CEDAR CREEK STREAM AND WETLAND RESTORATION PROJECT
BASELINE MONITORING DOCUMENT AND AS-BUILT REPORT

SAMPSON COUNTY, NORTH CAROLINA, PROJECT # 95718

Prepared for:

Division of Mitigation Services

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Cedar Creek
Sampson County, North Carolina
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Cape Fear River Basin
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EXECUTIVE SUMMARY

The Cedar Creek Stream Restoration Project is located within an agricultural watershed in Sampson County, North Carolina, approximately three miles southwest of Clinton. The stream channels had been heavily impacted by channelization and agricultural practices. This project involved the restoration and protection of streams in the Great Coharie Creek watershed. The purpose of this restoration project is to restore and enhance a stream and wetland complex located within the Cape Fear River Basin.

The project area is comprised of a single easement area along four tributaries to Great Coharie Creek (UT1, UT2, UT3 and UT4). UT1 is the primary channel at this site, and had been channelized throughout the project area. It flows westward through the site from Boykin Bridge Road to Great Coharie Creek. The upper drainage of UT1 originates to the southwest of Boykin Bridge Road (SR 1214) near Butlers Crossroads. The tributaries UT2, UT3, and UT4 flow southward into UT1. UT2 begins at the confluence of two headwater streams and had been ditched to the edge of the field. Flow is redirected along the upslope side of the cultivated field to an unnamed tributary to Cedar Creek. This unnamed tributary (UT4) enters Cedar Creek upstream of the natural valley for UT2. UT3 begins below a pond east of the airport and had been channelized down to a cultivated field where it had been redirected to the west. The historical flow path continues in a southerly direction through the cultivated field to its confluence with UT1.

The site consists of cultivated farmland and wooded areas. The total easement area is 42.0 acres, 26.9 acres of which are wooded. The remaining area is agricultural or clear-cut. The wooded areas along the corridors designated for restoration are classified as disturbed deciduous forest, and invasive species are common along the enhancement reaches. Several ditches existed throughout the project and flow into the main channel. All existing agricultural channels were degraded to a point where they no longer could access their floodplain, water quality was poor, and aquatic life was not supported. Little habitat was available to support aquatic life, and the channels were not maximizing their potential to filter nutrients because they were entrenched and/or had no buffer.

The objective for this restoration project is to restore wetland areas and design a natural waterway through a stream/wetland complex with appropriate cross-sectional dimension and slope that will provide function and meet the appropriate success criteria for the existing streams. Accomplishing this objective entailed the restoration of natural stream characteristics, such as stable cross sections, planform, and in-stream habitat. The floodplain areas were hydrologically reconnected to the channel providing natural exchange and storage during flooding events. The design was based on reference conditions, USACE guidance (USACE, 2005), and criteria that were developed during this project to achieve success. Additional project objectives, such as restoring the riparian buffer with native vegetation, ensuring hydraulic stability, and eradicating invasive species, are listed in Section 1 along with several other project objectives.

The design approach for Cedar Creek was to combine the analog method of natural channel design with analytical methods to evaluate stream flows and hydraulic performance of the channel and floodplain. The analog method involved the use of a “template” stream adjacent to, nearby, or previously in the same location as the design reach. The template parameters of the analog reach are replicated to create the features of the design reach. The analog approach is useful when watershed and boundary conditions are similar between the design and analog reaches (Skidmore, et al., 2001). Hydraulic geometry was developed using analytical methods in an effort to identify the design discharge.

The headwater valley restoration approach was performed along the upper end of UT2 and UT2C. The existing ditches/channels were plugged and then backfilled to the extent possible such that cut and fill was balanced along the reach. Priority Level I restoration was performed on UT2 and UT3 for the majority of the restoration reaches, the channel were rerouted from its current location to adjacent natural valley features.

Enhancement Levels I and II were performed for UT1 and Enhancement Level II only for UT4. Enhancement Level I included grading floodplain benches, bank stabilization treatments, and habitat improvements, while Enhancement Level II included minor bank grading and habitat improvements.

Wetland restoration occurred adjacent to UT1 and UT3. The approach was to reconnect the floodplain wetland to the stream, fill ditches, create shallow pool habitat, micro contour, and plant appropriate small stream swamp vegetation.

The site has been monitored on a regular basis after all construction and planting activities were completed. A physical inspection of the site is conducted a minimum of twice per year throughout the seven year post-construction monitoring period, or until performance standards are met. These site inspections identify site components and features that require routine maintenance. The measure of stream restoration success is documented bankfull flows and no change in stream channel classification. Sand bed channels are dynamic and minor adjustments to dimension and profile are expected. The measure of vegetative success for the site is the survival of at least 210 trees per acre at the end of Year 7 of the monitoring period. Annual monitoring data is reported using the DMS monitoring template.

Upon approval for closeout by the Interagency Review Team (IRT), the site will be transferred to the State of North Carolina (State). The State shall be responsible for periodic inspection of the site to ensure that restrictions required in the conservation easement or the deed restriction document(s) are upheld.

Reach	Mitigation Type	Proposed Stationing	Existing Length (LF)	As-Built Length (LF)	Mitigation Ratio	SMUs
UT1	Enhancement II	1+01 to 31+65	3,064	3,064	1:2.5	1,226
UT1	Enhancement I	31+65 to 35+80	415	415	1:1.5	277
UT1	Enhancement II	35+80 to 41+95	615	615	1:2.5	246
UT1	Enhancement I	41+95 to 44+60	265	265	1:1.5	177
UT1	Enhancement II	44+60 to 53+51	891	827	1:2.5	331
UT2	Headwater Valley	0+11 to 3+48	364	337	1:1	337
UT2	P1 Restoration	3+48 to 9+28	587	518	1:1	518
UT2C	Headwater Valley	0+02 to 1+95	NA	193	1:1	193
UT3	P1 Restoration	0+69 to 20+10	1,428	1,941	1:1	1,941
UT4	Enhancement II	0+36 to 1+14	78	78	1:2.5	31
		Total	**7,707**	**8,253**		**5,277**

Wetland	Mitigation Type	Mitigation Area (ac)	Mitigation Ratio	WMUs
W1	Restoration	13.72	1:1	13.72
	Total	**13.72**		**13.72**

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1 PROJECT GOALS, BACKGROUND AND ATTRIBUTES

1.1 Location and Setting

The Cedar Creek Stream and Wetland Site is located in Sampson County approximately 3.1 miles southwest of Clinton, NC (**Figure 1**). To access the Site from the town of Clinton, travel west on Highway 24 (Sunset Avenue), take a left onto Airport Road and go 1.3 miles. Turn right onto West Main Street Extension, go approximately 350 feet, and turn left onto a dirt farm path. Follow the farm path along the cultivated field edge to the southwest corner and enter the forest. Follow the dirt path to cultivated fields adjacent to the project below UT2. Turning to the left will take you to UT2. Going to the right will take you to UT3.

1.2 Project Goals and Objectives

The Cedar Creek Stream and Wetland Restoration Project has provided numerous ecological and water quality benefits within the Cape Fear River Basin. While many of these benefits are limited to the project area, others, such as pollutant removal and improved aquatic and terrestrial habitat, have more far-reaching effects. Expected improvements to water quality, hydrology, and habitat are outlined below.

Design Goals and Objectives

Benefits Related to Water Quality	
Nutrient removal	Benefit will be achieved through filtering of runoff from adjacent agricultural fields through buffer areas, the conversion of active farm fields to forested buffers, improved denitrification and nutrient uptake through buffer zones, and installation of BMPs at the headwaters of selected reaches.
Sediment removal	Benefit will be achieved through the stabilization of eroding stream banks and reduction of sediment loss from field areas due to lack of vegetative cover. Channel velocities will also be decreased through a reduction in slope, therefore decreasing erosive forces.
Increase dissolved oxygen concentration	Benefit will be achieved through the construction of instream structures to increase turbulence and dissolved oxygen concentrations and riparian canopy restoration to lower water temperature to increase dissolved oxygen capacity.
Runoff filtration	Benefit will be achieved through the restoration of buffer areas that will receive and filter runoff, thereby reducing nutrients and sediment concentrations reaching water bodies downstream.
Benefits to Flood Attenuation	
Water storage	Benefit will be achieved through the restoration of buffer areas which will infiltrate more water during precipitation events than under current site conditions. Wetland areas will provide additional storage of runoff and flood waters.
Improved groundwater recharge	Benefit will be achieved through the increased storage of precipitation in buffer areas, ephemeral depressions, and reconnection of existing floodplain. Greater storage of water will lead to improved infiltration and groundwater recharge.
Improved/restored hydrologic connections	Benefit will be achieved by restoring the stream to a natural meandering pattern with an appropriately sized channel, such that the channel's floodplain will be flooded more frequently at flows greater than the bankfull stage.
Benefits Related to Ecological Processes	
Restoration of habitats	Benefit will be achieved by restoring riparian buffer habitat to appropriate bottomland hardwood ecosystem. Protected riparian corridors will create contiguous natural areas with uninterrupted migration corridors.
Improved substrate and instream cover	Benefit will be achieved through the construction of instream structures designed to improve bedform diversity and to trap detritus. Stream will be designed with the appropriate channel dimension and will prevent aggradation and sedimentation within the channel. Substrate will become coarser as a result of the stabilization of stream banks and an overall decrease in the amount fine materials deposited in the stream.

Addition of large woody debris	Benefit will be achieved through the addition of wood structures as part of the restoration design. Such structures may include log vanes, root wads, and log weirs.
Reduced temperature of water due to shading	Benefit will be achieved through the restoration of canopy tree species to the stream buffer areas.
Restoration of terrestrial habitat	Benefit will be achieved through the restoration of riparian buffer bottomland hardwood habitats.

The Cedar Creek Stream and Wetland Restoration Project is located in the Great Coharie Creek Watershed (http://portal.ncdenr.org/web/DMS/priorities-map). This 14-digit Hydrologic Unit Code (HUC 03003006090060) and is identified as a Targeted Local Watershed (TLW) in the Cape Fear River Basin Restoration Priority (RBRP).

The North Carolina Division of Mitigation Services (NCDMS) develops River Basin Restoration Priorities (RBRP) to guide its restoration activities within each of the state's 54 cataloging units. RBRPs delineate specific watersheds that exhibit both the need and opportunity for wetland, stream and riparian buffer restoration. These TLWs receive priority for DMS planning and restoration project funds. Currently, no Local Watershed Plan (LWP) is available for the project area.

The 2009 Cape Fear RBRP identified water quality and agricultural impacts as major stressors within this TLW. The Cedar Creek Stream and Wetland Restoration Project was identified as a Stream and Wetland opportunity to improve water quality, habitat, and hydrology within the TLW.

The project goals addressed stressors identified in the TLW, and include the following:

- Water quality improvements,
- Natural resource protection, and
- Manage agricultural impacts.

The project goals were addressed through the following project objectives:

- Converting active farm fields to forested buffers,
- Stabilization of eroding stream banks,
- Reduction in stream bank slope,
- Restoration of riparian buffer bottomland hardwood habitats, and
- Construction of in-stream structures designed to improve bedform diversity.

1.3 Project Structure

Table 1a. Cedar Creek Site Project Components – Stream Mitigation

Reach	Mitigation Type	Proposed Stationing	Existing Length (LF)	As-Built Length (LF)	Mitigation Ratio	SMUs
UT1	Enhancement II	1+01 to 31+65	3,064	3,064	1:2.5	1,226
UT1	Enhancement I	31+65 to 35+80	415	415	1:1.5	277
UT1	Enhancement II	35+80 to 41+95	615	615	1:2.5	246
UT1	Enhancement I	41+95 to 44+60	265	265	1:1.5	177
UT1	Enhancement II	44+60 to 53+51	891	827	1:2.5	331
UT2	Headwater Valley	0+11 to 3+48	364	337	1:1	337
UT2	P1 Restoration	3+48 to 9+28	587	518	1:1	518
UT2C	Headwater Valley	0+02 to 1+95	NA	193	1:1	193
UT3	P1 Restoration	0+69 to 20+10	1,428	1,941	1:1	1,941
UT4	Enhancement II	0+36 to 1+14	78	78	1:2.5	31
		Total	**7,707**	**8,253**		**5,277**

Table 1b. Cedar Creek Site Project Components – Wetland Mitigation

Wetland	Mitigation Type	Mitigation Area (ac)	Mitigation Ratio	WMUs
W1	Restoration	13.72	1:1	13.72
	Total	**13.72**		**13.72**

1.3.1 Restoration Type and Approach

Stream restoration efforts along the unnamed tributaries to Great Coharie Creek were accomplished through analyses of geomorphic conditions and watershed characteristics. The design approach applied a combination of analytical and reference and/or analog reach based design methods that meet objectives commensurate with both ecological and geomorphic improvements. Proposed treatment activities ranged from minor bank grading and planting to re-establishing stable planform and hydraulic geometry. Reaches that required full restoration, natural design concepts have been applied and verified through rigorous engineering analyses and modeling. The objective of this approach was to design a geomorphically stable channel that provides habitat improvements and ties into the existing landscape.

The Cedar Creek Site included Priority Level I stream restoration, headwater valley restoration, stream Enhancement Levels I and II, and stream buffers throughout the project site have been restored and protected in perpetuity. Priority Level I stream restoration was incorporated into the design of a single-thread meandering channel, with parameters based on data taken from the reference

site. Priority 1 stream restoration was performed on 2,459 linear feet of stream channel. Headwater valley restoration was applied to 530 linear feet of channel. Enhancement Level I was applied to 680 linear feet of channel that required buffer enhancement, bank stabilization and habitat improvements. Enhancement Level II was applied to an additional 4,584 linear feet of channel that required buffer enhancement and/or minimal bank and habitat improvements.

UT1 (STA 1+01 to STA 53+51)
UT1 flows from southeast to northwest across the project, totaling 5,186 linear feet of Enhancement Level I and II. The upper-most portion of UT1 (reaches UT1A and UT1B) is stable and has a forested buffer along both banks; however, privet was dominant within the right buffer. The downstream portion of UT1 (reaches UT1C, UTD and UT1E) was moderately stable and exhibited some areas of localized erosion. The buffer along this section consisted of a five year old clear-cut along the left bank and cultivated fields along the right bank. A 60-foot easement break is present within the downstream section (UT1E) to account for an existing farm crossing which has been upgraded. 680 linear feet of Enhancement Level I was performed along reach UT1. Selective locations were identified to include streambed structures, minor bank grading, planting a native stream buffer and invasive species control. Primarily, Stabilization/Enhancement II activities included performing minor bank grading, planting the buffer with native vegetation, and invasive species control.

UT2 (STA 0+11 to STA 9+28)
UT2 is the middle tributary of the project, totaling 337 linear feet of headwater valley restoration along the upstream section and 518 linear feet of Priority 1 restoration through the downstream section. The upper section of the channel was channelized and bordered by cultivated fields to the northwest and a pine stand to the southeast, while the lower portion was a small ditch surrounded by cultivated fields. The headwater valley portion relocated the flow path to the natural valley (to the left of the existing ditch), and the abandoned ditch has been back filled. The performed P1 restoration included relocating the channel to follow the natural valley and emptying into Cedar Creek near STA 25+50. A 60-foot easement break crossing is present at STA 4+66 along UT2. Twin 24" HDPE culverts were installed within the easement break crossing. Restoration activities included constructing a meandering channel, installing habitat and drop structures, filling and plugging the abandoned channel, planting the buffer with native vegetation, and invasive species control.

UT2C (STA 0+02 to STA 1+95)
UT2C is also located in the middle of the project (adjacent to UT2), totaling 193 linear feet of headwater valley restoration. The upstream end of the reach begins at an existing wetland that borders a farm path to the north. Flow from the wetland originally had been diverted to a ditch that ran east-west along the farm path before it was conveyed across the path and into UT2 near the upstream end. Restoration activities involved redirecting channel flow to the natural valley and grading out the existing ditch and path such that the area matches existing grade on either side of the path. Additional activities included planting the buffer with native vegetation and invasive species control.

UT3 (STA 0+69 to STA 20+10)
UT3 is the western most tributary of the project, totaling 1,941 linear feet of Priority 1 restoration. The upper section of the channel was incised/oversized and began at a pond outlet east of the airport and flowed through a wooded area consisting of saplings and some mature hardwoods, while the lower section flowed through a cultivated field. The restored channel has been relocated to the west to follow the natural valley, and now flows through the middle of the wetland restoration area (W1). UT3 now outlets into Cedar Creek near STA 43+10. Restoration activities included constructing a meandering channel, installing habitat and grade control structures, filling and plugging the abandoned channel, planting the buffer with native vegetation, and invasive species control. Small

ditches located adjacent to UT3 and within the conservation easement have also been plugged and filled to redirect and diffuse flow through the wetland restoration area and/or into UT3.

UT4 (STA 0+36 to STA 1+14)
UT4 is the eastern most tributary of the project, totaling 78 linear feet of Enhancement Level II. The reach was relatively stable, but had been historically channelized. The buffer along this section consisted of an agricultural field along the right bank, and a forested buffer along the left bank; however, privet was common within the left buffer. Stabilization/Enhancement II activities included performing minor bank grading, cutting a floodplain bench, and planting the buffer with native vegetation, and invasive species control.

Wetland W1 (13.72 Acres)
This 13.72-acre wetland is located along UT3 and where it reaches the confluence of with UT1 Reach E. The pre-restoration land use was sparsely wooded and active cropland. Wetland restoration activities consisted of removing valley fill, filling drainage ditches, removing subsurface drainage tiles, and raising adjacent stream channels to reconnect the floodplain with seasonal and out of bank flows. Raising the stream bed will also reduce the "dry shoulder" effect near the stream channel. Specific wetland restoration activities included: reconnecting low lying areas of hydric soil with the floodplain, plugging agricultural drainage ditches, planting native tree and shrub species commonly found in small stream swamp ecosystems, and surface roughening to increase infiltration and storage. Wetland restoration limits and hydroperiods will be determined by on-site soil investigations and hydrologic modeling in conjunction with pre-construction water table monitoring at the restoration sites and reference wetlands. Combined with the stream restoration, these actions will result in a sufficiently high water table and flood frequency to support hydrophytic vegetation and wetland hydrology, resulting in restored riparian wetlands.

1.4 Project History, Contacts and Attribute Data

1.4.1 Project History

The Cedar Creek Stream and Wetland Restoration Site was restored by Resource Environmental Solutions, LLC (RES) through a full-delivery contract awarded by NCDMS in 2012. Tables 2, 3, and 4 provide a time sequence and information pertaining to the project activities, history, contacts, and baseline information.

1.4.2 Project Watersheds

The easement totals 42.0 acres and is broken into four tributaries, UT1, UT2, UT3, and UT4. The land use in the 2,778-acre (4.34 mi^2) project watershed that drains to UT1 consisted of row crop production, livestock production, silviculture, and sand mining areas. Past land use practices caused increased erosion and sedimentation along drainage-ways and stream banks in the watershed.

UT2 has a drainage area of 32 acres (0.05 mi^2) and flows southwest into UT1. Land use in this small drainage area consisted entirely of row crop production and disturbed hardwood forest. UT2 originated in a disturbed hardwood forest and flows through a cultivated field to its confluence with UT1.

UT3 has a drainage area of 147 acres (0.23 mi^2) and flows south into UT1. Land use in this drainage area consisted of row crop production, historical and future livestock production, disturbed hardwood

forest, maintained open space, and impervious surfaces associated with residential commercial development. Portions of the Sampson County Airport, including parts of the runway, terminal, and apron areas, lie within the UT3 drainage area. UT3 originates at a pond that is adjacent to the airport property. This reach flowed through a disturbed hardwood forest, and then through a cultivated field to its confluence with UT1.

UT4 has a drainage area of 77 acres (0.12 mi^2), originates within a disturbed hardwood forest, and flows southwest into UT1. Land use in this small drainage area consisted of a mix of row crop production and disturbed hardwood forest located primarily along the drainage way.

UT2, UT3 and UT4 were straightened, dredged, or re-aligned in the past to promote drainage. Soil investigations showed that much of the low-lying landscape adjacent to UT1 and its confluences with UT2 and UT3 exhibited hydric characteristics and a shallow seasonal high water table. The low lying fields in this area were considered prior converted wetlands (PC) that were drained and are currently utilized for row crop and livestock production.

The land use in the watershed is characterized by evergreen forest (47 percent), cultivation (31 percent), woody wetlands (9 percent), open space (8 percent) and shrub/scrub (5 percent).

2 Success Criteria

The success criteria for the Cedar Creek Site stream restoration will follow accepted and approved success criteria presented in the USACE Stream Mitigation Guidelines and subsequent NCDMS and agency guidance. Specific success criteria components are presented below. Monitoring reports are prepared annually and submitted to DMS.

2.1 Stream Restoration

2.1.1 Bankfull Events

Two bankfull flow events must be documented within the seven-year monitoring period. The two bankfull events must occur in separate years. Otherwise, the stream monitoring will continue until two bankfull events have been documented in separate years. Bankfull events will be documented using crest gauges, auto-logging crest gauges, photographs, and visual assessments for evidence of debris rack lines.

2.1.2 Cross Sections

There should be little change in as-built cross-sections. If changes do take place, they should be evaluated to determine if they represent a movement toward a less stable condition (for example down-cutting or erosion), or are minor changes that represent an increase in stability (for example settling, vegetative changes, deposition along the banks, or decrease in width/depth ratio). Cross-sections are classified using the Rosgen stream classification method, and all monitored cross-sections should fall within the quantitative parameters defined for channels of the design stream type.

2.1.3 Bank Pin Arrays

Bank pin arrays will be used as a supplemental method to monitor erosion on selected meander bends where there is not a cross section. Bank pin arrays will be installed along the outer bend of the meander. Bank pins will be installed just above the water surface and every two feet above the lowest pin. Bank pin exposure will be recorded at each monitoring event, and the exposed pin will be driven

flush with the bank.here should be little change in as-built cross-sections. If changes do take place, they should be evaluated to determine if they represent a movement toward a less stable condition (for example down-cutting or erosion), or are minor changes that represent an increase in stability (for example settling, vegetative changes, deposition along the banks, or decrease in width/depth ratio). Cross-sections shall be classified using the Rosgen stream classification method, and all monitored cross-sections should fall within the quantitative parameters defined for channels of the design stream type.

2.1.4 Digital Image Stations

Digital images are used to subjectively evaluate channel aggradation or degradation, bank erosion, success of riparian vegetation, and effectiveness of erosion control measures. Longitudinal images should not indicate the absence of developing bars within the channel or an excessive increase in channel depth. Lateral images should not indicate excessive erosion or continuing degradation of the banks over time. A series of images over time should indicate successional maturation of riparian vegetation.

2.2 Wetland Success Criteria

Success criteria and monitoring for wetland hydrology within the wetland restoration areas on the site follows NCDMS Guidance dated 7 November 2011. The target minimum wetland hydroperiod is 9 percent of the growing season. Stream hydrology and water balance calculations indicate the wetland area will meet jurisdictional criteria (5 percent hydroperiod). However, due to immature vegetation and reduced PET, a longer success criterion is appropriate. Auto recording gauges are used to measure daily groundwater elevations throughout the Sampson County growing season in all 7 years of monitoring.

If a hydrology gauge location fails to meet these success criteria in the seven year monitoring period then monitoring may be extended, remedial actions may be undertaken, or groundwater modeling may be used to demonstrate the limits of wetland restoration.

2.3 Vegetation Success Criteria

Specific and measurable success criteria for plant density within the wetland restoration and riparian buffers on the site will follow NCDMS Guidance dated 7 November 2011. Vegetation monitoring plots are a minimum of 0.02 acres in size, and cover a minimum of two percent of the planted area. The following data is recorded for all trees in the plots: species, height, planting date (or volunteer), and grid location. Monitoring occurs in the fall of Years 1, 2, 3, 5, and 7. The interim measures of vegetative success for the site is the survival of at least 320 three-year old planted trees per acre at the end of Year 3, and 260 planted trees per acre at the end of Year 5. The final vegetative success criteria is the survival of 210 planted trees per acre at the end of Year 7 of the monitoring period.

Invasive and noxious species will be monitored and controlled so that none become dominant or alter the desired community structure of the site. If necessary, RES will develop a species-specific control plan.

2.4 Scheduling/Reporting

The monitoring for the Cedar Creek Site stream mitigation follows current accepted and approved monitoring requirements presented in the USACE Stream Mitigation Guidelines, NCDMS

requirements, and subsequent agency guidance. The monitoring program has been implemented to document system development and progress toward achieving the success criteria. The restored stream morphology is assessed to determine the success of the mitigation. The monitoring program is undertaken for seven years or until the final success criteria are achieved, whichever is longer.

Monitoring reports will be prepared in the fall of each year of monitoring and submitted to NCDMS. The monitoring reports will include all information, and be in the format required by NCDMS in Version 2.0 of the NCDMS Monitoring Report Template (Oct. 2010).

3 MONITORING PLAN

Annual monitoring data will be reported using the DMS monitoring template. The monitoring report shall provide a project data chronology that will facilitate an understanding of project status and trends, population of DMS databases for analysis, research purposes, and assist in decision making regarding project close-out. The success criteria for the Best Site stream and wetland mitigation will follow current accepted and approved success criteria presented in the USACE Stream Mitigation Guidelines, NCDMS requirements, and subsequent agency guidance. Specific success criteria components are presented in **Table 2**. Monitoring reports will be prepared annually and submitted to NCDMS.

Table 2. Monitoring Requirements

Parameter	Quantity	Frequency	Notes
Pattern	As per April 2003 USACE Wilmington District Stream Mitigation Guidelines	Baseline	Additional surveys will be performed if monitoring indicates instability or significant channel migration
Dimension	As per April 2003 USACE Wilmington District Stream Mitigation Guidelines	Baseline, Years 1,2,3,5, and 7	Surveyed cross sections and bank pins
Profile	As per April 2003 USACE Wilmington District Stream Mitigation Guidelines	Baseline	Additional surveys will be performed if monitoring indicates instability
Surface Water Hydrology	As per April 2003 USACE Wilmington District Stream Mitigation Guidelines	Annual	Crest Gauges and/or Pressure Transducers will be installed on site; the devices will be inspected on a quarterly/semi-annual basis to document the occurrence of bankfull events on the project
Groundwater Hydrology		Annual	Groundwater monitoring gauges with data recording devices will be installed on site; the data will be downloaded on a quarterly basis during the growing season
Vegetation		Annual	Vegetation will be monitored using the Carolina Vegetation Survey (CVS) protocols
Exotic and Nuisance Vegetation		Annual	Locations of exotic and nuisance vegetation will be mapped
Project Boundary		Semi-annual	Locations of fence damage, vegetation damage, boundary encroachments, etc. will be mapped
Stream Visual		Annual	Semi-annual visual assessments
Wetland Visual		Annual	Semi-annual visual assessments

3.1 Stream Restoration

3.1.1 As-Built Survey

An as-built survey was conducted following construction to document channel size, condition, and location. The survey will include a complete profile of thalweg, water surface, bankfull, and top of bank to compare with future geomorphic data. Longitudinal profiles will not be required in annual monitoring reports unless requested by NCDMS or USACE.

3.1.2 Bankfull Events

Three sets of manual and auto-logging crest gauges were installed on the site, one along UT2, one along UT2C, and one along UT3. The auto logging crest gauges were installed within the channel and will continuously record flow conditions at an hourly interval. Manual crest gauges were installed on the bank at bankfull elevation. Crest gauges will be checked during each site visit to determine if a

bankfull event has occurred since the last site visit. Crest gauge readings and debris rack lines will be photographed to document evidence of bankfull events.

3.1.3 Cross Sections

A total of 27 permanent cross sections were installed to monitor channel dimensions and stability. Four cross sections were installed along UT1 where enhancement activities were performed. Eight cross sections (three pools, two runs, and three shallows) were installed along UT2 also. UT2C has one cross sections installed throughout its length. Stream reach UT3 has 14 cross sections installed along its length where stream restoration was performed. Cross sections were typically located at representative riffle/shallows and pool sections along each stream reach. Each cross section was permanently marked with 3/8 rebar pin to establish a monument location at each end. A marker pole was also installed at both ends of each cross section to allow ease locating during monitoring activities. Cross section surveys will be performed once a year during annual monitoring years 1, 2, 3, 5, and 7 and will include all breaks in slope including top of bank, bottom of bank, streambed, edge of water, and thalweg. Permanent cross-sections were installed at a minimum of one per 20 bankfull widths with half in pools and half in shallows. All cross-section measurements include bank height ratio and entrenchment ratio. Cross-sections are monitored annually. There should be little change in as-built cross-sections. If changes do take place, they should be evaluated to determine if they represent movement toward a less stable condition (for example, down-cutting or erosion), or are minor changes that represent an increase in stability (for example, settling, vegetative changes, deposition along the banks, or decrease in width/depth ratio). Bank height ratio shall not exceed 1.2, and the entrenchment ratio shall be no less than 2.2 within restored reaches. Channel stability should be demonstrated through a minimum of two bankfull events documented in the seven-year monitoring period.

3.1.4 Digital Image Stations

Digital photographs will be taken at least once a year to visually document stream and vegetation conditions. This monitoring practice will continue for seven years following construction and planting. Permanent photo point locations at cross sections and vegetation plots have been established so that the same directional view and location may be repeated each monitoring year. Monitoring photographs will also be used to document any stream and vegetation problematic areas such as erosion, stream and bank instability, easement encroachment and vegetation damage.

3.1.5 Bank Pin Arrays

Eight bank pin array sets have been installed at pool cross sections located along UT2 and UT3. These bank pin arrays were installed along the upstream and downstream third of the meander. Bank pins are a minimum of three feet long, and have been installed just above the water surface and every two feet above the lowest pin. Bank pin exposure will be recorded at each monitoring event, and the exposed pin will be driven flush with the bank.

3.1.6 Visual Assessment Monitoring

Visual monitoring of all mitigation areas is conducted a minimum of twice per monitoring year by qualified individuals. The visual assessments include vegetation density, vigor, invasive species, and easement encroachments. Visual assessments of stream stability include a complete stream walk and structure inspection. Digital images are taken at fixed representative locations to record each monitoring event as well as any noted problem areas or areas of concern. Results of visual monitoring are presented in a plan view exhibit with a brief description of problem areas and digital images. Photographs will be used to subjectively evaluate channel aggradation or degradation, bank erosion, success of riparian vegetation, and effectiveness of erosion control measures. Longitudinal photos

should indicate the absence of developing bars within the channel or an excessive increase in channel depth. Lateral photos should not indicate excessive erosion or continuing degradation of the banks over time. A series of photos over time should indicate successional maturation of riparian vegetation.

3.1.7 Surface Flow

The headwater valley restoration reaches on UT2 and UT2C will be monitored to document intermittent or seasonal surface flow. This will be accomplished through direct observation, photo documentation of dye tests, and continuous flow monitoring devices (pressure transducers). An auto logging crest gauges has been installed within the headwater valley channel and will continuously record flow conditions at an hourly interval. This gauge will be downloaded during each site visit to determine if intermittent or seasonal flows conditions are present.

3.2 Wetland Hydrology

Wetland hydrology will be monitored to document hydric conditions in the wetland restoration areas. This will be accomplished with automatic recording pressure transducer gauges installed in representative locations across the restoration areas and reference wetland areas. A total of fourteen automatic recording pressure transducers (Auto-Wells) have been installed on the site. Eleven auto-wells have been installed within the wetland restoration area and three within reference areas. The gauges will be downloaded quarterly and wetland hydroperiods will be calculated during the growing season. Gauge installation followed current regulatory and DMS guidance. Visual observations of primary and secondary wetland hydrology indicators will also be recorded during quarterly site visits.

3.3 Vegetation

A total of 20 vegetation plots were randomly established within the planted stream riparian buffer easement. Vegetation plots measure 10 meters by 10 meters or 5 meters by 20 meters (0.02 acres) and has all four corners marked with metal posts. Planted woody vegetation was assessed within each plot to establish a baseline dataset. Within each vegetation plot, each planted stem was identified for species, “X” and “Y” origin located, and measured for height. Reference digital photographs were also captured to document baseline conditions. Species composition, density, growth patterns, damaged stems, and survival ratios will be measured and reported on an annual basis. Vegetation plot data will be reported for each plot as well as an overall site average.

4 MAINTENANCE AND CONTINGENCY PLAN

All identified problematic areas or areas of concern such as stream bank erosion/instability, aggradation/degradation, lack of targeted vegetation, and invasive/exotic species which prevent the site from meeting performance success criteria will be evaluated on a case by case basis. These areas will be documented and remedial actions will be discussed amongst NCDMS staff to determine a plan of action. If it is determined remedial action is required, a plan will be provided.

4.1 Stream

Any stream problem areas which are identified during post construction monitoring activities will be documented and mapped on the Current Conditions Plan View (CCPV) as part of the annual monitoring report. Stream problem areas or areas of concern may include bank erosion, aggradation/degradation, structure failure or not performing as designed, beaver dams, cattle

encroachment due to fence damage, etc. If it is determined through NCDMS correspondence that remedial action is required to repair an area, a proposed work plan will be submitted for remediation.

4.2 Wetlands

Any wetland problem areas which are identified during post construction monitoring activities will be documented and mapped on the Current Conditions Plan View (CCPV) as part of the annual monitoring report. Wetland problem areas may include planted vegetation or wetland hydrology not meeting success criteria. If it is determined through NCDMS correspondence that remedial action is required to repair an area, a proposed work plan will be submitted for remediation.

4.3 Vegetation

Any vegetation problem areas which are identified during post construction monitoring activities will be documented and mapped on the Current Conditions Plan View (CCPV) as part of the annual monitoring report. Vegetation problem areas or areas of concern may include vegetation plot not meeting success criteria, invasive species abundance, sparse vegetation areas, etc. If it is determined through NCDMS correspondence that remedial action is required to repair an area, a proposed work plan will submitted for remediation.

5 AS-BUILT CONDITIONS (BASELINE)

The Cedar Creek Stream and Wetland Restoration as-built survey was completed in August 2015. A topographic survey on the constructed stream channel and adjacent floodplain areas was performed to document post construction conditions. The survey involved locating the stream channel thalweg, top of bank, stream structures, culvert crossings, woody debris, monitoring cross sections, vegetation plots, crest gauges, and a rain gauge.

The as-built survey drawings indicate that the Cedar Creek Stream and Wetland Restoration site was constructed to the mitigation plan design. Profile and dimension parameters are within the tolerances for stream and wetland mitigation construction. The Cedar Creek Site was constructed to design plan specifications with minimal modifications. Along UT2 and UT3 rock was placed in some of the riffle beds to prevent degradation and scour. Over time it is anticipated that the rock placed within the channel bed will be covered with sediment and perform as a grade control. A few additional log grade control structures were installed to the upstream portion of UT2 to prevent down cutting during construction activities. All changes were approved by the design engineer and are documented on the as-built drawings and red line markup drawings.

5.1 As-Built Drawings

The Cedar Creek Stream and Wetland Restoration As-Built Drawing is located in Appendix D which documents post construction conditions for the project.

5.2 Baseline Data Collection

5.2.1 Morphological State of the Channel

All morphological stream data for the as-built profile and dimensions were collected during the as-built survey performed during August 2015. Appendix B includes summary data tables, morphological parameters, and stream photographs.

Profile
The baseline (MY-0) profiles closely matches the proposed design profiles. The plotted longitudinal profiles can be found on the As-Built Drawings in Appendix D and morphological summary data tables can be found in Appendix B.

Dimension
The baseline (MY-0) cross sectional dimensions closely matches the proposed design cross section parameters. All cross section plots and data tables can be found in Appendix B.

Sediment Transport
The as-built conditions show that shear stress and velocities have been reduced for all restoration/enhancement reaches. Pre-construction conditions documented all four reaches as sand bed channels and remain classified as sand bed channels post-construction. Visual assessment shows the channel is transporting sediment as designed and will continue to be monitored for aggradation and degradation.

5.2.2 Vegetation

The baseline monitoring (MY-0) vegetation survey was completed in May 2015. The baseline vegetation monitoring on the Cedar Creek Stream and Wetland Restoration Site resulted in an average of 1,105 planted stems per acre, which is greater than the required 680 stems per acre density. The average stems per vegetation plot was 27 planted stems. The minimum planted stems per plots was 22 stems and the maximum was 42 stems. A total of 25,500 bare root stems were planted across the Cedar Creek Stream and Wetland Restoration Site. A total of 3,500 live stakes were also installed along the stream banks for bank stabilization. Vegetation summary data tables and vegetation plot photos can be found in Appendix C. Invasive species treatment will be continued as needed to promote the establishment of the target community.

5.2.3 Photo Documentation

Permanent photo point locations have been established at cross sections, vegetation plots, stream crossings, and stream structures by RES staff. Any additional problem areas or areas of concern will also be documented with a digital photograph during monitoring activities. Stream digital photographs can be found in Appendix B and Appendix C for vegetation photos.

5.2.4 Hydrology

Three sets of manual and auto-logging crest gauges were installed on the site, one along UT2, one along UT2C, and one along UT3. The auto logging crest gauges were installed within the channel and will continuously record flow conditions at an hourly interval. Manual crest gauges were installed on the bank at bankfull elevation. Crest gauges will be checked during each site visit to determine if a bankfull event has occurred since the last site visit. Crest gauge readings and debris rack lines will be photographed to document evidence of bankfull events. Wetland hydrology will be monitored with eleven automatic recording pressure transducer gauges that have been installed in representative

locations across the wetland restoration areas. An additional three gauges were installed in reference wetland areas.

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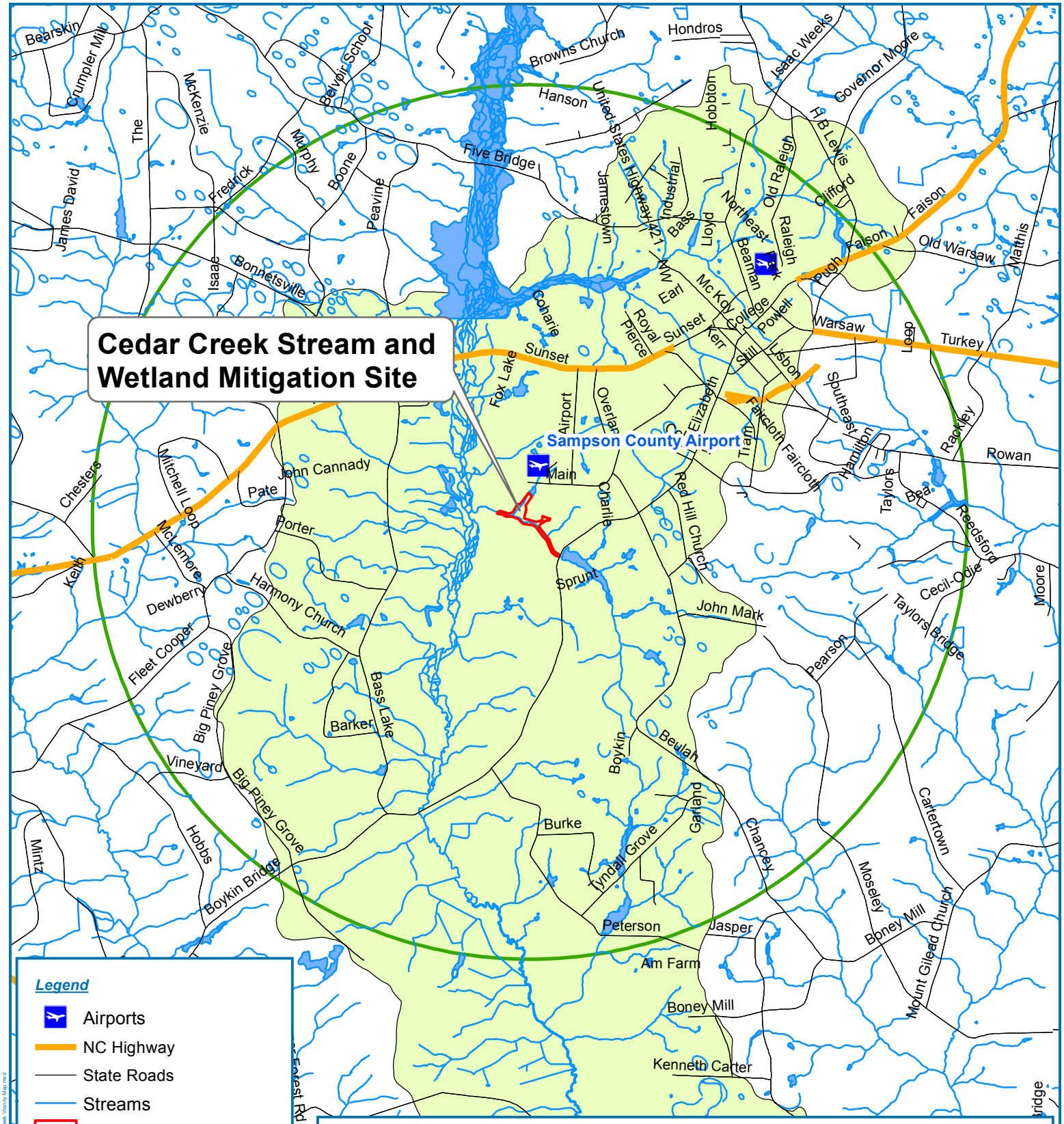
APPENDIX A

General Tables and Figures

Figure 1. Project Vicinity Map
Figure 2. Current Condition Plan View
Table 1. Project Components and Mitigation Credits
Table 2. Project Activity and reporting History
Table 3. Project Contacts
Table 4. Project Information



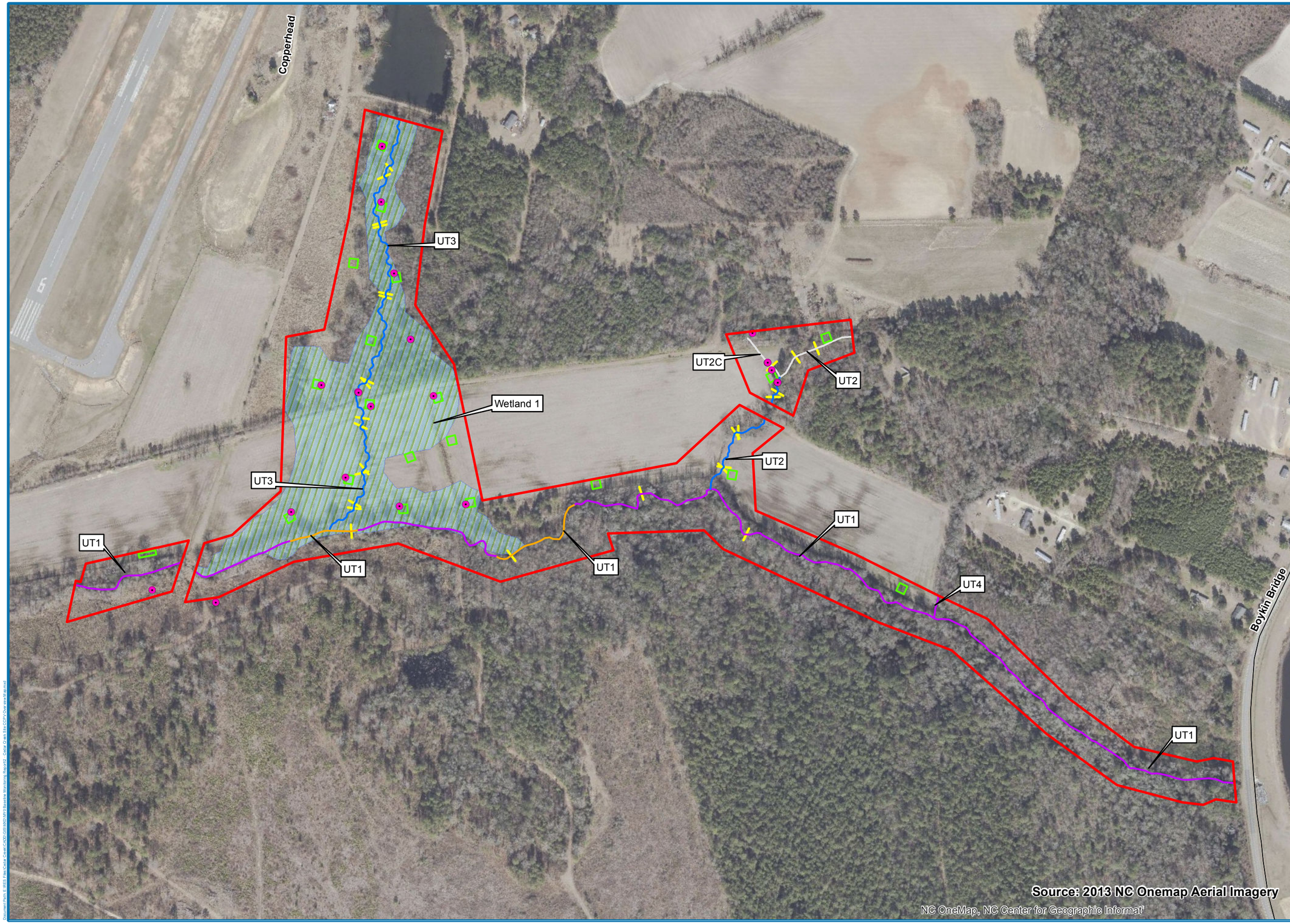
The Cedar Creek Stream and Wetland Site is located in Sampson County approximately 3.1 miles southwest of Clinton, NC. To access the Site from the town of Clinton, travel west on Highway 24 (Sunset Avenue), take a left onto Airport Road and go 1.3 miles. Turn right onto West Main Street Extension, go approximately 350 feet, and turn left onto a dirt farm path. Follow the farm path along the cultivated field edge to the southwest corner and enter the forest. Follow the dirt path to cultivated fields adjacent to the project below UT2. Turning to the left will take you to UT2. Going to the right will take you to UT3.

Figure1
Project Vicinity Map
Cedar Creek Stream and Wetland Restoration Site
Sampson County, North Carolina

Date: 11/6/2015
Drawn by: BSH

res

Document Path: E:\RES Files\Cedar Creek\CADD\GIS\MXD\MYD Baseline Monitoring Report\1 - Cedar Creek Vicinity Map.mxd



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Feet

1 inch = 350 feet

Figure 2.

Cedar Creek Restoration Project

Current Conditions Overview Map

Date: 1/5/2016	Drawn by: BSH

LEGEND

- Conservation Easement
- Vegetation Plots
- Stream/Wetland Gauges
- State Roads
- Enhancement I
- Enhancement II
- Headwater Valley Restoration
- P1 Restoration
- Cross Sections
- Wetland Restoration Area

Riparian Buffer Conditions

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

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1 inch = 100 feet

Figure 2a.

Cedar Creek Restoration Project

UT1/UT4 Current Conditions Plan View Map

Date: 1/5/2016	Drawn by: BSH

LEGEND

- Conservation Easement
- Vegetation Plots
- Stream/Wetland Gauges
- State Roads
- Enhancement I
- Enhancement II
- Headwater Valley Restoration
- P1 Restoration
- Cross Sections
- Wetland Restoration Area

Riparian Buffer Conditions

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

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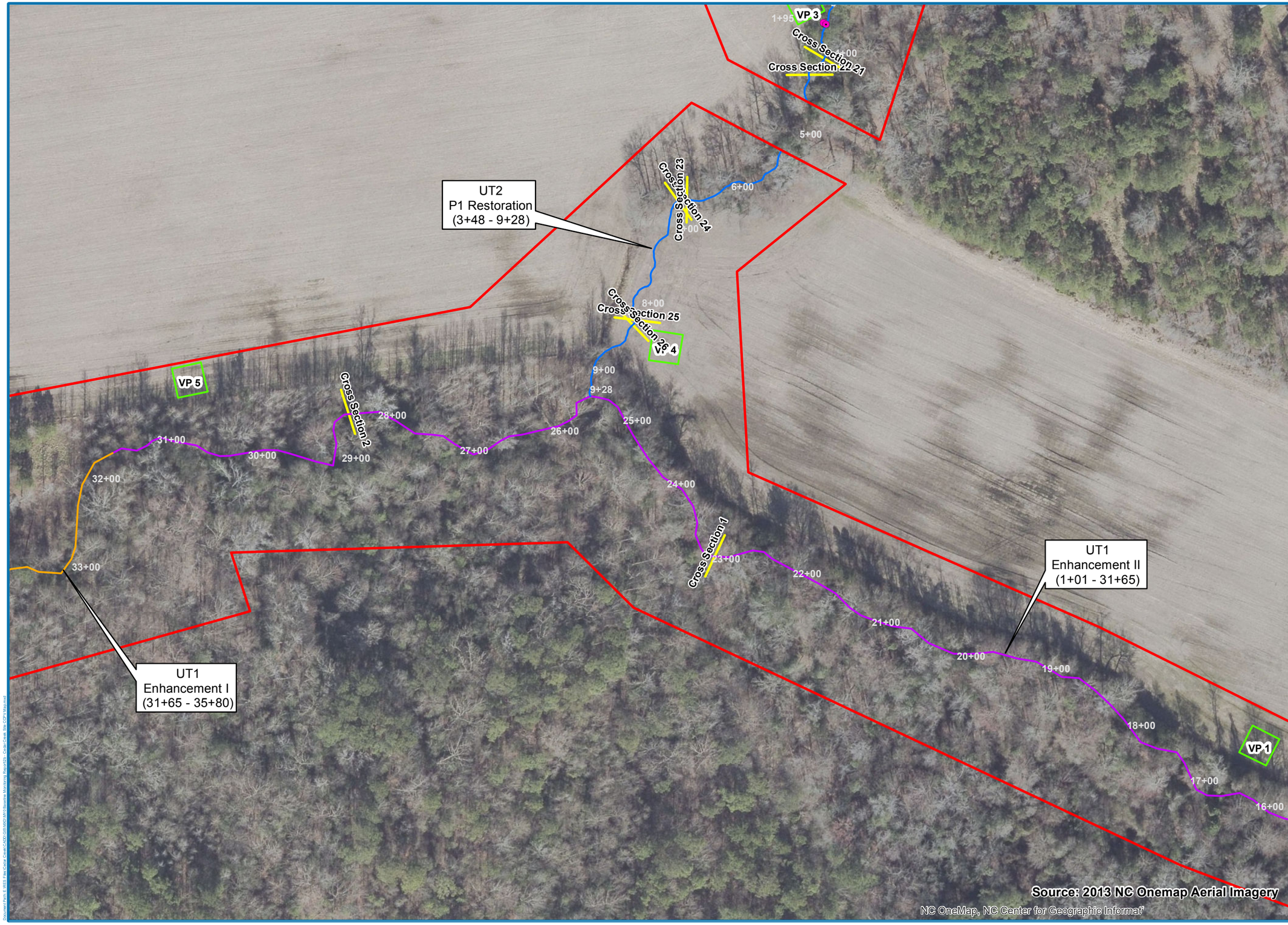

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Feet

1 inch = 100 feet

Figure 2b.

Cedar Creek Restoration Project

UT1 Current Conditions Plan View Map

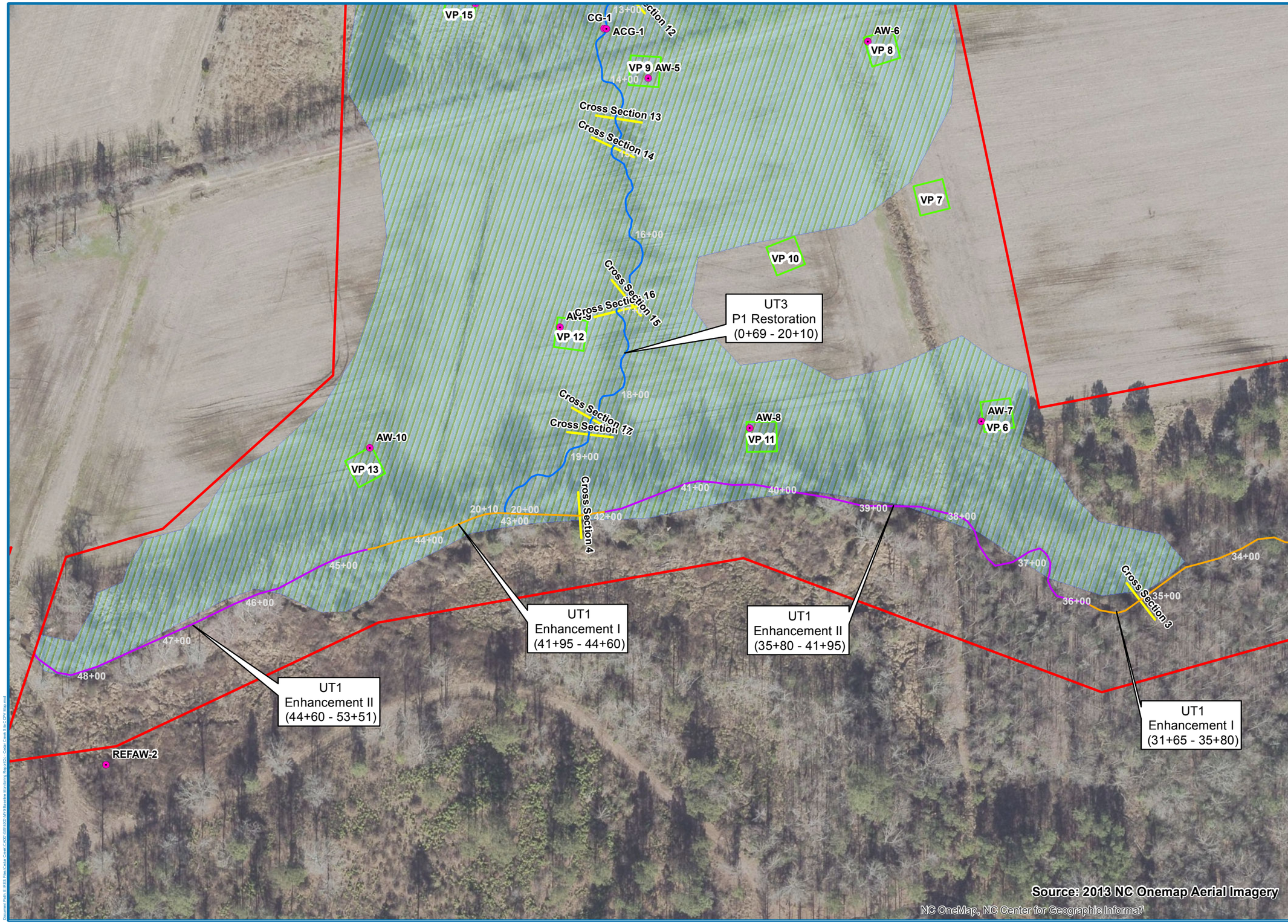
Date: 1/5/2016	Drawn by: BSH

LEGEND

- Conservation Easement
- Vegetation Plots
- Stream/Wetland Gauges
- State Roads
- Enhancement I
- Enhancement II
- Headwater Valley Restoration
- P1 Restoration
- Cross Sections
- Wetland Restoration Area

Riparian Buffer Conditions

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



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Feet

1 inch = 100 feet

Figure 2c.

Cedar Creek Restoration Project

UT1 Current Conditions Plan View Map

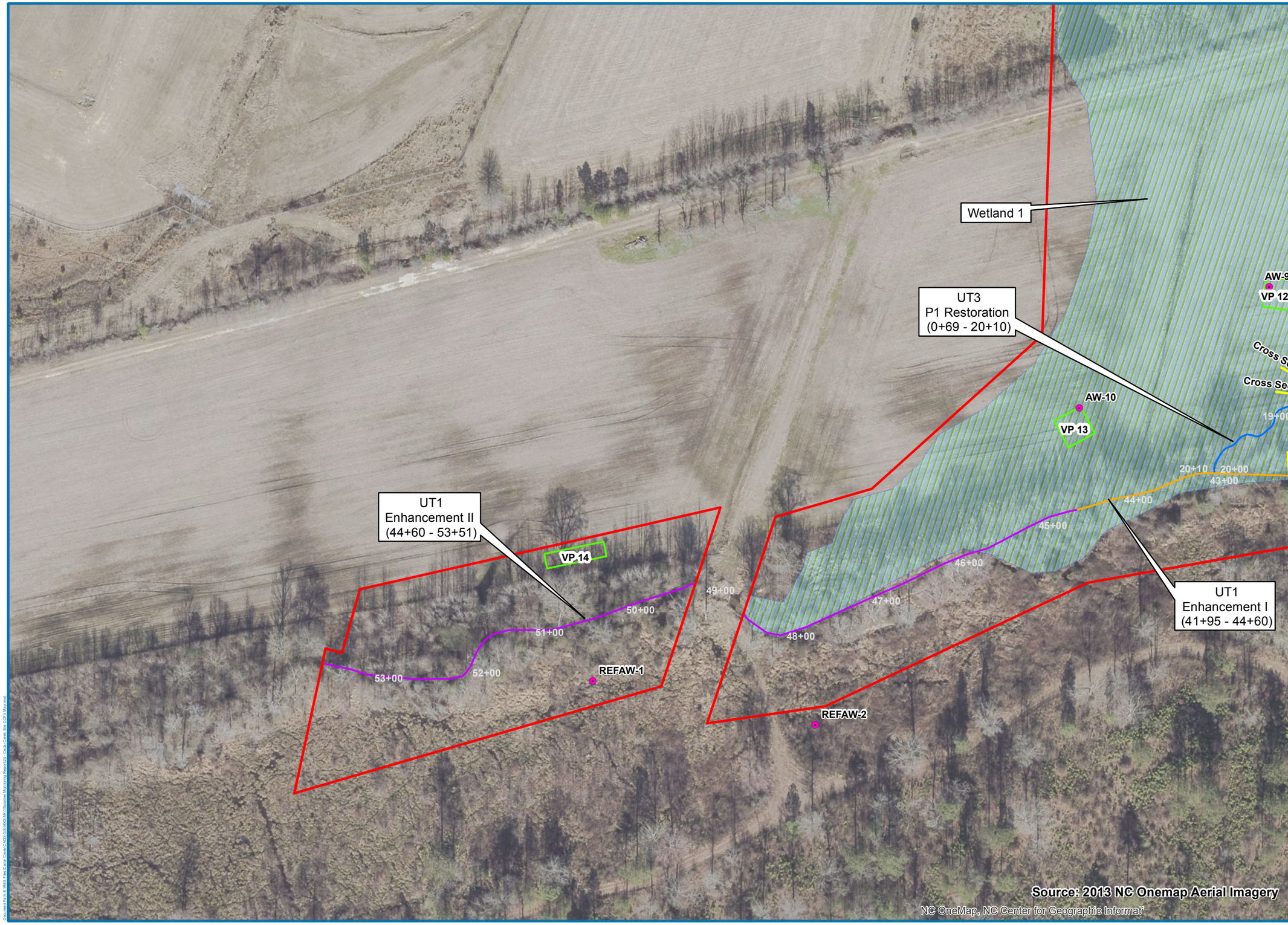
Date: 1/5/2016	Drawn by: BSH

LEGEND

- Conservation Easement
- Vegetation Plots
- Stream/Wetland Gauges
- State Roads
- Enhancement I
- Enhancement II
- Headwater Valley Restoration
- P1 Restoration
- Cross Sections
- Wetland Restoration Area

Riparian Buffer Conditions

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



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Feet

1 inch = 100 feet

Figure 2d.

Cedar Creek Restoration Project

UT1 Current Conditions Plan View Map

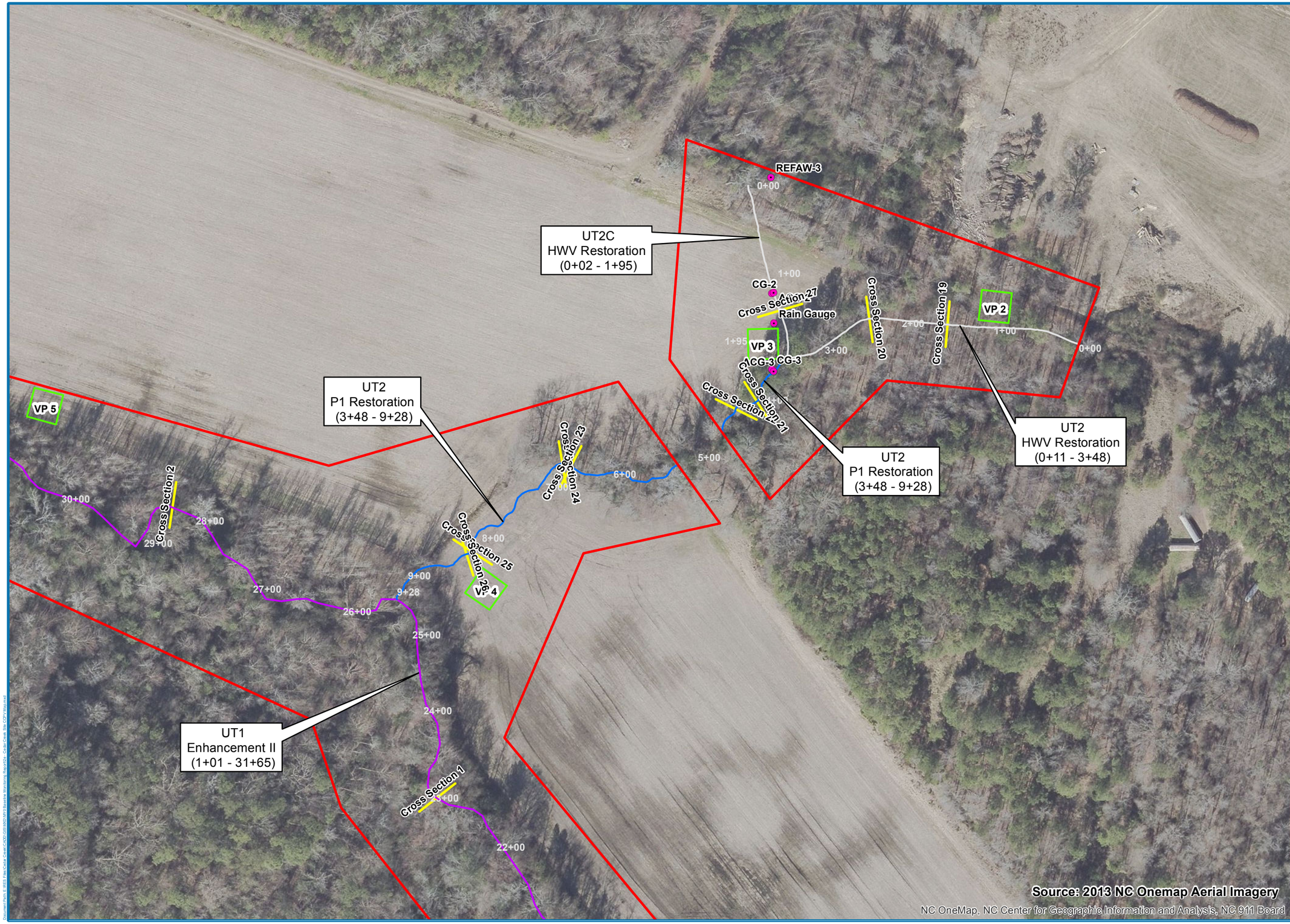
Date: 1/5/2016	Drawn by: BSH

LEGEND

- Conservation Easement
- Vegetation Plots
- Stream/Wetland Gauges
- State Roads
- Enhancement I
- Enhancement II
- Headwater Valley Restoration
- P1 Restoration
- Cross Sections
- Wetland Restoration Area

Riparian Buffer Conditions

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



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Feet

1 inch = 100 feet

Figure 2e.

Cedar Creek Restoration Project

UT2/UT2C Current Conditions Plan View Map

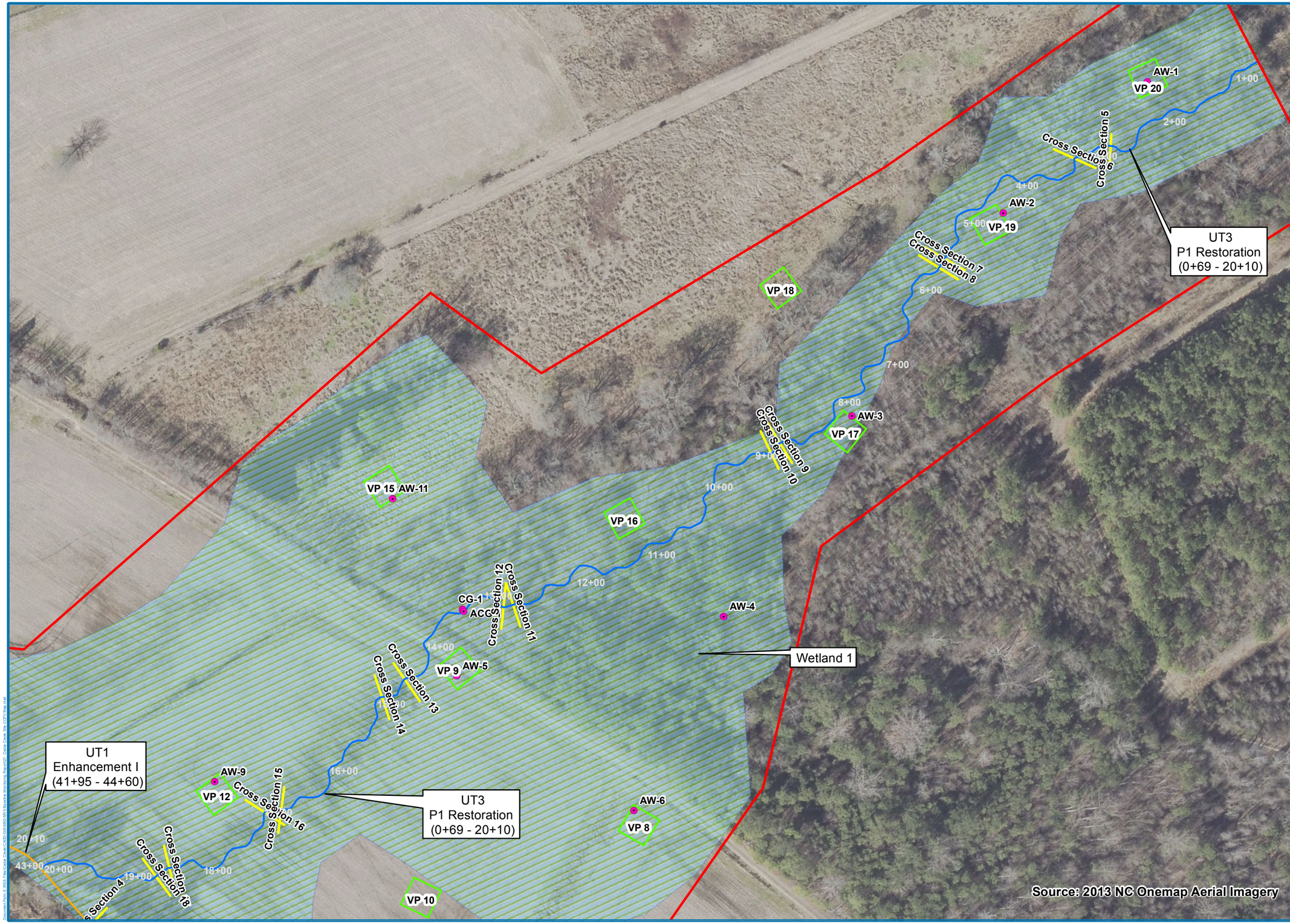
Date: 1/5/2016	Drawn by: BSH

LEGEND

- Conservation Easement
- Vegetation Plots
- Stream/Wetland Gauges
- State Roads
- Enhancement I
- Enhancement II
- Headwater Valley Restoration
- P1 Restoration
- Cross Sections
- Wetland Restoration Area

Riparian Buffer Conditions

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



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Feet

1 inch = 100 feet

Figure 2f.

Cedar Creek Restoration Project

UT3 Current Conditions Plan View Map

Date: 1/5/2016	Drawn by: BSH

LEGEND

- Conservation Easement
- Vegetation Plots
- Stream/Wetland Gauges
- State Roads
- Enhancement I
- Enhancement II
- Headwater Valley Restoration
- P1 Restoration
- Cross Sections
- Wetland Restoration Area

Riparian Buffer Conditions

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

Appendix A. General Tables and Figures
Table 1 Project Components and Mitigation Credits
Baseline Monitoring Report Year 0

Table 1. Project Components and Mitigation Credits
Cedar Creek Stream and Wetland Restoration Project/DMS Project # 95718

Mitigation Credits

	Stream		Riparian Wetland		Non-riparian Wetland		Buffer	Nitrogen Nutrient Offset	Phosphorous Nutrient Offset
Type	R	RE	R	RE	R	RE			
Totals	2,989	2,288	13.72	N/A	N/A	N/A	N/A	N/A	N/A

Project Components

Project Component -or-Reach ID	As-Built Stationing/Location (LF)	Existing Footage/Acreage	Approach (PI, PII etc.)	Restoration -or-Restoration Equivalent	Restoration Footage or Acreage	Mitigation Ratio	SMUs/ WMUs
UT1	0+01 to 31+65	3,064	Enhancement II	RE	3,064	1 : 2.5	1,226
UT1	31+65 to 35+80	415	Enhancement I	RE	415	1 : 1.5	277
UT1	35+80 to 41+95	615	Enhancement II	RE	615	1 : 2.5	246
UT1	41+95 to 44+60	265	Enhancement I	RE	265	1 : 1.5	177
UT1	44+60 to 53+51	891	Enhancement II	RE	827	1 : 2.5	331
UT2	0+11 to 3+48	364	Headwater Valley	R	337	1 : 1.0	337
UT2	3+48 to 9+28	587	P1 Restoration	R	518	1 : 1.0	518
UT2C	0+02 to 1+95	NA	Headwater Valley	R	193	1 : 1.0	193
UT3	0+69 to 20+10	1,428	P1 Restoration	R	1,941	1 : 1.0	1,941
UT4	0+36 to 1+14	78	Enhancement II	RE	78	1 : 2.5	31
Wetland 1	Adjacent to UT & UT3	17.30	Restoration	R	13.10	1 : 1.0	13.72

Component Summation

Restoration Level	Stream (linear feet)	Riparian Wetland (acres)		Non-riparian Wetland	Buffer (square feet)	Upland (acres)
		Riverine	Non-Riverine			
Restoration	2,459	13.72				
Headwater Valley	530					
Enhancement I	680					
Enhancement II	4,584					
Creation						
Preservation						
High Quality Preservation						

BMP Elements

Element	Location	Purpose/Function	Notes
---	---	---	---
---	---	---	---
---	---	---	---

BMP Elements
BR = Bioretention Cell; SF = Sand Filter; SW = Stormwater Wetland; WDP = Wet Detention Pond; DDP = Dry Detention Pond; FS = Filter Strip; S = Grassed Swale; LS = Level Spreader; NI = Natural Infiltration Area; FB = Forested Buffer

Table 2. Project Activity and Reporting History

Project Activity and Reporting History Cedar Creek Stream and Wetland Restoration Project / DMS Project #95718		
Activity or Report	**Data Collection Complete**	**Completion or Delivery**
Mitigation Plan	NA	August 2014
Final Design – Construction Plans	NA	December 2014
Construction Completed	March 2015	May 2015
Site Planting Completed	May 2015	May 2015
Baseline Monitoring Document (Year 0 Monitoring – baseline)	July 2015	November 2015
Year 1 Monitoring		
Year 2 Monitoring		
Year 3 Monitoring		
Year 4 Monitoring		
Year 5 Monitoring		
Year 6 Monitoring		
Year 7 Monitoring		

Table 3. Project Contacts

Project Contacts Table Cedar Creek Stream and Wetland Restoration Project /DMS Project # 95718	
Designer	WK Dickson and Co., Inc. 720 Corporate Center Drive Raleigh, NC 27607 (919) 782-0495 Frasier Mullen, PE
Construction Contractor	Wright Contracting PO Box 545 Siler City, NC 27344 (919) 663-0810 Joseph Wright
Planting Contractor	Resource Environmental Solutions, LLC 302 Jefferson Street, Suite 110 Raleigh, NC 27605 (919) 209-1061 David Godley
Seeding Contractor	Wright Contracting PO Box 545 Siler City, NC 27344 (919) 663-0810 Joseph Wright
Seed Mix Sources	Green Resource
Nursery Stock Suppliers	Arbogen, NC Forestry Services Nursery
Full Delivery Provider Project Manager:	Resource Environmental Solutions, LLC 302 Jefferson Street, Suite 110 Raleigh, NC 27605 (919) 209-1061 Daniel Ingram
Monitoring Performers Project Manager:	Resource Environmental Solutions, LLC 302 Jefferson Street, Suite 110 Raleigh, NC 27605 (919) 209-1061 Brian Hockett, PLS

Table 4. Project Information

Project Information

Project Name	Cedar Creek Site
County	Sampson
Project Area (acres)	42.0
Project Coordinates (latitude and longitude)	34° 57' 59.663" N 78° 22' 0.778" W

Project Watershed Summary Information

Physiographic Province	Outer Coastal Plain
River Basin	Cape Fear
USGS Hydrologic Unit 8-digit	03030006
USGS Hydrologic Unit 14-digit	03030006090060
DWQ Sub-basin	03-06-19
Project Drainage Area (acres)	2,890 acres
Project Drainage Area Percentage of Impervious Area	4.5%
CGIA Land Use Classification	Woody wetlands, Shrub/scrub, cultivated crops, evergreen forest

Reach Summary Information (As-Built Conditions)

Parameters	UT1	UT2	UT3	UT4
Length of reach (linear feet)	5,250	917	1941	78
Valley Classification	X	X	X	X
Drainage area (acres)	2780	35	151	77
NCDWQ stream identification score	50.0	34.5	40.0	42.5
NCDWQ Water Quality Classification	N/A	N/A	N/A	N/A
Morphological Description (stream type)	E5	E5	E5	E5
Evolutionary trend	Stage II	Stage II/III	Stage II/III	Stage II/III
Underlying mapped soils	BH	Jo	BH	BH
Drainage class	frequently flooded	undrained	frequently flooded	frequently flooded
Soil Hydric status	Hydric	Hydric	Hydric	Hydric
Slope	0.20%	1.40%	1.10%	1.0%
FEMA classification	N/A	N/A	AE	N/A
Native vegetation community	cultivated, mixed hardwood forest	cultivated, mixed hardwood forest	mixed hardwood forest	mixed hardwood forest
Percent composition of exotic invasive vegetation	<5	0	0	<5

Wetland Summary Information	
Parameters	**Wetland 1 UT1/3**
Size of Wetland (acres)	13.72
Wetland Type (non-riparian, riparian riverine or riparian non-riverine)	Riparian Riverine
Mapped Soil Series	Bibb/Johnson
Drainage class	Frequently Flooded
Soil Hydric Status	Hydric
Source of Hydrology	Runoff/Groundwater Discharge
Hydrologic Impairment	Incised Channel, Dredging
Native vegetation community	Forested
Percent composition of exotic invasive vegetation	1 – 2%

Regulatory Considerations

Regulation	Applicable	Resolved	Supporting Documentation
Waters of the United States - Section 404	Yes	Yes	SAW-2013-00389
Waters of the United States - Section 401	Yes	Yes	DWR # 13-0186
Endangered Species Act	Yes	Yes	USFWS (Corr. Letter)
Historic Preservation Act	Yes	Yes	SHPO (Corr. Letter)
Coastal Zone Management Act (CZMA)/Coastal Area Management Act (CAMA)	No	NA	N/A
FEMA Floodplain Compliance	Yes	Yes	EEP Floodplain Requirements Checklist
Essential Fisheries Habitat	No	NA	N/A

APPENDIX B

Morphological Summary Data and Plots

Table 5. Morphological Parameters Summary Data
Table 6. Dimensional Morphology Summary – Cross Sections Data
Cross Section Plots
Stream Photos

Table 5. Cedar Creek Morphological Parameters

	Reference Reach			Existing[1]										Design				As-Built			
				UT1 (Upper)		UT1 (Lower)		UT2 Reach A		UT3 Reach A (Upper)	UT3 Reach A (Lower)		UT4	UT2		UT3		UT2		UT3	
Feature	Pool	Run	Shallow	Shallow	Pool	Shallow	Pool	Shallow	Run	Run	Shallow	Run	Shallow	Shallow	Pool	Shallow	Pool	Shallow	Pool	Shallow	Pool
Drainage Area (ac)	81			2514		2780		34		116	150		79	41		146		41		146	
Drainage Area (mi^2)	0.13			3.93		4.34		0.05		0.18	0.23		0.12	0.06		0.23		0.06		0.23	
NC Regional Curve Discharge (cfs)[2]	---	---	3.7	44.3		47.7		2.0		4.8	5.8		3.7	2.3		5.7		2.3		5.7	
NC Regional Curve Discharge (cfs)[3]	---	---	1.8	24.9		26.8		0.9		2.4	2.9		1.8	1.1		2.9		1.1		2.9	
Design/Calculated Discharge (cfs)	---	---	5	---		---		---		---	---		---	4.0		6.0		4.0		6.0	
Dimension																					
BF Width (ft)	6.3	14.0	6.2	18.2	14.1	11.0	10.9	4.8	5.2	4.0	10.4	7.7	6.2	4.6	5.4	6.0	7.0	7.5	7.1	7.9	7.2
Floodprone Width (ft)	100.0	100.0	100.0	100	100	100	100	100	100	100	100	100	100	>50	>50	>50	>50	>50	>50	>50	>50
BF Cross Sectional Area (ft^2)	4.0	5.9	2.9	42.1	46.4	32.2	29.2	2.4	3.0	3.4	5.5	4.8	5.6	2.2	3.1	3.6	4.8	2.9	2.9	4.1	4.2
BF Mean Depth (ft)	0.6	0.4	0.5	2.3	3.3	2.9	2.7	0.5	0.6	0.9	0.5	0.6	0.9	0.5	0.6	0.6	0.7	0.4	0.4	0.5	0.6
BF Max Depth (ft)	1.0	0.5	0.8	3.2	4.4	3.7	3.3	0.7	0.9	1.0	0.8	1.1	1.3	0.7	1.0	0.8	1.2	0.9	0.9	1.0	1.2
Width/Depth Ratio	10.2	33.3	13.4	7.9	4.3	3.8	4.1	9.6	10.5	4.7	19.7	12.2	6.9	10.2	9.4	10.2	10.1	20.1	18.1	15.6	13.2
Entrenchment Ratio	>2.2	>2.2	>2.2	>2.2	>2.2	>2.2	>2.2	>2.2	>2.2	1.2	1.3	1.6	2.2	>2.2	>2.2	>2.2	>2.2	>2.2	>2.2	>2.2	>2.2
Wetted Perimeter (ft)	7.1	14.2	6.7	20.4	18.8	15.8	16.2	5.2	5.9	5.8	10.7	8.2	7.1	4.9	5.9	6.4	7.6	7.7	7.5	8.3	7.7
Hydraulic Radius (ft)	0.6	0.4	0.4	2.1	2.5	2.0	1.8	0.5	0.5	0.6	0.5	0.6	0.8	0.4	0.5	0.6	0.6	0.4	0.4	0.5	0.5
Substrate																					
	Medium/Coarse Sand			Medium/Coarse Sand										Medium/Coarse Sand				Medium/Coarse Sand			
Pattern																					
	Min	**Max**	**Med**	---		---		---		---	---		---	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**
Channel Beltwidth (ft)	13.0	19.3	13.9	---		---		---		---	---		---	10.5	15.7	12.6	18.8	10.3	23.9	14.3	23.3
Radius of Curvature (ft)	5.2	11.7	9.9	---		---		---		---	---		---	4.2	9.4	5.1	11.3	8.6	22.0	6.4	20.8
Radius of Curvature Ratio	0.7	1.6	1.3	---		---		---		---	---		---	1.0	3.0	1.0	3.0	1.1	2.9	0.8	2.6
Meander Wavelength (ft)	13.3	22.5	21.1	---		---		---		---	---		---	4.6	13.8	6.0	18.0	5.0	18.3	6.5	19.5
Meander Width Ratio	2.1	3.1	2.2	---		---		---		---	---		---	2.1	3.1	2.1	3.1	1.4	3.2	1.8	2.9
Profile																					
Shallow Length (ft)	2.0	30.9	10.9	---		---		---		---	---		---	1.6	24.5	1.9	29.4	2.5	26.2	2.3	33.2
Run Length (ft)	1.0	20.1	6.9	---		---		---		---	---		---	0.8	15.9	0.9	19.1	2.1	18.5	2.3	23.2
Pool Length (ft)	2.6	12.1	5.8	---		---		---		---	---		---	2.1	9.6	2.5	11.5	3.2	10.2	3.7	12.2
Pool -to-Pool Spacing (ft)	10.1	61.0	28.6	---		---		---		---	---		---	8.0	48.3	9.6	57.9	12.5	55.6	10.1	60.7
Additional Reach Parameters																					
Valley Length (ft)	164			3376		1515		255		486	731		78	643		1600		643		1600	
Channel Length (ft)	203			3694		1574		275		496	739		78	724		1912		740		1941	
Sinuosity	1.24			1.09		1.04		1.08		1.02	1.01		1.00	1.13		1.20		1.15		1.21	
Water Surface Slope (ft/ft)	0.009			---		---		---		---	---		---	---		---		---		---	
Channel Slope (ft/ft)	0.009			0.0022		0.0016		0.012		0.0164	0.007		0.010	0.0170		0.0095		0.0202		0.0130	
Rosgen Classification	E/C5			E5		E5		E5		E5	E5		E5	E5		E5		E5		E5	

[1] Bankfull stage was estimated using NC Regional Curve equations and existing conditions data

[2] NC Regional Curve equations source: Doll et al. (2003)

[3] NC Regional Curve equations source: Sweet and Geratz (2003)

Appendix B. Table 6a. - Monitoring Data - Dimensional Morphology Summary (Dimensional Parameters – Cross Sections)

Project Name/Number: Cedar Creek Site/ NCDMS Project # 95718

	Cross Section 1 (Run)							Cross Section 2 (Run)							Cross Section 3 (Riffle)							Cross Section 4 (Run)							Cross Section 5 (Riffle)						
Based on fixed baseline bankfull elevation[1]	Base	MY1	MY2	MY3	MY5	MY7	MY+	Base	MY1	MY2	MY3	MY5	MY7	MY+	Base	MY1	MY2	MY3	MY5	MY7	MY+	Base	MY1	MY2	MY3	MY5	MY7	MY+	Base	MY1	MY2	MY3	MY5	MY7	MY+
Record elevation (datum) used	89.8							89.2							88.1							85.8							106.1						
Bankfull Width (ft)	19.0							14.3							23.8							14.4							6.9						
Floodprone Width (ft)	50.0							50.0							50.0							50.0							50.0						
Bankfull Mean Depth (ft)	2.2							2.7							1.9							1.7							0.5						
Bankfull Max Depth (ft)	3.8							3.9							3.3							2.5							1.0						
Bankfull Cross Sectional Area (ft^2)	41.6							38.0							45.5							24.7							3.7						
Bankfull Width/Depth Ratio	8.6							5.4							12.4							8.4							12.8						
Bankfull Entrenchment Ratio	>2.2							>2.2							2.1							>2.2							>2.2						
Bankfull Bank Height Ratio	1.0							1.0							1.0							1.0							1.0						

	Cross Section 6 (Pool)							Cross Section 7 (Riffle)							Cross Section 8 (Pool)							Cross Section 9 (Riffle)							Cross Section 10 (Pool)						
Based on fixed baseline bankfull elevation[1]	Base	MY1	MY2	MY3	MY5	MY7	MY+	Base	MY1	MY2	MY3	MY5	MY7	MY+	Base	MY1	MY2	MY3	MY5	MY7	MY+	Base	MY1	MY2	MY3	MY5	MY7	MY+	Base	MY1	MY2	MY3	MY5	MY7	MY+
Record elevation (datum) used	105.3							103.5							103.5							97.9							97.4						
Bankfull Width (ft)	5.9							7.3							7.1							7.5							5.7						
Floodprone Width (ft)	50.0							50.0							50.0							50.0							50.0						
Bankfull Mean Depth (ft)	0.4							0.6							0.7							0.5							0.6						
Bankfull Max Depth (ft)	0.7							1.1							1.2							1.0							1.1						
Bankfull Cross Sectional Area (ft^2)	2.1							4.5							5.0							4.0							3.5						
Bankfull Width/Depth Ratio	16.0							11.8							9.9							14.2							9.1						
Bankfull Entrenchment Ratio	>2.2							>2.2							>2.2							>2.2							>2.2						
Bankfull Bank Height Ratio	1.0							1.0							1.0							1.0							1.0						

	Cross Section 11 (Riffle)							Cross Section 12 (Pool)							Cross Section 13 (Pool)							Cross Section 14 (Riffle)							Cross Section 15 (Riffle)						
Based on fixed baseline bankfull elevation[1]	Base	MY1	MY2	MY3	MY5	MY7	MY+	Base	MY1	MY2	MY3	MY5	MY7	MY+	Base	MY1	MY2	MY3	MY5	MY7	MY+	Base	MY1	MY2	MY3	MY5	MY7	MY+	Base	MY1	MY2	MY3	MY5	MY7	MY+
Record elevation (datum) used	93.5							93.1							90.9							90.9							89.0						
Bankfull Width (ft)	10.4							8.1							9.3							9.6							6.8						
Floodprone Width (ft)	50.0							50.0							50.0							50.0							50.0						
Bankfull Mean Depth (ft)	0.5							0.8							0.4							0.4							0.6						
Bankfull Max Depth (ft)	1.1							1.8							0.9							1.0							1.0						
Bankfull Cross Sectional Area (ft^2)	4.8							6.6							3.9							3.7							4.3						
Bankfull Width/Depth Ratio	22.2							10.0							22.2							25.0							10.8						
Bankfull Entrenchment Ratio	>2.2							>2.2							>2.2							>2.2							>2.2						
Bankfull Bank Height Ratio	1.0							1.0							1.0							1.0							1.0						

	Cross Section 16 (Pool)							Cross Section 17 (Pool)							Cross Section 18 (Riffle)							Cross Section 19 (Run)							Cross Section 20 (Run)						
Based on fixed baseline bankfull elevation[1]	Base	MY1	MY2	MY3	MY5	MY7	MY+	Base	MY1	MY2	MY3	MY5	MY7	MY+	Base	MY1	MY2	MY3	MY5	MY7	MY+	Base	MY1	MY2	MY3	MY5	MY7	MY+	Base	MY1	MY2	MY3	MY5	MY7	MY+
Record elevation (datum) used	88.8							87.4							87.1							108.8							105.4						
Bankfull Width (ft)	7.1							7.1							7.0							7.5							8.8						
Floodprone Width (ft)	50.0							50.0							50.0							50.0							50.0						
Bankfull Mean Depth (ft)	0.5							0.6							0.6							0.4							0.3						
Bankfull Max Depth (ft)	1.1							1.3							1.1							0.8							0.6						
Bankfull Cross Sectional Area (ft^2)	3.8							4.2							4.0							2.9							2.7						
Bankfull Width/Depth Ratio	13.1							12.0							12.3							19.6							29.1						
Bankfull Entrenchment Ratio	>2.2							>2.2							>2.2							>2.2							>2.2						
Bankfull Bank Height Ratio	1.0							1.0							1.0							1.0							1.0						

1 = Widths and depths for annual measurements will be based on the baseline bankfull datum regardless of dimensional/depositional development. Input the elevation used as the datum, which should be consistent and based on the baseline datum established. If the performer has inherited the project and cannot acquire the datum used for prior years this must be discussed with EEP. If this cannot be resolved in time for a given years report submission a footnote in this should be included that states: "It is uncertain if the monitoring datum has been consistent over the monitoring history, which may influence calculated values. Additional data from a prior performer is being acquired to provide confirmation. Values will be recalculated in a future submission based on a consistent datum if determined to be necessary."

Appendix B. Table 6b. - Monitoring Data - Dimensional Morphology Summary (Dimensional Parameters – Cross Sections)

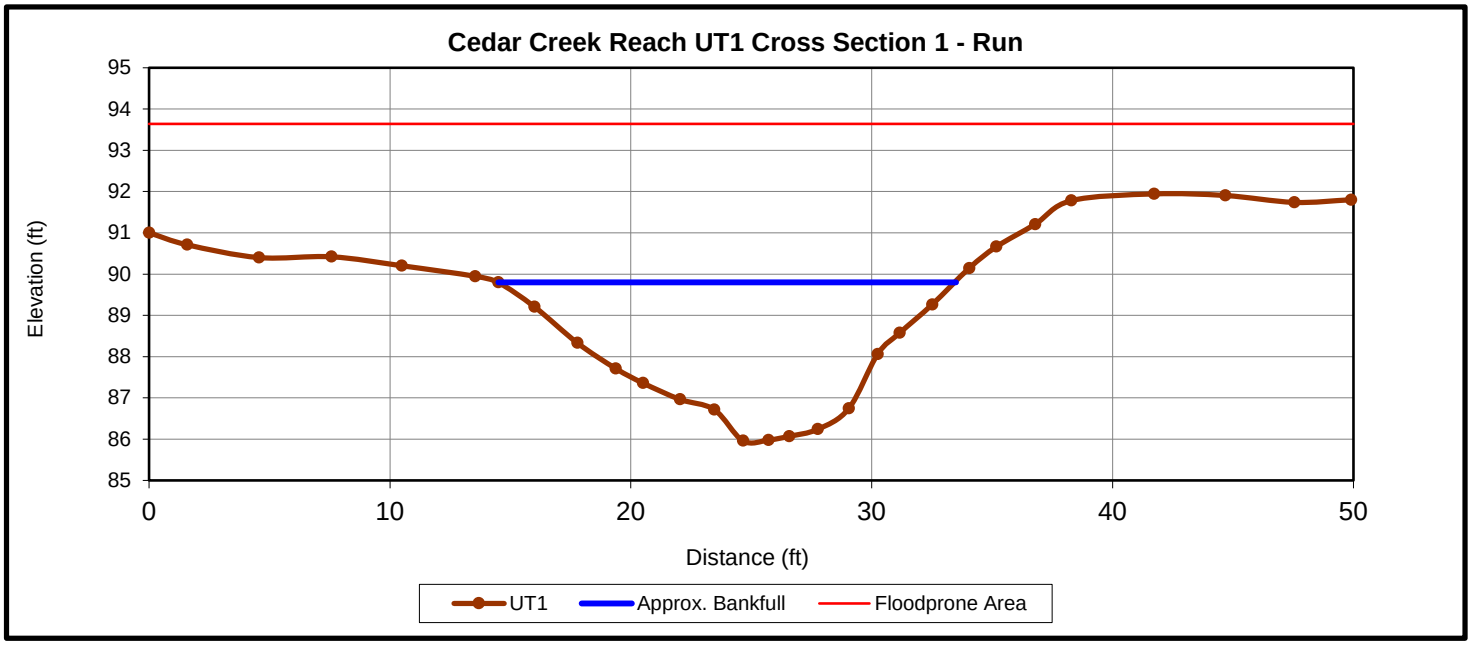
Project Name/Number: Cedar Creek Site/ NCDMS Project # 95718

	Cross Section 21 (Pool)							Cross Section 22 (Riffle)							Cross Section 23 (Riffle)							Cross Section 24 (Pool)							Cross Section 25 (Pool)						
Based on fixed baseline bankfull elevation[1]	Base	MY1	MY2	MY3	MY5	MY7	MY+	Base	MY1	MY2	MY3	MY5	MY7	MY+	Base	MY1	MY2	MY3	MY5	MY7	MY+	Base	MY1	MY2	MY3	MY5	MY7	MY+	Base	MY1	MY2	MY3	MY5	MY7	MY+
Record elevation (datum) used	101.8							101.3							95.6							95.4							91.5						
Bankfull Width (ft)	8.9							6.0							8.3							5.9							6.6						
Floodprone Width (ft)	50.0							50.0							50.0							50.0							50.0						
Bankfull Mean Depth (ft)	0.3							0.5							0.4							0.5							0.4						
Bankfull Max Depth (ft)	0.9							0.9							1.3							1.1							0.8						
Bankfull Cross Sectional Area (ft^2)	3.1							3.1							3.1							3.0							2.6						
Bankfull Width/Depth Ratio	25.6							11.6							21.9							11.8							17.0						
Bankfull Entrenchment Ratio	>2.2							>2.2							>2.2							>2.2							>2.2						
Bankfull Bank Height Ratio	1.0							1.0							1.0							1.0							1.0						
	Cross Section 26 (Riffle)							**Cross Section 27 (Run)**																													
Based on fixed baseline bankfull elevation[1]	Base	MY1	MY2	MY3	MY5	MY7	MY+	Base	MY1	MY2	MY3	MY5	MY7	MY+	Base	MY1	MY2	MY3	MY5	MY7	MY+	Base	MY1	MY2	MY3	MY5	MY7	MY+	Base	MY1	MY2	MY3	MY5	MY7	MY+
Record elevation (datum) used	91.3							105.3																												
Bankfull Width (ft)	6.8							6.4																												
Floodprone Width (ft)	50.0							50.0																												
Bankfull Mean Depth (ft)	0.4							0.4																												
Bankfull Max Depth (ft)	0.7							0.9																												
Bankfull Cross Sectional Area (ft^2)	2.5							2.8																												
Bankfull Width/Depth Ratio	18.1							14.8																												
Bankfull Entrenchment Ratio	>2.2							>2.2																												
Bankfull Bank Height Ratio	1.0							1.0																												
Based on fixed baseline bankfull elevation[1]	Base	MY1	MY2	MY3	MY5	MY7	MY+	Base	MY1	MY2	MY3	MY5	MY7	MY+	Base	MY1	MY2	MY3	MY5	MY7	MY+	Base	MY1	MY2	MY3	MY5	MY7	MY+	Base	MY1	MY2	MY3	MY5	MY7	MY+
Record elevation (datum) used																																				
Bankfull Width (ft)																																				
Floodprone Width (ft)																																				
Bankfull Mean Depth (ft)																																				
Bankfull Max Depth (ft)																																				
Bankfull Cross Sectional Area (ft^2)																																				
Bankfull Width/Depth Ratio																																				
Bankfull Entrenchment Ratio																																				
Bankfull Bank Height Ratio																																				
Based on fixed baseline bankfull elevation[1]	Base	MY1	MY2	MY3	MY5	MY7	MY+	Base	MY1	MY2	MY3	MY5	MY7	MY+	Base	MY1	MY2	MY3	MY5	MY7	MY+	Base	MY1	MY2	MY3	MY5	MY7	MY+	Base	MY1	MY2	MY3	MY5	MY7	MY+
Record elevation (datum) used																																				
Bankfull Width (ft)																																				
Floodprone Width (ft)																																				
Bankfull Mean Depth (ft)																																				
Bankfull Max Depth (ft)																																				
Bankfull Cross Sectional Area (ft^2)																																				
Bankfull Width/Depth Ratio																																				
Bankfull Entrenchment Ratio																																				
Bankfull Bank Height Ratio																																				

1 = Widths and depths for annual measurements will be based on the baseline bankfull datum regardless of dimensional/depositional development. Input the elevation used as the datum, which should be consistent and based on the baseline datum established. If the performer has inherited the project and cannot acquire the datum used for prior years this must be discussed with EEP. If this cannot be resolved in time for a given years report submission a footnote in this should be included that states: "It is uncertain if the monitoring datum has been consistent over the monitoring history, which may influence calculated values. Additional data from a prior performer is being acquired to provide confirmation. Values will be recalculated in a future submission based on a consistent datum if determined to be necessary."

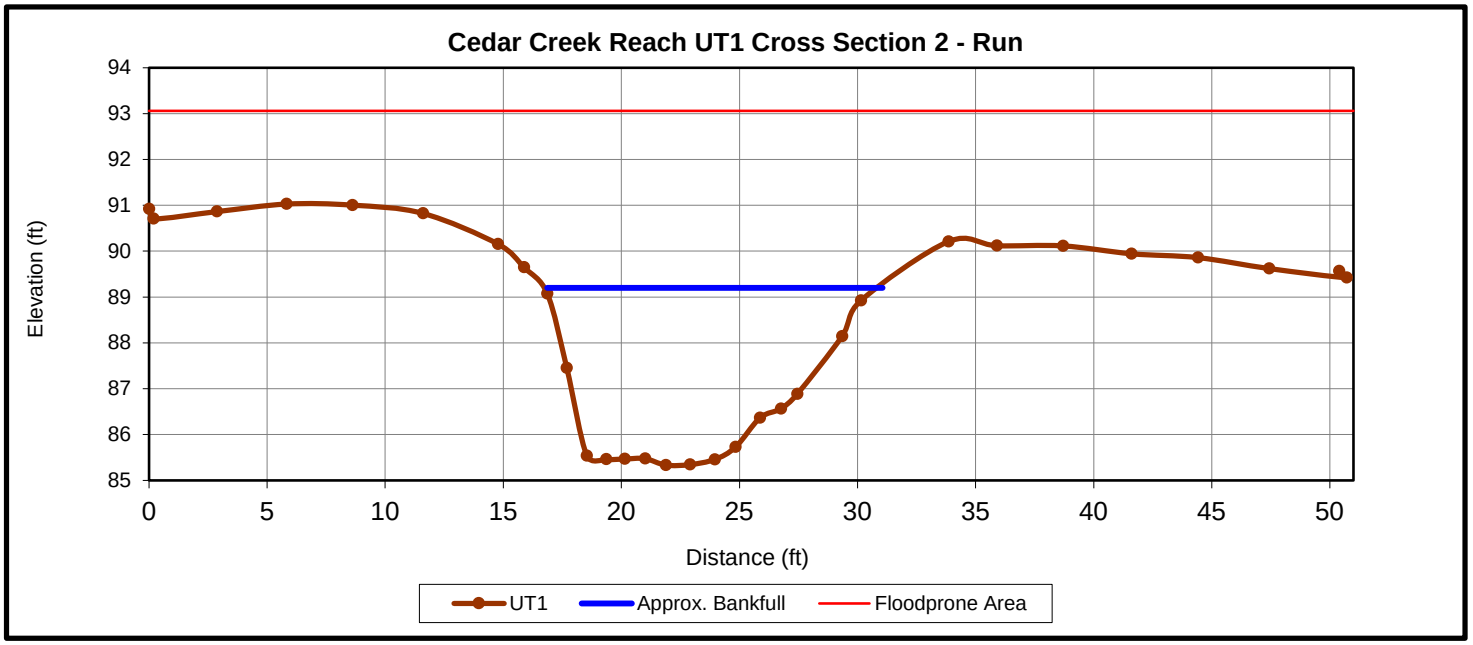
Upstream

Downstream



Upstream

Downstream



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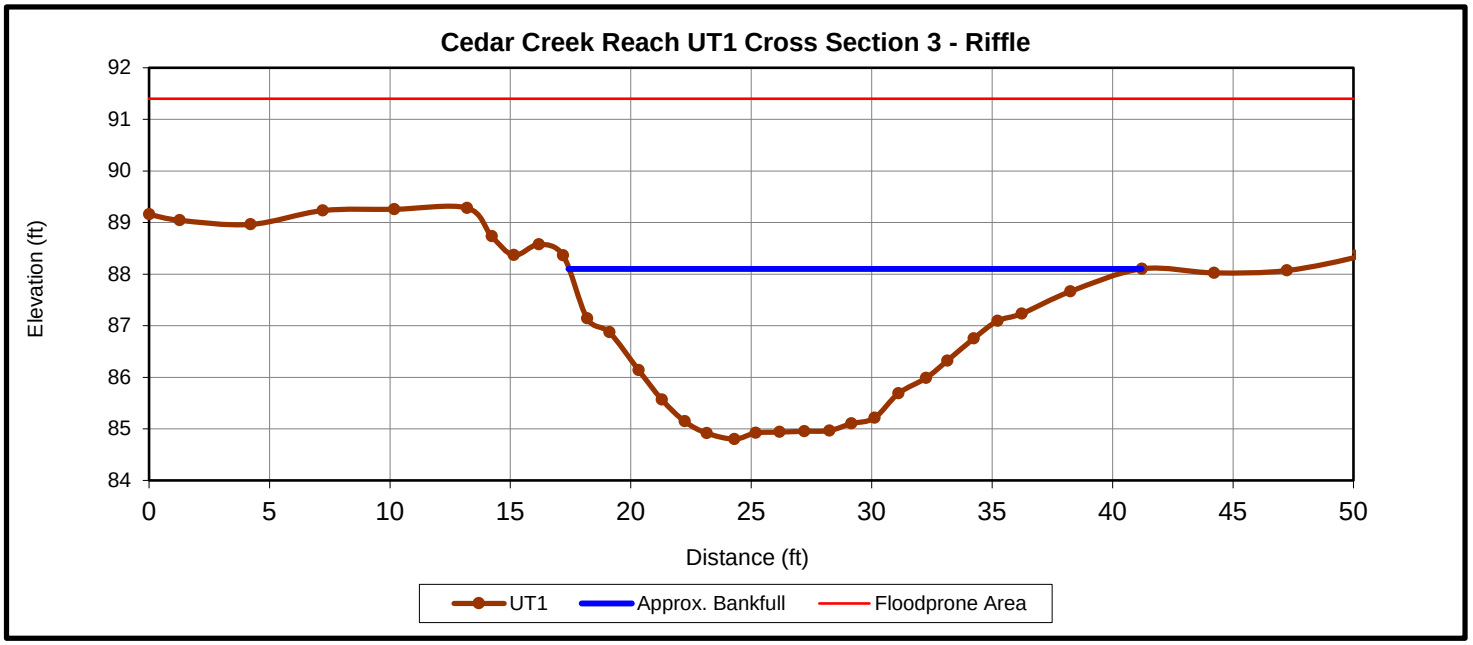
Downstream



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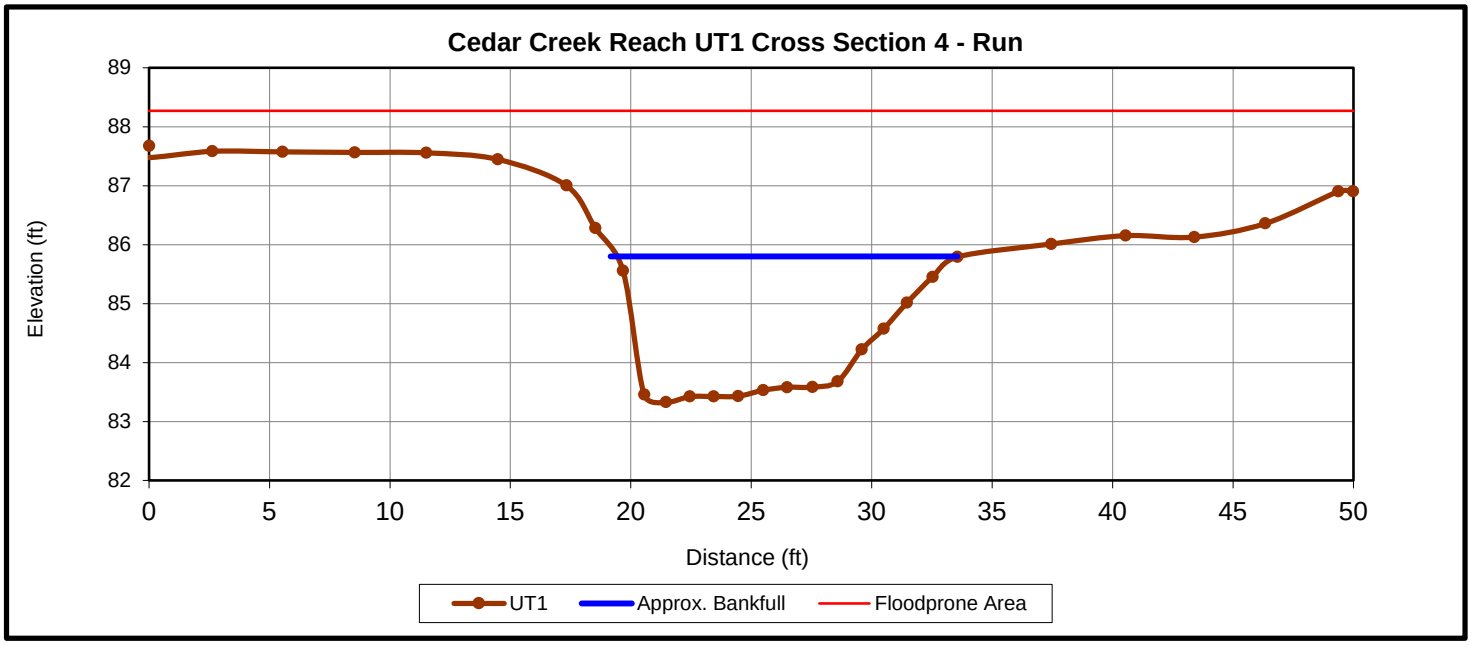

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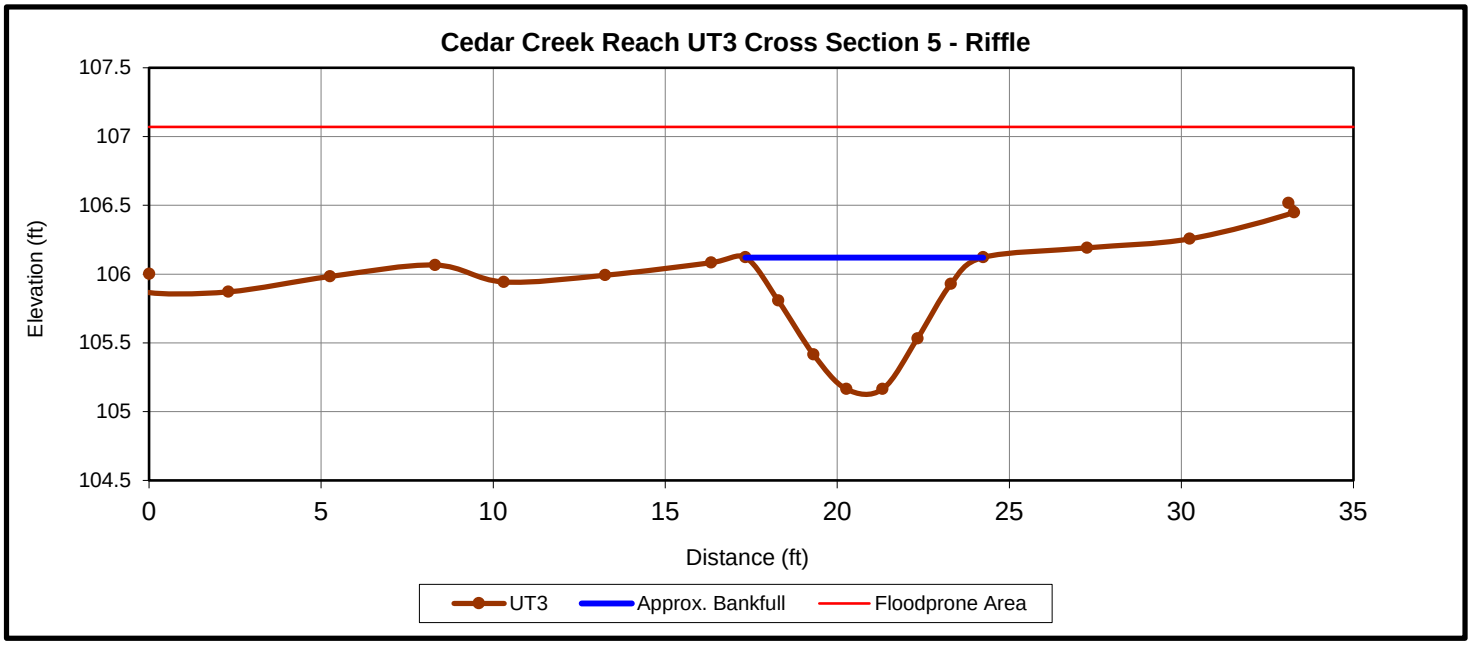

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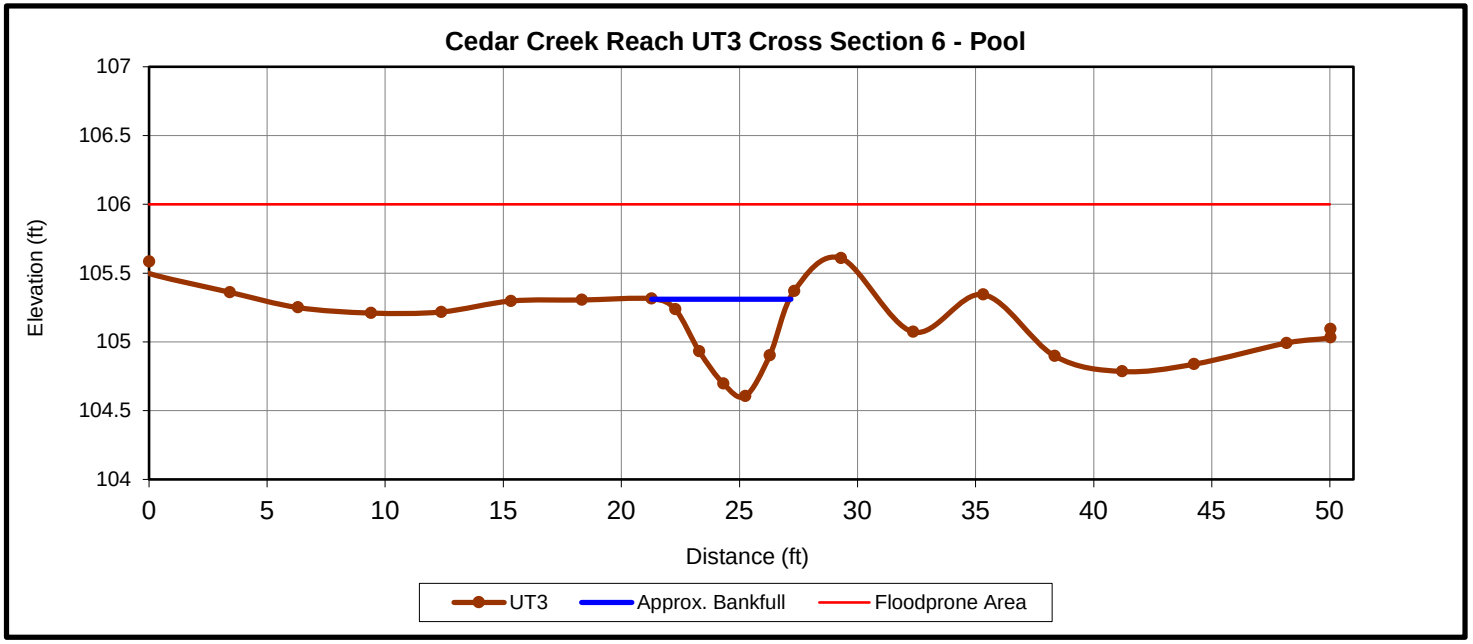

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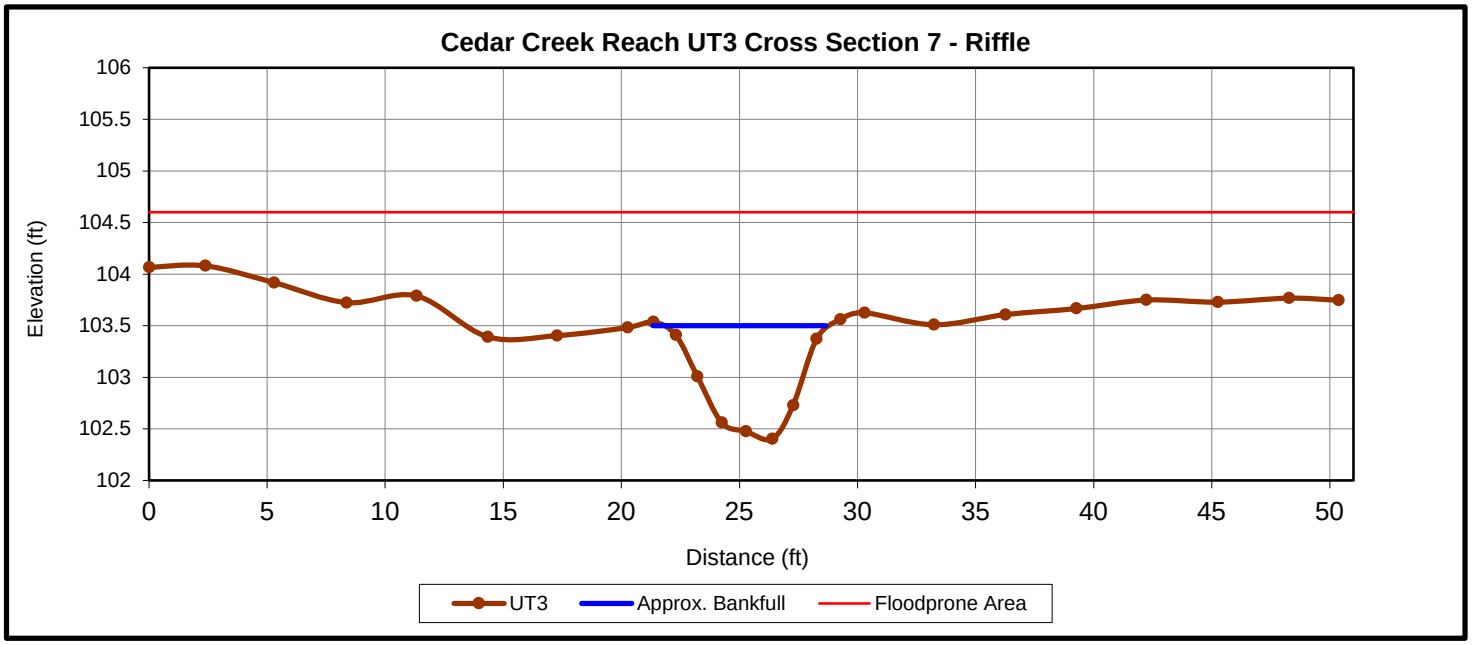

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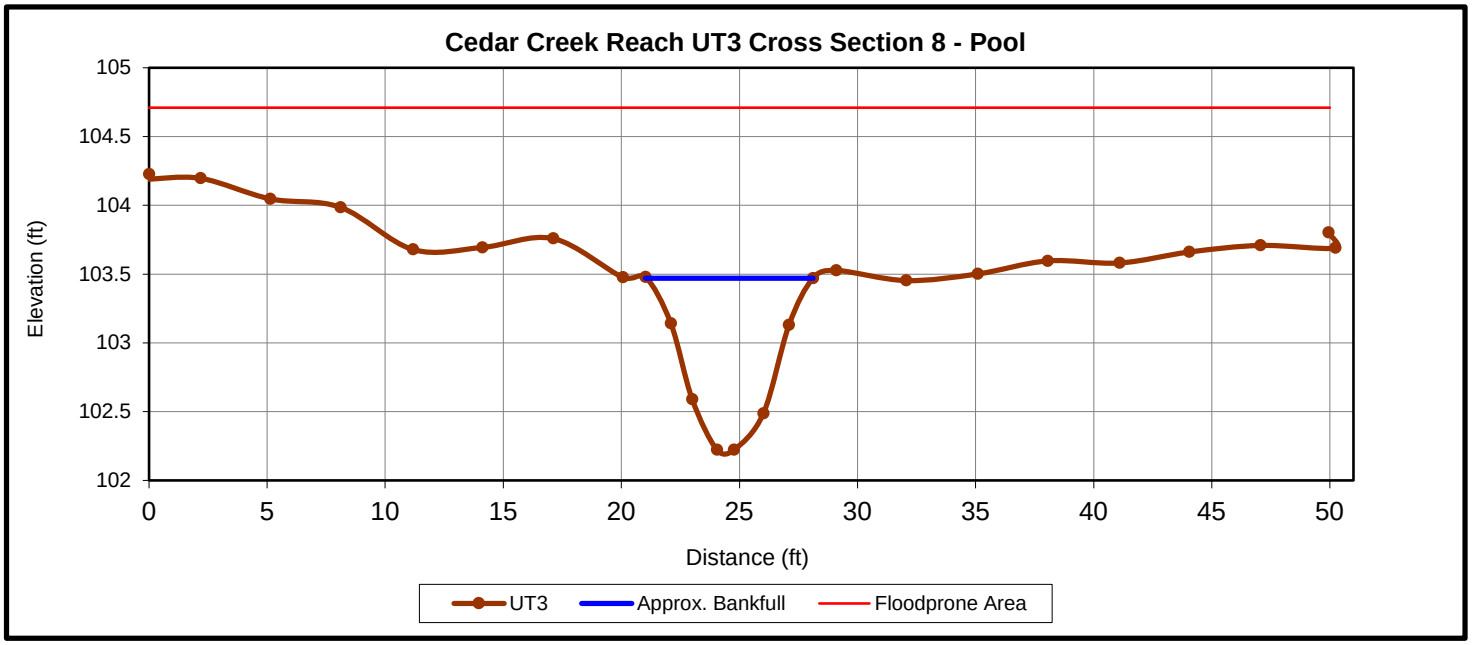

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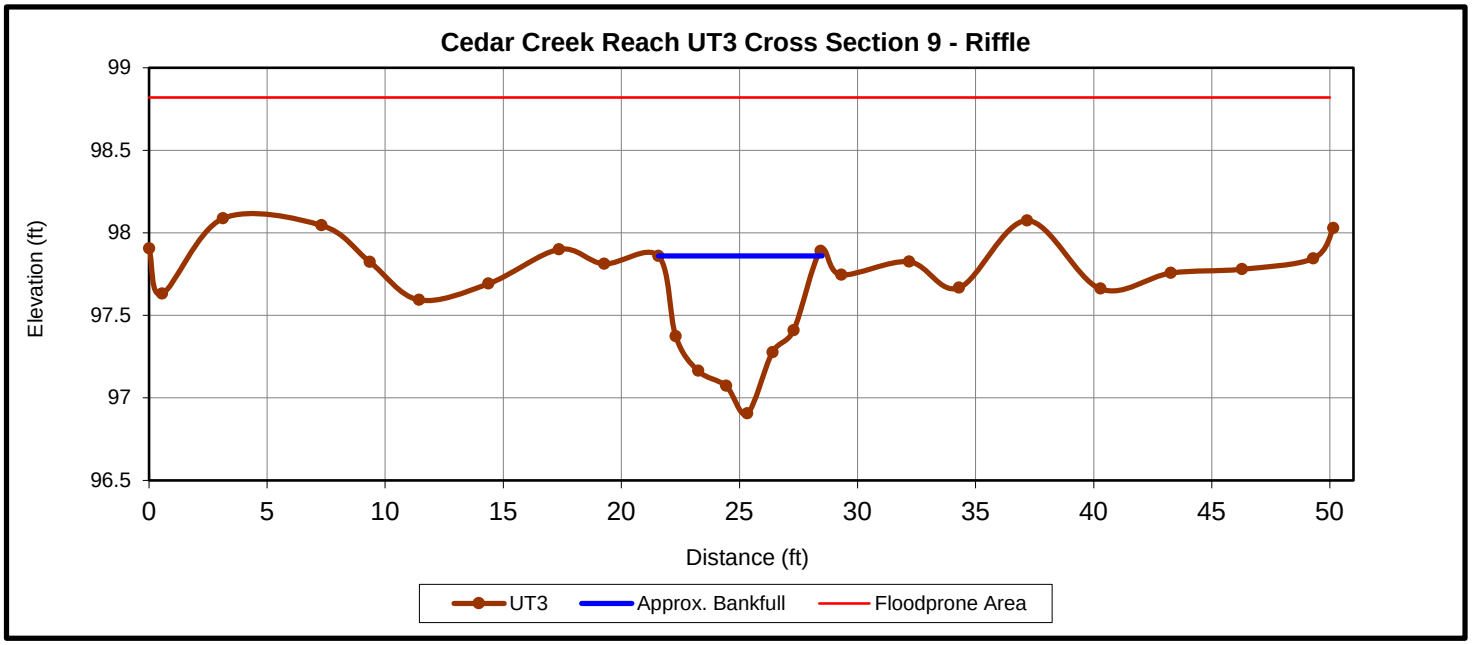

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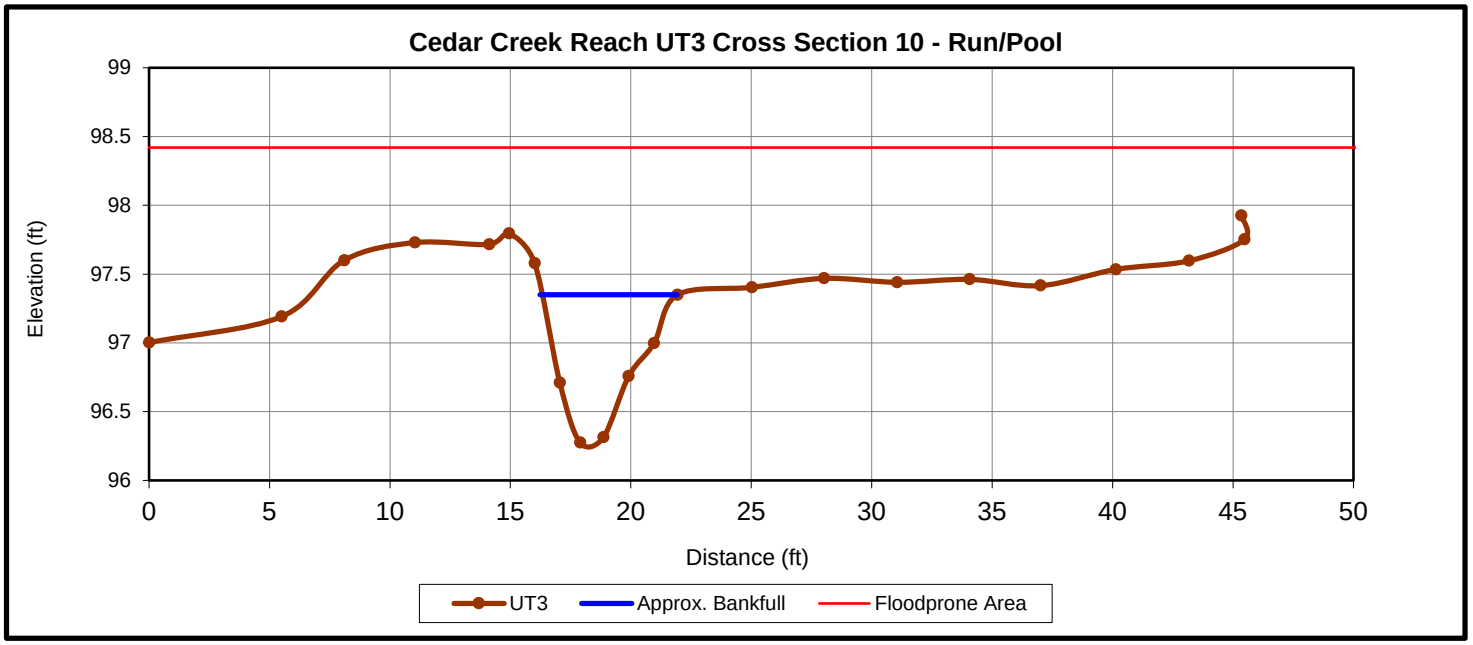

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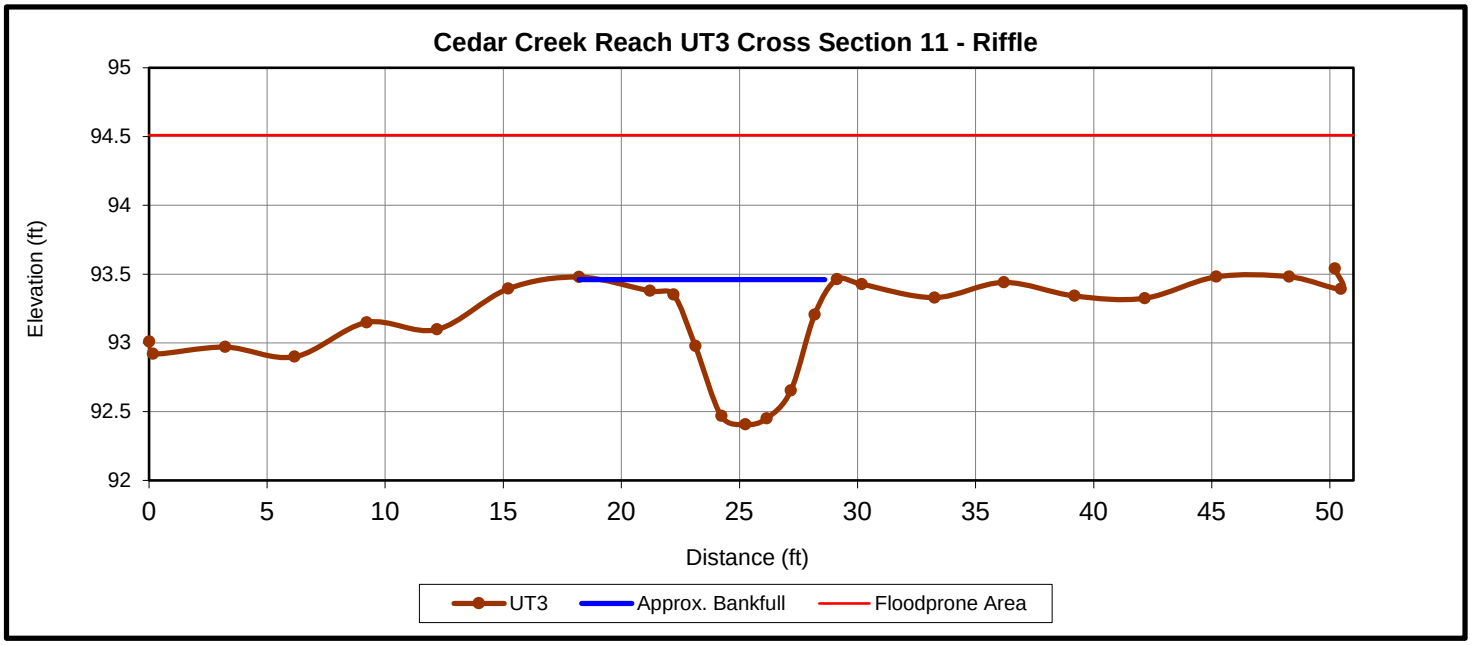

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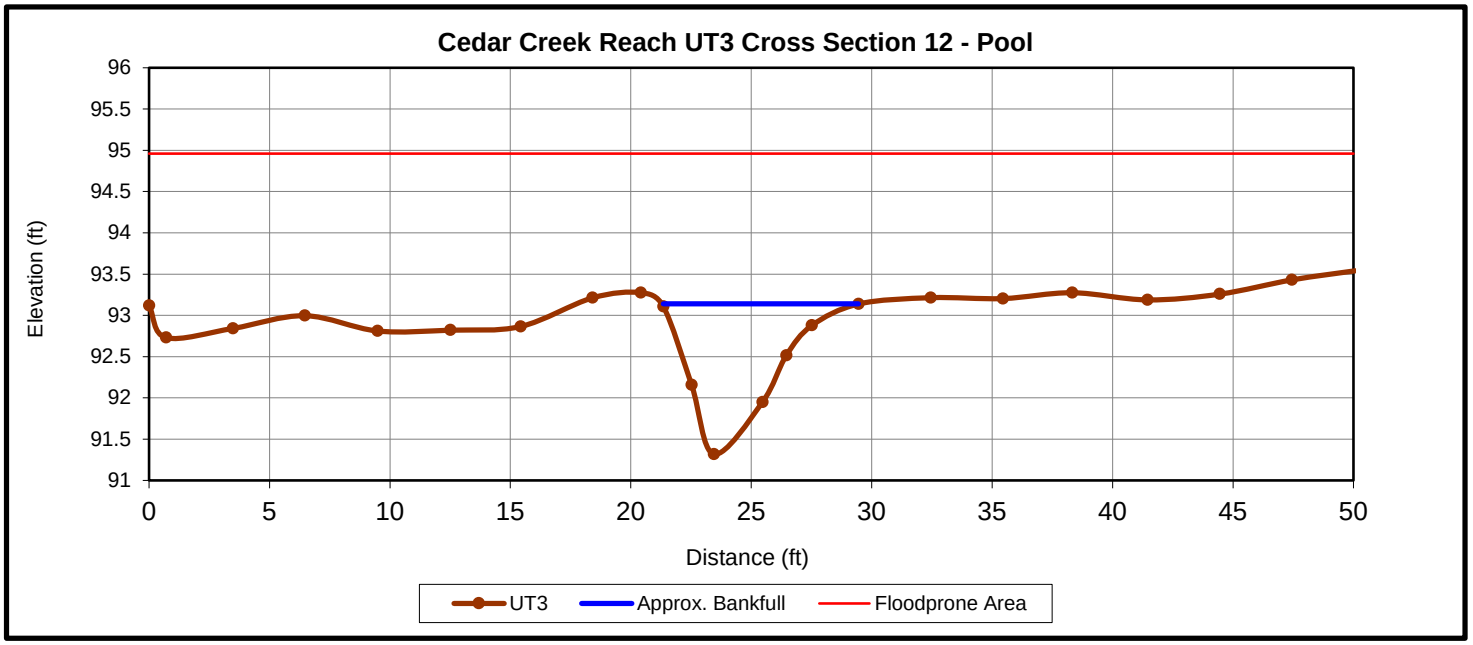
Downstream



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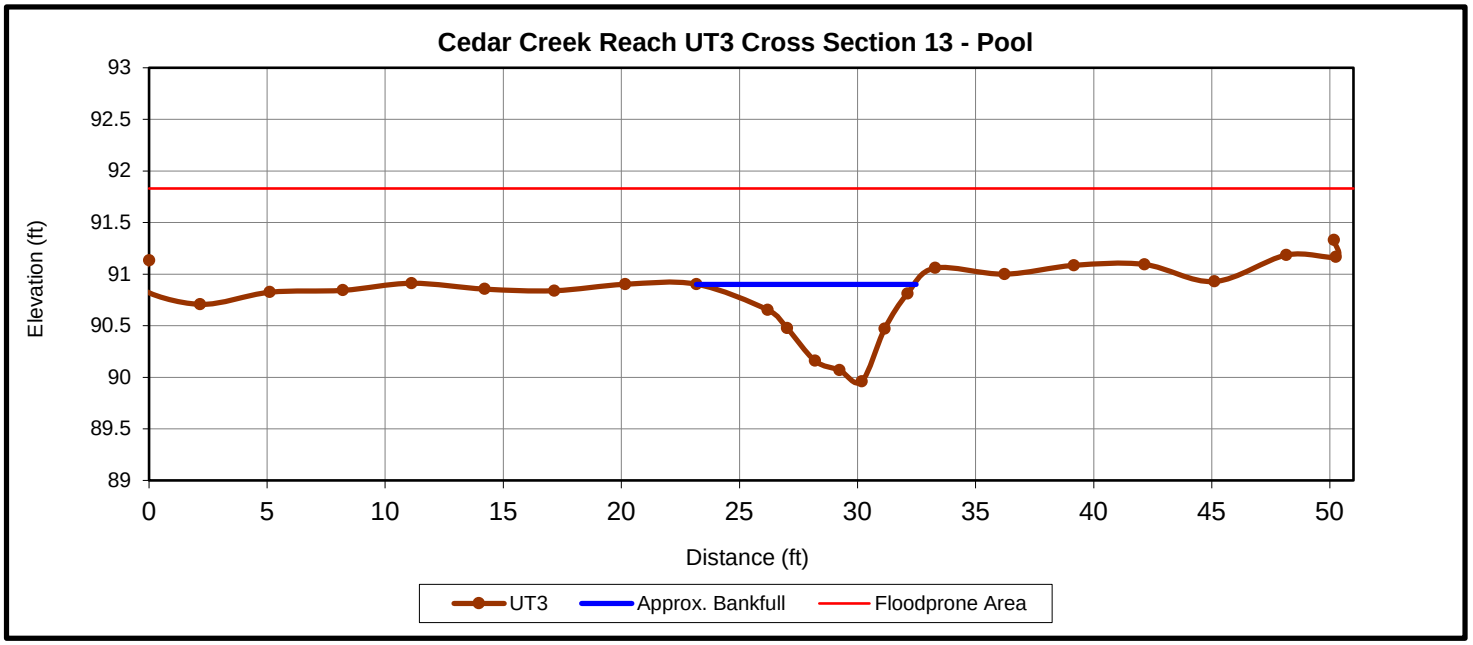
Downstream



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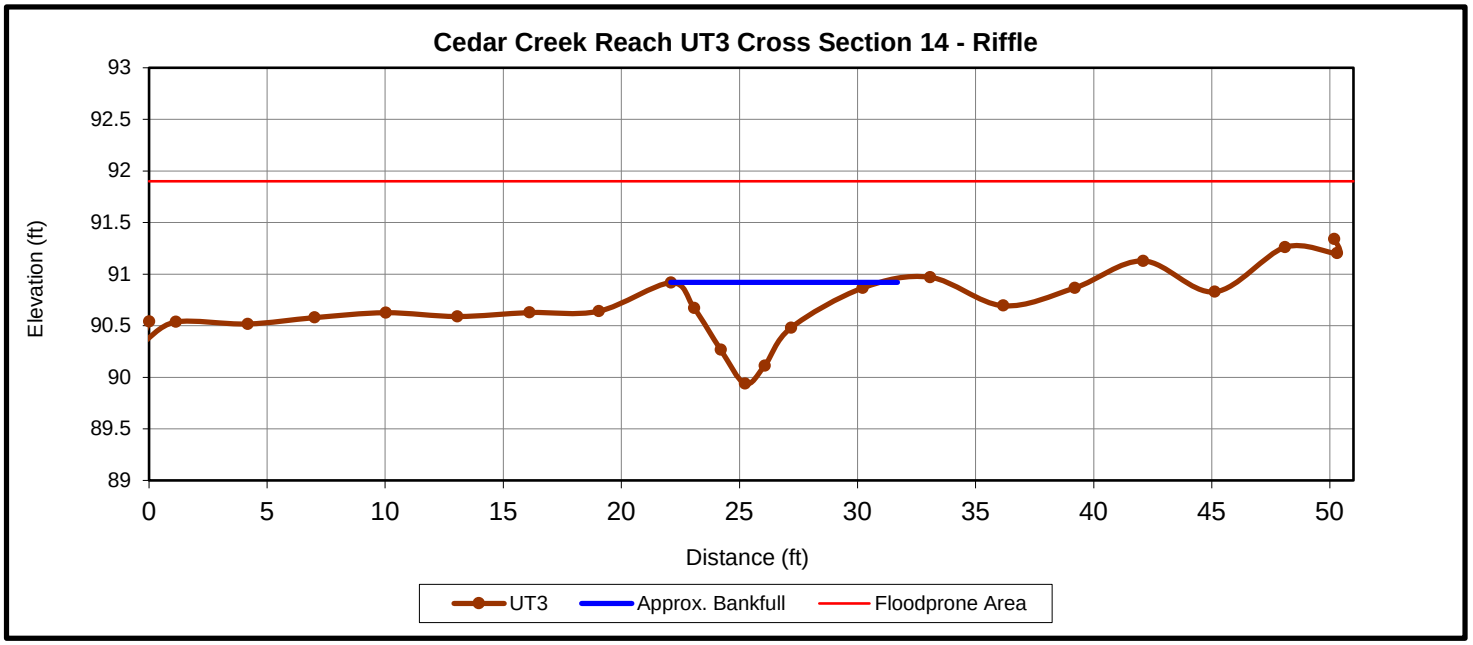
Downstream



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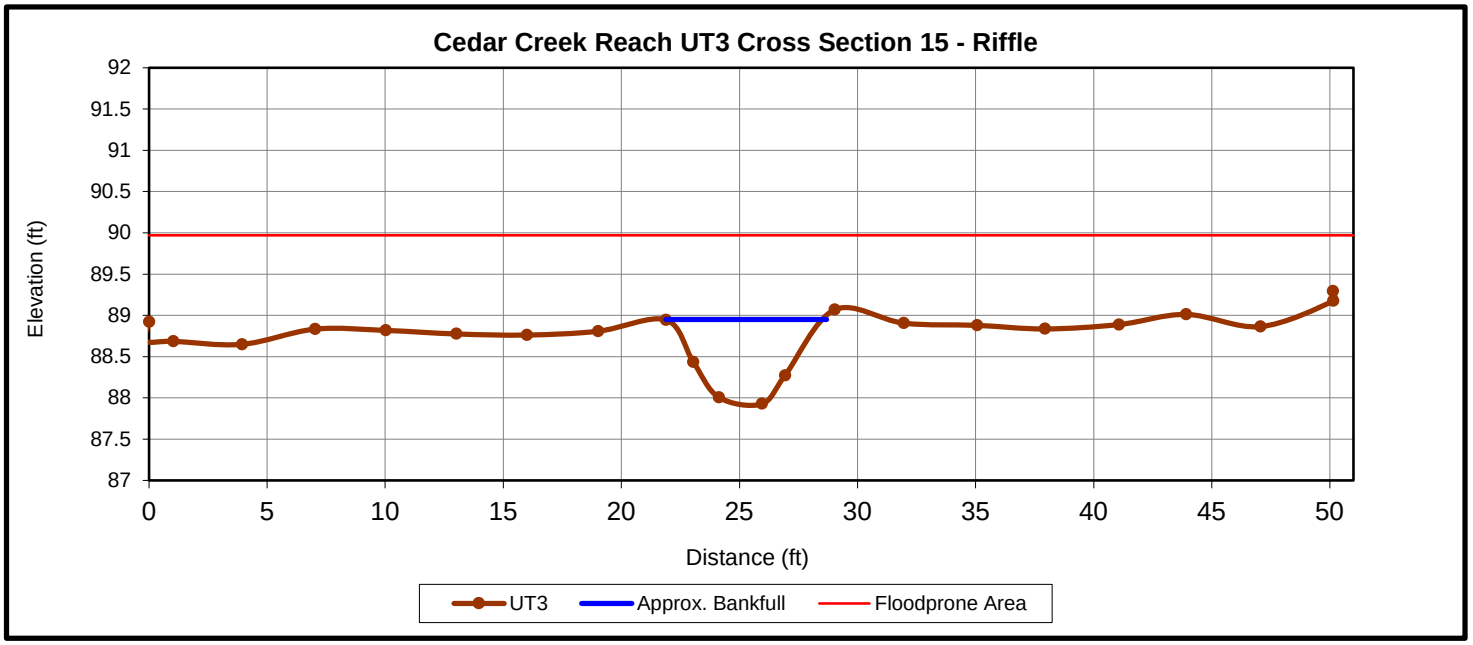
Downstream



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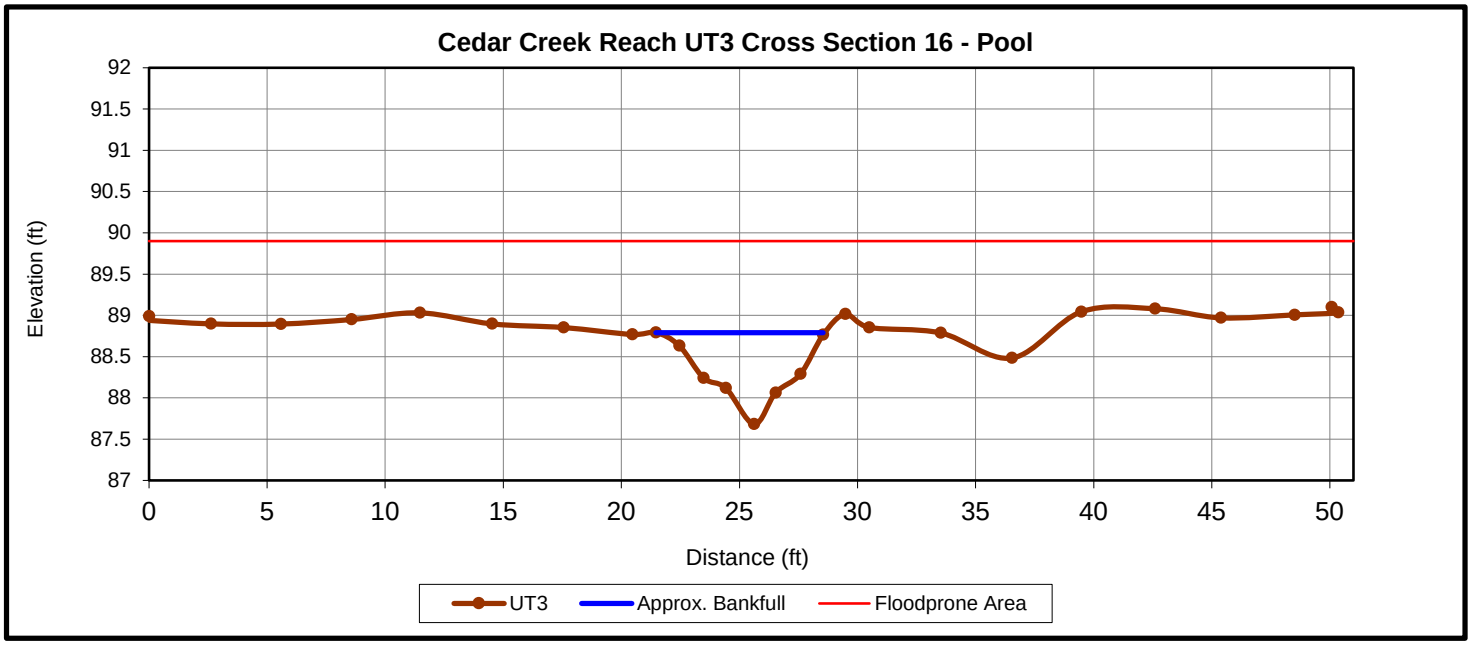
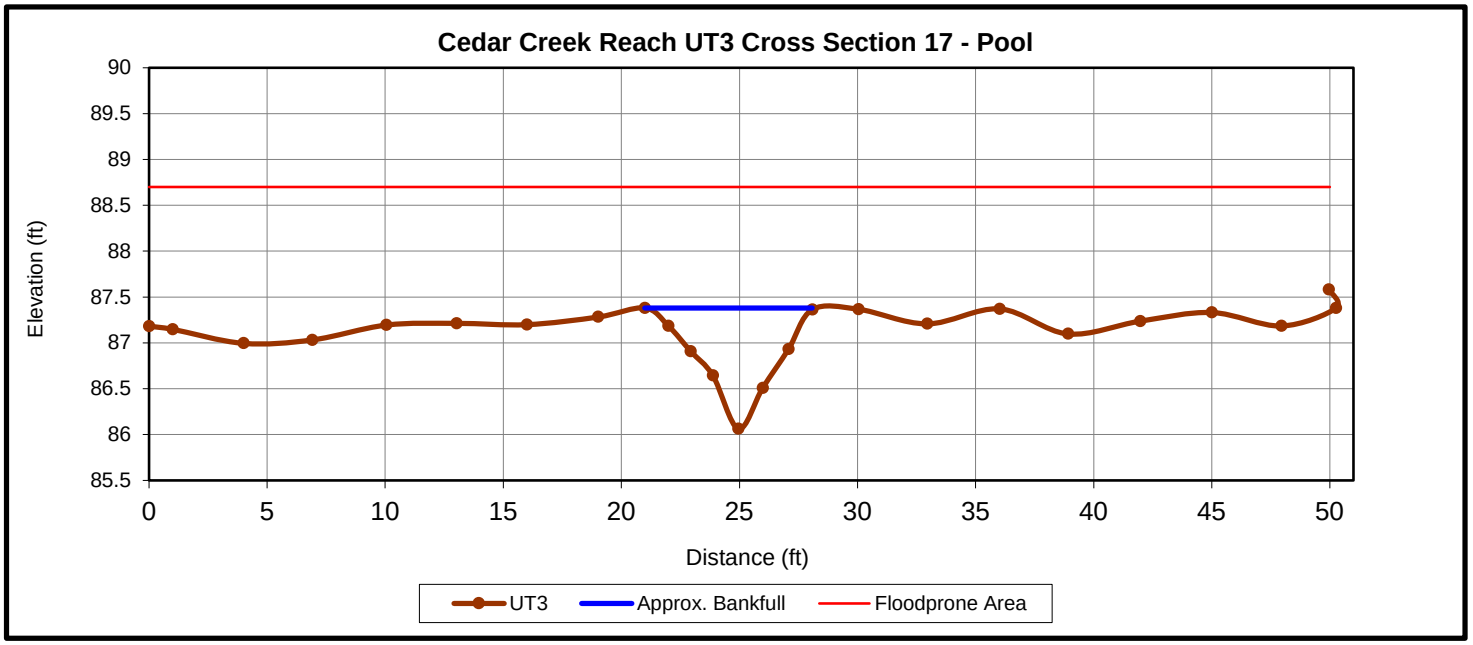
Downstream



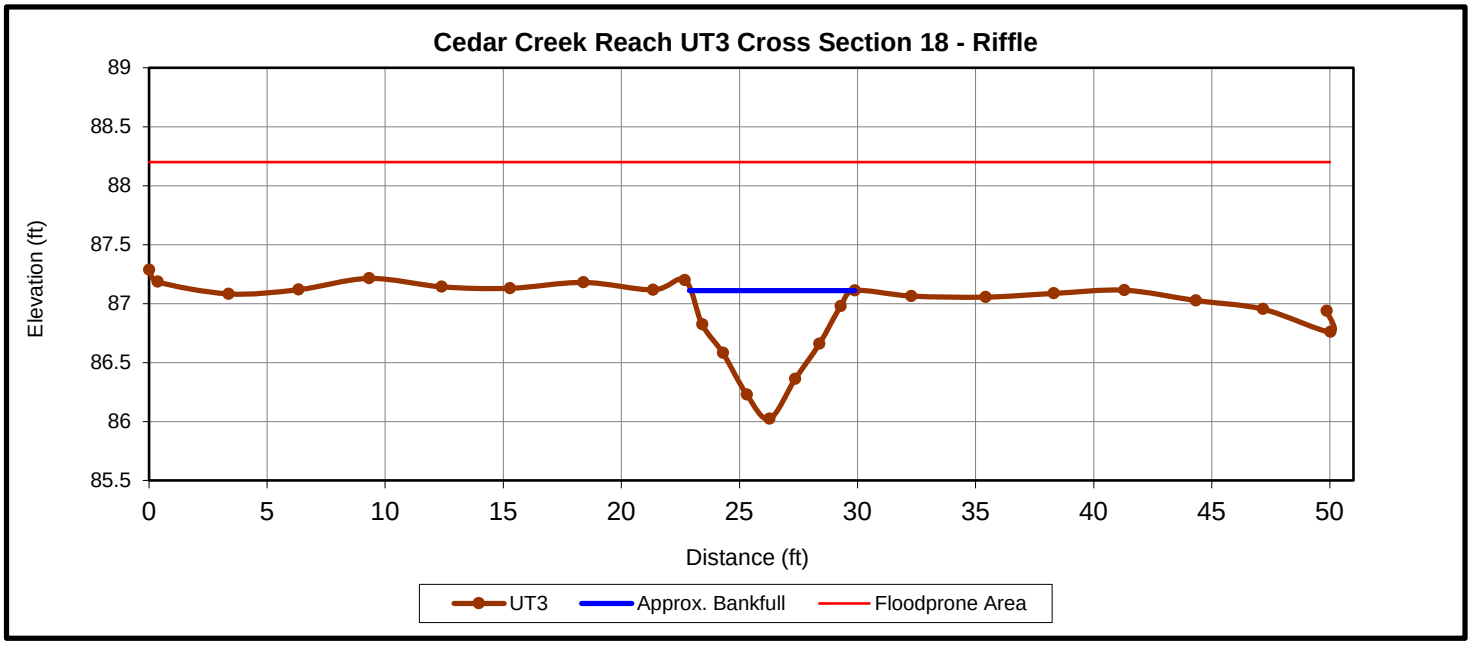
Upstream

Downstream



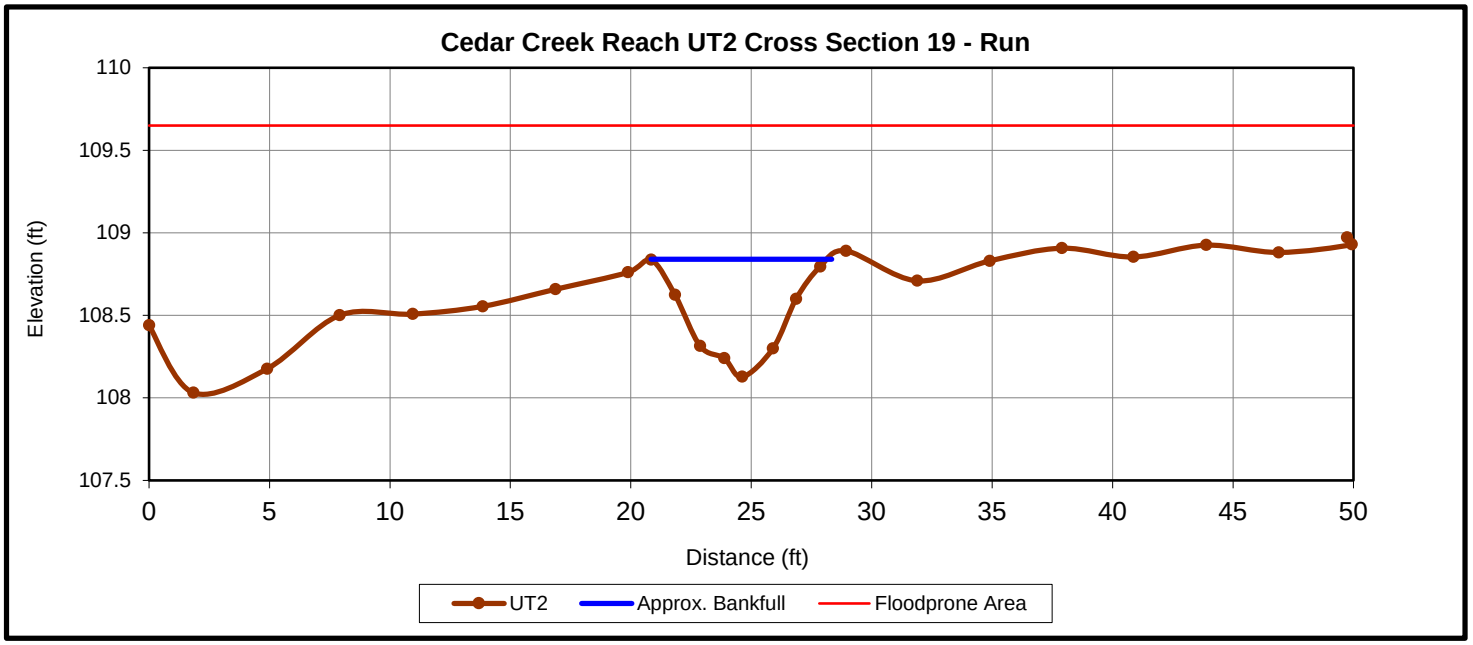
Upstream

Downstream



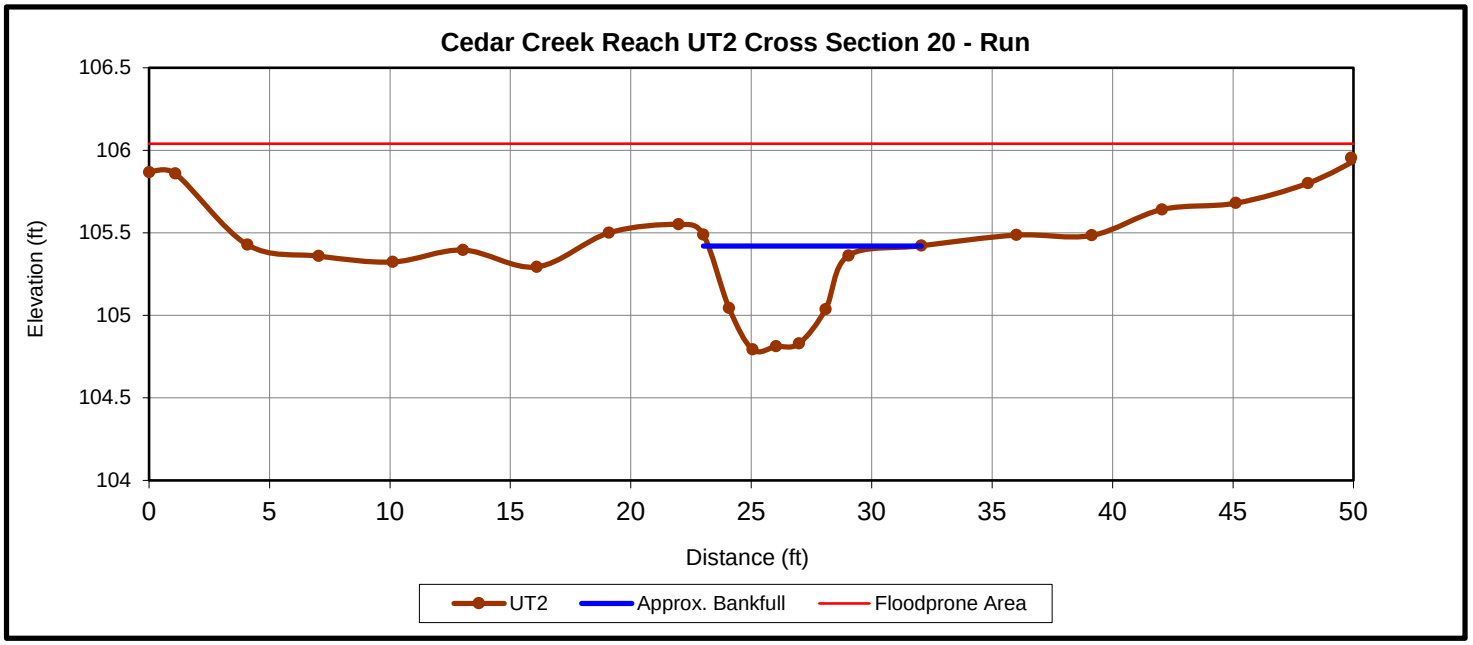
Upstream

Downstream



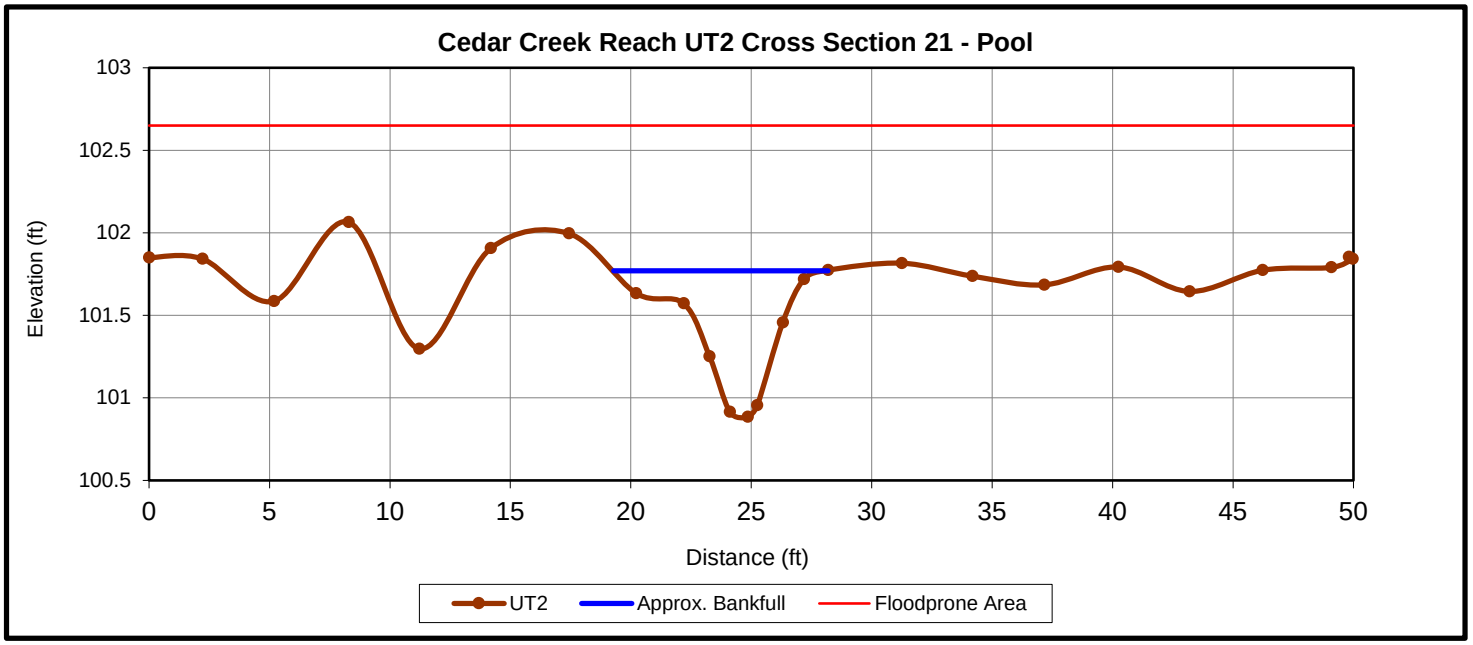
Upstream

Downstream



Upstream

Downstream



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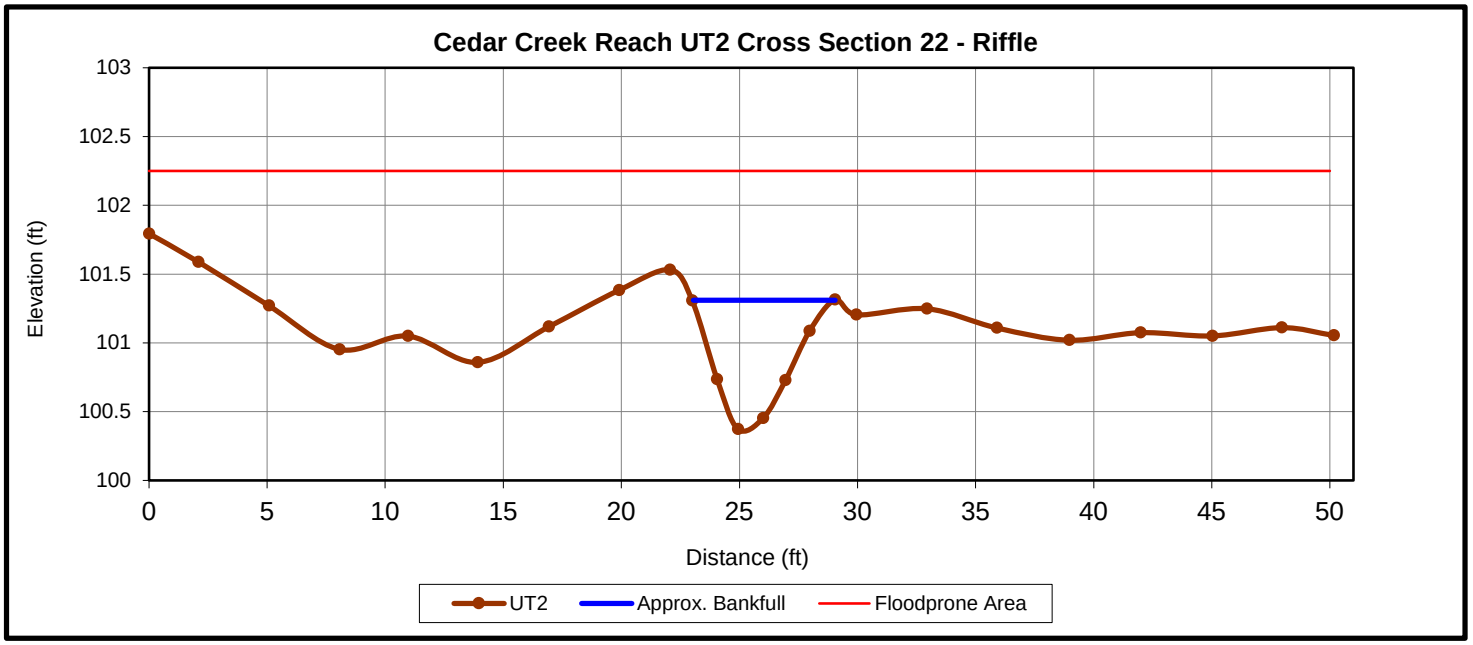
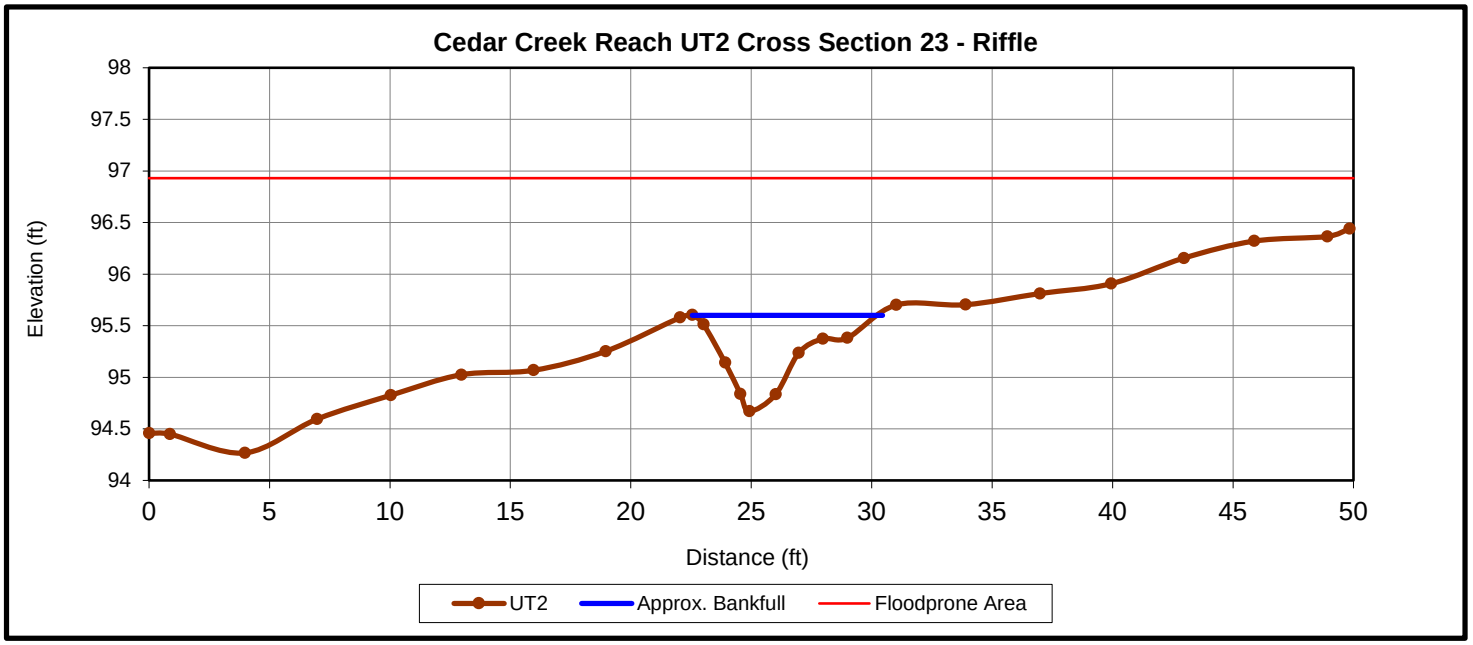
Downstream



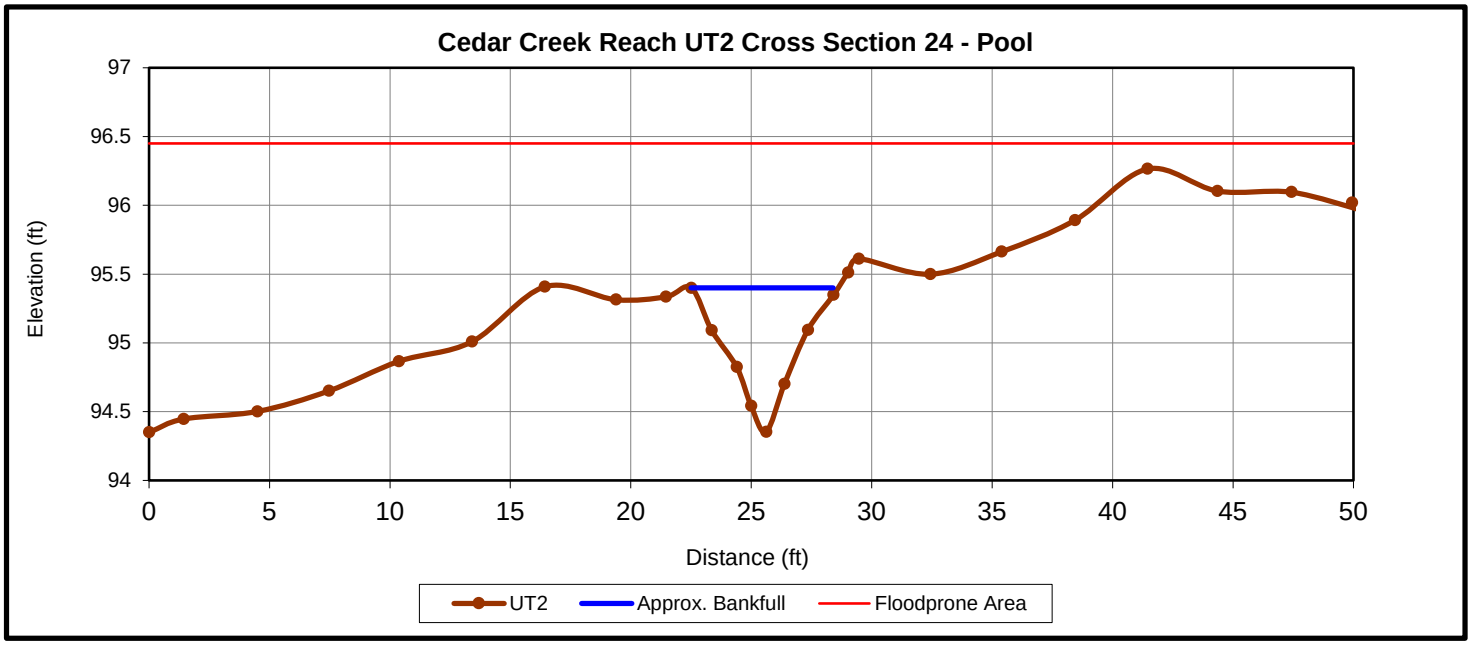
Upstream

Downstream



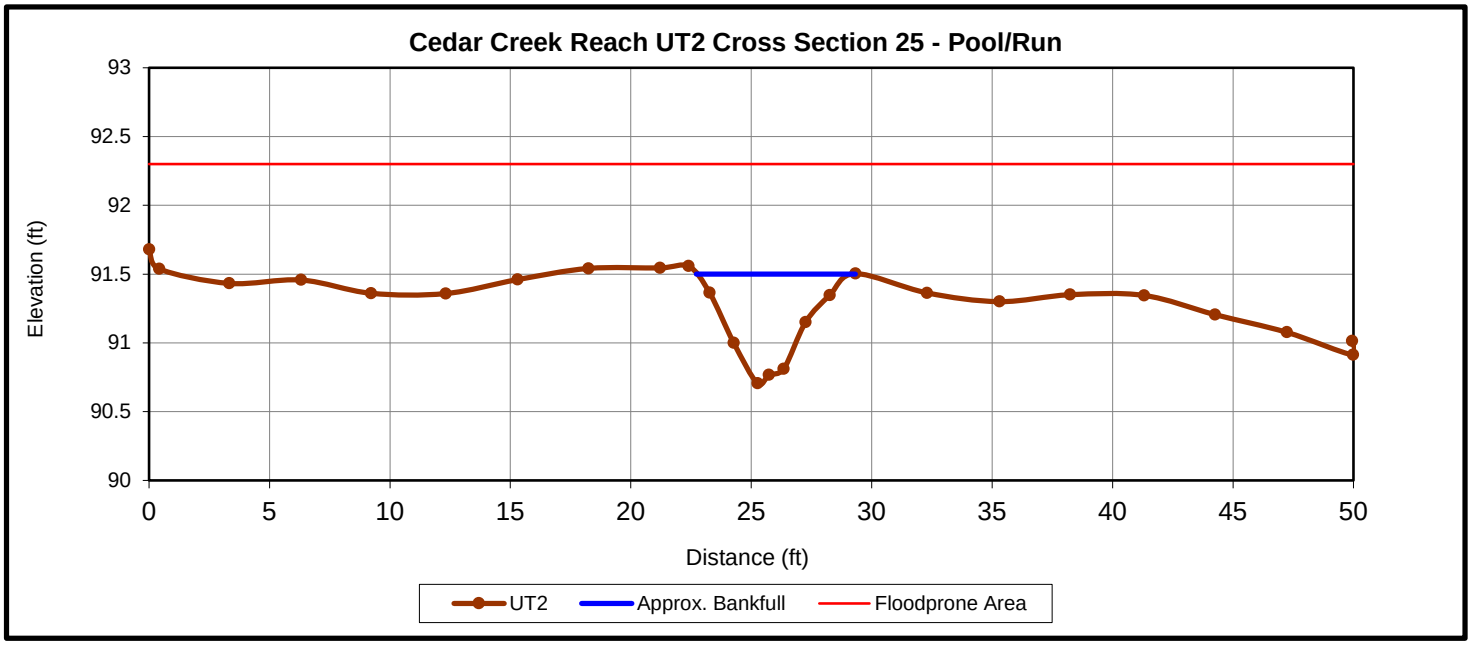
Upstream

Downstream



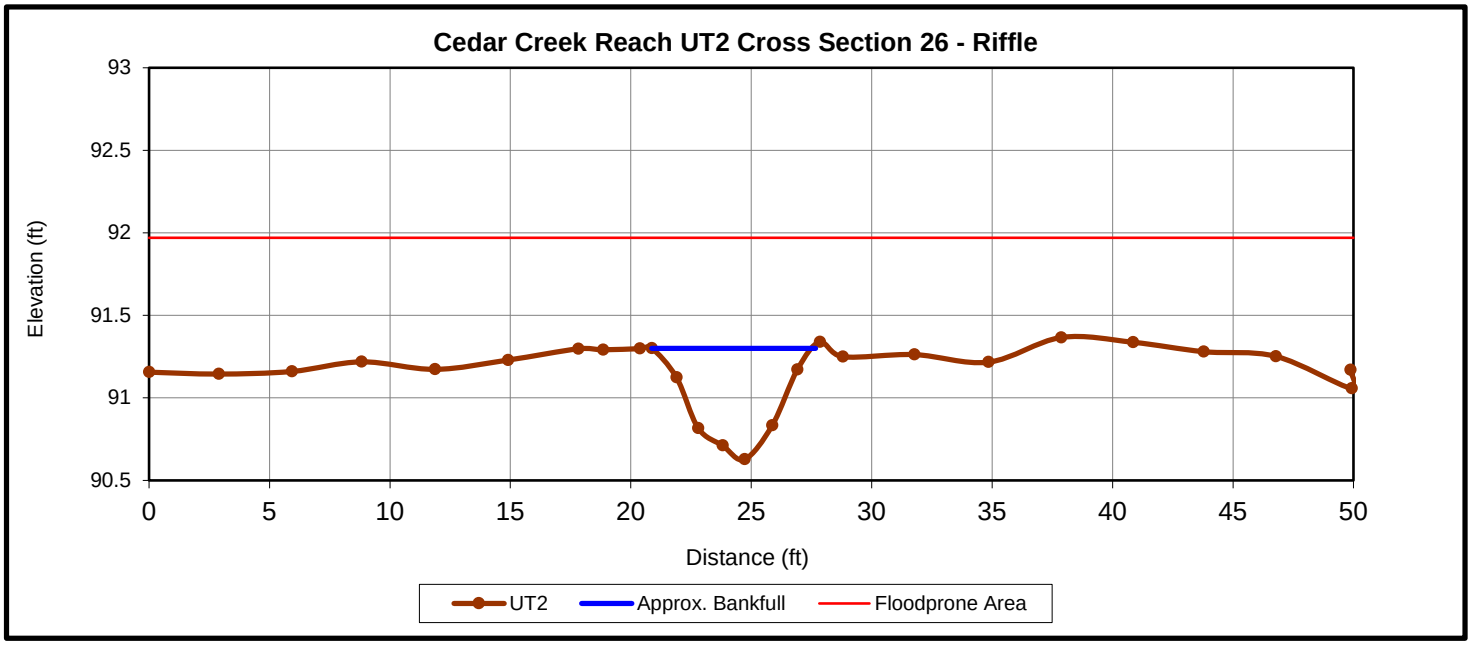
Upstream

Downstream



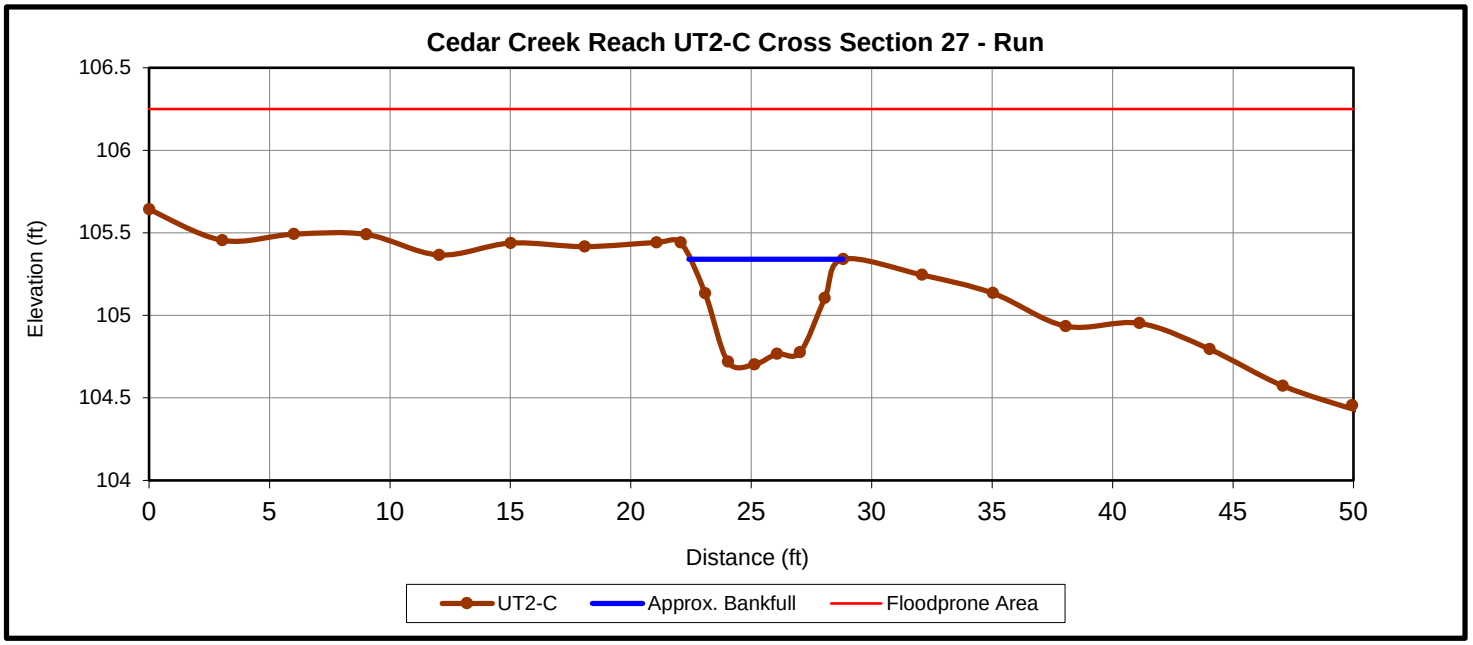
Upstream

Downstream



Upstream

Downstream



Appendix B.
Cedar Creek Stream/Wetland Photos

UT1 Cross Section 3 Looking Upstream (6/8/2015)

UT1 STA 25+50 Looking Upstream (7/30/2015)

UT2 STA 7+50 Looking Upstream (5/20/2015)

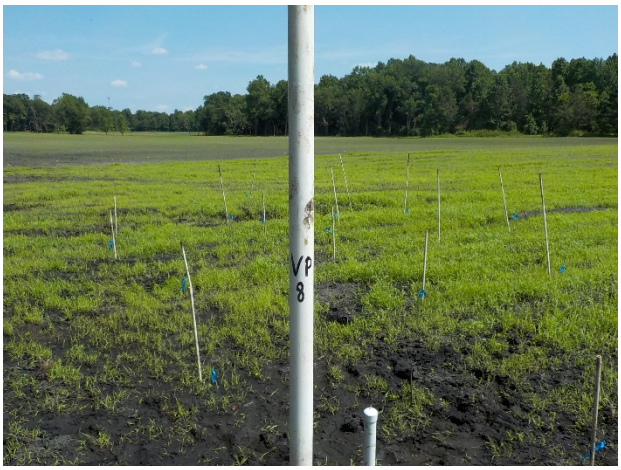
UT2 STA 8+50 Looking Downstream (5/20/2015)

UT3 STA 2+50 Looking Upstream (5/20/2015)

UT3 STA 14+00 Looking Downstream (5/20/2015)

Appendix B.
Cedar Creek Stream/Wetland Photos

Wetland Restoration Area 1 and UT3 (5/13/2015)



Wetland Hydrology Gauge AW6 (6/8/2015)

Crest Gauge 1 – UT3 (7/30/2015)

Crest Gauge 2 – UT2C (7/30/2015)

Crest Gauge 3 – UT2 (7/30/2015)

Rain Gauge and Ambient – (7/30/2015)

Appendix B.
Cedar Creek Stream/Wetland Photos

Bank Pin Array at Cross Section 6 (6/8/2015)

Bank Pin Array at Cross Section 10 (6/8/2015)

Bank Pin Array at Cross Section 12 (6/8/2015)

Bank Pin Array at Cross Section 13 (6/8/2015)

Bank Pin Array at Cross Section 16 (6/8/2015)

Bank Pin Array at Cross Section 17 (6/8/2015)

Appendix B.
Cedar Creek Stream/Wetland Photos

Bank Pin Array at Cross Section 24 (6/8/2015)

Bank Pin Array at Cross Section 25 (6/8/2015)

APPENDIX C

Vegetation Data and Tables

Table 7a. Baseline Planted Species Summary
Table 7b. Vegetation Plot Mitigation Success Criteria Summary
Table 7c. Vegetation Plot Data Summary (Species by Plot)
Vegetation Plot Photos

Table 7a. Baseline Planted Species Summary

Planted Date: May 26, 2015

Scientific Name	Common Name	Species Type	Total Stems Planted
Asiminaa triloba	Pawpaw	Bare Root	800
Betula nigra	River Birch	Bare Root	3,500
Cephalanthus occidentalis	Common Buttonbush	Bare Root	600
Chamaecyparis thyoides	Atlantic White Cedar	Bare Root	1,650
Malus angustifolia	Crab Apple	Bare Root	400
Nyssa sylvatica	Blackgum	Bare Root	1,500
Platanus occidentalis	American sycamore	Bare Root	4,800
Quercus lyrata	Overcup Oak	Bare Root	4,900
Quercus michauxii	Swamp Chestnut Oak	Bare Root	2,200
Quercus nigra	Water Oak	Bare Root	2,100
Quercus phellos	Willow Oak	Bare Root	900
Sambucus sp.	Elderberry	Bare Root	250
Taxodium distichum	Bald Cypress	Bare Root	2,400
		Total	**26,000**
Salix nigra	Black Willow	Live Stake	2,000
Populus deltoides	Cottonwood	Live Stake	1,000
Cornus amomum	Silky Dogwood	Live Stake	500
		Total	**3,500**

Table 7b. Vegetation Plot Mitigation Success Criteria Summary

Plot #	Stream/ Wetland Stems[2]	Volunteers[3]	Total[4]	Success Criteria Met?
1	1174	0	1174	Yes
2	1295	0	1295	Yes
3	1700	0	1700	Yes
4	1093	0	1133	Yes
5	1335	0	1335	Yes
6	1335	0	1335	Yes
7	1255	0	1255	Yes
8	971	0	971	Yes
9	890	0	890	Yes
10	971	0	971	Yes
11	931	0	971	Yes
12	931	0	931	Yes
13	890	0	890	Yes
14	1133	0	1174	Yes
15	1174	0	1174	Yes
16	931	0	931	Yes
17	890	0	890	Yes
18	1295	0	1295	Yes
19	890	0	890	Yes
20	890	0	890	Yes
Project Avg	**1099**	**0**	**1105**	**Yes**

Table 7c. Vegetation Plot Data Summary (Species by Plot)

			Current Plot Data (MY0 2015)																													Annual Means		
			95718-01-0001			95718-01-0002			95718-01-0003			95718-01-0004			95718-01-0005			95718-01-0006			95718-01-0007			95718-01-0008			95718-01-0009			95718-01-0010			MY0 (2015)		
Scientific Name	Common Name	Species Type	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	PnoLS	P-all	T	PnoLS	P-all	T
Asimina triloba	Pawpaw	Tree							1	1	1													2	2	2				13	13	13	30	30	30
Betula nigra	River Birch	Tree	13	13	13							1	1	1	3	3	3				2	2	2	2	2	2							28	28	28
Chamaecyparis thyoides	Atlantic White Cedar	Tree							6	6	6																12	12	12				34	34	34
Liriodendron tulipifera	Tuliptree	Tree																														19	19	19
Malus	Crab Apple	Tree																											2	2	2	10	10	10
Platanus occidentalis	American Sycamore	Tree	1	1	1							7	7	7	3	3	3	2	2	2	2	2	2	9	9	9				1	1	1	40	40	40
Quercus	Oak sp.	Tree	9	9	9	1	1	1	7	7	7	11	11	11	15	15	15	23	23	23	14	14	14	2	2	2	2	2	2	6	6	6	181	181	181
Quercus michauxii	Swamp Chestnut Oak	Tree							2	2	2	6	6	6	2	2	2				5	5	5	2	2	2							35	35	35
Quercus nigra	Water Oak	Tree																1	1	1													2	2	2
Quercus phellos	Willow Oak	Tree	6	6	6				3	3	3	2	2	2	4	4	4							3	3	3				2	2	2	21	21	21
Sambucus	Elderberry	Shrub																															1	1	1
Taxodium distichum	Bald Cypress	Tree				31	31	31	23	23	23				6	6	6	7	7	7	8	8	8	4	4	4	8	8	8				142	142	142
Unknown	Unknown	Shrub or Tree										1	1	1																		3	3	3
		Stem count	29	29	29	32	32	32	42	42	42	28	28	28	33	33	33	33	33	33	31	31	31	24	24	24	22	22	22	24	24	24	546	546	546
		size (ares)	1			1			1			1			1			1			1			1			1			1			20		
		size (ACRES)	0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.49		
		Species count	4	4	4	2	2	2	6	6	6	6	6	6	6	6	6	4	4	4	5	5	5	7	7	7	3	3	3	5	5	5	13	13	13
		Stems per ACRE	1174	1174	1174	1295	1295	1295	1700	1700	1700	1133	1133	1133	1335	1335	1335	1335	1335	1335	1255	1255	1255	971.2	971.2	971.2	890.3	890.3	890.3	971.2	971.2	971.2	1105	1105	1105

			Current Plot Data (MY0 2015)																													Annual Means		
			95718-01-0011			95718-01-0012			95718-01-0013			95718-01-0014			95718-01-0015			95718-01-0016			95718-01-0017			95718-01-0018			95718-01-0019			95718-01-0020			MY0 (2015)		
Scientific Name	Common Name	Species Type	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	PnoLS	P-all	T	PnoLS	P-all	T
Asimina triloba	Pawpaw	Tree	1	1	1				1	1	1	4	4	4	1	1	1	1	1	1							1	1	1	5	5	5	30	30	30
Betula nigra	River Birch	Tree	2	2	2										5	5	5																28	28	28
Chamaecyparis thyoides	Atlantic White Cedar	Tree				13	13	13													3	3	3										34	34	34
Liriodendron tulipifera	Tuliptree	Tree							4	4	4				3	3	3	2	2	2				7	7	7	3	3	3				19	19	19
Malus	Crab Apple	Tree							3	3	3	4	4	4													1	1	1				10	10	10
Platanus occidentalis	American Sycamore	Tree	1	1	1				4	4	4				7	7	7							3	3	3							40	40	40
Quercus	Oak sp.	Tree	14	14	14				4	4	4	15	15	15	5	5	5	10	10	10	8	8	8	21	21	21	7	7	7	7	7	7	181	181	181
Quercus michauxii	Swamp Chestnut Oak	Tree	1	1	1				1	1	1							6	6	6	4	4	4	1	1	1				5	5	5	35	35	35
Quercus nigra	Water Oak	Tree							1	1	1																						2	2	2
Quercus phellos	Willow Oak	Tree																									1	1	1				21	21	21
Sambucus	Elderberry	Shrub																												1	1	1	1	1	1
Taxodium distichum	Bald Cypress	Tree	4	4	4	10	10	10	4	4	4	5	5	5	8	8	8	4	4	4	7	7	7				9	9	9	4	4	4	142	142	142
Unknown	Unknown	Shrub or Tree	1	1	1							1	1	1																			3	3	3
		Stem count	24	24	24	23	23	23	22	22	22	29	29	29	29	29	29	23	23	23	22	22	22	32	32	32	22	22	22	22	22	22	546	546	546
		size (ares)	1			1			1			1			1			1			1			1			1			1			20		
		size (ACRES)	0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.49		
		Species count	7	7	7	2	2	2	8	8	8	5	5	5	6	6	6	5	5	5	4	4	4	4	4	4	6	6	6	5	5	5	13	13	13
		Stems per ACRE	971.2	971.2	971.2	930.8	930.8	930.8	890.3	890.3	890.3	1174	1174	1174	1174	1174	1174	930.8	930.8	930.8	890.3	890.3	890.3	1295	1295	1295	890.3	890.3	890.3	890.3	890.3	890.3	1105	1105	1105

Color for Density

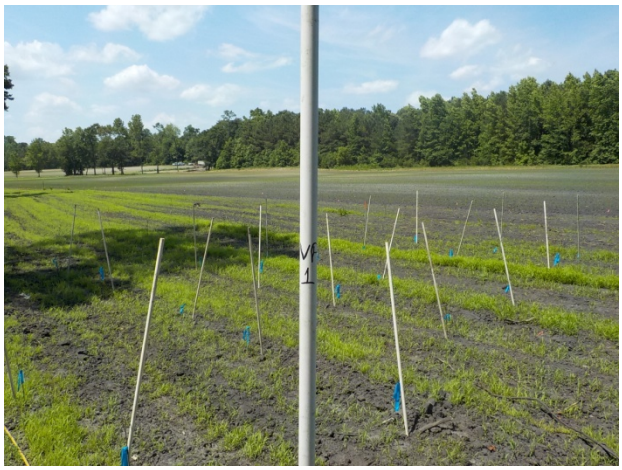
Exceeds requirements by 10%

Exceeds requirements, but by less than 10%

Fails to meet requirements, by less than 10%

Fails to meet requirements by more than 10%

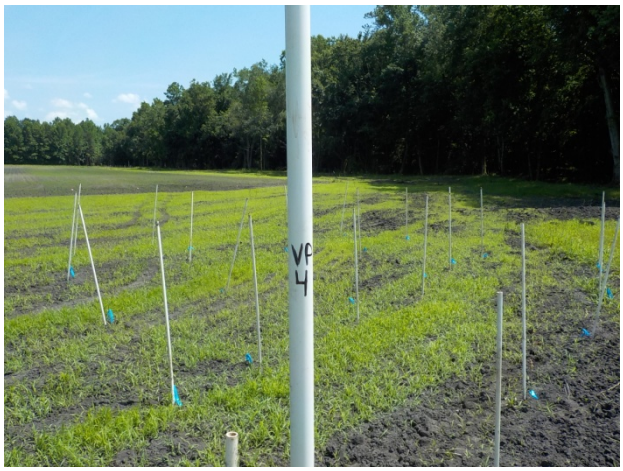
Appendix C.
Cedar Creek MY0 Vegetation Plot Photos



Vegetation Plot 1 (6/8/2015)

Vegetation Plot 2 (6/8/2015)

Vegetation Plot 3 (6/8/2015)



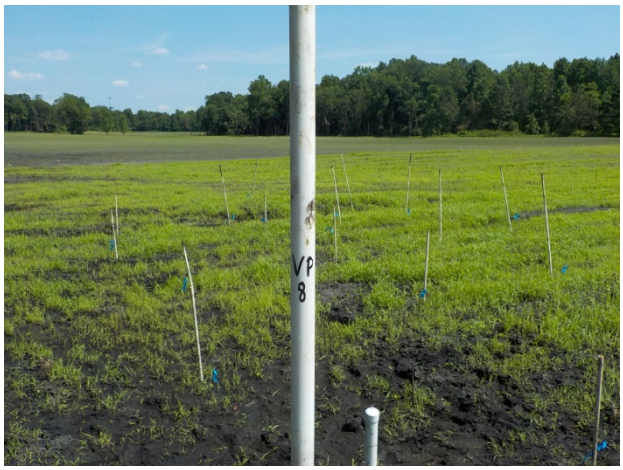
Vegetation Plot 4 (6/8/2015)

Vegetation Plot 5 (6/8/2015)

Vegetation Plot 6 (6/8/2015)

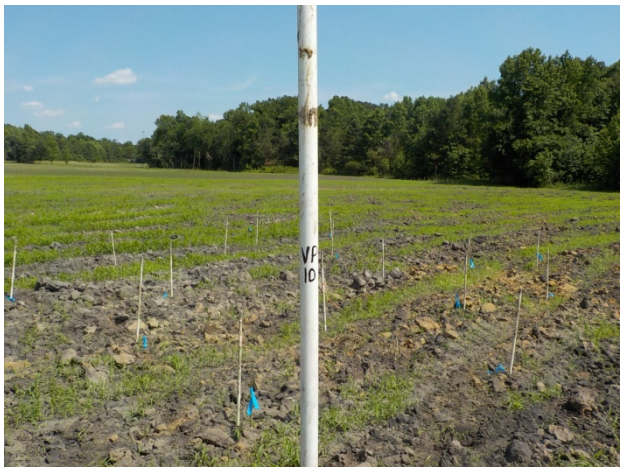
Cedar Creek MY0 Vegetation Plot Photos

Vegetation Plot 7 (6/8/2015)



Vegetation Plot 8 (6/8/2015)

Vegetation Plot 9 (6/8/2015)



Vegetation Plot 10 (6/8/2015)

Vegetation Plot 11 (6/8/2015)

Vegetation Plot 12 (6/8/2015)

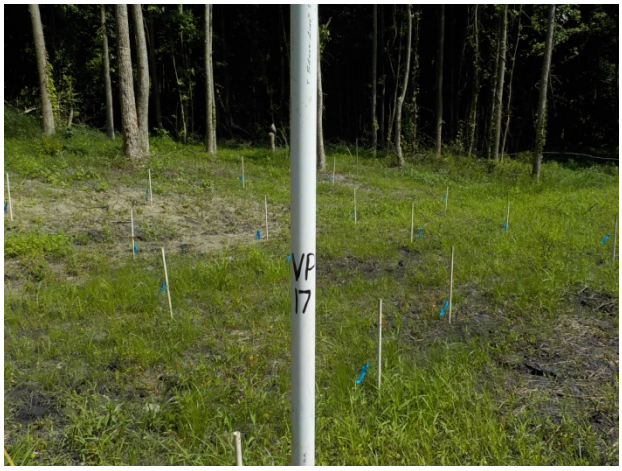
Cedar Creek MY0 Vegetation Plot Photos

Vegetation Plot 13 (6/8/2015)

Vegetation Plot 14 (6/8/2015)

Vegetation Plot 15 (6/8/2015)

Vegetation Plot 16 (6/8/2015)



Vegetation Plot 17 (6/8/2015)

Vegetation Plot 18 (6/8/2015)

Cedar Creek MY0 Vegetation Plot Photos

Vegetation Plot 19 (6/8/2015)

Vegetation Plot 20 (6/8/2015)

APPENDIX D

Cedar Creek Stream and Wetland Restoration Project
As-Built Survey

As-Built Survey Plan Sheets
Design Red Line Plans

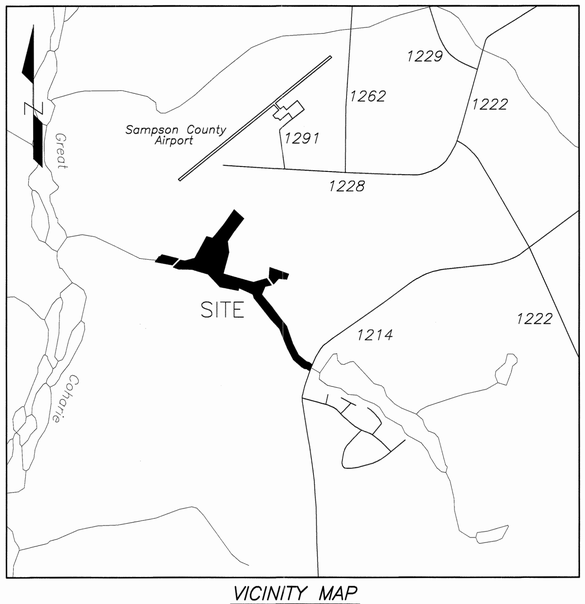
CEDAR CREEK STREAM AND WETLAND RESTORATION PROJECT

SAMPSON COUNTY, NORTH CAROLINA

CAPE FEAR RIVER BASIN
HUC: 3030006090060

NORTH CAROLINA DIVISION OF MITIGATION SERVICES
PROJECT # 95718
CONTRACT # 005011

AS-BUILT SURVEY



VICINITY MAP
NOT TO SCALE

PROJECT COORDINATES:
LATITUDE: 34.966827778° N
LONGITUDE: 78.36760556° W

PROJECT DIRECTORY

DESIGNER:
W. K. DICKSON
720 CORPORATE CENTER DR.
RALEIGH, NC 27607
(919) 782-0495

CONSTRUCTION CONTRACTOR:
WRIGHT CONTRACTING
PO BOX 545
SILER CITY, NC 27344
(919) 663-0810

FULL DELIVERY PROVIDER:
RESOURCE ENVIRONMENTAL SOLUTIONS, LLC
302 JEFFERSON ST., SUITE 110
RALEIGH, NC 27605
(919) 209-1061

MONITORING PERFORMERS:
RESOURCE ENVIRONMENTAL SOLUTIONS, LLC
302 JEFFERSON ST., SUITE 110
RALEIGH, NC 27605
(919)209-1061

SURVEYING:
MATRIX EAST, PLLC
906 N. QUEEN ST., SUITE A
KINSTON, NC 28501
(252)522-2500

SHEET INDEX

COVER SHEET	S1
LEGEND, NOTES, & CROSS SECTION CONTROL	S2
STREAM BASELINE OVERVIEW	S3
STREAM MONITORING OVERVIEW	S4
STREAM BASELINE AS-BUILTS	S5 THROUGH S10
WETLAND DETAIL	S11
CROSS SECTION CHARTS	S12

SEAL
12/17/15
NORTH CAROLINA PROFESSIONAL SEAL L-4712 LAND SURVEYOR JAMES R. WATSON
James R. Watson

SEAL

COVER SHEET

CEDAR CREEK RESTORATION PROJECT SAMPSON COUNTY, NC

MATRIX EAST, PLLC
906 N. QUEEN ST., SUITE A
KINSTON, NC 28501
TEL: 252-522-2500 FAX: 252-522-4747
FIRM LIC. # P-0221
EMAIL: surveyor@matrixeast.net

RESOURCE ENVIRONMENTAL SOLUTIONS, LLC
302 JEFFERSON ST., SUITE 110
RALEIGH, N.C. 27605

SCALE	DEPARTMENT
DRAWN BY: JRW	DATE STARTED: 9-30-15
SHEET No.: 1 OF 12	
APPROVED: JRW	DRAWING NO.: **S1**
DRAWING NAME: 20130080 ASB	
PROJECT NO.: 20130	

Cedar Creek Baseline Monitoring Cross Section Control

Description	Northing	Easting	Elevation		Description	Northing	Easting	Elevation
XS1-LEFT PIN	442909.73	2190246.16	91.00		XS15-LEFT PIN	443774.12	2189077.12	88.92
XS1-RIGHT PIN	442940.33	2190285.57	91.80		XS15-RIGHT PIN	443822.99	2189065.98	89.29
XS2-LEFT PIN	443219.45	2189973.62	90.92		XS16-LEFT PIN	443784.49	2189080.22	88.99
XS2-RIGHT PIN	443269.31	2189981.01	89.57		XS16-RIGHT PIN	443795.46	2189031.36	89.10
XS3-LEFT PIN	443226.78	2189431.41	89.16		XS17-LEFT PIN	443676.19	2188992.79	87.18
XS3-RIGHT PIN	443275.85	2189421.61	88.43		XS17-RIGHT PIN	443717.62	2188964.88	87.58
XS4-LEFT PIN	443585.84	2188910.65	87.67		XS18-LEFT PIN	443668.81	2188990.37	87.29
XS4-RIGHT PIN	443631.93	2188930.04	86.90		XS18-RIGHT PIN	443695.99	2188948.57	86.94
XS5-LEFT PIN	444773.29	2189675.02	106.00		XS19-LEFT PIN	443417.25	2190821.06	108.44
XS5-RIGHT PIN	444804.99	2189665.46	106.52		XS19-RIGHT PIN	443466.82	2190825.15	108.97
XS6-LEFT PIN	444764.44	2189661.76	105.58		XS20-LEFT PIN	443422.52	2190741.23	105.87
XS6-RIGHT PIN	444767.87	2189611.85	105.09		XS20-RIGHT PIN	443471.94	2190734.31	105.95
XS7-LEFT PIN	444610.33	2189566.84	104.07		XS21-LEFT PIN	443336.80	2190628.28	101.85
XS7-RIGHT PIN	444618.61	2189517.37	103.80		XS21-RIGHT PIN	443378.65	2190601.27	101.85
XS8-LEFT PIN	444598.28	2189563.58	104.23		XS22-LEFT PIN	443337.84	2190614.80	101.79
XS8-RIGHT PIN	444608.19	2189514.63	103.80		XS22-RIGHT PIN	443359.99	2190570.06	101.15
XS9-LEFT PIN	444347.64	2189462.74	97.90		XS23-LEFT PIN	443264.39	2190400.45	94.46
XS9-RIGHT PIN	444378.78	2189423.44	98.03		XS23-RIGHT PIN	443308.72	2190423.22	96.44
XS10-LEFT PIN	444336.48	2189451.40	97.00		XS24-LEFT PIN	443264.69	2190406.53	94.35
XS10-RIGHT PIN	444367.99	2189418.79	97.93		XS24-RIGHT PIN	443314.00	2190398.54	96.02
XS11-LEFT PIN	444076.87	2189246.76	93.01		XS25-LEFT PIN	443179.48	2190325.55	91.68
XS11-RIGHT PIN	444116.06	2189215.39	93.54		XS25-RIGHT PIN	443206.89	2190283.81	91.01
XS12-LEFT PIN	444067.66	2189228.24	93.12		XS26-LEFT PIN	443167.33	2190305.38	91.16
XS13-LEFT PIN	443962.58	2189171.86	91.13		XS26-RIGHT PIN	443214.82	2190290.16	91.17
XS13-RIGHT PIN	443991.46	2189130.82	91.33		XS27-LEFT PIN	443464.26	2190664.31	105.64
XS14-LEFT PIN	443932.56	2189147.47	90.54		XS27-RIGHT PIN	443449.88	2190616.48	104.46
XS14-RIGHT PIN	443971.75	2189116.11	91.34					

LEGEND

- C/L =CENTERLINE
- R/W =RIGHT OF WAY
- N/F =NOW OR FORMERLY
- HDPE =HIGH DENSITY POLYETHYLENE PIPE
- XS =CROSS SECTION
- VP =VEGETATION PLOT
- =WELL
- RG/A =RAIN GAUGE/AMBIENT GAUGE
- =GAUGE
- CG =CREST GAUGE
- ACG =AUTO-CREST GAUGE
- AW =AUTO-WELL
- =LOG STRUCTURE
- =ROCK STRUCTURE
- =ROCK AREA
- LCE =CONSERVATION EASEMENT LINE
- =BOUNDARY LINE
- =WETLAND BOUNDARY LINE
- =WOODLINE

NOTES:
1. ALL DISTANCES ARE HORIZONTAL GROUND DISTANCES UNLESS OTHERWISE NOTED.
2. THE HORIZONTAL DATUM IS NAD 83(2011) AND THE VERTICAL DATUM IS NAVD 88.
3. THIS MAP IS NOT FOR RECORDATION, SALES, OR CONVEYANCES.
4. THE PURPOSE OF THIS MAP IS TO SHOW POST CONSTRUCTION AS-BUILT CONDITIONS OF THE STREAM RESTORATION AND MAY NOT SHOW ALL UTILITIES, STRUCTURES, AND BOUNDARIES.
5. NO PROPERTY LINES WERE SURVEYED DURING THIS SURVEY. ALL CONSERVATION EASEMENTS, PROPERTY LINES, AND ADJOINING PROPERTY OWNERS ARE SHOWN BY PREVIOUS SURVEYS BY MATRIX EAST, PLLC AS RECORDED IN THE SAMPSON COUNTY REGISTER OF DEEDS OFFICE.

SEAL

12/17/15

NORTH CAROLINA PROFESSIONAL LAND SURVEYOR SEAL L-4712 JAMES R. WATSON

James R. Watson

SEAL

LEGEND, NOTES, & CROSS SECTION CONTROL

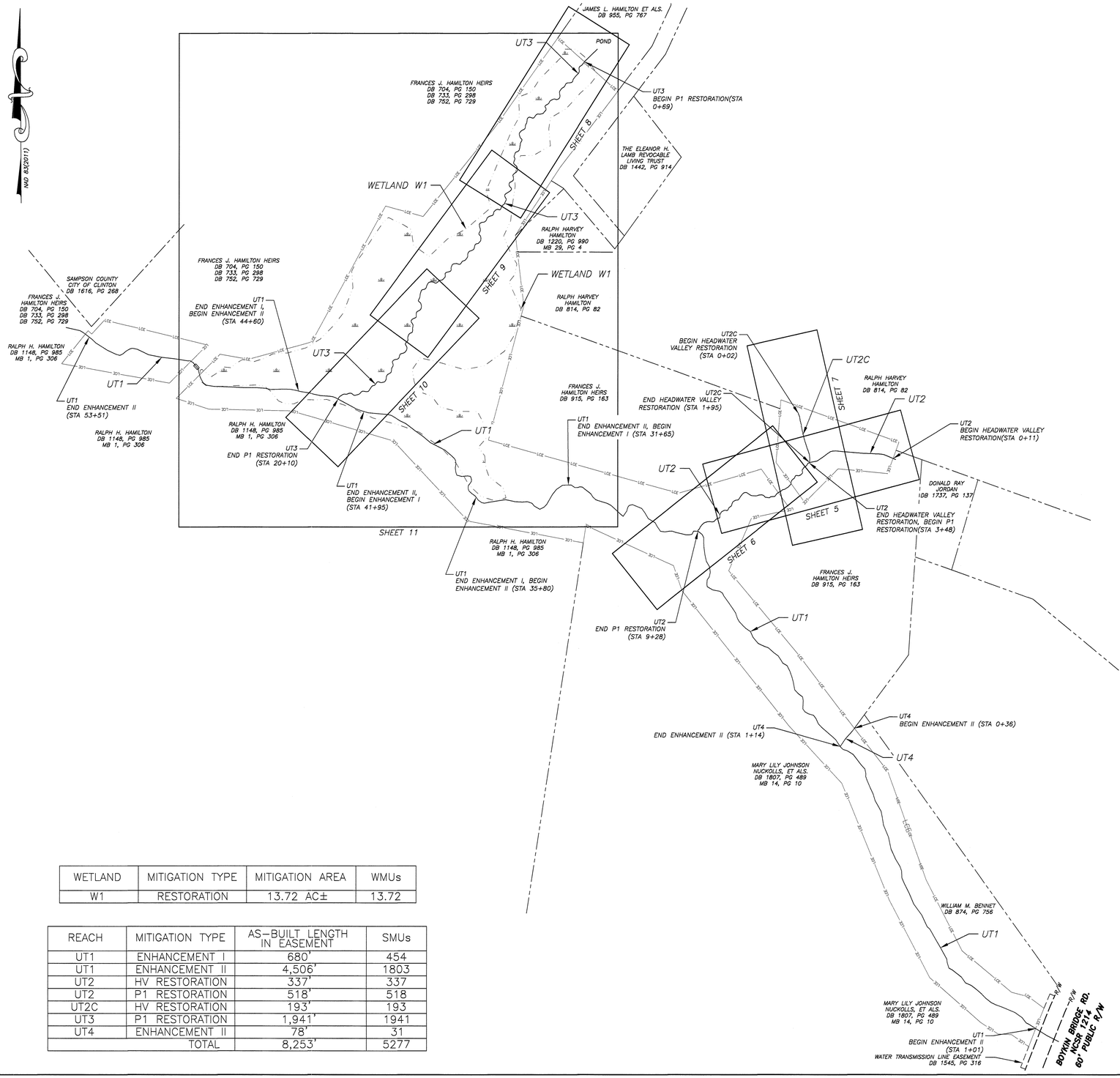
CEDAR CREEK RESTORATION PROJECT SAMPSON COUNTY, NC

MATRIX EAST, PLLC

906 N. QUEEN ST., SUITE A
KINSTON, NC 28501
TEL: 252-522-2500 FAX: 252-522-4747
FIRM LIC. # P-0221
EMAIL: surveyor@matrixeast.net

RESOURCE ENVIRONMENTAL SOLUTIONS, LLC
302 JEFFERSON ST., SUITE 110
RALEIGH, N.C. 27605

SCALE	DEPARTMENT
DRAWN BY: JRW	DATE STARTED: 9-30-15
SHEET No.: 2 OF 12	
APPROVED: JRW	DRAWING NO.: S2
DRAWING NAME: 20130080 ASB	
PROJECT NO.: 2013080	



WETLAND	MITIGATION TYPE	MITIGATION AREA	WMUs
W1	RESTORATION	13.72 AC±	13.72

REACH	MITIGATION TYPE	AS-BUILT LENGTH IN EASEMENT	SMUs
UT1	ENHANCEMENT I	680'	454
UT1	ENHANCEMENT II	4,506'	1803
UT2	HV RESTORATION	337'	337
UT2	P1 RESTORATION	518'	518
UT2C	HV RESTORATION	193'	193
UT3	P1 RESTORATION	1,941'	1941
UT4	ENHANCEMENT II	78'	31
	TOTAL	8,253'	5277

SEAL

12/7/15
NORTH CAROLINA PROFESSIONAL LAND SURVEYOR SEAL L-4712 JAMES R. WATSON
James R. Watson

SEAL

STREAM BASELINE OVERVIEW

CEDAR CREEK RESTORATION PROJECT SAMPSON COUNTY, NC

MATRIX EAST, PLLC
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FIRM LIC. # P-0221
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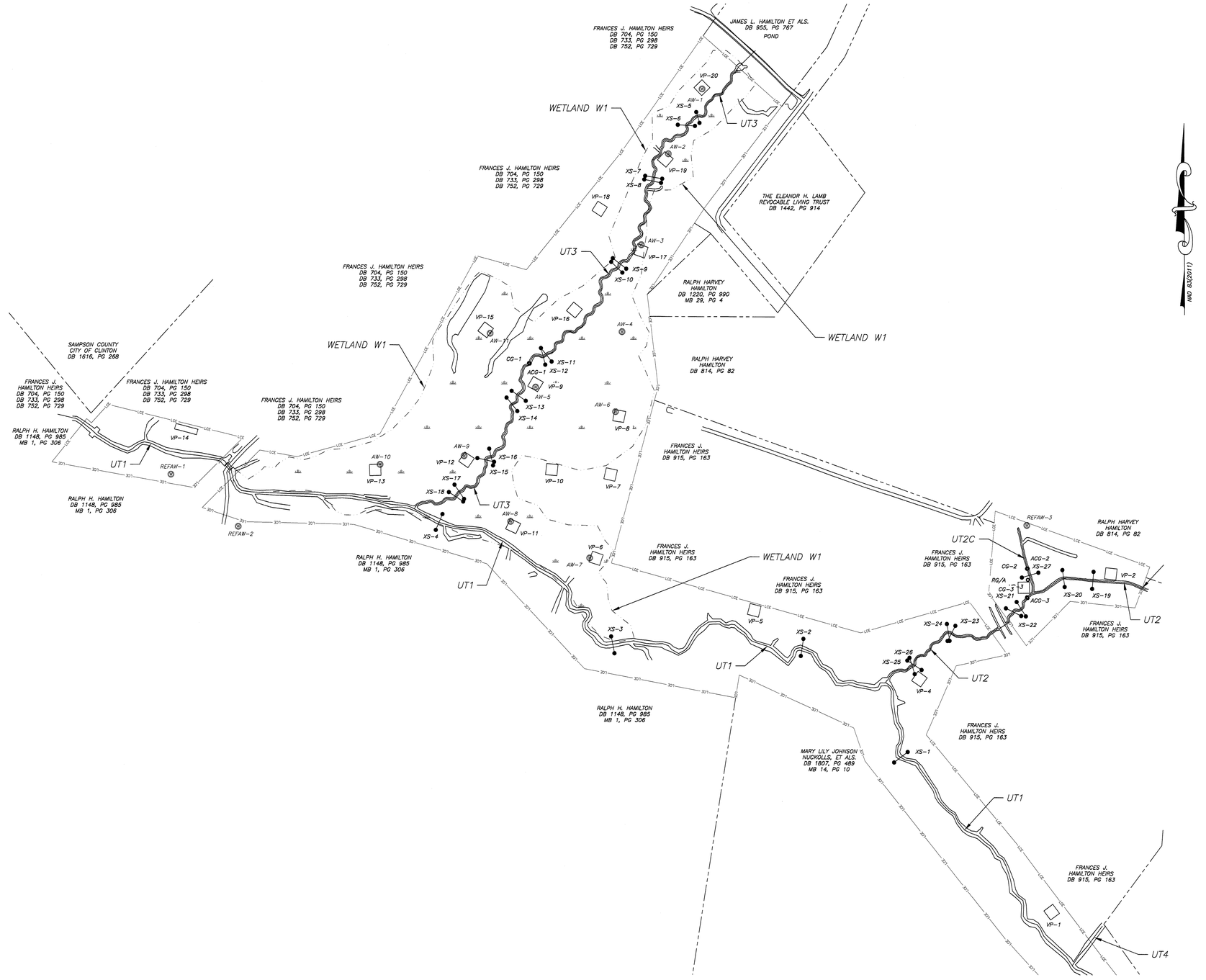
RESOURCE ENVIRONMENTAL SOLUTIONS, LLC
302 JEFFERSON ST., SUITE 110
RALEIGH, N.C. 27605

SCALE: 1" = 200'	DEPARTMENT:
DRAWN BY: JRW	DATE STARTED: 9-30-15
SHEET No.: 3 OF 12	
APPROVED: JRW	DRAWING NO.: **S3**
DRAWING NAME: 20130080 ASB	
PROJECT NO.: 2013080	



SEAL

12/17/15

NORTH CAROLINA PROFESSIONAL LAND SURVEYOR SEAL L-4712 JAMES R. WATSON

James R. Watson

SEAL

STREAM MONITORING OVERVIEW

CEDAR CREEK RESTORATION PROJECT SAMPSON COUNTY, NC

MATRIX EAST, PLLC

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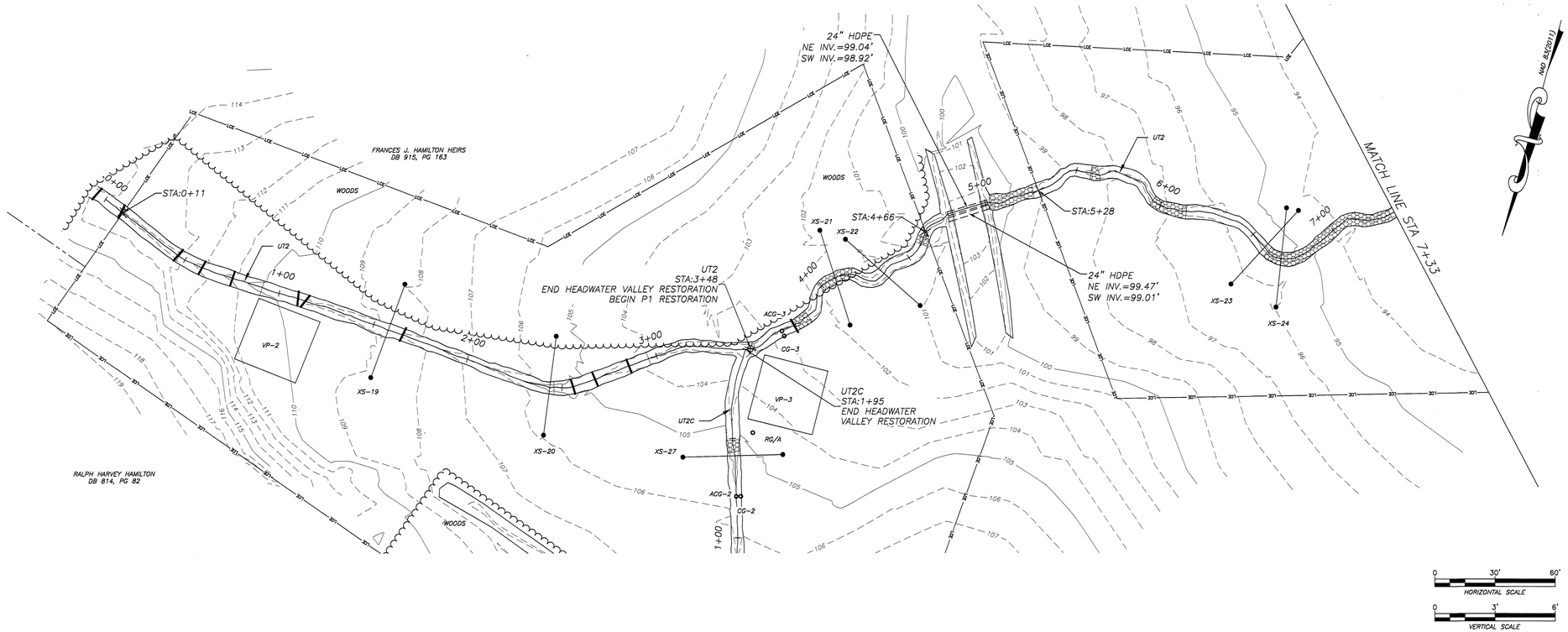
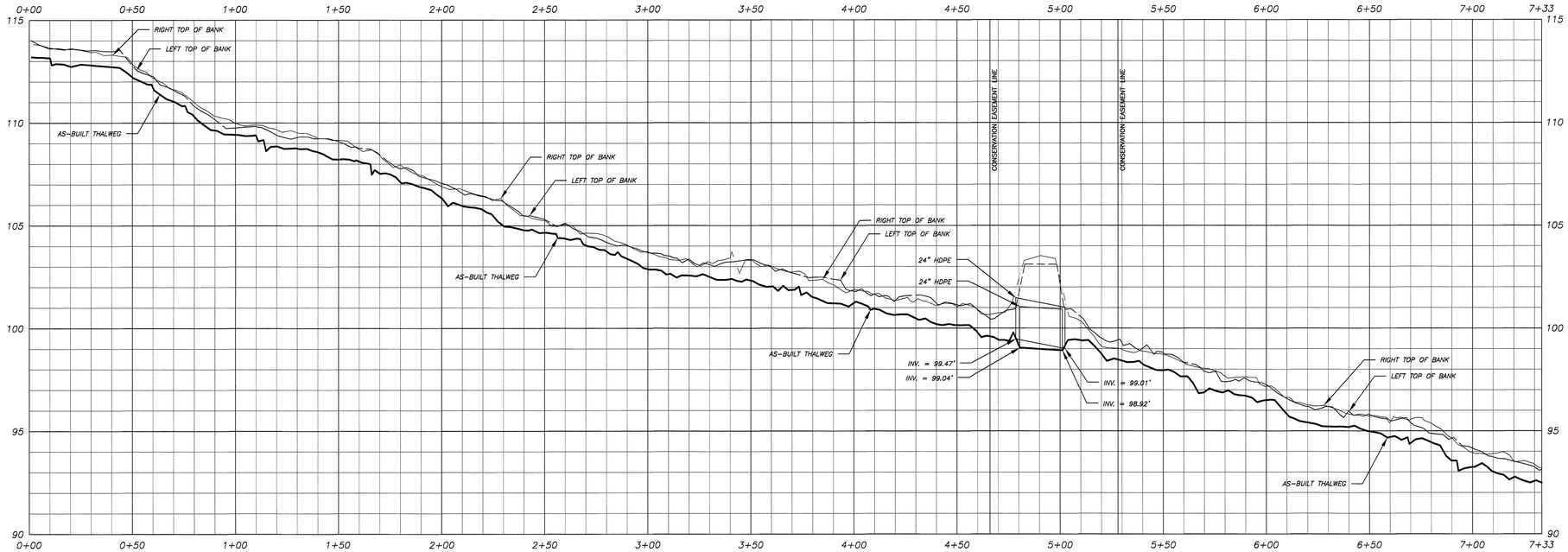
RESOURCE ENVIRONMENTAL SOLUTIONS, LLC
302 JEFFERSON ST., SUITE 110
RALEIGH, N.C. 27605

SCALE: 1" = 150'	DEPARTMENT:
DRAWN BY: JRW	DATE STARTED: 9-30-15
SHEET No.: 4 OF 12	
APPROVED: JRW	DRAWING NO.: **S4**
DRAWING NAME: 20130080 ASB	
PROJECT NO.: 2013080	



0 30' 60'
HORIZONTAL SCALE

0 3' 6'
VERTICAL SCALE



SEAL

12/17/15

NORTH CAROLINA PROFESSIONAL LAND SURVEYOR SEAL L-4712 JAMES R. WATSON

James R. Watson

SEAL

STREAM BASELINE AS-BUILT
UT2 PLAN & PROFILE (0+00 - 7+33)

CEDAR CREEK RESTORATION PROJECT SAMPSON COUNTY, NC

MATRIX East EAST, PLLC

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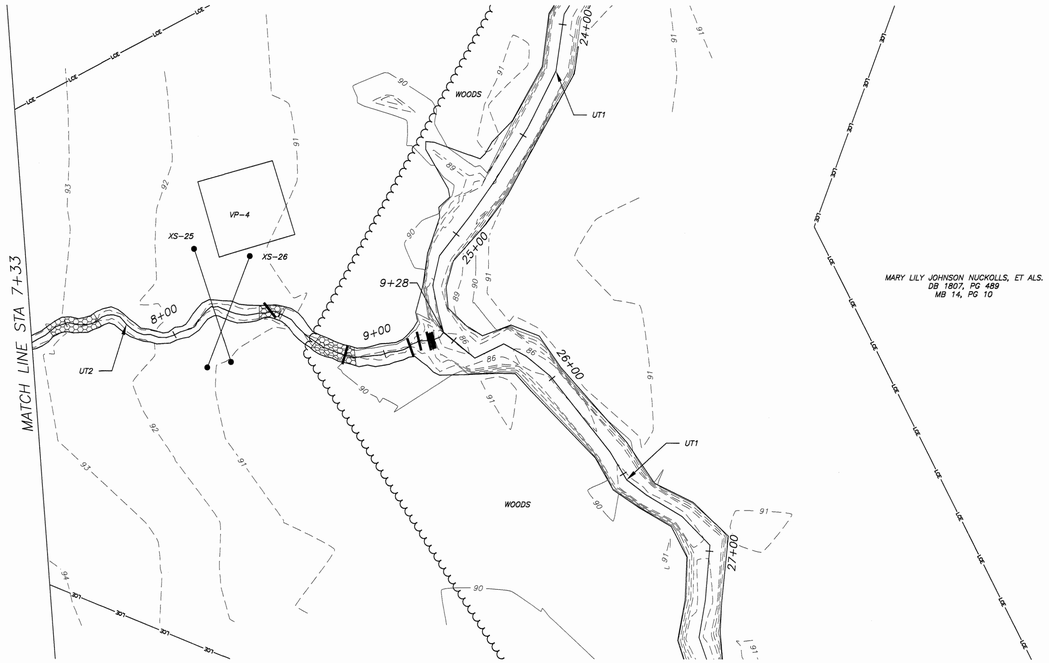
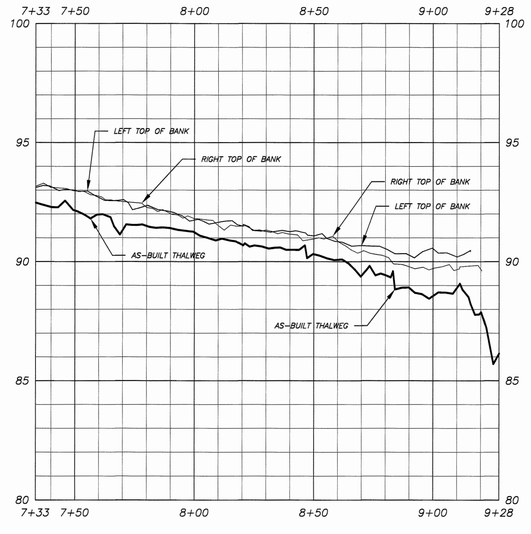
RESOURCE ENVIRONMENTAL SOLUTIONS, LLC
302 JEFFERSON ST., SUITE 110
RALEIGH, N.C. 27605

SCALE 1" = 30'	DEPARTMENT
DRAWN BY JRW	DATE STARTED 9-30-15
	SHEET No. 5 OF 12
APPROVED JRW	DRAWING NO. **S5**
DRAWING NAME 20130080 ASB	
PROJECT NO. 2013080	

NAD 83(2011)





0 30' 60'
HORIZONTAL SCALE

0 3' 6'
VERTICAL SCALE

SEAL

12/17/15
NORTH CAROLINA
PROFESSIONAL
SEAL
L-4712
LAND SURVEYOR
JAMES R. WATSON
James R. Watson

SEAL

STREAM BASELINE AS-BUILT
UT2 PLAN & PROFILE (7+33 - 9+28)

CEDAR CREEK RESTORATION PROJECT SAMPSON COUNTY, NC

MATRIX EAST, PLLC
906 N. QUEEN ST., SUITE A
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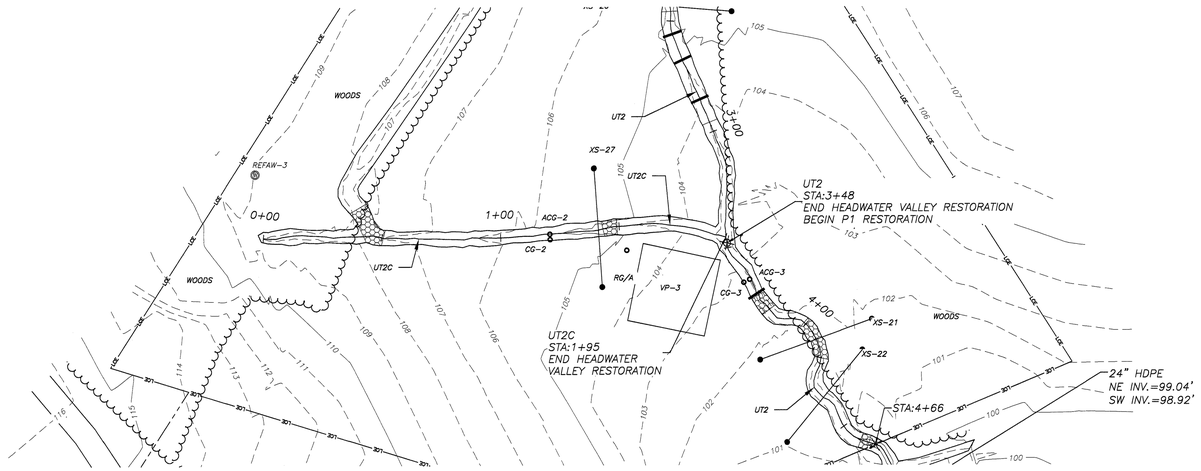
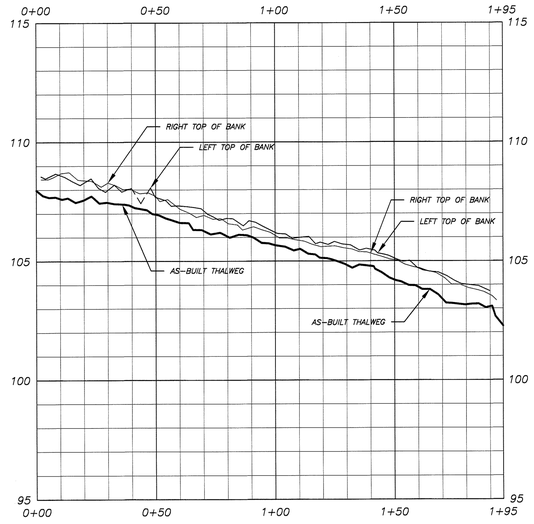
FIRM LIC. # P-0221
EMAIL: surveyor@matrixeast.net

RESOURCE ENVIRONMENTAL SOLUTIONS, LLC
302 JEFFERSON ST., SUITE 110
RALEIGH, N.C. 27605

SCALE 1" = 30'	DEPARTMENT
DRAWN BY JRW	DATE STARTED 9-30-15
SHEET No. 6 OF 12	
APPROVED JRW	DRAWING NO. **S6**
DRAWING NAME 20130080 ASB	
PROJECT NO. 2013080	





0 30' 60'
HORIZONTAL SCALE

0 3' 6'
VERTICAL SCALE

SEAL
12/17/15
NORTH CAROLINA
PROFESSIONAL
SEAL
L-4712
LAND SURVEYOR
JAMES R. WATSON
James R. Watson

SEAL

STREAM BASELINE AS-BUILT
UT2C PLAN & PROFILE (0+00 - 1+95)

CEDAR CREEK RESTORATION PROJECT SAMPSON COUNTY, NC

MATRIX EAST, PLLC
906 N. QUEEN ST., SUITE A
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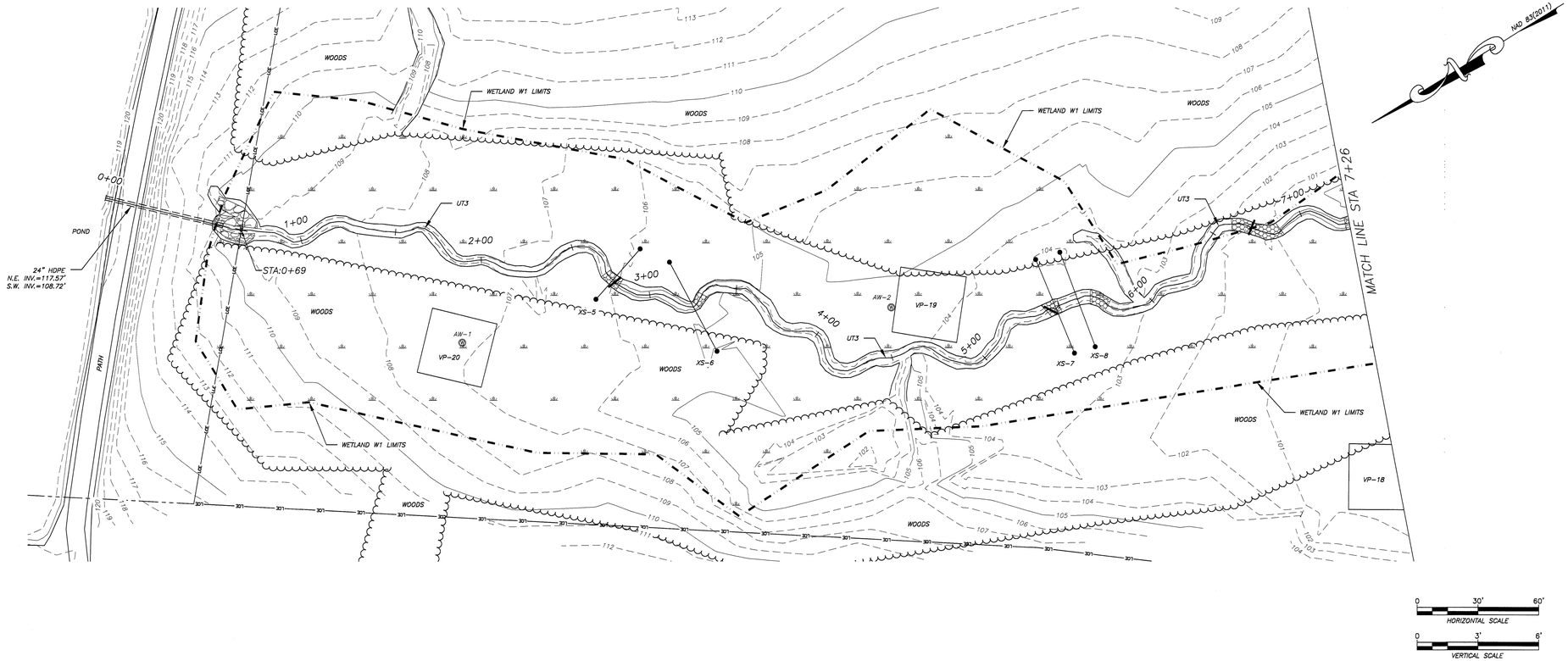
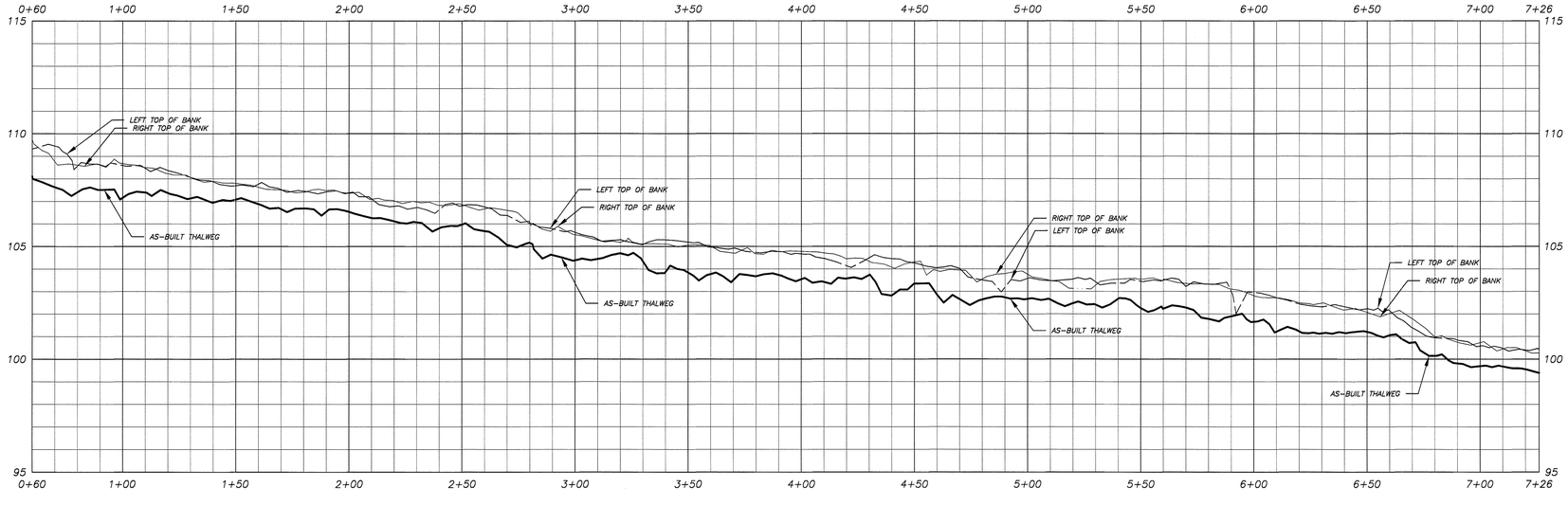
TEL: 252-522-2500 FAX: 252-522-4747
FIRM LIC. # P-0221
EMAIL: surveyor@matrixeast.net

RESOURCE ENVIRONMENTAL SOLUTIONS, LLC
302 JEFFERSON ST., SUITE 110
RALEIGH, N.C. 27605

SCALE 1" = 30'	DEPARTMENT
DRAWN BY JRW	DATE STARTED 9-30-15
	SHEET No. 7 OF 12
APPROVED JRW	DRAWING NO. S7
DRAWING NAME 20130080 ASB	
PROJECT NO. 2013080	





SEAL

12/17/15

NORTH CAROLINA PROFESSIONAL LAND SURVEYOR SEAL L-4712 JAMES R. WATSON

James R. Watson

SEAL

STREAM BASELINE AS-BUILT
UT3 PLAN & PROFILE (0+60 - 7+26)

CEDAR CREEK RESTORATION PROJECT SAMPSON COUNTY, NC

MATRIX EAST, PLLC

906 N. QUEEN ST., SUITE A
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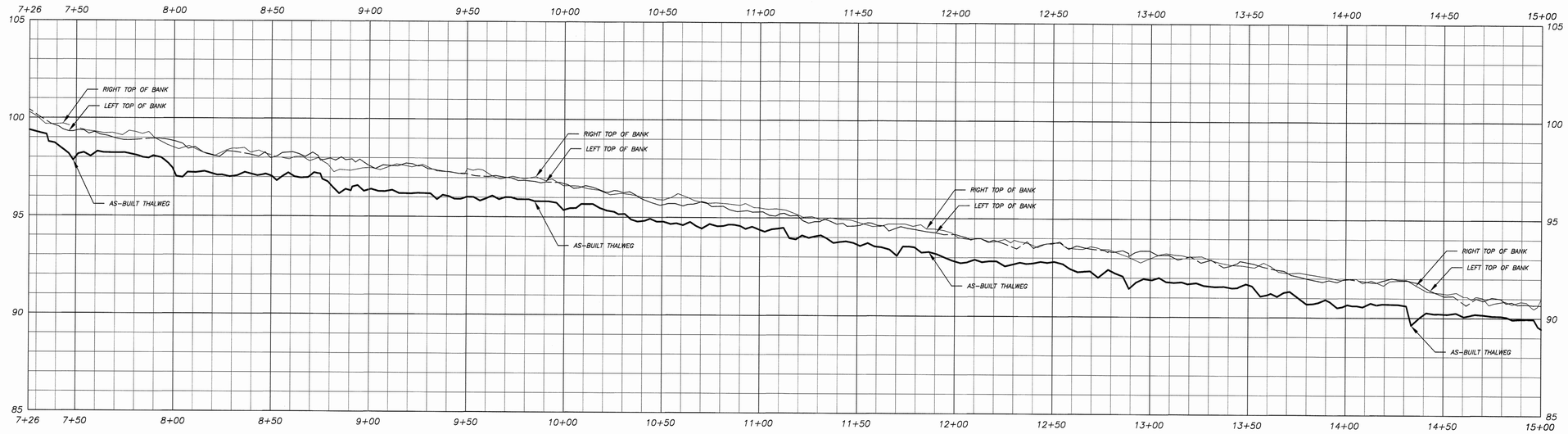
FIRM LIC. # P-0221
EMAIL: surveyor@matrixeast.net

RESOURCE ENVIRONMENTAL SOLUTIONS, LLC
302 JEFFERSON ST., SUITE 110
RALEIGH, N.C. 27605

SCALE 1" = 30'		DEPARTMENT	
DRAWN BY JRW	DATE STARTED 9-30-15	SHEET No. 8 OF 12	
APPROVED JRW		DRAWING NO. **S8**	
DRAWING NAME 20130080 ASB			
PROJECT NO. 2013080			



SEAL

12/17/15

NORTH CAROLINA PROFESSIONAL LAND SURVEYOR SEAL L-4712 JAMES R. WATSON

SEAL

STREAM BASELINE AS-BUILT
UT3 PLAN & PROFILE (7+26 - 15+00)

CEDAR CREEK RESTORATION PROJECT SAMPSON COUNTY, NC

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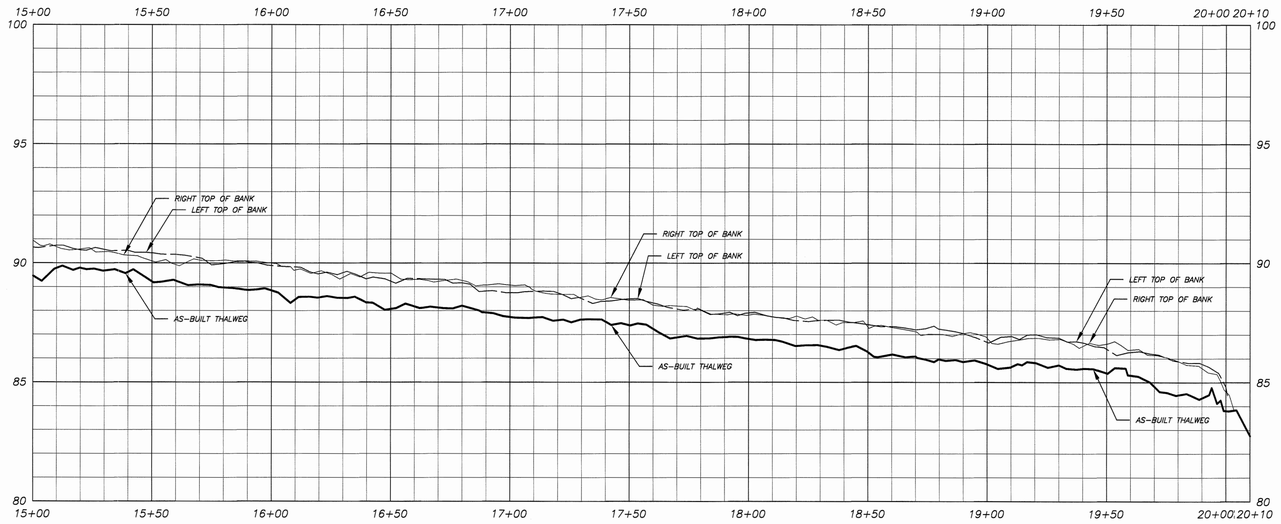
FIRM LIC. # P-0221
EMAIL: surveyor@matrixeast.net

RESOURCE ENVIRONMENTAL SOLUTIONS, LLC
302 JEFFERSON ST., SUITE 110
RALEIGH, N.C. 27605

SCALE 1" = 30'	DEPARTMENT
DRAWN BY JRW / DATE STARTED 9-30-15	SHEET No. 9 OF 12
APPROVED JRW	DRAWING NO. **S9**
DRAWING NAME 20130080 ASB	
PROJECT NO. 2013080	



0 30' 60'
HORIZONTAL SCALE

0 3' 6'
VERTICAL SCALE

SEAL

12/17/15
NORTH CAROLINA
PROFESSIONAL
LAND SURVEYOR
SEAL
L-4712
JAMES R. WATSON
James R. Watson

SEAL

STREAM BASELINE AS-BUILT
UT3 PLAN & PROFILE (15+00 - 20+10)

CEDAR CREEK RESTORATION PROJECT SAMPSON COUNTY, NC

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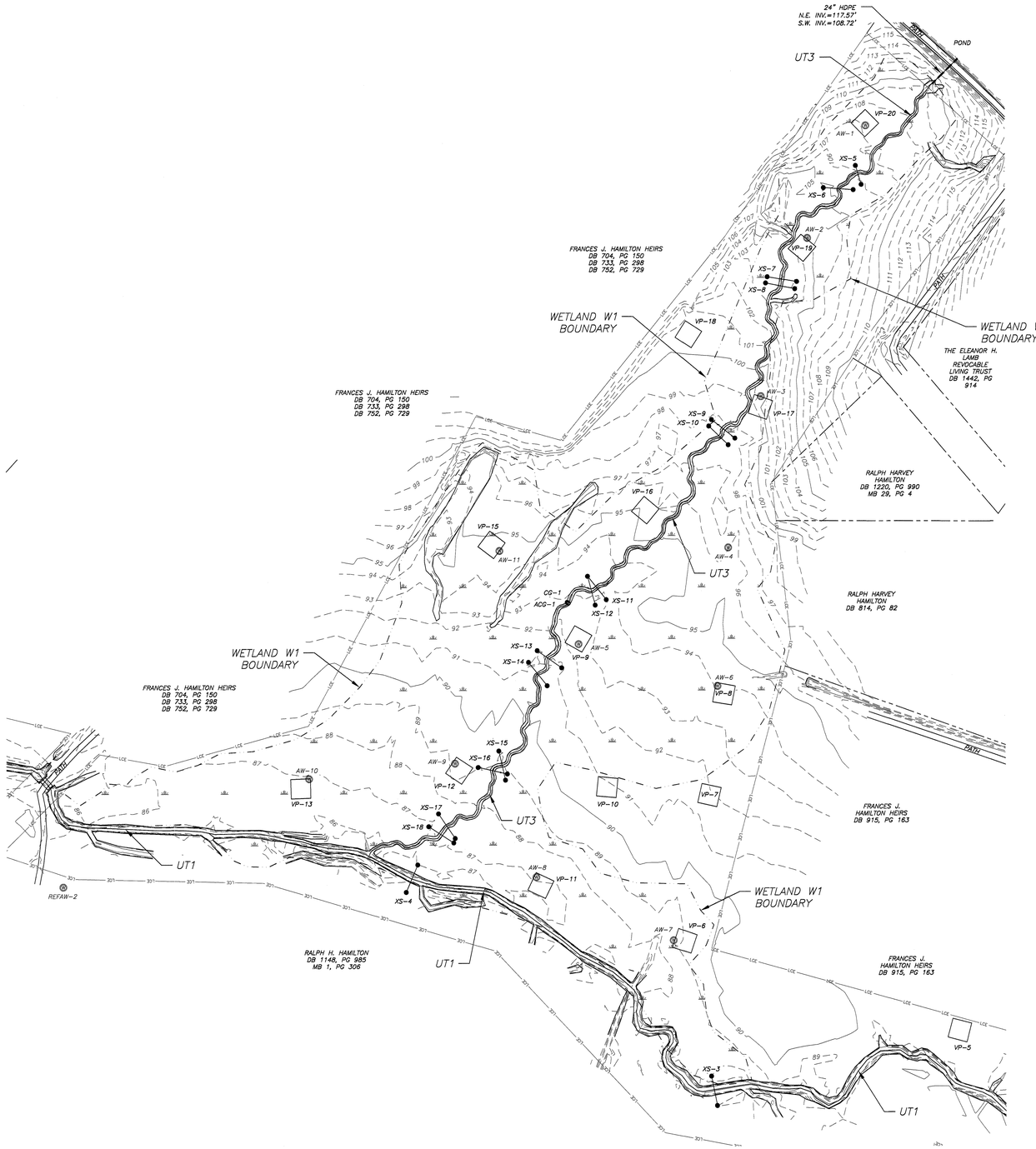
FIRM LIC. # P-0221
EMAIL: surveyor@matrixeast.net

RESOURCE ENVIRONMENTAL SOLUTIONS, LLC
302 JEFFERSON ST., SUITE 110
RALEIGH, N.C. 27605

SCALE 1" = 30'		DEPARTMENT
DRAWN BY JRW	DATE STARTED 9-30-15	SHEET No. 10 OF 12
APPROVED JRW		DRAWING NO. **S10**
DRAWING NAME 20130080 ASB		
PROJECT NO. 2013080		



AREA IN WETLAND W1=13.72 AC.±

SEAL

12/17/15

NORTH CAROLINA PROFESSIONAL SEAL L-4712 LAND SURVEYOR JAMES R. WATSON

James R. Watson

SEAL

WETLAND W1 DETAIL

CEDAR CREEK RESTORATION PROJECT SAMPSON COUNTY, NC

MATRIX EAST, PLLC

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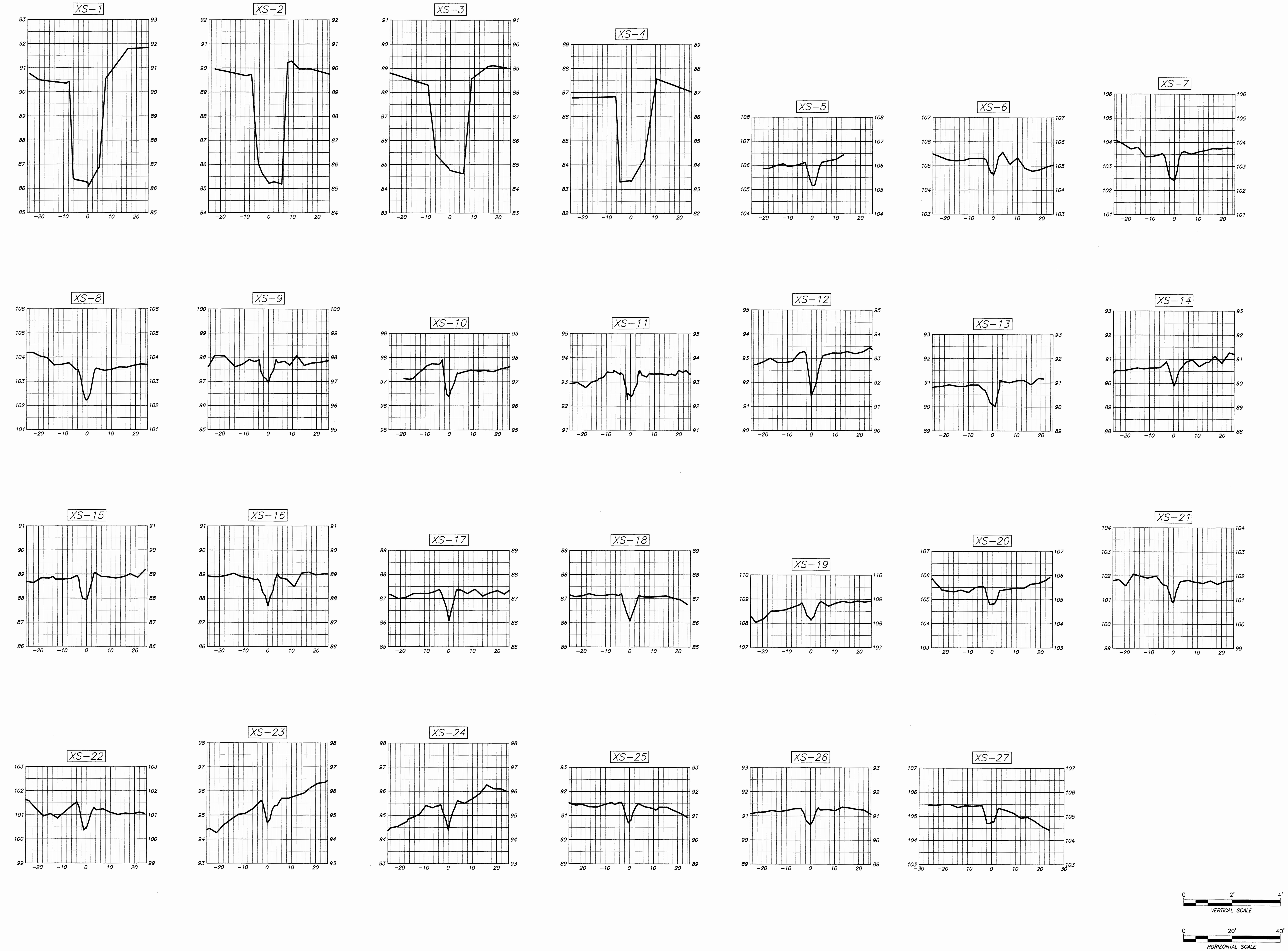
FIRM LIC. # P-0221
EMAIL: surveyor@matrixeast.net

RESOURCE ENVIRONMENTAL SOLUTIONS, LLC
302 JEFFERSON ST., SUITE 110
RALEIGH, N.C. 27605

SCALE: 1" = 100'		DEPARTMENT
DRAWN BY: JRW	DATE STARTED: 9-30-15	SHEET No.: 11 OF 12
APPROVED: JRW		DRAWING NO.: S11
DRAWING NAME: 20130080 ASB		
PROJECT NO.: 2013080		



SEAL 12/17/15

NORTH CAROLINA PROFESSIONAL SEAL L-4712 LAND SURVEYOR JAMES R. WATSON

SEAL

STREAM CROSS-SECTIONS (XS-1 THROUGH XS-27)

CEDAR CREEK RESTORATION PROJECT SAMPSON COUNTY, NC

MATRIX EAST, PLLC

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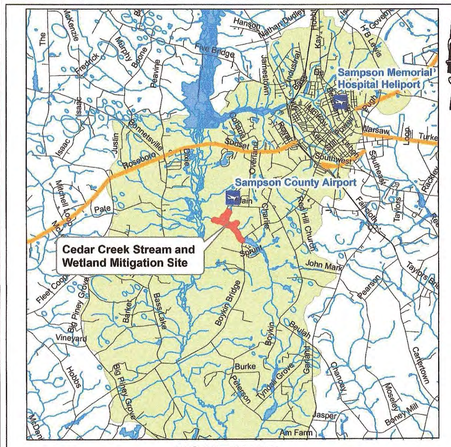
EMAIL: surveyor@matrixeast.net

RESOURCE ENVIRONMENTAL SOLUTIONS, LLC
302 JEFFERSON ST., SUITE 110
RALEIGH, N.C. 27605

SCALE 1" = 20'		DEPARTMENT
DRAWN BY JRW	DATE STARTED 9-30-15	SHEET No. 12 OF 12
APPROVED JRW		DRAWING NO.
DRAWING NAME 20130080 ASB		S12
PROJECT NO. 2013080		



VICINITY MAP
NTS

CEDAR CREEK STREAM AND WETLAND RESTORATION PROJECT

SAMPSON COUNTY, NORTH CAROLINA
CAPE FEAR RIVER BASIN CU 03030006
JANUARY 2016
NC DMS PROJECT#: 95718

RESOURCE ENVIRONMENTAL SOLUTIONS, LLC
302 JEFFERSON ST, SUITE 110
RALEIGH, NC 27605

Resource Environmental Solutions

Sheet List Table	
Sheet Number	Sheet Title
1	COVER
2	Reach UT-1 Plan & Profile
3	Reach UT-1 Plan & Profile
4	Reach UT-1 Plan & Profile
5	Reach UT-1 Plan & Profile
6	Reach UT-1 Plan & Profile
7	Reach UT-1 Plan & Profile
8	Reach UT-1 Plan & Profile
9	Reach UT-1 Plan & Profile
10	Reach UT-1 Plan & Profile
11	Reach UT-1 Plan & Profile
12	Reach UT-1 Plan & Profile
13	Reach UT-2 Plan & Profile
14	Reach UT-2 Plan & Profile
15	Reach UT-2 Plan & Profile
16	Reach UT-3 Plan & Profile
17	Reach UT-3 Plan & Profile
18	Reach UT-3 Plan & Profile
19	Reach UT-3 Plan & Profile
20	Reach UT-4 Plan & Profile
21	WETLAND

300 0 150 300 600
HORIZ. 1 inch = 300ft.

AS-BUILT SURVEY PREPARED BY:
MATRIX EAST, PLLC
906 N. QUEEN ST., SUITE A
KINSTON, NC 28501
(252)522-2500

NORTH CAROLINA PROFESSIONAL SEAL 031435 ENGINEER ANN F. MULLEN 1/6/16
PROFESSIONAL SEAL

RECORD DRAWINGS

WKD PROJ. NO.: 2013000100RA

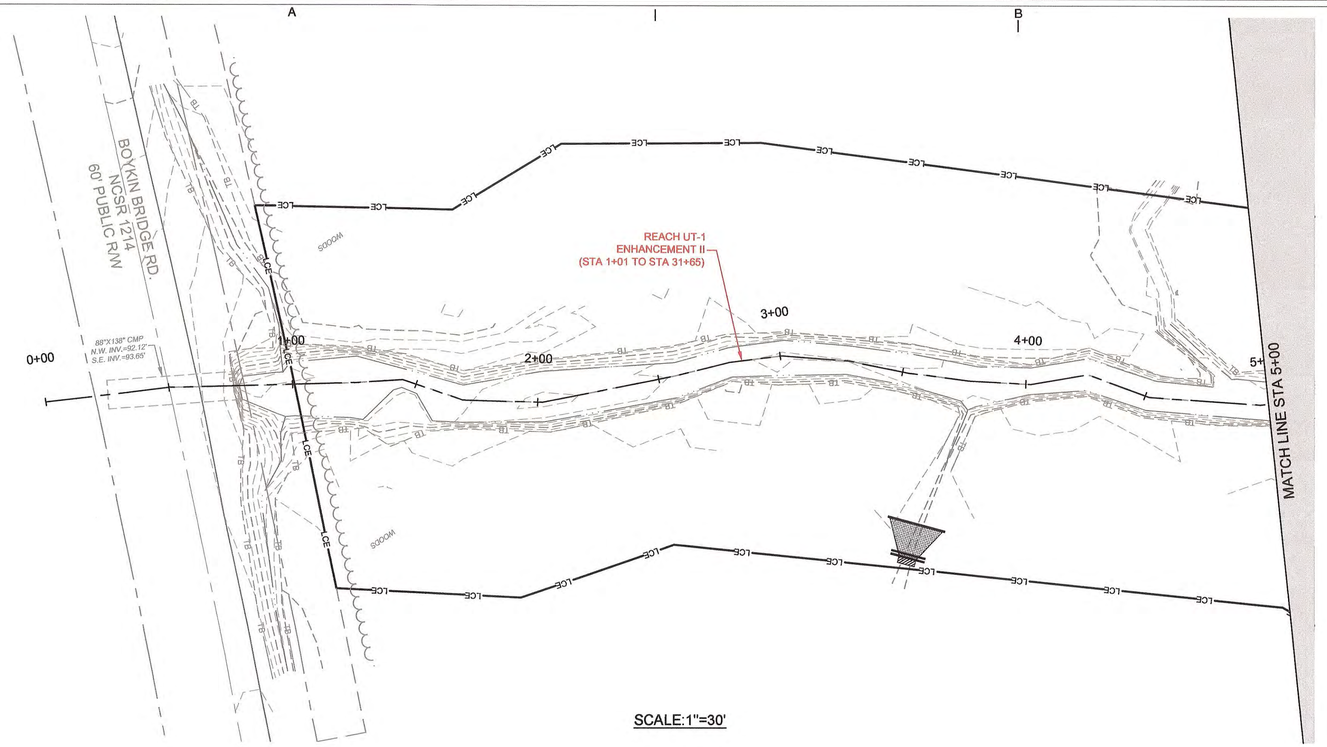
WK DICKSON community infrastructure consultants
720 CORPORATE CENTER DRIVE
RALEIGH, NC 27607
(919)782-0495
(919)782-0495
WWW.WKDICKSON.COM
LICENSE NO.

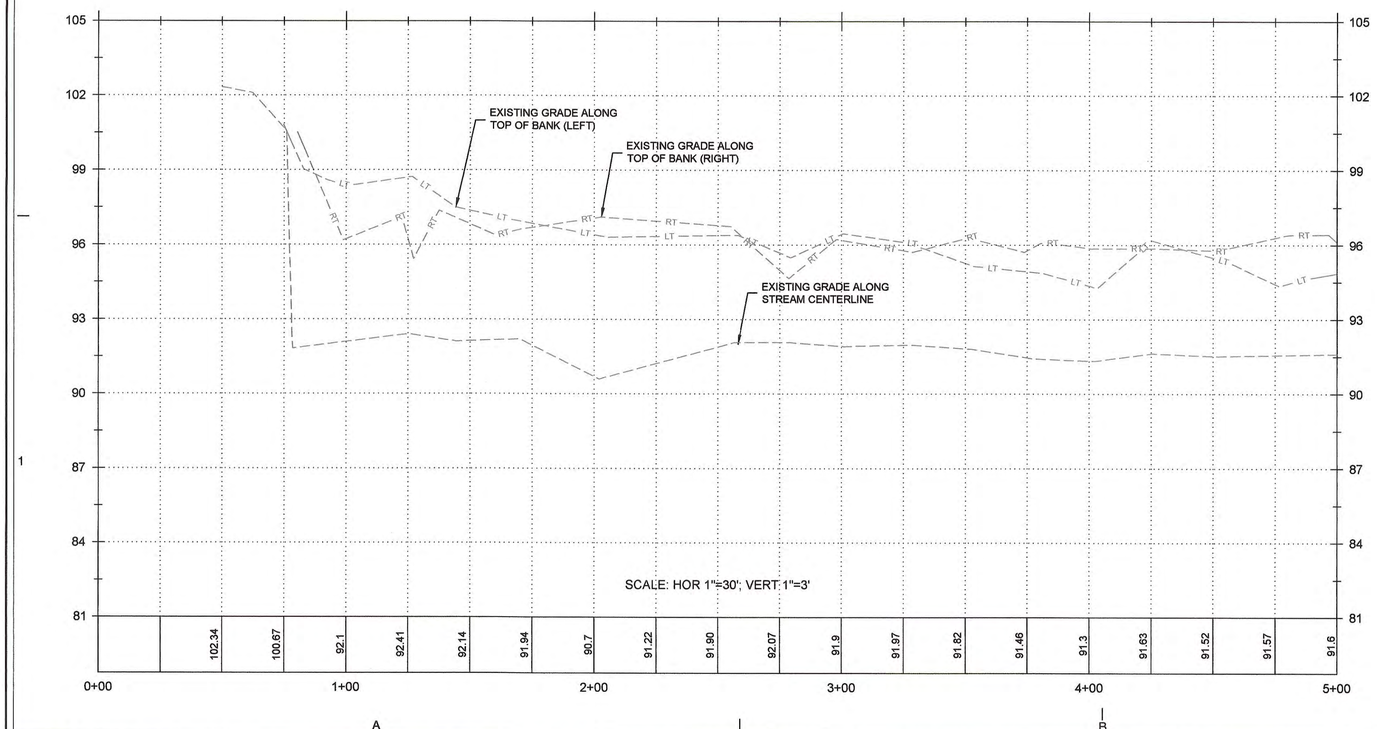
PROJ. DATE: NOV 2014 | PRINCIPAL: SW
Q.C.: FM | PROJ. MGR.: SS
Q.C. DATE: JAN 2016 | CAD TECH: KG

PROJECT NAME:
CEDAR CREEK STREAM & WETLAND RESTORATION PROJECT
RECORD DRAWINGS

DRAWING TITLE:
COVER

DRAWING NUMBER: 1
PLOT DATE: 1/6/2016





LEGEND

- AS-BUILT CONTOUR MAJOR — 50
- AS-BUILT CONTOUR MINOR — 46
- AS-BUILT CHANNEL LIMITS
- AS-BUILT IN-STREAM STRUCTURE
- AS-BUILT STONE
- EXISTING TOP OF BANK — TB
- EXISTING BOTTOM OF BANK
- EXISTING (ORIGINAL) CHANNEL FOOTPRINT
- PROPOSED CHANNEL CENTERLINE
- PROPOSED TOP OF BANK
- LIMITS OF PROPOSED CONSERVATION EASEMENT — LCE
- LOG TOE PROTECTION (PROPOSED)
- LOG STRUCTURE (PROPOSED)
- LOG GRADE CONTROL STRUCTURE (PROPOSED)
- DOUBLE LOG DROP (PROPOSED)
- PROPOSED FILL AREA
- PROPOSED WETLAND
- PROPOSED CHANNEL PLUG
- PROPOSED CHANNEL PLUG W/ OVERFLOW SPILLWAY
- LOG OUTLET STRUCTURE (PROPOSED)
- BEDDED LOG STRUCTURE (PROPOSED)
- FLOODPLAIN SILL (PROPOSED)
- DIFFUSE FLOW STRUCTURE (PROPOSED)
- PROPOSED LOG GRADE CONTROL (PROFILE)
- PROPOSED LOG STRUCTURE (PROFILE)
- PROPOSED DOUBLE LOG DROP (PROFILE)
- PROPOSED BEDDED LOG STRUCTURE (PROFILE)
- AS-BUILT CHANNEL CENTERLINE (PROFILE)
- AS-BUILT LEFT TOP OF BANK (PROFILE)
- AS-BUILT RIGHT TOP OF BANK (PROFILE)
- AS-BUILT STRUCTURE (PROFILE)

WK DICKSON
community infrastructure consultants
Transportation + Water Resources
Urban Development + Geomatics
720 Corporate Drive
Raleigh, NC 27607
(v) 919.782.0495
(f) 919.782.9672
www.wkdickson.com
NC. LICENSE NO. F-0374

NORTH CAROLINA PROFESSIONAL SEAL 031435 ENGINEER ANN F. MULLEN 1/6/16

FULL SCALE: 1"=30
0 30 60
2" = FULL SCALE
1" = HALF SCALE

PLOT DATE: 1/6/2016

MARK	DATE	DESCRIPTION
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REVISIONS:
RELEASED FOR: RECORD DRAWINGS

PROJECT NAME:
CEDAR CREEK STREAM & WETLAND RESTORATION PROJECT
RECORD DRAWINGS
RESOURCE ENVIRONMENTAL SOLUTIONS, LLC

DRAWING TITLE: REACH UT-1 PLAN & PROFILE

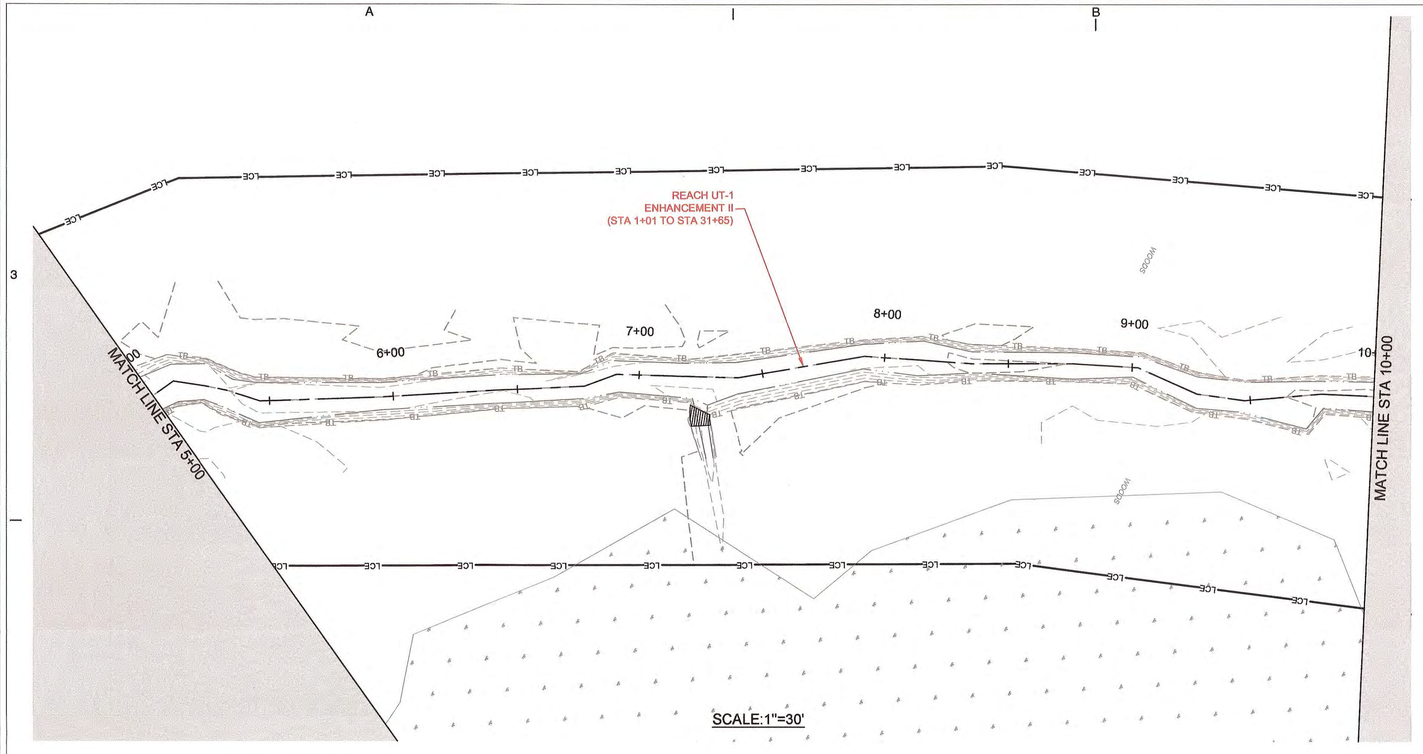
OWNER / 24 HR CONTACT:
ADDRESS:
PHONE:
MOBILE:

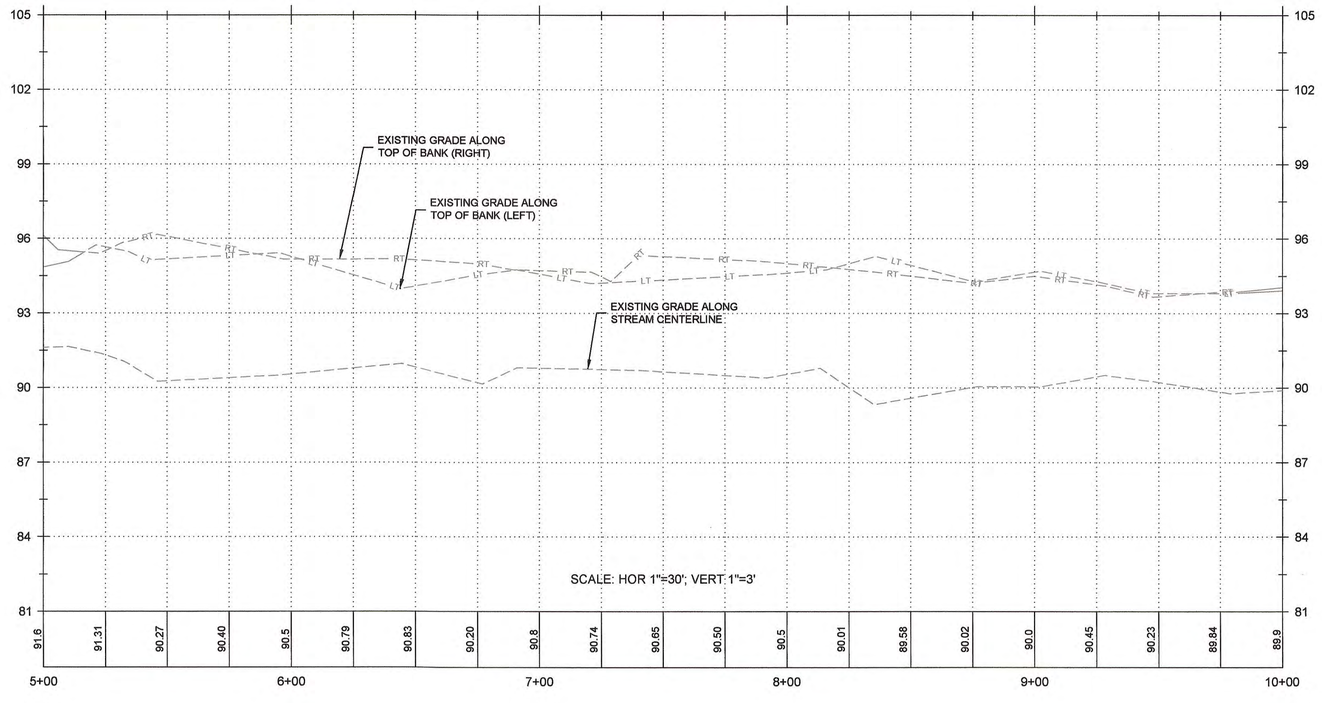
PROJ. DATE: NOV 2014
Q.C.: FM
Q.C. DATE: JAN 2016

DRAWING NUMBER: 2

PROJ. NO.: 2013000100RA

FILE NAME: I:\Projects\EBX\2013000100RA - Cedar Creek Stream and Wetland Mitigation Site\CADD\Record Drawings\2013000100_RECORD_DRAWINGS_UT-1.dwg - January 6, 2016 - Frasier Mullen





LEGEND

- AS-BUILT CONTOUR MAJOR — 50
- AS-BUILT CONTOUR MINOR — 46
- AS-BUILT CHANNEL LIMITS
- AS-BUILT IN-STREAM STRUCTURE
- AS-BUILT STONE
- EXISTING TOP OF BANK — TB
- EXISTING BOTTOM OF BANK
- EXISTING (ORIGINAL) CHANNEL FOOTPRINT
- PROPOSED CHANNEL CENTERLINE
- PROPOSED TOP OF BANK
- LIMITS OF PROPOSED CONSERVATION EASEMENT — LOC
- LOG TOE PROTECTION (PROPOSED)
- LOG STRUCTURE (PROPOSED)
- LOG GRADE CONTROL STRUCTURE (PROPOSED)
- DOUBLE LOG DROP (PROPOSED)
- PROPOSED FILL AREA
- PROPOSED WETLAND
- PROPOSED CHANNEL PLUG
- PROPOSED CHANNEL PLUG W/ OVERFLOW SPILLWAY
- LOG OUTLET STRUCTURE (PROPOSED)
- BEDDED LOG STRUCTURE (PROPOSED)
- FLOODPLAIN SILL (PROPOSED)
- DIFFUSE FLOW STRUCTURE (PROPOSED)
- PROPOSED LOG GRADE CONTROL (PROFILE)
- PROPOSED LOG STRUCTURE (PROFILE)
- PROPOSED DOUBLE LOG DROP (PROFILE)
- PROPOSED BEDDED LOG STRUCTURE (PROFILE)
- AS-BUILT CHANNEL CENTERLINE (PROFILE)
- AS-BUILT LEFT TOP OF BANK (PROFILE)
- AS-BUILT RIGHT TOP OF BANK (PROFILE)
- AS-BUILT STRUCTURE (PROFILE)

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NORTH CAROLINA PROFESSIONAL SEAL 031435 ENGINEER ANN F. MULLEN 1/6/16

FULL SCALE: 1"=30
0 30 60
2" = FULL SCALE
1" = HALF SCALE

PLOT DATE: 1/6/2016

MARK	DATE	DESCRIPTION
---	---	---

REVISIONS:

RELEASED FOR: RECORD DRAWINGS

PROJECT NAME: CEDAR CREEK STREAM & WETLAND RESTORATION PROJECT
RECORD DRAWINGS
RESOURCE ENVIRONMENTAL SOLUTIONS, LLC

DRAWING TITLE: REACH UT-1 PLAN & PROFILE

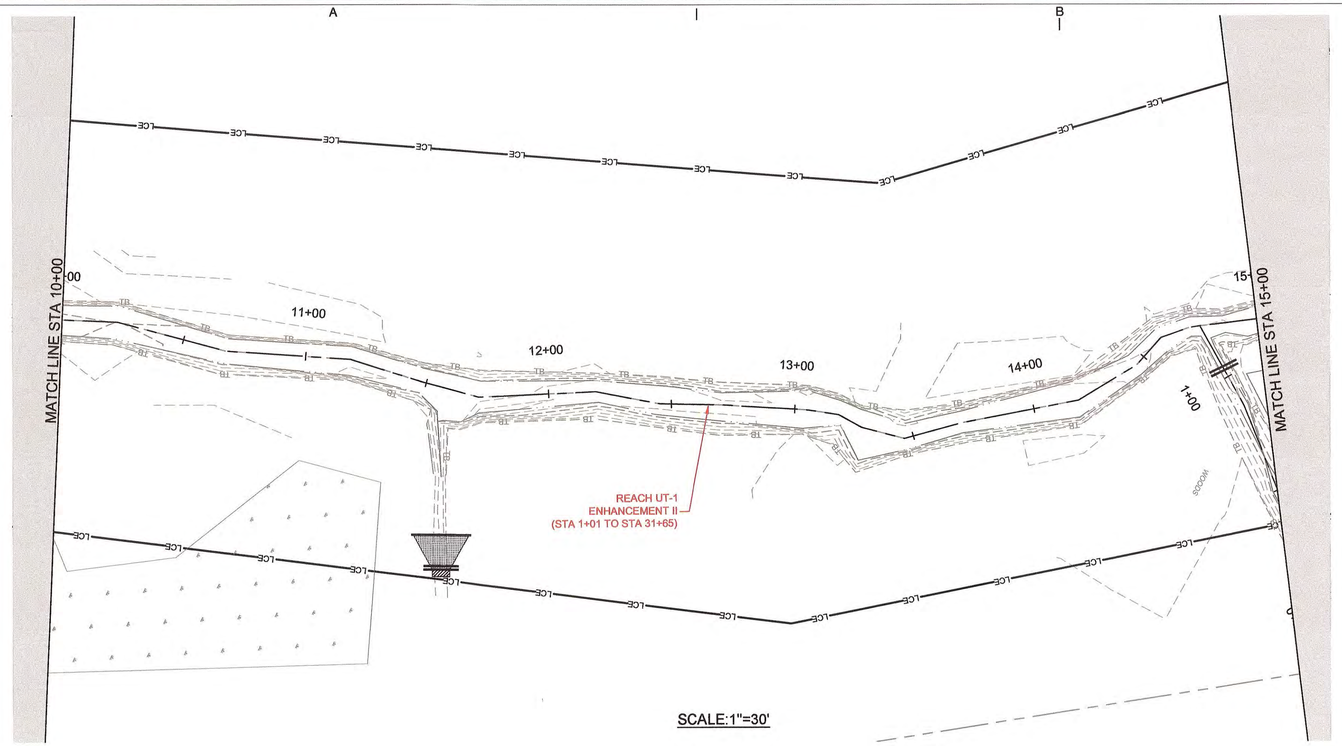
OWNER / 24 HR CONTACT:
ADDRESS:
PHONE:
MOBILE:

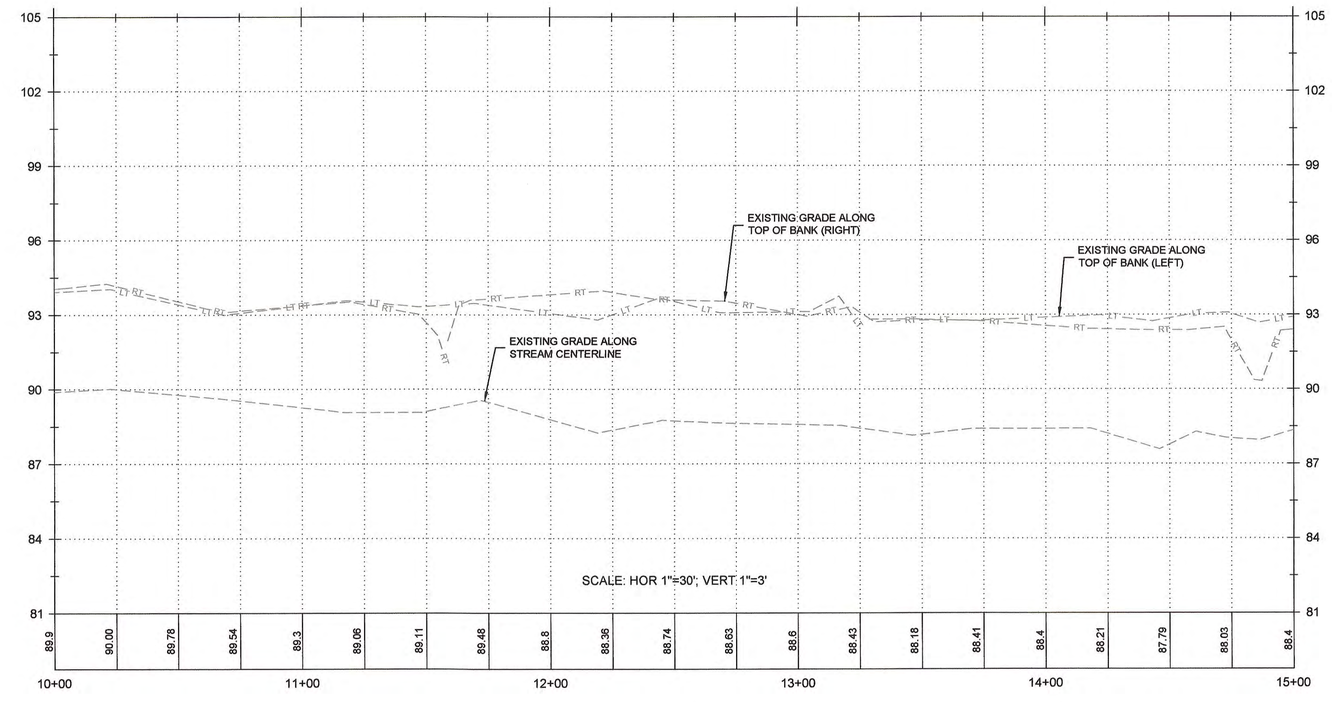
PROJ. DATE: NOV 2014
Q.C.: FM
Q.C. DATE: JAN 2016

DRAWING NUMBER: 3

PROJ. NO.: 2013000100RA

FILE NAME: I:\Projects\EBX\2013000100RA - Cedar Creek Stream and Wetland Mitigation Site\CADD\Record Drawings\2013000100_RECORD_DRAWINGS_UT-1.dwg - January 6, 2016 - Frasier Mullen





LEGEND

- AS-BUILT CONTOUR MAJOR
- AS-BUILT CONTOUR MINOR
- AS-BUILT CHANNEL LIMITS
- AS-BUILT IN-STREAM STRUCTURE
- AS-BUILT STONE
- EXISTING TOP OF BANK
- EXISTING BOTTOM OF BANK
- EXISTING (ORIGINAL) CHANNEL FOOTPRINT
- PROPOSED CHANNEL CENTERLINE
- PROPOSED TOP OF BANK
- LIMITS OF PROPOSED CONSERVATION EASEMENT
- LOG TOE PROTECTION (PROPOSED)
- LOG STRUCTURE (PROPOSED)
- LOG GRADE CONTROL STRUCTURE (PROPOSED)
- DOUBLE LOG DROP (PROPOSED)
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- AS-BUILT CHANNEL CENTERLINE (PROFILE)
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NORTH CAROLINA PROFESSIONAL SEAL 031435 ENGINEER AWN F. MULLEN 1/6/16

FULL SCALE: 1"=30'
0 30 60
2" = FULL SCALE
1" = HALF SCALE

PLOT DATE: 1/6/2016

MARK	DATE	DESCRIPTION
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REVISIONS:

RELEASED FOR: RECORD DRAWINGS

PROJECT NAME: CEDAR CREEK STREAM & WETLAND RESTORATION PROJECT
RECORD DRAWINGS
RESOURCE ENVIRONMENTAL SOLUTIONS, LLC

DRAWING TITLE: REACH UT-1 PLAN & PROFILE

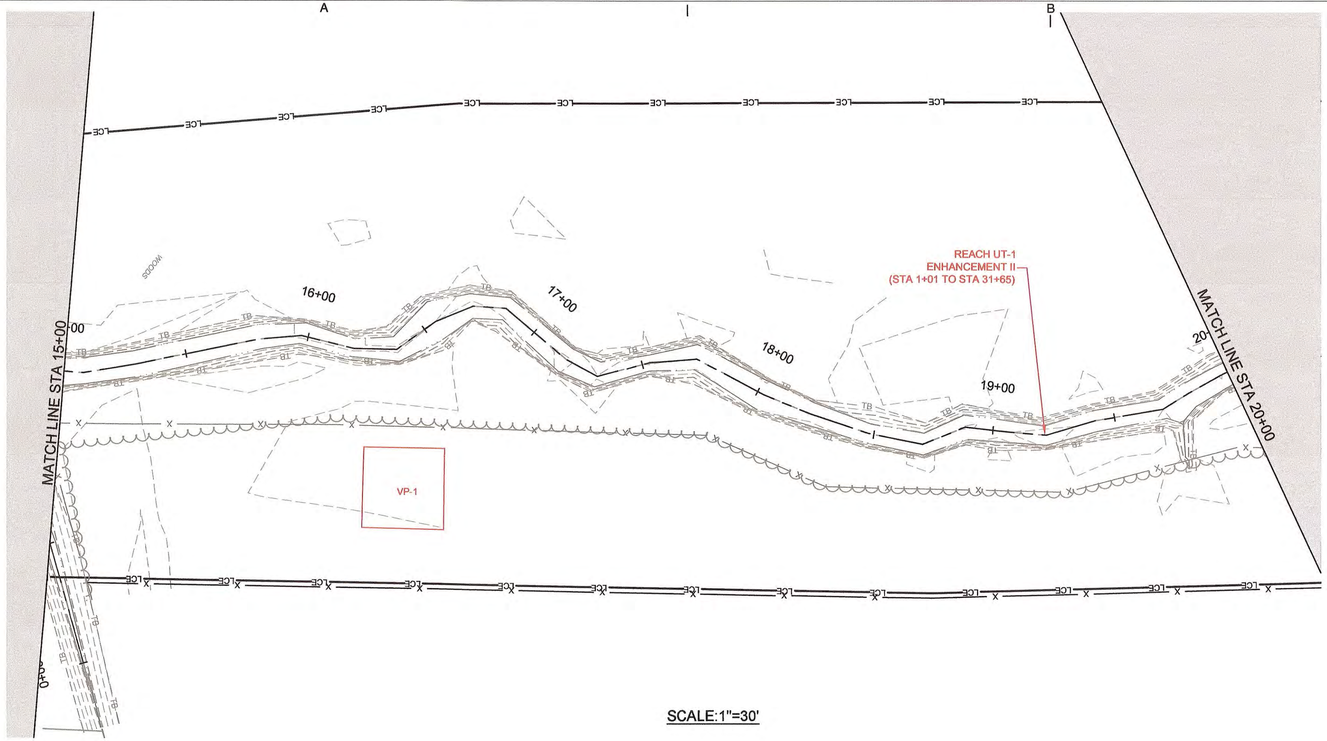
OWNER / 24 HR CONTACT:
ADDRESS:
PHONE:
MOBILE:

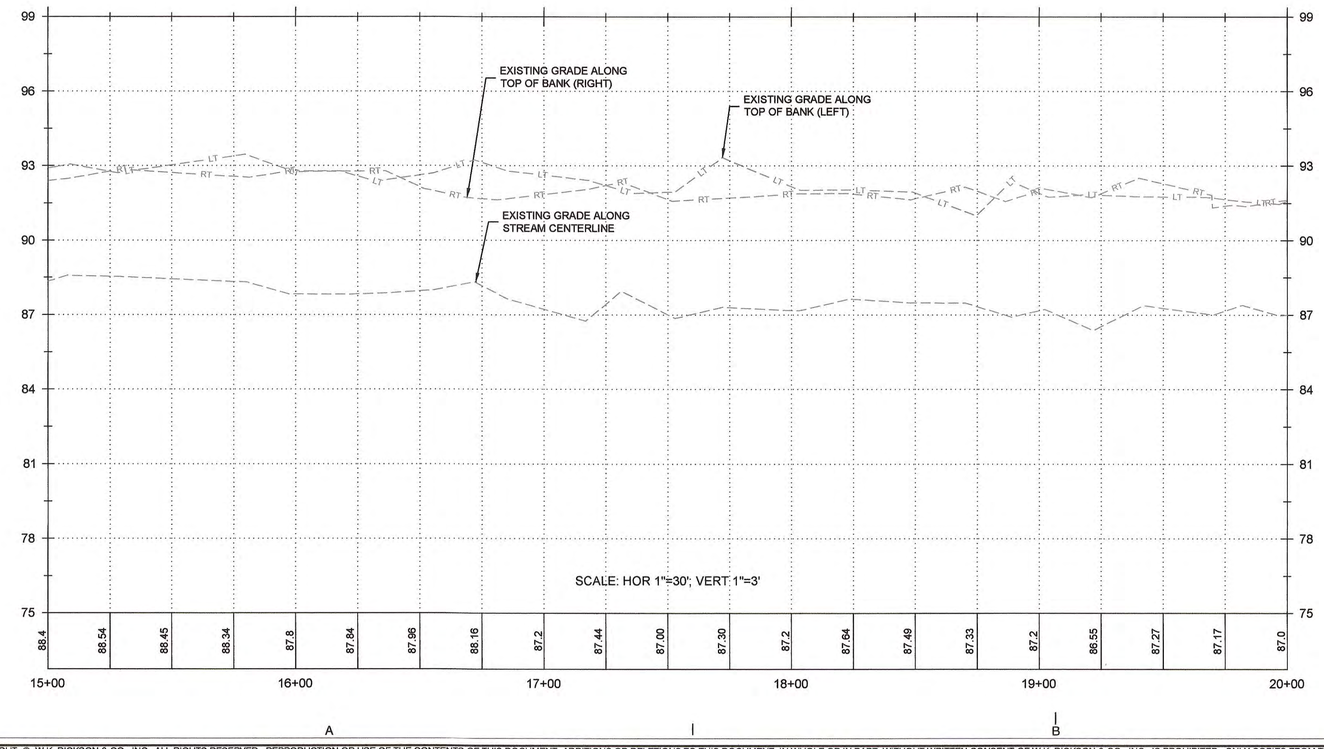
PROJ. DATE: NOV 2014
Q.C.: FM
Q.C. DATE: JAN 2016

DRAWING NUMBER: 4

PROJ. NO.: 2013000100RA

FILE NAME: I:\Projects\EBX\2013000100RA - Cedar Creek Stream and Wetland Mitigation Site\CADD\Record Drawings\2013000100_RECORD_DRAWINGS_UT-1.dwg - January 6, 2016 - Frasier Mullen





LEGEND

- AS-BUILT CONTOUR MAJOR — 50
- AS-BUILT CONTOUR MINOR — 46
- AS-BUILT CHANNEL LIMITS
- AS-BUILT IN-STREAM STRUCTURE
- AS-BUILT STONE
- EXISTING TOP OF BANK — TB
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NORTH CAROLINA PROFESSIONAL SEAL 031435 ENGINEER ANN F. MULLEN
1/6/16

FULL SCALE: 1"=30
0 30 60
2" = FULL SCALE
1" = HALF SCALE

PLOT DATE: 1/6/2016

MARK	DATE	DESCRIPTION
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REVISIONS:

RELEASED FOR: RECORD DRAWINGS

PROJECT NAME:
CEDAR CREEK STREAM & WETLAND RESTORATION PROJECT
RECORD DRAWINGS
RESOURCE ENVIRONMENTAL SOLUTIONS, LLC

DRAWING TITLE:
REACH UT-1 PLAN & PROFILE

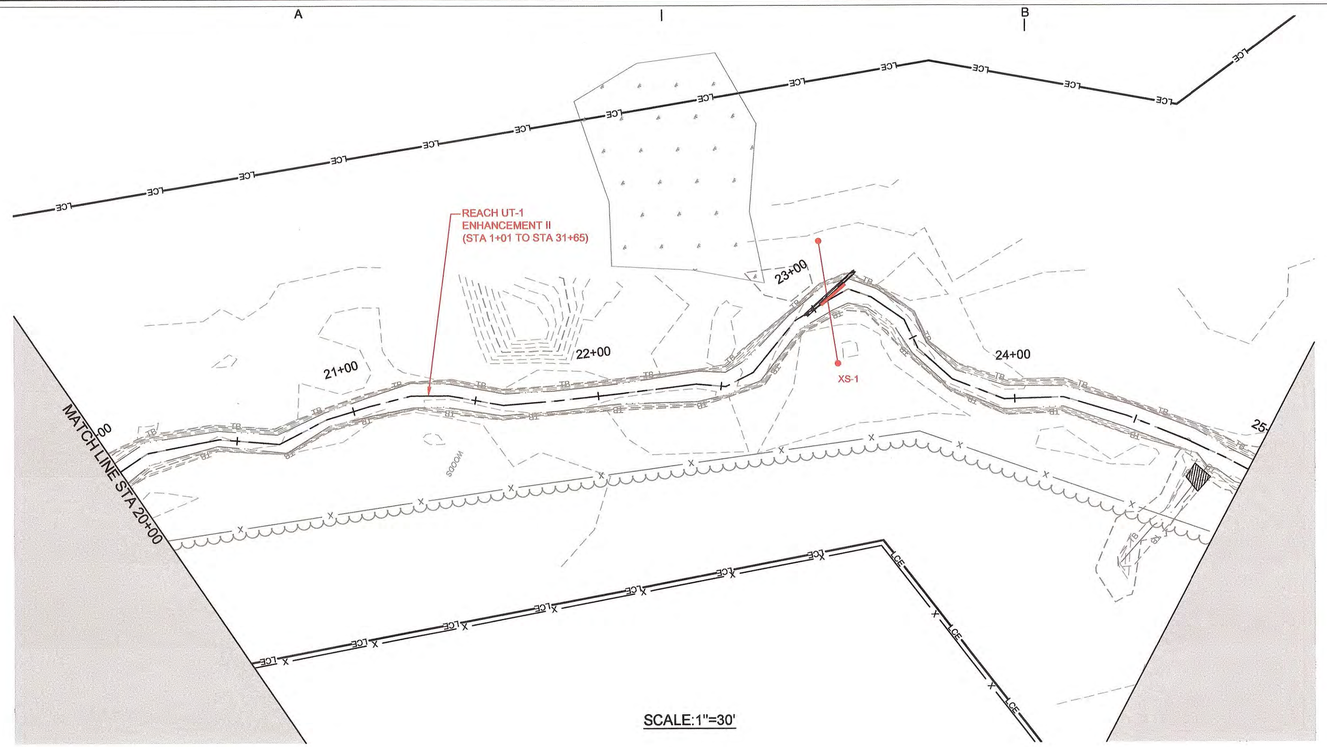
OWNER / 24 HR CONTACT:
ADDRESS:
PHONE:
MOBILE:

PROJ. DATE:	NOV 2014
Q.C.:	FM
Q.C. DATE:	JAN 2016

DRAWING NUMBER:
5

PROJ. NO.:
2013000100RA

FILE NAME: I:\Projects\EBX\2013000100RA - Cedar Creek Stream and Wetland Mitigation Site\CADD\Record Drawings\2013000100_RECORD_DRAWINGS_UT-1.dwg - January 6, 2016 - Frasier Mullen



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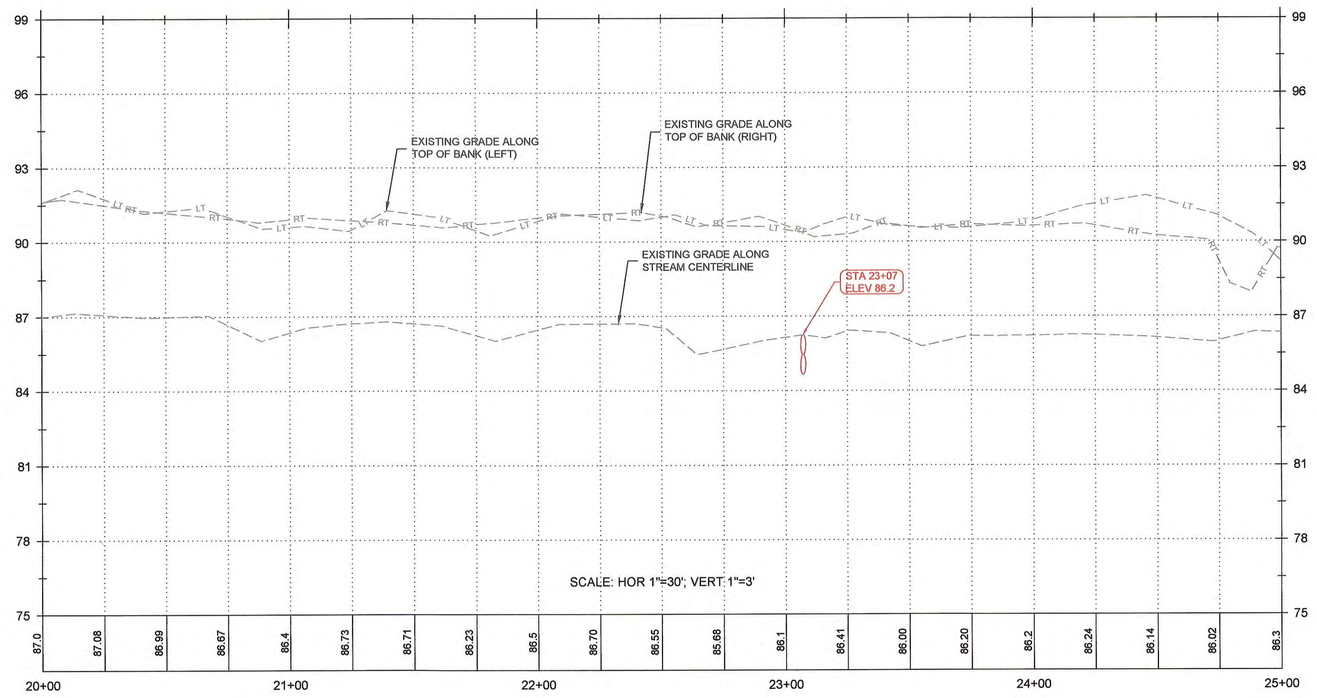

SCALE: HOR 1"=30'; VERT: 1"=3'

STRUCTURE TABLE

STRUCTURE	FROM		TO		BANK*
	STA	ELEV	STA	ELEV	
LOG VANE	23+00	86.25	23+16	88.25	----

* RIGHT (R) AND LEFT (L) BANK LOCATIONS ARE REFERENCED LOOKING DOWNSTREAM

LEGEND

- AS-BUILT CONTOUR MAJOR
- AS-BUILT CONTOUR MINOR
- AS-BUILT CHANNEL LIMITS
- AS-BUILT IN-STREAM STRUCTURE
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NORTH CAROLINA PROFESSIONAL SEAL 031435 ENGINEER ANN F. MULLEN 1/6/16

FULL SCALE: 1"=30
0 30 60
2" = FULL SCALE
1" = HALF SCALE

PLOT DATE: 1/6/2016

MARK	DATE	DESCRIPTION
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REVISIONS:
RELEASED FOR: RECORD DRAWINGS

PROJECT NAME:
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RECORD DRAWINGS
RESOURCE ENVIRONMENTAL SOLUTIONS, LLC

DRAWING TITLE:
REACH UT-1 PLAN & PROFILE

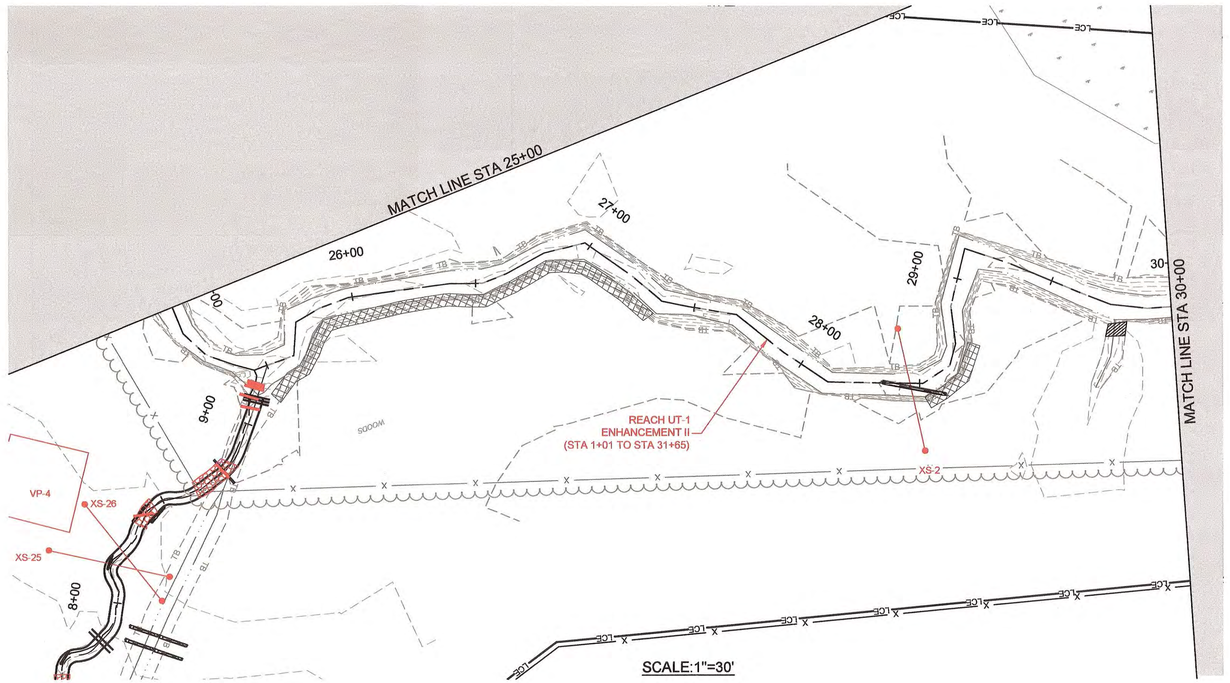
OWNER / 24 HR CONTACT:
ADDRESS:
PHONE:
MOBILE:

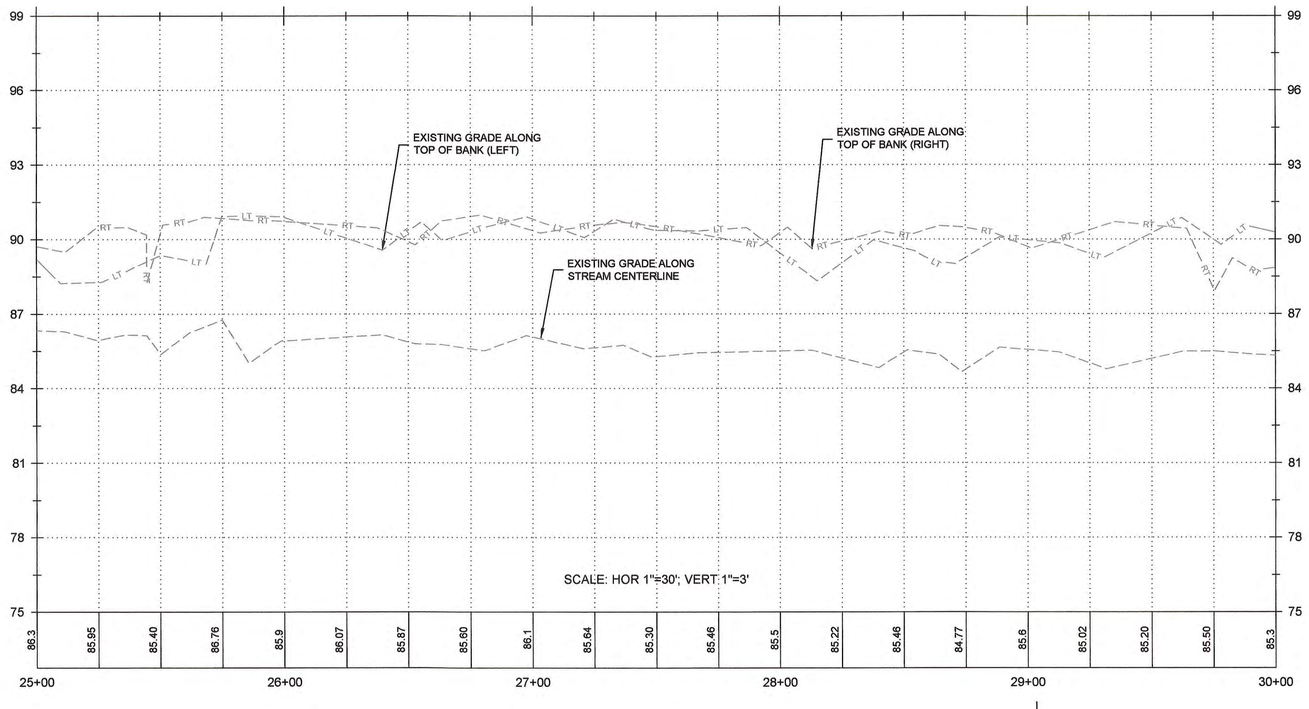
PROJ. DATE: NOV 2014
Q.C.: FM
Q.C. DATE: JAN 2016

DRAWING NUMBER:
6

PROJ. NO.:
2013000100RA

FILE NAME: I:\Projects\EBX\2013000100RA - Cedar Creek Stream and Wetland Mitigation Site\CADD\Record Drawings\2013000100_RECORD_DRAWINGS_UT-1.dwg - January 6, 2016 - Frasier Mullen





STRUCTURE TABLE					
STRUCTURE	FROM		TO		BANK*
	STA	ELEV	STA	ELEV	
LOG VANE	28+36	85.50	28+54	87.90	---
* RIGHT (R) AND LEFT (L) BANK LOCATIONS ARE REFERENCED LOOKING DOWNSTREAM					

LEGEND

- AS-BUILT CONTOUR MAJOR
- AS-BUILT CONTOUR MINOR
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- AS-BUILT STRUCTURE (PROFILE)

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NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 031435 FRASIER ANN F. MULLEN

FULL SCALE: 1"=30
0 30 60
2" = FULL SCALE
1" = HALF SCALE

PLOT DATE: 1/6/2016

MARK	DATE	DESCRIPTION
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REVISIONS:

RELEASED FOR: RECORD DRAWINGS

PROJECT NAME:
CEDAR CREEK STREAM & WETLAND RESTORATION PROJECT
RECORD DRAWINGS
RESOURCE ENVIRONMENTAL SOLUTIONS, LLC

DRAWING TITLE:
REACH UT-1 PLAN & PROFILE

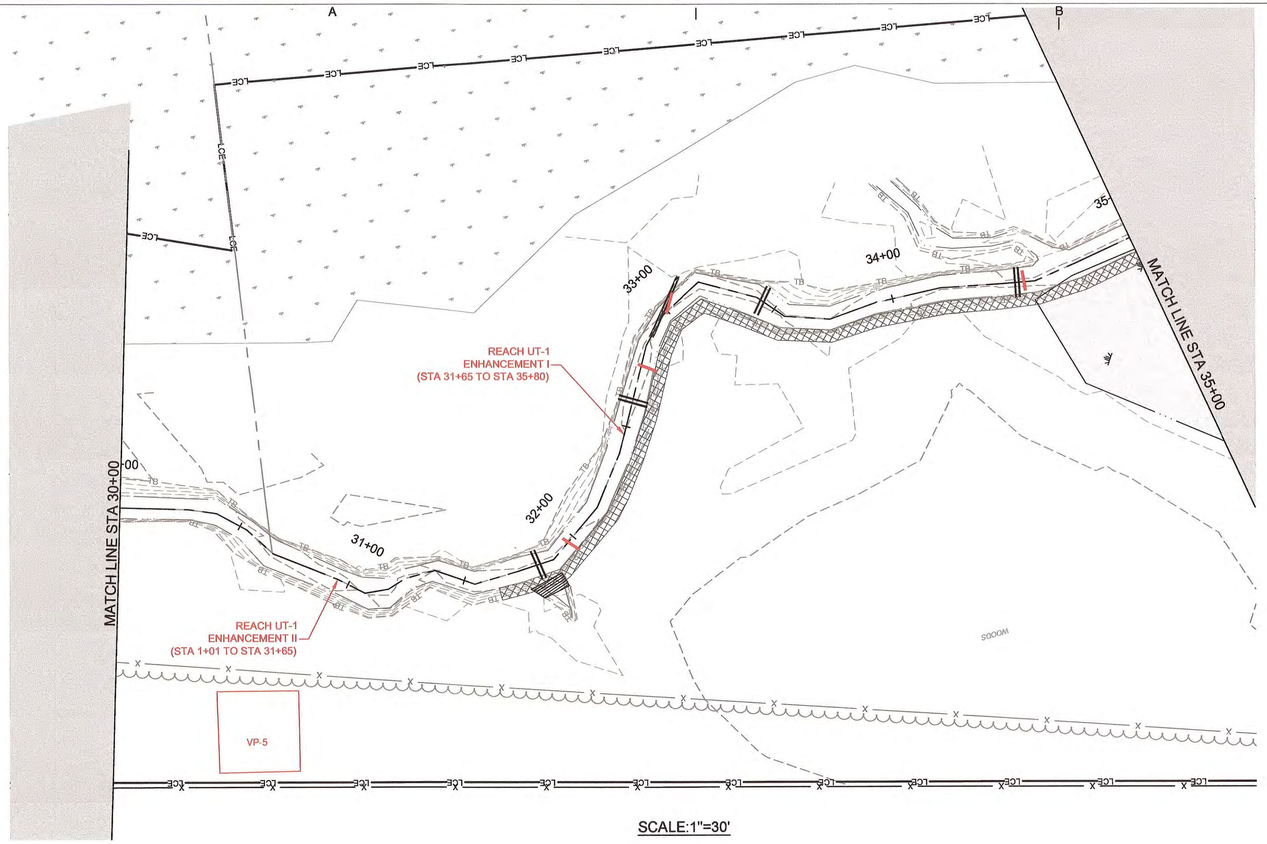
OWNER / 24 HR CONTACT:
ADDRESS:
PHONE:
MOBILE:

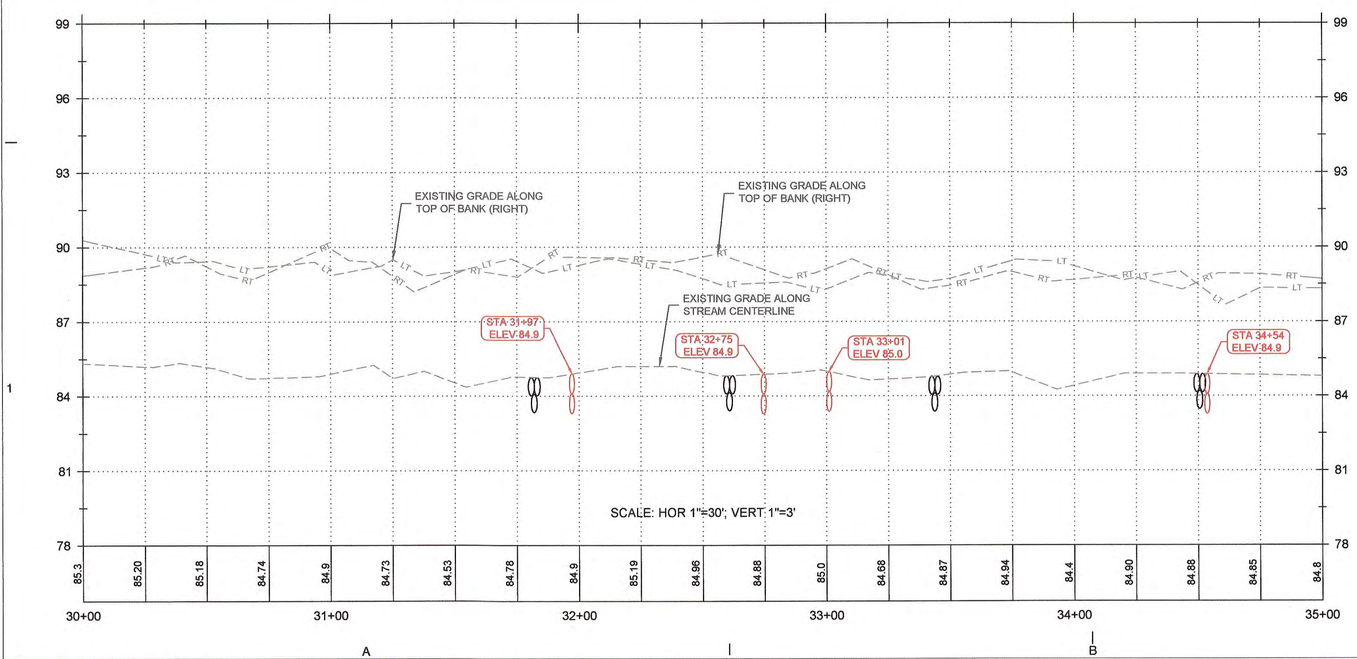
PROJ. DATE: NOV 2014
Q.C.: FM
Q.C. DATE: JAN 2016

DRAWING NUMBER:
7

PROJ. NO.:
2013000100RA

FILE NAME: I:\Projects\EBX\2013000100RA - Cedar Creek Stream and Wetland Mitigation Site\CADD\Record Drawings\2013000100_RECORD_DRAWINGS_UT-1.dwg - January 6, 2016 - Frasier Mullen





LEGEND

- AS-BUILT CONTOUR MAJOR
- AS-BUILT CONTOUR MINOR
- AS-BUILT CHANNEL LIMITS
- AS-BUILT IN-STREAM STRUCTURE
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- AS-BUILT CHANNEL CENTERLINE (PROFILE)
- AS-BUILT LEFT TOP OF BANK (PROFILE)
- AS-BUILT RIGHT TOP OF BANK (PROFILE)
- AS-BUILT STRUCTURE (PROFILE)

STRUCTURE TABLE

STRUCTURE	FROM		TO		BANK*
	STA	ELEV	STA	ELEV	
LOG GRADE CONTROL	31+82	84.76	----	----	----
LOG GRADE CONTROL	32+61	84.83	----	----	----
LOG VANE	32+90	85.00	33+06	87.00	----
LOG GRADE CONTROL	33+43	84.79	----	----	----
LOG GRADE CONTROL	34+50	84.88	----	----	----

* RIGHT (R) AND LEFT (L) BANK LOCATIONS ARE REFERENCED LOOKING DOWNSTREAM

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NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 031435 ANN F. MULLEN 10/6/16

FULL SCALE: 1"=30
0 30 60
2" = FULL SCALE
1" = HALF SCALE

MARK	DATE	DESCRIPTION
----	----	----

REVISIONS:
RELEASED FOR:
RECORD DRAWINGS

PLOT DATE: 1/6/2016

PROJECT NAME:
CEDAR CREEK STREAM & WETLAND RESTORATION PROJECT
RECORD DRAWINGS
RESOURCE ENVIRONMENTAL SOLUTIONS, LLC

DRAWING TITLE:
REACH UT-1 PLAN & PROFILE

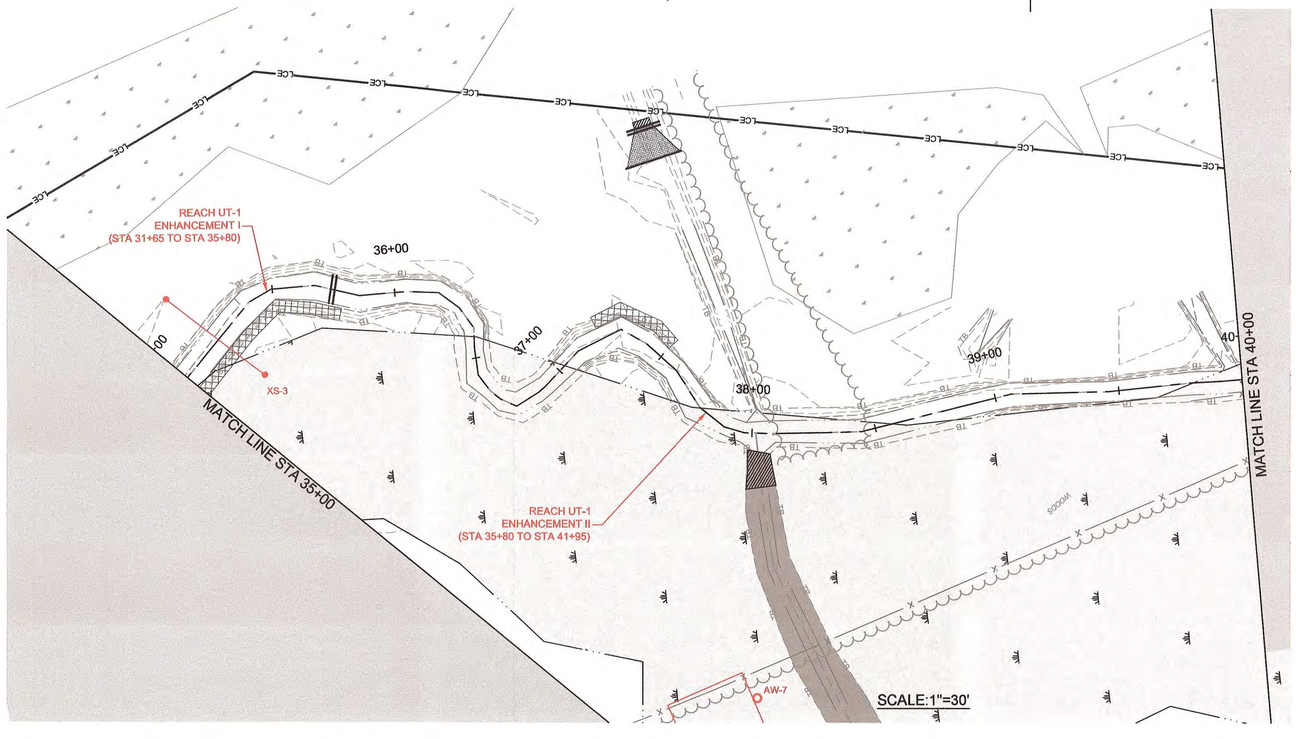
OWNER / 24 HR CONTACT:
ADDRESS:
PHONE:
MOBILE:

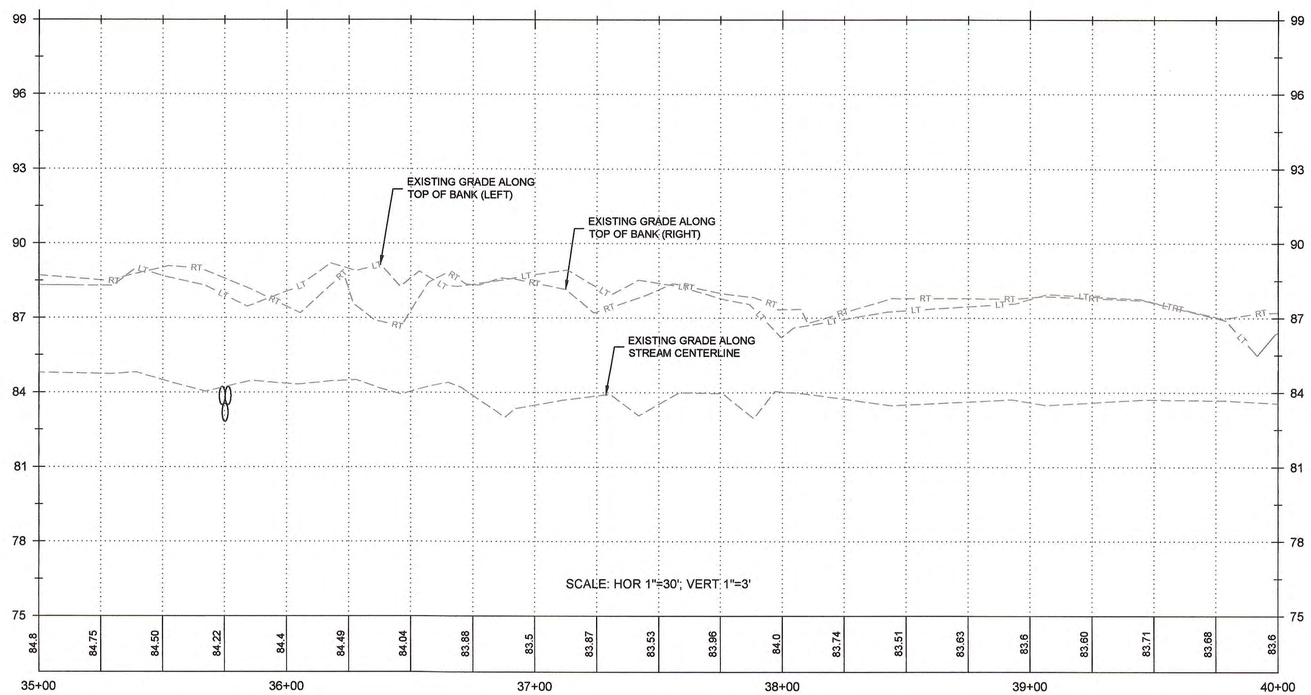
PROJ. DATE: NOV 2014
Q.C.: FM
Q.C. DATE: JAN 2016

DRAWING NUMBER:
8

PROJ. NO.:
2013000100RA

FILE NAME: I:\Projects\EBX\2013000100RA - Cedar Creek Stream and Wetland Mitigation Site\CADD\Record Drawings\2013000100_RECORD_DRAWINGS_UT-1.dwg - January 6, 2016 - Frasier Mullen





STRUCTURE TABLE

STRUCTURE	FROM		TO		BANK*
	STA	ELEV	STA	ELEV	
LOG GRADE CONTROL	35+75	84.22	----	----	----

* RIGHT (R) AND LEFT (L) BANK LOCATIONS ARE REFERENCED LOOKING DOWNSTREAM

LEGEND

- AS-BUILT CONTOUR MAJOR — 50
- AS-BUILT CONTOUR MINOR — 46
- AS-BUILT CHANNEL LIMITS
- AS-BUILT IN-STREAM STRUCTURE
- AS-BUILT STONE
- EXISTING TOP OF BANK — TB
- EXISTING BOTTOM OF BANK
- EXISTING (ORIGINAL) CHANNEL FOOTPRINT
- PROPOSED CHANNEL CENTERLINE
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NORTH CAROLINA PROFESSIONAL SEAL 031435 ENGINEER ANN F. MULLEN

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0 30 60
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PLOT DATE: 1/6/2016

MARK	DATE	DESCRIPTION
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REVISIONS:

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RECORD DRAWINGS
RESOURCE ENVIRONMENTAL SOLUTIONS, LLC

DRAWING TITLE:
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OWNER / 24 HR CONTACT:
ADDRESS:
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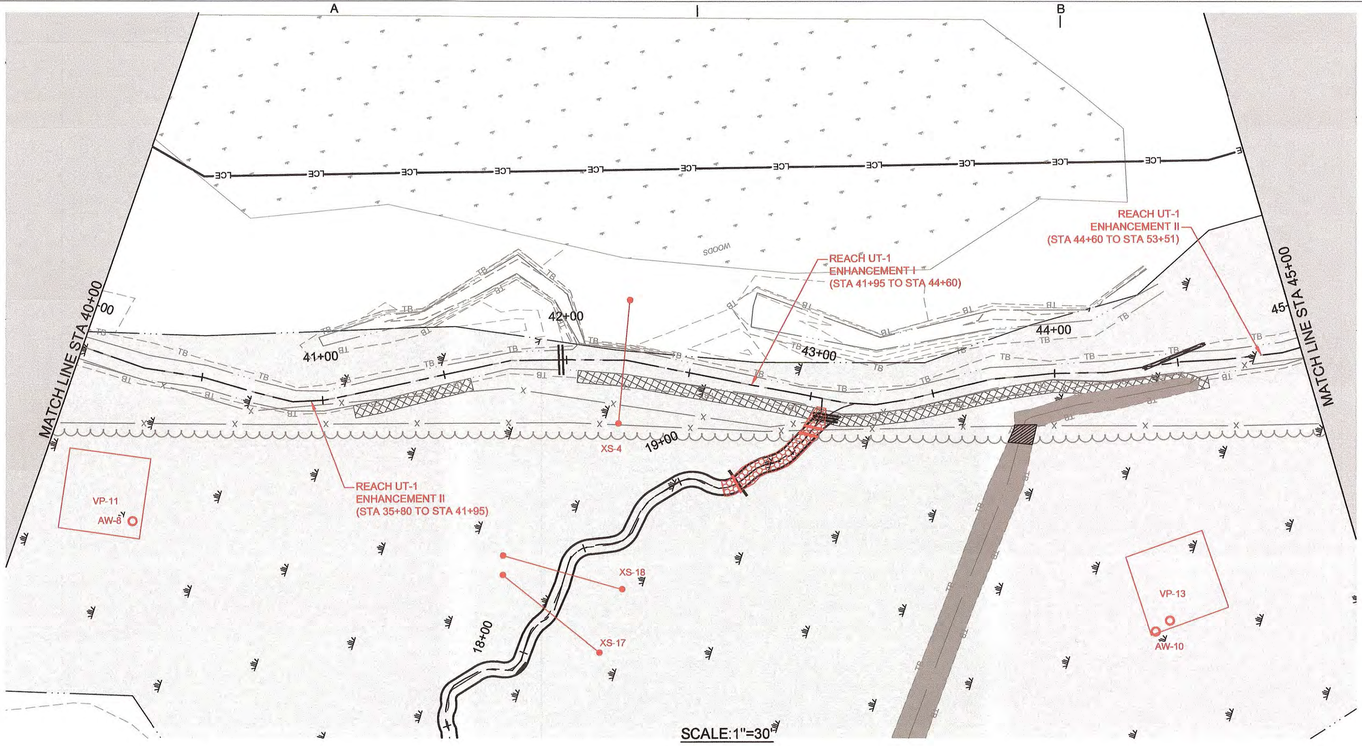
MOBILE:

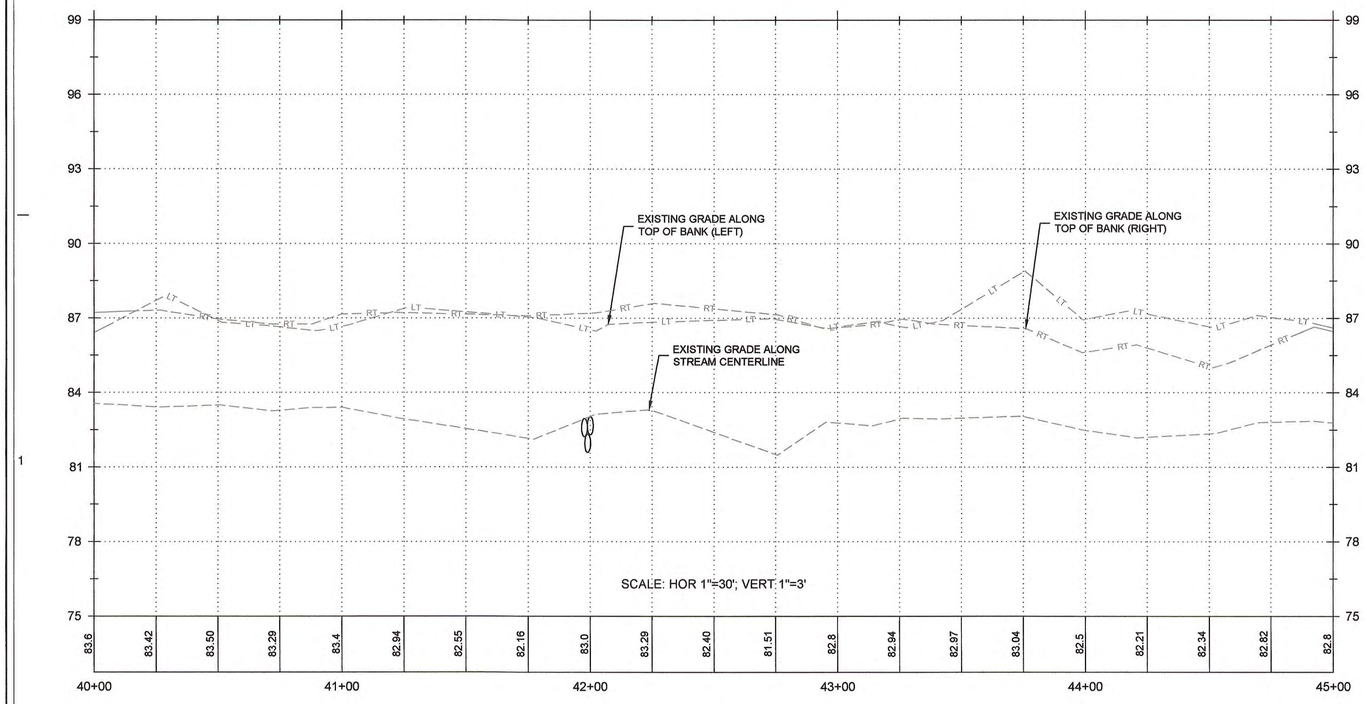
PROJ. DATE: NOV 2014
Q.C.: FM
Q.C. DATE: JAN 2016

DRAWING NUMBER:
9

PROJ. NO.:
2013000100RA

FILE NAME: I:\Projects\EBX\2013000100RA - Cedar Creek Stream and Wetland Mitigation Site\CADD\Record Drawings\2013000100_RECORD_DRAWINGS_UT-1.dwg - January 6, 2016 - Frasier Mullen





LEGEND

- AS–BUILT CONTOUR MAJOR
- AS–BUILT CONTOUR MINOR
- AS–BUILT CHANNEL LIMITS
- AS–BUILT IN–STREAM STRUCTURE
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- PROPOSED WETLAND
- PROPOSED CHANNEL PLUG
- PROPOSED CHANNEL PLUG W/ OVERFLOW SPILLWAY
- LOG OUTLET STRUCTURE (PROPOSED)
- BEDDED LOG STRUCTURE (PROPOSED)
- FLOODPLAIN SILL (PROPOSED)
- DIFFUSE FLOW STRUCTURE (PROPOSED)
- PROPOSED LOG GRADE CONTROL (PROFILE)
- PROPOSED LOG STRUCTURE (PROFILE)
- PROPOSED DOUBLE LOG DROP (PROFILE)
- PROPOSED BEDDED LOG STRUCTURE (PROFILE)
- AS–BUILT CHANNEL CENTERLINE (PROFILE)
- AS–BUILT LEFT TOP OF BANK (PROFILE)
- AS–BUILT RIGHT TOP OF BANK (PROFILE)
- AS–BUILT STRUCTURE (PROFILE)

STRUCTURE TABLE

STRUCTURE	FROM		TO		BANK*
	STA	ELEV	STA	ELEV	
LOG GRADE CONTROL	41+99	83.00	----	----	----
LOG VANE	44+36	82.75	44+54	84.80	----

* RIGHT (R) AND LEFT (L) BANK LOCATIONS ARE REFERENCED LOOKING DOWNSTREAM

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NC. LICENSE NO. F-0374

NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 031436 ANN F. MULLEN 10/6/16

FULL SCALE: 1"=30
0 30 60
2" = FULL SCALE
1" = HALF SCALE

MARK	DATE	DESCRIPTION
---	---	---

REVISIONS:

PLOT DATE: 1/6/2016

RELEASED FOR: RECORD DRAWINGS

PROJECT NAME:
CEDAR CREEK STREAM & WETLAND RESTORATION PROJECT
RECORD DRAWINGS
RESOURCE ENVIRONMENTAL SOLUTIONS, LLC

DRAWING TITLE:
REACH UT-1 PLAN & PROFILE

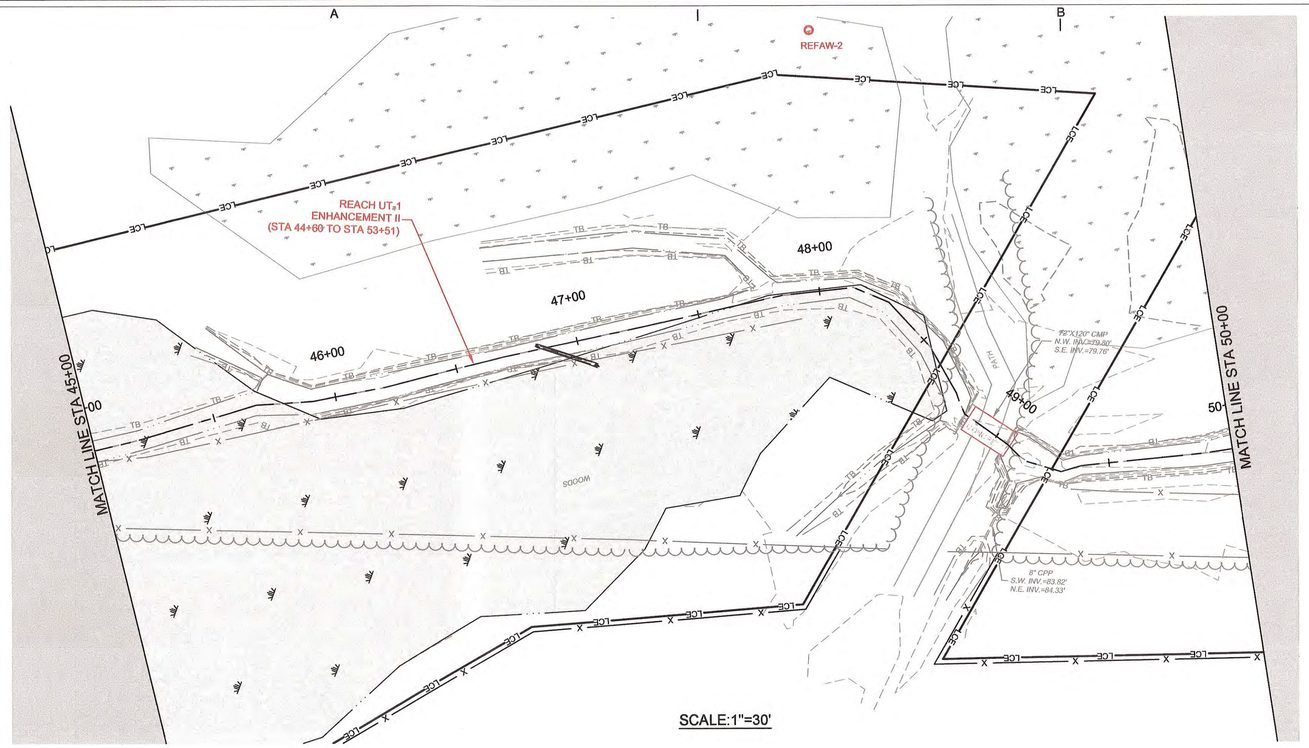
OWNER / 24 HR CONTACT:
ADDRESS:
PHONE:
MOBILE:

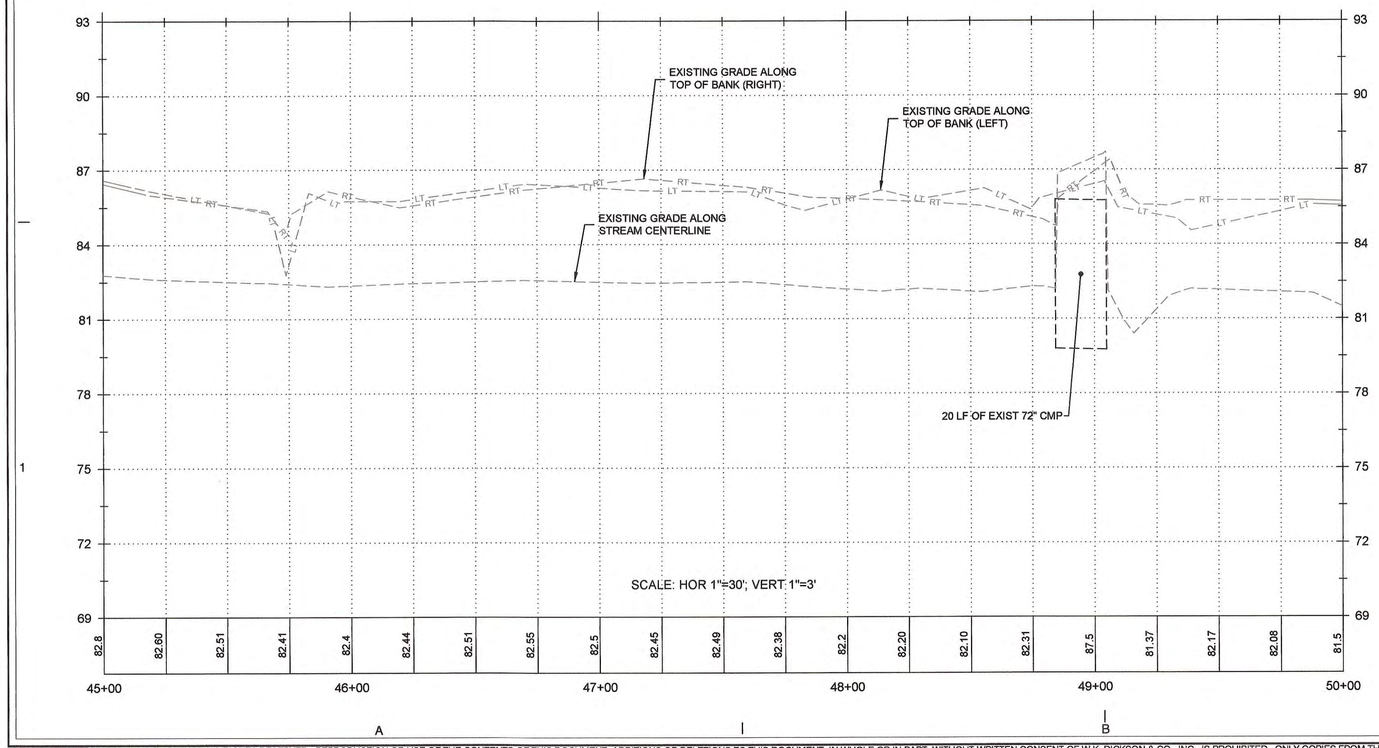
PROJ. DATE: NOV 2014
Q.C.: FM
Q.C. DATE: JAN 2016

DRAWING NUMBER:
10

PROJ. NO.:
2013000100RA

FILE NAME: I:\Projects\EBX\2013000100RA - Cedar Creek Stream and Wetland Mitigation Site\CADD\Record Drawings\2013000100_RECORD_DRAWINGS_UT-1.dwg - January 6, 2016 - Frasier Mullen





LEGEND

- AS–BUILT CONTOUR MAJOR
- AS–BUILT CONTOUR MINOR
- AS–BUILT CHANNEL LIMITS
- AS–BUILT IN–STREAM STRUCTURE
- AS–BUILT STONE
- EXISTING TOP OF BANK
- EXISTING BOTTOM OF BANK
- EXISTING (ORIGINAL) CHANNEL FOOTPRINT
- PROPOSED CHANNEL CENTERLINE
- PROPOSED TOP OF BANK
- LIMITS OF PROPOSED CONSERVATION EASEMENT
- LOG TOE PROTECTION (PROPOSED)
- LOG STRUCTURE (PROPOSED)
- LOG GRADE CONTROL STRUCTURE (PROPOSED)
- DOUBLE LOG DROP (PROPOSED)
- PROPOSED FILL AREA
- PROPOSED WETLAND
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- PROPOSED CHANNEL PLUG W/ OVERFLOW SPILLWAY
- LOG OUTLET STRUCTURE (PROPOSED)
- BEDDED LOG STRUCTURE (PROPOSED)
- FLOODPLAIN SILL (PROPOSED)
- DIFFUSE FLOW STRUCTURE (PROPOSED)
- PROPOSED LOG GRADE CONTROL (PROFILE)
- PROPOSED LOG STRUCTURE (PROFILE)
- PROPOSED DOUBLE LOG DROP (PROFILE)
- PROPOSED BEDDED LOG STRUCTURE (PROFILE)
- AS–BUILT CHANNEL CENTERLINE (PROFILE)
- AS–BUILT LEFT TOP OF BANK (PROFILE)
- AS–BUILT RIGHT TOP OF BANK (PROFILE)
- AS–BUILT STRUCTURE (PROFILE)

STRUCTURE TABLE

STRUCTURE	FROM		TO		BANK*
	STA	ELEV	STA	ELEV	
LOG VANE	46+85	82.50	47+01	84.40	

* RIGHT (R) AND LEFT (L) BANK LOCATIONS ARE REFERENCED LOOKING DOWNSTREAM

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NORTH CAROLINA PROFESSIONAL SEAL 031435 ENGINEER ANN F. MULLEN 1/6/16

FULL SCALE: 1"=30
0 30 60
2" = FULL SCALE
1" = HALF SCALE

MARK	DATE	DESCRIPTION
---	---	---

REVISIONS:
RELEASED FOR: RECORD DRAWINGS
PLOT DATE: 1/6/2016

PROJECT NAME:
CEDAR CREEK STREAM & WETLAND RESTORATION PROJECT
RECORD DRAWINGS
RESOURCE ENVIRONMENTAL SOLUTIONS, LLC

DRAWING TITLE:
REACH UT-1 PLAN & PROFILE

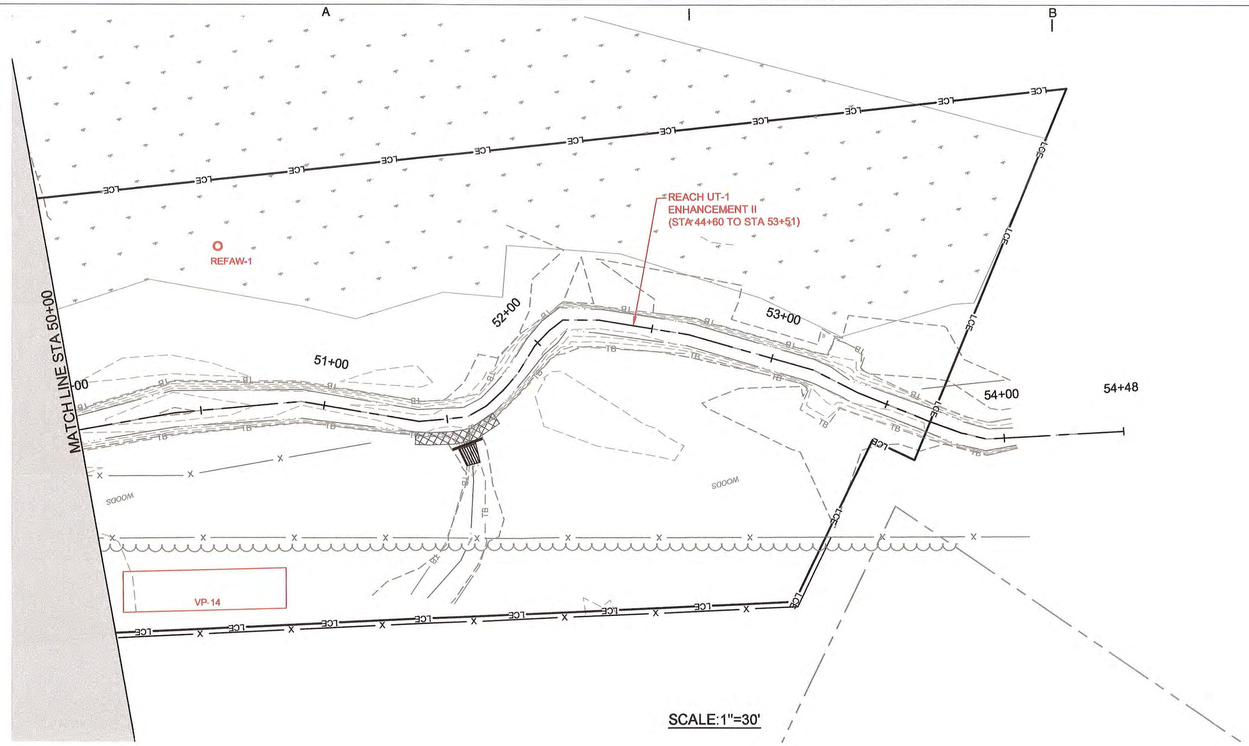
OWNER / 24 HR CONTACT:
ADDRESS:
PHONE:
MOBILE:

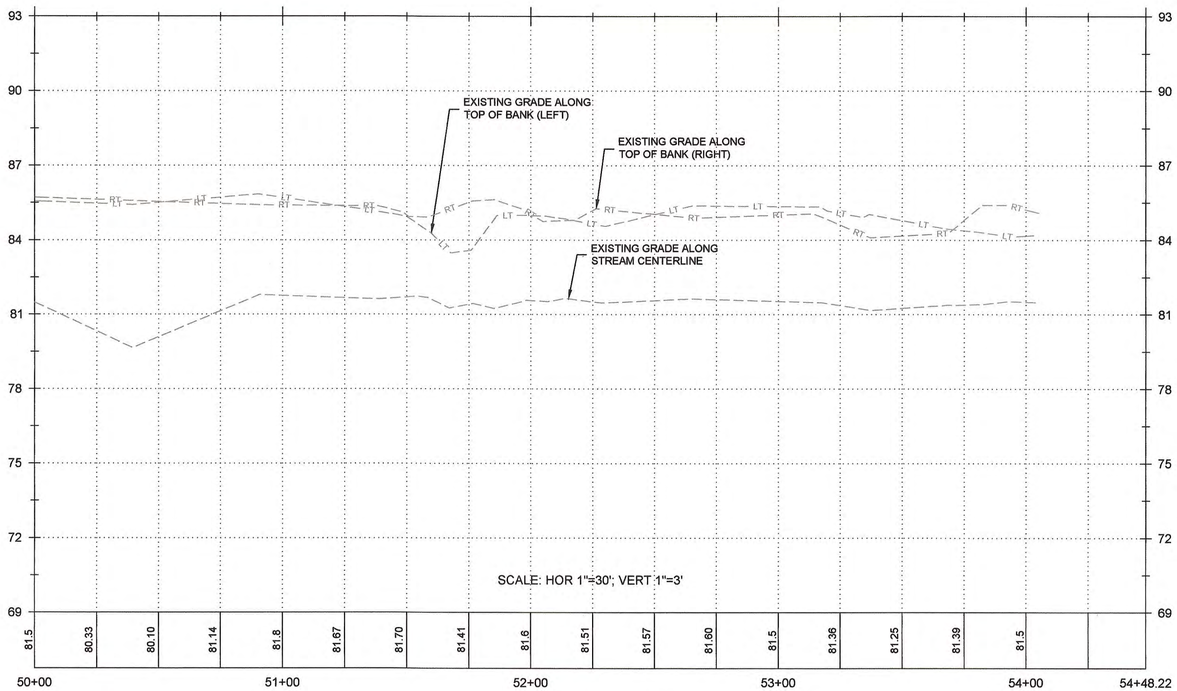
PROJ. DATE: NOV 2014
Q.C.: FM
Q.C. DATE: JAN 2016

DRAWING NUMBER:
11

PROJ. NO.:
2013000100RA

FILE NAME: I:\Projects\EBX\2013000100RA - Cedar Creek Stream and Wetland Mitigation Site\CADD\Record Drawings\2013000100_RECORD_DRAWINGS_UT-1.dwg - January 6, 2016 - Frasier Mullen





LEGEND

- AS-BUILT CONTOUR MAJOR
- AS-BUILT CONTOUR MINOR
- AS-BUILT CHANNEL LIMITS
- AS-BUILT IN-STREAM STRUCTURE
- AS-BUILT STONE
- EXISTING TOP OF BANK
- EXISTING BOTTOM OF BANK
- EXISTING (ORIGINAL) CHANNEL FOOTPRINT
- PROPOSED CHANNEL CENTERLINE
- PROPOSED TOP OF BANK
- LIMITS OF PROPOSED CONSERVATION EASEMENT
- LOG TOE PROTECTION (PROPOSED)
- LOG STRUCTURE (PROPOSED)
- LOG GRADE CONTROL STRUCTURE (PROPOSED)
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- PROPOSED FILL AREA
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- PROPOSED LOG GRADE CONTROL (PROFILE)
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- PROPOSED BEDDED LOG STRUCTURE (PROFILE)
- AS-BUILT CHANNEL CENTERLINE (PROFILE)
- AS-BUILT LEFT TOP OF BANK (PROFILE)
- AS-BUILT RIGHT TOP OF BANK (PROFILE)
- AS-BUILT STRUCTURE (PROFILE)

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NORTH CAROLINA PROFESSIONAL SEAL 031435 ENGINEER ANN F. MULLEN 11/6/16

FULL SCALE: 1"=30
0 30 60
2" = FULL SCALE
1" = HALF SCALE

PLOT DATE: 1/6/2016

MARK	DATE	DESCRIPTION
----	----	----
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REVISIONS:

RELEASED FOR: RECORD DRAWINGS

PROJECT NAME:
CEDAR CREEK STREAM & WETLAND RESTORATION PROJECT
RECORD DRAWINGS
RESOURCE ENVIRONMENTAL SOLUTIONS, LLC

DRAWING TITLE:
REACH UT-1 PLAN & PROFILE

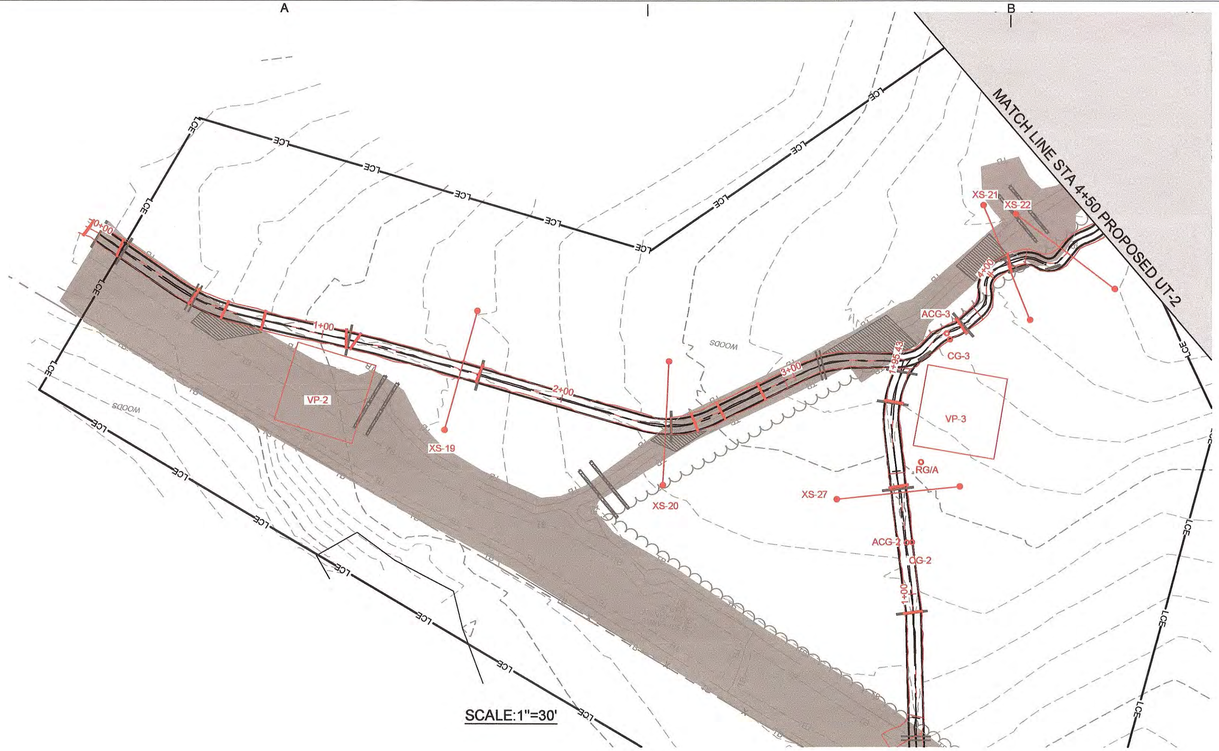
OWNER / 24 HR CONTACT:
ADDRESS:
PHONE:
MOBILE:

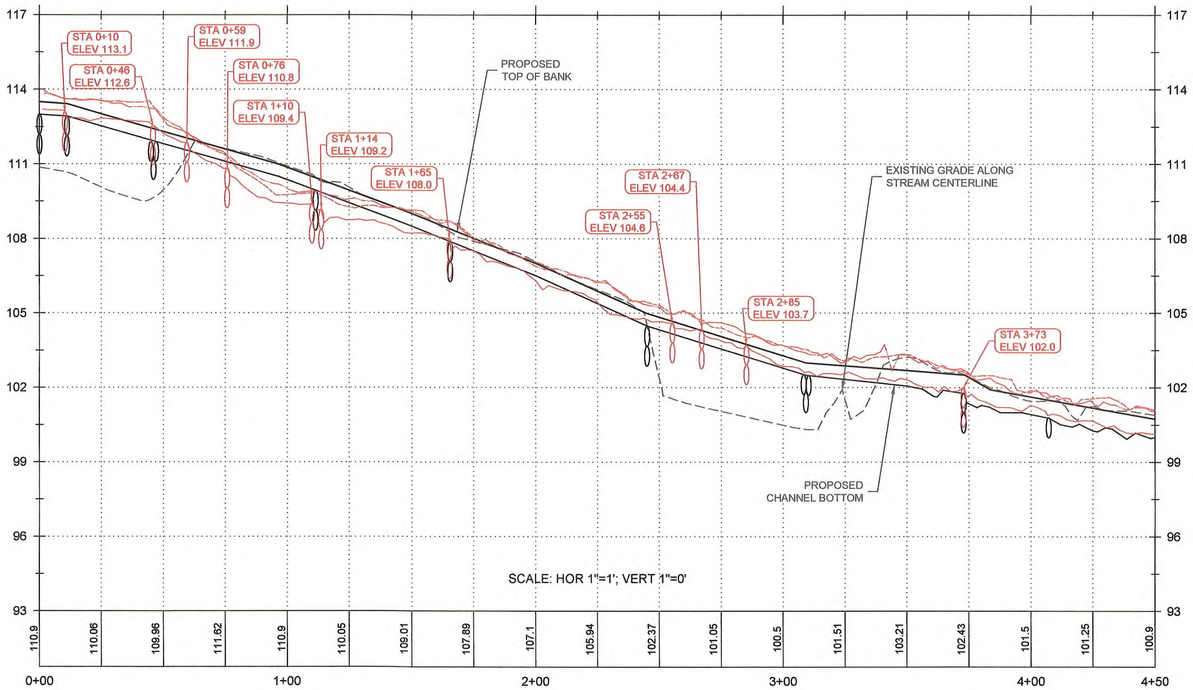
PROJ. DATE:	NOV 2014
Q.C.:	FM
Q.C. DATE:	JAN 2016

DRAWING NUMBER:
12

PROJ. NO.:
2013000100RA

FILE NAME: I:\Projects\EBX\2013000100RA - Cedar Creek Stream and Wetland Mitigation Site\CADD\Record Drawings\2013000100_RECORD_DRAWINGS_UT-1.dwg - January 6, 2016 - Frasier Mullen





LEGEND

- AS-BUILT CONTOUR MAJOR — 50
- AS-BUILT CONTOUR MINOR — 46
- AS-BUILT CHANNEL LIMITS
- AS-BUILT IN-STREAM STRUCTURE
- AS-BUILT STONE
- EXISTING TOP OF BANK — TB
- EXISTING BOTTOM OF BANK
- EXISTING (ORIGINAL) CHANNEL FOOTPRINT
- PROPOSED CHANNEL CENTERLINE
- PROPOSED TOP OF BANK
- LIMITS OF PROPOSED CONSERVATION EASEMENT — LCE — LCE
- LOG TOE PROTECTION (PROPOSED)
- LOG STRUCTURE (PROPOSED)
- LOG GRADE CONTROL STRUCTURE (PROPOSED)
- DOUBLE LOG DROP (PROPOSED)
- PROPOSED FILL AREA
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- PROPOSED LOG STRUCTURE (PROFILE)
- PROPOSED DOUBLE LOG DROP (PROFILE)
- PROPOSED BEDDED LOG STRUCTURE (PROFILE)
- AS-BUILT CHANNEL CENTERLINE (PROFILE)
- AS-BUILT LEFT TOP OF BANK (PROFILE)
- AS-BUILT RIGHT TOP OF BANK (PROFILE)
- AS-BUILT STRUCTURE (PROFILE)

STRUCTURE TABLE

STRUCTURE	FROM		TO		BANK*
	STA	ELEV	STA	ELEV	
LOG STRUCTURE	0+00	113.00	----	----	----
LOG STRUCTURE	0+11	112.90	----	----	----
LOG GRADE CONTROL	0+46	112.50	----	----	----
LOG STRUCTURE	1+11	109.90	----	----	----
LOG STRUCTURE	1+66	107.90	----	----	----
LOG STRUCTURE	2+45	104.50	----	----	----
LOG GRADE CONTROL	3+09	102.50	----	----	----
LOG TOE	3+49	102.00	3+56	102.0	R
LOG STRUCTURE	3+73	101.80	----	----	----
BEDDED LOG STRUCTURE	4+07	100.80	----	----	----
LOG TOE	4+30	100.40	4+37	100.40	R

* RIGHT (R) AND LEFT (L) BANK LOCATIONS ARE REFERENCED LOOKING DOWNSTREAM

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NC. LICENSE NO. F-0374

NORTH CAROLINA PROFESSIONAL SEAL 031435 ENGINEER AMY F. MULLEN

FULL SCALE: 1"=30
0 30 60
2" = FULL SCALE
1" = HALF SCALE

MARK	DATE	DESCRIPTION
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REVISIONS:
RELEASED FOR:
RECORD DRAWINGS

PLOT DATE: 1/6/2016

PROJECT NAME:
CEDAR CREEK STREAM & WETLAND RESTORATION PROJECT
RECORD DRAWINGS
RESOURCE ENVIRONMENTAL SOLUTIONS, LLC

DRAWING TITLE:
REACH UT-2 PLAN & PROFILE

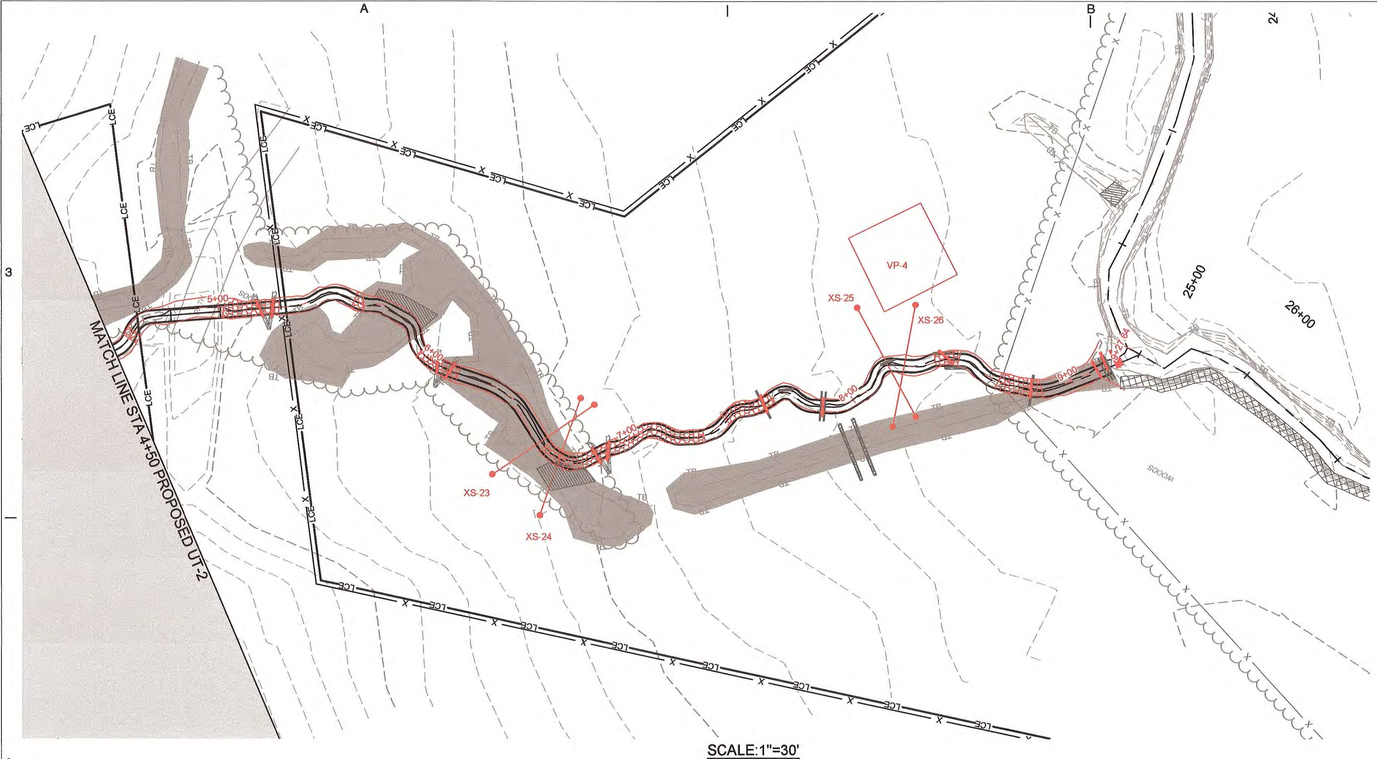
OWNER / 24 HR CONTACT:
ADDRESS:
PHONE:
MOBILE:

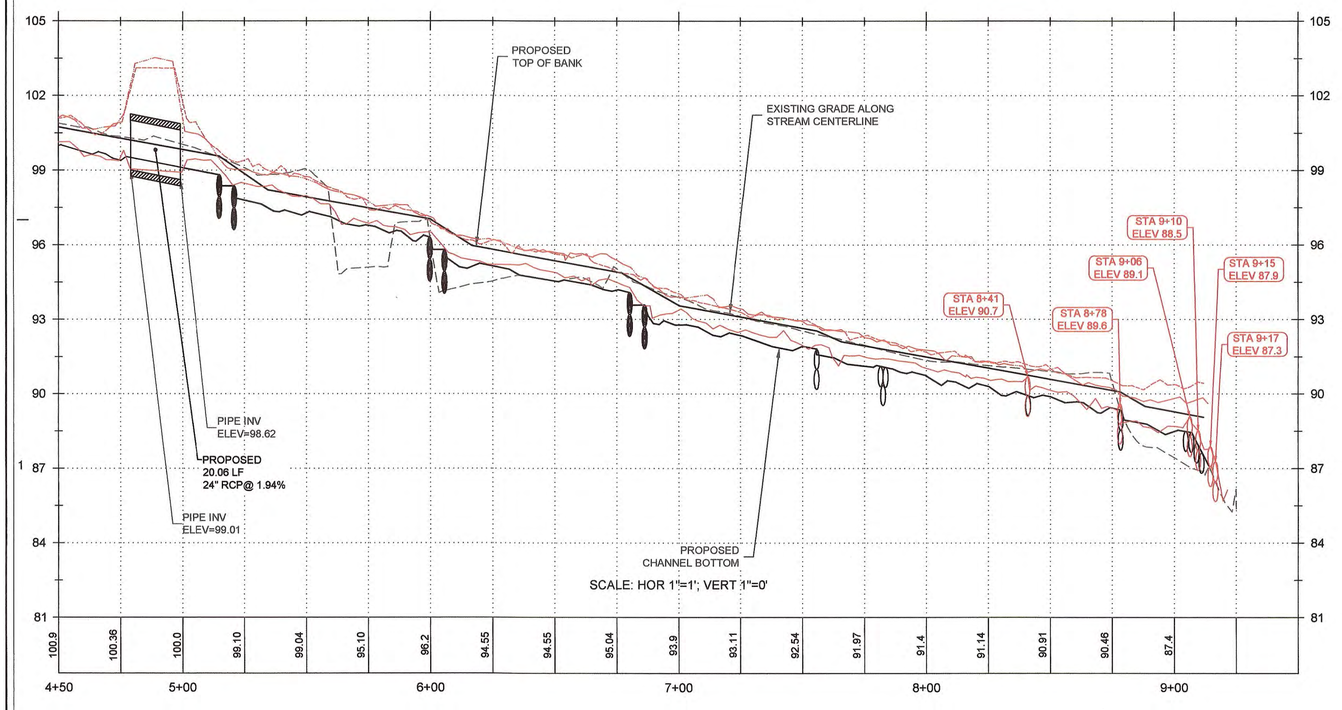
PROJ. DATE: NOV 2014
Q.C.: FM
Q.C. DATE: JAN 2016

DRAWING NUMBER:
13

PROJ. NO.:
2013000100RA

FILE NAME: I:\Projects\EBX\2013000100RA - Cedar Creek Stream and Wetland Mitigation Site\CADD\Record Drawings\2013000100_RECORD_DRAWINGS_UT-2.dwg - January 6, 2016 - Frasier Mullen





LEGEND

- AS-BUILT CONTOUR MAJOR
- AS-BUILT CONTOUR MINOR
- AS-BUILT CHANNEL LIMITS
- AS-BUILT IN-STREAM STRUCTURE
- AS-BUILT STONE
- EXISTING TOP OF BANK
- EXISTING BOTTOM OF BANK
- EXISTING (ORIGINAL) CHANNEL FOOTPRINT
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- FLOODPLAIN SILL (PROPOSED)
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- PROPOSED LOG GRADE CONTROL (PROFILE)
- PROPOSED LOG STRUCTURE (PROFILE)
- PROPOSED DOUBLE LOG DROP (PROFILE)
- PROPOSED BEDDED LOG STRUCTURE (PROFILE)
- AS-BUILT CHANNEL CENTERLINE (PROFILE)
- AS-BUILT LEFT TOP OF BANK (PROFILE)
- AS-BUILT RIGHT TOP OF BANK (PROFILE)
- AS-BUILT STRUCTURE (PROFILE)

STRUCTURE TABLE

STRUCTURE	FROM		TO		BANK*
	STA	ELEV	STA	ELEV	
DOUBLE LOG DROP	5+15	98.82	5+21	98.37	----
DOUBLE LOG DROP	6+00	96.30	6+06	95.80	----
LOG TOE	6+63	94.42	6+70	94.42	R
DOUBLE LOG DROP	6+80	94.08	6+86	93.58	----
LOG STRUCTURE	7+55	91.81	----	----	----
LOG TOE	7+65	91.25	7+71	91.25	L
LOG GRADE CONTROL	7+83	91.10	----	----	----
LOG TOE	8+13	90.40	8+20	90.40	L
BEDDED LOG STRUCTURE	8+41	89.93	----	----	----
LOG STRUCTURE	8+78	89.34	----	----	----
LOG OUTLET STRUCTURE	9+07	88.45	----	----	----

* RIGHT (R) AND LEFT (L) BANK LOCATIONS ARE REFERENCED LOOKING DOWNSTREAM

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NC. LICENSE NO. F-0274

NORTH CAROLINA PROFESSIONAL SEAL 031436 ENGINEER ANN F. MULLEN 10/1/16

FULL SCALE: 1"=30
0 30 60
2" = FULL SCALE
1" = HALF SCALE

MARK	DATE	DESCRIPTION
---	---	---

REVISIONS:

PLOT DATE: 1/6/2016

RELEASED FOR: RECORD DRAWINGS

PROJECT NAME: CEDAR CREEK STREAM & WETLAND RESTORATION PROJECT
RECORD DRAWINGS
RESOURCE ENVIRONMENTAL SOLUTIONS, LLC

DRAWING TITLE: REACH UT-2 PLAN & PROFILE

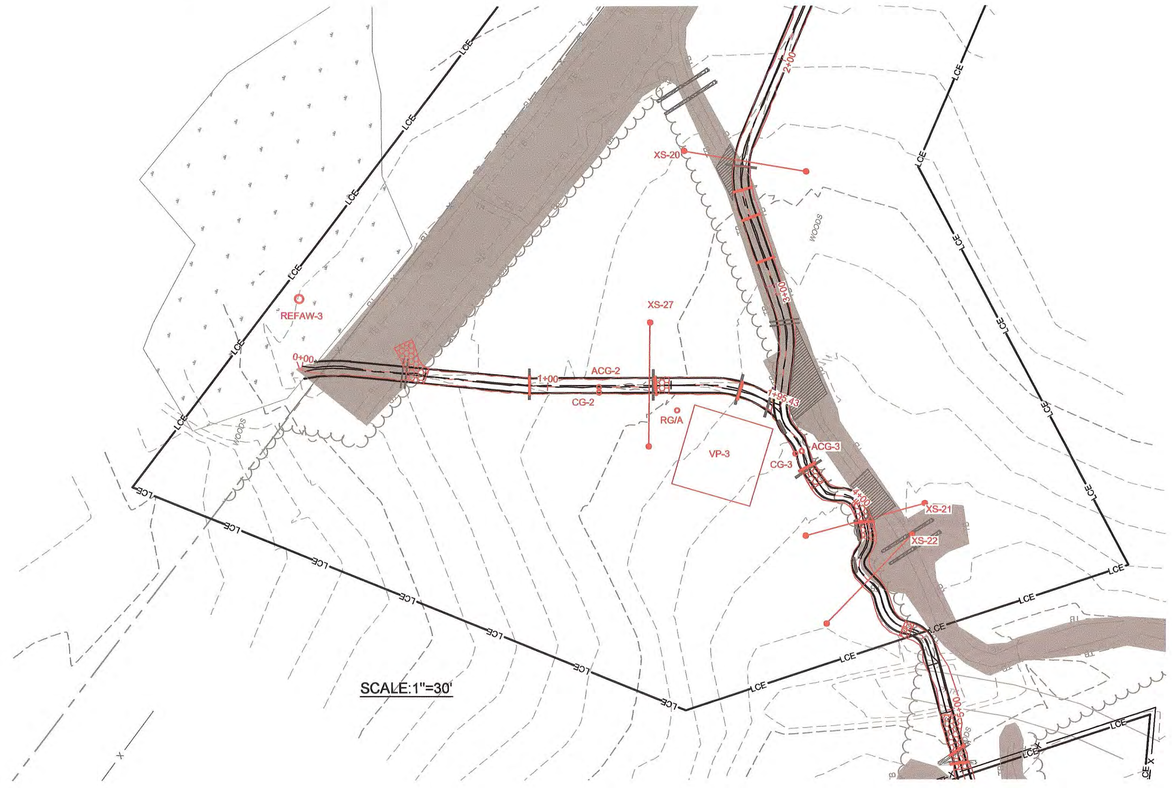
OWNER / 24 HR CONTACT:
ADDRESS:
PHONE:
MOBILE:

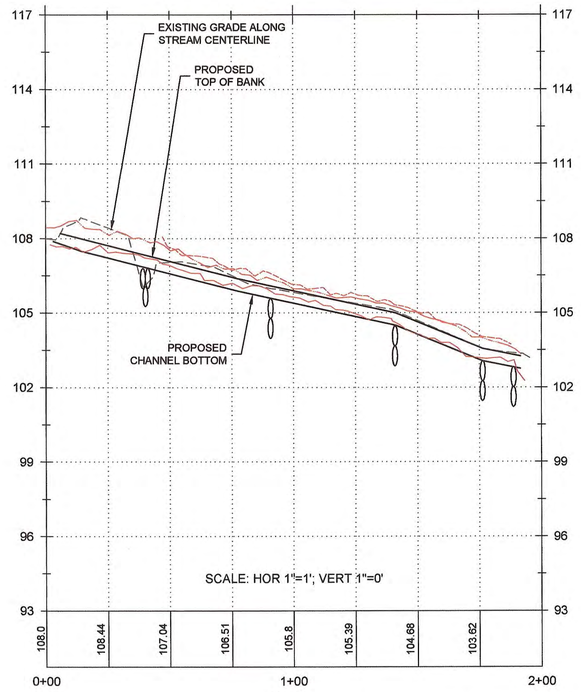
PROJ. DATE: NOV 2014
Q.C.: FM
Q.C. DATE: JAN 2016

DRAWING NUMBER: 14

PROJ. NO.: 2013000100RA

FILE NAME: I:\Projects\EBX\2013000100RA - Cedar Creek Stream and Wetland Mitigation Site\CADD\Record Drawings\2013000100_RECORD_DRAWINGS_UT-2.dwg - January 6, 2016 - Frasier Mullen





LEGEND

- AS-BUILT CONTOUR MAJOR
- AS-BUILT CONTOUR MINOR
- AS-BUILT CHANNEL LIMITS
- AS-BUILT IN-STREAM STRUCTURE
- AS-BUILT STONE
- EXISTING TOP OF BANK
- EXISTING BOTTOM OF BANK
- EXISTING (ORIGINAL) CHANNEL FOOTPRINT
- PROPOSED CHANNEL CENTERLINE
- PROPOSED TOP OF BANK
- LIMITS OF PROPOSED CONSERVATION EASEMENT
- LOG TOE PROTECTION (PROPOSED)
- LOG STRUCTURE (PROPOSED)
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- DOUBLE LOG DROP (PROPOSED)
- PROPOSED FILL AREA
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- LOG OUTLET STRUCTURE (PROPOSED)
- BEDDED LOG STRUCTURE (PROPOSED)
- FLOODPLAIN SILL (PROPOSED)
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- PROPOSED LOG GRADE CONTROL (PROFILE)
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- PROPOSED DOUBLE LOG DROP (PROFILE)
- PROPOSED BEDDED LOG STRUCTURE (PROFILE)
- AS-BUILT CHANNEL CENTERLINE (PROFILE)
- AS-BUILT LEFT TOP OF BANK (PROFILE)
- AS-BUILT RIGHT TOP OF BANK (PROFILE)
- AS-BUILT STRUCTURE (PROFILE)

STRUCTURE TABLE

STRUCTURE	FROM STA	FROM ELEV	TO STA	TO ELEV	BANK*
LOG GRADE CONTROL	0+40	106.84	----	----	----
LOG STRUCTURE	0+91	105.60	----	----	----
LOG STRUCTURE	1+41	104.50	----	----	----
LOG STRUCTURE	1+76	103.06	----	----	----
LOG STRUCTURE	1+89	102.82	----	----	----

* RIGHT (R) AND LEFT (L) BANK LOCATIONS ARE REFERENCED LOOKING DOWNSTREAM

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NC. LICENSE NO. F-0374

NORTH CAROLINA PROFESSIONAL SEAL 031435 ENGINEER ANN F. MULLEN 10/16

FULL SCALE: 1"=30
0 30 60
2" = FULL SCALE
1" = HALF SCALE

MARK	DATE	DESCRIPTION
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REVISIONS:
RELEASED FOR: RECORD DRAWINGS
PLOT DATE: 1/8/2016

PROJECT NAME:
CEDAR CREEK STREAM & WETLAND RESTORATION PROJECT
RECORD DRAWINGS
RESOURCE ENVIRONMENTAL SOLUTIONS, LLC

DRAWING TITLE:
REACH UT-2C PLAN & PROFILE

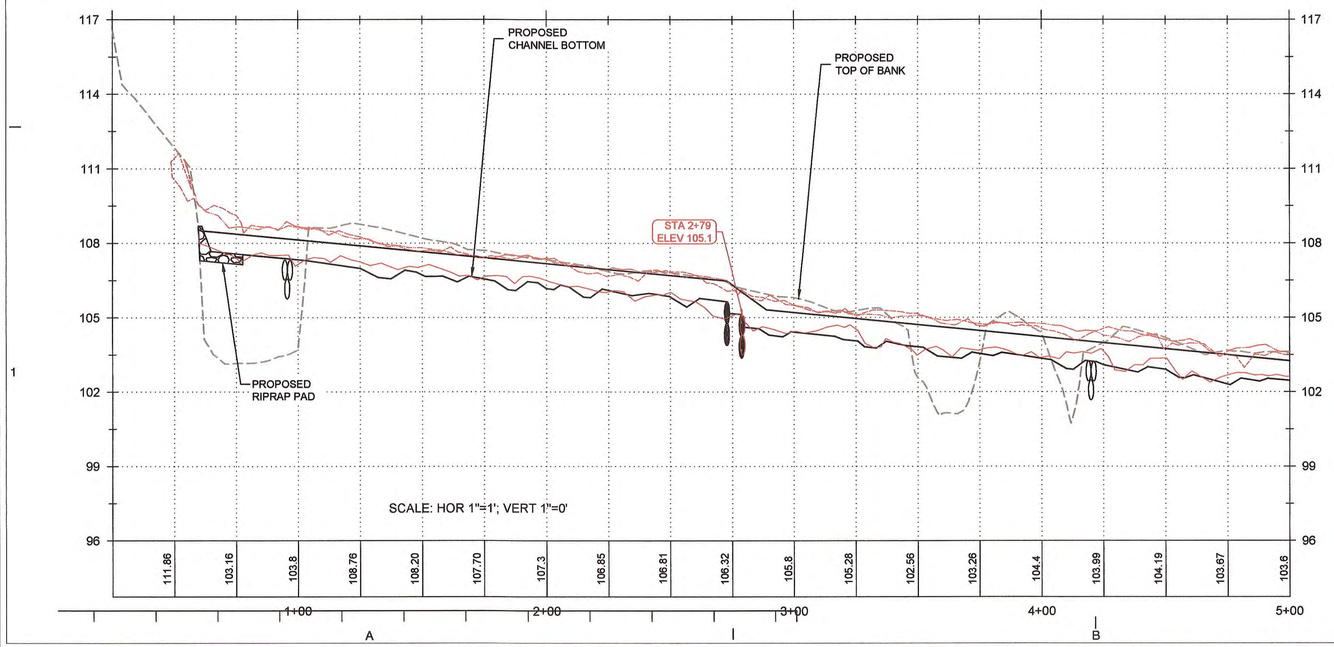
OWNER / 24 HR CONTACT:
ADDRESS:
PHONE:
MOBILE:

PROJ. DATE: NOV 2014
Q.C.: FM
Q.C. DATE: JAN 2016

DRAWING NUMBER:
15

PROJ. NO.:
2013000100RA

FILE NAME: I:\Projects\EBX\2013000100RA - Cedar Creek Stream and Wetland Mitigation Site\CADD\Record Drawings\2013000100_RECORD_DRAWINGS_UT-2.dwg - January 6, 2016 - Frasier Mullen



LEGEND

- AS-BUILT CONTOUR MAJOR
- AS-BUILT CONTOUR MINOR
- AS-BUILT CHANNEL LIMITS
- AS-BUILT IN-STREAM STRUCTURE
- AS-BUILT STONE
- EXISTING TOP OF BANK
- EXISTING BOTTOM OF BANK
- EXISTING (ORIGINAL) CHANNEL FOOTPRINT
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- AS-BUILT CHANNEL CENTERLINE (PROFILE)
- AS-BUILT LEFT TOP OF BANK (PROFILE)
- AS-BUILT RIGHT TOP OF BANK (PROFILE)
- AS-BUILT STRUCTURE (PROFILE)

STRUCTURE TABLE

STRUCTURE	FROM		TO		BANK*
	STA	ELEV	STA	ELEV	
LOG GRADE CONTROL	0+96	107.37	----	----	----
LOG TOE	1+62	106.50	1+69	106.50	L
LOG TOE	2+27	106.00	2+34	106.00	R
LOG TOE	2+62	105.80	2+69	105.80	L
DOUBLE LOG DROP	2+73	105.64	2+79	105.14	----
LOG TOE	3+27	103.91	3+34	103.91	L
LOG GRADE CONTROL	4+20	103.23	----	----	----
LOG TOE	4+73	102.37	4+80	102.37	R

* RIGHT (R) AND LEFT (L) BANK LOCATIONS ARE REFERENCED LOOKING DOWNSTREAM

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www.wkdickson.com
NC. LICENSE NO. F-0374

NORTH CAROLINA PROFESSIONAL SEAL 031439 ENGINEER ANN F. MULLEN 1/6/16

FULL SCALE: 1"=30'
0 30 60
2" = FULL SCALE
1" = HALF SCALE

MARK	DATE	DESCRIPTION
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REVISIONS:
RELEASED FOR: RECORD DRAWINGS
PLOT DATE: 1/6/2016

PROJECT NAME:
CEDAR CREEK STREAM & WETLAND RESTORATION PROJECT
RECORD DRAWINGS
RESOURCE ENVIRONMENTAL SOLUTIONS, LLC

DRAWING TITLE: REACH UT-3 PLAN & PROFILE

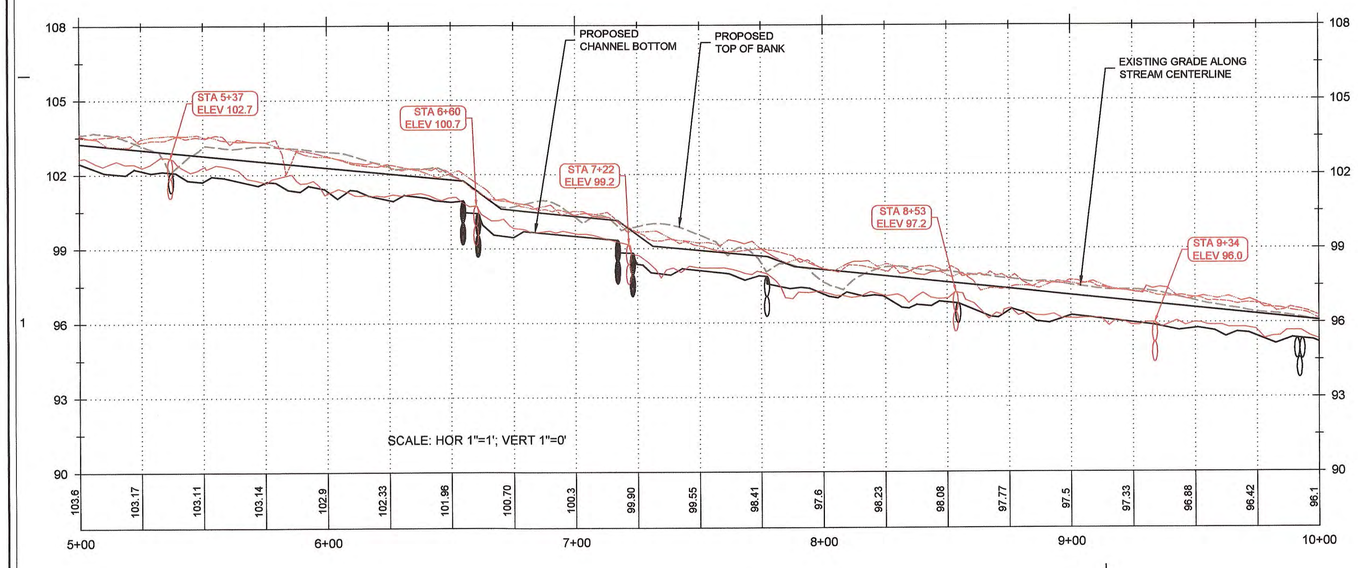
OWNER / 24 HR CONTACT:
ADDRESS:
PHONE:
MOBILE:

PROJ. DATE: NOV 2014
Q.C.: FM
Q.C. DATE: JAN 2016

DRAWING NUMBER: 16

PROJ. NO.: 2013000100RA

FILE NAME: I:\Projects\EBX\2013000100RA - Cedar Creek Stream and Wetland Mitigation Site\CADD\Record Drawings\2013000100_RECORD_DRAWINGS_UT-3.dwg - January 6, 2016 - Frasier Mullen



LEGEND

- AS-BUILT CONTOUR MAJOR
- AS-BUILT CONTOUR MINOR
- AS-BUILT CHANNEL LIMITS
- AS-BUILT IN-STREAM STRUCTURE
- AS-BUILT STONE
- EXISTING TOP OF BANK
- EXISTING BOTTOM OF BANK
- EXISTING (ORIGINAL) CHANNEL FOOTPRINT
- PROPOSED CHANNEL CENTERLINE
- PROPOSED TOP OF BANK
- LIMITS OF PROPOSED CONSERVATION EASEMENT
- LOG TOE PROTECTION (PROPOSED)
- LOG STRUCTURE (PROPOSED)
- LOG GRADE CONTROL STRUCTURE (PROPOSED)
- DOUBLE LOG DROP (PROPOSED)
- PROPOSED FILL AREA
- PROPOSED WETLAND
- PROPOSED CHANNEL PLUG
- PROPOSED CHANNEL PLUG W/ OVERFLOW SPILLWAY
- LOG OUTLET STRUCTURE (PROPOSED)
- BEDDED LOG STRUCTURE (PROPOSED)
- FLOODPLAIN SILL (PROPOSED)
- DIFFUSE FLOW STRUCTURE (PROPOSED)
- PROPOSED LOG GRADE CONTROL (PROFILE)
- PROPOSED LOG STRUCTURE (PROFILE)
- PROPOSED DOUBLE LOG DROP (PROFILE)
- PROPOSED BEDDED LOG STRUCTURE (PROFILE)
- AS-BUILT CHANNEL CENTERLINE (PROFILE)
- AS-BUILT LEFT TOP OF BANK (PROFILE)
- AS-BUILT RIGHT TOP OF BANK (PROFILE)
- AS-BUILT STRUCTURE (PROFILE)

STRUCTURE TABLE

STRUCTURE	FROM		TO		BANK*
	STA	ELEV	STA	ELEV	
BEDDED LOG STRUCTURE	5+37	102.00	-----	-----	-----
LOG TOE	6+12	101.36	6+19	101.36	R
DOUBLE LOG DROP	6+54	100.94	6+60	100.43	-----
DOUBLE LOG DROP	7+17	99.34	7+23	98.82	-----
LOG STRUCTURE	7+77	97.86	-----	-----	-----
LOG TOE	7+84	97.42	7+91	97.42	L
BEDDED LOG STRUCTURE	8+54	96.78	-----	-----	-----
LOG TOE	9+27	96.00	9+41	96.00	R
LOG TOE	9+70	95.60	9+77	95.60	R
LOG GRADE CONTROL	9+92	95.36	-----	-----	-----

* RIGHT (R) AND LEFT (L) BANK LOCATIONS ARE REFERENCED LOOKING DOWNSTREAM

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www.wkdickson.com
NC. LICENSE NO. F-0374

NORTH CAROLINA PROFESSIONAL SEAL 031435 ENGINEER ANN F. MULLEN
1/6/16

FULL SCALE: 1"=30
0 30 60
2" = FULL SCALE
1" = HALF SCALE

PLOT DATE: 1/6/2016

MARK	DATE	DESCRIPTION
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----	----	----

REVISIONS:
RELEASED FOR: RECORD DRAWINGS

PROJECT NAME: CEDAR CREEK STREAM & WETLAND RESTORATION PROJECT RECORD DRAWINGS RESOURCE ENVIRONMENTAL SOLUTIONS, LLC

DRAWING TITLE: REACH UT-3 PLAN & PROFILE

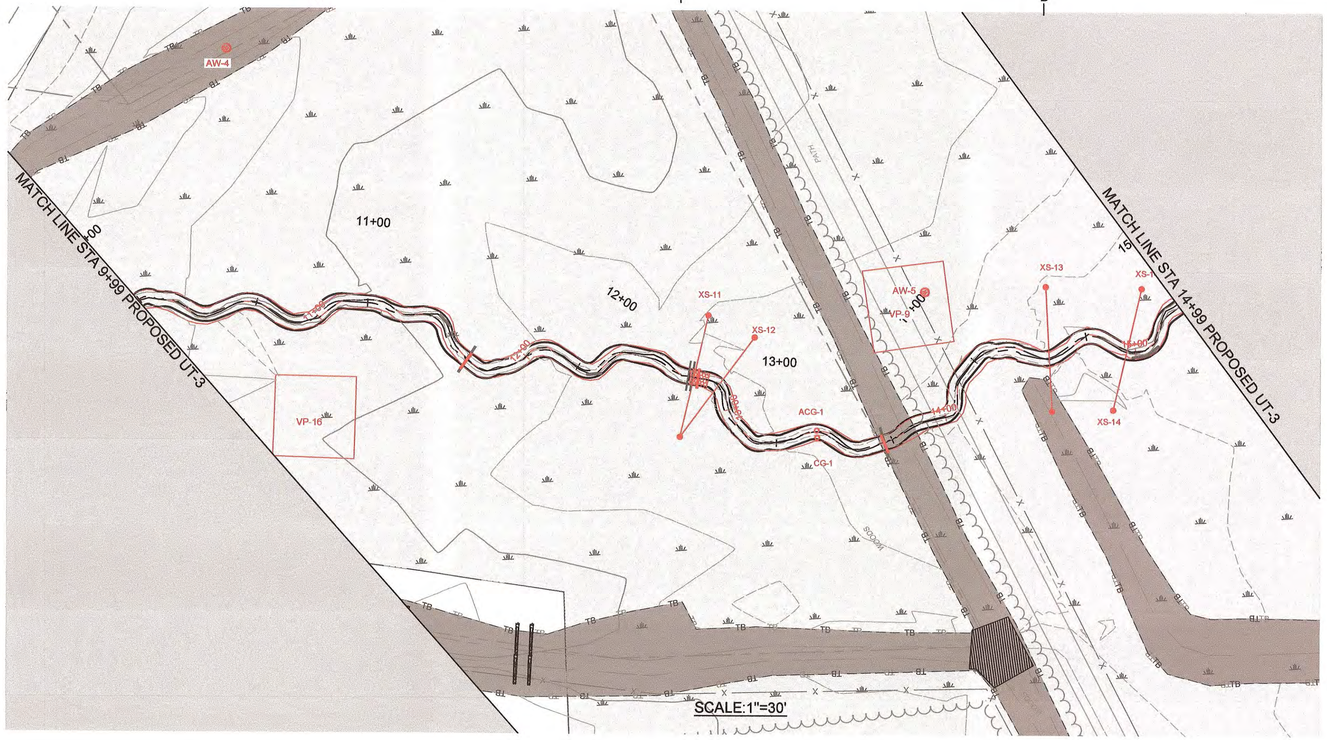
OWNER / 24 HR CONTACT:
ADDRESS:
PHONE:
MOBILE:

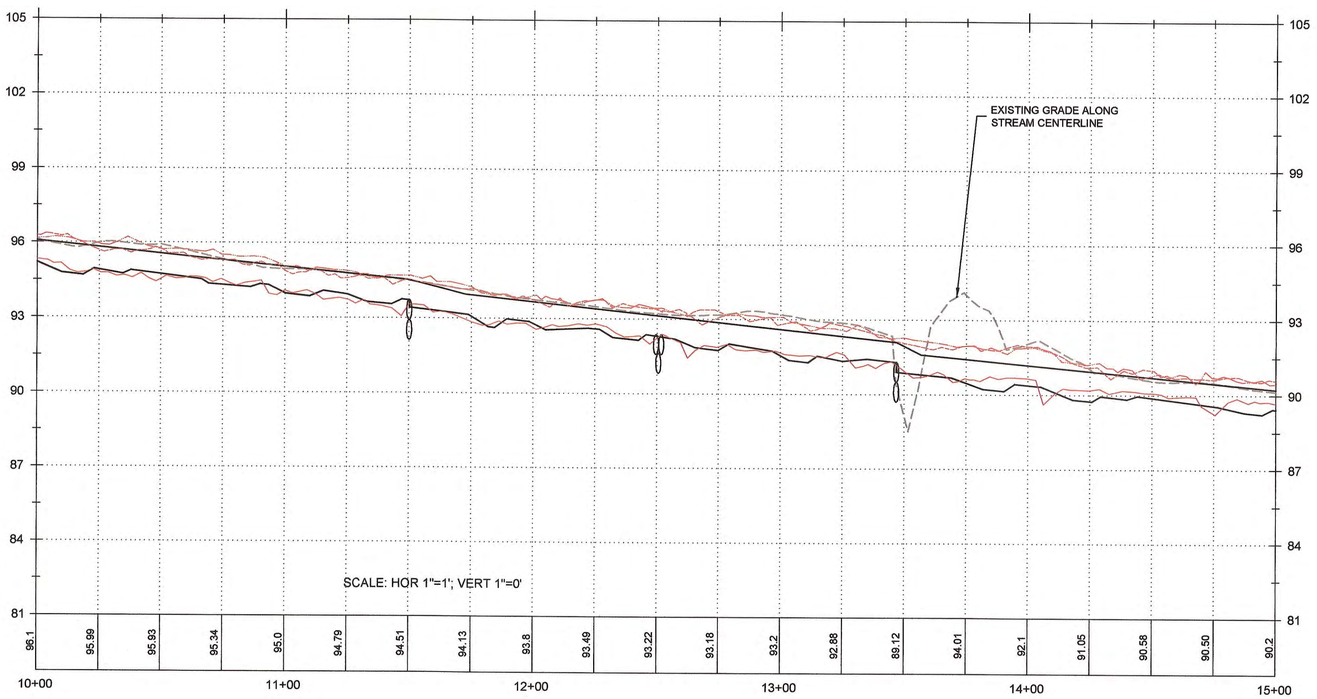
PROJ. DATE: NOV 2014
Q.C.: FM
Q.C. DATE: JAN 2016

DRAWING NUMBER: 17

PROJ. NO.: 2013000100RA

FILE NAME: I:\Projects\EBX\2013000100RA - Cedar Creek Stream and Wetland Mitigation Site\CADD\Record Drawings\2013000100_RECORD_DRAWINGS_UT-3.dwg - January 6, 2016 - Frasier Mullen





LEGEND

- AS-BUILT CONTOUR MAJOR — 50 —
- AS-BUILT CONTOUR MINOR — 46 —
- AS-BUILT CHANNEL LIMITS
- AS-BUILT IN-STREAM STRUCTURE
- AS-BUILT STONE
- EXISTING TOP OF BANK — TB —
- EXISTING BOTTOM OF BANK
- EXISTING (ORIGINAL) CHANNEL FOOTPRINT
- PROPOSED CHANNEL CENTERLINE
- PROPOSED TOP OF BANK
- LIMITS OF PROPOSED CONSERVATION EASEMENT — LOE —
- LOG TOE PROTECTION (PROPOSED)
- LOG STRUCTURE (PROPOSED)
- LOG GRADE CONTROL STRUCTURE (PROPOSED)
- DOUBLE LOG DROP (PROPOSED)
- PROPOSED FILL AREA
- PROPOSED WETLAND
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- PROPOSED CHANNEL PLUG W/ OVERFLOW SPILLWAY
- LOG OUTLET STRUCTURE (PROPOSED)
- BEDDED LOG STRUCTURE (PROPOSED)
- FLOODPLAIN SILL (PROPOSED)
- DIFFUSE FLOW STRUCTURE (PROPOSED)
- PROPOSED LOG GRADE CONTROL (PROFILE)
- PROPOSED LOG STRUCTURE (PROFILE)
- PROPOSED DOUBLE LOG DROP (PROFILE)
- PROPOSED BEDDED LOG STRUCTURE (PROFILE)
- AS-BUILT CHANNEL CENTERLINE (PROFILE)
- AS-BUILT LEFT TOP OF BANK (PROFILE)
- AS-BUILT RIGHT TOP OF BANK (PROFILE)
- AS-BUILT STRUCTURE (PROFILE)

STRUCTURE TABLE					
STRUCTURE	FROM		TO		BANK*
	STA	ELEV	STA	ELEV	
LOG TOE	11+25	93.95	11+32	93.95	L
LOG STRUCTURE	11+50	93.72	---	---	---
LOG TOE	12+05	92.55	12+12	92.55	R
LOG GRADE CONTROL	12+50	92.30	---	---	---
LOG STRUCTURE	13+46	91.30	---	---	---
LOG TOE	14+69	89.65	14+83	89.65	R

* RIGHT (R) AND LEFT (L) BANK LOCATIONS ARE REFERENCED LOOKING DOWNSTREAM

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NC. LICENSE NO. F-0374

NORTH CAROLINA PROFESSIONAL SEAL 031435 ENGINEER FRANK F. MULLEN 1/6/16

FULL SCALE: 1"=30
0 30 60
2" = FULL SCALE
1" = HALF SCALE

PLOT DATE: 1/6/2016

MARK	DATE	DESCRIPTION
---	---	---

REVISIONS:

RELEASED FOR: RECORD DRAWINGS

PROJECT NAME:
CEDAR CREEK STREAM & WETLAND RESTORATION PROJECT
RECORD DRAWINGS
RESOURCE ENVIRONMENTAL SOLUTIONS, LLC

DRAWING TITLE: REACH UT-3 PLAN & PROFILE

OWNER / 24 HR CONTACT:
ADDRESS:
PHONE:
MOBILE:

PROJ. DATE: NOV 2014
Q.C.: FM
Q.C. DATE: JAN 2016

DRAWING NUMBER: 18

PROJ. NO.: 2013000100RA

FILE NAME: I:\Projects\EBX\2013000100RA - Cedar Creek Stream and Wetland Mitigation Site\CADD\Record Drawings\2013000100_RECORD_DRAWINGS_UT-3.dwg - January 6, 2016 - Frasier Mullen

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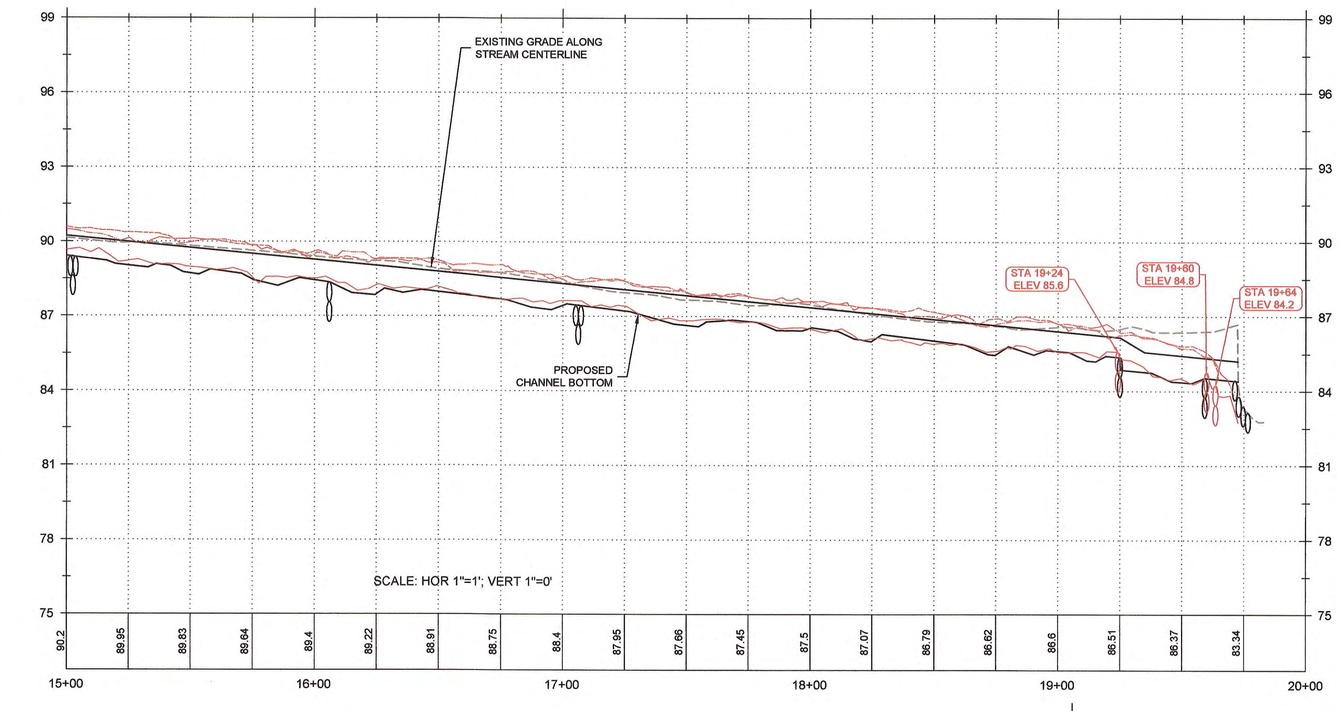

LEGEND

- AS-BUILT CONTOUR MAJOR
- AS-BUILT CONTOUR MINOR
- AS-BUILT CHANNEL LIMITS
- AS-BUILT IN-STREAM STRUCTURE
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- AS-BUILT RIGHT TOP OF BANK (PROFILE)
- AS-BUILT STRUCTURE (PROFILE)

STRUCTURE TABLE

STRUCTURE	FROM		TO		BANK*
	STA	ELEV	STA	ELEV	
LOG GRADE CONTROL	15+02	89.40	----	----	----
LOG STRUCTURE	16+06	88.35	----	----	----
LOG TOE	16+77	87.67	16+84	87.67	R
LOG GRADE CONTROL	17+06	87.45	----	----	----
LOG TOE	17+91	86.45	17+98	86.45	R
LOG STRUCTURE	19+25	85.37	----	----	----
LOG STRUCTURE	19+59	84.50	----	----	----
LOG OUTLET STRUCTURE	19+72	84.41	----	----	----

* RIGHT (R) AND LEFT (L) BANK LOCATIONS ARE REFERENCED LOOKING DOWNSTREAM

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NORTH CAROLINA PROFESSIONAL SEAL 031435 ENGINEER ANN F. MULLEN
1/6/16

FULL SCALE: 1"=30
0 30 60
2" = FULL SCALE
1" = HALF SCALE

PLOT DATE: 1/6/2016

MARK	DATE	DESCRIPTION
----	----	----

REVISIONS:

RELEASED FOR:
RECORD DRAWINGS

PROJECT NAME:
CEDAR CREEK STREAM & WETLAND RESTORATION PROJECT
RECORD DRAWINGS
RESOURCE ENVIRONMENTAL SOLUTIONS, LLC

DRAWING TITLE:
REACH UT-3 PLAN & PROFILE

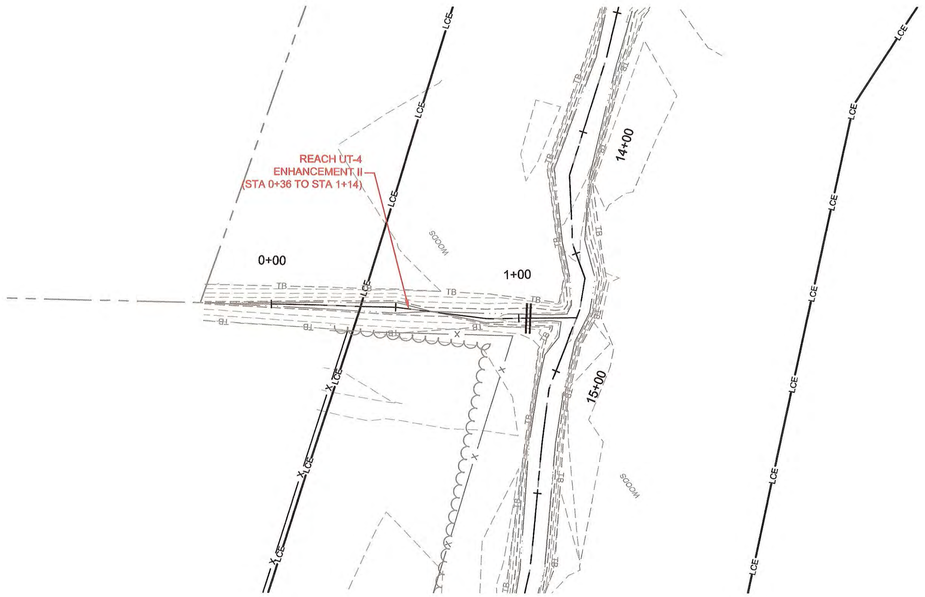
OWNER / 24 HR CONTACT:
ADDRESS:
PHONE:
MOBILE:

PROJ. DATE: NOV 2014
Q.C.: FM
Q.C. DATE: JAN 2016

DRAWING NUMBER:
19

PROJ. NO.:
2013000100RA

FILE NAME: I:\Projects\EBX\2013000100RA - Cedar Creek Stream and Wetland Mitigation Site\CADD\Record Drawings\2013000100_RECORD_DRAWINGS_UT-3.dwg - January 6, 2016 - Frasier Mullen



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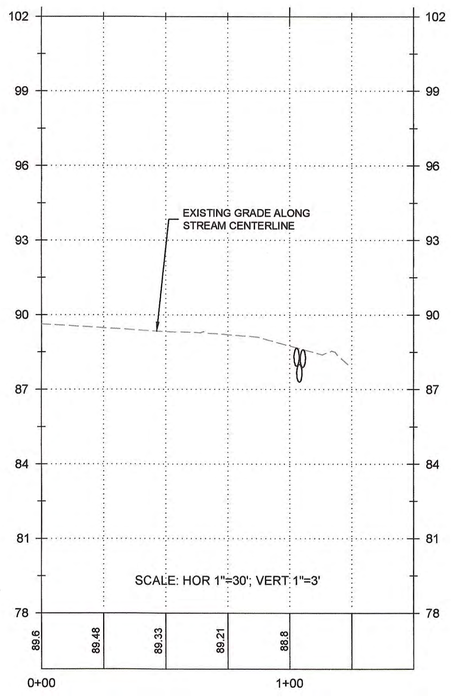

LEGEND

- AS-BUILT CONTOUR MAJOR
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- AS-BUILT RIGHT TOP OF BANK (PROFILE)
- AS-BUILT STRUCTURE (PROFILE)

STRUCTURE TABLE

STRUCTURE	FROM		TO		BANK*
	STA	ELEV	STA	ELEV	
LOG GRADE CONTROL	1+04	88.65	----	----	----

* RIGHT (R) AND LEFT (L) BANK LOCATIONS ARE REFERENCED LOOKING DOWNSTREAM

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NC. LICENSE NO. F-0374

NORTH CAROLINA PROFESSIONAL SEAL 031435 ENGINEER FRANK F. MULLEN 1/6/16

FULL SCALE: 1"=30
0 30 60
2" = FULL SCALE
1" = HALF SCALE

PLOT DATE: 1/6/2016

MARK	DATE	DESCRIPTION
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REVISIONS:

RELEASED FOR: RECORD DRAWINGS

PROJECT NAME:
CEDAR CREEK STREAM & WETLAND RESTORATION PROJECT
RECORD DRAWINGS
RESOURCE ENVIRONMENTAL SOLUTIONS, LLC

DRAWING TITLE:
REACH UT-4 PLAN & PROFILE

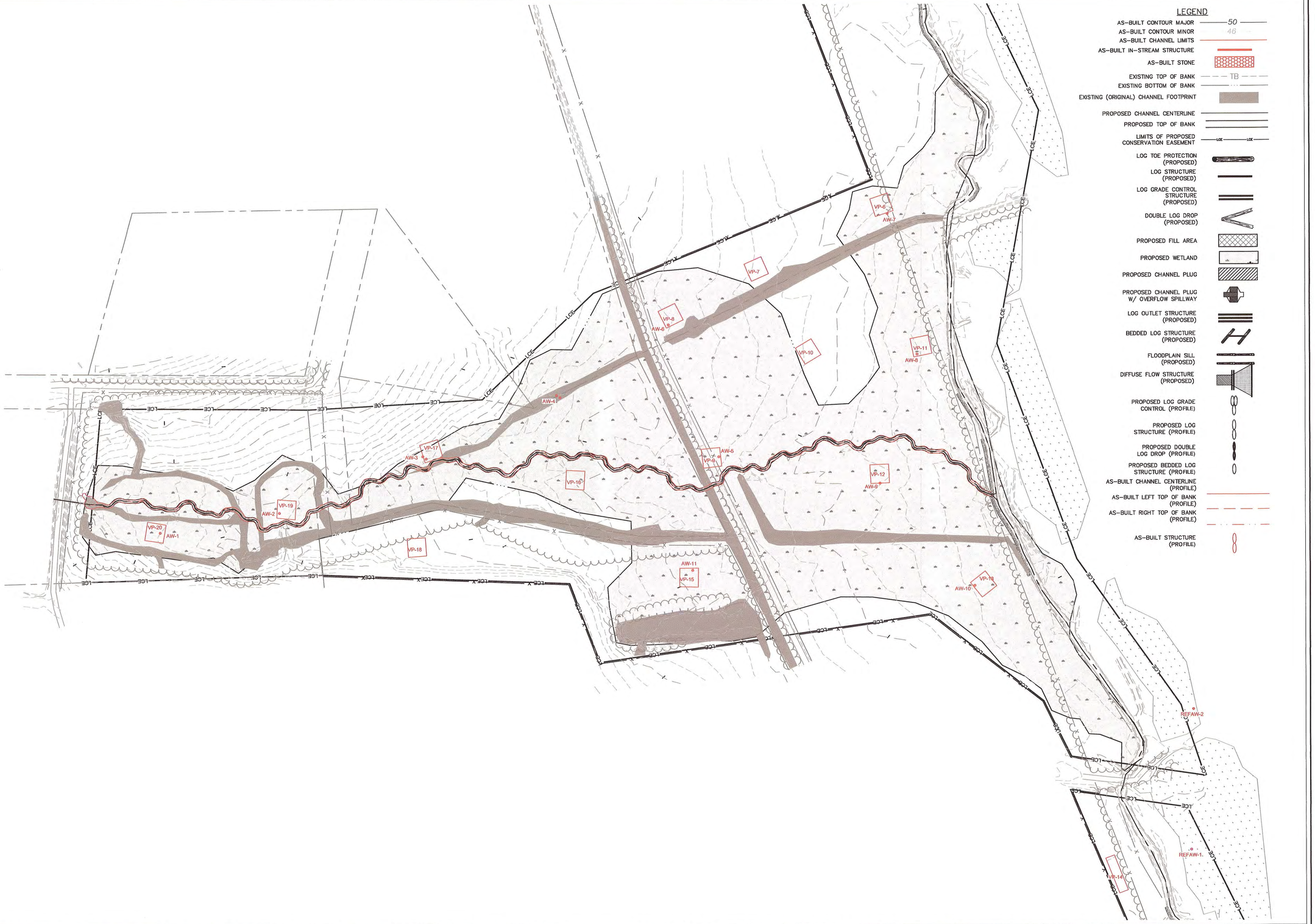
OWNER / 24 HR CONTACT:
ADDRESS:
PHONE:
MOBILE:

PROJ. DATE: NOV 2014
Q.C.: FM
Q.C. DATE: JAN 2016

DRAWING NUMBER:
20

PROJ. NO.:
2013000100RA

FILE NAME: I:\Projects\EBX\2013000100RA - Cedar Creek Stream and Wetland Mitigation Site\CADD\Record Drawings\2013000100_RECORD_DRAWINGS_UT-1.dwg - January 6, 2016 - Frasier Mullen



LEGEND

- AS-BUILT CONTOUR MAJOR
- AS-BUILT CONTOUR MINOR
- AS-BUILT CHANNEL LIMITS
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- AS-BUILT LEFT TOP OF BANK (PROFILE)
- AS-BUILT RIGHT TOP OF BANK (PROFILE)
- AS-BUILT STRUCTURE (PROFILE)

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NORTH CAROLINA PROFESSIONAL SEAL 031439 ENGINEER ANN F. MULLEN 1/6/16

FULL SCALE: 1"=80
0 80 160
2" = FULL SCALE
1" = HALF SCALE

PLOT DATE: 1/6/2016

MARK	DATE	DESCRIPTION
---	---	---

REVISIONS:

RELEASED FOR: RECORD DRAWINGS

PROJECT NAME: CEDAR CREEK STREAM & WETLAND RESTORATION PROJECT
RECORD DRAWINGS
RESOURCE ENVIRONMENTAL SOLUTIONS, LLC

DRAWING TITLE: WETLAND

OWNER / 24 HR CONTACT:
ADDRESS:
PHONE:
MOBILE:

PROJ. DATE:	NOV 2014
Q.C.:	FM
Q.C. DATE:	JAN 2016

DRAWING NUMBER: 21

PROJ. NO.: 2013000100RA

FILE NAME: I:\Projects\EBX\2013000100RA - Cedar Creek Stream and Wetland Mitigation Site\CADD\Record Drawings\2013000100_RECORD_DRAWINGS_WETLANDS.dwg - January 6, 2016 - Frasier Mullen