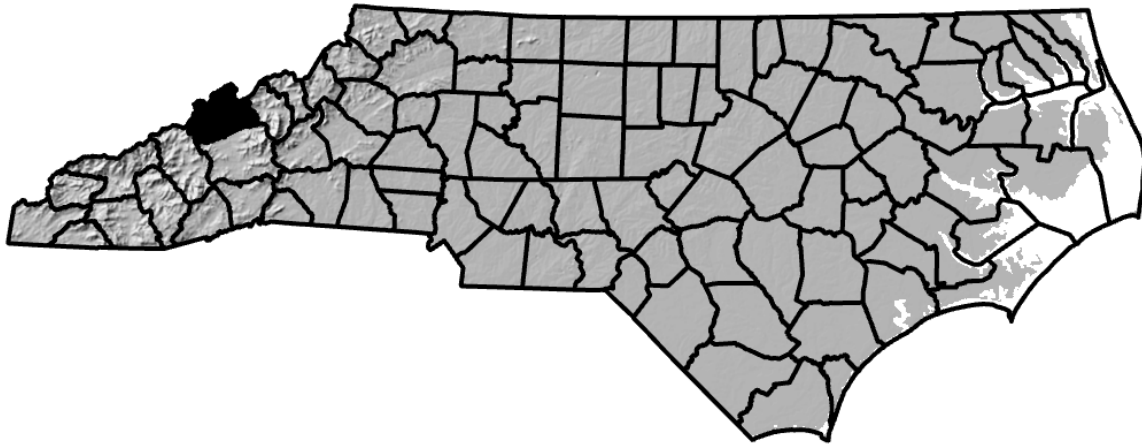


# ANNUAL REPORT FOR 2023



**Middle Fork California Creek Site I Mitigation Site**  
**Madison County**  
**TIP No. R-2518A**  
**COE Action ID: SAW-2007-2197-357/300**  
**DWR #: 20071134**



Prepared By:  
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December 2023

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## **SUMMARY**

The following report summarizes the stream monitoring activities that have occurred during the Year 2023 at the Middle Fork California Creek Site I Mitigation Site in Madison County. The North Carolina Department of Transportation (NCDOT) originally completed this project in October 2008. During this initial monitoring phase NCDOT attempted multiple remedial corrections to improve channel stability with varying levels of success. In 2022 NCDOT completed a final remediation effort at the site. This report provides the monitoring results for the first formal year of monitoring after remediation was completed. The Year 2023 monitoring period is the first of five scheduled years of monitoring on Site I (See Success Criteria Section 2.1).

Based on the overall conclusions of monitoring at Site I, it has met the required stream and vegetation monitoring protocols for the first formal year of monitoring. NCDOT will continue stream and vegetation monitoring at the Middle Fork California Creek Site I Mitigation Site in 2024.

## 1.0 INTRODUCTION

### 1.1 Project Description

The following report summarizes the stream monitoring activities that have occurred during the Year 2023 at Site I. Site I is located on US 19 in Madison County at Sta. 51+70 to 53+90 -L- Lt. (Figure 1). Site I was constructed to provide mitigation for stream impacts associated with Transportation Improvement Program (TIP) number R-2518A in Madison County.

The mitigation site was originally built to provide approximately 787 linear feet of stream relocation/restoration. The North Carolina Department of Transportation (NCDOT) originally completed this project in October 2008. The first year of monitoring was delayed until 2010 due to implementation of corrective measures made following initial construction. In the final (7<sup>th</sup>) year of the original monitoring period (2016) sections of the site became highly unstable. A remediation effort was undertaken in 2018 to stabilize the sections of the streambanks with rock toe protection and grading. This intermediate remediation effort was not successful due to continued areas of instability throughout the stream reach caused by multiple heavy rainfall events immediately following repairs.

NCDOT reevaluated the design and developed a new remediation plan in 2021. Construction of this remediation plan was completed in November 2022. The 2022 remediation effort involved reducing channel sinuosity in a couple of sections of the stream, installing rock cross vanes and rock & roll riffle structures along 575 linear feet of the channel and replanting the riparian buffer zone. This remediation effort is noted as a 'restart' in the project history in section 1.3.

### 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 2023 at the Site I mitigation site. Hydrologic monitoring was not required for this site.

### 1.3 Project History

October 2008	Construction Completed (Sta. 10+00 to 12+00)
March 2009	Site Planted (Type I only)
June 2009	Water Turned Into Stream (Sta. 10+00 to 12+00)
October 2009	As-Built Survey Completed (Sta. 10+00 to 12+00)
November 2010	Stream Channel Monitoring (Year 1)
May 2011	Construction Completed (Sta. 12+00 to 12+40)
October 2011	Stream Repairs by Main. Forces (Boulder Toe Wall)
November 2011	As-Built Survey Completed (Sta. 12+00 to 12+40)
November 2011	Stream Channel Monitoring (Year 2)
March 2012	Site Planted (Type I and II)
September 2012	Vegetation Monitoring (Year 1)

November 2012	Stream Channel Monitoring (Year 3)
March 2013	Bankfull Monitoring Gauge Installed
August 2013	Vegetation Monitoring (Year 2)
November 2013	Stream Channel Monitoring (Year 4)
April 2014	Stream Remediation Completed
June 2014	Herbicide Application on Japanese Knotweed
July 2014	Mowed Lespedeza Along West Buffer
July 2014	Herbicide Application on Japanese Knotweed
July 2014	Vegetation Monitoring (Year 3)
August 2014	Herbicide Application on Lespedeza Along West Buffer
November 2014	Stream Channel Monitoring (Year 5)
March 2015	Supplemental Planting
July 2015	Vegetation Monitoring (Year 4)
November 2015	Stream Channel Monitoring (Year 6)
July 2016	Vegetation Monitoring (Year 5)
November 2016	Stream Channel Monitoring (Year 7)
October 2019	Stream Repairs by Maintenance Forces
November 2022	Remediation Construction Completed
March 2023	Site Planted (Restart)
July 2023	Vegetation Monitoring (Year 1 Restart)
November 2023	Stream Channel Monitoring (Year 1 Restart)

#### **1.4 Debit Ledger**

The entire Middle Fork California Creek Site I stream mitigation site was used at a 1:1 ratio for the R-2518A project to compensate for unavoidable stream impacts.



Figure 1. Vicinity Map

## **2.0 STREAM ASSESSMENT**

### **2.1 Success Criteria**

The permittee shall monitor the restoration and enhancement mitigation sites following the Level 1 protocols outlined in the “Stream Mitigation Guidelines,” dated April 2003 with the following exceptions:

1. Pebble counts shall not be conducted.
2. Two cross sections shall be conducted for streams less than 500 linear feet and five (5) cross sections shall be conducted for streams greater than 500 linear feet.
3. Riparian success shall be by visual inspection of plant survival. Photos will be taken, and comments noted on plant survival.

The permittee shall monitor the preservation sites by visual inspection. Photos will be taken, and comments noted on plant survival. The monitoring shall be conducted annually for a minimum of five (5) years after final planting. The monitoring results shall be submitted to DWR in a final report within sixty (60) days after completing monitoring. After 5 years the NCDOT shall contact the DWR to schedule a site visit to “close out” the mitigation site.

### **2.2 Stream Description**

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

The original stream relocation of the Site I mitigation site involved excavation of a new floodplain and channel, installing several in-stream cross vane structures and planting the riparian buffer zone. The 2022 site remediation included straightening of some meander bends in the upper and lower reaches, installation of rock & roll riffle structures, rock cross vane structures and pools.

#### **2.2.2 *Monitoring Conditions***

The objective of the Site I stream restoration/relocation was to restore a C3 stream as identified in Rosgen’s Applied River Morphology. A total of five cross sections (three in a riffle and two in a pool) were surveyed. For this report, only cross sections containing riffles were used in the comparison of channel morphology presented below in Table 1 (Site I).

Table 1: Morphological Summary Table

Variable	Proposed	As-Built	Cross-Section #1	Cross-Section #3	Cross-Section #5	Average
Drainage Area (mi <sup>2</sup> )	7.08					
Width of the Floodprone Area (ft.)	60.0	56.3	61.0	60.0	50.0	57.0
Bankfull Width (ft.)	28.2	21.2	21.6	22.2	19.7	21.2
Entrenchment Ratio	2.2	2.6	2.8	2.7	2.5	2.7
Bankfull Mean Depth (ft.)	1.7	1.4	1.2	1.9	1.3	1.4
Maximum Bankfull Depth (ft.)	2.2	2.3	1.6	3.2	2.0	2.3
Width/Depth Ratio	29.4	15.7	18.5	11.8	15.5	15.2
Bankfull Cross Sectional Area (ft <sup>2</sup> )	47.0	30.7	25.4	41.9	24.9	30.7

\* Riffle values are used for classification purposes, pool values are shown in Appendix A.



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

### **2.3.1 Site Data**

The assessment included the survey of five cross sections and the longitudinal profile of Site I established by NCDOT after remediation of the site. The length of the profile along Site I was approximately 650 linear feet. Five cross sections were established during the as-built monitoring year. 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.

Middle Fork California Creek Site I Cross-Sections:

- ◆ Cross-Section #1: Middle Fork California Creek Site I, Station 1+44.00, midpoint of riffle
- ◆ Cross-Section #2: Middle Fork California Creek Site I, Station 1+90.50, midpoint of pool
- ◆ Cross-Section #3: Middle Fork California Creek Site I, Station 2+90.00, midpoint of riffle
- ◆ Cross-Section #4: Middle Fork California Creek Site I, Station 3+23.00, midpoint of pool
- ◆ Cross-Section #5: Middle Fork California Creek Site I, Station 4+56.00, midpoint of pool

Based on comparisons of the Remediation As-Built to the Year 1 monitoring data, all cross sections appear stable with little or no active bank erosion. The riffle sections demonstrate morphological characteristics of a C3 type stream according to Rosgen's Stream Classification method. Graphs and morphological data of the cross sections are presented in Appendix A. Future survey data will vary depending on the actual location of rod placement and alignment; however, this information should remain similar in appearance. The longitudinal profile showed that the channel bed was stable for the 2023 monitoring evaluation. Hydrologic monitoring was not required per the permit conditions. There was evidence of at least one bankfull event having occurred during the 2023 monitoring year by presence of matted vegetation and wrack lines. NCDOT will continue stream monitoring in 2024.

### **3.0 VEGETATION: MIDDLE FORK CALIFORNIA CREEK SITE I**

#### **3.1 Success Criteria**

**Mitigation Plan:** Riparian success shall be by visual inspection of plant survival. Photos will be taken and comments noted on plant survival.

#### **3.2 Description of Species**

The following live stake species were planted in the Streambank Area (Type I):

*Salix nigra*, Black Willow

*Cornus amomum*, Silky Dogwood

The following tree species were planted in the Buffer Area (Type II):

*Liriodendron tulipifera*, Tulip Poplar

*Platanus occidentalis*, American Sycamore

*Quercus rubra*, Northern Red Oak

*Quercus alba*, White Oak

*Fraxinus pennsylvanica*, Green Ash

*Betula nigra*, River Birch

*Prunus serotina*, Black Cherry

#### **3.3 Results of Vegetation Monitoring**

Streambank & Buffer Vegetation: The latest streambank reforestation was completed in March 2023 following remediation construction. The Year 1 vegetation monitoring evaluation noted: Type I: Black Willow and Silky Dogwood and Type II: Sycamore, Green Ash, Tulip Poplar, White Oak, and Northern Red Oak were surviving at the time of the monitoring evaluation. Based on this visual inspection planted vegetation including the live stakes and sycamore bareroot seedlings were surviving in high numbers. Tulip Poplar, White Oak and Northern Red Oak were not as visible surviving throughout the site. The overhead utility easement had been recently sprayed by the utility company representatives, in accordance with the existing easement language.

#### **3.4 Conclusions**

NCDOT plans to complete a supplemental buffer planting in February/March 2024 to increase the planted specie diversity throughout the site. NCDOT will continue to monitor the planted vegetation in 2024 at Middle Fork California Creek.

## **4.0 OVERALL CONCLUSIONS/RECOMMENDATIONS**

The Middle Fork California Creek Site I Mitigation Site has met the required monitoring protocols for the first formal year of monitoring following the latest remediation effort on the stream and planted vegetation.

NCDOT proposes to continue stream and vegetation monitoring at the site in 2024.

## **5.0 REFERENCES**

Stream Mitigation Plan, US Highway 19, R-2518A On-Site Mitigation  
Madison County, North Carolina, August 2006.

Design Plans for R-2518A, US 19 from I-26 to 0.8 KM east of the Yancey Co.  
Line, Stream Mitigation (Preservation, Enhancement, and Restoration),  
HSMM.

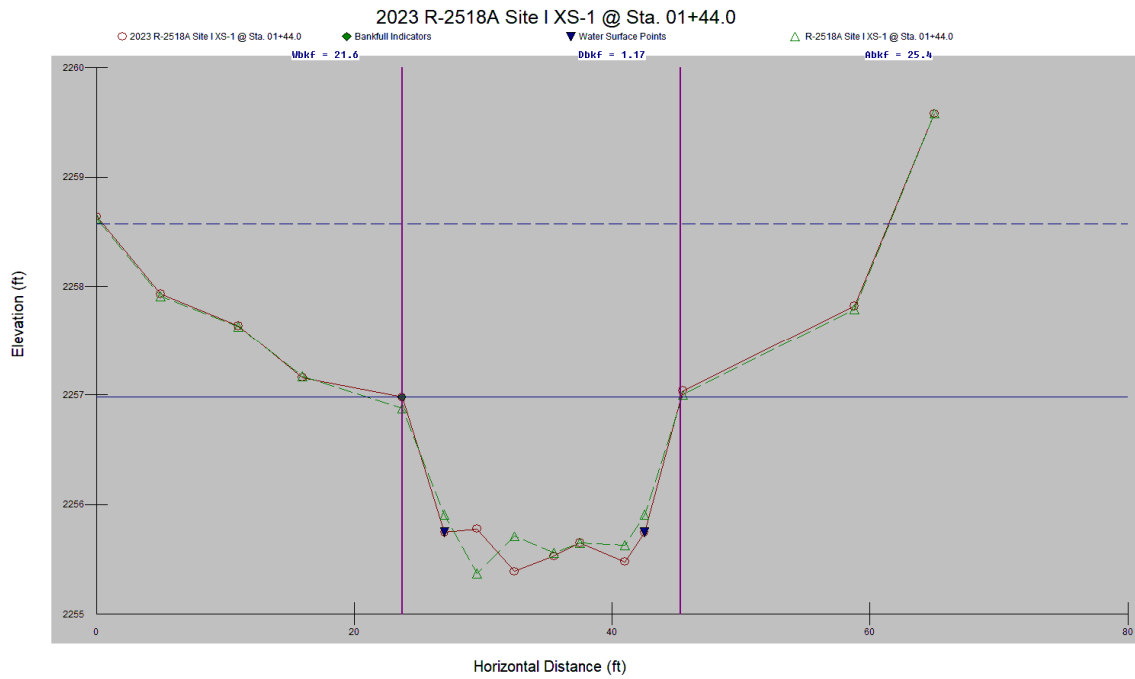
North Carolina Department of Transportation (NCDOT), April 29, 2008. 404 and  
401 Individual Permits for R-2518A and R-2518B (ACOE Permit No. 2007-  
2197-357/300 and DWR Project No. 20071134, Individual Certification No.  
3706).

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  
Resources.

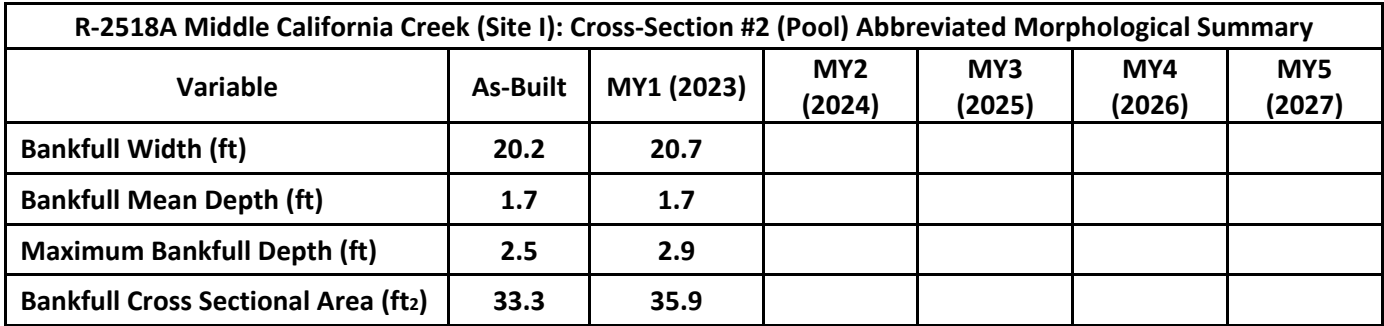
## **APPENDIX A**

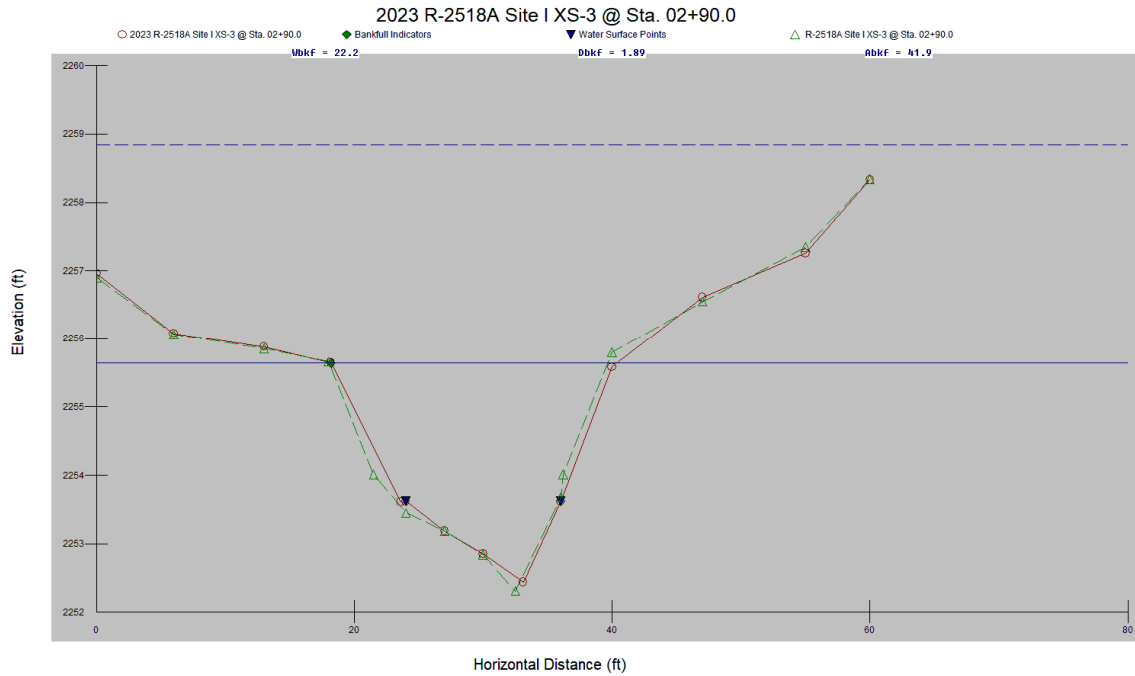
### **CROSS SECTIONS AND LONGITUDINAL PROFILE**



**R-2518A Middle California Creek (Site I): Cross-Section #1 (Riffle) Abbreviated Morphological Summary**

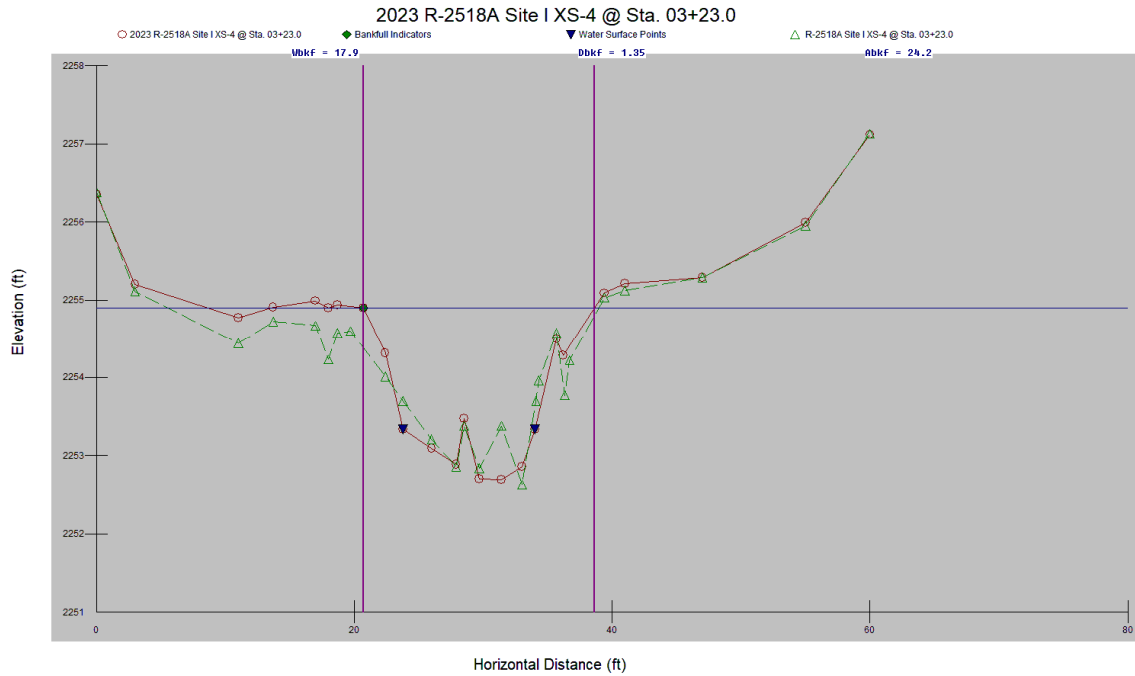
Variable	As-built	MY1 (2023)	MY2 (2024)	MY3 (2025)	MY4 (2026)	MY5 (2027)
Width of the Floodprone Area (ft)	56.3	61.0				
Bankfull Width (ft)	21.2	21.6				
Entrenchment Ratio	2.6	2.8				
Bankfull Mean Depth (ft)	1.4	1.2				
Maximum Bankfull Depth (ft)	2.3	1.6				
Width/Depth Ratio	15.7	18.5				
Bankfull Cross Sectional Area (ft <sup>2</sup> )	30.7	25.4				





**R-2518A Middle California Creek (Site I): Cross-Section #3 (Riffle) Abbreviated Morphological Summary**

Variable	As-built	MY1 (2023)	MY2 (2024)	MY3 (2025)	MY4 (2026)	MY5 (2027)
Width of the Floodprone Area (ft)	60.0	60.0				
Bankfull Width (ft)	21.7	22.2				
Entrenchment Ratio	2.8	2.7				
Bankfull Mean Depth (ft)	2.0	1.9				
Maximum Bankfull Depth (ft)	3.4	3.2				
Width/Depth Ratio	11.0	11.8				
Bankfull Cross Sectional Area (ft <sup>2</sup> )	43.0	41.9				

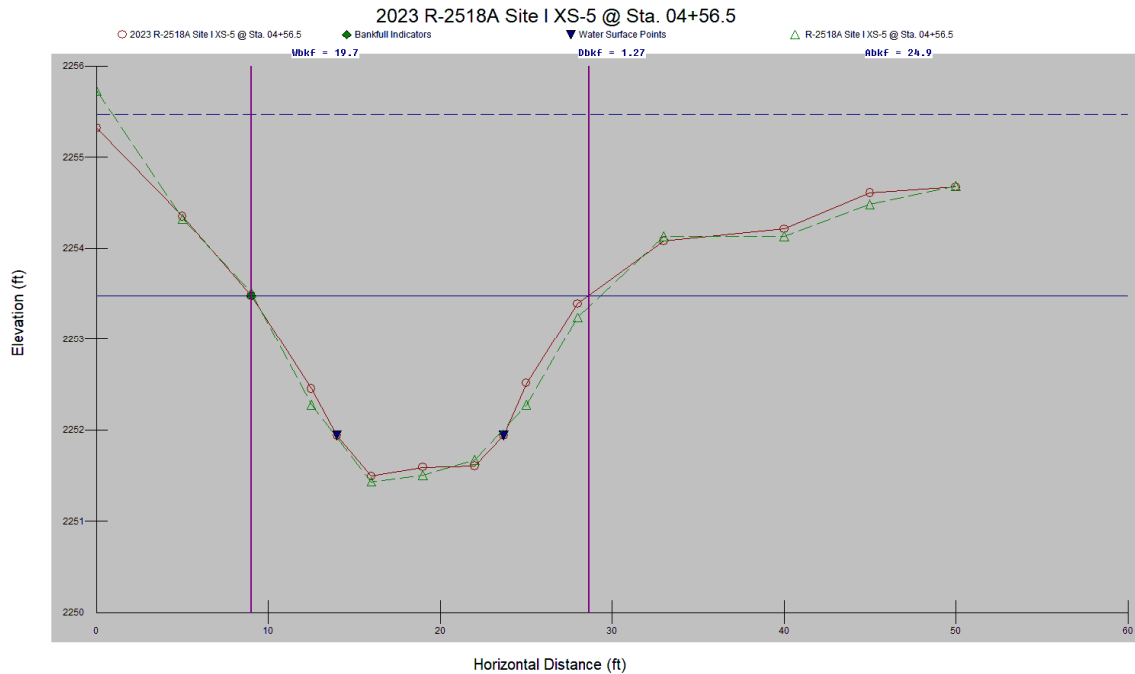


**R-2518A Middle California Creek (Site I): Cross-Section #4 (Pool) Abbreviated Morphological Summary**

Variable	As-Built	MY1 (2023)	MY2 (2024)	MY3 (2025)	MY4 (2026)	MY5 (2027)
Bankfull Width (ft)	18.3	17.9				
Bankfull Mean Depth (ft)	1.0	1.4				
Maximum Bankfull Depth (ft)	2.0	2.2				
Bankfull Cross Sectional Area (ft <sup>2</sup> )	18.0	24.2				

\*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.

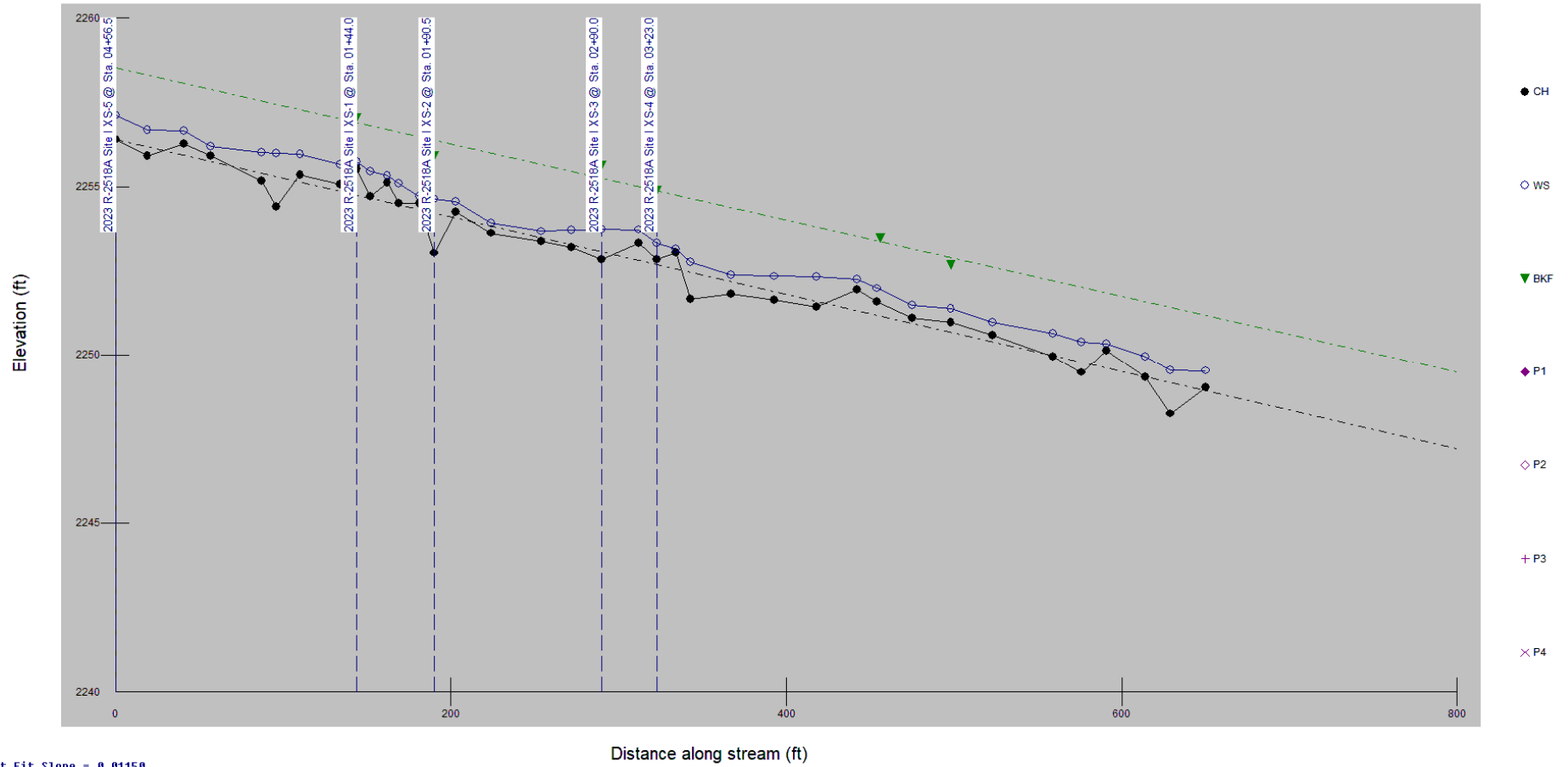




### R-2518A Middle California Creek (Site I): Cross-Section #5 (Riffle) Abbreviated Morphological Summary

Variable	As-built	MY1 (2023)	MY2 (2024)	MY3 (2025)	MY4 (2026)	MY5 (2027)
Width of the Floodprone Area (ft)	49.5	50.0				
Bankfull Width (ft)	20.5	19.7				
Entrenchment Ratio	2.4	2.5				
Bankfull Mean Depth (ft)	1.3	1.3				
Maximum Bankfull Depth (ft)	2.1	2.0				
Width/Depth Ratio	15.6	15.5				
Bankfull Cross Sectional Area (ft²)	27.0	24.9				

2023 R-2518A Site I Profile



**APPENDIX B**  
**SITE PHOTOGRAPHS**

# Middle Fork California Creek Site I



Photo Point #1 (Upstream)



Photo Point #1 (Downstream)



Photo Point #2 (Upstream)



Photo Point #2 (Downstream)



Photo Point #3 (Upstream)  
November 2023



Photo Point #3 (Downstream)



# Middle Fork California Creek Site I



Photo Point #4 (Upstream)



Photo Point #4 (Downstream)



Photo Point #5 (Upstream)



Photo Point#5 (Downstream)

November 2023



# Middle Fork California Creek Site I



PP#1 Upstream



PP#1 Downstream



PP#2 Upstream



PP#2 Downstream



PP#3 Upstream



PP#3 Downstream

July 2023



# Middle Fork California Creek Site I



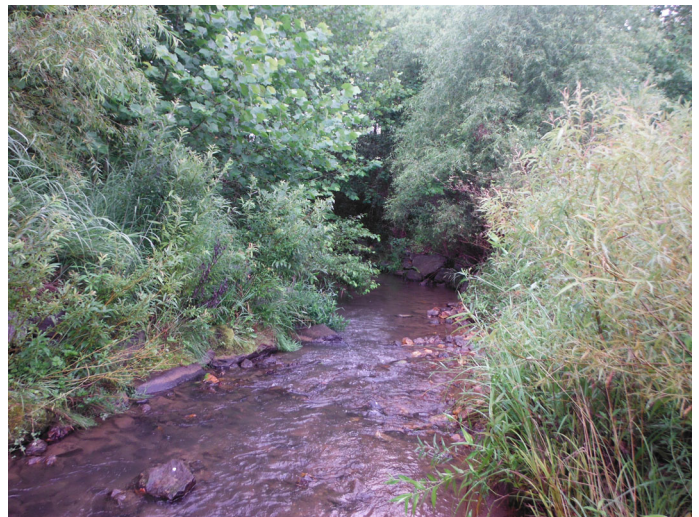
PP#4 Upstream



PP#4 Downstream



PP#5 Upstream



PP#5 Downstream



Buffer Overview from Shake Rag Rd.



Buffer Overview from Shake Rag Rd.

July 2023



# Middle Fork California Creek Site I



Aerial Site Overview Looking Upstream

November 2023



**APPENDIX C**

**AS-BUILT PLAN SHEETS**

04/12/23

Kimley » Horn

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RECORD DRAWING  
PLAN VIEW

PROJECT REFERENCE NO. *R-2518WM* SHEET NO. *OSM-4*

PROJECT ENGINEER



APPROVED BY:

DATE:

DOCUMENT NOT CONSIDERED FINAL  
UNLESS ALL SIGNATURES COMPLETED

**★AS-BUILT PLANS**

