

**Spring Valley Park Stream Restoration Site
Greensboro, North Carolina
EEP Project No. 354**

**2007 Annual Monitoring Report
Monitoring Year 4**



**Monitoring Year: 2007
Measurement Year 4
As-Built Date: 2004
NCEEP Project Number 354**

March 2008

Submitted by:

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**SPRING VALLEY PARK STREAM RESTORATION
2007 MONITORING REPORT**

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I. EXECUTIVE SUMMARY/PROJECT ABSTRACT

The Spring Valley Park Stream Restoration Site includes 1,409 linear feet of Piedmont Creek within the City of Greensboro, Guilford County, North Carolina. This site was constructed in 2004. Monitoring activities in 2007 represent the fourth year of monitoring following construction. The site must demonstrate a stable channel condition for a minimum of five years or until the project is deemed successful. The following report summarizes the monitoring activities that have occurred in the past year at the Spring Valley Park Stream Restoration Site.

The Spring Valley Park Stream Restoration site is monitored using a visual assessment and six permanent photo points. The monitoring does not include any groundwater gauges, rain gauge, cross section monuments, or vegetation plots.

Overall, the project has a number of stability issues. Down cutting since initial construction has exposed a sewer line crossing. Several rock structures are functioning properly, but in some header rocks were improperly placed, causing bank/bed scouring or allowing water to flow beneath the header rock. Failing structures should be repaired and stabilized using appropriate size rock material. In the downstream portion of the site unstable banks are present due to lack of rooted vegetation and coir matting failure. These problem areas need to be monitored and if the problems worsen over time, then a remedial plan needs to be developed. Repairs are recommended for the eroding banks and failing structures. Where absent, the replanting of a woody buffer is also recommended to stabilize banks or utilize other means to stabilize eroding banks. No action is recommended at the sewer line crossing at this time.

II. PROJECT BACKGROUND

A. LOCATION AND SETTING

The Spring Valley Park Stream Restoration Site is located in the City of Greensboro, North Carolina near the intersection of Interstate 40 and Freeman Mill Road (Figure 1). The site is along Piedmont Creek, a tributary to Buffalo Creek, in the Haw River Drainage Sub-basin of the Cape Fear River Basin (Hydrologic Unit 03030002). It includes 1,409 linear feet of Piedmont Creek. The drainage area for this project is approximately 550 acres (0.86 square miles). The drainage area is highly developed (>20% impervious) and surrounding landscape is urban. The site is surrounded by single family and multifamily homes. The project lies completely within the park boundaries.

To access the site, take exit 218B (Freeman Mill Road) off of I-40 near Greensboro. Travel north on Freeman Mill Road to Meadowview Road. Turn right onto Meadowview Road and follow to Spring Valley Park.

B. PROJECT RESTORATION COMPONENTS

Based on the 2005 Annual Monitoring Report and a draft Mitigation Plan of this project, the objectives and goals of the restoration of Piedmont Creek are:

- Restore an unstable stream channel to its natural stable form by modifying dimension, pattern, and/or profile based on reference reach parameters,
- Increase long-term stability and create a more functional riparian community,
- Vegetated buffers were designed to match local natural riparian communities,
- Improve the natural aesthetics of the stream corridor,

- Addresses the needs of local agencies, public safety, and physical constraints within Spring Valley Park, and
- Obtain mitigation credits for unavoidable impacts to streams within the same Hydrologic Unit Code (HUC).

The mitigation plan consisted of a Priority I and II restoration of Piedmont Creek along with establishment of a vegetated buffer. The construction of Piedmont Creek was completed in 2004 with Year 1 monitoring in 2005. This report details the fourth monitoring year. **Table I** shows the project restoration components and **Table II** discusses project history and activities.

Table I. Project Restoration Components					
Spring Valley Park Stream Mitigation/Project No. 354					
Project Segment	Mitigation Type	Approach	Linear Footage or Acreage	Stationing	Comment
Reach 1	R	PII	619	10+00 to 16+19	
Reach 2	R	PI	790	16+19 to 24+09	
R=Restoration El=Enhancement I Ell=Enhancement II S=Stabilization			PI=Priority I PII=Priority II PIII=Priority III SS-Stream Bank Stabilization		

Success Criteria

Per the draft planning document dated September 2001, photographs taken throughout the monitoring period will be used to subjectively evaluate channel aggradation or degradation, bank erosion, growth of riparian vegetation and the effectiveness of erosion control measures.

No documentation of cross-sections, profiles or vegetation stem counts are required and none have been performed for this annual monitoring report or for the 2005 and 2006 annual monitoring reports.

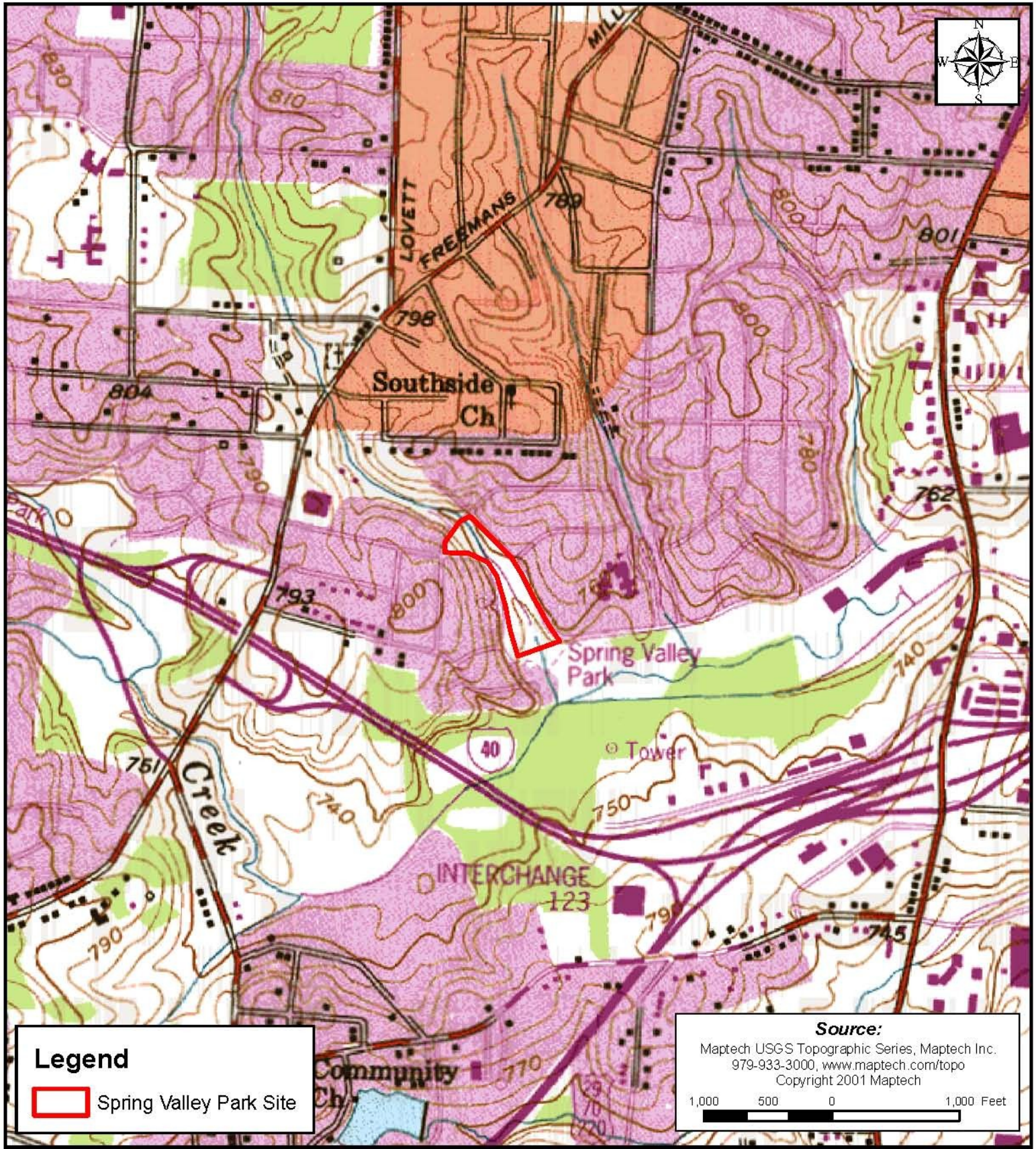
Table II. Project Activity and Reporting History		
Spring Valley Park Stream Mitigation/Project No. 354		
Activity or Report	Data Collection Complete	Actual Completion or Delivery
Restoration Plan	NA	NA
Final Design-90%	NA	October 2002
Construction	NA	January 2004
Temporary S&E mix*	NA	NA
Woody plantings for each reach/segment	NA	February 2004
Mitigation Plan/As-built (Year 0 Monitoring-baseline)	NA	NA
Structural maintenance	NA	2006
Remediation and Partial Replant	NA	February 2005
Year 1 Monitoring	December 2004	December 2004
Year 2 Monitoring	November 2005	December 2005
Year 3 Monitoring	September 2006	December 2006
Year 4 Monitoring	September 2007	November 2007
Year 5 Monitoring		

*Seed and mulch is added as each section of construction is completed.

C. PROJECT HISTORY AND BACKGROUND

The project was designed by Kimley-Horn & Associates. Initial monitoring in 2004 (Year 1) was performed by the North Carolina Department of Transportation (NCDOT) Roadside Environmental Unit. Year 2 monitoring was performed by Earth Tech. Monitoring activities for Years 3 and 4 were performed by WK Dickson and Co., Inc. Additional contact information is provided in **Table III**.

Table III. Project Contact Table Spring Valley Park Stream Mitigation/Project No. 354	
Designer	Kimley-Horn & Associates Raleigh, North Carolina
Monitoring Performers-2004	NCDOT Roadside Environmental Unit 1425 Rock Quarry Road Raleigh, NC 27610 M. Green and J. Wait
Monitoring Performers-2005	Earth Tech of North Carolina 701 Corporate Center Drive, Suite 475 Raleigh, NC 27607 Mr. Ron Johnson (919) 854-6210
Monitoring Performers-2006/2007	WK Dickson and Co., Inc. 3101 John Humphries Wynd. Raleigh, NC 27612 Mr. Daniel Ingram (919) 782-0495



Legend

 Spring Valley Park Site

Source:
 Maptech USGS Topographic Series, Maptech Inc.
 979-933-3000, www.maptech.com/topo
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1,000 500 0 1,000 Feet




FIGURE 01
VICINITY MAP
 Spring Valley Park Stream Restoration Site
 Greensboro, North Carolina
 Guilford County

The project is located within Guilford County, within the ecoregion of the Southern Outer Piedmont in the Piedmont physiographic province of North Carolina. The site is located within a highly urbanized area. Additional information summarizing project specific parameters are provided in **Table IV**.

Table IV. Project Background Table Spring Valley Park Stream Mitigation/Project No. 354	
Project County	Guilford
Drainage Area	523 acres
Drainage impervious cover estimate (%)	> 20%
Stream order	2nd order
Physiographic region	Piedmont
Ecoregion	Southern Outer Piedmont (45b)
Rosgen classification of As-built	C
Cowardin classification	N/A
Dominant soil types	Chewacla loam Mecklenburg-Urban land complex
Reference site ID	Piedmont Creek (~200 feet upstream from project site) Reddicks Creek
USGS HUC for Project	Deep River - HUC 03030003
NCDWQ sub-basin for project and reference	16-11-14-2
NCDWQ classification for project and reference	C, NSW
Any portion of project segment upstream of a 303(d) listed segment?	No
Reasons for 303d listing or stressor	N/A
% of project easement fenced	None – in City park

D. MONITORING PLAN VIEW

Photographs were taken throughout the monitoring season to document the evolution of the restored stream channel (see Appendix D). Due to severe drought the channel was nearly dry during the latter part of the growing season. Pools have maintained a variety of depths and habitat qualities, depending on the location and type of scour features (logs, root wads, transplants, etc.). During the early portion of the growing season a base flow was present.

III. PROJECT CONDITION AND MONITORING RESULTS

Monitoring results are discussed below. An initial visual survey was conducted on April 12, 2007 with a more detailed monitoring survey (evaluation of vegetation plots) conducted in September 2007.

A. VEGETATION ASSESSMENT

Woody vegetation is moderately dense along the banks of Reach I of the restored stream and consists of shrubs with more mature trees scattered throughout the buffer.

Vegetation in the upper portion of Reach 1 (Station 10+00 to 14+20) is very stable and functioning as designed. The woody buffer in this reach is narrow on the right bank along a maintained sewer easement, but sufficiently wide on the left bank. It consists of alder (*Alnus* sp.),

black willow (*Salix nigra*), and silky dogwood (*Cornus amomum*) along the stream banks with larger trees of sycamore (*Platanus occidentalis*), black willow, and northern red oak (*Quercus rubra*) present in the extended buffer. Natural regeneration includes black cherry (*Prunus serotina*), smooth sumac (*Rhus glabra*), and muscadine grape (*Vitis rotundifolia*). Exotic invasive species are present, but are not dominant. Exotic species include: mimosa (*Albizia julibrissin*), multiflora rose (*Rosa multiflora*), porcelainberry/Amur peppervine (*Ampelopsis brevipedunculata*), and Chinese privet (*Ligustrum sinensis*).

1. Soil Data

Table V. Preliminary Soil Data Spring Valley Park Stream Restoration Site					
Series	Max Depth (in)	% Clay on surface	K	T	OM %
Chewacla loam	65	10-35	0.28	5	1-4

Data from the Soil Survey of Guilford County (NRCS 1977).

Vegetation in Reach 2 is divided into two distinct segments, an upper and lower segment, having different vegetation characteristics. The upper segment (Station 16+20 to 21+00) has a narrow woody buffer on the right bank. The narrow woody buffer consists primarily of alder and black willow. The left bank is maintained grass to the top of bank with limited woody shrubs present. Bank erosion appears to be more prevalent along this segment also. The lower segment of Reach 2 has a good woody buffer that is approximately 40 feet from top of bank. Species includes black willow, alder, sycamore, and green ash (*Fraxinus pennsylvanica*). The woody vegetation is not dense and an understory of natural herbaceous vegetation is present. A few invasive species are present including mimosa and Chinese privet.

2. Vegetative Problem Areas

Table VI. Vegetative Problem Areas Spring Valley Park Stream Restoration Site			
Feature/Issue	Station #/Range	Probable Cause	Photo #
Coir matting failure	11+00 to 11+50	Unstable banks due to lack of rooted vegetation	PA #1

From observation, a large portion of the stream banks from station 16+50 through 21+50 lack cover vegetation and the banks appear to have localized erosion. NCDOT indicates this area lacking woody vegetation was by design because of line of sight requirements imposed by the city related to security concerns in recreational areas.

B. STREAM ASSESSMENT

WK Dickson personnel performed an initial site visit at Spring Valley Park on April 12, 2007. During the field visit notes were made regarding the condition of the stream restoration project and photos were taken. The site was visited again on September 10, 2007 at which time photographs were taken at all permanent photo points and all problem areas. Vegetative problem areas were described in **Table VI**.

Results of Stream Assessment

WK Dickson personnel completed an assessment of the Spring Valley Park stream restoration site in Guilford County (EEP Project Number 354) in April, 2007. All pertinent project features were located, including in-stream structures. The site was visited again on July 6, 2007 at which time photographs were taken at all permanent photo points and problem areas were located and photographed. At permanent photo points, one photo is taken upstream and one downstream. Potential problem areas identified were photographed. Appendix A contains photographs of the annual photo points. Appendix B contains problem areas photographs. A total of 15 previously identified problem areas were investigated. The previously identified problem areas #10 through #13 were not observed during this monitoring year. These problem areas were bank erosion and undercutting. The below normal rainfall and infrequent high flows may have allowed these areas to establish vegetation that stabilized the banks. A crest gage was installed at the site in Fall 2007 at X: 1760089.826; Y: 832860.872.

Overall, the project has problems with piping around structures, failure of a few structures, and areas of erosion. The observed problem areas are described in Appendix B along with photographs.

1. Current Conditions Plan View

A visual assessment of the stability of the channel was performed on September 9, 2007, by WK Dickson and Co., Inc. Several areas of concern were observed and documented including localized bank scour, aggradation, and failure of the engineered structures. These problem areas are located in Appendix B, Section B-1.

2. Problem Areas Table Summary

The Problem Areas Table Summary is located in Appendix B as Table B.1.

3. Representative Stream Problem Areas Photos Section

Representative photos of each category of stream problem area were taken and are shown in Appendix B, Section B-3.

4. Fixed Photo Station Photos

Photos from established photo stations were collected on September 9, 2007 during the stream survey. These photos are included in Appendix A.

IV. RECOMMENDATIONS

Overall, the project has a number of stability issues. A number of rock structures appear to be functioning properly, but in some cases header rocks were improperly placed causing scouring or allowing water to flow beneath the header rock. The improper placement has not created any loss of grade or headcutting but could potentially be an issue over the course of many years. Unstable banks are present due to lack of rooted vegetation and coir matting failure. These problem areas need to be monitored and if the problems worsen over time, then a remedial plan needs to be developed. Further details of present conditions of the site are summarized below.

- This is the fourth monitoring year since supplemental planting at the site.
- Channel stability monitoring indicated that a number of problems exist throughout the restored reach. Several areas where coir fiber matting has failed (constituting less than 15% of the reach), erosion exists but does not present a significant impact to the project.

- Short segments with erosional problems, such as piping or bank erosion, exist for approximately 10% of the reach.
- Although sediment deposition has occurred, bedform diversity is still present and riffles consist primarily of coarse gravel material.
- A number of rock structures (approximately 75%) appear to be functioning properly, but in some cases noted in plan view, header rocks were improperly placed causing scouring or water to flow beneath the header rock. Where these structures are improperly installed (STA 15+75 and 16+50), there are still pool features present and the bed above and below the structures appear to be holding grade.
- High out-of-bank flows have occurred throughout the project reach as confirmed by the wrack lines found along the reach.
- Bare banks are present due to lack of rooted vegetation and coir matting failure.
- Areas lacking woody vegetative buffer should be stabilized by planting woody vegetation or using other means to stabilize the banks.
- At this time, no repairs are recommended. The aforementioned problem areas discussed in Table B.1 need to be monitored and if the problems worsen over time, then a remedial plan needs to be developed.

References:

USACOE (2003) *Stream Mitigation Guidelines*. USACOE, USEPA, NCWRC, NCDENR-DWQ
USACOE (1987) *Corps of Engineers Wetlands Delineation Manual*. Tech report Y-87-1.
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Rosgen, D.L. (1996) *Applied River Morphology*. Wildland Hydrology Books, Pagosa Springs,
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The University of North Carolina Press, Chapel Hill, North Carolina.

APPENDIX A

Site Monitoring Photographs

A – 1 Monitoring Photographs

A – 2 Photo Points Plan View

**APPENDIX A-1
SPRING VALLEY STREAM RESTORATION SITE
2007 MONITORING PHOTO POINTS**



Photo Point #1 - Station 12+00 Upstream



Photo Point #1 - Station 12+00 Downstream

**APPENDIX A-1
SPRING VALLEY STREAM RESTORATION SITE
2007 MONITORING PHOTO POINTS**

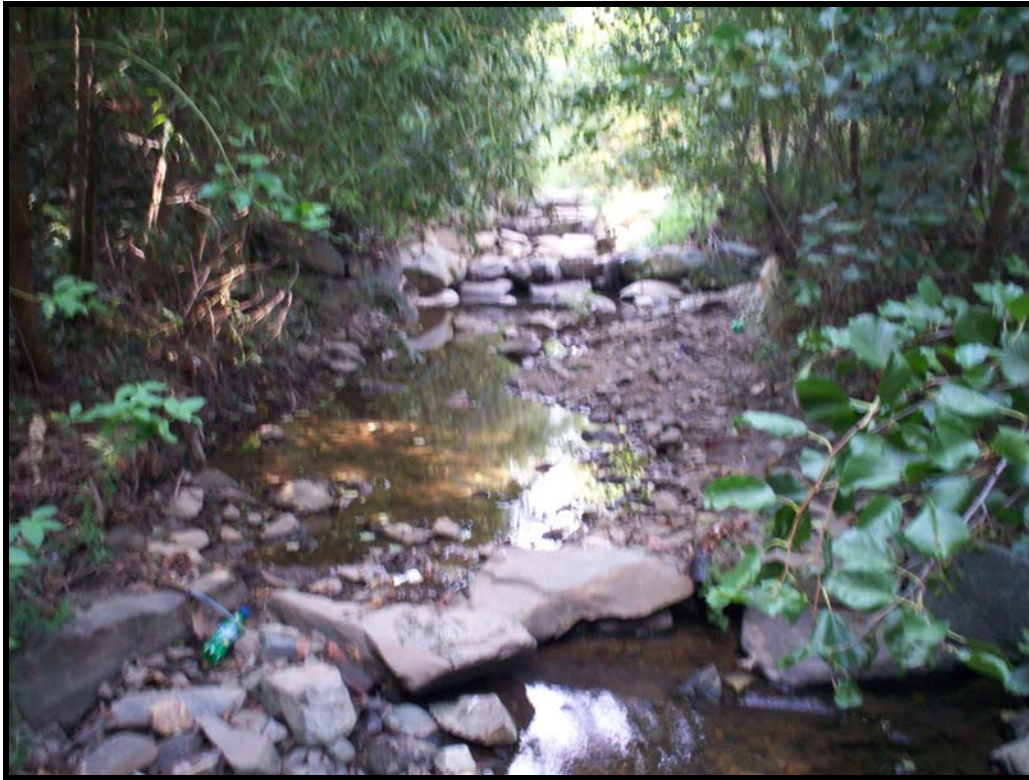


Photo Point #2 - Station 15+80 Upstream



Photo Point #2 - Station 15+80 Downstream

**APPENDIX A-1
SPRING VALLEY STREAM RESTORATION SITE
2007 MONITORING PHOTO POINTS**



Photo Point #3 - Station 18+00 Upstream



Photo Point #3 - Station 18+00 Downstream

**APPENDIX A-1
SPRING VALLEY STREAM RESTORATION SITE
2007 MONITORING PHOTO POINTS**



Photo Point #4 - Station 19+00 Upstream



Photo Point #4 - Station 19+00 Downstream

**APPENDIX A-1
SPRING VALLEY STREAM RESTORATION SITE
2007 MONITORING PHOTO POINTS**



Photo Point #5 - Station 21+00 Upstream



Photo Point #5 - Station 21+00 Downstream

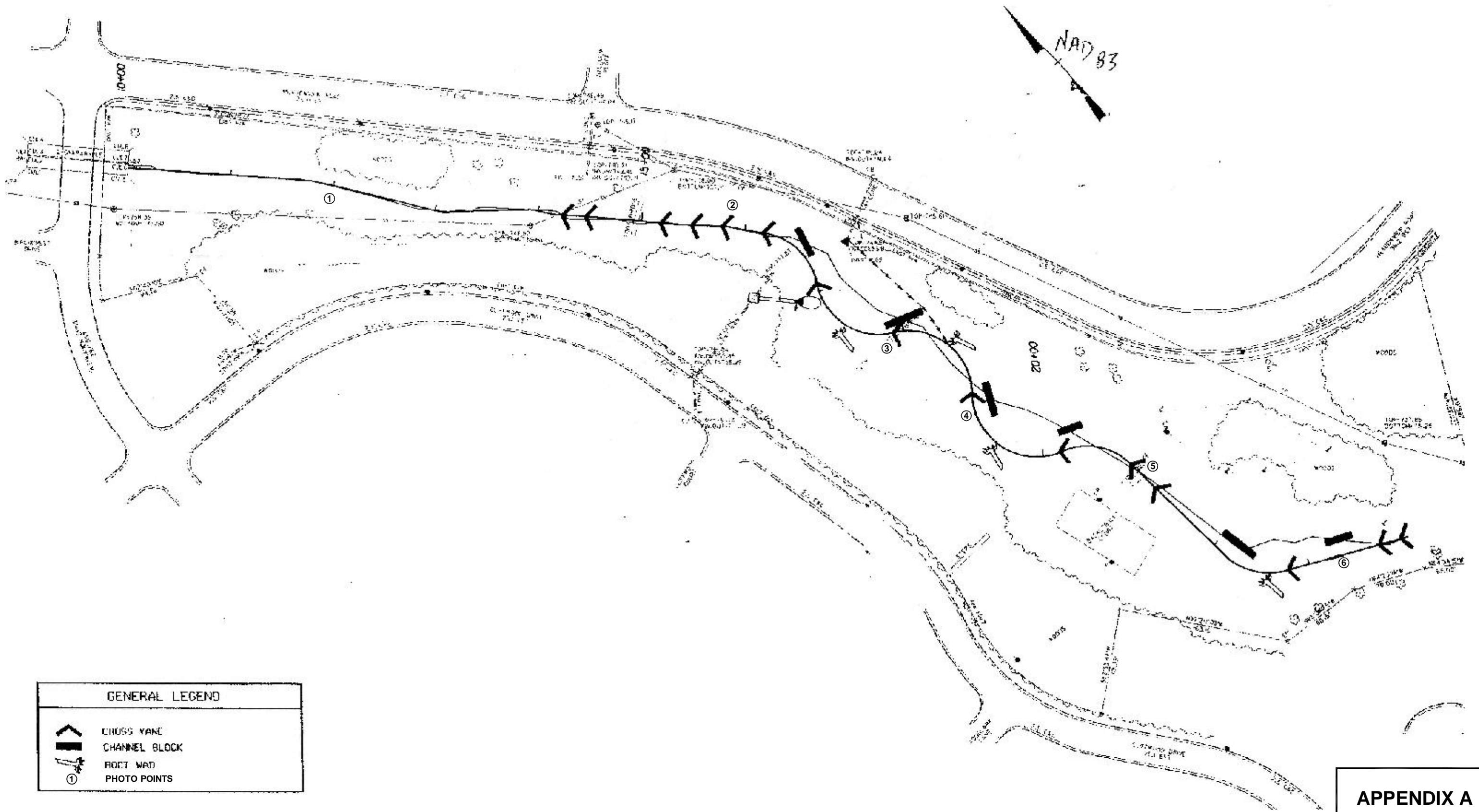
**APPENDIX A-1
SPRING VALLEY STREAM RESTORATION SITE
2007 MONITORING PHOTO POINTS**



Photo Point #6 - Station 23+50 Upstream



Photo Point #6 - Station 23+50 Downstream



GENERAL LEGEND	
	CROSS VANE
	CHANNEL BLOCK
	FOOT WALL
	PHOTO POINTS

APPENDIX A

PROJECT MANAGER
DPI
DRAWN BY
TRS
APPROVED BY
MAP DATE
PROJECT NUMBER
5045700RA



3101 JOHN HUMPHRIES WYND
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Office Locations:
North Carolina
South Carolina
Georgia
Florida

PREPARED FOR:

NORTH CAROLINA
ECOSYSTEM ENHANCEMENT PROGRAM

TITLE:

PHOTO POINTS
2007 (YEAR 4) PLAN VIEW
SPRING VALLEY
GREENSBORO, NORTH CAROLINA

APPENDIX B

Problem Areas

B – 1 Problem Areas Table

B - 2 Problem Area Photographs

B – 3 Current Conditions Plan View

Table B.1 Integrated Project Problem Areas Spring Valley (EEP Project No. 354) April 2007			
Feature Issue	Station Numbers	Suspected Cause	SPA in Figure
Coir matting failure	11+00 to 11+50	Unstable banks due to lack of rooted vegetation	PA #1
Coir matting failure	13+20		PA #2
Exposed sewer line	14+40	Down cutting due to downstream structure failure	PA #3
Headers on cross vanes are set too high	15+15	Improper installation	PA #4
	15+40		
Headers on cross vanes are set too high	15+75	Improper installation	PA #5
Left bank erosion	16+80	Unstable banks due to lack of rooted vegetation	PA #6
Header rock moved downstream from cross vane	17+10	Improper installation	PA #7
Bank washed out behind root wad	17+15	Unstable banks due to lack of rooted vegetation	PA #8
Coir matting failure	17+40	Unstable banks due to lack of rooted vegetation	PA #9
Bank erosion and undercutting	17+50 to 19+00	PAs #10, 11, 12, and 13 were not observed during this monitoring season. These problems appear to have stabilized with vegetation.	--
Right bank erosion at head of gabion.	19+20	Unstable banks due to lack of rooted vegetation	PA #14
Left bank erosion	18+75	Unstable banks due to lack of rooted vegetation	PA #15
Erosion – left vane arm	20+20	Improper installation	PA #16
Right bank erosion	20+30	Unstable banks due to lack of rooted vegetation	PA #17
Lack of woody vegetation along stream banks.	20+00 to 21+00	Unstable banks due to lack of rooted vegetation	PA #18

Continued monitoring of these problem areas is recommended.

It is recommended that PA #7 be investigated for effect on stream stability and possible repair of vane. No Remedial actions are recommended at this time.

APPENDIX B-2
SPRING VALLEY STREAM RESTORATION SITE
2007 MONITORING - PROBLEM AREA PHOTOGRAPHS



Problem Area # 1. Coir matting failure. Station 11+50 Left bank.



Problem Area # 2. Coir matting failure. Station 13+20 Left bank.

APPENDIX B-2
SPRING VALLEY STREAM RESTORATION SITE
2007 MONITORING - PROBLEM AREA PHOTOGRAPHS



Problem Area # 3. Sewer line exposed. Station 14+40 Upstream.



Problem Area # 4. Header on rock vane too high. Station 15+15 Upstream.

APPENDIX B-2
SPRING VALLEY STREAM RESTORATION SITE
2007 MONITORING - PROBLEM AREA PHOTOGRAPHS



Problem Area # 5. Header on rock vane too high. Station 15+75 Downstream.



Problem Area #6. Left bank erosion. Station 16+80 Left bank.

APPENDIX B-2
SPRING VALLEY STREAM RESTORATION SITE
2007 MONITORING - PROBLEM AREA PHOTOGRAPHS



Problem Area #7. Cross vane header moved downstream. Station 17+10 Upstream.



Problem Area #8. Erosion behind root wad. Station 17+15 Right bank.

APPENDIX B-2
SPRING VALLEY STREAM RESTORATION SITE
2007 MONITORING - PROBLEM AREA PHOTOGRAPHS



Problem Area #9. Coir matting failure. Station 17+50 Right bank.



Problem Area # 14. Minor erosion behind gabion wall. Station 19+20 Right bank.

APPENDIX B-2
SPRING VALLEY STREAM RESTORATION SITE
2007 MONITORING - PROBLEM AREA PHOTOGRAPHS



Problem Area # 15. Erosion and mass wasting along left bank due to lack of adequate buffer. Station 18+75 Left bank.



Problem Area # 16. Erosion behind rock vane arm. Station 20+20 Left bank.

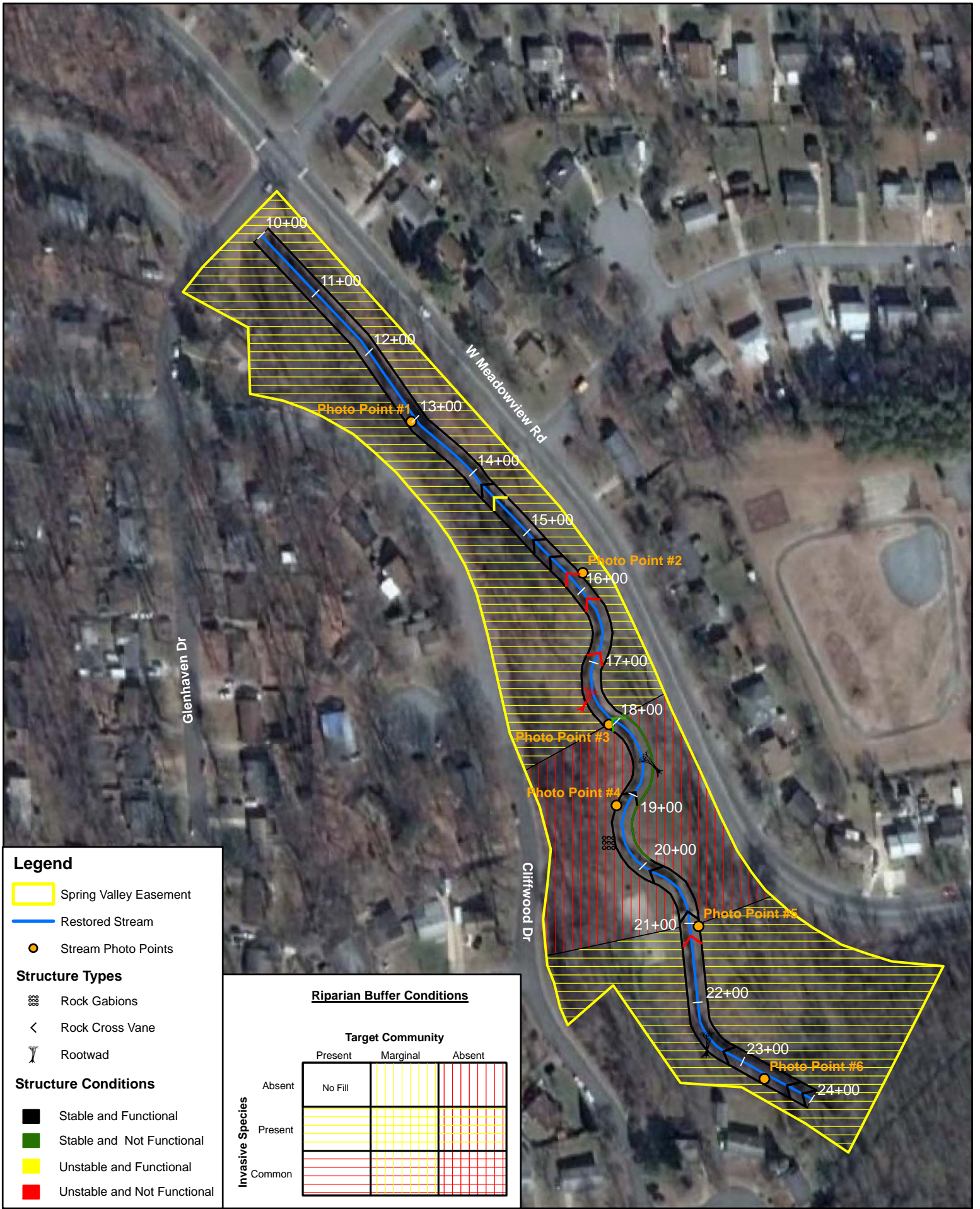
APPENDIX B-2
SPRING VALLEY STREAM RESTORATION SITE
2007 MONITORING - PROBLEM AREA PHOTOGRAPHS



Problem Area # 17. Unstable banks due to erosion. Station 20+30 Right bank.



Problem Area # 18. Lower portion of project lacks of woody vegetated buffer. Station 21+00 Upstream.



Legend

- Spring Valley Easement
- Restored Stream
- Stream Photo Points

Structure Types

- Rock Gabions
- Rock Cross Vane
- Rootwad

Structure Conditions

- Stable and Functional
- Stable and Not Functional
- Unstable and Functional
- Unstable and Not Functional

Riparian Buffer Conditions

		Target Community		
		Present	Marginal	Absent
Invasive Species	Absent	No Fill		
	Present			
	Common			

Spring Valley Current Conditions Plan View
Year 4 Monitoring
November 2007

