for the Goose Creek Watershed was initiated after receipt of the August 10, 2006 letter from NC DENR. A part of the WQRP was to catalog the storm water outfalls in the watershed. In order to satisfy the requirements of this inventory, all streams draining more than 50 acres were walked by MCWQP personnel. A part of the walk was to visually inspect the channel and buffer areas for evidence of fecal coliform discharges and to collect stream and end of pipe samples to be analyzed for fecal coliform. The results of the stream walks can be found in the MCWQP, 2007. In addition to the stream walks, the WQRP requires monitoring of storm drain outfalls, in stream monitoring and associated follow-up activities. These activities are outlined in MCWQP, 2009. Currently, the MCWQP has teamed with the Mecklenburg County Ground Water and Waste Water Program to evaluate septic systems in the watershed. At the time of writing of this plan a pilot study had been completed on a small area of the watershed. Approximately 180 inspections were conducted and 5 systems were found to be failing. Based upon these results the pilot study will be expanded throughout the Goose Creek Watershed in Mecklenburg County and is expected to be completed by the end of FY2011.

## SECTION 5. CANDIDATE RESTORATION, RETROFIT AND PRESERVATION SITES

### 5.1 Upland BMP Retrofit Sites

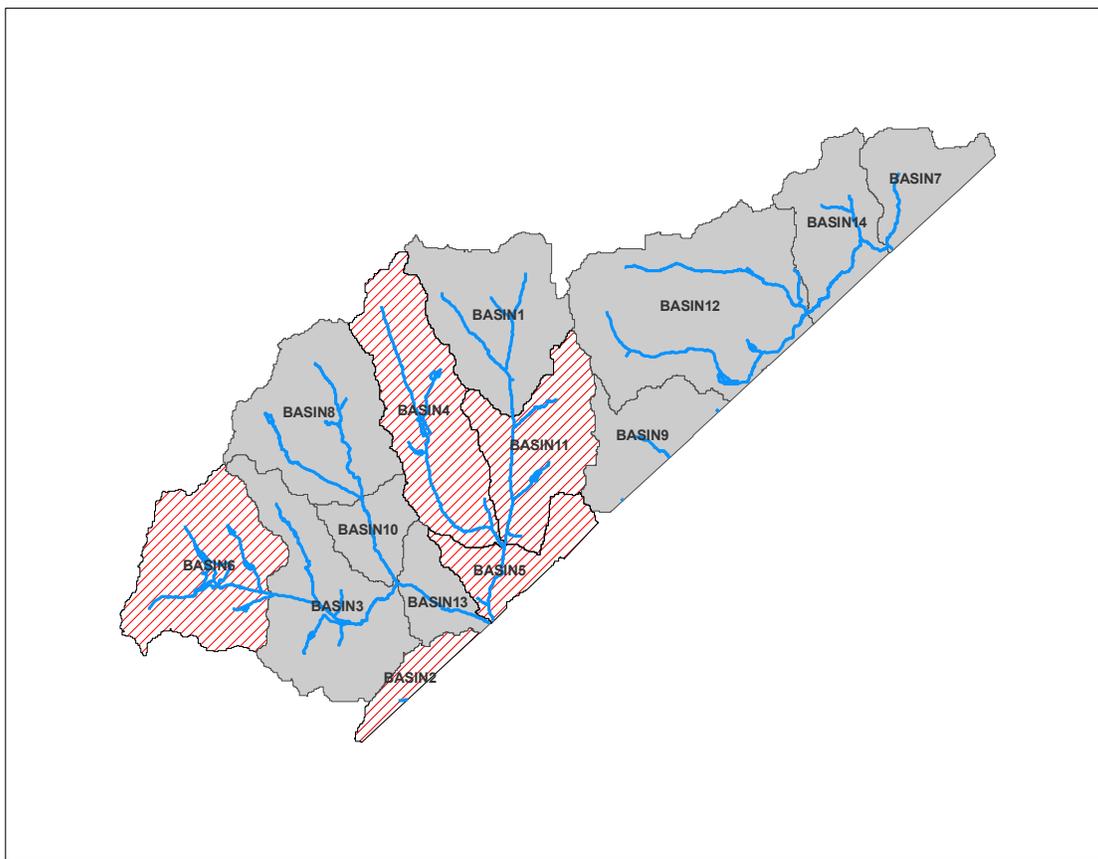
The intent of this section is two fold:

1. Identify publicly owned parcels that are significant sources of pollution that would benefit from BMP retrofit.
2. Identify catchments for detailed field investigation to identify privately owned parcels that are significant sources of pollution and appropriate for BMP retrofit.

All retrofit BMPs installed in the Goose Creek Watershed should be designed with the Upland Pollutant Loading Rate Goals (Table 11) as a design standard.

#### 5.1.1 Priority Basins

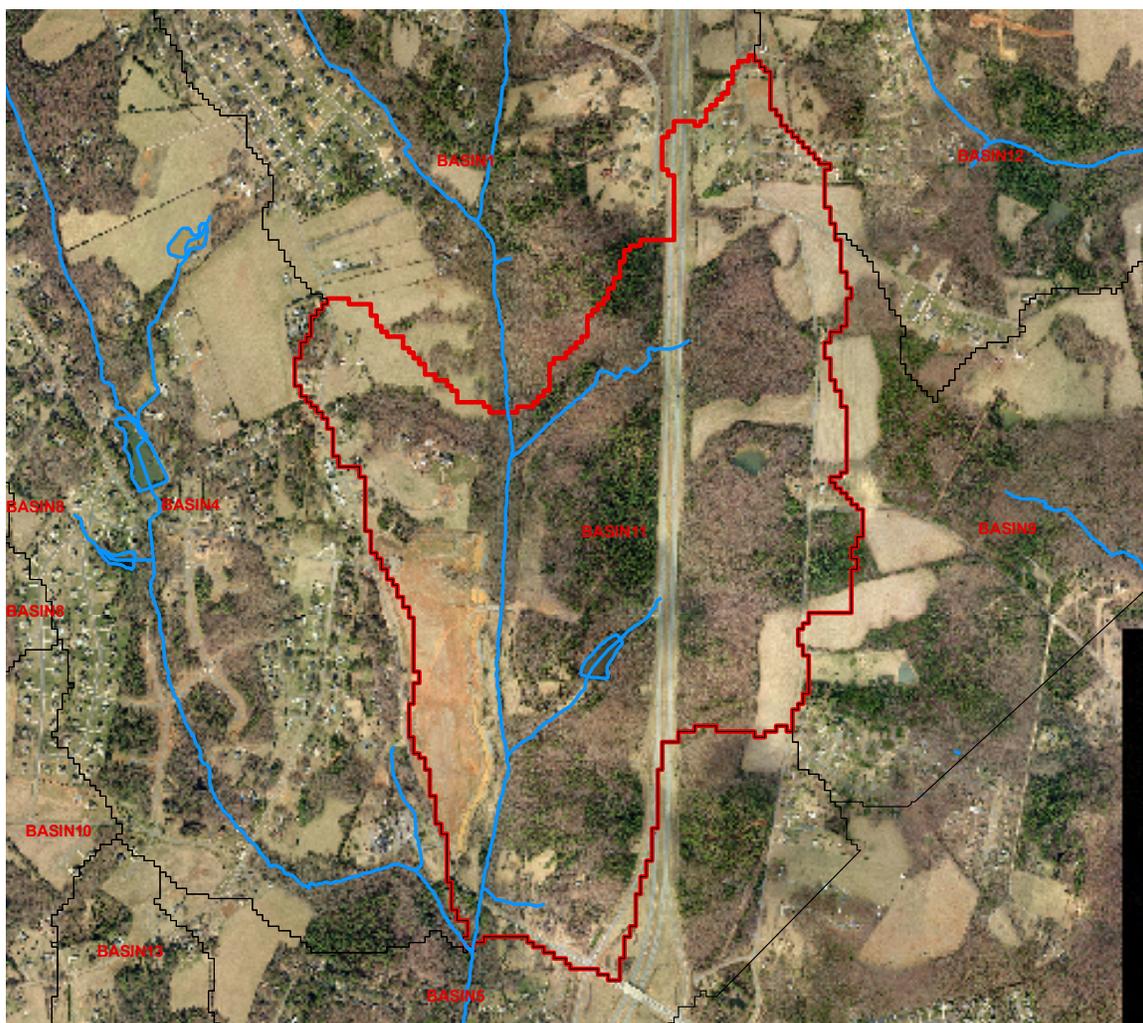
Based upon the upland pollutant load analysis, BMP retrofit efforts should be concentrated on or downstream of the most impacted basins. The 6 most impacted basins were focused upon for this plan. Figure 23 shows the extent of these focus basins within the Goose Creek Watershed. The following Section discusses each focus basin in detail.



**Figure 23: Focus Basins within the Goose Creek Watershed.**

***Focus Basin 11 (The Bridges)***

Focus Basin 11 has the highest estimated pollutant loads in the entire Goose Creek Watershed. Figure 24 shows the extent of the Basin. The primary reason for Basin 11 receiving the highest ranking is The Bridges mall site. Although the mall has not yet been built, grading permits have been issued and land clearing begun. Moreover, this basin contains much of the I-485 Lawyers Road interchange and a significant portion of I-485 north of the interchange. A limited amount of single family residential is also present in the basin. It is very likely that after the mall is constructed storm water volume and velocity as well as pollutant runoff will increase. Currently NCDOT owns one small parcel in the northeast portion of the basin on the drainage divide. This parcel may be suitable to treat a small portion of I-485.



**Figure 24: Focus Basin 11**

***Focus Basin 2 (Shannamara)***

Focus Basin 2 has the second highest estimated pollutant loads (normalized by area) in the entire Goose Creek Watershed. Figure 25 shows the extent of Focus Basin 2. The

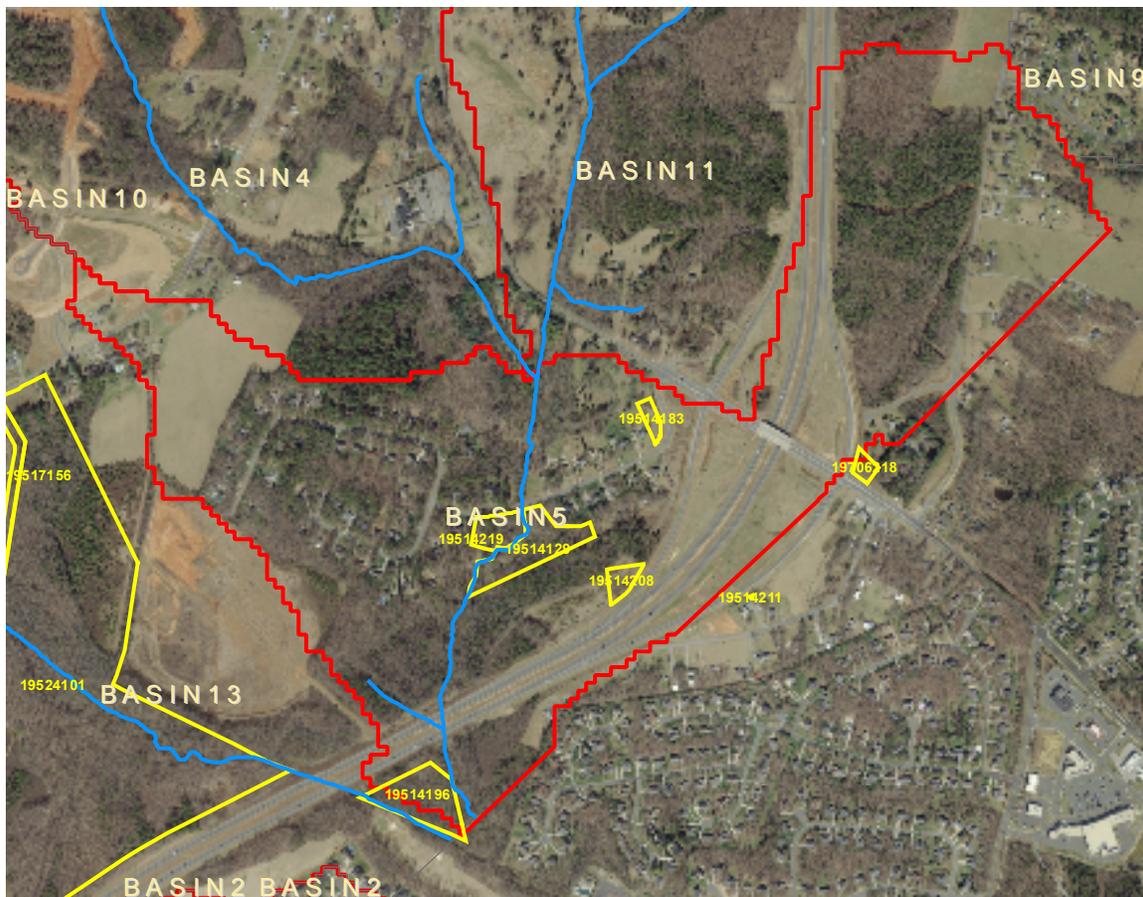
combination of I-485 road surface, golf course and medium density residential combines to cause the high pollutant loads. There appears to be minimal opportunity for land acquisition in Focus Area 1, however NC DOT has indicated their desire to partner with MCSWS within road ROW. There is very limited retrofit opportunity within the Shannamara neighborhood.



**Figure 25: Focus Basin 2**

***Focus Basin 5 (Lawyers Road and I-485)***

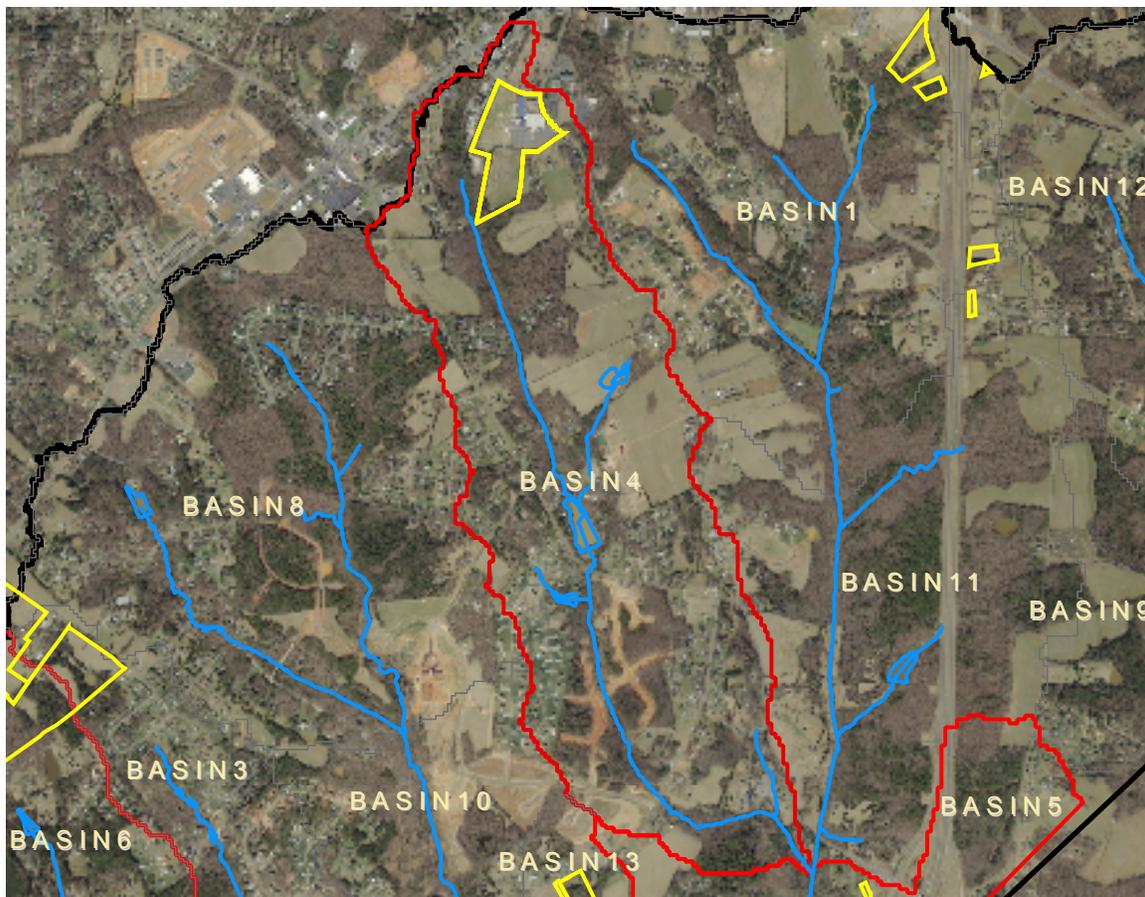
Figure 26 shows the extent of Focus Basin 5. It is comprised of I-485 with limited large lot residential. The key to this basin is capturing and treating runoff from I-485. NC DOT owns property where runoff from I-485 enters Goose Creek. During the site evaluation there appeared to be an impoundment on this property that may partially treat the runoff. Additional measures will need to be constructed to provide additional treatment to meet the goals outlined previously, particularly for NH4 and fecal coliform.



**Figure 26: Focus Basin 5 (Note: Publicly owned property shown in yellow).**

***Focus Basin 4 (Lawyers Road)***

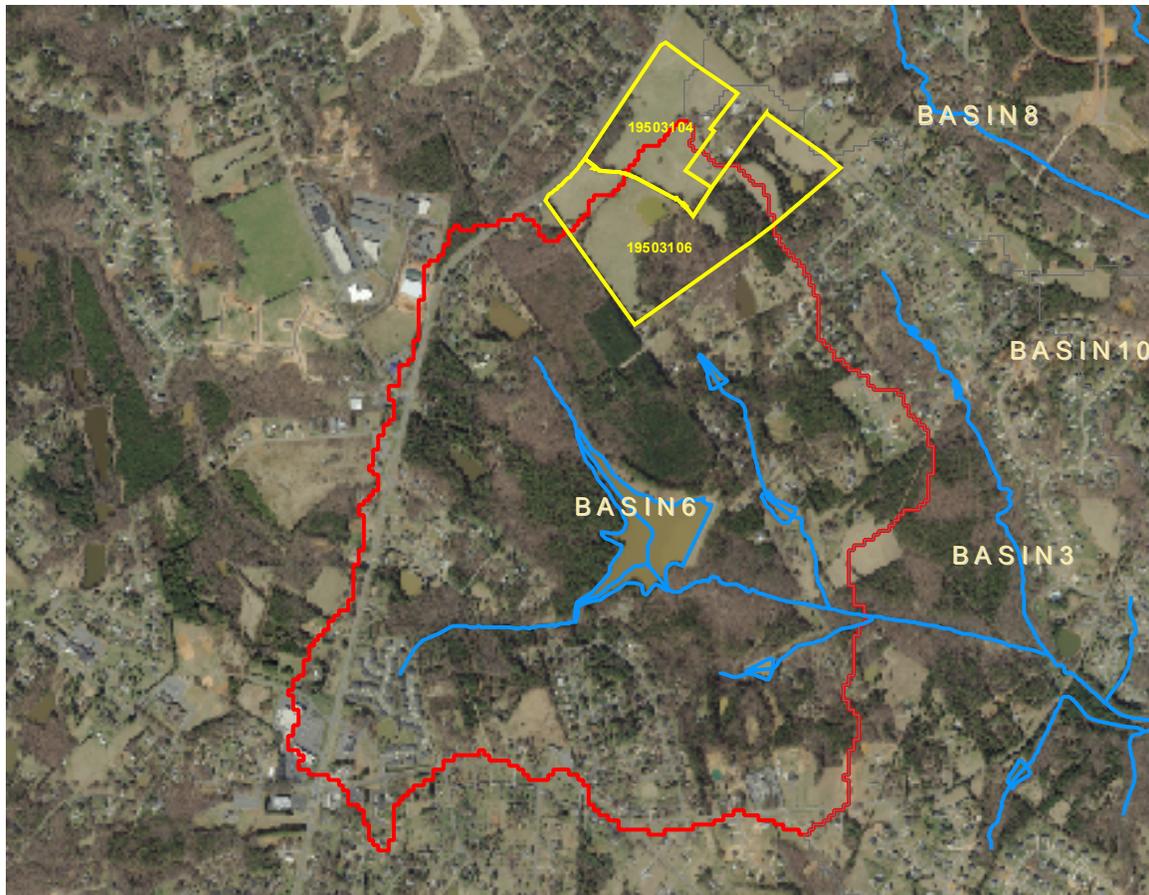
Figure 27 displays the extent of Focus Basin 4. It is essentially bisected by Lawyers Road from north to south. There is a substantial impoundment located in the center of the basin that could be retrofitted to provide detention and additional water quality treatment. The pond is currently poorly maintained and possibly a source of sediment. The headwaters of the basin are located at NC 51 and dominated by Queens Grant School. Bain Elementary School has an existing rain garden that treats a portion of a parking lot. Additional infiltration features should be retrofitted into the site. The basin is typified by agricultural plots with large lot residential and less medium density residential.



**Figure 27: Focus Basin 4.**

***Focus Basin 6 (Well Road)***

Figure 28 shows the distribution of Focus Basin 6, which is dominated by McWhirter Lake. It is essential for this catchment that McWhirter Lake remain intact and enhanced if possible. It provides significant treatment for several medium density residential developments and commercial areas.



**Figure 28: Focus Basin 6 (Public Parcels in Yellow).**

## Public Parcels

The intent of this Section is to identify publicly owned parcels for BMP retrofit. Specifically, publicly owned parcels that are significant sources of pollution and are located in one of the “Focus” areas have been assigned the highest priority.

There are currently 20 parcels in public ownership in the Goose Creek Watershed. These parcels are located throughout the watershed, but are mainly focused in areas around I-485 and Lawyers Road. Where beneficial to water quality, these properties should be further investigated to determine the final suitability for BMP installation using this report as a guide. Figure 29 shows the distribution of the parcels in public ownership in the Goose Creek Watershed. The parcels were evaluated and prioritized using the following criteria:

1. Position either on or downstream of a basin with a high or moderately high overall rank for upland pollutant loading.
2. Proximity to the stream. Parcels directly adjacent to the stream were ranked higher.
3. Parcels with adequate space for installation of reasonably sized BMPs were ranked higher. If there did not appear to be enough space for a BMP, the parcel was disqualified.
4. Parcels receiving runoff from more than two square miles were disqualified.
5. Parcels able to treat high concentrations of impervious area, regardless of size were ranked higher.

Of the 20 public parcels in the Goose Creek Watershed, 4 meet the criteria listed above. The Priority Parcels are presented in Table 18. Figures 30 – 32 are aerial photos of the High Priority Parcels.

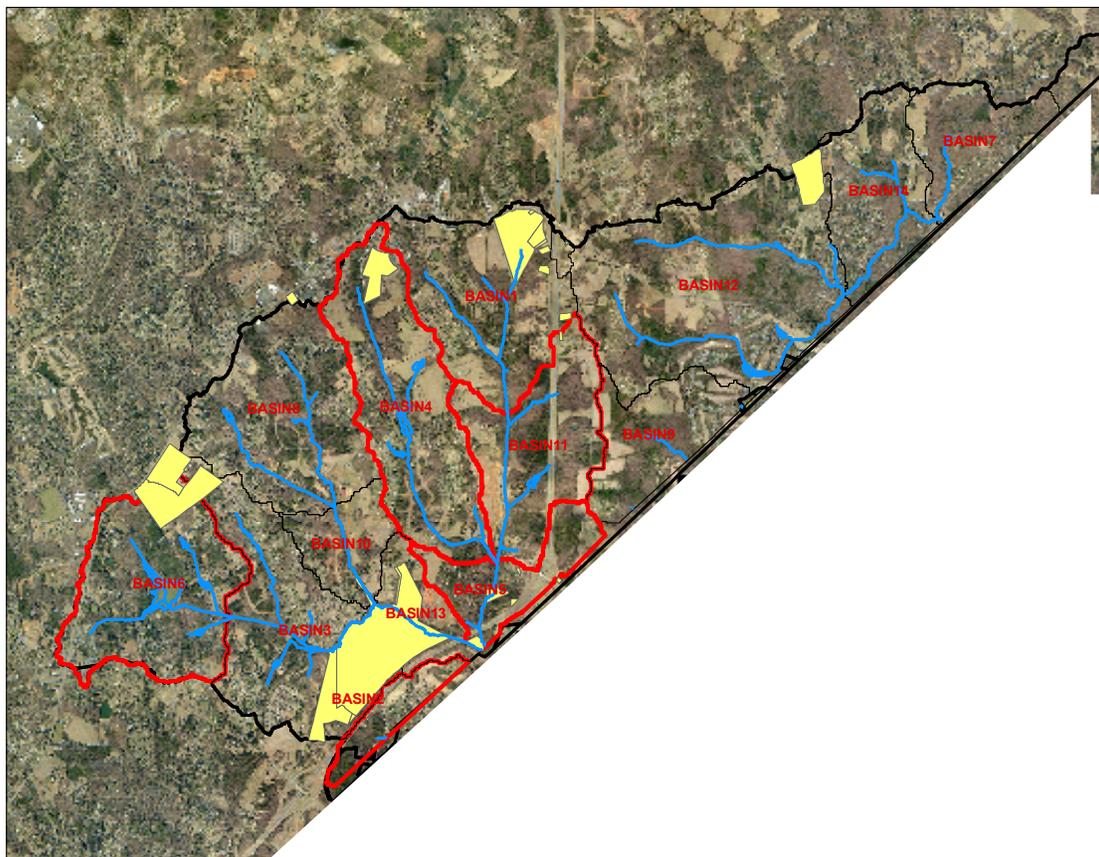
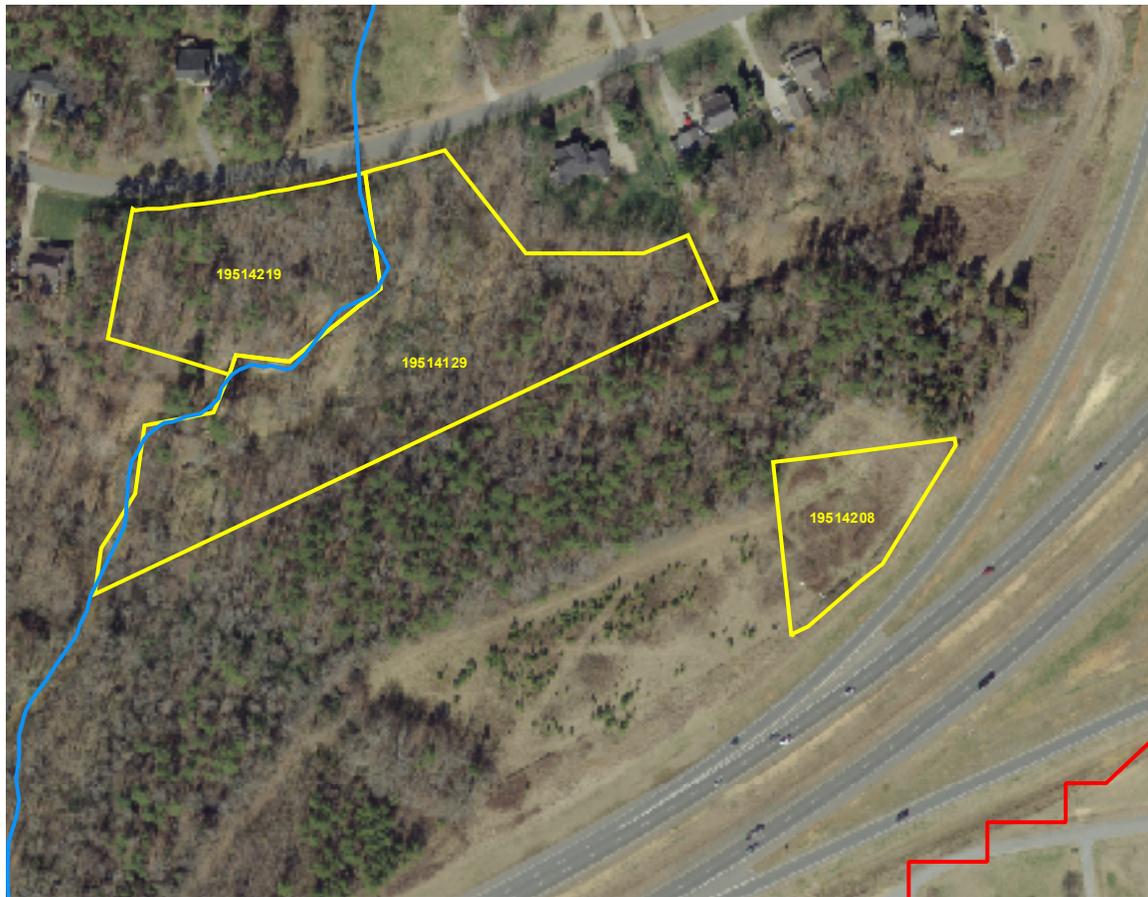


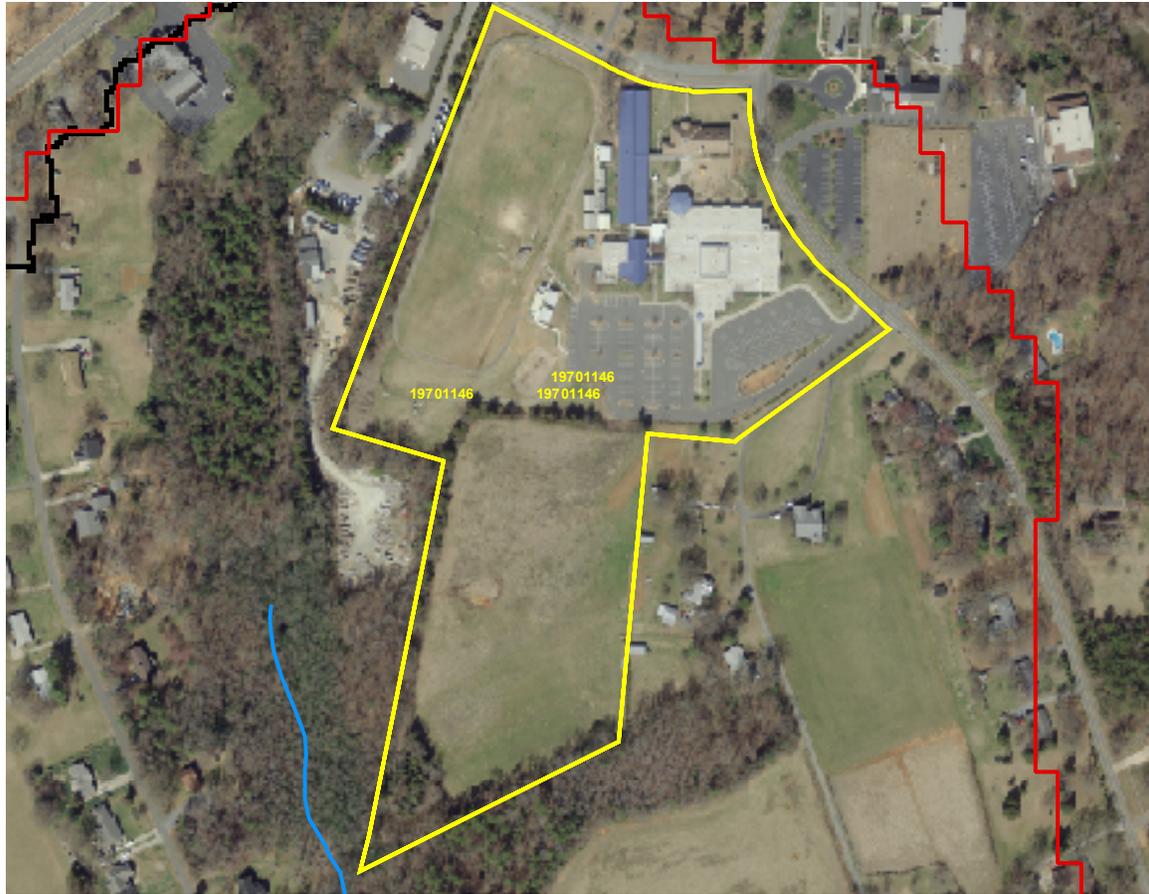
Figure 29: Goose Creek Watershed Public Parcels.

Table 18: Public Parcels Meeting BMP Criteria and Priority.

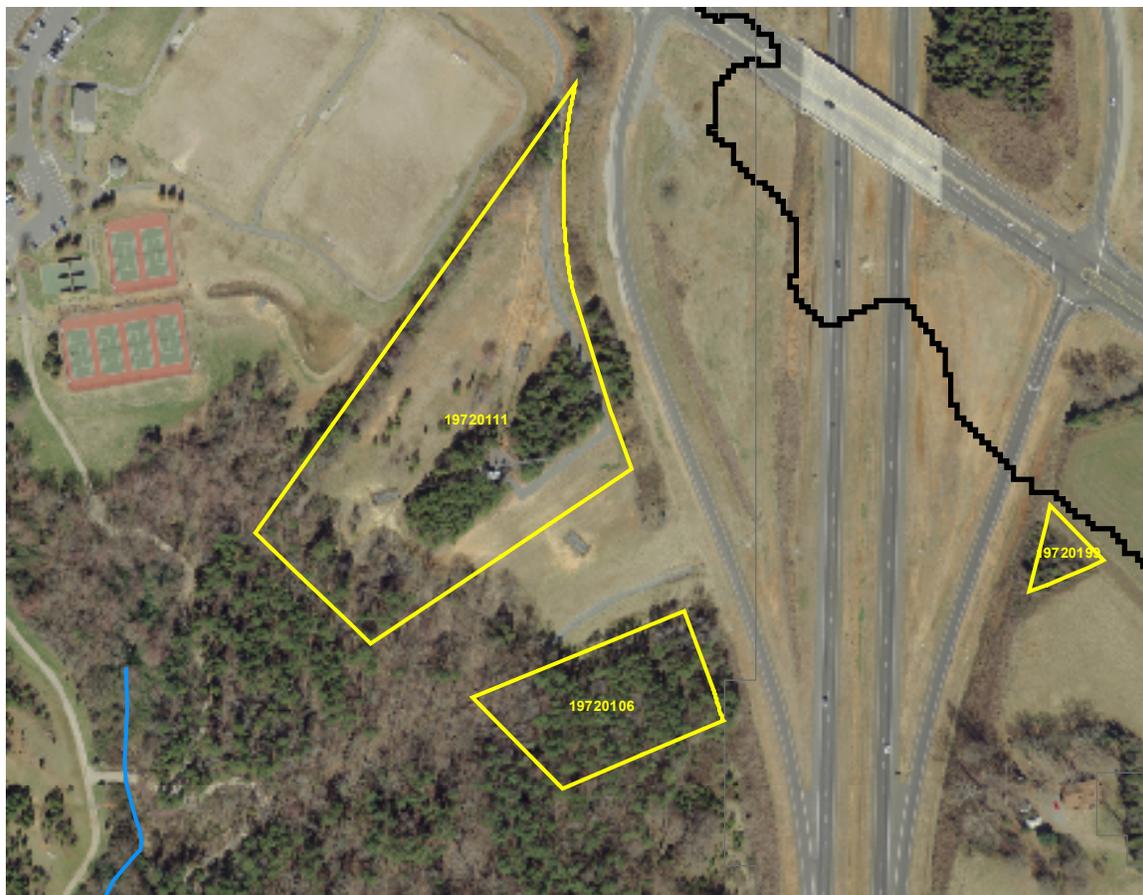
Parcel	Owner Info.	Priority
19701146	CHARLOTTE MECKLENBURG SCHOOLS	Medium
19514129	DEPT OF TRANSPORTATION	High
19514183	DEPT OF TRANSPORTATION	Low
19514196	DEPT OF TRANSPORTATION	Low
19514208	DEPT OF TRANSPORTATION	Low
19514211	DEPT OF TRANSPORTATION	Medium
19514219	DEPT OF TRANSPORTATION	High
19523107	DEPT OF TRANSPORTATION	Low
19523204	DEPT OF TRANSPORTATION	Low
19704137	DEPT OF TRANSPORTATION	Low
19704138	DEPT OF TRANSPORTATION	Low
19706218	DEPT OF TRANSPORTATION	Low
19720106	DEPT OF TRANSPORTATION	Low
19720111	DEPT OF TRANSPORTATION	Low
19720199	DEPT OF TRANSPORTATION	Low
19503104	MECKLENBURG COUNTY	Low
19503106	MECKLENBURG COUNTY	Low
19517156	MECKLENBURG COUNTY	Low
19523106	MECKLENBURG COUNTY	Low
19524101	MECKLENBURG COUNTY	Low



**Figure 30: Aerial Photo of Parcels 19514219 (High Priority), 19514129 (High Priority) and 19514208 (Low Priority).**



**Figure 31: Aerial Photo of Parcel 19701146 (Medium Priority).**



**Figure 32: Aerial Photo of Parcels 19720111(Low Priority) and 19720106 (Low Priority).**

## **5.2 Stream Channel Management Opportunities**

The management opportunities outlined in this plan are based on numerous considerations. The analysis of collected data easily allows a ranked hierarchy based on need; however, project feasibility is of equal importance and takes in account additional factors. For example, the location of utility right-of-ways can constrain design parameters or could be costly to relocate. The number of private property owners within the proposed project area plays a crucial role in determining scope and size. The procurement of easements can be challenging and time consuming, as a result, the lower number of adjacent land owners is considered more favorable. The presence and condition of a riparian buffer can also be a deciding factor during the prioritization process. A stream with little to no buffer is often highly prioritized. An intact buffer can hasten the lateral instability commonly found in the streams of Goose Creek Watershed. Also, riparian buffers with large mature trees increase cost and may limit restoration and enhancement techniques available. Table 19 identifies the highest priority stream reaches in the Goose Creek Watershed.

For the purposes of mitigation credit, the US Army Corps of Engineers defines restoration and enhancement as follows (USACE, 2003):

*Restoration – the process of converting an unstable altered or degraded stream corridor, including adjacent buffers and flood prone areas, to its natural stable condition. Restoration is based on reference conditions and includes restoring the appropriate channel dimension, pattern and profile. For impacts to fair or poor quality waters, the mitigation credit ratio is generally 1.0 (i.e. for every 100 feet of stream impact, 100 feet of stream restoration would be required for mitigation).*

*Enhancement Level I – mitigation category that includes improvements to the stream channel and riparian zone that restore dimension and profile, but do not address pattern. (required for every 100 feet of impact).*

*Enhancement Level II – mitigation category for measures that improve channel stability, water quality and habitat, but fall short of restoring both dimension and profile. Examples include bank stabilization, vegetating riparian buffers and using in-stream structures to enhance stability and habitat.*

**Table 19: Highest Priority Goose Creek Stream Reaches**

Reach	Rank
DSTOUS296	1
DSTOUS329	2
DSTOUS357	3
DSTOUS299	4
DSTOUS142	5
DSTOUS184	6

### **Reach DSTOUS296**

Reach DSTOUS296 is located in Basin 14 upstream of an impoundment (see Figure 33). There is rip-rap on the upstream portion of the reach and the trees have good root depth. Gravel riffles, and a beaver dam are present. 300 ft of stream has been denuded from beaver dam breach. Woody debris and root mats form habitat. Some mid-channel bars exist. Bedrock nick-points present. Recommendation is Enhancement Level 1.

Recommendation: Enhancement Level 1  
Estimated Cost: \$844,735  
System: Minor

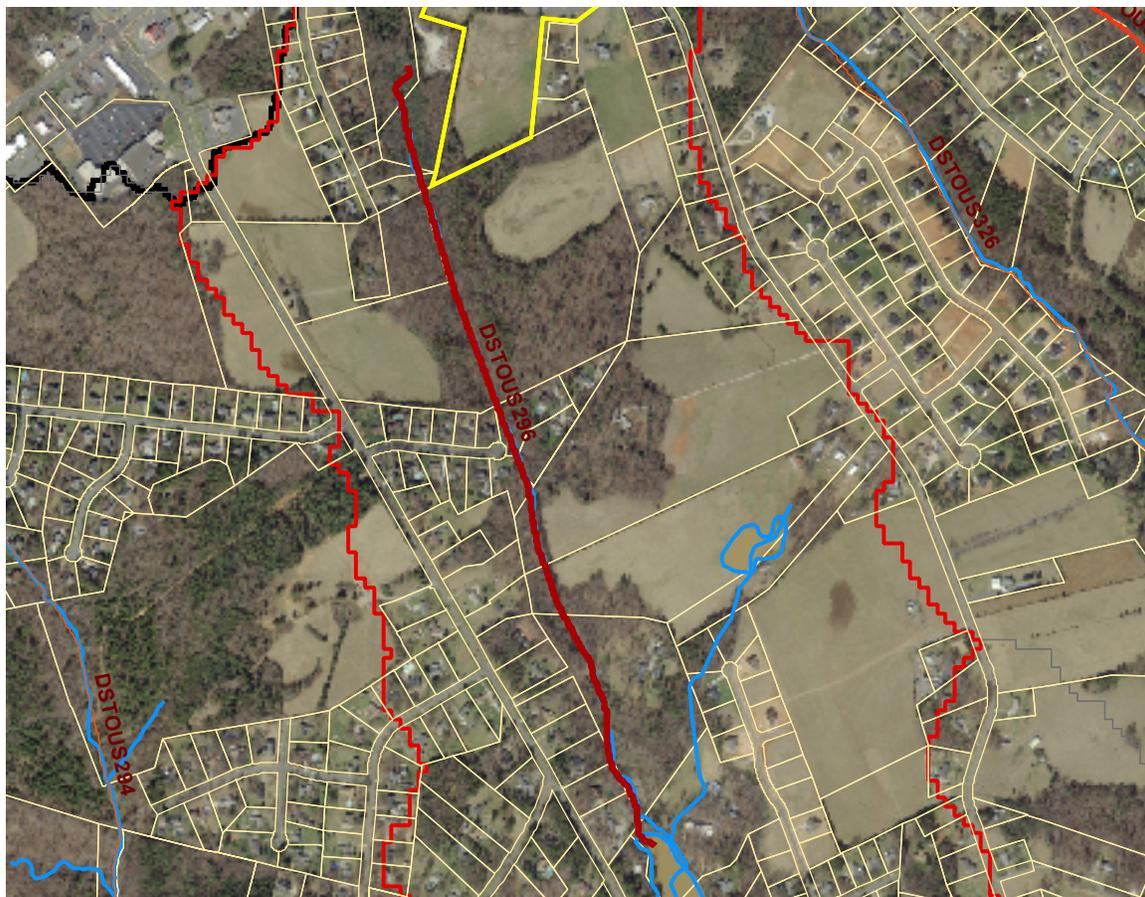


Figure 33: Reach DSTOUS296 Area Map.

**Reach DSTOUS329**

Reach DSTOUS329 is located in Basin 12 and flows through a relatively undeveloped stream corridor (see Figure 34). There is a well-vegetated buffer, except the downstream left bank is pasture. Banks are vegetated thoroughly with shrub and trees. Bed is composed of silt and sand. Several beaver dams are present. Downstream area has extreme bank erosion from cattle.

<u>Recommendation:</u>	Enhancement Level 1
<u>Estimated Cost:</u>	\$851,879
<u>System:</u>	Minor



**Figure 34: Reach DSTOUS329 Area Map.**

**Reach DSTOUS357**

Reach DSTOUS357 is located in Basin 1 and flows through a relatively undeveloped stream corridor (see Figure 35). A significant head-cut is present and the stream has a sandy bottom. Several bedrock nick-points were noted. Numerous deep pools below blockages have formed. Poor riffle pool sequence was noted. Numerous vegetated point bars and bank full benches present. Reach receives significant concentrated runoff from I-485.

<u>Recommendation:</u>	Restoration
<u>Estimated Cost:</u>	\$349,193
<u>System:</u>	Minor

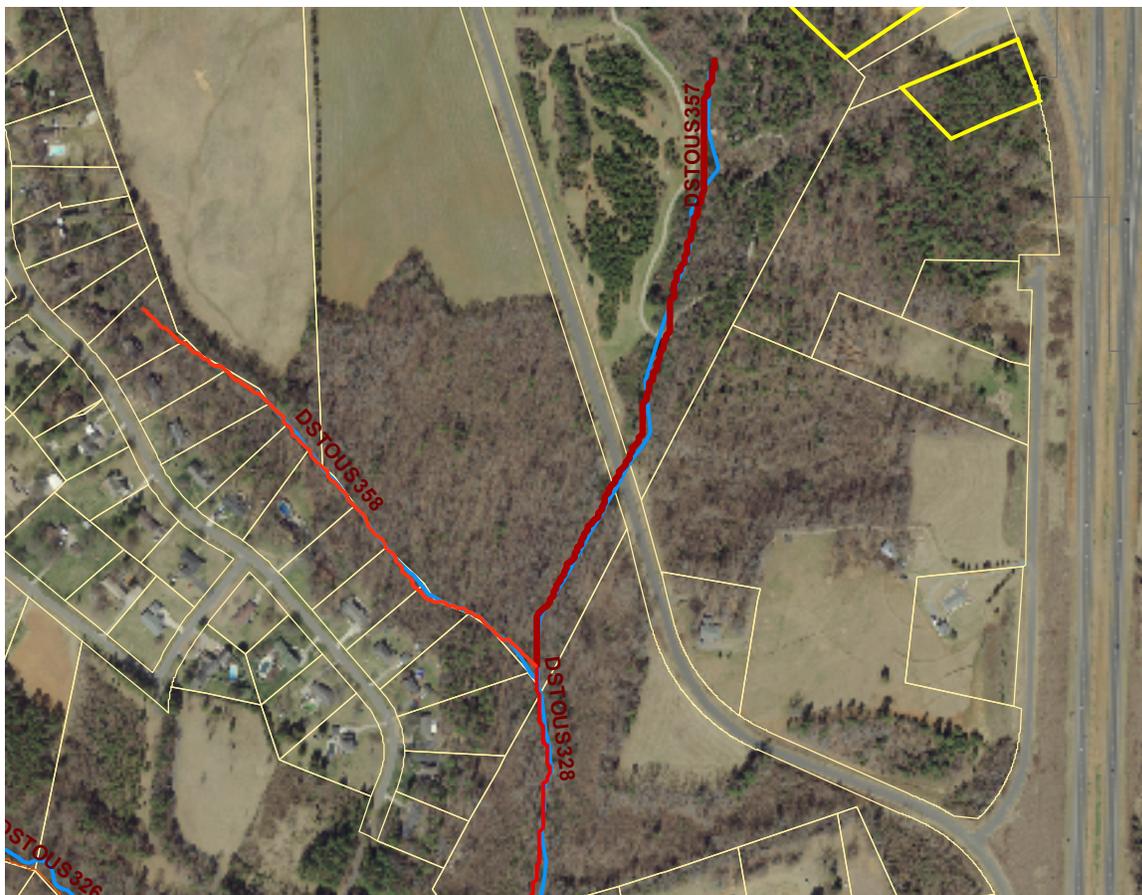
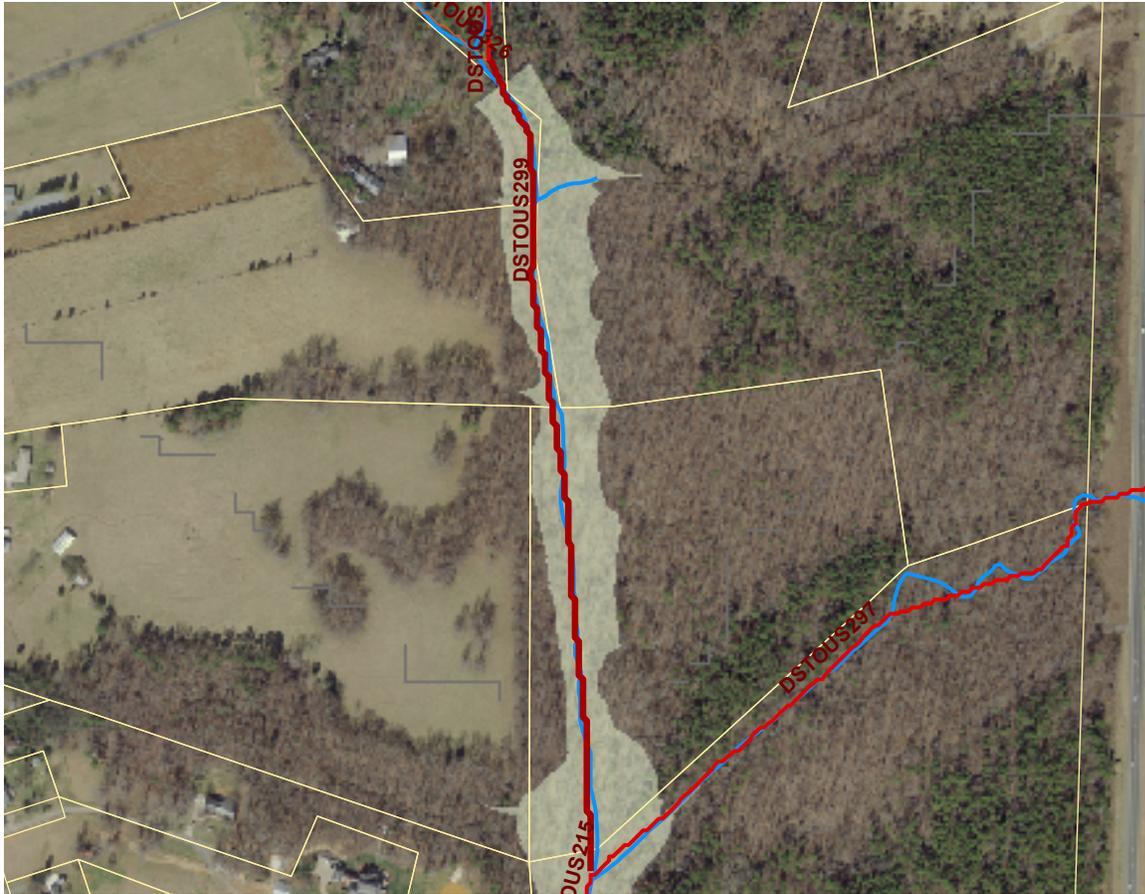


Figure 35: Reach DSTOUS357 Area Map.

**Reach DSTOUS299**

Reach DSTOUS299 is located in Basin 1 and flows through a relatively undeveloped stream corridor downstream of DSTOUS357 (see Figure 36). It may be beneficial to combine these two projects into a single effort. Livestock have access to the stream causing significant localized erosion and cows were noted in-stream at the time of assessment. Fencing of the livestock out of the creek should be a part of any restoration or enhancement effort. Notable bedrock and cobble are present. Pools are actively filling with sand and silt. Most of the entire stream reach is severely impacted by cattle. High BEHI with low NBS was noted. Good ripple pool sequence, very long riffles with cobbles and boulders.

<u>Recommendation:</u>	Restoration
<u>Estimated Cost:</u>	\$397,271
<u>System:</u>	Major



**Figure 36: Reach DSTOUS299 Area Map.**

**Reach DSTOUS142**

Reach DSTOUS142 is located in Basin 13 and flows through a relatively undeveloped stream corridor that is almost entirely in public ownership (see Figure 37). Good riffle pool frequency; pools shallow; riffles embedded with coarse sand. Mid-channel bars present. Bed is fully shaded with mature vegetation. Habitat consists of large cobble and boulders. Banks are raw due to little surface coverage, good root depth from hardwoods at top of bank. Bedrock nick-points throughout the reach were noted.

<u>Recommendation:</u>	Restoration
<u>Estimated Cost:</u>	\$774,953
<u>System:</u>	Major

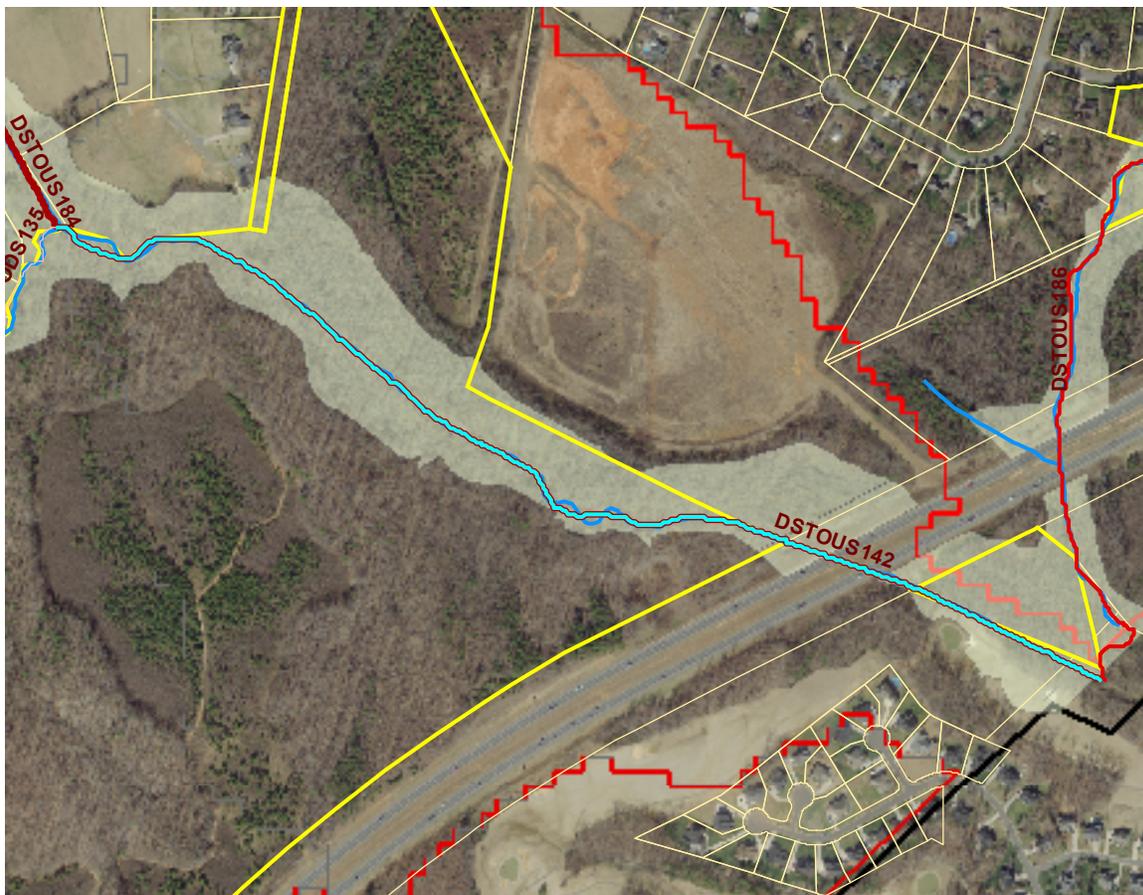


Figure 37: Reach DSTOUS142 Area Map.

**Reach DSTOUS184**

Reach DSTOUS184 is located in Basin 10 and flows through a developed stream corridor just upstream of DSTOUS142 (see Figure 38). These 2 reaches should be combined into a single project if possible. Stream is vertically stable, and actively aggrading with coarse sediment from upstream bank erosion. Stream is over-widening. Left bank buffer protection is inadequate and a good candidate for reforestation. Gravel and small boulder riffles present with poor frequency. Good pool depth variation bed is partially shaded. Banks are partially vegetated with grass and shrubs. Deep pools are limited to meanders and are actively filling with sand. Mid-channel bars of gravel were noted. Log jams were observed within the lower portion of the bank. Good surface protection. Invasive plant species are present throughout. Several transverse bars present. Habitat consists of undercut banks and large cobble.

<u>Recommendation:</u>	Restoration
<u>Estimated Cost:</u>	\$660,333
<u>System:</u>	Major



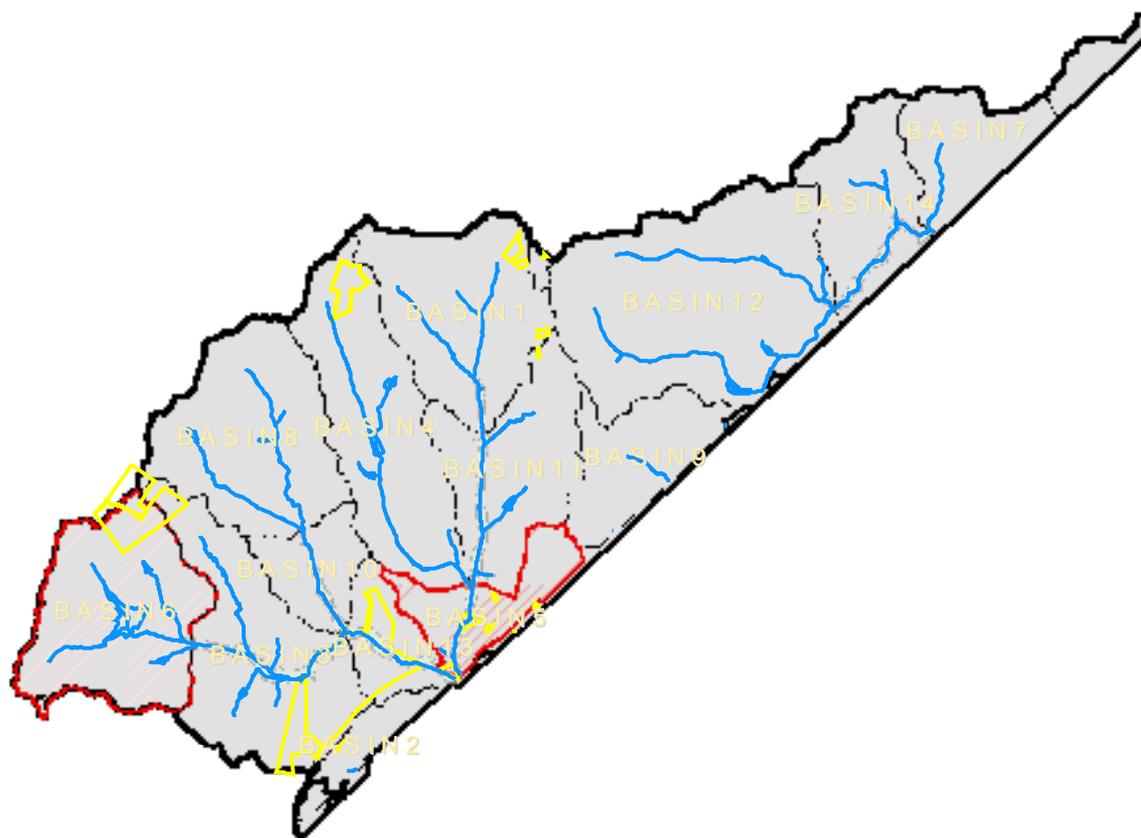
**Figure 38: Reach DSTOUS184 Area Map.**

### **5.3 Stream Buffer Restoration Areas**

The intent of this section is to identify basins with the highest percentage of impacted (un-forested) stream buffer. Table 20 and Figure 39 present the results of the tree canopy analysis. All of the basins had more that 74% of the buffer forested which is significant. Also, the data utilized to prepare the estimates is almost 10 years old and a grant has been applied for to update the information. At this time, it is recommended that prior to the initiation of any projects the analysis be redone with the anticipated updated information.

**Table 20: Results of the Stream Buffer Tree Canopy Analysis**

Basin	Percent of Buffer Intact	Rank
BASIN6	74%	1
BASIN5	81%	2
BASIN4	87%	3
BASIN12	89%	4
BASIN2	89%	5
BASIN3	89%	6
BASIN11	91%	7
BASIN13	91%	8
BASIN1	91%	9
BASIN9	93%	10
BASIN8	95%	11
BASIN10	95%	12
BASIN14	96%	13
BASIN7	98%	14



**Figure 39: Results of the Tree Canopy Analysis (priority basins are outlined in red).**

#### **5.4 Master Planning for Restoration, Retrofit and Preservation Projects**

A minimum of two (2) detailed Master Plans will be developed to guide restoration, retrofit and preservation projects in the Goose Creek Watershed. The goal of these Master Plans is to restore Goose Creek to a fully functioning and supporting stream ecosystem. The Master Planning process will start in the Focus Basins identified in Section 5.1.1 where the most impaired catchments are located. The planning process will begin with a thorough evaluation of all properties (including public and private) located in these Focus Basins to identify specific opportunities for restoration, retrofit and preservation projects, including properties to be recommended for acquisition by the County due to their water quality benefit. After the tree canopy data set is updated (expected in January 2010) specific recommendations will be made regarding buffer reforestation projects. The highest priority will be given to potential projects (including BMP retrofits, buffer reforestations and stream channel restorations) located on publicly owned properties. However, public property in the watershed is limited. Consideration will be given to the initiation of these projects as soon as possible. Once potential projects have been identified, a draft budget will be developed and funding sources specified. If grants will be included as a funding source, the grants and funding cycles will be specified as well as the necessary local match. At a minimum, the Master Plans will include the following:

- Specific location of all recommended projects (include on map).
- Detailed description of the projects, including type, size, etc. (include preliminary design sketches of the projects)
- Water quality benefit of the projects, including an estimate of pollutant removal capabilities.
- Budgets and funding sources for the projects.
- Individual project prioritization.
- Major or minor system.

An important component of maintaining water quality conditions in Goose Creek is ensuring the proper operation and maintenance of BMPs and septic systems installed to date to mitigate impacts from existing development as well as retrofit BMPs installed through the implementation of the Master Plans. This effort will begin in April of 2009 and continue through December 2009 and will include the identification and inspection of all existing BMPs and at least 200 septic systems in the watershed. Deficiencies detected will be reported to responsible parties for correction. A regular schedule of BMP inspections in the watershed will be developed and implemented for both public and private BMPs.

## **SECTION 6. MEASURING SUCCESS AND ADAPTIVE MANAGEMENT**

### **6.1 Establishing an Ongoing Water Quality Monitoring Program**

As discussed in Section 2.2, Mecklenburg County has historically collected water and macroinvertebrate samples from Goose Creek at monitoring site MY9, which is located at Stevens Mill Road in Union County approximately 4000 feet downstream of the Mecklenburg County and Union County line (see Figure 2). There is a USGS stream gage at Goose Creek and Mill Grove Road in Union County. A thorough evaluation has been completed of the historical chemical, physical and biological monitoring activities in the watershed and routine monitoring is being conducted to provide baseline data to measure the effectiveness of restoration measures as they are implemented

### **6.2 Annual Status Report**

By December 31 of every year beginning in 2009 and continuing through the completion of the Watershed Management Plan (anticipated for December 31, 2024), the Mecklenburg County Water Quality Program will complete a Goose Creek Watershed Management Plan Annual Status Report to at a minimum include the following information:

- Status of compliance with goals identified in Table 12.
- Status of all projects underway in the watershed.
- Recommended changes to Watershed Management Plan.

This report will be made available to all the key players involved in the implementation of the Watershed Management Plan, including the Director of Water & Land Resources, Manager of Storm Water Engineering, Manager of the Water Quality Program, Supervisor of the Yadkin Section and a representative from the Town of Mint Hill. This group will serve as the “Watershed Management Evaluation Team.”

### **6.3 Adaptive Management**

The Watershed Management Evaluation Team will meet at least annually following the completion of each Watershed Management Plan Annual Status Report to evaluate the effectiveness of the Plan at meeting the goals reported as outlined in Section 6.2. This evaluation will be based on the data and information contained in the Annual Report as well as other pertinent facts and information provided regarding the effectiveness of the Plan at meeting established goals. During these meetings, consideration will also be given as to the effectiveness of the goals at measuring the effectiveness of the Plan. It may be necessary that goals be changed or that changes be made to the Plan. These changes will be reflected in the Watershed Management Plan and will become effective immediately.

## **SECTION 7. CONCLUSION**

The Goose Creek Watershed has been designated critical habitat for the federally endangered Carolina Heelsplitter mussel and a Water Quality Recovery Program for fecal coliform has been developed for the watershed. Implementation of the Site Specific Management Plan is expected to prevent continued degradation of stream water quality from new development; however, pre-existing sources of pollution remain partially or completely un-mitigated. In order to restore the water quality in Goose Creek, pre-existing sources of pollution will need to be mitigated and in-stream stressors to benthic macroinvertebrate life removed. In this way Mecklenburg County can achieve its ultimate goal for Goose Creek of improving water quality conditions such that designated uses are met and the creek is no longer impaired. The effective implementation of this Watershed Management Plan will enable this to be accomplished but it will take time. It is currently anticipated that this process will take a minimum of 15 years between 2009 and 2024.

## Appendix A References

- Alan, C.J., 2004. Water Quality and Stream Stability Monitoring for Goose Creek Mecklenburg and Union Counties, North Carolina 2001 - 2003. US Department of Transportation, Research and Special Programs Administration, 400 7<sup>th</sup> Street, SW, Washington, DC 20590-0001. Report number 2004-06.
- Bales, J.D., J.C. Weaver, and J.B. Robinson. 1999. Relation of Land Use to Streamflow and Water Quality at Selected Sites in the City of Charlotte and Mecklenburg County, North Carolina, 1993-98. USGS Water-Resources Investigations Report 99-4180. Raleigh, NC.
- CH2MHill, 2003, Charlotte Area Local Watershed Plan. Prepared for North Carolina Wetlands Restoration Program, Raleigh, North Carolina.
- Charlotte-Mecklenburg Storm Water Services, 1997, Mecklenburg County Floodplain Management Guidance Document. Charlotte, NC
- U.S. Department of Agriculture – Soil Conservation Service, 1980, Soil Survey of Mecklenburg County, North Carolina. U.S. Government Printing Office: 1979—273-222/11.
- Ferrell, G.M., 2001, Effects of Land Use on Water Quality and Transport of Selected Constituents in Streams in Mecklenburg County, North Carolina, 1994-98. USGS Water-Resources Investigations Report 01-4118. Raleigh, North Carolina.
- Fridell, J.A., 1997, Recovery Plan for Carolina Heelsplitter (*Lasmigona decorate*) Lea. U.S. Fish and Wildlife Service, Southeast Region. Atlanta Georgia.
- Mecklenburg County Water Quality Program and NC Department of Environment and Natural Resources Division of Water Quality, 2005, Total Maximum Daily Loads for Fecal Coliform for Goose Creek, North Carolina [Waterbody ID NC\_13-17-18A and 13-17-18b). 1617 Mail Service Center, Raleigh, NC 27699-1617.
- Mecklenburg County Water Quality Program, 2007, Goose Creek Recovery Program for Fecal Coliform Bacteria - Stream Walk Final Report. 700 North Tryon Street, Charlotte, NC.
- Mecklenburg County Water Quality Program, 2009, Water Quality Monitoring Plan for Goose Creek Watershed Water Quality Recovery Program for Fecal Coliform Bacteria. 700 North Tryon Street, Charlotte, NC.
- North Carolina, 2004, North Carolina Water Quality Assessment and Impaired Waters List (2004 Integrated 305(b) and 303(d) Report) – Public Review Draft, accessed August 15, 2005, at URL <http://h2o.enr.state.nc.us/tmdl/documents/>

- 2004IntegratedReporttext\_001.pdf
- North Carolina, 2003, Yadkin-Pee Dee River Basinwide Water Quality Plan, March 2003, at URL  
<http://h2o.enr.state.nc.us/basinwide/yadkin/Yadkin%20final%202003%20BP/Yadkin%20final%20complete%20plan%204103.pdf>
- Robinson, J.B., W.F. Hazell, and R.G. Garrett. 1996. Precipitation, Streamflow, and Water-Quality Data from Selected Sites in the City of Charlotte and Mecklenburg County, North Carolina, 1993-95. USGS Open-File Report 96-150. Raleigh, NC.
- Robinson, J.B., W.F. Hazell, and R.G. Garrett. 1998. Precipitation, Streamflow, and Water-Quality Data from Selected Sites in the City of Charlotte and Mecklenburg County, North Carolina, 1995-97. USGS Open-File Report 98-67. Raleigh, NC.
- Rosgen, D. 2008. Personal communication with Brian Sikes, Mecklenburg County Storm Water Services.
- Sarver, K.M. and B.C. Steiner. 1998. Hydrologic and Water-Quality Data from Mountain Island Lake, North Carolina, 1994-97. USGS Open-File Report 98-549. Raleigh, NC.
- Sarver, K.M., W.F. Hazell, and J.B. Robinson. 1999. Precipitation, Atmospheric Deposition, Streamflow, and Water-Quality Data from Selected Sites in the City of Charlotte and Mecklenburg County, North Carolina, 1997-98. USGS Open-File Report 99-273. Raleigh, NC.
- Tetra Tech, Inc., 2004, Post Construction Ordinance Development Phase I Report – Draft. Prepared for Mecklenburg County Water Quality Program and Charlotte Storm Water Services, Mecklenburg County, North Carolina.
- Tetra Tech, Inc., 2005, Mecklenburg County Site Evaluation Tool Model Documentation. Prepared for Mecklenburg County Water Quality Program, Mecklenburg County, North Carolina.

# *Goose Creek Water Quality Recovery Program Plan for the Fecal Coliform TMDL*



*Prepared for:*

**Mecklenburg County  
Mint Hill  
Stallings  
Indian Trail**

*Prepared by:*

**Mecklenburg County Storm Water Services  
Version 2: November 12, 2009**



# Goose Creek Water Quality Recovery Program for the Approved Fecal Coliform TMDL

## TABLE OF CONTENTS

<b>SECTION 1.0</b>	<b>BACKGROUND .....</b>	<b>1</b>
<b>SECTION 2.0</b>	<b>PROGRAM DEVELOPMENT .....</b>	<b>6</b>
2.1	Components of the Water Quality Recovery Program (WQRP) for Goose Creek.....	6
2.2	Pollutant of Concern Addressed by the Water Quality Recovery Program.....	6
2.3	Purpose of the Water Quality Recovery Program.....	7
2.4	Purpose of the Water Quality Recovery Program (WQRP) Plan .....	8
2.5	Water Quality Recovery Program Advisory Group.....	8
2.6	Water Quality Recovery Program Website.....	9
2.7	Water Quality Recovery Program Monitoring Plan .....	9
2.7.1	Purpose.....	9
2.7.2	Water Quality Monitoring Strategy .....	9
2.7.3	Stream Walks .....	9
2.7.4	Land-Use Monitoring.....	11
2.7.5	In-Stream Monitoring .....	13
2.7.6	Continuous Monitoring and Alert Notification Network (CMANN).....	16
2.7.7	USGS Monitoring .....	17
2.7.8	Monitoring for Identification and Elimination of Pollution Sources.....	17
2.7.9	Quality Assurance / Quality Control.....	20
2.7.10	Data Analysis .....	20
2.8	Plan and Schedule for Identification of Storm Water Outfalls .....	21
<b>SECTION 3.0</b>	<b>PROGRAM IMPLEMENTATION .....</b>	<b>23</b>
3.1	Structural Best Management Practices .....	23
3.1.1	Purpose.....	23
3.1.2	Structural BMP Analysis .....	23
3.1.2.1	Review of Fecal Coliform TMDL Implementation Plans.....	23
3.1.2.2	Fecal Coliform Removal Efficiencies for BMPs .....	24
3.1.2.3	Fecal Coliform Data from Local Pilot BMP Monitoring Program .....	27
3.1.2.4	Observations from BMP Data Analysis .....	28
3.1.2.5	Recommendations .....	28
3.1.3	Existing and Proposed Structural BMPs in the Goose Creek Watershed.....	29
3.2	Septic System Inspections (Non-Structural BMP) .....	31
3.3	Public and Staff Participation and Outreach (Non-Structural BMP).....	31
3.3.1	Methodology .....	31
3.3.2	Public Workshop.....	32
3.3.3	Staff Development .....	32
3.3.4	Newsletters.....	32
3.3.5	Dog Waste.....	32
3.4	Documenting Removal Efficiencies for Structural and Non-Structural BMPs .....	35
3.5	BMP Implementation Schedule for FY10 .....	35
<b>SECTION 4.0</b>	<b>DATA COLLECTION AND DOCUMENTATION .....</b>	<b>37</b>
4.1	Data Collection .....	37
4.1.1	Monitoring Data.....	37
4.1.2	Storm Drain Inventory Data.....	37
4.1.3	Documentation of WQRP Activities .....	38

## Goose Creek Water Quality Recovery Program for the Approved Fecal Coliform TMDL

4.2	Reports .....	39
<b>SECTION 5.0</b>	<b>PROGRAM EVALUATION .....</b>	<b>40</b>
5.1	Assessing the Effectiveness of BMPs and WQRP .....	40
5.2	Cost-Benefit Analysis .....	40
<b>SECTION 6.0</b>	<b>ADAPTIVE MANAGEMENT .....</b>	<b>42</b>
6.1	Assessing the Need for Change .....	42
6.2	WQRP Plan Updates.....	42
6.3	Program Analysis and Adaptive Management Schedule.....	42
<b>SECTION 7.0</b>	<b>SCHEDULE .....</b>	<b>44</b>
<b>SECTION 8.0</b>	<b>REFERENCES.....</b>	<b>46</b>

### Figures:

Figure 1:	Location of the Goose Creek Watershed in Mecklenburg and Union Counties .....	1
Figure 2:	Goose Creek Watershed Area .....	2
Figure 3:	Goose Creek Water Quality Recovery Program (WQRP) .....	6
Figure 4:	Distribution of Stream Walks by Jurisdiction .....	11
Figure 5:	Land-Use Distribution in the Goose Creek Watershed.....	13
Figure 6:	Location of WQRP Monitoring Sites for FY10 .....	15
Figure 7:	Specialized IDDE Monitoring Sites .....	18
Figure 8:	Livestock Impact Monitoring Sites .....	19
Figure 9:	Locations of BMPs Completed or Proposed in the Goose Creek Watershed .....	30
Figure 10:	Pet Waste Postcard (front).....	34
Figure 11:	Bags on Board Containing Pet Waste Disposal Bags .....	35
Figure 12:	Storm Drain Inlets and Outlets in EDMS.....	38
Figure 13:	Work Order Template in EDMS .....	39

### Tables:

Table 1:	MS4 Jurisdictions in the Goose Creek Watershed .....	1
Table 2:	General Information Regarding the Goose Creek Watershed .....	3
Table 3:	Miles of Streams Walked or Waded by Jurisdiction .....	11
Table 4:	Jurisdictions and Land-Use Types to be Sampled.....	12
Table 5:	Land-Use Monitoring Sites in the Goose Creek Watershed.....	12
Table 6:	Description of Land-Use Monitoring in the Goose Creek Watershed .....	13
Table 7:	In-Stream Monitoring Sites in the Goose Creek Watershed .....	14
Table 8:	Description of In-Stream Monitoring in the Goose Creek Watershed .....	16
Table 9:	Description of CMANN Monitoring in the Goose Creek Watershed .....	16
Table 10:	Estimated Enhanced Monitoring Costs .....	20
Table 11:	BMP Data from TMDL Implementation Plan, Four Mile Run, Virginia.....	24
Table 12:	BMP Data from TMDL Implementation Plan, Blacks Run & Cooks Creek, Virginia.....	24
Table 13:	Fecal Coliform Removal Efficiency for BMP Treatment Train in Littleton, CO .....	25
Table 14:	Data from Bioretention Study by the State University of New Jersey .....	25
Table 15:	Data Summarized in the State University of New Jersey Report.....	25
Table 16:	Data from 6th Biennial Storm Water Research & Watershed Conference .....	26
Table 17:	Data Obtained from the International Storm Water Database for BMPs .....	26

## Goose Creek Water Quality Recovery Program for the Approved Fecal Coliform TMDL

---

Table 18: Data from BMP Monitoring in Mecklenburg County .....	27
Table 19: Summary of all Data Collected.....	27
Table 20: Recommended BMP Removal Efficiencies for Retro-Fitted BMPs .....	29
Table 21: Locations & Types of BMPs Completed or Proposed in the Goose Creek Watershed	29
Table 22: WQRP Schedule .....	44

### Appendices:

Appendix 1: Goose Creek TMDL Notification from N.C. Division of Water Quality .....	48
Appendix 2: Water Quality Recovery Program Guidance Document.....	50
Appendix 3: Septic System Inspection Form Used in the Goose Creek Watershed .....	54
Appendix 4: Septic System Educational Material Distributed During Goose Creek Inspections	56
Appendix 5: Prioritization Scheme for Septic System Inspections .....	58

### Common Acronyms:

BMP:	Best Management Practice
DWQ:	N.C. Department of Environment and Natural Resources, Division of Water Quality
EDMS:	Environmental Data Management System
FY:	Fiscal Year running from July 1 through June 30 of the following year with the FY number based on this last year (Example: FY10 runs from July 1, 2009 through June 30, 2010)
HOA:	Homeowners' Association
MCWQP:	Mecklenburg County Water Quality Program which is a component of Charlotte-Mecklenburg Storm Water Services
MS4:	Municipally Separate Storm Sewer System
TMDL:	Total Maximum Daily Load
WQRP:	Water Quality Recovery Program

## Goose Creek Water Quality Recovery Program for the Approved Fecal Coliform TMDL

### SECTION 1.0 BACKGROUND

The Goose Creek Watershed is located in the Yadkin/Pee Dee River Basin in southeastern Mecklenburg County and northeastern Union County in the southern piedmont region of North Carolina (see Figure 1).

Figure 1: Location of the Goose Creek Watershed in Mecklenburg and Union Counties



The headwaters of the Goose Creek Watershed originate in Mecklenburg County and flow to Union County where the creek discharges to the Rocky River. The main channel of Goose Creek has a length of approximately 16.3 miles. Stevens and Duck Creeks, which originate in Mecklenburg County, are both tributaries to Goose Creek. Stevens Creek flows to Goose Creek at the Mecklenburg-Union County line west of Stevens Mill Road while Duck Creek joins Goose Creek just upstream of Brief Road in Union County. The Goose Creek Watershed contains four (4) jurisdictions that have been issued NPDES Phase II Storm Water Permits for their municipally separate storm sewer systems (MS4s), including Mecklenburg County and the Towns of Mint Hill, Stallings and Indian Trail. Table 1 below describes the area within the Goose Creek Watershed contained in these jurisdictions. Table 2 below contains general information regarding the Goose Creek Watershed.

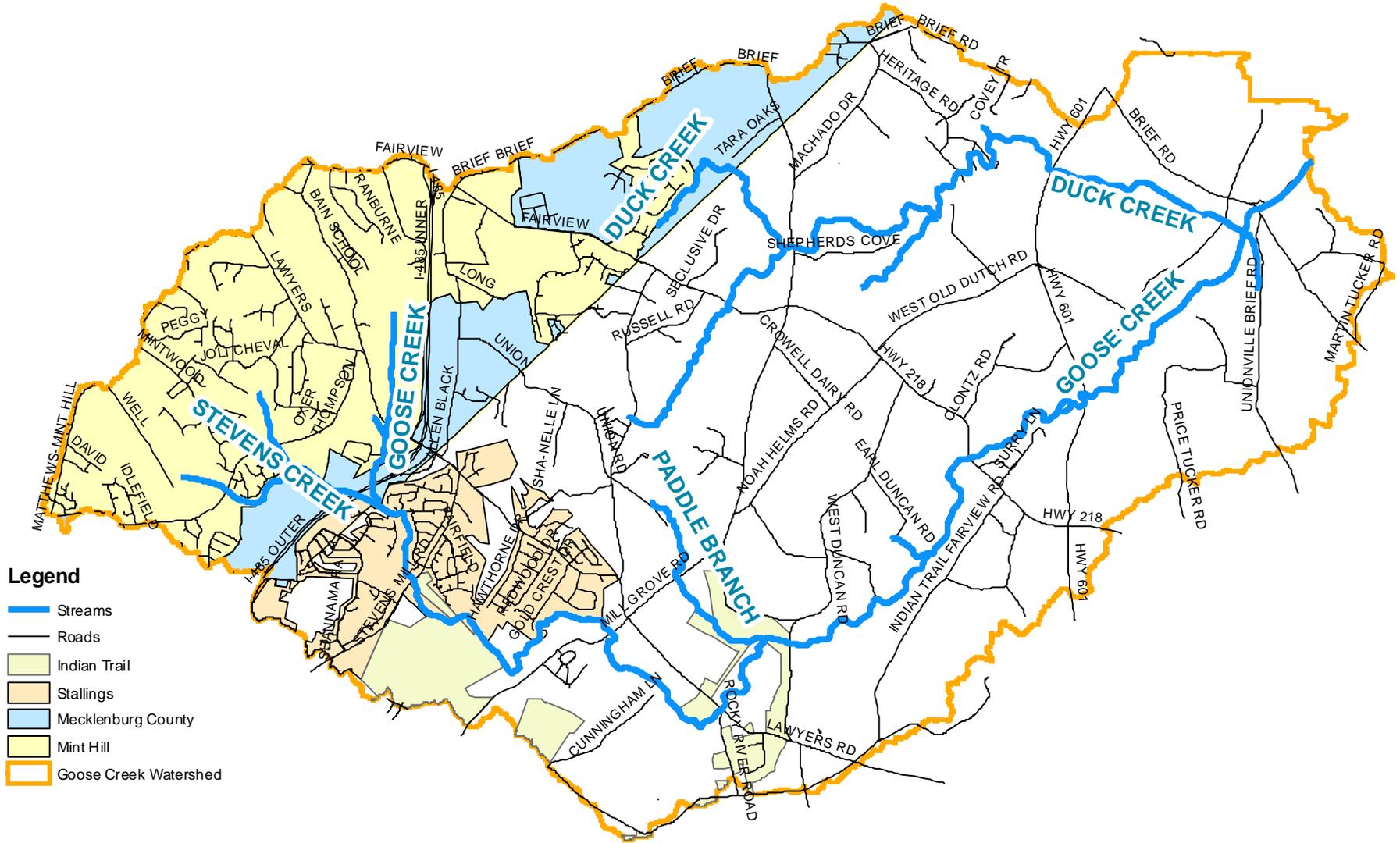
Table 1: MS4 Jurisdictions in the Goose Creek Watershed

MS4 Jurisdiction	Area in Watershed	% of Watershed
Mint Hill/Mecklenburg County(1)	7,195 acres	26%
Stallings	1,400 acres	5%
Indian Trail	855 acres	3%

(1) Mecklenburg County includes the Town of Mint Hill

# Goose Creek Water Quality Recovery Program for the Approved Fecal Coliform TMDL

Figure 2: Goose Creek Watershed Area



## Goose Creek Water Quality Recovery Program for the Approved Fecal Coliform TMDL

Table 2: General Information Regarding the Goose Creek Watershed

Watershed Area	42 square miles or 27,720 acres in the Yadkin/Pee Dee River Basin
Stream Length	Approximately 16.3 main channel miles
Stream Classification	Class C: Protected for secondary recreation, fishing, aquatic life, including propagation and survival, and wildlife.
Predominant Land-uses	Forest = 12,828 acres @ 46% Agricultural = 6,461 acres @ 23% >2 Acre Residential = 3,946 acres @ 14% 0.5 – 2 Acre Residential = 1,592 acres @ 6%
Topography	Highest elevation = 754 ft m.s.l. Lowest Elevation = 494 ft m.s.l. Generally the topography is rolling hills with moderate slopes of 2-4%.
Vegetation	Vegetation is a mix of hardwood forested areas, agriculture (row crops and hay) and grasses and shrubs associated with suburban development.
Climate	The climate is temperate with approximately 43" of rain per year.
Hydrology	Hydrology follows a typical dendritic drainage pattern typified by most piedmont areas.
Geology	Piedmont soils and occasional bedrock outcrops. This gives way to Carolina Slate Belt deposits that begin at the Mecklenburg and Union County line and extend east to where Goose Creek enters the Rocky River.
NPDES Permitted Dischargers	Oxford Glen: 15349 Bexley Place (0.075 mgd) Ashe Plantation: Quarters Lane (0.154 mgd) Country Woods: Country Woods Dr (1.036 mgd) Fairfield Plantation: Stoney Ridge Rd (0.108 mgd)
NPDES Phase II Storm Water Permits	Mint Hill and Mecklenburg County Stallings Indian Trail
Soils	Approximately 88% of the watershed is made up of Class B soils and 12% is Class C soils.
Population	The approximate population of the Goose Creek Watershed is 10,000 residents.
Aquatic Species	Typical piedmont aquatic species including several varieties of caddisflies, mayflies and stoneflies, terrestrial insects, fish, amphibians, mussels, snails and other species.

In 1998, North Carolina's 303(d) list of impaired waters identified Goose Creek from its source to the Rocky River as impaired due to elevated fecal coliform concentrations. This impairment triggered the development of a total maximum daily load (TMDL) for the watershed that was subsequently submitted and approved by EPA on July 8, 2005. The TMDL encompasses all the stream segments contained in the 303(d) list for the watershed. Goose Creek is also listed as impaired due to a lack of aquatic life; however, a TMDL has not been developed for this listing. Another issue in Goose Creek is that it provides critical habitat for the Carolina heelsplitter (*Lasmigona decorate*), a species of freshwater mussel that is listed as federally endangered by the U.S. Fish and Wildlife Service under the provisions of the Endangered Species Act. The document contained herein addresses only the fecal coliform TMDL and does not address the biological impairment or the preservation of the Carolina heelsplitter.

The Town of Mint Hill and Mecklenburg County as well as the Towns of Stallings and Indian Trail in Union County are located in the Goose Creek Watershed and have been issued NPDES

## Goose Creek Water Quality Recovery Program for the Approved Fecal Coliform TMDL

---

Phase II Storm Water Permits. Part II, *Final Limitations and Controls for Permitted Discharges*, Section A, *Program Implementation*, Paragraph 11 of these Phase II Permits specifies the following: “If the permitted MS4 becomes subject to an approved TMDL, and following notice of such by the Division, the permittee shall implement a TMDL Water Quality Recovery Program.” Parts (a) through (e) of Paragraph 11 contain additional requirements relating to the development and implementation of this Water Quality Recovery Program (WQRP) as follows:

- (a) *Within two years after receiving the Division’s notice that the permittee is subject to a TMDL, the permittee shall establish a TMDL Water Quality Recovery Program and shall identify the locations of all currently known MS4 outfalls within its jurisdictional area with the potential of discharging the pollutant(s) of concern: to the impaired segments, to their tributaries, and to segments and tributaries within the watershed contributing to the impaired segments. The permittee shall also develop a schedule to discover and locate all other MS4 outfalls within its jurisdictional area that may be discharging the pollutant(s) of concern: to the impaired stream segments, to their tributaries, and to segments and tributaries within the watershed contributing to the impaired segments.*
- (b) *Within two years after receiving the Division’s notice that the permittee is subject to a TMDL, the permittee shall develop a monitoring plan for each pollutant of concern. The monitoring plan shall include the sample location by verbal description and latitude and longitude coordinates, sample type, frequency, any seasonal considerations, and a monitoring implementation schedule for each pollutant of concern. Where appropriate, the permittee may reduce the monitoring burden by proposing to monitor outfalls that the Division would consider substantially similar to other outfalls. The permittee may also propose in-stream monitoring where it would complement the overall monitoring plan. The monitoring plan shall be adjusted as additional outfalls are identified in accordance with the schedule required in (a) above and as accumulating data may suggest.*
- (c) *The permittee shall include the location of all currently known MS4 outfalls with the potential of discharging the pollutant(s) of concern, the schedule for discovering and locating currently unknown MS4 outfalls with the potential of discharging the pollutant(s) of concern, and the monitoring plan, (all as required in (a) and (b) above, and all part of the TMDL Water Quality Recovery Program) in the first Storm Water Management Plan annual report due no earlier than two years after the Division’s initial notification of the applicability of a TMDL.*
- (d) *The next and each subsequent Storm Water Management Plan annual report shall include an assessment of the available data for each pollutant of concern, and an assessment of the effectiveness of the BMPs employed, to determine what, if any, additional BMP measures may be necessary to return the impaired segments to compliance with state water quality standards. The permittee shall implement appropriate BMPs to control the pollutant(s) of concern to the maximum extent practicable. Implementation of the appropriate best management practices constitutes compliance with the standard of reducing pollutants to the maximum extent practicable.*
- (e) *Following any review and comment by the Division on the TMDL Water Quality Recovery Program, the permittee shall incorporate any necessary changes into the program. The permittee shall incorporate the revised TMDL Water Quality Recovery Program into the Storm Water Management Plan.*

## Goose Creek Water Quality Recovery Program for the Approved Fecal Coliform TMDL

---

On August 10, 2006, the North Carolina Department of Environment and Natural Resources, Division of Water Quality (DWQ) initiated Paragraph 11 of the Phase II Permits by issuing written notification to Mecklenburg County and the Towns of Mint Hill, Stallings and Indian Trail that they were subject to the Goose Creek TMDL for fecal coliform bacteria. The letter specified that requirement (a) through (e) of Paragraph 11 be fulfilled within a specific time frame (see Appendix 1). On October 12, 2007, DWQ provided the Phase II jurisdictions in the Goose Creek Watershed with the “Goose Creek TMDL Water Quality Recovery Program (WQRP) Guidance Document” (see Appendix 2). This document was used as a guide by the Phase II jurisdictions to develop the “Goose Creek Water Quality Recovery Program” which was submitted as part of the annual report dated July 9, 2008. The document contained herein is the Water Quality Recovery Program Plan (WQRP Plan), which serves as a guide in the implementation of the WQRP.

## Goose Creek Water Quality Recovery Program for the Approved Fecal Coliform TMDL

### SECTION 2.0 PROGRAM DEVELOPMENT

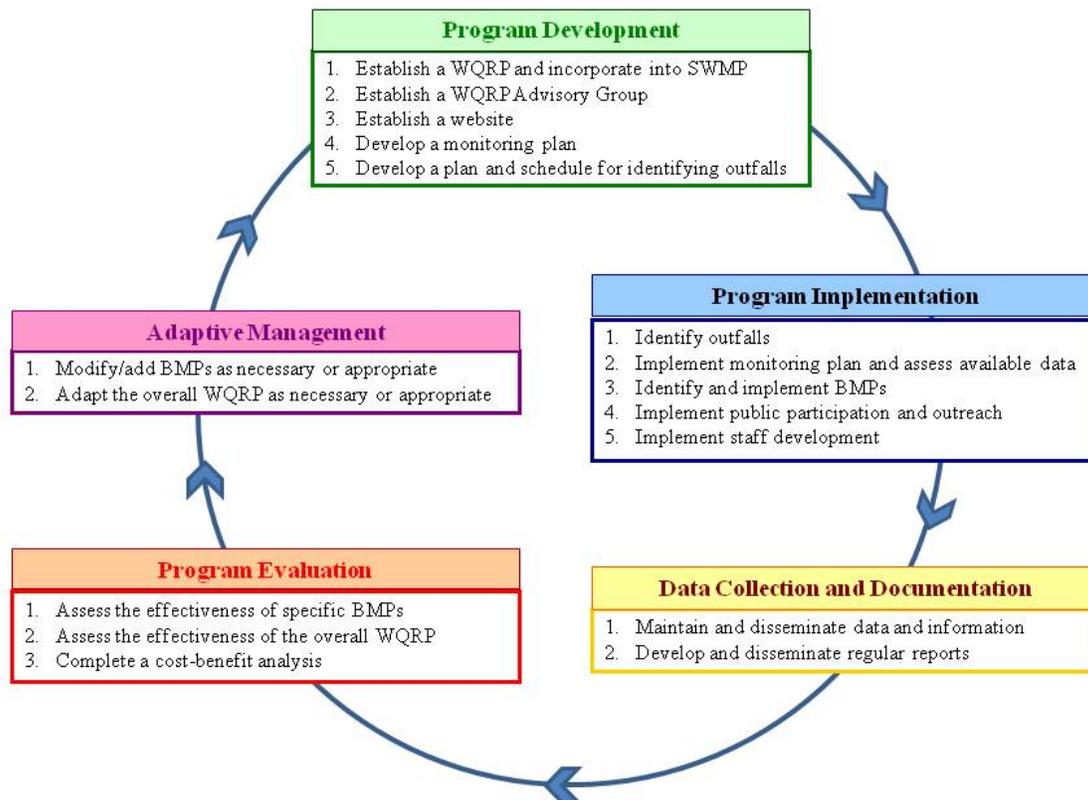
#### 2.1 Components of the Water Quality Recovery Program (WQRP) for Goose Creek

The WQRP developed for the Goose Creek Watershed includes the following five (5) major components

1. Program Development
2. Program Implementation
3. Data Collection and Documentation
4. Program Evaluation
5. Adaptive Management

These five (5) components include a total of 17 program activities that combine to form the WQRP as described in Figure 3.

Figure 3: Goose Creek Water Quality Recovery Program (WQRP)



#### 2.2 Pollutant of Concern Addressed by the Water Quality Recovery Program

The pollutant of concern addressed in the WQRP for the Goose Creek Watershed is fecal coliform bacteria as identified in the approved TMDL. Fecal coliform bacteria are found in the fecal material of humans and animals and can enter surface waters through direct discharges of waste from mammals and birds as well as from agriculture, storm water runoff and malfunctioning sewage collection and treatment systems. Fecal coliform bacteria do not cause diseases but rather serve as an indicator of a variety of microorganism in feces that are known to

## Goose Creek Water Quality Recovery Program for the Approved Fecal Coliform TMDL

---

be pathogenic. Fecal coliform bacteria is used as an indicator of these pathogens in surface waters because testing for its presence is cheap, reliable and fast particularly in comparison to tests for known pathogens. Water quality monitoring performed by DWQ in the Goose Creek Watershed has revealed elevated levels of fecal coliform bacteria, which is the reason for concern.

### 2.3 Purpose of the Water Quality Recovery Program

The purpose of the WQRP is to reduce fecal coliform bacteria levels, to the maximum extent practicable, in accordance with the assigned MS4 NPDES regulated Waste Load Allocation (WLA) identified in the approved TMDL for the Goose Creek Watershed, which is represented as a 92.5% reduction in the existing fecal coliform load from the MS4. There are four (4) NPDES regulated MS4s in the Goose Creek Watershed, including Mecklenburg County and the Towns of Mint Hill, Stallings and Indian Trail. The TMDL further identifies a 92.5% reduction in the fecal coliform load associated with nonpoint sources that do not originate from the MS4s. The TMDL indicates that these combined reductions will restore water quality conditions in the Goose Creek Watershed in compliance with the North Carolina fresh water quality standard for fecal coliform in Class C waters (T15A:02B.0211) that states:

*“Organisms of the coliform group: fecal coliforms shall not exceed a geometric mean of 200/100 ml (membrane filter count) based upon at least five consecutive samples examined during any 30-day period, nor exceed 400/100 ml in more than 20 percent of the samples examined during such period; violations of the fecal coliform standard are expected during rainfall events and, in some cases, this violation is expected to be caused by uncontrollable nonpoint source pollution; all coliform concentrations are to be analyzed using the membrane filter technique unless high turbidity or other adverse conditions necessitate the tube dilution method; in case of controversy over results, the MPN 5-tube dilution technique will be used as the reference method.”*

The WQRP specifically addresses the 92.5% reduction in fecal coliform loading assigned to the MS4s in the TMDL and does not cover the 92.5% reduction that is not associated with the MS4s. The biggest source of this non-MS4 related fecal coliform bacteria load is agricultural activity, which encompasses approximately 23% of the Goose Creek Watershed (see Table 2). Other than forests, this is the predominant land-use in the watershed. Based on the TMDL, in the absence of control of these non-MS4 sources the water quality standard will not be achieved; therefore, the achievement of this standard is not a specific goal of the WQRP.

The WQRP endpoint of a 92.5% reduction in fecal coliform loading from MS4s will be achieved through the implementation of structural and non-structural BMPs as described in the WQRP Plan (see Section 3.0). The implementation of these BMPs in accordance with the WQRP Plan will constitute compliance with the standard of reducing pollutants to the maximum extent practicable as specified in the Part II, Section A, Paragraph 11 (d) of the Phase II Permits. For each BMP utilized, a fecal coliform removal efficiency will be assigned in future versions of the WQRP Plan, including non-structural BMPs such as education and septic system inspections. The combined removal efficiencies of BMPs employed to treat the runoff from an MS4 area will need to total at least 92.5% for the area to be considered compliant with the assigned TMDL WLA. Once this has been achieved for all MS4 areas within the Goose Creek Watershed the

## Goose Creek Water Quality Recovery Program for the Approved Fecal Coliform TMDL

---

WQRP Plan will consider the MS4 areas to be compliant with the TMDL and the WQRP will have reached its endpoint. Section 3.4 contains additional information regarding this process.

To ensure the effective and efficient implementation of the WQRP in accordance with Phase II Permit requirements, the WQRP Plan contained herein has been incorporated into the Storm Water Management Program Plans for Mecklenburg County and the Towns of Mint Hill, Stallings and Indian Trail.

### 2.4 Purpose of the Water Quality Recovery Program (WQRP) Plan

The document contained herein is referred to as the WQRP Plan. The purpose of this Plan is to guide the implementation of the WQRP. It includes the monitoring plan, plan and schedule for identification of municipally separate storm sewer system (MS4) outfalls, description of best management practices (BMPs) to be employed to meet the TMDL, and other necessary TMDL compliance measures. This Plan will not include the assessment of the available data or an assessment of the effectiveness of the BMPs employed as required by Part II, Section A, Paragraph 11 (d) of the Phase II Permits. These assessments will be included in the annual reports developed for the WQRP by July 15<sup>th</sup> of each year. These annual reports will also include a determination regarding additional BMPs or other measures necessary to return the impaired segments to compliance with State water quality standards. These additional BMP measures as well as additions and/or modifications to any other compliance measures or plans will be incorporated into annual updates to the WQRP Plan that will be completed by August 30<sup>th</sup> of each year. These updates to the WQRP Plan are necessary to ensure its continued effectiveness as a guide to the implementation of the WQRP. Section 6 describes this process in more detail.

### 2.5 Water Quality Recovery Program Advisory Group

The first step in the development of the Goose Creek WQRP was the establishment of the TMDL Advisory Group consisting of representatives from the following:

- Mecklenburg County Water Quality Program
- Town of Mint Hill
- Town of Stallings
- Town of Indian Trail
- Union County
- DWQ

Initial TMDL Advisory Group meetings focused on the development of the Goose Creek WQRP and resulted in a request to DWQ for a more detailed outline of the requirements of the WQRP. DWQ provided the group with the Draft “Goose Creek TMDL Water Quality Recovery Program Guidance Document” on October 12, 2007 (see Appendix 2), which formed the basis for the development of the WQRP for Goose Creek. Subsequent meetings of the group led to development and implementation of the WQRP by July 2008. The 17 program activities identified in the WQRP Plan (see Figure 3) are implemented by the Mecklenburg County Water Quality Program (MCWQP) under Charlotte-Mecklenburg Storm Water Services for Mecklenburg County and the Towns of Mint Hill, Stallings and Indian Trail. The TMDL

## Goose Creek Water Quality Recovery Program for the Approved Fecal Coliform TMDL

---

Advisory Group meets at least annually to review program activities and successes and to modify the WQRP Plan as necessary to improve its overall effectiveness.

### 2.6 Water Quality Recovery Program Website

A page was developed off Charlotte-Mecklenburg Storm Water Services' website as follows: <http://stormwater.charmeck.org> (select "Storm Water Professionals", select "Water Quality", and select "TMDLs-Mecklenburg County"). This website serves to document and disseminate information and results regarding the Goose Creek WQRP. The WQRP Plan along with annual reports and water quality monitoring data are maintained on this website.

### 2.7 Water Quality Recovery Program Monitoring Plan

#### 2.7.1 Purpose

The purpose of the water quality monitoring plan developed for the Goose Creek WQRP is to present a strategy for the collection of information to support the implementation of the WQRP for the Goose Creek Watershed and to monitor its effectiveness. The monitoring plan also serves to identify pollution sources that are subsequently eliminated if found to be in noncompliance with water quality regulations. Some sources such as livestock in the stream are not in violation and therefore will not be eliminated unless voluntarily done so by the property owner. The monitoring plan outlines a strategy for sampling individual land-use sources from select MS4 outfalls as well as in-stream fecal coliform concentrations. The plan describes the sampling strategy for Mecklenburg County and the three (3) incorporated areas of the watershed, including the Towns of Mint Hill, Indian Trail and Stallings.

#### 2.7.2 Water Quality Monitoring Strategy

The goals of the Goose Creek Water Quality Monitoring Plan are as follows:

1. Obtain watershed data and information for the successful development and implementation of BMPs as part of the WQRP.
2. Identify and eliminate pollution sources.
3. Evaluate Goose Creek for compliance with the State's fecal coliform standard for Class C waters as described in Section 2.2 above.

The monitoring strategy developed to achieve these goals consists of the following components that are described in detail in the following Sections:

1. Stream Walks
2. Land-Use Monitoring
3. In-Stream Monitoring
4. Continuous Monitoring and Alert Notification Network (CMANN)
5. USGS Monitoring

#### 2.7.3 Stream Walks

Between May and July 2007, MCWQP walked and/or waded all the perennial and intermittent streams in the Goose Creek Watershed and its tributaries within the boundaries of Mecklenburg

## Goose Creek Water Quality Recovery Program for the Approved Fecal Coliform TMDL

---

County and the Towns of Mint Hill, Stallings and Indian Trail. It is anticipated that these streams will be walked again in 2012 to document changes. The purpose of the stream walks is three (3) fold as follows:

1. Identify and eliminate potential sources of fecal coliform bacteria.
2. Identify land-use monitoring sites.
3. Identify MS4 Outfalls for each jurisdiction.

In addition to those streams within each jurisdiction, streams flowing into a jurisdiction or those streams likely to be annexed by a jurisdiction are also identified for stream walks. The distribution of streams to be walked by jurisdiction is shown in Figure 4. The following information is collected during stream walks:

1. Samples are collected at tributaries upstream of the confluence of tributary mid-points and 50-acre drainage terminus points if stream flow is present. Samples are analyzed for fecal coliform and temperature.
2. Samples are collected of observed dry weather flows and laboratory analyses are performed for fecal coliform, temperature, specific conductance, chlorine, nutrients, fluoride, surfactant, NO<sub>2</sub>, and estimated flow (gpm).
3. A record is obtained of the locations of all storm water outfalls, pipe material and pipe diameter as well as any maintenance issues with the outfalls.
4. A record is obtained of the location of all Charlotte-Mecklenburg Utilities critical assets (aerials, stream crossings, etc.).
5. A record is obtained of the location of all stream blockages that could potentially cause flooding.
6. A record is obtained of potential sources of fecal coliform. These include dog kennels, active domestic animal operations, potential septic system problems and industrial outfalls, etc. Follow up investigations are conducted as necessary to eliminate pollution sources.
7. A record is obtained of areas of excessive erosion.
8. Future land-use sampling sites as described in Section 2.6.2 are identified.

More detailed information regarding the procedures followed in the performance of stream walk activities is contained in the Illicit Discharge Detection and Elimination (IDDE) Policies and Procedures Manual (Mecklenburg County Water Quality Program, 2009).

## Goose Creek Water Quality Recovery Program for the Approved Fecal Coliform TMDL

Figure 4: Distribution of Stream Walks by Jurisdiction

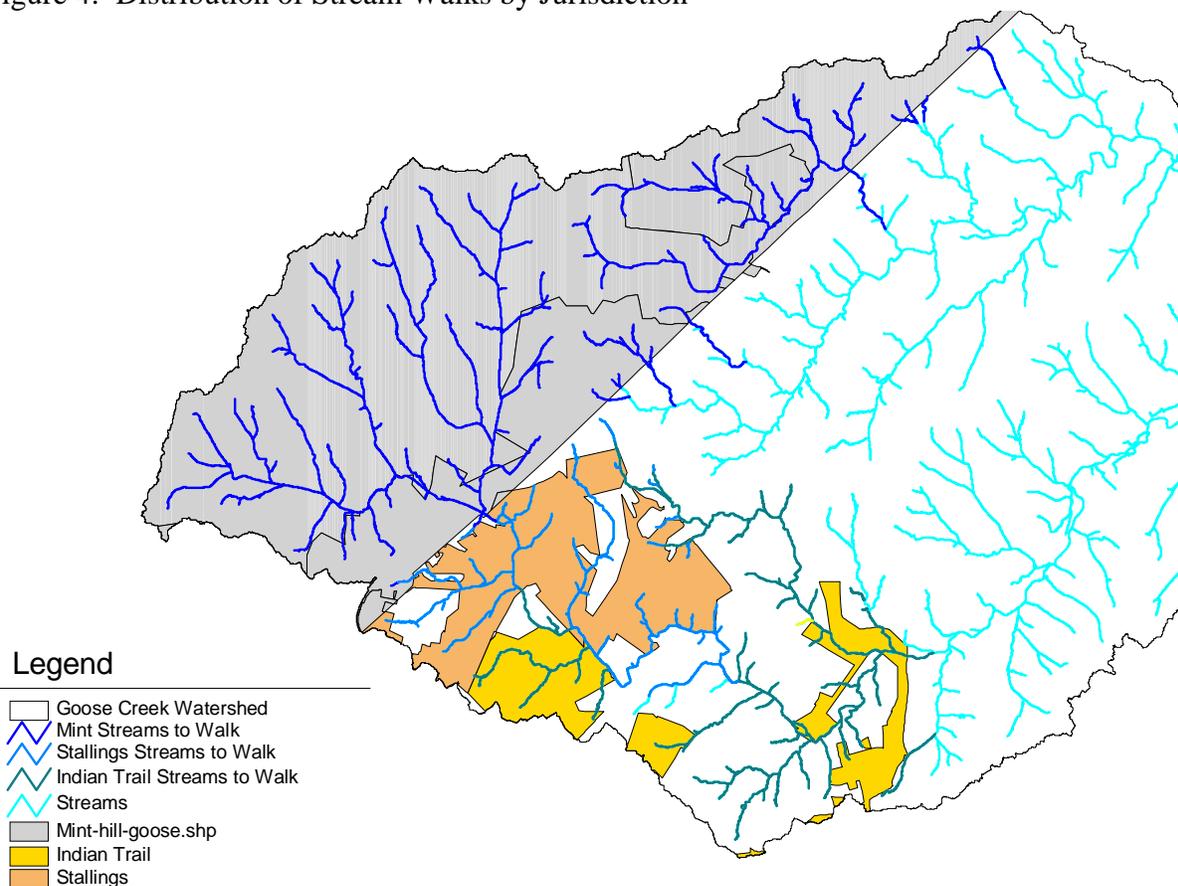


Table 3 presents the miles of stream walked or waded by jurisdiction in the Goose Creek Watershed.

Table 3: Miles of Streams Walked or Waded by Jurisdiction

<b>Jurisdiction</b>	<b>Miles Perennial Stream</b>	<b>Miles Intermittent Stream</b>	<b>Total Miles to Walk</b>
<b>Mint Hill</b>	32.8	13.9	<b>46.7</b>
<b>Indian Trail</b>	16.9	6.4	<b>23.3</b>
<b>Stallings</b>	9.3	4.4	<b>13.7</b>

### 2.7.4 Land-Use Monitoring

MCWQP personnel are performing monthly sampling at select MS4 outfalls located downstream of each of the land-use types in the jurisdictions described in Table 4. The physical locations of the monitoring sites as identified in Table 5 and Figure 6 were identified during the stream walks conducted between May and July 2007 (see Section 2.6.3). This land-use monitoring began in October 2007 and is planned to continue through June 2010. The purpose of this monitoring is to categorize fecal coliform levels originating from individual land-uses in each of the jurisdictions. This monitoring data will be used identify specific land-uses for BMP retrofits to decrease fecal coliform levels in Goose Creek in compliance with the TMDL. As outlined in the Goose Creek TMDL Water Quality Recovery Program Guidance Document provided by DWQ,

## Goose Creek Water Quality Recovery Program for the Approved Fecal Coliform TMDL

permit holders may sample “substantially similar outfalls” to reduce the monitoring and analysis burden. Therefore, a minimum of one (1) site is sampled monthly downstream of each of the major land-use types found in Mint Hill, Stallings and Indian Trail. Figure 5 shows the general distribution of land-uses within the Goose Creek Watershed. Monitoring sites will be evaluated annually and new sites selected as necessary to ensure representativeness of the watershed as a whole. The following changes have occurred to site locations since monitoring began in October 2007:

- Site B moved from 6400 Matthews Mint Hill Road (longitude -80.662952, latitude 35.169341) to 3501 Matthews Mint Hill Road (Site B1) on October 5, 2009 (see Table 5).
- Site I moved from 2002 Centerview Drive (longitude -80.63122, latitude 35.118041) to 5004 Centerview Drive on September 18, 2008 due to 2002 Centerview Drive being discontinued as an active construction site (see Table 5).

Table 4: Jurisdictions and Land-Use Types to be Sampled

Jurisdiction	Land-Use Types				
<b>Mint Hill</b>	0.25 – 0.5 ac Residential	Commercial	Institutional (school)	Medium Density Residential (0.5 – 1 ac)	I-485
<b>Stallings</b>	0.25 – 0.5 ac Residential	Commercial			
<b>Indian Trail</b>	0.25 – 0.5 ac Residential	Active Development			

Table 5: Land-Use Monitoring Sites in the Goose Creek Watershed

Jurisdiction	Monitoring Type	ID	Location	Longitude	Latitude
Meck. Co.	Runoff (0.25-0.5acre res.)	A	15130 Yarmouth Rd.	-80.655236	35.139909
Meck. Co.	Runoff (Commercial)	B1	3501 Matthews Mint Hill Rd.	-80.683341	35.138450
Meck. Co.	Runoff (Institutional)	C	11524 Bain School Road	-80.647348	35.174619
Meck. Co.	Runoff (0.5 - 1 acre res.)	D	5221 Turkey Oak Drive	-80.660474	35.146612
Meck. Co.	Runoff (I-485)	E	I-485	-80.629102	35.163096
Stallings	Runoff (0.25-0.5 acre res.)	F	9108 Tenby Lane	-80.637598	35.138339
Stallings	Runoff (Commercial)	G	7800 Stevens Mill Road	-80.622643	35.140097
Indian Trail	Runoff (0.25-0.5 acre res.)	H	7006 Joyful Noise Lane	-80.629475	35.117090
Indian Trail	Runoff (Active Const.)	I	5004Centerview Dr.	-80.629790	35.117733

Table Notes: Meck. Co. includes the Town of Mint Hill. Latitude and Longitude in Decimal Degrees.

## Goose Creek Water Quality Recovery Program for the Approved Fecal Coliform TMDL

Figure 5: Land-Use Distribution in the Goose Creek Watershed

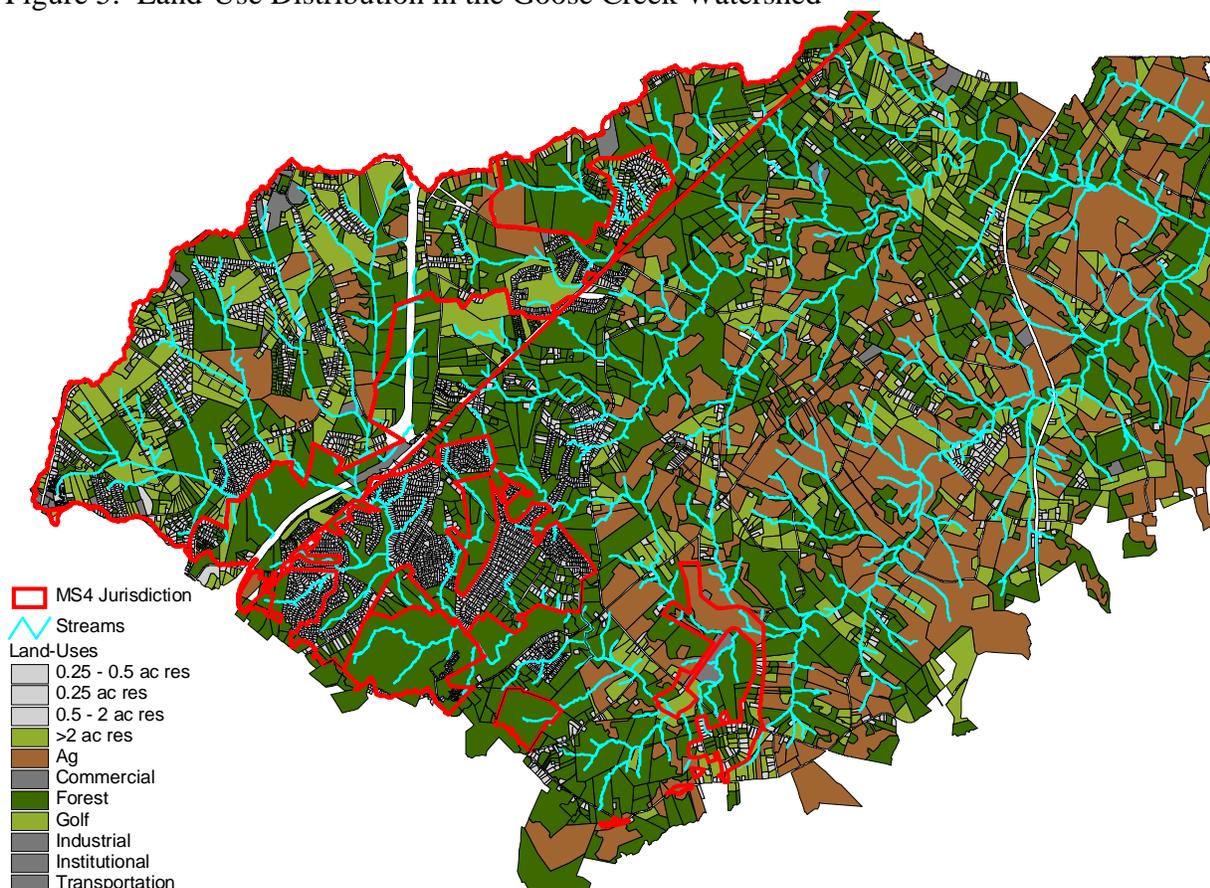


Table 6 provides a description of the land-use monitoring performed in Mecklenburg County and the Towns of Mint Hill, Stallings and Indian Trail as part of the Goose Creek WQRP.

Table 6: Description of Land-Use Monitoring in the Goose Creek Watershed

<b>Sample Type</b>	Grab sample collected at MS4 outfalls at the locations described in Table 5 above.
<b>Frequency</b>	Monthly during runoff events.
<b>Seasonal Considerations</b>	Sampling is performed without seasonal variation.
<b>Implementation Schedule</b>	Begin in October 2007 and continue through June 2010.
<b>Parameters Analyzed</b>	Fecal coliform bacteria, E coli, nitrite + nitrate, ammonia, total kjeldahl nitrogen, total phosphorus and copper.

### 2.7.5 In-Stream Monitoring

MCWQP personnel are performing monthly in-stream sampling at the six (6) sites identified in Table 7 and Figure 6. Monitoring began in June 2007 at the in-stream monitoring sites located at Goose Creek and Stevens Mill Road in Union County (MY9) and at 10801 Tara Oaks Drive in

## Goose Creek Water Quality Recovery Program for the Approved Fecal Coliform TMDL

Mecklenburg County (MY14). Plans are to continue in-stream monitoring at these two (2) sites indefinitely. These sites are sampled on the third Wednesday of every month unless flow conditions are determined to be unsafe in which case sampling is performed immediately upon the return of safe conditions. This is referred to as fixed interval monitoring. Sampling began at the other four (4) in-stream sites identified in Table 7 in October 2009. Plans are to discontinue this monitoring in June 2010 along with the land-use monitoring described in the previous Section. These four (4) in-stream sites are sampled during runoff conditions along with the land-use monitoring sites. The purpose of in-stream monitoring is as follows:

- Identify and eliminate pollution problems.
- Measure watershed scale fecal coliform levels.
- Assess the overall effectiveness of the WQRP at attaining the water quality standard for fecal coliform.

Table 7: In-Stream Monitoring Sites in the Goose Creek Watershed

Jurisdiction	Monitoring Type	Location	ID	Longitude	Latitude
Meck. Co.	Runoff	14805 Bridgewater Ln	MY9A	-80.657647	35.141011
Meck. Co.	Runoff	4216 Crump Hill Ct	SCT	-80.652128	35.146806
Meck. Co.	Runoff	16100 Thompson Rd	GT1	-80.641504	35.150959
Meck. Co.	Runoff	13186 Lawyers Rd	GC1	-80.639121	35.157171
Stallings	Fixed Interval	Goose Creek at Stevens Mill Rd	MY9	-80.631719	35.130114
Mint Hill	Fixed Interval	10801 Tara Oaks Dr.	MY14	-80.587390	35.180144

Table Notes: Meck. Co. includes the Town of Mint Hill. Latitude and Longitude in Decimal Degrees.

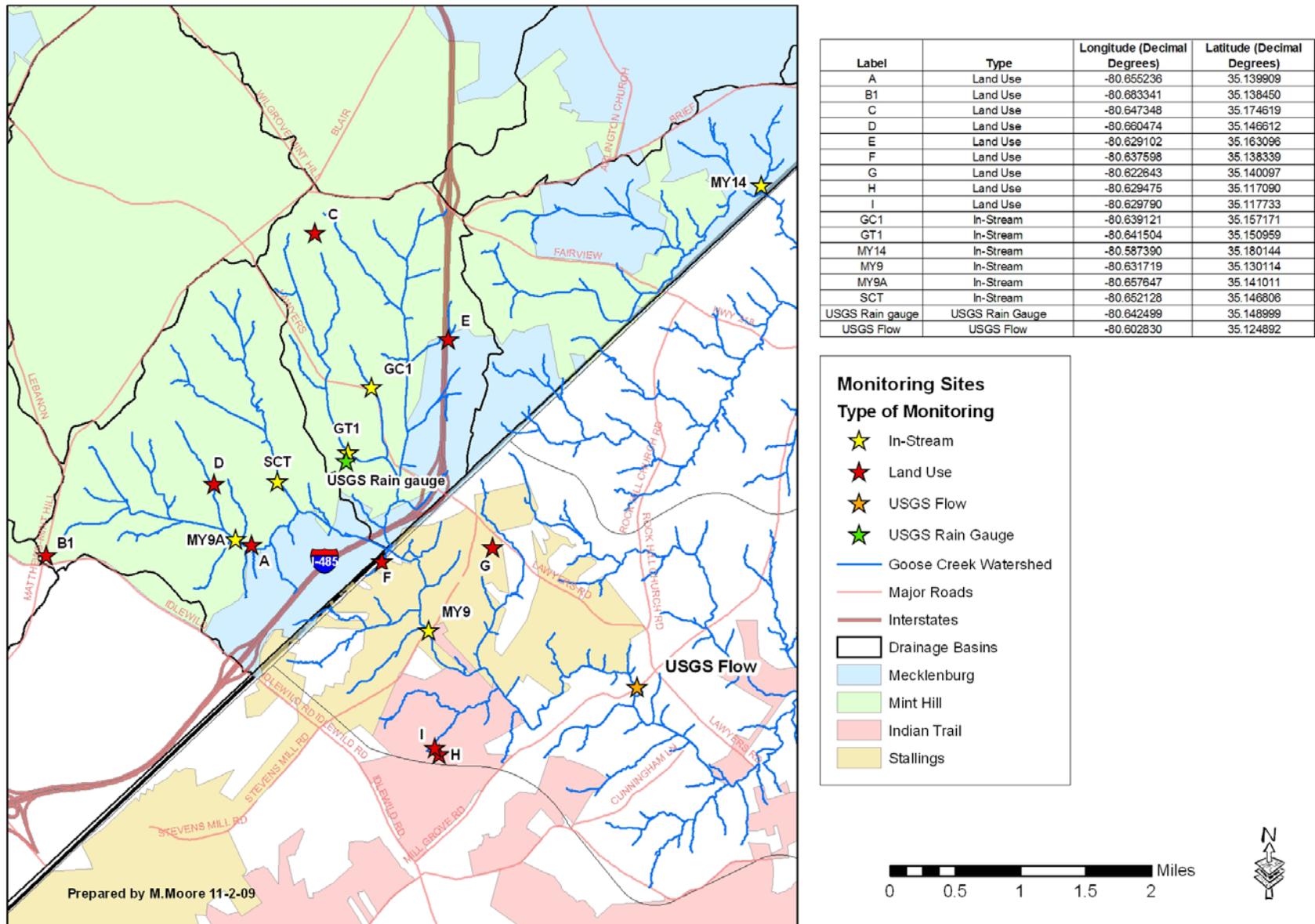
Monitoring sites will be evaluated annually and new sites selected as necessary to ensure representativeness of the watershed as a whole. The following changes have occurred to site locations since in-stream monitoring began in June 2007:

- Sample site located at the DWQ compliance point on Mill Grove Road at Goose Creek moved to 10801 Tara Oaks Drive in July 2008.
- Four (4) runoff sample sites added in October 2009.

Table 8 provides a description of the in-stream monitoring performed as part of the Goose Creek WQRP.

## Goose Creek Water Quality Recovery Program for the Approved Fecal Coliform TMDL

Figure 6: Location of WQRP Monitoring Sites for FY10



## Goose Creek Water Quality Recovery Program for the Approved Fecal Coliform TMDL

Table 8: Description of In-Stream Monitoring in the Goose Creek Watershed

<b>Sample Type</b>	Grab sample collected in the main flow of the stream channel.
<b>Frequency</b>	<ol style="list-style-type: none"> <li>Two (2) sites sampled monthly on a fixed interval, which is the third Wednesday of every month unless flow conditions are determined to be unsafe in which case sampling is performed immediately upon the return of safe conditions. These sites are identified in Table 7 above as the "Fixed Interval" monitoring type.</li> <li>Four (4) sites sampled monthly during runoff events at the same time that land-use monitoring is performed. These sites are identified in Table 7 above as the "Runoff" monitoring type.</li> </ol>
<b>Seasonal Considerations</b>	Sampling is performed without seasonal variation.
<b>Implementation Schedule</b>	Fixed interval monitoring began in June 2007 and will continue indefinitely. Runoff monitoring began in October 2009 and will continue through June 2010.
<b>Parameters Analyzed</b>	<ol style="list-style-type: none"> <li>Fixed Interval Monitoring Sites (2): USGS flow rate, temperature, dissolved oxygen, conductivity, pH, fecal coliform bacteria, E-coli bacteria, enterococcus bacteria, ammonia nitrogen, nitrate + nitrite, total kjeldahl nitrogen, total phosphorus, suspended solids, suspended sediment, turbidity, copper, zinc, chromium, and lead</li> <li>Runoff Monitoring Sites (4): Fecal coliform bacteria.</li> </ol>

### 2.7.6 Continuous Monitoring and Alert Notification Network (CMANN)

In July 2009, MCWQP personnel installed a Continuous Monitoring and Alert Notification Network (CMANN) monitoring site at the in-stream monitoring site at MY9 (see Table 7 and Figure 6). CMANN monitoring began in June 2007 and is ongoing. The purpose of this monitoring is as follows:

- Identify pollution problems for implementation of corrective actions.
- Identify the relationship between turbidity (an indicator of suspended sediment) and fecal coliform levels.

Monitoring sites will be evaluated annually and new sites selected as necessary to ensure representativeness of the watershed as a whole. The following changes will occur to CMANN site locations:

- By January 1, 2010, two (2) additional CMANN sites will be added, including one at MY14 (see Table 7 and Figure 6) and another at 12809 Bain School Road.

Table 9 provides a description of the CMANN monitoring performed as part of the Goose Creek WQRP.

Table 9: Description of CMANN Monitoring in the Goose Creek Watershed

<b>Sample Type</b>	Automated sampling using a YSI multi probe sonde which transmits data to a data logger that downloads to a website via an automated dial out system.
<b>Frequency</b>	Hourly.
<b>Seasonal Considerations</b>	Sampling is performed without seasonal variation.

## Goose Creek Water Quality Recovery Program for the Approved Fecal Coliform TMDL

<b>Implementation Schedule</b>	Begin in June 2007 and continue indefinitely.
<b>Parameters Analyzed</b>	Turbidity, temperature, pH, dissolved oxygen, and conductivity.

### 2.7.7 USGS Monitoring

The USGS maintains a flow gauge at Goose Creek at Mill Grove Road (USGS Site 0212467595) and a rainfall gauge at the Thompson Farm site off Lawyers Road in Mint Hill, NC (USGS Site 350857080383245) as indicated in Figure 6. Data from these sites will be incorporated into the WQRP.

### 2.7.8 Monitoring for Identification and Elimination of Pollution Sources

Identification and elimination of sources of fecal coliform in the Goose Creek Watershed is an essential element in the overall strategy for reducing in-stream fecal coliform concentrations in Goose Creek. To accomplish this goal, MCWQP will utilize the same techniques outlined in its Illicit Discharge Detection and Elimination (IDDE) Policies and Procedures Manual (Mecklenburg County Water Quality Program, 2009). In addition, stream walks will be initiated as necessary to more thoroughly evaluate larger catchments. These procedures are identified in the monitoring plan described in Section 2.5.3 above. Over and above the IDDE Manual and monitoring plan, several specialized procedures have been developed for the identification of sources of fecal coliform in the Goose Creek Watershed as described below.

#### Specialized IDDE Monitoring:

An enhanced monitoring strategy was developed for the identification and elimination of pollution sources in the Goose Creek Watershed. This strategy involved the collection of samples every Thursday that were analyzed for temperature, fecal coliform and E coli. On the second Tuesday of each month, samples were collected and analyzed for temperature, fecal coliform, E coli, ammonia nitrogen (NH<sub>3</sub>), total kjeldahl nitrogen (TKN), nitrite + nitrate (NO<sub>x</sub>) and total phosphorus (TP). The monitoring consisted of at least five (5) consecutive samples collected during a 30 day period to determine if the fecal coliform levels exceeded the State standard (referred to 5/30 monitoring). Data from this sampling was used to identify sites for more source specific monitoring, including DNA analyses. This specialized monitoring was initiated every Thursday beginning on May 8, 2008 as well as the second Tuesday of each month beginning on May 13, 2008. The monitoring was conducted at the State compliance point located at Stevens Mill Road (Site MY9) and at six (6) locations upstream of MY9 as well as the compliance point located on Mill Grove Road (Site GC4) and the in-stream monitoring site at GC4. The monitoring sites are shown in Figure 7. All the sites were found to be in compliance with the State's 5/30 standard except GC2A and GC3, which had fecal coliform counts at 878 c.f.u. and 810 c.f.u., respectively. Both of these sites are located on a tributary of Goose Creek. DNA analyses were performed on samples collected from this tributary confirming that the source was human. The area draining to this tributary was targeted for septic system inspections resulting in the identification of two (2) system malfunctions that were subsequently repaired. The 5/30 monitoring was discontinued on September 4, 2008. Sampling is planned at site GC2A

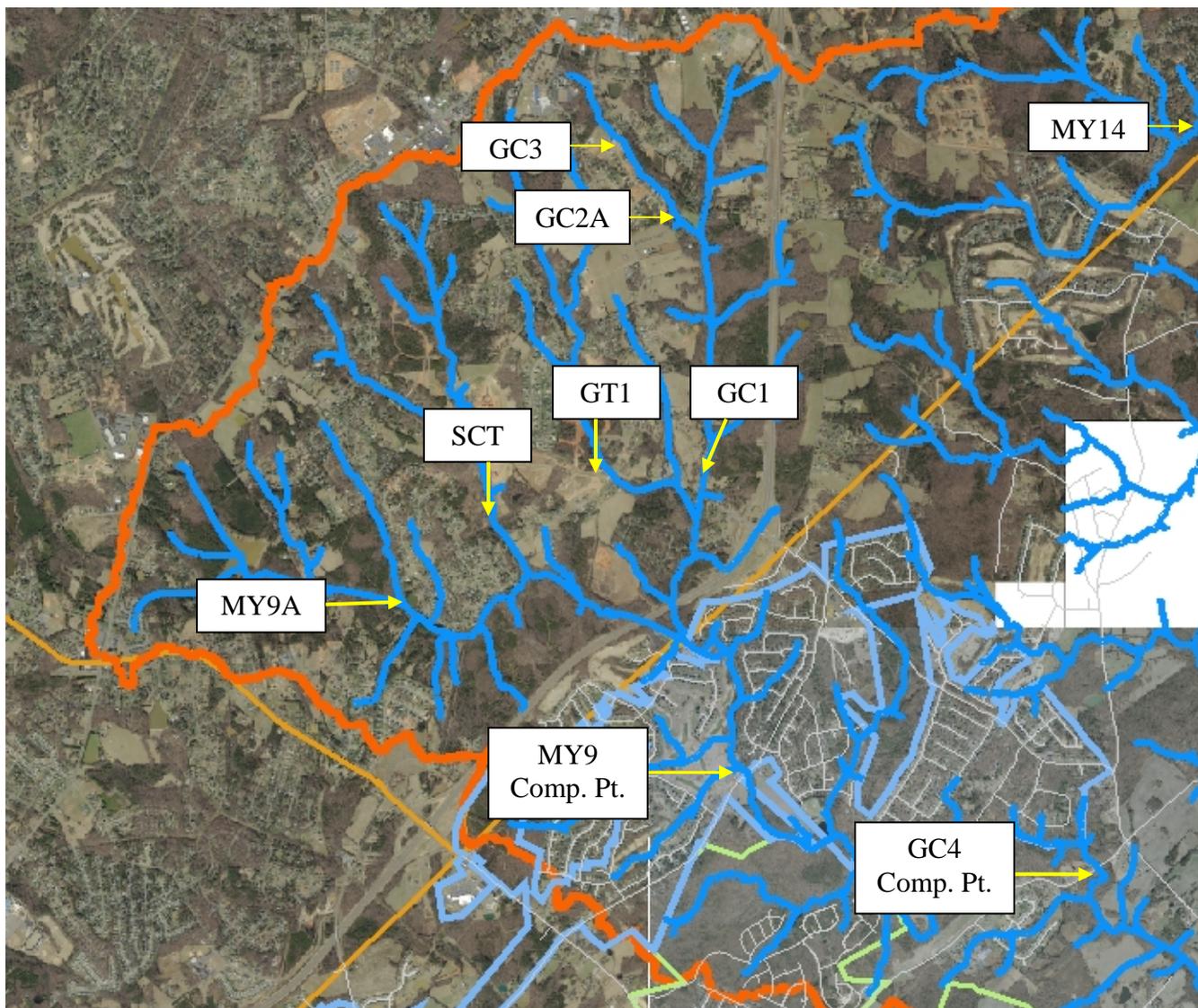
## Goose Creek Water Quality Recovery Program for the Approved Fecal Coliform TMDL

during FY10 to determine if the elimination of the septic system discharges will result in compliance with the standard.

### Livestock Impact Monitoring:

In August and September 2009, samples were collected and analyzed for fecal coliform bacteria on three (3) separate occasions upstream and downstream of an area where cows have direct access to Goose Creek. The three (3) monitoring points are shown in Figure 8. This monitoring confirmed that the cows had a significant impact on fecal coliform levels in the creek. The property owner has been contacted and negotiations will occur in FY10 to attempt to eliminate livestock access to the creek.

Figure 7: Specialized IDDE Monitoring Sites



## Goose Creek Water Quality Recovery Program for the Approved Fecal Coliform TMDL

Figure 8: Livestock Impact Monitoring Sites



### DNA Analysis:

DNA analysis can determine the presence, identify the source and quantify fecal contamination in water samples. One method used targets bacteroidetes that are present in warm blooded animals. *Bacteroidetes* are predominately found in humans, cattle, swine, horses and dogs. These tests are effective for determining recent forms of fecal pollution.

## Goose Creek Water Quality Recovery Program for the Approved Fecal Coliform TMDL

The phylum *Bacteroidetes* is composed of three (3) groups of bacteria with the best-known category being *Bacteroidaceae*. This family of bacteria is found primarily in the intestinal tracts and mucous membranes of warm-blooded animals and is sometimes considered pathogenic.

Fecal *Bacteroidetes* are considered an alternative to more traditional indicator organisms such as *E. coli* and *Enterococci*. Since they are strict anaerobes, they are indicative of recent fecal contamination when found in water systems. This is a particularly strong reference point when trying to determine recent outbreaks in fecal pollution. They are also more abundant in feces of warm-blooded animals than *E. coli* and *Enterococci*. Furthermore, these latter two (2) organisms are facultative anaerobes and as such they can be problematic for monitoring purposes since it has been shown that they are able to proliferate in soil, sand and sediments, which is not the case for *Bacteroidetes*.

### Costs:

The estimated costs for implementing the enhanced monitoring effort are outlined in Table 10. Costs shown are for each 30 day period.

Table 10: Estimated Enhanced Monitoring Costs

<b>Task Description</b>	<b>Cost per 30 day period</b>
Fecal Coliform Sample Analysis ( 8 sites x \$34.00/sample x 5 samples)	\$1,360.00
Nutrient Sample Analysis (8 sites x \$62.75 x 1 sample)	\$502.00
Sample Collection, prep and sample turn in (4 hrs. x \$42.80 x 5 events)	\$856.00
<b>Total Cost per 30 Day Period</b>	<b>\$2,718.00</b>

### 2.7.9 Quality Assurance / Quality Control

All data discussed above will be collected by MCWQP staff, with the exception of flow and rainfall data which is collected by USGS. All sampling performed and data collected by MCWQP staff is in strict adherence to the following documents:

- Charlotte-Mecklenburg Surface Water Quality Sampling Procedures Manual, 2005
- Continuous Monitoring Policy and Procedure Manual, 2005
- Mecklenburg County Water Quality Program QA/QC Data Tracking, 2006
- Charlotte-Mecklenburg Storm Water Services Quality Assurance Project Plan (QAPP), 2007

Mecklenburg County holds the following certifications associated with monitoring:

- *NC Division of Water Quality Laboratory Certification Program – 5235*: This certification is associated with the collection of samples, field parameters and instrumentation.

### 2.7.10 Data Analysis

Data collected under this plan is subject to analysis on several levels as follows:

1. **Stream Walks:** Information collected from the stream walks will be categorized and converted to GIS format. The locations of sampling sites, storm water outfalls and

## Goose Creek Water Quality Recovery Program for the Approved Fecal Coliform TMDL

---

potential pollution sources will be identified. Sample results indicating the presence of high levels of fecal coliform (>1,000 c.f.u.) will be assigned for follow-up activities by the appropriate jurisdiction. The purpose of these follow up activities will be to identify and eliminate pollution sources. Identified land-use sampling sites will be established and sampled.

2. Land-Use Monitoring: The results from the land-use samples will be analyzed on a site by site basis. Basic descriptive statistics will be calculated for the data collected at each site, each group of like sites (e.g. residential), each jurisdiction and the data set as a whole. The land-use fecal coliform data set will be compared to rainfall and flow records, which are collected by the USGS, to develop a better understanding of fecal coliform build-up and wash-off for each of the land-uses. The number of dry days prior to sample collection, time since start of rainfall, rainfall intensity and other parameters will be assessed and compared to the fecal coliform dataset. It is anticipated that trends will be detected in the data which will help guide watershed restoration and retrofit efforts.
3. In-Stream Monitoring: The results from the in-stream fecal coliform sampling will be analyzed on a site by site basis to assess compliance with the fecal coliform standard. Sample results indicating the presence of high levels of fecal coliform ( $\geq 1,000$  c.f.u.) will be assigned to MCWQP staff for the initiation of immediate follow-up activities. The purpose of these follow up activities will be to identify and eliminate pollution sources. Basic descriptive statistics will be calculated for the data collected for each site and the dataset as a whole. Sample date and time will be used to identify the rainfall and flow regime in Goose Creek at the time of sample collection. The primary purpose of evaluating a flow or rainfall versus fecal coliform level is to determine if a reproducible relationship between the two exists. If a strong correlation does exist, USGS flow data may be used as a surrogate for fecal coliform.
4. CMANN: The results from the CMANN automated monitoring will be analyzed using basic descriptive statistics. The results will be compared to the USGS dataset to determine if a turbidity versus flow relationship exists. Monitoring results indicating potential water quality problems (action level exceedances) will be assigned for follow-up activities by MCWQP. The purpose of these follow up activities will be to identify and eliminate pollution sources.
5. USGS Monitoring: The USGS flow and rainfall dataset will be downloaded and analyzed to determine basic flow and rainfall distribution for the Goose Creek Watershed. USGS monitoring data will be used in conjunction with other data to determine if relationships between flow and or rainfall and fecal coliform or turbidity exist.
6. Pollution Sources: Records will be maintained of all pollution sources identified and eliminated, including source location and description, pollutant type, date detected and corrected, responsible staff, and any other relevant information.

### 2.8 Plan and Schedule for Identification of Storm Water Outfalls

During the performance of stream walk activities for the water quality monitoring program, MCWQP staff collected data regarding the location of all storm water outfalls, pipe material and pipe diameter as well as any maintenance issues with the outfalls. This work was performed in

## **Goose Creek Water Quality Recovery Program for the Approved Fecal Coliform TMDL**

---

Mecklenburg County as well as the Towns of Mint Hill, Stallings and Indian Trail. Stream walk activities are discussed in more detail in Section 2.5.3 above. All spatial data was geocoded and stored in hand-held computers while in the field. Upon returning to the office, the data was downloaded into GIS and made available to staff for implementation of the WQRP. All outfall data was compiled and provided to DWQ in June 2007. It is anticipated that streams will be walked again in 2012 and the storm water outfall data updated.

## Goose Creek Water Quality Recovery Program for the Approved Fecal Coliform TMDL

---

### SECTION 3.0 PROGRAM IMPLEMENTATION

MCWQP anticipates that new sources of fecal coliform bacteria will be effectively controlled by the restrictions on future land development activities and wastewater treatment plant expansions imposed by the N.C. Site Specific Water Quality Management Plan for the Goose Creek Watershed that went into effect in February 2009. Therefore, the focus of MCWQP's water quality recovery efforts in the Goose Creek Watershed will be on the control of existing sources of fecal coliform bacteria. This will be accomplished through the implementation of structural and non-structural best management practices (BMPs) designed to restore water quality conditions in the Goose Creek Watershed in compliance with the approved fecal coliform TMDL. The following Sections describe these BMPs.

#### 3.1 Structural Best Management Practices

##### 3.1.1 Purpose

Retro-fitting existing land uses with structural BMPs to treat fecal coliform bacteria is one tool that can be implemented to reduce fecal coliform loading in the Goose Creek Watershed. The purpose of this Section is to identify structural BMPs that are effective at removing fecal coliform bacteria based on available research and to identify existing and proposed structural BMPs in the Goose Creek Watershed. Information regarding nonstructural BMPs for the control of fecal coliform bacteria in the Goose Creek Watershed is provided in Sections 3.2 and 3.3.

##### 3.1.2 Structural BMP Analysis

To evaluate the fecal coliform removal capabilities of various BMPs, MCWQP performed the following activities:

- Review of Fecal Coliform TMDL Implementation Plans from other jurisdictions.
- Research literature values for fecal coliform removal efficiencies for BMPs.
- Summarize and analyze local fecal coliform removal rates from MCWQP's Pilot BMP Monitoring Program.

##### 3.1.2.1 Review of Fecal Coliform TMDL Implementation Plans

MCWQP reviewed 20 published plans to evaluate the structural BMPs other jurisdictions propose to use or are using as part of their Fecal Coliform TMDL Implementation Plan. The plans typically included lists of non-structural controls that were going to be implemented to reduce fecal coliform loadings. In addition, most plans indicated that structural BMPs may be used for control, but provided no data on the level of control or treatment that would be provided by the BMPs. MCWQP reviewed three (3) plans in detail and the results are provided below.

Plan 1: The *Moore's Creek Fecal Coliform TMDL Implementation Plan* (Thomas Jefferson Planning District Commission, 2005) noted that regional storm water treatment BMPs were not feasible for achieving the required fecal coliform reduction from existing urban lands and that non-structural measures, such as sanitary sewer and septic system improvements, would be used in these areas.

## Goose Creek Water Quality Recovery Program for the Approved Fecal Coliform TMDL

**Plan 2:** A few plans did mention structural storm water BMPs that were proposed for reducing fecal coliform loads and indicated levels of treatment for several BMPs. The *Implementation Plan for the Fecal Coliform TMDL (Total Maximum Daily Load) for Four Mile Run, Virginia* (Northern Virginia Regional Commission, 2004) included a graph of BMPs and approximate removal efficiencies from the Metropolitan Washington Council of Government's Presentation Materials dated September 26, 2004. Table 11 provides a summary of the data contained in this graph. The plan concludes that BMPs with biological and chemical treatment processes (wet ponds, wetlands, and bioretention facilities) are more effective at removing fecal coliform bacteria.

Table 11: BMP Data from TMDL Implementation Plan, Four Mile Run, Virginia

Structural BMP	Bacteria Removal Efficiency (%)
Bioretention	85
Infiltration Trench	85
Sand Filter	70
Wetlands	72
Wet Ponds	65

Note: Removal efficiency is concentration based.

**Plan 3:** The *Water Quality Implementation Plan for Blacks Run and Cooks Creek (Fecal Coliform and Aquatic Life TMDLs)* (Virginia Department of Conservation and Recreation, 2006) identified the BMPs indicated in Table 12 as appropriate for implementation as part of their TMDL.

Table 12: BMP Data from TMDL Implementation Plan, Blacks Run & Cooks Creek, Virginia

Structural BMP	Bacteria Removal Efficiency (%)
Bioretention Filter	85
Rain Garden	85
Wet Retention Pond	80
Vegetated Buffer	50

Note: Removal efficiency is concentration based.

This plan referenced that the removal efficiencies for the bioretention filter, rain garden, and wet retention pond BMPs were estimated based upon total suspended solid (TSS) removal efficiencies. Additionally, the vegetated buffer BMP efficiency was for buffers that treat twice the buffer area upstream of the buffer.

### 3.1.2.2 Fecal Coliform Removal Efficiencies for BMPs

MCWQP reviewed several publications that contained BMP performance data for fecal coliform. In addition, the International Storm Water Database (Water Environment Research Foundation et al, 1999 - 2007) was used to search for performance data for various BMPs. One article entitled Grant Ranch Stormwater-Quality Management Program published in Storm Water Magazine (Jones et al, 2004) featured an evaluation of the performance of BMPs for a residential subdivision (Grant Ranch) in Littleton, CO. The 77-acre subdivision was designed with three (3) extended dry detention basins that discharge into a single wetland, thus creating a BMP

## Goose Creek Water Quality Recovery Program for the Approved Fecal Coliform TMDL

treatment train system. Three (3) years of influent and effluent data was collected on the BMP system. Table 13 summarizes the fecal coliform results from the BMP system.

Table 13: Fecal Coliform Removal Efficiency for BMP Treatment Train in Littleton, CO

<b>Structural BMP</b>	<b>Minimum Fecal Coliform Removal Efficiency (%)</b>	<b>Maximum Fecal Coliform Removal Efficiency (%)</b>	<b>Mean Fecal Coliform Removal Efficiency (%)</b>
Dry Detention with Wetland	81	99	91

Note: Removal efficiency is concentration based.

The above BMPs were reportedly constructed in accordance with the 1992 Urban Drainage and Flood Control District Urban Storm Drainage Criteria Manual for Colorado (Urban Drainage and Flood Control District, 1992).

A publication by Rutgers, The State University of New Jersey entitled *Efficiency of Bioretention Systems to Reduce Fecal Coliform Counts in Storm Water* (Rusciano et al, 2005) studied the effects various media depths of soil media, sand, and gravel had on the fecal coliform removal efficiency of bioretention systems. The pilot study was conducted in a laboratory using bioretention tubes. The results provided in Table 14 were provided by this study.

Table 14: Data from Bioretention Study by the State University of New Jersey

<b>Structural BMP</b>	<b>Minimum Fecal Coliform Removal Efficiency (%)</b>	<b>Maximum Fecal Coliform Removal Efficiency (%)</b>	<b>Mean Fecal Coliform Removal Efficiency (%)</b>
Bioretention (varying depths of soil media, sand, and gravel)	54.7	99.7	87.8

Note: Removal efficiency is concentration based.

The same study also quoted literature values reported by other studies as summarized in Table 15.

Table 15: Data Summarized in the State University of New Jersey Report

<b>Structural BMP</b>	<b>Reference</b>	<b>Fecal Coliform Removal Efficiency (%)</b>
Wetland	Birch et al., 2004	76
Wetland	Kadlec and Knight, 1996	90
Wetland	Davies and Bavor, 2000	79

Note: Removal efficiency is concentration based.

The Rutgers' study indicated that fecal coliform removal in BMPs was increased with:

- Removal of particle sizes of 2 micron and greater because fecal coliform has an affinity for adsorbing to particle sizes greater than 2 microns.
- Increased vegetation.

## Goose Creek Water Quality Recovery Program for the Approved Fecal Coliform TMDL

- BMPs that have periods of wetness and dryness (such as bioretention) that stimulate increased anaerobic and aerobic microbes that are predatory to bacteria.
- Increased temperature.

A publication entitled *Removal of Microbial Indicators From Storm Water Using Sand Filtration, Wet Detention, and Alum Treatment Best Management Practices* presented at the Sixth Biennial Storm Water Research & Watershed Management Conference September 14-17, 1999 (Southwest Florida Water Management District, 1999) studied three (3) BMPs under simulated storm conditions produced by flowing storm water (previously collected in a holding tank) of known fecal concentration into the BMP and collecting effluent samples at various time periods. Table 16 provides the results of this study.

Table 16: Data from 6th Biennial Storm Water Research & Watershed Conference (Southwest Florida Water Management District, 1999)

<b>Structural BMP</b>	<b>BMP Condition 1</b>	<b>BMP Condition 2</b>	<b>Fecal Coliform Removal Efficiency (%)</b>
Wet Pond	3.3-ft water depth	5-day detention	98.2
Wet Pond	9.0-ft water depth	5-day detention	88.5
Wet Pond	3.3-ft water depth	14-day detention	76.4
Wet Pond	9.0-ft water depth	14-day detention	69.2
Sand Filter	--	--	65.4
Alum Settling (jar test)	--	--	99.9

Note: Removal efficiency is load based.

The above BMPs were reportedly constructed in accordance with Chapter 40D-4 of the Florida Administrative Code (Southwest Florida Water Management District, 1999). The study noted that shallower wet ponds were more effective at removing fecal coliform because of increased exposure to sunlight or UV radiation, which is known to eliminate fecal coliform.

In addition to reviewing articles, MCWQP conducted searches on the International Storm Water Database for BMPs (Water Environment Research Foundation et al, 1999 - 2007) that have fecal coliform data. Neither the sampling protocols used nor the construction specifications for these BMPs were available for review. Table 17 presents the data obtained from searches on the International Storm Water Database for BMPs (Water Environment Research Foundation et al, 1999 - 2007).

Table 17: Data Obtained from the International Storm Water Database for BMPs

<b>Structural BMP</b>	<b>BMP Name</b>	<b>Fecal Coliform Removal Efficiency (%)</b>
Wet Pond	La Costa WB	99
Sand Filter	La Costa PR	99.8
Sand Filter	Foothill SF	71.5
Wet Pond	DUST Marsh Debris	90
Peat/Sand Filter	Via Verde	40

Note: Removal efficiency is concentration based.

## Goose Creek Water Quality Recovery Program for the Approved Fecal Coliform TMDL

### 3.1.2.3 Fecal Coliform Data from Local Pilot BMP Monitoring Program

MCWQP has been monitoring several BMPs locally for the past four (4) years. The data has been tracked by MCWQP in cooperation with the City of Charlotte and North Carolina State University (NCSU). A summary of the monitoring data was provided by NCSU in a series of reports dated January 2007 (North Carolina State University, 2007). The reports included estimates of the efficiency ratios for each BMP based upon influent and effluent concentrations. Since influent and effluent flow data was also monitored for each BMP, MCWQP was able to calculate load efficiencies for certain BMPs. A summary of the monitoring data is provided in Table 18.

Table 18: Data from BMP Monitoring in Mecklenburg County

<b>Structural BMP</b>	<b>NCSU Fecal Coliform Removal Efficiency (%)</b>	<b>MCWQP Fecal Coliform Removal Efficiency (%)</b>
Hal Marshall Rain Garden	69	94
Bruns Rain Garden	--	36
Bruns Wetland	70	--
Edwards Branch Wetland	99	--
West Brandywine Wetland	--	51
Pierson Wet Pond	57	--
Morehead Place Dry Detention	< - 21 >	< - 49 >
University Executive Park Dry Detention	< - 3 >	< - 160 >

Note: Removal efficiency is concentration based.

It should be noted that the sampling protocol for fecal coliform grab sampling did not specify at which point during the rain event (runoff hydrograph) the influent and effluent samples were to be collected; therefore, the grab samples were collected at various periods during the rain event.

Table 19 provides a summary of the BMPs studied and evaluated as part of the WQRP for Goose Creek.

Table 19: Summary of all Data Collected

<b>Structural BMP</b>	<b>Reported Fecal Coliform Removal Efficiency (%)</b>	<b>Average Fecal Coliform Efficiencies from Studied BMPs (%)</b>
Hal Marshall Rain Garden	94	78
Bruns Rain Garden	36	
VA 4-mile Rain Garden	85	
VA Blacks Run Rain Garden	85	78
Rutgers Rain Garden	88	

## Goose Creek Water Quality Recovery Program for the Approved Fecal Coliform TMDL

Structural BMP	Reported Fecal Coliform Removal Efficiency (%)	Average Fecal Coliform Efficiencies from Studied BMPs (%)
Bruns Wetland	70	79
Edwards Branch Wetland	99	
West Brandywine Wetland	51	
VA 4-mile Wetland	72	
Grant Ranch Dry Detention /Wetland	91	
Birch Wetland	76	
Kadlec Wetland	90	
Davies Wetland	79	

Note: Removal efficiency is concentration based.

### 3.1.2.4 Observations from BMP Data Analysis

Based upon review of the various fecal coliform TMDL Implementation Plans, literature publications, laboratory and field monitoring data, MCWQP makes the following observations:

- Other jurisdictions are using structural storm water BMPs as one tool for meeting their fecal coliform TMDL limitations.
- There is variability in the design criteria proposed for optimizing fecal coliform removal in BMPs.
- Dry detention ponds were not found to be effective at removing fecal coliform and in some instances increased loads of fecal coliform.
- Bioretention gardens, wet ponds, wetlands, sand filters, and infiltration BMPs show removal of fecal coliform from storm water runoff. It should be noted that all studied BMPs were designed according to different specifications.
- The depths of soil media, gravel, and sand layer in a bioretention cell do not affect the fecal coliform removal capability of the bioretention cell.
- Wet ponds with shallower permanent pool depths are more effective at removing fecal coliform than deeper wet ponds.
- Wet Ponds with 5-day detention time are more effective at removing fecal coliform than wet ponds with 14-day detention times.
- Comparison of the “tested” BMPs indicates variability of fecal coliform removal rates for various BMP types, but general trends were noted.

### 3.1.2.5 Recommendations

MCWQP recommends that structural storm water BMPs be used as one tool for reducing fecal coliform concentrations in the Goose Creek Watershed. For BMP selection and use, the following additional recommendations are provided:

- Dry Detention BMPs should not be used to remove fecal coliform loads.
- Bioretention cells, wetlands, wet ponds, infiltration BMPs, and sand filters can be used to effectively remove fecal coliform loads.
- Since BMPs designed according to different standards showed fairly consistent removal of fecal coliform, MCWQP believes that there is no need to provide specific design

## Goose Creek Water Quality Recovery Program for the Approved Fecal Coliform TMDL

standards for BMPs used to remove fecal coliform. MCWQP recommends the use of existing design standards contained in the Mecklenburg County BMP Design Manual.

- In the absence of test data for a site-specific BMP, MCWQP recommends the use of the fecal coliform removal rates contained in Table 20 for estimating removal for retro-fitted BMPs.

Table 20: Recommended BMP Removal Efficiencies for Retro-Fitted BMPs

Structural BMP	Reported Fecal Coliform Removal Efficiency (%)
Bioretention Cells	80
Wetlands	80
Wet Ponds	80
Sand Filters	80

Note: Removal efficiency is concentration based.

### 3.1.3 Existing and Proposed Structural BMPs in the Goose Creek Watershed

Table 21 provides the locations and types of BMPs either currently in operation in the Goose Creek Watershed and those proposed for installation by June 30, 2010. A map showing the locations of these BMPs in the watershed is provided in Figure 9.

Table 21: Locations & Types of BMPs Completed or Proposed in the Goose Creek Watershed

BMP-ID	Location	Status	BMP Type	Longitude	Latitude
97	Bain School	Completed	Bioretention	-80.6497	35.17484
87	Mint Hill Park	Completed	Bioretention	-80.6343	35.1795
88	Mint Hill Park	Completed	Bioretention	-80.6345	35.17919
89	Mint Hill Park	Completed	Bioretention	-80.6338	35.17948
90	Mint Hill Park	Completed	Bioretention	-80.6341	35.17912
91	Mint Hill Park	Completed	Bioretention	-80.634	35.17857
92	Mint Hill Park	Completed	Bioretention	-80.6341	35.17823
93	Mint Hill Park	Completed	Bioretention	-80.6336	35.17805
94	Mint Hill Park	Completed	Bioretention	-80.6342	35.17722
95	Mint Hill Park	Completed	Bioretention	-80.6324	35.17973
534	Trinity Episcopal Church	Completed	Wet Pond	-80.6814	35.13748
389	Bain School	Completed	Bioretention	-80.6486	35.17508
511	Byrd & Ropas Doctor's Off.	Completed	Bioretention	-80.6646	35.16752
535	Trinity Episcopal Church	Completed	Wet Pond	-80.6811	35.13768
544	CMC Medical Building	Completed	Dry Detention	-80.6811	35.14706
G-1	Yarmouth Road	Completed	Bioretention	-80.6497	35.14305
<b>G-2</b>	<b>Oxford Glen Sub-division</b>	<b>Proposed</b>	<b>Bioretention</b>	<b>-80.651</b>	<b>35.14633</b>
G-3	Queens Grant School	Completed	Dry Detention	-80.6627	35.16575
G-4	Country Woods	Completed	Linear Wetland	-80.6336	35.14531
<b>G-5</b>	<b>Bain School Road</b>	<b>Proposed</b>	<b>Livestock Fencing</b>	<b>-80.6352</b>	<b>35.16246</b>

Note: Latitude and Longitude in Decimal Degrees.

### Goose Creek Water Quality Recovery Program for the Approved Fecal Coliform TMDL

As indicated in Table 21, the two (2) new BMPs planned for implementation in the Goose Creek Watershed in FY10 include the installation of a structural BMP with a culvert improvement in the 15400 block of Thompson Road in Mint Hill and the installation of a fence to exclude livestock from the creek at 12601 Bain School Road also in Mint Hill. Figure 9 shows these sites as G2 and G5, respectively.

Figure 9: Locations of BMPs Completed or Proposed in the Goose Creek Watershed



## Goose Creek Water Quality Recovery Program for the Approved Fecal Coliform TMDL

---

### 3.2 Septic System Inspections (Non-Structural BMP)

The primary sewage disposal method in the Goose Creek Watershed is the on-site septic system. It is estimated that over 1,300 of these systems are in operation on single-family residential lots dispersed throughout the watershed in Mecklenburg County. Municipal sewer collection is very sparse in the Goose Creek Watershed and there are only five (5) private wastewater treatment plants with two (2) in Mecklenburg County and three (3) in Union County. Due to the proliferation of septic systems in the watershed, it is expected that failing or malfunctioning systems are a source of fecal coliform bacteria from humans. The primary reasons for failing systems are improper maintenance by the system owner and poor installation. A pilot study for the inspection of individual septic systems was implemented from April through June of 2009 in the Goose Creek Watershed in Mecklenburg County. Septic systems in Mecklenburg County are regulated by Ground Water and Waste Water Services (GWWS); therefore, MCWQP worked with the inspectors employed by GWWS in the completion of this pilot study. The purpose of these inspections was to inform residents regarding the proper maintenance of their septic systems and to inspect the system to ensure proper operation. The inspection form used is provided Appendix 3. A copy of the educational information distributed during these inspections is provided in Appendix 4. All septic systems in Mecklenburg County are planned to be inspected by July 2011. The prioritization scheme to be following in scheduling these inspections is provided in Appendix 5. Stallings and Indian Trail are considering the implementation of a similar septic system inspection program within their jurisdictions.

### 3.3 Public and Staff Participation and Outreach (Non-Structural BMP)

#### 3.3.1 Methodology

The goals of the public participation and outreach efforts to be conducted in the Goose Creek Watershed are as follows:

- Increase awareness of the WQRP on the part of citizens and public employees in the watershed and inform them of the actions they can take to lower fecal coliform concentrations in the creek.
- Increase participation among residents in the watershed in existing volunteer programs offered by Mecklenburg County, including Adopt-A-Stream and Storm Drain Marking.
- Inform citizens of the proper disposal of dog waste.

These goals will be achieved by completing the following actions at least once during each fiscal year beginning in FY10. The following Sections provide additional detail regarding these actions.

- Conduct a minimum of one (1) public workshop in the watershed.
- Conduct a minimum of one (1) workshop targeted toward public employees within the watershed, particularly employees with the Mecklenburg and Union Counties as well as the Towns of Mint Hill, Stallings and Indian Trail.
- Place a minimum of one article in the newsletters distributed by the Towns of Mint Hill, Stallings and Indian Trail.
- Distribute postcards, fliers and other written educational materials by mail, at event displays, etc.

## Goose Creek Water Quality Recovery Program for the Approved Fecal Coliform TMDL

---

### 3.3.2 Public Workshop

Beginning in FY2010, MCWQP will conduct annual workshops for staff and the general public in the Goose Creek Watershed to inform them of the WQRP in Goose Creek and the actions they can take to assist in our efforts to reduce fecal coliform bacteria levels. Brochures and various other educational materials will be distributed during these workshops. Attendees will be solicited for participation in volunteer activities to restore water quality conditions in Goose Creek, including Storm Drain Marking and Adopt-A-Stream.

### 3.3.3 Staff Development

Beginning in November 2009, MCWQP will host annual workshops for the staff of Mecklenburg and Union Counties as well as the Towns of Mint Hill, Stallings, Fairview and Indian Trail. The workshops will include the use of PowerPoint presentations, handouts and other information to cover the following topics:

- Why efforts to protect and restore water quality conditions in Goose Creek were initiated, how have these efforts evolved over time and why, and what is our measure of the success of these efforts.
- Overview of the Goose Creek Water Quality Recovery Program, including a description of each component and time frame for implementation.
- Overview of the Goose Creek Site Specific Management Plan.
- Detailed description of how staff will be involved in the implementation of the programs described in numbers 2 and 3 above.
- Description of educational materials available to residents.

### 3.3.4 Newsletters

Beginning in January 2010 and occurring annually thereafter, MCWQP will provide the Towns of Mint Hill, Stallings and Indian Trail with articles for inclusion in their newsletters to inform residents of the WQRP in Goose Creek and the actions they can take to assist in our efforts to reduce fecal coliform bacteria levels. Participation in the volunteer programs will also be solicited in the articles and dates for future workshops will be announced.

### 3.3.5 Dog Waste

Dog waste is a potential contributor of elevated fecal coliform bacteria levels. Dog waste left on trails, sidewalks, streets, and grassy areas are carried by rainwater into storm drains to nearby rivers, lakes and streams, including Goose Creek. Like human waste, animal waste may contain parasites, viruses, intestinal worms and bacteria, particularly fecal coliform. A single gram of pet waste contains an average of 23 million colonies of fecal coliform bacteria.

Some of the suggested behaviors for pet owners to adopt to reduce fecal coliform bacteria levels in surface waters are as follows:

- Pick up after your pet every single time they defecate.
- Check with your pet store for products that make picking up dog waste easy.
- Throw away pet waste in the garbage; never wash it into the gutter or storm drain.

## Goose Creek Water Quality Recovery Program for the Approved Fecal Coliform TMDL

---

- Never dispose of waste in or leave it near creeks and lakes.
- Carry extra bags in your car, so you are prepared when you travel with your pet.
- Get involved in a pet group and remind others to pick up after their pets.
- Educate neighbors.

MCWQP believes that by educating pet owners in the Goose Creek Watershed regarding the above behaviors an increased amount of pet waste will be properly disposed of and not end up in the creek thus reducing in-stream fecal coliform bacteria levels. The target of this educational campaign will be pet owners. Typically, active dog walkers pick up after their pets; therefore, the educational campaign will focus on residents in the Goose Creek Watershed that leave their dogs in the yard. In the Goose Creek Watershed, the addresses of pet owners that reside adjacent to the creek have been obtained. During November and December of 2009, MCWQP will mail these pet owners a postcard with information regarding the proper disposal of pet waste (see Figure 10). Homeowner Association (HOA) presidents in the Goose Creek Watershed will also receive this information as well as an article for inclusion in the HOA newsletter.

The next step in the educational campaign for proper pet waste disposal will be to partner with veterinarians and dog related businesses to get the message out where dog owners shop. Each veterinarian and pet store within the Goose Creek Watershed will receive posters to hang up in their business and information to hand out to customers. This will occur in February and March of 2010.

The final approach will be to reach dog owners where they take their pets. This will occur in May and June of 2010. MCWQP will partner with Mecklenburg County Park and Recreation to establish protocol for dog waste removal at its numerous dog parks. Their mutt-mitt stations will be labeled with a message to promote cleaning up after pets. A traveling exhibit will also be created to take to dog related events, such as Bark in the Park, Pet Parade and Earth Day.

Some of the products of the campaign have already been created; others will be designed around the focus group results. In preliminary discussions the following are being considered:

- Postcards for distribution in mail or at businesses (see Figure 10).
- Posters at veterinarians' offices.
- Signs in pet store waste removal aisles.

Incentives have also been considered to help dog owners establish correct pet waste disposal methods. In order for the avid dog walker to always be prepared when taking walks with their pet, MCWQP will provide bags on board product (see Figure 11) to pet owners in the Goose Creek Watershed that attend a dog event.

The major baseline for program evaluation is water quality. We have sampling sites in all of the target watersheds. Fecal numbers will be recorded before the marketing campaign begins, during the campaign, as well as to be determined intervals after the message goes out. Other methods of evaluation are the number of pledge cards received, to be counted by staff. Charlotte-Mecklenburg Storm Water Services will work with pet stores to determine the number of pet waste disposal products sold in their stores. Veterinarians will tally the number of materials handed out in their offices.

Figure 10: Pet Waste Postcard (front)



## WHY SCOOP THE POOP?

Cleaning up pet waste is good for your health and the environment. Seriously.

It is estimated that there are over 218,000 dogs in Mecklenburg County - and those dogs are producing 72,000 pounds of waste each day!

Pet waste left on the ground, especially near streets and sidewalks, gets washed into storm drains which flow to your local waterway... without being treated.

Bacteria, parasites, and viruses found in pet waste can be harmful to human health and water quality.

Picking up pet waste is the responsible thing to do for you, your kids and the environment.

(back)

## What can you do?

- ◆ Pick up after your pet every single time.
- ◆ Check with your pet store for products that make picking up easy.
- ◆ Throw away pet waste in the garbage; never wash it into the gutter or storm drain.
- ◆ Never dispose of waste in or leave it near creeks and lakes.
- ◆ Carry extra bags in your car so you are prepared when you travel with your pet.
- ◆ Educate neighbors.

Visit <http://stormwater.charmeck.org> and click **Pollution Prevention** for more information.



700 N. Tryon St.  
Charlotte, NC 28202

Figure 11: Bags on Board Containing Pet Waste Disposal Bags



### 3.4 Documenting Removal Efficiencies for Structural and Non-Structural BMPs

As described in Section 2.2, fecal coliform removal efficiencies will be assigned to each BMP utilized in the Goose Creek Watershed as part of the WQRP, including both structural and non-structural varieties. Section 3.1.2 contains sufficient documentation for the establishment of the removal efficiencies for structural BMPs but research needs to be completed to establish the removal efficiencies for the non-structural variety, including septic system surveys, public education and involvement, etc. It is believed that such removal efficiencies have been documented elsewhere in the country. During FY09-10, MCWQP will research this documentation and establish removal efficiencies for non-structural BMPs using the best available data and information. This research and established removal efficiencies will be documented in the FY10 revisions to Section 3 of the WQRP Plan, which will be completed and submitted to DWQ for review and consideration by August 31, 2010. Following approval of by DWQ, MCWQP will track and total the removal efficiencies for all the BMPs completed in the watershed. Once sufficient BMPs have been employed to achieve a 92.5% removal efficiency in all the MS4 areas in the Goose Creek Watershed the WQRP Plan will consider the MS4 areas to be compliant with the TMDL and the WQRP will have reached its endpoint.

### 3.5 BMP Implementation Schedule for FY10

Provided below is the schedule for the development and implementation of the BMPs planned for FY10:

1. July 2009 through June 30, 2010: Continuation of the septic system survey in the watershed.
2. October 2009: Initiate efforts toward the installation of fencing at 12601 Bain School Road in Mint Hill to exclude livestock from the creek.
3. November 2009: Conduct annual workshop for staff and the general public.
4. December of 2009: Mail pet waste postcard.

**Goose Creek Water Quality Recovery Program for the Approved Fecal Coliform TMDL**

---

5. January 2010: Initiate efforts toward the installation of BMPs with the culvert project planned for the 15400 block of Thompson Road in Mint Hill.
6. January 2010: Distribute articles in the Towns' newsletter.
7. February and March of 2010: Partner with veterinarians and pet related businesses to distribute pet waste information.
8. May and June of 2010: Reach owners where they take their pets (dog parks, etc.).

## Goose Creek Water Quality Recovery Program for the Approved Fecal Coliform TMDL

---

### SECTION 4.0 DATA COLLECTION AND DOCUMENTATION

#### 4.1 Data Collection

The data collected for the Goose Creek WQRP consists of water quality monitoring data, locations of the storm drain inlets and outlets, and various data and information documenting the activities performed and BMPs employed to restore water quality conditions in compliance with State standards. The data in each of these three (3) categories differs with regard to how it is collected, assessed and maintained as described below. All data is stored on a Mecklenburg County server that is maintained by the IST Department.

##### 4.1.1 Monitoring Data

All monitoring activities for the WQRP will be performed in strict accordance with MCWQP's QAPP. This QAPP is maintained on the following LAN site: G:\WQ\_Xfer\WQ\Policies & Procedures\11.QAPP. MCWQP's Quality Assurance and Quality Control (QA/QC) Officer will be responsible for ensuring compliance with this QAPP. The majority of the samples collected by MCWQP for the WQRP will be delivered for analysis to the laboratory operated by Charlotte-Mecklenburg Utilities (CMU) located at 4222 Westmont Drive in Charlotte, N.C. (certification #192). On occasion, due to laboratory work load or in order for holding times to be met, samples will be delivered for analysis to Prism Laboratory located at 449 Springbrook Road in Charlotte, N.C. (certification #402). Analytical results will be transferred digitally and via hard copy to the QA/QC Officer from the laboratory within 45 days of sample collection. The only exception to this rule will be with the CMANN data, which will be reviewed and quality assured by the CMANN Project Officer and submitted to the QA/QC Officer electronically. Field staff will provide completed field data sheets and copies of Chain of Custody forms to the QA/QC officer on the same day the samples and field measurements are collected. The QA/QC Officer is responsible for the compilation, review, verification, validation, and warehousing of all water quality monitoring data collected by MCWQP. As part of this process, the QA/QC Officer will immediately forward all exceedances of State standards or local Action Levels as well as any observed negative water quality conditions to the Water Quality Supervisor for the initiation of immediate follow up activities to identify and eliminate pollution source(s) in accordance with IDDE Procedures for MCWQP.

On at least a monthly basis, data will be compiled, quality assured and added to the Water Quality Data Repository (WQDR), which is a component of the Environmental Data Management System (EDMS) maintained for MCWQP. This data will be readily available to staff through the use of SAS reports. In addition, data will be maintained on the website described in Section 2.4 above.

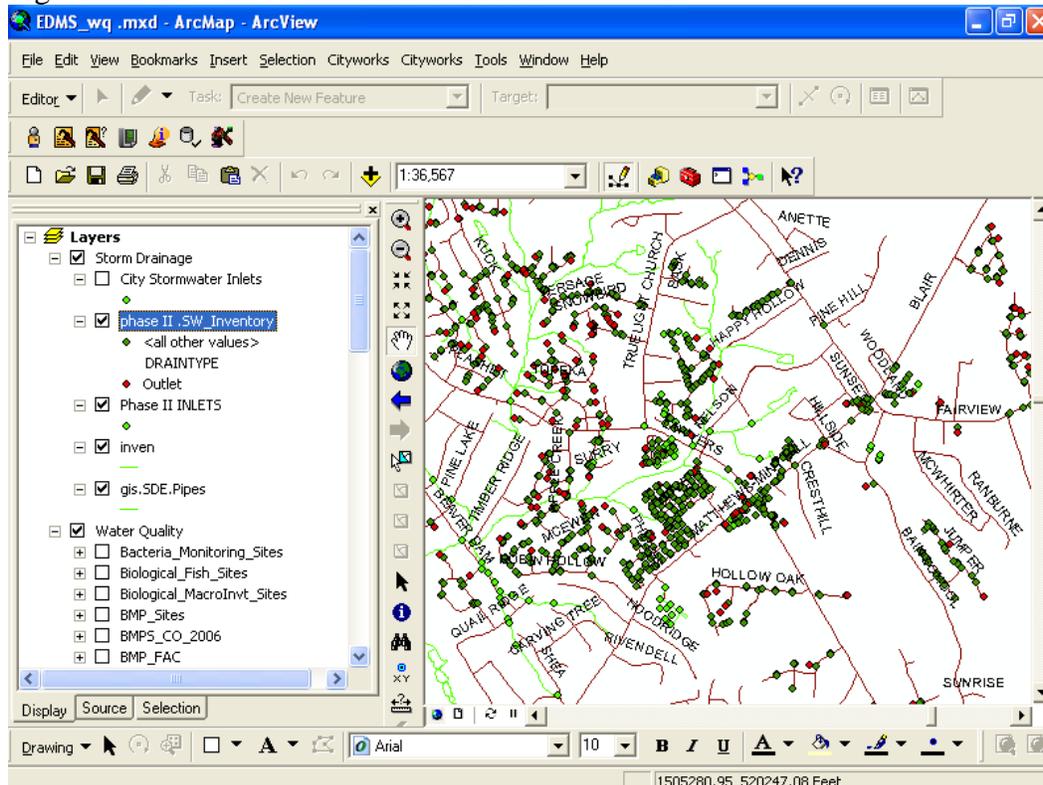
##### 4.1.2 Storm Drain Inventory Data

During the course of the stream walks conducted in the Goose Creek Watershed during the summer of 2007, all storm drain inlets and outlets were identified in Mecklenburg County and the Towns of Mint Hill, Stallings and Indian Trail. Data was collected in the field using ArcPad software installed on GPS enabled hand-held computers called Trimble Units. Upon return to

## Goose Creek Water Quality Recovery Program for the Approved Fecal Coliform TMDL

the office, data was downloaded from the Trimble Units into GIS and stored in EDMS, which is accessible by all MCWQP staff for Mecklenburg County and Mint Hint Hill. Figure 12 illustrates how this data is represented in EDMS. For the Towns of Stallings and Indian Trail, GIS data was downloaded onto a CD and provided to staff for their use.

Figure 12: Storm Drain Inlets and Outlets in EDMS



Storm drain inlets and outlets will be updated in EDMS as new development occurs based on data submitted to Mecklenburg County by builders and developers. This is a requirement prior to the final approval of construction activities.

### 4.1.3 Documentation of WQRP Activities

Written reports will be completed to document the activities performed and BMPs employed to restore water quality conditions in compliance with State standards. These reports will be entered into EDMS on Work Order forms contained in software called Cityworks. These Work Orders include "Comment" fields and attachments to describe activities completed. Figure 13 illustrates a Work Order template in EDMS.

## Goose Creek Water Quality Recovery Program for the Approved Fecal Coliform TMDL

Figure 13: Work Order Template in EDMS

The screenshot displays the EDMS interface for a work order titled "Goose Creek Recovery Plan Stream Walks" with ID 73257. The interface includes a top navigation bar with icons for Save, Print, Tools, Inspections, Tasks, Labor, Material, and Equipment. Below this is a search bar and a list of tabs: General, Details, Attachments, Cycle, Print, and Custom. The main content area is divided into several sections:

- Description:** "Goose Creek Recovery Plan Stream Walks", Entity Type: "BUILDINGS", Number: "73257", Status: "CLOSED", Priority: "Medium".
- Requested By:** "FARMER, RICHARD", Initiated By: "FARMER, RICHARD" (5/29/07 2:32:58 PM), Submitted By: "BERRY, ERNESTINE" (2/2/09 4:33:50 PM), Supervisor: "BERRY, ERNESTINE".
- Projected Start/Finish:** "05/17/2007" to "MM/DD/YYYY", **Actual Start/Finish:** "MM/DD/YYYY" to "MM/DD/YYYY".
- Units Accomplished:** "BERRY, ERNESTINE" (2/2/09 4:33:49 PM).
- General Location:** "GOOSE CREEK RECOVERY - STALLINGS".
- Comments:** A section for "New Comments" and "Existing Comments". An existing comment by "FARMER, RICHARD" (1/30/2009 4:21:21 PM) states: "Stream walks were conducted between April 24, 2007 and June 20, 2007."
- Task List:** A table with columns: Sequence, Task, Status, Proceed, Rework, Assigned To, Shop, Start Date, Finish Date, Proj Start Date, Proj Finish Date. The first row shows Sequence 1, Task "Town", and Status "Closed".

### 4.2 Reports

An annual report summarizing the activities associated with the WQRP and its overall effectiveness will be prepared and submitted to the WQRP Advisory Group described in Section 2.4 above by July 15<sup>th</sup> of each year, which is two (2) weeks following the end of the fiscal year. These annual reports will include the following sections:

1. **Water Quality Data Assessment:** Assessment of data collected through the water quality monitoring program established for the WQRP, including current status and trends toward meeting the State standard for fecal coliform.
2. **BMP Assessment:** Description of the BMPs employed during the fiscal year and an assessment of their effectiveness as well as BMP measures that will be implemented next fiscal year to restore water quality conditions in compliance with State standards.
3. **Cost-Benefit Analysis:** Analysis of each BMPs cost relative to the amount of fecal coliform bacteria removed.
4. **Source Reduction:** Description of the water quality problems identified and eliminated and the estimated load reduction.
5. **Adaptive Management:** Recommended changes to the WQRP to improve compliance with TMDL targets and the State water quality standard.
6. **Public Participation and Outreach:** Description of the activities performed to educate and involve the public in efforts to restore water quality conditions in Goose Creek.
7. **Staff Development:** Description of the activities performed to educate and involve staff in efforts to restore water quality conditions in Goose Creek.

## Goose Creek Water Quality Recovery Program for the Approved Fecal Coliform TMDL

---

### SECTION 5.0 PROGRAM EVALUATION

#### 5.1 Assessing the Effectiveness of BMPs and WQRP

The WQRP Advisory Group described in Section 2.4 above was developed in November 2006 for the purpose of reviewing program activities and data and assessing the need for change. This group consists of representatives from the following:

- Mecklenburg County Water Quality Program
- Town of Mint Hill
- Town of Stallings
- Town of Indian Trail
- Union County
- DWQ

In addition, representatives of other jurisdictions interested in the recovery program and private citizens with an interest and knowledge of the TMDL program often participate in discussions and meetings. The MCWQP representative will take the lead in setting up the meetings, establishing agendas and providing all necessary background information. The WQRP Advisory Group will meet at a minimum of annually before August 15<sup>th</sup> following the release of the WQRP annual report by July 15<sup>th</sup> (see Section 4.2 above). Additional meetings will be held during the year as deemed necessary by MCWQP or any other member of the WQRP Advisory Group. The purpose of this meeting will be to assess the effectiveness of the BMPs employed during the fiscal year and the overall effectiveness of the WQRP at meeting TMDL targets. The group will also identify additional BMPs or changes in the WQRP needed to ensure the fulfillment of all TMDL objectives. MCWQP staff will review the data presented in the annual report during the meeting of the group after which a discussion will take place for evaluating the overall effectiveness of the BMPs and associated cost-benefit analysis as well as the overall WQRP.

#### 5.2 Cost-Benefit Analysis

The cost-benefit analysis is an integral component of the process for evaluating the WQRP. The costs associated with the completion of both structural and non-structural BMPs will be carefully documented throughout the fiscal year. In addition, the removal efficiencies for these BMPs as described in Section 3.4 will be tracked. At the end of each fiscal year, this data will be compiled to identify the estimated cost associated with the removal of fecal coliform bacteria for each BMP employed. This data will be summarized and included in the annual report completed and submitted the WQRP Advisory Group and DWQ by July 15<sup>th</sup> of every year. This data will be carefully evaluated during the annual meetings of the WQRP Advisory Group for identification of the BMPs to be employed the next fiscal year.

For FY09, cost data was available for the retrofit BMP projects (bioretention systems) installed at Mint Hill Park on Fairveiw Road and the non-structural BMP implemented through the septic system survey. The total fecal coliform load removed as a result of these BMPs was also estimated to identify the benefit of these BMPs. The results of this analysis are as follows:

## Goose Creek Water Quality Recovery Program for the Approved Fecal Coliform TMDL

---

### BMP Cost vs. Benefit

- Estimated annual fecal coliform removal from the 2 rain gardens = 869 billion colonies
- The estimated cost of the 2 rain gardens = \$249,000
- Cost per billion colonies removed = \$286

### Septic System Survey Cost vs. Benefit

- Estimated annual fecal coliform removal from septic system inspections = 135 billion colonies
- The estimated cost of the septic system inspections = \$8,989 (includes inspection costs only and the cost to the owner of the repair)
- Cost per billion colonies removed = \$67 (based on the assumption that all the fecal bacteria from the failing system reaches the creek)

Based on the above cost-benefit analysis, septic system inspections are approximately four (4) times more cost effective at the removal of fecal coliform bacteria than retrofitted-structural BMPs in the Goose Creek Watershed. In other words, for every \$1 spent on the septic system inspection program at least \$4 would have to be spent on structural BMP retrofits to achieve the same pollutant removal load. Therefore, maximum effort should be focused on the completion of the septic system survey and the implementation of the survey in Indian Trail and Stallings.

## Goose Creek Water Quality Recovery Program for the Approved Fecal Coliform TMDL

---

### SECTION 6.0 ADAPTIVE MANAGEMENT

#### 6.1 Assessing the Need for Change

During the annual meeting of the WQRP Advisory Group held in August of every year as discussed in Section 5.1 above, MCWQP staff will explain the overall effectiveness of the BMPs and WQRP at complying with the State water quality standard and lead a subsequent discussion regarding the changes that are needed to maximize the cost-benefit ratio. The purpose of this discussion will be to identify specific changes and/or additions to the BMPs and WQRP Plan that are necessary in order to more effectively comply with the TMDL targets and State water quality standard in a cost efficient manner.

#### 6.2 WQRP Plan Updates

MCWQP will record comments and input received during the annual WQRP Advisory Group meeting regarding the effectiveness of the BMPs and WQRP as well as the changes necessary to improve compliance with the TMDL targets and State water quality standard. MCWQP staff will carefully consider these comments and update the WQRP Plan accordingly. In addition, the annual report will be modified if the WQRP Advisory Group believes that data and information presented in the annual report is inaccurate or incomplete. The updated WQRP Plan and annual report will be provided to DWQ no later than August 30<sup>th</sup> of every year. As required by Part II, Section A, Paragraph 11 (e) of the Phase II Permit, following any review and comment by DWQ regarding the WQRP, MCWQP will incorporate any necessary changes into the WQRP Plan. The WQRP Plan will be incorporated into the Storm Water Management Program Plan by August 30<sup>th</sup> of every year and implementation of the new Plan will begin immediately. The revised WQRP Plan and Storm Water Management Program Plan will be placed on the website. An email will be sent to the WQRP Advisory Group informing them that the revised WQRP Plan has been finalized and making them aware of its location on the website.

As the WQRP Plan is changed, the version and date are to be changed on the front cover of the document. Only the current version is to be located on the website under the name "Goose Creek WQRP V\_.doc." The blank after WQRP Plan is to include the version number such as 1, 2, 3, 4, etc. The current version of this Plan is also to be maintained on the LAN in the following folder: G:\WQ\_Xfer\WQ\Goose Recovery Plan. Old versions of the WQRP Plan are to be maintained on the LAN in the following folder: G:\WQ\_Xfer\WQ\Goose Recovery Plan\Archived WQRPs.

#### 6.3 Program Analysis and Adaptive Management Schedule

Provided below is the schedule for program assessment and adaptive management as described in Sections 5.1 and 6.1 above.

1. By July 15<sup>th</sup> of every year: MCWQP to complete annual report including a cost-benefit analysis of BMPs and provide to members of the WQRP Advisory Group.
2. By August 15<sup>th</sup> of every year: MCWQP to hold a meeting of the WQRP Advisory Group to review the annual report, assess the effectiveness of BMPs and modify and/or add to the WQRP Plan and/or BMPs as deemed appropriate.

## Goose Creek Water Quality Recovery Program for the Approved Fecal Coliform TMDL

---

3. By August 30<sup>th</sup> of every year: MCWQP to complete modifications to the WQRP Plan, BMPs and annual reports and submit to DWQ.
4. By August 30<sup>th</sup> of every year: MCWQP to place revised WQRP Plan, Storm Water Management Program Plan, annual report, and all monitoring data on the website and send an email to the WQRP Advisory Group informing them that the revisions and making them aware of its location on the website. All changes to the WQRP will become effective on August 30<sup>th</sup> of each year.

## Goose Creek Water Quality Recovery Program for the Approved Fecal Coliform TMDL

### SECTION 7.0 SCHEDULE

Table 22 provides the WQRP activities to be performed and the associated schedule.

Table 22: WQRP Schedule

Activity	Initiation Date	Completion Date	Measure of Success
<b>Program Development</b>			
Develop a Water Quality Recovery Plan (WQRP) for the Goose Creek Fecal Coliform TMDL	August 2006	April 2007	WQRP Plan developed, implemented & incorporated into Storm Water Management Program Plan with updates ongoing.
Develop WQRP Advisory Group	November 2006	Ongoing	Active group established and ongoing with meetings at least annually in August.
Develop WQRP Website	April 2007	Ongoing with a minimal of annual updates	Website developed, including at a minimum the WQRP Plan, Annual Reports and Monitoring Data.
Develop WQRP Monitoring Plan	April 2007	Ongoing	Monitoring plan developed and incorporated into WQRP Plan.
Develop a Plan & Schedule for Identification of Storm Water Outfalls	April 2007	April 2007	Plan and schedule developed and incorporated into WQRP Plan.
<b>Program Implementation</b>			
Identification of Storm Water Outfalls	May 2007	July 2007	Outfalls identified and made available to staff through GIS. Updates to the database will be provided by contractors/ developers as new development occurs.
Implementation of Monitoring Program	May 2007	Ongoing	Monitoring conducted in accordance with Plan in Section 2.6. Data evaluation & pollution sources identified and eliminated immediately upon receipt of data.
Identification & Implementation of BMPs	April 2007	Ongoing	BMP study completed to identify BMPs some of which were implemented in FY09 as discussed in Section 3. BMPs to be implemented during FY10 are listed in Section 3.4.
Implementation of Public Participation & Outreach Efforts	May 2009	Ongoing	Brochures for proper maintenance of septic systems. FY10 activities and schedules included in Section 3.3.

## Goose Creek Water Quality Recovery Program for the Approved Fecal Coliform TMDL

---

Activity	Initiation Date	Completion Date	Measure of Success
Staff Development	April 2007	Ongoing	Staff training and updates on WQRP during staff meetings. FY10 activities and schedules included in Section 3.3
<b>Data Collection &amp; Documentation</b>			
Data Collection	May 2007	Ongoing	Data collection occurs during monitoring and BMP implementation.
Reports	July 9, 2008	Ongoing	Data summarized and provided in annual report submitted to WQRP Advisory Group and DWQ by July 15 <sup>th</sup> of every year. Also placed on website.
<b>Program Evaluation</b>			
Assessing the Effectiveness of BMPs & WQRP	August 4, 2009	Ongoing	Occurs at a minimum of annually in accordance with Section 5.
Cost-Benefit Analysis	August 4, 2009	Ongoing	Occurs at a minimum of annually in accordance with Section 5.
FY09 Program Evaluation	May 2009	August 4, 2009	Occurs at a minimum of annually in accordance with Section 5.
<b>Adaptive Management</b>			
Assessing the Need for Change	August 4, 2009	Ongoing	Occurs at a minimum of annually in accordance with Section 6.
WQRP Updates	August 4, 2009	Ongoing	Occurs at a minimum of annually in accordance with Section 6.

## Goose Creek Water Quality Recovery Program for the Approved Fecal Coliform TMDL

---

### SECTION 8.0 REFERENCES

Mecklenburg County Water Quality Program, 2009, Illicit Discharge Detection and Elimination (IDDE) Policies and Procedures. 700 North Tryon Street, Charlotte, N.C.

Thomas Jefferson Planning District Commission. 2005. Moore's Creek Fecal Coliform TMDL Implementation Plan. 401 East Water Street, Charlottesville, VA.

Northern Virginia Regional Commission. 2004. Implementation Plan for the Fecal Coliform TMDL (Total Maximum Daily Load) for Four Mile Run, Virginia. 7535 Little River Turnpike, Suite 100, Annandale, VA.

Virginia Department of Conservation and Recreation. 2006. Water Quality Implementation Plan for Blacks Run and Cooks Creek (Fecal Coliform and Aquatic Life TMDLs). 44 Sanger Lane, Suite 102, Staunton, VA.

Water Environment Research Foundation. 1999 – 2000. American Society of Civil Engineers (ASCE) / Environmental and Water Resources Institute (EWRI), the American Public Works Association (APWA), the Federal Highway Administration (FHWA), and U.S. Environmental Protection Agency (EPA), 1999 – 2007, International Storm Water Database, [www.bmpdatabase.org](http://www.bmpdatabase.org).

Jones, Jonathan E., Earles, Andrew, Fassman, Elizabeth A., Doerfer, John T. and Carroll, John E.: 2004. *Grant Ranch Stormwater-Quality Management Program*, Stormwater Magazine. Forester Media Inc., Santa Barbara, CA.

Urban Drainage and Flood Control District. 1992. *Urban Storm Drainage Criteria Manual*, Denver, CO.

Rusciano, G.M., C.C. Obropta. 2005. Rusciano, G.M. Efficiency of Bioretention Systems to Reduce Fecal Coliform Counts in Stormwater. Proceedings of The North American Surface Water Quality Conference and Exposition, Orlando, Florida, July 18-25, 2005. Forrester Communications, Inc., Santa Barbara, CA.

Birch, G.F., C. Matthai, M.S. Fazeli, and J. Suh. 2004. Efficiency of a Constructed Wetland in Removing Contaminants from Stormwater. *Wetlands*.

Kadlec, R.H. and R.L. Knight. Pathogens. 1996. In *Treatment Wetlands*. CRC Press, Inc.: Boca Raton, FL

Davies, C.M. and H.J. Bavor. 2000. The Fate of Stormwater-Associated Bacteria in Constructed Wetland and Water Pollution Control Pond Systems. *Journal of Applied Microbiology*.

Southwest Florida Water Management District. 1999. *Removal of Microbial Indicators From Storm Water Using Sand Filtration, Wet Detention, and Alum Treatment Best Management*

## **Goose Creek Water Quality Recovery Program for the Approved Fecal Coliform TMDL**

---

*Practices* presented at the Sixth Biennial Storm Water Research & Watershed Management Conference September 14-17, 1999. 2379 Broad Street, Brooksville, FL.

North Carolina State University. 2007. City of Charlotte Pilot BMP Monitoring Program Pierson Pond Final Monitoring Report, City of Charlotte Pilot BMP Monitoring Program Shade Valley Wet Pond Final Monitoring Report, City of Charlotte Pilot BMP Monitoring Program Edwards Branch Wetland Final Monitoring Report, City of Charlotte Pilot BMP Monitoring Program Bruns Ave. Elementary School Wetland Final Monitoring Report, City of Charlotte Pilot BMP Monitoring Program Morehead Dry Detention Basin Final Monitoring Report, City of Charlotte Pilot BMP Monitoring Program University Executive Park Dry Detention Basin Final Monitoring Report, and City of Charlotte Pilot BMP Monitoring Program Hal Marshall Bioretention Final Monitoring Report. Raleigh, NC.

# Goose Creek Water Quality Recovery Program for the Approved Fecal Coliform TMDL

## Appendix 1: Goose Creek TMDL Notification from N.C. Division of Water Quality

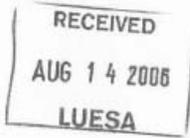


**North Carolina Department of Environment and Natural Resources**  
Division of Water Quality

Michael F. Easley, Governor William G. Ross, Jr., Secretary  
Alan W. Klimek, P.E., Director

August 10, 2006

Mr. Rusty Rozzelle  
Mecklenburg County  
700 North Tryon Street  
Charlotte, North Carolina 28202



Subject: NPDES Permit Number NCS000395  
County of Mecklenburg and the Town of Mint Hill

Dear Mr. Rozzelle:

Pursuant to the terms and conditions of your NPDES Permit, Number NCS000395, Part II, Final Limitations and Controls for Permitted Discharges, Section A, Program Implementation, Paragraph 11 (a), Mecklenburg County is subject to an approved Total Maximum Daily Load (TMDL).

Section 303(d) of the Clean Water Act (CWA) requires states to develop a list of waters not meeting water quality standards or which have impaired uses. This list, referred to as the 303(d) list, is submitted to the U.S. Environmental Protection Agency (EPA) for review. The 303(d) process requires that a TMDL be developed for each of the waters appearing on the 303(d) list. The 2002 list identified the 17.0 mile segment of Goose Creek from its source to the Rocky River as impaired due to elevated fecal coliform concentrations. In response to the high level of interest in this TMDL a stakeholder group was formed in 2003. The TMDL approved by EPA July 8, 2005, encompasses all stream segments listed in the 2002-303(d) list for this watershed. Mecklenburg County can identify the impaired stream segments by referencing the current version of the N.C. Water Quality Assessment and Impaired Waters List (305(b) and 303(d) Report, available on the website of the Division of Water Quality Modeling and TMDL Unit at:

[http://h2o.enr.state.nc.us/tmdl/General\\_303d.htm](http://h2o.enr.state.nc.us/tmdl/General_303d.htm)

The objective of a TMDL is to allocate allowable pollutant loads to known sources so that actions may be taken to restore the water to its intended uses. Thus the implementation of fecal coliform controls will be necessary to restore uses in Goose Creek. The involvement of local governments and agencies will be needed in order to develop implementation plans.

---

1617 Mail Service Center, Raleigh, North Carolina 27699-1617  
512N. Salisbury St., Raleigh, North Carolina 27604  
Phone: 919-733-7015 / FAX: 919-733-2496 / Internet: h2o.enr.state.nc.us

An Equal Opportunity/Affirmative Action Employer – 50% Recycled/10% Post Consumer Paper



## Goose Creek Water Quality Recovery Program for the Approved Fecal Coliform TMDL

---

Pursuant to the terms and conditions of your NPDES Permit, Number NCS000395, Part II, Final Limitations and Controls for Permitted Discharges, Section A, Program Implementation, Paragraph 11, Mecklenburg County shall establish a TMDL Water Quality Recovery Program within two years after receiving this notice.

Within two years after receiving this notice, Mecklenburg County shall identify potential sources of fecal coliform and develop a monitoring plan for fecal coliform. Mecklenburg County shall include the location of all known MS4 outfalls with the potential of discharging fecal coliform, the schedule for discovering and locating unknown MS4 outfalls with the potential of discharging fecal coliform, and the monitoring plan, in the first Stormwater Plan annual report due no earlier than two years after notification of the applicability of a TMDL. Following any review and comment by the Division on the TMDL Water Quality Recovery Program, the Mecklenburg County shall incorporate necessary changes into the program and incorporate the revised TMDL Water Quality Recovery Program into their Stormwater Management Plan.

The permit requirements for a TMDL in Part II Section (A) paragraph (11), should be coordinated with requirements in Part II, Section (D) (illicit discharges), Section (F) paragraph (2) paragraph (c) and other Best Management Practices (BMPs). The schedule developed under the TMDL requirements does not modify the implementation schedule requirements in Part II, Section (D), Section (F) or other BMPs prescribed in your permit.

If you have any questions, please contact Mike Randall at telephone number 919/733-5083 ext. 545.

Sincerely,



Alan W. Klimck, P.E.

cc: Mike Mitchell, EPA Region IV  
Central Files  
Stormwater and General Permit Unit Files  
DWQ Mooresville Regional Office

## Goose Creek Water Quality Recovery Program for the Approved Fecal Coliform TMDL

---

### Appendix 2: Water Quality Recovery Program Guidance Document

#### **Notification**

Pursuant to the terms and conditions of their NPDES Permit, Part II, Final Limitations and Controls for Permitted Discharges, Section A, Program Implementation, Paragraph 11 (a), Mecklenburg County was notified that they are subject to an approved Total Maximum Daily Load (TMDL).

#### **Permit Requirements**

##### Program Development

No later than September 1, 2008, Permittee shall:

- Establish a TMDL Water Quality Recovery Program (WQRP).
- Identify the locations of all currently known MS4 outfalls within its jurisdictional area with the potential of discharging the pollutant(s) of concern to the impaired segments, to their tributaries, and to segments and tributaries within the watershed contributing to the impaired segments.
- Develop and submit a schedule to discover and locate all other MS4 outfalls within its jurisdictional area that may be discharging the pollutant(s) of concern to the impaired stream segments, to their tributaries, and to segments and tributaries within the watershed contributing to the impaired segments.
- Develop a monitoring plan for each pollutant of concern and submit for DWQ review and approval.

##### Annual Report (No later than September 1, 2008):

Include the location of all currently known MS4 outfalls with the potential of discharging the pollutant(s) of concern, the schedule for discovering and locating currently unknown MS4 outfalls with the potential of discharging the pollutant(s) of concern, and the monitoring plan.

##### Annual Reports (No later than September 1, 2009 and thereafter):

- Include an assessment of data collected for each pollutant of concern.
- Include an assessment of the effectiveness of the BMPs employed and propose additional BMP measures that may be necessary to return the impaired segments to compliance with state water quality standards.

#### **Implementation**

- The permittee shall implement appropriate BMPs to control pollutants of concern to the maximum extent practicable.
- Following any review and comment by the Division on the TMDL Water Quality Recovery Program, the permittee shall incorporate any necessary changes into the

## Goose Creek Water Quality Recovery Program for the Approved Fecal Coliform TMDL

---

program. The permittee shall incorporate the revised TMDL WQRP into the Storm Water Management Plan.

### Suggested Minimum Elements of a Water Quality Recovery Program

- Identify the purpose and goals of a TMDL WQRP.
- Establish a TMDL advisory group.
- Establish a website to document and disseminate information and results.
- Identify the location of all currently known MS4 outfalls with the potential of discharging the pollutant(s) of concern.
- Develop a schedule for discovering and locating currently unknown MS4 outfalls with the potential of discharging the pollutant(s) of concern.
- Develop and implement a monitoring plan.
- An assessment of the available data for pollutant of concern.
- Identify BMPs, time frames, and costs necessary to achieve reduction.
- An assessment of the effectiveness of the BMPs employed, to determine what, if any, additional BMP measures may be necessary to return the impaired segments to compliance with State water quality standards.
- Implement appropriate BMPs to control the pollutants of concern to the maximum extent practicable.
- Incorporate the TMDL WQRP into the Permittee's Storm Water Management Plan.
- Documentation.
- Public Participation and Outreach Activities.
- Staff Development
- Cost-Benefit Analysis.

### Monitoring Plan

The monitoring plan shall include the sample location by verbal description and latitude and longitude coordinates, sample type, frequency, any seasonal considerations, and a monitoring implementation schedule for each pollutant of concern. Where appropriate, the permittee may reduce the monitoring burden by proposing to monitor outfalls that the Division would consider substantially similar to other outfalls. The permittee may also propose in-stream monitoring where it would complement the overall monitoring plan. The monitoring plan shall be adjusted as additional outfalls are identified in accordance with the schedule required above and as accumulating data may suggest.

### Documentation

Documentation of progress toward fulfilling the source reduction targets and the resulting water quality improvements is extremely important at several levels including:

- The public/local citizens interested in water quality improvement.
- Local agencies responsible for components of the implementation
- State agencies responsible for assessing water quality and adjusting programs to address concerns.

## **Goose Creek Water Quality Recovery Program for the Approved Fecal Coliform TMDL**

---

- Federal agencies, primarily the USEPA, responsible for oversight of State programs and ultimately responsible for TMDL implementation.

To ensure effective documentation and communication of results at all levels, data will be collected and summarized and made available to the general public via the website and to NCDENR and the S.C. Department of Health and Environmental Control (SCDHEC) via written reports. This reporting regimen will ensure adequate assessment of the TMDL WQRP and the timely implementation of TMDL modifications for maximum effectiveness.

The following documentation methods and reporting will be used to measure TMDL effectiveness and report results:

- “TMDL Monitoring Reports” including data collected from source and in-stream compliance monitoring activities posted monthly on website.
- “Source Reduction Reports” for each of the major pollutant(s) of concern sources included in the TMDLs. This information will be posted annually on the website and a written copy will be made available to NCDENR and SCDHEC.
- “Water Quality Reports” that use the annual Source Reduction Reports to summarize water quality information regarding compliance with the TMDLs for pollutant(s) of concern. This information will be posted on the website and a written copy will be made available to NCDENR and SCDENR.

### Public Participation and Outreach Activities

Workshops for the general public, publicized through media releases, will be held for the purpose of explaining efforts that are being undertaken to reduce pollutant(s) of concern.

### Staff Development Phase

Staff will need to be adequately informed of the specific requirements of the WQRP. Staff will also need to be informed of their specific duties and responsibilities toward fulfilling the WQRP.

### Cost-Benefit Analysis

Using the data collected through stream monitoring and assessments, a cost-benefit analysis of the elimination of the various sources for each pollutant of concern should be conducted. The purpose of this analysis will be to determine the most cost effective method of eliminating sources of the pollutant(s) of concern detected through direct stream evaluation. Established loading rates for each pollutant of concern will be compared to the costs to eliminate sources, which might include illicit discharges, septic system failures, sanitary sewer overflows, illicit connections, domestic animals, and leaking sanitary sewer lines. The results of the analysis will be used to prioritize limited funds for elimination of the greatest load for the least expenditure for each pollutant(s) of concern.

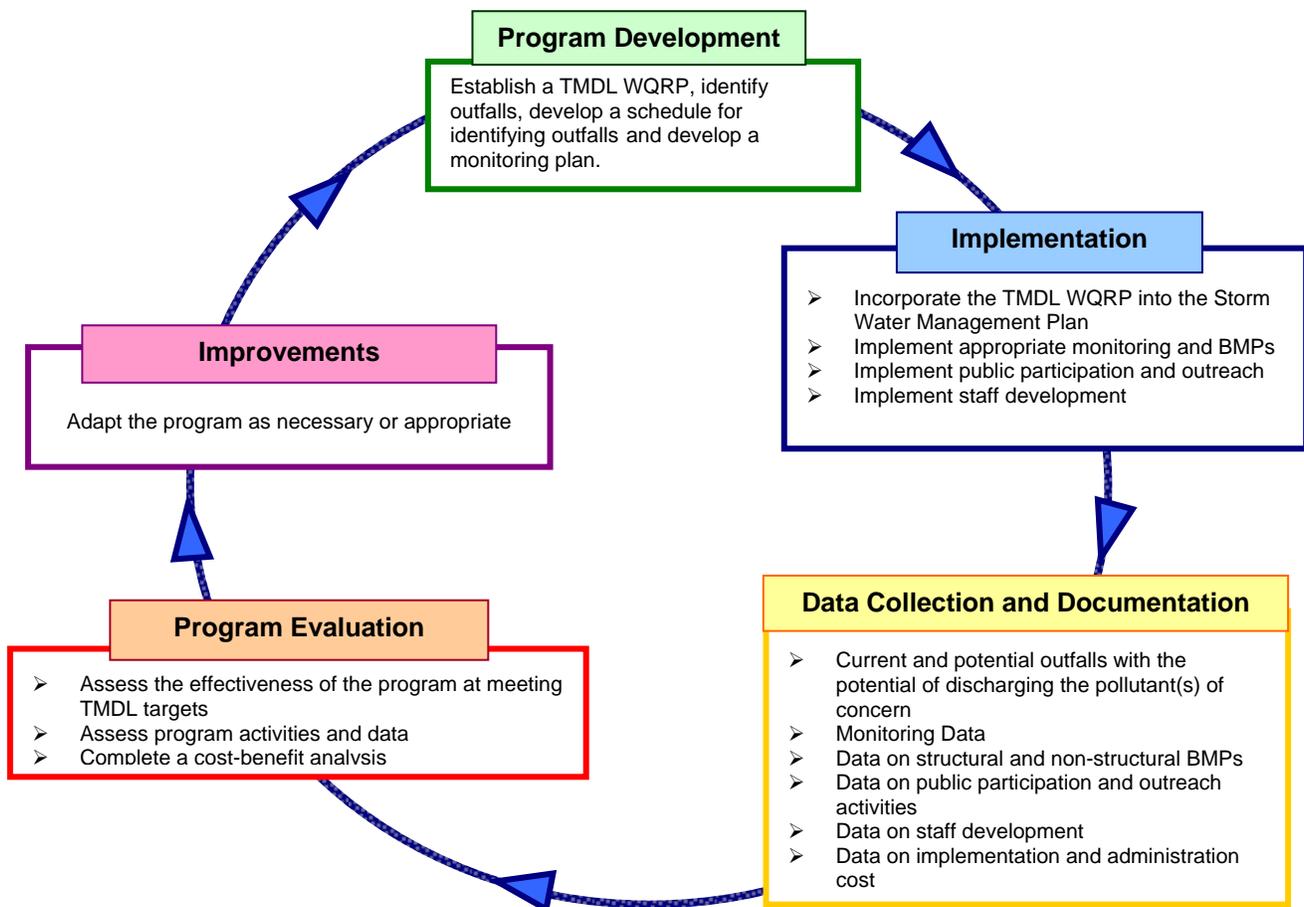
### **Assessing the Need for Change**

## Goose Creek Water Quality Recovery Program for the Approved Fecal Coliform TMDL

A TMDL work group will be developed for the purpose of reviewing program activities and data and assessing the need for change and to assess the effectiveness of the program at meeting TMDL targets and changing the strategy as necessary to ensure the fulfillment of all TMDL objectives.

The TMDL work group will adapt the TMDL WQRP as necessary to ensure that source reduction targets are effectively and efficiently fulfilled and that progress is being made toward achieving the ultimate goal of compliance with the N.C. water quality standard for each pollutant(s) of concern. All changes will be communicated to the agencies responsible for the implementation of the TMDL in the form of an annual report. This report will be posted on the web and made available to both NCDENR and SCDHEC for comment and input.

### Water Quality Recovery Program Life Cycle



Goose Creek Water Quality Recovery Program for the Approved Fecal Coliform TMDL

Appendix 3: Septic System Inspection Form Used in the Goose Creek Watershed

Groundwater & Wastewater Services
700 N. Tryon St., Suite 211
Charlotte, NC 28202
Ph: 704-336-5103

Septic System Inspection Form

Inspection Date: \_\_\_\_\_ Inspection Completed By: \_\_\_\_\_

Site Parcel Id #: \_\_\_\_\_ Site Address: \_\_\_\_\_

GWS File #: \_\_\_\_\_ Watershed: \_\_\_\_\_ Catchment Id: \_\_\_\_\_

Septic System Information:

System Classification: [ ] II [ ] III [ ] IV [ ] V [ ] VI
[ ] a [ ] b [ ] c [ ] d [ ] e [ ] f [ ] g

System Description: \_\_\_\_\_
(Ex: pump to 25% reduction)

Year Operation Permit Issued: \_\_\_\_\_ (If no permit record is available use built date year from POLARIS.)

System Age: Years \_\_\_\_\_ [ ] Actual [ ] Estimated

Inspection Information:

Comments

Site accessible for inspection: [ ] Yes [ ] No \_\_\_\_\_

Owner present: [ ] Yes [ ] No \_\_\_\_\_

Drain field probed: [ ] Yes [ ] No \_\_\_\_\_

System malfunction observed: [ ] Yes [ ] No \_\_\_\_\_

Notice of Violation required: [ ] Yes [ ] No \_\_\_\_\_

System located <200 ft. from surface water body: [ ] Yes [ ] No \_\_\_\_\_

System located <50 ft. from stormwater BMP or diversion: [ ] Yes [ ] No \_\_\_\_\_

Trees/vegetation in drain field: [ ] Yes [ ] No \_\_\_\_\_

Irrigation on drain field: [ ] Yes [ ] No \_\_\_\_\_

Well(s) located on property: [ ] Yes [ ] No \_\_\_\_\_

Goose Creek Water Quality Recovery Program for the Approved Fecal Coliform TMDL

General comments/observations: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

# photos taken: \_\_\_\_\_ Dye Pack Left:  Yes  No Signature: \_\_\_\_\_

**Checklist:**

1. Perform file review for inspection site in the office (system type, age, location, etc.)
2. Conduct field inspection & complete inspection form before leaving the site
3. Take photos (2 minimum) of the drain field/tank(s) area from multiple locations
4. Leave project brochure & literature on door
5. Create a work order in Cityworks for each inspection completed
6. Attach each work order to a septic GIS feature (permitted or pre-existing layers). If a GIS feature does not exist the system should be registered in WASPS as a pre-existing, active system and then attached to the work order.
7. Complete all work order sections, including the required CUSTOM fields (remember to upload the pictures taken as attachments!)
8. When finished submit the work order to Trevor Thomason for review & place the completed inspection form in his mailbox.

\*All scanned files and related photos should be saved to the following location on the network share drive:

<\\Hmcf01\attachments\GWS\WorkOrders\SepticSystemInspections\>

Make sure to save the files in the appropriate watershed folder (Ex: Goose Creek)

**All wells identified during the inspection should be checked in GIS. If the wells are not visible in GIS they must be registered in WASPS.**

## Goose Creek Water Quality Recovery Program for the Approved Fecal Coliform TMDL

### Appendix 4: Septic System Educational Material Distributed During Goose Creek Inspections

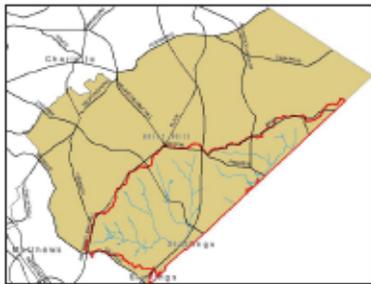
#### About your watershed

The Goose Creek watershed is made up of 42 square miles in Union and Mecklenburg counties and includes parts of Mint Hill. The watershed is home to the Carolina heelsplitter mussel which was added to the federal endangered species list in 1993.



In order to protect the water quality and habitat needed to sustain and recover the Carolina heelsplitter population, a set of management rules were developed and approved by the N. C. Department of Environment & Natural Resources (NC DENR).

In order to comply with the rules put forth by the State, the Town of Mint Hill and Mecklenburg County established a Water Quality Recovery Plan (WQRP) for fecal coliform in the Goose Creek Watershed. The main goal of the WQRP is to identify and remove sources of fecal coliform in the Watershed.



Storm Water Services has conducted field surveys of the watershed including the sampling and identification of all storm water outfalls, in-stream sampling and stream walks of the entire watershed. These efforts have not been successful in identifying sources of fecal coliform. The one remaining potential source that has yet to be thoroughly investigated is septic systems. Septic systems are being targeted because the vast majority of the Goose Creek Watershed does not have a municipal sanitary sewer system.

For questions concerning septic systems, wells and groundwater issues contact  
Groundwater & Wastewater Services  
704-336-5103  
wellreg@mecklenburgcountync.gov

For questions concerning the Water Quality Recovery Plan of the Goose Creek Watershed contact  
David Kroening  
704-336-5448  
david.kroening@mecklenburgcountync.gov

#### A Guide for Homeowners

### Septic Systems in Goose Creek Watershed



To protect your ground and surface water resources



## Goose Creek Water Quality Recovery Program for the Approved Fecal Coliform TMDL

### About your septic system

A typical septic system has four main components: a pipe from the home, a septic tank, a drainfield, and the soil. Microbes in the soil digest or remove most contaminants from wastewater before it eventually reaches groundwater.



Homeowners are responsible for the care and maintenance of their septic systems. With reasonable use and periodic maintenance, your system should last a long time. Some things you should do to insure your system remains in good working order are:

- ◆ Do regular pumping of the septage from the septic tank.
- ◆ Locate the septic tank lid and keep it marked.
- ◆ Know what the minimum maintenance requirements are for your type of septic system.
- ◆ Respond to a failing system with required maintenance, particularly when surfacing of effluent occurs or odors are apparent.
- ◆ Keep records of the system design, location and maintenance activities (including pumping dates).

**Keeping your system functioning properly prevents the spread of infection and disease and protects water resources.**

### About your inspection

Prior to this field inspection, the inspector reviewed the permit issued for installation of the system and looked at recent aerial photography to identify the location of the system.

The inspector may have 'probed' the area of the drain field to determine the location of the tank and drain lines and any repair areas. The inspector looked for signs of a malfunctioning system.

Your septic system was inspected on:

\_\_\_\_\_

Inspector's name:

\_\_\_\_\_

Inspector's contact number:

\_\_\_\_\_

Your inspection showed:

- No problems, system functioning normally
- Pooling sewage on the land surface
- Trees growing in the drain field
- Irrigation of the drain field
- \_\_\_\_\_

**Please call the above inspector directly if you have questions or concerns about the inspection of your septic system.**

### Tips for a healthy system

Although a conventional septic system has no moving parts and normally does not require weekly or monthly maintenance, attention must be paid to some general principles of maintenance. Important maintenance practices include the following:



#### 1 Minimize water usage.

- ◆ Repair leaky faucets and toilets promptly.
- ◆ Run dishwashers & washing machines only with full loads.
- ◆ Turn water off while shaving, brushing teeth, washing dishes, etc.
- ◆ Install low-flow faucets and water-saving showerheads.



#### 2 Provide adequate site drainage.

- ◆ Direct gutters and downspouts away from the septic tank and drainfield.
- ◆ Do not drive over or park on the drainfield.



#### 3 Use proper landscaping.

- ◆ A healthy grass cover should be maintained over the drainfield to prevent soil erosion.
- ◆ Trees and shrubs should not be planted too close to the drainfield.
- ◆ No structures, sheds, pools, patios, or paved surfaces should be constructed over the septic tank or drainfield area.



#### 4 Use sound waste disposal practices.

The following substances should NOT be disposed of through the household plumbing system:

- |                      |                              |
|----------------------|------------------------------|
| ◆ Coffee grounds     | ◆ Cigarette butts            |
| ◆ Dental floss       | ◆ Plastics                   |
| ◆ Disposable diapers | ◆ Facial tissues             |
| ◆ Cat litter         | ◆ Paper towels               |
| ◆ Sanitary napkins   | ◆ Fat, grease, or oil        |
| ◆ Tampons            | ◆ Household hazardous wastes |

**For more tips on septic systems visit**  
<http://groundwater.charmeck.org>.

Goose Creek Water Quality Recovery Program for the Approved Fecal Coliform TMDL

---

Appendix 5: Prioritization Scheme for Septic System Inspections  
March 16, 2009

Factors used to determine the order (priority) that septic systems will be inspected:

1. Catchment basin (14 total)
2. Proximity to stream (200 ft. buffer)
3. Age of septic system (estimated from CAMA development data)

Catchments will be prioritized from 1 to 14 by the Water Quality (WQ) program and provided to Groundwater & Wastewater Services (GWS). GWS will then develop an inspection schedule for each catchment based on the following matrix:

Tier	Proximity to stream	Septic System Age (yrs.)
1	<= 200 ft.	29+ (Pre-1980)
2	<= 200 ft.	0-28 (1981-2009)
3	> 200 ft.	29+ (Pre-1980)
4	> 200 ft.	14-28 (1980-1995)
5	> 200 ft.	0-13 (1996-2009)

Time estimation per inspection:

Task	Estimated Time (hrs.)	Comments:
Inspection	0.50	Complete inspection form
Documentation	0.50	File review & CW data entry
*Travel Time	0.25	Inspections will be assigned in clusters.
Total Time	1.25	

Estimate of 1.25 hours for each inspection performed.

Travel time is estimated based on the following:

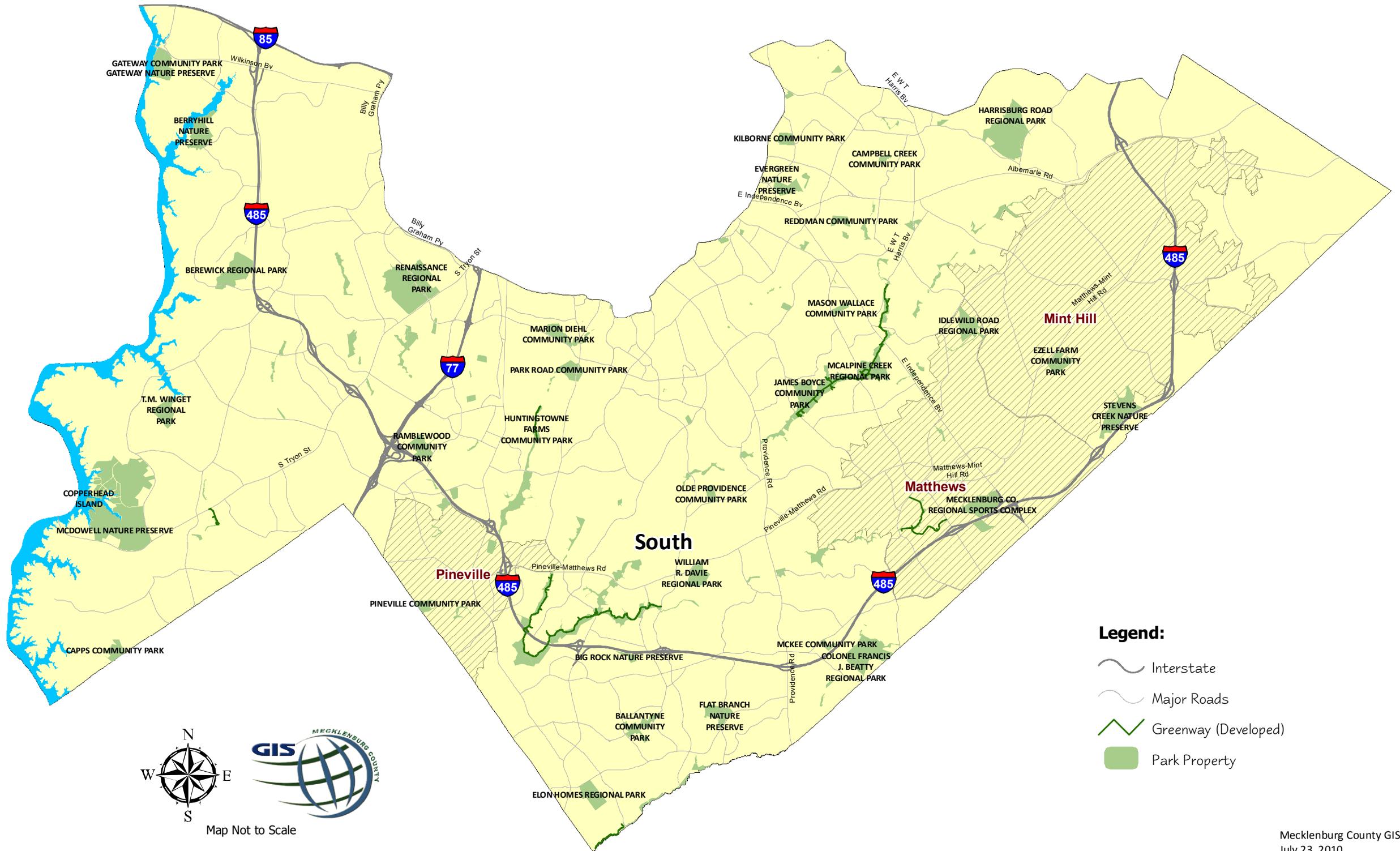
1. Inspections will be assigned in grouped clusters
2. Inspections will be completed in batches (5 or more inspections)
  - Example: Travel time to site from Hal Marshall = 30 minutes
  - Travel time from site to Hal Marshall = 30 minutes
  - Travel time between inspection sites = 5 minutes
  - 10 inspections conducted during one trip = 50 minutes
  - 110 minutes/10 inspections = 11 minutes/inspection

Total time analysis for **10** inspections:

1. 0.5 hrs. x 10 inspections = 5 hours for inspection
2. 0.5 hrs. x 10 inspections = 5 hours for file review & work order completion
3. 0.25 hrs. x 10 inspections = 2.5 hours of travel time

Field/travel = 7.5 hours

Office/documentation = 5 hours



- Legend:**
-  Interstate
  -  Major Roads
  -  Greenway (Developed)
  -  Park Property



Map Not to Scale



May 26, 2011

Mr. Tom Reeder  
N.C. Division of Water Resources  
1611 Mail Service Center  
Raleigh, North Carolina 27699-1611

Subject: IBT Report for 2008

Dear Tom:

We are sending our calendar year 2008 IBT Annual Report. We are also transmitting this report to you electronically. The report follows the format of earlier reports and includes a narrative section with background and program progress reports along with spreadsheets detailing the IBT amount calculation.

For calendar year 2008, we experienced an actual maximum day IBT of 17.42 mgd based on July billing data and as of December 31, 2008, had additional outstanding IBT commitments of 2.24 mgd. The summation of these amounts would indicate a 2008 IBT amount of 19.66 mgd which is less than 60% of our authorized amount.

Please let me know if you have any questions.

Sincerely,

CHARLOTTE-MECKLENBURG UTILITIES

A handwritten signature in black ink, appearing to read "Barry M. Gullet", is written over the typed name.

Barry M. Gullet, PE  
Director

Cc: Toya F. Ogallo



*Charlotte-Mecklenburg Utilities  
Annual Report on Interbasin Transfer  
Calendar Year 2008*

The North Carolina Environmental Management Commission (EMC) approved Charlotte Mecklenburg Utilities' (Utilities') petition to increase the amount of water transferred from the Catawba basin to the Rocky River basin and an interbasin transfer (IBT) Certificate was issued on March 14, 2002. The Certificate authorizes Utilities to transfer up to 33 million gallons per day (mgd) from the Catawba River basin to the Rocky River basin.

The IBT Certificate requires Utilities to report maximum daily IBT amounts annually to the North Carolina Division of Water Resources (NC DWR) until such time as the transfer amount exceeds 80% of the authorized amount. Once that amount is exceeded, Utilities is required to report monthly. To date, Charlotte-Mecklenburg Utilities has not exceeded 80% of the authorized IBT amount.

### **System Overview**

The Utilities operates the water and wastewater systems that serve Charlotte, Cornelius, Davidson, Huntersville, Mint Hill, Matthews, Pineville, and much of the unincorporated areas of Mecklenburg County. This system is divided between two river basins designated by NC General Statutes for regulation of IBT water. The western portion of the system is within the Catawba River basin and the eastern portion is within the Rocky River basin. Water transferred from the Catawba River basin to the Rocky River basin that is not returned to the Catawba is regulated IBT.

Water for distribution to Utilities' customers is withdrawn from the Catawba River basin at two locations. An intake at Lake Norman sends water to the Lee S. Dukes Water Treatment Plant. A second intake at Mountain Island Lake sends water to the Walter M. Franklin Water Treatment Plant and to the Vest Water Treatment Plant. Potable water from these three plants is delivered through an interconnected distribution system to retail customers throughout Utilities' service area in Mecklenburg County and in small areas of Iredell, Cabarrus, and Union Counties. The Utilities also provides wholesale water to municipal systems for Resale including: City of Concord (NC), Town of Harrisburg (NC), Union County (NC), York County Water & Sewer Authority (SC), and Lancaster County Water and Sewer District (SC).

Utilities treats wastewater at five advanced wastewater treatment plants (WWTP's) which discharge into small streams in Mecklenburg County. Four of the streams are tributary to the Catawba River basin and one (Mallard Creek) is tributary to the Rocky River basin. Utilities also conveys wastewater generated in portions of Mecklenburg to the Rocky River Regional Wastewater Treatment Plant (RRRWWTP) operated by the Water and Sewer Authority of Cabarrus County (WSACC). The RRRWWTP discharges treated effluent to the Rocky River.

### **IBT Monitoring**

Water supplied to Utilities' retail customers in the Rocky River Basin, that is not returned to the Catawba basin is included in the reported IBT amounts. Water provided to municipalities with service areas in the Rocky River basin include the City of Concord and the Town of Harrisburg.

Utilities can transfer treated potable water to the City of Concord through three metered connections to their water system. All of Concord's service area is within the Rocky River basin, so any water purchased by them becomes an IBT. Water service is only provided as an emergency back-up to Concord's routine supply which is Lake Howell and several smaller reservoirs. All of these reservoirs are within the Rocky River basin. Wastewater from Concord is treated at the RRRWWTP. Utilities' agreement with Concord is that water will be supplied to them subject to availability and subject to regulatory constraints including IBT and Federal Energy Regulatory Commission (FERC) limitations.

Concord received an IBT Certificate in January 2007, for the transfer of up to 10 mgd from the Catawba River basin to the Rocky River basin. NC DWR advised Utilities that water sold to Concord should not be applied to Utilities' IBT amount. Concord did not purchase any potable water from Utilities in calendar year 2008, so the IBT amounts reported do not include sales to Concord.

Utilities can transfer treated potable water to the Town of Harrisburg through two metered connections to their water system. All of Harrisburg's service area is within the Rocky River basin and is included in the Utilities' IBT amounts.

Table 1 below summarizes actual IBT amounts for calendar years 2002 through 2008 (all calculated using the methodology approved by NC DWR in June of 2006). The table considers the daily amounts of water transferred from the Catawba basin to customers within the Rocky River basin that is not returned to the Catawba basin.

The data indicates that the maximum amount of IBT for year 2008 occurred in July, and was 17.42 mgd, less than 53% of the authorized maximum day value of 33 mgd. The average IBT for 2008 was 11.39 mgd, which is approximately 35% of the authorized maximum day value. In addition to the amount of actual IBT reported in Table 1, Utilities has committed to provide additional IBT to development that has been proposed but not yet activated in the Rocky River basin. As of December 31, 2008, 1.42 mgd was committed to permitted donated projects (subdivisions) that had not been activated and 0.81 mgd was committed to master meter connections (generally commercial or multi-family developments) that had not been activated, both based on maximum day estimates. This brings the total of the actual and outstanding IBT in 2008 to 19.66 mgd, or less than 60% of the authorized maximum day value.

**Table 1. Actual IBT Summary**

<b>Calendar Year</b>	<b>Avg. Annual IBT (mgd)</b>	<b>Max. Day IBT (mgd)</b>
2002	6.74	11.97
2003	6.91	9.82
2004	7.79	12.56
2005	8.66	13.79
2006	9.56	14.35
2007	9.96	17.22
2008	11.39	17.42

**Compliance with Certificate Conditions**

Condition 1 of Utilities’ IBT certificate requires Mecklenburg County to summarize progress in implementation of watershed management approaches of the Surface Water Improvement and Management Program (S.W.I.M. program). This summary follows:

*The watershed management approaches of the Surface Water Improvement and Management (SWIM) Program continued to be implemented in the McDowell and Goose Creek Watersheds during calendar year 2008 resulting in the completion of the following activities:*

- a. *Construction was completed on a BMP retrofit project at the following locations in the McDowell Creek Watershed near Interstate 77, Highway 73 (Sam Furr Road) and US 21 (Statesville Road):*

- *Northcross Shopping Center*
- *Carolinas Medical Center-Northcross*
- *Northcross Commons*
- *Monteith Park subdivision*



Rain Garden at Northcross Shopping Center

*These projects included retrofitting rain gardens and wetlands into existing developments to collect and treat storm water runoff for pollutant removal as part of efforts to restore water quality conditions in McDowell Creek. The total cost for the projects was \$1,900,000.*

- b. *Planning and design was completed for a stream restoration project including over 7,500 feet in the McDowell Creek Watershed from Westmoreland Road in Cornelius to Sam*

*Furr Road in Huntersville. The objectives of this project are to return the stream channel to a more natural pattern, stabilize eroding stream banks, revitalize surrounding floodplains, improve overall water quality, and restore aquatic and terrestrial habitat along the project corridor. The total cost for the project is estimated at \$1,250,000.*

- c. Planning and design was completed for a stream restoration project including 1,700 feet in the upper portion of the McDowell Creek Watershed near Danesway Lane in Huntersville. The badly-eroded stream bed will be relocated. Wetlands and a rain garden will also be added along the restored stream to filter out pollutants. The total cost for the project is estimated at \$742,000.*
- d. Planning and design was completed for a stream restoration and BMP retrofit project on Caldwell Station Creek in the upper portion of the McDowell Creek Watershed in Cornelius. No cost estimate is available.*
- e. The Goose Creek Watershed Management Plan was completed, including specific actions aimed at reducing fecal coliform bacteria levels in the stream. Efforts were initiated for the identification of specific projects for restoring overall water quality conditions.*
- f. Mecklenburg County continues to partner with the Sierra Club and local schools to plant trees along the banks of McDowell Creek to restore the water quality buffer. During 2008, over 2,500 trees were planted in the McDowell Creek buffer including participation by 350 volunteers.*

Condition 2 of Utilities' IBT certificate required a stakeholder process to investigate, develop, adopt, and implement storm water ordinances that control water quantity from single-family development and water quality for all development until completed. The requirements of Condition 2 were completed in 2007.

Condition 3 of the IBT Certificate removes the Goose Creek subbasin from the area to be served by the IBT, and imposes a moratorium on the installation of new IBT water lines (water lines crossing the ridgeline) into Goose Creek subbasin until the impacts of additional growth on the endangered species are fully evaluated.

*The Utilities received proposals for performing an Environmental Assessment (EA) of new development in the Goose Creek basin (Mint Hill area), impacts to water quality, and measures required to protect the Carolina Heelsplitter. Due to budget and cost considerations the Utilities has postponed plans for undertaking the study and has requested the NC Division of Water Resources (DWR) to prepare the EA.*

Condition 4 of the IBT Certificate provides that the Environmental Management Commission may reopen the Certificate under certain circumstances. This did not occur in 2008.

Condition 5 of the IBT Certificate requires Utilities to develop a compliance and monitoring plan for reporting maximum daily transfer amounts, compliance with certificate conditions, and progress on mitigation measures, and drought management activities. Utilities' monitoring plan and reporting format were approved in June of 2006 by NCDWR and continued to be used for 2008.

*The drought that gripped the Catawba River Basin in 2007 persisted throughout 2008, requiring the continued implementation of drought management activities. The drought response plan adopted by the utility members of the Catawba- Wateree Drought Management Group contained specific triggers or measurements intended to guide the activities to reduce overall consumption.*

*Restrictions prohibiting outdoor water use carried over into 2008, resulting in significant reductions in withdrawals from the Catawba – Wateree basin. These measures helped the basin realize savings of 20 – 30 % as compared to unrestricted use.*

*Outdoor water use restrictions were eased to allow outdoor watering two times a week starting in September 2008. The result was a continued decline in consumption. The improvements in water supply in the basin were slow and caused Charlotte Mecklenburg Utilities to maintain water restrictions throughout all of 2008. Customer behaviors remained conservative resulting in an overall reduction of 22% for the year.*

### **Summary**

The actual maximum day amount of water transferred from the Catawba River basin to the Rocky River basin was 17.42 mgd, less than 53% of the authorized maximum day value of 33 mgd. The total of actual and outstanding IBT was 19.66 mgd, less than 60% of the authorized maximum day value. Utilities is in full compliance with IBT authorizations and compliance conditions for calendar year 2008.



May 26, 2011

Mr. Tom Reeder  
N.C. Division of Water Resources  
1611 Mail Service Center  
Raleigh, North Carolina 27699-1611

Subject: IBT Report for 2009

Dear Tom:

We are sending our calendar year 2009 IBT Annual Report. We are also transmitting this report to you electronically. The report follows the format of earlier reports and includes a narrative section with background and program progress reports along with spreadsheets detailing the IBT amount calculation.

For calendar year 2009, we experienced an actual maximum day IBT of 16.00 mgd based on August billing data and as of December 31, 2009, had additional outstanding IBT commitments of 1.63 mgd. The summation of these amounts would indicate a 2009 IBT amount of 17.63 mgd which is less than 54% of our authorized amount.

Please let me know if you have any questions.

Sincerely,

CHARLOTTE-MECKLENBURG UTILITIES

A handwritten signature in black ink, appearing to read "Barry Gullet", is written over the typed name.

Barry M. Gullet, PE  
Director

Cc: Toya F. Ogallo



*Charlotte-Mecklenburg Utilities  
Annual Report on Interbasin Transfer  
Calendar Year 2009*

The North Carolina Environmental Management Commission (EMC) approved Charlotte Mecklenburg Utilities' (Utilities') petition to increase the amount of water transferred from the Catawba basin to the Rocky River basin and an interbasin transfer (IBT) Certificate was issued on March 14, 2002. The Certificate authorizes Utilities to transfer up to 33 million gallons per day (mgd) from the Catawba River basin to the Rocky River basin.

The IBT Certificate requires Utilities to report maximum daily IBT amounts annually to the North Carolina Division of Water Resources (NC DWR) until such time as the transfer amount exceeds 80% of the authorized amount. Once that amount is exceeded, Utilities is required to report monthly. To date, Charlotte-Mecklenburg Utilities has not exceeded 80% of the authorized IBT amount.

### **System Overview**

The Utilities operates the water and wastewater systems that serve Charlotte, Cornelius, Davidson, Huntersville, Mint Hill, Matthews, Pineville, and much of the unincorporated areas of Mecklenburg County. This system is divided between two river basins designated by NC General Statutes for regulation of IBT water. The western portion of the system is within the Catawba River basin and the eastern portion is within the Rocky River basin. Water transferred from the Catawba River basin to the Rocky River basin that is not returned to the Catawba is regulated IBT.

Water for distribution to Utilities' customers is withdrawn from the Catawba River basin at two locations. An intake at Lake Norman sends water to the Lee S. Dukes Water Treatment Plant. A second intake at Mountain Island Lake sends water to the Walter M. Franklin Water Treatment Plant and to the Vest Water Treatment Plant. Potable water from these three plants is delivered through an interconnected distribution system to retail customers throughout Utilities' service area in Mecklenburg County and in small areas of Iredell, Cabarrus, and Union Counties. The Utilities also provides wholesale water to municipal systems for Resale including: City of Concord (NC), Town of Harrisburg (NC), Union County (NC), York County Water & Sewer Authority (SC), and Lancaster County Water and Sewer District (SC).

Utilities treats wastewater at five advanced wastewater treatment plants (WWTP's) which discharge into small streams in Mecklenburg County. Four of the streams are tributary to the Catawba River basin and one (Mallard Creek) is tributary to the Rocky River basin. Utilities also conveys wastewater generated in portions of Mecklenburg County to the Rocky River Regional Wastewater Treatment Plant (RRRWWTP) operated by the Water and Sewer Authority of Cabarrus County (WSACC). The RRRWWTP discharges treated effluent to the Rocky River.

### **IBT Monitoring**

Water supplied to Utilities' retail customers in the Rocky River Basin, that is not returned to the Catawba basin, is included in the reported IBT amounts. Water provided to municipalities with service areas in the Rocky River basin include the City of Concord and the Town of Harrisburg.

Utilities can transfer treated potable water to the City of Concord through three metered connections to their water system. All of Concord's service area is within the Rocky River basin, so any water purchased by them becomes an IBT. Water service is only provided as an emergency back-up to Concord's routine supply which is Lake Howell and several smaller reservoirs. All of these reservoirs are within the Rocky River basin. Wastewater from Concord is treated at the RRRWWTP. Utilities' agreement with Concord is that water will be supplied to them subject to availability and subject to regulatory constraints including IBT and Federal Energy Regulatory Commission (FERC) limitations.

Concord received an IBT Certificate in January 2007, for the transfer of up to 10 mgd from the Catawba River basin to the Rocky River basin. NC DWR advised Utilities that water sold to Concord should not be applied to Utilities' IBT amount. Concord did not purchase any potable water from Utilities in calendar year 2009, so the IBT amounts reported do not include sales to Concord.

Utilities can transfer treated potable water to the Town of Harrisburg through two metered connections to their water system. All of Harrisburg's service area is within the Rocky River basin and is included in the Utilities' IBT amounts.

Table 1 below summarizes actual IBT amounts for calendar years 2002 through 2009 (all calculated using the methodology approved by NC DWR in June of 2006). The table considers the daily amounts of water transferred from the Catawba basin to customers within the Rocky River basin that is not returned to the Catawba basin.

The data indicates that the maximum amount of IBT for year 2009 occurred in August, and was 16.00 mgd, less than 49% of the authorized maximum day value of 33 mgd. The average IBT for 2009 was 12.04 mgd, which is approximately 36% of the authorized maximum day value. In addition to the amount of actual IBT reported in Table 1, Utilities has committed to provide additional IBT to development that has been proposed but not yet activated in the Rocky River basin. As of December 31, 2009, 1.41 mgd was committed to permitted donated projects (subdivisions) that had not been activated and 0.22 mgd was committed to master meter connections (generally commercial or multi-family developments) that had not been activated, both based on maximum day estimates. This brings the total of the actual and outstanding IBT in 2009 to 17.63 mgd, or less than 54% of the authorized maximum day value.

**Table 1. Actual IBT Summary**

<b>Calendar Year</b>	<b>Avg. Annual IBT (mgd)</b>	<b>Max. Day IBT (mgd)</b>
2002	6.74	11.97
2003	6.91	9.82
2004	7.79	12.56
2005	8.66	13.79
2006	9.56	14.35
2007	9.96	17.22
2008	11.39	17.42
2009	12.04	16.00

**Compliance with Certificate Conditions**

Condition 1 of Utilities’ IBT certificate requires Mecklenburg County to summarize progress in implementation of watershed management approaches of the Surface Water Improvement and Management Program (S.W.I.M. program). This summary follows:

*The watershed management approaches of the Surface Water Improvement and Management (SWIM) Program continued to be implemented during calendar year 2009. Efforts continued to focus on McDowell and Goose Creeks as in 2007 and 2008 but were expanded to include the South Prong and West Branch of the Rocky River in Davidson during 2009. During calendar year 2009, the following work was completed in the three (3) watersheds:*

- a) *Construction was completed for the installation of three (3) large rain gardens at the North Mecklenburg Recycling Center located in the Torrence Creek Watershed, which is a tributary of McDowell Creek in Huntersville. These rain gardens collect and treat 100% of the storm water runoff from the facility resulting in a reduction in the pollutant load entering Torrence Creek. The total cost for the project was \$307,000.*



- b) *Planning and design was completed for a stream restoration project including 7,700 feet in the main stem of Torrence Creek starting at McCoy Road and 9,000 linear feet*

*of Torrence Creek Tributary #2 from I-77 to Bradford Hill Lane. Construction is to be completed by December 2010. The total cost for the project is estimated at \$2,000,000.*

- c) Planning and design is underway for the restoration of Upper McDowell Creek in Cornelius, NC. The project will restore some of the most severely damaged sections of McDowell Creek and install BMPs to treat urban runoff before it enters the creek. The project is being funded by Cornelius, Mecklenburg County and the North Carolina 319 Grant Program. The total cost for the project is not available.*
- d) Mecklenburg County continues to partner with Creek ReLeaf, the Sierra Club and local schools to plant trees along the banks of McDowell Creek to restore the water quality buffer and floodplain. During 2009, over 2,500 trees were planted by approximately 400 volunteers along the floodplain in McDowell Creek.*
- e) The Goose Creek Watershed Management Plan was finalized and implementation initiated. One of the primary implementation measures was the inspection of all of the septic systems in the watershed to ensure that they are functioning properly and that all problems are corrected to prevent the discharge of sewage. Plans are to inspect all the septic systems in the watershed by June, 2011.*
- f) Efforts began toward the drafting of the Rocky River Watershed Management Plan. Field work commenced during the second half of 2009.*

Condition 2 of Utilities' IBT certificate required a stakeholder process to investigate, develop, adopt, and implement storm water ordinances that control water quantity from single-family development and water quality for all development until completed. The requirements of Condition 2 were completed in 2007.

Condition 3 of the IBT Certificate removes the Goose Creek subbasin from the area to be served by the IBT, and imposes a moratorium on the installation of new IBT water lines (water lines crossing the ridgeline) into Goose Creek subbasin until the impacts of additional growth on the endangered species are fully evaluated.

*The Utilities has requested the NC Division of Water Resources (DWR) to prepare an Environmental Assessment (EA) of new development in the Goose Creek basin (Mint Hill area), impacts to water quality, and measures required to protect the Carolina Heelsplitter.*

Condition 4 of the IBT Certificate provides that the Environmental Management Commission may reopen the Certificate under certain circumstances. This did not occur in 2009.

Condition 5 of the IBT Certificate requires Utilities to develop a compliance and monitoring plan for reporting maximum daily transfer amounts, compliance with certificate conditions, and progress on mitigation measures, and drought management activities. Utilities' monitoring plan and reporting format were approved in June of 2006 by NC DWR and continue to be used for 2009.

*2009 showed slow, but steady improvement from the drought conditions that gripped our state. The Catawba-Wateree Basin was slow to recover normal stream flows and the ground water lagged well behind surface water recharge. Charlotte Mecklenburg Utilities along with the other utilities in the Catawba-Wateree Basin remained in level 2 water restrictions until May 2009, in accordance with the Low Inflow Protocol adopted by the region's drought management group.*

*Customer consumption did not return to pre drought levels after the easing of restrictions in 2008 and did not rebound upward after the lifting of all restrictions in 2009. In fact, water use continued to decline in the Charlotte region. Even without restrictions, per account usage hit an all time low in 2009 for Charlotte Mecklenburg Utilities customers.*

*Water use in the Catawba – Wateree River Basin continued to track below historic average levels and closed out the year approximately 12 - 15% below normal.*

### **Summary**

The actual maximum day amount of water transferred from the Catawba River basin to the Rocky River basin was 16.00 mgd, less than 49% of the authorized maximum day value of 33 mgd. The total of actual and outstanding IBT was 17.63 mgd, less than 54% of the authorized maximum day value. Utilities is in full compliance with IBT authorizations and compliance conditions for calendar year 2009.



# CHARLOTTE

May 26, 2011

Mr. Tom Reeder  
N.C. Division of Water Resources  
1611 Mail Service Center  
Raleigh, North Carolina 27699-1611

Subject: IBT Report for 2010

Dear Tom:

We are sending our calendar year 2010 IBT Annual Report. We are also transmitting this report to you electronically. The report follows the format of earlier reports and includes a narrative section with background and program progress reports along with spreadsheets detailing the IBT amount calculation.

For calendar year 2010, we experienced an actual maximum day IBT of 18.22 mgd based on August billing data and as of December 31, 2010, had additional outstanding IBT commitments of 1.64 mgd. The summation of these amounts would indicate a 2010 IBT amount of 19.88 mgd which is less than 61% of our authorized amount.

Please let me know if you have any questions.

Sincerely,

CHARLOTTE-MECKLENBURG UTILITIES

A handwritten signature in black ink, appearing to read "Barry Gallet", is written over the typed name.

Barry M. Gallet, PE  
Director

Cc: Toya F. Ogallo



*Charlotte-Mecklenburg Utilities  
Annual Report on Interbasin Transfer  
Calendar Year 2010*

The North Carolina Environmental Management Commission (EMC) approved Charlotte Mecklenburg Utilities' (Utilities') petition to increase the amount of water transferred from the Catawba basin to the Rocky River basin and an interbasin transfer (IBT) Certificate was issued on March 14, 2002. The Certificate authorizes Utilities to transfer up to 33 million gallons per day (mgd) from the Catawba River basin to the Rocky River basin.

The IBT Certificate requires Utilities to report maximum daily IBT amounts annually to the North Carolina Division of Water Resources (NC DWR) until such time as the transfer amount exceeds 80% of the authorized amount. Once that amount is exceeded, Utilities is required to report monthly. To date, Charlotte-Mecklenburg Utilities has not exceeded 80% of the authorized IBT amount.

### **System Overview**

The Utilities operates the water and wastewater systems that serve Charlotte, Cornelius, Davidson, Huntersville, Mint Hill, Matthews, Pineville, and much of the unincorporated areas of Mecklenburg County. This system is divided between two river basins designated by NC General Statutes for regulation of IBT water. The western portion of the system is within the Catawba River basin and the eastern portion is within the Rocky River basin. Water transferred from the Catawba River basin to the Rocky River basin that is not returned to the Catawba is regulated IBT.

Water for distribution to Utilities' customers is withdrawn from the Catawba River basin at two locations. An intake at Lake Norman sends water to the Lee S. Dukes Water Treatment Plant. A second intake at Mountain Island Lake sends water to the Walter M. Franklin Water Treatment Plant and to the Vest Water Treatment Plant. Potable water from these three plants is delivered through an interconnected distribution system to retail customers throughout Utilities' service area in Mecklenburg County and in small areas of Iredell, Cabarrus, and Union Counties. The Utilities also provides wholesale water to municipal systems for Resale including: City of Concord (NC), Town of Harrisburg (NC), Union County (NC), York County Water & Sewer Authority (SC), and Lancaster County Water and Sewer District (SC).

Utilities treats wastewater at five advanced wastewater treatment plants (WWTP's) which discharge into small streams in Mecklenburg County. Four of the streams are tributary to the Catawba River basin and one (Mallard Creek) is tributary to the Rocky River basin. Utilities also conveys wastewater generated in portions of Mecklenburg County to the Rocky River Regional Wastewater Treatment Plant (RRRWWTP) operated by the Water and Sewer Authority of Cabarrus County (WSACC). The RRRWWTP discharges treated effluent to the Rocky River.

### **IBT Monitoring**

Water supplied to Utilities' retail customers in the Rocky River Basin, that is not returned to the Catawba basin, is included in the reported IBT amounts. Water provided to municipalities with service areas in the Rocky River basin include the City of Concord and the Town of Harrisburg.

Utilities can transfer treated potable water to the City of Concord through three metered connections to their water system. All of Concord's service area is within the Rocky River basin, so any water purchased by them becomes an IBT. Water service is only provided as an emergency back-up to Concord's routine supply which is Lake Howell and several smaller reservoirs. All of these reservoirs are within the Rocky River basin. Wastewater from Concord is treated at the RRRWWTP. Utilities' agreement with Concord is that water will be supplied to them subject to availability and subject to regulatory constraints including IBT and Federal Energy Regulatory Commission (FERC) limitations.

Concord received an IBT Certificate in January 2007, for the transfer of up to 10 mgd from the Catawba River basin to the Rocky River basin. NC DWR advised Utilities that water sold to Concord should not be applied to Utilities' IBT amount. Concord did not purchase any potable water from Utilities in calendar year 2010, so the IBT amounts reported do not include sales to Concord.

Utilities can transfer treated potable water to the Town of Harrisburg through two metered connections to their water system. All of Harrisburg's service area is within the Rocky River basin and is included in the Utilities' IBT amounts.

Table 1 below summarizes actual IBT amounts for calendar years 2002 through 2010 (all calculated using the methodology approved by NC DWR in June of 2006). The table considers the daily amounts of water transferred from the Catawba basin to customers within the Rocky River basin that is not returned to the Catawba basin.

The data indicates that the maximum amount of IBT for year 2010 occurred in August, and was 18.22 mgd, less than 56% of the authorized maximum day value of 33 mgd. The average IBT for 2010 was 13.45 mgd, which is approximately 41% of the authorized maximum day value. In addition to the amount of actual IBT reported in Table 1, Utilities has committed to provide additional IBT to development that has been proposed but not yet activated in the Rocky River basin. As of December 31, 2010, 1.16 mgd was committed to permitted donated projects (subdivisions) that had not been activated and 0.50 mgd was committed to master meter connections (generally commercial or multi-family developments) that had not been activated, both based on maximum day estimates. This brings the total of the actual and outstanding IBT in 2010 to 19.88 mgd, or less than 61% of the authorized maximum day value.

**Table 1. Actual IBT Summary**

<b>Calendar Year</b>	<b>Avg. Annual IBT (mgd)</b>	<b>Max. Day IBT (mgd)</b>
2002	6.74	11.97
2003	6.91	9.82
2004	7.79	12.56
2005	8.66	13.79
2006	9.56	14.35
2007	9.96	17.22
2008	11.39	17.42
2009	12.04	16.00
2010	13.45	18.22

**Compliance with Certificate Conditions**

Condition 1 of Utilities’ IBT certificate requires Mecklenburg County to summarize progress in implementation of watershed management approaches of the Surface Water Improvement and Management Program (S.W.I.M. program). This summary follows:

*The watershed management approaches of the Surface Water Improvement and Management (SWIM) Program continued to be implemented during calendar year 2010. Efforts continued to focus on McDowell and Goose Creeks as in 2007, 2008 and 2009 as well as the South Prong and West Branch of the Rocky River in Davidson as initiated in 2009. During calendar year 2010, the following work was completed in the three (3) watersheds:*

- a) Survey and design were initiated on the restoration of 1,000 feet of stream and the retrofit of 5 rain gardens within the North Mecklenburg Park Property in the McDowell Creek watershed. In addition to the water quality benefits of the project, it will act as an educational destination for property owners potentially affected by future stream restoration and BMP retrofit projects.*
  
- b) Since 2002 Goose Creek has been listed by the N.C. Department of Environment and Natural Resources (NCDENR) as impaired due to elevated levels of fecal coliform bacteria. The predominant sewer treatment system in the watershed is private septic systems; therefore, it was assumed that malfunctioning septic systems were a primary source of the elevated bacteria levels. In 2008, Mecklenburg County initiated a program to complete an inspection of all the septic systems in the watershed in order to identify deficiencies and take the necessary actions to ensure correction. This effort was completed in 2010 with the inspection of 1,422 septic systems resulting in the correction of 13 deficiencies that could contribute to elevated bacteria levels in Goose Creek. Following the completion of this project, NCDENR data documented a reduction in fecal coliform bacteria levels and Goose Creek was removed from the list of impaired waters.*

- c) *Mecklenburg County continues to partner with Creek ReLeaf, environmental organizations and local schools to plant trees along the banks of streams in Mecklenburg County. The purpose of this effort is to restore the water quality buffer and floodplain. During 2010, over 2,200 trees were planted by more 400 volunteers along the floodplain of Little Sugar Creek.*
- d) *Construction of the restoration of 10,000 linear feet of Torrence and Torrence Tributary #2 was nearly completed in 2010. This project is expected to reduce the overall sediment load in the McDowell Creek watershed by as much as 7%.*
- e) *In 2010, Mecklenburg County requested that the Army Corps of Engineers include the Rocky River watershed in Mecklenburg County into their 206 Program for restoration. As a result, the Corps selected the watershed for inclusion in Program.*
- f) *Mecklenburg County applied for two Clean Water Management Trust Fund Grants for the restoration of an additional 10,000 feet of stream in the McDowell Creek Watershed.*

Condition 2 of Utilities' IBT certificate required a stakeholder process to investigate, develop, adopt, and implement storm water ordinances that control water quantity from single-family development and water quality for all development until completed. The requirements of Condition 2 were completed in 2007.

Condition 3 of the IBT Certificate removes the Goose Creek subbasin from the area to be served by the IBT, and imposes a moratorium on the installation of new IBT water lines (water lines crossing the ridgeline) into Goose Creek subbasin until the impacts of additional growth on the endangered species are fully evaluated.

*The Utilities has requested the NC Division of Water Resources (DWR) to prepare an Environmental Assessment (EA) of new development in the Goose Creek basin (Mint Hill area), impacts to water quality, and measures required to protect the Carolina Heelsplitter.*

Condition 4 of the IBT Certificate provides that the Environmental Management Commission may reopen the Certificate under certain circumstances. This did not occur in 2010.

Condition 5 of the IBT Certificate requires Utilities to develop a compliance and monitoring plan for reporting maximum daily transfer amounts, compliance with certificate conditions, and progress on mitigation measures, and drought management activities. Utilities' monitoring plan and reporting format were approved in June of 2006 by NC DWR and continue to be used for 2010.

*Charlotte Mecklenburg Utilities monitored water treatment plant pump rates, streamflow and lake storage indicators, the US Drought Monitor, and other factors in accordance with the Utilities Water Shortage Response Plan. Measurements were assessed monthly to identify designated triggers that could indicate developing drought conditions. All appropriate planning, communication and preparation were in place to respond as needed to changing conditions.*

*In coordination with 15 other utilities in the Catawba-Wataree river basin, Charlotte-Mecklenburg participated in regional drought response planning and response activities as directed by the FERC- approved Low Inflow Protocol.*

### **Summary**

The actual maximum day amount of water transferred from the Catawba River basin to the Rocky River basin was 18.22 mgd, less than 56% of the authorized maximum day value of 33 mgd. The total of actual and outstanding IBT was 19.88 mgd, less than 61% of the authorized maximum day value. Utilities is in full compliance with IBT authorizations and compliance conditions for calendar year 2010.



Aug. 30, 2012  
Mr. Tom Reeder  
N.C. Division of Water Resources  
1611 Mail Service Center  
Raleigh, North Carolina 27699-1611

Subject: IBT Report for 2011

Dear Tom:

We are sending our calendar year 2011 IBT Annual Report. We are also transmitting this report to you electronically. The report follows the format of earlier reports and includes a narrative section with background and program progress reports along with spreadsheets detailing the IBT amount calculation.

For calendar year 2011, we experienced an actual maximum day IBT of 18.82 mgd based on September billing data. As of December 31, 2011, there were additional outstanding IBT commitments of 2.08 mgd. The total amount of IBT for 2011 was 20.9 mgd, approximately 64% of the authorized amount.

Please let me know if you have any questions.

Sincerely,

CHARLOTTE-MECKLENBURG UTILITIES

David W. Czerr, PE  
Program Manager – Planning Section

CC: Toya Ogallo

**RECEIVED**

SEP 24 2012

**DIVISION OF WATER RESOURCES**

*Charlotte-Mecklenburg Utilities Department  
Annual Report on Interbasin Transfer  
Calendar Year 2011*

**INTRODUCTION**

The North Carolina Environmental Management Commission (EMC) approved Charlotte-Mecklenburg Utilities Department's (CMUD's) petition to increase the amount of water transferred from the Catawba basin to the Rocky River basin and an interbasin transfer (IBT) Certificate was issued on March 14, 2002. The Certificate authorizes CMUD to transfer up to 33 million gallons per day (mgd) from the Catawba River basin to the Rocky River basin.

The IBT Certificate requires CMUD to report maximum daily IBT amounts annually to the North Carolina Division of Water Resources (NC DWR) until such time as the transfer amount exceeds 80% of the authorized amount. Once that amount is exceeded, CMUD is required to report monthly. To date, The Charlotte-Mecklenburg Utilities Department has not exceeded 80% of the authorized IBT amount.

**SYSTEM OVERVIEW**

CMUD operates the water and wastewater systems that serve Charlotte, Cornelius, Davidson, Huntersville, Mint Hill, Matthews, Pineville, and much of the unincorporated areas of Mecklenburg County. This system is divided between two river basins designated by NC General Statutes for regulation of IBT water. The western portion of the system is within the Catawba River basin and the eastern portion is within the Rocky River basin. Water transferred from the Catawba River basin to the Rocky River basin that is not returned to the Catawba river basin is regulated IBT.

Water for distribution to CMUD's customers is withdrawn from the Catawba River basin at two locations. An intake at Lake Norman sends water to the Lee S. Dukes Water Treatment Plant. A second intake at Mountain Island Lake sends water to the Walter M. Franklin Water Treatment Plant and to the Vest Water Treatment Plant. Potable water from these three plants is delivered through an interconnected distribution system to retail customers throughout CMUD's service area in Mecklenburg County and in small areas of Iredell, Cabarrus, and Union Counties. CMUD also provides wholesale water to municipal systems for Resale including: City of Concord (NC), Town of Harrisburg (NC), Union County (NC), York County Water & Sewer Authority (SC), and Lancaster County Water and Sewer District (SC).

CMUD treats wastewater at five advanced wastewater treatment plants (WWTP's) that discharge into small streams in Mecklenburg County. Four of the streams are tributary to the

Catawba River basin and one (Mallard Creek) is tributary to the Rocky River basin. CMUD also conveys wastewater generated in portions of Mecklenburg County to the Rocky River Regional Wastewater Treatment Plant (RRRWTP) operated by the Water and Sewer Authority of Cabarrus County (WSACC). The RRRWTP discharges treated effluent to the Rocky River.

## **IBT MONITORING**

Water supplied to CMUD's retail customers in the Rocky River Basin, that is not returned to the Catawba basin, is included in the reported IBT amounts. Water provided to municipalities with service areas in the Rocky River basin includes the City of Concord and the Town of Harrisburg.

CMUD can transfer treated potable water to the City of Concord through three metered connections to their water system. All of Concord's service area is within the Rocky River basin, so any water purchased by them becomes an IBT. Water service is only provided as an emergency back-up to Concord's routine supply which is Lake Howell and several smaller reservoirs. All of these reservoirs are within the Rocky River basin. Wastewater from Concord is treated at the RRRWTP. CMUD's agreement with Concord is that water will be supplied to them subject to availability and subject to regulatory constraints including IBT and Federal Energy Regulatory Commission (FERC) limitations.

Concord received an IBT Certificate in January 2007, for the transfer of up to 10 mgd from the Catawba River basin to the Rocky River basin. NC DWR advised CMUD that water sold to Concord should not be applied to CMUD's IBT amount. Concord did not purchase any potable water from CMUD in calendar year 2011, so the IBT amounts reported do not include sales to Concord.

CMUD can transfer treated potable water to the Town of Harrisburg through two metered connections to their water system. All of Harrisburg's service area is within the Rocky River basin and is included in CMUD's IBT amounts.

Table 1 summarizes actual IBT amounts for calendar years 2002 through 2011 (all calculated using the methodology approved by NC DWR in June of 2006). The table considers the daily amounts of water transferred from the Catawba basin to customers within the Rocky River basin that is not returned to the Catawba basin.

The maximum monthly IBT for calendar year 2011 was 18.82 mgd in September, which was approximately 57% of the authorized IBT of 33 mgd. The average IBT for 2011 was 13.11 mgd, approximately 40% of the authorized IBT. In addition to the actual amount of IBT reported in Table 1, CMUD has committed to provide IBT to development that has been proposed but has not yet been activated in the Rocky River basin. As of December 31, 2011, 1.15 mgd was committed to permitted donated projects (subdivisions) that had not been activated and 0.93 mgd was committed to master meter connections (generally commercial or multi-family

developments) that had not been activated, both based on maximum day estimates. The combined actual plus promised IBT for 2011 was 20.9 mgd, approximately 64% of the authorized IBT.

**Table 1. Actual IBT Summary**

Calendar Year	Avg. Annual IBT (mgd)	Max. Day IBT (mgd)
2002	6.74	11.97
2003	6.91	9.82
2004	7.79	12.56
2005	8.66	13.79
2006	9.56	14.35
2007	9.96	17.22
2008	11.39	17.42
2009	12.04	16.00
2010	13.33	18.33
2011	13.11	18.82

**COMPLIANCE WITH CERTIFICATE CONDITIONS**

***Condition 1: S.W.I.M. Program Summary***

Mecklenburg County is required to annually summarize progress in implementation of watershed management approaches of the Surface Water Improvement and Management Program (S.W.I.M. program). The Division of Water Resources shall have the authority to approve modifications to and need for continued reporting as necessary.

Surface Water Improvement and Management (S.W.I.M.) Program watershed management approaches continued to be implemented during calendar year 2011. Efforts continued to focus on McDowell and Goose Creeks, as initiated in 2007, as well as on the South Prong and West Branch of the Rocky River in Davidson that began in 2009. During calendar year 2011, the following work was completed in the three (3) watersheds:

*McDowell Creek (including the Torrence Creek Tributary to McDowell Creek)*

1. Initiated construction on the restoration of 1,000 feet of stream and the retrofit of 5 rain gardens and 2 water quality swales on the North Mecklenburg Park property in Huntersville. In addition to the water quality benefits of the project, it will act as an educational destination for property owners potentially affected by future stream restoration and BMP retrofit projects.

2. Awarded a Clean Water Management Trust Fund Grant in the amount of \$400,000 to restore approximately 2 miles of stream along Torrence Creek. The total cost of the project is estimated at \$2,000,000. Design is underway and construction will begin in 2012.
3. Applied for a Clean Water Management Trust Fund Grant to restore approximately 1 mile of stream in The Park Huntersville Phase I, which is located in the upper portion of Torrence Creek.
4. Initiated planning for the restoration of approximately 2 miles of stream along McDowell Creek upstream of the confluence with Torrence Creek.
5. Initiated planning for a 2<sup>nd</sup> phase of The Park Huntersville project, including the restoration of approximately 1 mile of stream along Torrence Creek.
6. Identified a stream restoration project in the McDowell Creek Watershed Management Plan and worked with a private mitigation bank to move the project forward, which includes BMP retrofits, the stream restoration along a 1 mile tributary of Torrence Creek and wetland restoration within Monteith Park. Design is currently underway.
7. Identified a stream restoration project in the McDowell Creek Watershed Management Plan and worked with a private mitigation bank to move the project forward, which includes the stream restoration of approximately 2 miles along a tributary of McDowell Creek and wetland restoration along Bud Henderson Road. Design is currently underway.

Goose Creek (including the Stevens Creek Tributary to Goose Creek)

1. Initiated planning for the restoration of 2 miles of stream along Stevens Creek.

Rocky River

1. Coordinated with the U.S. Corps of Engineers in an application to obtain 20G Program Funding for the restoration of the Rocky River.

**Condition 2: Stakeholder Process (Completed)**

A stakeholder process is required to investigate, develop, adopt, and implement storm water ordinances that control water quantity from single-family development and water quality for all development until completed. The requirements of Condition 2 were completed in 2007.

**Condition 3: Goose Creek Subbasin**

The IBT Certificate removes the Goose Creek subbasin from the area to be served by the IBT, and imposes a moratorium on the installation of new IBT water lines (water lines crossing the ridgeline) into Goose Creek subbasin until the impacts of additional growth on the endangered species are fully evaluated.

*CMUD submitted an Environmental Assessment of new development in the Goose Creek basin (Mint Hill area) to the NC Division of Water Resources (DWR) on December 5, 2011. Subsequent comments by DWR were received by CMUD on February 17, 2012. The revised report is anticipated to be completed by May 11, 2012 and submitted to DWR thereafter.*

**Condition 4: Environmental Management Commission**

The IBT Certificate provides that the Environmental Management Commission may reopen the Certificate under certain circumstances. This did not occur in 2011.

**Condition 5: Compliance and Monitoring Plan**

The IBT Certificate requires CMUD to develop a compliance and monitoring plan for reporting maximum daily transfer amounts, compliance with certificate conditions, and progress on mitigation measures, and drought management activities. CMUD's monitoring plan and reporting format were approved in June of 2006 by NC DWR and continue to be used for 2011.

*Charlotte Mecklenburg Utilities monitored water treatment plant pump rates, streamflow and lake storage indicators, the US Drought Monitor, and other factors in accordance with the CMUD Water Shortage Response Plan. Measurements were assessed monthly to identify designated triggers that could indicate developing drought conditions. All appropriate planning, communication and preparation were in place to respond as needed to changing conditions.*

*In coordination with 17 other utilities in the Catawba-Wateree river basin, Charlotte-Mecklenburg participated in regional drought response planning and response activities as directed by the FERC- approved Low Inflow Protocol.*

**SUMMARY**

The actual maximum day amount of water transferred from the Catawba River basin to the Rocky River basin was 18.82 mgd, less than 57% of the authorized maximum day value of 33 mgd. The total of actual and outstanding IBT was 20.9 mgd, less than 64% of the authorized maximum day value. CMUD is in full compliance with IBT authorizations and compliance conditions for calendar year 2011.