TRIBUTARY TO REEDY FORK CREEK STREAM RESTORATION

GUILFORD COUNTY, NORTH CAROLINA

CONTRACT # D06028-A

Prepared For:

Ecosystem Enhancement Program
Department of Environment and Natural Resources
1652 Mail Service Center
Raleigh, NC 27699-1652

ANNUAL MONITORING REPORT (YEAR 2 OF 5)

DECEMBER 2009

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Year 0 - Photo Point 4

Year 2 – Photo Point 4

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Owner

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1.0 Executive Summary

This annual monitoring report details the second year monitoring activities and their results for the Tributary to Reedy Fork Creek Stream Restoration Site (RFC). All of the monitoring activities were conducted and the subsequent results are reported in accordance with the approved mitigation plan (Mulkey Engineers and Consultants, 2008) for RFC. The content and format of this report were developed in accordance with the contract requirements for the Full Delivery RFP 16-D06028 (NCEEP, 2005). Accordingly, this report includes project background information, project monitoring results, and description of the project monitoring methodology.

Mulkey Engineers & Consultants (Mulkey) submitted RFC for the Full Delivery RFP 16-D06028 to provide 7,000 Stream Mitigation Units (SMUs). Mulkey was awarded the stream restoration contract by the Ecosystem Enhancement Program Department of Environment and Natural Resources (NCEEP) and began work on the project on November 26, 2007. The primary goals of RFC were to improve water quality, to reduce bank erosion, to reestablish a floodplain along each of the stream reaches, and to improve the aquatic and terrestrial wildlife habitat. These goals were met through the following objectives:

- By using natural channel design to restore stable pattern, dimension, and profile for approximately 7,511 linear feet of stream channel
- By establishing a conservation easement, which will protect the streams from cattle intrusion and future development activities
- By establishing a floodplain or reconnecting the stream back to its historic floodplain, or a combination of both, for each project stream reach
- By creating or restoring floodplain features such as vernal pools, off channel ponds, or riparian wetlands
- By increasing the amount of aquatic habitat through the addition of rock and wood structures
- By reestablishing native plant communities throughout the conservation easement, whereby reintroducing shading, cover areas, and travel corridors.

RFC located in Guilford County, North Carolina near the Town of Gibsonville and is situated in the Cape Fear River Basin. Past land use practices, including extensive cattle farming and clearing of the riparian buffers resulted in substantial degradation of the stream systems at RFC. RFC is comprised of seven stream reaches totaling approximately 7,511 feet of restored stream channel. All of the analyses, design, and restoration at RFC were accomplished using natural stream channel design methods. In addition to stream channel restoration, the restored stream banks and the riparian and upland buffer areas along RFC were also replanted with native species vegetation.

The survivability of the planted vegetation at RFC will be monitored at representative vegetation plots as well as project-wide. Stem counts, photo documentation and comparison, and visual assessment will be utilized. Bare root stock were planted at a density of 680 stems per acre (eight foot by eight foot spacing) and live stakes were planted on the stream banks at a density of 1,742 stems per acre (five foot by five foot spacing). A

total of 16 representative vegetation plots were installed at RFC based on the recommendations set forth by NCEEP regarding the acreage contained in the conservation easement. The survivability of the planted woody vegetation at RFC will be monitored using annual stem counts at each of the plots. In addition to the stem counts, annual photos will be taken at each of the plots and also from eight other permanent photo reference points. The vegetation plot photos will be used for photo documentation and comparison of the vegetation growth at each plot. The photo documentation at the reference points will be employed to assist in a project-wide visual assessment of the vegetation at RFC. Survivability will be based on achieving a minimum of 320 stems per acre, the rate required to be present during the third year of monitoring, across the project site. The stem counts will be conducted during the latter part of the growing season months (August, September, and October) to insure survival throughout a complete growing season while still allowing for relative ease in identification.

In late September 2008, the vegetation monitoring for Monitoring Year 1 was conducted using the methodologies described above, including stem counts, photo documentation, and visual assessment. The stem counts for the 16 vegetation plots ranged from 121 to 972 stems per acre, with an average survivability of 478 stems per acre. These results indicated that the survivability of the planted woody vegetation at RFC may not meet the success criteria of achieving at least 320 stems per acre after three years and 260 stems per acre after five years at RFC. Based on the results of the stem counts, supplemental plantings of bare root seedlings were recommended to be conducted by Mulkey during the 2008-2009 planting season to ameliorate any deficiencies. The comparisons of the baseline and Monitoring Year 1 photos at both the 16 vegetation plot photo reference points and the eight permanent photo reference points did not reveal any concerns, problems, or negative trends. No vegetation problem areas were observed or documented during the project-wide visual assessment. Beyond the described supplemental plantings, Mulkey did not make any additional recommendations or take any other action other than to proceed with the annual vegetation monitoring.

Mulkey conducted the recommended supplemental plantings of bare root seedlings in late winter 2008. These supplemental plantings were conducted only at the areas of the site where the most mortality was observed. Subsequent to the described replanting, the results of the Monitoring Year 2 stem counts showed that the counts for the 16 vegetation plots ranged from 504 to 972 stems per acre, with an average survivability of 697 stems per acre. These results indicated that the survivability of the planted woody vegetation at RFC should meet the success criteria of achieving at least 320 stems per acre after three years and 260 stems per acre after five years at RFC. The comparisons of the baseline, Monitoring Year 1, and Monitoring Year 2 photos at both the 16 vegetation plot photo reference points and the eight permanent photo reference points did not reveal any concerns, problems, or negative trends. No vegetation problem areas were observed or documented during the project-wide visual assessment. Based on the positive results from the vegetative monitoring for Monitoring Year 2 at RFC, Mulkey does not propose any additional recommendations or actions other than to proceed with the annual vegetation monitoring.

Stream dimension, pattern, profile, stream bed material, bank stability, and bankfull hydrology will be monitored to evaluate the success of stream restoration at RFC. The limits of the project stream reaches to be monitored at RFC were determined using the sampling rates outlined by the USACE *et al*. (2003). The monitoring involves using annual field surveys, pebble counts, crest gage recordation, visual assessment and photo documentation. Baseline conditions for comparison of the stream parameters to be monitored were established from data gathered immediately after construction through the as-built survey process. Longitudinal profiles and Modified Wolman pebble counts were conducted for all reaches and a total of seven permanent cross sections were surveyed and photo documented across RFC. A total of three crest gages across RFC were installed for hydrologic monitoring to verify the occurrence of bankfull storm events. Annual photo documentation will used for stream monitoring to complement and validate the other stream monitoring practices from eight permanent reference photo points. Annual project wide visual assessment will be conducted using field observation and pedestrian surveys to identify any specific problem areas. The BEHI information was not collected since it is only required during Monitoring Year 3 and Monitoring Year 5. Stream restoration success at RFC will be evaluated by comparison of the annual monitoring results against those same parameters as predicted, specified, and required in the proposed design and as implemented during the construction process represented by the as-built or baseline conditions. Success is achieved when all such comparisons reveal positive trends toward overall stream stability.

In late September 2008, the stream monitoring for Monitoring Year 1 was conducted using the methodologies described above. The results of the stream dimension, pattern, and profile monitoring demonstrated that all of the reaches were experiencing the expected minor adjustments indicative of movement toward increased stream stability and are attributed to vegetation establishment and natural channel adjustments. Fluctuations in bed materials were expected to occur during the early years following construction. Fining of the bed materials was documented by the stream bed material monitoring. Mulkey believes that this fluctuation was attributed to the deposition of finer bed materials (sands and silts) mobilized during construction and during subsequent storm events. Mulkey believes that the stream bed materials will coarsen as stream bank stability increases. These monitoring results suggested that on-site sediment supply from RFC is being greatly reduced as a result of the restoration. Fluctuations in bed materials will likely continue to occur and several years may be needed to observe a consistent bed material. Two of the three crest gages recorded flood stages in excess of the bankfull stage. The evidence recorded by the crest gages indicates that a storm event producing a stage in excess of the bankfull storm occurred at RFC during Monitoring Year 1. This documented the first of two required bankfull events over the five year monitoring period in order to achieve success with regards to hydrologic monitoring at RFC. No stream problems were documented through the photo documentation comparison process or through the conduction of the project-wide visual assessment along each of the project stream reaches. RFC experienced no stream problem areas and was deemed a success for Year 1 Monitoring.

Between early and mid-September 2009, the stream monitoring for Monitoring Year 2 was conducted using the methodologies described above. The results of the stream dimension, pattern, and profile monitoring demonstrated that all of the reaches were experiencing the

expected minor adjustments indicative of movement toward increased stream stability and are attributed to vegetation establishment and natural channel adjustments. Fluctuations in bed materials were again documented. The Monitoring Year 2 results also suggest that on-site sediment supply from RFC is being greatly reduced as a result of the restoration. Both of the crest gages recorded flood stages in excess of the bankfull stage. The evidence recorded by the crest gages indicates that a storm event producing a stage in excess of the bankfull storm occurred again at RFC during Monitoring Year 2. This documented the second of two required bankfull events over the five year monitoring period in order to achieve success with regards to hydrologic monitoring at RFC. No stream problems were documented through the photo documentation comparison process or through the conduction of the project-wide visual assessment along each of the project stream reaches. RFC experienced no stream problem areas and was again deemed a success for Year 2 Monitoring.

Therefore, based on the positive results of both the vegetative and the stream monitoring for Monitoring Year 2 at RFC, along with the positive results from the previous monitoring year, Mulkey does not propose any actions other than to proceed with the annual stream monitoring.

2.0 Project Background

2.1 Project Location and Setting

RFC located in Guilford County, North Carolina approximately five miles north of the Town of Gibsonville, approximately one half mile east of the intersection of NC Highway 61 and Sockwell Road (SR 2735) and immediately south of SR 2735 (Figure 1). RFC is situated in the Cape Fear River Basin 8-digit cataloging unit 03030002 and the 14-digit cataloging unit 03030002020070. Mulkey proposed to provide 7,000 Stream Mitigation Units (SMUs) with RFC under the Full Delivery RFP 16-D06028 issued by NCEEP. Mulkey acquired and installed permanent fencing along an easement covering 19.64 acres, which encompasses the streams and associated buffers at RFC.

2.2 Project Goals and Objectives

The primary goals of RFC were to improve water quality, to reduce bank erosion, to reestablish a floodplain along each of the stream reaches, and to improve the aquatic and terrestrial wildlife habitat.

These goals will be met through the following objectives:

- By using natural channel design to restore stable pattern, dimension, and profile for approximately 7,511 linear feet of stream channel
- By establishing a conservation easement, which will protect the streams from cattle intrusion and future development activities
- By establishing a floodplain or reconnecting the stream back to its historic floodplain, or a combination of both, for each project stream reach

- By creating or restoring floodplain features such as vernal pools, off channel ponds, or riparian wetlands
- By increasing the amount of aquatic habitat through the addition of rock and wood structures
- By reestablishing native plant communities throughout the conservation easement, whereby reintroducing shading, cover areas, and travel corridors.

2.3 Project Restoration Approach and Mitigation Type

RFC is comprised of three main reaches (R2-1, R2-2, R2-3) and four tributaries (R1, R2-4A, R2-4b, and R2-4c). Prior to construction, these seven reaches were identified and proposed for restoration due to their distinct stream characteristics and drainage areas. These seven existing reaches totaled approximately 7,093 linear feet. A total of approximately 7,511 linear feet of stream channel was restored at RFC within the 19.64-acre conservation easement.

Analyses, design, and restoration of the stream channels at RFC was accomplished using Natural Stream Channel design methods developed by Rosgen (Rosgen, D. L., 1994, 1996, 1998). The proposed Rosgen channel type for each the stream reaches was a C4 channel. A combination of Priority Level I and II methods were used to construct these reaches.

The most significant stream restoration component at RFC involved reconstruction of each of the stream reaches such that stream flows greater than bankfull are allowed to access the restored stream's floodplain. Two different approaches were used to insure such floodplain access. The first approach involved relocating and raising the stream bed such that the historic floodplain is accessed by stream flows greater than bankfull (the sections of the project stream reaches that were restored using Priority Level I methodologies). A second approach was used where site constraints prevented such relocation and raising of the stream bed. The second approach involved building a floodplain at a level lower than the historic floodplain through the construction of bankfull benches (the sections of the project stream reaches that were restored using Priority Level II methodologies). In-stream structures were installed along each of the stream reached to provide grade control and stream bank protection, and to increase in-stream habitat diversity. The in-stream structures that were installed included rock cross vanes, j-hook rock vanes, rock vanes, constructed riffles, and root wads. Stream banks were further stabilized through the installation of coir fiber erosion control matting, temporary and permanent seeding, and the installation of native species vegetation in the form of transplants, live stakes, and bare root seedlings. All areas of the site that were disturbed during construction activities were stabilized using temporary and permanent seeding. The riparian and upland buffer communities along RFC were also restored with native species vegetation using a target community which will emulate the Piedmont/Low Mountain Alluvial Forest described by Shafale and Weakley (1990). The conservation easement was fenced to permanently protect the restored stream and buffer areas. Information regarding the restoration approach and mitigation type for each of the seven project stream reaches is detailed in Table 1.

2.4 Project History

The existing conditions at RFC prior to restoration were a result of cattle use for the past 50 years. When Mulkey initially became involved with this project, there were approximately 150 dairy cattle utilizing the pastures and directly accessing the stream channels. This continual livestock access to the streams resulted in substantial erosion along the stream banks, incision of the channels, channel widening in some areas, and heavy siltation throughout RFC, as well as reduced water quality due to large quantities of fecal matter into the stream system. As a result of these land and water quality issues, Mulkey submitted RFC for the Full Delivery RFP 16-D06028 to provide 7,000 Stream Mitigation Units (SMUs). Mulkey was awarded the stream restoration contract by the NCEEP and began work on the project on November 26, 2007. The project activity and reporting history are detailed in Table II. Table III lists the contacts for the designer, contractor, relevant suppliers, and monitoring firm for RFC. Table IV provides a complete listing of project background information.

2.5 Project Monitoring Plan View

Mulkey conducted monitoring baseline surveys along the entire length of each of the restored project stream reaches using total station survey equipment. These surveys were conducted to establish and document baseline conditions for the newly restored stream channels for future monitoring activities. As-built drawings were developed using the results of the monitoring baseline surveys. These drawing depicted the post construction condition of RFC and are included in Appendix A. The as-built drawings consisted of plan sheets that include the following:

- Title sheet
- Legend sheet
- As-built planimetric drawings and profiles developed from the baseline monitoring field surveys

The as-built drawings illustrate the location of all major project elements, including, but not limited to the:

- Restored stream channel thalweg, normal edges of water, constructed bankfull channel limits, and the constructed cut slope limits
- Conservation easement boundaries
- Permanent fencing limits
- Topography
- In-stream structures
- Photo points
- Crest gages
- Vegetation plots locations
- Permanent cross sections
- Project survey control
- Monitoring profile survey limits

- Relevant structures and utilities

3.0 Project Condition and Monitoring Results

3.1 Project Vegetation Monitoring

3.1.1 Vegetation Monitoring Methodology

The survivability of the planted vegetation at RFC, including both woody and herbaceous species, will be monitored at representative vegetation plots as well as project-wide. Monitoring at representative vegetation plots will focus primarily on planted woody vegetation and will be conducted using stem counts and photo documentation. Project-wide monitoring of planted vegetation will include both woody and herbaceous species and will be accomplished using visual assessment as well as photo documentation.

Major grading and channel construction was completed in mid-April 2008. Throughout construction, appropriate temporary and permanent seeding was conducted to stabilize areas disturbed during construction. Appropriate existing native species vegetation was also salvaged, where feasible, in the form of transplants and live stakes, throughout the construction process. Immediately following the completion of the major grading and channel construction activities, all remaining plant material was installed during the months of March and April 2008, with all such planting being completed by mid-April 2008. These remaining plant materials consisted of native species bare root seedlings and live stakes and were installed, as appropriate, to restore the riparian and upland buffer communities along RFC within the conservation easement area. A complete listing of the planting zones, their corresponding acreages, and the corresponding vegetation species was included in the approved mitigation report (Mulkey Engineers and Consultants, 2008). The bare root stock were planted at a density of 680 stems per acre (eight foot by eight foot spacing) and the lives stakes were planted on the stream banks at a density of 1,742 stems per acre (five foot by five foot spacing).

As-Built Surveys were initiated immediately following the installation of plant materials. In the period between March and May 2008, during the as-built surveys and after the completion of planting, a total of 16 representative vegetation plots (vegetation plots one through 16) were installed randomly across RFC. An iron pipe was installed at each plot corner for monumentation and a polyvinyl chloride (PVC) pipe, along with a label specifying the plot number, was also installed at one of the corners of each plot. The plot corners were strategically located such that each plot has a total area of approximately 100 square meters. Between April and May 2008, after the establishment of the plots, the species of each planted stem in each plot was identified. Each of these stems was then tallied, by species, and marked with loosely tied survey flagging (on lateral branches) to facilitate future identification. The survivability of the planted woody vegetation at RFC will be monitored using annual stem counts at each of the plots. During the annual stem counts, the planted stems will re-flagged as required to insure that all planted stems were accounted for and considered in the survivability calculations. In addition to the stem counts, photos will be taken at each of the plots. Where necessary, the corner of each plot

will be remarked with the PVC pipe and the plot number relabeled. This PVC plot corner will be used as the reference point from which the annual vegetation plot photos will be taken such that the photos at each plot will have the same orientation. The photos will be compared to the photos from the previous year to validate and document vegetation success. In addition to the photo reference points established at each of the vegetation plots, a total of eight additional permanent photo reference points were installed across RFC. These photo reference points were monumented using steel rebar and PVC pipe and will be used for additional photo documentation of vegetation growth across RFC. Photos will be taken from each of the eight permanent photo reference points with the same orientation each year and used for photo documentation and annual comparison of the vegetation growth across RFC. This exercise will help to further validate and document vegetation success at RFC. Between April and May 2008, after installation of the described eight photo reference points, photos were taken from each of the photo reference points to document the baseline conditions at RFC with regards to planted vegetation. Project-wide visual assessment will also be used for vegetation monitoring at RFC. A visual assessment will be conducted using annual field observation and pedestrian surveys to identify any specific vegetation problem areas at RFC during the monitoring period. Any problem areas where vegetation is lacking or exotic vegetation is present, will be identified and categorized as bare bank, bare bench, bare floodplain, or invasive population. Such areas will be documented using representative photos and their locations will be mapped.

3.1.2 Vegetation Monitoring Success Criteria

Vegetation success at RFC will be measured by stem survivability. Survivability will be based on achieving at least 320 stems per acre, the rate required to be present during Year 3 Monitoring. The stem counts will be conducted during the latter part of the growing season months (August, September, and October) to insure survival throughout a complete growing season while still allowing for relative ease in identification. As described above, photo documentation and visual assessment will be used to complement the stem counts as part of the vegetation monitoring protocol at RFC. If during any given year, the planted species are not anticipated to meet final criteria established for vegetation, supplemental plantings will be considered. In the event that this occurs, a remedial planting plan will be developed that achieves the survivability goals established for Years 3 and 5.

3.1.3 Vegetative Monitoring Results for Year 1 of 5

In late September 2008, the vegetation monitoring for Monitoring Year 1 was conducted. The methodologies described in the Vegetation Monitoring Methodology Section above were used for the vegetation monitoring at RFC for Monitoring Year 1. Stem counts were conducted at each of the 16 vegetation plots. Table V presents the results of these stem counts for each of the plots. This table includes and compares the results of the initial stem counts from the original planting and the results of the Monitoring Year 1 stem counts. Photos were taken from the photo reference points at each of the 16 vegetation plots. Appendix B compares these photos with the initial baseline photos taken from the photo reference points at each of the 16 vegetation plots. Photos were also taken from each of the eight permanent photo reference points. Appendix C compares these photos with the initial

baseline photos taken from the original eight permanent photo reference points. A project-wide visual assessment was also conducted to identify any specific vegetation problem areas. Table VI summarizes the results of the project-wide vegetation visual assessment.

The results of the Monitoring Year 1 stem counts showed that the counts for the 16 vegetation plots ranged from 121 to 972 stems per acre, with an average survivability of 478 stems per acre. These results indicated that the survivability of the planted woody vegetation at RFC may not meet the success criteria of achieving at least 320 stems per acre after three years and 260 stems per acre after five years at RFC. Based on the results of the stem counts, supplemental plantings of bare root seedlings were recommended to be conducted by Mulkey during the 2008 – 2009 planting season to ameliorate any deficiencies. The comparisons of the baseline and Monitoring Year 1 photos at both the 16 vegetation plot photo reference points and the eight permanent photo reference points did not reveal any concerns, problems, or negative trends. No vegetation problem areas were observed or documented during the project-wide visual assessment. No significant volunteer woody species were observed at any of the 16 vegetation plots. Beyond the supplemental plantings, Mulkey did not propose any additional recommendations or actions other than to proceed with the annual vegetation monitoring.

3.1.4 Vegetative Monitoring Results for Year 2 of 5

Mulkey conducted the recommended supplemental plantings of bare root seedlings in late winter 2008. These supplemental plantings were conducted only at the areas of the site where the most mortality was observed. Between early and mid-September 2009, the vegetation monitoring for Monitoring Year 2 was conducted. The methodologies described in the Vegetation Monitoring Methodology Section above were used for the vegetation monitoring at RFC for Monitoring Year 2. Stem counts were conducted at each of the 16 vegetation plots. Table V presents the results of these stem counts for each of the plots. This table includes and compares the results of the initial stem counts from the original planting, the results of the Monitoring Year 1 stem counts, and the results of the Monitoring Year 2 stem counts. Photos were taken from the photo reference points at each of the 16 vegetation plots. Appendix B compares these photos with the initial baseline photos taken from the photo reference points at each of the 16 vegetation plots. Photos were also taken from each of the eight permanent photo reference points. Appendix C compares these photos with the initial baseline photos taken from the original eight permanent photo reference points. A project-wide visual assessment was also conducted to identify any specific vegetation problem areas. Table VI summarizes the results of the project-wide vegetation visual assessment.

Subsequent to the described replanting, the results of the Monitoring Year 2 stem counts showed that the counts for the 16 vegetation plots ranged from 504 to 972 stems per acre, with an average survivability of 697 stems per acre. These results indicated that the survivability of the planted woody vegetation at RFC should meet the success criteria of achieving at least 320 stems per acre after three years and 260 stems per acre after five years at RFC. The comparisons of the baseline, Monitoring Year 1, and Monitoring Year 2 photos at both the 16 vegetation plot photo reference points and the eight permanent photo

reference points did not reveal any concerns, problems, or negative trends. No vegetation problem areas were observed or documented during the project-wide visual assessment. No significant volunteer woody species were observed at any of the 16 vegetation plots. Native species herbaceous vegetation was clearly observed to be flourishing at RFC in conjunction with the woody species vegetation. Both the woody and herbaceous vegetation are establishing well along the stream banks, with root mats for both clearly visible along the edges of water for the project stream reaches. Based on the positive results from the vegetative monitoring for Monitoring Year 2 at RFC, Mulkey does not propose any additional recommendations or actions other than to proceed with the annual vegetation monitoring.

3.2 Project Stream Monitoring

3.2.1 Stream Monitoring Methodology

Stream dimension, pattern, profile, stream bed material, bank stability, and bankfull hydrology will be monitored to evaluate the success of the stream restoration activities at RFC. The monitoring of stream dimension, pattern, and profile, or morphometric monitoring, along with the monitoring of stream bed material, will be conducted using annual field surveys along with visual assessment. The morphometric, stream bed material, and stream bank stability monitoring will be conducted along representative sections of the project stream reaches. Hydrologic monitoring will consist of field measurements of bankfull events using crest gages. Project-wide stream monitoring will be accomplished using visual assessment as well as photo documentation.

Major grading and channel construction were completed in mid-April 2008. Immediately following the completion of the major grading and channel construction activities, all remaining plant material was installed during the months of March and April 2008. The as-built surveys of all of the stream reaches at RFC were initiated immediately following the installation of plant materials and were conducted utilizing total station surveys while following the protocols set forth by the 2003 USACE Stream Mitigation guidelines (USACE *et al*., 2003). In addition to documenting the construction of RFC for comparison to the proposed design, the results of the as-built surveys were also used to establish baseline morphology for the proposed monitoring. This information is presented in Table VII. A summary of the restored stream channel lengths is outlined in Table I. A complete set of As-Built Drawings including a monitoring plan view and longitudinal profile for the as-built conditions of the restored channels can be found in Appendix A. After the completion of the as-built surveys, the limits and corresponding lengths of the project stream reaches to be monitored at RFC were determined using the sampling rates outlined by the USACE *et al.* (2003). A total of 3,060 linear feet of all restored stream channels will be surveyed annually during the monitoring period. This amount satisfies the 3,000 linear feet required minimum. Based on these the sampling rates, the limits of the project stream reaches to be surveyed annually for monitoring are as follows:

Reach R1 – 600 Linear Feet Total (Stations 0+00-R1- through 6+00-R1-)
Reach R2-2 – 453 Linear Feet Total (Stations 18+43-R2- through 22+96-R2-)

Reach R2-3 – 1,633 Linear Feet Total (Stations 2+10-R2- through 18+43-R2-)
Reach R2-4a – 174 Linear Feet Total (Stations 0+36-R2- through 2+10-R2-)
Reach R2-4b – 100 Linear Feet Total (Stations 0+31-R2-4b- through 1+31-R2-4b-)
Reach R2-4c – 100 Linear Feet Total (Stations 0+00-R2-4c- through 1+00-R2-4c-)

The upstream and downstream limits of these reaches were monumented in the field using steel rebar/PVC pin. Each pin was also labeled with an aluminum tag identifying the respective reach and the correct descriptor ("begin" or "end").

A total of seven permanent cross sections, consisting of both riffles and pools, were established across RFC and surveyed during the as-built surveys. The number of cross sections was determined using the sampling rates outlined by the USACE *et al*. (2003). The left and right ends of each cross section were monumented with a steel rebar pin and PVC pipe. An aluminum tag identifying the cross section number was also installed at the pin on the left side of the channel. In addition to the cross section surveys, photos were taken at each of the seven cross sections, looking across the stream from left to right, to document the baseline conditions at each respective cross section. Specific stations along each permanent cross section were established during the as-built surveys to promote replication and consistency during the subsequent annual cross section surveys. The stationing for each cross section was established to always begin on the left side of the channel, facing downstream, at the left rebar/PVC pin, and to continue across the stream channel to the rebar/PVC pin on the right side. The as-built surveys of the seven cross sections established the baseline conditions with regards to stream dimension. All of the seven cross sections will be surveyed each year during the five-year monitoring period and the resulting parameters will be compared annually. The parameters to be monitored include bankfull width, floodprone width, bankfull cross sectional area, bankfull mean depth, bankfull max depth, width to depth ratio, entrenchment ratio, wetted perimeter, and hydraulic radius. Photos will be taken annually at each of the seven cross sections, with the same orientation, looking across the stream from left to right and will be compared annually to the photos from the previous year to document stream condition at each respective cross section.

The pattern for all of the stream reaches was surveyed and baseline conditions were established as part of the as-built surveys. Monitoring surveys for stream pattern will be limited to the project stream reaches specified above for annual monitoring surveys. The stream pattern parameters resulting form the annual monitoring surveys will include sinuosity, belt width, radius of curvature, meander wavelength, and meander width ratio. These parameters will be compared annually.

The as-built surveys included longitudinal profile survey along the entire length of all restored stream reaches. Longitudinal profiles were surveyed by identifying each stream feature (riffle, run, pool, or glide) and surveying specific points at each feature. These specific locations included top of bank, bankfull, water's edge or surface, and thalweg). The as-built surveys were used to establish the baseline conditions with regards to longitudinal profile. The longitudinal profiles surveys conducted each year will be limited to the project stream reaches specified above for annual monitoring surveys. The parameters resulting from the yearly surveys of the longitudinal profile will be compared on an annual basis. The

parameters to be monitored will include bankfull slope, riffle length, riffle slope, pool length, and pool to pool spacing.

During the as-built surveys, Modified Wolman pebble counts were conducted at each of the project stream reaches to classify the stream bed materials. The pebble counts for the larger project stream reaches (R2-2 and R2-3) were conducted at each of the permanent cross sections by performing an equal number of counts at each cross section and then combining the results into a reach-wide count. These larger reaches were sampled at a minimum rate of 25 counts per cross section such that a minimum of 100 counts were made for each of the larger reaches. Reach-wide pebble counts were conducted along the smaller project stream reaches (R1, R2-4a, R2-4b, and R2-4c). A minimum of 100 counts were made for each of these smaller reaches. The stream bed materials will be monitored at RFC by repeating these same pebble count procedures on an annual basis. The results of the pebble counts for each specified project stream reach will be compared on an annual basis.

BEHI information was collected during the existing condition surveys and sediment transport rates were subsequently developed. The resulting information served as baseline data for stream bank stability at RFC. Stream bank stability monitoring using these parameters is required in Monitoring Year 3 and 5. Data collected during these years will be compared with pre-construction conditions to determine the change in bank erosion hazard indices and sediment export rates for each reach assessed. Positive change, namely reduction, in both the stream bank erosion rates and sediment transport rates at RFC are expected as a result of restoration and will be documented as described to demonstrate success.

During the as-built surveys, a total of three crest gages were installed across RFC, with two along Reach R2 and one at Reach R1. At the base of each crest gage a permanent vertical datum was installed. The locations of each crest gage along with the elevation of the permanent vertical datum were surveyed during the as-built surveys. The crest gages will be used for the hydrologic monitoring at RFC to verify the occurrence of bankfull storm events. Each crest gage was set during its initial installation and baseline photos were taken. The crest gages will be checked annually and the flood stage(s) recorded by each gage and measured relative to the permanent vertical datum of the respective gage. The results of these measurements will be used to document the occurrence of significant storm events, with the goal of specifically documenting the occurrence of bankfull and larger stream flow events.

Photo documentation and project-wide visual assessment will be used for stream monitoring at RFC to complement the other stream monitoring practices. A total of eight permanent reference photo points were installed across RFC during the as-built surveys. These photo points were monumented using steel rebar/PVC pins. Photos were taken at that time to provide photo documentation of baseline stream conditions. Photos will be taken from each of the eight permanent photo reference points with the same orientation each year and will be used for photo documentation and annual comparison of the stream conditions across RFC. This exercise will help to further validate and document stream restoration success at RFC. The visual assessment will be conducted using annual field observation and

pedestrian surveys to identify any specific problem areas along the streams at RFC during the monitoring period. Any such problem areas will be identified and organized under appropriate categories. Such areas will be documented using representative photos, where applicable, and their locations will be mapped. The suspected cause and appropriate remedial action for each problem will be determined. If during any given year, the streams are not anticipated to meet the final established monitoring criteria, corrective actions will be considered. Such modifications will be documented and discussed with NCEEP.

3.2.2 Stream Monitoring Success Criteria

Stream dimension, pattern, profile, stream bed material, bank stability, and bankfull hydrology will be monitored annually for the project stream reaches as described in detail above. Stream restoration success at RFC will be evaluated by comparison of those annual results against those same parameters as predicted, specified, and required in proposed design. Success will be achieved when all such comparisons reveal positive trends toward overall stream stability. The stream monitoring results should show that the stream channels at RFC are of the proposed stream channel type (Rosgen 1994).

Stream dimension parameters including bankfull width, floodprone width, bankfull cross sectional area, bankfull mean depth, bankfull max depth, width to depth ratio, entrenchment ratio, wetted perimeter, and hydraulic radius will be measured and/or calculated for each of the permanent cross sections. The described dimension parameters are expected to remain consistent from year to year and should fall within the ranges established by the original proposed design parameters. It is expected and acceptable that minor adjustments in dimension will occur such as the development of point bars and the subsequent deepening of pools. As vegetation becomes established and the stream banks are stabilized, the anticipation is that the width depth ratios will decrease and the entrenchment ratios will increase slightly, both within the normal ranges for C and E stream channel types (Rosgen, 1994).

Stream pattern parameters including sinuosity, belt width, radius of curvature, meander wavelength, and meander width ratio will be measured and/or calculated. Stream pattern measurements are expected to remain consistent from year to year and to fall within the originally proposed design parameters. As vegetation becomes established and the stream banks are stabilized, it is anticipated that the sinuosity of the streams will also adjust, likely becoming more sinuous with time.

Stream longitudinal profile parameters including bankfull slope, riffle length, riffle slope, pool length, and pool to pool spacing will be measured. Longitudinal profiles parameters are expected to remain relatively consistent from year to year. The stream profiles should not show aggrading or degrading conditions during the five-year monitoring period, however, minor profile adjustments such as deepening of pools is expected.

Stream bed material will be monitored using the described Modified Wolman pebble counts. The success criteria for the bed material will be determined at the end of the five-year monitoring period when data can be reviewed and compared to the proposed channel

material types. Fluctuations in bed materials will likely occur during the early years following construction and several years may be needed to observe a consistent bed material. Bed materials should ultimately reflect the proposed design conditions for each reach at RFC.

Stream bank stability will be monitored using BEHI and sediment transport estimates during Monitoring Years 3 and 5. Data collected during these years will be compared with pre-construction conditions to determine the change in bank erosion hazard indices and sediment export rates for each reach assessed. Positive change, namely reduction, in both stream bank erosion rates and sediment transport rates at RFC are expected as a result of restoration and will be documented as described to demonstrate success.

Hydrologic monitoring success will be based on the ability to document the occurrence of bankfull storm events at RFC. A minimum of two bankfull events, each occurring in two separate monitoring years, are required to be documented within the five-year monitoring period. The described crest gauges will be used to determine and document the occurrence of these bankfull events.

As described above, photo documentation and visual assessment will be used to complement the other stream monitoring practices as part of the stream monitoring protocol at RFC. If during any given year, the streams are not anticipated to meet the final established monitoring criteria, corrective actions will be considered. Such modifications will be documented and discussed with NCEEP.

3.2.3 Stream Monitoring Results for Year 1 of 5

In late September 2008, the stream monitoring for Monitoring Year 1 was conducted. The methodologies described in the Stream Monitoring Methodology Section above were used for the stream monitoring at RFC for Monitoring Year 1. Detailed surveys were conducted along the project stream reaches specified to be surveyed for annual monitoring as described in detail above. The results of these surveys were used as the basis for the morphometric monitoring, including stream dimension, pattern and profile.

All of the seven cross sections were surveyed to measure the bankfull width, floodprone width, bankfull cross sectional area, bankfull mean depth, bankfull max depth, width to depth ratio, entrenchment ratio, wetted perimeter, and hydraulic radius. The results of the cross section surveys are presented in Table VIII. Appendix D compares photos taken during Monitoring Year 1 with the initial baseline photos at each of the seven cross sections. Appendix E provides an overlay of the Monitoring Year 1 and baseline conditions along with the raw data for each cross section. The comparison of the baseline and Monitoring Year 1 stream dimension morphometric data for each of the project stream reaches showed very positive results, all of which were comparable to the originally proposed design parameters. The results showed that all of the reaches were experiencing the expected minor adjustments including decreasing width to depth ratios, increasing entrenchment ratios, and minor increases in depth. Each of these trends was indicative of movement toward increased stream stability and was attributed to vegetation establishment and natural channel

adjustments. The comparison of the Year 1 Monitoring cross section photos to the as-built cross section photos strongly complemented these suggestions, as no concerns, problems, or negative trends were documented.

The pattern for all of the stream reaches was surveyed to measure the parameters of sinuosity, belt width, radius of curvature, meander wavelength, and meander width ratio. The results of the pattern surveys are presented in Table VIII. The comparison of the baseline and Monitoring Year 1 stream pattern morphometric data for each of the project stream reaches showed very positive results, all of which were comparable to the originally proposed design parameters. The results showed that all of the reaches were experiencing the expected minor adjustment attributed to vegetation establishment and natural channel adjustments. This adjustment included slightly increasing radius of curvature in various locations, indicative of movement toward increased stream stability. These minor adjustments can be viewed through the overlays included in Appendix A.

Longitudinal profile surveys were conducted along each of the project stream reaches specified for annual monitoring surveys. The surveys were performed to measure the parameters of bankfull slope, riffle length, riffle slope, pool length, and pool to pool spacing. The results of the longitudinal profile surveys are presented in Table VIII. The comparison of the baseline and Monitoring Year 1 longitudinal profiles for each of the monitored project stream reaches showed very positive results, all of which were comparable to the originally proposed design parameters. The results showed that all of the reaches were experiencing the expected minor adjustment attributed to vegetation establishment and natural channel adjustments, including deepening of pools. The comparison of the baseline and Monitoring Year 1 longitudinal profiles did not show excessive aggrading or degrading. Overlays can be found in Appendix E along with the raw data from both the baseline and Monitoring Year 1 conditions.

Modified Wolman pebble counts were repeated at each of the project stream reaches to classify the stream bed materials for comparison to the baseline conditions. The results of the pebble counts are presented in Table VIII while the raw data and overlays of the percent accumulation graphs can be viewed in Appendix E. Fluctuations in bed materials were expected to occur during the early years following construction. This expectation was observed in comparing the results of the baseline and Monitoring Year 1 pebble counts. Specifically, the bed material d50 and d84 for each of the stream reaches decreased. Mulkey believes that this fluctuation is attributed to the deposition of finer bed materials (sands and silts) mobilized during construction that have been subsequently deposited during storm events. At this time, Mulkey still believes that the stream bed materials will coarsen as stream bank stability increases with additional vegetation establishment and as the finer bed materials are concurrently flushed through the stream systems at RFC. The monitoring results suggested that on-site sediment supply from RFC is being greatly reduced as a result of the restoration. As noted earlier, the success criteria for the bed material will be determined at the end of the five-year monitoring period when data can be reviewed and compared to the proposed channel material types. Fluctuations in bed materials will likely continue to occur and several years may be needed to observe a consistent bed material.

Stream bank stability monitoring was not conducted, as this monitoring practice is scheduled to be performed using BEHI and sediment transport estimates during Monitoring Years 3 and 5. BEHI information was collected during the existing condition surveys and sediment transport rates were subsequently developed. The resulting information will serve as baseline data for stream bank stability at RFC and is presented in Table IX. The raw data for this table can be viewed in Appendix E.

Each of the three crest gages were checked during the Monitoring Year 1 surveys to monitor hydrology at RFC. Wrack lines were observed well above the bankfull stage across RFC during the Monitoring Year 1 surveys, suggesting that a flood event in excess of the bankfull event. One of the crest gages along Reach R2 was apparently washed away during this flood event. The two remaining crest gages (one each at Reach R1 and Reach R2) recorded flood stages in excess of the bankfull stage. Both of the remaining crest gages were reset after checking stage measurements to record future events. Table X lists the information related to the verification of bankfull events at RFC for Monitoring Year 1 while the raw data can be found in Appendix E. The evidence recorded by the crest gages indicated a storm event producing a stage in excess of the bankfull storm occurred at RFC during Monitoring Year 1. This was further validated through conversations with the land owner, Mr. George Teague, as he noted he had not seen a flood event of that magnitude in decades. This documentation of the first bankfull event at RFC during the monitoring period suggests success with regards to hydrologic monitoring at RFC.

Photo documentation and project-wide visual assessment were used to complement the other Monitoring Year 1 stream monitoring practices. Photos were taken from each of the eight permanent photo reference points. Appendix C includes all of the described photos and provides comparison of the photos with the initial baseline photos taken from the eight permanent photo reference points. No stream problems were documented through the photo comparison process. A project-wide visual assessment was conducted along each of the project stream reaches to identify any specific stream problem areas. The project-wide visual assessment did not reveal any specific stream problem areas. Table XI presents the results of the project-wide visual assessment. Table XII presents the findings of no stream problem areas. Based on the results of the stream monitoring for Monitoring Year 1 at RFC, Mulkey did not propose any additional recommendations or actions other than to proceed with the annual stream monitoring.

3.2.4 Stream Monitoring Results for Year 2 of 5

Between early and mid September 2009, the stream monitoring for Monitoring Year 2 was conducted. The methodologies described in the Stream Monitoring Methodology Section above were used for the stream monitoring at RFC for Monitoring Year 2. Detailed surveys were conducted along the project stream reaches specified to be surveyed for annual monitoring as described in detail above. The results of these surveys were used as the basis for the morphometric monitoring, including stream dimension, pattern and profile.

All of the seven cross sections were surveyed to measure the bankfull width, floodprone width, bankfull cross sectional area, bankfull mean depth, bankfull max depth, width to

depth ratio, entrenchment ratio, wetted perimeter, and hydraulic radius. The results of the cross section surveys are presented in Table VIII. Appendix D compares photos taken during Monitoring Year 2 with the initial baseline photos at each of the seven cross sections. Appendix E provides an overlay of the Monitoring Years 1 and 2, as well as baseline conditions, along with the raw data for each cross section. The comparison of the baseline condition along with the Monitoring Years 1 and 2 stream dimension morphometric data for each of the project stream reaches showed very positive results, all of which were comparable to the originally proposed design parameters. The results showed that all of the reaches were experiencing the expected minor adjustments to the width to depth ratios, entrenchment ratios, and depth. Each of these trends was indicative of movement toward increased stream stability and was attributed to vegetation establishment and natural channel adjustments. The comparison of the baseline condition, Monitoring Year 1, and Monitoring Year 2 cross section photos strongly complemented these conclusions, as no concerns, problems, or negative trends were documented.

The pattern for all of the stream reaches was surveyed to measure the parameters of sinuosity, belt width, radius of curvature, meander wavelength, and meander width ratio. The results of the pattern surveys are presented in Table VIII. The comparison of the baseline condition, Monitoring Year 1, and Monitoring Year 2 stream pattern morphometric data for each of the project stream reaches showed very positive results, all of which were comparable to the originally proposed design parameters. The results showed that all of the reaches were experiencing the expected minor adjustment attributed to vegetation establishment and natural channel adjustments. This adjustment included minor changes to the radius of curvature in various locations, indicative of movement toward increased stream stability. These minor adjustments can be viewed through the overlays included in Appendix A.

Longitudinal profile surveys were conducted along each of the project stream reaches specified for annual monitoring surveys. The surveys were performed to measure the parameters of bankfull slope, riffle length, riffle slope, pool length, and pool-to-pool spacing. The results of the longitudinal profile surveys are presented in Table VIII. The comparison of the baseline condition, Monitoring Year 1, and Monitoring Year 2 longitudinal profiles for each of the monitored project stream reaches showed very positive results, all of which were comparable to the originally proposed design parameters. The results showed that all of the reaches were experiencing the expected minor adjustment attributed to vegetation establishment and natural channel adjustments. The comparison of the baseline condition, Monitoring Year 1, and Monitoring Year 2 longitudinal profiles did not show excessive aggrading or degrading. Overlays can be found in Appendix E along with the raw data from the baseline conditions, as well as for Monitoring Years 1 and 2.

Modified Wolman pebble counts were repeated at each of the project stream reaches to classify the stream bed materials for comparison to the baseline conditions. The results of the pebble counts are presented in Table VIII while the raw data and overlays of the percent accumulation graphs for the baseline conditions, Monitoring Year 1 and Monitoring Year 2 can be viewed in Appendix E. The comparison of the results of the pebble counts for Monitoring Year 1 and Monitoring Year 2 showed varied fluctuation of the bed material d50

and d84 along the sampled project stream reaches. Most of these fluctuations were slight. The bed material d50 fined or decreased slightly for project stream reaches R2-4a, R2-4b, R2-2, and R2-3; coarsened or increased slightly for project stream reach R2-4c; and remained the same for project stream reach R1. The bed material d84 fined or decreased for project stream reaches R1, R2-2, R2-3, R2-4a, and R2-4c; and coarsened or increased for project stream reach R2-4b. During the pebble counts, Mulkey noted that herbaceous vegetation is thriving in the subject stream reaches. This vegetation appears to be catching finer bed materials such that the actual stream bed in overlain with a thin layer of vegetation, root mass, and trapped finer materials. Upon further observation, coarser bed materials not reflected in the described pebble counts could be found directly under the layer of organics and trapped finer bed materials. Mulkey believes that this is the reason for the fining of the bed material reflected by the pebble counts for some reaches. The monitoring results continue to suggest that on-site sediment supply from RFC is being greatly reduced as a result of the restoration. As noted earlier, the success criteria for the bed material will be determined at the end of the five-year monitoring period when data can be reviewed and compared to the proposed channel material types. Fluctuations in bed materials will likely continue to occur and several years may be needed to observe a consistent bed material.

Stream bank stability monitoring was not conducted, as these monitoring practices are scheduled to be performed using BEHI and sediment transport estimates during Monitoring Years 3 and 5. BEHI information was collected during the existing condition surveys and sediment transport rates were subsequently developed. The resulting information will serve as baseline data for stream bank stability at RFC and is presented in Table IX. The raw data for this table can be viewed in Appendix E.

Both of the crest gages (one each at Reach R1 and Reach R2) were checked during the Monitoring Year 2 surveys to monitor hydrology at RFC. Deposition was observed above the bankfull stage across RFC during the Monitoring Year 2 surveys, suggesting that a flood event in excess of the bankfull event. Both of the crest gages recorded flood stages in excess of the bankfull stage. Both of the crest gages were reset after checking stage measurements to record future events. Table X lists the information related to the verification of bankfull events at RFC for Monitoring Year 1 while the raw data can be found in Appendix E. The evidence recorded by the crest gages indicated a storm event producing a stage in excess of the bankfull storm occurred at RFC during Monitoring Year 2. Documentation of the second bankfull event at RFC during the monitoring period suggests success with regards to hydrologic monitoring at RFC and also satisfies the requirement that a minimum of two bankfull events, each occurring in two separate monitoring years, be documented within the five-year monitoring period.

Photo documentation and project-wide visual assessment were used to complement the other Monitoring Year 2 stream monitoring practices. Photos were taken from each of the eight permanent photo reference points. Appendix C includes all of the described photos and provides comparison of the photos between the baseline conditions, Monitoring Year 1 and Monitoring Year 2 photos taken from the eight permanent photo reference points. No stream problems were documented through the photo comparison process. A project-wide visual assessment was conducted along each of the project stream reaches to identify any

specific stream problem areas. The project-wide visual assessment did not reveal any specific stream problem areas. Table XI presents the results of the project-wide visual assessment. Table XII presents the findings of no stream problem areas. As noted in the vegetation monitoring section above, root mats for both the woody and herbaceous vegetation are clearly visible along the edges of water for the project stream reaches. Such vegetation growth is contributing greatly to the restoration of stream stability at RFC. The smaller reaches (R1, R2-4 a, b, and c) have shown tremendous success with their reconnection to the floodplain. As a result, vigorous establishment of herbaceous wetland vegetation is occurring within the riparian buffers along these reaches. Given the relative small capacity of these streams, the described vegetation has begun to encroach into the stream channel, creating the elevation difference noticeable in reaches R1 and R2-4c. Additionally, the increased roughness created by the vegetation in the channel allows for some of the upstream sediment to accumulate within the vegetation mats. Reach R2-4a is an example of where this activity has occurred. The denuded upstream channel (off-site) offers a sediment source and the establishing vegetation is trapping the finer materials creating a bed for the next layer of vegetation. Reach R2-4b was influenced similarly by the encroaching vegetation, but not to the same degree as the other reaches. Given that there are no areas of scour, bare banks, or sparse vegetation, Mulkey believes this aggradation does not imply future stability problems. Actually, the vegetation responsible for the aggradation is contributing to increased grade control, channel stability, and providing exceptional in-stream habitat. It is Mulkey's belief that over time, woody vegetation will out compete the current herbaceous vegetation, and the channel will begin to show a trend back towards the originally restored conditions. Other field observations made during the Monitoring Year 2 include the presence of large minnows and/or small fish in the deeper restored pools. Fish of this size and number had not been previously observed at RFC by Mulkey pre or post construction. Based on the positive results of the stream monitoring for Monitoring Year 2 at RFC, Mulkey does not propose any additional recommendations or actions other than to proceed with the annual stream monitoring.

4.0 Project Monitoring Methodology

Success criteria for stream mitigation sites are based on guidelines established by the USACE, US Environmental Protection Agency (USEPA), NC Wildlife Resources Commission (NCWRC) and the NCDWQ (USACE *et. al,* 2003). These guidelines establish criteria for monitoring both hydrologic conditions and vegetation survival. These same guidelines were used to develop the monitoring methods, frequencies, and success criteria discussed herein for RFC and further described in detail in the approved mitigation report (Mulkey Engineers and Consultants, 2008). RFC site conditions will be monitored annually during the latter part of the growing season months (August, September, and October) over the five-year monitoring period. This monitoring period complies with the requirements set fourth in the Full Delivery RFP 16-D06028. Monitoring results will be documented on an annual basis, with the associated reports submitted to the NCEEP as evidence that the established project goals and objectives are being achieved. The results of annual monitoring will be used to evaluate the degree of success RFC has achieved in meeting the said goals and objectives. In the event that goals are not being met, Mulkey will coordinate with the NCEEP to develop a plan for ameliorating the areas of concern.

5.0 References

Mulkey Engineers and Consultants. 2008. Tributary to Reedy Fork Creek Stream Restoration Mitigation Report. July 2008.

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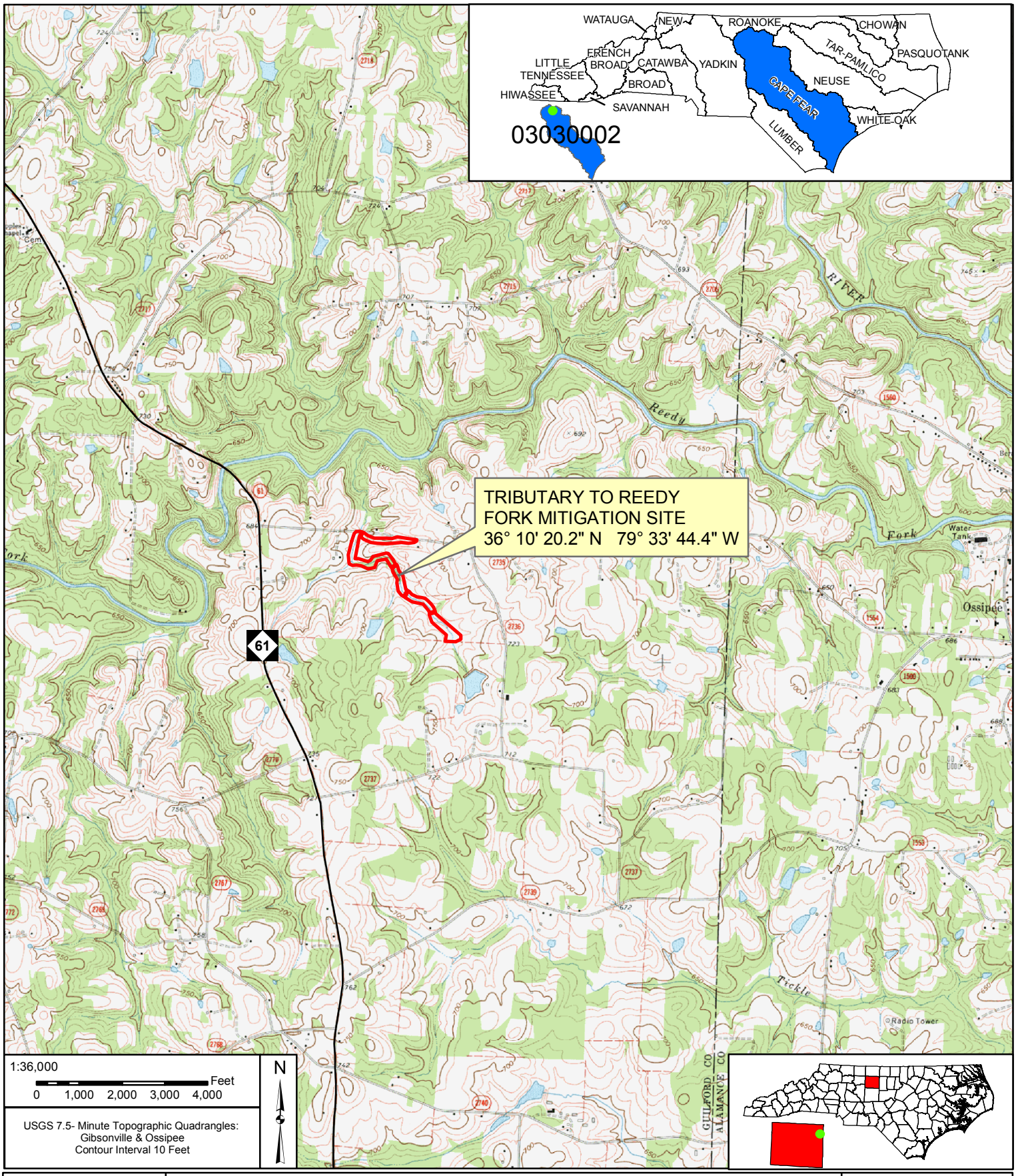
Rosgen, D.L. 1994. A Classification of Natural Rivers. Catena, 22:169-199.

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

Rosgen, D.L. 1998. The Reference Reach – A Blueprint for Natural Channel Design. From Proceedings of the Wetlands and Restoration Conference, March 1998, Denver CO. Wildland Hydrology, Pagosa Springs, CO.

Schafale, M.P. and A.S. Weakley. 1990. Classification of the Natural Communities of North Carolina, Third Approximation. North Carolina Natural Heritage Program, Division of Parks and Recreation, N.C. Department of Environment, Health and Natural Resources.

USACE, USEPA, NCWRC, and NCDWQ. 2003. Stream Mitigation Guidelines. April 2003.



LOCATION MAP

TRIBUTARY TO REEDY FORK

GUILFORD COUNTY, NORTH CAROLINA

May 30, 2008

Ecosystem Enhancement Program

MULKEY ENGINEERS & CONSULTANTS

PROJECT NO. D06028-A

Figure 1

Exhibit Table I. Project Restoration Approach and Mitigation Type Table Tributary to Reedy Fork Creek Stream Restoration / D06028-A						
Stream Reach ID	**Restoration Approach**	**Mitigation Type**	**Original Channel Length (lf)**	**Restored Channel Length (lf)**	**Stream Mitigation Units (SMU)***	**Comments**
R1	P1/P2	R	1,409	1,632	1,600	Includes both P1 (connection to historic floodplain) and P2 (channel relocation with floodplain excavation)
R2-1	P2	R	906	819	819	P2 (channel relocation with floodplain excavation)
R2-2	P1/P2	R	2,522	853	853	Includes both P1 (connection to historic floodplain) and P2 (channel relocation with floodplain excavation)
	P2	EII		418	167	Includes both P2 (channel relocation with floodplain excavation) and EII
	P1/P2	R		1,273	1,213	Includes both P1 (connection to historic floodplain) and P2 (channel relocation with floodplain excavation)
R2-3	P2	R	1,584	1,771	1,741	P2 (channel relocation with floodplain excavation)
R2-4a	P2	R	289	231	195	P2 (channel relocation with floodplain excavation)
R2-4b	P2	R	226	307	276	P2 (channel relocation with floodplain excavation)
R2-4c	P2	R	157	208	208	P2 (channel relocation with floodplain excavation)
		Totals	7,093	7,512	7,072	

*** Stream Mitigation Units do not include restored channel outside of easement and within crossings.**

R = Restoration P1 = Priority I

EII = Enhancement II P2 = Priority II

Exhibit Table II. Project Activity and Reporting History Tributary to Reedy Fork Creek Stream Restoration / D06028-A			
Activity or Report	**Scheduled Completion**	**Data Collection Completion**	**Actual Completion or Delivery**
Restoration Plan Prepared	Dec-06	Oct-06	10-Jul-07
Restoration Plan Approved	Jan-07	N/A	30-Jul-07
Final Design - 90%	Feb-07	N/A	10-Aug-07
Construction	Aug-07	N/A	14-Apr-08
Temporary S&E mix applied to entire project area	Aug-07	N/A	14-Apr-08
Permanent seed mix applied to entire project area	Aug-07	N/A	14-Apr-08
Planting live stakes	Dec-07	N/A	14-Apr-08
Planting bare roots	Dec-07	N/A	14-Apr-08
End of Construction	Dec-07	N/A	14-Apr-08
Survey of As-built conditions (Year 0 Monitoring - Baseline)	Jan-08	May-08	28-May-08
Monitoring			
Year 1 - 2008	Dec-08	Sep-08	Dec-08
Year 2 - 2009	Dec-09	Sep-09	Nov-09
Year 3 - 2010	Dec-10	N/A	N/A
Year 4 - 2011	Dec-11	N/A	N/A
Year 5 - 2012	Dec-12	N/A	N/A

Bolded items represent those events or deliverables that are variable. Non-bolded items represent events that are standard components over the course of a typical project.

Exhibit Table III. Project Contacts Tributary to Reedy Fork Creek Stream Restoration / D06028-A		
Designer		
	Mulkey Engineers and Consultants	6750 Tryon Road Cary, NC 27518 Contact: William Scott Hunt, III Tel. 919.858.1825
Construction Contractor		
	Vaughan Contracting, LLC	P.O. Box 796 Wadesboro, NC 28170 Contact: Tommy Vaughan Tel. 704.694.6450
Planting Coordinator		
	Bruton Nurseries and Landscapes	150 Black Creek Road Fremont, NC 27830 Contact: Charles Bruton, Jr. Tel. 919.242.6555
Seeding Contractor		
	Vaughan Contracting, LLC	P.O. Box 796 Wadesboro, NC 28170 Contact: Tommy Vaughan Tel. 704.694.6450
Seed Mix Sources		
	Evergreen Seed	P.O. Box 669 Willow Spring, NC 27592 Contact: Wister Heald Tel. 919.567.1333
Nursery Stock Suppliers		
	North Carolina Forestry Service Claridge Nursery	762 Claridge Nursery Road Goldsboro, NC 27530 Contact: James West Tel. 919.731.7988
Monitoring Performers		
	Mulkey Engineers and Consultants	6750 Tryon Road Cary, NC 27518 Contact: William Scott Hunt, III Tel. 919.858.1825

Exhibit Table IV. Project Background Tributary to Reedy Fork Creek Stream Restoration / D06028-A	
Project County	Guilford County, North Carolina
Drainage Area [sq. mi(acres)]	
R1	0.028 (17.71)
R2-1	0.92 (591.5)
R2-2	0.51 (326.1)
R2-3	0.33 (210.9)
R2-4a	0.09 (55.7)
R2-4b	0.09 (55.7)
R2-4c	0.09 (55.7)
Drainage Impervious cover estimate (%)	
R1	2
R2-1	2
R2-2	2
R2-3	2
R2-4a	2
R2-4b	2
R2-4c	2
Stream Order	
R1	1
R2-1	2
R2-2	2
R2-3	2
R2-4a	1
R2-4b	1
R2-4c	1
Physiographic Region	Piedmont
Ecoregion	Southern Outer Piedmont
Rosgen Classification (As-built)	
R1, R2-1, R2-2, R2-3, R2-4a, R2-4b, R2-4c	C4
Cowardin Classification	R3UB3*
Dominat Soil Types	Enon-Mecklenburg
Reference Site ID	UT to Wells Creek
USGS HUC for Project and Reference	
Project	03030002
Reference	03030002
NCDWQ Sub-basin for Project and Reference	
Project	03-06-02 (Cape Fear)
Reference	03-06-04 (Cape Fear)
NCDWQ Classification for Project and Reference	
Project	C NSW
Reference	C NSW
Any portion of any project segement 303d?	Yes
Any portion of any project segement upstream of a 303d listed segment?	Yes
Reasons for 303d listing or stressor	Imparied Biological Integrity
Percent of project easement fenced	100

*(R) Riverine (3) Upper Perennial (UB) Unconsolidated Bottom (3) Cobble-Gravel

Exhibit Table V. Stem Counts Monitoring Year 1 for Each Species Arranged by Plot
Triburary to Reedy Fork Creek Stream Restoration / D06028-A

Species	Plots																Initial Totals	Initial Totals Adjusted [A]	Year 1 Totals	Year 2 Totals [B]	Survival % [C]
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16					
Shrubs																					
Cornus amomum													1				1	1	1	1	100%
Trees																					
Betula nigra		7	5			1	1	4	3	2	1			3	1	1	24	23	17	29	100%
Diospyros virginiana		2		2			2			1	3	1	7		3		25	26	17	21	100%
Juglans nigra	6			1	3		2	1			2	6	6	1			0	0	0	28	100%
Pinus echinata		2		1									2				19	15	6	5	100%
Pinus strobus				2								5		1			14	14	4	8	100%
Pinus virginiana				1									1	1		1	11	15	8	4	100%
Prunus serotina																	4	4	0	0	**NLE**
Plantanus occidentalis				1	3		3			4	4			3	7	7	0	0	0	32	100%
Quercus alba	2	2		2	1				2		6	4			3	1	20	23	17	23	100%
Quercus falcata														1		1	32	45	25	2	100%
Quercus michauxii		1	4	3	1	1	1	3	5	4	1		4	3	3	4	28	32	28	38	100%
Quercus nigra		1		1	1	9		13	5	5		1				2	52	37	24	38	100%
Quercus phellos	11	1	5	2	6	5	6	3		4	1				1		62	57	40	45	100%
Salix nigra									2								2	2	2	2	100%
Totals	19	16	14	16	15	16	15	24	17	20	18	17	21	13	18	17	294	294	189	276	100%

Stems Per Acre Summary

Plot Acreage	0.025	0.025	0.025	0.025	0.025	0.025	0.024	0.025	0.025	0.025	0.025	0.025	0.024	0.026	0.025	0.025	Min	Ave	Max
Stems/Acre	763.1	650.4	571.4	637.5	602.4	645.2	627.6	971.7	693.9	816.3	717.1	685.5	860.7	503.9	725.8	685.5	504	697	972

[A] "Initial Totals Adjusted" represents the most accurate species occurrence, following corrections for misidentification and other issues during the initial counting process.

[B] "Year 2 Totals" represents the current species following replanting in Year 1 (2008).

[C] "Survival %" represents the Year 2 Totals with no mortality due to the replanting in Year 1 (2008).

NLE - This species no longer exists within the permanent monitoring vegetation plots.

Exhibit Table VI. Vegetative Problem Areas Triburary to Reedy Fork Creek Stream Restoration / D06028-A			
Feature/Issue	**Station / Range**	**Probable Cause**	**Photo No. (If Available)**
No problem areas observed in Year 2 (2009)	All project reaches	N/A	N/A
Site replanted late winter 2009 following Year 1 (2008) due to mortality from drought	All project reaches	N/A	N/A
Scattered bare root planting mortality in Year 1 (2008)	All project reaches	Drought	N/A

Exhibit Table VII. Baseline Morphology and Hydraulic Summary
Tributary to Reedy Fork Creek Stream Restoration / D06028-A
Reach R1 (1,632 ft)

PARAMETERS	USGS Gage Data			Regional Curve Interval			Pre-Existing Condition			Project Reference Stream			Design			As-built		
Dimension - Riffle	Min	Max	Med	LL	UL	Eq	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med
BKF Width (ft)	--	--	--	--	--	--	3.0	8.1	5.6	6.2	8.6	7.2	--	--	6.9	7.0	9.1	8.0
Floodprone Width (ft)	--	--	--	--	--	--	3.5	26.7	15.1	15.3	25.0	20.5	13.4	28.0	20.5	34.3	52.3	43.3
BKF Cross Sectional Area (sq. ft.)	--	--	--	--	--	--	3.2	7.8	5.5	3.9	6.3	5.4	--	--	4.0	3.8	4.4	4.1
BKF Mean Depth (ft)	--	--	--	--	--	--	0.97	1.06	1.01	0.56	1.02	0.79	--	--	0.58	0.49	0.54	0.52
BKF Max Depth (ft)	--	--	--	--	--	--	1.15	1.75	1.45	0.64	1.38	1.02	0.47	1.01	0.75	0.89	1.16	1.03
Width/Depth Ratio	--	--	--	--	--	--	2.9	8.4	5.6	6.1	12.6	9.1	--	--	12.0	12.9	18.5	15.7
Entrenchment Ratio	--	--	--	--	--	--	1.1	3.3	2.2	1.9	4.1	3.0	1.9	4.1	3.0	3.8	7.5	5.7
Wetted Perimeter (ft)	--	--	--	--	--	--	--	--	7.59	--	--	--	--	--	8.1	7.5	9.3	8.4
Hydraulic Radius (ft)	--	--	--	--	--	--	--	--	0.73	--	--	--	--	--	0.49	0.47	0.50	0.49
Pattern	Min	Max	Med	LL	UL	Eq	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med
Channel Beltwidth (ft)	--	--	--	--	--	--	--	--	--	10.0	35.0	20.9	9.7	33.9	20.3	3.7	32.4	12.2
Radius of Curvature (ft)	--	--	--	--	--	--	--	--	--	2.3	31.8	13.5	2.2	30.8	13.1	7.1	26.0	14.7
Meander Wavelength (ft)	--	--	--	--	--	--	--	--	--	35.0	70.0	50.0	33.9	67.9	48.5	32.5	66.4	45.4
Meander Width Ratio	--	--	--	--	--	--	--	--	--	1.4	4.9	2.9	1.4	4.9	2.9	0.5	4.1	1.5
Profile	Min	Max	Med	LL	UL	Eq	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med
Riffle Length (ft)	--	--	--	--	--	--	9.1	67.7	38.4	2.5	25.4	13.8	2.4	24.7	13.4	2.3	10.8	5.2
Riffle Slope (ft/ft)	--	--	--	--	--	--	0.014	0.075	0.029	0.016	0.085	0.040	0.016	0.083	0.039	0.011	0.102	0.040
Pool Length (ft)	--	--	--	--	--	--	35.7	96.9	66.0	7.3	27.5	14.6	7.1	26.6	14.2	7.2	20.9	13.5
Pool Spacing (ft)	--	--	--	--	--	--	134.2	253.1	180.5	16.5	62.8	36.5	16.0	60.9	35.4	19.1	52.9	35.1
Substrate																		
d50 (mm)	--			--			1.1			6.2			1.1			4.9		
d84 (mm)	--			--			16.8			72.7			16.8			25.7		
Additional Reach Parameters																		
Bankfull Slope (ft/ft)	--			--			0.0237			0.0199			0.0197			0.0198		
Channel Length(ft)	--			--			1409			496			1693			1632		
Valley Length (ft)	--			--			1311			352			1311			1311		
Sinuosity	--			--			1.07			1.41			1.29			1.24		
Rosgen Classification	--			--			Degraded E5b			C4/1			C4/1			C4/1		

Exhibit Table VII. cont. Baseline Morphology and Hydraulic Summary
Tributary to Reedy Fork Creek Stream Restoration / D06028-A
Reach R2-1 (819 ft)

PARAMETERS	USGS Gage Data			Regional Curve Interval			Pre-Existing Condition			Project Reference Stream			Design			As-built		
Dimension	Min	Max	Med	LL	UL	Eq	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med
BKF Width (ft)	--	--	--	7.0	27.0	14.0	10.6	11.4	11.0	6.2	8.6	7.2	--	--	15.8	--	--	15.8
Floodprone Width (ft)	--	--	--	--	--	--	48.9	50.6	49.8	15.3	25.0	20.5	30.5	64.0	46.7	--	--	66.1
BKF Cross Sectional Area (sq. ft.)	--	--	--	9.0	40.0	21.0	17.0	21.2	19.1	3.9	6.3	5.4	--	--	20.0	--	--	18.3
BKF Mean Depth (ft)	--	--	--	0.90	2.30	1.70	1.60	1.86	1.73	0.56	1.02	0.79	--	--	1.26	--	--	1.15
BKF Max Depth (ft)	--	--	--	--	--	--	1.75	2.47	2.13	0.64	1.38	1.02	1.03	2.22	1.64	--	--	1.94
Width/Depth Ratio	--	--	--	--	--	--	6.1	6.6	6.4	6.1	12.6	9.1	--	--	12.5	--	--	13.8
Entrenchment Ratio	--	--	--	--	--	--	4.4	4.6	4.5	1.9	4.1	3.0	1.9	4.1	3.0	--	--	4.2
Wetted Perimeter (ft)	--	--	--	--	--	--	--	--	14.5	--	--	--	--	--	18.3	--	--	16.7
Hydraulic Radius (ft)	--	--	--	--	--	--	--	--	1.32	--	--	--	--	--	1.09	--	--	1.09
Pattern	Min	Max	Med	LL	UL	Eq	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med
Channel Beltwidth (ft)	--	--	--	--	--	--	4.3	44.6	24.3	10.0	35.0	20.9	22.1	77.5	46.3	17.9	39.7	28.3
Radius of Curvature (ft)	--	--	--	--	--	--	19.8	54.3	33.8	2.3	31.8	13.5	5.1	70.4	29.9	24.2	85.6	41.1
Meander Wavelength (ft)	--	--	--	--	--	--	53.6	114.7	79.9	35.0	70.0	50.0	77.5	154.9	110.7	94.3	143.2	115.4
Meander Width Ratio	--	--	--	--	--	--	0.4	4.1	2.2	1.4	4.9	2.9	1.4	4.9	2.9	1.1	2.5	1.8
Profile	Min	Max	Med	LL	UL	Eq	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med
Riffle Length (ft)	--	--	--	--	--	--	9.0	104.8	38.4	2.5	25.4	13.8	5.6	56.3	30.5	6.2	11.6	9.6
Riffle Slope (ft/ft)	--	--	--	--	--	--	0.0078	0.0362	0.0169	0.016	0.085	0.040	0.005	0.028	0.013	0.003	0.031	0.017
Pool Length (ft)	--	--	--	--	--	--	14.2	75.5	36.7	7.3	27.5	14.6	16.2	60.8	32.4	20.2	36.4	26.7
Pool Spacing (ft)	--	--	--	--	--	--	44.34	165.18	97.35	16.5	62.8	36.5	36.6	139.0	80.8	38.0	82.9	64.6
Substrate																		
d50 (mm)	--			--			17.5			6.2			17.5			3.0		
d84 (mm)	--			--			81.3			72.7			81.3			19.3		
Additional Reach Parameters																		
Bankfull Slope (ft/ft)	--			--			0.0067			0.0199			0.0074			0.0075		
Channel Length(ft)	--			--			906			496			802			819		
Valley Length (ft)	--			--			745			352			745			745		
Sinuosity	--			--			1.22			1.41			1.08			1.10		
Rosgen Classification	--			--			Degraded E4/1			C4/1			C4/1			C4/1		

Exhibit Table VII. cont. Baseline Morphology and Hydraulic Summary
Tributary to Reedy Fork Creek Stream Restoration / D06028-A
Reach R2-2 (2,544 ft)

PARAMETERS	USGS Gage Data			Regional Curve Interval			Pre-Existing Condition			Project Reference Stream			Design			As-built		
Dimension	Min	Max	Med	LL	UL	Eq	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med
BKF Width (ft)	--	--	--	5.5	20.0	11.0	14.1	15.5	14.8	6.2	8.6	7.2	--	--	15.8	13.5	14.8	14.3
Floodprone Width (ft)	--	--	--	--	--	--	46.1	82.5	64.3	15.3	25.0	20.5	30.5	64.0	46.7	61.1	85.0	73.6
BKF Cross Sectional Area (sq. ft.)	--	--	--	6.0	28.0	15.5	19.6	21.6	20.6	3.9	6.3	5.4	--	--	20.0	14.5	17.6	15.7
BKF Mean Depth (ft)	--	--	--	0.75	2.00	1.40	1.27	1.53	1.40	0.56	1.02	0.79	--	--	1.26	0.99	1.31	1.03
BKF Max Depth (ft)	--	--	--	--	--	--	1.59	2.11	1.79	0.64	1.38	1.02	1.03	2.22	1.64	1.53	2.23	1.79
Width/Depth Ratio	--	--	--	--	--	--	9.2	12.2	10.7	6.1	12.6	9.1	--	--	12.5	10.3	14.8	13.3
Entrenchment Ratio	--	--	--	--	--	--	3.0	5.8	4.4	1.9	4.1	3.0	1.9	4.1	3.0	4.1	6.3	5.2
Wetted Perimeter (ft)	--	--	--	--	--	--	--	--	17.6	--	--	--	--	--	18.3	15.1	15.5	15.3
Hydraulic Radius (ft)	--	--	--	--	--	--	--	--	1.17	--	--	--	--	--	1.09	0.96	1.17	1.03
Pattern	Min	Max	Med	LL	UL	Eq	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med
Channel Beltwidth (ft)	--	--	--	--	--	--	10.3	94.8	39.6	10.0	35.0	20.9	22.1	77.5	46.3	14.3	65.6	33.4
Radius of Curvature (ft)	--	--	--	--	--	--	15.9	76.7	45.6	2.3	31.8	13.5	5.1	70.4	29.9	17.3	66.8	33.0
Meander Wavelength (ft)	--	--	--	--	--	--	73.2	238.2	139.3	35.0	70.0	50.0	77.5	154.9	110.7	79.1	133.5	107.8
Meander Width Ratio	--	--	--	--	--	--	0.7	6.4	2.7	1.4	4.9	2.9	1.4	4.9	2.9	1.0	4.6	2.3
Profile	Min	Max	Med	LL	UL	Eq	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med
Riffle Length (ft)	--	--	--	--	--	--	6.43	91.81	28.91	2.5	25.4	13.8	5.58	56.3	30.47	3.9	17.1	9.5
Riffle Slope (ft/ft)	--	--	--	--	--	--	0.009	0.040	0.020	0.016	0.085	0.040	0.008	0.041	0.019	0.006	0.041	0.018
Pool Length (ft)	--	--	--	--	--	--	6.8	119.7	46.0	7.3	27.5	14.6	16.2	60.8	32.4	15.3	69.9	34.7
Pool Spacing (ft)	--	--	--	--	--	--	35.3	343.6	143.8	16.5	62.8	36.5	36.6	139.0	80.8	37.2	99.6	63.5
Substrate																		
d50 (mm)	--			--			50.9			6.2			50.9			6.0		
d84 (mm)	--			--			152.5			72.7			152.5			29.1		
Additional Reach Parameters																		
Bankfull Slope (ft/ft)	--			--			0.0092			0.0199			0.0094			0.0096		
Channel Length(ft)	--			--			2522			496			2490			2544		
Valley Length (ft)	--			--			2116			352			2116			2116		
Sinuosity	--			--			1.19			1.41			1.18			1.20		
Rosgen Classification	--			--			Degraded E4/1			C4/1			C4/1			C4/1		

Exhibit Table VII. cont. Baseline Morphology and Hydraulic Summary
Tributary to Reedy Fork Creek Stream Restoration / D06028-A
Reach R2-3 (1,771 ft)

PARAMETERS	USGS Gage Data			Regional Curve Interval			Pre-Existing Condition			Project Reference Stream			Design			As-built		
Dimension	Min	Max	Med	LL	UL	Eq	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med
BKF Width (ft)	--	--	--	4.5	18.0	9.0	4.2	4.4	4.3	6.2	8.6	7.2	--	--	10.0	10.6	10.6	10.6
Floodprone Width (ft)	--	--	--	--	--	--	7.8	32.7	20.3	15.3	25.0	20.5	19.3	40.5	29.5	78.5	78.7	78.6
BKF Cross Sectional Area (sq. ft.)	--	--	--	5.0	20.0	10.0	4.1	5.2	4.6	3.9	6.3	5.4	--	--	8.0	7.3	8.4	7.8
BKF Mean Depth (ft)	--	--	--	0.6	1.7	1.1	0.93	1.23	1.08	0.56	1.02	0.79	--	--	0.80	0.69	0.79	0.74
BKF Max Depth (ft)	--	--	--	--	--	--	1.11	1.76	1.35	0.64	1.38	1.02	0.65	1.40	1.04	1.19	1.34	1.27
Width/Depth Ratio	--	--	--	--	--	--	3.4	4.7	4.1	6.1	12.6	9.1	--	--	12.5	13.4	15.3	14.4
Entrenchment Ratio	--	--	--	--	--	--	1.8	7.8	4.8	1.9	4.1	3.0	1.9	4.1	3.0	7.4	7.4	7.4
Wetted Perimeter (ft)	--	--	--	--	--	--	--	--	6.5	--	--	--	--	--	11.6	10.9	11.1	11.0
Hydraulic Radius (ft)	--	--	--	--	--	--	--	--	0.71	--	--	--	--	--	0.69	0.67	0.76	0.72
Pattern	Min	Max	Med	LL	UL	Eq	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med
Channel Beltwidth (ft)	--	--	--	--	--	--	3.0	67.0	26.9	10.0	35.0	20.9	14.0	49.0	29.3	5.9	61.6	26.8
Radius of Curvature (ft)	--	--	--	--	--	--	12.2	76.6	30.7	2.3	31.8	13.5	3.2	44.5	18.9	14.9	64.7	24.8
Meander Wavelength (ft)	--	--	--	--	--	--	46.8	149.4	83.2	35.0	70.0	50.0	49.0	98.0	70.0	55.8	147.2	83.6
Meander Width Ratio	--	--	--	--	--	--	0.7	15.6	6.3	1.4	4.9	2.9	1.4	4.9	2.9	0.6	5.8	2.5
Profile	Min	Max	Med	LL	UL	Eq	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med
Riffle Length (ft)	--	--	--	--	--	--	4.3	42.3	18.7	2.5	25.4	13.8	3.5	35.6	19.3	5.5	15.2	8.9
Riffle Slope (ft/ft)	--	--	--	--	--	--	0.008	0.082	0.026	0.016	0.085	0.040	0.006	0.031	0.014	0.005	0.023	0.012
Pool Length (ft)	--	--	--	--	--	--	4.8	85.2	31.8	7.3	27.5	14.6	10.2	38.4	20.5	15.9	27.7	20.9
Pool Spacing (ft)	--	--	--	--	--	--	71.1	296.3	149.8	16.5	62.8	36.5	23.1	87.9	51.1	27.6	83.2	41.9
Substrate																		
d50 (mm)	--			--			0.2			6.2			0.2			6.5		
d84 (mm)	--			--			6.1			72.7			6.1			18.4		
Additional Reach Parameters																		
Bankfull Slope (ft/ft)	--			--			0.0080			0.0199			0.0075			0.0073		
Channel Length(ft)	--			--			1584			496			1734			1771		
Valley Length (ft)	--			--			1291			352			1305			1305		
Sinuosity	--			--			1.23			1.41			1.33			1.36		
Rosgen Classification	--			--			Degraded E5			C4/1			C4/1			C4/1		

Exhibit Table VII. cont. Baseline Morphology and Hydraulic Summary
Tributary to Reedy Fork Creek Stream Restoration / D06028-A
Reach R2-4a (231 ft)

PARAMETERS	USGS Gage Data			Regional Curve Interval			Pre-Existing Condition			Project Reference Stream			Design			As-built		
Dimension	Min	Max	Med	LL	UL	Eq	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med
BKF Width (ft)	--	--	--	--	--	--	--	--	--	6.2	8.6	7.2	--	--	7.1	--	--	--
Floodprone Width (ft)	--	--	--	--	--	--	--	--	--	15.3	25.0	20.5	13.6	28.6	20.9	--	--	--
BKF Cross Sectional Area (sq. ft.)	--	--	--	--	--	--	--	--	--	3.9	6.3	5.4	--	--	4.0	--	--	--
BKF Mean Depth (ft)	--	--	--	--	--	--	--	--	--	0.56	1.02	0.79	--	--	0.57	--	--	--
BKF Max Depth (ft)	--	--	--	--	--	--	--	--	--	0.64	1.38	1.02	0.46	0.99	0.73	--	--	--
Width/Depth Ratio	--	--	--	--	--	--	--	--	--	6.1	12.6	9.1	--	--	12.5	--	--	--
Entrenchment Ratio	--	--	--	--	--	--	--	--	--	1.9	4.1	3.0	1.9	4.1	3.0	--	--	--
Wetted Perimeter (ft)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hydraulic Radius (ft)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Pattern	Min	Max	Med	LL	UL	Eq	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med
Channel Beltwidth (ft)	--	--	--	--	--	--	--	--	--	10.0	35.0	20.9	9.9	34.6	20.7	12.5	25.4	18.1
Radius of Curvature (ft)	--	--	--	--	--	--	--	--	--	2.3	31.8	13.5	2.3	31.5	13.4	12.1	28.2	18.3
Meander Wavelength (ft)	--	--	--	--	--	--	--	--	--	35.0	70.0	50.0	34.6	69.3	49.5	59.4	75.2	65.4
Meander Width Ratio	--	--	--	--	--	--	--	--	--	1.4	4.9	2.9	1.4	4.9	2.9	--	--	--
Profile	Min	Max	Med	LL	UL	Eq	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med
Riffle Length (ft)	--	--	--	--	--	--	--	--	--	2.5	25.4	13.8	2.5	25.2	13.6	4.1	13.4	7.5
Riffle Slope (ft/ft)	--	--	--	--	--	--	--	--	--	0.016	0.085	0.040	0.006	0.031	0.014	0.005	0.026	0.015
Pool Length (ft)	--	--	--	--	--	--	--	--	--	7.3	27.5	14.6	7.2	27.2	14.5	5.8	29.5	17.2
Pool Spacing (ft)	--	--	--	--	--	--	--	--	--	16.5	62.8	36.5	16.4	62.2	26.1	32.9	53.8	44.3
Substrate																		
d50 (mm)	--			--			0.2			6.2			0.2			0.4		
d84 (mm)	--			--			6.1			72.7			6.1			7.3		
Additional Reach Parameters																		
Bankfull Slope (ft/ft)	--			--			0.0069			0.0199			0.0035			0.0080		
Channel Length(ft)	--			--			289			496			226			231		
Valley Length (ft)	--			--			215			352			178			178		
Sinuosity	--			--			1.35			1.41			1.27			1.30		
Rosgen Classification	--			--			n/a			C4/1			C4/1			C4/1		

Exhibit Table VII. cont. Baseline Morphology and Hydraulic Summary
Tributary to Reedy Fork Creek Stream Restoration / D06028-A
Reach R2-4b (307 ft)

PARAMETERS	USGS Gage Data			Regional Curve Interval			Pre-Existing Condition			Project Reference Stream			Design			As-built		
Dimension - Riffle	Min	Max	Med	LL	UL	Eq	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med
BKF Width (ft)	--	--	--	--	--	--	--	--	--	6.2	8.6	7.2	--	--	7.1	--	--	10.4
Floodprone Width (ft)	--	--	--	--	--	--	--	--	--	15.3	25.0	20.5	13.6	28.6	20.9	--	--	44.4
BKF Cross Sectional Area (sq. ft.)	--	--	--	--	--	--	--	--	--	3.9	6.3	5.4	--	--	4.0	--	--	7.7
BKF Mean Depth (ft)	--	--	--	--	--	--	--	--	--	0.56	1.02	0.79	--	--	0.57	--	--	0.74
BKF Max Depth (ft)	--	--	--	--	--	--	--	--	--	0.64	1.38	1.02	0.46	0.99	0.73	--	--	1.45
Width/Depth Ratio	--	--	--	--	--	--	--	--	--	6.1	12.6	9.1	--	--	12.5	--	--	14.0
Entrenchment Ratio	--	--	--	--	--	--	--	--	--	1.9	4.1	3.0	1.9	4.1	3.0	--	--	4.3
Wetted Perimeter (ft)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	11.1
Hydraulic Radius (ft)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.70
Pattern	Min	Max	Med	LL	UL	Eq	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med
Channel Beltwidth (ft)	--	--	--	--	--	--	--	--	--	10.0	35.0	20.9	9.9	34.6	20.7	3.3	29.8	12.6
Radius of Curvature (ft)	--	--	--	--	--	--	--	--	--	2.3	31.8	13.5	2.3	31.5	13.4	11.9	29.5	16.4
Meander Wavelength (ft)	--	--	--	--	--	--	--	--	--	35.0	70.0	50.0	34.6	69.3	49.5	40.5	55.6	47.7
Meander Width Ratio	--	--	--	--	--	--	--	--	--	1.4	4.9	2.9	1.4	4.9	2.9	0.3	2.9	1.2
Profile	Min	Max	Med	LL	UL	Eq	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med
Riffle Length (ft)	--	--	--	--	--	--	--	--	--	2.5	25.4	13.8	2.5	25.2	13.6	4.4	5.2	4.8
Riffle Slope (ft/ft)	--	--	--	--	--	--	--	--	--	0.016	0.085	0.040	0.006	0.031	0.014	0.009	0.046	0.032
Pool Length (ft)	--	--	--	--	--	--	--	--	--	7.3	27.5	14.6	7.2	27.2	14.5	9.6	18.3	12.6
Pool Spacing (ft)	--	--	--	--	--	--	--	--	--	16.5	62.8	36.5	16.4	62.2	26.1	24.4	41.6	31.2
Substrate																		
d50 (mm)	--			--			0.2			6.2			0.2			5.7		
d84 (mm)	--			--			6.1			72.7			6.1			15.4		
Additional Reach Parameters																		
Bankfull Slope (ft/ft)	--			--			0.0155			0.0199			0.0155			0.0178		
Channel Length(ft)	--			--			226			496			334			307		
Valley Length (ft)	--			--			213			352			267			267		
Sinuosity	--			--			1.06			1.41			1.25			1.15		
Rosgen Classification	--			--			n/a			C4/1			C4/1			C4/1		

Exhibit Table VII. cont. Baseline Morphology and Hydraulic Summary
Tributary to Reedy Fork Creek Stream Restoration / D06028-A
Reach R2-4c (208 ft)

PARAMETERS	USGS Gage Data			Regional Curve Interval			Pre-Existing Condition			Project Reference Stream			Design			As-built		
Dimension - Riffle	Min	Max	Med	LL	UL	Eq	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med
BKF Width (ft)	--	--	--	--	--	--	--	--	--	6.2	8.6	7.2	--	--	7.1	--	--	8.7
Floodprone Width (ft)	--	--	--	--	--	--	--	--	--	15.3	25.0	20.5	13.6	28.6	20.9	--	--	42.6
BKF Cross Sectional Area (sq. ft.)	--	--	--	--	--	--	--	--	--	3.9	6.3	5.4	--	--	4.0	--	--	6.0
BKF Mean Depth (ft)	--	--	--	--	--	--	--	--	--	0.56	1.02	0.79	--	--	0.57	--	--	0.68
BKF Max Depth (ft)	--	--	--	--	--	--	--	--	--	0.64	1.38	1.02	0.46	0.99	0.73	--	--	1.23
Width/Depth Ratio	--	--	--	--	--	--	--	--	--	6.1	12.6	9.1	--	--	12.5	--	--	12.9
Entrenchment Ratio	--	--	--	--	--	--	--	--	--	1.9	4.1	3.0	1.9	4.1	3.0	--	--	4.9
Wetted Perimeter (ft)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	9.3
Hydraulic Radius (ft)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.65
Pattern	Min	Max	Med	LL	UL	Eq	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med
Channel Beltwidth (ft)	--	--	--	--	--	--	--	--	--	10.0	35.0	20.9	9.9	34.6	20.7	5.7	18.2	11.6
Radius of Curvature (ft)	--	--	--	--	--	--	--	--	--	2.3	31.8	13.5	2.3	31.5	13.4	14.0	21.8	16.6
Meander Wavelength (ft)	--	--	--	--	--	--	--	--	--	35.0	70.0	50.0	34.6	69.3	49.5	46.0	57.4	50.8
Meander Width Ratio	--	--	--	--	--	--	--	--	--	1.4	4.9	2.9	1.4	4.9	2.9	0.7	2.1	1.3
Profile	Min	Max	Med	LL	UL	Eq	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med
Riffle Length (ft)	--	--	--	--	--	--	--	--	--	2.5	25.4	13.8	2.5	25.2	13.6	4.7	5.5	5.2
Riffle Slope (ft/ft)	--	--	--	--	--	--	--	--	--	0.016	0.085	0.040	0.006	0.031	0.014	0.008	0.040	0.028
Pool Length (ft)	--	--	--	--	--	--	--	--	--	7.3	27.5	14.6	7.2	27.2	14.5	6.5	14.7	9.9
Pool Spacing (ft)	--	--	--	--	--	--	--	--	--	16.5	62.8	36.5	16.4	62.2	26.1	26.9	38.9	34.7
Substrate																		
d50 (mm)	--			--			0.2			6.2			0.2			4.0		
d84 (mm)	--			--			6.1			72.7			6.1			9.7		
Additional Reach Parameters																		
Bankfull Slope (ft/ft)	--			--			0.0144			0.0199			0.0048			0.0075		
Channel Length(ft)	--			--			157			496			232			208		
Valley Length (ft)	--			--			148			352			187			187		
Sinuosity	--			--			1.07			1.41			1.24			1.11		
Rosgen Classification	--			--			n/a			C4/1			C4/1			C4/1		

Exhibit Table VIII. Morphology and Hydraulic Monitoring Summary
Tributary to Reedy Fork Creek Stream Restoration / D06028-A
Reach R1 (1,632 ft)

PARAMETERS	Cross Section 7 Pool																													
Dimension	MY1	MY2	MY3	MY4	MY5	MY1	MY2	MY3	MY4	MY5	MY1	MY2	MY3	MY4	MY5	MY1	MY2	MY3	MY4	MY5	MY1	MY2	MY3	MY4	MY5	MY1	MY2	MY3	MY4	MY5
BKF Width (ft)	7.8	8.7																												
Floodprone Width (ft)	78.0	76.7																												
BKF Cross Sectional Area (sq. ft.)	5.3	5.0																												
BKF Mean Depth (ft)	0.69	0.58																												
BKF Max Depth (ft)	1.57	1.52																												
Width/Depth Ratio	11.2	14.9																												
Entrenchment Ratio	10.1	8.9																												
Wetted Perimeter (ft)	8.6	9.4																												
Hydraulic Radius (ft)	0.62	0.53																												

PARAMETERS	MY-01 (2008)			MY-02 (2009)			MY-03 (2010)			MY-04 (2011)			MY-05 (2012)		
Pattern	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med
Channel Beltwidth (ft)	6.1	24.8	11.5	3.3	24.2	9.9									
Radius of Curvature (ft)	7.2	20.8	11.8	6.8	19.8	12.7									
Meander Wavelength (ft)	28.4	50.1	38.8	31.4	49.7	39.1									
Meander Width Ratio	--	--	--	--	--	--									
Profile	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med
Riffle Length (ft)	1.4	6.0	4.1	6.9	16.5	10.4									
Riffle Slope (ft/ft)	0.019	0.177	0.063	0.030	0.070	0.054									
Pool Length (ft)	7.0	13.9	10.7	6.8	8.9	8.0									
Pool Spacing (ft)	23.2	68.8	37.1	21.7	41.5	31.5									
Substrate															
d50 (mm)		0.04			0.04										
d84 (mm)		4			0.06										
Additional Reach Parameters															
Bankfull Slope (ft/ft)		0.0196			0.0196										
Monitored Channel Length (ft)		627			602										
Monitored Valley Length (ft)		499			493										
Sinuosity		1.26			1.22										
Total Channel Length (ft)		1632			1632										
Rosgen Classification		C6			C6										

Exhibit Table VIII. Morphology and Hydraulic Monitoring Summary
Tributary to Reedy Fork Creek Stream Restoration / D06028-A
Reach R2-2 (2,544 ft)

PARAMETERS	No Cross Section																													
Dimension	MY1	MY2	MY3	MY4	MY5	MY1	MY2	MY3	MY4	MY5	MY1	MY2	MY3	MY4	MY5	MY1	MY2	MY3	MY4	MY5	MY1	MY2	MY3	MY4	MY5	MY1	MY2	MY3	MY4	MY5
BKF Width (ft)	--																													
Floodprone Width (ft)	--																													
BKF Cross Sectional Area (sq. ft.)	--																													
BKF Mean Depth (ft)	--																													
BKF Max Depth (ft)	--																													
Width/Depth Ratio	--																													
Entrenchment Ratio	--																													
Wetted Perimeter (ft)	--																													
Hydraulic Radius (ft)	--																													

PARAMETERS	MY-01 (2008)			MY-02 (2009)			MY-03 (2010)			MY-04 (2011)			MY-05 (2012)		
Pattern	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med
Channel Beltwidth (ft)	6.6	64.4	36.4	3.8	67.8	40.5									
Radius of Curvature (ft)	23.6	42.6	30.1	24.1	55.9	36.0									
Meander Wavelength (ft)	81.3	102.4	90.8	80.2	152.5	110.0									
Meander Width Ratio	--	--	--	--	--	--									
Profile	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med
Riffle Length (ft)	5.4	14.6	9.6	10.8	22.9	17.8									
Riffle Slope (ft/ft)	0.009	0.066	0.029	0.018	0.046	0.028									
Pool Length (ft)	16.5	60.3	29.7	13.6	60.9	29.2									
Pool Spacing (ft)	21.4	99.2	55.7	89.1	117.2	101.0									
Substrate															
d50 (mm)		0.06			0.04										
d84 (mm)		6.47			1.00										
Additional Reach Parameters															
Bankfull Slope (ft/ft)		0.0108			0.0112										
Monitored Channel Length (ft)		476			442										
Monitored Valley Length (ft)		356			329										
Sinuosity		1.34			1.35										
Total Channel Length (ft)		2544			2544										
Rosgen Classification		C6			C6										

Exhibit Table VIII. Morphology and Hydraulic Monitoring Summary
Tributary to Reedy Fork Creek Stream Restoration / D06028-A
Reach R2-3 (1,771 ft)

PARAMETERS	Cross Section 3 Pool					Cross Section 4 Riffle					Cross Section 5 Riffle					Cross Section 6 Pool														
Dimension	MY1	MY2	MY3	MY4	MY5	MY1	MY2	MY3	MY4	MY5	MY1	MY2	MY3	MY4	MY5	MY1	MY2	MY3	MY4	MY5	MY1	MY2	MY3	MY4	MY5	MY1	MY2	MY3	MY4	MY5
BKF Width (ft)	10.1	11.75				10.8	10.77				9.95	10.41				10.87	12.0													
Floodprone Width (ft)	71.78	64.05				60.27	62.5				76.64	75.66				92.77	100.0													
BKF Cross Sectional Area (sq. ft.)	10.0	8.6				6.2	5.1				6.3	5.4				10.05	10.35													
BKF Mean Depth (ft)	0.99	0.73				0.57	0.47				0.63	0.52				0.92	0.86													
BKF Max Depth (ft)	1.82	1.62				1.07	1.18				1.10	0.99				1.89	2.29													
Width/Depth Ratio	10.2	16.1				19.0	22.9				15.79	20.0				11.82	13.93													
Entrenchment Ratio	7.1	5.5				5.6	5.8				7.7	7.3				8.5	8.4													
Wetted Perimeter (ft)	11.1	12.6				11.2	11.49				10.38	10.7				11.7	13.46													
Hydraulic Radius (ft)	0.90	0.68				0.55	0.45				0.61	0.50				0.86	0.77													

PARAMETERS	MY-01 (2008)			MY-02 (2009)			MY-03 (2010)			MY-04 (2011)			MY-05 (2012)		
Pattern	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med
Channel Beltwidth (ft)	3.4	43.2	25.2	1.8	40.6	23.4									
Radius of Curvature (ft)	14.3	37.2	22.7	14.0	41.5	24.3									
Meander Wavelength (ft)	57.7	98.0	79.8	55.1	98.6	79.7									
Meander Width Ratio	0.3	4.2	2.4	0.2	3.8	2.2									
Profile	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med
Riffle Length (ft)	3.5	16.5	10.0	7.9	21.3	13.3									
Riffle Slope (ft/ft)	0.009	0.056	0.021	0.0108	0.04103	0.02253									
Pool Length (ft)	11.2	30.4	19.7	9.2	35.2	18.7									
Pool Spacing (ft)	24.3	95.9	56.6	17.1	82.3	50.9									
Substrate															
d50 (mm)		0.06			0.04										
d84 (mm)		6.47			1.00										
Additional Reach Parameters															
Bankfull Slope (ft/ft)		0.0076			0.0077										
Monitored Channel Length (ft)		1608			1629										
Monitored Valley Length (ft)		1305			1301										
Sinuosity		1.23			1.25										
Total Channel Length (ft)		1771			1771										
Rosgen Classification		C6			C6										

Exhibit Table VIII. Morphology and Hydraulic Monitoring Summary
Tributary to Reedy Fork Creek Stream Restoration / D06028-A
Reach R2-4a (231 ft)

PARAMETERS	No Cross Section																													
Dimension	MY1	MY2	MY3	MY4	MY5	MY1	MY2	MY3	MY4	MY5	MY1	MY2	MY3	MY4	MY5	MY1	MY2	MY3	MY4	MY5	MY1	MY2	MY3	MY4	MY5	MY1	MY2	MY3	MY4	MY5
BKF Width (ft)	--	--																												
Floodprone Width (ft)	--	--																												
BKF Cross Sectional Area (sq. ft.)	--	--																												
BKF Mean Depth (ft)	--	--																												
BKF Max Depth (ft)	--	--																												
Width/Depth Ratio	--	--																												
Entrenchment Ratio	--	--																												
Wetted Perimeter (ft)	--	--																												
Hydraulic Radius (ft)	--	--																												

PARAMETERS	MY-01 (2008)			MY-02 (2009)			MY-03 (2010)			MY-04 (2011)			MY-05 (2012)		
Pattern	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med
Channel Beltwidth (ft)	10.1	21.6	14.8	9.3	22.1	15.3									
Radius of Curvature (ft)	15.1	35.4	21.6	14.5	27.4	19.8									
Meander Wavelength (ft)	58.9	66.4	62.2	59.3	67.0	63.8									
Meander Width Ratio	--	--	--	--	--	--									
Profile	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med
Riffle Length (ft)	6.1	8.8	7.4	7.4	11.9	9.3									
Riffle Slope (ft/ft)	0.004	0.033	0.016		No water										
Pool Length (ft)	14.2	18.0	16.1	9.1	19.3	14.2									
Pool Spacing (ft)	25.1	54.8	78.3	24.7	42.5	34.4									
Substrate															
d50 (mm)		0.04			0.03										
d84 (mm)		0.25			0.06										
Additional Reach Parameters															
Bankfull Slope (ft/ft)		0.0074			0.00779 (No Water)										
Monitored Channel Length (ft)		169			205										
Monitored Valley Length (ft)		147			174										
Sinuosity		1.15			1.18										
Total Channel Length (ft)		231			231										
Rosgen Classification		C6			C6										

Exhibit Table VIII. Morphology and Hydraulic Monitoring Summary
Tributary to Reedy Fork Creek Stream Restoration / D06028-A
Reach R2-4b (307 ft)

PARAMETERS	Cross Section 1 Riffle																													
Dimension	MY1	MY2	MY3	MY4	MY5	MY1	MY2	MY3	MY4	MY5	MY1	MY2	MY3	MY4	MY5	MY1	MY2	MY3	MY4	MY5	MY1	MY2	MY3	MY4	MY5	MY1	MY2	MY3	MY4	MY5
BKF Width (ft)	9.38	9.31																												
Floodprone Width (ft)	37.18	38.0																												
BKF Cross Sectional Area (sq. ft.)	4.5	4.2																												
BKF Mean Depth (ft)	0.48	0.45																												
BKF Max Depth (ft)	0.84	0.89																												
Width/Depth Ratio	19.54	20.69																												
Entrenchment Ratio	3.97	4.1																												
Wetted Perimeter (ft)	9.7	9.8																												
Hydraulic Radius (ft)	0.47	0.43																												

PARAMETERS	MY-01 (2008)			MY-02 (2009)			MY-03 (2010)			MY-04 (2011)			MY-05 (2012)		
Pattern	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med
Channel Beltwidth (ft)	8.4	17.1	13.2	6.3	12.1	8.4									
Radius of Curvature (ft)	13.2	39.3	20.4	16.0	21.6	18.1									
Meander Wavelength (ft)	46.1	56.5	51.3	43.1	55.8	49.5									
Meander Width Ratio	0.9	1.8	1.4	0.7	1.3	0.9									
Profile	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med
Riffle Length (ft)	4.0	12.0	6.6	3.06	10.44	7.6									
Riffle Slope (ft/ft)	0.004	0.048	0.025	0.011	0.027	0.017									
Pool Length (ft)	5.03	13.29	9.16	7.77	12.99	9.76									
Pool Spacing (ft)	23.92	40.72	33.48	24.71	44.75	61.9									
Substrate															
d50 (mm)		0.7			0.5										
d84 (mm)		7.11			10.66										
Additional Reach Parameters															
Bankfull Slope (ft/ft)		0.0212			0.0145										
Monitored Channel Length (ft)		119			152										
Monitored Valley Length (ft)		104			134										
Sinuosity		1.15			1.13										
Total Channel Length (ft)		307			307										
Rosgen Classification		C5			C5										

Exhibit Table VIII. Morphology and Hydraulic Monitoring Summary
Tributary to Reedy Fork Creek Stream Restoration / D06028-A
Reach R2-4c (208 ft)

PARAMETERS	Cross Section 2 Riffle																													
Dimension	MY1	MY2	MY3	MY4	MY5	MY1	MY2	MY3	MY4	MY5	MY1	MY2	MY3	MY4	MY5	MY1	MY2	MY3	MY4	MY5	MY1	MY2	MY3	MY4	MY5	MY1	MY2	MY3	MY4	MY5
BKF Width (ft)	8.06	8.82																												
Floodprone Width (ft)	42.63	39.55																												
BKF Cross Sectional Area (sq. ft.)	6.0	5.5																												
BKF Mean Depth (ft)	0.74	0.62																												
BKF Max Depth (ft)	1.26	1.06																												
Width/Depth Ratio	10.89	14.23																												
Entrenchment Ratio	5.3	4.5																												
Wetted Perimeter (ft)	8.6	9.2																												
Hydraulic Radius (ft)	0.69	0.60																												

PARAMETERS	MY-01 (2008)			MY-02 (2009)			MY-03 (2010)			MY-04 (2011)			MY-05 (2012)		
Pattern	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med
Channel Beltwidth (ft)	5.3	17.3	13.1	3.7	16.0	11.5									
Radius of Curvature (ft)	14.9	24.5	18.3	10.8	25.0	17.3									
Meander Wavelength (ft)	48.7	58.1	53.4	47.2	56.0	51.6									
Meander Width Ratio	0.7	2.1	1.6	0.4	1.8	1.3									
Profile	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med
Riffle Length (ft)	5.9	8.1	7.3	7.41	11.66	9.54									
Riffle Slope (ft/ft)	0.004	0.009	0.006	0.001	0.0217	0.012									
Pool Length (ft)	11.72	13.02	12.37	11.78	14.94	13.36									
Pool Spacing (ft)	30.76	40.6	36.59	47.24	47.84	47.54									
Substrate															
d50 (mm)		0.04			0.05										
d84 (mm)		1.00			0.06										
Additional Reach Parameters															
Bankfull Slope (ft/ft)		0.0047			0.0050										
Monitored Channel Length (ft)		117			107										
Monitored Valley Length (ft)		101			93										
Sinuosity		1.15			1.15										
Total Channel Length (ft)		208			208										
Rosgen Classification		C6			C6										

Exhibit Table IX. BEHI and Sediment Export Estimates
Tributary to Reedy Fork Creek Stream Restoration / D06028-A

Time Point	Segment / Reach[1]	Linear Footage or Acreage	Extreme		Very High		High		Moderate		Low		Very Low		Sediment Export
			ft	%	ft	%	ft	%	ft	%	ft	%	ft	%	Tons/yr
Preconstruction 2006	R1	1409	1409	100											126.8
	R2-1	906	906	100											81.5
	R2-2	2522	2522	100											126.1
	R2-3	1584	1584	100											110.9
	R2-4a	289													n/a
	R2-4b	226													n/a
	R2-4c	157													n/a
	TOTAL	7092	6420	91	0	0	0	0	0	0	0	0	0	0	445
Monitoring Y3 2010 (**NOT APPLICABLE**)	R1	1632													
	R2-1	819													
	R2-2	2544													
	R2-3	1771													
	R2-4a	231													
	R2-4b	307													
	R2-4c	208													
	TOTAL	7512	0	0	0	0	0	0	0	0	0	0	0	0	0
Monitoring Y5 2012 (**NOT APPLICABLE**)	R1	1632													
	R2-1	819													
	R2-2	2544													
	R2-3	1771													
	R2-4a	231													
	R2-4b	307													
	R2-4c	208													
	TOTAL	7512	0	0	0	0	0	0	0	0	0	0	0	0	0

[1] BEHI and Sediment Export estimates were not conducted for reaches R2-4a, R2-4b, and R2-4c.

Exhibit Table X. Verification of Bankfull Events Tributary to Reedy Fork Creek Stream Restoration / D06028-A			
Date of Data Collection	**Date of Occurrence**	**Method**	**Photo No. (If Available)**
9/22/08-9/24/08	Unknown	Crest Guages	N/A
9/9/2009	Unknown	Crest Guages	N/A

Exhibit Table XI. Categorical Stream Feature Visual Stability Assessment Tributary to Reedy Fork Creek Stream Restoration / D06028-A						
Reach R1 (1,632 ft)						
Feature	**Initial**	**MY-01**	**MY-02**	**MY-03**	**MY-04**	**MY-05**
Riffles	100%	100%	100%			
Pools	100%	100%	100%			
Thalwegs	100%	100%	100%			
Meanders	100%	100%	100%			
Bed General	100%	100%	100%			
Structures	100%	100%	100%			
Rootwads	100%	100%	100%			
Reach R2-1 (819 ft)						
Feature	**Initial**	**MY-01**	**MY-02**	**MY-03**	**MY-04**	**MY-05**
Riffles	100%	100%	100%			
Pools	100%	100%	100%			
Thalwegs	100%	100%	100%			
Meanders	100%	100%	100%			
Bed General	100%	100%	100%			
Structures	100%	100%	100%			
Rootwads	100%	100%	100%			
Reach R2-2 (2,544 ft)						
Feature	**Initial**	**MY-01**	**MY-02**	**MY-03**	**MY-04**	**MY-05**
Riffles	100%	100%	100%			
Pools	100%	100%	100%			
Thalwegs	100%	100%	100%			
Meanders	100%	100%	100%			
Bed General	100%	100%	100%			
Structures	100%	100%	100%			
Rootwads	100%	100%	100%			
Reach R2-3 (1,771 ft)						
Feature	**Initial**	**MY-01**	**MY-02**	**MY-03**	**MY-04**	**MY-05**
Riffles	100%	100%	100%			
Pools	100%	100%	100%			
Thalwegs	100%	100%	100%			
Meanders	100%	100%	100%			
Bed General	100%	100%	100%			
Structures	100%	100%	100%			
Rootwads	100%	100%	100%			
Reach R2-4a (231 ft)						
Feature	**Initial**	**MY-01**	**MY-02**	**MY-03**	**MY-04**	**MY-05**
Riffles	100%	100%	100%			
Pools	100%	100%	100%			
Thalwegs	100%	100%	100%			
Meanders	100%	100%	100%			
Bed General	100%	100%	100%			
Structures	100%	100%	100%			
Rootwads	100%	100%	100%			
Reach R2-4b (307 ft)						
Feature	**Initial**	**MY-01**	**MY-02**	**MY-03**	**MY-04**	**MY-05**
Riffles	100%	100%	100%			
Pools	100%	100%	100%			
Thalwegs	100%	100%	100%			
Meanders	100%	100%	100%			
Bed General	100%	100%	100%			
Structures	100%	100%	100%			
Rootwads	100%	100%	100%			

Exhibit Table XII. Stream Problem Areas Tributary to Reedy Fork Creek Stream Restoration / D06028-A			
Feature/Issue	**Station / Range**	**Probable Cause**	**Photo No. (If Available)**
None observed Monitoring Year 2 (2009)	N/A	N/A	N/A
None observed Monitoring Year 1 (2008)	N/A	N/A	N/A

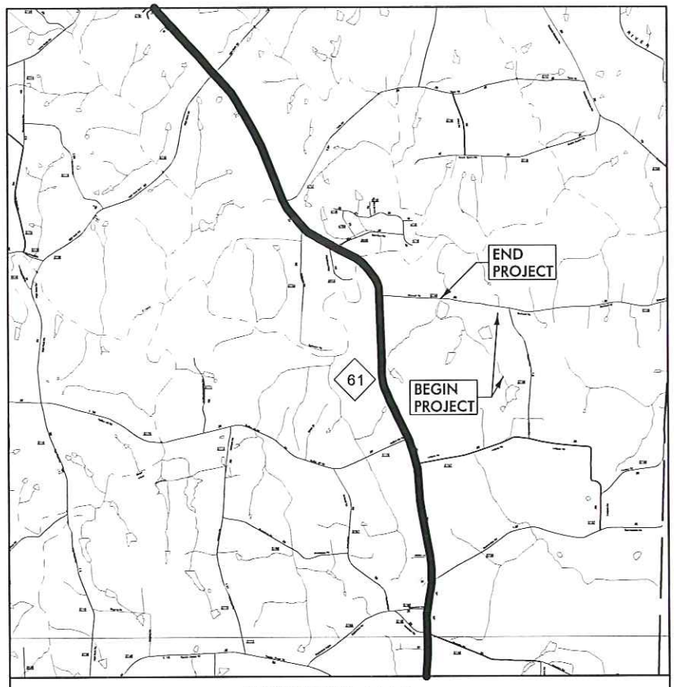
SCO ID NO. D06028-A

GUILFORD COUNTY

TRIBUTARY TO REEDY FORK STREAM RESTORATION SITE

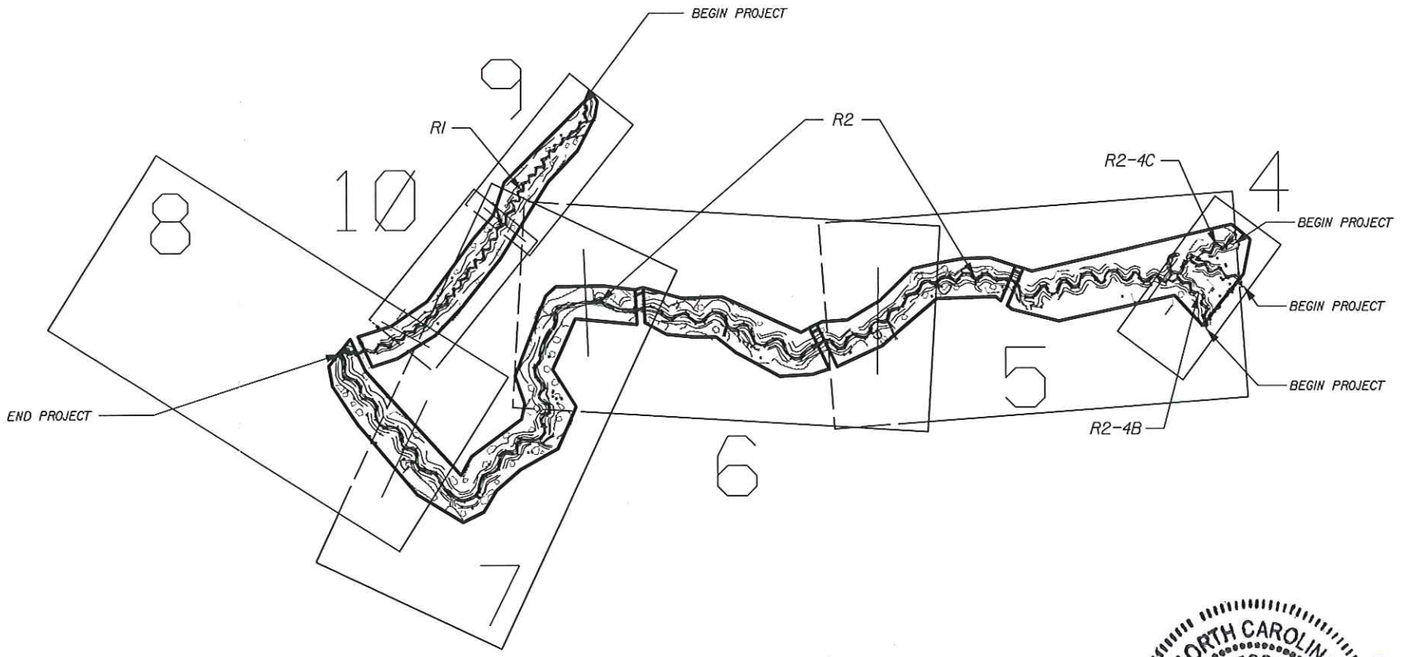
LOCATION: APPROXIMATELY 0.5 MILES EAST OF THE INTERSECTION OF NC 61 AND SR 2735 (SOCKWELL RD) AND IMMEDIATELY SOUTH OF SR 2735

YEAR 1 MONITORING



VICINITY MAP

NOT TO SCALE



INDEX OF SHEETS

SHEET NUMBER	SHEET
1	TITLE SHEET
2	LEGEND
4 - 12	YEAR 2 MONITORING OVERLAY

NORTH CAROLINA PROFESSIONAL SEAL 22967 ENGINEER WILLIAM SCOTT HUNT, III 11.10.09

NOT TO SCALE

REVISIONS		
DATE	BY	DESCRIPTION
1/8/09	WBA	YEAR 1 MONITORING
10/26/09	EMP	YEAR 2 MONITORING

SCALE AS SHOWN

DATE:	10/26/09
DESIGNED:	WSH
DRAWN:	EMP
CHECKED:	WSH
APPROVED:	WSH

MULKEY PROJECT NUMBER 2006240.00

PLANS PREPARED BY:

MULKEY ENGINEERS & CONSULTANTS

PO Box 33127
Raleigh, N.C. 27636
(919) 851-1912
(919) 851-1918 (FAX)
www.mulkeyinc.com

MULKEY PROJECT MANAGER
WILLIAM SCOTT HUNT, III, PE

MULKEY SENIOR ENGINEER
WILLIAM SCOTT HUNT, III, PE

MULKEY SENIOR SCIENTIST
THOMAS BARRETT, RF

PROJECT ENGINEER

TITLE SHEET

SHEET 1 OF 12

NOTE: NOT TO SCALE
Not all symbols used in plans

LEGEND

REVISIONS		
DATE	BY	DESCRIPTION
1/8/09	WBA	YEAR MONITORING

PROJECT ENGINEER

PROJECT REFERENCE NO.	SHEET NO.
TRIBUTARY TO REEDY FORK	2

LEGEND

MULKEY
ENGINEERS & CONSULTANTS
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RALEIGH, N.C. 27636
(919) 851-1912
(919) 851-1918 (FAX)
WWW.MULKEYINC.COM

NORTH CAROLINA PROFESSIONAL SEAL 22967 ENGINEER WILLIAM SCOTT HUNT, III
11.10.09

BOUNDARIES AND PROPERTY:

- State Line
- County Line
- Township Line
- City Line
- Reservation Line
- Property Line
- Existing Iron Pin (EIP)
- Property Corner
- Property Monument (ECM)
- Existing Fence
- Temporary Fence
- Proposed Woven Wire Fence
- Proposed Chain Link Fence
- Proposed Barbed Wire Fence
- Tree Protection Fence
- Wetland Boundary
- Proposed Oxbow Wetland Boundary (WLB)
- Conservation Easement
- Construction Limits
- Limits Of Disturbance
- Proposed Gate (G)
- Bench Mark
- Control Point

BUILDINGS AND OTHER CULTURE:

- Sign (S)
- Foundation
- Area Outline
- Building
- School
- Church

HYDROLOGY:

- Hydro, Pool or Reservoir
- River Basin Buffer (RBB)
- Flow Arrow
- Disappearing Stream
- Spring
- Thalweg
- Top Of Bank
- Swamp Marsh
- Proposed Lateral, Tail, Head Ditch (FLOW)
- Bedrock

RAILROADS:

- Standard Guage (CSX TRANSPORTATION)
- RR Signal Milepost (MILEPOST 35)
- Switch (SWITCH)
- RR Abandoned

ROADS AND RELATED FEATURES:

- Existing Edge of Pavement
- Existing Curb
- Existing Soil Road
- Existing Metal Guardrail
- Existing Cable Guiderail

VEGETATION:

- Single Tree
- Single Shrub
- Hedge
- Woods Line
- Orchard
- Vineyard

EXISTING STRUCTURES:

MAJOR:

- Bridge, Tunnel or Box Culvert (CONC)
- Bridge Wing Wall, Head Wall and End Wall (CONC WW)

MINOR:

- Head and End Wall (CONC HW)
- Pipe Culvert
- Footbridge
- Drainage Box: Catch Basin, DI or JB (CB)
- Paved Ditch Gutter
- Storm Sewer Manhole (S)
- Storm Sewer (S)

UTILITIES:

POWER:

- Existing Power Pole
- Existing Joint Use Pole
- Power Manhole (P)
- Power Line Tower
- Power Transformer (T)
- U/G Power Cable Hand Hole (PH)
- H-Frame Pole
- Recorded U/G Power Line (P)

GAS:

- Gas Meter
- Recorded U/G Gas Line (G)
- Above Ground Gas Line (A/G Gas)

TELEPHONE:

- Existing Telephone Pole
- Telephone Manhole (T)
- Telephone Booth
- Telephone Pedestal (T)
- Telephone Cell Tower
- U/G Telephone Cable Hand Hole (TH)
- Recorded U/G Telephone Cable (T)
- Recorded U/G Telephone Conduit (TC)
- Recorded U/G Fiber Optics Cable (T FO)

WATER:

- Water Manhole (W)
- Water Valve
- Water Hydrant
- Recorded U/G Water Line (W)
- Above Ground Water Line (A/G Water)

TV:

- TV Satellite Dish
- TV Pedestal (C)
- TV Tower
- U/G TV Cable Hand Hole (TH)
- Recorded U/G TV Cable (TV)
- Recorded U/G Fiber Optic Cable (TV FO)

MISCELLANEOUS:

- Utility Pole
- Utility Pole with Base
- Utility Located Object
- Utility Traffic Signal Box (S)
- Utility Unknown U/G Line (?UTL)
- U/G Tank; Water, Gas, Oil
- A/G Tank; Water, Gas, Oil
- Abandoned According to Utility Records (AATUR)
- End of Information (E.O.I.)

SANITARY SEWER:

- Sanitary Sewer Manhole (S)
- Sanitary Sewer Cleanout
- U/G Sanitary Sewer Line (SS)
- Above Ground Sanitary Sewer (A/G Sanitary Sewer)
- Recorded SS Forced Main Line (FSS)

PROPOSED STREAM WORK:

STREAM STRUCTURES:

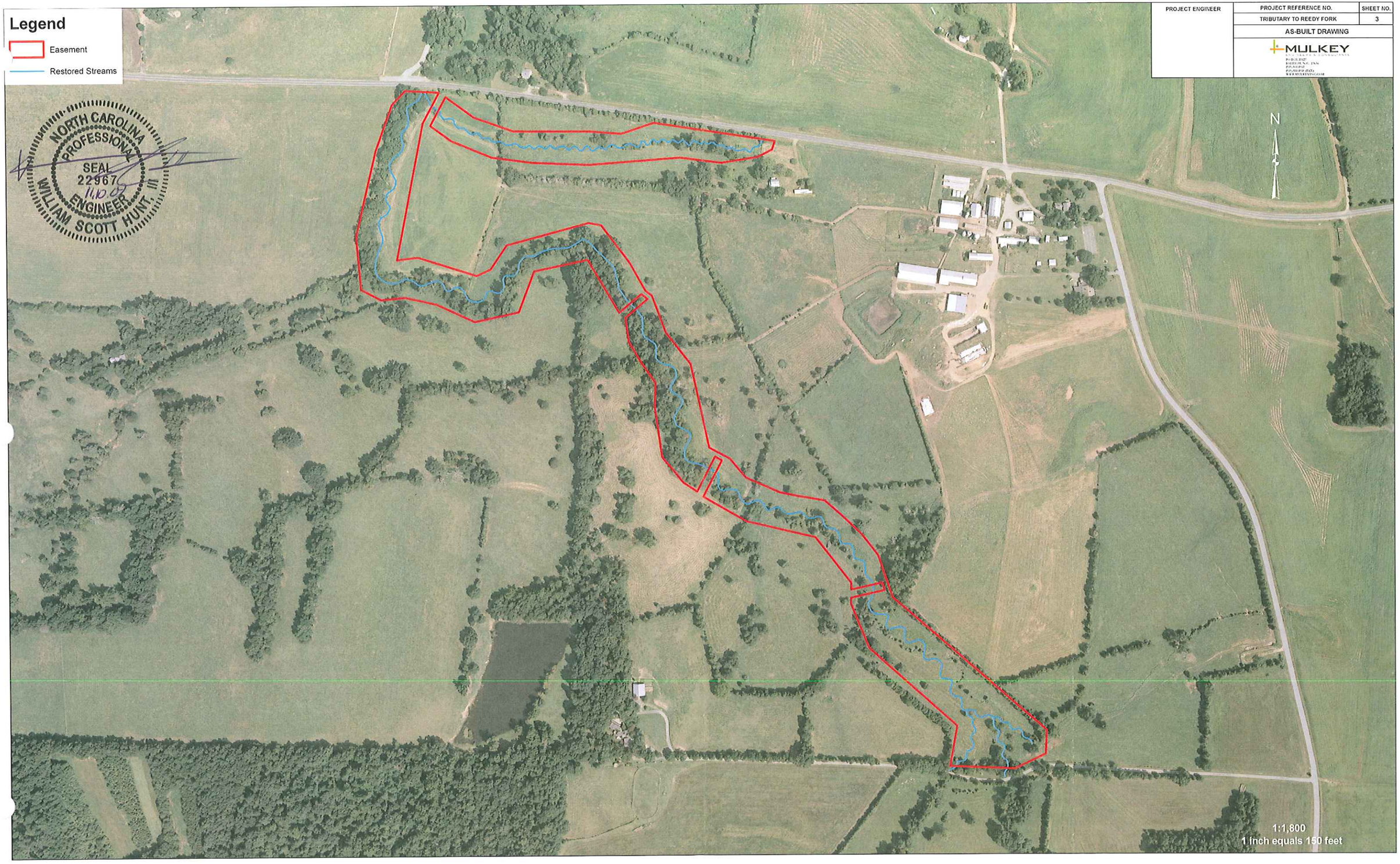
- Rock Crossvane
- Rock Vane
- J Hook Rock Vane
- Flood Plane Interceptor
- Constructed Riffle
- Root Wad
- Log Weir
- Structure Number
- Constructed Flood Plane Interceptor

STREAM FEATURES:

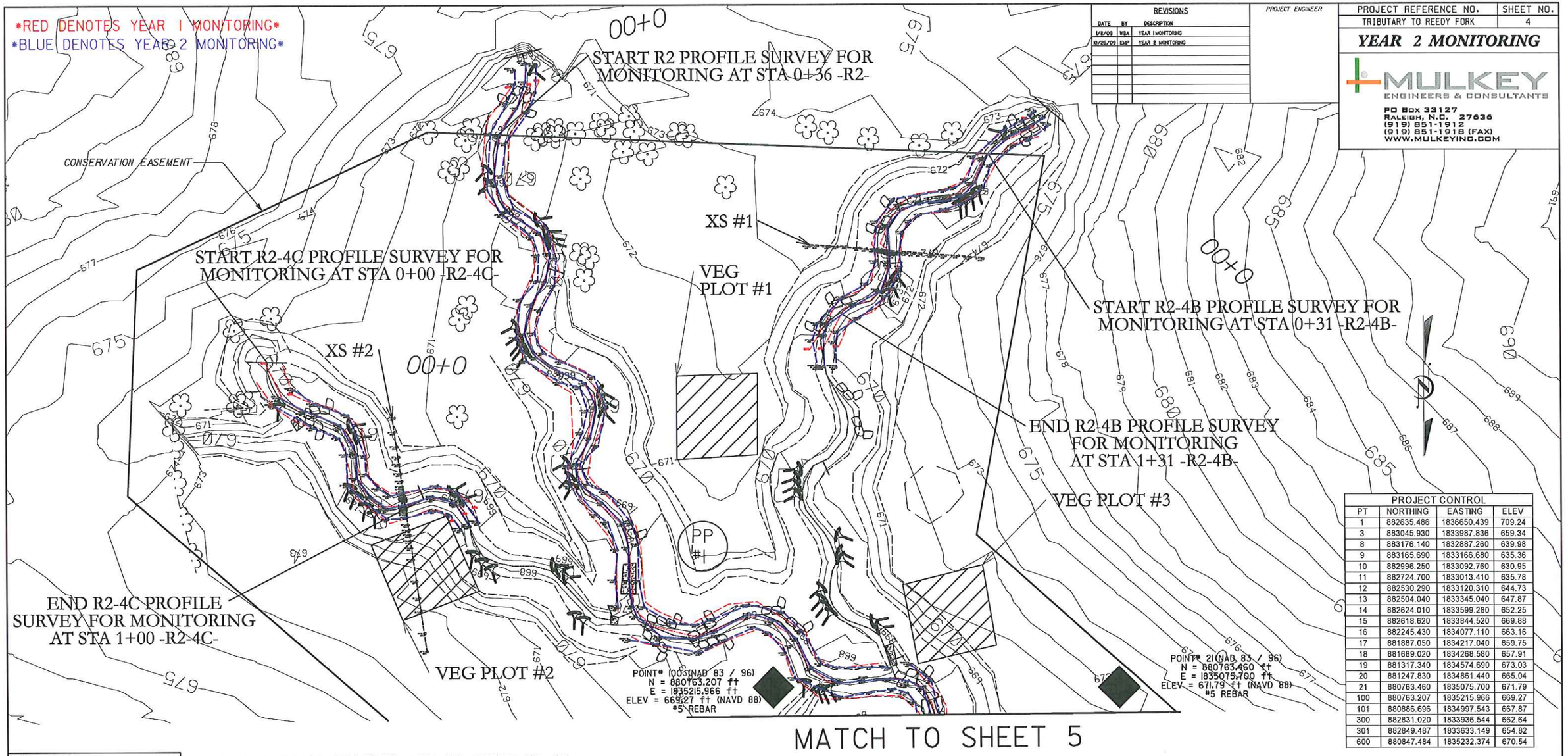
- Constructed Bankfull/Top Of Bank
- Old Top Of Bank
- Constructed Thalweg
- Proposed Thalweg
- Waters Edge
- Old Waters Edge
- Vernal Pool
- Surface Water
- Staging Area
- Impervious Dike
- Permanent Improved Gravel Road
- Temporary Gravel Road
- Stone Outlet Sediment Trap
- Impervious Stream Channel Plug
- Fill Existing Stream Channel
- Vegetation Plot
- Brush Pile

MISCELLANEOUS:

- Photo Point (PP #1)
- Cross Section
- Crest Gauge


Legend
Easement
Restored Streams
NORTH CAROLINA
PROFESSIONAL
SEAL
22967
ENGINEER
WILLIAM SCOTT HUNT, III
11.10.22
PROJECT ENGINEER
PROJECT REFERENCE NO.
SHEET NO.
TRIBUTARY TO REEDY FORK
3
AS-BUILT DRAWING
MULKEY
N
1:1,800
1 inch equals 150 feet

RED DENOTES YEAR 1 MONITORING
BLUE DENOTES YEAR 2 MONITORING



REVISIONS		
DATE	BY	DESCRIPTION
1/8/09	WBA	YEAR 1 MONITORING
10/26/09	EMP	YEAR 2 MONITORING

PROJECT ENGINEER

PROJECT REFERENCE NO.	SHEET NO.
TRIBUTARY TO REEDY FORK	4

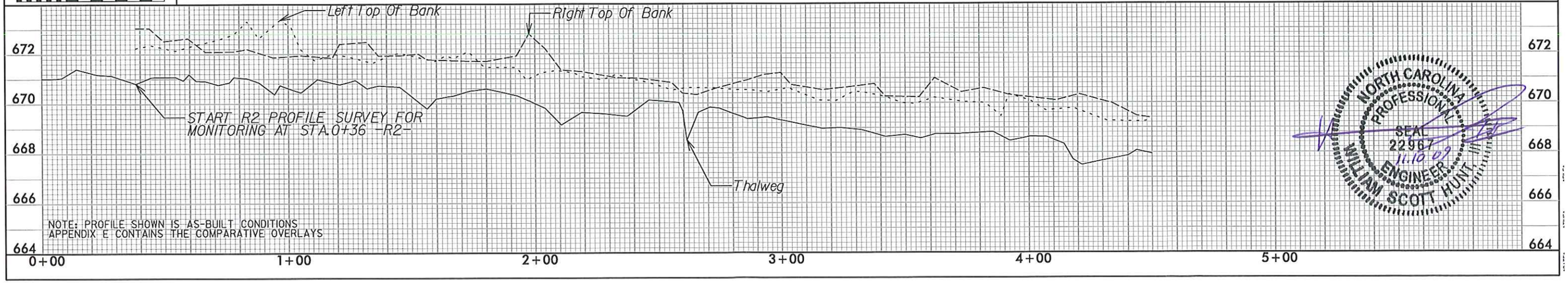
YEAR 2 MONITORING

MULKEY
ENGINEERS & CONSULTANTS
PO BOX 33127
RALEIGH, N.C. 27636
(919) 851-1912
(919) 851-1918 (FAX)
WWW.MULKEYINC.COM

PROJECT CONTROL			
PT	NORTHING	EASTING	ELEV
1	882635.486	1836650.439	709.24
3	883045.930	1833987.836	659.34
8	883176.140	1832887.260	639.98
9	883165.690	1833166.680	635.36
10	882996.250	1833092.760	630.95
11	882724.700	1833013.410	635.78
12	882530.290	1833120.310	644.73
13	882504.040	1833345.040	647.87
14	882624.010	1833599.280	652.25
15	882618.620	1833844.520	669.88
16	882245.430	1834077.110	663.16
17	881887.050	1834217.040	659.75
18	881689.020	1834268.580	657.91
19	881317.340	1834574.690	673.03
20	881247.830	1834861.440	665.04
21	880763.460	1835075.700	671.79
100	880763.207	1835215.966	669.27
101	880886.696	1834997.543	667.87
300	882831.020	1833936.544	662.64
301	882849.487	1833633.149	654.82
600	880847.484	1835232.374	670.54

20 0 40

* R2-4B & R2-4C PROFILES ARE ON SHEET NO. 12 *



NOTE: PROFILE SHOWN IS AS-BUILT CONDITIONS
APPENDIX E CONTAINS THE COMPARATIVE OVERLAYS

NORTH CAROLINA PROFESSIONAL SEAL 22967 ENGINEER WILLIAM SCOTT HUNT
1.10.07

RED DENOTES YEAR 1 MONITORING
BLUE DENOTES YEAR 2 MONITORING

PROJECT CONTROL			
PT	NORTHING	EASTING	ELEV
1	882635.486	1836650.439	709.24
3	883045.930	1833987.836	659.34
8	883176.140	1832887.260	639.98
9	883165.690	1833166.680	635.36
10	882996.250	1833092.760	630.95
11	882724.700	1833013.410	635.78
12	882530.290	1833120.310	644.73
13	882504.040	1833345.040	647.87
14	882624.010	1833599.280	652.25
15	882618.620	1833844.520	669.88
16	882245.430	1834077.110	663.16
17	881887.050	1834217.040	659.75
18	881689.020	1834268.580	657.91
19	881317.340	1834574.690	673.03
20	881247.830	1834861.440	665.04
21	880763.460	1835075.700	671.79
100	880763.207	1835215.966	669.27
101	880886.696	1834997.543	667.87
300	882831.020	1833936.544	662.64
301	882849.487	1833633.149	654.82
600	880847.484	1835232.374	670.54

REVISIONS		
DATE	BY	DESCRIPTION
1/8/09	WBA	YEAR 1 MONITORING
10/26/09	EMP	YEAR 2 MONITORING

PROJECT ENGINEER

PROJECT REFERENCE NO.	SHEET NO.
TRIBUTARY TO REEDY FORK	5

YEAR 2 MONITORING

MULKEY
ENGINEERS & CONSULTANTS
PO Box 33127
RALEIGH, N.C. 27636
(919) 851-1912
(919) 851-1918 (FAX)
WWW.MULKEYING.COM

EXIST. AT&T FIBER OPTIC EASEMENT

MATCH TO SHEET 4

MATCH TO SHEET 6

PASTURE

POINT# 101 (NAD 83 / 96)
N = 880886.696 ft
E = 1834997.543 ft
ELEV = 667.87 ft (NAVD 88)
#5 REBAR

POINT# 19 (NAD 83 / 96)
N = 881317.340 ft
E = 1834574.690 ft
ELEV = 673.03 ft (NAVD 88)
#5 REBAR

POINT# 20 (NAD 83 / 96)
N = 881247.830 ft
E = 1834861.440 ft
ELEV = 665.04 ft (NAVD 88)
#5 REBAR

VEG PLOT #4
VEG PLOT #5
VEG PLOT #6
VEG PLOT #7

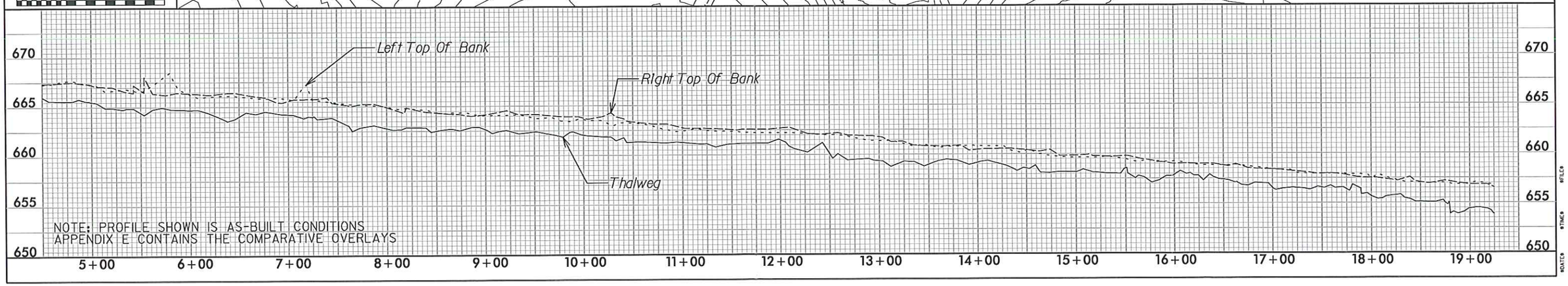
XS #3
XS #4
XS #5
XS #6

PP #2

CONSERVATION EASEMENT

50 0 100

NORTH CAROLINA PROFESSIONAL SEAL 22967 ENGINEER WILLIAM SCOTT HUNT, III
11.10.09



NOTE: PROFILE SHOWN IS AS-BUILT CONDITIONS
APPENDIX E CONTAINS THE COMPARATIVE OVERLAYS

•RED DENOTES YEAR 1 MONITORING•
•BLUE DENOTES YEAR 2 MONITORING•

REVISIONS		
DATE	BY	DESCRIPTION
1/8/09	WBA	YEAR 1 MONITORING
10/26/09	EMP	YEAR 2 MONITORING

PROJECT ENGINEER

PROJECT REFERENCE NO.	SHEET NO.
TRIBUTARY TO REEDY FORK	6

YEAR 2 MONITORING

MULKEY ENGINEERS & CONSULTANTS
PO Box 33127
RALEIGH, N.C. 27636
(919) 851-1912
(919) 851-1918 (FAX)
WWW.MULKEYINC.COM

EXIST. OVERHEAD POWER EASEMENT

PASTURE

END R2 PROFILE SURVEY FOR MONITORING AT STA 22+96 -R2-

VEG PLOT #8

CREST GAUGE #1

VEG PLOT #5

XS #6

POINT# 18 (NAD 83 / 96)
N = 881689.020 ft
E = 1834268.580 ft
ELEV = 657.91 ft (NAVD 88)
#5 REBAR

POINT# 17 (NAD 83 / 96)
N = 881887.050 ft
E = 1834217.040 ft
ELEV = 659.75 ft (NAVD 88)
#5 REBAR

POINT# 16 (NAD 83 / 96)
N = 882245.430 ft
E = 1834077.110 ft
ELEV = 663.16 ft (NAVD 88)
#5 REBAR

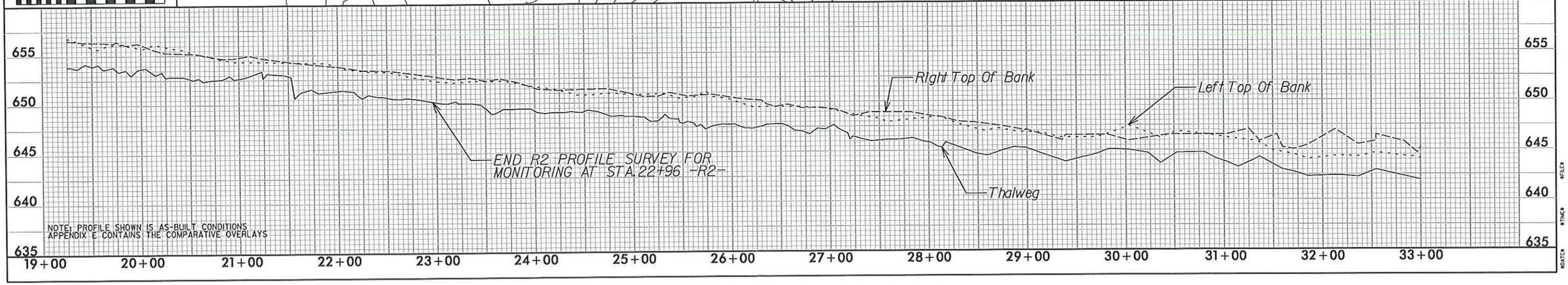
CONSERVATION EASEMENT

MATCH TO SHEET 5

MATCH TO SHEET 7

PROJECT CONTROL			
PT	NORTHING	EASTING	ELEV
1	882635.486	1836650.439	709.24
3	883045.930	1833987.836	659.34
8	883176.140	1832887.260	639.98
9	883165.690	1833166.680	635.36
10	882996.250	1833092.760	630.95
11	882724.700	1833013.410	635.78
12	882530.290	1833120.310	644.73
13	882504.040	1833345.040	647.87
14	882624.010	1833599.280	652.25
15	882618.620	1833844.520	669.88
16	882245.430	1834077.110	663.16
17	881887.050	1834217.040	659.75
18	881689.020	1834268.580	657.91
19	881317.340	1834574.690	673.03
20	881247.830	1834861.440	665.04
21	880763.460	1835075.700	671.79
100	880763.207	1835215.966	689.27
101	880886.696	1834997.543	667.87
300	882831.020	1833936.544	662.64
301	882849.487	1833633.149	654.82
600	880847.484	1835232.374	670.54

50 0 100



NORTH CAROLINA PROFESSIONAL SEAL 22967 ENGINEER WILLIAM SCOTT HUNT, III
11.10.09

•RED DENOTES YEAR 1 MONITORING•

•BLUE DENOTES YEAR 2 MONITORING•

REVISIONS		
DATE	BY	DESCRIPTION
1/8/09	WBA	YEAR 1 MONITORING
10/26/09	EMP	YEAR 2 MONITORING

PROJECT ENGINEER

PROJECT REFERENCE NO.	SHEET NO.
TRIBUTARY TO REEDY FORK	7

YEAR 2 MONITORING

MULKEY
ENGINEERS & CONSULTANTS
PO Box 33127
RALEIGH, N.C. 27636
(919) 851-1912
(919) 851-1918 (FAX)
WWW.MULKEYING.COM

PROJECT CONTROL			
PT	NORTHING	EASTING	ELEV
1	882635.486	1836650.439	709.24
3	883045.930	1833987.836	659.34
8	883176.140	1832887.260	639.98
9	883165.690	1833166.680	635.36
10	882996.250	1833092.760	630.95
11	882724.700	1833013.410	635.78
12	882530.290	1833120.310	644.73
13	882504.040	1833345.040	647.87
14	882624.010	1833599.280	652.25
15	882618.620	1833844.520	669.88
16	882245.430	1834077.110	663.16
17	881887.050	1834217.040	659.75
18	881689.020	1834268.580	657.91
19	881317.340	1834574.690	673.03
20	881247.830	1834861.440	665.04
21	880763.460	1835075.700	671.79
100	880763.207	1835215.966	669.27
101	880886.696	1834997.543	667.87
300	882831.020	1833936.544	662.64
301	882849.487	1833633.149	654.82
600	880847.484	1835232.374	670.54

MATCH TO SHEET 6

MATCH TO SHEET 8

PASTURE

CONSERVATION EASEMENT

VEG PLOT #10

VEG PLOT #11

VEG PLOT #12

POINT# 16 (NAD 83 / 96)
N = 882618.620 ft
E = 1833844.520 ft
ELEV = 669.88 ft (NAVD 88)
#5 REBAR

POINT# 14 (NAD 83 / 96)
N = 882624.010 ft
E = 1833599.280 ft
ELEV = 652.25 ft (NAVD 88)
#5 REBAR

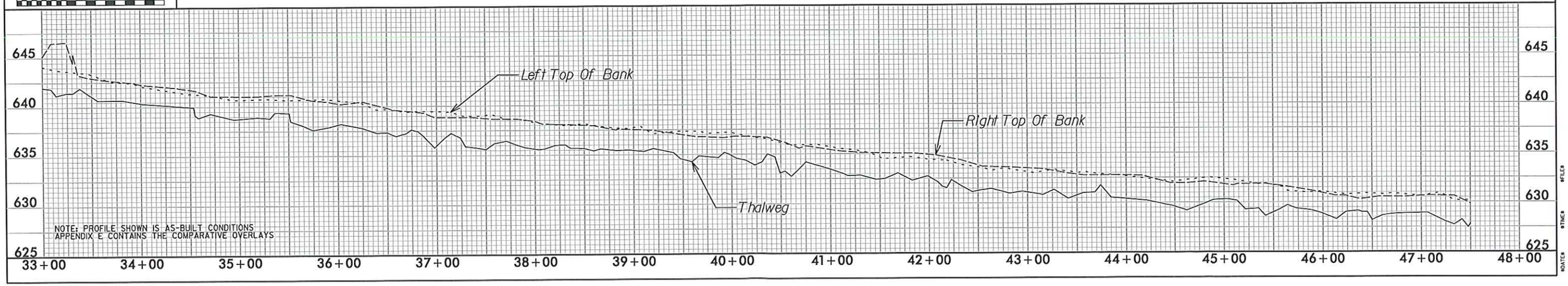
POINT# 13 (NAD 83 / 96)
N = 882504.040 ft
E = 1833345.040 ft
ELEV = 647.87 ft (NAVD 88)
#5 REBAR

POINT# 12 (NAD 83 / 96)
N = 882530.290 ft
E = 1833120.310 ft
ELEV = 644.73 ft (NAVD 88)
#5 REBAR

POINT# 11 (NAD 83 / 96)
N = 882724.700 ft
E = 1833013.410 ft
ELEV = 635.78 ft (NAVD 88)
#5 REBAR

NORTH CAROLINA PROFESSIONAL SEAL 22967 ENGINEER WILLIAM SCOTT HUNT, III
11.10.09

50 0 100



NOTE: PROFILE SHOWN IS AS-BUILT CONDITIONS
APPENDIX E CONTAINS THE COMPARATIVE OVERLAYS

•RED DENOTES YEAR 1 MONITORING•
•BLUE DENOTES YEAR 2 MONITORING•

REVISIONS		
DATE	BY	DESCRIPTION
1/13/09	MBA	YEAR 1 MONITORING
10/26/09	DMP	YEAR 2 MONITORING

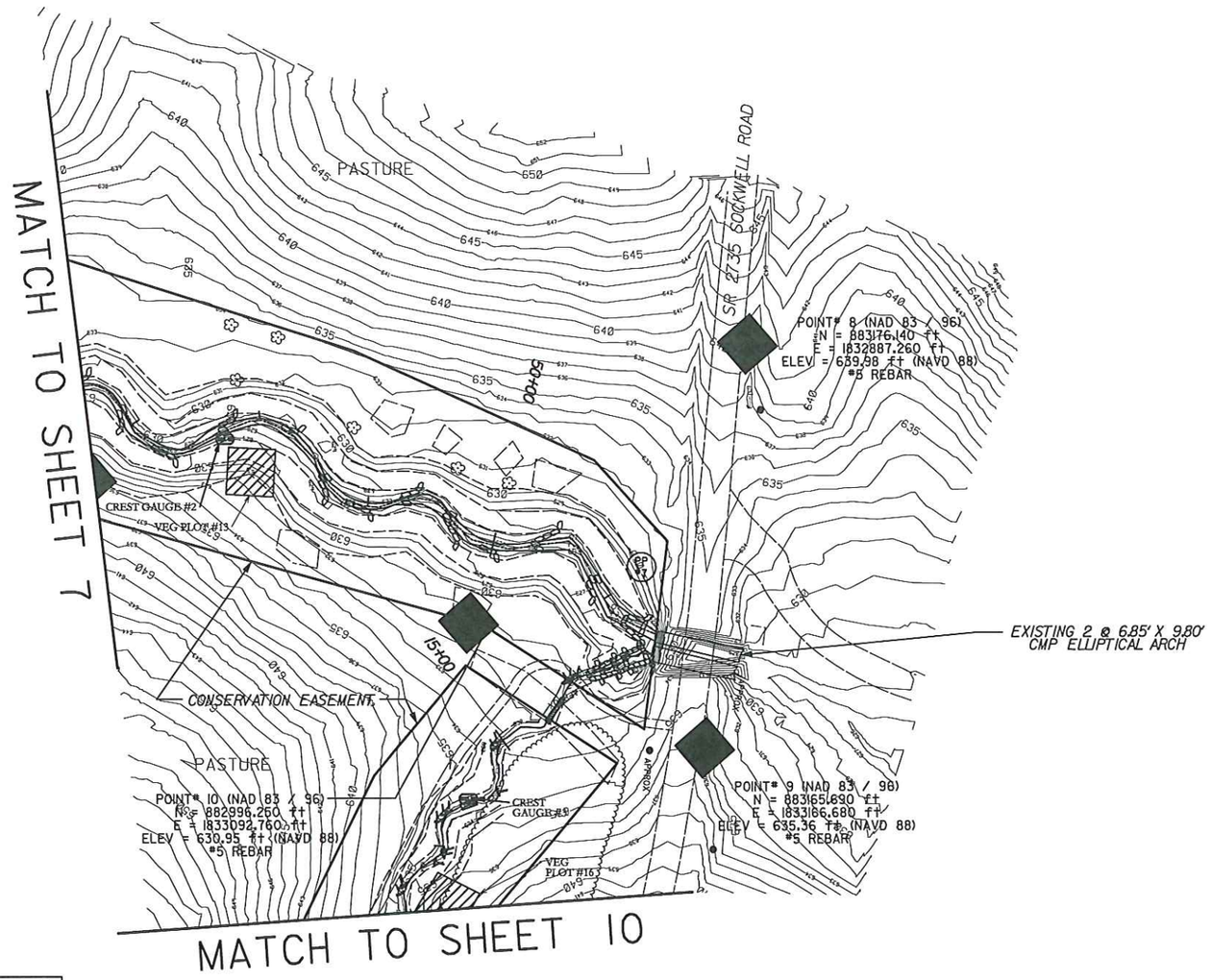
PROJECT ENGINEER

PROJECT REFERENCE NO.	SHEET NO.
TRIBUTARY TO REEDY FORK	8

YEAR 2 MONITORING

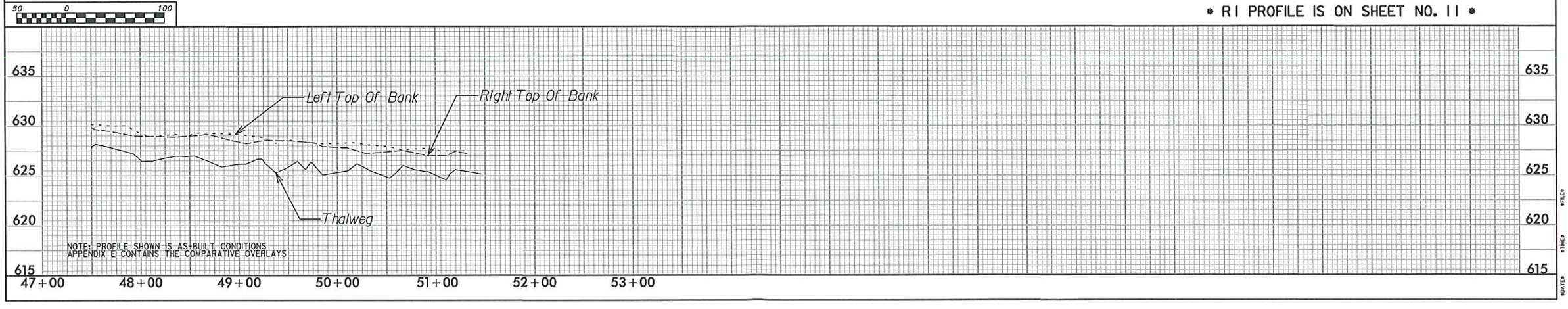
MULKEY
ENGINEERS & CONSULTANTS
PO Box 33127
Raleigh, N.C. 27636
(919) 851-1912
(919) 851-1918 (FAX)
WWW.MULKEYINC.COM

PROJECT CONTROL			
PT	NORTHING	EASTING	ELEV
1	882635.486	1836650.439	709.24
3	883045.930	1833987.836	659.34
8	883176.140	1832887.260	639.98
9	883165.690	1833166.680	635.36
10	882996.250	1833092.760	630.95
11	882724.700	1833013.410	635.78
12	882530.290	1833120.310	644.73
13	882504.040	1833345.040	647.87
14	882624.010	1833599.280	652.25
15	882618.620	1833844.520	669.88
16	882245.430	1834077.110	663.16
17	881887.050	1834217.040	659.75
18	881689.020	1834268.580	657.91
19	881317.340	1834574.690	673.03
20	881247.830	1834861.440	665.04
21	880763.460	1835075.700	671.79
100	880763.207	1835215.966	669.27
101	880886.696	1834997.543	667.87
300	882831.020	1833936.544	662.64
301	882849.487	1833633.149	654.82
600	880847.484	1835232.374	670.54



NORTH CAROLINA PROFESSIONAL SEAL 22967 ENGINEER WILLIAM SCOTT HUNT, III
11.10.09

• R1 PROFILE IS ON SHEET NO. 11 •



RED DENOTES YEAR 1 MONITORING

BLUE DENOTES YEAR 2 MONITORING

PROJECT CONTROL			
PT	NORTHING	EASTING	ELEV
1	882635.486	1836650.439	709.24
3	883045.930	1833987.836	659.34
8	883176.140	1832887.260	639.98
9	883165.690	1833166.680	635.36
10	882996.250	1833092.760	630.95
11	882724.700	1833013.410	635.78
12	882530.290	1833120.310	644.73
13	882504.040	1833345.040	647.87
14	882624.010	1833599.280	652.25
15	882618.620	1833844.520	669.88
16	882245.430	1834077.110	663.16
17	881887.050	1834217.040	659.75
18	881689.020	1834268.580	657.91
19	881317.340	1834574.690	673.03
20	881247.830	1834861.440	665.04
21	880763.460	1835075.700	671.79
100	880763.207	1835215.966	669.27
101	880886.696	1834997.543	667.87
300	882831.020	1833936.544	662.64
301	882849.487	1833633.149	654.82
600	880847.484	1835232.374	670.54

REVISIONS		
DATE	BY	DESCRIPTION
1/8/09	WBA	YEAR 1 MONITORING
10/26/09	EMP	YEAR 2 MONITORING

PROJECT ENGINEER

PROJECT REFERENCE NO.	SHEET NO.
TRIBUTARY TO REEDY FORK	9

YEAR 2 MONITORING

MULKEY
ENGINEERS & CONSULTANTS
PO Box 33127
RALEIGH, N.C. 27636
(919) 851-1912
(919) 851-1918 (FAX)
WWW.MULKEYING.COM

POINT# 300 (NAD 83 / 96)
N = 882831.020 ft
E = 1833936.544 ft
ELEV = 662.64 ft (NAVD 88)
#5 REBAR

END R1 PROFILE SURVEY FOR MONITORING AT STA 6+00 -R1-

CONSERVATION EASEMENT

PASTURE

PASTURE

SR 2735 SOCKWELL ROAD

START R1 PROFILE SURVEY FOR MONITORING AT STA 0+00 -R1-

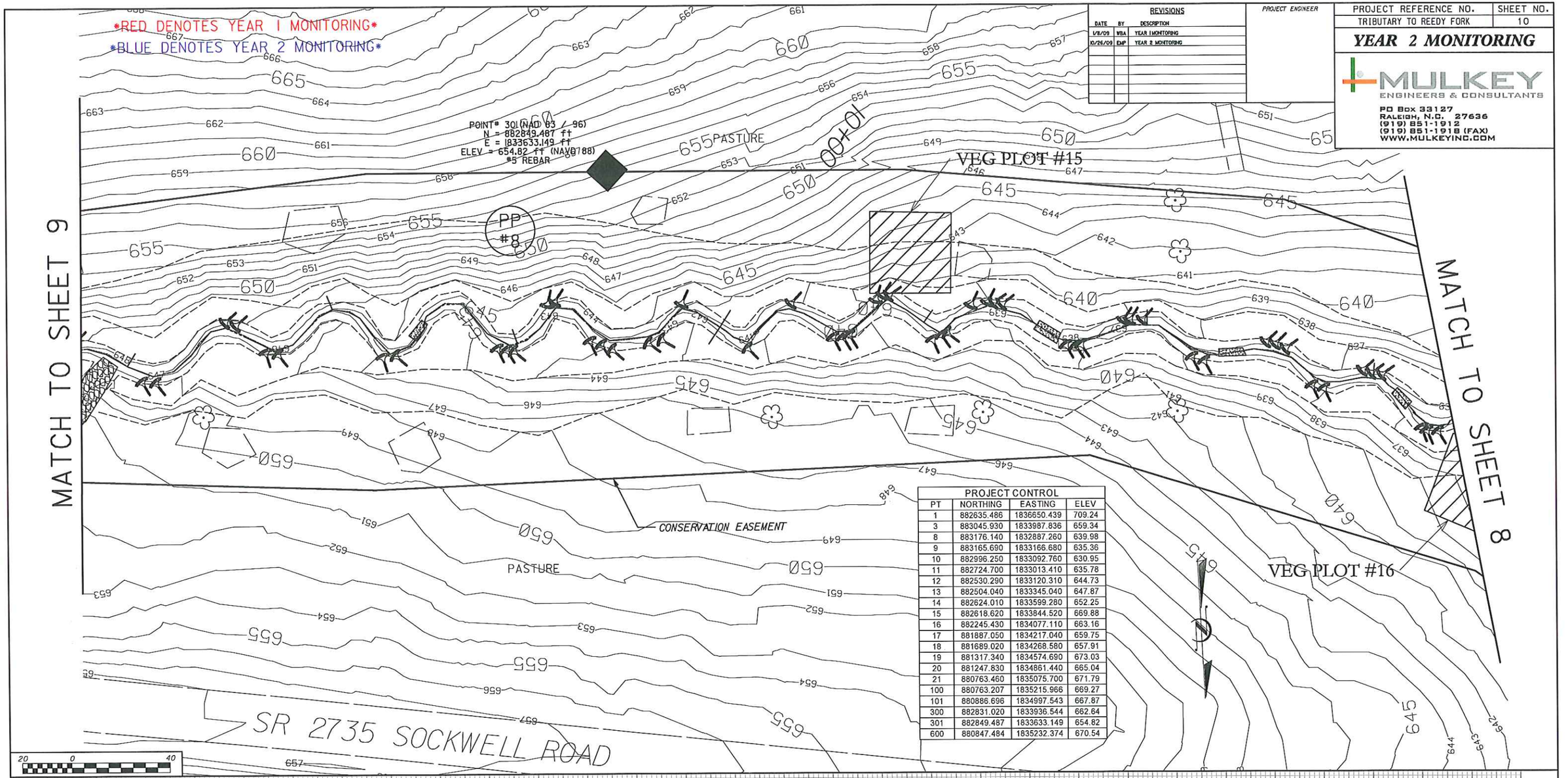
POINT# 3 (NAD 83 / 96)
N = 883045.930 ft
E = 1833987.836 ft
ELEV = 659.34 ft (NAVD 88)
#5 REBAR

MATCH TO SHEET 10

SEE SHEET NO. 11 FOR -R1- PROFILE

NORTH CAROLINA PROFESSIONAL SEAL 22967 ENGINEER WILLIAM SCOTT HUNT, III

11.10.09



PROJECT CONTROL			
PT	NORTHING	EASTING	ELEV
1	882635.486	1836650.439	709.24
3	883045.930	1833987.836	659.34
8	883176.140	1832887.260	639.98
9	883165.690	1833166.680	635.36
10	882996.250	1833092.760	630.95
11	882724.700	1833013.410	635.78
12	882530.290	1833120.310	644.73
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14	882624.010	1833599.280	652.25
15	882618.620	1833844.520	669.88
16	882245.430	1834077.110	663.16
17	881887.050	1834217.040	659.75
18	881689.020	1834268.580	657.91
19	881317.340	1834574.690	673.03
20	881247.830	1834861.440	665.04
21	880763.460	1835075.700	671.79
100	880763.207	1835215.966	669.27
101	880886.696	1834997.543	667.87
300	882831.020	1833936.544	662.64
301	882849.487	1833633.149	654.82
600	880847.484	1835232.374	670.54

REVISIONS

DATE	BY	DESCRIPTION
1/8/09	WBA	YEAR 1 MONITORING
10/26/09	EMP	YEAR 2 MONITORING

PROJECT ENGINEER

PROJECT REFERENCE NO. | SHEET NO.
TRIBUTARY TO REEDY FORK | 10

YEAR 2 MONITORING

MULKEY
ENGINEERS & CONSULTANTS
PO Box 33127
Raleigh, N.C. 27636
(919) 851-1912
(919) 851-1918 (FAX)
WWW.MULKEYINC.COM

SEE SHEET NO. 11 FOR -R1- PROFILE

NORTH CAROLINA PROFESSIONAL SEAL 22961 ENGINEER WILLIAM SCOTT HUNT, III
11-16-09

AS-BUILT PROFILES

REVISIONS		
DATE	BY	DESCRIPTION
1/8/09	WBA	YEAR 1 MONITORING
10/26/09	EMP	YEAR 2 MONITORING

PROJECT ENGINEER

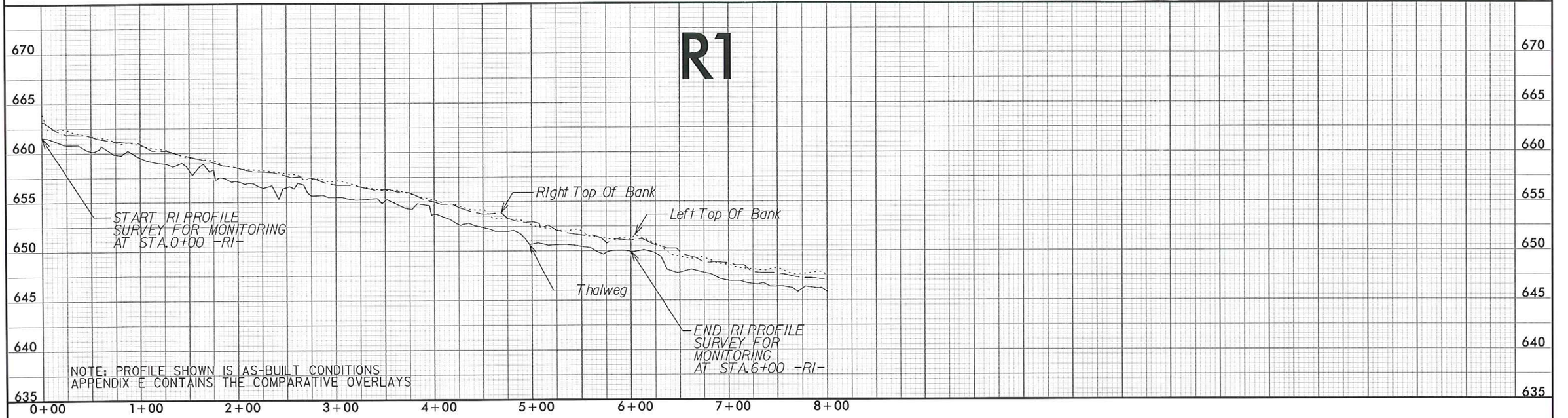
PROJECT REFERENCE NO. | SHEET NO.
TRIBUTARY TO REEDY FORK | 11

YEAR 2 MONITORING

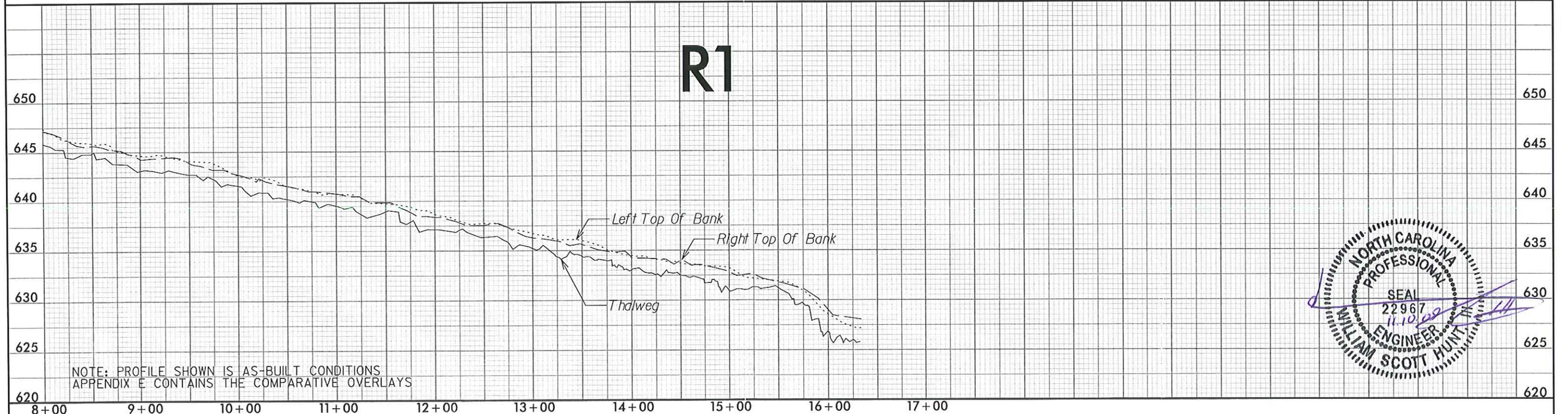
MULKEY ENGINEERS & CONSULTANTS

HORIZONTAL SCALE 50 0 100
VERTICAL SCALE 5 0 10

R1



R1



NORTH CAROLINA PROFESSIONAL SEAL 22967 ENGINEER WILLIAM SCOTT HUNT, III
11.10.09

AS-BUILT PROFILES

REVISIONS		
DATE	BY	DESCRIPTION
1/13/09	WBA	YEAR 1 MONITORING
10/26/09	EMP	YEAR 2 MONITORING

PROJECT ENGINEER

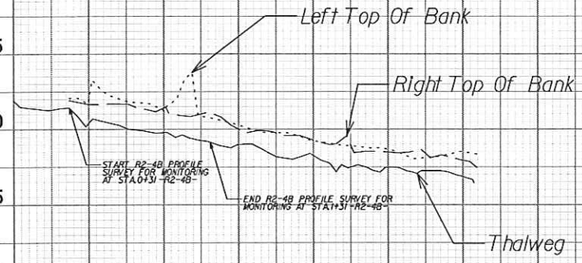
PROJECT REFERENCE NO. | SHEET NO.
TRIBUTARY TO REEDY FORK | 12

YEAR 2 MONITORING

MULKEY ENGINEERS & CONSULTANTS

HORIZONTAL SCALE 50 0 100
VERTICAL SCALE 5 0 10

R2-4B

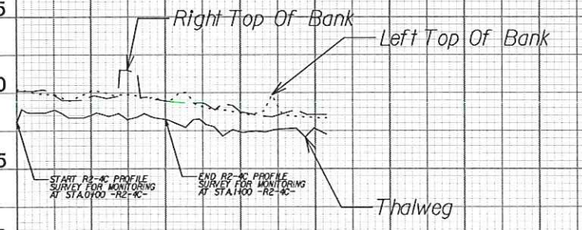


NOTE: PROFILE SHOWN IS AS-BUILT CONDITIONS
APPENDIX E CONTAINS THE COMPARATIVE OVERLAYS

690 685 680 675 670 665 660 655

0+00 1+00 2+00 3+00 4+00

R2-4C



NOTE: PROFILE SHOWN IS AS-BUILT CONDITIONS
APPENDIX E CONTAINS THE COMPARATIVE OVERLAYS

680 675 670 665 660 655 650

0+00 1+00 2+00 3+00

NORTH CAROLINA PROFESSIONAL SEAL 22967 ENGINEER WILLIAM SCOTT HUNT III
11.10.09

Veg Plot 1

As-Built Surveys, April 2008

Year 1 Monitoring, September 2008

Year 2 Monitoring, September 2009

Year 3 Monitoring

Year 4 Monitoring

Year 5 Monitoring

Veg Plot 2

As-Built Surveys, April 2008

Year 1 Monitoring, September 2008

Year 2 Monitoring, September 2009

Year 3 Monitoring

Year 4 Monitoring

Year 5 Monitoring

Veg Plot 3

As-Built Surveys, April 2008

Year 1 Monitoring, September 2008

Year 2 Monitoring, September 2009

Year 3 Monitoring

Year 4 Monitoring

Year 5 Monitoring

Veg Plot 4

As-Built Surveys, April 2008

Year 1 Monitoring, September 2008

Year 2 Monitoring, September 2009

Year 3 Monitoring

Year 4 Monitoring

Year 5 Monitoring

Veg Plot 5

As-Built Surveys, April 2008

Year 1 Monitoring, September 2008

Year 2 Monitoring, September 2009

Year 3 Monitoring

Year 4 Monitoring

Year 5 Monitoring

Veg Plot 6

As-Built Surveys, April 2008

Year 1 Monitoring, September 2008

Year 2 Monitoring, September 2009

Year 3 Monitoring

Year 4 Monitoring

Year 5 Monitoring

Veg Plot 7

As-Built Surveys, April 2008

Year 1 Monitoring, September 2008

Year 2 Monitoring, September 2009

Year 3 Monitoring

Year 4 Monitoring

Year 5 Monitoring

Veg Plot 8

As-Built Surveys, April 2008

Year 1 Monitoring, September 2008

Year 2 Monitoring, September 2009

Year 3 Monitoring

Year 4 Monitoring

Year 5 Monitoring

Veg Plot 9

As-Built Surveys, April 2008

Year 1 Monitoring, September 2008

Year 2 Monitoring, September 2009

Year 3 Monitoring

Year 4 Monitoring

Year 5 Monitoring

Veg Plot 10

As-Built Surveys, April 2008

Year 1 Monitoring, September 2008

Year 2 Monitoring, September 2009

Year 3 Monitoring

Year 4 Monitoring

Year 5 Monitoring

Veg Plot 11

As-Built Surveys, April 2008

Year 1 Monitoring, September 2008

Year 2 Monitoring, September 2009

Year 3 Monitoring

Year 4 Monitoring

Year 5 Monitoring

Veg Plot 12

As-Built Surveys, April 2008

Year 1 Monitoring, September 2008

Year 2 Monitoring, September 2009

Year 3 Monitoring

Year 4 Monitoring

Year 5 Monitoring

Veg Plot 13

As-Built Surveys, April 2008

Year 1 Monitoring, September 2008

Year 2 Monitoring, September 2009

Year 3 Monitoring

Year 4 Monitoring

Year 5 Monitoring

Veg Plot 14

As-Built Surveys, April 2008

Year 1 Monitoring, September 2008

Year 2 Monitoring, September 2009

Year 3 Monitoring

Year 4 Monitoring

Year 5 Monitoring

Veg Plot 15

As-Built Surveys, April 2008

Year 1 Monitoring, September 2008

Year 2 Monitoring, September 2009

Year 3 Monitoring

Year 4 Monitoring

Year 5 Monitoring

Veg Plot 16

As-Built Surveys, April 2008

Year 1 Monitoring, September 2008

Year 2 Monitoring, September 2009

Year 3 Monitoring

Year 4 Monitoring

Year 5 Monitoring

Photo Point 1: Looking upstream toward driveway

As-Built Surveys, April 2008

Year 1 Monitoring, September 2008

Year 2 Monitoring, September 2009

Year 3 Monitoring

Year 4 Monitoring

Year 5 Monitoring

Photo Point 1: Looking toward Reach R2-4a and R2-4c

As-Built Surveys, April 2008

Year 1 Monitoring, September 2008

Year 2 Monitoring, September 2009

Year 3 Monitoring

Year 4 Monitoring

Year 5 Monitoring

Photo Point 1: Looking upstream on Reach R2-4b

As-Built Surveys, April 2008

Year 1 Monitoring, September 2008

Year 2 Monitoring, September 2009

Year 3 Monitoring

Year 4 Monitoring

Year 5 Monitoring

Photo Point 1: Looking downstream on Reach R2

As-Built Surveys, April 2008

Year 1 Monitoring, September 2008

Year 2 Monitoring, September 2009

Year 3 Monitoring

Year 4 Monitoring

Year 5 Monitoring

Photo Point 2: Looking upstream on Reach R2

As-Built Surveys, April 2008

Year 1 Monitoring, September 2008

Year 2 Monitoring, September 2009

Year 3 Monitoring

Year 4 Monitoring

Year 5 Monitoring

Photo Point 2: Looking downstream on Reach R2

As-Built Surveys, April 2008

Year 1 Monitoring, September 2008

Year 2 Monitoring, September 2009

Year 3 Monitoring

Year 4 Monitoring

Year 5 Monitoring

Photo Point 3: Looking upstream on Reach R2

As-Built Surveys, April 2008

Year 1 Monitoring, September 2008

Year 2 Monitoring, September 2009

Year 3 Monitoring

Year 4 Monitoring

Year 5 Monitoring

Photo Point 3: Looking downstream on Reach R2

As-Built Surveys, April 2008

Year 1 Monitoring, September 2008

Year 2 Monitoring, September 2009

Year 3 Monitoring

Year 4 Monitoring

Year 5 Monitoring

Photo Point 4: Looking upstream on Reach R2

As-Built Surveys, April 2008

Year 1 Monitoring, September 2008

Year 2 Monitoring, September 2009

Year 3 Monitoring

Year 4 Monitoring

Year 5 Monitoring

Photo Point 4: Looking downstream on Reach R2

As-Built Surveys, April 2008

Year 1 Monitoring, September 2008

Year 2 Monitoring, September 2009

Year 3 Monitoring

Year 4 Monitoring

Year 5 Monitoring

Photo Point 5: Looking upstream on Reach R2

As-Built Surveys, April 2008

Year 1 Monitoring, September 2008

Year 2 Monitoring, September 2009

Year 3 Monitoring

Year 4 Monitoring

Year 5 Monitoring

Photo Point 5: Looking downstream on Reach R2

As-Built Surveys, April 2008

Year 1 Monitoring, September 2008

Year 2 Monitoring, September 2009

Year 3 Monitoring

Year 4 Monitoring

Year 5 Monitoring

Photo Point 6: Looking upstream on Reach R2

As-Built Surveys, April 2008

Year 1 Monitoring, September 2008

Year 2 Monitoring, September 2009

Year 3 Monitoring

Year 4 Monitoring

Year 5 Monitoring

Photo Point 6: Looking downstream on Reach R2

As-Built Surveys, April 2008

Year 1 Monitoring, September 2008

Year 2 Monitoring, September 2009

Year 3 Monitoring

Year 4 Monitoring

Year 5 Monitoring

Photo Point 7: Looking upstream on Reach R2

As-Built Surveys, April 2008

Year 1 Monitoring, September 2008

Year 2 Monitoring, September 2009

Year 3 Monitoring

Year 4 Monitoring

Year 5 Monitoring

Photo Point 7: Looking across Reach R2, upstream on Reach R1

As-Built Surveys, April 2008

Year 1 Monitoring, September 2008

Year 2 Monitoring, September 2009

Year 3 Monitoring

Year 4 Monitoring

Year 5 Monitoring

Photo Point 8; Looking upstream on Reach R1

As-Built Surveys, April 2008

Year 1 Monitoring, September 2008

Year 2 Monitoring, September 2009

Year 3 Monitoring

Year 4 Monitoring

Year 5 Monitoring

Photo Point 8: Looking downstream on Reach R1

As-Built Surveys, April 2008

Year 1 Monitoring, September 2008

Year 2 Monitoring, September 2009

Year 3 Monitoring

Year 4 Monitoring

Year 5 Monitoring

Permanent Cross Section 1

As-Built Surveys, April 2008

Year 1 Monitoring, September 2008

Year 2 Monitoring, September 2009

Year 3 Monitoring

Year 4 Monitoring

Year 5 Monitoring

Permanent Cross Section 2

As-Built Surveys, April 2008

Year 1 Monitoring, September 2008

Year 2 Monitoring, September 2009

Year 3 Monitoring

Year 4 Monitoring

Year 5 Monitoring

Permanent Cross Section 3

As-Built Surveys, April 2008

Year 1 Monitoring, September 2008

Year 2 Monitoring, September 2009

Year 3 Monitoring

Year 4 Monitoring

Year 5 Monitoring

Permanent Cross Section 4

As-Built Surveys, April 2008

Year 1 Monitoring, September 2008

Year 2 Monitoring, September 2009

Year 3 Monitoring

Year 4 Monitoring

Year 5 Monitoring

Permanent Cross Section 5

As-Built Surveys, April 2008

Year 1 Monitoring, September 2008

Year 2 Monitoring, September 2009

Year 3 Monitoring

Year 4 Monitoring

Year 5 Monitoring

Permanent Cross Section 6

As-Built Surveys, April 2008

Year 1 Monitoring, September 2008

Year 2 Monitoring, September 2009

Year 3 Monitoring

Year 4 Monitoring

Year 5 Monitoring

Permanent Cross Section 7

As-Built Surveys, April 2008

Year 1 Monitoring, September 2008

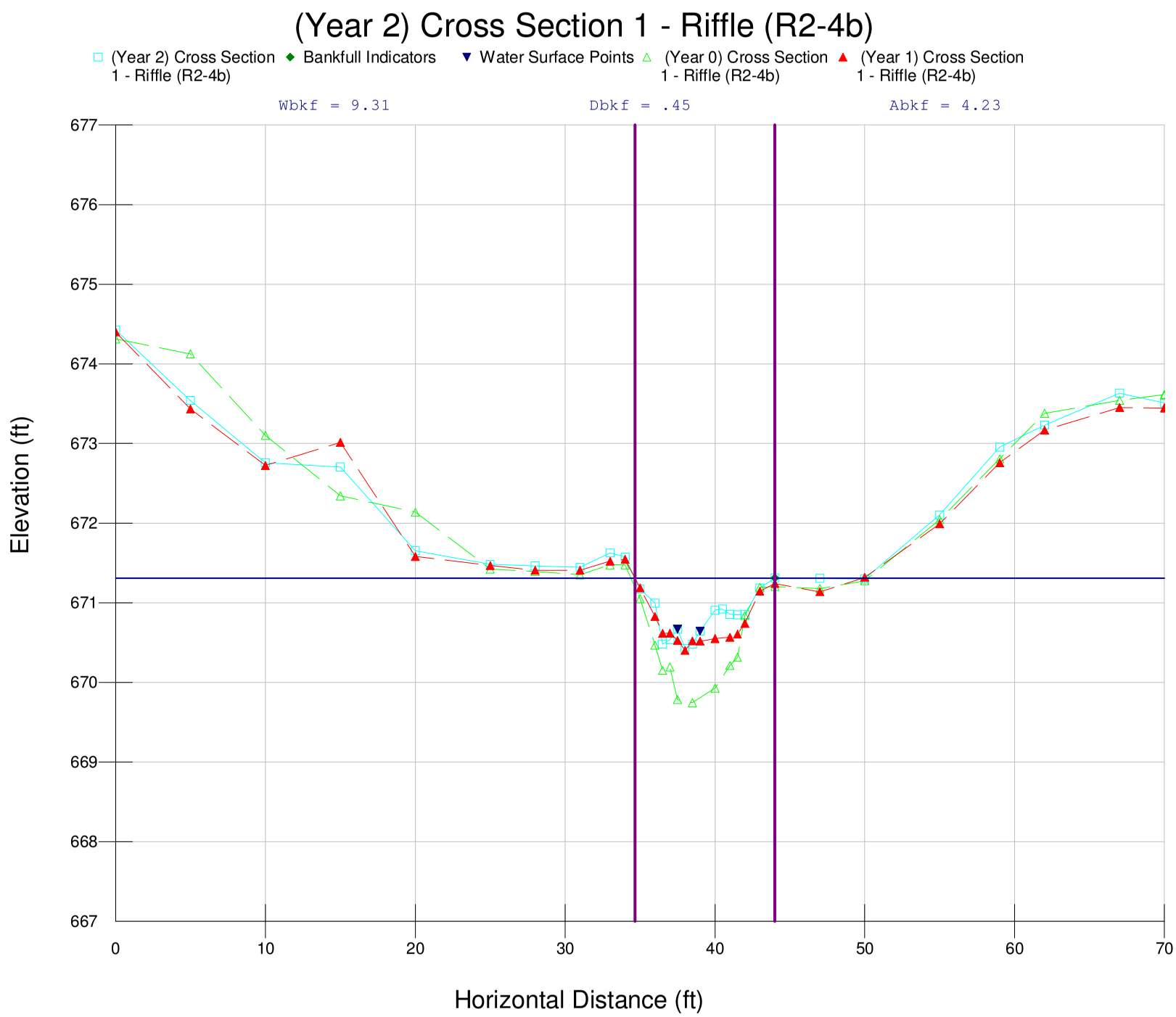
Year 2 Monitoring, September 2009

Year 3 Monitoring

Year 4 Monitoring

Year 5 Monitoring

Cross Sections


(Year 2) Cross Section 1 - Riffle (R2-4b)
(Year 2) Cross Section 1 - Riffle (R2-4b)
Bankfull Indicators
Water Surface Points
(Year 0) Cross Section 1 - Riffle (R2-4b)
(Year 1) Cross Section 1 - Riffle (R2-4b)
Wbkf = 9.31
Dbkf = .45
Abkf = 4.23
Elevation (ft)
677
676
675
674
673
672
671
670
669
668
667
0
10
20
30
40
50
60
70
Horizontal Distance (ft)

RIVERMORPH CROSS SECTION SUMMARY

River Name: (Year 2) Reedy Fork Creek
Reach Name: R2-4b
Cross Section Name: (Year 2) Cross Section 1 - Riffle (R2-4b)
Survey Date: 10/05/2009

Cross Section Data Entry

BM Elevation: 0 ft
Backsight Rod Reading: 0 ft

TAPE	FS	ELEV	NOTE
0	0	674.425177	GS
5	0	673.540717	GS
10	0	672.756742	GS
15	0	672.704091	GS
20	0	671.652243	GS
25	0	671.482944	GS
28	0	671.46207	GS
31	0	671.445237	GS
33	0	671.625643	GS
34	0	671.574347	LB
35	0	671.172617	GS
36	0	670.996224	GS
36.5	0	670.480696	GS
37	0	670.535195	GS
37.5	0	670.666514	LEW
38	0	670.424342	TW
38.5	0	670.480609	GS
39	0	670.643241	REW
40	0	670.906642	GS
40.5	0	670.920611	GS
41	0	670.85547	GS
41.5	0	670.847822	GS
42	0	670.855698	GS
43	0	671.185099	GS
44	0	671.31347	BKF
47	0	671.307366	GS
50	0	671.300101	GS
55	0	672.103685	GS
59	0	672.954508	GS
62	0	673.231074	GS
67	0	673.632806	GS
70	0	673.510106	GS

Cross Sectional Geometry

	Channel	Left	Right
Floodprone Elevation (ft)	672.2	672.2	672.2
Bankfull Elevation (ft)	671.31	671.31	671.31
Floodprone Width (ft)	38.02	-----	-----
Bankfull Width (ft)	9.31	6.95	2.36
Entrenchment Ratio	4.08	-----	-----
Mean Depth (ft)	0.45	0.53	0.22
Maximum Depth (ft)	0.89	0.89	0.46
Width/Depth Ratio	20.69	13.11	10.73
Bankfull Area (sq ft)	4.23	3.7	0.53
Wetted Perimeter (ft)	9.78	7.81	2.88

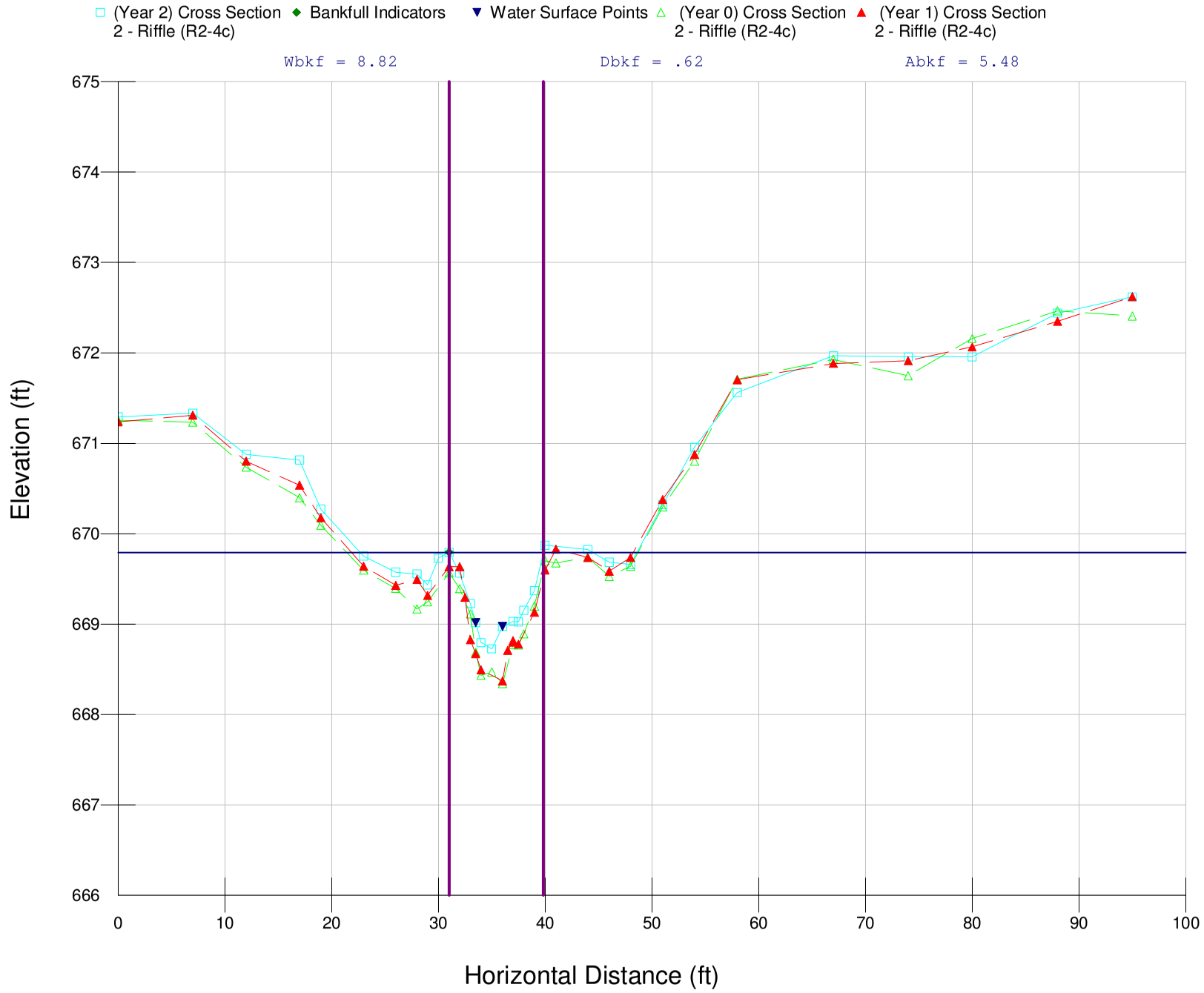
Hydraulic Radius (ft)	0.43	0.47	0.18
Begin BKF Station	34.66	34.66	41.61
End BKF Station	43.97	41.61	43.97

Entrainment Calculations

Entrainment Formula: Rosgen Modified Shields Curve

	Channel	Left Side	Right Side
Slope	0	0	0
Shear Stress (lb/sq ft)			
Movable Particle (mm)			

(Year 2) Cross Section 2 - Riffle (R2-4c)



RIVERMORPH CROSS SECTION SUMMARY

River Name: (Year 2) Reedy Fork Creek
Reach Name: R2-4c
Cross Section Name: (Year 2) Cross Section 2 - Riffle (R2-4c)
Survey Date: 10/05/2009

Cross Section Data Entry

BM Elevation: 0 ft
Backsight Rod Reading: 0 ft

TAPE	FS	ELEV	NOTE
0	0	671.29087	GS
7	0	671.334038	GS
12	0	670.878599	GS
17	0	670.815651	GS
19	0	670.271752	GS
23	0	669.75146	GS
26	0	669.572581	GS
28	0	669.553285	GS
29	0	669.433523	GS
30	0	669.729203	GS
31	0	669.795013	BKF
32	0	669.562597	GS
33	0	669.227631	GS
33.5	0	669.015984	LEW
34	0	668.795566	GS
35	0	668.726072	TW
36	0	668.972223	REW
37	0	669.027274	GS
37.5	0	669.024195	GS
38	0	669.151238	GS
39	0	669.36885	GS
40	0	669.872042	RB
44	0	669.824363	GS
46	0	669.682487	GS
48	0	669.659614	GS
51	0	670.322147	GS
54	0	670.957392	GS
58	0	671.561706	GS
67	0	671.967203	GS
74	0	671.955916	GS
80	0	671.956129	GS
88	0	672.439744	GS
95	0	672.619577	GS

Cross Sectional Geometry

	Channel	Left	Right
Floodprone Elevation (ft)	670.85	670.85	670.85
Bankfull Elevation (ft)	669.79	669.79	669.79
Floodprone Width (ft)	39.55	-----	-----
Bankfull Width (ft)	8.82	1.22	7.6
Entrenchment Ratio	4.49	-----	-----
Mean Depth (ft)	0.62	0.14	0.7
Maximum Depth (ft)	1.06	0.31	1.06
Width/Depth Ratio	14.23	8.71	10.86
Bankfull Area (sq ft)	5.48	0.18	5.31

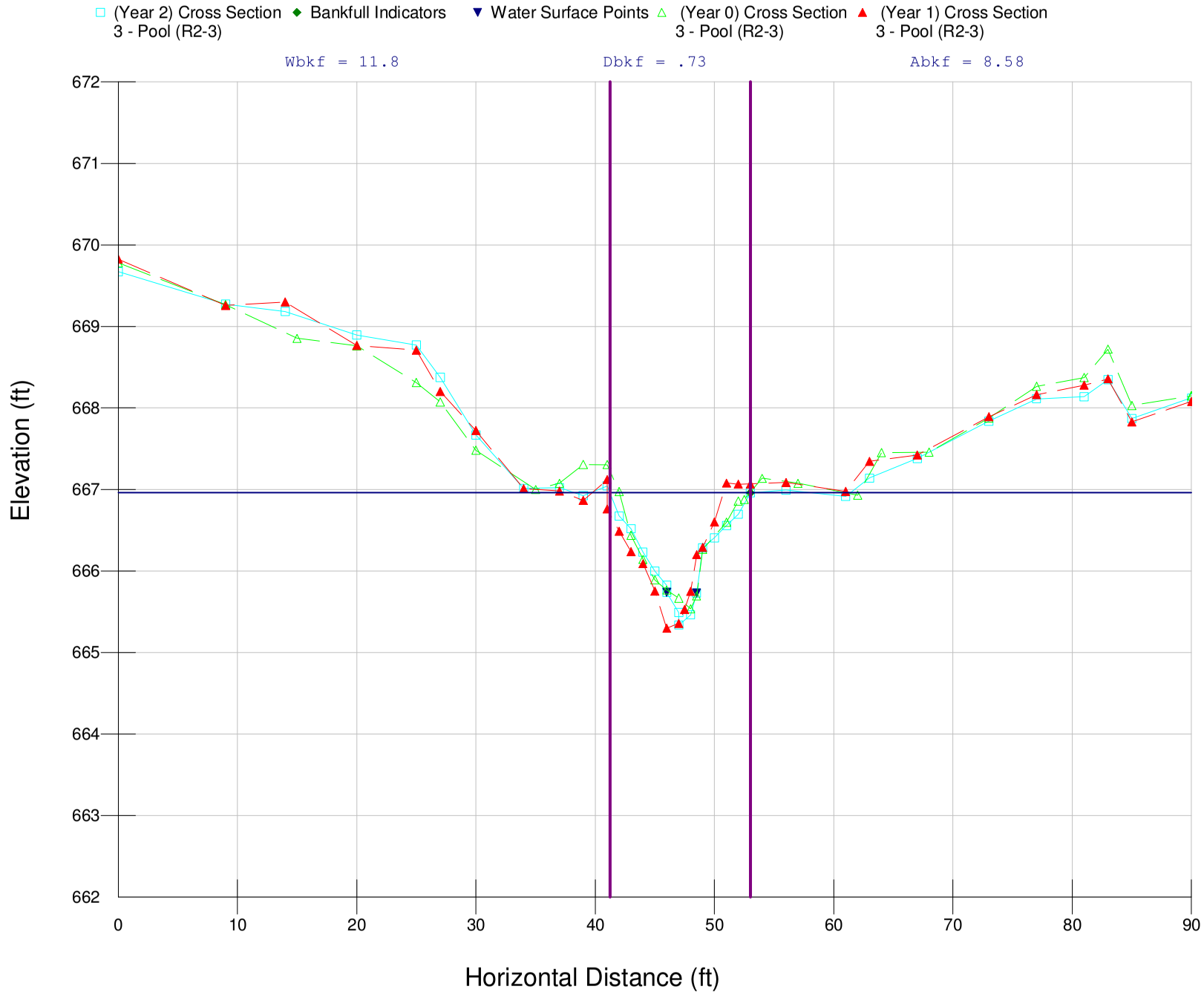
Wetted Perimeter (ft)	9.16	1.57	8.21
Hydraulic Radius (ft)	0.6	0.11	0.65
Begin BKF Station	31.02	31.02	32.24
End BKF Station	39.84	32.24	39.84

Entrainment Calculations

Entrainment Formula: Rosgen Modified Shields Curve

	Channel	Left Side	Right Side
Slope	0	0	0
Shear Stress (lb/sq ft)			
Movable Particle (mm)			

(Year 2) Cross Section 3 - Pool (R2-3)



Maximum Depth (ft)	1.62	1.29	1.62
Width/Depth Ratio	16.1	7.61	8.52
Bankfull Area (sq ft)	8.58	3.29	5.28
Wetted Perimeter (ft)	12.56	6.56	8.58
Hydraulic Radius (ft)	0.68	0.5	0.62
Begin BKF Station	41.25	41.25	46.27
End BKF Station	53	46.27	53

Entrainment Calculations

Entrainment Formula: Rosgen Modified Shields Curve

	Channel	Left Side	Right Side
Slope	0	0	0
Shear Stress (lb/sq ft)			
Movable Particle (mm)			

RIVERMORPH CROSS SECTION SUMMARY

River Name: (Year 2) Reedy Fork Creek
Reach Name: R2-3
Cross Section Name: (Year 2) Cross Section 3 - Pool (R2-3)
Survey Date: 10/06/2009

Cross Section Data Entry

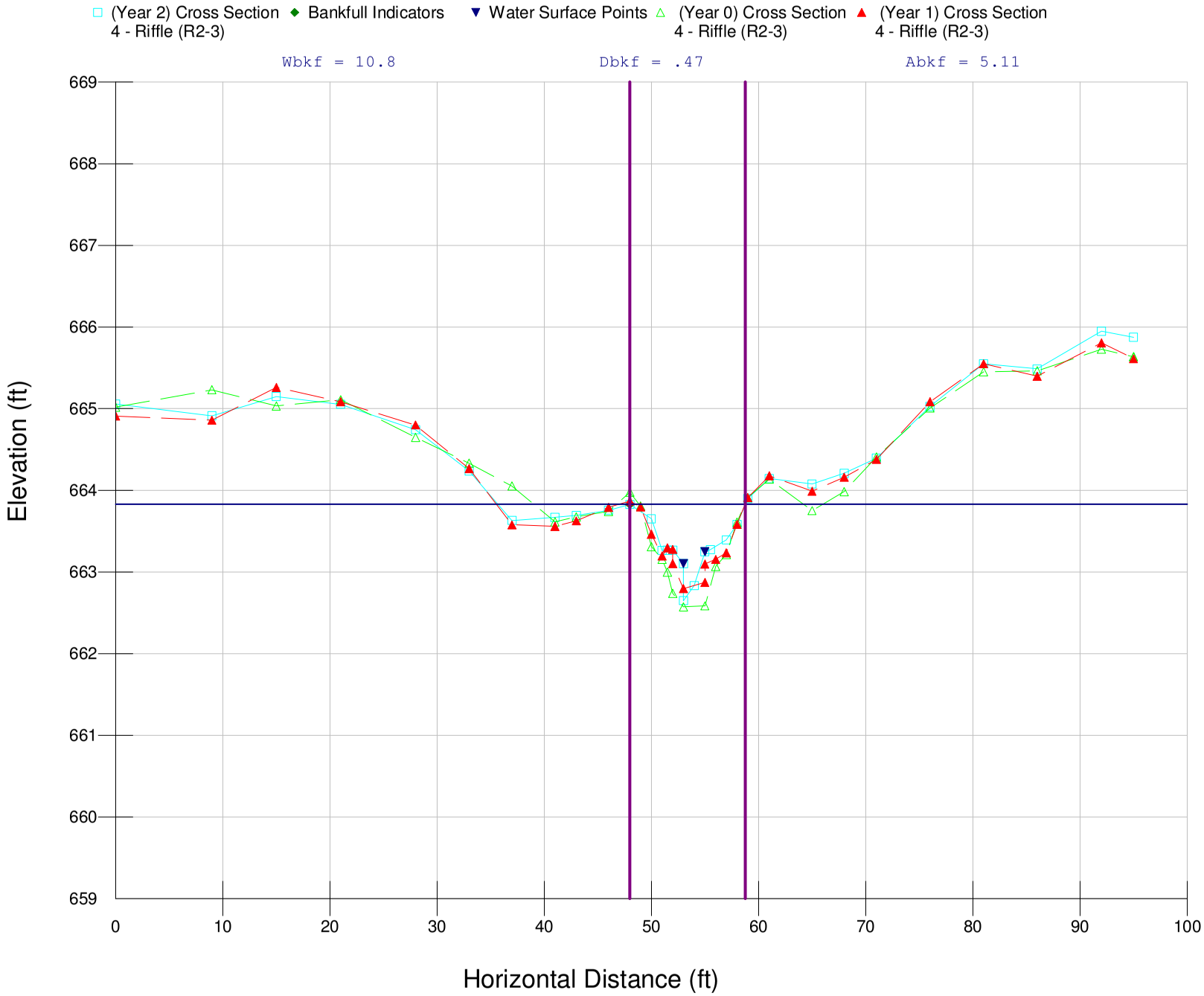
BM Elevation: 0 ft
Backsight Rod Reading: 0 ft

TAPE	FS	ELEV	NOTE
0	0	669.670749	GS
9	0	669.274552	GS
14	0	669.18316	GS
20	0	668.895864	GS
25	0	668.773526	GS
27	0	668.374376	GS
30	0	667.669279	GS
34	0	667.013451	GS
37	0	667.021137	GS
39	0	666.924621	GS
41	0	667.044198	LB
42	0	666.675859	GS
43	0	666.518337	GS
44	0	666.230162	GS
45	0	665.997117	GS
46	0	665.825713	GS
46	0	665.737644	LEW
47	0	665.490007	GS
47	0	665.337032	TW
48	0	665.462717	GS
48.5	0	665.728381	REW
49	0	666.283469	GS
50	0	666.405977	GS
51	0	666.558498	GS
52	0	666.696584	GS
53	0	666.958715	BKF
56	0	666.993953	GS
61	0	666.916145	GS
63	0	667.139987	GS
67	0	667.378547	GS
73	0	667.838243	GS
77	0	668.111695	GS
81	0	668.137386	GS
83	0	668.347595	GS
85	0	667.870148	GS
90	0	668.122755	GS

Cross Sectional Geometry

	Channel	Left	Right
Floodprone Elevation (ft)	668.58	668.58	668.58
Bankfull Elevation (ft)	666.96	666.96	666.96
Floodprone Width (ft)	64.05	-----	-----
Bankfull Width (ft)	11.75	5.02	6.73
Entrenchment Ratio	5.45	-----	-----
Mean Depth (ft)	0.73	0.66	0.79

(Year 2) Cross Section 4 - Riffle (R2-3)



RIVERMORPH CROSS SECTION SUMMARY

River Name: (Year 2) Reedy Fork Creek
Reach Name: R2-3
Cross Section Name: (Year 2) Cross Section 4 - Riffle (R2-3)
Survey Date: 10/06/2009

Cross Section Data Entry

BM Elevation: 0 ft
Backsight Rod Reading: 0 ft

TAPE	FS	ELEV	NOTE
0	0	665.056961	GS
9	0	664.912477	GS
15	0	665.14915	GS
21	0	665.053939	GS
28	0	664.743642	GS
33	0	664.238036	GS
37	0	663.630722	GS
41	0	663.668823	GS
43	0	663.693625	GS
46	0	663.756225	GS
48	0	663.826283	BKF
50	0	663.650847	GS
51	0	663.263857	GS
51.5	0	663.266079	GS
52	0	663.267963	GS
53	0	663.101922	LEW
53	0	662.649238	TW
54	0	662.834417	GS
55	0	663.248551	REW
55.5	0	663.273028	GS
57	0	663.392091	GS
58	0	663.581546	GS
59	0	663.896606	GS
61	0	664.143417	RB
65	0	664.077119	GS
68	0	664.207998	GS
71	0	664.392136	GS
76	0	665.028451	GS
81	0	665.548975	GS
86	0	665.486636	GS
92	0	665.948141	GS
95	0	665.873503	GS

Cross Sectional Geometry

	Channel	Left	Right
Floodprone Elevation (ft)	665.01	665.01	665.01
Bankfull Elevation (ft)	663.83	663.83	663.83
Floodprone Width (ft)	62.5	-----	-----
Bankfull Width (ft)	10.77	5.36	5.41
Entrenchment Ratio	5.8	-----	-----
Mean Depth (ft)	0.47	0.41	0.54
Maximum Depth (ft)	1.18	1.18	1.11
Width/Depth Ratio	22.91	13.07	10.02
Bankfull Area (sq ft)	5.11	2.18	2.94
Wetted Perimeter (ft)	11.49	7.03	6.68

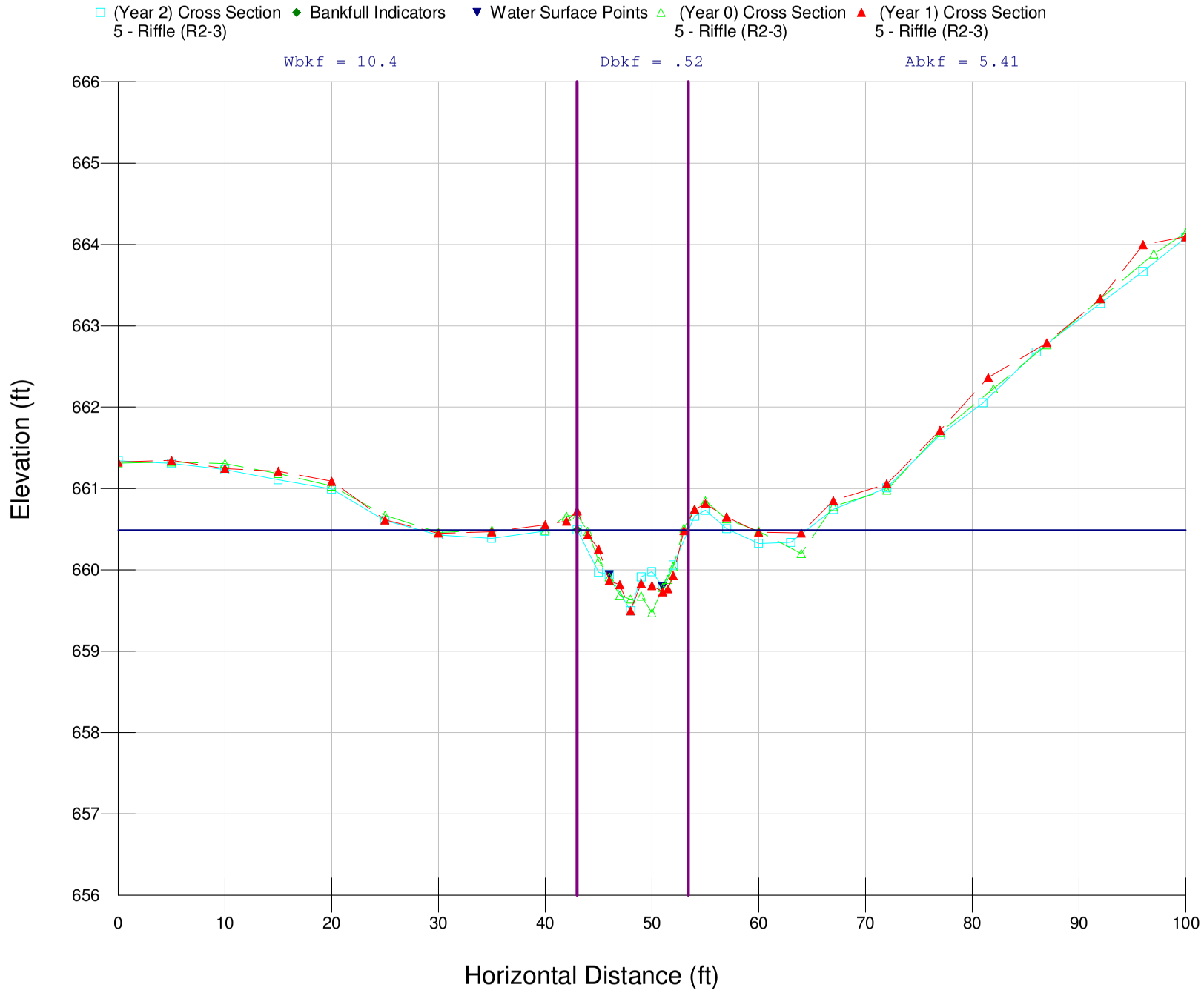
Hydraulic Radius (ft)	0.45	0.31	0.44
Begin BKF Station	48	48	53.36
End BKF Station	58.77	53.36	58.77

Entrainment Calculations

Entrainment Formula: Rosgen Modified Shields Curve

	Channel	Left Side	Right Side
Slope	0	0	0
Shear Stress (lb/sq ft)			
Movable Particle (mm)			

(Year 2) Cross Section 5 - Riffle (R2-3)



RIVERMORPH CROSS SECTION SUMMARY

River Name: (Year 2) Reedy Fork Creek
Reach Name: R2-3
Cross Section Name: (Year 2) Cross Section 5 - Riffle (R2-3)
Survey Date: 10/06/2009

Cross Section Data Entry

BM Elevation: 0 ft
Backsight Rod Reading: 0 ft

TAPE	FS	ELEV	NOTE
0	0	661.341335	GS
5	0	661.30829	GS
10	0	661.232079	GS
15	0	661.107886	GS
20	0	660.992908	GS
25	0	660.604405	GS
30	0	660.429515	GS
35	0	660.386965	GS
40	0	660.475778	GS
43	0	660.493785	BKF
45	0	659.969932	GS
46	0	659.940232	LEW
48	0	659.495826	TW
49	0	659.913571	GS
50	0	659.977319	GS
51	0	659.788861	REW
52	0	660.059247	GS
54	0	660.659232	GS
55	0	660.73315	RB
57	0	660.507482	GS
60	0	660.325652	GS
63	0	660.337139	GS
67	0	660.744111	GS
72	0	661.007186	GS
77	0	661.6581	GS
81	0	662.054492	GS
86	0	662.679251	GS
92	0	663.276254	GS
96	0	663.667327	GS
100	0	664.084096	GS

Cross Sectional Geometry

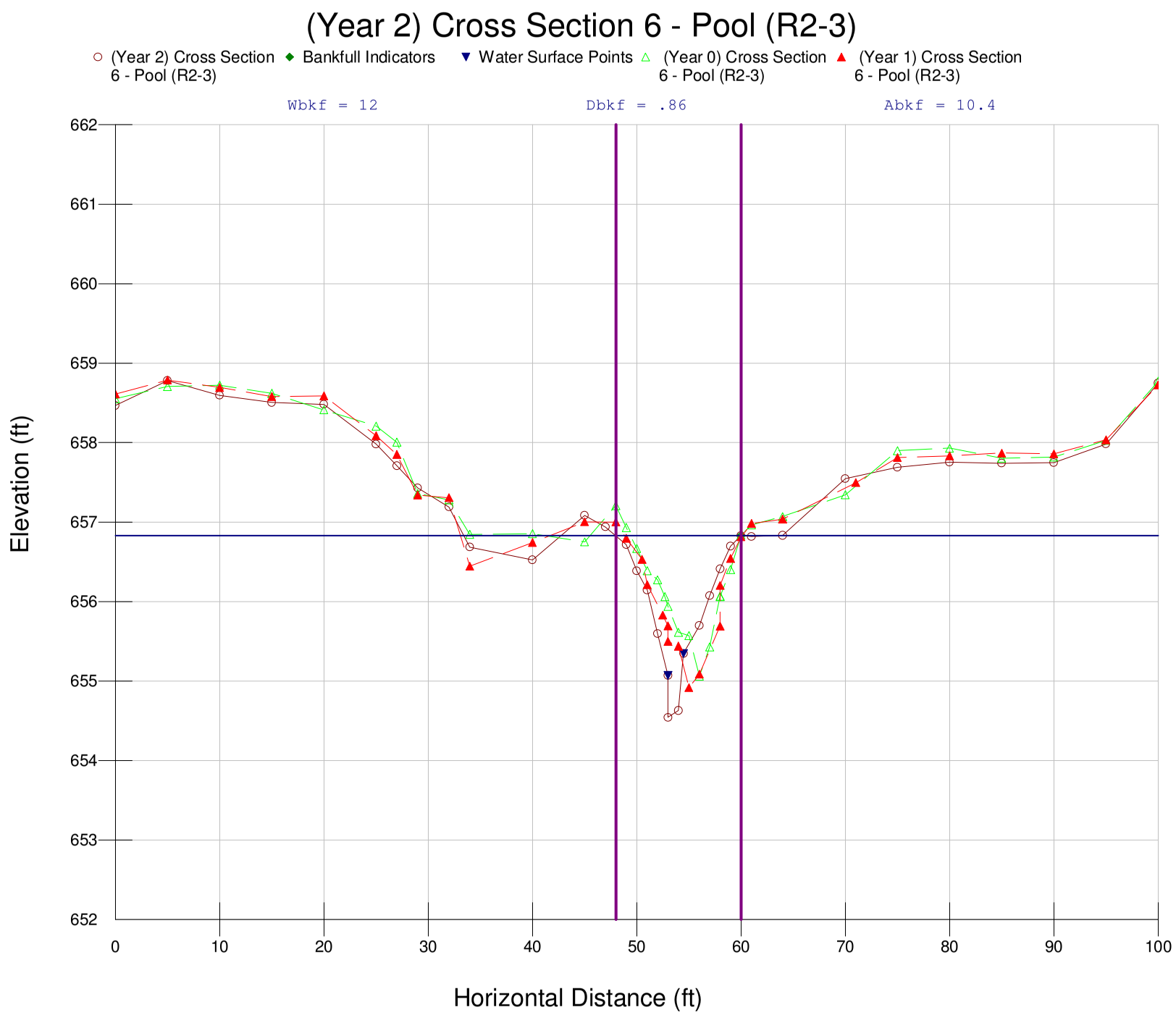
	Channel	Left	Right
Floodprone Elevation (ft)	661.48	661.48	661.48
Bankfull Elevation (ft)	660.49	660.49	660.49
Floodprone Width (ft)	75.66	-----	-----
Bankfull Width (ft)	10.41	0.96	9.45
Entrenchment Ratio	7.27	-----	-----
Mean Depth (ft)	0.52	0.13	0.56
Maximum Depth (ft)	0.99	0.25	0.99
Width/Depth Ratio	20.02	7.38	16.87
Bankfull Area (sq ft)	5.41	0.12	5.29
Wetted Perimeter (ft)	10.73	1.24	9.99
Hydraulic Radius (ft)	0.5	0.1	0.53
Begin BKF Station	43.01	43.01	43.97

End BKF Station	53.42	43.97	53.42

Entrainment Calculations

Entrainment Formula: Rosgen Modified Shields Curve

	Channel	Left Side	Right Side
Slope	0	0	0
Shear Stress (lb/sq ft)			
Movable Particle (mm)			


(Year 2) Cross Section 6 - Pool (R2-3)
(Year 2) Cross Section 6 - Pool (R2-3)
Bankfull Indicators
Water Surface Points
(Year 0) Cross Section 6 - Pool (R2-3)
(Year 1) Cross Section 6 - Pool (R2-3)
Wbkf = 12
Dbkf = .86
Abkf = 10.4
Elevation (ft)
662
661
660
659
658
657
656
655
654
653
652
0
10
20
30
40
50
60
70
80
90
100
Horizontal Distance (ft)

RIVERMORPH CROSS SECTION SUMMARY

River Name: (Year 2) Reedy Fork Creek
Reach Name: R2-3
Cross Section Name: (Year 2) Cross Section 6 - Pool (R2-3)
Survey Date: 10/06/2009

Cross Section Data Entry

BM Elevation: 0 ft
Backsight Rod Reading: 0 ft

TAPE	FS	ELEV	NOTE
0	0	658.468124	GS
5	0	658.781203	GS
10	0	658.594794	GS
15	0	658.504469	GS
20	0	658.481654	GS
25	0	657.98197	GS
27	0	657.710135	GS
29	0	657.431137	GS
32	0	657.190801	GS
34	0	656.686352	GS
40	0	656.524581	GS
45	0	657.084067	GS
47	0	656.940328	GS
49	0	656.716898	LB
50	0	656.387054	GS
51	0	656.144593	GS
52	0	655.597898	GS
53	0	655.071761	LEW
53	0	654.542795	GS
54	0	654.628949	TW
54.5	0	655.347637	REW
56	0	655.697578	GS
57	0	656.073402	GS
58	0	656.410761	GS
59	0	656.69753	GS
60	0	656.831669	BKF
61	0	656.819593	GS
64	0	656.832119	GS
70	0	657.547771	GS
75	0	657.689357	GS
80	0	657.754624	GS
85	0	657.741588	GS
90	0	657.747475	GS
95	0	657.983714	GS
100	0	658.748092	GS

Cross Sectional Geometry

	Channel	Left	Right
Floodprone Elevation (ft)	659.12	659.12	659.12
Bankfull Elevation (ft)	656.83	656.83	656.83
Floodprone Width (ft)	100	-----	-----
Bankfull Width (ft)	11.98	5.86	6.12
Entrenchment Ratio	8.35	-----	-----
Mean Depth (ft)	0.86	0.91	0.82
Maximum Depth (ft)	2.29	2.29	2.21

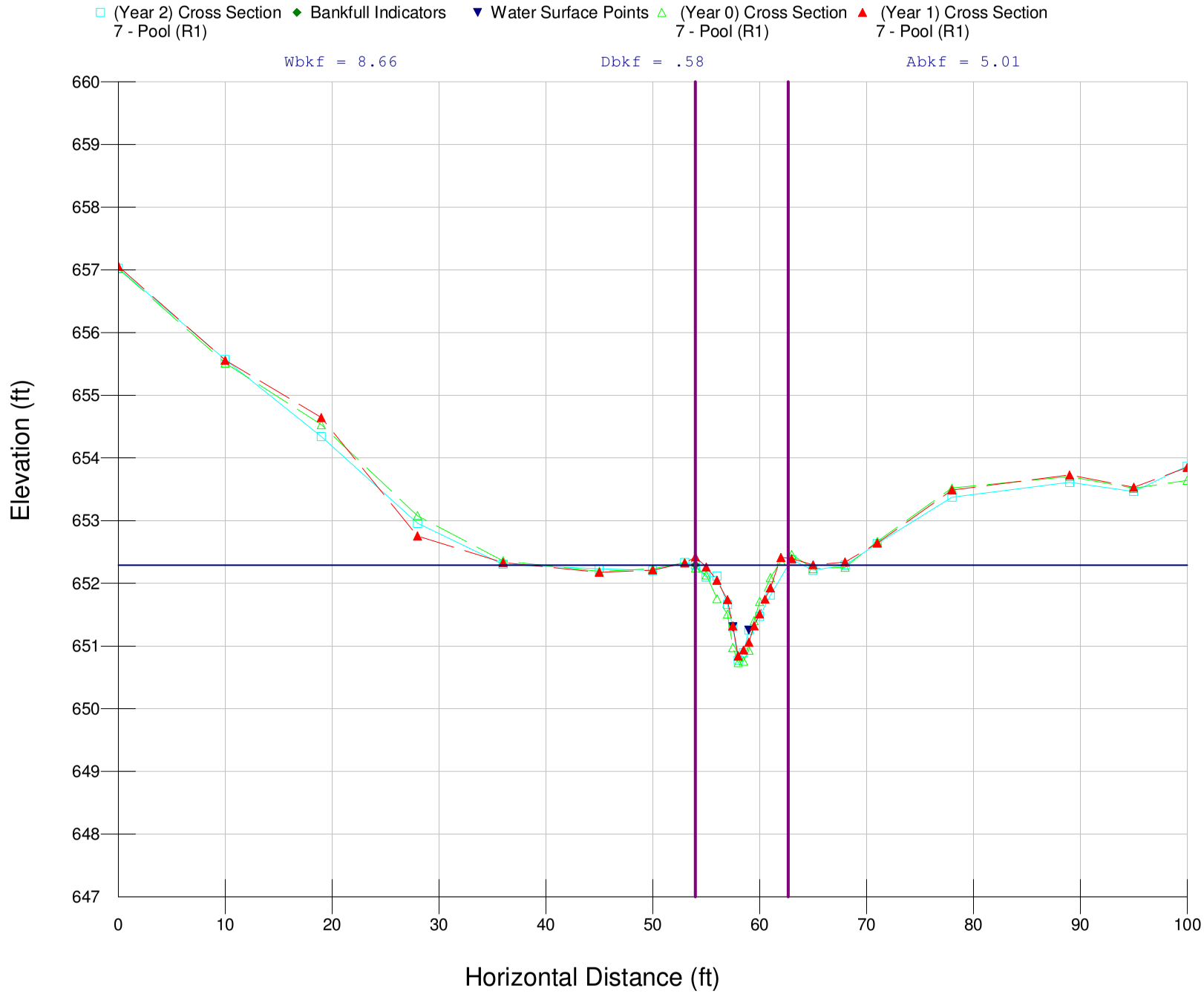
Width/Depth Ratio	13.93	6.44	7.46
Bankfull Area (sq ft)	10.35	5.31	5.04
Wetted Perimeter (ft)	13.46	8.96	8.92
Hydraulic Radius (ft)	0.77	0.59	0.57
Begin BKF Station	48.01	48.01	53.87
End BKF Station	59.99	53.87	59.99

Entrainment Calculations

Entrainment Formula: Rosgen Modified Shields Curve

	Channel	Left Side	Right Side
Slope	0	0	0
Shear Stress (lb/sq ft)			
Movable Particle (mm)			

(Year 2) Cross Section 7 - Pool (R1)



RIVERMORPH CROSS SECTION SUMMARY

River Name: (Year 2) Reedy Fork Creek
Reach Name: R1
Cross Section Name: (Year 2) Cross Section 7 - Pool (R1)
Survey Date: 10/05/2009

Cross Section Data Entry

BM Elevation: 0 ft
Backsight Rod Reading: 0 ft

TAPE	FS	ELEV	NOTE
0	0	657.028159	GS
10	0	655.569178	GS
19	0	654.343565	GS
28	0	652.959702	GS
36	0	652.304828	GS
45	0	652.231145	GS
50	0	652.205915	GS
53	0	652.334897	GS
54	0	652.29336	BKF
55	0	652.097754	GS
56	0	652.11728	GS
57	0	651.663554	GS
57.5	0	651.305858	LEW
58	0	650.774432	TW
58.5	0	650.891618	GS
59	0	651.253934	REW
60	0	651.47453	GS
61	0	651.81175	GS
63	0	652.382317	RB
65	0	652.210821	GS
68	0	652.291809	GS
71	0	652.634513	GS
78	0	653.374257	GS
89	0	653.610878	GS
95	0	653.466301	GS
100	0	653.872797	GS

Cross Sectional Geometry

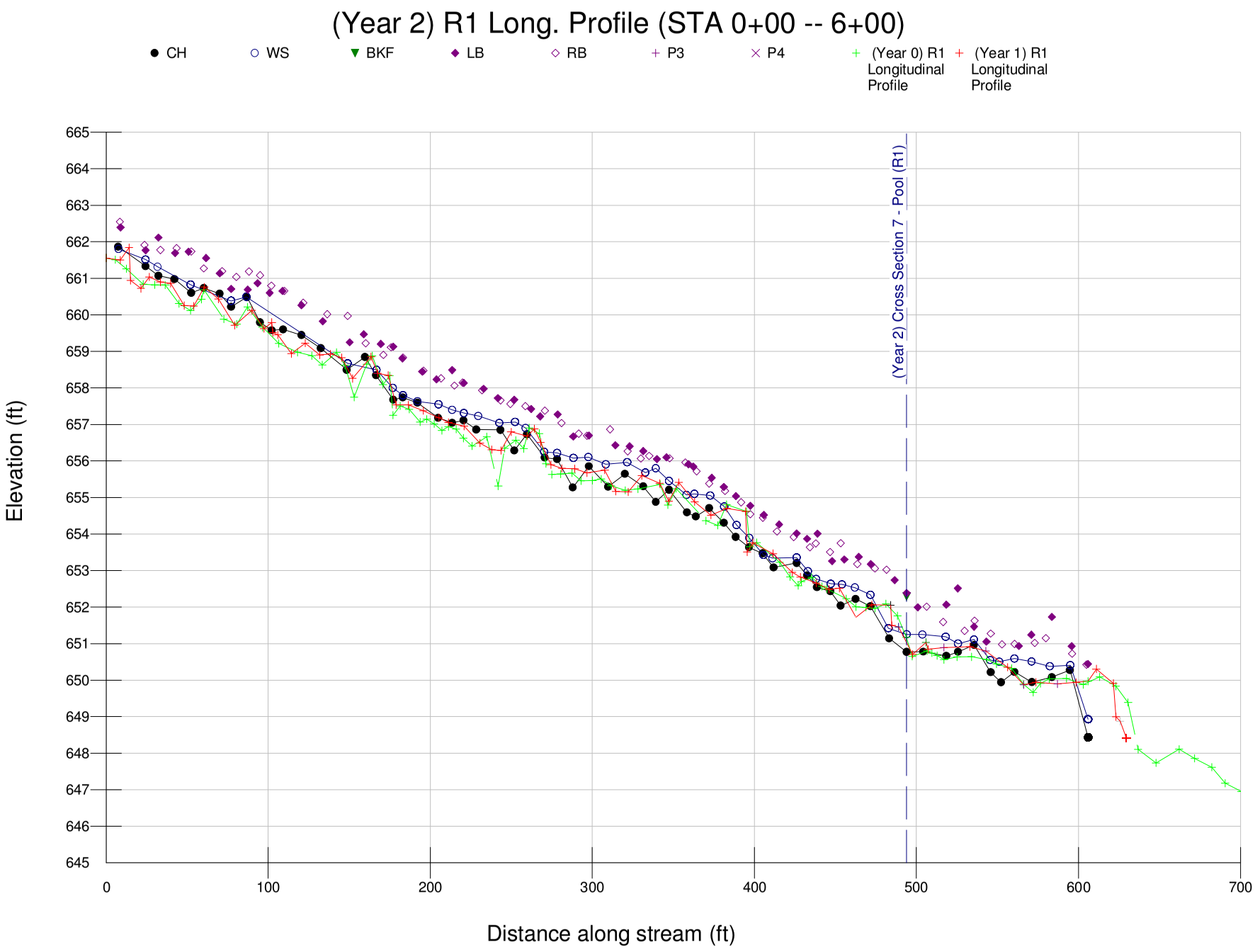
	Channel	Left	Right
Floodprone Elevation (ft)	653.81	653.81	653.81
Bankfull Elevation (ft)	652.29	652.29	652.29
Floodprone Width (ft)	76.67	-----	-----
Bankfull Width (ft)	8.66	4.1	4.56
Entrenchment Ratio	8.85	-----	-----
Mean Depth (ft)	0.58	0.46	0.69
Maximum Depth (ft)	1.52	1.52	1.49
Width/Depth Ratio	14.93	8.91	6.61
Bankfull Area (sq ft)	5.01	1.88	3.13
Wetted Perimeter (ft)	9.4	6.05	6.32
Hydraulic Radius (ft)	0.53	0.31	0.5
Begin BKF Station	54.02	54.02	58.12
End BKF Station	62.68	58.12	62.68

Entrainment Calculations

Entrainment Formula: Rosgen Modified Shields Curve

	Channel	Left Side	Right Side
Slope	0	0	0
Shear Stress (lb/sq ft)			
Movable Particle (mm)			

Longitudinal Profiles


(Year 2) R1 Long. Profile (STA 0+00 -- 6+00)
CH
WS
BKF
LB
RB
P3
P4
(Year 0) R1 Longitudinal Profile
(Year 1) R1 Longitudinal Profile
(Year 2) Cross Section 7 - Pool (R1)
Elevation (ft)
Distance along stream (ft)
665
664
663
662
661
660
659
658
657
656
655
654
653
652
651
650
649
648
647
646
645
0
100
200
300
400
500
600
700

RIVERMORPH PROFILE SUMMARY

River Name: (Year 2) Reedy Fork Creek
Reach Name: R1
Profile Name: (Year 2) R1 Long. Profile (STA 0+00 -- 6+00)
Survey Date: 10/07/2009

Survey Data

DIST	CH	WS	BKF	LB	RB	P3	P4
7.4502	661.864						
7.6442		661.803					
8.4292					662.549		
8.8592				662.394			
23.6752					661.916		
24.3372	661.335						
24.3372				661.769			
24.3782		661.51					
31.7922		661.317					
32.2652	661.07						
32.2652				662.114			
33.4652					661.777		
42.2082	660.982						
42.5922				661.695			
43.4392					661.828		
50.8792				661.73			
52.1232		660.824					
52.5082					661.735		
52.5082	660.602						
60.2112	660.735						
60.2112					661.271		
61.7122				661.556			
70.1282	660.577						
70.1282				661.137			
71.5212					661.193		
77.1062		660.382					
77.1062	660.218						
77.1062				660.707			
80.3742					661.038		
86.5442		660.496					
86.8832	660.487						
87.4012				660.69			
88.1302					661.187		
93.4032				660.868			
94.9922					661.083		
94.9922	659.797						
100.9062				660.602			
101.9222					660.797		
102.1182	659.58						
108.8602				660.653			
109.2282	659.601						
109.8932					660.658		
120.4852				660.264			
120.4852	659.445						
121.6572					660.329		
132.4862	659.087						
133.6802				659.825			
136.4312					660.017		
148.5212	658.493						
149.0792		658.672					

149.0852 659.971
150.2762 659.25
158.9692 659.469
159.8172 658.844
160.2242 659.224
166.5322 658.345
166.9012 658.491
169.4752 659.204
171.1182 658.903
175.7732 659.114
176.9752 657.997
177.1992 657.676
177.1992 659.13
182.8122 658.807
183.1252 657.737
183.1862 658.83
183.2392 657.796
192.0952 657.595
192.0952 657.632
195.0982 658.447
195.8642 658.471
203.9302 658.233
204.9272 657.179
205.1722 657.552
206.7492 658.265
213.5072 657.397
213.5072 657.044
213.5072 658.487
214.9942 658.065
220.0312 658.147
220.5692 657.111
220.7612 658.131
220.7962 657.309
228.4502 656.861
229.6872 657.232
231.9732 657.936
232.9172 657.977
241.7312 657.721
242.7362 657.04
243.3792 656.849
243.3952 657.658
249.3972 657.562
251.8192 657.675
251.8192 656.288
252.4122 657.065
258.7292 657.502
258.8892 656.902
259.7082 656.731
262.2462 657.421
267.8402 657.22
270.4112 656.245
270.6362 656.093
270.7372 657.378
278.3372 656.052
278.3372 656.22
278.6312 657.273
281.0152 657.037
287.9822 655.274
288.2102 656.669
288.4462 656.082
291.6612 656.75
296.7952 656.691
297.5882 656.105
297.8792 655.855
297.9072 656.697
308.4052 655.907

309.7542 655.294
311.0022 656.868
314.2622 656.432
320.1642 655.645
321.5422 655.963
321.8492 656.266
323.0052 656.403
329.9962 656.069
331.4152 656.272
331.4152 655.303
332.8312 655.68
335.1072 656.138
339.2082 654.881
339.2082 655.798
339.8332 656.054
345.7392 656.099
347.3812 655.211
347.4042 655.451
347.7092 656.073
357.4492 655.959
358.1412 655.07
358.4272 654.589
359.3112 655.91
362.2512 655.848
363.0562 655.097
363.8652 654.477
364.3562 655.718
372.0972 655.381
372.0972 654.711
372.8502 655.052
373.7792 655.539
381.1602 655.288
381.1602 654.308
381.4982 654.751
381.9582 655.179
388.5702 653.917
388.6192 655.038
389.0172 654.246
391.7952 654.867
396.6922 653.636
396.9182 653.888
397.4562 654.545
397.4672 654.774
405.0942 653.47
405.2102 654.444
405.6962 653.421
405.8352 654.521
411.2032 653.336
411.9582 653.082
413.9402 654.074
415.3242 654.261
424.2812 653.918
426.1512 653.208
426.1512 653.359
426.1512 654.014
432.5312 652.865
432.5312 653.869
433.0872 652.977
434.3092 653.637
437.9282 653.743
438.1492 652.772
438.6162 652.544
439.0062 654.008
446.6762 653.507
446.9102 652.432
447.2042 652.636

448.0412   653.26
453.3362 652.038
453.3362   653.749
454.0962   652.619
455.5522   653.302
462.1082   652.532
462.5012 652.223
463.5452   653.177
464.4582   653.375
471.6132   652.335
471.6132 652.021
471.8952   653.175
474.3482   653.057
481.5352   653.024
482.8102   651.419
483.2862 651.144
486.5952   652.736
494.0192 650.774 651.254 652.293 652.382
500.8362   651.993
503.7252   651.251
504.2992 650.781
506.2972   652.01
516.5142   651.594
518.0702   651.187
518.4572   652.068
518.5192 650.666
525.5532   652.511
525.7492   650.999
525.7492 650.778
529.7742   651.35
535.6022   651.462
535.6022 650.961 651.111
535.9262   651.628
543.2312   651.054
545.5302   650.551
545.8622 650.217
545.8732   651.276
551.0482   650.502
552.2512 649.939
552.7872   650.977
560.6052 650.225
560.6052   650.591
560.6052   650.989
563.2732   650.934
570.9392   651.242
571.1312   650.505
571.3182 649.947
572.9912   651.02
579.8542   651.152
582.3372   650.375
583.5472   651.731
583.5472 650.083
594.7832 650.274
595.0172   650.406
595.8672   650.93
596.1302   650.724
604.8682   650.427
605.8512   650.444
606.0452 648.433 648.928

Cross Section / Bank Profile Locations

Name	Type	Profile Station
(Year 2) Cross Section 7 - Pool (R1)	Riffle XS	494

Measurements from Graph

Bankfull Slope: 0

Variable	Min	Avg	Max
S riffle	0	0	0
S pool	0	0	0
S run	0	0	0
S glide	0	0	0
P - P	0	0	0
Pool length	0	0	0
Riffle length	0	0	0
Dmax riffle	0	0	0
Dmax pool	0	0	0
Dmax run	0	0	0
Dmax glide	0	0	0
Low bank ht	0	0	0

Length and depth measurements in feet, slopes in ft/ft.

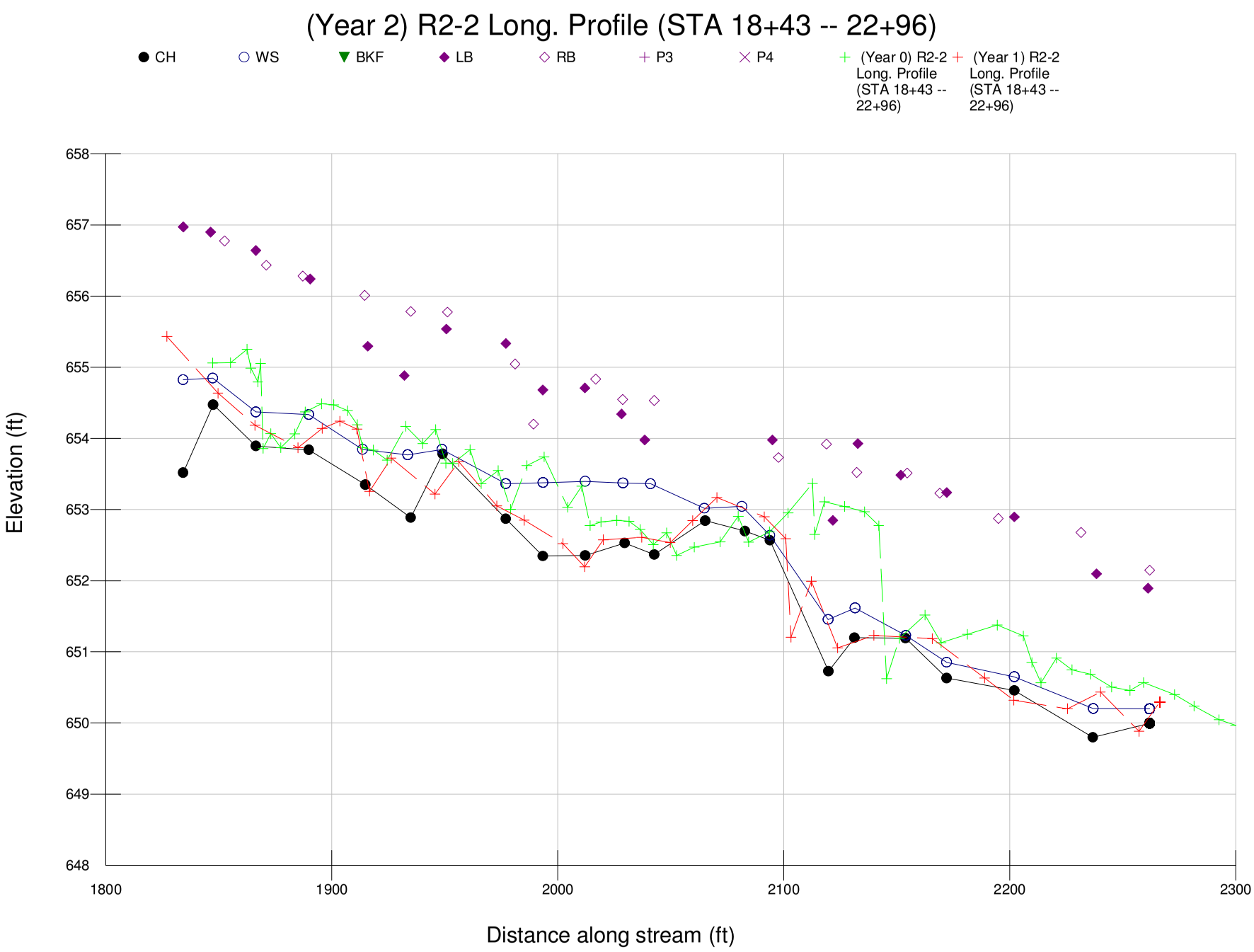
RIVERMORPH PROFILE SUMMARY

Notes

River Name: (Year 2) Reedy Fork Creek
Reach Name: R1
Profile Name: (Year 2) R1 Long. Profile (STA 0+00 -- 6+00)
Survey Date: 10/07/2009

DIST	Note
7.6442	REW
24.3782	REW
31.7922	REW
52.1232	REW
77.1062	REW
86.5442	REW
149.0792	REW
166.9012	REW
176.9752	REW
183.2392	REW
192.0952	REW
205.1722	REW
213.5072	REW
220.7962	REW
229.6872	REW
242.7362	REW
252.4122	REW
258.8892	REW
270.4112	REW
278.3372	REW
288.4462	REW
297.5882	REW
308.4052	REW
321.5422	REW
332.8312	REW
339.2082	REW
347.4042	REW
358.1412	REW
363.0562	REW
372.8502	REW
381.4982	REW
389.0172	REW

396.9182 REW
405.6962 REW
411.2032 REW
426.1512 REW
433.0872 REW
438.1492 REW
447.2042 REW
454.0962 REW
462.1082 REW
471.6132 REW
482.8102 REW
494.0192 XS7 - TW Intersect @ station 494
503.7252 REW
518.0702 REW
525.7492 REW
545.5302 REW
551.0482 REW
560.6052 REW
571.1312 REW
582.3372 REW
595.0172 REW


(Year 2) R2-2 Long. Profile (STA 18+43 -- 22+96)
CH
WS
BKF
LB
RB
P3
P4
(Year 0) R2-2 Long. Profile (STA 18+43 -- 22+96)
(Year 1) R2-2 Long. Profile (STA 18+43 -- 22+96)
Elevation (ft)
658
657
656
655
654
653
652
651
650
649
648
1800
1900
2000
2100
2200
2300
Distance along stream (ft)

RIVERMORPH PROFILE SUMMARY

River Name: (Year 2) Reedy Fork Creek
Reach Name: R2-2
Profile Name: (Year 2) R2-2 Long. Profile (STA 18+43 -- 22+96)
Survey Date: 10/06/2009

Survey Data

DIST	CH	WS	BKF	LB	RB	P3	P4
1834.28541	653.518						
1834.28541				656.973			
1834.28541		654.825					
1834.38741					656.969		
1846.45941				656.899			
1847.39641		654.847					
1847.55941	654.474						
1852.59541					656.775		
1866.44741				656.642			
1866.44741		654.371					
1866.44741	653.893						
1871.03341					656.434		
1887.25141					656.282		
1889.90941	653.838						
1889.90941		654.334					
1890.43141				656.24			
1913.68741		653.844					
1914.62541					656.009		
1914.92141	653.349						
1915.97441				655.295			
1932.15441				654.884			
1933.64641		653.769					
1934.99641					655.784		
1934.99641	652.886						
1948.81341		653.844					
1949.10541	653.782						
1950.76441				655.537			
1951.21541					655.775		
1977.04441	652.87						
1977.04441				655.334			
1977.04441		653.363					
1981.12041					655.045		
1989.32341					654.2		
1993.46341				654.68			
1993.46341	652.347						
1993.51241		653.379					
2012.01141				654.709			
2012.16841		653.397					
2012.17441	652.354						
2016.84541					654.834		
2028.24141				654.343			
2028.76441					654.547		
2028.93741		653.373					
2029.63941	652.529						
2038.54541				653.978			
2041.10141		653.361					
2042.75541	652.367						
2042.75541					654.534		
2064.89641		653.018					
2065.24341	652.844						

2081.55741 653.044
2082.86341652.696
2093.91341652.567 652.637
2094.98341 653.977
2097.67941 653.732
2118.93741 653.92
2119.66441 651.455
2119.80241650.727
2121.73241 652.849
2131.34141651.198
2131.58341 651.616
2132.34541 653.522
2132.83841 653.927
2151.77641 653.483
2153.91341651.191
2154.05441 651.231
2154.62141 653.513
2169.04041 653.23
2172.13741 650.853
2172.13741 653.238
2172.13741650.631
2194.93041 652.874
2202.03641 650.648
2202.03641650.457
2202.03641 652.897
2231.51741 652.678
2236.79941649.797
2236.99341 650.203
2238.44341 652.096
2261.15341 651.894
2261.92841 652.147
2261.92841649.993 650.199

Cross Section / Bank Profile Locations

Name	Type	Profile Station

Measurements from Graph

Bankfull Slope: 0.01115

Variable	Min	Avg	Max
S riffle	0.01776	0.02769	0.04611
S pool	0	0	0
S run	0	0	0
S glide	0	0	0
P - P	89.05	101	117.17
Pool length	13.59	29.18	60.93
Riffle length	10.78	17.81	22.97
Dmax riffle	0	0	0
Dmax pool	0	0	0
Dmax run	0	0	0
Dmax glide	0	0	0
Low bank ht	0	0	0

Length and depth measurements in feet, slopes in ft/ft.

RIVERMORPH PROFILE SUMMARY

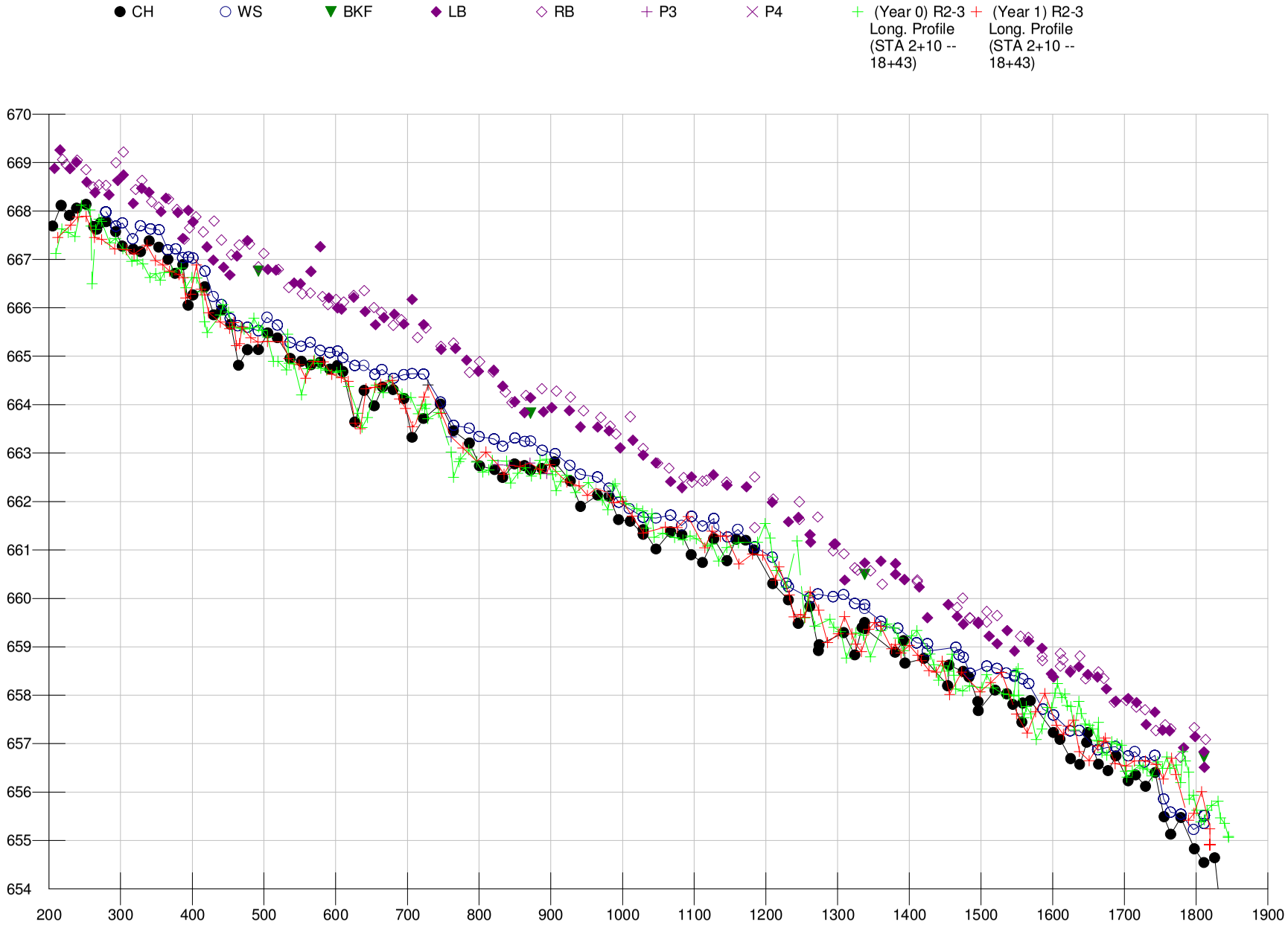
Notes

River Name: (Year 2) Reedy Fork Creek

Reach Name: R2-2
Profile Name: (Year 2) R2-2 Long. Profile (STA 18+43 -- 22+96)
Survey Date: 10/06/2009

DIST	Note
1834.28541	REW
1847.39641	REW
1866.44741	REW
1889.90941	REW
1913.68741	REW
1933.64641	REW
1948.81341	REW
1977.04441	REW
1993.51241	REW
2012.16841	REW
2028.93741	REW
2041.10141	REW
2064.89641	REW
2081.55741	REW
2119.66441	REW
2131.58341	REW
2154.05441	REW
2172.13741	REW
2202.03641	REW
2236.99341	REW

(Year 2) R2-3 Long. Profile (STA 2+10 -- 18+43)



RIVERMORPH PROFILE SUMMARY

River Name: (Year 2) Reedy Fork Creek
Reach Name: R2-3
Profile Name: (Year 2) R2-3 Long. Profile (STA 2+10 -- 18+43)
Survey Date: 10/06/2009

Survey Data

DIST	CH	WS	BKF	LB	RB	P3	P4
205.3934	667.687						
207.8094				668.88			
215.7864				669.259			
217.2464	668.115						
218.9704					669.063		
224.2874					668.96		
229.0554	667.91						
229.5774				668.876			
238.3514				669.008			
238.7274	668.056						
239.7164					669.053		
251.7724					668.856		
252.0424	668.137						
252.7864				668.598			
262.1254					668.493		
262.5824	667.678						
264.2244				668.382			
266.9104	667.619						
270.0164					668.54		
272.3114	667.755						
279.7834		667.981					
279.7834	667.777						
279.7834					668.532		
283.6724				668.334			
293.2914	667.573						
293.5774		667.685					
293.6244					668.999		
296.0754				668.63			
302.5124	667.275						
302.5574		667.753					
303.9444					669.221		
304.1074				668.748			
316.9214		667.424					
317.7514	667.209						
317.7514				668.157			
321.0194					668.445		
327.7504		667.696					
328.0834	667.163						
329.3154				668.471			
329.8304					668.637		
339.8024				668.389			

340.1014	667.383			
341.8354		667.63		
343.2864				668.195
353.4324				668.082
353.4324	667.253			
353.8974		667.614		
356.5304			667.987	
363.3544			668.267	
365.9114		667.198		
366.2764	667.001			
366.8404				668.248
376.2274	666.712			
377.1884		667.216		
378.6424				668.031
379.8614			667.97	
386.6414		667.033		
386.7574			667.436	
386.9714	666.891			
389.0814				667.417
394.3064			668.014	
394.3064	666.052			
394.9914		667.05		
396.4084				667.65
400.9624	666.265			
400.9624		667.028		
400.9624			667.775	
405.1474				667.881
415.4214				667.568
417.6924	666.433			
417.9124		666.755		
420.3754			667.26	
429.3924		666.236		
429.4744			666.988	
430.1104	665.855			
430.5194				667.793
440.6874				667.4
440.8334		666.067		
441.0574	665.957			
443.7314			666.837	
452.3834			666.678	
452.8884		665.781		
453.5424	665.659			
454.5224				667.097
462.4674			667.073	
463.6154		665.63		
464.5914	664.813			
465.5164				667.298
477.0644			667.388	
477.0644		665.6		
477.0644	665.134			
480.0274				667.317
492.2874	665.137	665.528	666.759	666.844
499.8714				667.123
504.2884		665.803		
505.3324			666.796	
505.3324	665.481			
516.7794			666.778	

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518.8454          665.642
518.8454  665.38
520.2534                                  666.796
534.6724                                  666.424
536.5324          665.285
536.5544  664.954
542.1054                        666.514
550.9374                        666.498
551.8714          665.206
552.3314  664.895
553.6154                                  666.29
564.6774                                  666.307
564.7904          665.286
565.6634                        666.75
565.6634  664.822
578.5314          665.121
578.6164                        667.265
578.6164  664.875
581.6744                                  666.233
589.2994                                  666.069
590.5004                        666.206
592.2124  664.734
592.2124          665.075
600.5914                                  666.172
602.4564                        665.998
602.4564  664.802
602.8344          665.108
608.0294                        665.975
610.1554  664.681
610.2354          664.969
611.3134                                  666.121
625.1904                                  666.258
625.2134                        666.217
626.8324  663.642
626.8324          664.806
639.4824          664.809
639.7204  664.295
639.9024                                  666.356
641.0344                        665.924
653.3444                                  666.007
653.8794  663.973
654.5664          664.62
655.4934                        665.652
663.9534                                  665.907
664.6634          664.725
665.4744  664.363
667.1934                        665.799
680.2814  664.31
680.2814                                  665.639
680.6574          664.544
681.9444                        665.871
691.6864                                  665.756
695.1254          664.617
695.1654                        665.665
695.1654  664.125
706.5344          664.642
706.5344  663.324
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706.5344                          666.175
714.2034                                  665.388
722.7584  663.713
722.7584                          665.656
722.7584          664.63
725.8224                                  665.588
746.0674  664.011
746.3294          664.052
746.8224                                  665.208
747.1554                          665.144
764.2584  663.461
764.2584                                  665.27
764.6434          663.573
767.2454                          665.162
782.6054                          664.92
786.4474          663.514
786.7484  663.206
786.9084                                  664.668
799.2174                          664.69
800.2384          663.341
800.9074                                  664.89
800.9074  662.735
819.7324                                  664.678
820.4364                          664.709
821.0934          663.29
821.9044  662.656
833.1334  662.495
833.1334          663.137
833.1334                          664.382
836.5984                                  664.261
845.8774                                  664.042
849.6074                          664.06
849.6074  662.777
849.9224          663.311
863.3314                          663.837
863.3314  662.738
863.7294          663.24
865.6014                                  664.193
871.8774  662.649 663.249 663.826 664.143
887.6064                                  664.33
887.6064  662.683
888.0794          663.055
889.7124                          663.852
901.2654                          663.94
905.3784  662.821
906.3054          662.988
907.6974                                  664.28
925.9694                          663.876
926.6374          662.745
927.4404  662.422
927.4404                                  664.156
941.0934          662.561
941.3274                          663.543
941.6014  661.897
945.6584                                  663.873
965.3034                          663.537
965.3034  662.129
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965.3034          662.504
969.8534                                  663.738
981.3704                         663.461
981.3704          662.273
981.3704  662.107
982.9754                                  663.559
990.8514                                  663.394
994.5824  661.625
995.0404          661.984
996.8274                         663.108
1009.6424         661.854
1010.8144 661.595
1010.8144                                 663.753
1014.7014                        663.267
1028.8664                                 663.096
1028.8664 661.32
1029.0024 661.419
1029.0024                        662.959
1029.0804         661.674
1046.6654                        662.802
1046.7444         661.656
1046.9014 661.017
1048.9884                                 662.793
1064.9674                                 662.689
1067.2524                        662.413
1067.2524 661.374
1067.2524         661.717
1082.4584         661.504
1082.9084 661.311
1082.9084                        662.286
1085.5124                                 662.497
1095.9314 660.899
1096.2904                        662.511
1096.4274         661.693
1096.9524                                 662.397
1111.7664 660.739
1111.7664         661.49
1111.7664                                 662.42
1117.0114                                 662.439
1126.8884                        662.551
1127.4064 661.23
1127.5484         661.647
1127.5734         661.464
1145.2824                                 662.402
1145.8134 660.777
1145.8654                        662.338
1146.9334         661.264
1158.5184 661.22
1160.9414         661.423
1171.9594 661.2
1172.9324                        662.301
1183.6354 660.995
1184.4034                                 662.508
1184.4044         661.062
1184.5424                                 661.461
1208.9134                        661.986
1209.1014         660.85
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1209.7544 660.305
1210.3614                                   662.055
1228.4324         660.308
1231.4484 659.966
1231.4484                           661.582
1231.5834         660.24
1245.3364 659.483
1245.3364                           661.672
1246.5964                                   661.995
1246.6404                                   661.63
1261.4054 659.832
1261.4554         660.009
1261.6874                           661.315
1262.5024                           661.161
1272.2714                                   661.68
1272.5314         660.089
1273.4234 658.919
1274.5014 659.04
1293.7344                                   660.979
1293.7344         660.034
1295.0164                           661.118
1296.7914                           661.126
1308.5354         660.077
1308.7054 659.29
1308.8334                                   660.918
1310.0544                           660.376
1323.9284         659.893
1323.9284 658.83
1323.9284                                   660.627
1327.9134                                   660.584
1334.3264 659.393
1337.7774         659.867
1337.7774 659.496 659.789 660.494 660.733
1337.8984 659.375
1346.0924                                   660.57
1360.4334         659.526
1360.4334                           660.77
1360.8254         659.424
1362.2354                                   660.293
1380.4244 658.884
1380.8054                           660.499
1380.8054                           660.715
1384.1864         659.382
1392.2234 659.125
1393.2854                                   660.391
1393.4134                           660.387
1394.1664 658.66
1410.3314         659.081
1411.2064                                   660.342
1411.2484                                   660.379
1413.9274                           660.233
1420.5844 658.758
1425.3944         659.061
1425.3944                           659.599
1425.3944         658.91
1453.5934 658.193
1454.2524                           659.871
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1465.1924         658.989
1466.6244                           659.813
1466.7374                   659.627
1469.7084         658.831
1474.5274                           660.006
1475.2154 658.487
1475.4044                   659.468
1475.5744         658.782
1483.3904 658.372
1484.3244                           659.6
1484.8734                           659.588
1484.8734         658.45
1495.9284 657.869
1496.3164                   659.48
1496.4544 657.68
1496.4544                   659.506
1508.1704         658.6
1508.1704                           659.51
1508.1704                           659.729
1511.3604                   659.218
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1522.5634                           659.645
1522.5634                   659.062
1535.4554         658.456
1535.9224 658.025
1536.5514                   659.335
1536.5514                           659.335
1544.4544 657.807
1546.6434         658.39
1546.6434                   658.912
1547.2484         658.413
1555.2854                           659.216
1557.0444 657.442
1558.1524         658.337
1558.1524 657.834
1565.9774                           659.196
1566.7364                   659.115
1566.7364         658.238
1568.9974 657.887
1585.0294                   658.969
1585.2874                           658.808
1585.7124                           658.714
1586.5414         657.712
1598.1144                   658.441
1601.2614 657.228
1601.2644                   658.373
1601.2644         657.59
1610.2664 657.087
1610.6714                           658.86
1610.6874                           658.6
1614.1074                           658.733
1624.4304                   658.479
1624.4624         657.26
1625.0334 656.689
1625.0924                           658.513
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1636.5044                          658.588
1636.9764         657.267
1637.6774 656.57
1638.0464                                  658.81
1645.9724                                  658.335
1647.5874 657.024
1648.9574                          658.428
1648.9574 657.226
1662.3014                          658.376
1662.7764         656.87
1664.0224 656.575
1664.0224                                  658.478
1671.5424                                  658.345
1674.8434                          658.13
1674.9114         656.913
1677.1954 656.439
1685.8954                                  657.853
1687.6814         656.94
1688.0154                          657.878
1688.1394 656.744
1702.3984                                  657.895
1705.2914                          657.928
1705.3324         656.744
1705.3324 656.23
1714.5004         656.834
1715.5974 656.349
1716.7674                                  657.753
1717.1314                          657.848
1727.7274         656.618
1728.6214                                  657.701
1729.6544 656.116
1730.3894                          657.395
1742.5574                          657.649
1742.5844         656.757
1743.0134 656.401
1744.0844                                  657.268
1753.1904                          657.277
1754.7754         655.854
1755.3844 655.488
1756.9584                                  657.389
1763.2354                          657.26
1764.3974         655.582
1764.6364 655.127
1764.6604                                  657.307
1778.0834                                  656.718
1778.8424 655.472
1778.8424         655.54
1782.6854                          656.914
1796.5504         655.225
1797.4334                                  657.331
1797.6024 654.825
1798.4864                          657.144
1810.9174 654.543 655.348 656.717 656.832
1811.4784                          656.511
1811.4784         655.512
1813.1554                                  657.083
1825.9264 654.64
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1834.2854 653.518

Cross Section / Bank Profile Locations

Name	Type	Profile Station
(Year 2) Cross Section 3 - Pool (R2-3)	Riffle XS	492
(Year 2) Cross Section 4 - Riffle (R2-3)	Riffle XS	872
(Year 2) Cross Section 5 - Riffle (R2-3)	Riffle XS	1337
(Year 2) Cross Section 6 - Pool (R2-3)	Riffle XS	1810

Measurements from Graph

Bankfull Slope: 0

Variable	Min	Avg	Max
S riffle	0	0	0
S pool	0	0	0
S run	0	0	0
S glide	0	0	0
P - P	0	0	0
Pool length	0	0	0
Riffle length	0	0	0
Dmax riffle	0	0	0
Dmax pool	0	0	0
Dmax run	0	0	0
Dmax glide	0	0	0
Low bank ht	0	0	0

Length and depth measurements in feet, slopes in ft/ft.

RIVERMORPH PROFILE SUMMARY

Notes

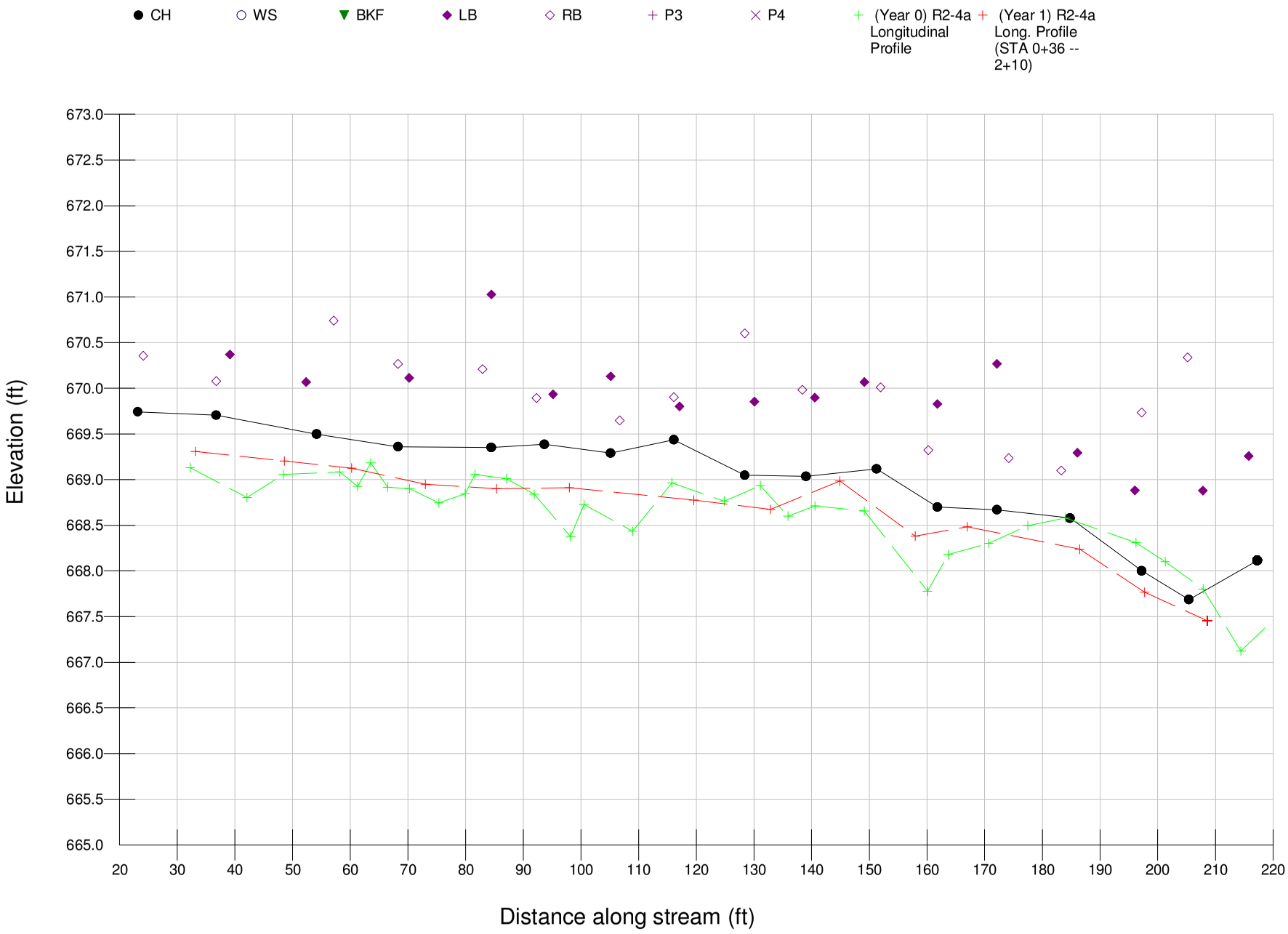
River Name: (Year 2) Reedy Fork Creek
Reach Name: R2-3
Profile Name: (Year 2) R2-3 Long. Profile (STA 2+10 -- 18+43)
Survey Date: 10/06/2009

DIST	Note
279.7834	REW
293.5774	REW
302.5574	REW
316.9214	REW
327.7504	REW
341.8354	REW
353.8974	REW
365.9114	REW
377.1884	REW
386.6414	REW
394.9914	REW
400.9624	REW
417.9124	REW
429.3924	REW
440.8334	REW
452.8884	REW
463.6154	REW
477.0644	REW
492.2874	XS3 - TW Intersect @ station 492
504.2884	REW
518.8454	REW
536.5324	REW
551.8714	REW
564.7904	REW
578.5314	REW
592.2124	REW
602.8344	REW
610.2354	REW
626.8324	REW
639.4824	REW
654.5664	REW
664.6634	REW
680.6574	REW
695.1254	REW
706.5344	REW
722.7584	REW
746.3294	REW
764.6434	REW
786.4474	REW
800.2384	REW
821.0934	REW
833.1334	REW
849.9224	REW

```
863.7294   REW
871.8774   XS4 - TW Intersect @ station 872
888.0794   REW
906.3054   REW
926.6374   REW
941.0934   REW
965.3034   REW
981.3704   REW
995.0404   REW
1009.6424  REW
1029.0804  REW
1046.7444  REW
1067.2524  REW
1082.4584  REW
1096.4274  REW
1111.7664  REW
1127.5484  REW
1127.5734  REW
1146.9334  REW
1160.9414  REW
1184.4044  REW
1209.1014  REW
1228.4324  REW
1231.5834  REW
1261.4554  REW
1272.5314  REW
1293.7344  REW
1308.5354  REW
1323.9284  REW
1337.7774  REW
1337.7774  XS5 - TW Intersect @ station 1337
1360.4334  REW
1360.8254  REW
1384.1864  REW
1410.3314  REW
1425.3944  REW
1425.3944  REW
1465.1924  REW
1469.7084  REW
1475.5744  REW
1484.8734  REW
1508.1704  REW
1522.5634  REW
1535.4554  REW
1546.6434  REW
1547.2484  REW
1558.1524  REW
1566.7364  REW
1586.5414  REW
1601.2644  REW
1624.4624  REW
1636.9764  REW
1662.7764  REW
1674.9114  REW
1687.6814  REW
1705.3324  REW
1714.5004  REW
```

1727.7274 REW
1742.5844 REW
1754.7754 REW
1764.3974 REW
1778.8424 REW
1796.5504 REW
1810.9174 XS6 - TW Intersect @ station 1810
1811.4784 REW

(Year 2) R2-4a Longitudinal Profile (STA 0+36 -- 2+10)



RIVERMORPH PROFILE SUMMARY

River Name: (Year 2) Reedy Fork Creek
Reach Name: R2-4a
Profile Name: (Year 2) R2-4a Longitudinal Profile (0+36 -- 2+10
Survey Date: 10/05/2009

Survey Data

DIST	CH	WS	BKF	LB	RB	P3	P4
23.1464	669.743						
24.1134					670.355		
36.7654	669.706						
36.7654					670.079		
39.1424				670.37			
52.3664				670.067			
54.1804	669.499						
57.1504					670.74		
68.2904	669.361						
68.2904					670.268		
70.2054				670.113			
82.9194					670.209		
84.4534				671.027			
84.4534	669.353						
92.2794					669.894		
93.6644	669.386						
95.1644				669.935			
105.1354				670.132			
105.1354	669.29						
106.6884					669.649		
116.0844	669.436						
116.0844					669.903		
117.0714				669.802			
128.3904	669.048						
128.3904					670.603		
130.0724				669.854			
138.3554					669.984		
139.0134	669.036						
140.5324				669.898			
149.1304				670.067			
151.2554	669.118						
151.9534					670.01		
160.2164					669.323		
161.7874	668.7						
161.7874				669.827			
172.1034	668.669						
172.1034				670.269			
174.1684					669.235		
183.2434					669.099		
184.7814	668.579						
186.0714				669.293			
196.0404				668.883			
197.2124	668.002						
197.2124					669.736		
205.1744					670.338		
205.3934	667.687						
207.8094				668.88			
215.7864				669.259			
217.2464	668.115						

Cross Section / Bank Profile Locations

Name	Type	Profile Station

Measurements from Graph

Bankfull Slope: 0

Variable	Min	Avg	Max
S riffle	0	0	0
S pool	0	0	0
S run	0	0	0
S glide	0	0	0
P - P	0	0	0
Pool length	0	0	0
Riffle length	0	0	0
Dmax riffle	0	0	0
Dmax pool	0	0	0
Dmax run	0	0	0
Dmax glide	0	0	0
Low bank ht	0	0	0

Length and depth measurements in feet, slopes in ft/ft.

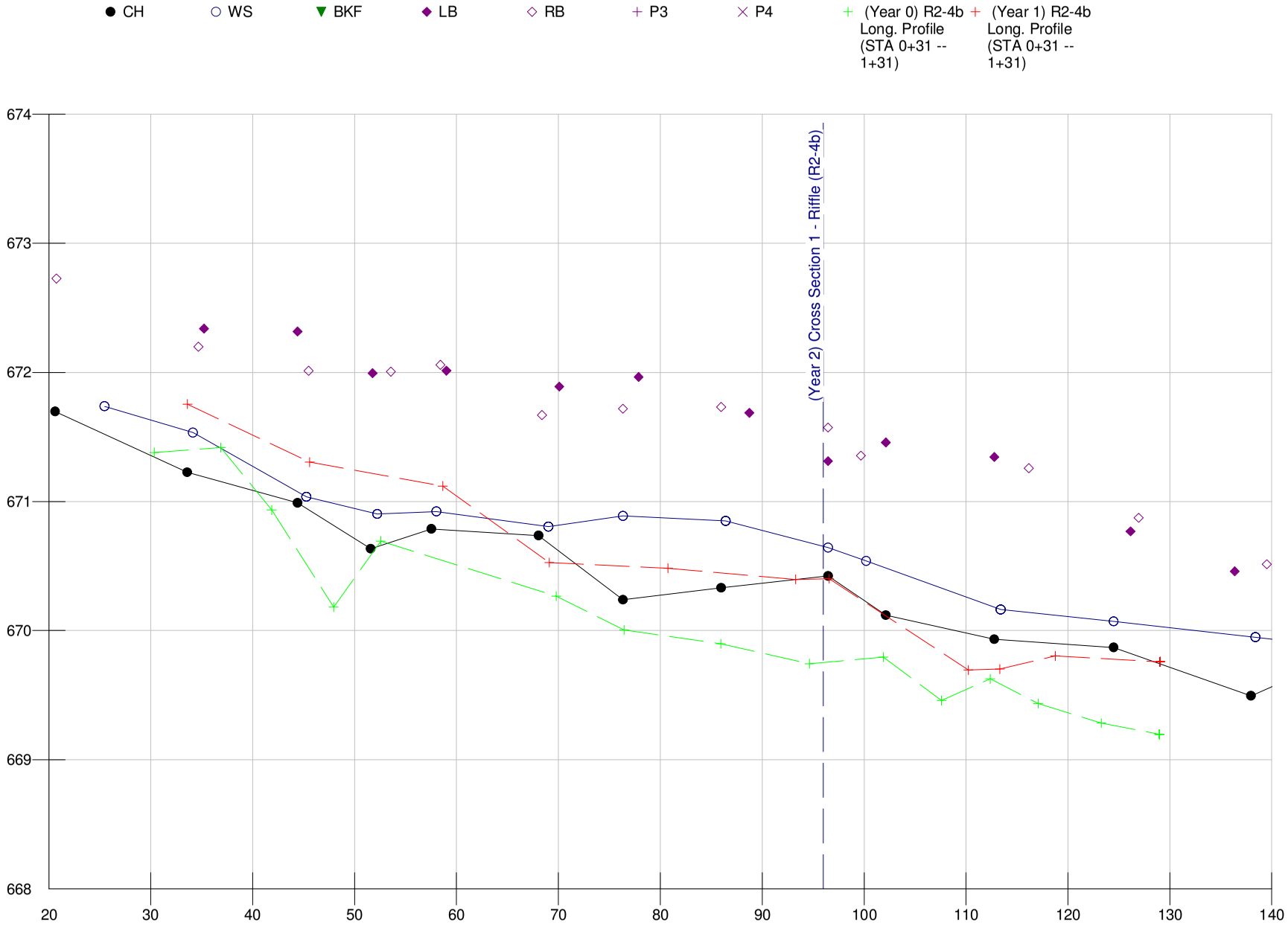
RIVERMORPH PROFILE SUMMARY

Notes

River Name: (Year 2) Reedy Fork Creek
Reach Name: R2-4a
Profile Name: (Year 2) R2-4a Longitudinal Profile (0+36 -- 2+10
Survey Date: 10/05/2009

DIST	Note

(Year 2) R2-4b Longitudinal Profile (0+31 -- 1+31)



RIVERMORPH PROFILE SUMMARY

River Name: (Year 2) Reedy Fork Creek
Reach Name: R2-4b
Profile Name: (Year 2) R2-4b Longitudinal Profile
Survey Date: 10/05/2009

Survey Data

DIST	CH	WS	BKF	LB	RB	P3	P4
20.6274	671.697						
20.7464					672.728		
25.4604		671.737					
33.5854	671.227						
34.1444		671.533					
34.6854					672.2		
35.2354				672.34			
44.4084	670.99						
44.4084				672.317			
45.2884		671.036					
45.4814					672.012		
51.5804	670.635						
51.7694				671.995			
52.2294		670.903					
53.5664					672.006		
57.5324	670.788						
58.0364		670.923					
58.4164					672.058		
59.0254				672.013			
68.0494	670.737						
68.3864					671.669		
69.0414		670.806					
70.0914				671.891			
76.3404	670.239						
76.3404		670.888					
76.3404					671.719		
77.8784				671.965			
85.9794	670.332						
85.9794					671.732		
86.4204		670.85					
88.7404				671.687			
96.4664	670.424	670.643		671.313	671.574		
99.6954					671.355		
100.2074		670.54					
102.1354				671.457			
102.1354	670.12						
112.7704				671.345			
112.7704	669.933						
113.4124		670.163					
116.1704					671.259		
124.4954	669.87						
124.4954		670.071					
126.1344				670.768			
126.9334					670.873		
136.3714				670.46			
137.9644	669.495						
138.4124		669.949					
139.5234					670.514		
142.5504	669.656						
142.9794		669.907					

144.5374 670.098
145.7104 670.301
155.7074 669.899
155.7824 670.005
155.7824 669.904
155.7824 669.118

Cross Section / Bank Profile Locations

Name	Type	Profile Station
(Year 2) Cross Section 1 - Riffle (R2-4b)	Riffle XS	96

Measurements from Graph

Bankfull Slope: 0.01447

Variable	Min	Avg	Max
S riffle	0.01064	0.01721	0.02665
S pool	0	0	0
S run	0	0	0
S glide	0	0	0
P - P	24.71	44.75	61.9
Pool length	7.77	9.76	12.99
Riffle length	3.06	7.6	10.44
Dmax riffle	0	0	0
Dmax pool	0	0	0
Dmax run	0	0	0
Dmax glide	0	0	0
Low bank ht	0	0	0

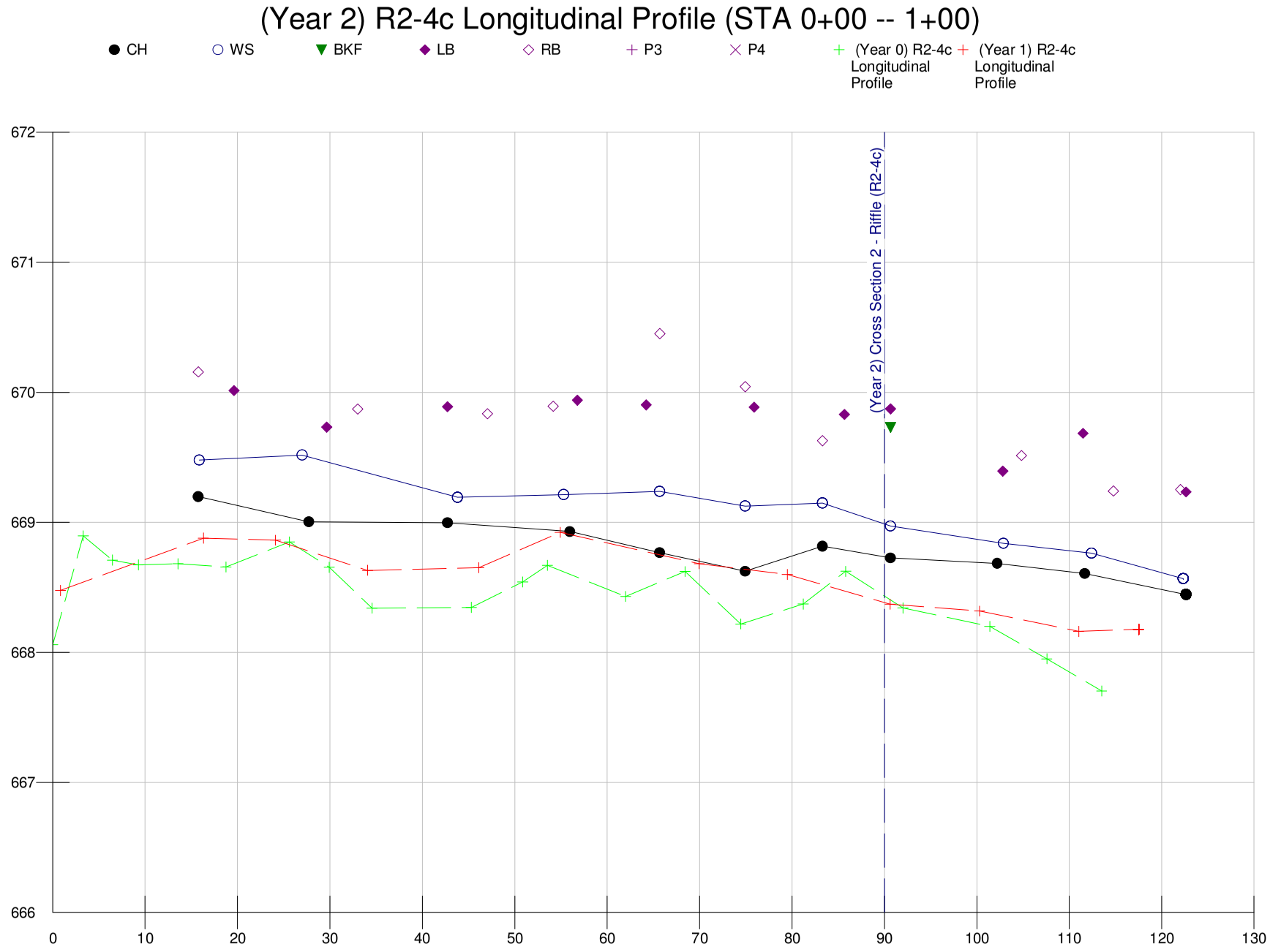
Length and depth measurements in feet, slopes in ft/ft.

RIVERMORPH PROFILE SUMMARY

Notes

River Name: (Year 2) Reedy Fork Creek
Reach Name: R2-4b
Profile Name: (Year 2) R2-4b Longitudinal Profile
Survey Date: 10/05/2009

DIST	Note
25.4604	REW
34.1444	REW
45.2884	REW
52.2294	REW
58.0364	REW
69.0414	REW
76.3404	REW
86.4204	REW
96.4664	XS1 - TW Intersect @ station 96
100.2074	REW
113.4124	REW
124.4954	REW
138.4124	REW
142.9794	REW
155.7824	REW


(Year 2) R2-4c Longitudinal Profile (STA 0+00 -- 1+00)
CH
WS
BKF
LB
RB
P3
P4
(Year 0) R2-4c Longitudinal Profile
(Year 1) R2-4c Longitudinal Profile
(Year 2) Cross Section 2 - Riffle (R2-4c)
672
671
670
669
668
667
666
0
10
20
30
40
50
60
70
80
90
100
110
120
130

RIVERMORPH PROFILE SUMMARY

River Name: (Year 2) Reedy Fork Creek
Reach Name: R2-4c
Profile Name: (Year 2) R2-4c Longitudinal Profile
Survey Date: 10/05/2009

Survey Data

DIST	CH	WS	BKF	LB	RB	P3	P4
15.7418	669.197						
15.7418					670.157		
15.8558		669.479					
19.6108				670.013			
26.9868		669.518					
27.7098	669.005						
29.6378				669.732			
32.9958					669.871		
42.7298	668.997						
42.7298				669.89			
43.8028		669.192					
47.0318					669.835		
54.1568					669.893		
55.2888		669.214					
55.9468	668.929						
56.7758				669.939			
64.2228				669.903			
65.6818		669.238					
65.6818	668.767						
65.6998					670.451		
74.9328		669.125					
74.9328					670.043		
74.9328	668.624						
75.8998				669.886			
83.2958	668.816						
83.2958		669.149					
83.2958					669.628		
85.6618				669.83			
90.6488	668.726	668.972	669.729	669.872			
102.2008	668.684						
102.8168				669.394			
102.8798		668.839					
104.8348					669.514		
111.4828				669.685			
111.6898	668.607						
112.4168		668.763					
114.7798					669.241		
122.0378					669.252		
122.3408		668.567					
122.6458				669.234			
122.6458	668.445						

Cross Section / Bank Profile Locations

Name	Type	Profile Station
(Year 2) Cross Section 2 - Riffle (R2-4c)	Riffle XS	90

Measurements from Graph

Bankfull Slope: 0.00502

Variable	Min	Avg	Max
S riffle	0.00131	0.0115	0.02168
S pool	0	0	0
S run	0	0	0
S glide	0	0	0
P - P	47.24	47.54	47.84
Pool length	11.78	13.36	14.94
Riffle length	7.41	9.54	11.66
Dmax riffle	0	0	0
Dmax pool	0	0	0
Dmax run	0	0	0
Dmax glide	0	0	0
Low bank ht	0	0	0

Length and depth measurements in feet, slopes in ft/ft.

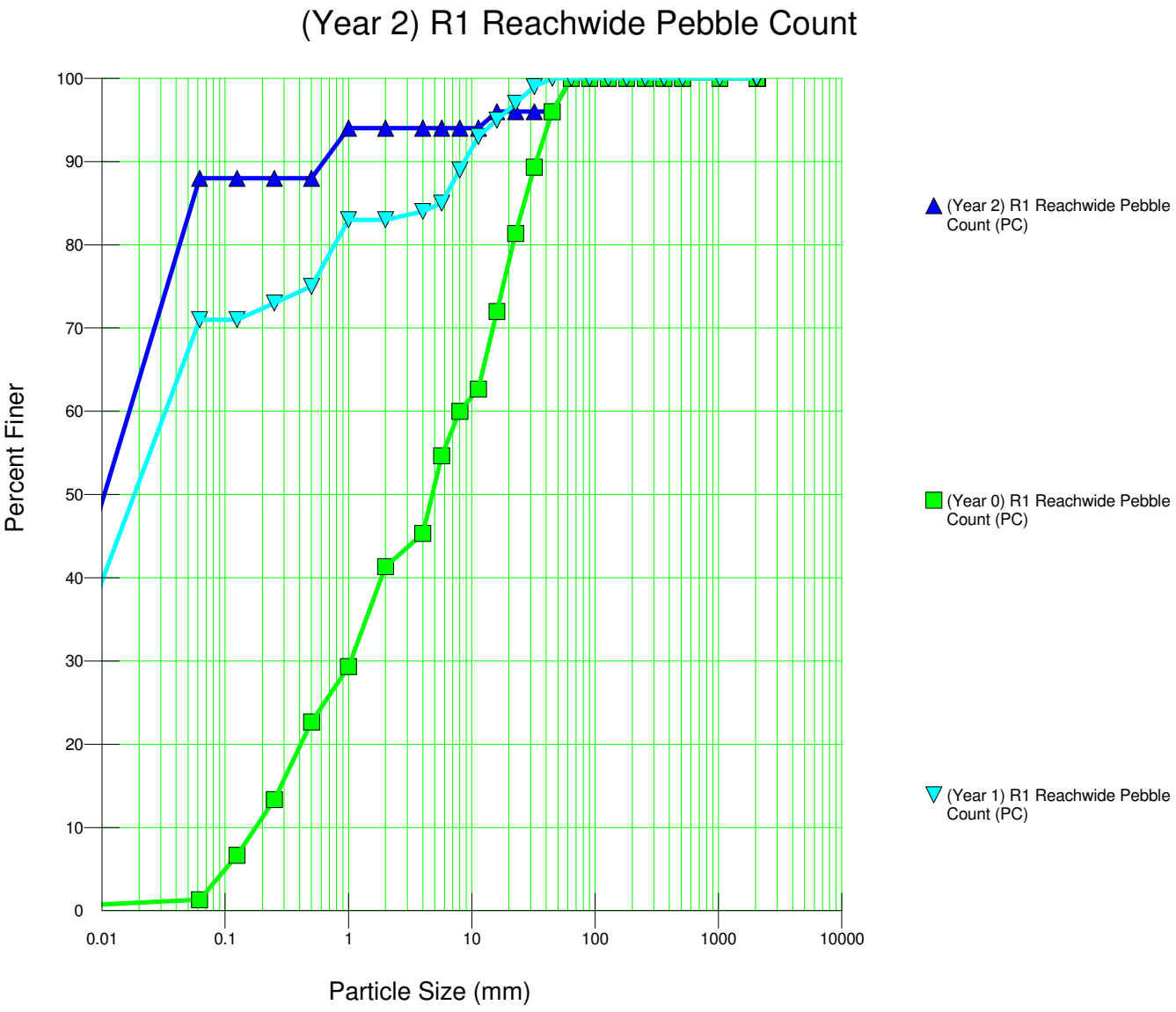
RIVERMORPH PROFILE SUMMARY

Notes

River Name: (Year 2) Reedy Fork Creek
Reach Name: R2-4c
Profile Name: (Year 2) R2-4c Longitudinal Profile
Survey Date: 10/05/2009

DIST	Note
15.8558	REW
26.9868	REW
43.8028	REW
55.2888	REW
65.6818	REW
74.9328	REW
83.2958	REW
90.6488	XS2 - TW Intersect @ station 90
102.8798	REW
112.4168	REW
122.3408	REW

Modified Wolman Pebble Counts


(Year 2) R1 Reachwide Pebble Count
Percent Finer
100
90
80
70
60
50
40
30
20
10
0
0.01
0.1
1
10
100
1000
10000
Particle Size (mm)
(Year 2) R1 Reachwide Pebble Count (PC)
(Year 0) R1 Reachwide Pebble Count (PC)
(Year 1) R1 Reachwide Pebble Count (PC)

RIVERMORPH PARTICLE SUMMARY

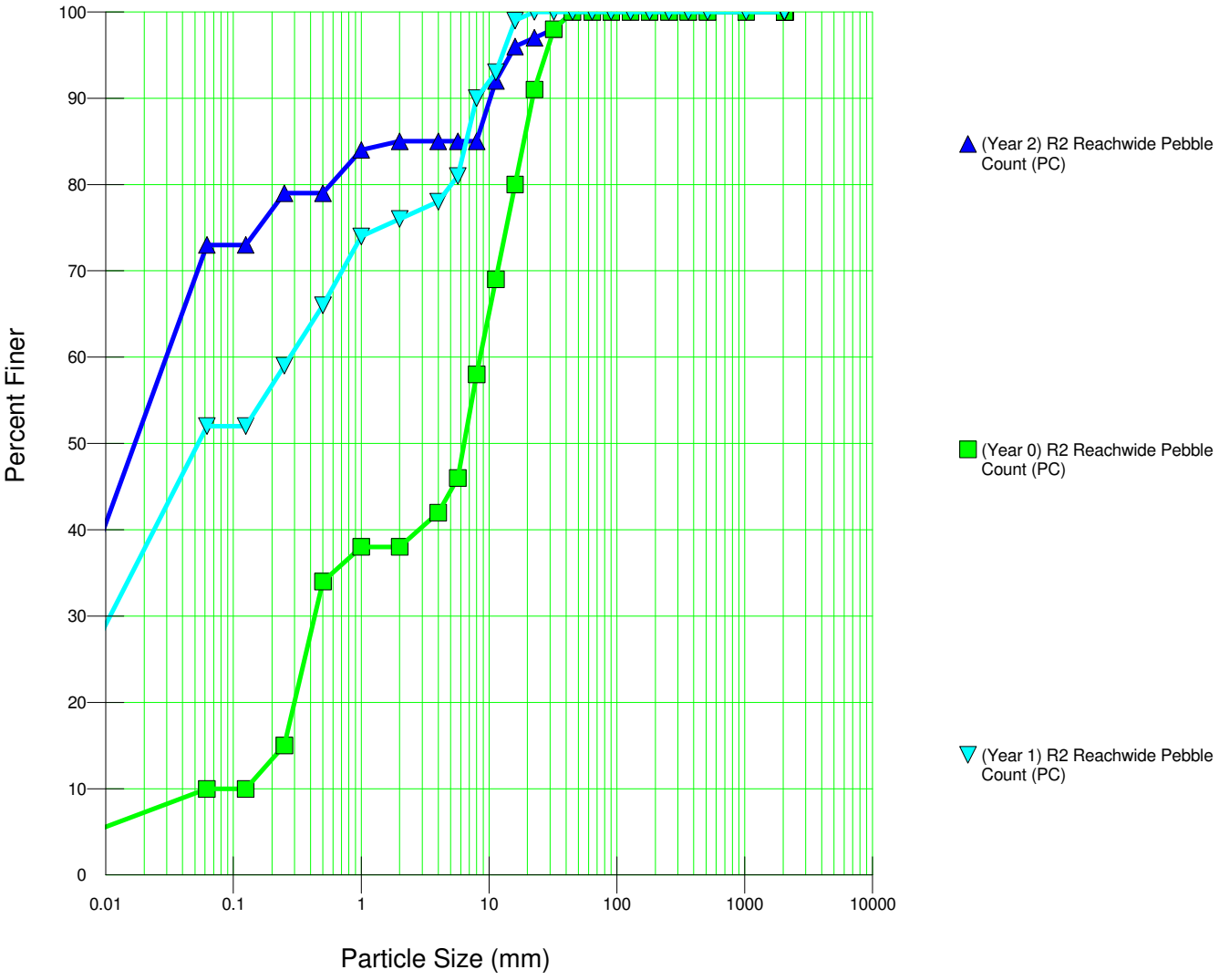
River Name: (Year 2) Reedy Fork Creek
Reach Name: R1
Sample Name: (Year 2) R1 Reachwide Pebble Count
Survey Date: 09/09/2009

Size (mm)	TOT #	ITEM %	CUM %
0 - 0.062	44	88.00	88.00
0.062 - 0.125	0	0.00	88.00
0.125 - 0.25	0	0.00	88.00
0.25 - 0.50	0	0.00	88.00
0.50 - 1.0	3	6.00	94.00
1.0 - 2.0	0	0.00	94.00
2.0 - 4.0	0	0.00	94.00
4.0 - 5.7	0	0.00	94.00
5.7 - 8.0	0	0.00	94.00
8.0 - 11.3	0	0.00	94.00
11.3 - 16.0	1	2.00	96.00
16.0 - 22.6	0	0.00	96.00
22.6 - 32.0	0	0.00	96.00
32 - 45	0	0.00	96.00
45 - 64	2	4.00	100.00
64 - 90	0	0.00	100.00
90 - 128	0	0.00	100.00
128 - 180	0	0.00	100.00
180 - 256	0	0.00	100.00
256 - 362	0	0.00	100.00
362 - 512	0	0.00	100.00
512 - 1024	0	0.00	100.00
1024 - 2048	0	0.00	100.00
Bedrock	0	0.00	100.00

D16 (mm)	0.01
D35 (mm)	0.03
D50 (mm)	0.04
D84 (mm)	0.06
D95 (mm)	13.65
D100 (mm)	64
Silt/Clay (%)	88
Sand (%)	6
Gravel (%)	6
Cobble (%)	0
Boulder (%)	0
Bedrock (%)	0

Total Particles = 50 (need at least 60).

(Year 2) R2 Reachwide Pebble Count



RIVERMORPH PARTICLE SUMMARY

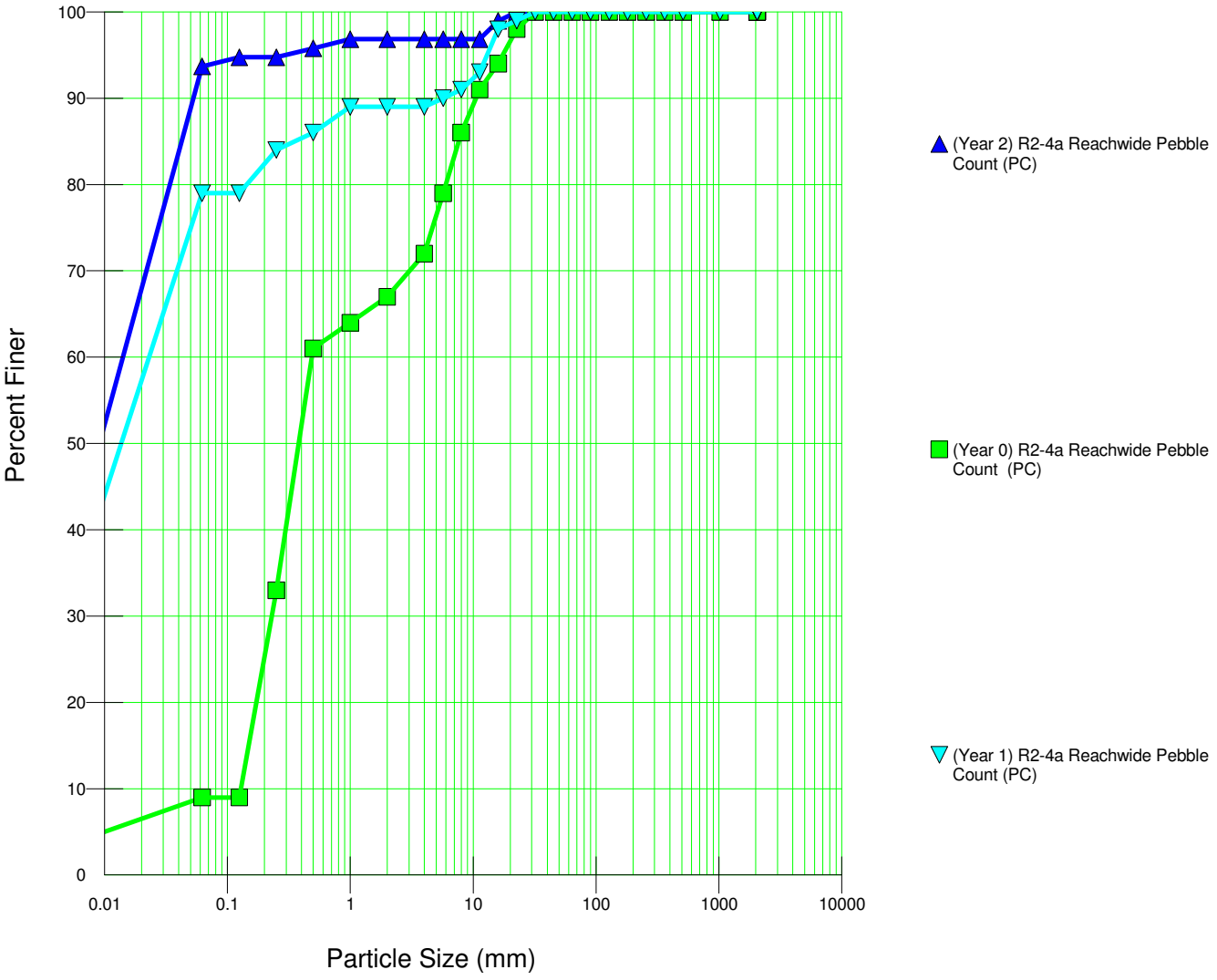
River Name: (Year 2) Reedy Fork Creek
Reach Name: R2-3
Sample Name: (Year 2) R2 Reachwide Pebble Count
Survey Date: 09/21/2009

Size (mm)	TOT #	ITEM %	CUM %
0 - 0.062	73	73.00	73.00
0.062 - 0.125	0	0.00	73.00
0.125 - 0.25	6	6.00	79.00
0.25 - 0.50	0	0.00	79.00
0.50 - 1.0	5	5.00	84.00
1.0 - 2.0	1	1.00	85.00
2.0 - 4.0	0	0.00	85.00
4.0 - 5.7	0	0.00	85.00
5.7 - 8.0	0	0.00	85.00
8.0 - 11.3	7	7.00	92.00
11.3 - 16.0	4	4.00	96.00
16.0 - 22.6	1	1.00	97.00
22.6 - 32.0	1	1.00	98.00
32 - 45	2	2.00	100.00
45 - 64	0	0.00	100.00
64 - 90	0	0.00	100.00
90 - 128	0	0.00	100.00
128 - 180	0	0.00	100.00
180 - 256	0	0.00	100.00
256 - 362	0	0.00	100.00
362 - 512	0	0.00	100.00
512 - 1024	0	0.00	100.00
1024 - 2048	0	0.00	100.00
Bedrock	0	0.00	100.00

D16 (mm)	0.01
D35 (mm)	0.03
D50 (mm)	0.04
D84 (mm)	1
D95 (mm)	14.83
D100 (mm)	45
Silt/Clay (%)	73
Sand (%)	12
Gravel (%)	15
Cobble (%)	0
Boulder (%)	0
Bedrock (%)	0

Total Particles = 100.

(Year 2) R2-4a Reachwide Pebble Count



RIVERMORPH PARTICLE SUMMARY

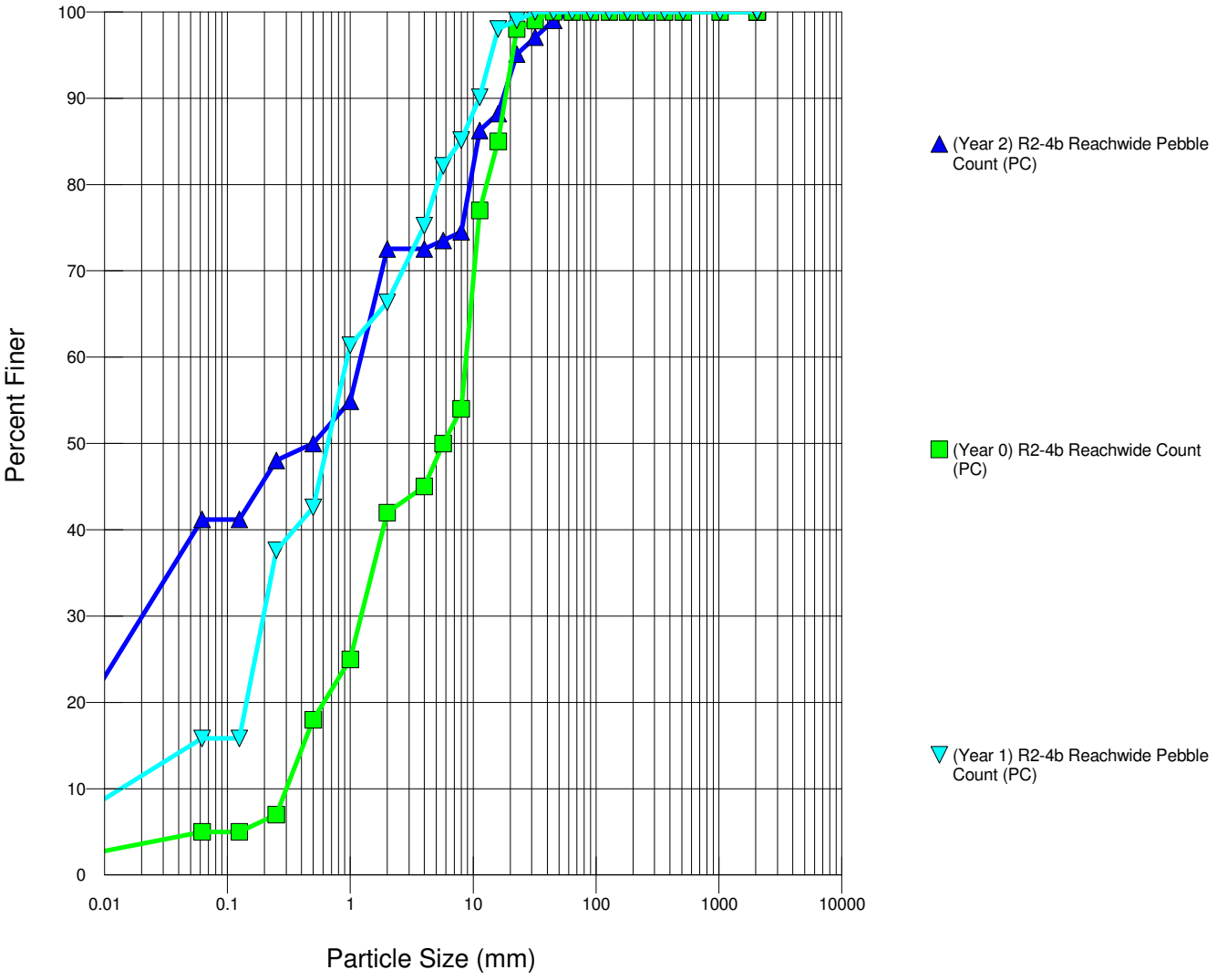
River Name: (Year 2) Reedy Fork Creek
Reach Name: R2-4a
Sample Name: (Year 2) R2-4a Reachwide Pebble Count
Survey Date: 09/14/2009

Size (mm)	TOT #	ITEM %	CUM %
0 - 0.062	89	93.68	93.68
0.062 - 0.125	1	1.05	94.74
0.125 - 0.25	0	0.00	94.74
0.25 - 0.50	1	1.05	95.79
0.50 - 1.0	1	1.05	96.84
1.0 - 2.0	0	0.00	96.84
2.0 - 4.0	0	0.00	96.84
4.0 - 5.7	0	0.00	96.84
5.7 - 8.0	0	0.00	96.84
8.0 - 11.3	0	0.00	96.84
11.3 - 16.0	2	2.11	98.95
16.0 - 22.6	1	1.05	100.00
22.6 - 32.0	0	0.00	100.00
32 - 45	0	0.00	100.00
45 - 64	0	0.00	100.00
64 - 90	0	0.00	100.00
90 - 128	0	0.00	100.00
128 - 180	0	0.00	100.00
180 - 256	0	0.00	100.00
256 - 362	0	0.00	100.00
362 - 512	0	0.00	100.00
512 - 1024	0	0.00	100.00
1024 - 2048	0	0.00	100.00
Bedrock	0	0.00	100.00

D16 (mm)	0.01
D35 (mm)	0.02
D50 (mm)	0.03
D84 (mm)	0.06
D95 (mm)	0.31
D100 (mm)	22.6
Silt/Clay (%)	93.68
Sand (%)	3.16
Gravel (%)	3.16
Cobble (%)	0
Boulder (%)	0
Bedrock (%)	0

Total Particles = 95.

(Year 2) R2-4b Reachwide Pebble Count



RIVERMORPH PARTICLE SUMMARY

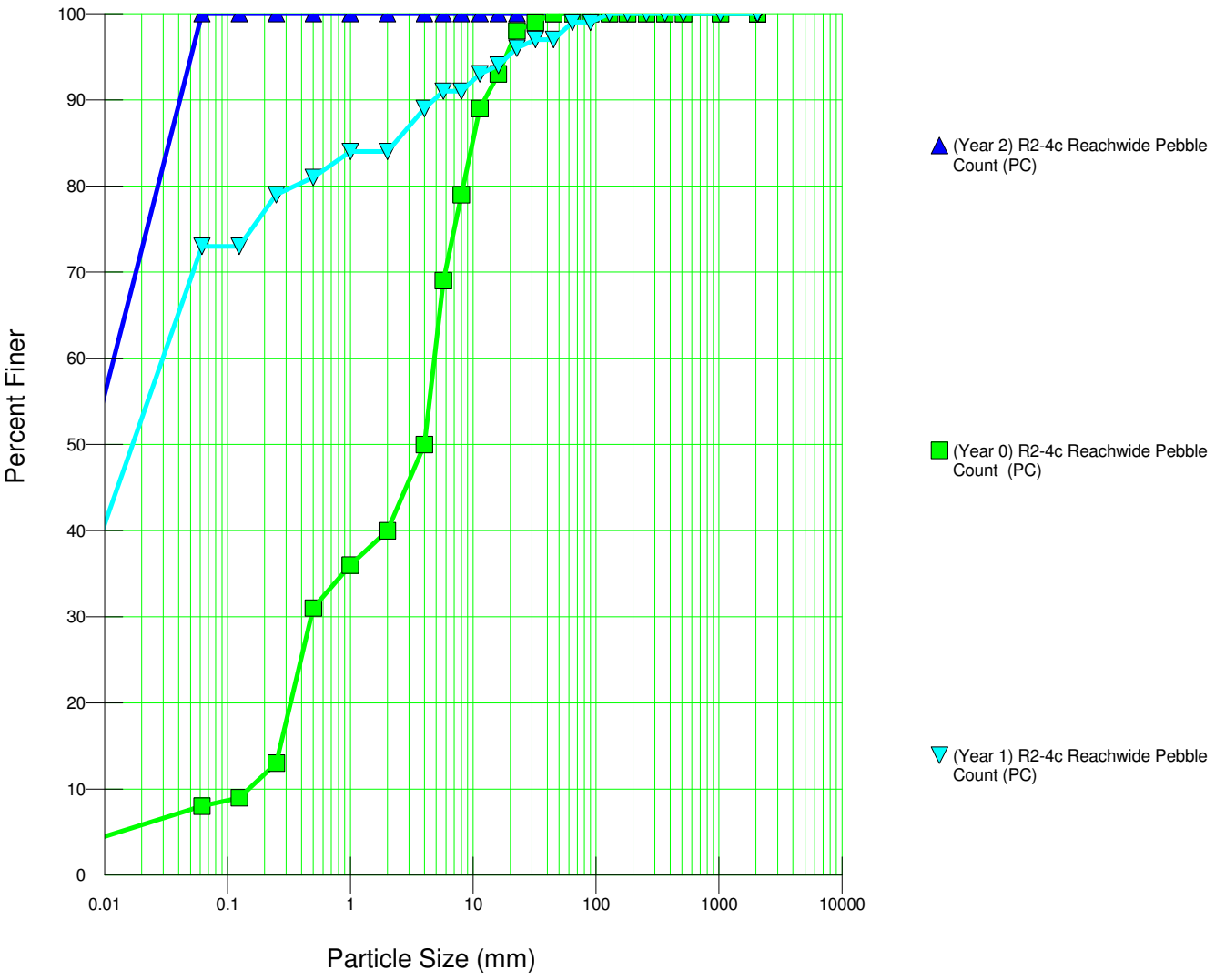
River Name: (Year 2) Reedy Fork Creek
Reach Name: R2-4b
Sample Name: (Year 2) R2-4b Reachwide Pebble Count
Survey Date: 09/21/2009

Size (mm)	TOT #	ITEM %	CUM %
0 - 0.062	42	41.18	41.18
0.062 - 0.125	0	0.00	41.18
0.125 - 0.25	7	6.86	48.04
0.25 - 0.50	2	1.96	50.00
0.50 - 1.0	5	4.90	54.90
1.0 - 2.0	18	17.65	72.55
2.0 - 4.0	0	0.00	72.55
4.0 - 5.7	1	0.98	73.53
5.7 - 8.0	1	0.98	74.51
8.0 - 11.3	12	11.76	86.27
11.3 - 16.0	2	1.96	88.24
16.0 - 22.6	7	6.86	95.10
22.6 - 32.0	2	1.96	97.06
32 - 45	2	1.96	99.02
45 - 64	1	0.98	100.00
64 - 90	0	0.00	100.00
90 - 128	0	0.00	100.00
128 - 180	0	0.00	100.00
180 - 256	0	0.00	100.00
256 - 362	0	0.00	100.00
362 - 512	0	0.00	100.00
512 - 1024	0	0.00	100.00
1024 - 2048	0	0.00	100.00
Bedrock	0	0.00	100.00

D16 (mm)	0.02
D35 (mm)	0.05
D50 (mm)	0.5
D84 (mm)	10.66
D95 (mm)	22.5
D100 (mm)	64
Silt/Clay (%)	41.18
Sand (%)	31.37
Gravel (%)	27.45
Cobble (%)	0
Boulder (%)	0
Bedrock (%)	0

Total Particles = 102.

(Year 2) R2-4c Reachwide Pebble Count



RIVERMORPH PARTICLE SUMMARY

River Name: (Year 2) Reedy Fork Creek
Reach Name: R2-4c
Sample Name: (Year 2) R2-4c Reachwide Pebble Count
Survey Date: 09/21/2009

Size (mm)	TOT #	ITEM %	CUM %
0 - 0.062	100	100.00	100.00
0.062 - 0.125	0	0.00	100.00
0.125 - 0.25	0	0.00	100.00
0.25 - 0.50	0	0.00	100.00
0.50 - 1.0	0	0.00	100.00
1.0 - 2.0	0	0.00	100.00
2.0 - 4.0	0	0.00	100.00
4.0 - 5.7	0	0.00	100.00
5.7 - 8.0	0	0.00	100.00
8.0 - 11.3	0	0.00	100.00
11.3 - 16.0	0	0.00	100.00
16.0 - 22.6	0	0.00	100.00
22.6 - 32.0	0	0.00	100.00
32 - 45	0	0.00	100.00
45 - 64	0	0.00	100.00
64 - 90	0	0.00	100.00
90 - 128	0	0.00	100.00
128 - 180	0	0.00	100.00
180 - 256	0	0.00	100.00
256 - 362	0	0.00	100.00
362 - 512	0	0.00	100.00
512 - 1024	0	0.00	100.00
1024 - 2048	0	0.00	100.00
Bedrock	0	0.00	100.00

D16 (mm)	0.01
D35 (mm)	0.02
D50 (mm)	0.03
D84 (mm)	0.05
D95 (mm)	0.06
D100 (mm)	0.06
Silt/Clay (%)	100
Sand (%)	0
Gravel (%)	0
Cobble (%)	0
Boulder (%)	0
Bedrock (%)	0

Total Particles = 100.

Bank Erosion

BEHI and Sediment Export Estimates for Project Site Streams

Tributary to Reedy Fork Creek Site - D06028-A

Project Phase	Project Reach[1]	Reach Length (lf)	Extreme		Very High		High		Moderate		Low		Very Low		Estimated Sediment Export
			ft	%[2]	ft	%[2]	ft	%[2]	ft	%[2]	ft	%[2]	ft	%[2]	Tons/Year
Pre-Construction	R1	1409	1409	100											126.8
	R2-1	906	906	100											81.5
	R2-2	2522	2522	100											126.1
	R2-3	1584	1584	100											110.9
	R2-4a	289													n/a
	R2-4b	226													n/a
	R2-4c	157													n/a

[1] BEHI and Sediment Export estimates were not conducted for reaches R2-4a, R2-4b, and R2-4c.

[2] Indicates the percentage of linear stream footage exhibiting characteristics of the BEHI Adjective Rating displayed.

Crest Gage

Project Name: Tributary to Reedy Fork Creek **Installation Date:** 4/8/2008

County, State: Guilford County, North Carolina

Year of Sampling

Crest Gauge Information			2008	2008	2009	2010	2011	2012	
Gauge ID	Bankfull Elevation (ft)	Zero Elevation (ft)	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Total Exceedance by Gauge
1	653.48	653.24	0	1	1	0	0	0	2
2	629.42	629.42	0	1	0	0	0	0	1
3	633.70	633.62	0	1	1	0	0	0	2
4			0	0	0	0	0	0	0
5			0	0	0	0	0	0	0
6			0	0	0	0	0	0	0
7			0	0	0	0	0	0	0
8			0	0	0	0	0	0	0
9			0	0	0	0	0	0	0
10			0	0	0	0	0	0	0

Gauge washed away in 1st year

Initial Data Entry for Crest Gage (feet)													
Gage ID	**BKF Elev.**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
1	653.48	0.26											
2	629.42												
3	633.70	0.91											
4	0.00												
5	0.00												
6	0.00												
7	0.00												
8	0.00												
9	0.00												
10	0.00												

Peak Flow Height by Crest Gage (feet)													
Gage ID	**BKF Elev.**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
1	653.48	653.50	653.24	653.24	653.24	653.24	653.24	653.24	653.24	653.24	653.24	653.24	653.24
2	629.42	629.42	629.42	629.42	629.42	629.42	629.42	629.42	629.42	629.42	629.42	629.42	629.42
3	633.70	634.53	633.62	633.62	633.62	633.62	633.62	633.62	633.62	633.62	633.62	633.62	633.62
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Bankfull Exceedance by Crest Gage														Exceed. by Gage
Gage ID	**BKF Elev.**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	
1	653.48	exceeds	below	below	below	below	below	below	below	below	below	below	below	1
2	629.42	below	below	below	below	below	below	below	below	below	below	below	below	0
3	633.70	exceeds	below	below	below	below	below	below	below	below	below	below	below	1
4	0.00	below	below	below	below	below	below	below	below	below	below	below	below	0
5	0.00	below	below	below	below	below	below	below	below	below	below	below	below	0
6	0.00	below	below	below	below	below	below	below	below	below	below	below	below	0
7	0.00	below	below	below	below	below	below	below	below	below	below	below	below	0
8	0.00	below	below	below	below	below	below	below	below	below	below	below	below	0
9	0.00	below	below	below	below	below	below	below	below	below	below	below	below	0
10	0.00	below	below	below	below	below	below	below	below	below	below	below	below	0
No. of Exceedances by Sampling		2	0	0	0	0	0	0	0	0	0	0	0	