APPENDIX 3
Mitigation Issues

Abstract

Five issues have been identified that demonstrate fundamental flaws with the proposed attempts to mitigate for unavoidable environmental impacts of the Spruce No. 1 mine. Although they were identified and briefly discussed in the Recommended Determination, additional explanation and clarification is provided herein. **(1)** Severe misclassification of the proposed impacted resource—nearly 27,000 feet of perennial stream is likely to be directly affected compared to the mere 825 feet of perennial stream reported by Mingo Logan. The classification of streams determines the types of expected aquatic communities, the degree in which structure and function are provided, and amount of organic matter, nutrients, and pollutants ultimately retained or loaded to receiving streams. These properties determine the amount of mitigation, restoration, and compensation that would be required. **(2)** EPA believes that compensation for the impacts to high quality headwater streams within the Spruce mine area using enhanced on-bench sediment ditches is inappropriate because the resulting aquatic physical, chemical, and biological quality of "replacements" would likely be highly degraded. These ditches represent a completely different aquatic systems, and thus will not compensate for the loss of high quality Appalachian headwater streams. **(3)** On-site "restoration" of 11,000 feet and off-site "enhancement" of 7,000 feet of streams will not provide compensation for buried streams. **(4)** The proposed riparian vegetation restoration includes planting several tree species non-native to WV or atypical of the riparian ecosystems found along Appalachian headwater streams. **(5)** Additional compensation for buried streams using more than 26,000 feet of "connectivity channels" created by NPDES overflows will result in the export of degraded water to forested hillsides resulting in impaired downstream aquatic communities.

Misclassification of Stream Resources

As noted in the Recommended Determination, EPA believes that an adequate compensatory mitigation plan should be based upon an accurate delineation of on-site impacts to ephemeral, intermittent, and perennial stream-types in the Spruce Fork watershed. As the stream delineations originally completed for the EIS are now nine years old, EPA believes that new field studies, using more up-to-date assessment tools, would provide a more accurate representation of the proposed impacts to water resources.

Headwater streams are the small ephemeral, intermittent and perennial tributaries at the head of watersheds. Definitions of ephemeral, intermittent and perennial streams vary widely among regulatory agencies. Some of these definitions are based on arbitrary watershed areas or flow cutoffs. The presence or absence of continuous surface water alone is not a good predictor of aquatic life potential.

Most scientists agree that classifying streams by single abiotic or hydrological parameters for assessing aquatic life potential is unsatisfactory for several reasons. First,

hydrological parameters vary temporally and seasonally and can be difficult to measure accurately. Second, several abiotic parameters determine whether a stream can support aquatic life (e.g. length of dry period, connectivity through subsurface or interstitial flow, presence and quantity of refugia) (Boulton 1989, Williams and Hynes 1977, Williams 1986, Williams 1987). Third, many aquatic invertebrates have generalized adaptations for surviving periods of low or no surface flow (Williams 1996). Biological assemblage data can indicate the long term hydrological characteristics of streams because many of the species are long lived and require flowing water for their life cycles. Consequently biological data can be used in conjunction with hydrologic data to more accurately describe or confirm the long term hydrologic characteristics of streams.

Accurate estimation of the extent of headwater intermittent and perennial streams is often problematic. For example, national or regional spatial coverage is generally known to underestimate the extent of headwaters. Within USEPA Region III, 1:24,000 scale maps generally indicate approximately 50% or more stream miles than larger scale, coarser grained 1:100,000 scale maps. Moreover, complementary field verification can add many more miles to the stream network.

The USGS has documented the flow origin, drainage areas and hydrologic characteristics of perennial and intermittent streams in this region in 2000 and 2001 (Paybins 2003). Results indicated that the median drainage area upstream of the origin of intermittent flow was 14.5 acres. USGS defined the intermittent point (i.e., the boundary between ephemeral and intermittent flow), as the point where base flow begins in the late winter or early spring. The median drainage area upstream of the origin of perennial flow was found to be 40.8 acres. The boundary between intermittent and perennial flow (i.e., the perennial point), was defined by the lowest water table elevation, where base flow begins in the late summer and early August. These median drainage areas were used to delineate the watersheds. Additionally, a flow accumulation model and the National Elevation Dataset (NED) were used to estimate the stream lengths associated with intermittent flow and perennial flow in this region (Note: no attempt was made to model the extent of ephemeral streams). The results of the computer modeling were compared to the National Hydrology Dataset (NHD), which is basically a stream network based on 1:100,000 scale maps.

The GIS model results have also been compared to independent field data which were collected to verify perennial and intermittent stream lengths for a proposed mining permit (Green and Passmore, 1999). The USEPA field survey defined two types of perennial streams using the WV water quality standards methodology for determining perennial streams and was conducted during a relatively dry, late summer period. The study found multiple segments of WVDEP Type 1 (flow and indicator biota requiring 6 mo. life cycle) and Type 2 (intermittent flow but indicator biota requiring 6 mo. life cycle) (WVDEP 1999).

Concerning the Spruce No. 1 project, EPA first compared lengths of stream channel in Pigeonroost, Seng Camp, and Oldhouse from USGS estimates using drainage area to estimates made in the EIS for these stream reaches. Median drainage areas for

ephemeral/intermittent (14.5 acres) and intermittent/perennial (40.1 acres) have been documented by USGS (Paybins, 2003). Moreover further studies by the US EPA Office of Research and Development (Fritz et al., 2007, 2008), US EPA Region III (EPA-Wheeling 2007), and Svec et al. 2005 that these USGS drainage area estimates are quite reliable for the Cumberland Plateau sub-ecoregion.

EPA compared lengths of stream channel in Pigeonroost, Seng Camp, and Oldhouse from USGS estimates to estimates made by the permittee. For example, median drainage areas for ephemeral/intermittent (14.5 acres) and intermittent/perennial (40.1 acres) have been documented by USGS (Paybins, 2003). Using this information, EPA believes that the proposed valley fills will likely impact a greater quantity (by thousands of feet) of intermittent and perennial stream channels than is currently proposed to be compensated for by the project's Compensatory Mitigation Plan (CMP).

On-the-ground field observations in the Spruce No. 1 project area also support the conclusion that stream resources have been underestimated. A field reconnaissance by EPA (accompanied by Sturm Environmental, Inc.) during dry conditions in September 1998 (reported in Green and Passmore, 1999) found distinct perennial benthic communities (i.e., long-lived taxa representative of perennial conditions in the upper reaches of Seng Camp, Pigeonroost, and Oldhouse that were largely not acknowledged by the USACE during the permit process. This 1999 EPA report was sent to Huntington District USACE Regulatory Branch Chief (M.D. Gheen) on July 29, 1999 and was subsequently published in the Corps' September 2006 FEIS, but was not incorporated into the analysis.

Based on these new scientific studies and previously collected field data, EPA believes that all proposed valley fills will impact previously undelineated segments of intermittent and perennial stream channels. An example of mischaracterization is in Oldhouse Branch. The uppermost ephemeral/intermittent delineation point (T1; CMP Final Exhibit 2-Stream Delineation Map) occurs at approximately the 255 acre watershed size (this corresponds the Green and Passmore, 1999 site O1 in Figure 1). At this watershed size, EPA contends that a strong perennial stream channel is present for thousands of feet upstream of this point. Figure 1 shows an excerpt from a 7.5 min USGS topographic map depicting Green and Passmore (1999) study sites, overlain with Paybins (2003) drainage-area derived intermittent and perennial delineations.

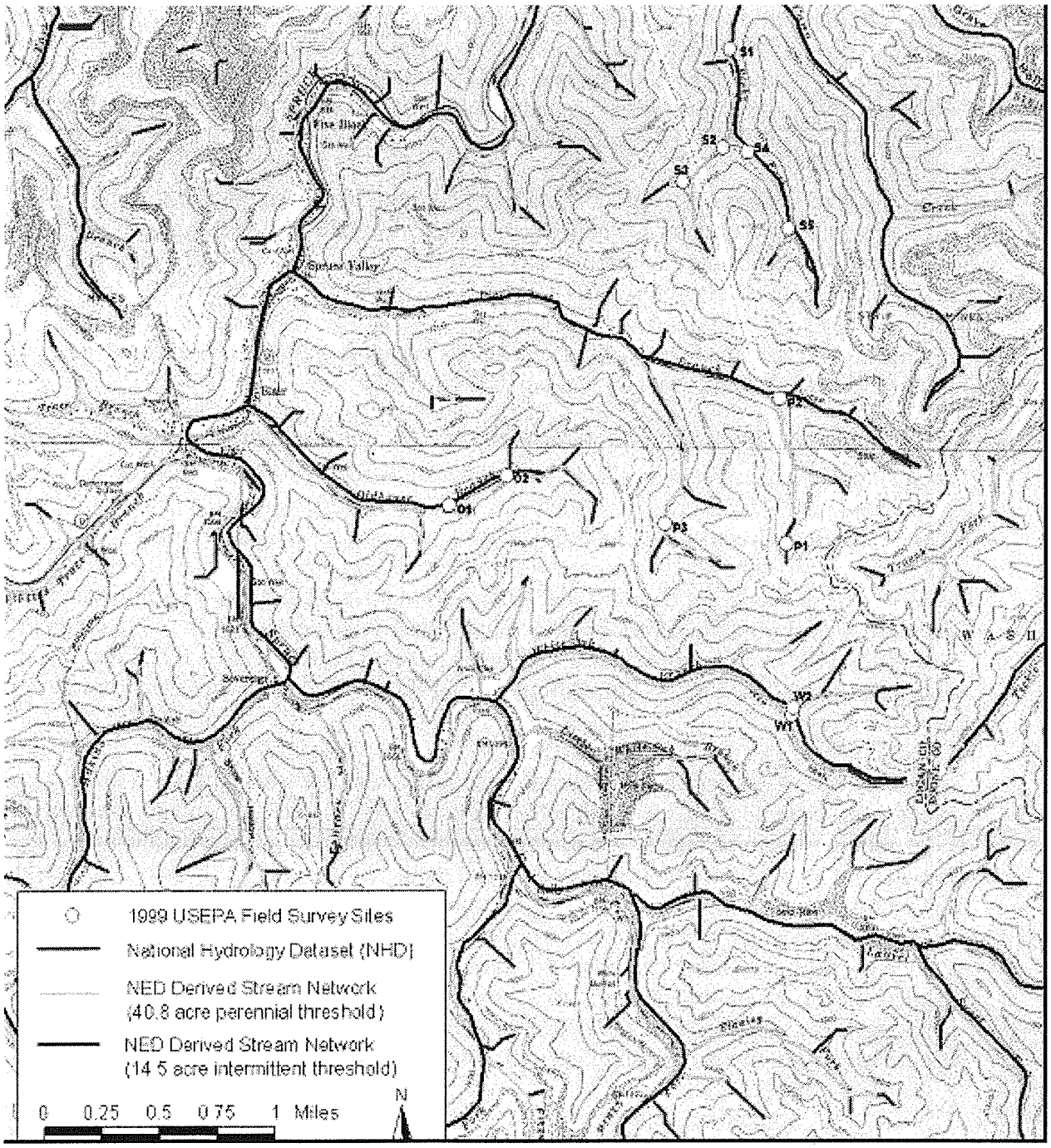

Figure 1. Excerpt from USGS 24K topographic map showing EPA sample sites overlain by Paybins (2003) drainage area-derived intermittent and perennial designations. Blue lines are NHD (1:24,000) streams, yellow lines are perennial streams, and red lines are intermittent streams. The magenta areas are mined lands.

EPA compared lengths of stream channel in Pigeonroost, Seng Camp, and Oldhouse from USGS estimates, to field delineations made by the applicant. As an example, it is EPA's determination that at point T1 (mentioned above) in Oldhouse Branch (the applicant's

demarcation for ephemeral/intermittent found in CMP Final Exhibit 2-Stream Delineation Map) that there are approximately 3100 feet of unaccounted for perennial stream above that point. Moreover, in Oldhouse, an additional 1100 feet in "Second Unnamed Right Tributary" (T2 in CMP Exhibit) probably run perennially. By adding the additional distance from T1 down to the toe of the proposed fill, it is probable that there are over 7000 cumulative feet of perennial stream channel that will be mined-through or filled in Oldhouse Branch alone. This is in contrast to the <200 feet determined by the applicant.

In Pigeonroost, EPA believes that additional stream lengths, which have been classified as ephemeral or intermittent by the applicants, are likely perennial waters. Again, the EPA study (Green and Passmore, 1999) used the WV water quality standards methodology for determining perennial streams and was conducted during a relatively dry, late summer period. The study found WVDEP Type 1 (flow and indicator biota requiring 6 mo. life cycle) and Type 2 (intermittent flow but indicator biota requiring 6 mo. life cycle) perennial conditions near the very headwaters of Pigeonroost. Additionally, one site in upper Middle Fork of Pigeonroost (P1 in Figure 1) with a catchment area of only 15 acres was also deemed to be a Type 1 perennial stream.

Overall, through onsite visits and biological data collection, EPA conservatively determined that, within the mine footprints of Rt. Fork Seng Camp, Pigeonroost, and Oldhouse Branch, over 5 miles of stream (~27,000 feet) are Type 1 perennial. This is in contrast to the marked underestimation in the Spruce No. 1 permit. USACE's permit accounted for less than 200 feet of perennial waters within the entire project area. Thus, the applicant appears to have significantly misclassified tens of thousands feet of perennial waters within the project area. Therefore any calculations of debits and credits, and subsequent offsets using the Stream Habitat Unit method (SHU), or any other known method or compensation ratio, would be misleading and not fully compensatory for the destroyed natural resources. Further concerns on the SHU are discussed below.

Acknowledging that the stream class determinations made by Decota Consulting (on behalf of Mingo Logan) were based on WVDEP's guidance document (dated Oct. 25, 1999), the actual results do not correspond with independent data (see Green and Passmore, 1999), and new scientific information concerning the designation of these stream types (Paybins 2003; Svec et al.2005: Fritz et al., 2007, 2008; EPA, 2007). The delineations were conducted in June, July, August, and October of 2000. The time period of June through August was a period of above average precipitation while October was a period of below average rainfall.[1] Although the area was not in drought status at the time of assessment,[2] we question the actual delineation of streams types in the project area.

The classification of resource type is extremely consequential. With regard to Spruce No. 1, the classification determines the expectations concerning stream structure and function including the biota and the amount of organic matter, nutrients and pollutants

[1] (http://lwf.ncdc.noaa.gov/oa/climate/research/cag3/wv.html).
[2] (http://www.cpc.ncep.noaa.gov/products/analysis_monitoring/regional_monitoring/palmer/2000/),

retained or loaded to receiving streams. EPA believes that Mingo Logan and USACE grossly underestimated the stream resources within the project area. Therefore, the need for mitigation was underestimated.

Inappropriate Use of Erosion Control Ditches as Mitigation

The CMP's use of on-bench ditches as mitigation continues to be problematic. On-bench sediment ditches are a consequence of SMCRA-required best management practices (BMPs) to control water and erosion runoff and should not be considered adequate compensation for loss of high quality stream resources such as those in Pigeonroost and Old House Branch. Data show that water quality in sediment ditches in previously mined areas is highly degraded, because ditch water has percolated through mine spoil. Because of the degraded water quality, these channels should be considered sources of pollution rather than a mitigation feature. These created water bodies would be considered non-attaining in terms of aquatic life uses based on the assessment of benthic communities and could subsequently be listed as impaired on the state 303(d) list. Data from Kirk (1999), Green et al. (2000), and Gingerich (2009) strongly suggests that indigenous benthic assemblages in these ditches do not resemble those found in natural, high-gradient Appalachian headwater streams like those in Spruce mine area and would be assessed as severely impaired. Moreover, the water quality (e.g., salinity) is so degraded that it could potentially foster the establishment of toxic Golden Algae. Although the CMP considers on-site erosion control structures equivalent to existing streams, these drainage ditches are designed to control physical forces and do not replace the range of stream functions that existed prior to mining. The natural resources that are being lost are healthy, biologically functioning streams. The erosion control structures are designed to control and convey water and are not likely to replace the lost ecological services provided by the streams.

The permit's Special Conditions require that biological scores (i.e., WVSCI) and habitat scores (i.e., RBP) be similar to or better than pre-mine conditions in the erosion control ditches. As already noted these conditions may be extremely difficult to achieve. Given the current knowledge of the physical, chemical and biological conditions in several representative on-bench ditches, it is clear that compensation for buried headwater streams will not be attained by these mitigation measures. Evidence reported below (Figs. 2, 3, 4) reveals that the created channels will fail to meet the conditions of the permit for most sites. Even when the sediment ditches are enhanced for benthic substrata and riparian vegetation (e.g., boulder clusters every 500-1,000 ft), the water quality will likely be so degraded that the ditches will not meet or exceed pre-mining WVSCI scores required by the permit's Special Conditions.

The following Figures 2 through 3 show aerial views of examples of on-bench sediment ditches with the accompanying biological and physicochemical data. EPA has observed the following conditions in these sediment ditches, in comparison to natural high-gradient streams:

1) Altered flow regime (e.g., unnaturally low velocities)

2) Altered temperature regime (e.g., extreme high temperatures)
3) Severely contaminated water (e.g., ions, metals)
4) Depauperate and tolerant biota (e.g., typical of roadside ditches/urban swales)

The CMP indicates that the streams will be "enhanced" by the additional flow from these ditches, changing them from intermittent to perennial. This is problematic, however, if the goal is to replace some of the natural intermittent streams found within the project area. Intermittent streams provide their own ecological functions and many species (including some EPT taxa) rely on intermittent streams as part of their life history strategy. Conversion of naturally intermittent flows to unnatural perennial flows will place naturally occurring fauna at a competitive disadvantage, further contributing to the elimination of this unique wildlife from the watershed. These ditches therefore represent completely different aquatic systems, and thus will not compensate for the loss of high quality Appalachian headwater streams.

Thus, without data showing that this form of stream creation has replaced lost functions (i.e., equivalent to a fully functional Appalachian mountain stream); there is no basis in the record to allow the use of such on-bench mitigation to compensate for the permanent destruction of high quality streams such as Pigeonroost Branch and Oldhouse Branch. Any conditions for corrective remedial measures imposed by the permit are deficient because the high quality resource will be lost in perpetuity.

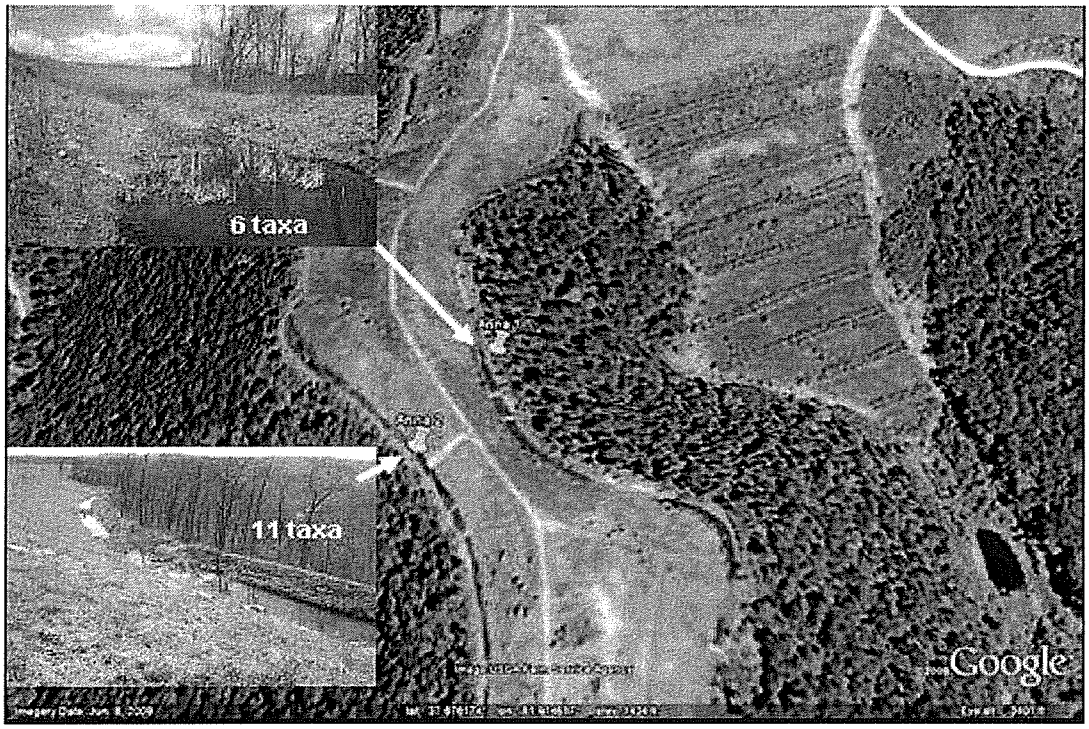

Figure 2. Reclaimed sediment ditch: Anna Branch (Logan Co., WV).

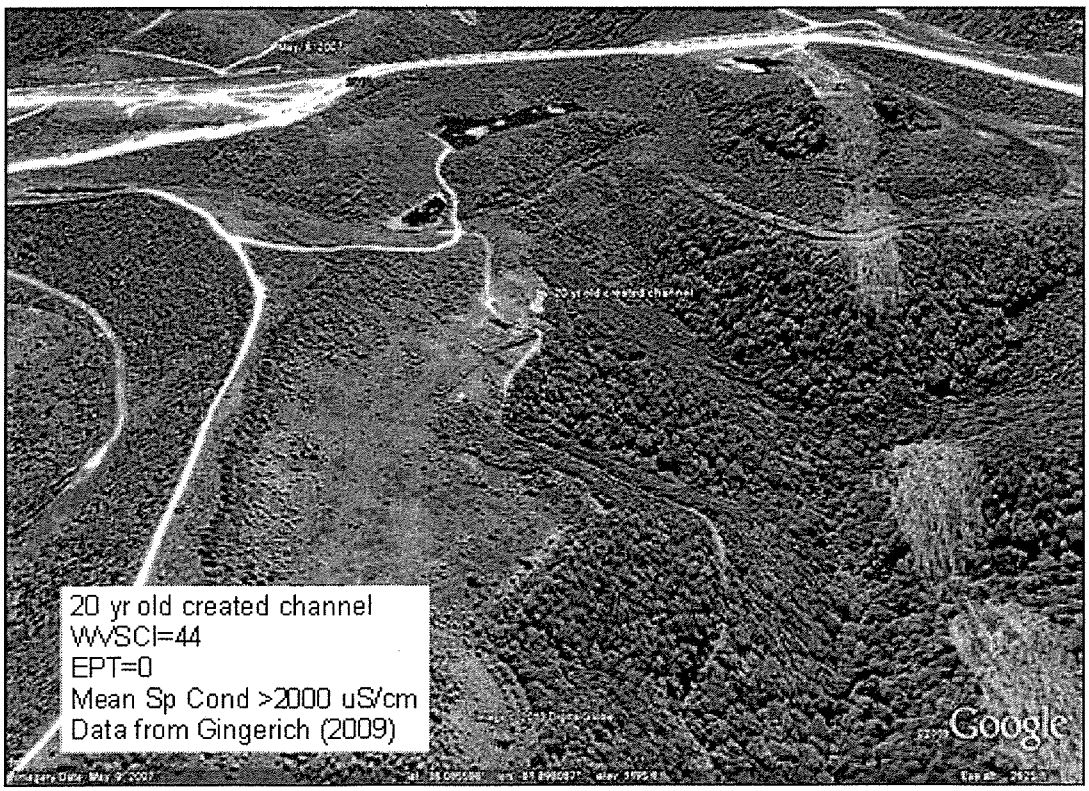

Figure 3. Reclaimed sediment ditch: Big Horse Cr (Little Coal River basin).

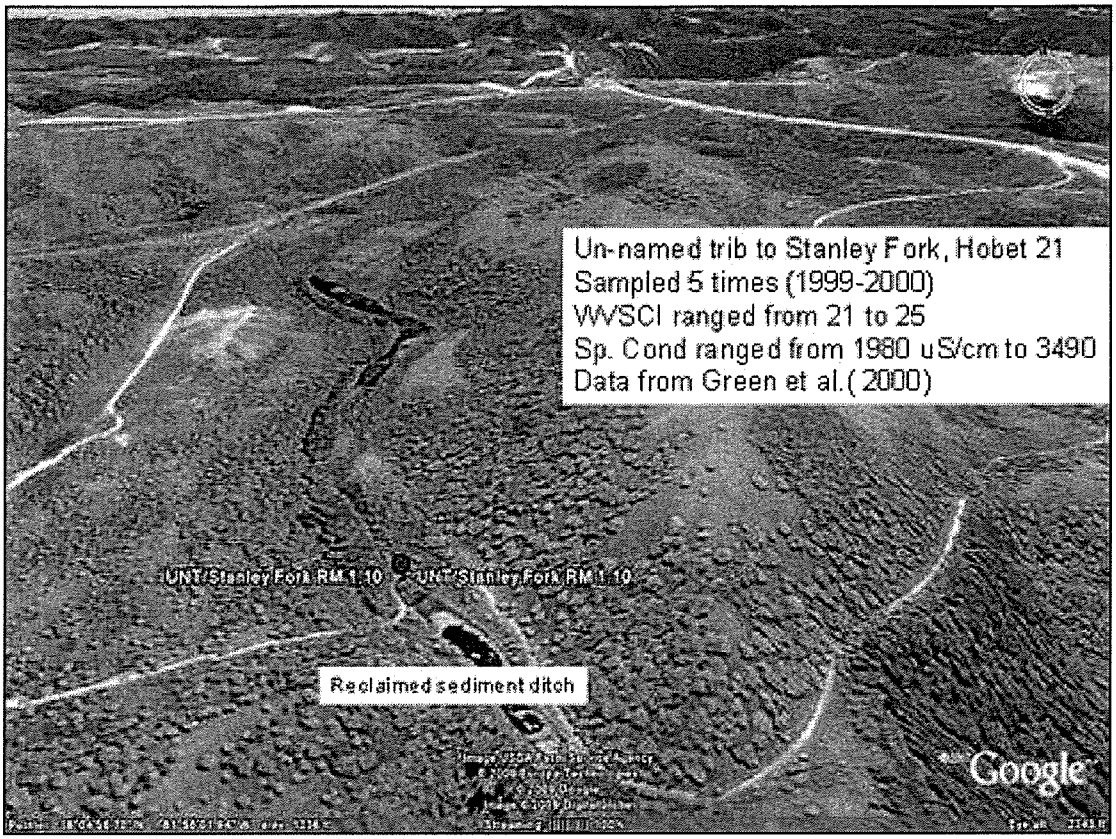

Figure 4. Reclaimed sediment ditch on Hobet mine (Mud River basin). Gingerich (2009) re-sampled this site nearly 10 years after Green et al. (2000), now 20 years old, and found only one EPT taxon with conductivity still averaging >2200 uS/cm.

Furthermore, there is no compelling evidence that these systems work to replace headwater stream loss. In previous letters to the Corps of Engineers, EPA referred to the proposed ditches as "doubtful mitigation opportunities" and recommended that the Corps find meaningful examples where proposed techniques had actually been successful. The record continues to lack information showing success with this type of compensation. The high "likely to fail" scenario that goes with stream creation (Bernhardt et al. 2007; Palmer et al. 2009) in general should place a higher emphasis on avoidance and minimization for these high quality resources.

Restoration

The CMP proposes over 11,000 feet of "enhancement", and over 7,000 feet of "restoration" for adverse stream impacts from the Spruce No. 1 Mine. The notion that enhancement (e.g., stream bank protection, adding structural complexity in the form of boulder clusters, j-hooks, vortex rock weirs, etc.) can replace the functions and values lost from burial of high quality streams on a foot per foot basis is scientifically unfounded. The 2,500 feet of "enhancement" activities in Rockhouse Fork will likely gain little biological lift since this stream is chemically polluted from MTM activities (i.e., high Se, conductivity, and sulfates). Some sections of Spruce Fork proposed for enhancement appear to be, for the most part; already physically intact, ecologically

functioning streams. The diagrams of enhancement techniques (i.e., vortex weirs, j-hooks, boulder clusters) pictured in Exhibits 7-15 of the CMP, and to be deployed in Spruce Fork and Rockhouse, give EPA no assurances whatsoever that lost headwater stream structure and function will be offset by enhancements in the mitigated stream segments.

The on-site "restored" sections of stream in connection with sedimentation ponds and mine-through areas will also not function like pre-mining streams because of chronic chemical pollution leaching from mine spoils and valley fills (e.g., Pond et al. 2008; Fritz et al. 2010). The term "restoration" means to return an ecosystem to its historic pre-disturbance ecological trajectory. Because water quality drives the structure of aquatic communities within affected streams, simply applying a "natural channel design" component and riparian plantings will not re-establish the naturally occurring indigenous wildlife or ecosystem functions that currently exist in Seng Camp, Pigeonroost, and Oldhouse. Furthermore, these "restored" segments will continue to export degraded water to Spruce Fork and the Little Coal River.

Riparian Plantings

Mingo Logan proposes to restore or create 71 acres of riparian forest. The EPA agrees that trees should be planted along any newly created stream channels, but has not seen evidence that they will replace lost natural riparian ecosystems. Indeed, these newly created riparian ecosystems will be of degraded, poor quality for many, many years. Simply planting trees does not create a riparian forest. Some of the tree species listed in the CMP for riparian revegetation are not even native to West Virginia (Cherrybark Oak, Sawtooth Oak, and Swamp Chestnut Oak). Out of the 11 tree species listed in the CMP, only 2 (red maple and sycamore) are potentially valid choices for riparian planting. The others are not found within or near the project area. From an ecosystem compensation standpoint, most of the proposed tree (and shrub) species are"non-native" to the ecoregion, and thus not representative of Appalachian headwater areas. Pines (*Pinus* spp.) such as White Pine and Virginia Pine should not be planted in riparian zones since they are not naturally occurring in headwater riparian zones in the ecoregion and contribute little to benthic organic matter and have low organic matter breakdown rates (Webster and Benfield 1986). Overall, this re-vegetation plan is inadequate, in terms of creating a healthy riparian forest designed to replace the existing streamside forests within the Spruce project area. The current riparian zone consists largely of basswood, beech, tulip poplar, buckeye, sugar maple, white oak and red oak. EPA contends that these resident native species would, at a minimum, be better choices to help replace some structure and function of the headwater stream ecosystem.

Connectivity Channels

An additional 26,625 feet of high gradient stream credit is sought for areas where surface water flows from the on-bench ditches, through NPDES outfalls, and down hill to eventually "form a hydrological connection to a surface tributary of a navigable water" (USACE ROD Special Conditions). These connectivity channels are simply overflow channels through wooded hill slopes. The premise is that, if properly placed, the mine

runoff water will travel down natural, steep ephemeral channels and the increased water will flow intermittently into these naturally non-flowing receiving segments. Topographic maps and drainage area, however, indicate that some of the overflows will travel down-gradient within already formed channels that EPA Region III believes are already jurisdictional waters.

Mingo Logan seeks credit for the entire linear distance from the bench, down to the natural receiving stream. However, EPA contends that many of these receiving channels are likely naturally perennial. For example, connectivity channels to Spruce Fork and White Oak Branch (labeled SF1, SF2, and WOB2 in Final CMP) all naturally drain catchments which are nearly 90 acres in area. EPA believes these are already perennially flowing in their lower portions, especially since EPA found perennial conditions in watersheds as small as 15 acres in area (i.e., one sixth the size of the watersheds of several of the proposed channels) in upper Pigeonroost.

Additionally, there is significant risk and uncertainty associated with this concept of stream mitigation. If these connectivity channels are created, they are expected to have minimal function for the water quality reasons discussed in the previous section. Whether created or natural, they will likely receive suspended sediments, metals, and high ion concentrations resulting in further degradation. In addition, the receiving headwater streams (whether intermittent or perennial) may become impaired from the upgradient mining and pollutant loading, leading to potential water quality standards violations and additional 303(d) listings.

After mining, proposed drainage areas above the entering connectivity channels are 10-97 acres (CMP-Table 8). These subwatersheds could yield considerable water volume, especially during storm events. Both in the short-term and the long-term, increased storm flow and effluent through the NPDES outlets and into natural channels will likely (1) increase sedimentation to downstream receiving waters through the process of erosive downcutting in receiving channels which have not evolved to handle the increased runoff; and (2) deliver water of such degraded quality as to "impair" the remaining resident biological communities. EPA notes that an example of this practice was observed in July 2007 on a field trip with USACE ERDC[3], Huntington District, EPA, WVDEP, USFWS, and WVDNR to a Hobet mine site. The WVDEP commented that this "connectivity channel" (which is very similar to what is proposed here by Mingo Logan) was illegal and a Notice of Violation (NOV) was issued (D. Stottlemyer, WVDEP pers. comm.). The gully had eroded to bedrock, was highly entrenched, and had virtually no aquatic life. Therefore, for all of the reasons stated above, EPA does not believe connectivity channels proposed for the Spruce project will offset buried stream resources.

[3] Engineer Research and Development Center (ERDC) is the US Army Corps of Engineers research and development command.