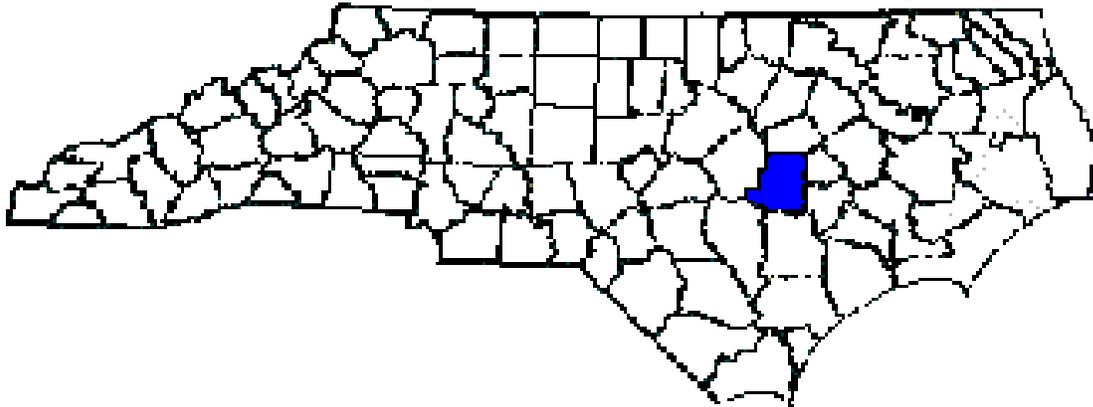


# ANNUAL REPORT FOR 2013



**Unnamed Tributary to Little River  
Wayne County  
TIP No. R-2554A – Site 7  
USACE Action ID: SAW-2008-00252  
DWQ Project # 20080570**



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- Appendix A – Cross Section Comparisons & Longitudinal Profile
- Appendix B – Site Photographs, Cross Section & Photo Point Locations

## **SUMMARY**

The following report summarizes the stream monitoring activities that have occurred during 2013 at the UT to Little River Mitigation Site in Wayne County. The site was constructed during 2013 by the North Carolina Department of Transportation (NCDOT). This report provides the monitoring results for the first formal year of monitoring (Year 2013). The Year 2013 monitoring period is the first of five scheduled years for monitoring on UT to Little River (See Success Criteria Section 2.1).

Based on the overall conclusions of monitoring along UT to Little River, the site has met the required monitoring protocols for the first formal year of monitoring. Based on comparing the first year of monitoring data to the as-built data, the channel is stable throughout the stream at this time. The streambank and buffer are meeting planted vegetation success criteria for the first year of monitoring. The upper buffer needs some additional planting due to missing or dead tree seedlings. This additional planting should be completed by March 2014.

NCDOT will continue stream and vegetation monitoring at the UT to Little River Mitigation Site for 2014.

## **1.0 INTRODUCTION**

### **1.1 Project Description**

The following report summarizes the stream monitoring activities that have occurred during 2013 at the UT to Little River Mitigation Site. The site is located along the US 70 Bypass which is currently under construction just west of Salem Church Road in Goldsboro, NC (Figure 1). UT to Little River Mitigation Site was constructed to provide mitigation for stream impacts associated with Transportation Improvement Program (TIP) number R-2554A in Wayne County.

The mitigation project covers approximately 545 linear feet of stream relocation. Construction was completed in 2013 by NCDOT. Stream restoration involved the installation of rock cross vanes, rock vanes, construction of a new stream channel and construction of the floodplain to allow for overbank flooding. It also included the installation of coir fiber matting and live stakes along the streambank and bareroot seedlings in the buffer area.

### **1.2 Purpose**

In order for a mitigation site to be considered successful, the site must meet the success criteria. This report details the monitoring in 2013 at the UT to Little River Mitigation Site. Hydrologic monitoring was not required for the site.

### **1.3 Project History**

February 2013	Water Turned Into Relocated Channel
April 2013	Streambank Reforestation Completed
May 2013	As-Built Survey Completed
August 2013	Stream Channel and Vegetation Monitoring (Year 1)

### **1.4 Debit Ledger**

The entire UT to Little River Mitigation Site was used for the R-2554A project to compensate for unavoidable stream impacts.



**Figure 1. Site Location Map**

## **2.0 STREAM ASSESSMENT**

### **2.1 Success Criteria**

The stream mitigation site shall be monitored for five years or until success criteria are satisfied. Monitoring protocols shall follow the Monitoring Level I outlined in the Stream Mitigation Guidelines, April 2003. NCDOT will evaluate the success of the stream relocation project based on guidance provided by the Stream Mitigation Guidelines disseminated by the United States Army Corps of Engineers-Wilmington District. The survey of channel dimension will consist of permanent cross sections placed at approximately four cross sections (two riffles and two pools). Annual photographs showing both banks and upstream and downstream views will be taken from permanent, mapped photo points. The survey of the longitudinal profile will represent distinct areas of the stream and will cover a cumulative total of 544 linear feet of channel. The entire restored length of stream will be investigated for channel stability and in-stream structure functionality. Any evidence of channel instability will be identified, mapped and photographed.

#### **Vegetation Success**

For the onsite buffer mitigation sites, the permittee shall monitor the sites for five years. An annual report shall be submitted to the DWQ for a period of 5 years showing monitoring results, survival rate, success of tree and vegetation establishment, and that diffuse flow through the riparian buffer has been maintained. The first annual report shall be submitted within one year of final planting. Failure to achieve a buffer density of 320 trees per acre after 5 years will require the annual report to provide appropriate remedial actions to be implemented and a schedule for implementation. Approval of the final annual report, and a formal "close out" of the mitigation site by the DWQ is required. The success of vegetation plantings will be measured through stem counts. Permanent quadrants will be used to sample the riparian buffer. Survival of the live stakes will be determined by visual observation throughout the 5 year monitoring period.

Bareroot vegetation will be evaluated using 2 staked survival plots. Plots will be 50 ft. by 50 ft. and flagged stems will be counted in these plots. Success will be defined as 320 stems per acre after 5 years. All vegetation monitoring will be conducted during the growing season.

### **2.2 Stream Description**

#### **2.2.1 Post-Construction Conditions**

The mitigation project covers approximately 545 linear feet of stream relocation. Construction was completed in 2013 by NCDOT. Stream restoration involved the installation of rock cross vanes, rock vanes, construction of a new stream channel and construction of the floodplain to allow for overbank flooding. It also included the installation of coir fiber matting and live stakes along the streambank and bareroot seedlings in the buffer area.

### **2.2.2 Monitoring Conditions**

The objective of the UT to Little River Mitigation Site relocation was to build a C5 stream type as identified in the Rosgen's Applied River Morphology. A total of four cross sections (two in a riffle, two in a pool) were surveyed. For this report, only cross sections containing riffles were used in the comparison of channel morphology in Table 1.

<b>Table 1. Abbreviated Morphological Summary (UT to Little River - Site 7 Cross Sections #1 and #4)</b>				
<b>Variable</b>	<b>Proposed</b>	<b>Cross Section #1 (Riffle)</b>	<b>Cross Section #4 (Riffle)</b>	<b>Min. - Max Values (Riffle Sections Only)</b>
		<b>2013</b>	<b>2013</b>	<b>2013</b>
Drainage Area (sq. mi)	0.096	0.096	0.096	0.096
Bankfull Width (ft)	6.0	5.76	7.6	5.76 – 7.6
Bankfull Mean Depth (ft)	0.5	0.58	0.54	0.54 – 0.58
Width/Depth Ratio	12	9.93	14.07	9.93 – 14.07
Bankfull Cross Sectional Area (ft <sup>2</sup> )	6.8	3.32	4.08	3.32 – 4.08
Maximum Bankfull Depth (ft)	0.75	1.22	0.95	0.95 – 1.22
Floodprone Area (ft)	85 -115	40	40	40
Entrenchment Ratio	14 - 19	6.94	5.26	5.26 – 6.94

\*Drainage Area, Floodprone Width, and Slope are averaged values only.

\*Riffle values are used for classification purposes.

## **2.3 Results of the Stream Assessment**

### **2.3.1 Site Data**

The assessment included the survey of four cross sections and the longitudinal profile of UT to Little River Mitigation Site established by the NCDOT after construction. The length of the profile along UT to Little River was approximately 544 linear feet. Four cross sections were established during the as-built. Cross section locations were subsequently based on the stationing of the longitudinal profile and are presented below. The location of the cross sections and longitudinal profile are shown in Appendix A.

- ◆ Cross Section #1. UT to Howell Branch, Station 130+00 linear feet, midpoint of riffle
- ◆ Cross Section #2. UT to Howell Branch, Station 255+00 linear feet, midpoint of pool
- ◆ Cross Section #3. UT to Howell Branch, Station 369+00 linear feet, midpoint of pool
- ◆ Cross Section #4. UT to Howell Branch, Station 412+00 linear feet, midpoint of riffle

Based on comparisons of the as-built to 2013 monitoring data, all four cross sections appear stable with little or no active bank erosion. Graphs of the cross sections are presented in Appendix A. Future survey data will vary depending on actual location of rod placement and alignment; however this information should remain similar in appearance. The longitudinal profile shows that the channel is stable for the 2013 monitoring evaluation.

## 2.4 Results of Stream and Buffer Vegetation

### 2.4.1 Description of Species

The following live stake species were planted on the streambank:

*Salix nigra*, Black Willow

*Cornus amomum*, Silky Dogwood

The following tree species were planted in the buffer area:

*Liriodendron tulipifera*, Tulip Poplar

*Platanus occidentalis*, American Sycamore

*Betula nigra*, River Birch

*Fraxinus pennsylvanica*, Green Ash

### 2.4.2 Results of Vegetation Monitoring

**Buffer Vegetation:** Two 50 ft. x 50 ft. vegetation plots were set to determine the trees per acre in the buffer area.

**Table 2.** Vegetation Monitoring Results

Plot #	Tulip Poplar	American Sycamore	River Birch	Green Ash	Total (Year 1)	Total (at planting)	Density (Trees/Acre)
1	3	12	7	3	25	44	386
2		6	20	7	33	33	680
Average Density (Trees/Acre)							533

**Site Notes:** The black willow and silky dogwood live stakes were surviving along the streambank. There were missing or dead tree seedlings noted along the upper portion of the buffer. Other vegetation noted included lespedeza, rye grain, *Scirpus* sp., soft rush, ragweed, cattail, fennel, and various grasses.

### **2.4.3 Conclusions**

There were two vegetation monitoring plots established throughout the buffer area. The 2013 vegetation monitoring of the site revealed an average tree density of 533 trees per acre. This average is above the minimum success criteria of 320 trees per acre after year one monitoring. The upper portion of the buffer needs some additional planting due to missing or dead tree seedlings. This additional planting should be completed by March 2014. NCDOT will continue to monitor the vegetation at the UT to Little River Mitigation Site.

## **3.0 OVERALL CONCLUSIONS/RECOMMENDATIONS**

The UT to Little River Mitigation Site has met the required monitoring protocols for the first formal year of monitoring. The channel and structures throughout the stream are stable at this time. The streambank and buffer are meeting planted vegetation success criteria for the first year of monitoring. The upper portion of the buffer will require additional planting due to missing or dead tree seedlings. This additional planting should be completed by March 2014. NCDOT will continue stream and vegetation monitoring at the UT to Little River Mitigation Site for 2014.

## **4.0 REFERENCES**

Natural Channel Design for UT to Little River (Permit Site 7); Wayne County, NC, Rev. October 10, 2007.

As-Built Report for Stream Relocation on R-2554A Permit Site 7, Wayne County, NC, June 17, 2013.

Rosgen, D.L, 1996. Applied River Morphology. Wildland Hydrology, Pagosa Springs, Colorado.

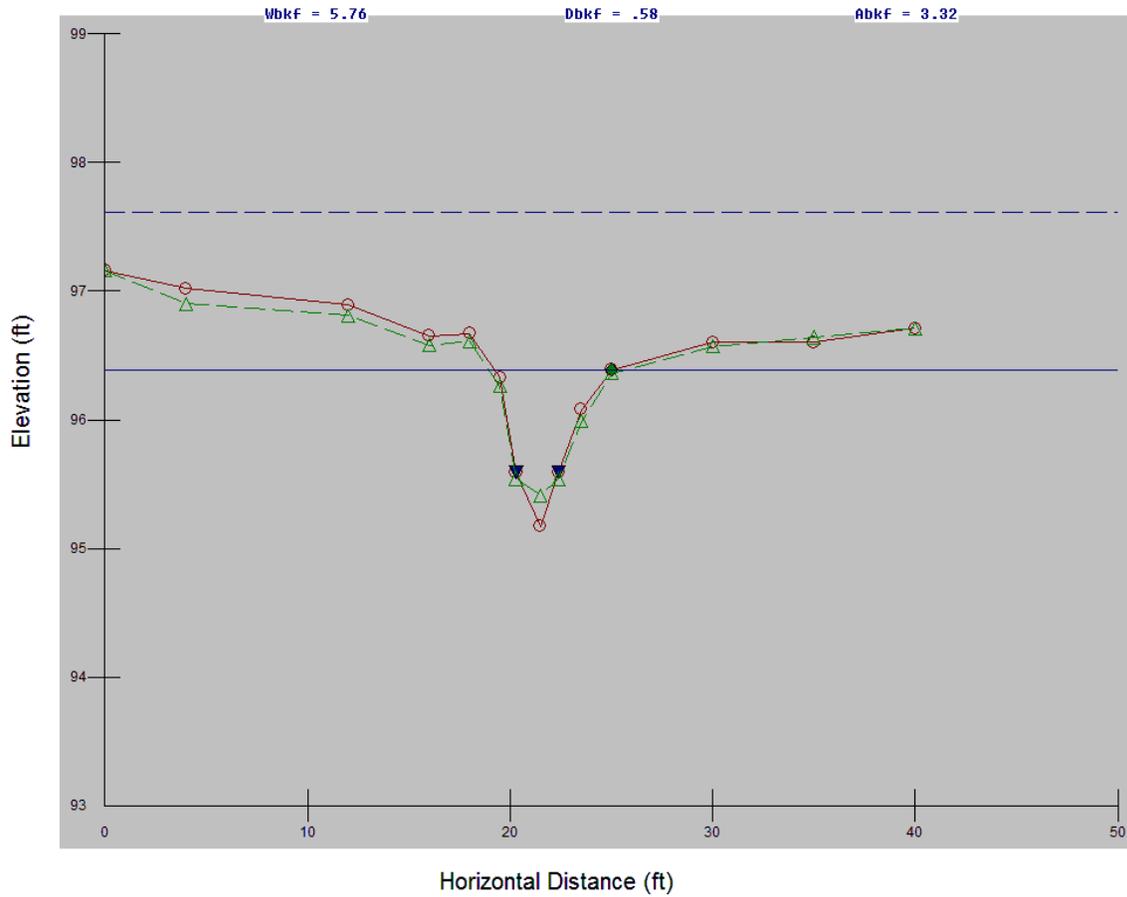
US Army Corps of Engineers (USACE), 2003. Stream Mitigation Guidelines. Prepared with cooperation from the US Environmental Protection Agency, NC Wildlife Resources Commission, and the NC Division of Water Quality.

**APPENDIX A**

**CROSS SECTION COMPARISONS**  
**&**  
**LONGTITUDINAL PROFILE**

### R-2554A Site 7 XS1 @ Sta. 130+00

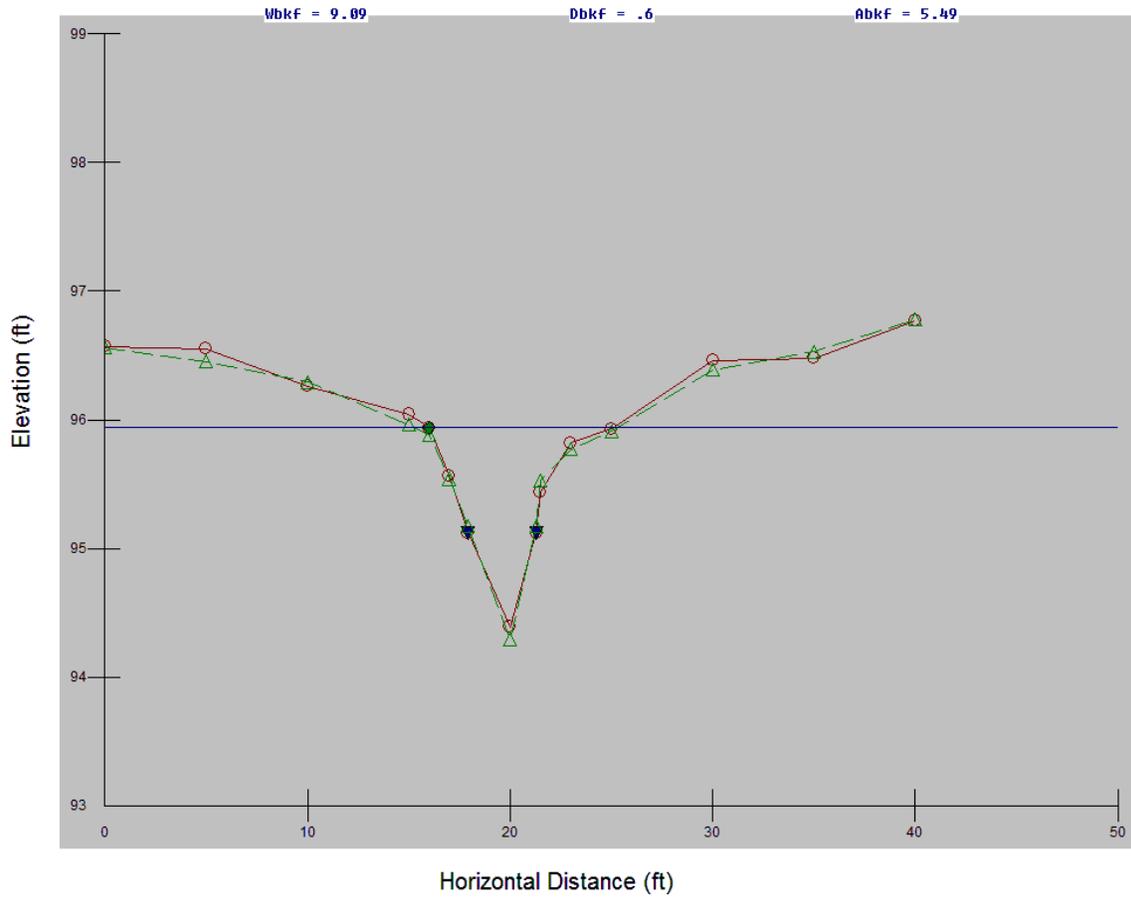
○ 2013 R-2554A Site 7 XS1 @130+00 Year 1    
 ◆ Bankfull Indicators    
 ▼ Water Surface Points    
 △ 2013 R-2554A Site 7 As-built XS #1 @ Sta. 130+00



Cross-Section #1 (Riffle) Abbreviated Morphological Summary					
	2013	2014	2015	2016	2017
Bankfull Width (ft.)	5.76				
Bankfull Mean Depth (ft.)	0.58				
Width/Depth Ratio	9.93				
Bankfull Cross Sectional Area (ft <sup>2</sup> )	3.32				
Maximum Bankfull Depth (ft.)	1.22				
Width of the Floodprone Area (ft.)	40				
Entrenchment Ratio	6.94				

### R-2554A Site 7 XS2 @ Sta. 255+00

○ 2013 R-2554A Site 7 XS2 @255+00 Year 1    
 ◆ Bankfull Indicators    
 ▼ Water Surface Points    
 △ 2013 R-2554A Site 7 As-built XS #2 @ Sta. 255+00



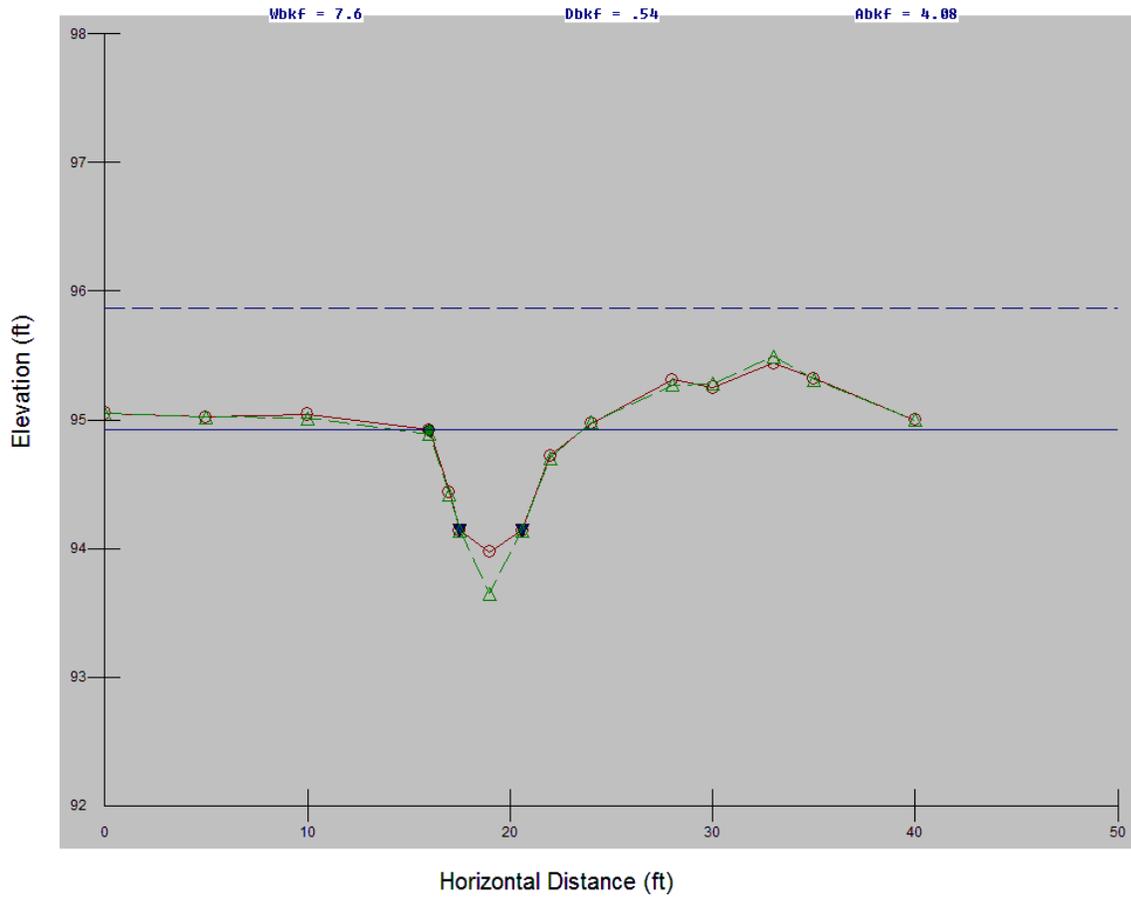
Cross-Section #2 (Pool) Abbreviated Morphological Summary*					
	2013	2014	2015	2016	2017
Bankfull Cross Sectional Area (ft <sup>2</sup> )	5.49				
Maximum Bankfull Depth (ft.)	1.55				
Bankfull Mean Depth (ft.)	0.6				
Bankfull Width (ft.)	9.09				

\* According to the Rosgen Classification of Natural Rivers floodprone width, entrenchment ratio, and width depth ratio are not measured in pool, glide, or run features.



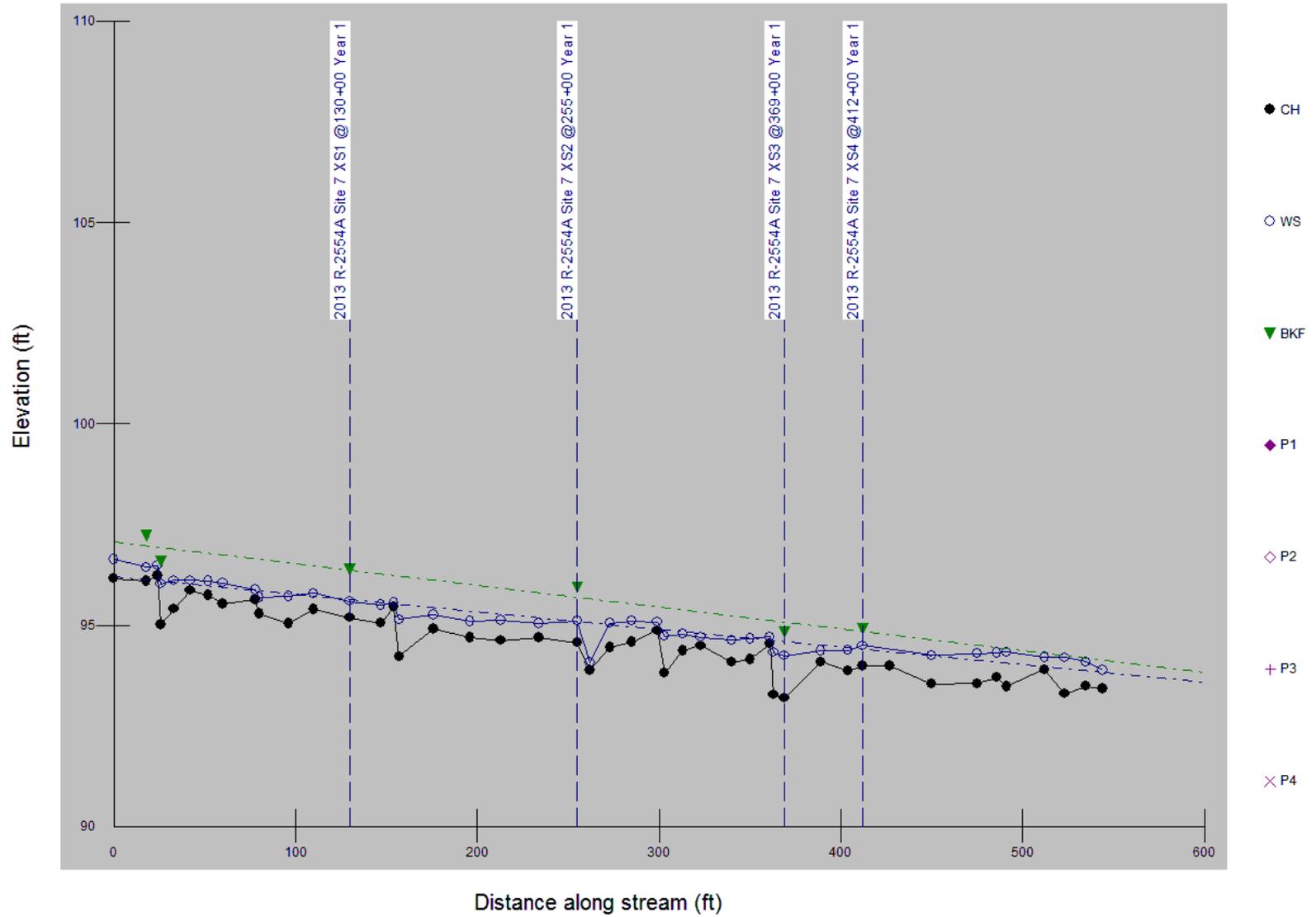
### R-2554A Site 7 XS4 @ Sta. 412+00

○ 2013 R-2554A Site 7 XS4 @412+00 Year 1    
 ◆ Bankfull Indicators    
 ▼ Water Surface Points    
 △ 2013 R-2554A Site 7 As-built XS #4 @ Sta. 412+00



Cross-Section #4 (Riffle) Abbreviated Morphological Summary					
	2013	2014	2015	2016	2017
Bankfull Width (ft.)	7.6				
Bankfull Mean Depth (ft.)	0.54				
Width/Depth Ratio	14.07				
Bankfull Cross Sectional Area (ft <sup>2</sup> )	4.08				
Maximum Bankfull Depth (ft.)	0.95				
Width of the Floodprone Area (ft.)	40				
Entrenchment Ratio	5.26				

2013 R-2554A UT to Little River (Site 7) Longitudinal Profile



**APPENDIX B**

**SITE PHOTOGRAPHS, CROSS SECTION AND**

**PHOTO POINT LOCATIONS**

# UT to Little River



Photo Point #1 (Upstream)



Photo Point #1 (Downstream)



Photo Point #2 (Upstream)



Photo Point #2 (Downstream)



Photo Point #3 (Upstream)



Photo Point #3 (Downstream)

August 2013

# UT to Howell Branch



Photo Point #4 (Upstream)



Photo Point #4 (Downstream)



Overview Photo

August 2013

# R-2554A Site 7 As-Built Photo Point, X-section and Vegetation Plot Location

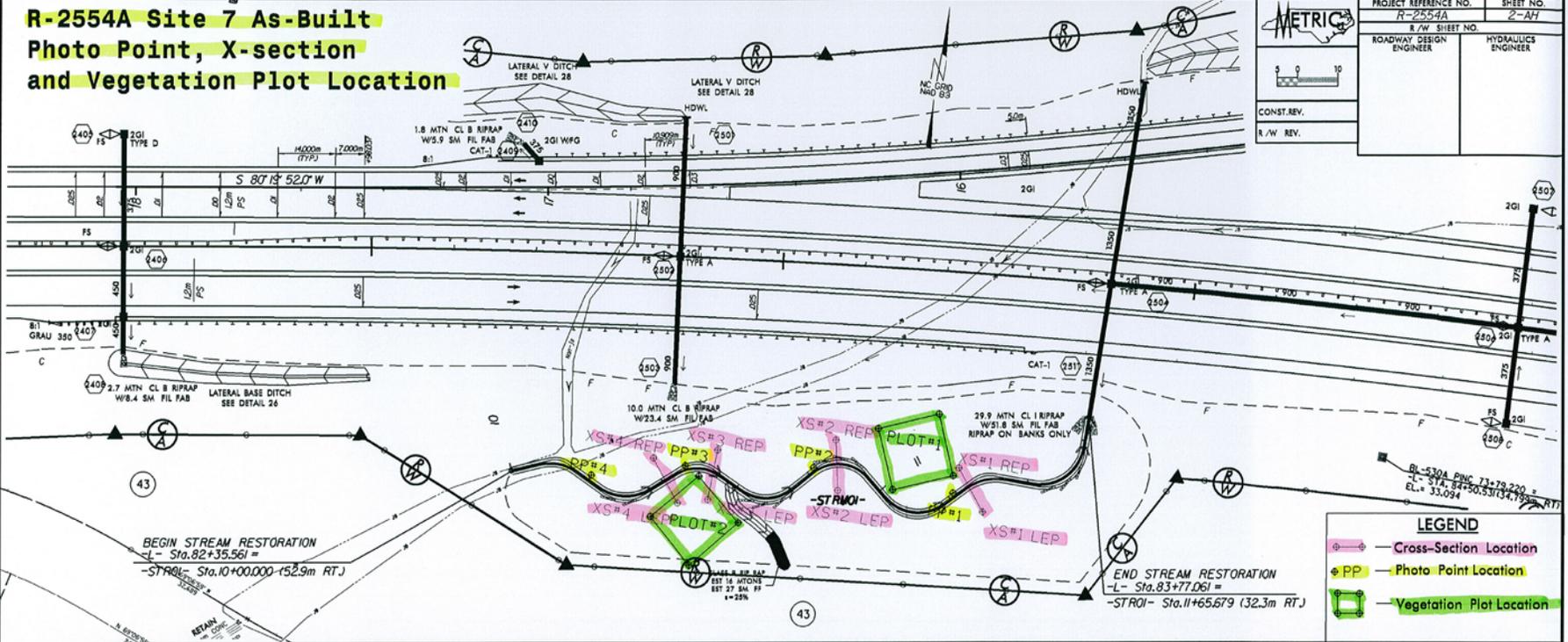
**METRIC**

PROJECT REFERENCE NO. R-2554A SHEET NO. 2-A1

R/W SHEET NO. ROADWAY DESIGN ENGINEER HYDRAULICS ENGINEER

CONST. REV. R/W REV.

5 0 10



**LEGEND**

- Cross-Section Location
- PP Photo Point Location
- Vegetation Plot Location

