

As-Built Baseline Monitoring Report

Final

Little Pine Creek II

Monitoring Year 0

NCDMS Project No. 856

DWR Project No. 20090048 (v.2)

USACE Action ID: SAW-2009-00591

Alleghany County, North Carolina

Data Collected: July 2019 – January 2020

Date Submitted: March 5, 2020



Submitted to:

NCDEQ-Division of Mitigation Services
1652 Mail Service Center Raleigh N C 27699-1652

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February 24, 2020

Harry Tsomides
NC DMS Project Manager
DENR
5 Ravenscroft Dr. Suite 102
Asheville, NC 28801

Subject: Draft Baseline Monitoring Report (MYO)
Little Pine Creek II Mitigation Project, Alleghany County
DMS Project # 856
DEQ Contract #LP082819

Dear Harry ,

DMS has completed the review of the Little Pine Creek II Draft MYO (Baseline) monitoring report. Following are the review comments/questions:

- *Cover page – Delete NCDMS Contract number and SCO ID (no longer necessary, as these are included in review correspondences).*
NCDMS Contract number and SCO ID deleted.
- *Please adjust narrative format so that the first line of each paragraph is not indented. Everything should be left-justified.*
All text left-justified. Indentation removed from first line of each paragraph.
- *Appendices/morph tables etc – should all be either letter sized or 11x17 foldout sheets; Footers and page numbers are not needed in the appendices, so images/graphs should be expanded to fit the page as efficiently as possible.*
All pages either letter or 11x17 foldout sheets. Footers and page numbers have been removed from Appendices and images and graphs expanded to fit page.
- *Section 1.1. has a split paragraph; please combine.*
The split paragraph in Section 1.1 has been combined.
- *Section 1.2 has a reference to Little Pine III.*
Reference to Little Pine III has been removed from section 1.2.
- *Project Goals and Objectives – Please copy-and-paste Table 1. Project Goals and Objectives from the 2016 Mitigation Plan Addendum, and indicate it is from that document. Keep the first paragraph and replace the rest with the table.*
The Project Goals and Objectives table has been updated and the narrative indicates it is from the 2016 Mitigation Plan Addendum. Additional text has been removed.

- *Section 2.11 - Remove sentence about the DMS approval. The IRT Approval should be indicated in Table 2 as February 2016.*
Sentence about DMS approval removed. IRT Approval indicated in Table 2 as February 2016.
- *There are two sections labeled 2.3.1. Please correct.*
Section labels corrected.
- *Section 2.3 – Wetlands are being tracked by NCDMS as riparian, non-riverine. Please adjust text as necessary. Also, preservation is discussed as having livestock fencing. The livestock exclusion is more pertinent to the restoration segments across the project.*
Text corrected to indicate the wetlands are being tracked as riparian, non-riverine. Discussion about livestock exclusion moved to the more pertinent portion of the report.
- *Please indicate in Section 2.4 that a memo dated September 9, 2019 from DMS to the IRT indicated updated performance standards, monitoring plan, and 7-year credit release schedule. Please reference and include the memo in an Appendix (email attachment to this letter). In addition, please note that a site meeting was then held on 11/5/2019, and reference/include that memo (also attached) in the Appendix.*
Text changed to indicate relevant performance standards, monitoring plan, and 7-year credit release schedule and the associated memo. That memo and site meeting memo were added to the Appendix.
- *Section 3.0 - Please verify and indicate that listed performance criteria reflect the memo dated September 9, 2019 from DMS to the IRT (as you did for the monitoring).*
Sentence added to indicate listed performance criteria reflect the aforementioned memo from DMS to the IRT.
- *As Built Data Documentation – please add detail indicating the reach by reach reasons; e.g., geolift structure installed at LPC STA 100+00 to assist in sediment transport following Fall 2018 Florence and Michael storm damages; Trib C tie in to LPC adjusted; etc.*
Detail added for alignment deviations.
- *Please verify and indicate that monitoring features and locations reflect the September 2019 IRT memo, or indicate where different (and why). For example, please indicate why Cross sections 1 and 2 were chosen at different locations than planned. Cross sections should be at reach-specific representative riffle-pool locations. Other features and locations appear to reflect the memo, with insignificant variations, but please verify.*
Language added to indicate that monitoring features and locations mostly reflect the September 2019 IRT memo except for Cross Sections 1 and 2. An explanation for that deviation is provided.
- *Typo in Pattern section – M7.*
Typo corrected.
- *4.2.1 Vegetation (and CCPV) – Only quite obvious areas devoid of woody stems should be mapped as low stem density; the site is young and as you indicate, the assessments were made during dormant season.*

Low stem density polygons revised to indicate those areas most devoid of woody stems. These areas are primarily those affected by a greater than bankfull event between planting and monitoring.

- *References – spelling typo “Projection” (last entry)*
Typo corrected.
- *Table 1 – if there are no cool credits, please remove the 0.000.*
“0.000” removed
- *Table 2 – Project “Initiation Date” should be Project “Institution Date” and listed at 12/21/2007. Indicate both month and year for completion or delivery. “Draft Design Plan” and “Final Design Plan” are not needed here, as Restoration Plan is already indicated. Please note that substantial completion for construction grading was approved May 21, 2019; this (May 2019) should be the Construction complete month-year. Please also revise the Planting Date; planting was completed between 4/2/2019 and 4/8 2019 so Planting Complete should be April 2019.*
Project “Initiation Date” changed to Project “Institution Date” and listed at 12/21/2007.
- *Table 3 – Project designer is Jeff Keaton, Wildlands; Planting contractor is Carolina Silvics (Mary Margaret McKinney)*
Project contractor and contacts updated accordingly.
- *Maps – CCPV, Assets/Components, and Monitoring features should all be combined, and split into 3 detail maps (Generally, LPC Reach 1, Reach 2A, and Reach 2B and surrounding areas). These are typically called “Integrated CCPV” Sheet 1, 2, etc. Zooming in will allow all features to be included on each sheet, enable a better resolution, and avoid redundancy. An overall CCPV sheet with the 3 sheets keyed out with an overlay would work well, so as follows:*
 - *Little Pine Creek II Stream and Wetland Mitigation Site (Key).*
 - *Little Pine Creek II Integrated Current Condition Plan View (Sheet 1)*
 - *Little Pine Creek II Integrated Current Condition Plan View (Sheet 2)*
 - *Little Pine Creek II Integrated Current Condition Plan View (Sheet 3)*CCPV, Assets/Components, and Monitoring features combined on reach scale detail maps.
- *Constructed vernal pools should be added to the CCPVs.*
Constructed vernal pools were added to the CCPVs.
- *CVS table – At construction close out, the designer certified that the site was planted at 605 stems per acre (4665 bare roots / 7.7 acres), per the construction contract (bid addendum 03, dated 9/28/2017); the site wide stem density (273 stems/acre) indicates high mortality or below the planting density requirement. Did Equinox find that the plots had planted stems that died, or just were not present in the specified planted density? Equinox notes (Sec 4.2.1) that field conditions during the assessments were made in conditions not favorable for identifying planted stems. What field conditions? Can Equinox advise on why the MYO numbers might be below success criteria?*
Equinox did not identify dead stems in the plots; stems were not present. Snow cover of approximately 3-4” and recent alluvial deposition were the field conditions which were unfavorable for assessment. Stems could have been covered by alluvial deposition or removed by high flows.



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- Please add all common names to CVS table.

Common names added to CVS table.

- The wetland planting zones had a few additional species on the wetland zone planting list, not reflected in the CVS table (*Sambucus*, *Lindera*, *Quercus*, *Nyssa*, etc). Were these not found in VP2 or VP6 (wetland plots)?

All species which were found within the vegetation monitoring plots are included in the CVS table.

- Table 6 - Planted acreage should not reflect disturbed acreage associated with vernal pools. Disturbed and planted acreage was 7.7 acres when vernal pools are accounted for. Also, two red footnotes appear unreferenced. This table should be formatted to letter size. Please see prior comment on low stem density area determination and mapping.

Disturbed and planted acreage area adjusted to 7.7 acres. Two red footnotes removed. Table formatted to letter size.

Sincerely,

Danvey Walsh

Project Manager

Prepared by:



EQUINOX

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37 Haywood Street, Suite 100
Asheville, NC 28801

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1.0 **PROJECT BACKGROUND AND GOALS**

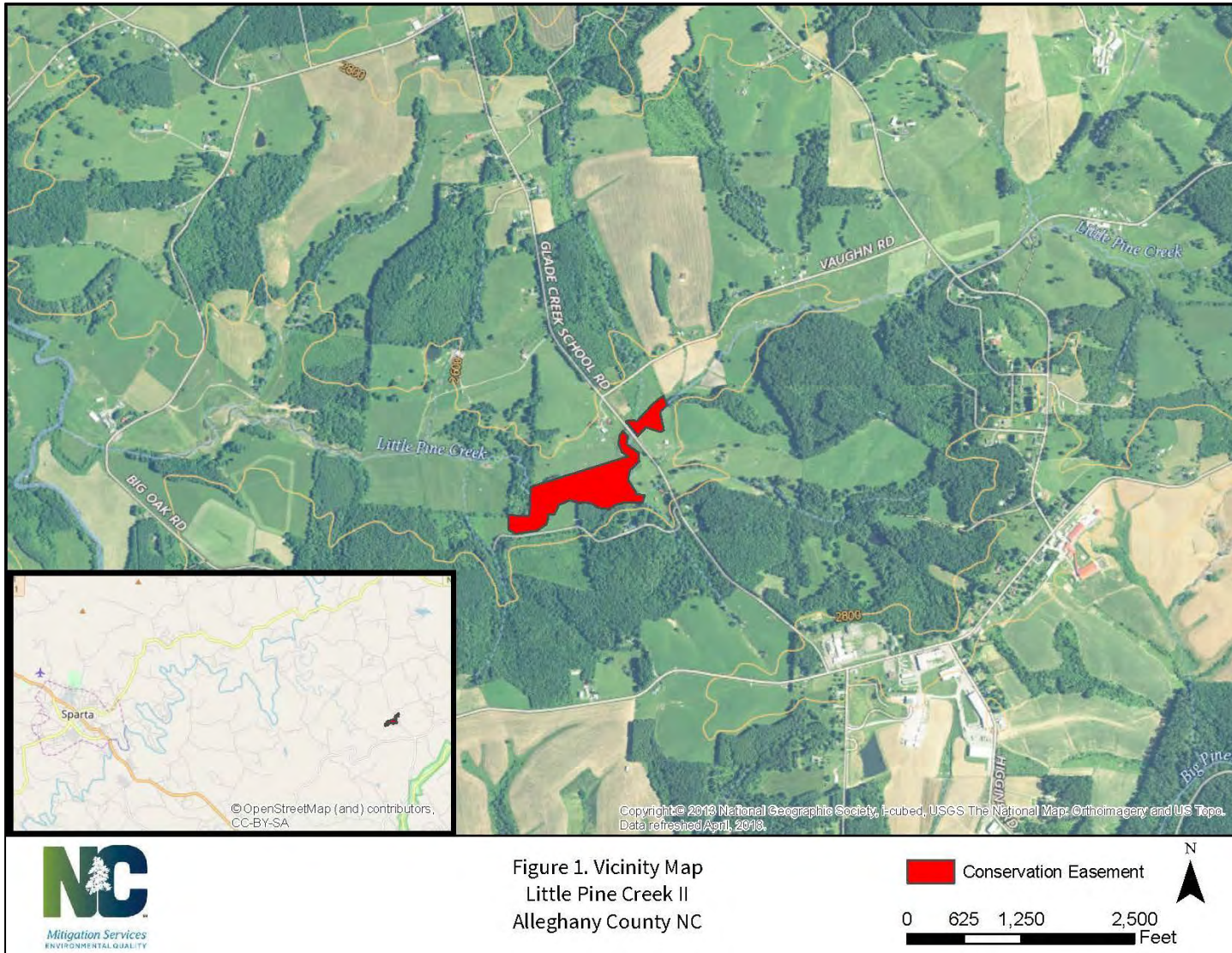
1.1. **Location and Setting**

The Site is located in eastern Alleghany County, NC as shown in Figure 1. The Site is approximately eight miles east of the Town of Sparta, NC and approximately four miles south of the Virginia border. (Figure 1).

The Site is located in the New River Basin; eight-digit Cataloging Unit (CU) 05050001 and the 14-digit Hydrologic Unit Code (HUC) 05050001030030 (Figure 1). Located in the Blue Ridge Belt of the Blue Ridge Province (USGS, 1998), the project watershed includes primarily managed herbaceous, mixed upland hardwoods, and other forested land. The drainage area for the Site is 2,784 acres. The North Carolina Division of Water Resources (DWR) assigns best usage classifications to State Waters that reflect water quality conditions and potential resource usage. Little Pine Creek (DWR Index No. 10-9-10-5) is the main tributary of the project and is classified as Class C waters. Class C waters are protected for secondary recreation, fishing, wildlife, fish and aquatic life propagation and survival, agriculture, and other uses. Little Pine Creek also has a supplemental classification as Trout Waters (Tr). Trout waters are protected to sustain and allow for trout propagation and survival and include tributaries to stocked trout streams. Trout are not currently stocked in Little Pine Creek. Brush Creek, which is located downstream of the Site, is hatchery supported.

The Site is located within a TLW in the New River RBRP plan (NCDENR, 2009), and is identified in the Little River and Brush Creek LWP Project Atlas (NCDENR, 2007). The Little River and Brush Creek LWP identified the following stressors in the watershed: unforested buffers that are heavily grazed, livestock access to streams, heavily eroded stream banks, land-disturbing activities on steep slopes, and storm water runoff in and around the town of Sparta. The LWP Project Atlas identified the Little Pine Creek II Stream and Wetland Restoration Project (LPC1-04, LPC1-W10) as a stream and wetland restoration opportunity with the potential to improve water quality, habitat, and hydrology within the Brush Creek watershed.

Prior to construction activities, livestock had full access to most of the Site streams and used them as a water source. The riparian buffers in areas proposed for restoration were primarily herbaceous with a few sparse trees. Deposition of fine sediment, severe bank erosion, and trampling of banks, impacted the in-stream habitat. Channel widening and incision indicated instability. Table 1 in Appendix A and Table 7 in Appendix D present the pre-restoration conditions in detail.



1.2. Goals and Objectives

The LPC II Site is intended to provide numerous ecological benefits within the New River Basin. While many of these benefits are limited to the Little Pine II project area, others, such as pollutant removal, reduced sediment loading, and improved aquatic and terrestrial habitat, have farther-reaching effects. Expected improvements to water quality and ecological processes are outlined below as project goals and objectives. These project goals were established with careful consideration of goals and objectives that were described in the RBRP and to address stressors identified in the LWP. Below is the Project Goals and Objectives table from 2016 Mitigation Plan Addendum.

Goal	Objective	Expected Outcomes
Restore riparian buffers.	Plant native tree and understory species in riparian zone	Create and improve forested riparian habitats. Provide a canopy to shade streams and reduce thermal loadings. Create a source of woody inputs for streams. Reduce flood flow velocities on floodplain and allow pollutants and sediment to settle.
Exclude cattle from project streams.	Install fencing around conservation easements adjacent to cattle pastures	Reduce pollutant inputs including fecal coliform, nitrogen, and phosphorous.
Stabilize eroding stream banks.	Reconstruct stream channels with stable dimensions. Add bank revetments and in-stream structures to protect restored/enhanced streams.	Reduce inputs of sediment into streams.
Construct stream channels that are laterally and vertical stable.	Construct stream channels that will maintain a stable pattern and profile considering the hydrologic and sediment inputs to the system, the landscape setting, and the watershed conditions.	Return a network of streams to a stable form that is capable of supporting hydrologic, biologic, and water quality functions.
Improve instream habitat.	Install habitat features such as constructed riffles and brush toes into restored/enhanced streams. Add woody materials to channel beds. Construct pools of varying depth.	Improve aquatic communities in project streams.
Improve channel and floodplain connectivity.	Reconstruct stream channels with bankfull at or near the floodplain elevation (with bank height ratios ranging from 1.0 to 1.1).	Raise local groundwater elevations. Inundate floodplain wetlands and vernal pools. Reduce shear stress on channels during larger flow events.
Permanently protect the project site from harmful uses.	Establish a conservation easement on the site.	Ensure that development and agricultural uses that would damage the site or reduce the benefits of project are prevented.

2.0 **PROJECT ATTRIBUTES**

2.1. **Project Structure**

Construction activities were completed in June 2019 by Wright Contracting, LLC. Turner Land Surveying completed the as-built survey in July 2019 and Equinox completed the baseline monitoring activities in January 2020. Planting was completed by Wright Contracting, LLC in June 2019. Final monitoring activities and close out will commence in December 2026. Minimal adjustments were made during construction and field adjustments made during construction are described in further detail in section 4. Please refer to Appendix A for detailed project activity, history, contact information, and watershed/site background information.

2.2. **Mitigation Components**

The LPC II Site is expected to provide 3,281.6 SMUs and 1.47 WMUs. The components and mitigation credits reflect the as-built condition of the site as represented in the Turner Land Surveying as-built survey. Refer to the Project Assets Map (Figure 2) for the stream and wetland features and table 1 for the project component, assets, and mitigation credit information for the LPC II Site.

2.3. **Restoration Type and Approach**

2.3.1 **Streams**

The project includes stream restoration and preservation as well as wetland enhancement and preservation. The specific proposed stream and wetland types are described below.

The stream restoration portion of the Site includes six reaches; three reaches on Little Pine Creek, one reach on Tributary A, one reach on Tributary B, and one reach on Tributary C. The stream restoration design was developed based on reference conditions, representing streams within the Blue Ridge Belt region with similar drainage areas, valley slopes, morphology, and bed material. The design streams were restored to the appropriate type based on the surrounding landscape, climate, and natural vegetation communities and with thorough consideration to the existing watershed conditions and their trajectory. Fencing is installed to ensure livestock exclusion.

The preservation portion of the Site includes Tributaries D, E, and F. The preservation reaches are preserved as-is because they are stable and flow through mature forest.

2.3.2. **Wetlands**

The wetland portion of the LPC II Site includes three wetland zones. Wetland 1 is a riparian, non-riverine wetland enhancement zone. Wetland 2A is a riparian, non-riverine wetland enhancement zone. The enhancement activities included supplemental planting and fencing to remove livestock. Wetland 2B is preservation only.

2.4. **Project History, Contacts and Construction Summary**

This project, a DMS design-bid-build project originally instituted in December 2007, has had several delays due to landowner issues, a temporary ban on trout waivers (2010), a construction contract termination and design reassignment (2013), conservation easement adjustment (2015), mitigation plan addendum (2016) and significant hurricane damage during construction (2018). The project was

built according to the January 2016 mitigation plan addendum design (Wildlands Engineering), and now has a final, sealed as-built survey dated July 14, 2019. A memorandum dated September 9, 2019 From DMS to the IRT indicated updated performance standards, monitoring plan, and 7-year credit release schedule. A site meeting with the IRT was held November 5, 2019 and a memorandum was issued regarding the meeting. Copies of the memorandums along with Tables 2, 3, and 4 are in Appendix A and provide detailed information regarding the project schedule, project contracts, and project information and attributes.

3.0 SUCCESS CRITERIA AND MONITORING

The listed performance criteria for the LPCII site was taken from the LPC II Monitoring update memorandum dated September 9, 2019 and is detailed below.

3.1. Stream

Restored Stream Channels

- All streams must maintain an Ordinary High-Water Mark (OHWM), per RGL 05-05.
- Continuous surface flow must be documented each year for at least 30 consecutive days.
- Bank height ratio (BHR) cannot exceed 1.2 for all measured cross sections on a given reach.
- Entrenchment ratio (ER) must be above 2.2 for all measured riffle cross-sections on a given reach (for C and E streams).
- BHR and ER should not change by more than 10% in any given year for all measured cross sections on a given reach.
- Must document occurrence of at least 4 bankfull events in separate years during the monitoring period.

3.2. Vegetation

Riparian Vegetation

- Within planted portions of the site, a minimum of 320 stems per acre must be present at year 3; a minimum of 260 stems per acre must be present at year 5; and a minimum of 210 stems per acre must be present at year 7.
- Trees must average 6 feet in height at year 5, and 8 feet in height at year 7 (mountain region).
- Planted and volunteer stems are counted, provided they are included in the approved planting list for the site.
- Any single species can only account for 50% of the required stems per monitoring Plot.

3.3. Wetlands

Performance standards are not defined for the wetland enhancement areas. Hydrologic data will be collected will not be used to evaluate success criteria for the LPC II Site.

3.4. Monitoring Plan

The monitoring plan for the LPCII site was taken from the LPC II Monitoring update memorandum dated September 9, 2019 and is detailed below. Cross Sections 1 and 2 were moved upstream from the proposed locations due to infilled condition of the pool at the proposed location during the installation of the monitoring features. Cross Sections 1 and 2 were installed at a riffle and pool pair representative of the design dimensions for LPC Reach 1. All other monitoring features were installed at locations as outlined in the September 2019 IRT memo with insignificant variations.

Parameter	Method	Schedule/ Frequency	Number/ Extent
Stream Morphology			
Stream Profile	Longitudinal profile of the thalweg, water surface, bankfull, and top of bank	MY0 only (unless otherwise required)	All restored stream channels (2496 LF Little Pine Creek, 763 LF Tributaries)
Stream Dimension	Cross sections	Years 0,1, 2, 3, 5, and 7	9 cross sections on Little Pine Creek (5 Riffle /4 pool), 4 cross sections on tributaries (A/B/C)
Channel Stability	Visual Assessment	Annually	All restored stream channels
Vegetation			
Vegetation establishment and vigor	CVS Level II Permanent vegetation plots, 0.02 acre in size (minimum)	Years 0,1, 2, 3, 5, and 7	8 plots
	Annual random vegetation plots, 0.02 acre in size (minimum)		4 plots
Hydrology			
Stream Hydrology	Continuous stage recorders (CSR) and crest gauges (CG); When possible overbank events will be corroborated with photographic evidence.	Annually	Little Pine Creek (1 CSR) and Tributaries A(1 CG), B(1 CG), and C (1 CSR)
Wetland Enhancement Hydrology	Wetland gauges; During mitigation plan review, DWR recommended placing gauges in the wetland enhancement areas to document the changes in the water tables relative to the stream restoration (no assigned hydroperiod); gauges will be installed according to the October 2016 NCIRT guidance.	Annually	2 ground water gauges (one each in enhancement wetlands 1 and 2A)
Rainfall Data	Rain Gauge; should be measured on-site using at least one recording rain gauge; rainfall from the nearest available weather station can be used to supplement data collected on-site	Annually	1 rain gauge
Site-wide			
Encroachments, poor vegetation growth, beaver activity, invasive vegetation, etc.	Permanent Photo Locations and Visual assessment as required in the October 2016 NCIRT guidance, with mapping and tabulation as per the latest DMS format template	Annually	na

4.0 **AS-BUILT DATA DOCUMENTATION**

A sealed set of the record drawings are located in Appendix E. Below, are notable as-built condition deviations from the design alignment.

LPC Reach 1

- Station 100+00 to 100+61 – Alignment Deviation. Geolift structure installed at LPC STA 100+00 to assist in sediment transport following Fall 2018 Florence and Michael storm damages.

Tributary A

- Station 200+50 to 200+85 – Alignment Deviation. Trib A tie in to LPC adjusted.

Tributary B

- Station 300+50 to 300+75 – Alignment Deviation. Trib B tie in to LPC adjusted.

Tributary C

- Station 406+00 to 406+26 – Alignment Deviation. Trib C tie in to LPC adjusted.

DMS met at the site with the IRT on 11/14/2019. Tributaries E and F (50 LF and 153 LF, respectively) had been jurisdictionally confirmed, however the lower section of Tributary F had appeared to down cut since project design. The IRT indicated that, despite some stable segments of Tributary F upstream of a head cut, that recent impacts and a head cut along Tributary F have affected stream performance on these reaches to the degree that Tributaries E and F should not yield stream preservation credits. These reaches are not being credited.

4.1. **Stream**

Morphological data for the as-built profile was collected between November 2019 and January 2020. Please refer to Appendix D for summary data tables, morphological plots, and stream photographs.

Profile

The MY0 profiles closely match the profile design parameters. On the design profiles, riffles were depicted as straight lines with consistent slopes. However, at some locations the riffle profiles within the as-built survey are not consistent in slope due to the installation of structures and woody debris within the streambed. Riffle slopes and bankfull slopes are generally within the design range. Maximum pool depths typically exceed design parameters and are expected to trend towards the design depths as a result of natural deposition over time. These variations pool depths likely do not constitute a problem nor do they indicate a need for remedial action; they will be assessed visually during the annual assessments.

Dimension

The MY0 dimension numbers closely match the design parameters within acceptable ranges of variation. Variations in baseline parameters are reflected in the cross- sections as a larger maximum pool depth. We anticipate that over time pools may accumulate with sediment and organic matter. This accumulation of sediment within pools would not be seen as an indicator of instability. Maximum depth in riffles are occasionally exceeded due to micropools forming through lateral scour near hard features, but this is not expected to adversely impact the stability of the channel.

Pattern

The MY0 pattern metrics fell within acceptable ranges of the design parameters for all three reaches. Pattern data will be evaluated in MY7 if there are any indicators through the profile or dimension assessments that significant geomorphic adjustments have occurred.

Bankfull Events

Bankfull events recorded following completion of construction will be reported in the MY1 report.

4.2.1 Vegetation

The MY0 average planted density is 273 stems per acre, which does not meet the interim measure of vegetative success of at least 320 planted stems per acre at the end of the third monitoring year. Summary data and photographs of each plot can be found in Appendix C.

It should be noted that there is a general appearance of low stem density within the channel-belt on the floodplain; recent flooding resulted in deposition of bed material onto the floodplain, and also much of the floodplain vegetation being laid over horizontally in a downstream direction. Furthermore, recent snowfall on the ground surface and temperatures around 10°F made it difficult to locate planted stems amongst other frozen vegetation.

4.2.2 Wetlands

Groundwater gage data will be reported in the annual MY1 and subsequent monitoring reports.

5.0 REFERENCES

- Lee, Michael T., R.K. Peet, S.D. Roberts, and T.R. Wentworth. 2008. CVS-EEP Protocol for Recording Vegetation, Version 4.2 (<http://cvs.bio.unc.edu/methods.htm>)
- NCDENR. 2009. New River Basin Restoration Priorities. Retrieved from <http://deq.nc.gov/about/divisions/mitigation-services/dms-planning/watershed-planning-documents/new-river-basin>
- NCDENR. 2007. Little River & Brush Creek Local Watershed Plan (LWP) Project Atlas. Retrieved from <http://deq.nc.gov/about/divisions/mitigation-services/dms-planning/watershed-planning-documents/new-river-basin>
- Turner Land Surveying. 2019. As-Built Survey of Little Pine Creek II Stream and Wetland Restoration Project. Prepared for North Carolina Department of Environmental Quality, Division of Mitigation Services.
- United States Army Corps of Engineers (USACE), 2003. Stream Mitigation Guidelines. USACE, NCDENR-DWQ, USEPA, NCWRC.
- Wildlands Engineering. 2019. Restoration Plan Addendum – Little Pine Creek II Restoration Project Prepared for North Carolina Department of Environmental Quality, Division of Mitigation Services. DMS Project No. 856.

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Appendix A

Background Tables

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**Table 1. Project Mitigation Assets and Components
Little Pine Creek II Stream and Wetland Mitigation Site**

Project Segment	Existing Footage or Acreage	Mitigation Plan Footage or Acreage*	Mitigation Category	Restoration Level	Priority Level	Mitigation Ratio (X:1)	As-Built Centerline Footage or Acreage^	Comments
Reach 1	2,894	530	Cold	R	P2	1:1	517	20' LF Not-credited due to OHW ROW
Reach 2A		1,512	Cold	R	P1	1:1	1,476	Cattle crossing at upstream end; 30' LF Not-credited due to OWH ROW
Reach 2B		321	Cold	R	P1	1:1	334	Additional 13' LF at end of project
Tributary A	119	86	Cold	R	P2	1:1	82	Sinuosity less than design; confluence with Reach 2A farther upstream than proposed
Tributary B	50	104	Cold	R	P1	1:1	78	Confluence with Reach 2A farther upstream than proposed
Tributary C	299	578	Cold	R	P1	1:1	577	
Tributary D	899	655	Cold	P	N/A	5:1	655	
Tributary E	50	50	Cold	P	N/A	5:1	50	Not-credited due to head cutting
Tributary F	153	153	Cold	P	N/A	5:1	153	Not-credited due to head cutting
Wetland 1	0.32	0.32	RNR	Enh		2:1	0.322	
Wetland 2A	0.88	0.88	RNR	Enh		2:1	0.878	
Wetland 2B	4.42	4.42	RNR	P		5:1	4.420	

* Mitigation plan footage accounts for breaks in conservation easements and are based on design stream stationing and taken from the approved mitigation plan.

^ Based on centerline calculations from the as-built survey, accounts for breaks in conservation easement and utility right-of-ways.

Project Credits

Restoration Level	Stream			Riparian Wetland		Non-Rip	Coastal
	Warm	Cool	Cold	Riverine	Non-Riv	Wetland	Marsh
Restoration	-	-	3,064	-	-	-	-
Re-establishment				-	-	-	-
Rehabilitation				-	-	-	-
Enhancement				-	0.600	-	-
Enhancement I	-	-	-				
Enhancement II	-	-	-				
Creation				-	-	-	-
Preservation	-	-	131	-	0.884	-	
Total Credits %	-	-	3,195	-	1.484	-	-

% Project credits reflect the sum of credits consistent with as-built condition.

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Table 2. Project Activity and Reporting History
Little Pine Creek II Mitigation Site – NCDMS Project No.856

Activity or Report	Data Collection Complete	Completion or Delivery
Project Institution Date (Contract Date)	-	Dec-2007
Restoration Plan	-	Jan-2016
Construction (substantial construction complete 05/21/19)	-	May-2019
Planting	-	Apr-2019
As-built – MY0	Stream Survey	Jan-2020
	Vegetation Survey	Nov-2019
		Mar-2020

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Table 4. Project Baseline Information and Attributes

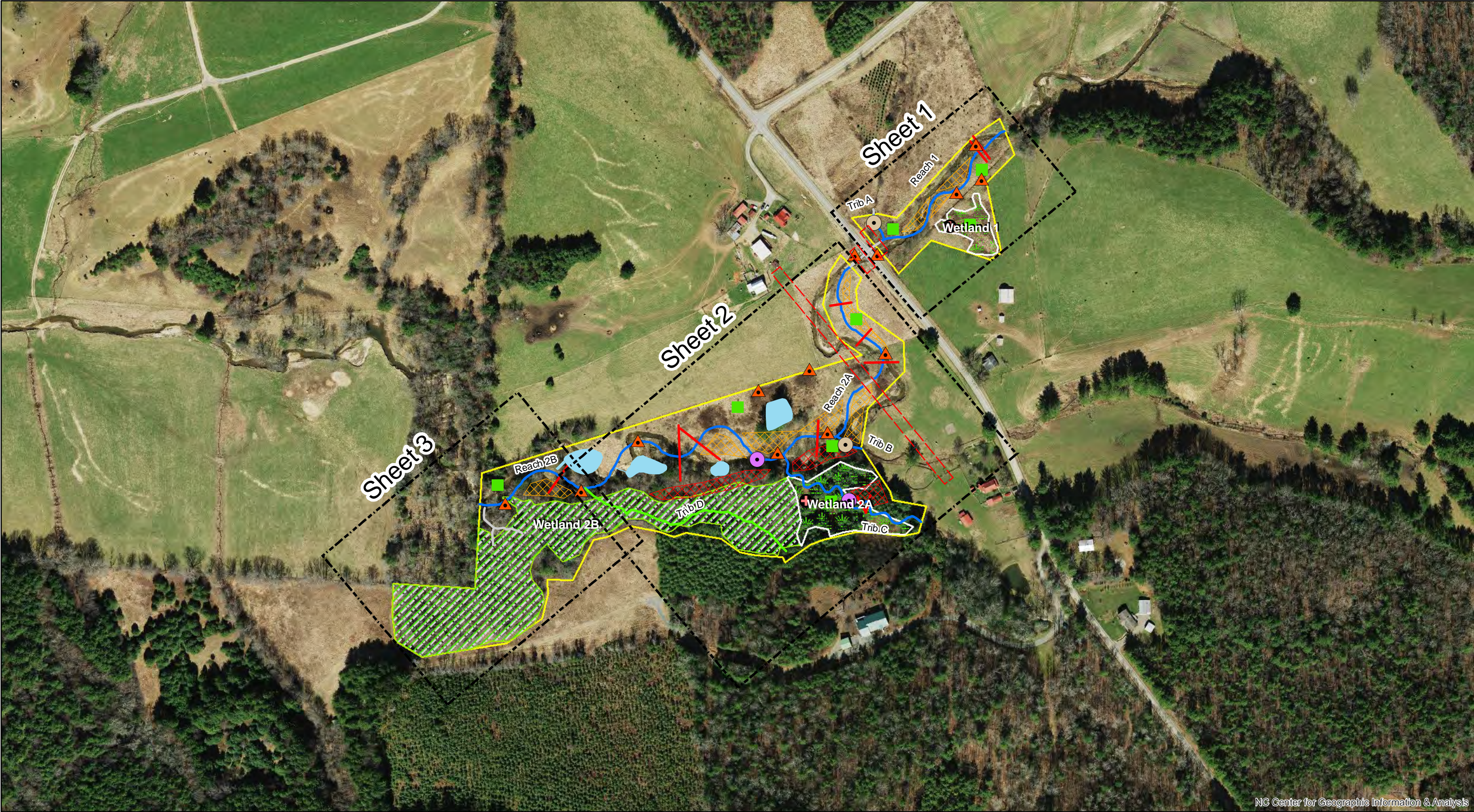
Project Information									
Project Name	Little Pine Creek II Stream and Wetland Mitigation Site								
County	Alleghany								
Project Area (acres)	14.61								
Project Coordinates (latitude and longitude)	36.5069° N, -80.9878° W								
Project Watershed Summary Information									
Physiographic Province	Blue Ridge								
River Basin	New River								
USGS Hydrologic Unit 8-digit	5050001	USGS Hydrologic Unit 14-digit	5050001030030						
DWR Sub-basin	05-07-03								
Project Drainage Area (acres)	3.34								
Project Drainage Area Percentage of Impervious Area	< 1%								
CGIA Land Use Classification	Pasture/Hay								
Reach Summary Information									
Parameters	Little Pine Creek Reach 1	Little Pine Creek 2A	Little Pine Creek 2B	Tributary A	Tributary B	Tributary C	Tributary D	Tributary E	Tributary F
Length of Reach (linear feet) ^	533	150,677	334	82	77	577	899	50	153
Valley Confinement (Rosgen)	VI	VI	VI	VI	VI	VI	VI	VI	VI
Drainage area (miles ²)	2.93	3.31	3.34	0.39	0.26	0.11	0.13	0.04	0.05
Perennial, Intermittent, Ephemeral	Perennial	Perennial	Perennial	Perennial	Perennial	Intermittent	Perennial	Perennial	Perennial
NCDWR Water Quality Classification	C	C	C	C	C	C	C	C	C
Stream Classification (existing)	C	C	C	C	C	G	C	C	C
Stream Classification (proposed)	C	C	C	C	C	C	C	C	C
FEMA classification	-	-	-	-	-	-	-	-	-
Wetland Summary Information									
Parameters	Wetland 1		Wetland 2A			Wetland 2B			
Size of Wetland (acres)	0.32		0.88			4.42			
Wetland Type (non-riparian, riparian riverine or riparian non-riverine)	Riparian		Riparian			Riparian			
Mapped Soil Series	Alluvial land, wet (nikwasi)		Alluvial land, wet (nikwasi)			Alluvial land, wet (nikwasi)			
Drainage class	Very Poorly		Very Poorly			Very Poorly			
Soil Hydric Status	Hydric		Hydric			Hydric			
Source of Hydrology	Spring		Spring			Spring			
Hydrologic Impairment	Agriculture/ Livestock Grazing		Agriculture/ Livestock Grazing			Agriculture/ Livestock Grazing			
Native vegetation community	Mountain Bottomland Forest		Mountain Bottomland Forest			Mountain Bottomland Forest			
Percent composition of exotic invasive vegetation	0%		0%			0%			
Regulatory Considerations									
Regulation	Applicable?	Resolved?			Supporting Documentation				
Waters of the United States – Section 404	Yes	Yes			Jurisdictional Determination				
Waters of the United States – Section 401	Yes	Yes			Jurisdictional Determination				
Endangered Species Act	Yes	Yes			ERTR				
Historic Preservation Act	No	N/A			ERTR				
Coastal Zone Management Act (CZMA) Coastal Area Management Act (CAMA)	No	N/A			N/A				
FEMA Floodplain Compliance	Yes	Yes			Yes				
Essential Fisheries Habitat	No	N/A			N/A				

^ Based on actual thalweg calculations from the as-built survey, accounts for breaks in conservation easement and utility right-of-ways.

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Appendix B
Visual Assessment Data

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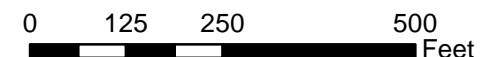
NC Center for Geographic Information & Analysis



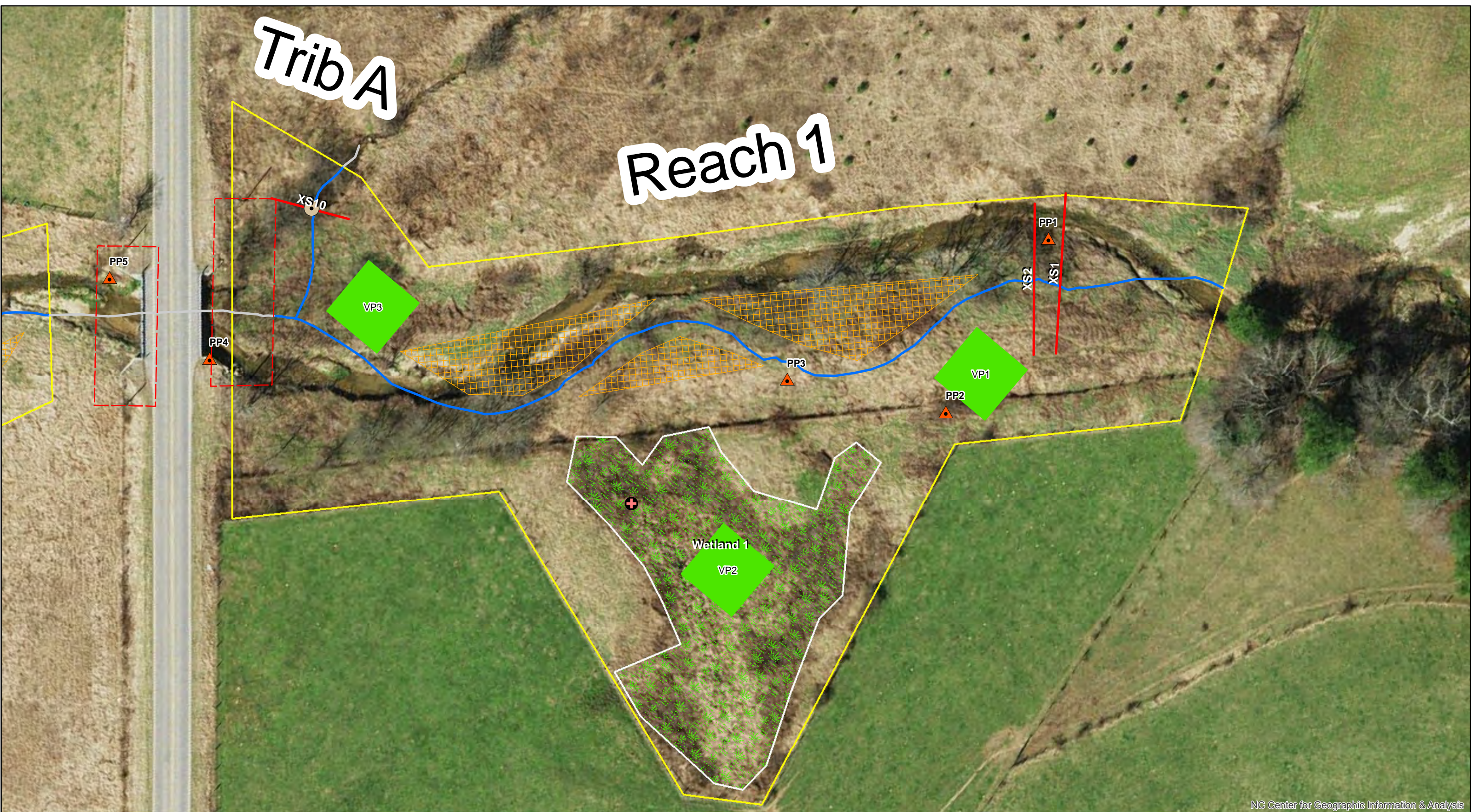
Integrated CCPV
 Little Pine Creek II
 Alleghany County, NC

Sheet 1 of 4

- | | | | |
|------------------|---------------------------|------------------------|------------------------|
| Utility Easement | Continuous stage recorder | Non-Credit | Invasive Problem Areas |
| Vernal Pool | Wetland gauge | Preservation | Enhancement |
| Photopoints | Cross Sections | Restoration | Preservation |
| Crest gauge | CVS Vegetation Plots | Low Stem Density Areas | LPC II Easement |



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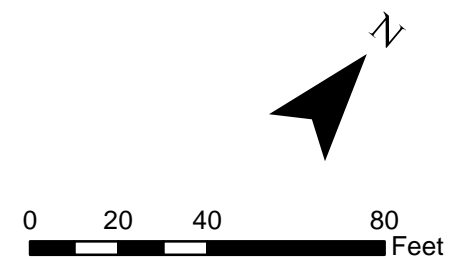
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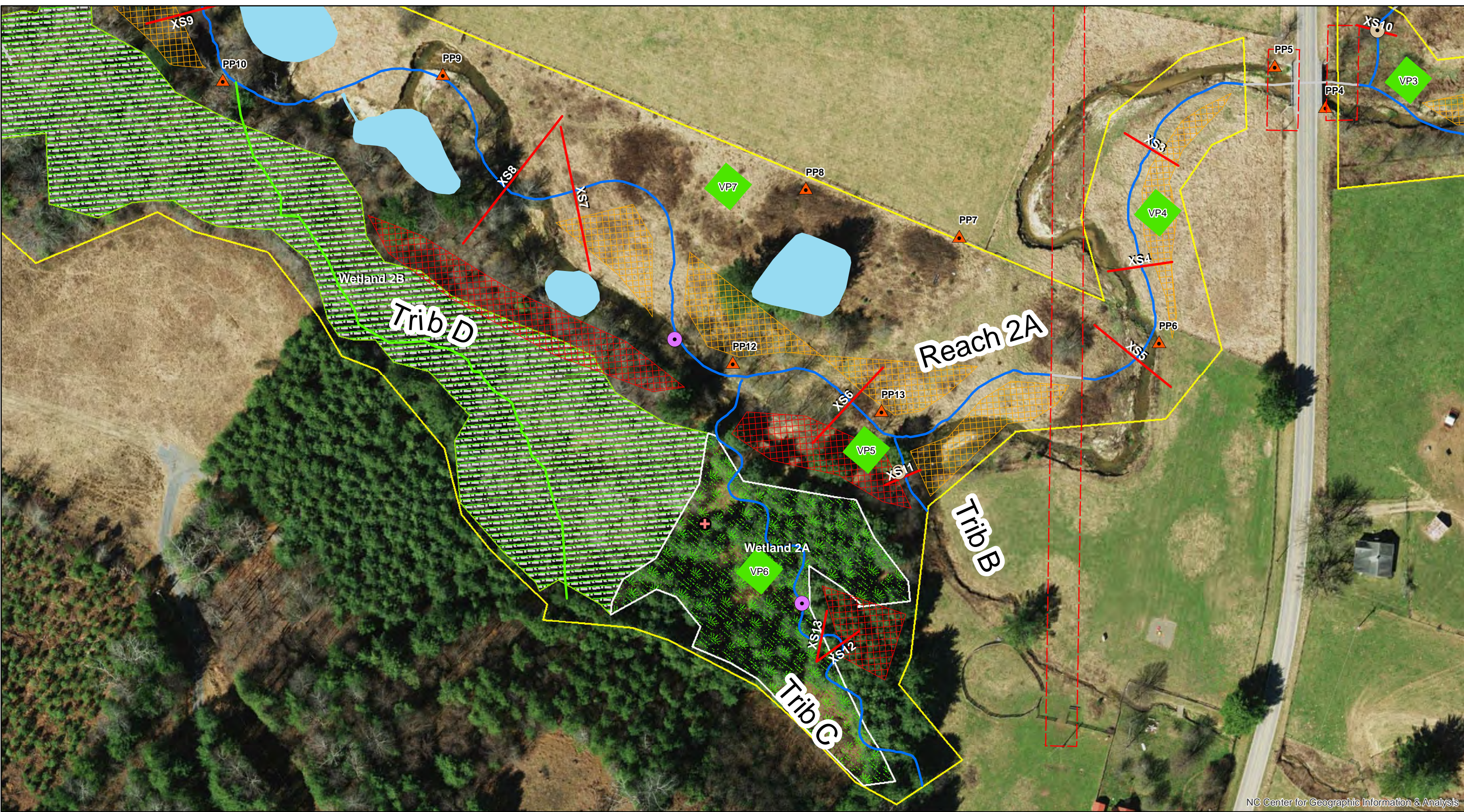
Integrated CCPV
Little Pine Creek II
Alleghany County, NC

Sheet 2 of 4

- | | | | |
|------------------|----------------------|------------------------|-----------------|
| Utility Easement | Wetland gauge | Non-Credit | Enhancement |
| Photopoints | Cross Sections | Restoration | LPC II Easement |
| Crest gauge | CVS Vegetation Plots | Low Stem Density Areas | |



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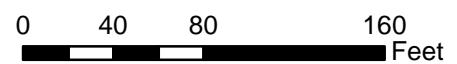
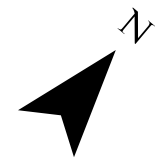
NC Center for Geographic Information & Analysis



Integrated CCPV
 Little Pine Creek II
 Alleghany County, NC

Sheet 3 of 4

- | | | | |
|------------------|---------------------------|------------------------|------------------------|
| Utility Easement | Continuous stage recorder | Non-Credit | Invasive Problem Areas |
| Vernal Pool | Wetland gauge | Preservation | Enhancement |
| Photopoints | Cross Sections | Restoration | Preservation |
| Crest gauge | CVS Vegetation Plots | Low Stem Density Areas | LPC II Easement |



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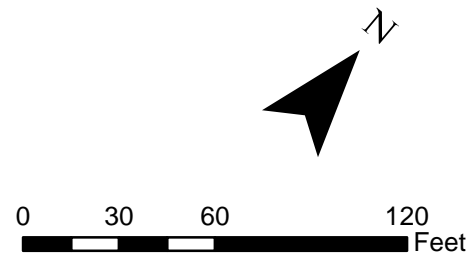
NC Center for Geographic Information & Analysis



Integrated CCPV
 Little Pine Creek II
 Alleghany County, NC

Sheet 4 of 4

- | | | | |
|----------------|----------------------|------------------------|-----------------|
| Vernal Pool | CVS Vegetation Plots | Restoration | Preservation |
| Photopoints | Non-Credit | Low Stem Density Areas | LPC II Easement |
| Cross Sections | Preservation | Invasive Problem Areas | |



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Table 6		Vegetation Condition Assessment						
Planted Acreage:		7.7						
Vegetation Category	Definitions	Mapping Threshold	CCPV Depiction	Number of Polygons	Combined Acreage	% of Planted Acreage		
1. Bare Areas	Very limited cover of both woody and herbaceous material.	0.1 acres	Pattern and Color	0	0	0.00%		
2. Low Stem Density Areas	Woody stem densities clearly below target levels based on MY3, 4, or 5 stem count criteria.	0.1 acres	n/a	9	2.27	16.21%		
Total				9	2.27	16.21%		
3. Areas of Poor Growth Rates or Vigor	Areas with woody stems of a size class that are obviously small given the monitoring year.	0.25 acres	n/a	0	0	0.00%		
Cumulative Total				9	2.27	16.21%		
Easement Acreage:		14						
Vegetation Category	Definitions	Mapping Threshold	CCPV Depiction	Number of Polygons	Combined Acreage	% of Easement Acreage		
4. Invasive Areas of Concern	Areas or points (if too small to render as polygons at map scale).	1000 SF	n/a	3	0.5	3.57%		
5. Easement Encroachment Areas	Areas or points (if too small to render as polygons at map scale).	none	n/a	0	0	0.00%		

Vegetation Plot Photos



Vegetation Monitoring Plot 1



Vegetation Monitoring Plot 2



Vegetation Monitoring Plot 3



Vegetation Monitoring Plot 4



Vegetation Monitoring Plot 5



Vegetation Monitoring Plot 6



Vegetation Monitoring Plot 7



Vegetation Monitoring Plot 8

Permanent Photo Stations



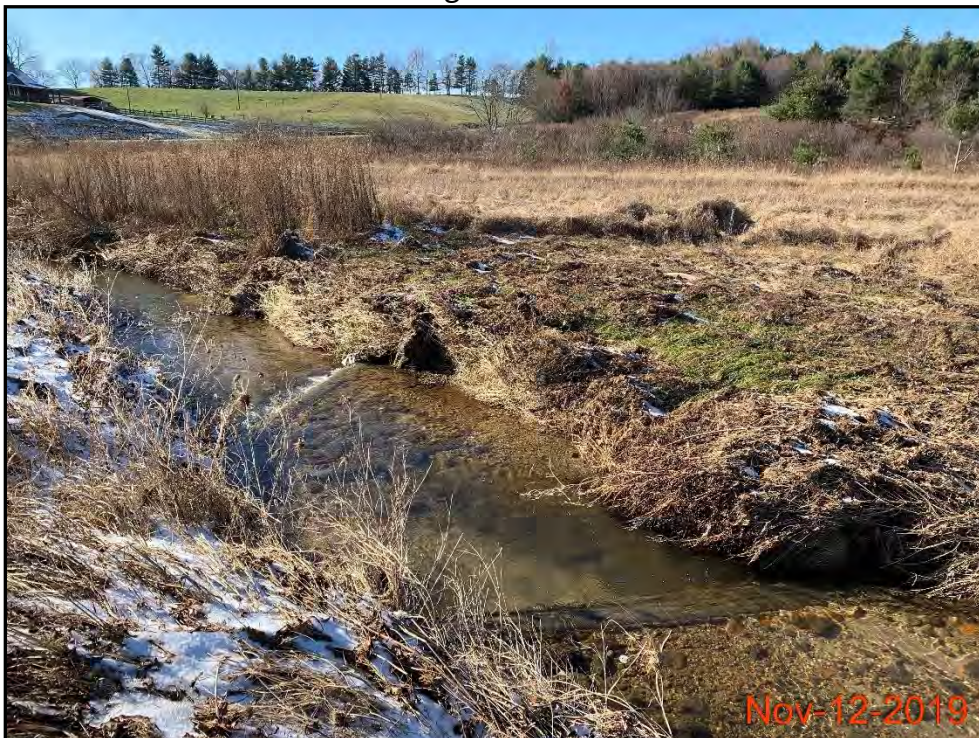
Little Pine Creek – Permanent Photo Station 1
Looking Upstream



Little Pine Creek – Permanent Photo Station 2a
Looking Upstream



Little Pine Creek – Permanent Photo Station 2b
Looking Downstream



Little Pine Creek – Permanent Photo Station 3a
Looking Downstream



Little Pine Creek – Permanent Photo Station 3b
Looking Upstream



Little Pine Creek – Permanent Photo Station 4a
Looking Upstream



Little Pine Creek – Permanent Photo Station 4b
Little Pine Creek confluence with Trib A



Little Pine Creek – Permanent Photo Station 5
Looking Downstream



Little Pine Creek – Permanent Photo Station 6a
Looking Upstream



Little Pine Creek – Permanent Photo Station 6b
Looking Downstream



Little Pine Creek – Permanent Photo Station7a
Looking Northeast



Little Pine Creek – Permanent Photo Station 7b
Looking East



Little Pine Creek – Permanent Photo Station 7c
Looking Southwest



Little Pine Creek – Permanent Photo Station 8a
Looking over vernal pool



Little Pine Creek – Permanent Photo Station 8b
Looking Downstream



Little Pine Creek – Permanent Photo Station 9a
Looking Upstream



Little Pine Creek – Permanent Photo Station 9b
Looking Southeast



Little Pine Creek – Permanent Photo Station 9c
Looking Downstream



Little Pine Creek – Permanent Photo Station 10a
Looking Upstream



Little Pine Creek – Permanent Photo Station 10b
Looking Downstream



Little Pine Creek – Permanent Photo Station 11a
Looking Upstream Trib D



Little Pine Creek – Permanent Photo Station 11b
Looking Downstream



Little Pine Creek – Permanent Photo Station 11c
Looking North



Little Pine Creek – Permanent Photo Station 12a
Looking Downstream



Little Pine Creek – Permanent Photo Station 12b
Looking Upstream



Little Pine Creek – Permanent Photo Station 13a
Confluence with Trib B



Little Pine Creek – Permanent Photo Station 13b
Looking Downstream



Little Pine Creek – Permanent Photo Station 14a
Looking at floodplain pool



Little Pine Creek – Permanent Photo Station 14b
Looking Upstream



Little Pine Creek – Permanent Photo Station 14c
Looking North

Appendix C
Vegetation Plot Data

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CVS Project Code 082819. Project Name: Little Pine Creek II

			Current Plot Data (MY0 2019)																								Annual Means					
Scientific Name	Common Name	Species Type	082819-01-0001			082819-01-0002			082819-01-0003			082819-01-0004			082819-01-0005			082819-01-0006			082819-01-0007			082819-01-0008			MY0 (2019)					
			PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T			
Acer rubrum	Eastern Red Maple	Tree	3	3	3										1	1	1				3	3	3	3	3	3	3	3	3	10	10	10
Betula nigra	River Birch	Tree	3	3	3				1	1	1	6	6	6	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	18	18	18
Cornus amomum	Silky Dogwood	Shrub Tree	2	2	2	5	5	5	1	1	1				1	1	1													9	9	9
Fraxinus pennsylvanica	Green Ash	Tree	2	2	2										3	3	3							1	1	1				6	6	6
Liriodendron tulipifera	Tulip Poplar	Tree										1	1	1										3	3	3				4	4	4
Platanus occidentalis	Sycamore	Tree	1	1	1				3	3	3	1	1	1				1	1	1	1	1	1							7	7	7
Stem count			11	11	11	5	5	5	5	5	5	8	8	8	7	7	7	3	3	3	6	6	6	9	9	9	9	9	9	54	54	54
size (ares)			1			1			1			1			1			1			1			1			8					
size (ACRES)			0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.20					
Species count			5	5	5	1	1	1	3	3	3	3	3	3	4	4	4	2	2	2	3	3	3	4	4	4	4	4	4	6	6	6
Stems per ACRE			445	445	445	202	202	202	202	202	202	324	324	324	283	283	283	121	121	121	243	243	243	364	364	364	273	273	273			

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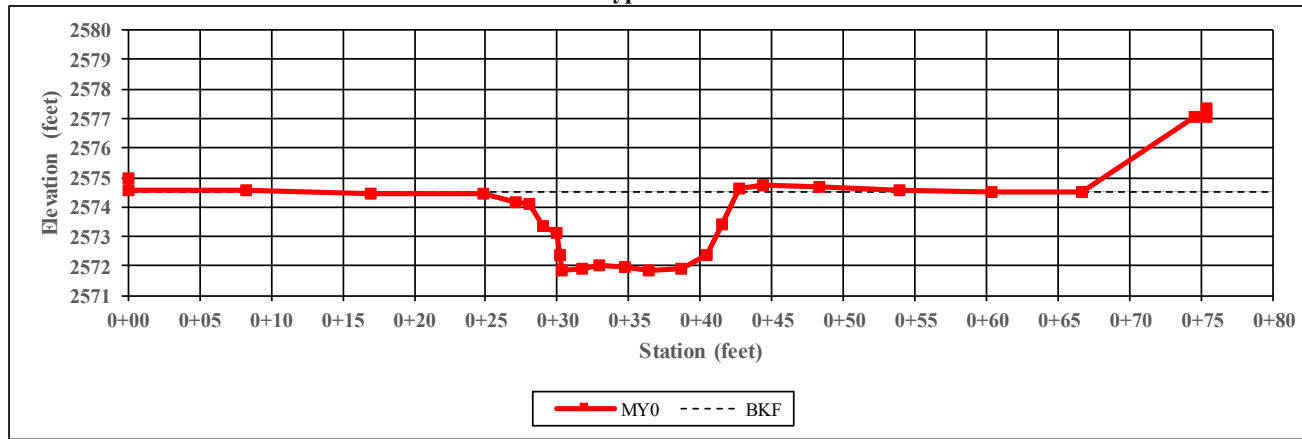
Appendix D
Stream Measurement and Geomorphology Data

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Project Name: LPC II
Reach Name: Little Pine Creek

XS Number: 1
XS Type: Riffle

Station: 100+77



CHANNEL DIMENSIONS SUMMARY	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankful Width (ft)	25.5	-	-	-	-	-	-	-
Floodprone Width (ft)	100.0	-	-	-	-	-	-	-
Bankfull Mean Depth (ft)	1.2	-	-	-	-	-	-	-
Bankfull Max Depth (ft)	2.7	-	-	-	-	-	-	-
Bankfull Cross-Sectional Area (ft ²)	31.6	-	-	-	-	-	-	-
Width/Depth Ratio	20.6	-	-	-	-	-	-	-
Entrenchment Ratio	3.9	-	-	-	-	-	-	-
Bank Height Ratio	1.1	-	-	-	-	-	-	-



Left Descending Bank

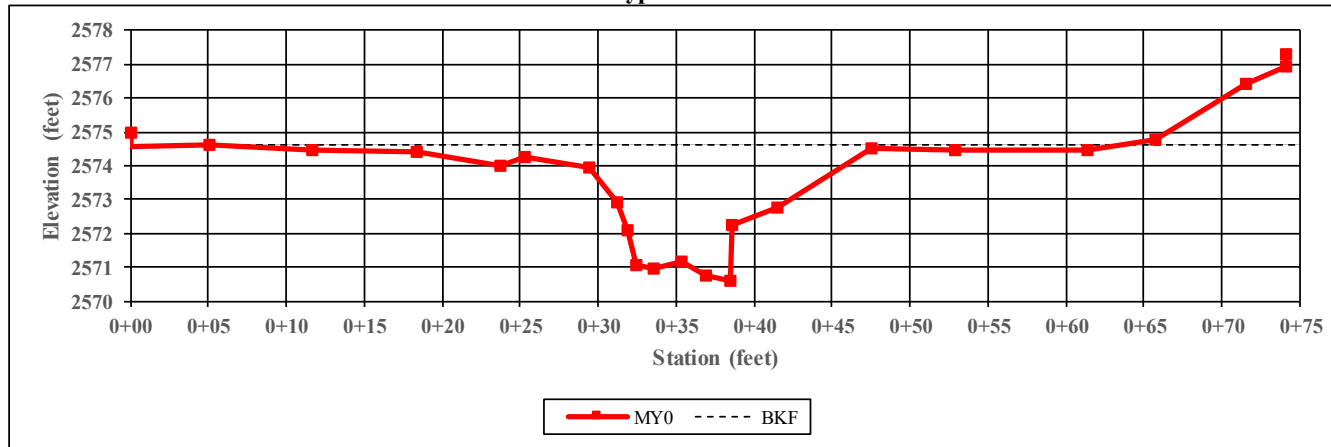


Right Descending Bank

Project Name: LPC II
Reach Name: Little Pine Creek

XS Number: 2
XS Type: Pool

Station: 100+91



CHANNEL DIMENSIONS SUMMARY	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankful Width (ft)	23.7	-	-	-	-	-	-	-
Floodprone Width (ft)	70.0	-	-	-	-	-	-	-
Bankfull Mean Depth (ft)	1.8	-	-	-	-	-	-	-
Bankfull Max Depth (ft)	4.0	-	-	-	-	-	-	-
Bankfull Cross-Sectional Area (ft ²)	42.3	-	-	-	-	-	-	-
Width/Depth Ratio	13.3	-	-	-	-	-	-	-
Entrenchment Ratio	3.0	-	-	-	-	-	-	-
Bank Height Ratio	1.0	-	-	-	-	-	-	-



Left Descending Bank

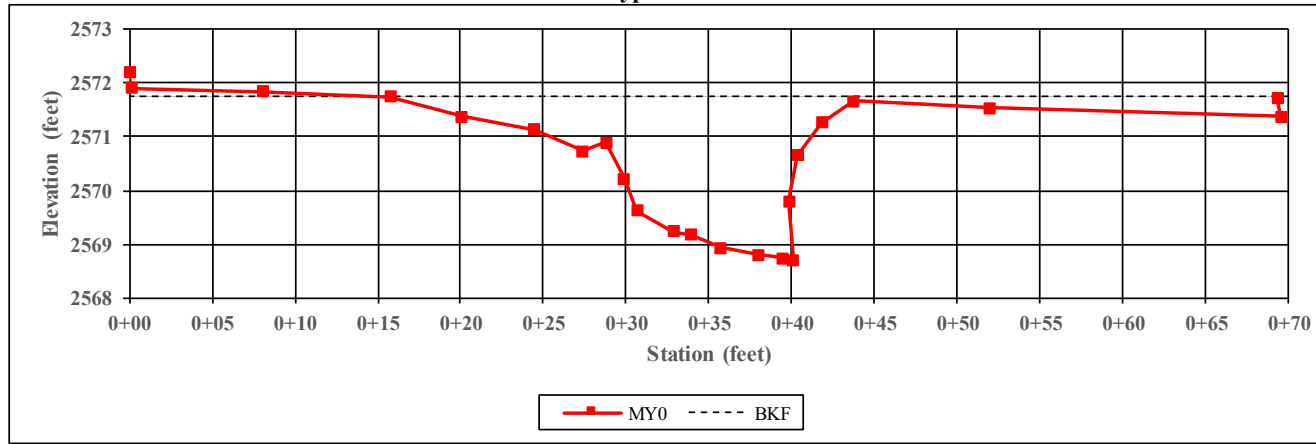


Right Descending Bank

Project Name: LPC II
Reach Name: Little Pine Creek

XS Number: 3
XS Type: Riffle

Station: 107+50



CHANNEL DIMENSIONS SUMMARY	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankful Width (ft)	28.0	-	-	-	-	-	-	-
Floodprone Width (ft)	100.0	-	-	-	-	-	-	-
Bankfull Mean Depth (ft)	1.3	-	-	-	-	-	-	-
Bankfull Max Depth (ft)	3.1	-	-	-	-	-	-	-
Bankfull Cross-Sectional Area (ft ²)	36.7	-	-	-	-	-	-	-
Width/Depth Ratio	21.4	-	-	-	-	-	-	-
Entrenchment Ratio	3.6	-	-	-	-	-	-	-
Bank Height Ratio	1.0	-	-	-	-	-	-	-



Left Descending Bank

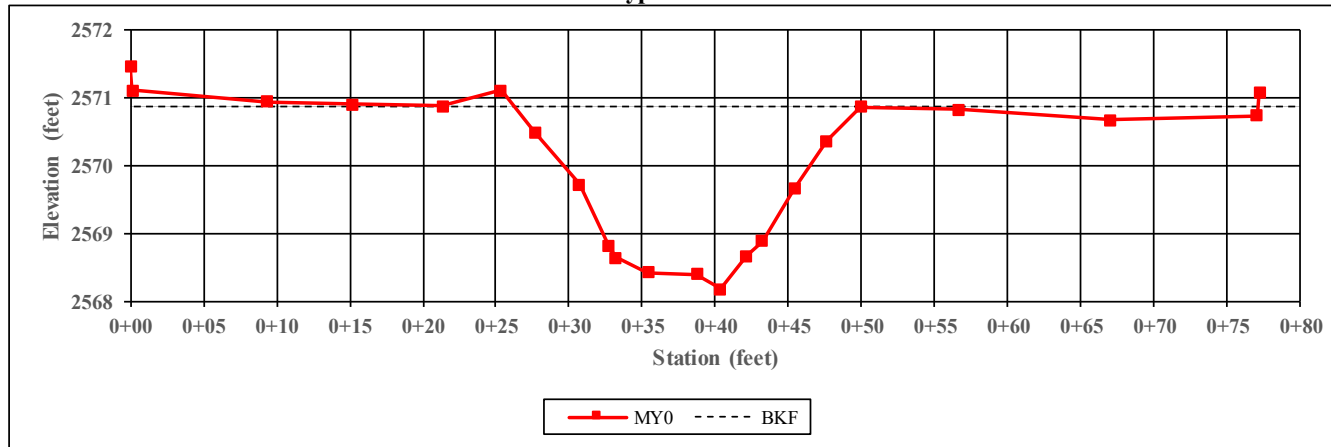


Right Descending Bank

Project Name: LPC II
Reach Name: Little Pine Creek

XS Number: 4
XS Type: Riffle

Station: 108+69



CHANNEL DIMENSIONS SUMMARY	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankful Width (ft)	21.3	-	-	-	-	-	-	-
Floodprone Width (ft)	100.0	-	-	-	-	-	-	-
Bankfull Mean Depth (ft)	1.7	-	-	-	-	-	-	-
Bankfull Max Depth (ft)	2.7	-	-	-	-	-	-	-
Bankfull Cross-Sectional Area (ft ²)	36.4	-	-	-	-	-	-	-
Width/Depth Ratio	12.5	-	-	-	-	-	-	-
Entrenchment Ratio	4.7	-	-	-	-	-	-	-
Bank Height Ratio	1.1	-	-	-	-	-	-	-



Left Descending Bank

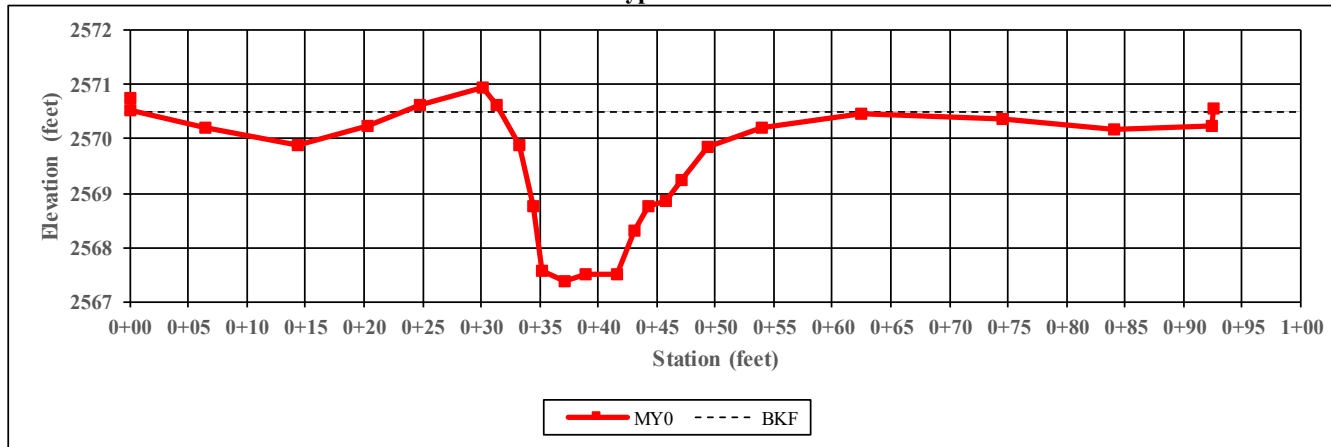


Right Descending Bank

Project Name: LPC II
Reach Name: Little Pine Creek

XS Number: 5
XS Type: Pool

Station: 109+64



CHANNEL DIMENSIONS SUMMARY	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankful Width (ft)	22.2	-	-	-	-	-	-	-
Floodprone Width (ft)	100.0	-	-	-	-	-	-	-
Bankfull Mean Depth (ft)	1.7	-	-	-	-	-	-	-
Bankfull Max Depth (ft)	3.1	-	-	-	-	-	-	-
Bankfull Cross-Sectional Area (ft ²)	37.9	-	-	-	-	-	-	-
Width/Depth Ratio	13.0	-	-	-	-	-	-	-
Entrenchment Ratio	4.5	-	-	-	-	-	-	-
Bank Height Ratio	1.1	-	-	-	-	-	-	-



Left Descending Bank

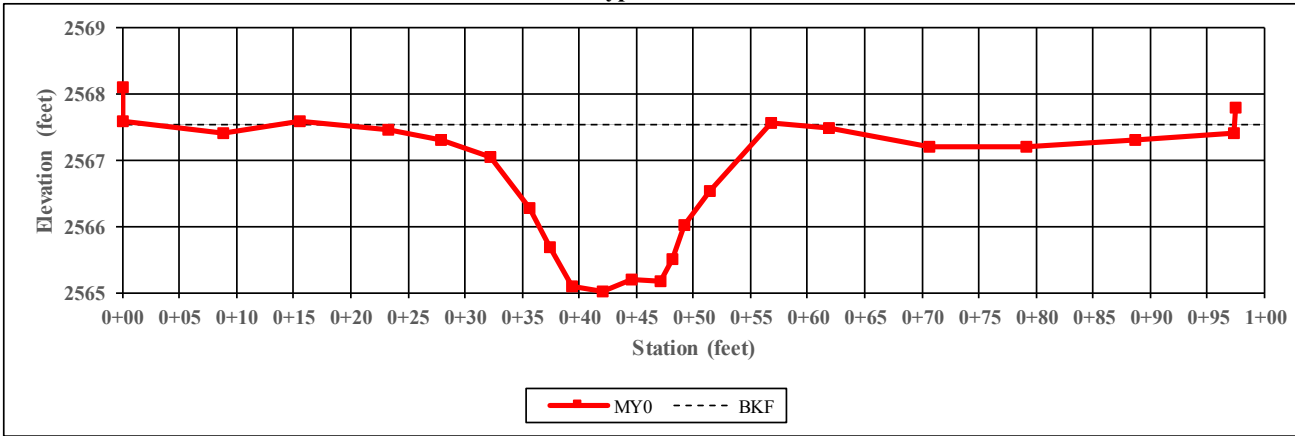


Right Descending Bank

Project Name: LPC II
Reach Name: Little Pine Creek

XS Number: 6
XS Type: Riffle

Station: 112+81



CHANNEL DIMENSIONS SUMMARY	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankful Width (ft)	23.5	-	-	-	-	-	-	-
Floodprone Width (ft)	100.0	-	-	-	-	-	-	-
Bankfull Mean Depth (ft)	1.6	-	-	-	-	-	-	-
Bankfull Max Depth (ft)	2.5	-	-	-	-	-	-	-
Bankfull Cross-Sectional Area (ft ²)	37.4	-	-	-	-	-	-	-
Width/Depth Ratio	14.7	-	-	-	-	-	-	-
Entrenchment Ratio	4.3	-	-	-	-	-	-	-
Bank Height Ratio	1.0	-	-	-	-	-	-	-



Left Descending Bank

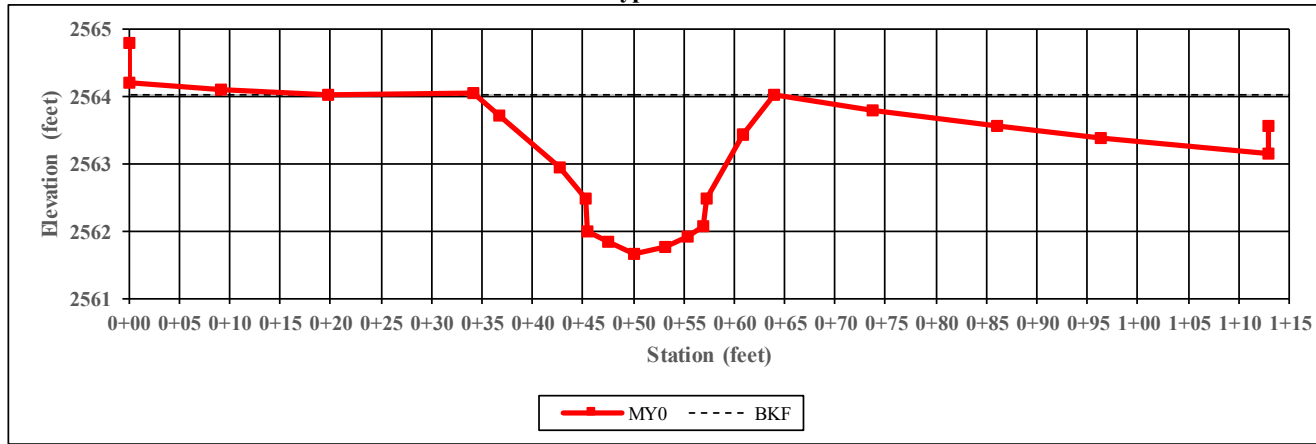


Right Descending Bank

Project Name: LPC II
Reach Name: Little Pine Creek

XS Number: 7
XS Type: Riffle

Station: 117+00



CHANNEL DIMENSIONS SUMMARY	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankful Width (ft)	29.7	-	-	-	-	-	-	-
Floodprone Width (ft)	100.0	-	-	-	-	-	-	-
Bankfull Mean Depth (ft)	1.3	-	-	-	-	-	-	-
Bankfull Max Depth (ft)	2.4	-	-	-	-	-	-	-
Bankfull Cross-Sectional Area (ft ²)	39.2	-	-	-	-	-	-	-
Width/Depth Ratio	22.5	-	-	-	-	-	-	-
Entrenchment Ratio	3.4	-	-	-	-	-	-	-
Bank Height Ratio	1.0	-	-	-	-	-	-	-



Left Descending Bank

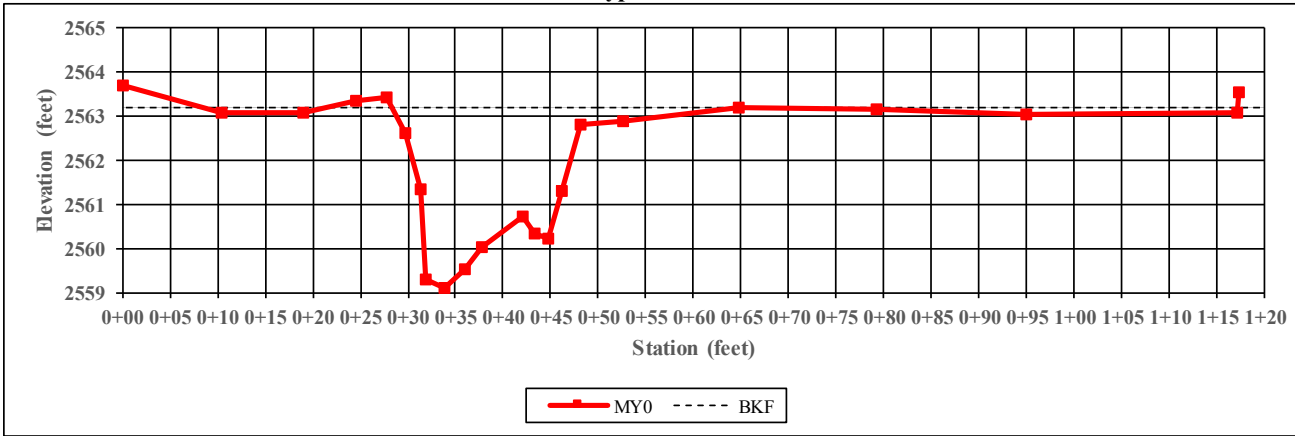


Right Descending Bank

Project Name: LPC II
Reach Name: Little Pine Creek

XS Number: 8
XS Type: Pool

Station: 117+79



CHANNEL DIMENSIONS SUMMARY	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankful Width (ft)	24.4	-	-	-	-	-	-	-
Floodprone Width (ft)	100.0	-	-	-	-	-	-	-
Bankfull Mean Depth (ft)	2.2	-	-	-	-	-	-	-
Bankfull Max Depth (ft)	4.1	-	-	-	-	-	-	-
Bankfull Cross-Sectional Area (ft ²)	53.2	-	-	-	-	-	-	-
Width/Depth Ratio	11.2	-	-	-	-	-	-	-
Entrenchment Ratio	4.1	-	-	-	-	-	-	-
Bank Height Ratio	1.0	-	-	-	-	-	-	-



Left Descending Bank

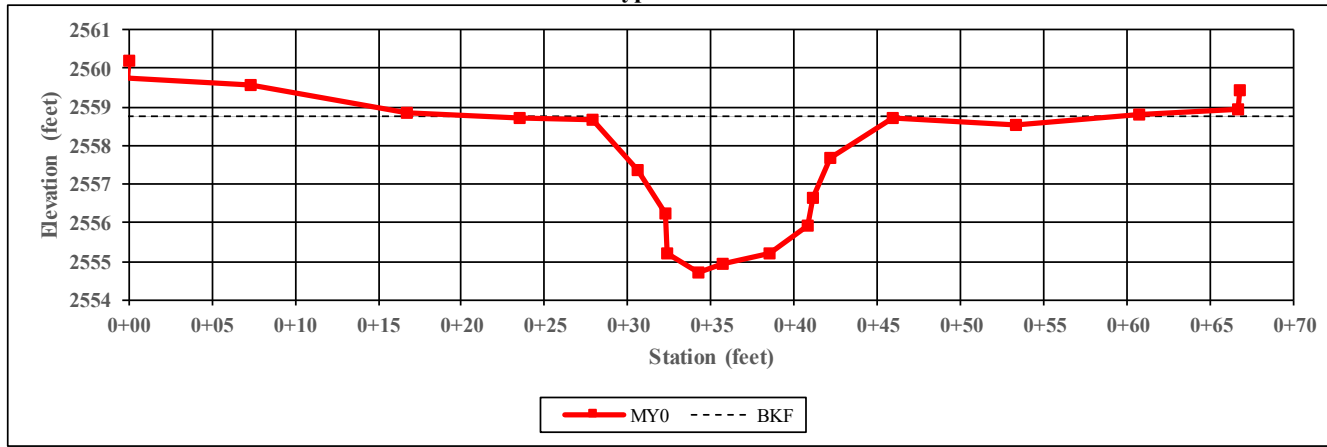


Right Descending Bank

Project Name: LPC II
Reach Name: Little Pine Creek

XS Number: 9
XS Type: Pool

Station: 122+77



CHANNEL DIMENSIONS SUMMARY	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankful Width (ft)	36.7	-	-	-	-	-	-	-
Floodprone Width (ft)	100.0	-	-	-	-	-	-	-
Bankfull Mean Depth (ft)	1.2	-	-	-	-	-	-	-
Bankfull Max Depth (ft)	4.1	-	-	-	-	-	-	-
Bankfull Cross-Sectional Area (ft ²)	42.3	-	-	-	-	-	-	-
Width/Depth Ratio	31.9	-	-	-	-	-	-	-
Entrenchment Ratio	2.7	-	-	-	-	-	-	-
Bank Height Ratio	1.0	-	-	-	-	-	-	-

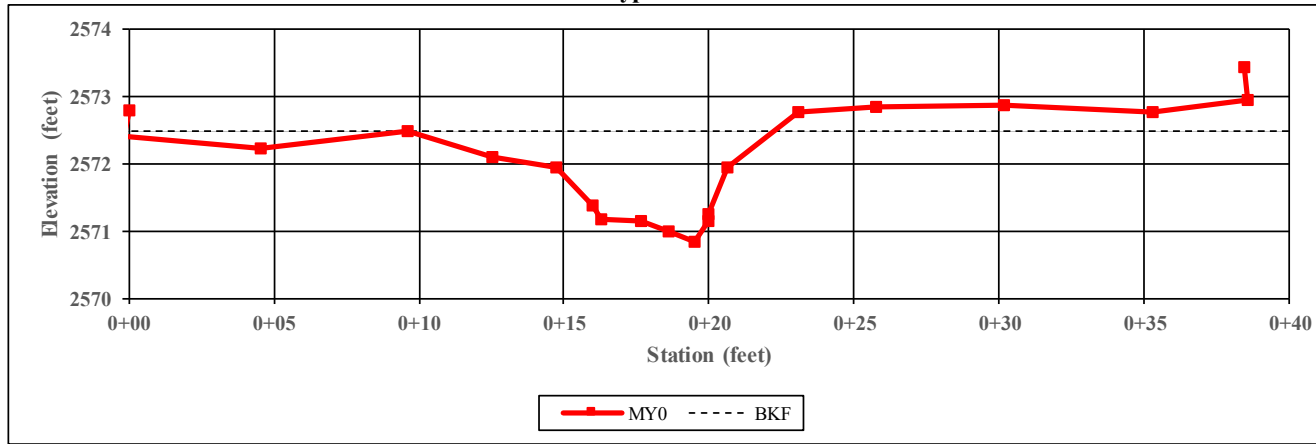


Looking Upstream XS9

Project Name: LPC II
Reach Name: Trib A

XS Number: 10
XS Type: Pool

Station: 200+31



CHANNEL DIMENSIONS SUMMARY	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankful Width (ft)	12.6	-	-	-	-	-	-	-
Floodprone Width (ft)	40.0	-	-	-	-	-	-	-
Bankfull Mean Depth (ft)	0.7	-	-	-	-	-	-	-
Bankfull Max Depth (ft)	1.6	-	-	-	-	-	-	-
Bankfull Cross-Sectional Area (ft ²)	9.2	-	-	-	-	-	-	-
Width/Depth Ratio	17.4	-	-	-	-	-	-	-
Entrenchment Ratio	3.2	-	-	-	-	-	-	-
Bank Height Ratio	1.2	-	-	-	-	-	-	-



Left Descending Bank

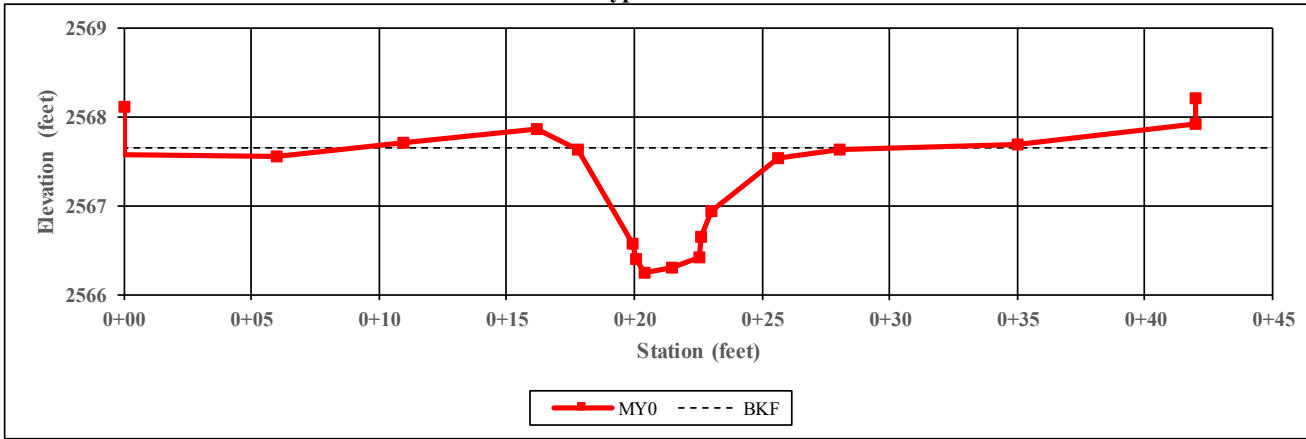


Right Descending Bank

Project Name: LPC II
Reach Name: Trib B

XS Number: 11
XS Type: Riffle

Station: 300+45



CHANNEL DIMENSIONS SUMMARY	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankful Width (ft)	10.4	-	-	-	-	-	-	-
Floodprone Width (ft)	30.0	-	-	-	-	-	-	-
Bankfull Mean Depth (ft)	0.6	-	-	-	-	-	-	-
Bankfull Max Depth (ft)	1.4	-	-	-	-	-	-	-
Bankfull Cross-Sectional Area (ft ²)	6.3	-	-	-	-	-	-	-
Width/Depth Ratio	17.2	-	-	-	-	-	-	-
Entrenchment Ratio	2.9	-	-	-	-	-	-	-
Bank Height Ratio	1.2	-	-	-	-	-	-	-



Left Descending Bank

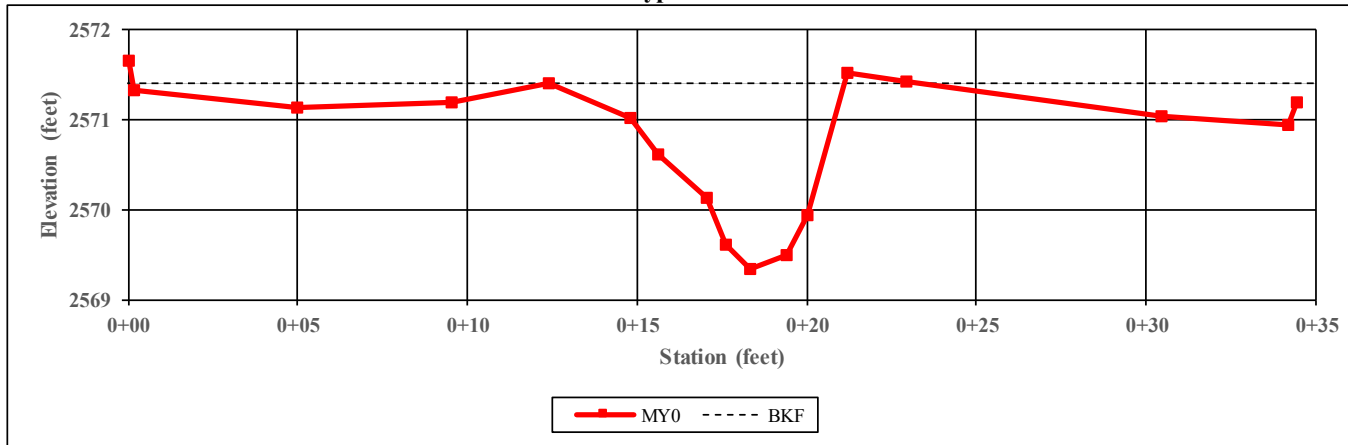


Right Descending Bank

Project Name: LPC II
Reach Name: Trib C

XS Number: 12
XS Type: Pool

Station: 402+52



CHANNEL DIMENSIONS SUMMARY	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankful Width (ft)	8.7	-	-	-	-	-	-	-
Floodprone Width (ft)	40.0	-	-	-	-	-	-	-
Bankfull Mean Depth (ft)	1.0	-	-	-	-	-	-	-
Bankfull Max Depth (ft)	2.1	-	-	-	-	-	-	-
Bankfull Cross-Sectional Area (ft ²)	8.7	-	-	-	-	-	-	-
Width/Depth Ratio	8.7	-	-	-	-	-	-	-
Entrenchment Ratio	4.6	-	-	-	-	-	-	-
Bank Height Ratio	1.0	-	-	-	-	-	-	-



Left Descending Bank

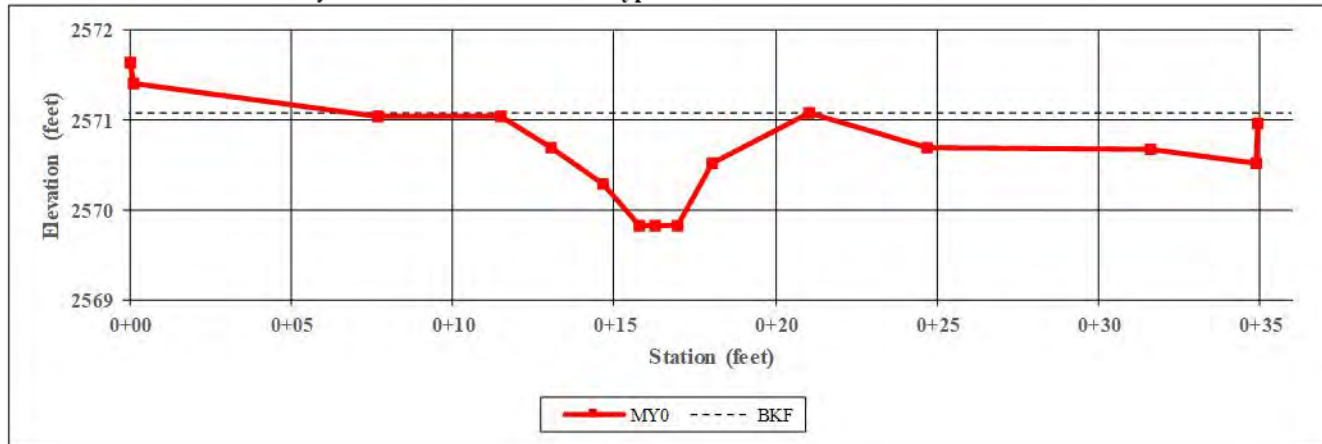


Right Descending Bank

Project Name: LPC II
Reach Name: Tributary C

XS Number: 13
XS Type: Riffle

Station: 402+75



CHANNEL DIMENSIONS SUMMARY	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankful Width (ft)	28.1	-	-	-	-	-	-	-
Floodprone Width (ft)	100.0	-	-	-	-	-	-	-
Bankfull Mean Depth (ft)	0.4	-	-	-	-	-	-	-
Bankfull Max Depth (ft)	1.3	-	-	-	-	-	-	-
Bankfull Cross-Sectional Area (ft ²)	11.1	-	-	-	-	-	-	-
Width/Depth Ratio	71.7	-	-	-	-	-	-	-
Entrenchment Ratio	3.6	-	-	-	-	-	-	-
Bank Height Ratio	1.0	-	-	-	-	-	-	-



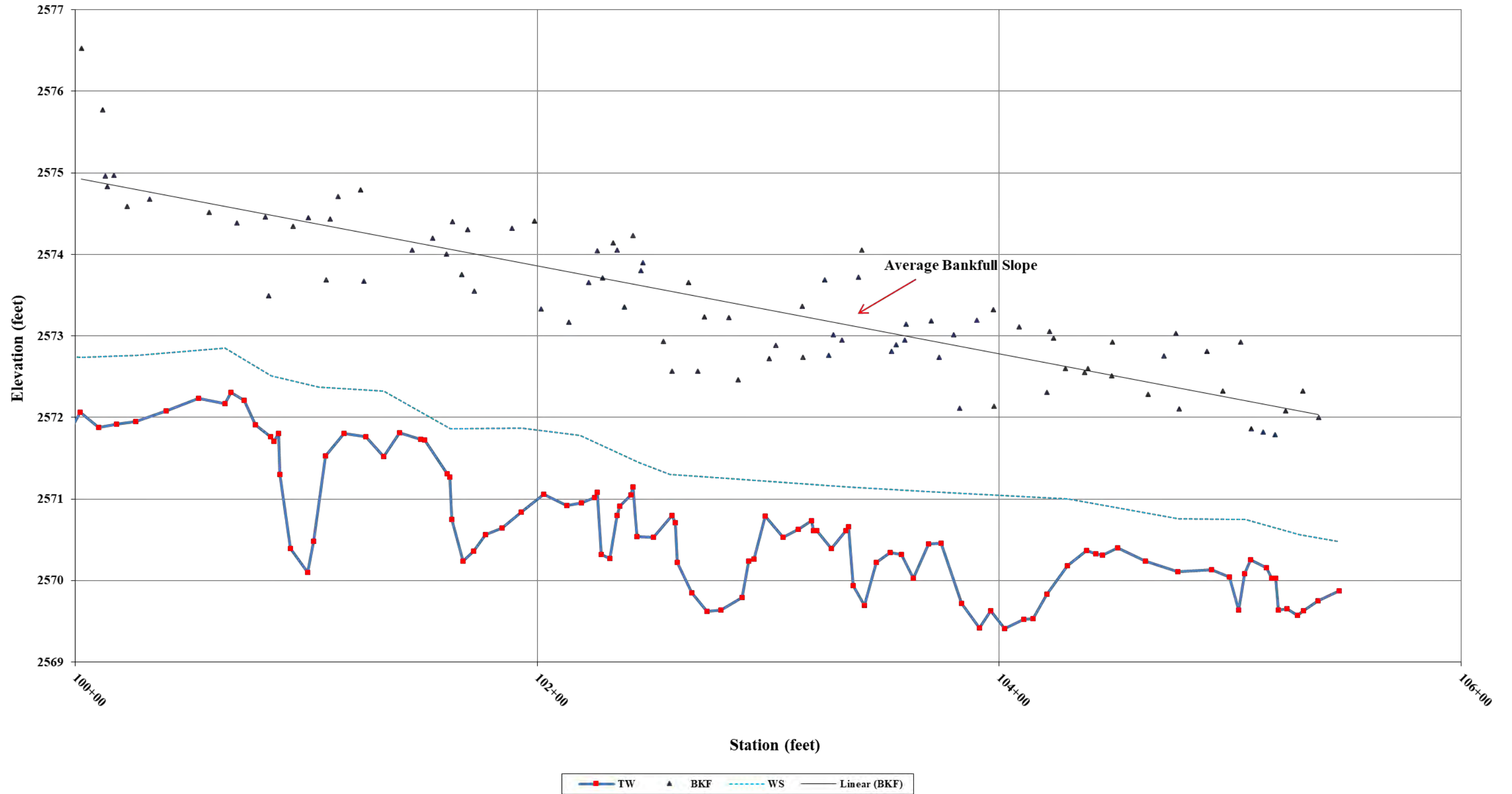
Left Descending Bank



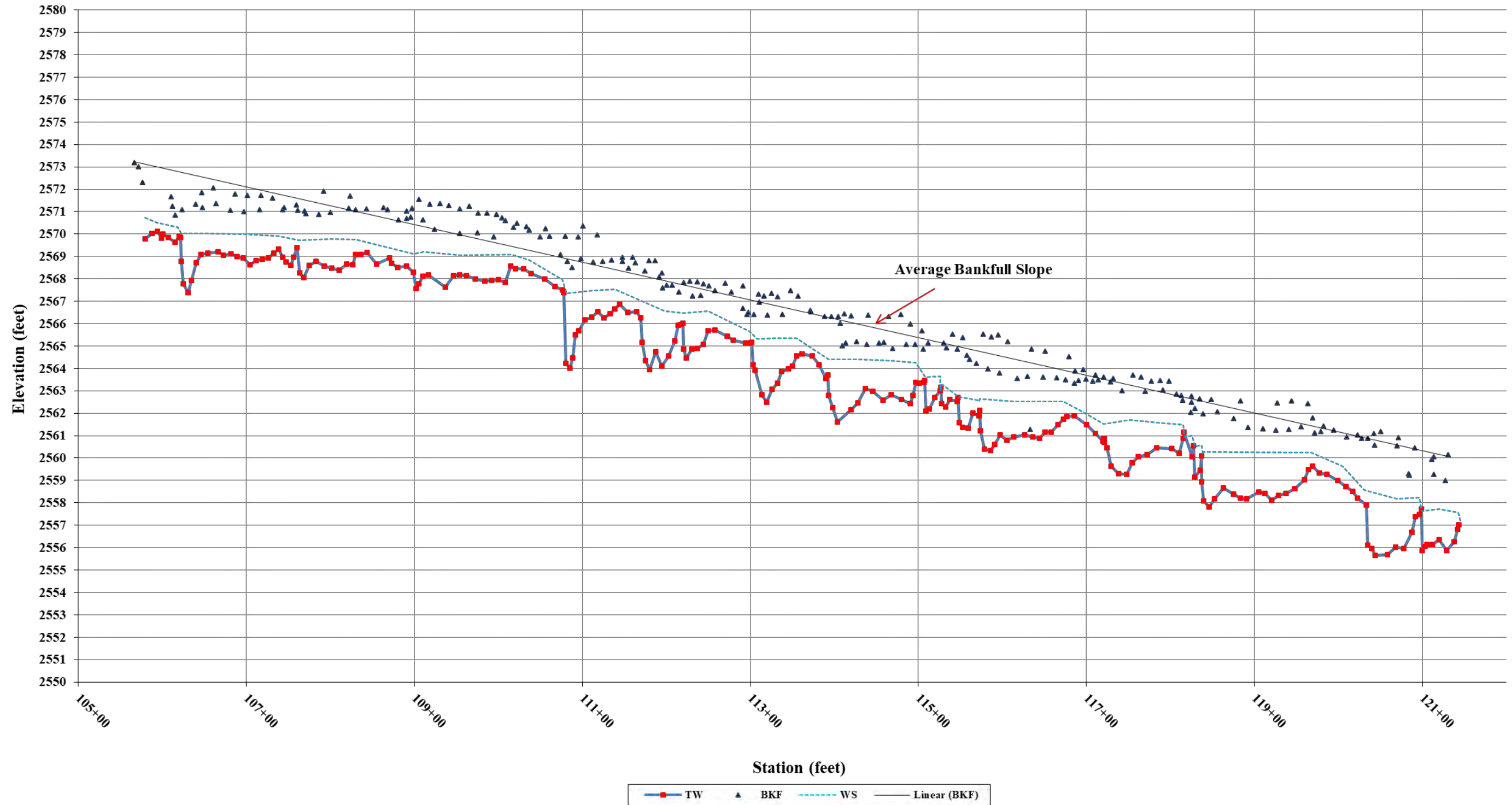
Right Descending Bank

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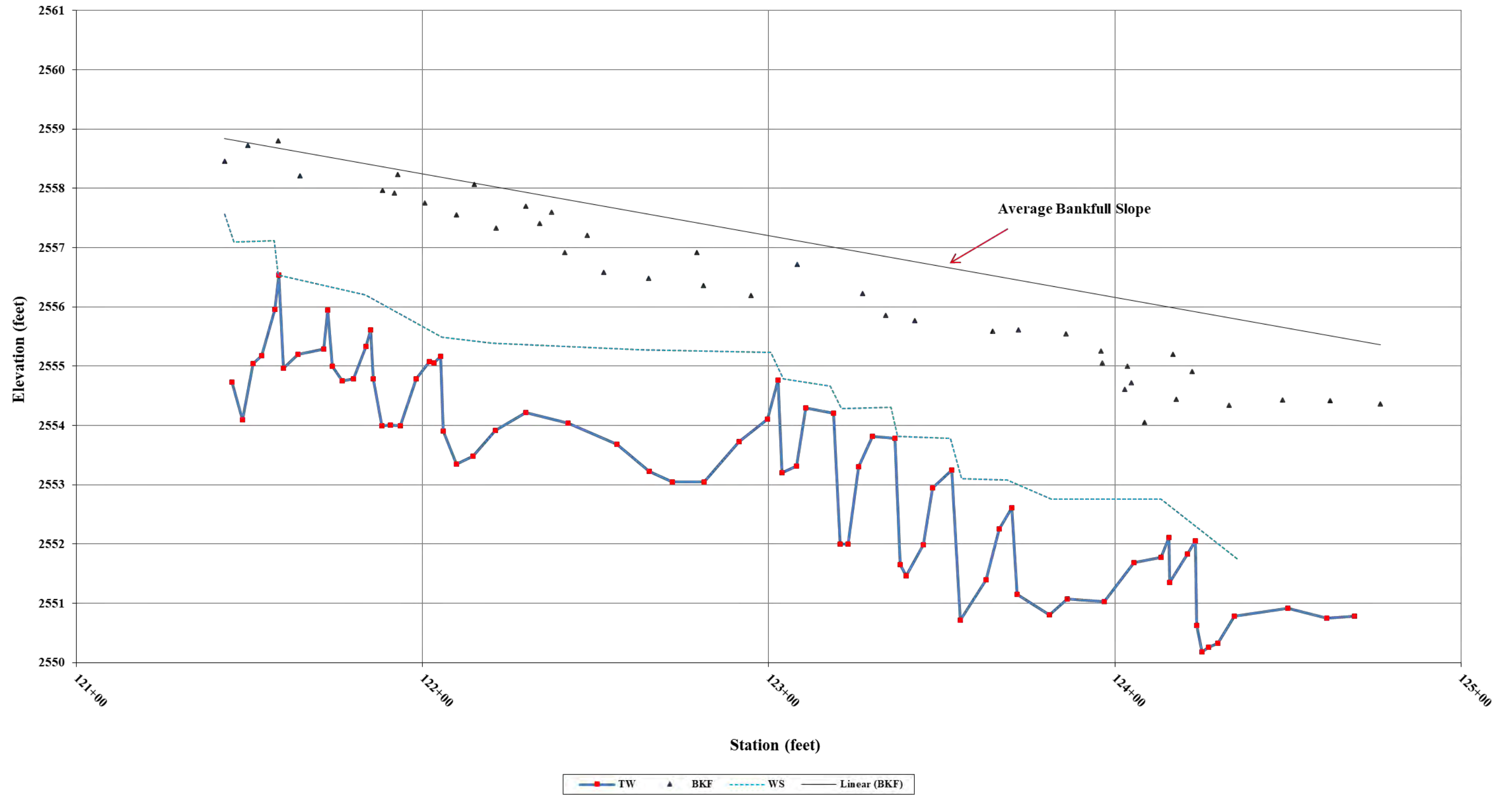
Little Pine Creek Reach 1 - Longitudinal Profile
Stationing 100+00 to 105+47



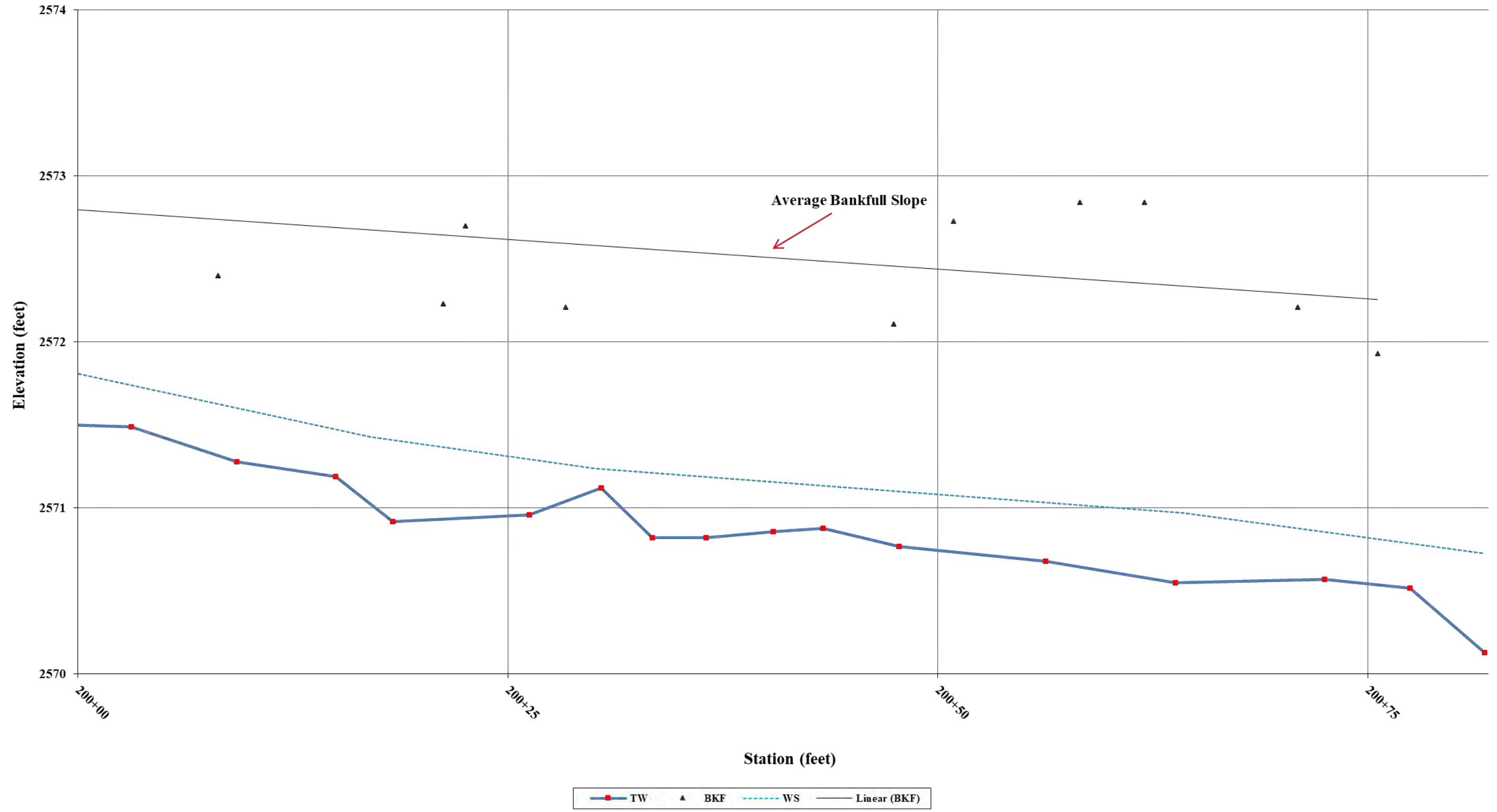
Little Pine Creek Reach 2A - Longitudinal Profile
Stationing 105+80 to 121+45



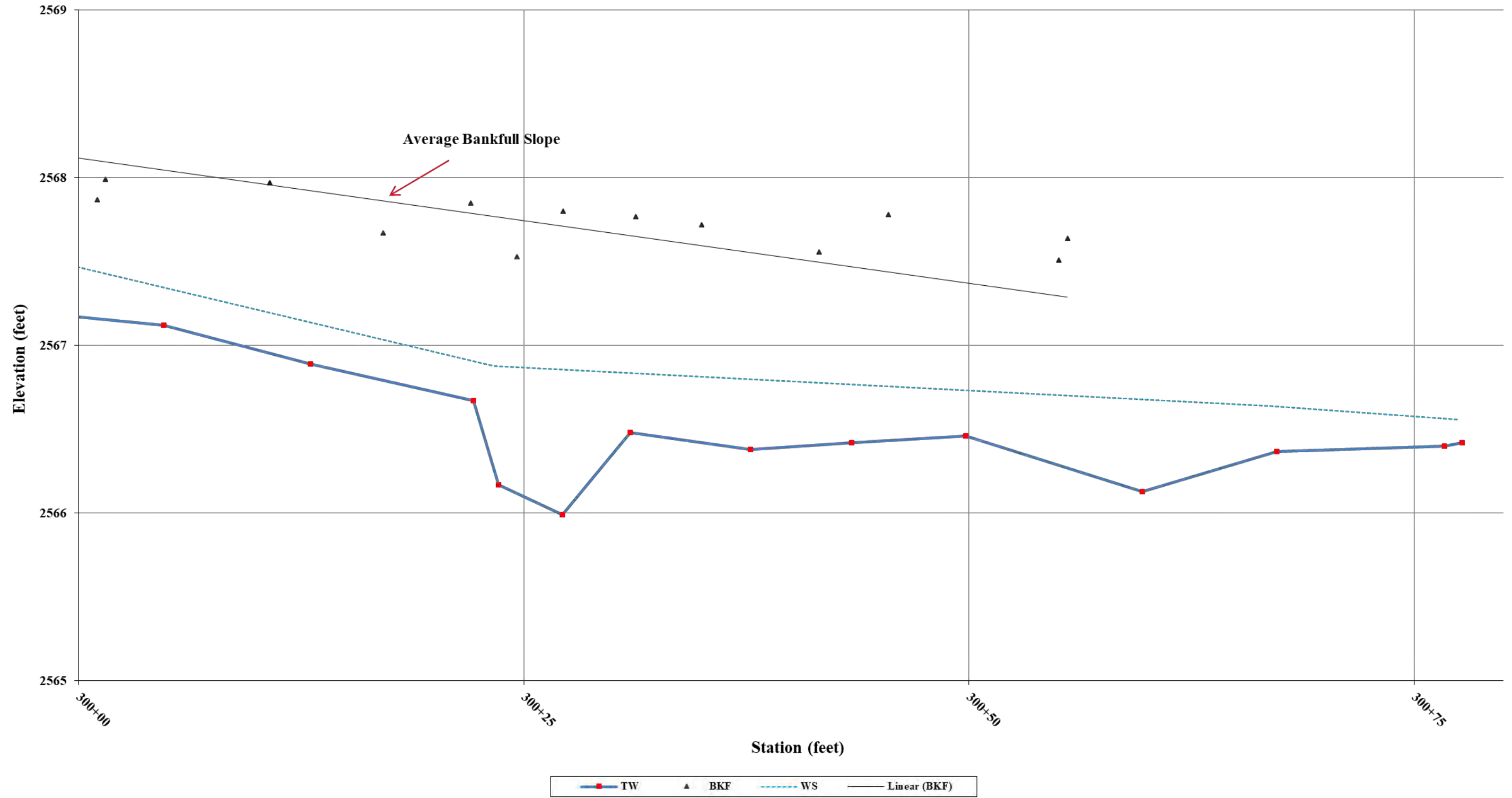
Little Pine Creek Reach 2B - Longitudinal Profile
Stationing 121+45 to 124+69



Little Pine Creek Trib A - Longitudinal Profile
Stationing 200+00 to 200+82



Little Pine Creek Trib B - Longitudinal Profile
Stationing 300+00 to 300+78



Little Pine Creek Trib C - Longitudinal Profile
Stationing 400+38 to 406+27

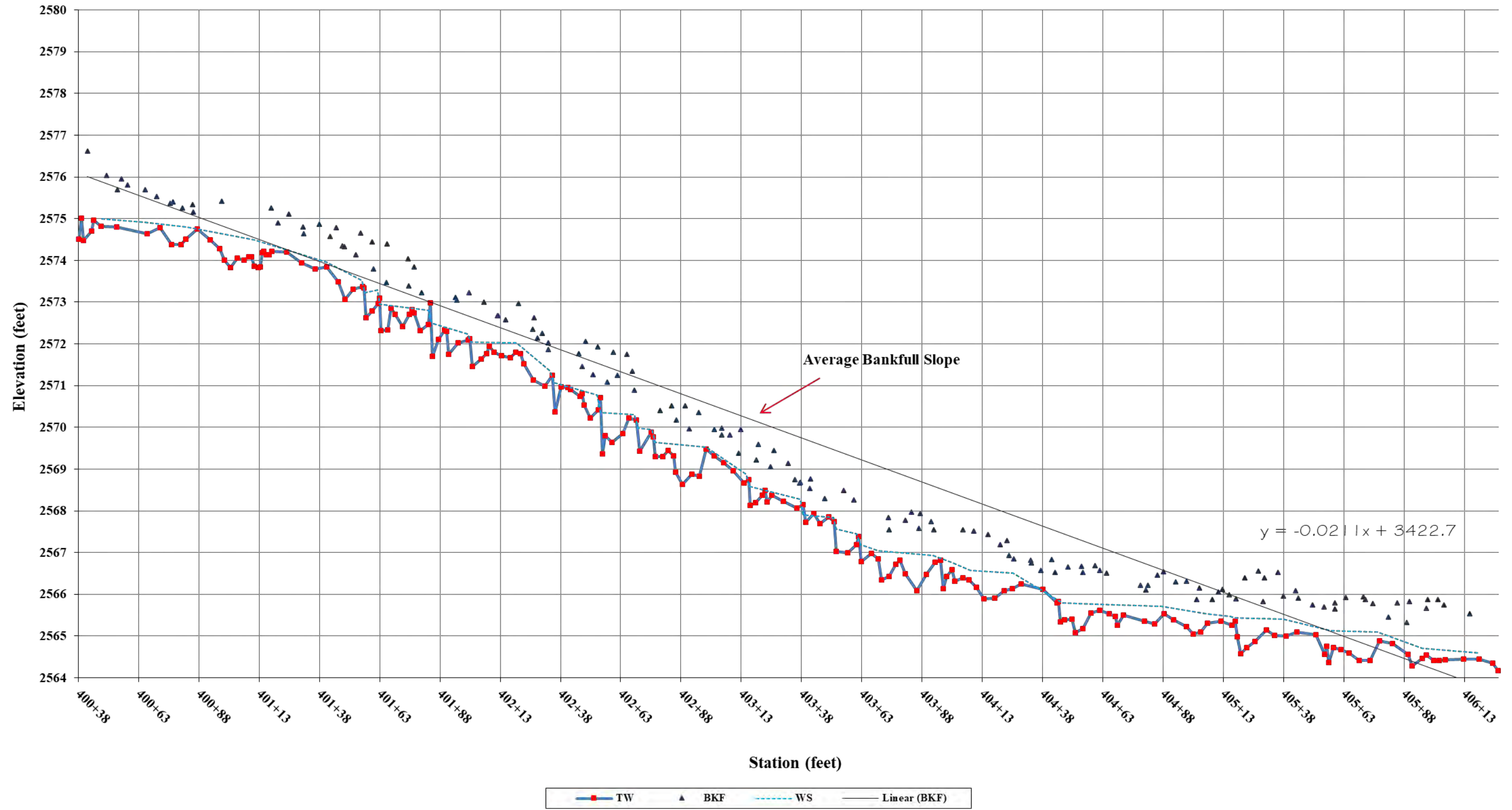


Table 7. Baseline Stream Data Summary
Little Pine Creek II Mitigation Site - Little Pine Creek Reach 1 (533 feet)

Parameter	Regional Curve			Pre-Existing Condition						Reference Reach Data						Design			As-Built / Baseline						
Dimension & Substrate - Riffle	LL	UL	Eq.	Min	Mean	Med	Max	SD	N	Min	Mean	Med	Max	SD	N	Min	Mean	Max	Min	Mean	Med	Max	SD	N	
Bankfull Width (ft)				-	23.7	-	-	-	1	16.4	-	-	21.4	-	2	-	24.0	-	-	25.5	-	-	-	-	1
Floodprone Width (ft)				-	100+	-	-	-	1	70.0	-	-	200	-	2	-	>50	-	-	100.0	-	-	-	-	1
Bankfull Mean Depth (ft)				-	1.9	-	-	-	1	1.9	-	-	2.1	-	2	-	1.7	-	-	1.2	-	-	-	-	1
Bankfull Max Depth (ft)				-	3.4	-	-	-	1	2.5	-	-	3.1	-	2	-	2.5	-	-	2.7	-	-	-	-	1
Bankfull Cross Sectional Area (ft ²)				-	45.6	-	-	-	1	18.0	-	-	27.2	-	2	-	41.3	-	-	31.6	-	-	-	-	1
Width/Depth Ratio				-	12.3	-	-	-	1	12.0	-	-	14.0	-	2	-	14.0	-	-	20.6	-	-	-	-	1
Entrenchment Ratio				-	4.1+	-	-	-	1	>2.2	-	-	>2.3	-	2	-	>2.2	-	-	3.9	-	-	-	-	1
Bank Height Ratio				-	1.4	-	-	-	1	1.0	-	-	1.1	-	2	-	1.0	-	-	1.1	-	-	-	-	1
d50 (mm)				-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Profile																									
Riffle Length (ft)				-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	36.4	58.4	52.5	80.1	19.8	12	
Riffle Slope (ft/ft)				-	-	-	-	-	-	-	-	-	-	-	-	0.006	0.010	0.013	0.003	0.004	0.004	0.005	0.001	12	
Pool Length (ft)				-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	16.4	25.0	26.5	32.2	6.0	5	
Pool Max Depth (ft)				-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.6	4.2	4.5	5.4	1.1	5	
Pool Spacing (ft)				-	-	-	-	-	-	-	-	-	-	-	-	36.0	87.0	138.0	66.1	105.5	107.1	128.2	25.3	5	
Pattern																									
Channel Belt Width (ft)				-	-	-	-	-	-	-	-	-	-	-	-	46.0	-	53.0	35.4	46.0	47.9	52.6	6.8	4.0	
Radius of Curvature (ft)				-	-	-	-	-	-	-	-	-	-	-	-	48.0	-	96.0	51.0	55.0	54.0	60.0	3.7	3.0	
Rc: Bankfull Width (ft/ft)				-	-	-	-	-	-	-	-	-	-	-	-	2.0	-	4.0	2.0	2.2	2.2	2.4	0.1	3.0	
Meander Wavelength (ft)				-	-	-	-	-	-	-	-	-	-	-	-	168.0	-	288.0	160.0	170.0	170.0	180.0	7.5	2.0	
Meander Width Ratio				-	-	-	-	-	-	-	-	-	-	-	-	2.0	-	5.0	1.4	1.8	1.9	2.1	0.3	4.0	
Substrate, Bed and Transport Parameters																									
Reach Shear Stress (Competency) lb/ft ²																			0.74						
Max Part Size (mm) Mobilized at Bankfull																			122						
Stream Power (Transport Capacity) W/m ²																			-						
Additional Reach Parameters																									
Drainage Area (mi ²)																			2.93						2.93
Rosgen Classification																			C4						C4
Bankfull Velocity (fps)																			3.4						-
Bankfull Discharge (cfs)																			140						-
Valley Length (ft)																			-						-
Channel Thalweg Length (ft)																			-						-
Sinuosity																			1.09						1.09
Water Surface Slope (ft/ft)																			-						0.004
Bankfull Slope (ft/ft)																			-						0.005
Bankfull Floodplain Area (acres)																			-						-
% of Reach with Eroding Banks																			-						-
Channel Stability or Habitat Metric																			-						-
Biological or Other																			-						-

Table 7. Baseline Stream Data Summary																									
Little Pine Creek II Mitigation Site - Little Pine Creek Reach 2A (1,506 feet)																									
Parameter	Regional Curve			Pre-Existing Condition					Reference Reach Data					Design			As-Built/ Baseline								
Dimension & Substrate - Riffle	LL	UL	Eq.	Min	Mean	Med	Max	SD	N	Min	Mean	Med	Max	SD	N	Min	Mean	Max	Min	Mean	Med	Max	SD	N	
Bankfull Width (ft)				-	31.9	-	-	-	1	16.4	-	-	21.4	-	2	-	24.0	-	21.3	24.8	23.5	29.7	3.5	3	
Floodprone Width (ft)				-	106+	-	-	-	1	70.0	-	-	200	-	2	-	>53	-	100.0	100.0	100.0	100.0	0.0	3	
Bankfull Mean Depth (ft)				-	1.9	-	-	-	1	1.9	-	-	2.1	-	2	-	1.6	-	1.3	1.5	1.6	1.7	0.2	3	
Bankfull Max Depth (ft)				-	3.4	-	-	-	1	2.5	-	-	3.1	-	2	-	2.3	-	2.4	2.5	2.5	2.7	0.1	3	
Bankfull Cross Sectional Area (ft ²)				-	45.6	-	-	-	1	18.0	-	-	27.2	-	2	-	39.3	-	36.4	37.6	37.4	39.2	1.2	3	
Width/Depth Ratio				-	12.3	-	-	-	1	12.0	-	-	14.0	-	2	-	14.6	-	12.5	16.6	14.7	22.5	4.3	3	
Entrenchment Ratio				-	4.1+	-	-	-	1	>2.2	-	-	>2.3	-	2	-	>2.2	-	3.4	4.1	4.3	4.7	0.5	3	
Bank Height Ratio				-	1.4	-	-	-	1	1.0	-	-	1.1	-	2	-	1.0	-	1.0	1.0	1.0	1.1	0.1	3	
d50 (mm)				-	72.0	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Profile																									
Riffle Length (ft)				-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	22.1	50.4	52.3	86.9	18.7	12	
Riffle Slope (ft/ft)				-	-	-	-	-	-	-	-	-	-	-	-	0.004	-	0.06	0.006	0.016	0.014	0.030	0.007	12	
Pool Length (ft)				-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	14.0	56.6	53.9	109.4	26.4	16	
Pool Max Depth (ft)				-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.6	4.6	4.1	7.3	1.6	16	
Pool Spacing (ft)				-	-	-	-	-	-	-	-	-	-	-	-	36	-	168	35.0	122.6	124.9	215.4	49.9	15	
Pattern																									
Channel Belt Width (ft)				-	-	-	-	-	-	-	-	-	-	-	-	48.0	-	120.0	52.5	86.4	86.2	109.4	15.8	8	
Radius of Curvature (ft)				-	-	-	-	-	-	-	-	-	-	-	-	48.0	-	96.0	54.2	63.6	61.5	78.8	8.3	7	
Rc: Bankfull Width (ft/ft)				-	-	-	-	-	-	-	-	-	-	-	-	2.0	-	4.0	2.2	2.6	2.5	3.2	0.3	7	
Meander Wavelength (ft)				-	-	-	-	-	-	-	-	-	-	-	-	168	-	288	172.9	242.1	232.3	301.3	39.6	8	
Meander Width Ratio				-	-	-	-	-	-	-	-	-	-	-	-	2	-	5.0	2.1	3.5	3.5	4.4	0.6	8	
Substrate, Bed and Transport Parameters																									
Reach Shear Stress (Competency) lb/ft ²																			0.74						
Max Part Size (mm) Mobilized at Bankfull																			122						
Stream Power (Transport Capacity) W/m ²																									
Additional Reach Parameters																									
Drainage Area (mi ²)						3.31						4.4						3.31					3.31		
Rosgen Classification						C/F						E4/C4						C4					4		
Bankfull Velocity (fps)						-						-						5.1					-		
Bankfull Discharge (cfs)						-						-						224					-		
Valley Length (ft)						-						-						-					1,840		
Channel Thalweg Length (ft)						-						-						-					1,479		
Sinuosity						-						-						1.1					1.24		
Water Surface Slope (ft/ft)						-						-						0.013					0.010		
Bankfull Slope (ft/ft)						-						-						0.011					0.010		
Bankfull Floodplain Area (acres)						-						-						-					-		
% of Reach with Eroding Banks						-						-						-					-		
Channel Stability or Habitat Metric						-						-						-					-		
Biological or Other						-						-						-					-		

**Table 7. Baseline Stream Data Summary
Little Pine Creek II Mitigation Site - Little Pine Creek Reach 2B (334 feet)**

Parameter	Regional Curve			Pre-Existing Condition					Reference Reach Data					Design			As-Built / Baseline								
Dimension & Substrate - Riffle	LL	UL	Eq.	Min	Mean	Med	Max	SD	N	Min	Mean	Med	Max	SD	N	Min	Mean	Max	Min	Mean	Med	Max	SD	N	
Bankfull Width (ft)	-	-	-	-	31.9	-	-	-	1	16.4	-	-	21.4	-	2	-	24.0	-							
Floodprone Width (ft)				-	106+	-	-	-	1	70.0	-	-	>200	-	2	-	>53	-							
Bankfull Mean Depth (ft)				-	1.9	-	-	-	1	1.9	-	-	2.1	-	2	-	1.6	-							
Bankfull Max Depth (ft)				-	3.4	-	-	-	1	2.5	-	-	3.1	-	2	-	2.3	-							
Bankfull Cross Sectional Area (ft ²)				-	45.6	-	-	-	1	18.0	-	-	27.2	-	2	-	39.3	-							
Width/Depth Ratio				-	12.3	-	-	-	1	12.0	-	-	14.0	-	2	-	14.6	-							
Entrenchment Ratio				-	4.1+	-	-	-	1	>2.2	-	-	>2.3	-	2	-	>2.2	-							
Bank Height Ratio				-	1.4	-	-	-	1	1.0	-	-	1.1	-	2	-	1.0	-							
d50 (mm)				-	72.0	-	-	-	1	-	-	-	-	-	-	-	-	-							
Profile																									
Riffle Length (ft)				-	-	-	-	-	-	-	-	-	-	-	-				36.9	50.2	50.2	63.5	18.8	2	
Riffle Slope (ft/ft)				-	-	-	-	-	-	-	0.024	-	-	-	0.004	-	0.06	0.02	0.02	0	0.02	0	0.02	0	2
Pool Length (ft)				-	-	-	-	-	-	-	-	-	-	-	-				14.0	54.6	47.5	109.4	43.4	4	
Pool Max Depth (ft)				-	-	-	-	-	-	-	3.1	-	-	-	-				6.2	6.7	6.7	7.3	0.5	4	
Pool Spacing (ft)				-	-	-	-	-	-	-	224	-	-	-	-	36	-	168	35.0	90.2	96.3	133.2	46.6	4	
Pattern																									
Channel Belt Width (ft)				-	-	-	-	-	-	105.0	-	-	-	-	48.0	-	120.0	-	83.5	-	-	-	-	1	
Radius of Curvature (ft)				-	-	-	-	-	-	76.7	-	-	133.8	-	48.0	-	96.0	-	70.9	-	-	-	-	1	
Rc: Bankfull Width (ft/ft)				-	-	-	-	-	-	2.5	-	-	4.36	-	2.0	-	4.0	-	2.9	-	-	-	-	1	
Meander Wavelength (ft)				-	-	-	-	-	-	350	-	-	-	-	168	-	288	-	256.3	-	-	-	-	1	
Meander Width Ratio				-	-	-	-	-	-	3.2	-	-	-	-	2	-	5.0	-	3.4	-	-	-	-	1	
Substrate, Bed and Transport Parameters																									
Reach Shear Stress (Competency) lb/ft ²						-					-					0.74			-						
Max Part Size (mm) Mobilized at Bankfull						-					-					122			-						
Stream Power (Transport Capacity) W/m ²						-					-					-			-						
Additional Reach Parameters																									
Drainage Area (mi ²)						3.34					4.4					3.34			3.34						
Rosgen Classification						C/F					E4/C4					C4			C4						
Bankfull Velocity (fps)						-					5.1					4.5			-						
Bankfull Discharge (cfs)						-					224					170			-						
Valley Length (ft)						-					-					-			282						
Channel Thalweg Length (ft)						-					-					-			334						
Sinuosity						-					1.1					1.23			1.18						
Water Surface Slope (ft/ft)						-					-					0.013			0.017						
Bankfull Slope (ft/ft)						-					-					0.011			0.010						
Bankfull Floodplain Area (acres)						-					-					-			-						
% of Reach with Eroding Banks						-					-					-			-						
Channel Stability or Habitat Metric						-					-					-			-						
Biological or Other						-					-					-			-						

Table 7. Baseline Stream Data Summary
Little Pine Creek II Mitigation Site - Little Pine Creek Tributary C (577 feet)

Parameter	Regional Curve			Pre-Existing Condition							Reference Reach Data							Design			As-Built/ Baseline						
Dimension & Substrate - Riffle	LL	UL	Eq.	Min	Mean	Med	Max	SD	N	Min	Mean	Med	Max	SD	N	Min	Mean	Max	Min	Mean	Med	Max	SD	N			
Bankfull Width (ft)				-	8.0	-	-	-	1	6.2	6.8	-	12.6	5.8	2	-	6.5	-	-	9.3	-	-	-	-	1		
Floodprone Width (ft)				-	16.9	-	-	-	1	14.3	23.7	-	46.3	22.7	2	-	>13	-	-	40.0	-	-	-	-	1		
Bankfull Mean Depth (ft)				-	0.9	-	-	-	1	0.05	0.8	-	0.7	0.16	2	-	0.5	-	-	0.6	-	-	-	-	1		
Bankfull Max Depth (ft)				-	1.6	-	-	-	1	0.8	1.0	-	1.03	0.02	2	-	0.7	-	-	1.2	-	-	-	-	1		
Bankfull Cross Sectional Area (ft ²)				-	7.1	-	-	-	1	3.8	3.1	-	5.1	2.05	2	-	3.1	-	-	5.3	-	-	-	-	1		
Width/Depth Ratio				-	8.9	-	-	-	1	9.1	12.7	-	24.3	11.7	2	-	13.7	-	-	16.4	-	-	-	-	1		
Entrenchment Ratio				-	2.1	-	-	-	1	1.3	4.3	-	7.5	3.25	2	-	>2.2	-	-	4.3	-	-	-	-	1		
Bank Height Ratio				-	2.0	-	-	-	1	1.0	1.6	-	2.1	0.55	2	-	1.0	-	-	1.0	-	-	-	-	1		
d50 (mm)				-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
Profile				-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9.4	24.3	20.2	52.9	13.4	13			
Riffle Length (ft)				-	-	-	-	-	-	0.04	-	-	0.05	-	2	0.023	-	0.042	0.005	0.021	0.010	0.042	0.013	13			
Riffle Slope (ft/ft)				-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3.5	12.3	12.4	21.1	5.7	15			
Pool Length (ft)				-	-	-	-	-	-	0.7	1.7	1.9	2.5	0.7	4	-	0.7	-	0.6	1.5	1.3	2.6	0.8	15			
Pool Max Depth (ft)				-	-	-	-	-	-	15.8	61.4	78	90.5	32.7	3	10.0	-	46.0	15.7	33.3	28.1	56.6	14.1	14			
Pool Spacing (ft)				-	-	-	-	-	-	19.0	-	-	26.0	-	2	13.0	-	46.0	13.3	24.2	23.8	32.1	4.9	13			
Channel Belt Width (ft)				-	-	-	-	-	-	22.0	-	-	66.0	-	2	13.0	-	26.0	9.3	14.3	13.3	25.8	4.0	13			
Radius of Curvature (ft)				-	-	-	-	-	-	2.65	-	-	8.75	-	2	2.0	-	4.0	1.00	1.54	1.43	2.77	0.43	13			
Rc: Bankfull Width (ft/ft)				-	-	-	-	-	-	55	-	-	140	-	2	46	-	78	44.3	59.0	58.7	75.5	11.0	8			
Meander Wavelength (ft)				-	-	-	-	-	-	7.3	-	-	18.6	-	2	2.0	-	5.0	1.4	2.5	2.5	3.5	0.6	13			
Meander Width Ratio				-	-	-	-	-	-																		
Substrate, Bed and Transport Parameters																											
Reach Shear Stress (Competency) lb/ft ²																											
Max Part Size (mm) Mobilized at Bankfull																											
Stream Power (Transport Capacity) W/m ²																											
Additional Reach Parameters																											
Drainage Area (mi ²)										0.11			0.051; 0.12		0.11									0.11			
Rosgen Classification										G			B4/C4; A/B4		C									C			
Bankfull Velocity (fps)										-			-		2.9									-			
Bankfull Discharge (cfs)										-			-		10.0									-			
Valley Length (ft)										-			-		-									1,616			
* Channel Thalweg Length (ft)										-			-		-									577			
^ Channel Centerline										-			-		-									-			
Sinuosity										-			-		-			1.23						1.31			
Water Surface Slope (ft/ft)										-			-		-			-						0.022			
Bankfull Slope (ft/ft)										-			-		-			-						0.021			
Bankfull Floodplain Area (acres)										-			-		-			-						-			
% of Reach with Eroding Banks										-			-		-			-						-			
Channel Stability or Habitat Metric										-			-		-			-						-			
Biological or Other										-			-		-			-						-			

**Table 9. Monitoring Data - Stream Reach Data Summary
LPCII - Little Pine Creek Reach 1 (533 feet)**

Parameter	Baseline						MY - 1						MY - 2						MY - 3						MY - 5						MY - 7					
	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n
Bankfull Width (ft)	-	25.5	-	-	-	1																														
Floodprone Width (ft)	-	100.0	-	-	-	1																														
Bankfull Mean Depth (ft)	-	1.2	-	-	-	1																														
Bankfull Max Depth (ft)	-	2.7	-	-	-	1																														
Bankfull Cross-Sectional Area (ft ²)	-	31.6	-	-	-	1																														
Width/Depth Ratio	-	20.6	-	-	-	1																														
Entrenchment Ratio	-	3.9	-	-	-	1																														
Bank Height Ratio	-	1.1	-	-	-	1																														
Profile																																				
Riffle Length (ft)	36.4	58.4	52.5	80.1	19.8	12																														
Riffle Slope (ft/ft)	0.003	0.004	0.004	0.005	0.001	12																														
Pool Length (ft)	16.4	25.0	26.5	32.2	6.0	5																														
Pool Max Depth (ft)	2.6	4.2	4.5	5.4	1.1	5																														
Pool Spacing (ft)	66.1	105.5	107.1	128.2	25.3	5																														
Pattern																																				
Channel Belt Width (ft)	35.4	46.0	47.9	52.6	6.8	4																														
Radius of Curvature (ft)	51.0	55.0	54.0	60.0	3.7	3																														
Rc: Bankfull Width (ft/ft)	2.0	2.2	2.2	2.4	0.1	3																														
Meander Wavelength (ft)	160.0	170.0	170.0	180.0	7.5	2																														
Meander Width Ratio	1.4	1.8	1.9	2.1	0.3	4																														
Additional Reach Parameters																																				
Rosgen Classification	C4																																			
Channel Thalweg Length (ft)	533																																			
Sinuosity (ft)	1.11																																			
Water Surface Slope (Channel) (ft/ft)	0.004																																			
Bankfull Slope (ft/ft)	0.005																																			
Ri% / Ru% / P% / G% / S%	50%	10%	21%	19%	0%																															

**Table 9 Cont'd. Monitoring Data - Stream Reach Data Summary
Little Pine Creek II - Little Pine Creek Reach 2A (1,506 feet)**

Parameter	Baseline						MY - 1						MY - 2						MY - 3						MY - 5						MY - 7					
	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n
Dimension & Substrate - Riffle																																				
Bankfull Width (ft)	21.3	24.8	23.5	29.7	3.5	3																														
Floodprone Width (ft)	100.0	100.0	100.0	100.0	0.0	3																														
Bankfull Mean Depth (ft)	1.3	1.5	1.6	1.7	0.2	3																														
Bankfull Max Depth (ft)	2.4	2.5	2.5	2.7	0.1	3																														
Bankfull Cross-Sectional Area (ft ²)	36.4	37.6	37.4	39.2	1.2	3																														
Width/Depth Ratio	12.5	16.6	14.7	22.5	4.3	3																														
Entrenchment Ratio	3.4	4.1	4.3	4.7	0.5	3																														
Bank Height Ratio	1.0	1.0	1.0	1.1	0.1	3																														
Profile																																				
Riffle Length (ft)	22.1	50.4	52.3	86.9	18.7	12																														
Riffle Slope (ft/ft)	0.006	0.016	0.014	0.030	0.007	12																														
Pool Length (ft)	14.0	56.6	53.9	109.4	26.4	16																														
Pool Max Depth (ft)	1.6	4.6	4.1	7.3	1.6	16																														
Pool Spacing (ft)	35.0	122.6	124.9	215.4	49.9	15																														
Pattern																																				
Channel Belt Width (ft)	52.5	86.4	86.2	109.4	15.8	8																														
Radius of Curvature (ft)	54.2	63.6	61.5	78.8	8.3	7																														
Re: Bankfull Width (ft/ft)	2.2	2.6	2.5	3.2	0.3	7																														
Meander Wavelength (ft)	172.9	242.1	232.3	301.3	39.6	8																														
Meander Width Ratio	2.1	3.5	3.5	4.4	0.6	8																														
Additional Reach Parameters																																				
Rosgen Classification				C4																																
Channel Thalweg Length (ft)				1,506																																
Sinuosity (ft)				1.24																																
Water Surface Slope (Channel) (ft/ft)				0.0099																																
Bankfull Slope (ft/ft)				0.0082																																
Ri% / Ru% / P% / G% / S%	32%	3%	48%	16%	0%																															

**Table 9 Cont'd. Monitoring Data - Stream Reach Data Summary
LPC II - Trib B (78 feet)**

Parameter	Baseline						MY - 1						MY - 2						MY - 3						MY - 5						MY - 7					
	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n
Dimension & Substrate - Riffle																																				
Bankfull Width (ft)	-	9.3	-	-	-	1																														
Floodprone Width (ft)	-	40.0	-	-	-	1																														
Bankfull Mean Depth (ft)	-	0.6	-	-	-	1																														
Bankfull Max Depth (ft)	-	1.2	-	-	-	1																														
Bankfull Cross-Sectional Area (ft ²)	-	5.3	-	-	-	1																														
Width/Depth Ratio	-	16.4	-	-	-	1																														
Entrenchment Ratio	-	4.3	-	-	-	1																														
Bank Height Ratio	-	1.0	-	-	-	1																														
Profile																																				
Riffle Length (ft)	19.4	21.0	21.0	22.6	2.3	2																														
Riffle Slope (ft/ft)	0.005	0.015	0.015	0.025	0.014	2																														
Pool Length (ft)	4.2	9.2	9.2	14.1	7.0	2																														
Pool Max Depth (ft)	1.1	1.4	1.4	1.7	0.4	2																														
Pool Spacing (ft)	-	32.5	-	-	-	1																														
Pattern																																				
Channel Belt Width (ft)	-	5.5	-	-	-	1																														
Radius of Curvature (ft)	21.8	24.6	-	27.3	-	2																														
Rc: Bankfull Width (ft/ft)	2.1	2.4	-	2.6	-	2																														
Meander Length (ft)	-	-	-	-	-	-																														
Meander Length Ratio (L_m/W_{bf}) (ft)	-	-	-	-	-	-																														
Additional Reach Parameters																																				
Rosgen Classification				C5																																
Channel Thalweg Length (ft)				78																																
Sinuosity (ft)				1.03																																
Water Surface Slope (Channel) (ft/ft)				0.0150																																
Bankfull Slope (ft/ft)				0.0080																																
Ri% / Ru% / P% / G% / S%	54%	6%	24%	16%	0%																															

**Table 9 Cont'd. Monitoring Data - Stream Reach Data Summary
LPC II - Trib C (577 feet)**

Parameter	Baseline						MY - 1						MY - 2						MY - 3						MY - 5						MY - 7					
	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n
Dimension & Substrate - Riffle																																				
Bankfull Width (ft)	-	9.3	-	-	-	1																														
Floodprone Width (ft)	-	40.0	-	-	-	1																														
Bankfull Mean Depth (ft)	-	0.6	-	-	-	1																														
Bankfull Max Depth (ft)	-	1.2	-	-	-	1																														
Bankfull Cross-Sectional Area (ft ²)	-	5.3	-	-	-	1																														
Width/Depth Ratio	-	16.4	-	-	-	1																														
Entrenchment Ratio	-	4.3	-	-	-	1																														
Bank Height Ratio	-	1.0	-	-	-	1																														
Profile																																				
Riffle Length (ft)	9.4	24.3	20.2	52.9	13.4	13																														
Riffle Slope (ft/ft)	0.005	0.021	0.010	0.042	0.013	10																														
Pool Length (ft)	3.5	12.3	12.4	21.1	5.7	15																														
Pool Max Depth (ft)	0.6	1.5	1.3	2.6	0.8	17																														
Pool Spacing (ft)	15.7	33.3	28.1	56.6	14.1	14																														
Pattern																																				
Channel Belt Width (ft)	13.3	24.2	23.8	32.1	4.9	13																														
Radius of Curvature (ft)	9.3	14.3	13.3	25.8	4.0	13																														
Rc: Bankfull Width (ft/ft)	1.0	1.5	1.4	2.8	0.4	13																														
Meander Wavelength (ft)	44.3	59.0	58.7	75.5	11.0	8																														
Meander Width Ratio	1.4	2.5	2.5	3.5	0.6	13																														
Additional Reach Parameters																																				
Rosgen Classification				C4																																
Channel Thalweg Length (ft)				577																																
Sinuosity (ft)				1.31																																
Water Surface Slope (Channel) (ft/ft)				0.022																																
Bankfull Slope (ft/ft)				0.021																																
Ri% / Ru% / P% / G% / S%	54%	7%	31%	6%	2%																															

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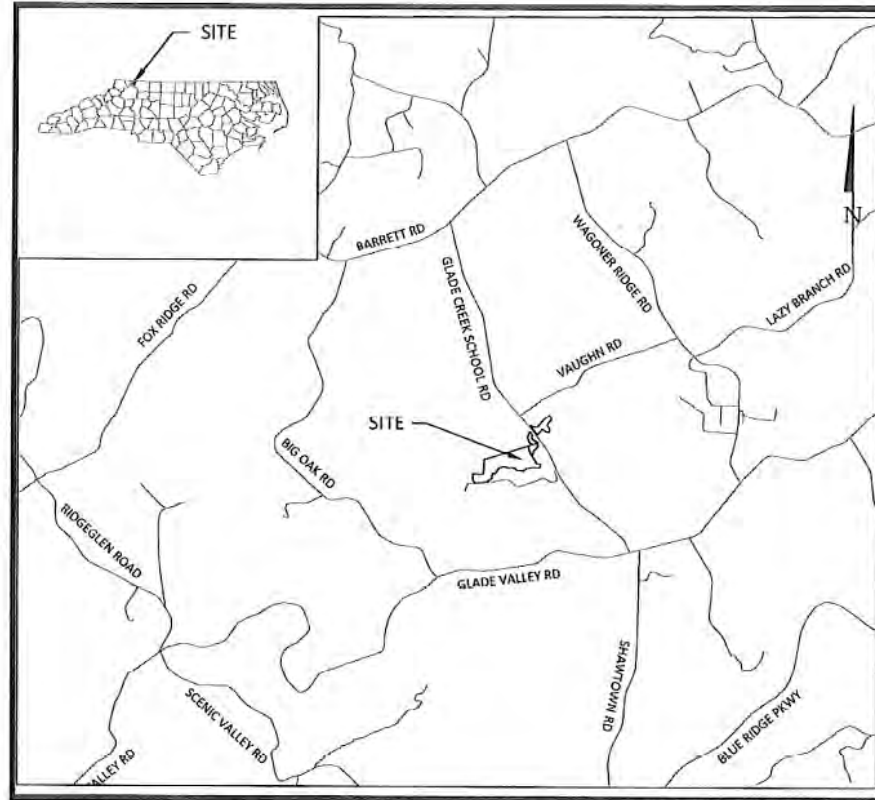
Appendix E
As-Built Survey and Record Drawings Plan Set

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Little Pine II Stream & Wetland As-Built

Alleghany County, North Carolina

Prepared for
NCDEQ Division of Mitigation Services



Vicinity Map
Not to Scale

RECORD DRAWINGS
ISSUED SEPTEMBER 16, 2019

Stream Origins		
Stream	Latitude	Longitude
Little Pine Creek	N 36° 30' 28.47"	W 80° 59' 11.36"
Tributary A	N 36° 30' 26.24"	W 80° 59' 15.81"
Tributary B	N 36° 30' 19.65"	W 80° 59' 16.07"
Tributary C	N 36° 30' 17.57"	W 80° 59' 13.51"

CERTIFICATE OF SURVEY
AND
ACCURACY

I, David S. Turner, CERTIFY THAT THE GROUND TOPOGRAPHIC SURVEY PORTION OF THIS PROJECT WAS COMPLETED UNDER MY DIRECT SUPERVISION FROM AN ACTUAL SURVEY MADE UNDER MY DIRECT SUPERVISION, THAT THE RECORD DRAWINGS WERE PREPARED BY WILDLANDS ENGINEERING, INC FROM DIGITAL FILES PROVIDED BY TURNER LAND SURVEYING, PLLC AS SHOWN ON AN AS-BUILT SURVEY FOR "THE STATE OF NC, DIVISION OF MITIGATION SERVICES", DATED MAY 22, 2019; THAT THIS SURVEY WAS PERFORMED AT THE 95% CONFIDENCE LEVEL TO MEET THE FEDERAL GEOGRAPHIC DATA COMMITTEE STANDARDS; THAT THIS SURVEY WAS PERFORMED TO MEET THE REQUIREMENTS FOR A TOPOGRAPHIC SURVEY TO THE ACCURACY OF CLASS A HORIZONTAL AND CLASS C VERTICAL WHERE APPLICABLE; THAT THE ORIGINAL DATA WAS OBTAIN BETWEEN THE DATES OF MAY 2019-JULY 2019; THAT THE CONTOURS SHOWN AS BROKEN LINES MAY NOT MEET THE STATED STANDARD AND ALL COORDINATES ARE BASED ON NAD 83 (NSRS 2011) AND ALL ELEVATIONS ARE BASE ON NAVD 88; THAT THIS MAP MEETS THE SPECIFICATIONS FOR TOPOGRAPHIC SURVEYS AS STATED IN TITLE 21, CHAPTER 56, SECTION .1606; THAT THIS MAP WAS NOT PREPARED IN ACCORDANCE WITH G.S. 47-30, AS AMENDED AND DOES NOT REPRESENT AN OFFICIAL BOUNDARY SURVEY.

WITNESS MY ORIGINAL SIGNATURE, REGISTRATION NUMBER, AND SEAL THIS THE 16th DAY OF September, 2019.

OFFICIAL SEAL



David S. Turner
DAVID S. TURNER, PLS L-4551

Sheet Index

Title Sheet	0.1
General Notes and Symbols	0.2
Project Overview	0.3
Stream Plan and Profile	2.1-2.11
Planting Plan	3.1-3.5

Project Directory

Designer:
Wildlands Engineering, Inc.
License No. F-0831
312 West Millbrook Road
Suite 225
Raleigh, NC 27609
Jeff Keaton, PE
919-851-9986

Owner:
NCDEQ Division of
Mitigation Services
5 Ravenscroft Dr, Suite 102
Asheville, NC 28801
Jeff Jurek
919-707-8291

Initial Surveying:
Cavanaugh & Associates PA
37 Montford Ave.
Asheville, NC 28801
828-251-0728

DEQ Contract No. D13022S
DMS ID No. 856
SCO No. 07-07088-06
Disturbed Acreage: 10 Acres

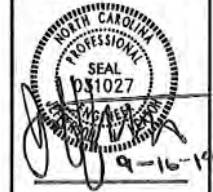
As-Built Surveying:
Turner Land Surveying, PLLC
P.O. Box 148
Swannanoa, NC 8778
919-827-0745

Project Component or Reach ID	Proposed Stationing/Location	Restoration or Restoration Equivalent	Restoration Footage or Acreage
Little Pine Reach 1	100+00 - 105+30	Restoration	530
Little Pine Reach 2A	106+19 - 121+31	Restoration	1,512
Little Pine Reach 2B	121+31 - 124+51	Restoration	321
Tributary A	200+00 - 200+86	Restoration	86
Tributary B	300+00 - 301+04	Restoration	104
Tributary C	400+49 to 406+27	Restoration	578
Tributary D	500+00 to 506+55	Restoration Equivalent	655
Tributary E	600+00 to 600+50	Restoration Equivalent	50
Tributary F	700+00 to 701+53	Restoration Equivalent	153
Wetland 1	N/A	Enhancement	0.32
Wetland 2A	N/A	Enhancement	0.88
Wetland 2B	N/A	Preservation	4.42



BEFORE YOU DIG!
CALL 1-800-832-4949
N.C. ONE-CALL CENTER
IT'S THE LAW

WILDLANDS
ENGINEERING, INC.
312 West Millbrook Road, Ste 225
Raleigh, NC 27609
Tel: 919-851-9986
Fax: 919-851-9986
Firm License No. F-0831



Little Pine II Stream & Wetland As-Built
Alleghany County, North Carolina

Title Sheet

RECORD DRAWINGS

Revisions:

Date: September 16, 2019
Job Number: 015-40137
Project Engineer: JK
Drawn By: JCK
Checked By: CDB

0.1

Sheet

C:\Users\jacob\OneDrive\Documents\Projects\2019\2019-09-16-19\2019-09-16-19.dwg
 September 16, 2019

CONSTRUCTION SEQUENCE:

Channel Construction Notes for all Reaches

- Contractor shall not disturb more active stream channel than can be stabilized by the end of the day. All stream banks and the buffer area within 25' of the active stream shall be stabilized at the end of each work day. Stockpiles shown are to be used while the existing stream is flowing. Stockpiles are prohibited within 25' of the top of the flowing stream bank. A 24-hour pump-around may be required if in-stream construction is not completed by the end of the work day.
- No material from the off-line Design stream channel excavation may be backfilled into the adjacent existing stream channel until the newly-constructed Design stream section is completed, stabilized, and the stream flow has been diverted into it, not even if that section of old/ existing stream is being pumped.
- Clearing and grubbing activities shall not extend more than 150 linear feet ahead of in-stream work.

The Little Pine Creek II Stream & Wetland Restoration Project construction will follow the construction sequence protocol as described below, unless otherwise noted.

Initial Site Preparation

- Contact North Carolina "ONE CALL" Center (1-800-632-4949) before any excavation.
- Contact NC Division of Energy, Mining, and Land Resources (DEMLR) at 336-776-9800 before any work begins on the project and notify them of the start date.
- Install temporary livestock exclusion fencing as outlined in the specifications.
- Prepare stabilized construction entrances and staging areas as indicated on the plans.
- Mobilize equipment, materials, prepare staging, disposal, and material stockpile area(s) as shown on plans.
- Walk site with Designer to identify and flag transplants to be harvested for used throughout project.
- Set up erosion control measures as outlined in the plans. Erosion and sediment control measures shall be installed by the Contractor to protect the Design stream channel from significant runoff prior to permanent stabilization. Silt fence should be installed where appropriate at any designated soil harvest or disposal areas. Contractor is responsible for inspection and maintenance of erosion control measures through the duration of construction.
- Install safety fence along wetlands as detailed on the Erosion Control plan sheets. Safety fence shall be installed along the boundary of all wetlands adjacent to disturbance not permitted for impact.
- Install temporary stream crossings. Temporary stream crossings shall be culverts on Little Pine Creek and mudmat crossings on the tributaries. Mudmats shall be installed such that there are no gaps in the timbers.
- Install and maintain an onsite rain gauge and log book to record the rainfall amounts and dates. Complete the self-inspection as required by NC DEMLR permit.

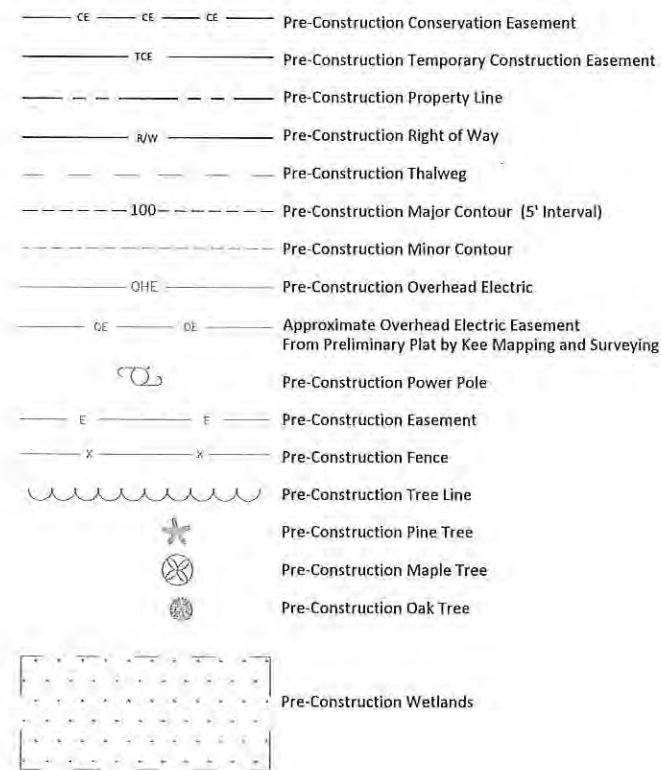
Little Pine Creek Channel Construction Notes

- Construction shall generally begin at the upstream extent of the project (Little Pine Creek, Reach 1, Station 100+00) and progress downstream to Sta. 124+51.
- As work progresses, remove and stockpile the top 3 inches of soil from the active grading area. Stockpiled topsoil shall be kept separate for onsite replacement prior to floodplain seeding.
- Install the pump around system prior to beginning excavation within the existing live channel bed. The pump around system needs to be employed only when work is being conducted within the active channel. Contractor shall stage his work to minimize the duration of pump around operations.
- Install impervious dikes at upstream and downstream ends of pump around locations. The pump around operation shall be performed between these locations as described in plan details.
- Remove all non-native and invasive vegetation prior to beginning the channel construction.
- Contractor should attempt to construct the channel offline where feasible. If site conditions permit, more than one offline section may be constructed concurrently, however offline sections shall be tied online sequentially from downstream to upstream.
- The Contractor shall not disturb more active stream channel than can be stabilized with seed, mulch, and matting by the end of the day. Excess cut material from above Glade Creek School Road may be stockpiled within the established stockpile area upstream of the road or hauled directly to the fill location downstream.
- Construct the Design stream channel to the grade specified in the cross sections and profile. Transfer coarse material from abandoned channel riffles to new channel riffles. Backfill abandoned channel sections with stockpiled soil.
- Install log and stone structures and in-bank bioengineering such as brush mattress or brush toe after channel grading is completed.
- Seed (with appropriate seed mix) and straw mulch areas where the coir fiber matting is to be installed.
- Install coir fiber matting.
- When channel construction is completed remove the temporary stream crossing structures and install the permanent ford crossing per the plans and

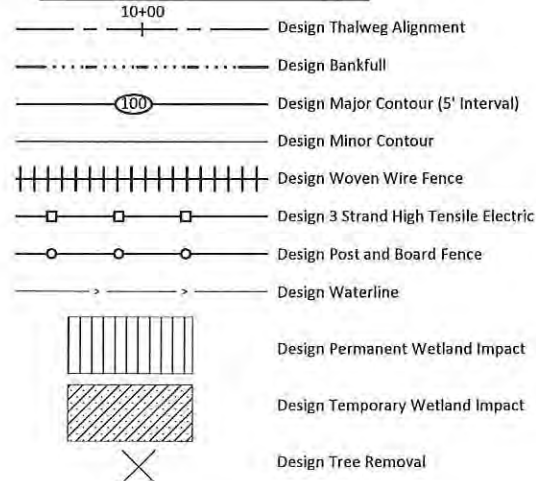
specifications.

- Prepare floodplain for seeding by applying stockpiled topsoil to the floodplain between bankfull elevation and the grading limits, ripping, and raking/ smoothing. Seed and mulch. Any areas within the conservation easement that have not been graded shall have fescue herbicide treatment and will not be ripped or seeded.
 - Plant live stakes and herbaceous plugs according to planting details and specifications.
- Tributary A, B, C Channel Construction Notes**
- Construction shall generally begin at the upstream project boundary (Tributary A Station 200+00, Tributary B Station 300+00, and Tributary C Station 400+00) and progress downstream towards the Little Pine confluence. Tributary A shall be constructed before work begins on Little Pine downstream from Station 105+28, and Little Pine Creek construction shall be complete to this station so that the confluence may be constructed appropriately. Tributary B shall be constructed before work begins on Little Pine downstream from Station 112+50, and Little Pine Creek construction shall be complete to this station and the log j-hook at station 112+05 installed so that the confluence may be constructed appropriately. Tributary C shall be constructed before work begins on Little Pine downstream from Station 114+00, and Little Pine Creek construction shall be complete to this station and the log j-hook at station 113+75 installed so that the confluence may be constructed appropriately.
 - Establish pump around system for areas of construction where Design channel intersects existing channel frequently. Contractor shall stage his work to minimize the duration of pump around operations.
 - Install impervious dikes at upstream and downstream ends of pump around locations. The pump around operation shall be performed between these locations as described in plan details.
 - Tributaries will be constructed from the upstream end, working downstream, along the existing stream channel. As work progresses, remove and stockpile the top 3 inches of soil from the active grading area. Stockpiled topsoil shall be kept separate for onsite replacement prior to floodplain seeding.
 - Remove all non-native and invasive vegetation prior to beginning the channel construction. All pines within 20 feet of Tributary C's Design alignment shall be cleared with stumps removed.
 - Clear and grub only the portion of stream channel that can be completed, stabilized, and matted within the same day.
 - Construct the Design stream channel to the grade specified in the cross sections and profile. Stockpile any material suitable for fill or topsoil where indicated on the plan sheets.
 - Excavate and stockpile any remaining coarse bed material found in the old channel separately from the excavated soil. Bed material shall be incorporated into the riffles of the newly constructed channel.
 - Install log and stone structures in the dry after grading is completed.
 - Seed (with appropriate seed mix) and straw mulch areas where the coir fiber matting is to be installed.
 - Install coir fiber matting.
 - Once disturbed areas and exposed slopes area stabilized; remove impervious dikes, install channel plug, and turn water into the new channel.
 - Backfill abandoned channel sections with stockpiled soil. Non-native and invasive vegetation (i.e. privet, multiflora rose, and Japanese honeysuckle) shall be removed from the existing channel prior to backfilling.
 - Seed, mat, and mulch backfill sections before proceeding to the next area.
 - Prepare floodplain for seeding by applying stockpiled topsoil between bankfull elevation and the grading limits, ripping, and raking/ smoothing. Wetlands disturbed by construction as detailed on the erosion control plan sheets shall be disked prior to seeding and mulching. Seed and mulch. Any areas within the conservation easement that have remaining ground cover of fescue that has not been graded shall have fescue herbicide treatment and will not be ripped or seeded.
 - Plant live stakes and herbaceous plugs according to planting details and specifications.
- Fencing Plan**
- Install fencing and gates as indicated on the fencing plan and in these specifications.
- Construction Demobilization**
- Remove temporary stream crossings.
 - Walk the entire easement with a plant specialist. Identify any remaining invasive species within the easement and conduct manual removal and appropriate herbicide treatment.
 - The Contractor shall ensure that the site is free of trash and leftover materials prior to demobilization of equipment from the site.
 - Complete the removal of any additional stockpiled material from the site.
 - Demobilize grading equipment from the site.
 - All rock and other stockpiled materials must be removed from the limits of disturbance and conservation easement. All areas outside the conservation easement shall be returned to pre-project conditions or better.
 - Seed, mulch, and stabilize staging areas, stockpile areas, haul roads, and construction entrances. Pasture seed mix is to be applied to areas of disturbance outside of the conservation easement.
 - Coordinate removal of any remaining temporary cattle exclusion fencing with the Designer.
 - Plant bare roots according to details and specifications.

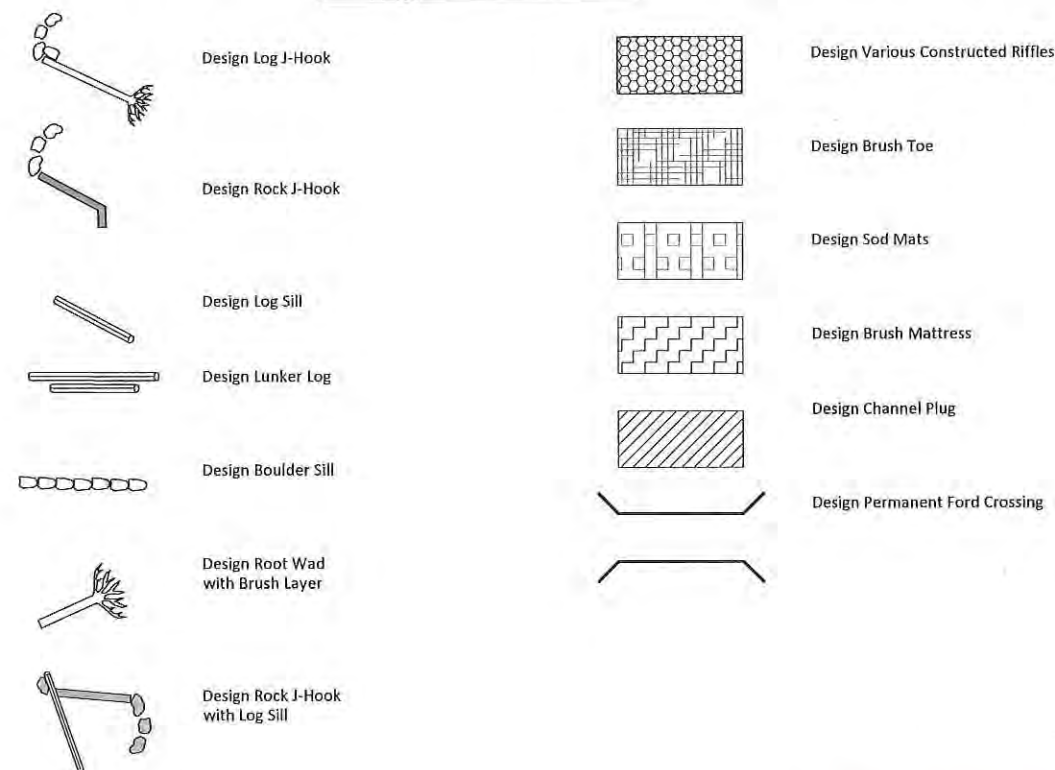
Pre-Construction Conditions



Design Conditions



Design Structures



WILDLANDS
 ENGINEERING
 312 West Millbrook Road, Ste 225
 Raleigh, NC 27605
 Tel: 919-851-9986
 Fax: 919-851-9986
 Firm License No. F-0831

9-16-19

Little Pine II Stream & Wetland As-Built
 Alleghany County, North Carolina
 General Notes and Symbols

RECORD DRAWINGS

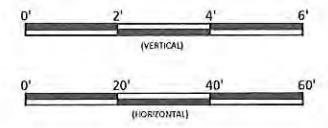
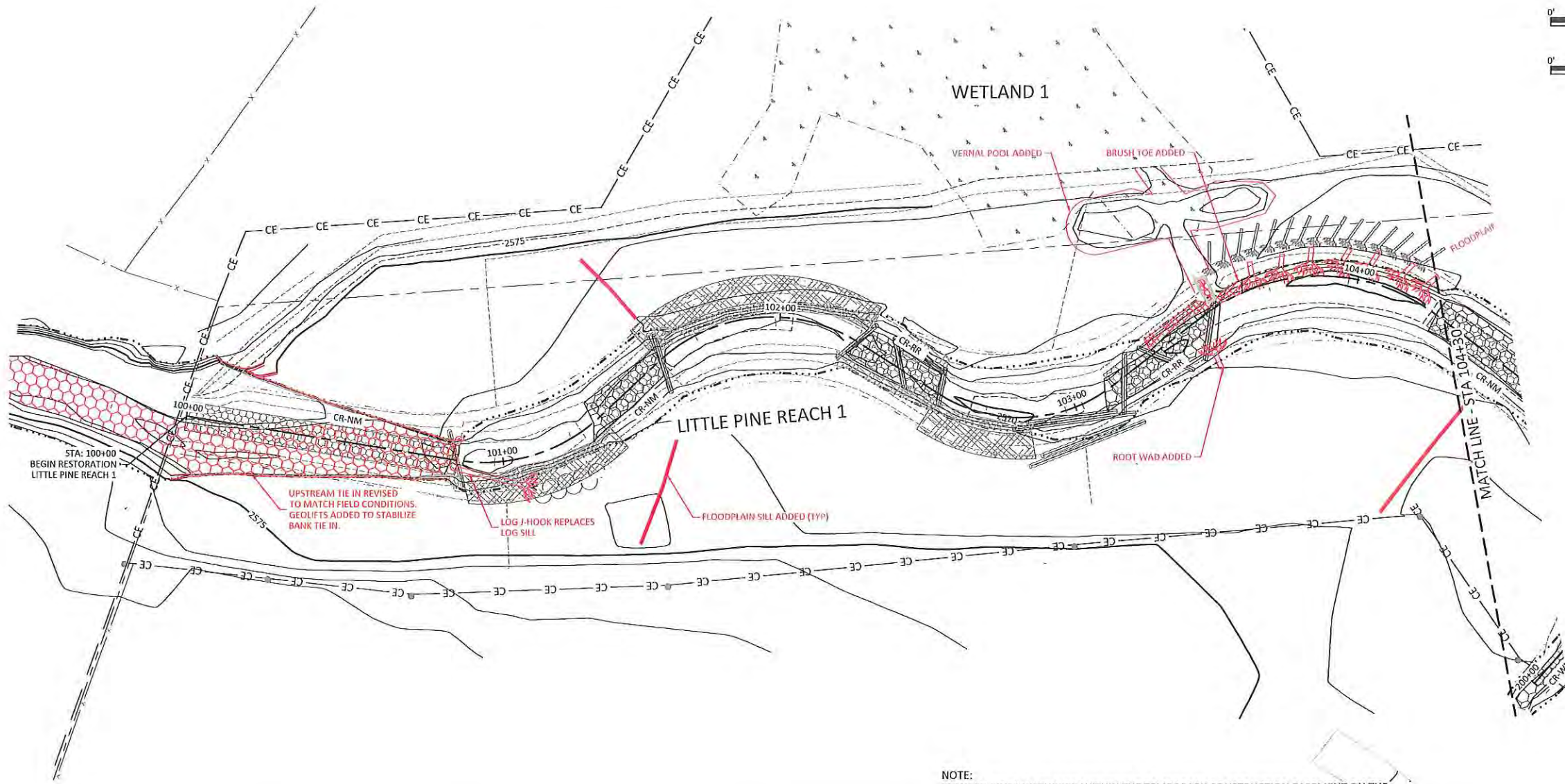
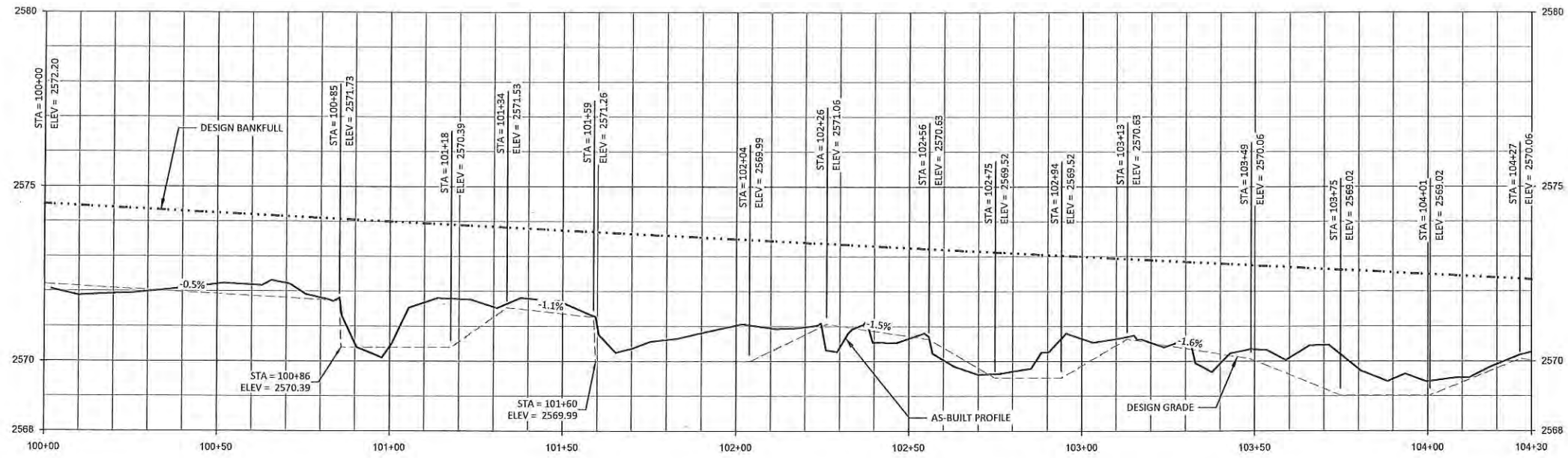
Date: September 16, 2019
 Job Number: MS-02137
 Project Engineer: JK
 Drawn By: CLK
 Checked By: CDB

0.2

Project Notes:
 Deviations from the design are shown in red.

Sheet

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 September 16, 2019
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 September 16, 2019



NOTE:
 PLANTED PINES DISTURBED WITHIN THE TEMPORARY CONSTRUCTION EASEMENT ON THE ROBERTS PROPERTY SHALL BE REPLANTED UPON COMPLETION OF CONSTRUCTION.

RECORD DRAWINGS

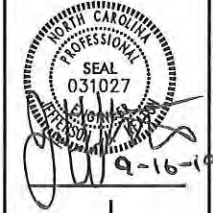
Revisions:

Date: September 16, 2019
 Job Number: 015-02137
 Project Engineer: JK
 Drawn By: JCK
 Checked By: CDB

1.1

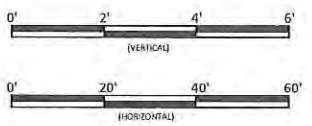
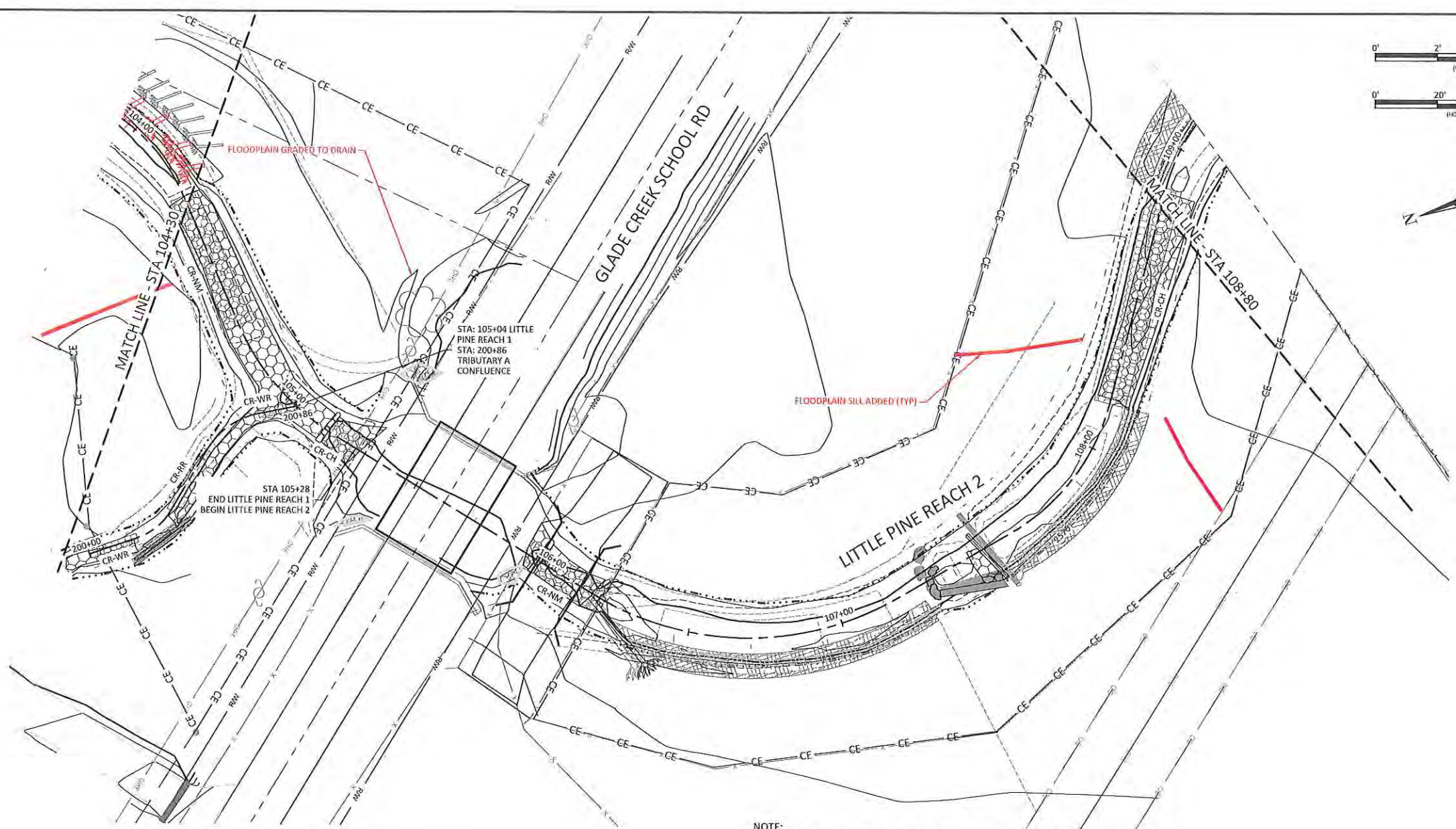
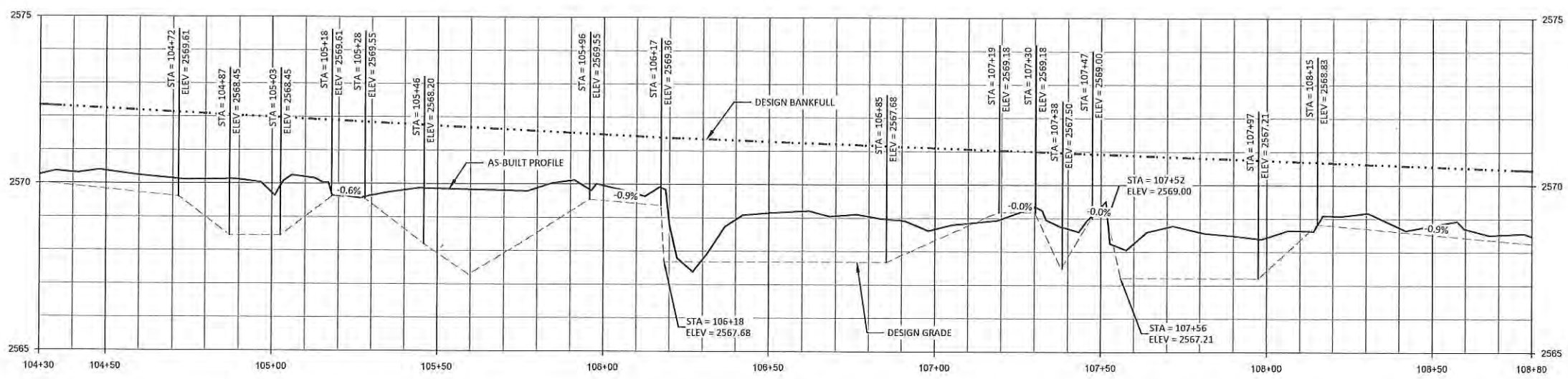
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Little Pine II Stream & Wetland As-Built
 Allegheny County, North Carolina
 Little Pine Creek
 Stream Plan and Profile



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 September 24, 2019



NOTE:
 PLANTED PINES DISTURBED WITHIN THE TEMPORARY CONSTRUCTION EASEMENT ON THE ROBERTS PROPERTY SHALL BE REPLANTED UPON COMPLETION OF CONSTRUCTION.

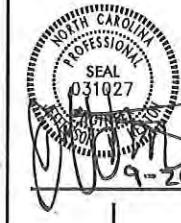
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Date:	September 16, 2019
Job Number:	035-02137
Project Engineer:	JK
Drawn By:	JCK
Checked By:	CDB

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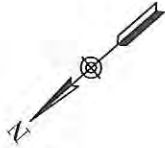
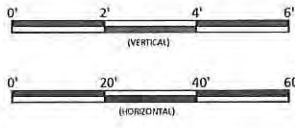
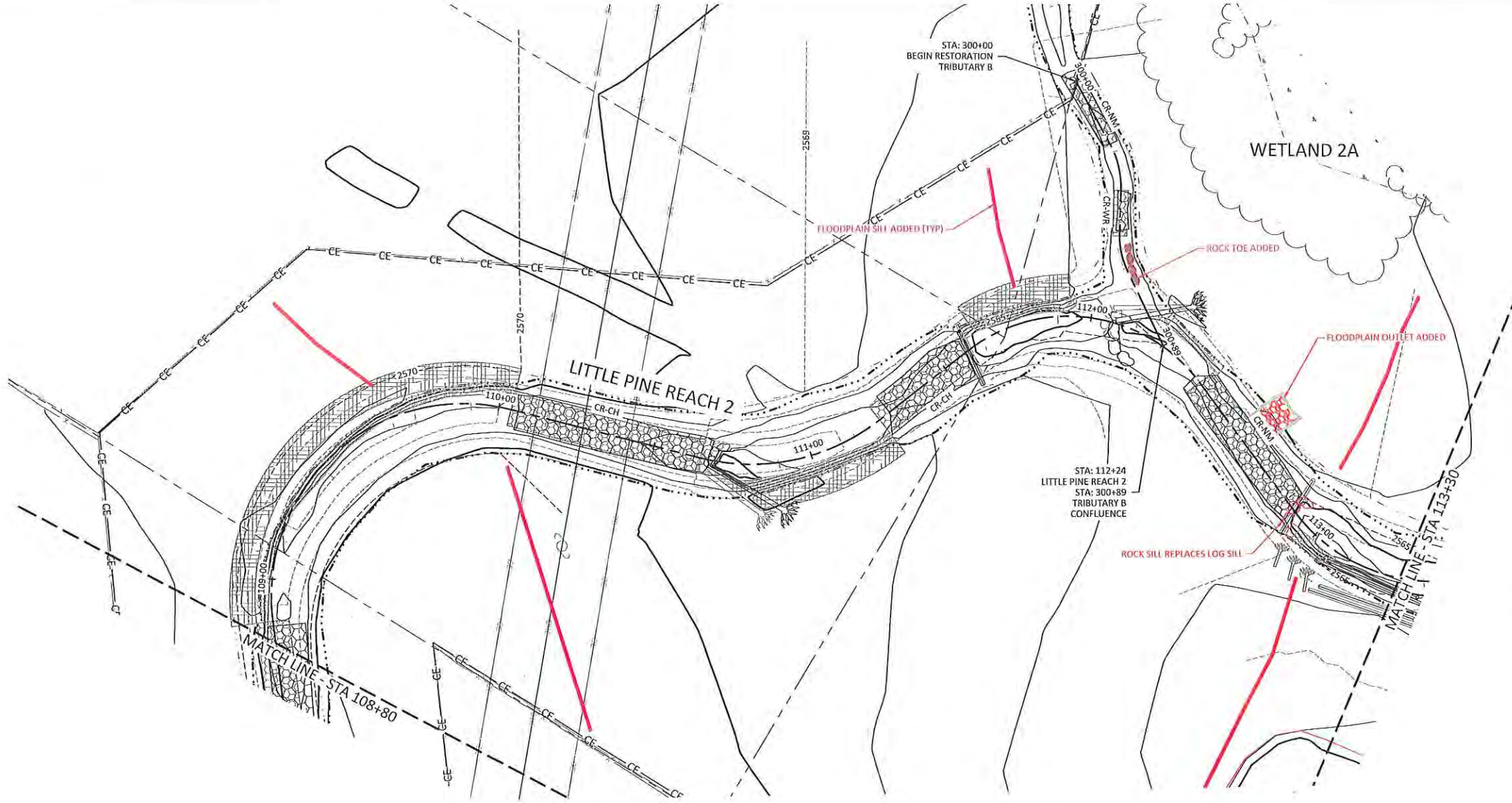
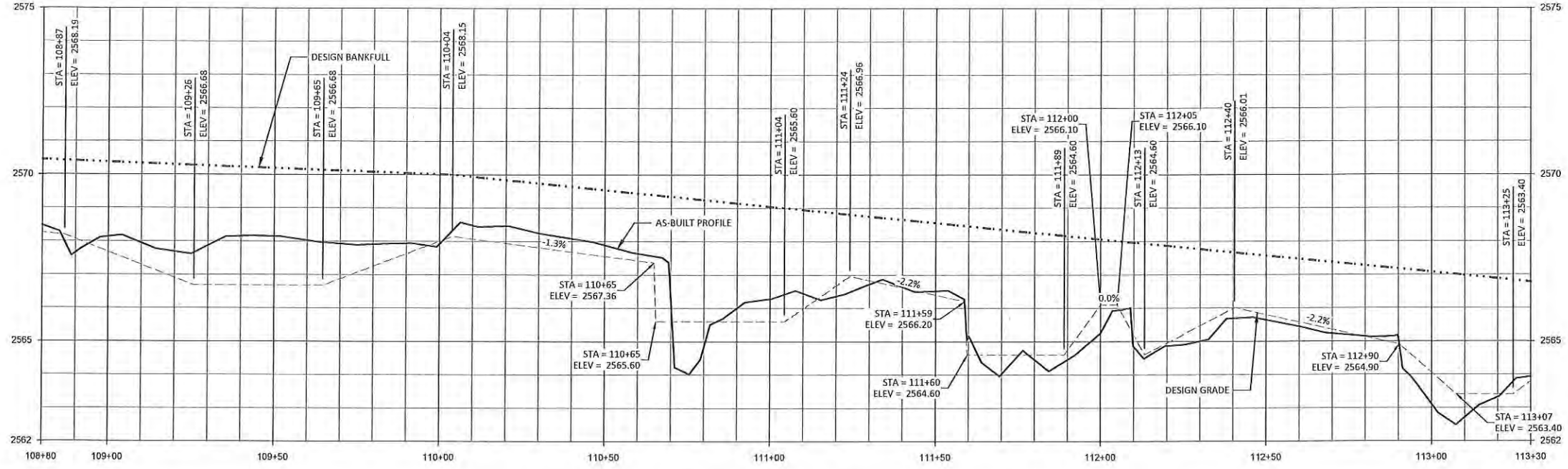
Little Pine II Stream & Wetland As-Built
 Allegheny County, North Carolina
 Little Pine Creek
 Stream Plan and Profile



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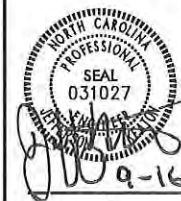
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 Project Engineer: JK
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 Checked By: CDB

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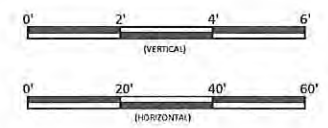
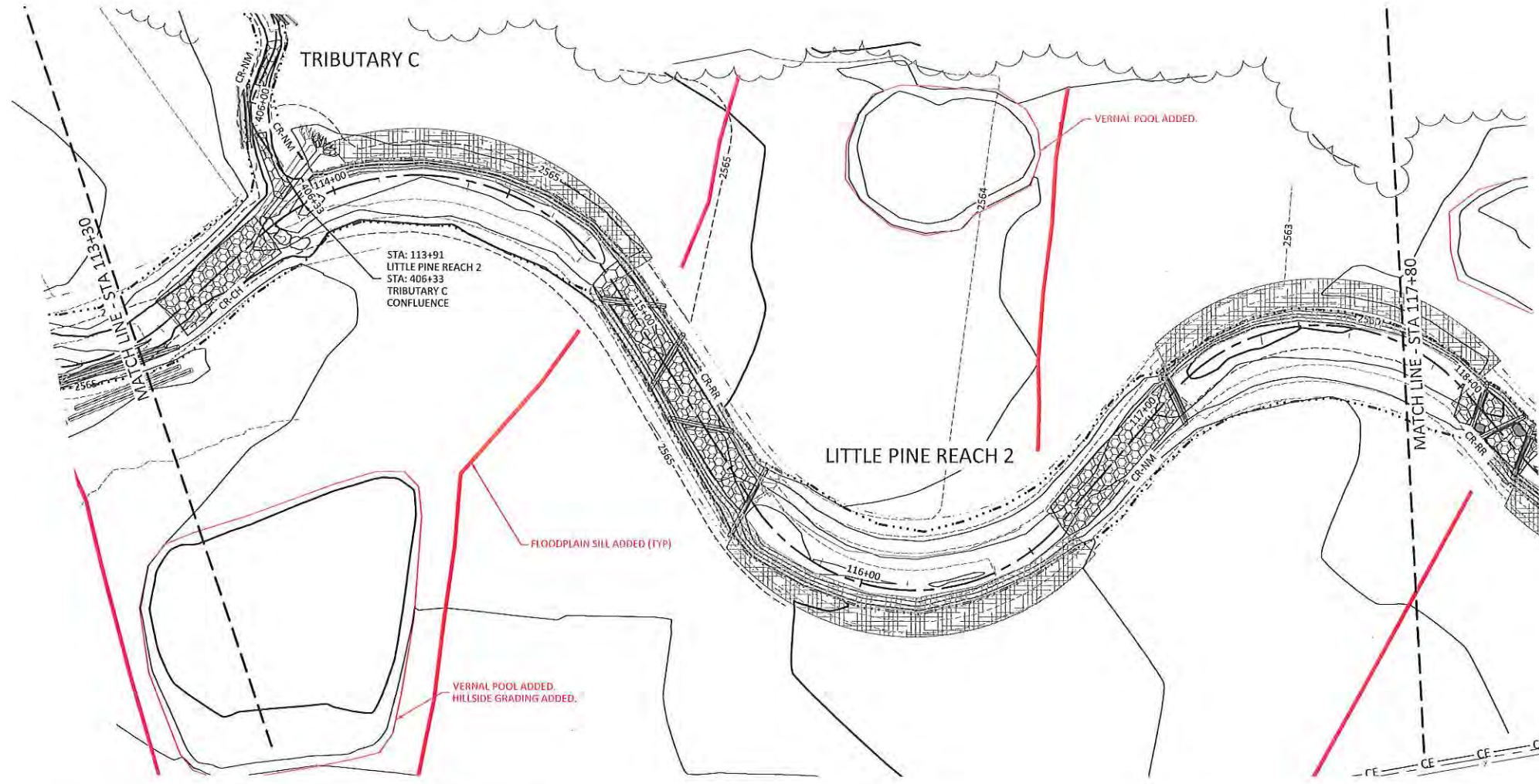
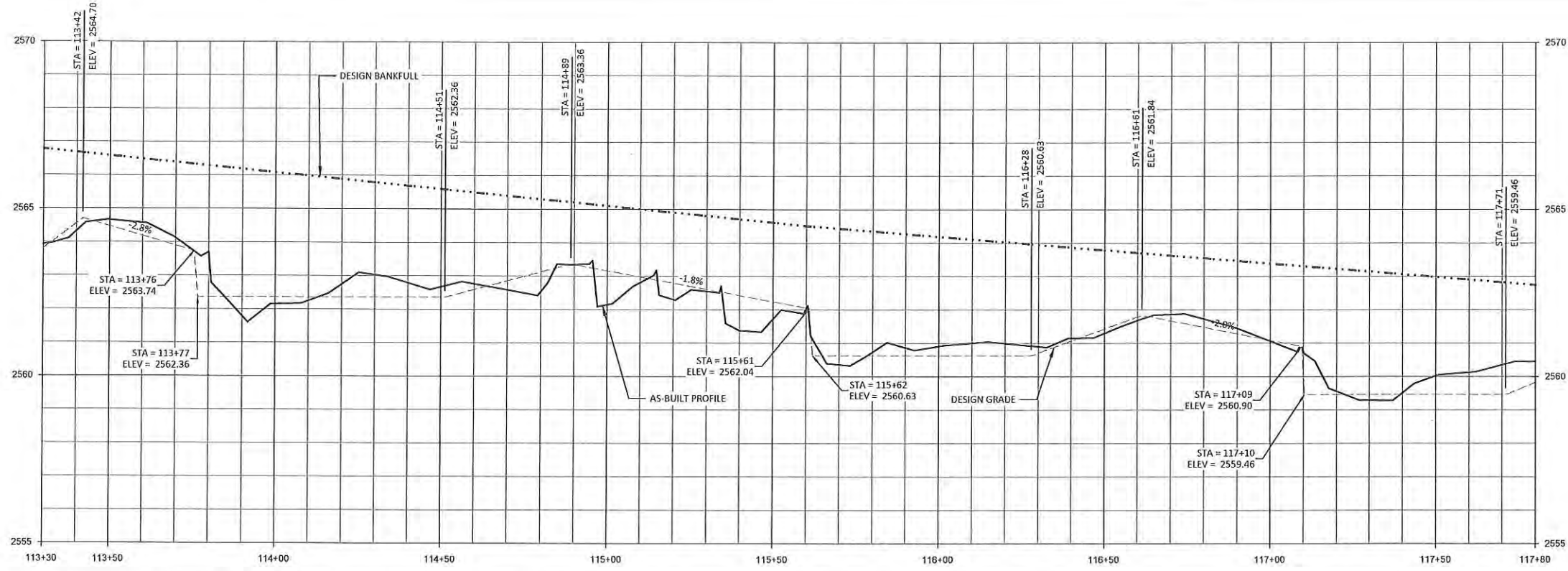
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Little Pine II Stream & Wetland As-Built
 Alleghany County, North Carolina
 Little Pine Creek
 Stream Plan and Profile



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Date:	September 16, 2019
Job Number:	015-02137
Project Engineer:	JK
Drawn By:	JCK
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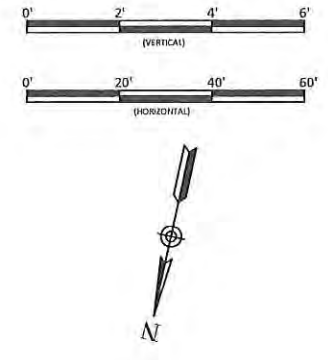
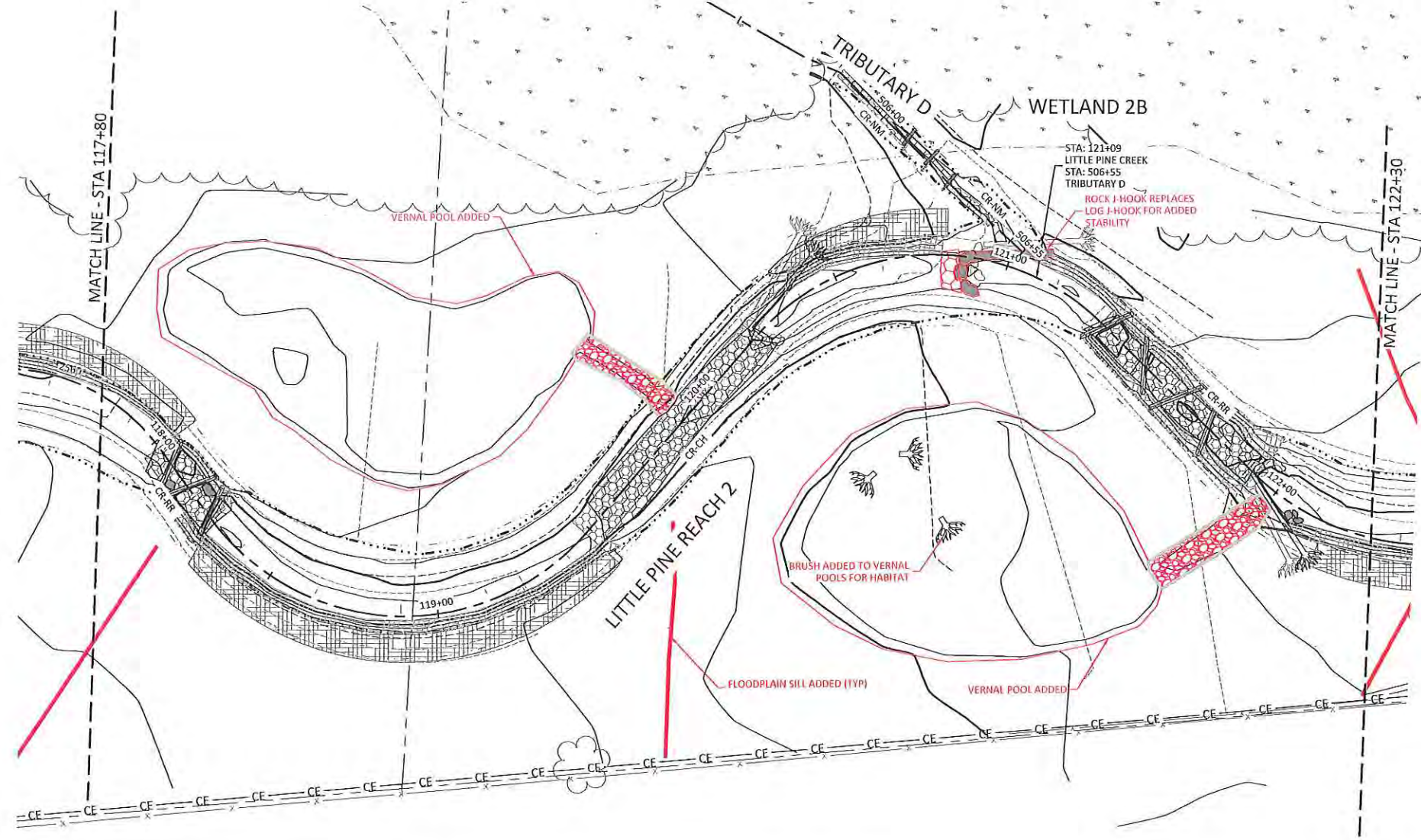
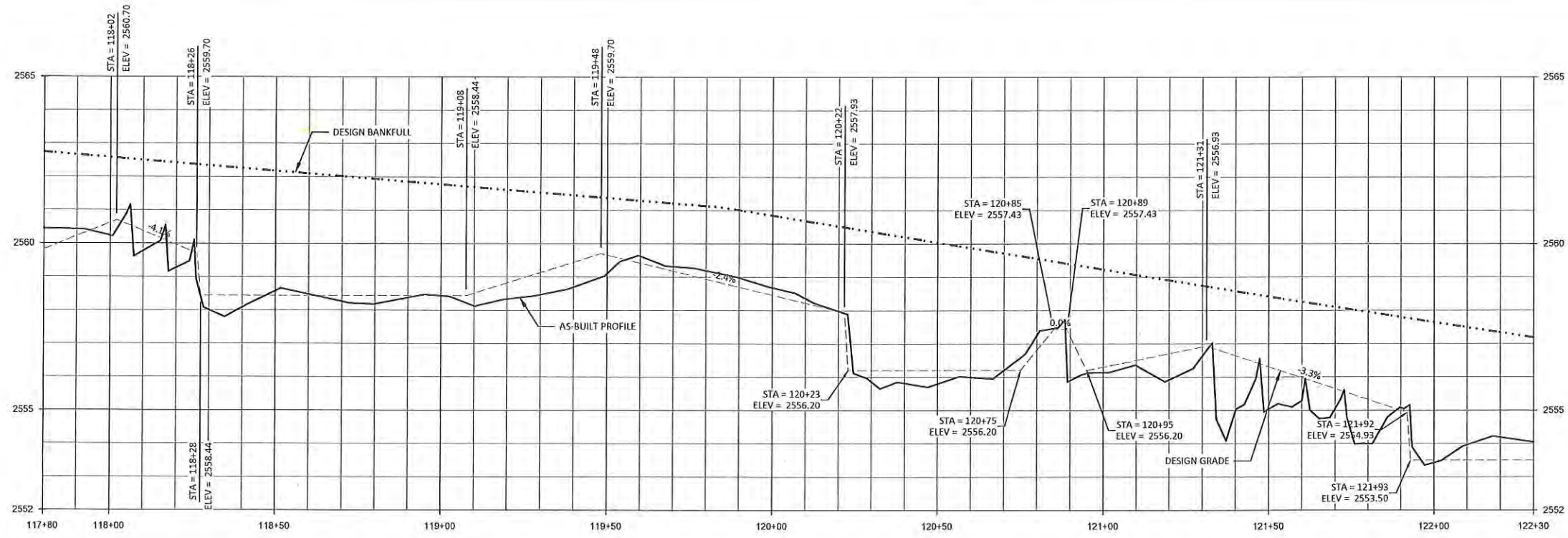
Little Pine II Stream & Wetland As-Built
 Allegheny County, North Carolina

Little Pine Creek
 Stream Plan and Profile



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 Allegheny County, North Carolina
 Little Pine Creek
 Stream Plan and Profile

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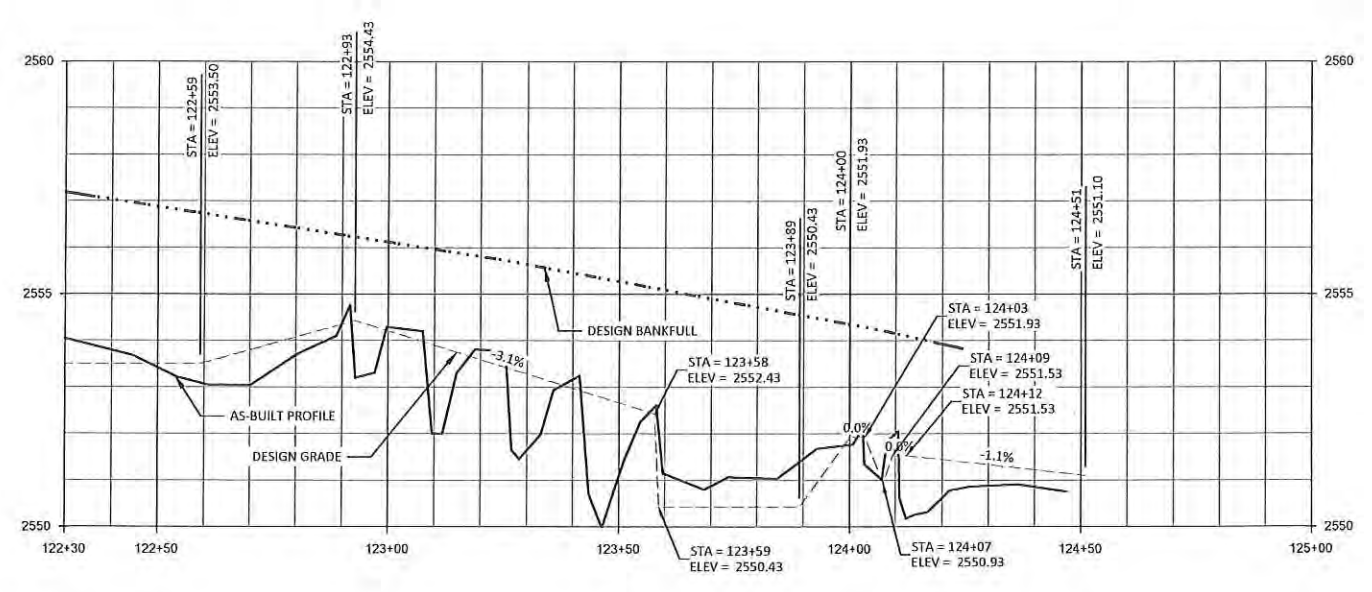
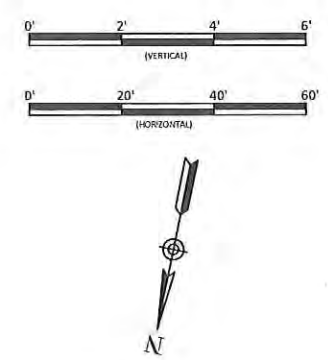
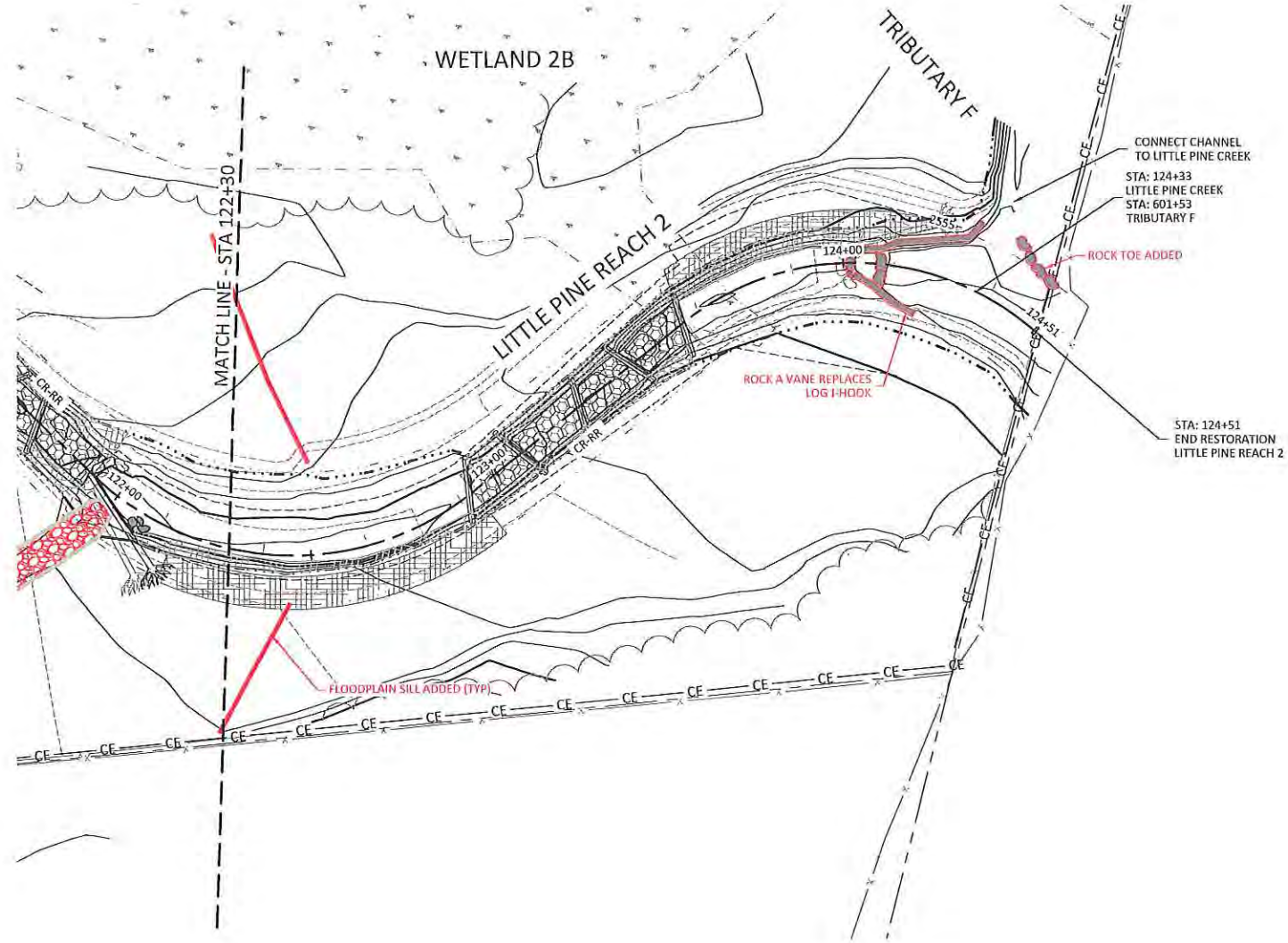


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Date:	September 16, 2019
Job Number:	015-02137
Project Engineer:	JK
Drawn By:	JCK
Checked By:	CDB

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Date:	September 16, 2019
Job Number:	1005-02137
Project Engineer:	JK
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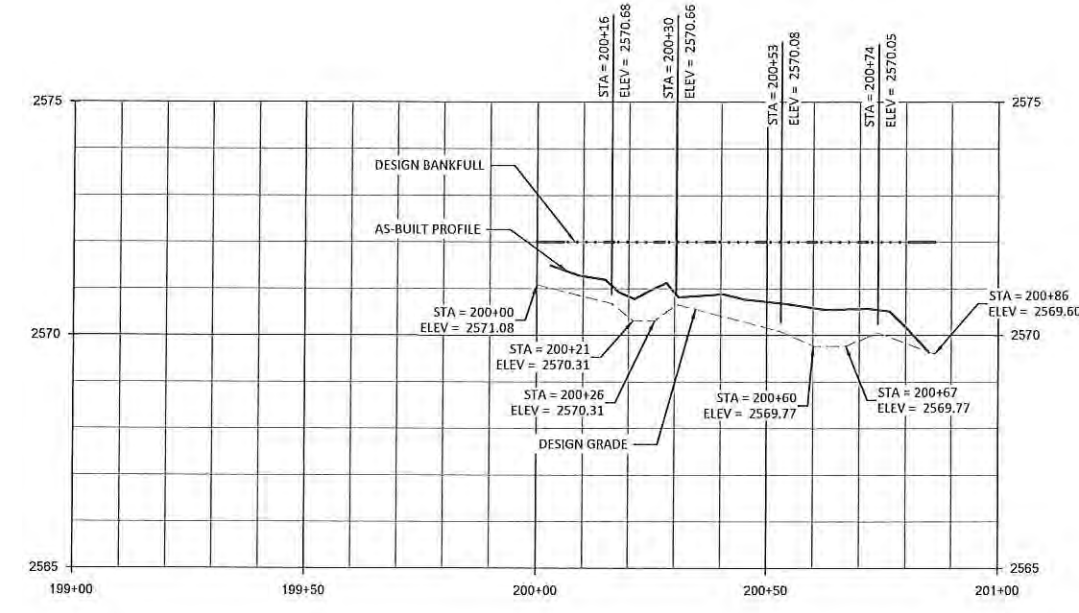
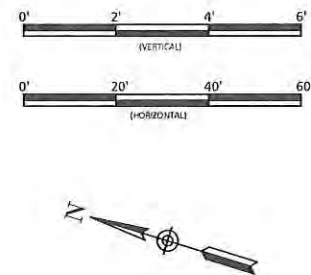
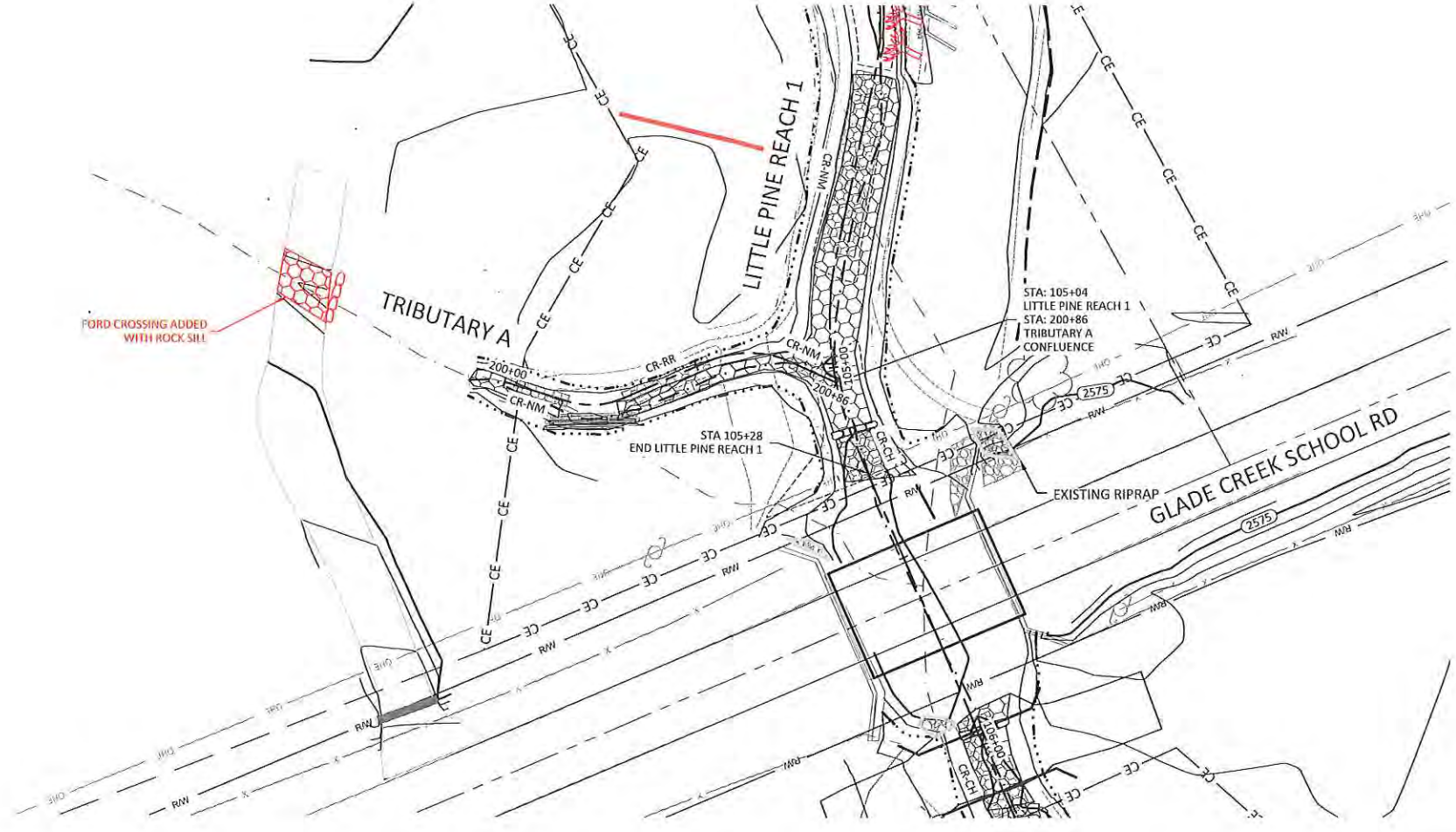
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 Little Pine Creek
 Stream Plan and Profile



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September 16, 2019

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RECORD DRAWINGS

Date: September 16, 2019
 Job Number: 035-02137
 Project Engineer: JK
 Drawn By: JCK
 Checked By: CDB

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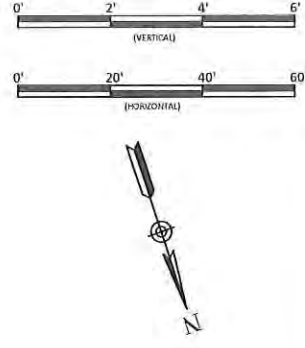
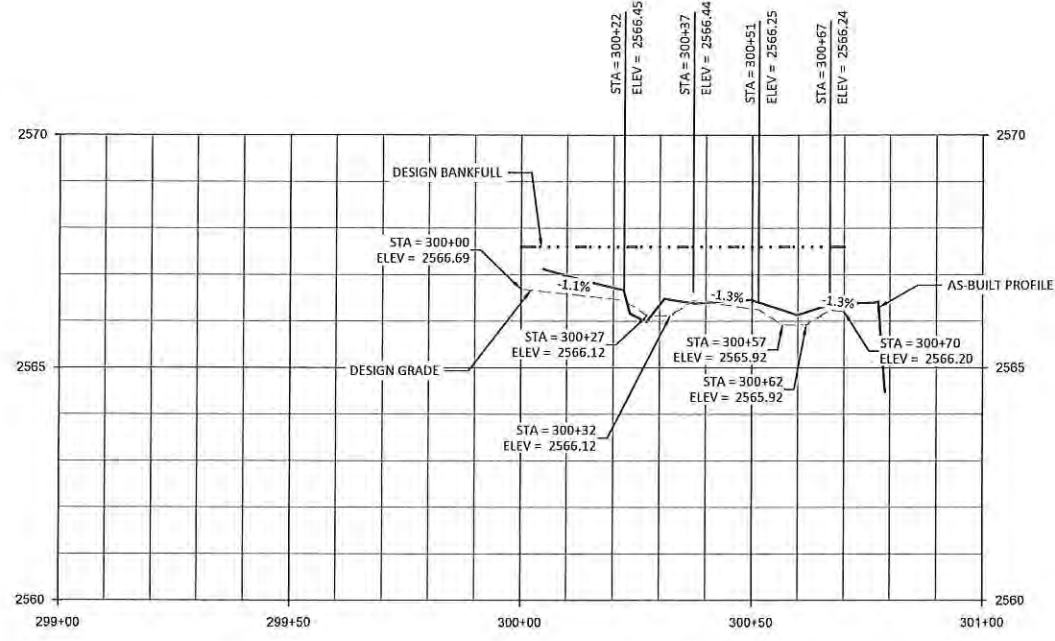
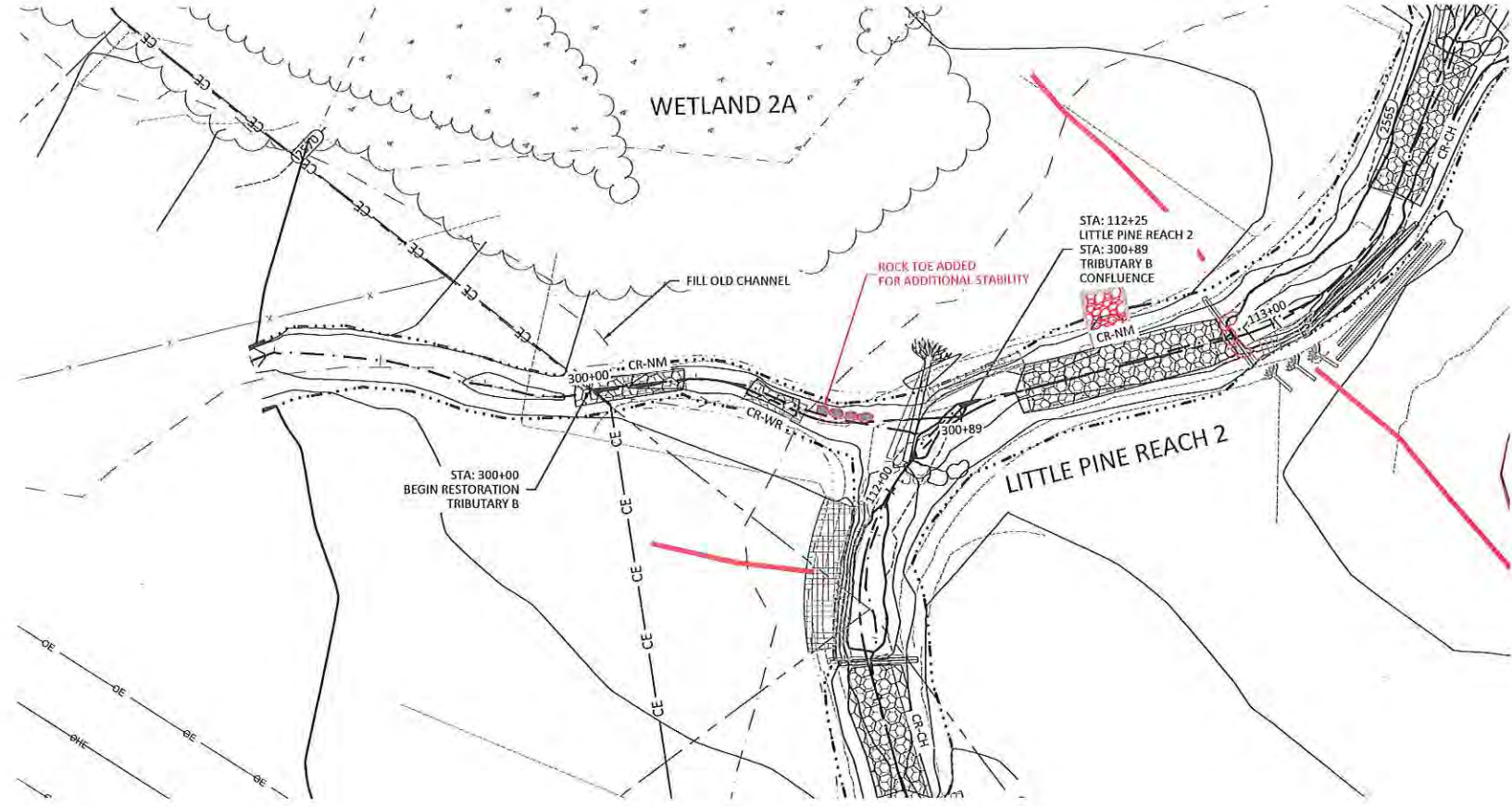
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Little Pine II Stream & Wetland As-Built
 Alleghany County, North Carolina

Tributary A
 Stream Plan and Profile



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Date: September 16, 2019
 Job Number: 015-02137
 Project Engineer: JK
 Drawn By: JCK
 Checked By: CDB

Revisions:

1.8

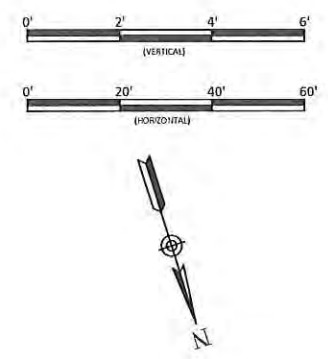
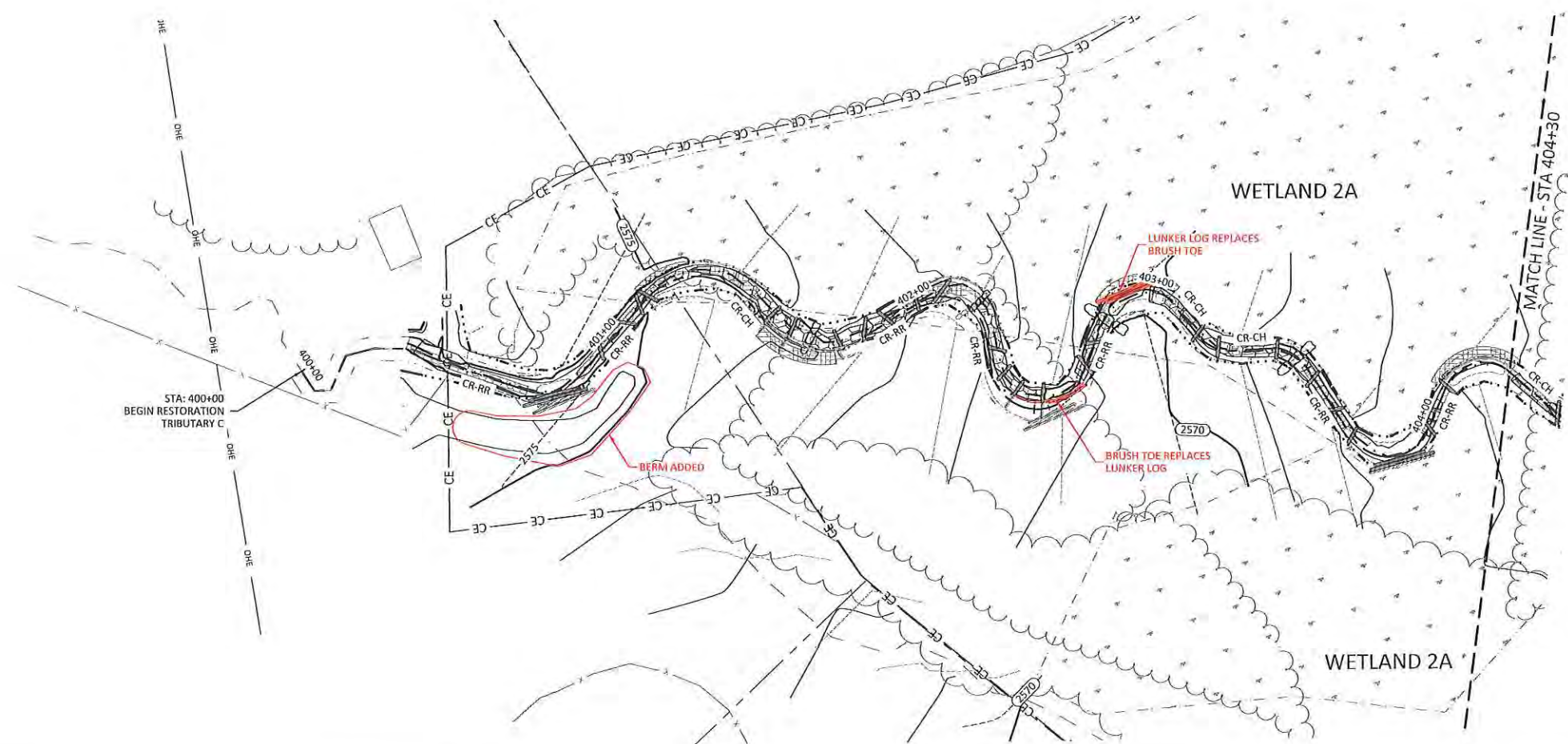
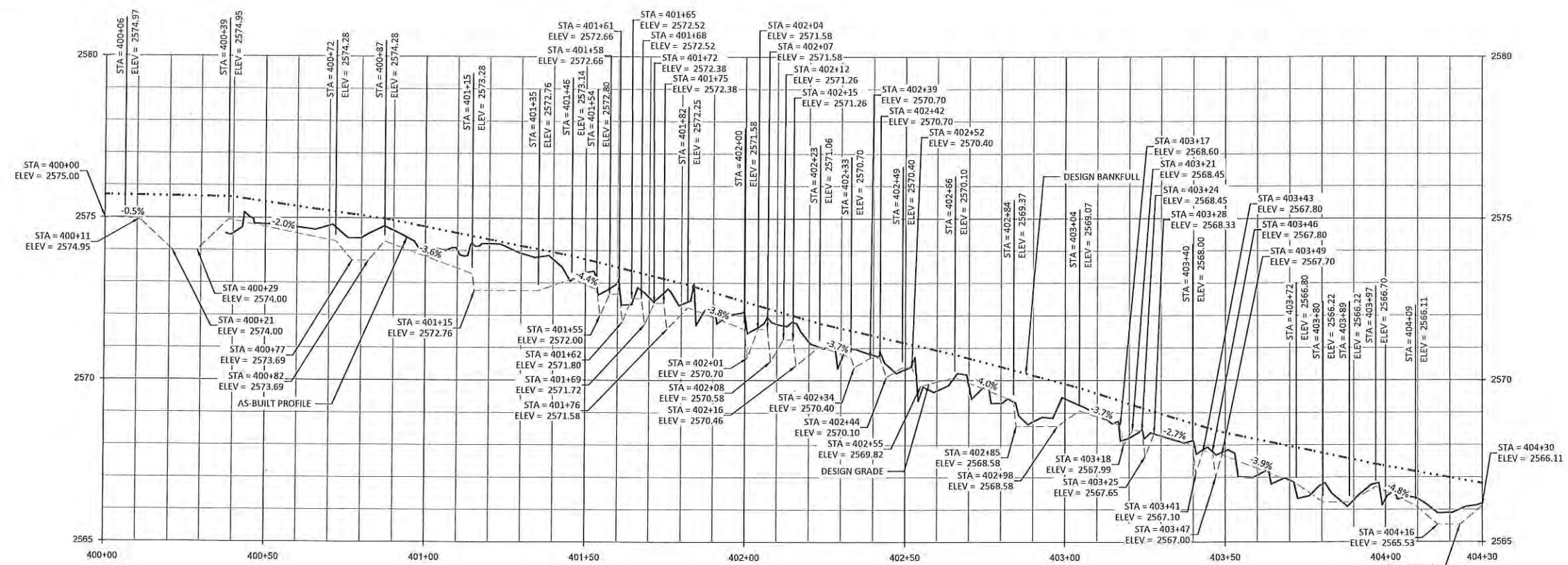
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Little Pine II Stream & Wetland As-Built
 Alleghany County, North Carolina
 Tributary B
 Stream Plan and Profile



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 September 16, 2019



RECORD DRAWINGS

Revisions:	
Date:	September 16, 2019
Job Number:	005-02137
Project Engineer:	JK
Drawn By:	JKK
Checked By:	CDB

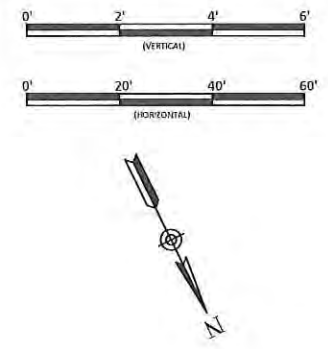
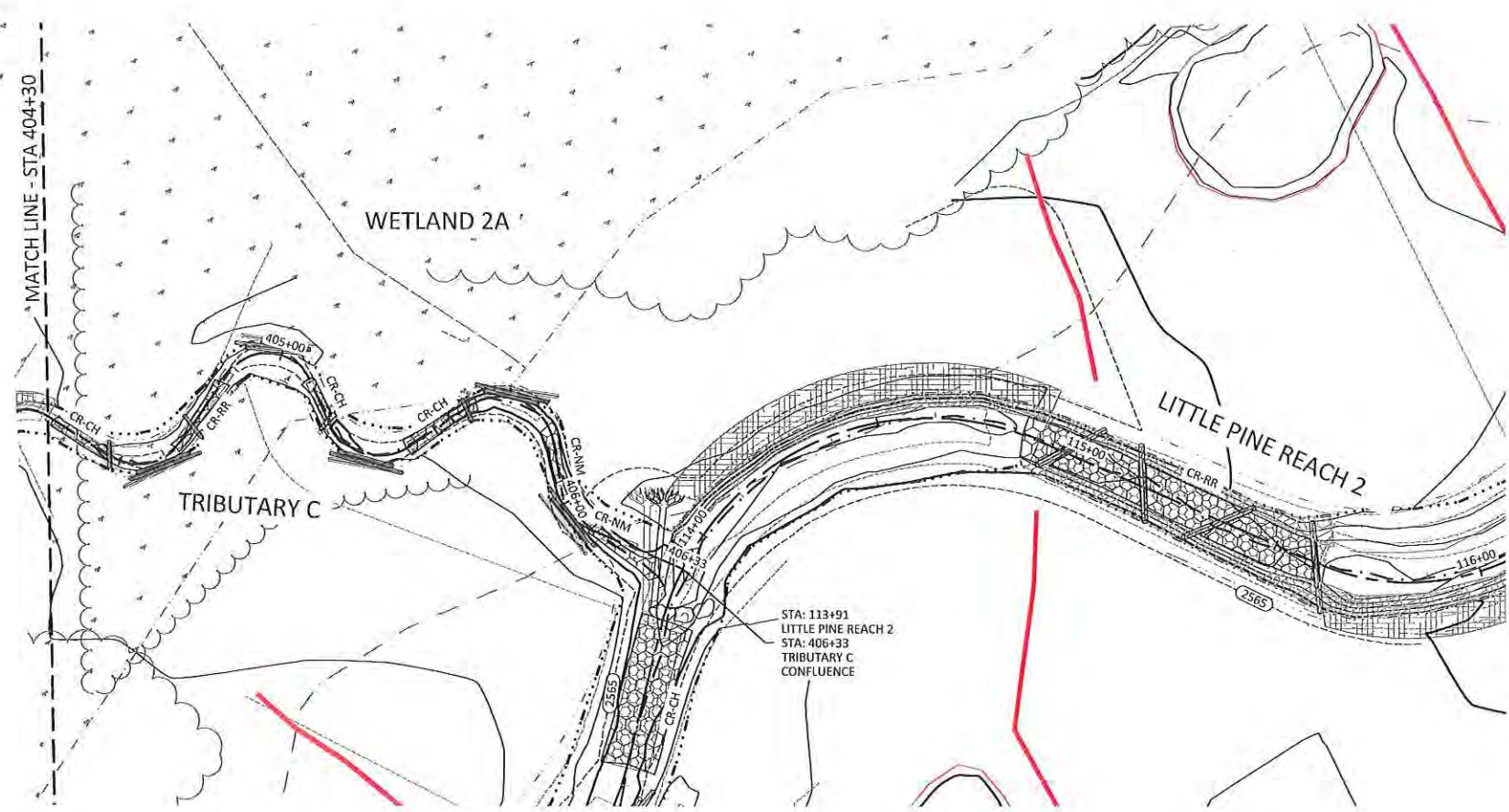
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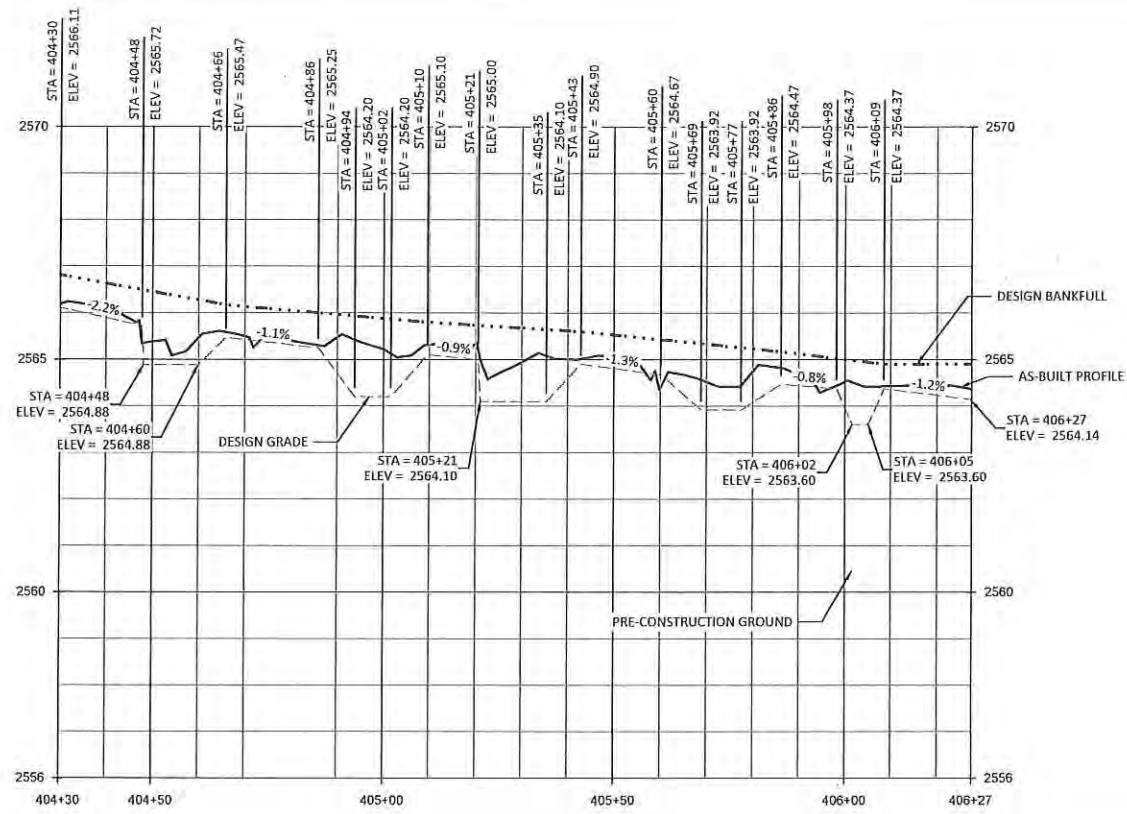
Little Pine II Stream & Wetland As-Built
 Allegheny County, North Carolina
 Tributary C
 Stream Plan and Profile



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NOTE:
PINES WITHIN 20 FEET OF THE NEW STREAM CHANNELS WILL BE REMOVED.



RECORD DRAWINGS

Date: September 16, 2019
 Job Number: 015-02137
 Project Engineer: JK
 Drawn By: JCK
 Checked By: CDB

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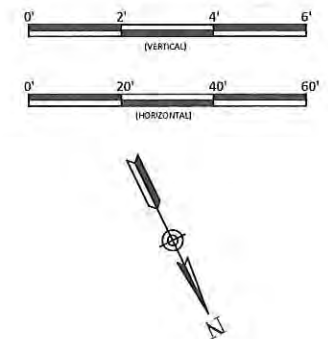
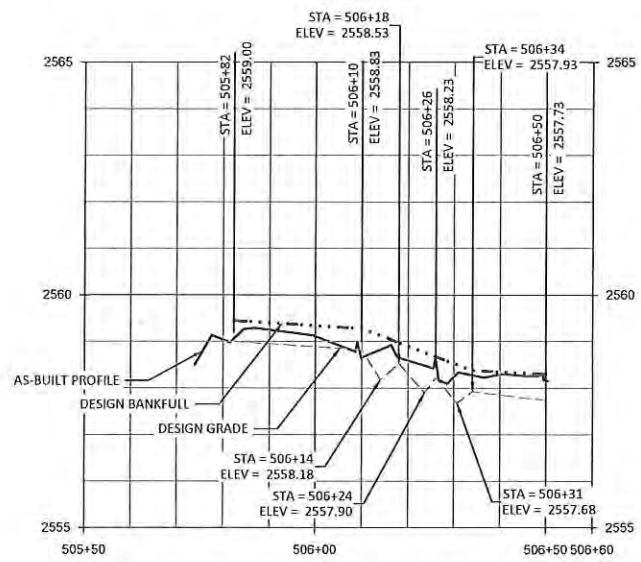
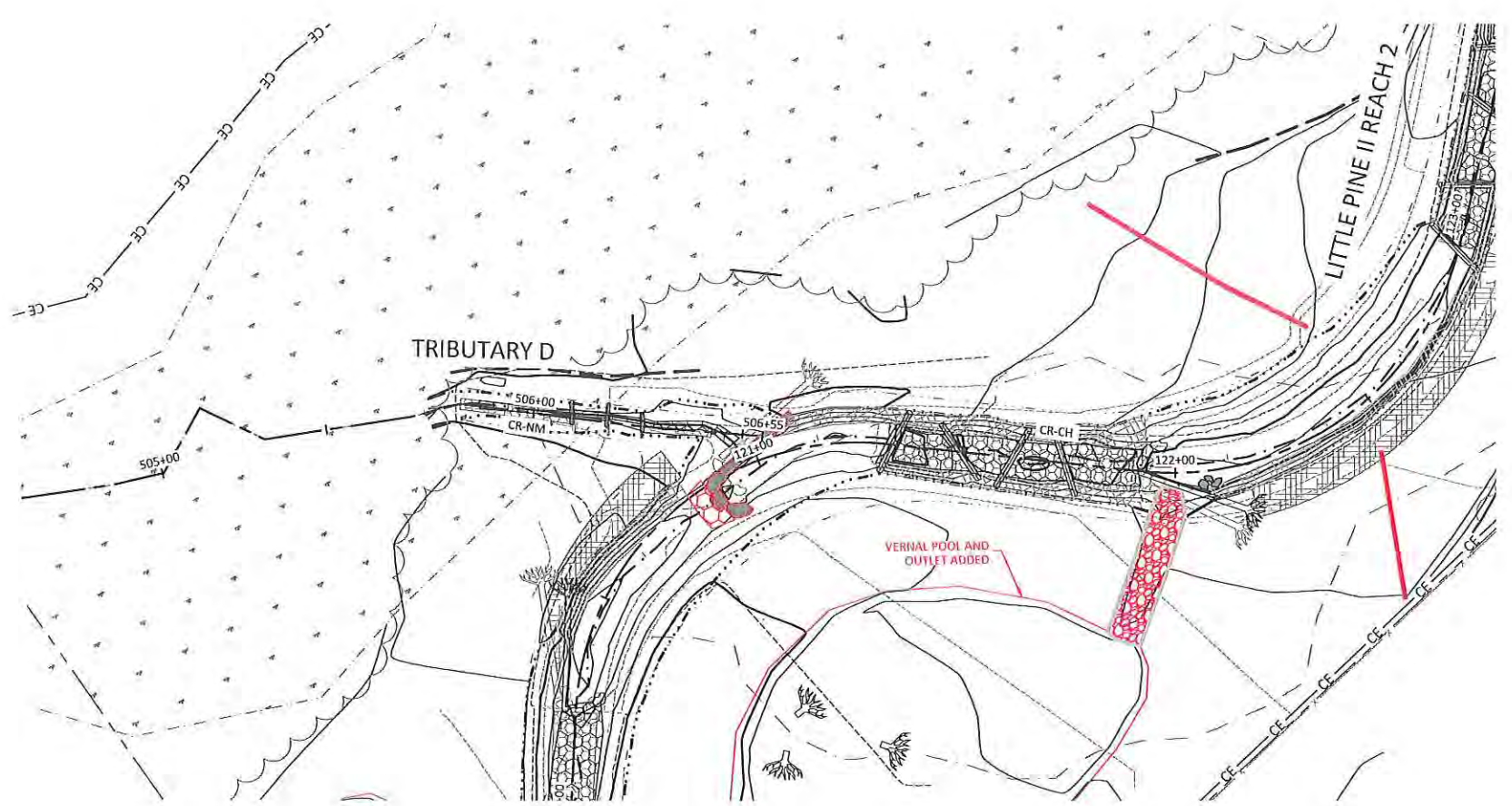
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Little Pine II Stream & Wetland As-Built
 Alleghany County, North Carolina

Tributary C
 Stream Plan and Profile



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NOTE:
PINES WITHIN 20 FEET OF THE NEW STREAM
CHANNELS WILL BE REMOVED.

RECORD DRAWINGS

Date:	September 16, 2019
Job Number:	015-02137
Project Engineer:	JK
Drawn By:	JCK
Checked By:	CDB


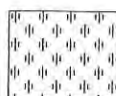




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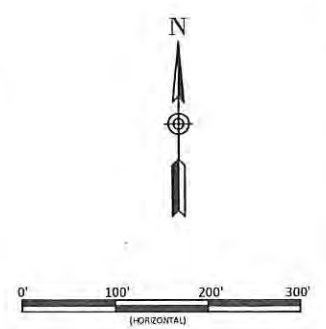
Little Pine II Stream & Wetland As-Built
Alleghany County, North Carolina
Tributary D
Stream Plan and Profile



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September 24, 2019
 CS: Aerial Photos, Aerial Map of Little Pine Creek II, Mountain View, Mountain View, VA, 03125A, B, Planting Overview.dwg

-  ZONE 1 - STREAM BANK PLANTING ZONE
-  ZONE 2 - BUFFER PLANTING ZONE
-  ZONE 3 - HILL SLOPE BUFFER PLANTING ZONE
-  ZONE 4 - WETLAND 1 AND TRIBUTARY C BUFFER IN WETLAND 2A PLANTING ZONE
-  ZONE 5 - WETLAND 2A PLANTING ZONE
-  ZONE 6 - PASTURE SEEDING ZONE



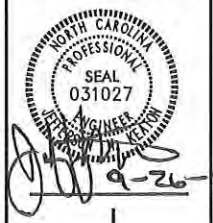
RECORD DRAWINGS

Date:	September 16, 2019
Job Number:	005-02137
Project Engineer:	JK
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Checked By:	CDB

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Little Pine II Stream & Wetland As-Built
 Allegheny County, North Carolina
 Planting Overview
 Planting Plan



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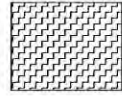
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Streambank Planting Zone			
Bare Root Species	Common Name	Stratum	% of Stems
<i>Cornus amomum</i>	Silky dogwood	Shrub	25
<i>Salix sericea</i>	Silky willow	Shrub	25
<i>Cephalanthus occidentalis L.</i>	Common buttonbush	Shrub	25
<i>Physocarpus opulifolius</i>	Ninebark	Shrub	25
<i>Carex stricata</i>	Tussock sedge	Herb	Plug
<i>Juncus effusus</i>	Common rush	Herb	Plug
<i>Panicum virgatum</i>	Switchgrass	Herb	Plug



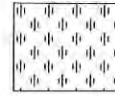
ZONE 1 - STREAM BANK PLANTING ZONE

Wetland 1 Planting Zone and Wetland 2A within 20' of Trib C Top of Bank			
Bare Root Species	Common Name	Stratum	% of Stems
<i>Acer negundo</i>	Box elder	Canopy	5
<i>Acer rubrum</i>	Red maple	Canopy	5
<i>Betula nigra</i>	River birch	Canopy	20
<i>Cornus amomum</i>	Silky dogwood	shrub	10
<i>Fraxinus pennsylvanica</i>	Green ash	Canopy	20
<i>Nyssa sylvatica</i>	Black gum	Canopy	10
<i>Platanus occidentalis</i>	Sycamore	Canopy	20
<i>Quercus michauxii</i>	Swamp chestnut oak	Canopy	10



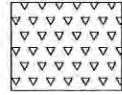
ZONE 4 - WETLAND 1 AND TRIBUTARY C BUFFER IN WETLAND 2A PLANTING ZONE

Riparian Buffer Planting Zone			
Bare Root Species	Common Name	Stratum	% of Stems
<i>Acer rubrum</i>	Red maple	Canopy	5
<i>Betula nigra</i>	River birch	Canopy	20
<i>Fraxinus pennsylvanica</i>	Green ash	Canopy	20
<i>Liriodendron tulipifera</i>	Tulip poplar	Canopy	20
<i>Platanus occidentalis</i>	Sycamore	Canopy	20
<i>Oxydendrum arboreum</i>	Sourwood	Canopy	15



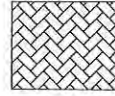
ZONE 2 - BUFFER PLANTING ZONE

Wetland 2A Planting Zone (under existing canopy)			
Species	Common Name	Stratum	% of Stems
<i>Alnus serrulata</i>	Tag alder	shrub	20
<i>Carpinus caroliniana</i>	Ironwood	small tree/shrub	20
<i>Cornus amomum</i>	Silky dogwood	shrub	20
<i>Lindera benzoin</i>	Spicebush	shrub	20
<i>Sambucus nigra</i>	Elderberry	shrub	20



ZONE 5 - WETLAND 2A PLANTING ZONE

Hill Slope Buffer Planting Zone			
Bare Root Species	Common Name	Stratum	% of Stems
<i>Acer rubrum</i>	Red maple	Canopy	5
<i>Aesculus ostryifera</i>	Yellow buckeye	Canopy	15
<i>Fraxinus americana</i>	White ash	Canopy	20
<i>Liriodendron tulipifera</i>	Tulip poplar	Canopy	20
<i>Nyssa sylvatica</i>	Blackgum	Canopy	15
<i>Quercus rubra</i>	Northern red oak	Canopy	20
<i>Oxydendrum arboreum</i>	Sourwood	Canopy	5



ZONE 3 - HILL SLOPE BUFFER PLANTING ZONE

Permanent Riparian Seeding		
Pure Live Seed (20 lbs/acre)		
Species Name	Common Name	Density (lbs/acre)
<i>Elymus virginicus</i>	Virginia Wild Rye	2.0
<i>Andropogon ternarius</i>	Split Beardgrass	0.6
<i>Bouteloua curtipendula</i>	Side Oats Grama	2.6
<i>Bouteloua gracilis</i>	Blue Grama	3.1
<i>Carex vulpinoidea</i>	Fox Sedge	0.8
<i>Chasmanthium latifolium</i>	Indian Woodoats	1.6
<i>Coreopsis lanceolata</i>	Lanceleaf Coreopsis	1.0
<i>Panicum clandestinum</i>	Deertongue	3.5
<i>Rudbeckia hirta</i>	Blackeyed Susan	1.0
<i>Schizachyrium scaparium</i>	Little Bluestem	2.6
<i>Sporobolus clandestinus</i>	Rough Dropseed	1.2

Pasture Seeding		
Pure Live Seed (42 lbs/acre)		
Species Name	Common Name	Density (lbs/acre)
<i>Dactylis glomerata</i>	Orchard Grass	40
<i>Trifolium repens</i>	White Ladino Clover	2

Temporary Seeding			
Approved Date	Species Name	Common Name	Density (lbs/acre)
August 15 - May 1	<i>Secale cereale</i>	Rye Grain	130
April 30 - August 14	<i>Urochloa ramosa</i>	Browntop Millet	45

RECORD DRAWINGS

Revisions:

Date: September 16, 2019
 Job Number: 005-02137
 Project Engineer: JK
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 Created By: CDB

3.2

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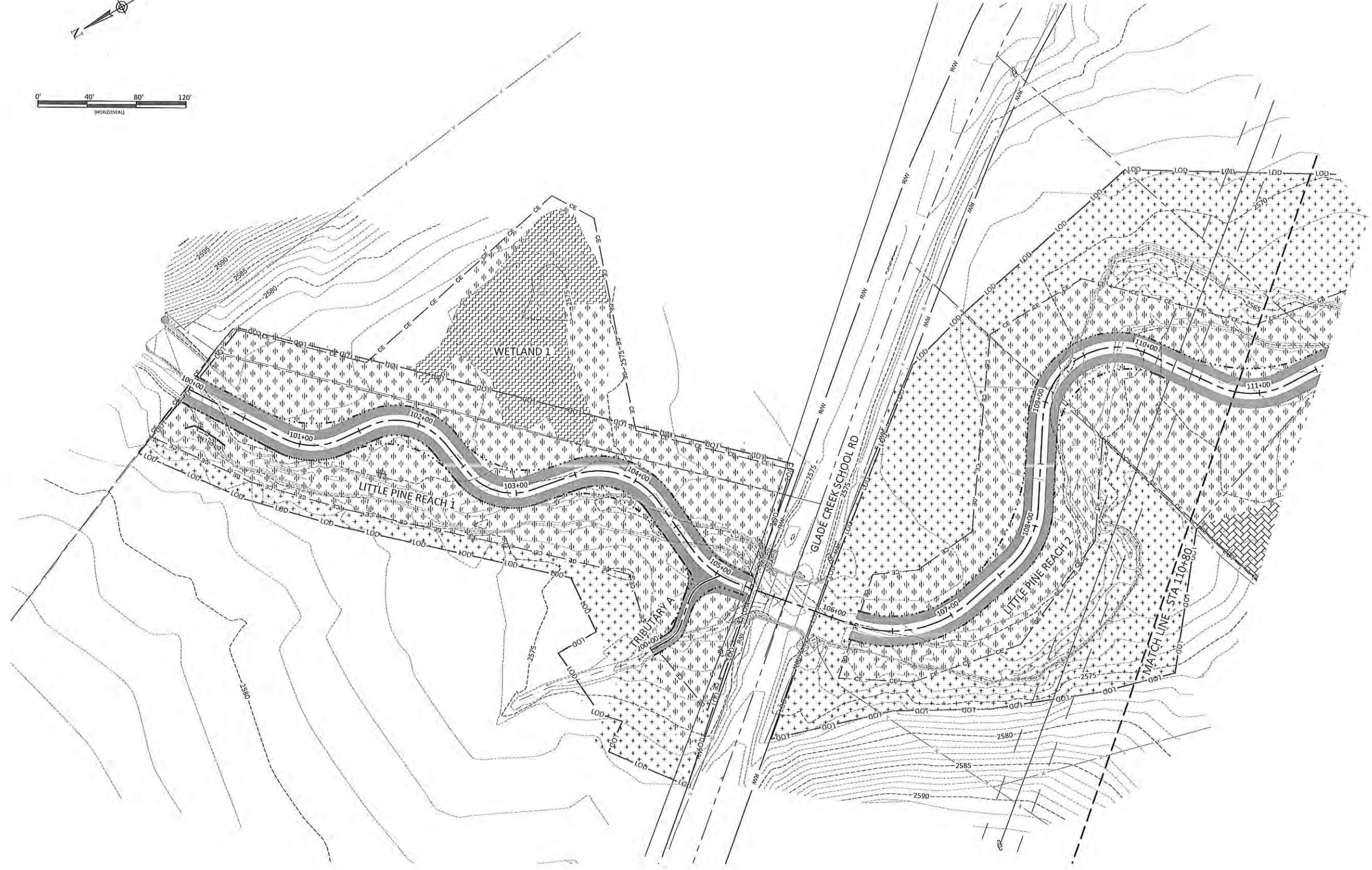
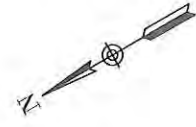
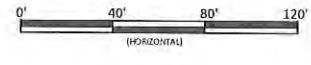


Little Pine II Stream & Wetland As-Built

Allegheny County, North Carolina

Planting Summary
Planting Plan

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 September 16, 2019



- ZONE 1 - STREAM BANK PLANTING ZONE
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- ZONE 5 - WETLAND 2A PLANTING ZONE
- ZONE 6 - PASTURE SEEDING

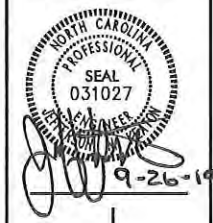
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Checked By:	CDB

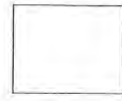
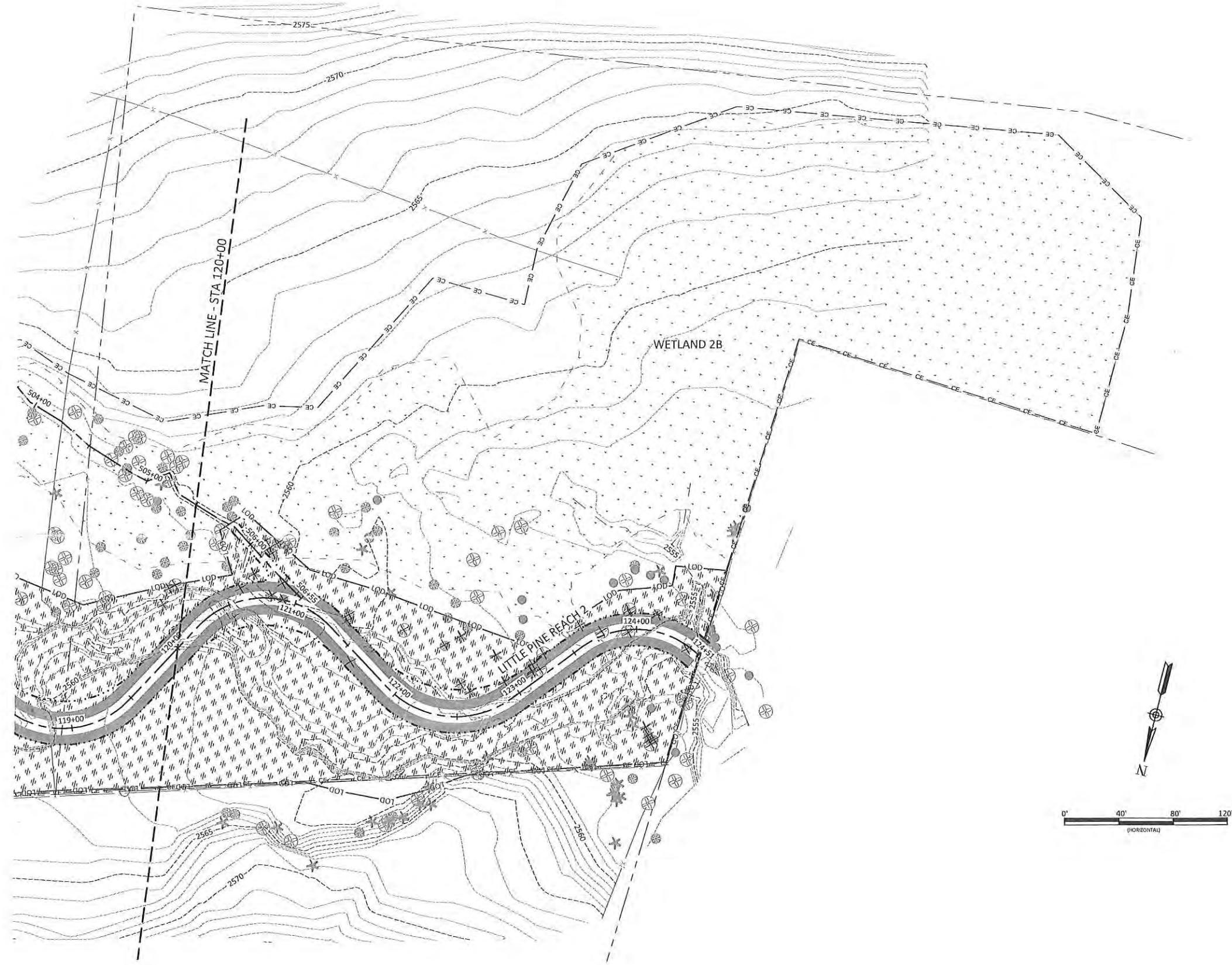
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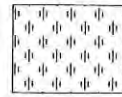
Little Pine II Stream & Wetland As-Built
 Alleghany County, North Carolina
 Little Pine Reach 1, Reach 2, and Tributary A
 Planting Plan



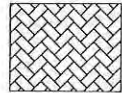
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 312 W. WILSON ST.
 RALEIGH, NC 27609
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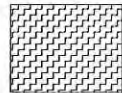
ZONE 1 - STREAM BANK PLANTING ZONE



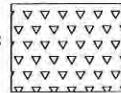
ZONE 2 - BUFFER PLANTING ZONE



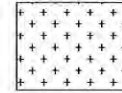
ZONE 3 - HILL SLOPE BUFFER PLANTING ZONE



ZONE 4 - WETLAND 1 AND TRIBUTARY C BUFFER IN WETLAND 2A PLANTING ZONE



ZONE 5 - WETLAND 2A PLANTING ZONE



ZONE 6 - PASTURE SEEDING

RECORD DRAWINGS

Revisions:

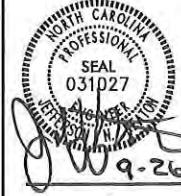
Date: September 16, 2019
 Job Number: 005-02137
 Project Engineer: JK
 Drawn By: JCK
 Checked By: CDB

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Little Pine II Stream & Wetland As-Built
 Alleghany County, North Carolina

Little Pine Reach 2
 Planting Plan

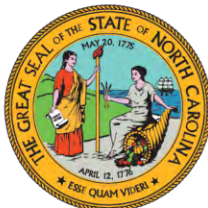


9-26-19

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Appendix G
Background Communications

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NORTH CAROLINA
Environmental Quality

ROY COOPER
Governor

MICHAEL S. REGAN
Secretary

TIM BAUMGARTNER
Director

MEMORANDUM:

TO: Todd Tugwell, Chair, North Carolina Interagency Review Team (NCIRT)

FROM: Harry Tsomides, NCDEQ - DMS Project Manager

CC: Paul Wiesner, NCDEQ - DMS Western Regional Supervisor
Melonie Allen, NCDEQ - DMS Credit Release Coordinator
Jim Stanfill, NCDEQ - DMS Asset Manager
Tim Baumgartner, NCDEQ - DMS Division Director

SUBJECT: Little Pine Creek II – Monitoring update from 5 years to 7 years
DMS # 856
USACE Action ID: SAW-2009-00591
DWR# 09-0048
Alleghany County, North Carolina

DATE: September 9, 2019

1. Background Information

DMS requests to update the Little Pine Creek II Restoration Project from a 5-year, non-credit release monitoring term to a 7-year, credit release term to become better aligned with more recent project monitoring and credit release schedules.

This project, a DMS design-bid-build project originally instituted in December 2007, has had several delays due to landowner issues, a temporary ban on trout waivers (2010), a construction contract termination and design reassignment (2013), conservation easement adjustment (2015), mitigation plan addendum (2016) and significant hurricane damage during construction (2018). The project was built according to the January 2016 mitigation plan addendum design (Wildlands Engineering), and now has a final, LSS-sealed as-built survey dated July 14, 2019; it is currently under advertisement for post-construction monitoring services (firm to be determined via bidding process).



2. Performance Standards

Performance criteria from the October 24, 2016 USACE Public Notice guidance will be followed and are outlined as follows:

Restored Stream Channels

1. All streams must maintain an Ordinary High-Water Mark (OHWM), per RGL 05-05.
2. Continuous surface flow must be documented each year for at least 30 consecutive days.
3. Bank height ratio (BHR) cannot exceed 1.2 for all measured cross sections on a given reach.
4. Entrenchment ratio (ER) must be above 2.2 for all measured riffle cross-sections on a given reach (for C and E streams).
5. BHR and ER should not change by more than 10% in any given year for all measured cross sections on a given reach.
6. Must document occurrence of at least 4 bankfull events in separate years during the monitoring period.

Riparian Vegetation

1. Within planted portions of the site, a minimum of 320 stems per acre must be present at year 3; a minimum of 260 stems per acre must be present at year 5; and a minimum of 210 stems per acre must be present at year 7.
2. Trees must average 6 feet in height at year 5, and 8 feet in height at year 7 (mountain region).
3. Planted and volunteer stems are counted, provided they are included in the approved planting list for the site.
4. Any single species can only account for 50% of the required stems per monitoring Plot.

3. Monitoring Plan

A MY0 baseline report and as built record drawings will be provided to the NCIRT for review and comment prior to the initial 30% release for the site (see credit release section below). The baseline report will be performed by the firm awarded the monitoring contract and provided by NCDMS together along with the designer-sealed record drawings. The most recent DMS As-Built Baseline Monitoring Report Template will be used to document the baseline conditions. Annual monitoring data will be reported using the latest NCDMS Monitoring Report Template. All monitoring reports will include at least a brief narrative of site developments, a representative photo log, and a Current Condition Plan View (CCPV).

Monitoring Year 1 will be calendar year 2020. The proposed locations of monitoring features are shown in the monitoring figure below as an Attachment. Annual monitoring reports will be completed for all seven years and provided to the NCIRT no later than April 1 of each monitoring year. Monitoring data collected on the site will include reference photos, plant survival analyses, hydrology, channel stability analyses, and visual assessments.

Stream monitoring will include monitoring of the hydrologic and geomorphic functions of the project restoration reaches. Vegetation monitoring will evaluate the establishment of planted and volunteer vegetation across the site. A visual assessment of the entire project will be conducted on an annual basis. This data will be presented in the Current Condition Plan View (CCPV) with supporting



documentation presented in the tables outlined by DMS’s most recent guidance. Problem areas of vegetation, in-stream structures, and channel migration will be noted and documented with photos.

Monitored parameters, methods, schedule/frequency, and extent are summarized as follows:

Parameter	Method	Schedule/ Frequency	Number/ Extent
Stream Morphology*			
Stream Profile	Longitudinal profile of the thalweg, water surface, bankfull, and top of bank	MY0 only (unless otherwise required)	All restored stream channels (2496 LF Little Pine Creek, 763 LF Tributaries)
Stream Dimension	Cross sections	Years 0,1, 2, 3, 5, and 7	9 cross sections on Little Pine Creek (5 Riffle /4 pool), 4 cross sections on tributaries (A/B/C)
Channel Stability	Visual Assessment	Annually	All restored stream channels
Vegetation			
Vegetation establishment and vigor	CVS Level II Permanent vegetation plots, 0.02 acre in size (minimum)	Years 0,1, 2, 3, 5, and 7	8 plots
	Annual random vegetation plots, 0.02 acre in size (minimum)		4 plots
Hydrology			
Stream Hydrology	Continuous stage recorders (CSR) and crest gauges (CG); When possible overbank events will be corroborated with photographic evidence.	Annually	Little Pine Creek (1 CSR) and Tributaries A(1 CG), B(1 CG), and C (1 CSR)
Wetland Enhancement Hydrology	Wetland gauges; During mitigation plan review, DWR recommended placing gauges in the wetland enhancement areas to document the changes in the water tables relative to the stream restoration (no assigned hydroperiod); gauges will be installed according to the October 2016 NCIRT guidance.	Annually	2 ground water gauges (one each in enhancement wetlands 1 and 2A)
Rainfall Data	Rain Gauge; should be measured on-site using at least one recording rain gauge; rainfall from the nearest available weather station can be used to supplement data collected on-site	Annually	1 rain gauge
Site-wide			
Encroachments, poor vegetation growth, beaver activity, invasive vegetation, etc.	Permanent Photo Locations and Visual assessment as required in the October 2016 NCIRT guidance, with mapping and tabulation as per the latest DMS format template	Annually	na

*In addition, should bank erosion develop in excess of 5% of the reach length, or at the discretion of NCDMS, bank pins sufficient to capture the observed variation in erosional features will be installed. Pins will be 3 foot sections of 3/8” rebar driven at the bank toe and above at approximately 2 foot intervals. Each vertical array will be captured with a GPS and included on the CCPV. Pins should be measured for bank retreat at a minimum of twice per year. Pin installation and monitoring would follow the October 24, 2016 USACE Public Notice guidance.



4. Proposed Credit Release Schedule

The project will follow the release schedule specified in the October 2016 NCIRT guidance for ILF/NCDMS projects. The following conditions will apply to the credit release schedules:

- A. A reserve of 10% of a site’s total stream credits will be released after four bankfull events have occurred, in separate years, provided the channel is stable and all other performance standards are met. In the event that less than four bankfull events occur during the monitoring period, release of these reserve credits is at the discretion of the NCIRT.
- B. After the second milestone, the credit releases are scheduled to occur on an annual basis, assuming that the annual monitoring report has been provided to the USACE in accordance with Section IV (General Monitoring Requirements) of this document, and that the monitoring report demonstrates that interim performance standards are being met and that no other concerns have been identified on-site during the visual monitoring. All credit releases require written approval from the USACE.
- C. The credits associated with the final credit release milestone will be released only upon a determination by the USACE, in consultation with the NCIRT, of functional success as defined in the Mitigation Plan.

Proposed Stream Credit Release Schedule

Credit Release Milestone	Release Activity	Interim Release	Total Released
1	Site Establishment (includes all required criteria stated above)	0%	0%
2	Completion of all initial physical and biological improvements made pursuant to the Mitigation Plan	30%	30%
3	Year 1 monitoring report demonstrates that channels are stable and interim performance standards have been met	10%	40%
4	Year 2 monitoring report demonstrates that channels are stable and interim performance standards have been met	10%	50%
5	Year 3 monitoring report demonstrates that channels are stable and interim performance standards have been met	10%	60%
6*	Year 4 monitoring report demonstrates that channels are stable and interim performance standards have been met	5%	65% (75%**)
7	Year 5 monitoring report demonstrates that channels are stable and interim performance standards have been met	10%	75% (85%**)
8*	Year 6 monitoring report demonstrates that channels are stable and interim performance standards have been met	5%	80% (90%**)
9	Year 7 monitoring report demonstrates that channels are stable and interim performance standards have been met	10%	90% (100%**)

**Please note that vegetation data may not be required with monitoring reports submitted during these monitoring years unless otherwise required by the Mitigation Plan or directed by the NCIRT.*

***10% reserve of credits to be held back until the bankfull event performance standard has been met.*

Proposed Wetland Credit Release Schedule

Credit Release Milestone	Release Activity	Interim Release	Total Released
1	Site Establishment (includes all required criteria stated above)	0%	0%
2	Completion of all initial physical and biological improvements made pursuant to the Mitigation Plan	30%	30%
3	Year 1 monitoring report demonstrates that interim performance standards have been met	10%	40%
4	Year 2 monitoring report demonstrates that interim performance standards have been met	10%	50%

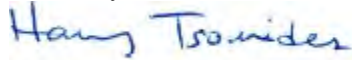


5	Year 3 monitoring report demonstrates that interim performance standards have been met	15%	65%
6*	Year 4 monitoring report demonstrates that interim performance standards have been met	5%	70%
7	Year 5 monitoring report demonstrates that interim performance standards have been met	15%	85%
8*	Year 6 monitoring report demonstrates that interim performance standards have been met	5%	90%
9	Year 7 monitoring report demonstrates that interim performance standards have been met	10%	100%

**Please note that vegetation data may not be required with monitoring reports submitted during these monitoring years unless otherwise required by the Mitigation Plan or directed by the IRT.*

Please let me know if you have any comments, questions, or concerns.

Sincerely,



Harry Tsomides

Project Manager

Division of Mitigation Services

NC Department of Environmental Quality

Tel. (828) 545-7057

Harry.Tsomides@ncdenr.gov

Attachments – Monitoring Features Map



Little Pine II Monitoring Features Map (updated August 2019)

Legend

- Stream - Restoration
- Stream - Preservation
- CVS Vegetation Plots
- Cross Sections
- LP II Easement

Hydrology

Type

- Crest gauge
- Continuous stage recorder
- + Wetland gauge

Wetlands

Approach

- Enhancement
- Preservation





NORTH CAROLINA
Environmental Quality

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Director

11/14/2019

PROJECT SITE MEETING MINUTES

Little Pine Creek II Stream and Wetland Restoration Site, Alleghany County

Meeting Date: 11/5/2019

DMS Project ID 856

USACE ACTION ID: SAW 2009-00591

DWR # 09-0048

In attendance:

Kim Browning (USACE), Erin Davis (NCDWR) Mac Haupt (NCDWR), Paul Wiesner (NCDMS), Harry Tsomides (NCDMS), Melonie Allen (NCDMS), Kelly Phillips (NCDMS)

Meeting Summary

The field review meeting was held at the request of DMS in order to view as-built conditions on this recently constructed Design-Bid-Build site, and identify any concerns heading into the project monitoring phase.

This project recently got updated via a request from DMS to the IRT dated 9/9/2019, to update the monitoring period from 5 years to 7 years, outline updated monitoring requirements and performance standards, and introduce a formal credit release schedule. Project construction officially closed on 8/13/2019, subsequently had a monitoring contract awarded, and is currently undergoing baseline monitoring features set up. Mitigation success monitoring will be started in 2020 (MY01), and the MY0 report should be made available in late January 2020.

The following is a summary of the field review and items discussed during the meeting:

- The group met at the wet crossing on project Tributary A, and briefly discussed the project status and recent history. It was noted that a monitoring firm had recently been awarded a contract and that the baseline monitoring feature installation would begin on 11/12/2019. Hard copies of the official designer as-built record drawings and a DMS proposed monitoring features map were distributed by DMS.
- The group walked to the upstream end of the project (STA 100+00); the group then walked to the neighboring property upstream of the project to understand the nature of



the offsite stream and how it might be influencing onsite project streams. The IRT noted that during a previous mitigation plan review visit there had been concern about the offsite stream cutting into the project area across the right floodplain, but stream hydrology currently appears to be flowing into the project area in a more favorable orientation, with a possible oxbow forming (offsite). The geolift/riffle structure from STA 100+00 TO 101+00 installed as a post-hurricane Florence (Sept. 2018) storm repair appeared to be performing well and moving sediment through the system while protecting the stream banks adequately thus far.

- Walking downstream to the bridge crossing on Glade Creek School Road, the stream appeared to reflect the record drawings and no major concerns were noted on Little Pine Creek or Tributary A. The boundary is well marked, and flood flows were evident on the left floodplain from an overbank event approximately 10 days earlier. The floodplain sills and associated brush material appeared to be intact and performing well.
- The group moved farther downstream across the roadway and bridge, where DMS noted that a breakaway electrified cattle rope along a wet crossing adjacent to Glade Creek School Road had become entangled with a white pine branch and ripped loose (likely during the recent overbank event). DMS indicated that the landowner is expected to fix the fence and that he had been contacted.
- The group moved farther downstream towards STA 112+00 and the confluence of Tributary B with Little Pine Creek. All structures appeared to be intact and performing as installed. Tributary B was observed.
- The group walked along the right floodplain of Little Pine Creek to the downstream limits of the project. In general, there were no major issues noted, and all structures were intact and performing well but DMS and IRT agreed that floodplain woody vegetation did not seem very dense in areas, despite post-construction bare root planting at 605 stems/acre. Floodplain soils in some areas are gravel and cobble-dominated, where floodplain flows are moving sediments during overbank events. It was noted that vegetation density will be monitored closely upon receipt of the MYO baseline report and vegetation data, and supplemental planting will occur in the next dormant season if initial stem counts are poor. There were some concerns with the standing water in the vernal pool on the right floodplain near STA 113+50; while there had been a recent overbank event that likely filled the pool, ideally the vernal pools should not hold water for extended time periods. The IRT noted that planting of aquatic vegetation in the pools would improve these features in the event that they hold water longer than preferable. The other three vernal pools farther downstream were not holding water during the site visit.
- DMS asked the IRT to observe preservation Tributaries E and F (two small wetland 2B tributaries that merge together near the edge of Little Pine Creek), since the lower section of Tributary F has appeared to down cut somewhat since project design. Tributaries E and F (50 LF and 153 LF, respectively) were jurisdictionally confirmed during the design stage.



The IRT indicated that, despite some stable segments of Tributary F upstream of the head cut, that recent impacts and a head cut along Tributary F have affected stream performance on these reaches to the degree that they should not yield stream preservation credits. DMS indicated that the upcoming MY0 baseline report would reflect no mitigation crediting for preservation on Tributaries E and F.

- The group walked upstream through Wetland 2B and inspected the boundary marking along Wetland 2B. The entire length of preservation Tributary D (655 LF) was walked, flow was evident, and no major concerns were noted. DMS noted where the conservation easement contained the spring source and entire headwater feature on Tributary D. The group walked into the floodplain of Tributary C (restoration tributary totaling 578 LF). The adjacent enhancement wetland 2A appeared wet and the IRT seemed fine with the mapped location of the enhancement wetland gauge, although a more ideal location 10-15 feet closer to Tributary C was agreed on; if changed, the installed gauge will reflect this updated location and will be noted in the baseline report. Tributary C was observed and no major concerns were noted, other than the thick herbaceous vegetation making visibility of bare root plantings difficult.
- Other than the minor location adjustment of the wetland 2A gauge, there were no requested changes to quantities or locations of any monitoring features/devices (as communicated in the 9/9/2019 update memo and monitoring map provided by DMS to IRT).
- The meeting concluded with DMS indicating their intention to post the MY0 baseline report when it is finalized, and discuss the project accordingly at the next credit release meeting.

Meeting notes compiled by:

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