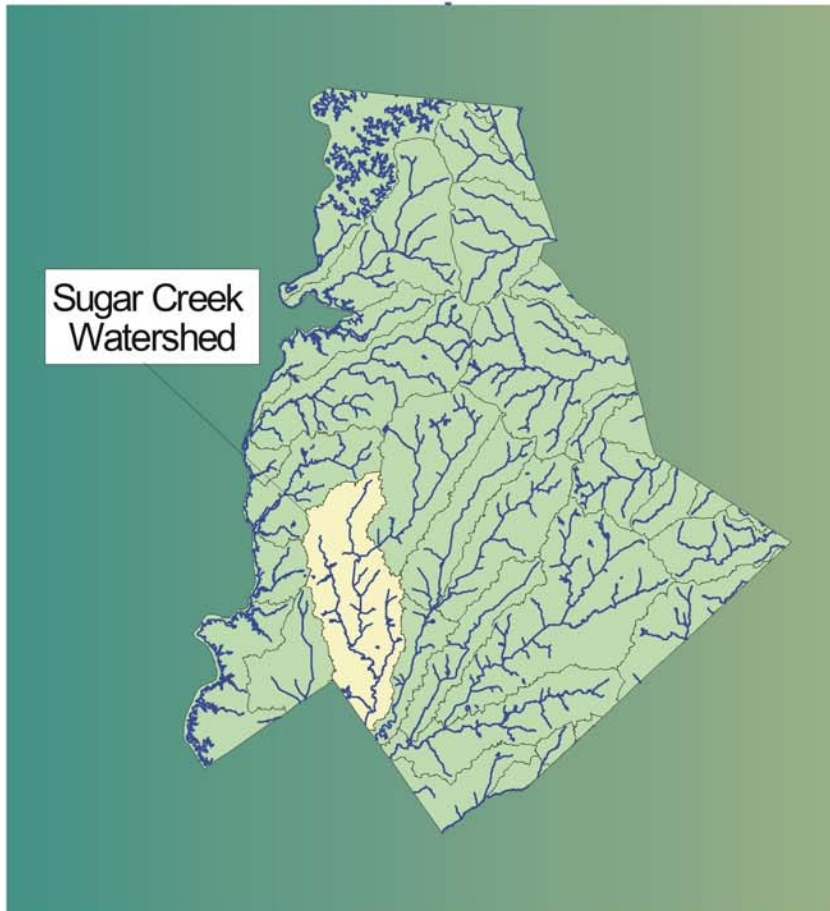


PRELIMINARY ENGINEERING REPORT

Watershed Study No. 3

Sugar Creek Watershed



Prepared for
Mecklenburg
Storm Water Services

Prepared by
HDR Engineering, Inc.
of the Carolinas
128 S. Tryon Street, Suite 1400
Charlotte, North Carolina 28202



October 2001



MCSWS Project No. 44002

**MECKLENBURG COUNTY
STORM WATER SERVICES**

**PRELIMINARY ENGINEERING REPORT
FOR
WATERSHED STUDY No. 3**

SUGAR CREEK WATERSHED

ACKNOWLEDGEMENT

The project staff of HDR Engineering, Inc. of the Carolinas (HDR) would like to express our sincere appreciation to Mecklenburg County Storm Water Services (MCSWS) for its assistance and support during this project. HDR would especially like to thank Mr. Dave Canaan and his staff.

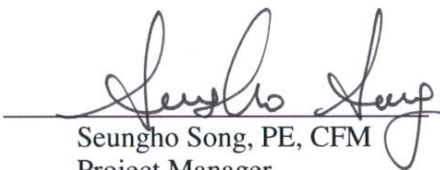
DISCLAIMER

This watershed-wide study is for planning purposes only. These study results and recommendations are preliminary and should not be used for construction without additional detailed engineering design analysis.

CERTIFICATION

I hereby certify that this Preliminary Engineering Report for Watershed Study No. 3, Sugar Creek Watershed, for Mecklenburg County was prepared by me or under my direct supervision.

Signed, sealed, and dated this 25 day of October 2001.

By: 
Seungho Song, PE, CFM
Project Manager



(SEAL)

**MECKLENBURG COUNTY
STORM WATER SERVICES
PRELIMINARY ENGINEERING REPORT
FOR
WATERSHED STUDY No. 3

SUGAR CREEK WATERSHED**

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GLOSSARY

Future Condition Floodplain (FCF):	Floodplain delineated for the 1% chance of flood event in any given year using future land use condition. It is currently defined as Floodplain Land Use Map (FLUM) in Mecklenburg County.
Existing Condition Floodplain:	Floodplain delineated for the 1% chance of flood event in any given year using current land use condition. It is defined as the same as within the Flood Insurance Rate Map (FIRM).
1% Annual Chance Flood:	The 1% annual chance flood is the flood that has a 1% chance of being equaled or exceeded in any given year, which is referred to as the “100-year flood,” in general.
Base Flood Elevation (BFE):	Water surface elevation based on the 1% annual chance flood (100-year flood).

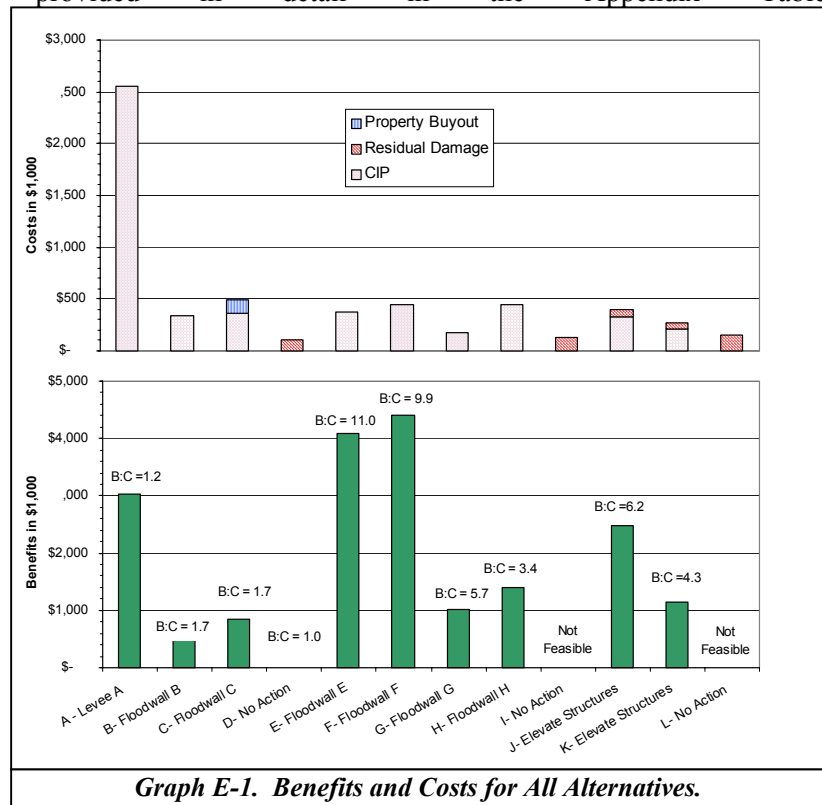
EXECUTIVE SUMMARY

SUGAR CREEK WATERSHED

This Preliminary Engineering Report (PER) summarizes a study focused on flood hazard mitigation and ecological restoration of Sugar Creek Watershed. This watershed includes the major tributaries of McCullough Creek (1.5 mi), Coffey Creek (6.3 mi), Taggart Creek (3.4 mi), and Kings Branch (4.3 mi), and the main stem of Sugar Creek (12.1 mi) for the total stream length of 27.6 miles. Since Mecklenburg County (County) classifies Irwin Creek Watershed as a major drainage basin separately from Sugar Creek, Irwin Creek Watershed is not included in this study. Using field visits, available hydraulic information, aerial photographs, Geographic Information Systems (GIS), and a structural flooding damage analysis model, recommendations are proposed to meet the project goals.

The first priority for this study is economic analysis of flood hazard mitigation for a total of 164 structures located within the limits of the 1% annual chance **Future Condition Floodplain** (FCF). The second priority of this study is ecological restoration through wetland construction and also stream bank stabilization. Ninety-seven of these 164 structures have lowest finished floor elevations below the Base Flood Elevation (BFE: 1% annual chance of FCF water surface elevation). Graph E-1 illustrates Benefit:Cost Analysis results of each problem area improvement analyses employed in this study. Economic information is provided in detail in the Appendix Table

A-1. Of 164 flood potential structures, 51 were constructed before 1973 (Pre-FIRM). A majority of these structures are along Sugar Creek (133). While structures are within the limits of the FCF along all streams in this study, flooding structures are only along Sugar and Coffey Creeks. Therefore, flood hazard mitigation options are only presented along these two creeks. The total improvement construction costs, operation and maintenance costs, and buyout costs for the improvements along Sugar Creek and Coffey Creek are estimated at \$4,557,400 and \$816,300, respectively, for a total cost of \$5,373,700 (using the January 29, 2001, Federal Discount Rate of 5.5 percent) (Graph E-1, Table E-1).



Figures E-1 and E-2 show the Sugar Creek locations where mitigation options were applied, and Figures E-4 and E-5 show the Coffey Creek locations where mitigation options were applied. Figures E-3 and E-6 exhibit representative cross sections in these locations for both existing conditions and mitigation options.

Table E-1
Estimated Costs of Recommended Improvements (2001 Dollars)

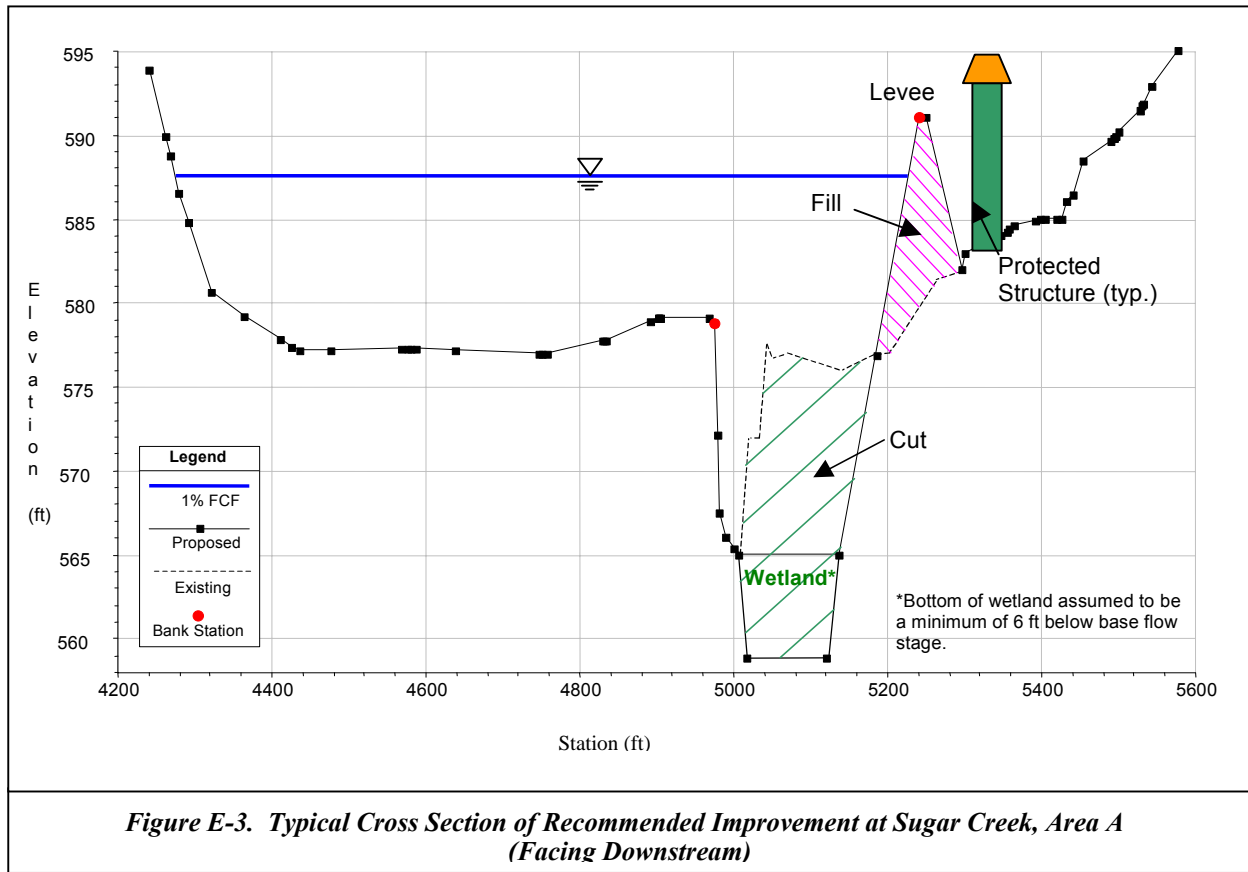
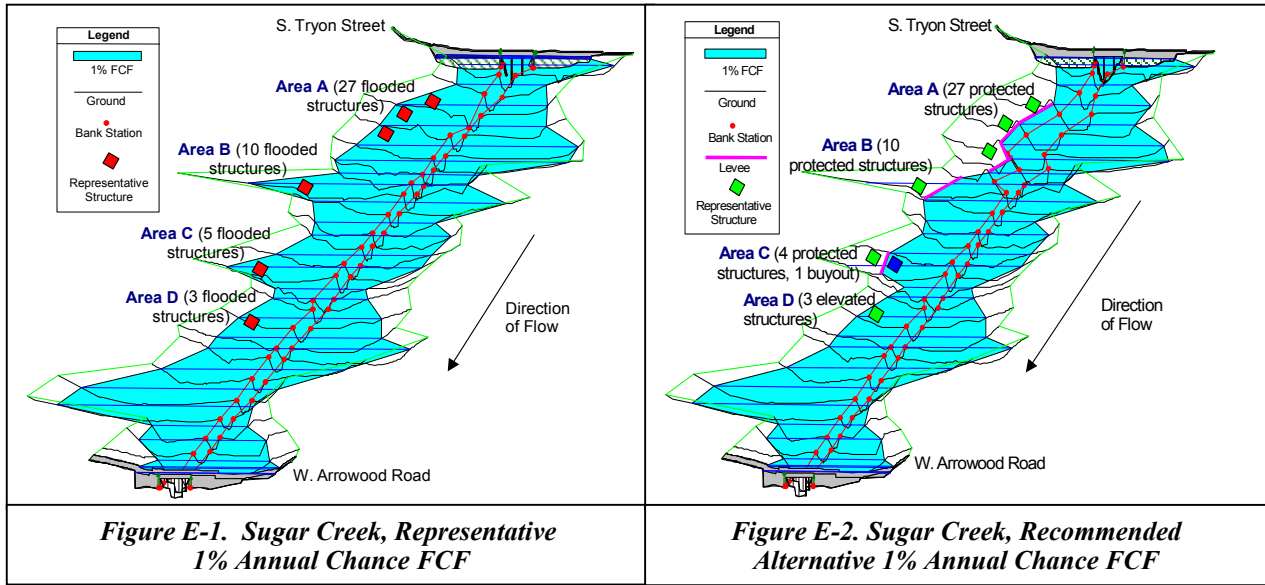
	Total	Sugar Creek	Coffey Creek
Improvement Construction Costs	\$4,309,400	\$3,662,400	\$647,000
Operating and Maintenance	\$931,200	\$761,900	\$169,300
Buyout Costs	\$133,100	\$133,100	\$0
Total	\$5,373,700	\$4,557,400	\$816,300

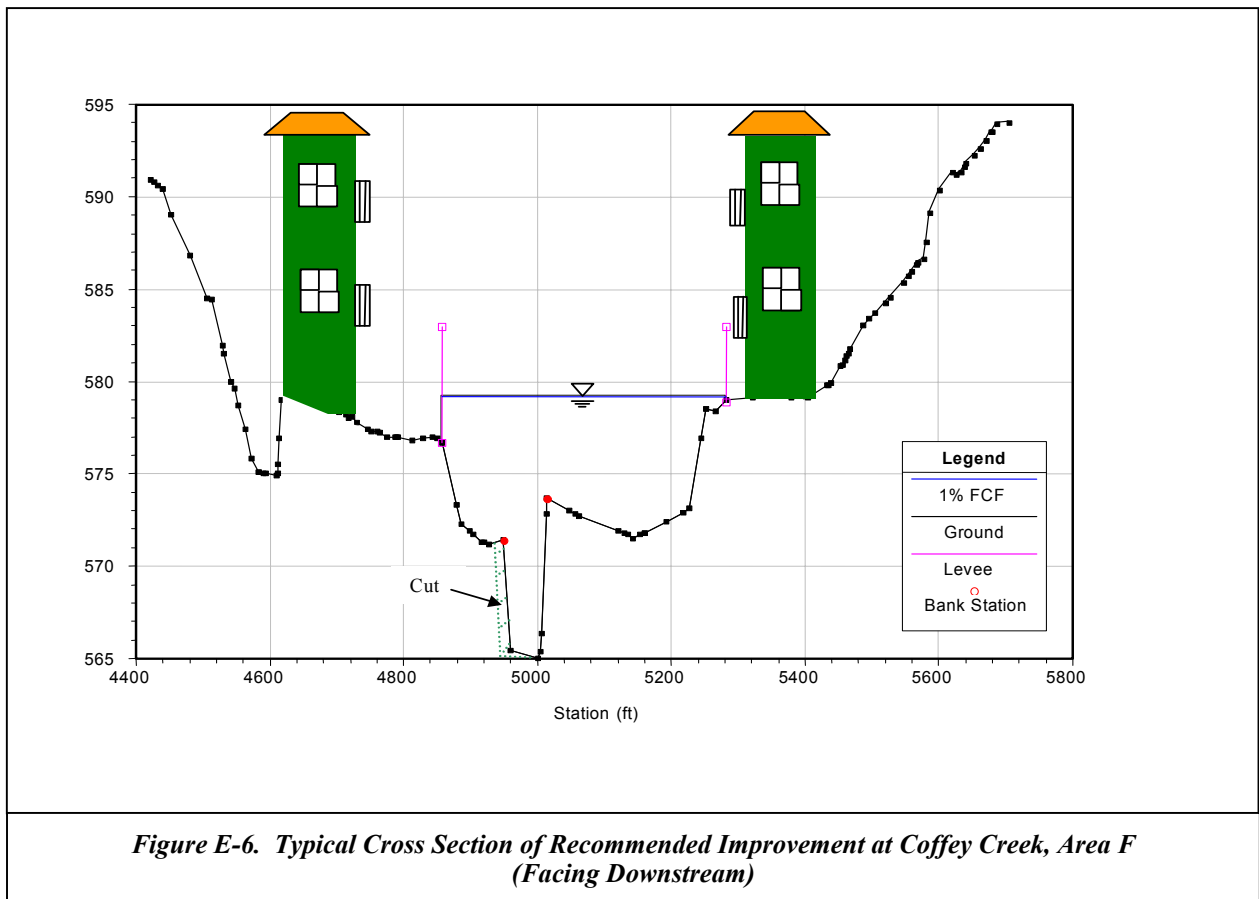
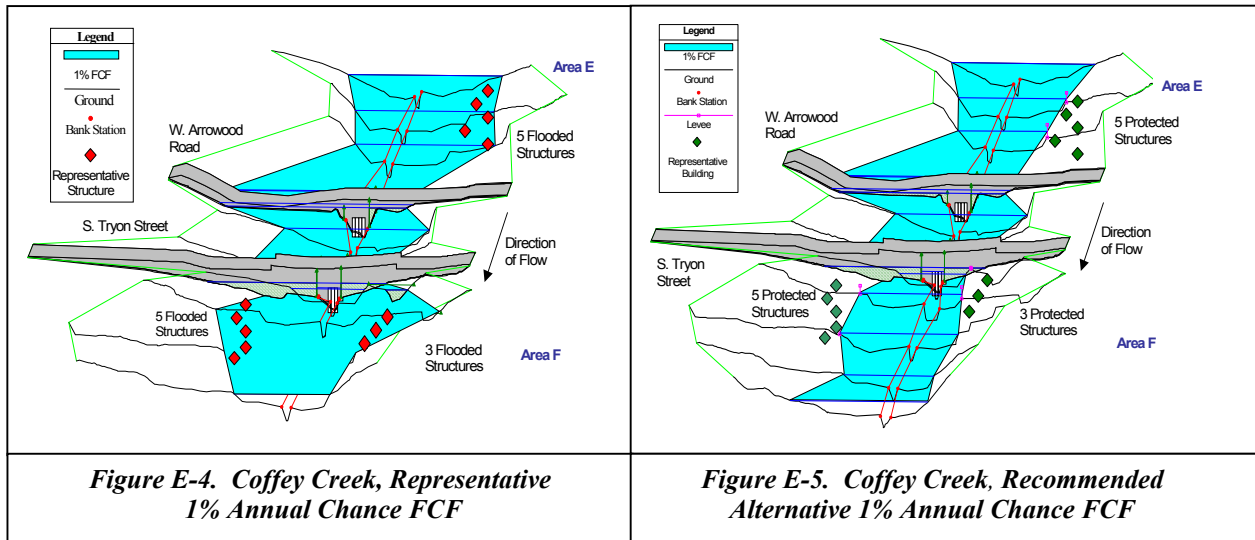
The combination of proposed flood mitigation options includes purchasing flooded properties, elevating structures, and constructing floodwalls. Two structures, built before the establishment of Federal Emergency Management Agency (FEMA) maps, cannot be protected by the floodwalls and should be purchased. Eleven structures, all along Sugar Creek, should be elevated because of their location, or due to the fact that it is not cost-effective to either purchase or protect these properties with a levee. Levees are designed to protect 65 structures, 51 along Sugar Creek and 14 along Coffey Creek. These recommendations also include no action for 19 structures along the banks of Sugar Creek. Ten of these were constructed before the establishment of FEMA FIRM maps; nine were not. The benefits and costs of all considered improvement options are summarized in Graph E-1. Flooding problem locations are assigned a one-letter label as presented in Figures E-7 through E-12, and Figure 18. For areas of clustered structures, a common label is assigned to represent a whole cluster. Problem Area I represents three structures that are not clustered. The recommended improvements will not impact the BFE of FCF and will reduce the FCF floodplain area (see Figures E-1 through E-6). Figure E-7 presents Sugar Creek watershed and sub-watersheds. Figures E-8 through E-12 illustrate recommended improvements along Sugar and Coffey Creeks. Figure E-13 shows Capital Improvement Projects in Mecklenburg County.

Bridge or culvert improvement options were investigated for possible lowering flood stages at flooding problem areas, especially when significant headloss occurs at bridge and/or culvert crossings. After review of the HEC-RAS results and water surface profile plots (Appendix Figures A-2 through A-6), it was determined that no possible bridge or culvert crossing improvements would significantly benefit upstream flooding problem areas without adverse downstream impacts. Therefore, bridge/culvert improvement options were not considered.

The Sugar Creek watershed within Mecklenburg County is 80 percent developed, 60.5 percent of which occurred before 1970. Sixty-nine percent of the land use in the watershed is residential. Urban development has changed the landscape of both the watershed and the creek channels. The Sugar Creek watershed is influenced by the Charlotte/Douglas International Airport and Interstates 77, 85, and 485. Coffey Creek watershed is the least developed sub-watershed, but is a rapidly developing suburban area.

This development has impacted the natural character of the stream channels and banks. Abundant vegetation protects most of the channel banks, providing shade and some aquatic habitat. The main Sugar Creek channel is wide and typically has steep banks, a characteristic of entrenchment. The major tributaries also show these characteristics. At some locations, natural channel meanders are restricted by bank realignments that accommodate large diameter sanitary sewers. A few locations exhibited mild lower bank erosion, while one location exhibited severe bank erosion. Sand and silt bed material characterizes a majority of the channels. At many sites, riprap had been added into the channel as well as along the banks. Natural rock material was only observed in a few locations.





During field visits, little aquatic wildlife was observed in Sugar Creek and its major tributaries. According to the Mecklenburg County Water and Land Resources – Water Quality Program (Water Quality Program), from 1994 to 1998 overall water quality remained fairly consistent in the Sugar Creek watershed. Review of ambient water quality data dating back to 1968 does not reveal significant trends in most of the data over time or by location along the creeks. Current Water Quality Index values indicate an average of “Good” water quality throughout the watershed, with the best water quality, “Good-Excellent,” in the headwaters of Coffey Creek.

The Water Quality Index indicates water quality conditions better than the fish and macroinvertebrate communities reflect. The aquatic fauna communities throughout the watershed have consistently ranked “Poor” and “Fair,” while fish sampling ranked “Poor-Fair” and “Fair,” which results in a less than desirable diversity of species. This may indicate that aquatic habitat conditions limit these communities to some extent. While aquatic life is present in the creeks, the sand and gravel benthic material (without instream features such as boulders and woody debris) does not provide a protective habitat, and bottom dwelling communities are not as abundant and diverse as may be desired.

Sanitary sewers are present along Sugar Creek and its major tributaries; consequently, any stream-side capital improvement projects should accommodate the existing utilities. The County’s Year 2000 Inter-Agency Coordination of Capital Improvement Projects (CIPs) map (Figure E-13) indicates MCSWS has proposed action along Sugar Creek from Shopton Road to Arrowood Road. No other activities are currently planned for the remainder of the watershed. MCSWS should continue to coordinate with Charlotte-Mecklenburg Utilities (CMU) to identify any potential projects or conflicts that arise in the future. If MCSWS is aware of CMU projects, it may influence the alignment of the relief sanitary sewer to coincide with the recommendations of this PER. Although there are no existing greenways within the Sugar Creek watershed, the 1999 Mecklenburg County Greenway Master Plan recommends that the greenway system be expanded as a floodplain management buffer and water quality program to include all streams throughout the County. Future plans include a greenway along Coffey Creek from Shopton Road to Sugar Creek and along Sugar Creek from Billy Graham Parkway to the Lancaster, South Carolina, city line. The Sugar Creek watershed is a good candidate as a greenway corridor due to its proximity to residential developments. MCSWS should monitor future Mecklenburg County Park and Recreation Commission (MCPRC) plans for the County greenway system, because this study could be included in future greenway development.

Figure E-7, Study No. 3: Sugar Creek Watershed

