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Annual Monitoring Report 2010

Remining No. 2 Surface Mine
Lick Fork/Grapevine Creek Stream Restoration

1.0 Applicant Information

Central Appalachia Mining, LLC (CAM) located at P.O. Box 1169, 265 Hambley Blvd., Pikeville, Kentucky 41509 is the entity responsible for this project. CAM contracted Heritage Technical Associates (HTA) of Chapmanville, WV to conduct annual monitoring for mitigation actions associated with the Remining No. 2 Surface Mine located near Edgarton in Mingo County, West Virginia (Attachment 1). If any questions should arise concerning this project please contact HTA.

2.0 Introduction

Mitigation actions for Lick Fork and for the lower reach of Grapevine Creek have been completed. These actions included long-term physical structure and stability of the channel, establishment of native species within the riparian zone where appropriate and practicable, and enhancement to the aquatic habitat by the installation of cross vanes. Annual monitoring of the mitigation actions is required per the Compensatory Mitigation Plan (CMP). Field assessments of these actions have indicated that the stream channel has been contained by the placement of cross vanes, the riparian zone has a vegetative cover, and pools have been created that improve aquatic habitat.

3.0 Purpose

This is the sixth Annual Monitoring Report (AMR) that has been prepared and submitted for Lick Fork. The As-Built Report was submitted in 2004. The first Annual Monitoring Report was submitted in 2005. This is the seventh year for the Lick Fork restoration. This report assesses mitigation efforts undertaken to compensate for impacts of the Remining No. 2 Surface Mine. Section I, Monitoring and Long-Term Management, of the CMP requires annual monitoring in order to determine the success of the restoration plan based on the CMP performance standards. The CMP stipulates completion of in-stream structures and seeding of the stream restoration area in Lick Fork, a tributary of Grapevine Creek, and in the lowest 1540 feet of Grapevine Creek, a tributary of the Tug Fork River. This is the fifth AMR for the lower section of Grapevine Creek. The As-Built Report was submitted in February 2006 (for the 2005 year). This is the sixth year for the lower Grapevine Creek restoration.

This AMR includes both restored stream sections. The scope of the restoration efforts for both streams includes: long-term physical structure and stability of the channel, establishment of native species within the riparian zone, where appropriate and practicable, and enhancement to the aquatic habitat by the installation of cross vanes.

The Lick Fork restoration was completed during Phases I and II of the mitigation plan. To achieve long-term channel stability, one step-pool complex structure and 37

rock cross vanes were constructed in Lick Fork. Stream restoration began at the upper weir (0+00), and terminated at the access road to Pond 2 (31+88), compiling a total length of 3,188 linear feet. The step-pool complex structure (0+00 to 0+50) dissipates energy and maintains erosion control in the steeply graded area directly below the weir. Cross vanes were placed at approximately 84 foot intervals, approximately six bankfull widths[1], throughout the remaining length of stream. Attachment 2 illustrates the as-built locations of the cross vane and step-pool structures in comparison to the proposed locations.

Grapevine Creek restoration was completed during Phase III of the mitigation plan. Thirteen rock cross vanes were constructed within the lower portion of Grapevine Creek. Stream restoration began approximately 1540 linear feet from the confluence of Grapevine Creek and the Tug Fork River (0+00) and ended just before a bridge just upstream from the confluence with the Tug Fork (13+00), compiling a total length of 1300 linear feet. The CMP proposed the restoration of 1540 feet of lower Grapevine Creek, however, due to the construction of a new bridge restoration activities could not be implemented in the lower 240 feet. Cross vanes were placed at approximately 84 foot intervals, approximately six bankfull widths, throughout the remaining length of stream. Attachment 3 illustrates the Grapevine Creek as-built location of the in-stream structures in comparison to the proposed locations.

To quantify success of the in-stream structures, conditions of the structures were examined and compared to the initial as-built configuration. Additional monitoring conducted included analyses of benthic macroinvertebrate surveys, water chemistry, habitat survey, stream channel stability and documentation of vegetative cover. Vantage points, areas with long continual vistas of riparian disturbances, were selected along the stream to assist in annual evaluation and documentation. Annual photographs, taken from the same locations, were used to monitor and compare the progression and naturalization of the mitigation sites. A detailed description of management actions implemented throughout the year and photographic confirmation of the mitigation efforts are also incorporated.

4.0 Project Overview

The primary objective for this restoration plan was to construct a stream channel capable of supporting an ecosystem comparable to the pre-mitigation ecosystem, while minimizing impacts from past mining practices. The jurisdictional waters proposed for impact have a heterotrophic[2] food web[3]. In this type of system, coarse particulate organic matter (CPOM), such as leaves, sticks or wood, provides the primary source of energy to aquatic organisms. The organisms that feed on CPOM may be transported downstream, providing food for larger organisms and fish. The constructed stream channels are anticipated to maintain a similar heterotrophic ecosystem, while reducing channel instabilities.

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[1]Bankfull width is a typical top width of a stream at the occurrence of a bankfull storm event

[2]Heterotrophic is defined as “obtaining nourishment from organic substances,...” (The American Heritage Dictionary, Second College Edition, 1982.)

[3]A heterotrophic food web derives its energy source from the contribution of organic matter from other sources such as leaves, sticks and wood as compared to an autotrophic system which produces energy from photosynthesis.

The stream restoration techniques implemented more than compensate for the anticipated impacts to jurisdictional waters. The completion of mitigation efforts and water quality improvements that are expected after the remining of this project will provide a habitat with the potential for an increase in the number and diversity of taxa within the streams.

4.1 Project Goals and Objectives

Mitigation actions were undertaken in order to produce a more stable stream channel with an equivalent or improved ecosystem in the areas of temporary impacts and below the valley fills.

Stream restoration structures have been constructed in Lick Fork to create a diverse habitat, dissipate energy within the channel, and control the anticipated erosion stresses. The stream restoration structures installed are capable of accommodating "bankfull" flow events and enhancing channel morphology.

The jurisdictional waters impacted by the foot print of Valley Fill 3, Pond 1 and Ponds 3 & 3A were offset by the stream restoration in Lick Fork and in the lower portion of Grapevine Creek. Valley Fills 1, 2, and Pond 2 were not constructed due to geologic conditions encountered, which lessened the amount of mineral removal and consequential disturbance to jurisdictional waters.

Lick Fork and Grapevine Creek stream restoration efforts also included the planting of native species within the riparian zone. These remedial actions included seeding all disturbed areas in the riparian zones with native grasses and the planting of native shrubs and trees. These stream restoration measures are intended to increase soil stability, reduce erosion potential and enhance the aquatic habitat by providing shade and CPOM to the ecosystem. Re-vegetation of the riparian zone assures that ecological functions, present prior to mitigation, return to the restored streams.

During construction, precautions were taken to minimize disturbance of the existing riparian zone and reduce or prevent erosion and sedimentation from occurring as presented in prior reports. Precautions included leaving larger trees intact and placing hay bails downstream to impede sediment movement related to cross vane construction.

Thus far, the restoration plan has proven successful by accomplishing the primary restoration objective: to establish a stable channel capable of supporting an ecosystem comparable to the pre-mitigation ecosystem, while minimizing impacts from past mining practices.

4.2 Performance Standards

The performance or success standards for this mitigation plan have established qualitative and quantitative gauges of success. Performance standards, set forth in the CMP previously accepted by the USACE, are described in detail below:

4.2.1 Riparian Zone Vegetation

The project will be considered successful if native species are established on at least 80 percent of the mitigation sites. Species proposed for planting are considered native species. Natural succession has occurred and adjacent tree species have migrated into the mitigation sites. The project will not be considered successful if non-native species prevent

the establishment of at least 80 percent of the native species. Success will be determined by visual analyses and inventory of the site.

4.2.2 Stream Stability

Stream morphology will be visually examined to determine if erosion is controlled. The project will be considered successful if the stream and structures installed are stable, both laterally and vertically.

4.2.3 Stream Geometry

The mitigation plan will be deemed successful if the structures are constructed in the approximate location proposed in the pre-plans. The structures should have vertical tolerances of +/- 1 foot. Stream channel geometry will be surveyed as needed.

4.2.4 Benthic Populations

Benthic macroinvertebrate populations will be monitored until the project is determined successful by the USACE. Benthic analysis will help assess the overall health of the restored stream. However, benthic populations, including the presence of certain species, will not be used as a gauge of success.

4.3 Project Success

The overall project will be deemed a success once the following has occurred: 1) Construction of restored stream channels, 2) Vigorous vegetation has been established in appropriate areas, 3) Native species have been established in over 80 percent of the mitigation site, 4) The reclamation bond for the operation is released by the WVDEP. Since the reclamation bond can only be released after a minimum of five years, the five year project success time frame will be obtained.

Presently, the mitigation plan is progressing as planned and it is anticipated that the project will achieve the proposed performance standards. CAM is responsible for all phases of construction and compliance proposed within the original CMP. CAM is obligated to maintain compliance with criteria set forth in the CMP and make adequate repairs to the site when necessary. The site must meet requirements set forth by the State of West Virginia, including the requirements for water quality improvements stipulated by the WVDEP[4].

CAM has provided the financial assurances needed to achieve project success. Financial assurance guarantees implementation of the proposed mitigation actions and maintenance of the mitigation sites until final acceptance by the USACE. Thus, it is assured that CAM will adequately comply with the requirements within the original CMP.

CAM will not be responsible for damages to the site caused by violations of the proposed restrictive covenants or any damage caused by parties other than Central Appalachian Mining, LLC.

Thus far, with the exception of the establishment of at least 80 percent native riparian vegetation, the majority of the mitigation efforts are progressing accordingly. There are no indications that the actions proposed within the CMP will not be successful. However, if mitigation cannot be implemented

[4]The variance from water quality was granted by the West Virginia Environmental Quality Board (EQB). The authority to grant water quality variances was transferred by the legislature to the WVDEP effective July 1, 2005.

successfully in the proposed locations, adjacent jurisdictional waters that have also been impacted by mining may be included in a future, revised CMP.

4.4 Monitoring and Management

For at least five years following completion of the mitigation site construction, mitigated areas have been monitored annually to determine project success based on the pre-determined performance standards. Annual monitoring has occurred once each calendar year after completion of the project, until final WVDEP reclamation bond release and USACE approval. Areas inspected and monitored include the stability of the stream channel and success of the vegetation. Maintenance has been performed on an as-needed basis to assure that CMP objectives are accomplished.

Cross-sections established on as-built maps provide a baseline reference for the restored stream channels. Cross-sections were prepared for critical areas, such as restored channels through the reclaimed sediment pond areas. Cross-sections were also established in other reaches of the restored stream channels in intervals not exceeding 500 feet. These cross-sections will help identify any adverse changes to dimensions of the restored channels. Permanent survey markers were used to monument the cross-sections. Limits of the mitigation reaches were delineated by the establishment of a monument in the form of a marker or sign.

The mitigation sites were not fenced, since the restored streams provide water resources for the wildlife indigenous to the area.

Six representative sections, vantage points, with long continual vistas of riparian disturbances were selected along the stream to assist in annual evaluation and documentation. Photographs will be taken from the same locations annually to monitor and compare the progression and naturalization of the mitigation sites.

5.0 Site Integrity

The integrity of the site is guaranteed by CAM through the implementation of the restrictive covenants set forth in the agreement with the landowner. The current landowners are Logan Coal and Timber Corp., 37 North Road, Building 2, Paoli, PA 19301 and Heartwood Forestland Fund II, P. O. Box 916, Chapel Hill, NC 27515[5].

Restrictive covenant areas are depicted on maps enclosed in the CMP (Attachments 26 to 29) previously accepted by the USACE.

6.0 Mitigation Actions

In the Annual Monitoring Report submitted in December of 2005, CAM proposed to revise the phases within the mitigation plan to reflect the actual impacts of the project and the mitigation implemented to offset the actual impacts. Fewer impacts occurred since 2 valley fills and 1 pond was not constructed. This altered the mitigation requirements for the project. As documented below, the mitigation actions installed to date surpass the mitigation required to offset the impacts to jurisdictional waters (Tables 1 and 2).

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[5]Restrictive covenants have been obtained from Logan Coal and Timber Corp. Because the amount of impacts have been lessened, as will be explained in more detail later in this AMR, restrictive covenants from Heartwood Forestland Fund II will not be necessary since restoration measures were not constructed on Heartwood property.

The revised proposed mitigation plan consists of four phases. The first three phases of the proposed plan have been completed. Phase IV will be completed at the end of the project. This will see final mitigation actions for Ponds 1, 3, and 3a which will allow for final bond release. Mitigation actions taken to date are described below and illustrated on the phase map (Attachment 4).

6.1 Mitigation Phases

The remining operation (Remining No. 1 Mine) conducted on adjacent lands has significantly improved the water quality. Thus, the primary restoration objective of this project was to enhance the physical structure of the same stream channel where the water quality improvements resultant of remining activities have occurred. The installation of cross vanes (CMP Attachment 19) and step-pool channel features (CMP Attachment 20) have accomplished the following: 1) added channel structure, 2) provided vertical stability to the stream, inhibiting further entrenchment, 3) provided lateral stability, preventing the stream from cutting into the natural hillsides and haul road fill banks, and 4) established the formation of channel features such as, pools, glides, riffles, and runs, improving the habitat and the occurrence of natural stream processes. Phase maps can be found in Attachment 4.

Phase I

Completed measures of Phase I of the original accepted mitigation plan included the restoration[6] of Lick Fork from 0+00 to 18+40 (CMP Attachments 14 to 16). Restoration work began at the most upstream location and progressed downstream. Channel structure and features were established with the construction of a step-pool complex and cross vanes in a stream that was previously impacted by the physical and chemical effects of mining. Disturbed riparian zones were seeded and planted with the appropriate seed mixture and tree species. Large trees, growing in the riparian zone, were not disturbed. These trees provide bank stability, contribute leaf litter and debris to the stream, and contribute seeds to the riparian area.

Restoration work began with installation of the step-pool channel. The step-pool complex (0+00 to 0+50) provides a form of energy dissipation and maintains erosion control within the steeply graded channel directly below Pond 3 of the adjacent Remining No. 1 Mine (Permit No. S-4006-00). Cross vanes were placed at approximately 84 foot intervals, approximately 6 bankfull widths, throughout the remaining length of the restored stream segment (0+50 to 18+40). This interval was determined with hydraulic and geomorphologic analysis of similar, stable streams and general accepted information (Leopold) regarding stream size.

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[6]Due to the incised characteristics of the streams to be restored with this CMP which include narrow, confined floodplains and deep entrenchment ratios, it was determined that a “Priority 4” restoration would be most practical. “Priority 1” restoration cannot be accomplished because there is no historical floodplain for which to reconnect the streams to be restored. “Priority 2” restoration cannot be accomplished because a new floodplain and stream pattern cannot be created within the narrow confines of the streams to be restored. “Priority 3” restoration cannot be accomplished because there is no room to widen the floodplain due to the narrow confines of the streams to be restored. “Priority 4” restoration can be accomplished and will stabilize the stream banks in their current location.

As per the CMP, construction of channel features began in Phase I, work then commenced in Valley Fill 1 and on the access road. However, geologic conditions prevented the remining of the Alma Seam within the confines of Valley Fill 1. Due to this, Valley Fill 1 was not constructed. Pond 1, which would have provided drainage control for Valley Fill 1, was installed in anticipation of construction of the valley fill. The area designated for Valley Fill 1 was cleared, but no material was placed in the valley fill. The construction of Pond 1 will temporarily impact jurisdictional waters.

Phase II

Phase II stream restoration involved the completion of restoration within Lick Fork from approximately 19+60 to 31+88 (CMP Attachments 16 to 18). Cross vane installation in the channels was based on criteria discussed above.

Originally, Phase II operations proposed the installation of two stream crossings, one for Haulroad A and one for the access road. However, since Haulroad A was never constructed and the access road was not used, no culverts were installed.

Phase III

Phase III stream restoration involved the completion of stream restoration structures in Grapevine Creek from 0+00 to 13+00 (CMP Attachment 33). The CMP proposed that the Grapevine Creek restoration extend to the confluence of Grapevine Creek and the Tug Fork River, approximately 1540 feet. Restoration plans had to be altered, due to the construction of a bridge by the West Virginia Department of Highways (Attachment 6). The bridge altered the channel morphology, adding a retaining wall that flanks the left side of the stream. The proposed stable construction of step-pools in this area could not be achieved with the new retaining wall in place. Constructed cross vanes were located at approximately 84 foot intervals, approximately 6 bankfull widths, throughout the length of the restored stream segment.

The original accepted CMP stated that Phases II and III could occur simultaneously. After construction of channel features began in Phase I, work commenced in Valley Fill 3. The construction of Ponds 3 & 3A, which serve as drainage control for the Valley Fill 3, were also completed. Ponds 3 & 3A temporarily impact jurisdictional waters, while Valley Fill 3 will permanently impact jurisdictional waters.

Phase IV

Phase IV will be the final phase of the project. Adjustments were made to phases proposed within the original accepted CMP, due to changes in the remining process dictated by geologic conditions. Fewer disturbances will occur since Valley Fill 2 and Pond 2 are no longer planned for construction.

Phase IV will involve the restoration of streams temporarily impacted by Ponds 1, 3 and 3A. This stream restoration is not complete at this time but will occur as the structures are removed during the WVDEP permit release process. Channel restoration through the footprints of Ponds 1, 3, and 3A will be accomplished and allow for final bond release.

After restoration has been completed, a stream length of 4728 lf (Lick Fork and Grapevine Creek mitigation) will be restored to compensate for permanent disturbances and a stream length of 765 lf (pond area mitigation) will be restored to offset temporary disturbances.

6.2 Mitigation Summary

A total stream length of 5493 lf will be restored through mitigation efforts (Table 2). The actual permanent stream disturbance length is 1682 lf (Table 1). After considering the temporal effects of 5% for every five year phase [1682+ (1682x5%) + (1682x5%)], the total length of mitigation required is 1850.2 lf. The completed restoration total is 4488 lf (Table 2). Mitigation efforts will restore a greater length (2638 lf) of channel than is required to offset disturbances[7]. The mitigation efforts above what is required (2638 lf) may be used by CAM to offset future impacts to jurisdictional waters.

Table 1. Proposed Impacts versus Actual Impacts to Jurisdictional Waters

Proposed Impact Features	**Proposed Permanent Stream Disturbance (lf)**	**Proposed Temporary Stream Disturbance (lf)**	**Actual Permanent Stream Disturbance (lf)**	**Actual Temporary Stream Disturbance (lf)**
Valley Fill 1	1309 lf of intermittent 219 lf of ephemeral	0 lf	290 lf of intermittent	0 lf
Valley Fill 2	1437 lf of intermittent	0 lf	0 lf	0 lf
Valley Fill 3	1180 lf of intermittent 212 lf of ephemeral	0 lf	1180 lf of intermittent 212 lf of ephemeral	0 lf
Pond 1	0 lf	225 lf of intermittent	0 lf	225 lf of intermittent
Pond 2	0 lf	254 lf of intermittent	0 lf	0 lf
Pond 3 and 3A	0 lf	540 lf of intermittent	0 lf	540 lf of intermittent
Total Disturbance	**4357 lf total stream**	**1019 lf total stream**	**1682 total stream**	**765 lf total stream**

[7][Completed stream restoration (4488lf)] minus [Adjusted actual stream disturbance (1850)] = [2638 lf of restored stream above what is required]

Table 2. Proposed and Completed Stream Restoration Actions

Stream	Proposed Restoration	Completed Restoration	Phases Addressed
Lick Fork	3188 lf of perennial	3188 lf of perennial	I and II
Grapevine Creek	1540 lf of perennial	1300 lf of perennial	III
Channels through Pond 1	225 lf of intermittent	0 lf of intermittent	IV
Channels through Ponds 3 and 3A	540 lf of intermittent	0 lf of intermittent	IV
Total Restoration	**5493 lf total stream**	**4488 lf total stream**	

7.0 Monitoring and Sampling Methods

Environmental biologists for Heritage Technical Associates, Inc. of Chapmanville, West Virginia conducted the annual monitoring for Lick Fork and the lower portion of Grapevine Creek on October 19, 2010. Benthic and water sampling occurred on October 13, 2010 for Lick Fork and for the lower portion of Grapevine Creek. Monitoring and sampling methods are described in detail in the following sections:

7.1 Structures

In stream structures were visually assessed in the field for noticeable changes to structure configuration. Photographs of the structures were taken in order to compare to the previous years pictures of the structures.

In May 2009, Mingo County and surrounding areas experienced flash flooding. During a 24-hour period, four inches of rain fell causing massive flooding and extreme damage to the area. Some of the Lick Fork and Grapevine Creek Stream Restoration structures were damaged due to the rapid water current caused by the flood.

During the 2010 annual monitoring, it was observed that some structures were still not functioning properly as in the previous year. Lick Fork has 3 complete cross vane failures and 2 partial failures. Cross Vane 16 is not working as intended due to a fallen tree. Debris from the tree has filled the pool, but the structure is still intact. Cross Vane 19's left side failed due to a tree falling across the structure, which cause two rocks to be washed downstream. Cross Vane 25 is a partial failure due to water undercutting the right wing wall, which appears to have shifted. Cross Vane 25 is a partial success due to the fact that water is flowing through the center, the left side appears to be stable, and it is functioning as intended. The center of Cross Vane 26 fell forward causing failure to the structure. This structure has a fallen tree on it and the pool is filled with woody debris. Cross Vane 33 is a partial failure due water undercutting right wing wall. Cross Vane 35 seems to be functioning as intended except that the water is flowing under the top rocks. Lick Fork has 32 of the 37 cross vanes and one step-pool complex structure that are functioning as intended.

Grapevine Creek has 7 of the 14 cross vanes that are not functioning as intended. Cross Vanes 47, 42, 41, 40, and 35 are no longer present. Cross Vane 46 has water flowing under right side and is covered with excess sedimentation. Cross Vane 45 was damaged due to the removal of creek gravel which caused the internal boulders to collapse causing failure to the cross vane.

Representative photographs depicting the current cross vane configuration are located in Attachments 2 and 3.

Lick Fork

Lick Fork restoration involved the construction of 37 rock cross vanes and one step-pool complex structure. Mitigation practices began at the upper weir (0+00) and terminated at the access road to Pond 2 (31+88), amassing a total stream length of 3,188 lf. The step-pool complex structure (0+00 to 0+50) continues to provide energy dissipation and maintains erosion control within the steep graded channel below Pond 3 of the adjacent Remining No. 1 (Permit No. S-) and Remining No. 3 (Permit No. S-4006-00) mines. Cross vanes were located at approximately 84 foot intervals, approximately 6 bankfull widths, throughout the remaining length of the stream (0+50 to 31+88).

Cross Vanes 27 to 30 were relocated from their proposed positions to upstream positions during construction, due to bedrock restraints occurring at the proposed locations within the channel. These structures appear stable and have formed new pools within the stream.

Representative photographs depicting the current cross vane configuration are located in the map in Attachment 2.

Grapevine Creek

Grapevine Creek restoration involved the construction of 14 rock cross vanes, amassing a total of 1300 lf of stream restoration. Cross vanes were located at approximately 84 foot intervals, approximately 6 bankfull widths, throughout the remaining length of the stream. Representative photographs depicting the current cross vane configuration are located in the map in Attachment 3.

7.2 Erosion Control

Stream morphology was visually examined to determine if erosion has been controlled during the past year. Stream channels and restoration structures were visually inspected to determine stability conditions, both laterally and vertically. Lick Fork and lower Grapevine Creek appear to have a similar morphology to the channel form assessed immediately after as-built completion. Some noticeable bank instabilities have occurred as a result of undercut banks, although, it is concluded that the in-stream structures have successfully dissipated energy, relieved near bank stresses and achieved lateral stability. Undercutting was observed upstream in Grapevine Creek at Cross Vane 46 and in Lick Fork at Cross Vanes 8, 23, 33, and 35.

Lick Fork

There is an increasing amount of large woody debris within the upper reach of the Lick Fork restoration. In November of 2005, a large tree was observed in the stream near Cross Vane 35. A large amount of the woody debris

is directly on top of the structure. The large woody debris within Lick Fork will be monitored to determine if any negative impacts begin to occur. In 2007, woody debris was observed directly on top of Cross Vanes 16 and 19. There have been no negative impacts observed in the past year due to the accumulation of woody debris on these structures. Some large woody debris within stream channels is beneficial to the aquatic ecosystems; however, channel stability should be monitored closely in areas where the debris is present.

During annual monitoring conducted in 2006 there was only one stability issue associated with the cross vanes. Cross Vane 22 showed most of the water within the channel flowing directly over the cross vane as intended, a smaller amount of water was flowing into a gap and underneath the left wing of the cross vane. During the 2008 annual monitoring Cross Vane 22 was stabilized and appeared to be functioning properly.

Corrective measures are necessary after conducting the annual monitoring for 2010 in Lick Fork and the lower portion of Grapevine Creek.

Grapevine Creek

No stability issues associated with cross vanes were observed during annual monitoring conducted in 2007. Cross vanes observed during annual monitoring conducted in 2010 exhibited changes in appearance and stability issues.

7.3 Vegetation

Six representative sections, vantage points, with long continual vistas of riparian disturbances along the stream were used to quantify the vegetative progression of the restored sites in comparison to the pre-existing vegetative conditions. Vantage Points 1 through 5 were located along Lick Fork, while Vantage Point 6 was located along the lower portion of Grapevine Creek (Attachment 6). Each vantage point has an upstream and downstream photograph except for vantage point 2, which is located alongside the haulroad at the lower end of the culvert crossing. An upstream photograph at this location would not adequately represent riparian areas of concern. Vantage point photographs and visual evaluations conducted in the field were used to document and compare annual site assessments. Vantage point pictures for 2010 can be found in Attachment 6.

During construction, precautions were taken to minimize disturbances to the existing riparian zone. Precautions included leaving larger trees intact and putting hay bails downstream to impede sediment movement relating to cross vane construction. After completion of the in-steam structures, disturbed areas were seeded to maintain bank stability and reduce erosion. Fertilizer was applied during seeding at the rate of 600 lbs/ac. The fertilizer rate was 10-20-10. Wood cellulose mulch was applied at the time of seeding to provide moisture retention and adhesion for the seed mixture for Lick Fork. Since vegetation was established with at least 80 percent aerial coverage there was no need for re-seeding or re-mulching.

Both Lick Fork and the lower section of Grapevine Creek had increases in the number of trees found within the riparian zone due to the planting of new trees. With the addition of these new trees and the larger trees that were left, the

canopy cover will continue to increase. This increase in canopy cover will provide shading of the stream which will aid in controlling temperature fluctuations within the stream. This will allow for a more constant temperature regime which will aid in the establishment of benthic communities and fish assemblages.

Lick Fork

The vegetative seed mixture applied to the streambanks was a combination of grasses that naturally occur on streambanks and was selected for optimal growth. The grass mixture included Switchgrass (*Pannicum virgatum*), Redtop (*Agrostis alba*), and Japanese Millet (*Echinochloa crugallo frumenta*) as set forth in the CMP. Ground cover was established immediately after disturbance. Vegetation progress was evaluated and is evident in the annual Vantage Point pictures (Attachment 5). The grasses have created a protective vegetative cover on the impacted banks.

Tree planting occurred during December of 2004 when the trees became available from the nursery. Trees were planted on five foot staggered intervals immediately above the restored stream channel. The trees selected for the riparian zone enhancement are native to riparian zones and include Silky Dogwood (*Cornus florida*), Sycamore (*Plantinus occidentalis*), and Willow Cuttings (*Salix purpurea*). These trees will help supply bank stability in order to help prevent erosion, shade the stream, and produce Coarse Particulate Organic Matter (CPOM) for the aquatic ecosystem.

Tree saplings were difficult to identify during the annual vegetation survey of 2005. Some saplings were identified; however, it was difficult to determine many tree species since much of the leaves had dropped. The vegetation survey for the 2006 Annual Report was conducted in September, when saplings were easier to identify. The planted sycamore appeared to have the largest presence, while willow cuttings were common. Dogwood were identified but were less frequent. Greater observations of sycamore and willow were observed in the upstream areas of Lick Fork opposed to the lower section of Grapevine.

Common vegetation, apart from the planted species, identified throughout the Vantage Point areas included jewel weed (*Impatiens capensis*), joe pye weed (*Eupatorium fistulosum*), knotweed (*Polygonum aviculare*), colts foot (*Tussilago farfara*), lespedeza (*Lespedeza sp.*), and grass species.

Mitigation areas were examined to determine if invasive species such as knotweed or kudzu had invaded. The areas along the haulroads were seeded by CAM to provide erosion control for the newly constructed haulroads, as per their permit. The seed mix used included lespedeza. Due to the heavy propagation of the lespedeza species in areas surrounding the upper mitigation areas of Lick Fork and evidence of the species invading some sites, it is evident that invasive species could present problems in the upstream reach of Lick Fork. Knotweed was also observed in the lower reach of Lick Fork, but was less frequent than the lespedeza. Efforts may be considered to maintain native species within these sites if the invasive species is deemed controllable.

Grapevine Creek

The vegetative seed mixture applied to the streambanks was a combination of grasses that naturally occur on streambanks and was selected for optimal

growth. The grass mixture included Switchgrass (*Pannicum virgatum*), Redtop (*Agrostis alba*), and Japanese Millet (*Echinochloa crugallo frumenta*) as determined in the CMP. Vegetation progress was evaluated.

Tree planting occurred during March of 2006 when the trees became available from the nursery. Trees were planted on five foot staggered intervals immediately above the restored stream channel. The trees selected for the riparian zone enhancement are native to riparian zones and include Black Cherry (*Prunus serotina*), Sycamore (*Plantinus occidentalis*), and Willow Cuttings (*Salix purpurea*). These trees will help supply bank stability to prevent erosion, shade the stream and produce Coarse Particulate Organic Matter (CPOM) for the aquatic ecosystem.

The vegetation survey for the 2006 Annual Report was conducted in September, when saplings were easier to identify. The planted sycamore appeared to have the largest presence, while willow cuttings were much less common. The black cherry saplings did not appear to survive.

Common vegetation, apart from the planted species, identified throughout the Vantage Point areas include jewel weed (*Impatiens capensis*), coltsfoot (*Tussilago farfara*), autumn olive (*Eleagnus umbellate*), and stinging nettle (*Urtica dioica*).

Mitigation areas were examined to determine if invasive species such as knotweed or kudzu had invaded. Knotweed was observed in the lower portion of Grapevine Creek. There was evidence of small amounts of knotweed in some mitigation areas. These areas will be assessed in the future to determine if action should be taken.

7.4 Benthic Macroinvertebrate Survey Analysis

Benthic macroivertebrates were monitored to help assess the overall health of the restored stream. However, benthic population, including the presence of certain species, will not be used for the gauge of success for this restoration project.

Benthic macroinvertebrates were sampled in accordance with the Standard Conditions for Environmental Assessments on Wadeable Streams issued by the West Virginia Division of Natural Resources and Scientific Collection Permits, which are based upon the United States Environmental Protection Agency (EPA) Rapid Bioassessment Protocols for use in Streams and Wadeable Rivers. This survey provides taxonomical baseline data on the benthic macroinvertebrates collected, substrate composition, habitat composition, and physical stream characteristics present between April 15, 2010 and October 15, 2010.

Two benthic macroinvertebrate sites were chosen based on stream features, pre-determined Vantage Points and on the Rapid Bioassessment Protocols for use in Streams and Wadeable Rivers.[8] Approximate locations of the collection sites in relation to proposed permit boundaries, stream delineation, valley fills, and associated sediment ponds are indicated in Attachment 1.

Samples were collected with a 0.5 meter rectangular dipnet. The bottom substrate was disturbed for approximately 0.25m² by foot and hand in front of the net. The Coarse Particular Organic Matter (CPOM) and Fine Particulate Organic

[8] Site locations for benthic samples were based upon the EPA Interim Chemical and Biological Protocols for Mountaintop Removal

mater (FPOM) were allowed to flow into the dipnet. After suspended materials settled the net was lifted from the sample location. The net contents were washed into a five-gallon bucket. Larger materials (pebbles > 20 mm, leaves or sticks) were washed and discarded from the sample. The sample was poured into a sieve to remove excess water and fine soil particles. The sieve was rinsed into a one liter sample container. This procedure was repeated until four riffle/run sections were sampled. After completion of the final sample location the rectangular kick net and five gallon bucket were closely examined for any remaining debris and or macroinvertebrates. Remaining debris and or macroinvertebrates found were placed into the sample container. Ninety-five percent ethanol was added to each sample for preservation.

Benthic Macroinvertebrates sample sorting and identification was based on a 200 ± 20 percent organism sub-sample procedure. Samples were rinsed and spread evenly over a 36cm x 30cm pan. A 6cm x 6cm grid was placed over the sample and random generated numbers determined the grid that would be identified. This was repeated until a sub-sample of 220 organisms was removed. All grids were inspected in situations where 200 organisms were not present. Species were identified to the family level using the key in Aquatic Insects of North America. Attachment 5 contains benthic survey results in detail, habitat assessments, stream characterization, representative photographs, watershed features and sediment/substrate types.

The Ranges and ranks of the WVSCI are shown in Table 3

Table 3. Scoring Criteria for the WVSCI

WVSCI Scoring Criteria	
Not-Impaired	78.01-100 = Very Good
	68.01-78.00 = Good
	60.61-68.00 = "Gray Zone"
Impaired	45.01-60.60 = Slightly Impaired
	22.01-45.00 = Moderately Impaired
	0-22.00 = Severely Impaired

8.0 Proposed or Implemented Corrective Measures

The corrective measures in the 2009 Annual Monitoring Report stipulated that that Cross Vanes 16, 19, 25, 26, 33, 35, 40, 41, 42, 45, and 47 would be monitored. The flood event detailed in the 2009 Report contributed a great amount of sediment, cobble and slope wash in the stream, overwhelming the structures. During the 2009 and 2010, natural degradation process have taken place and portions of the sediment load have been flushed from the stream system. The cross vanes that were once completely covered by sediment and were thought to be obliterated are becoming to have become visible again. Erosional force continue to transport aggradational sediment through the stream system. The cross vane structures are helping the system recover by providing grade control that is halting the degradation by erosion and providing a reason for pools to form. No

additional field work is planned for the coming year. The structures will continue to be monitored as natural forces work to correct the effects of the flood event.

9.0 Discussion of Success Criteria

Annual monitoring has been conducted on Lick Fork for the Remining No. 2 mine to evaluate success of the restoration plan. Mitigation actions should produce a more stable stream channel with an equivalent or improved ecosystem in the areas of temporary and permanent impacts associated with valley fills. The CMP stipulates completion of in-stream structures (As-Built) and seeding of the stream restoration area within Lick Fork and the lower portion of Grapevine Creek. The project will be deemed a success once the following has occurred: 1) Restored stream channels have been constructed, 2) Vigorous vegetation has been established in appropriate areas, 3) Native species are present in over 80 percent of the mitigation sites, 4) The reclamation bond for the operation is released by the WVDEP.

Control structures were established within Lick Fork and Grapevine Creek to create a more complex habitat, dissipate energy within the channel, and control the anticipated erosion stresses. One step-pool complex structure and 37 rock cross vanes were constructed to stabilize Lick Fork. Fourteen cross vanes were constructed within the lower portion of Grapevine Creek. To quantify success of the in-stream structures, stability conditions were visually examined and compared to initial as-built configurations. Fifty-two water control structures are functioning as intended, while 12 water control structures have either failed, are no longer present, or not functioning as intended.

Stream morphology was visually examined to determine if erosion had been controlled during the past year. The stream channel was inspected to determine if the bed and banks were stable, both laterally and vertically. Some noticeable bank instabilities have occurred as a result of undercut banks, although, it is concluded that the in-stream structures have successfully dissipated energy, relieved near bank stresses and achieved lateral stability.

Riparian zone enhancement involved seeding with native grasses and planting with native shrubs and trees. These restoration practices have been implemented in order to increase soil stability, reduce erosion potential, and enhance the aquatic habitat by providing shade and CPOM to the ecosystem. A riparian zone will provide the opportunity for ecological functions to return to the stream that existed prior to mitigation.

Annual Vantage Point photographs have proven to be an efficient method to determine the naturalization of vegetation within the mitigation sites. The 3 species of trees (Silky Dogwood, Sycamore, and Willow) that were planted along Lick Fork were observed. There is lespedeza along the haul road next to Lick Fork. This lespedeza was seeded by CAM to control erosion of the constructed road. The lespedeza grows quickly and shades out light for other plant species. These areas will be monitored and, as the mitigation sites mature, if the invasive species can be controlled corrective actions will be taken.

Three species of trees were planted along Grapevine Creek (black cherry, sycamore, willow). Sycamore and willow were identified along the lower portion of Grapevine Creek. The black cherry saplings observed did not survive. The presence of some invasive species including knotweed and autumn olive will need to be monitored.

The stream restoration techniques implemented thus far more than compensate (4488 lf of restored channel) for the anticipated impacts to jurisdictional waters (1531 lf of impacted channel). The mitigation efforts above what is required (2957 lf) may be used by CAM to offset future impacts to jurisdictional waters. The completion of mitigation efforts will provide a habitat with the potential for an increase in the number and diversity of taxa within the streams.

10.0 Conclusions

Mitigation actions have increased channel stability, decreased erosion potential by reducing near bank stresses with water control structures, and established a vegetative cover. It is anticipated that an equivalent or improved ecosystem will develop in the areas of temporary and permanent impacts associated with valley fills. Results from the annual monitoring conducted during September of 2006 will be compared to future monitoring to evaluate habitat, vegetative progression and channel morphology.

Some major corrective measures associated with channel stability were found to be necessary. Channel geometry appeared stable, with some structures intact and functioning as intended. The infiltration of invasive species may present problems in the future. Vegetation will be monitored and if the invasive species are controllable, corrective action may be taken.

Benthic macroinvertebrate surveys indicate that the ecological stream health of Lick Fork has remained relatively consistent from 2006 to 2010, while Grapevine Creek's stream health declined considerably in 2009 it improved or 2010. This is based on the number of biota collected, habitat scores, and WVSCI scores. The habitat assessment scores for 2010 dropped lower than 2006 scores from suboptimal to the marginal range. The benthic metrics scores for 2010 indicated that the streams were "Slightly Impaired" for Lick Fork and "Slightly Impaired" for Grapevine Creek. 2010 benthic metric scores improved from the previous year.

The restoration plan has accomplished the primary restoration objective: to achieve long-term physical structure and stability of the channel. Planted saplings will be monitored closely during the next calendar year to determine their survival status. Stream restoration has been completed. This year's annual report has demonstrated success of the mitigation actions: channel stability, and establishment of a vegetative cover.

References

1. United States Department of Energy, Energy Information Administration – *"Challenges of Electric Power Industry reconstruction for Fuel Suppliers"*, 1997
2. Statement of Mary J. Hutzler, Energy Information Administration, Department of Energy, before the Subcommittee on Energy and air Quality, Committee on Energy and Commerce, United States House of Representatives, Hearing on Coal, March 14, 2001
3. West Virginia Office of Miner's Health, Safety and Training – *Various publications including coal production figures*
4. National Mining Association – *Various publications including national production figures*
5. West Virginia Bureau of Employment Programs – *Various publications including job sectors, wages and unemployment rates*
6. US Census Bureau – *Population trends and figures*
7. US Federal Emergency Relief Administration – *December 7, 1934 Letter to Mr. Hopkins concerning historic coal production*
8. West Virginia Office of the Treasury – *Coal severance tax information*
9. US Environmental Protection Agency – *"Environmental Impact Statement" concerning coal and mountaintop removal surface mining*
10. Canaan Valley Institute
11. West Virginia Department of Environmental Protection – *Various information including regulations, AMD fact sheets, policies, watershed management information*
12. United States Fish and Wildlife Service – *"An Atlas of Cerulean Warbler Populations, Final Report to USFWS: 1997 – 2000 Breeding Seasons" – Rosenburg, Barker & Rohibaugh, Cornell Laboratory of Ornithology, Ithaca, NY, December, 2000*
13. USACE – Mitigation Guidelines for WV (PN200400008 – WV, 9-23-04)
14. West Virginia University – Bureau of Business and Economic Research – *"County Data Profile, Mingo County, September, 2000"*
15. West Virginia Department of Health and Human Resources, Bureau for Public Health, Health Statistics Center – *"A look at West Virginia's Population by Decade, 1950-2000, Brief No. 8"*
16. Leopold L.B. 1994. A View of a River. Harvard University Press Cambridge, Mass. London England. 298p.

17. Rosgen, D.L. 1996. Applied River Morphology. Wildland Hydrology, Pagosa Springs, CO. 390p.
18. Barbour, M.T., J. Gerritsen, B.D. Snyder, and J.B. Stribling. 1999 Rapid Bioassessment Protocols for Use in Streams and Wadeable Rivers: Periphyton, Benthic Macroinvertebrates and Fish, Second Edition. EPA 841-B-99-002. U.S. Environmental Protection Agency; Office of Water; Washington, D.C.
19. Tetra Tech. 2000. Stream Condition Index for West Virginia Wadeable Streams. Owings Mills, Maryland