Big Cedar Creek Stream Restoration
Final Mitigation Plan and As-built Baseline Report
Stanly County, North Carolina

EEP Project Number D06054-D

Submitted to/prepared for:

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Data Collection Period: Winter 2008-2009

Submission Date: July 2009

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1.0 EXECUTIVE SUMMARY

The Big Cedar Stream Restoration Site (Site) was restored by Michael Baker Engineering, Inc. (Baker) through a full delivery contract with the North Carolina Ecosystem Enhancement Program (NCEEP). A length of 11,103 linear feet (LF) of perennial and intermittent channel along Big Cedar Creek (BCC) and six unnamed tributaries (UT1, UT2, UT3, UT1A, UT1B, and UT1C) were fully restored through a combination of Priority 1 and 2 restoration approaches, in addition to 1,171 LF of enhancement along Big Cedar Creek, and UT1, and 539 LF of preservation along Big Cedar Creek and the northern most unnamed tributary (UT2). There were four main goals associated with this restoration project: to create geomorphically stable conditions, to improve and restore hydrologic connections between the streams and their floodplains, to improve the water quality in the Big Cedar Creek and Rocky River watersheds, and to improve aquatic and terrestrial habitat along the project corridor.

The Site has a history of general agricultural usage including cattle, cotton and corn production. Prior to restoration, the streams on the Site were channelized and riparian vegetation on the majority of the site was absent. The riparian vegetation that was present on much of the site consisted of successional and invasive species such as Chinese privet (*Ligustrum sinense)* and Japanese honeysuckle (*Lonicera japonica*).

In order to accomplish the established goals at the Site, Baker proposed restoration of the existing incised, eroding and channelized streams by creating stable channels with access to a floodplain. In-stream structures and riffle pool sequences were proposed to provide varied aquatic habitat and to diversify the bedform. Ephemeral pools in the floodplain were proposed to provide additional habitat for amphibians. Native herbaceous and woody riparian vegetation were proposed to enhance terrestrial habitat and to shade the stream and decrease water temperatures. Fences were proposed for livestock exclusion in order to protect the channel stability and the health of the riparian vegetation. Through these activities, water quality benefits would be seen in the form of storm water filtration and nutrient uptake of the riparian vegetation, and decreased sediment loading from the channel banks.

This report documents the completion of the restoration construction and presents as-built monitoring data for the five-year monitoring period. Table 1 summarizes site conditions before and after restoration as well as the conditions predicted in the previously approved site restoration plan.

2.0 PROJECT GOALS, BACKGROUND, & ATTRIBUTES

2.1 Project Location and Description

The Big Cedar Creek Stream Restoration Site ("Site") is located in Stanly County, NC (Figure 1, Appendix A) approximately ten miles south of the City of Albemarle. The Site is part of the Yadkin River Basin within NCDWQ sub-basin 03-07-14 and USGS hydrologic unit 03040105060080.

The Site is part of the Piedmont physiographic province. Medina and others describe the Piedmont as, "… consist(ing) of generally rolling, well-rounded hills and ridges with a few hundred feet of elevation difference between the hills and valleys" (Medina, 2004). The local geology is typical of the Carolina Slate Belt lithotectonic province of central North Carolina, and is comprised of Proterozoic and Cambrian age siltstone, mudstone, and mafic hypabyssal intrusive rocks according to the 1 degree by 2 degree geologic map of the Charlotte Quadrangle prepared by the USGS (Goldsmith et al., 1988). Soil types at the site were researched using Natural Resources Conservation Service (NRCS) soil survey data for Stanly County, along with on-site evaluations. The predominant soil series within the floodplain area of the site is mapped as Oakboro silt loam series, a hydric soil.

The Big Cedar Creek restoration project area drains predominately forested and agricultural lands, as well as a portion of the residential and commercial district of the town of Norwood. The Winston-Salem Southbound Railroad line parallels Big Cedar to the east, then turns to cross Big Cedar and UT1 upstream of their confluence.

To visit the Site, take Highway 52 for approximately ten miles south, turn right onto Mount Zion Church Road (1.25 miles south of the Town of Norwood). Follow Mount Zion Church Road for approximately 0.5 mile west to the intersection of Mount Zion Road and Big Cedar Creek. UT1, UT2, and the upstream reaches of Big Cedar Creek can be accessed from the farm road on the north side of Mount Zion Church Road, approximately 0.25 miles east of the intersection of the railroad and Mount Zion Church road. Reach 5 and 6 of Big Cedar Creek can be accessed from a farm field approximately 0.1 mile west of the intersection of the railroad and Mount Zion Church road.

2.2 Restoration Summary

2.2.1 Mitigation Goals and Objectives

The specific goals for the Big Cedar Creek Site Restoration Project were as follows:

- Create geomorphically stable conditions on the Big Cedar Creek project site.
- Improve and restore hydrologic connections between the streams and their floodplains.
- Improve the water quality in the Big Cedar Creek and Rocky River watersheds.
- Improve aquatic and terrestrial habitat along the project corridor.

The primary objective of the Big Cedar Restoration project was to accelerate the channel evolutionary processes by constructing channels with geomorphically stable cross sections, increased sinuosity, and access to the floodplain at bankfull stage. Flood attenuation, increased groundwater infiltration, and alleviation of bank stress resulted from providing floodplain access. Water quality improvements were made through fencing cattle out of the restored reaches and by reducing bank erosion throughout the project site. Aquatic habitat was improved by providing geomorphically stable habitat features and through placement of in-stream habitat structures. Invasive vegetative species removal efforts and reforestation of the riparian buffer with native species complemented the restoration of Big Cedar Creek, UT1, UT2, UT3, UT1A, UT1B, and UT1C. Existing native trees were preserved onsite wherever feasible. The vegetative efforts will benefit both aquatic and terrestrial habitat as the site matures.

2.2.2 Projection Description and Restoration Approach

The project involved the restoration, enhancement, and preservation of Big Cedar Creek and six unnamed tributaries to Big Cedar Creek. A total of 11,103 linear feet (LF) of stream channel along Big Cedar Creek and six unnamed tributaries (UT1, UT2, UT3, UT1A, UT1B, and UT1C) were restored. Additionally 1,171 LF of Enhancement II along Big Cedar Creek and UT1 and 539 LF of preservation along Big Cedar Creek and UT2 based on the post-construction as-built survey. The area has a history of general agricultural usage including cattle, cotton and corn production. The streams on the project site were channelized and riparian vegetation on the majority of the site had been removed. The riparian vegetation that was present on much of the site consists of successional and invasive species such as Chinese privet (*Ligustrum sinense)* and Japanese honeysuckle (*Lonicera japonica*). As a result of channelization, many of the project reaches were incised and lacked bankfull floodplain access.

For analysis and design purposes, Big Cedar Creek, UT1, and UT2 were divided into 11 reaches (As-built Plan Sheets, Appendix D). Big Cedar Creek flows from north to south entering the site at the northern property line. The reaches on Big Cedar Creek were numbered sequentially from north to south. Big Cedar Creek Reach 1 starts at the northern property line and ends at the confluence with UT2. Big Cedar Creek Reaches 2 through 4 are located between this confluence and the Winston-Salem Southbound Railroad line crossing. Big Cedar Creek Reach 5 begins below the railroad crossing and continues to just upstream of Big Cedar's confluence with UT1. Reach 6 begins where Reach 5 ends and continues to the culvert at Mount Zion Church Road. UT1 Reach 1 flows from west to east entering the site at the western most property line. The reaches on UT1 (1 through 4) were numbered sequentially from west to east. UT1 ends at its confluence with Big Cedar Creek. UT2 flows northwest to southeast entering the site along the northern property line. UT2 ends at its confluence with Big Cedar Creek.

A holistic restoration approach was based on the condition of the overall site and each reach's potential for restoration as determined during the site assessment. Design criteria for the proposed stream concept were selected based on the range of the reference data and the desired performance of the proposed channel. The developed design criteria were then compared to past projects built with similar conditions. Ultimately, these sites provide the best pattern and dimension ratios because they reflect site conditions after construction. While most reference reaches are in mature forests, restoration sites are in floodplains with little or no mature woody vegetation. This lack of mature woody vegetation severely alters floodplain processes and stream bank conditions. If past ratios did not provide adequate stability or bedform diversity, they were not used. Conversely, if past project ratios created stable channels with optimal bedform diversity, they were incorporated into the design.

Following the initial application of design criteria, detailed refinements were made to accommodate the existing valley morphology and to promote natural channel adjustment following construction.

For example, old meander scars in the Big Cedar Creek floodplain were incorporated for a more historical replication of channel alignment. The design philosophy employed at the Big Cedar Creek site was to use conservative design parameter values based on reference reach data and lessons learned from past projects. This allows the project to evolve in a positive direction as the permanent vegetation becomes established.

The overall restoration approach for the Site allows stream flows larger than bankfull flows to spread onto the floodplain, dissipating flow energies and reducing stress on streambanks. In-stream structures were used throughout all reaches to control streambed grade, reduce streambank stress, and promote bedform sequences and habitat diversity. The in-stream structures consist of root wads, log vanes, log weirs, cross vanes, j-hooks, and constructed riffles, which promote a diversity of habitat features in the restored channel. Where grade control was a consideration, constructed riffles and grade control j-hooks were installed to provide long-term stability. Streambanks were stabilized using a combination of erosion control matting, temporary and permanent seeding, bare-root planting, and brush mattresses. The Site was planted with native vegetation as shown in Table 8 (Appendix C) and is protected through a permanent conservation easement. Table 2 (Appendix A) provides a summary of the project components.

2.2.3 Project History, Contacts, and Attribute Data

Big Cedar Creek was restored by Baker through a full delivery contract with NCEEP. The chronology of the Big Cedar Creek Restoration Project is presented in Table 3. The contact information for all designers, contractors, and relevant suppliers is presented in Table 4. Relevant project background information is presented in Table 5. Tables 3, 4, and 5 are located in Appendix A of this report.

2.2.3.1 Construction Summary

Construction activities, in accordance with the approved restoration plan and permits for the middle of the project (UT1 mainstem), began with site preparation, harvesting of root wads, and establishment of the staging areas, haul roads, and stockpile areas. Materials were stockpiled as needed for the initial stages of construction.

Stream construction began with the installation of temporary rock dams at station 25+80 and 35+00 of UT1 reach 2. After existing trees were harvested for root wads, log vanes, and cover logs, grade stakes were installed along the thalweg and bench limits to direct the grading activities. The contractor constructed the channel and excavated floodplain areas to design grades starting at UT1 reach 1 station 10+00 and worked downstream. Excavated material was stockpiled in specified areas near field ditches and existing channels that were to be filled. Where necessary, silt fencing was installed between stockpiles and the active ditches to prevent erosion of sediment into the channel.

The offline sections of the channel were the first stream segments to be constructed. Pump-around operations were used where necessary for tying in newly constructed offline stream segments. Construction continued in a downstream direction for the entire length of UT1 mainstem channel. All disturbed areas were covered with temporary and permanent seed and straw before mobilizing to the next project area.

As construction continued downstream along UT1, reach 1 (station 10+46-22+94), reach 2 (station 22+94- 33+63), and reach 3 (station 33+63-53+03) were built in succession per the approved design plans. In-stream structures varied slightly from the design plans along all of UT1 due to the lack of available onsite material (for rootwads) or in areas where bedrock was encountered. Brush mattresses were substituted for rootwads in areas where rootwads were not available. Seeding, mulching, and coir matting where used in areas where bedrock was

encountered and structures could not be installed. Constructed riffles on reaches 1 and 2 were built out of a well graded mix of on-site alluvium and quarried Class 1, 2, and A stone. Riffles were constructed entirely with on-site alluvium on reaches 3 and 4. Three ephemeral pools where constructed along reach 1 to generate extra material necessary to backfill the existing channel and grade the floodplain. All disturbed areas were covered with temporary and permanent seed and straw before mobilizing to the next project area.

Construction activities were halted on reach 3 at station 40+00 in early May 2008 due to review of a Conditional Letter of Map Revision (CLOMR) by the Federal Emergency Management Agency (FEMA). The contractor subsequently demobilized from the site. No construction occurred between early May 2008 and late August 2008.

On August 24, 2008 Reiser and River Works, Inc. mobilized construction equipment on UT1 and Big Cedar Creek respectively. Reiser resumed work on UT1 reach 3 starting at station 40+00 and continued constructing the channel downstream. Construction of UT1 reach 4 (station 53+03 - 63+52) followed the completion of UT1 reach 3. Reiser finalized construction on UT1 in September 2008. In-stream structures and pattern alignments are shown on the as-built plan sheets within Appendix D.

River Works started site preparation on Big Cedar Creek and UT2 by installing a temporary rock check dam at station 60+00 on Big Cedar. Two temporary stream crossings were established at station 34+50 and 60+40 on Big Cedar Creek. Staging areas, haul roads, and stockpile areas were established. Silt fencing was installed between stockpiles and along the active channel to prevent erosion of sediment into the channel. Clearing, grubbing, and harvesting of root wads along Big Cedar and UT2 followed. Materials were stockpiled as needed for the initial stages of construction.

Three crews were staged on Big Cedar Creek. One crew started construction of UT2 (station 10+00 - 16+09) and then proceeded onto Big Cedar Creek reach 1 (station 10+00 - 16+03). A second crew began construction on Big Cedar Creek reach 2 (station 16+03 - 38+92) and a third began construction of Big Cedar Creek reach 3 (station 38+92 - 57+19). All offline sections of the channels were constructed first. A pump-around operation was used in certain sections of the project reaches where offline sections were tied back into the existing channel. In-stream structures varied slightly from the design plans along UT2 and Big Cedar Creek due to seasonality and in areas where bedrock was encountered. Because brush mattresses need to be installed during the dormant season (November-March), rootwads were substituted for brush mattresses in many areas along UT2 and Big Cedar during the summer construction months. Seeding, mulching, and coir matting where used in areas where bedrock was encountered and structures could not be installed. Riffles were constructed entirely of on-site alluvium on both Big Cedar Creek and UT2. All disturbed areas were covered with temporary and permanent seed and straw before mobilizing to the next project area.

After the completion of Big Cedar Creek reaches 1 through 3 and UT2, construction activities continued on Big Cedar Creek reach 4 (station 57+19 - 61+29) and reach 6 (Sta. 67+57 - 78+03). A temporary rock dam was installed near station 77+00 as construction crews worked downstream simultaneously on each reach. Construction procedures and activities were consistent with the upstream reaches. Enhancement activities on Big Cedar Creek reach 6 consisted of adding a log j-hook structure (station 68+00), a rock cross vane (station 77+25), and bank stabilization (bank sloping and a geolift). Channel construction activities concluded with the completion of Big Cedar Creek reach 4. All disturbed areas including the access routes were covered with temporary and permanent seed and straw before demobilizing from the site. Planting of bare roots and live stakes was completed in February 2009.

All riparian buffer areas within the project boundaries are a minimum of fifty feet from the top of the stream bank and are protected in perpetuity by a conservation easement that totals 40.7 acres. High tensile woven wire fencing was installed along the left side and a portion of the right side of Big Cedar Creek on reaches 1-4, and on the left side of Big Cedar Creek on reaches 5 and 6 as shown on the As-built Plan Sheets in Appendix D.

Slight changes to construction sequencing were made during construction to increase efficiency during high flow periods, such as continuing to construct offline channel sections further downstream and waiting to tie the channel back in until high flow conditions had abated. Other on-site changes involved the location and selection of in-stream structures and bank stabilization practices. Substitutions and/or omissions were made based on existing field conditions and best professional judgment. These changes, along with the as-built cross-sections and longitudinal profiles are documented in the attached as-built plan sheets in Appendix D. The as-built stream lengths for the project areas total 12,786 LF as indicated in Table 2 in Appendix A.

3.0 MONITORING PLAN

Channel stability, vegetation survival, and macroinvertebrate communities will be monitored on the project site. Post-restoration monitoring will be conducted for five years following the completion of construction to document project success.

3.1 Stream Monitoring

Geomorphic monitoring of restored stream reaches will be conducted for five years to evaluate the effectiveness of the restoration practices. Monitored stream parameters include bankfull flows, stream dimension (cross-sections), pattern and profile (longitudinal profile survey), and photographic documentation. The methods used and any related success criteria are described below for each parameter. For monitoring stream success criteria, 33 permanent cross-sections, 2 crest gauges, and 104 photo identification points were established. The specific locations of these monitoring features are represented on the as-built plan sheets in Appendix D.

3.1.1 Bankfull Events

The occurrence of bankfull events within the monitoring period will be documented by the use of crest gauges and photographs on each project reach. Two crest gauges were installed on the floodplain within 10 feet of the restored channel. The crest gauges will record the highest watermark between site visits, and the gauge will be checked at each site visit to determine if a bankfull event has occurred. Photographs will be used to document the occurrence of debris lines and sediment deposition on the floodplain during monitoring site visits.

Two bankfull flow events must be documented at the crest gauge within the 5-year monitoring period. The two bankfull events must occur in separate years; otherwise, the stream monitoring will continue until two bankfull events have been documented in separate years.

3.1.2 Cross-sections

Thirty three permanent cross-sections were installed throughout the entire Site. Within each project reach the distance interval between cross-sections was approximately equal to the combined length of 20 bankfull widths. An emphasis has been placed on riffle data collection because many of the project design parameters are based on riffle dimensions. This is reflected in a higher ratio of riffle to pool cross sections selected for monitoring. Each cross-section was marked on both banks with

permanent pins to establish the exact transect used. A common benchmark will be used for cross-sections and consistently referenced to facilitate comparison of year-to-year data. The annual cross-sectional survey will include points measured at all breaks in slope, including top of bank, bankfull, inner berm, water surface, and thalweg, if the features are present.

There should be little change in as-built cross-sections. If changes do take place, they will be evaluated to determine if they represent a movement toward a more unstable condition (e.g., down-cutting or erosion) or a movement toward increased stability (e.g., settling, vegetative changes, deposition along the banks, or decrease in width/depth ratio). Riffle cross-sections will be classified using the Rosgen Stream Classification System, and all monitored cross-sections should fall within the quantitative parameters defined for channels of the design stream type.

3.1.3 Pattern

Annual measurements taken for the plan view of the Site will include sinuosity and meander width ratio. Radius of curvature measurements will be taken on newly constructed meanders for the first year of monitoring only. Pattern measurements should show little adjustment over the five year monitoring period. If adjustments to occur, they will be evaluated to ensure that the new measurements fall within the quantitative parameters defined for channels of the design stream type.

3.1.4 Longitudinal Profile

A longitudinal profile will be completed annually during each year of the monitoring period. The profile will be conducted for 3,331 LF of restored stream reaches where pattern has been adjusted. The exact location of the annual longitudinal profile is marked on the As-built plan sheets in Appendix D. Measurements will include thalweg, water surface, inner berm, bankfull, and top of low bank. Each of these measurements will be taken at the head of each feature (e.g., riffle, run, pool, glide) and at the maximum pool depth. The survey will be tied to a permanent benchmark.

The longitudinal profiles should show that the bedform features are remaining stable (i.e., they are not aggrading or degrading). The pools should remain deep, with flat water surface slopes, and the riffles should remain steeper and shallower than the pools. Bedforms observed should be consistent with those observed for channels of the design stream type.

3.1.5 Bed Material Analysis

One substrate sample was taken at a constructed riffle on UT1 to show a general particle distribution at the baseline condition. These data are provided in Appendix B. Six post-restoration pebble counts will be performed on Big Cedar, six on UT1, and two on UT2. Pebble counts will be conducted during post-restoration monitoring years 1, 3, and 5 at the time the cross sectional data is collected. This data will be compared to known distributions from the existing conditions surveys. Results should indicate either maintenance of seeded bed material or a progression towards previous distributions.

3.1.6 Watershed Observations

As part of the post-construction monitoring following construction, any observed activities or changes in the watershed will be noted and connections to onsite observations will be drawn, where appropriate.

3.1.7 Photo Reference Sites

Photographs will be used to document restoration success visually. Reference stations will be photographed after construction and for five years following construction. Reference photos will be taken once a year, from a height of approximately five to six feet. Permanent markers will be established to ensure that the same locations (and view directions) on the Site are monitored during

each monitoring period. Photographs taken at cross sections are provided in Appendix B, while structure photographs are shown in Appendix E.

3.1.7.1 Lateral Reference Photos

Reference photo transects will be taken at each permanent cross-section. Photographs will be taken of both banks at each cross-section. The survey tape will be centered in the photographs of the bank. The water line will be located in the lower edge of the frame, and as much of the bank as possible will be included in each photo. Photographers will make an effort to consistently document the same view in each photo point over time.

3.1.7.2 Structure Photos

Photographs will be taken at grade control structures along the restored streams. Photographers will make every effort to consistently document the same area in each photo point over time. Photographs will be used to evaluate channel aggradation or degradation, bank erosion, success of riparian vegetation, and effectiveness of erosion control measures subjectively. Lateral photos should not indicate excessive erosion or continuing degradation of the banks. A series of photos over time should indicate successive maturation of riparian vegetation. The position of each structure photo point is located on the as-built plan sheets in Appendix D.

3.2 Vegetation Monitoring

Successful restoration of the vegetation on a mitigation site is dependent upon hydrologic restoration, active planting of preferred canopy species, and volunteer regeneration of the native plant community. In order to determine if the criteria are achieved, twenty-three vegetation monitoring quadrants were installed across the Site as directed by EEP monitoring guidance. The number of quadrants required is based on the plot number spreadsheet (07312006-2) provided by NCEEP that captures approximately five percent of the total conservation easement. The sizes of individual quadrants are 100 square meters for woody tree species. Vegetation monitoring will occur in the fall, prior to the loss of leaves. Individual quadrant data will be provided and will include species composition, density, and survivability. Individual seedlings will be marked to ensure that they can be found in subsequent monitoring years. Mortality will be determined from the difference between the previous year's living, planted seedlings and the current year's living, planted seedlings.

At the end of the first growing season, species composition, density, and survival will be evaluated. For each subsequent year, until the final success criteria are met, the Site will be evaluated between June and November.

The interim measure of vegetative success for the Site will be the survival of at least 320, three-year-old, planted trees per acre at the end of Year 3 of the monitoring period. The final vegetative success criterion will be the survival of 260, five-year old, planted trees per acre at the end of Year 5 of the monitoring period. While measuring species density is the current accepted methodology for evaluating vegetation success on restoration projects, species density alone may be inadequate for assessing plant community health. For this reason, the vegetation monitoring plan will incorporate the evaluation of additional plant community indices to assess overall vegetative success.

Herbaceous vegetation, primarily native grasses, were planted at the site shall have at least 80 percent coverage of the seeded/planted area. Any herbaceous vegetation not meeting these criteria shall be replanted. At a minimum, at all times ground cover at the project site shall be in compliance with the North Carolina Erosion and Sedimentation Control Ordinance.

3.3 Biological Monitoring

Benthic macroinvertebrates can be used to assess quantity and quality of life in the creek. In particular, specimens belonging to the insect orders Ephemeroptera (mayflies), Plecoptera (stoneflies) and Trichoptera (caddisflies) are useful as an index of water quality. These groups are generally the least tolerant to water pollution and therefore are very useful indicators of water quality. Sampling for these three orders is referred to as EPT sampling. Because of the importance of biological success of a stream restoration project, benthic macroinvertebrate sampling will be conducted for post-restoration years 1, 3, and 5 on the Site.

Pre-construction monitoring was conducted at three sites within the project limits and at one upstream reference site in September 2006 (Figure 3). The results of this sampling event will be used as a baseline for comparison of post restoration monitoring results. Post restoration monitoring sites shall be located in the same general vicinity as the pre restoration monitoring sites. In general, post restoration monitoring results should show trends towards biological distributions similar to that observed at the reference site.

The sampling methodology shall follow the Qual 4 method listed in North Carolina Division of Water Quality's (NCDWQ) Standard Operating Procedures for Benthic Macroinvertebrates (2006). Laboratory identification of collected species will be conducted by a lab properly certified by NCDWQ.

3.4 Maintenance and Contingency Plan

Maintenance requirements vary from site to site and are generally driven by the following conditions:

- Projects without established, woody floodplain vegetation are more susceptible to erosion from floods than those with a mature, hardwood forest.
- Projects with sandy, non-cohesive soils are more prone to short-term bank erosion than cohesive soils or soils with high gravel and cobble content.
- Alluvial valley channels with wide floodplains are less vulnerable than confined channels.
- Wet weather during construction can make accurate channel and floodplain excavations difficult.
- Extreme and/or frequent flooding can cause floodplain and channel erosion.
- Extreme hot, cold, wet, or dry weather during and after construction can limit vegetation growth, particularly temporary and permanent seed.
- The presence and aggressiveness of invasive species can affect the extent to which a native buffer can be established.
- The presence of beaver can affect vegetation survivability and stream function.

Maintenance issues and recommended remediation measures will be detailed and documented in the monitoring reports. Factors that may have caused any maintenance needs, including any of the conditions listed above, shall be discussed. NCEEP approval will be obtained prior to any remedial action.

4.0 MONITORING RESULTS – 2009 AS-BUILT DATA

The five-year monitoring plan for the Site includes criteria to evaluate the success of the vegetation and stream components of the project. The specific locations of vegetation plots, permanent cross-sections, and the crest gauges are shown on the as-built plan sheets. Photo points, located at each of the grade control structures along the restored stream channel, are also located on the as-built plan sheets in Appendix D.

4.1 Stream Data

For monitoring stream success criteria, 33 permanent cross-sections, 2 crest gauges, and 104 photo identification points were installed on the Site. The permanent cross-sections will be used to monitor channel dimension and bank stability over time. The crest gauges will be used to document the occurrence of bankfull events. In addition, a longitudinal survey was completed for the restored stream channels to provide a base-line for evaluating changes in bed conditions over time. The longitudinal profile included the elevations of all grade control structures. The as-built permanent cross-sections (with photos) and as-built longitudinal data as well as the quantitative pre-construction, reference reach, and design data used to determine restoration approach are provided in Appendix B. The locations of the permanent cross-sections and the crest gauges are shown on the as-built plan sheets in Appendix D. Photographs are provided in Appendix E.

4.1.1 Results and Discussion

No results were available at the submittal of this report. As-built data will be compared with first year monitoring data in the Year 1 Monitoring Report, scheduled for submittal to NCEEP during December 2009.

4.2 Vegetation Data

Bare-root trees and shrubs were planted within all areas of the conservation easement. A minimum 30-foot buffer was established along all restored stream reaches. In general, bare-root vegetation was planted at a target density of 680 stems per acre, in an 8-foot by 8-foot grid pattern. Planting of bare-root trees and shrubs were completed in February 2009. Species planted are summarized in Tables 8 and 9.

The restoration plan for the Site specifies that the number of quadrants required is based on the CVS-NCEEP monitoring guidance. The number of quadrants required was determined using the plot number spreadsheet (07312006-2) provided by NCEEP that captures five percent of the total conservation easement. The sizes of individual quadrants are 100 square meters. A total of 23 vegetation plots, each 10 meters by 10 meters in size, were established across the restored site. The initial planted density within each of the vegetation monitoring plots is given in Table 5. The average density of planted bare root stems, based on the data from the 23 monitoring plots, is 892 stems per acre. The locations of the vegetation plots are shown on the as-built plan sheets in Appendix 3.

4.2.1 Results and Discussion

No results were available at the submittal of this report. Vegetation survival will be compared with first year monitoring data in the Year 1 Monitoring Report, scheduled for submittal to NCEEP during December 2009.

4.3 Areas of Concern

No areas of concern have been identified during the first months following completion of the project.

5.0 REFERENCES

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Appendix A

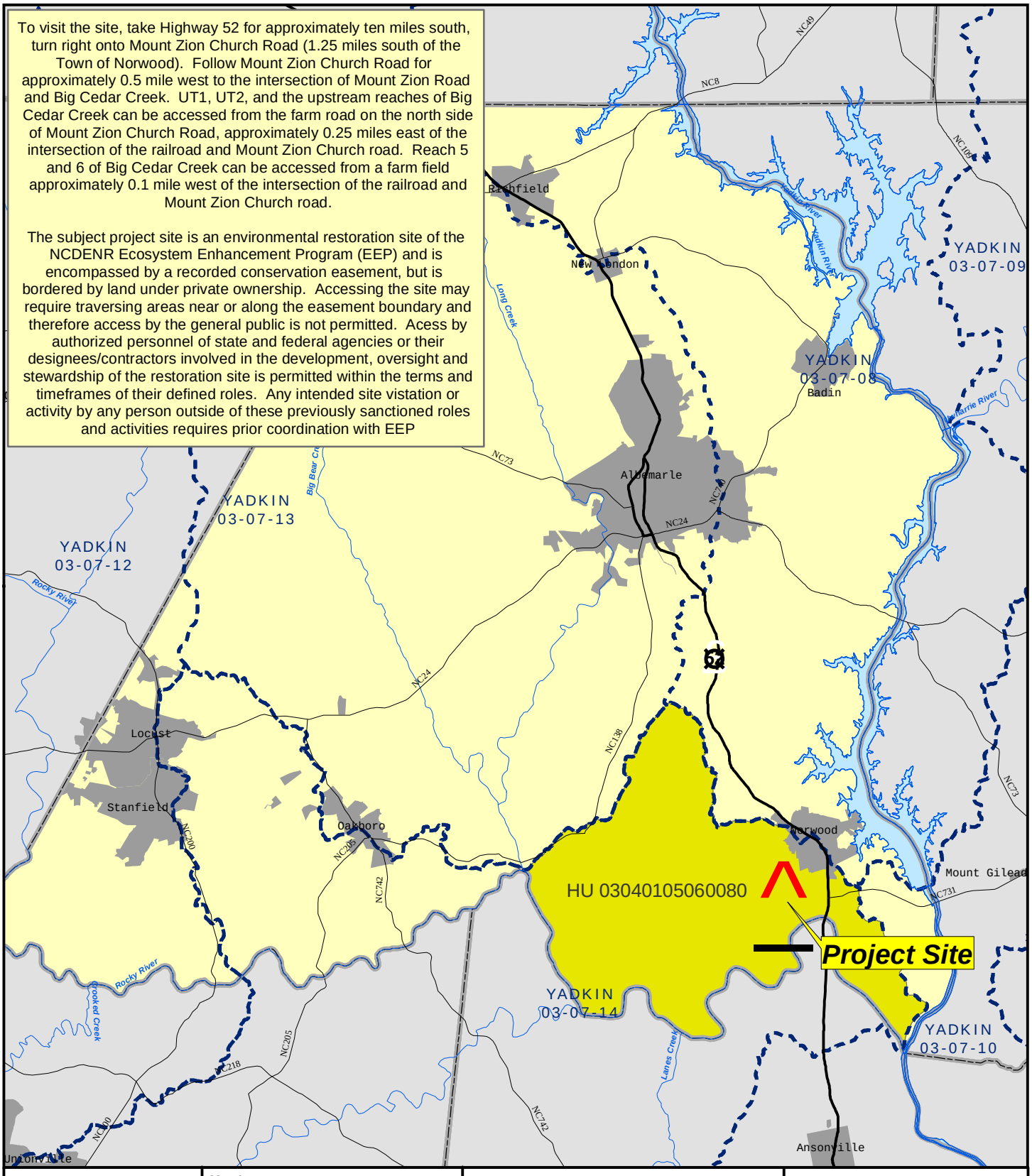
General Tables and Figures

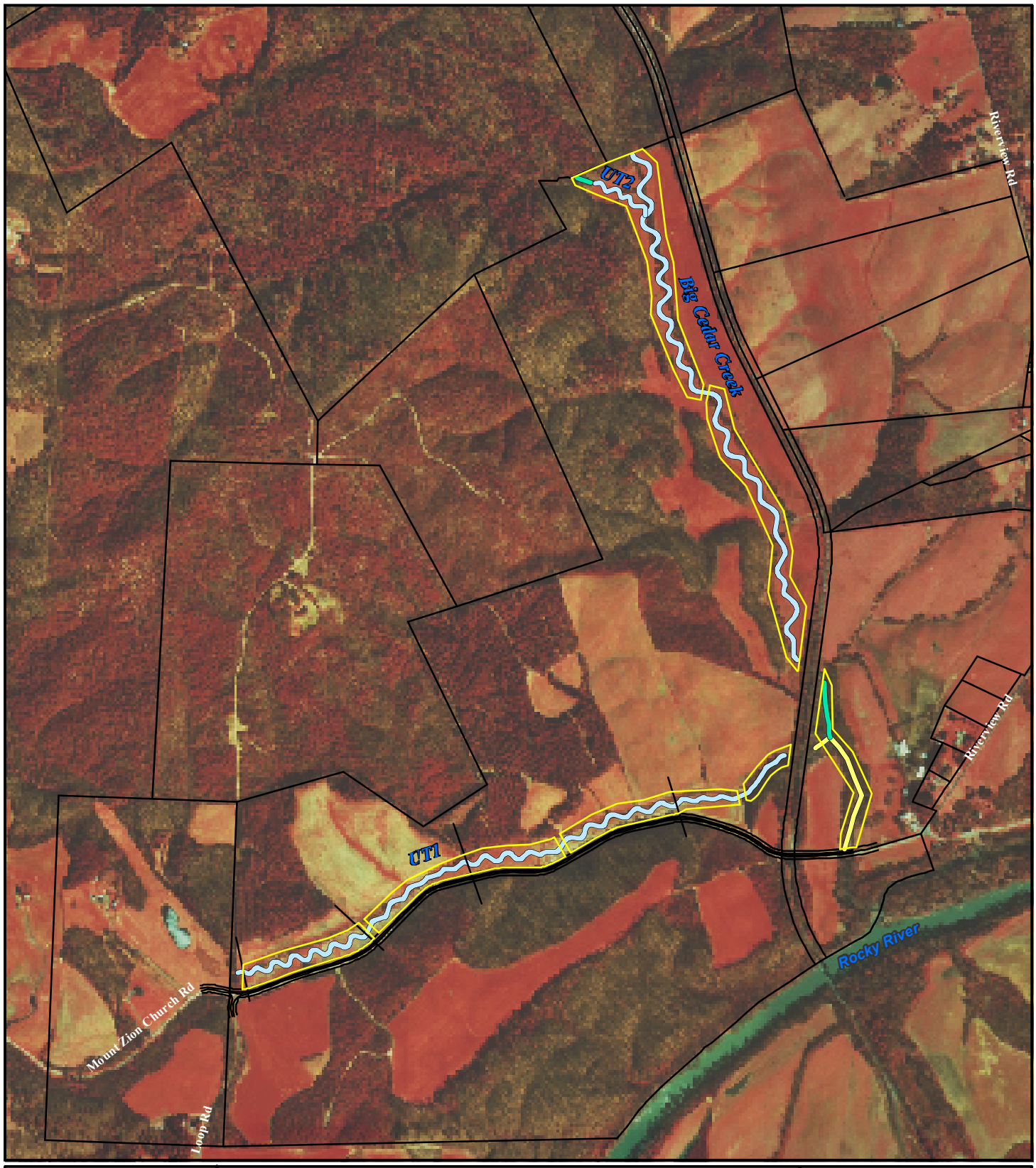
Vicinity Map

Project Components Map

Benthic Macroinvertebrate Sampling Map

Tables 1 - 5


To visit the site, take Highway 52 for approximately ten miles south, turn right onto Mount Zion Church Road (1.25 miles south of the Town of Norwood). Follow Mount Zion Church Road for approximately 0.5 mile west to the intersection of Mount Zion Road and Big Cedar Creek. UT1, UT2, and the upstream reaches of Big Cedar Creek can be accessed from the farm road on the north side of Mount Zion Church Road, approximately 0.25 miles east of the intersection of the railroad and Mount Zion Church road. Reach 5 and 6 of Big Cedar Creek can be accessed from a farm field approximately 0.1 mile west of the intersection of the railroad and Mount Zion Church road.
The subject project site is an environmental restoration site of the NCDENR Ecosystem Enhancement Program (EEP) and is encompassed by a recorded conservation easement, but is bordered by land under private ownership. Accessing the site may require traversing areas near or along the easement boundary and therefore access by the general public is not permitted. Acess by authorized personnel of state and federal agencies or their designees/contractors involved in the development, oversight and stewardship of the restoration site is permitted within the terms and timeframes of their defined roles. Any intended site vistation or activity by any person outside of these previously sanctioned roles and activities requires prior coordination with EEP
YADKIN 03-07-09
YADKIN 03-07-08
YADKIN 03-07-13
YADKIN 03-07-12
YADKIN 03-07-14
YADKIN 03-07-10
HU 03040105060080
Project Site
Richfield
New London
Badin
Albemarle
Locust
Stanfield
Oakboro
Norwood
Mount Gilead
Ansonville
Unionville
Yadkin River
Rocky River
Long Creek
Lanes Creek
Crooked Creek
NC8
NC49
NC109
NC73
NC24
NC138
NC200
NC205
NC742
NC731
NC218
NC740
Map Inset
Stanly County, NC
LEGEND
USGS Hydrologic Unit
NCDWQ Sub-basin
Counties
0 2 4 Miles
Ecosystem Enhancement PROGRAM
EEP Project No.: D06054-D
Figure 1: Vicinity Map
Big Cedar Creek
Stream Restoration Project
Mitigation Plan
Stanly County, NC
Baker



Ecosystem Enhancement Program

LEGEND

- Preservation
- Enhancement
- Restoration
- Parcels
- Conservation Easement

EEP Project No. : D06054-D

0 400 800 Feet

Figure 2: Restoration Summary & Recorded Conservation Easement
Big Cedar Creek
Stream Restoration Project
Mitigation Plan
Stanly County, NC

Baker

LEGEND

- As-Built Streams
- Macroinvertebrate Sampling Sites
- Conservation Easement
- Parcels
- Streams

EEP Project No. : D06054-D

0 400 800 Feet

Ecosystem Enhancement PROGRAM

Figure 3:
Benthic Macroinvertebrate Sampling Sites
Big Cedar Creek
Stream Restoration Project
Mitigation Plan
Stanly County, NC

Baker

Table 1
Restoration and Mitigation Components

Pre-Construction Site Conditions	
Site	
Location	Stanley County, NC (see Figure 1), approximately ten miles south of the City of Albemarle, NC.
USGS Hydro Unit	3040105060080
NCDWQ Sub-basin	03/07/14
Contract Mitigation Units	**11,640 SMU**

Pre-Construction Site Conditions			
Stream			
Reach	**Length**	**Channel Condition and Stream Type**	**Drainage Area**
Big Cedar Creek – Reach 1	350 LF	Channelized & incised, E4/1	2.85 mi^2
Big Cedar Creek – Reach 2	1,016 LF	Channelized & incised, B4/1c	2.91 mi^2
Big Cedar Creek – Reach 3	2,046 LF	Channelized & incised, C4/1	3.30 mi^2
Big Cedar Creek – Reach 4	976 LF	Channelized & incised, C4/1	3.35 mi^2
Big Cedar Creek – Reach 5	534LF	Stable & quasi-equilibrium, B3/1c	4.67 mi^2
Big Cedar Creek – Reach 6	904 LF	Incised & aggrading, F3/1	4.71 mi^2
UT1 – Reach 1	1,998 LF	Channelized & incised, C4/1	0.93 mi^2
UT1 – Reach 2	759 LF	Channelized & incised, E4/1	0.98 mi^2
UT1 – Reach 3	1,518 LF	Channelized & incised, C4/1	1.18 mi^2
UT1 – Reach 4	935 LF	Channelized & incised, C4/1	1.21 mi^2
UT2	625 LF	Channelized & incised, G4	0.55 mi^2
Total	**11,661 LF**		**4.71 mi^2**

Restoration Plan		
Stream		
Reach	**Restoration/Enhancement Type**	**Length (LF)**
Big Cedar Creek – Reach 1	Restoration – Priority Level II approach	573
Big Cedar Creek – Reach 2	Restoration – Priority Level I approach	2,190
Big Cedar Creek – Reach 3	Restoration – Priority Level I approach	1,809
Big Cedar Creek – Reach 4	Restoration – Priority Level II approach	400
Big Cedar Creek – Reach 5	Preservation	435
Big Cedar Creek – Reach 6	Enhancement – Level II approach	969
UT1 – Reach 1	Restoration – Priority Level I approach	1,235
UT1 – Reach 2	Restoration – Priority Level I approach	973
UT1 – Reach 3	Restoration – Priority Level I approach	1,899
UT1 – Reach 4	Restoration - Priority Level I and Enhancement II approaches	993
	Preservation	162
UT2	Restoration – Priority Level I & II approaches	605
Total		**12,243**

Post-Construction Site Conditions			
Stream			
Reach	**Restoration/Enhancement Type**	**Length (LF)**	**SMU**
Big Cedar Creek – Reach 1	Restoration – Priority Level II approach	603	603
Big Cedar Creek – Reach 2	Restoration – Priority Level I approach	2,239	2239
Big Cedar Creek – Reach 3	Restoration – Priority Level I approach	1,827	1,827
Big Cedar Creek – Reach 4	Restoration – Priority Level II approach	410	410
Big Cedar Creek – Reach 5	Restoration – Preservation	378	76
Big Cedar Creek – Reach 6	Enhancement – Level II approach	1,046	418
UT1 – Reach 1	Restoration – Priority Level I approach	1,248	1,248
UT1 – Reach 2	Restoration – Priority Level I approach	1,016	1,016
UT1 – Reach 3	Restoration – Priority Level I approach	1,885	1,885
UT1 – Reach 4	Restoration - Priority Level I & II approaches	996	996
	Enhancement II	125	50
UT2	Preservation	161	32
	Restoration – Priority Level I & II approaches	609	609
Additional Tributaries	**Restoration/Enhancement Type**	**Length (LF)**	**SMU**
UT3 to Big Cedar Creek	Restoration – Priority Level I approach	73	73
UT1A	Restoration – Priority Level I approach	85	85
UT1B	Restoration – Priority Level I approach	34	34
UT1C	Restoration – Priority Level I approach	78	78
Total		**12,813**	**11,679**

Riparian Buffer Acreage	
Planted Riparian Buffer Acreage	~40.7 AC

Ecological Benefits	
Water Quality	Nutrient, sediment, and erosion reduction; increased dissolved oxygen concentrations an pollutant retention; improved stream bank stability.
Water Quantity/Flood Attenuation	Increased water storage/flood control; reduced downstream flooding by reconnecting strear with its floodplain; improved groundwater recharge; improved/restored hydrologic connections.
Aquatic and Terrestrial Habitat	Improved substrate and in-stream cover; addition of large woody debris; reduced water temperature by increasing shading; restoration of terrestrial habitat; improved aesthetics.
Monitoring Plan	
Success Criteria	Success is measured with permanent cross-sections, vegetation plots, crest gauges, and a longitudinal profile conducted annually for a period of five years. Additionally, photographs will be used to evaluate channel aggradation or degradation, bank erosion, riparian vegetation and effectiveness of erosion control measures.
Methodology	Cross-sections and longitudinal profile are surveyed annually and tied to a common benchma along all reaches. Crest gauges (2) will monitor flooding frequency during post-restoration conditions. Each tree planted within the 100-square-meter vegetation plots are flagged and identified.
Remedial Action	N/A

Table 2. Mitigation Components
Big Cedar Creek Restoration Site: Project No. D06054-D

Project Segment or Reach ID	Existing Feet/Acres*	Mitigation Type	Approach	Linear Footage or Acreage*	Mitigation Ratio	Migation Units	Stationing	Comment
BCC_R1	350	R	P2	603	1:1	603	10+00 to 16+03	Installed in-stream structures to control grade and reduce bank erosion. Priority 2 was in this section of transition to bring the channel up into the historic floodplain as quick as possible.
BCC_R2	1,016	R	P1	2,239	1:1	2,239	16+03 to 38+92	Installed in-stream structures to control grade and reduce bank erosion
BCC_R3	2,046	R	P1	1,827	1:1	1,827	38+92 to 57+19	Installed in-stream structures to control grade and reduce bank erosion
BCC_R4	976	R	P2	410	1:1	410	57+19 to 61+29	Installed in-stream structures to control grade and reduce bank erosion. Priority 2 was employeed to tie the channel into the box culvert at the railroad crossing.
BCC_R5	534	P	P	378	1:5	76	63+79 to 67+57	Preservation
BCC_R6	904	E	EII	1,046	1:2.5	418	67+57 to 78+03	Regraded banks, installed one grade control cross-vane and one log vane.
UT1_R1	1,998	R	P1	1,248	1:1	1,248	10+46 to 22+94	Installed in-stream structures to control grade and reduce bank erosion
UT1_R2	759	R	P1	1,016	1:1	1,016	22+94 to 33+36	Installed in-stream structures to control grade and reduce bank erosion. The valley narrows and slopes increase to accommodate the decrease in floodplain area.
UT1_R3	1,518	R	P1	1,885	1:1	1,885	33+36 to 53+04	Installed in-stream structures to control grade and reduce bank erosion
UT1_R4	935	R	P1	996	1:1	996	53+04 to 63+52	Installed in-stream structures to control grade and reduce bank erosion. The reach was designed to transition from the orginial floodplain elevation to a new floodplain elevation.
	125	E	EII	125	1:2.5	50	N/A	Regraded banks and existing riffle.
UT2	625	R	P1, P2	609	1:1	609	10+00 to 16+09	Installed in-stream structures to control grade and reduce bank erosion
	162	P	P	161	1:5	32	N/A	Preservation
UT3 to Big Cedar Creek	73	R	P1	73	1:1	73	11+08 to 11+82	Installed in-stream structures to control grade. Regraded banks, stabilized with matting, installed stable cattle crossing outside easement to protect reach.
UT1A	85	R	P1	85	1:1	85	10+41 to 11+26	Constructed new pattern to connect tributary to UT1. Installed coir matting and planted.
UT1B	33	R	P1	34	1:1	34	10+00 to 10+34	Constructed new pattern to connect tributary to UT1. Installed coir matting and planted.
UT1C	78	R	P1	78	1:1	78	10+54 to 11+32	Constructed new pattern to connect tributary to UT1. Installed coir matting and planted.
SUM						11,679		

* Existing reach breaks and design reach breaks varied based on initial geomorphic differences and design requirements.

Component Summations

Restoration Level	Stream (LF)	Riparian Wetland (Ac)		Non-Ripar (Ac)	Upland (Ac)	Buffer (Ac)	BMP
		Riverine	Non-Riverine				
Restoration	11,103						
Enhancement							
Enhancement I							
Enhancement II	1,171						
Creation							
Preservation	539						
HQ Preservation							
Totals	**12,813**					40.7	

Table 3. Project Activity and Reporting History

Big Cedar Creek Restoration Site: Project No. D06054-D			
Activity or Report	**Scheduled Completion**	**Data Collection Complete**	**Actual Completion or Delivery**
Restoration Plan Prepared	N/A	N/A	Jul-07
Restoration Plan Amended	N/A	N/A	Jul-07
Restoration Plan Approved	Mar-07	N/A	Jul-07
Final Design – (at least 90% complete)	N/A	N/A	Jun-07
Construction Begins	Oct-07	N/A	Nov-07
Temporary S&E mix applied to entire project area	NA	N/A	Dec-08
Permanent seed mix applied to entire project area	Dec-07	N/A	Dec-08
Planting of live stakes	Dec-07	N/A	Feb-09
Planting of bare root trees	Dec-07	N/A	Feb-09
End of Construction	Dec-07	N/A	Feb-09
Survey of As-built conditions (Year 0 Monitoring-baseline)	May-09	Feb-09	May-09
Year 1 Monitoring	Scheduled Dec-09	Scheduled Nov-09	N/A
Year 2 Monitoring	Scheduled Dec-10	Scheduled Nov-10	N/A
Year 3 Monitoring	Scheduled Dec-11	Scheduled Nov-11	N/A
Year 4 Monitoring	Scheduled Dec-12	Scheduled Nov-12	N/A
Year 5 Monitoring	Scheduled Dec-13	Scheduled Nov-13	N/A

Table 4. Project Contact Table

Big Cedar Creek Restoration Site: Project No. D06054-D	
Designer	
Michael Baker Engineering, Inc.	1447 South Tryon Street, Suite 200 Charlotte, NC 28203 Contact: Christine Miller, Tel. 704-319-7898
Construction Contractor	
River Works, Inc.	8000 Regency Parkway, Suite 200 Cary, NC 27518 Contact: Will Pedersen, Tel. 919-459-9001
Planting Contractor	
River Works, Inc.	8000 Regency Parkway, Suite 200 Cary, NC 27518 Contact: Will Pedersen, Tel. 919-459-9001
Seeding Contractor	
River Works, Inc.	8000 Regency Parkway, Suite 200 Cary, NC 27518 Contact: Will Pedersen, Tel. 919-459-9001
Seed Mix Sources	Mellow Marsh Farm, 919-742-1200
Nursery Stock Suppliers	International Paper, 1-888-888-7159
Monitoring Performers	
Michael Baker Engineering, Inc.	1447 South Tryon Street, Suite 200 Charlotte, NC 28203
Stream Monitoring Point of Contact:	Ian Eckardt, Tel. 704-334-4454
Vegetation Monitoring Point of Contact:	Ian Eckardt, Tel. 704-334-4455

Table 5. Project Attribute Table Big Cedar Creek Restoration Site: Project No. D06054-D

Project County	Stanly County, NC
Physiographic Region	Piedmont
Ecoregion	Carolina Slate Belt
Project River Basin	Yadkin/Pee Dee
USGS HUC for Project and Reference sites	030101031700030 (Project); 030401010800010 (Ref.)
NCDWQ Sub-basin for Project and Reference	03-02-01 (Project); 03-07-02 (Ref.)
Within extent of EEP Watershed Plan ?	Yadkin-Pee Dee, 2003
WRC Class (Warm, Cool, Cold)	Warm
% of project easement fenced or demarcated	100%
Beaver activity observed during design phase ?	None

Restoration Component Attribute Table

	BCC Reach 1	BCC Reach 2	BCC Reach 3	BCC Reach 4	BCC Reach 5	BCC Reach 6	UT1 Reach 1	UT1 Reach 2	UT1 Reach 3	UT1 Reach 4	UT1A	UT1B	UT1C	UT2	UT3
Drainage area	2.85	2.91	3.3	3.35	4.67	4.71	0.93	0.98	1.18	1.21	0.02	0.12	0.10	0.55	0.15
Stream order	3rd	3rd	3rd	3rd	3rd	3rd	2nd	2nd	2nd	2nd	1st	1st	1st	1st	1st
Restored length	603	2,220	1,823	410	N/A	N/A	1,247	1,016	1,885	997	85	33	78	609	73
Perennial or Intermittent	Perennial	Perennial	Perennial	Perennial	Perennial	Perennial	Perennial	Perennial	Perennial	Perennial	Intermittent	Intermittent	Intermittent	Perennial	Perennial
Watershed type (Rural, Urban, Developing etc.)	Rural	Rural	Rural	Rural	Rural	Rural	Rural	Rural	Rural	Rural	Rural	Rural	Rural	Rural	Rural
Watershed LULC Distribution (e.g.)															
Developed Low-Medium Intensity	1.3														
Ag-Cultivated Crops	1.5														
Ag-Pasture/Hay	26														
Forested	56														
Other (Open water, Grassland, Etc.)	15.2														
Watershed impervious cover (%)	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U
NCDWQ AU/Index number	13-17-44	13-17-44	13-17-44	13-17-44	13-17-44	13-17-44	13-17-44	13-17-44	13-17-44	13-17-44	13-17-44	13-17-44	13-17-44	13-17-44	13-17-44
NCDWQ classification	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
303d listed ?	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
Upstream of a 303d listed segment?	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
Reasons for 303d listing or stressor	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total acreage of easment	40.7														
Total planted arceage as part of the restoration	40.7														
Rosgen classification of pre-existing	E4/1	B4/1c	C4/1	C4/1	B3/1c	F3/1	C4/1	E4/1	C4/1	C4/1	G	G	G	G4	G
Rosgen classification of As-built	E/C	E/C	E/C	E/C	B3/1c	F3/1	E/C	E/C	E/C	C	E/C	E/C	E/C	E	E/C
Valley type	Alluvial	Alluvial	Alluvial	Alluvial	Alluvial	Alluvial	Alluvial	Alluvial	Alluvial	Alluvial	Alluvial	Alluvial	Alluvial	Alluvial	Alluvial
Valley slope	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Valley side slope range (e.g. 2-3%)	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Valley toe slope range (e.g. 2-3%)	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Cowardin classification	Riverine, Upper Perennial, Unconsolidated Bottom, Cobble-Gravel														
Trout waters designation	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
Species of concern, endangered etc.? (Y?N)	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
Dominant soil series and characteristics															
Series	Oa	Oa	Oa	Oa	Co	Co, BaF	Oa	Oa, GoF	Oa, GoF	Oa, Co	Oa	Oa	Oa	Oa	Oa
Depth	10	10	10	10	10	10, 6	10	10, 7	10, 7	10, 10	10	10	10	10	10
Clay %	27	27	27	27	15	15, 27	27	27, 15	27, 15	27, 15	27	27	27	27	27
K	0.28	0.28	0.28	0.28	0.24	0.24, 0.15	0.28	0.28, 0.5	0.28, 0.5	0.28, 0.24	0.28	0.28	0.28	0.28	0.28
T	3	3	3	3	5	5, 3	3	3, 2	3, 2	3, 5	3	3	3	3	3

Appendix B

Morphological Summary Data

Cross-section Plots

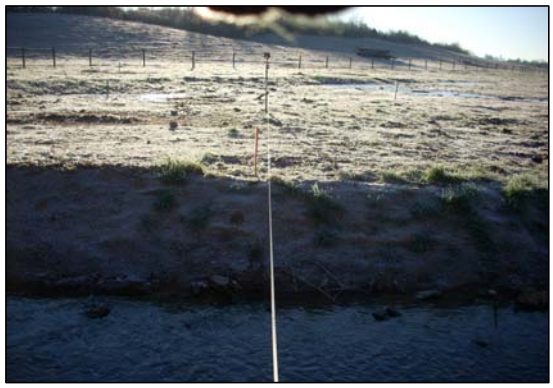
Profile Plots

Tables 6 & 7

Sediment Data

Permanent Cross Section X1

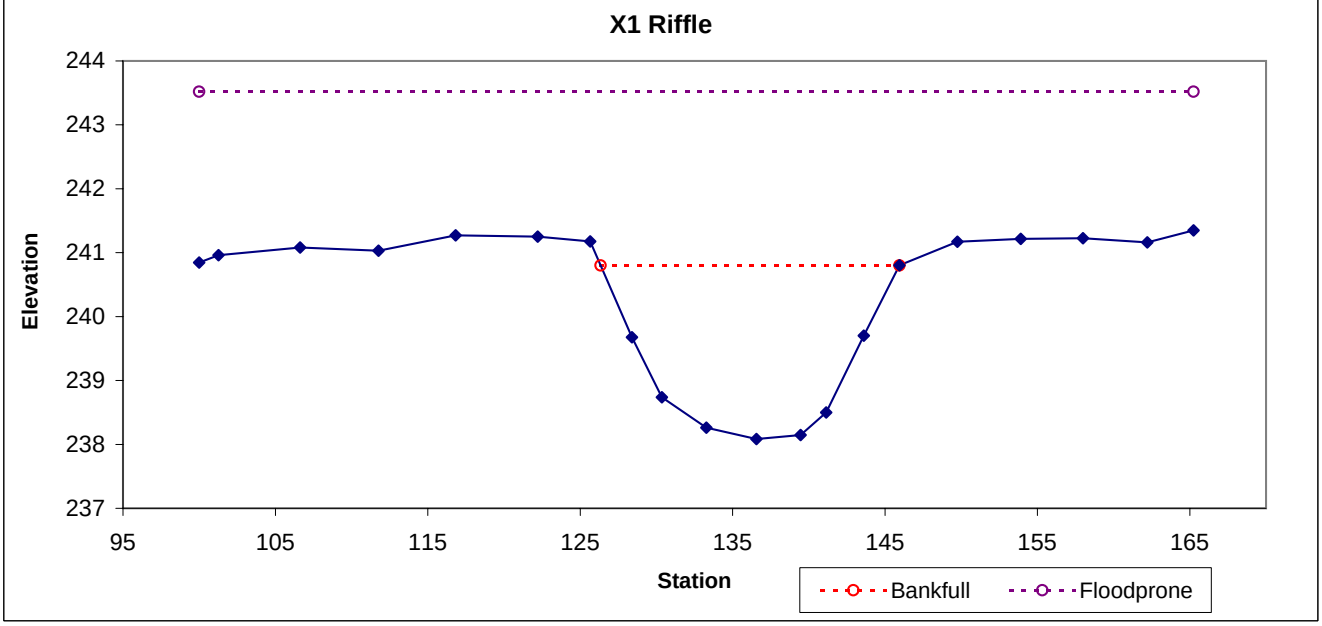
(As-built Data - collected February 2009)



Looking at the Left Bank

Looking at the Right Bank

Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev	TOB Elev
Riffle	E	37.1	19.61	1.89	2.72	10.37	1	3.3	240.8	240.8



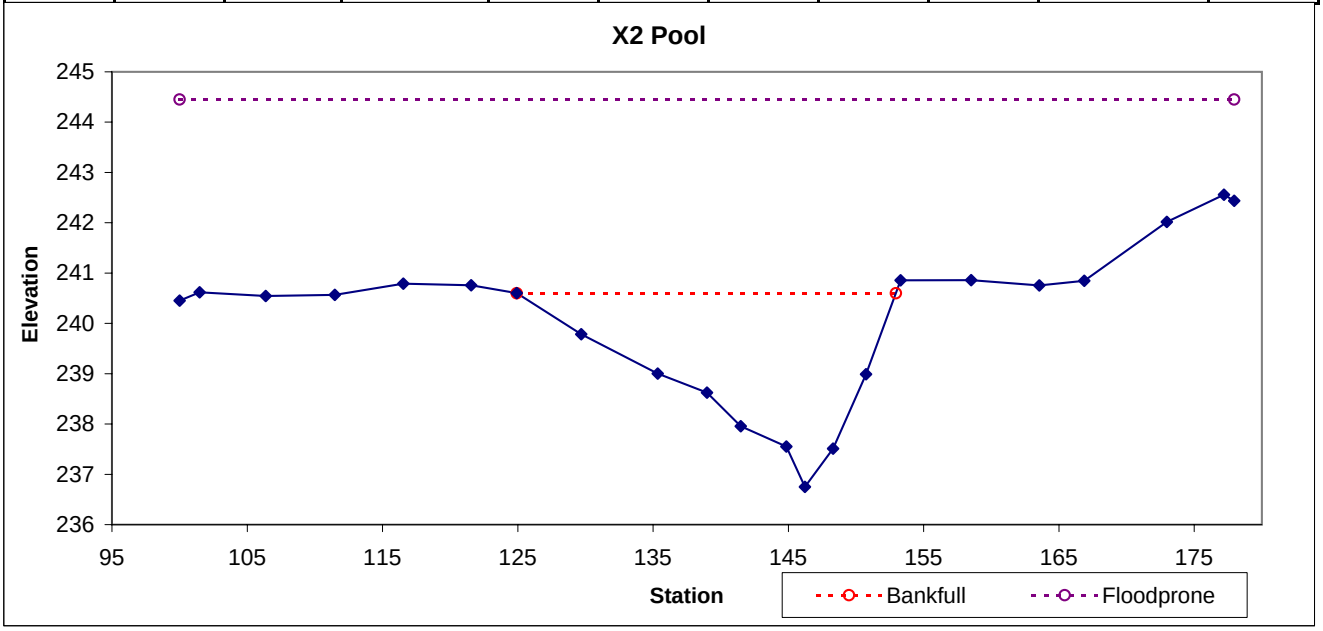
Permanent Cross Section X2

(As-built Data - collected February 2009)

Looking at the Left Bank

Looking at the Right Bank

Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev	TOB Elev
Pool		50.1	28.03	1.79	3.85	15.67	1		240.6	240.6



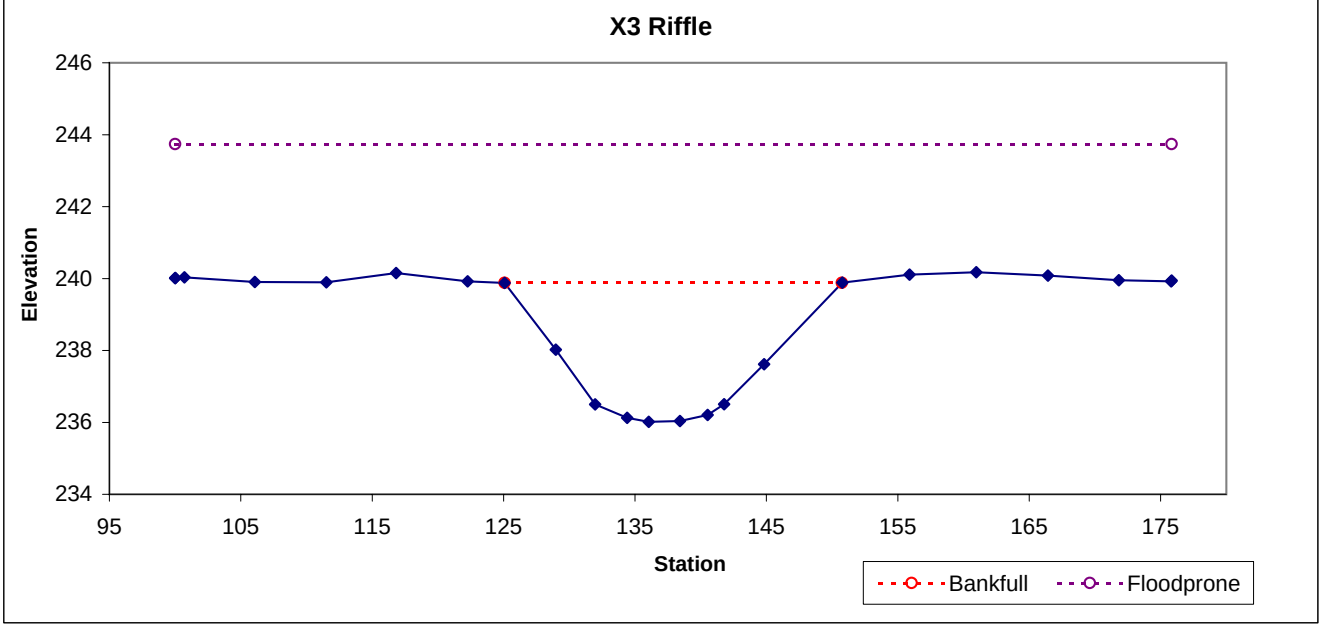
Permanent Cross Section X3

(As-built Data - collected February 2009)

Looking at the Left Bank

Looking at the Right Bank

Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev	TOB Elev
Riffle	E	63.1	25.67	2.46	3.86	10.44	1	3	239.88	239.88



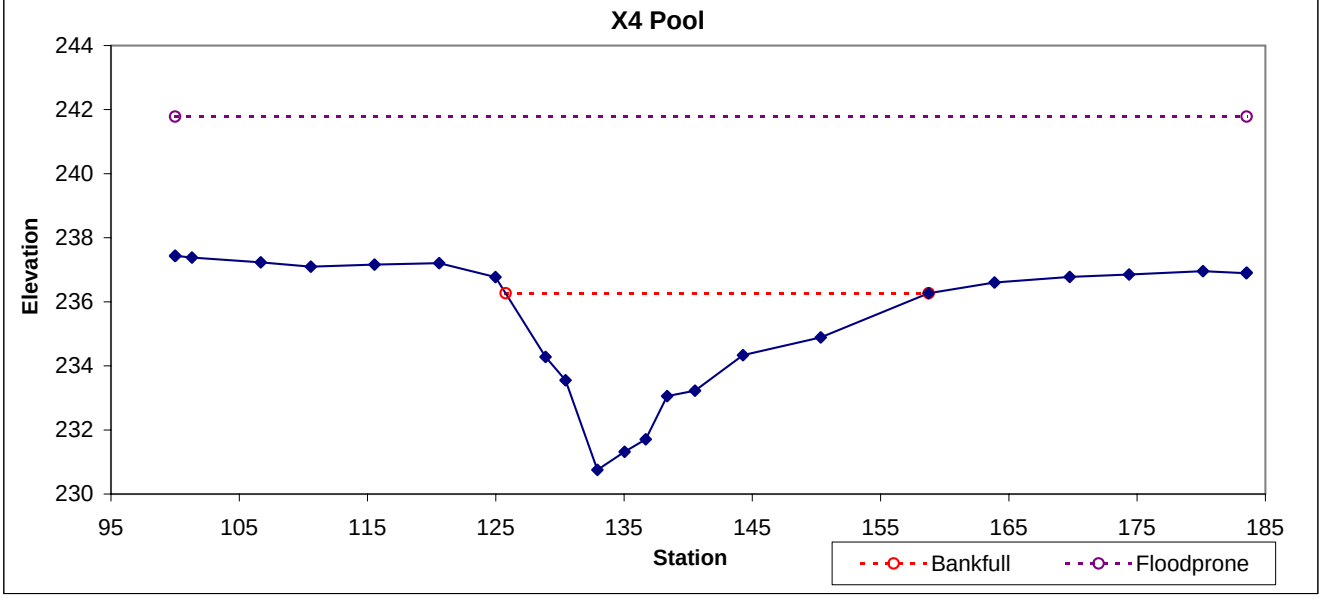
Permanent Cross Section X4

(As-built Data - collected February 2009)

Looking at the Left Bank

Looking at the Right Bank

Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev	TOB Elev
Pool		74.3	32.98	2.25	5.52	14.64	1		236.27	236.27



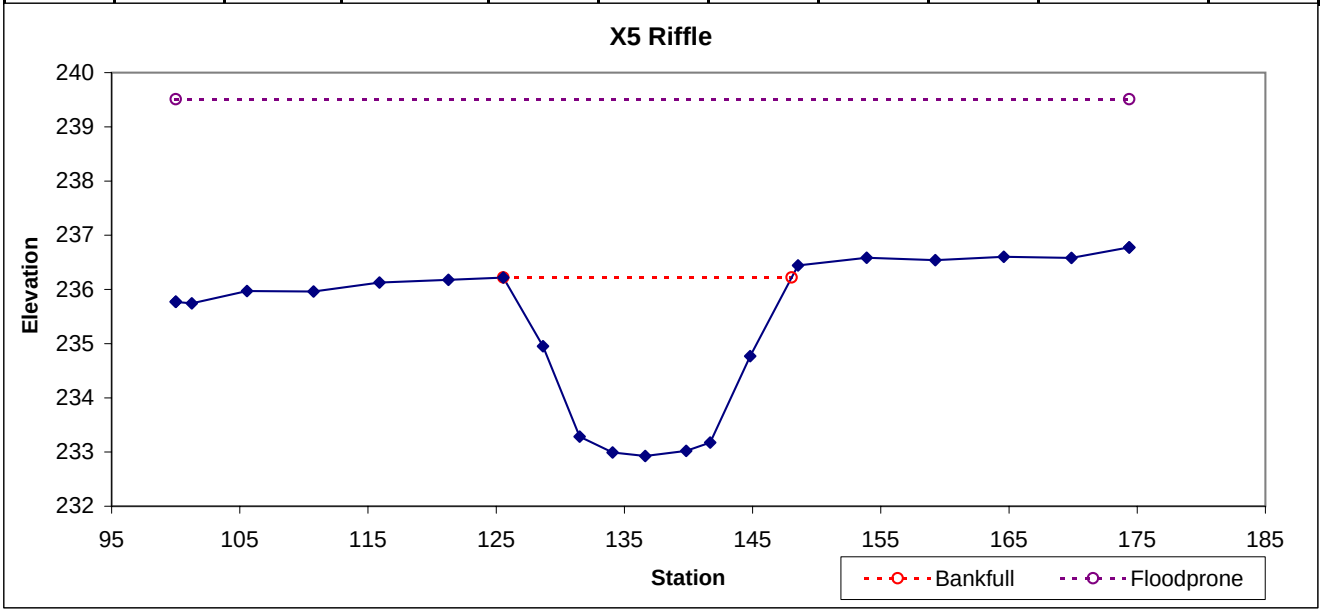
Permanent Cross Section X5

(As-built Data - collected February 2009)

Looking at the Left Bank

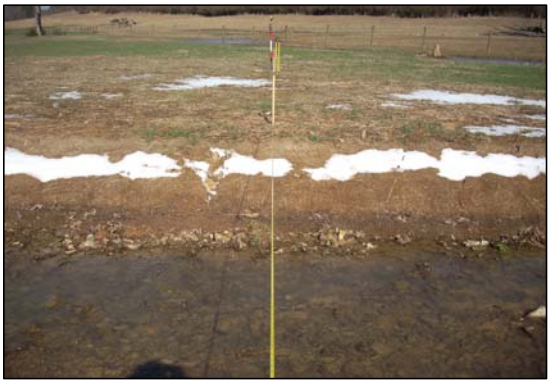
Looking at the Right Bank

Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev	TOB Elev
Riffle	E	49.7	22.49	2.21	3.29	10.17	1	3.3	236.22	236.22



Permanent Cross Section X6

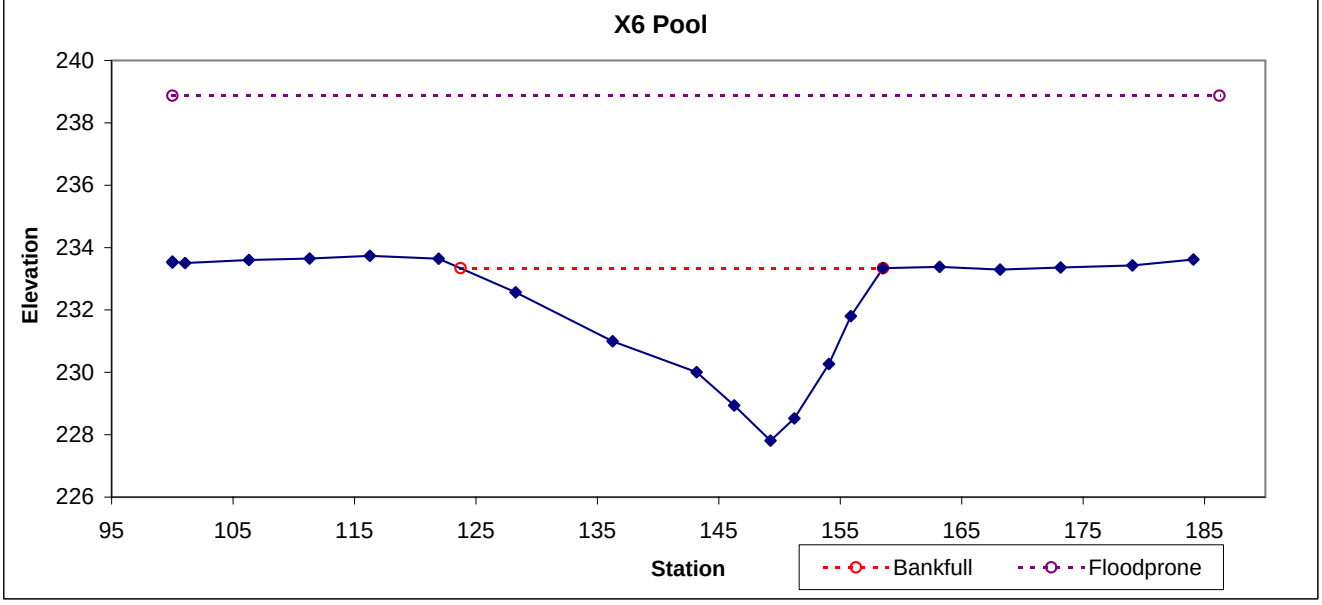
(As-built Data - collected February 2009)



Looking at the Left Bank

Looking at the Right Bank

Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev	TOB Elev
Pool		88.2	34.79	2.54	5.53	13.72	1		233.34	233.34



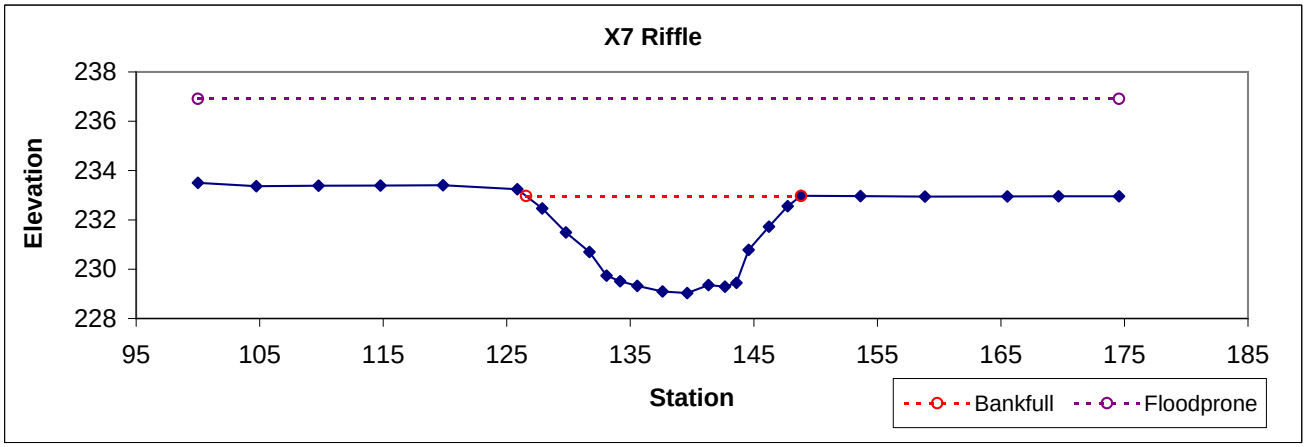
Permanent Cross Section X7

(As-built Data - collected May 2009)

Looking at the Left Bank (February 2009)

Looking at the Right Bank (February 2009)

Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev	TOB Elev
Riffle	E	55.6	22.25	2.5	3.94	8.91	1	3.4	232.97	232.97



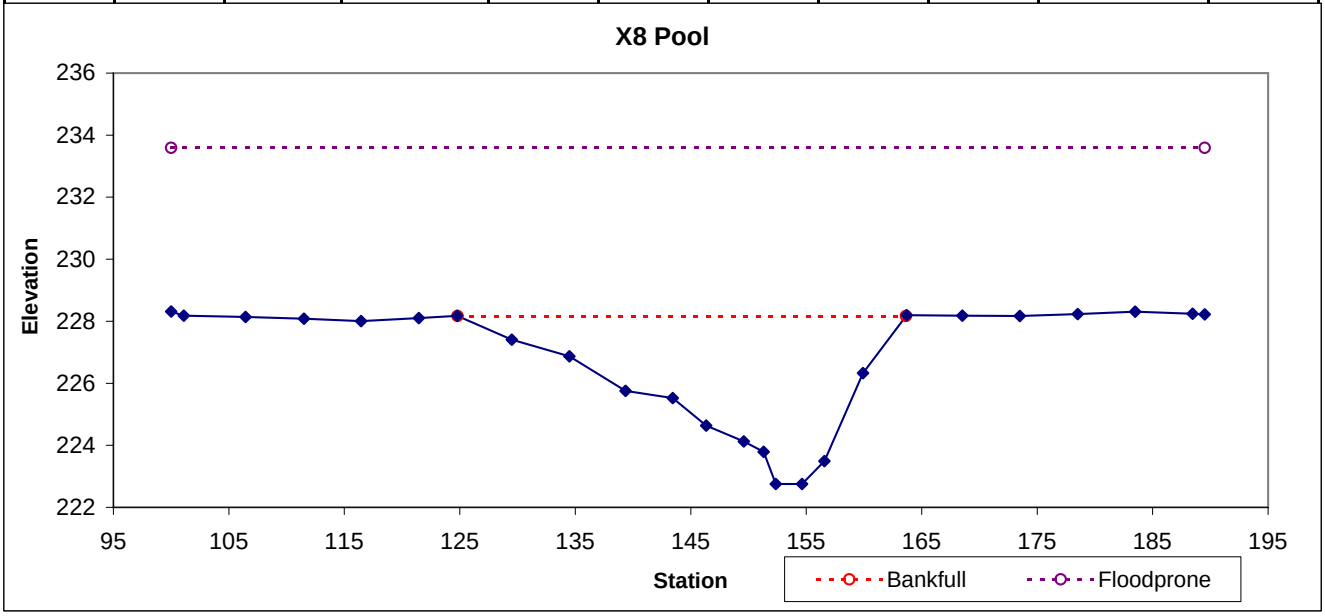
Permanent Cross Section X8

(As-built Data - collected February 2009)

Looking at the Left Bank

Looking at the Right Bank

Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev	TOB Elev
Pool		96.4	38.83	2.48	5.42	15.63	1		228.17	228.18



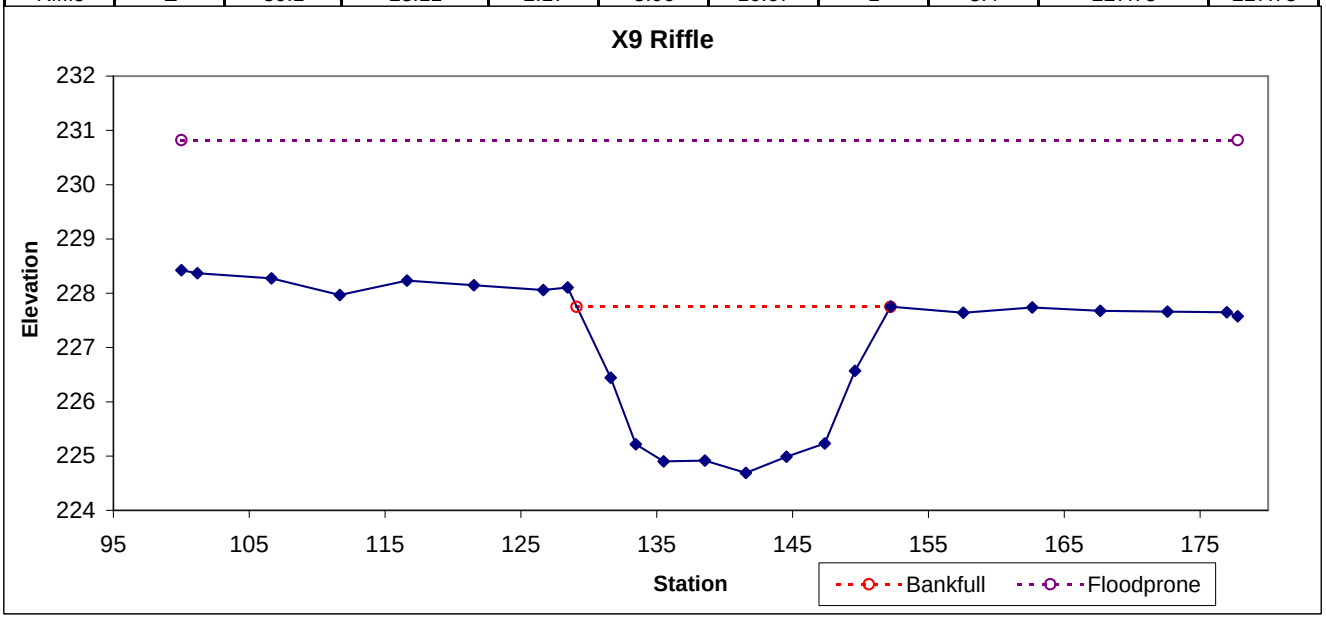
Permanent Cross Section X9

(As-built Data - collected February 2009)

Looking at the Left Bank

Looking at the Right Bank

Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev	TOB Elev
Riffle	E	50.1	23.11	2.17	3.06	10.67	1	3.4	227.75	227.75



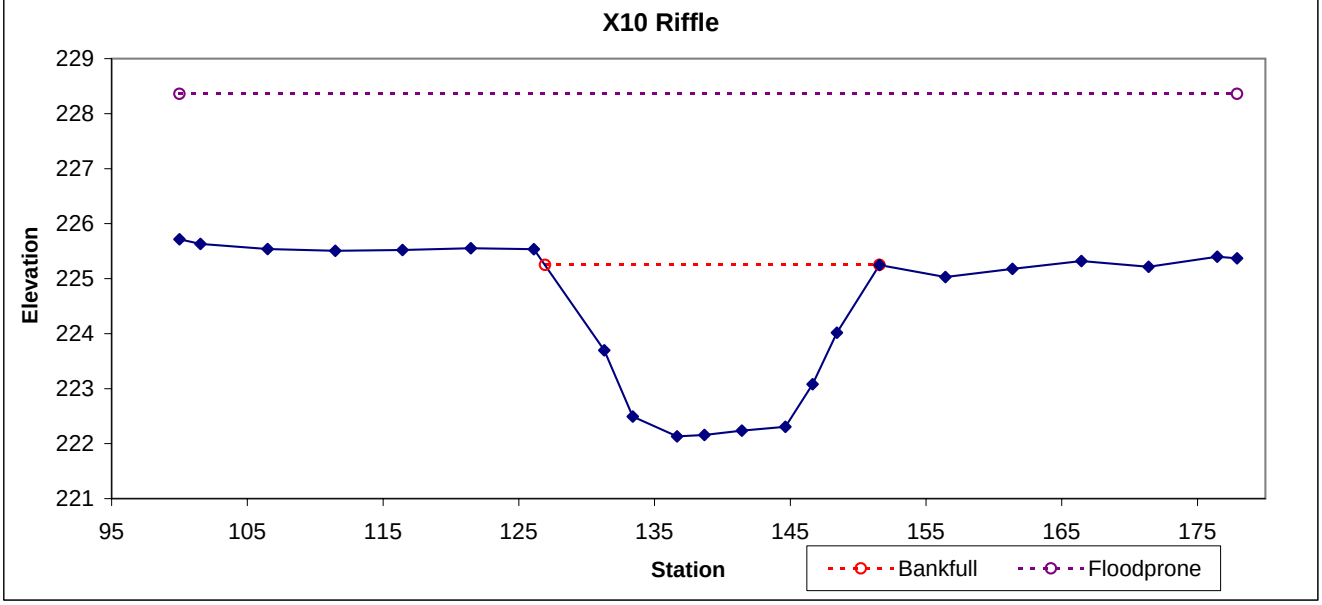
Permanent Cross Section X10

(As-built Data - collected February 2009)

Looking at the Left Bank

Looking at the Right Bank

Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev	TOB Elev
Riffle	E	51.8	24.64	2.1	3.11	11.73	1	3.2	225.25	225.25



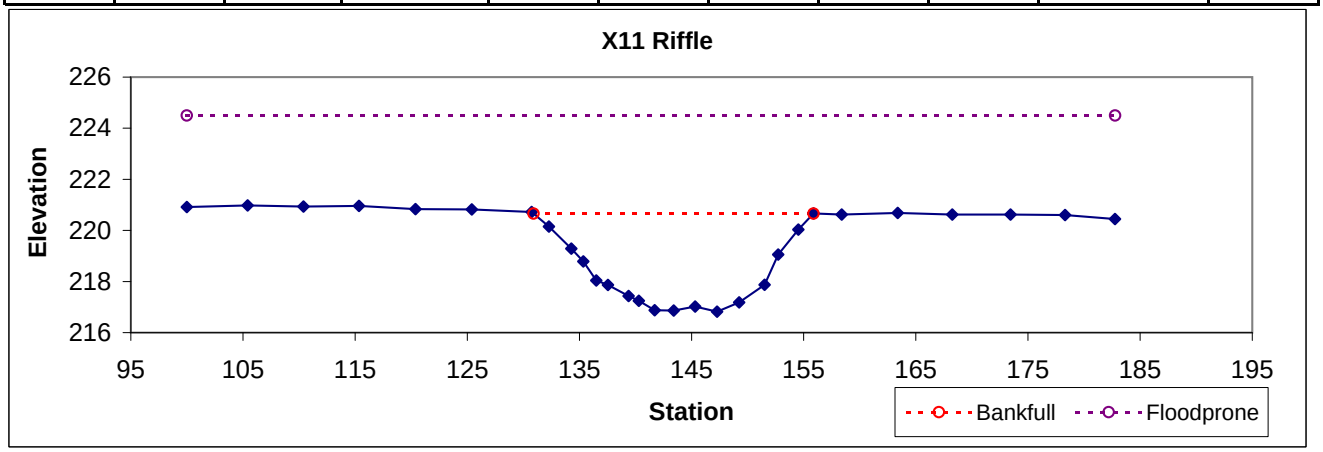
Permanent Cross Section X11

(As-built Data - collected May 2009)

Looking at the Left Bank (February 2009)

Looking at the Right Bank (February 2009)

Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev	TOB Elev
Riffle	E	63.2	24.97	2.53	3.84	9.86	1	3.3	220.66	220.66



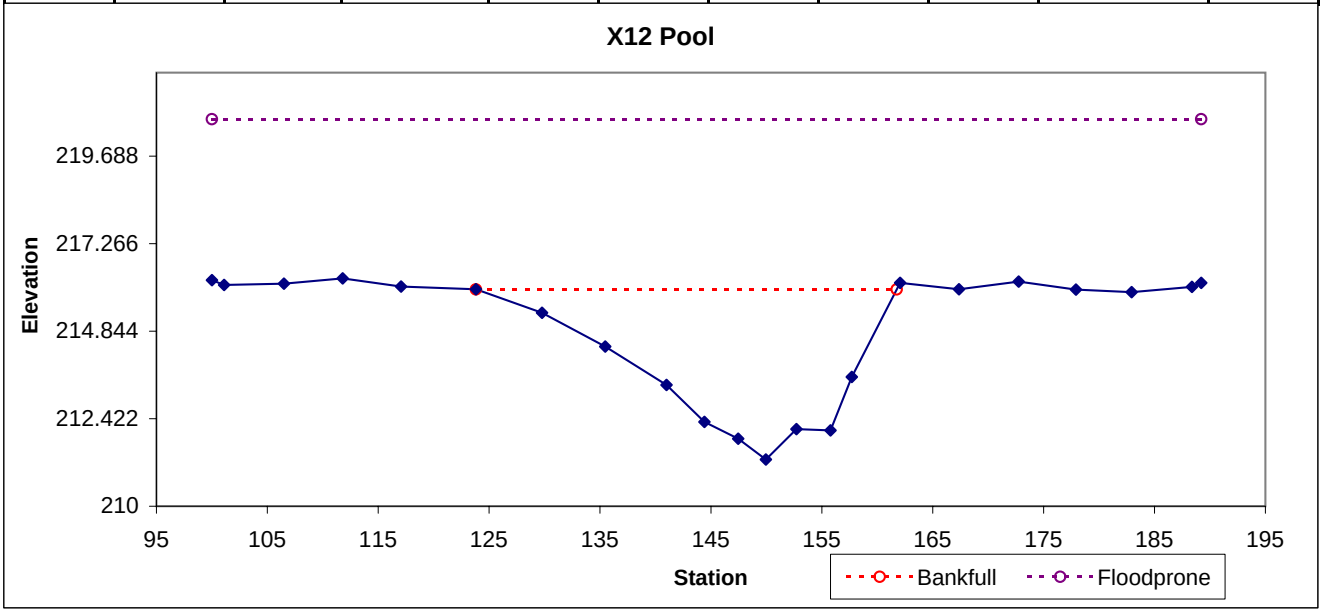
Permanent Cross Section X12

(As-built Data - collected February 2009)

Looking at the Left Bank

Looking at the Right Bank

Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev	TOB Elev
Pool		88.5	37.95	2.33	4.71	16.27	1		216	216



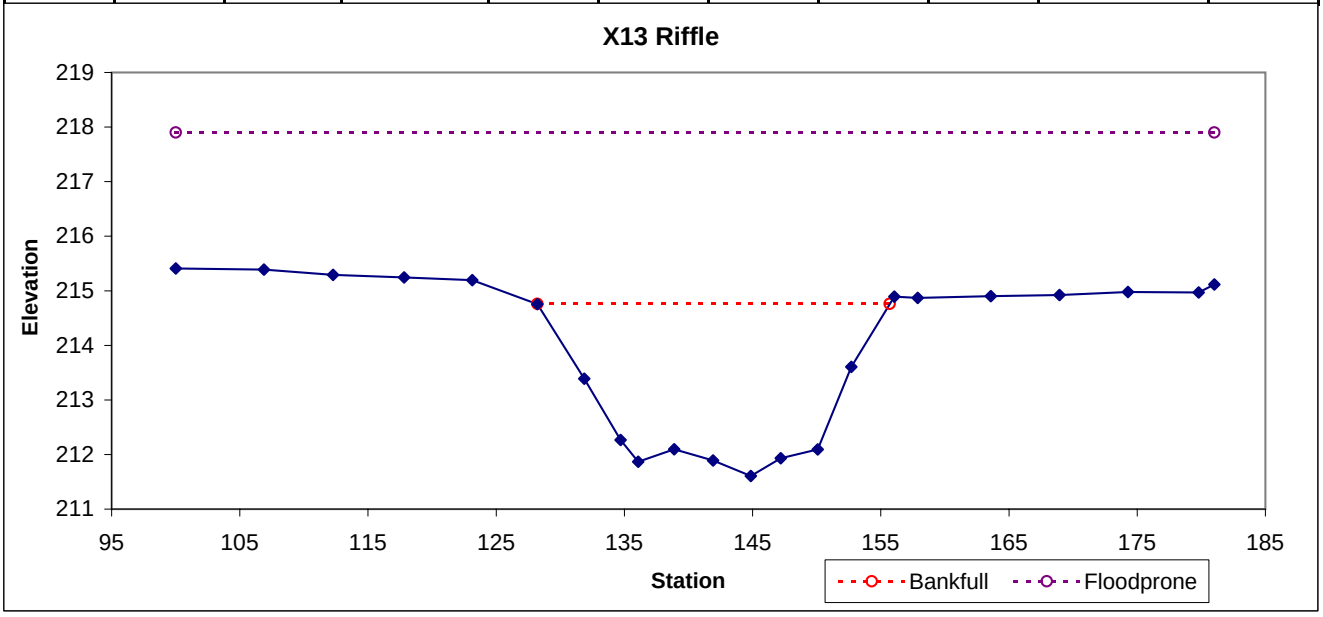
Permanent Cross Section X13

(As-built Data - collected February 2009)

Looking at the Left Bank

Looking at the Right Bank

Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev	TOB Elev
Riffle	C	58.3	27.49	2.12	3.15	12.97	1	2.9	214.76	214.76



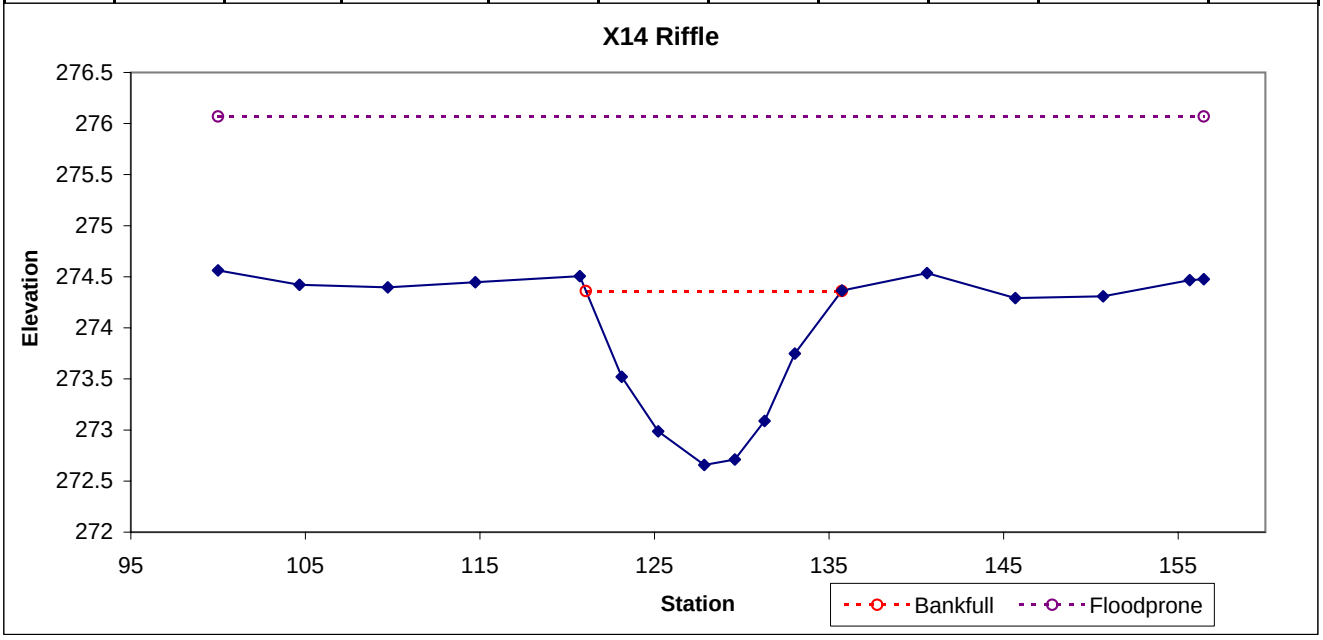
Permanent Cross Section X14

(As-built Data - collected February 2009)

Looking at the Left Bank

Looking at the Right Bank

Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev	TOB Elev
Riffle	C	15.2	14.67	1.03	1.71	14.2	1	3.8	274.36	274.36



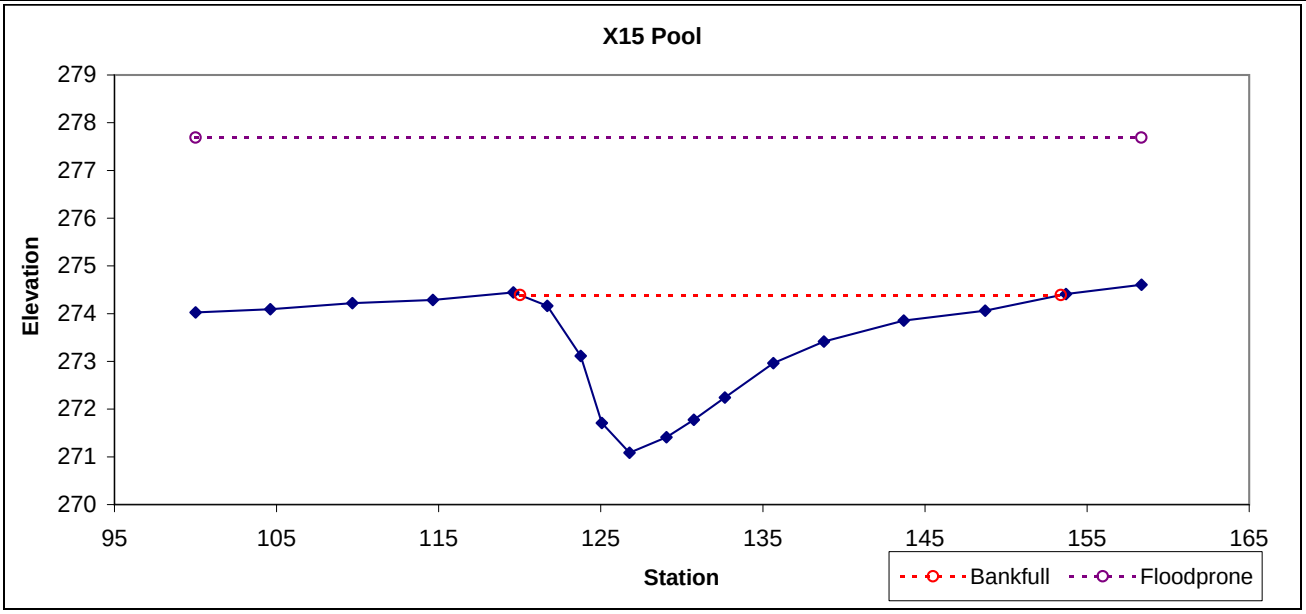
Permanent Cross Section X15

(As-built Data - collected February 2009)

Looking at the Left Bank

Looking at the Right Bank

Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev	TOB Elev
Pool		41.6	33.37	1.25	3.3	26.75	1		274.39	274.41



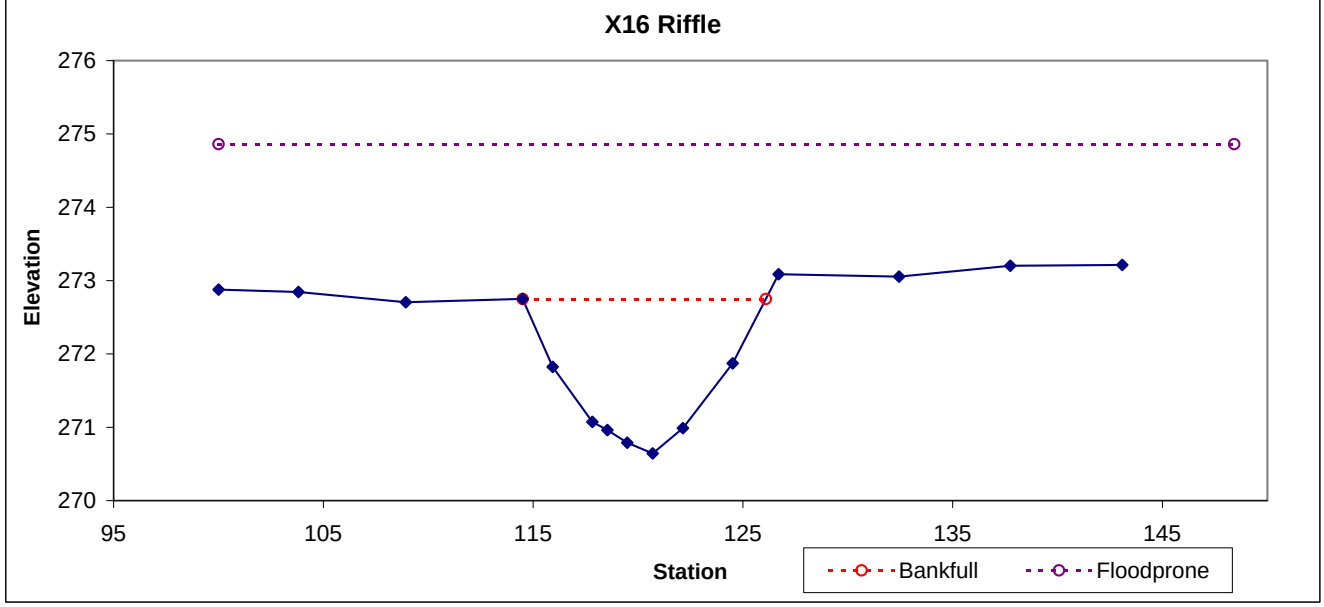
Permanent Cross Section X16

(As-built Data - collected February 2009)

Looking at the Left Bank

Looking at the Right Bank

Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev	TOB Elev
Riffle	E	15.2	11.6	1.31	2.11	8.83	1	4.2	272.75	272.75

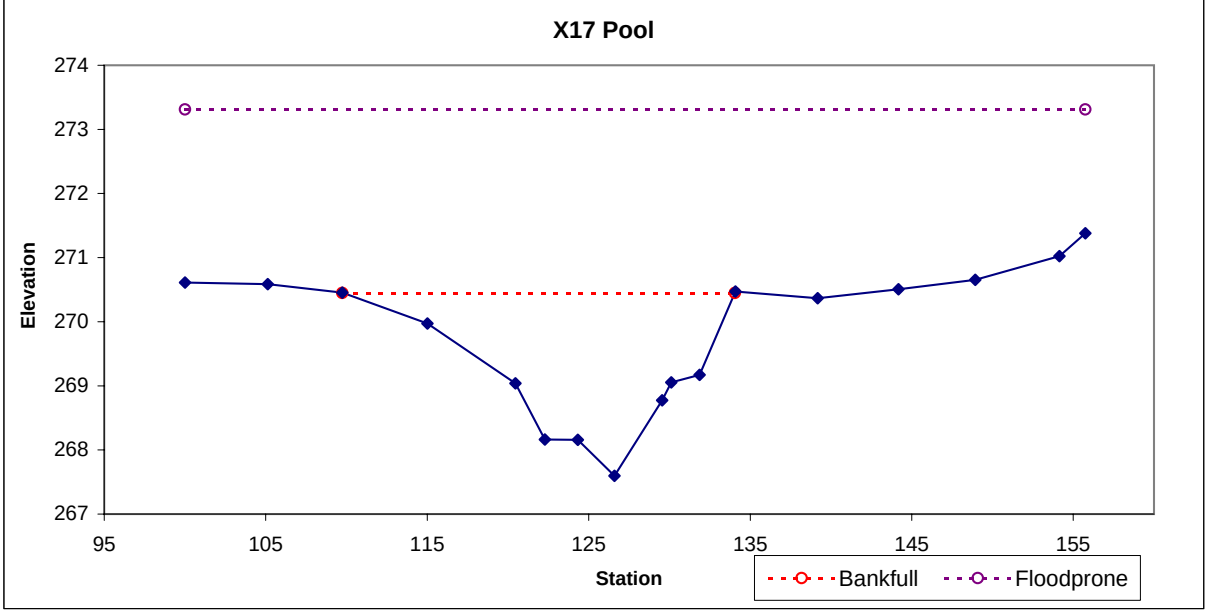


Permanent Cross Section X17
(As-built Data - collected February 2009)

Looking at the Left Bank

Looking at the Right Bank

Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev	TOB Elev
Pool		31.6	24.31	1.3	2.86	18.67	1		270.45	270.45



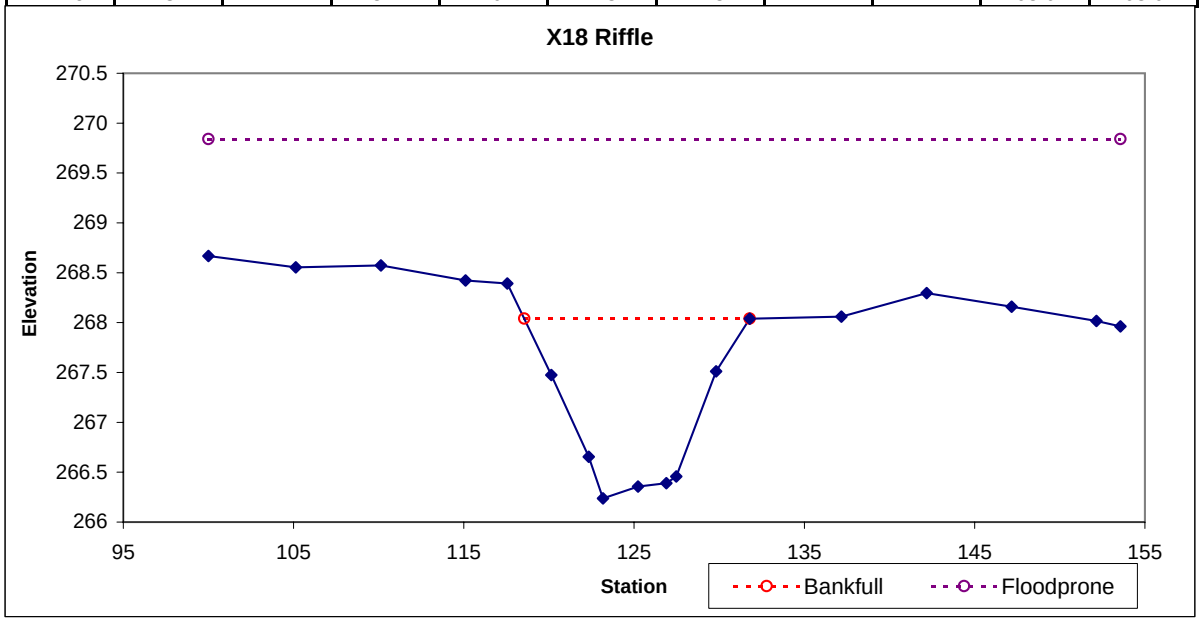
Permanent Cross Section X18

(As-built Data - collected February 2009)

Looking at the Left Bank

Looking at the Right Bank

Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev	TOB Elev
Riffle	C	14.2	13.24	1.07	1.8	12.34	1	4	268.04	268.04



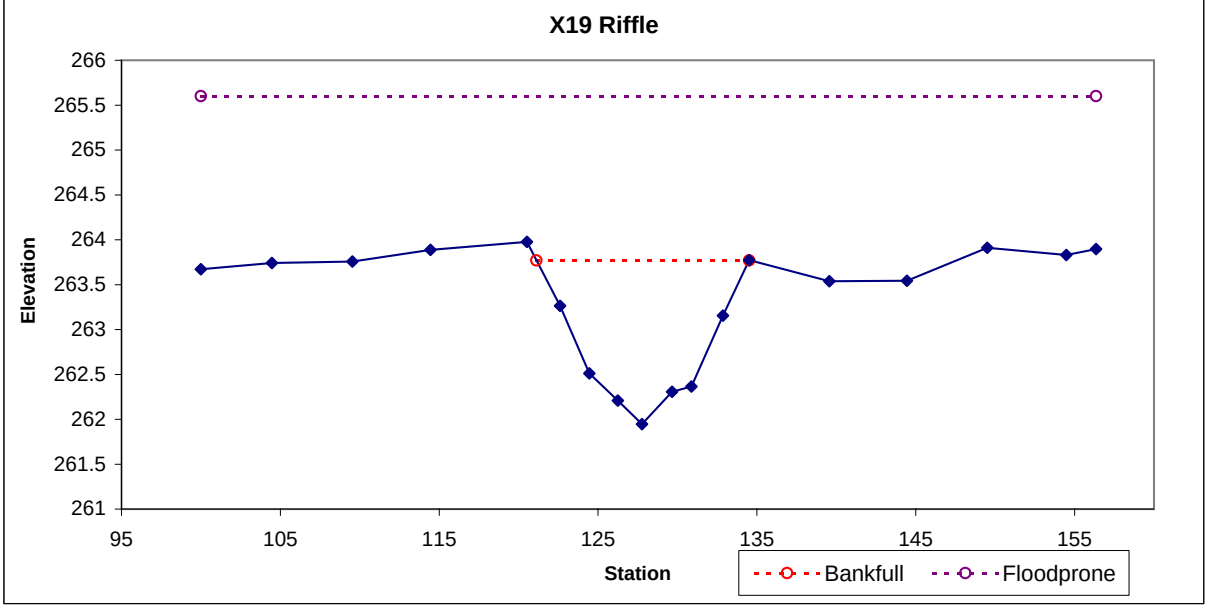
Permanent Cross Section X19

(As-built Data - collected February 2009)

Looking at the Left Bank

Looking at the Right Bank

Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev	TOB Elev
Riffle	C	14.5	13.4	1.08	1.83	12.37	1	4.2	263.77	263.77

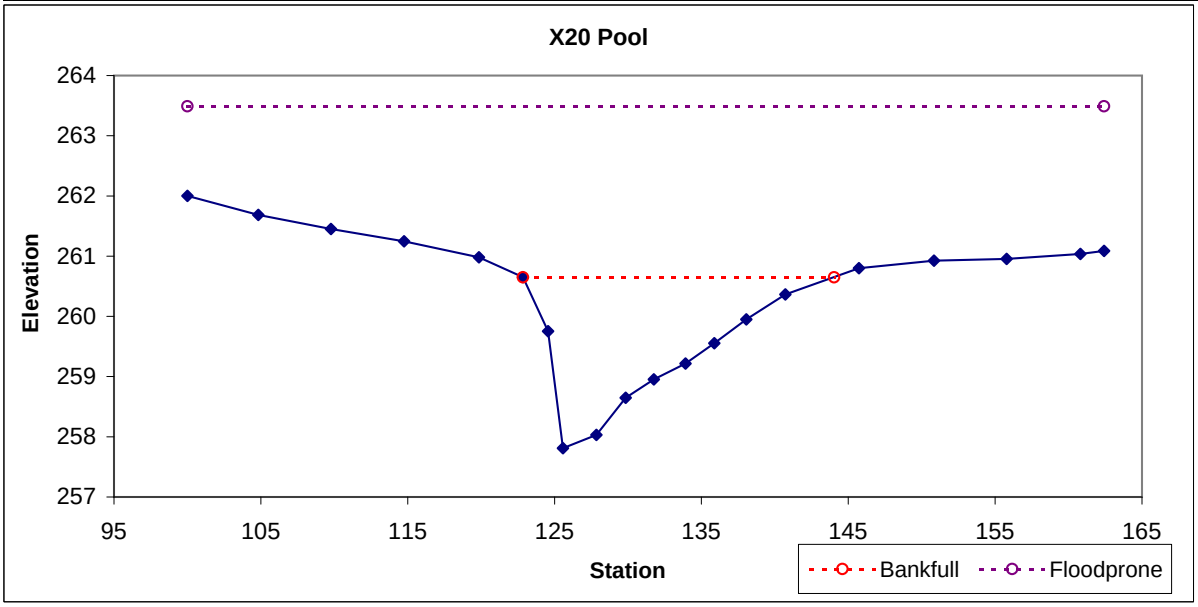


Permanent Cross Section X20
(As-built Data - collected February 2009)

Looking at the Left Bank

Looking at the Right Bank

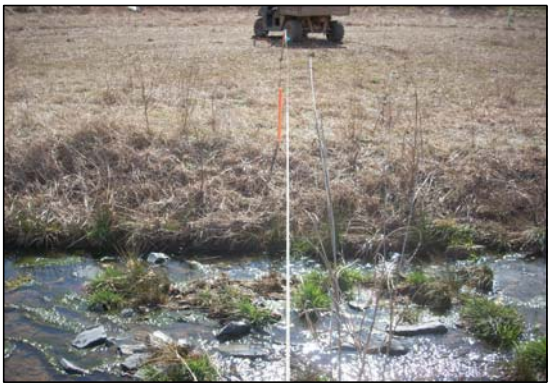
Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev	TOB Elev
Pool		26.7	21.19	1.26	2.84	16.83	1		260.65	260.65



Permanent Cross Section X21

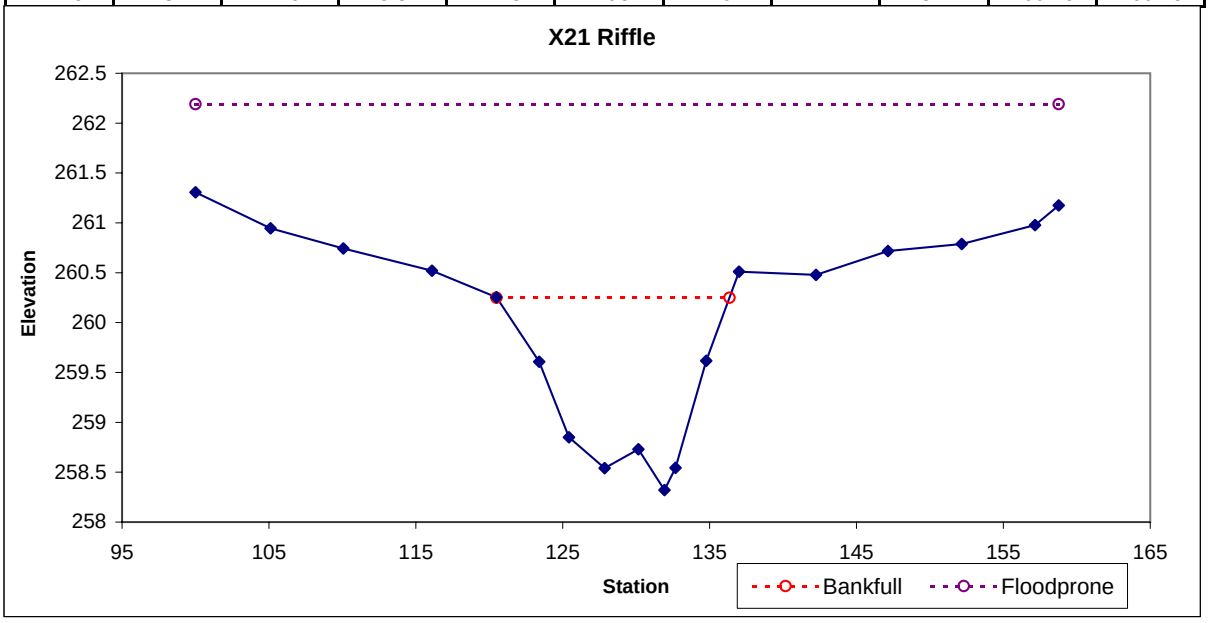
(As-built Data - collected February 2009)

Looking at the Left Bank



Looking at the Right Bank

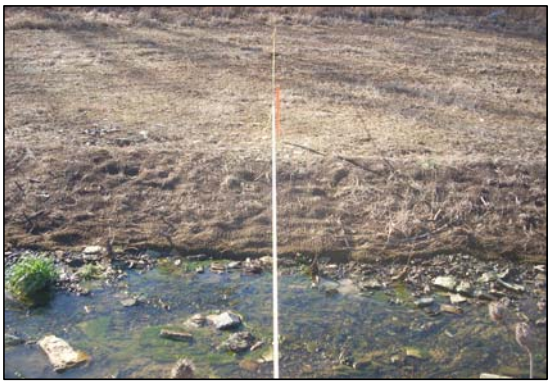
Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev	TOB Elev
Riffle	C	17.9	15.87	1.13	1.93	14.04	1	3.7	260.25	260.25



Permanent Cross Section X22

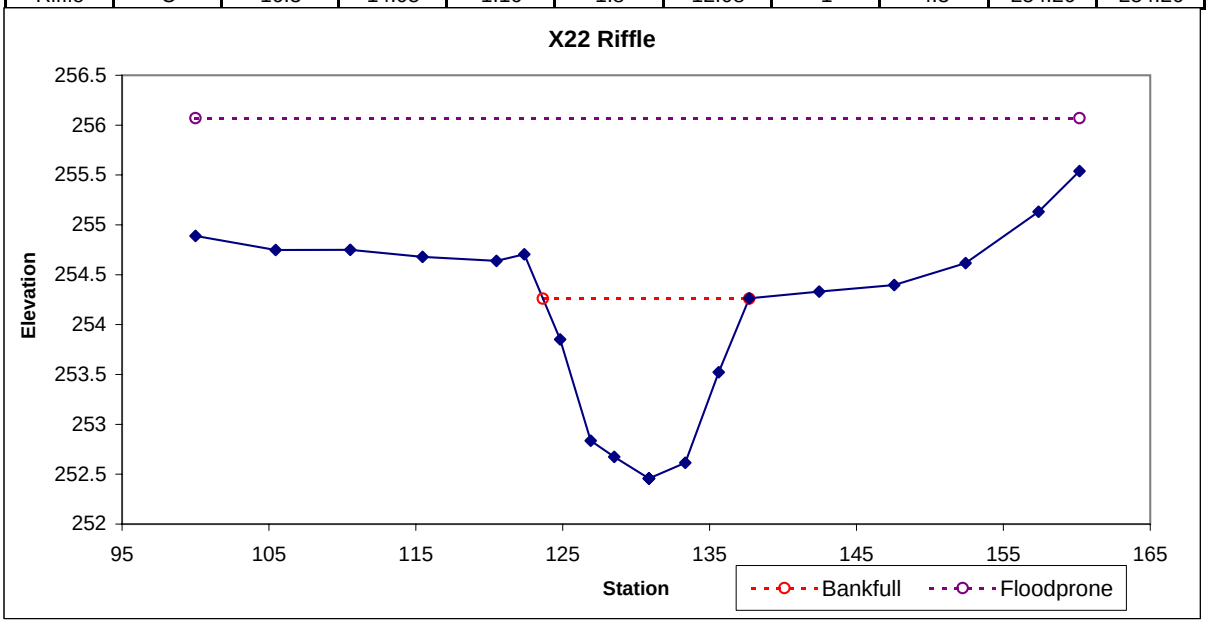
(As-built Data - collected February 2009)

Looking at the Left Bank



Looking at the Right Bank

Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev	TOB Elev
Riffle	C	16.3	14.05	1.16	1.8	12.08	1	4.3	254.26	254.26



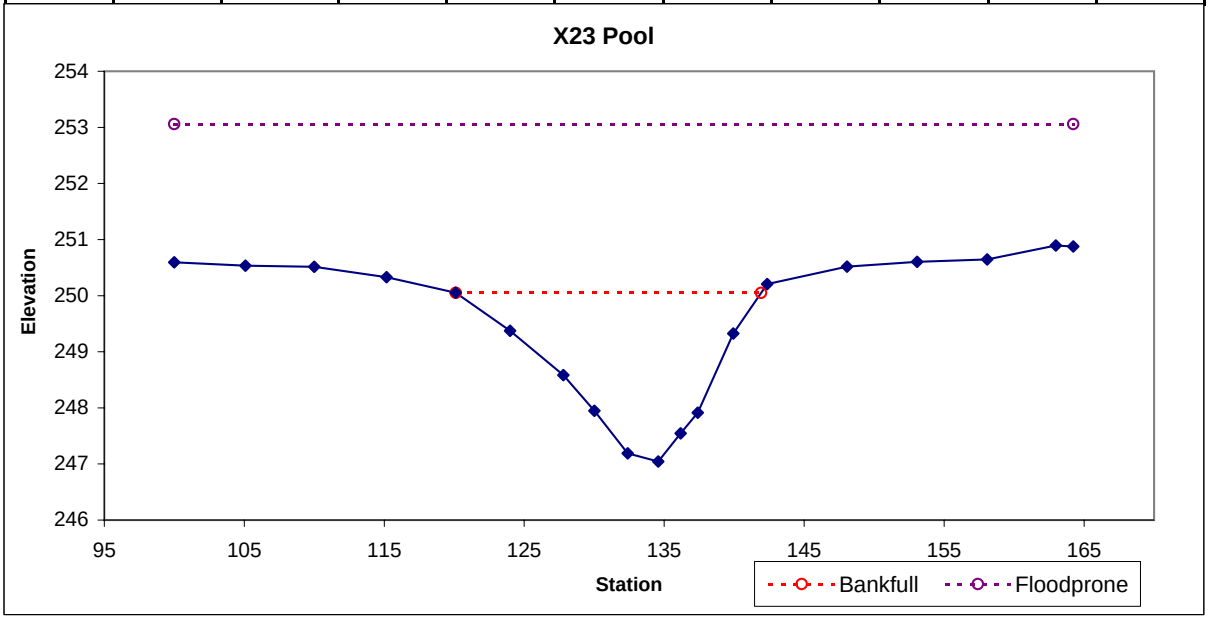
Permanent Cross Section X23

(As-built Data - collected February 2009)

Looking at the Left Bank

Looking at the Right Bank

Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev	TOB Elev
Pool		33.3	21.82	1.53	3.01	14.31	1		250.05	250.05



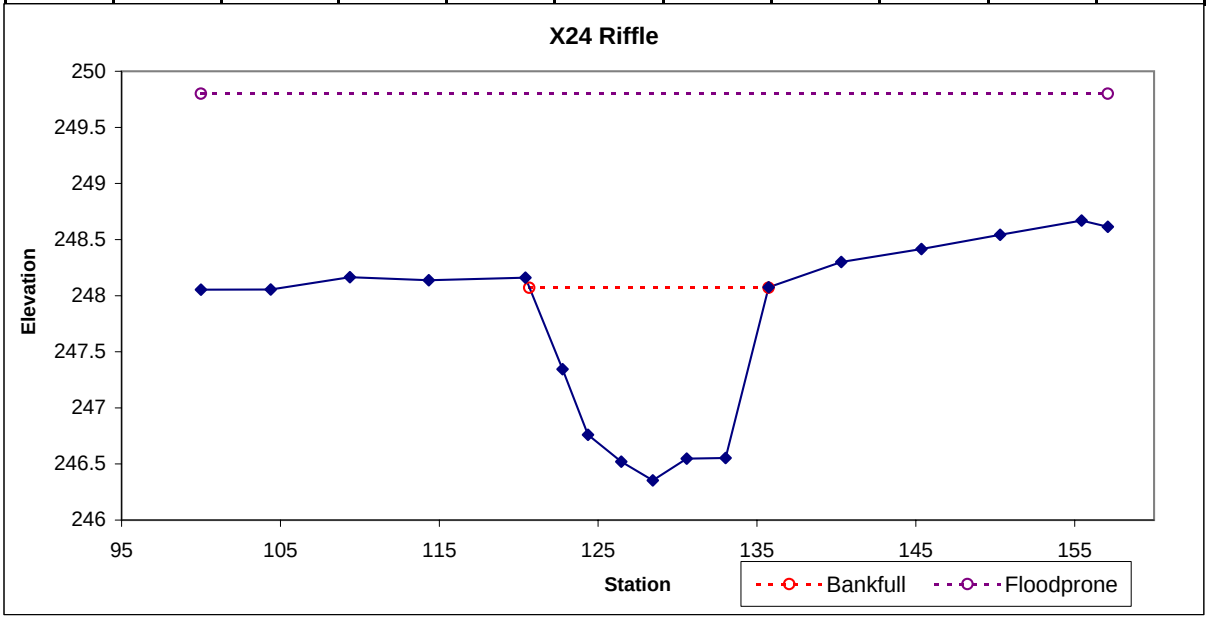
Permanent Cross Section X24

(As-built Data - collected February 2009)

Looking at the Left Bank

Looking at the Right Bank

Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev	TOB Elev
Riffle	C	17.9	15.07	1.19	1.72	12.67	1	3.8	248.07	248.07



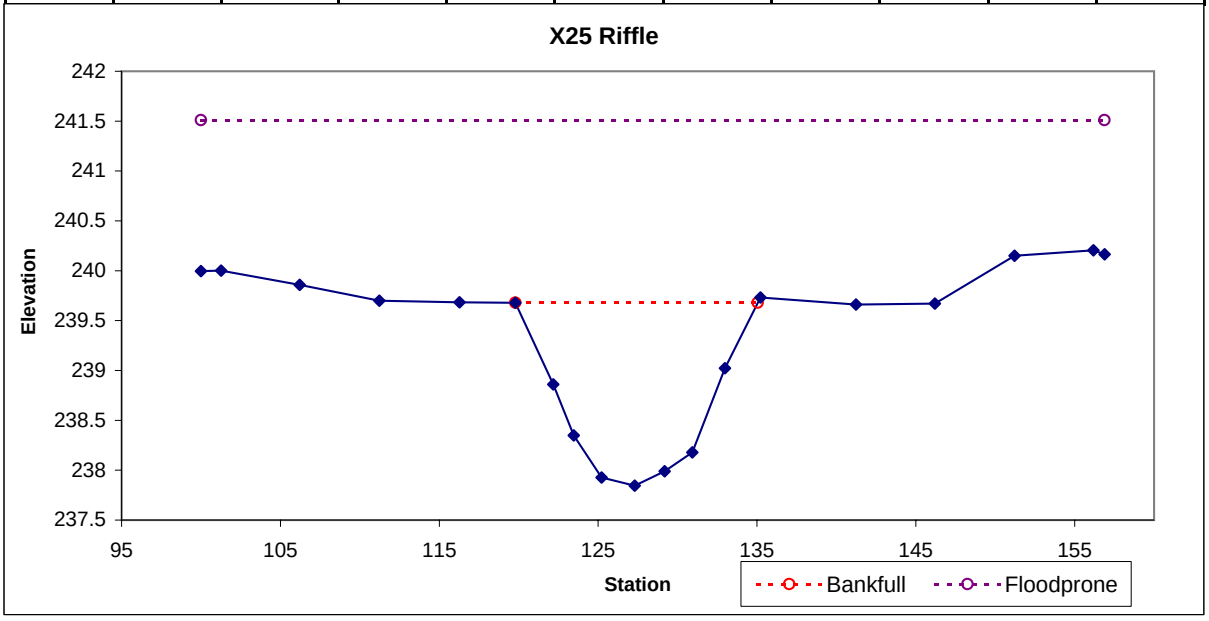
Permanent Cross Section X25

(As-built Data - collected February 2009)

Looking at the Left Bank

Looking at the Right Bank

Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev	TOB Elev
Riffle	C	17.8	15.26	1.17	1.83	13.1	1	3.7	239.68	239.68



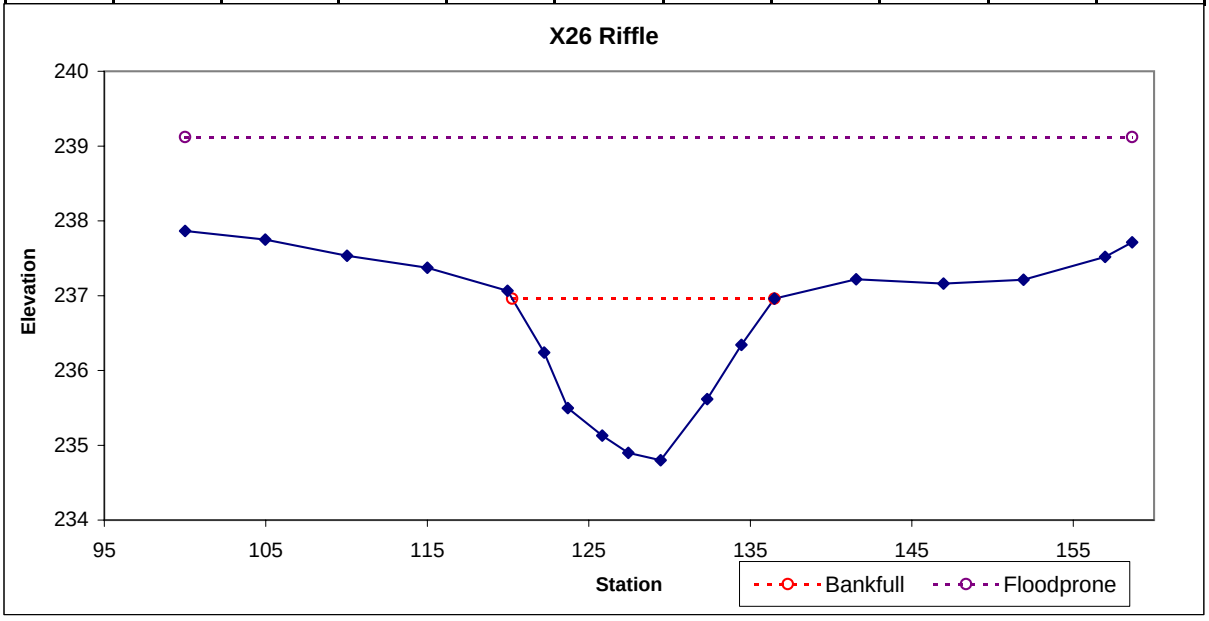
Permanent Cross Section X26

(As-built Data - collected February 2009)

Looking at the Left Bank

Looking at the Right Bank

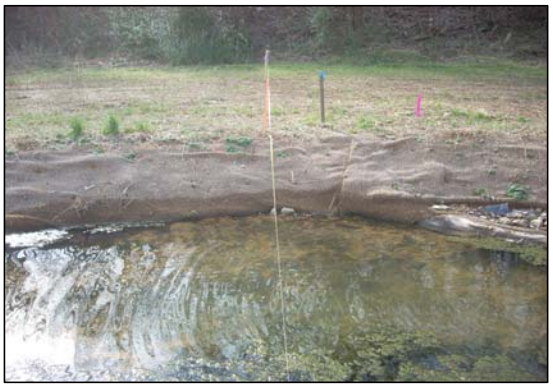
Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev	TOB Elev
Riffle	C	20.9	16.24	1.29	2.16	12.59	1	3.6	236.96	236.96



Permanent Cross Section X27

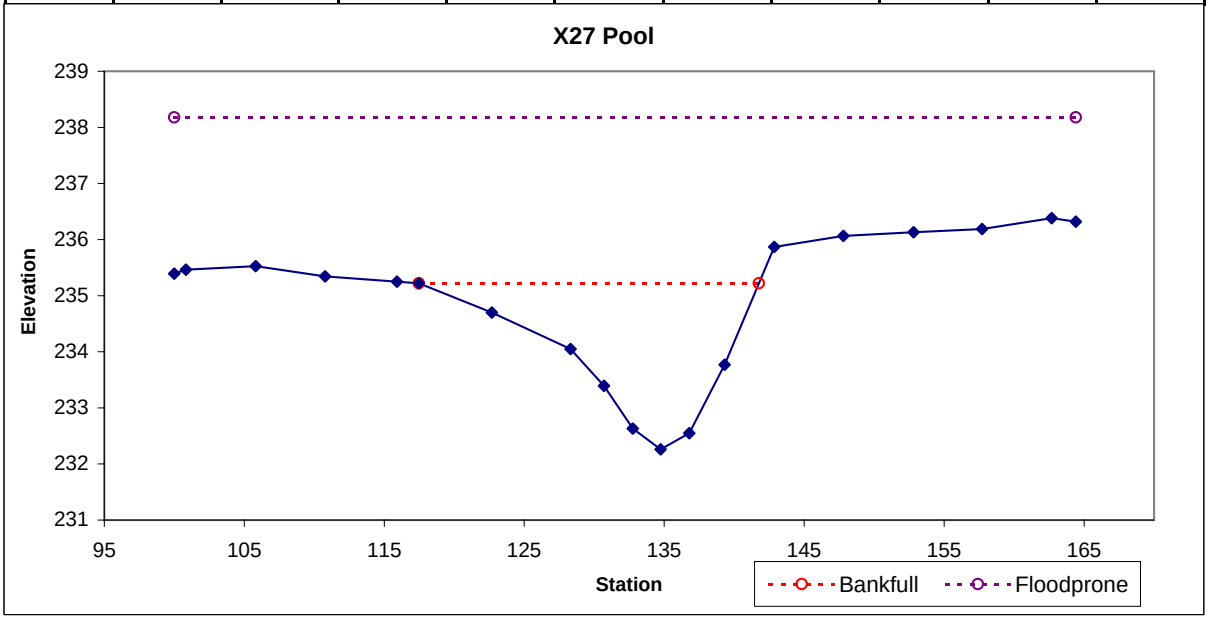
(As-built Data - collected February 2009)

Looking at the Left Bank



Looking at the Right Bank

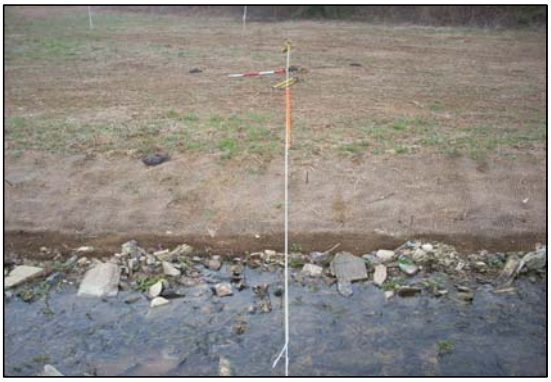
Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev	TOB Elev
Pool		32.5	24.3	1.34	2.96	18.14	1		235.22	235.22



Permanent Cross Section X28

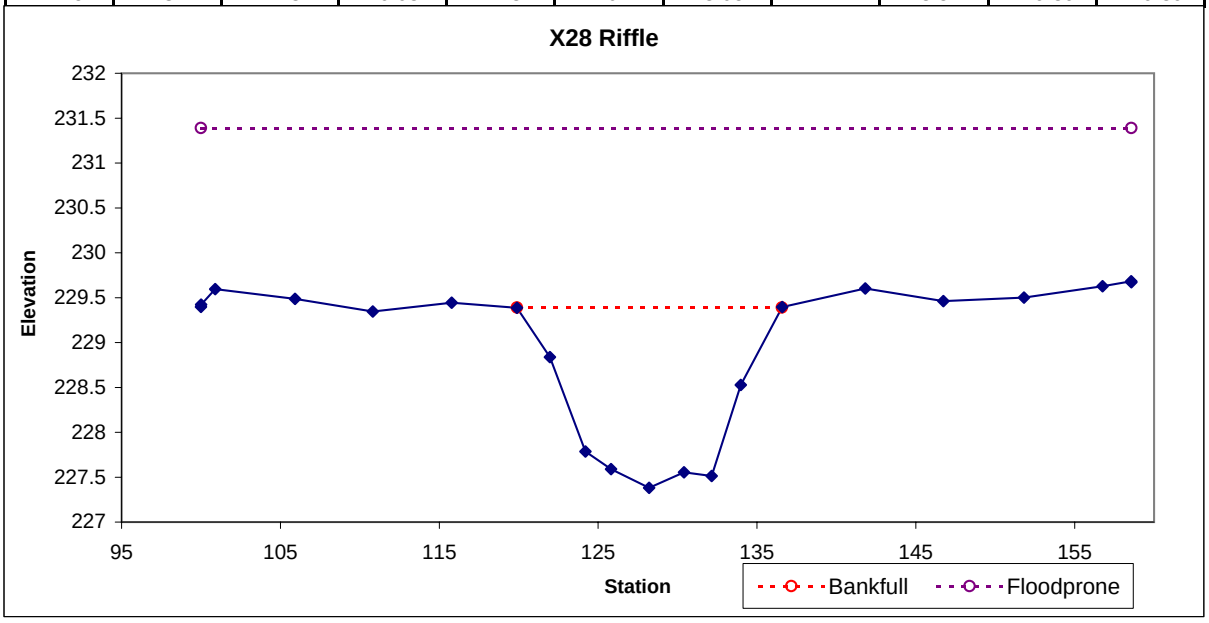
(As-built Data - collected February 2009)

Looking at the Left Bank



Looking at the Right Bank

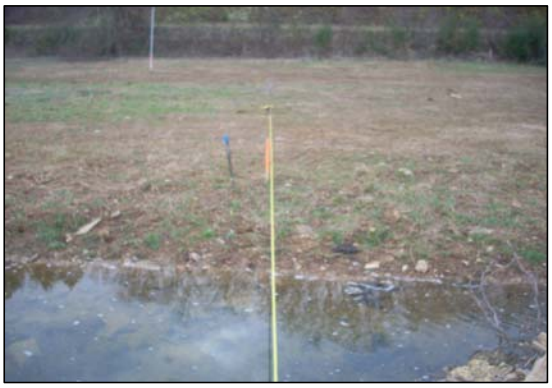
Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev	TOB Elev
Riffle	C	21.3	16.68	1.28	2.01	13.05	1	3.5	229.39	229.39



Permanent Cross Section X29

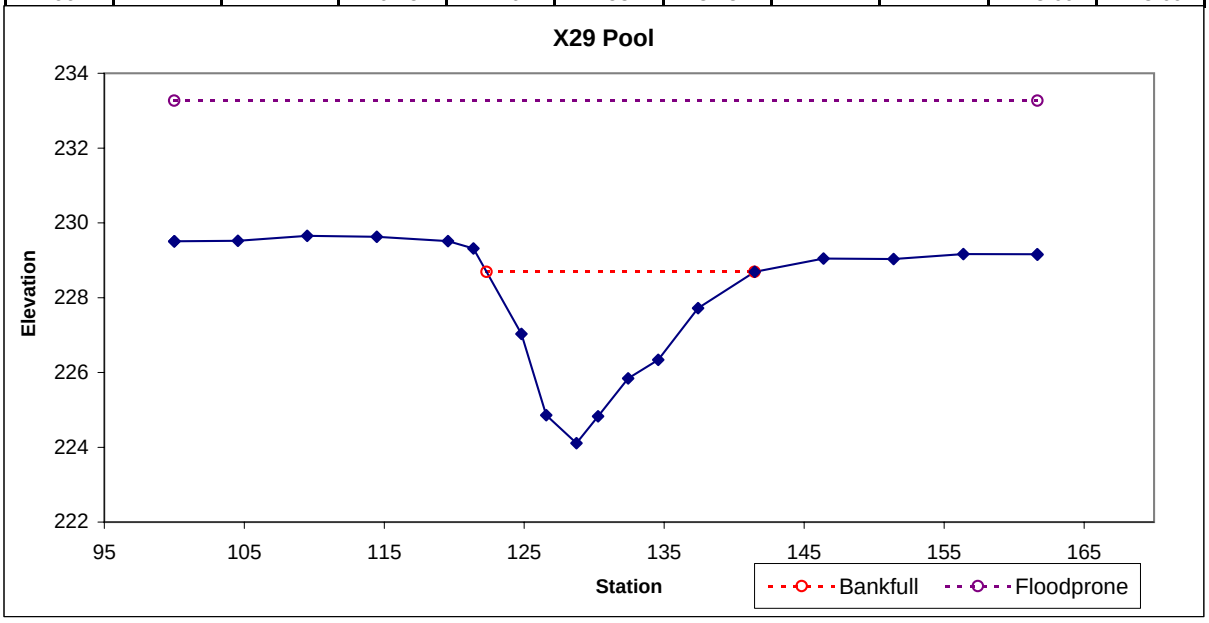
(As-built Data - collected February 2009)

Looking at the Left Bank



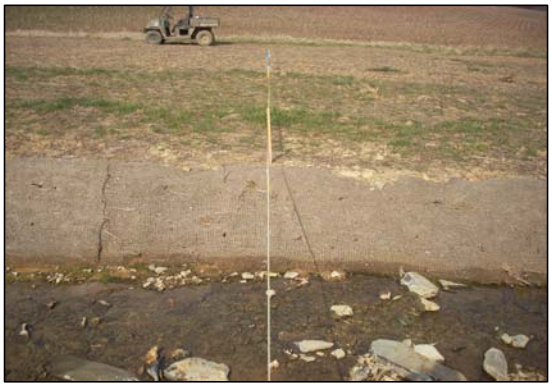
Looking at the Right Bank

Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev	TOB Elev
Pool		42	19.15	2.19	4.58	8.73	1		228.69	228.69



Permanent Cross Section X30

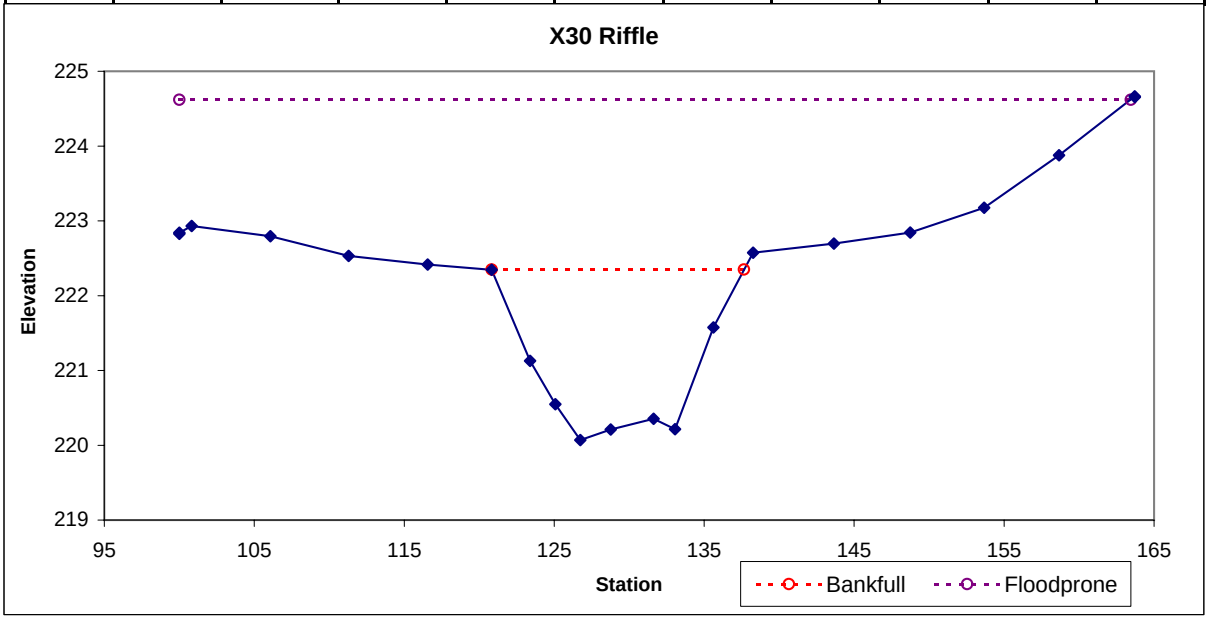
(As-built Data - collected February 2009)



Looking at the Left Bank

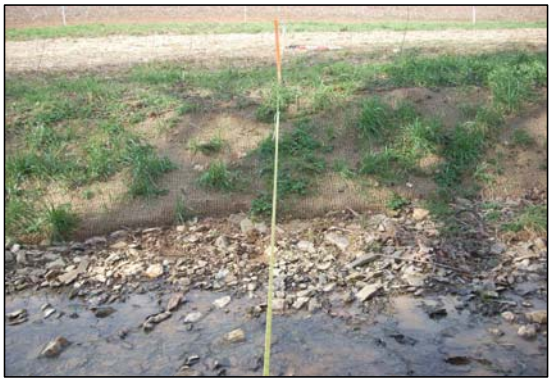
Looking at the Right Bank

Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev	TOB Elev
Riffle	E	25.3	16.82	1.5	2.28	11.18	1	3.8	222.35	222.35



Permanent Cross Section X31

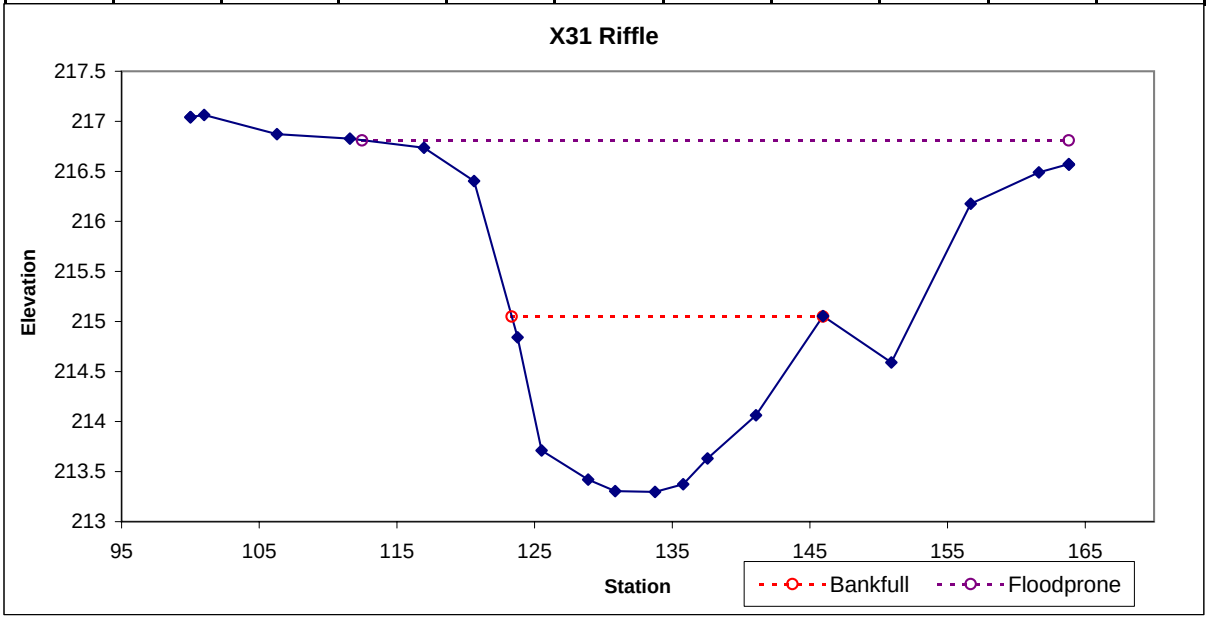
(As-built Data - collected February 2009)



Looking at the Left Bank

Looking at the Right Bank

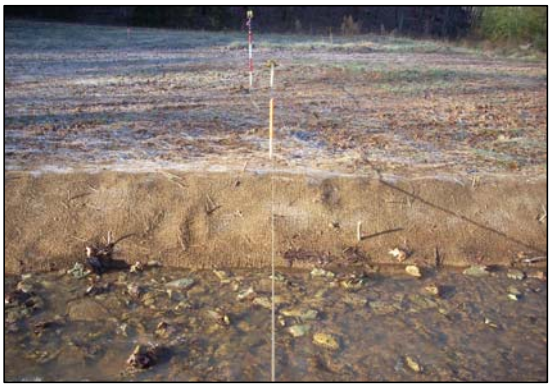
Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev	TOB Elev
Riffle	C	27.8	22.62	1.23	1.76	18.43	1	2.3	215.05	215.05



Permanent Cross Section X32

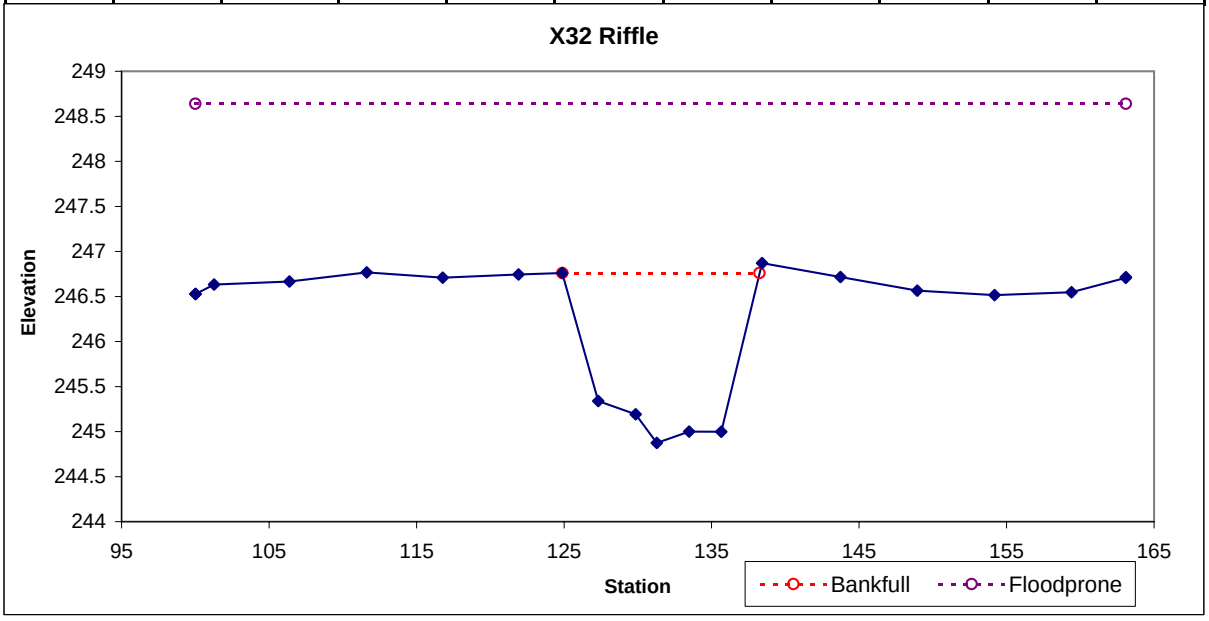
(As-built Data - collected February 2009)

Looking at the Left Bank



Looking at the Right Bank

Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev	TOB Elev
Riffle	E	18.1	13.37	1.35	1.88	9.88	1	4.7	246.76	246.76

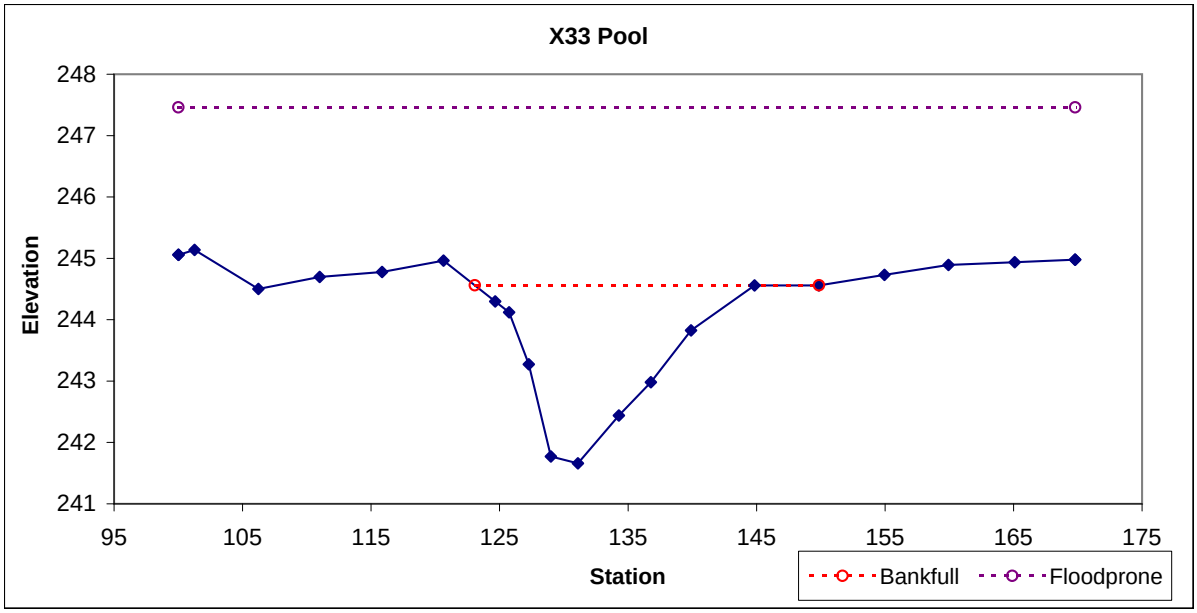


Permanent Cross Section X33
(As-built Data - collected February 2009)

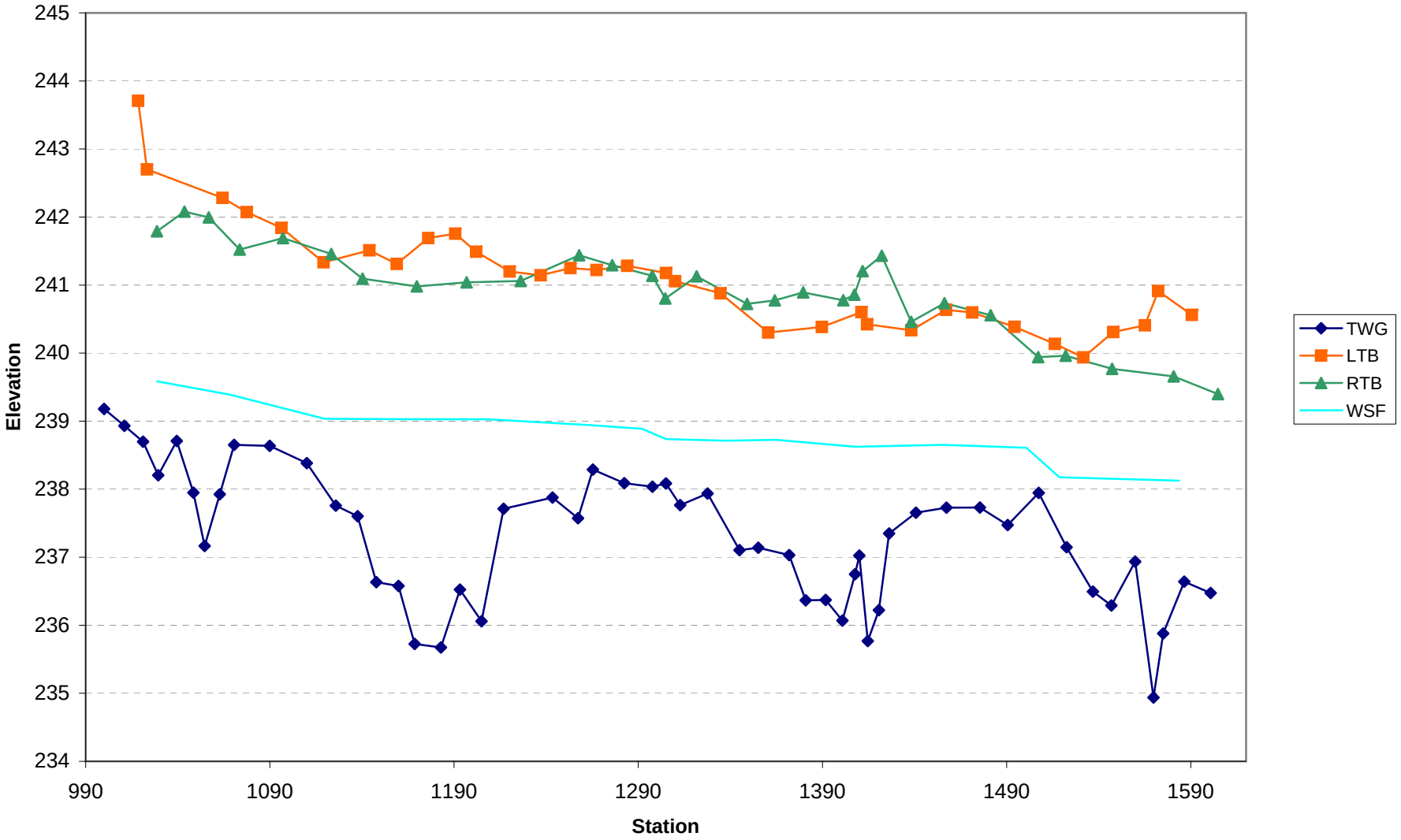
Looking at the Left Bank

Looking at the Right Bank

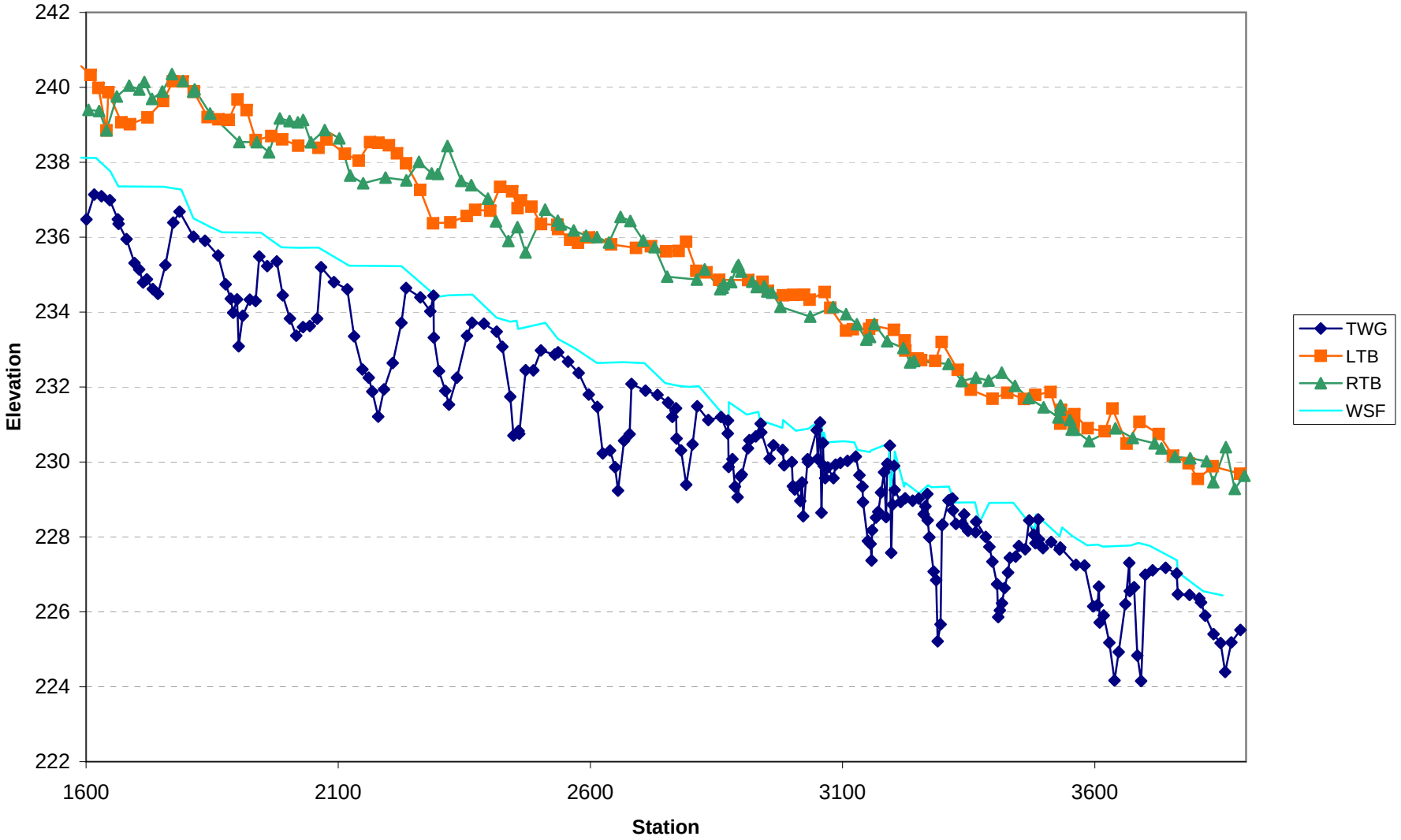
Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev	TOB Elev
Pool		29.4	26.78	1.1	2.9	24.38	1		244.56	244.56



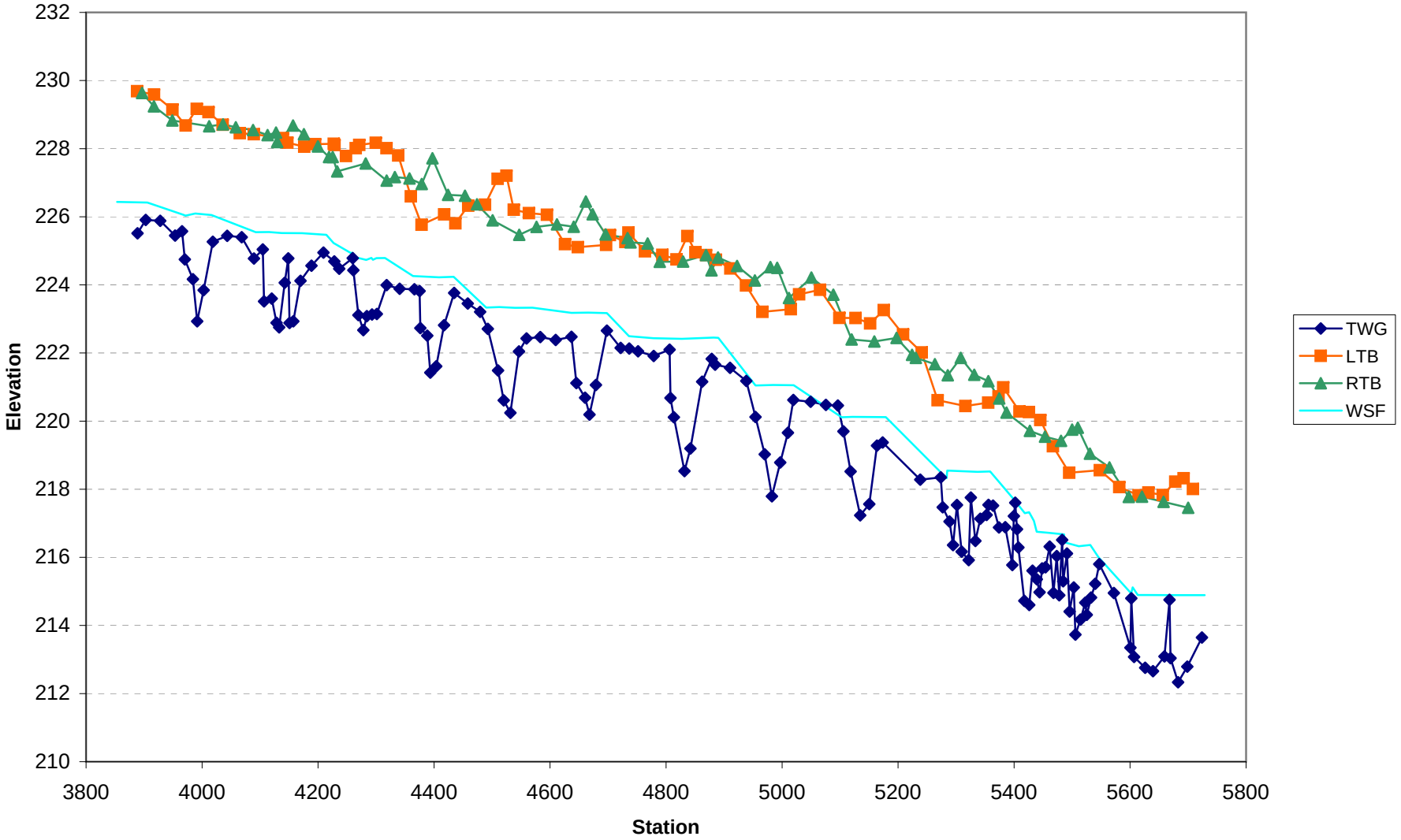
Big Cedar Creek - Reach 1



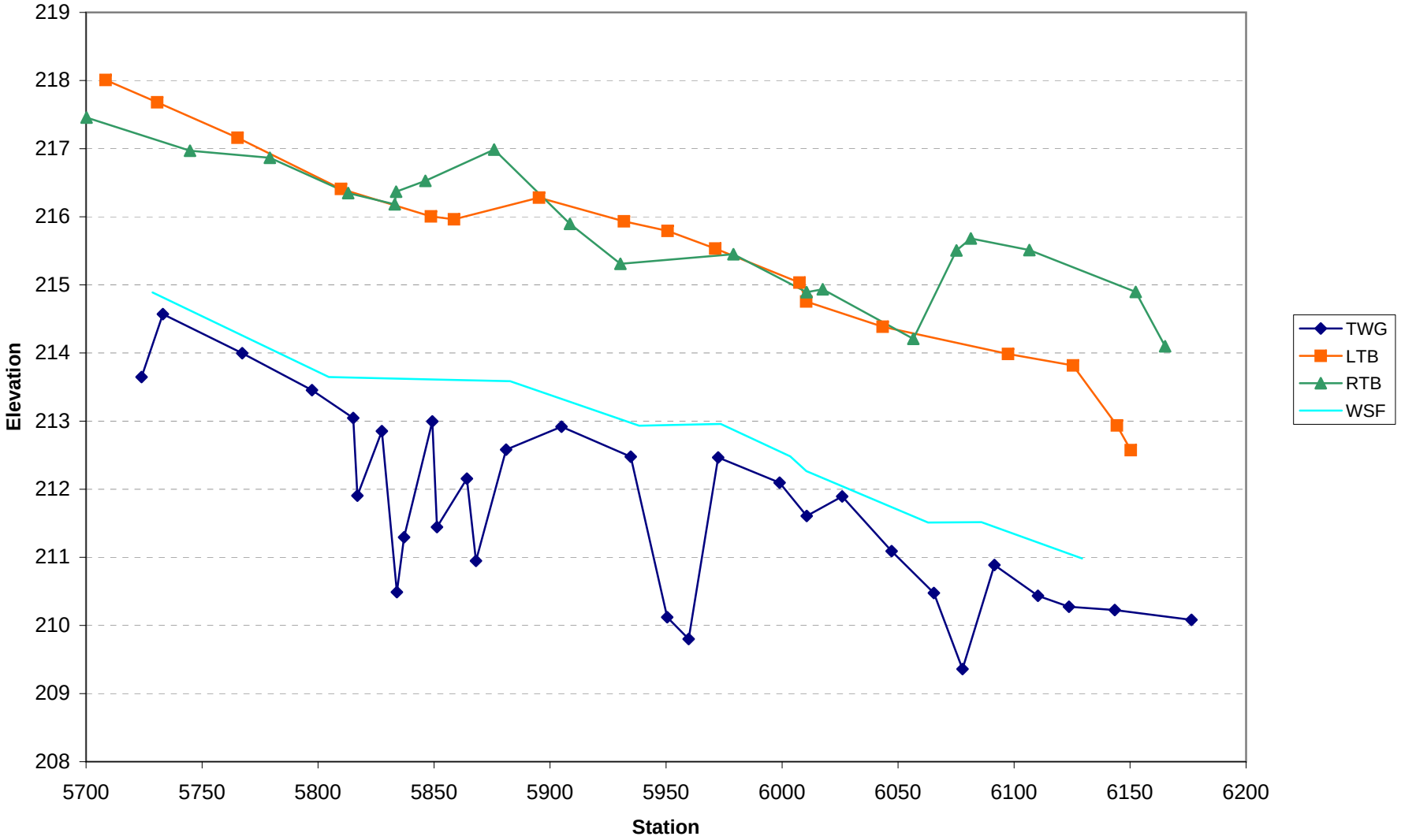
Big Cedar Creek - Reach 2



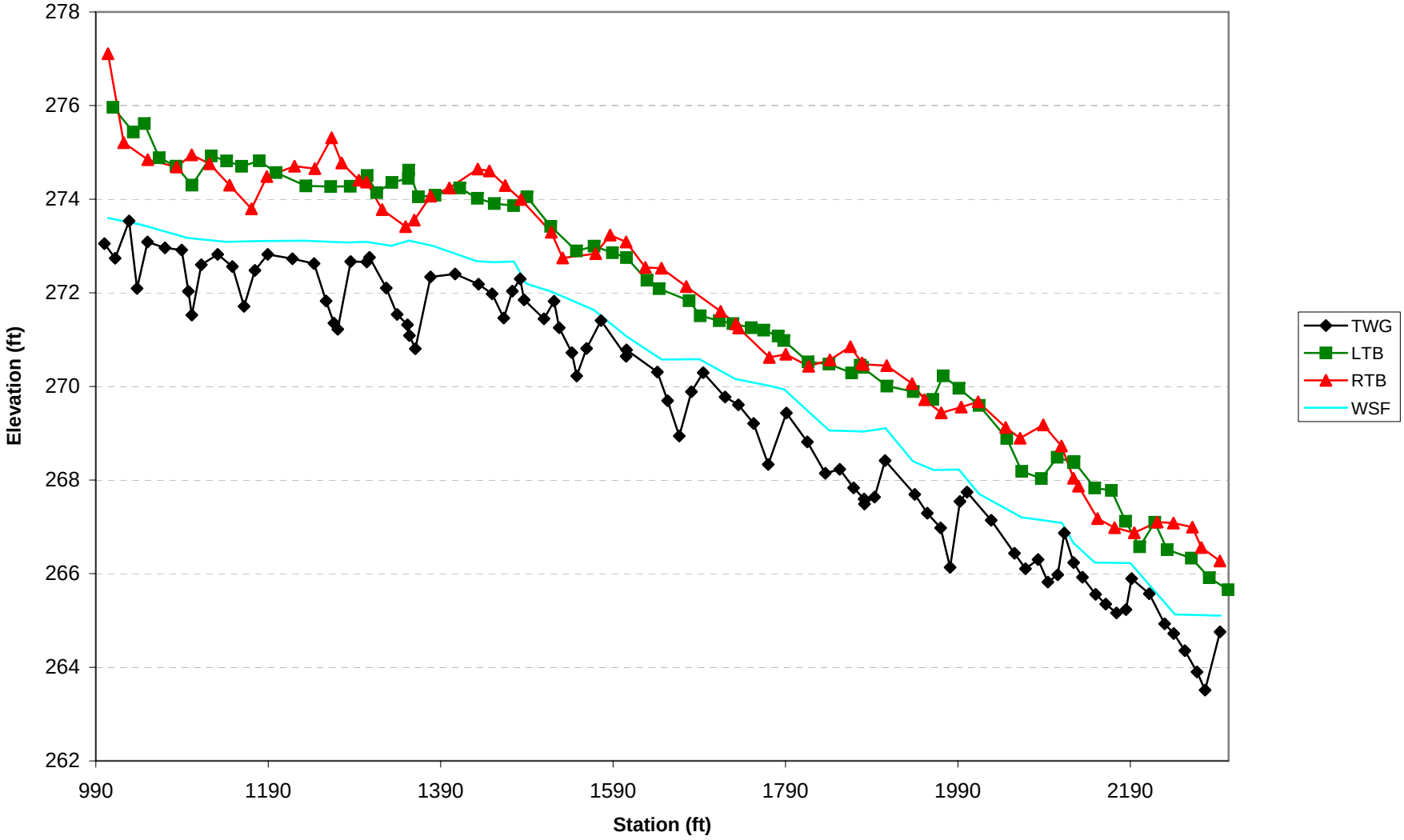
Big Cedar Creek - Reach 3



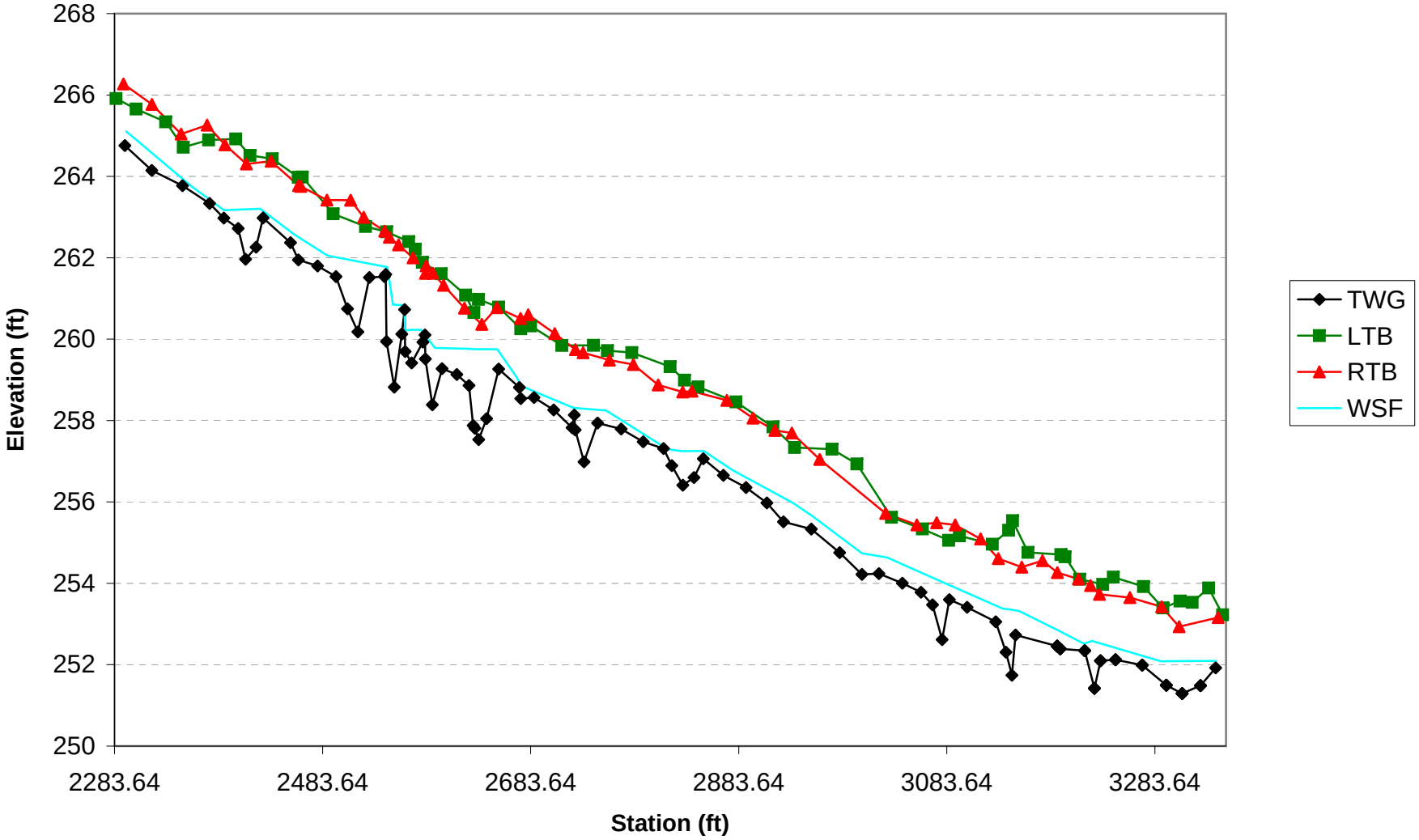
Big Cedar Creek - Reach 4



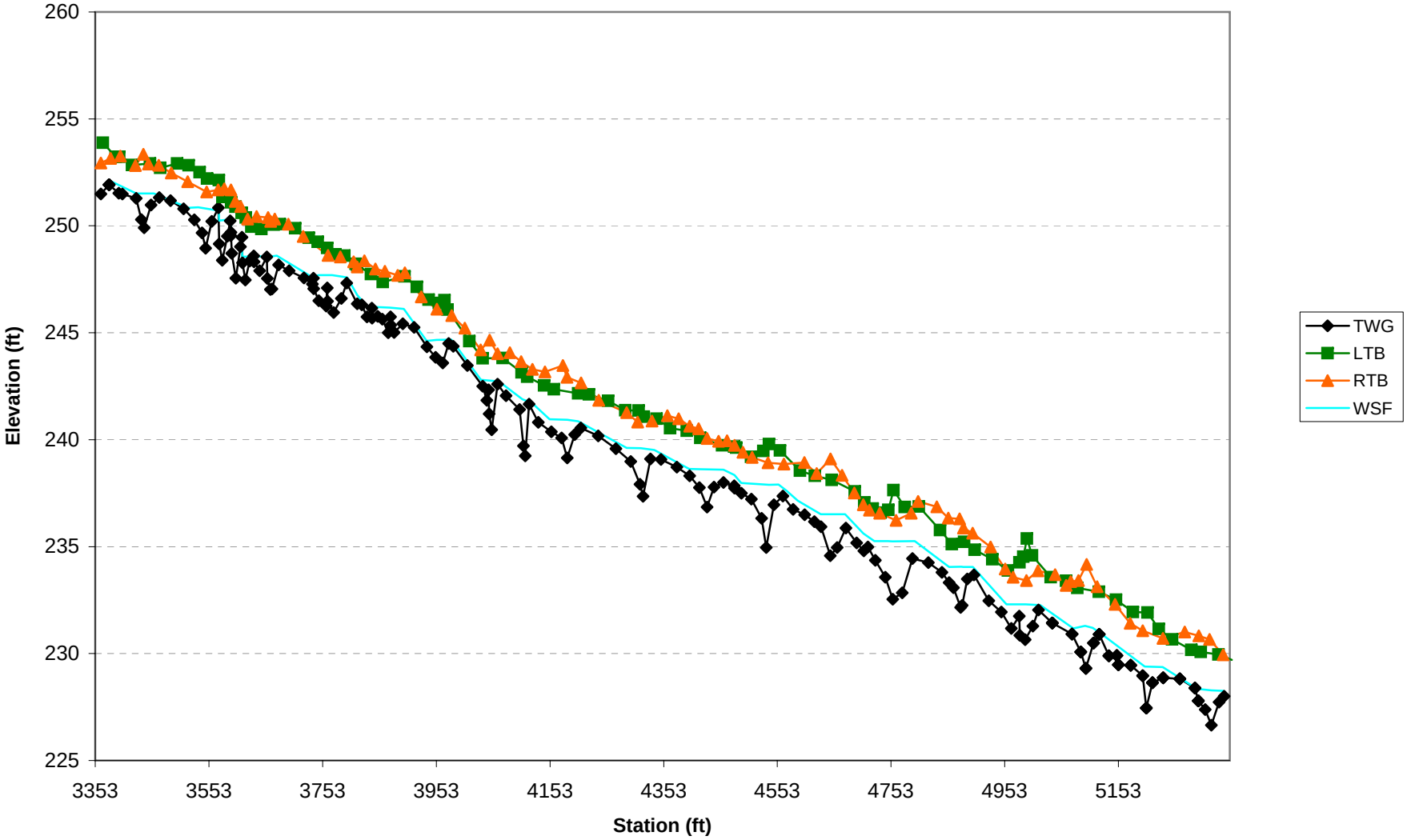
UT1 Reach 1 Profile



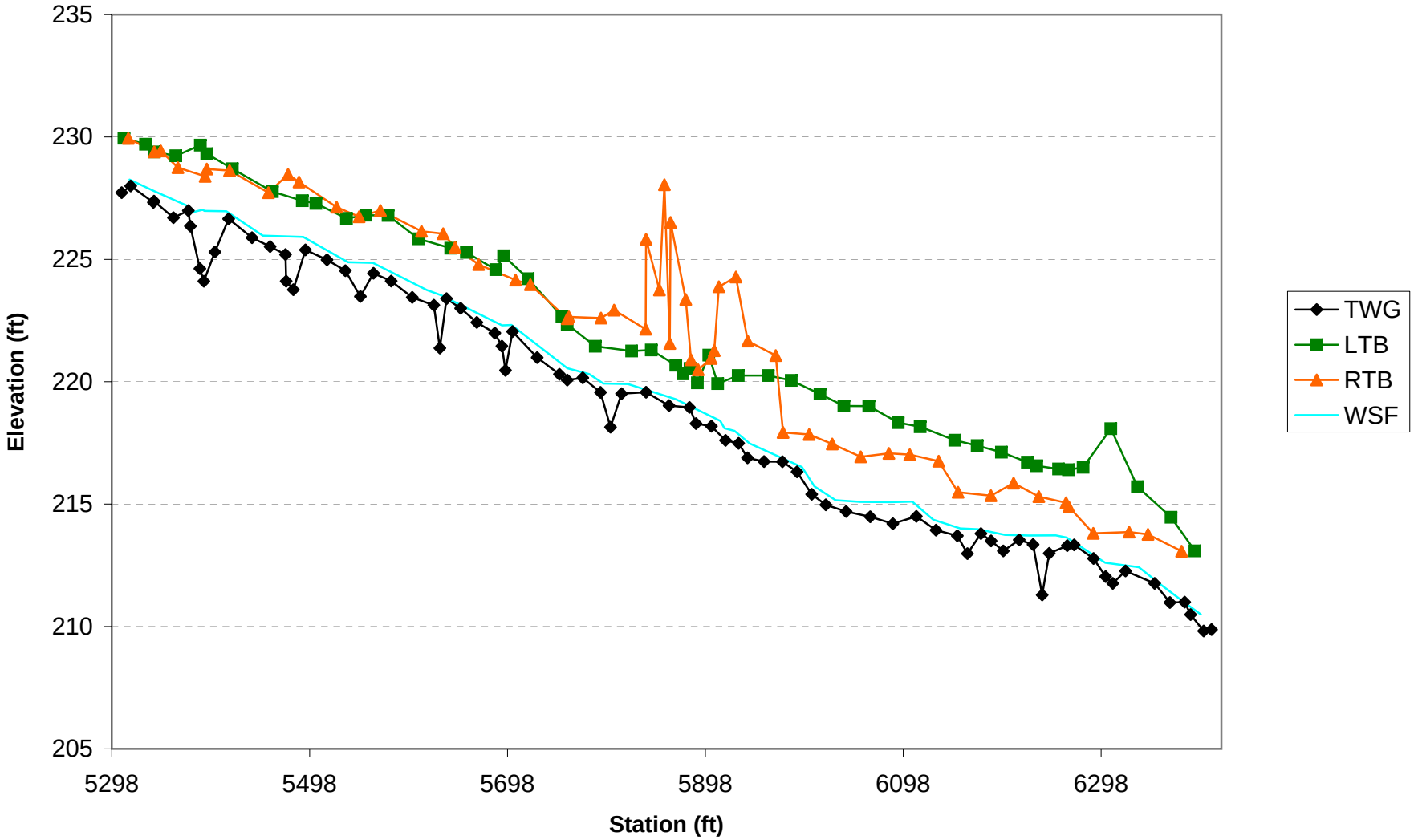
UT1 Reach 2 Profile



UT1 Reach 3 Profile



UT1 Reach 4 Profile



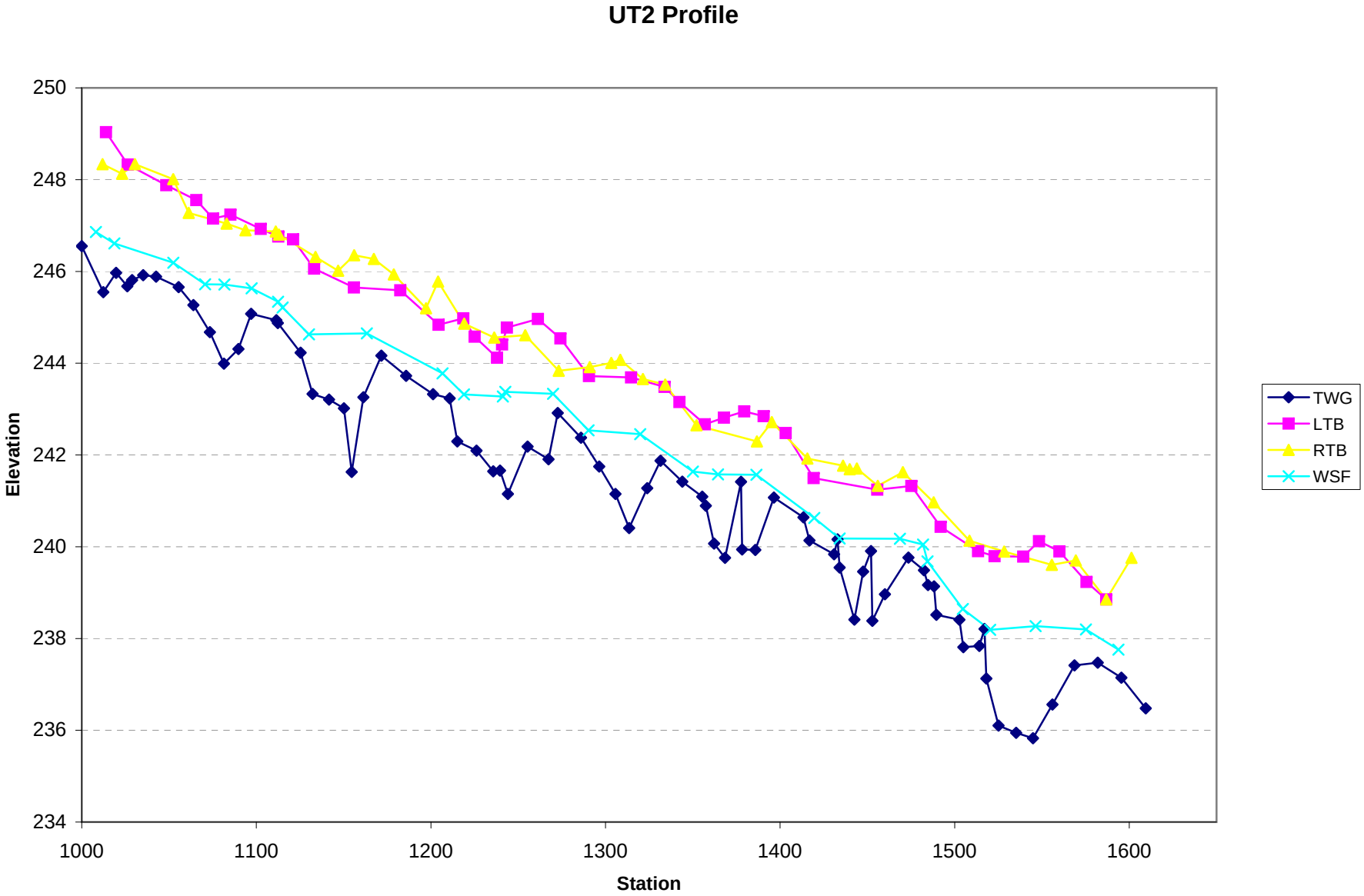

UT2 Profile
250
248
246
244
242
240
238
236
234
Elevation
1000
1100
1200
1300
1400
1500
1600
Station
TWG
LTB
RTB
WSF

Table 6. Baseline Stream Summary

Big Cedar Creek Reach 1 (603 LF)

Parameter	USGS Gauge	Regional Curve Interval			Pre-Existing Condition						Reference Reach(es) Data Morgan Creek						Design						As-built					
		LL	UL	Eq.	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n
Dimension and Substrate - Riffle																												
BF Width (ft)	-----	10.0	35.0	18.7	-----	16.3	-----	-----	-----	1	-----	33.2	-----	-----	-----	2	-----	20.0	-----	-----	-----	1	-----	19.6	-----	-----	-----	1
Floodprone Width (ft)	-----	-----	-----	-----	-----	>126.6	-----	-----	-----	1	-----	77.5	-----	-----	-----	2	-----	87.0	-----	-----	-----	1	-----	65.3	-----	-----	-----	1
BF Mean Depth (ft)	-----	1.3	3.1	2.1	-----	2.3	-----	-----	-----	1	-----	2.3	-----	-----	-----	2	-----	2.0	-----	-----	-----	1	-----	1.9	-----	-----	-----	1
BF Max Depth (ft)	-----	-----	-----	-----	-----	2.8	-----	-----	-----	1	-----	2.8	-----	-----	-----	2	-----	2.8	-----	-----	-----	1	-----	2.7	-----	-----	-----	1
BF Cross-sectional Area (ft²)	-----	18.0	68.0	43.7	-----	36.7	-----	-----	-----	1	-----	75.1	-----	-----	-----	2	-----	39.0	-----	-----	-----	1	-----	37.0	-----	-----	-----	1
Width/Depth Ratio	-----	-----	-----	-----	-----	7.1	-----	-----	-----	1	-----	14.1	-----	-----	-----	2	-----	10.0	-----	-----	-----	1	-----	10.4	-----	-----	-----	1
Entrenchment Ratio	-----	-----	-----	-----	-----	>7.8	-----	-----	-----	1	-----	2.3	-----	-----	-----	2	-----	4.4	-----	-----	-----	1	-----	3.3	-----	-----	-----	1
Bank Height Ratio	-----	-----	-----	-----	-----	1.8	-----	-----	-----	1	-----	1.0	-----	-----	-----	2	-----	1.0	-----	-----	-----	1	-----	1.0	-----	-----	-----	1
d50 (mm)	-----	-----	-----	-----	-----	14.0	-----	-----	-----	-----	-----	3.0	-----	-----	-----	1	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Pattern																												
Channel Beltwidth (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	103.0	-----	-----	132.0	-----	3	106.6	116.1	109.8	132.0	13.8	3
Radius of Curvature (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	50.0	-----	-----	70.0	-----	3	48.0	59.7	61.0	70.0	11.1	3
Rc:Bankfull width (ft/ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	2.5	-----	-----	3.5	-----	3	2.5	3.0	-----	3.6	-----	3
Meander Wavelength (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	281.0	-----	-----	285.0	-----	2	251.7	272.8	257.2	309.4	31.8	3
Meander Width Ratio	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	5.2	-----	-----	6.6	-----	3	5.4	-----	-----	6.7	-----	3
Profile																												
Riffle Length (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	52.0	69.0	73.0	83.0	12.9	3
Riffle Slope (ft/ft)	-----	-----	-----	-----	0.01	-----	-----	0.04	-----	-----	0.01	-----	-----	0.02	-----	2	0.0073	-----	-----	0.0079	-----	4	0.0	0.0	0.0	0.0	0.0	3
Pool Length (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Pool Spacing (ft)	-----	-----	-----	-----	46.0	-----	-----	98.0	-----	-----	146.0	-----	-----	-----	-----	2	150.0	-----	-----	205.0	-----	4	128.0	172.0	155.0	232.0	44.0	3
Pool Max Depth (ft)	-----	-----	-----	-----	-----	3.8	-----	-----	-----	-----	4.1	-----	-----	-----	-----	1	-----	6.5	-----	-----	-----	1	-----	3.9	-----	-----	-----	-----
Pool Volume (ft³)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Substrate and Transport Parameters																												
Ri% / Ru% / P% / G% / S%	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
SC% / Sa% / G% / B% / Be%	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
d16 / d35 / d50 / d84 / d95	-----	-----	-----	-----	<0.063 / 6 / 14 / 100 / 300						N/A / 1.2 / 3 / 77 / 800						-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Reach Shear Stress (competency) lb/ft²	-----	-----	-----	-----	-----	0.88	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	0.31	-----	-----	-----	-----	-----	0.2	-----	-----	-----	1
Max part size (mm) mobilized at bankfull (Rosgen Curve)	-----	-----	-----	-----	-----	250.0	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	80.0	-----	-----	-----	-----	-----	53.0	-----	-----	-----	1
Stream Power (transport capacity) W/m²	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	11.6	-----	-----	-----	1
Additional Reach Parameters																												
Drainage Area (SM)	-----	-----	-----	-----	2.3	-----	-----	2.9	-----	-----	-----	-----	-----	8.4	-----	-----	2.3	-----	-----	2.3	-----	-----	2.3	-----	-----	2.3	-----	-----
Impervious cover estimate (%)	-----	-----	-----	-----		-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Rosgen Classification	-----	-----	-----	-----	-----	E4/1	-----	-----	-----	-----	-----	C4	-----	-----	-----	-----	-----	E/C4	-----	-----	-----	-----	-----	E/C	-----	-----	-----	-----
BF Velocity (fps)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	6.6	-----	-----	-----	-----	-----	3.8	-----	-----	-----	-----	-----	4.1	-----	-----	-----	-----
BF Discharge (cfs)	-----	58.0	450.0	189.7	-----	-----	-----	-----	-----	-----	-----	524.0	-----	-----	-----	-----	-----	150.0	-----	-----	-----	-----	-----	150.0	-----	-----	-----	-----
Valley Length	-----	-----	-----	-----	-----	350.0	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	460.0	-----	-----	-----	-----
Channel length (ft)	-----	-----	-----	-----	-----	350.0	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	573.0	-----	-----	-----	-----	-----	603.0	-----	-----	-----	-----
Sinuosity	-----	-----	-----	-----	-----	1.00	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	1.30	-----	-----	-----	-----	-----	1.31	-----	-----	-----	-----
Water Surface Slope (Channel) (ft/ft)	-----	-----	-----	-----		0.0080	-----	-----	-----	-----	-----	0.0070	-----	-----	-----	-----	-----	0.0030	-----	-----	-----	-----	-----	0.0	-----	-----	-----	-----
BF slope (ft/ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Bankfull Floodplain Area (acres)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
BEHI VL% / L% / M% / H% / VH% / E%	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Channel Stability or Habitat Metric	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Biological or Other	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

Big Cedar Creek Reach 2 (2239 LF)

Parameter	USGS Gauge	Regional Curve Interval			Pre-Existing Condition						Reference Reach(es) Data Morgan Creek						Design						As-built					
		LL	UL	Eq.	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n
Dimension and Substrate - Riffle																												
BF Width (ft)	-----	12.0	39.0	18.8	-----	22.0	-----	-----	-----	1.0	-----	33.2	-----	-----	-----	2	-----	23	-----	-----	-----	1	22.5	23.9	23.4	25.7	1.3	3
Floodprone Width (ft)	-----	-----	-----	-----	-----	33.0	-----	-----	-----	1.0	-----	77.5	-----	-----	-----	2	-----	100.0	-----	-----	-----	1	74.4	74.9	74.5	75.8	0.7	3
BF Mean Depth (ft)	-----	1.4	3.3	2.1	-----	1.8	-----	-----	-----	1.0	-----	2.3	-----	-----	-----	2	-----	2.3	-----	-----	-----	1	2.2	2.4	2.4	2.5	0.1	3
BF Max Depth (ft)	-----	-----	-----	-----	-----	2.6	-----	-----	-----	1.0	-----	2.8	-----	-----	-----	2	-----	3.3	-----	-----	-----	1	3.3	3.6	3.5	3.9	0.2	3
BF Cross-sectional Area (ft²)	-----	23.0	85.0	44.3	-----	39.7	-----	-----	-----	1.0	-----	75.1	-----	-----	-----	2	-----	52.7	-----	-----	-----	1	49.7	56.6	56.9	63.1	5.5	3
Width/Depth Ratio	-----	-----	-----	-----	-----	12.2	-----	-----	-----	1.0	-----	14.1	-----	-----	-----	2	-----	10.0	-----	-----	-----	1	9.6	10.1	10.2	10.4	0.3	3
Entrenchment Ratio	-----	-----	-----	-----	-----	1.5	-----	-----	-----	1.0	-----	2.3	-----	-----	-----	2	-----	4.3	-----	-----	-----	1	3.0	3.2	3.2	3.3	0.1	3
Bank Height Ratio	-----	-----	-----	-----	-----	1.9	-----	-----	-----	1.0	-----	1.0	-----	-----	-----	2	-----	1.0	-----	-----	-----	1	1.0	1.0	1.0	1.0	0.0	3
d50 (mm)	-----	-----	-----	-----	-----	17.0	-----	-----	-----	1.0	-----	3.0	-----	-----	-----	1	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Pattern																												
Channel Beltwidth (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	73.0	-----	-----	144.0	-----	14	72.4	99.2	99.7	144.0	18.9	14
Radius of Curvature (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	44.0	-----	-----	77.0	-----	15	37.0	52.7	47.0	89.0	14.2	15
Rc:Bankfull width (ft/ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	1.9	-----	-----	3.3	-----	15	1.6	2.2	-----	3.8	-----	15
Meander Wavelength (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	197.0	-----	-----	312.0	-----	13	184.9	229.4	216.6	297.5	33.1	14
Meander Width Ratio	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	3.2	-----	-----	6.3	-----	14	3.0	-----	-----	6.0	-----	14
Profile																												
Riffle Length (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	41.0	62.0	59.0	102.0	18.5	15
Riffle Slope (ft/ft)	-----	-----	-----	-----	0.0	-----	-----	0.0	-----	-----	0.01	-----	-----	0.02	-----	2	0.0092	-----	-----	0.0144	-----	15	0.0070	0.0110	0.0110	0.0170	0.0030	15
Pool Length (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Pool Spacing (ft)	-----	-----	-----	-----	40.0	-----	-----	242.0	-----	-----	146.0	-----	-----	-----	-----	2	110.0	-----	-----	223.0	-----	15	101.0	135.0	150.0	225.0	39.2	15
Pool Max Depth (ft)	-----	-----	-----	-----	-----	4.2	-----	-----	-----	-----	4.1	-----	-----	-----	-----	1	-----	5.2	-----	-----	-----	1	5.5	-----	-----	5.5	-----	2
Pool Volume (ft³)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Substrate and Transport Parameters																												
Ri% / Ru% / P% / G% / S%	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
SC% / Sa% / G% / B% / Be%	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
d16 / d35 / d50 / d84 / d95	-----	-----	-----	-----	<0.063 / 8 / 17 /85 / 350						N/A / 1.2 / 3 / 77 / 800						-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Reach Shear Stress (competency) lb/ft²	-----	-----	-----	-----	-----	0.7	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	0.6	-----	-----	-----	-----	-----	0.62	-----	-----	-----	1
Max part size (mm) mobilized at bankfull (Rosgen Curve)	-----	-----	-----	-----	-----	190.0	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	150.0	-----	-----	-----	-----	-----	170.0	-----	-----	-----	1
Stream Power (transport capacity) W/m²	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	29.3	-----	-----	-----	1
Additional Reach Parameters																												
Drainage Area (SM)	-----	-----	-----	-----	2.9	-----	-----	2.9	-----	-----	-----	-----	-----	8.4	-----	-----	2.3	-----	-----	3.1	-----	-----	2.3	-----	-----	3.1	-----	-----
Impervious cover estimate (%)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Rosgen Classification	-----	-----	-----	-----	-----	B4/1c	-----	-----	-----	-----	-----	C4	-----	-----	-----	-----	-----	E/C4	-----	-----	-----	-----	-----	E/C	-----	-----	-----	-----
BF Velocity (fps)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	6.6	-----	-----	-----	-----	-----	3.5	-----	-----	-----	-----	-----	3.3	-----	-----	-----	-----
BF Discharge (cfs)	-----	72.0	530.0	192.6	-----	-----	-----	-----	-----	-----	-----	524.0	-----	-----	-----	-----	-----	185.0	-----	-----	-----	-----	-----	185.0	-----	-----	-----	-----
Valley Length (ft)	-----	-----	-----	-----	-----	1016.0	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	1723.0	-----	-----	-----	-----	-----	1694.0	-----	-----	-----	-----
Channel length (ft)	-----	-----	-----	-----	-----	1016.0	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	2240.0	-----	-----	-----	-----	-----	2220.0	-----	-----	-----	-----
Sinuosity	-----	-----	-----	-----	-----	1.00	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	1.30	-----	-----	-----	-----	-----	1.31	-----	-----	-----	-----
Water Surface Slope (Channel) (ft/ft)	-----	-----	-----	-----	-----	0.0077	-----	-----	-----	-----	-----	0.0070	-----	-----	-----	-----	-----	0.0050	-----	-----	-----	-----	-----	0.0050	-----	-----	-----	-----
BF slope (ft/ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Bankfull Floodplain Area (acres)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
BEHI VL% / L% / M% / H% / VH% / E%	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Channel Stability or Habitat Metric	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Biological or Other	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

Big Cedar Creek Reach 3 (1827 LF)

Parameter	USGS Gauge	Regional Curve Interval			Pre-Existing Condition						Reference Reach(es) Data Morgan Creek						Design						As-built					
Dimension - Riffle		LL	UL	Eq.	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n
BF Width (ft)	-----	13.0	40.0	19.9	-----	19.5	-----	-----	-----	1	-----	33.2	-----	-----	-----	2	-----	24.4	-----	-----	-----	1	23.1	24.5	24.6	25.7	1.1	3
Floodprone Width (ft)	-----	-----	-----	-----	-----	>111.4	-----	-----	-----	1	-----	77.5	-----	-----	-----	2	-----	100+	-----	-----	-----	1	77.8	79.5	77.9	82.9	2.4	3
BF Mean Depth (ft)	-----	1.4	3.5	2.2	-----	1.7	-----	-----	-----	1	-----	2.3	-----	-----	-----	2	-----	2.1	-----	-----	-----	1	2.1	2.2	2.2	2.2	0.0	3
BF Max Depth (ft)	-----	-----	-----	-----	-----	2.7	-----	-----	-----	1	-----	2.8	-----	-----	-----	2	-----	3.0	-----	-----	-----	1	3.1	3.2	3.1	3.3	0.1	3
BF Cross-sectional Area (ft²)	-----	25.0	90.0	48.3	-----	32.8	-----	-----	-----	1	-----	75.1	-----	-----	-----	2	-----	52.1	-----	-----	-----	1	50.1	52.7	51.8	56.2	2.6	3
Width/Depth Ratio	-----	-----	-----	-----	-----	11.5	-----	-----	-----	1	-----	14.1	-----	-----	-----	2	-----	11.6	-----	-----	-----	1	10.7	11.4	11.7	11.8	0.5	3
Entrenchment Ratio	-----	-----	-----	-----	-----	>5.7	-----	-----	-----	1	-----	2.3	-----	-----	-----	2	-----	4.1+	-----	-----	-----	1	3.2	3.3	3.2	3.4	0.1	3
Bank Height Ratio	-----	-----	-----	-----	-----	1.6	-----	-----	-----	1	-----	1.0	-----	-----	-----	2	-----	1.0	-----	-----	-----	1	1.0	1.0	1.0	1.0	0.0	3
d50 (mm)	-----	-----	-----	-----	-----	17.0	-----	-----	-----	1	-----	3.0	-----	-----	-----	1	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Pattern																												
Channel Beltwidth (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	52.0	-----	-----	114.0	-----	12	50.0	76.8	79.5	103.0	14.3	12
Radius of Curvature (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	44.0	-----	-----	83.0	-----	13	40.0	57.2	50.0	103.0	17.6	13
Rc:Bankfull Width (ft/ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	1.8	-----	-----	3.4	-----	13	1.6	-----	-----	4.2	-----	13
Meander Wavelength (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	187.0	-----	-----	313.0	-----	11	176.5	240.0	247.6	285.0	35.6	13
Meander Width Ratio	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	2.1	-----	-----	4.7	-----	12	2.0	-----	-----	4.2	-----	12
Profile																												
Riffle Length (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	37	70	66	127	25	12
Riffle Slope (ft/ft)	-----	-----	-----	-----	0.0100	-----	-----	0.0490	-----	-----	0.0140	-----	-----	0.0240	-----	2	0.0080	-----	-----	0.0169	-----	13	0.0020	0.0130	0.0110	0.0310	0.0076	13
Pool Length (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Pool Spacing (ft)	-----	-----	-----	-----	59.0	-----	-----	242.0	-----	-----	146.0	-----	-----	-----	-----	2	83.0	-----	-----	185.0	-----	13	87.0	140.0	141.0	183.0	26.4	13
Pool Max Depth (ft)	-----	-----	-----	-----	-----	3.3	-----	-----	-----	-----	4.1	-----	-----	-----	-----	1	-----	5.2	-----	-----	-----	1	-----	5.42	-----	-----	-----	1
Pool Volume (ft³)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Substrate and Transport Parameters																												
Ri% / Ru% / P% / G% / S%	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
SC% / Sa% / G% / B% / Be%	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
d16 / d35 / d50 / d84 / d95	-----	-----	-----	-----	<0.063 / 8 / 17 / 85 / 350						N/A / 1.2 / 3 / 77 / 800						-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Reach Shear Stress (competency) lb/ft²	-----	-----	-----	-----	-----	0.4	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	0.8	-----	-----	-----	-----	-----	0.68	-----	-----	-----	1
Max part size (mm) mobilized at bankfull (Rosgen Curve)	-----	-----	-----	-----	-----	100.0	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	190.0	-----	-----	-----	-----	-----	180	-----	-----	-----	1
Stream Power (transport capacity) W/m²	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	36.8	-----	-----	-----	1
Additional Reach Parameters																												
Drainage Area (SM)	-----	-----	-----	-----	2.9	-----	-----	3.3	-----	-----	-----	-----	-----	8.4	-----	-----	3.1	-----	-----	3.3	-----	-----	3.1	-----	-----	3.32	-----	-----
Impervious cover estimate (%)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Rosgen Classification	-----	-----	-----	-----	-----	C4/1	-----	-----	-----	-----	-----	C4	-----	-----	-----	-----	-----	E/C4	-----	-----	-----	N/A	-----	E/C	-----	-----	-----	-----
BF Velocity (fps)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	6.6	-----	-----	-----	-----	-----	3.7	-----	-----	-----	-----	-----	3.7	-----	-----	-----	-----
BF Discharge (cfs)	-----	68.0	590.0	210.9	-----	-----	-----	-----	-----	-----	-----	524.0	-----	-----	-----	-----	-----	195.0	-----	-----	-----	N/A	-----	195.0	-----	-----	-----	-----
Valley Length (ft)	-----	-----	-----	-----	-----	1860.0	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	1558.0	-----	-----	-----	-----
Channel length (ft)	-----	-----	-----	-----	-----	2046.0	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	1809.0	-----	-----	-----	-----	-----	1823.0	-----	-----	-----	-----
Sinuosity	-----	-----	-----	-----	-----	1.10	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	1.10	-----	-----	-----	-----	-----	1.17	-----	-----	-----	-----
Water Surface Slope (Channel) (ft/ft)	-----	-----	-----	-----	-----	0.0045	-----	-----	-----	-----	-----	0.0070	-----	-----	-----	-----	-----	0.0077	-----	-----	-----	-----	-----	0.0060	-----	-----	-----	-----
BF Slope (ft/ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Banfull Floodplain Area (Acres)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
BEHI VL% / L% / M% / H% / VH% / E%	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Channel Stability or Habitat Metric	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Biological or Other	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

Big Cedar Creek Reach 4 (410 LF)

Parameter	USGS Gauge	Regional Curve Interval			Pre-Existing Condition						Reference Reach(es) Data Morgan Creek						Design						As-built					
Dimension - Riffle		LL	UL	Eq.	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n
BF Width (ft)	-----	13.0	40.0	20.0	-----	29.6	-----	-----	-----	-----	-----	33.2	-----	-----	-----	2	-----	26.0	-----	-----	-----	1	-----	27.5	-----	-----	-----	1
Floodprone Width (ft)	-----	-----	-----	-----	-----	>109.7	-----	-----	-----	-----	-----	77.5	-----	-----	-----	2	-----	94.0	-----	-----	-----	1	-----	81.0	-----	-----	-----	1
BF Mean Depth (ft)	-----	1.4	3.5	2.2	-----	1.6	-----	-----	-----	-----	-----	2.3	-----	-----	-----	2	-----	2.2	-----	-----	-----	1	-----	2.1	-----	-----	-----	1
BF Max Depth (ft)	-----	-----	-----	-----	-----	2.3	-----	-----	-----	-----	-----	2.8	-----	-----	-----	2	-----	3.0	-----	-----	-----	1	-----	3.2	-----	-----	-----	1
BF Cross-sectional Area (ft²)	-----	25.0	90.0	48.8	-----	47.1	-----	-----	-----	-----	-----	75.1	-----	-----	-----	2	-----	57.2	-----	-----	-----	1	-----	58.3	-----	-----	-----	1
Width/Depth Ratio	-----	-----	-----	-----	-----	18.5	-----	-----	-----	-----	-----	14.1	-----	-----	-----	2	-----	11.8	-----	-----	-----	1	-----	13.0	-----	-----	-----	1
Entrenchment Ratio	-----	-----	-----	-----	-----	>3.7	-----	-----	-----	-----	-----	2.3	-----	-----	-----	2	-----	3.6	-----	-----	-----	1	-----	3.0	-----	-----	-----	1
Bank Height Ratio	-----	-----	-----	-----	-----	1.6	-----	-----	-----	-----	-----	1.0	-----	-----	-----	2	-----	1.0	-----	-----	-----	1	-----	1.0	-----	-----	-----	1
d50 (mm)	-----	-----	-----	-----	-----	17	-----	-----	-----	-----	-----	3.0	-----	-----	-----	1	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Pattern																												
Channel Beltwidth (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	58.0	-----	-----	91.0	-----	3	57.0	89.3	97.0	114.0	29.3	3
Radius of Curvature (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	52.0	-----	-----	53.0	-----	3	27.0	46.0	51.0	60.0	17.1	3
Rc:Bankfull Width (ft/ft)	-----	-----	-----	-----			-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	2.0	-----	-----	2.0	-----	3	1.0	-----	-----	2.2	-----	3
Meander Wavelength (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	207.0	-----	-----	247.0	-----	2	224.3	236.6	236.6	248.9	17.4	2
Meander Width Ratio	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	2.2	-----	-----	3.5	-----	3	2.1	-----	-----	4.2	-----	-----
Profile																												
Riffle Length (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	43.0	66.5	67.0	89.0	18.0	4
Riffle Slope (ft/ft)	-----	-----	-----	-----	0.0138	-----	-----	0.0498	-----	-----	0.0140	-----	-----	0.0240	-----	2	0.0119	-----	-----	0.0237	-----	4	0.0120	0.0140	0.0140	0.0160	0.0020	4
Pool Length (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Pool Spacing (ft)	-----	-----	-----	-----	20.0	-----	-----	236.0	-----	-----	146.0	-----	-----	-----	-----	2	105.0	-----	-----	112.0	-----	2	118.0	122.0	122.0	126.0	-----	2
Pool Max Depth (ft)	-----	-----	-----	-----	-----	3.4	-----	-----	-----	-----	4.1	-----	-----	-----	-----	1	-----	5.0	-----	-----	-----	1	-----	4.7	-----	-----	-----	1
Pool Volume (ft³)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Substrate and Transport Parameters																												
Ri% / Ru% / P% / G% / S%	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
SC% / Sa% / G% / B% / Be%	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
d16 / d35 / d50 / d84 / d95	-----	-----	-----	-----	<0.063 / 5 / 17 / 120 / >2048						N/A / 1.2 / 3 / 77 / 800						-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Reach Shear Stress (competency) lb/ft²	-----	-----	-----	-----	-----	0.8	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	1.2	-----	-----	-----	-----	-----	1.1	-----	-----	-----	1
Max Part Size (mm) mobilized at bankfull (Rosgen Curve)	-----	-----	-----	-----	-----	200.0	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	275.0	-----	-----	-----	-----	-----	260.0	-----	-----	-----	1
Stream Power (transport capacity) W/m²	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	53.6	-----	-----	-----	1
Additional Reach Parameters																												
Drainage Area (SM)	-----	-----	-----	-----	3.3	-----	-----	3.4	-----	-----	-----	-----	-----	8.4	-----	-----	3.3	-----	-----	3.4	-----	-----	3.3	-----	-----	3.4	-----	-----
Impervious cover estimate (acres)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Rosgen Classification	-----	-----	-----	-----	-----	C4/1	-----	-----	-----	-----	-----	C4	-----	-----	-----	-----	-----	E/C4	-----	-----	-----	-----	-----	E/C	-----	-----	-----	-----
Bankfull Velocity (fps)	-----	-----	-----	-----	-----	1.6	-----	-----	-----	-----	-----	6.6	-----	-----	-----	-----	-----	3.5	-----	-----	-----	-----	-----	3.4	-----	-----	-----	-----
BF Discharge (cfs)	-----	68.0	590.0	213.2	-----		-----	-----	-----	-----	-----	524.0	-----	-----	-----	-----	-----	199.0	-----	-----	-----	-----	-----	199.0	-----	-----	-----	-----
Valley Length (ft)	-----	-----	-----	-----	-----	887.0	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	350.0	-----	-----	-----	-----
Channel length (ft)	-----	-----	-----	-----	-----	976.0	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	400.0	-----	-----	-----	-----	-----	410.0	-----	-----	-----	-----
Sinuosity	-----	-----	-----	-----	-----	1.10	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	1.10	-----	-----	-----	-----	-----	1.17	-----	-----	-----	-----
Water Surface Slope (Channel) (ft/ft)	-----	-----	-----	-----	-----	0.0090	-----	-----	-----	-----	-----	0.0070	-----	-----	-----	-----	-----	0.0098	-----	-----	-----	-----	-----	0.0094	-----	-----	-----	-----
BF slope (ft/ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Bankfull Floodplain Area (acres)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
BEHI VL% / L% / M% / H% / VH% / E%	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Channel Stablibity or Habitat Metric	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Biological or Other	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

UT1 Reach 1 (1248 LF)

Parameter	USGS Gauge	Regional Curve Interval			Pre-Existing Condition						Reference Reach(es) Data – Spencer Creek						Design						As-built					
		LL	UL	Eq.	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n
Dimension and Substrate - Riffle																												
BF Width (ft)	-----	7.0	26.0	11.5	-----	18.9	-----	-----	-----	1	-----	8.7	-----	-----	-----	1	-----	13.0	-----	-----	-----	1	11.6	13.2	13.2	14.7	1.3	3
Floodprone Width (ft)	-----	-----	-----	-----	-----	>135.3	-----	-----	-----	1	-----	228.5	-----	-----	-----	1	-----	73.8	-----	-----	-----	1	48.4	52.8	53.6	56.5	3.3	3
BF Mean Depth (ft)	-----	0.9	2.4	1.5	-----	0.8	-----	-----	-----	1	-----	1.2	-----	-----	-----	1	-----	1.2	-----	-----	-----	1	1.0	1.1	1.1	1.3	0.1	3
BF Max Depth (ft)	-----	-----	-----	-----	-----	1.8	-----	-----	-----	1	-----	1.9	-----	-----	-----	1	-----	1.7	-----	-----	-----	1	1.7	1.9	1.8	2.1	0.2	3
BF Cross-sectional Area (ft^2)	-----	10.0	38.0	20.4	-----	14.4	-----	-----	-----	1	-----	10.6	-----	-----	-----	1	-----	15.3	-----	-----	-----	1	14.2	14.9	15.2	15.2	0.5	3
Width/Depth Ratio	-----	-----	-----	-----	-----	23.6	-----	-----	-----	1	-----	7.3	-----	-----	-----	1	-----	10.8	-----	-----	-----	1	8.8	11.8	12.3	14.2	2.2	3
Entrenchment Ratio	-----	-----	-----	-----	-----	>7.2	-----	-----	-----	1	-----	26.3	-----	-----	-----	1	-----	5.7	-----	-----	-----	1	3.9	4.0	4.0	4.2	0.1	3
Bank Height Ratio	-----	-----	-----	-----	-----	1.6	-----	-----	-----	1	-----	1.0	-----	-----	-----	1	-----	1.0	-----	-----	-----	1	1.0	1.0	1.0	1.0	1.0	3
d50 (mm)	-----	-----	-----	-----	-----	18.0	-----	-----	-----	1	-----	8.6	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	39.0	-----	-----	-----	1
Pattern																												
Channel Beltwidth (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	24.0	-----	-----	52.0	-----	2	29.0	-----	-----	64.0	-----	13	42.0	65.6	67.0	75.0	10.2	13
Radius of Curvature (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	5.4	-----	-----	22.1	-----	5	28.0	-----	-----	40.0	-----	14	22.0	32.4	33.0	41.0	5.2	14
Rc:Bankfull Width (ft/ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	0.6	-----	-----	2.5	-----	5	-----	-----	-----	-----	-----	-----	1.7	-----	-----	3.1	-----	1
Meander Wavelength (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	54.0	-----	-----	196.0	-----	2	140.0	-----	-----	157.0	-----	12	111.3	151.9	150.7	174.0	15.9	12
Meander Width Ratio	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	2.8	-----	-----	6.0	-----	2	2.2	-----	-----	4.9	-----	13	3.2	-----	-----	5.7	-----	13
Profile																												
Riffle Length (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	29.0	47.0	46.0	78.0	15.0	14
Riffle Slope (ft/ft)	-----	-----	-----	-----	0.0180	-----	-----	0.1530	-----	2	0.010	-----	-----	0.067	-----	2	0.0115	-----	-----	0.0230	-----	14	0.0000	0.0110	0.0120	0.0270	0.0081	14
Pool Length (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Pool Spacing (ft)	-----	-----	-----	-----	9.9	-----	-----	182	-----	-----	13.0	-----	-----	46.5	-----	5	63.0	-----	-----	115.0	-----	13	61.0	95.0	102.0	113.0	17.0	13
Pool Max Depth (ft)	-----	-----	-----	-----	-----	2.2	-----	-----	-----	-----	-----	2.5	-----	-----	-----	1	-----	-----	-----	-----	-----	-----	2.3	-----	-----	2.9	-----	2
Pool Volume (ft^3)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Substrate and Transport Parameters																												
Ri% / Ru% / P% / G% / S%	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
SC% / Sa% / G% / B% / Be%	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
d16 / d35 / d50 / d84 / d95	-----	-----	-----	-----	<0.063 / 7 / 18 / 149 / >2048						0.06 / 3 / 8.6 / 77 / 180						-----	-----	-----	-----	-----	-----	12 / 24 / 39 / 110 / 160					
Reach Shear Stress (competency) lb/ft^2	-----	-----	-----	-----	-----	0.5	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	0.5	-----	-----	-----	-----	-----	0.4	-----	-----	-----	1
Max part size (mm) mobilized at bankfull (Rosgen Curve)	-----	-----	-----	-----	-----	125.0	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	125.0	-----	-----	-----	-----	-----	95.0	-----	-----	-----	1
Stream Power (transport capacity) W/m^2	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	24.4	-----	-----	-----	1
Additional Reach Parameters																												
Drainage Area (SM)	-----	-----	-----	-----	0.7	-----	-----	0.9	-----	-----	-----	-----	-----	0.5	-----	-----	0.7	-----	-----	0.8	-----	-----	0.7	-----	-----	0.8	-----	-----
Impervious cover estimate (%)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Rosgen Classification	-----	-----	-----	-----	-----	C4/1	-----	-----	-----	-----	-----	E4/C4	-----	-----	-----	-----	-----	E/C4	-----	-----	-----	-----	-----	E/C	-----	-----	-----	-----
BF Velocity (fps)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	4.5	-----	-----	-----	-----	-----	4.6	-----	-----	-----	-----
BF Discharge (cfs)	-----	30.0	235.0	84.5	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	69.0	-----	-----	-----	-----	-----	69.0	-----	-----	-----	-----
Valley Length (ft)	-----	-----	-----	-----	-----	1,816.0	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	959.0	-----	-----	-----	-----
Channel length (ft)	-----	-----	-----	-----	-----	1,998.0	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	1276.0	-----	-----	-----	-----	-----	1247.0	-----	-----	-----	-----
Sinuosity	-----	-----	-----	-----	-----	1.10	-----	-----	-----	-----	-----	1.10	-----	-----	-----	-----	-----	1.30	-----	-----	-----	-----	-----	1.30	-----	-----	-----	-----
Water Surface Slope (Channel) (ft/ft)	-----	-----	-----	-----	-----	0.0116	-----	-----	-----	-----	-----	0.0132	-----	-----	-----	-----	-----	0.0080	-----	-----	-----	-----	-----	0.0060	-----	-----	-----	-----
BF Slope (ft/ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Bankfull Floodplain Area (acres)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
BEHI VL% / L% / M% / H% / VH% / E%	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Channel Stability or Habitat Metric	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Biological or Other	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

UT1 Reach 2 (1016 LF)

Parameter	USGS Gauge	Regional Curve Interval			Pre-Existing Condition						Reference Reach(es) Data – Spencer Creek						Design						As-built					
		LL	UL	Eq.	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n
Dimension and Substrate- Riffle																												
BF Width (ft)	-----	7.0	27.0	11.8	-----	13.1	-----	-----	-----	1	-----	8.7	-----	-----	-----	1	-----	15.0	-----	-----	-----	1	13.4	14.4	14.1	15.9	1.1	3
Floodprone Width (ft)	-----	-----	-----	-----	-----	48.8	-----	-----	-----	1	-----	228.5	-----	-----	-----	1	-----	85.5	-----	-----	-----	1	56.4	58.4	58.8	60.2	1.6	3
BF Mean Depth (ft)	-----	0.9	1.5	1.5	-----	1.4	-----	-----	-----	1	-----	1.2	-----	-----	-----	1	-----	4.5	-----	-----	-----	1	1.1	1.1	1.1	1.2	0.0	3
BF Max Depth (ft)	-----	-----	-----	-----	-----	2.2	-----	-----	-----	1	-----	1.9	-----	-----	-----	1	-----	1.5	-----	-----	-----	1	1.8	1.9	1.8	1.9	0.1	3
BF Cross-sectional Area (ft^2)	-----	11.0	40.0	21.1	-----	18.5	-----	-----	-----	1	-----	10.6	-----	-----	-----	1	-----	16.8	-----	-----	-----	1	14.5	16.3	16.3	17.9	1.4	3
Width/Depth Ratio	-----	-----	-----	-----	-----	9.4	-----	-----	-----	1	-----	7.3	-----	-----	-----	1	-----	13.6	-----	-----	-----	1	12.1	12.8	12.4	14.0	0.9	3
Entrenchment Ratio	-----	-----	-----	-----	-----	3.7	-----	-----	-----	1	-----	26.3	-----	-----	-----	1	-----	5.7	-----	-----	-----	1	3.7	4.1	4.2	4.3	0.3	3
Bank Height Ratio	-----	-----	-----	-----	-----	2.1	-----	-----	-----	1	-----	1.0	-----	-----	-----	1	-----	1.0	-----	-----	-----	1	1.0	1.0	1.0	1.0	1.0	3
d50 (mm)	-----	-----	-----	-----	-----	40.0	-----	-----	-----	1	-----	8.6	-----	-----	-----	1	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Pattern																												
Channel Beltwidth (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	24.0	-----	-----	52.0	-----	2	30.0	-----	-----	45.0	-----	10	29.0	45.3	48.0	58.0	11.7	10
Radius of Curvature (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	5.4	-----	-----	22.1	-----	5	30.0	-----	-----	48.0	-----	11	20.0	35.3	36.0	47.0	6.2	11
Rc:Bankfull Width (ft/ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	0.6	-----	-----	2.5	-----	5	2.0	-----	-----	3.2	-----	11	1.4	-----	-----	3.3	-----	1
Meander Wavelength (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	54.0	-----	-----	196.0	-----	2	134.0	-----	-----	199.0	-----	9	68.6	145.1	146.3	222.4	44.6	11
Meander Width Ratio	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	2.8	-----	-----	6.0	-----	2	2.0	-----	-----	3.0	-----	10	2.0	-----	-----	4.0	-----	1
Profile																												
Riffle Length (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	48.0	67.0	64.0	94.0	14.0	10
Riffle Slope (ft/ft)	-----	-----	-----	-----	0.0242	-----	-----	0.178	-----	2	0.0100	-----	-----	0.0670	-----	2	0.01920	-----	-----	0.02800	-----	11	0.0080	0.0160	0.0170	0.0220	0.0045	10
Pool Length (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Pool Spacing (ft)	-----	-----	-----	-----	9.8	-----	-----	118.2	-----	-----	13.0	-----	-----	46.5	-----	5	62.0	-----	-----	140.0	-----	11	17.0	74.0	77.0	116.0	28.0	11
Pool Max Depth (ft)	-----	-----	-----	-----	-----	2.1	-----	-----	-----	-----	-----	2.5	-----	-----	-----	1	-----	3.5	-----	-----	-----	1	-----	2.6	-----	-----	-----	1
Pool Volume (ft^3)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Substrate and Transport Parameters																												
Ri% / Ru% / P% / G% / S%	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
SC% / Sa% / G% / B% / Be%	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
d16 / d35 / d50 / d84 / d95	-----	-----	-----	-----	<0.063 / 11 / 40 / >2048 / >2048						0.06 / 3 / 8.6 / 77 / 180						-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Reach Shear Stress (competency) lb/ft^2	-----	-----	-----	-----	-----	1.0	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	0.8	-----	-----	-----	-----	-----	0.8	-----	-----	-----	1
Max part size (mm) mobilized at bankfull (Rosgen Curve)	-----	-----	-----	-----	-----	250.0	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	200.0	-----	-----	-----	-----	-----	200.0	-----	-----	-----	1
Stream Power (transport capacity) W/m^2	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	54.1	-----	-----	-----	1
Additional Reach Parameters																												
Drainage Area (SM)	-----	-----	-----	-----	0.9	-----	-----	1.0	-----	-----	-----	-----	-----	0.5	-----	-----	0.8	-----	-----	0.9	-----	-----	0.8	-----	-----	0.9	-----	-----
Impervious cover estimate (%)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Rosgen Classification	-----	-----	-----	-----	-----	E4/1	-----	-----	-----	-----	-----	E4/C4	-----	-----	-----	-----	-----	B4c	-----	-----	-----	-----	-----	E/C	-----	-----	-----	-----
BF Velocity (fps)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	4.5	-----	-----	-----	-----	-----	4.7	-----	-----	-----	-----
BF Discharge (cfs)	-----	30.0	260.0	87.7	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	76.0	-----	-----	-----	-----	-----	76.0	-----	-----	-----	-----
Valley Length (ft)	-----	-----	-----	-----	-----	759.0	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	----	924.0	-----	-----	-----	-----
Channel length (ft)	-----	-----	-----	-----	-----	759.0	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	1025.0	-----	-----	-----	-----	-----	1016.0	-----	-----	-----	-----
Sinuosity	-----	-----	-----	-----	-----	1.00	-----	-----	-----	-----	-----	1.10	-----	-----	-----	-----	-----	1.00	-----	-----	-----	-----	----	1.10	-----	-----	-----	-----
Water Surface Slope (Channel) (ft/ft)	-----	-----	-----	-----	-----	0.0140	-----	-----	-----	-----	-----	0.0132	-----	-----	-----	-----	-----	0.0128	-----	-----	-----	-----	----	0.0130	-----	-----	-----	-----
BF Slope (ft/ft)	-----	-----	-----	-----	-----	0.0139	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	----	-----	-----	-----	-----	-----
Banfull Floodplain Area (Acres)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
BEHI VL% / L% / M% / H% / VH% / E%	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Channel Stability or Habitat Metric	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Biological or Other	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

UT1 Reach 3 (1885 LF)

Parameter	USGS Gauge	Regional Curve Interval			Pre-Existing Condition						Reference Reach(es) Data – Spencer Creek						Design						As-built					
		LL	UL	Eq.	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n
Dimension and Substrate - Riffle																												
BF Width (ft)	-----	7.5	27.0	12.8	-----	17.6	-----	-----	-----	1	-----	8.7	-----	-----	-----	1	-----	15.0	-----	-----	-----	1	15.1	15.5	15.3	16.2	0.5	3
Floodprone Width (ft)	-----	-----	-----	-----	-----	>115.2	-----	-----	-----	1	-----	228.5	-----	-----	-----	1	-----	85.2	-----	-----	-----	1	56.9	57.5	57.1	58.6	0.8	3
BF Mean Depth (ft)	-----	1.0	2.5	1.6	-----	1.2	-----	-----	-----	1	-----	1.2	-----	-----	-----	1	-----	1.2	-----	-----	-----	1	1.2	1.2	1.2	1.3	0.1	3
BF Max Depth (ft)	-----	-----	-----	-----	-----	2.4	-----	-----	-----	1	-----	1.9	-----	-----	-----	1	-----	1.5	-----	-----	-----	1	1.7	1.9	1.8	2.2	0.2	3
BF Cross-sectional Area (ft^2)	-----	12.0	43.0	24.0	-----	20.9	-----	-----	-----	1	-----	10.6	-----	-----	-----	1	-----	17.3	-----	-----	-----	1	17.8	18.9	17.9	21.0	1.5	3
Width/Depth Ratio	-----	-----	-----	-----	-----	14.7	-----	-----	-----	1	-----	7.3	-----	-----	-----	1	-----	12.5	-----	-----	-----	1	12.6	12.8	12.7	13.1	0.2	3
Entrenchment Ratio	-----	-----	-----	-----	-----	>6.5	-----	-----	-----	1	-----	26.3	-----	-----	-----	1	-----	5.7	-----	-----	-----	1	3.6	3.7	3.7	3.8	0.1	3
Bank Height Ratio	-----	-----	-----	-----	-----	1.4	-----	-----	-----	1	-----	1.0	-----	-----	-----	1	-----	1.0	-----	-----	-----	1	1.0	1.0	1.0	1.0	0.0	3
d50 (mm)	-----	-----	-----	-----	-----	16.0	-----	-----	-----	1	-----	8.6	-----	-----	-----	1	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Pattern																												
Channel Beltwidth (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	24.0	-----	-----	52.0	-----	2	22.0	-----	-----	65.0	-----	18	29.0	63.7	68.0	76.0	12.9	18
Radius of Curvature (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	5.4	-----	-----	22.1	-----	5	30.0	-----	-----	50.0	-----	19	29.0	38.4	37.0	52.0	6.8	19
Rc:Bankfull Width (ft/ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	0.6	-----	-----	2.5	-----	5	2.0	-----	-----	3.3	-----	19	1.9	-----	-----	3.4	-----	1
Meander Wavelength (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	54.0	-----	-----	196.0	-----	2	127.0	-----	-----	198.0	-----	17	129.7	177.7	181.2	220.1	22.0	18
Meander Width Ratio	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	2.8	-----	-----	6.0	-----	2	1.5	-----	-----	4.3	-----	18	1.9	-----	-----	4.9	-----	18
Profile																												
Riffle Length (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	31.0	55.0	59.0	85.0	15.0	18
Riffle Slope (ft/ft)	-----	-----	-----	-----	0.0274	-----	-----	0.0628	-----	2	0.0100	-----	-----	0.0670	-----	2	0.0175	-----	-----	0.0354	-----	19	0.0100	0.0220	0.0200	0.0390	0.008	18
Pool Length (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Pool Spacing (ft)	-----	-----	-----	-----	27.2	-----	-----	539.5	-----	-----	13	-----	-----	46.5	-----	5	61.0	-----	-----	137.0	-----	19	23.0	94.0	106.5	134.0	30.0	20
Pool Max Depth (ft)	-----	-----	-----	-----	-----	2.1	-----	-----	-----	-----	-----	2.5	-----	-----	-----	1	-----	3.3	-----	-----	-----	1	3.0	3.0	-----	3.0	-----	2
Pool Volume (ft^3)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Substrate and Transport Parameters																												
Ri% / Ru% / P% / G% / S%	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
SC% / Sa% / G% / B% / Be%	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
d16 / d35 / d50 / d84 / d95	-----	-----	-----	-----	<0.063 / 8 / 16 / 110 / 1024						0.06 / 3 / 8.6 / 77 / 180						-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Reach Shear Stress (competency) lb/ft^2	-----	-----	-----	-----	-----	0.9	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	0.7	-----	-----	-----	-----	-----	0.8	-----	-----	-----	1
Max part size (mm) mobilized at bankfull (Rosgen Curve)	-----	-----	-----	-----	-----	225.0	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	190.0	-----	-----	-----	-----	-----	200.0	-----	-----	-----	1
Stream Power (transport capacity) W/m^2	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	57.9	-----	-----	-----	1
Additional Reach Parameters																												
Drainage Area (SM)	-----	-----	-----	-----	1.0	-----	-----	1.2	-----	-----	-----	-----	-----	0.5	-----	-----	0.9	-----	-----	1.1	-----	-----	0.9	-----	-----	1.1	-----	-----
Impervious cover estimate (%)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Rosgen Classification	-----	-----	-----	-----	-----	C4/1	-----	-----	-----	-----	-----	E4/C4	-----	-----	-----	-----	-----	C4	-----	-----	-----	-----	-----	E/C	-----	-----	-----	-----
BF Velocity (fps)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	5.5	-----	-----	-----	-----	-----	5.0	-----	-----	-----	-----
BF Discharge (cfs)	-----	35.0	290.0	100.3	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	95.0	-----	-----	-----	-----	-----	95.0	-----	-----	-----	-----
Valley Length (ft)	-----	-----	-----	-----	-----	1518.0	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	1571.0	-----	-----	-----	-----
Channel length (ft)	-----	-----	-----	-----	-----	1518.0	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	1954.0	-----	-----	-----	-----	-----	1885.0	-----	-----	-----	-----
Sinuosity	-----	-----	-----	-----	-----	1.00	-----	-----	-----	-----	-----	1.10	-----	-----	-----	-----	-----	1.20	-----	-----	-----	-----	-----	1.20	-----	-----	-----	-----
Water Surface Slope (Channel) (ft/ft)	-----	-----	-----	-----	-----	0.0134	-----	-----	-----	-----	-----	0.013	-----	-----	-----	-----	-----	0.0118	-----	-----	-----	-----	-----	0.0120	-----	-----	-----	-----
BF Slope (ft/ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Banfull Floodplain Area (Acres)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
BEHI VL% / L% / M% / H% / VH% / E%	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Channel Stability or Habitat Metric	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Biological or Other	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

UT1 Reach 4 (996 LF)

Parameter	USGS Gauge	Regional Curve Interval			Pre-Existing Condition						Reference Reach(es) Data – Spencer Creek						Design						As-built					
		LL	UL	Eq.	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n
Dimension and Substrate - Riffle																												
BF Width (ft)	-----	7.5	27.0	12.9	-----	23.1	-----	-----	-----	1	-----	8.7	-----	-----	-----	1	-----	16.0	-----	-----	-----	1	16.7	18.7	16.8	22.6	2.8	3
Floodprone Width (ft)	-----	-----	-----	-----	-----	69.2	-----	-----	-----	1	-----	228.5	-----	-----	-----	1	-----	87.0	-----	-----	-----	1	51.3	57.8	58.6	63.5	5.0	3
BF Mean Depth (ft)	-----	1.0	2.5	1.6	-----	1.0	-----	-----	-----	1	-----	1.2	-----	-----	-----	1	-----	1.3	-----	-----	-----	1	1.2	1.3	1.3	1.5	0.1	3
BF Max Depth (ft)	-----	-----	-----	-----	-----	1.8	-----	-----	-----	1	-----	1.9	-----	-----	-----	1	-----	1.7	-----	-----	-----	1	1.8	2.0	2.0	2.3	0.2	3
BF Cross-sectional Area (ft^2)	-----	12.0	43.0	24.4	-----	22.6	-----	-----	-----	1	-----	10.6	-----	-----	-----	1	-----	20.0	-----	-----	-----	1	21.3	24.8	25.3	27.8	2.7	3
Width/Depth Ratio	-----	-----	-----	-----	-----	23.1	-----	-----	-----	1	-----	7.3	-----	-----	-----	1	-----	12.3	-----	-----	-----	1	11.2	14.2	13.1	18.4	3.1	3
Entrenchment Ratio	-----	-----	-----	-----	-----	3.0	-----	-----	-----	1	-----	26.3	-----	-----	-----	1	-----	5.4	-----	-----	-----	1	2.3	3.2	3.5	3.8	0.7	3
Bank Height Ratio	-----	-----	-----	-----	-----	1.8	-----	-----	-----	1	-----	1.0	-----	-----	-----	1	-----	1.0	-----	-----	-----	1	1.0	1.0	1.0	1.0	1.0	3
d50 (mm)	-----	-----	-----	-----	-----	32.0	-----	-----	-----	1	-----	8.6	-----	-----	-----	1	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Pattern																												
Channel Beltwidth (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	24.0	-----	-----	52.0	-----	2	31.0	-----	-----	47.0	-----	7	38.0	55.3	41.0	112.0	26.4	7
Radius of Curvature (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	5.4	-----	-----	22.1	-----	5	32.0	-----	-----	50.0	-----	9	14.0	36.3	36.0	55.0	1.1	9
Rc:Bankfull Width (ft/ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	0.6	-----	-----	2.5	-----	5	2.0	-----	-----	3.1	-----	9	0.9	-----	-----	3.6	-----	9
Meander Wavelength (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	54.0	-----	-----	196.0	-----	2	133.0	-----	-----	168.0	-----	5	136.3	156.1	159.8	181.0	62.9	6
Meander Width Ratio	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	2.8	-----	-----	6.0	-----	2	1.9	-----	-----	2.9	-----	7	2.0	-----	-----	3.6	-----	7
Profile																												
Riffle Length (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	37.0	55.0	54.0	79.0	13.0	10
Riffle Slope (ft/ft)	-----	-----	-----	-----	0.0264	-----	-----	0.2521	-----	-----	0.0100	-----	-----	0.0670	-----	2	0.0222	-----	-----	0.0301	-----	12	0.0050	0.0220	0.0230	0.0310	0.0070	10
Pool Length (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Pool Spacing (ft)	-----	-----	-----	-----	34.4	-----	-----	156.4	-----	-----	13.0	-----	-----	46.5	-----	5	64.0	-----	-----	105.0	-----	9	66.0	81.0	75.0	106.0	13.0	9
Pool Max Depth (ft)	-----	-----	-----	-----	-----	3.0	-----	-----	-----	-----	-----	2.5	-----	-----	-----	1	-----	4.0	-----	-----	-----	1	-----	4.6	-----	-----	-----	1
Pool Volume (ft^3)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Substrate and Transport Parameters																												
Ri% / Ru% / P% / G% / S%	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
SC% / Sa% / G% / B% / Be%	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
d16 / d35 / d50 / d84 / d95	-----	-----	-----	-----	<0.063 / 11 / 32 / 100 / 180						0.06 / 3 / 8.6 / 77 / 180						-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Reach Shear Stress (competency) lb/ft^2	-----	-----	-----	-----	-----	0.8	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	1.1	-----	-----	-----	-----	-----	1.2	-----	-----	-----	1
Max part size (mm) mobilized at bankfull (Rosgen Curve)	-----	-----	-----	-----	-----	200.0	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	250.0	-----	-----	-----	-----	-----	290.0	-----	-----	-----	1
Stream Power (transport capacity) W/m^2	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	68.2	-----	-----	-----	1
Additional Reach Parameters																												
Drainage Area (SM)	-----	-----	-----	-----	1.2	-----	-----	1.2	-----	-----	-----	-----	-----	0.5	-----	-----	1.1	-----	-----	1.2	-----	-----	1.1	-----	-----	1.2	-----	-----
Impervious cover estimate (%)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Rosgen Classification	-----	-----	-----	-----	-----	C4/1	-----	-----	-----	-----	-----	E4/C4	-----	-----	-----	-----	-----	B4c	-----	-----	-----	-----	-----	C	-----	-----	-----	-----
BF Velocity (fps)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	5.0	-----	-----	-----	-----	-----	4.0	-----	-----	-----	-----
BF Discharge (cfs)	-----	35.0	290.0	102.2	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	100.0	-----	-----	-----	-----	-----	100.0	-----	-----	-----	-----
Valley Length (ft)	-----	-----	-----	-----	-----	850.0	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	915.0	-----	-----	-----	-----
Channel length (ft)	-----	-----	-----	-----	-----	935.0	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	1501.0	-----	-----	-----	-----	-----	997.0	-----	-----	-----	-----
Sinuosity	-----	-----	-----	-----	-----	1.10	-----	-----	-----	-----	-----	1.10	-----	-----	-----	-----	-----	1.00	-----	-----	-----	-----	-----	1.09	-----	-----	-----	-----
Water Surface Slope (Channel) (ft/ft)	-----	-----	-----	-----	-----	0.0145	-----	-----	-----	-----	-----	0.0132	-----	-----	-----	-----	-----	0.0161	-----	-----	-----	-----	-----	0.0160	-----	-----	-----	-----
BF Slope (ft/ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Banfull Floodplain Area (Acres)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
BEHI VL% / L% / M% / H% / VH% / E%	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Channel Stability or Habitat Metric	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Biological or Other	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

UT2 (609 LF)																												
Parameter	**USGS Gauge**	**Regional Curve Interval**			**Pre-Existing Condition**						**Reference Reach(es) Data Spencer Creek**						**Design**						**As-built**					
Dimension and Substrate - Riffle		LL	UL	Eq.	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n
BF Width (ft)	-----	5.5	21.0	9.2	-----	9.2	-----	-----	-----	1	-----	8.7	-----	-----	-----	1	-----	13	-----	-----	-----	1	-----	13.4	-----	-----	-----	1
Floodprone Width (ft)	-----	-----	-----	-----	-----	>142.2	-----	-----	-----	1	-----	228.5	-----	-----	-----	1	-----	74.0+	-----	-----	-----	1	-----	63.1	-----	-----	-----	1
BF Mean Depth (ft)	-----	0.8	2.1	1.2	-----	1.2	-----	-----	-----	1	-----	1.2	-----	-----	-----	1	-----	1.1	-----	-----	-----	1	-----	1.4	-----	-----	-----	1
BF Max Depth (ft)	-----	-----	-----	-----	-----	1.6	-----	-----	-----	1	-----	1.9	-----	-----	-----	1	-----	1.4	-----	-----	-----	1	-----	1.9	-----	-----	-----	1
BF Cross-sectional Area (ft²)	-----	7.0	27.0	14.3	-----	10.8	-----	-----	-----	1	-----	10.6	-----	-----	-----	1	-----	14.3	-----	-----	-----	1	-----	18.1	-----	-----	-----	1
Width/Depth Ratio	-----	-----	-----	-----	-----	7.7	-----	-----	-----	1	-----	7.3	-----	-----	-----	1	-----	11.8	-----	-----	-----	1	-----	9.9	-----	-----	-----	1
Entrenchment Ratio	-----	-----	-----	-----	-----	>15.5	-----	-----	-----	1	-----	26.3	-----	-----	-----	1	-----	5.7+	-----	-----	-----	1	-----	4.7	-----	-----	-----	1
Bank Height Ratio	-----	-----	-----	-----	-----	1.3	-----	-----	-----	1	-----	1.0	-----	-----	-----	1	-----	1.0	-----	-----	-----	1	-----	1.0	-----	-----	-----	1
d50 (mm)	-----	-----	-----	-----	-----	15.0	-----	-----	-----	1	-----	8.6	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Pattern		-----	-----																									
Channel Beltwidth (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	24.0	-----	-----	52.0	-----	2	46.0	-----	-----	55.0	-----	7	44.0	52.6	53.0	61.0	5.6	7
Radius of Curvature (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	5.4	-----	-----	22.1	-----	5	23.0	-----	-----	37.0	-----	7	25.0	31.6	30.0	43.0	6.4	7
Rc:Bankfull Width (ft/ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	0.6	-----	-----	2.5	-----	5	1.8	-----	-----	2.8	-----	7	2.5	-----	-----	3.6	-----	7
Meander Wavelength (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	54.0	-----	-----	196.0	-----	2	98.0	-----	-----	142.0	-----	6	99.0	122.4	120.5	147.8	17.0	6
Meander Width Ratio	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	2.8	-----	-----	6.0	-----	2	3.5	-----	-----	4.2	-----	7	5.4	-----	-----	6.7	-----	1
Profile																												
Riffle Length (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	20.0	40.8	43.0	56.0	12.5	8
Riffle Slope (ft/ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	0.0100	-----	-----	0.0670	-----	2	0.0230	-----	-----	0.0504	-----	8	0.0090	0.0280	0.0280	0.0490	0.0120	8
Pool Length (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----		-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Pool Spacing (ft)	-----	-----	-----	-----	61.0	-----	-----	114.0	-----	-----	13.0	-----	-----	46.5	-----	5	62.0	-----	-----	99.0	-----	7	55.0	76.0	73.0	103.0	15.7	7
Pool Max Depth (ft)	-----	-----	-----	-----	-----	2.2	-----	-----	-----	-----	-----	2.5	-----	-----	-----	1	-----	3.6	-----	-----	-----	1	-----	2.5	-----	-----	-----	1
Pool Volume (ft³)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Substrate and Transport Parameters																												
Ri% / Ru% / P% / G% / S%	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
SC% / Sa% / G% / B% / Be%	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
d16 / d35 / d50 / d84 / d95	-----	-----	-----	-----	<0.063 / 8 / 15 / 64 / 90						0.06 / 3 / 8.6 / 77 / 180						-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Reach Shear Stress (competency) lb/ft²	-----	-----	-----	-----	-----	1.3	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	0.9	-----	-----	-----	-----	-----	1.0	-----	-----	-----	1
Max part size (mm) mobilized at bankfull (Rosgen Curve)	-----	-----	-----	-----	-----	300.0	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	220.0	-----	-----	-----	-----	-----	250.0	-----	-----	-----	1
Stream Power (transport capacity) W/m²	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	44.0	-----	-----	-----	1
Additional Reach Parameters																												
Drainage Area (SM)	-----	-----	-----	-----	0.5	-----	-----	0.6	-----	-----	-----	-----	-----	0.5	-----	-----	0.5	-----	-----	0.6	-----	-----	0.5	-----	-----	0.6	-----	-----
Impervious cover estimate (%)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Rosgen Classification	-----	-----	-----	-----	-----	G4	-----	-----	-----	-----	-----	E4/C4	-----	-----	-----	-----	-----	E/C4	-----	-----	-----	-----	-----	E	-----	-----	-----	-----
BF Velocity (fps)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	3.9	-----	-----	-----	-----	-----	3.1	-----	-----	-----	-----
BF Discharge (cfs)	-----	20.0	175.0	57.8	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	56.0	-----	-----	-----	-----	-----	56.0	-----	-----	-----	-----
Valley Length (ft)	-----	-----	-----	-----	-----	568.0	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	476.0	-----	-----	-----	-----
Channel length (ft)	-----	-----	-----	-----	-----	625.0	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	605.0	-----	-----	-----	-----	-----	609.0	-----	-----	-----	-----
Sinuosity	-----	-----	-----	-----	-----	1.10	-----	-----	-----	-----	-----	1.10	-----	-----	-----	-----	-----	1.20	-----	-----	-----	-----	-----	1.28	-----	-----	-----	-----
Water Surface Slope (Channel) (ft/ft)	-----	-----	-----	-----	-----	0.0215	-----	-----	-----	-----	-----	0.0130	-----	-----	-----	-----	-----	0.0150	-----	-----	-----	-----	-----	0.0140	-----	-----	-----	-----
BF Slope (ft/ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Bankfull Floodplain Area (Acres)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
BEHI VL% / L% / M% / H% / VH% / E%	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Channel Stability or Habitat Metric	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Biological or Other	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

Table 7. Morphology and Hydraulic Monitoring Summary

Big Cedar Creek Restoration Site: Project No. D06054-D																								
Big Cedar Creek Reach 1 (603 LF)																								
	Cross-section 1 (Riffle)						Cross-section 2 (Pool)																	
Dimension and substrate	Base	MY1	MY2	MY3	MY4	MY5	Base	MY1	MY2	MY3	MY4	MY5	Base	MY1	MY2	MY3	MY4	MY5	Base	MY1	MY2	MY3	MY4	MY5
Based on fixed baseline bankfull elevation																								
BF Width (ft)	19.6						28.0																	
BF Mean Depth (ft)	1.9						1.8																	
Width/Depth Ratio	10.4						15.7																	
BF Cross-sectional Area (ft²)	37.1						50.1																	
BF Max Depth (ft)	2.7						3.9																	
Width of Floodprone Area (ft)	>64.7						>78.0																	
Entrenchment Ratio	>3.3						N/A																	
Bank Height Ratio	1.0						1.0																	
Wetted Perimeter (ft)	23.4						31.6																	
Hydraulic Radius (ft)	1.6						1.6																	
Based on current/developing bankfull feature																								
BF Width (ft)																								
BF Mean Depth (ft)																								
Width/Depth Ratio																								
BF Cross-sectional Area (ft²)																								
BF Max Depth (ft)																								
Width of Floodprone Area (ft)																								
Entrenchment Ratio																								
Bank Height Ratio																								
Wetted Perimeter (ft)																								
Hydraulic Radius (ft)																								
Cross Sectional Area between end pins (ft²)	-						-																	
d50 (mm)	-						-																	
	Cross-section 1 (Riffle)						Cross-section 2																	
Dimension and substrate	Base	MY1	MY2	MY3	MY4	MY5	Base	MY1	MY2	MY3	MY4	MY5	Base	MY1	MY2	MY3	MY4	MY5	Base	MY1	MY2	MY3	MY4	MY5
Based on fixed baseline bankfull elevation																								
BF Width (ft)																								
BF Mean Depth (ft)																								
Width/Depth Ratio																								
BF Cross-sectional Area (ft²)																								
BF Max Depth (ft)																								
Width of Floodprone Area (ft)																								
Entrenchment Ratio																								
Bank Height Ratio																								
Wetted Perimeter (ft)																								
Hydraulic Radius (ft)																								
Based on current/developing bankfull feature																								
BF Width (ft)																								
BF Mean Depth (ft)																								
Width/Depth Ratio																								
BF Cross-sectional Area (ft²)																								
BF Max Depth (ft)																								
Width of Floodprone Area (ft)																								
Entrenchment Ratio																								
Bank Height Ratio																								
Wetted Perimeter (ft)																								
Hydraulic Radius (ft)																								
Cross Sectional Area between end pins (ft²)																								
d50 (mm)																								

Big Cedar Creek Reach 2 (2239 LF)																								
	Cross-section 3 (Riffle)						Cross-section 4 (Pool)						Cross-section 5 (Riffle)						Cross-section 6 (Pool)					
Dimension and substrate	Base	MY1	MY2	MY3	MY4	MY5	Base	MY1	MY2	MY3	MY4	MY5	Base	MY1	MY2	MY3	MY4	MY5	Base	MY1	MY2	MY3	MY4	MY5
Based on fixed baseline bankfull elevation																								
BF Width (ft)	25.7						33.0						22.5						34.8					
BF Mean Depth (ft)	2.5						2.3						2.2						2.5					
Width/Depth Ratio	10.4						14.6						10.2						13.7					
BF Cross-sectional Area (ft^2)	63.1						74.3						49.7						88.2					
BF Max Depth (ft)	3.9						5.5						3.3						5.5					
Width of Floodprone Area (ft)	>75.8						>83.5						>74.4						>86.2					
Entrenchment Ratio	>3.0						N/A						>3.3						N/A					
Bank Height Ratio	1.0						1.0						1.0						1.0					
Wetted Perimeter (ft)	30.6						37.5						26.9						39.9					
Hydraulic Radius (ft)	2.1						2.0						1.8						2.2					
Based on current/developing bankfull feature																								
BF Width (ft)																								
BF Mean Depth (ft)																								
Width/Depth Ratio																								
BF Cross-sectional Area (ft^2)																								
BF Max Depth (ft)																								
Width of Floodprone Area (ft)																								
Entrenchment Ratio																								
Bank Height Ratio																								
Wetted Perimeter (ft)																								
Hydraulic Radius (ft)																								
Cross Sectional Area between end pins (ft^2)	-						-						-						-					
d50 (mm)	-						-						-						-					
	Cross-section 7 (Riffle)																							
Dimension and substrate	Base	MY1	MY2	MY3	MY4	MY5	Base	MY1	MY2	MY3	MY4	MY5	Base	MY1	MY2	MY3	MY4	MY5	Base	MY1	MY2	MY3	MY4	MY5
Based on fixed baseline bankfull elevation																								
BF Width (ft)	22.3																							
BF Mean Depth (ft)	2.5																							
Width/Depth Ratio	8.9																							
BF Cross-sectional Area (ft^2)	55.6																							
BF Max Depth (ft)	3.9																							
Width of Floodprone Area (ft)	>75.8																							
Entrenchment Ratio	>3.4																							
Bank Height Ratio	1.0																							
Wetted Perimeter (ft)	27.3																							
Hydraulic Radius (ft)	2.0																							
Based on current/developing bankfull feature																								
BF Width (ft)																								
BF Mean Depth (ft)																								
Width/Depth Ratio																								
BF Cross-sectional Area (ft^2)																								
BF Max Depth (ft)																								
Width of Floodprone Area (ft)																								
Entrenchment Ratio																								
Bank Height Ratio																								
Wetted Perimeter (ft)																								
Hydraulic Radius (ft)																								
Cross Sectional Area between end pins (ft^2)	-																							
d50 (mm)	-																							

Big Cedar Creek Reach 3 (1827 LF)																								
	Cross-section 8 (Pool)						Cross-section 9 (Riffle)						Cross-section 10 (Riffle)						Cross-section 11 (Riffle)					
Dimension and substrate	Base	MY1	MY2	MY3	MY4	MY5	Base	MY1	MY2	MY3	MY4	MY5	Base	MY1	MY2	MY3	MY4	MY5	Base	MY1	MY2	MY3	MY4	MY5
Based on fixed baseline bankfull elevation																								
BF Width (ft)	38.8						23.1						24.6						25.0					
BF Mean Depth (ft)	2.5						2.2						2.1						2.5					
Width/Depth Ratio	15.6						10.7						11.7						9.9					
BF Cross-sectional Area (ft²)	96.4						50.1						51.8						63.2					
BF Max Depth (ft)	5.4						3.1						3.1						3.8					
Width of Floodprone Area (ft)	>89.5						>77.8						>77.9						>82.5					
Entrenchment Ratio	N/A						>3.4						>3.2						>3.3					
Bank Height Ratio	1.0						1.0						1.0						1.0					
Wetted Perimeter (ft)	43.8						27.5						28.8						30.0					
Hydraulic Radius (ft)	2.2						1.8						1.8						2.1					
Based on current/developing bankfull feature																								
BF Width (ft)																								
BF Mean Depth (ft)																								
Width/Depth Ratio																								
BF Cross-sectional Area (ft²)																								
BF Max Depth (ft)																								
Width of Floodprone Area (ft)																								
Entrenchment Ratio																								
Bank Height Ratio																								
Wetted Perimeter (ft)																								
Hydraulic Radius (ft)																								
Cross Sectional Area between end pins (ft²)	-						-						-						-					
d50 (mm)	-						-						-						-					
Dimension and substrate	Base	MY1	MY2	MY3	MY4	MY5	Base	MY1	MY2	MY3	MY4	MY5	Base	MY1	MY2	MY3	MY4	MY5	Base	MY1	MY2	MY3	MY4	MY5
Based on fixed baseline bankfull elevation																								
BF Width (ft)																								
BF Mean Depth (ft)																								
Width/Depth Ratio																								
BF Cross-sectional Area (ft²)																								
BF Max Depth (ft)																								
Width of Floodprone Area (ft)																								
Entrenchment Ratio																								
Bank Height Ratio																								
Wetted Perimeter (ft)																								
Hydraulic Radius (ft)																								
Based on current/developing bankfull feature																								
BF Width (ft)																								
BF Mean Depth (ft)																								
Width/Depth Ratio																								
BF Cross-sectional Area (ft²)																								
BF Max Depth (ft)																								
Width of Floodprone Area (ft)																								
Entrenchment Ratio																								
Bank Height Ratio																								
Wetted Perimeter (ft)																								
Hydraulic Radius (ft)																								
Cross Sectional Area between end pins (ft²)																								
d50 (mm)																								

Big Cedar Creek Reach 4 (410 LF)																								
	Cross-section 12 (Pool)						Cross-section 13 (Riffle)																	
Dimension and substrate	Base	MY1	MY2	MY3	MY4	MY5	Base	MY1	MY2	MY3	MY4	MY5	Base	MY1	MY2	MY3	MY4	MY5	Base	MY1	MY2	MY3	MY4	MY5
Based on fixed baseline bankfull elevation																								
BF Width (ft)	38.0						27.5																	
BF Mean Depth (ft)	2.3						2.1																	
Width/Depth Ratio	16.3						13.0																	
BF Cross-sectional Area (ft²)	88.5						58.3																	
BF Max Depth (ft)	4.7						3.2																	
Width of Floodprone Area (ft)	>89.2						>81.0																	
Entrenchment Ratio	N/A						>2.9																	
Bank Height Ratio	1.0						1.0																	
Wetted Perimeter (ft)	42.6						31.7																	
Hydraulic Radius (ft)	2.1						1.8																	
Based on current/developing bankfull feature																								
BF Width (ft)																								
BF Mean Depth (ft)																								
Width/Depth Ratio																								
BF Cross-sectional Area (ft²)																								
BF Max Depth (ft)																								
Width of Floodprone Area (ft)																								
Entrenchment Ratio																								
Bank Height Ratio																								
Wetted Perimeter (ft)																								
Hydraulic Radius (ft)																								
Cross Sectional Area between end pins (ft^2)	-						-																	
d50 (mm)	-						-																	
Dimension and substrate	Base	MY1	MY2	MY3	MY4	MY5	Base	MY1	MY2	MY3	MY4	MY5	Base	MY1	MY2	MY3	MY4	MY5	Base	MY1	MY2	MY3	MY4	MY5
Based on fixed baseline bankfull elevation																								
BF Width (ft)																								
BF Mean Depth (ft)																								
Width/Depth Ratio																								
BF Cross-sectional Area (ft²)																								
BF Max Depth (ft)																								
Width of Floodprone Area (ft)																								
Entrenchment Ratio																								
Bank Height Ratio																								
Wetted Perimeter (ft)																								
Hydraulic Radius (ft)																								
Based on current/developing bankfull feature																								
BF Width (ft)																								
BF Mean Depth (ft)																								
Width/Depth Ratio																								
BF Cross-sectional Area (ft²)																								
BF Max Depth (ft)																								
Width of Floodprone Area (ft)																								
Entrenchment Ratio																								
Bank Height Ratio																								
Wetted Perimeter (ft)																								
Hydraulic Radius (ft)																								
Cross Sectional Area between end pins (ft^2)																								
d50 (mm)																								

UT1 Reach 1 (1248 LF)																								
	Cross-section 14 (Riffle)						Cross-section 15 (Pool)						Cross-section 16 (Riffle)						Cross-section 17 (Pool)					
Dimension and substrate	Base	MY1	MY2	MY3	MY4	MY5	Base	MY1	MY2	MY3	MY4	MY5	Base	MY1	MY2	MY3	MY4	MY5	Base	MY1	MY2	MY3	MY4	MY5
Based on fixed baseline bankfull elevation																								
BF Width (ft)	14.7						33.3						11.6						24.3					
BF Mean Depth (ft)	1.0						1.3						1.3						1.3					
Width/Depth Ratio	14.2						26.8						8.8						18.7					
BF Cross-sectional Area (ft²)	15.2						41.6						15.2						31.6					
BF Max Depth (ft)	1.7						3.3						2.1						2.9					
Width of Floodprone Area (ft)	>56.5						>57.2						>48.4						>55.8					
Entrenchment Ratio	>3.8						N/A						>4.2						N/A					
Bank Height Ratio	1.0						1.0						1.0						1.0					
Wetted Perimeter (ft)	16.7						35.9						14.2						26.9					
Hydraulic Radius (ft)	0.9						1.2						1.1						1.2					
Based on current/developing bankfull feature																								
BF Width (ft)																								
BF Mean Depth (ft)																								
Width/Depth Ratio																								
BF Cross-sectional Area (ft²)																								
BF Max Depth (ft)																								
Width of Floodprone Area (ft)																								
Entrenchment Ratio																								
Bank Height Ratio																								
Wetted Perimeter (ft)																								
Hydraulic Radius (ft)																								
Cross Sectional Area between end pins (ft²)	-						-						-						-					
d50 (mm)	-						-						-						-					
	Cross-section 18 (Riffle)																							
Dimension and substrate	Base	MY1	MY2	MY3	MY4	MY5	Base	MY1	MY2	MY3	MY4	MY5	Base	MY1	MY2	MY3	MY4	MY5	Base	MY1	MY2	MY3	MY4	MY5
Based on fixed baseline bankfull elevation																								
BF Width (ft)	13.2																							
BF Mean Depth (ft)	1.1																							
Width/Depth Ratio	12.3																							
BF Cross-sectional Area (ft²)	14.2																							
BF Max Depth (ft)	1.8																							
Width of Floodprone Area (ft)	>56.6																							
Entrenchment Ratio	>4.0																							
Bank Height Ratio	1.0																							
Wetted Perimeter (ft)	15.4																							
Hydraulic Radius (ft)	0.9																							
Based on current/developing bankfull feature																								
BF Width (ft)																								
BF Mean Depth (ft)																								
Width/Depth Ratio																								
BF Cross-sectional Area (ft²)																								
BF Max Depth (ft)																								
Width of Floodprone Area (ft)																								
Entrenchment Ratio																								
Bank Height Ratio																								
Wetted Perimeter (ft)																								
Hydraulic Radius (ft)																								
Cross Sectional Area between end pins (ft²)	-																							
d50 (mm)	39																							

UT1 Reach 2 (1016 LF)																								
	Cross-section 19 (Riffle)						Cross-section 20 (Pool)						Cross-section 21 (Riffle)						Cross-section 22 (Riffle)					
Dimension and substrate	Base	MY1	MY2	MY3	MY4	MY5	Base	MY1	MY2	MY3	MY4	MY5	Base	MY1	MY2	MY3	MY4	MY5	Base	MY1	MY2	MY3	MY4	MY5
Based on fixed baseline bankfull elevation																								
BF Width (ft)	13.4						21.2						15.9						14.1					
BF Mean Depth (ft)	1.1						1.3						1.1						1.2					
Width/Depth Ratio	12.4						16.8						14.0						12.1					
BF Cross-sectional Area (ft²)	14.5						26.7						17.9						16.3					
BF Max Depth (ft)	1.8						2.8						1.9						1.8					
Width of Floodprone Area (ft)	>56.4						>62.4						>58.8						>60.1					
Entrenchment Ratio	>4.2						N/A						>3.7						>4.3					
Bank Height Ratio	1.0						1.0						1.0						1.0					
Wetted Perimeter (ft)	15.6						23.8						18.1						16.4					
Hydraulic Radius (ft)	0.9						1.1						1.0						1.0					
Based on current/developing bankfull feature																								
BF Width (ft)																								
BF Mean Depth (ft)																								
Width/Depth Ratio																								
BF Cross-sectional Area (ft²)																								
BF Max Depth (ft)																								
Width of Floodprone Area (ft)																								
Entrenchment Ratio																								
Bank Height Ratio																								
Wetted Perimeter (ft)																								
Hydraulic Radius (ft)																								
Cross Sectional Area between end pins (ft^2)	-						-						-						-					
d50 (mm)	-						-						-						-					
Dimension and substrate	Base	MY1	MY2	MY3	MY4	MY5	Base	MY1	MY2	MY3	MY4	MY5	Base	MY1	MY2	MY3	MY4	MY5	Base	MY1	MY2	MY3	MY4	MY5
Based on fixed baseline bankfull elevation																								
BF Width (ft)																								
BF Mean Depth (ft)																								
Width/Depth Ratio																								
BF Cross-sectional Area (ft²)																								
BF Max Depth (ft)																								
Width of Floodprone Area (ft)																								
Entrenchment Ratio																								
Bank Height Ratio																								
Wetted Perimeter (ft)																								
Hydraulic Radius (ft)																								
Based on current/developing bankfull feature																								
BF Width (ft)																								
BF Mean Depth (ft)																								
Width/Depth Ratio																								
BF Cross-sectional Area (ft²)																								
BF Max Depth (ft)																								
Width of Floodprone Area (ft)																								
Entrenchment Ratio																								
Bank Height Ratio																								
Wetted Perimeter (ft)																								
Hydraulic Radius (ft)																								
Cross Sectional Area between end pins (ft^2)																								
d50 (mm)																								

UT1 Reach 3 (1885 LF)																								
	Cross-section 23 (Pool)						Cross-section 24 (Riffle)						Cross-section 25 (Riffle)						Cross-section 26 (Riffle)					
Dimension and substrate	Base	MY1	MY2	MY3	MY4	MY5	Base	MY1	MY2	MY3	MY4	MY5	Base	MY1	MY2	MY3	MY4	MY5	Base	MY1	MY2	MY3	MY4	MY5
Based on fixed baseline bankfull elevation																								
BF Width (ft)	21.8						15.1						15.3						16.2					
BF Mean Depth (ft)	1.5						1.2						1.2						1.3					
Width/Depth Ratio	14.3						12.7						13.1						12.6					
BF Cross-sectional Area (ft²)	33.3						17.9						17.8						20.9					
BF Max Depth (ft)	3.0						1.7						1.8						2.2					
Width of Floodprone Area (ft)	>64.2						>57.1						>56.9						>58.6					
Entrenchment Ratio	N/A						>3.8						>3.7						>3.6					
Bank Height Ratio	1.0						1.0						1.0						1.0					
Wetted Perimeter (ft)	24.9						17.5						17.6						18.8					
Hydraulic Radius (ft)	1.3						1.0						1.0						1.1					
Based on current/developing bankfull feature																								
BF Width (ft)																								
BF Mean Depth (ft)																								
Width/Depth Ratio																								
BF Cross-sectional Area (ft²)																								
BF Max Depth (ft)																								
Width of Floodprone Area (ft)																								
Entrenchment Ratio																								
Bank Height Ratio																								
Wetted Perimeter (ft)																								
Hydraulic Radius (ft)																								
Cross Sectional Area between end pins (ft²)	-						-						-						-					
d50 (mm)	-						-						-						-					
	Cross-section 27 (Pool)																							
Dimension and substrate	Base	MY1	MY2	MY3	MY4	MY5	Base	MY1	MY2	MY3	MY4	MY5	Base	MY1	MY2	MY3	MY4	MY5	Base	MY1	MY2	MY3	MY4	MY5
Based on fixed baseline bankfull elevation																								
BF Width (ft)	24.3																							
BF Mean Depth (ft)	1.3																							
Width/Depth Ratio	18.1																							
BF Cross-sectional Area (ft²)	32.5																							
BF Max Depth (ft)	3.0																							
Width of Floodprone Area (ft)	>64.4																							
Entrenchment Ratio	N/A																							
Bank Height Ratio	1.0																							
Wetted Perimeter (ft)	27.0																							
Hydraulic Radius (ft)	1.2																							
Based on current/developing bankfull feature																								
BF Width (ft)																								
BF Mean Depth (ft)																								
Width/Depth Ratio																								
BF Cross-sectional Area (ft²)																								
BF Max Depth (ft)																								
Width of Floodprone Area (ft)																								
Entrenchment Ratio																								
Bank Height Ratio																								
Wetted Perimeter (ft)																								
Hydraulic Radius (ft)																								
Cross Sectional Area between end pins (ft²)	-																							
d50 (mm)	-																							

UT1 Reach 4 (996 LF)																								
	Cross-section 28 (Riffle)						Cross-section 29 (Pool)						Cross-section 30 (Riffle)						Cross-section 31 (Riffle)					
Dimension and substrate	Base	MY1	MY2	MY3	MY4	MY5	Base	MY1	MY2	MY3	MY4	MY5	Base	MY1	MY2	MY3	MY4	MY5	Base	MY1	MY2	MY3	MY4	MY5
Based on fixed baseline bankfull elevation																								
BF Width (ft)	16.7						19.2						16.8						22.6					
BF Mean Depth (ft)	1.3						2.2						1.5						1.2					
Width/Depth Ratio	13.1						8.7						11.2						18.4					
BF Cross-sectional Area (ft²)	21.3						42.0						25.3						27.8					
BF Max Depth (ft)	2.0						4.6						2.3						1.8					
Width of Floodprone Area (ft)	>58.6						>61.7						>63.5						51.3					
Entrenchment Ratio	>3.5						N/A						>3.8						2.3					
Bank Height Ratio	1.0						1.0						1.0						1.0					
Wetted Perimeter (ft)	19.2						23.5						19.8						25.1					
Hydraulic Radius (ft)	1.1						1.8						1.3						1.1					
Based on current/developing bankfull feature																								
BF Width (ft)																								
BF Mean Depth (ft)																								
Width/Depth Ratio																								
BF Cross-sectional Area (ft²)																								
BF Max Depth (ft)																								
Width of Floodprone Area (ft)																								
Entrenchment Ratio																								
Bank Height Ratio																								
Wetted Perimeter (ft)																								
Hydraulic Radius (ft)																								
Cross Sectional Area between end pins (ft²)	-						-						-						-					
d50 (mm)	-						-						-						-					
Dimension and substrate	Base	MY1	MY2	MY3	MY4	MY5	Base	MY1	MY2	MY3	MY4	MY5	Base	MY1	MY2	MY3	MY4	MY5	Base	MY1	MY2	MY3	MY4	MY5
Based on fixed baseline bankfull elevation																								
BF Width (ft)																								
BF Mean Depth (ft)																								
Width/Depth Ratio																								
BF Cross-sectional Area (ft²)																								
BF Max Depth (ft)																								
Width of Floodprone Area (ft)																								
Entrenchment Ratio																								
Bank Height Ratio																								
Wetted Perimeter (ft)																								
Hydraulic Radius (ft)																								
Based on current/developing bankfull feature																								
BF Width (ft)																								
BF Mean Depth (ft)																								
Width/Depth Ratio																								
BF Cross-sectional Area (ft²)																								
BF Max Depth (ft)																								
Width of Floodprone Area (ft)																								
Entrenchment Ratio																								
Bank Height Ratio																								
Wetted Perimeter (ft)																								
Hydraulic Radius (ft)																								
Cross Sectional Area between end pins (ft²)																								
d50 (mm)																								

UT2 (609 LF)																								
	Cross-section 32 (Riffle)						Cross-section 33 (Pool)																	
Dimension and substrate	Base	MY1	MY2	MY3	MY4	MY5	Base	MY1	MY2	MY3	MY4	MY5	Base	MY1	MY2	MY3	MY4	MY5	Base	MY1	MY2	MY3	MY4	MY5
Based on fixed baseline bankfull elevation																								
BF Width (ft)	13.4						26.8																	
BF Mean Depth (ft)	1.4						1.1																	
Width/Depth Ratio	9.9						24.4																	
BF Cross-sectional Area (ft²)	18.1						29.4																	
BF Max Depth (ft)	1.9						2.9																	
Width of Floodprone Area (ft)	>63.1						>69.8																	
Entrenchment Ratio	>4.7						N/A																	
Bank Height Ratio	1.0						1.0																	
Wetted Perimeter (ft)	16.1						29.0																	
Hydraulic Radius (ft)	1.1						1.0																	
Based on current/developing bankfull feature																								
BF Width (ft)																								
BF Mean Depth (ft)																								
Width/Depth Ratio																								
BF Cross-sectional Area (ft²)																								
BF Max Depth (ft)																								
Width of Floodprone Area (ft)																								
Entrenchment Ratio																								
Bank Height Ratio																								
Wetted Perimeter (ft)																								
Hydraulic Radius (ft)																								
Cross Sectional Area between end pins (ft²)	-						-																	
d50 (mm)	-						-																	
Dimension and substrate	Base	MY1	MY2	MY3	MY4	MY5	Base	MY1	MY2	MY3	MY4	MY5	Base	MY1	MY2	MY3	MY4	MY5	Base	MY1	MY2	MY3	MY4	MY5
Based on fixed baseline bankfull elevation																								
BF Width (ft)																								
BF Mean Depth (ft)																								
Width/Depth Ratio																								
BF Cross-sectional Area (ft²)																								
BF Max Depth (ft)																								
Width of Floodprone Area (ft)																								
Entrenchment Ratio																								
Bank Height Ratio																								
Wetted Perimeter (ft)																								
Hydraulic Radius (ft)																								
Based on current/developing bankfull feature																								
BF Width (ft)																								
BF Mean Depth (ft)																								
Width/Depth Ratio																								
BF Cross-sectional Area (ft²)																								
BF Max Depth (ft)																								
Width of Floodprone Area (ft)																								
Entrenchment Ratio																								
Bank Height Ratio																								
Wetted Perimeter (ft)																								
Hydraulic Radius (ft)																								
Cross Sectional Area between end pins (ft²)																								
d50 (mm)																								

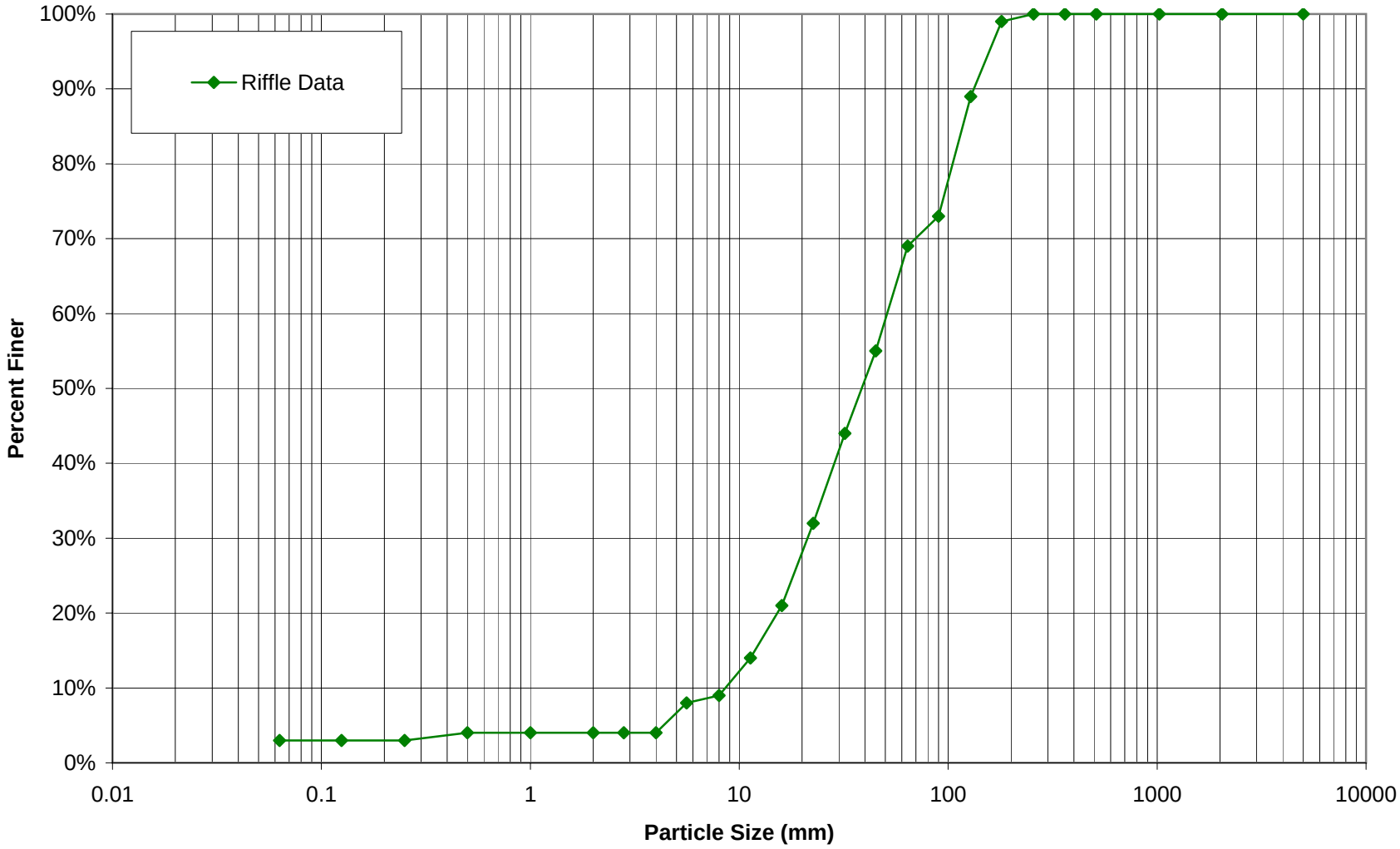
PEBBLE COUNT DATA SHEET: RIFFLE 100-COUNT

	BUCK PROJECT NO. 109261
SITE OR PROJECT:	Big Cedar Creek As-Built
REACH/LOCATION:	UT1 Reach 1, X18 Riffle
DATE COLLECTED:	3/17/2009
FIELD COLLECTION BY:	CAT/CDM
DATA ENTRY BY:	IJE

			PARTICLE CLASS COUNT	Summary	
MATERIAL	PARTICLE	SIZE (mm)	Riffle	Class %	% Cum
SILT/CLAY	Silt / Clay	< .063	3	3%	3%
SAND	Very Fine	.063 - .125			3%
	Fine	.125 - .25			3%
	Medium	.25 - .50	1	1%	4%
	Coarse	.50 - 1.0			4%
	Very Coarse	1.0 - 2.0			4%
GRAVEL	Very Fine	2.0 - 2.8			4%
	Very Fine	2.8 - 4.0			4%
	Fine	4.0 - 5.6	4	4%	8%
	Fine	5.6 - 8.0	1	1%	9%
	Medium	8.0 - 11.0	5	5%	14%
	Medium	11.0 - 16.0	7	7%	21%
	Coarse	16.0 - 22.6	11	11%	32%
	Coarse	22.6 - 32	12	12%	44%
	Very Coarse	32 - 45	11	11%	55%
	Very Coarse	45 - 64	14	14%	69%
COBBLE	Small	64 - 90	4	4%	73%
	Small	90 - 128	16	16%	89%
	Large	128 - 180	10	10%	99%
	Large	180 - 256	1	1%	100%
BOULDER	Small	256 - 362			100%
	Small	362 - 512			100%
	Medium	512 - 1024			100%
	Large-Very Large	1024 - 2048			100%
BEDROCK	Bedrock	> 2048			100%
		Total	**100**	**100%**	

Largest particles: 200.00
(riffle)

UT1 to Big Cedar Creek
Reach 1 - X18 Riffle
Pebble Count Particle Size Distribution



Appendix C

Vegetation Data

Tables 8 & 9

Table 8. Vegetation Species Planted Across the Restoration Site
Big Cedar Creek Restoration Site: Project No. D06054-D

Scientific Name	Common Name	Percent Planted by Species	Total Number of Stems
Bare Root Trees Species			
Acer rubrum	Red Maple	2%	200
Betula nigra	River Birch	22%	2800
Carya ovata	Shagbark Hickory	1%	100
Diospyros virginiana	Persimmon	1%	150
Fraxinus pennsylvanica	Green Ash	9%	1200
Liriodendron tulipifera	Tulip Poplar	2%	225
Platanus occidentalis	Sycamore	27%	3500
Quercus alba	White Oak	1%	100
Quercus falcata	Southern Red Oak	2%	300
Quercus michauxii	Swamp Chestnut Oak	9%	1100
Quercus nigra	Water Oak	20%	2600
Quercus phellos	Willow Oak	2%	200
Quercus rubra	Northern Red Oak	3%	350
Shrub Species			
Calycanthus floridus	Sweet Shrub	2%	150
Carpinus carolinanum	Ironwood	18%	1800
Cornus amomum	Silky Dogwood	28%	2700
Corylus americana	Hazelnut	2%	150
Ilex verticillata	Deciduous Holly	8%	830
Lindera benzoin	Spicebush	20%	2000
Symphorocarpos orbiculatus	Coralberry	2%	170
Viburnum dentatum	Arrowwood Viburnum	20%	2000
Native Herbaceous Species			
Agrostis alba	Redtop	10%	N/A
Andropogon gerardii	Big blue stem	15%	N/A
Binden frondosa	Beggars tick	10%	N/A
Elymus virginicus	Virginia wildrye	15%	N/A
Juncus effusus	Soft rush	5%	N/A
Panicum clandestinum	Deer tongue	20%	N/A
Panicum virgatum	Switch grass	10%	N/A
Polygonum pennsylvanicum	Pennsylvanie smartweed	5%	N/A
Sorgastum nutans	Indian grass	10%	N/A

Table 9 Stem Count for Each Species Arranged by Plot

Big Cedar Creek Restoration Site Contract No. D06054-D

	Plots																						
Tree Species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Acer rubrum							1																
Betula nigra	3	5	4	6	4		3	1	5	2	2	2	1	2	3	5	2	5	4	3		3	7
Capinus caroliniana	6	3		1			1	1	2				7	4	1	1	3	1	3	2			2
Cornus amomum	3	4	1	1	5	5	5	4	2	3	7	3	6	3	1	4	1	3	1		4	2	1
Corylus americana								4			3	1											
Calycanthus floridus								1				1					1						
Fraxinus pennsylvanica		1	1			4	1	2	1	4	1	3				1			2		2	1	1
Ilex verticillata				1							2			5	1	1	1		1		2	4	1
Lindera benzoin	3	2	4		1	2	1	3	1	5					3	2		3	2	1	2	1	3
Platanus occidentalis	8	6	9	7	2	4	6	6	6	10	5	7	5	4	2	4	10	2	7	2	2	2	
Quercus michauxii				1		3	6	1	2	1											1	2	3
Quercus nigra						1	1					1			2	2	3	1		1	3	1	2
Quercus phellos			2	2	6	3	1	1	4						3			5	1	7	2	2	2
Quercus rubra		1	1		1	1											1						
Symphoricarpos orbiculatus									1	1	1	1										1	
Viburnum dentatum	2	2	2		3	2		2	3	1		3	2	2		1				1	4	2	2
Stems/plot	25	24	24	19	22	25	26	26	27	27	21	22	21	20	16	21	22	20	21	17	22	21	24
Stems/acre	1000	960	960	760	880	1000	1040	1040	1080	1080	840	880	840	800	640	840	880	800	840	680	880	840	960
Total Stems/ Acre for Year 0 As-Built (Baseline Data)																						892	

Appendix D

As-Built Plan Sheets

BIG CEDAR CREEK

SCO # D06054-D

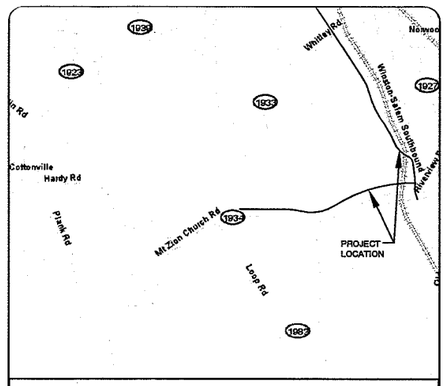
STATE	BAKER PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
NC	109261	1	67
SCO PROJECT NO. D06054-D			

NC ECOSYSTEM ENHANCEMENT PROGRAM

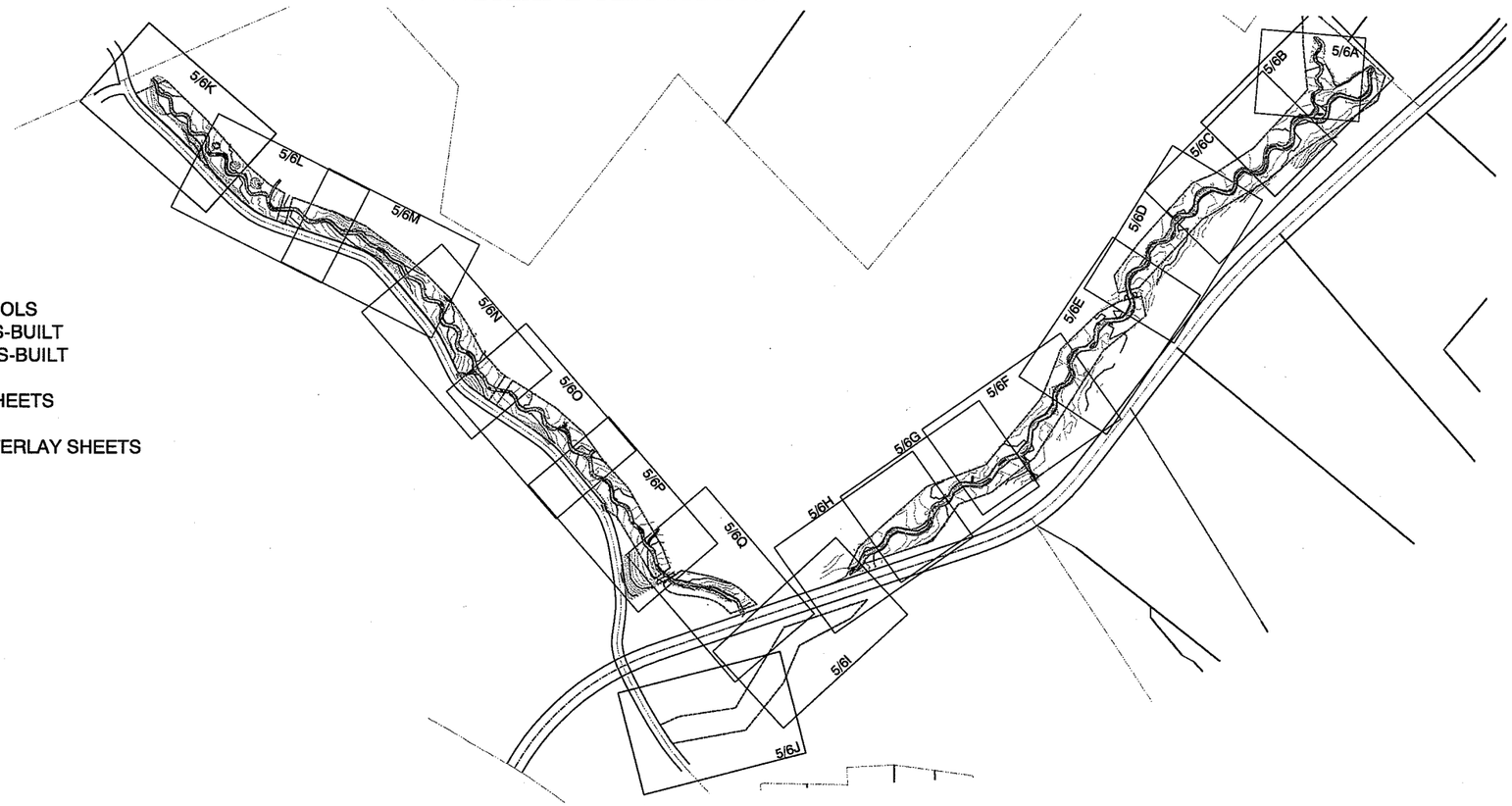
STANLY COUNTY

LOCATION:
SOUTH APPROX. 12 MILES FROM THE INTERSECTION OF HWY 24/27 & HWY 52 THEN APPROX. 1 MILE FROM INTERSECTION OF HWY 52 & MT. ZION CHURCH RD.

TYPE OF WORK:
STREAM AND WETLAND RESTORATION



VICINITY MAP - NTS



INDEX OF SHEETS

GRAPHIC SCALES

20 0 20 40
PLANS

20 0 20 40
PROFILE (HORIZONTAL)

2 0 2 4
PROFILE (VERTICAL)

STREAM COORDINATE SUMMARY

STREAM NAME	STATION	LATITUDE & LONGITUDE
BIG CEDAR CREEK	10+00	LAT: 35° 12' 31.80" LONG: 80° 07' 43.62"
UNNAMED TRIBUTARY 1	10+00	LAT: 35° 11' 29.40" LONG: 80° 05' 19.14"
UNNAMED TRIBUTARY 2	10+00	LAT: 35° 12' 29.49" LONG: 80° 07' 47.34"
UNNAMED TRIBUTARY 3	10+00	LAT: 35° 12' 04.35" LONG: 80° 07' 27.84"
UNNAMED TRIBUTARY 1A	10+00	LAT: 35° 11' 44.02" LONG: 80° 07' 36.06"
UNNAMED TRIBUTARY 1B	10+00	LAT: 35° 11' 41.86" LONG: 80° 07' 45.39"
UNNAMED TRIBUTARY 1C	10+00	LAT: 35° 11' 33.41" LONG: 80° 08' 08.97"

PREPARED FOR THE OFFICE OF:

Ecosystem Enhancement PROGRAM

NCDENR-ECOSYSTEM ENHANCEMENT PROGRAM
2728 CAPITAL BLVD, SUITE 1H 103
RALEIGH, NC 27604

NCEEP CONTACT: GUY PEARCE
REVIEW COORDINATOR

NCEEP CONTACT: TIM BAUMGARTNER
PROJECT MANAGER

PREPARED IN THE OFFICE OF:

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Michael Baker Engineering, Inc.
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Charlotte, NC 28203
Phone: 704.334.4454
Fax: 704.334.4492

KEVIN TWEEDY, P.E.
PROJECT ENGINEER

CHRISTINE D. MILLER
PROJECT DESIGNER

PROJECT ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 027337 ENGINEER KEVIN L. TWEEDY

8-11-09

SIGNATURE P.E.

BAKER PROJECT REFERENCE NO.	SHEET NO.
109261	2

PROJECT ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 027337 ENGINEER KEVIN L. WEEKS

8-11-09

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SYMBOLOGY

- E — RECORDED CONSERVATION EASEMENT
- 725 — EXISTING MAJOR CONTOUR
- EXISTING MINOR CONTOUR
- X — EXISTING FENCE
- CENTERLINE RAILROAD
- ROW
- PARCEL BOUNDARY
- EXISTING ROAD/PAVEMENT
- 10+00 — EXISTING STREAM ALIGNMENT
- 10+00 — PROPOSED STREAM ALIGNMENT
- EXISTING EDGE OF WOODS
- EXISTING TREE
- PERMANENT STREAM CROSSING
- FLOW DIRECTION
- GEOLIFT
- BANK STABILIZATION
- TRANSPLANT
- ROCK CROSS VANE
- LOG SILL
- ROOT WAD
- LOG J-HOOK VANE
- BRUSH MATTRESS
- LOG VANE
- LOG STEP-POOL
- CONSTRUCTED RIFFLE (NATIVE MATERIAL)
- FLOODPLAIN POOL
- COVER LOG

BIG CEDAR CREEK

SYMBOLOGY

BAKER PROJECT REFERENCE NO.	SHEET NO.
109261	3

PROJECT ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 027337 ENGINEER KEVIN L. TWEEL

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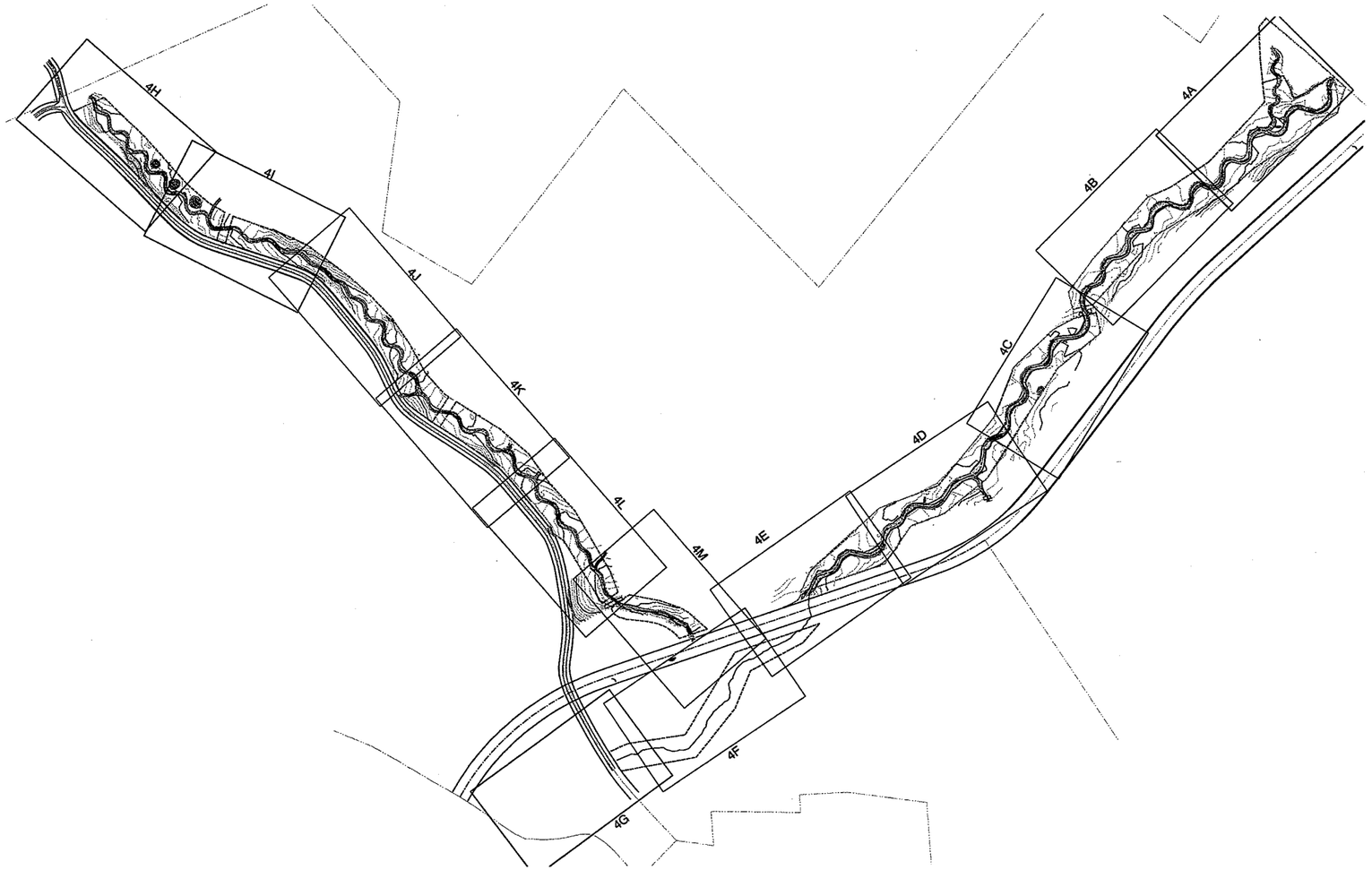
PROPOSED DESIGN KEY SHEET



BIG CEDAR CREEK

PROPOSED DESIGN

BAKER PROJECT REFERENCE NO.	SHEET NO.
109261	3A

PROJECT ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 027337 ENGINEER KEVIN L. TWEEDY

9-11-09

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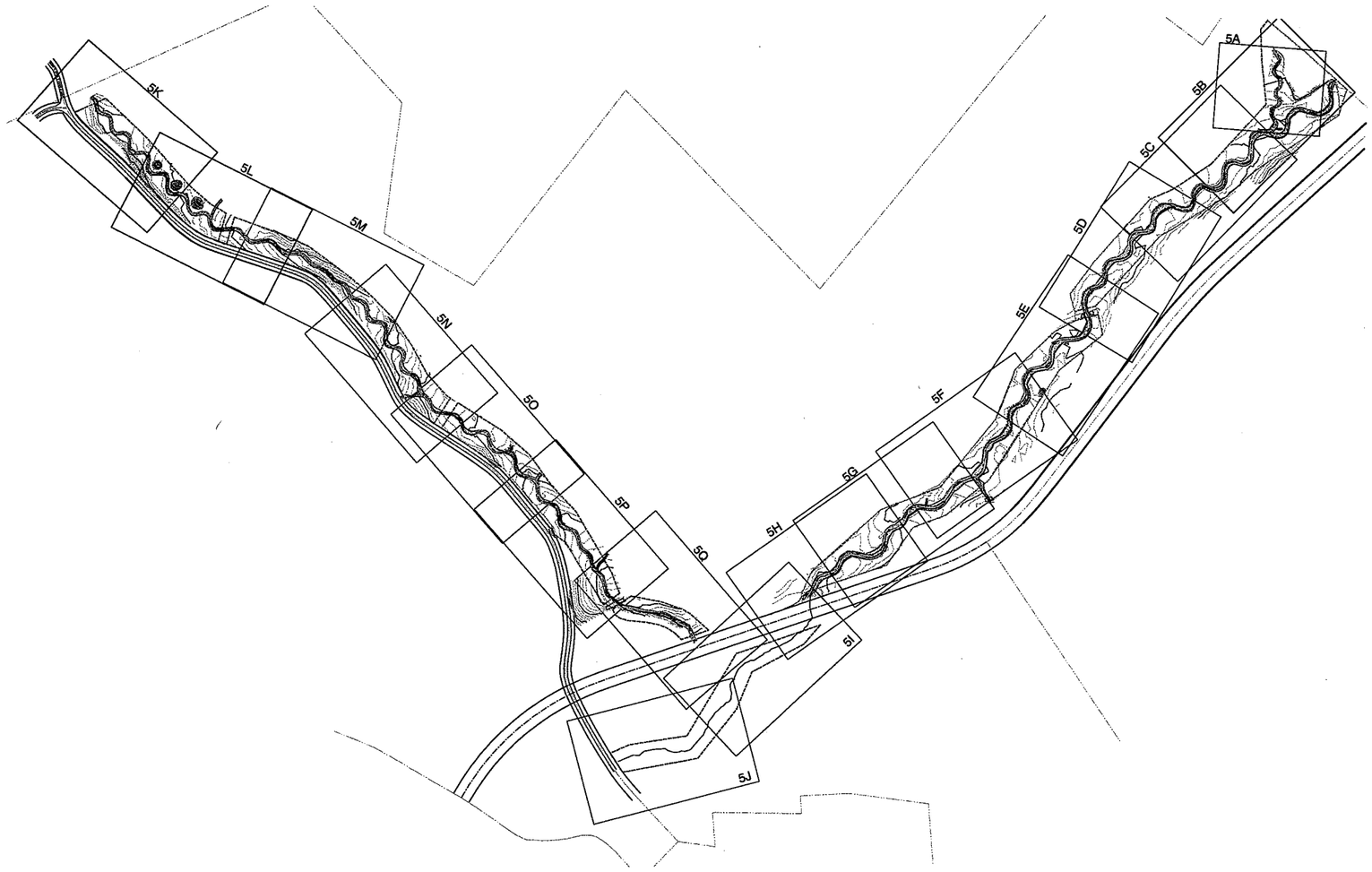
AS-BUILT KEY SHEET



BIG CEDAR CREEK

AS-BUILT KEY SHEET

BAKER PROJECT REFERENCE NO.	SHEET NO.
109261	3B

PROJECT ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 027337 ENGINEER KEVIN L. TWEDDY

8-11-09

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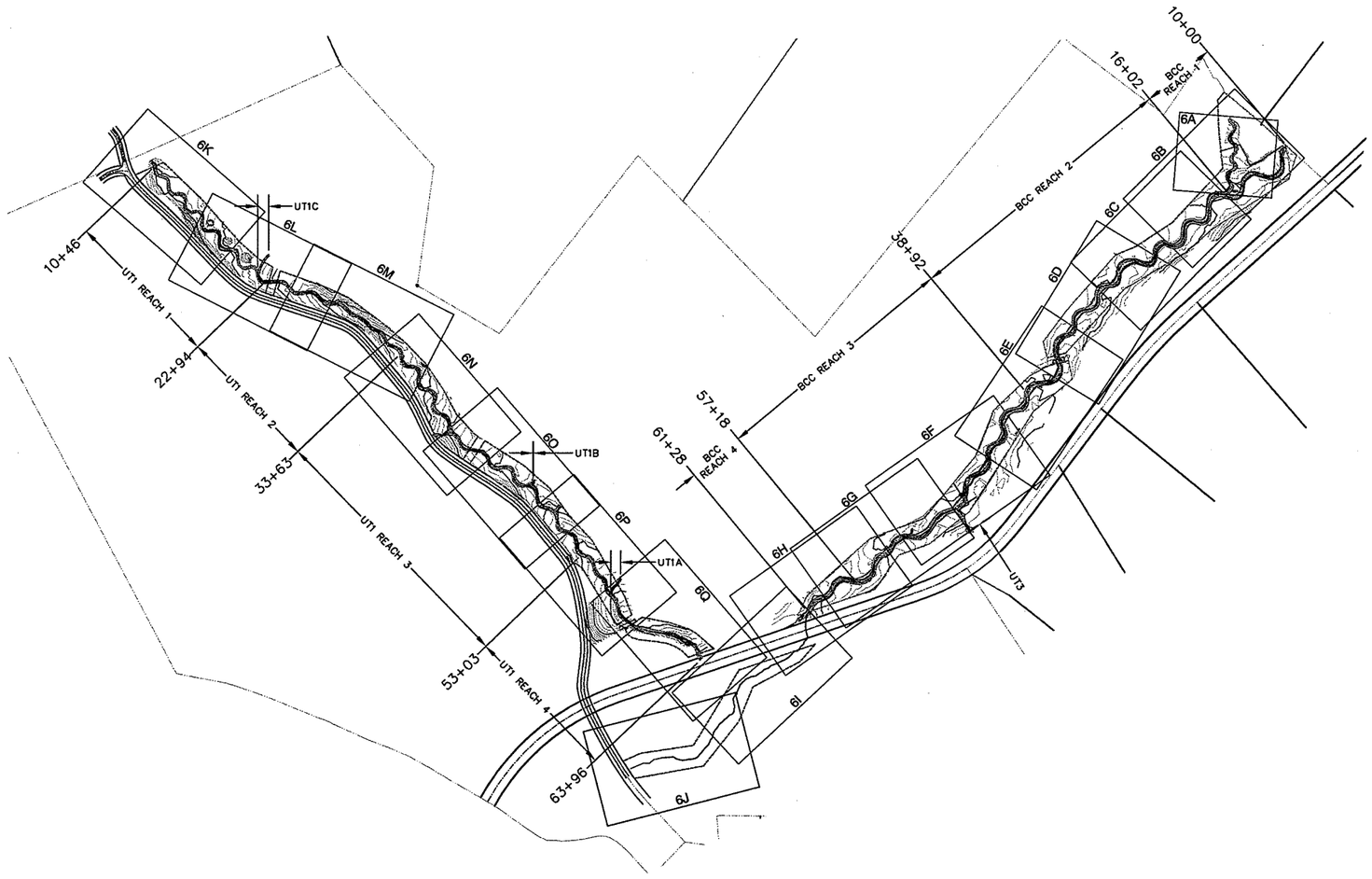
AS-BUILT OVERLAY KEY SHEET



400 0 400 800
SCALE (FT)

BIG CEDAR CREEK

AS-BUILT REACH REFERENCE SHEET

BAKER PROJECT REFERENCE NO.	SHEET NO.
109261	4A

PROJECT ENGINEER

ORIGINAL DESIGN PLANS SEALED ON 3/5/08 BY KEVIN TWEEDY, P.E. (#027337)

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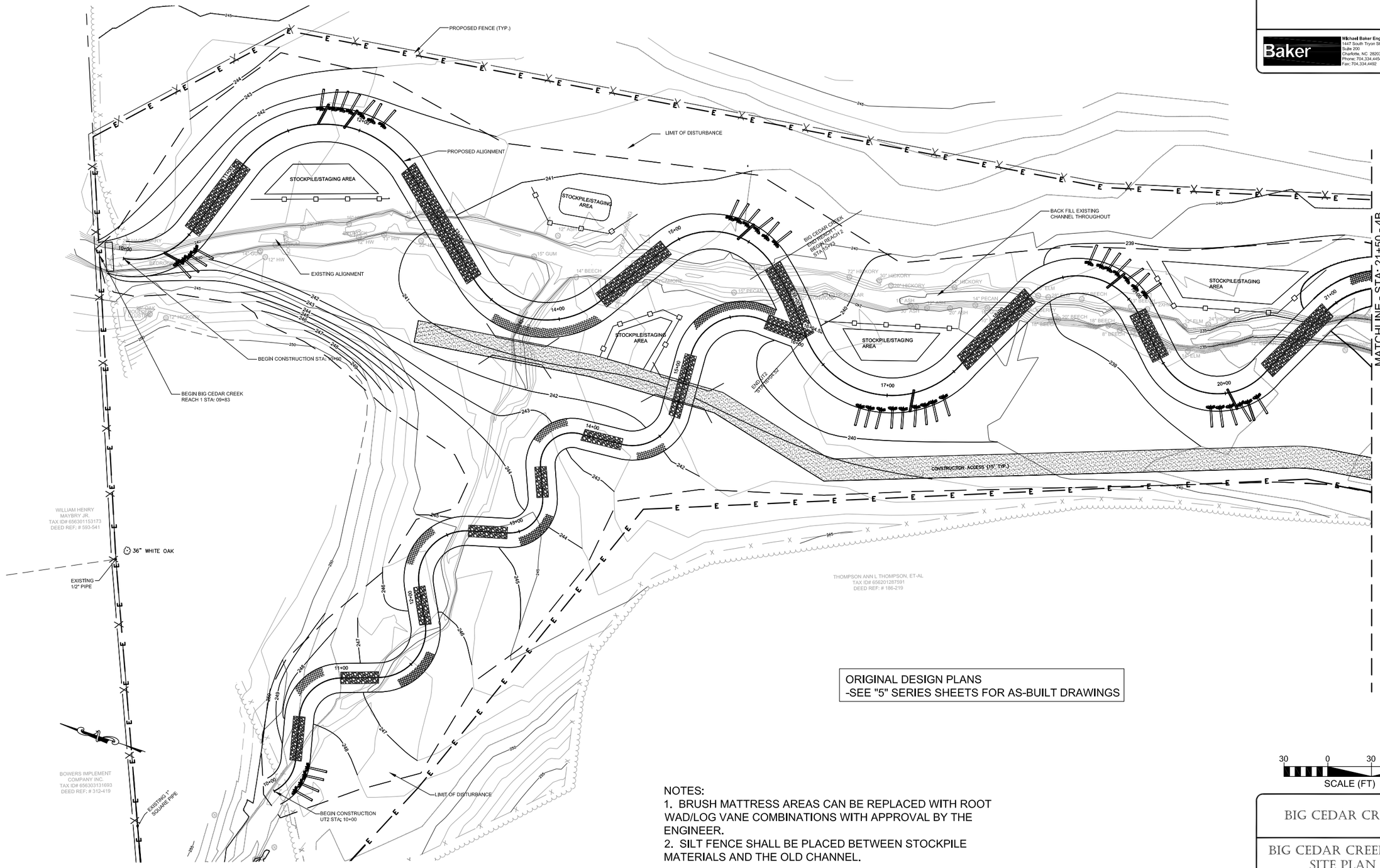

ORIGINAL DESIGN PLANS
-SEE "5" SERIES SHEETS FOR AS-BUILT DRAWINGS

NOTES:
1. BRUSH MATTRESS AREAS CAN BE REPLACED WITH ROOT WAD/LOG VANE COMBINATIONS WITH APPROVAL BY THE ENGINEER.
2. SILT FENCE SHALL BE PLACED BETWEEN STOCKPILE MATERIALS AND THE OLD CHANNEL.

30 0 30 60
SCALE (FT)

BIG CEDAR CREEK

BIG CEDAR CREEK/UT2 SITE PLAN

BAKER PROJECT REFERENCE NO.	SHEET NO.
109261	4B

PROJECT ENGINEER

ORIGINAL DESIGN PLANS SEALED ON 3/5/08 BY KEVIN TWEEDY, P.E. (#027337)

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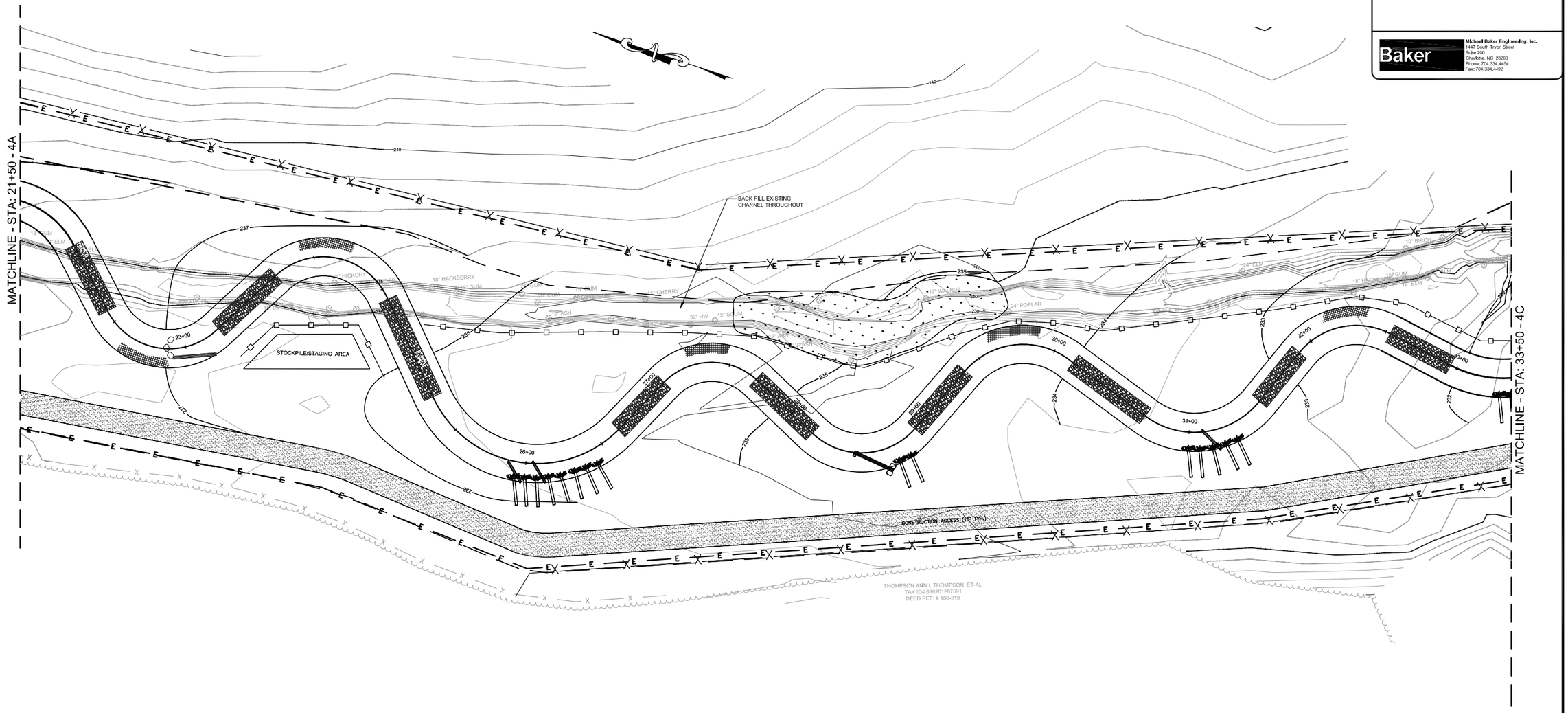

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30 0 30 60
SCALE (FT)

BIG CEDAR CREEK

BIG CEDAR CREEK
SITE PLAN

BAKER PROJECT REFERENCE NO.	SHEET NO.
109261	4C

PROJECT ENGINEER

ORIGINAL DESIGN PLANS SEALED ON 3/5/08 BY KEVIN TWEEDY, P.E. (#027337)

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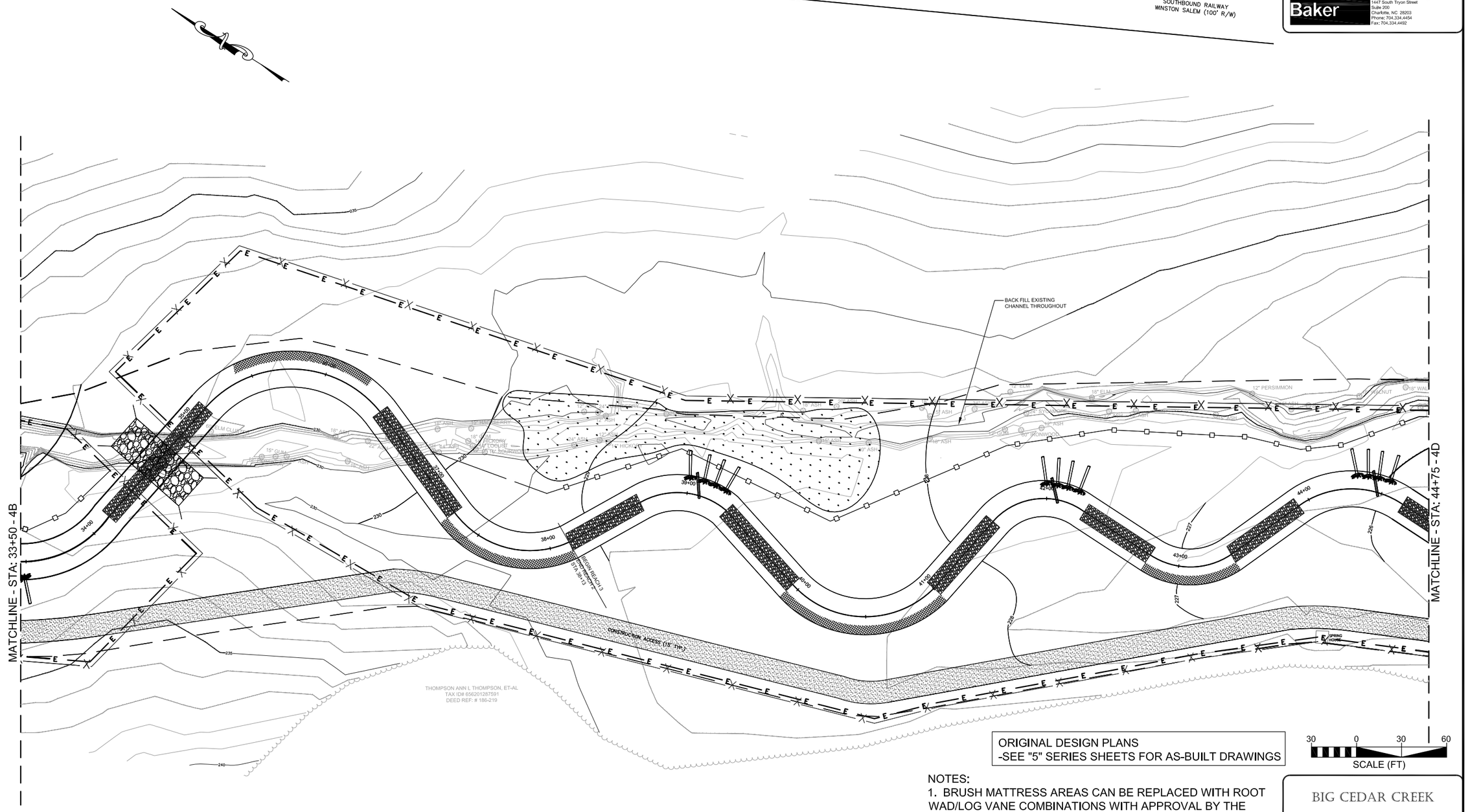
SOUTHBOUND RAILWAY
WINSTON SALEM (100' R/W)



ORIGINAL DESIGN PLANS
-SEE "5" SERIES SHEETS FOR AS-BUILT DRAWINGS

30 0 30 60
SCALE (FT)

NOTES:
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BIG CEDAR CREEK

BIG CEDAR CREEK SITE PLAN

BAKER PROJECT REFERENCE NO.	SHEET NO.
109261	4D

PROJECT ENGINEER

ORIGINAL DESIGN PLANS SEALED ON 3/5/08 BY KEVIN TWEEDY, P.E. (#027337)

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SOUTHBOUND RAILWAY
WINSTON SALEM (100' R/W)

BACK FILL EXISTING CHANNEL THROUGHOUT

MATCHLINE - STA: 44+75 - 4C

MATCHLINE - STA: 54+25 - 4F

CONSTRUCTION ACCESS (16' TYP.)

DIRT FARM ROAD
(UNPAVED)

THOMPSON ANN L THOMPSON, ET-AL
TAX ID# 6560128759
DEED REF: # 186-219

ORIGINAL DESIGN PLANS
-SEE "5" SERIES SHEETS FOR AS-BUILT DRAWINGS

30 0 30 60
SCALE (FT)

NOTES:
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BIG CEDAR CREEK

BIG CEDAR CREEK
SITE PLAN

BAKER PROJECT REFERENCE NO.	SHEET NO.
109261	4E

PROJECT ENGINEER

ORIGINAL DESIGN PLANS SEALED ON 3/5/08 BY KEVIN TWEEDY, P.E. (#027337)

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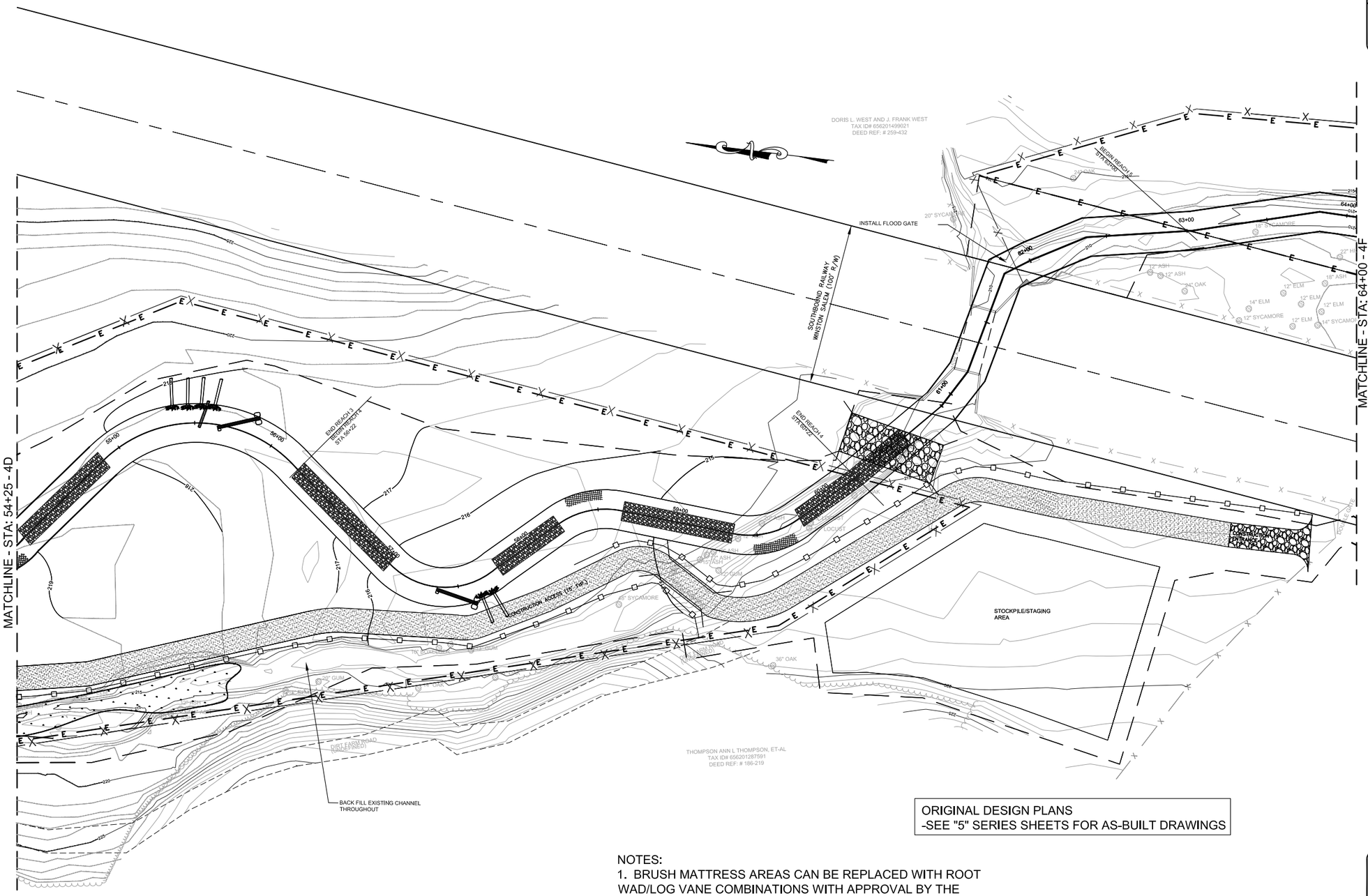

ORIGINAL DESIGN PLANS
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30 0 30 60
SCALE (FT)

BIG CEDAR CREEK

BIG CEDAR CREEK
SITE PLAN

BAKER PROJECT REFERENCE NO.	SHEET NO.
109261	4F

PROJECT ENGINEER

ORIGINAL DESIGN PLANS SEALED ON 3/5/08 BY KEVIN TWEEDY, P.E. (#027337)

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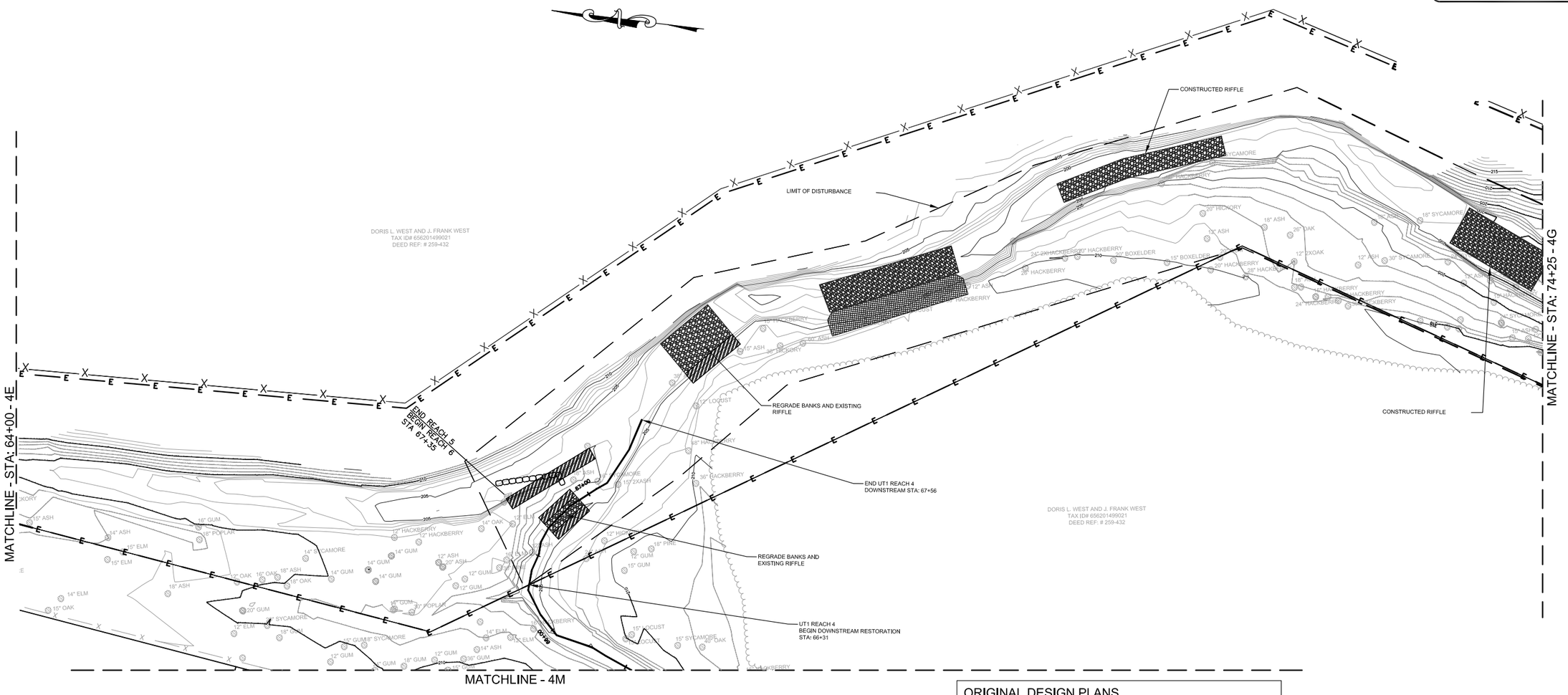

ORIGINAL DESIGN PLANS
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NOTES:
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30 0 30 60
SCALE (FT)

BIG CEDAR CREEK

BIG CEDAR CREEK
SITE PLAN

BAKER PROJECT REFERENCE NO.	SHEET NO.
109261	4G

PROJECT ENGINEER

ORIGINAL DESIGN PLANS SEALED ON 3/5/08 BY KEVIN TWEEDY, P.E. (#027337)

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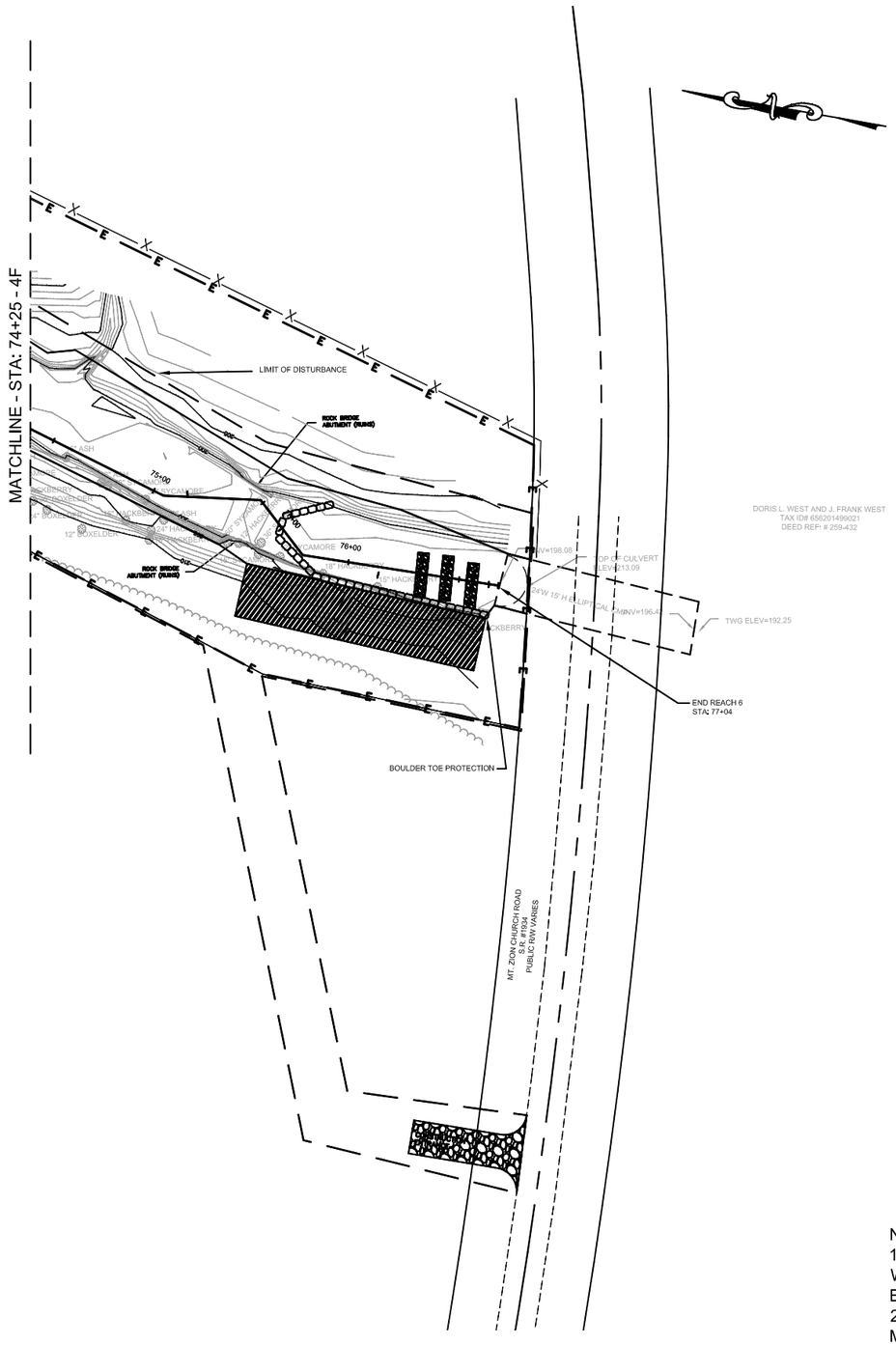
Fax: 704.334.4492



ORIGINAL DESIGN PLANS
-SEE "5" SERIES SHEETS FOR AS-BUILT DRAWINGS

NOTES:
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30 0 30 60
SCALE (FT)

BIG CEDAR CREEK

BIG CEDAR CREEK
SITE PLAN

BAKER PROJECT REFERENCE NO.	SHEET NO.
109261	4H

PROJECT ENGINEER

ORIGINAL DESIGN PLANS SEALED ON 3/5/08 BY KEVIN TWEEDY, P.E. (#027337)

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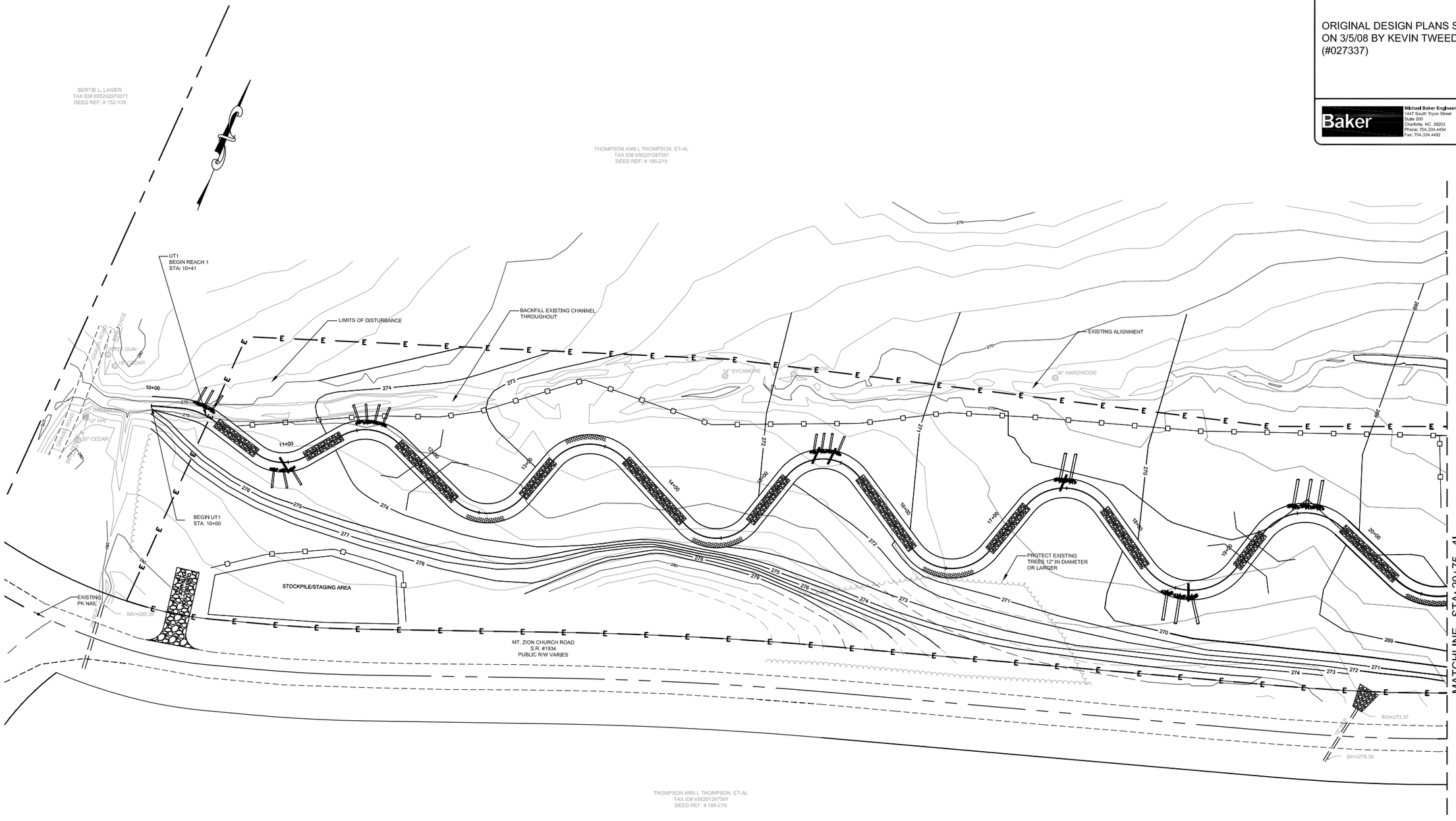

ORIGINAL DESIGN PLANS
-SEE "5" SERIES SHEETS FOR AS-BUILT DRAWINGS

30 0 30 60
SCALE (FT)

NOTES:
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BIG CEDAR CREEK

UT1
SITE PLAN

BAKER PROJECT REFERENCE NO.	SHEET NO.
109261	41

PROJECT ENGINEER

ORIGINAL DESIGN PLANS SEALED ON 3/5/08 BY KEVIN TWEEDY, P.E. (#027337)

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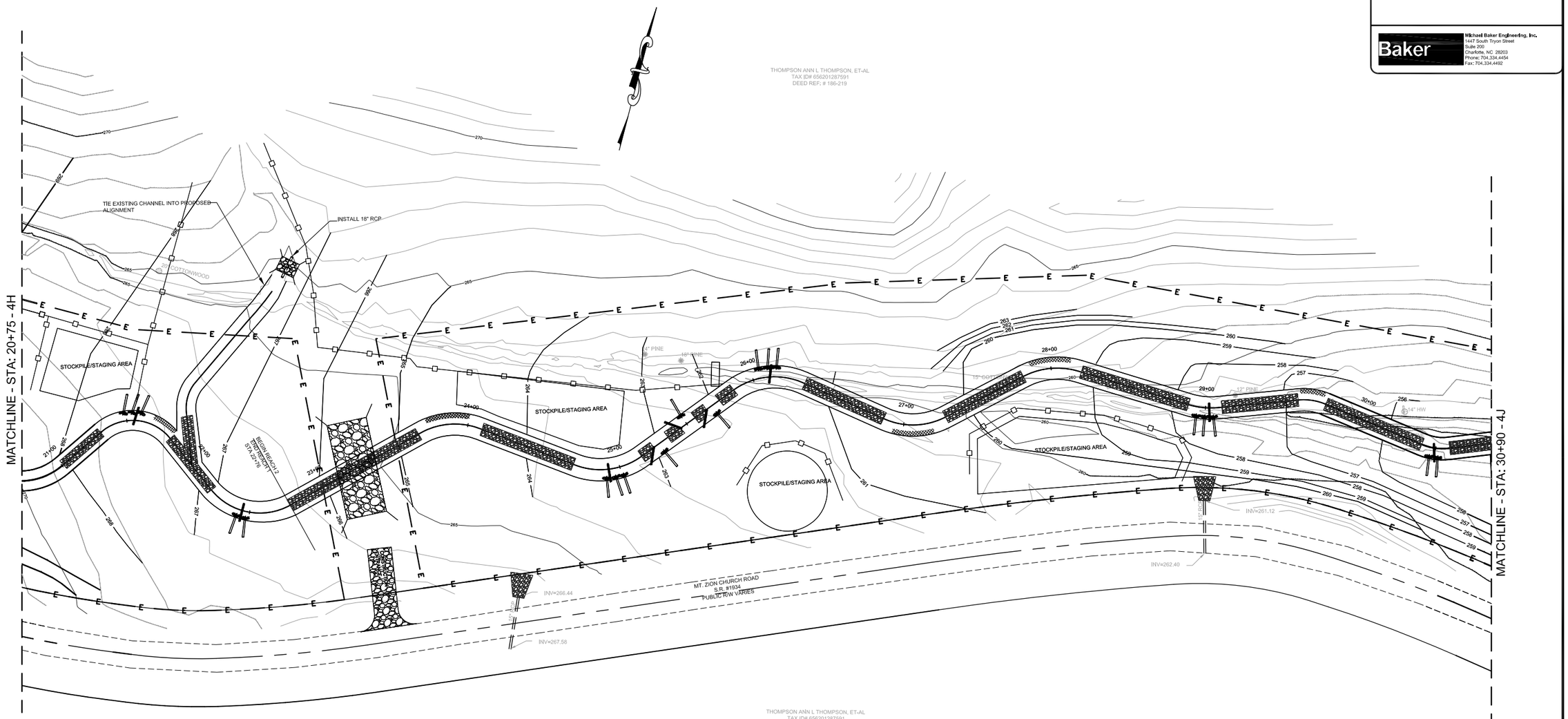

ORIGINAL DESIGN PLANS
-SEE "5" SERIES SHEETS FOR AS-BUILT DRAWINGS

30 0 30 60
SCALE (FT)

NOTES:
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BIG CEDAR CREEK

UT1
SITE PLAN

BAKER PROJECT REFERENCE NO.	SHEET NO.
109261	4J

PROJECT ENGINEER

ORIGINAL DESIGN PLANS SEALED ON 3/5/08 BY KEVIN TWEEDY, P.E. (#027337)

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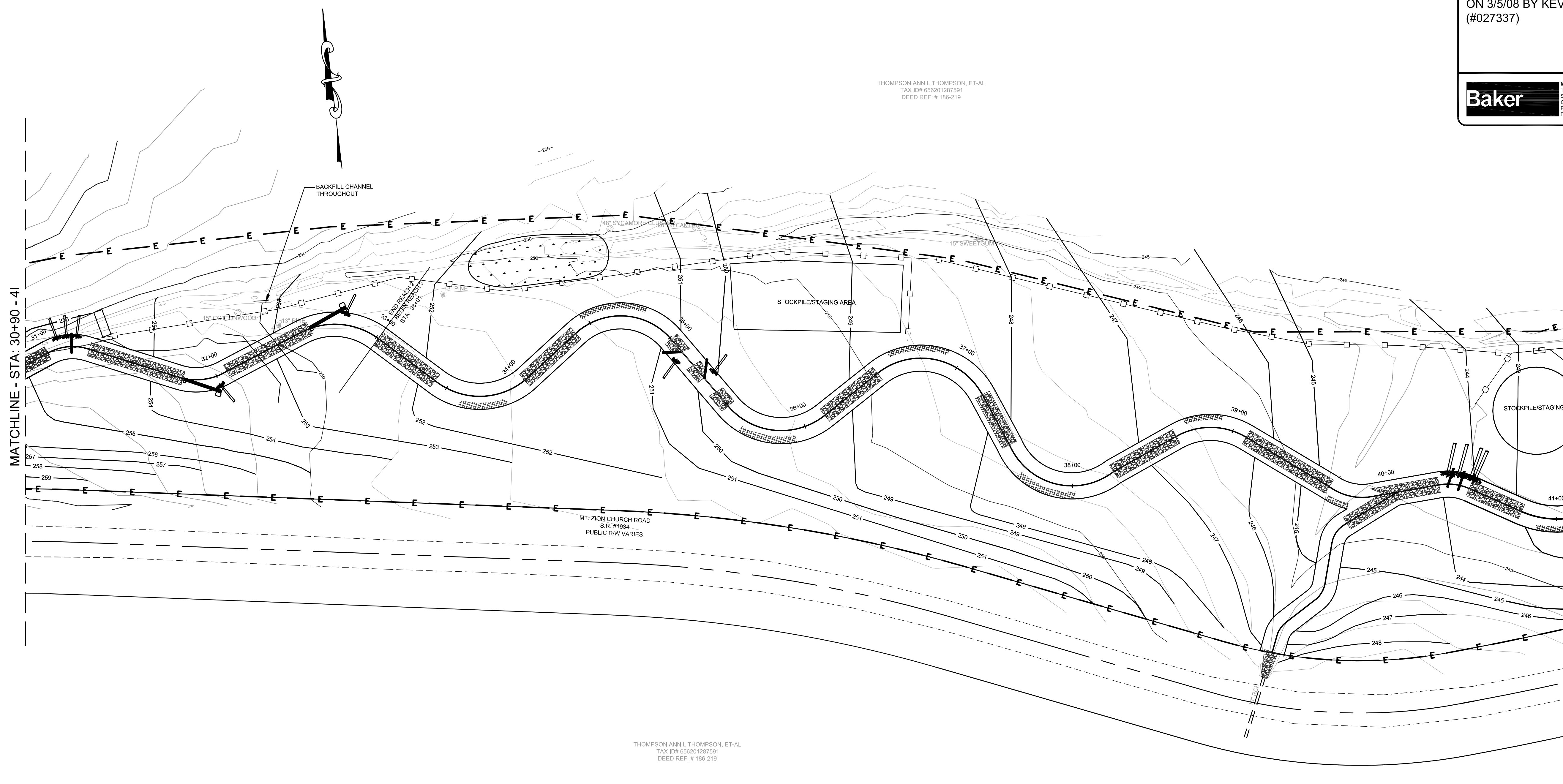

ORIGINAL DESIGN PLANS
-SEE "5" SERIES SHEETS FOR AS-BUILT DRAWINGS

30 0 30 60
SCALE (FT)

NOTES:
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BIG CEDAR CREEK

UT1
SITE PLAN

BAKER PROJECT REFERENCE NO.	SHEET NO.
109261	4K

PROJECT ENGINEER

ORIGINAL DESIGN PLANS SEALED ON 3/5/08 BY KEVIN TWEEDY, P.E. (#027337)

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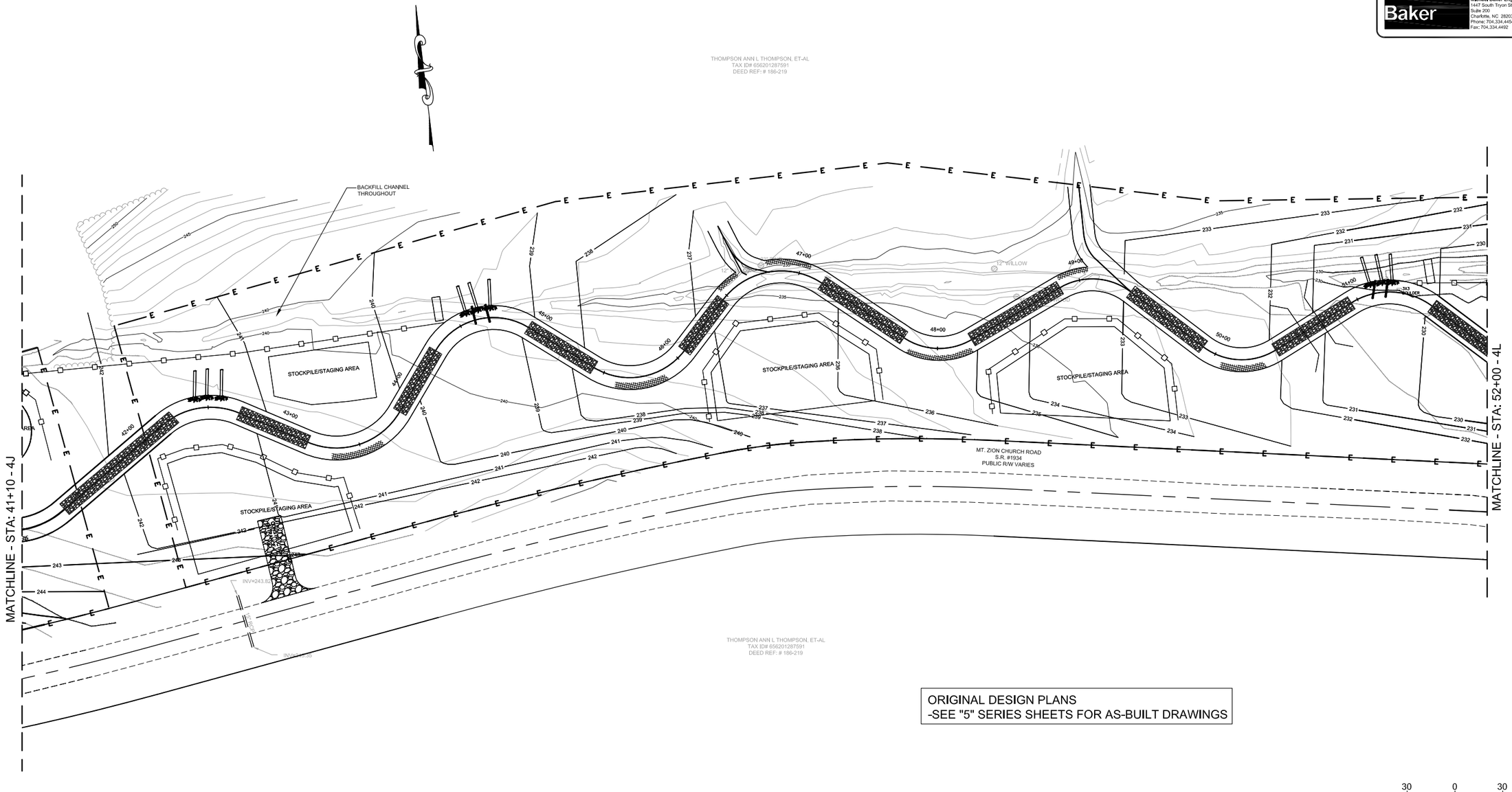

ORIGINAL DESIGN PLANS
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30 0 30 60
SCALE (FT)

NOTES:
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BIG CEDAR CREEK

UT1
SITE PLAN

BAKER PROJECT REFERENCE NO.	SHEET NO.
109261	4L

PROJECT ENGINEER

ORIGINAL DESIGN PLANS SEALED ON 3/5/08 BY KEVIN TWEEDY, P.E. (#027337)

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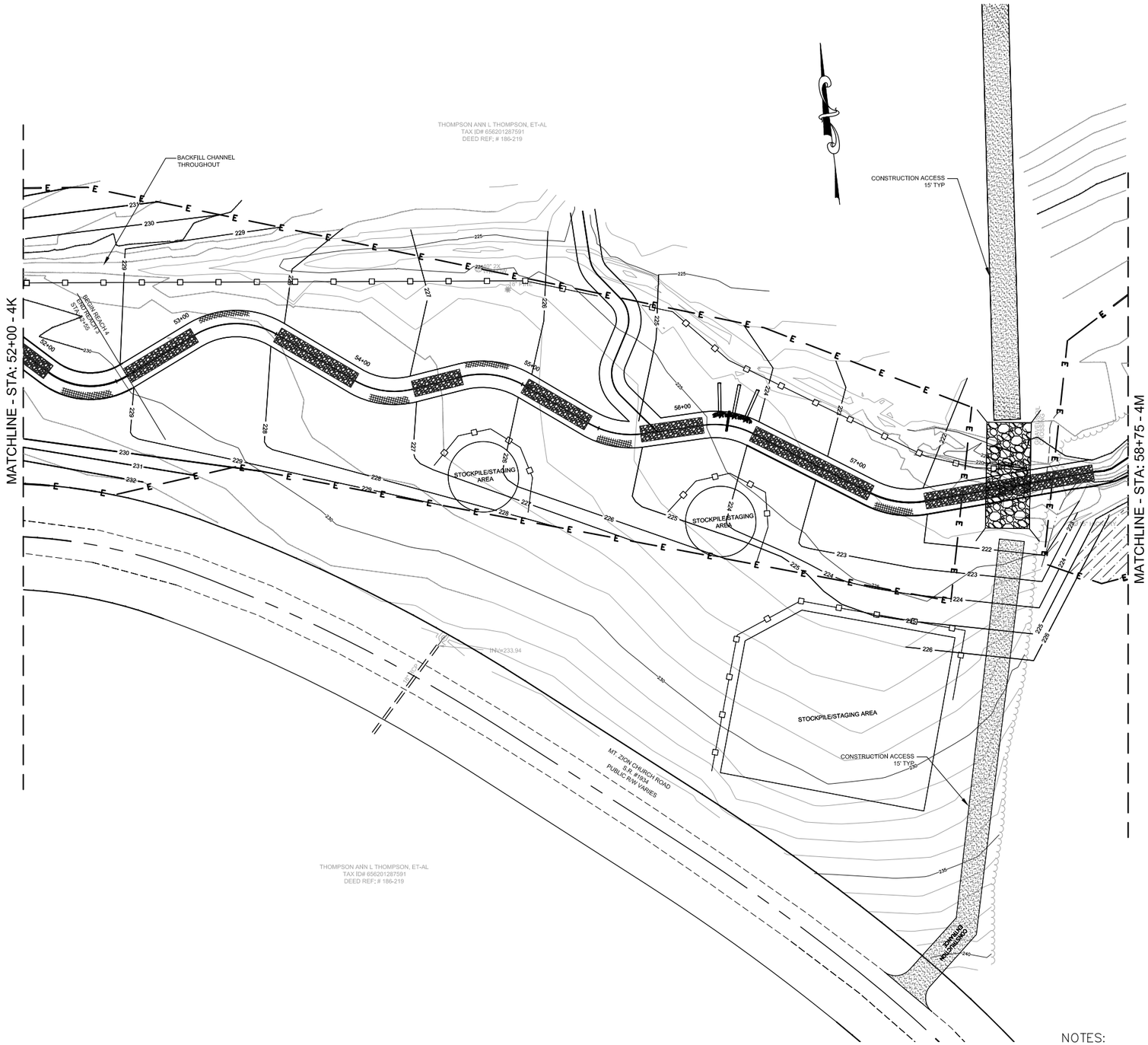

ORIGINAL DESIGN PLANS
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30 0 30 60
SCALE (FT)

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BIG CEDAR CREEK

UT1
SITE PLAN

BAKER PROJECT REFERENCE NO.	SHEET NO.
109261	4M

PROJECT ENGINEER

ORIGINAL DESIGN PLANS SEALED ON 3/5/08 BY KEVIN TWEEDY, P.E. (#027337)

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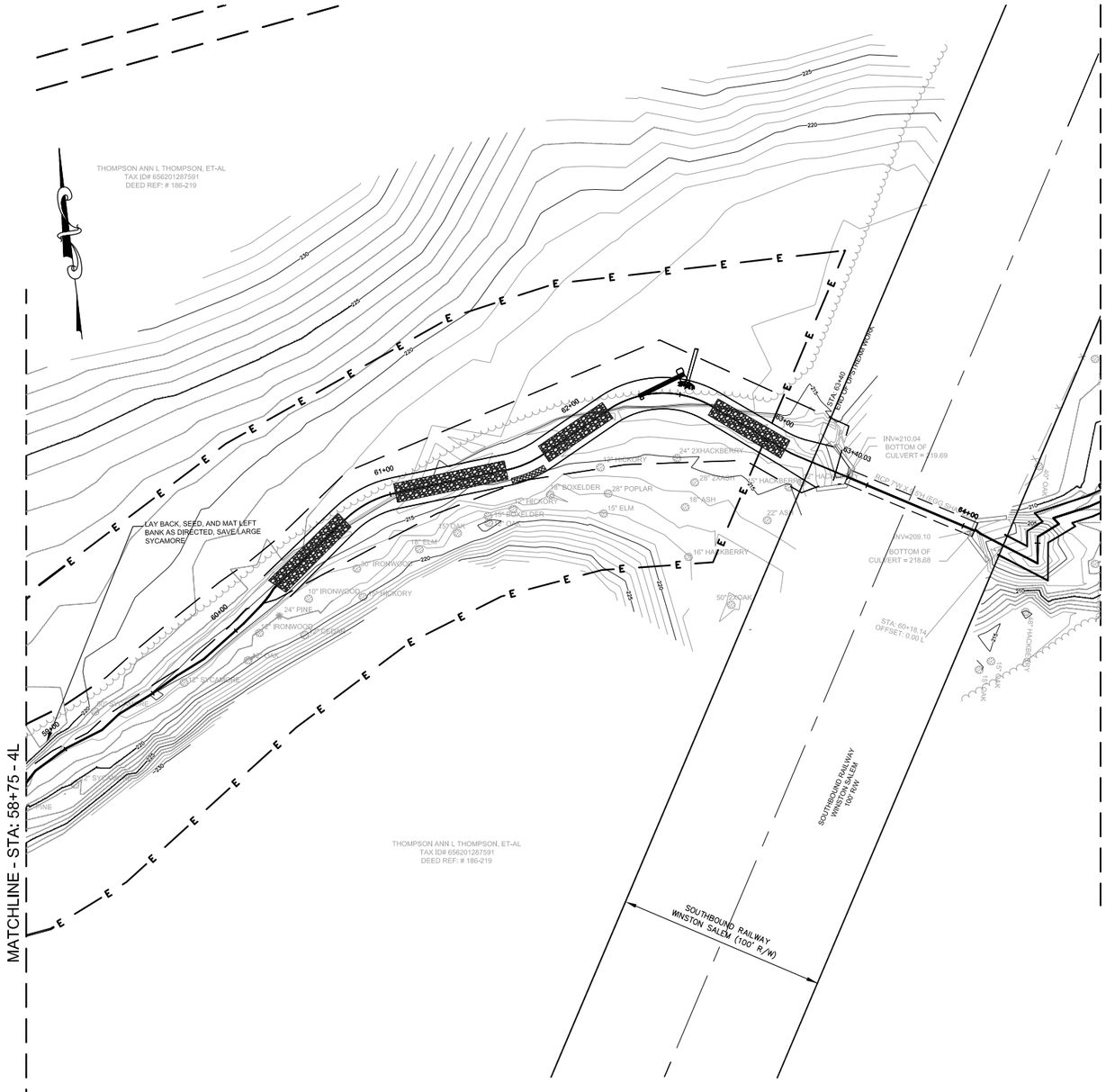

ORIGINAL DESIGN PLANS
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NOTES:
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30 0 30 60
SCALE (FT)

BIG CEDAR CREEK

UT1
SITE PLAN

BAKER PROJECT REFERENCE NO.	SHEET NO.
109261	4N

PROJECT ENGINEER

ORIGINAL DESIGN PLANS SEALED ON 3/5/08 BY KEVIN TWEEDY, P.E. (#027337)

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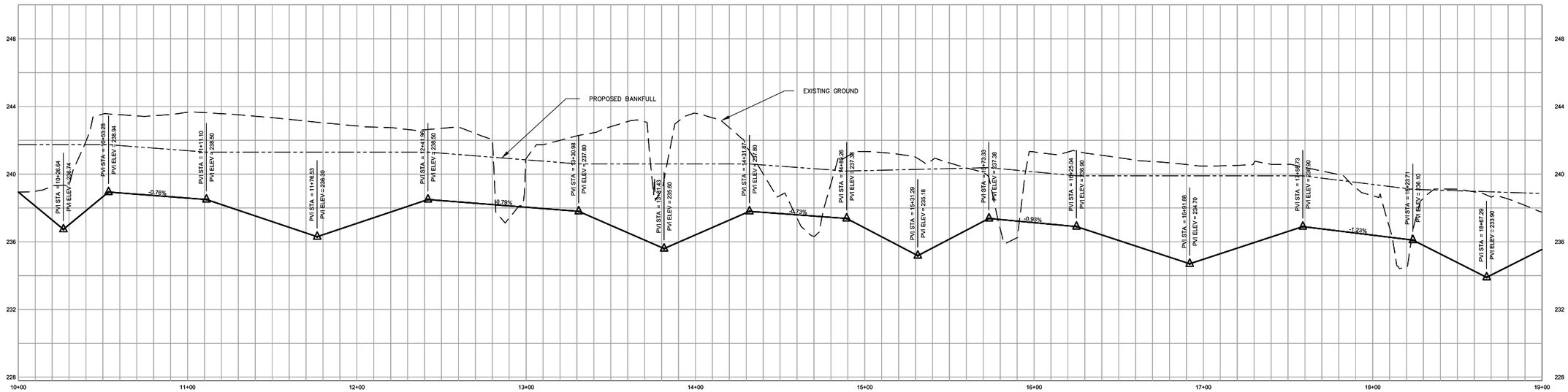

ORIGINAL DESIGN PLANS
-SEE "5" SERIES SHEETS FOR AS-BUILT DRAWINGS

3 0 3 6
VERTICAL SCALE (FT)

30 0 30 60
HORIZONTAL SCALE (FT)

BIG CEDAR CREEK

BIG CEDAR CREEK
PROFILE

BAKER PROJECT REFERENCE NO.	SHEET NO.
109261	40

PROJECT ENGINEER

ORIGINAL DESIGN PLANS SEALED ON 3/5/08 BY KEVIN TWEEDY, P.E. (#027337)

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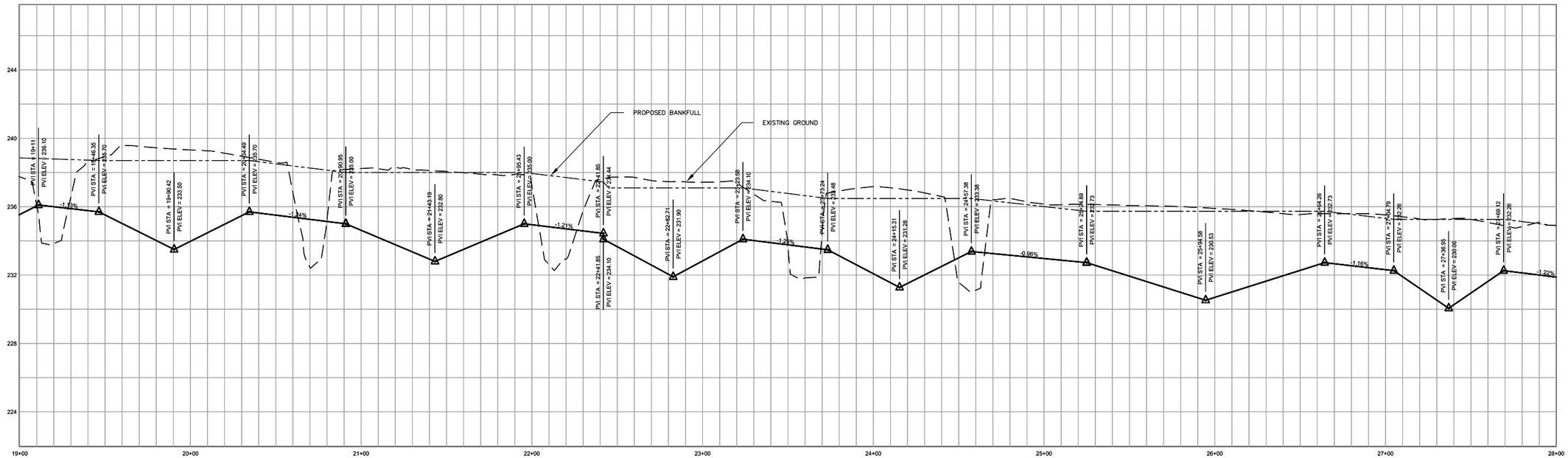

ORIGINAL DESIGN PLANS
-SEE "5" SERIES SHEETS FOR AS-BUILT DRAWINGS

3 0 3 6
VERTICAL SCALE (FT)

30 0 30 60
HORIZONTAL SCALE (FT)

BIG CEDAR CREEK

BIG CEDAR CREEK
PROFILE

BAKER PROJECT REFERENCE NO.	SHEET NO.
109261	4P

PROJECT ENGINEER

ORIGINAL DESIGN PLANS SEALED ON 3/5/08 BY KEVIN TWEEDY, P.E. (#027337)

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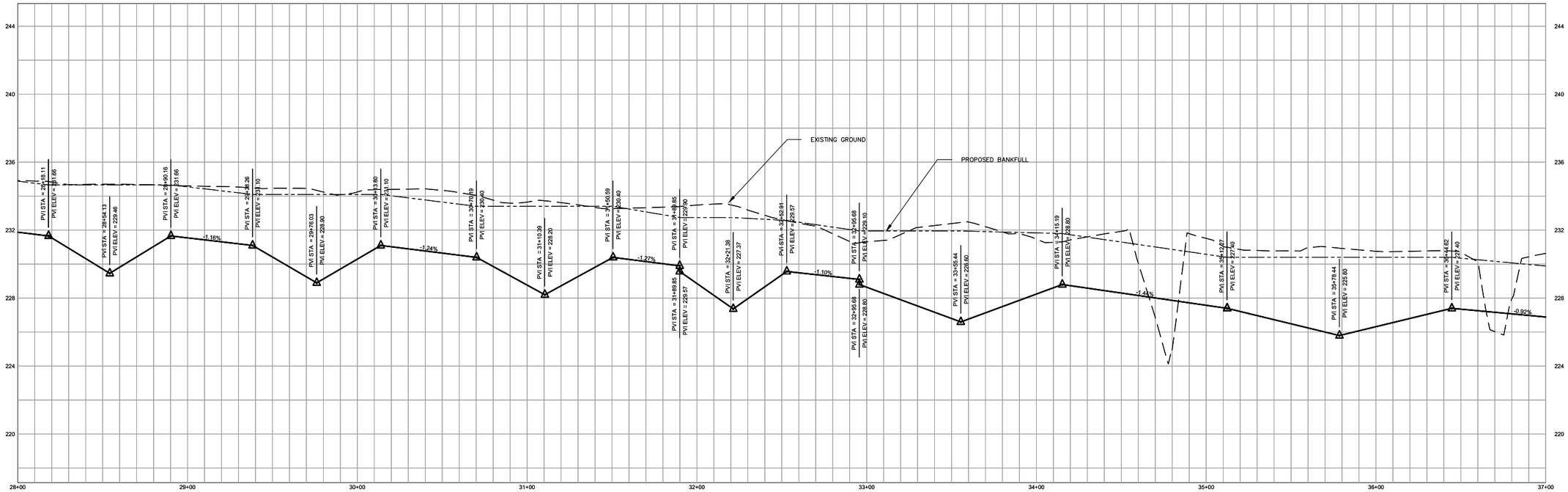


ORIGINAL DESIGN PLANS
-SEE "5" SERIES SHEETS FOR AS-BUILT DRAWINGS

3 0 3 6
VERTICAL SCALE (FT)

30 0 30 60
HORIZONTAL SCALE (FT)

BIG CEDAR CREEK

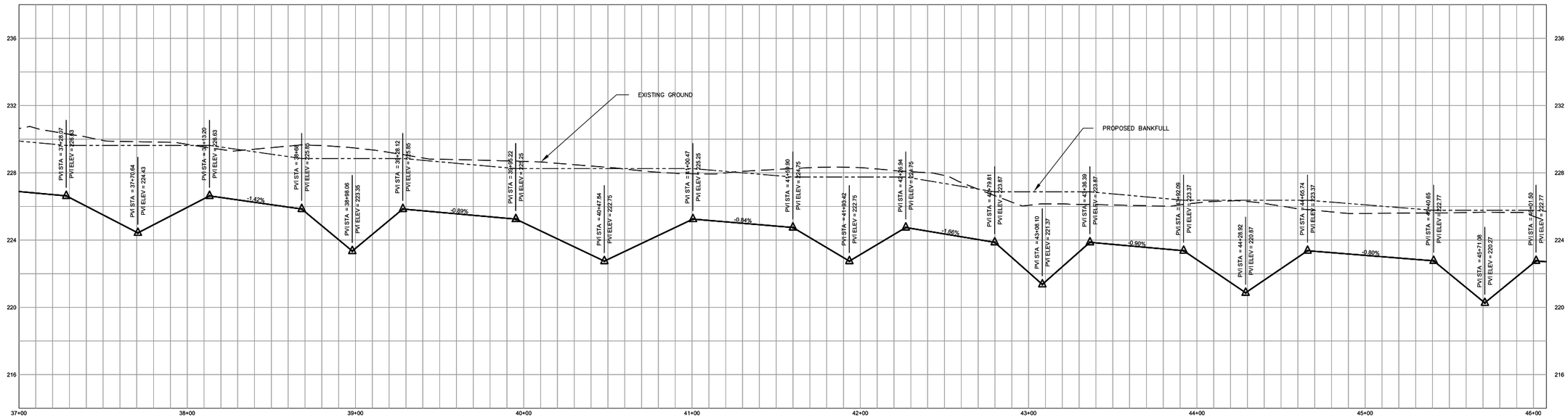
BIG CEDAR CREEK
PROFILE

BAKER PROJECT REFERENCE NO.	SHEET NO.
109261	4Q

PROJECT ENGINEER

ORIGINAL DESIGN PLANS SEALED ON 3/5/08 BY KEVIN TWEEDY, P.E. (#027337)

Baker
Michael Baker Engineering, Inc.
1447 South Tryon Street
Suite 200
Charlotte, NC 28203
Phone: 704.334.4454
Fax: 704.334.4492



ORIGINAL DESIGN PLANS
-SEE "5" SERIES SHEETS FOR AS-BUILT DRAWINGS

3 0 3 6
VERTICAL SCALE (FT)

30 0 30 60
HORIZONTAL SCALE (FT)

BIG CEDAR CREEK

BIG CEDAR CREEK PROFILE

BAKER PROJECT REFERENCE NO.	SHEET NO.
109261	4R

PROJECT ENGINEER

ORIGINAL DESIGN PLANS SEALED ON 3/5/08 BY KEVIN TWEEDY, P.E. (#027337)

Baker

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1447 South Tryon Street
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Charlotte, NC 28203
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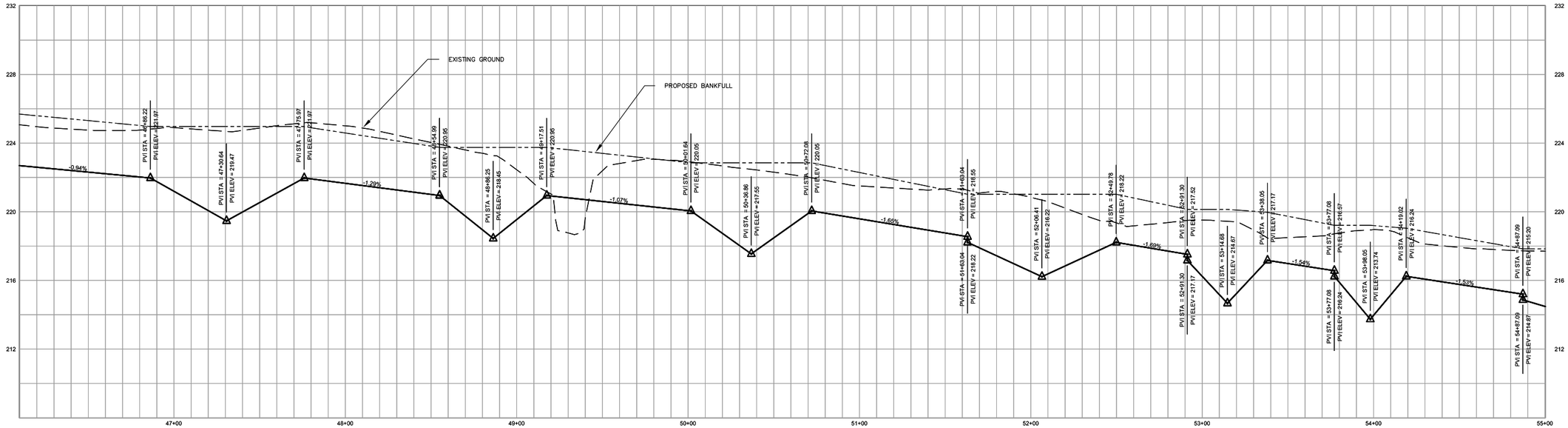
Fax: 704.334.4492



ORIGINAL DESIGN PLANS
-SEE "5" SERIES SHEETS FOR AS-BUILT DRAWINGS

3 0 3 6
VERTICAL SCALE (FT)

30 0 30 60
HORIZONTAL SCALE (FT)

BIG CEDAR CREEK

BIG CEDAR CREEK
PROFILE

BAKER PROJECT REFERENCE NO.	SHEET NO.
109261	45

PROJECT ENGINEER

ORIGINAL DESIGN PLANS SEALED ON 3/5/08 BY KEVIN TWEEDY, P.E. (#027337)

Baker

Michael Baker Engineering, Inc.
1447 South Tryon Street
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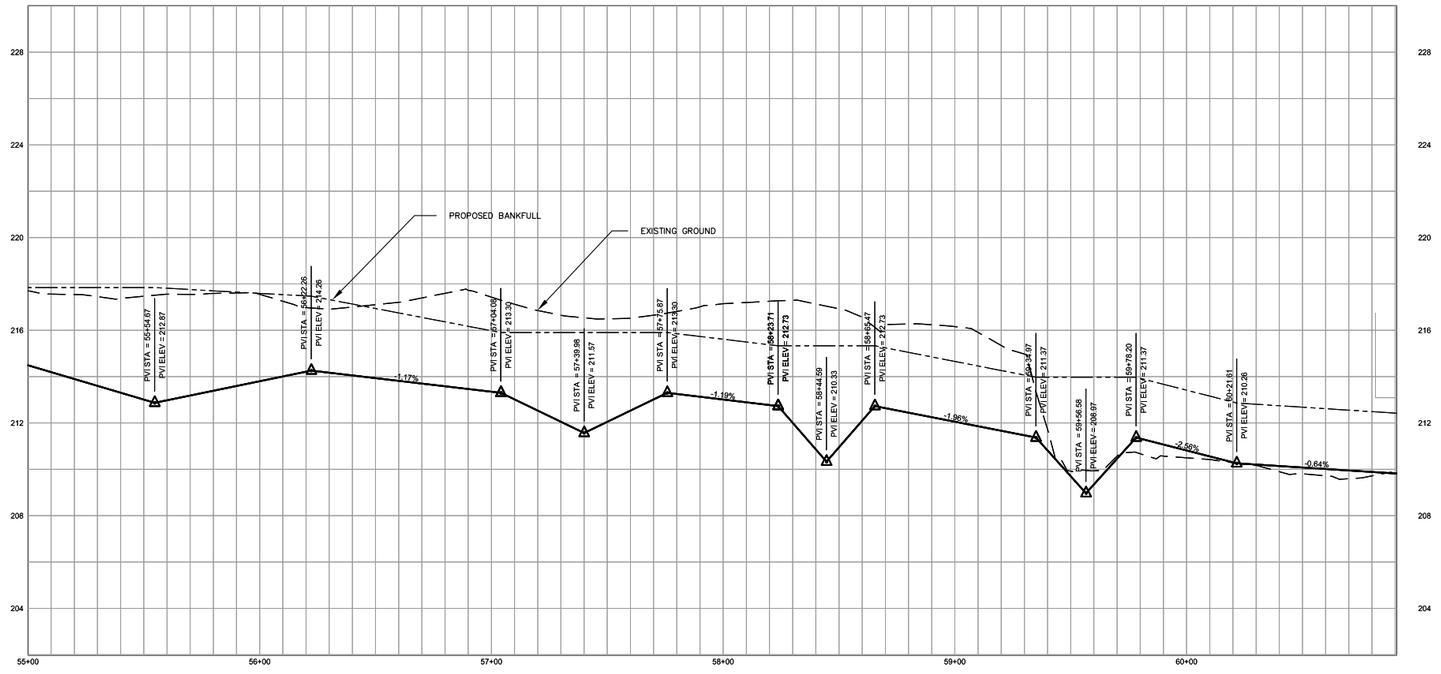

ORIGINAL DESIGN PLANS
-SEE "5" SERIES SHEETS FOR AS-BUILT DRAWINGS

3 0 3 6
VERTICAL SCALE (FT)

30 0 30 60
HORIZONTAL SCALE (FT)

BIG CEDAR CREEK

BIG CEDAR CREEK
PROFILE

BAKER PROJECT REFERENCE NO.	SHEET NO.
109261	4T

PROJECT ENGINEER

ORIGINAL DESIGN PLANS SEALED ON 3/5/08 BY KEVIN TWEEDY, P.E. (#027337)

Baker

Michael Baker Engineering, Inc.
1447 South Tryon Street
Suite 200
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Phone: 704.334.4454
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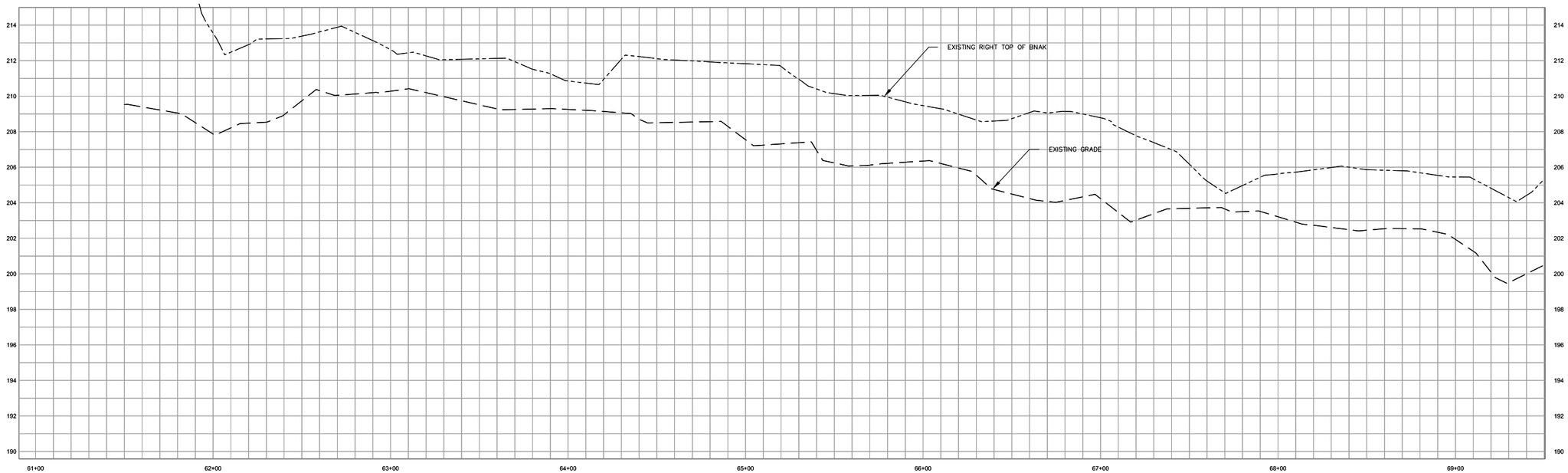

ORIGINAL DESIGN PLANS
-SEE "5" SERIES SHEETS FOR AS-BUILT DRAWINGS

NOTE: SEE PLAN VIEW AND DETAILS FOR PROFILE CHANGES FROM 61+50 TO 76+60

BIG CEDAR CREEK

BIG CEDAR CREEK
PROFILE

BAKER PROJECT REFERENCE NO.	SHEET NO.
109261	4U

PROJECT ENGINEER

ORIGINAL DESIGN PLANS SEALED ON 3/5/08 BY KEVIN TWEEDY, P.E. (#027337)

Baker

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1447 South Tryon Street
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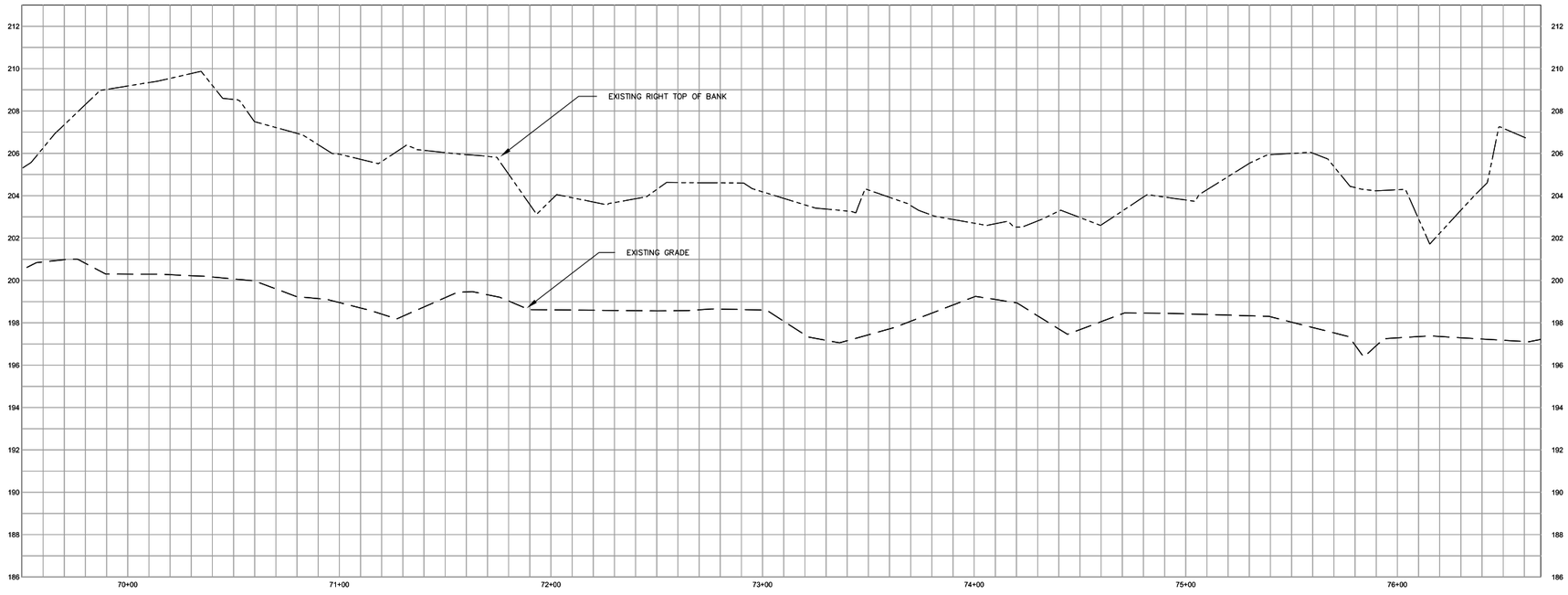
Fax: 704.334.4492



ORIGINAL DESIGN PLANS
-SEE "5" SERIES SHEETS FOR AS-BUILT DRAWINGS

NOTE: SEE PLAN VIEW AND DETAILS FOR PROFILE CHANGES FROM 61+50 TO 76+60

BIG CEDAR CREEK

BIG CEDAR CREEK
PROFILE

BAKER PROJECT REFERENCE NO.	SHEET NO.
109261	4V

PROJECT ENGINEER

ORIGINAL DESIGN PLANS SEALED ON 3/5/08 BY KEVIN TWEEDY, P.E. (#027337)

Baker

Michael Baker Engineering, Inc.
1447 South Tryon Street
Suite 200
Charlotte, NC 28203
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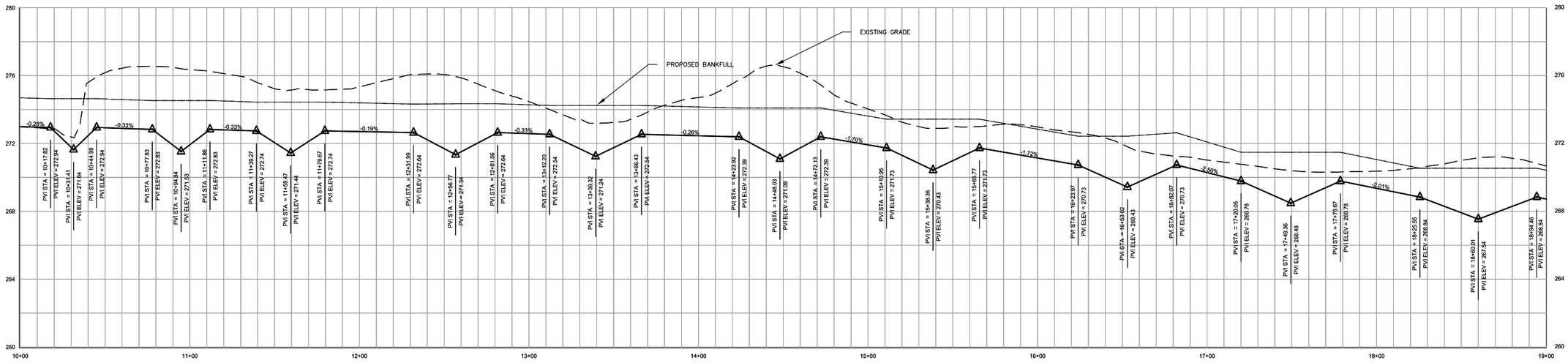
Fax: 704.334.4492



ORIGINAL DESIGN PLANS
-SEE "5" SERIES SHEETS FOR AS-BUILT DRAWINGS

BIG CEDAR CREEK

UT1 PROFILE

BAKER PROJECT REFERENCE NO.	SHEET NO.
109261	4W

PROJECT ENGINEER

ORIGINAL DESIGN PLANS SEALED ON 3/5/08 BY KEVIN TWEEDY, P.E. (#027337)

Baker

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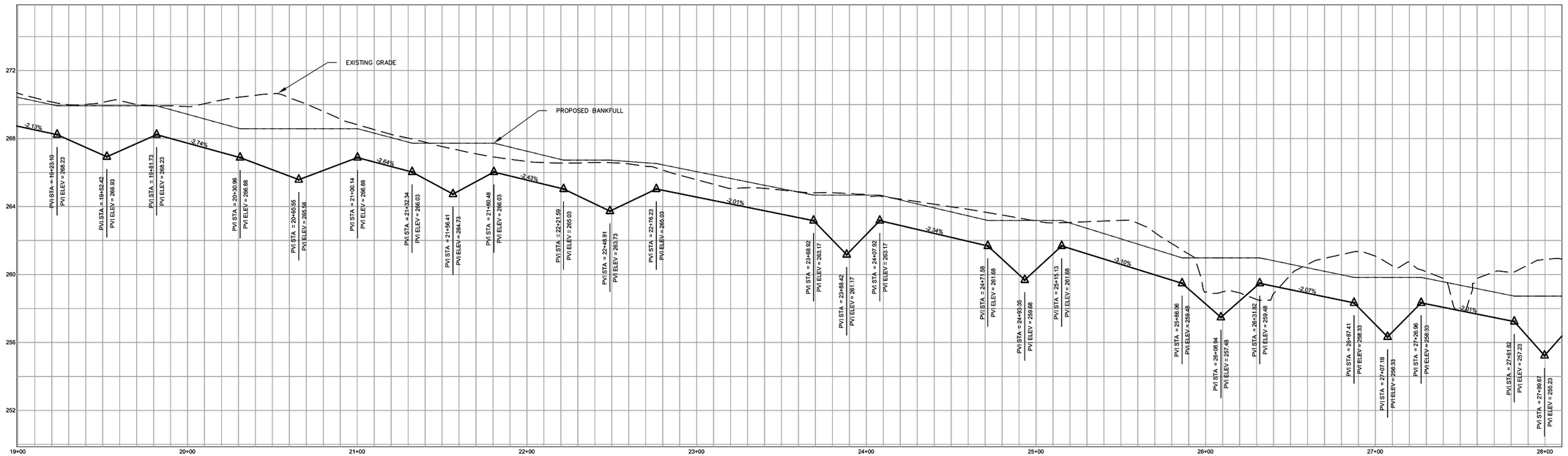

ORIGINAL DESIGN PLANS
-SEE "5" SERIES SHEETS FOR AS-BUILT DRAWINGS

BIG CEDAR CREEK

UT1 PROFILE

BAKER PROJECT REFERENCE NO.	SHEET NO.
109261	4X

PROJECT ENGINEER

ORIGINAL DESIGN PLANS SEALED ON 3/5/08 BY KEVIN TWEEDY, P.E. (#027337)

Baker

Michael Baker Engineering, Inc.
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Suite 200
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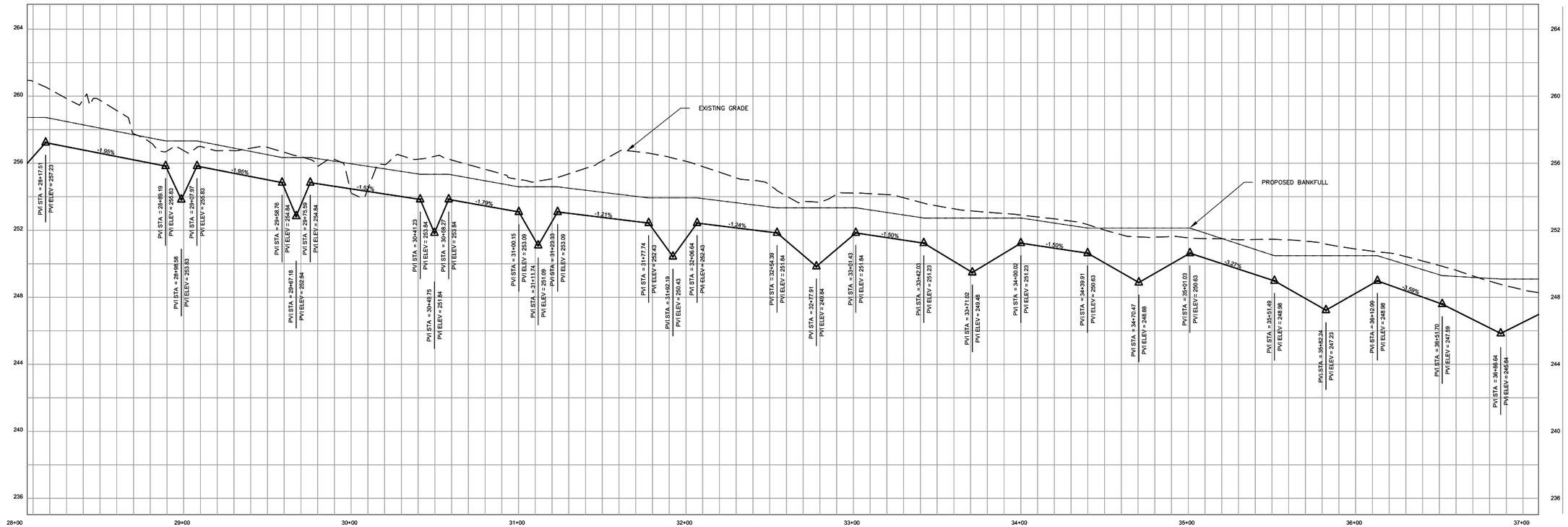

ORIGINAL DESIGN PLANS
-SEE "5" SERIES SHEETS FOR AS-BUILT DRAWINGS

BIG CEDAR CREEK

UT1 PROFILE

BAKER PROJECT REFERENCE NO.	SHEET NO.
109261	4Y

PROJECT ENGINEER

ORIGINAL DESIGN PLANS SEALED ON 3/5/08 BY KEVIN TWEEDY, P.E. (#027337)

Baker

Michael Baker Engineering, Inc.
1447 South Tryon Street
Suite 200
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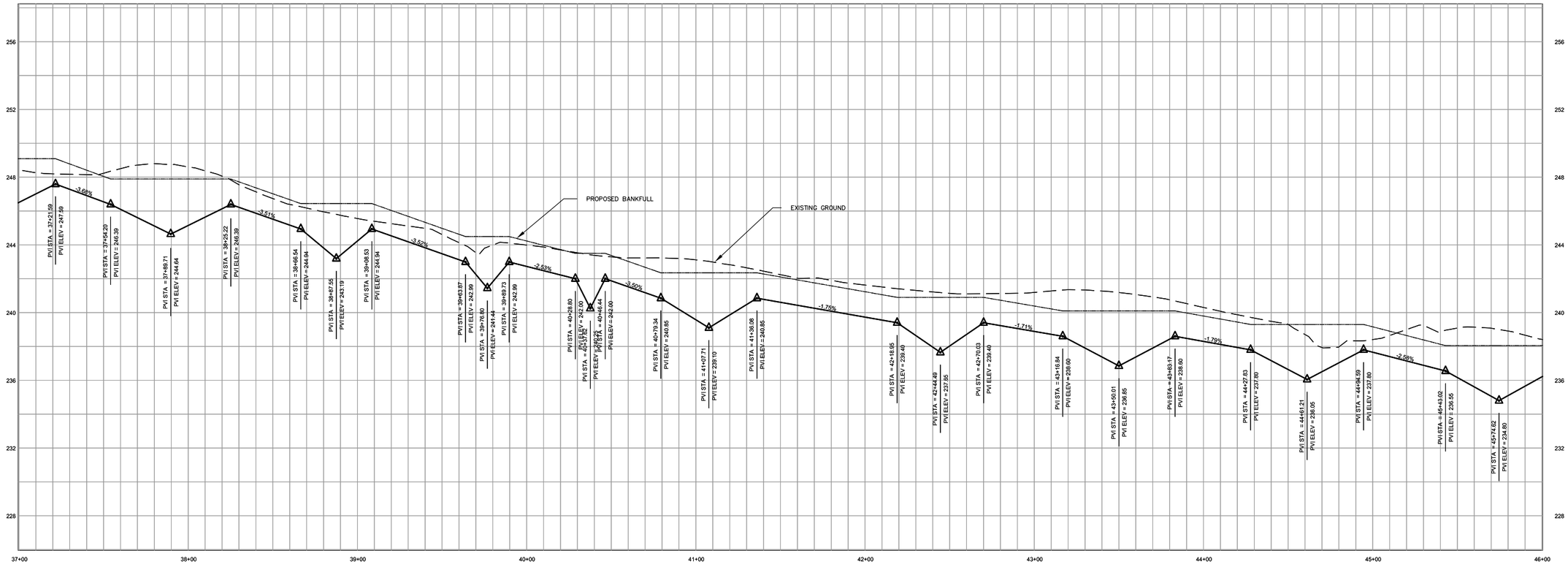
Fax: 704.334.4492



ORIGINAL DESIGN PLANS
-SEE "5" SERIES SHEETS FOR AS-BUILT DRAWINGS

BIG CEDAR CREEK

UT1 PROFILE

BAKER PROJECT REFERENCE NO.	SHEET NO.
109261	4Z

PROJECT ENGINEER

ORIGINAL DESIGN PLANS SEALED ON 3/5/08 BY KEVIN TWEEDY, P.E. (#027337)

Baker

Michael Baker Engineering, Inc.
1447 South Tryon Street
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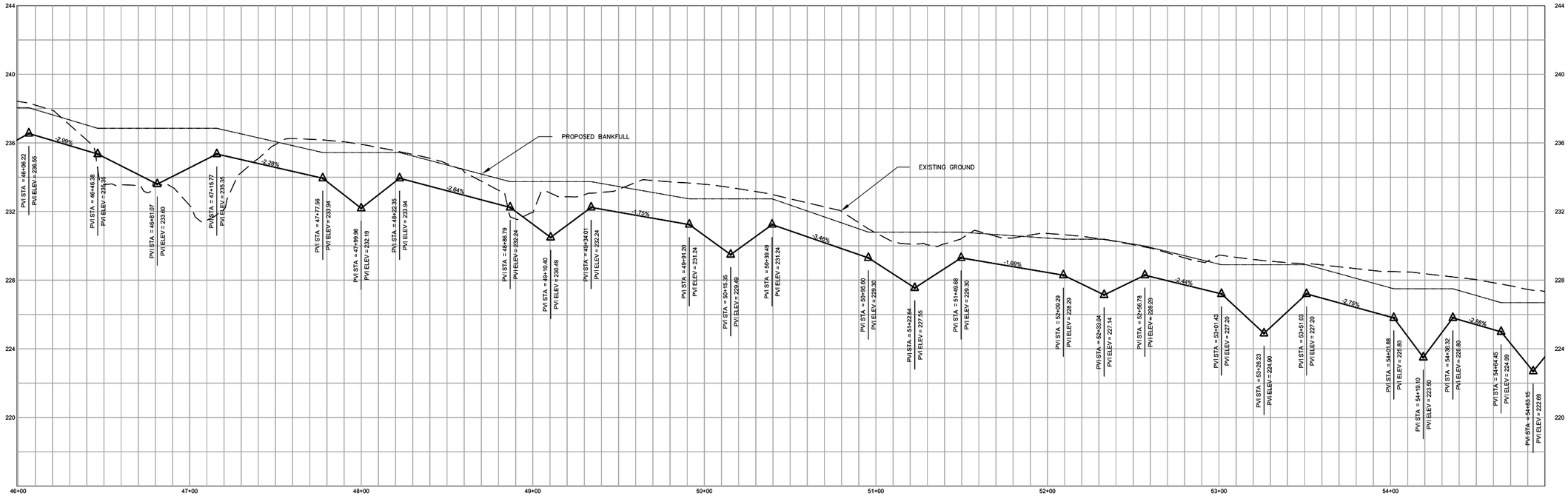


ORIGINAL DESIGN PLANS
-SEE "5" SERIES SHEETS FOR AS-BUILT DRAWINGS

BIG CEDAR CREEK

UT1 PROFILE

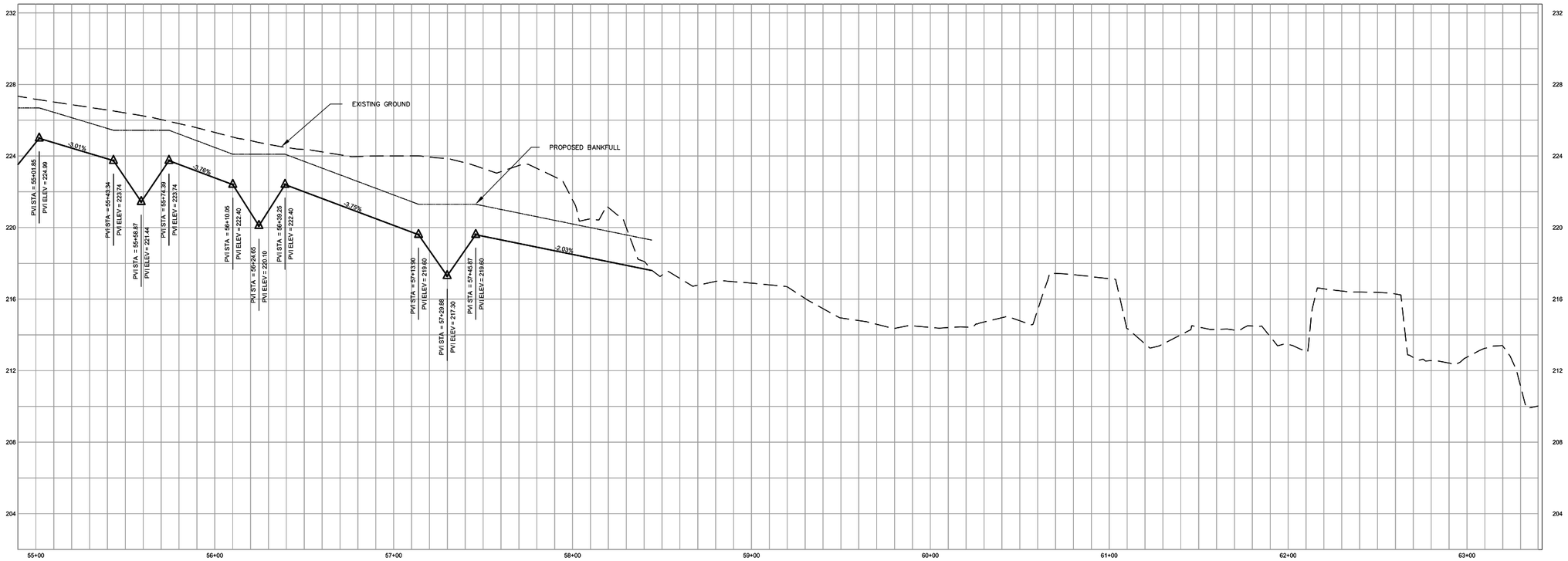
BAKER PROJECT REFERENCE NO.	SHEET NO.
109261	4AA

PROJECT ENGINEER

ORIGINAL DESIGN PLANS SEALED ON 3/5/08 BY KEVIN TWEEDY, P.E. (#027337)

Baker

Michael Baker Engineering, Inc.
1447 South Tryon Street
Suite 200
Charlotte, NC 28203
Phone: 704.334.4454
Fax: 704.334.4492



ORIGINAL DESIGN PLANS
-SEE "5" SERIES SHEETS FOR AS-BUILT DRAWINGS

BIG CEDAR CREEK

UT1 PROFILE

BAKER PROJECT REFERENCE NO.	SHEET NO.
109261	4AB

PROJECT ENGINEER

ORIGINAL DESIGN PLANS SEALED ON 3/5/08 BY KEVIN TWEEDY, P.E. (#027337)

Baker

Michael Baker Engineering, Inc.
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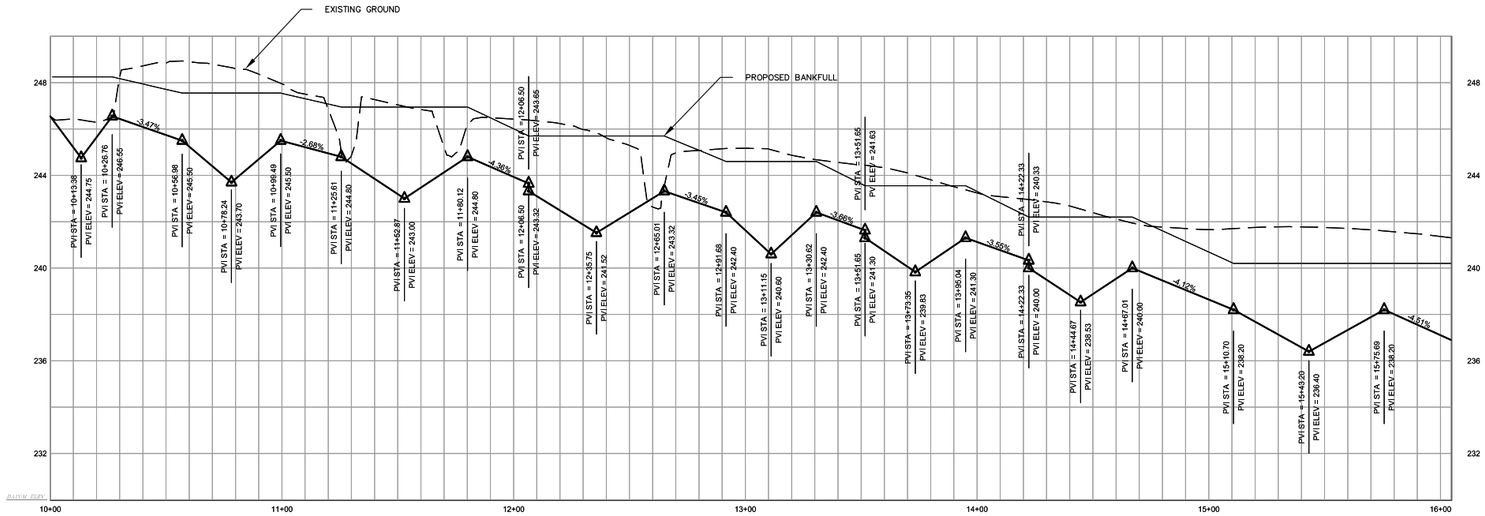
Suite 200
Charlotte, NC 28203
Phone: 704.334.4454
Fax: 704.334.4492



ORIGINAL DESIGN PLANS
-SEE "5" SERIES SHEETS FOR AS-BUILT DRAWINGS

BIG CEDAR CREEK

UT2 PROFILE

BAKER PROJECT REFERENCE NO.	SHEET NO.
109261	5A

PROJECT ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 027337 ENGINEER KEVIN L. ZIMMERMAN

8-11-09

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Charlotte, NC 28203
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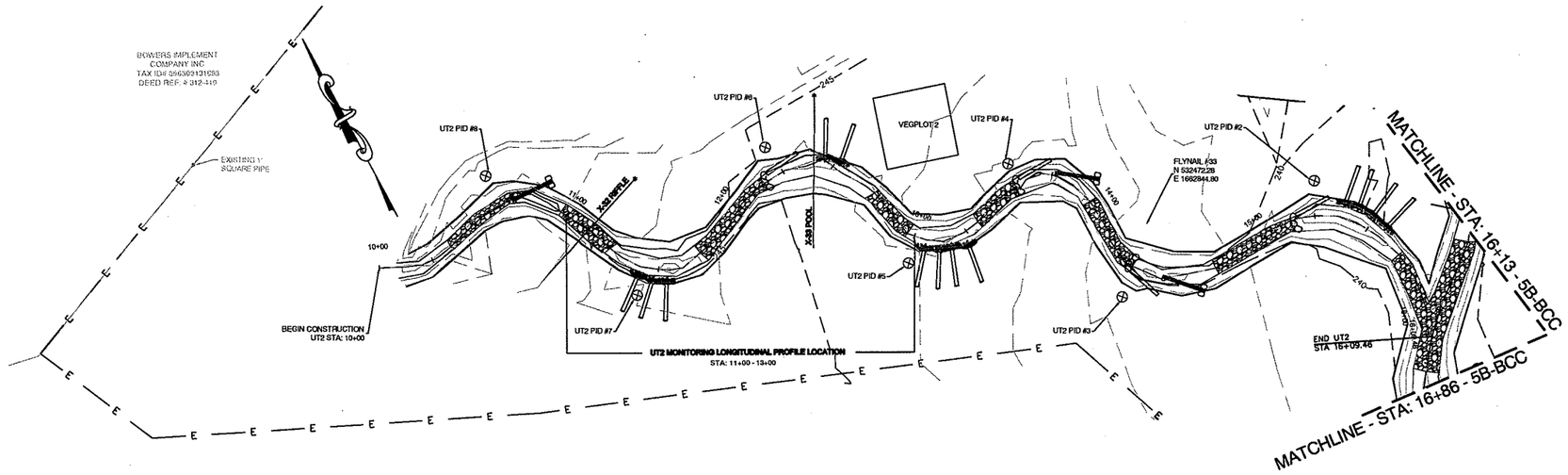
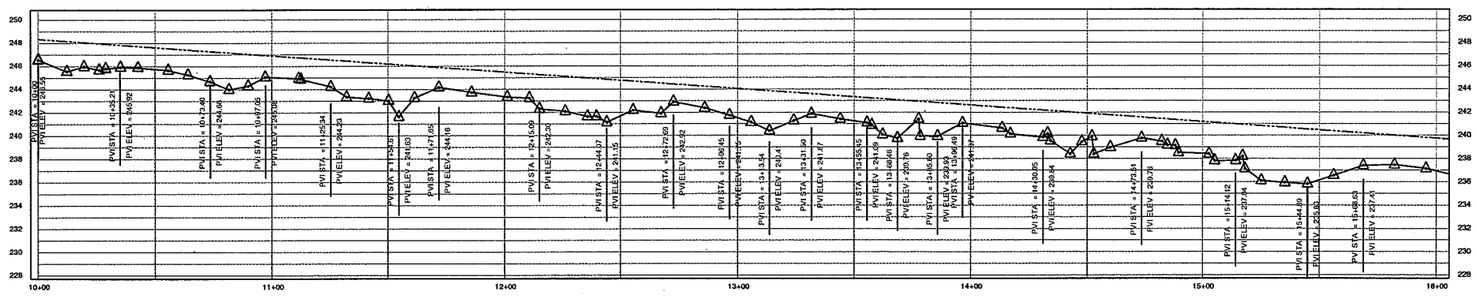
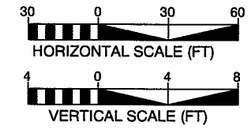
Fax: 704.334.4492







BIG CEDAR CREEK

UT2 AS-BUILT

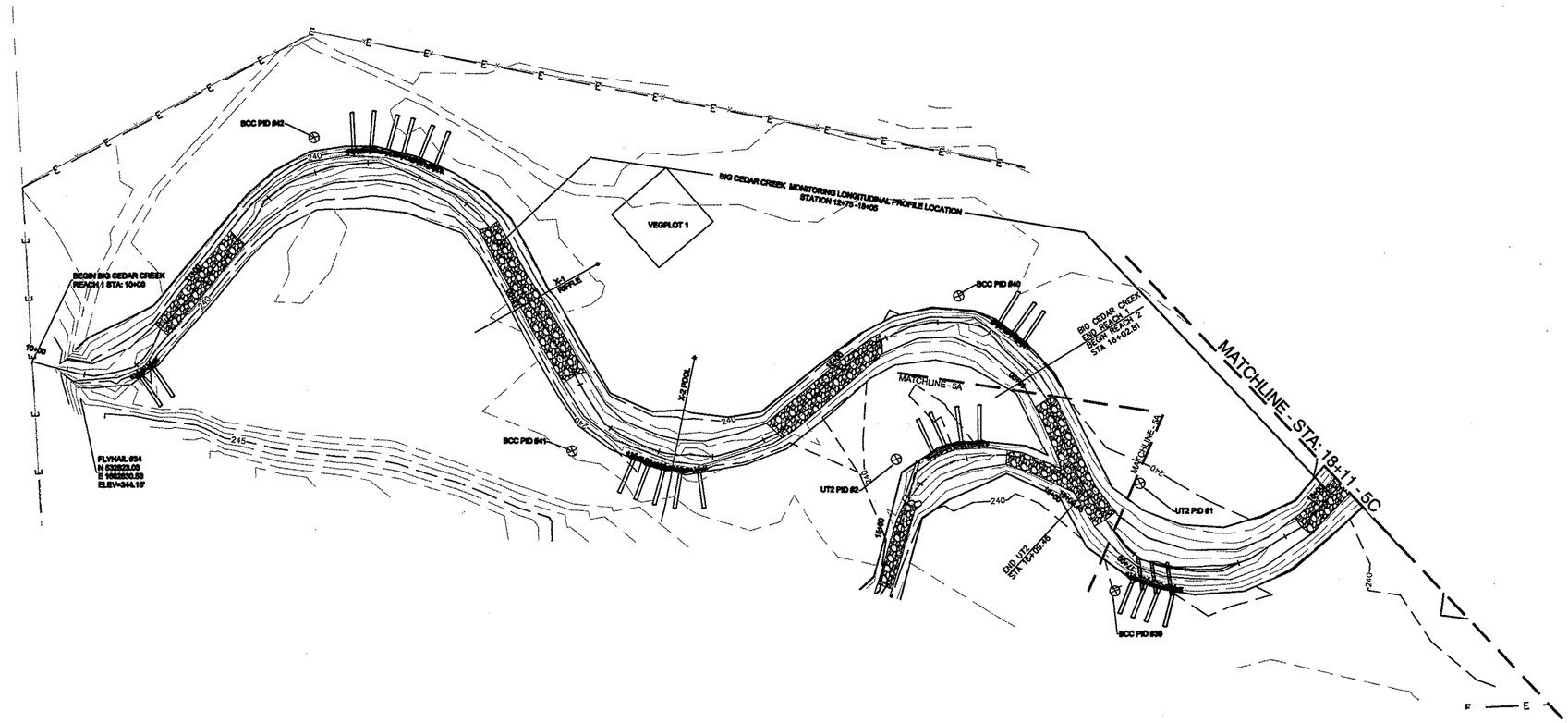
BAKER PROJECT REFERENCE NO.	SHEET NO.
109261	5B

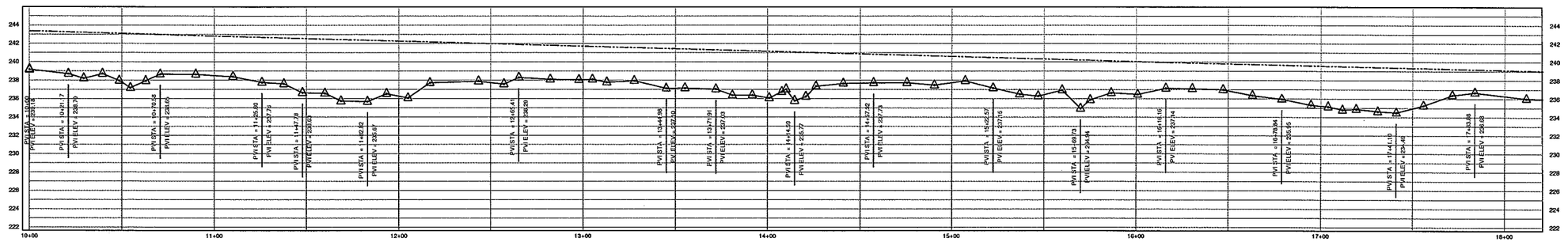
PROJECT ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 027337 ENGINEER KEVIN L. TWEDDLE

8-11-09

Baker
Michael Baker Engineering, Inc.
1447 South Tryon Street
Suite 200
Charlotte, NC 28203
Phone: 704.334.4454
Fax: 704.334.4492





30 0 30 60
HORIZONTAL SCALE (FT)

4 0 4 8
VERTICAL SCALE (FT)

BIG CEDAR CREEK

BIG CEDAR CREEK
AS-BUILT

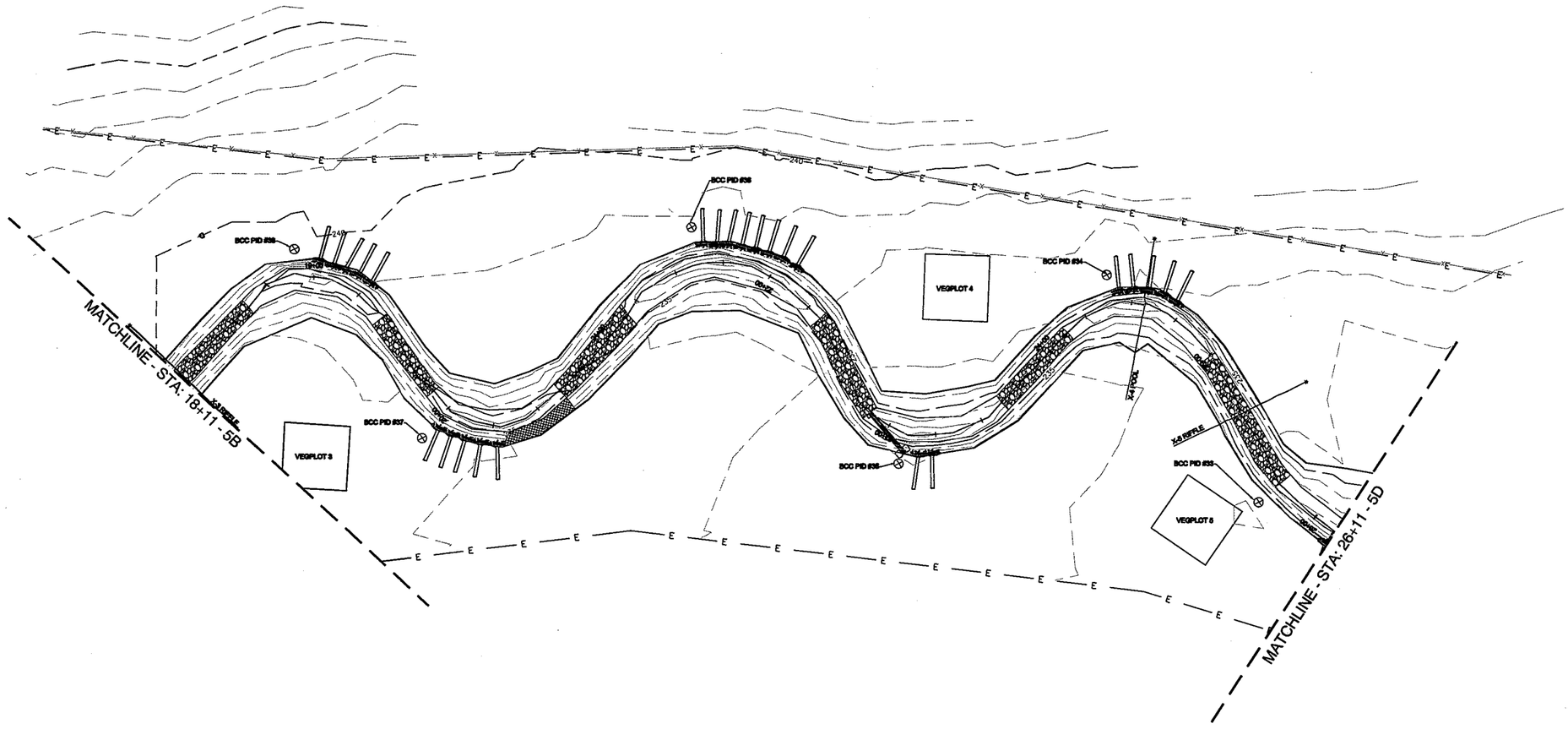
BAKER PROJECT REFERENCE NO.	SHEET NO.
109261	5C

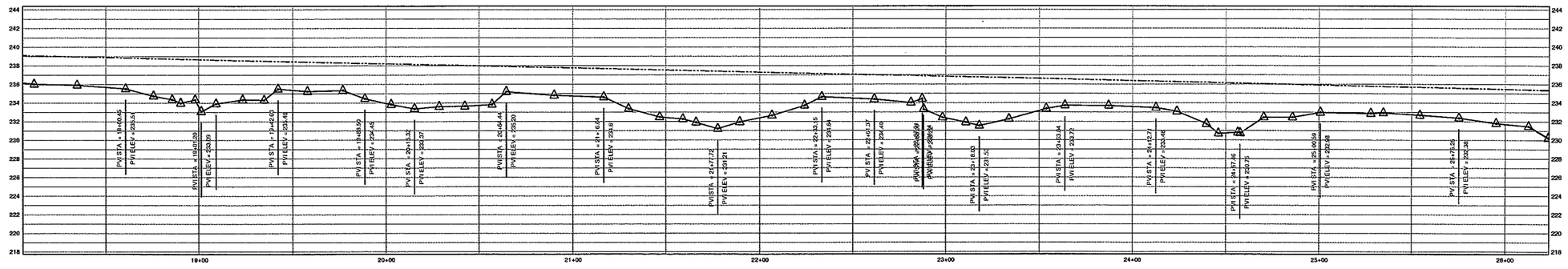
PROJECT ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 027337 ENGINEER KEVIN V. TWEEDY

8-11-09

Baker
Michael Baker Engineering, Inc.
1447 South Tryon Street
Suite 200
Charlotte, NC 28203
Phone: 704.334.4454
Fax: 704.334.4482





30 0 30 60
HORIZONTAL SCALE (FT)

4 0 4 8
VERTICAL SCALE (FT)

BIG CEDAR CREEK

BIG CEDAR CREEK
AS-BUILT

BAKER PROJECT REFERENCE NO.	SHEET NO.
109261	5D

PROJECT ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 027337 ENGINEER KEVIN L. TWEDDY

8-16-09

Baker
Michael Baker Engineering, Inc.
1447 South Tryon Street
Suite 200
Charlotte, NC 28203
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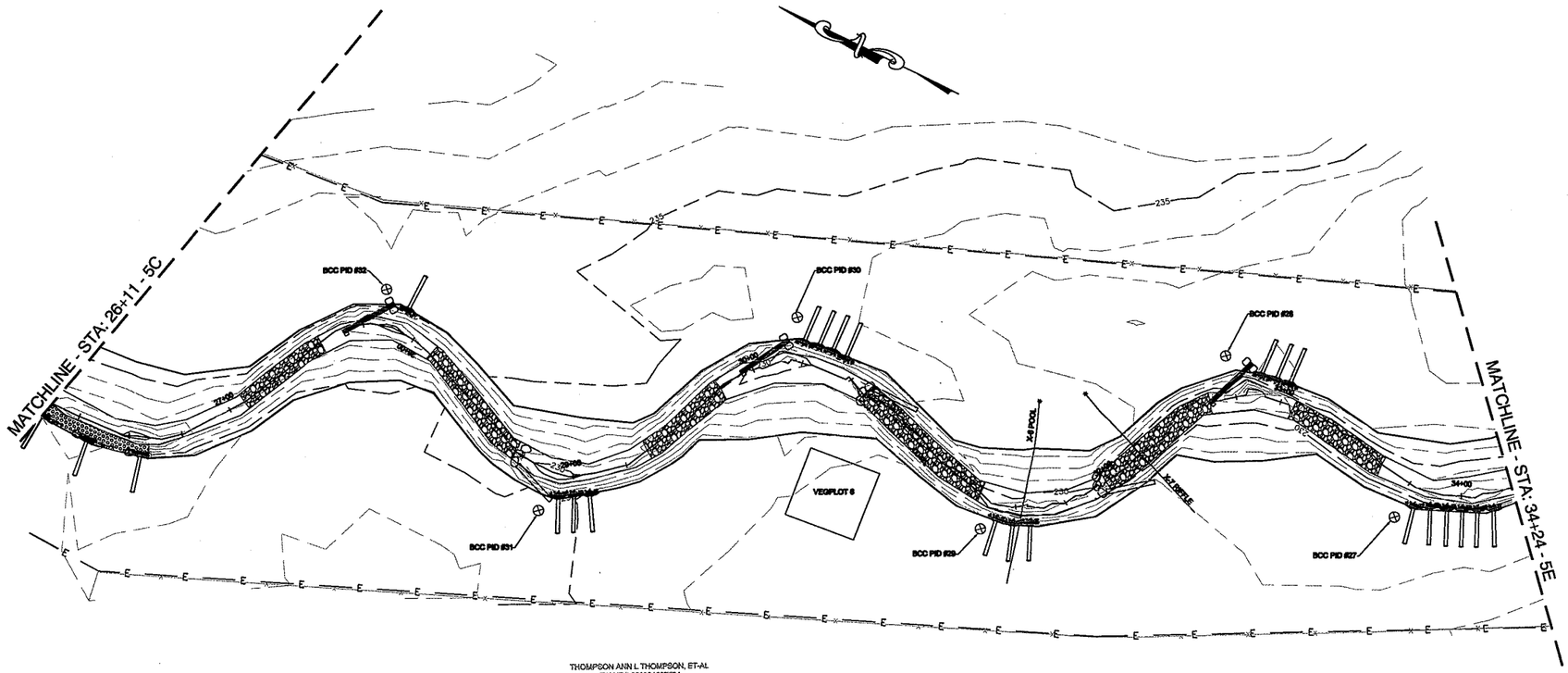
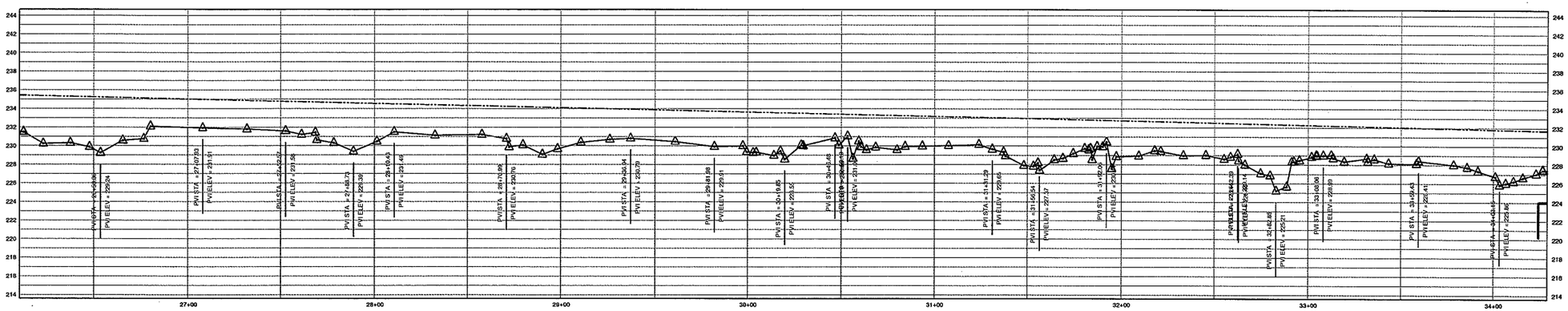
Fax: 704.334.4492





30 0 30 60
HORIZONTAL SCALE (FT)

4 0 4 8
VERTICAL SCALE (FT)

BIG CEDAR CREEK

BIG CEDAR CREEK
AS-BUILT

BAKER PROJECT REFERENCE NO.	SHEET NO.
109261	5E

PROJECT ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 027337 ENGINEER KEVIN L. TWEDT

8-11-09

Baker
Michael Baker Engineering, Inc.
1447 South Tryon Street
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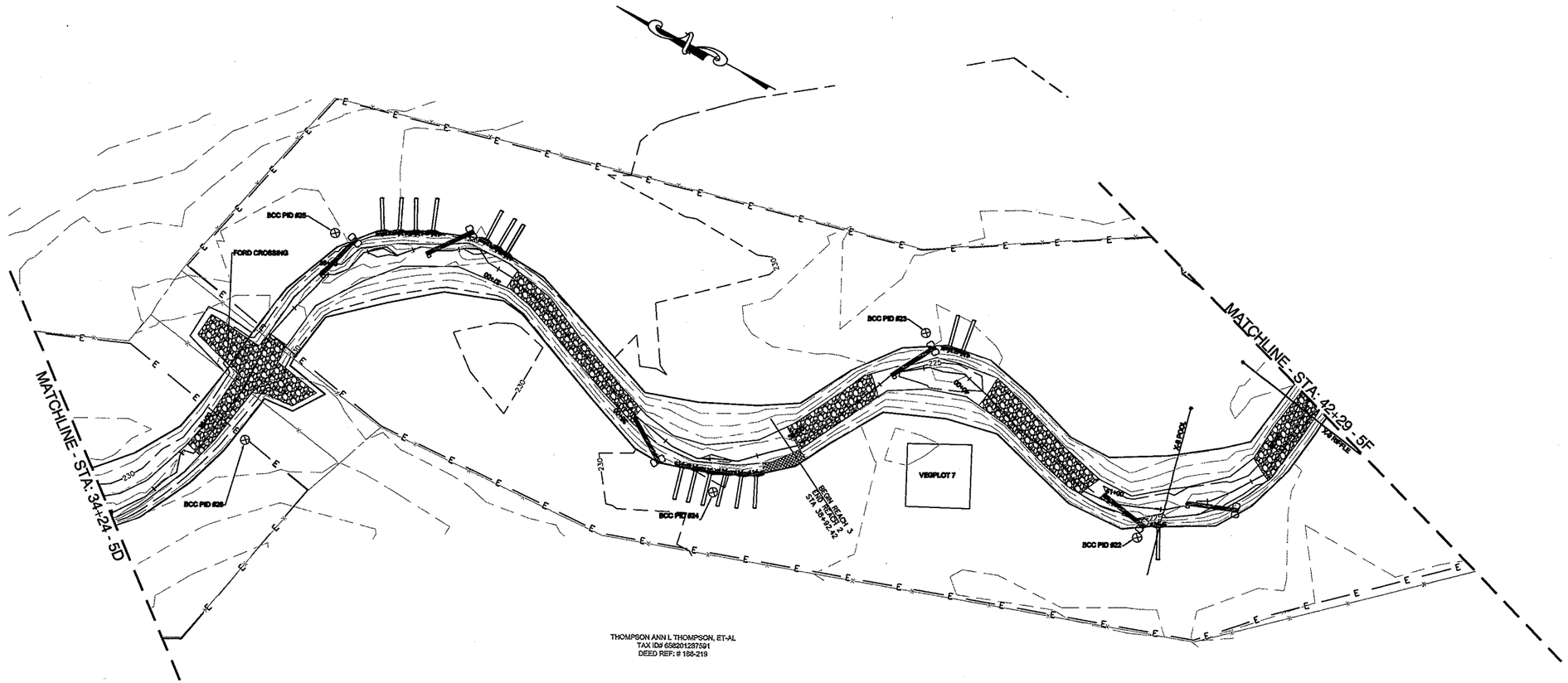

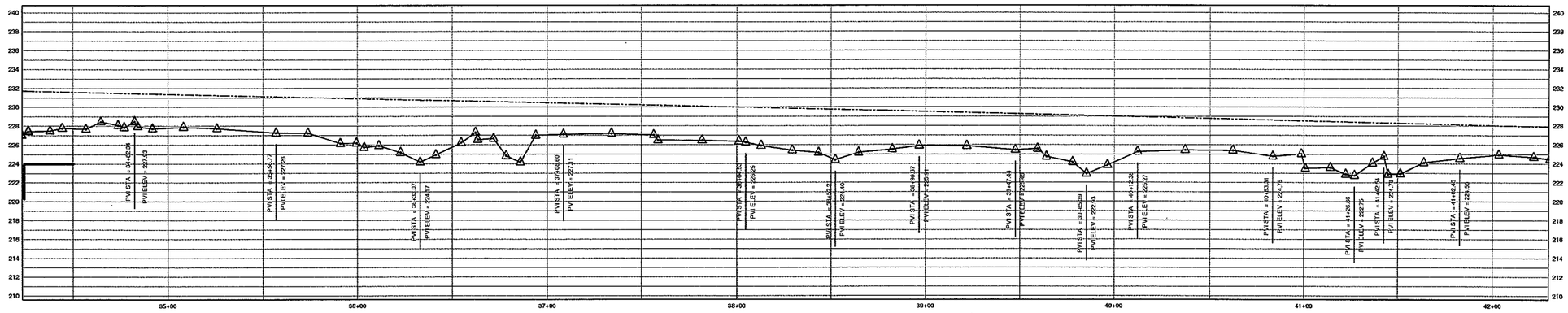

30 0 30 60
HORIZONTAL SCALE (FT)

4 0 4 8
VERTICAL SCALE (FT)

BIG CEDAR CREEK

BIG CEDAR CREEK
AS-BUILT

BAKER PROJECT REFERENCE NO.	SHEET NO.
109261	5F

PROJECT ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 027337 ENGINEER KEVIN L. TWEEDY

8-11-09

Baker
Michael Baker Engineering, Inc.
1447 South Tryon Street
Suite 200
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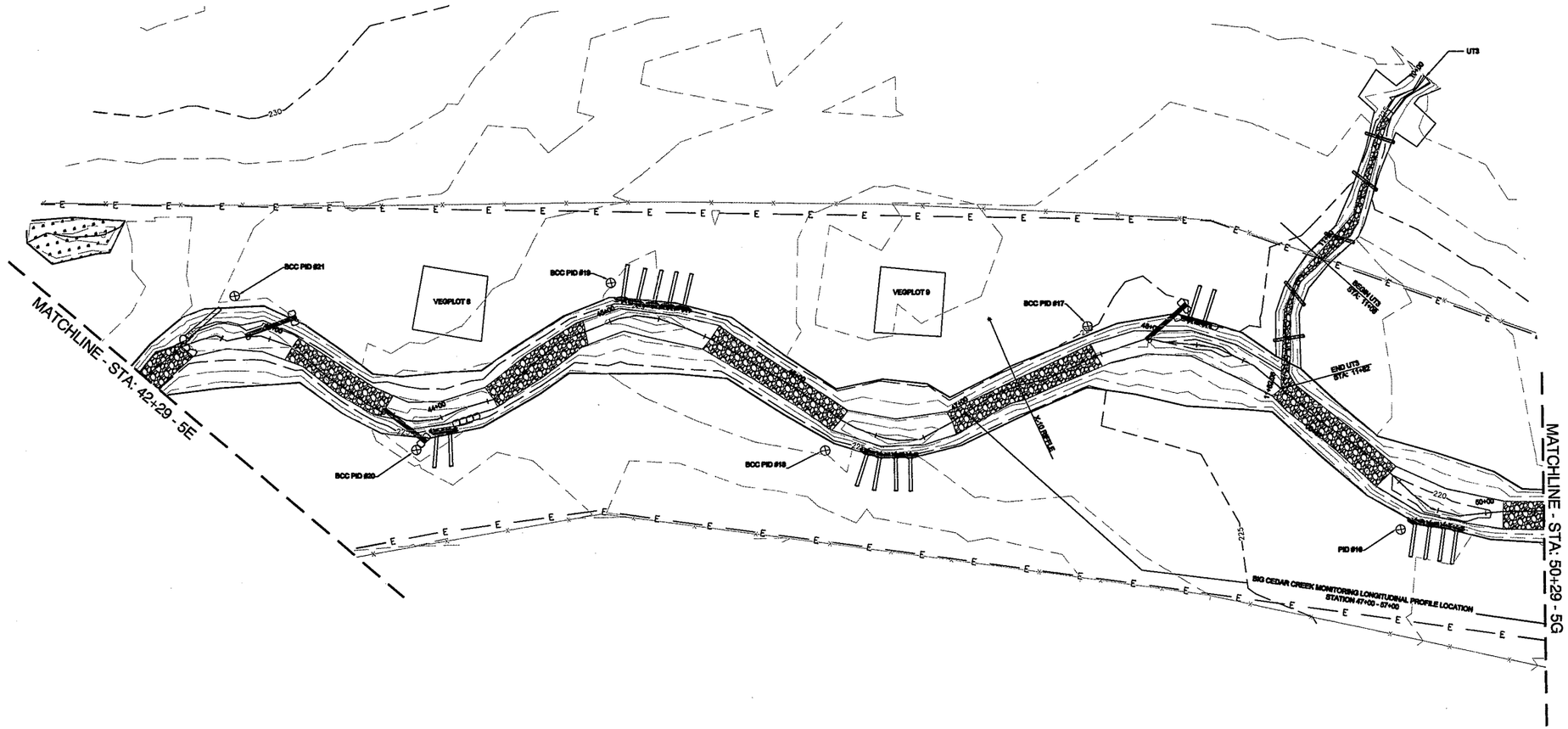
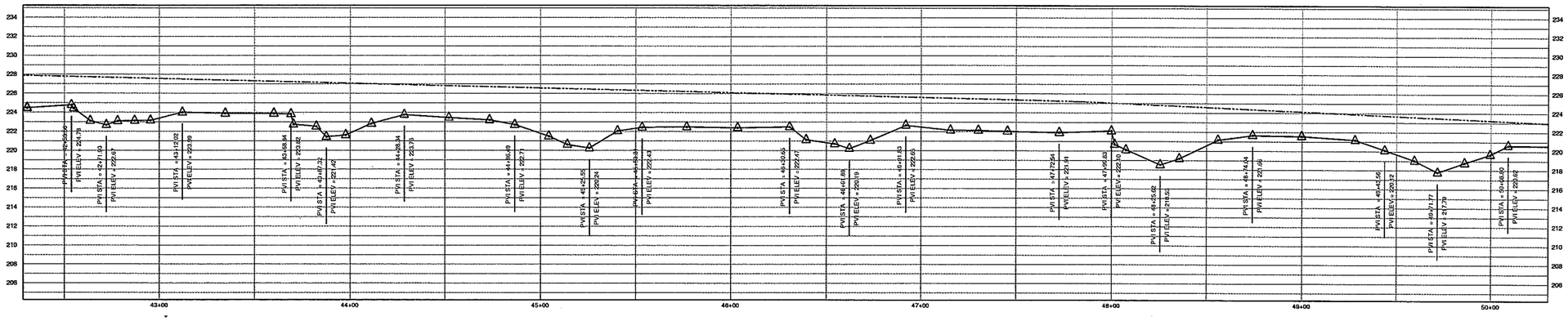
Fax: 704.334.4492





30 0 30 60
HORIZONTAL SCALE (FT)

4 0 4 8
VERTICAL SCALE (FT)

BIG CEDAR CREEK

BIG CEDAR CREEK
AS-BUILT

BAKER PROJECT REFERENCE NO.	SHEET NO.
109261	5G

PROJECT ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 027337 ENGINEER KEVIN I. WARREN

8-11-09

Baker
Michael Baker Engineering, Inc.
1447 South Tryon Street
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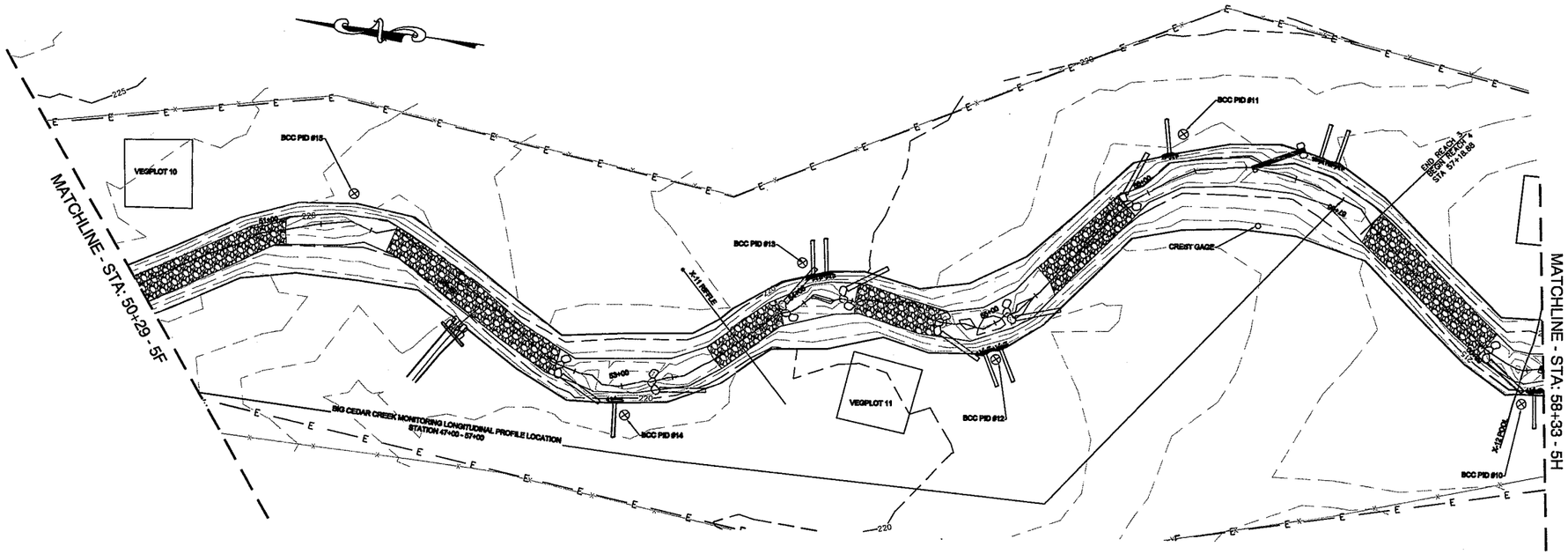
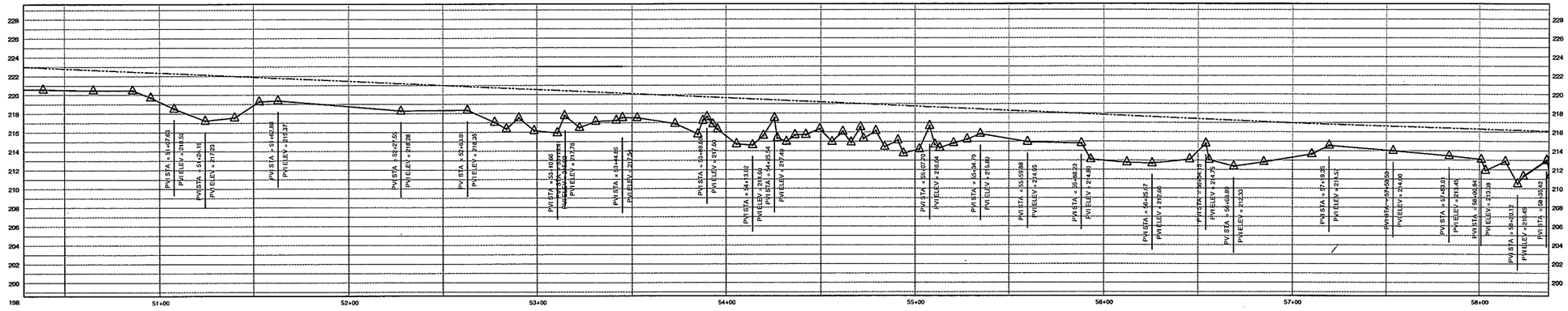
Fax: 704.334.4492





30 0 30 60
HORIZONTAL SCALE (FT)

4 0 4 8
VERTICAL SCALE (FT)

BIG CEDAR CREEK

BIG CEDAR CREEK
AS-BUILT

BAKER PROJECT REFERENCE NO.	SHEET NO.
109261	5H

PROJECT ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 027337 ENGINEER KEVIN J. THOMPSON

5/11/09

Baker
Michael Baker Engineering, Inc.
1447 South Tryon Street
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Charlotte, NC 28203
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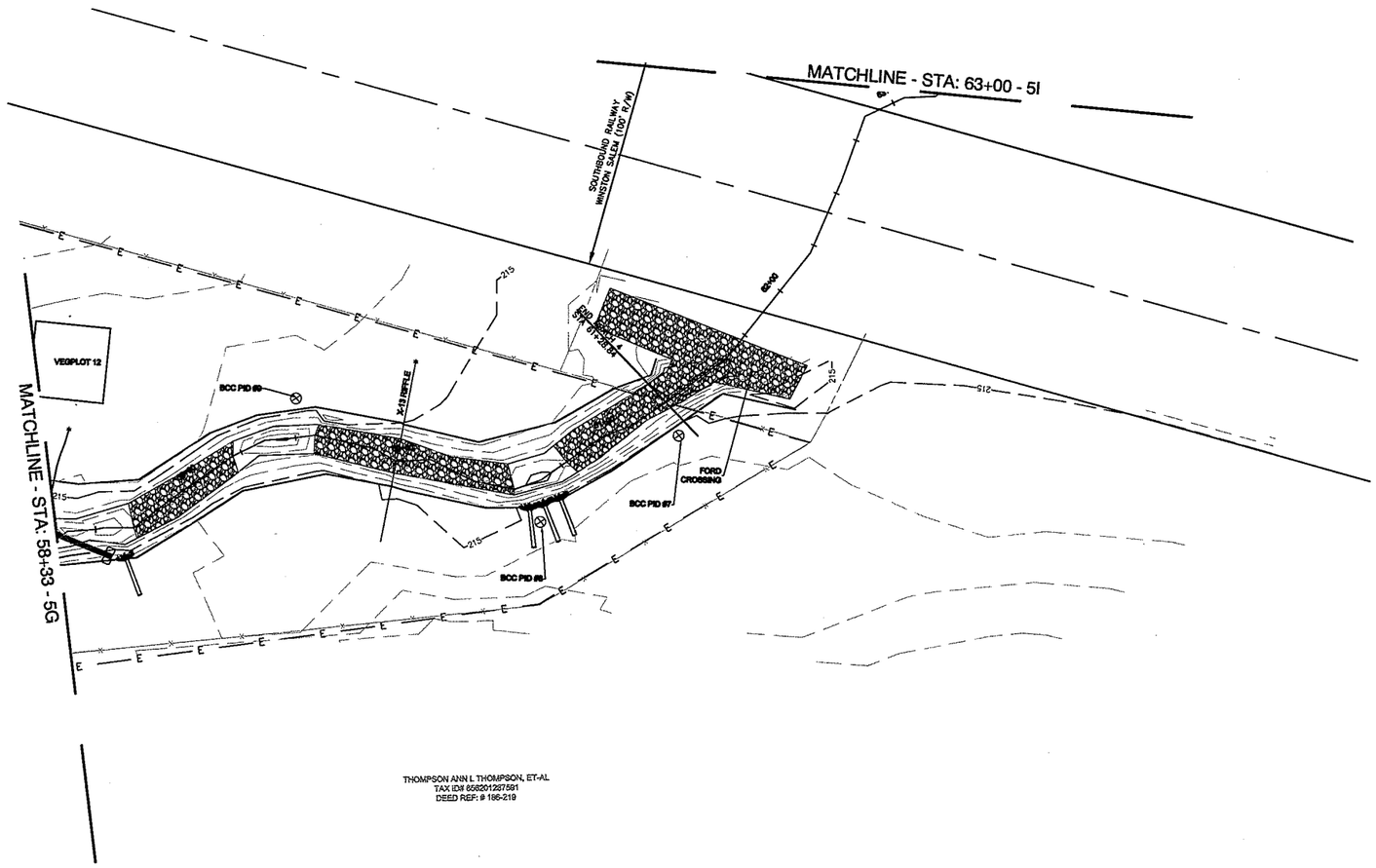
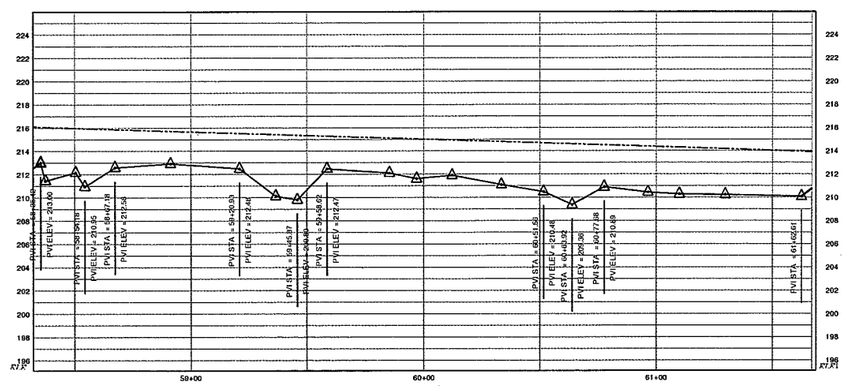
Fax: 704.334.4492





30 0 30 60
HORIZONTAL SCALE (FT)

4 0 4 8
VERTICAL SCALE (FT)

BIG CEDAR CREEK

BIG CEDAR CREEK
AS-BUILT

BAKER PROJECT REFERENCE NO.	SHEET NO.
109261	51

PROJECT ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 027337 ENGINEER SERVING THE NATION

5-11-09

Baker

Michael Baker Engineering, Inc.
1447 South Tryon Street
Suite 200
Charlotte, NC 28203
Phone: 704.334.4454
Fax: 704.334.4492

DORIS L. WEST AND J. FRANK WEST
TAX ID# 8562014969021
DEED REF: # 259-432

DORIS L. WEST AND J. FRANK WEST
TAX ID# 8562015950021
DEED REF: # 259-432

MATCHLINE - STA: 63+00 - 5H

MATCHLINE - STA: 72+50 - 5J

BEGIN REACH 3 STA: 63+31

END REACH 3 BEGIN REACH 4 STA: 64+20

UT1 REACH 4 BEGIN DOWNSTREAM RESTORATION STA: 66+31

END UT1 REACH 4 DOWNSTREAM STA: 69+17

BCC PID #3

UT1 PID #1

BCC PID #5

BCC PID #4

VEGPLOT 13

60+00

62+00

64+00

66+00

68+00

69+00

70+00

71+00

72+00

SOUTHBOUND RAILWAY WESTON SALEM (100' R/W)

30 0 30 60

HORIZONTAL SCALE (FT)

BIG CEDAR CREEK

BIG CEDAR CREEK AS-BUILT

BAKER PROJECT REFERENCE NO.	SHEET NO.
109261	5J

PROJECT ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 027337 ENGINEER KEVIN L. TWEEDY

5-11-09

Baker
Michael Baker Engineering, Inc.
1447 South Tryon Street
Suite 200
Charlotte, NC 28203
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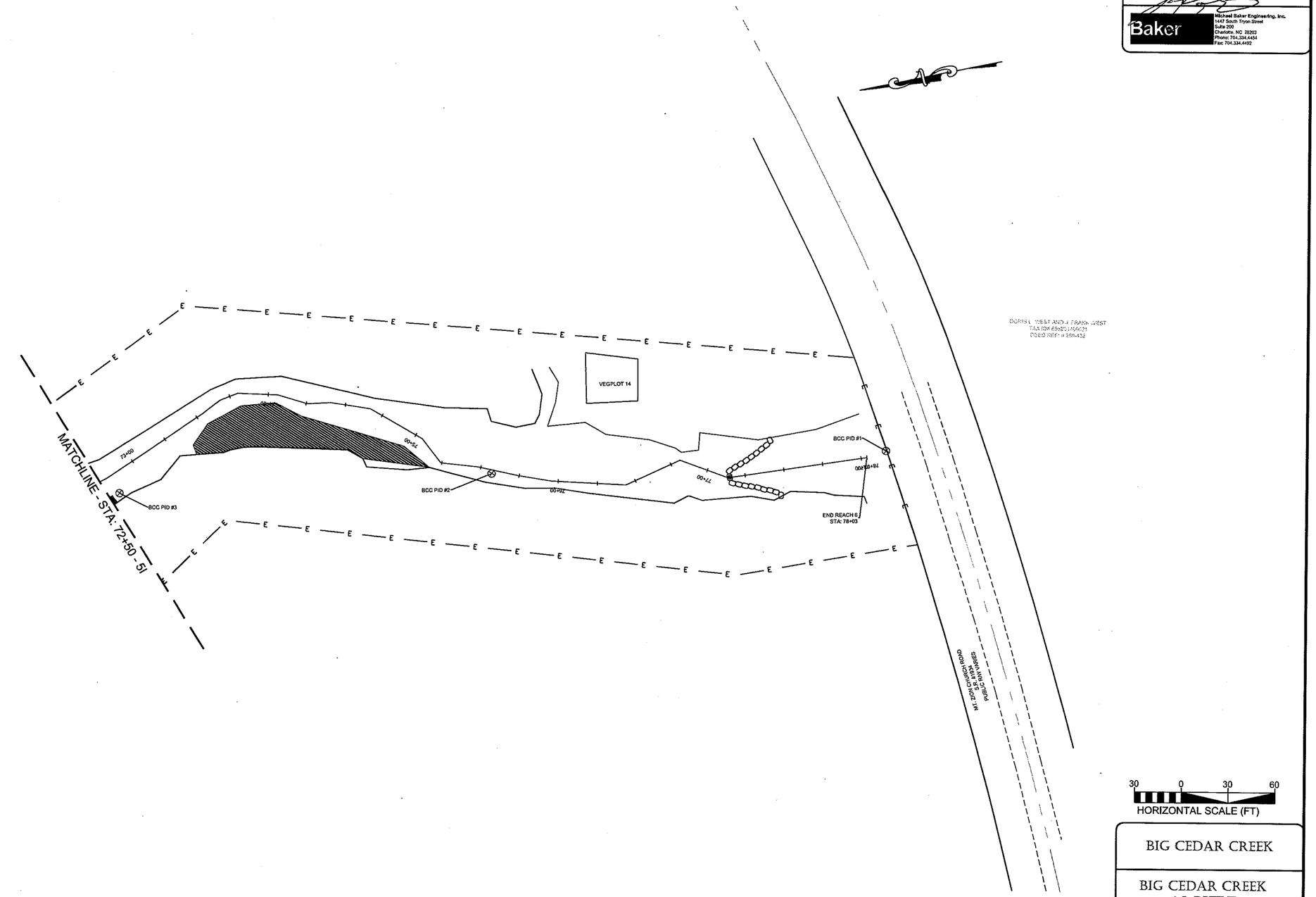

30 0 30 60
HORIZONTAL SCALE (FT)

BIG CEDAR CREEK

BIG CEDAR CREEK
AS-BUILT

BAKER PROJECT REFERENCE NO.	SHEET NO.
109261	5K

PROJECT ENGINEER

SOUTH CAROLINA PROFESSIONAL SEAL 027337 ENGINEER KEVIN L. TWEEDY

8-18-09

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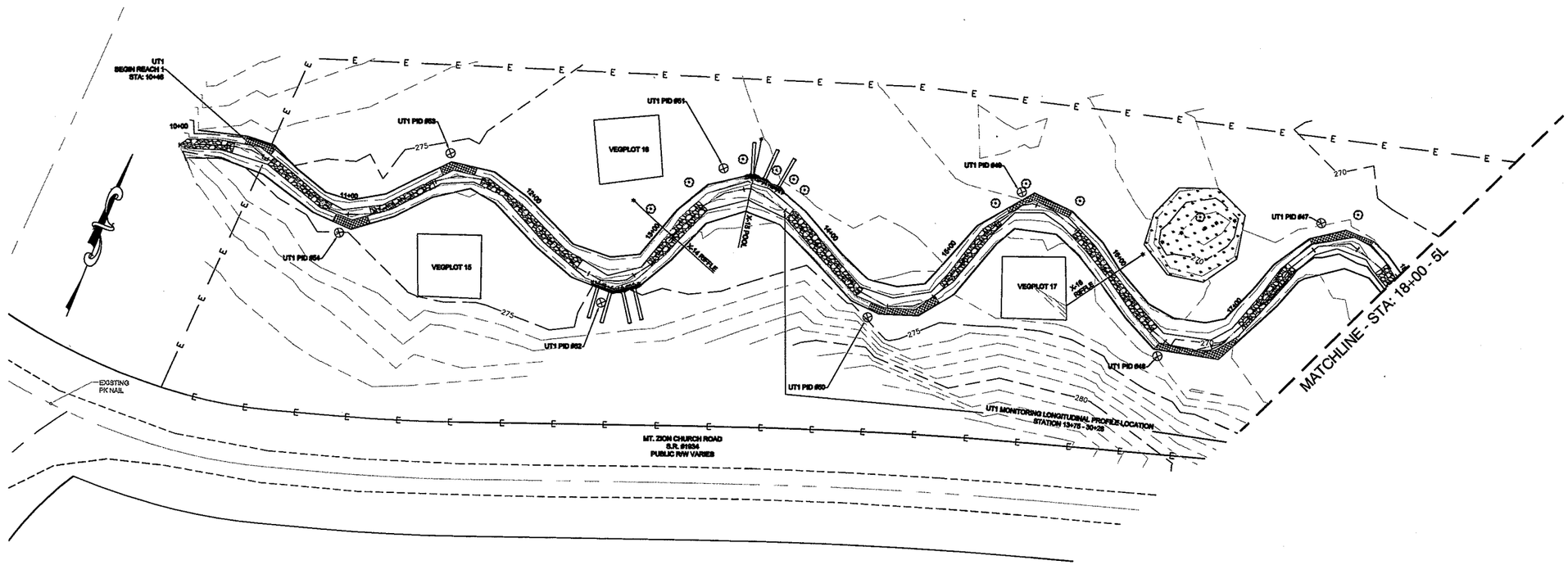
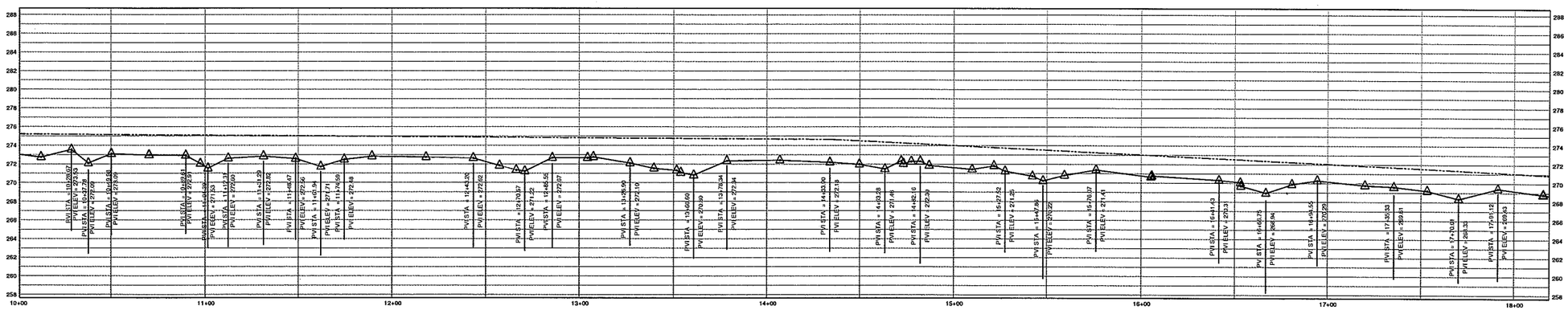
Phone: 704.334.4454
Fax: 704.334.4492





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HORIZONTAL SCALE (FT)

4 0 4 8
VERTICAL SCALE (FT)

BIG CEDAR CREEK

UT1 AS-BUILT

BAKER PROJECT REFERENCE NO.	SHEET NO.
109261	5L

PROJECT ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 027337 ENGINEER KEVIN L. TWEEDY

8-11-09

Baker
Michael Baker Engineering, Inc.
1447 South Tryon Street
Suite 200
Charlotte, NC 28203
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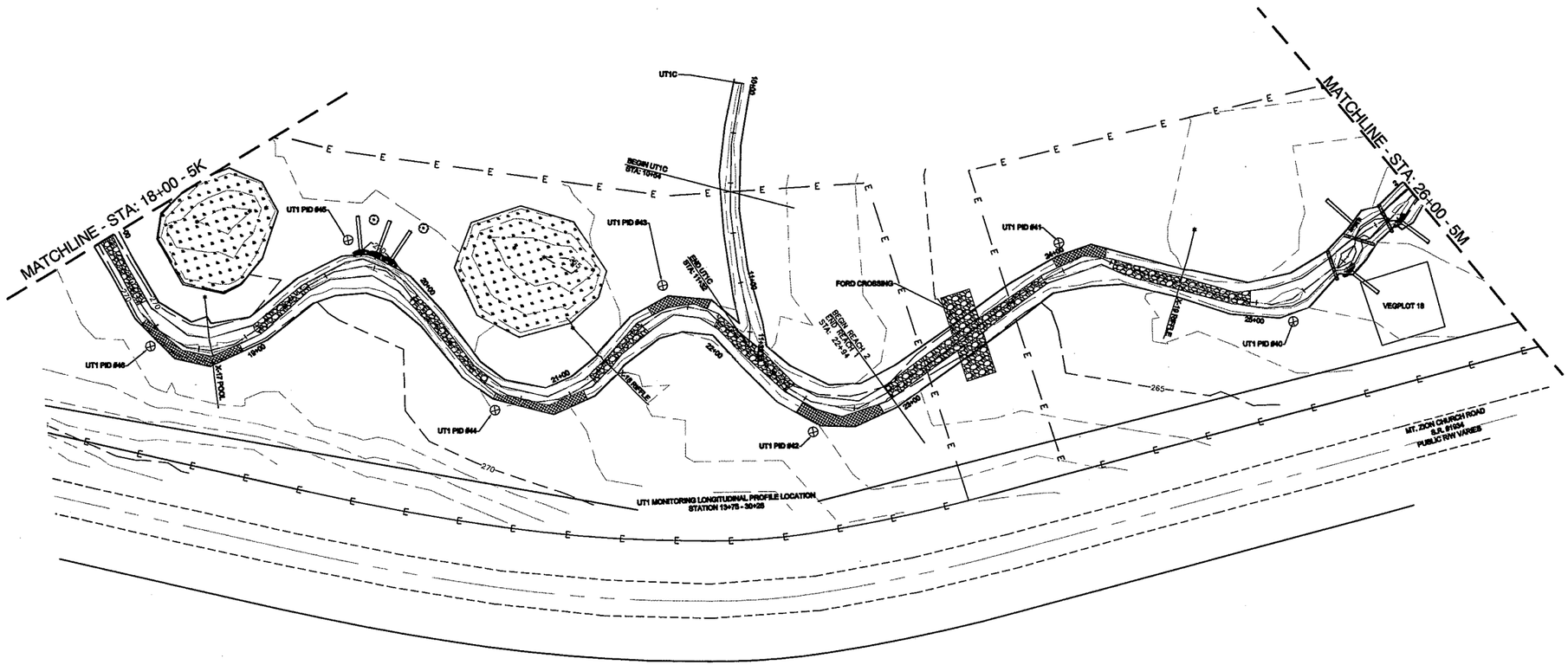
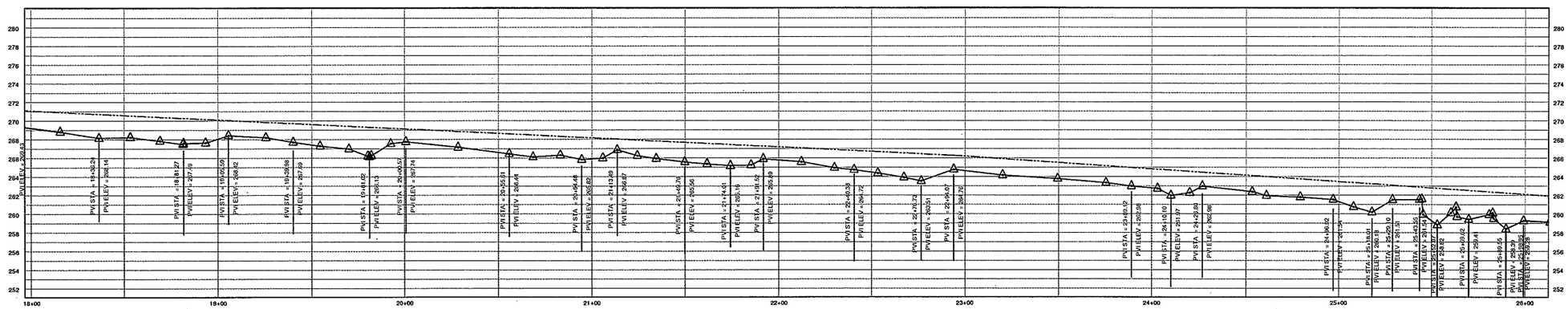
Fax: 704.334.4492





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HORIZONTAL SCALE (FT)

4 0 4 8
VERTICAL SCALE (FT)

BIG CEDAR CREEK

UT1 AS-BUILT

BAKER PROJECT REFERENCE NO.	SHEET NO.
109261	5M

PROJECT ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 027337 ENGINEER KEVIN I. HARRIS

8-11-09

Baker
Michael Baker Engineering, Inc.
1447 South Tryon Street
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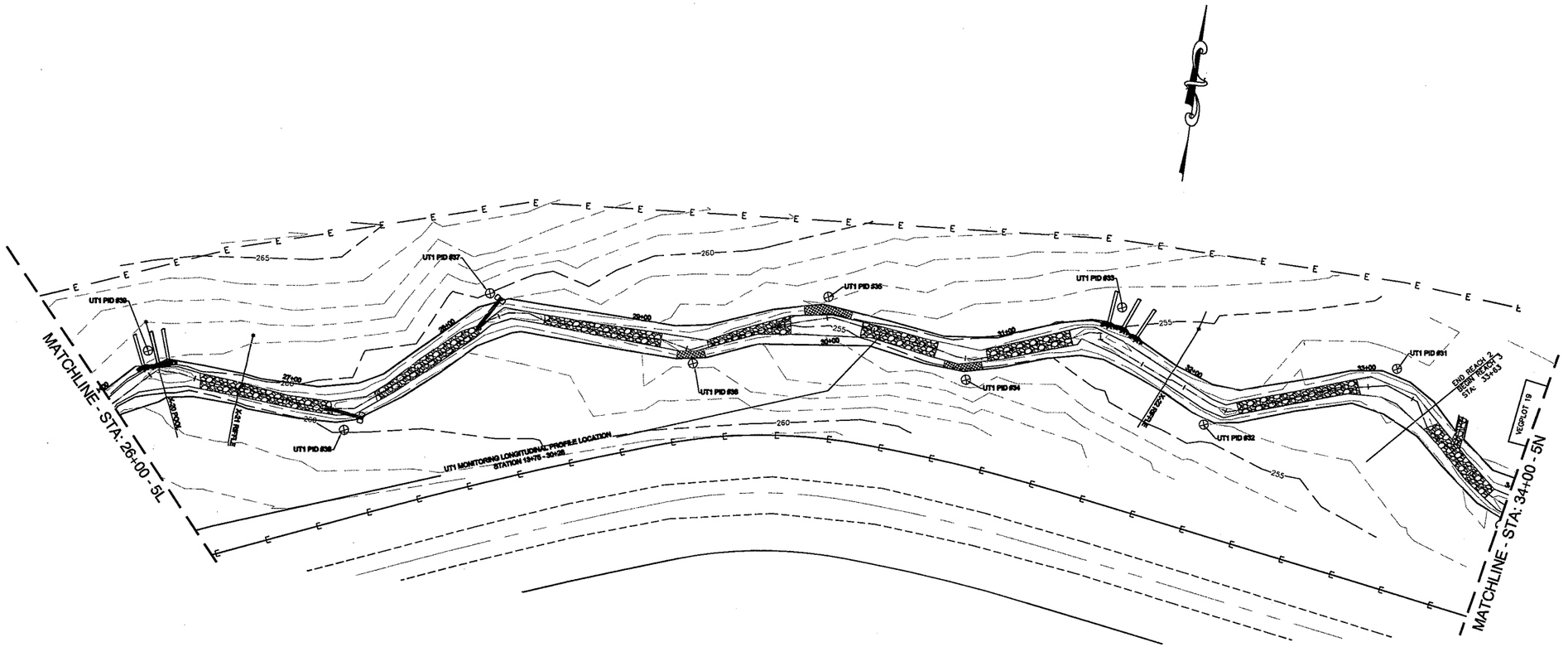

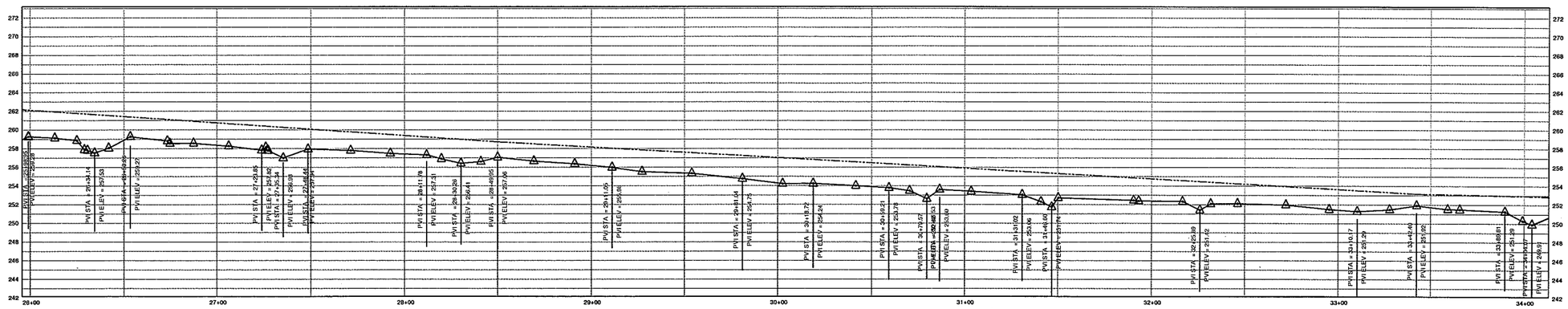

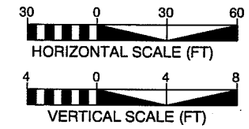

BIG CEDAR CREEK

UT1 AS-BUILT

BAKER PROJECT REFERENCE NO.	SHEET NO.
109261	5N

PROJECT ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 027337 ENGINEER KEVIN L. TWEDT

8-11-09

Baker
Michael Baker Engineering, Inc.
1447 South Tryon Street
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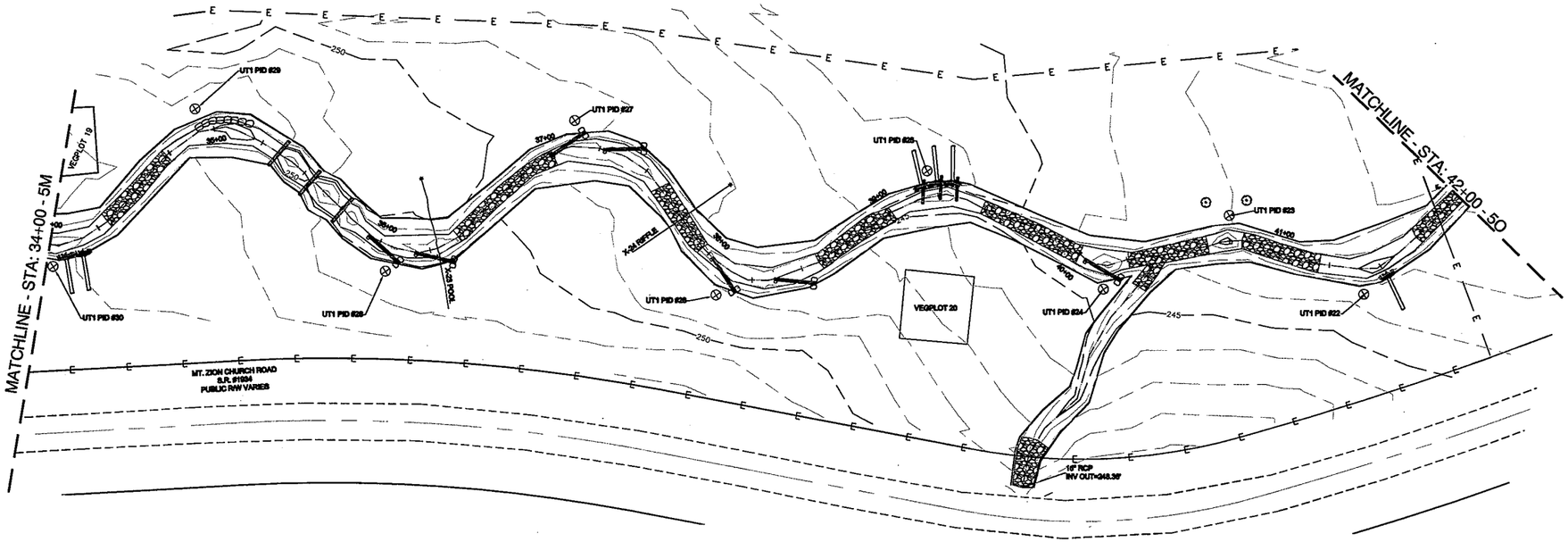

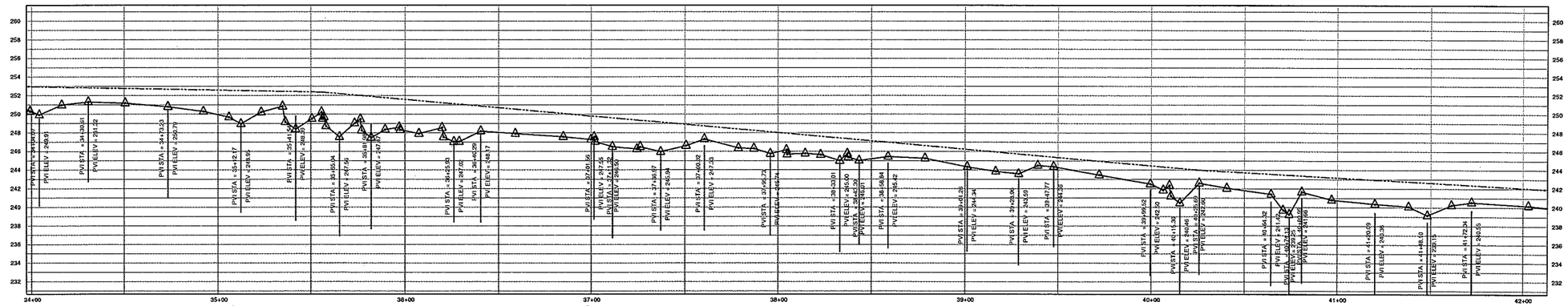

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HORIZONTAL SCALE (FT)

4 0 4 8
VERTICAL SCALE (FT)

BIG CEDAR CREEK

UT1 AS-BUILT

BAKER PROJECT REFERENCE NO.	SHEET NO.
109261	50

PROJECT ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 027337 ENGINEER KEVIN L. TWEERY

8-11-09

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Michael Baker Engineering, Inc.
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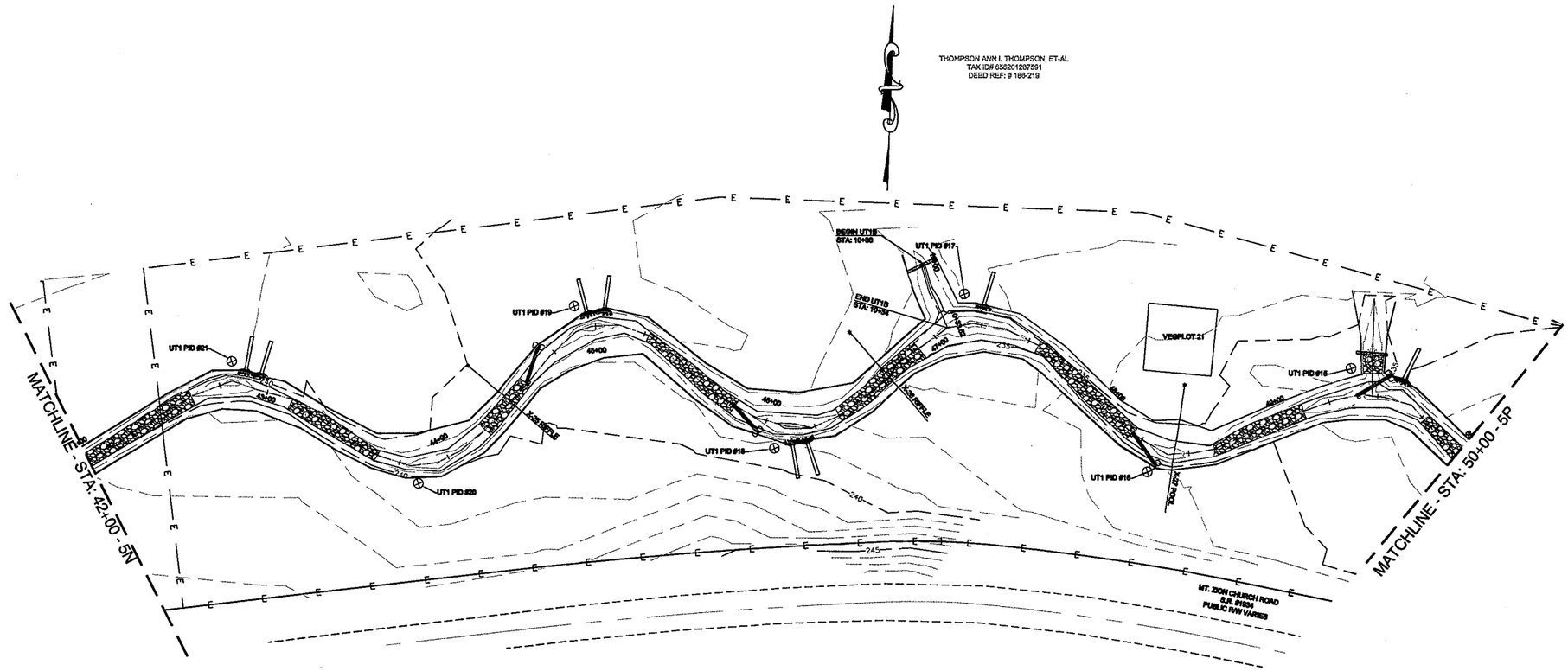

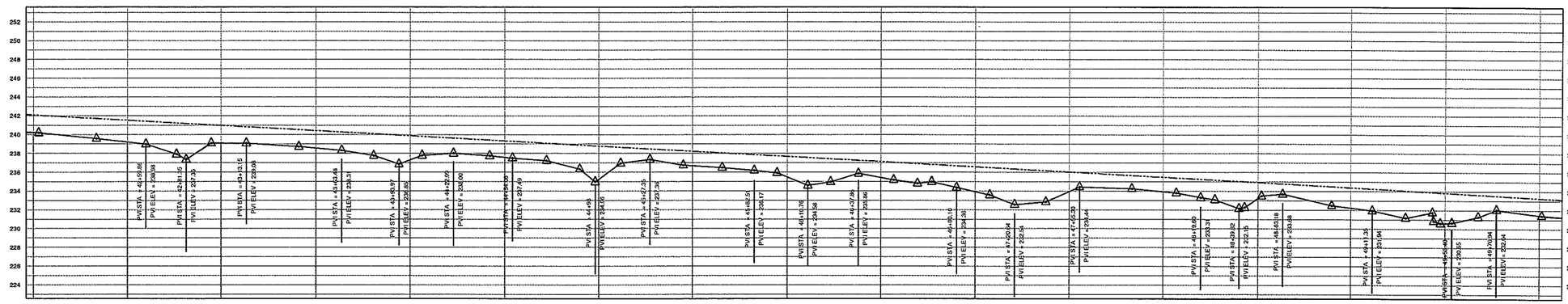

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HORIZONTAL SCALE (FT)

4 0 4 8
VERTICAL SCALE (FT)

BIG CEDAR CREEK

UT1 AS-BUILT

BAKER PROJECT REFERENCE NO.	SHEET NO.
109261	5P

PROJECT ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 027337 ENGINEER KEVIN L. TWEEDY

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Baker
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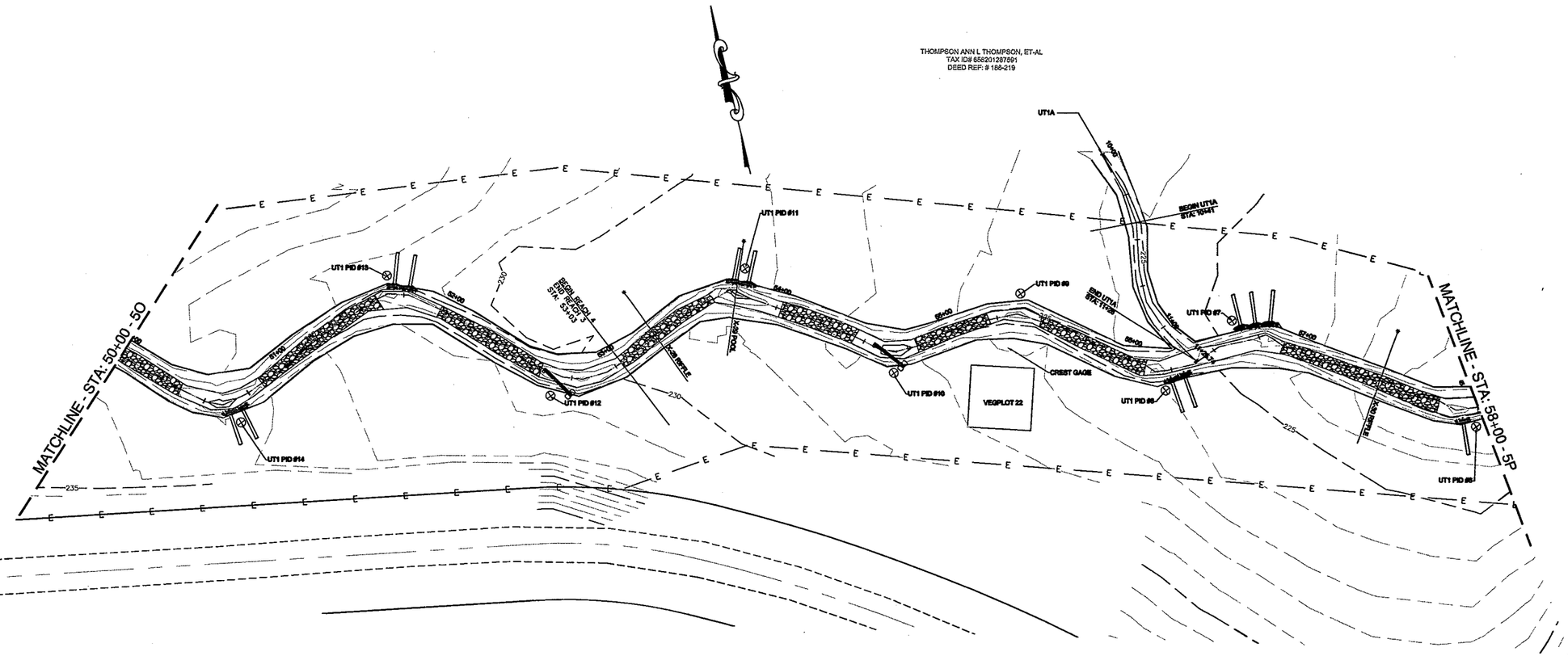

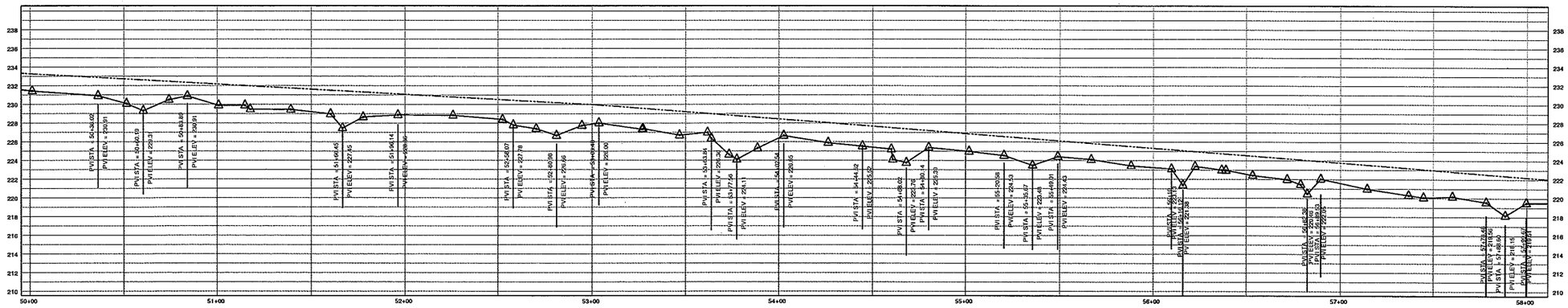

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HORIZONTAL SCALE (FT)

4 0 4 8
VERTICAL SCALE (FT)

BIG CEDAR CREEK

UT1 AS-BUILT

BAKER PROJECT REFERENCE NO.	SHEET NO.
109261	5Q

PROJECT ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 027337 ENGINEER KEVIN L. TWEDT

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Baker
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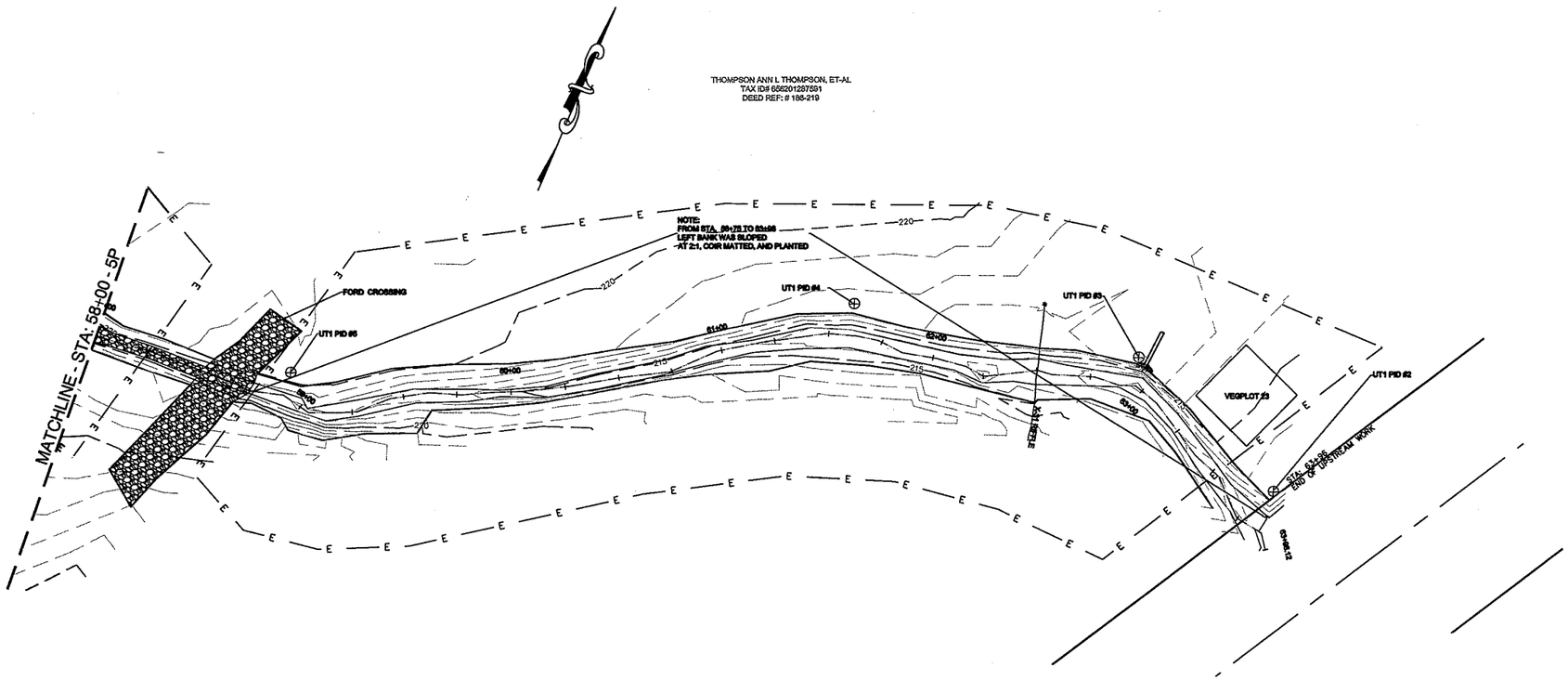

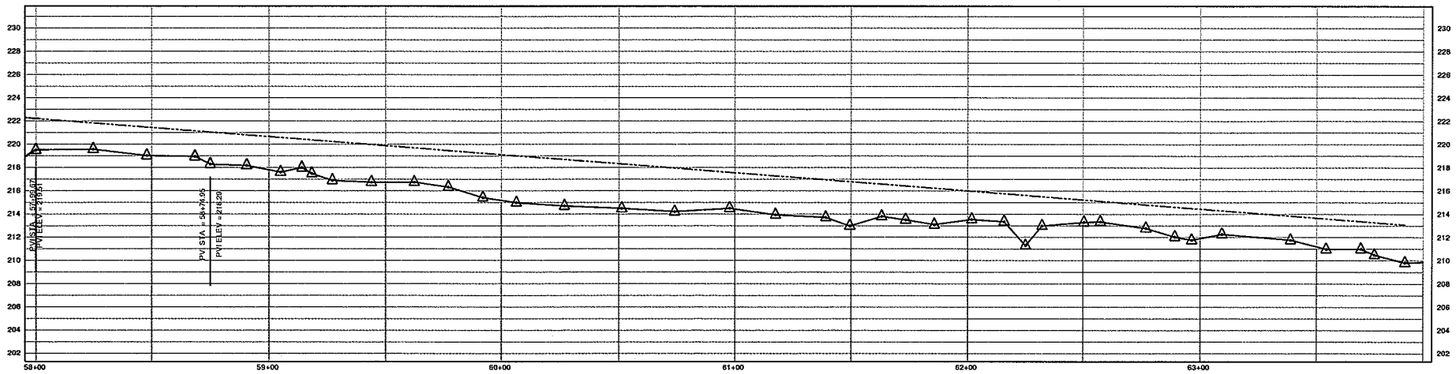

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HORIZONTAL SCALE (FT)

4 0 4 8
VERTICAL SCALE (FT)

BIG CEDAR CREEK

UT1 AS-BUILT

BAKER PROJECT REFERENCE NO.	SHEET NO.
109261	6A

PROJECT ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 027337 ENGINEER KEVIN L. TWEDT

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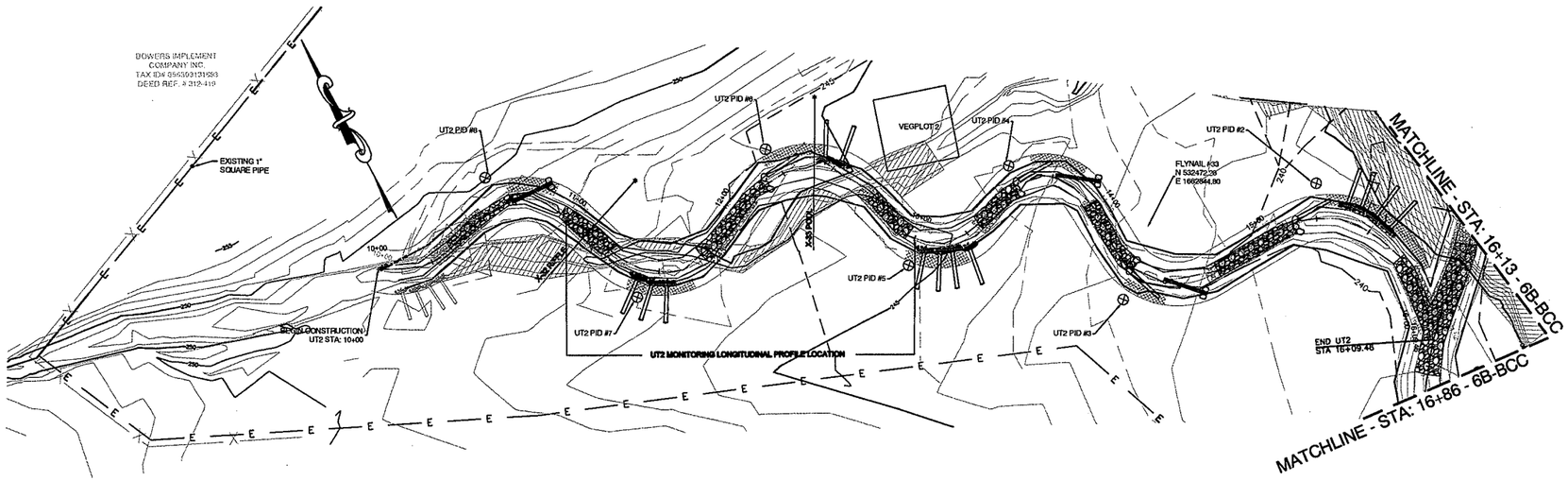

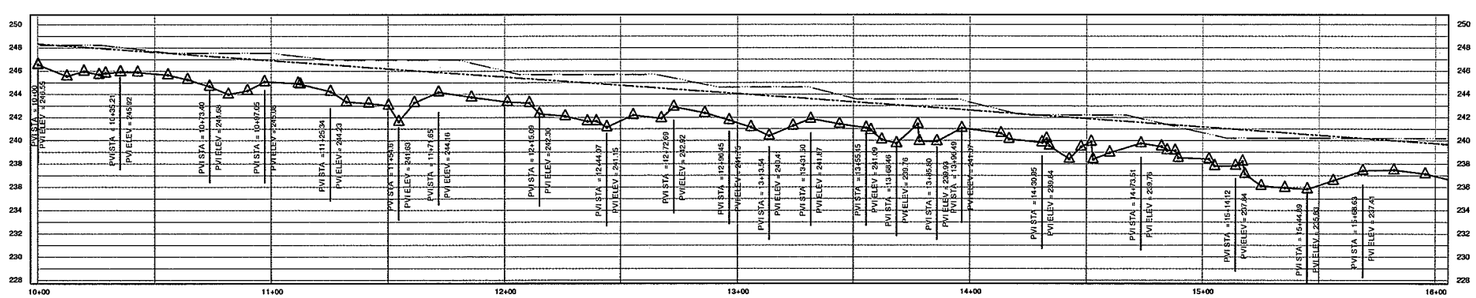

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HORIZONTAL SCALE (FT)

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VERTICAL SCALE (FT)

BIG CEDAR CREEK

UT2 AS-BUILT

BAKER PROJECT REFERENCE NO.	SHEET NO.
109261	6B

PROJECT ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 027337 ENGINEER KEVIN L. TWEEDY

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Baker
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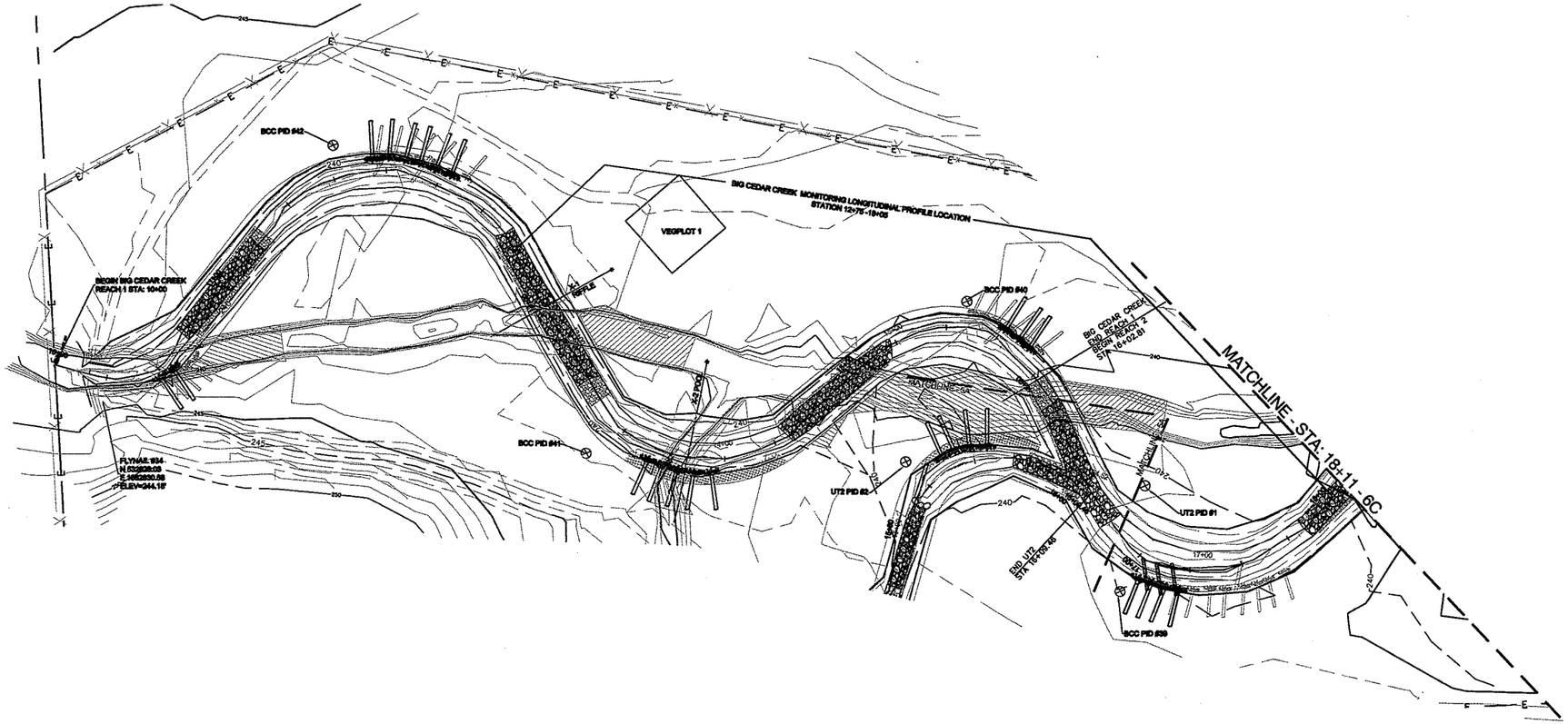

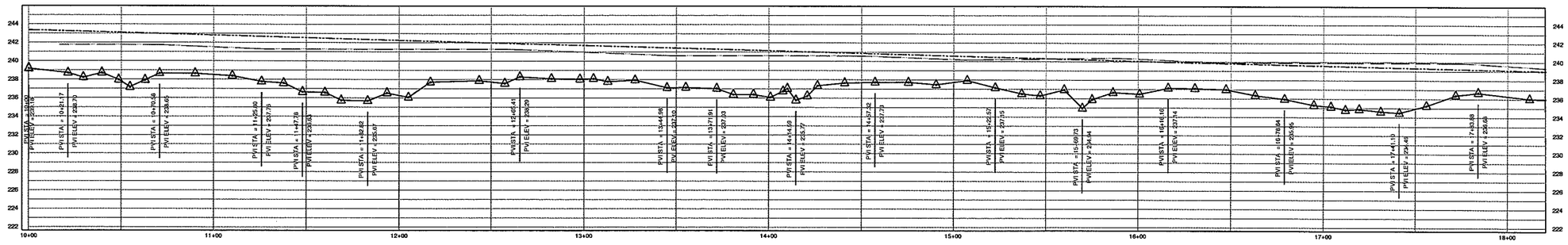

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VERTICAL SCALE (FT)

BIG CEDAR CREEK

BIG CEDAR CREEK
AS-BUILT

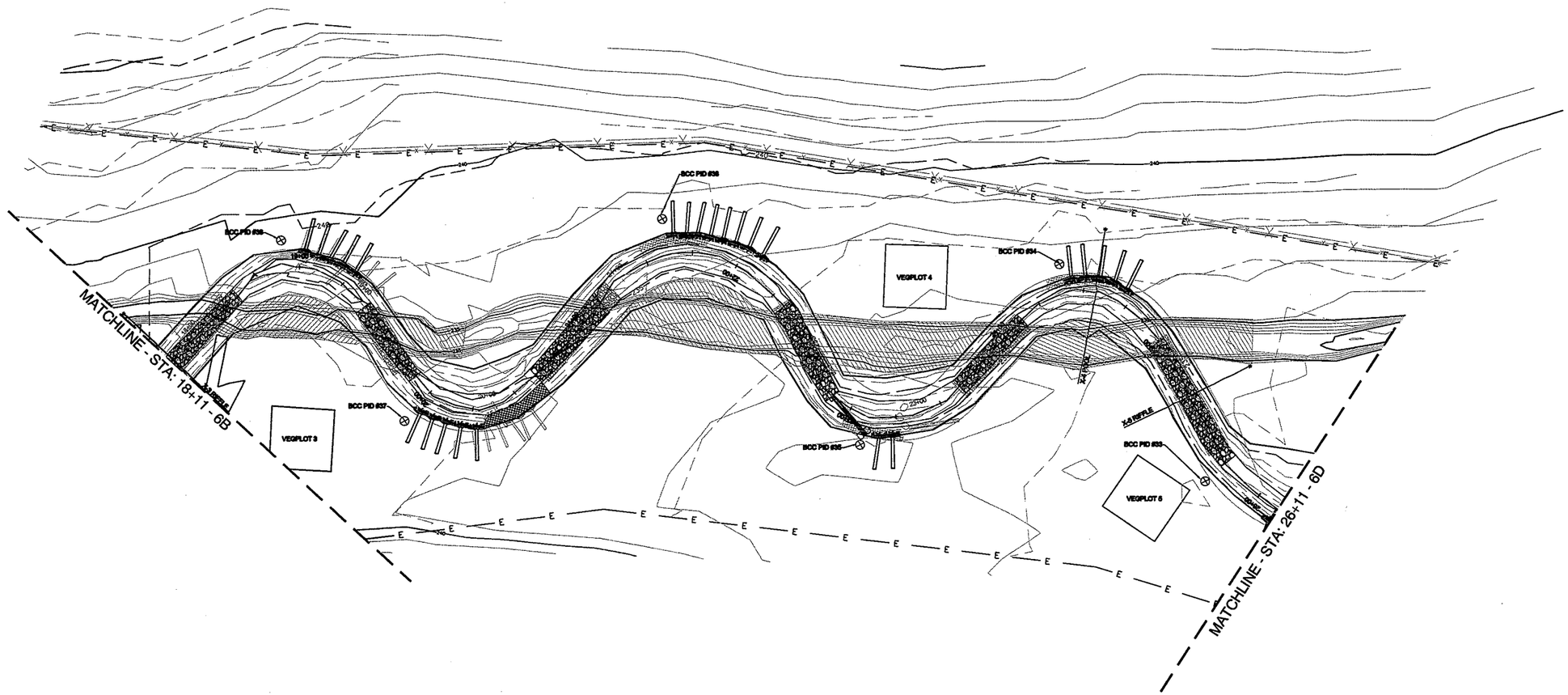
BAKER PROJECT REFERENCE NO.	SHEET NO.
109261	6C

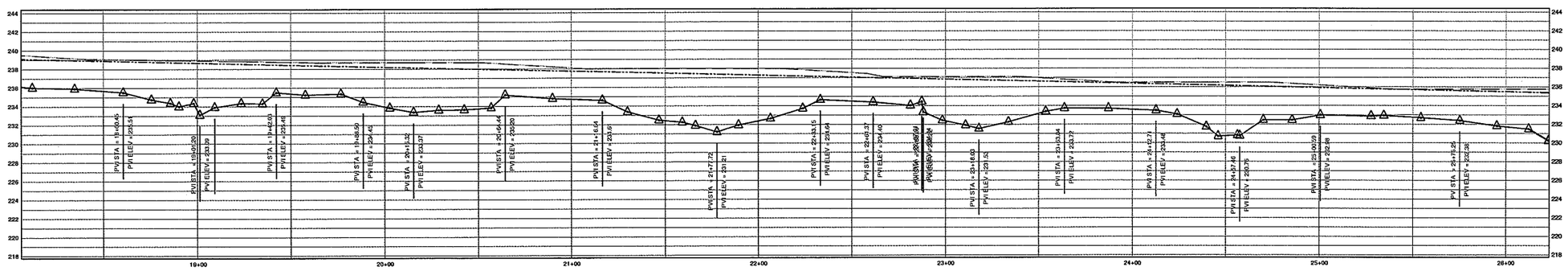
PROJECT ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 027337 ENGINEER KEVIN A. TWEEDY

8-11-09

Baker
Michael Baker Engineering, Inc.
1447 South Tryon Street
Suite 200
Charlotte, NC 28203
Phone: 704.334.4454
Fax: 704.334.4492





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HORIZONTAL SCALE (FT)

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VERTICAL SCALE (FT)

BIG CEDAR CREEK

BIG CEDAR CREEK
AS-BUILT

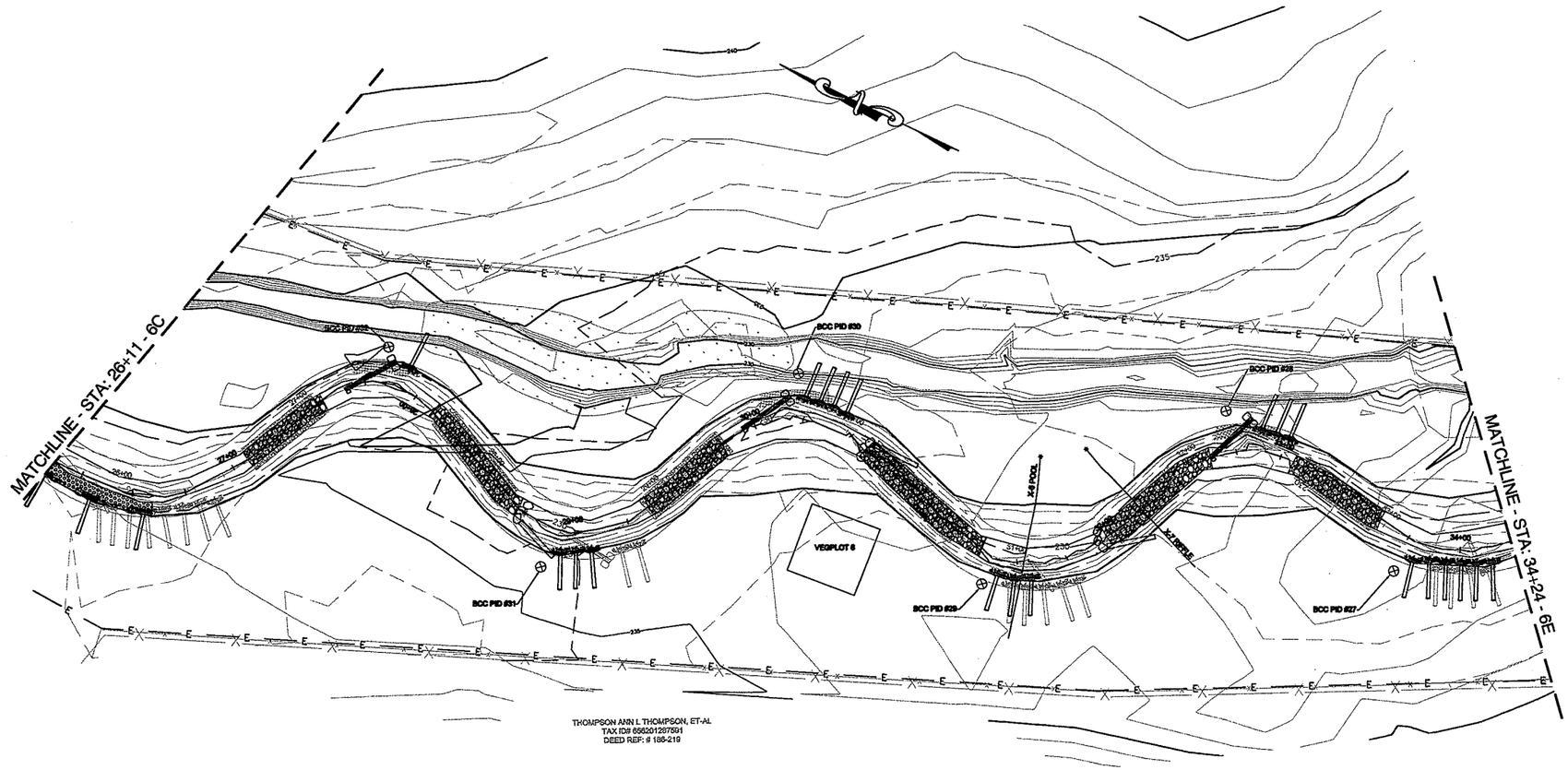
BAKER PROJECT REFERENCE NO.	SHEET NO.
109261	6D

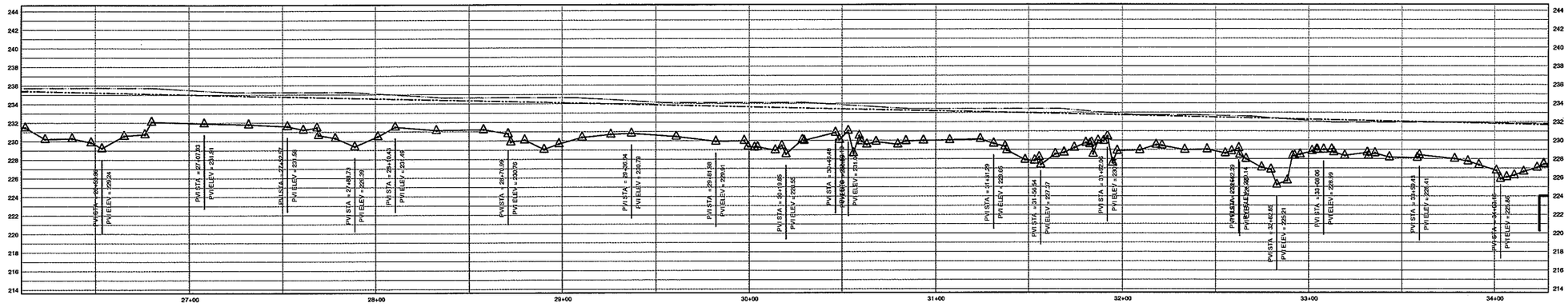
PROJECT ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 027337 ENGINEER KEVIN L. THOMPSON

8/11/09

Baker
Michael Baker Engineering, Inc.
1447 South Tryon Street
Suite 200
Charlotte, NC 28203
Phone: 704.334.4454
Fax: 704.334.4492





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HORIZONTAL SCALE (FT)

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VERTICAL SCALE (FT)

BIG CEDAR CREEK

BIG CEDAR CREEK
AS-BUILT

BAKER PROJECT REFERENCE NO.	SHEET NO.
109261	6E

PROJECT ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 027337 ENGINEER KEVIN L. TWEADY

8-11-09

Baker
Michael Baker Engineering, Inc.
1447 South Tryon Street
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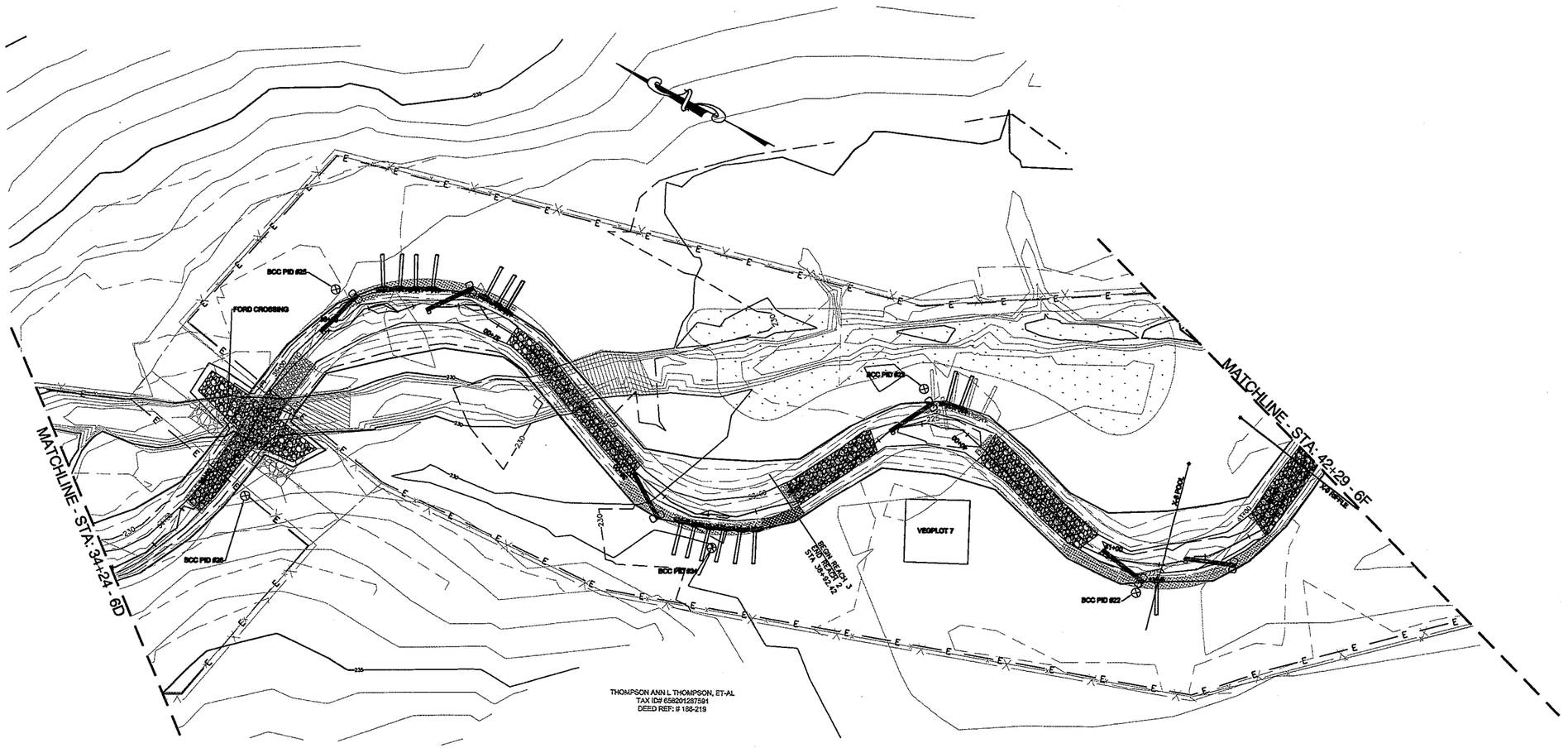
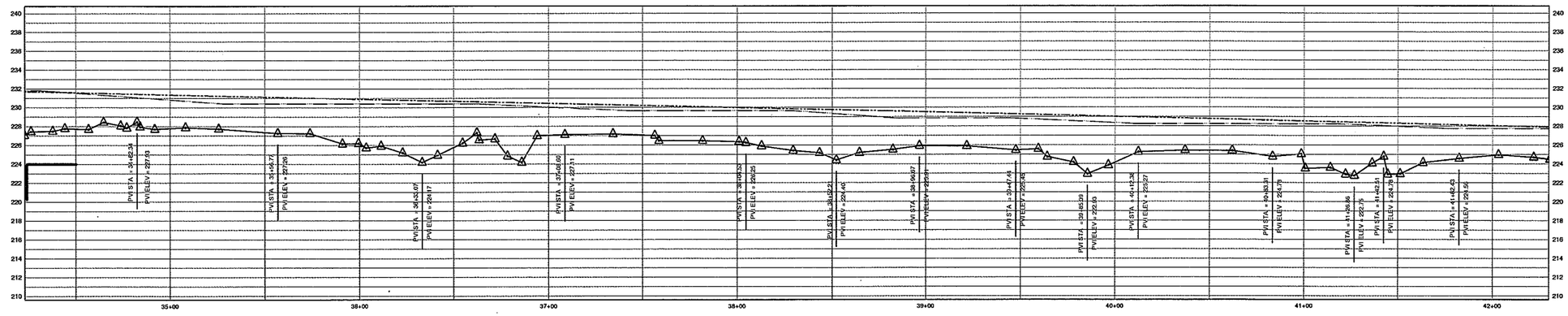
Fax: 704.334.4492





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HORIZONTAL SCALE (FT)

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VERTICAL SCALE (FT)

BIG CEDAR CREEK

BIG CEDAR CREEK
AS-BUILT

BAKER PROJECT REFERENCE NO.	SHEET NO.
109261	6F

PROJECT ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 027337 ENGINEER KEVIN W. TWEDDY

8-11-09

Baker
Michael Baker Engineering, Inc.
1447 South Tryon Street
Suite 200
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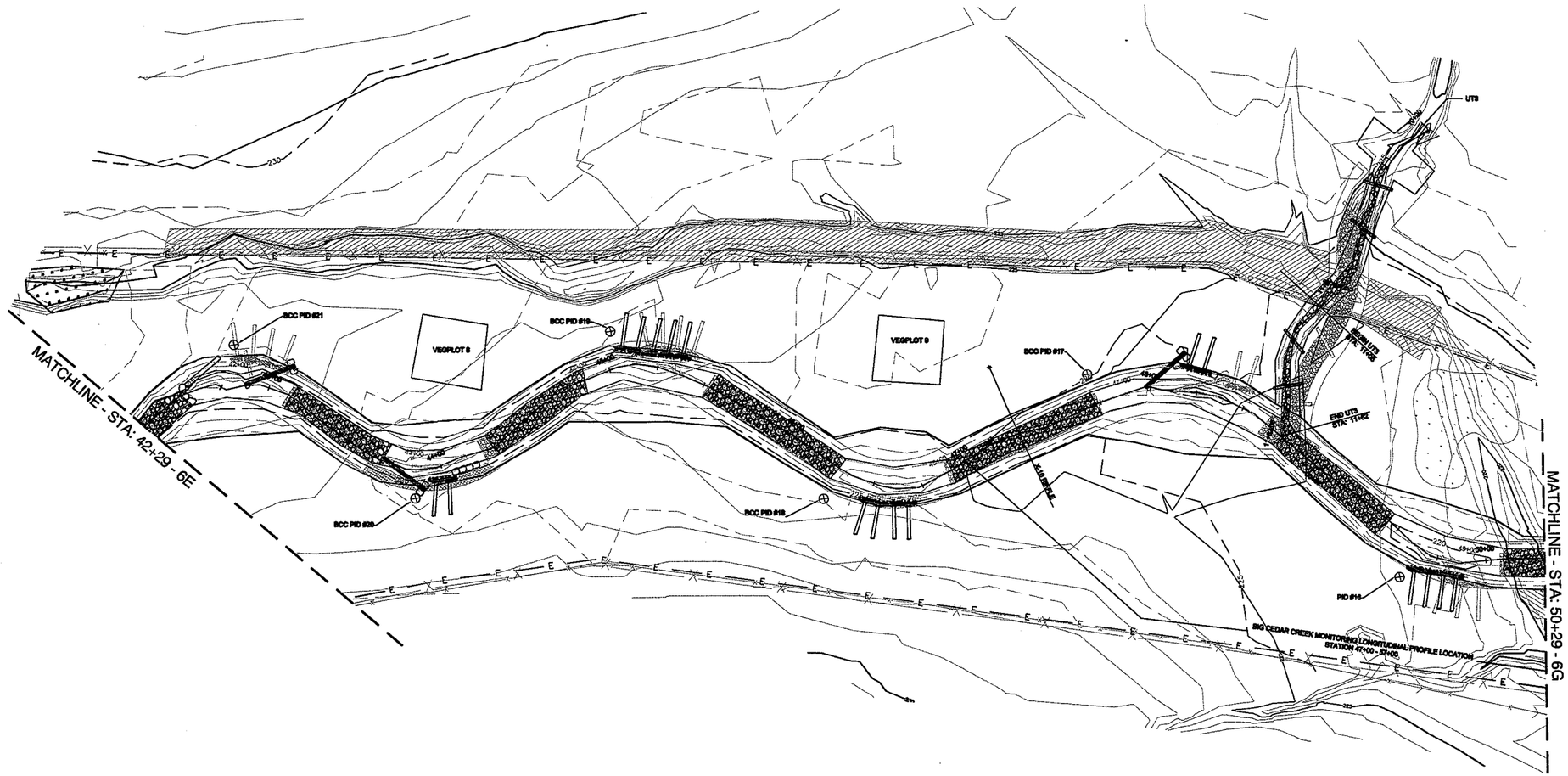
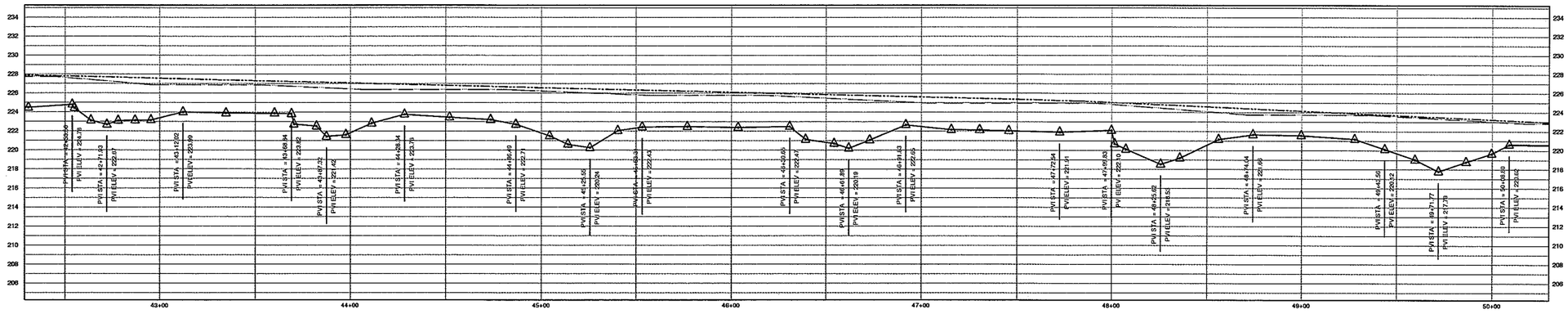
Phone: 704.334.4454
Fax: 704.334.4492





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HORIZONTAL SCALE (FT)

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VERTICAL SCALE (FT)

BIG CEDAR CREEK

BIG CEDAR CREEK
AS-BUILT

BAKER PROJECT REFERENCE NO.	SHEET NO.
109261	6G

PROJECT ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 027337 ENGINEER KEVIN L. JAMES

8-11-09

Baker
Michael Baker Engineering, Inc.
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Suite 200
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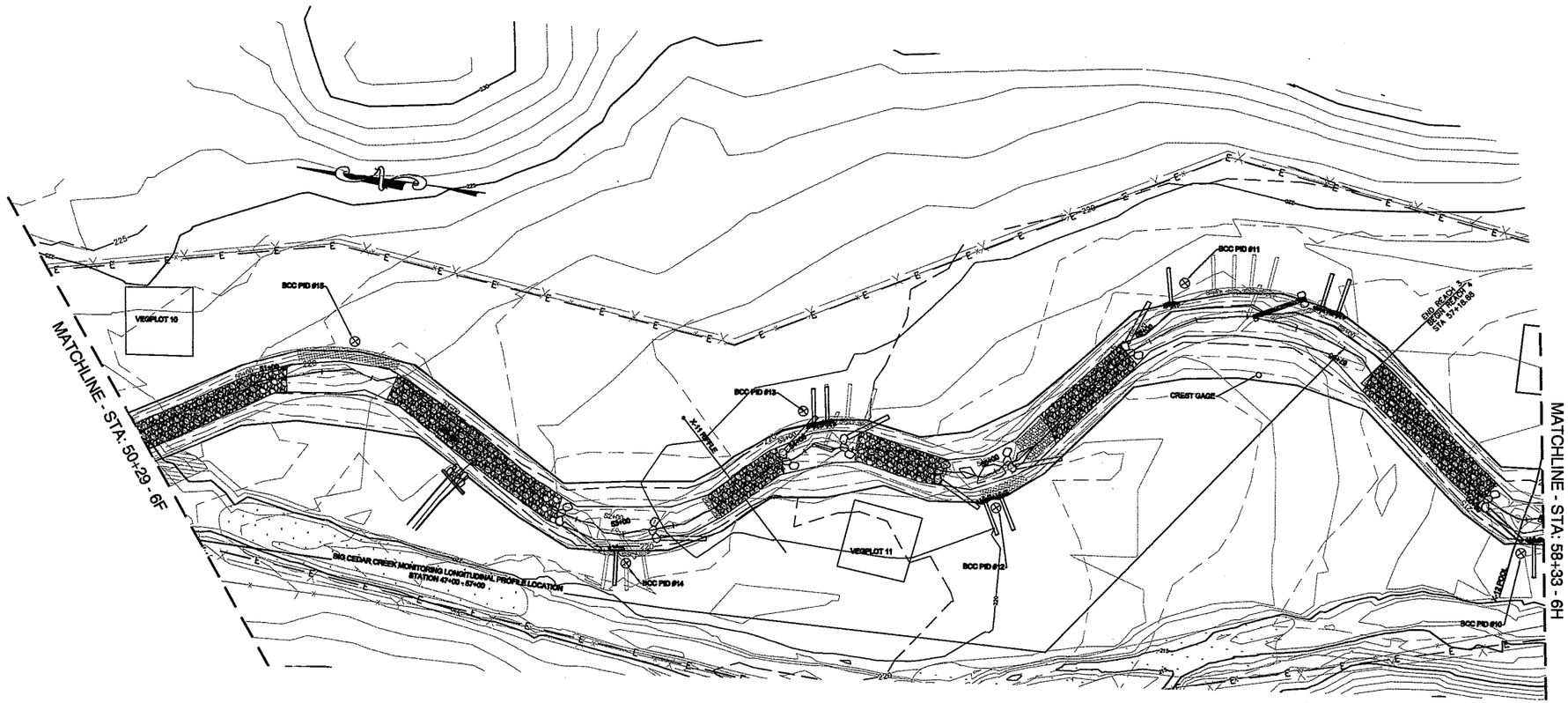

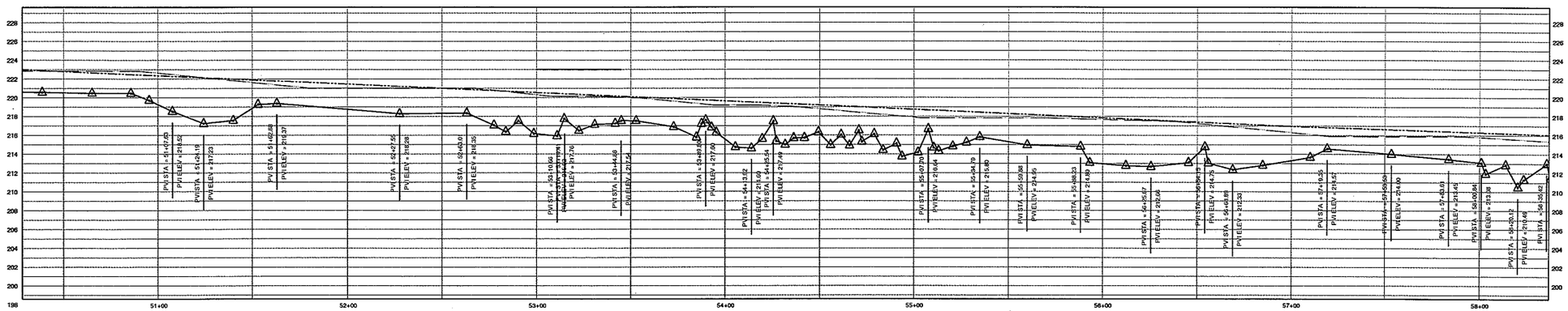

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HORIZONTAL SCALE (FT)

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VERTICAL SCALE (FT)

BIG CEDAR CREEK

BIG CEDAR CREEK
AS-BUILT

BAKER PROJECT REFERENCE NO.	SHEET NO.
109261	6H

PROJECT ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 027337 ENGINEER KEVIN L. INGRAM

3-11-09

Baker
Michael Baker Engineering, Inc.
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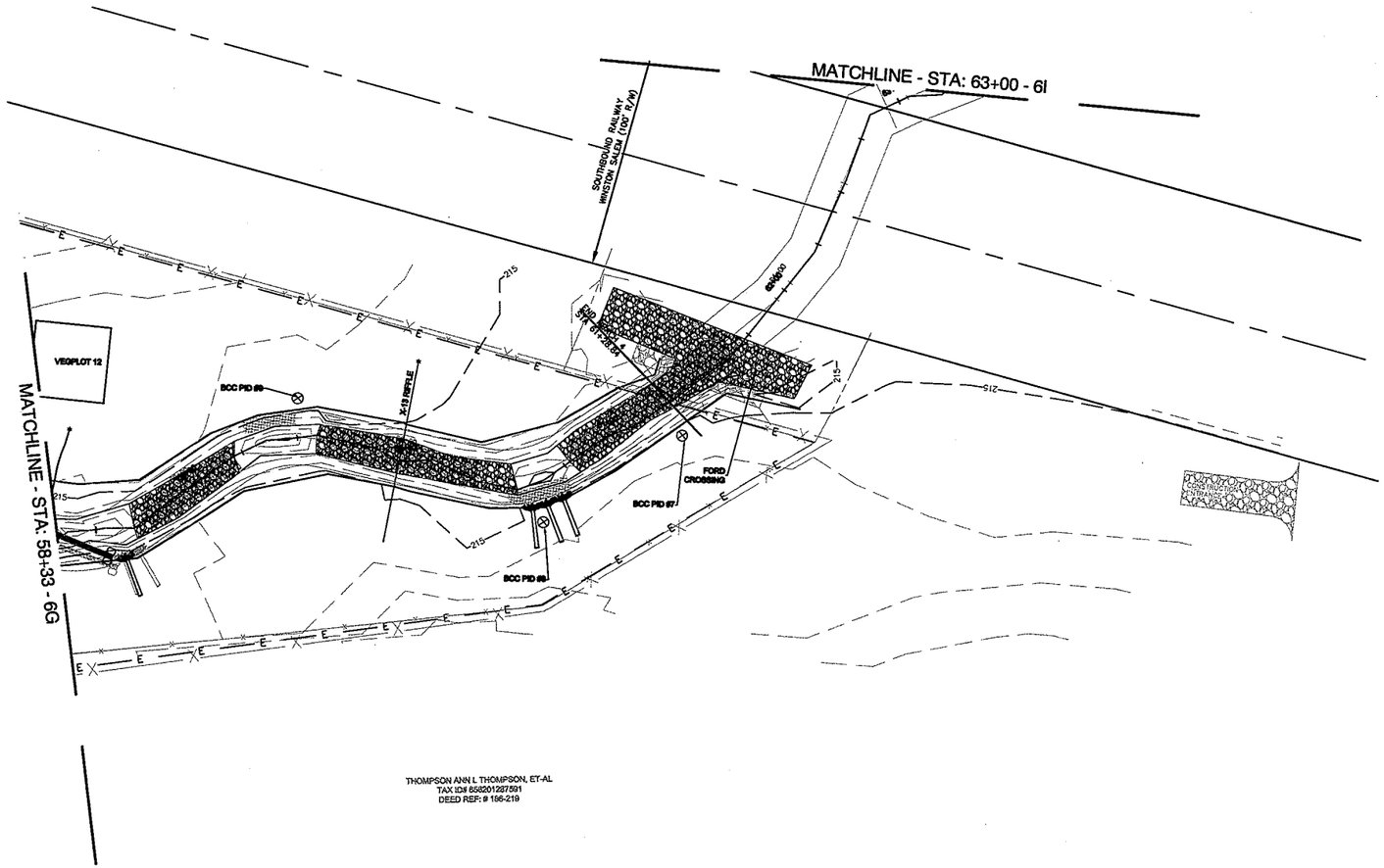
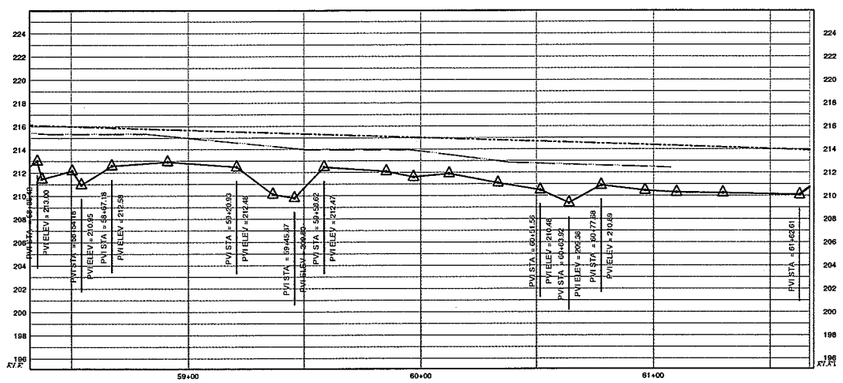
Fax: 704.334.4492





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HORIZONTAL SCALE (FT)

4 0 4 8
VERTICAL SCALE (FT)

BIG CEDAR CREEK

BIG CEDAR CREEK
AS-BUILT

BAKER PROJECT REFERENCE NO.	SHEET NO.
109261	61

PROJECT ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 027337 ENGINEER KEVIN L. TWEEDY

8-11-09

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DORIS L. WEST AND J. FRANK WEST

DORIS L. WEST AND J. FRANK WEST
TAX ID# 6562014499021
DEED REF: # 259-432

MATCHLINE - STA: 63+00 - 6H

MATCHLINE - STA: 73+00 - 6J

BEGIN REACH 5 STA: 65+20

END UT1 REACH 4 DOWNSTREAM STA: 69+17

BEGIN DOWNSTREAM RESTORATION STA: 66+34

UT1 REACH 4

UT1 PID #3

BCC PID #5

BCC PID #4

VEGPLOT 13

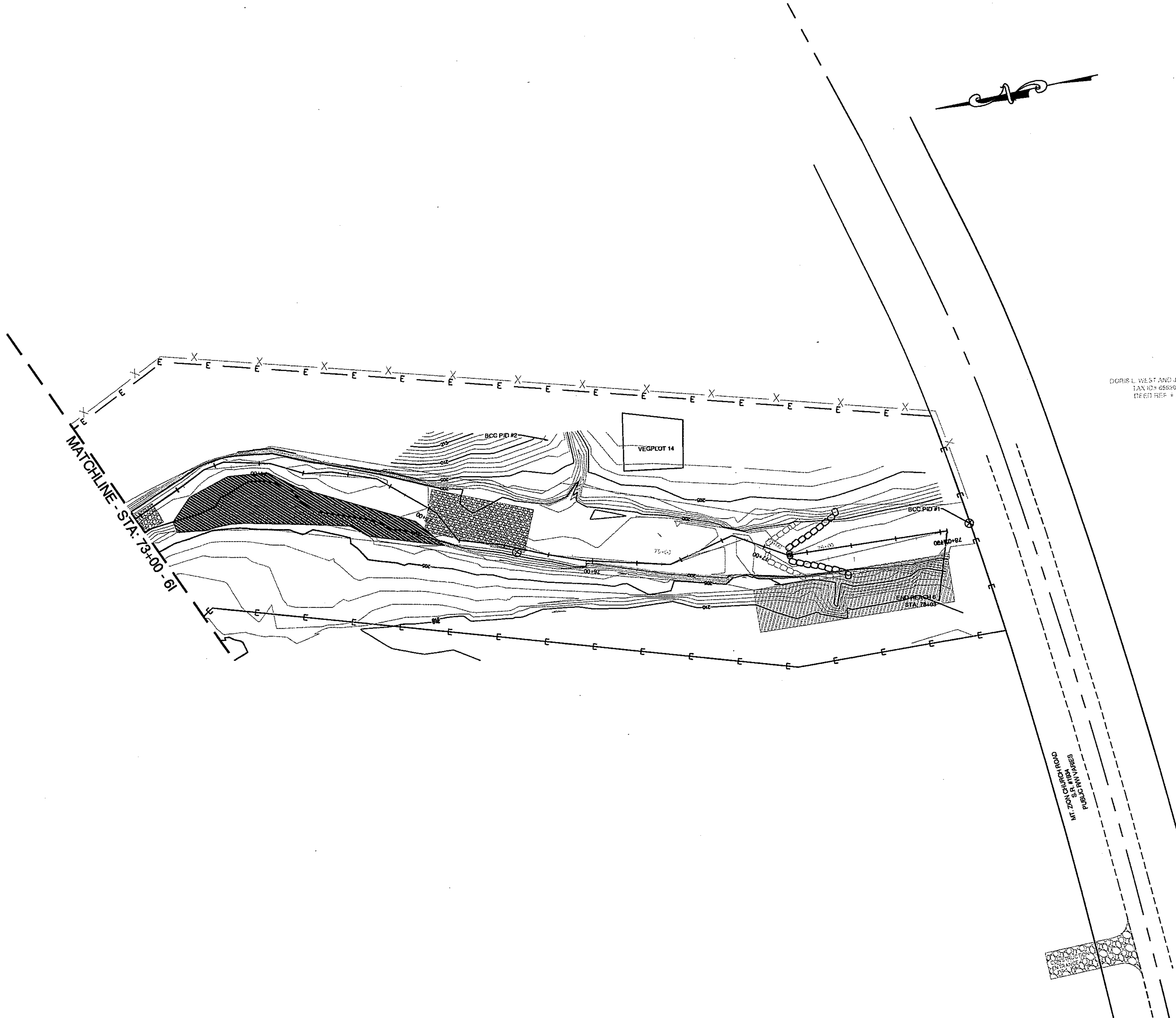
SOUTHBOUND RAILWAY WINSTON SALEM (100' R/W)

DORIS L. WEST AND J. FRANK WEST
TAX ID# 6562014499021
DEED REF: # 259-432

30 0 30 60
HORIZONTAL SCALE (FT)

BIG CEDAR CREEK

BIG CEDAR CREEK
AS-BUILT



BAKER PROJECT REFERENCE NO.	SHEET NO.
109261	6J

PROJECT ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 027337 ENGINEER KEVIN L. TWEEDY

8-11-09

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Fax: 704.334.4492

BIG CEDAR CREEK

BIG CEDAR CREEK
AS-BUILT

BAKER PROJECT REFERENCE NO.	SHEET NO.
109261	6K

PROJECT ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 027337 ENGINEER STEVEN V. TWEART

8-11-09

Baker
Michael Baker Engineering, Inc.
1447 South Tryon Street
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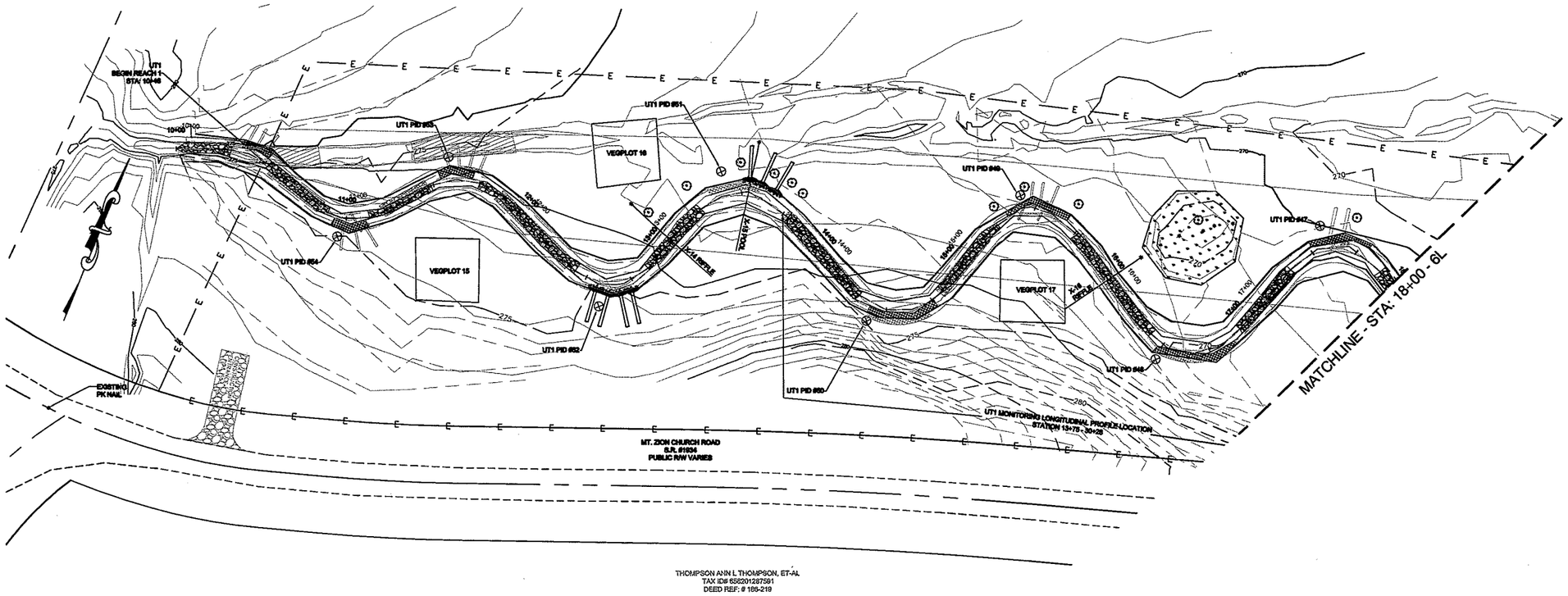

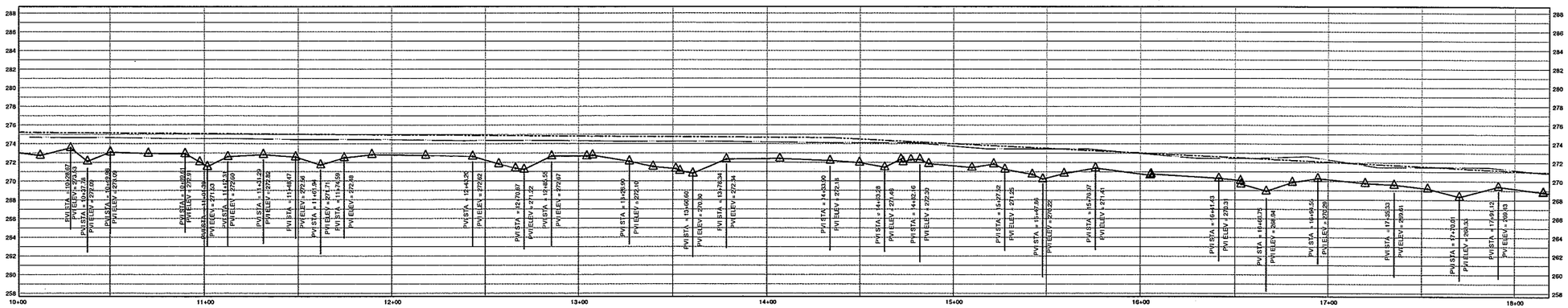

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HORIZONTAL SCALE (FT)

4 0 4 8
VERTICAL SCALE (FT)

BIG CEDAR CREEK

UT1 AS-BUILT

BAKER PROJECT REFERENCE NO.	SHEET NO.
109261	6L

PROJECT ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 027337 ENGINEER KEVIN L. WEST

5-11-09

Baker
Michael Baker Engineering, Inc.
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Charlotte, NC 28203
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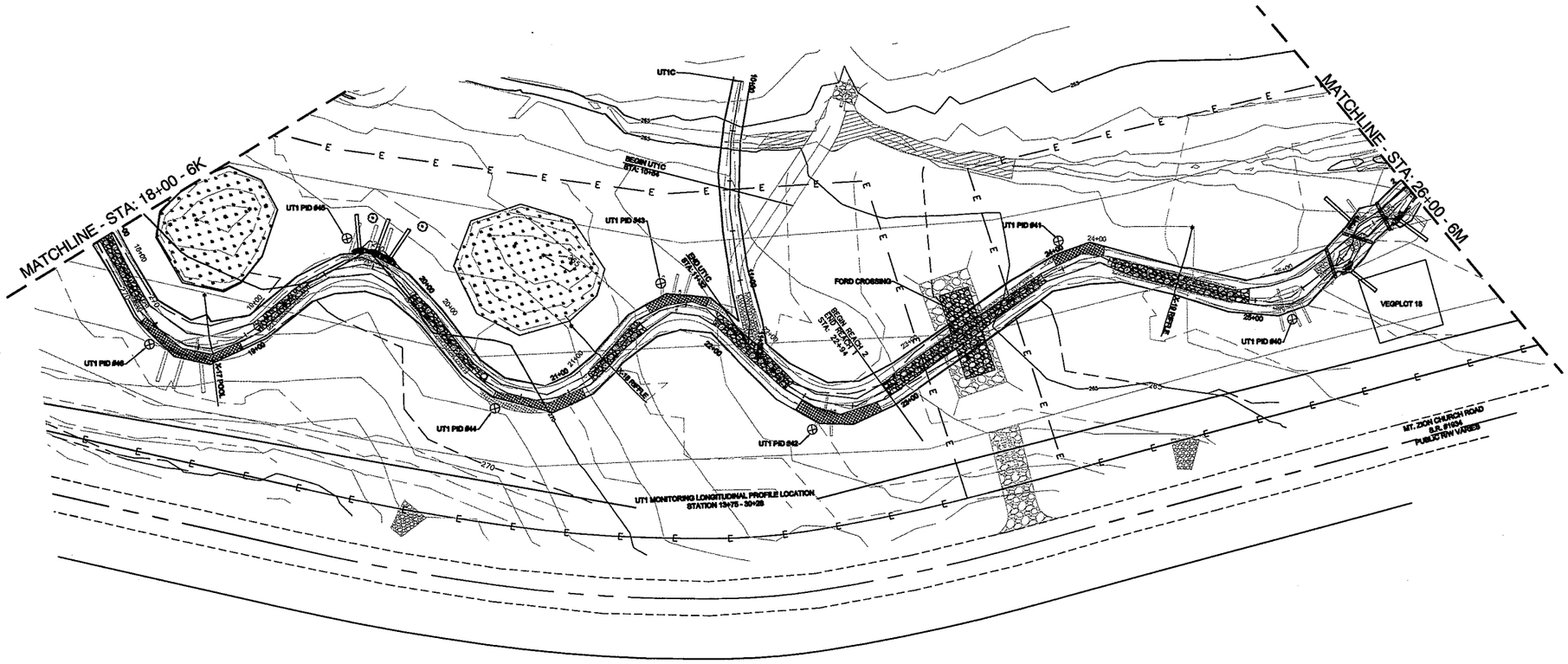
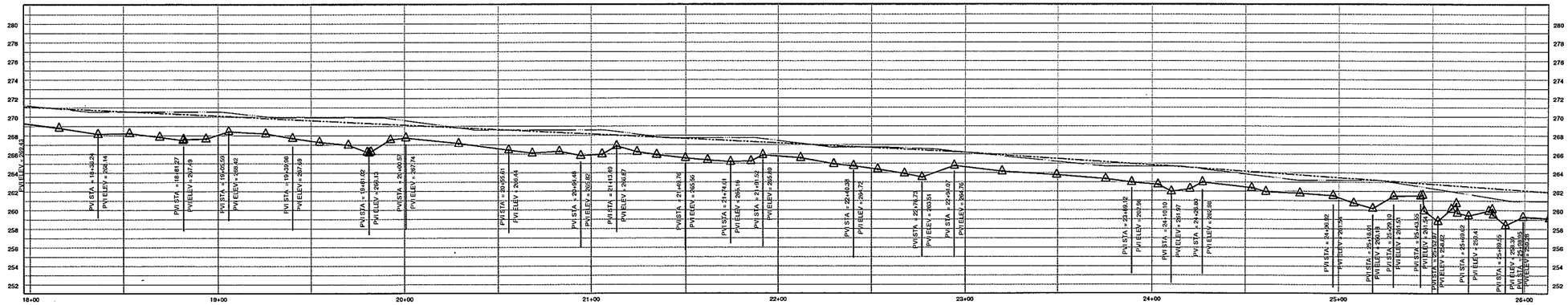
Fax: 704.334.4492





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HORIZONTAL SCALE (FT)

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VERTICAL SCALE (FT)

BIG CEDAR CREEK

UT1 AS-BUILT

BAKER PROJECT REFERENCE NO.	SHEET NO.
109261	6M

PROJECT ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 027337 ENGINEER KEVIN I. TWEEDY

8-11-09

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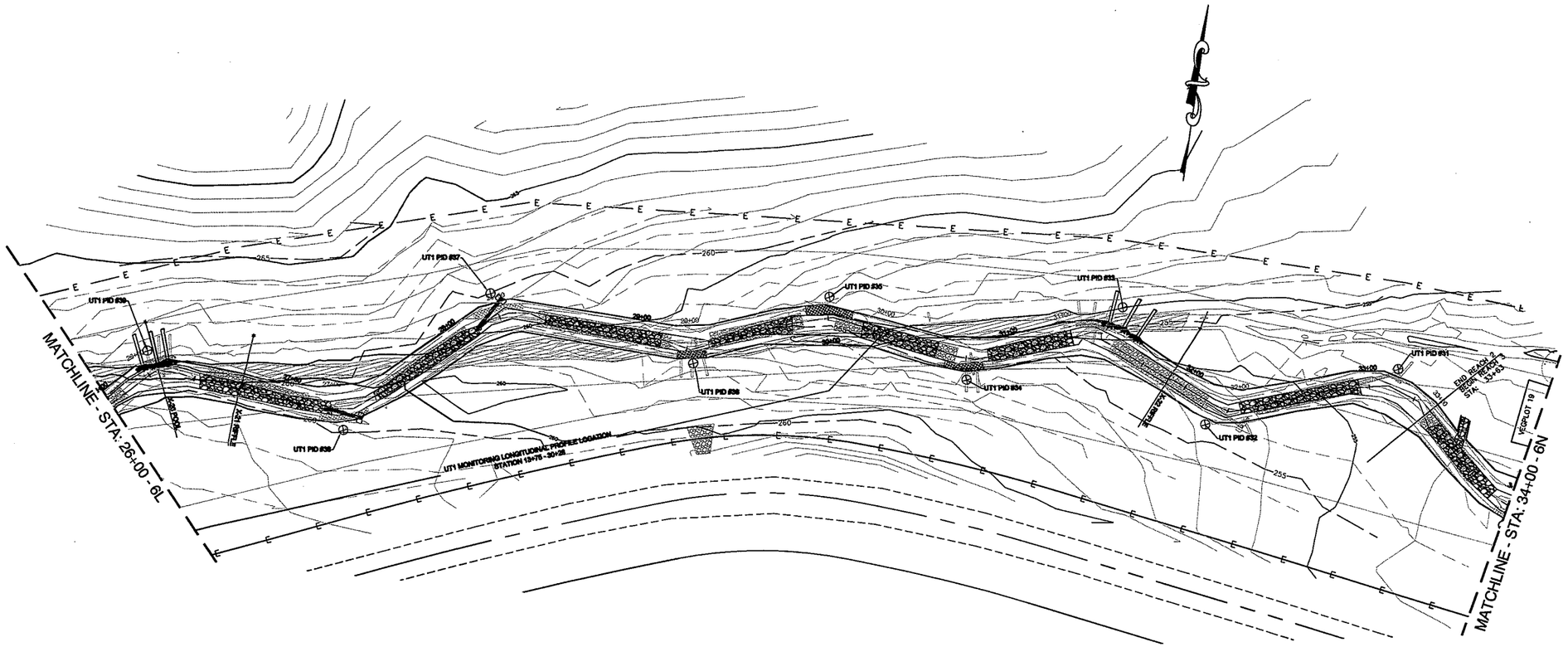

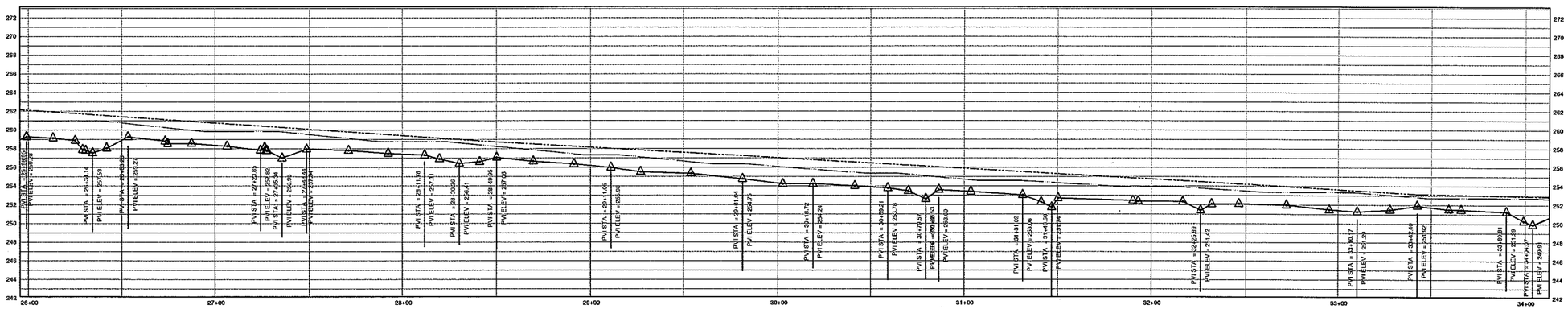

30 0 30 60
HORIZONTAL SCALE (FT)

4 0 4 8
VERTICAL SCALE (FT)

BIG CEDAR CREEK

UT1 AS-BUILT

BAKER PROJECT REFERENCE NO.	SHEET NO.
109261	6N

PROJECT ENGINEER

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8-11-09

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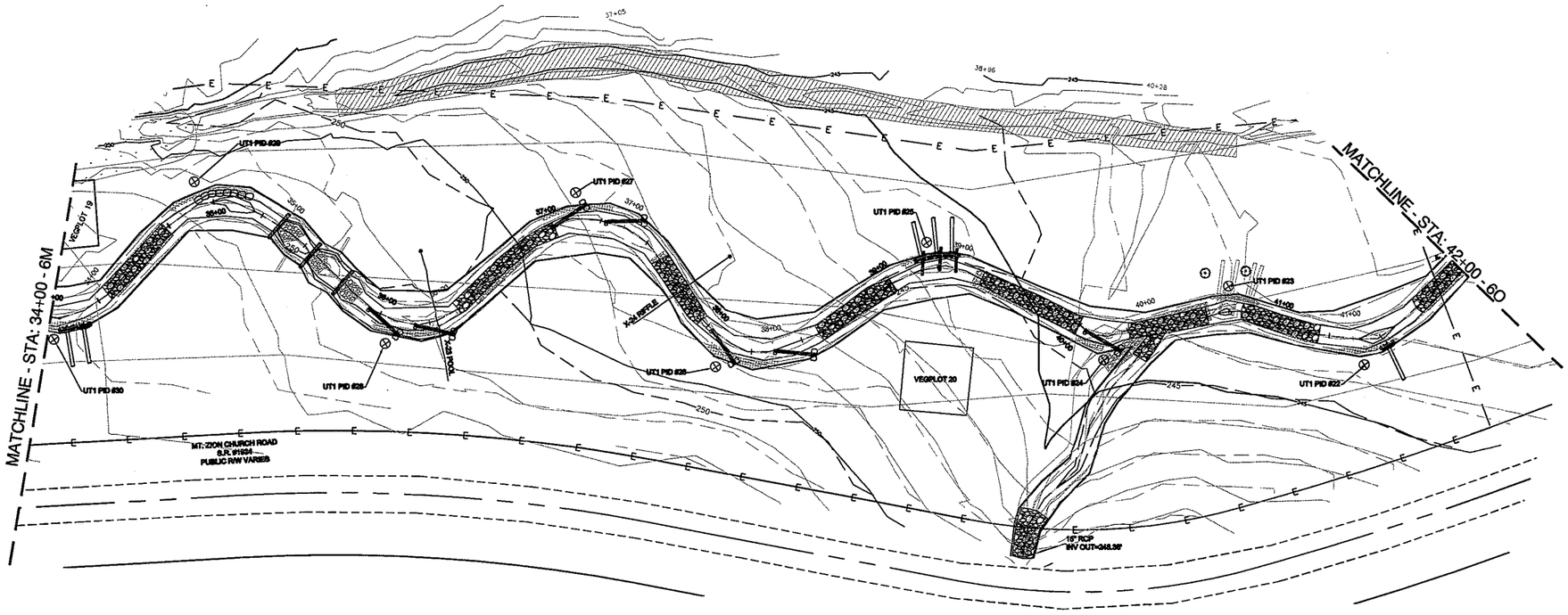

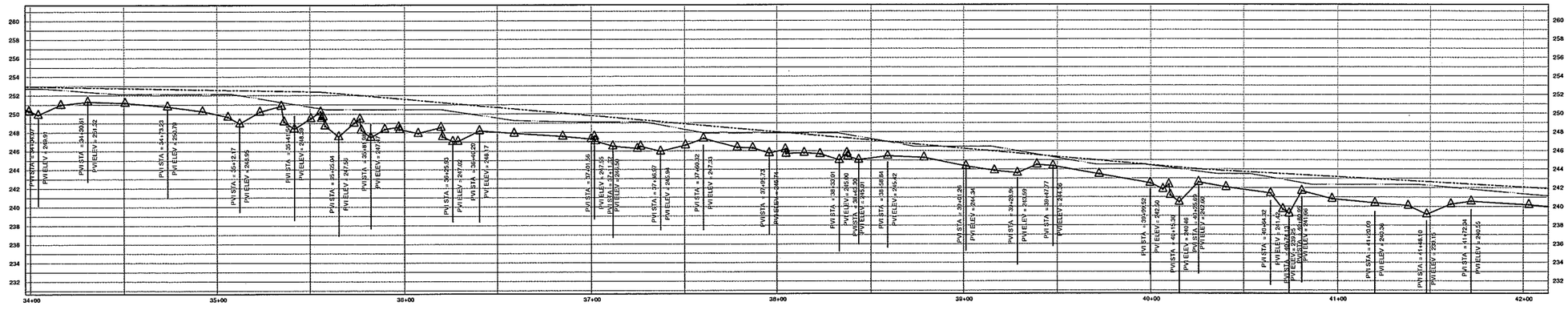

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HORIZONTAL SCALE (FT)

4 0 4 8
VERTICAL SCALE (FT)

BIG CEDAR CREEK

UT1 AS-BUILT

BAKER PROJECT REFERENCE NO.	SHEET NO.
109261	60

PROJECT ENGINEER

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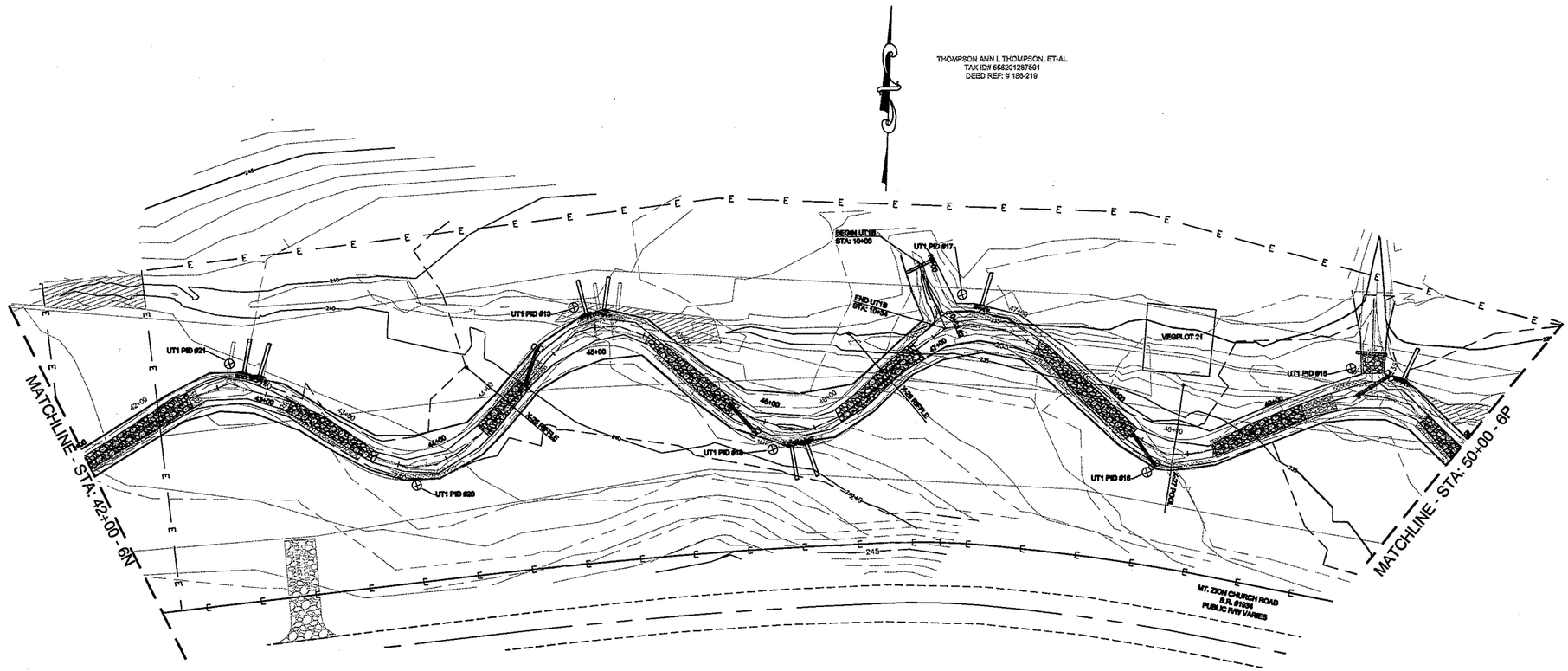

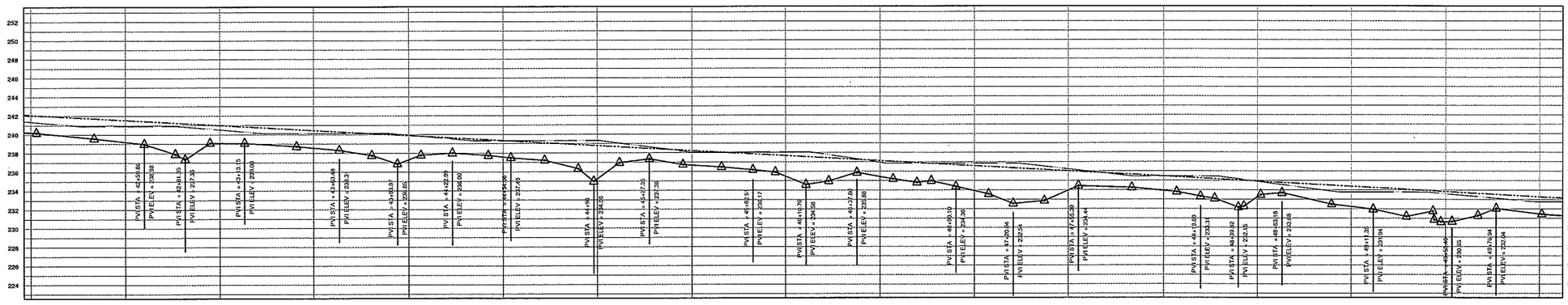

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HORIZONTAL SCALE (FT)

4 0 4 8
VERTICAL SCALE (FT)

BIG CEDAR CREEK

UT1 AS-BUILT

BAKER PROJECT REFERENCE NO.	SHEET NO.
109261	6P

PROJECT ENGINEER

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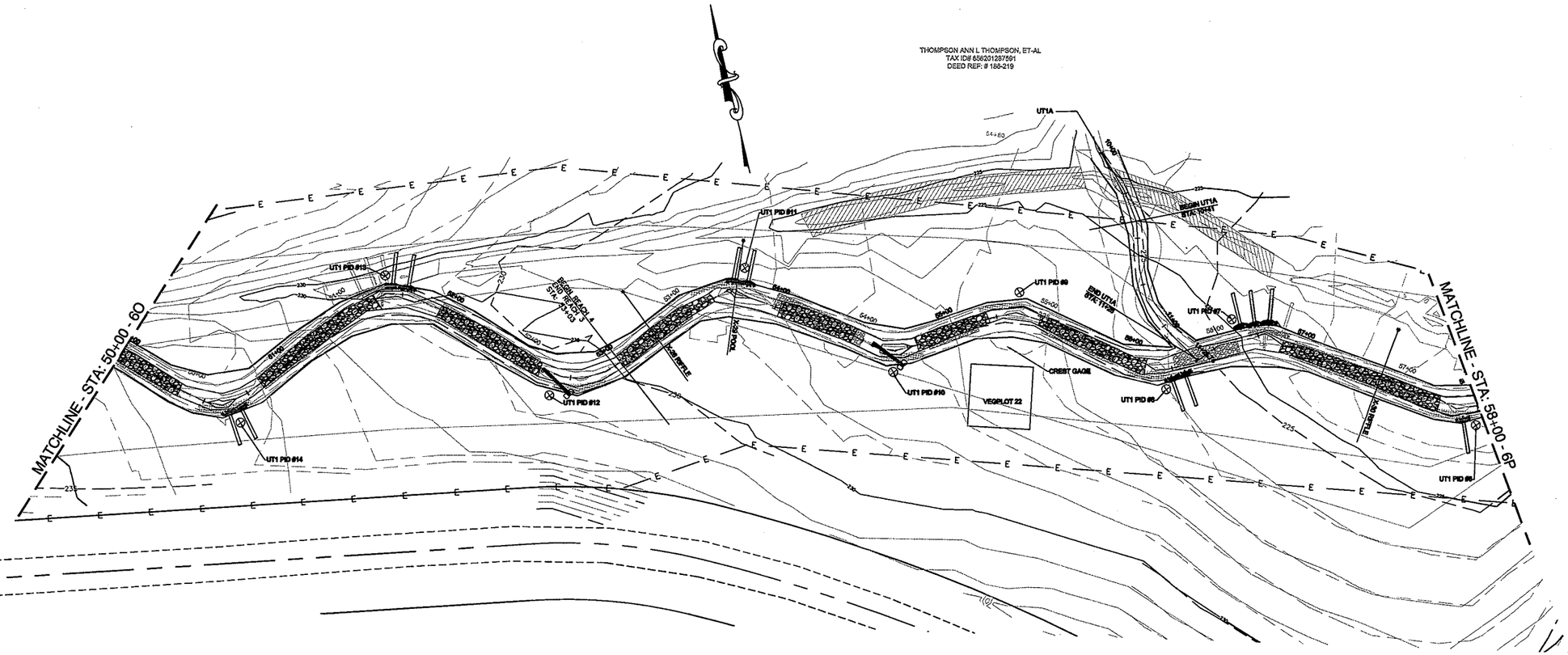

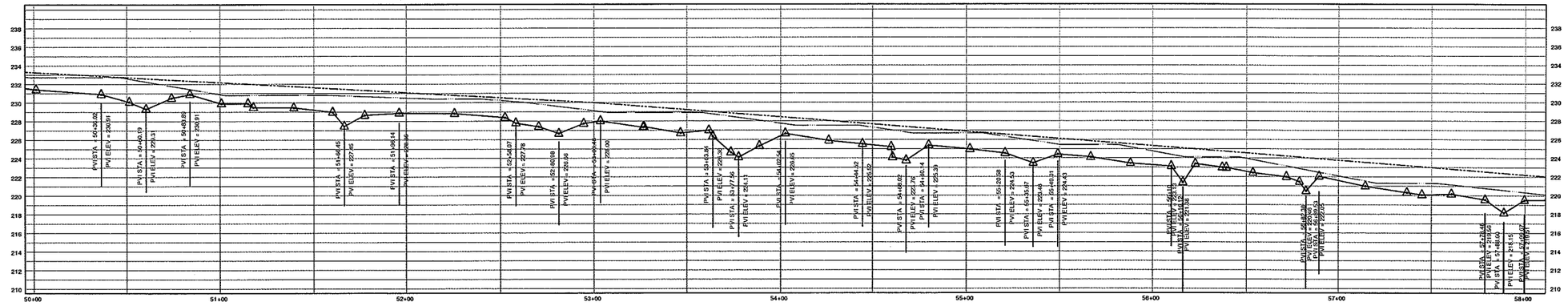

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HORIZONTAL SCALE (FT)

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VERTICAL SCALE (FT)

BIG CEDAR CREEK

UT1 AS-BUILT

BAKER PROJECT REFERENCE NO.	SHEET NO.
109261	6Q

PROJECT ENGINEER

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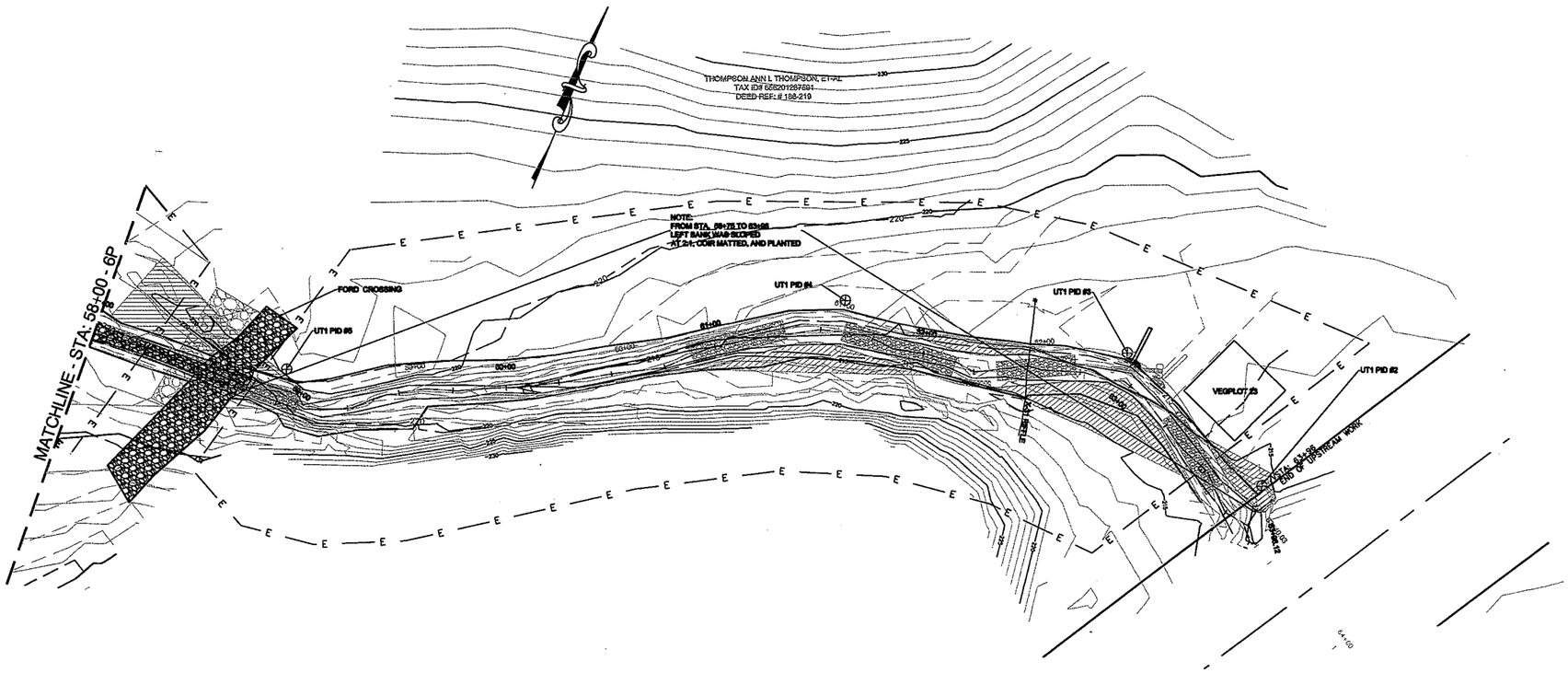

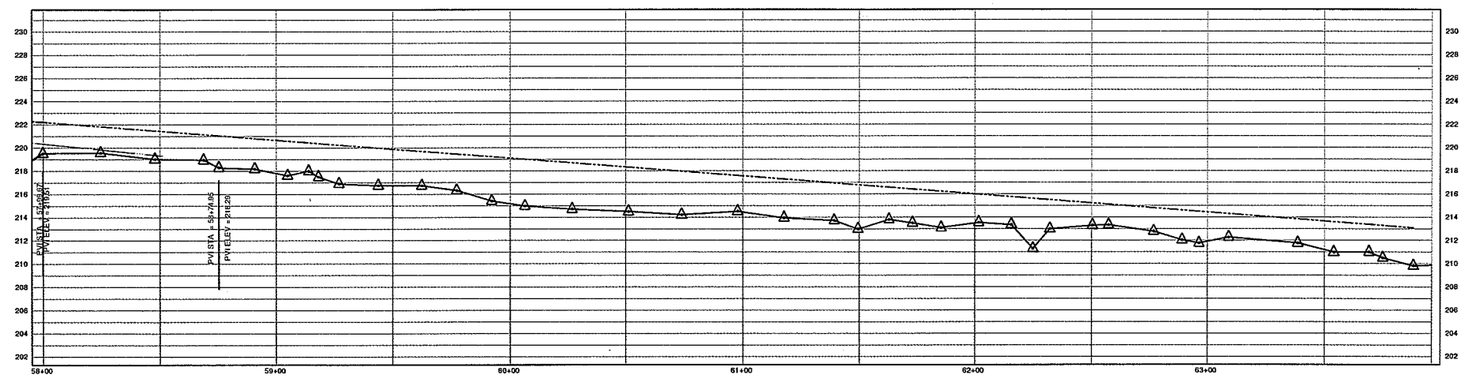

30 0 30 60
HORIZONTAL SCALE (FT)

4 0 4 8
VERTICAL SCALE (FT)

BIG CEDAR CREEK

UT1 AS-BUILT

APPENDIX E
PHOTO ID LOG

Big Cedar Creek Photos

BCC P1D 1– Cross Vane, BCC Reach 6 End

BCC PID 2 – Re-graded Riffle, BCC Reach 6

BCC PID 3 –Existing Riffle, BCC Reach 6

BCC PID 4 – Re-graded Riffle, BCC Reach 6

BCC PID 5 – Re-graded Riffle, BCC Reach 6

BCC PID 6 – Log Vane in distance, BCC Reach 6 Start

BCC PID 7 – Constructed Riffle, BCC Reach 4 End

BCC PID 8 – Constructed Riffle, BCC Reach 4

BCC PID 9 – Constructed Riffle, BCC Reach 4

BCC PID 10 – Constructed Riffle, BCC Reach 4 Start

BCC PID 11 – Log J-Hook & Constructed Riffle , BCC Reach 3 End

BCC PID 12 – Log J-Hook Step Pool, BCC Reach 3

BCC PID 13 – Log J-Hook &
Constructed Riffle, BCC Reach 3

BCC PID 14 – Constructed Riffle, BCC Reach 3

BCC PID 15 – Constructed Riffle, BCC Reach 3

BCC PID 16 – Constructed Riffle, BCC Reach 3

BCC PID 17 – Constructed Riffle, UT1 Reach 3

BCC PID 18 – Constructed Riffle, BCC Reach 3

BCC PID 19 – Constructed Riffle, BCC Reach 3

BCC PID 20 – Constructed Riffle, BCC Reach 3

BCC PID 21 – Constructed Riffle, BCC Reach 3

BCC PID 22 – Constructed Riffle, BCC Reach 3

BCC PID 23 – Constructed Riffle, BCC Reach 3 Start

BCC PID 24 – Constructed Riffle, BCC Reach 2 End

BCC PID 25 – Riffle Crossing, BCC Reach 2

BCC PID 26 – Constructed Riffle, BCC Reach 2

BCC PID 27 – Constructed Riffle, BCC Reach 2

BCC PID 28 – Log J-Hook & Constructed Riffle, BCC Reach 2

BCC PID 29 – Log J-Hook & Constructed Riffle, BCC Reach 2

BCC PID 30 – Constructed Riffle, BCC Reach 2

BCC PID 31 – Constructed Riffle, BCC Reach 2

BCC PID 32 – Constructed Riffle, BCC Reach 2

BCC PID 33 – Constructed Riffle, BCC Reach 2

BCC PID 34 – Constructed Riffle, BCC Reach 2

BCC PID 35 – Constructed Riffle, BCC Reach 2

BCC PID 36 – Constructed Riffle, BCC Reach 2

BCC PID 37 – Constructed Riffle, BCC Reach 2

BCC PID 38 – Constructed Riffle, BCC Reach 2

BCC PID 39 – Constructed Riffle, BCC Reach 2 Start

BCC PID 40 – Constructed Riffle, BCC Reach 1 End

BCC PID 41 – Constructed Riffle, BCC Reach 1

BCC PID 42 – Constructed Riffle, BCC Reach 1 Start

UT1 Photos

UT1 PID 1 – Constructed Riffle, UT1 Reach 4 End

UT1 PID 2 – Constructed Riffle, UT1 Reach 4

UT1 PID 3 – Constructed Riffle, UT1 Reach 4

UT1 PID 4 – Constructed Riffle, UT1 Reach 4

UT1 PID 5 – Riffle Crossing, UT1 Reach 4

UT1 PID 6 – Constructed Riffle, UT1 Reach 4

UT1 PID 7 – Constructed Riffle, UT1 Reach 4

UT1 PID 8 – Constructed Riffle, UT1 Reach 4

UT1 PID 9 – Constructed Riffle, UT1 Reach 4

UT1 PID 10 – Constructed Riffle, UT1 Reach 4

UT1 PID 11 – Constructed Riffle, UT1 Reach 4 Start

UT1 PID 12 – Constructed Riffle, UT1 Reach 3 End

UT1 PID 13 – Constructed Riffle, UT1 Reach 3

UT1 PID 14 – Constructed Riffle, UT1 Reach 3

UT1 PID 15 – Constructed Riffle, UT1 Reach 3

UT1 PID 16 – Constructed Riffle, UT1 Reach 3

UT1 PID 17 – Constructed Riffle, UT1 Reach 3

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UT1 PID 24 – Constructed Riffle, UT1 Reach 3

UT1 PID 25 – Constructed Riffle, UT1 Reach 3

UT1 PID 26 – Constructed Riffle, UT1 Reach 3

UT1 PID 27 – Constructed Riffle, UT1 Reach 3

UT1 PID 28 – Log sill step pools (3), UT1 Reach 3

UT1 PID 29 – Constructed Riffle, UT1 Reach 3

UT1 PID 30– Constructed Riffle, UT1 Reach 3 Start

UT1 PID 31 – Constructed Riffle, UT1 Reach 2 End

UT1 PID 32 – Constructed Riffle, UT1 Reach 2

UT1 PID 33 – Constructed Riffle, UT1 Reach 2

UT1 PID 34 – Constructed Riffle, UT1 Reach 2

UT1 PID 35 – Constructed Riffle, UT1 Reach 2

UT1 PID 36 – Constructed Riffle, UT1 Reach 2

UT1 PID 37 – Constructed Riffle, UT1 Reach 2

UT1 PID 38 – Constructed Riffle, UT1 Reach 2

UT1 PID 39 – Rock and roll structures (3), UT1 Reach 3

UT1 PID 40 – Constructed Riffle, UT1 Reach 2

UT1 PID 41 – Riffle crossing, UT1 Reach 2 Start

UT1 PID 42 – Constructed Riffle, UT1 Reach 1 End

UT1 PID 43 – Constructed Riffle, UT1 Reach 1

UT1 PID 44 – Constructed Riffle, UT1 Reach 1

UT1 PID 45 – Constructed Riffle, UT1 Reach 1

UT1 PID 46 – Constructed Riffle, UT1 Reach 1

UT1 PID 47 – Constructed Riffle, UT1 Reach 1

UT1 PID 48 – Constructed Riffle, UT1 Reach 1

UT1 PID 49 – Constructed Riffle, UT1 Reach 1

UT1 PID 50 – Constructed Riffle, UT1 Reach 1

UT1 PID 51 – Constructed Riffle, UT1 Reach 1

UT1 PID 52 – Constructed Riffle, UT1 Reach 1

UT1 PID 53 – Constructed Riffle, UT1 Reach 1

UT1 PID 54 – Constructed Riffle, UT1 Reach 1 Start

UT2 Photos

UT2 PID 1 – Constructed Riffle, UT2 End

UT2 PID 2 – Constructed Riffle

UT2 PID 3 – Constructed Riffle

UT2 PID 4 – Constructed Riffle

UT2 PID 5 – Constructed Riffle

UT2 PID 6 – Constructed Riffle

UT2 PID 7 – Constructed Riffle

UT2 PID 8 – Constructed Riffle, UT2 Start