As-built report for the AH&W Mitigation Site
Big and Little Warrior Creeks
Wilkes County

Big Warrior Creek before construction, 12/9/98

Little Warrior Creek before construction, 12/11/98

Big Warrior Creek after construction, *1130103*

Little Warrior Creek after construction, 1/30/03

North Carolina Wildlife Resources Commission
Micky Clemmons and Brent Burgess

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Project Objectives

The general objectives at this stream mitigation site were to improve water quality, fisheries habitat, riparian quality and stability of Big Warrior and Little Warrior Creeks and the various tributaries to these creeks at this site. A number of activities were undertaken to accomplish these primary objectives. At eroding sections, the stream banks were reshaped to a more stable cross-sectional profile. Channels that had been straightened and were incised were modified to a more sinuous pattern with lower banks. Areas of high bank stress were protected using structures or by realigning the channel. Structural improvements were made to improve aquatic habitat. Sections where channel morphology had been destroyed by livestock, had the dimension, pattern and profile reestablished to concentrate flow in a single channel and improve habitat. Disturbed sections of the riparian zone were sloped and planted with native vegetation. Livestock were excluded from the riparian zone to protect vegetation while alternative watering sites and livestock crossings were developed. Initially grasses, sedges, rushes, and other herbaceous vegetation were seeded throughout the riparian zone. During the dormant winter season, bare rooted trees and live stakes of woody species were planted extensively from the bankfull elevation up-slope to the easement line. This project consisted of restoring severely degraded channels as well as the enhancement of channels that were degraded, but morphologically not as badly impacted. Specific objectives for the A, H & W Farm site are described below. The methods used to achieve these objectives are described in the following sections.

1. Establish a conservation easement along Big Warrior Creek, Little Warrior Creek and tributaries to allow for the proper dimension, pattern and profile and to protect vegetation and channel morphology.

2. Connect Big and Little Warrior Creeks to their floodplains, in areas where they had become incised, by lowering the banks and increasing channel sinuosity (priority 2 restoration).

3. Modify dimension and profile along upper Big Warrior Creek to dissipate energy over this steeper reach and realign the channel where it was eroding into steep slopes.

4. Increase the pool habitat along both creeks by constructing cross-vane structures.

5. Plant native trees, bushes and ground cover that will stabilize the creek banks, shade the stream, and provide wildlife cover and food.

6. Enhance fish habitat with structures constructed from natural materials along the primary channels.

7. Control existing erosion and sedimentation problems by grading and vegetating problem areas.

8. Construct fences and stream crossings where needed to protect the stream riparian buffer established through the conservation easement.

9. Install a livestock watering system in fields where cattle are fenced out of the stream, so that the livestock will no longer need to drink from the creek.

General Construction Narrative

Construction at this site was done over a 12-month period with most of Big Warrior Creek being restored under an informal contract with P.G. Park Grading and Little Warrior Creek being restored under a separate informal contract with J & N Mowing. Both of these informal contracts were advertised, a pre-bid meeting was held with potential bidders and the lowest bidder was awarded the contract. Construction on Big Warrior Creek began on August 31, 2001 and ended on November 7, 2001 after 54 days of work. Construction began at the upper easement line and continued downstream to the upper end of the bottom pasture. We stopped work at this point because it was late in the year for vegetation to germinate and grow and the landowner wanted us to stop at a cross fence for the winter. We began construction under the second informal contract on April 22, 2002, and continued until August 30, 2002, for a total of 67 days. We began at the point where we stopped in November and finished Big Warrior Creek in about 2 weeks. At that point we moved to Little Warrior Creek and completed it in the remaining time. Each contractor provided two track-hoes, one rubber tired loader, dump trucks and hand labor, as needed. Access to the site was from Highway 18, Andrews Road SR-1126, farm roads and across the landowner's property. Rootwads were provided by NCDOT from the Highway 441 construction project. We hauled the rootwads to the site under the 1st informal contract and distributed them around the site as needed for construction. Large boulders were purchased from a quarry in Lenoir, NC and hauled to the site as they were needed during construction.

Construction began at the upstream end of each creek and continued downstream with work on the tributaries being done as they were encountered. Vertical eroding banks were sloped, vegetated and erosion control materials installed. Excess soil was moved to sites on the farm where is could be used by the landowner or was used to fill the old channel on Little Warrior Creek. J-hook vanes, cross-vanes, rootwad revetments and floodplain benches were constructed along the channel to improve stability. The upper half of Big Warrior Creek, which had a steeper valley slope, was constructed as a B type channel with cross-vanes creating plunge pools. The lower half of Big Warrior Creek and most of Little Warrior Creek, had a low valley slope and was developed as a C channel with increased sinuosity and an accessible floodplain. Livestock management practices were installed to mitigate the impacts that stream restoration activities would have on the farms activities. These livestock management practices included a watering system that includes a well serving 21 watering tanks across the farm, electric fencing protecting the easement, and stream crossings to move livestock through easement areas. The site was vegetated with a native, riparian seed mix and a cover crop. The cover crop developed well and stabilized the ground surface in spite of the fact that we encountered severe drought conditions during this period. During the dormant period last winter bare rooted trees and live stakes were planted throughout the completed reach on Big Warrior Creek. We have trees ordered for the remainder of Big Warrior Creek and Little Warrior Creek. We also will be harvesting live stakes during March. The trees and live stakes will be planted in March throughout the recently completed areas.

Preconstruction Site Conditions:

Prior to construction the channels at this site were degraded due to past channel dredging, straightening and unrestricted access of livestock. Since construction on each channel was conducted as separate projects, the pre-existing conditions will be described separately.

Big Warrior Creek

Channel Condition - The primary channel is Big Warrior Creek; however, this reach also has three unnamed tributary channels. There was 6540 linear feet of channel on the Big Warrior Creek mainstem, and 2200 linear feet of channel on the 3 tributaries prior to construction. Only one of the tributaries is a perennial stream. Big Warrior Creek at the lower end of the project drains approximately 1.17 square miles, but only 0.7 square miles at the upper end of the site. This appears to make a small difference in cross-sectional area. The one perennial stream that is a tributary drains 0.18 square miles. Pebble count data indicates this stream is dominated by a gravel substrate. A plot of the percentage of the pebble count sample in each size group indicates a bimodal size distribution of bed material (information attached). Most of the sample was composed of course gravel and the smaller component was composed of medium sand. The D_{50} was 11.3 mm and the D_{84} was 50 mm. Although not demonstrated by the pebble data, a fine layer of silt often coated the bottom sediment.

The primary channel transitions from a steep valley (slope=.034, Valley Type II) to a flatter and wider valley (slope=.012, Valley Type VIII) as you move downstream. The stream type that existed here before the channel was degraded is difficult to determine. Based on valley slope, Big Warrior Creek was a B type stream that transitioned to C or E stream type as the valley slope decreased. The channel had been moved over time and had become incised. When the project was being planned the stream type varied over the project reach, and reaches of G, F, B, D and even E could be found at various locations.

Livestock degraded all of these channels. Bankfull was difficult to determine with certainty because livestock had destroyed most indicators. While these streams were adjusting their banks, the smaller tributaries had relatively stable bankfull channels. This is primarily due to the low flows that the tributaries carry and because of the stabilizing influence of vegetation (grasses) on the interberm. The bank height ratios for most cross-sections were high, indicating that the ability of the channel to carry flood flows without damaging the banks is low.

Upper Big Warrior Creek above the bridge had been channelized and moved to the edge of the field. This increased the slope of the channel and caused the channel to become incised at various locations along the reach. The channel had been cut through ridges and was continuing to erode these high clay banks. The upper channel had very little pool habitat and was primarily one long riffle. In the area of the old feedlot, which is just above the bridge, the channel was completely degraded by livestock. Dimension, pattern and profile were completely altered and for most of the reach, the channel was in a braided condition.

Lower Big Warrior Creek below the bridge has a low slope. This reach had been channelized and straightened in the past; however, for the most part it had not become extremely incised. A few stable meanders developed and these were used to evaluate parameters from the reference reach for the design. Most of this section of the creek however, continued to have low sinuosity. The stream was cutting the banks and attempting to reestablish a sinuous pattern. This was moderated somewhat by extensive fescue grass growth on the interberm.

Riparian Condition - The riparian zone was in poor condition. The lower reach of Big Warrior Creek had little or no woody vegetation on its banks. The upper reach had woody vegetation along the north bank but had little herbaceous vegetation under the trees. Lower growing herbaceous vegetation had been damaged or removed by livestock grazing. The south bank was vegetated by pasture grasses only. The tributaries also lack trees and erosion is extensive along these banks. Cattle had access to all of these creeks and grazing of the riparian vegetation and trampling of the banks had further degraded the riparian area. While the tributaries carry none to low flows for most of the year, they are a major sediment source during periods of high flow. The absence of woody root-mass in the banks results in bank erosion during floods. The lack of woody vegetation also results in the water of these creeks warming beyond a point that will support cold or cool water fish species as demonstrated by the temperature data for August, 2001 and 2002 attached in the data section.

Little Warrior Creek

Channel Condition - The primary channel is Little Warrior Creek; however, this reach also includes three unnamed tributary channels. There was 4610 linear feet of channel on Little Warrior Creek and 3200 linear feet of channel on the 3 unnamed tributaries prior to construction. All three of the tributaries are perennial streams. Little Warrior Creek at the lower end of the project drains approximately .91 square miles, but only 0.43 square miles at the upper end of the site. The lower most unnamed tributary drains from a 5-acre farm pond and contributes approximately the same drainage area (.47 mi^2) as LWC at their confluence. Most of this tributaries pre-construction channel was not put in an easement since its alignment was changed and the old degraded channel was filled. Streambed particle data indicates sand and gravel dominate the bedload. A plot of the percentage of the pebble count sample (by count) and subpavement samples (by weight) in each size group indicates a bimodal size distribution of bed material. Two subpavement samples were taken because of the large difference between the 1st subpavement sample and the pebble count. All are plotted in the attached information for comparison. Subsample 2 is considered more representative of the reach. The pebble count is biased toward sand because pebble counts were carried on above normal flow to the bankfull elevation. All particles above base flow stage were sand; however, the base flow channel was more diverse in terms of particle size classes. The heavy vegetation above base flow caused this bias. In our analysis we used the second subpavement sample to represent the bedload, believing that it was more representative of the size of material that moves during a bankfull flow. Most of the sample was composed of small to medium gravel and 30% was composed of sand. The D_{50} was 6.5 mm and the D_{84} was 15 mm.

The project reach is gently sloping with a relatively wide valley (Valley Type VIII) and slope decreases (.013 to .005) and valley width increases as you move downstream. The stream type prior to degradation was difficult to determine. Based on valley slope, Little Warrior Creek was a C or E stream type. The channel had been moved and straightened in the past and had incised. Prior to construction, the stream type varied some over the project reach but was primarily a G type stream. The upper most unnamed tributary was a B or G type channel and primarily carried highway drainage during rain events. It had a number of small headcuts due to the condition it was left in after highway construction and due to the presence of cattle.

Livestock access to all of these streams had degraded the morphology of the channels and eliminated riparian vegetation. Bankfull was difficult to determine with certainty because livestock had destroyed most indicators. While Little Warrior Creek was adjusting its banks, the smaller tributaries were relatively stable. This was primarily due to the low flows that these tributaries carry and because of the stabilizing influence of vegetation (grasses). These tributary channels had also widened and established floodplains. However, the floodplain area is relatively small and steep banks border these small floodplains. The bank height ratios for most cross-sections was high, indicating that the ability of the channel to carry flood flows without damaging the banks was low. These banks were eroding due to livestock access and needed to be resloped. The upper tributary above the highway culvert, was bordered on the right bank by Highway 18. A steep slope drops from the roadway approximately 30 to 200 feet to the creek. Drainage pipes from this road were causing erosion and litter problems on the slope above the creek and were contributing soil and litter directly to the creek.

Riparian Zone - The riparian zone was in poor condition. The lower reach of Little Warrior Creek (below Andrews Road, SR 1126) had no woody vegetation on its banks. The upper reach had woody vegetation along the south bank but little herbaceous vegetation under the trees. Lower growing herbaceous vegetation had been limited by grazing. Most stream banks were vegetated by pasture grasses to some degree. On Little Warrior Creek, grazing of the riparian vegetation and trampling of the banks was a primary reason for degradation of the riparian area. The tributaries also lacked trees and erosion was extensive along the upper banks were cattle crossed the streams or accessed water. While the tributaries carried low flows for most of the year, they were a major sediment source during periods of higher flows. The absence of a woody root-mass in the banks resulted in bank erosion during floods. The lack of woody vegetation also resulted in the water of these creeks warming to a point that was lethal to cold or cool water fish species native to the stream (information attached).

Channel Modifications:

A reference reach in the immediate vicinity of the AH&W mitigation site could not be located. Design specifications were determined from stable areas on the existing channels, from relic channels in the fields or on floodplains and from a surveyed reference reach on Basin Creek in northwestern Wilkes County (Dan Clinton, personal communication). Reference information was taken from two separate reaches on Basin Creek, a C4 stream that drains areas of 6.8 square miles at one reach and 7.2 square miles at the other. Dimensionless ratios of measurements taken at these sites were compared with information taken onsite. The design was also compared with both the Mountain and Piedmont Regional Curve information. All of this information was used to develop the design for both Big and Little Warrior Creeks. Maps of each channel are attached that show structures installed, pattern modifications made and livestock practices installed during the course of this project. Longitudinal profiles, Cross-sections and photos are also attached that detail the modifications described below.

<u>Big Warrior Creek</u>

Our first approach to restoring upper Big Warrior Creek was to do a priority 1 restoration and reestablish the channel through the field. This would allow for better sinuosity and a floodplain for the channel. However, the landowner would not agree to this, fearing that it would interfere with his existing farming operations. Since the valley slope through this field is rather steep, any new channel would be a B stream type. This stream type could be successfully constructed by modifying the existing channel in place.

A moderately steep reach, such as that found on upper Big Warrior creek above the bridge, will normally not be as sinuous as that found in flatter valleys. Energy that is dissipated through meanders on low slope streams is dissipated by plunge pools on steeper streams. Our approach on upper Big Warrior was to develop a more natural series of riffles and pools. Prior to construction most of this reach was one long riffle with almost no pool habitat. This provided little deep-water habitat for fish and increased erosion of the banks during flooding. Long-term this can result in an entrenched channel; an example of this existed just above the feedlot. We used boulders, rootwads and logs to create pool habitat along this channel. These materials were used to build structures that provided habitat while at the same time protected the stream banks. In areas with steeper slopes, such as the head-cut halfway up this reach, cross-vane type structures were placed close together to transition through the area. On more gently sloping areas these structures were moved further apart. The attached longitudinal profile shows the increased pool habitat that was created along the channel. In locations where the stream had cut across ridges it had created high, vertical clay banks. We moved the channel away from those banks and developed a floodplain bench at the toe of the vertical slope. The base of this bench was constructed with boulders and this bench was then covered with 1 to 2 feet of soil to allow vegetation to grow. This moved the water off the foot of the clay bank and provided a floodplain bench to dissipate high water velocities and catch any soil that drops from the clay bank. Meanders in the channel were protected using rootwads, and in some cases J-hook vanes. Where the channel was entrenched we lowered the banks and developed floodplains. These modifications can be seen in the attached photos and cross-sections.

The most significant earth moving took place immediately upstream of the upper ford, where the stream was extremely incised. We cut a temporary bypass channel and excavated a new floodplain and channel in the dry. This reach was steep and required a number of cross-vane structures to drop across the slope. Where Big Warrior Creek flowed through the old feedlot, the channel was almost nonexistent. Because of the slope, the B type channel was continued from above through this area, to the bridge. The bankfull elevation on the channel were delineated using coir rolls and soil was filled in behind the rolls. Pools were developed using boulder cross-vanes and log vanes. Overall, our approach on the stream above the bridge was to increase the number of pools, provide access to the floodplain and stabilize the banks by sloping and vegetating them. This should provide habitat and reduce the erosive force of high water.

The flatter reach of Big Warrior Creek (below the bridge) was altered to increase the meandering pattern that it should naturally have. Meanders decrease the slope of the stream, which in turn decrease the erosive force that the stream has during high water events. Meander geometry for this stream was determined by measuring a few stable meanders on the existing channel, by measuring abandoned meanders that are present in the fields and by using measurements from a reference reach. Reference information indicated that for this drainage area belt-width, or width over which the stream meanders, ranged from 45 to 64 feet. This data and landowner concerns lead us to propose an average total easement width of 60 feet. There are areas where existing uses or structures limited the width we could get for a short distance. Other areas allowed for a greater width, but on average, a 60-foot wide easement provided the needed belt-width. The easement along the tributaries has a narrower width since they carry much less flow and in general have a width of approximately 40 feet. The attached surveys show the perpetual easements that are now in place and attached to the deeds of these properties.

Increasing channel meander required that the new channel cross over the existing stream. This required completing the new channel between crossings in the dry, moving as many animals as possible from the old channel to the new one, turning the water from the old channel by blocking the up stream confluence and filling the old channel. Pools were created in the meander bends and riffles constructed to connect pools through the straighter, crossover sections. Areas along the stream bank that receive high stress during flooding flows were protected using rootwads and in some cases rock vanes. Meanders also had coir rolls and blankets installed to provide stability while vegetation developed.

Little Warrior Creek

Our initial approach to restoring Little Warrior Creek was to do a priority-1 restoration and realign the channel through the field. This would allow for greater sinuosity and access to the floodplain by the channel. However, the landowner would not agree to this, fearing that it would interfere with his existing farming operation. The presence of a number of culvert crossings also limited our ability to change the existing channel elevation. A C-type stream was appropriate for this valley type and could be successfully constructed using a priority-2 restoration approach.

On all streams, a primary objective was to reconnect the bankfull channel to its floodplain. This was less of a problem on the tributaries to LWC but was a significant problem on the mainstem. Channelization in the past and down-cutting by the stream had resulted in a very incised condition. Because the stream could not access its floodplain during flood flows, tremendous erosion of the stream banks would occur. Over time, the stream would erode the banks to such an extent that eventually a new floodplain would be established at the elevation of the stream. However, this requires a great deal of time and results in the loss of pasture as tons of soil move down the stream. For this project we lowered the banks along the channel to a bankfull elevation appropriate for the C-type stream that was constructed.

Our approach on the upper unnamed tributary, at the foot of the slope off of Highway 18, was to develop a natural series of riffles and pools. This reach was left by NCDOT as a long straight drainage ditch lined with riprap. This had resulted in a number of small headcuts over the steep section. Long-term this would have resulted in an entrenched channel and excessive sedimentation downstream. We used boulders to create cross-vanes and plunge pools along this steep reach were the headcuts were found. This should result in energy dissipation during storm flows and provide wetland habitat during other times. The boulder structures should arrest any further head cutting.

The other tributaries and the mainstem of Little Warrior Creek are flatter and were altered to increase the meandering pattern that should naturally be found. Meander geometry for these streams was similar to that used for Big Warrior Creek and varied slightly as drainage area changed. The smaller channel above the confluence with the pond tributary has a meander length of 135-feet and an average radius of curvature of 25-feet. LWC below the confluence has approximately twice the drainage area and had a meander length of 200-feet with an average radius of curvature of 50-feet.

Construction of meanders that moved back and forth across the existing channel followed the same approach as was used on Big Warrior Creek, with construction being completed from meander to meander before the next section was started. In locations where the stream cut across ridges, it had created high, vertical clay banks. There were a couple of these sites on LWC above Andrews Road, S.R. 1126. We moved the channel away from the banks and built a floodplain bench at the foot of the bank. The bench was constructed of small boulders placed at or below the bankfull elevation. The boulders were then covered with soil and compacted to form a surface that was vegetated and matted with erosion control materials.

The first tributary to Little Warrior Creek drains out of a farm pond, flows under S.R. 1126 and, prior to construction, then flowed down the pasture for 400 feet to the confluence. Over that distance the two channels ran parallel approximately 100 feet apart before coming together. Both channels had been straightened in the past and were incised, with low habitat value. We moved the pond tributary channel so that it connected to Little Warrior Creek higher in the pasture and just below Andrews Road. The new channel is a meandering channel or S curve with a low slope through the meanders and then drops over a series of rock cross-vanes. It has a total length of approximately 170 feet. The old channel was filled with soil excavated from stream banks on the project. This resulted in a loss of 400 feet of degraded, incised channel and the gain of 170 feet of naturally designed channel that will have good to excellent habitat value over time. This channel change was done as the last channel work on the project so that access could be maintained into the field. To facilitate access so that channel work could be done and the old channel filled the stream was placed in a temporary bypass channel until the new floodplain and channel could be constructed. This temporary channel was lined with synthetic erosion control cloth and had a number of check dams constructed through its length. This was all removed as the final channel change was done to connect the tributary to Little Warrior Creek.

The greatest obstacle to restoring the channel on Little Warrior Creek was the soils that we encountered at this site. There was very little rock in them and they tended to wash easily. There was also a great deal of clay present. This caused problems in two ways: vegetation grows poorly in these soils and the soil tends to wash out from around the structures. We did get a good stand of the cover crop in the fields and on the side slopes, but not as good on the constructed floodplains. We are continuing to work with these areas and believe that the perennial mix will do well as it develops. The day construction was completed we had a 2 to 3 inch rain in about 1 hour. This caused problems around the structures that stepped down the cross over channel to Little Warrior Creek and to the structure we constructed to raise the pool and eliminate the drop below DOT's culvert under Andrews Road. It appeared that the soil dissolved away as the bed below the structures completely mobilized during the high water event. We repaired these structures by placing filter fabric in front of the structures and filling in front of the structures with a layer of riprap size rock, then a layer of large washed stone. This was then buried with the bed material. There have been a number of high water events since these repairs were made and the structures seems to be in good shape.

Riparian Improvements:

Riparian improvements were common to both Big Warrior Creek and Little Warrior Creek and included the following practices. The stream was reconnected to the floodplain, which resulted in a natural condition where high water will overflow the floodplain reducing water velocity, causing suspended soil to deposit, enriching the soil and improving water quality. Banks at the back of the created floodplains were graded to approximately a 2:1 slope. At the interface between the bankfull channel and the floodplain, biodegradable erosion control materials were used to provide stability while vegetation grew. After the creek bank had been shaped and before erosion control materials were installed, it was limed, fertilized and seeded. A temporary ground cover of millet, wheat, or barley was seeded under the erosion control blankets. Due to extremely dry conditions these areas were then watered using a gas powered water pump so that quick germination would occur. A perennial seed mixture was also planted under these erosion control materials (Table 1). We expect this mixture to be slow in developing and recognize that it is often 1 to 2 years before a good stand of the perennial plants develop. This mixture was planted throughout the easement area. In addition to the seed mixtures, during the dormant season of late winter, the riparian area close to the creek was planted with native woody species such as alder, willow, dogwood and button bush. On the upper banks, we planted taller growing trees that will provide shade, wildlife cover and food, and stability to the creek banks. Woody species were planted as bare-rooted trees and live stakes. Plantings on Big Warrior Creek took place in winter 2002 and Little Warrior Creek will be planted in winter 2003.

Areas of the channel that were incised had the floodplain reconnected to the stream by excavating the existing banks within the easement down to the bankfull elevation. Banks were protected by structural modifications when needed and by erosion control materials such as coir rolls and coir matting. Coir rolls were used to establish a bankfull elevation where this had been degraded and around the outside of meanders. Coir and Jute matting was used as ground stabilization along the entire new channel. Straw was used in seeded, bare ground areas outside of the channel. The easement along the upper tributary of Little Warrior Creek includes a wide sloping area from Highway 18 down to the stream. The soil of this slope is unproductive red clay, fill material. It has been grazed since originally constructed, so little vegetation has developed. In addition water running off of the highway had caused erosion problems in a number of areas due to drainage pipes that extended only partway down the slope. These drainage culverts were extended to carry runoff down the slope to the channel. Screened settling basins at the mouths of the drainage culverts, were located along the banks of the stream to capture litter washing from the roadway. Some trees were planted along this slope during the winter of 2002 and additional trees will be planted in 2003. This area will be managed for slope stability, safety on the roadway and maximum wildlife benefits from the vegetation.

Table 1. Native Riparian Seed mix sewn throughout the easement area at the AH&W mitigation site.

Plant	Botanical Name
Sunburst Switchgrass	*Panicum virgatum*
Partridge Pea	*Chamaecrista fasciculate*
Slender Smartweed	*Polygonum lapathifolium*
Lance-leaved Coreopsis	*Coreopsis lanceolata*
Smartweed	*Polygonum pennsylvanicum*
Smooth Panicgrass	*Panicum dichotomiflorum*
Virginia Wild Rye	*Elymus virginicus*
Osage Indiangrass	*Sorghastrum nutans*
Southern Arrowwood	*Viburnum dentatum*
Biannual Evening Primrose	*Oenothera biennis*
Bur-Marigold/Showy Tickseed	*Bidens aristosa*
Little Bluestem	*Andropogon scoparius*
Big Bluestem	*Andropogon gerardii*
Silky Dogwood	*Cornus amomum*
Ashy Sunflower	*Helianthus mollis*
Buttonbush	*Cephalanthus occidentalis*
River Oats	*Uniola latifolia*

Livestock Management:

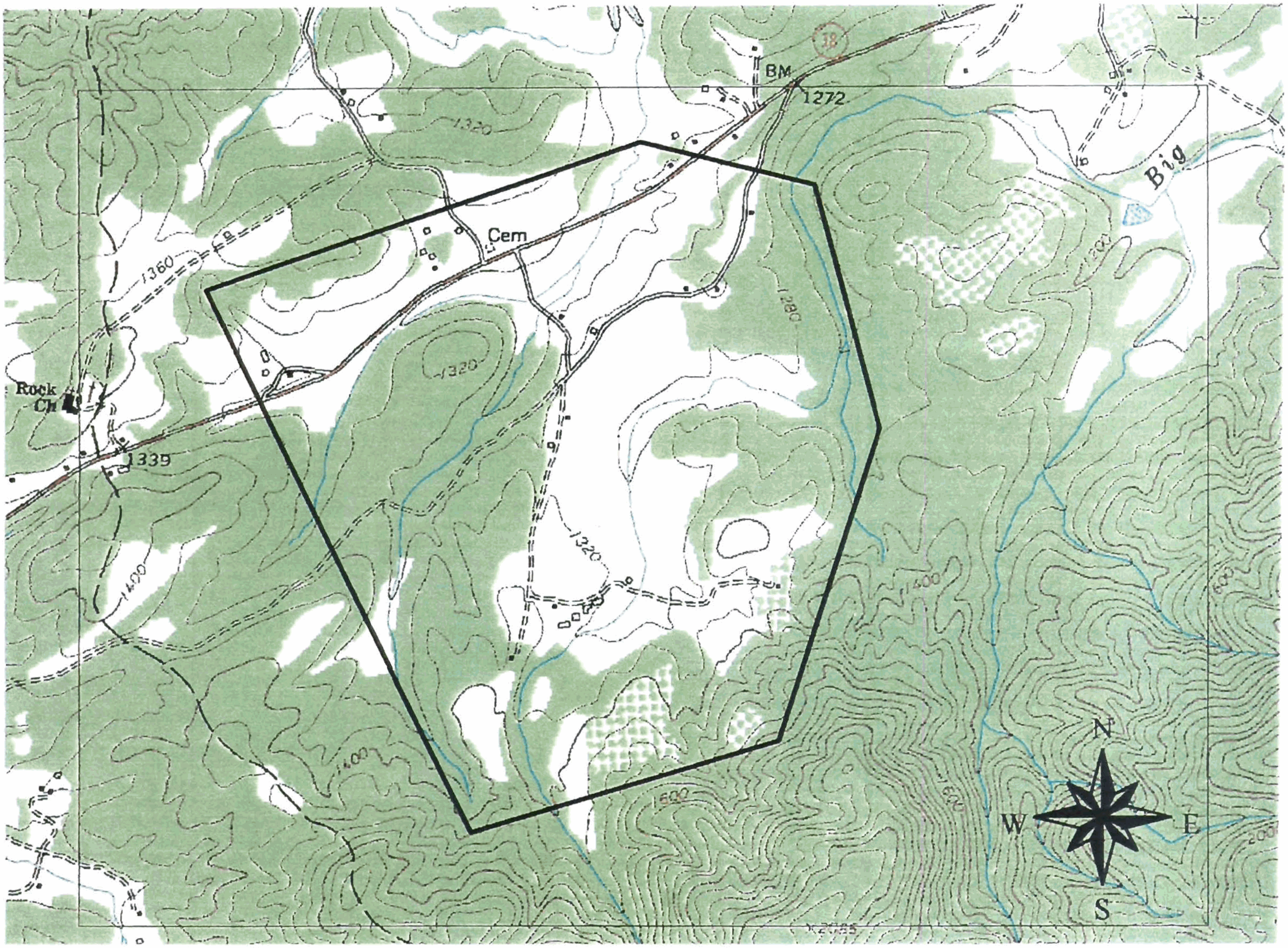
An important part of this stream mitigation plan is the exclusion of livestock from the riparian zones of Big and Little Warrior Creeks and their tributaries. In large part, livestock management will determine the success of the total project. The Natural Resource Conservation Service (NRCS) developed a livestock management proposal in consultation with the Farm management and the North Carolina Wildlife Resources Commission (NCWRC). These plans are for the entire farm and include addressing issues on all watercourses on the farm. The estimated total cost of the livestock practices proposed for this site is $115,689.00. These are broken down among the landowners as follows: Andrews - $67,101, Weston - $37,838, all others - $10,750. The attached map of agricultural practices details the practices that have been and are being installed. The landowner or a designated contractor hired by NRCS can do the installation of these practices. At this site the landowners chose to do the installation. The have completed many of the planned activities but still have some fencing to complete and a few watering tanks to install. The NRCS administers construction of all phases of this part of the mitigation plan. The WRC and NRCS will monitor the functioning of these practices during their initial 2 years of operation. After this period, the landowner is responsible for those practices that are not within the easement. This primarily refers to the watering system. The NCWRC will continue to maintain the fence and crossings. Landowners are expected to do minor fence and crossing maintenance, which may be required, such as tightening due to cattle pushing the wire, farm equipment damaging the fence or gates and removing debris that may block crossings.

Fencing: Approximately 28,000 linear feet of fencing has been or is being installed to protect the easement at this site. The map of the site, shows the location of fencing. We are fencing livestock out of all streams within the easement. This will include any length of the easement line along each primary stream and their tributaries where livestock might access the easement area. In those areas where cattle will not be pastured a fence is not required, for example on upper Big Warrior Creek were the cattle will only be on the pasture side of the easement or on upper Little Warrior Creek were the cattle will be on the pasture side of the easement and not in the woods. Where no fence is constructed, a provision in the easement agreement leaves this option open to the NCWRC if it is needed to protect the easement in the future. Five tributaries have crossings proposed and to install the crossings we will have to protect the channels with an easement and fencing. The proposed fence is a permanent, high tensile electric fence.

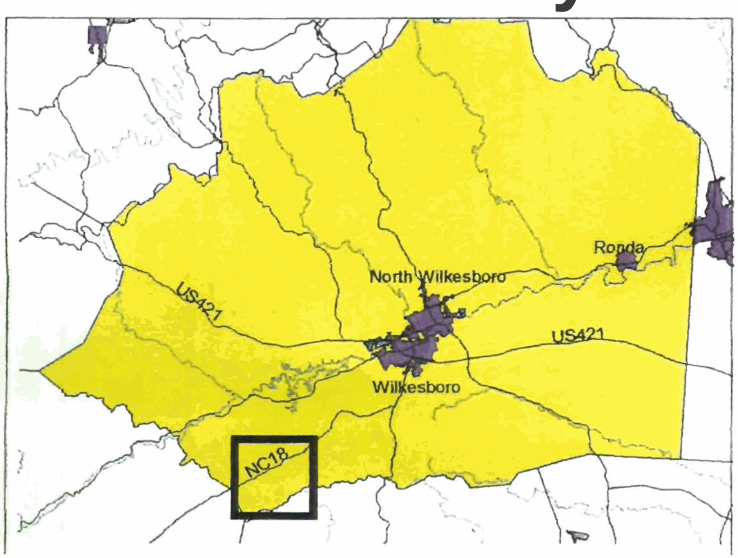
Watering facilities: The fencing needed to protect the easement will remove the water source livestock presently use on this farm. A watering system has been installed that should provide sufficient water for the number of cattle that these pastures can support. This should provide better quality drinking water than the creeks and improve livestock health. Twenty-one watering tanks are being installed on the entire farm. The division of these tanks by pasture can be seen on the accompanying map. A well was drilled and connected to existing farm wells to supply water under pressure to all of the watering tanks on the system. Tanks are rectangular two or four hole tanks, constructed of thick walled plastic. The tanks are insulated and should not freeze if the cattle use them enough to keep water flowing through the system. Water supply lines are all buried and should not freeze. Tank locations are hardened for high use and kept well away from the easements.

Cattle Crossings: To facilitate cattle moving from pasture to pasture through the easement, a number of stream crossings were installed. Three culvert crossings were installed on the small tributaries to Big Warrior Creek. These were sized to be sufficient for carrying the 10-year storm. Culvert crossings installed at this mitigation site consisted of a large pipe that carries base flow as well as storm flow and a smaller culvert placed at the bankfull elevation to carry storm flow that is moving across the floodplain. Two existing culverts in the upper pasture on Big Warrior Creek w be extended so cattle can pass over these tributaries. These crossings are to be managed by being open, as farm operations dictate. The bridge below the present feedlot was upgraded with decking so that it can be used to move cattle from one side of Big Warrior Creek to the other. Future maintenance of this upgraded bridge is the responsibility of the landowner. Two ford type crossings were installed on Big Warrior Creek at the lower end of the upper pasture and in the middle of the lower pasture. These fords were constructed using a 4-inch Terracell structure that was back-filled with stone. Below each structure a cross-vane was built to maintain the grade across the crossing. The fords should be maintained as limited access crossings and opened to move cattle from pasture to pasture, but not left open for cattle to use at will. The reason for this is that one objective of this project is to improve water quality and if cattle have constant access to the stream there will be water quality degradation. A culvert crossing was installed on the small tributary to Little Warrior Creek below the Ham house. This culvert was built in the same way as the Big Warrior culverts were constructed. Four ford type crossings were installed on LWC. One ford was built at either end of the large box culvert under Highway 18 and two at the top on each end of a cattle trail built around a narrow section on upper Little Warrior Creek near Highway 18. These last two crossings will allow the cattle to move along a cattle trail through the woods and up to the upper pasture on LWC, while keeping them out of the easement. These will be stoned crossings, gated to limit access. Two existing culverts under Highway 18, in the upper pasture on Little Warrior Creek, were extended so cattle can pass over these tributaries, while allowing the rest of the tributary to be fenced.

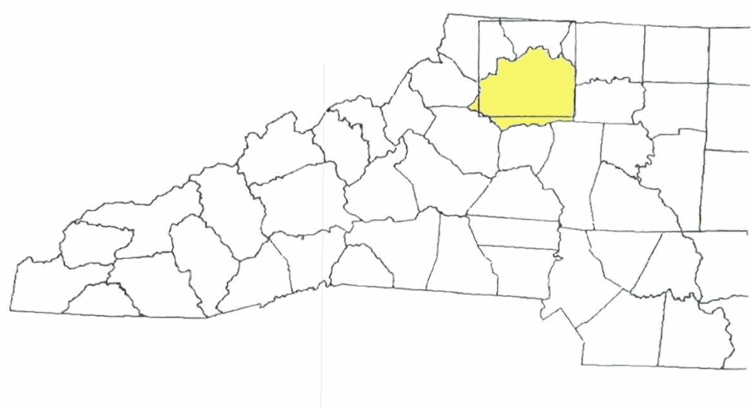
A, H, & W Farm Site



Wilkes County



North Carolina

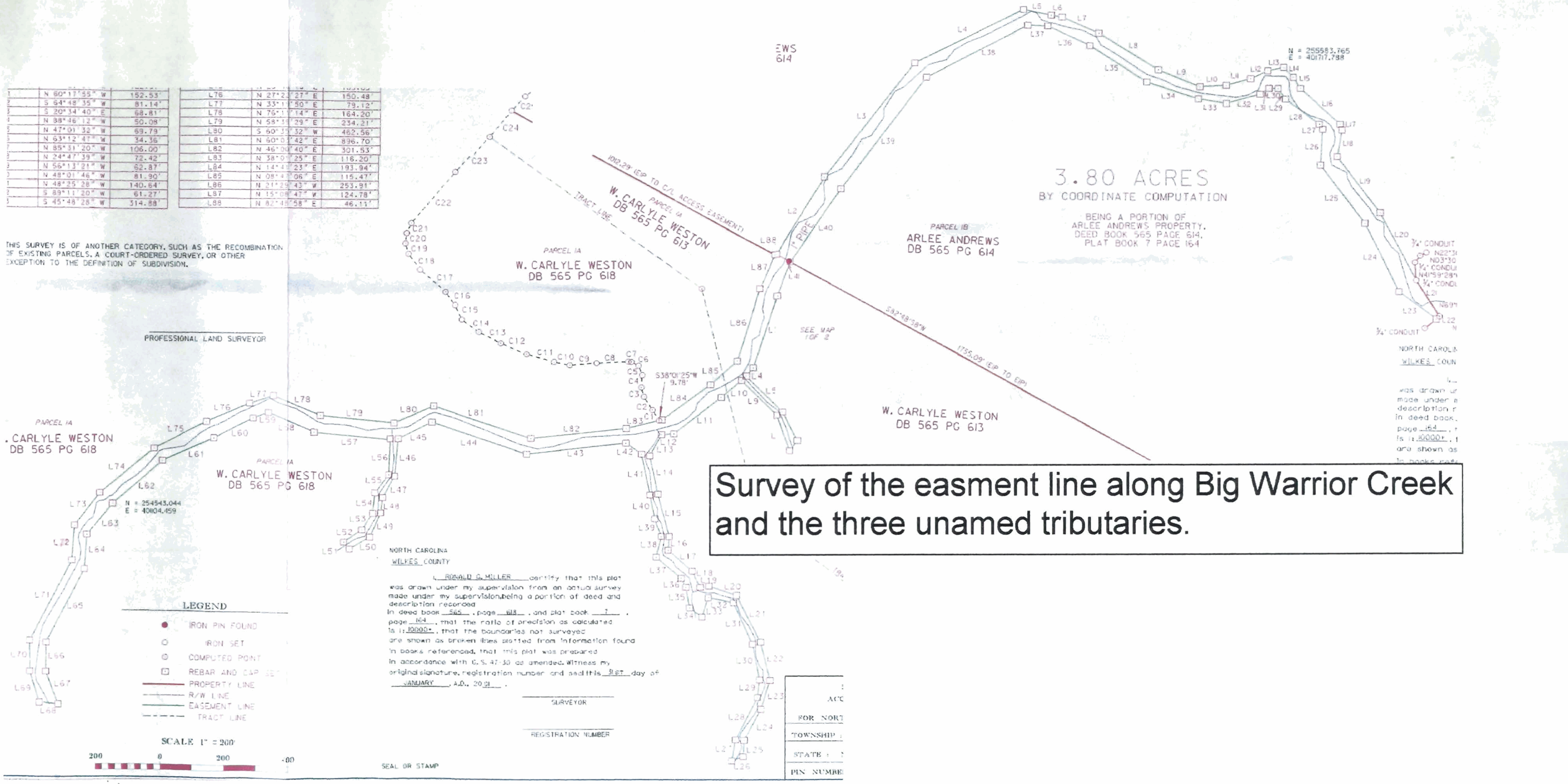


Livestock Management Practices Installed at the AH&W Mitigation Site

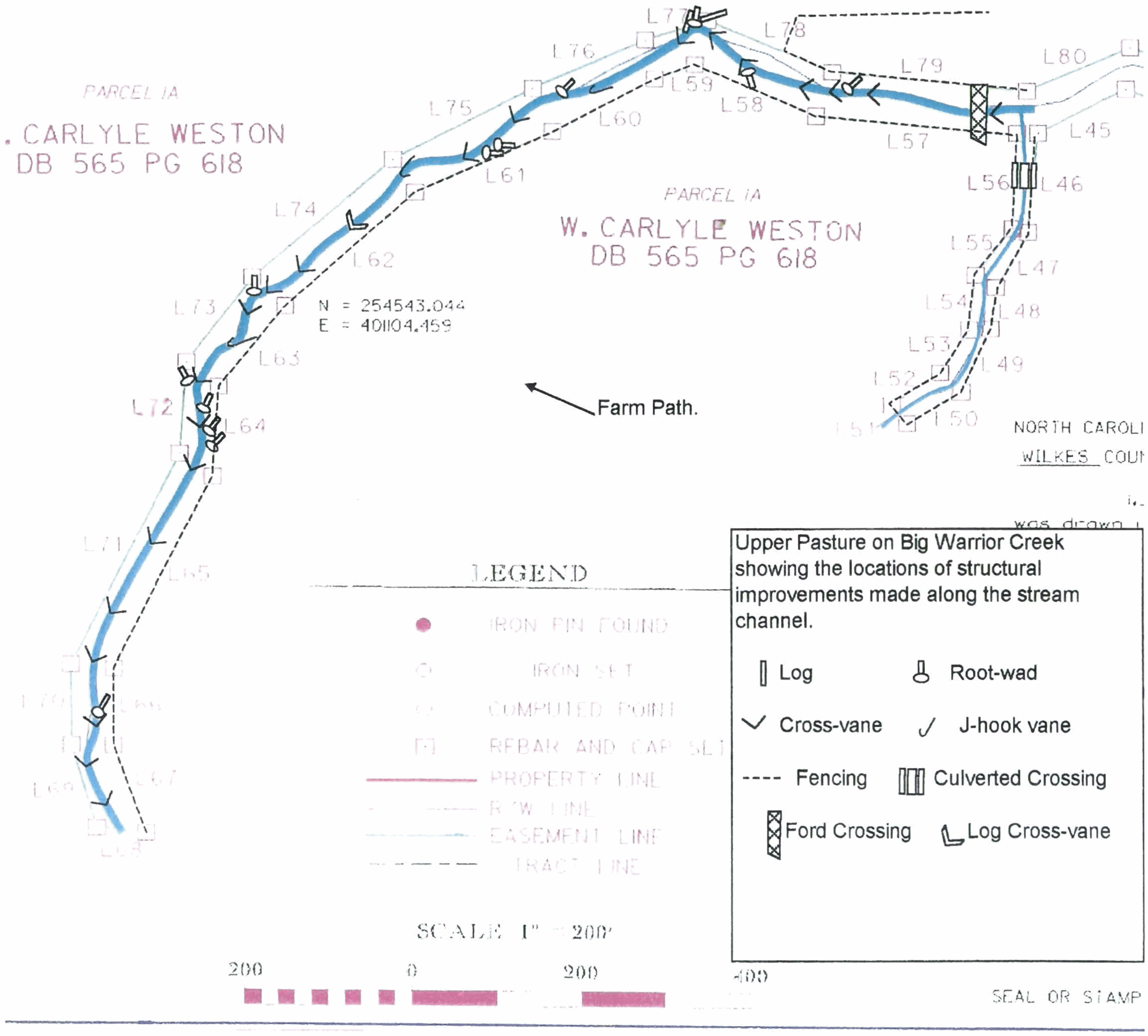
Big Warrior Creek
As-built Stream Restoration Data

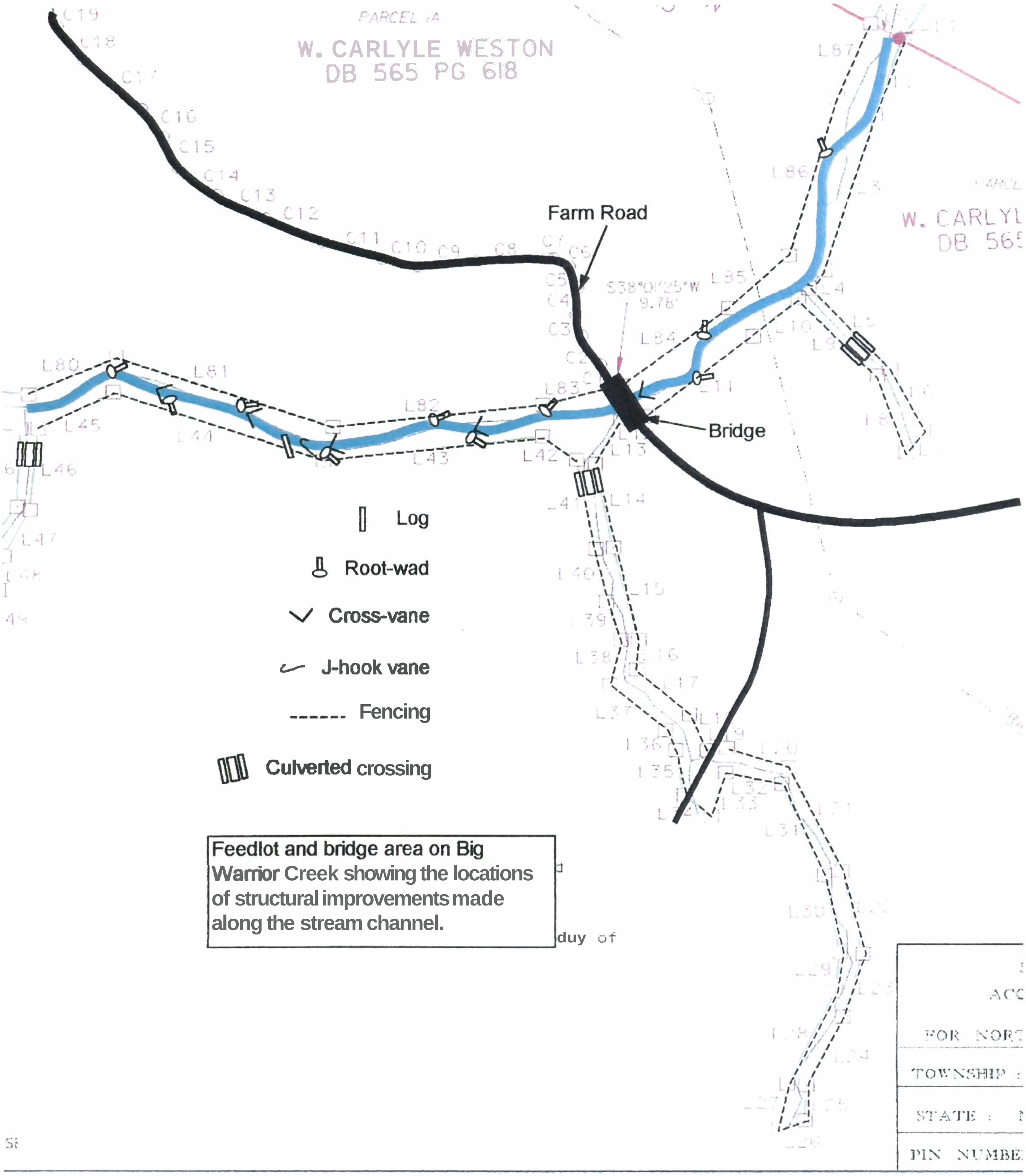
Survey
Project modifications
Reference Photo Locations
Photos of Big Warrior Creek
Pebble Count Data
Cross-section & Longitudinal Profile Locations
Cross-section (Dimension) Data
Longitudinal Profile Data

1	N 60°17'55" W	152.53'	L76	N 27°2[illegible]'27" E	150.48'
2	S 64°48'35" W	81.14'	L77	N 33°1[illegible]'50" E	79.12'
3	S 20°34'40" E	68.81'	L78	N 76°1[illegible]'14" E	164.20'
4	N 88°46'12" W	50.08'	L79	N 58°3[illegible]'29" E	234.21'
5	N 47°01'32" W	69.79'	L80	S 60°35'32" W	462.56'
6	N 63°12'47" W	34.36'	L81	N 60°0[illegible]'42" E	896.70'
7	N 85°31'20" W	106.00'	L82	N 46°00'40" E	301.53'
8	N 24°47'39" W	72.42'	L83	N 38°0[illegible]'25" E	116.20'
9	N 56°13'21" W	62.87'	L84	N 14°4[illegible]'23" E	193.94'
0	N 48°01'46" W	81.90'	L85	N 08°4[illegible]'06" E	115.47'
1	N 48°25'28" W	140.64'	L86	N 21°29'43" W	253.91'
2	S 89°11'20" W	61.27'	L87	N 15°08'47" W	124.78'
3	S 45°48'28" W	314.88'	L88	N 82°4[illegible]'58" E	46.11'

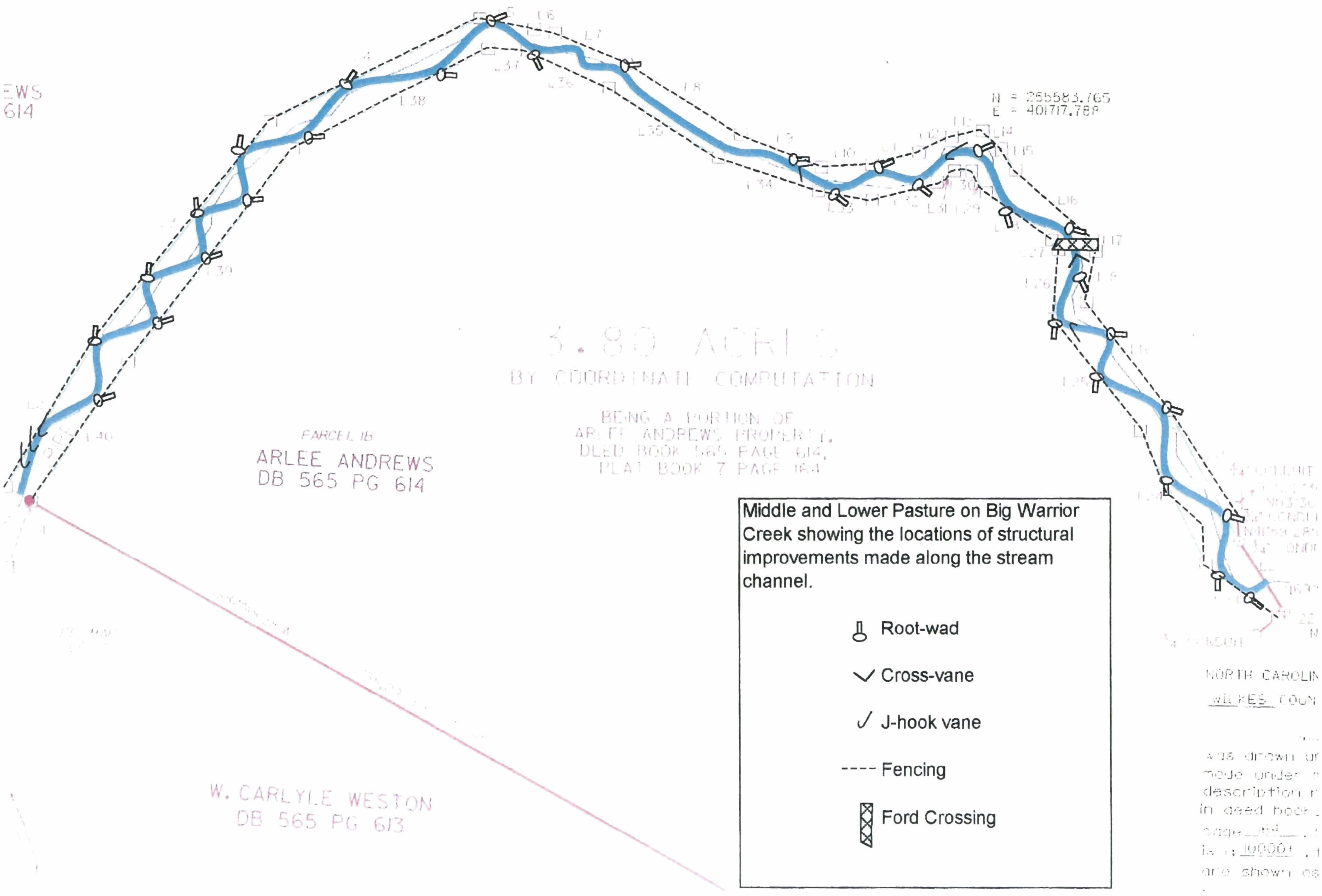


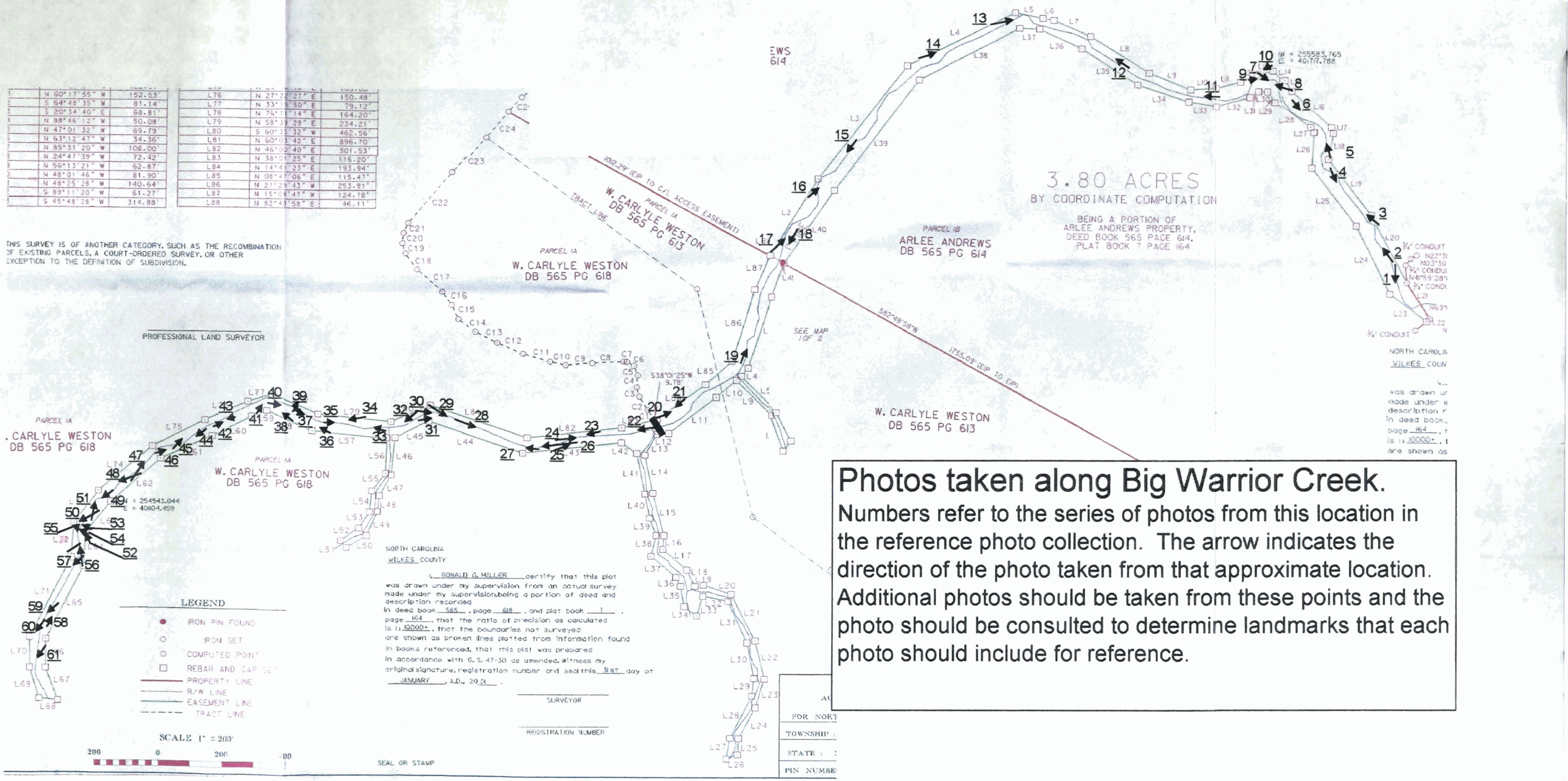
Survey of the easment line along Big Warrior Creek and the three unamed tributaries.


PARCEL IA
. CARLYLE WESTON
DB 565 PG 618
PARCEL IA
W. CARLYLE WESTON
DB 565 PG 618
N = 254543.044
E = 401104.459
Farm Path.
L45
L46
L47
L48
L49
L50
L52
L53
L54
L55
L56
L57
L58
L59
L60
L61
L62
L63
L64
L72
L73
L74
L75
L76
L78
L79
L80
NORTH CAROLI
WILKES COUN
LEGEND
IRON PIN FOUND
IRON SET
COMPUTED POINT
REBAR AND CAP SET
PROPERTY LINE
R/W LINE
EASEMENT LINE
TRACT LINE
SCALE 1" = 200'
200
0
200
400
SEAL OR STAMP
Upper Pasture on Big Warrior Creek showing the locations of structural improvements made along the stream channel.
Log
Root-wad
Cross-vane
J-hook vane
Fencing
Culverted Crossing
Ford Crossing
Log Cross-vane



Feedlot and bridge area on Big Warrior Creek showing the locations of structural improvements made along the stream channel.


N = 255583.765
E = 401717.788
3.80 ACRES
BY COORDINATE COMPUTATION
BEING A PORTION OF
ARLEE ANDREWS PROPERTY,
DEED BOOK 565 PAGE 614,
PLAT BOOK 7 PAGE 164
PARCEL IB
ARLEE ANDREWS
DB 565 PG 614
W. CARLYLE WESTON
DB 565 PG 613
NORTH CAROLIN
WILKES COUN
Middle and Lower Pasture on Big Warrior Creek showing the locations of structural improvements made along the stream channel.
Root-wad
Cross-vane
J-hook vane
Fencing
Ford Crossing



Photos taken along Big Warrior Creek.

Numbers refer to the series of photos from this location in the reference photo collection. The arrow indicates the direction of the photo taken from that approximate location. Additional photos should be taken from these points and the photo should be consulted to determine landmarks that each photo should include for reference.

Mvc-003s, AH&W 98-12-9

DSC00243, 3/1/30

Reach is above the last Left bank meander, in the lower pasture, on Big Warrior Creek. Photo is taken from inside the easement looking upstream. This is series number 3 from the BWC reference photos.

MVC-005S, AH&W 98-12-9

DSC00248, 3/1/30

Reach below the high clay bank, in the lower pasture, on Big Warrior Creek. Photo is taken from the top of the bank looking downstream. This is series number 7 from the BWC reference photos.

MVC-004S, AH&W 98-12-9

DSC00249, 3/1/30

Reach showing the high clay bank and above, in the lower pasture, on Big Warrior Creek. Photo is taken from the top of the bank looking upstream. This is series 8 from the BWC referenece photos.

MVC-007S, AH&W 98-12-9

DSC00249, 3/1/30

Bend at the end of the middle pasture, on Big Warrior Creek. Photo is taken looking downstream from just above the bend. This is series number 13 from the BWC reference photos.

MVC-002S, AH&W 98-12-9

DSC00256, 3/1/30

Reach is in the middle of the middle pasture, on Big Warrior Creek. Photo is taken from a point bar looking upstream. This is series number 15 from the BWC reference photos.

MVC-008S, AH&W 98-12-9

DSC00258, 3/1/30

Reach below the Feed Barn, in the middle pasture, on Big Warrior Creek. Photo is taken from the property line survey point looking downstream. This is series number 17 from the BWC reference photos.

MVC-010F, AH&W 01-8-01

DSC00266, 3/1/30

Reach above the bridge in feedlot, on Big Warrior Creek. Photo is taken from the left bank just above the first sycamore, looking downstream to bridge. This is series number 24 from the BWC reference photos.

MVC-011F, AH&W 01-8-01

DSC00266, 3/1/30

Reach is in the middle of the feedlot, on Big Warrior Creek. Photo is taken from the right bank, just below survey point 1A44, looking upstream. This is series number 27 from the BWC reference photos.

MVC-008F, AH&W 01-8-01

DSC00266, 3/1/30

Reach is in the middle of the feedlot, on Big Warrior Creek. Photo is taken from the mid-channel, at the old cross-fence just below survey point 1A45 looking downstream. This is series number 28 from the BWC reference photos.

MVC-009S, AH&W 98-12-9

DSC00273, 3/1/30

Reach is in the upper end of the feedlot, on Big Warrior Creek. Photo is from the left bank, just above the old cross-fence at survey point 1A45 looking downstream. This is series 30 from the BWC reference photos.

MVC-0012S, AH&W 98-12-9

DSC00293, 3/1M

Reach is in the middle of the upper pasture, on Big Warrior Creek. Photo is taken from the right bənʌ just below s.p. 1A65 looking downstream to eroding clay bənʌ area. This is series 52 from the BWC reference photos.

MVC-0013S, AH&W 98-12-9

DSC00290, 3/1/30

Reach is in the middle of the upper pasture, on Big Warrior Creek. Photo is taken from the right bank just below survey point 1A63 looking upstream to site of old headcut area. This is series number 49 from the BWC reference photos.

MVC-0011S, AH&W 98-12-9

DSC00298, 3/1/30

Reach is at the upper end of the upper pasture, on Big Warrior Creek. Photo is taken from the left bank looking downstream to the single locust tree and cross-vane. This is series 58 from the BWC reference photos.

PEBBLE COUNT INFORMATION

					PEBBLE COUNT			PEBBLE COUNT			PEBBLE COUNT		
Site:					Date: 5/17/2001			Date: 5/7/2001			Date: 5/7/2001		
Party:					Reach: BWC pebble count			Reach: BWC subpave.			Reach: BWC bar sample		
PARTICLE	MILLIMETER			PARTICLE COUNT	TOT #	ITEM %	% CUM	TOT #	ITEM %	% CUM	TOT #	ITEM %	% CUM
Silt/Clay	< .062	0.062	S/C		7	6.8%	7%	6	0%	0%	35	0%	0%
Very Fine	.062 - .125	0.125	S		6	5.8%	13%	12	0%	0%	100	1%	1%
Fine	.125 - .25	0.25	A		21	20.4%	33%	39	1%	2%	436	4%	5%
Medium	.25 - .50	0.5	N		3	2.9%	36%	118	3%	5%	786	6%	11%
Coarse	.50 - 1.0	1	D		1	1.0%	37%	150	4%	9%	1237	10%	21%
Very Coarse	1 - 2	2	S			0.0%	37%	108	3%	12%	941	8%	29%
Very Fine	2 - 4	4			1	1.0%	38%	97	3%	14%	789	6%	35%
Fine	4 - 5.7	5.7	G		3	2.9%	41%	64	2%	16%	303	2%	38%
Fine	5.7 - 8	8	R		2	1.9%	43%	87	2%	18%	393	3%	41%
Medium	8 - 11.3	11.3	A		8	7.8%	50%	155	4%	23%	561	5%	46%
Medium	11.3 - 16	16	V		9	8.7%	59%	292	8%	30%	741	6%	52%
Coarse	16 - 22.6	22.6	E		10	9.7%	69%	595	16%	46%	1173	10%	61%
Coarse	22.6 - 32	32	L		5	4.9%	74%	787	21%	68%	1515	12%	73%
Very Coarse	32 - 45	45	S		8	7.8%	82%	1199	32%	100%	1697	14%	87%
Very Coarse	45 - 64	64			8	7.8%	89%		0%	100%	1553	13%	100%
Small	64 - 90	90	C		8	7.8%	97%		0%	100%		0%	100%
Small	90 - 128	128	O		2	1.9%	99%		0%	100%		0%	100%
Large	128 - 180	180	B			0.0%	99%		0%	100%		0%	100%
Large	180 - 256	256	L		1	1.0%	100%		0%	100%		0%	100%
Small	256 - 362	362	B			0.0%	100%		0%	100%		0%	100%
Small	362 - 512	512	L			0.0%	100%		0%	100%		0%	100%
Medium	512-1024	1024	D			0.0%	100%		0%	100%		0%	100%
Lrg-Vry Lrg	1024 - 2048	2048	R			0.0%	100%		0%	100%		0%	100%
Bedrock		10000	BEDROCK			0.0%	100%		0%	100%		0%	100%
				TOTALS:	103			3709			12260		

Channel Particle Sizes (mm):

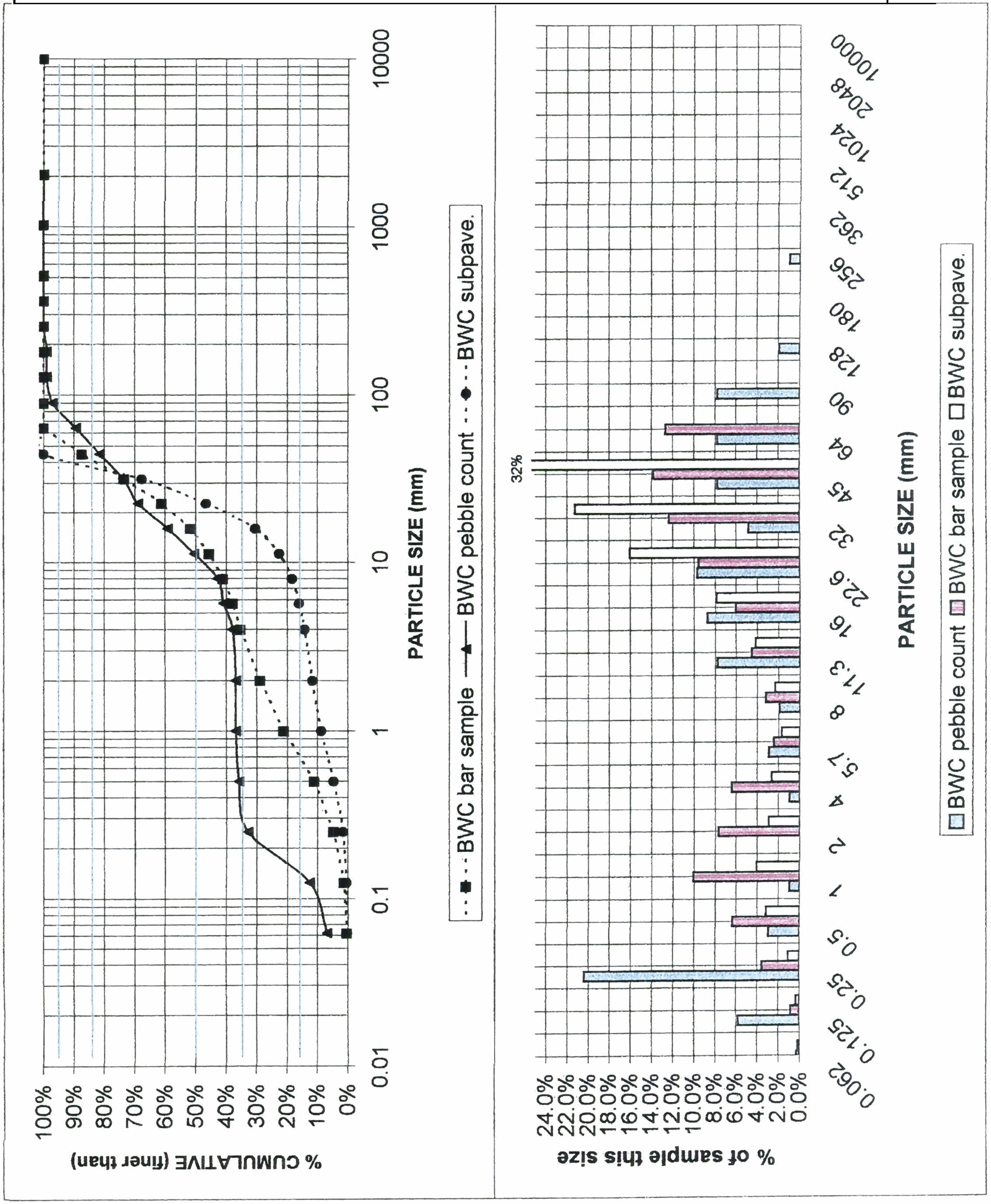
Pebble Count:	
D16	0.13
D35	0.28
D50	11.3
D84	50
D95	80

Subpavement Sample:	
D16	5.7
D35	18
D50	24
D84	38
D95	41

Bar Sample:	
D16	0.75
D50	15.5
D84	40
D95	55

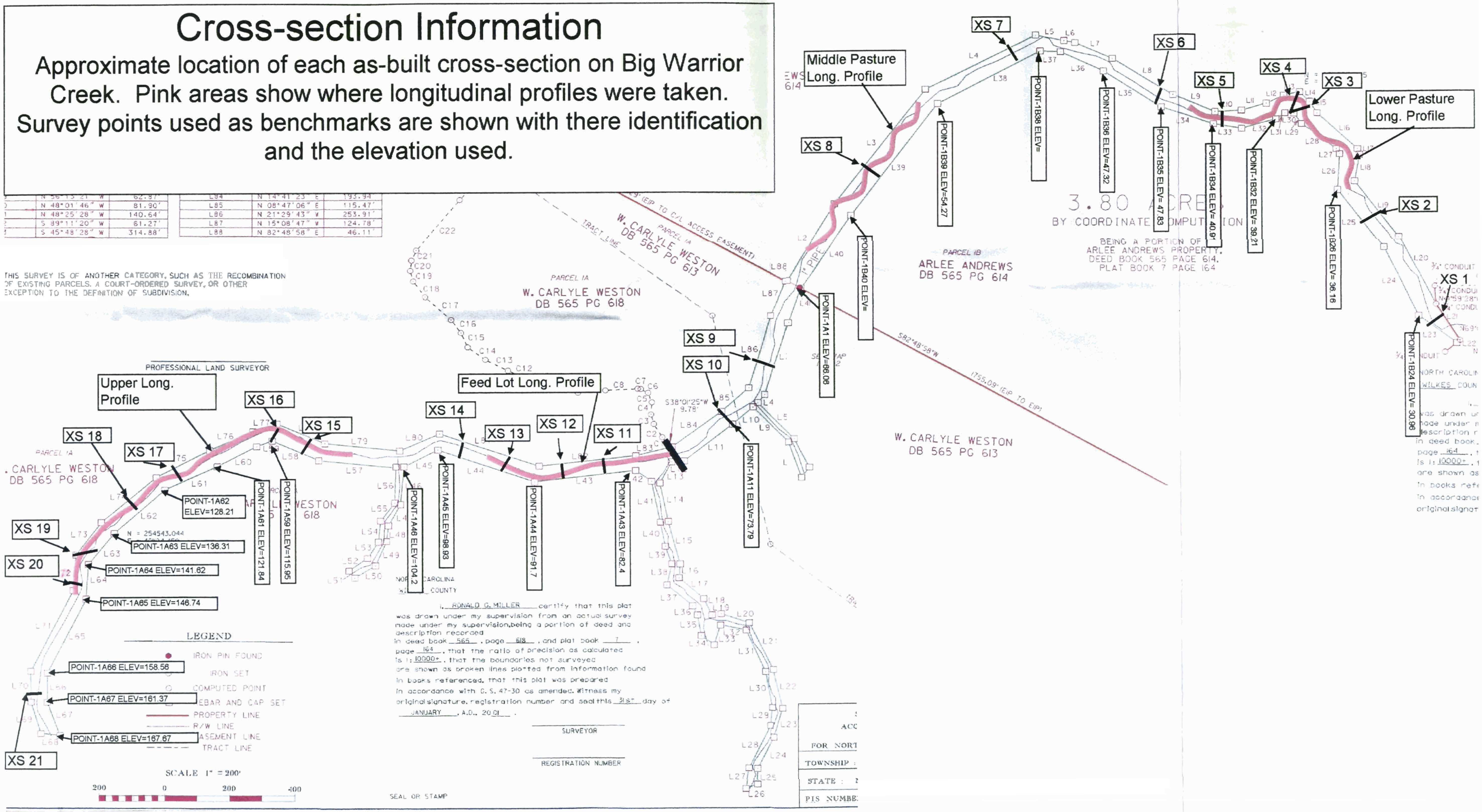
Largest Size at Toe of Bar (mm)	80

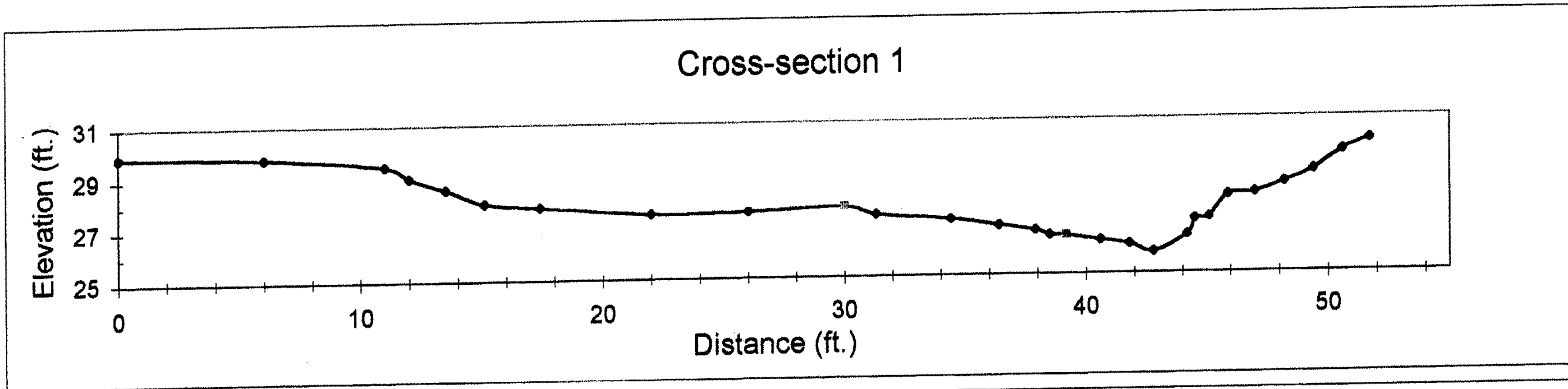
PEBBLE COUNT INFORMATION

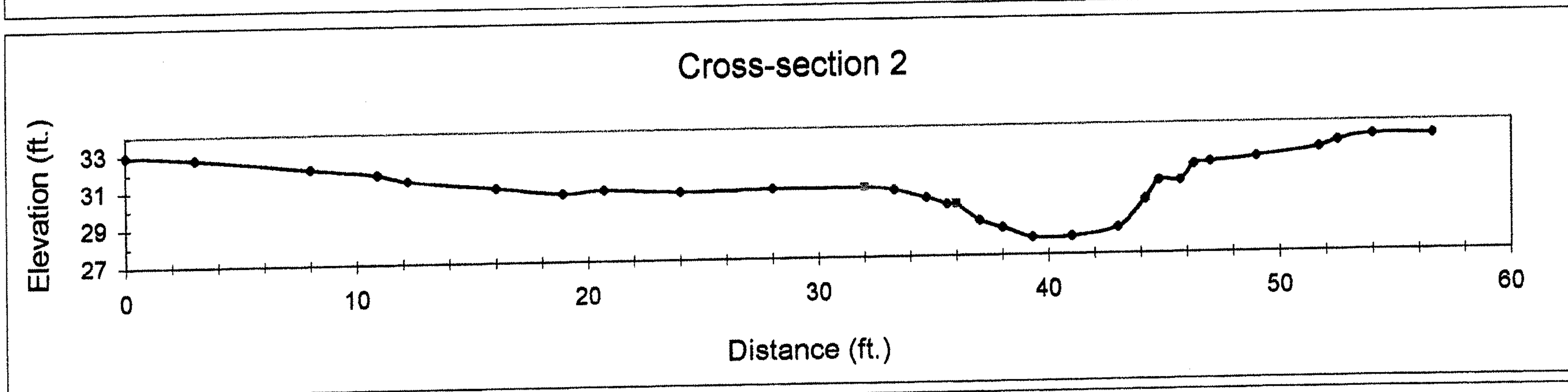


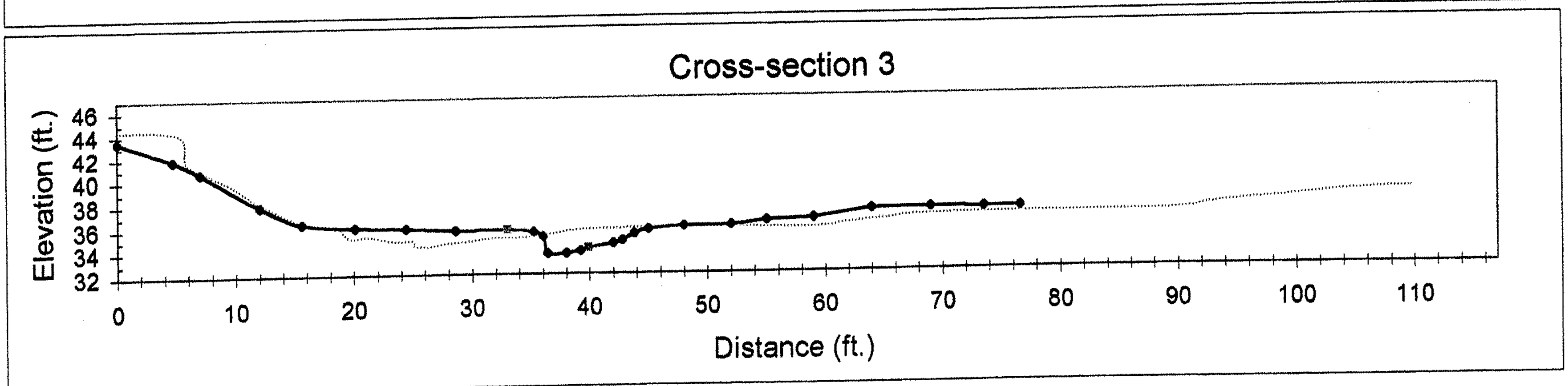
Cross-section Information

Approximate location of each as-built cross-section on Big Warrior Creek. Pink areas show where longitudinal profiles were taken. Survey points used as benchmarks are shown with there identification and the elevation used.

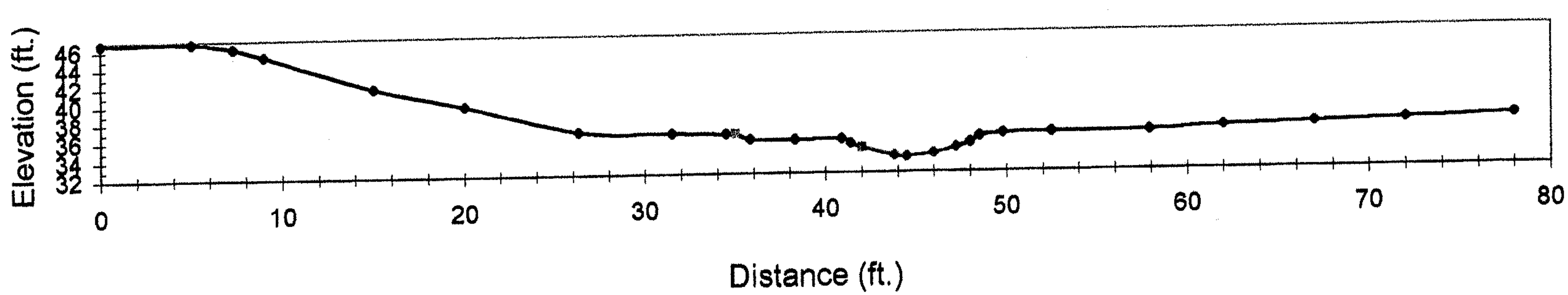



Cross-section 1
Elevation (ft.)
31
29
27
25
0
10
20
30
40
50
Distance (ft.)

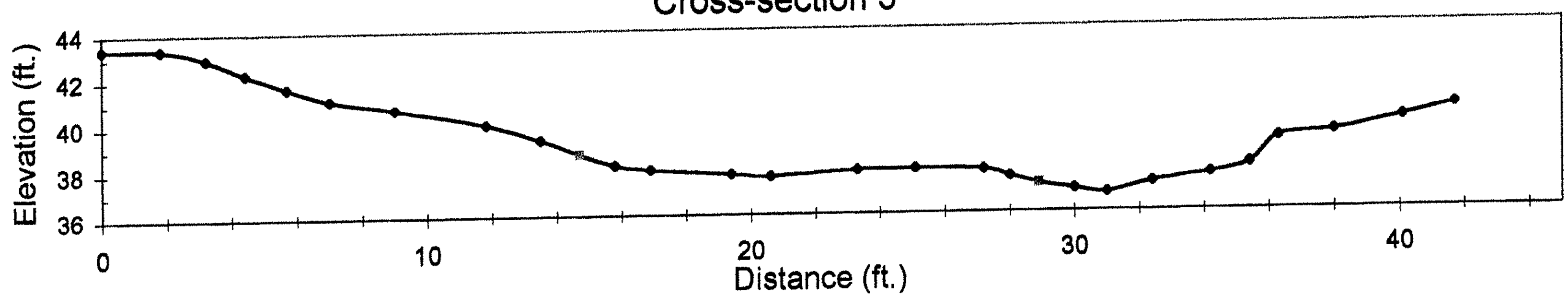

Cross-section 2
Elevation (ft.)
33
31
29
27
0
10
20
30
40
50
60
Distance (ft.)


Cross-section 3
Elevation (ft.)
46
44
42
40
38
36
34
32
0
10
20
30
40
50
60
70
80
90
100
110
Distance (ft.)

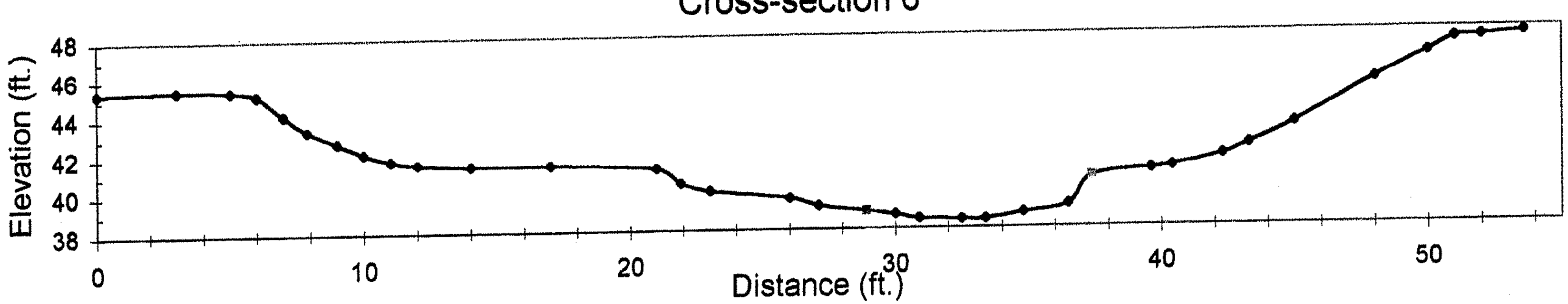
Cross-section 4



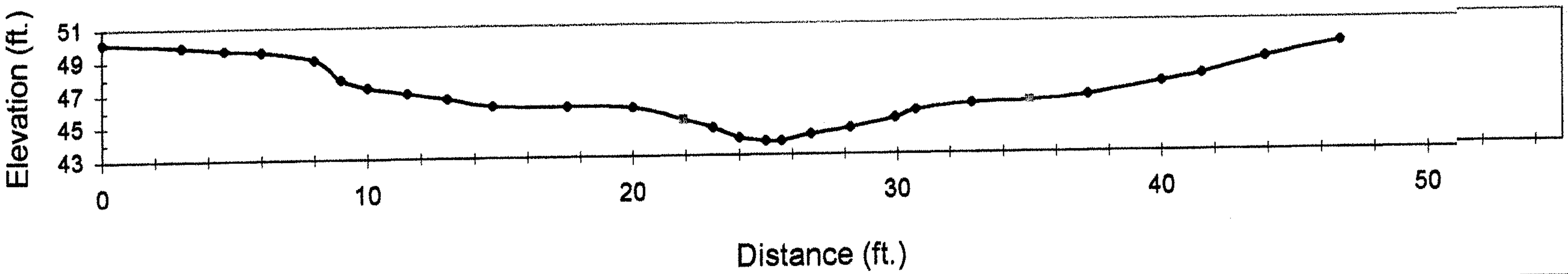
Cross-section 5



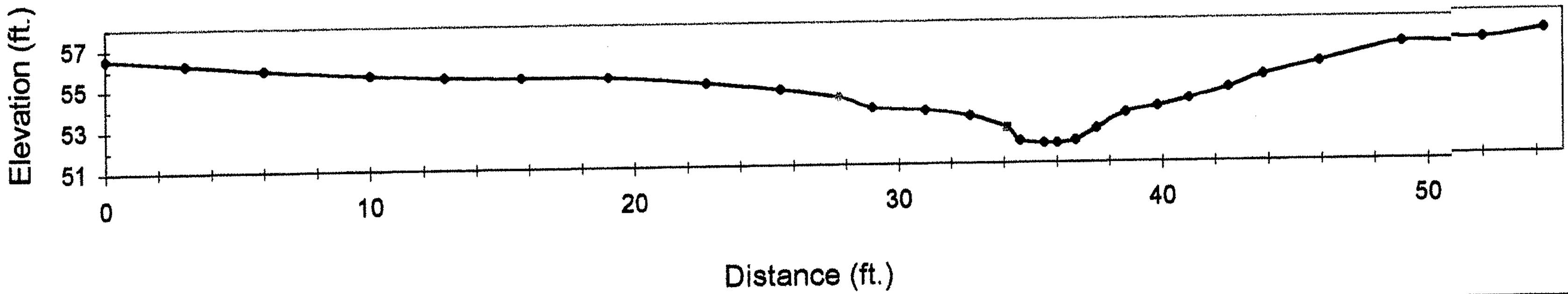
Cross-section 6



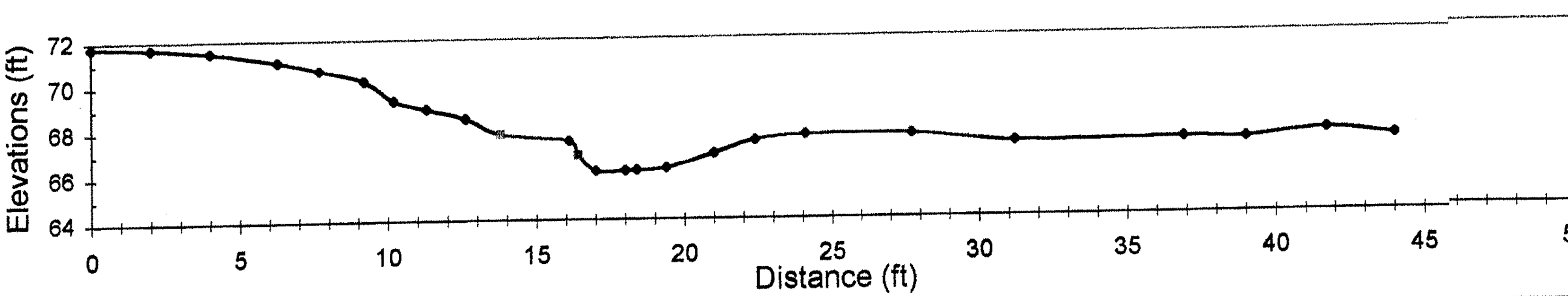
Cross-section 7

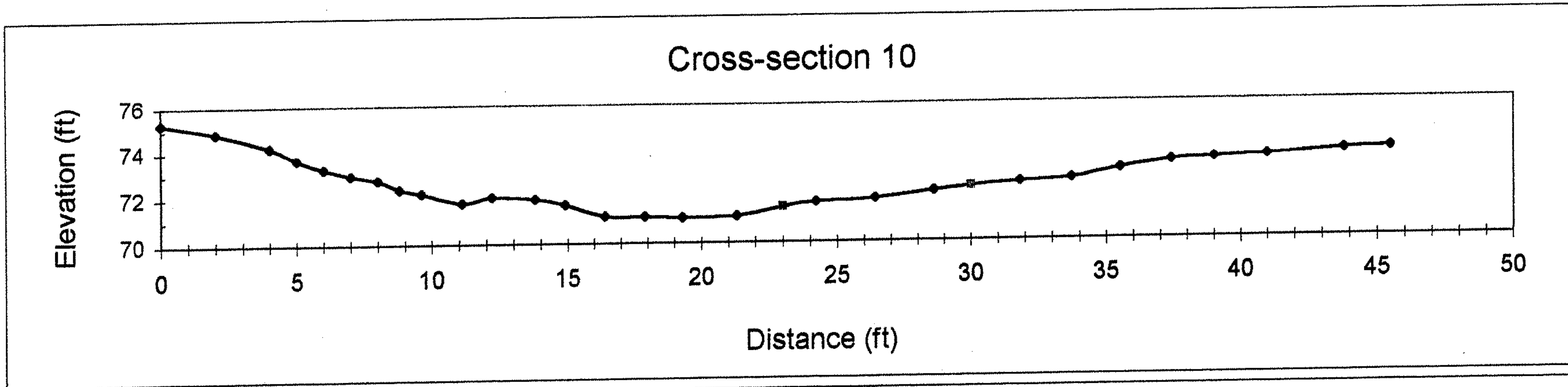


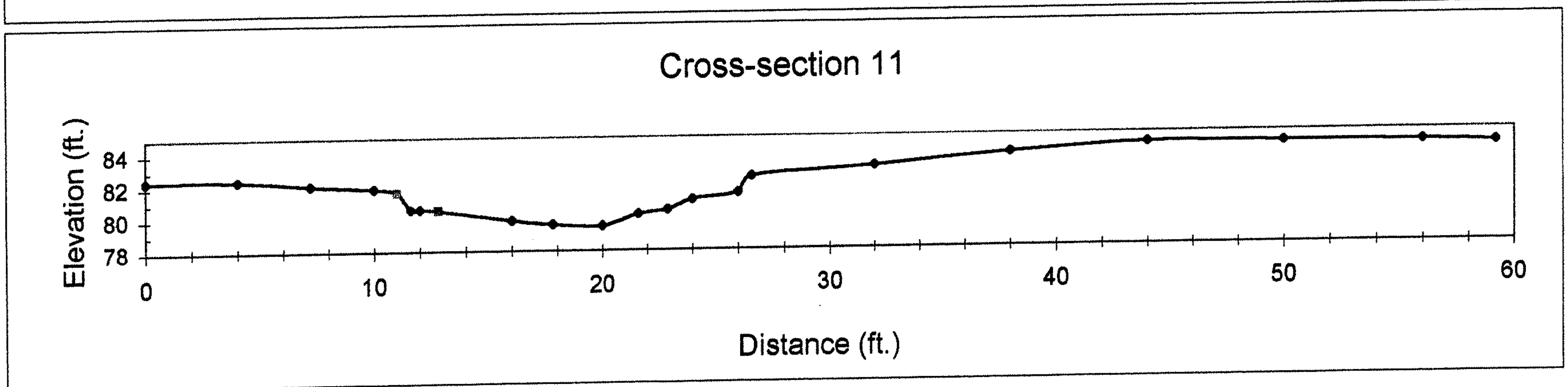
Cross-section 8

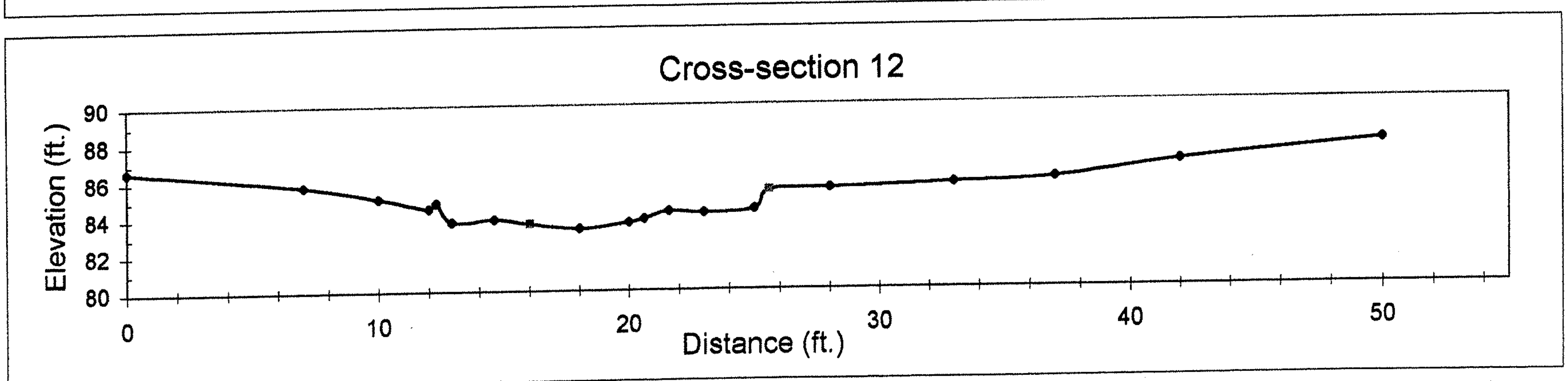


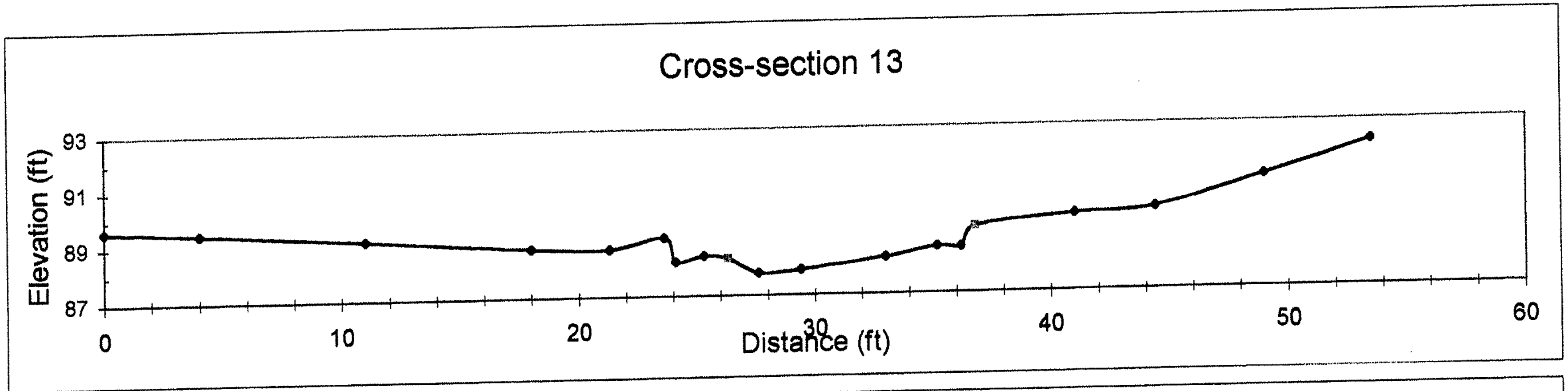
Cross-section 9

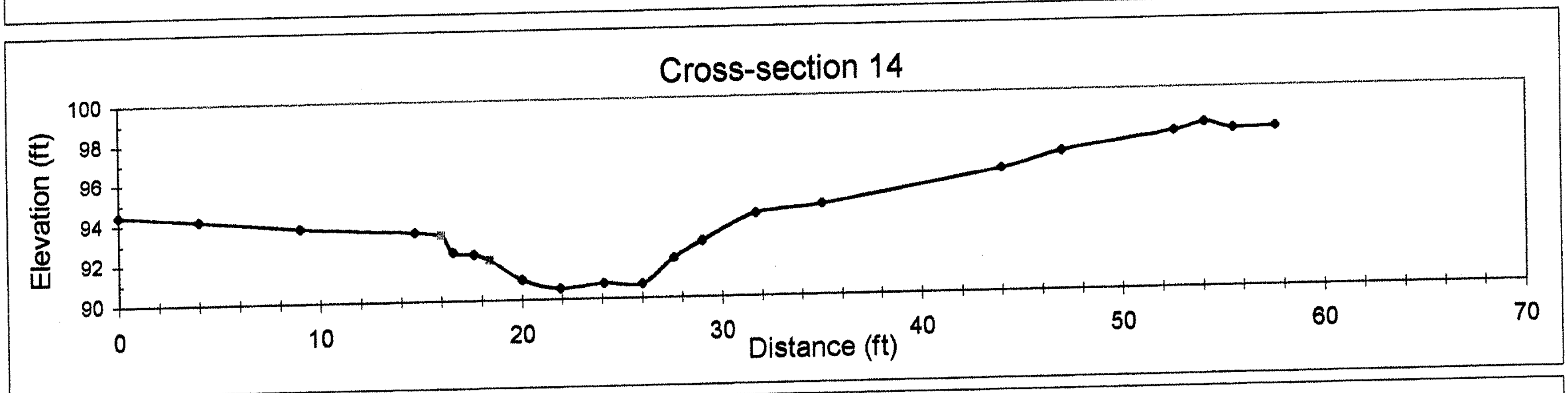


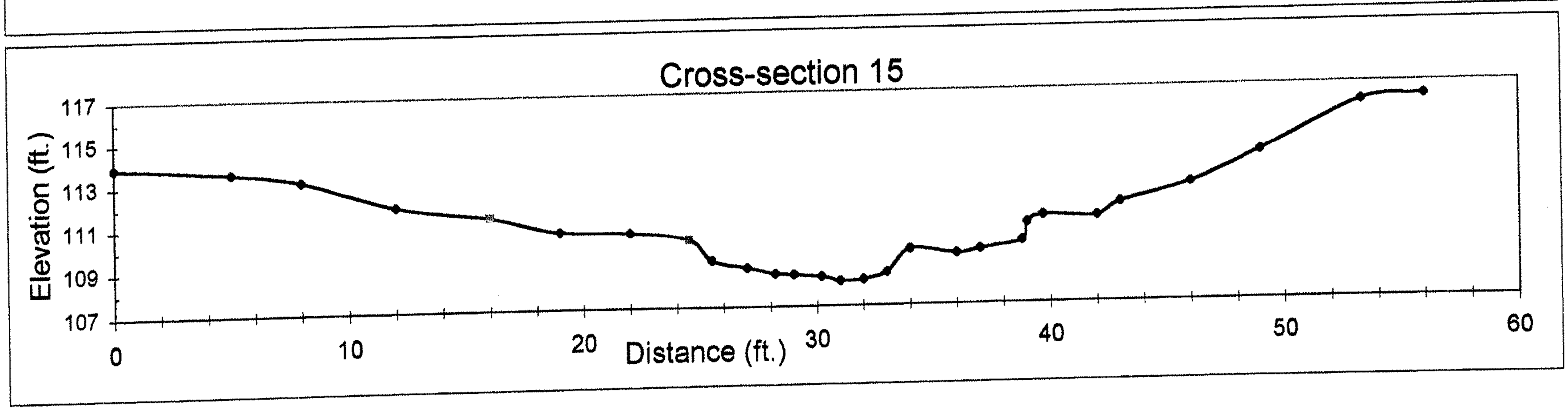

Cross-section 10
Elevation (ft)
76
74
72
70
0
5
10
15
20
25
30
35
40
45
50
Distance (ft)


Cross-section 11
Elevation (ft.)
84
82
80
78
0
10
20
30
40
50
60
Distance (ft.)

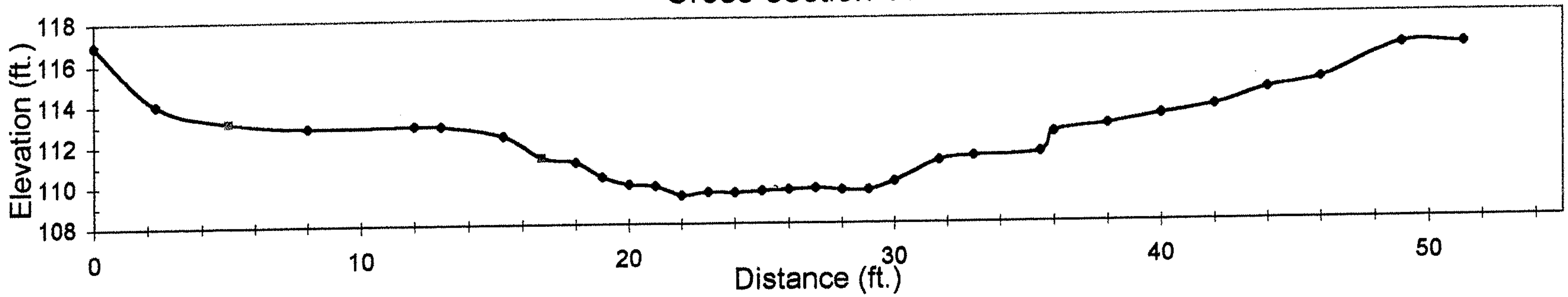

Cross-section 12
Elevation (ft.)
90
88
86
84
82
80
0
10
20
30
40
50
Distance (ft.)


Cross-section 13
Elevation (ft)
93
91
89
87
0
10
20
30
40
50
60
Distance (ft)

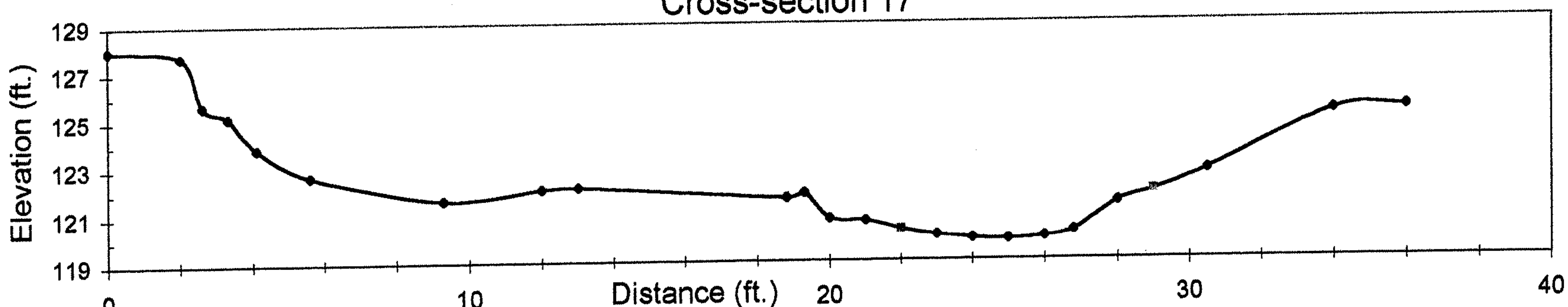

Cross-section 14
Elevation (ft)
100
98
96
94
92
90
0
10
20
30
40
50
60
70
Distance (ft)


Cross-section 15
Elevation (ft.)
117
115
113
111
109
107
0
10
20
30
40
50
60
Distance (ft.)

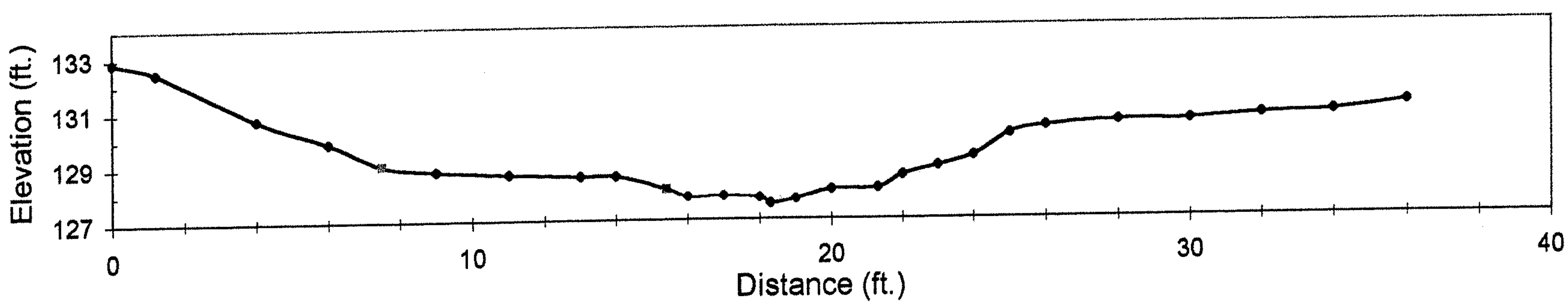
Cross-section 16

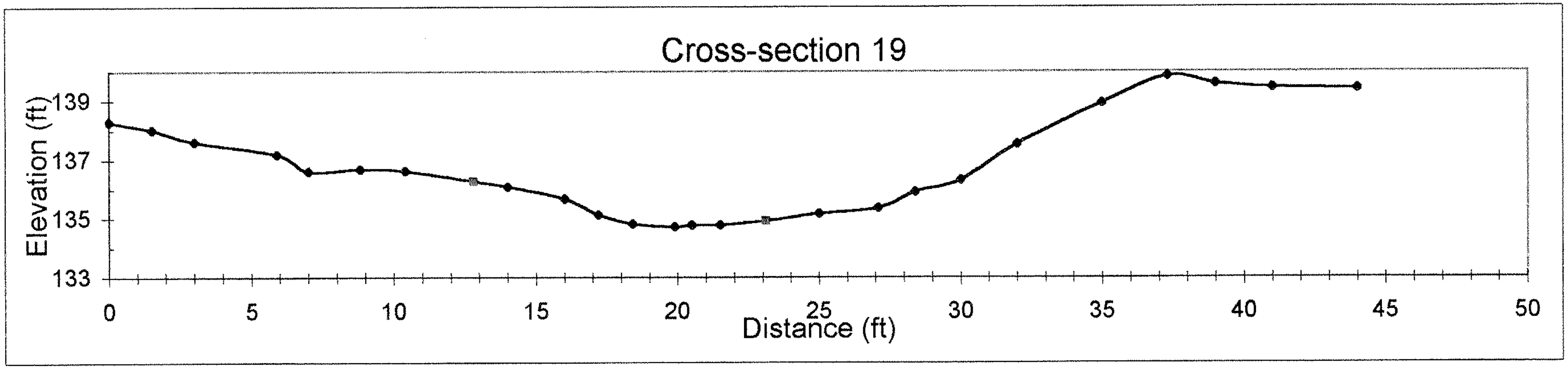


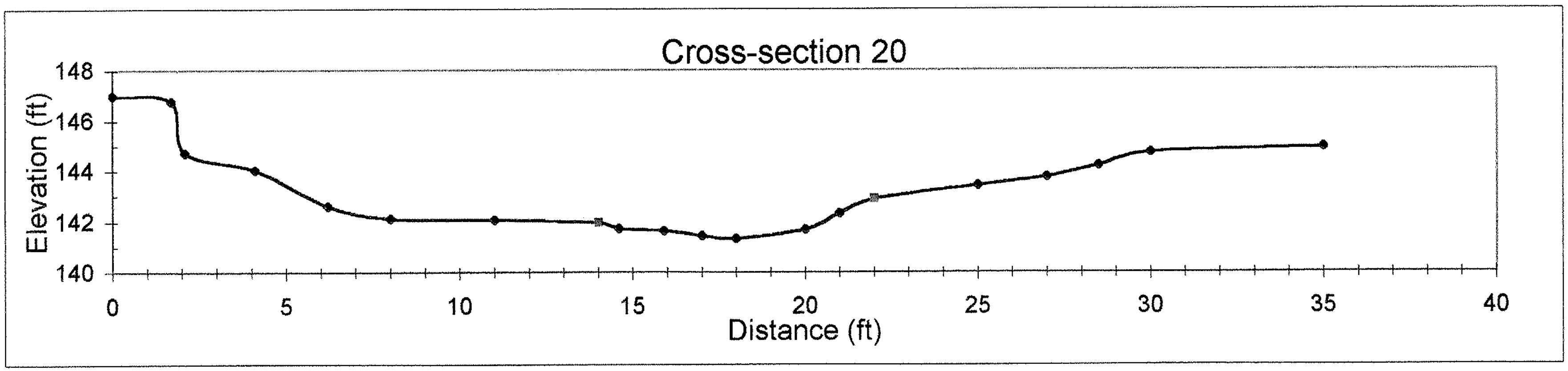
Cross-section 17

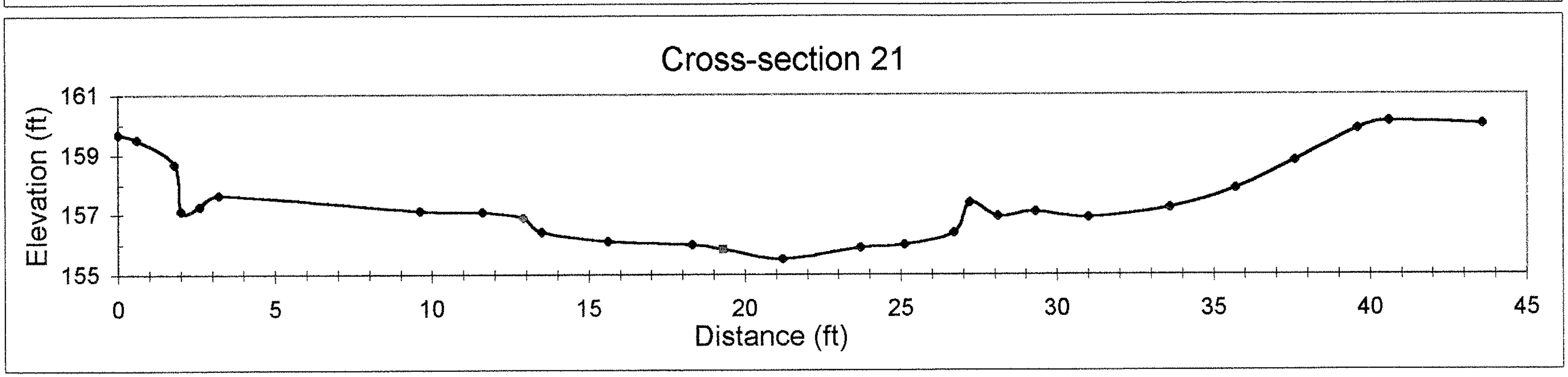


Cross-section 18




Cross-section 19
Elevation (ft)
139
137
135
133
0
5
10
15
20
25
30
35
40
45
50
Distance (ft)


Cross-section 20
Elevation (ft)
148
146
144
142
140
0
5
10
15
20
25
30
35
40
Distance (ft)


Cross-section 21
Elevation (ft)
161
159
157
155
0
5
10
15
20
25
30
35
40
45
Distance (ft)

Longitudinal Profile Information for Upper Pasture

Longitudinal Profile Data Sheet for: As-built information on AH&W site.

Profile description: Long-profile starts at the head of the pool below the x-vane at or just us of survey point 1A65, starts 1' below the center rock(rebar on the RB marks beginning). Long Pro. Starts on 507' on total channel length

See other notes at bottom.

																Dbkf		RIFFLE-POOL				
Feature	HI	Length	Tot. Dist.	Thal.	Thal. Elev	slope	W.S.	W.S. elev.	slope	BF	BF Elev.	slope	Top bank	T.B. elev.	slope	pool	riffle	pool-L	riffle-L	R:P	TB-Thal	Bkf-W.S.
HoP&Dep	147.6	0	26	5.85	141.75	-0.03	4.71	142.89	0.0050	3.75	143.85	0.0	0.048	147.552	0.0397	2.1		26		83	5.802	0.96
HoRi	147.6	26	55	5.09	142.51	0.03	4.84	142.76	0.0256	3.75	143.85	0.1	1.08	146.52	0.0529		1.34		57		4.01	1.09
top of xv	147.6	81	2	6.65	140.95	1.17	6.25	141.35	0.6400	5.57	142.03	0.0	3.99	143.61	0.0000						2.66	0.68
HoP&Dep	147.6	83	4	8.99	138.61	-0.34	7.53	140.07	-0.0025	6.58	141.02	0.0	3.99	143.61	0.0500	2.41		4		58	5	0.95
HoRi	147.6	87	50	7.62	139.98	0.03	7.52	140.08	0.0172	6.58	141.02	0.1	4.19	143.41	0.0256		1.04		54		3.43	0.94
top of xv	147.6	137	4	8.9	138.7	0.38	8.38	139.22	0.3575	7.97	139.63	0.0	5.47	142.13	0.0000						3.43	0.41
HoP	147.6	141	6	10.43	137.17	0.07	9.81	137.79	0.0000	7.97	139.63	0.0	5.47	142.13	0.0000	2.46		11		101	4.96	1.84
Depth	147.6	147	5	10.87	136.73	-0.13	9.81	137.79	0.0120	7.97	139.63	0.1	5.47	142.13	0.1700						5.4	1.84
HoRi	147.6	152	38	10.21	137.39	0.06	9.87	137.73	0.0561	9.34	138.26	0.1	6.32	141.28	0.0518		0.87		90		3.89	0.53
top of J-h	147.6	190	50	12.54	135.06	0.05	12	135.6	0.0546	11.17	136.43	0.1	8.29	139.31	0.0776						4.25	0.83
top of xv	138.13	240	2	5.35	132.78	0.62	5.26	132.87	0.4450	3.85	134.28	0.1	2.7	135.43	0.0000						2.65	1.41
HoP	138.13	242	6	6.58	131.55	0.09	6.15	131.98	0.0100	5.38	132.75	0.0	2.7	135.43	0.0000	1.2		11		35	3.88	0.77
Depth	138.13	248	5	7.13	131	-0.11	6.21	131.92	0.0020	5.38	132.75	0.0	2.7	135.43	0.0000						4.43	0.83
HoRi	138.13	253	23	6.58	131.55	0.00	6.22	131.91	0.0013	5.08	133.05	0.0	2.7	135.43	-0.0304		1.5		24		3.88	1.14
top of xv	138.13	276	1	6.62	131.51	3.03	6.25	131.88	1.4700	5.72	132.41	0.0	2	136.13	0.0000						4.62	0.53
HoP&Dep	138.13	277	16	9.65	128.48	-0.10	7.72	130.41	0.0044	6.94	131.19	0.0	2	136.13	0.1781	2.71		16		62	7.65	0.78
HoRi	138.13	293	45	8.1	130.03	0.02	7.79	130.34	0.0151	6.94	131.19	0.0	4.85	133.28	0.0664		1.16		46		3.25	0.85
top of xv	138.13	338	1	8.97	129.16	1.35	8.47	129.66	1.0100	7.84	130.29	0.0	7.84	130.29	0.6000						1.13	0.63
HoP	138.13	339	11	10.32	127.81	0.03	9.48	128.65	0.0000	8.44	129.69	0.0	8.44	129.69	0.0000	1.88		23		87	1.88	1.04
Depth	138.13	350	12	10.65	127.48	-0.05	9.48	128.65	0.0075	8.44	129.69	0.0	8.44	129.69	-0.0008						2.21	1.04
HoRi	138.13	362	61	10	128.13	0.01	9.57	128.56	0.0080	8.43	129.7	0.0	8.43	129.7	0.0179		1.57		64		1.57	1.14
top of xv	138.13	423	3	10.42	127.71	0.39	10.06	128.07	0.3100	9.52	128.61	0.0	9.52	128.61	0.0000						0.9	0.54
HoP	138.13	426	8	11.58	126.55	0.05	10.99	127.14	0.0000	9.52	128.61	0.0	9.52	128.61	0.0000	2.06		16		181	2.06	1.47
Depth	138.13	434	8	12	126.13	-0.07	10.99	127.14	0.0075	9.52	128.61	0.0	9.52	128.61	0.1375						2.48	1.47
HoRi	138.13	442	77	11.4	126.73	0.04	11.05	127.08	0.0366	10.62	127.51	0.1	10.62	127.51	0.0160		0.78		165		0.78	0.43
top of J-h	138.13	519	87	14.27	123.86	0.04	13.87	124.26	0.0457	13.09	125.04	0.2	11.85	126.28	0.0594						2.42	0.78
top of xv	129.02	606	1	8.94	120.08	0.76	8.74	120.28	0.6800	7.91	121.11	0.0	7.91	121.11	0.0000						1.03	0.83
HoP	129.02	607	6	9.7	119.32	0.16	9.42	119.6	0.0100	7.91	121.11	0.0	7.91	121.11	0.0000	1.79		16		63	1.79	1.51
Depth	129.02	613	10	10.65	118.37	-0.08	9.48	119.54	0.0020	7.91	121.11	0.0	7.91	121.11	0.0570						2.74	1.57
HoRi	129.02	623	44	9.82	119.2	0.03	9.5	119.52	0.0277	8.48	120.54	0.1	8.48	120.54	0.0191		1.34		47		1.34	1.02
top of xv	129.02	667	3	10.98	118.04	0.37	10.72	118.3	0.2000	10.24	118.78	0.0	9.32	119.7	0.1900						1.66	0.48
HoP	129.02	670	5	12.09	116.93	0.09	11.32	117.7	0.0000	9.89	119.13	0.0	9.89	119.13	0.0000	2.2		18		214	2.2	1.43
Depth	129.02	675	13	12.55	116.47	-0.07	11.32	117.7	0.0046	9.89	119.13	0.0	9.89	119.13	0.0608						2.66	1.43
HoRi	129.02	688	82	11.67	117.35	0.03	11.38	117.64	0.0217	10.68	118.34	0.1	10.68	118.34	0.0165		0.99		196		0.99	0.7
top of J-h	129.02	770	111	13.78	115.24	0.03	13.16	115.86	0.0294	12.03	116.99	0.1	12.03	116.99	0.0332						1.75	1.13
top of xv	121.23	881	3	8.93	112.3	0.22	8.63	112.6	0.0000	7.92	113.31	0.0	7.92	113.31	0.0000						1.01	0.71
HoP&Dep	121.23	884	19	9.6	111.63	-0.03	8.63	112.6	0.0132	7.92	113.31	0.0	7.92	113.31	-0.0411	1.68		19		48	1.68	0.71
HoRi	121.23	903	28	8.96	112.27	0.02	8.88	112.35	0.0164	7.14	114.09	0.0	7.14	114.09	0.0454		1.82		29		1.82	1.74
top of xv	121.23	931	1	9.55	111.68	1.29	9.34	111.89	0.8600	8.41	112.82	0.0	8.41	112.82	0.0000						1.14	0.93
HoP	121.23	932	3	10.84	110.39	0.33	10.2	111.03	0.0000	8.41	112.82	0.0	8.41	112.82	0.0000	2.43		27		75	2.43	1.79
Depth	121.23	935	24	11.83	109.4	-0.05	10.2	111.03	0.0017	8.41	112.82	0.0	8.41	112.82	0.0246						3.42	1.79
HoRi	121.23	959	46	10.61	110.62	0.02	10.24	110.99	0.0191	9	112.23	0.0	9	112.23	0.0204		1.61		48		1.61	1.24
top of xv	121.23	1005	2	11.31	109.92	1.12	11.12	110.11	0.4400	9.94	111.29	0.0	9.94	111.29	0.0000						1.37	1.18
HoP&Dep	121.23	1007	15	13.54	107.69	-0.08	12	109.23	0.0060	9.94	111.29	0.0	9.94	111.29	0.0193	3.6		15		57	3.6	2.06
HoRi	121.23	1022	40	12.38	108.85	0.03	12.09	109.14	0.0297	10.23	111	0.1	10.23	111	0.0422		2.15		42		2.15	1.86
top of xv	121.23	1062	2	13.68	107.55	0.92	13.28	107.95	0.5600	11.92	109.31	0.0	11.92	109.31	0.0000						1.76	1.36
HoP&Dep	121.23	1064	16	15.51	105.72	-0.04	14.4	106.83	0.0019	11.92	109.31	0.1	11.92	109.31	0.1175	3.59		16		41	3.59	2.48
HoRi	121.23	1080	24	14.79	106.44	0.03	14.43	106.8	0.0367	13.8	107.43	0.0	13.8	107.43	0.0242		0.99		25		0.99	0.63
top of xv	121.23	1104	1	15.6	105.63	2.84	15.31	105.92	1.3600	14.38	106.85	0.0	14.38	106.85	0.0800						1.22	0.93
HoP&Dep	116.73	1105	12	13.94	102.79	-0.11	12.17	104.56	0.0108	9.96	106.77	0.1	9.96	106.77	0.1458	3.98		12		62	3.98	2.21
HoRi	116.73	1117	48	12.65	104.08	0.01	12.3	104.43	0.0142	11.71	105.02	0.0	11.71	105.02	0.0085		0.94		50		0.94	0.59
top of xv	116.73	1165	2	13.3	103.43	0.77	12.98	103.75	0.4000	12.12	104.61	0.0	12.12	104.61	0.0000						1.18	0.86
HoP&Dep	116.73	1167	16	14.85	101.88	-0.04	13.78	102.95	0.0031	12.12	104.61	0.0	12.12	104.61	0.0594	2.73		16			2.73	1.66
HoRi	116.73	1183		14.13	102.6		13.83	102.9		13.07	103.66		13.07	103.66			1.06				1.06	0.76
															Average=	3.00	1.37	17.5	66.9	60.0	1.96	1.31

Pool slopes=	0.0050	-0.0025	0.0120	0.0120	0.0044	0.0075	0.0075	0.0120	0.0046	0.0132
Avg. slope=	0.0338		Avg. Riffle slope=	0.0233		Avg. Pool slope=	0.0076			
Avg. Pool length	17.5		Avg. Riffle length	66.9						
Total Pool length	246	21%	Total Riffle length	937	79%	1183 =TOTAL				

Range:		pool	riffle	pool-L	riffle-L	R:P	TB-Thal	Bkf-W.S.
	min	1.68	0.94	12	25	41	0.94	0.59
	max	3.98	2.15	27	196	75	3.98	2.48

Water surface slope from head of 1st riffle to bottom of last pool

distance = 1183
top = 142.89
bottom = 102.9
39.99 difference from top to bottom of the valley

Water Surface Slope = 0.0338

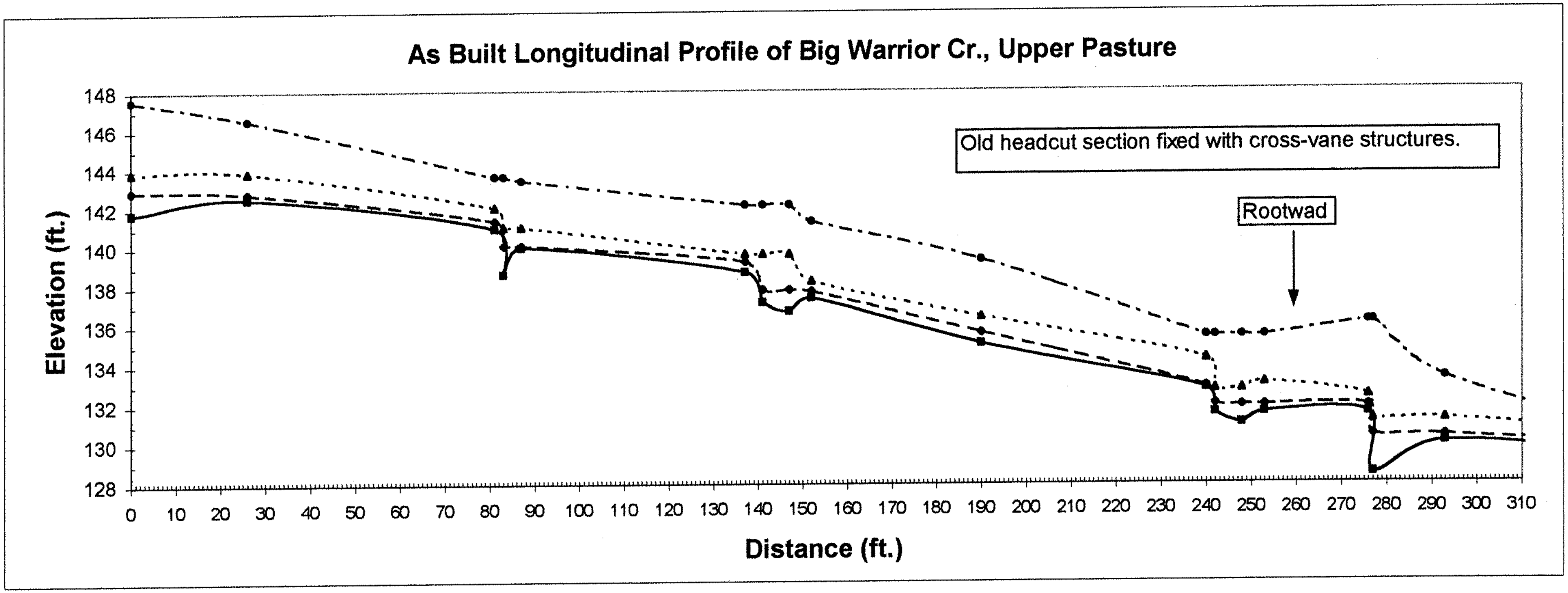
Valley slope from head of 1st top of bank to last

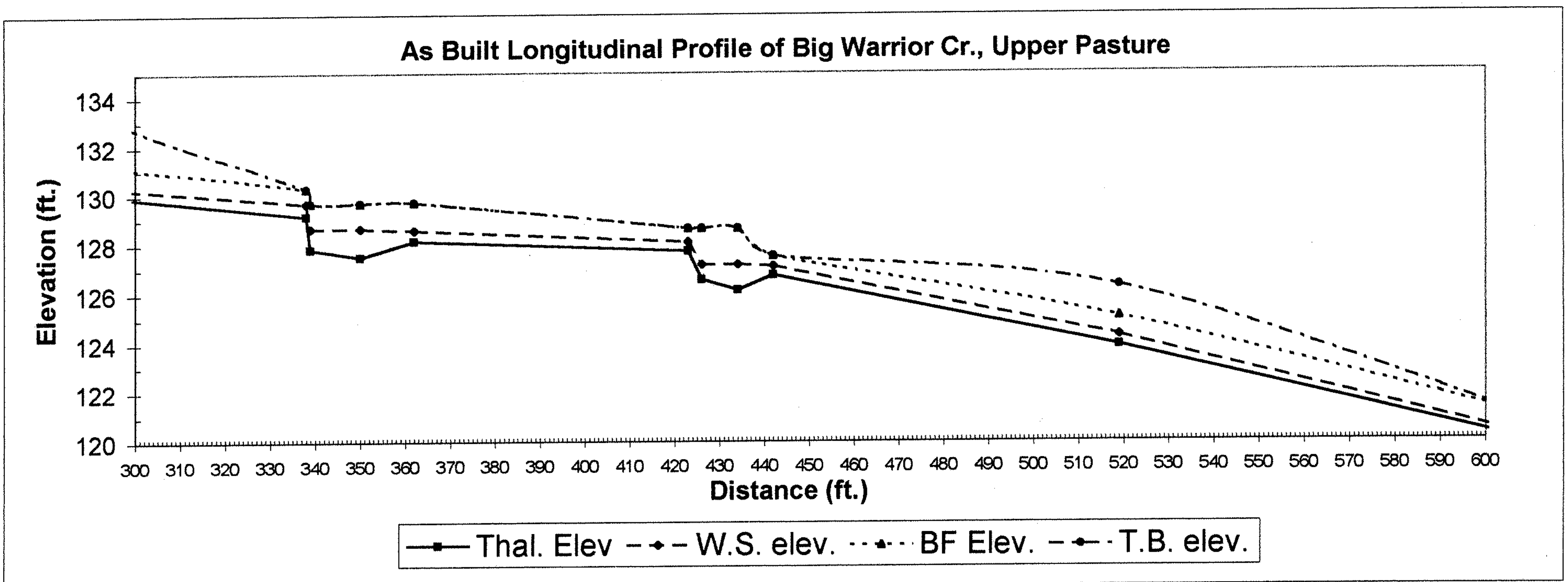
distance = 1183
1st top of bank = 147.552
last top of bank= 103.66
43.892 difference from top to bottom of the valley

Valley Slope = 0.0371 Sinuosity= 1.097574

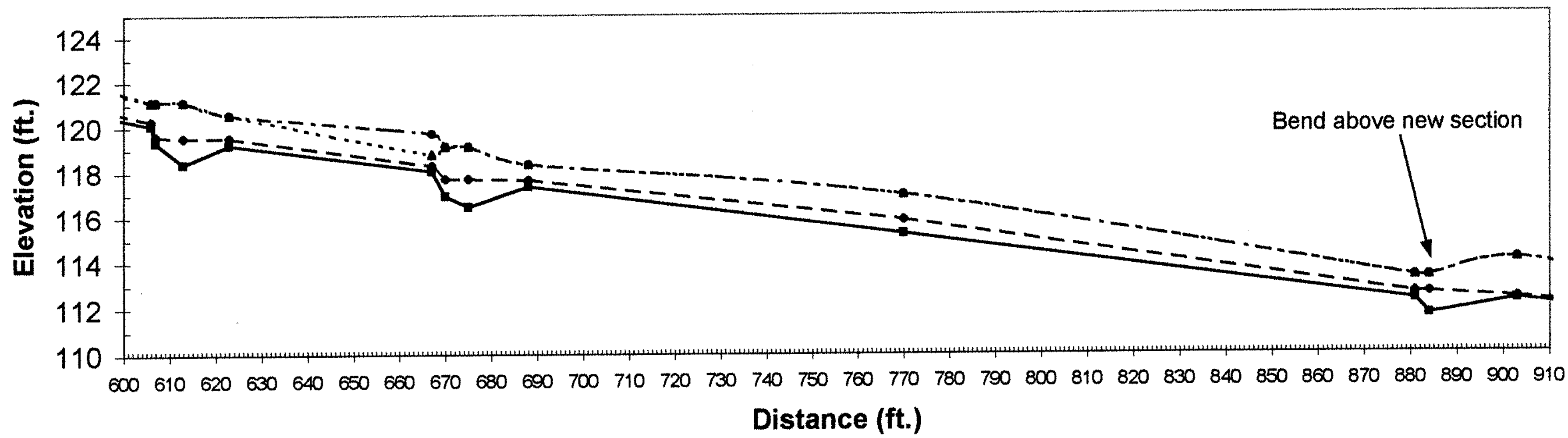
0' on this long Pro. Falls at 507' on total channel length
93' on this long Pro. Falls at 600' on total channel length
392' on this long pro. Falls at 900' on total channel length.
691' on this long pro. Falls at 1200' on total channel length;
984' on this long pro. Falls at 1500' on total channel length.

cross-section at 853' on this long. pro., 52.6'us of point 1A59
cross-section at 946' on this long. pro, 1.75' ds of point 1A59
cross-section at 1042.3' on this long. pro., 107' ds of point 1A59 & 53' us of 1A58

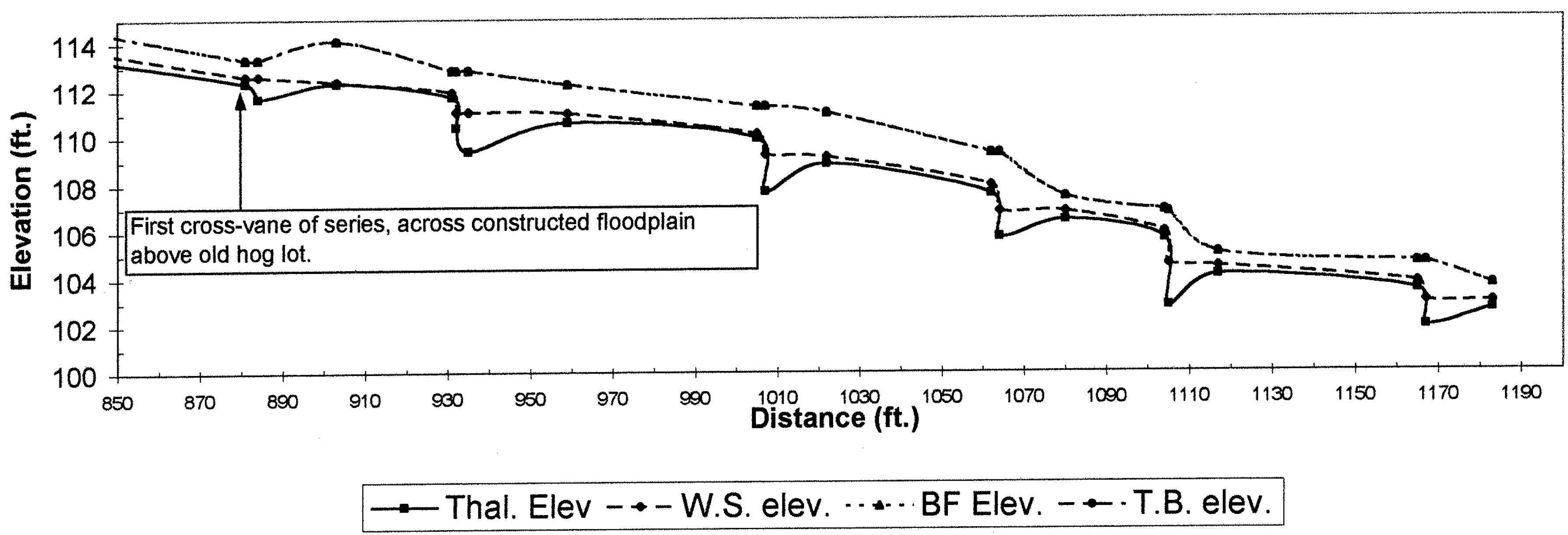

As Built Longitudinal Profile of Big Warrior Cr., Upper Pasture
Old headcut section fixed with cross-vane structures.
Rootwad
Elevation (ft.)
Distance (ft.)
148
146
144
142
140
138
136
134
132
130
128
0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190 200 210 220 230 240 250 260 270 280 290 300 310


As Built Longitudinal Profile of Big Warrior Cr., Upper Pasture
Elevation (ft.)
Distance (ft.)
134
132
130
128
126
124
122
120
300 310 320 330 340 350 360 370 380 390 400 410 420 430 440 450 460 470 480 490 500 510 520 530 540 550 560 570 580 590 600
Thal. Elev
W.S. elev.
BF Elev.
T.B. elev.

As Built Longitudinal Profile of Big Warrior Cr., Upper Pasture



As Built Longitudinal Profile of Big Warrior Cr., Upper Pasture



Longitudinal Profile Information in Feed Lot

Longitudinal Profile Data Sheet for: As-built information on AH&W site.

Profile description: Feed Lot longitudinal profile starts at bridge and goes upstream 600'. It begins at deepest part of pool in front of rootwad just over from ds end of feed trough. It goes ds to us side, middle of bridge, ending at the head of the pool under the bridge.

																Dbkf		RIFFLE-POOL				
Feature	HI	Length	Tot. Dist.	Thal.	Thal. Elev	slope	W.S.	W.S. elev.	slope	BF	BF Elev.	slope	Top bank	T.B. elev.	slope	pool	riffle	pool-L	riffle-L	R:P	TB-Thal	Bkf-W.S.
Depth	98.93	0	15	8.95	89.98	-0.06	7.78	91.15	0.0013	6.97	91.96	0.0	6.97	91.96	0.0100						1.98	0.81
top of xv	98.93	15	1	8.04	90.89	1.39	7.8	91.13	1.1600	7.12	91.81	0.0	7.12	91.81	0.0000						0.92	0.68
HoP	98.93	16	2	9.43	89.5	0.26	8.96	89.97	0.0000	7.12	91.81	0.0	7.12	91.81	-0.0550	2.31		17		175	2.31	1.84
Depth	98.93	18	15	9.95	88.98	-0.05	8.96	89.97	0.0027	7.01	91.92	0.1	7.01	91.92	0.0733						2.94	1.95
HoRi	98.93	33	49	9.25	89.68	0.03	9	89.93	0.0284	8.11	90.82	0.1	8.11	90.82	0.0278		1.14		49		1.14	0.89
run	98.93	82	15	10.8	88.13	0.00	10.39	88.54	0.0107	9.47	89.46	0.0	9.47	89.46	-0.0033						1.33	0.92
top of J-h	98.93	97	4	10.77	88.16	0.17	10.55	88.38	0.0750	9.42	89.51	0.0	9.42	89.51	-0.0050						1.35	1.13
HoRi	98.93	101	90	11.43	87.5	0.02	10.85	88.08	0.0221	9.4	89.53	0.2	9.4	89.53	0.0268		2.03		90		2.03	1.45
HoP	98.93	191	13	13.51	85.42	-0.01	12.84	86.09	0.0046	11.81	87.12	0.0	11.81	87.12	-0.0162	1.7		16		16	1.7	1.03
top of xv	98.93	204	3	13.39	85.54	0.63	12.9	86.03	0.3200	11.6	87.33	0.0	11.6	87.33	0.0000						1.79	1.3
HoP	98.93	207	3	15.27	83.66	0.09	13.86	85.07	0.0000	11.6	87.33	0.0	11.6	87.33	-0.1767	3.67		13		79	3.67	2.26
Depth	98.93	210	10	15.53	83.4	-0.13	13.86	85.07	-0.0040	11.07	87.86	0.1	11.07	87.86	0.1550						4.46	2.79
HoRi	98.93	220	66	14.21	84.72	0.04	13.82	85.11	0.0377	12.62	86.31	0.1	12.62	86.31	0.0312		1.59		66		1.59	1.2
HoP	90.62	286	10	8.22	82.4	0.13	8	82.62	-0.0060	6.37	84.25	0.0	6.37	84.25	0.0060	1.85		34		118	1.85	1.63
Depth	90.62	296	24	9.48	81.14	-0.04	7.94	82.68	0.0067	6.43	84.19	0.1	6.43	84.19	0.0325						3.05	1.51
HoRi	90.62	320	82	8.47	82.15	0.02	8.1	82.52	0.0148	7.21	83.41	0.0	7.21	83.41	0.0080		1.26		82		1.26	0.89
top of xv	90.62	402	2	9.74	80.88	1.00	9.31	81.31	0.5150	7.87	82.75	0.0	7.87	82.75	0.0000						1.87	1.44
HoP	90.62	404	3	11.74	78.88	0.07	10.34	80.28	0.0200	7.87	82.75	0.0	7.87	82.75	-0.0400	3.87		20		85	3.87	2.47
Depth	90.62	407	17	11.96	78.66	-0.07	10.4	80.22	0.0000	7.75	82.87	0.1	7.75	82.87	0.0641						4.21	2.65
HoRi	90.62	424	65	10.77	79.85	0.03	10.4	80.22	0.0331	8.84	81.78	0.2	8.84	81.78	0.0362		1.93		65		1.93	1.56
HoP	90.62	489	6	12.71	77.91	0.12	12.55	78.07	0.0050	11.19	79.43	0.0	11.19	79.43	0.0000	1.52		12		101	1.52	1.36
Depth	90.62	495	6	13.45	77.17	-0.07	12.58	78.04	0.0117	11.19	79.43	0.0	11.19	79.43	0.0350						2.26	1.39
HoRi	90.62	501	89	13.02	77.6	0.03	12.65	77.97	0.0243	11.4	79.22	0.2	11.4	79.22	0.0302		1.62		89		1.62	1.25
HoP	90.62	590		15.42	75.2		14.81	75.81		14.09	76.53		14.09	76.53		1.33					1.33	0.72
			0		0			0			0	0.0		0								
			0		0			0			0			0								
															Average=	2.32	1.60	18.7	73.5	95.5	2.17	1.46

	Pool slopes=	0.0013	0.0046	-0.0020	0.0003	0.0100	0.0083	
Avg. slope=	0.0260		Avg. Riffle slope=	0.0267	Avg. Pool slope=	0.0038		
Avg. Pool length	18.7		Avg. Riffle length 73.5					
Total Pool length 112	19%		Total Riffle length 441	75%	590 =TOTAL			

Range:		pool	riffle	pool-L	riffle-L	R:P	TB-Thal	Bkf-W.S.
	min	1.33	1.14	12	49	16	0.92	0.68
	max	3.87	2.03	34	90	175	4.46	2.79

Water surface slope from head of 1st riffle to bottom of last pool

distance = 590
top = 91.15
bottom = 75.81
15.34 difference from top to bottom of the valley

Water Surface Slope = 0.0260

Valley slope from head of 1st top of bank to last

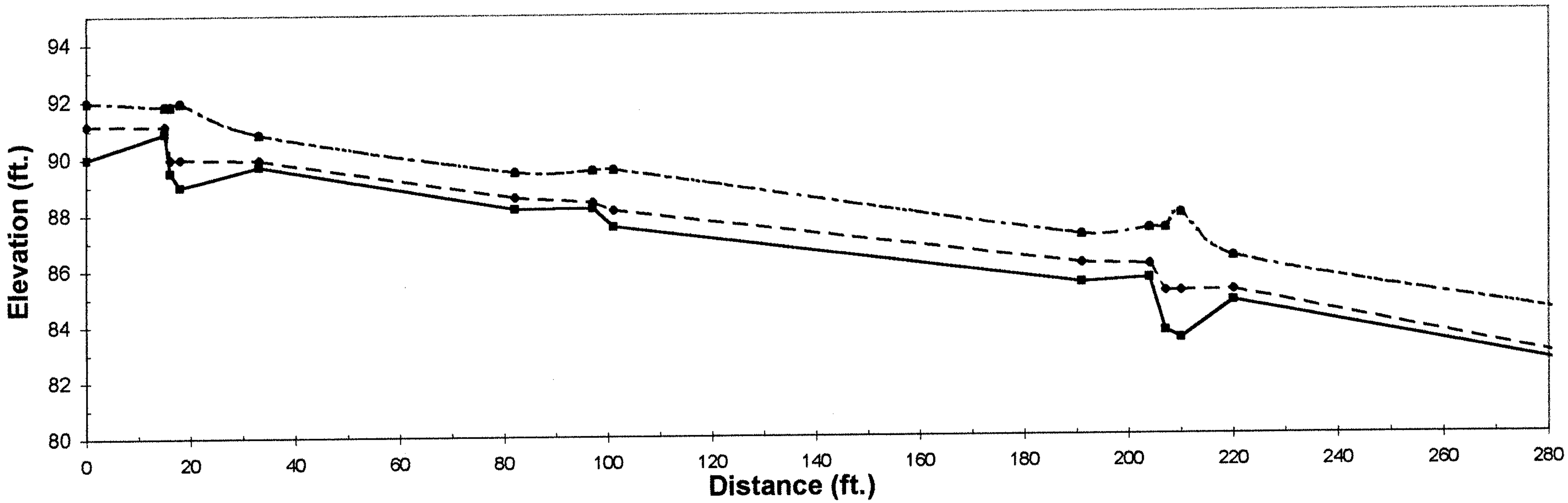
distance = 590
1st top of bank = 91.96
last top of bank= 76.53
15.43 difference from top to bottom of the valley

Valley Slope = 0.0262 Sinuosity= 1.005867

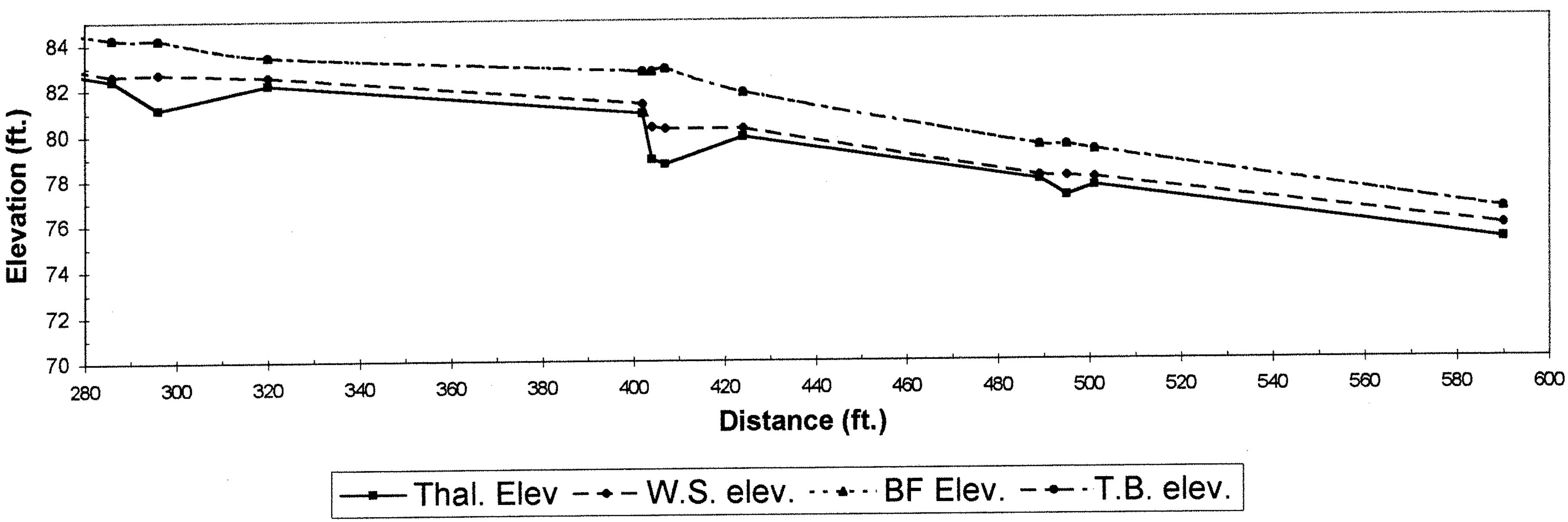
239' on this F.L. Long. Profile falls at 2400' on the total channel length
536' on this F.L. Long. Profile falls at 2700' on the total channel length

Cross-section #12 is located at 418.7 on the F.L. Long. Profile
Cross-section #13 is located at 253' on the F.L. Long. Profile
Cross-section #14 is located at 92.6' on the F.L. Long. Profile

As Built Longitudinal Profile of Big Warrior Cr., Feed Lot



As Built Longitudinal Profile of Big Warrior Cr., Feed Lot



Longitudinal Profile Information for Middle Pasture

Longitudinal Profile Data Sheet for: As-built information on AH&W site.

Profile description: Middle Pasture longitudinal profile starts at 1st J-hook at end of cross-fence from feed barn and goes downstream 602'. It begins on the top of the 1st J-hook vane and ends in deepest point of pool 602' downstream. Rebar marks both ends of profile.

Feature	HI	Length	Tot. Dist.	Thal.	Thal. Elev	slope	W.S.	W.S. elev.	slope	BF	BF Elev.	slope	Top bank	T.B. elev.	slope	Dbkf pool	Dbkf riffle	RIFFLE-POOL pool-L	riffle-L	R:P	TB-Thal	Bkf-W.S.
top of J-h	67.93	0	5	8.57	59.36	0.15	7.98	59.95	0.0640	7.21	60.72	0.0	7.21	60.72	0.0000		1.36				1.36	
HoP&Dep	67.93	5	12	9.31	58.62	-0.06	8.3	59.63	0.0000	7.21	60.72	0.1	7.21	60.72	0.0342	2.1		12		30	2.1	1.09
HoRi	67.93	17	15	8.6	59.33	0.03	8.3	59.63	0.0087	7.62	60.31	0.0	7.62	60.31	0.0000		0.98		18		0.98	0.68
top of J-h	67.93	32	3	9	58.93	0.12	8.43	59.5	0.0833	7.62	60.31	0.0	7.62	60.31	0.0500						1.38	0.81
HoP&Dep	67.93	35	13	9.37	58.56	-0.02	8.68	59.25	0.0046	7.77	60.16	0.1	7.77	60.16	0.0208	1.6		13		32	1.6	0.91
HoRi	67.93	48	15	9.16	58.77	0.02	8.74	59.19	0.0147	8.04	59.89	0.0	8.04	59.89	0.0000		1.12		19		1.12	0.7
top of J-h	67.93	63	4	9.42	58.51	0.27	8.96	58.97	0.0100	8.04	59.89	0.0	8.04	59.89	0.0450						1.38	0.92
HoP&Dep	67.93	67	10	10.49	57.44	-0.06	9	58.93	0.0450	8.22	59.71	0.1	8.22	59.71	0.0280	2.27		10		69	2.27	0.78
HoRi	67.93	77	59	9.85	58.08	0.02	9.45	58.48	0.0203	8.5	59.43	0.2	8.5	59.43	0.0175		1.35		59		1.35	0.95
HoP	67.93	136	5	11.15	56.78	0.14	10.65	57.28	0.0100	9.53	58.4	0.0	9.53	58.4	-0.0240	1.62		26		94	1.62	1.12
Depth	67.93	141	21	11.83	56.1	-0.03	10.7	57.23	0.0043	9.41	58.52	0.0	9.41	58.52	0.0095						2.42	1.29
HoRi	67.93	162	68	11.17	56.76	0.02	10.79	57.14	0.0182	9.61	58.32	0.2	9.61	58.32	0.0163		1.56		68		1.56	1.18
HoP	67.93	230	6	12.63	55.3	0.05	12.03	55.9	-0.0200	10.72	57.21	0.0	10.72	57.21	-0.0200	1.91		44		78	1.91	1.31
Depth	67.93	236	38	12.91	55.02	-0.01	11.91	56.02	0.0024	10.6	57.33	0.1	10.6	57.33	0.0082						2.31	1.31
HoRi	67.93	274	34	12.5	55.43	0.03	12	55.93	0.0376	10.91	57.02	0.2	10.91	57.02	0.0350		1.59		34		1.59	1.09
HoP	67.93	308	10	13.67	54.26	0.04	13.28	54.65	0.0010	12.1	55.83	0.0	12.1	55.83	0.0190	1.57		24		78	1.57	1.18
Depth	67.93	318	14	14.04	53.89	-0.04	13.29	54.64	-0.0043	12.29	55.64	-0.1	12.29	55.64	-0.0207						1.75	1
HoRi	67.93	332	54	13.54	54.39	0.02	13.23	54.7	0.0191	12	55.93	0.3	12	55.93	0.0241		1.54		54		1.54	1.23
HoP	67.93	386	8	14.56	53.37	0.09	14.26	53.67	0.0000	13.3	54.63	0.0	13.3	54.63	0.0188	1.26		26		60	1.26	0.96
Depth	67.93	394	18	15.31	52.62	-0.03	14.26	53.67	0.0000	13.45	54.48	0.0	13.45	54.48	-0.0028						1.86	0.81
HoRi	67.93	412	34	14.69	53.24	0.03	14.26	53.67	0.0271	13.4	54.53	0.1	13.4	54.53	0.0129		1.29		34		1.29	0.86
HoP	61.07	446	6	8.95	52.12	0.08	8.32	52.75	0.0050	6.98	54.09	0.0	6.98	54.09	0.0000	1.97		14		73	1.97	1.34
Depth	61.07	452	8	9.45	51.62	-0.06	8.35	52.72	0.0213	6.98	54.09	0.1	6.98	54.09	0.0350						2.47	1.37
HoRi-run	61.07	460	33	8.96	52.11	0.00	8.52	52.55	0.0033	7.26	53.81	0.1	7.26	53.81	0.0130				59		1.7	1.26
HoRi	61.07	493	26	9.03	52.04	0.02	8.63	52.44	0.0169	7.69	53.38	0.1	7.69	53.38	0.0154		1.34				1.34	0.94
HoP	61.07	519	8	9.6	51.47	0.05	9.07	52	-0.0237	8.09	52.98	0.1	8.09	52.98	0.0413	1.51		29		83	1.51	0.98
Depth	61.07	527	21	10.02	51.05	-0.03	8.88	52.19	0.0062	8.42	52.65	0.0	8.42	52.65	0.0010						1.6	0.46
HoRi	61.07	548	50	9.43	51.64	0.03	9.01	52.06	0.0258	8.44	52.63	0.2	8.44	52.63	0.0206		0.99		54		0.99	0.57
HoP	61.07	598	4	10.71	50.36	0.16	10.3	50.77	0.0250	9.47	51.6	0.0	9.47	51.6	0.0500	1.24					1.24	0.83
Depth	61.07	602		11.35	49.72		10.4	50.67		9.67	51.4		9.67	51.4							1.68	0.73
														Average=		1.71	1.31	22.0	44.3	66.3	1.62	0.99
														Range:	min	1.24	0.98	10	18	30	0.98	0.46
															max	2.27	1.59	44	68	94	2.47	1.37

Pool slopes=	0.0000	0.0046	0.0450	0.0071	-0.0088	-0.0016	0.0000	0.0131	-0.0088

Avg. slope=	0.0154	Avg. Riffle slope=	0.0192	Avg. Pool slope=	0.0056
Avg. Pool length	22.0	Avg. Riffle length 44.3			
Total Pool length 198	36%	Total Riffle length 399	73%	548 =TOTAL	

Water surface slope from head of 1st riffle to bottom of last pool

Channel distance = 602

top = 59.95

bottom = 50.67

9.28 difference from top to bottom of the valley

Water Surface Slope = 0.0154

Valley slope from head of 1st top of bank to last

Valley distance = 500

1st top of bank = 60.72

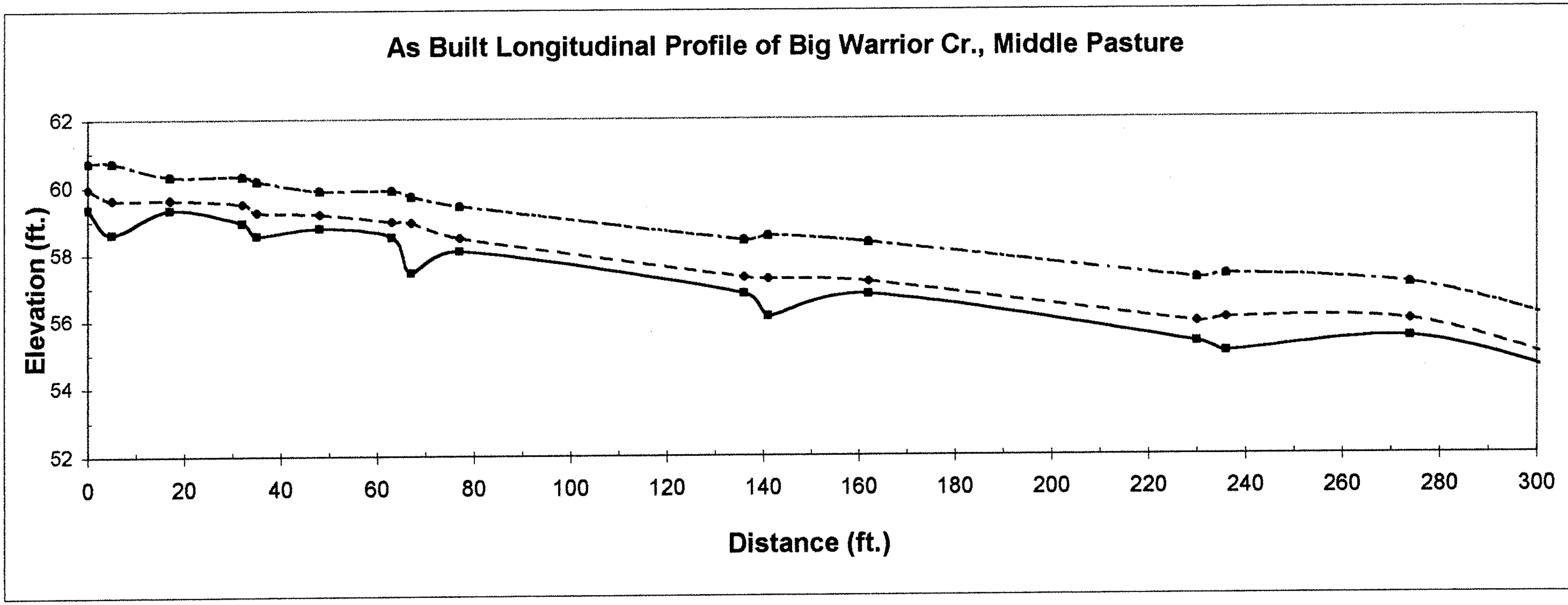
last top of bank= 51.4

9.32 difference from top to bottom of the valley

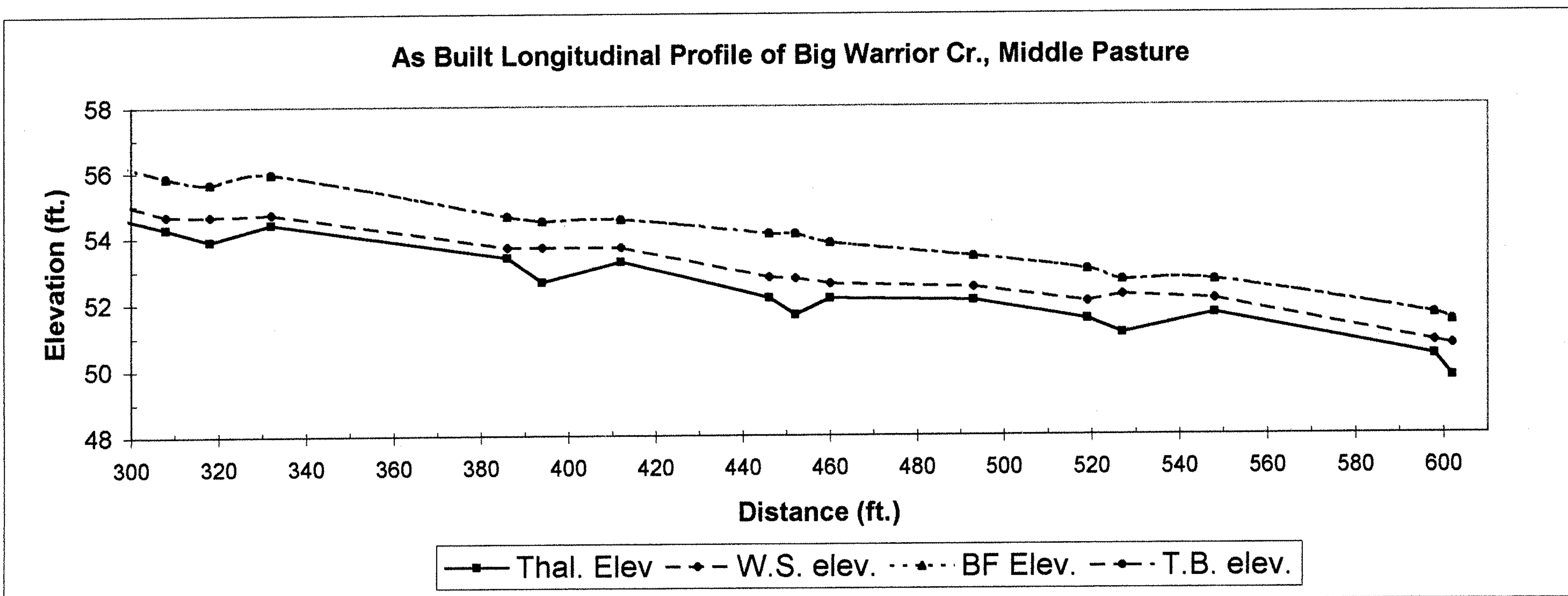
Valley Slope = 0.0186 Sinuosity= 1.20919

3624' to where the Middle Pasture Long. Profile begins on the total channel length

Cross-section #8 is located at 466.5 on the M.P. Long. Profile



As Built Longitudinal Profile of Big Warrior Cr., Middle Pasture
Elevation (ft.)
62
60
58
56
54
52
0
20
40
60
80
100
120
140
160
180
200
220
240
260
280
300
Distance (ft.)



As Built Longitudinal Profile of Big Warrior Cr., Middle Pasture
Elevation (ft.)
58
56
54
52
50
48
300
320
340
360
380
400
420
440
460
480
500
520
540
560
580
600
Distance (ft.)
Thal. Elev
W.S. elev.
BF Elev.
T.B. elev.

Longitudinal Profile Information for the Lower Pasture

Longitudinal Profile Data Sheet for: As-built information on AH&W site.

HoP&Dep

Profile description: Lower Pasture Longitudinal Profile begins 42.3' ds of 1B9 in the head of the pool before the rootwad and ends on the the J-hook vane in the thalwag as it crosses the vane, 35' ds of 1B26

																Dbkf		RIFFLE-POOL				
Feature	HI	Length	Tot. Dist.	Thal.	Thal. Elev	slope	W.S.	W.S. elev.	slope	BF	BF Elev.	slope	Top bank	T.B. elev.	slope	pool	riffle	pool-L	riffle-L	R:P	TB-Thal	Bkf-W.S.
HoP	46.69	0	14	8.77	37.92	0.08	7.97	38.72	0.0000	7.01	39.68	0.0	7.01	39.68	0.0021			55.0		55.0	1.76	0.96
Depth	46.69	14	41	9.95	36.74	-0.03	7.97	38.72	0.0010	7.04	39.65	0.0	7.04	39.65	0.0129	2.9					2.91	0.93
Hop/top xv	46.69	55	2	8.53	38.16	0.77	8.01	38.68	0.3750	7.57	39.12	0.0	7.57	39.12	0.0000			10.0		75.0	0.96	0.44
Depth	46.69	57	8	10.06	36.63	-0.11	8.76	37.93	0.0113	7.57	39.12	0.0	7.57	39.12	0.0287	2.5					2.49	1.19
HoRi	46.69	65	65	9.18	37.51	0.01	8.85	37.84	0.0085	7.8	38.89	0.0	7.8	38.89	0.0083		1.4		65.0		1.38	1.05
HoP	46.69	130	13	9.97	36.72	0.04	9.4	37.29	0.0123	8.34	38.35	0.0	8.34	38.35	0.0208			32.0		75.0	1.63	1.06
Depth	46.69	143	19	10.55	36.14	-0.04	9.56	37.13	0.0037	8.61	38.08	0.0	8.61	38.08	0.0100	1.9					1.94	0.95
HoRi	46.69	162	43	9.87	36.82	0.01	9.63	37.06	0.0088	8.8	37.89	0.0	8.8	37.89	0.0077		1.1		43.0		1.07	0.83
HoP	46.69	205	10	10.5	36.19	0.07	10.01	36.68	0.0080	9.13	37.56	0.0	9.13	37.56	0.0000			19.5		71.0	1.37	0.88
Depth	46.69	215	9.5	11.24	35.45	-0.08	10.09	36.6	0.0105	9.13	37.56	0.0	9.13	37.56	0.0021	2.1					2.11	0.96
HoRi	46.69	224.5	51.5	10.5	36.19	0.01	10.19	36.5	0.0070	9.15	37.54	0.0	9.15	37.54	0.0095		1.4		51.5		1.35	1.04
HoP	46.69	276	13	10.95	35.74	0.06	10.55	36.14	-0.0031	9.64	37.05	0.0	9.64	37.05	0.0000			20.0		65.0	1.31	0.91
Depth	46.69	289	7	11.7	34.99	-0.11	10.51	36.18	0.0086	9.64	37.05	0.0	9.64	37.05	0.0043	2.1					2.06	0.87
HoRi	46.69	296	45	10.95	35.74	0.02	10.57	36.12	0.0111	9.67	37.02	0.1	9.67	37.02	0.0162		1.3		45.0		1.28	0.9
Hop/top J-	46.69	341	1.3	11.66	35.03	0.70	11.07	35.62	0.2154	10.4	36.29	0.0	10.4	36.29	0.0000			13.3		38.0	1.26	0.67
Depth	46.69	342.3	12	12.57	34.12	-0.06	11.35	35.34	0.0000	10.4	36.29	0.0	10.4	36.29	-0.0150	2.2					2.17	0.95
HoRi	46.69	354.3	24.7	11.8	34.89	0.03	11.35	35.34	0.0247	10.22	36.47	0.1	10.22	36.47	0.0296		1.6		24.7		1.58	1.13
HoP	46.69	379	9	12.49	34.2	0.06	11.96	34.73	-0.0011	10.95	35.74	0.0	10.95	35.74	-0.0322			20.8		34.5	1.54	1.01
Depth	46.69	388	11.8	13.07	33.62	-0.06	11.95	34.74	0.0059	10.66	36.03	0.0	10.66	36.03	0.0034	2.4					2.41	1.29
HoRi	46.69	399.8	13.7	12.37	34.32	0.04	12.02	34.67	0.0255	10.7	35.99	0.0	10.7	35.99	0.0234		1.7		13.7		1.67	1.32
HoP	46.69	413.5	4.8	12.95	33.74	0.12	12.37	34.32	0.0125	11.02	35.67	0.0	11.02	35.67	0.0000			13.5		68.5	1.93	1.35
Depth	46.69	418.3	8.7	13.51	33.18	-0.07	12.43	34.26	0.0080	11.02	35.67	0.0	11.02	35.67	0.0655	2.5					2.49	1.41
HoRi	46.69	427	35	12.86	33.83	0.00	12.5	34.19	0.0029	11.59	35.1	0.0	11.59	35.1	0.0111		1.3		55.0		1.27	0.91
Ri	46.69	462	20	12.87	33.82	0.04	12.6	34.09	0.0250	11.98	34.71	0.0	11.98	34.71	-0.0010						0.89	0.62
HoP	46.69	482	8.5	13.66	33.03	0.04	13.1	33.59	0.0000	11.96	34.73	0.0	11.96	34.73	0.0459			19.5		68.0	1.7	1.14
Depth	46.69	490.5	11	14	32.69	-0.04	13.1	33.59	0.0036	12.35	34.34	0.0	12.35	34.34	-0.0027	1.7					1.65	0.75
HoRi	46.69	501.5	48.5	13.6	33.09	0.01	13.14	33.55	0.0095	12.32	34.37	0.0	12.32	34.37	0.0076		1.3		48.5		1.28	0.82
HoP	46.69	550	11	14	32.69	0.09	13.6	33.09	0.0027	12.69	34	0.0	12.69	34	-0.0018			38.0		88.5	1.31	0.91
Depth	46.69	561	27	14.97	31.72	-0.02	13.63	33.06	0.0041	12.67	34.02	0.0	12.67	34.02	0.0193	2.3					2.3	0.96
Hrun	41.3	588	38	8.95	32.35	0.01	8.35	32.95	0.0163	7.8	33.5	0.0	7.8	33.5	0.0053				50.5		1.15	0.55
HoRi	41.3	626	12.5	9.18	32.12	0.04	8.97	32.33	0.0360	8	33.3	0.0	8	33.3	0.0000		1.2				1.18	0.97
Hop/top xv	41.3	638.5	2.2	9.71	31.59	0.49	9.42	31.88	-0.0818	8	33.3	0.0	8	33.3	0.0000			12.5		29.0	1.71	1.42
Depth	41.3	640.7	10.3	10.79	30.51	-0.11	9.24	32.06	0.0010	8	33.3	0.0	8	33.3	0.0369	2.8					2.79	1.24
HoRi	41.3	651	16.5	9.7	31.6	0.01	9.25	32.05	0.0164	8.38	32.92	0.0	8.38	32.92	0.0073		1.3		16.5		1.32	0.87
HoP	41.3	667.5	5.5	9.89	31.41	0.13	9.52	31.78	0.0218	8.5	32.8	0.0	8.5	32.8	-0.0055			15.5		61.5	1.39	1.02
Depth	41.3	673	10	10.6	30.7	-0.06	9.64	31.66	0.0010	8.47	32.83	0.0	8.47	32.83	-0.0080	2.1					2.13	1.17
HoRi	41.3	683	46	9.98	31.32	0.01	9.65	31.65	0.0087	8.39	32.91	0.0	8.39	32.91	0.0150		1.6		46.0		1.59	1.26
HoP	41.3	729	6	10.46	30.84	0.10	10.05	31.25	-0.0050	9.08	32.22	0.0	9.08	32.22	0.0167			36.0			1.38	0.97
Depth	41.3	735	30	11.08	30.22	-0.02	10.02	31.28	0.0033	9.18	32.12	0.0	9.18	32.12	0.0077	1.9					1.9	0.84
HoRi	41.3	765	14	10.5	30.8	0.01	10.12	31.18	0.0186	9.41	31.89	0.0	9.41	31.89	0.0000		1.1		14.0		1.09	0.71
top of J-h	41.3	779		10.58	30.72		10.38	30.92		9.41	31.89		9.41	31.89							1.17	0.97
			Pool slopes=	0.0005	0.0080	0.0093	0.0027	0.0024	0.0103	0.0018	0.0034	0.0114	-0.0008									
						Average=										2.3	1.3	23.5	39.5	60.8	1.66	0.98
						Range: min										1.7	1.1	10.0	13.7	29.0	0.9	0.4
						max										2.9	1.7	55.0	65.0	88.5	2.9	1.4

Avg. slope=	0.0100	Avg. Riffle slope=	0.0148	Avg. Pool slope=	0.0049
Avg. Pool length	23.5	Avg. Riffle length	39.5		
Total Pool length	305.6 39%	Total Riffle length	473.4 61%	779.0 =TOTAL	

Water surface slope from head of 1st riffle to bottom of last pool

distance = 779
top = 38.72
bottom = 30.92
7.80 difference from top to bottom of the valley

Water Surface Slope = 0.0100

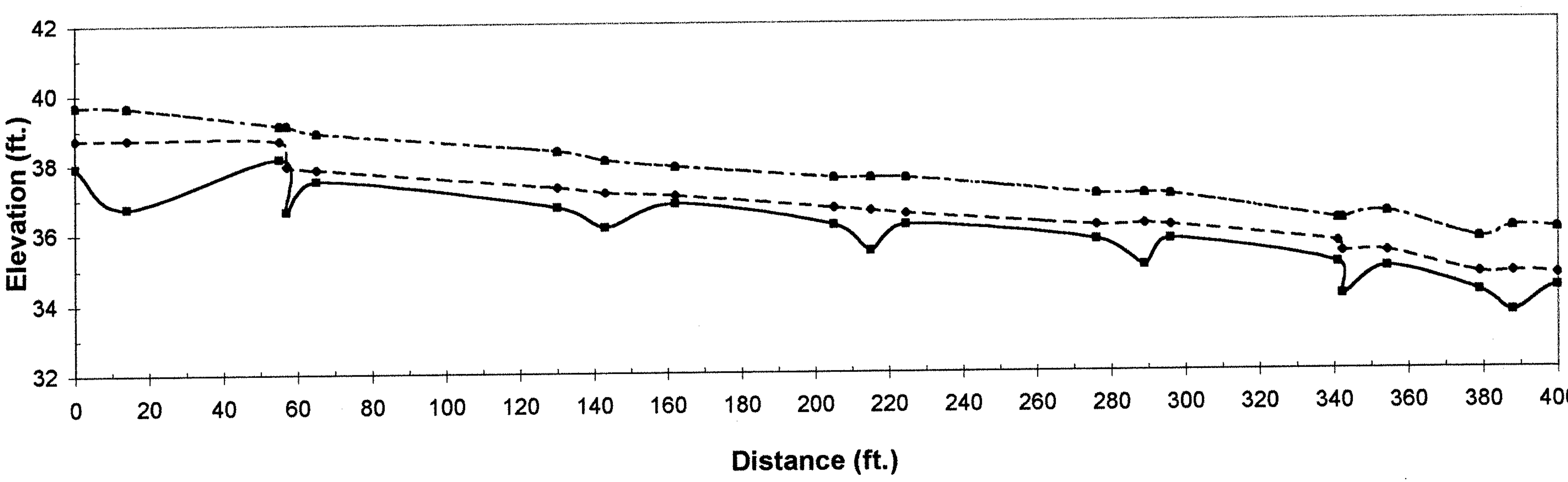
Valley slope from head of 1st top of bank to last

distance = 590
1st top of bank = 39.68
last top of bank= 31.89
7.79 difference from top to bottom of the valley

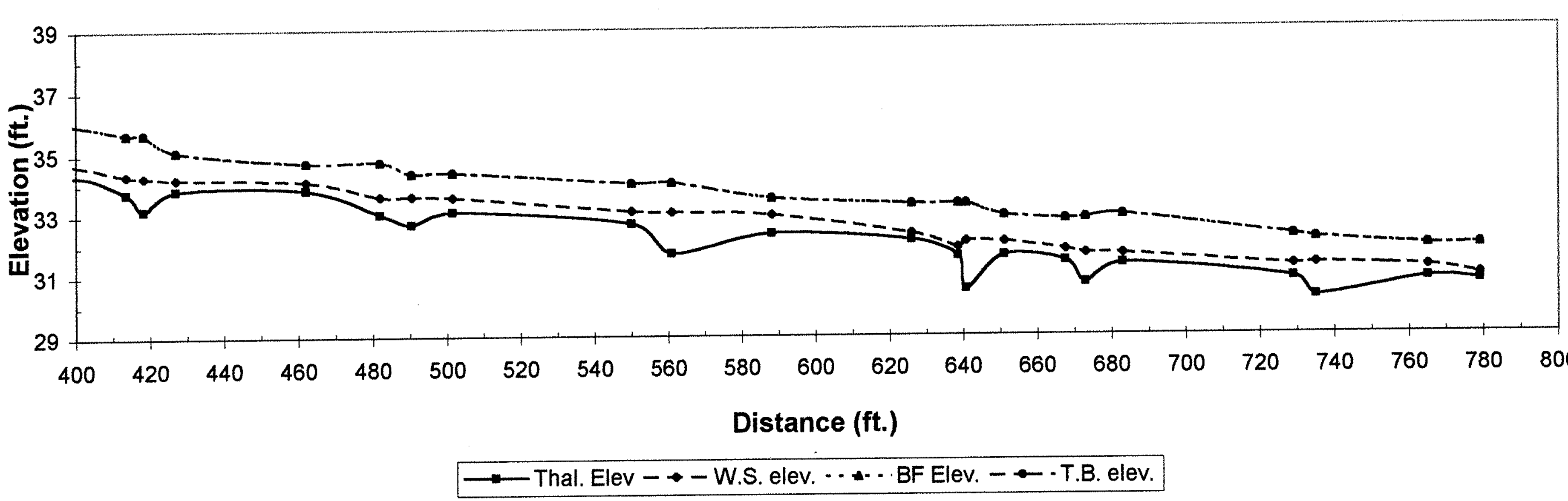
Valley Slope = 0.0132

Sinuosity based on slope=	1.3186
Sinuosity based on length=	1.3203

As Built Longitudinal Profile of Big Warrior Cr., Lower Pasture



As Built Longitudinal Profile of Big Warrior Cr., Lower Pasture

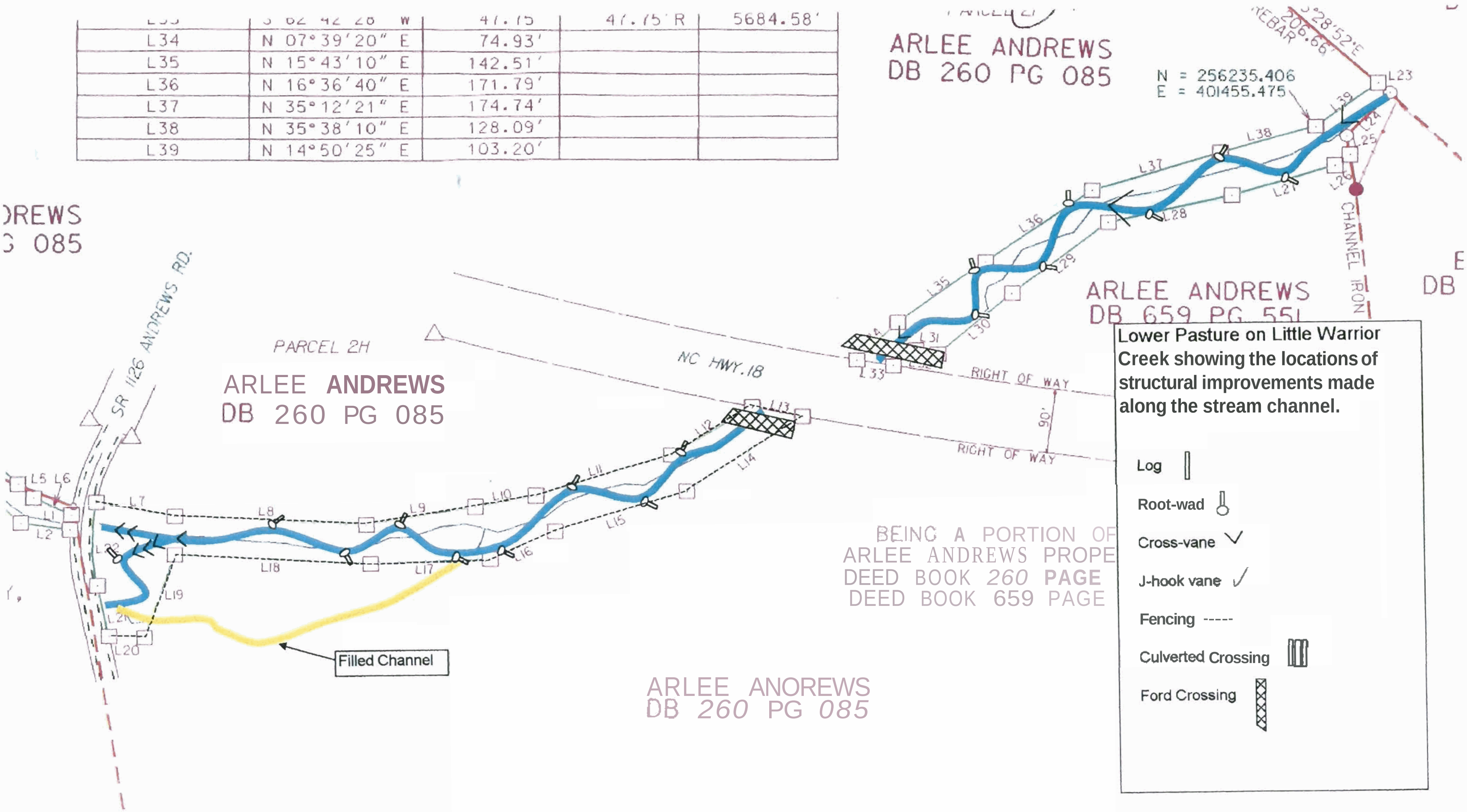


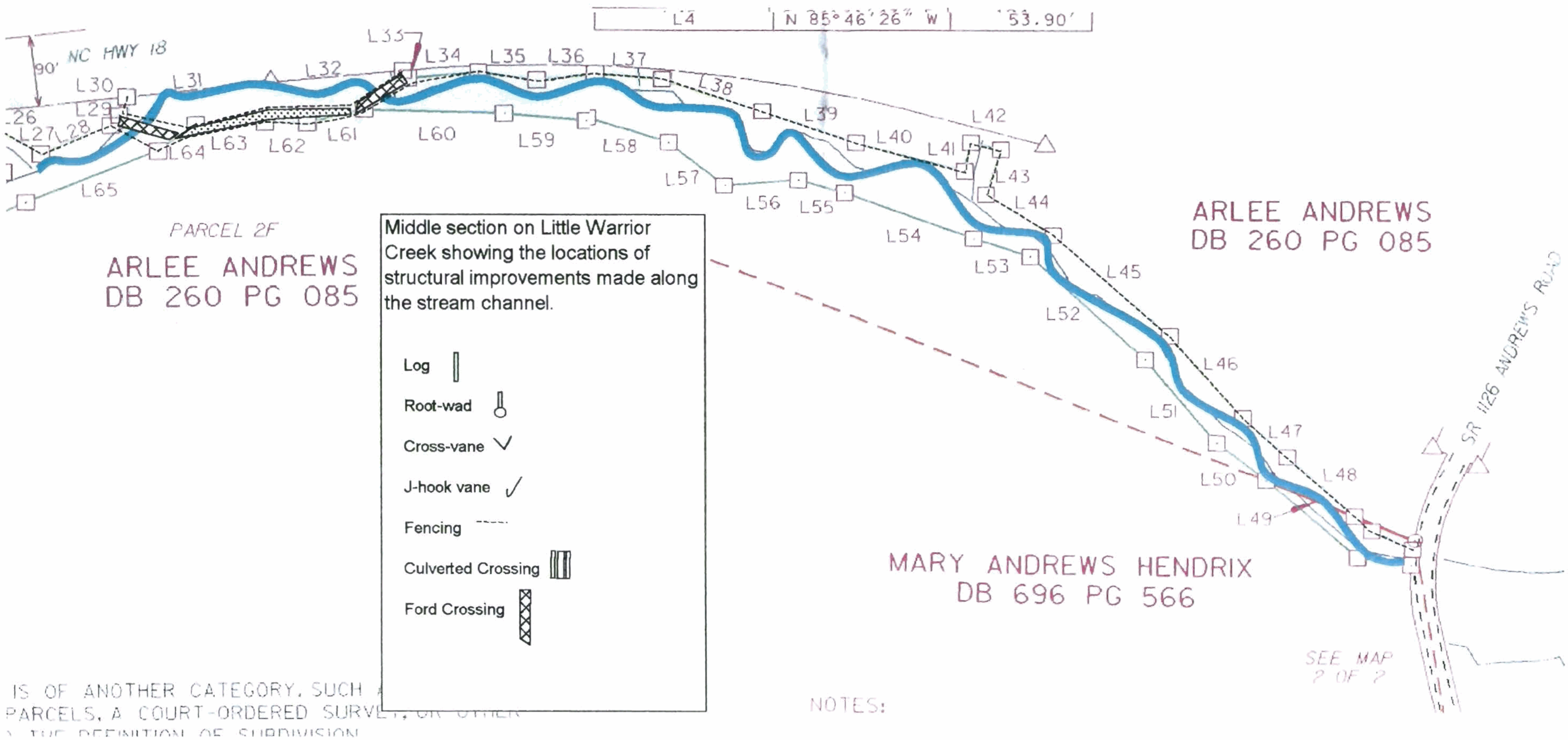
Little Warrior Creek As-built Stream Restoration Data

Survey
Project modifications
Reference Photo Locations
Photos of Big Warrior Creek
Pebble Count Data
Cross-section & Longitudinal Profile Locations
Cross-section (Dimension) Data
Longitudinal Profile Data

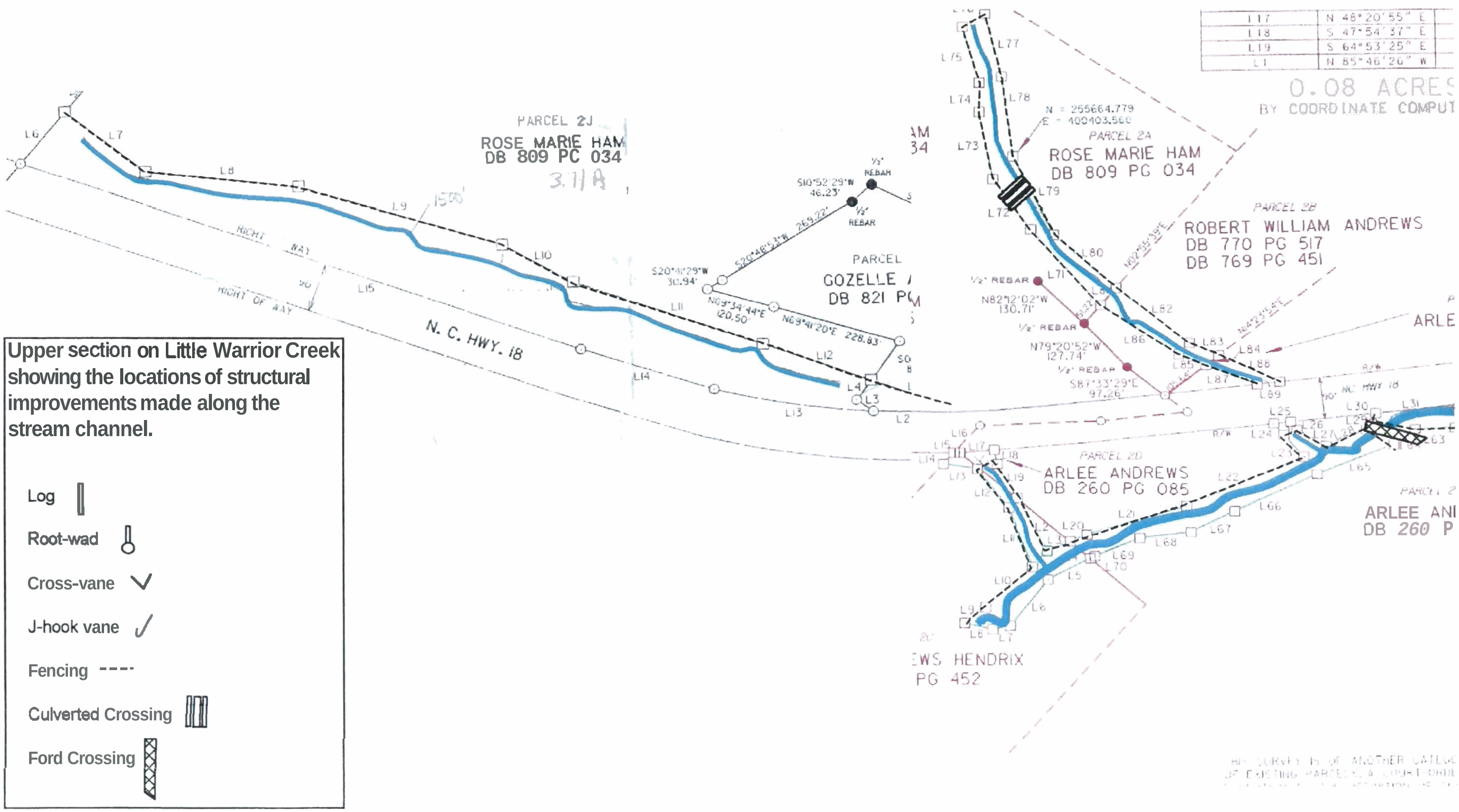
Survey of the Easement line along Little Warrior Creek and unnamed tributaries.

L33	S 62°42'28" W	47.75'	47.75' R	5684.58'
L34	N 07°39'20" E	74.93'		
L35	N 15°43'10" E	142.51'		
L36	N 16°36'40" E	171.79'		
L37	N 35°12'21" E	174.74'		
L38	N 35°38'10" E	128.09'		
L39	N 14°50'25" E	103.20'		





L4
N 85°46'26" W
53.90'
90' NC HWY 18
L30
L31
L32
L33
L34
L35
L36
L37
L38
L39
L40
L41
L42
L43
L44
L45
L46
L47
L48
L49
L50
L51
L52
L53
L54
L55
L56
L57
L58
L59
L60
L61
L62
L63
L64
L65
PARCEL 2F
ARLEE ANDREWS
DB 260 PG 085
ARLEE ANDREWS
DB 260 PG 085
MARY ANDREWS HENDRIX
DB 696 PG 566
SR 1126 ANDREWS ROAD
SEE MAP 2 OF 2
NOTES:
IS OF ANOTHER CATEGORY, SUCH
PARCELS, A COURT-ORDERED SURVE
Middle section on Little Warrior Creek showing the locations of structural improvements made along the stream channel.
Log
Root-wad
Cross-vane
J-hook vane
Fencing
Culverted Crossing
Ford Crossing

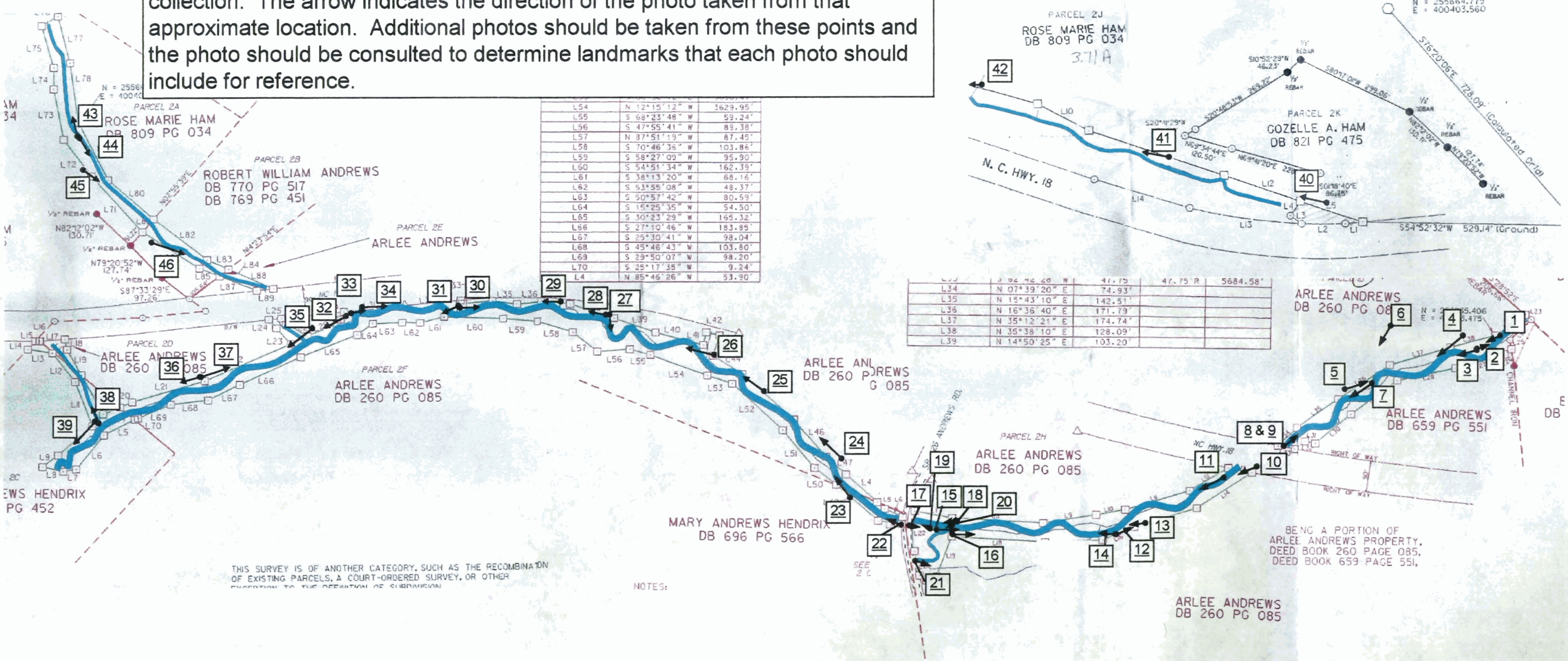


Upper section on Little Warrior Creek showing the locations of structural improvements made along the stream channel.

- Log
- Root-wad
- Cross-vane
- J-hook vane
- Fencing ----
- Culverted Crossing
- Ford Crossing

Photos taken along Little Warrior Creek

Numbers refer to the series of photos from this location in the reference photo collection. The arrow indicates the direction of the photo taken from that approximate location. Additional photos should be taken from these points and the photo should be consulted to determine landmarks that each photo should include for reference.



L54	N 12°15'12" W	3629.95'
L55	S 68°23'48" W	59.24'
L56	S 47°55'41" W	89.38'
L57	N 87°51'19" W	87.45'
L58	S 70°46'36" W	103.86'
L59	S 58°27'09" W	95.90'
L60	S 54°51'34" W	162.39'
L61	S 38°13'20" W	68.16'
L62	S 53°55'08" W	48.37'
L63	S 50°57'42" W	80.59'
L64	S 15°25'35" W	54.50'
L65	S 30°23'29" W	165.32'
L66	S 27°10'46" W	183.85'
L67	S 25°30'41" W	98.04'
L68	S 45°46'43" W	103.80'
L69	S 29°50'07" W	98.20'
L70	S 25°17'35" W	9.24'
L4	N 85°46'26" W	53.90'

[illegible]	[illegible]	47.75'	47.75' R	5684.58'
L34	N 07°39'20" E	74.93'		
L35	N 15°43'10" E	142.51'		
L36	N 16°36'40" E	171.79'		
L37	N 35°12'21" E	174.74'		
L38	N 35°38'10" E	128.09'		
L39	N 14°50'25" E	103.20'		

Lwbelow 18C, AH&W 98-12-11

DSC00316, 03/1/31

Reach is the lower end of the lower pasture, on Little Warrior Creek. Photos are from the end of the project looking upstream to the lower large willow.
This is series number 1 from the LWC reference photos.

US of willow, 01-7-19 thermo & crossing

DSC00320, 03/1/31

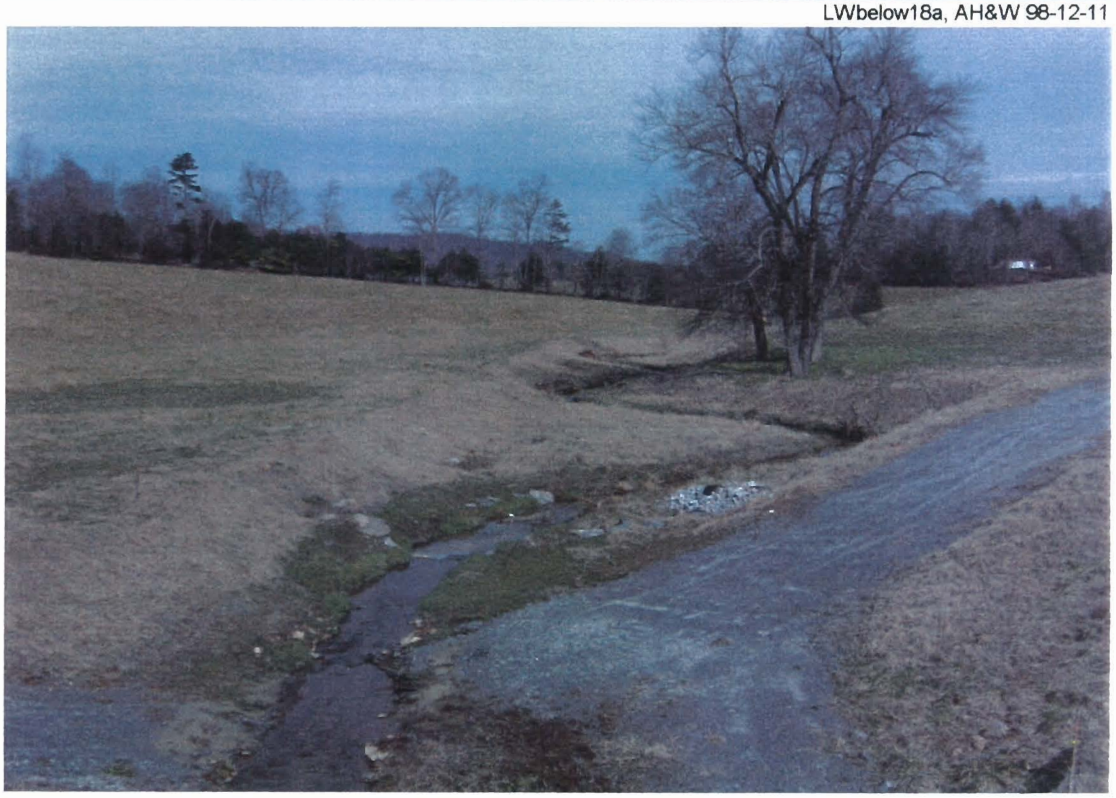
Reach is **the** lower end of the lower pasture, on Little Warrior Creek. Photos are taken from just upstream of survey point 2A38 looking upstream
This is series number **4** from the LWC reference photos.

Chan US of willow, 01-7-19thermo & crossing

DSC00319, 03/1/31

Reach is at the lower end of lower pasture below Hwy 18, on Big Warrior Creek.
Photo is taken from just above the large willow looking upstream.
This is series number 3 from the LWC reference photos.

LWbelow18a, AH&W 98-12-11



DSC00302, 03/1/31

Reach is the upper end of lower pasture below Hwy 18, on Big Warrior Creek. Photo is taken from on top of the culvert under Hwy. 18 looking downstream. This is series number 8 from the LWC reference photos.

LWabove18a, AH&W 98-12-11

DSC00304, 03/1/31

Reach is above the Hwy 18 culvert, on Big Warrior Creek. Photo is taken from slope below Hwy. 18, looking upstream towards Andrews Road.
This is series number 10 from the LWC reference photos.

MVC-0016S, AH&W 98-12-9

DSC00313, 03/1/31

Reach is below the culvert on Andrews Road, on Little Warrior Creek. Photo is taken from the right side of the culvert looking downstream towards Hwy. 18. This is series number 17 from the LWC reference photos.

LW-Rta, AH&W 98-12-11

DSC00314, 03/1/31

Reach is above the culvert on Andrews Road, on Little Warrior Creek. Photo is taken from the right side of the culvert looking upstream towards Hwy. 18. This is series number 22 from the LWC reference photos.

LW-RTB, AH&W 98-12-11

DSC00314, 03/1/31

Reach is in the upper pasture south of Hwy 18 on Little Warrior Creek. Photo is taken from the left side of the channel looking upstream towards upper end of cattle crossing. This is series number 32 from the LWC reference photos.

Lwbypassed culvert, AH&W 98-12-11

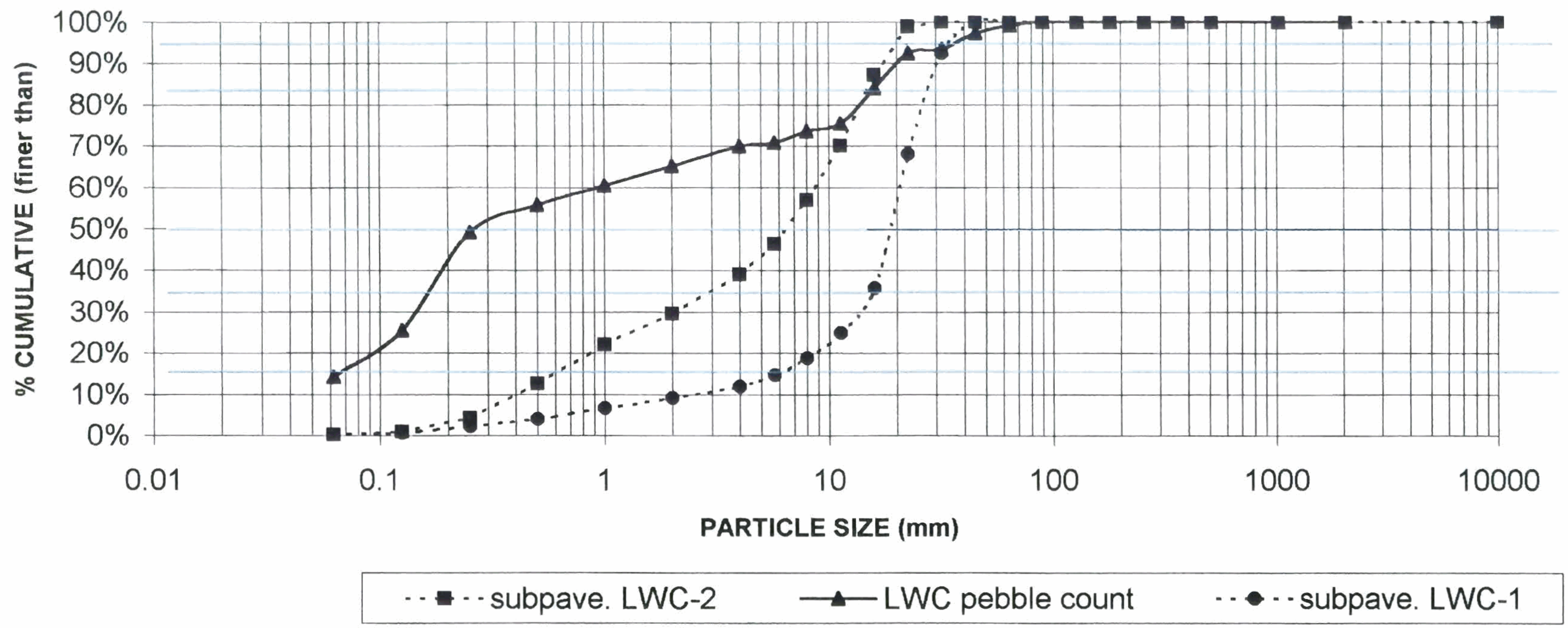
DSC00314, 03/1/31

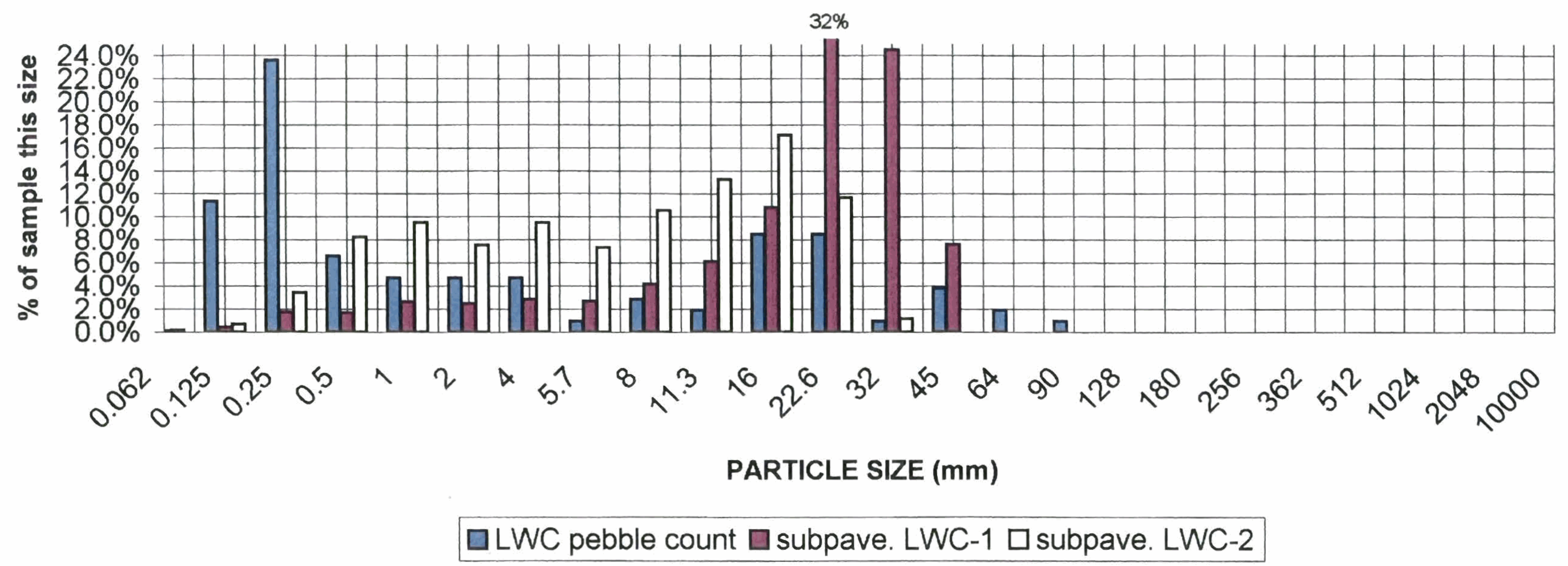
Reach is the upper tributary the crosses Hwy 18 on Little Warrior Creek. Photo is taken from the confluence looking upstream towards the highway.
This is series number 38 from the LWC reference photos.

Pebble Count Information from Little Warrior Creek

PEBBLE COUNT								PEBBLE COUNT			PEBBLE COUNT		
Site:					Date: 3/17/01			Date: 12/6/00			Date: 5/17/01		
Party:					Reach: LWC pebble count			Reach: subpave. LWC-1			Reach: subpave. LWC-2		
PARTICLE	MILLIMETER			PARTICLE (	TOT #	ITEM %	% CUM	TOT WT.	ITEM %	% CUM	TOT WT.	ITEM %	% CUM
Silt/Clay	< .062	0.062	S/C		15	14.2%	14%	3	0%	0%	4	0%	0%
Very Fine	.062 - .125	0.125	S		12	11.3%	25%	13	0%	1%	18	1%	1%
Fine	.125 - .25	0.25	A		25	23.6%	49%	54	2%	2%	87	3%	4%
Medium	.25 - .50	0.5	N		7	6.6%	56%	52	2%	4%	209	8%	13%
Coarse	.50 - 1.0	1	D		5	4.7%	60%	82	3%	7%	240	9%	22%
Very Coarse	1 - 2	2	S		5	4.7%	65%	77	2%	9%	191	8%	30%
Very Fine	2 - 4	4			5	4.7%	70%	89	3%	12%	240	9%	39%
Fine	4 - 5.7	5.7	G		1	0.9%	71%	83	3%	15%	186	7%	46%
Fine	5.7 - 8	8	R		3	2.8%	74%	129	4%	19%	267	11%	57%
Medium	8 - 11.3	11.3	A		2	1.9%	75%	191	6%	25%	335	13%	70%
Medium	11.3 - 16	16	V		9	8.5%	84%	337	11%	36%	433	17%	87%
Coarse	16 - 22.6	22.6	E		9	8.5%	92%	1005	32%	68%	295	12%	99%
Coarse	22.6 - 32	32	L		1	0.9%	93%	762	24%	92%	30	1%	100%
Very Coarse	32 - 45	45	S		4	3.8%	97%	237	8%	100%		0%	100%
Very Coarse	45 - 64	64			2	1.9%	99%		0%	100%		0%	100%
Small	64 - 90	90	C		1	0.9%	100%		0%	100%		0%	100%
Small	90 - 128	128	O			0.0%	100%		0%	100%		0%	100%
Large	128 - 180	180	B			0.0%	100%		0%	100%		0%	100%
Large	180 - 256	256	L			0.0%	100%		0%	100%		0%	100%
Small	256 - 362	362	B			0.0%	100%		0%	100%		0%	100%
Small	362 - 512	512	L			0.0%	100%		0%	100%		0%	100%
Medium	512-1024	1024	D			0.0%	100%		0%	100%		0%	100%
Lrg-Vry Lrg	1024 - 2048	2048	R			0.0%	100%		0%	100%		0%	100%
Bedrock		10000	BEDROCK			0.0%	100%		0%	100%		0%	100%
				TOTALS:	106			3114			2535		

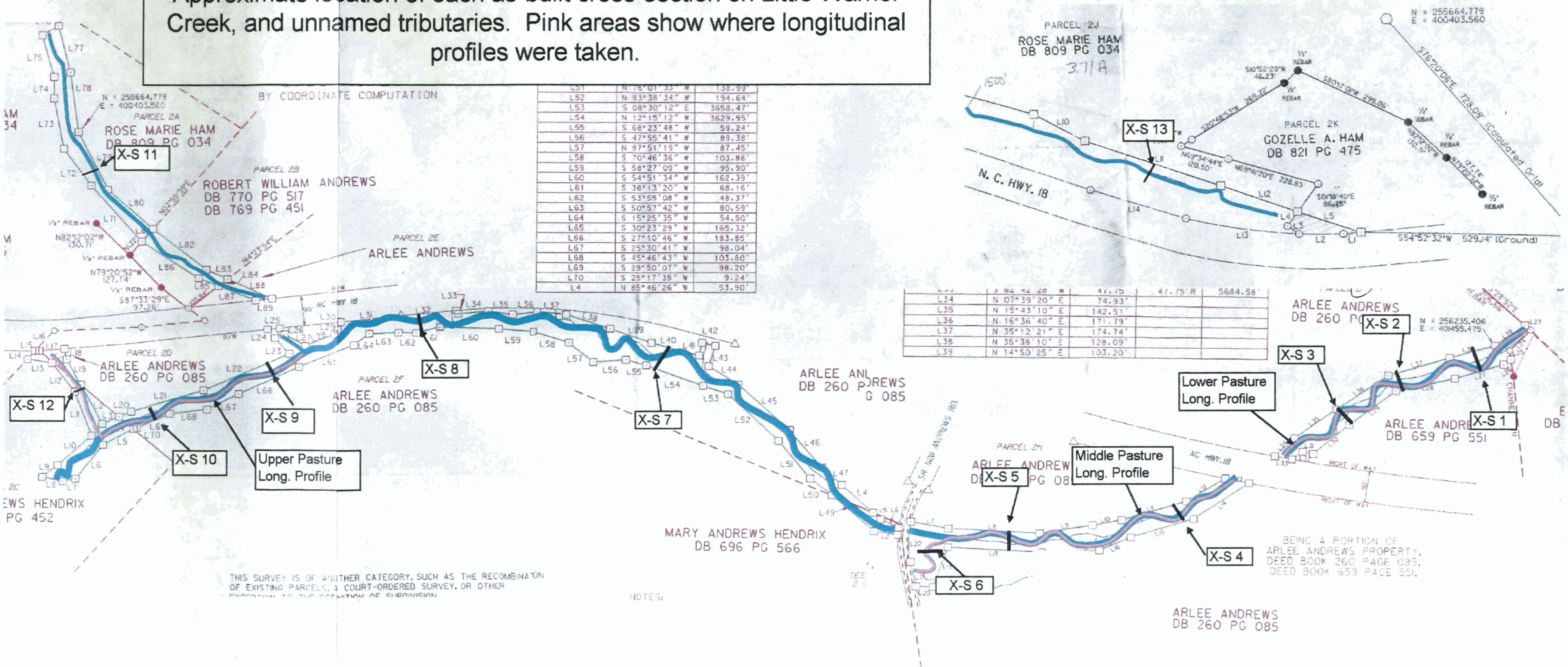
PEBBLE COUNT INFORMATION





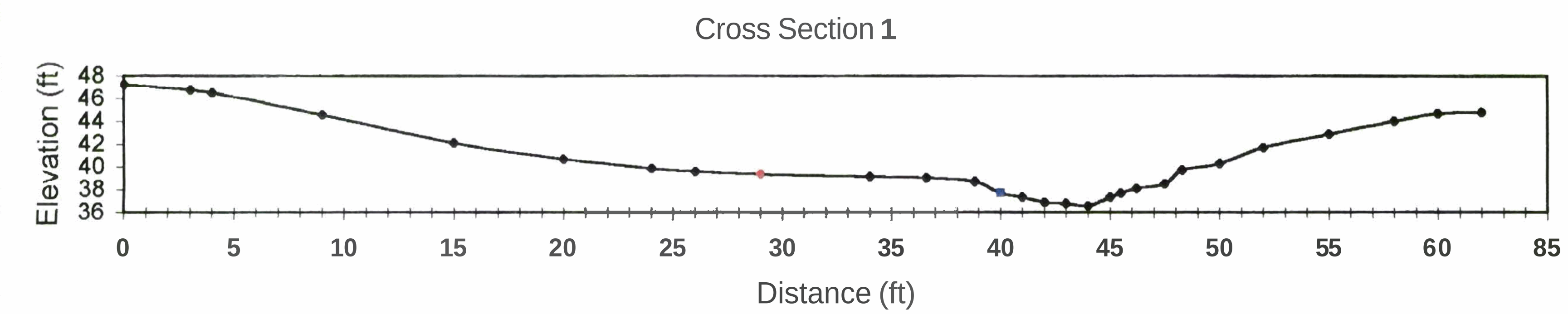
Cross-section Information

Approximate location of each as-built cross-section on Little Warrior Creek, and unnamed tributaries. Pink areas show where longitudinal profiles were taken.

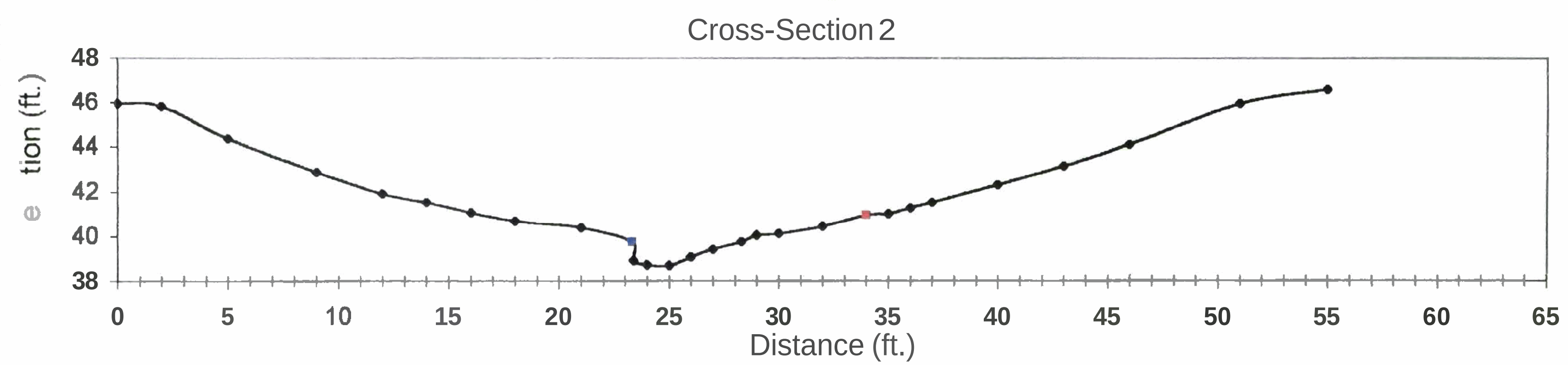


L51	N 76°01'33" W	138.99'
L52	N 83°38'34" W	194.64'
L53	S 08°30'12" E	3658.47'
L54	N 12°15'12" W	3629.95'
L55	S 68°23'48" W	59.24'
L56	S 47°55'41" W	89.38'
L57	N 87°51'19" W	87.45'
L58	S 70°46'36" W	103.86'
L59	S 58°27'09" W	95.90'
L60	S 54°51'34" W	162.39'
L61	S 38°13'20" W	68.16'
L62	S 53°55'08" W	48.37'
L63	S 50°57'42" W	80.59'
L64	S 15°25'35" W	54.50'
L65	S 30°23'29" W	165.32'
L66	S 27°10'46" W	183.85'
L67	S 25°30'41" W	98.04'
L68	S 45°46'43" W	103.80'
L69	S 29°50'07" W	98.20'
L70	S 25°17'35" W	9.24'
L4	N 85°46'26" W	53.90'

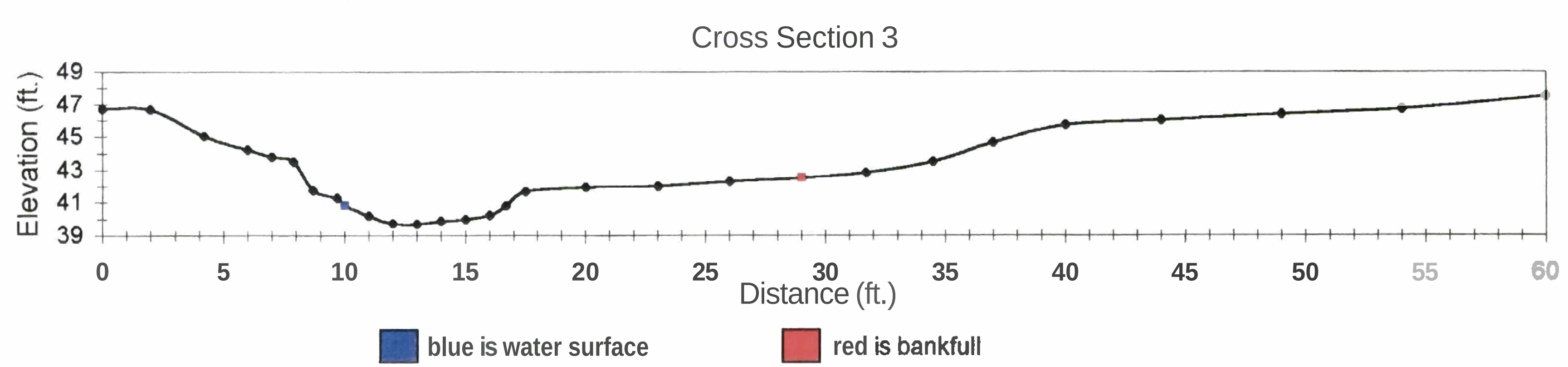
L33	S 62°42'26" W	47.75'	47.75' R	5684.58'
L34	N 07°39'20" E	74.93'		
L35	N 15°43'10" E	142.51'		
L36	N 16°36'40" E	171.79'		
L37	N 35°12'21" E	174.74'		
L38	N 35°38'10" E	128.09'		
L39	N 14°50'25" E	103.20'		



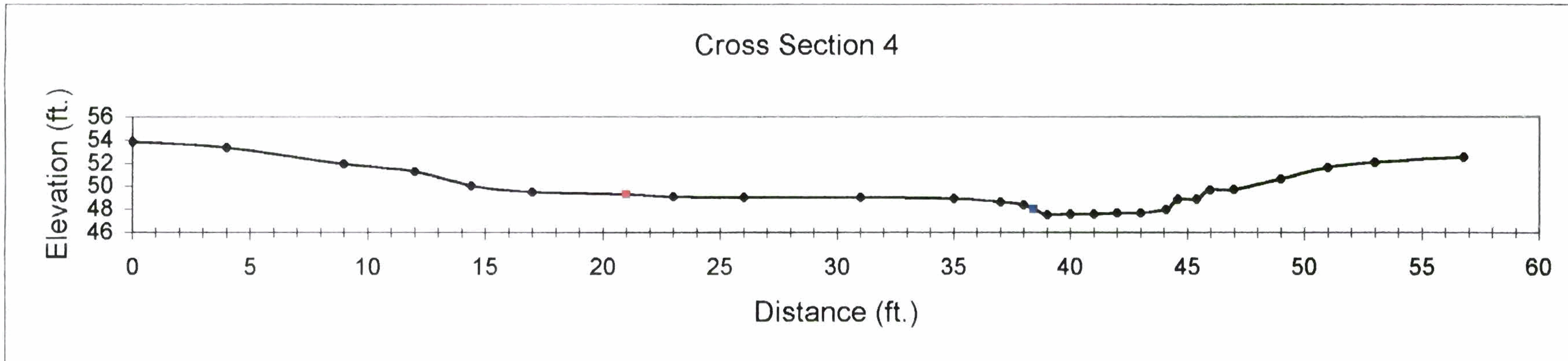
Cross Section 1
Elevation (ft)
48
46
44
42
40
38
36
0
5
10
15
20
25
30
35
40
45
50
55
60
85
Distance (ft)

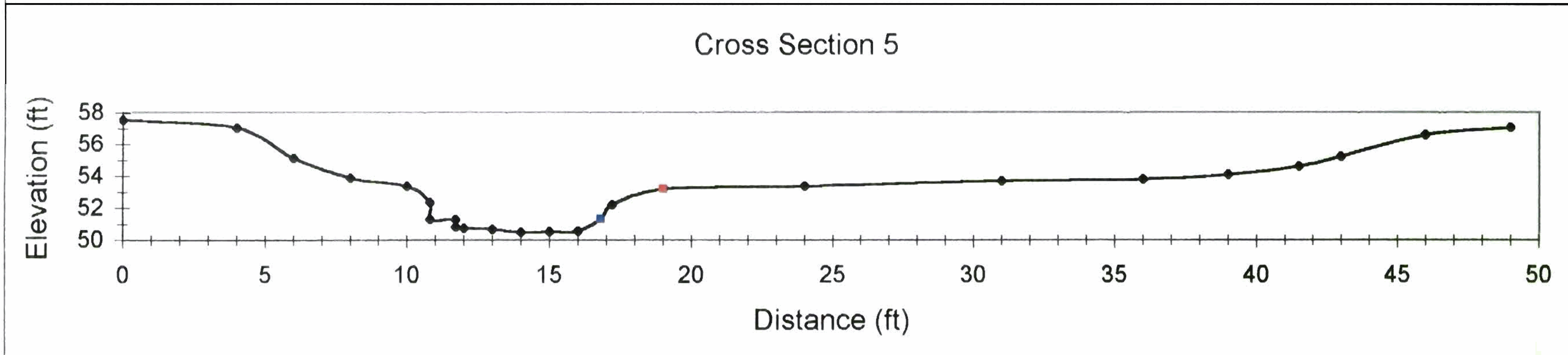


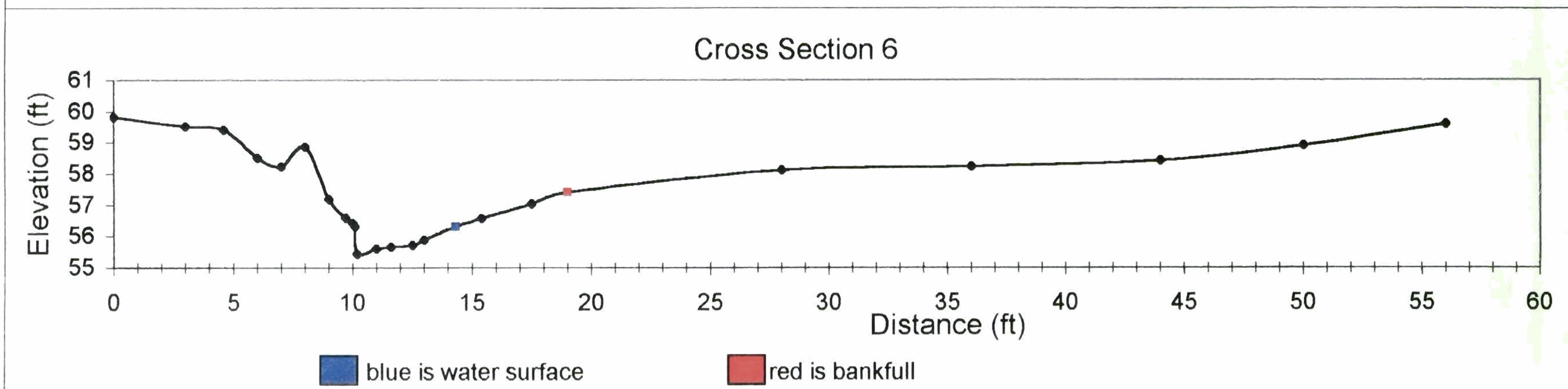
Cross-Section 2
e tion (ft.)
48
46
44
42
40
38
0
5
10
15
20
25
30
35
40
45
50
55
60
65
Distance (ft.)



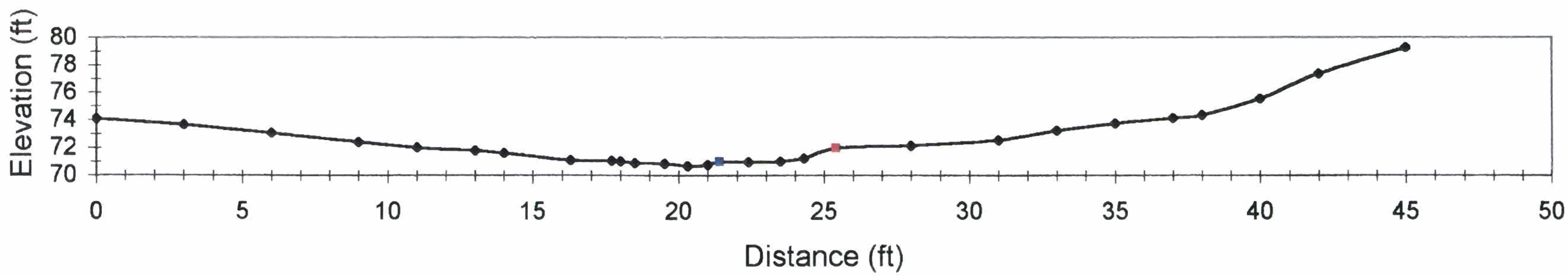
Cross Section 3
Elevation (ft.)
49
47
45
43
41
39
0
5
10
15
20
25
30
35
40
45
50
55
60
Distance (ft.)
blue is water surface
red is bankfull


Cross Section 4
Elevation (ft.)
56
54
52
50
48
46
0
5
10
15
20
25
30
35
40
45
50
55
60
Distance (ft.)

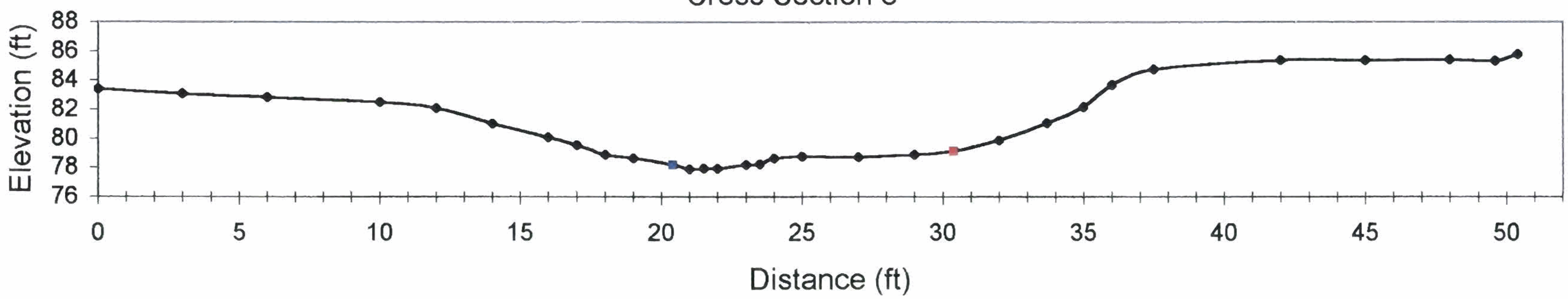

Cross Section 5
Elevation (ft)
58
56
54
52
50
0
5
10
15
20
25
30
35
40
45
50
Distance (ft)


Cross Section 6
Elevation (ft)
61
60
59
58
57
56
55
0
5
10
15
20
25
30
35
40
45
50
55
60
Distance (ft)
blue is water surface
red is bankfull

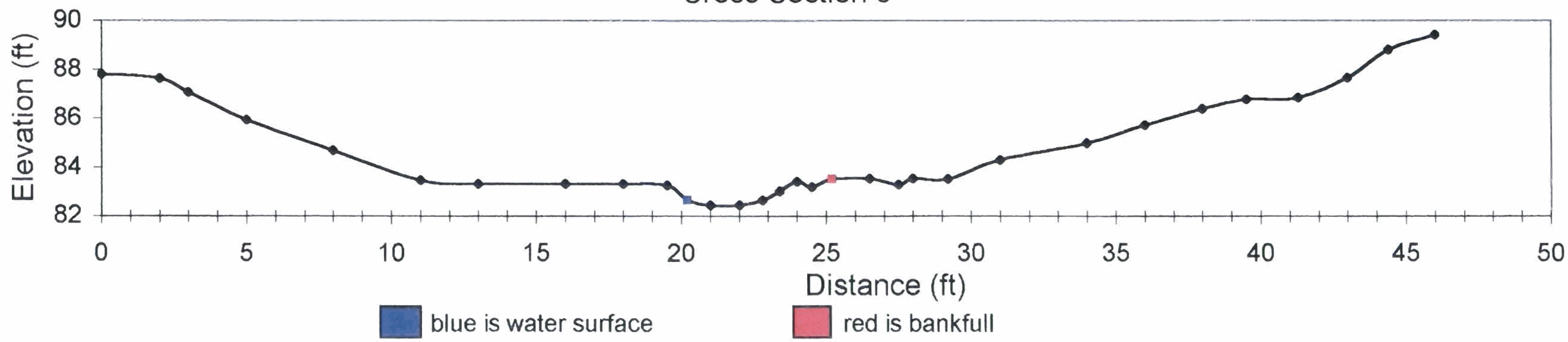
Cross Section 7

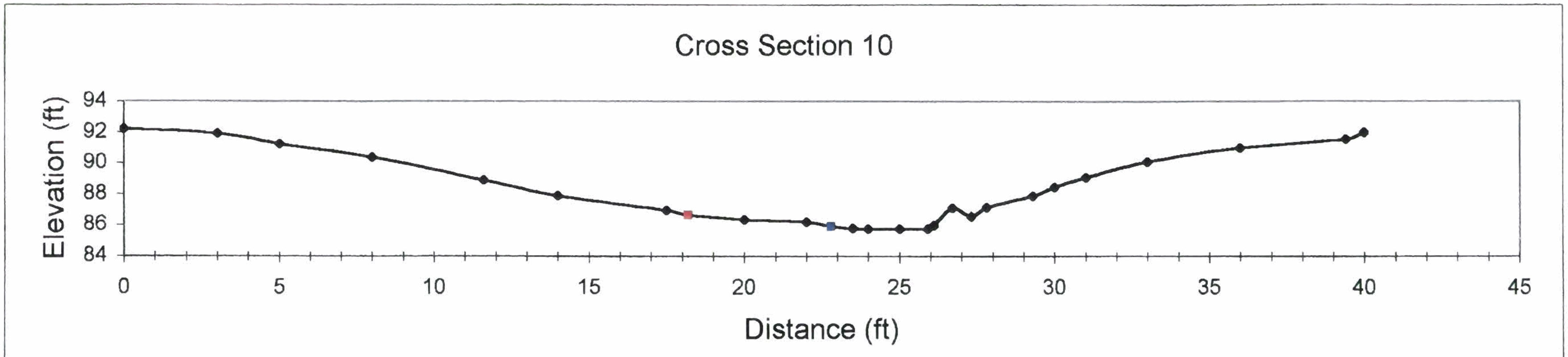


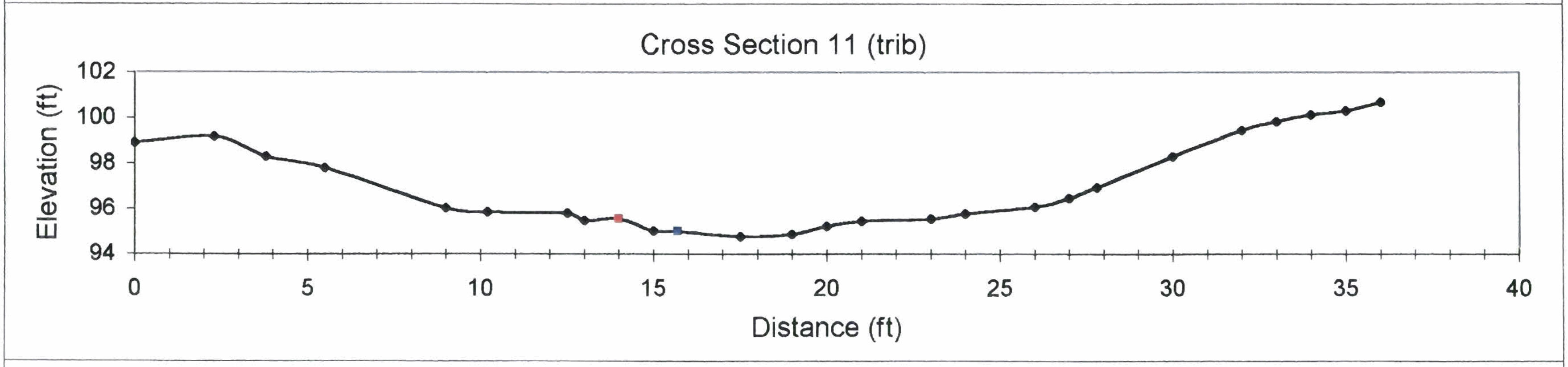
Cross Section 8

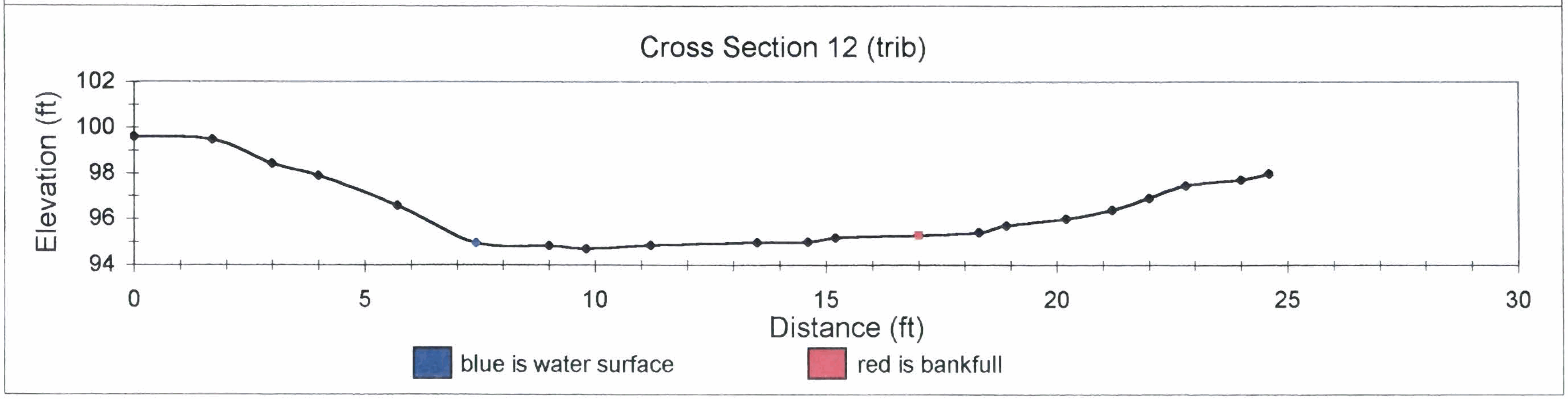


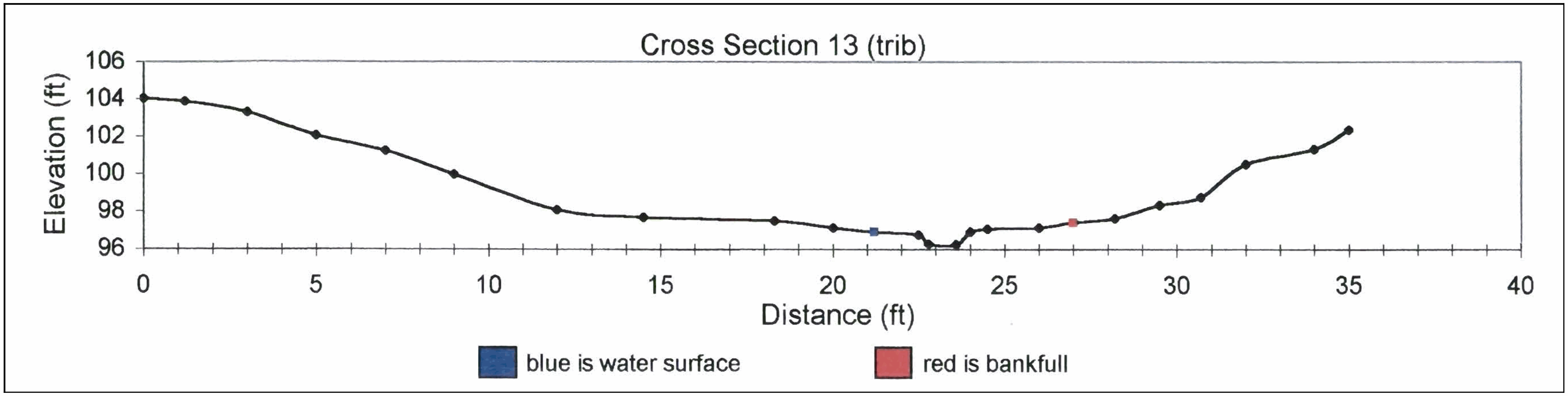
Cross Section 9




Cross Section 10
Elevation (ft)
94
92
90
88
86
84
0
5
10
15
20
25
30
35
40
45
Distance (ft)


Cross Section 11 (trib)
Elevation (ft)
102
100
98
96
94
0
5
10
15
20
25
30
35
40
Distance (ft)


Cross Section 12 (trib)
Elevation (ft)
102
100
98
96
94
0
5
10
15
20
25
30
Distance (ft)
blue is water surface
red is bankfull



Cross Section 13 (trib)
Elevation (ft)
106
104
102
100
98
96
0
5
10
15
20
25
30
35
40
Distance (ft)
blue is water surface
red is bankfull

Longitudinal Profile Information for the Upper Pasture on Little Warrior Creek

Longitudinal Profile Data Sheet for: As-built information on AH&W site.

Profile description: Long-profile starts on tributary at culvert mouth below Hwy. 18 and continues ds to the confluence with the next tributary by big sycamore tree.

See other notes at bottom.

																Dbkf		RIFFLE-POOL				
Feature	HI	Length	Tot. Dist.	Thal.	Thal. Elev	slope	W.S.	W.S. elev.	slope	BF	BF Elev.	slope	Top bank	T.B. elev.	slope	pool	riffle	pool-L	riffle-L	R:P	TB-Thal	Bkf-W.S.
culvert lip	105.14	0	5	9.59	95.55	0.10	9.37	95.77	0.0380	8.55	96.59	0.0250	6.36	98.78	0.0280				5	29	3.23	0.82
HoP	105.14	5	6	10.1	95.04	-0.06	9.56	95.58	0.0050		96.465	0.0250		98.64	0.0233	1.43		6			3.60	0.89
HoR	105.14	11	18	9.73	95.41	0.03	9.59	95.55	0.0172	8.8	96.34	0.0640	6.64	98.5	-0.0189		0.93		18		3.09	0.79
HoP	105.14	29	7	10.28	94.86	0.04	9.9	95.24	0.0000	9.12	96.02	0.0040	6.3	98.84	0.0050	1.16		12		57	3.98	0.78
Deep	105.14	36	5	10.56	94.58	-0.09	9.9	95.24	0.0020		96	0.0040		98.805	0.0070						4.23	0.76
HoR	105.14	41	33	10.13	95.01	0.02	9.91	95.23	0.0209	9.16	95.98	0.0755	6.37	98.77	0.0140		0.97		45		3.76	0.75
riffle	105.14	74	4	10.84	94.3	0.11	10.6	94.54	0.1000		95.6025	0.0755		98.3075	0.1156						4.01	1.06
riffle	105.14	78	1	11.28	93.86	0.27	11	94.14	0.3100		95.225	0.0755		97.845	0.4625						3.99	1.08
riffle	105.14	79	1.5	11.55	93.59	0.09	11.31	93.83	0.1267		94.8475	0.0755		97.3825	0.3083						3.79	1.02
riffle	105.14	80.5	5.5	11.68	93.46	0.12	11.5	93.64	0.0473	10.67	94.47	0.0175	8.22	96.92	0.0164						3.46	0.83
HoP	105.14	86	4	12.32	92.82	-0.12	11.76	93.38	0.0050		94.3825	0.0175		96.83	0.0225	1.56		4		7	4.01	1.00
HoR	105.14	90	3	11.85	93.29	0.26	11.78	93.36	0.0433		94.295	0.0175		96.74	0.0300		1.01		3		3.45	0.94
HoP	105.14	93	7	12.62	92.52	-0.07	11.91	93.23	-0.0014		94.2075	0.0175		96.65	0.0129	1.69		7		18	4.13	0.98
HoR	105.14	100	7	12.16	92.98	0.06	11.9	93.24	0.0686	11.02	94.12	0.0710	8.58	96.56	-0.0357		1.14		11		3.58	0.88
Top of xv	105.14	107	4	12.56	92.58	0.15	12.38	92.76	0.1550		93.765	0.0710		96.81	-0.0625						4.23	1.01
HoP	105.14	111	7	13.17	91.97	-0.01	13	92.14	0.0043	11.73	93.41	0.0760	8.08	97.06	0.0300	1.44		7		9	5.09	1.27
HoR	105.14	118	2	13.12	92.02	0.44	13.03	92.11	0.3600		93.03	0.1020		96.85	0.1400		1.01		2		4.83	0.92
HoP	105.14	120	8	14	91.14	-0.02	13.75	91.39	0.0075		92.52	0.0760		96.57	0.0262	1.38		8		11	5.43	1.13
Top of xv	105.14	128	3	13.87	91.27	0.33	13.81	91.33	0.2600	13	92.14	0.0740	8.78	96.36	0.0183		0.87		3		5.09	0.81
HoP	105.14	131	2	14.86	90.28	-0.05	14.59	90.55	-0.0050		91.77	0.0740		96.305	0.0275	1.49		2		17	6.03	1.22
Top of xv	105.14	133	15	14.75	90.39	0.10	14.58	90.56	0.0353	13.74	91.4	0.0290	8.89	96.25	-0.0107				15		5.86	0.84
HoP	105.14	148	6	18.21	88.93	-0.14	15.11	90.03	0.0167		91.255	0.0290		96.41	-0.0267	2.32		6		13	7.48	1.22
Top of xv	105.14	154	7	15.37	89.77	0.09	15.21	89.93	0.0214		91.11	0.0290		96.57	-0.0229				7		6.80	1.18
HoP	105.14	161	7	16.01	89.13	-0.06	15.36	89.78	0.0029		90.965	0.0290		96.73	-0.0229	1.84		7		36	7.60	1.19
HoR	105.14	168	29	15.56	89.58	0.06	15.38	89.76	0.0500	14.32	90.82	0.1970	8.25	96.89	0.0290		1.24		29		7.31	1.06
HoP	100.5	197	9	12.57	87.93	-0.02	12.19	88.31	0.0078		89.835	0.1970		96.05	0.0933	1.9		9		23	8.12	1.52
HoR	100.5	206	10	12.37	88.13	0.07	12.26	88.24	0.0650	11.65	88.85	0.0000	5.29	95.21	0.0020		0.72		14		7.08	0.61
riffle	100.5	216	4	13.09	87.41	0.04	12.91	87.59	0.0100		88.85	-0.0020		95.19	0.0050						7.78	1.26
HoP	100.5	220	25	13.26	87.24	0.00	12.95	87.55	0.0032		88.86	-0.0020		95.17	0.0008	1.62		25		39	7.93	1.31
HoR	100.5	245	14	13.25	87.25	0.04	13.03	87.47	0.0229	11.63	88.87	-0.0210	5.35	95.15	0.0807		1.62		14		7.90	1.40
HoP	100.5	259	8	13.75	86.75	-0.02	13.35	87.15	0.0025		88.975	-0.0210		94.02	0.1413	2.22		8		33	7.27	1.82
HoR	100.5	267	25	13.63	86.87	0.02	13.37	87.13	0.0064	11.42	89.08	0.1500	7.61	92.89	-0.0044		2.21		25		6.02	1.95
run	100.5	292	32	14.13	86.37	-0.01	13.53	86.97	0.0056	12.17	88.33	0.1620	7.5	93	0.0447			32		55	6.63	1.36
HoR	100.5	324	23	13.93	86.57	0.04	13.71	86.79	0.0283	12.98	87.52	-0.0080	8.93	91.57	0.0052		0.95		23		5.00	0.73
HoP	100.5	347	16	14.91	85.59	0.00	14.36	86.14	-0.0006		87.56	-0.0040		91.45	0.0038	1.97		23		31	5.86	1.42
thalwag	100.5	363	7	14.94	85.56	-0.05	14.35	86.15	0.0057		87.58	-0.0040		91.39	0.0029						5.83	1.43
HoR	100.5	370	8	14.61	85.89	0.07	14.39	86.11	0.0275	12.9	87.6	0.0680	9.13	91.37	-0.0206		1.71		8		5.48	1.49
HoP	100.5	378	19	15.14	85.36	-0.02	14.61	85.89	0.0011		87.26	0.0680		91.54	-0.0087	1.9		19		45	6.18	1.37
HoR	100.5	397	26	14.8	85.7	0.02	14.63	85.87	0.0058	13.58	86.92	0.0260	8.8	91.7	0.0019		1.22		26		6.00	1.05
HoP	100.5	423	12	15.21	85.29	-0.01	14.78	85.72	0.0058		86.79	0.0260		91.65	0.0042	1.5		12		59	6.36	1.07
HoR	100.5	435	47	15.04	85.46	0.02	14.85	85.65	0.0117	13.84	86.66	-0.0560	8.9	91.6	0.0030		1.2		47		6.14	1.01
HoP	100.5	482	4	15.81	84.69	0.10	15.4	85.1	0.0000		86.94	0.0320		91.46	0.0425	2.25		10		59	6.77	1.84
thalwag	100.5	486	6	16.21	84.29	-0.09	15.4	85.1	0.0000		86.78	-0.0560		91.29	0.0233						7.00	1.68
HoR	100.5	492	49	15.69	84.81	0.01	15.4	85.1	0.0129	13.44	87.06	0.1180	9.35	91.15	0.0057		2.25		49		6.34	1.96
HoP	100.5	541	15	16.34	84.16	0.00	16.03	84.47	0.0040		86.47	0.1180		90.87	0.0187	2.31		15		89	6.71	2.00
HoR	100.5	556	74	16.28	84.22	0.02	16.09	84.41	0.0130	14.62	85.88	0.1610	9.91	90.59	0.0100		1.66		74		6.37	1.47
HoP	94.19	630	19	11.17	83.02	-0.01	10.74	83.45	0.0005		85.075	0.1610		89.85	0.0389	2.05		19		33	6.83	1.62
HoR	94.19	649	14	10.98	83.21	0.04	10.75	83.44	0.0064	9.92	84.27	-0.0280	5.08	89.11	0.0411		1.06		14		5.90	0.83
HoP	94.19	663	10	11.52	82.67	-0.04	10.84	83.35	0.0010		84.41	-0.0280		88.54	0.0575	1.74		10		80	5.86	1.06
HoR	94.19	673	46	11.13	83.06	0.01	10.85	83.34	0.0093	9.64	84.55	0.0680	6.23	87.96	0.0020		1.49		70		4.90	1.21
riffle	94.19	719	24	11.72	82.47	0.01	11.28	82.91	0.0087		84.21	0.0900		87.87	0.0046						5.40	1.30
HoP	94.19	743	10	11.97	82.22	-0.03	11.49	82.7	0.0030		83.76	0.0680		87.76	0.0090	1.54		10		58	5.54	1.06
HoR	94.19	753	48	11.64	82.55	0.02	11.52	82.67	0.0077	10.77	83.42	0.0090	6.52	87.67	0.0045		0.87		48		5.12	0.75
HoP	94.19	801	14	12.46	81.73	-0.02	11.89	82.3	0.0064		83.375	0.0090		87.46	0.0154	1.65		14		22	5.73	1.08
HoR	94.19	815	8	12.23	81.96	0.04	11.98	82.21	0.0137	10.86	83.33	-0.0020	6.95	87.24	0.0075		1.37		8		5.28	1.12
HoP	94.19	823	14	12.59	81.6	-0.01	12.09	82.1	0.0014		83.34	-0.0020		87.18	0.0043	1.74		14		14	5.58	1.24
HoR	94.19	837	-837	12.41	81.78	-0.10	12.11	82.08	-0.0981	10.84	83.35	16.6700	7.07	87.12	-0.1041		1.57				5.34	1.27
																	0					
		0.0050	0.0000	0.0050	-0.0014	0.0043	0.0075	-0.0050	0.0167	0.0029	0.0078				Average=	1.87	1.28	12.1	29.2	49.8	5.93	1.30
Pool slopes=		0.0032	0.0025	-0.0006	0.0011	0.0058	0.0000	0.0040	0.0005	0.0010	0.0030	0.0064	0.0014									
	Avg. slope=	0.0164			Avg. Riffle slope=		0.0416	Avg. Pool slope=		0.0032												
	Avg. Pool length	12.1			Avg. Riffle length		29.2															
	Total Pool length	279	33%		Total Riffle length		558	67%	837 =TOTAL					Range:	min	1.16	0.72	2	2	7	3.09	0.61
															max	2.32	2.25	32	74	89	8.12	2

Water surface slope from head of 1st riffle to bottom of last pool

distance = 837
top = 95.77
bottom = 82.08
13.69 difference from top to bottom of the valley

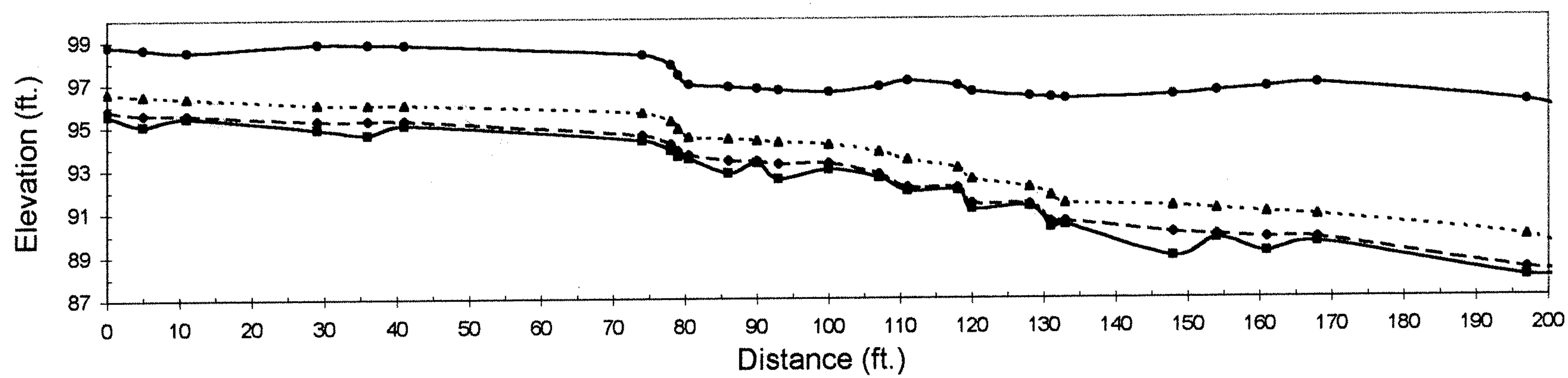
Water Surface Slope = 0.0164

Valley slope from head of 1st top of bank to last

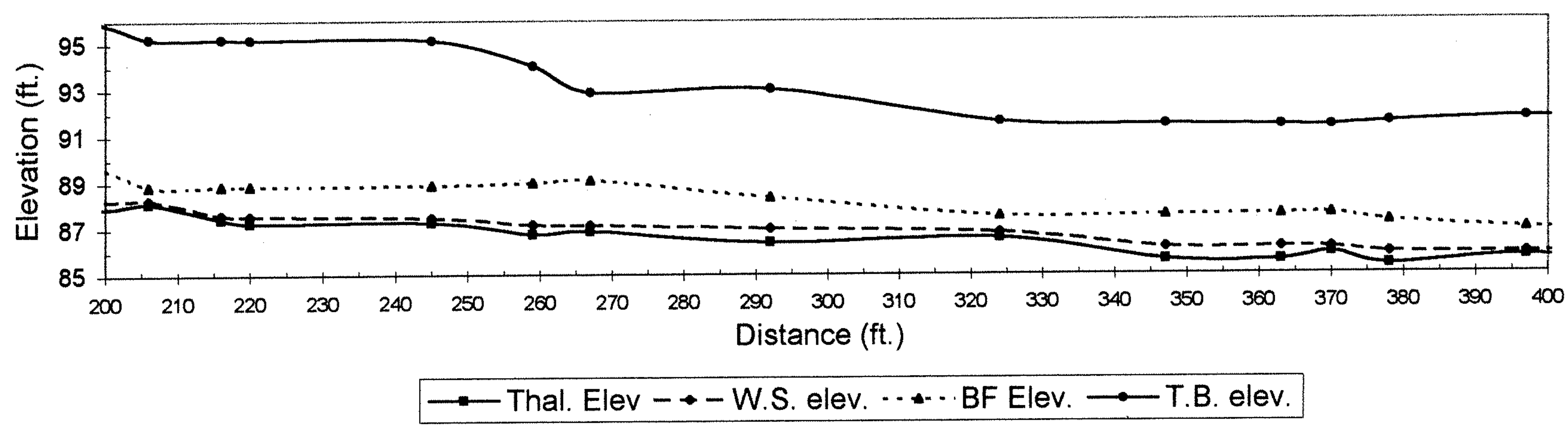
distance = 800
1st top of bank = 98.78
last top of bank= 87.12
11.66 difference from top to bottom of the valley

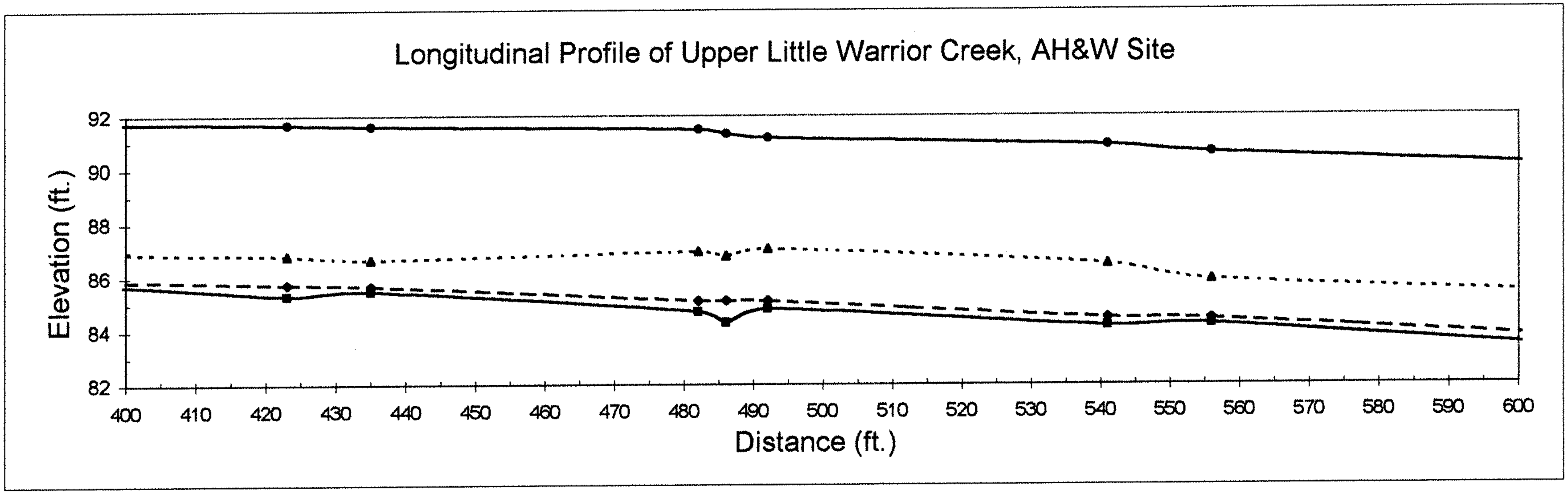
Valley Slope = 0.0146 Sinuosity= 0.891108

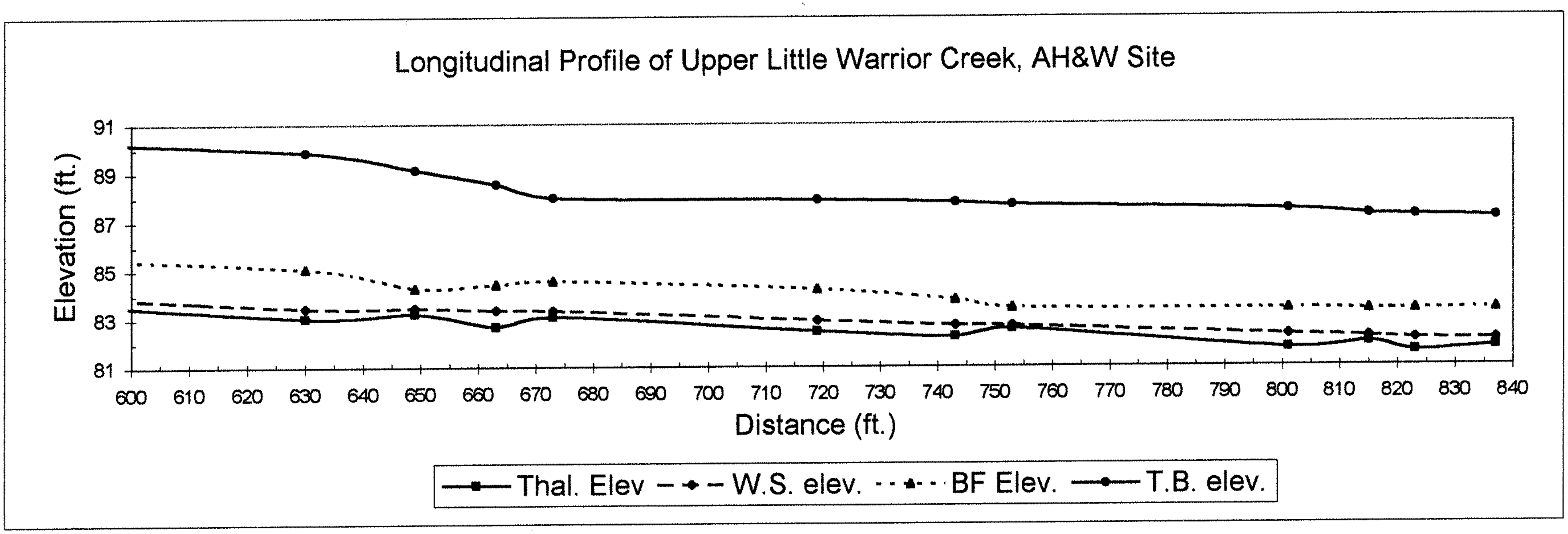
Longitudinal Profile of Upper Little Warrior Creek, AH&W Site



Longitudinal Profile of Upper Little Warrior Creek, AH&W Site




Longitudinal Profile of Upper Little Warrior Creek, AH&W Site
Elevation (ft.)
92
90
88
86
84
82
400
410
420
430
440
450
460
470
480
490
500
510
520
530
540
550
560
570
580
590
600
Distance (ft.)


Longitudinal Profile of Upper Little Warrior Creek, AH&W Site
Elevation (ft.)
91
89
87
85
83
81
600
610
620
630
640
650
660
670
680
690
700
710
720
730
740
750
760
770
780
790
800
810
820
830
840
Distance (ft.)
Thal. Elev
W.S. elev.
BF Elev.
T.B. elev.

Longitudinal Profile Information for the Middle Pasture on Little Warrior Creek

Longitudinal Profile Data Sheet for: As-built information on AH&W site.

Profile description: Long-profile starts a from pond culvert DS to mouth of culvert under Hwy. 18.

See other notes at bottom.

Feature	HI	Length	Tot. Dist.	Thal.	Thal. Elev	slope	W.S.	W.S. elev.	slope	BF	BF Elev.	slope	Top bank	T.B. elev.	slope	Dbkf pool	Dbkf riffle	RIFFLE-POOL pool-L	riffle-L	R:P	TB-Thal	Bkf-W.S.
HoP	93.09	0	32	6.15	86.94	-0.03	4.88	88.21	0.0016	4.3	88.79	-0.010	0.85	92.24	0.0338	1.85		32		40	5.30	0.58
HoR	93.09	32	8	5.18	87.91	0.14	4.93	88.16	0.0100	3.98	89.11	0.015	1.93	91.16	0.0481		1.2		8		3.25	0.95
HoP	93.09	40	6	6.3	86.79	-0.09	5.01	88.08	0.0867		88.99	0.020		90.78	0.0642	2.2		6		38	3.99	0.91
HoR	93.09	46	32	5.77	87.32	0.03	5.53	87.56	0.0091		88.87	0.004		90.39	0.0120		1.55		32		3.07	1.31
HoP	93.09	78	20	6.72	86.37	0.00	5.82	87.27	0.0009		88.75	0.006		90.01	0.0192	2.38		46		53	3.63	1.47
thalwag	93.09	98	14	6.77	86.32	0.00		87.253	0.0011		88.62	0.009		89.62	0.0275						3.30	1.37
thalwag	93.09	112	12	6.74	86.35	-0.03		87.237	0.0014		88.50	0.010		89.24	0.0321						2.88	1.26
HoR	93.09	124	5	6.34	86.75	0.02	5.87	87.22	0.0960	4.71	88.38	0.088	4.24	88.85	0.0000		1.63		7		2.10	1.16
Top of xv	93.09	129	2	6.43	86.66	1.18		86.74	0.2400		87.94	0.220		88.85	-0.0463						2.19	1.20
HoP-dep	93.09	131	6	8.78	84.31	-0.29	6.83	86.26	0.0017		87.5	0.073		88.94	-0.0154	3.19		11		11	4.63	1.24
Top of xv	93.09	137	5	7.03	86.06	0.16	6.84	86.25	0.0940		87.06	0.088		89.04	-0.0185						2.97	0.81
HoP-dep	93.09	142	4	7.85	85.24	-0.05	7.31	85.78	0.0100		86.62	0.110		89.13	-0.0231	1.38		15		15	3.89	0.84
Top of xv	93.09	146	11	7.65	85.44	0.19	7.35	85.74	0.1382		86.18	0.040		89.22	-0.0084						3.78	0.44
HoP-dep	93.09	157	3	9.7	83.39	-0.21	8.87	84.22	0.0033		85.74	0.147		89.31	1.3375	2.35		8		8	5.92	1.52
Top of xv	93.09	160	5	9.08	84.01	0.20	8.88	84.21	0.0700		85.3	0.088		85.30	0.0880						1.29	1.09
HoP-dep	93.09	165	12	10.09	83	-0.01	9.23	83.86	0.0042	8.23	84.86	0.009	3.5	84.86	0.0085	1.86		17		24	1.86	1.00
thalwag	93.09	177	5	9.95	83.14	-0.04		83.81	0.0100		84.76	0.020		84.76	0.0205						1.62	0.95
HoR	93.09	182	7	9.77	83.32	0.24	9.33	83.76	0.1043		84.66	0.015		84.66	0.0146		1.33		7		1.33	0.89
HoP-dep	93.09	189	13	11.45	81.64	-0.08	10.06	83.03	-0.0015		84.55	0.008		84.55	0.0079	2.91		13		42	2.91	1.52
HoR	93.09	202	29	10.43	82.66	0.03	10.04	83.05	0.0145	8.64	84.45	0.007	3.4	84.45	0.0067		1.79		29		1.79	1.40
HoP	93.09	231	14	11.39	81.7	-0.03	10.46	82.63	-0.0011		84.26	0.014		84.26	0.0138	2.56		26		53	2.56	1.63
thalwag	93.09	245	12	11.01	82.08	-0.02		82.645	-0.0013		84.06	0.016		84.06	0.0161						1.98	1.42
HoR	93.09	257	27	10.82	82.27	0.02	10.43	82.66	0.0156	9.22	83.87	0.005	4.73	83.87	0.0046		1.6		27		1.60	1.21
HoP	93.09	284	4	11.38	81.71	0.08	10.85	82.24	0.0200		83.75	0.031		83.75	0.0308	2.04		41		112	2.04	1.51
deep	93.09	288	37	11.71	81.38	-0.01		82.16	0.0022		83.62	0.003		83.62	0.0033						2.24	1.46
HoR	93.09	325	31	11.26	81.83	0.00		82.08	0.0026		83.50	0.004		83.50	0.0040		1.67		71		1.67	1.42
thalwag	93.09	356	40	11.4	81.69	0.03	11.09	82	0.0087		83.38	0.003		83.38	0.0031						1.69	1.38
HoP	93.09	396	11	12.56	80.53	-0.06	11.44	81.65	0.0027		83.25	0.011		83.25	0.0112	2.72		11		62	2.72	1.60
HoR	93.09	407	51	11.91	81.18	0.02	11.47	81.62	0.0104	9.96	83.13	0.010	6.89	83.13	0.0105		1.95		51		1.95	1.51
HoP-dep	93.09	458	13	12.73	80.36	-0.03	12	81.09	-0.0031		82.595	0.041		82.595	0.0412	2.24		13		40	2.24	1.51
HoR	93.09	471	27	12.35	80.74	0.05	11.96	81.13	0.0144	11.03	82.06	0.003	7.55	82.06	0.0026		1.32		27		1.32	0.93
HoP-dep	93.09	498	17	13.57	79.52	-0.05	12.35	80.74	0.0006		81.99	0.004		81.99	0.0041	2.47		17		43	2.47	1.25
HoR	93.09	515	26	12.71	80.38	0.04	12.36	80.73	0.0077		81.92	0.003		81.92	0.0027		1.54		26		1.54	1.19
HoP-dep	93.09	541	36	13.65	79.44	-0.02	12.56	80.53	0.0000		81.85	0.002		81.85	0.0019	2.41		36		73	2.41	1.32
HoR	93.09	577	37	12.93	80.16	0.04		80.53	0.0151	11.31	81.78	0.000	7.83	81.78	0.0003		1.62		37		1.62	1.25
HoP-dep	93.09	614	16	14.55	78.54	-0.06	13.12	79.97	0.0006		81.77	0.001		81.77	0.0006	3.23		16		157	3.23	1.80
HoR	93.09	630	62	13.65	79.44	0.01	13.13	79.96	0.0084	11.33	81.76	0.012	7.96	81.76	0.0123		2.32		141		2.32	1.80
thalwag	93.09	692	66	14.17	78.92	0.00	13.65	79.44	0.0039		81	0.012		81.00	0.0115						2.08	1.56
thalwag	93.09	758	13	14.31	78.78	0.05	13.91	79.18	0.0069	12.85	80.24	0.004	9.09	80.24	0.0042						1.46	1.06
HoP	93.09	771	27	14.97	78.12	-0.02	14	79.09	0.0000		80.19	0.002		80.19	0.0020	2.07		27		76	2.07	1.10
HoR	93.09	798	49	14.43	78.66	0.01		79.09	0.0035		80.13	0.001		80.13	0.0011		1.47		49		1.47	1.04
HoP-dep	93.09	847	40	15.16	77.93	-0.01	14.17	78.92	0.0010		80.08	0.001		80.08	0.0014	2.15		40		163	2.15	1.16
HoR	93.09	887	32	14.63	78.46	0.00	14.21	78.88	0.0075	13.07	80.02	0.003	9.87	80.02	0.0030		1.56		123		1.56	1.14
thalwag	93.09	919	40	14.74	78.35	0.00	14.45	78.64	0.0000		79.92	0.002		79.92	0.0024						1.57	1.28
thalwag	93.09	959	51	14.76	78.33	0.01	14.45	78.64	0.0006		79.83	0.002		79.83	0.0019						1.50	1.19
HoP-dep	93.09	1010	22	15.22	77.87	-0.01	14.48	78.61	0.0041		79.73	0.004		79.73	0.0044	1.86		22		43	1.86	1.12
HoR	93.09	1032	18	14.91	78.18	0.00	14.57	78.52	0.0100	13.46	79.63	0.000	11.1	79.63	0.0000		1.45		21		1.45	1.11
top of xv	93.09	1050	3	14.91	78.18	0.28	14.75	78.34	0.1200		79.63	0.000		79.63	0.0000						1.45	1.29
HoP	93.09	1053	5	15.76	77.33	15.47	15.11	77.98			79.63	15.926		79.63	15.9260	2.3		5			2.30	1.65
culvert inv	93.09	1058																				
Pool slopes=		0.0016	0.0867	0.0009	0.0017	0.0100	0.0033	0.0042	-0.0015	-0.0011	0.0111	0.0027	-0.0031		Average=	2.32	1.60	21.2	43.7	58.5	2.41	1.24
		0.0006	0.0000	0.0006	0.0000	0.0010	0.0041															
		Avg. slope=	0.0097		Avg. Riffle slope=		0.0219	Avg. Pool slope=		0.0068												
	Avg. Pool length		21.2		Avg. Riffle length		43.7															
	Total Pool length		402	38%	Total Riffle length		656	62%	1058 =TOTAL													
														Range:	min	1.38	1.2	5	7	8	1.29	0.44
															max	3.23	2.32	46	141	163	5.9225	1.8

Water surface slope from head of 1st riffle to bottom of last pool

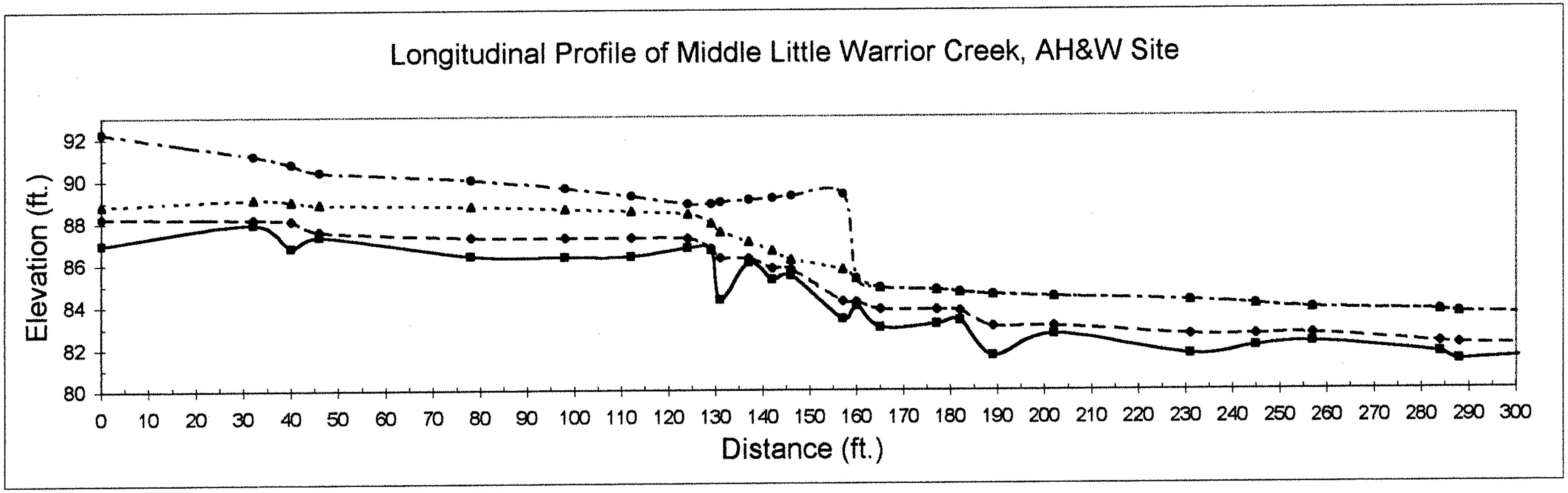
distance = 1058
top = 88.21
bottom = 77.98
10.23 difference from top to bottom of the valley

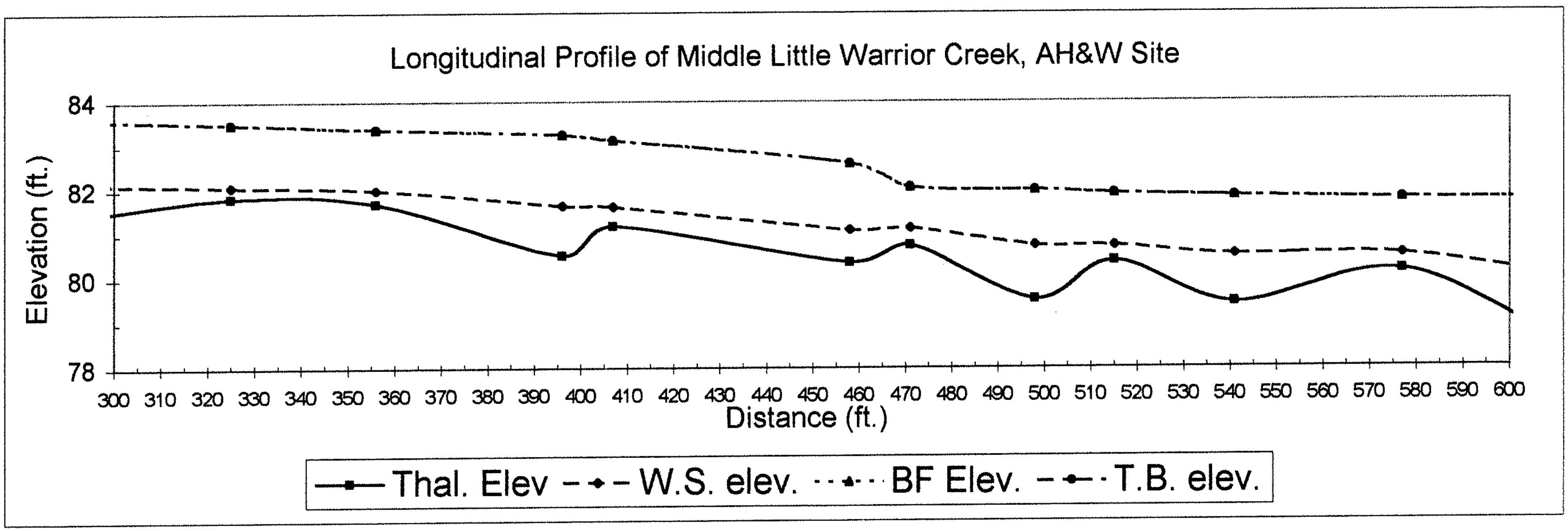
Water Surface Slope = 0.0097

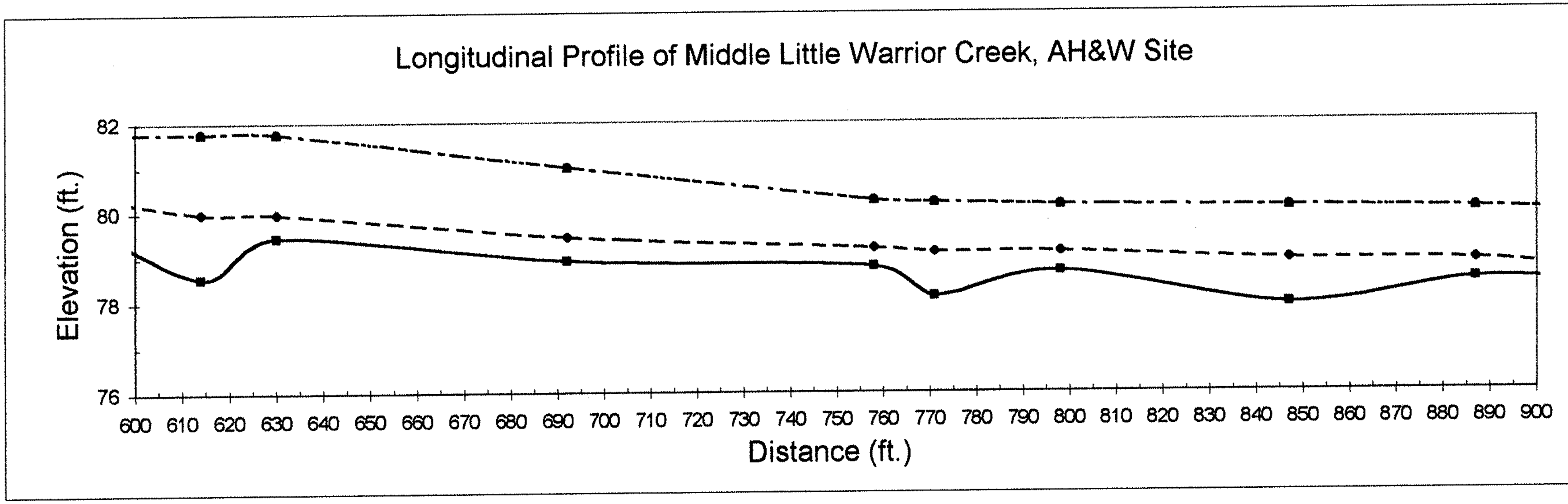
Valley slope from head of 1st top of bank to last

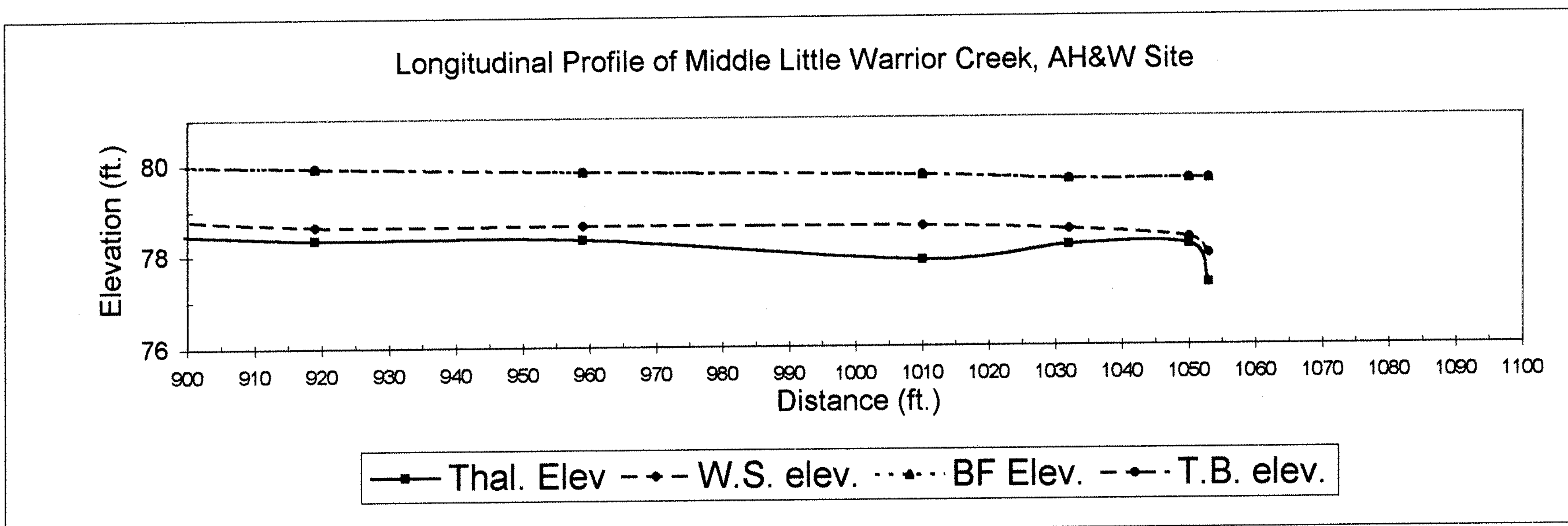
distance = 1058
1st top of bank = 92.24
last top of bank= 79.63
12.61 difference from top to bottom of the valley

Valley Slope = 0.0119 Sinuosity= 1.232649


Longitudinal Profile of Middle Little Warrior Creek, AH&W Site
Elevation (ft.)
92
90
88
86
84
82
80
0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190 200 210 220 230 240 250 260 270 280 290 300
Distance (ft.)


Longitudinal Profile of Middle Little Warrior Creek, AH&W Site
Elevation (ft.)
84
82
80
78
300 310 320 330 340 350 360 370 380 390 400 410 420 430 440 450 460 470 480 490 500 510 520 530 540 550 560 570 580 590 600
Distance (ft.)
Thal. Elev
W.S. elev.
BF Elev.
T.B. elev.


Longitudinal Profile of Middle Little Warrior Creek, AH&W Site
Elevation (ft.)
82
80
78
76
600 610 620 630 640 650 660 670 680 690 700 710 720 730 740 750 760 770 780 790 800 810 820 830 840 850 860 870 880 890 900
Distance (ft.)


Longitudinal Profile of Middle Little Warrior Creek, AH&W Site
Elevation (ft.)
80
78
76
900 910 920 930 940 950 960 970 980 990 1000 1010 1020 1030 1040 1050 1060 1070 1080 1090 1100
Distance (ft.)
Thal. Elev
W.S. elev.
BF Elev.
T.B. elev.

Longitudinal Profile Information for the Lower Pasture, Little Warior Creek

Longitudinal Profile Data Sheet for: As-built information on AH&W site.

Profile description: Long-profile starts at below Hwy.18 @ starting at box culvert mouth, centered on

See other notes at bottom.

Feature	HI	Length	Tot. Dist.	Thal.	Thal. Elev	slope	W.S.	W.S. elev.	slope	BF	BF Elev.	slope	Top bank	T.B. elev.	slope	Dbkf pool	Dbkf riffle	RIFFLE-POOL pool-L	riffle-L	R:P	TB-Thal	Bkf-W.S.
HOR	52.15	0	40	9.61	42.54	0.00	9.2	42.95	0.0028		52.15	0.000	4.16	47.99	0.0000		9.61		74	100	5.45	9.2
thalwag-cc	52.15	40	32	9.7	42.45	0.01	9.31	42.84	0.0069		52.15	0.264	4.16	47.99	0.0000						5.54	9.31
x-vane	52.15	72	2	10.03	42.12	0.56	9.53	42.62	0.0000	8.46	43.69	0.000	4.16	47.99	0.0000						5.87	1.07
HOP&deep	52.15	74	26	11.15	41	-0.02	9.53	42.62	0.0223	8.46	43.69	0.016	4.16	47.99	-0.0065	2.69		26			6.99	1.07
HOR	52.15	100	59	10.57	41.58	0.00	10.11	42.04	0.0000	8.87	43.28	0.000	3.99	48.16	0.0827		1.7		62	74	6.58	1.24
thalwag	52.15	159	3	10.72	41.43	0.22	10.11	42.04	0.0833	8.87	43.28	0.107		43.28	0.1067						1.85	1.24
HOP&deep	52.15	162	12	11.39	40.76	-0.05	10.36	41.79	-0.0083	9.19	42.96	-0.002		42.96	-0.0025	2.2		12			2.2	1.17
HOR	52.15	174	40	10.74	41.41	0.04	10.26	41.89	0.0273	9.16	42.99	0.020		42.99	0.0205		1.58		40	111	1.58	1.1
HOP	52.15	214	27	12.43	39.72	0.00	11.35	40.8	-0.0004	9.98	42.17	0.014		42.17	0.0141	2.45		71			2.45	1.37
Deep pool	52.15	241	44	12.5	39.65	-0.02	11.34	40.81	0.0011	10.36	41.79	-0.003		41.79	-0.0032						2.14	0.98
HOR	52.15	285	19	11.7	40.45	0.02	11.39	40.76	0.0153	10.22	41.93	0.017		41.93	0.0168		1.48		27	40	1.48	1.17
thalwag	52.15	304	8	12.16	39.99	0.07	11.68	40.47	0.0000	10.54	41.61	0.000		41.61	0.0000						1.62	1.14
HOP&deep	52.15	312	13	12.76	39.39	-0.03	11.68	40.47	0.0054	10.54	41.61	0.022		41.61	0.0215	2.22		13			2.22	1.14
HOR	52.15	325	58	12.4	39.75	0.00	11.75	40.4	0.0079	10.82	41.33	0.007		41.33	0.0069		1.58		58	91	1.58	0.93
HOP	52.15	383	7	12.69	39.46	0.15	12.21	39.94	0.0000	11.22	40.93	0.000		40.93	0.0000	1.47		33			1.47	0.99
Deep pool	52.15	390	26	13.71	38.44	-0.05	12.21	39.94	0.0035	11.22	40.93	0.011		40.93	0.0108						2.49	0.99
HOR	52.15	416	16	12.47	39.68	0.04	12.3	39.85	0.0062	11.5	40.65	-0.021		40.65	-0.0206		0.97		16	37	0.97	0.8
HOP	52.15	432	18	13.04	39.11	-0.01	12.4	39.75	0.0017	11.17	40.98	-0.012		40.98	-0.0117	1.87		21			1.87	1.23
x-vane	52.15	450	3	12.89	39.26	0.35	12.43	39.72	0.1967	10.96	41.19	0.207		41.19	0.2067						1.93	1.47
Hoglide	52.15	453	12	13.94	38.21	-0.01	13.02	39.13	0.0175	11.58	40.57	0.025		40.57	0.0250				12	79	2.36	1.44
HOP	52.15	465	5	13.78	38.37	0.04	13.23	38.92	0.0060	11.88	40.27	0.014		40.27	0.0140	1.9		67			1.9	1.35
thalwag	52.15	470	31	13.97	38.18	0.01	13.26	38.89	-0.0006	11.95	40.2	0.000		40.2	0.0000						2.02	1.31
Deep pool	52.15	501	31	14.41	37.74	-0.02	13.24	38.91	0.0019	11.95	40.2	0.001		40.2	0.0013						2.46	1.29
HOR	52.15	532	31	13.66	38.49	0.03	13.3	38.85	0.0181	11.99	40.16	0.024		40.16	0.0239		1.67		31	68	1.67	1.31
HOP	52.15	563	6	14.44	37.71	0.20	13.86	38.29	0.0000	12.73	39.42	0.000		39.42	0.0000	1.71		37			1.71	1.13
Deep pool	52.15	569	31	15.62	36.53	-0.04	13.86	38.29	0.0068	12.73	39.42	-0.005		39.42	-0.0052						2.89	1.13
HOR	52.15	600	41	14.45	37.7	0.01	14.07	38.08	0.0117	12.57	39.58	0.011		39.58	0.0107		1.88		41	64	1.88	1.5
HOP	52.15	641	7	14.96	37.19	0.09	14.55	37.6	0.0000	13.01	39.14	0.000		39.14	0.0000	1.95		23			1.95	1.54
Deep pool	52.15	648	16	15.57	36.58	-0.05	14.55	37.6	0.0000	13.01	39.14	0.004		39.14	0.0038						2.56	1.54
HOR	52.15	664	82	14.84	37.31	0.00	14.55	37.6	0.0039	13.07	39.08	0.000		39.08	0.0000		1.77		83	84	1.77	1.48
x-vane HOP	52.15	746	1	15.16	36.99	0.74	14.87	37.28	0.1900	13.07	39.08	0.480		39.08	0.4800	2.09		1			2.09	1.8
	52.15	747		15.9	36.25		15.06	37.09		13.55	38.6	#DIV/0!		38.6							2.35	1.51
															Average=	2.06	2.47	30.40	44.40	74.80	2.63	1.76

Pool slopes=	0.0223	-0.0083	-0.0004	0.0054	0.0000	0.0000	0.0017	0.0060	0.0000	0.0000

Avg. slope=	0.0078		Avg. Riffle slope=	0.0103		Avg. Pool slope=	0.0027
Avg. Pool length	30.4		Avg. Riffle length	44.4			
Total Pool length	304	41%	Total Riffle length	444	59%	747 =TOTAL	

Range:		pool	riffle	pool-L	riffle-L	R:P	TB-Thal	Bkf-W.S.
	min	1.47	0.97	1	12	37	0.97	0.8
	max	2.69	9.61	71	83	111	6.99	9.31

Water surface slope from head of 1st riffle to bottom of last pool

distance = 747
top = 42.95
bottom = 37.09
5.86 difference from top to bottom of the valley

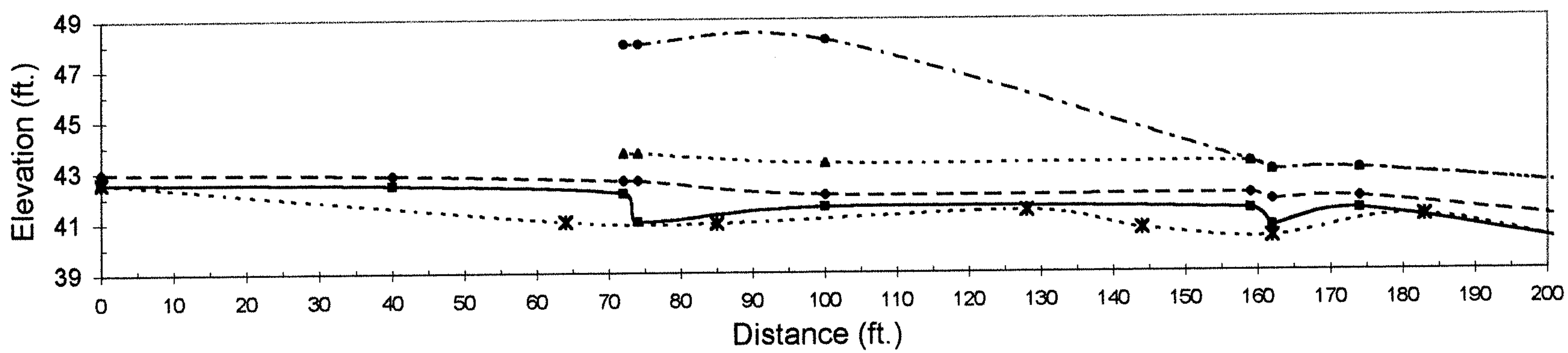
Water Surface Slope = 0.0078

Valley slope from head of 1st top of bank to last

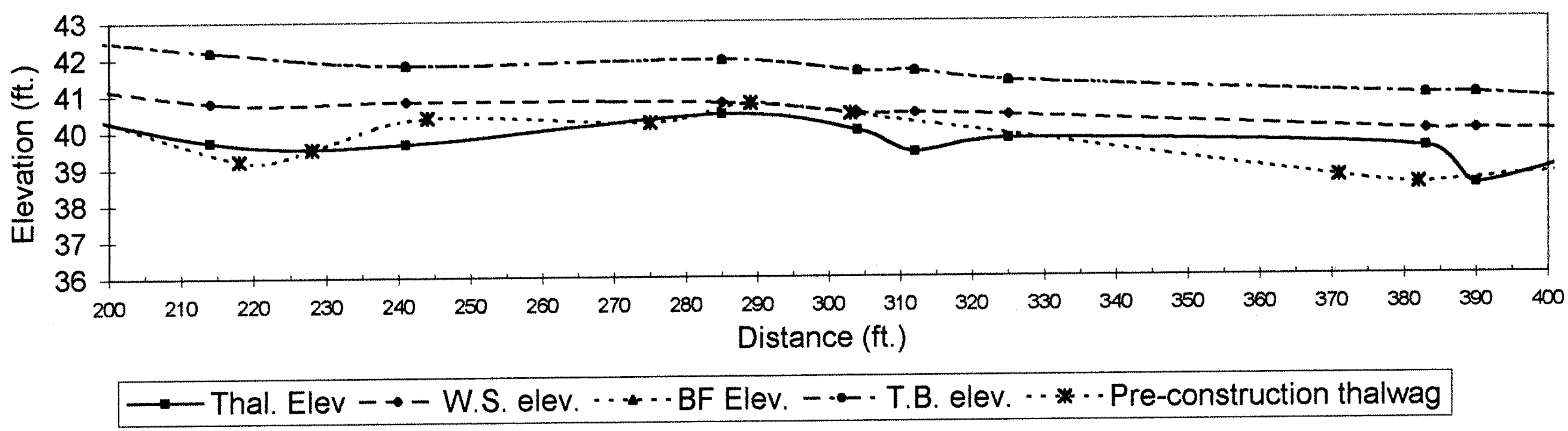
distance = 747
1st top of bank = 47.99
last top of bank= 38.6
9.39 difference from top to bottom of the valley

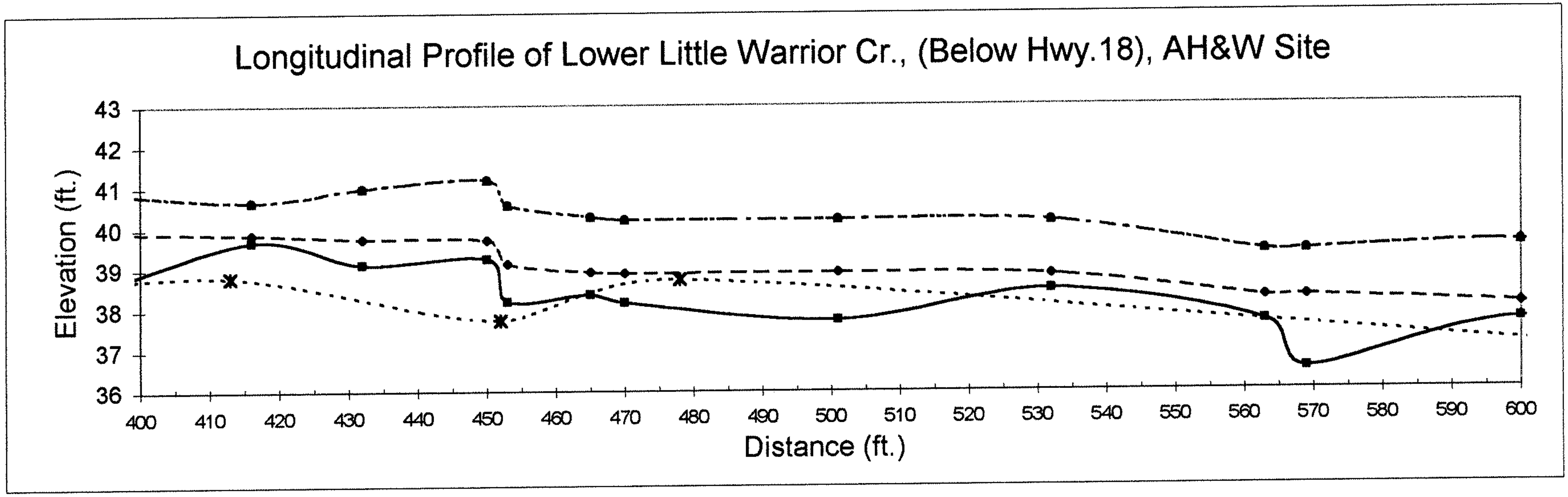
Valley Slope = 0.0126 Sinuosity= 1.602389

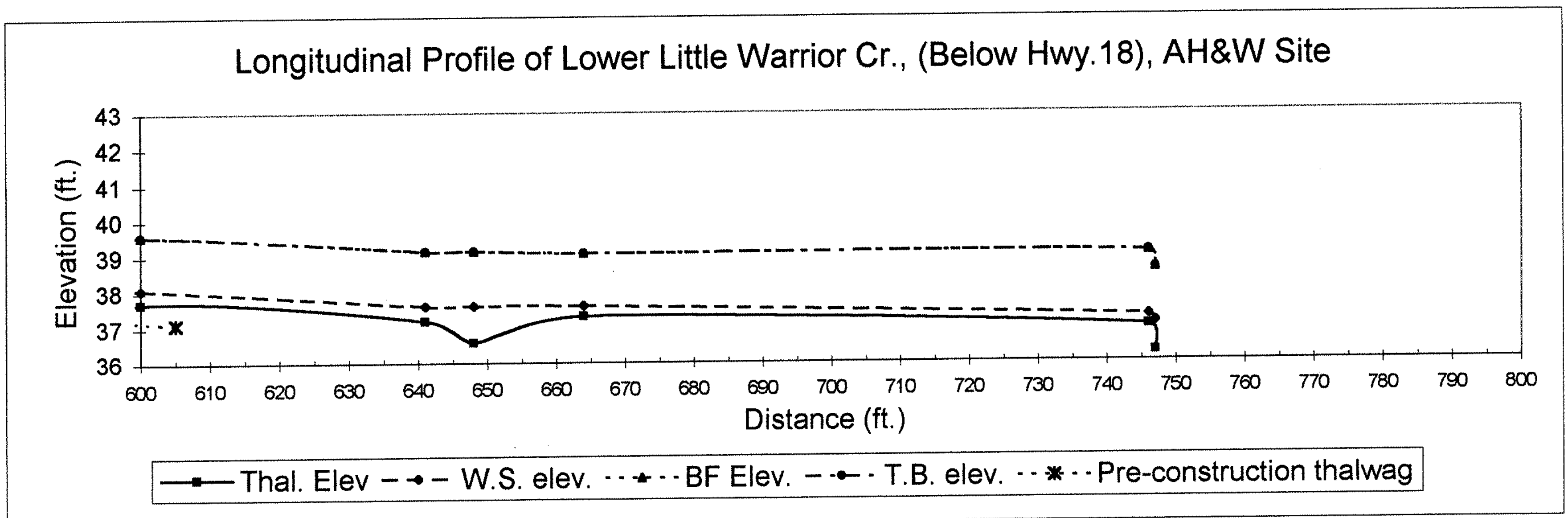
Longitudinal Profile of Lower Little Warrior Cr., (Below Hwy.18), AH&W Site



Longitudinal Profile of Lower Little Warrior Cr., (Below Hwy.18), AH&W Site

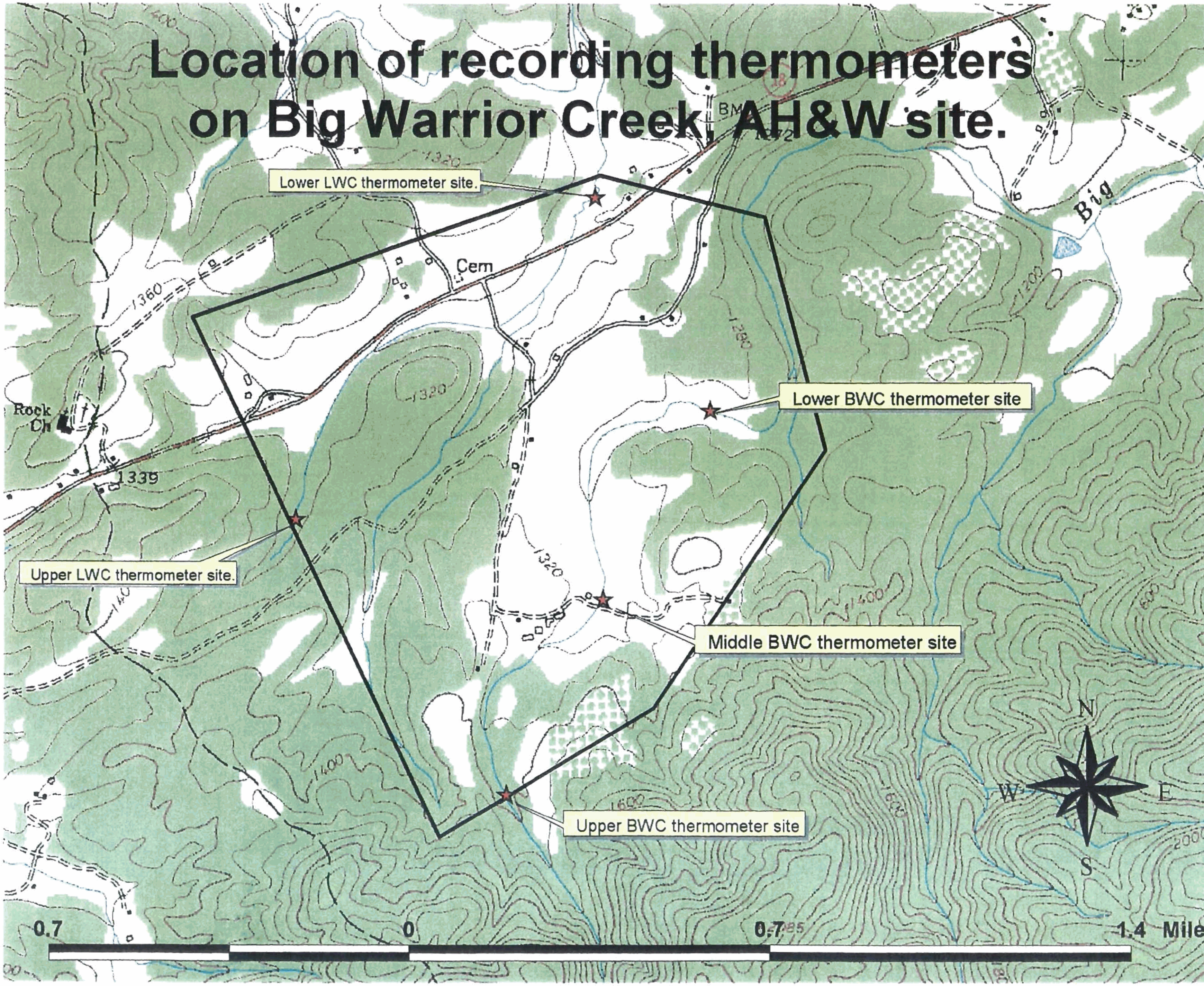



Longitudinal Profile of Lower Little Warrior Cr., (Below Hwy.18), AH&W Site
Elevation (ft.)
43
42
41
40
39
38
37
36
400
410
420
430
440
450
460
470
480
490
500
510
520
530
540
550
560
570
580
590
600
Distance (ft.)

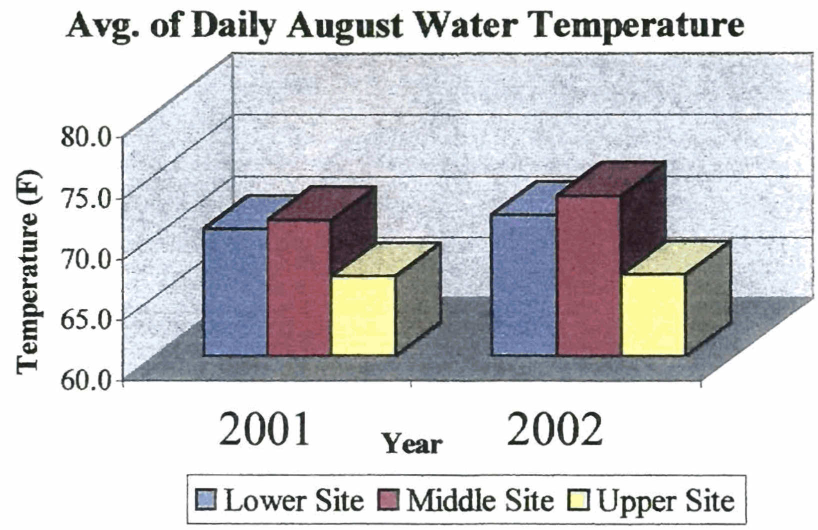

Longitudinal Profile of Lower Little Warrior Cr., (Below Hwy.18), AH&W Site
Elevation (ft.)
43
42
41
40
39
38
37
36
600
610
620
630
640
650
660
670
680
690
700
710
720
730
740
750
760
770
780
790
800
Distance (ft.)
Thal. Elev
W.S. elev.
BF Elev.
T.B. elev.
Pre-construction thalwag

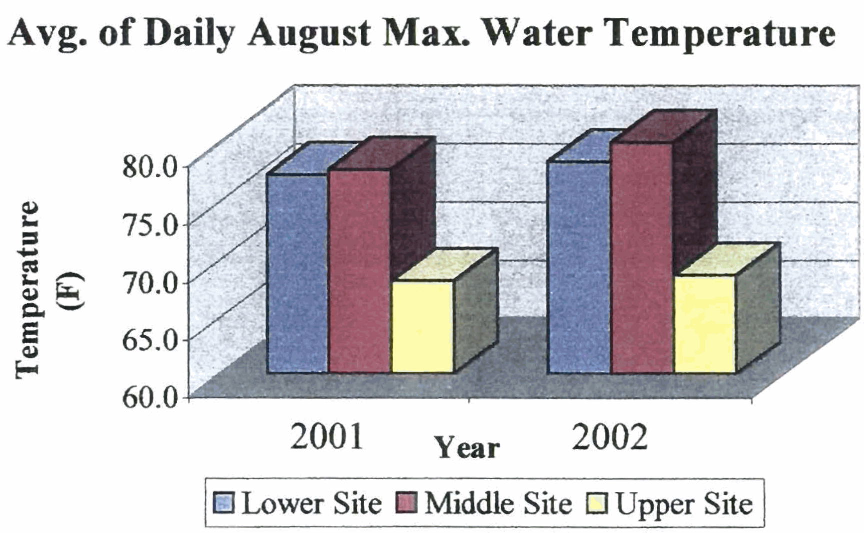
Water Temperature Data
for
Big and Little Warrior Creeks
2001 and 2002

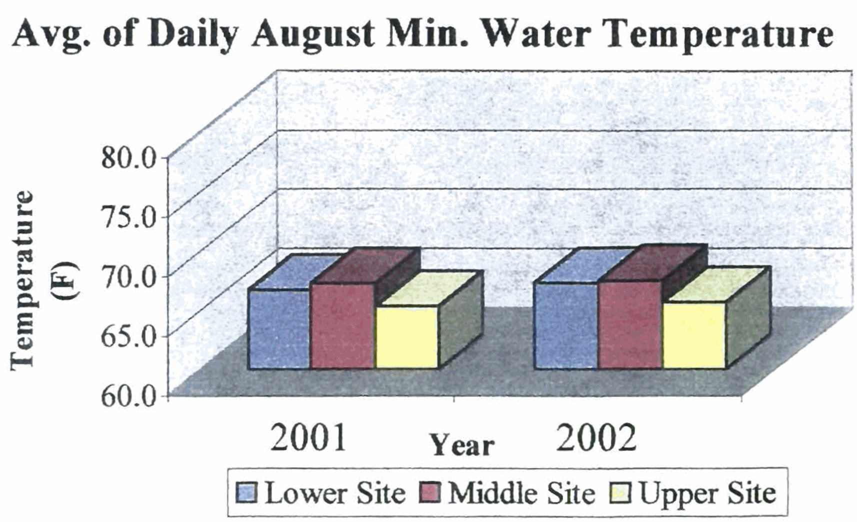
Locations of Onset Thermometers
Big Warrior Creek
Little Warrior Creek


Location of recording thermometers
on Big Warrior Creek, AH&W site.
Lower LWC thermometer site.
Upper LWC thermometer site.
Lower BWC thermometer site
Middle BWC thermometer site
Upper BWC thermometer site
Cem
Rock Ch
1339
1360
1320
1280
1200
1400
1600
Big
BM
N
S
E
W
0.7
0
0.7
1.4 Miles

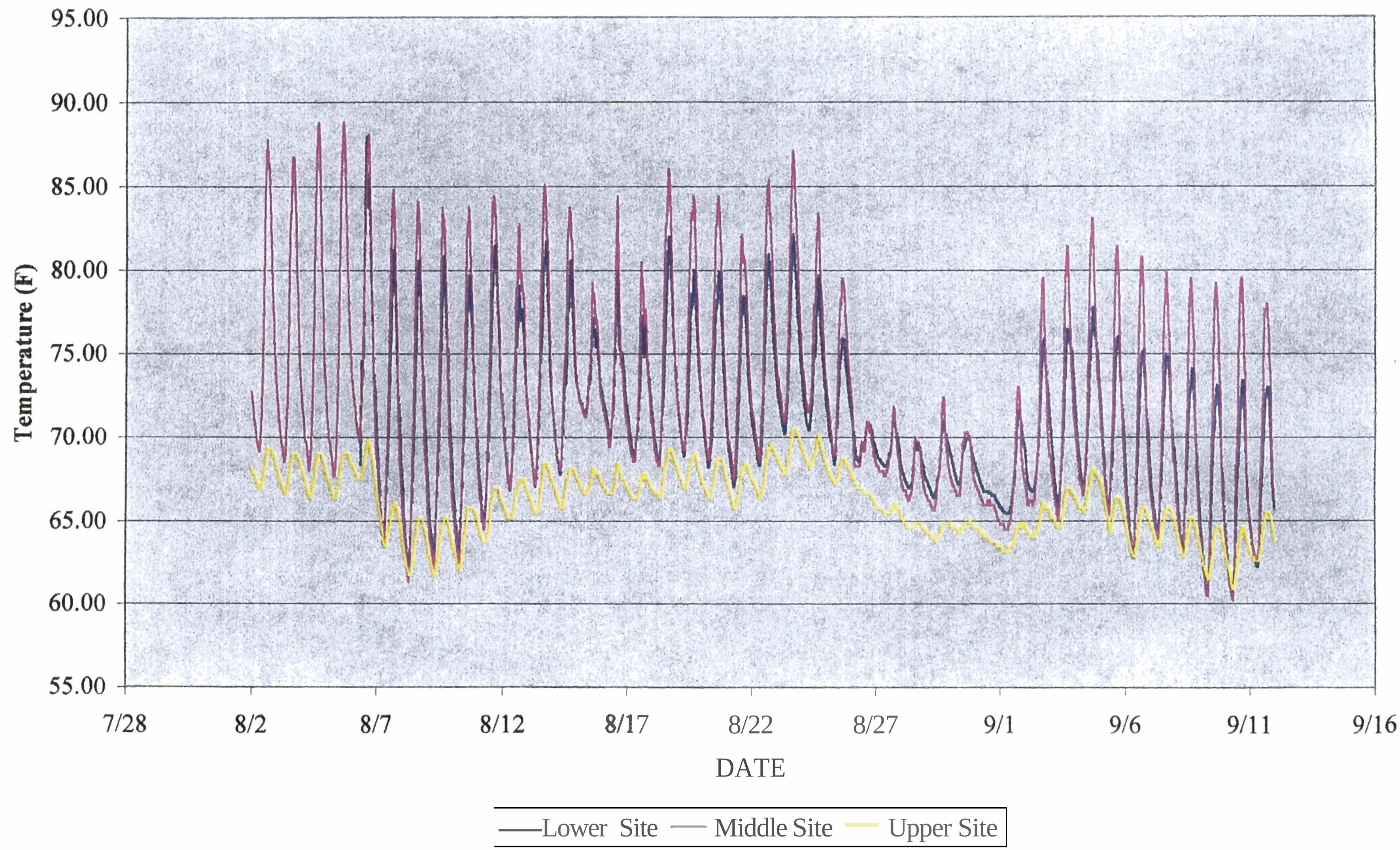
Big Warrior Creek at AH&W site, August water temperature data for 3 sites during 2001 and 2002.



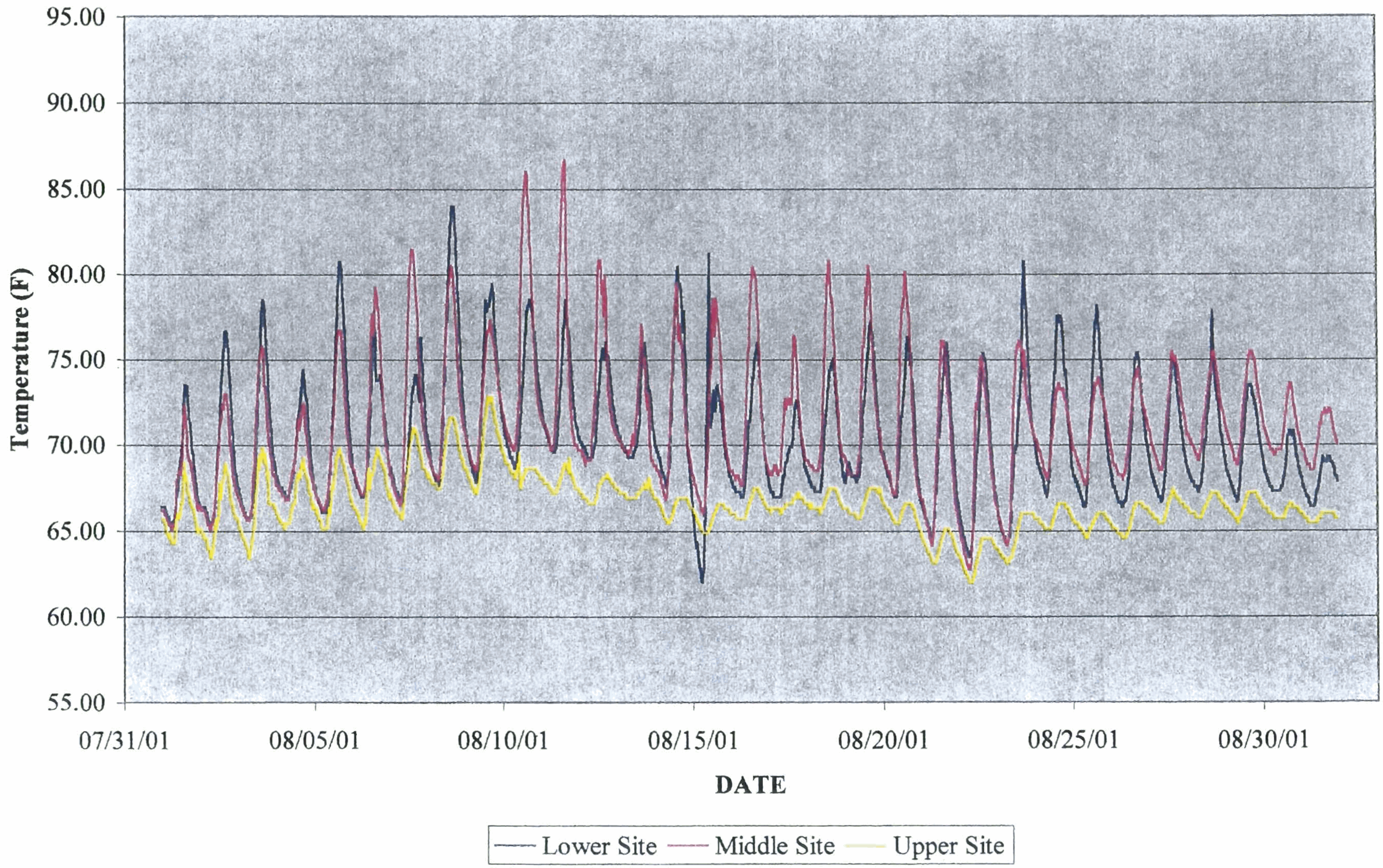




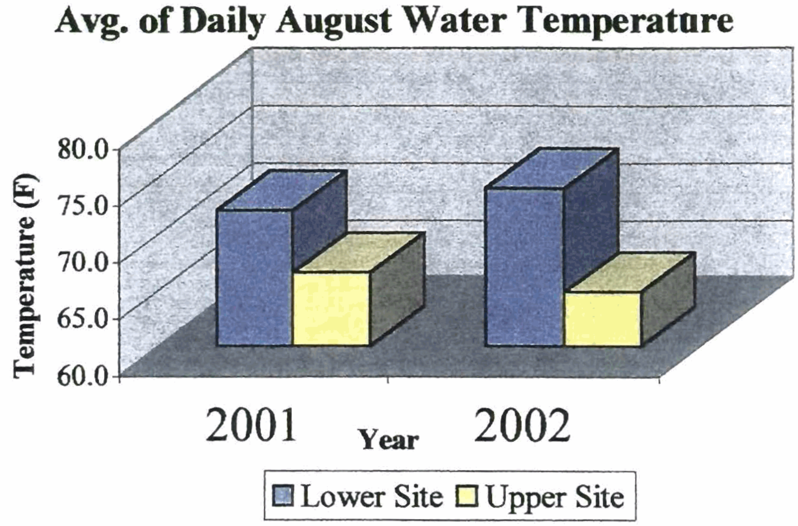
August 2002 Water Termperature on Big Warrior Creek

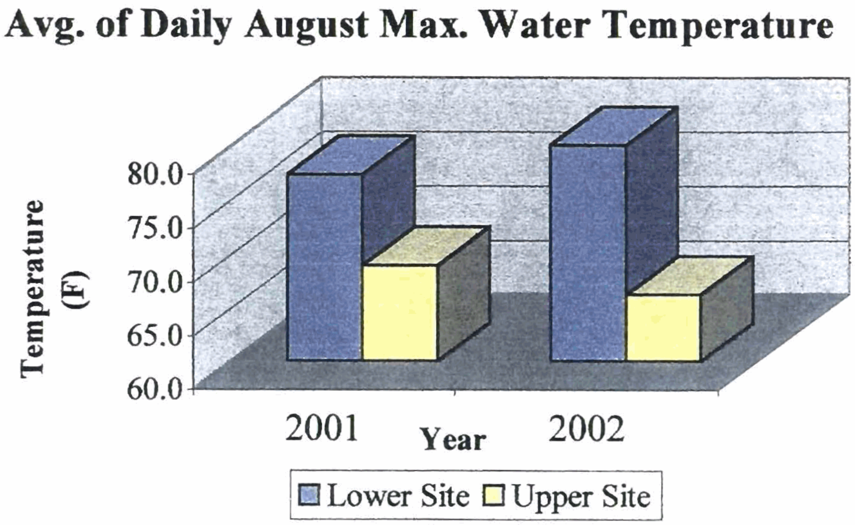


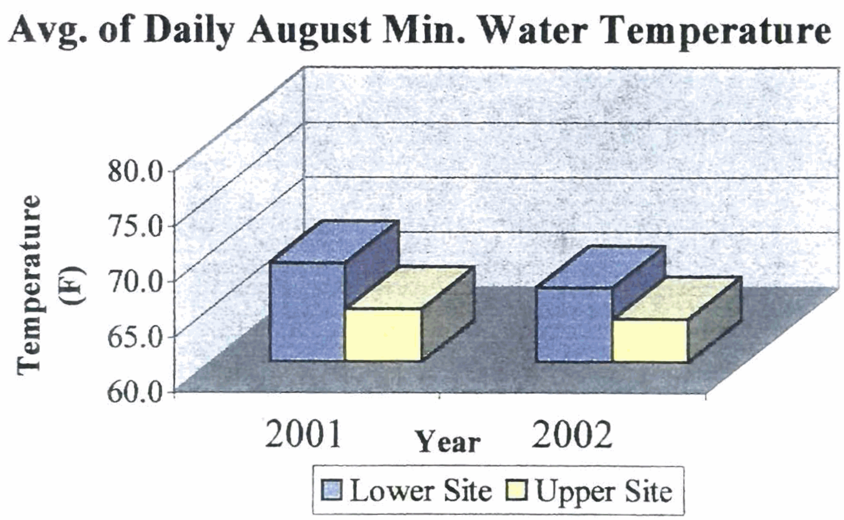
August 2001 Water Termperature on Big Warrior Creek



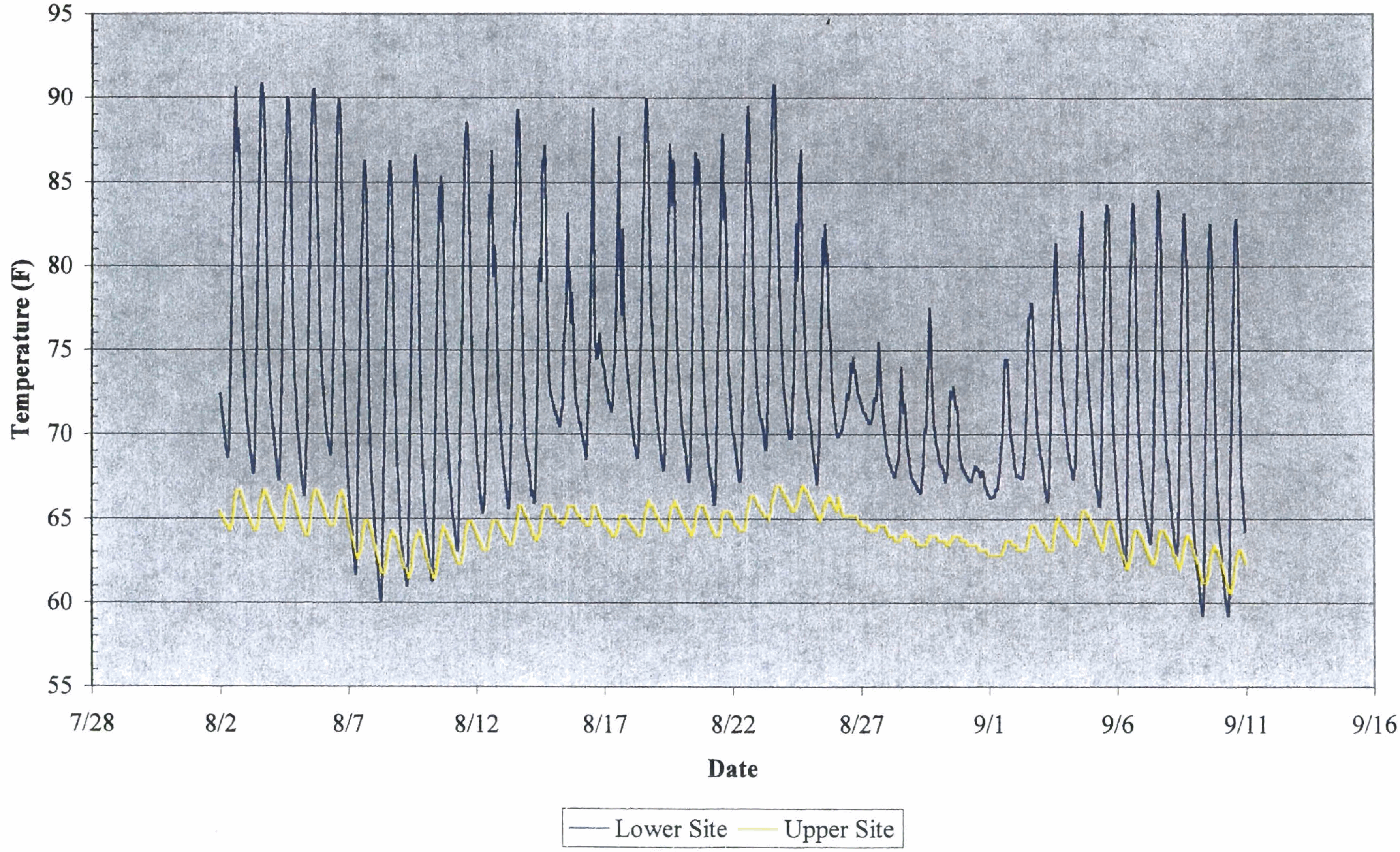
Little Warrior Creek at AH&W site, August water temperature data for 2 sites during 2001 and 2002.







August 2002 Water Temperature on Little Warrior Creek



August 2001 Water Temperature on Little Warrior Creek