# A Need to Identify "Special Protection" Status and Apply Existing Use Protections to Certain Waterways in Greene and Washington Counties Pennsylvania

**Prepared for:** 

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# With the support of:

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26 April 2010

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# I EXECUTIVE SUMMARY

This report provides the technical and regulatory justifications for PADEP to conduct immediately the necessary bioassessment surveys to document the existing "special protection" uses of certain streams within the 9,688-acre approved Enlow Fork Mine expansion area in Washington County, PA, and within the 3,175-acre proposed expansion area for the Bailey Mine in Greene County, PA. Sections of these streams exhibit water quality conditions better than their currently-designated uses, and thus require a higher level of protection to comply with existing law. <u>The urgency of this matter is related to the fact that these streams and their associated wetlands are in imminent danger of being damaged by longwall coal mining and Marcellus Shale gas production, and their currently existing uses are at significant risk of degradation.</u>

# **II INTRODUCTION**

In its review and approval of the 9,688-acre expansion of longwall mining at Consol's Enlow Fork Mine (Bituminous Coal Mining Activity Permit # 3081317, Revision 70, issued 18 January 2008), the California District Mining Office failed to make the required existing use determinations of overlying waters. Likewise, no existing use determinations have yet been made for the streams and wetlands at risk from Consol's proposed Bailey Mine east expansion, which encompasses 3,175 acres (application for revision submitted April 2007, Bituminous Coal Mining Activity Permit # 3081317). Technical data collected for the permittee (Consol Pennsylvania Coal Company, in both cases), and submitted to DEP as part of the respective applications, provide ample evidence that some of the streams in the permit areas have existing uses better than their designated uses. Yet, DEP has not made use of this readily available information, as required by Pa. Code 93.4c(a)(1).

It is imperative that existing use determinations be made right away, for two important reasons:

1. The timeframe for making such determinations is nearing its end for the current field sampling season. According to Tony Shaw (DEP Office of Water Management, personal communication with S. Kunz, 8 April 2010), the optimal sampling "window" for streambed organisms generally is November through May, although special care must be taken toward the end of that period (*i.e.*, in May). Indeed, the Water Quality Antidegradation Implementation Guidance (TGD 391-0300-002; PADEP 2003) reads as follows:

The recommended months to sample are mid-October through April. .... The months of May and June are a special case because most important insect taxa emerge then. The biologist must consider the effect emergent taxa might have on the results. Because aquatic insects emerge with greater frequency in May and June, it is important that reference and candidate sites be sampled within

a day of each other during this period, to reflect similar phases of emergent activities on both waterbodies.

2. Longwall mining is proceeding in the DEP-approved Enlow Fork Mine expansion area. As of mid-April 2010, mining was occurring in the E19 and F18 Panels. It is possible that the "special protection" headwater streams of Buffalo Creek will be undermined later this year (2010), and there is a high likelihood that some or all of those streams may be damaged by mining-induced changes, including flow loss. The reasons for these expected impacts are explained further below. The Bailey Mine expansion has been under review by DEP for 3 years and could be approved at any time. Additionally, the current frenzy surrounding natural gas exploration and drilling in the Marcellus Shale threatens streams and wetlands throughout southwestern Pennsylvania.

# **III LOCATION OF AREAS OF CONCERN**

There are two primary areas of concern addressed in this report (Figure 1). The first is the **Enlow Fork Mine expansion**, an area covering 9,688 acres to the north of the existing Enlow Fork mine. The approved expansion allows longwall mining in parts of three municipalities in Washington County: East Finley Township, Morris Township, and South Franklin Township (Figure 2). Streams to be undermined in this expansion area (and their Chapter 93 designated uses; Figure 3) are as follows:

Crafts Creek (TSF<sup>1</sup>) Templeton Fork (TSF) Tenmile Creek (TSF) Buffalo Creek (HQ-WWF) Sawhill Run (HQ-WWF)

Sawhill Run flows into Buffalo Creek, which flows westward into West Virginia to the Ohio River. Fully 40% of the proposed expansion area is in these watersheds currently designated HQ. Thus, this represents the largest expansion ever of longwall mining into "special protection" waters. The TSF streams within the Enlow Fork Mine expansion area are within the Tenmile Creek watershed, which is tributary to the Monongahela River. The Monongahela River in turn joins the Allegheny River at Pittsburgh to form the Ohio River.

The second primary area of concern is the **Bailey Mine expansion**, an area covering 3,175 acres to the east of the existing Bailey mine (see Figure 2). New longwall mining has not yet been approved by DEP for this proposed expansion area. The proposed mine permit area is entirely within Richhill Township in Greene County. Streams proposed to be undermined in this expansion area include the following:

Kent Run (TSF) Polen Run (TSF) Whitehorn Run (TSF) Jacobs Run (HQ-WWF) North Fork Dunkard Fork (TSF)

<sup>&</sup>lt;sup>1</sup> TSF = trout stocking fishes, WWF = warm water fishes, HQ = high quality

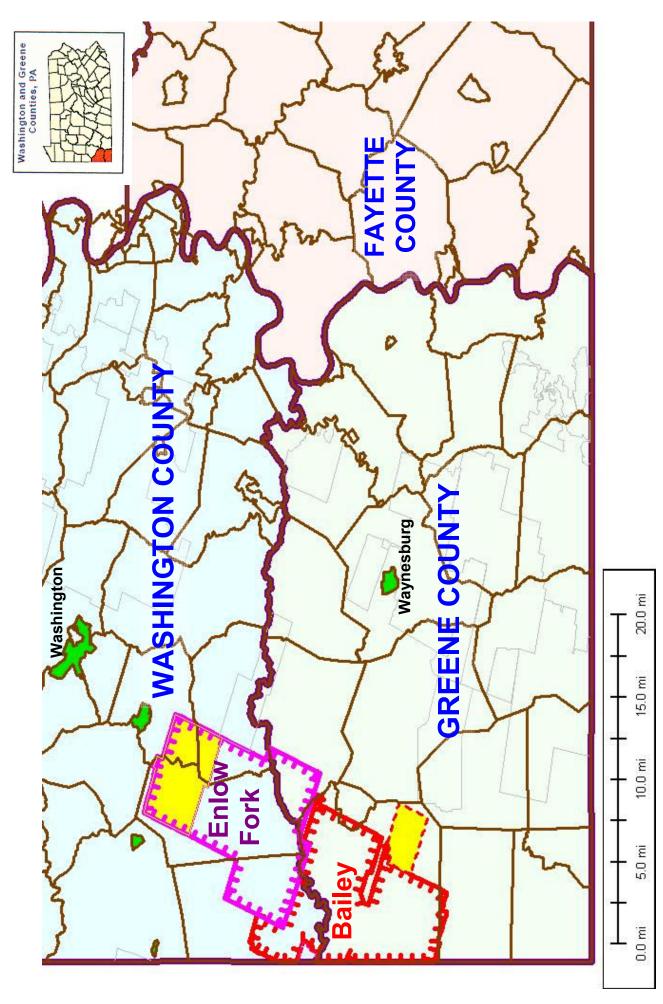
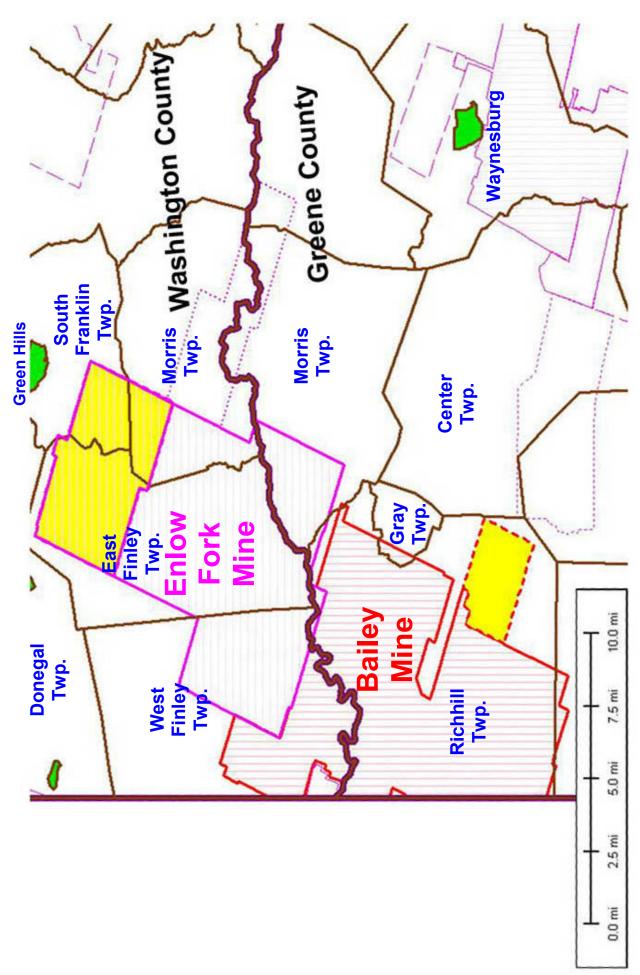


FIGURE 1. Location map showing Enlow Fork Mine (purple outline) and Bailey Mine (red outline) and their expansion areas (yellow shading) in western Greene and Washington Counties, Pennsylvania. Municipalities are outlined in brown. Faint lines indicate other existing or proposed coal mines.



expansion areas (yellow shading) in southwestern PA. Surrounding municipalities are noted. FIGURE 2. Locations of Enlow Fork Mine (purple outline) and Bailey Mine (red outline) and their Faint lines indicate other existing or proposed coal mines in the vicinity.

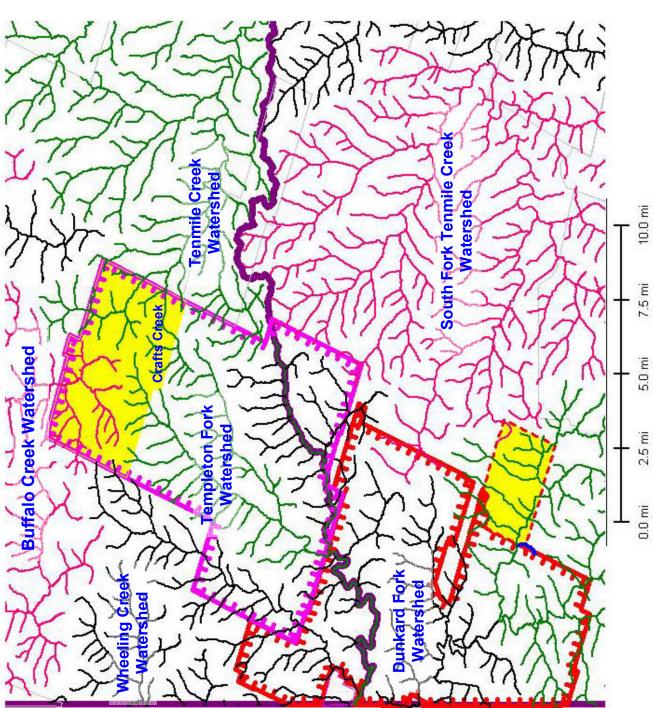


FIGURE 3: Streams and watersheds within and near Enlow Fork Mine (purple outline) and Bailey Mine (red outline) and their expansion areas (yellow shading). Chapter 93 designations are as follows: Pink = HQ-WWF, Green = TSF, Black = WWF. The TSF streams within the Bailey Mine expansion area are within the Dunkard Fork watershed of the Enlow Fork Creek basin, which is tributary to Wheeling Creek. Wheeling Creek flows westward through West Virginia and discharges into the Ohio River. Jacobs Run (HQ-WWF) is a tributary to South Fork Tenmile Creek, which is a tributary to the Monongahela River.

# IV EXISTING USE REQUIREMENTS

Under the federal Clean Water Act, States are required to adopt an antidegradation policy that meets minimum federal requirements. Each State must include the antidegradation policy as an element of its surface water quality standards program in order to gain federal approval. The basic concept of antidegradation is to promote the maintenance and protection of existing water quality for Exceptional Value (EV) and High Quality (HQ) waters, as well as to protect existing uses for all surface waters. The Pennsylvania program, as reflected in 25 Pa. Code Chapter 93 (Water Quality Standards<sup>2</sup>), acknowledges that <u>existing</u> water quality and uses have inherent values worthy of protection and preservation. Furthermore, it recognizes EV and HQ waters as "special protection" waters, and §93.4a provides additional levels of protection for such waters.

An "existing use" is defined at §93.1 as

Those uses actually attained in the water body on or after Nov. 28, 1975, whether or not they are included in the water quality standards.

The same definition appears in the federal regulations at 40 CFR §131.3(e). An "existing use" is different from a "designated use." A "designated use" is defined in §93.1 as those uses specified in §§93.9a-93.9z for each waterbody or segment, whether or not the use is being attained. As described in the Water Quality Antidegradation Implementation Guidance (PADEP 2003):

....while a designated use is a regulation that is the product of a rulemaking process, an existing use is a DEP classification for a stream based on valid technical information for a surface water that DEP has reviewed. Existing uses are generally the same as, but in some situations may be more or less protective than, designated uses. [page 6]

Existing use protection is required by regulation to be provided for a waterbody segment when DEP takes a final action on a permit application. Anyone seeking a permit or approval from DEP to conduct an activity that may impact a surface water must demonstrate to DEP that its activity will protect and maintain the more protective of the designated use or the existing use for the waterway. This typically is done in the context of NPDES permit reviews, but it applies equally to all other DEP

<sup>&</sup>lt;sup>2</sup> <u>http://www.pacode.com/secure/data/025/chapter93/chap93toc.html</u>

permits or approvals. Public participation in the process of making an existing use determination is encouraged (PADEP 2003):

Interested persons and applicants are encouraged to submit existing use information on other applications [other than NPDES] and requests for DEP approval that may impact a surface water. In addition to NPDES discharges, these activities may include the sewage facilities planning (Act 537) process; **resource extraction activities such as surface and underground mining** and <u>oil and gas extraction</u>; landfills; requests for approval of water obstructions, encroachments, and dams; stormwater management planning (Act 167) activities; water withdrawal requests; and other activities which require a DEP permit or approval and may impact a surface water. [emphasis added] [page 12]

Furthermore,

Classification of existing uses is an on-going process driven by the sources of data listed above. Individuals, agencies, or organizations outside DEP have the option of providing sufficient data to substantiate their position that the existing use differs from the designated use, or simply providing enough information to establish that the waterbody in question warrants an existing use evaluation. [emphasis added] [page 8]

# One of the primary objectives of this report is to provide the existing information that demonstrates that numerous waterbodies in the Enlow Fork Mine and Bailey Mine expansion areas warrant existing use evaluations.

The standard for existing use protection is described in §93.4a(b):

Existing instream water uses and the level of water quality necessary to protect the existing uses shall be maintained and protected.

This directive is mandatory, not discretionary. §93.4c(a)(1) further provides that:

(i) Existing use protection shall be provided when the Department's evaluation of information (including data gathered at the Department's own initiative, data contained in a petition to change a designated use submitted to the Environmental Quality Board pursuant to §93.4d(a), or data considered in the context of a Department permit or approval action) indicates that a surface water has attained an existing use.

and

(iv) The Department will make a final determination of existing use protection for the surface water as part of the final approval action.

Again, these provisions are mandatory, not discretionary. In the context of coal mining, these provisions are repeated in DEP's guidance "*Surface Water Protection - Underground Bituminous Coal Mining Operations*" (PADEP 2005).

The bituminous coal mining regulations in 25 Pa. Code Chapter 89 establish permit application requirements and performance standards for underground coal mining activities. The operation plan for an underground mine requires both the evaluation and protection of overlying streams. Chapter 89 also requires permit applicants to collect baseline hydrologic information on surface and ground waters above the mine area.

Prior to the significant revisions of TGD 563-2000-655 which became effective in part on 8 October 2005 (and fully effective on 8 October 2007), minimal information was being collected on the premining condition of streams. In accordance with the current TGD, however, mine applicants now specifically are required to collect and monitor detailed information on wetlands and streams, including their physical characteristics, their water quality, and their existing uses. The data collected for the two mine expansion areas discussed herein indicate that many of the streams are likely to have existing uses better than their designated uses, <u>but no formal attempt has yet been made by DEP to recognize</u>, disclose, and protect those existing uses.

# V DATA REGARDING EXISTING WATER QUALITY AND USES

Approximately 40% of the Enlow Fork Mine expansion area encompasses watersheds of streams that currently are designated HQ-WWF, including the Buffalo Creek watershed and the Sawhill Run watershed. Existing data suggest that some of these waterbodies may have existing uses of "Exceptional Value" (EV). The streams within the remaining 60% of this mine expansion area are designated TSF, but existing data collected as part of the mine application suggest that some of them also have existing uses of "EV" or "HQ". Likewise, in the Bailey Mine expansion area, most of the streams currently are designated TSF, but existing data suggest that some of them have existing uses of "EV" or "HQ".

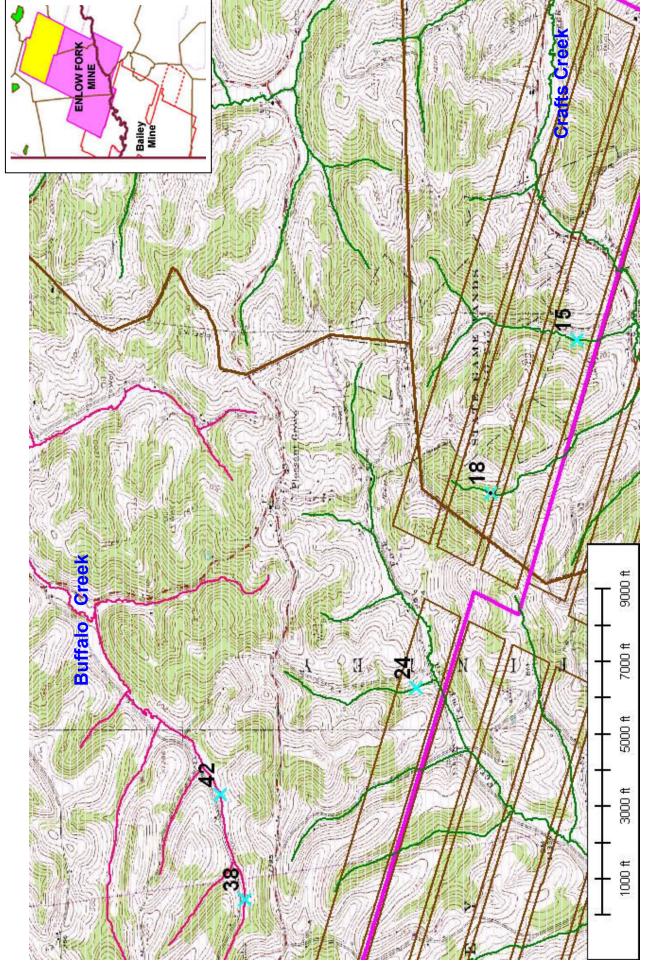
The TGD requirements applicable to mine applications (including those for *expansions*) include: (1) baseline monitoring of stream flow for at least two years prior to mining, (2) baseline information on wetlands, fish, and macroinvertebrate communities, and (3) physical and chemical characterization of streams. The data collected in accordance with these requirements are not by themselves sufficient to make an existing use determination. To do that requires comparison of the macroinvertebrate data from a subject stream with contemporaneous data from an EV reference stream.

The data collected in these two mine expansion areas, however, sufficiently characterize the macroinvertebrate community to identify streams which clearly are attaining uses higher than their designated uses at the present time. As noted above, the information provided to DEP by outside individuals or organizations needs only to be adequate to establish that the waterbody in question warrants an existing use evaluation. These premining inventory data already in DEP's files clearly do that.

Specific data for eight streams are summarized here and presented in more detail in Appendix A and Appendix B. <u>These eight streams likely are **not** the only streams that</u> <u>potentially have attained existing uses better than their designated uses; they are</u> <u>merely a representative sampling of such streams in these two expansion areas</u>. Five streams within the Enlow Fork Mine expansion area (Figure 4) are highlighted here for their outstanding biological conditions. Three streams in the Bailey Mine expansion area (Figure 5) are similarly highlighted. Appendices A and B provide relevant excerpts from the mining consultant's reports on their bioassessment procedures and the results of their evaluations with respect to these eight streams. The DEP California District Mining Office has copies of the original reports in their entirety.

The table below identifies the eight stream stations selected for discussion in this report. Listed in the table are the highest Habitat Assessment Score (HAS) and the highest Total Biological Score (TBS) identified at each station by CEC (Civil & Environmental Consultants, Inc.) on behalf of Consol. These eight stream segments typically exhibited "optimal" (or high "suboptimal") HASs, and among the highest TBSs of all the streams within the respective mine permit area. Other streams in these areas, by comparison, scored lower on their HASs and TBSs during the same assessment period, although most were at least attaining their designated uses.

	Latitude N.	Longitude W.	Highest Habitat Assess't Score	Highest Total Biological Score	Mine Panel Location
Enlow Fork Mine, North Expansion Area			<u></u>	<u></u>	
Crafts Creek (designated TS) Station <b>BSW 15</b>	SF) 40°03'12.77"	80°20'42.86"	140	85.4	Panel E18
Station <b>BSW 15</b>	40°03'12.77 40°03'36.42"	80 20 42.86 80°21'24.70"	140	83.7	Panel E19
UNT Templeton Fork (des	ignated TSF)				
Station BSW 24	40°03'56.53"	80°22'17.65"	137	87.1	Panel F18
Buffalo Creek (designated H	,				
Station BSW 38	40°04'43.25"	80°23'15.41"	161	71.1	Panel F20
Station BSW 42	40°04'49.82"	80°22'46.76"	114	80.7	Panel F21
Bailey Mine, East Expansion Area					
Kent Run (designated TSF)					
Station BSW 02	39°53'52.86"	80°25'30.26"	161	82.5	Panel A1
UNT North Fork Dunkard Fork (designated TSF)					
Station BSW 16	39°52'35.78"	80°23'29.50"	141	83.7	Panel A4
UNT North Fork Dunkard Fork (designated TSF)					
Station BSW 20	39°52'33.29"	80°24'09.18"	159	82.3	Panel A5



BSW 24, BSW 38, and BSW 42) within the DEP-approved Enlow Fork Mine expansion area (yellow shading in inset). Stations BSW 38 and BSW 42 are along streams currently designated as "HQ-FIGURE 4. Location of the five bioassessment stations discussed in this report (BSW 15, BSW 18, WWF". Longwall mine panels already mined in southern section of view are outlined.

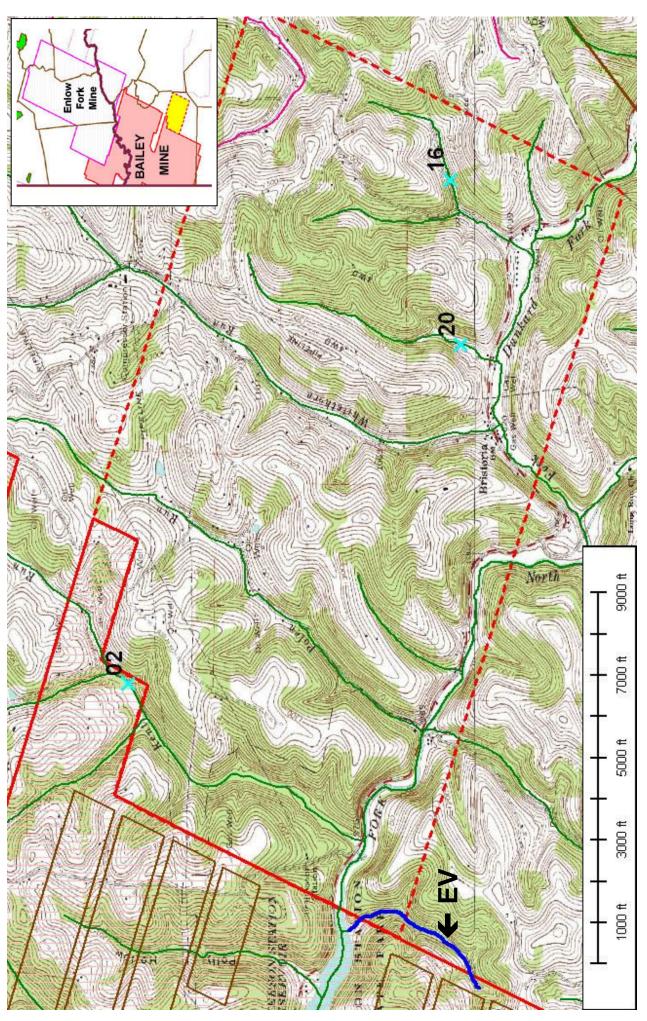


FIGURE 5. Location of the proposed Bailey Mine East Expansion (outlined in dashed red; yellow shading discussed in this report (BSW 02, BSW 16, and BSW 20) are identified. EV reference stream (blue in inset), in Richhill Township, Greene County. Selected bioassessment monitoring locations line) in Ryerson Station State Park is noted at arrow.

# Summary of Enlow Fork Mine Expansion Area Bioassessment Data

The premining bioassessment data compiled for streams in the Enlow Fork Mine expansion area were collected between 13 March and 7 May 2007 (CEC 2007a). During that period, CEC sampled 60 biomonitoring stations within the portion of the permit area expected to be mined within the first two years following approval, which included the E18-E23 and F18-F23 longwall panels. CEC performed basic water quality measurements, evaluated physical habitat conditions, and performed habitat and stream assessments in accordance with the stream assessment protocols prescribed in the TGD (PADEP 2005). Five of the 60 stream sections are summarized here and highlighted in Appendix A.

Eight stations were evaluated on tributaries to Crafts Creek, including **BSW 15** and **BSW 18**. The highest TBSs (85.4 and 83.7) were found at BSW 15 and BSW 18, respectively. The overall biological metrics for these two stations suggest excellent macroinvertebrate communities in these streams; they are very diverse (34 and 30 total taxa, respectively), have a very high number of intolerant benthic taxa (23 and 20, respectively), and have a high number of Trichopteran taxa (caddisflies): 7 at BSW 18 and 5 at BSW 15.

Six stations were evaluated on tributaries to Templeton Fork, including **BSW 24**. The highest TBS (87.1) was recorded at station BSW 24. In comparison, the lowest nearby TBS, recorded at BSW 26 (45.8), was only 53% of BSW 24. The biological metrics for Station BSW 24 showed extremely high diversity within the benthic macroinvertebrate community; a total of 37 taxa, a total of 19 intolerant taxa, and a total of 9 Trichoptera. The diversity and richness at this station were attributed to favorable habitats created by the multiple snags and the wide range in sizes of substrate.

Four stations were evaluated on the Buffalo Creek mainstem, including **BSW 38** and **BSW 42**. Station BSW 38 had the highest Habitat Assessment Scores (161 for high gradient [riffle/run] habitats and 160 for low gradient [pool/glide] habitats), indicating optimal conditions for both types of instream habitats. The highest Total Biological Score of 80.7 was found above the F21 Panel at Station BSW 42. The biological metrics for Stations BSW 38 and BSW 42 showed high diversity within the benthic macroinvertebrate community, with 25 and 26 total taxa, respectively. These two stations also exhibited a richness of intolerant taxa (17 and 16, respectively) and a high number of Trichoptera (4 and 6, respectively).

# Summary of Bailey Mine Expansion Area Bioassessment Data

Data were collected and evaluated from 24 stations within the Bailey Mine expansion area between October 2006 and January 2007 (CEC 2007b). The consultant for Consol performed basic water quality measurements, evaluated physical habitat conditions, and performed habitat and stream assessments in accordance with the

procedures detailed in the TGD (PADEP 2005). Three of the 24 stream sections are summarized here and highlighted in Appendix B.

Six stations were evaluated on Kent Run by CEC, including Station **BSW 02**. All six stations had optimal Habitat Assessment Scores of 80% or higher for either their high or low gradient habitats, and in many cases for both. Station BSW 02 had the highest TBS (82.5) of all six stations. This station exhibited very high diversity within the benthic macroinvertebrate community, with 34 total taxa, including 19 intolerant taxa and 5 Trichoptera. Stable cobble/gravel substrates and cover habitat were abundant and were believed to have contributed to the establishment and maintenance of a productive macroinvertebrate population at this station.

Five stations on tributaries to North Fork Dunkard Fork were evaluated, including Station **BSW 16** and Station **BSW 20**. All 5 stations had optimal or high suboptimal Habitat Assessment Scores, with Station BSW 20 scoring 80% for high gradient habitat. Gravel (48%) and cobble (35%) were the dominant substrates at Station BSW 20. Station BSW 16 had the highest TBS (83.7) of all five stations on North Fork Dunkard Fork; indeed, that score was the highest of all 24 stations sampled for this mine expansion. Station BSW 20 also had a very high TBS of 82.3. Both Station BSW 16 and Station BSW 20 exhibited high diversity within the benthic macroinvertebrate community, with 26 and 28 total taxa (respectively) and intolerant taxa numbering 18 and 20. Station BSW 16 had the highest number of Trichoptera (7) of all 24 biomonitoring stations. Riffle-pool-riffle sequences reportedly provided varied niche habitats throughout the watercourses at these stations.

The data for these eight streams clearly indicate excellent water quality and biological conditions. Particularly in the streams which currently are designated TSF, these data suggest that EV or HQ conditions probably exist. Some of the streams currently designated HQ-WWF likewise may deserve an even greater (EV) level of protection. At minimum, these data clearly establish that these waterbodies warrant existing use evaluation by DEP. Other streams within the expansion area, not specifically highlighted herein, also may have existing uses better than their currently-designated uses. As discussed below, there is a significant, credible risk that the flow and water quality of these streams will be damaged by prospective resource extraction.

# VI LIKELIHOOD OF IMMINENT DAMAGE TO SPECIAL PROTECTION WATERS

A severe loss of water attributed to longwall mining adversely impacted Crafts Creek beginning in November 2008, only months after the Enlow Fork expansion was approved by DEP. Significantly, the loss of streamflow was <u>not expected</u> to occur when the permit application was prepared by Consol's consultants and reviewed by DEP. Using the same criteria and predictive models, no flow loss is expected by the permittee or by DEP in any of the streams in the adjacent Buffalo Creek watershed.

In Consol's July 2005 application for the Enlow Fork Expansion, 38 sections of streams were predicted to experience stream *pooling* (and thus a need for stream restoration), but no adverse flow loss impacts were anticipated. In Module 19 of the expansion application, bonding costs were listed for specific actions expected to be taken for stream remediation in each of the streams predicted to be affected. For Crafts Creek and its tributaries, remediation costs totaling more than \$69,000 were estimated for the 7 gate cuts predicted to be needed to correct mining-induced pooling. No estimates were provided for grouting or other measures that might be needed to address water loss issues. For Buffalo Creek and its tributaries the estimates totaled more than \$236,000 for the 11 gate cuts that will be needed to repair expected pooling, but like Crafts Creek, nothing was proposed to address possible water loss because no such impact was anticipated.

As discussed above, some of the streams in the Buffalo Creek watershed, once evaluated by DEP, are likely to be recognized as having "Exceptional Value" existing uses, whereas currently they are designated "only" as "HQ". Furthermore, any wetland located in or along the floodplain of any EV stream is itself an EV water per Chapter 93, as well as being an "exceptional value wetland" per Chapter 105.

The Pennsylvania Environmental Hearing Board<sup>3</sup> found that changes such as pooling and flow loss fit within the definition of "pollution" under the Clean Streams Law<sup>4</sup>, which includes physical alteration of surface waters such as a diminution or deviation in flow. This raises an important policy question as to whether existing use protection is being provided to these "special protection" waterways (whether they are EV or "only" HQ) when an activity has been authorized which is expected to drop the streambed by several feet, resulting in pooling behind the unsubsided gate, which then will require, at minimum, excavation of the streambed through the gate area and other measures to restore flow to that waterway. The proposed cost estimates for restoration mentioned above assume that everything goes as "predicted"; otherwise, sections of the same "special protection" waterways may become dewatered and require a year or more of additional physical disturbances as efforts are undertaken to try to restore premining hydrologic and biologic conditions.

DEP completed a required CHIA (Cumulative Hydrologic Impact Assessment) for the proposed Enlow Fork Mine expansion. In the section of the CHIA entitled "Underground Mining Effects on Surface Waters", which directs DEP to

Identify all perennial and intermittent streams that will have mining within their "zones of potential influence" and describe the conditions or measures that will serve to prevent their diminution

the DEP response was that flow loss is "NA [not applicable] based on amount of cover present beneath all streams"; i.e., only pooling was expected to occur.

<sup>&</sup>lt;sup>3</sup> *Oley Township v. DEP*, 1996 EHB 1098 <sup>4</sup> 35 P.S. §691.1

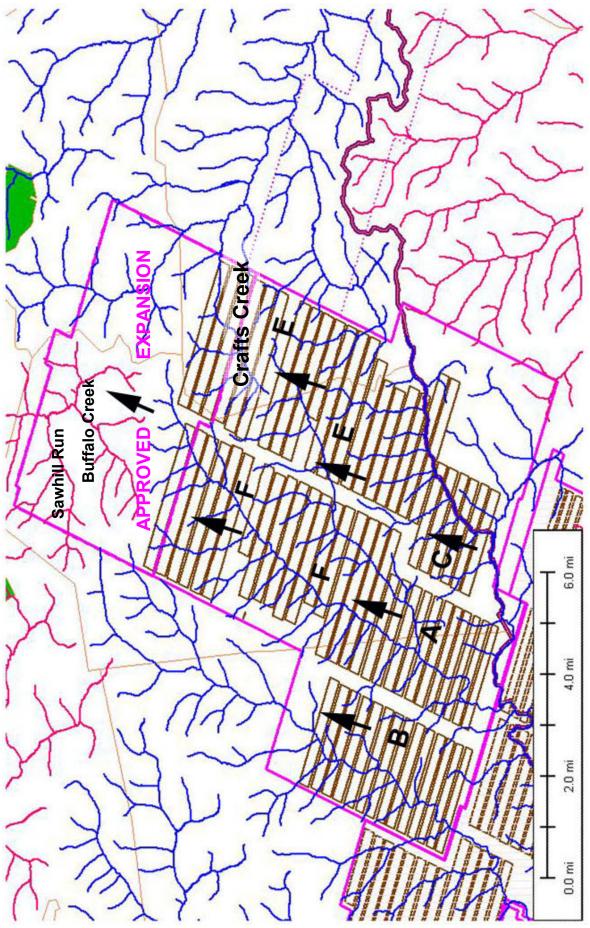
Despite these predictions and expectations, during November 2008 at least 1,400 feet of a perennial section of Crafts Creek unexpectedly went dry as the result of longwall mining in the newly-authorized expansion of Enlow Fork Mine (Compliance Order #086004, dated 13 November 2008). The documented loss of water above the E18 longwall panel also caused a fishkill. One year later, as explained by DEP representatives to a meeting of residents in Morris Township, the stream still had not returned to its natural condition, despite numerous attempts by Consol to grout the streambed and to artificially provide flow using surface and groundwater sources.

In Module 8 of its 2008 permit application for expansion of its Bailey Mine, Consol provided the following information regarding the greater potential it had observed for flow loss in headwater areas as a result of full-extraction (longwall) mining of coal:

Percent of watershed mined is a **primary factor** in evaluating the potential for mining induced flow loss. The increase in the percentage of watershed mined directly increases the influence of other primary parameters and incorporates the secondary supplemental variables of mining beneath headwaters/feeder springs and cumulative impacts. The percent of watershed mined influences at least two elements of flow maintenance: contributory flow sources and surface flow dewatering. As the percent of watershed mined increases, one or both of these elements may be affected leading to an impact or increased impact. Streams that are supported by a number of contributory flow sources and multiple subwatersheds generally maintain a higher average baseflow and are less likely to experience long term or irreversible changes to flow conditions as a result of mine subsidence. As more of the watershed is mined, the potential for a change in the hydrologic system is increased and the potential for a flow loss impact in a section of stream is increased. Particularly is this so under conditions where the contribution from flow sources is limited, as is the case with headwater type streams that are supported by small feeder springs and surface runoff only, the potential for dewatering is significantly higher.

Based on observations at some undermined streams, it appears the impacts to stream flow by longwall mining are influenced by the number of times the streambed is undermined. In general, the more times the stream is undermined, the greater the potential overall cumulative impact will be to the stream. [emphasis added]

Consol's Enlow Fork Mine was originally known as "Bailey No. 2 Mine" when it was first proposed in the early 1980s. Consol's Bailey (No. 1) Mine began mining near Enlow Fork Creek (which forms the boundary between Greene and Washington Counties) and proceeded generally southwestward. Bailey No. 2 Mine (Enlow Fork Mine) began near Enlow Fork Creek at the edge of Bailey (No. 1) Mine and proceeded northeastward. As illustrated in Figure 6, the general pattern of mining



The headwater watersheds of Buffalo Creek and Sawhill Run, both designated HQ, will be undermined in the next FIGURE 6. Enlow Fork Mine (purple outline) showing longwall panels already mined (A through F) outlined in brown Direction of mining (arrows) has been to the northeast, beginning near Enlow Fork Creek and proceeding up its tributary watersheds. Crafts Creek was mined first in its headwater watershed, and suffered water loss in 2008. few panels. has been to start near the mouth of streams and proceed upstream towards the headwaters. The Enlow Fork Mine expansion, by contrast, began longwall operations beneath the headwaters of Crafts Creek and proceeded to undermine all of its headwater tributaries. As Consol acknowledged in the quotation above (page 10), when a stream's source of water is limited, as it is in headwater areas, undermining of those sources is more likely to result in dewatering of the stream because a greater percentage of its watershed is affected. Shortly after the headwaters of Crafts Creek were undermined, it suffered an adverse flow loss. The imminent mining of Panels F20 and F21 will undermine the headwaters of Buffalo Creek (Figure 7), quite possibly with the same adverse results.

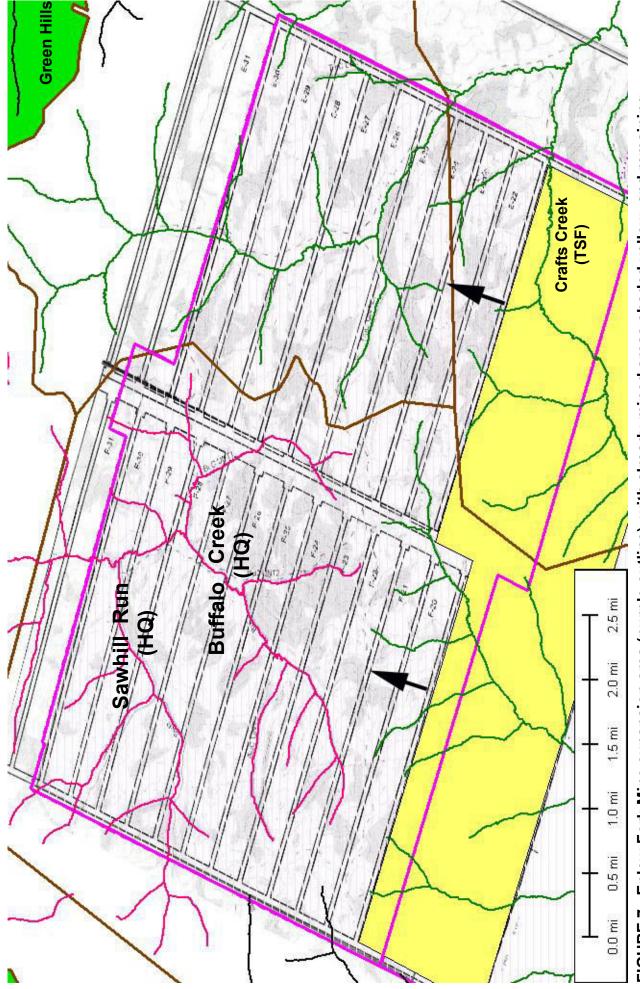
A progression of total-extraction mining similar to that which occurred beneath Crafts Creek (*i.e.*, longwall mining beginning in the headwaters area instead of near the mouth of a stream) occurred in 2004 under Maple Creek in Fallowfield Township, Washington County, where UMCO's High Quality Mine completely dried up the stream. Restoration of flow in Maple Creek was unable to be accomplished, no matter what mitigation techniques were attempted. PennFuture and DEP litigated and won a case against UMCO<sup>5</sup>, whereby it was not allowed to continue to use longwall mining in the subsequent panels planned under nearby streams. DEP determined that additional longwall mining there would have similar adverse impacts on the streams, and so it authorized only room-and-pillar mining (which UMCO elected not to undertake). One acknowledged means of avoiding damage to streams due to full-extraction (longwall) mining is to utilize a different method of underground mining (*e.g.,* room-and-pillar).

As noted above, the percent of watershed mined is a "primary" factor in the potential for mining-induced flow loss in streams. The depth of cover ("overburden") is another primary factor which affects whether a stream may experience flow loss, with the risk increasing as depth of cover decreases. The minimum depths of cover under Buffalo Creek (500 feet) and Sawhill Run (510 feet) are similar to (indeed, slightly *less* than) the cover which existed under nearby Crafts Creek (540 feet). Taken together, these factors portend the significant likelihood of a flow loss in the "special protection" waters of the Buffalo Creek watershed.

# VII RECENT LOCAL EXPERIENCES WITH EV DESIGNATIONS

It is not unheard of for streams with designated uses of HQ or lower actually to be attaining EV uses, especially in undisturbed forested headwater sections of those streams in the little-studied hollows of Greene and Washington Counties. Indeed, the DEP maintains a publicly accessible list of surface water segments by county (<u>http://www.portal.state.pa.us/portal/server.pt/community/existing\_use/10557</u>) where instream data have been evaluated which indicate an existing use of a waterbody

<sup>&</sup>lt;sup>5</sup> UMCO Energy, Inc. *vs* PADEP and PennFuture, EHB Docket No. 2004-245-L, 5 September 2006, *aff'd*, 938 A.2d 530 (Pa. Cmwlth. 2007)(*en banc*)



panels dashed. Undermining will proceed toward the northeast, as noted by arrows. Streams in the Sawhill Run FIGURE 7. Enlow Fork Mine expansion area (purple outline), with already-mined areas shaded yellow, and remaining Longwall mining in the headwaters of Crafts Creek caused unpredicted flow loss beginning in November 2008. and Buffalo Creek watersheds currently are designated HQ-WWF, but some may have existing uses of "EV"

that is more protective than the designated use in §§ 93.9a – 93.9z. The list is maintained and updated by the Bureau of Water Supply and Wastewater Management.

During 2008, in conjunction with routine stream assessment fieldwork, DEP aquatic biologists identified the very first Exceptional Value (EV) streams ever recognized in all of Greene and Washington Counties. UNT North Fork Dunkard Fork (Stream Code 32599), which previously had been designated TSF, was found to be attaining EV uses. UNT Owens Run (Stream Code 32704), which previously had been designated WWF, also was found to be attaining EV uses. Both of those streams are in Richhill Township, Greene County. Notably, UNT North Fork Dunkard Fork was found to be among the best of all EV streams, and thus qualifies as a "reference EV" stream.

During June 2008, a formal petition was submitted to the Pennsylvania EQB (Environmental Quality Board) by Foundation Mining, L.P., to redesignate to WWF several streams that were designated HQ-WWF in the upper South Fork Tenmile Creek basin. Foundation Mining planned to conduct longwall mining activities in the vicinity of the subject streams and knew it would have to comply with more stringent discharge requirements if the streams maintained their "special protection" designation as HQ than if they were redesignated WWF. In conjunction with the petition, Foundation Mining submitted stream assessment data documenting relatively poor water quality conditions in the streams for which it was seeking a downgrade in designation.

In response to the petition, and on behalf of PennFuture and local environmental protection groups, Dr. Ben Stout conducted independent bioassessment studies on the streams (Stout 2009; Schmid and Company, Inc. 2009). Dr. Stout's analyses demonstrated, and DEP's own studies subsequently confirmed, that several of the subject streams actually were attaining EV uses. Consequently, instead of reducing the regulatory protections afforded to them, five HQ-designated waterways<sup>6</sup> were immediately reassigned in 2009 to the most protective classification of all - *Exceptional Value* - on the DEP statewide list.

That the coal company consultants' data on stream conditions and water quality differed so sharply from what Dr. Stout and DEP actually documented must be kept in mind in the current situation. The premining bioassessment data provided in the Enlow Fork and Bailey mine expansion applications (which are discussed herein in part) suggest that some of the streams have very good water quality, but even those data must be viewed skeptically as minimum indicators of the aquatic uses and conditions of streams in the areas where coal extraction is intended.

<sup>&</sup>lt;sup>6</sup> UNT #40637 House Run, UNT #40638 House Run, UNT#40629 McCourtney Run, UNT #40634 Hoge Run, and UNT #40633 Hoge Run.

# VIII SUMMARY AND CONCLUSIONS

This report provides existing technical data which clearly establish that numerous waterbodies in Greene and Washington Counties warrant existing use evaluation by DEP. In accordance with the requirements of Chapter 93, the DEP should conduct immediately the necessary bioassessment surveys to document the existing "special protection" uses of streams within the 9,688-acre DEP-approved Enlow Fork Mine expansion area and within the 3,175-acre proposed expansion area for the Bailey Mine. The need for these specific evaluations is urgent in light of the imminent threats to these streams, to their existing uses, and to their associated wetlands posed by longwall coal mining and Marcellus Shale natural gas production.

Looking forward, the DEP District Mining Offices should formalize an arrangement with the DEP Office of Water Management so that the latter's aquatic biologists can perform routine reviews of premining inventory data, with followup in-field investigations as warranted, prior to approving any permits for surface or underground coal mining activities.

# IX AUTHORSHIP

This report was compiled by Stephen P. Kunz , with assistance from James A. Schmid, senior ecologists with Schmid & Company, Inc. Mr. Kunz has been an environmental consultant since receiving a degree in human ecology from Rutgers University in 1977. Dr. Schmid is a biogeographer with 40 years of experience in ecological consulting. Both Mr. Kunz and Dr. Schmid are certified as *Senior Ecologists* by the Ecological Society of America and as *Professional Wetland Scientists* by the Society of Wetland Scientists.

Mr. Kunz and Dr. Schmid offer outstanding credentials as experts in ecology, wetlands, environmental regulation, and impact assessment. They have analyzed the environmental impacts of many kinds of proposed development activities in 10 states, including coal mining facilities, industrial facilities, transportation facilities, commercial developments, and residential developments. They have written Environmental Impact Statements under contract to the US Environmental Protection Agency, Army Corps of Engineers, Interstate Commerce Commission, various agencies of state and local governments, and a diverse array of private sector entities. They have prepared comprehensive analyses of environmental regulations of nationwide scope.

# **X ACKNOWLEDGMENTS**

Much of the information and underlying mine permit documents presented herein were obtained by the authors from the files of the Pennsylvania DEP's Bureau of Mining and Reclamation offices pursuant to the Pennsylvania Right to Know Law (Act

3 of 2008). The authors sincerely appreciate the cooperation of the Department, and in particular the assistance of the staff of the California District Mining Office in Coal Center, PA. The authors' review of those records, and the consequent discovery of the significant and serious issues regarding current and ongoing longwall coal mining operations and permitting as presented in this report, were made possible by grants from the Pennsylvania Chapter of the Sierra Club (Bernheim Fund) and the Allegheny Group of the Pennsylvania Chapter of the Sierra Club (Huplits Wildlife Fund).

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# **APPENDIX A:**

Excerpts from

CEC Bioassessment Report for the Enlow Fork Mine Expansion Area

dated 12 November 2007

Appendix A



Selected excerpts provided herewith

# BIOLOGICAL MONITORING REPORT ENLOW FORK MINE NORTH EXPANSION E18-E23 AND F18-F23 PANELS EAST FINLEY, MORRIS AND SOUTH FRANKLIN TOWNSHIPS WASHINGTON COUNTY, PENNSYLVANIA

**Prepared for:** 

# CONSOL PENNSYLVANIA COAL COMPANY CLAYSVILLE, PENNSYLVANIA

CEC Projects 070-338.0003

November 12, 2007





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### **1.0 INTRODUCTION**

### 1.1 BACKGROUND

Consol Pennsylvania Coal Company (CPCC) retained Civil & Environmental Consultants, Inc. (CEC) to collect and interpret baseline ecological monitoring data for the two-year mining plan of the proposed Enlow Fork Mine North Expansion area located in East Finley, Morris and South Franklin Townships, Washington County, Pennsylvania. The study area includes the E18-E23 Panels and the F18-F23 Panels longwall mining panels, and the shared main, which exceeds the two-year mining plan area (Figure 1 – Site Location Map). Pike Environmental Consulting (PEC) was a subconsultant to CEC and performed the biomonitoring for the F18-F23 Panels.

The ecological data collection involved sampling representative stream reaches for water quality, habitat characteristics, benthic macroinvertebrates, and fish. The biological sampling was performed in accordance with the low gradient stream sampling protocol presented in Appendix B of the Pennsylvania Department of Environmental Protection (PADEP) Technical Guidance Document (TGD) 563-2000-655, *Surface Water Protection – Underground Bituminous Coal Mining Operations* (PADEP 2005). The Appendix B data collected include total biological scores based on the low gradient benthic macroinvertebrate sampling, Wolman pebble counts, and low gradient stream habitat assessment scores.

The data presented in this report were collected between March 13 and May 7, 2007. These data supplement the initial baseline data presented in *Biological Monitoring Data Report, Enlow Fork Mine North Expansion Area, Washington County, Pennsylvania* dated June 24, 2005 (CEC 2005).

### 1.2 PURPOSE

The purpose of this study was to collect ecological data that will be used by CPCC in preparing various permit applications, as well as fulfilling the biological monitoring requirements of the

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PADEP TGD 563-2000-655. The permit applications will address potential ecological impacts to streams as well as the proposed stream restoration activities.

# 1.3 STUDY AREA CHARACTERISTICS

This study area encompasses approximately 7,865 acres including the proposed permit boundary (Panels E18-E23 and F18-F23) and a shared main as shown on Figure 1 – Site Location Map. The study area is located within the Waynesburg Hills physiographic province (Pennsylvania Department of Conservation and Natural Resources, PA DCNR 2000) of the Western Allegheny Plateau Ecoregion (United Stated Environmental Protection Agency, USEPA 1999) located within the Monongahela River catchment area. The study area includes portions of the following watersheds:

Stream Name and PADEP Stream Code	Total Watershed Area (Acres)	Watershed Area within Study Area (Acres)
Buffalo Creek (32777)	104,121	3,997
Crafts Creek (40938)	2,405	1,652
Robinson Fork (32650)	14,343	235
Sawhill Run (32982)	1,806	1,124
Templeton Fork (32708)	13,280	1,371
Tenmile Creek (40285)	216,255	4,096

Crafts Creek is a tributary to Tenmile Creek which flows into the Monongahela River. Sawhill Run is a tributary to Buffalo Creek which discharges directly into the Ohio River. Both Templeton Fork and Robinson Fork flow into Enlow Fork which then flows into Wheeling Creek. The following table provides the total acreage for each of these watersheds and the acreage for that portion of each watershed located within the study area.

Predominant land-uses within the study area include primarily farmland on floodplains and moderate slopes, and interspersed tracts of forest (second-growth, mixed mesophytic). The watersheds within the study area display dendritic patterns of drainage within their catchment

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areas. The streams for the most part are moderate-gradient (2 to 4% slope) (Rosgen 1996). The stream order (Strahler 1964) for streams within the study area ranges from unmapped headwater tributaries to second-order streams based on United States Geological Survey (USGS) topographic mapping.

# 1.4 PA CHAPTER 93 AQUATIC LIFE PROTECTED USE

According to Pennsylvania's *Water Quality Standards* (Chapter 93, Title 25, Pennsylvania Code; Pennsylvania Code Online 2006), Templeton Fork, Crafts Creek, Tenmile Creek and their unnamed tributaries, including the headwater stream reaches contained within the site boundaries, all have a protected aquatic life use designation of Trout Stocking (TSF). The TSF protected use is defined as "maintenance of stocked trout from February 15 to July 31 and maintenance and propagation of fish species and additional flora and fauna which are indigenous to a warm water habitat.

Buffalo Creek, Sawhill Run, and their unnamed tributaries, including headwater streams contained within the site boundaries have a protected aquatic life use designation of Warm Water Fishes (WWF) and special protection use of High Quality (HQ). The WWF protected use is defined as "maintenance and propagation of fish species and additional flora and fauna which are indigenous to a warm water habitat".

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#### 2.0 METHODS

## 2.1 APPENDIX B STREAM BIOLOGICAL MONITORING

The Appendix A stream classification data presented in CEC's *Stream Classification Report*, *Enlow Fork Mine North Expansion E18-E23 and F18-F23 Panels, East Finley, Morris and South Franklin Townships, Washington County, Pennsylvania* (CEC 2007) was examined to determine the extent of biologically diverse streams within the study area. Sixty biomonitoring stations were established on biologically diverse stream reaches within the study area for the TGD Appendix B (PADEP 2005) benthic macroinvertebrate sampling. The stations were located based on geographical distribution, stream order, gradient of the streams within the panels, and potential for undermining effects (Figure 2). Photographs of each station are included in Appendix B of this report.

 $\equiv$  C performed basic water quality measurements, evaluated physical habitat conditions, performed USEPA (1999) habitat assessments and modified Wolman pebble counts in conjunction with the Appendix B benthic macroinvertebrate sampling. Field data forms for the stream biomonitoring are in Appendix A. The methods used to collect this information are presented in the following sections.

2.1.1 Stream Physical and Chemical Parameters

Field water quality parameters, including temperature, dissolved oxygen (DO), pH, and conductivity were measured at the biomonitoring stations concurrent with benthic macroinvertebrate sampling. Temperature, conductivity, and DO were measured in situ using a handheld YSI Model 85 meter. The pH was measured in situ using a handheld Cole Parmer Model 300 meter. Water velocity was measured across a representative slow riffle/run cross-section with a uniform bottom and laminar flow (if possible) using a calibrated Marsh-McBirney Model 2000 Flow-Mate stream velocity meter. These meters were maintained, operated, and calibrated per the manufacturer's instructions. Stream flow rates were calculated using the U.S.

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Geological Survey midsection, current meter method (Nolan and Shields 2000, Carter and Davidian 1968, Buchanan and Somers 1968).

Water quality measurements were recorded on a modified U.S. Environmental Protection Agency (USEPA 1999) Physical Habitat/Water Quality Field Data Sheet. Stream velocity, width, and depth measurements were recorded on a modified USEPA (1998) Stream Discharge Field Data Form.

### 2.1.2 Stream Habitat Characteristics

Stream habitat characteristics were recorded at biomonitoring stations. Habitat characteristics observed and recorded during the stream sampling included the following physical habitat descriptors and features: (1) visual appearance of water and sediment quality; (2) dimensions (length and width) of the wetted channel; (3) minimum and maximum water depth; and (4) degree of channel canopy cover (e.g., open, partly open, shaded, or partly shaded). These data were recorded on a modified USEPA (1999) Physical Habitat/Water Quality Field Data Sheet (Appendix A). Stream habitat was evaluated using the USEPA Habitat Assessment Field Data Sheets (modified from USEPA 1999). The Habitat Assessment Field Data Sheet - Low Gradient Streams was used to score reaches comprised predominantly of pool and glide habitats and the Habitat Assessment Field Data Sheet - High Gradient Streams was used to score reaches comprised predominantly of riffle and run habitats. A modified Wolman Pebble Count was also performed at each station according to methods presented in Harrelson, et al. (1994) to characterize the particle size distribution of the stream substrate.

### 2.1.3 Stream Benthic Macroinvertebrate Community Data

The following sections describe the methods used to collect and analyze benthic macroinvertebrate community data for the streams surveyed in this study.



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### 2.1.3.1 Benthic Macroinvertebrate Community Sampling

Benthic macroinvertebrate samples were collected in accordance with the conditions of Pennsylvania Fish and Boat Commission (PAFBC) 2007 Pennsylvania Scientific Collector Type III, Permit No. 159. The benthic macroinvertebrate community sampling procedure employed by CEC is described in detail in the following paragraphs.

The field sampling of benthic macroinvertebrates was performed in accordance with PADEP TGD 563-2000-655, *Surface Water Protection – Underground Bituminous Coal Mining Operations* (PADEP 2005). CEC followed the specific procedures outlined in, "Appendix B – PADEP Low Gradient Stream Assessment Protocol" presented on pages 30-41 of the TGD.

Stream biomonitoring stations were established in the field based on stream habitat characteristics within the individual stream reaches initially identified for Appendix B sampling (Figure 2 and Section 3.1). Each sampling station identified for assessment was 100 meters long. After identifying and quantifying the available habitat types present within the stream reach (i.e., snag, submerged aquatic vegetation, cobble/gravel, sand/fine sediment, and coarse particulate organic matter (CPOM)), ten benthic sampling locations were selected that effectively represented the observed habitats so that at least two jab samples were collected with a D-frame net in each type of habitat present. Detailed descriptions of each habitat type (e.g., snag, submerged aquatic vegetation, etc.) are presented on PADEP Appendix B-Benthic Macroinvertebrate Field Data Sheets located in Appendix A. When one or more of the specified habitats was absent from the sampling reach, the D-frame jab samples allocated to these missing habitats were re-assigned to the available habitats, proportionately among the most extensive habitat type(s) in the stream reach.

After selecting the ten prospective jab locations, a D-frame dip net (12 inches wide x 10 inches high x 18 inches deep) with nylon Nitex multifilament net (500 micron mesh size) was used to perform one jab at each location. One jab consisted of sampling a 30-inch long path within the habitat type using the D-frame net. The specific methods and mechanics used to physically collect jabs in the five different habitat types are presented in the TGD Appendix B document.

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The number of proposed jabs and actual jabs collected in each available habitat type were recorded on a modified PADEP Appendix B-Low Gradient Stream Assessment Protocol Benthic Macroinvertebrate Field Data Sheet (Appendix A).

Immediately after collecting an individual jab, the net was carefully inverted and the contents emptied into a benthos bucket equipped with a 500 micron screen bottom. The net was examined for clinging organisms, which were also transferred into the bucket. After the ten jabs were collected, the organisms and material retained in the bucket were combined into one 2-gallon sample bucket and preserved with ethanol (>70% final concentration). The station number, stream name, station location, PADEP Appendix B sample and date were clearly marked on each sample container. The container was sealed and returned to the CEC laboratory for analysis.

A 200 ±20% subsample of benthic macroinvertebrates was processed in the laboratory from the composite sample collected at each biomonitoring station, according to the methods presented in the PADEP TGD (2005). Each composite macroinvertebrate sample was initially washed in a U.S. Standard No. 35 sieve. Large rocks and sticks were washed over the sieve, carefully examined for organisms, then discarded. The sieve contents were then transferred into a shallow pan with a numbered grid consisting of 28 squares (each square measured 2" x 2") with 4 rows consisting of 7 squares per row. Approximately  $1\frac{1}{2}$  to 2 inches of water was then added to the pan and the sample material was gently stirred to disperse the contents evenly throughout the pan.

Grid cutters (stainless steel tubular pipe sections), each with an inside area of approximately 4 in<sup>2</sup>, were used as the subsampling devices. First, a random numbers table for the 28 grid squares was created for the sample using Microsoft® Excel. Starting with the first random number, the grid cutter was centered over that selected grid number and gently "cut" into the sample material. The material within the grid cutter was carefully removed and placed in a white enamel pan, then dispersed with tap water and examined for identifiable benthic macroinvertebrates which were removed, counted and temporarily placed in a Petri dish containing water. This process was repeated for the next three grids, resulting in the first four grid numbers being sorted.

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If the subsample count was within the targeted  $200\pm20\%$  (160-240 range) organism count, then subsampling was complete and the organisms were transferred into a 4-ounce glass jar that contained 70% ethanol and was labeled with the required sample information. If the sample count was below the minimum 160 organism count after sorting four grids, then a grid cutter was placed on the fifth grid listed on the random numbers table and the material was removed and sorted for macroinvertebrates. Additional grids were sorted until the  $200\pm20\%$  organism goal was met, at which point the organisms were transferred to labeled sample jars containing 70% ethanol. Once a square was chosen, it was entirely sorted for macroinvertebrates. In those instances where the 240 organism limit was exceeded by sorting the initial four grids for the sample, secondary subsampling was required to bring the organism total back under the specified maximum limit. In these cases, the organisms collected from the first four grids were placed in a second gridded pan containing a small amount of cold water. The organisms were distributed as evenly as possible within the pan. A new random numbers table was generated for the selection of grid numbers. Grids were sorted in order until the 200 ±20% organism goal was reached.

Identification of benthic macroinvertebrates was performed employing a variable magnification (20 to 120X) stereomicroscope, a tungsten halogen light with a bifurcated gooseneck extension, and keys by Peckarsky et al. (1990), Merritt and Cummins (1996), Smith (2001), Stewart and Stark (2002), Wiggins (2000), and Thorp and Covich (1991). All sorted macroinvertebrates were stored in 70% ethanol solution and archived for future reference. CEC identified most insect taxa to the genus level and other taxa to the lowest practical level, with the exception of Annelids, which were identified to class level, and Curculionidae, Chironomidae, Ceratopogonidae, Talitridae, Decapoda, Gastropoda, and Pelecypoda, which were identified to family level. Data reports for the benthic macroinvertebrates are presented in Appendix C.

Collembola (spring-tails), Hemipterans and aquatic beetles other than larval Gyrinidae, Hydroscaphidae, Haliplidae, Psephenidae and Ptilodactylidae and larval and adult Elmidae were excluded from the 200 organism subsample used to generate the benthic metrics. Tolerance values and Functional Feeding Group (FFG) designations used to calculate the Intolerant taxa richness and Filterer-Collector + Predator taxa richness metrics were obtained from an expanded taxa list provided to Michael Davison of CEC by Mr. Charles McGarrell of the PADEP Central

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Office via e-mail transmission dated November 23, 2005. The expanded taxa list includes additional taxa not present in the original list in the PADEP TGD Appendix B section.

# 2.1.3.2 Benthic Macroinvertebrate Community Metrics

The taxonomic identification of benthic macroinvertebrates present within the  $200 \pm 20\%$  organism subsample produced for each sampling station resulted in the generation of a taxa list with the number of organisms present for each distinct taxon. These data were used to calculate the values for the five biological metrics presented in PADEP TGD, Appendix B – Low Gradient Stream Assessment Protocol. These five benthic metrics, which are all based on taxa richness rather than percent abundance, are presented on the following table:

<b>Biological Metric</b>	Metric Category	Description
Taxonomic Richness	Richness	Total Number of taxa
Trichoptera Taxa Richness	Richness	Total Number of caddisfly taxa
Percent EPT Taxa	Composition	The total number of Ephemeroptera (mayfly), Plecoptera (stonefly), and Trichoptera (caddisfly) taxa divided by the total number of taxa
Intolerant Taxa Richness	Tolerance	The total number of taxa with a pollution tolerance value <5
Filterer-Collector + Predator Taxa Richness	Trophic	The total number of taxa in the filterer- collector and predator functional feeding groups

All five of these metrics generally show a decrease in values in response to degradation in water quality or other environmental perturbation.

The observed values for the five biological metrics were calculated for each sampling station. It was then necessary to normalize each observed value obtained for the five metrics to a scale of 0 to 100 based on the 95<sup>th</sup> percentile value from the PADEP's statewide low gradient stream dataset using the following equation:

Normalized Metric score = (Observed Value / 95<sup>th</sup> Percentile Value) x 100



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The 95<sup>th</sup> percentile values from the Pennsylvania statewide, low gradient stream dataset are presented in the following table, which provides an example of the metric calculations performed for Station BSW16 on Crafts Creek within the study area:

Biological Metric	Station BSW16 Crafts Creek (Observed Values)	95 <sup>th</sup> Percentile Value of PA Statewide Dataset	Normalized Score (Observed Value / 95 <sup>th</sup> percentile value) x 100
Taxonomic Richness	22	30.5	72.1
Trichoptera Taxa Richness	1	10.5	9.5
Percent EPT Taxa	36.4	61.6	59.1
Intolerant Taxa Richness	8	16.0	50.0
Filterer-Collector + Predator Taxa Richness	7	13.5	51.9
Total Biological Score (mean of adjusted values)		u.	48.5

The total biological score was calculated as the mean of the five normalized metric scores. In those instances where the observed value is better than the 95<sup>th</sup> percentile value for a metric, the normalized score is converted to a maximum of 100 before the total biological score is calculated for the sampling station. The total biological score was calculated for the 45 Appendix B benthic macroinvertebrate sampling stations in the E18-E23 and F18-F23 panel study area.

# 2.2 FISH COMMUNITY DATA

Fish community sampling procedures and the metrics used to analyze fish community data are described in the following sections.

2.2.1 Fish Community Sampling

Electrofishing surveys were conducted by CEC at the 26 biomonitoring stations on the E18 through E23 panels. Fish sampling was not performed concurrently with the Appendix B

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# 3.0 STREAM BIOLOGICAL MONITORING RESULTS

### 3.1 STREAM BIOMONITORING STATIONS

During March through May 2007, CEC and PEC sampled 60 biomonitoring stations within the projected two-year monitoring plan of the permit area, which includes the E18-E23 and F18-F23 Panels. The biomonitoring stations are listed in the table below and are shown in Figure 2. Field data forms and photographs collected at the biomonitoring stations are provided in appendices A and B, respectively. Stream water quality, habitat, and biological data are presented in Tables 1 - 19. The following sections present the biomonitoring results for each major watershed and the streams sampled in the study area.

Stream Name	Biomonitoring Stations
Buffalo Creek (main stem)	32777-Enlow-F20 Panel-BSW38
	32777-Enlow-F21 Panel-BSW42
	32777-Enlow-F22 Panel-BSW46
	32777-Enlow-F23 Panel-BSW51
Buffalo Creek tributaries	32777(23)-Enlow-F20 Panel-BSW39
	32777(16)-Enlow-F21 Panel-BSW41
	33000-Enlow-F21 Panel-BSW43
	32996(6)-Enlow-F22 Panel-BSW44
	32996-Enlow-F22 Panel-BSW45
	32999-Enlow-F22 Panel-BSW47
	32998-Enlow-F22 Panel-BSW48
	32996(3)-Enlow-F23 Panel-BSW50
	32998-Enlow-F23 Panel-BSW52
	32998-Enlow-F23 Panel-BSW53
Crafts Creek (main stem)	40938-Enlow-E18 Panel-BSW16
	40938-Enlow-E19 Panel-BSW20
	40938-Enlow-E20 Panel-BSW26

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Stream Name	Biomonitoring Stations
Crafts Creek tributaries	40944-Enlow-E18 Panel-BSW13
	40944(1)-Enlow-E18 Panel-BSW14
	40942-Enlow-E18 Panel-BSW15
	40944-Enlow-E19 Panel-BSW18
	40942-Enlow-E19 Panel-BSW19
	40938(5)-Enlow-E19 Panel-BSW21
	40942-Enlow-E20 Panel-BSW22
	40943-Enlow-E20 Panel-BSW23
	40941-Enlow-E20 Panel-BSW24
	40938(6)-Enlow-E20 Panel-BSW25
	40943(1)-Enlow-E21 Panel-BSW28
	40938(3)-Enlow-E21 Panel-BSW29
	40939-Enlow-E22 Panel-BSW32
	40939-Enlow-E22 Panel-BSW33
	40940-Enlow-E23 Panel-BSW38
Tributary 32682 to Robinson Run	32650-Enlow-F22 Panel-BSW49
	32682-Enlow-F19 Panel-BSW35
	32682-Enlow-F20 Panel-BSW40
Templeton Fork (main stem)	32708-Enlow-E21 Panel-BSW27
	32708-Enlow-E22 Panel-BSW31
	32708-Enlow-E22 Panel-BSW34
	32708-Enlow-F18 Panel-BSW23
-	32708-Enlow-F19 Panel-BSW30
Templeton Fork tributaries	32741-Enlow-E18 Panel BSW10
	32708(50)-Enlow-E19 Panel-BSW11
8	32708(50)-Enlow-E20 Panel-BSW12
	32708(9)-Enlow-E22 Panel-BSW30
	32744-Enlow-F18 Panel-BSW24
	32743-Enlow-F18 Panel-BSW25
	32742-Enlow-F18 Panel-BSW26
	32738-Enlow-F18 Panel-BSW27
	32739-Enlow-F18 Panel-BSW28
	32739(2)-Enlow-F18 Panel-BSW29
	32745-Enlow-F19 Panel-BSW31
	32744-Enlow-F19 Panel-BSW32
	32743-Enlow-F19 Panel-BSW33
	32739-Enlow-F19 Panel-BSW34
3	32745-Enlow-F20 Panel-BSW36
Tenmile Creek tributaries	32744-Enlow-F20 Panel-BSW37
remine Creek indutaries	40937-Enlow-E18 Panel-BSW17
	40949(1)-Enlow-E23 Panel-BSW35
	40949-Enlow-E23 Panel-BSW36
	40951-Enlow-E23 Panel-BSW37

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# STREAM WATER QUALITY, HABITAT CHARACTERISTICS, AND BENTHIC MACROINVERTEBRATE APPENDIX B SCORES TRIBUTARIES 40942, 40943, AND 40943(1) TO CRAFTS CREEK ENLOW FORK MINE NORTH EXPANSION, PANELS E18-E23 AND F18-F23 CONSOL PENNSYLVANIA COAL COMPANY WASHINGTON COUNTY, PENNSYLVANIA T\_\_LE 9

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				AIIDAD UNIT	SI HEAM WATER QUALITY AND HABITAT CHARACTERISTICS	RISTICS				
				CRA	CRAFTS CREEK TRIBUTARY STATIONS	RIBUTARY STA	TIONS			
PAHAMELEH	40942-Enlow-E1 BSW15	40942-Enlow-E18 Panel- BSW15	40942-Enlov BSV	40942-Enlow-E19 Panel- BSW19	40942-Enlov BSN	40942-Enlow-E20 Panel- BSW22	40943-Enlor BSI	40943-Enlow-E20 Panel- BSW23	40943(1)-Enl BS	40943(1)-Enlow-E21 Panel- BSW28
	March 13, 2007	3, 2007	March .	March 13, 2007	March 1	March 14, 2004	March .	March 14, 2007	March	March 19, 2007
	Riffle	Pool	Riffle	Pool	Riffle	Pool	Riffle	Pool	Riffle	Pool
Water Temperature (°C)	5.0	5.0	9.7	9.7	7.8	7.8	9.5	9.5	4.3	4.3
Dissolved Oxygen (mg/L)	11.9	10.5	10.0	10.0	10.6	10.1	10.2	8.9	10.7	94
pH (Standard Units)	7.19	7.29	7.47	7.43	7.32	7.38	7.30	7.32	6.46	6.37
Conductivity (uS/cm)	209	208	146	206	123	125	149	150	109	110
Habitat Reach Length (feet)	238	90	198	130	297	31	262	99	264	64
Stream Width (feet)	2-5	5	e	3-5	ν.	2-4	1.1	1.5-6		-4
Stream Depth (inches)	1-18	18	÷	1-24	÷	1-6	2-	2-12		1-6
Stream Flow Rate (cubic feet per second)	0.37	37	0.71	11	0.0	0.06	Ö	0.08		0.04
Substrate Composition (%): "	には、法律に	小学をないない	「ないな」	A NOT THE OWNER OF THE OWNER OWNE	「「「「「「「」」」	A State Stat	A STATISTICS OF A STATISTICS	「「「「「「「」」」	A State of the second s	二、二、二、二、二、二、二、二、二、二、二、二、二、二、二、二、二、二、二、
bedrock (> 2,084 millimeters)					9	6%				
boulder (256 - 2,084 millimeters)	1.	1%							-	1%
cobble (64 - 256 millimeters)	30%	%	æ	8%	35	35%	4	4%	14	14%
gravel (2 - 64 millimeters)	35%	%	99	66%	36	36%	40	40%	3	34%
sand (0.062 - 2 millimeters)	25%	%	24	24%	13	13%	36	36%	26	28%
silt (0.004- 0.062 millimeters)										
clay (< 0.004 millimeters)	%A	ø	N	5%	10	10%	20	20%	8	23%
USEPA (1999) Habitat Assessment Score (out of possible 200) <sup>b</sup>	140	124	148	135	142	133	103	107	121	118
	20%	62%	74%	68%	71%	67%	52%	54%	61%	59%
Habitat Assessment Score (Narrative Criteria) [ Si	Suboptimal	Suboptimal	Suboptimal	Suboptimal	Suboptimal	Suboptimal	Marginal	Suboptimal	Suboptimal	Suboptimal

\* A Modified Wolman (1954) Pebble Count technique was employed to determine percent substrate composition as Wentworth (1922) Size Classes.

<sup>b</sup> U.S. Environmental Protection Agency (1999).

			A	PPENDIX B M	APPENDIX B MACROINVERTEBRATE COMMUNITY METRICS	TEBRATE CO	M YTINUMMO	ETRICS					
					CRAF	<b>TS CREEK TR</b>	CRAFTS CREEK TRIBUTARY STATIONS	TIONS					
		40942-Enlow	40942-Enlow-E18 Panel-	40942-Enlow-E19 Panel-	/-E19 Panel-	40942-Enlow	40942-Enlow-E20 Panel-	40943-Enlow	40943-Enlow-E20 Panel-	40943(1)-Enlow-E21 Panel-	w-E21 Panel-	:	
	RIOLOGICAL METRIC	BSW15	V15	BSV	BSW19	BSV	BSW22	BSV	BSW23	BSV	BSW28	Mean	Standard
		March 13, 2007	3, 2007	March 13, 2007	3, 2007	March 14, 2004	4, 2004	March 14, 2007	4, 2007	March 19, 2007	9.2007	(Observed	Deviation
		Observed	Normalized	Observed	Normalized	Observed	Normalized	Observed	Normalized	Observed	Normalized	Value)	
		Value	Score	Value	Score	Value	Score	Value	Score	Value	Score		
Taxa Richness	ness	34	100.0	34	100.0	31	100.0	25	82.0	15	49.2	28	08
Trichopter	Trichoptera Richness	5	47.6	4	38.1	4	38.1	4	38.1	2	19.0	4	11
E% EPT Richness	chness	55.9	90.7	55.9	90.7	45.2	73.4	56.0	90.9	40.0	64.9	51	75
Intolerant	Intolerant Taxa Richness	23	100.0	24	100.0	21	100.0	18	100.0	6	56.3	19	E O
FC + PR	FC + PR Taxa Richness	12	88.9	11	81.5	11	81.5	12	88.9	5	37.0	10	2.9
Total Biole	Total Biological Score (Mean of Adjusted Values)		85.4		82.1		78.6		80.0		45.3		
 VEL 2007	d blown its		<del>~</del>										

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# STREAM WATER QUALITY, HABITAT CHARACTERISTICS, AND BENTHIC MACROINVERTEBRATE APPENDIX B SCORES ENLOW FORK MINE NORTH EXPANSION, PANELS E18-E23 AND F18-F23 CONSOL PENNSYLVANIA COAL COMPANY TRIBUTARIES 40944 AND 40944(1) TO CRAFTS CREEK WASHINGTON COUNTY, PENNSYLVANIA CEC Project 070-338

**BSW 18** 

STREAM WATER QUALITY AND HABITAT CHARACTERISTICS	ER QUALITY	AND HABITAT	CHARACTE	RISTICS		
		CRA	FTS CREEK TI	CRAFTS CREEK TRIBUTARY STATIONS	TIONS	
PARAMETER	40944-Enlov BSV	40944-Enlow-E18 Panel- BSW13	40944(1)-Enk BSI	40944(1)-Enlow-E18 Panel- BSW14	40944-Enlor BS	40944-Enlow-E19 Pan <mark>el-</mark> BSW18
	March 3	March 30, 2007	March :	March 30, 2007	March	March 22, 2007
	Riffle	Pool	Rittle	Pool	Riffle	Pool
Water Temperature (°C)	11.9	11.9	6.9	6.9	10.8	10.9
Dissolved Oxygen (mg/L)	9.8	9.2	9.9	7.8	8.8	8.3
pH (Standard Units)	7.13	7.20	6.85	6.77	7.18	7.18
Conductivity (uS/cm)	166	170	136	135	154	154
Habitat Reach Length (feet)	293	35	287	41	297	31
Stream Width (feet)	¥	1-3.5	-	1-5	-	1-5
Stream Depth (inches)	ę	3-12	-	1-5	2	2-6
Stream Flow Rate (cubic feet per second)	0.	0.24	.0	0.03	Ö	0.26
Substrate Composition (%): <sup>a</sup>	The second se	「「「「「「」」の「「「」」」の	The second s	Station and the state	ないのであるとなったの	A State of the state
bedrock (> 2,084 millimeters)			27	27%		
boulder (256 - 2,084 millimeters)	1	1%	2	2%	-	1%
cobble (64 - 256 millimeters)	6	9%	24	24%	21	21%
gravel (2 - 64 millimeters)	58	58%	26	26%	99	66%
sand (0.062 - 2 millimeters)	16	16%	12	12%	6	9%
silt (0.004- 0.062 millimeters)		2				
clay (< 0.004 millimeters)		0.70	מ	8%8	ε Σ	3%
USEPA (1999) Habitat Assessment Score (out of possible 200) <sup>b</sup>	112	100	156	139	156	153
Percent of Maximum Possible USEPA (1999)	56%	50%	78%	20%	78%	77%
Habitat Assessment Score (Narrative Criteria) <sup>b</sup>	Suboptimal	Marginal	Optimal	Suboptimal	Optimal	Suboptimal

<sup>a</sup> A Modified Wolman (1954) Pebble Count technique was employed to determine percent substrate composition as Wentworth (1922) Size Classes. <sup>b</sup> U.S. Environmental Protection Agency (1999).

			Standard	Deviation			5.0	17	117	6.0	2.1		
			mean	(ODServed	value		25	2	41	14	8		
		-E19 Panel-	V18	2, 2007	Normalized	Score	98.4	66.7	86.5	100.0	66.7	83.7	*
TRICS	LIONS	40944-Enlow-E19 Panel-	BSW18	March 22, 2007	Observed	Value	30	7	53.3	20	6		
APPENDIX B MACROINVERTEBRATE COMMUNITY METRICS	CRAFTS CREEK TRIBUTARY STATIONS	40944(1)-Enlow-E18 Panel-	V14	0, 2007	Normalized	Score	82.0	38.1	64.9	87.5	74.1	69.3	
<b>TEBRATE CC</b>	FTS CREEK TR	40944(1)-Enlo	BSW14	March 30, 2007	Observed	Value	25	4	40.0	14	10		
MACROINVEF	CRAI	40944-Enlow-E18 Panel-	BSW13	March 30, 2007	Normalized	Score	65.6	38.1	48.7	50.0	44.4	49.4	
APPENDIX B		40944-Enlov	BSI	March	Observed	Value	20	4	30.0	8	6		
			RIOLOGICAL METRIC				Taxa Richness	Trichoptera Richness	% EPT Richness	Intolerant Taxa Richness	FC + PR Taxa Richness	Total Biological Score (Mean of Adjusted Values)	
		ŀ	2		C		-		/	E	D		

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STREAM WATER QUALITY, HABITAT CHARACTERISTICS, AND BENTHIC MACROINVERTEBRATE APPENDIX B SCORES TRIBUTARIES 32742, 32743, 3274 TO TEMPLETON FORK ENLOW FORK NORTH EXPANSION, PANELS E18-E23 AND F18-F23 CONSOL PENNSYLVANIA COAL COMPANY WASHINGTON COUNTY, PENNSYLVANIA BSW 24 CEC Project: 070-338 2

		TemF25L-32742-Enlow-F18   TemF27L-32744-Enlow-F19   TemF26L-32743-Enlow-F19   TemF27L-32744-Enlow-F20 Panel-BSW26 Panel-BSW26	And 6 2007	Bitt	41	11 98	7.83	359	D/a	21	15.25	0.05	And the second se			1%	44%	40%	ou or	15%	136 131	68% 66%	Suboptimal Sul
		6L-32743-Enlow	April 2. 2007	Pool	$\left  \right $		$\left  \right $			2.4	1.25-3	0.36	「日本のないので、「日日			6%	65%	20%		8%	123	62%	Sut
		9 TemF26		Riffle	14.9	9.33	8.00	252	n/a				のないであるので								138	%69	Suboptimal
	ATIONS	7L-32744-Enlow-F1	May 21, 2007	Pool	n/a	n/a	n/a	n/a	n/a	1.5	0.5-12	0.13	「「「「「「「」」」」	4%	9%	10%	52%	8%		6%	150	75%	Suboptimal
RISTICS	RIBUTARY ST	TemF27L-32	Mav	Riffle	11.33	8.97	8.10	334	n/a		0	0	A STANDARD CON			-	5	-			154	21%	Suboptimal
SI HEAM WATER QUALITY AND HABITAT CHARACTERISTICS	TEMPLETON FORK TRIBUTARY STATIONS	5L-32742-Enlow-F18 Panel-BSW26	May 14, 2007	Pool	n/a	n/a	n/a	n/a	n/a	0.83	.75	0.01	の語の言語をするない			4%	23%	29%		44%	147	74%	Suboptimal
ND HABITAT	TEMPLI	TemF25L-327 Panel-	May 1	Riffle	15.8	8.86	7.92	266	n/a	0	1.	0	二日 二			4	23	29		44	137	69%	Suboptimal
A QUALITY A		43-Enlow-F18 SSW25	2007	Pool	n/a	n/a	n/a	n/a	n/a	1.75	.25	3	the second marked		9	9	*	*			66	50%	Marginal
HEAM WATER		TemF26L-32743-Enlow-F18 Panel-BSW25	April 2, 2007	Riffle	11.6	10.2	7.91	266	n/a	1.7	3.5-4.25	0.43	あいい いち ちまう	3%	1%	8%	65%	21%		%Z	112	56%	Suboptimal
S		27L-32744-Enlow-F18	2007	Pool	n/a	n/a	n/a	n/a	na	8	5.75	3	Contraction of the local distance of the loc			%	%	%			137	69%	Suboptimal
		TemF27L-32744-Enic	April 2, 2007	Riffle	8.88	10.47	7.65	216	n/a	2.08	3.25-5.75	0.53	ないのないとないない	5%	5%	22	43%	17%	8	0.29	133	67%	Suboptimal
		PARAMETER			Water Temperature (°C)	Dissolved Oxygen (mg/L)	pH (Standard Units)	Conductivity (uS/cm)	Habitat Reach Length (feet)	Stream Width (feet) <sup>c</sup>	Stream Depth (inches) <sup>a</sup>	Stream Flow Rate (cubic feet per second)	Substrate Composition (%): *	bedrock (> 2,084 millimeters)	boulder (256 - 2,084 millimeters)	cobble (64 - 256 millimeters)	gravel (2 - 64 millimeters)	sand (0.062 - 2 millimeters)	silt (0.004- 0.062 millimeters)	clay (< 0.004 millimeters)	USEPA (1999) Habitat Assessment Score (out of possible 200) <sup>b</sup>	Percent of Maximum Possible USEPA (1999)	Habitat Assessment Score (Narrative Criteria) b

\* A Modified Woiman (1954) Pebble Count technique was employed to determine percent substrate composition as Wentworth (1922) Size Classes. b U.S. Environmental Protection Agency (1989).

<sup>e</sup> Measured at the stream discharge monitoring location NM = Not Measured (i.e., habitat very limited or not present).

Mr         TemF26L-32743-Enlow-F19         TemF27L-32744           Panel-BSW33         Panel-BSW33         Panel-BSW33           Iliced         Observed         Normalized         Observed         Normalized           rise         Value         Score         Value         20         1           8         6.57.1         45.0         1         20         20           9         46.4         72.7         45.0         1         20           2         13         96.3         8         6         5				AP	PENDIX B M	ACROINVERT	APPENDIX B MACROINVERTEBRATE COMMUNITY METRICS	AMUNITY MET	rRICS						
AL METRIC TemP27L32744Enlow-F18 TemP28L32743-Enlow-F18 TemP28L32743-Enlow-F18 TemP38L3W25 Tem18.52W25 Tem18.52W5 Tem18.55W5 Tem18.52W5 Tem18.52W						TEMPLE	TON FORK TRI	BUTARY STAT	IONS						
All Mic Frid.         April 2, 2007         April 1, 2007         May 14, 2007         May 14, 2007         April 12, 2007         Tailer 2, 2007		TemF27L-327 Panel-f	744-Enlow-F18 BSW24	TemF26L-3274 Panel-B	43-Enlow-F18 SW25		42-Enlow-F18	TemF27L-3274	14-Enlow-F19	TemF26L-3274	13-Enlow-F19	TemF27L-3274	14-Enlow-F20	Mean	
Observed         Normalized         Observed <th< td=""><td></td><td>April 2</td><td>, 2007</td><td>April 2.</td><td>2007</td><td>May 14</td><td> 2007</td><td>May 21</td><td>2007</td><td>And 2</td><td>2002</td><td>And 6</td><td>1000</td><td>(Observed</td><td>Deviation</td></th<>		April 2	, 2007	April 2.	2007	May 14	2007	May 21	2007	And 2	2002	And 6	1000	(Observed	Deviation
Water         Construct         Const         Const         Const		Cheaned	Momonizad	Choosed	Manual and	No. of the second secon				in make		'o not	1007	Value)	
Value         Score         Value         Score <th< td=""><td></td><td>COSCINEN</td><td>DATIRILION</td><td>naviasion</td><td>Normalized</td><td>Coserved</td><td>Normalized</td><td>Coserved</td><td>Normalized</td><td>Observed</td><td>Normalized</td><td>Observed</td><td>Normalized</td><td></td><td></td></th<>		COSCINEN	DATIRILION	naviasion	Normalized	Coserved	Normalized	Coserved	Normalized	Observed	Normalized	Observed	Normalized		
37         100.0         29         95.0         18         59.0         24         78.6         28         91.8         20           9         95.7         4         39.0         2         19.0         6         57.1         6         57.1         4         20           5         51.3         85.7         41.3         57.0         38.8         54.1         66.4         72.7         4.6         72.7         4.6         76.0         16         100.0         15         4.6         75.7         4.6         76.0         16         100.0         11         4.6         72.7         4.6.7         75.7         4.5.7         16         100.0         16         100.0         11         100.0         11         <		Value	Score	Value	Score	Value	Score	Value	Score	Value	Score	Value	Score		
9         85.7         4         38.0         2         19.0         6         57.1         6         57.1         4         50           1         15.13         83.2         41.3         67.0         38.8         62.9         54.1         87.8         45.0         15         45.0         16         100.0         11         45.0         16         100.0         11         16         100.0         11         16         100.0         11         16         100.0         11         16         100.0         11         16         100.0         11         16         100.0         11         16         100.0         11         17         16         100.0         11         16         100.0         11         17         16         100.0         11         17         16         100.0         11         17         16         100.0         11         17         16         100.0         11         17         16         100.0         11         17         16         100.0         11         17         16         100.0         11         17         16         100.0         11         17         16         100.0         16         16 <t< td=""><td>Taxa Richness</td><td>37</td><td>100.0</td><td>29</td><td>95.0</td><td>18</td><td>69.0</td><td>24</td><td>78.6</td><td>28</td><td>918</td><td>00</td><td>AK A</td><td>ac</td><td>0.0</td></t<>	Taxa Richness	37	100.0	29	95.0	18	69.0	24	78.6	28	918	00	AK A	ac	0.0
51.3         83.2         41.3         67.0         38.8         62.9         51.1         87.1         6         07.1         4         4           1         19         100.0         15         93.7         7         43.7         16         100.0         16         70.0         11         4           1         9         66.6         9         66.6         6         44.4         8         59.2         13         96.3         8         10         11         1 <td< td=""><td>Trichoptera Richness</td><td>a</td><td>85.7</td><td></td><td>20.0</td><td>c</td><td>0.07</td><td>9</td><td></td><td></td><td></td><td>3</td><td>0.00</td><td>20</td><td>0.9</td></td<>	Trichoptera Richness	a	85.7		20.0	c	0.07	9				3	0.00	20	0.9
13         913         67.0         38.8         62.9         54.1         87.8         46.4         72.7         45.0           13         13         93.2         15         93.7         16         100.0         11         16         100.0         11         16         100.0         11         16         100.0         11         16         100.0         11         16         100.0         11         16         100.0         11         16         100.0         11         16         100.0         11         16         100.0         11         16         100.0         11         16         100.0         11         16         100.0         11         16         100.0         11         16         100.0         11         16         100.0         11         17         16         100.0         11         17         16         100.0         11         17         16         100.0         11         17         16         100.0         11         17         16         100.0         11         17         16         100.0         11         17         16         100.0         11         17         16         100.0         11         17	er ent picture				2.00	-	0.61	0	1.16	0	1.70	4	38.1	5	2.4
19         100.0         15         93.7         7         43.7         16         100.0         16         100.0         11         1           9         66.6         9         66.6         6         44.4         8         59.2         13         96.3         8         16         100.0         11         1<	76 EPT HIGHNESS	51.3	83.2	41.3	67.0	38.8	62.9	54.1	87.8	46.4	72.7	45.0	73.1	46	5.8
lean of Adjusted Values) 9 66.6 9 66.6 6 44.4 8 59.2 13 96.3 8 6a fam. of Adjusted Values) 87.1 72.0 45.8 75.0 45.8 75.0 75.0 75.0 75.0 75.0 75.0 75.0 75.0	Intolerant Taxa Richness	19	100.0	15	93.7	7	43.7	16	100.0	16	100.0	11	68.0		0.0
82.1 72.0 45.8 76.6 60.E	FC + PR Taxa Richness	6	66.6	6	66.6	9	44.4	80	59.2	13	96.3	a	50.0	t	0.4
	Total Biological Score (Mean of Adjusted Values)		87.1		72.0		45.8		78.5		3 69	,	0.00	a	27

V NOV 1 2 2007 Pept. of Environmental Protection California District Office

STREAM WATER QUALITY, HABITAT CHARACTERISTICS, AND BENTHIC MACROINVERTEBRATE APPENDIX B SCORES BUFFALO CREEK MAIN STEM (PADEP STREAM CODE: 32777) Thure 1

# ENLOW FORK MINE NORTH EXPANSION, PANELS E18-E23 AND F18-F23 CONSOL PENNSYLVANIA COAL COMPANY

# WASHINGTON COUNTY, PENNSYLVANIA CBSW 42 70-338

**BSW 38** 

	STREAM WATER OILALITY AND HABITAT CHAPACTEDISTICS	FR OILAL ITV	AND HARITA	T CHABACTER	DICTICS	
				BUFFALO CRI	BUFFALO CREEK STATIONS	
	BufC-32777-EI	nlow Fork Mine	BufC-32777-E	nlow Fork Mine-	BufC-32777-Er	BufC-32777-Enlow Fork Mine  BufC-32777-Enlow Fork Mine  BufC-32777-Enlow Fork Mine-
PARAMETER	F20 Pane	F20 Panel-BSW38	F21 Pane	F21 Panel-BSW42	F22 Panel-BSW46	I-BSW46
	April 3	April 3, 2007	April 10	April 10, 2007	April 23, 2007	3, 2007
	Riffle	Pool	Riffle	Pool	Riffle	Pool
Temperature (°C)	12.7	n/a	8.7	n/a	18.5	n/a
ved Oxygen (mg/L)	9.9	n/a	12.1	n/a	11.1	n/a
andard Units)	7.8	n/a	8.1	n/a	8.8	n/a
ctivity (uS/cm)	232.0	n/a	295.0	n/a	220.0	n/a
t Reach Length (feet)	n/a	n/a	n/a	n/a	n/a	n/a
n Width (feet)	2.6°	66	2	2.3°	3.25°	5°
Denth (inches)	2 4 2 6	10	C	0 1 10		

	Burc-32///-Er	<b>IOW FORK MIDE</b>	BurC-32777-EI	nlow Fork Mine-	BufC-32777-EI	Burc-32/1/1-Enlow Fork Mine  Burc-32/1/1-Enlow Fork Mine  Burc-32777-Enlow Fork Mine-  Burc-32777-Enlow Fork Mine-	BufC-32777-EI	nlow Fork Mine-
PARAMETER	F20 Pane	F20 Panel-BSW38	F21 Pane	F21 Panel-BSW42	F22 Pane	F22 Panel-BSW46	F23 Pane	F23 Panel-BSW51
	April 3, 2007	, 2007	April 10, 2007	0, 2007	April 2	April 23, 2007	May 1	May 1, 2007
	Riffle	Pool	Riffle	Pool	Riffle	Pool	Riffle	Pool
Water Temperature (°C)	12.7	n/a	8.7	n/a	18.5	n/a	15.2	n/a
Dissolved Oxygen (mg/L)	9.9	n/a	12.1	n/a	11.1	n/a	11.8	n/a
pH (Standard Units)	7.8	n/a	8.1	n/a	8.8	n/a	8.3	n/a
Conductivity (µS/cm)	232.0	n/a	295.0	n/a	220.0	n/a	300.0	n/a
Habitat Reach Length (feet)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Stream Width (feet)	2.6°	5°	2	2.3°	3.2	3.25°		4.5°
Stream Depth (inches)	2.5-4°	-4°	2.5	2.5-5°	2:0	2.0-20	1-7	1-7.5°
Stream Flow Rate (cubic feet per second)	0.4	4	Ö	0.5	0	0.9		1.8
Substrate Composition (%): <sup>a</sup>	「「「「「「「」」」」」	「ない」のないのである	大学ないの一部のである	ののないのでのであるのである	「「「「「「「「」」」」という	A LOW DOWN DOWN		「「「「「「「「「」」」」」」」」」」」」」」」」」」」」」」」」」」」」」
bedrock (> 2,084 millimeters)	7.0%	%	5.0%	%	0.0	0.0%	5.0	2.0%
boulder (256 - 2,084 millimeters)	12.0%	0%	2.0%	%	0.0	0.0%	14.	14.0%
cobble (64 - 256 millimeters)	7.0%	%	21.0%	%0	2.0%	%	8.0	8.0%
gravel (2 - 64 millimeters)	53.0%	%0	47.0%	%0	43.	43.0%	47.	47.0%
sand (0.062 - 2 millimeters)	18.0%	%0	23.0%	%0	28.	28.0%	25.	25.0%
silt (0.004- 0.062 millimeters)	c	20						
clay (< 0.004 millimeters)	3.0%	%	2.0%	%	21.0%	%0	4.0	4.0%
USEPA (1999) Habitat Assessment Score (out of possible 200) <sup>b</sup>	161.0	160.0	114.0	108.0	124.0	132.0	129.0	125.0
Percent of Maximum Possible USEPA (1999)	80 <mark>%</mark>	80%	57%	54%	62%	66%	65%	63%
Habitat Assessment Score (Narrative Criteria) b	Optimal	Optimal	Suboptimal	Suboptimal	Suboptimal	Suboptimal	Subontimal	Subontimal
								1000000

<sup>a</sup> A Modified Wolman (1954) Pebble Count technique was employed to determine percent substrate composition as Wentworth (1922) Size Classes.

° Measured at the stream discharge monitoring location <sup>b</sup> U.S. Environmental Protection Agency (1999).

E.	-	-	-	-		-	_	-	-	-	-	-		-
				Standard	Deviation			4.3	1.9	10.2	5.5	2.2		
			:	Mean	(Observed	value)		22	4	40	12	8		
			low Fork Mine-	I-BSW51	2007	Normalized	Score	59.0	19.0	54.1	43.8	51.9	45.6	
			BufC-32777-En	F23 Panel-BSW51	May 1, 2007	Observed	Value	18	2	33.3	7	7		
	TRICS		ow Fork Mine-	-BSW46	, 2007	Normalized	Score	59.0	19.0	51.3	43.8	37.0	42.0	
	MMUNITY ME	BUFFALO CREEK STATIONS	BufC-32777-En	F22 Panel-BSW46	April 23, 2007	Observed	Value	18	2	31.6	7	5		
00	PPENDIX B MACHOINVEHTEBHATE COMMUNITY METRICS	BUFFALO CRE	low Fork mine  ButC-32777-Enlow Fork Mine  ButC-32777-Enlow Fork Mine-  ButC-32777-Enlow Fork Mine-	I-BSW42	, 2007	Normalized	Score	85.2	57.1	87.3	100.0	74.1	80.7	•
C	ACHOINVEH		BufC-32777-En	F21 Panel-BSW42	April 10, 2007	Observed	Value	26	9	53.8	16	10		
	APPENDIX B N		nlow Fork mine	el- <mark>BSW38</mark>	3, 2007	Normalized	Score	82.0	38.1	68.7	100.0	66.7	71.1	-
			BufC-32777-En	F20 Panel	April 3,	Observed	Value	25	4	42.3	17	6		
				BIOLOGICAL METRIC				chness	Trichoptera Richness	% EPT Richness	Intolerant Taxa Richness	FC + PR Taxa Richness	Total Biological Score (Mean of Adjusted Values)	
			i E N(	=( )+C			2	Taxa Richness	Trichopte	L% EPTE	Intoleran	FC + PR	Total Bio	
		De	PL	a la	nvin	anin	ent	al P	rote	otic	'n			

California District Office

						TA OUFET (Dans		BSW 15
	Station:	TC+C-4	PHYSICAL HAI		-BSW15	TA SHEET (Page Project No.:	220502.1	1452
	Stream Name:		TILLA	ALEK	Date/Time:	3.13.07		9:15 AM
	River Basin:	MONONE	HELA		Inve stigators:	NLS, JWC.	MOE, DOT	
						, ,		
				SKET	сн мар	ş		<u> </u>
	FLOW	1.		Mark	<u></u>	- up		
	=					<b>↑</b>	~ 	
ş	V			1506	6	8		0
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				"tune		300		11
				Y.		12		
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	na na na	a e	nd OLD PASTU	RE E	19002 0	and a strange way of the		
	10 10 18	FIE	vol pasin	N.V.	1990 - 19 19			6
	a 2 			A 14 5	101			0
					10'EULE			W
	2	= Direction of Flor		cour (xx)		234pp		
	Lacation	a of Water Quality Measurements		Y XX	4.	r M		P
	← €	) - Photograph Humber/Hem			2002			
	1	Yy - Emergent Vegetation		Bil	$\sim$		E	Â
		- Rootwad Rootmal		C (x x r	× )			8
540 		X = Large Weady Debrie		21	×	· · · · · · · · · · · · · · · · · · ·	1941 1941	
· .:		Milli - Dedarch	<b>.</b>	0/2	4" PINL 15' 1	LIDE		
v		AAA - Boundary	ti -	Ċ	X			
		X X XX - Control X X X X X X X X			AXX			
			÷ .		Axx xx	V.		
					41	- Jown	/	
			- 12			<b>1</b>	2	
		Air Temperature:	60 c			HABITAT L	ENGTHS IN SAMPLIN	G REACH
						E		
		Weather	Now	Past 24 hrs	Past 7 days	Habitat	Length (steps)	Length (ft)
inia a di si	Anti-contractor	Weather	Now	Past 24 hrs	Past 7 days	Habitat Riffle	Length (steps)	Length (ft) 2-38
rth quitte	· .	Weather Heavy Rain Steady Rain	·			Riffle Z	Length (steps)	238
in a chai	WEATHER	Weather	·	angele rie con a cardina		Riffle Z	Length (steps)	<u>138</u> <u>90</u>
inin qualitati	WEATHER	Weather Heavy Rain Steady Rain Intermit. Rain		angele rie con a cardina		Riffle Z	Length (steps)	238
::::::::::::::::::::::::::::::::::::::	WEATHER	Weather Heavy Rain Steady Rain Intermit. Rain % Cloud Cover		angele rie con a cardina		Riffle Ruín Pool Z Glide	Length (steps)	<u>138</u> <u>90</u>
	WEATHER	Weather Heavy Rain Steady Rain Intermit. Rain % Cloud Cover Clear/Sunny Other:	307.	a		Riffle Ruín Pool Ruín Glide	Length (steps)	<u>138</u> <u>90</u>
	WEATHER CONDITIONS	Weather Heavy Rain Steady Rain Internit. Rain % Cloud Cover Clear/Sunny Other: Subsystem:	Perennial	angele rie con a cardina		Riffle Ruín Pool Ruín Glide	Length (steps)	<u>138</u> <u>90</u>
	WEATHER CONDITIONS	Weather Heavy Rain Steady Rain Intermit. Rain % Cloud Cover Clear/Sunny Other:	307.			Riffle Ruín Pool Glide Total		<u>138</u> <u>90</u>
2.750 g - 2,5 - 2,5	WEATHER CONDITIONS	Weather Heavy Rain Steady Rain Intermit. Rain % Cloud Cover Clear/Sunny Other: Subsystem: Type:	Perennial	Intermittent	Tidal	Riffle Ruín Pool Glide Total		<u>90</u> <u>328</u>
	WEATHER CONDITIONS	Weather Heavy Rain Steady Rain Intermit. Rain % Cloud Cover Clear/Sunny Other: Subsystem: Type:	Perennial	Intermittent Warmwater Wetland	Tidal	Riffle Ruín Pool Glide Total	Mixture	238 90 328
	WEATHER CONDITIONS STREAM CHARACTER- IZATION	Weather Heavy Rain Steady Rain Intermit. Rain % Cloud Cover Clear/Sunny Other: Subsystem: Type:	Perennial Coldwater Spring-fed	Intermittent Warmwater Wetland	Tidal	Riffle Ruín Pool Glide Total	Mixture	238 90 328

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**BSW 15** 

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HIGH GRADIENT STREAMS HABITAT ASSESSMENT FIELD DATA SHEET (Page 1)

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Station: UNTCrC-40942-ENLOW-E18P-BSW15	Project No.: 270502.0452
Summer 40942 TO CRAPTS MEER	Date/Time: 3, 9.01
River Basin: MONON 6-AHELA	Investigators: NLS, JWC, MBE, AVP

Habitat		a tintin at	Marginal	Poor
Parameter 1. Epifaunal Substrate/ Available Cover	substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble	Subopti m at 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 fate at	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE 14	not new fall and not transient). 20 19 (18) 17 16	high end of scale).	10 9 8 7 6	543210
SCORE 14	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 15	20 19 18 17 16	(15) 14 13 12 11	10 9 8 7 6	
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 to wer, 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 15	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% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel; sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% 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	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.
18	20 19 (18) 17 10	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
SCORE 7	14V 17 [1-)			

**BSW 15** 

# HIGH GRADIENT STREAMS HABITAT ASSESSMENT FIELD DATA SHEET (Page 2)

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Station: UNTCIC - 40942-ENLOW-E189-BS	W/5 Project No.: 120502, 1452
Stream Name: 40942 TO CRAFTS ULEEN	Date/Time: 3.13.07
River Basin: MONONGAHELA	Investigators: NLS, JWC, MOF, DTP

	Hab	itat		2			<del></del>		n Catego			1		
	Paran		0	ptim	al *	S	ubopti	mal		Margin	al		Poor	
	Channel eration		Channeliz dredging minimal; normal pa	absent	or	of bridg evidenc channel	usually e abutn e of pas ization, g, (grea yr) may but rec ization	in areas nents; i.e., ter than be ent	extensit or shori present and 40	ng struc on both to 80% of hanneliz	ankments tures banks; of stream	gabion 80% of channel disrupte	the streat ized and d. Instru- greatly a	nt; over im reach cam litered or
C	ORE	19	20 (19)	18	17 1	5 15 14	1. 13	12 11	10 9	8	7 6	5 4	32	1 0
		bends)	Occurrence relatively of distance riffles div of the stree (generally variety of In streams are contin placement other larg obstructio	freque e betw ided b am < 5 to habits when uous, t of bo e, nati	ent; ratio veen by width 7:1 7); at is key. e riffles outders ou aral	between by the v stream i 15.	nt: dist riffes vidth of s betwe	ance divided the sen 7 to	bend; b provide distance divided the strea to 25.	by the v am is be	ontours abitat; n riffles vidth of tween 15	or shalld habitat; rifiles d width of ratio of	ow riffle distance ivided b the stre >25.	between y the am is a
sc	ORE	18	20 19	(18)	17 1	6 15 14	1 13	12 11	10 9	8	7 6	5 4	3 2	10
Noi	ight sid	n bank) mine left	Banks sta of crosion failure ab minimal; for future <5% of ba	or ba sent o little p proble	nk r otential ems	erosion	mostly 30% o s areas	all areas of healed f bank in	60% of areas of	bank in erosion	table; 30- reach has ; high 1 during	areas; "r frequent sections	aw" area along s and ben bank sk 6 of ban	traight ds; oughing;
•	ORE	• •	Left Bank	10	9	8	7	(6)	5	.4	3	2	Î.	0
	1	) (RB)	Right Bar	ık. 10	9	8	. 7	6	5	- 4	3	2	1	0
Pre	Vegetati stection h bank)	(score	More than streambar immediat covered b vegetation trees, und or nonwo macrophy disruption grazing o minimat almost all to grow n	nk sur e ripan y nati n, incl erstor ody nes; v n throu r mow or not l plant	faces and ian zone ve uding y shrubs, egetative igh ing evident; s allowed	covered vegetati of plant represe evident full plan potentia extent; half of	ank sur by nat on, but s is not need; di but not nt grow l to any more the height ng.	ive one class well- sruption t affecting th y great an one- initial plant	covered disrupti patches closely vegetati than on potentia height r	ank surf by vege on obvio of bare cropped on com chalf of l plant s emainin	etation; bus; soil or mon; less the tubble g.	vegetatio vegetatio removed 5 centim average	ank surfa by vege on of stre on is ver on has b to stubble	aces tation; ambank y high; cen less in height.
SC	ORE 1	_(LB)	Left Bank	¢ 10	9	8	$\underline{()}$	6		and the second second		2		
SC	ORE	(RB)	Right Ba	nk 10	9	8	7	6	5	4	(3)	***2	Served Same	0
Ve	dth (sci	ian Zone ore each an zonc)	Width of >18 mete activities lots, road cuts, law have not	rs; hu (i.e., j beds, ns, or	man parking clear- crops)	12-18 r activitie zone or	neters:	ian zone human impacted imally.	6-12 me	of riparia ters; hu s have i great dea	man mpacted il.	riparian to huma	rs: little vegetati	or no
SC	ORE	3 (LB)	Left Ban	k 10	9	8	7	6	5	4	$\Theta$	2	1	0
	ORE 5	(RB)	Right Ba	nk. EO	9	. 8.	7	6	(5)		3	2	1	. 0

Narrative categories and scoring ranges: Optimal = 156-200; Sub-optimal = 106-155; Marginal = 56-105; Poor = 0-55 NOV 1  $\frac{2}{2}$  2007

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FFG	la	되	R L	SH	PB	SC	С С	GC	SC			30		E	20	H	с Г	ပ္ပ	ST	R	SC	ST	SC	00	CC	SC	C.		SI S	a	E IS	LUN I	L S	BH	PR	PR	R	2	LS I	RA	SC	20						36	00		L S	00	S	S	SC
_	I OIETANCE	4	4	5	2	5	80					Fu	10	0.1	0	5	5	4.7	5	5	N	4	0	5		4	4	. 10	1		2 40	2		N	2	2	5	5	4				0	7		4 0	- 4	0 40		1	4		5	2.9	4
	I OIEFANCE	4	4	5	-	e	80	10	4	. 6		Fu			0	9	N	~	4	4	2	4	0	9	-	4	C.	4	· m	C	n m	0	0	N	2	2	9	0	4	-	m	80	2	Ŧ	+ 4		0 4	0		0	4	0	9	1	4
Quantity		18	4	1	5	3	5	0	-		1	0	2 4	0	RZ	-	30	2	2	1	1	5	1	-	7	0	-	0		-	29	7		-	5	2	0	N	0	10	12	9	- 0	u u		- 0	900	00	2	0	0	10	10	17	5
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Family	lana a bilida a	Limnephilidae	Limnephilidae	Phryganeidae	Rhyacophilidae	Uenoidae	Sohaeriidae	Unidentified	Crandonvctidae	Cambaridae	Elmidae	Deanhanidea	Ceretanocconidao	Ceraiupuguillae	Chironomicae	Empididae	Simuliidae	Tabanidae	Tipulidae	Tipulidae	Tipulidae	Tipulidae	Ameletidae	Baetidae	Ephemerellidae	Ephemerellidae	Hentageniidae	Leotophlebiidae	Capniidae	Chloroperlidae	Nemouridae	Nemouridae	Nemouridae	Perlodidae	Perlodidae	Perlodidae	Hydropsychidae	Hydropsychidae	Limnephilidae	Rhyacophilidae	Uenoidae	sphaeriidae		Elmidae	Elmidad	Caratononnidae	Chironomidaa	Simulidae	Tabanidae	Tipulidae	Tipulidae	Ameletidae	Baetidae	Ephemerellidae	Ephemerellidae
Order	Telebootone	I ricnoptera	Trichoptera	Trichoptera	Trichoptera	Trichoptera	Veneroida	Unidentified	Amphipoda	Decapoda	Coleontera	Colecutera	Dintera	Distan	Uptera			Diptera	Diptera	Diptera	Diptera	Diptera	Ephemeroptera	Γ	Ephemeroptera	Ephemeroptera	Enhemeroptera	Ephemeroptera	Plecoptera	Plecontera	Plecoptera	Plecoptera	Plecoptera							T			Amphinodo	T	T	T						Ephemeroptera			Ephemeroptera
Class	and a state	Insecta	Insecta	Insecta	Insecta	Insecta	Bivalvia	Oligochaeta	Crustacea	Crustacea	Insecta	Incarta	Insorta	Iliseua	Insecta	BIVAIVIA	Critetace	Incarta	Incorta	Incorto		Insecta	Insecta	Insecta	Insecta	Insecta	Insecta	Insecta	Insecta																										
Phylum	allocated a	Arinropoda	Arthropoda	Arthropoda	Arthropoda	Arthropoda	Mollusca	Annelida	Arthropoda	Arthropoda	Arthronoda	Arthronoda	Arthropoda	Attropode	Arthropoda	Arthronoda	Arthropoda	Arthropoda	Arthropoda ·	Arthropoda	Mollusca	Annelida	Arthronoda	Arthronoda	Arthronoda	Arthronoda	Arthropoda	Arthropoda	Arthropoda	Arthropoda	Arthropoda	Arthropoda	Arthropoda	Arthropoda																					
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Macroinvertebrates Enlow Fork North Expansion

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ation: 11/17	C.C - 40944	-ENLOW-L	E19P-BSW	18	Project No.:	220502.0	152	
ream Name:	40944 70	CRAFTS	CREEK		3.77.07		10:30 AM	A
ver Basin:	MONONGA			Inve stigators	SMF, MOL	F, DVP	-	-
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			SKE	TCH MAP		· ·		
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la renerativa de la constante d	Air Temperature:	60 c			HABITAT	LENGTHS IN SAMPLIN	G REACH	
	Weather	Now	Past 24 hrs	Past 7 days	Habitat	Length (steps)	Length (ft)	
1. 	Heavy Rain				Riffle		297	
WEATHER	Steady Rain	- the second science is			Rún 2	and the second s	and in property with	н. Т
ONDITIONS	Internit. Rain			1	Pool		31	·
	% Cloud Cover	307.			Glide 5			
	Clear/Sunny		<u> </u>		Total	<u> </u>	328	
	Other:							
			/					
STREAM	Subsystem:	Perennial	Intermittent	Tidal			1	
HARACTER-	Туре:	Coldwater	Warmwater				22	
	Origin:	Spring-fed	Wetland	Montane	Glacial	Mixture	Other	
S UNIT USED:		CAMERA USED:		PHOTO NO.S:	10 711	NOV	1 2 2007	

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**BSW 18** 

HIGH GRADIENT STREAMS HABITAT ASSESSMENT FIELD DATA SHEET (Page 1)

Station: UNTCrC-40944-ENLOW-E19P-BSW18	Project No.:	221502.0452	
WARDS WARDY TO WARTS CREEK	Date/ Time:	3.44.01	11. JU AT
Stream Name: 49999 70 0004773 000000	Investigators	SMF, MDE, ANY	

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3'p2.

L Hat	itat		Condition	Marginal	Poor
	meter	Optimal	Subopti m al 40-70% mix of stable	20-40% mix of stable	Less than 20% stable
1. Epifaui Substrate Available	1	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 stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	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).	habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE	16	20 19 18 17 (16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
2. Embed	dedness	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	5.4.3210
3. Veloci Regime	y/Depth	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 lo wer, 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	12	20 19 18 17 16	15 14 13 (12) 11	10 9 8 7 6	5 4 3 2 1 0
4. Sedim Depositio	ent	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment, 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more that 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	11	20 19 18 17 16	15 14 13 12 (11)	10 9 8 7 6	5 4 3 2 1
5. Chani 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	11		5 15 14 13 12 11	10 9 8 7 6	5 4 3 2 1

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# HIGH GRADIENT STREAMS HABITAT ASSESSMENT FIELD DATA SHEET (Page 2)

Station: UNTCIC-40944-ENLOW-E19P-BSW	& Project No.: 220502,0452	
Stream Name: 40944 TO CAAFTS CREEK	Date/Time: 3.22,07	11:50 AM
River Basin: MONON FAHELA	Investigators: SMF, MDE, D	

	Habitat		Conditio	n Category	
	Parameter	Optimal	Suboptismal	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, (grea ter than past 20 yr) may be present, but rec ent 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 reac channelized and disrupted. Instream habitat greatly altered o removed entirely.
	SCORE 19	20 (19) 18 17 16	15 14 13 12 11	10 9 8 7 6	543210
	7. Frequency of 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: dist ance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; boltom 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 betwee riffles divided by the width of the stream is a ratio of >25:
	SCORE 17	20 19 18 (17) 16	15 14 13 12 11	10 9 8 7 6	543210
	8. Bank Stability (score each bank) Note: determine left or right side by facing downstream.	Banks stable; evidence of crosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of crosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Lareas of crossion; high crossion 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 6 (LB)	Left Bank 10 9	8 7 6	S 4	2 1 0
:	SCORE 6 (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 streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytics; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	remaining.	50-70% of the streambank 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 streambank surfaces covered by vegetation; disruption of streamban vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
	SCORE 10 (LB)	Left Bank (10) 9	8 7 6	5 4 3	2 1 0
	SCORE (RB)	Right Bank (10) 9	8 7 6	5 4 3	2
. : 	10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters: buman activities (i.e., parking lots, roadbeds, clear- cuts, lawns, or crops) have not impacted zone.	Width of riper ian zone 12-18 meters: human activities have impacted zone only min imally.	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 (LB)	Left Bank (10) 9	8 7 6	5 4 3	2 1 0
	SCORE 10 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0

Narrative categories and scoring ranges: Optimal = 156-200; Sub-optimal = 106-155; Marginal = 56-105; Poor = 0-55

Rep         Date         Enumerated By         Sample Type         Phylum           1         3/30/2007         M. Logan         Oualitative         Arthropoda           1         3/30/2007         M. Nagy         Oualitative         A	Order           a         Diptera           a         Ephemeroptera           a         Ephemeroptera           a         Ephemeroptera           a         Plecoptera           a         Plecoptera           a         Trichoptera           a         Unidentified           caa         Decoptera           caa         Docoptera           caa         Diptera           Diptera         Diptera           Diptera         Diptera           Diptera         Diptera           Trichoptera         Trichoptera	Family Tipulidae Ameleridae Ephemereliidae Ephemereliidae Leptophebiidae Leotordaidae Nermoundiae Periodidae Nermoundiae Periodidae Limmephilidae Limmephilidae Limmephilidae Cambanidae	Genus Pseudolimnophila Ameletus Ephemerella Unidentified Nigronia Leuctra Anabolia Unidentified Pycnopschye Molarna Pycnopschye Carngoryx Carngarus Dubiraphia Carngarus Dubiraphia Crangarus Dubiraphia Crangarus Dubiraphia Crangarus Crangarus Conduegaster Conduegaster Conduegaster	Quantity 4 4 4 4 7 4 0 0 0 0 4 0 4 0 0 0 4 0 0 4 0 0 4 0 0 4 0 0 4 0 0 4 0 0 4 0 0 4 0 0 4 0 0 4 0 0 4 0 0 4 0 0 4 0 0 4 0 0 4 0 0 0 4 0 0 0 4 0 0 0 4 0	PA Tolerance Tolerance Tolerance 22 20 24 20 24 20 22 20 22 20 22 20 22 20 22 20 22 20 22 20 20	7         7 <th7< th=""> <th7< th=""> <th7< th=""> <th7< th=""></th7<></th7<></th7<></th7<>
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I         3:300/2007         M. Logan         Cualitative         Arthropoda           1         3:300/2007         M. Nagy         Qualitative         <	999 999 999	Molannidae Sphaeriidae Crangonyctidae Crangonyctidae Cambaridae Elimidae Elimidae Caristopogonidae Caristopogonidae Simulidae Simulidae Tipulidae Ameletidae Cordulegastridae	Molanna Molanna Unided Crangonyx Cambarus Dubiraphia Unideantified Unideantified Prosimulium Prosimulium Prevedolimophila Ameletus Cordulegaster	<u> </u>	-	
<ul> <li>a.302/02/07 M. Lugari Cualitative Annelida</li> <li>a.302/02/07 M. Nagy Qualitative Anthropoda</li> <li>a.3202/07/14/14/14/14/14/14/14/14/14/14/14/14/14/</li></ul>	898 898 898 898 898 898 898 898 898 898	Sphaerlidae Unidentified Unidentified Cambaridae Elimidae Elimidae Ceratopogonidae Simulidae Simulidae Tipulidae Tipulidae Ameletidae Cordulogastridae	Pisidium Unidentified Crangoryx Carangoryx Carangarus Dubiraphia Duhidentified Unidentified Prosimulium Presudolimnophila Ameletus Corduletus	<u>でのちのののちも</u> のの ち の の し し し し し し し し し し し し し	-	
1         3/3/2/2007         M. Nagy         Qualitative         Arthropoda           1         3/3/02/007         M. Nagy         Qualitative <t< td=""><td></td><td>Undentined Crangonyctidae Cambaridae Elimidae Elimidae Ceratopogonidae Simulidae Tabanidae Tipulidae Ameletidae Cordulogastridae</td><td>Unidentified Crangentys Carnagentys Dubinservus Ontidentified Unidentified Prosimulium Presendolimnophila Ameletus Corduegaster</td><td>0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0</td><td>-</td><td></td></t<>		Undentined Crangonyctidae Cambaridae Elimidae Elimidae Ceratopogonidae Simulidae Tabanidae Tipulidae Ameletidae Cordulogastridae	Unidentified Crangentys Carnagentys Dubinservus Ontidentified Unidentified Prosimulium Presendolimnophila Ameletus Corduegaster	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	-	
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1     3/30/2007     M. Nagy     Qualitative     Arthropoda       1     3/30/2007     M. Nagy     Qu	a la	Eleminationae Eleminationae Eleminaae Ceratopogonidae Chironomidae Chironomidae Tabanidae Tabanidae Ameletidae Ameletidae Cordulegastridae	Dubritaphia Dubritaphia Optioservus Unidentified Prostimulium Preseudolimnophila Ameletus Cordulegaster	NNN (2008) 4 NN -		
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1     3/30/2007     M. Nagy     Qualitative     Arthropoda       1     3/30/2007     M. Nagy     Qu		Certatopogonidae Chironomidae Simuliidae Tipulidae Ameletidae Ameletidae	Unidentified Unidentified Prosimulium Chrysops Peseudolimnophila Ameletus Cordulegaster	- 10 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0		
1         3/30/2007         M. Nagy         Qualitative         Arthropoda           1         3/30/2007         M. Nagy         Qualitative         Arthropoda </td <td></td> <td>Chironomidae Simuliidae Tabanidae Tipulidae Ameletidae Cordulegastridae</td> <td>Unidentified Prosimulium Chrysops Pesudolimophila Ameletus Cordulegaster</td> <td>0 0 0 0 0 0 0 0 0 0 0 0 0 0 0</td> <td><u>אסמאמסמ</u></td> <td></td>		Chironomidae Simuliidae Tabanidae Tipulidae Ameletidae Cordulegastridae	Unidentified Prosimulium Chrysops Pesudolimophila Ameletus Cordulegaster	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	<u>אסמאמסמ</u>	
1         3/30/2007         M. Nagy         Qualitative         Arthropoda           1         3/30/2007         M. Nagy         Qualitative         Arthropoda </td <td></td> <td>Simuliidae Tabanidae Tipulidae Ameletidae Cordulegastridae</td> <td>Prosimulium Chrysops Pseudolimnophila Ameletus Cordulegaster</td> <td>90 7 V 7</td> <td><u> </u></td> <td></td>		Simuliidae Tabanidae Tipulidae Ameletidae Cordulegastridae	Prosimulium Chrysops Pseudolimnophila Ameletus Cordulegaster	90 7 V 7	<u> </u>	
1         3/30/2007         M. Nagy         Qualitative         Arthropoda           1         3/30/2007         M. Nagy         Qualitative         Arthropoda </td <td></td> <td>Tabanidae Tipulidae Ameletidae Cordulegastridae</td> <td>Chrysops Pseudolimnophila Ameletus Cordulegaster</td> <td>4 10 01 +</td> <td>K 0 0 M</td> <td></td>		Tabanidae Tipulidae Ameletidae Cordulegastridae	Chrysops Pseudolimnophila Ameletus Cordulegaster	4 10 01 +	K 0 0 M	
1         3/30/2007         M. Nagy         Gualitative         Arthropoda           1         3/30/2007         M. Nagy         Qualitative         Mollusca           1         3/30/2007         M. Nagy         Qualitative         Mollusca           1         3/30/2007         M. Nagy         Qualitative         Arthropoda           1         3/30/2007         M. Engelhardt         Qualitative         Arthropoda           1         3/30/2007         M. Engelhardt         Qualitative         Arth		Tipulidae Ameletidae Cordulegastridae	Pseudolimnophila Ameletus Cordulegaster	- 25	00	
1     3/30/2007     M. Nagy     Qualitative     Arthropoda       1     3/30/2007     M. Nagy     Qualitative     Mollusca       1     3/30/2007     M. Engelharctt     Qualitative     Arthropoda       1     3/30/2007     M. Engelharctt     Qualitative     Arthropoda       1     3/30/2007     M. Engelharctt     Qualitative     Arthropoda       1     3/22/2007     M. Engelharctt     Qualitative     Arthropoda       1     3/22/2007     M.		Ameletidae Cordulegastridae	Ameletus Cordulegaster	5	30	
1     3/30/2007     M. Nagy     Qualitative     Arthropoda       1     3/30/2007     M. Nagy     Qualitative     Mollusca       1     3/30/2007     M. Nagy     Qualitative     Mollusca       1     3/30/2007     M. Nagy     Qualitative     Mollusca       1     3/30/2007     M. Engelnarct     Qualitative     Arthropoda       1     3/30/2007     M. Engelnarct     Qualitative     Arthropoda       1     3/22/2007		Cordulegastridae	Cordulegaster	-	e	
1     3/30/2007     M. Nagy     Qualitative     Arthropoda       1     3/30/2007     M. Nagy     Qualitative     Mollusca       1     3/30/2007     M. Nagy     Qualitative     Mollusca       1     3/30/2007     M. Nagy     Qualitative     Arthropoda       1     3/30/2007     M. Nagy     Qualitative     Arthropoda       1     3/30/2007     M. Engelmarct     Qualitative     Arthropoda       1     3/22/2007			Amphican			
1     3/30/2007     M. Nagy     Qualitative     Arthropoda           1         3/30/2007         M. Nagy         Qualitative         Arthropoda           1         3/30/2007         M. Nagy         Qualitative         Arthropoda           1         3/30/2007         M. Nagy         Qualitative         Arthropoda           1         3/30/2007         M. Nagy         Qualitative         Arthropoda           1         3/30/2007         M. Nagy         Qualitative         Mollusca           1         3/30/2007         M. Nagy         Qualitative         Mollusca           1         3/30/2007         M. Nagy         Qualitative         Mollusca           1         3/30/2007         M. Nagy         Qualitative         Arthropoda           1         3/30/2007         M. Engelmarcht         Qualitative         Arthropoda           1         3/22/2007         M. Engelmarcht         Qualitative         Arthrop	Π	L imnenhilidae	I Inidentified	N	m	L
1         3/30/2007         M. Nagy         Qualitative         Arthropoda           1         3/30/2007         M. Nagy         Qualitative         Mollusca           1         3/30/2007         M. Nagy         Qualitative         Mollusca           1         3/30/2007         M. Nagy         Qualitative         Mollusca           1         3/30/2007         M. Nagy         Qualitative         Arthropoda           1         3/30/2007         M. Engelharcht         Qualitative         Arthropoda           1         3/22/2007         M. Engelharcht         Quali	İ	Limnephilidae	Anabolia	4 0	+ u	4 u
1         3/32/2007         M. Nagy         Qualitative         Arthropoda           1         3/30/2007         M. Nagy         Qualitative         Arthropoda           1         3/30/2007         M. Nagy         Qualitative         Mollusca           1         3/30/2007         M. Engelhardt         Qualitative         Arthropoda           1         3/22/2007         M. Engelhardt         Q		Limnephilidae	Pycnopschye	1+	24	0 4 7
3/3/2007         M. Nagy         Qualitative         Arthropoda           1         3/3/2007         M. Nagy         Qualitative         Mollusca           1         3/3/2007         M. Nagy         Qualitative         Mollusca           1         3/3/2007         M. Nagy         Qualitative         Mollusca           1         3/3/2007         M. Engelhardt         Qualitative         Mollusca           1         3/2/2007         M. Engelhardt         Qualitative         Annelida           1         3/2/2/2007         M. Engelhardt         Qualitative         Anthropoda           1         3/2/2/2007         M. Engelhardt         Qualitat		Phryganeidae	Ptilostomis	-	5	
1     3/3/20207     M. Nagy     Qualitative     Mollusca       1     3/3/0/2007     M. Nagy     Qualitative     Mollusca       1     3/3/0/2007     M. Engelhardt     Qualitative     Mollusca       1     3/3/2/2007     M. Engelhardt     Qualitative     Annelida       1     3/2/2/2007     M. Engelhardt     Qualitative     Annelida       1     3/2/2/2007     M. Engelhardt     Qualitative     Arthropoda	T	Rhyacophilidae	Rhyacophila	1	1	
1         3/3/2007         M. Nary         Cualitative         Mollusca           1         3/3/2007         M. Nary         Qualitative         Mollusca           1         3/2/2007         M. Engelhardt         Qualitative         Mollusca           1         3/2/2007         M. Engelhardt         Qualitative         Anthropoda           1         3/2/2/2007         M. Engelhardt         Qualitative         Arthropoda		Sphaeriidae	Unidentified	10	8	
1         3/22/2007         M. Engelhardt         Qualitative         Annelida           1         3/22/2007         M. Engelhardt         Qualitative         Anthropoda           1         3/22/2007         M. Engelhardt         Qualitative         Arthropoda		_	Unidentified	+	7	6 SC
1         3/22/2007         M. Engelhardt         Qualitative         Arthropoda	adta Il Inidantifiad	I Inidentified			0	
1         3/22/2007         M. Engelhardt         Qualitative         Arthropoda		Crandonvctidae	Crandonvy	0	0	10 60
1         3/22/2007         M. Engelhardt         Qualitative         Arthropoda		Cambaridae	Cambarus	1 -	4 0	4 4
3/22/2007         M. Engelhardt         Qualitative         Arthropoda           1         3/22/2007         M. Engelhardt         Qualitative         Arthropoda	Π	Dryopidae	Helichus	-	22	
1 3/22/2007 M. Engelhardt Qualitative Arthropoda 1 3/22/2007 M. Engelhardt Qualitative Arthropoda 1 3/22/2007 M. Engelhardt Qualitative Arthropoda		Elmidae	Optioservus	e	4	4 SC
1 3/22/2007 M. Engelhardt Qualitative Arthropoda		Psephenidae	Ectopria	-	5	5 SC
	Dintera	Ceratopogonidae	Unidentified		9	5.7 PR
1 3/22/2007 M. Engelhardt Qualitative Arthropoda	Γ	Simuliidae	Prosimulium	38	90	200
1 3/22/2007 M. Engelhardt Qualitative Arthropoda		Tabanidae	Chrysops	0	7 4	200
M. Engelhardt Qualitative	Diptera	Tipulidae	Dicranota	-	. 00	- 10
1 3/22/2007 M. Engelhardt Qualitative Arthropoda	Diptera	Tipulidae	Pseudolimnophila	13	2	2 GC
APDX R 1 2/22/2007 M Encelhardt Cuclimative Arthropoda	T	Tipulidae	Tipula	4	4	4 SH
APDX B 1 3/22/2007 M. Encelhardt	T	Ameletidae	Ameletus	+	0	0 GC
1 3/22/2007 M. Engelhardt Qualitative Arthropoda	Enhemerontera	Ephemerelildae Hentadaniidae	Ephemerella	12	-	2.9 GC
1 3/22/2007 M. Engelhardt Qualitative Arthropoda	Ephemeroptera	Leotophlehiidae	Unidentified		4	
1 3/22/2007 M. Engelhardt Qualitative Arthropoda	Plecoptera	Capniidae	Allocapnia		t c.	
M. Engelhardt Qualitative	Plecoptera	Leuctridae	Leuctra	-	0	
I I Jorzzizuur IM. Engeinardt		Nemouridae	Amphinemura	24	m	5 SH

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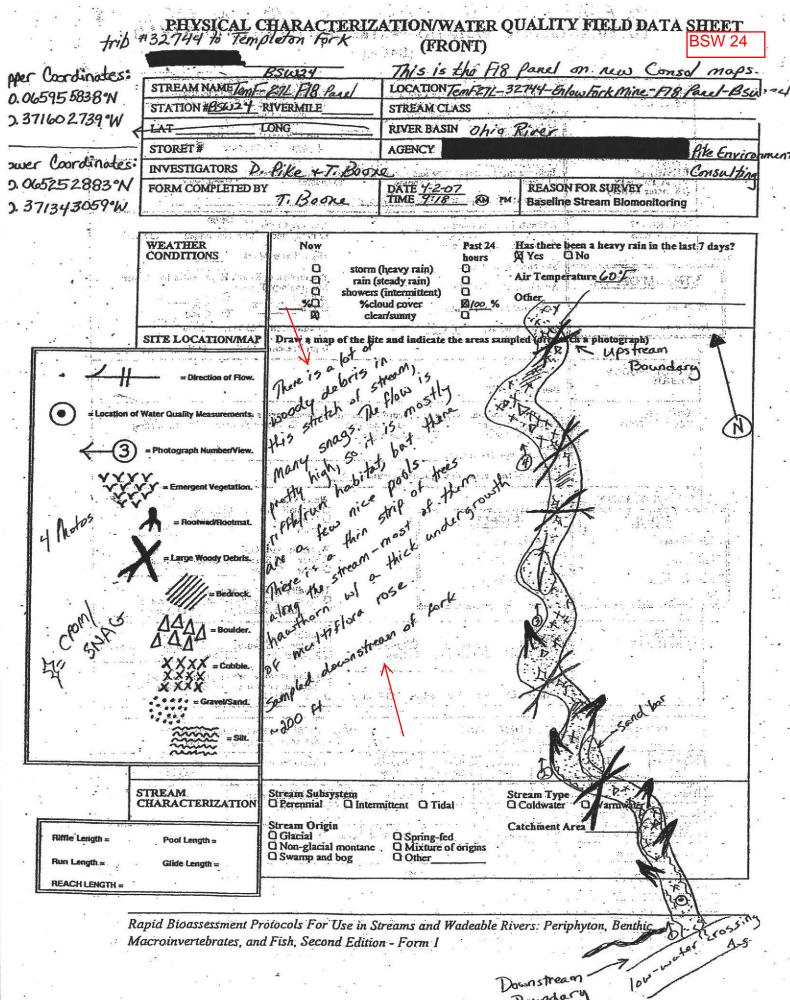
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				07/10/0	100211010-100211010	11						
Station (Data Base Name)	Rep	Enumerated By	,pe	Phylum	Class	Order	Family	Genus	Quantity		EPA	FFG
UNICIC-40944-Enlow-E19P-BSW18_APDX B	-,	M. Engelhardt	Qualitative	Arthropoda	Insecta	Plecoptera	Perlodidae	Cultus		1 Olerance	I olerance	0
UNTCrC-40944-Enlow-E19P-BSW18_APDX R	R 1 3/22/2007	M. Engelhardt	Qualitative	Arthropoda	Insecta	Plecoptera	Perlodidae	Isoperla				
UNTCrC-40944-Enlow-E19P-BSW18 APDX B		M Fnoelhardt	Qualitative	Arthropoda	Insecta	Trichoptera	Hydropsychidae	Diplectrona	=	0	20	102
UNTCrC-40944-Enlow-E19P-BSW18_APDX B	-	M. Endelhardt	Oualitative	Arthropoda	Insecta	I richoptera	Lepidostomatidae	Lepidostoma	~	-	-	R
UNTCrC-40944-Enlow-E19P-BSW18_APDX B	-	M. Engelhardt	Qualitative	Arthronoda	Insecta	Trichontera	Limnephilidae	Hydatophylax		~	5	R
UNTCrC-40944-Enlow-E19P-BSW18_APDX B	-	M. Engelhardt		Arthropoda	Insecta	Trichontera	Molecoldoc	Pycnopschye		4	4	R
UNTCrC-40944-Enlow-E19P-BSW18_APDX B	B 1 3/22/2007	M. Engelhardt		Arthropoda	Insecta	Trichontera	Bhyscophilidae	Dhimonal		9	9	SC
UNICrC-40944-Enlow-E19P-BSW18_APDX B	-	M. Engelhardt		Arthropoda	Insecta	Trichoptera	Uenoidae	Nacrobrita			CV	PR
UNIC/C-40944-Enlow-E19P-BSW18_APDX B	-	M. Engelhardt			Bivalvia	Veneroida	Sphaeriidae	Unidentified		0	00	SC
DIVICIO-40944-ENIOW-E19P-BSW18_APDX B	-	M. Engelhardt		Mollusca	oda	Basommatophora	-	Unidentified		10	8	20
RobF-20R-Enlow Fork-FISP-BSW35-Apdx B		PEC	Π		68	Decapoda	-	Unidentified		, a	0 0	2 C
RobF-20R-Enlow Fork-F19P-BSW35-Andx B	1 4/3/2007	PEC	T		Insecta	Coleoptera	Elmidae	Dubiraphia	2	9	9 9	30
RobF-20R-Enlow Fork-F19P-BSW35-Apdx B	-	PEC	Ouditative		T	Coleoptera	Ptilodactylidae	Anchytarsus	2		5	SH
	-	PEC	T	Arthropoda	Insecta	Distore	Ceratopogonidae	Unidentified	4	9	5.7	PR
RobF-20R-Enlow Fork-F19P-BSW35-Apdx_B	1 4/3/2007	PEC		T	Τ	Dintara	Ciminonomidae	Unidentified	66		5	gc
HODF-20H-Enlow Fork-F19P-BSW35-Apdx_B	-	PEC			Γ	Diotera	Tahanidae	Christie	39	9	5	R
Port COD Fillow Fork-F19P-BSW35-Apdx_B	-	PEC			Γ	Diptera		Hevetome	4 4		4.7	S
Poblic 2011-Enlow Fork-F19P-BSW35-Apdx_B	-	PEC				Diptera		Pseudolimnonhila	- 0	NC		H
RohF-20R-Frilow Fork-F19P-BSW35-ApdX_B		PEC			Insecta	Ephemeroptera	Baetidae	Acerpenna	2+	vu		30
RobF-20R-Enlow Fork-F19P-RSM35. Andv. D		PEC				Ephemeroptera	Leptophlebiidae	Leptophlebia	4	4	T U	
RobF-20R-Enlow Fork-F19P-BSW35-Andy R	1 4/3/2007	DEC	Τ	Τ		Ephemeroptera	lebiidae	Paraleptophlebia		-	- 1	2 C C C C C C
RobF-20R-Enlow Fork-F19P-BSW35-Andx R	-		T		1	Megaloptera		Sialis	0	9	4	2 G
RobF-20R-Enlow Fork-F19P-BSW35-Apdx B			Qualitative P		T	Plecoptera	Leuctridae	Leuctra	-	0	0	E S
RobF-20R-Enlow Fork-F19P-BSW35-Apdx_B	-			Arthropoda	Insecta	Trichcoptera	Nemouridae	Amphinemura	37	e	5	R
RobF-20R-Enlow Fork-F19P-BSW35-Apdx_B	1		Τ		Ť	Trichontera	Hydropsychidae	Cheumatopsyche	-	9	5	R
Hobr-20H-Enlow Fork-F19P-BSW35-Apdx_B	-				ľ	Trichoptera	Limnenhilidae	Purnorenche		m	4	P
HODT-20H-Enlow Fork-F19P-BSW35-Apdx_B	-		Qualitative A	a		Trichoptera		Rhvacophila		4 -	4 0	E la
RohF-20R-Enlow Fork-E10P-DOW35 Apdx B	-					Veneroida		Unidentified	rα	- 0	VO	
RobF-20B-Fnlow Fork-F90P-BSW40-Andv B	1002/2/4					Basommatophora	Physidae	Unidentified		οα	0 9	20
RobF-20R-Enlow Fork-F20P-RSW40-Andv B	10/0/0/1				aeta	Unidentified	Unidentified	Unidentified		10	° ¢	20
RobF-20R-Enlow Fork-F20P-BSW40-Andx B	1002/6/10		T		Τ	Diptera	lae	Unidentified	10	9	5.7	BE
	1 4/3/2007		Т	Arthropoda Ir	Insecta L	Diptera	dae	Unidentified	17	9	5	8
RobF-20R-Enlow Fork-F20P-BSW40-Apdx_B	1 4/3/2007		Т	T	T	Diptore	8	Chrysops	7	7	4.7	S
RobF-20R-Enlow Fork-F20P-BSW40-Apdx_B	1 4/3/2007		Qualitative A		Γ	Diptera	Tipulidae	Ulcranota		00	20	E
Pohe-2019-Enlow Fork-F20P-BSW40-Apdx B	1 4/3/2007				Insecta D	Diptera		Pseudolimnoohila	- α	NC	NC	I C
RobF-20R-Enlow Fork-F20P-RSW40-Apdx B	1 4/3/2007	PEC	T			Ephemeroptera		Ameletus	0 4	v C	VC	
RobF-20R-Enlow Fork-F20P-BSW40-Andv B	1/0/2/2/0/1		T			Ephemeroptera	Leptophlebiidae I	Leptophlebia	. 0	4		
RobF-20R-Enlow Fork-F20P-BSW40-Andv R	10/2/2/01		T	Τ		ecoptera		Leuctra	-	0		31
RobF-2DR-Enlow Fork-F20P-BSW40-Andx B	1 4/3/2007		T			Plecoptera	9	Amphinemura	4	m	20	5 H
	1 4/3/2007		T	Ι	T	Plecoptera		Unidentified	5	2	2	E
RobF-20R-Enlow Fork-F20P-BSW40-Apdx_B	1 4/3/2007		T	Arthronoda	Insecta T	Trichcotore	T	Isoperia	9	0	2	PR B
RobF-20R-Enlow Fork-F20P-BSW40-Apdx_B	1 4/3/2007		T	Γ	ľ	Trichontara	l imporbilidoo	Upiectrona	CN	0	5	ñ
	1 4/3/2007				ľ	Trichoptera	T		- 0	4	4	л Ш
PERF OOD T-I	1 4/3/2007			Γ		Trichoptera	T	Pvrnonsvcha	2	201	4	J.
Boke 200 Eclour Fork-F20P-BSW40-Apdx B	1 4/3/2007			Arthropoda In	İ			Rhvacophila	4 0	4 -	4	H
RahF-20R-Enlow Fork-F20F-B5W40-Apox B	4/3/2007				-		Γ	Unidentified	17	- α		E
TemF-24R-Enlow Fork Mine-E19P-BSW11-	1 3/20/2007		Qualitative M		_	phora		Unidentified	-		9 6	
TemF-24R-Enlow Fork Mine-E19P-BSW11-	1 3/20/2007		Τ		Uligochaeta U	Unidentified	-	Unidentified	7	10	10	C
				A discondia				DOUBLIC DOUBLIC		2		j

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Boundary

# HABITAT ASSESSMENT FIELD DATA SHEET - LOW GRADIENT STREAMS (FRONT)

STREAM NAME Templeton Fork tributary 27L	F18 Panel	LOCATION	TemF27L-32744-EFM-F18 Panel-BSW24
STATION #BSW24 (F18) RIVERMILE		STREAM CL	
Upper Bndry LAT 40.065955838°N LONG 80.	.371602739°W	RIVER BASI	N Ohio River
Lower Bndry LAT _40.065252883°N LONG _80.3	371343059°W	AGENCY	Pike Environmental Consulting
INVESTIGATORS D. Pike and T. Boo	ne		
FORM COMPLETED BY T. Boone	DATE	4/2/2007 10:20 a.m.	REASON FOR SURVEY Baseline Stream Biomonitoring

Habitat		Condition	Category	2
Parameter	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/Available Cover	Greater than 50% of substrate favorable for eifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at a stage to allow full colonization potential (i.e., logs/snags that are <u>not</u> new fall and <u>not</u> transient).	30-50% 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).	10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disurbed or removed.	Less than 10% stable habitat; lack of habitat is obvious; substrate unstabl or lacking.
SCORE 17	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
2. Pool Substrate Characterization	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan clay or bedrock; no root mat or vegetation.
SCORE 15	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Pool Variability	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pools large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small- shallow or pools absent.
SCORE 10	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 <20% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 20-50% of the bottom affected; slight deposition in pools.	affected; sediment deposits at obstructions,	almost absent due to substantial sediment
SCORE 10	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	amount of channel	Water fills >75% of the available channel; or <25% of channel substrate is exposed.		Very little water in channel and mostly present as standing pools.
SCORE 17	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0



**BSW 24** 

Rapid Bioassessment Protocols For Use in Streams and Wadeable Rivers: Periphyton, Benthic Macroinvertebrates, and Fish, Second Edition - Form 2

# HABITAT ASSESSMENT FIELD DATA SHEET - LOW GRADIENT STREAMS (BACK)

**BSW 24** 

STREAM NAME	Templeton Fork tributary 27L F18 Panel	LOCATION	TemF27L-32744-EFM-F18 Panel-BSW24
AGENCY	Pike Environmental Consulting	DATE	April 2, 2007

T	Habitat		Condition	Category	
	Parameter	Optimal	Suboptimal	Marginal	Poor
6	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 th stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
s	SCORE 16	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	7. Channel Sinuosity	was in a straight line. (Note - channel braiding is considered normal in coastal plains and other low lying areas. This parameter is not easily rated in these areas.)		The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	Channel straight; waterwa has been channelized for long distance.
s	SCORE 14	20, 19 18 17 18	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
8	3. Bank Stability (score each bank)	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 frequer along straight sections an bends; obvious bank sloughing 60-100% of bar has erosional scars.
ss	SCORE (LB) 5 SCORE (RB) 5	Left Bank 10 9 Right Bank 10 9	8 7 6 8 7 6	5 4 3 5 4 3	2 1 0 2 1 0
	9. Vegetative Protection (score each bank) Note: determine left or right side by facing Jownstream	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophtes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank 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 streambank 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 streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
-	SCORE (LB) 6 SCORE (RB) 6	Letir Bank 10 9 Right Bank 10 9	8 7 6 8 7 6	5 4 3 5 4 3	2 - 1 = 0 2 - 1 = 0
Z	10. Riparian Vegetative Zone Width (score each bank riparian 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.	meters' little or no ripariar
-	SCORE (LB) 8 SCORE (RB) 8	Leit Bank 10 9 Right Bank 10 9	8 7 6 8 7 6	5 4 8 5 4 8	2 1 0 2 1 0

**Total Score** 

137

Rapid Bioassessment Protocols For Use in Streams and Wadeable Rivers: Periphyton, Benthic Macroinvertebrates, and Fish, Second Edition - Form 2

	ŀ									Contraction of the second second second second second second second second second second second second second s			
Station (Data Base Name)	Rep	p Date	Enumerated By	Sample Type	Phylum	Class	Order	Family	Genus	Quantity PA		EPA	FFG
TemF-26L-Enlow Fork-F19P-BSW33-Apdx_B	-	4/2/2007		Qualitative	Arthropoda	Insecta	Diptera	Empididae	Hemerodromia	-	I Olerance	I olerance	0
	-	4/2/2007		Qualitative	Arthropoda	Insecta	Diptera	Simuliidae	Unidentified				
Temp-26L-Enlow Fork-F19P-BSW33-Apdx_B	-	4/2/2007		Qualitative	Arthropoda	Insecta	Diptera	Tabanidae	Chrysops	0		47	
Tome of Falary Factor Factor Pointon And B	-	4/2/2007	PEC	Qualitative	Arthropoda	Insecta	Diptera	Tipulidae	Hexatoma	4	C	3	B
	÷	4/2/2001		Qualitative	Arthropoda	Insecta	Diptera	Tipulidae	Pseudolimnophila	16	C	2	09
TemE-261 -Enlow FOIN-F 19F-BSW33-ApdX_B	÷	1002/2/4		Qualitative	Arthropoda	Insecta	Diptera	Tipulidae	Tipula	2	4	4	HS HS
TemE-261 -Ealow Fork Early Early BOWING ALL: D	-	4/2/2007		Qualitative	Arthropoda	Insecta	Ephemeroptera	Ameletidae	Ameletus	+	0	0	GC
TemE-261 - Enlow Fork-F 19P-65W33-ApdX_B		4/2/2007		Qualitative	Arthropoda	Insecta	Ephemeroptera	Ephemerellidae	Ephemerella	5	-	2.9	GC
TemE-261 -Enlow Fork-E10D DOW23-Apdx_B		1002/2/4		Qualitative	Arthropoda	Insecta	Ephemeroptera	Ephemerellidae	Eurylophelia	2	4	4	
TemE-261 -Enlow Fork-F19F-BSW32-Apdx B		4/2/2001	PEC	Qualitative	Arthropoda	Insecta	Ephemeroptera	Leptophlebiidae	Leptophlebia	8	4	5	SO
TemE-261 -Enlow Fork-E10D. BCM/33-AptX_B		4/2/2001		Qualitative	Arthropoda	Insecta	Megaloptera	Sialidae	Sialis	-	9	4	PR
TamE-261 -Enlow Fork-E10D-BCM/32-Apdx_B	+	1002/2/14		Guaitative	Arthropoda	Insecta	Plecoptera	Nemouridae	Amphinemura	20	e	5	R
TamE-261 -Enlow Fork-E10D-RCM22-Apdx_D	÷	4/0/001		Qualitative	Arthropoda	Insecta	Plecoptera	Perlodidae	Clioperla	1	2	2	PR
TemE-261 - Fnlow Fork-F10P-RSW23-Apdy_B	+	1000/014		Qualitative	Arthropoda	Insecta	Plecoptera	Perlodidae	Diploperla	2	2	0	PR
TemF-261 -Enlow Fork-F19P-RSW33-Andv B	+	1002/2/4		Qualitative	Arthropoda	Insecta	Trichoptera	Hydropsychidae	Cheumatopsyche	1	9	5	FC
TemF-26L-Enlow Fork-F19P-BSW33-Andx R	+-	4/9/9007		Cualitativo	Arthropoda	Insecta	I ricroptera	Hydropsychidae	Diplectrona	6	0	5	FC
TemF-26L-Enlow Fork-F19P-BSW33-Andx B		4/2/2007		Ouslissing	Arthropoda	Insecta	I richoptera	Limnephilidae	Pycnopsyche	4	4	4	SH
TemF-26L-Enlow Fork-F19P-BSW33-Andv R		4/9/9007		Qualitative	Arthropoda	Insecta	I richoptera	Philopotamidae	Chimarra	-	4	4	FO
TemF-26L-Enlow Fork-F19P-BSW33-Andx R	-	4/2/2007		Ouslimite	Arthropode	Insecta	I richoptera	Phryganeidae	Ptilostomis	-	5	5	R
TemF-26L-Enlow Fork-F19P-BSW33-Andx B	-	4/9/9007		Ousitativo	Mallingo	Illisecial	I richoptera	HINACOPIIIDAE	Hhyacophila	-	-	2	PR
TemF-27L-Enlow Fork-F18P-BSW24-Abdx B		4/9/9007		Qualitative	Anolida	Disabla		Sphaerlidae	Unidentified	2	80	80	C.
TemF-27L-Enlow Fork-F18P-BSW24-Apdx B	-	4/9/9007		Qualitativo	Arthronodo	Oligocriaeta		Unidentified	Unidentified	7	10	10	GC
FemF-27L-Enlow Fork-F18P-BSW24-Apdx B	-	4/2/2007		Ouslitative	Arthropodo	Crustacea	Ampripoda	Crangonycridae	Crangonyx	N	4	4	GC
TemF-27L-Enlow Fork-F18P-BSW24-Apdx B	-	4/2/2007	PEC	Qualitative	Arthronoda	Incerta	Colocotoro	Carnoaridae		-	9	9	ဗ
emF-27L-Enlow Fork-F18P-BSW24-Apdx_B	-	4/2/2007		Qualitative	Arthropoda	Insecta	Dintera	Caratonononidae	Uubirapma Hinidootifiod	- 0	90	0	S
[emF-27L-Enlow Fork-F18P-BSW24-Apdx_B	-	4/2/2007		Qualitative	Arthropoda	Insecta	Dintera	Chironomidae		0 2	0	9.1	H
TemF-27L-Enlow Fork-F18P-BSW24-Apdx_B	-	4/2/2007		Qualitative	Arthropoda	Insecta	Diptera	Dividae	Diva	5	•	<u>,</u>	200
emF-27L-Enlow Fork-F18P-BSW24-Apdx_B	-	4/2/2007		Qualitative	Arthropoda	Insecta	Diptera	Simulidae	Unidentified	- 0	- 0	- 4	
TemF-27L-Enlow Fork-F18P-BSW24-Apdx_B	-	4/2/2007		Qualitative	Arthropoda	Insecta	Diptera	Stratiomvidae	Oxvcera	- T		n u	26
emr-2/L-Enlow Fork-F18P-BSW24-Apdx_B	_	4/2/2007		Qualitative	Arthropoda	Insecta	Diptera	Stratiomyidae	Stratiomvs		2		200
emt-2/L-Enlow Fork-F18P-BSW24-Apdx_B	-	4/2/2007		Qualitative	Arthropoda	Insecta	Diptera	Tabanidae	Chrysops			47	200
T	-	4/2/2007		Qualitative	Arthropoda	Insecta	Diptera	Tipulidae	Pseudolimnophila	2	~	~	30
emr-z/L-Enlow Fork-F18P-BSW24-Apdx_B	-	4/2/2007		Qualitative	Arthropoda	Insecta	Diptera	Tipulidae	Tipula	. 01	14	14	S L
TemE-271 Eclow Fork-F18P-BSW24-ApdX_B	-	4/2/2007			Arthropoda	Insecta	Ephemeroptera	Ameletidae	Ameletus	0	0	0	SC
anti-z/L-crilow Fork-F18F-BSW24-ApdX_B	-	4/2/2007			Arthropoda		Ephemeroptera	Baetidae	Acerpenna	3	9	4	R
TamE-271 - Folow Fork-E18D-BOW24-Apdx B	- -	4/2/2001		T	Arthropoda		Ephemeroptera	Ephemerellidae	Eurylophella	2	4	4	SC
	- -	1002/2/4			Arthropoda		Ephemeroptera	Ephemeridae	Ephemera	4	2	3.1	gC
emF-27L-Enlow Fork-F18P-BSW24-Andy R	-  -	4/2/2007		Qualitative	Arthropoda		Ephemeroptera	Heptageniidae	Stenonema	7	e	4	SC
TemF-27L-Enlow Fork-F18P-BSW24-Abdx B	-	4/2/2007		Т	Arthropoda	Insecta	Cohomoroptoro	Leptophieblidae	Leptophlebia	7	4	S.	ပ္ပ
	-	4/2/2007		T	Arthronoda	Insecta	Epnemeroptera	Leptophieblidae	Paraleptophlebia	-	-	-	ဗ္ဗ
TemF-27L-Enlow Fork-F18P-BSW24-Apdx_B	-	4/2/2007		Г	Arthropoda	Insecta	Odonata	Comphidae	Comohilo		2	2	E I
emF-27L-Enlow Fork-F18P-BSW24-Apdx B	-	4/2/2007		T	Arthronoda	Insacta	Placentara		GUITIDIS		20	2	H
TemF-27L-Enlow Fork-F18P-BSW24-Apdx_B	-	4/2/2007		T	Arthropoda	Insecta	Planntara	Namouridae	A mobilormino	- 5	0	0	R
emF+27L-Enlow Fork-F18P-BSW24-Apdx_B	-	4/2/2007		T	Arthropoda	Insecta	Plecontera	Parlodidaa	Amplimenura leocodo	87		0	HS I
TemF-27L-Enlow Fork-F18P-BSW24-Apdx_B	-	4/2/2007			Arthropoda	Insecta	Trichontera	Goeridae	Goara	0 -			HA
TemF+27L+Enlow Fork-F18P-BSW24-Apdx_B	-	4/2/2007	PEC	F	Arthropoda	Insecta	Trichoptera	Hvdropsvchidae	Cheumatonsvche	- 0		2	
TemF-27L-Enlow Fork-F18P-BSW24-Apdx_B	-	4/2/2007			Arthropoda	Insecta	Trichoptera	Hydropsychidae	Diplectrona	1 0			26
Iemr-2/L-Enlow Fork-F18P-BSW24-Apdx_B	-	4/2/2007			Arthropoda	Insecta	Trichoptera	Hydropsychidae	Hydropsyche	-	2	24	2
entr-2/1-Enlow Fork-F18P-BSW24-Apdx B	_	4/2/2007			Arthropoda	Insecta	Trichoptera	Limnephilidae	Ironoquia	-	0	4	HS
TemE-271 -Enlow Fork-F18D-RCM04-Andv B		1002/24		T	Arthropoda		Trichoptera		Pycnopsyche	2	4	4	R
amE-271-Fnlow Fork-F18P_RSW04. Andv B		1000/01/			Arthropoda	Τ			Ptilostomis	1	5	5	SH
	-	TUCIDAL		Cualitative 1	Arthropoda	Insecta	I richoptera	Bhvacophilidae	Bhuannhile	101	•	c	Ba

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BSW 24

Benthic Macroinvertebrate Data Enlow Fork North Expansion

Station (Data Base Name)	Rep Date	Fnimerated Bu	B Fruimaratad Bu Samula Tuna	S/U/2	1/200	7				ſ	
		Enumerated by	sample lype	Phylum	Class	Order	Family	Genus	Quantity 704	Brance	EPA Tolerance
TamE-271 - Enlow Fork-F18P-BSW24-Apdx B	4/2/2007		Qualitative	Arthropoda	Insecta	Trichoptera	Uenoidae	Neophylax	4	10	9
TemF-271 -Fnlow Fork-F18P-BSW24-Apdx_B	1/2/2/2/01/1	PEC	Qualitative	Mollusca		Veneroida		Unidentified	37	8	8
TemF-27L-Enlow Fork-F18P-BSW24-Andv B	10/0/0/01		Qualitative	Mollusca	_	Basommatophora	-	Unidentified	+	9	20
TemF-27L-Entow Fork-F19P-BSW32-Apdx B	1 5/21/2007		Qualitativo	Arthronodo	Gastropoda	Physicae	Unidentified	Unidentified	e	80	8
TemF-27L-Enlow Fork-F19P-BSW32-Apdx B	1 5/21/2007	PEC	Ouslitative	Arthropoda	Urusidea	Decapoda	Cambaridae	Unidentified	-	9	9
	1 5/21/2007	DEC	Ouditativo	Athropode	Insecta	Coleoptera	Elmidae	Dubiraphia	11	9	9
emF-27L-Enlow Fork-F19P-BSW32-Apdx B	1 5/21/200	PEC	Oriolitative	Arthropoda	T	Coleoptera	Elmidae	Optioservus	-	4	4
TemF-27L-Enlow Fork-F19P-BSW32-Andx R	1 5/91/9007	DEC .	Qualitative Outitative	Athropode	T	Coleoptera	Ptilodactylidae	Anchytarsus	1	4	5
emF-27L-Enlow Fork-F19P-RSW32-Andv R	1 5/21/2007		Qualitative	Artiriopoda		Ulptera	Ceratopogonidae	Unidentified	4	9	5.7
emF-27L-Enlow Fork-F19P-RSW32-Andv B	1 5/04/0001		Qualitative	Armopoda		Uiptera	Chironomidae	Unidentified	26	9	5
TemE-271 . Entow Fork-E100-DOMOS Andv D	002/12/2	LEC	Qualitative	Arthropoda		Diptera	Simuliidae	Unidentified	-	9	2
Dill 2/1-Cillow Folk-Fight Source 4	1002/12/6	FEC	Qualitative	Arthropoda	Insecta	Diptera	Tabanidae	Chrysops	e		47
BUT-2/L-ENIOW FORK-F19P-BSW32-Apdx_B	1 5/21/2007	PEC	Qualitative	Arthropoda	Insecta	Diptera	Tipulidae	Pseudolimnophila	0 4		
emr-2/L-Enlow Fork-F19P-BSW32-Apdx_B	1 5/21/2007	PEC	Qualitative	Arthropoda	Insecta	Diptera	Tipulidae	Tipula	0	4	4
emF-27L-Enlow Fork-F19P-BSW32-Apdx_B	1 5/21/2007	PEC	Qualitative	Arthropoda		Enhemerontera	Baatidaa	Acercence	2 00	<del>5</del> (	4
emF-27L-Enlow Fork-F19P-BSW32-Apdx_B	1 5/21/2007	PEC	Qualitative	Arthronoda		Enhamerontara	Enhomoridae	Presentia	89	9	4
amF-27L-Enlow Fork-F19P-BSW32-Apdx B	1 5/21/2007	DEC	Ouslitative	Arthropodo		Cabarationulaid	chilemende	Epnemera	m	N	3.1
emF-27L-Enlow Fork-F19P-BSW32-Apdx B	1 5/21/2007	DEC	Ounitativo	Athropode		chrieneropiera	Heptageniidae	Stenonema	e	9	4
amF-271 -Enlow Fork-F19P-BSW32-Andv B	1 5/04/0007		Gualitative	Arthropoda	Τ	t phemeroptera	Leptophlebiidae	Paraleptophlebia	5	-	-
amE-071 -Enlow Early E400 DOMPO Andr. D	1002/12/01	LEC	Quairtative	Arthropoda		Plecoptera	Nemouridae	Amphinemura	50	6	5
COLLECTION ON THE POWSERDUN D	1002/12/2	LEC	Qualitative	Arthropoda		Plecoptera	Perlidae	Perlesta	2	4	45
SILIT-2/L-ENIOW FOR-F18P-BSW32-Apdx_B	1 5/21/2007	PEC	Qualitative	Arthropoda	Insecta	Plecoptera	Perlodidae	Isoperia	-	0	0
STIL-2/L-EUIOW FORK-F19P-BSW32-Apdx_B	1 5/21/2007	PEC	Qualitative	Arthropoda	Insecta -	Trichoptera	Hvdropsvchidae	Diplectrona	C	10	1
amF-27L-Enlow Fork-F19P-BSW32-Apdx_B	1 5/21/2007	PEC	Qualitative	Arthropoda	ľ	Trichootera	Limnenhilidae	Irononija		> <	0
imF-27L-Enlow Fork-F19P-BSW32-Apdx_B	1 5/21/2007	PEC	Qualitative	Arthropoda	ľ	Trichontera	l imnanhilidaa	l imoorbilitio		20	4
mF-27L-Enlow Fork-F19P-BSW32-Apdx_B	1 5/21/2007	PEC	Oualitative	Arthronoda	T	Trichontera	Limoohildoo			n	0
mF-27L-Enlow Fork-F19P-BSW32-Apdx B	1 5/21/2007	PEC	Oualitativa	Arthronoda	ľ	Frichostoro		r youpsycne	-	4	4
mF-27L-Enlow Fork-F19P-BSW32-Apdx B	1 5/21/2007	PEC		Arthropode	T	Trichotore	LI I I I I I I I I I I I I I I I I I I	Huyacopnila	4	-	N
mF-27L-Enlow Fork-F19P-BSW32-Andx B	5/21/2007	DIG		Mallingo	T	I ricrioptera	Uenoldae	Neophylax	2	3	5
TemF-27L-Enlow Fork-F20P-BSW37-Andx B	4/6/2007	DEC		Anneliale		Veneroida	sphaeriidae	Unidentified	8	8	8
emF-27L-Enlow Fork-F20P-BSW37-Andy R	4/6/2007		Qualitative	Athenda	aera		Unidentified	Unidentified	1	10	10
mF-271 -Fnlow Fork-F20P-RSW37-Andv B	TOOODH I		T	Arthropoda	Τ	Uiptera	Ceratopogonidae	Unidentified	9	9	5.7
mE-271 .Enlow Early Early Early Andy D	1002014		T	Arthropoda		Diptera	Chironomidae	Unidentified	26	9	5
mE-271 -Enlow Fork-E90B-BEM/97-Apdv D	1012/014		Qualitative	Arthropoda	Ι	Diptera	Ptychopteridae	Ptychoptera	5	80	5
mc 21 Edan Fort Fort Port 201-00W07-70W4 B	1002/011		1	Arthropoda		Diptera	Tabanidae	Chrysops	4	-	47
TELETION FORFEZUP-BSW3/-Apox B	4/6/2007			Arthropoda	Insecta	Diptera	Tipulidae	Dicranota	e.		u u
TIT-2/L-Eniow Fork-F20P-BSW3/-Apdx_B	4/6/2007			Arthropoda	Insecta [	Diptera	Tipulidae	Pseudolimnonhila	14	0	0
mF-27L-Enlow Fork-F20P-BSW37-Apdx_B	4/6/2007			Arthropoda		Diptera	Tinulidae	Tinula		-	1
mF-27L-Enlow Fork-F20P-BSW37-Apdx_B	4/6/2007		Γ	Arthropoda	T	Enhamerontera	Enhamarallidaa	Enhamoralla		+	4
TemF-27L-Enlow Fork-F20P-BSW37-Apdx_B	4/6/2007	PEC	Qualitative	Arthropoda	T	Enhamarontara	1 antonhahidaa	Lentenhonia Lentenhohia		-	5.9
TemF-27L-Enlow Fork-F20P-BSW37-Apdx_B	4/6/2007		Γ	Arthronoda	T	Manalontoro	Ciclidee	Citic	0	4	2
TemF-27L-Enlow Fork-F20P-BSW37-Apdx B	4/6/2007		Т	Arthronoda	T		OIGIIUGE	DIBIIS	-	9	4
TemF-27L-Enlow Fork-F20P-BSW37-Apdx B	4/6/2007		T	Atheodo	T	Liecopiera	Nernouridae	Ampninemura	13	0	5
mF-27L-Enlow Fork-F20P-BSW37-Andv B	4/8/2007		T	Athenda			Periodidae	Diploperla	1	2	2
mF-271 -Fninw Fork-FOND-RSW127-Andv D	2000/0/2		T	Arthropoda			Perlodidae	Isoperla	2	~	CV
TemE-071 Coloni Colo COOD DOMOT A da D	4/0/2/0/1		1	Arthropoda	Insecta T	Trichoptera	Hydropsychidae	Diplectrona	8	-	4
Tent of Land Total Tent Power Street	4/6/2007			Arthropoda		Trichoptera	Limnephilidae	Unidentified	4		
TIL-2/L-ETHOW FORK-FZUP-BSW3/-Apdx_B	4/6/2007			Arthropoda	Insecta T	richoptera	Limnephilidae	Ironoquia	0 4	- 0	
I emr-2/L-Enlow Fork-F20P-BSW37-Apdx_B 1	4/6/2007			Arthropoda	f	Trichoptera	l imnenhilidae	Purchaserahe	,	2	4
TemF-27L-Enlow Fork-F20P-BSW37-Apdx_B 1	4/6/2007		Γ	Arthropoda	Í	richontera	Photomotidae	Diloctomia	2	4	4
TemF-27L-Enlow Fork-F20P-BSW37-Apdx_B 1	4/6/2007		T	Mollusca	Í		Cohooriidoo		N	0	2
TemF-27L-Enlow Fork-F20P-BSW37-Apdx_B	4/6/2007		Г	Mollusca	-		Obiidaliiuda	Orlidentified		8	8
TemF-28L-Enlow Fork-F19P-BSW31-Apdx_B	3/30/2007		Г	Annelicia		Т	1 Inidonitical		N		8
mF-28L-Enlow Fork-F19P-BSW31-Apdx B	3/30/2007		Ouslitative	Arthronoda	-		Orinerinieu	Unidentified	-	9	9
mF-28L-Enlow Fork-F19P-BSW31-Apdx B	3/30/2007		T	uthronodo	T	na	Cambaridae	Unidentified	-	9	9
TemF-28L-Enlow Fork-F19P-BSW31-Andx B 1	3/30/2007		T	Athropoda	ea			Unidentified	2	8	8
mF-28L-Enlow Fork-F19P-RSW31-Andv R 1	3/20/2007		Cualitative of	Attricopode	T			Stenelmis	2	5	S
	10020000			Arthropoda	Insecta C	Coleoptera	Ptilodactylidae	Anchytarsus	0	V	v

← BSW 24

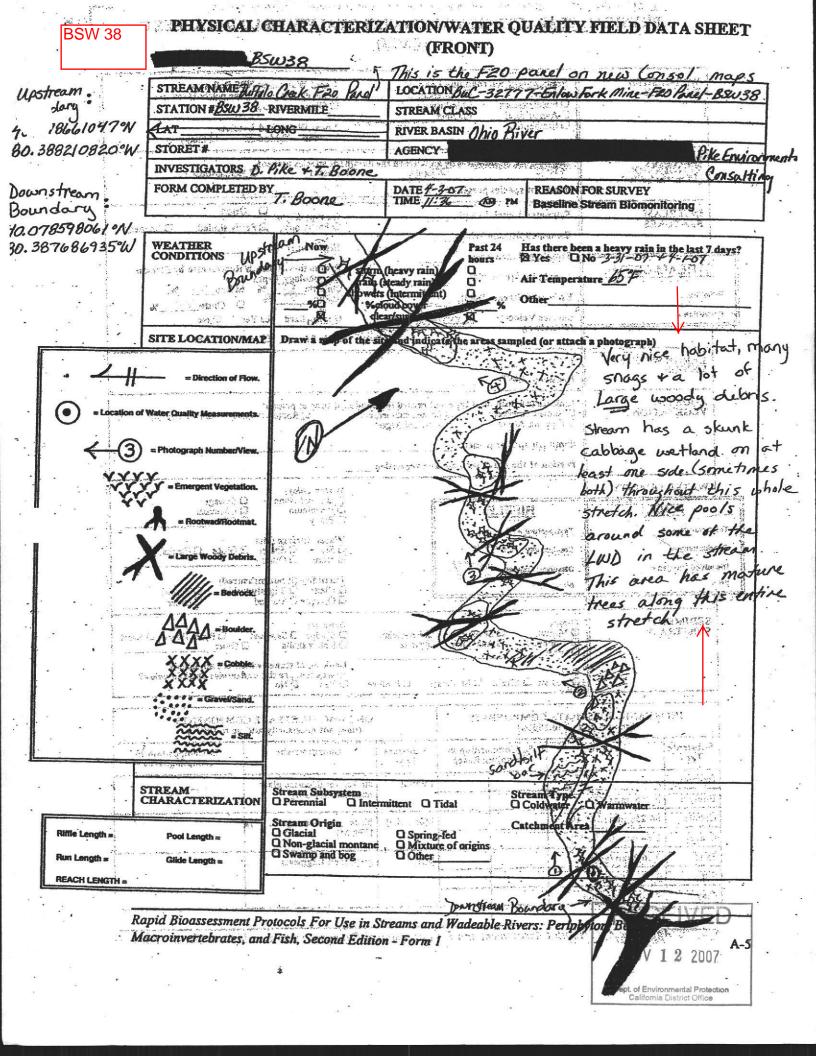
Benthic Macroinvertebrate Data

22 of 25

# BSW 24 ←

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# HABITAT ASSESSMENT FIELD DATA SHEET - HIGH GRADIENT STREAMS (FRONT)

**BSW 38** 

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STREAM NAME Buffalo Creek F20 Panel	LOCATION BufC-32777-EFM-F20 Panel-BSW38
STATION #BSW38 (F20) RIVERMILE	STREAM CLASS
Upper Bndry LAT 40.078661047°N LONG 80.388210820°W	_ RIVER BASIN Ohio River
Lower Bndry LAT 40.078598061°N LONG 80.387686935°W	AGENCY Pike Environmental Consulting
INVESTIGATORS D. Pike and T. Boone	1
DATE	4/3/2007 REASON FOR SURVEY
FORM COMPLETED BY T. Boone TIME	12:35 p.m. Baseline Stream Biomonitoring

	Habi	itat		Condition	n Category	
	Param	neter	Optimal	Suboptimal	Marginal	Poor
reach	1. Epifaunal Substrate/Ava Cover	ailable	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 a stage to allow full colonization potential (i.e., logs/snags that are <u>not</u> new fall and <u>not</u> 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 desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
	SCORE	18	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
samp	2. Embeddedi	ness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment.	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.
din	SCORE	15	2(0) (19) (18) (17) (16)	15 14 16 12 11	10 9 8 7 6	5 4 3 2 1 0
to be evaluated	3. Velocity/De	pth 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	16	20 19 18 17 16	15 14 18 12 11	10 9 8 7 6	5 4 3 2 1 0
Paran	4. Sediment D		Little or no enlargement of islands or point bars and less than <5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	affected; sediment deposits at obstructions, constrictions, and bends; modrate deposition of pcols prevalent.	material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
	SCORE	14	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	5. Channel Flo	ow 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	16	20 19 18 17 16	15 14 19 12 11	10 9 8 7 6	5 4 3 2 1 0

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### HABITAT ASSESSMENT FIELD DATA SHEET - HIGH GRADIENT STREAMS (BACK)

STREAM
AGENCY

Zone Width (score each bank riparian zone)

SCORE (LB) 9 SCORE (RB) 9

STREAM NAME Buffalo Creek F20 Panel Pike Environmental Consulting

LOCATION BufC-32777-EFM-F20 Panel-BSW38 DATE April 3, 2007

BENCY Pike Envi	ronmental Consulting	DATE	April 3, 2007	
Habitat	1	Condition	n Category	
Parameter	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	Banks shored with gabion
SCORE 19	20 19 18 17 16	-15 14 18 12 11-	10 9 8 7 6	543210
7. Frequency of Riffles (or bends) SCORE 17	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 17	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 frequen along straight sections and bends; obvious bank sloughing 60-100% of bant has erosional scars.
SCORE (LB) 7	Left Bank 10 9	8 7 6 8 7 6	5 4 3 5 4 3	2 1 0
<ul> <li>8. Bank Stability (score each bank)</li> <li>Note: determine left or right side by facing downstream</li> <li>SCORE (LB) 7</li> <li>SCORE (RB) 7</li> <li>9. Vegetative Protection (score each bank)</li> </ul>	Right Bank 2010 9 More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophtes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank 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.	5 4 4 4 4 4 5 5 5 5 7 7 0% of the streambank 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.	2 1 1 0 Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE (LB) 7	Leff Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE (RB) 7 10. Riparian Vegetative Zone Width (score each back dradae zone)	Right Bank at 10 10 9) Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops)		Width of riparian zone 6-12 meters; human activities have impacted zone a great deal	meters' little or no riparian

Right Bank RECEIVEL **Total Score** 161 NOV 1 2 2007

deal.

activities.

clear-cuts, lawns, or crops) minimally.

have not impaced zone.

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				3/10/2	3/01/2001-5/31/2001						
Station (Data Base Name)	Rep Date	Enumerated By	Sample Type	Phylum	Class	Order	Family	Genus	Quantity Tole	PA EPA Tolerance Tole	EPA Tolerance
	1 4/23/2007	PEC	Qualitative	Annelida	Oligochaeta	Unidentified	Unidentified	Unidentified	1	0	10 GC
BufC-16L-Enlow Fork-F21P-BSW41-Apdx_B	1 4/23/2007	PEC	Qualitative	Arthropoda		Diptera	Ceratopogonidae	Unidentified	e	9	5.7 PR
ButC-16L-Enlow Fork-F21P-BSW41-Apdx_B	4/23/2007	PEC	Qualitative	Arthropoda	Τ	Diptera	Chironomidae	Unidentified	107	9	
Build-19L-Elliow Fork-E21F-B3W41-Apdx_B	1002/02/10/1		Qualitative	Arthropoda	Insecta	Diptera	Tipulidae	Ulicranota	NT	000	HA G
low Fork-F21P-BSW41-Apdx B	1 4/23/2007	PEC	Qualitative	Arthropoda		Diotera	Tipulidae	Ormosia	- 0	V V	
BufC-16L-Enlow Fork-F21P-BSW41-Apdx_B	1 4/23/2007	PEC	Qualitative	Arthropoda		Diptera	Tipulidae	Pseudolimnophila	1 (1	0 0	2 60
ow Fork-F21P-BSW41-Apdx_B	1 4/23/2007		Qualitative	Arthropoda	Γ	Diptera	Tipulidae	Tipula	4	4	4
BufC-16L-Enlow Fork-F21P-BSW41-Apdx_B	1 4/23/2007	PEC	Qualitative	Arthropoda	Insecta	Ephemeroptera	Ameletidae	Ameletus	1	0	0 GC
ow Fork-F21P-BSW41-Apdx_B	1 4/23/2007		Qualitative	Arthropoda		Ephemeroptera	Ephemerellidae	Ephemerella	7	-	2.9 GC
BufC-16L-Enlow Fork-F21P-BSW41-Apdx_B	1 4/23/2007	PEC	Qualitative	Arthropoda	Τ	Ephemeroptera	Heptageniidae	Epeorus	80	0	1.2
ow Fork-F21P-BSW41-Apdx_B	1 4/23/2007		Qualitative	Arthropoda		Plecoptera	Leuctridae	Leuctra	1	0	0 SF
ow Fork-F21P-BSW41-Apdx_B	1 4/23/2007		Qualitative	Arthropoda		Plecoptera	Nemouridae	Amphinemura	53	3	2
BUIC-16L-ENIOW FOR-F21P-BSW41-Apox_B	1 4/23/2007	PEC	Qualitative	Arthropoda	T	Plecoptera	Periodidae	Diploperla	0	2	2
ButC-16L-Enlow Fork-F21P-BSW41-Apdx_B	1 4/23/2007		Qualitative	Arthropoda		Plecoptera	Perlodidae	Isoperia	5	2	~
DW FORK-F21P-BSW41-Apdx B	1 4/23/2007			Arthropoda	T	Trichoptera	Hydropsychidae	Diplectrona	e	0	2
BUIC-16L-Enlow Fork-F21P-BSW41-Apdx_B	4/23/2007	PEC		Arthropoda		Trichoptera	Limnephilidae	Pycnopsyche	5	4	4
ButC-16L-Enlow Fork-F21P-BSW41-Apdx_B	1 4/23/2007			Arthropoda	1	a	Rhyacophilidae	Rhyacophila	-	-	2
BUIC-16L-ENIOW FORK-F21P-BSW41-Apdx_B	1 4/23/2007		Qualitative	Mollusca	-		Sphaeriidae	Unidentified	-	8	8
BUIC-22L-ENIOW FOR-F20P-BSW39-Apdx_B	1002/01/14	PEC	Qualitative	Annelida	aeta	tified	Unidentified	Unidentified	-	10	
BUIC-22L-ENIOW FOR-F20P-BSW39-Apdx_B	10/2001/4			Arthropoda			Ceratopogonidae	Unidentified	10	9	
BUIC-22L-ENIOW FOR-F20P-BSW39-Apdx_B	1 4/10/2007			Arthropoda			Chironomidae	Unidentified	85	9	5 GC
BUTC-22L-Eniow Fork-F2UP-BSW39-Apdx_B	1002/01/14	PEC		Arthropoda			Tabanidae	Chrysops	5	-	
OW FORK-FZUP-BSW39-ApdX B	1002/01/14 1			Arthropoda	T	Diptera	Tipulidae	Dicranota	0	<del></del>	
BUIC-22L-ETIIOW FOR-FZUF-BSW38-ApdX_B	1 4/10/2001	LEC		Arthropoda	T	Uptera	I ipulidae	Pseudolimnophila	m	CV	
W FORK-FZUP-BSW38-Apdx B	10/2/01/14			Arthropoda		Ephemeroptera	Ameletidae	Ameletus	<del></del>	•	
Build-22L-Enlow Fork-Earb-Bows9-Apdx_B	4/10/2001		Qualitative	Arthropoda	Insecta	Ephemeroptera	Ephemerellidae	Ephemerella	22	- 0	1
Build 201 Eclain Fort FOOD DEMOD Andu D	10020114		Cualitative	Arthropoda		prierrieropiera	hepiageniidae	Epeorus	N	5	
BUIC-22L-ERIOW FOR-F20F-BOW39-ADUX_B	10/2001		Qualitative	Arthropoda	T	Odonata	Gompnidae	Gomphus	- 00	20	
Build 22L-ELIIOW FOIL-ESUE-DOW 39-Apux_D	1 4/10/2001		Qualitative	Arthropoda	T	Plecoptera	Nemoundae	Ampninemura	53		
W Fork-FODP-RSW39-Andy B	1 4/10/2007		Ouslitative	Arthronoda		Placontara	Deriodideo	Internoura	4 ¢	- 0	000
BufC-22L-Enlow Fork-F20P-BSW39-Andr B	1 4/10/2007	PEC	Dualitative	Arthronoda	T	Trichontara	Hudroneuchidae	Dinladrona	7	vc	
W Fork-F20P-BSW39-Apdx B	1 4/10/2007		Qualitative	Arthropoda	T	Trichontera	l imnenhilidae	Pucnonsucha	- ^		1
BufC-22L-Enlow Fork-F20P-BSW39-Apdx B	1 4/10/2007		Qualitative	Arthropoda	T	Trichoptera	Rhvacophilidae	Rhvacophila	22	-	
BufC-22L-Enlow Fork-F20P-BSW39-Apdx_B	1 4/10/2007	PEC	Qualitative	Arthropoda	Ī	Trichoptera	Uenoidae	Neophylax	<u>}</u> +-	. 0	2 SC
BufC-Enlow Fork Mine-F20P-BSW38-Apdx_B	1 4/3/2007		Qualitative	Annelida	aeta	Unidentified	Unidentified	Unidentified	e	10	
BufC-Enlow Fork Mine-F20P-BSW38-Apdx_B	1 4/3/2007	PEC	Qualitative	Arthropoda	_	Decapoda	Cambaridae	Unidentified	2	9	
ork Mine-F20P-BSW38-Apdx_B	1 4/3/2007		Qualitative	Arthropoda		Coleoptera	Elmidae	Optioservus	2	4	4 SC
ork Mine-F20P-BSW38-Apdx_B	1 4/3/2007	PEC	Qualitative	Arthropoda		Diptera	Ceratopogonidae	Unidentified	2	9	5.7
BufC-Enlow Fork Mine-F20P-BSW38-Apdx_B	1 4/3/2007		Qualitative	Arthropoda		Diptera	Chironomidae	Unidentified	102	9	9 S
BUIC-Enlow Fork Mine-F20P-BSW38-Apdx_B	4/3/2007		Qualitative	Arthropoda	Ι	Diptera	Dixidae	Dixa	-	-	-
Build-Enlow Fork Mine-FOR-BOW39-Apdx_B	1 4/3/2007		Qualitative	Arthropoda	Insecta	Distore	Tionidae	Circosops	-		4.7
BufO-Enlow Fork Mine-F20P-BSW38-Aodx B	1 4/3/2007		Qualitative	Arthronoda		Dintera	Tinulidae	Ormosia	- 0	<u>,</u>	0 4
BufO-Enlow Fork Mine-F20P-BSW38-Apdx B	1 4/3/2007		Qualitative	Arthropoda		Dintera	Tipulidae	Pseudolimnonhila	40	0	000
BufG-Enlow Fork Mine-F20P-BSW38-Apdx_B	1 4/3/2007		Qualitative	Arthropoda		Diptera	Tipulidae	Tipula	000	14	1
BufC-Enlow Fork Mine-F20P-BSW38-Apdx_B	1 4/3/2007		Qualitative	Arthropoda		Ephemeroptera	Ephemerellidae	Ephemerella	4	-	1
BufC-Enlow Fork Mine-F20P-BSW38-Apdx_B	1 4/3/2007		Qualitative	Arthropoda	Γ	Ephemeroptera	Heptageniidae	Stenacron	-	4	4 SC
BufQ-Enlow Fork Mine-F20P-BSW38-Apdx_B	1 4/3/2007		Qualitative	Arthropoda		Megaloptera	Corydalidae	Nigronia	0	0	1
BufC-Enlow Fork Mine-F20P-BSW38-Apdx_B	1 4/3/2007	PEC	Qualitative	Arthropoda		Plecoptera	Capniidae	Allocapnia	-	e	
ork Mine-F20P-BSW38-Apdx_B	1 4/3/2007	PEC	Qualitative	Arthropoda		Plecoptera	Leuctridae	Leuctra	З	0	0 81
ButC-Enlow Fork Mine-F20P-BSW38-Apdx_B	1 4/3/2007	PEC		Arthropoda	Insecta	Plecoptera	Nemouridae	Amphinemura	19	3	5 SH

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tenthic Macroinvertebrate Data	inlow Fork North Expansion	3/01/2007-5/31/2007
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Station (Data Base Name)	Rep Date	Enumerated By	Sample Type	Phylum	Class	Order	Family	Genus	Quantity	PA Tolerance	EPA	FFG
BufC-Enlow Fork Mine-F20P-BSW38-Apdx_B	1 4/3/2007	PEC	Qualitative	Arthropoda	Insecta	Plecoptera	Perlodidae	Isoperia	6		20000	d
BufC-Enlow Fork Mine-F20P-BSW38-Apdx_B	1 4/3/2007	PEC	Qualitative	Arthropoda	Insecta	Trichoptera	Hydropsychidae	Diplectrona	-	0	2	E
BufC-Enlow Fork Mine-F20P-BSW38-Apdx_B	1 4/3/2007	PEC	Qualitative	Arthropoda	Insecta	Trichoptera	Limnephilidae	Ironoquia	+	6	4	ц С
BufC-Enlow Fork Mine-F20P-BSW38-Apdx_B	1 4/3/2007	PEC	Qualitative	Arthropoda	Insecta	Trichoptera	Limnephilidae	Pycnopsyche	10	4	4	R
BufC-Enlow Fork Mine-F20P-BSW38-Apdx_B	1 4/3/2007	PEC	Qualitative	Arthropoda	Insecta	Trichoptera	Rhyacophilidae	Rhyacophila	9	1	2	Ч
BufC-Enlow Fork Mine-F20P-BSW38-Apdx_B	1 4/3/2007	PEC	Qualitative .	Mollusca	Bivalvia	Veneroida	Sphaeriidae	Unidentified	e	80	80	5 0 2
BufC-Enlow Fork Mine-F21P-BSW42-Apdx_B	1 4/10/2007	PEC	Qualitative	Annelida	Oligochaeta	Unidentified	Unidentified	Unidentified	e	10	10	
BufC-Enlow Fork Mine-F21P-BSW42-Apdx_B	1 4/10/2007	PEC	Qualitative	Arthropoda	_	Coleoptera	Elmidae	Dubiraphia	CV	9	9	
BufC-Enlow Fork Mine-F21P-BSW42-Apdx_B	1 4/10/2007	PEC	Qualitative	Arthropoda	Insecta	Diptera	Ceratopogonidae	Unidentified	CV	9	5.7	d
	1 4/10/2007	PEC	Qualitative	Arthropoda	Insecta	Diptera	Chironómidae	Unidentified	17	9	5	g
BufC-Enlow Fork Mine-F21P-BSW42-Apdx_B	1 4/10/2007	PEC	Qualitative	Arthropoda	Insecta	Diptera	Simuliidae	Unidentified	5	9	5	
BufC-Enlow Fork Mine-F21P-BSW42-Apdx_B	1 4/10/2007	PEC	Qualitative	Arthropoda	Insecta	Diptera	Tabanidae	Chrysops	8	7	4.7	00
BufC-Enlow Fork Mine-F21P-BSW42-Apdx_B	1 4/10/2007	PEC	Qualitative	Arthropoda	Insecta	Diptera	Tipulidae	Dicranota	-	Ø	5	PB
	1 4/10/2007	PEC	Qualitative	Arthropoda	Insecta	Diptera	Tipulidae	Pedicia	-	9	5	d
BufC-Enlow Fork Mine-F21P-BSW42-Apdx_B	1 4/10/2007	PEC	Qualitative	Arthropoda	Insecta	Diptera	Tipulidae	Pseudolimnophila	9	N	2	US
BufC-Enlow Fork Mine-F21P-BSW42-Apdx_B	1 4/10/2007	PEC	Qualitative	Arthropoda	Insecta	Diptera	Tipulidae	Tipula	-	4	4	с о
BufC-Enlow Fork Mine-F21P-BSW42-Apdx_B	1 4/10/2007	PEC	Qualitative	Arthropoda	Insecta	Ephemeroptera	Ameletidae	Ameletus	-	0	0	Ø
BufC-Enlow Fork Mine-F21P-BSW42-Apdx_B	1 4/10/2007	PEC	Qualitative	Arthropoda	Insecta	Ephemeroptera	Ephemerellidae	Eurylophella	-	4	4	ы М
BufC-Enlow Fork Mine-F21P-BSW42-Apdx_B	1 4/10/2007		Qualitative	Arthropoda		Ephemeroptera	Ephemeridae	Ephemera	-	5	3.1	Ø
BufC-Enlow Fork Mine-F21P-BSW42-Apdx_B	1 4/10/2007	PEC	Qualitative	Arthropoda	Insecta	Ephemeroptera	Heptageniidae	Stenacron	-	4	4	ŝ
BufC-Enlow Fork Mine-F21P-BSW42-Apdx_B	1 4/10/2007		Qualitative	Arthropoda		Ephemeroptera	Leptophlebildae	Leptophlebia	1	4	5	8
BufC-Enlow Fork Mine-F21P-BSW42-Apdx_B	1 4/10/2007	PEC	Qualitative	Arthropoda	Insecta	Megaloptera	Sialidae	Sialis		9	4	R H
	1 4/10/2007	PEC	Qualitative	Arthropoda		Plecoptera	Leuctridae	Leuctra	-	0	0	Ś
BufC-Enlow Fork Mine-F21P-BSW42-Apdx_B	1 4/10/2007	PEC	Qualitative	Arthropoda	Insecta	Plecoptera	Nemouridae	Amphinemura	19	e	5	ŝ
BufC-Enlow Fork Mine-F21P-BSW42-Apdx_B	1 4/10/2007	PEC	Qualitative	Arthropoda	Insecta	Plecoptera	Perlodidae	Isoperla	12	N	N	ā
BufC-Enlow Fork Mine-F21P-BSW42-Apdx_B	1 4/10/2007	PEC	Qualitative	Arthropoda	Insecta	<b>Frichoptera</b>	Hydropsychidae	Diplectrona	2	0	5	Щ
BufC-Enlow Fork Mine-F21P-BSW42-Apdx_B	1 4/10/2007	PEC	Qualitative	Arthropoda	Insecta .	Trichoptera	Limnephilidae	Unidentified	5	4	4	ŝ
ButC-Enlow Fork Mine-F21P-BSW42-Apdx_B	1 4/10/2007	PEC	Qualitative	Arthropoda		<b>Frichoptera</b>	Limnephilidae	Ironoquia	1	3	4	ົດ
BufC-Enlow Fork Mine-F21P-BSW42-Apdx_B	1 4/10/2007	PEC	Qualitative	Arthropoda	Insecta.	Trichoptera	Limnephilidae	Pycnopsyche	5	4	4	ŝ
BufC-Enlow Fork Mine-F21P-BSW42-Apdx_B	1 4/10/2007	PEC	Qualitative	Arthropoda		Trichoptera	Phryganeidae	Ptilostomis	ß	5	5	ŝ
ButC-Enlow Fork Mine-F21P-BSW42-Apdx_B	1 4/10/2007	PEC	Qualitative	Arthropoda		Trichoptera	Rhyacophilidae	Rhyacophila	11	-	2	đ
ButC-Enlow Fork Mine-F21P-BSW42-Apdx_B	1 4/10/2007	PEC	Qualitative	Arthropoda	T	Trichoptera	Uenoidae	Neophylax	N	e	5	S
BUIC-ENIOW FORK MINE-F21P-BSW42-ApdX_B	1 4/10/2007	PEC	Qualitative	Mollusca		Veneroida	Sphaeriidae	Unidentified	9	8	80	Щ
BUIC-ENIOW FORK MINE-F21P-BSW42-Apdx_B	1 4/10/2007	PEC	Qualitative	Mollusca		Basommatophora	Physidae	Unidentified	10	80	8	ő
BUTC-Enlow Fork Mine-F22P-BSW46-Apdx_B	1 4/23/2007	PEC	Qualitative	Annelida	aeta	Unidentified	Unidentified	Unidentified	-	10	10	ğ
BUIC-ENIOW FORK MINE-F22P-BSW46-Apdx_B	4/23/2007	PEC	Qualitative	Arthropoda		Coleoptera	Elmidae	Dubiraphia	-	9	9	ğ
BUIC-ERIOW FORK MIRB-FZZF-BSW46-ApdX_B	4/23/2007	PEC	Qualitative	Arthropoda		Coleoptera	Elmidae	Optioservus	-	4	4	š
Durc-Erilow Fork Mille-FZZF-BSW40-ApdX_B	1 4/23/2001	LEC	Qualitative	Arthropoda	T	Coleoptera	Elmidae	Stenelmis	4	5	5	ю М
	1002/20101		Qualitativo	Arthropoda	T	Distan	Ceratopogonidae		N	90	5.7	ī l
Build-Enlow Fork Mine-F22P-BSW46-Andv B	1002/20/14		Qualitative	Arthropoda	T	Diptera	Chironomidae		123	90	2	5
BufC-Enlow Fork Mine-F22P-BSW46-Andx B	1 4/93/2007		Oualitative	Arthronoda	Insecta	Dintera	Strationwidae	Onidentined	- 0			Ĩ
ButC-Enlow Fork Mine-F22P-BSW46-Apdx B	1 4/23/2007		Qualitative	Arthropoda	T	Dintera	Tahanidaa	Christone	u u	4 0		
BufC-Enlow Fork Mine-F22P-BSW46-Apdx_B	1 4/23/2007	PEC	Qualitative	Arthropoda		Ephemeroptera	Ephemeridae	Ephemera	- 1	- 0	31	j C
BufC-Enlow Fork Mine-F22P-BSW46-Apdx_B	1 4/23/2007		Qualitative	Arthropoda		Ephemeroptera	Heptageniidae	Epeorus	-	0	1.2	S
BufC-Enlow Fork Mine-F22P-BSW46-Apdx_B	1 4/23/2007	PEC	Qualitative	Arthropoda		Plecoptera	Nemouridae	Amphinemura	13	m	5	5
	1 4/23/2007		Qualitative	Arthropoda		Plecoptera	Perlodidae	Isoperla	CV	N	S	La la
BufC-Enlow Fork Mine-F22P-BSW46-Apdx_B	1 4/23/2007		Qualitative	Arthropoda	Insecta 7	<b>Frichoptera</b>	Limnephilidae	Limnephilus	1	3	5	ŝ
Bufg-Enlow Fork Mine-F22P-BSW46-Apdx_B	1 4/23/2007		Qualitative	Arthropoda	T	Trichoptera	Rhyacophilidae	Rhyacophila	4	+	2	đ
Burg-Enlow Fork Mine-F22P-BSW46-Apdx_B	1 4/23/2007		Qualitative	Mollusca	_	Veneroida	Sphaeriidae	Unidentified	15	80	8	ш
Butg-Enlow Fork Mine-F22P-BSW46-Apdx_B	1 4/23/2007		Qualitative	Mollusca		Basommatophora	Lymnaeidae	Unidentified	N	7	6	S
BUIC-ENIOW FORK MINE-F22P-BSW46-ApdX_B	4/23/2007		Qualitative	Mollusca		Basommatophora	Physidae	Unidentified	18	8	8	S
BUIC-ENIOW FOR MINE-F23P-BSW51-Apox B	1002/1/9 1	LEC.	Qualitative	Annelida	aeta	Unidentified	Unidentified	Unidentified	~	10	10	ğ
	1 MILLING			RUUUUUU		CIERCIA CONTRACT	1 TIMUDAD					2

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Upper _ to	0.079655616 W	Lover 40.080036836 W Boundary # 80. 383091205 W
Boundary 80	-383904605°W	Boundary 80. 383091205°W
		B QUALITY FIELD DATA SHEET (FRONT) BSW 42
PRISICAL	UNANAGI ERIZA HUNVIVA I E	TOUALITT FIELD DATA SHEET (FRONT)
STREAM NAME Buffalo Creek 1 STATION #BSD42 RIVERMILE		STREAM CLASS SUNCE DOUBLE I
		RIVER BASIN Obio River
A REAL LAT	LONG	AGENCY Pike Environmental Consulting
FORM COMPLETED BY	DATE	4-10-2007 REASON FOR SURVEY
		1:10 pm Baseline Stream Biomonitoring
WEATHER	LA- Upst	Past 24 Has there been a heavy rain in
CONDITIONS	Now	hours the last 7 days?
	storm (he rain (ste	
	showers (in	
a and a second second second second second second second second second second second second second second second		cover 0_% Other
SITE LOCATION MAP		
Direction of flow	Cat	the here through the stream runs the stream runs the s
Direction of flow=	1.12	a com passure. 129
Se garage a		in the pasture has b
Location of WQ measurements=	X XXX	heavily grazed. The si
	1.81	is incised, a good
Photo No.	and the second	of bank crosion is evi
and View=		D you some light up shamps of soil lyin
Emergent VVVV		the stream. Noticed ,
Vegetation=	i al Carrier i miste 🔨	Swimming here. No
	Carlora a standa 💦 🤘	With at all along or close
Rootwad/Rootmat=	a server a server a server a	K. T.V. Stream. There are a
		Scattered clumps of r
Large Woody Debris=	a sector and a sector of the	AV growing along banks
	rise h	A X I Some of which acted a
Bedrock=	a substance in the second second	g" Snags:
	Man Ale	W X HALAN
	n in de lander in 35 mei en 2010 - 1 Mei als de mension der de lander	V: ) B We sampled from
	and an and a state of the second second second second second second second second second second second second s	to road drainage
Cobble=	an an An An An An An An An An An An An An An	to road draingad
XXXX	<ul> <li>Landstates and scheme</li> </ul>	culvert.
Gravel/Sand=	i a siya alƙ ya siya kata s	Al
22222	and the second s	
sitt=		
	a haran ana an an an an an an an an an an an	and the second sec
STREAM CHARACTERIZATION	Stream Subsystem	mettent
. Rittle Length= Pool Length=	Downstream -	7/ Oll Continuent Area Road Drainage Culverts
Run Length= Glide Length=	Glacial )	□ Spring-fed
REACH LENGTH=	Non-glacial montane     Swamp and bog	Mixture of drigins     Other

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2

# HABITAT ASSESSMENT FIELD DATA SHEET - HIGH GRADIENT STREAMS (FRONT)

**BSW 42** 

RECEIVED

NOV 1 2 2007

STREAM NAME Buffalo Creek F21 Panel	LOCATION BufC-32777-EFM-F21 Panel-BSW42
STATION #BSW42 (F21) RIVERMILE	STREAM CLASS
Upper Bndry LAT _40.079655616°N LONG _80.383904605°W	RIVER BASIN Ohio River
Lower Bndry LAT 40.080036836°N LONG 80.383091205°W	AGENCY Pike Environmental Consulting
INVESTIGATORS D. Pike and T. Boone	
FORM COMPLETED BY T. Boone DATE	4/10/2007 REASON FOR SURVEY
FORM COMPLETED BY T. Boone TIME	2:19 p.m. Baseline Stream Biomonitoring

	Habitat		Condition	n Category	е. С
	Parameter	Optimal	Suboptimal	Marginal	Poor
reach	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 a stage to allow full colonization potential (i.e., logs/snags that are <u>not</u> new fall and <u>not</u> 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 desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
	SCORE 15	. 20 19 18 17 46	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
i sampling	2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment.	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.
P	SCORE 11	20 19 18 17 16	15 14 18 12 11	10 9 8 7 6	5 4 3 2 1 0
eva	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).
s t	SCORE 13	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
Parameters to be	4. Sediment Deposition	Little or no enlargement of islands or point bars and less than <5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	sediment on old and new bars; 30-50% of the bottom	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment
	SCORE 12	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	amount of channel		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 16	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

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# HABITAT ASSESSMENT FIELD DATA SHEET - HIGH GRADIENT STREAMS (BACK)

STREAM
AGENCY

STREAM NAME Buffalo Creek F21 Panel **Pike Environmental Consulting** 

BufC-32777-EFM-F21 Panel-BSW42 LOCATION DATE April 10, 2007

Habitat		Condition	Category	
Parameter	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.	shoring structures present on both banks; and 40 to	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE 16	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends) SCORE 16	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 16	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.	areas of erosion.	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 (LB) 3	Left Bank 10 91	8 7 6	5 4 3	2 1 0
SCORE (LB) 3 SCORE (RB) 2	Right Bank 10 9	8 7 6	5 4 3	2 [ 0
9. Vegetative Protection (score each bank)	understory shrubs, or nonwoody macrophtes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	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.	height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE (LB) 2	Left Bank 10 9	8 7 6	5 4 3 5 4 3	$\frac{1}{2}$ 1 0 2 1 0
SCORE (RB) 2 10. Riparian Vegetative Zone Width (score each bank riparian zone)	Right Bank 10 9 Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impaced zone.	Width of riparian zone 12- 18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12	Width of riparian zone <6 meters' little or no riparian
SCORE (LB) 3 SCORE (RB) 3	Left Bank 10 9 Right Bank 10 9	- 8 7 6 8 7 6	5 4 3 5 4 3	2 1 0 2 1 0

**Total Score** 114

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		-		3/01/20	3/01/2007-5/31/2007	4					
	Rep Date	Enumerated By	Sample Type	Phylum	Class	Order	Family	Genus	Quantity PA	erance	EPA Tolerance
BufC-Enlow Fork Mine-F20P-BSW38-Apdx_B	1 4/3/2007		Qualitative	Arthropoda	Insecta	Plecoptera	Perlodidae	Isoperia	6	2	2
ButC-Enlow Fork Mine-F20P-BSW38-Apdx_B	1 4/3/2007	PEC	Qualitative	Arthropoda		Trichoptera	Hydropsychidae	Diplectrona	-	0	5
BUIC-ENIOW FOR MINE-F20P-BSW38-Apdx_B	4/3/2007		Qualitative	Arthropoda	T	Trichoptera	Limnephilidae	Ironoquia	-	e	4
Build-Enlow Fork Mine-F20F-D5W30-Apdx_D	10/0/01		Qualitative	Arthropoda	Insecta	Trichoptera	Limnephilidae	Pycnopsycne	10	4	4
Build-Enlow Fork Mine-FOR-BOW39-Andy B	1002/0/14		Qualitative	Mallinood	Ť	Veneralde	Printacophilidae	Hnyacophila	0	- (	
Build-Enlow Fork Mine-F20F-B3W30-ApdX_B	1002/01/1		Qualitative	Anolida	Divalvia	Verieroida	Sphaeriidae			×	80 9
Build Enlow Fork Mine-E21D-DOM42-Andy D	10/2/01/14		Cualitative	Athened	_	Celectric	Unidentified	Unidentified			1
Build-Enlow Fork Mine-F21P-BSW42-ApdX_B	10/2001		Ouditative	Arthropoda	T	Coleoptera	Elmidae			0	91
Build Enlow Fork Mille-F2 IF-BSW42-Apdx B	4/10/2001	LEC	Cualitative	Arthropoda	Τ	Diptera	Ceratopogonidae	Unidentified	2	0	5.7
Build-Enlow Fork Mine-F21F-BSW42-ApdX_B	4/10/2001		Qualitative	Arthropoda	T	Diptera	Chironomidae	Unidentitied		0	2
Build-Enlow Fork Mine-F21P-BSW42-ApdX_B	10/2/01/14 1		Qualitative	Arthropoda	T	Diptera	Tohooldoo	Unidentified	202	01	1 2
Build-Enlow Fork Mine-F21F-B5W42-Apdx_B			Qualitative	Arthropoda	T	Diptera	I abanidae	Crirysops	0,	-	4.7
BufC-Enlow Fork Mine-F21P-BSW42-Andx B		PEC	Qualitative	Arthropoda	Insecta	Dintera	Tipulidae	Dedicia		200	0
BufC-Enlow Fork Mine-F21P-BSW42-Apdx B	-		Qualitative	Arthronoda	Τ	Dintera	Tinulidae	Pseudolimoochila	- 4	000	0 0
BufC-Enlow Fork Mine-F21P-BSW42-Apdx B	-		Qualitative	Arthropoda	T	Dintera	Tinulidae	Tinula	> -	V	4
BufC-Enlow Fork Mine-F21P-BSW42-Apdx B	-		Qualitative	Arthropoda		Enhemerontera	Ameletidae	Amelatric		rc	FC
BufC-Enlow Fork Mine-F21P-BSW42-Apdx B	-		Qualitative	Arthropoda	T	Ephemeroptera	Ephemerellidae	Europhella	-		
BufC-Enlow Fork Mine-F21P-BSW42-Apdx_B	-		Qualitative	Arthropoda	Γ	Ephemeroptera	Ephemeridae	Ephemera	-	~	34
BufC-Enlow Fork Mine-F21P-BSW42-Apdx_B	1 4/10/2007		Qualitative	Arthropoda		Ephemeroptera	Heptageniidae	Stenacron	-	4	4
BufC-Enlow Fork Mine-F21P-BSW42-Apdx B	-		Qualitative	Arthropoda	Γ	Ephemeroptera	Leptophlebildae	Leotophia	-	4	
BufC-Enlow Fork Mine-F21P-BSW42-Apdx B	-		Qualitative	Arthropoda	Γ	Г	Sialidae	Sialis		- 40	7
BufC-Enlow Fork Mine-F21P-BSW42-Apdx B	-		Qualitative	Arthropoda	Γ		Leuctridae	Leictra			rc
BufC-Enlow Fork Mine-F21P-BSW42-Apdx B	-		Qualitative	Arthropoda	Г	Plecoptera	Nemouridae	Amohinemura	- 0-	o e	o ur
BufC-Enlow Fork Mine-F21P-BSW42-Apdx_B	-		Qualitative	Arthropoda			Perlodidae	Isoperla	12		
BufC-Enlow Fork Mine-F21P-BSW42-Apdx_B	1 4/10/2007		Qualitative	Arthropoda	ſ		Hvdropsvchidae	Diplectrona		0	
BufC-Enlow Fork Mine-F21P-BSW42-Apdx_B	-		Qualitative	Arthropoda	Insecta -	Trichoptera	Limnephilidae	Unidentified	5	4	4
BufC-Enlow Fork Mine-F21P-BSW42-Apdx_B	1 4/10/2007		Qualitative	Arthropoda	Insecta 7	Trichoptera	Limnephilidae	Ironoquia	-	9	4
BufC-Enlow Fork Mine-F21P-BSW42-Apdx_B	1 4/10/2007		Qualitative	Arthropoda		Trichoptera	Limnephilidae	Pycnopsyche	5	4	4
BufC-Enlow Fork Mine-F21P-BSW42-Apdx_B	1 4/10/2007		Qualitative	Arthropoda	Insecta	Trichoptera	Phryganeidae	Ptilostomis	3	5	5
BufC-Enlow Fork Mine-F21P-BSW42-Apdx_B	1 4/10/2007		Qualitative	Arthropoda		Trichoptera	Rhyacophilidae	Rhyacophila	11	-	N
BUIC-Eniow Fork Mine-F21P-BSW42-Apdx_B	1 4/10/2007		Qualitative	Arthropoda	T	Trichoptera	Uenoidae	Neophylax	N	~	S
Burd-Eniow Fork Mine-F21P-BSW42-Apdx_B	1 4/10/2007	PEC	Qualitative	Mollusca	_	_	Sphaeriidae	Unidentified	0	80	80
BUIC-ENIOW FORK MINE-F21P-BSW42-ApdX_B	1 4/10/2007		Qualitative	Mollusca		phora	Physidae	Unidentified	0	80	œ
BUIC-ENIOW FOR MINE-F22P-BSW46-Apdx_B	1 4/23/2007		Qualitative	Annelida	aeta		Unidentified	Unidentified	-	10	9
BUIC-ENIOW FORK MINE-FZZF-BSW46-APDX_B	4/23/2007		Qualitative	Arthropoda			Elmidae	Dubiraphia	-	9	ø
Buito Enlow Fork Mine-FZZP-BSW46-ApdX_B	4/23/2007	PEC	Qualitative	Arthropoda	T		Elmidae	Optioservus	-	4	4
Build-Enlow Fork Mine-F22F-B3W40-Apux_B	1000/00/1		Qualitative	Arthropoda	T	era	Elmidae	Steneimis	4	20	10
BuffFilow Fork Mine-F22P-BSW46-Andv B	1 4/22/2007		Ouslitative	Arthropoda	Insecta	Distore	Chironomidoo	Unidentified	2007	20	6
BufC-Enlow Fork Mine-F22P-BSW46-Andy B	1 4/23/2007		Ouslitative	Arthronoda	T	Dintara	Simulidae		- 123	0 0	
BufC-Enlow Fork Mine-F22P-BSW46-Apdx B	1 4/23/2007	PEC	Qualitative	Arthropoda	Τ	Diptera	Stratiomvidae	Stratiomus	- 0	0 40	0 0
ButC-Enlow Fork Mine-F22P-BSW46-Apdx B	1 4/23/2007		Qualitative	Arthropoda	Γ	Diotera	Tabanidae	Chrysons	1 9		47
BufC-Enlow Fork Mine-F22P-BSW46-Apdx_B	1 4/23/2007	PEC	Qualitative	Arthropoda		Ephemeroptera	Ephemeridae	Ephemera	-		31
BufC-Enlow Fork Mine-F22P-BSW46-Apdx_B	1 4/23/2007		Qualitative	Arthropoda	Γ	Ephemeroptera	Heptageniidae	Epeorus	-	0	12
BufC-Enlow Fork Mine-F22P-BSW46-Apdx_B	1 4/23/2007	PEC	Qualitative	Arthropoda	Insecta F	Plecoptera	Nemouridae	Amphinemura	13	m	2
BufG-Enlow Fork Mine-F22P-BSW46-Apdx_B	1 4/23/2007		Qualitative	Arthropoda	Insecta F	Plecoptera	Perlodidae	Isoperla	2	N	CV
BufC-Enlow Fork Mine-F22P-BSW46-Apdx_B	1 4/23/2007		Qualitative	Arthropoda		Trichoptera	Limnephilidae	Limnephilus	1	3	20
Bufg-Enlow Fork Mine-F22P-BSW46-Apdx_B	1 4/23/2007	PEC	Qualitative	Arthropoda	T	8	Rhyacophilidae	Rhyacophila	4	-	N
Build Endow Fork Mine-F22F-BSW40-Apdx B	4/23/2007		Qualitative	Mollusca	-		Sphaerlidae	Unidentified	15		80
Build-Enlow Fork Mine-F22P-BSW46-Andv B	1002/02/14 1	DEC	Qualitative	Mollueca	Gastropoda	_	Dhundelgae		2 07		90
BufG-Enlow Fork Mine-F23P-BSW51-Andy B	1 5/1/2007		T	Annalida	_		I Inidentified		10	0	0 0
Build Enlow Early Mine-E22D-DOMEL-Andv D	1004110		T	DOID IN	acia	neillianiin	חוותפווווופח	loundennied		2	2
	/ MILLING	CHA		Arthronoda	Incorts 1	Colomboro	Elmidoo	Dubicopio	c	4	9

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Dept. of Environmental Protection California District Office

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BSW 42

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# **APPENDIX B:**

# Excerpts from

CEC Bioassessment Report for the Bailey Mine Expansion Area

dated 28 March 2007

Selected excerpts included herewith

# BIOLOGICAL MONITORING REPORT BAILEY EAST MINE EXPANSION AREA RICHHILL TOWNSHIP GREENE COUNTY, PENNSYLVANIA

**Prepared for:** 

# CONSOL PENNSYLVANIA COAL COMPANY CLAYSVILLE, PENNSYLVANIA

CEC Project 060-851

March 28, 2007



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## **1.0 INTRODUCTION**

# 1.1 BACKGROUND



Consol Pennsylvania Coal Company (CPCC) retained Civil & Environmental Consultants, Inc. (CEC) to collect and interpret baseline biological monitoring data for the proposed Bailey Mine East Expansion area located in Richhill Township, Greene County, Pennsylvania. The study area includes the proposed A1 through A6 longwall mining panels, plus a 1000-foot buffer surrounding the perimeter of the six panels (Figure 1 – Site Location Map). The biological data collection included identifying and classifying streams within the study area; sampling representative stream reaches for water quality, habitat characteristics, and benthic macroinvertebrate and fish communities; identifying and delineating wetlands; and sampling representative ponds for water quality, habitat characteristics, and benthic macroinvertebrate and fish communities; the initial baseline data for the Bailey Mine East Expansion study area.

## 1.2 PURPOSE

The purpose of this study was to collect ecological data that will be used by CPCC in preparing various permit applications, as well as fulfilling the initial biological monitoring requirements of the Pennsylvania Department of Environmental Protection (PADEP), Technical Guidance Document (TGD) 563-2000-655, *Surface Water Protection – Underground Bituminous Coal Mining Operations* (PADEP 2005). The permit applications will address potential stream and wetland impacts as well as the anticipated restoration activities.

# **1.3 STUDY AREA CHARACTERISTICS**

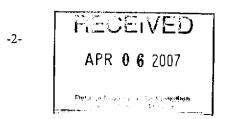
This study area encompasses approximately 3,904 acres including the expansion area permit boundary (Panels A1-A6) and a 1000-ft. buffer surrounding the permit area as shown on Figure 1 – Site Location Map. The streams within the study area are warmwater streams located within

the Waynesburg Hills Section physiographic province of Pennsylvania (Pennsylvania Department of Conservation and Natural Resources, PA DCNR 2000) of the Western Allegheny Plateau – Permian Hills ecoregion (United Stated Environmental Protection Agency, USEPA 1999) within the Ohio River and Monongahela River catchment areas. The study area includes portions of the North Fork Dunkard Fork (PADEP Stream Code: 32594), Kent Run (PADEP Stream Code: 32600), Polen Run (PADEP Stream Code: 32603), Whitethorn Run (PADEP Stream Code: 32616), Long Run (PADEP Stream Code: 32604), and Jacobs Run (PADEP Stream Code: 40709) watersheds. The following table provides the total acreage for each of these watersheds and the acreage for that portion of each watershed located within the study area.

Stream Name and Stream Code	Size of Watershed (Total Acres)	Size of Watershed within Study Area (Acres)
Jacobs Run (40709)	1,389	250
Whitethorn Run (32616)	1,297	536
Polen Run (32603)	885	623
Kent Run (32600)	1,703	663
Long Run (32604)	2,405	47
North Fork Dunkard Fork (32594)	17,907	3,635

Predominant land-uses within the study area include farmland on floodplains and moderate slopes, and large tracts of forest (second-growth, mixed mesophytic) located on steep slopes. The watersheds within the study area display dendritic patterns of drainage within their catchment areas. The streams range from low-gradient (< 2% slope) to high-gradient (> 4% slope) (Rosgen 1996). The stream order (Strahler 1964) for streams within the study area ranges from unmapped headwater tributaries to second-order streams based on United States Geological Survey (USGS) topographic mapping.

Precipitation data was obtained from a National Weather Service (NWS) station located in Waynesburg, Pennsylvania for the six month period prior to the start of this study (April through September 2006) and for the four month interval (October 2006 through January 2007) during which this work was performed (AWIS 2006). Although, this NWS station is not located



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directly within the study area (approximately 10 miles due east), it provides trends for precipitation to aid in the interpretation of the data, particularly for the PADEP TGD Appendix A stream classification task (Section 2.1) which involves investigating the headwaters of these watersheds up to their points of origin,

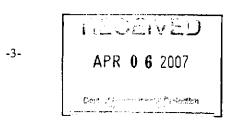
#### PA CHAPTER 93 AQUATIC LIFE PROTECTED USE 1.4

According to Pennsylvania's Water Quality Standards (Title 25, Pennsylvania Code, Chapter 93; Pennsylvania Code Online 2006), North Fork Dunkard Fork, Kent Run, Polen Run, Whitethorn Run and their unnamed tributaries, including the headwater stream reaches contained within the study area, have a protected aquatic life use designation of Trout Stocking (TSF). The TSF protected use is defined as "maintenance of stocked trout from February 15 to July 31 and maintenance and propagation of fish species and additional flora and fauna which are indigenous to a warm water habitat."

Long Run and its unnamed tributaries have a protected aquatic life use designation of Warm Water Fishes (WWF). The WWF protected use is defined as "maintenance and propagation of fish species and additional flora and fauna which are indigenous to a warm water habitat." An unnamed tributary to Long Run located in the 1000-ft. buffer south of the A-6 panel was evaluated by CEC as part of the PADEP TGD Appendix A sampling task (Section 2.1).

Jacobs Run and its unnamed tributaries have a protected aquatic life use of High Quality-Warm Water Fishes (HQ-WWF). This stream is a headwater tributary in the South Fork Tenmile Creek watershed (Monongahela River basin) which carries the HQ-WWF classification from its source downstream to the confluence with Browns Creek near Waynesburg, Pennsylvania. The HQ-WWF protected use is defined as "high quality waters-maintenance and propagation of fish species and additional flora and fauna which are indigenous to a warm water habitat."

The following table presents a summary of the study area stream reaches, sampling locations, and their corresponding protected aquatic life use designation:



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	NORTH FORK DUNKARD FOR	RK
Stream Name	<b>Biomonitoring Station(s)</b>	Ch. 93 Designation
North Fork	NoF-Bailey-A6 Panel-BSW22	
Dunkard Fork	NoF-Bailey-A6 Panel-BSW23	TSF
32594	NoF-Bailey-A6 Panel-BSW24	
20(19)	32618-Bailey-A3 Panel-BSW11	TSF
<mark>32618</mark>	32618-Bailey-A5 Panel-BSW20	
32620	32620-Bailey-A3 Panel-BSW12	TSF
	32620-Bailey-A5 Panel-BSW21	
<mark>32619</mark>	32619-Bailey-A4 Panel-BSW16	TSF
	KENT RUN	
Stream Name	Biomonitoring Station(s)	Ch. 93 Designation
	KeR-Bailey-A1 Panel-BSW02	
	KeR-Bailey-A2 Panel-BSW05	
Kent Run	KeR-Bailey-A3 Panel-BSW08	TSF
<mark>32600</mark>	KeR-Bailey-A4 Panel-BSW13	
	KeR-Bailey-A5 Panel-BSW17	
32601	32601-Bailey-A1 Panel-BSW01	TSF
	POLEN RUN	
Stream Name	Biomonitoring Station(s)	Ch. 93 Designation
	PolR-Bailey-A2 Panel-BSW06	
Polen Run	PolR-Bailey-A3 Panel-BSW09	
32603	PolR-Bailey-A4 Panel-BSW14	TSF
52005	PolR-Bailey-A5 Panel-BSW18	
	WHITETHORN RUN	
Stream Name	<b>Biomonitoring Station</b>	Ch. 93 Designation
	WhiR-Bailey-A1 Panel-BSW03	
	WhiR-Bailey-A2 Panel-BSW07	
Whitethorn Run	WhiR-Bailey-A3 Panel-BSW10	TSF
32616	WhiR-Bailey-A4 Panel-BSW15	151
	WhiR-Bailey-A5 Panel-BSW19	
1	JACOBS RUN	
Stream Name	Biomonitoring Station	Ch. 93 Designation
Jacobs Run 40709	JaR-Bailey-A1 Panel-BSW04	HQ-WWF

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## 2.2 APPENDIX B STREAM BIOLOGICAL MONITORING

The Appendix A stream classification data was examined to determine the extent of biologically diverse streams within the study area. The North Fork Dunkard Fork (second-order stream within study area) and several first-order streams flowing into that stream were determined to be biologically diverse based on a review of the Appendix A data. Twenty-four biomonitoring stations were established on biologically diverse stream reaches within the study area for the TGD Appendix B (PADEP 2005) benthic macroinvertebrate sampling based on being representative of the geographical distribution, stream order, gradient of the streams within the panels and potential for undermining effects (Figure 3). Three to five biomonitoring stations were established on Jacobs Run before the Appendix A classification could be performed for this stream. The Appendix A data indicated that this stream was biologically variable at the location of biomonitoring station BSW04.

CEC performed basic water quality measurements, evaluated physical habitat conditions and performed habitat assessments in conjunction with the Appendix B benthic macroinvertebrate sampling. The methods used to collect this information are presented in the following sections.

## 2.2.1 Stream Physical and Chemical Parameters

Field water quality parameters, including temperature, dissolved oxygen (DO), pH, and conductivity were measured at all biomonitoring stations concurrent with benthic macroinvertebrate sampling. Temperature, conductivity, and DO were measured in situ using a handheld YSI Model 85 meter. The pH was measured in situ using a handheld Cole Parmer Model 59002 meter. Water velocity was measured across a representative slow riffle/run cross-section with a uniform bottom and laminar flow (if possible) using a calibrated Marsh-McBirney Model 2000 Flow-Mate stream velocity meter. These meters were maintained, operated, and calibrated per the manufacturer's instructions. Stream flow rates were calculated using the U.S. Geological Survey midsection, current meter method (Nolan and Shields 2000, Carter and Davidian 1968, Buchanan and Somers 1968).

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Water quality measurements were recorded on a modified U.S. Environmental Protection Agency (USEPA 1999) Physical Habitat/Water Quality Field Data Sheet. Stream velocity, width, and depth measurements were recorded on a modified USEPA (1998) Stream Discharge Field Data Form (Appendix 2).

## 2.2.2 Stream Habitat Characteristics

Stream habitat characteristics were recorded at all biomonitoring stations. Habitat characteristics observed and recorded during the stream sampling included the following physical habitat descriptors and features: (1) visual appearance of water and sediment quality; (2) dimensions (length and width) of the wetted channel; (3) minimum and maximum water depth; and (4) degree of channel canopy cover (e.g., open, partly open, shaded, or partly shaded). These data were recorded on a modified USEPA (1999) Physical Habitat/Water Quality Field Data Sheet (Appendix 2). Stream habitat was evaluated using the USEPA Habitat Assessment Field Data Sheets (modified from USEPA 1999). The Habitat Assessment Field Data Sheet - Low Gradient Streams was used to score reaches comprised predominantly of pool and glide habitats and the Habitat Assessment Field Data Sheet - High Gradient Streams was used to score reaches comprised predominantly of pool and glide habitats and the Habitat Assessment Field Data Sheet - High Gradient Streams was used to score reaches comprised predominantly of pool and glide habitats and the Habitat Assessment Field Data Sheet - High Gradient Streams was used to score reaches comprised predominantly of pool and glide habitats and the Habitat Assessment Field Data Sheet - High Gradient Streams was used to score reaches comprised predominantly of riffle and run habitats. A modified Wolman Pebble Count was also performed at each station according to methods presented in Harrelson, et al. (1994) to characterize the particle size distribution of the stream substrate.

# 2.2.3 Stream Benthic Macroinvertebrate Community Data

The following sections describe the methods used to collect and analyze benthic macroinvertebrate community data for the streams surveyed in this study.

# 2.2,3.1 Benthic Macroinvertebrate Community Sampling

Benthic macroinvertebrate samples were collected in accordance with the conditions of Pennsylvania Fish and Boat Commission (PAFBC) 2007 Pennsylvania Scientific Collector Type

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III, Permits No. 043, No. 124, and No. 159. The benthic macroinvertebrate community sampling procedure employed by CEC is described in detail in the following paragraphs.

The field sampling of benthic macroinvertebrates was performed in accordance with PADEP TGD 563-2000-655, *Surface Water Protection – Underground Bituminous Coal Mining Operations* (PADEP 2005). CEC followed the specific procedures outlined in, "Appendix B – PADEP Low Gradient Stream Assessment Protocol" presented on pages 30-41 of the TGD.

First, individual stream reaches that were initially identified for Appendix B sampling (Section 2.2) were established in the field based on stream habitat characteristics. Each sampling station identified for assessment was approximately 100 meters in length. After identifying the available habitat types that were present within the stream reach, 10 sampling locations were selected that effectively represented the observed habitats so that at least 2 jabs were collected in each type of habitat present. Descriptions of each habitat type (e.g., snag, submerged aquatic vegetation) are presented on PADEP Appendix B-Benthic Macroinvertebrate Field Data Sheets located in Appendix 2. When, the total number of jabs (10) was not divisible by the number of habitats present, the remaining jab(s) were distributed proportionately among the most extensive habitat type(s) in the stream reach.

After selecting the 10 prospective jab locations, a D-frame dip net (12 inches wide x 10 inches high x 18 inches deep) with nylon Nitex multifilament net (500 micron mesh size) was used to perform one jab at each location. One jab consisted of sampling a 30-inch long path within the habitat type using the D-frame net. The specific methods and mechanics used to physically collect jabs in the five different habitat types are presented in the TGD Appendix B document. The number of proposed jabs and actual jabs collected in each available habitat type were recorded on a modified PADEP Appendix B-Low Gradient Stream Assessment Protocol Benthic Macroinvertebrate Field Data Sheet (Appendix 2).

Immediately after collecting an individual jab, the net was carefully inverted and the contents emptied into a rinse bucket equipped with a 500 micron screen bottom. The net was examined for clinging organisms, which were also transferred into the rinse bucket. After the ten jabs were

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collected, the organisms and material retained in the rinse bucket were composited into one 2gallon sample bucket and preserved with ethanol (>70% final concentration). The station number, stream name, station location, and date were clearly marked on each sample container. The container was sealed and returned to the CEC laboratory for analysis.

A 200  $\pm$ 20% subsample of benthic macroinvertebrates was processed in the laboratory from the composite sample collected at each biomonitoring station according to methods presented in the PADEP TGD (2005). Each composite macroinvertebrate sample was initially washed in a U.S. Standard No. 35 sieve then transferred into a shallow pan with a numbered grid consisting of 28 squares (each square measured 2" x 2") with 4 rows consisting of 7 squares per row. Approximately  $1\frac{1}{2}$  to 2 inches of water was then added to the pan and the sample material was gently stirred to disperse the contents evenly throughout the pan.

Grid cutters (stainless steel tubular pipe sections), each with an inside area of approximately 4 in<sup>2</sup>, were used as the subsampling devices. First, a random numbers table for the 28 grid squares was created for the sample using Microsoft® Excel. Starting with the first random number, the grid cutter was centered over that selected grid number and gently "cut" into the sample material. The material within the grid cutter was carefully removed and placed in a white enamel pan, then dispersed with tap water and examined for identifiable benthic macroinvertebrates which were removed, counted and temporarily placed in a Petri dish containing water. This process was repeated for the next three grids resulting in the first four grid numbers being sorted.

If the subsample count was within the targeted 200±20% (160-240 range) organism count, then subsampling was complete and the organisms were transferred into a 4-ounce glass jar that contained 70% ethanol and was labeled with the required sample information. If the sample count was below the targeted 160 organism count after sorting four grids, then a grid cutter was placed on the fifth grid listed on the random numbers table and the material was removed and sorted for macroinvertebrates. Additional squares were sorted until the 200±20% organism goal was met, at which point the organisms were transferred to labeled sample jars containing 70% ethanol. Once a square was chosen, it was entirely sorted for macroinvertebrates. In those instances where the 240 organism limit was exceeded by sorting the initial four grids for the APR 0 6 2007

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sample, secondary subsampling was required to bring the organism total back under the specified maximum limit. In these cases, the organisms collected from the first four grids were placed in a second gridded pan containing a small amount of cold water. The organisms were distributed as evenly as possible within the pan. A new random numbers table was generated for the selection of grid numbers. Grids were sorted in order until the 200  $\pm 20\%$  organism goal was reached.

Identifications were made employing a (20 to 120X) stereomicroscope, a tungsten halogen light with a bifurcated gooseneck extension, and keys by Peckarsky et al. (1990), Merritt and Cummins (1996), Smith (2001), Stewart and Stark (2002), Wiggins (2000), and Thorp and Covich (1991). All sorted macroinvertebrates were stored in 70% ethanol solution and archived for future reference. CEC identified most insect taxa to the genus level and other taxa to the lowest practical level, with the exception of Annelids, which were identified to class level and Curculionidae, Chironomidae, Ceratopogonidae, Talitridae, Decapoda, Gastropoda, and Pelecypoda which were identified to family level. Data reports for the benthic macroinvertebrates are presented in Appendix 5.

Hemipterans and aquatic beetles other than larval Gyrinidae, Hydroscaphidae, Haliplidae, Psephenidae and Ptilodactylidae and larval and adult Elmidae were excluded from the 200 organism subsample used to generate the benthic metrics. Tolerance values and Functional Feeding Group (FFG) designations used to calculate the Intolerant taxa richness and Filterer-Collector + Predator taxa richness metrics were obtained from an expanded taxa list provided to CEC (Michael Davison) by Mr. Charles McGarrell (PADEP Central Office) via e-mail transmission dated November 23, 2005, which listed additional taxa not present in the original list in the PADEP TGD Appendix B section.

# 2.2.3.2 Benthic Macroinvertebrate Community Metrics

The taxonomic identification of benthic macroinvertebrates present within the 200  $\pm$ 20% organism subsample produced for each sampling station resulted in the generation of a taxa list with the number of organisms present for each distinct taxon. This data was used to calculate the values for the five biological metrics that are presented in PADEP TGD, Appendix B – Low

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Gradient Stream Assessment Protocol. These five benthic metrics, which are all based on taxa richness rather than percent abundance, are presented below:

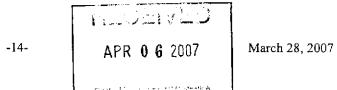
<b>Biological Metric</b>	Metric Category	Description
Taxonomic Richness	Richness	Total Number of taxa
Trichoptera Taxa Richness Richness		Total Number of caddisfly taxa
Percent EPT Taxa	Composition	The total number of Ephemeroptera (mayfly), Plecoptera (stonefly), and Trichoptera (caddisfly) taxa divided by the total number of taxa
Intolerant Taxa Richness	Tolerance	The total number of taxa with a pollution tolerance value <5
Filterer-Collector + Predator Taxa Richness	Trophic	The total number of taxa in the filterer- collector and predator functional feeding groups

All five of these metrics generally show a decrease in values in response to degradation in water quality or other environmental perturbation.

The observed values for the five biological metrics were calculated for each sampling station. It was then necessary to normalize each observed value obtained for the five metrics to a scale of 0 to 100 based on the 95<sup>th</sup> percentile value from the PADEP's statewide low gradient stream dataset using the following equation:

Normalized Metric score = (Observed Value / 95<sup>th</sup> Percentile Value) x 100

The 95<sup>th</sup> percentile values from the Pennsylvania statewide, low gradient stream dataset are presented in the following table which provides an example of the metric calculations performed for Station BSW05 on Kent Run within the study area:



Biological Metric	Station BSW05 Kent Run (Observed Values)	95 <sup>th</sup> Percentile Value of PA Statewide Dataset	Normalized Score (Observed Value / 95 <sup>th</sup> percentile value) x 100
Taxonomic Richness	27	30.5	88.5
Trichoptera Taxa Richness	4	10.5	38.1
Percent EPT Taxa	55.6	61.6	90.3
Intolerant Taxa Richness	17	16.0	100.0
Filterer-Collector + Predator Taxa Richness	8	13.5	59.3
Total Biological Score (mean of adjusted values)			75.2

The total biological score was calculated as the mean of the five normalized metric scores. In the one instance where the observed value was better than the 95<sup>th</sup> percentile value for a metric (Intolerant Taxa Richness), the normalized score was converted to a maximum of 100 before the total biological score was calculated for the sampling station. The total biological score was calculated for the 24 benthic macroinvertebrate sampling stations in the A1-A6 panel study area.

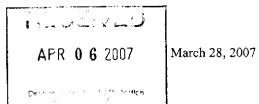
# 2.2.4 Stream Fish Community Data

Fish community sampling procedures and the metrics used to analyze fish community data are described in the following sections.

# 2.2.4.1 Fish Community Sampling

Fish community sampling was conducted at all twenty-four biomonitoring stations using a combination of sampling protocols described in the following guidance documents:

 American Fisheries Society's Fisheries Techniques, Second Edition (AFS 1996) was consulted for electrofishing operational and safety guidelines;



### TAB STREAM WATER QUALITY AND HABITAT CHARACTERISTICS KENT RUN (PADEP STREAM BAILEY EAST EXPAN CONSOL PENNSYLV/ GREENE COUNTY **BSW 02 CEC** Proje

		S	TREAM WATE	R QUALITY	AND HABITAT
	TRIB TO	KENT RUN			
	32601-Bailey-A1 Panel-		KeR-Baile	KeR-Bailey-A1 Panel-	
PARAMETER	BSW01		BS	W02	BSV
	January	17, 2007	January	17, 2007	January
	Riffle	Pool	Riffle	Pool	Riffle
Water Temperature (°C)	3.7	3.8	5.8	5.7	5.8
Dissolved Oxygen (mg/L)	9.6	9.3	9.3	8.9	9.5
pH (Standard Units)	7.47	7.45	7.78	7.77	7.71
Conductivity (µS/cm)	126	136	185	184	188
Habitat Reach Length (feet)	235	93	273	54	268
Stream Width (feet)	3-15		5-15		7-
Stream Depth (inches)	1-18		4-24		1-:
Stream Flow Rate (cubic feet per second)	0.77		5.79		3.0
Substrate Composition (%): a					
bedrock (> 2,084 millimeters)	1%		5%		-
boulder (256 - 2,084 millimeters)	4 1%		5%		20
cobble (64 - 256 millimeters)	25%		30%		45
gravel (2 - 64 millimeters)	52%		43%		44
sand (0.062 - 2 millimeters)	12%		12%		99
silt (0.004- 0.062 millimeters)	0	0/	5	%	1
clay (< 0.004 millimeters)	7 9	%	5	/0	
USEPA (1999) Habitat Assessment Score (out of	100	150	161	142	174
possible 200) <sup>b</sup>	169	150	101	142	1/4
Percent of Maximum Possible USEPA (1999)	85% Optimal	75%	81% Optimal	71%	87% Optimal
Habitat Assessment Score (Narrative Criteria) <sup>b</sup>	65% Opumai	Suboptimal	or to Optimal	Suboptimal	or to opumal

<sup>a</sup> A Modified Wolman (1954) Pebble Count technique was employed to determine percent substrate composition as Wentworth (192

<sup>b</sup> U.S. Environmental Protection Agency (1999).

NM = Not Measured (i.e., no pool habitat present ).

#### APPENDIX B MACROINVERTER

	TRIB TO	KENT RUN			
		ey-A1 Panel- W01	KeR-Baile BS	KeR-Bailey- BSW January {	
BIOLOGICAL METRIC	January	17, 2007	January 17, 2007		
	Observed	Normalized	Observed	Normalized	Observed
	Value	Score	Value	Score	Value
Taxa Richness	27	88.5	34	100.0	27
Trichoptera Richness	. 3	28.6	6	57.1	4
% EPT Richness	51.9	84.3	- 50	81.2	55.6
Intolerant Taxa Richness	21	100.0	·19	100.0	17
FC + PR Taxa Richness	8	59.3	11	74.1	8
Total Biological Score (Mean of Adjusted Values)		72.1		82.5	



## STREAM WATER QUALITY AND HABITAT CHARAC'ERTEBRATE METRIC SO JACOBS RUN (PADEP STREAM CODE: 40709) AND TRIBORK DUNKARD FORK W BAILEY EA

**BSW 20** 

CONSOL P

**BSW 16** 

		ST	REAM WATE	R QUALITY A	N			
р	TRIB	UTARY 32618	TO NORTH FO	ORK	NO	RTH FORK		
	32618-Bailey-A3					21 32619-Bailey-A4 Panel-BSW		
PARAMETER	January 2	1, 2007	January	21, 2007		Januan	/ 24, 2007	
	Riffle	Pool	Riffle	Pool		Riffle	Pool	
Water Temperature (°C)	0.1	NM	0.3	0.4 10.4		2.7	2.8	
Dissolved Oxygen (mg/L)	13.0	NM				11.3	10.7	
bH (Standard Units)	7.43	NM	7.30	7.32		7.49	7.46	
Conductivity (µS/cm)	89	NM	97	91		120	121	
Habitat Reach Length (feet)	328	0	283	45		306	22	
Stream Width (feet)	2-8		3-7			1-7 1-10		
Stream Depth (inches)	1-12 0.15		1-10					
Stream Flow Rate (cubic feet per second)			0.25			0.10		
Substrate Composition (%): a								
bedrock (> 2,084 millimeters)	349	10	6%					
boulder (256 - 2,084 millimeters)				2%		5%		
cobble (64 - 256 millimeters)	279	10	35%			41%		
gravel (2 - 64 millimeters)	35%	10	48%		47%			
sand (0.062 - 2 millimeters)	4%	5	6%			5%		
silt (0.004- 0.062 millimeters)			3%		_	2	%	
clay (< 0.004 millimeters)	1							
EPA (1999) Habitat Assessment Score (out of	158	NM	159	149		141	132	
ssible 200) <sup>b</sup> rcent of Maximum Possible USEPA (1999) bitat Assessment Score (Narrative Criteria) <sup>b</sup>	79% Optimal		80% Optimal	75% Suboptimal	8	71% Suboptimal	66% Suboptimal	

Modified Wolman (1954) Pebble Count technique was employed to determine percent substrate composition as W S. Environmental Protection Agency (1999).

= Not Measured (i.e., no pool habitat present ).

			APF	PENDIX B MA	CF			
	TRI	TRIBUTARY 32618 TO NORTH FORK RTH FORK						
	32618-Bailey-A3 Panel-BSW11 3 January 21, 2007		32618-Bailey-A5 Panel-BSW20 January 21, 2007		32 <mark>32619-Bailey-A4 Panel-BSW16</mark> January 24, 2007			
BIOLOGICAL METRIC								
	Observed	Normalized	Observed	Normalized	Observed	Normalized		
				010	Value	Score		
xa Richness	23	75.4	28	91.8	26	85.2		
choptera Richness	4	38.1	4	38.1	7	66.7		
EPT Richness	69.6	100.0	64.3	100.0	73.1	100.0		
	18	100.0	20	100.0	18	100.0		
olerant Taxa Richness + PR Taxa Richness	9	66.7	11	81.5	9	66.7		
Biological Score (Mean of Adjusted Values)		76.0		82.3		83.7		

		PHYSICAL HAE	BITAT/WATER QU	JALITY FIELD DA	TA SHEET (Page	1)	BSW 02
tation: K	eR-Bailey				Project No.:	060851.0003	
tream Name:	14		3	Date/Time:	1/17/07	1415	(Pre mining)
iver Basin:	Ohio	v/ ]		Investigators:	MRH. JI	4D. LFO	10-2
					THNE, JI	10,00	
			SKE	TCH MAP			
<ul> <li>✓</li> /ul>	#       = Diffection of Prove         ton of Weiser Coulding Measurements         3)       = Photograph Mumber/View         *       = Energent Vegetation         *       = Rootvest/Photoment         *       = Rootvest/Photoment	100-M SAM	Appendix Peinic Real large sycam	And Park River Park River Park River	RU A C A A A A A A A A A A A A A A A A A		THEP NOUDED SLOPE
	- 584				R: 1 +	1 mail	
					•	T-G S	- - P.3
2.12	-					na parte a la composición de la composición de la composición de la composición de la composición de la composi La composición de la c	
	Air Temperature:	C			HABITAT	LENGTHS IN SAMPL	ING REACH
989 0	- Weather	Now	Past 24 hrs	Past 7 days	Habitat	Length (steps)	Length (ft)
	Heavy Rain			1 ×,	Riffle	17	213
WEATHER	Steady Rain	1. A.		1	Run		
ONDITIONS	Intermit. Rain	1.	1	. /	Pool	7	54'
	% Cloud Cover				Glide		
	Clear/Sunny	V			Total		327'
91 14	Other:					Si	
			N 2		-		2 S
OTDEAN	Subsystem:	Perennial	Intermittent	Tidal			
STREAM CHARACTER-	Туре:	Coldwater	Warmwater			/	
IZATION	Origin:	Spring-fed	Wetland	Montane	Glacial	Mixture	Other
			in the second second			2-10 C C C C C C C C C C C C C C C C C C C	
	GEOXTR	CAMERA USED:	H	PHOTO NO.S:	11-23		1

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station: KeR-Bailey Al-BSW02	Project No.: 060851.0003
Stream Name: Kent Run (PA DEP 32600)	Date/Time: 1/17/07 1730
River Basin: Ohlo	Investigators: MRH

	Habitat Parameter	·	Conditio	a Category	
		Optimal	Suboptimal	Marginal	Poor
<b>E</b>	1. Epifaunal Substrate/ Available Cover	Greater than 50% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are <u>not</u> new fall and <u>not</u> transient).	30-50% 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).	10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 10% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
reac	SCORE 16	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	2. Pool Substrate Characterization BR, Sand, Gravel, Copula SCORE	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand	Hard-pan clay or Gedrock; ho root mat or vegetation.
Date	SCORE'	20 19 18 17 16	15 14 13 12 (11)	10 9 8 7 6,	5 4 3 2 1 0
845 50 AV	3. Pool Variability	Even mix of large- shallow, large-deep, small-shallow, small- deep, pools present.	Majority of pools large- deep; very sew shallow.	Shallow pools much	Majority of pools small- shallow or pools absent.
	SCORE 10	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	3 4 T 2 I 0
	4. Sediment Deposition	Little or no enlargement of islands or point bars and less than <20% of the bottom affected by sediment deposition.	deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions,	Heavy deposits of fine material, increased bar development; more than 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
Ļ	SCORE 15	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 1 2 1 0
	S. Channel Flow Status	minimal amount of	available channel; or <a></a>	Water fills 25-75% of the available channel, and/or criffle substrates are	Very little water in channel and mostly present as standing pools.
Ŀ	SCORE 16	20 19 18 17 (16)	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

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HIGH GRADIENT STREAMS HABITAT ASSESSMENT FIELD DATA SHEET (Page 2)

Station: KER-Bailey All-BSW07-	Project No.:	060851.0003
Stream Name: Kent Run (PADEP 32600)	Date/Time:	1/17/07 1730
River Basin: Ohio	investigators:	MRH

		Condition	1 Category	
Habitat Parameter	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 of removed entirely.
SCORE 16	20 19 18 17 (16)	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends) $\frac{B+30}{2}$ welt 54 w 7	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, matural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional ritile 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 betwee riffles divided by the width of the stream is a ratio of >25.
SCORE 16	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 stoughing 60-100% of bank has erosional scars.
SCORE 9 (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. Vegelative Protection (score each bank)	More than 90% of the streambank 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; atmost all plants allowed to grow naturally.	70-90% of the streambank 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.		Less than 50% of the streambank surfaces covered by vegetation: distription of streamban vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE (LB)	Left Bank 10 9	8 6 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 [2-18 melets: 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 of no riparian vegetation due to human activities.
SCORE 10 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 10 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0

164 Total Score \_

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Narrative categories and scoring ranges: Optimal = 156-200; Sub-optimal = 106-155; Marginal = 56-105; Poor = 0-55

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AF, JX 5 BAILEY EAST EXPANSION PANELS A1-A6 CONSOL PENNSLYVANIA COAL COMPANY GREENE COUNTY, PENNSYLVANIA CEC PROJECT 060-851

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EPA Tolerance	ç	5.7	s,	5	4.7	G	~	4	0	, n	4	-	8	5	5	8	9	10	9	9	4	5,7	4.5	5	9	Ś	ъ	4.7	2.8	4	3.1	4	9.5 7	ruc		e7	0	5	5	S	~	1.5	2	4	4	~	0	. u	0
P.A. Tolerance	9	9	8	10	2		.~	4	0	G	4	6	5	5	9	8	- 2	10	9	9	4	9	2	9	10	~	8	7	-	4	5	8	N	, <b>4</b>	•	9	0	ġ	5	•	~	0	•	4	4		31	•	. 60
Quantity		· <del>-</del>	76	-	-	6	₽ P	e	6		-	~	4	-	4	6	£	4	1	5	-	<b>е</b>	1	68	-	N	٦	۲	9	7	8		-  -	-		34	4	8	6	-	-	-	с,	-	5	- 4			-
Genus	Dubiraphia	Unidentified	Unidentified	Unidentified	Chrysops	Tabanus	PseudolImnophila	Tipula	Ameletus	Unidentified	Eurytophetia	Unidentified	Isoperta	Ptilostomis	Neophylax	Unidentified	Unidentified	Unidentified	Caecidotea	Dubiraphia	Optioservus	Unidentified	Atrichopogon	Unidemtified	Unidentified	Prosimulium	Unidentified	Chrysops	Ephemerelia	Eurylophella	Ephemera	Stenonema	· Slalic	Calmtenur	Unidentified	Allocaphia	Sweltsa	Amphinemura	Prostola	Soyedina	Taenlopteryx	Glossosoma	Diplectrona	Unidentitied	Pychopschye	Necohulay	Ferrissia	Unidentified	Physella
Family	Elmidae	Ceratopoponidae	Chironomidae	Psychodidae	Tabanidae	Tabanidae	Tipulidae	Tipulidae	Ameletidae	Baetidae	Ephemerallidae	Capulidae	Periodidae	Phryganeidae	Uenoidae	Sphaerildae	Lymaeidae	Unidentified	Asellidae	Elmidae	Elmidae	Ceratopogonidae	Ceratopogonidae	Chironomidae	Psychodidae	Simulidae	Stratiomyldae	Tabanidae	Ephemerellidae	Ephemerellidae	Ephemeridae	Heptagenlidae	Slalidae	Calontervoldae	Gomphidae	Capniidae	Chloroperlidae	Nemouridae	Nemouridae	Nemouridae	+ aeniopierygidae	Glossosomatidae	Hydropsychidae			Lianoidae	Ancylidae	Lymnaeidae	Physidae
Order	Coleoptera	Diptera	Diptera	Diptera	Diptera	Diptera	Diptera	Diptera	Ephemeroptera	Ephemeroptera	Ephemeroptera	Plecoptera	Plecoptera	Trichoptera	Trichoptera	Veneroida	Basommatophora	Unidentified	Isopoda	Coleoptera	Coleoptera	Diptera	Diptera	Diptera	Diptera	Diplera	Diptera	Diptera	Ephemeroptera	Ephemeroptera	Ephemeroptera	Liphemeroptera	Mensiontera	Odonata	Odonata	Plecoptera	Plecoptera	Plecoptera	Plecoptera	Plecoptera	Plecoplera	TICHOPTER T	Inchoptera		Trichoniera	Trichootera	Basommatophora	Basommatophona	Basommatophora
Class	Insecta	Insecta	Insecta	Insecta	Insecta	Insecta	Insecta	Insecta	Insecta	Insecta	Insecta	Insecta	Insecta	Insecta	Insecta	BivaMia	Gastropoda	Oligochaeta	Crustacea	Insecta	Insecta	Insecta	Insecta	Insecta	Insecta	Insecta	Insecta	Insecta	Insecta	Insecta	Insecta	Insecta	Intecta	Insecta	Insecta	Insecta	Insecta	Insecta	Insecta	Insecta	Insecta	Insecta	Insecta	IIISeCUX Anothe	Insecta	Insecta	Gastropoda	Gastropoda	Gastropoda
Phytum	Arthropoda	Arthropoda	Arthropoda	Arthropoda	Arthropoda	Arthropoda	Arthropoda	Arthropoda	Arthropoda	Arthropoda	Arthropoda	Arthropoda	Arthropoda	Arthropoda	Arthropoda	Mollusca	Mollusca	Annelida	Arthropoda	Arthropoda	Arthropoda	Arthropoda	Arthropoda	Arthropoda	Arthropoda	Arthropoda	Arthropoda	Arthropoda	Arthropoda	Arthropoda	Annropoda	Arthropoda	Arthropoda	Arthropoda	Arthropoda	Arthropoda	Arthropoda	Arthropoda	Arthropoda	Arthropoda	Armopoda	Arthropoda	Arthropoda	Arthropoda	Arthropoda	Arthropoda	Mollusca	Mollusca	Moltusca
Sample Type	Qualitative	Qualitative	Qualitative	Qualitative	Qualitative	Qualitative	Qualitative	Qualitative	Qualitative	Qualitative	Qualitative	Qualitative	Qualitative	Oualitative	Qualitative	Qualitative	Cualitative	Qualitative	Qualitative	Qualitative	Qualitative	Qualitative	Qualitative	Qualitative	Qualitative	Qualitative	Qualitative	Qualitative	Qualitative	Qualitative		Cualitative	Ousitative	Qualitative	Qualitative	Qualitative	Qualitative	Qualitative	Qualitative	Qualitative	Cualitative Cualitative	CUBINETIVE	Cualitative	Outsiltative	Outlitetive	Qualitative	Qualitative	Qualitative	Qualitative
Enumerated By	N. Newcomer	N, Newcomer	N. Newcomer	N. Newcorner	N. Newcomer	N. Newcomer	N. Newcorner	N. Newcomer	N. Newcomer	N, Newcomer	N. Newcomer	N. Newcomer	N. Newcomer		N. Newcomer	N. Newcomer	N. Newcomer	N. Newcomer	N. Newcomer	N. Newcomer	N. Newcomer	N. Newcomer	N. Newcomer	N. Newcomer	N. Newcomer	N. Newcomer	N. Newcomer	N. Newcomer	N. Newcomer	N. Newcomer	N. Newcorner	N Newcomer	N. Newcorner	N. Newcomer	N. Newcomer	N. Newcomer	N. Newcomer	N. Newcomer	N. Newcomer	N. Newcomer	N. Newcomer	N. Newcolfier	N. Newcorrier	N Nowcomer	N Newnmer	N. Newcomer	N. Newcomer	N. Newcomer	N. Newcomer
Date	1/19/2007	1/19/2007	1/19/2007	1/19/2007	1/19/2007	1/18/2007	1/19/2007	1/19/2007	1/19/2007	1/19/2007	1/19/2007	1/19/2007	1/19/2007	1/19/2007	1/19/2007	1/19/2007	1/002/61/1	1/17/2007	1/17/2007	1/17/2007	1/17/2007	1/17/2007	1/17/2007	1/17/2007	1002/11/1	1002/11/1	1007/1 VI	1/17/2007	1/17/2007	1002/1/1	1002/11/1	1/12/2002	1/17/2007 1	1/17/2007	1/17/2007	1/17/2007	1/17/2007	1/17/2007	2002/2 1/1	1002/11/1	1002/11/1	1002/11/	1002/11	1/2000	1/17/2007	1/17/2007	1/17/2007	1/17/2007	1/17/2007
Station	JaR-Bailey Mine-A1 Panel-BSW04 Apdx B	JaR-Balley Mine-A1 Panel-BSW04_Apdx, B	JaR-Balley Mine-A1 Panel-BSW04_Apdx. B	ApdX	JaR-Balley Mine-A1 Panel-BSW04_Apdx. B	JaR-Bailey Mine-A1 Panel-BSW04_Apdx. B	JaR-Balley Mine-A1 Panel-BSW04_Apdx, B	JaR-Bailey Mine-A1 Panel-BSW04_Apdx. B	JaR-Bailey Mine-A1 Panel-BSW04_Apdx. B	JaR-Bailey Mine-A1 Panel-BSW04_Apdx. B	JaR-Bailey Mine-A1 Panel-BSW04_Apdx. B	JaR-Bailey Mine-A1 Panel-BSW04_Apdx, B	JaR-Bailey Mine-A1 Panel-BSW04_Apdx. B	JaR-Bailey Mine-A1 Panel-BSW04 Apdx. B	Jart-Balley Mine-A1 Panel-BSW04 Apdx B	Jah-Barley Mine-A1 Panel-BSW04 Abdx B	JEH-EBIIEY MINE-A1 Panel-BSWU4_ApdX. B	KR-Balley Mine-A1 Panel-BSW02 Apdx. B	KR-Bailey Mine-A1 Panel-BSW02 Apdx. B	KR-Bailey Mine-A1 Panel-BSW02 Apdx B	KR-Bailey Mine-A1 Panel-BSW02 Apdx. B	KR-Bailey Mine-A1 Panel-BSW02 Apdx. B	KR-Bailey Mine-A1 Panel-BSW02 Apdx B	KR-Balley Mine-A1 Panel-BSW02 Apdx B	VO BAILLANIA AT PAREL-BSWUZ ADDX, B	KR-balley Mine-Al Panel-BCWUZ ApdX B	KR-Balley Mine-Al Panel-BSWUZ Apdx. B	KH-Balley Mine-A1 Panel-BSW02 Apdx. B	1	t	VD-DAILINY MIRR-AL PARAI-DOWUZ, ADOX, D	Andy B	T	Apdx. B	KR-Bailey Mine-A1 Panel-BSW02_Apdx. B	1	Aodx 8	KH-Balley Mine-A1 Panel-BSW02 Apdx B	╞	VD Dellow hitter At Date DOWUS Apox D	VO-Dollow Miner AL Pariel DOW UK AUGK D	t	KP-Reliev Mine-A1 Parel-DOM/02 Ardv B	t	╞		KR-Bailey Mine-A1 Panel-BSW02 Apdx. B	Π	

**BSW 02** 

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tation. 20	100 221			JALITY HELD DA			
	2619 - Buile				Project No.:	060851.0003	
tream Name	100 100 11 12 10	NOMH FOR	LK (32619)	Date/Time:	124/07	/315	Pre mining
liver Basin:	Ohio			Investigators:	DJP, JAD.	MDE, JU	K LFO
		<u> </u>					
				TCH MAP			·
 • • • • • •		Perry Rd	C AX X X X A X			UPL GORE 18 Call Vater Call PG6 X A X A X X X X X X X X X X X X X X X	ON UP
	Air Temperature:	<del>27 <u>f</u> F</del>			HABITAT	LENGTHS IN SAMPLE	NG REACH
	Weather	Now	Past 24 hrs	. Past 7 days	Habitat	Length (steps)	Length (ft)
	Heavy Rain			ļ	Riffle		306'
WEATHER CONDITIONS	Steady Rain				Run		
	Internit, Rain	100 %	<u> </u>		Pool	<u>├</u> _/	221 -7.
	% Cloud Cover	100 10	<u> </u>		Glide		
	Clear/Sunny	<u> </u>	<u> </u>		Total		3281 32
	A			<b>v</b>	F		
	Other: SN	iow /			1		·
· · · · · · · · · · · · · · · · · · ·				· · · ·			• • • • •
STREAM	Subsystem:	Perennial	intermittent	Tidal	<b>.</b>		· · · · · · · · · · · · · · · · · · ·
STREAM CHARACTER- IZATION				Tidat	J		

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# **BSW 16**

LOW GRADIENT STREAMS HABITAT ASSESSMENT FIELD DATA SHEET (Page 1)

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	Project No.: 060851.0003
Stream Name: UNT - NORTH FORK (32619)	Date/Time: 1/24/07
River Basin: Ohlo	Investigators: DTP, MOE, LFO, JWC, JAD

	Habitat Parameter		Conditio	n Category	
		Optimal	Suboptimal	Marginal	Poor
-	1. Epifaunal Substrate/ Available Cover	Greater than 50% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are <u>not</u> new fall and <u>not</u> transient).	30-50% 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).	10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 10% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
reac	SCORE 14	20 19 18 17 16	15 (14) 13 12 11	10 9 8 7 6	5 4 3 2 1 0
Parameters to be evaluated in sampling reach	2. Pool Substrate Characterization	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan clay or bedrock; no root mat or vegetation.
uatec	SCORE	20 19 18 17 16	15 14 13 12 (11)	10 9 8 7 6,	5 4 3 2 1 0
to be eval	3. Pool Variability	Even mix of large- shallow, large-deep, small-shallow, small- deep pools present.	Majority of pools large- deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small- shallow or pools absent.
leters	SCORE 4	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	(3) 4 3 2 1 0
Paran		Little or no enlargement of islands or point bars and less than <20% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 20-50% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
	SCORE 9	20 19 18 17 16	15 14 13 12 11		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	Very little water in channel and mostly present as standing pools.
	SCORE 15	20 19 18 17 16	(13) 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

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## BSW 16

HIGH GRADIENT STREAMS HABITAT ASSESSMENT FIELD DATA SHEET (Page 2)

Station: 31	19-BAILEY-AY-BSW16	Project No.:	060851.0003
Stream Name: 💋	(NT - NORTH FORK (32619)	Date/Time:	1/24/01
River Basin: O	hio	Investigators:	DTT, MOE, LFO, JWC, JAD

			Condition	Category	
	Habitat Parameter	Optimal	Suboptimat	Marginal	Paor
	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 allered or removed entirely.
	SCORE 9	20 (19) 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
npling reach	7. Frequency of Riffes (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.
Sart	SCORE 4	20 19 (18) 17 16	15 14 13 12 11	10 9 8 7 6	543210
Parameters to be evaluated broader than sampling reach	8. Bank Stability (score each bank) Note: determine left or right side by facing dovestream.	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.
C.	SCORE (LB)	Left Bank 10 9	(8) 7 6	5 4 3	2 1 0
o be	SCORE (RB)	Right Bank 10 9	(8) 7 6	5 4 3	2 1 0
Parameters (	9. Vegetative Protection (score cach bank)	More than 90% of the streambank 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 streambank 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 streambank 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 streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
	SCORE (LB)	Left Bank 10 (9)	8 7 6	5 4 3	2 1 0
	SCORE 6 (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 7 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
	SCORE <b>2</b> (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0

Total Score 141

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Narrative categories and scoring ranges: Optimal = 156-200; Sub-optimal = 106-155; Marginal = 56-105; Poor = 0-55

AF //X 5 BAILEY EAST EXPANSION PANELS A1-A6 CONSOL PENNSLYVANIA COAL COMPANY GREENE COUNTY, PENNSYLVANIA CEC PROJECT 060-851

Macroinvertebrates

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Genus	Unidentified	Unidentified	Unidentified	Caloparyphus	Chrysops	Pseudolimnophila	Tipula	Ameletus	Eurylophelia	Serratella	Epeorus	Sialis	Allocaphia	Paracapria	Alloperia	Leuctra	Amphinemura	Clioperta	Cultus	Isoperta	Mailrekus	Pychopsyche	Wormaldia	Rhyacophila	Neophytax	Unidentified	Unidentined	Unidentified	Unidentified	Unidentified	Chrysops	Pseudolimnophila	Tipula	Ameletus Haidomidiod	Unidentified	Eurdophella	Unidentified	Allocaprila	Unidentified	Leucina	Amphinemura		Curus	Coera	Hurroneurha	Purnnachua	Oligostomis	<b>Hhyacophila</b>	Neophylax	Unidentified
Family	Unidentified	Ceratopogonidae	Chironomidae	Stratiomyidae	Tabanidae	Tipulidae	Tipulidae	Ameletidae	Ephemerellidae	Ephemerellidae	Heptageniidae	Slalidae	Caprildae	Capnildae	Chloroperlidae	Leuctridae	Nemounidae	Periodidae	Periodidae	Periodidae	Periodidae	Limnephilidae	Philopotamidae	Rhyacophilidae	Uenoidae	Sphaerlidae	Lynnaeioae	Unidentified	Ceratopogonidae	Chironomidae	Tabanidae	Tipulidae	Tipulidae	Ameleticae Reelidee	Ephemerellidae	Ephemerellidae	Leptophlebiidae	Capnlidae	Chloroperlidae	Leuchidae		renodidae	renodidae	Closticate Listensischica	Hudronsuchidae	Limmonilidae	Phryganeidae	Rhyacophilidae	Uenoidae	Sphaerlidae
Order	Unidentified	Diptera	Diptera	Diptera	Diptera	Diptera	Diptera	Ephemeroptera	Ephemeroptera	Ephemeroptera	Ephemeroptera	Megaloptera	Plecoptera	Plecoptera	Plecoptera	Plecoptera	Plecoptera	Plecoptera	Plecoptera	Plecoptera	Plecoptera	Trichoptera	Trichoptera	Trichoptera	Trichoptera	Veneroida	pasornmanoprora	Unidentified	Diptera	Diptera	Diptera	Ciptera	Ulptera	Enhamanotera	Ephemerootera	Ephemeroptera	Ephemeroptera	Plecoptera	Plecoptera	Plecoptera		Placoptera	Tribooptera	Trichentom	Trichontena	Trichontera	Trichoptera	Trichoptera	Trichoptera	Veneroida
Class	Oligochaeta	Insecta	Insecta	Insecta	Insecta	Insecta	Insecta	Insecta	Insecta	Insecta	Insecta	Insecta	Insecta	Insecta	Insecta	Insecta	Insecta	Insecta	Insecta	Insecta	Insecta	Insecta	Insecta	Insecta	Insecta	BivaNia	Gasilopoda	Oligochaeta	Insecta	= Insecta	Insecta	Insecta	Insecta	neacta	Insecta	Insecta	Insecta	Insecta	Insecta	Insecta	Insecta	Insecta	Incorts	Ineerts	Insecta	Insecta	Insecta	Insecta	Insecta	Bivalvia
Phylum	Annelida	Arthropoda	Arthropoda	Arthropoda	Arthropoda	Arthropoda	Arthropoda	Anhropoda	Arthropoda	Arthropoda	Arthropoda	Arthropoda	Anhropoda	Arthropoda	Arthropoda	Arthropoda	Arthropoda	Arthropoda	Artimopoda	Arthropoda	Arthropoda	Arthropoda	Arthropoda	Arthropoda	Arthropoda	Mollusca	IN/OILDS/CO	Annelida	Arthropoda	Arthropoda	Arthropoda	Annropoda	Arthropoda	Arthropoda	Arthropoda	Arthropoda	Arthropoda	Arthropoda	Arthropoda	Arthropoda	Athenodo	Attractional	Athenoode	Arthronorda	Arthropoda	Arthropoda	Arthropoda	Arthropoda	Arthropoda	Molluaca
Sample Type	Qualitative	Qualitative	Qualitative	Qualitative	Qualitative	Qualitative	Qualitative	Qualitative	Qualitative	Qualitative	Qualitative	Qualitative	Qualitative	Oualitative	Ousitrative	Qualitative	Qualitative	CUBITRIVE	CUBILITATIVE	Qualitative	Qualitative	Qualitative	Qualitative	Qualitative	Qualitative	Qualitative	CUCHINA	Qualitative	Qualitative	Qualitative	Qualitative	CILBING	Cualitative	Ousitative	Qualitative	Qualitative	Qualitative	Qualitative	Cualitative	Cuantative	Quantative	Cualitative	Oralitative	Oualitativa	Qualitative	Qualitative	Qualitative	Qualitative	Qualitative	Gualitative
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Date	1/21/2007	1/21/2007	1/21/2007	1/21/2007	1/21/2007	1/21/2007	1/21/2007	1/21/2007	1/21/2007	1/21/2007	1/21/2007	1/21/2007	1/21/2007	1/21/2007	1/21/2007	1/21/2007	1/21/2007	1002/12/1	1/21/2/1	1/21/2007	1/21/2007	1/21/2007	1/21/2007	1/21/2007	1/21/2007	1/21/2007	100211211	1/24/2007	1/24/2007	1/24/2007	1/24/2007	1002/02/1	10000001	1/24/2007	1/24/2007	1/24/2007	1/24/2007	1/24/2007	1/24/200/	1/24/2007	100/10/1	1/124/2007	1/24/2007	1/24/2007	1/24/2007	1/24/2007	1/24/2007	1/24/2007	1/24/2007	1/24/2007
Station	32618B-Bailey Mine-A5 Panel-BSW20, Apdx, B	32618B-Bailey Mine-A5 Panel-BSW20_Apdx. B	32618B-Balley Mine-A5 Panel-BSW20_Apdx, B	32618B-Bailey Mine-A5 Panel-BSW20 Apdx, B	32618B-Bailey Mine-A5 Parel-BSW20 Apdx. B		32618B-Balley Mine-A5 Panel-BSW20, Apdx, B	32618B-Balley Mine-A5 Panel-BSW20_Apdx, B	320185-Bailey Mine-A5 Panel-B5W20 Apdx, B	32618B-Bailey Mine-A5 Panel-BSW20 Apdx. B	32618B-Balley Mine-A5 Panel-BSW20, Apdx, B	326188-Bailey Mine-A5 Panel-BSW20 Apdx. B		32618B-Bailey Mine-A5 Panel-BSW20 Apdx. B	32618B-Bailey Mine-A5 Panel-BSW20 Apdx, B	320186-Bailey Mine-A5 Panel-BSW20, Apdx, B	32618B-Balley Mine-A5 Panel-BSW20 Apdx. B	2461 005-08110Y MINO-AO PRINELESWZU, ADUX, B	OCOLOD-DAIRY MINE AD FAIRH-DOVEN ADDA. D	326186-Bailey Mine-A5 Panel-BSW20 Apdx. B	326165-58167 Mine-A5 Panel-BSW20 Apdx. B		32618B-Balley Mine-A5 Panel-BSW20 Apdx, B	32618B-Balley Mine-A5 Panel-BSW20_Apdx. B	32618B-Bailey Mine-A6 Panel-BSW20, Apdx, B	326185-Bailey Mine-A5 Panel-BSW20, Apdx B 326186-Bailey Mina-A5 Panel-BSW20, Apdx B		32619-Bailey Mine, A4 Panel-BSW16 Apdx, B	32019-bailey Mine, A4 Panel-BSW18, Apdx, B	A4 Panel-65W16 Apdx	22013-Dalley Mine A4 Parel-BSW15 ADX. B	22013-Dalley Mile A4 Farel-DOV 10 Apox 5		A4 Panel-BSW16 Apdx	A4 Panel-BSW16_Apdx.	32619-Balley Mine_A4 Panel-BSW16_Apdx_B	32619-Bailey Mine_A4 Panel-BSW16_Apdx. B		OCTO DUCTION MINE A4 PRIME-BOW 15 ADOX 15	22013-Dalloy Mirre A4 Panel-DSW 10 Apox, D 32610-Ballav Mirre A4 DanaLRSW16 Andv B	22010-Dailey Mine A4 PaneLRCW16 Andv R			22619-Bailay Mina A& Panal-RSW16 Andr R		32619-Bailey Mine A4 Panel-BSW16 Apdx. B	32619-Bailey Mine_A4 Panel-BSW16_Apdx. B	A4 Panel-BSW16 Apdx	32619-Balley Mine A4 Panel-BSW16 Apdx. B	32019-Balley Mine A4 Panel-BSW16 Apox, B

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**BSW 16** 

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**BSW 16** 

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lation: 326	B Bai	lag-AS-	RSW 20		Project No	o.: 060851.0003	
tream Name:	32618	<u>w-1 119</u>		Date/Time:	1/21	07 1030	Pre mining
	Ohio			Investigators:	MNL	JAD LFO	JWC
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		<u></u>	<u> </u>			BITAT LENGTHS IN SAMP	UNG REACH
	Air Temperature:	20 / F	T	· · · · · · · · · · · · · · · · · · ·			
	Weather	Now	Past 24 hrs	Past <u>7 days</u>	Riffle	at Length (steps)	283
i	Heavy Rain				Run		3 1
WEATHER CONDITIONS	Steady Buttis MOL				Pool		7.451
	Intermit. Rain				Glide		13 1
	% Cloud Cover				Total		300
	Clear/Sunny.	·		<u> </u>	1		
	Other:				<b></b>		
	Subsystem:	Perennial	intermittent	 Tidal	· ·		
STREAM CHARACTER- IZATION	Type:	Coldwater	Warmwater			1 -	- 1

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# BSW 20

LOW GRADIENT STREAMS HABITAT ASSESSMENT FIELD DATA SHEET (Page 1)

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station: 32618 - Bailey AS-BSW 20	Project No.: 060851.0003
Stream Name: 3261 8	Date/Time: 1/2/07
River Basin: Ohio	Investigators: MNL

	Habitat Parameter		Conditio	n Category	
	· arameter	Optimal	Suboptimal	Marginal	Poor
-	I. Epifaunal Substrate/ Available Cover	Greater than 50% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	30-50% 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).	10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 10% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
rcac	score $13$	20 19 18 17 16	15 14 (13) 12 11	10 9 8 7 6	5 4 3 2 1 0
A ALMINICION OF CAMINATOR IN SAMPLING FCACH	2. Pool Substrate Characterization	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan clay or bedrock; no root mat or vegetation.
Inte	SCORE 19	20 19 18 17 16	15 (14) 13 12 11	10 9 8 7 6,	5 4 3 2 1 0
to DC CYAI	3. Pool Variability	Even mix of large- shallow, large-deep, small-shallow, small- deep pools present.	Majority of pools large- deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small- shallow or pools absent.
	SCORE 10	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 <20% of the bottom affected by sediment deposition.		new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions,	Heavy deposits of fine material, increased bar development; more than 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
	SCORE 15	20 19 18 17 16	101		5 4 3 2 1 0
		Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	<pre>available channel; or &lt;25% of channel</pre>	Water fills 25-75% of the available channel, and/or riffle substrates are	Very little water in channel and mostly present as standing pools.
L	score /	20 19 18 17 16	15)14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

APR 0 6 2007

Dept. of Environmental Protection California District Cillua HIGH GRADIENT STREAMS HABITAT ASSESSMENT FIELD DATA SHEET (Page 2)

Station: 3261 8	- Bailey A5-BSW20	Project No.:	060851.0003
Stream Name: 32	618	Date/Time:	1/21/07
River Basin: Ohio	3	Investigators:	MNC

				Condition	1 Category	y .	· · · · · · · · · · · · · · · · · · ·								
	Habitat Parameter	Optimal	Subop	imal	۷	Aargina	1		Роог						
	6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channel present, usual of bridge abui- evidence of p channelization dredging, (gre past 20 yr) ma present, but re channelization present.	ly in areas ments: ist i, i.e., ater than by be cent	Channeli extensive or shorin present o and 40 to reach chi disrupted	e; embai g structo n both b 80% of annelize	nkments ures panks; Estream	Banks si gabion of 80% of channeli disrupte habitat g removed	the stream ized and d. Instre treatly al	it; over m reach am litered or					
	SCORE 20	20) 19 18 17 16	15 14 13	12 11	10 9	8	76	54	32	1 0					
tpling reach	7. Frequency of RiMes (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 infrequent; di between riffle by the width of stream is betw 15.	stance s divided of the	Occasion bend; bo provide : distance divided I the stream to 25.	ttom con some hal between by the w	ntours bitat; i riffles idth of	Generall or shallc habitat; riftles di width of ratio of :	w riffles distance vided by the stre	i; poor between / the					
230	SCORE 10	20 19 18 17 (16)	15 14 13	12 11	10 9	8	7 6	54	32	ιď					
Parameters to be evaluated broader than sampling reach	8. Bank Stability (score each bank) Note: determine left or right side by facing doyenstream.	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately st infrequent, sn erosion mostl over. 5-30% reach has area erosion.	all areas of y healed of bank in	Moderat 60% of t areas of erosion p floods.	ank in r crosion;	high	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing 60-100% of bank has erosional scars.							
l E A S	SCORE (LB)	Left Bank 10 9	18 7	6	5	4	3	2	1	0					
o be c	SCORE (RB)	Right Bank 10 9	(8) 7	6	5	- 4	3	2	1	0					
Parameters to	9. Vegetative Protection (score each Bank)	More than 90% of the streambank 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 streambank su covered by na vegetation, bi of plants is no represented; c evident but no full plant group potential to an extent; more it half of the poo stubble heigh remaining.	rfaces tive to one class it well- lisruption of affecting with ay great han one- tential plant	50-70% streamba covered disruptio patches of closely c vegetatic than one potential height re	ank surfa by veget of bare s ropped on comm -half of plant st	tation; us; oil or non; less the ubble		ank surfa by veget on of stre on is ver on has b	ices tation; :ambank y high; cen less in					
	SCORE $\frac{10}{(LB)}$	Left Bank (10/ 9	87	6	5	4	3	2	.1	0					
	SCORE (RB)	Right Bank 10 (9)	87	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 ripa 12-18 meters: activities have zone only min	human impacted	Width of 6-12 me activities zone a g	ters: hur s have it	nan npacted	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.							
	$score \left  \bigcup_{i \in \mathcal{D}} (LB) \right $	Left Bank (0) 9	8 7	6	5	4	3	2	1	0					
	SCORE (RB)	Right Bank 10 (9)	8 7	6	5	4	3	2	t	0					

Total Score 159

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Narrative categories and scoring ranges: Optimal = 156-200; Sub-optimal = 106-155; Marginal = 56-105; Poor = 0-55

acroinvertebrates

AF //X 5 BAILEY EAST EXPANSION PANELS A1-A6 CONSOL PENNSLYVANIA COAL COMPANY GREENE COUNTY, PENNSYLVANIA CEC PROJECT 060-851

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Genus	Unidentified	Unidentified	Unidentified	Calonarvohus	Chrysops	Pseudolimnophila	Tipula	Ameletus	Eunyophelia	Serratella	Epeorus	Sialis	Allocaphia	Paracapnia	Alloperia	Leuctra	Amphinemura	Clioperta	Cultus	Isopena	Mailrekus	Pychopsyche	Wormaldia	Rhyacophila	Neophytax	Unidentified	Unidentified	Unidentified	Unidentified	Unidentified	Chrysops	Pseudolimnophila	Tipula	Ameletus	Unidentified		Eurylophella		Allocaphia	DAIMAN	Amphinamura	Unidentified	Cattue	Goara	Diplectrons	Hvdroosvche	Pvcnopschve	Oligostomis	Rhyacophila	Neophylax	Unidentified
Family	Unidentified	Ceratopodonidae	Chironomidae	Stratiomvidae	Tabankae	Tipulidae	Tipulidae	Ameletidae	Ephemerellidae	Ephemerellidae	Heptageniidae	Slalidae	Caprildae	Capnildae	Chloroperlidae	Leuctridae	Nemouridae	Periodidae	Periodidae	Periodidae	Periodidae	Limnephilidae	Philopotamidae	Rhyacophilidae	Uenoidae	Sphaerlidae	Lymnaeldae	Unidentified	Ceratopogonidae	Chironomidae	Tabanidae	Tipulidae	Tipulidae	Ameletidae	Eaetidae	Ephemerellidae	Ephemerellidae		Caprildae		Namounda	Periodidae	Periodicae	Goeridae	Hudropsvchidae	Hvdropsvchidae	Limnephilidae	Phryganeldae	Rhyacophilidae	Uenoidae	Sphaerlidae
Order	Unidentified	Diptera	Diptera	Diptera	Diptera	Diptera	Diptera	Ephemeroptera	Ephemeroptera	Ephemeroptera	Ephemeroptera	Megaloptera	Plecoptera	Plecoptera	Plecoptera	Plecoptera.	Plecoptera	Plecoptera	Plecoptera	Plecoptera	Plecoptera	Trichoptera	Trichoptena	Trichoptera	Trichoptera	Veneroida	Basommatophora	Unidentified	Diptera	Diptera	Diptera	Diptera	Diptera	Ephemeroptera	Ephemeropiera	Chamerootera	Chomeropreia		Discontaria		Placontera	Plecoptera	Placoptera	Trichoptera	Trichoptera	Trichoptera	Trichoptera	Trichoptera	Trichoptera	Trichoptera	Veneroida
Class	Oligochaeta	Insecta	Insecta	Insecta	Insecta	Insecta	Insecta	Insecta	Insecta	BivaNia	Gastropoda	Oligochaeta	Insecta	<ul> <li>Insecta</li> </ul>	Insecta	Insecta	Insecta	INSECTE	Insecta	Insecta	Insecta		Incerta	Incorte	Insecta	Insecta	Insecta	Insecta	insecta	Insecta	Insecta	Insecta	Insecta	Insecta	Bivalvia																
Phylum	Annelida	Arthropoda	Anhropoda	Arthropoda	Anhropoda	Arthropoda	Arthropoda	Arthropoda	Arthropoda	Arthropoda	Arthropoda	Arthropoda	Arthropoda	Arthropoda	Arthropoda	Arthropoda	Arthropoda	Mollusca	Mollusca	Annelida	Arthropoda.	Arthropoda	Arthropoda	Arthropoda	Arthropoda	Arthropoda	Articopoda	Arhenooda	Attractor	Adhenoide	Arthronda	Arhennets	Arthropoda	Arthropoda	Arthropoda	Arthropoda	Arthropoda	Arthropoda	Arthropoda	Arthropoda	Arthropoda	Arthropoda	Mollusca								
Sample Type	Qualitative	Qualitative	Qualitative	Qualitative	Qualitative	Qualitative	Qualitative	Qualitative	Qualitative	Qualitative	Qualitative	Qualitative	Qualitative	Oualitative	Ousitrative	Oualitative	Qualitative	Oualitative	Qualitative	Qualitative	Qualitative	Qualitative	Qualitative	Qualitative	Qualitative	Qualitative	Qualitative	Qualitative	Qualitative	Qualitative	Qualitative	Qualitative	Qualitative	Cualitative	Cudingalye	Ounitative	Qualitative	Cualitative	Ovalitative	Ousitetive	Oualitative	Qualitative	Qualitative	Qualitative	Qualitative	Qualitative	Qualitative	Qualitative	Qualitative	Qualitative	Qualitative
Enumerated By	M. Logan	M. Logan	M. Logan	M. Logan	M. Logan	M. Logan	M. Logan	M. Logan	M. Logan	M. Logan	M. Logan	M. Logan	M. Logan	M. Logan	M. Logan	M. Logan	M. Logan	M. Logen	M. Logan	M. Logan	M. Logan	M. Logen	M. Logan	M. Logan	M. Logan	M. Logan	M. Logan	W. Trimbath	W. Trimbath	W. Trimbath	W. Trimbath	W. Trimbeth	W. Trimbath	W. Trimbeth	IN Temboli	W. Trimutin	W Trimbath	101 Trimbath	W Trimhath	W Trimheth	W. Trimbath	W. Trimbath	W. Trimbath	W. Trimbath	W. Trimbath	W. Trimbath	W. Trimoath				
Date	1/21/2007	1/21/2007	1/21/2007	1/21/2007	1/21/2007	1/21/2007	1/21/2007	1/21/2007	1/21/2007	1/21/2007	1/21/2007	1/21/2007	1/21/2007	1/21/2007	1/21/2007	1/21/2007	1/21/2007	1/21/2007	1/21/2007	1/21/2007	1/21/2007	1/21/2007	1/21/2007	1/21/2007	1/21/2007	1/21/2007	1/21/2007	1/24/2007	1/24/2007	1/24/2007	1/24/2007	1/24/2007	1/24/2007	1/24/2007	1.04/2007	104/2007	100001	1 104 1007	1/24/2007	1/24/2017	1/24/2007	1/24/2007	1/24/2007	1/24/2007	1/24/2007	1/24/2007	1/24/2007	1/24/2007	1/24/2007	1/24/2007	1/24/2007
Station	32618B-Bailey Mine-A5 Panel-BSW20, Apdx. B	32618B-Bailey Mine-A5 Panel-BSW20_Apdx. B	32618B-Balley Mine-A5 Panel-BSW20_Apdx, B	32618B-Bailey Mine-A5 Panel-BSW20_Apdx, B	32616B-Bailey Mine-A5 Parel-BSW20_Apdx. B	32618B-Balley Mine-A5 Panel-BSW20_Apdx. B	32618B-Bailey Mine-A5 Panel-BSW20_Apdx. B	32618B-Bailey Mine-A5 Panel-BSW20_Apdx, B	32618B-Bailey Mine-A5 Panel-BSW20_Apdx. B	32618B-Bailey Mine-A5 Panel-BSW20_Apdx. B	32618B-Bailey Mine-A5 Panel-BSW20 Apdx. B	32618B-Bailey Mine-A5 Panel-BSW20_Apdx, B	32618B-Bailey Mine-A5 Panel-BSW20_Apdx, B	32616B-Bailey Mine-A5 Panel-BSW20_Apdx. B	32618B-Bailey Mine-A5 Panel-BSW20, Apdx, B	32618B-Bailey Mine-A5 Panel-BSW20_Apdx. B	32618B-Bailey Mine-A5 Panel-BSW20 Apdx. B	32616B-Bailey Mine-A5 Panel-BSW20_Apdx. B	32618B-Balley Mine-A5 Panel-BSW20, Apdx. B	32618B-Balley Mine-A5 Panel-BSW20_Apdx. B	32618B-Balley Mine-A5 Panel-BSW20_Apdx. B	32618B-Balley Mine-A5 Panel-BSW20 Apdx, B	32618B-Bailey Mine-A5 Panel-BSW20 Apdx B	326189-bailey Mine-A5 Panel-BSW20_Apdx, B	32619-Bailey Mine A4 Panel-BSW16 Apdx B	32619-Bailey Mine A4 Panel-BSW18 Apdx. B	32619-Bailey Mine_A4 Panel-BSW16_Apdx_B	32619-Bailey Mine A4 Panel-BSW16 Apdx. B			3201 3-Dattey Mine A4 Panel-BSW 16 Apox B		32610-Rallev Mine A4 Panal-RCW16 Andv R	32619-Railay Mine A4 Panel RSW16 Andv R	20610. Pallav Mina Ad Panal, RSW16 Andv R	32619-Bailev Mine A4 Panel-BSW16 Andy B	32619-Railey Mine A4 Panal-RSW16 Andy R	32619-Bailey Mire A4 Panel-BSW16 Apdx B	32619-Bailey Mine A4 Panel-BSW16 Apdx B	32619-Bailey Mine_A4 Panel-BSW16_Apdx_B	32619-Bailey Mine A4 Panel-BSW16 Apdx B	32619-Bailey Mine_A4 Panel-BSW16_Apdx. B	32619-Balley Mine A4 Panel-BSW16 Apdx. B	32619-Bailey Mine A4 Panel-BSW16 Apdx. B	32619-Bailey Mine_A4 Panel-BSW16_Apdx. B	32619-Bailey Mine_A4 Panel-BSW16 Apdx. B	32619-Bailey Mine A4 Panel-BSW16 Apdx B	32019-Bailey Mine, A4 Panel-BSW 16, Apox, B			

Detailed and an order of the monotonic of the second secon 

**BSW 20**