BASELINE MONITORING DOCUMENT AND AS-BUILT BASELINE REPORT

Final

HOPEWELL STREAM MITIGATION SITE

Randolph County, NC
DENR Contract 004642
NCEEP Project Number 95352

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EXECUTIVE SUMMARY

Wildlands Engineering (Wildlands) completed a full delivery project at the Hopewell Mitigation Site (Site) for the North Carolina Ecosystem Enhancement Program (NCEEP) to restore, enhance, and preserve a total of 12,471 linear feet (LF) of perennial and intermittent streams in Randolph County, NC. The Site is expected to generate 7,412 stream mitigation units (SMUs). The Site is located near the town of Asheboro in Randolph County, NC in the Yadkin-Pee Dee River Basin; eight digit Cataloging Unit (CU) 03040104 and the 14-digit Hydrologic Unit Code (HUC) 03040104030010 (Figure 1). The Little River eventually flows into the Pee Dee River near the town of Ingram in Richmond County. The other five streams are small headwater tributaries to the Little River. The project streams consist of the Little River, and five unnamed tributaries (UTs) to the Little River (Figures 2a and 2b). The adjacent land to the streams and wetlands is primarily pasture lands and forest.

The Site is located in the Little River watershed which was designated as a Targeted Local Watershed (TLW) in the 2009 Lower Yadkin Pee-Dee River Basin Restoration Priorities (RBRP) plan. The RBRP plan does not specifically identify stressors or project goals in this TLW, but states that continuing watershed improvements will increase ecological uplift. The intent of this project is to help meet the goals for the watershed outlined in the RBRP and provide numerous ecological benefits within the Yadkin-Pee Dee River Basin.

The project goals established in the mitigation plan (Wildlands, 2013) were completed with careful consideration of goals and objectives that were described in the RBRP and to meet NCEEP mitigation needs while maximizing the ecological and water quality uplift within the watershed. The following project goals established include:

- Restoring a degraded stream impacted by cattle to create and improve aquatic habitat, reduce sediment inputs from streambank erosion, and reduce agricultural runoff pollution; and
- Restoring a riparian buffer along stream corridors for additional terrestrial and aquatic habitat, nutrient input reduction, and water quality benefits.

The Site construction and as-built surveys were completed between July 2014 and January 2015. Minimal adjustments were made during construction, as needed, based on site conditions and availability of materials. Several constructed riffles were added and the presence of bedrock resulted in two minor deviations of the design alignment. Specific changes are detailed in Section 5.1. Baseline (MY0) profiles and cross-section dimensions closely match the design parameters. Cross section widths and pool depths occasionally exceed design parameters within a normal range of variability for natural streams. The Site has been built as designed and is on track to meeting the upcoming monitoring year's success criteria.

TABLE OF CONTENTS

APPENDICES i
Section 1: PROJECT GOALS, BACKGROUND AND ATTRIBUTES 1-1
1.1 Project Location and Setting 1-1
1.2 Project Goals and Objectives 1-1
1.3 Project Structure, Restoration Type and Approach 1-3
1.3.1 Project Structure 1-3
1.3.2 Restoration Type and Approach 1-3
1.4 Project History, Contacts and Attribute Data 1-4
Section 2: PERFORMANCE STANDARDS 2-1
2.1 Streams 2-1
2.1.1 Dimension 2-1
2.1.2 Pattern and Profile 2-1
2.1.3 Substrate 2-1
2.1.4 Photo Documentation 2-2
2.1.5 Bankfull Documentation 2-2
2.2 Vegetation 2-2
2.3 Schedule and Reporting 2-2
Section 3: MONITORING PLAN 3-1
3.1 Stream 3-1
3.1.1 Dimension 3-1
3.1.2 Pattern and Profile 3-1
3.1.3 Substrate 3-2
3.1.4 Photo Reference Points 3-2
3.1.5 Hydrology Documentation 3-2
3.1.6 Visual Assessment 3-2
3.2 Vegetation 3-2
Section 4: MAINTENANCE AND CONTINGENCY PLAN 4-1
4.1 Stream 4-1
4.2 Vegetation 4-1
4.3 Site Boundary 4-1
Section 5: AS-BUILT CONDITION (BASELINE) 5-1
5.1 As-Built/Record Drawings 5-1
5.1.1 UT2 Reach 1 5-1
5.1.2 UT2 Reach 2 5-1
5.1.3 UT2A Reach 2 5-1
5.1.4 UT2C Reach 3 5-1
5.1.5 UT1B Reach 2 5-1
• Station 305+53 riffle not installed due to bedrock in channel. 5-1
5.2 Baseline Data Assessment 5-1
5.2.1 Morphological State of the Channel 5-2
5.2.2 Vegetation 5-2
5.2.3 Hydrology 5-2
Section 6: REFERENCES 6-1

APPENDICES

Appendix 1 **General Tables and Figures**
Figure 1 Vicinity Map
Figure 2 Project Component/Asset Map
Table 1 Project Components and Mitigation Credits
Table 2 Project Activity and Reporting History
Table 3 Project Contact Table
Table 4 Project Information and Attributes
Table 5 Monitoring Component Summary

Appendix 2 **Morphological Summary Data and Plots**
Table 6a-d Baseline Stream Data Summary
Table 7a-b Morphology and Hydraulic Summary
Longitudinal Profile Plots
Cross-Section Plots
Reachwide and Cross-Section Pebble Count Plots
Stream Photographs

Appendix 3 **Vegetation Plot Data**
Table 8 Planted and Total Stem Counts
Vegetation Photographs

Appendix 4 **Baseline Drawings**

Section 1: PROJECT GOALS, BACKGROUND AND ATTRIBUTES

1.1 Project Location and Setting

The Site is located in central Randolph County 4 miles southwest of Asheboro along Hopewell Friends Road, Mack Road, and Pisgah Covered Bridge Road, just east of Interstate 74/73 (Figure 1). The Site is located on a tract owned by Double T Farms of Randolph, LLC (PIN 7648735056). A conservation easement was recorded on 35.954 acres with the parcel (Deed Book 2371, Page 108-122).

The Site is located in the Yadkin-Pee Dee River Basin; eight digit Cataloging Unit (CU) 03040104 and the 14-digit Hydrologic Unit Code (HUC) 03040104030010 (Figure 1). Located in the Carolina Slate Belt of the Piedmont Physiographic Province (USGS, 1998), the project watershed consists of mostly agricultural and wooded land but the northern extent of the watershed includes portions of the City of Asheboro. The drainage area for the project site is 4,517 acres. From Route 64 in Asheboro, take Route 220 south 4.6 miles. Take Exit 68 for Dawson Miller Road. Turn right onto Dawson Miller Road and travel 1.2 miles. Turn left onto Pisgah Covered Bridge Road and travel 0.2 miles. The main entrance to the site is on the right.

Little River and its UTs are located within the NC Division of Water Resources (NCDWR) subbasin 03-07-15. Little River (NCDWQ Index No. 13-25-(1)) is classified as C waters. Class C waters are protected for uses such as secondary recreation, fishing, wildlife, fish and aquatic life propagation and survival, and agriculture. Little River eventually drains to the Pee Dee River below Lake Tillery. This section of the Pee Dee River is classified as WS-V; B. This section of the Pee Dee River has a use support rating of "not rated" at this time. The 2009 Lower Yadkin Pee-Dee River Basin Restoration Priorities (RBRP) plan prepared by the NCDWR cites runoff from agricultural operations and the inability of small streams to assimilate waste loads as contributing factors to stream impairment in this 8-digit HU.

Prior to construction activities, many of the streams on the Site, especially those that were accessed less by cattle, exhibited relative stability. However, other project reaches appeared incised and had been severely trampled by cattle so that the banks had become unstable and the bed morphologies were often destroyed. Table 4 in Appendix 1 and Tables 6a-d in Appendix 2 present the pre-restoration conditions in more detail.

1.2 Project Goals and Objectives

This mitigation site is intended to provide numerous ecological benefits within the Yadkin-Pee Dee River Basin. The Site will help meet the goals for the watershed outlined in the RBRP and provide numerous ecological benefits within the Yadkin-Pee Dee River Basin. While many of these benefits are limited to the Hopewell project area, others, such as pollutant removal, reduced sediment loading, and improved aquatic and terrestrial habitat, have farther-reaching effects. Expected improvements to water quality and ecological processes are outlined below as project goals and objectives. These project goals established were completed with careful consideration of goals and objectives that were described in the RBRP and to meet the NCEEPs mitigation needs while maximizing the ecological and water quality uplift within the watershed.

The RBRP describes the goals for the 8-digit HUC as the following:

- Continuation of watershed improvement efforts already on-going;
- Protection of valuable natural resources; and

- Development of local partnerships that will work together to implement management strategies for stormwater impacts.

The following project specific goals established in the mitigation plan (Wildlands, 2013) to contribute to meeting management goals as described above for the Yadkin-Pee Dee Catalog Unit 03040104 and the Little River TLW include:

- Restoring a degraded stream impacted by cattle to create and improve aquatic habitat, reduce sediment inputs from streambank erosion, and reduce agricultural runoff pollution; and
- Restoring a riparian buffer along stream corridors for additional terrestrial and aquatic habitat, nutrient input reduction, and water quality benefits.

The project goals were addressed through the following project objectives:

- On-site nutrient inputs will be decreased by removing cattle from streams and filtering on-site runoff through buffer zones. Off-site nutrient inputs will be absorbed on–site by filtering flood flows through restored floodplain areas, where flood flow will spread through native vegetation;
- Restored buffers and exclusion of livestock to streams will significantly reduce inputs of livestock wastes to streams. This will eliminate a major source of fecal coliform pollution;
- Streambank erosion which contributes sediment load to the creek will be greatly reduced, if not eliminated, in the project area. Eroding stream banks will be stabilized using bioengineering, natural channel design techniques, and grading to reduce bank angles and bank height. Storm flow containing fine sediment will be filtered through restored floodplain areas, where flow will spread through native vegetation. Spreading flood flows will also reduce velocity and allow sediment to settle out. Sediment transport capacity of restored reaches will be improved so that capacity balances more closely to load;
- Restored riffle/pool sequences will promote aeration of water and create deep water zones, helping to lower water temperature. Establishment and maintenance of riparian buffers will create long-term shading of the channel flow to minimize thermal heating. Lower water temperatures will help maintain dissolved oxygen concentrations;
- In-stream structures will be constructed to improve habitat diversity and trap detritus. Wood habitat structures will be included in the stream as part of the restoration design. Such structures may include log drops and riffle structures that incorporate woody debris;
- Adjacent buffer and riparian habitats will be restored with native vegetation as part of the project. Native vegetation will provide cover and food for terrestrial wildlife. Native plant species will be planted and invasive species will be treated. Eroding and unstable areas will also be stabilized with vegetation as part of this project; and
- The restored land will be protected in perpetuity through a conservation easement.

1.3 Project Structure, Restoration Type and Approach

The final mitigation plan was submitted and accepted by the NCEEP in October of 2013. Construction, planting, and as-built survey activities were completed in January 2015 by Land Mechanic Designs, Inc., Bruton Natural Systems, Inc., and Turner Land Surveying, PLLC, respectively. Minimal adjustments were made during construction, as needed, based on site conditions and availability of materials. Due to bedrock, a slight alignment adjustment was made along UT2 Reach 2. Field adjustments made during construction are described in detail in section 5.1. Please refer to Appendix 1 for more detailed project activity, history, contact information, and watershed/site background information.

1.3.1 Project Structure

The project is expected to provide 7,412 stream mitigation units (SMUs). Please refer to Figures 2a and 2b for the project component/asset map for the stream feature exhibits and Table 1 for the project component and mitigation credit information for the Site.

1.3.2 Restoration Type and Approach

The design streams were restored to the appropriate type based on the surrounding landscape, climate, and natural vegetation communities but also with thorough consideration to existing watershed conditions and trajectory. The project includes stream restoration, enhancement, and preservation. The specific proposed stream restoration types are described below.

The stream restoration portion of this project includes six reaches on four streams:

- UT2 (Reaches 1 and 2): This restoration reach extends from a point 380 feet southwest of the eastern corner on the northern-most property boundary to the existing location at which the stream crosses the southern property boundary on the western side. This reach includes one easement break for a culvert farm road crossing and the stream within this break is not included in the restoration credit total. The design includes two reaches – upstream of the confluence with UT2A Reach 2 and one downstream of the confluence with UT2A Reach 2 starting from its confluence with UT2A flowing south to the southern edge on the west side of the property;
- UT2A (Reach 2): This reach begins immediately downstream of the confluence with UT2B and continues to the confluence with UT2. This reach also includes one easement break for a culvert farm road crossing that is not included in the restoration credit total;
- UT2B (Reach 2): The stream was restored from the end of the enhancement II section to the confluence with UT2A; and
- UT2C (Reaches 2 and 3): The stream was restored from the end of the enhancement II section to the confluence with UT2, except for a short section of the stream which flows off the property on the southern property boundary which is not included in the restoration credit total.

The project also includes stream enhancement on six reaches classified as either enhancement I (EI) or enhancement II (EII):

- UT1B, EI (Reach 1): The enhancement I reach on UT1B extends from the upstream end of the project reach just 100 feet downstream of the DOT right-of-way along Pisgah Covered Bridge Road to the woodline east of the pond;

- UT2A, EI: The enhancement I reach on UT2A extends immediately downstream of the existing culvert on UT2A and continues to the confluence with UT2B;
- Little River, EII (Reach 2): Enhancement II will be performed on a section of Little River beginning 704 feet downstream from the northern property boundary on the eastern side to the point where the river flows off of the property on the southern property boundary. This reach includes one easement break for a bridge farm road crossing and the river within this break is not included in the enhancement credit total;
- UT1A, EII (Reach 1): Enhancement II will also be performed from the beginning of UT1A near the eastern property boundary to a point 117 feet upstream from the confluence with Little River. This reach includes one easement break for a culvert farm road crossing that is not included in the enhancement II credit total;
- UT1B, EII (Reaches 2 and 3): Enhancement II on this stream includes two reaches. Reach 2 begins at the woodline east of the pond and continues to the pond. Reach 3 begins at a point where the spillway channel from the pond enters UT1B below the pond and continues to the confluence with Little River. No credit is claimed for the pond or UT1B between the pond outlet and the confluence with the spillway channel. However, a restrictive covenant has been placed on the pond to require that cattle not have access to the pond;
- UT2B, EII (Reach 1): The enhancement II reach on this stream begins approximately 120 feet south of the northern property boundary on the western side. It extends to a point on the restored channel that is 198 feet upstream of the confluence with UT2A; and
- UT2C (Reach 1): Enhancement II will be performed from a point where perennial flow begins at a spring head approximately 415 feet east of Mack Road to a point 1,550 feet downstream where a short section of restoration begins.

The project also includes preservation on two reaches:

- Little River (Reach 1): The upstream 704 feet of Little River on the property is held in preservation.
- UT1A (Reach 2): The downstream 117 feet of UT1A between the EII section and the confluence with Little River is also held in preservation

The project design was developed based on reference conditions, representing streams within the Carolina Slate Belt region of the Piedmont with similar drainage areas, valley slopes, morphology, and bed material. The enhancement I and restoration reaches were designed as threshold channels. This design approach was determined to be appropriate due to the low bedload supply and the desire to establish an immobile channel boundary. The channels are not intended to be fully alluvial and are not expected to migrate laterally over time. Various types of constructed riffles were installed to provide grade control and address excess shear stress.

1.4 Project History, Contacts and Attribute Data

The Site was restored by Wildlands through a full delivery contract with NCEEP. Tables 2, 3, and 4 in Appendix 1 provide detailed information regarding the Project Activity and Reporting History, Project Contacts, and Project Baseline Information and Attributes.

Section 2: PERFORMANCE STANDARDS

The stream restoration performance criteria for the Site will follow approved performance criteria presented in the NCEEP Mitigation Plan Template (version 2.1, 09/01/2011), the NCEEP Monitoring Requirements and Performance Standards for Stream and/or Wetland Mitigation (11/7/2011), and the Stream Mitigation Guidelines issued in April 2003 by the United States Army Corps of Engineers (USACE) and NCDWQ. Annual monitoring and semi-annual site visits will be conducted to assess the condition of the finished project. The stream restoration and enhancement level I reaches (UT1B, UT2, UT2A, UT2B Reach 2, and UT2C Reaches 2 and 3) of the project will be assigned specific performance criteria components for stream morphology, hydrology, and vegetation. The enhancement level II reaches (Little River, UT1A Reach 1, UT1B Reaches 2 and 3, UT2B Reach 1, and UT2C Reach 1) will be documented through photographs, visual assessments, hydrology, and vegetation to verify that no significant degradation is occurring in the stream channel or riparian corridor. Performance criteria will be evaluated throughout the seven year post-construction monitoring. If all performance criteria have been successfully met and two bankfull events have occurred during separate years, at the completion of MY5 Wildlands may propose to terminate stream and/or vegetation monitoring in accordance with the Early Closure Provision included in the EEP Monitoring Requirements and Performance Standards for Stream and/or Wetland Mitigation (11/7/2011). An outline of the performance criteria components follows.

2.1 Streams

2.1.1 Dimension

Riffle cross-sections on the restoration reaches should be stable and should show little change in bankfull area, maximum depth ratio, and width-to-depth ratio. Per EEP guidance, bank height ratios shall not exceed 1.2 and entrenchment ratios shall be at least 2.2 for restored channels to be considered stable. Riffle cross-sections should fall within the parameters defined for channels of the appropriate Rosgen stream type. If any changes do occur, these changes will be evaluated to assess whether the stream channel is showing signs of instability. Indicators of instability include trends in vertical incision or bank erosion. Changes in the channel that indicate a movement toward stability or enhanced habitat include a decrease in the width-to-depth ratio in meandering channels or an increase in pool depth. Remedial action would not be taken if channel changes indicate a movement toward stability.

2.1.2 Pattern and Profile

Longitudinal profile surveys will not be conducted during the seven year monitoring period unless other indicators during the annual monitoring indicate a trend toward vertical and lateral instability. If a longitudinal profile is deemed necessary, monitoring will follow standards as described in the EEP Monitoring Requirements and Performance Standards for Stream and/or Wetland Mitigation (11/7/2011) and the 2003 USACE and NCDWQ Stream Mitigation Guidance for the necessary reaches. A longitudinal profile was conducted as part of the as-built survey to provide a baseline for comparison should it become necessary to perform longitudinal profile surveys later during monitoring.

2.1.3 Substrate

Substrate materials in the restoration reaches should indicate a progression towards or the maintenance of coarser materials in the riffle features and smaller particles in the pool features.

2.1.4 Photo Documentation

Photographs should illustrate the Site's vegetation and morphological stability on an annual basis. Cross-section photos should demonstrate no excessive erosion or degradation of the banks. Longitudinal photos should indicate the absence of persistent bars within the channel or vertical incision. Grade control structures should remain stable. Deposition of sediment on the bank side of vane arms is preferable. Maintenance of scour pools on the channel side of vane arms is expected.

2.1.5 Bankfull Documentation

Two bankfull flow events must be documented on the restoration and enhancement reaches within the seven-year monitoring period. The two bankfull events must occur in separate years. Stream monitoring will continue until success criteria in the form of two bankfull events in separate years have been documented. Bankfull events will be documented using submerged pressure transducers, crest gages, photographs, and visual assessments such as debris lines.

2.2 Vegetation

The final vegetative success criteria will be the survival of 210 planted stems per acre in the riparian corridor along restored and enhanced reaches at the end of the required monitoring period (MY7). The interim measure of vegetative success for the Site will be the survival of at least 320 planted stems per acre at the end of the third monitoring year and at least 260 stems per acre at the end of the fifth year of monitoring. Planted vegetation must average 10 feet in height in each plot at the end of the seventh year of monitoring. If this performance standard is met by MY5 and stem density is trending towards success (i.e., no less than 260 five year old stems/acre), monitoring of vegetation on the Site may be terminated provided written approval is provided by the USACE in consultation with the NC Interagency Review Team. The extent of invasive species coverage will also be monitored and controlled as necessary throughout the required monitoring period (seven years).

2.3 Schedule and Reporting

Monitoring reports will be prepared in the fall of each year of monitoring and submitted to NCEEP. Based on the NCEEP Monitoring Report Template (version 1.4, 11/7/11), the monitoring reports will include the following:

- Project background which includes project objectives, project structure, restoration type and approach, location and setting, history and background;
- As-built topographic plans of major project elements including such items as grade control structures, vegetation plots, permanent cross-sections, crest gages, and pressure transducers;
- Photographs showing views of the restored Stream Site taken from fixed point stations;
- Assessment of the stability of the Stream Site based on the cross-sections
- Vegetative data as described above including the identification of any invasion by undesirable plant species;
- A description of damage by animals or vandalism;
- Maintenance issues and recommended remediation measures will be detailed and documented; and
- Wildlife observations

Section 3: MONITORING PLAN

Monitoring will consist of collecting morphological, vegetative, and hydrological data to assess the project success based on the restoration goals and objectives on an annual basis or until success criteria is met. The success of the project will be assessed using measurements of the stream channel's dimension, substrate composition, permanent photographs, vegetation, surface water hydrology, and groundwater hydrology. Any areas with identified high priority problems, such as streambank instability, aggradation/degradation, insufficient groundwater hydroperiod, or lack of vegetation establishment will be evaluated on a case-by-case basis. The problem areas will be visually noted and remedial actions will be discussed with NCEEP staff to determine a plan of action. Refer to Table 5 in Appendix 1 for monitoring component summary.

3.1 Stream

Geomorphic assessments follow guidelines outlined in the Stream Channel Reference Sites: An Illustrated Guide to Field Techniques (Harrelson et al., 1994), methodologies utilized in the Rosgen stream assessment and classification documents (Rosgen, 1994 and 1996), and in the Stream Restoration: A Natural Channel Design Handbook (Doll et al, 2003). Please refer to Appendix 4 for monitoring locations discussed below.

3.1.1 Dimension

In order to monitor the channel dimension, 17 permanent cross-sections were installed along stream restoration and enhancement I reaches, with riffle and pool sections in proportion to EEP guidance. Two cross sections were installed per 1,000 linear feet of stream restoration work, with riffle and pool sections in proportion to NCEEP guidance. Each cross-section is permanently marked with capped rebar installed in concrete and 1/2 inch PVC pipes. Cross-section surveys include points measured at all breaks in slope, including top of bank, bankfull, edge of water, and thalweg If moderate bank erosion is observed at a stream reach during the monitoring period, an array of bank pins will be installed in representative areas where erosion is occurring for reaches with a bankfull width of greater than three feet. Bank pins will be installed in at least three locations (one in upper third of the pool, one at the mid-point of the pool, and one in the lower third of the pool). Bank pins will be monitored by measuring exposed rebar and maintaining pins flush to bank to capture bank erosion progression. Annual cross section and bank pin survey (if applicable) will be conducted in monitoring years one (MY1), two (MY2), three (MY3), five (MY5), and seven (MY7). Photographs will be taken annually of the cross sections looking upstream and downstream.

3.1.2 Pattern and Profile

Longitudinal profile surveys will not be conducted during the seven year monitoring period unless other indicators during the annual monitoring indicate a trend toward vertical and lateral instability. If a longitudinal profile is deemed necessary, monitoring will follow standards as described in the NCEEP Monitoring Requirements and Performance Standards for Stream and/or Wetland Mitigation (11/7/2011) and the 2003 USACE and NCDWR Stream Mitigation Guidance for the necessary reaches. Stream pattern and profile will be assessed visually as described below in section 3.1.6.

3.1.3 Substrate

A reach-wide pebble count will be performed in each restoration reach each year for classification purposes. A pebble count will be performed at each surveyed riffle to characterize the pavement. Substrate analysis will be conducted for seven years following construction.

3.1.4 Photo Reference Points

A total of 64 permanent photograph reference points were established within the project area after construction. Photographs will be taken looking upstream and downstream once a year to visually document stability for seven years following construction. Permanent markers were established so that the same locations and view directions on the Site are monitored each year. Cross-sectional photos will be taken of each permanent cross-section looking upstream and downstream. Reference photos will also be taken for each of the vegetation plots. Representative digital photos of each permanent photo point, cross-section and vegetation plot will be taken on the same day of the stream and vegetation assessments are conducted. The photographer will make every effort to consistently maintain the same area in each photo over time. The representative digital photo(s) will be taken on the same day(s) the surveys are conducted.

3.1.5 Hydrology Documentation

Bankfull events will be documented using crest gages, pressure transducers, photographs, and visual assessments such as debris lines. Five hydrology monitoring stations with crest gages and pressure transducers were installed; one on UT2B Reach 2, one on UT2A Reach 2, one on UT2 Reach 2, one on UT2C Reach 2 and one on UT1B Reach 1. The gages were installed within a surveyed riffle cross-section of the restored channels. The gages will be checked at each site visit to determine if a bankfull event has occurred. Photographs will be used to document the occurrence of debris lines and sediment deposition. Additionally, the pressure transducer data will be plotted and included in the annual monitoring reports.

3.1.6 Visual Assessment

Visual assessments will be performed along all stream and buffer restoration areas on a semi-annual basis during the seven year monitoring period. Problem areas will be noted such as channel instability (i.e. lateral and/or vertical instability, in-stream structure failure/instability and/or piping, headcuts), vegetated health (i.e. low stem density, vegetation mortality, invasive species or encroachment), beaver activity, or livestock access. Areas of concern will be mapped, photographed, and described through a written description in the annual report. Problem areas will be re-evaluated during each subsequent visual assessment. Should remedial actions be required, recommendations will be provided in the annual monitoring report.

3.2 Vegetation

Planted woody vegetation will be monitored in accordance with the guidelines and procedures developed by the Carolina Vegetation Survey-EEP Level 2 Protocol (Lee et al., 2006) to monitor and assess the planted woody vegetation. A total of 31 vegetation plots were established within the project easement area. All of the plots were established as standard 10 meter by 10 meter squares.

Vegetation plots were randomly established within the planted corridor of the restoration areas to capture the heterogeneity of the designed vegetative communities. The vegetation plot corners have been marked and are recoverable either through field identification or with the use of a GPS unit. Reference photographs at the origin looking diagonally across the plot to the opposite corner were taken

during the baseline monitoring in January 2015. Subsequent annual assessments following baseline survey will capture the same reference photograph locations. Species composition, density and survival rates will be evaluated on an annual basis by plot and for the entire Site. Individual plot data will be provided and will include diameter, height, density, vigor, damage (if any), and percent survival. Planted woody stems will be marked annually as needed based off of a known origin so they can be found in succeeding monitoring years. Mortality will be determined from the difference between the baseline year's living planted stems and the current year's living planted stems.

Section 4: MAINTENANCE AND CONTINGENCY PLAN

Wildlands will perform maintenance as needed on the mitigation project. A physical inspection of the Site shall be conducted a minimum of once per year throughout the post-construction monitoring period until performance standards are met. These site inspections may identify components and features that require routine maintenance. Routine maintenance should be expected most often in the first two years following site construction and may include one or more of the following components.

4.1 Stream

Stream problem areas will be mapped and included in the Current Condition Plan View (CCPV) as part of the annual stream assessment. Stream problems areas may include bank erosion, structure failure, beaver dams, aggradation/degradation, etc. Routine channel maintenance and repair activities may include chinking of in-stream structures to prevent piping, securing loose coir matting, and supplemental installations of live stakes and other target vegetation along the channel. Areas where storm water runoff flows into the channel may also require maintenance to prevent bank failures and head-cutting.

4.2 Vegetation

Vegetative problem areas will be mapped and included in the CCPV as part of the annual vegetation assessment. Vegetation problems areas may include planted vegetation not meeting success criteria, persistent invasive species, barren areas with little to no herbaceous cover, or grass suffocation/crowding of planted stems. Routine vegetation maintenance and repair activities may include supplemental planting, pruning, mulching, and fertilizing. Exotic invasive plant species shall be controlled by mechanical and/or chemical methods. Any vegetation control requiring herbicide application will be performed in accordance with NC Department of Agriculture (NCDA) rules and regulations.

4.3 Site Boundary

Site boundary issues will be mapped and included in the CCPV as part of the annual visual assessment. Site boundary issues may include mowing encroachment or boundary markers/fencing disturbed. Routine maintenance will be conducted to address disturbed, damaged, or destroyed easement boundary markers and will be repaired and/or replaced on an as-needed basis.

Section 5: AS-BUILT CONDITION (BASELINE)

The Site construction and as-built surveys were completed in January 2015. The survey included developing an as-built topographic surface and locating the channel boundaries, structures, and cross-sections. For comparison purposes, during the baseline assessments, reaches were divided into assessment reaches in the same way that they were established for design parameters: UT2 Reaches 1 and 2, UT2A Reaches 1 and 2, UT2B Reach 2, and UT2C Reaches 2 and 3.

5.1 As-Built/Record Drawings

A half-size baseline plan is located in Appendix 4 that includes the post-construction survey and alignments for the project. A record drawing has also been provided to NCEEP as a separate document that includes redlines for any significant field adjustments made during construction that were different from the design plans. Minimal adjustments were made during construction, where needed. The presence of bedrock at two locations along UT2 Reach 2 resulted in slight deviations in pattern and elimination of a root wad in UT2A Reach 2. Occasional changes were made to brush toe based on supply available. Specific changes are detailed below:

5.1.1 UT2 Reach 1

- Station 408+52 to Station 408+87 Brush Toe was not installed to avoid tree impacts.

5.1.2 UT2 Reach 2

- Station 420+50 to station 421+60 channel alignment deviation; remains in existing stream location due to bedrock preventing excavation along proposed alignment;
- Station 421+60 rootwads replaced with brush toe due to availability of materials; and
- Station 423+10 constructed riffle not installed due to backwater from downstream offsite.

5.1.3 UT2A Reach 2

- Station 517+75 rock toe installed instead of brush toe due to bedrock in bank.

5.1.4 UT2C Reach 3

- Station 800+90 Brush toe not installed.

5.1.5 UT1B Reach 2

- Station 305+53 riffle not installed due to bedrock in channel.

5.2 Baseline Data Assessment

Baseline monitoring (MY0) was conducted in January 2015. The first annual monitoring assessment (MY1) will be completed in the fall of 2015. The streams and wetlands will be monitored for a total of seven years, with the final monitoring activities conducted in 2021. The close-out for the Site will be conducted in 2022 given the success criteria is met. As part of the closeout process, NCEEP will evaluate the Site at the end of the fourth year monitoring period to determine whether or not the site is eligible to closeout

following monitoring year five. If the Site is meeting success criteria, NCEEP will propose to the interagency review team (IRT) to proceed with the closeout process. If the Site is not meeting success criteria, then an additional two years of monitoring will be conducted by Wildlands.

5.2.1 Morphological State of the Channel

Morphological data for the as-built profile was collected in January 2015. Please refer to Appendix 2 for summary data tables, morphological plots, and stream photographs.

Profile

The baseline (MY0) profiles closely match the profile design parameters. On the design profiles, riffles were depicted as straight lines with consistent slopes. However, at some locations the as-built survey riffle profiles are not consistent in slope due to existing bedrock. Additionally, maximum pool depths typically exceed design parameters. These variations in riffle slope and pool depths do not constitute a problem or indicate a need for remedial actions and will be assessed visually during the CCPV site walks.

Dimension

The baseline (MY0) dimension numbers closely match the design parameters with minor variations in all reaches. These occasional variations are primarily due to a larger as-built bankfull width or depth reflected in the cross sections.

Pattern

The baseline (MY0) pattern metrics fell within the design parameters for all six reaches. One adjustment was made to the UT2 Reach alignment during construction due to the presence of bedrock. Pattern data will only be evaluated in MY5 if there are any indicators through the profile or dimensions that significant geomorphic adjustments have occurred.

Sediment Transport

As-built shear stresses and velocities are similar to design parameters and should reduce the risk of further erosion along the restoration reaches. The as-built condition for each of these reaches indicates an overall increase in substrate particle size (Table 6a – 6c). The substrate data for each constructed reach were compared to the design shear stress parameters from the mitigation plan to assess the potential for bed degradation. The shear stresses calculated for the constructed channels are within the allowable range, which indicates that the channel is not at risk to trend toward channel degradation.

5.2.2 Vegetation

The baseline (MY0) planted density is 647 stems/acre, which exceeds the MY5 density requirement. Summary data and photographs of each plot can be found in Appendix 3.

5.2.3 Hydrology

Bankfull events were recorded following completion of construction. Bankfull events recorded will be reported in the year 1 monitoring report.

Section 6: REFERENCES

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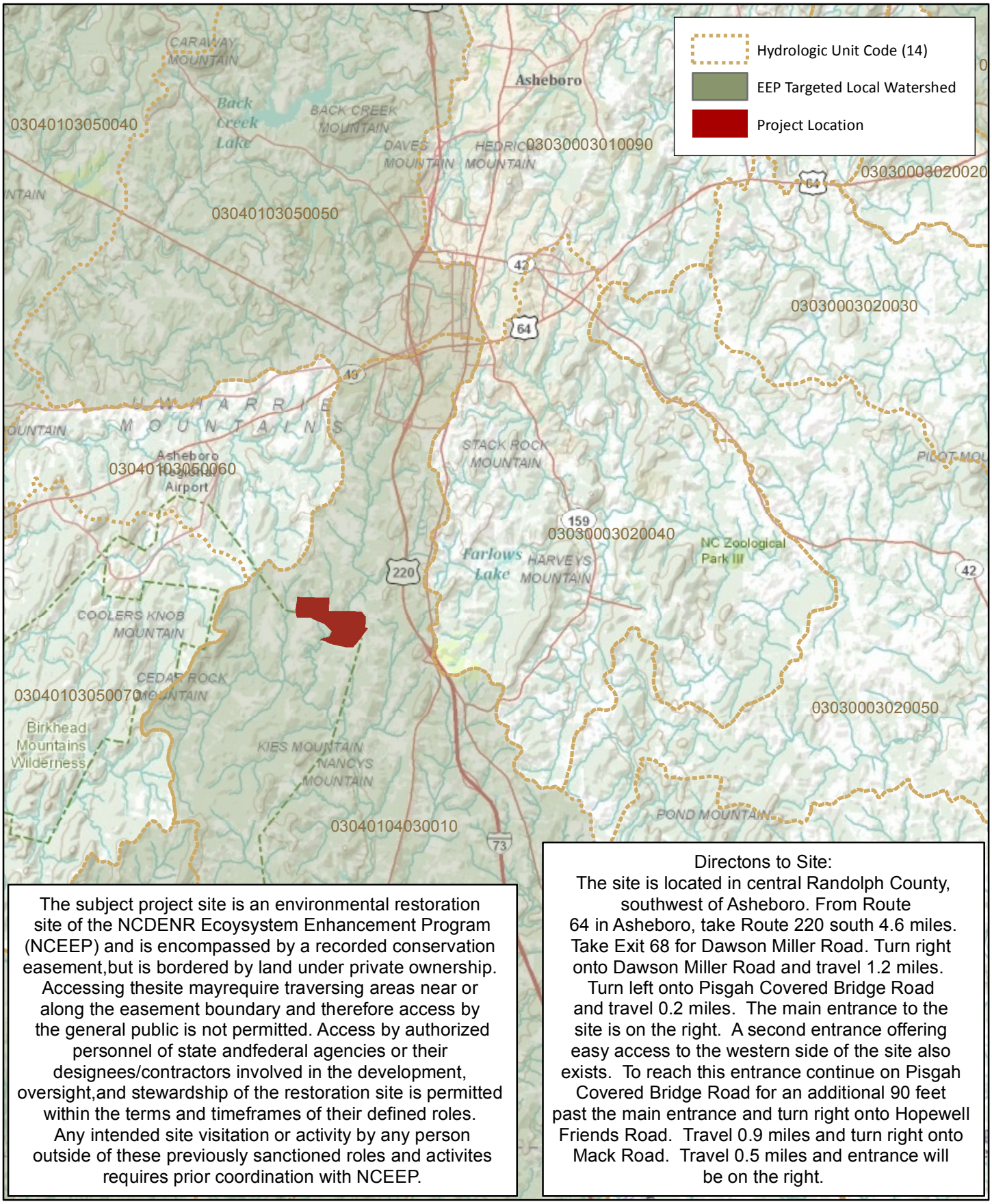
APPENDIX 1. General Tables and Figures



The subject project site is an environmental restoration site of the NCDENR Ecoysystem Enhancement Program (NCEEP) and is encompassed by a recorded conservation easement,but is bordered by land under private ownership. Accessing thesite mayrequire traversing areas near or along the easement boundary and therefore access by the general public is not permitted. Access by authorized personnel of state andfederal agencies or their designees/contractors involved in the development, oversight,and stewardship of the restoration site is permitted within the terms and timeframes of their defined roles. Any intended site visitation or activity by any person outside of these previously sanctioned roles and activites requires prior coordination with NCEEP.

Directons to Site:
The site is located in central Randolph County, southwest of Asheboro. From Route 64 in Asheboro, take Route 220 south 4.6 miles. Take Exit 68 for Dawson Miller Road. Turn right onto Dawson Miller Road and travel 1.2 miles. Turn left onto Pisgah Covered Bridge Road and travel 0.2 miles. The main entrance to the site is on the right. A second entrance offering easy access to the western side of the site also exists. To reach this entrance continue on Pisgah Covered Bridge Road for an additional 90 feet past the main entrance and turn right onto Hopewell Friends Road. Travel 0.9 miles and turn right onto Mack Road. Travel 0.5 miles and entrance will be on the right.

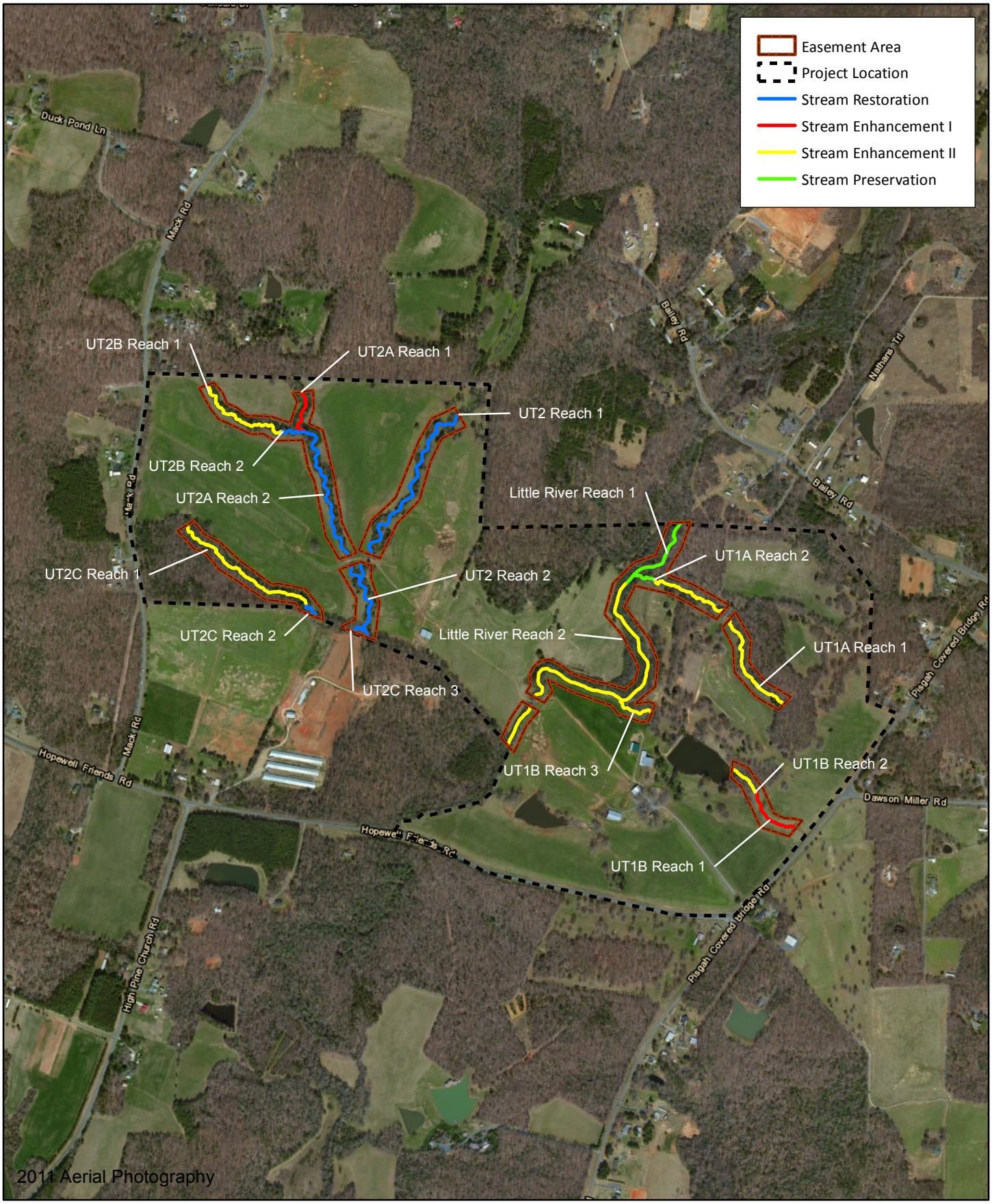
WILDLANDS ENGINEERING

Ecosystem Enhancement PROGRAM

0 0.5 1 2 Miles

N

Figure 1 Vicinity Map
Hopewell Stream Mitigation Site
NCEEP Project Number 95352
Monitoring Year 0 - 2015
Randolph County, NC



WILDLANDS ENGINEERING

Ecosystem Enhancement PROGRAM

0 500 1,000 Feet

N

Figure 2 Project Component Map
Hopewell Stream Mitigation Site
NCEEP Project Number 95352
Monitoring Year 0 - 2015
Randolph County, NC

Table 1. Project Components and Mitigation Credits
Hopewell Stream Mitigation Site (NCEEP Project No.95021)
Monitoring Year 0 - 2015

MITIGATION CREDITS

	Stream		Riparian Wetland		Non-Riparian Wetland		Buffer	Nitrogen Nutrient Offset	Phosphorous Nutrient Offset
Type	R	RE	R	RE	R	RE			
Totals	7,248	164	N/A	N/A	N/A	N/A	N/A	N/A	N/A

PROJECT COMPONENTS

Reach ID	As-Built Stationing/ Location	Existing Footage/ Acreage	Approach	Restoration or Restoration Equivalent	Restoration Footage/ Acreage	Mitigation Ratio	Credits (SMU/ WMU)
STREAMS							
Little River Reach 1	100+00 - 107+04	704	Fencing/ invasives control	P	704	5:1	141
Little River Reach 2	107+04 - 126+53 128+06 - 131+57	2,374	Fencing/ invasives control	EII	2,300	2.5:1	920
UT1A Reach 1	200+00 - 208+95 209+84 - 217+00	1,611	Fencing/ invasives control	EII	1,611	2.5:1	644
UT1A Reach 2	217+00 - 218+17	117	Fencing/ invasives control	P	117	5:1	23
UT1B Reach 1	300+87 - 305+67	475	P2	EI	480	1.5:1	320
UT1B Reach 2 & 3	305+67 - 308+25 350+00 - 353+17	580	Fencing/ invasives control	EII	575	2.5:1	230
UT2 Reach 1 & 2	400+00 - 415+47 416+35 - 423+16	2,419	P1	R	2,228	1:1	2,228
UT2A Reach 1	500+39 - 504+25	386	Fencing/ invasives control – P1	EI	386	1.5:1	257
UT2A Reach 2	504+25 - 516+21 517+00 - 518+68	1,368	P1	R	1,364	1:1	1,364
UT2B Reach 1	600+00 - 608+48	848	Fencing/ invasives control – P1	EII	848	2.5:1	339
UT2B Reach 2	608+48 - 610+46	114	P1	R	198	1:1	198
UT2C Reach 1	700+00 - 712+50	1,215	Fencing/ invasives control	EII	1,250	2.5:1	500
UT2C Reach 2	712+50 - 713+60	326	P2	R	110	1:1	110
UT2C Reach 3	800+00 - 801+37		P3	R	137	1:1	137

COMPONENT SUMMATION

Restoration Level	Stream (LF)	Riparian Wetland (acres)		Non-Riparian Wetland (acres)	Buffer (square feet)	Upland (acres)
		Riverine	Non-Riverine			
Restoration	3,900	-	-	-	-	-
Enhancement		-	-	-	-	-
Enhancement I	866					
Enhancement II	6,584					
Creation		-	-	-		
Preservation	821	-	-	-		-
High Quality Preservation	-	-	-	-		-

N/A: not applicable

Table 2. Project Activity and Reporting History
Hopewell Stream Mitigation Site (NCEEP Project No.95021)
Monitoring Year 0 - 2015

Activity or Report	Data Collection Complete	Completion or Scheduled Delivery
Mitigation Plan	January 2013	November 2013
Final Design - Construction Plans	January 2013	March 2014
Construction	July 2014-November 2014	November 2014
Temporary S&E mix applied to entire project area [1]	November 2014	November 2014
Permanent seed mix applied to reach/segments	November 2014	November 2014
Bare root and live stake plantings for reach/segments	January 2015	January 2015
Baseline Monitoring Document (Year 0)	December 2014-January 2015	February 2015
Year 1 Monitoring	2015	December 2015
Year 2 Monitoring	2016	December 2016
Year 3 Monitoring	2017	December 2017
Year 4 Monitoring	2018	December 2018
Year 5 Monitoring	2019	December 2019
Year 6 Monitoring	2020	December 2020
Year 7 Monitoring	2021	December 2021

[1]Seed and mulch is added as each section of construction is completed.

Table 3. Project Contact Table
Hopewell Stream Mitigation Site (NCEEP Project No.95021)
Monitoring Year 0 - 2015

Designer Jeff Keaton, PE	**Wildlands Engineering, Inc.** 312 West Millbrook Road, Suite 225 Raleigh, NC 27609 919.851.9986
Construction Contractor	**Land Mechanic Designs, Inc.** 126 Circle G Lane Willow Spring, NC 27592
Planting Contractor	**Bruton Natural Systems, Inc** P.O. Box 1197 Fremont, NC 27830
Seeding Contractor	**Terry's Plumbing** 465 Lewallen Road Asheboro, NC 27205
Seed Mix Sources	**Green Resource, LLC**
Nursery Stock Suppliers	
Bare Roots **Live Stakes**	**Dykes and Son Nursery** **Bruton Natural Systems, Inc**
Monitoring Performers	**Wildlands Engineering, Inc.**
Monitoring, POC	Kirsten Gimbert 704.332.7754, ext. 110

Table 4. Project Information and Attributes
Hopewell Stream Mitigation Site (NCEEP Project No.95021)
Monitoring Year 0 - 2015

PROJECT INFORMATION	
Project Name	Hopewell Stream Mitigation Site
County	Randolph county
Project Area (acres)	35
Project Coordinates (latitude and longitude)	35°37'37.32" N, 79° 51'13.27" W
PROJECT WATERSHED SUMMARY INFORMATION	
Physiographic Province	Carolina Slate Belt of the Piedmont Physiographic Province
River Basin	Yadkin-Pee Dee
USGS Hydrologic Unit 8-digit	03040104
USGS Hydrologic Unit 14-digit	03040104030010
DWR Sub-basin	03-07-15
Project Drainiage Area (acres)	4,517
Project Drainage Area Percentage of Impervious Area	<1%
CGIA Land Use Classification	2.01.03 – Hay and Pasture Land; 2.99.05 - Farm Ponds; 4 – Forest Land

REACH SUMMARY INFORMATION

Parameters	Little River	UT1A	UT1B Reach 1	UT1B Reach 2&3	UT2 Reach 1	UT2 Reach 2	UT2A Reach 1	UT2A Reach 2	UT2B	UT2C
Length of reach (linear feet) - Post-Restoration	3,004	1,728	480	575	1,547	681	386	1,364	1,046	1,797
Drainage area (acres)	4083	38	19	45	246	378	64	102	22	51
NCDWR stream identification score	43.5	22.5	24.5	30	35.5	35.5	27	35	23.7	31
NCDWR Water Quality Classification	C									
Morphological Desription (stream type)	P	I	I	P	P	P	I	P	I	P
Evolutionary trend (Simon's Model) - Pre- Restoration	I/II	I	III	I	III/IV	IV	III	III/IV	III	III
Underlying mapped soils	Badin-Tarrus Complex, Chewacla Loam, Georgeville silt loam, Georgeville silty clay loam, Mecklenburg clay loam, Riverview sandy loam									
Drainage class	---	---	---	---	---	---	---	---	---	---
Soil Hydric status	---	---	---	---	---	---	---	---	---	---
Slope	0.0051	0.0389	0.03	0.0583	0.0093	0.0075	0.0102	0.011	0.0259	0.0154
FEMA classification	AE									
Native vegetation community	Piedmont Bottomland Forest / Mixed Mesic Hardwood Forest									
Percent composition exotic invasive vegetation -Post-Restoration	0%									

REGULATORY CONSIDERATIONS

Regulation	Applicable?				Resolved?		Supporting Documentation
Waters of the United States - Section 404	X					X	USACE Nationwide Permit No.27 and DWQ 401 Water Quality Certification No. 3885.
Waters of the United States - Section 401	X					X	
Division of Land Quality (Dam Safety)	N/A					N/A	N/A
Endangered Species Act	X					X	Hopewell Mitigation Plan; Wildlands determined "no effect" on Randolph County listed endangered species. (Letter from USFWS dated July 27, 2012)
Historic Preservation Act	X					X	No historic resources were found to be impacted (letter from SHPO dated 7/13/2012).
Coastal Zone Management Act (CZMA)/Coastal Area Management Act (CAMA)	N/A					N/A	N/A
FEMA Floodplain Compliance	X					X	Little River is a mapped Zone AE floodplain with defined base flood elevations. A floodway has not been delineated but non-encroachment widths have been defined; (FEMA Zone AE, FIRM panel 7648).
Essential Fisheries Habitat	N/A					N/A	N/A

Table 5. Monitoring Component Summary
Hopewell Stream Mitigation Site (NCEEP Project No.95021)
Monitoring Year 0 - 2015

Restoration and Enhancement I Reaches							
Parameter	**Monitoring Feature**	**Quantity/ Length by Reach**					**Frequency**
		UT1B R1	**UT2**	**UT2A**	**UT2B R2**	**UT2C R2 & 3**	
Dimension	Riffle Cross Sections	1	3	3	1	1	Annual
	Pool Cross Section	1	2	3	1	1	Annual
Pattern	Pattern	n/a	n/a	n/a	n/a	n/a	n/a
Profile	Longitudinal Profile	n/a	n/a	n/a	n/a	n/a	n/a
Substrate	Reach wide (RW), Riffle (RF) 100 pebble count	1 RW, 1 RF	1 RW, 3 RF	1 RW, 2 RF	1 RW, 1 RF	1 RW, 1 RF	Annual
Hydrology	Crest Gage	1	1	1	1	1	Annual
Vegetation	Vegetation Plots	3	6	5	1	1	Annual
Visual Assessment	All Streams	Y	Y	Y	Y	Y	Semi-Annual
Exotic and nuisance vegetation							Annual
Project Boundary							Annual
Reference Photos	Photos	4	12	9	2	2	Annual

Enhancement II Reaches							
Parameter	**Monitoring Feature**	**Quantity/ Length by Reach**					**Frequency**
		Little River	**UT1A**	**UT1B R2 & 3**	**UT2B R1**	**UT2C R1**	
Dimension	Riffle Cross Sections	n/a	n/a	n/a	n/a	n/a	n/a
	Pool Cross Section	n/a	n/a	n/a	n/a	n/a	n/a
Pattern	Pattern	n/a	n/a	n/a	n/a	n/a	n/a
Profile	Longitudinal Profile	n/a	n/a	n/a	n/a	n/a	n/a
Substrate	Reach wide (RW), Riffle (RF) 100 pebble count	n/a	n/a	n/a	n/a	n/a	n/a
Hydrology	Crest Gage	n/a	n/a	n/a	n/a	n/a	n/a
Vegetation	Vegetation Plots	7	4	n/a	2	2	Annual
Visual Assessment	All Streams	Y	Y	Y	Y	Y	Semi-Annual
Exotic and nuisance vegetation							Annual
Project Boundary							Annual
Reference Photos	Photos	12	9	4	4	6	Annual

APPENDIX 2. Morphological Summary and Data Plots

Table 6a. Baseline Stream Data Summary
Hopewell Stream Mitigation Site (NCEEP Project No. 95352)
Monitoring Year 0

Hopewell-UT2 Reaches 1 and 2

		PRE-RESTORATION CONDITION				REFERENCE REACH DATA										DESIGN				AS-BUILT/BASELINE			
Parameter	**Gage**	**UT2 Reach 1**		**UT2 Reach 2**		**Dutchman's Creek**		**UT to Rocky Creek**		**Spencer Creek Reach 1**		**Spencer Creek Reach 2**		**Spencer Creek Reach 3**		**UT2 Reach 1**		**UT2 Reach 2**		**UT2 Reach 1**		**UT2 Reach 2**	
		Min	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**
Dimension and Substrate - Riffle																							
Bankfull Width (ft)		7.9	10.9	10.7		23.0	32.0	12.2		8.7		2.1	2.6	1.0	1.2	12.5		14.0		10.6	14.2	15.3	
Floodprone Width (ft)		12.0	18.0	14.0		61.2	69.4	72.0		229.0		60.0	>114	14.0	125.0	50	125	50	125	68.1	94.3	55.4	
Bankfull Mean Depth		1.0	1.4	1.4		1.1	1.4	1.3		1.2		1.6	1.8	0.8	1.0	1.0		1.0		0.8	0.9	1.0	
Bankfull Max Depth		1.4	1.8	2.0		1.9	2.1	1.8		1.9		2.1	2.6	1.0	1.2	1.5		1.5		1.3	1.7	1.5	
Bankfull Cross-sectional Area (ft^2)	N/A	11.1	11.4	14.9		32.9	36.1	16.3		10.6		17.8	19.7	6.6	8.7	12.0		14.3		8.4	12.7	14.8	
Width/Depth Ratio		5.7	10.4	7.7		16.4	28.9	9.1		7.3		5.8	7.1	7.9	9.3	13.0		14.0		13.2	15.8	15.8	
Entrenchment Ratio		1.5	1.7	1.3		2.2	2.6	6.0		26.3		5.5	10.2	1.7	4.3	4.0	10.0	3.6	8.9	6.5	6.6	3.6	
Bank Height Ratio		1.4	1.9	2.1		---		1.0		1.0		1.0		1.0		1.0		1.0		1.0		1.0	
D50 (mm)		0.1		12.5																24.2	28	45.8	
Profile																							
Riffle Length (ft)						---		---		---		---		---		---		---		10.6	119.6	23.9	36.3
Riffle Slope (ft/ft)		---		---		---		0.0606	0.0892	0.01	0.067	0.013		0.0184	0.0343	0.0105	0.0225	0.0154	0.033	0.0033	0.0227	0.0104	0.0386
Pool Length (ft)	N/A					---		---		---		---		---		---		---		16.5	66.2	41.4	104.9
Pool Max Depth (ft)		2	2.2	2.2		---		2.2	6.7	2.5		3.3		1.2	1.8	1.8	2.4	1.9	2.5	1.7	3.6	3.2	5.0
Pool Spacing (ft)		---		---		---		26	81	13	47	71		9	46	19	81	21	91	20	108	65	132
Pool Volume (ft^3)																							
Pattern																							
Channel Beltwidth (ft)		45	79	67	69	---		---		24.0	52.0	38.0	41.0	10.0	50.0	20.0	75.0	22.0	84.0	5.3	11.2	31.5	79.1
Radius of Curvature (ft)		12	28	22	25	---		---		5.0	22.0	11.0	15.0	12.0	85.0	23.0	38.0	25.0	42.0	12.9	35.5	21.2	24.0
Rc:Bankfull Width (ft/ft)	N/A	1.5	2.6	2.1	2.3	---		---		0.6	2.5	1.3	1.4	1.9	9.1	1.8	3.0	1.8	3	1.2	2.5	1.4	1.6
Meander Length (ft)		102	245	125	132	---		---		---		---		53.0	178.0	50	188	56	120	60	171	113	120
Meander Width Ratio		5.7	7.2	6.3	6.4	---		---		2.8	6.0	3.4	3.6	1.6	5.4	1.6	6.0	1.6	6.0	0.5	0.8	2.1	5.2
Substrate, Bed and Transport Parameters																							
Ri%/Ru%/P%/G%/S%																							
SC%/Sa%/G%/C%/B%/Be%																							
d16/d35/d50/d84/d95/d100	N/A	SC/SC/0.1/45/180		SC/4.6/12.5/70/128		---		SC/2.4/22.6/120/256		0.1/3/8.6/77/180		SC/3/8.8/42/90		1.9/8.85/11/64/128						15/31/46/97/228/>2048		15/31/46/97/228/>2048	
Reach Shear Stress (Competency) lb/ft^2		---		---												0.39		0.61		0.37	0.43	0.67	
Max part size (mm) mobilized at bankfull																							
Stream Power (Capacity) W/m^2																							
Additional Reach Parameters																							
Drainage Area (SM)		0.38		0.59		2.90		1.10		0.50		0.96		0.37		0.38		0.59		0.38		0.59	
Watershed Impervious Cover Estimate (%)		1%		1%		---		---		---		---		---		1%		1%		1%		1%	
Rosgen Classification		G5/4		G4		B/C		E4b		E4/C4		E4		E4		C4		C4		C4		C4	
Bankfull Velocity (fps)		3.7	4.0	3.9		---		5.5		N/P		4.9	5.4	5	5.6	3.1		3.9		2.7	3.0	3.8	
Bankfull Discharge (cfs)		45		58		203		85		N/P		97.0		35.0		40		54.0		22.9	38.0	55.8	
Q-NFF regression (2-yr)		85		112																			
Q-USGS extrapolation (1.2-yr)	N/A	46		62																			
Q-Mannings		---		---																			
Valley Length (ft)		1465		428		---		---		---		---		---		1465		428		1,465		428	
Channel Thalweg Length (ft)		1,527		704		---		---		---		---		---		1,715		732		1,787		529	
Sinuosity		1.3		1.1		---		1.1		1.1		1.3		1.0	1.3	1.0	1.2	1.0	1.2	1.2		1.2	
Water Surface Slope (ft/ft^2)		---		---		---		---		---		---		---		---		---		0.0087		0.0126	
Bankfull Slope (ft/ft)		0.0083		0.0082		0.019		0.0235		0.132		0.0047		0.019	0.022	0.0083		0.0108		0.0085	0.0086	0.0103	0.0107

SC: Silt/Clay <0.062 mm diameter particles
(---): Data was not provided
N/A: Not Applicable

Table 6b. Baseline Stream Data Summary
Hopewell Stream Mitigation Site (NCEEP Project No. 95352)
Monitoring Year 0

Hopewell-UT2A Reaches 1 and 2

		PRE-RESTORATION CONDITION				REFERENCE REACH DATA	DESIGN				AS-BUILT/BASELINE			
Parameter	Gage	UT2A Reach 1		UT2A Reach 2		See Table 5a.	UT2A Reach 1		UT2A Reach 2		UT2A Reach 1		UT2A Reach 2	
		Min	Max	Min	Max		Min	Max	Min	Max	Min	Max	Min	Max
Dimension and Substrate - Riffle														
Bankfull Width (ft)	N/A	6.2		6.0	7.9	See Table 5a.	9.0		10.0		10.3		8.9	9.8
Floodprone Width (ft)		40.0		6.0	10.0		50	125	50	125	87.1		62.5	88.4
Bankfull Mean Depth		1.0		0.8	1.0		0.6		0.7		0.8		0.7	0.9
Bankfull Max Depth		2.0		1.1	1.5		0.9		0.8	1.1	1.6		1.1	1.2
Bankfull Cross-sectional Area (ft^2)		6.2		6.1	6.2		5.7		7.0		8.0		6.8	7.8
Width/Depth Ratio		6.2		5.9	10.0		14.0		14.0		13.3		10.2	14.0
Entrenchment Ratio		6.5		0.8	1.7		5.6	13.9	5	12.5	8.4		7.0	9.1
Bank Height Ratio		1.4		2.3	2.9		1.0		1.0		1.0		1.0	
D50 (mm)		0.1		0.1							34.3		37.4	
Profile														
Riffle Length (ft)	N/A					See Table 5a.	---		---		18.4	54.3	10.1	67.0
Riffle Slope (ft/ft)		---		---			0.119	0.0255	0.013	0.028	0.0032	0.0210	0.0034	0.0330
Pool Length (ft)							---		---		17.7	54.5	13.8	55.3
Pool Max Depth (ft)		2.3		1.9	2.7		1.2	1.5	1.4	1.7	1.4	2.9	1.5	4.1
Pool Spacing (ft)		---		---			14	59	15	65	40	67	27	88
Pool Volume (ft^3)														
Pattern														
Channel Beltwidth (ft)	N/A	18	22	26	72	See Table 5a.	14	54	16	60	20	38	15	42
Radius of Curvature (ft)		8	31	6	28		16	27	18	30	16.1	25.0	17.7	30.0
Rc:Bankfull Width (ft/ft)		1.3	5	1	3.5		1.8	3.0	1.8	3.0	0.5	2.4	2.0	3.1
Meander Length (ft)		54	61	102	173		36	135	40	150	76	116	64	147
Meander Width Ratio		2.9	3.6	4.3	9.1		1.6	6.0	1.6	60.0	1.9	3.7	1.7	4.3
Substrate, Bed and Transport Parameters														
Ri%/Ru%/P%/G%/S%	N/A					See Table 5a.								
SC%/Sa%/G%/C%/B%/Be%														
d16/d35/d50/d84/d95/d100		SC/SC/0.1/3/7		SC/SC/0.1/3/7							SC/2/18/57/87/180		SC/2/18/57/87/180	
Reach Shear Stress (Competency) lb/ft^2		---		---			0.3		0.36		0.25		0.44	0.45
Max part size (mm) mobilized at bankfull														
Stream Power (Capacity) W/m^2														
Additional Reach Parameters														
Drainage Area (SM)	N/A	0.10		0.16		See Table 5a.	0.10		0.16		0.10		0.16	
Watershed Impervious Cover Estimate (%)		<1%		<1%			<1%		<1%		<1%		<1%	
Rosgen Classification		E/G5/4		E/G5/4			C4		C4		C4		C4	
Bankfull Velocity (fps)		3.0		2.7	3.1		2.6		3.0		2.2		2.9	3.0
Bankfull Discharge (cfs)		19		19			15.0		21.0		17.7		20.0	23.2
Q-NFF regression		35		48										
Q-USGS extrapolation		18		25										
Q-Mannings		---		---										
Valley Length (ft)		283		1,198			283		1,198		283		1,198	
Channel Thalweg Length (ft)		368		1,368			386		1,311		386		1,443	
Sinuosity		1.3		1.2			1.0	1.2	1.0	1.2	1.3		1.2	
Water Surface Slope ($ft/ft)^2$		---		---			---		---		0.006		0.0108	
Bankfull Slope (ft/ft)		0.0082		0.0086			0.0102		0.0110		0.0084	0.0092	0.0107	0.0109

SC: Silt/Clay <0.062 mm diameter particles
(---): Data was not provided
N/A: Not Applicable

Table 6c. Baseline Stream Data Summary
Hopewell Stream Mitigation Site (NCEEP Project No. 95352)
Monitoring Year 0

Hopewell-UT2B Reach 2 and UT2C Reaches 2 and 3

		PRE-RESTORATION CONDITION				REFERENCE REACH DATA	DESIGN				AS-BUILT/BASELINE			
Parameter	Gage	UT2B		UT2C		See Table 5a.	UT2B Reach 2		UT2C Reach 2 & 3		UT2B Reach 2		UT2C Reach 2 & 3	
		Min	Max	Min	Max		Min	Max	Min	Max	Min	Max	Min	Max
Dimension and Substrate - Riffle														
Bankfull Width (ft)	N/A	3.4	5.1	4.2	6.4	See Table 5a.	5.0		7.8		5.2		9.9	
Floodprone Width (ft)		4.0	8.0	7.0	53.0		50	125	50	125	40.6		37.0	
Bankfull Mean Depth		0.4	0.6	0.6	0.9		0.4		0.6		0.4		0.5	
Bankfull Max Depth		0.7	1.0	0.9	1.4		0.5	0.6	0.7	0.8	0.6		1.1	
Bankfull Cross-sectional Area (ft^2)		2.2	2.3	3.8	4.2		2.1		4.3		2.1		5.3	
Width/Depth Ratio		5.5	11.3	4.6	9.6		12		14.0		13.0		18.4	
Entrenchment Ratio		1.2	1.6	1.2	2.6		10	25	6.4	16.0	7.8		3.7	
Bank Height Ratio		1.7	4.0	1.0	3.4		1.0		1.0		1.0		1.0	
D50 (mm)		2.1		6.0							25.4		18.4	
Profile														
Riffle Length (ft)	N/A					See Table 5a.	---		---		7.1	25.4	6.3	20.1
Riffle Slope (ft/ft)		---		---			0.03	0.065	0.0180	0.0380	0.0146	0.0441	0.0051	0.0584
Pool Length (ft)							---		---		10.3	21.5	3.2	24.5
Pool Max Depth (ft)		---		1.1	1.2		0.6	1.0	1.1	1.5	1.3	2.8	2.2	3.7
Pool Spacing (ft)		---		---			8	33	12	51	19	36	23	36
Pool Volume (ft^3)														
Pattern														
Channel Beltwidth (ft)	N/A	25	32	33	46	See Table 5a.	8	30	12.0	47.0	8	19	10	25
Radius of Curvature (ft)		20	20	6	20		9	15	14	23	9.0	15.0	13.7	14.6
Rc:Bankfull Width (ft/ft)		2.9	3.9	1.4	3.1		1.8	3	1.9	3.0	1.7	2.9	1.4	1.5
Meander Length (ft)		23.2	21	160	165		20	75	31	117	40	62	45	82
Meander Width Ratio		7.4	6.3	7.9	7.2		1.6	6	1.6	6.0	1.6	3.6	1.0	2.5
Substrate, Bed and Transport Parameters														
Ri%/Ru%/P%/G%/S%	N/A					See Table 5a.								
SC%/Sa%/G%/C%/B%/Be%														
d16/d35/d50/d84/d95/d100		SC/SC/2.1/18/107		SC/0.8/6/45/78							SC/6/21/55/128/256		SC/SC/9/45/78/128	
Reach Shear Stress (Competency) lb/ft^2		---		---			0.49		0.46	0.72	0.46		0.25	1.11
Max part size (mm) mobilized at bankfull														
Stream Power (Capacity) W/m^2														
Additional Reach Parameters														
Drainage Area (SM)	N/A	0.03		0.08		See Table 5a.	0.03		0.08		0.03		0.08	
Watershed Impervious Cover Estimate (%)		<1%		<1%			<1%		<1%		<1%		<1%	
Rosgen Classification		G4		E/G4			C4		C4		C4b		C4/C4b	
Bankfull Velocity (fps)		3.0	3.2	3.3	3.7		3		2.7		2.7		2.1	
Bankfull Discharge (cfs)		7		14			7		13		5.5		11.2	
Q-NFF regression		18		31										
Q-USGS extrapolation		9		15										
Q-Mannings		---		---										
Valley Length (ft)		183		296			183		229		183		229	
Channel Thalweg Length (ft)		114		326			198		247		198		247	
Sinuosity		1.2		1.1			1.0	1.2	1.0	1.2	1.1		1.1	
Water Surface Slope $(ft/ft)^2$		---		---			---		---		0.0211		0.0083	0.0365
Bankfull Slope (ft/ft)		0.0250		0.0120			0.0259		0.0154	0.024	0.0207	0.0215	0.0102	0.0459

SC: Silt/Clay <0.062 mm diameter particles
(---): Data was not provided
N/A: Not Applicable

Table 6d. Baseline Stream Data Summary
Hopewell Stream Mitigation Site (NCEEP Project No. 95352)
Monitoring Year 0

Hopewell-UT1B Reach 1

		PRE-RESTORATION CONDITION		REFERENCE REACH DATA	DESIGN		AS-BUILT/BASELINE	
Parameter	**Gage**	**UT1B Reach 1**		**See Table 5a.**	**UT1B Reach 1**		**UT1B Reach 1**	
		Min	**Max**		**Min**	**Max**	**Min**	**Max**
Dimension and Substrate - Riffle								
Bankfull Width (ft)	N/A	7.1	13.2	See Table 5a.	5.0		4.8	
Floodprone Width (ft)		8	28		10	25	12.4	
Bankfull Mean Depth		0.7	1.1		0.4		0.4	
Bankfull Max Depth		1.2	1.9		0.5		0.6	
Bankfull Cross-sectional Area (ft^2)		8	12		1.9		1.8	
Width/Depth Ratio		10.1	12		13.0		13.3	
Entrenchment Ratio		2.2			10.0	25.0	2.6	
Bank Height Ratio		2.5			1.0		1.0	
D50 (mm)		52.3					56.3	
Profile								
Riffle Length (ft)	N/A			See Table 5a.	---		10.5	46.8
Riffle Slope (ft/ft)		---			0.0154	0.033	0.0185	0.0646
Pool Length (ft)					---		20.4	105.2
Pool Max Depth (ft)		1.4	2.6		1.9	2.5	1.1	1.6
Pool Spacing (ft)^		---			21	91	56	103
Pool Volume (ft^3)								
Pattern								
Channel Beltwidth (ft)	N/A	20	47	See Table 5a.	22.0	84.0	---	
Radius of Curvature (ft)		10	84		25.0	42.0	---	
Rc:Bankfull Width (ft/ft)		0.9	7.5		1.8	3.0	---	
Meander Length (ft)		68	294		56	210	---	
Meander Width Ratio		1.8	4.2		1.6	6.0	---	
Substrate, Bed and Transport Parameters								
Ri%/Ru%/P%/G%/S%	N/A			See Table 5a.				
SC%/Sa%/G%/C%/B%/Be%								
d16/d35/d50/d84/d95/d100		SC/15.41/52.3/136/172					SC/1/6/128/256/512	
Reach Shear Stress (Competency) lb/ft^2		---			0.61		0.54	
Max part size (mm) mobilized at bankfull								
Stream Power (Capacity) W/m^2								
Additional Reach Parameters								
Drainage Area (SM)	N/A	0.03		See Table 5a.	0.03		0.03	
Watershed Impervious Cover Estimate (%)		<1%			<1%		<1%	
Rosgen Classification		Eb/B4			C4b		C4b	
Bankfull Velocity (fps)		1.7			3.3		2.8	
Bankfull Discharge (cfs)		12			6.0		5.0	
Q-NFF regression		15						
Q-USGS extrapolation		7						
Q-Mannings		---						
Valley Length (ft)		431			431		431	
Channel Thalweg Length (ft)		475			475		480	
Sinuosity		1.1			1.0	1.2	1.1	
Water Surface Slope ($ft/ft)^2$		---			---		0.0270	
Bankfull Slope (ft/ft)		0.0369			0.0360		0.0246	0.0260

SC: Silt/Clay <0.062 mm diameter particles
(---): Data was not provided
N/A: Not Applicable

Table 7a. Morphology and Hydraulic Summary (Dimensional Parameters - Cross-Section)

Hopewell Stream Mitigation Site (NCEEP Project No. 95352)

Monitoring Year 0

	Cross-Section 1, UT2A Reach 1 (Pool)						Cross-Section 2, UT2A Reach 1 (Riffle)						Cross-Section 3, UT2A Reach 2 (Riffle)						Cross-Section 4, UT2A Reach 2 (Pool)					
Dimension and Substrate	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**
based on fixed bankfull elevation	722.6						722.4						719.7						719.6					
Bankfull Width (ft)	12.1						10.3						9.8						12.1					
Floodprone Width (ft)	---						>87						>88						---					
Bankfull Mean Depth (ft)	1.4						0.8						0.7						1.4					
Bankfull Max Depth (ft)	2.7						1.6						1.1						3.0					
Bankfull Cross-Sectional Area (ft^2)	16.8						8.0						6.8						16.7					
Bankfull Width/Depth Ratio	8.7						13.3						14.0						8.8					
Bankfull Entrenchment Ratio	---						>8						>9						---					
Bankfull Bank Height Ratio	1.0						1.0						1.0						1.0					
	Cross-Section 5, UT2A Reach 2 (Pool)						**Cross-Section 6, UT2A R2 (Riffle)**						**Cross-Section 7, UT2 R2 (Pool)**						**Cross-Section 8, UT2 R2 (Riffle)**					
Dimension and Substrate	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**
based on fixed bankfull elevation	713.5						713.4						705.9						705.0					
Bankfull Width (ft)	11.9						8.9						32.2						15.3					
Floodprone Width (ft)	---						62.5						93.1						>55					
Bankfull Mean Depth (ft)	1.0						0.9						1.2						1.0					
Bankfull Max Depth (ft)	1.6						1.2						3.8						1.5					
Bankfull Cross-Sectional Area (ft^2)	12.0						7.8						38.6						14.8					
Bankfull Width/Depth Ratio	11.7						10.2						26.9						15.8					
Bankfull Entrenchment Ratio	---						7.0						2.9						>4					
Bankfull Bank Height Ratio	0.7						1.0						1.0						1.0					
	Cross-Section 9, UT2B R2 (Riffle)						**Cross-Section 10, UT2B R2 (Pool)**						**Cross-Section 11, UT2 R1 (Riffle)**						**Cross-Section 12, UT2 R1 (Riffle)**					
Dimension and Substrate	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**
based on fixed bankfull elevation	724.4						723.4						719.3						717.3					
Bankfull Width (ft)	5.2						9.0						14.2						10.6					
Floodprone Width (ft)	>41						---						94.3						>68					
Bankfull Mean Depth (ft)	0.4						0.9						0.9						0.8					
Bankfull Max Depth (ft)	0.6						1.5						1.7						1.3					
Bankfull Cross-Sectional Area (ft^2)	2.1						7.9						12.7						8.4					
Bankfull Width/Depth Ratio	13.0						10.2						15.8						13.2					
Bankfull Entrenchment Ratio	>8						---						6.6						>7					
Bankfull Bank Height Ratio	1.0						1.0						1.0						1.0					

Table 7b. Morphology and Hydraulic Summary (Dimensional Parameters - Cross-Section)

Hopewell Stream Mitigation Site (NCEEP Project No. 95352)

Monitoring Year 0

	Cross-Section 13, UT2 R1 (Pool)						Cross-Section 14, UT1B R1 (Pool)						Cross-Section 15, UT1B R1 (Riffle)						Cross-Section 16, UT2C R2 (Riffle)					
Dimension and Substrate	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**
based on fixed bankfull elevation	717.4						764.2						761.9						709.2					
Bankfull Width (ft)	19.6						5.2						4.8						9.9					
Floodprone Width (ft)	---						---						12.4						>37					
Bankfull Mean Depth (ft)	1.2						0.5						0.4						0.5					
Bankfull Max Depth (ft)	2.4						0.7						0.6						1.1					
Bankfull Cross-Sectional Area (ft^2)	23.1						2.5						1.8						5.3					
Bankfull Width/Depth Ratio	16.7						10.5						13.3						>18					
Bankfull Entrenchment Ratio	---						---						2.6						3.7					
Bankfull Bank Height Ratio	1.0						1.0						1.0						1.0					

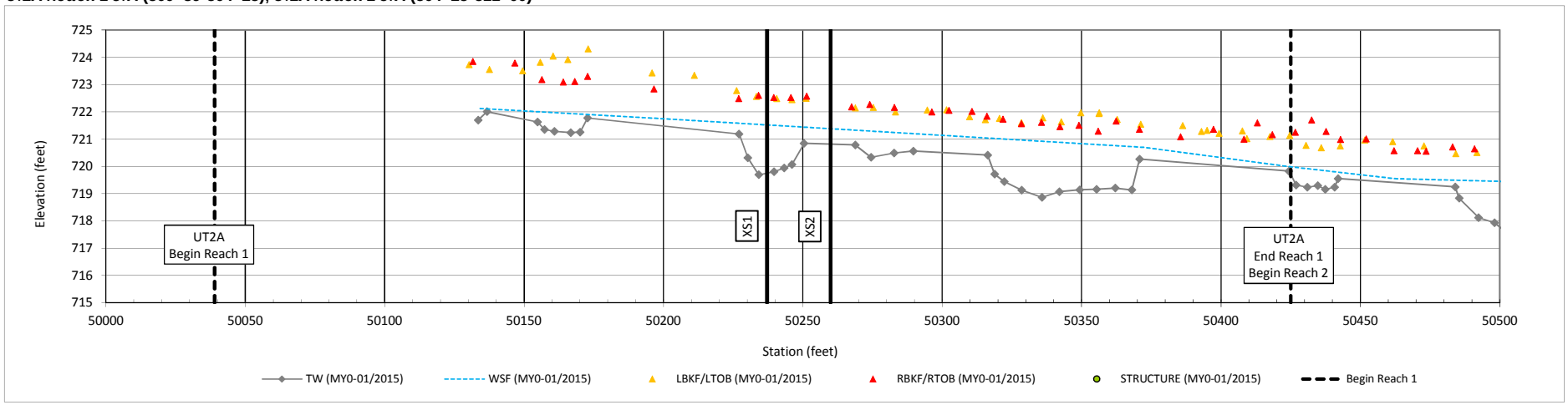
	Cross-Section 17, UT2C R2 (Pool)					
Dimension and Substrate	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**
based on fixed bankfull elevation	708.3					
Bankfull Width (ft)	13.0					
Floodprone Width (ft)	---					
Bankfull Mean Depth (ft)	0.9					
Bankfull Max Depth (ft)	2.0					
Bankfull Cross-Sectional Area (ft^2)	11.2					
Bankfull Width/Depth Ratio	15.1					
Bankfull Entrenchment Ratio	---					
Bankfull Bank Height Ratio	1.0					

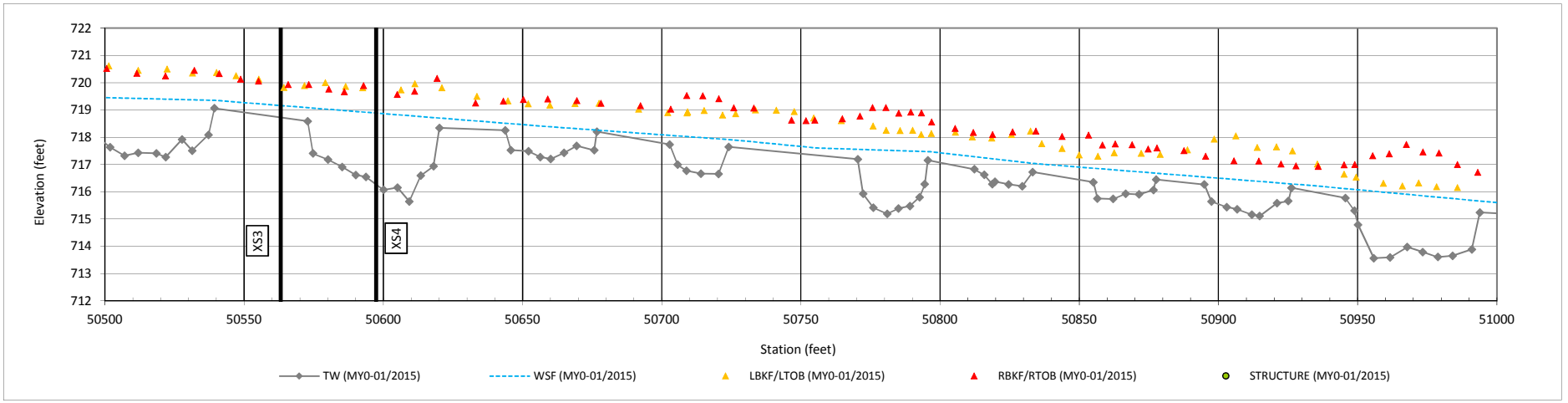
Longitudinal Profile Plots

Hopewell Stream Mitigation Site (NCEEP Project No.95021)

Monitoring Year 0 - 2015

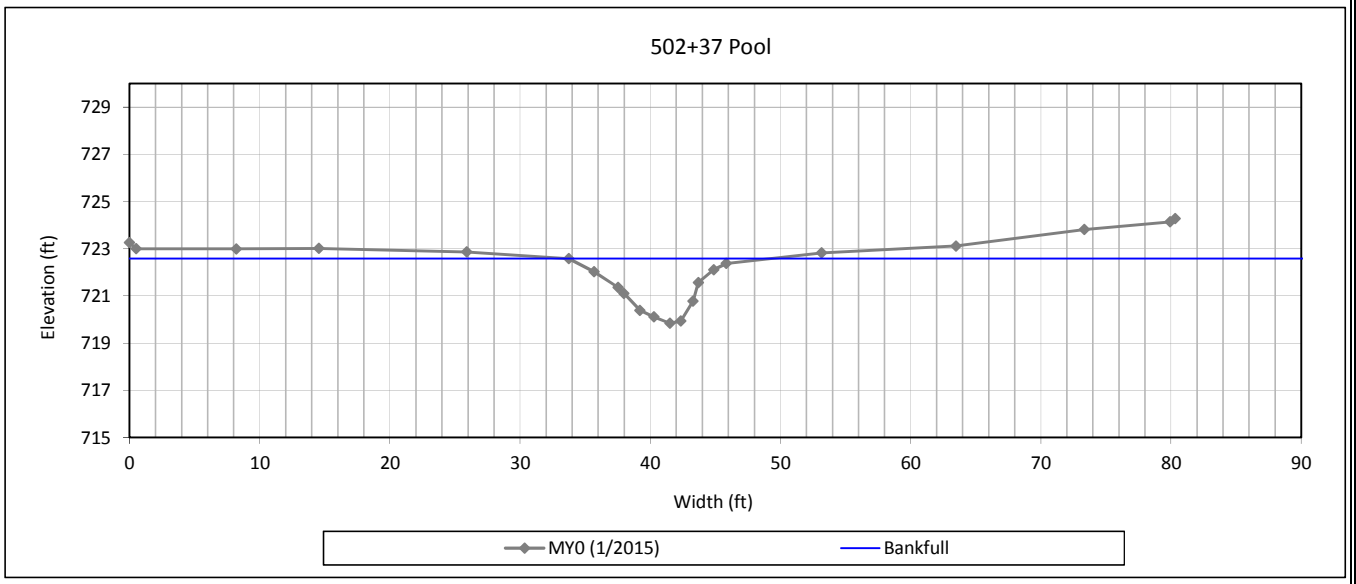
UT2A Reach 1 STA (500+39-504+25); UT2A Reach 2 STA (504+25-511+00)





Cross Section Plots
Hopewell Stream Mitigation Site (NCEEP Project No. 95352)
Monitoring Year 0

Cross Section 1, UT2A Reach 1



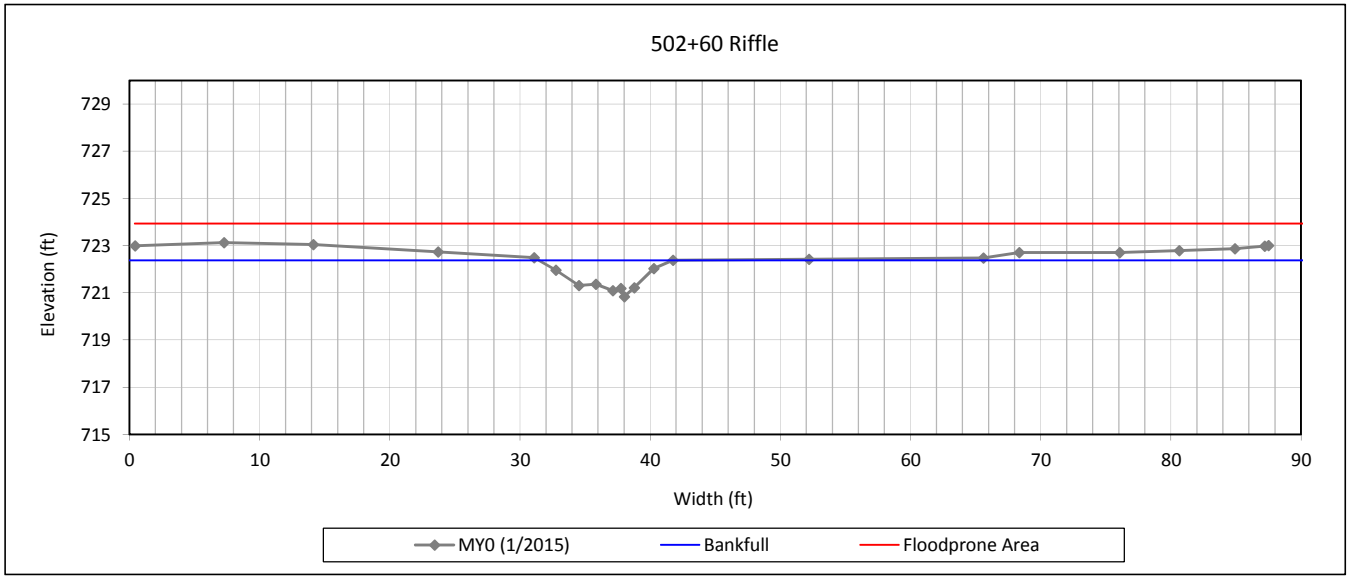
Bankfull Dimensions	
16.8	x-section area (ft.sq.)
12.1	width (ft)
1.4	mean depth (ft)
2.7	max depth (ft)
13.6	wetted parimeter (ft)
1.2	hyd radi (ft)
8.7	width-depth ratio
---	W flood prone area (ft)
---	entrenchment ratio
1.0	low bank height ratio

Survey Date: 1/2015
Field Crew: Turner Surveying

View Downstream

Cross Section Plots
Hopewell Stream Mitigation Site (NCEEP Project No. 95352)
Monitoring Year 0

Cross Section 2, UT2A Reach 1



Bankfull Dimensions	
8.0	x-section area (ft.sq.)
10.3	width (ft)
0.8	mean depth (ft)
1.6	max depth (ft)
11.1	wetted parimeter (ft)
0.7	hyd radi (ft)
13.3	width-depth ratio
87.1	W flood prone area (ft)
8.4	entrenchment ratio
1.0	low bank height ratio

Survey Date: 1/2015
Field Crew: Turner Surveying

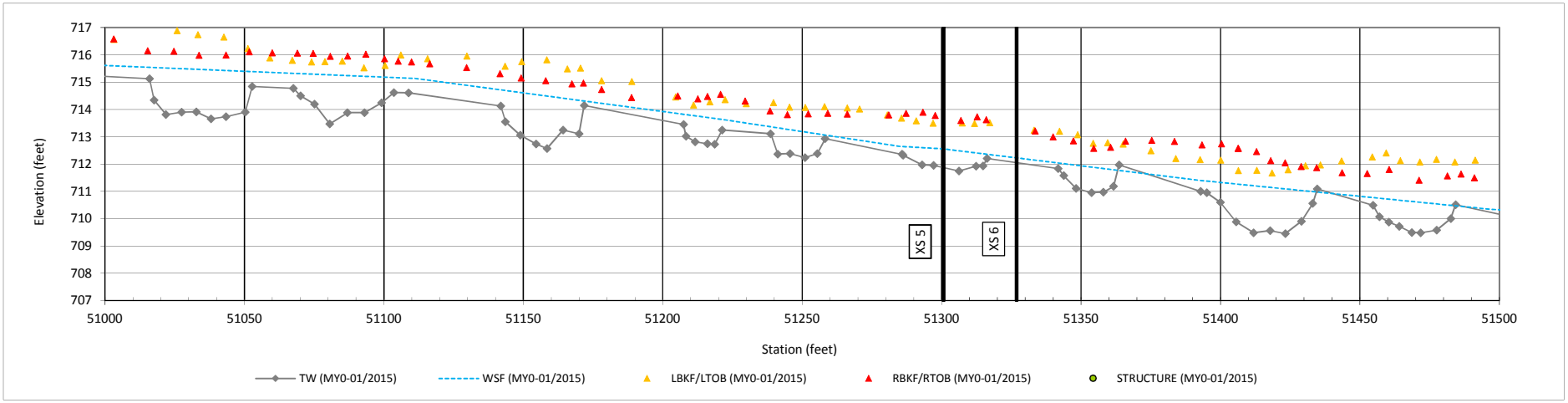
View Downstream

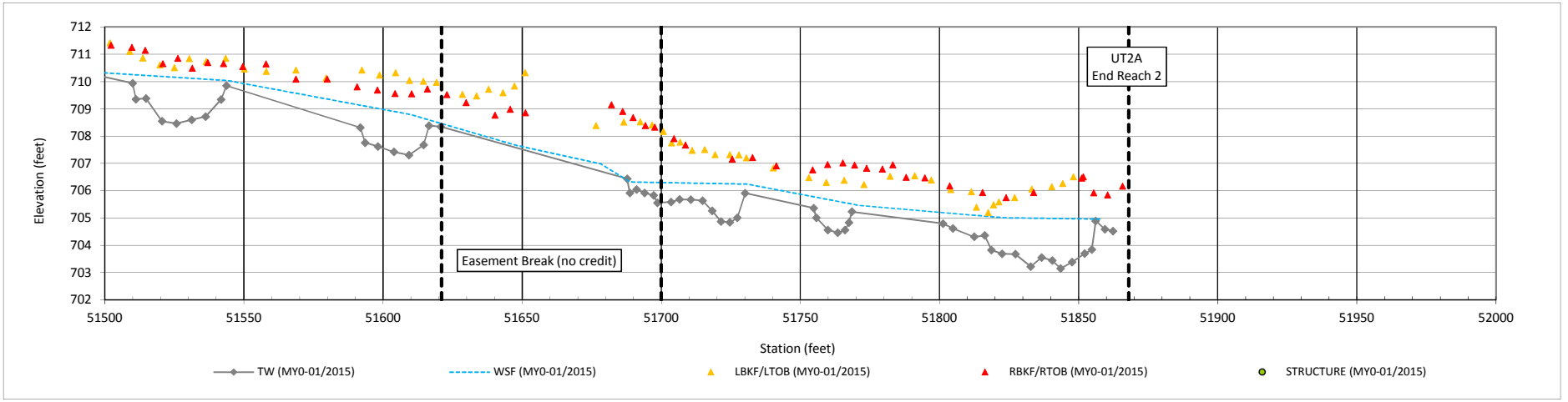
Longitudinal Profile Plots

Hopewell Stream Mitigation Site (NCEEP Project No.95021)

Monitoring Year 0 - 2015

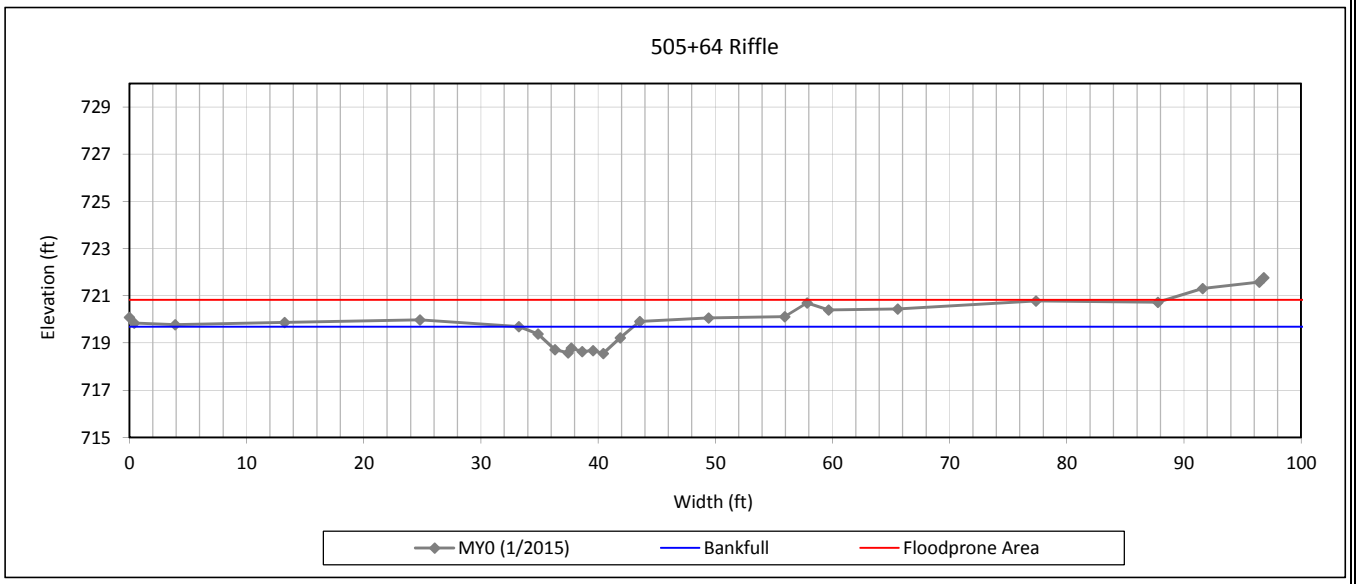
UT2A Reach 2 STA 511+00 - 518+68





Cross Section Plots
Hopewell Stream Mitigation Site (NCEEP Project No. 95352)
Monitoring Year 0

Cross Section 3, UT2A Reach 2



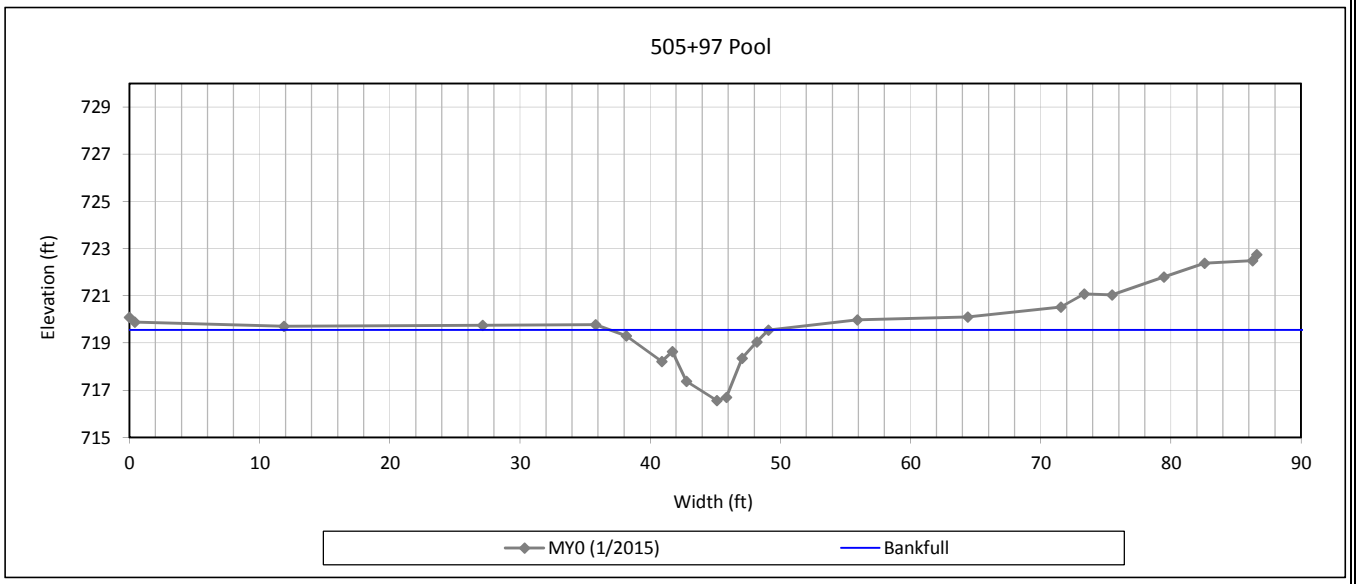
Bankfull Dimensions	
6.8	x-section area (ft.sq.)
9.8	width (ft)
0.7	mean depth (ft)
1.1	max depth (ft)
10.3	wetted parimeter (ft)
0.7	hyd radi (ft)
14.0	width-depth ratio
88.4	W flood prone area (ft)
9.1	entrenchment ratio
1.0	low bank height ratio

Survey Date: 1/2015
Field Crew: Turner Surveying

View Downstream

Cross Section Plots
Hopewell Stream Mitigation Site (NCEEP Project No. 95352)
Monitoring Year 0

Cross Section 4, UT2A Reach 2



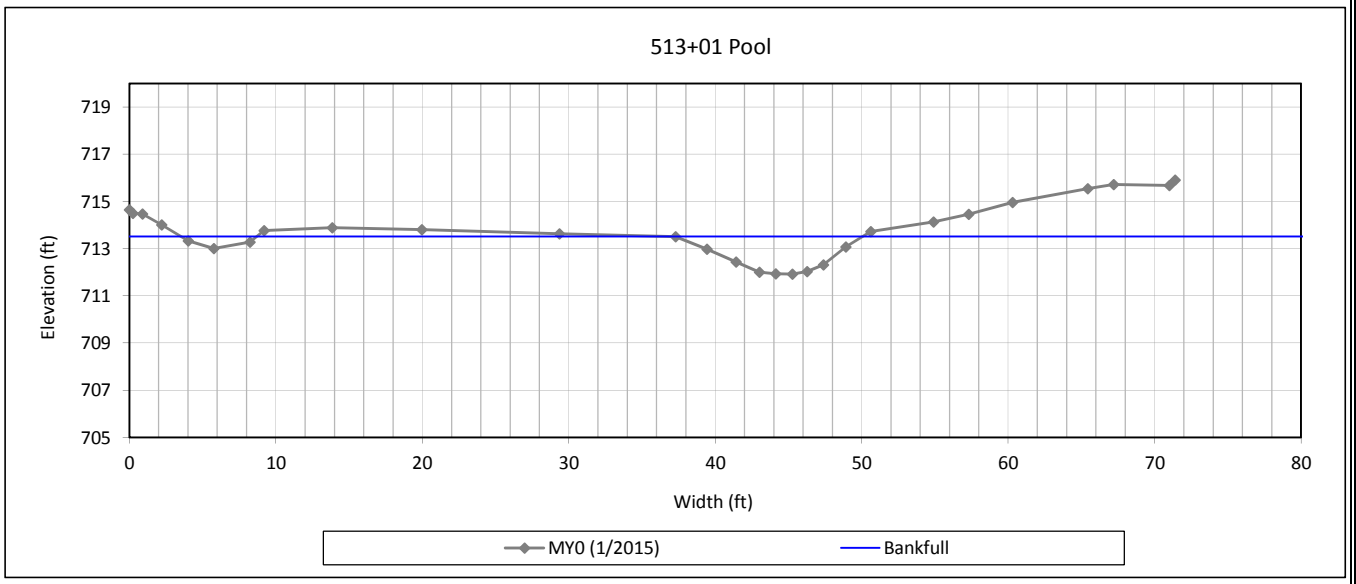
Bankfull Dimensions	
16.7	x-section area (ft.sq.)
12.1	width (ft)
1.4	mean depth (ft)
3.0	max depth (ft)
14.3	wetted parimeter (ft)
1.2	hyd radi (ft)
8.8	width-depth ratio
---	W flood prone area (ft)
---	entrenchment ratio
1.0	low bank height ratio

Survey Date: 1/2015
Field Crew: Turner Surveying

View Downstream

Cross Section Plots
Hopewell Stream Mitigation Site (NCEEP Project No. 95352)
Monitoring Year 0

Cross Section 5, UT2A Reach 2



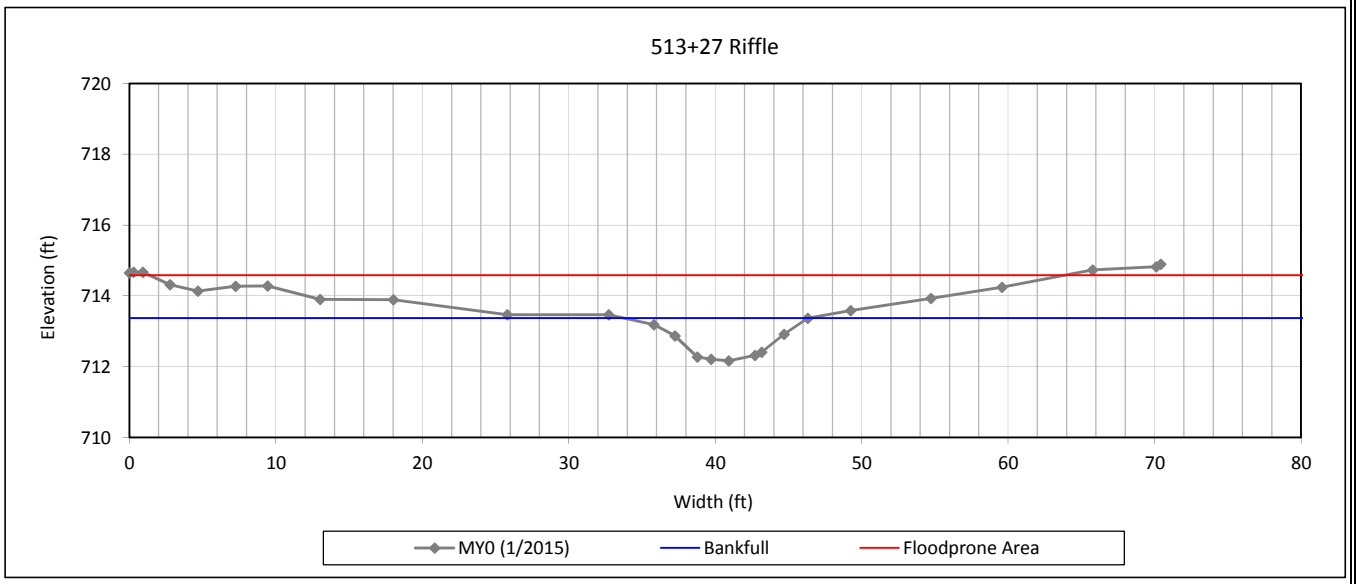
Bankfull Dimensions	
12.0	x-section area (ft.sq.)
11.9	width (ft)
1.0	mean depth (ft)
1.6	max depth (ft)
12.3	wetted parimeter (ft)
1.0	hyd radi (ft)
11.7	width-depth ratio
---	W flood prone area (ft)
---	entrenchment ratio
0.7	low bank height ratio

Survey Date: 1/2015
Field Crew: Turner Surveying

View Downstream

Cross Section Plots
Hopewell Stream Mitigation Site (NCEEP Project No. 95352)
Monitoring Year 0

Cross Section 6, UT2A R2



Bankfull Dimensions	
7.8	x-section area (ft.sq.)
8.9	width (ft)
0.9	mean depth (ft)
1.2	max depth (ft)
9.1	wetted parimeter (ft)
0.9	hyd radi (ft)
10.2	width-depth ratio
62.5	W flood prone area (ft)
7.0	entrenchment ratio
1.0	low bank height ratio

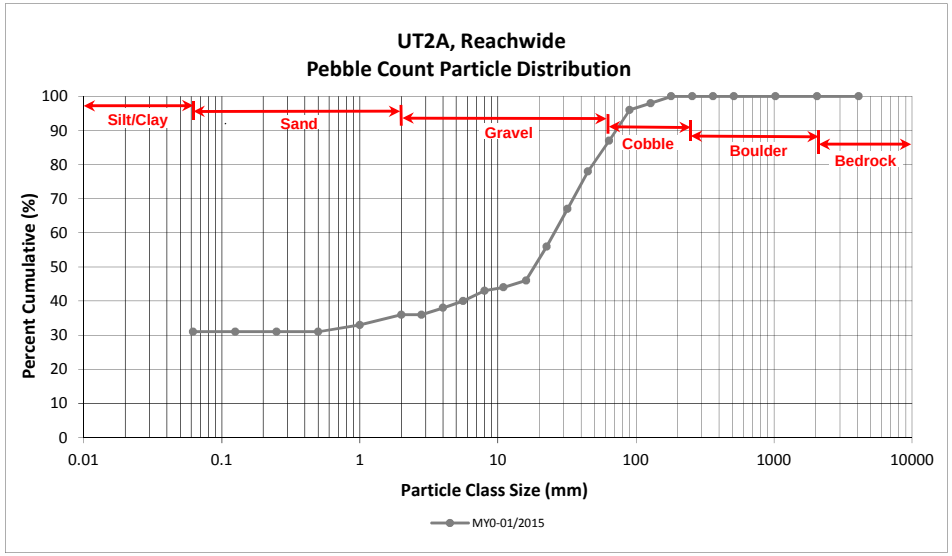
Survey Date: 1/2015
Field Crew: Turner Surveying

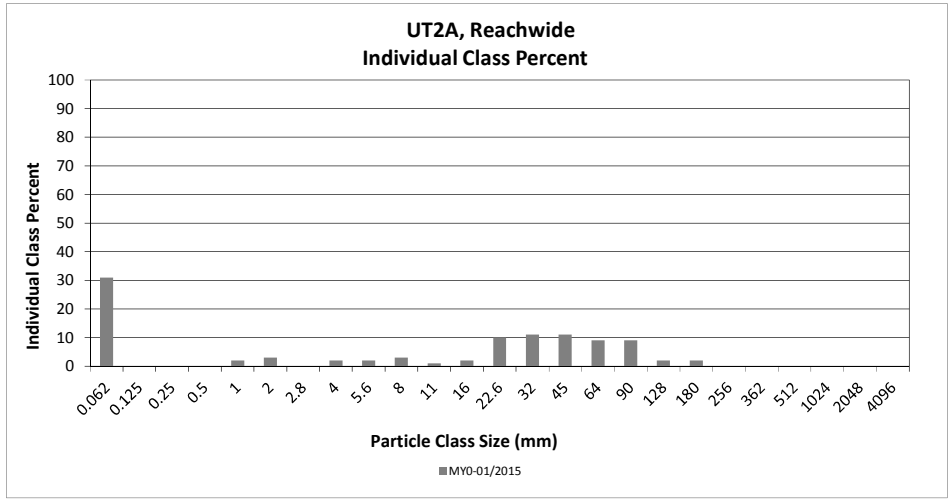
View Downstream

Reachwide and Cross Section Pebble Count Plots
Hopewell Stream Mitigation Site (NCEEP Project No. 95352)
UT2A, Reachwide
Monitoring Year 0 - 2015

Particle Class		Diameter (mm)		Particle Count			Reach Summary	
		min	max	Riffle	Pool	Total	Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062	1	30	31	31	31
SAND	Very fine	0.062	0.125					31
	Fine	0.125	0.250					31
	Medium	0.25	0.50					31
	Coarse	0.5	1.0		2	2	2	33
	Very Coarse	1.0	2.0		3	3	3	36
GRAVEL	Very Fine	2.0	2.8					36
	Very Fine	2.8	4.0		2	2	2	38
	Fine	4.0	5.6		2	2	2	40
	Fine	5.6	8.0		3	3	3	43
	Medium	8.0	11.0		1	1	1	44
	Medium	11.0	16.0	1	1	2	2	46
	Coarse	16.0	22.6	8	2	10	10	56
	Coarse	22.6	32	9	2	11	11	67
	Very Coarse	32	45	9	2	11	11	78
	Very Coarse	45	64	9		9	9	87
COBBLE	Small	64	90	9		9	9	96
	Small	90	128	2		2	2	98
	Large	128	180	2		2	2	100
	Large	180	256					100
BOULDER	Small	256	362					100
	Small	362	512					100
	Medium	512	1024					100
	Large/Very Large	1024	2048					100
BEDROCK	Bedrock	2048	>2048					100
			Total	**50**	**50**	**100**	**100**	**100**

Reachwide	
Channel materials (mm)	
D_{16} =	Silt/Clay
D_{35} =	1.59
D_{50} =	18.4
D_{84} =	56.9
D_{95} =	86.7
D_{100} =	180.0

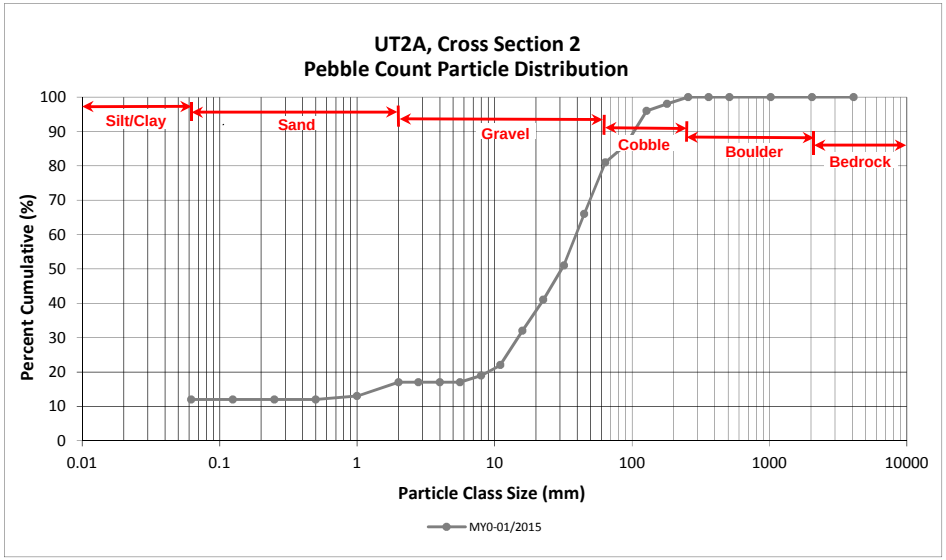


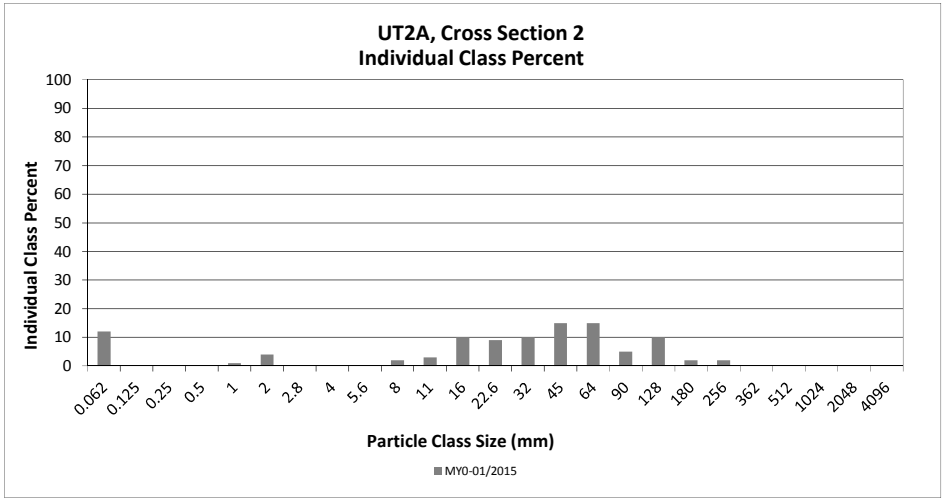


Reachwide and Cross Section Pebble Count Plots
Hopewell Stream Mitigation Site (NCEEP Project No. 95352)
UT2A, Cross Section 2
Monitoring Year 0 - 2015

Particle Class		Diameter (mm)		Riffle 100-Count	Summary	
		min	max		Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062	8	8	8
SAND	Very fine	0.062	0.125			8
	Fine	0.125	0.250			8
	Medium	0.25	0.50			8
	Coarse	0.5	1.0	2	2	10
	Very Coarse	1.0	2.0	2	2	12
GRAVEL	Very Fine	2.0	2.8			12
	Very Fine	2.8	4.0	1	1	13
	Fine	4.0	5.6			13
	Fine	5.6	8.0			13
	Medium	8.0	11.0	2	2	15
	Medium	11.0	16.0	7	7	22
	Coarse	16.0	22.6	13	13	35
	Coarse	22.6	32	12	12	47
	Very Coarse	32	45	15	15	62
	Very Coarse	45	64	15	15	77
COBBLE	Small	64	90	12	12	89
	Small	90	128	6	6	95
	Large	128	180	5	5	100
	Large	180	256			100
BOULDER	Small	256	362			100
	Small	362	512			100
	Medium	512	1024			100
	Large/Very Large	1024	2048			100
BEDROCK	Bedrock	2048	>2048			100
			Total	**100**	**100**	**100**

Cross Section 3	
Channel materials (mm)	
D_{16} =	11.60
D_{35} =	22.60
D_{50} =	34.3
D_{84} =	78.1
D_{95} =	128.0
D_{100} =	180.0

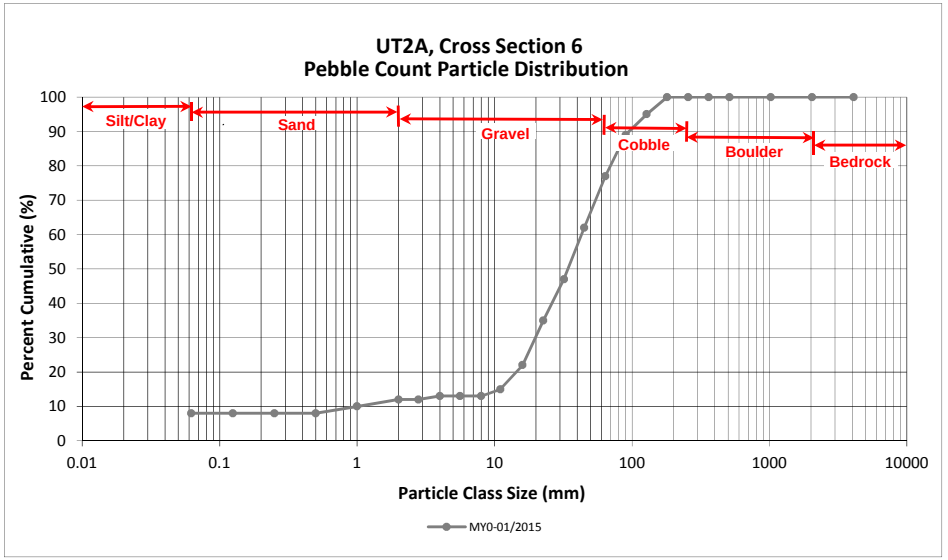


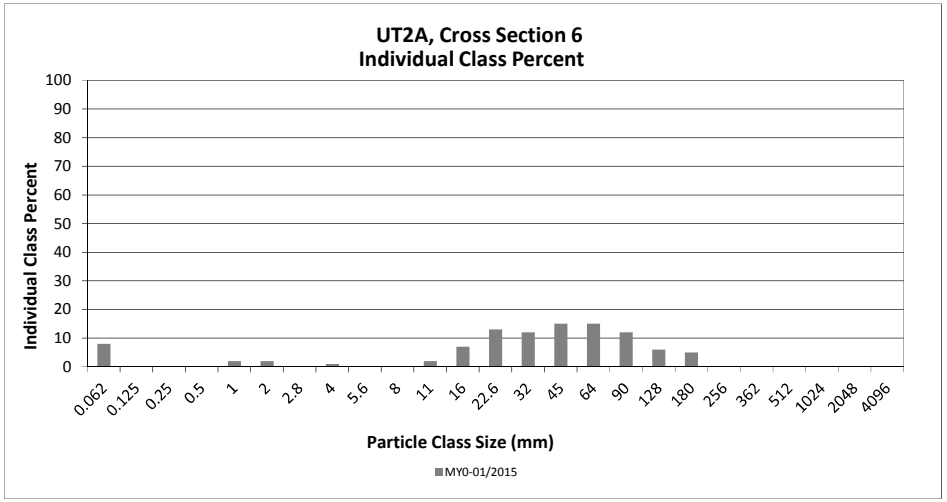


Reachwide and Cross Section Pebble Count Plots
Hopewell Stream Mitigation Site (NCEEP Project No. 95352)
UT2A, Cross Section 6
Monitoring Year 0 - 2015

Particle Class		Diameter (mm)		Riffle 100-Count	Summary	
		min	max		Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062	8	8	8
SAND	Very fine	0.062	0.125			8
	Fine	0.125	0.250			8
	Medium	0.25	0.50			8
	Coarse	0.5	1.0			8
	Very Coarse	1.0	2.0	2	2	10
GRAVEL	Very Fine	2.0	2.8			10
	Very Fine	2.8	4.0			10
	Fine	4.0	5.6			10
	Fine	5.6	8.0			10
	Medium	8.0	11.0	4	4	13
	Medium	11.0	16.0	10	10	23
	Coarse	16.0	22.6	10	10	33
	Coarse	22.6	32	13	13	45
	Very Coarse	32	45	11	11	56
	Very Coarse	45	64	12	12	67
COBBLE	Small	64	90	10	10	77
	Small	90	128	10	10	87
	Large	128	180	8	8	94
	Large	180	256	4	4	98
BOULDER	Small	256	362	2	2	100
	Small	362	512			100
	Medium	512	1024			100
	Large/Very Large	1024	2048			100
BEDROCK	Bedrock	2048	>2048			100
			Total	**104**	**100**	**100**

Cross Section 5	
Channel materials (mm)	
D_{16} =	12.14
D_{35} =	24.10
D_{50} =	37.4
D_{84} =	116.6
D_{95} =	193.1
D_{100} =	362.0



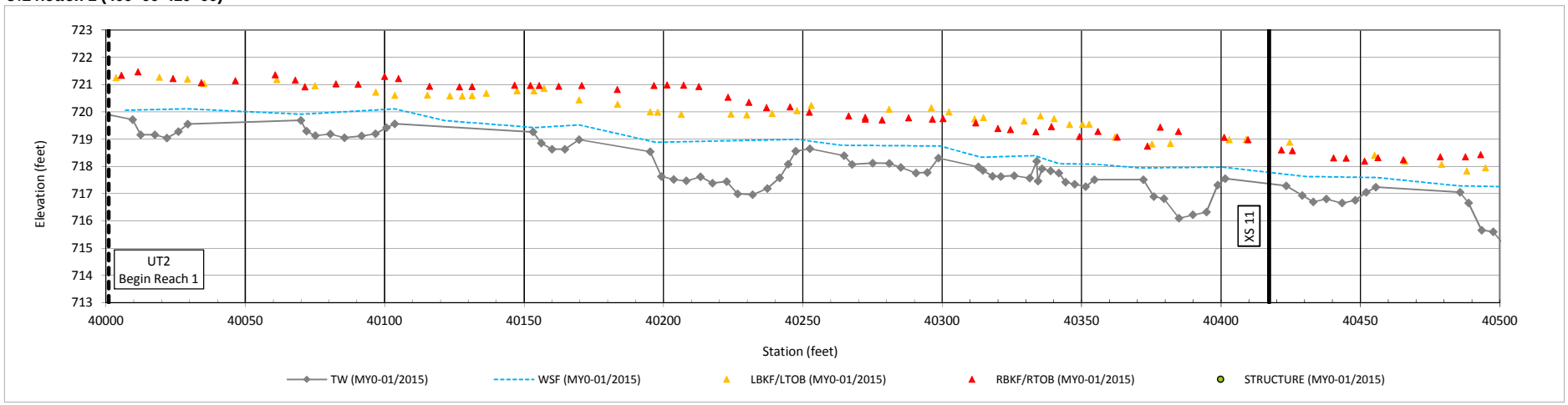


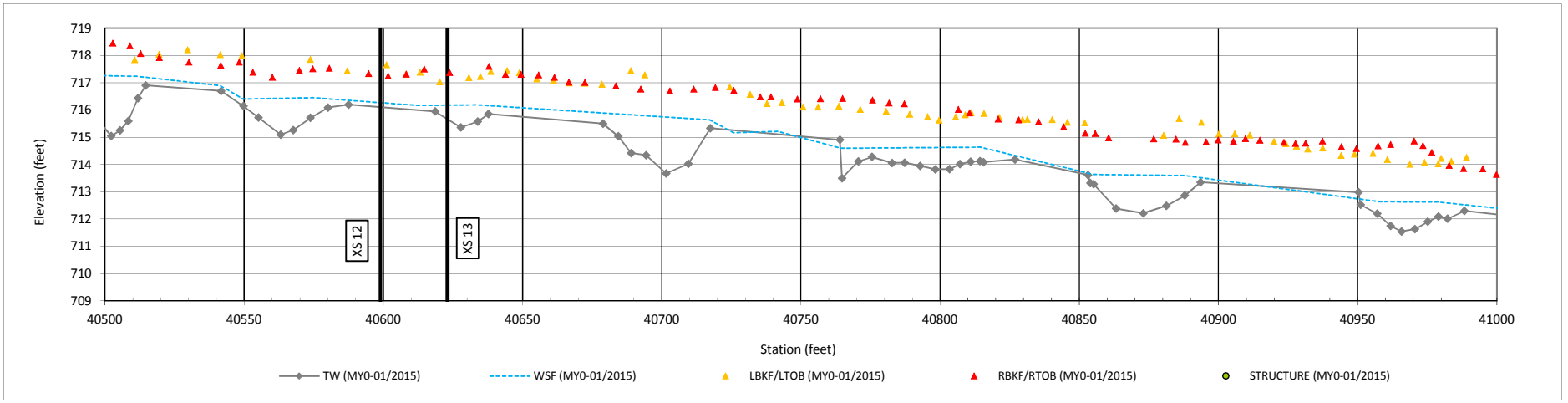
Longitudinal Profile Plots

Hopewell Stream Mitigation Site (NCEEP Project No.95021)

Monitoring Year 0 - 2015

UT2 Reach 1 (400+00-410+00)



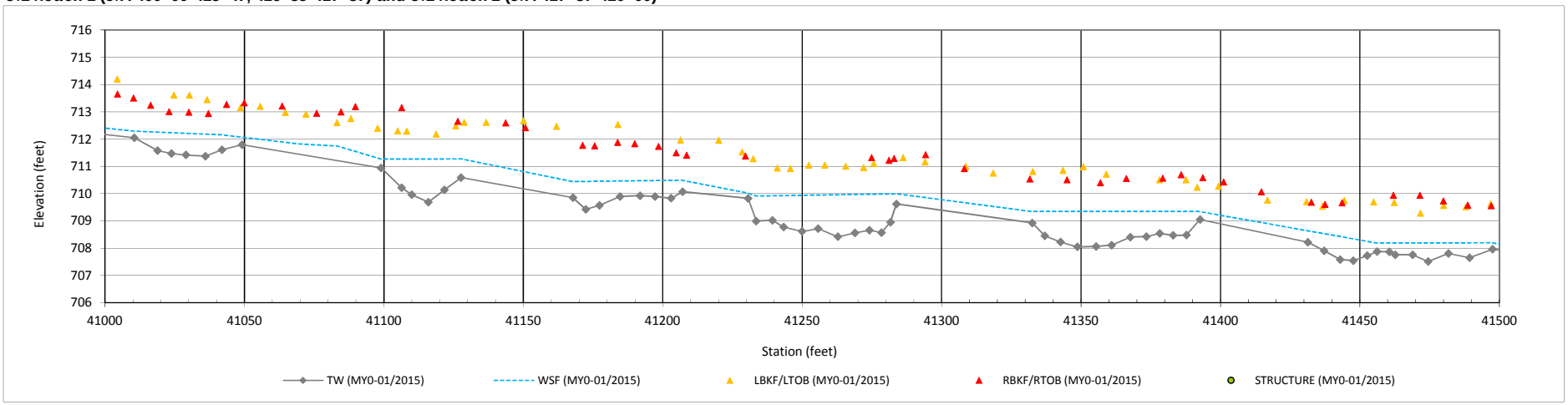


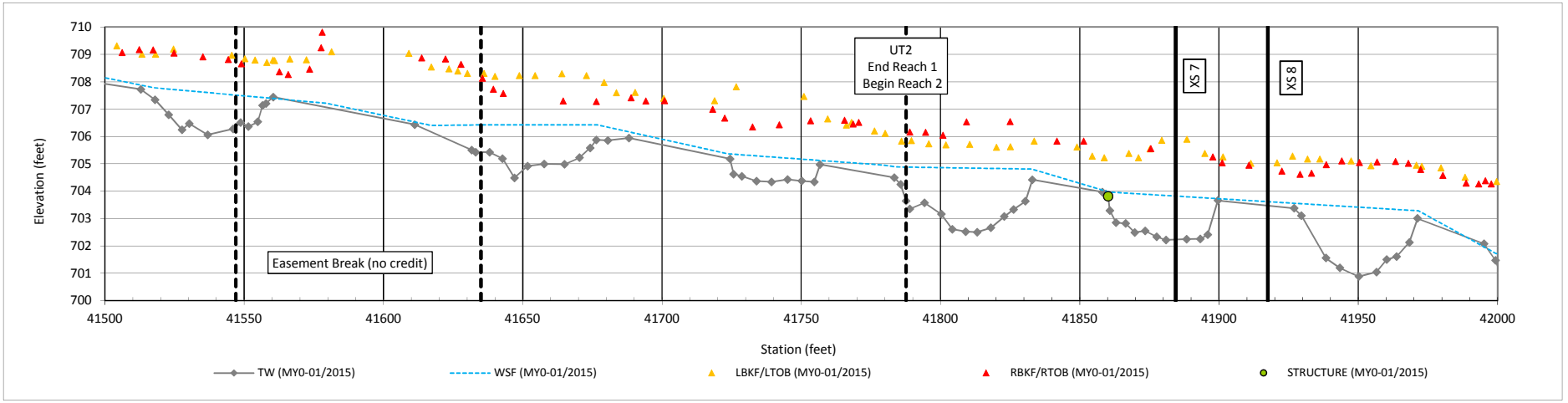
Longitudinal Profile Plots

Hopewell Stream Mitigation Site (NCEEP Project No.95021)

Monitoring Year 0 - 2015

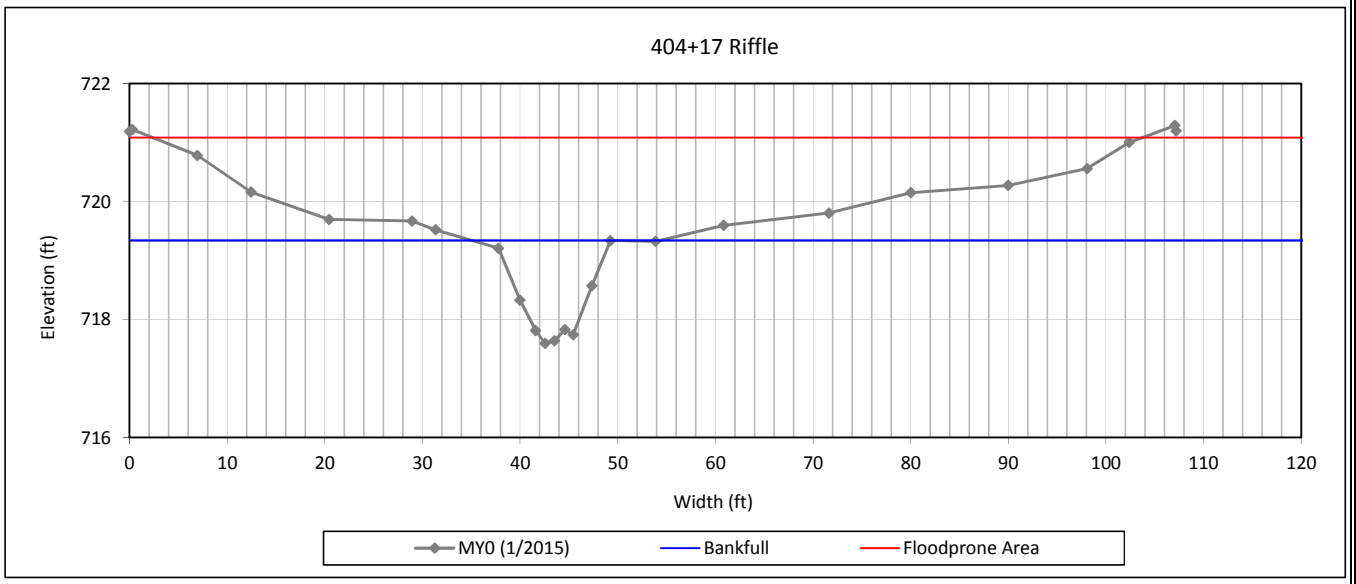
UT2 Reach 1 (STA 400+00-415+47; 416+35-417+87) and UT2 Reach 2 (STA 417+87-420+00)





Cross Section Plots
Hopewell Stream Mitigation Site (NCEEP Project No. 95352)
Monitoring Year 0

Cross Section 11, UT2 R1



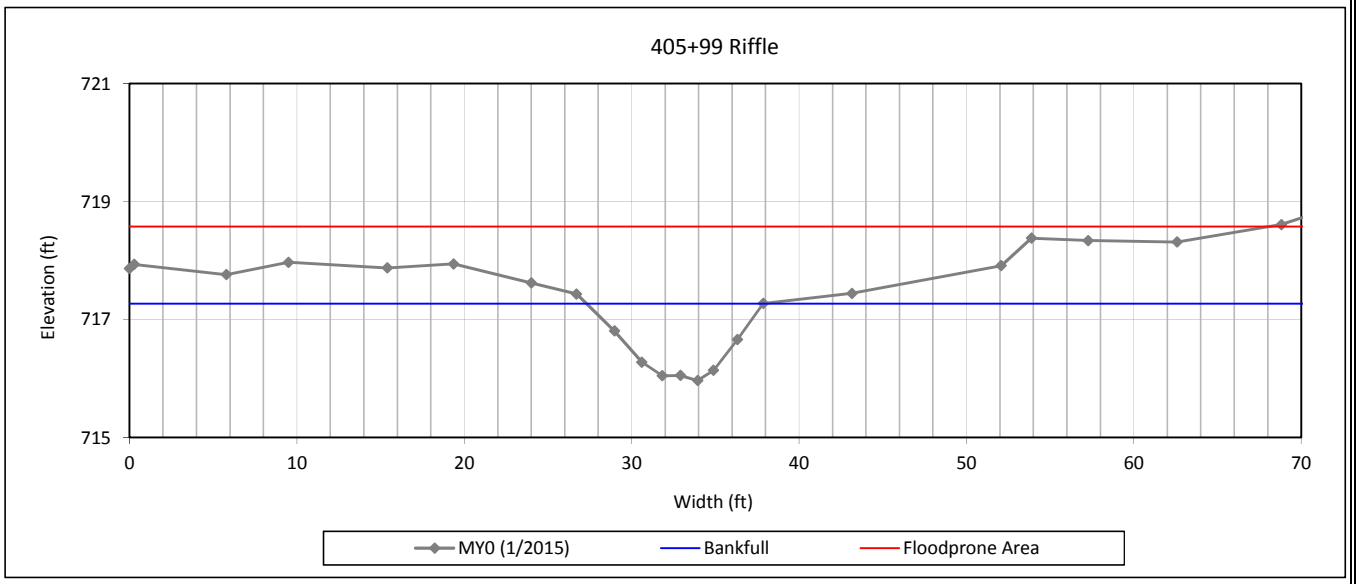
Bankfull Dimensions	
12.7	x-section area (ft.sq.)
14.2	width (ft)
0.9	mean depth (ft)
1.7	max depth (ft)
14.8	wetted parimeter (ft)
0.9	hyd radi (ft)
15.8	width-depth ratio
94.3	W flood prone area (ft)
6.6	entrenchment ratio
1.0	low bank height ratio

Survey Date: 1/2015
Field Crew: Turner Surveying

View Downstream

Cross Section Plots
Hopewell Stream Mitigation Site (NCEEP Project No. 95352)
Monitoring Year 0

Cross Section 12, UT2 R1



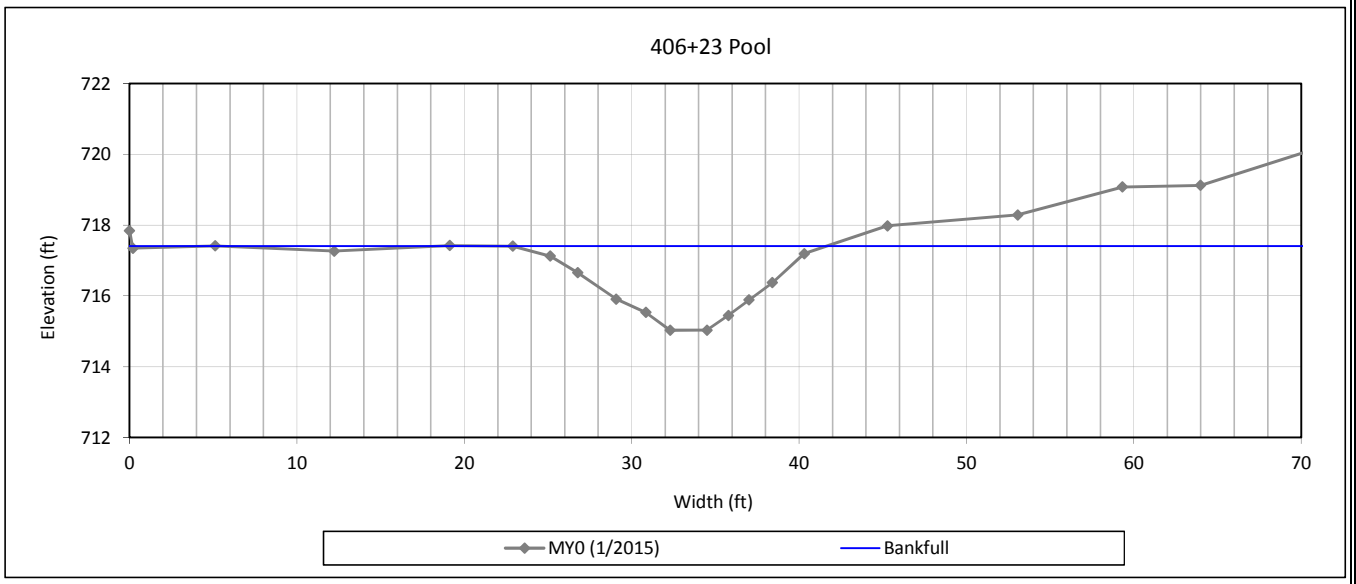
Bankfull Dimensions	
8.4	x-section area (ft.sq.)
10.6	width (ft)
0.8	mean depth (ft)
1.3	max depth (ft)
10.9	wetted parimeter (ft)
0.8	hyd radi (ft)
13.2	width-depth ratio
68.1	W flood prone area (ft)
6.5	entrenchment ratio
1.0	low bank height ratio

Survey Date: 1/2015
Field Crew: Turner Surveying

View Downstream

Cross Section Plots
Hopewell Stream Mitigation Site (NCEEP Project No. 95352)
Monitoring Year 0

Cross Section 13, UT2 R1



Bankfull Dimensions	
23.1	x-section area (ft.sq.)
19.6	width (ft)
1.2	mean depth (ft)
2.4	max depth (ft)
20.4	wetted parimeter (ft)
1.1	hyd radi (ft)
16.7	width-depth ratio
---	W flood prone area (ft)
---	entrenchment ratio
1.0	low bank height ratio

Survey Date: 1/2015
Field Crew: Turner Surveying

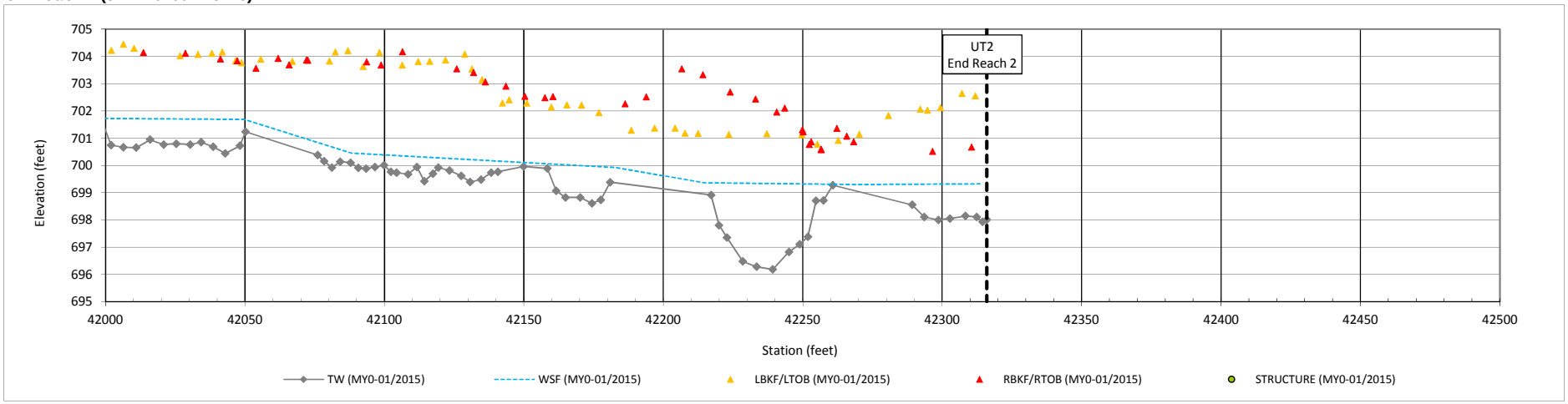
View Downstream

Longitudinal Profile Plots

Hopewell Stream Mitigation Site (NCEEP Project No.95021)

Monitoring Year 0 - 2015

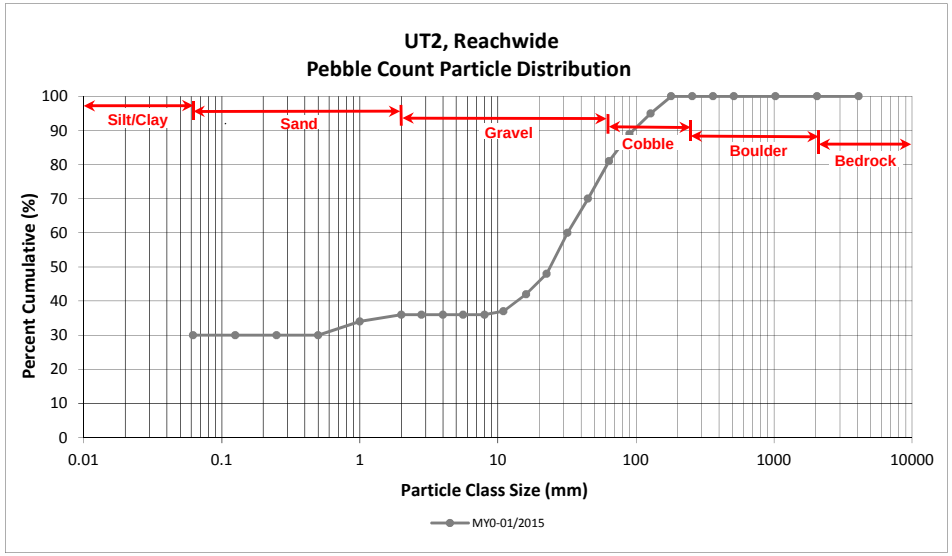
UT2 Reach 2 (STA 420+00-423+16)

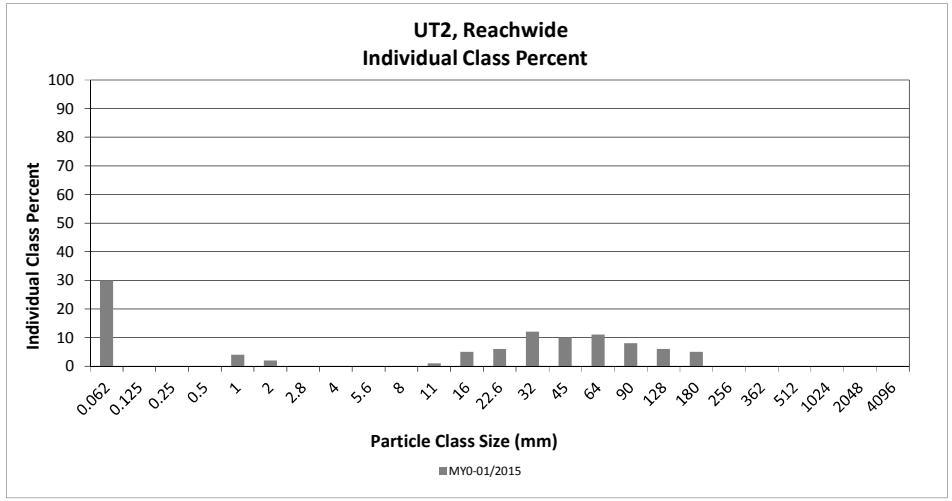


Reachwide and Cross Section Pebble Count Plots
Hopewell Stream Mitigation Site (NCEEP Project No. 95352)
UT2, Reachwide
Monitoring Year 0 - 2015

Particle Class		Diameter (mm)		Particle Count			Reach Summary	
		min	max	Riffle	Pool	Total	Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062		30	30	30	30
SAND	Very fine	0.062	0.125					30
	Fine	0.125	0.250					30
	Medium	0.25	0.50					30
	Coarse	0.5	1.0	1	3	4	4	34
	Very Coarse	1.0	2.0	1	1	2	2	36
GRAVEL	Very Fine	2.0	2.8					36
	Very Fine	2.8	4.0					36
	Fine	4.0	5.6					36
	Fine	5.6	8.0					36
	Medium	8.0	11.0		1	1	1	37
	Medium	11.0	16.0	2	3	5	5	42
	Coarse	16.0	22.6	3	3	6	6	48
	Coarse	22.6	32	8	4	12	12	60
	Very Coarse	32	45	7	3	10	10	70
	Very Coarse	45	64	9	2	11	11	81
COBBLE	Small	64	90	8		8	8	89
	Small	90	128	6		6	6	95
	Large	128	180	5		5	5	100
	Large	180	256					100
BOULDER	Small	256	362					100
	Small	362	512					100
	Medium	512	1024					100
	Large/Very Large	1024	2048					100
BEDROCK	Bedrock	2048	>2048					100
			Total	**50**	**50**	**100**	**100**	**100**

Reachwide	
Channel materials (mm)	
D_{16} =	Silt/Clay
D_{35} =	1.41
D_{50} =	23.9
D_{84} =	72.7
D_{95} =	128.0
D_{100} =	180.0

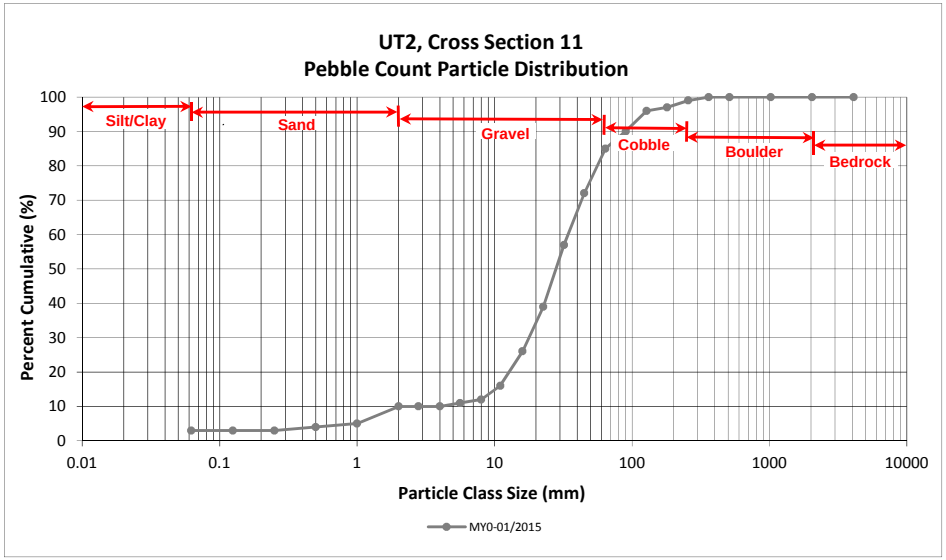


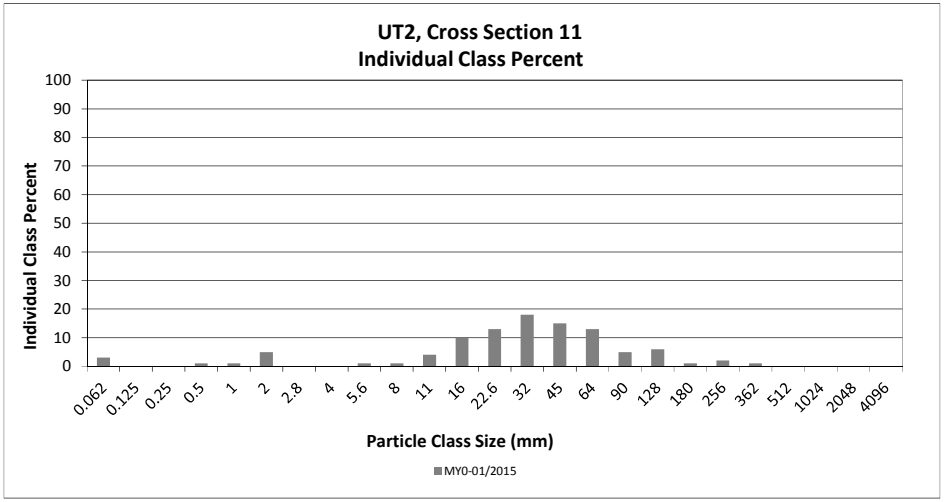


Reachwide and Cross Section Pebble Count Plots
Hopewell Stream Mitigation Site (NCEEP Project No. 95352)
UT2, Cross Section 11
Monitoring Year 0 - 2015

Particle Class		Diameter (mm) min	Diameter (mm) max	Riffle 100-Count	Summary: Class Percentage	Summary: Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062	3	3	3
SAND	Very fine	0.062	0.125			3
	Fine	0.125	0.250			3
	Medium	0.25	0.50	1	1	4
	Coarse	0.5	1.0	1	1	5
	Very Coarse	1.0	2.0	5	5	10
GRAVEL	Very Fine	2.0	2.8			10
	Very Fine	2.8	4.0			10
	Fine	4.0	5.6	1	1	11
	Fine	5.6	8.0	1	1	12
	Medium	8.0	11.0	4	4	16
	Medium	11.0	16.0	10	10	26
	Coarse	16.0	22.6	13	13	39
	Coarse	22.6	32	18	18	57
	Very Coarse	32	45	15	15	72
	Very Coarse	45	64	13	13	85
COBBLE	Small	64	90	5	5	90
	Small	90	128	6	6	96
	Large	128	180	1	1	97
	Large	180	256	2	2	99
BOULDER	Small	256	362	1	1	100
	Small	362	512			100
	Medium	512	1024			100
	Large/Very Large	1024	2048			100
BEDROCK	Bedrock	2048	>2048			100
			Total	**100**	**100**	**100**

Cross Section 13	
Channel materials (mm)	
D_{16} =	11.00
D_{35} =	20.32
D_{50} =	28.0
D_{84} =	62.3
D_{95} =	120.7
D_{100} =	362.0

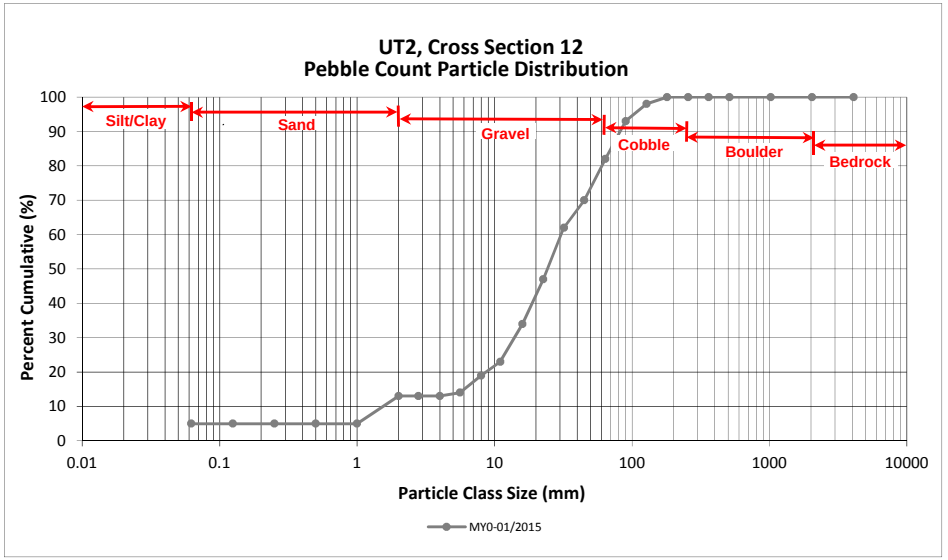


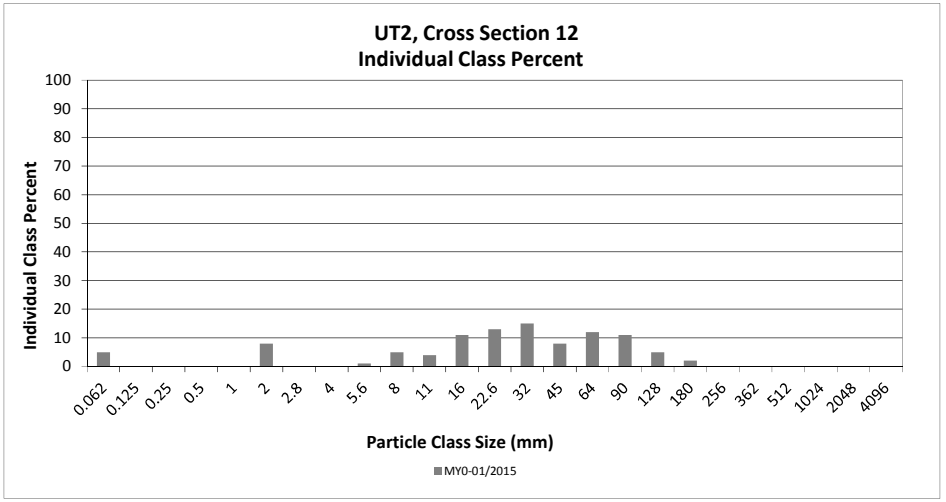


Reachwide and Cross Section Pebble Count Plots
Hopewell Stream Mitigation Site (NCEEP Project No. 95352)
UT2, Cross Section 12
Monitoring Year 0 - 2015

Particle Class		Diameter (mm) min	Diameter (mm) max	Riffle 100-Count	Summary: Class Percentage	Summary: Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062	5	5	5
SAND	Very fine	0.062	0.125			5
	Fine	0.125	0.250			5
	Medium	0.25	0.50			5
	Coarse	0.5	1.0			5
	Very Coarse	1.0	2.0	8	8	13
GRAVEL	Very Fine	2.0	2.8			13
	Very Fine	2.8	4.0			13
	Fine	4.0	5.6	1	1	14
	Fine	5.6	8.0	5	5	19
	Medium	8.0	11.0	4	4	23
	Medium	11.0	16.0	11	11	34
	Coarse	16.0	22.6	13	13	47
	Coarse	22.6	32	15	15	62
	Very Coarse	32	45	8	8	70
	Very Coarse	45	64	12	12	82
COBBLE	Small	64	90	11	11	93
	Small	90	128	5	5	98
	Large	128	180	2	2	100
	Large	180	256			100
BOULDER	Small	256	362			100
	Small	362	512			100
	Medium	512	1024			100
	Large/Very Large	1024	2048			100
BEDROCK	Bedrock	2048	>2048			100
			Total	**100**	**100**	**100**

Cross Section 11	
Channel materials (mm)	
D_{16} =	6.46
D_{35} =	16.43
D_{50} =	24.2
D_{84} =	68.1
D_{95} =	103.6
D_{100} =	180.0

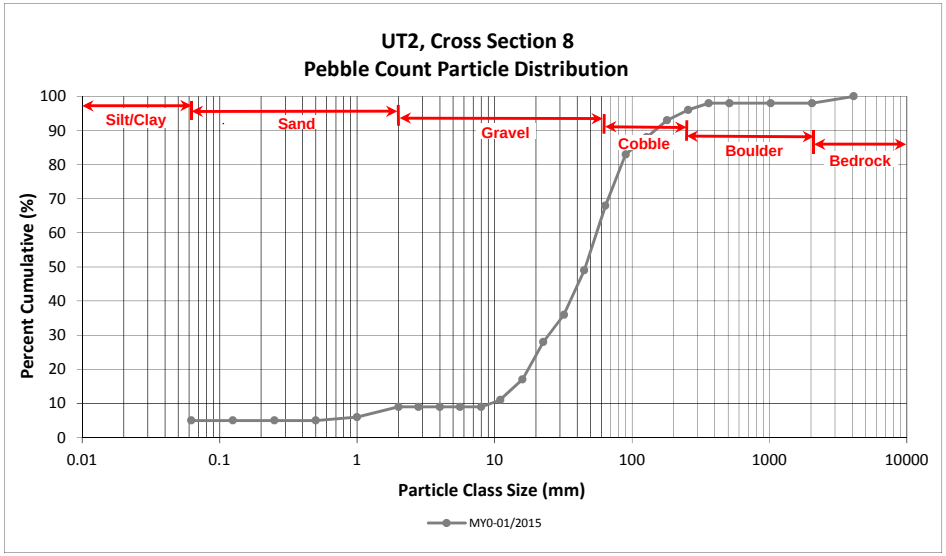


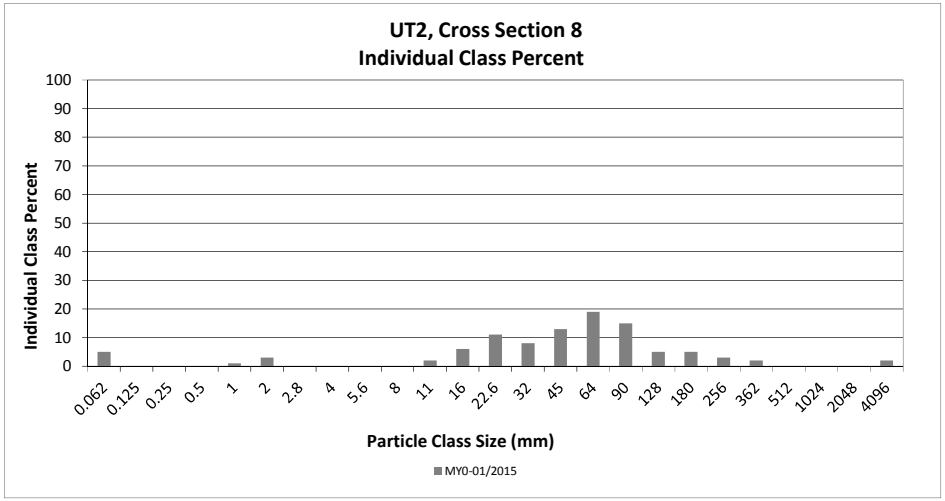


Reachwide and Cross Section Pebble Count Plots
Hopewell Stream Mitigation Site (NCEEP Project No. 95352)
UT2, Cross Section 8
Monitoring Year 0 - 2015

Particle Class		Diameter (mm) min	Diameter (mm) max	Riffle 100-Count	Summary: Class Percentage	Summary: Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062	5	5	5
SAND	Very fine	0.062	0.125			5
	Fine	0.125	0.250			5
	Medium	0.25	0.50			5
	Coarse	0.5	1.0	1	1	6
	Very Coarse	1.0	2.0	3	3	9
GRAVEL	Very Fine	2.0	2.8			9
	Very Fine	2.8	4.0			9
	Fine	4.0	5.6			9
	Fine	5.6	8.0			9
	Medium	8.0	11.0	2	2	11
	Medium	11.0	16.0	6	6	17
	Coarse	16.0	22.6	11	11	28
	Coarse	22.6	32	8	8	36
	Very Coarse	32	45	13	13	49
	Very Coarse	45	64	19	19	68
COBBLE	Small	64	90	15	15	83
	Small	90	128	5	5	88
	Large	128	180	5	5	93
	Large	180	256	3	3	96
BOULDER	Small	256	362	2	2	98
	Small	362	512			98
	Medium	512	1024			98
	Large/Very Large	1024	2048			98
BEDROCK	Bedrock	2048	>2048	2	2	100
			Total	**100**	**100**	**100**

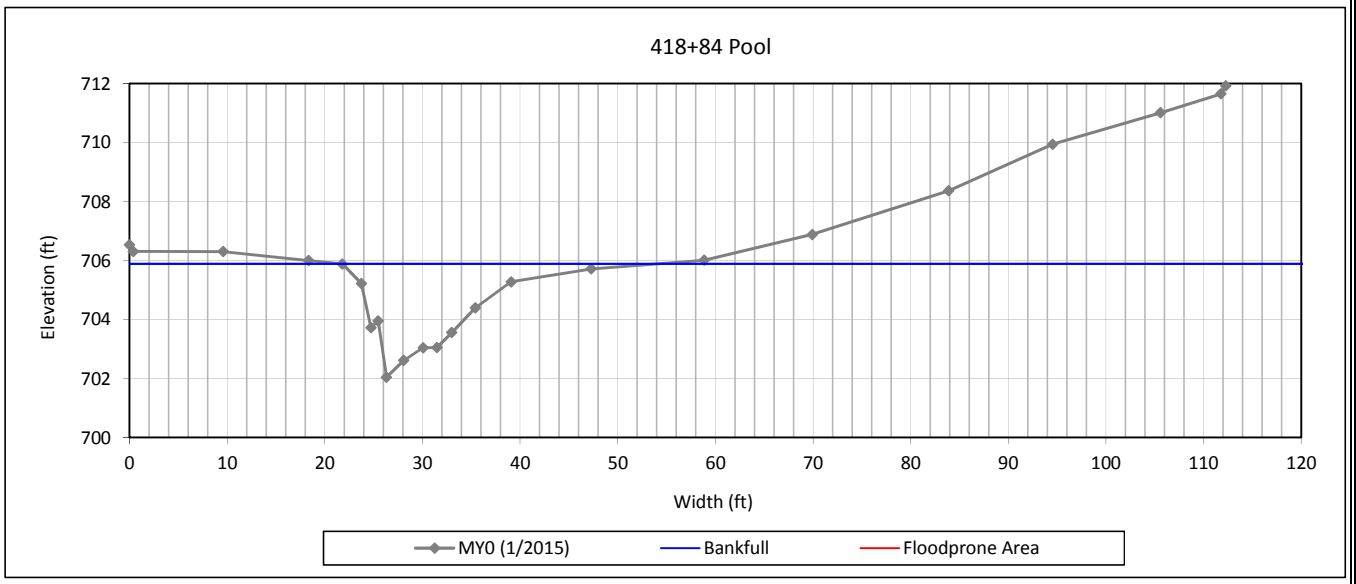
Cross Section 1	
Channel materials (mm)	
D_{16} =	15.03
D_{35} =	30.64
D_{50} =	45.8
D_{84} =	96.6
D_{95} =	227.6
D_{100} =	>2048





Cross Section Plots
Hopewell Stream Mitigation Site (NCEEP Project No. 95352)
Monitoring Year 0

Cross Section 7, UT2 R2



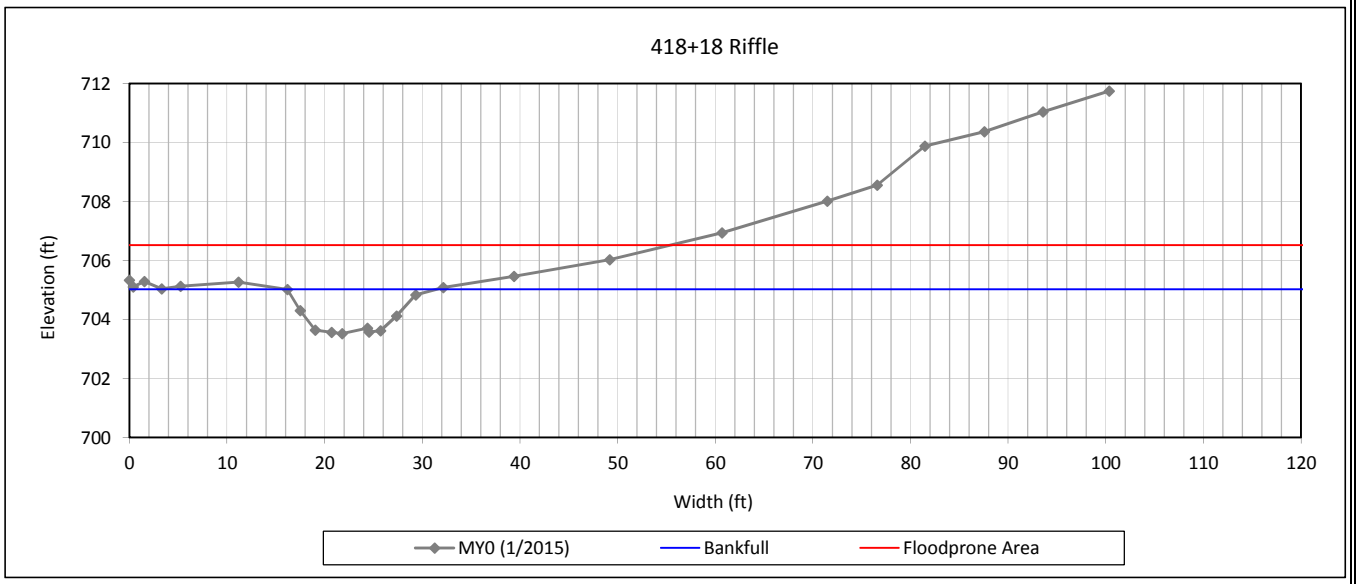
Bankfull Dimensions	
38.6	x-section area (ft.sq.)
32.2	width (ft)
1.2	mean depth (ft)
3.8	max depth (ft)
34.9	wetted parimeter (ft)
1.1	hyd radi (ft)
26.9	width-depth ratio
93.1	W flood prone area (ft)
2.9	entrenchment ratio
1.0	low bank height ratio

Survey Date: 1/2015
Field Crew: Turner Surveying

View Upstream

Cross Section Plots
Hopewell Stream Mitigation Site (NCEEP Project No. 95352)
Monitoring Year 0

Cross Section 8, UT2 R2



Bankfull Dimensions	
14.8	x-section area (ft.sq.)
15.3	width (ft)
1.0	mean depth (ft)
1.5	max depth (ft)
15.9	wetted parimeter (ft)
0.9	hyd radi (ft)
15.8	width-depth ratio
55.4	W flood prone area (ft)
3.6	entrenchment ratio
1.0	low bank height ratio

Survey Date: 1/2015
Field Crew: Turner Surveying

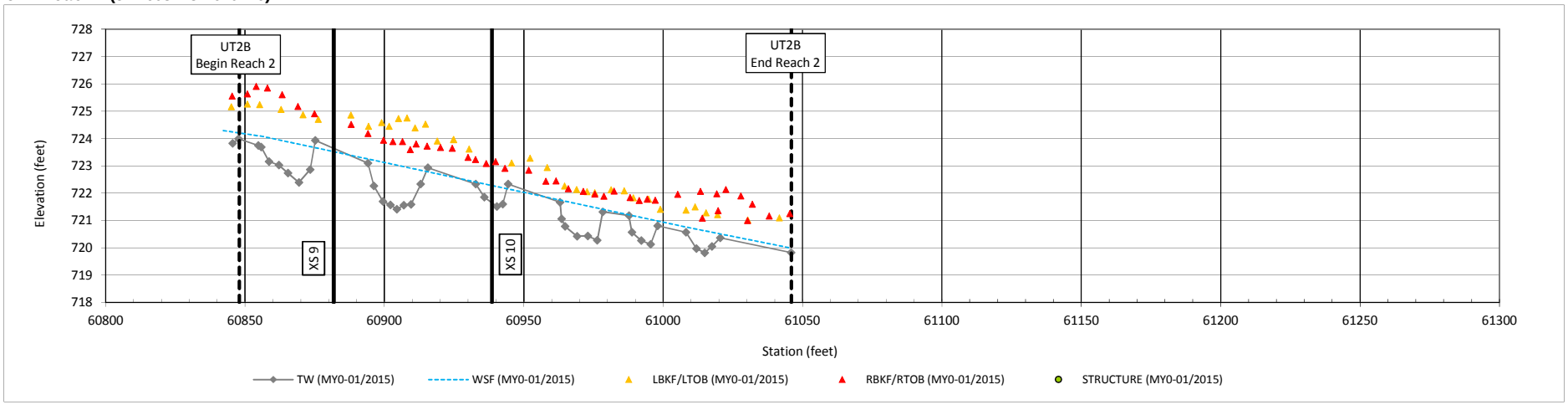
View Downstream

Longitudinal Profile Plots

Hopewell Stream Mitigation Site (NCEEP Project No.95021)

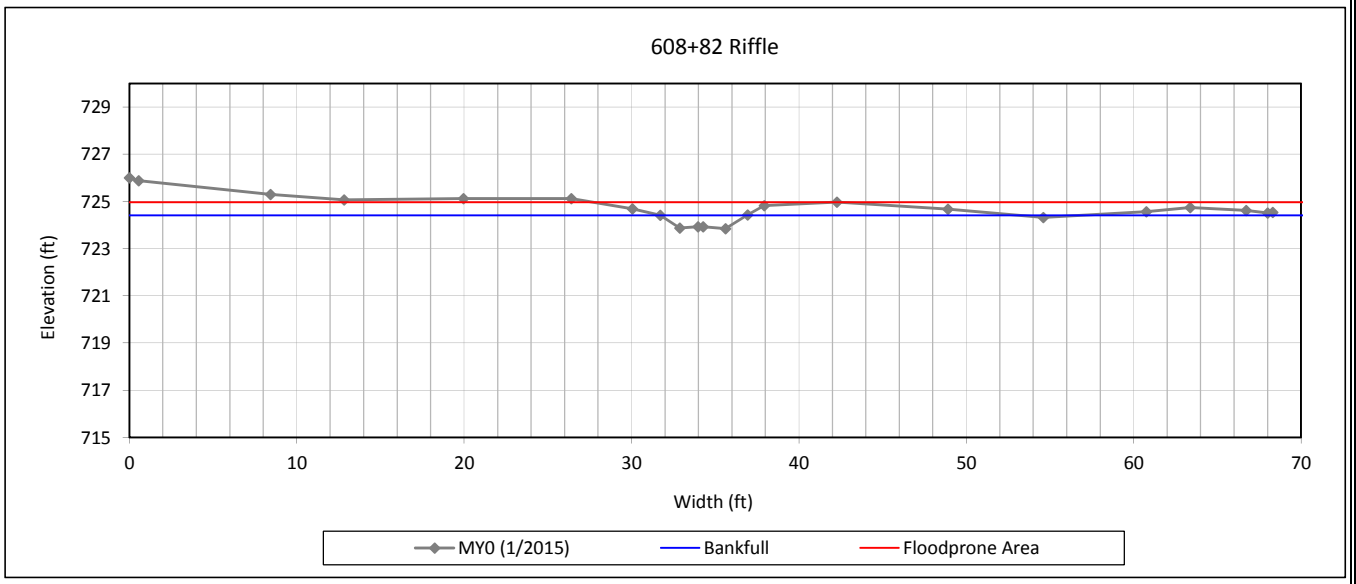
Monitoring Year 0 - 2015

UT2B Reach 2 (STA 608+48 - 610+46)



Cross Section Plots
Hopewell Stream Mitigation Site (NCEEP Project No. 95352)
Monitoring Year 0

Cross Section 9, UT2B R2



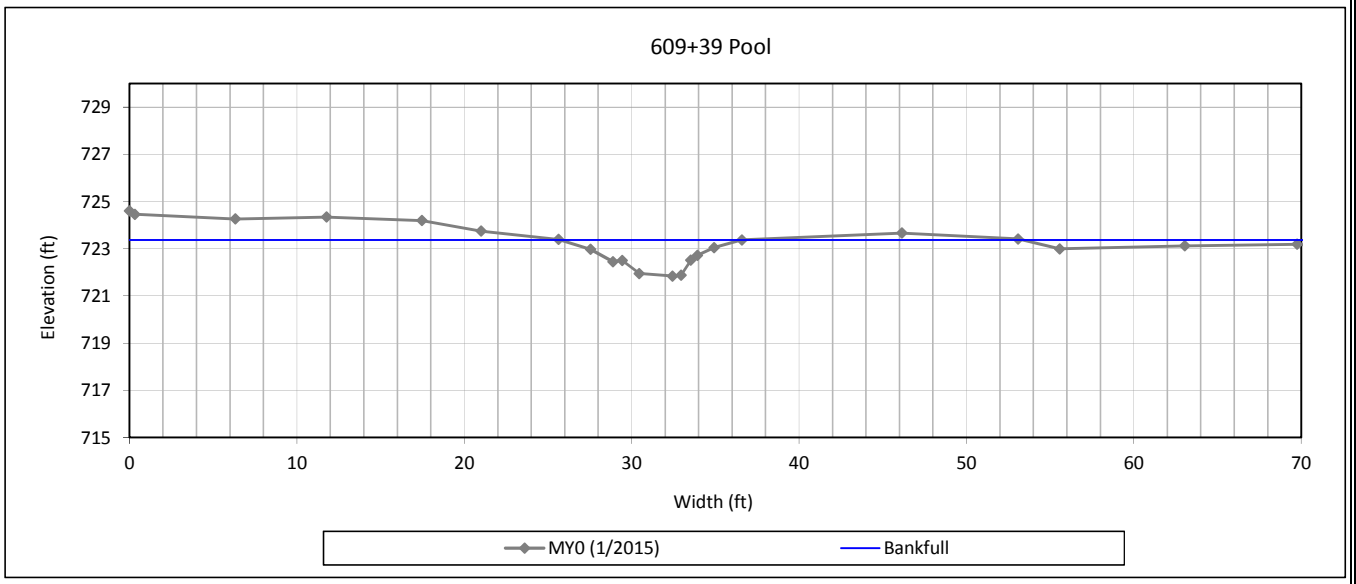
Bankfull Dimensions	
2.1	x-section area (ft.sq.)
5.2	width (ft)
0.4	mean depth (ft)
0.6	max depth (ft)
5.4	wetted parimeter (ft)
0.4	hyd radi (ft)
13.0	width-depth ratio
40.6	W flood prone area (ft)
7.8	entrenchment ratio
1.0	low bank height ratio

Survey Date: 1/2015
Field Crew: Turner Surveying

View Downstream

Cross Section Plots
Hopewell Stream Mitigation Site (NCEEP Project No. 95352)
Monitoring Year 0

Cross Section 10, UT2B R2



Bankfull Dimensions	
7.9	x-section area (ft.sq.)
9.0	width (ft)
0.9	mean depth (ft)
1.5	max depth (ft)
9.7	wetted parimeter (ft)
0.8	hyd radi (ft)
10.2	width-depth ratio
---	W flood prone area (ft)
---	entrenchment ratio
1.0	low bank height ratio

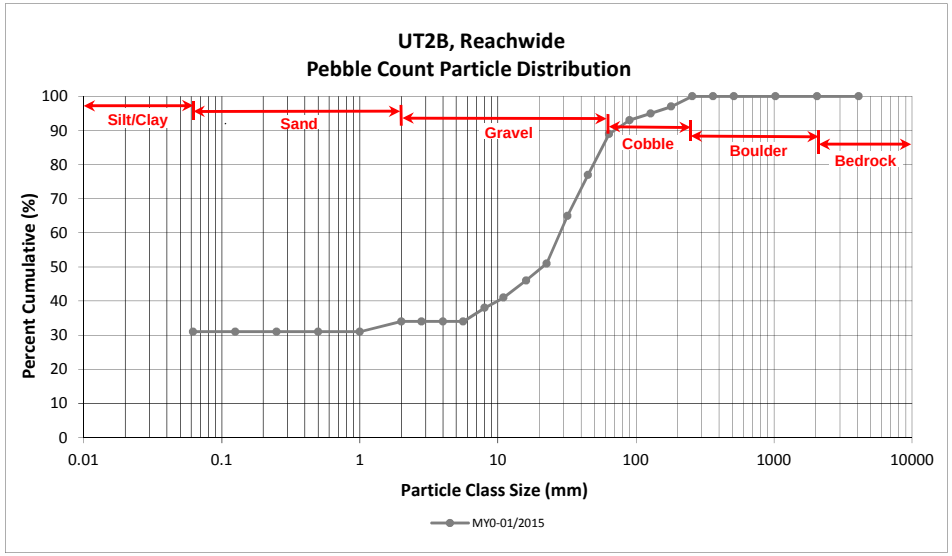
Survey Date: 1/2015
Field Crew: Turner Surveying

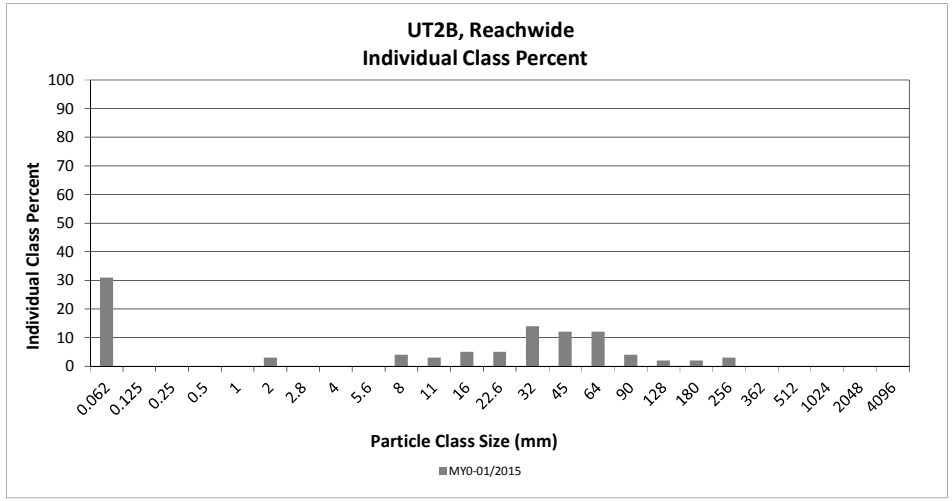
View Downstream

Reachwide and Cross Section Pebble Count Plots
Hopewell Stream Mitigation Site (NCEEP Project No. 95352)
UT2B, Reachwide
Monitoring Year 0 - 2015

Particle Class		Diameter (mm)		Particle Count			Reach Summary	
		min	max	Riffle	Pool	Total	Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062	1	30	31	31	31
SAND	Very fine	0.062	0.125					31
	Fine	0.125	0.250					31
	Medium	0.25	0.50					31
	Coarse	0.5	1.0					31
	Very Coarse	1.0	2.0		3	3	3	34
GRAVEL	Very Fine	2.0	2.8					34
	Very Fine	2.8	4.0					34
	Fine	4.0	5.6					34
	Fine	5.6	8.0	2	2	4	4	38
	Medium	8.0	11.0	2	1	3	3	41
	Medium	11.0	16.0	5		5	5	46
	Coarse	16.0	22.6	4	1	5	5	51
	Coarse	22.6	32	10	4	14	14	65
	Very Coarse	32	45	10	2	12	12	77
	Very Coarse	45	64	10	2	12	12	89
COBBLE	Small	64	90	2	2	4	4	93
	Small	90	128	2		2	2	95
	Large	128	180	2		2	2	97
	Large	180	256		3	3	3	100
BOULDER	Small	256	362					100
	Small	362	512					100
	Medium	512	1024					100
	Large/Very Large	1024	2048					100
BEDROCK	Bedrock	2048	>2048					100
			Total	**50**	**50**	**100**	**100**	**100**

Reachwide	
Channel materials (mm)	
D_{16} =	Silt/Clay
D_{35} =	6.12
D_{50} =	21.1
D_{84} =	55.3
D_{95} =	128.0
D_{100} =	256.0

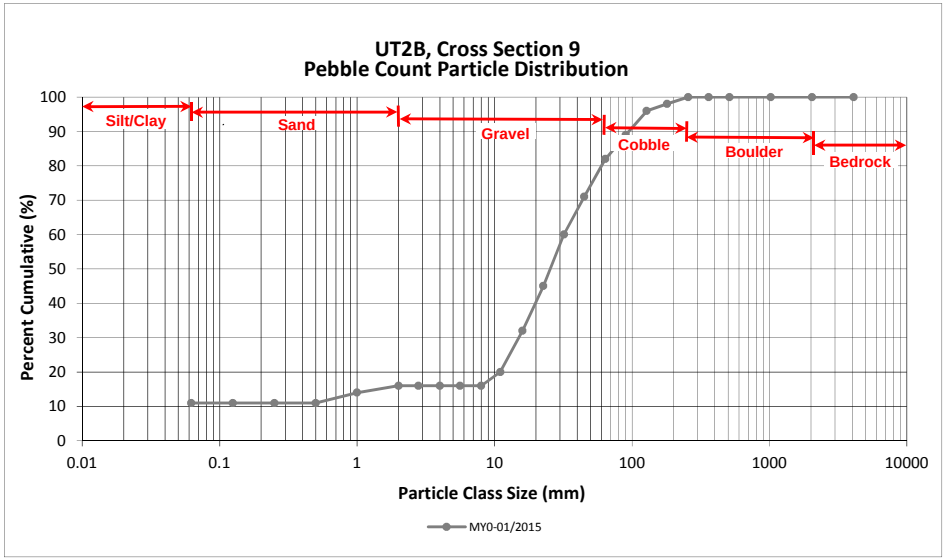


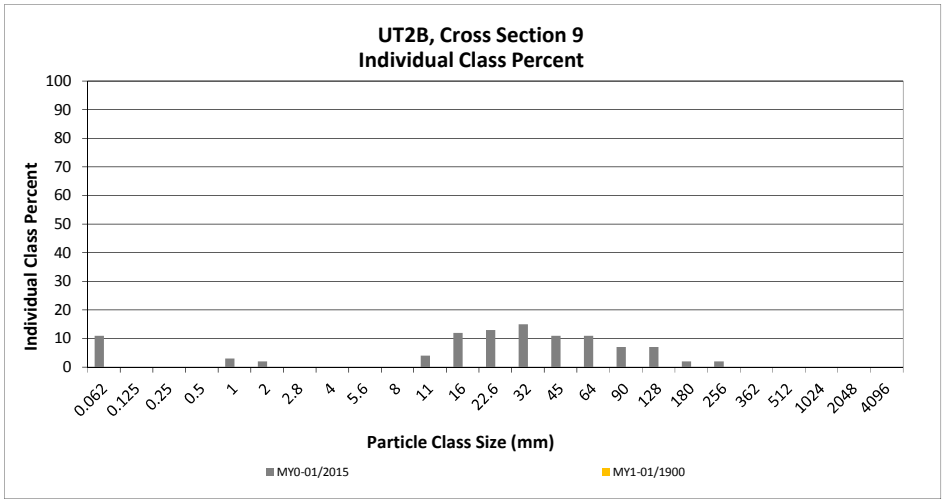


Reachwide and Cross Section Pebble Count Plots
Hopewell Stream Mitigation Site (NCEEP Project No. 95352)
UT2B, Cross Section 9
Monitoring Year 0 - 2015

Particle Class		Diameter (mm)		Riffle 100-Count	Summary	
		min	max		Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062	11	11	11
SAND	Very fine	0.062	0.125			11
	Fine	0.125	0.250			11
	Medium	0.25	0.50			11
	Coarse	0.5	1.0	3	3	14
	Very Coarse	1.0	2.0	2	2	16
GRAVEL	Very Fine	2.0	2.8			16
	Very Fine	2.8	4.0			16
	Fine	4.0	5.6			16
	Fine	5.6	8.0			16
	Medium	8.0	11.0	4	4	20
	Medium	11.0	16.0	12	12	32
	Coarse	16.0	22.6	13	13	45
	Coarse	22.6	32	15	15	60
	Very Coarse	32	45	11	11	71
	Very Coarse	45	64	11	11	82
COBBLE	Small	64	90	7	7	89
	Small	90	128	7	7	96
	Large	128	180	2	2	98
	Large	180	256	2	2	100
BOULDER	Small	256	362			100
	Small	362	512			100
	Medium	512	1024			100
	Large/Very Large	1024	2048			100
BEDROCK	Bedrock	2048	>2048			100
			Total	**100**	**100**	**100**

Cross Section 10	
Channel materials (mm)	
D_{16} =	2.00
D_{35} =	17.33
D_{50} =	25.4
D_{84} =	70.5
D_{95} =	121.7
D_{100} =	256.0



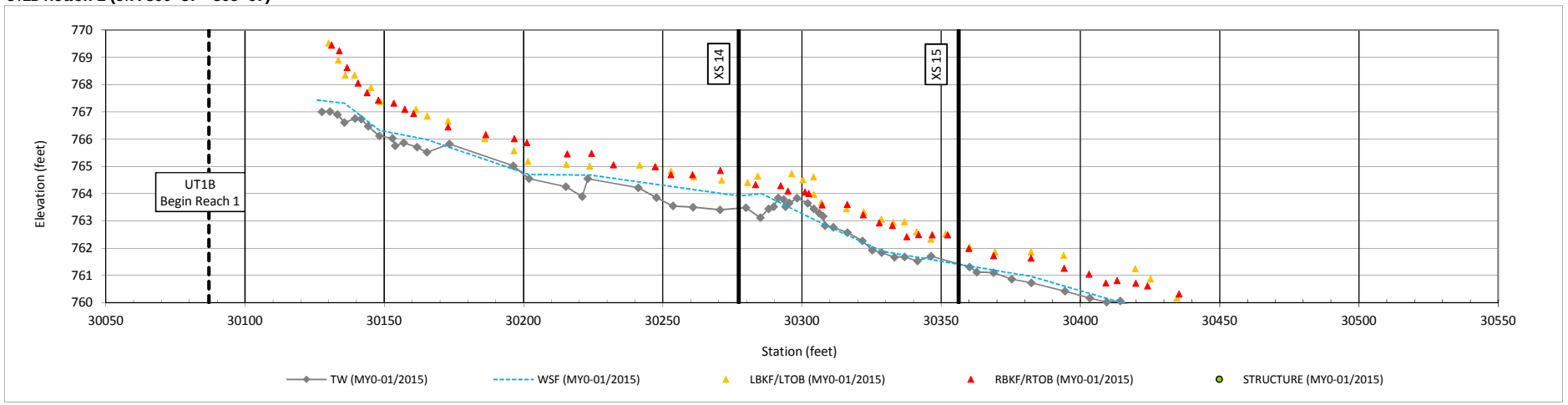


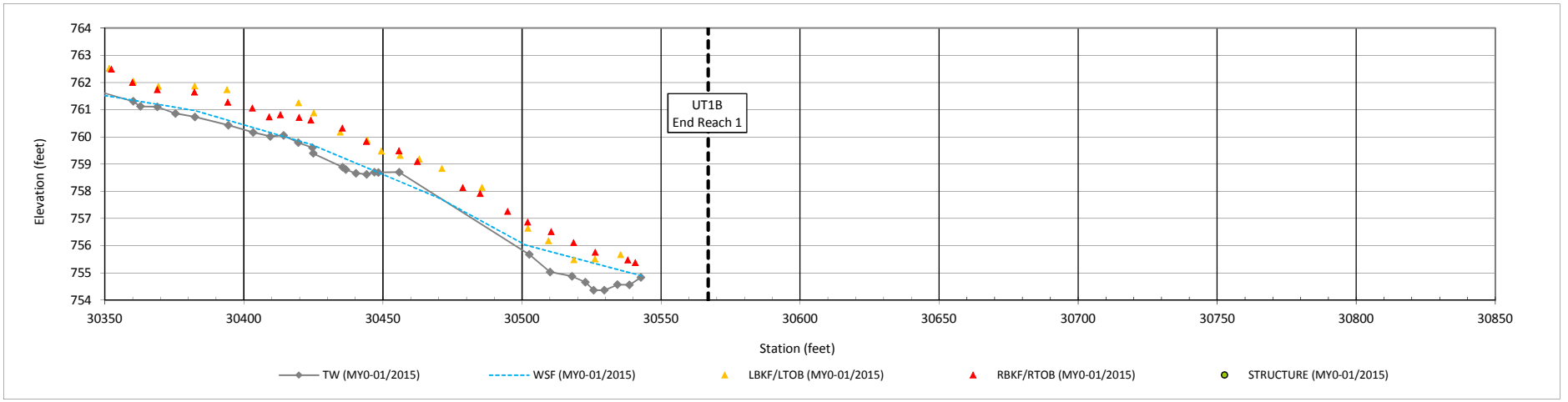
Longitudinal Profile Plots

Hopewell Stream Mitigation Site (NCEEP Project No.95021)

Monitoring Year 0 - 2015

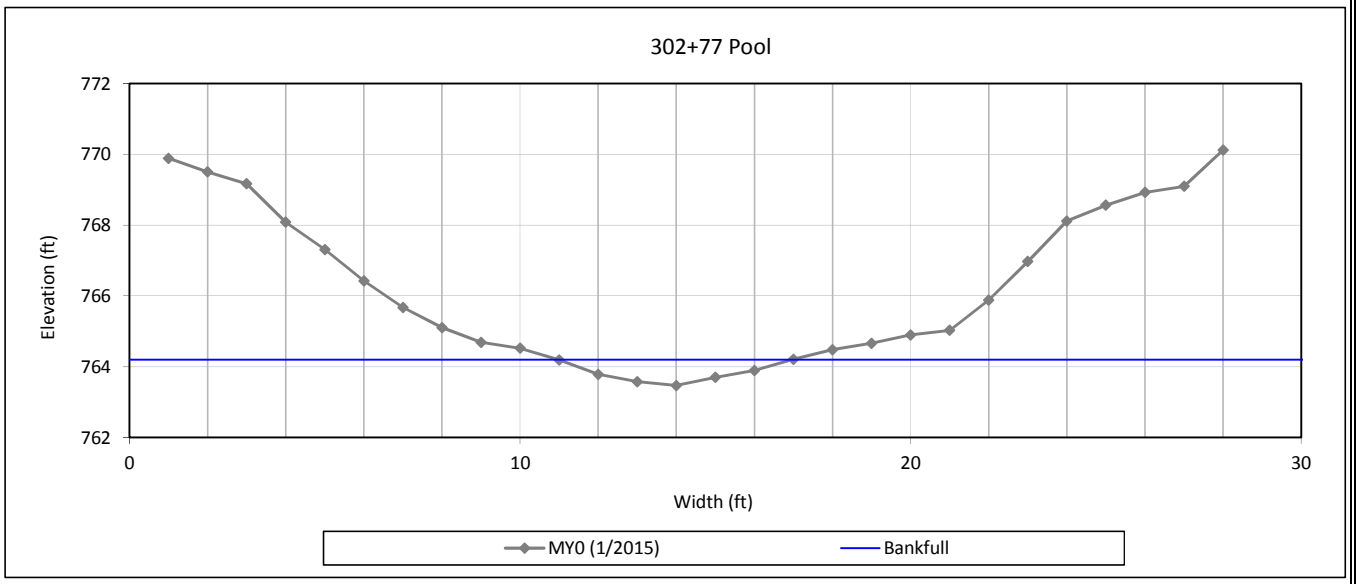
UT1B Reach 1 (STA 300+87 - 305+67)





Cross Section Plots
Hopewell Stream Mitigation Site (NCEEP Project No. 95352)
Monitoring Year 0

Cross Section 14, UT1B R1



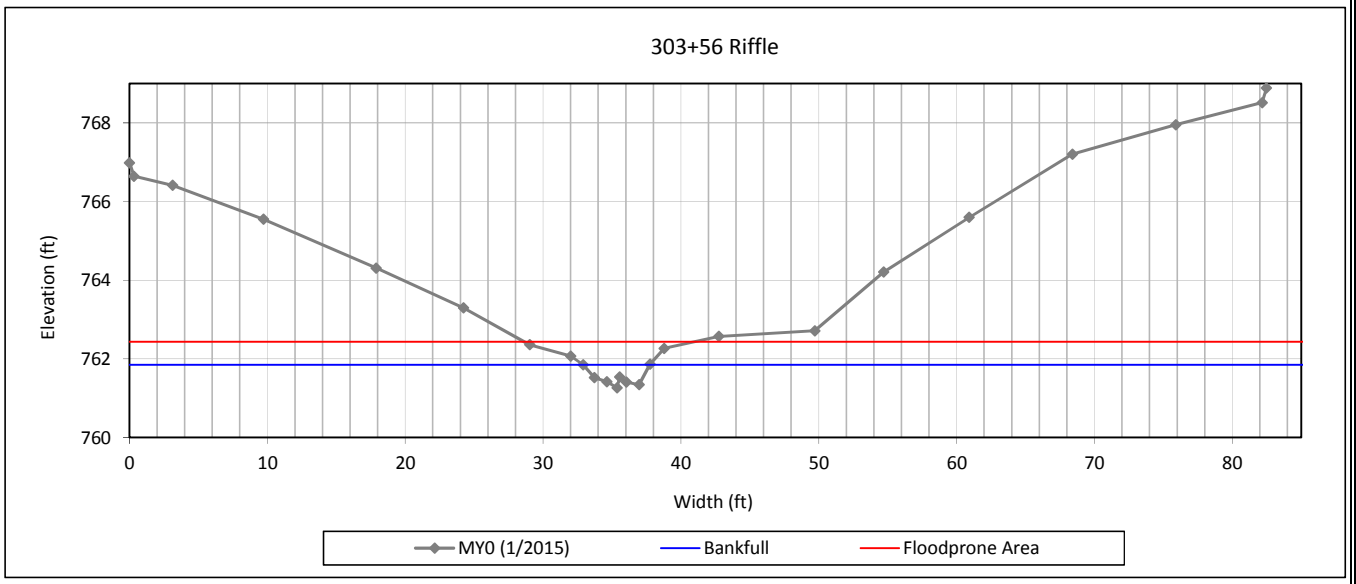
Bankfull Dimensions	
2.5	x-section area (ft.sq.)
5.2	width (ft)
0.5	mean depth (ft)
0.7	max depth (ft)
5.4	wetted parimeter (ft)
0.5	hyd radi (ft)
10.5	width-depth ratio
---	W flood prone area (ft)
---	entrenchment ratio
1.0	low bank height ratio

Survey Date: 1/2015
Field Crew: Turner Surveying

View Downstream

Cross Section Plots
Hopewell Stream Mitigation Site (NCEEP Project No. 95352)
Monitoring Year 0

Cross Section 15, UT1B R1



Bankfull Dimensions	
1.8	x-section area (ft.sq.)
4.8	width (ft)
0.4	mean depth (ft)
0.6	max depth (ft)
5.2	wetted parimeter (ft)
0.3	hyd radi (ft)
13.3	width-depth ratio
12.4	W flood prone area (ft)
2.6	entrenchment ratio
1.0	low bank height ratio

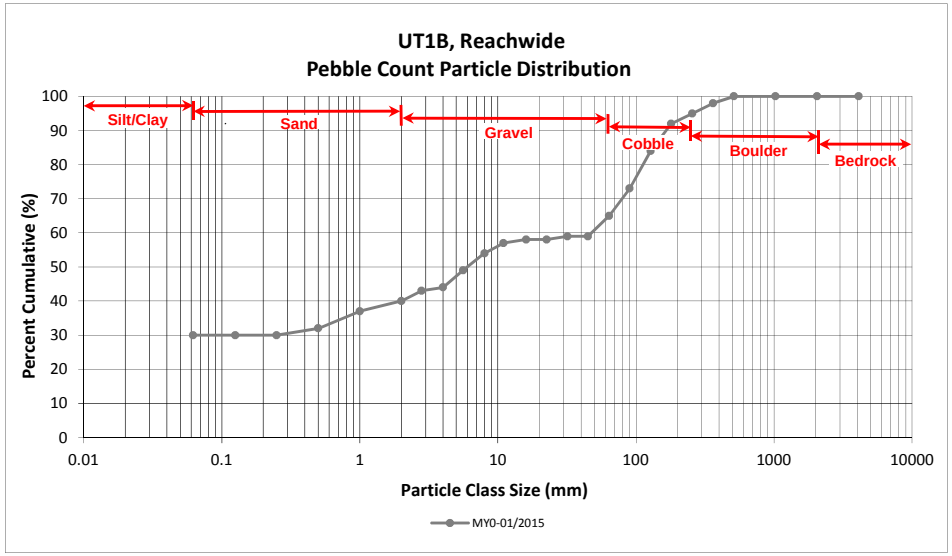
Survey Date: 1/2015
Field Crew: Turner Surveying

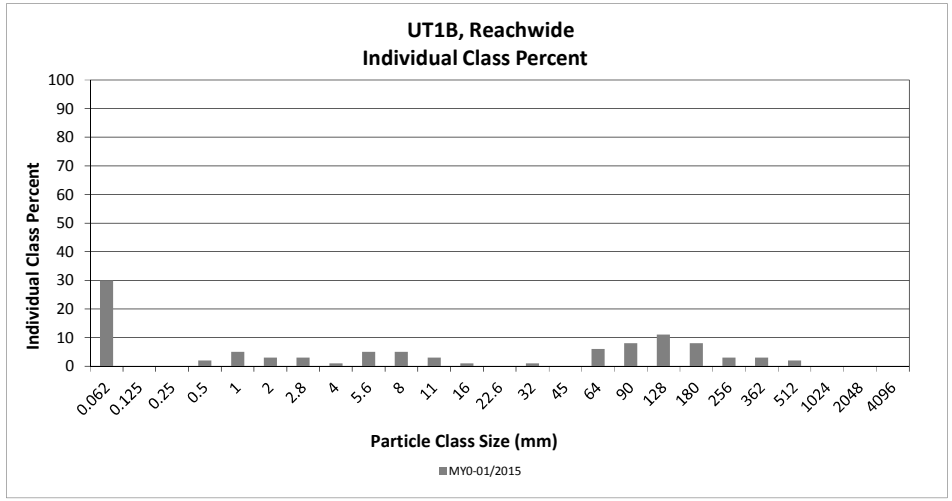
View Downstream

Reachwide and Cross Section Pebble Count Plots
Hopewell Stream Mitigation Site (NCEEP Project No. 95352)
UT1B, Reachwide
Monitoring Year 0 - 2015

Particle Class		Diameter (mm)		Particle Count			Reach Summary	
		min	max	Riffle	Pool	Total	Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062	2	28	30	30	30
SAND	Very fine	0.062	0.125					30
	Fine	0.125	0.250					30
	Medium	0.25	0.50		2	2	2	32
	Coarse	0.5	1.0		5	5	5	37
	Very Coarse	1.0	2.0	2	1	3	3	40
GRAVEL	Very Fine	2.0	2.8		3	3	3	43
	Very Fine	2.8	4.0		1	1	1	44
	Fine	4.0	5.6	2	3	5	5	49
	Fine	5.6	8.0	2	3	5	5	54
	Medium	8.0	11.0	2	1	3	3	57
	Medium	11.0	16.0		1	1	1	58
	Coarse	16.0	22.6					58
	Coarse	22.6	32	1		1	1	59
	Very Coarse	32	45					59
	Very Coarse	45	64	6		6	6	65
COBBLE	Small	64	90	7	1	8	8	73
	Small	90	128	10	1	11	11	84
	Large	128	180	8		8	8	92
	Large	180	256	3		3	3	95
BOULDER	Small	256	362	3		3	3	98
	Small	362	512	2		2	2	100
	Medium	512	1024					100
	Large/Very Large	1024	2048					100
BEDROCK	Bedrock	2048	>2048					100
			Total	**50**	**50**	**100**	**100**	**100**

Reachwide	
Channel materials (mm)	
D_{16} =	Silt/Clay
D_{35} =	0.76
D_{50} =	6.0
D_{84} =	128.0
D_{95} =	256.0
D_{100} =	512.0

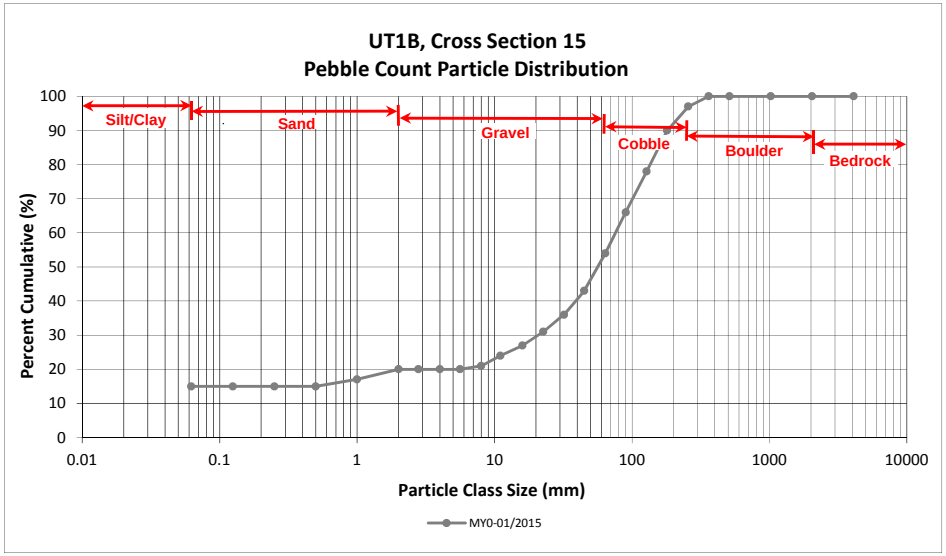


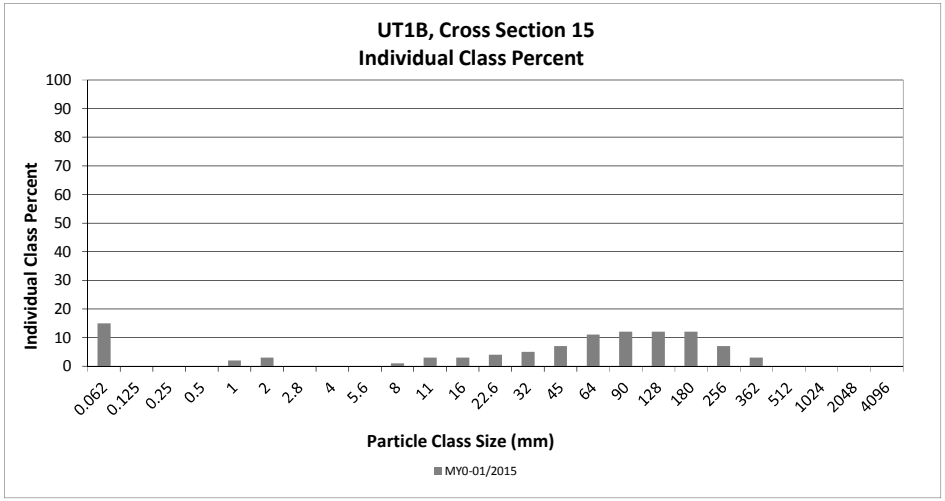


Reachwide and Cross Section Pebble Count Plots
Hopewell Stream Mitigation Site (NCEEP Project No. 95352)
UT1B, Cross Section 15
Monitoring Year 0 - 2015

Particle Class		Diameter (mm) min	Diameter (mm) max	Riffle 100-Count	Summary: Class Percentage	Summary: Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062	15	15	15
SAND	Very fine	0.062	0.125			15
	Fine	0.125	0.250			15
	Medium	0.25	0.50			15
	Coarse	0.5	1.0	2	2	17
	Very Coarse	1.0	2.0	3	3	20
GRAVEL	Very Fine	2.0	2.8			20
	Very Fine	2.8	4.0			20
	Fine	4.0	5.6			20
	Fine	5.6	8.0	1	1	21
	Medium	8.0	11.0	3	3	24
	Medium	11.0	16.0	3	3	27
	Coarse	16.0	22.6	4	4	31
	Coarse	22.6	32	5	5	36
	Very Coarse	32	45	7	7	43
	Very Coarse	45	64	11	11	54
COBBLE	Small	64	90	12	12	66
	Small	90	128	12	12	78
	Large	128	180	12	12	90
	Large	180	256	7	7	97
BOULDER	Small	256	362	3	3	100
	Small	362	512			100
	Medium	512	1024			100
	Large/Very Large	1024	2048			100
BEDROCK	Bedrock	2048	>2048			100
			Total	**100**	**100**	**100**

Cross Section 15	
Channel materials (mm)	
D_{16} =	0.71
D_{35} =	29.85
D_{50} =	56.3
D_{84} =	151.8
D_{95} =	231.5
D_{100} =	362.0



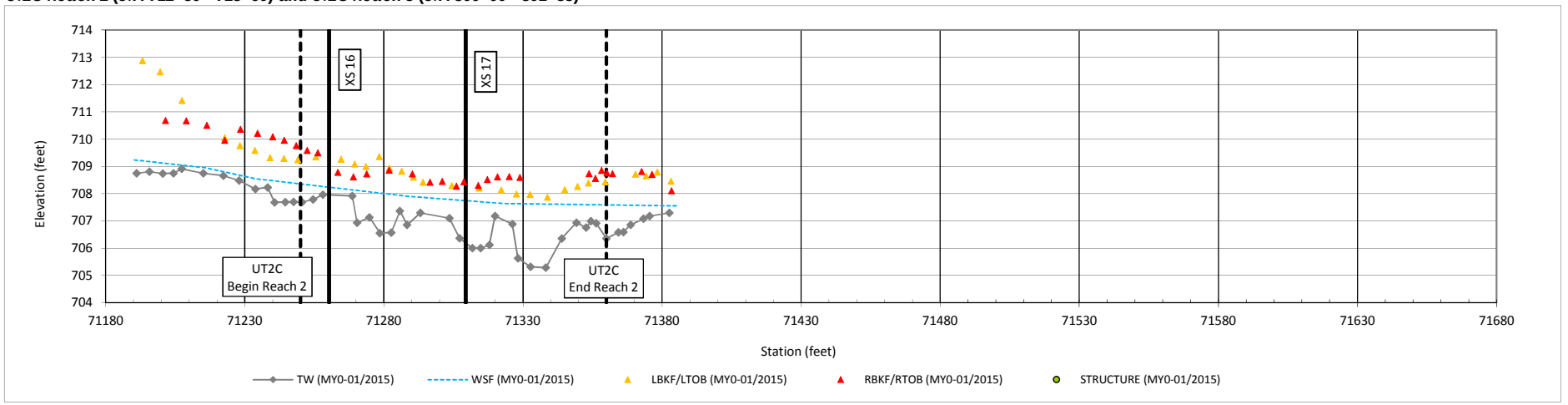


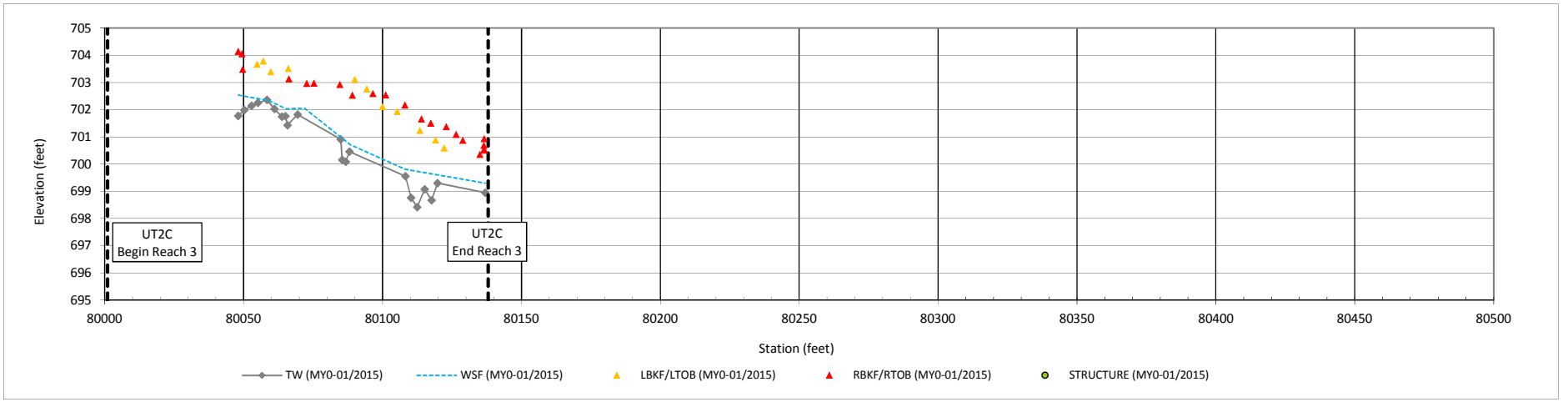
Longitudinal Profile Plots

Hopewell Stream Mitigation Site (NCEEP Project No.95021)

Monitoring Year 0 - 2015

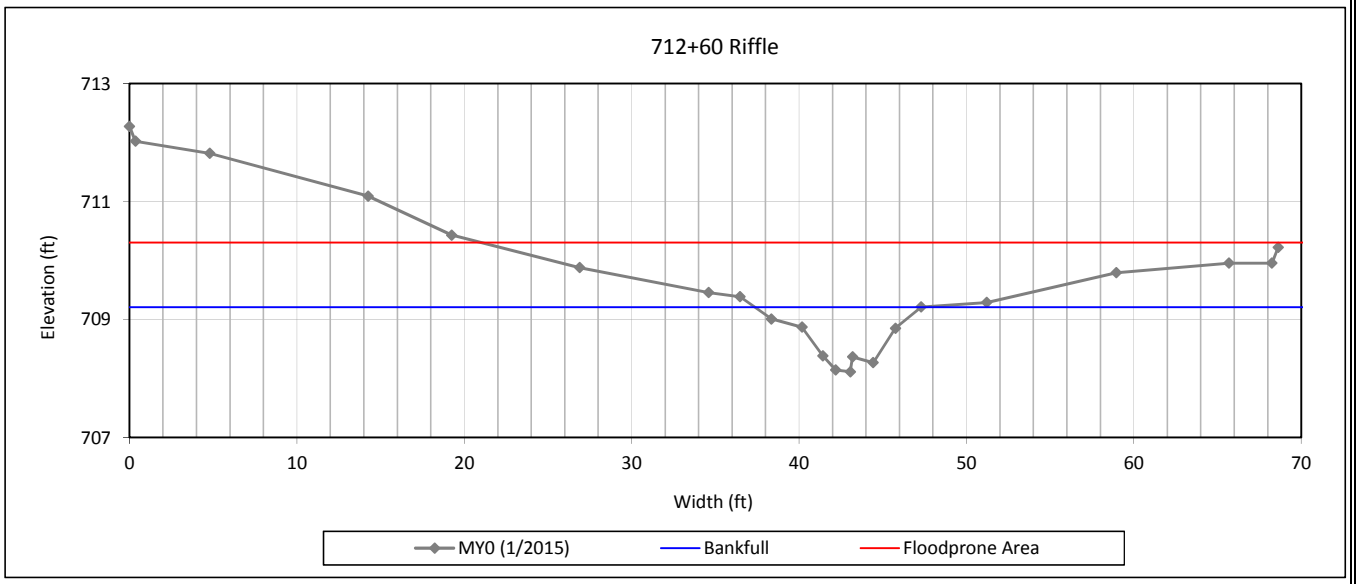
UT2C Reach 2 (STA 712+50 - 713+60) and UT2C Reach 3 (STA 800+00 - 801+38)





Cross Section Plots
Hopewell Stream Mitigation Site (NCEEP Project No. 95352)
Monitoring Year 0

Cross Section 16, UT2C R2



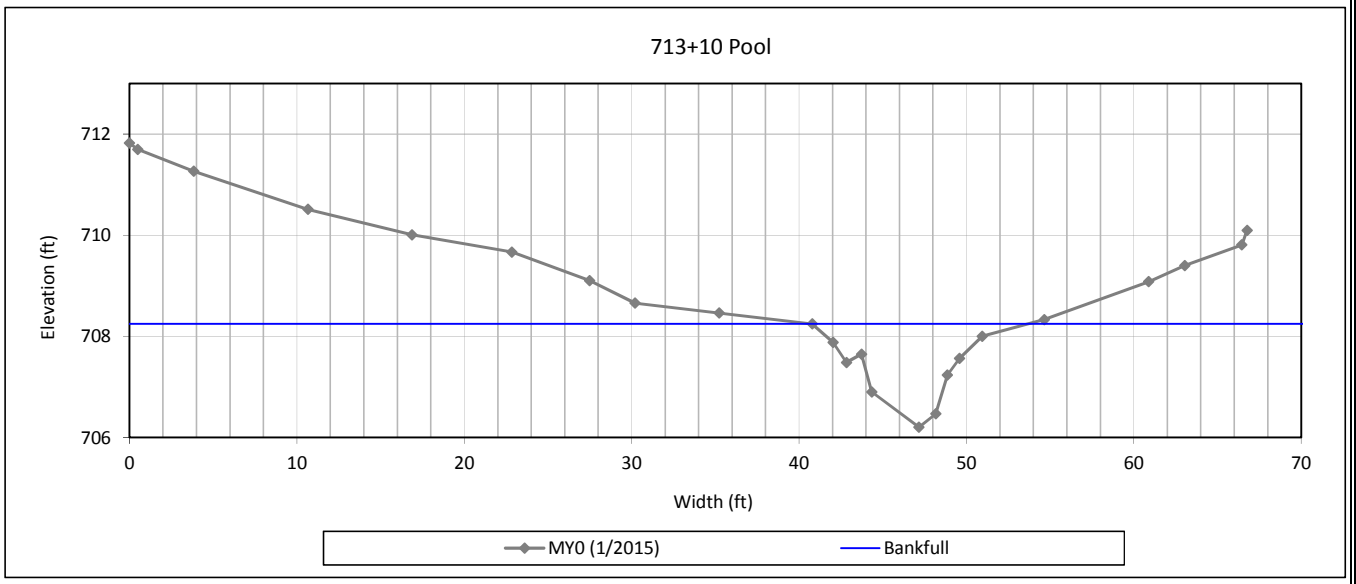
Bankfull Dimensions	
5.3	x-section area (ft.sq.)
9.9	width (ft)
0.5	mean depth (ft)
1.1	max depth (ft)
10.4	wetted parimeter (ft)
0.5	hyd radi (ft)
18.4	width-depth ratio
37.0	W flood prone area (ft)
3.7	entrenchment ratio
1.0	low bank height ratio

Survey Date: 1/2015
Field Crew: Turner Surveying

View Downstream

Cross Section Plots
Hopewell Stream Mitigation Site (NCEEP Project No. 95352)
Monitoring Year 0

Cross Section 17, UT2C R2



Bankfull Dimensions	
11.2	x-section area (ft.sq.)
13.0	width (ft)
0.9	mean depth (ft)
2.0	max depth (ft)
14.1	wetted parimeter (ft)
0.8	hyd radi (ft)
15.1	width-depth ratio
---	W flood prone area (ft)
---	entrenchment ratio
1.0	low bank height ratio

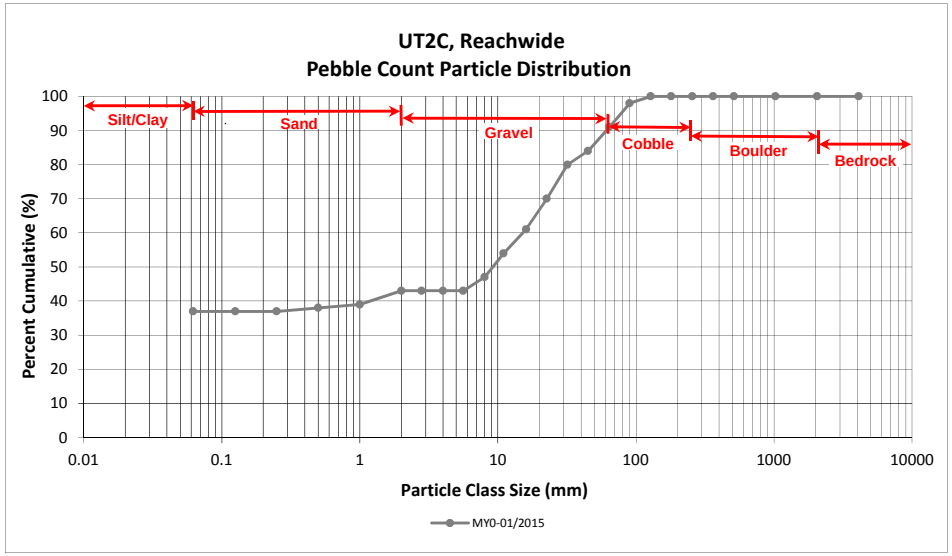
Survey Date: 1/2015
Field Crew: Turner Surveying

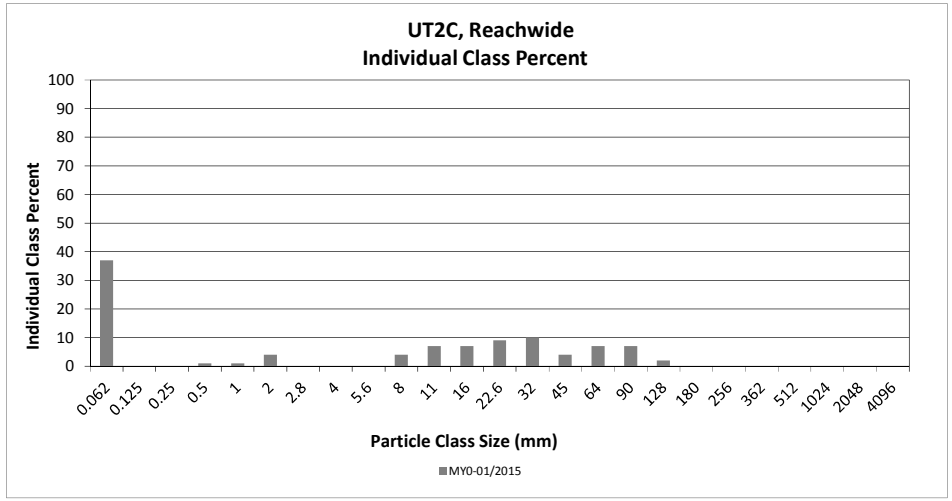
View Downstream

Reachwide and Cross Section Pebble Count Plots
Hopewell Stream Mitigation Site (NCEEP Project No. 95352)
UT2C, Reachwide
Monitoring Year 0 - 2015

Particle Class		Diameter (mm)		Particle Count			Reach Summary	
		min	max	Riffle	Pool	Total	Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062	7	30	37	37	37
SAND	Very fine	0.062	0.125					37
	Fine	0.125	0.250					37
	Medium	0.25	0.50	1		1	1	38
	Coarse	0.5	1.0	1		1	1	39
	Very Coarse	1.0	2.0	2	2	4	4	43
GRAVEL	Very Fine	2.0	2.8					43
	Very Fine	2.8	4.0					43
	Fine	4.0	5.6					43
	Fine	5.6	8.0	2	2	4	4	47
	Medium	8.0	11.0	4	3	7	7	54
	Medium	11.0	16.0	5	2	7	7	61
	Coarse	16.0	22.6	5	4	9	9	70
	Coarse	22.6	32	6	4	10	10	80
	Very Coarse	32	45	4		4	4	84
	Very Coarse	45	64	5	2	7	7	91
COBBLE	Small	64	90	7		7	7	98
	Small	90	128	1	1	2	2	100
	Large	128	180					100
	Large	180	256					100
BOULDER	Small	256	362					100
	Small	362	512					100
	Medium	512	1024					100
	Large/Very Large	1024	2048					100
BEDROCK	Bedrock	2048	>2048					100
			Total	**50**	**50**	**100**	**100**	**100**

Reachwide	
Channel materials (mm)	
D_{16} =	Silt/Clay
D_{35} =	Silt/Clay
D_{50} =	9.2
D_{84} =	45.0
D_{95} =	77.8
D_{100} =	128.0

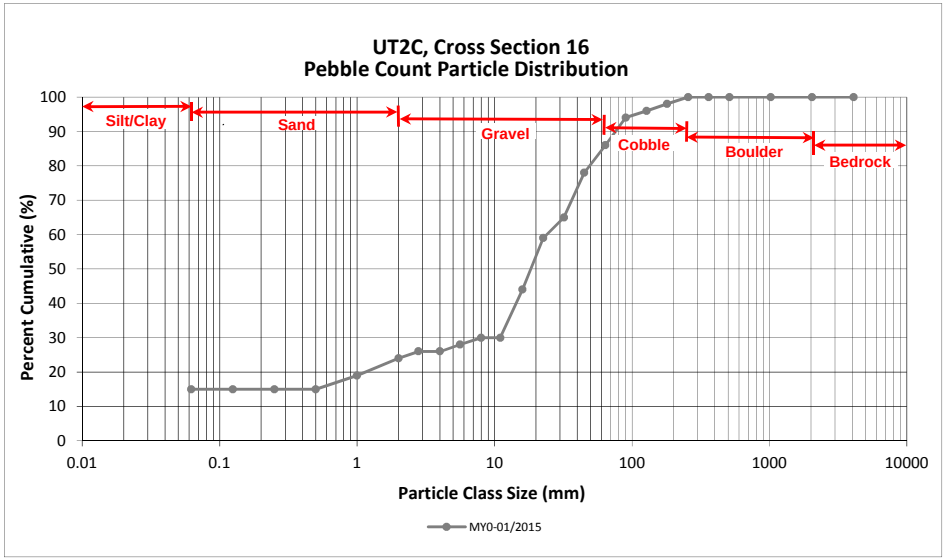


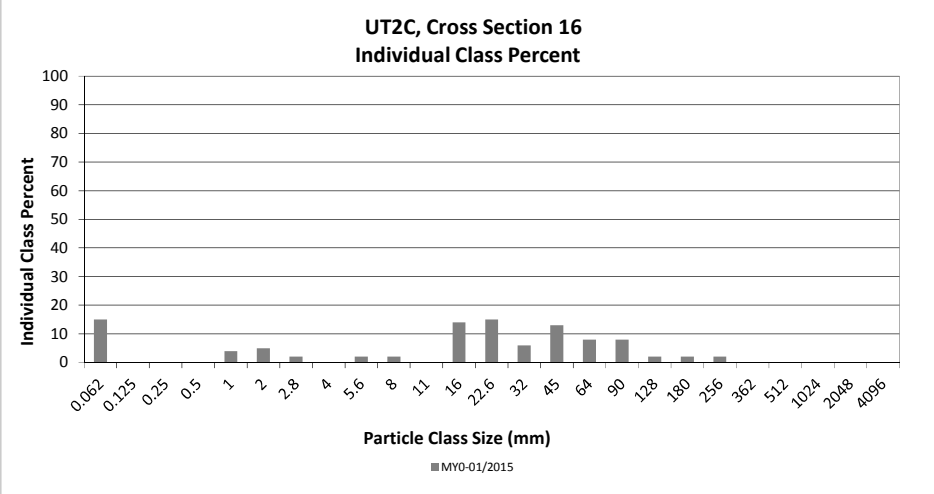


Reachwide and Cross Section Pebble Count Plots
Hopewell Stream Mitigation Site (NCEEP Project No. 95352)
UT2C, Cross Section 16
Monitoring Year 0 - 2015

Particle Class		Diameter (mm) min	Diameter (mm) max	Riffle 100-Count	Summary: Class Percentage	Summary: Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062	15	15	15
SAND	Very fine	0.062	0.125			15
	Fine	0.125	0.250			15
	Medium	0.25	0.50			15
	Coarse	0.5	1.0	4	4	19
	Very Coarse	1.0	2.0	5	5	24
GRAVEL	Very Fine	2.0	2.8	2	2	26
	Very Fine	2.8	4.0			26
	Fine	4.0	5.6	2	2	28
	Fine	5.6	8.0	2	2	30
	Medium	8.0	11.0			30
	Medium	11.0	16.0	14	14	44
	Coarse	16.0	22.6	15	15	59
	Coarse	22.6	32	6	6	65
	Very Coarse	32	45	13	13	78
	Very Coarse	45	64	8	8	86
COBBLE	Small	64	90	8	8	94
	Small	90	128	2	2	96
	Large	128	180	2	2	98
	Large	180	256	2	2	100
BOULDER	Small	256	362			100
	Small	362	512			100
	Medium	512	1024			100
	Large/Very Large	1024	2048			100
BEDROCK	Bedrock	2048	>2048			100
			Total	**100**	**100**	**100**

Cross Section 16	
Channel materials (mm)	
D_{16} =	0.59
D_{35} =	12.58
D_{50} =	18.4
D_{84} =	58.6
D_{95} =	107.3
D_{100} =	256.0





Stream Photographs

	
Photo Point 1 – looking upstream (01/19/2015)	Photo Point 1 – looking downstream (01/19/2015)
	
Photo Point 2 – looking upstream (01/19/2015)	Photo Point 2 – looking downstream (01/19/2015)
	
Photo Point 3 – looking upstream (01/19/2015)	Photo Point 3 – looking downstream (01/19/2015)

Photo Point 4 – looking upstream (01/19/2015)

Photo Point 4 – looking downstream (01/19/2015)

Photo Point 5 – looking upstream (01/19/2015)

Photo Point 5 – looking downstream (01/19/2015)

Photo Point 6 – looking upstream (01/19/2015)

Photo Point 6 – looking downstream (01/19/2015)

	
Photo Point 7 – looking upstream (01/19/2015)	Photo Point 7 – looking downstream (01/19/2015)
	
Photo Point 8 – looking upstream (01/19/2015)	Photo Point 8 – looking downstream (01/19/2015)
	
Photo Point 9 – looking upstream (01/19/2015)	Photo Point 9 – looking downstream (01/19/2015)

	
Photo Point 10 – looking upstream (01/19/2015)	Photo Point 10 – looking downstream (01/19/2015)
	
Photo Point 11 – looking upstream (01/19/2015)	Photo Point 11 – looking downstream (01/19/2015)
	
Photo Point 12 – looking upstream (01/19/2015)	Photo Point 12 – looking downstream (01/19/2015)

	
Photo Point 13 – looking upstream (01/19/2015)	Photo Point 13 – looking downstream (01/19/2015)
	
Photo Point 14 – looking upstream (01/19/2015)	Photo Point 14 – looking downstream (01/19/2015)
	
Photo Point 15 – looking upstream (01/19/2015)	Photo Point 15 – looking downstream (01/19/2015)

	
Photo Point 16 – looking upstream (01/19/2015)	Photo Point 16 – looking downstream (01/19/2015)
	
Photo Point 17 – looking upstream (01/19/2015)	Photo Point 17 – looking downstream (01/19/2015)
	
Photo Point 18 – looking upstream (01/19/2015)	Photo Point 18 – looking downstream (01/19/2015)

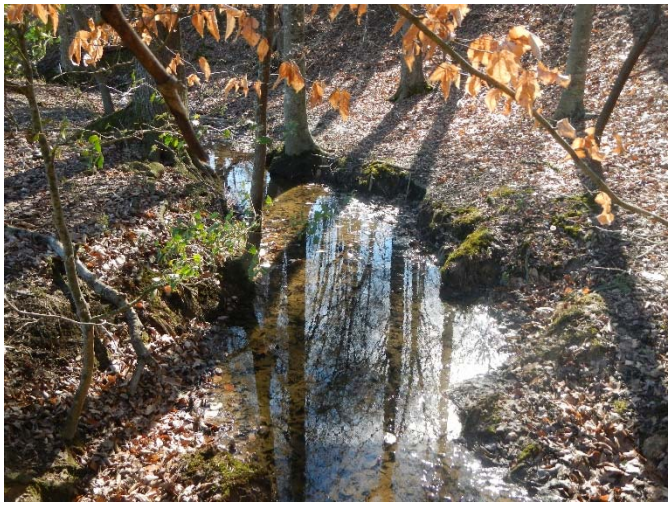
	
Photo Point 19 – looking upstream (01/19/2015)	Photo Point 19 – looking downstream (01/19/2015)
	
Photo Point 20 – looking upstream (01/19/2015)	Photo Point 20 – looking downstream (01/19/2015)
	
Photo Point 21 – looking upstream (01/19/2015)	Photo Point 21 – looking downstream (01/19/2015)

	
Photo Point 22 – looking upstream (01/19/2015)	Photo Point 22 – looking downstream (01/19/2015)
	
Photo Point 23 – looking upstream (01/19/2015)	Photo Point 23 – looking downstream (01/19/2015)
	
Photo Point 24 – looking upstream (01/19/2015)	Photo Point 24 – looking downstream (01/19/2015)

	
Photo Point 25 – looking upstream (03/25/2015)	Photo Point 25 – looking downstream (03/25/2015)
	
Photo Point 26 – looking upstream (01/19/2015)	Photo Point 26 – looking downstream (01/19/2015)
	
Photo Point 27 – looking upstream (01/19/2015)	Photo Point 27 – looking downstream (01/19/2015)

	
Photo Point 28 – looking upstream (01/19/2015)	Photo Point 28 – looking downstream (01/19/2015)
	
Photo Point 29 – looking upstream (01/19/2015)	Photo Point 29 – looking downstream (01/19/2015)
	
Photo Point 30 – looking upstream (01/19/2015)	Photo Point 30 – looking downstream (01/19/2015)

	
Photo Point 31 – looking upstream (01/19/2015)	Photo Point 31 – looking downstream (01/19/2015)
	
Photo Point 32 – looking upstream (01/19/2015)	Photo Point 32 – looking downstream (01/19/2015)
	
Photo Point 33 – looking upstream (01/19/2015)	Photo Point 33 – looking downstream (01/19/2015)

	
Photo Point 34 – looking upstream (01/19/2015)	Photo Point 34 – looking downstream (01/19/2015)
	
Photo Point 35 – looking upstream (01/19/2015)	Photo Point 35 – looking downstream (01/19/2015)
	
Photo Point 36 – looking upstream (01/19/2015)	Photo Point 36 – looking downstream (01/19/2015)

	
Photo Point 37 – looking upstream (01/19/2015)	Photo Point 37 – looking downstream (01/19/2015)
	
Photo Point 38 – looking upstream (01/19/2015)	Photo Point 38 – looking downstream (01/19/2015)
	
Photo Point 39 – looking upstream (01/19/2015)	Photo Point 39 – looking downstream (01/19/2015)

	
Photo Point 40 – looking upstream (01/19/2015)	Photo Point 40 – looking downstream (01/19/2015)
	
Photo Point 41 – looking upstream (01/19/2015)	Photo Point 41 – looking downstream (01/19/2015)
	
Photo Point 42 – looking upstream (01/19/2015)	Photo Point 42 – looking downstream (01/19/2015)

	
Photo Point 43 – looking upstream (01/19/2015)	Photo Point 43 – looking downstream (01/19/2015)
	
Photo Point 44 – looking upstream (01/19/2015)	Photo Point 44 – looking downstream (01/19/2015)
	
Photo Point 45 – looking upstream (01/19/2015)	Photo Point 45 – looking downstream (01/19/2015)

	
Photo Point 46 – looking upstream (01/19/2015)	Photo Point 46 – looking downstream (01/19/2015)
	
Photo Point 47 – looking upstream (01/19/2015)	Photo Point 47 – looking downstream (01/19/2015)
	
Photo Point 48 – looking upstream (01/19/2015)	Photo Point 48– looking downstream (01/19/2015)

	
Photo Point 49 – looking upstream (01/19/2015)	Photo Point 49 – looking downstream (01/19/2015)
	
Photo Point 50 – looking upstream (01/19/2015)	Photo Point 50 – looking downstream (01/19/2015)
	
Photo Point 51 – looking upstream (01/19/2015)	Photo Point 51 – looking downstream (01/19/2015)

	
Photo Point 52 – looking upstream (01/19/2015)	Photo Point 52 – looking downstream (01/19/2015)
	
Photo Point 53 – looking upstream (01/19/2015)	Photo Point 53 – looking downstream (01/19/2015)
	
Photo Point 54 – looking upstream (01/19/2015)	Photo Point 54 – looking downstream (01/19/2015)

	
Photo Point 55 – looking upstream (01/19/2015)	Photo Point 55 – looking downstream (01/19/2015)
	
Photo Point 56 – looking upstream (01/19/2015)	Photo Point 56 – looking downstream (01/19/2015)
	
Photo Point 57 – looking upstream (01/19/2015)	Photo Point 57 – looking downstream (01/19/2015)

	
Photo Point 58 – looking upstream (01/19/2015)	Photo Point 58 – looking downstream (01/19/2015)
	
Photo Point 59 – looking upstream (01/19/2015)	Photo Point 59– looking downstream (01/19/2015)
	
Photo Point 60 – looking upstream (01/19/2015)	Photo Point 60 – looking downstream (01/19/2015)

	
Photo Point 61 – looking upstream (01/19/2015)	Photo Point 61 – looking downstream (01/19/2015)
	
Photo Point 62 – looking upstream (01/19/2015)	Photo Point 62– looking downstream (01/19/2015)
	
Photo Point 63 – looking upstream (01/19/2015)	Photo Point 63 – looking downstream (01/19/2015)

	
Photo Point 64 – looking upstream (01/19/2015)	Photo Point 64 – looking downstream (01/19/2015)

APPENDIX 3. Vegetation Plot Data

Table 8. Planted and Total Stems

Hopewell Stream Mitigation Site (NCEEP Project No.95021)

Monitoring Year 0 - 2015

			Current Plot Data (MY1 2014)Current Plot Data (MY0 2015)																				
			95352-01-0001			95352-01-0002			95352-01-0003			95352-01-0004			95352-01-0005			95352-01-0006			95352-01-0007		
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**
Betula nigra	river birch	Tree	1	1	1	1	1	1													2	2	2
Fraxinus pennsylvanica	green ash	Tree				1	1	1	6	6	6	5	5	5				3	3	3	1	1	1
Liriodendron tulipifera	tuliptree	Tree				1	1	1	2	2	2				1	1	1	3	3	3			
Platanus occidentalis	American sycamore	Tree	3	3	3	2	2	2	2	2	2	7	7	7	3	3	3	1	1	1	9	9	9
Quercus michauxii	swamp chestnut oak	Tree	4	4	4	3	3	3	1	1	1	1	1	1	3	3	3	5	5	5	3	3	3
Quercus phellos	willow oak	Tree	6	6	6	5	5	5	5	5	5	3	3	3	6	6	6	3	3	3	1	1	1
Quercus rubra	northern red oak	Tree	2	2	2	3	3	3							3	3	3	1	1	1			
		Stem count	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16
		size (ares)	1			1			1			1			1			1			1		
		size (ACRES)	0.02			0.02			0.02			0.02			0.02			0.02			0.02		
		Species count	5	5	5	7	7	7	5	5	5	4	4	4	5	5	5	6	6	6	5	5	5
		Stems per ACRE	647	647	647	647	647	647	647	647	647	647	647	647	647	647	647	647	647	647	647	647	647

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%

Table 8. Planted and Total Stems

Hopewell Stream Mitigation Site (NCEEP Project No.95021)

Monitoring Year 0 - 2015

			Current Plot Data (MY0 2015)																				
			95352-01-0008			95352-01-0009			95352-01-0010			95352-01-0011			95352-01-0012			95352-01-0013			95352-01-0014		
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**
Betula nigra	river birch	Tree	3	3	3	2	2	2	1	1	1	4	4	4	2	2	2				1	1	1
Fraxinus pennsylvanica	green ash	Tree				2	2	2	2	2	2	4	4	4	3	3	3	2	2	2	1	1	1
Liriodendron tulipifera	tuliptree	Tree	1	1	1	1	1	1	5	5	5	5	5	5	3	3	3	3	3	3	4	4	4
Platanus occidentalis	American sycamore	Tree	5	5	5	7	7	7	2	2	2	1	1	1	4	4	4	10	10	10			
Quercus michauxii	swamp chestnut oak	Tree	2	2	2	1	1	1				2	2	2	1	1	1				5	5	5
Quercus phellos	willow oak	Tree	4	4	4	1	1	1	1	1	1							1	1	1	4	4	4
Quercus rubra	northern red oak	Tree	1	1	1	2	2	2	6	6	6				3	3	3				1	1	1
		Stem count	16	16	16	16	16	16	17	17	17	16	16	16	16	16	16	16	16	16	16	16	16
		size (ares)	1			1			1			1			1			1			1		
		size (ACRES)	0.02			0.02			0.02			0.02			0.02			0.02			0.02		
		Species count	6	6	6	7	7	7	6	6	6	5	5	5	6	6	6	4	4	4	6	6	6
		Stems per ACRE	647	647	647	647	647	647	688	688	688	647	647	647	647	647	647	647	647	647	647	647	647

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%

Table 8. Planted and Total Stems

Hopewell Stream Mitigation Site (NCEEP Project No.95021)

Monitoring Year 0 - 2015

			Current Plot Data (MY0 2015)																				
			95352-01-0015			95352-01-0016			95352-01-0017			95352-01-0018			95352-01-0019			95352-01-0020			95352-01-0021		
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**
Betula nigra	river birch	Tree	1	1	1	3	3	3	3	3	3	3	3	3	3	3	3	4	4	4	2	2	2
Fraxinus pennsylvanica	green ash	Tree	2	2	2	3	3	3	4	4	4	2	2	2	6	6	6	5	5	5	1	1	1
Liriodendron tulipifera	tuliptree	Tree	1	1	1							4	4	4	1	1	1	1	1	1	3	3	3
Platanus occidentalis	American sycamore	Tree	9	9	9	6	6	6	5	5	5	2	2	2	4	4	4	1	1	1	3	3	3
Quercus michauxii	swamp chestnut oak	Tree	1	1	1	3	3	3	1	1	1	1	1	1	1	1	1						
Quercus phellos	willow oak	Tree							2	2	2	1	1	1	1	1	1				3	3	3
Quercus rubra	northern red oak	Tree	2	2	2	1	1	1	1	1	1	3	3	3				5	5	5	4	4	4
		Stem count	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16
		size (ares)	1			1			1			1			1			1			1		
		size (ACRES)	0.02			0.02			0.02			0.02			0.02			0.02			0.02		
		Species count	6	6	6	5	5	5	6	6	6	7	7	7	6	6	6	5	5	5	6	6	6
		Stems per ACRE	647	647	647	647	647	647	647	647	647	647	647	647	647	647	647	647	647	647	647	647	647

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%

Table 8. Planted and Total Stems

Hopewell Stream Mitigation Site (NCEEP Project No.95021)

Monitoring Year 0 - 2015

			Current Plot Data (MY0 2015)																				
			95352-01-0022			95352-01-0023			95352-01-0024			95352-01-0025			95352-01-0026			95352-01-0027			95352-01-0028		
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**
Betula nigra	river birch	Tree	3	3	3	2	2	2	3	3	3	2	2	2	1	1	1						
Fraxinus pennsylvanica	green ash	Tree	5	5	5	1	1	1	1	1	1	2	2	2	3	3	3	4	4	4	6	6	6
Liriodendron tulipifera	tuliptree	Tree	1	1	1	2	2	2	1	1	1	2	2	2	3	3	3	1	1	1			
Platanus occidentalis	American sycamore	Tree	1	1	1	9	9	9	3	3	3	4	4	4	2	2	2	3	3	3	4	4	4
Quercus michauxii	swamp chestnut oak	Tree	3	3	3				1	1	1							4	4	4			
Quercus phellos	willow oak	Tree	2	2	2	1	1	1	5	5	5	1	1	1	4	4	4	4	4	4	6	6	6
Quercus rubra	northern red oak	Tree	1	1	1	1	1	1	2	2	2	5	5	5	3	3	3						
		Stem count	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16
		size (ares)	1			1			1			1			1			1			1		
		size (ACRES)	0.02			0.02			0.02			0.02			0.02			0.02			0.02		
		Species count	7	7	7	6	6	6	7	7	7	6	6	6	6	6	6	5	5	5	3	3	3
		Stems per ACRE	647	647	647	647	647	647	647	647	647	647	647	647	647	647	647	647	647	647	647	647	647

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%

Table 8. Planted and Total Stems

Hopewell Stream Mitigation Site (NCEEP Project No.95021)

Monitoring Year 0 - 2015

			Current Plot Data (MY0 2015)									Annual Summary		
			95352-01-0029			95352-01-0030			95352-01-0031			MY0 (2015)		
Scientific Name	**Common Name**	**Species Type**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**
Betula nigra	river birch	Tree	4	4	4	2	2	2				53	53	53
Fraxinus pennsylvanica	green ash	Tree	3	3	3	6	6	6	8	8	8	92	92	92
Liriodendron tulipifera	tuliptree	Tree	1	1	1	1	1	1	1	1	1	52	52	52
Platanus occidentalis	American sycamore	Tree	2	2	2							114	114	114
Quercus michauxii	swamp chestnut oak	Tree										46	46	46
Quercus phellos	willow oak	Tree				1	1	1				71	71	71
Quercus rubra	northern red oak	Tree	6	6	6	6	6	6	7	7	7	69	69	69
		Stem count	16	16	16	16	16	16	16	16	16	497	497	497
		size (ares)	1			1			1			31		
		size (ACRES)	0.02			0.02			0.02			0.77		
		Species count	5	5	5	5	5	5	3	3	3	7	7	7
		Stems per ACRE	647	647	647	647	647	647	647	647	647	649	649	649

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%

Vegetation Photographs

Vegetation Plot 1 – (01/19/2015)

Vegetation Plot 2 – (01/19/2015)

Vegetation Plot 3 – (01/19/2015)

Vegetation Plot 4 – (01/19/2015)

Vegetation Plot 5 – (01/19/2015)

Vegetation Plot 6 – (01/19/2015)

Vegetation Plot 7 – (01/19/2015)

Vegetation Plot 8 – (01/19/2015)

Vegetation Plot 9 – (01/19/2015)

Vegetation Plot 10 – (01/19/2015)

Vegetation Plot 11 – (01/19/2015)

Vegetation Plot 12 – (01/19/2015)

Vegetation Plot 13 – (01/19/2015)

Vegetation Plot 14 – (01/19/2015)

Vegetation Plot 15 – (01/19/2015)

Vegetation Plot 16 – (01/19/2015)

Vegetation Plot 17 – (01/19/2015)

Vegetation Plot 18 – (01/19/2015)

	
Vegetation Plot 19 – (01/19/2015)	Vegetation Plot 20 – (01/19/2015)
	
Vegetation Plot 21 – (01/19/2015)	Vegetation Plot 22 – (01/19/2015)
	
Vegetation Plot 23 – (01/19/2015)	Vegetation Plot 24– (01/19/2015)

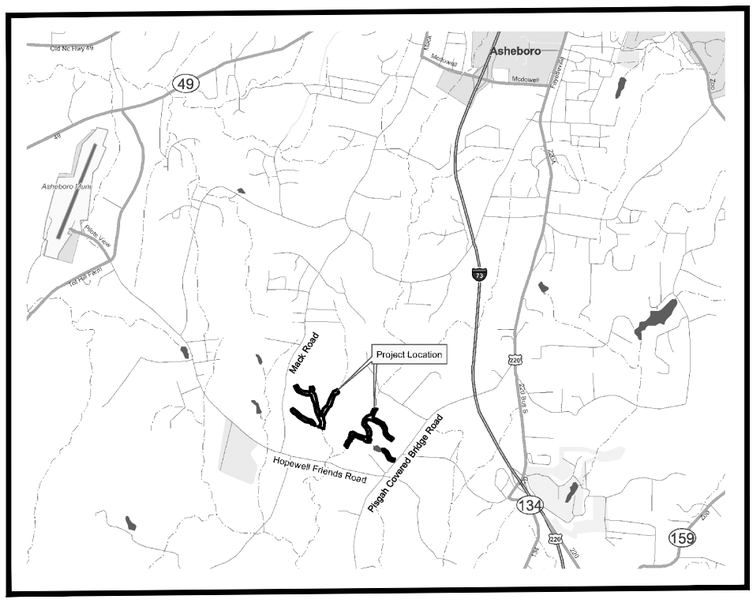
	
Vegetation Plot 25 – (01/19/2015)	Vegetation Plot 26 – (01/19/2015)
	
Vegetation Plot 27 – (01/19/2015)	Vegetation Plot 28 – (01/19/2015)
	
Vegetation Plot 29 – (01/19/2015)	Vegetation Plot 30– (01/19/2015)

Vegetation Plot 31 – (01/19/2015)

APPENDIX 4. As-Built Plan Sheets

Hopewell Stream Mitigation Site

Yadkin River Basin 03040105
Randolph County, North Carolina
for
North Carolina Ecosystem Enhancement Program



Vicinity Map
Not to Scale

BEFORE YOU DIG!
CALL 1-800-632-4949
N.C. ONE-CALL CENTER
IT'S THE LAW!

Ecosystem Enhancement PROGRAM

BASELINE DRAWINGS
ISSUED FEBRUARY 27, 2015

Sheet Index

Title Sheet	0.1
General Notes and Symbols	0.2
Project Overviews	0.3-0.4
Monitoring Plans	
UT1A	1.0-1.1
UT1B	1.2-1.3
UT2	1.4-1.5
UT2A	1.6-1.7
UT2B	1.8
UT2C	1.9-1.10
Little River	1.11-1.13

Project Directory

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Turner Land Surveying, PLLC
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David S. Turner, PLS
919-875-1378

Engineering:
Wildlands Engineering, Inc
License No. F-0831
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Jeff Keaton, PE
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Owner:
Ecosystem Enhancement Program
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Raleigh, NC 27699-1652
Jeff Jurek
919-707-8976

DENR Contract No. 004642

NCEEP ID No. 95352

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Hopewell Stream Mitigation Site
Randolph County, North Carolina

Title Sheet
Baseline Drawings

Revisions:

Date: February 27, 2015
Job Number: 005-02133
Project Engineer: JNK
Drawn By: RPH
Checked By: KYG

Sheet 0.1

February 27, 2015

PL — PL — Property Line

R/W — Right of Way

Trees Saved During Construction

Power Pole

Farm Road

CE — CE — Conservation Easement

10+00 Thalweg Alignment

As-Built Bankfull

100 As-Built Major Contour

As-Built Minor Contour

As-Built Cross Section

As-Built Angle Log Drop

As-Built Rootwad

As-Built J-Hook

As-Built Cover Log

CR-NM As-Built Constructed Riffle

CR-CH As-Built Chunky Riffle

CR-RR As-Built Rock and Roll Riffle

CR-WD As-Built Woody Riffle

As-Built Brush Mattress

As-Built Brush Toe

VP #1 Vegetation Plot

PP 1 Photo Point

CG 1 Crest Gage

RG 1 Rain Gage

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Hopewell Stream Mitigation Site
Randolph County, North Carolina

General Notes and Symbols
Baseline Drawings

Revisions:

Date: February 27, 2015
Job Number: 005-02133
Project Engineer: JNK
Drawn By: RTH
Checked By: KYG

Sheet 0.2

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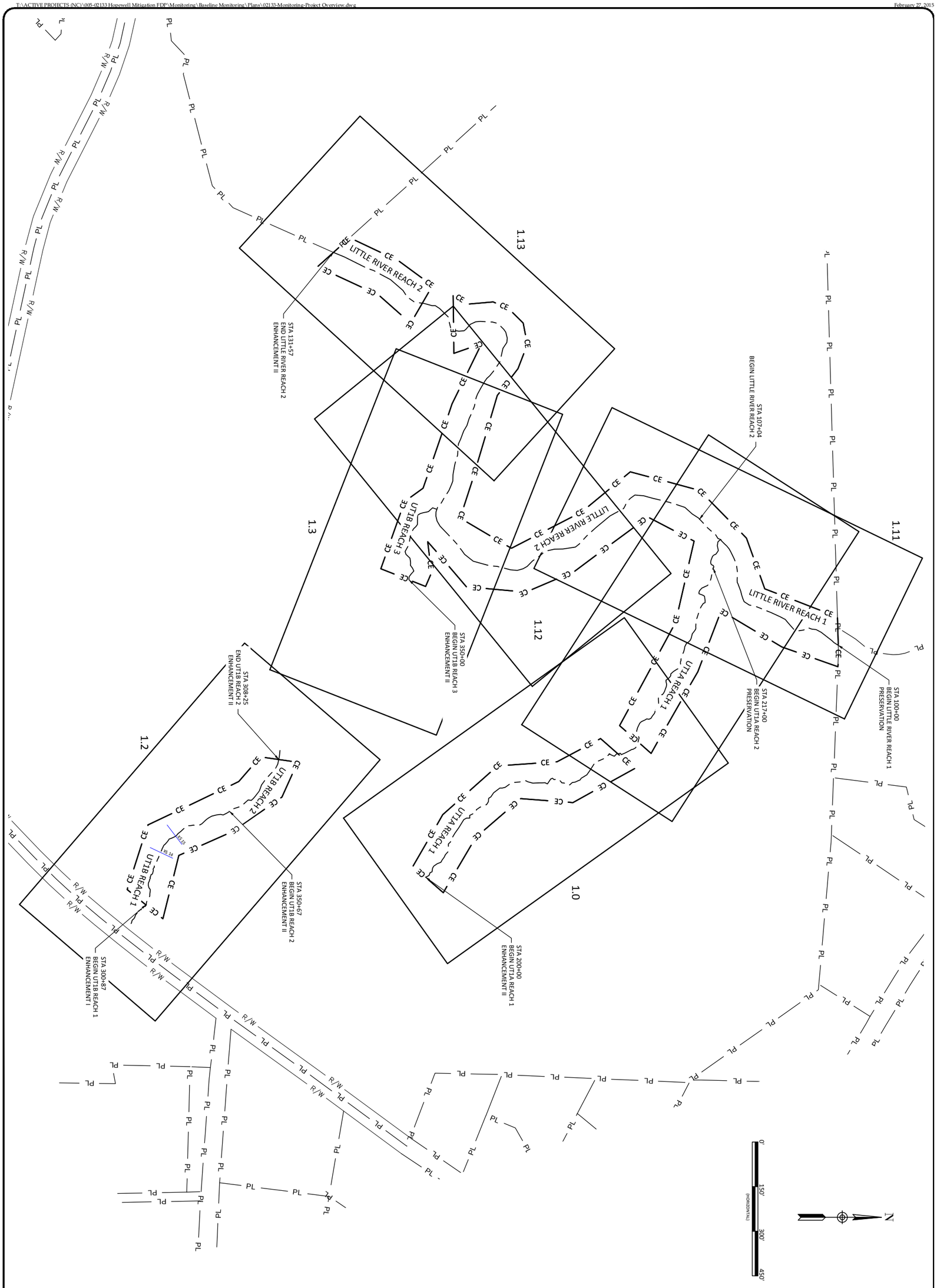

Date:	February 27, 2015
Job Number:	005-02133
Project Engineer:	JNK
Drawn By:	RPH
Checked By:	KYG

Revisions:

0.3
Sheet

Hopewell Stream Mitigation Site
Randolph County, North Carolina

Project Overview - East Side
Baseline Drawings

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Date:	February 27, 2015
Job Number:	005-02133
Project Engineer:	JNK
Drawn By:	RPH
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0.4

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Hopewell Mitigation Site
Randolph County, North Carolina

Project Overview - West Side
Baseline Drawings

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Date: February 27, 2015
Job Number: 005-02133
Project Engineer: JNK
Drawn By: RPH
Checked By: KYG

1.0
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Revisions:

Hopewell Stream Mitigation Site
Randolph County, North Carolina

UT1A
Baseline Drawings

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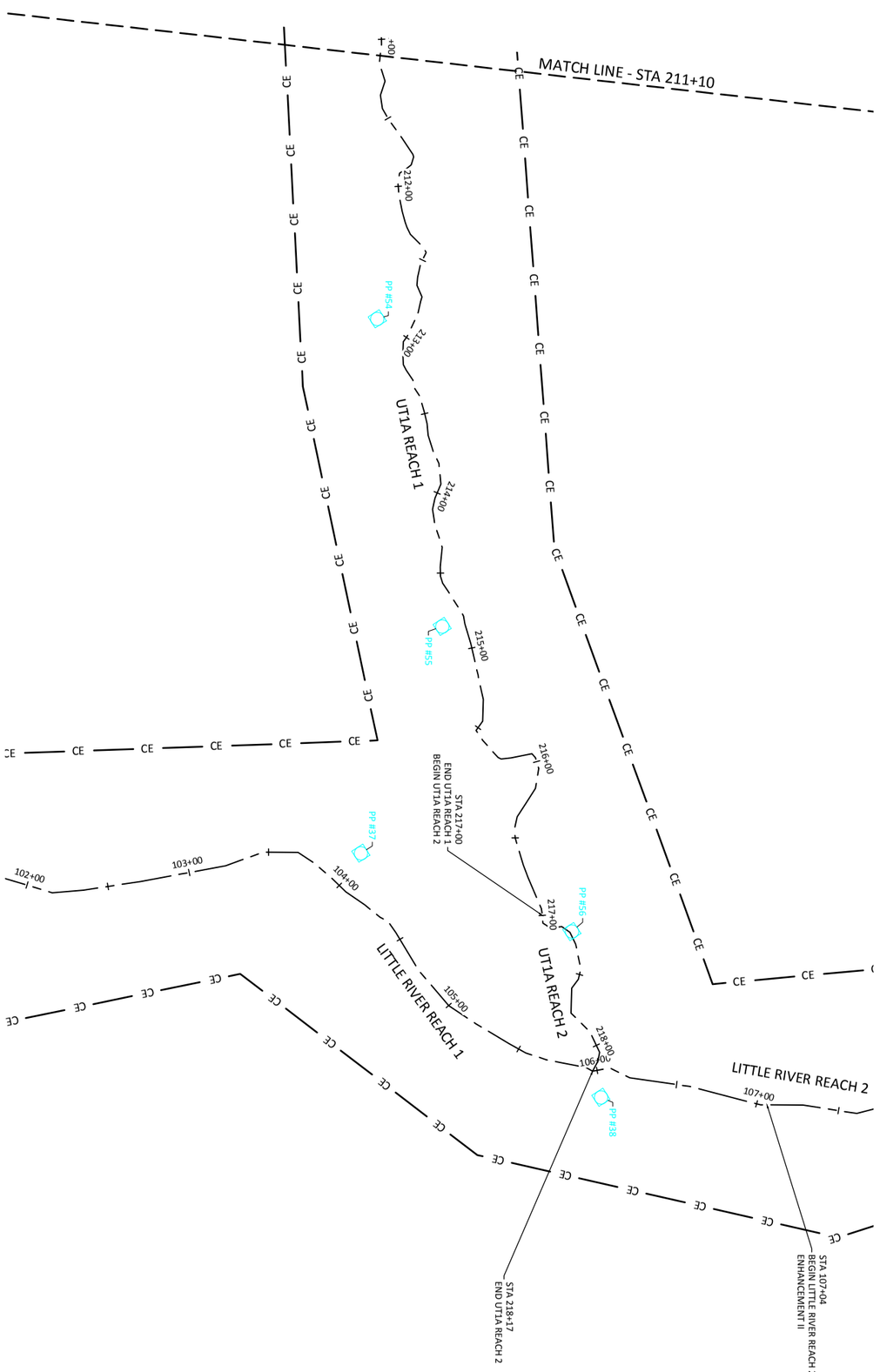

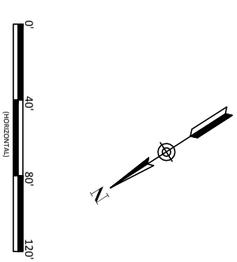

Date:	February 27, 2015
Job Number:	005-02133
Project Engineer:	JNK
Drawn By:	RPH
Checked By:	KYG

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Hopewell Stream Mitigation Site
Randolph County, North Carolina

UT1A
Baseline Drawings

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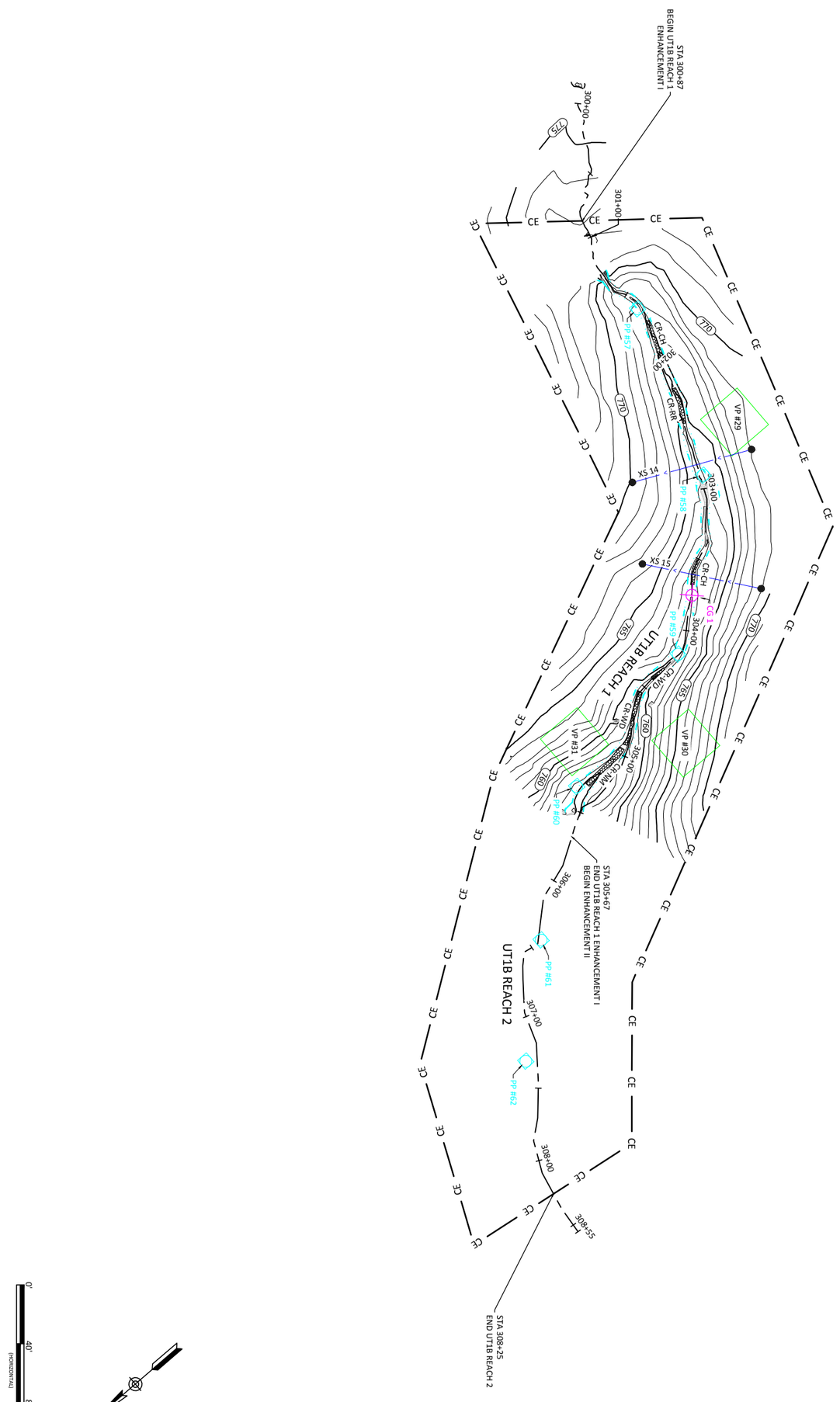

Date:	February 27, 2015
Job Number:	005-02133
Project Engineer:	JNK
Drawn By:	RPH
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Revisions:

Hopewell Stream Mitigation Site
Randolph County, North Carolina

UT1B Reach 1 & 2
Baseline Drawings

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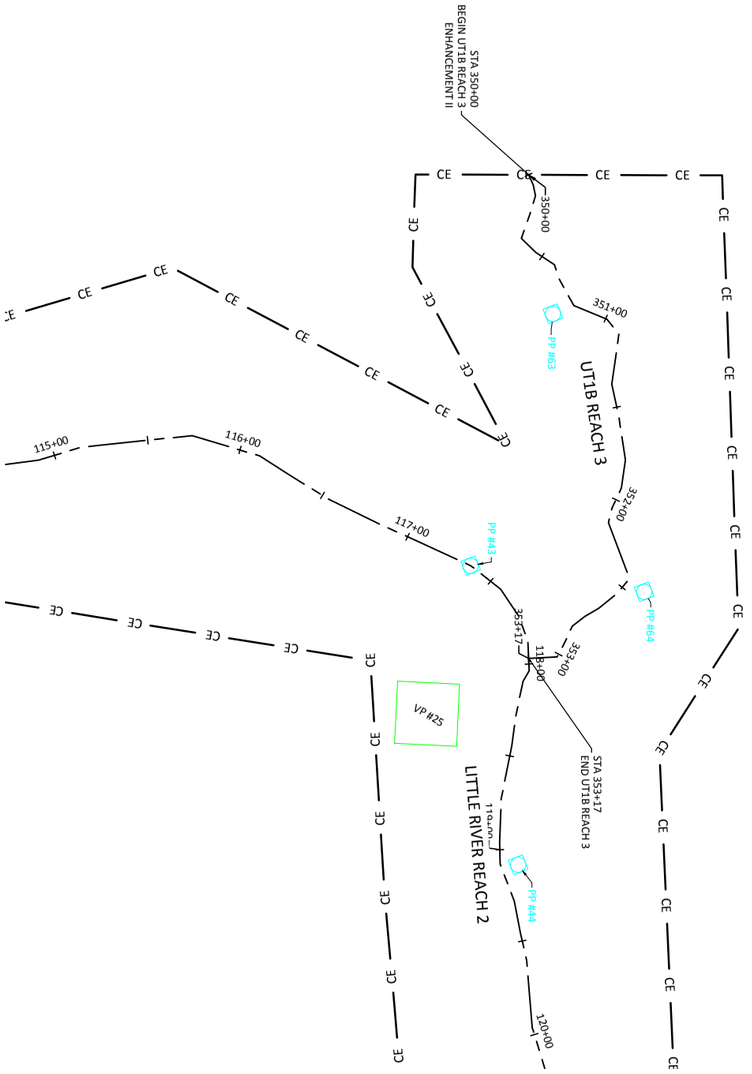

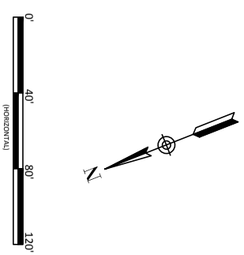

Date:	February 27, 2015
Job Number:	005-02133
Project Engineer:	JNK
Drawn By:	RPH
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1.3
Sheet

Revisions:

Hopewell Stream Mitigation Site
Randolph County, North Carolina

UT1B Reach 3
Baseline Drawings

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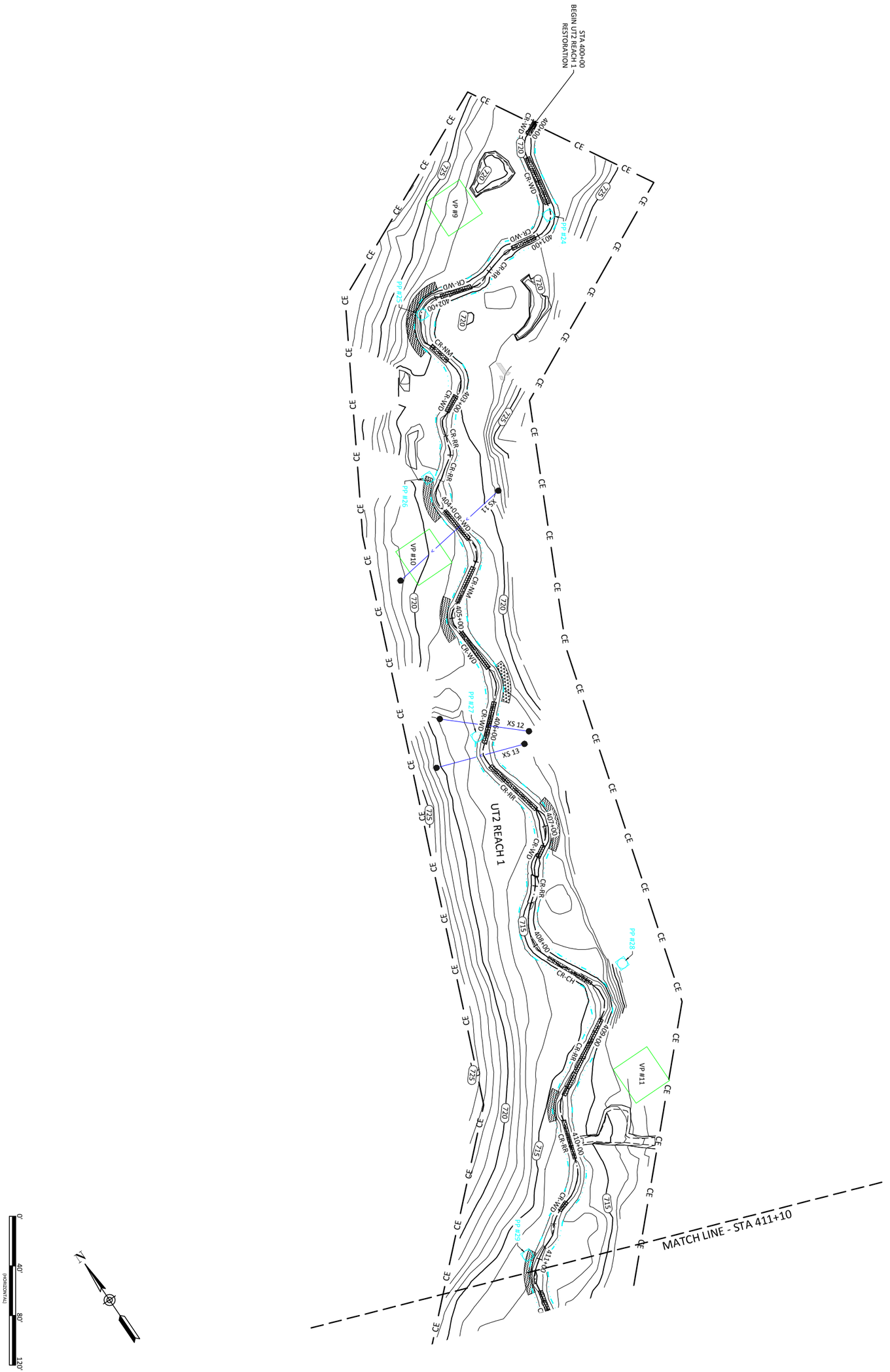

Date: February 27, 2015
Job Number: 005-02133
Project Engineer: JNK
Drawn By: RPH
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1.4
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Revisions:

Hopewell Stream Mitigation Site
Randolph County, North Carolina

UT2
Baseline Drawings

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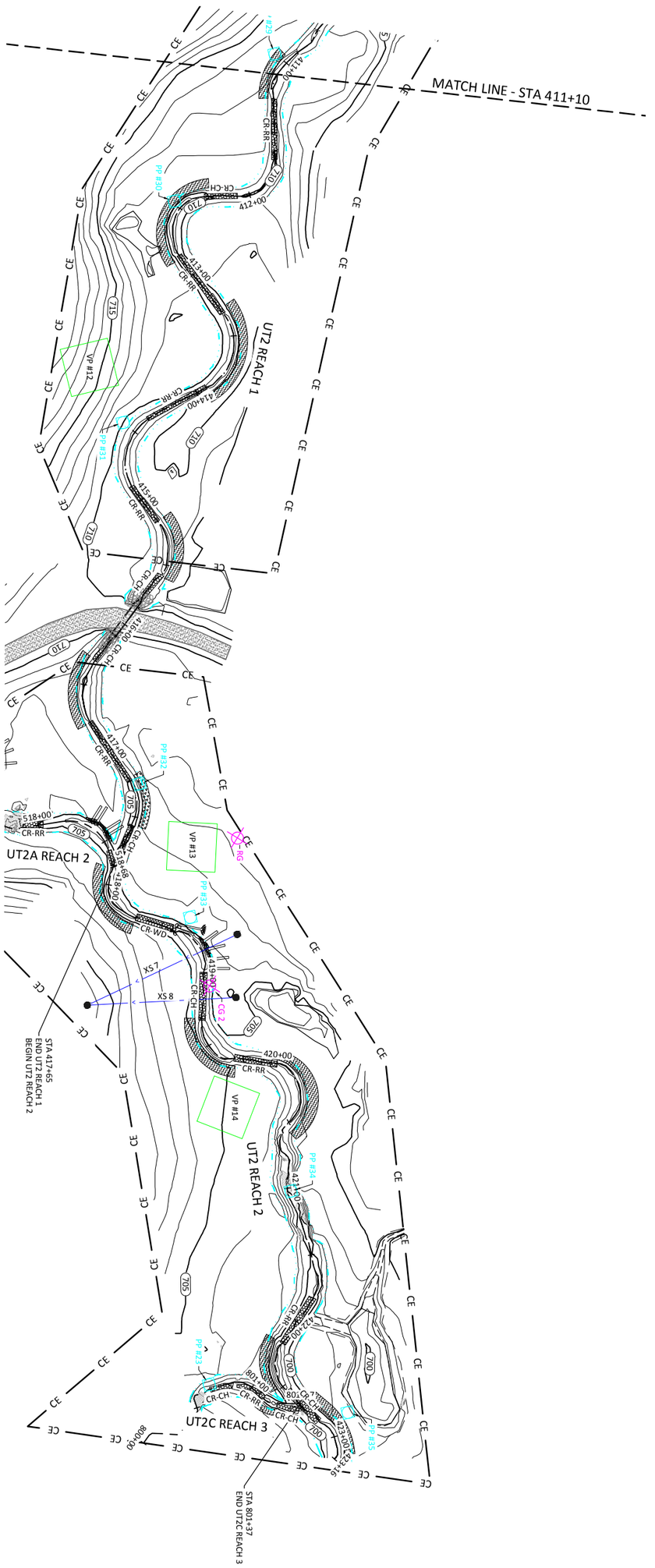

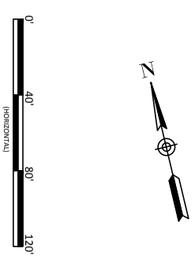

Date:	February 27, 2015
Job Number:	005-02133
Project Engineer:	JNK
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1.5
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Revisions:

Hopewell Stream Mitigation Site
Randolph County, North Carolina

UT2
Baseline Drawings

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Job Number:	005-02133
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1.6
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Revisions:

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Randolph County, North Carolina

UT2A
Baseline Drawings

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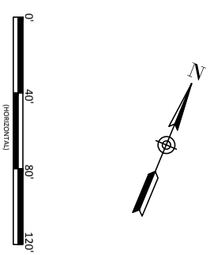

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Job Number:	005-02133
Project Engineer:	JNK
Drawn By:	RPH
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Hopewell Stream Mitigation Site
Randolph County, North Carolina

UT2A
Baseline Drawings

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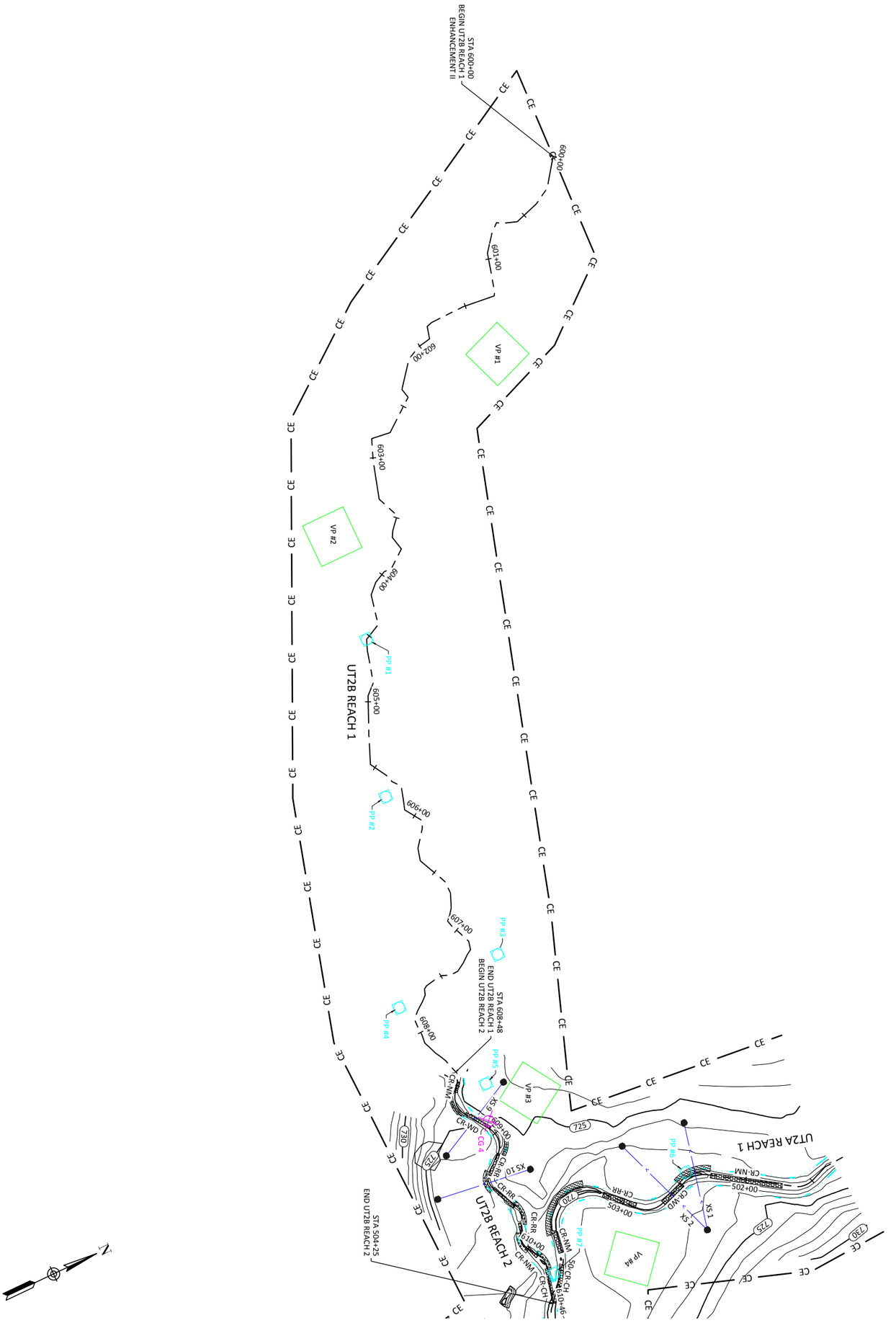

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Job Number:	005-02133
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Hopewell Stream Mitigation Site
Randolph County, North Carolina

UT2B Reach 1 & 2
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1.9
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Randolph County, North Carolina

UT2C
Baseline Drawings

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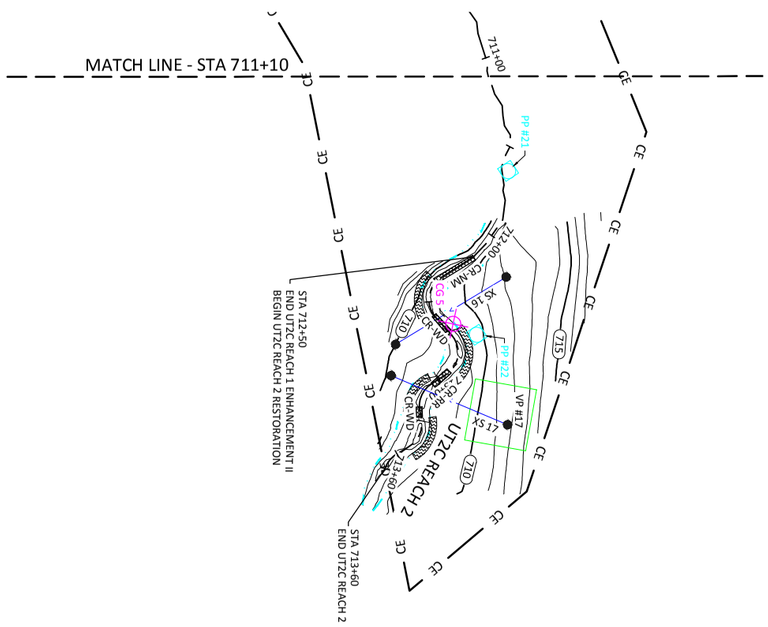

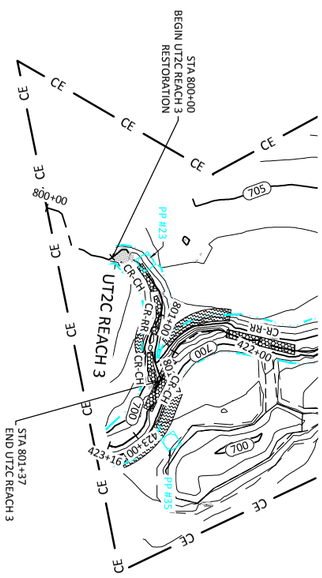

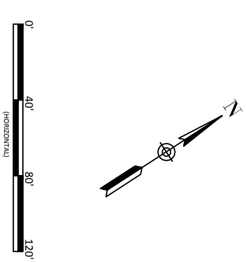

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Hopewell Stream Mitigation Site
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UT2C
Baseline Drawings

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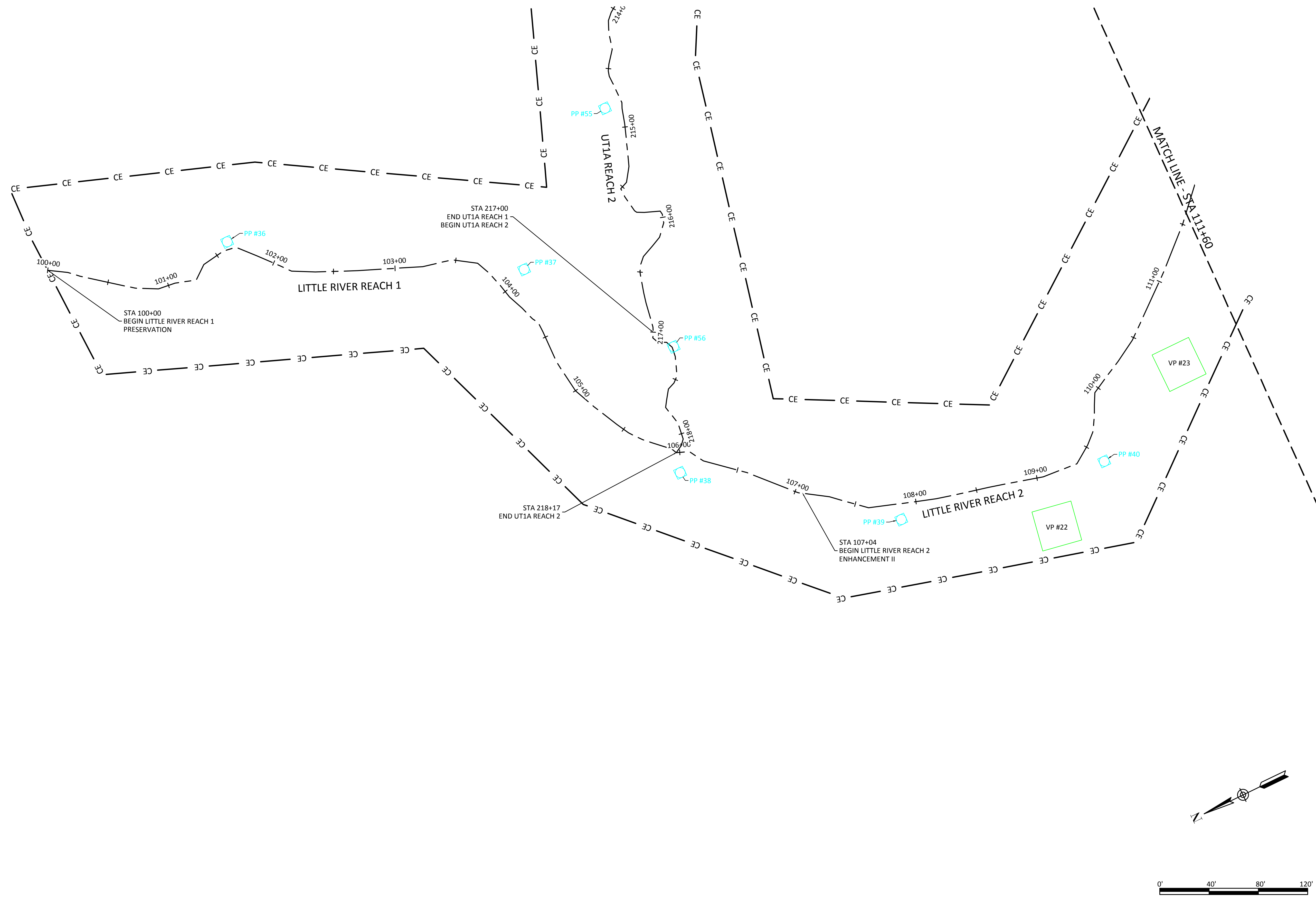

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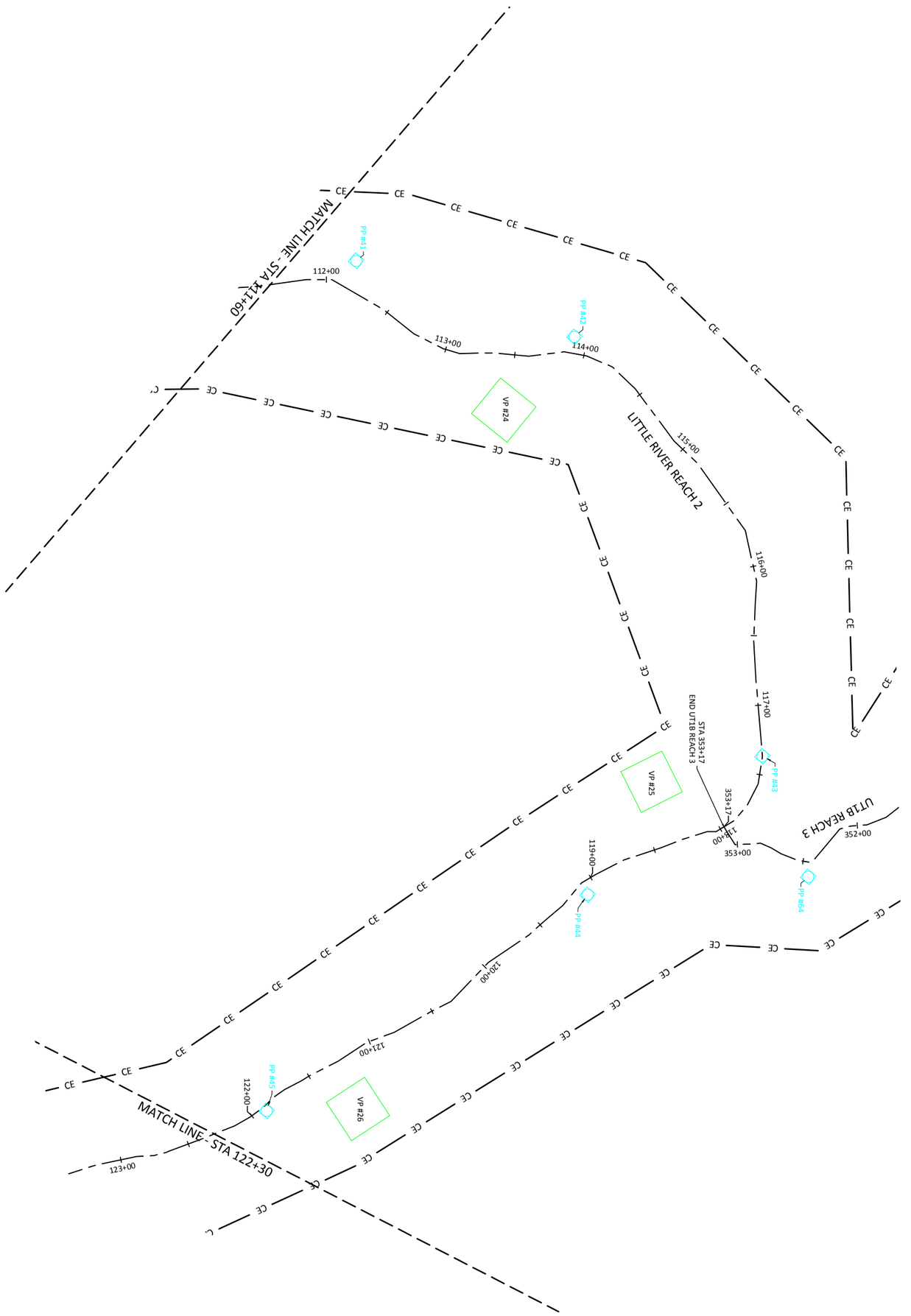
Hopewell Stream Mitigation Site
Randolph County, North Carolina

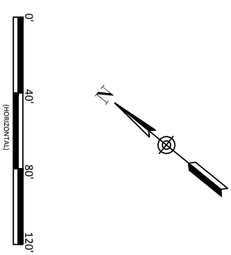
Little River
Baseline Drawings

Revisions:

Date:	February 27, 2015
Job Number:	005-02133
Project Engineer:	JNK
Drawn By:	RPH
Checked By:	KYG

Sheet 1.11





Date:	February 27, 2015
Job Number:	005-02133
Project Engineer:	JNK
Drawn By:	RPH
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Revisions:

Hopewell Stream Mitigation Site
Randolph County, North Carolina

Little River
Baseline Drawings

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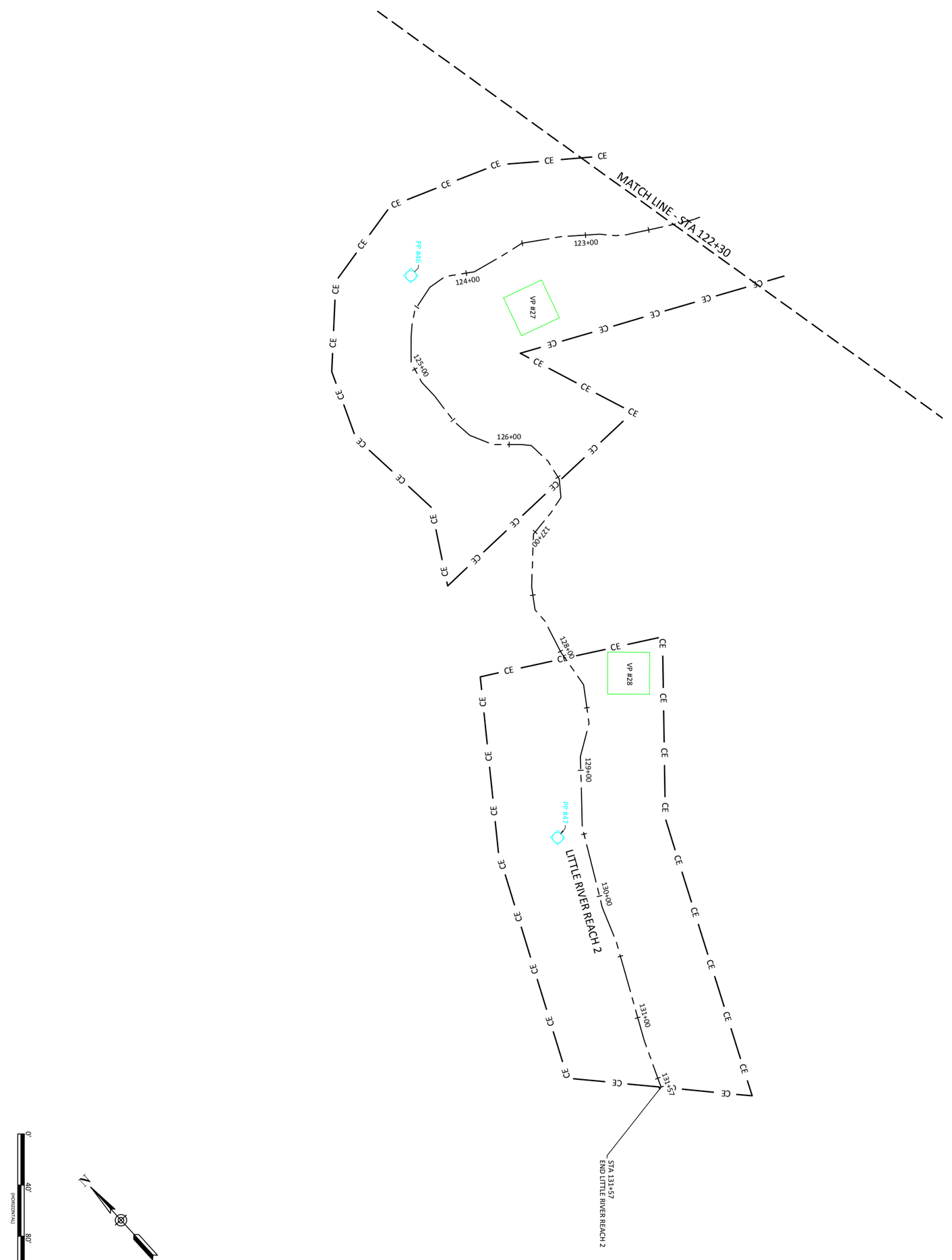

Date:	February 27, 2015
Job Number:	005-02133
Project Engineer:	JNK
Drawn By:	RPH
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Hopewell Stream Mitigation Site
Randolph County, North Carolina

Little River
Baseline Drawings

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