D.R. ALLEN & ASSOCIATES, P. C.

Civil • Environmental • Mining

A & G COAL CORPORATION

ISON ROCK RIDGE SURFACE MINE

USACE PROJECT NO. NAO-2007-1351
VDMLR APPLICATION NO. 1003841

AQUATIC RESOURCES MITIGATION PLAN
PRE-CONSTRUCTION NOTIFICATION
NATIONWIDE PERMIT 21

MARCH, 2007
DRA PROJECT NO. 07-316B1
Office Copy

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TABLE OF CONTENTS

NARRATIVE

APPENDICES

TABLE OF CONTENTS - cont.

MAPS AND DRAWINGS

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April 2, 2007

Ms. Annette Poore
Clinch Valley Field Office, Norfolk District
U. S. Army Corps of Engineers
18575 Ironwood Loop
Abingdon, VA 24212

Hand Delivered

RE: PRE-CONSTRUCTION NOTIFICATION, NWP 21
A&G Coal Corporation
Ison Rock Ridge Surface Mine
USACE Project No. NAO-2007-1351
VDMLR Application No. 1003841

Dear Ms. Poore:

On behalf of our client, A&G Coal Corporation (A&G), enclosed is an original copy of the referenced Pre-Construction Notification (PCN) as required by NWP 21, as published in the January 15, 2002 Federal Register.

A&G has applied to the Virginia Division of Mined Land Reclamation (VDMLR) for a new coal surface mining and reclamation permit for this project. The VDMLR is the state regulatory authority under Title V of the Surface Mining Control and Reclamation Act of 1977 (SMCRA). The VDMLR has assigned the referenced application number.

The proposed permit area consists of approximately 1,291.64 acres. Impacts due to proposed mining operations will require the disturbance of approximately 14,640 LFt. of intermittent stream.

As discussed in the PCN, impacts to these aquatic resources are unavoidable. To aid the Corps in evaluation of this project, a summary of impacts and mitigation is contained in the PCN. Impacts and mitigation have been summarized on a project basis.

To ensure that the adverse impacts on aquatic resources are minimal, both individually and cumulatively, we have included an Aquatic Resource Mitigation Plan (Mitigation Plan). The Mitigation Plan has been designed to meet the requirements of the March 12th, 2007 Federal Register, the March 7, 2003 Norfolk District Public Notice for NWP 21 Activities and the December 24, 002 Regulatory Guidance Letter No. 02-2, "Guidance on Compensatory

Mitigation 2 Projects for Aquatic Resource Impacts".

We believe the proposed Mitigation Plan ensures that adverse impacts to aquatic resources, resulting from the proposed surface mining operation, will be minimal, both individually and cumulatively. Therefore, we believe the proposed operation is sanctioned under NWP 21 and request verification that activities proposed in the PCN satisfy the criteria contained in NWP 21.

We have provided as complete a submittal as possible in order to expedite the Corps' review. Your immediate attention and cooperation in this matter would be sincerely appreciated. If we may be of assistance in any manner whatsoever, please do not hesitate to contact us.

Sincerely,

David R. Allen, P.E.
President

Enclosures

cc: Project File 07-316B1

Summary Of Aquatic Resource Impacts And Mitigation Measures
A&G Coal Corporation
Ison Rock Ridge Surface Mine
USACE Project No. NAO-2007-1351
VDMLR Application No. 1003841

TOTAL PROJECT SUMMARY

IMPACTS

Waters	Stream		Wetlands
	LFt.	EIUs	Ac.
Perennial	-	-	-
Intermittent	14,640	5,263.2	-
Ephemeral	-	-	-
Emergent	-	-	-
TOTALS	14,640	5,263.2	0.0

MITIGATION

Waters	Stream		Wetlands
	LFt.	EIUs	Ac.
Perennial	-	-	-
Intermittent	10,790	5,346.7	-
Ephemeral	-	-	-
Emergent	-	-	-
TOTALS	10,790	5,346.7	0.0

TYPE OF IMPACT

Waters	Stream		Wetlands
	LFt.	Ac.	Ac.
Filled	9,280	1.3	-
Innundated	1,570	0.2	-
Excavated	3,610	0.5	-
Indirect	180	<0.1	-
Culvert	0	0.0	-
TOTALS	14,640	2.0	0.0

Fill in Corps Jurisdictional Area	
UTLC-4	200 Cyds.
UTLC-5	296 Cyds.
UTCC-1	866 Cyds.
UTPC-1	351 Cyds.
UTPC-2	204 Cyds.
	1,917 Cyds.

Sub-Watershed Drainage Areas

UTLC-1	33 Acres
UTLC-2 and 3	102 Acres
UTLC-4	129 Acres
UTLC-5	163 Acres
UTCC-1	153 Acres
UTPC-1 and 2	189 Acres

DRA/A & G, 07-316B1, 03-19-07

Summary Of Aquatic Resource Impacts And Mitigation Measures
A&G Coal Corporation
Ison Rock Ridge Surface Mine
USACE Project No. NAO-2007-1351
VDMLR Application No. 1003841

TOTAL PROJECT SUMMARY BY SUB-WATERSHED

Looney Creek Sub-watershed*

IMPACTS

Waters	Stream		Wetlands
	LFt.	EIUs	Ac.
Perennial	-	-	-
Intermittent	8,070	3,174.0	-
Ephemeral	-	-	-
Emergent	-	-	-
TOTALS	8,070	3,174.0	0.0

MITIGATION

Waters	Stream		Wetlands
	LFt.	EIUs	Ac.
Perennial	-	-	-
Intermittent	4,560	2,416.8	-
Ephemeral	-	-	-
Emergent	-	-	-
TOTALS	4,560	2,416.8	0.0

Callahan Creek Sub-Watershed**

IMPACTS

Waters	Stream		Wetlands
	LFt.	EIUs	Ac.
Perennial	-	-	-
Intermittent	1,920	787.2	-
Ephemeral	-	-	-
Emergent	-	-	-
TOTALS	1,920	787.2	0.0

MITIGATION

Waters	Stream		Wetlands
	LFt.	EIUs	Ac.
Perennial	-	-	-
Intermittent	610	323.3	-
Ephemeral	-	-	-
Emergent	-	-	-
TOTALS	610	323.3	0.0

***Includes UTLC-1,2,3,4, and 5**
****Includes UTCC-1**

DRA/A & G, 07-316B1, 03-19-07

Summary Of Aquatic Resource Impacts And Mitigation Measures
A&G Coal Corporation
Ison Rock Ridge Surface Mine
USACE Project No. NAO-2007-1351
VDMLR Application No. 1003841

TOTAL PROJECT SUMMARY BY SUB-WATERSHED

Preacher Creek Sub-watershed*

IMPACTS

Waters	Stream		Wetlands
	LFt.	EIUs	Ac.
Perennial	-	-	-
Intermittent	4,650	1,302.0	-
Ephemeral	-	-	-
Emergent	-	-	-
TOTALS	4,650	1,302.0	0.0

MITIGATION

Waters	Stream		Wetlands
	LFt.	EIUs	Ac.
Perennial	-	-	-
Intermittent	1,900	1,007.0	-
Ephemeral	-	-	-
Emergent	-	-	-
TOTALS	1,900	1,007.0	0.0

Kelly Branch Creek Sub-Watershed

IMPACTS

Waters	Stream		Wetlands
	LFt.	EIUs	Ac.
Perennial	-	-	-
Intermittent	-	-	-
Ephemeral	-	-	-
Emergent	-	-	-
TOTALS	-	-	-

MITIGATION

Waters	Stream		Wetlands
	LFt.	EIUs	Ac.
Perennial	-	-	-
Intermittent	3,720	1,599.6	-
Ephemeral	-	-	-
Emergent	-	-	-
TOTALS	3,720	1,599.6	0.0

***Includes UTPC-1 and 2**

DRA/A & G, 07-316B1, 03-19-07

SECTION 1.00

GENERAL NOTIFICATION REQUIREMENTS

1.00 GENERAL NOTIFICATION REQUIREMENTS

PROSPECTIVE PERMITTEE

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AUTHORIZED AGENT

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LOCATION

The site is situated in Wise County near the Town of Appalachia. Access to the site will be from State Routes 160, 78 and 686. The latitude and longitude of the site are approximately 36°55'14" and 82°48'38", respectively. The permit area is approximately 1,291.64 acres. The permit area will be within the watersheds of unnamed tributaries to Looney Creek, Preacher Creek, and Callahan Creek. Off-site mitigation will be conducted in Kelly Branch, which is a tributary to Callahan Creek. The Appalachia, VA-KY USGS 7.5-minute quadrangle map was used to describe the location of the permit area.

GENERAL PROJECT DESCRIPTION

Description

The proposed project is a coal surface mining and reclamation operation. Impacts proposed under this modification are necessary for the mining operation, disposal of excess spoil and sediment control.

Purpose

The purpose of the project is to recover coal reserves from the Pinhook, Redwine, Lower Wilson, Upper Wilson, Taggart Marker, Taggart D and Taggart B Coal Seams.

GENERAL PROJECT DESCRIPTION - cont.

Adverse Environmental Effects

The proposed operation will impact intermittent streams, which are confirmed as Corps' jurisdictional area. The stream reaches to be impacted, their length, and type of waters are shown on the Environmental Resources Map. Additionally, a Summary of Aquatic Resource Impacts and Mitigation Measures are located at the beginning of this document.

Other Corp Permits

The entire project is proposed to be authorized under NWP 21. No other NWP's, regional general permits or individual permits are necessary to authorize the proposed project.

VDMLR Mitigation Plan

A & G will ensure that the mitigation plan submitted with the PCN will be identical to the mitigation plan submitted to VDMLR.

PROJECT DRAWINGS

Project drawings are listed in the Table of Contents and contained at the end of this document. The Location Map shows the project location on the Appalachia, VA-KY USGS 7.5 Minute Quadrangle Map. The Digital Ortho Photography depicts the general condition of the project and adjacent areas. The Environmental Resources Maps depict the locations of USACE jurisdictional areas and survey locations. The Mitigation Maps depict the location of the proposed mitigation. The Restored Stream Channel Details drawing depicts construction details of the Mitigation Plan.

SECTION 2.00

DETAILED PROJECT DESCRIPTION

2.00 DETAILED PROJECT DESCRIPTION

AQUATIC IMPACTS

Location

Aquatic impacts from the proposed operation will occur in five (5) unnamed tributaries to Looney Creek, two (2) unnamed tributaries to Preacher Creek, and one (1) unnamed tributary to Callahan Creek. All unnamed tributaries to be impacted are intermittent streams. Preacher Creek, Callahan Creek, and Looney Creek are all perennial streams. Preacher Creek is a tributary to Callahan Creek. Callahan Creek is a tributary to the Powell River. Looney Creek is a tributary to Pigeon Creek, which is a tributary to the Powell River. The Powell River Watershed is assigned USGS HUC 06010206. The locations of the impacts are shown on the Environmental Resources Maps.

Impact Quantities and Drainage Areas

Impacts to aquatic resources and proposed mitigation measures have been summarized in tabular form and are shown in the Summary of Aquatic Resource Impacts and Mitigation Measures. The tables summarize linear feet of stream, Ecological Integrity Units (EIU's), acres of wetland (if present), type of impacts, watershed area and fill placed in Corps' jurisdictional area.

Fill in Jurisdictional Areas

Fill placed in Corps' jurisdictional area is associated with construction of sediment ponds, hollow fills, and with backfilling and regrading operations associated with restoring the site to its approximate original contour. Fill material placed in Corps jurisdictional area will be non-acid/toxic spoil produced from the surface mining operation, i.e., sandstone and shale overburden units.

Commencement and Completion Dates

Operations on the proposed permit area will commence as soon as possible following USACE and VDMLR authorization. The operation is expected to be completed within five (5) years.

DELINEATION OF SPECIAL AQUATIC SITES

Streams

Physical descriptions of streams to be directly impacted by the proposed operation have been made in accordance with current fluvial geomorphologic principles. A representative reach of stream was surveyed in UTPC-1. The location of the survey is shown on the Environmental Resources Maps. Data from the survey is contained in Appendix B. Results of the survey data are discussed in Section 3.00.

In order to document the existing stream channel morphology and stream type, a representative riffle and pool reach was surveyed. The reach was profiled and representative cross sections were taken in a riffle and pool. Channel material in the reach was classified utilizing the "pebble count" method developed by Wolman (1954). The survey and classification were performed in accordance with the methods and procedures contained in Leopold, 1964; Harrelson, 1994; and Rosgen, 1996.

Five (5) Aquatic Biological Sampling (ABS) Stations were sampled to document a representative sample of the existing aquatic resources. The location of each station is shown on the Environmental Resources Maps. Data from the assessments are contained in Appendix A.

Biological and physical assessments of the streams to be impacted by the proposed operation were made in accordance with the procedures and methods outlined in the "EPA Rapid Bioassessment Protocols (RBP)", by Barbour et al., 1999. Representative stream reaches were selected to document aquatic resources. Stream surveys at each ABS consisted of a habitat assessment, benthic macroinvertebrate sample and water quality sample. Each ABS consisted of a 100-meter reach that is representative of the overall stream characteristics. Analysis of the benthic macroinvertebrate sample was conducted using the Eastern Kentucky Stream Assessment Protocol (EKSAP), Version 2002.6.

Habitat assessments were conducted at each ABS station in accordance with RBP, total habitat scores were accessed using EKSAP. The water quality sample was analyzed for specific conductance and assessed using EKSAP.

DELINEATION OF SPECIAL AQUATIC SITES - cont.

Wetlands

A survey was conducted to document the presence of wetlands within the proposed permit area. National Wetland Inventory Maps, current ten (10) foot contour interval aerial mapping and digital ortho-photography were used in the survey. Field investigations were conducted to locate potential wetlands and determine their status as either jurisdictional or isolated. Wetlands were delineated in accordance with the Corps' 1987 Wetland Delineation Manual. No jurisdictional wetlands were observed within the proposed permit area.

THREATENED AND ENDANGERED SPECIES

In order to determine if any threatened and endangered (T&E) species have been documented within, or in close proximity to, the Corps' jurisdictional area, the Virginia Department of Game and Inland Fisheries, Fish and Wildlife Information Service was queried to document the existence of any federally listed threatened or endangered aquatic species within three (3) air miles of the site. No federally listed threatened or endangered aquatic species have been confirmed in the search area.

PERSONNEL AND DATES

Delineation of special aquatic sites and T&E surveys were performed from January through March, 2007. The sites were delineated by the following D. R. Allen and Associates, P.C. personnel:

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SURFACE WATER QUALITY

A surface water baseline (SWBL) monitoring program has been conducted in order to document the quality and quantity of surface waters which will be directly impacted by the operation and surface waters which will receive discharges from the proposed operation. A total of four (4) points were used. The locations of the points are shown on the Environmental Resources Maps. Data is contained in Appendix D. The following points were used in the program:

Points	Stream
BL-2	Preacher Creek; Upstream
KB-1S	Callahan Creek; Upstream
KB-2S	Callahan Creek; Downstream
BL-4	Looney Creek; Downstream

WATERSHED CONDITIONS

The Digital Ortho Photography illustrates the condition of the watershed. The photography was performed by the Commonwealth of Virginia and is circa 2003.

In the coalfields of southwest Virginia, primarily three (3) natural resources are harvested. Those resources are coal, timber and natural gas. Coal mining and commercial timbering commenced in the early 1900's. Natural gas development commenced in the 1950's and development began to be conducted on a large scale in the 1980's. The siting of towns and communities occurred in the late 1800's to early 1900's and was primarily driven by the coal industry. Because of the period when the towns and communities were sited, substantial development has occurred in valley floors, adjacent to streams, where topography is relatively moderate.

As illustrated by the Digital Ortho Photography, extensive mining, logging, and gas well development have been conducted in the Looney Creek, Preacher Creek and Callahan Creek Watersheds.

HYDROLOGY

Historic

The site is situated along Looney Creek, Callahan Creek and Preacher Creek in the Appalachian Plateau Physiographic Province of southwest Virginia. Stratigraphic units found at the site belong to the Wise formation. The lithology of the impact area is composed exclusively of

HYDROLOGY -cont.

alternating beds of shale, sandstone and coal. Shales and sandy shales are extremely fine-grained and exhibit very low primary permeability. The sandstone strata are generally more porous; however, they are so well cemented that they are likewise poor media for transmission of groundwater.

In undisturbed areas, research has shown, and coal surface mining regulatory authorities acknowledge that, due to the low permeabilities of most stratigraphic units in the Appalachian Plateau Physiographic Province, groundwater movement is principally controlled by topography and secondary permeability (movement of groundwater along fracture system, bedding planes, joints, faults, etc.). Of primary importance are fracture systems resulting from stress-relief or unloading effects. The results of numerous studies indicate this fracture-flow zone is normally limited to the uppermost 150 feet of overburden.

In undisturbed areas, below the fractured zone, the only lithologic units with significant transmissivity are coal seams and even this decreases as depth increases. Recharge of the coal seams is through deep vertical fractures. Springs are often associated with coal seam outcrops and their associated perched aquifers. This is because the coal seams are relatively permeable and are often underlain by relatively impermeable strata. These aquifers are of little regional significance as water sources.

In undisturbed areas, groundwater originates as precipitation, migrates through the soil and colluvium, and enters the stress-relief and/or tectonic fracture systems in upper-slope or highland terrain i.e. valley side slopes. Groundwater movement continues down-gradient to the valley floor system. The coal seams may act as aquifers, cleating providing secondary permeability with the underclays acting as aquitards to isolate the unit as a perched aquifer. Coal seams may alter the general down-slope movement to a down-dip movement, exiting as springs at the seam outcrops. Groundwater may emerge as contact springs at the outcrop or colluvial springs further downslope, but overall movement is to the streams and underlying fractures.

The valley side slope system flow media is primarily colluvial soils and fractures. The transmission capacity of the media is primarily a function of permeability and elevation head

HYDROLOGY - cont.

(slope). Water tables are not normally associated with these systems, i.e. the soil and fracture voids do not become saturated. When these systems do become saturated, usually during extreme precipitation events, slope failures normally occur. Recharge to this system is from precipitation and is primarily a function of infiltration rates.

The valley floor system flow media is primarily colluvial or alluvial soils and fractures. The transmission capacity of the media is a function of permeability and elevation head (slope). Water tables are normally associated with this system. Groundwater movement in these systems is generally in a lateral, down gradient direction, at an extremely slow rate.

Intermittent and perennial streams form when the quantity of groundwater being transmitted through valley side slope systems exceeds the transmission capacity of valley floor systems. Ephemeral streams are streams that respond to rainfall events and are found above this boundary. Intermittent streams, i.e. streams that have flowing water during certain times of the year, when groundwater provides water for stream flow, form in the upper reaches of valley floor systems. Perennial streams, i.e. streams that have flowing water year round and the water table is located above the stream for most of the year, form in the lower reaches of valley floor systems.

Groundwater sources for intermittent streams are primarily groundwater collected in stream channels from side slope systems due to elevation heads, groundwater from perched aquifers located in side slope systems and groundwater from water tables when the water table rises above the floor of the stream channel. Groundwater sources for perennial streams are primarily from water tables located slightly above the stream channels.

Effects of Surface Mining

In areas located above coal seams being mined, surface mining operations replace original flow media with spoil, i.e. overburden that has been blasted. The overburden then becomes the flow media for a reach of the system. Because of the normally increased depth and permeability of the spoil, relative to the original flow media, significant portions of groundwater flow is transmitted through the overburden at elevations below post mining grades.

In areas located below the coal seams being mined, and where fill is placed, the original

HYDROLOGY - cont.

flow media and streams, if present, are covered. The original flow media still conveys groundwater and because of the depth and permeability of spoil, water tables normally do not develop to post mining grades in the fills. Groundwater emerges from the fill at the downstream toe, in the lowest elevation of the valley floor.

Relative to native soils, mine soils have higher infiltration rates, which result in the introduction of larger volumes of precipitation into the groundwater system. Because of the large volume of spoil associated with surface mines, spoil acts as a groundwater reservoir which stores and releases groundwater over a longer period of time, relative to the original flow media. This effect results in slightly larger and more sustained base flows being introduced into receiving streams.

Groundwater is not lost or destroyed by surface mining operations. Groundwater is merely stored and rerouted thru the system in a manner slightly different from the original flow media.

Effects of Deep Mining

Deep mines can become perched aquifers as a result of mine voids intercepting fracture systems, which convey groundwater. Fractures from deep mine subsidence can enhance natural fracture systems. If subsidence fractures extend to the ground surface, they can result in the introduction of surface waters into the mine void. Water collected in mine voids flow to down gradient portions of the mine. If the mine is located above drainage, groundwater can emerge to the surface as mine discharges or springs or enter down gradient flow systems located below the floor of the mine.

Post Mining Hydrology

The post mining hydrology will closely resemble that which is described in Effects of Surface Mining. Hollow fills located in jurisdictional waters will permanently fill stream channels. Sediment ponds will temporarily impact stream channels. Upon reclamation of the site, stream channels will be restored below the hollow fill toe through the sediment ponds as part of

HYDROLOGY - cont.

the overall mitigation plan. Sources from these streams will be groundwater flows from the hollow fills and upstream areas.

Expected stream type, i.e. ephemeral, intermittent and perennial, which will be restored upon reclamation of the site are shown on the Summary of Aquatic Resource Impacts and Mitigation Measures and the Mitigation Maps. Stream types were classified in accordance with the Corps' definitions and are based upon stream flow characteristics expected from each respective watershed.

Expected stream types after reclamation were based on the presence and type of stream in upstream, undisturbed watersheds, the effect of both existing and proposed mining in the watershed, the size of the watershed, existing groundwater sources, field investigations, and surface water baseline data. Expected stream types after reclamation and watershed limits are shown on the Mitigation Maps.

SECTION 3.00

RELATIVE AQUATIC QUALITY ASSESSMENT

3.00 RELATIVE AQUATIC QUALITY ASSESSMENT

BIOLOGICAL ASSESSMENT

Five (5) Aquatic Biological Sampling (ABS) Stations were used to document existing aquatic resources. Biological and physical assessments of the streams to be directly impacted by the proposed operation and their receiving stream were made in accordance with the procedures and methods outlined in EPA's Rapid Bioassessment Protocol (Barbour et al. 1999) and the Eastern Kentucky Stream Assessment Protocol (Version 2002.6). Representative stream reaches were selected to document aquatic resources. Stream surveys at each ABS station consisted of habitat assessment, benthic macroinvertebrate samples and, if necessary, fish counts. A surface water baseline sample was collected at each location and analyzed for specific conductance. These analyses are contained in Appendix A. Each ABS station consisted of a 100-meter reach that is representative of the overall stream characteristics. The locations of all ABS stations are shown on the Environmental Resources Maps. The following stations were established:

ABS	Stream
1	Unnamed Tributary to Looney Creek 2 (UTLC-2)
2	Unnamed Tributary to Looney Creek 4 (UTLC-4)
3	Unnamed Tributary to Callahan Creek 1 (UTCC-1)
4	Unnamed Tributary to Preacher Creek 1 (UTPC-1)
5	Kelly Branch

ABS-1 is located in an unnamed tributary to Looney Creek (UTLC-2) that flows through an existing Pre-SMCRA Mine Bench. The stream at ABS-1 was not stable. The stream is channelized due to spoil generated from previous mining activity.

ABS-2 is located in an unnamed tributary to Looney Creek (UTLC-4) and originates from the toe of a pre-SMCRA fill. The stream at ABS-2 has been previously disturbed due to pre-SMCRA mining which has caused severe bank erosion.

ABS-3 is located in an unnamed tributary to Callahan Creek (UTCC-1) and originates from a mine discharge located in the abandoned Imboden deep mine. The stream at ABS-3 is moderately stable with some disturbances from pre-SMCRA mining and logging.

ABS-4 is located in an unnamed tributary (UTPC-1) to Preacher Creek. The stream at ABS-4 is not stable. Fill from road development has channelized the stream and increased sediment loading in the

BIOLOGICAL ASSESSMENT - cont.

channel. Extensive logging and mining have been conducted upstream of ABS-4.

ABS-5 was conducted in order to assess Kelly Branch, which will be used as a mitigation site. Kelly Branch has been mined and is currently a large trapezoidal rip-rap ditch.

Results

The results of the stream surveys are detailed in Appendix A and summarized on the EKSAP EII Calculation forms located in Appendix C.

STREAM MORPHOLOGY ASSESSMENT

A detailed fluvial geomorphological survey was performed for the main stem of UTPC-1. Methods used for the survey are discussed in detail in Section 2.00. UTPC-1 was classified as a B4 stream type. This stream type is moderately entrenched and associated with gravel colluvial deposits and structurally controlled drainways. Substrate of this stream type is predominately gravel with lesser amounts of boulders, cobble and sand. The reach appeared to be unstable with clear indications of severe aggradation.

A detailed fluvial geomorphological survey is contained in Appendix B.

FUNCTIONAL ASSESSMENT

Streams

The primary function of the streams to be impacted is drift. Drift is the movement of benthic macroinvertebrates and organic matter downstream. A secondary function is to provide habitat to benthic macroinvertebrates.

Headwater streams contribute organic matter, which is not efficiently utilized by headwater organisms, to downstream ecosystems. Headwater streams are accumulators, processors, and transporters of particulate organic matter from terrestrial ecosystems (Smith 1996). Typically, over 90% of the energy input comes from the forested (terrestrial) watershed or upstream (Smith 1996). Approximately 60% of the organic input into headwater streams is transported downstream with less than half being utilized locally (Smith 1996). Headwater streams (1-3 order) have low primary production (production from green plants) and are less efficient in retaining nutrients than larger (4-6 order) streams (Smith 1996).

FUNCTIONAL ASSESSMENT – cont.

Organic matter in streams consists of Coarse Particulate Organic Matter (CPOM) Fine Particulate Organic Matter (FPOM) and Dissolved Organic Matter (DOM) (Smith 1996). CPOM consists of leaves and woody debris which is broken into FPOM. FPOM consists of materials less than 1 mm such as invertebrate feces, leaf fragments, and precipitated DOM. DOM consists of materials less than 0.5 microns in solution (Smith 1996). Streams utilize these types of nutrient inputs through biological processes. This organic matter combines with benthos to form drift.

Drift is essential to the production process of downstream ecosystems (Smith 1996). Drift is measurable amounts of CPOM, FPOM, and invertebrates moving downstream where they are utilized by larger order streams with greater productivity (Smith 1996).

Headwater streams (1-3 order) provide habitat to organisms which have adapted to life in moving water. Headwater streams are typically dominated by collectors and shredders with some grazers and predators. Shredders primarily consume CPOM, collectors primarily consume FPOM, grazers consume green aquatic plants and predators prey on other species. Consumer organisms in headwater streams are adapted to a narrow temperature range, a reduced nutrient regime, and to maintenance of their position in the current (Smith 1996).

SECTION 4.00

HOLISTIC WATERSHED IMPACTS

4.00 HOLISTIC WATERSHED IMPACTS

HISTORICAL OVERVIEW OF AREA

Land use and development patterns in Virginia's coalfield region were constrained by the dominant topographic features of the area, such as rivers, streams, mountains and valleys. Communities settled along rivers and within valleys primarily for transportation and agricultural purposes (EPA 2002). The coal deposits, as well as the physical limits to other types of development have defined the locations and extent of settlement and distribution (EPA 2002). Within the coalfield region, there is a scarcity of land suitable for agricultural, residential, commercial, and industrial development. As a result, the limited development of the region has occurred almost exclusively on valley floors adjacent to streams and rivers. The current transportation infrastructure generally follows this same pattern.

The early part of the 20th century came with extensive timber cutting and land clearing mainly for subsistence agriculture. Many of these agricultural lands were often located on steep terrain or along streams which increased soil erosion. The forests of the region are largely second and third growth today, due to the timber cutting and land clearing of the early 20th century.

During the 1950s and 1960s the region saw an increased dependence on coal mining as a source of income, and a gradual decline in the scope of farming and timbering. Improved technology and an increased demand for coal allowed the development of a substantial coal industry. During the period through the mid 1970's the coal industry had little if any environmental regulation. Many of the Abandoned Mine Lands (AML) of today are a result of the period. Additionally, timber harvest during this period was conducted without regulation or guidance and straight pipe sewer discharges became more common as homes were constructed or retrofitted with indoor plumbing. Due to the topography of the land, space for conventional septic systems was, and still is, at a premium. Over time, unregulated land use practices, without knowledge or awareness of the environmental consequences, led to degraded aquatic resources.

ENVIRONMENTAL TRENDS

Growing public awareness and concern for controlling water pollution led to enactment of the Federal Water Pollution Control Act Amendments of 1972. As amended in 1977, this law became

ENVIRONMENTAL TRENDS - cont.

commonly known as the Clean Water Act (CWA). The CWA established the basic structure for regulating discharges of pollutants into the waters of the United States. The CWA set water quality standards for contaminants in surface waters. The CWA made it unlawful for any person to discharge any pollutant from a point source into navigable waters, unless a permit was obtained under its provisions. It also funded the construction of sewage treatment plants under the construction grants program and recognized the need for planning to address the critical problems posed by non-point source pollution. (EPA 2005).

In 1978 the Federal Surface Mining Control and Reclamation Act (SMCRA) went into effect. Prior to SMCRA little or no reclamation of coal mined lands was required in Virginia. In 1980 SMCRA became the blueprint by which the Virginia Department of Mined Land Reclamation (VDMLR) assumed primacy under the Virginia Surface Mining Control and Reclamation Act. Since that time VDMLR has been responsible for the review, issuance and enforcement of coal mining permits in Virginia. Additionally, the VDMLR is currently responsible for the review, issuance and enforcement of CWA National Pollutant Discharge Elimination System (NPDES) permits associated with coal mining operations.

In 1980, approximately 58,600 acres of Abandoned Mine Lands (AML) existed in the coalfields of Virginia (OSM 2005). Since 1980, the Virginia Division of Mined Land Reclamation's AML Unit has been responsible for the reclamation of approximately 13,100 acres of these lands (OSM 2005). It is expected, however, that the majority of AML will be reclaimed through remining. Although cumulative remining statistics are not currently available in Virginia, from January 2002 through March 2003 approximately 9,900 acres of AML have been approved for remining (VDMLR 2005). The VDMLR has been promoting remining since 1980 as a means of reclaiming AML and improving water quality.

In Virginia, loggers are required to protect water quality and the Virginia Department of Forestry (VDOF) created Best Management Practices (BMPs) as guidelines for proper timber harvesting. To ensure voluntary compliance with BMPs, VDOF has been monitoring logging operations since 1993. They have found that BMP implementation has increased since that time (VDOF 2003).

Presently general improvements in water quality and aquatic habitat have resulted from the enactment and enforcement of modern environmental regulations (Stewart 2003). AML has been

ENVIRONMENTAL TRENDS - CONT.

reclaimed, sewer and waste water treatment systems have been installed, erosion and sediment control measures are commonplace, and logging operations are complying with BMPs now more than ever.

Today coal mining, timber harvesting, and natural gas extraction are the dominate land uses in the coal field region. Impacts to aquatic resources from these land use practices are inevitable; however, modern environmental regulations and guidance should minimize the impacts.

Future impacts to aquatic resources will likely consist of continued harvesting of remaining coal and natural gas reserves. Coal reserves in the area are expected to be depleted in the next 20 years. Natural gas reserves are expected to be depleted in the next 50 years. Periodic timber harvesting is expected to occur as long as there is a market for timber. Residential and municipal land use is expected to remain fairly constant while straight pipe sewer discharges should eventually be eliminated. Further improvements to water quality should occur in the watershed due to stream restoration activities, and reclamation of pre-SMCRA features through remining.

SECTION 5.00

AVOIDANCE AND MINIMIZATION

5.00 AVOIDANCE AND MINIMIZATION

AVOIDANCE

The presence of coal bearing deposits within the strata determines the physical location and extent of a reserve body. Geologic exploration of the reserve body within the project area indicates that the area under consideration for the proposed surface mine operation is a reasonable and practicable location. Unlike residential or industrial development, extractive industries must locate projects where the target geologic deposits are found. This makes avoidance difficult and often impracticable.

Due to the location of abandoned underground mine works and the extent to which they have been mined, additional underground mining is not considered feasible. However, during underground mining operations, barriers of coal are left between the outcrop and mine workings. If these barriers or blocks of coal have adequate overburden to coal ratios then surface mining techniques can be used to extract the remaining reserves. Due to this fact, surface area, contour and auger mining are considered the only feasible and practicable mining methods for this site.

All practicable mining techniques and spoil storage methods were analyzed during design. The operation was designed to avoid and minimize environmental impacts to the greatest extent practicable. A&G will use appropriate equipment to mine the site in a timely and efficient manner. This will allow the greatest use and conservation of the coal, while utilizing the most appropriate technology currently available to maintain environmental integrity, so that reaffecting the land in the future through surface coal mining operations is minimized.

This project is necessary to provide continuing employment for the region and produce low-sulfur bituminous coal, which is used for production of electricity across the entire U.S.

MINIMIZATION

Three (3) basic impacts will occur to Corps' jurisdictional area as a result of the proposed surface mining operation. In areas where streams are located at or above the elevation of the lowest coal seam being mined, the stream will be mined thru to access coal reserves. In areas where the stream is located below the elevation of the lowest coal seam being mined, sediment ponds will be constructed or fill will be

MINIMIZATION - cont.

placed.

Sediment ponds will be constructed to control runoff from the proposed hollow fills. Sediment control ponds minimize impacts to downstream aquatic resources. They are necessary for the mining operation to comply with NPDES standards. The proposed ponds are essential for preventing sedimentation of downstream reaches and protecting water quality.

Several steps are taken in order to minimize direct impacts from sediment pond construction. Where feasible, sediment control ponds have been designed in an upland setting, e.g. bench ponds. Additionally, in-stream ponds have been placed as close to the mining operation and as far upstream as practicable.

Sediment control ponds will be constructed in accordance with VDMLR regulations found at 4 VAC 25-130-816.46. Each pond will provide a minimum volume of 0.125 acre-feet per acre of disturbed drainage area, of which 0.075 acre-feet per acre disturbed shall be sediment storage volume and the remainder shall be detention storage volume. For safety reasons, individual sediment ponds cannot exceed a volume of 20 Ac-Ft.

The locations of sediment ponds and drainage structures, which will be used to meet NPDES and VDMLR requirements, are shown on the Environmental Resources Maps. The pond names associated with the proposed operation and the streams they affect are as follows:

Stream Name	Pond
UTLC-1	Pond L10
UTLC-2	Pond L10
UTLC-5	Pond L6
UTPC-1	Ponds P1and P2
UTPC-2	Pond P2
UTCC-1	Pond C1

Excess overburden generated during the proposed mining will be placed in hollow fills. A number of steps are taken in order to minimize aquatic impacts due to hollow fill construction. To reduce stream loss, hollow fills are constructed in upland areas or in the "head of the hollow" where practicable. In addition, excess spoil is used to reclaim pre-SMCRA features such as highwalls. Also, disposal sites previously used for fill material are re-used when practicable.

MINIMIZATION - cont.

The proposed hollow fills are designed to reduce the potential for erosion, slumping or leaching of materials into the surrounding aquatic ecosystem. To meet the requirements of long-term erosion stability, hollow fill ditches are designed to pass the flows from a 100 year, 6 hour duration storm event. In order to meet mass stability, hollow fills are designed to exhibit a static safety factor greater than 1.5. No acid/toxic material is expected to leach from the site because no potentially acid/toxic material will be placed in the hollow fills. Hollow fill drainage is designed so that erosion is not excessive from the fill during precipitation events. The mass stability safety factor ensures that mass movement or slumping of the fill material should not occur. Once hollow fills are constructed, they will be planted with vegetation in order to reduce erosion.

The proposed mining operation has been designed to minimize impacts to Corps' jurisdictional area. While the fill limits were placed as far upstream as economically feasible, the fill locations were dictated by the proposed operation plan.

As noted in the detailed project description, approximately, 326.94 acres of pre-SMCRA lands, and 51,900 LFt. of unreclaimed highwall exist within the permit area. In addition to reducing existing sediment loading to the impacted watersheds, the reclamation of these existing features will utilize excess spoil that would otherwise be disposed of in excess spoil fills.

When implemented, the mitigation plan should enhance the existing stream quality within the permit area, thus minimizing the long-term impacts of mining. The proposed operation has been designed to minimize impacts to aquatic resources. The proposed plan, with the protective measures required by SMCRA and the mitigation required by the USACE, makes the adverse environmental effects of the project minimal, both individually and cumulatively. All state and federal requirements have been met and all appropriate and practicable steps have been taken to minimize the potential adverse impacts of this project on the aquatic ecosystem.

SECTION 6.00

COMPENSATORY MITIGATION PLAN

6.00 COMPENSATORY MITIGATION PLAN

BASELINE INFORMATION

The type, linear feet and/or acreage of aquatic resources which will be impacted and restored as a part of the proposed mitigation plan, are shown on the Summary of Aquatic Resource Impacts and Mitigation Measures. Impacts and mitigation have been summarized on a project basis by stream type. Physical, chemical and biological characteristics have been described in detail in Sections 2.00 and 3.00. Historic and existing hydrology, as well as aquatic functions, are also discussed in Sections 2.00 and 3.00.

Impacts to aquatic resources will result from coal surface mining operations. The proposed mitigation cannot be fully implemented in each sub-watershed until surface mining and associated reclamation operations are nearly completed, i.e. backfilling and regrading operations are completed and the sub-watershed has been stabilized by an initial herbaceous cover. Therefore, impacts must occur before mitigation within the mining area.

GOALS AND OBJECTIVES

As discussed in the Functional Assessment portion of Section 3.00, the primary function of the streams to be impacted is drift.

Goals

The goal of stream mitigation is to reestablish the function of drift, decrease the sediment load generated within the streams, and to the extent practicable, create and enhance in-stream habitat.

Objectives

The objective of the stream mitigation effort is restoration of "natural", stable stream channels, which provide the function of drift. The linear feet type and location of proposed stream restoration is shown on the Mitigation Maps. Additionally, the mitigation is summarized on the Summary of Aquatic Resource Impacts and Mitigation Measures at the beginning of this document. Natural stream channels have been designed based on current fluvial, geomorphologic principles. Geomorphological design was primarily performed in accordance with the procedures and recommendation of Rosgen, 1996. Geomorphological stream types B3, B3c, A2, and A2a+

GOALS AND OBJECTIVES - cont.

have been proposed. Stream types vary with expected postmining slopes and valley types.

ADEQUACY OF MITIGATION

The Eastern Kentucky Stream Assessment Protocol was used to determine if the proposed natural stream channel restoration fully mitigated for the proposed impacts. The Pre-Impact Ecological Integrity Indices (EII's) and Ecological Integrity Units (EIU's) for the proposed impacted streams were calculated using data collected at each ABS station using the Habitat + Conductivity + Benthic form of the model.

The Habitat + Conductivity version of the model was used to predict the Mitigation EIU's generated by the mitigation plan. We feel it reasonable to assume that, if properly constructed, the total habitat score for restored stream channels should be 167, which is classified as fully supporting biotic integrity. While the proposed riparian corridor will enhance the functions of the restored streams, we scored these categories low due to the time required for the development of a mature vegetative cover.

Due to the existing conductivities observed, we assumed a postmining conductivity of at least 500 umhos/cm for the restored channels within the mining area. A conductivity of 500 umhos/cm generates a conductivity sub-index value of 0.1, which is the lowest sub-index value generated by the model.

The existing stream condition (riparian, substrate, etc.) was considered in the pre-impact EII score for each of the off-site mitigation areas. Therefore, only partial credit (lift) is given for the restored stream channel outside of the immediate mining area.

The EII calculations and the EIU outputs have been summarized on both a project and sub-watershed basis. That summary is contained in Appendix C and precedes the model output. As an overall total, the mitigation proposed would result in a net gain of EIU's.

SITE SELECTION

Watershed Considerations

The proposed mitigation plan will be constructed within or adjacent to the impacted area, located within the VDMLR permit area. Because the primary objective of the mitigation plan is to provide the function of drift, the continuum between the watershed and downstream stream reaches must be maintained.

SITE SELECTION – cont.

Mitigation Outside of Immediate Mining Area

Intermittent stream restoration will occur outside of the proposed mining area in the Kelly Branch sub-watershed. Kelly Branch is located in the Callahan Creek watershed. All mitigation outside of the immediate mining area is contained within VDMLR permit number 1101750, Kelly Branch Surface Mine. This area has been reclaimed using conventional mine reclamation techniques; therefore, natural stream channel restoration will be applied in order to increase the ecological integrity of the stream. The type, linear feet, and location of this mitigation are shown on the Kelly Branch Mitigation Map. Additionally, the linear feet, type, and EIU's generated by the plan are shown on the Summary of Aquatic Resources Impacts and Mitigation Measures located at the beginning of this document. Some of the proposed impacts are located in the Callahan Creek watershed.

Practicability

The proposed mitigation plan proposes restoration of "natural" stream channels, diversion ditches, and wetlands. VDMLR permit holders routinely construct wetlands and diversion channels under their permits. From a practical point of view, reconstruction of "natural" stream channels are similar to construction of rock-lined ditches. The major differences from a construction viewpoint are that natural stream channels are of a smaller scale and more intricate in nature.

Air Traffic

Because of the remoteness of this site relative to airports and the minimal potential to attract waterfowl or other bird species that might pose a threat to air traffic, threat to aircraft is not a consideration.

MITIGATION WORK PLAN

Design

Stream channels to be constructed were primarily designed in accordance with the fluvial geomorphological principles contained in Rosgen, 1996. Key design parameters are contained in Appendix E.

MITIGATION WORK PLAN - cont.

Generally, the type of proposed stream channel was chosen by determining the stable form expected for the existing valley type, slopes, and material. Type B3, B3c, A2, and A2a+ channels are proposed.

Type B3 and B3c channels have been specified in portions of the permit area where slopes exist or will be constructed on grades ranging from 1 to 2 percent. Cross Vanes and meanders will be utilized to aid in energy dissipation, as well as provide grade control and habitat.

Type A2 and A2a+ channels have been specified in steeper portions of the permit area where slopes will be constructed on grades greater than 5 percent. These channels utilize step-pool systems to aid in energy dissipation and provide habitat.

Construction Plans and Specifications

The plan location of mitigation structures are shown at a 1" = 400' scale on the Mitigation Maps. The maps show the following:

- Riparian corridors.
- The locations of proposed mitigation measures.
- The locations of restored stream reaches, by channel type.
- The locations of pre-SMCRA lands.
- The locations of receiving streams.

The Restored Stream Channel Details, Type A and B Channels drawing shows construction details and dimensions. The drawing shows construction details by stream types, i.e. B3, A2, etc. Within each stream type, construction dimensions are varied by slope.

The drawing shows typical plan views and profiles pool and riffle lengths. The drawing also depicts typical pool and riffle channel cross sections. Key depths are depicted by the pool and riffle typical cross sections.

Key construction parameters for restored stream channels are shown on the Restored Stream Channel Schedules. Key construction parameters are varied by valley slope. Bankfull widths, minimum valley floor widths and the median substrate stone size are specified. Riffle lengths, depths and slopes, and pool lengths and depths, are also specified.

Construction notes, supplementing typical construction details and schedules, are contained on the Restored Stream Channel, Type A and B Channels drawing. Great care has been

MITIGATION WORK PLAN - cont.

exercised in preparation of the drawing in order to clearly depict the intent of the design and to provide sufficient information to allow the channels to be built in accordance with the design.

Timing, Sequence and Methods

As discussed in the Baseline Information portion of this section, impacts must occur prior to mitigation within the mining area. Because the surface mining operation will disturb significant portions of the watersheds, portions of restored stream channels not associated with VDMLR sediment ponds will be constructed in the construction season following establishment of an herbaceous cover in the watershed, i.e. after the watershed is stabilized. In areas associated with VDMLR sediment ponds, restored stream channels will be constructed during pond removal operations.

If necessary, sufficient durable, non-acid/toxic sandstone shot rock will be stockpiled and later used for construction. Temporary ditches will be used to convey flows thru completed areas until the restored stream channels are constructed.

VDMLR sediment ponds must remain in place for at least two (2) years after establishment of an herbaceous cover in the watershed. To the extent practicable, A & G will attempt to gain VDMLR approval to remove sediment ponds after the two (2) year revegetation period and construct the restored stream channels and wetlands in the next construction season following VDMLR approval of pond removal.

After stabilization of the watershed, the restored stream channels not associated with sediment ponds will be constructed. After VDMLR approval to remove sediment ponds, restored stream channels and wetlands will be constructed.

Water Sources, Connections and Uplands

Water sources for the restored stream channels will be runoff from rainfall events, ground waters originating from upstream areas, and perennial stream flow from upstream.

MITIGATION WORK PLAN - cont.

Vegetation

Because the streams to be impacted under this application are headwater streams, the streams have no significant aquatic vegetation. Because the streams to be impacted have no significant aquatic vegetation, aquatic vegetation is not proposed in the restored stream channels.

Riparian corridors have been proposed in upland areas. The riparian corridors will extend 100 HFt. from the top of each restored stream channel bank, where practical. The approximate limits of the riparian corridors are shown on the Mitigation Maps. Species chosen for the revegetation plan are species that are normally acceptable to the VDMLR. The proposed riparian corridor revegetation plan is shown on the Mitigation Maps.

The revegetation plan for areas upland of riparian corridors consists of an herbaceous cover and trees and shrubs. The VDMLR permit area will be returned to a postmining land use of unmanaged forest and agricultural grazingland. Species chosen are species normally acceptable to the VDMLR for restoration of surface mined lands.

Existing Seed Banks or Plantings

Where practicable, local plant material such as native wetland plants and riparian trees and shrubs may be transplanted to mitigation sites. These plants will be transplanted to the mitigation sites to enhance ecological recovery of the stream or wetland mitigation sites. Only native plants will be transplanted and great care will be taken to minimize disturbances to the source area.

Control of Exotic, Invasive Vegetation

Exotic, invasive species are not proposed for use in either the Corps permit or the VDMLR permit. Therefore, invasion of these species is not expected within the Corps' jurisdictional area.

Construction Control for Target Species

No target species are proposed for restored stream channels.

MITIGATION WORK PLAN - cont.

Fluvial Geomorphological Features

As discussed in the Construction Plans and Specifications portion of this section, great care has been exercised in preparation of the drawing in order to clearly depict the intent of the design and to provide sufficient information to allow the channels to be constructed in accordance with the design. The construction plans and specifications will allow the channels to be built in accordance with the design, which includes appropriate fluvial geomorphological features.

PERFORMANCE STANDARDS

Duration and Reporting

Performance monitoring will be conducted on a yearly basis for five (5) years or until the project has been demonstrated as functionally mature and self-sustaining. Performance monitoring will begin in the fall or spring following completion of construction. Performance monitoring will be conducted in the same season and, to the extent practicable, after similar climatic events. Monitoring reports will be submitted to the Corps yearly. The permittee will be responsible for the monitoring program. Performance standards monitored will be indicators that demonstrate the mitigation is developing or has developed. As-Built data will be submitted when construction is substantially different from design drawings.

Streams

As outlined in the Goals and Objectives portion of this section, the goal of stream mitigation is to reestablish the function of drift and, to the extent practicable, benthic macro-invertebrate habitat. This goal shall be met when the restored stream channels are determined to be stable. Because the restored stream channels were designed in accordance with fluvial geomorphological principles, stable stream channels should provide adequate aquatic habitat. Stream stability will be determined by performing Level III and Level IV analysis, in accordance with Rosgen (1996).

In order to determine the success of the proposed restored stream channels, all of the restored stream channels will be walked yearly. Any areas that are potentially unstable will be noted and repaired if necessary.

PERFORMANCE STANDARDS - cont.

In addition, the approximate location monitored for baseline data will be monitored annually to determine the success of the restoration. The proposed monitoring location is shown on the Mitigation Maps. During the 1st monitoring event, a permanent bench mark and permanent points for riffle and pool cross section will be established. By comparing the pre-existing stream condition with the restored channel it should provide a good opportunity to monitor the success of the restoration.

During the first monitoring event and at year three (3) and year five (5) the riffle and pool cross sections and the longitudinal profile of each reach will be measured and documented. Channel material classification will be performed on each reach utilizing the "pebble count" method developed by Wolman (1954). Pebble counts will be conducted yearly during the monitoring period.

In order to monitor the biological recovery of the streams over time, biological sampling will be conducted at the proposed monitoring location annually. The benthic macro-invertebrate population will be sampled in each reach and habitat quality will be assessed using RBP protocol. Sampling will be conducted in the fall or early spring in order to obtain the best benthos assemblages. If fish are observed in any of the representative reaches, then their presence will be documented, and the population will be sampled using RBP protocol.

SITE PROTECTION

The Mitigation Plan consists of restored stream channels and wetlands. These structures are connected to Waters of the United States. Because these structures are connected to Waters of the United States, they will be afforded the same level of protection as Waters of the United States.

CONTINGENCY PLANS

Unanticipated site conditions or changes will be addressed thru revisions to VDMLR and Corps permits. Modification to performance standards may be proposed if compensatory mitigation goals are being met, but in unanticipated ways. If mitigation sites are adversely impacted by forces beyond A&G's control, then the VDMLR and the Corps will be informed as soon as practical.

PERFORMANCE STANDARDS - cont.

MONITORING AND LONG-TERM MANAGMENT

A&G is responsible for accomplishing, maintaining and monitoring the mitigation. If A&G does not perform its reclamation obligations, then the VDMLR will forfeit A&G's bond and be responsible for accomplishing, maintaining and monitoring the mitigation. The period of responsibility shall end when the demonstration is made that the project is functionally mature and self-sustaining in accordance with performance standards.

FINANCIAL ASSURANCES

A&G provides financial assurances to the VDMLR through a performance bond. The performance bond is made payable to the VDMLR and conditioned upon the faithful performance of all the requirements of the Virginia Coal Surface Mining Control and Reclamation Act of 1979 (Chapter 19 (§45.1-226 et seq.) of Title 45.1 of the Code of Virginia), the permit, and the reclamation plan. Performance bond liability is for the duration of the surface coal mining reclamation operation and for a period which is coincident with the permittee's period of extended responsibility for successful vegetation. The period of extended responsibility is five (5) years for all lands.

The VDMLR releases bond after it determines that all reclamation obligations have been fulfilled. In the case of the mitigation, bond may be reduced or released once the project has been demonstrated to be functionally mature and self-sustaining in accordance with the performance standards.

A&G will ensure that the Corps' Mitigation Plan is incorporated in the VDMLR permit. Incorporation of the Corps' Mitigation into the VDMLR permit makes the Corps' Mitigation a condition of the VDMLR permit.

SECTION 7.00

MINIMAL IMPACT STATEMENT

7.00 MINIMAL IMPACT STATEMENT

Section 5.00 demonstrates that impacts to aquatic resources are unavoidable and that the operation has been designed to minimize impacts. Section 3.00 documents the existing condition of streams to be impacted. Section 3.00 also documents that the primary functions of the impacted stream reaches and receiving streams is drift, while a secondary function is support of common, indigenous benthos. Section 4.00 documents past, present and probable impacts to the affected watersheds, from a holistic view point.

The Compensatory Mitigation Plan contained in Section 6.00 has been designed using the most current reclamation technologies. "Natural" stream channel designs have been used for restored stream channels to ensure stable channels which provide aquatic habitat. From a holistic watershed view point, the restoration of stable stream channels will enhance the functions and values of the stream.

The restored stream channel system has been designed to ensure the stream continuum between the upstream watersheds and the receiving streams. By restoring unstable stream channels with stable channels and reclaiming upland previously mined areas, the amount of sediment entering streams should be greatly reduced. The reduced sediment loading should improve habitat quality both within the restored stream channels and downstream.

Over time, as the proposed riparian corridor matures the organic input entering streams from the permit area should equal or potentially exceed the current input. The restored stream channels should improve the benthos habitat, resulting in a more diverse benthos assemblage. This should allow organic input to be more efficiently broken down, resulting in increased drift. The aquatic and terrestrial restoration measures proposed should, over time, result in increased aquatic function, which should benefit the entire affected watershed.

The proposed plan, with protective measures required by SMCRA and the mitigation required by the USACE, makes the adverse impacts of the project minimal, both individually and cumulatively. All state and federal requirements have been met, and all appropriate and practicable steps have been taken to minimize the potential adverse impacts of this project on the aquatic ecosystem.

SECTION 8.00

REFERENCES

8.00 REFERENCES

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APPENDIX A

DELINEATION OF SPECIAL AQUATIC SITES – RBP DATA

HABITAT ASSESSMENT DATA SHEET - HIGH GRADIENT STREAMS

Stream Name **UTLC-2** Aquatic Sampling Station No. **1**

Latitude **36°55'03"** Longitude **82°30'52"** Stream Drainage **Upper Powell**

Investigators **Jonathan Stamper and Lance DeBord, D.R. Allen & Associates, P.C.**

Date **2/21/2007** Time **10:20 a.m.** Reason for Survey **document existing resources**

Elevation **2100** State **VA** County **Wise**

USGS 7.5 minute topographic map **Appalachia** Stream Order **1st**

Habitat Parameter	Condition Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover, mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at state to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than a desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE 8	20 19 18 17 16	15 14 13 12 11	10 9 **8** 7 6	5 4 3 2 1 0
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE 13	20 19 18 17 16	15 14 **13** 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is <0.3 m/s, deep is >0.5 m.).	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/depth regime (usually slow-deep).
SCORE 8	20 19 18 17 16	15 14 13 12 11	10 9 **8** 7 6	5 4 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% (<20% for low-gradient streams) of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% (20-50% for low gradient) of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% (50-80% for low-gradient) of the bottom affected; sediment deposits at obstructions, constructions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% (80% for low-gradient) of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE 8	20 19 18 17 16	15 14 13 12 11	10 9 **8** 7 6	5 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE 13	20 19 18 17 16	15 14 **13** 12 11	10 9 8 7 6	5 4 3 2 1 0

HABITAT ASSESSMENT DATA SHEET - HIGH GRADIENT STREAMS (cont.)

Habitat Parameter	Condition Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE 11	20 19 18 17 16	15 14 13 12 **11**	10 9 8 7 6	5 4 3 2 1 0
7. Frequency or Riffles (or bends)	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent, distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles, divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.
SCORE 8	20 19 18 17 16	15 14 13 12 11	10 9 **8** 7 6	5 4 3 2 1 0
8. Bank Stability (score each bank) **Note: determine left or right side by facing downstream.**	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE 7 (LB)	Left Bank 10 9	8 **7** 6	5 4 3	2 1 0
SCORE 7 (RB)	Right Bank 10 9	8 **7** 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank)	More than 90% of the stream bank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the stream banks surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the stream banks surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the stream banks surfaces covered by vegetation; disruption of stream banks vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE 9 (LB)	Left Bank 10 **9**	8 7 6	5 4 3	2 1 0
SCORE 9 (RB)	Right Bank 10 **9**	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE 9 (LB)	Left Bank 10 **9**	8 7 6	5 4 3	2 1 0
SCORE 9 (RB)	Right Bank 10	8 7 6	5 4 3	2 1 0

Total Score 119 Habitat quality: ☐ fully supporting ☐ supporting/threatened ☐ partially supporting ☒ not supporting

DRA/A & G, 07-316B1, 03-19-07

PHYSICAL CHARACTERIZATION/WATER QUALITY DATA SHEET

Stream Name UTLC-2 **Aquatic Sampling Station Number** 1

Weather Conditions: Now / Past 24 hrs.
- [ ] / [ ] storm (heavy rain)
- [X] / [X] rain (steady rain)
- [ ] / [ ] showers (intermittent)
- [ ] / [ ] clear/sunny

Has there been a heavy rain in the last 7 days? [X] Yes [ ] No
Air Temperature 55 °F
Other

Stream Characterization:
Stream Subsystem: [ ] Perennial [X] Intermittent
Stream Type: [X] Cold Water [ ] Warm Water
Stream Origin: [X] Spring-fed [ ] Other

Watershed Features:
Predominant Surrounding Land Use: [X] Forest [ ] Commercial [ ] Field/Pasture [ ] Industrial [ ] Agricultural [ ] Residential [X] Other **mining**
Local Watershed Erosion: [ ] None [X] Heavy [ ] Moderate
Stocked trout stream: [ ] Yes [X] No

Riparian Vegetation: (18 Meter Buffer)
Indicate the dominant type and record the dominant species present.
[X] Trees [ ] Shrubs [ ] Grasses [ ] Herbaceous
Dominant Species Present: **Eastern Hemlock, Tulip Poplar, American Beech**

Instream Features:

	width	depth	length
Average stream channel (ft.):	6	0.5	
Average pool (ft.)			
Average riffle (ft.)			
Average run (ft.)			

Dam present: [ ] Yes [X] No
Channelized: [ ] Yes [X] No
Canopy cover: [X] Partly Open [ ] Open [ ] Partly Shaded [ ] Shaded
Proportion of reach represented by stream morphology types: Riffle 100 % Run ___ % Pool ___ %

Aquatic Vegetation: [ ] Rooted [ ] Algae [X] None Portion of the reach with aquatic vegetation ___ %

Water Quality:
Water Odors: [X] Normal [ ] Sewage [ ] Fishy [ ] Petroleum [ ] Chemical [ ] Other
Water Surface Oils: [ ] Slick [ ] Sheen [X] None [ ] Globs [ ] Flecks [ ] Other
Turbidity: [ ] Clear [X] Opaque [ ] Stained [ ] Slightly Turbid [ ] Turbid [ ] Other

Sediment/ Substrate:
Odors: [X] Normal [ ] Sewage [ ] Petroleum [ ] Chemical [ ] Anaerobic [ ] None [ ] Other
Deposits: [ ] Sludge [ ] Sawdust [ ] Paper fiber [X] Sand [ ] Relict shells [ ] Other
Oils: [X] Absent [ ] Slight [ ] Moderate [ ] Profuse
Looking at stones which are not deeply embedded, are the undersides black in color? [X] Yes [ ] No

INORGANIC SUBSTRATE COMPONENTS (should add up to 100%)			ORGANIC SUBSTRATE COMPONENTS (does not necessarily add up to 100%)		
Substrate Type	**Diameter**	**% Composition in Sampling Reach**	**Substrate Type**	**Characteristic**	**% Composition in Sampling Area**
Bedrock			Detritus	sticks, wood coarse plant material	**10**
Boulder	>256 mm (10")				
Cobble	64-256 mm (2.5"-10")	**20**	Muck-Mud	black, very fine organic	**0**
Gravel	2-64 mm (0.1"-2.5")	**40**			
Sand	0.06-2 mm (gritty)	**40**			
Silt	0.004-0.06 mm				
Clay	<0.004 mm (slick)				

FISH SAMPLING DATA SHEET

Stream Name UTLC-2 **Aquatic Sampling Station No.** 1

SAMPLE COLLECTION	**How were the fish captured?** ☐ back pack ☐ tote barge ☐ other _____ **Block nets used?** ☐ YES ☐ NO **Sampling Duration:** Start time _____ End time _____ Duration _____ **Length of stream reach sampled:** _____ **meters**
AVAILABLE FISH HABITAT	**Indicate the percentage of each habitat type present.** Deep pools _____ % Rooted aquatics _____ % Overhanging brush _____ % Undercut bank _____ % Rock ledges _____ % Large rocks _____ % Debris in stream _____ % Other ( ) _____ % Habitat quality: fully supporting ☐ partially supporting ☐ supporting/threatened ☐ not supporting ☐
GENERAL COMMENTS	**Fish survey not conducted.**

SPECIES	TOTAL (COUNT)	ANOMALIES						
		D	E	F	L	M	S	Z

*ANOMALY CODES: D = deformities; E = eroded fins; F = fungus; L = lesions; M = multiple DELT anomalies; S = emaciated; Z = other

BENTHIC MACROINVERTEBRATE SAMPLING DATA SHEET

Stream Name UTLC-1 **Aquatic Sampling Station Number** 1

SAMPLE COLLECTION	**How were the macroinvertebrates captured?** [ ] kick-net [X] D-frame dip net [ ] other _____ **Which RBP sampling approach was used?** [X] single habitat [ ] multihabitat [ ] other _____ **Number of kicks** 4 **Number of jabs** 4 **Length of stream reach sampled:** 30 **meters**
AVAILABLE MACROINVERTEBRATE HABITAT	**Indicate the percentage of each habitat type present.** Cobble 50 % Snags 10 % Vegetated banks 20 % Submerged macrophytes ____ % Sand 20 % Other ( ) ____ % **Habitat quality:** [ ] fully supporting [ ] supporting/threatened [ ] partially supporting [X] not supporting
GENERAL COMMENTS	

Organisms		No.	Organisms		No.
(ORDER) Oligochaeta (aquatic worms)			(ORDER) Megaloptera (dobsonflies, alderflies & fishflies)		
(ORDER) Trichoptera (caddisflies)	**Hydropsychidae**	**9**	(ORDER) Coleoptera (aquatic beetles)	**Psephenidae**	**2**
	Philopotamidae	**1**			
(ORDER) Isopoda (sowbugs)	**Asellidae**	**32**	(ORDER) Diptera (craneflies, midges, mosquitoes, black flies)	**Ceratapondidae**	**1**
				Chironomidae	**12**
				Empididae	**1**
				Tipulidae	**6**
(ORDER) Amphipoda (scuds)			(ORDER) Gastropoda (snails)		
(ORDER) Decapoda (crayfish)			(CLASS) Bivalvia (mussels & clams)		
(ORDER) Ephemeroptera (mayflies)	**Amelitidae**	**3**	(ORDER) Odonata (dragon fly)	**Gomphidae**	**2**
	Baetidae	**4**			
	Ephemerellidae	**4**			
(ORDER) Plecoptera (stoneflies)	**Nemouridae**	**39**	(ORDER) Collembolla (spring tails)		
	Peltoperlidae	**8**			
	Perlodidae	**1**			

Total No. Different Organisms 15

SPECTRUM
LABORATORIES

MAILING: P.O. BOX 1578, COEBURN, VIRGINIA 24230-1578
SHIPPING: 1014 LAUREL AVE., COEBURN, VIRGINIA 24230

Certificate of Analysis

Reporting Address: **DR Allen & Associates**
P.O. Box 573
Abingdon, VA 24212

Laboratory: Spectrum Laboratories
P. O. Box 1578
Coeburn, Virginia 24230

Location Code : DRASWB
Sample Description : DR Allen SWB - (ABS-1)
Sample Lab Number : AC12916
Client Project Number : 06-316B
Comment :

Work Order Number : E-8892
Sample Collector : CLINTSTEELE
Collection Date : 02/21/2007
Collection Time : 10:00:00 AM
Matrix : Water
Received Date / Time : 02/27/2007 14:26

Parameter	*Result*	*Units*	*Reporting Limit*	*Analyst*	*Analysis Date*	*Analysis Time*	*Method Reference*
Acidity Total Hot	<5.8	mg/L	5.8	GFA	02/28/2007	12:00	EPA 305.1
Alkalinity Total	136.0	mg/L	3.0	GFA	02/28/2007	12:00	EPA 310.1
Conductance Specific	502	umho/CM		CSR	02/27/2007	15:30	EPA 120.1
Iron Total	0.561	mg/L	0.025	MRD	03/01/2007	11:21	EPA 200.7
Manganese Total	0.031	mg/L	0.024	MRD	03/01/2007	11:21	EPA 200.7
pH LAB	7.49	Standard units		CSR	02/27/2007	15:30	
Sulfate	19.7	mg/L	0.170	CSR	02/28/2007	17:43	EPA 300.0
Total Dissolved Solids	253.0	mg/L	10.0	GFA	02/28/2007	6:15	EPA 160.3
Total Suspended Solids	18.0	mg/L	1.0	CSR	02/28/2007	8:45	EPA 160.2

Janet L. Musick

Janet L. Musick
Manager of Quality Control
03/05/2007

PHONE (276) 679-7097 • (276) 679-7092
FAX (276) 395-6740

PROJECT NO. 06-316B

FILE NAME ABS-1.PLT

PHOTO DATE 02-21-07

PERMIT/APPLICATION NO. PENDING/1003841

D.R. ALLEN & ASSOCIATES, P.C.

Civil · Environmental · Mining

Abingdon, Virginia

A & G COAL CORPORATION
ISON ROCK SURFACE MINE

ABS-1

HABITAT ASSESSMENT DATA SHEET - HIGH GRADIENT STREAMS

Stream Name **UTLC-4** Aquatic Sampling Station No. **2**

Latitude **36°55'08"** Longitude **82°49'57"** Stream Drainage **Upper Powell River**

Investigators **Jonathan Stamper and Lance DeBord, D.R. Allen & Associates, P.C.**

Date **2/21/2007** Time **11:00 a.m.** Reason for Survey **document existing resources**

Elevation **2100** State **VA** County **Wise**

USGS 7.5 minute topographic map **Appalachia** Stream Order **1st**

Habitat Parameter	Condition Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover, mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at state to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than a desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE 8	20 19 18 17 16	15 14 13 12 11	10 9 **8** 7 6	5 4 3 2 1 0
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE 13	20 19 18 17 16	15 14 **13** 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is <0.3 m/s, deep is >0.5 m.).	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/depth regime (usually slow-deep).
SCORE 8	20 19 18 17 16	15 14 13 12 11	10 9 **8** 7 6	5 4 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% (<20% for low-gradient streams) of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% (20-50% for low gradient) of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% (50-80% for low-gradient) of the bottom affected; sediment deposits at obstructions, constructions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% (80% for low-gradient) of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE 8	20 19 18 17 16	15 14 13 12 11	10 9 **8** 7 6	5 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE 13	20 19 18 17 16	15 14 **13** 12 11	10 9 8 7 6	5 4 3 2 1 0

HABITAT ASSESSMENT DATA SHEET - HIGH GRADIENT STREAMS (cont.)

Habitat Parameter	Condition Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE 11	20 19 18 17 16	15 14 13 12 **11**	10 9 8 7 6	5 4 3 2 1 0
7. Frequency or Riffles (or bends)	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent, distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles, divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.
SCORE 8	20 19 18 17 16	15 14 13 12 11	10 9 **8** 7 6	5 4 3 2 1 0
8. Bank Stability (score each bank) **Note: determine left or right side by facing downstream.**	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE 7 (LB)	Left Bank 10 9	8 **7** 6	5 4 3	2 1 0
SCORE 7 (RB)	Right Bank 10 9	8 **7** 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank)	More than 90% of the stream bank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the stream banks surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the stream banks surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the stream banks surfaces covered by vegetation; disruption of stream banks vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE 9 (LB)	Left Bank 10 **9**	8 7 6	5 4 3	2 1 0
SCORE 9 (RB)	Right Bank 10 **9**	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE 9 (LB)	Left Bank 10 **9**	8 7 6	5 4 3	2 1 0
SCORE 9 (RB)	Right Bank 10	8 7 6	5 4 3	2 1 0

Total Score 119 Habitat quality: ☐ fully supporting ☐ supporting/threatened ☐ partially supporting ☒ not supporting

DRA/A & G, 07-316B1, 03-19-07

PHYSICAL CHARACTERIZATION/WATER QUALITY DATA SHEET

Stream Name UTLC-4 **Aquatic Sampling Station Number** 2

Weather Conditions:

Now	Past 24 hrs.	
[ ]	[ ]	storm (heavy rain)
[X]	[X]	rain (steady rain)
[ ]	[ ]	showers (intermittent)
[ ]	[ ]	clear/sunny

Has there been a heavy rain in the last 7 days? [X] Yes [ ] No

Air Temperature 55 °F

Other _____

Stream Characterization:

Stream Subsystem: [ ] Perennial [X] Intermittent

Stream Type: [X] Cold Water [ ] Warm Water

Stream Origin: [X] Spring-fed [ ] Other _____

Watershed Features:

Predominant Surrounding Land Use: [X] Forest [ ] Commercial [ ] Field/Pasture [ ] Industrial [ ] Agricultural [ ] Residential [X] Other **mining**

Local Watershed Erosion: [ ] None [X] Heavy [ ] Moderate

Stocked trout stream: [ ] Yes [X] No

Riparian Vegetation: (18 Meter Buffer)

Indicate the dominant type and record the dominant species present.

[X] Trees [ ] Shrubs [ ] Grasses [ ] Herbaceous

Dominant Species Present: **Eastern Hemlock, Tulip Poplar, American Beech**

Instream Features:

Average stream channel (ft.):	width	**6**	depth	**0.5**	length		Dam present: [ ] Yes [X] No
Average pool (ft.)	width		depth		length		Channelized: [ ] Yes [X] No
Average riffle (ft.)	width		depth		length		Canopy cover: [X] Partly Open
Average run (ft.)	width		depth		length		[ ] Open

Proportion of reach represented by stream morphology types:

Riffle **100** % Run ____ % Pool ____ %

[ ] Partly Shaded [ ] Shaded

Aquatic Vegetation:

[ ] Rooted [ ] Algae [X] None Portion of the reach with aquatic vegetation _____ %

Water Quality:

Water Odors:	[X] Normal	[ ] Sewage	[ ] Fishy	[ ] Petroleum	[ ] Chemical	[ ] Other	
Water Surface Oils:	[ ] Slick	[ ] Sheen	[X] None	[ ] Globs	[ ] Flecks	[ ] Other	
Turbidity:	[ ] Clear	[X] Opaque	[ ] Stained	[ ] Slightly Turbid	[ ] Turbid	[ ] Other	

Sediment/ Substrate:

Odors: [X] Normal [ ] Sewage [ ] Petroleum [ ] Chemical [ ] Anaerobic [ ] None [ ] Other _____

Deposits: [ ] Sludge [ ] Sawdust [ ] Paper fiber [X] Sand [ ] Relict shells [ ] Other _____

Oils: [X] Absent [ ] Slight [ ] Moderate [ ] Profuse

Looking at stones which are not deeply embedded, are the undersides black in color? [X] Yes [ ] No

INORGANIC SUBSTRATE COMPONENTS (should add up to 100%)			ORGANIC SUBSTRATE COMPONENTS (does not necessarily add up to 100%)		
Substrate Type	**Diameter**	**% Composition in Sampling Reach**	**Substrate Type**	**Characteristic**	**% Composition in Sampling Area**
Bedrock			Detritus	sticks, wood coarse plant material	**10**
Boulder	>256 mm (10")				
Cobble	64-256 mm (2.5"-10")	**20**	Muck-Mud	black, very fine organic	**0**
Gravel	2-64 mm (0.1"-2.5")	**40**			
Sand	0.06-2 mm (gritty)	**40**			
Silt	0.004-0.06 mm				
Clay	<0.004 mm (slick)				

FISH SAMPLING DATA SHEET

Stream Name UTLC-4 **Aquatic Sampling Station No.** 2

SAMPLE COLLECTION	**How were the fish captured?** ☐ back pack ☐ tote barge ☐ other _____ **Block nets used?** ☐ YES ☐ NO **Sampling Duration:** Start time _____ End time _____ Duration _____ **Length of stream reach sampled:** _____ **meters**
AVAILABLE FISH HABITAT	**Indicate the percentage of each habitat type present.** Deep pools _____ % Rooted aquatics _____ % Overhanging brush _____ % Undercut bank _____ % Rock ledges _____ % Large rocks _____ % Debris in stream _____ % Other ( ) _____ % Habitat quality: fully supporting ☐ partially supporting ☐ supporting/threatened ☐ not supporting ☐
GENERAL COMMENTS	**Fish survey not conducted.**

SPECIES	TOTAL (COUNT)	ANOMALIES						
		D	E	F	L	M	S	Z

*ANOMALY CODES: D = deformities; E = eroded fins; F = fungus; L = lesions; M = multiple DELT anomalies; S = emaciated; Z = other

BENTHIC MACROINVERTEBRATE SAMPLING DATA SHEET

Stream Name UTLC-4 **Aquatic Sampling Station Number** 2

SAMPLE COLLECTION	**How were the macroinvertebrates captured?** [ ] kick-net [X] D-frame dip net [ ] other _____ **Which RBP sampling approach was used?** [X] single habitat [ ] multihabitat [ ] other _____ **Number of kicks** 4 **Number of jabs** 4 **Length of stream reach sampled:** 25 **meters**
AVAILABLE MACROINVERTEBRATE HABITAT	**Indicate the percentage of each habitat type present.** Cobble 60 % Snags 10 % Vegetated banks 10 % Submerged macrophytes ____ % Sand 20 % Other ( ) ____ % **Habitat quality:** [ ] fully supporting [ ] supporting/threatened [ ] partially supporting [X] not supporting
GENERAL COMMENTS	

Organisms		No.	Organisms		No.
(ORDER) Oligochaeta (aquatic worms)	**Oligochaeta**	**5**	(ORDER) Megaloptera (dobsonflies, alderflies & fishflies)		
(ORDER) Trichoptera (caddisflies)	**Hydropsychidae**	**2**	(ORDER) Coleoptera (aquatic beetles)		
	Limnephilidae	**3**			
	Rhyacophilidae	**2**			
	Ueonoidae	**1**			
(ORDER) Isopoda (sowbugs)			(ORDER) Diptera (craneflies, midges, mosquitoes, black flies)	**Ceratapogonidae**	**2**
				Chironomidae	**14**
				Tipulidae	**3**
(ORDER) Amphipoda (scuds)			(ORDER) Gastropoda (snails)		
(ORDER) Decapoda (crayfish)			(CLASS) Bivalvia (mussels & clams)		
(ORDER) Ephemeroptera (mayflies)	**Amelitidae**	**4**	(ORDER) Odonata (dragon fly)		
(ORDER) Plecoptera (stoneflies)	**Capniidae**	**7**	(ORDER) Collembolla (spring tails)	**Entomobryidae**	**1**
	Chloroperlidae	**1**			
	Nemouridae	**52**			
	Perlodidae	**5**			

Total No. Different Organisms 14

SPECTRUM
LABORATORIES

MAILING: P.O. BOX 1578, COEBURN, VIRGINIA 24230-1578
SHIPPING: 1014 LAUREL AVE., COEBURN, VIRGINIA 24230

Certificate of Analysis

Reporting Address: **DR Allen & Associates**
P.O. Box 573
Abingdon, VA 24212

Laboratory: Spectrum Laboratories
P. O. Box 1578
Coeburn, Virginia 24230

Location Code : DRASWB
Sample Description : DR Allen SWB - (ABS-2)
Sample Lab Number : AC12917
Client Project Number : 06-316B
Comment :

Work Order Number : E-8892
Sample Collector : CLINT STEELE
Collection Date : 02/21/2007
Collection Time : 10:30:00 AM
Matrix : Water
Received Date / Time : 02/27/2007 14:26

Parameter	*Result*	*Units*	*Reporting Limit*	*Analyst*	*Analysis Date*	*Analysis Time*	*Method Reference*
Acidity Total Hot	<5.8	mg/L	5.8	GFA	02/28/2007	12:00	EPA 305.1
Alkalinity Total	119.0	mg/L	3.0	GFA	02/28/2007	12:00	EPA 310.1
Conductance Specific	373	umho/CM		CSR	02/27/2007	15:30	EPA 120.1
Iron Total	0.091	mg/L	0.025	MRD	03/01/2007	11:24	EPA 200.7
Manganese Total	<0.024	mg/L	0.024	MRD	03/01/2007	11:24	EPA 200.7
pH LAB	7.77	Standard units		CSR	02/27/2007	15:30	
Sulfate	30.8	mg/L	0.170	CSR	02/28/2007	17:50	EPA 300.0
Total Dissolved Solids	209.0	mg/L	10.0	GFA	02/28/2007	6:15	EPA 160.3
Total Suspended Solids	6.0	mg/L	1.0	CSR	02/28/2007	8:45	EPA 160.2

Janet L. Musick

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Manager of Quality Control
03/05/2007

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PROJECT NO. 06-316B

FILE NAME ABS-2.PLT

PHOTO DATE 02-21-07

PERMIT/APPLICATION NO. PENDING/1003841

D.R. ALLEN & ASSOCIATES, P.C.

Civil · Environmental · Mining

Abingdon, Virginia

A & G COAL CORPORATION
ISON ROCK SURFACE MINE

ABS-2

HABITAT ASSESSMENT DATA SHEET - HIGH GRADIENT STREAMS

Stream Name **UTCC-1** Aquatic Sampling Station No. **3**

Latitude **36°55'08"** Longitude **82°49'57"** Stream Drainage **Upper Powell River**

Investigators **Clint Steele and Aaron Brown, D.R. Allen & Associates, P.C.**

Date **2/21/2007** Time **11:00 a.m.** Reason for Survey **document existing resources**

Elevation **2200** State **VA** County **Wise**

USGS 7.5 minute topographic map **Appalachia** Stream Order **1st**

Habitat Parameter	Condition Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover, mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at state to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than a desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE 14	20 19 18 17 16	15 **14** 13 12 11	10 9 8 7 6	5 4 3 2 1 0
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE 10	20 19 18 17 16	15 14 13 12 11	**10** 9 8 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is <0.3 m/s, deep is >0.5 m.).	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/depth regime (usually slow-deep).
SCORE 5	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	**5** 4 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% (<20% for low-gradient streams) of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% (20-50% for low gradient) of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% (50-80% for low-gradient) of the bottom affected; sediment deposits at obstructions, constructions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% (80% for low-gradient) of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE 8	20 19 18 17 16	15 14 13 12 11	10 9 **8** 7 6	5 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE 10	20 19 18 17 16	15 14 13 12 11	**10** 9 8 7 6	5 4 3 2 1 0

HABITAT ASSESSMENT DATA SHEET - HIGH GRADIENT STREAMS (cont.)

Habitat Parameter	Condition Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE 14	20 19 18 17 16	15 **14** 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency or Riffles (or bends)	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent, distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles, divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.
SCORE 6	20 19 18 17 16	15 14 13 12 11	10 9 **8** 7 **6**	5 4 3 2 1 0
8. Bank Stability (score each bank) **Note: determine left or right side by facing downstream.**	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE 7 (LB)	Left Bank 10 9	8 **7** 6	5 4 3	2 1 0
SCORE 7 (RB)	Right Bank 10 9	8 **7** 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank)	More than 90% of the stream bank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the stream banks surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the stream banks surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the stream banks surfaces covered by vegetation; disruption of stream banks vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE 7 (LB)	Left Bank 10 9	8 **7** **6**	5 4 3	2 1 0
SCORE 7 (RB)	Right Bank 10 9	8 **7** 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE 9 (LB)	Left Bank 10 **9**	8 7 6	5 4 3	2 1 0
SCORE 8 (RB)	Right Bank 10 9	**8** 7 6	5 4 3	2 1 0

Total Score 112 Habitat quality: [ ] fully supporting [ ] supporting/threatened [ ] partially supporting [X] not supporting

DRA/A & G, 06-316B1, 03-19-07

PHYSICAL CHARACTERIZATION/WATER QUALITY DATA SHEET

Stream Name UTCC-1 **Aquatic Sampling Station Number** 3

Weather Conditions:

Now	Past 24 hrs.	
[ ]	[ ]	storm (heavy rain)
[X]	[X]	rain (steady rain)
[ ]	[ ]	showers (intermittent)
[ ]	[ ]	clear/sunny

Has there been a heavy rain in the last 7 days? [X] Yes [ ] No

Air Temperature 55 °F

Other _____

Stream Characterization:

Stream Subsystem: [ ] Perennial [X] Intermittent

Stream Type: [X] Cold Water [ ] Warm Water

Stream Origin: [X] Spring-fed [ ] Other _____

Watershed Features:

Predominant Surrounding Land Use: [X] Forest [ ] Commercial [ ] Field/Pasture [ ] Industrial [ ] Agricultural [ ] Residential [X] Other **mining**

Local Watershed Erosion: [ ] None [X] Heavy [ ] Moderate

Stocked trout stream: [ ] Yes [X] No

Riparian Vegetation: (18 Meter Buffer)

Indicate the dominant type and record the dominant species present.

[X] Trees [ ] Shrubs [ ] Grasses [ ] Herbaceous

Dominant Species Present: **Eastern Hemlock, Tulip Poplar, American Beech**

Instream Features:

Average stream channel (ft.):	width	**6**	depth	**0.5**	length		Dam present: [ ] Yes [X] No
Average pool (ft.)	width		depth		length		Channelized: [ ] Yes [X] No
Average riffle (ft.)	width		depth		length		Canopy cover: [X] Partly Open
Average run (ft.)	width		depth		length		[ ] Open

Proportion of reach represented by stream morphology types:

Riffle **100** % Run ____ % Pool ____ %

[ ] Partly Shaded [ ] Shaded

Aquatic Vegetation:

[ ] Rooted [ ] Algae [X] None Portion of the reach with aquatic vegetation _____ %

Water Quality:

Water Odors:	[X] Normal	[ ] Sewage	[ ] Fishy	[ ] Petroleum	[ ] Chemical	[ ] Other	
Water Surface Oils:	[ ] Slick	[ ] Sheen	[X] None	[ ] Globs	[ ] Flecks	[ ] Other	
Turbidity:	[ ] Clear	[X] Opaque	[ ] Stained	[ ] Slightly Turbid	[ ] Turbid	[ ] Other	

Sediment/ Substrate:

Odors: [X] Normal [ ] Sewage [ ] Petroleum [ ] Chemical [ ] Anaerobic [ ] None [ ] Other _____

Deposits: [ ] Sludge [ ] Sawdust [ ] Paper fiber [X] Sand [ ] Relict shells [ ] Other _____

Oils: [X] Absent [ ] Slight [ ] Moderate [ ] Profuse

Looking at stones which are not deeply embedded, are the undersides black in color? [X] Yes [ ] No

INORGANIC SUBSTRATE COMPONENTS (should add up to 100%)			ORGANIC SUBSTRATE COMPONENTS (does not necessarily add up to 100%)		
Substrate Type	**Diameter**	**% Composition in Sampling Reach**	**Substrate Type**	**Characteristic**	**% Composition in Sampling Area**
Bedrock			Detritus	sticks, wood coarse plant material	**10**
Boulder	>256 mm (10")				
Cobble	64-256 mm (2.5"-10")	**20**	Muck-Mud	black, very fine organic	**0**
Gravel	2-64 mm (0.1"-2.5")	**40**			
Sand	0.06-2 mm (gritty)	**40**			
Silt	0.004-0.06 mm				
Clay	<0.004 mm (slick)				

FISH SAMPLING DATA SHEET

Stream Name UTCC-1 **Aquatic Sampling Station No.** 3

SAMPLE COLLECTION	**How were the fish captured?** ☐ back pack ☐ tote barge ☐ other _____ **Block nets used?** ☐ YES ☐ NO **Sampling Duration:** Start time _____ End time _____ Duration _____ **Length of stream reach sampled:** _____ **meters**
AVAILABLE FISH HABITAT	**Indicate the percentage of each habitat type present.** Deep pools _____ % Rooted aquatics _____ % Overhanging brush _____ % Undercut bank _____ % Rock ledges _____ % Large rocks _____ % Debris in stream _____ % Other ( ) _____ % Habitat quality: fully supporting ☐ partially supporting ☐ supporting/threatened ☐ not supporting ☐
GENERAL COMMENTS	**Fish survey not conducted.**

SPECIES	TOTAL (COUNT)	ANOMALIES						
		D	E	F	L	M	S	Z

*ANOMALY CODES: D = deformities; E = eroded fins; F = fungus; L = lesions; M = multiple DELT anomalies; S = emaciated; Z = other

BENTHIC MACROINVERTEBRATE SAMPLING DATA SHEET

Stream Name UTCC-1 **Aquatic Sampling Station Number** 3

SAMPLE COLLECTION	**How were the macroinvertebrates captured?** [ ] kick-net [X] D-frame dip net [ ] other _____ **Which RBP sampling approach was used?** [X] single habitat [ ] multihabitat [ ] other _____ **Number of kicks** 5 **Number of jabs** 4 **Length of stream reach sampled:** 20 **meters**
AVAILABLE MACROINVERTEBRATE HABITAT	**Indicate the percentage of each habitat type present.** Cobble 40 % Snags 10 % Vegetated banks 10 % Submerged macrophytes ____ % Sand 50 % Other ( ) ____ % **Habitat quality:** [ ] fully supporting [ ] supporting/threatened [ ] partially supporting [X] not supporting
GENERAL COMMENTS	

Organisms		No.	Organisms		No.
(ORDER) Oligochaeta (aquatic worms)			(ORDER) Megaloptera (dobsonflies, alderflies & fishflies)		
(ORDER) Trichoptera (caddisflies)	**Hydropsychidae**	12	(ORDER) Coleoptera (aquatic beetles)	**Chironomidae**	21
	Rhyacophilidae	2			
(ORDER) Isopoda (sowbugs)			(ORDER) Diptera (craneflies, midges, mosquitoes, black flies)		
(ORDER) Amphipoda (scuds)			(ORDER) Gastropoda (snails)		
(ORDER) Decapoda (crayfish)			(CLASS) Bivalvia (mussels & clams)		
(ORDER) Ephemeroptera (mayflies)	**Baetidae**	1	(ORDER) Odonata (dragon fly)	**Gomphidae**	1
	Ephemerellidae	9			
(ORDER) Plecoptera (stoneflies)	**Capniidae**	55	(ORDER) Collembolla (spring tails)	**Entomobryidae**	1
	Nemouridae	11			
	Peltoperlidae	6			

Total No. Different Organisms 10

SPECTRUM
LABORATORIES

MAILING: P.O. BOX 1578, COEBURN, VIRGINIA 24230-1578
SHIPPING: 1014 LAUREL AVE., COEBURN, VIRGINIA 24230

Certificate of Analysis

Reporting Address: **DR Allen & Associates**
P.O. Box 573
Abingdon, VA 24212

Laboratory: Spectrum Laboratories
P. O. Box 1578
Coeburn, Virginia 24230

Location Code : DRASWB
Sample Description : DR Allen SWB - (ABS-3)
Sample Lab Number : AC14290
Client Project Number : 07-316B1
Comment :

Work Order Number : E-8902
Sample Collector : CLINT STEELE
Collection Date : 3/20/2007
Collection Time : 12:00:00 AM
Matrix : Water
Received Date / Time : 3/20/2007 10:34

Parameter	*Result*	*Units*	*Reporting Limit*	*Analyst*	*Analysis Date*	*Analysis Time*	*Method Reference*
Conductance Specific	383	umho/CM		CSR	3/20/2007	10:53	EPA 120.1

Janet L. Musick

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PROJECT NO. 06-3168

FILE NAME ABS-3.PLT

PHOTO DATE 02-21-07

PERMIT/APPLICATION NO. PENDING/1003841

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Civil • Environmental • Mining

Abingdon, Virginia

A & G COAL CORPORATION
ISON ROCK SURFACE MINE

ABS-3

HABITAT ASSESSMENT DATA SHEET - HIGH GRADIENT STREAMS

Stream Name **UTPC-1** Aquatic Sampling Station No. **4**

Latitude **36°55'25"** Longitude **82°49'01"** Stream Drainage **Upper Powell River**

Investigators **Clint Steele and Aaron Brown, D.R. Allen & Associates, P.C.**

Date **2/21/2007** Time **11:30 a.m.** Reason for Survey **document existing resources**

Elevation **2200** State **VA** County **Wise**

USGS 7.5 minute topographic map **Appalachia** Stream Order **1st**

Habitat Parameter	Condition Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover, mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at state to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than a desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE 10	20 19 18 17 16	15 **14** 13 12 11	**10** 9 8 7 6	5 4 3 2 1 0
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE 6	20 19 18 17 16	15 14 13 12 11	10 9 8 7 **6**	5 4 3 2 1 0
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is <0.3 m/s, deep is >0.5 m.).	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/depth regime (usually slow-deep).
SCORE 5	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	**5** 4 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% (<20% for low-gradient streams) of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% (20-50% for low gradient) of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% (50-80% for low-gradient) of the bottom affected; sediment deposits at obstructions, constructions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% (80% for low-gradient) of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE 8	20 19 18 17 16	15 14 13 12 11	10 9 **8** 7 6	5 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE 8	20 19 18 17 16	15 14 13 12 11	10 9 **8** 7 6	5 4 3 2 1 0

HABITAT ASSESSMENT DATA SHEET - HIGH GRADIENT STREAMS (cont.)

Habitat Parameter	Condition Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE 11	20 19 18 17 16	15 14 13 12 **11**	10 9 8 7 6	5 4 3 2 1 0
7. Frequency or Riffles (or bends)	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent, distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles, divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.
SCORE 6	20 19 18 17 16	15 14 13 12 11	10 9 8 7 **6**	5 4 3 2 1 0
8. Bank Stability (score each bank) **Note: determine left or right side by facing downstream.**	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE 4 (LB)	Left Bank 10 9	8 7 6	5 **4** 3	2 1 0
SCORE 7 (RB)	Right Bank 10 9	8 **7** 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank)	More than 90% of the stream bank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the stream banks surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the stream banks surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the stream banks surfaces covered by vegetation; disruption of stream banks vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE 7 (LB)	Left Bank 10 9	8 **7** **6**	5 4 3	2 1 0
SCORE 5 (RB)	Right Bank 10 9	8 7 6	**5** 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE 5 (LB)	Left Bank 10 **9**	8 7 6	**5** 4 3	2 1 0
SCORE 7 (RB)	Right Bank 10 9	8 **7** 6	5 4 3	2 1 0

Total Score 95 Habitat quality: [ ] fully supporting [ ] supporting/threatened [ ] partially supporting [X] not supporting

DRA/A & G, 07-316B1, 03-19-07

PHYSICAL CHARACTERIZATION/WATER QUALITY DATA SHEET

Stream Name UTPC-1 **Aquatic Sampling Station Number** 4

Weather Conditions: Now / Past 24 hrs.
- [ ] / [ ] storm (heavy rain)
- [X] / [X] rain (steady rain)
- [ ] / [ ] showers (intermittent)
- [ ] / [ ] clear/sunny

Has there been a heavy rain in the last 7 days? [X] Yes [ ] No
Air Temperature 55 °F
Other

Stream Characterization:
Stream Subsystem: [ ] Perennial [X] Intermittent
Stream Type: [X] Cold Water [ ] Warm Water
Stream Origin: [X] Spring-fed [ ] Other

Watershed Features:
Predominant Surrounding Land Use: [X] Forest [ ] Commercial [ ] Field/Pasture [ ] Industrial [ ] Agricultural [ ] Residential [X] Other **mining**
Local Watershed Erosion: [ ] None [X] Heavy [ ] Moderate
Stocked trout stream: [ ] Yes [X] No

Riparian Vegetation: (18 Meter Buffer)
Indicate the dominant type and record the dominant species present.
[X] Trees [ ] Shrubs [ ] Grasses [ ] Herbaceous
Dominant Species Present: **Eastern Hemlock, Tulip Poplar, American Beech**

Instream Features:
Average stream channel (ft.): width **6.2** depth **0.74** length
Average pool (ft.) width depth length
Average riffle (ft.) width depth length
Average run (ft.) width depth length
Proportion of reach represented by stream morphology types:
Riffle **100** % Run % Pool %
Dam present: [ ] Yes [X] No
Channelized: [ ] Yes [X] No
Canopy cover: [X] Partly Open [ ] Open [ ] Partly Shaded [ ] Shaded

Aquatic Vegetation: [ ] Rooted [ ] Algae [X] None Portion of the reach with aquatic vegetation %

Water Quality:
Water Odors: [X] Normal [ ] Sewage [ ] Fishy [ ] Petroleum [ ] Chemical [ ] Other
Water Surface Oils: [ ] Slick [ ] Sheen [X] None [ ] Globs [ ] Flecks [ ] Other
Turbidity: [ ] Clear [X] Opaque [ ] Stained [ ] Slightly Turbid [ ] Turbid [ ] Other

Sediment/ Substrate:
Odors: [X] Normal [ ] Sewage [ ] Petroleum [ ] Chemical [ ] Anaerobic [ ] None [ ] Other
Deposits: [ ] Sludge [ ] Sawdust [ ] Paper fiber [X] Sand [ ] Relict shells [ ] Other
Oils: [X] Absent [ ] Slight [ ] Moderate [ ] Profuse
Looking at stones which are not deeply embedded, are the undersides black in color? [X] Yes [ ] No

INORGANIC SUBSTRATE COMPONENTS (should add up to 100%)			ORGANIC SUBSTRATE COMPONENTS (does not necessarily add up to 100%)		
Substrate Type	**Diameter**	**% Composition in Sampling Reach**	**Substrate Type**	**Characteristic**	**% Composition in Sampling Area**
Bedrock			Detritus	sticks, wood coarse plant material	**10**
Boulder	>256 mm (10")				
Cobble	64-256 mm (2.5"-10")	**20**	Muck-Mud	black, very fine organic	**0**
Gravel	2-64 mm (0.1"-2.5")	**40**			
Sand	0.06-2 mm (gritty)	**40**			
Silt	0.004-0.06 mm				
Clay	<0.004 mm (slick)				

FISH SAMPLING DATA SHEET

Stream Name UTPC-1 **Aquatic Sampling Station No.** 4

SAMPLE COLLECTION	**How were the fish captured?** ☐ back pack ☐ tote barge ☐ other _____ **Block nets used?** ☐ YES ☐ NO **Sampling Duration:** Start time _____ End time _____ Duration _____ **Length of stream reach sampled:** _____ **meters**
AVAILABLE FISH HABITAT	**Indicate the percentage of each habitat type present.** Deep pools _____ % Rooted aquatics _____ % Overhanging brush _____ % Undercut bank _____ % Rock ledges _____ % Large rocks _____ % Debris in stream _____ % Other ( ) _____ % Habitat quality: fully supporting ☐ partially supporting ☐ supporting/threatened ☐ not supporting ☐
GENERAL COMMENTS	**Fish survey not conducted.**

SPECIES	TOTAL (COUNT)	ANOMALIES						
		D	E	F	L	M	S	Z

*ANOMALY CODES: D = deformities; E = eroded fins; F = fungus; L = lesions; M = multiple DELT anomalies; S = emaciated; Z = other

BENTHIC MACROINVERTEBRATE SAMPLING DATA SHEET

Stream Name UTPC-1 **Aquatic Sampling Station Number** 4

SAMPLE COLLECTION	**How were the macroinvertebrates captured?** [ ] kick-net [X] D-frame dip net [ ] other _____ **Which RBP sampling approach was used?** [X] single habitat [ ] multihabitat [ ] other _____ **Number of kicks** 5 **Number of jabs** 4 **Length of stream reach sampled:** 20 **meters**
AVAILABLE MACROINVERTEBRATE HABITAT	**Indicate the percentage of each habitat type present.** Cobble 25 % Snags ____ % Vegetated banks 10 % Submerged macrophytes ____ % Sand 65 % Other ( ) ____ % **Habitat quality:** [ ] fully supporting [ ] supporting/threatened [ ] partially supporting [X] not supporting
GENERAL COMMENTS	

Organisms		No.	Organisms		No.
(ORDER) Oligochaeta (aquatic worms)			(ORDER) Megaloptera (dobsonflies, alderflies & fishflies)		
(ORDER) Trichoptera (caddisflies)	**Hydropsychidae**	2	(ORDER) Coleoptera (aquatic beetles)		
	Limnephilidae	2			
(ORDER) Isopoda (sowbugs)			(ORDER) Diptera (craneflies, midges, mosquitoes, black flies)	**Ceratapogonidae**	6
				Chironomidae	97
				Dixidae	1
				Tipulidae	1
(ORDER) Amphipoda (scuds)			(ORDER) Gastropoda (snails)		
(ORDER) Decapoda (crayfish)			(CLASS) Bivalvia (mussels & clams)		
(ORDER) Ephemeroptera (mayflies)	**Ameletidae**	3	(ORDER) Odonata (dragon fly)		
(ORDER) Plecoptera (stoneflies)	**Capniidae**	2	(ORDER) Collembolla (spring tails)	**Entomobryidae**	3
	Nemouridae	6			
	Perlodidae	3			

Total No. Different Organisms 11

SPECTRUM
LABORATORIES

MAILING: P.O. BOX 1578, COEBURN, VIRGINIA 24230-1578
SHIPPING: 1014 LAUREL AVE., COEBURN, VIRGINIA 24230

Certificate of Analysis

Reporting Address: **DR Allen & Associates**
P.O. Box 573
Abingdon, VA 24212

Laboratory: Spectrum Laboratories
P. O. Box 1578
Coeburn, Virginia 24230

Location Code : DRASWB
Sample Description : DR Allen SWB - (ABS-4)
Sample Lab Number : AC12919
Client Project Number : 06-316B
Comment :

Work Order Number : E-8892
Sample Collector : CLINT STEELE
Collection Date : 02/21/2007
Collection Time : 11:00:00 AM
Matrix : Water
Received Date / Time : 02/27/2007 14:26

Parameter	*Result*	*Units*	*Reporting Limit*	*Analyst*	*Analysis Date*	*Analysis Time*	*Method Reference*
Acidity Total Hot	<5.8	mg/L	5.8	GFA	02/28/2007	12:00	EPA 305.1
Alkalinity Total	123.0	mg/L	3.0	GFA	02/28/2007	12:00	EPA 310.1
Conductance Specific	370	umho/CM		CSR	02/27/2007	15:30	EPA 120.1
Iron Total	1.99	mg/L	0.025	MRD	03/01/2007	11:29	EPA 200.7
Manganese Total	0.045	mg/L	0.024	MRD	03/01/2007	11:29	EPA 200.7
pH LAB	7.88	Standard units		CSR	02/27/2007	15:30	
Sulfate	78.9	mg/L	0.170	CSR	02/28/2007	18:30	EPA 300.0
Total Dissolved Solids	210.0	mg/L	10.0	GFA	02/28/2007	6:15	EPA 160.3
Total Suspended Solids	39.0	mg/L	1.0	CSR	02/28/2007	8:45	EPA 160.2

Janet L. Musick

Janet L. Musick
Manager of Quality Control
03/05/2007

PHONE (276) 679-7097 • (276) 679-7092
FAX (276) 395-6740

PROJECT NO. 06-3168

FILE NAME ABS-4.PLT

PHOTO DATE 02-21-07

PERMIT/APPLICATION NO. PENDING/1003841

D.R. ALLEN & ASSOCIATES, P.C.

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ABS-4

HABITAT ASSESSMENT DATA SHEET - HIGH GRADIENT STREAMS

Stream Name **Kelly Branch** Aquatic Sampling Station No. **5**

Latitude **36°55'38"** Longitude **82°46'28"** Stream Drainage **Upper Powell River**

Investigators **Clint Steele and Lance DeBord, D.R. Allen & Associates, P.C.**

Date **3/21/2007** Time **12:30 p.m.** Reason for Survey **document existing resources**

Elevation **2100** State **VA** County **Wise**

USGS 7.5 minute topographic map **Appalachia** Stream Order **1st**

Habitat Parameter	Condition Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover, mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at state to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than a desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE 1	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 **1** 0
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE 1	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 **1** 0
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is <0.3 m/s, deep is >0.5 m.).	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/depth regime (usually slow-deep).
SCORE 1	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	**5** 4 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% (<20% for low-gradient streams) of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% (20-50% for low gradient) of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% (50-80% for low-gradient) of the bottom affected; sediment deposits at obstructions, constructions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% (80% for low-gradient) of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE 1	20 19 18 17 16	15 14 13 12 11	10 9 **8** 7 6	5 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE 1	20 19 18 17 16	15 14 13 12 11	10 9 **8** 7 6	5 4 3 2 1 0

HABITAT ASSESSMENT DATA SHEET - HIGH GRADIENT STREAMS (cont.)

Habitat Parameter	Condition Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE 1	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 **1** 0
7. Frequency or Riffles (or bends)	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natura obstruction is important.	Occurrence of riffles infrequent, distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles, divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.
SCORE 1	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 **1** 0
8. Bank Stability (score each bank) **Note: determine left or right side by facing downstream.**	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE 9 (LB)	Left Bank 10 **9**	8 7 6	5 4 3	2 1 0
SCORE 9 (RB)	Right Bank 10 **9**	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank)	More than 90% of the stream bank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the stream banks surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the stream banks surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the stream banks surfaces covered by vegetation; disruption of stream banks vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE 0 (LB)	Left Bank 10 9	8 7 **6**	5 4 3	2 1 **0**
SCORE 1 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 **1** 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE 0 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 **0**
SCORE 1 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 **1** 0

Total Score 27 Habitat quality: [ ] fully supporting [ ] supporting/threatened [ ] partially supporting [X] not supporting

PHYSICAL CHARACTERIZATION/WATER QUALITY DATA SHEET

Stream Name Kelly Branch **Aquatic Sampling Station Number** 5

Weather Conditions: Now / Past 24 hrs.
- [ ] [ ] storm (heavy rain)
- [ ] [ ] rain (steady rain)
- [ ] [ ] showers (intermittent)
- [X] [X] clear/sunny

Has there been a heavy rain in the last 7 days? [ ] Yes [X] No
Air Temperature 65 °F
Other

Stream Characterization:
Stream Subsystem: [ ] Perennial [X] Intermittent
Stream Type: [X] Cold Water [ ] Warm Water
Stream Origin: [X] Spring-fed [ ] Other

Watershed Features:
Predominant Surrounding Land Use: [ ] Forest [ ] Commercial [ ] Field/Pasture [ ] Industrial [ ] Agricultural [ ] Residential [X] Other mining
Local Watershed Erosion: [ ] None [X] Heavy [ ] Moderate
Stocked trout stream: [ ] Yes [X] No

Riparian Vegetation: (18 Meter Buffer)
Indicate the dominant type and record the dominant species present.
[ ] Trees [ ] Shrubs [X] Grasses [ ] Herbaceous
Dominant Species Present: Fescue

Instream Features:

Average stream channel (ft.):	width	N/A	depth	N/A	length	300	Dam present: [ ] Yes [X] No
Average pool (ft.)	width		depth		length		Channelized: [X] Yes [ ] No
Average riffle (ft.)	width		depth		length		Canopy cover: [ ] Partly Open
Average run (ft.)	width		depth		length		[X] Open

Proportion of reach represented by stream morphology types:
Riffle 100 % Run ____ % Pool ____ %
[ ] Partly Shaded [ ] Shaded

Aquatic Vegetation:
[ ] Rooted [ ] Algae [X] None Portion of the reach with aquatic vegetation ____ %

Water Quality:
Water Odors: [X] Normal [ ] Sewage [ ] Fishy [ ] Petroleum [ ] Chemical [ ] Other
Water Surface Oils: [ ] Slick [ ] Sheen [X] None [ ] Globs [ ] Flecks [ ] Other
Turbidity: [ ] Clear [X] Opaque [ ] Stained [ ] Slightly Turbid [ ] Turbid [ ] Other

Sediment/ Substrate:
Odors: [X] Normal [ ] Sewage [ ] Petroleum [ ] Chemical [ ] Anaerobic [ ] None [ ] Other
Deposits: [ ] Sludge [ ] Sawdust [ ] Paper fiber [X] Sand [ ] Relict shells [ ] Other
Oils: [X] Absent [ ] Slight [ ] Moderate [ ] Profuse
Looking at stones which are not deeply embedded, are the undersides black in color? [X] Yes [ ] No

INORGANIC SUBSTRATE COMPONENTS (should add up to 100%)			ORGANIC SUBSTRATE COMPONENTS (does not necessarily add up to 100%)		
Substrate Type	**Diameter**	**% Composition in Sampling Reach**	**Substrate Type**	**Characteristic**	**% Composition in Sampling Area**
Bedrock			Detritus	sticks, wood coarse plant material	**0**
Boulder	>256 mm (10")	**99**			
Cobble	64-256 mm (2.5"-10")	**1**	Muck-Mud	black, very fine organic	**0**
Gravel	2-64 mm (0.1"-2.5")				
Sand	0.06-2 mm (gritty)				
Silt	0.004-0.06 mm				
Clay	<0.004 mm (slick)				

FISH SAMPLING DATA SHEET

Stream Name Kelly Branch **Aquatic Sampling Station No.** 5

SAMPLE COLLECTION	**How were the fish captured?** ☐ back pack ☐ tote barge ☐ other _____ **Block nets used?** ☐ YES ☐ NO **Sampling Duration:** Start time _____ End time _____ Duration _____ **Length of stream reach sampled:** _____ **meters**
AVAILABLE FISH HABITAT	**Indicate the percentage of each habitat type present.** Deep pools _____ % Rooted aquatics _____ % Overhanging brush _____ % Undercut bank _____ % Rock ledges _____ % Large rocks _____ % Debris in stream _____ % Other ( ) _____ % Habitat quality: fully supporting ☐ partially supporting ☐ supporting/threatened ☐ not supporting ☐
GENERAL COMMENTS	**Fish not present in stream.**

SPECIES	TOTAL (COUNT)	ANOMALIES						
		D	E	F	L	M	S	Z

*ANOMALY CODES: D = deformities; E = eroded fins; F = fungus; L = lesions; M = multiple DELT anomalies; S = emaciated; Z = other

BENTHIC MACROINVERTEBRATE SAMPLING DATA SHEET

Stream Name Kelly Branch **Aquatic Sampling Station Number** 5

SAMPLE COLLECTION	**How were the macroinvertebrates captured?** ☐ kick-net ☐ D-frame dip net ☐ other _____ **Which RBP sampling approach was used?** ☐ single habitat ☐ multihabitat ☐ other _____ **Number of kicks** _____ **Number of jabs** _____ **Length of stream reach sampled:** _____ **meters**
AVAILABLE MACROINVERTEBRATE HABITAT	**Indicate the percentage of each habitat type present.** Cobble 1 % Snags _____ % Vegetated banks _____ % Submerged macrophytes _____ % Sand _____ % Other ( ) _____ % **Habitat quality:** ☐ fully supporting ☐ supporting/threatened ☐ partially supporting ☒ not supporting
GENERAL COMMENTS	**Unable to collect benthos sample due to existing condition of stream, see photo.**

Organisms		No.	Organisms		No.
(ORDER) Oligochaeta (aquatic worms)			(ORDER) Megaloptera (dobsonflies, alderflies & fishflies)		
(ORDER) Trichoptera (caddisflies)			(ORDER) Coleoptera (aquatic beetles)		
(ORDER) Isopoda (sowbugs)			(ORDER) Diptera (craneflies, midges, mosquitoes, black flies)		
(ORDER) Amphipoda (scuds)			(ORDER) Gastropoda (snails)		
(ORDER) Decapoda (crayfish)			(CLASS) Bivalvia (mussels & clams)		
(ORDER) Ephemeroptera (mayflies)			(ORDER) Odonata (dragon fly)		
(ORDER) Plecoptera (stoneflies)			(ORDER) Collembolla (spring tails)		

Total No. Different Organisms _____

PROJECT NO. 06-316B

FILE NAME ABS-5.PLT

PHOTO DATE 03-22-07

PERMIT/APPLICATION NO. PENDING/1003841

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ABS-5

APPENDIX B

DELINEATION OF SPECIAL AQUATIC SITES - FLUVIAL GEOMORPHOLOGICAL DATA

FLUVIAL GEOMORPHOLOGICAL DATA

(UTPC-1)

Stream Channel Classification
Dimension, Pattern, Profile

Stream Name:	**Unnamed Tributary to Preacher Creek 1 (UTPC-1)**		
Basin Name:	**Powell River**	Drainage Area:	**205** (Ac.)
Location:	**See Environmental Resources Map.**		
Northing:	**243,831**	Easting:	**738,627**
Observers:	**Lance DeBord; Jonathan Stamper**	Date:	**3-19-07**

Bankfull WIDTH (W_{bkf}) **6.2 ft.**

WIDTH of the stream channel at bankfull stage elevation, in a riffle section.

Bankfull DEPTH (d_{bkf}) **0.55 ft.**

Mean DEPTH of the stream channel cross-section, at bankfull stage elevation, in a riffle section ($d_{bkf} = A_{bkf}/W_{bkf}$)

Bankfull X-Section AREA (A_{bkf}) **3.4 ft.^{2}**

AREA of the stream channel cross-section, at bankfull stage elevation, in a riffle section.

WIDTH/DEPTH Ratio (W_{bkf}/d_{bkf}) **11.2 ft./ft.**

Bankfull WIDTH divided by bankfull mean DEPTH, in a riffle section.

Maximum DEPTH (D_{bkf}) **0.74 ft.**

Maximum DEPTH of the bankfull channel cross-section, or distance between the bankfull stage and thalweg elevations, in a riffle section.

Flood Prone WIDTH (W_{fp}) **10.7 ft.**

WIDTH determined at twice the maximum DEPTH, in a riffle section.

Entrenchment Ratio (ER) **1.73 ft./ft.**

The ratio of flood-prone WIDTH divided by bankfull channel WIDTH. (W_{fp}/W_{bkf})(riffle section)

Channel Materials (Particle Size Index) D50 **15 mm.**

The D_{50} particle size index represents the mean diameter of channel materials, as sampled from the channel surface, between the bankfull stage and thalweg elevations.

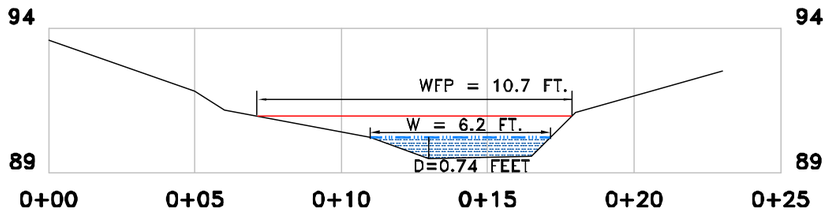
Water Surface SLOPE (S) **0.035 ft./ft.**

The difference in elevation, at the water surface, of the starting and ending riffle (rise) divided by the length of the reach (run).

Channel SINUOSITY (K) **1.03**

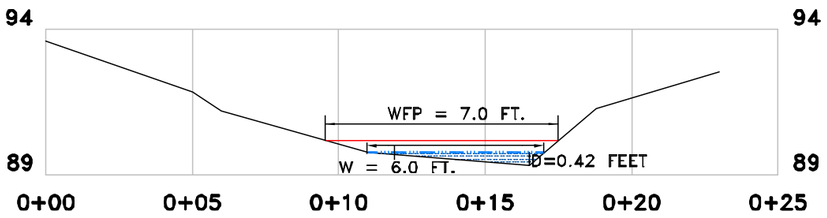
Sinuosity is an index of channel pattern, determined from a ratio of stream length divided by valley length (SL/VL); or estimated from a ratio of valley slope divided by channel slope (VS/CS).

Stream Type	**B4**



RIFFLE CROSS SECTION

SCALE: 1"= 5'



POOL CROSS SECTION

SCALE: 1"= 5'

SECTION LEGEND

EXISTING STREAM CHANNEL

BANKFULL

FLOOD PRONE WIDTH

NOTES: W = BANKFULL WIDTH, WFP = FLOOD PRONE WIDTH, D = MAXIMUM DEPTH

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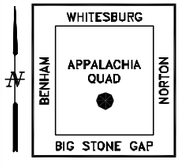
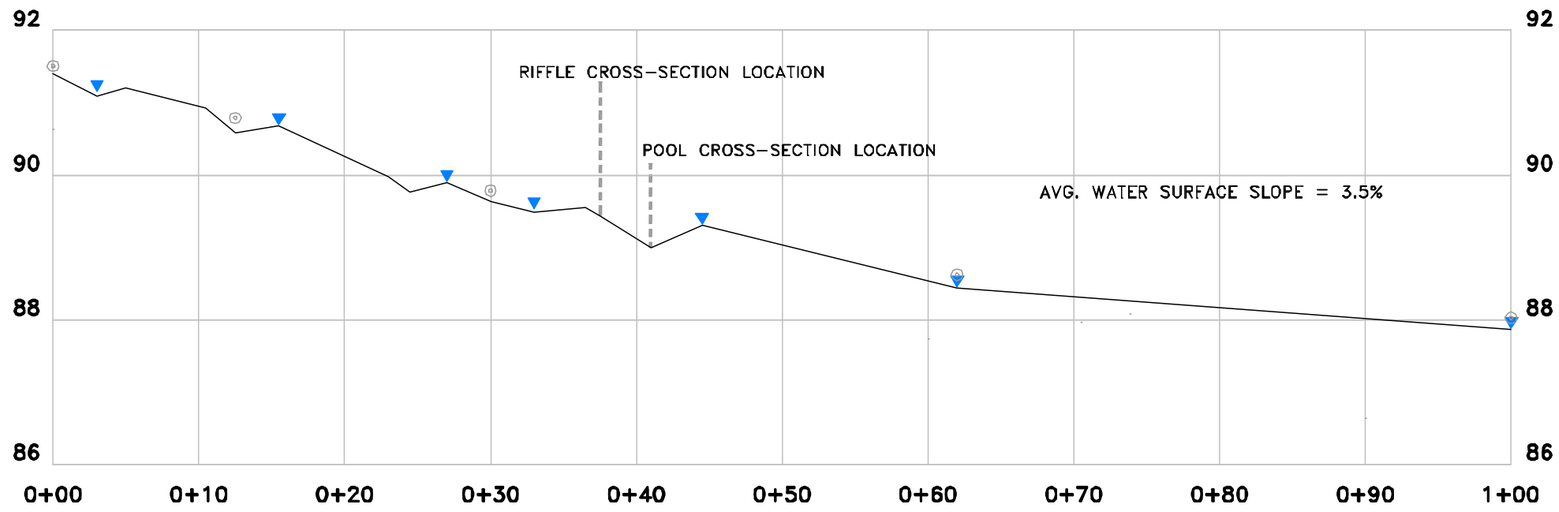


A & G COAL CORPORATION
ISON ROCK RIDGE SURFACE MINE
VDMLR PERMIT APPLICATION NO. 1003841
USACE PROJECT NO. NAO-2007-1351

CROSS SECTIONS
UTPC-1

DESIGNED	CWS	DATE	3-30-07
DRAWN	CWS		
CHECKED	TRB	SCALE	1"= 5"

PROJECT NO.	FILE NAME	DRAWING NO.
07-316B1	CROSS SECTIONS.DWG	1 OF 2



UTPC-1
LONGITUDINAL PROFILE

VERTICAL SCALE: 1"=2'
HORIZONTAL SCALE: 1"=10'

PROFILE LEGEND

- THALWEG
- WATER SURFACE ELEVATION
- BANKFULL

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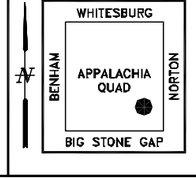

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ISON ROCK RIDGE SURFACE MINE
VDMLR PERMIT APPLICATION NO. 1003841
USACE PROJECT NO. NAO-2007-1351

LONGITUDINAL PROFILE
UTPC-1

DESIGNED CWS		DATE 03-30-07	
DRAWN CWS			
CHECKED TRB		SCALE AS SHOWN	
PROJECT NO. 07-316B1	FILE NAME LONG PRO.DWG	DRAWING NO. 2 OF 2	

APPENDIX C

EASTERN KENTUCKY STREAM ASSESSMENT PROTOCOL

Comparison of Ecological Integrity Indices (EII) and Units (EIU)

(Pre-Impact and Restoration Conditions)

A&G Coal Corporation
Ison Rock Ridge Surface Mine
USACE Project No. NAO-2007-1351
VDMLR Application No. 1003841

	EII*	Stream Length (LFt.)	Stream Type	EIU
UTLC-1				
Pre-Impact:	0.34	940	Intermittent	-319.6
Restoration:	0.53	940	Intermittent	498.2
	Sub-Watershed Total:			**178.6**
UTLC-2				
Pre-Impact:	0.34	1,350	Intermittent	-459.0
Restoration:	0.53	1,350	Intermittent	715.5
	Sub-Watershed Total:			**256.5**
UTLC-3				
Pre-Impact:	0.34	1,000	Intermittent	-340.0
Restoration:	0.53	1,000	Intermittent	530.0
	Sub-Watershed Total:			**190.0**
UTLC-4				
Pre-Impact:	0.43	2,050	Intermittent	-881.5
Restoration:	0.53	250	Intermittent	132.5
	Sub-Watershed Total:			**-749.0**
UTLC-5				
Pre-Impact:	0.43	2,730	Intermittent	-1,173.9
Restoration:	0.53	1,020	Intermittent	540.6
	Sub-Watershed Total:			**-633.3**
UTCC-1				
Pre-Impact:	0.41	1,920	Intermittent	-787.2
Restoration:	0.53	610	Perennial	323.3
				-463.9

* - Pre-Impact and Restoration EII Calculations immediately follow this summary.

Comparison of Ecological Integrity Indices (EII) and Units (EIU)

(Pre-Impact and Restoration Conditions)

A&G Coal Corporation
Ison Rock Ridge Surface Mine
USACE Project No. NAO-2007-1351
VDMLR Application No. 1003841

	EII*	Stream Length (LFt.)	Stream Type	EIU
UTPC-1				
Pre-Impact:	0.28	3,450	Intermittent	-966.0
Restoration:	0.53	1750	Intermittent	927.5
				-38.5
UTPC-2				
Pre-Impact:	0.28	1,200	Intermittent	-336.0
Restoration:	0.53	150	Intermittent	79.5
				-256.5
Kelly Branch				
Restoration - Lift Only:				
(0.53 - 0.10 = 0.43)**	0.43	3,720	Intermittent	1,599.6
Sub-Watershed Total:				**1599.6**

Project Totals:		**EIU**
Project Losses:		5,263.2
Project Gains:		5,346.7
	Net Loss =	
	Net Gain =	**83.50**

* - Pre-Impact and Restoration EII Calculations immediately follow this summary.

** - Current EII for proposed Stream Mitigation Areas taken from ABS-5 (Kelly Branch).

EII Calculation for High Gradient Streams in Eastern Kentucky Coalfield (Version 2002.6)
****(Family Level Taxonomy - Riffle Only Sample)****

Project ID:	07-316B1
Stream/Reach:	UTLC-2 (ABS-1)
Assessment Objectives:	To Determine the existing Ecological Integrity of UTLC-2.

EII	Model
0.34	Ecological Integrity Index (MBI + Habitat Integrity + Conductivity)
0.20	Ecological Integrity Index (Habitat Integrity + Conductivity)

Variables	Measure	Units
Enter quantitative or categorical measure from Field Data Sheet in shaded cells		
RBP Habitat Parameters		
1. Epifaunal Substrate	8	no units (0-20)
2. Embeddedness	13	no units (0-20)
3. Velocity/Depth Regime	8	no units (0-20)
4. Sediment Deposition	8	no units (0-20)
5. Channel Flow Status	13	no units (0-20)
6. Channel Alteration	11	no units (0-20)
7. Freq. Of Riffles (bends)	8	no units (0-20)
8. Bank stability (both combined)	14	no units (0-20)
9. Veg. Protection (both combined)	18	no units (0-20)
10. Riparian Width (both combined)	18	no units (0-20)
Total Habitat Score	119	no units
Habitat Integrity Index		Subindex 0.29
Macroinvertebrate Data - Family Level (Riffle Only)		
11. Family Taxa Richness	15	# of taxa sampled
12. Family EPT Richness	8	# of EPT species sampled
13. % Ephemeroptera	9	% Mayflies (0-100)
14. % Chironomidae & Oligochaeta	10.7	% Midges & Worms (0-100)
16. mFBI	5.49	no units
Macroinvertebrate Bioassessment	52.20	no units 0.64
Conductivity	502	microMhos 0.10

EII Calculation for High Gradient Streams in Eastern Kentucky Coalfield (Version 2002.6)
****(Family Level Taxonomy - Riffle Only Sample)****

Project ID:	**07-316B1**
Stream/Reach:	**UTLC-4 (ABS-2)**
Assessment Objectives:	**To Determine the existing Ecological Integrity of UTLC-4.**

EII	Model
0.43	Ecological Integrity Index (MBI + Habitat Integrity + Conductivity)
0.34	Ecological Integrity Index (Habitat Integrity + Conductivity)

Variables	Measure	Units
Enter quantitative or categorical measure from Field Data Sheet in shaded cells		
RBP Habitat Parameters		
1. Epifaunal Substrate	8	no units (0-20)
2. Embeddedness	13	no units (0-20)
3. Velocity/Depth Regime	8	no units (0-20)
4. Sediment Deposition	8	no units (0-20)
5. Channel Flow Status	13	no units (0-20)
6. Channel Alteration	11	no units (0-20)
7. Freq. Of Riffles (bends)	8	no units (0-20)
8. Bank stability (both combined)	14	no units (0-20)
9. Veg. Protection (both combined)	18	no units (0-20)
10. Riparian Width (both combined)	18	no units (0-20)
Total Habitat Score	119	no units
Habitat Integrity Index		Subindex 0.29
Macroinvertebrate Data - Family Level (Riffle Only)		
11. Family Taxa Richness	14	# of taxa sampled
12. Family EPT Richness	9	# of EPT species sampled
13. % Ephemeroptera	4	% Mayflies (0-100)
14. % Chironomidae & Oligochaeta	19	% Midges & Worms (0-100)
16. mFBI	4.9	no units
Macroinvertebrate Bioassessment	51.10	metric 0.62
Conductivity	373	microMHOs 0.39

EII Calculation for High Gradient Streams in Eastern Kentucky Coalfield (Version 2002.6)
****(Family Level Taxonomy - Riffle Only Sample)****

Project ID:	**07-316B1**
Stream/Reach:	**UTCC-1 (ABS-3)**
Assessment Objectives:	**To Determine the existing Ecological Integrity of UTCC-1.**

EII	Model
0.41	Ecological Integrity Index (MBI + Habitat Integrity + Conductivity)
0.31	Ecological Integrity Index (Habitat Integrity + Conductivity)

Variables	Measure	Units	
Enter quantitative or categorical measure from Field Data Sheet in shaded cells			
RBP Habitat Parameters			
1. Epifaunal Substrate	14	no units (0-20)	
2. Embeddedness	10	no units (0-20)	
3. Velocity/Depth Regime	5	no units (0-20)	
4. Sediment Deposition	8	no units (0-20)	
5. Channel Flow Status	10	no units (0-20)	
6. Channel Alteration	14	no units (0-20)	
7. Freq. Of Riffles (bends)	6	no units (0-20)	
8. Bank stability (both combined)	14	no units (0-20)	
9. Veg. Protection (both combined)	14	no units (0-20)	
10. Riparian Width (both combined)	17	no units (0-20)	
Total Habitat Score	[illegible]	no units	Subindex
Habitat Integrity Index			0.22
Macroinvertebrate Data - Family Level (Riffle Only)			
11. Family Taxa Richness	10	# of taxa sampled	
12. Family EPT Richness	7	# of EPT species sampled	
13. % Ephemeroptera	8	% Mayflies (0-100)	
14. % Chironomidae & Oligochaeta	18	% Midges & Worms (0-100)	
16. mFBI	4.19	no units	
Macroinvertebrate Bio-assessment	[illegible]	[illegible]	[illegible]
Conductivity	373	[illegible]	[illegible]

EII Calculation for High Gradient Streams in Eastern Kentucky Coalfield (Version 2002.6)
****(Family Level Taxonomy - Riffle Only Sample)****

Project ID:	**07-316B1**
Stream/Reach:	**UTPC-1 (ABS-4)**
Assessment Objectives:	**To Determine the existing Ecological Integrity of UTPC-1.**

EII	Model
0.28	Ecological Integrity Index (MBI + Habitat Integrity + Conductivity)
0.25	Ecological Integrity Index (Habitat Integrity + Conductivity)

Variables	Measure	Units	Subindex
Enter quantitative or categorical measure from Field Data Sheet in shaded cells			
RBP Habitat Parameters			
1. Epifaunal Substrate	10	no units (0-20)	
2. Embeddedness	6	no units (0-20)	
3. Velocity/Depth Regime	5	no units (0-20)	
4. Sediment Deposition	8	no units (0-20)	
5. Channel Flow Status	8	no units (0-20)	
6. Channel Alteration	11	no units (0-20)	
7. Freq. Of Riffles (bends)	6	no units (0-20)	
8. Bank stability (both combined)	11	no units (0-20)	
9. Veg. Protection (both combined)	12	no units (0-20)	
10. Riparian Width (both combined)	12	no units (0-20)	
Total Habitat Score	89	no units	
Habitat Integrity Index			0.40
Macroinvertebrate Data - Family Level (Riffle Only)			
11. Family Taxa Richness	12	# of taxa sampled	
12. Family EPT Richness	6	# of EPT species sampled	
13. % Ephemeroptera	2	% Mayflies (0-100)	
14. % Chironomidae & Oligochaeta	72	% Midges & Worms (0-100)	
16. mFBI	7	no units	
Macroinvertebrate Bioassessment	2924	Normalize	0.36
Conductivity	370	micro-MHOs	0.40

EII Calculation for High Gradient Streams in Eastern Kentucky Coalfield (Version 2002.6)
****(Family Level Taxonomy - Riffle Only Sample)****

Project ID:	07-316B1
Stream/Reach:	Kelly Branch (ABS-5)
Assessment Objectives:	To Determine the existing Ecological Integrity of Kelly Branch Mitigation Area..

EII	Model
NA	Ecological Integrity Index (MBI + Habitat Integrity + Conductivity)
0.10	Ecological Integrity Index (Habitat Integrity + Conductivity)

Variables	Measure	Units	Subindex
Enter quantitative or categorical measure from Field Data Sheet in shaded cells			
RBP Habitat Parameters			
1. Epifaunal Substrate	1	no units (0-20)	
2. Embeddedness	1	no units (0-20)	
3. Velocity/Depth Regime	1	no units (0-20)	
4. Sediment Deposition	1	no units (0-20)	
5. Channel Flow Status	1	no units (0-20)	
6. Channel Alteration	1	no units (0-20)	
7. Freq. Of Riffles (bends)	1	no units (0-20)	
8. Bank stability (both combined)	18	no units (0-20)	
9. Veg. Protection (both combined)	1	no units (0-20)	
10. Riparian Width (both combined)	1	no units (0-20)	
Total Habitat Score	27	no units	Subindex
Habitat Integrity Index			0.10
Macroinvertebrate Data - Family Level (Riffle Only)			
11. Family Taxa Richness	0	# of taxa sampled	
12. Family EPT Richness	0	# of EPT species sampled	
13. % Ephemeroptera	0	% Mayflies (0-100)	
14. % Chironomidae & Oligochaeta	0	% Midges & Worms (0-100)	
16. mFBI	0	no units	
Macroinvertebrate Bioassessment	NA	no units	NA
Conductivity	500	uS/cm	0.10

EII Calculation for High Gradient Streams in Eastern Kentucky Coalfield (Version 2002.6)
****(Family Level Taxonomy - Riffle Only Sample)****

Project ID:	**07-316B1**
Stream/Reach:	**Restored Stream Channels**
Assessment Objectives:	**To predict the future Ecological Integrity of all restored stream channels..**

EII	Model
NA	Ecological Integrity Index (MBI + Habitat Integrity + Conductivity)
0.53	Ecological Integrity Index (Habitat Integrity + Conductivity)

Variables	Measure	Units
Enter quantitative or categorical measure from Field Data Sheet in shaded cells		
RBP Habitat Parameters		
1. Epifaunal Substrate	16	no units (0-20)
2. Embeddedness	15	no units (0-20)
3. Velocity/Depth Regime	18	no units (0-20)
4. Sediment Deposition	18	no units (0-20)
5. Channel Flow Status	18	no units (0-20)
6. Channel Alteration	18	no units (0-20)
7. Freq. Of Riffles (bends)	18	no units (0-20)
8. Bank stability (both combined)	16	no units (0-20)
9. Veg. Protection (both combined)	14	no units (0-20)
10. Riparian Width (both combined)	14	no units (0-20)
Total Habitat Score	167	no units
Habitat(current) index		
Macroinvertebrate Data - Family Level (Riffle Only)		
11. Family Taxa Richness	0	# of taxa sampled
12. Family EPT Richness	0	# of EPT species sampled
13. % Ephemeroptera	0	% Mayflies (0-100)
14. % Chironomidae & Oligochaeta	0	% Midges & Worms (0-100)
16. mFBI	0	no units
Macroinvertebrate Bio-Assessment	NA	no units
Conductivity	500	

Subindex
0.98
NA
0.10

APPENDIX D

SURFACE WATER QUALITY

A&G Coal Corporation
Ison Rock Ridge Surface Mine
KB-1S (Latest Data)

VA ST PL N: 249,250
VA ST PL E: 744,463
MPID# 0003822, PN 1101750
Location: Upstream; Callahan Creek

See the Surface Water Hydrology Map.

Sample Date	Flow (GPM)	Flow Type	pH	Total Iron (mg/l)	Total Manganese (mg/l)	Total Suspended Solids (mg/l)	Appearance	Color	Temperature (oC)	Acidity (mg/l)	Alkalinity (mg/l)	Conductivity (umhos/cm)	Total Dissolved Solids (mg/l)	Sulfates (mg/l)
10/20/2005	3000		7.9	0.2		2	1	A	17	0	256	920	630	303
11/28/2005	4000		8	0.2		10	1	A	12	0	203	778	636	261
12/19/2005	700		7.9	0.2		2	1	A	6	0	161	725	490	186
1/23/2006	8500		7.9	1.2	0.1	67	2	B	10	0	94	511	269	88
2/23/2006	10000		7.8	1.2	0.1	49	2	B	9	0	107	526	386	106
3/16/2006	10000		7.9	0.4		10	1	A	10	0	102	506	377	110
4/25/2006	12000		7.8	0.3		4	1	A	16	0	103	553	314	111
5/24/2006	8000		7.8	0.2		2	1	A	14	0	159	827	528	161
6/23/2006	8500		7.7	8.5	0.2	382	2	B	19	0	290	758	480	224
7/19/2006	10000		7.5	0.5		16	2	A	21	0	178	829	608	262
8/21/2006	9000		7.9	1		22	2	A	21	0	160	720	480	208
9/19/2006	9000		7.8	0.2		2	1	A	20	0	181	904	600	323
Minimum	700		7.5	0.2	0.1	2			6	0	94	506	269	88
Average	7725		N/A	1.2	0.1	47			15	0	166	713	483	195
Median	8750		7.9	0.4	0.1	10			15	0	161	742	485	197
Maximum	12000		8.0	8.5	0.2	382			21	0	290	920	636	323

Sample Date	Flow (GPM)	Flow Type	pH	Total Iron (mg/l)	Total Manganese (mg/l)	Total Suspended Solids (mg/l)	Appearance	Color	Temperature (oC)	Acidity (mg/l)	Alkalinity (mg/l)	Conductivity (umhos/cm)	Total Dissolved Solids (mg/l)	Sulfates (mg/l)
Comparison (Median)														
Earliest	3150		7.9	0.2	0.1	7			12	0	116	470	388	183
Latest	8750		7.9	0.4	0.1	10			15	0	161	742	485	197

Note:
N/A for pH and Appearance = Not Applicable.
N/A for other Parameters = Not Analyzed.
1A for Appearance = Clear and Natural.
=max. detection limit; actual value is below detection limit

DRA/A & G, 07-316B1, 03-19-07

A&G Coal Corporation
Ison Rock Ridge Surface Mine
KB-2S (Latest Data)

VA ST PL N: 237,435
VA ST PL E: 748,103
MPID# 0003823 (PN 1101750)
Location: Downstream Callahan Crk.

See the Surface Water Hydrology Map.

Sample Date	Flow (GPM)	Flow Type	pH	Total Iron (mg/l)	Total Manganese (mg/l)	Total Suspended Solids (mg/l)	Appearance	Color	Temperature (oC)	Acidity (mg/l)	Alkalinity (mg/l)	Conductivity (umhos/cm)	Total Dissolved Solids (mg/l)	Sulfates (mg/l)
4/28/2005	10000		7.1	0.5		18	1	A	11	0	81	420	240	108
5/27/2005	9500		8.1	0.2		14	1	A	15	0	150	680	390	269
6/23/2005	7500		8.2	0.2		2	1	A	22	0	155	735	501	224
7/5/2005	10000		7.5	0.8	0.1	202	2	B	22	0	141	580	564	145
8/22/2005	10000		8	0.3		2	1	A	22	0	182	780	500	225
9/24/2005	5500		8.3	0.2		2	1	A	21	0	188	905	579	261
10/20/2005	3500		8.2	0.2		2	1	A	18	0	205	880	513	298
11/27/2005	4000		8.1	0.2		8	1	A	6	0	197	734	582	225
12/19/2005	8000		8	0.2		5	1	A	5	0	143	675	500	193
1/23/2006	10000		8	1.1	0.1	67	2	B	10	0	88	511	287	135
2/23/2006	12000		7.9	1.5	0.1	61	2	B	9	0	91	480	331	123
3/16/2006	11000		8	0.4		11	1	A	11	0	91	465	341	124
Minimum	3500		7.1	0.20	0.10	2			5	0.0	81	420	240	108
Average	8417		N/A	0.48	0.10	33			14	0.0	143	654	444	194
Median	9750		8.0	0.25	0.10	10			13	0.0	147	678	500	209
Maximum	12000		8.3	1.50	0.10	202			22	0.0	205	905	582	298

Sample Date	Flow (GPM)	Flow Type	pH	Total Iron (mg/l)	Total Manganese (mg/l)	Total Suspended Solids (mg/l)	Appearance	Color	Temperature (oC)	Acidity (mg/l)	Alkalinity (mg/l)	Conductivity (umhos/cm)	Total Dissolved Solids (mg/l)	Sulfates (mg/l)

Note:
N/A for pH and Appearance = Not Applicable.
N/A for other Parameters = Not Analyzed.
1A for Appearance = Clear and Natural.
=max. detection limit; actual value is below detection limit

DRA/A & G, 07-316B1, 03-19-07

A&G Coal Corporation
Ison Rock Ridge Surface Mine
BL-2 (Latest Data)

VA ST PL N: 248,757
VA ST PL E: 734,999
MPID# 1520079, PN 1301427
Location: Upstream; Preacher Creek

See the Surface Water Hydrology Map.

Sample Date	Flow (GPM)	Flow Type	pH	Total Iron (mg/l)	Total Manganese (mg/l)	Total Suspended Solids (mg/l)	Appearance	Color	Temperature (oC)	Acidity (mg/l)	Alkalinity (mg/l)	Conductivity (umhos/cm)	Total Dissolved Solids (mg/l)	Sulfates (mg/l)
10/14/2005	65		6.7	0.1	0.1	11	1	A	17	0	635	309	174	55
11/14/2005	95		7	0.1	0.2	5	1	A	14	0	98	324	180	46
12/15/2005	240		7.3	0.1	0.1	15	2	B	11	0	43	196	120	30
1/19/2006	460		7.9	0.9	0.1	12	1	A	12	0	348	1355	617	19
2/20/2006	1960		7.5	0.1	0.1	51	1	A	10	0	35	238	124	24
3/23/2006	400		7.1	0.3	0.1	5	1	A	11	0	49	282	94	78
4/20/2006	500		7.4	0.8	0.1	13	1	A	12	0	41	180	91	93
5/22/2006	300		6.8	0.1	0.1	19	1	A	13	0	55	225	240	131
6/16/2006	60		7.5	0.4	0.1	21	1	A	14	0	53	230	125	71
7/18/2006	150		7.4	0.4	0.1	23	1	A	17	0	61	210	121	92
8/25/2006	60		7	0.7	0.1	24	1	A	19	0	234	250	376	93
9/14/2006	50		7	0.6	0.1	25	1	A	14	0	262	220	139	87
Minimum	50		6.7	0.1	0.1	5			10	0	35	180	91	19
Average	362		N/A	0.4	0.1	19			14	0	160	335	200	68
Median	195		7.2	0.4	0.1	17			14	0	58	234	132	75
Maximum	1960		7.9	0.9	0.2	51			19	0	635	1355	617	131

Sample Date	Flow (GPM)	Flow Type	pH	Total Iron (mg/l)	Total Manganese (mg/l)	Total Suspended Solids (mg/l)	Appearance	Color	Temperature (oC)	Acidity (mg/l)	Alkalinity (mg/l)	Conductivity (umhos/cm)	Total Dissolved Solids (mg/l)	Sulfates (mg/l)
Comparison (Median)														
Earliest	1600		7.6	0.2	0.1	8			14	0	56	235	157	38
2000	80		7.9	0.1	0.1	4			15	0	61	220	128	43
Latest	195		7.2	0.4	0.1	17			14	0	58	234	132	75

Note:

N/A for pH and Appearance = Not Applicable.
N/A for other Parameters = Not Analyzed.
1A for Appearance = Clear and Natural.
=max. detection limit; actual value is below detection limit

DRA/A & G, 07-316B1, 03-19-07

A&G Coal Corporation
Ison Rock Ridge Surface Mine
BL-4 (Latest Data)

VA ST PL N: 235,398
VA ST PL E: 745,617
MPID# 0005004 (PN 1701152)
Location: Downstream Looney Crk.

See the Surface Water Hydrology Map.

Sample Date	Flow (GPM)	Flow Type	pH	Total Iron (mg/l)	Total Manganese (mg/l)	Total Suspended Solids (mg/l)	Appearance	Color	Temperature (oC)	Acidity (mg/l)	Alkalinity (mg/l)	Conductivity (umhos/cm)	Total Dissolved Solids (mg/l)	Sulfates (mg/l)
10/20/2004	780		8.1	0.1	0.1	4	1	A	11	0	130	1060	349	84
11/8/2004			8	0.3	0.1	4	1	A	10	0	215	655	105	65
12/16/2004	9650		7.2	0.1	0.1	79	1	A	12	0	117	587	206	66
1/21/2005	180		6.9	0.1	0.1	12	1	A	9	0	205	230	328	48
2/21/2005	2700		7.1	0.1	0.1	8	1	A	9	0	177	560	274	64
3/23/2005	2600		7.5	0.3	0.1	32	1	A	10	0	181	598	285	66
4/22/2005	3610		8	0.1	0.1	33	2	B	9	0	18	527	293	63
5/20/2005	3210		7.8	0.1	0.1	10	1	A	12	0	24	584	361	80
6/11/2005	2610		8.1	0.2	0.1	9	1	A	12	0	224	709	358	46
7/20/2005	2610		7.8	0.2	0.1	14	1	A	15	0	20	625	382	52
8/10/2005	2160		8	0.1	0.1	14	1	A		0	24	815	454	77
9/27/2005	750		7.4	0.1	0.2	5			16	0	293	700	448	94
Minimum	180		6.9	0.10	0.10	4			9	0.0	18	230	105	46
Average	2805		N/A	0.15	0.11	19			11	0.0	136	638	320	67
Median	2610		7.8	0.10	0.10	11			11	0.0	154	612	339	66
Maximum	9650		8.1	0.30	0.20	79			16	0.0	293	1060	454	94

Sample Date	Flow (GPM)	Flow Type	pH	Total Iron (mg/l)	Total Manganese (mg/l)	Total Suspended Solids (mg/l)	Appearance	Color	Temperature (oC)	Acidity (mg/l)	Alkalinity (mg/l)	Conductivity (umhos/cm)	Total Dissolved Solids (mg/l)	Sulfates (mg/l)

Note:
N/A for pH and Appearance = Not Applicable.
N/A for other Parameters = Not Analyzed.
1A for Appearance = Clear and Natural.
=max. detection limit; actual value is below detection limit

DRA/A & G, 07-316B1, 03-19-07

APPENDIX E

RESTORED STREAM CHANNEL DESIGN INFORMATION

RESTORED STREAM CHANNEL DESIGN INFORMATION

Looney Creek Watershed (Page 1 of 2)

A&G Coal Corporation
Ison Rock Ridge Surface Mine

USACE Project No. NAO-2007-1351

	Average Valley Slope, %				
	10%	20%	10%	20%	10%
General Information					
- Stream Name	**RSC-UTLC-1**	**RSC-UTLC-1**	**RSC-UTLC-2**	**RSC-UTLC-2**	**RSC-UTLC-3**
- Drainage Area (mi.^{2})	0.05	0.05	0.04	0.04	0.11
- Stream Type	A2a+	A2a+	A2a+	A2a+	A2a+
- Entrenchment Ratio	1.3	1.3	1.3	1.3	1.3
- Width/Depth Ratio	9.5	9.0	9.5	9.0	9.5
- Sinuosity	1.0	1.0	1.0	1.0	1.0
- Channel Material, D_{50} (in.)	3.6*1	6.0*1	3.6*1	4.8*1	6.0*1
Bankfull Information					
- Bankfull Discharge (cfs)	4.0	4.0	3.4	3.4	7.5
- Bankfull Width (ft.)	3.7	3.6	3.4	3.3	4.9
- Bankfull Mean Depth (ft.)	0.4	0.4	0.4	0.4	0.5
Pool Information					
- Max. Pool Depth (ft.)	1.0-1.3	1.0-1.4	0.9-1.2	1.0-1.3	1.3-1.8
- Pool Length (ft.)	0.7-3.7	0.7-3.6	0.7-3.4	0.7-3.3	1.0-4.9
Riffle Information					
- Max. Riffle Depth (ft.)	0.4-0.7	0.4-0.7	0.4-0.6	0.4-0.7	0.6-0.9
- Riffle Length (ft.)	3.0-10.8	2.9-10.5	2.7-9.9	2.7-9.6	3.9-14.3
Pattern Information					
- Meander Length (ft.)	*2	*2	*2	*2	*2
- Radius of Curvature (ft.)	*2	*2	*2	*2	*2
- Pool-Pool Spacing (ft.)	3.7-14.5	3.6-14.1	3.4-13.3	3.4-12.9	4.9-19.2
Vane Information					
- Vane Type (J-Hook or X-Vane)	*3	*3	*3	*3	*3
- Angle from Tangent (°)	*3	*3	*3	*3	*3
- Vane Length (ft.)	*3	*3	*3	*3	*3
- Height of Protrusion (ft.)	*3	*3	*3	*3	*3
- Boulder Diameter (ft.)	*3	*3	*3	*3	*3

*1 – If present, native streambed materials shall be utilized for channel lining.

*2 – Due to the short lengths of A2 channel and the minimal meandering of steeper channels, the meander geometry has not been specified.

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DRA/A & G, 07-316B1, 03-19-07

RESTORED STREAM CHANNEL DESIGN INFORMATION

Looney Creek Watershed (Page 2 of 2)

A&G Coal Corporation
Ison Rock Ridge Surface Mine

USACE Project No. NAO-2007-1351

	Average Valley Slope, %				
	20%	10%	20%	5%	10%
General Information					
- Stream Name	**RSC-UTLC-3**	**RSC-UTLC-4**	**RSC-UTLC-4**	**RSC-UTLC-5**	**RSC-UTLC-5**
- Drainage Area (mi.^{2})	0.11	0.20	0.20	0.26	0.26
- Stream Type	A2a+	A2a+	A2a+	A2	A2a+
- Entrenchment Ratio	1.3	1.3	1.3	1.3	1.3
- Width/Depth Ratio	9.0	9.5	9.0	10.0	9.5
- Sinuosity	1.0	1.0	1.0	1.0	1.0
- Channel Material, D_{50} (in.)	8.4*1	6.0*1	10.8*1	6.0*1	8.4*1
Bankfull Information					
- Bankfull Discharge (cfs)	7.5	12.1	12.1	14.9	14.9
- Bankfull Width (ft.)	4.8	6.1	6.0	6.9	6.7
- Bankfull Mean Depth (ft.)	0.5	0.6	0.7	0.7	0.7
Pool Information					
- Max. Pool Depth (ft.)	1.4-1.8	1.7-2.2	1.7-2.2	1.8-2.3	1.8-2.4
- Pool Length (ft.)	1.0-4.8	1.2-6.1	1.2-6.1	1.4-6.9	1.3-6.7
Riffle Information					
- Max. Riffle Depth (ft.)	0.6-1.0	0.7-1.2	0.7-1.2	0.8-1.2	0.8-1.3
- Riffle Length (ft.)	3.8-13.9	4.9-17.7	4.8-17.3	5.5-20.0	5.4-19.5
Pattern Information					
- Meander Length (ft.)	*2	*2	*2	*2	*2
- Radius of Curvature (ft.)	*2	*2	*2	*2	*2
- Pool-Pool Spacing (ft.)	4.8-18.7	6.1-23.8	6.0-23.4	6.9-26.9	6.7-26.2
Vane Information					
- Vane Type (J-Hook or X-Vane)	*3	*3	*3	*3	*3
- Angle from Tangent (°)	*3	*3	*3	*3	*3
- Vane Length (ft.)	*3	*3	*3	*3	*3
- Height of Protrusion (ft.)	*3	*3	*3	*3	*3
- Boulder Diameter (ft.)	*3	*3	*3	*3	*3

*1 – If present, native streambed materials shall be utilized for channel lining.

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DRA/A & G, 07-316B1, 03-19-07

RESTORED STREAM CHANNEL DESIGN INFORMATION

Callahan Creek Watershed (Page 1 of 1)

A&G Coal Corporation
Ison Rock Ridge Surface Mine

USACE Project No. NAO-2007-1351

	Average Valley Slope, %				
	10%	20%			
General Information					
- Stream Name	**RSC-UTCC-1**	**RSC-UTCC-1**			
- Drainage Area (mi.^{2})	0.08	0.08			
- Stream Type	A2a+	A2a+			
- Entrenchment Ratio	1.3	1.3			
- Width/Depth Ratio	9.5	9.0			
- Sinuosity	1.0	1.0			
- Channel Material, D_{50} (in.)	4.8*1	6.0*1			
Bankfull Information					
- Bankfull Discharge (cfs)	5.8	5.8			
- Bankfull Width (ft.)	4.4	4.3			
- Bankfull Mean Depth (ft.)	0.5	0.5			
Pool Information					
- Max. Pool Depth (ft.)	1.2-1.6	1.2-1.6			
- Pool Length (ft.)	0.9-4.4	0.9-4.3			
Riffle Information					
- Max. Riffle Depth (ft.)	0.5-0.8	0.5-0.9			
- Riffle Length (ft.)	3.5-12.7	3.4-12.4			
Pattern Information					
- Meander Length (ft.)	*2	*2			
- Radius of Curvature (ft.)	*2	*2			
- Pool-Pool Spacing (ft.)	4.4-17.1	4.3-16.7			
Vane Information					
- Vane Type (J-Hook or X-Vane)	*3	*3			
- Angle from Tangent (°)	*3	*3			
- Vane Length (ft.)	*3	*3			
- Height of Protrusion (ft.)	*3	*3			
- Boulder Diameter (ft.)	*3	*3			

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DRA/A & G, 07-316B1, 03-19-07

RESTORED STREAM CHANNEL DESIGN INFORMATION

Preacher Creek Watershed (Page 1 of 1)

A&G Coal Corporation
Ison Rock Ridge Surface Mine

USACE Project No. NAO-2007-1351

	Average Valley Slope, %				
	10%	20%	10%	20%	
General Information					
- Stream Name	**RSC-UTPC-1**	**RSC-UTPC-1**	**RSC-UTPC-2**	**RSC-UTPC-2**	
- Drainage Area (mi.^{2})	0.3	0.3	0.07	0.07	
- Stream Type	A2A+	A2A+	A2A+	A2A+	
- Entrenchment Ratio	1.3	1.3	1.3	1.3	
- Width/Depth Ratio	9.5	9.0	9.5	9.0	
- Sinuosity	1.0	1.0	1.0	1.0	
- Channel Material, D_{50} (in.)	9.6*1	12.0*1	4.8*1	7.2*1	
Bankfull Information					
- Bankfull Discharge (cfs)	16.6	16.6	5.2	5.2	
- Bankfull Width (ft.)	7.1	6.9	4.2	4.1	
- Bankfull Mean Depth (ft.)	0.7	0.8	0.7	0.7	
Pool Information					
- Max. Pool Depth (ft.)	1.9-2.5	2.0-2.6	1.1-1.5	1.2-1.5	
- Pool Length (ft.)	1.4-7.1	1.4-6.9	0.8-4.2	0.8-4.1	
Riffle Information					
- Max. Riffle Depth (ft.)	0.8-1.3	0.8-1.4	0.5-0.8	0.5-0.8	
- Riffle Length (ft.)	5.7-20.5	5.5-20.0	3.4-12.2	3.3-11.8	
Pattern Information					
- Meander Length (ft.)	*2	*2	*2	*2	
- Radius of Curvature (ft.)	*2	*2	*2	*2	
- Pool-Pool Spacing (ft.)	7.1-27.6	6.9-26.9	4.2-16.4	4.1-15.9	
Vane Information					
- Vane Type (J-Hook or X-Vane)	*3	*3	*3	*3	
- Angle from Tangent (°)	*3	*3	*3	*3	
- Vane Length (ft.)	*3	*3	*3	*3	
- Height of Protrusion (ft.)	*3	*3	*3	*3	
- Boulder Diameter (ft.)	*3	*3	*3	*3	

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DRA/A & G, 07-316B1, 03-19-07

RESTORED STREAM CHANNEL DESIGN INFORMATION

Kelly Branch Watershed (Page 1 of 1)

A&G Coal Corporation
Ison Rock Ridge Surface Mine

USACE Project No. NAO-2007-1351

	Average Valley Slope, %				
	1%	2%	6%	10%	20%
General Information					
- Stream Name	**Kelly Br.**	**Kelly Br.**	**Kelly Br.**	**Kelly Br.**	**Kelly Br.**
- Drainage Area (mi.^{2})	0.23	0.23	0.23	0.23	0.23
- Stream Type	B3c	B3	A2	A2a+	A2a+
- Entrenchment Ratio	1.4	1.4	1.3	1.3	1.3
- Width/Depth Ratio	12.5	12.0	10.0	9.5	9.0
- Sinuosity	1.3	1.3	1.0	1.0	1.0
- Channel Material, D_{50} (in.)	0.8	2.2	6.0	8.4	10.8
Bankfull Information					
- Bankfull Discharge (cfs)	13.5	13.5	13.5	13.5	13.5
- Bankfull Width (ft.)	7.4	7.2	6.6	6.4	6.3
- Bankfull Mean Depth (ft.)	0.6	0.6	0.7	0.7	0.7
Pool Information					
- Max. Pool Depth (ft.)	1.2-2.4	1.2-2.5	1.7-2.2	1.8-2.3	1.8-2.4
- Pool Length (ft.)	5.5-8.1	5.4-8.0	1.3-6.6	1.3-6.4	1.3-6.3
Riffle Information					
- Max. Riffle Depth (ft.)	0.6-0.9	0.7-0.9	0.7-1.2	0.7-1.2	0.8-1.3
- Riffle Length (ft.)	8.5-28.8	8.3-28.2	5.3-19.1	5.1-18.7	5.0-18.2
Pattern Information					
- Meander Length (ft.)	88.6-140.3	86.8-137.4	*2	*2	*2
- Radius of Curvature (ft.)	29.5-13.8	28.9-72.3	*2	*2	*2
- Pool-Pool Spacing (ft.)	14.0-36.9	13.7-36.2	6.6-25.8	6.4-25.1	6.3-24.5
Vane Information					
- Vane Type (J-Hook or X-Vane)	X-Vane	X-Vane	*3	*3	*3
- Angle from Tangent (°)	20	20	*3	*3	*3
- Vane Length (ft.)	6.8	6.6	*3	*3	*3
- Height of Protrusion (ft.)	0.2	0.2	*3	*3	*3
- Boulder Diameter (ft.)	2.3	2.7	*3	*3	*3

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DRA/A & G, 07-316B1, 03-19-07

MAPS AND DRAWINGS

1. LOCATION MAP
2. DIGITAL ORTHO PHOTOGRAPHY
3. ENVIRONMENTAL RESOURCES MAP - WEST
4. ENVIRONMENTAL RESOURCES MAP - EAST
5. MITIGATION MAP - WEST
6. MITIGATION MAP - EAST
7. KELLY BRANCH MITIGATION AREA
8. RESTORED STREAM CHANNEL DETAILS, TYPE A AND B CHANNELS