



CONCEPTUAL MITIGATION PLAN

AMERICAN ELECTRIC POWER CO., INC.
PROPOSED MITCHELL LANDFILL PROJECT
CRESAP, MARSHALL COUNTY, WEST VIRGINIA

Prepared for:

AMERICAN ELECTRIC POWER CO., INC.

Prepared by:

CIVIL & ENVIRONMENTAL CONSULTANTS, INC.
CINCINNATI, OHIO

CEC Project No. 110-416.8500

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Civil & Environmental Consultants, Inc.

Cincinnati	4274 Glendale Milford Road Cincinnati, Ohio 45242 Ph: 513/985-0226 / Fx: 513/985-0228 Toll Free: 800/759-5614 cincinnati@cecinc.com www.cecinc.com	Austin	855/365-2324	Columbus	888/598-6808	North Central PA	877/321-2324
		Boston	866/312-2024	Detroit	866/380-2324	Phoenix	877/231-2324
		Charlotte	855/859-9932	Export	800/899-3610	Pittsburgh	800/365/2324
		Chicago	877/963-6026	Indianapolis	877/746-0749	St. Louis	866/250-3679
		Cleveland	866/507-2324	Nashville	800/763-2326	Toledo	888/598-6808



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1.0 INTRODUCTION

The purpose of this conceptual mitigation plan is to describe the proposed mitigation measures that will be used to offset impacts to streams and wetlands associated with construction and operation of the proposed Ohio Power Company dba American Electric Power Company, Inc. (AEP) Mitchell Landfill Project (the Project). The Project area is located in Cresap, Marshall County, West Virginia, on Gatts Ridge Road west of its intersection with Taylors Ridge Road (Figure 1). The Project consists of a proposed coal combustion byproducts landfill, a proposed haul road, and adjacent areas that may be impacted by soil borrow and other construction and operation activities.

The project purpose is to construct a residual solid waste landfill, complying with West Virginia Code of State Rules, Title 33, Series 1-Solid Waste Management Rule (33CSR1), within proximity to the Mitchell Plant located along the Ohio River. AEP has proposed construction of a landfill facility for long-term management of fly ash, bottom ash (including pulverizer rejects), synthetic gypsum, and Chloride Purge Stream (CPS) Filter Cake material created by the coal combustion process as well as the construction of a haul road to connect the existing haul road to the proposed coal combustion byproducts landfill. AEP anticipates selling synthetic gypsum for commercial purposes. However, providing airspace for all synthetic gypsum produced is a prudent approach if currently contracted synthetic gypsum sales are not realized due to market changes. The proposed landfill design capacity must be large enough for a substantial design life in order to accommodate disposal of up to 10 million cubic yards of fly ash, bottom ash, CPS Filter Cake material, and synthetic gypsum produced at the Mitchell Plant. Assuming continued synthetic gypsum sales, the landfill design will provide disposal capacity for the Mitchell Plant for approximately 24 years.

The Minimum Degradation Alternative/Proposed Site Plan includes a total of approximately 207.3 acres which is comprised of:

- 58 acres for the landfill footprint;
- 3 acres of stormwater ponds;



- 11.7 acres of roads;
- 16 acres of stockpile areas;
- 45 acres of disturbance associated with construction of the Phase II Haul Road; and
- 73.6 acres of potential additional disturbance associated with construction of stormwater ponds, roads, landfill operation facilities, and other attendant features.

This conceptual mitigation plan has been prepared to comply with the West Virginia Code §22-1-6(d)(6), Sections 401 and 404 of the federal Clean Water Act (CWA), and the *Compensatory Mitigation for Losses of Aquatic Resources - Final Rule* [33 CFR § 332 and 332; 40 CFR § 230 (USACE and USEPA 2008)]. The plan will provide the basis for wetland and stream mitigation, which will provide replacement functions and values for the wetlands and streams proposed to be impacted during the construction and operation of the Project. This plan has been prepared to satisfy the requirements of the U.S. Army Corps of Engineers (USACE) and the West Virginia Department of Environmental Protection Agency (WVDEP). The following sections present a summary of the proposed stream and wetland impacts, values and functions, mitigation goals and success criteria, the proposed stream and wetland mitigation plan, the monitoring and maintenance plan, protection mechanisms, long-term management plan, adaptive management plan, and financial assurances.



2.0 METHODOLOGY

2.1 WETLANDS

Wetland delineation studies were performed by Civil & Environmental Consultants, Inc. (CEC) within the Project area. The delineation efforts were completed by CEC as two separate studies. The first delineation study was conducted from August 11 to August 15, 2011, and on September 27 and 28, 2011, for the Proposed Site Plan (Minimum Degradation Alternative) and the Original Site Plan (Maximum Degradation Alternative). The second delineation was conducted on February 14, 15, and 28, 2012, as well as on March 20 and 21, 2012, for the proposed 45-acre Phase II Haul Road limits of disturbance. The wetland delineation studies were conducted in accordance with the procedures outlined in the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Eastern Mountains and Piedmont Region* (Interim Regional Supplement, July 2010). Stantec also conducted wetland delineation activities within a Phase II Haul Road study area during August and September of 2011 using the same wetland delineation methodology. Appendix A of the Individual CWA Section 404 Permit/CWA Section 401 Water Quality Certification (WQC) application contains the April 2012 Jurisdictional Waters Delineation Reports for the Proposed Mitchell Landfill and the Mitchell Landfill Phase II Haul Road Projects.

2.2 STREAMS

Using professional judgment and field indicators such as flow, substrate composition, embeddedness, defined bed and bank, vegetation, and benthic macroinvertebrates, stream segments within the Project area were classified into one of three stream types: ephemeral, intermittent, and perennial. The following descriptions are provided to clarify the different stream classifications.

- Ephemeral Stream – An ephemeral stream has flowing water only during, and for a short duration after, precipitation events in a typical year. Ephemeral stream beds are located above the water table year-round. Groundwater is not a source of water for the stream. Runoff from rainfall is the primary source of water for stream flow.



- Intermittent Stream – An intermittent stream has flowing water during certain times of the year, when groundwater provides water for stream flow. During dry periods, intermittent streams may not have flowing water. Runoff from rainfall is a supplemental source of water for stream flow. Intermittent streams have also been defined as those streams which have no flow during sustained periods of no precipitation and which do not support life whose life history requires residence in flowing waters for a continuous period of at least 6 months.
- Perennial Stream – A perennial stream has flowing water year-round during a typical year. The water table is located above the stream bed for most of the year. Groundwater is the primary source of water for stream flow. Runoff from rainfall is a supplemental source of water for stream flow.

Following the methodology outlined in the U.S. Environmental Protection Agency’s (USEPA) *Rapid Bioassessment Protocols for Use in Streams and Wadeable Rivers: Periphyton, Benthic Macroinvertebrates, and Fish, Second Edition* (Barbour et al. 1999), CEC and/or Stantec completed the following forms for each stream identified within the Project area and within the mitigation sites.

- Habitat Assessment Field Data Sheet – High Gradient Streams
- Physical Characterization/Water Quality Field Data Sheet
- Benthic Macroinvertebrate Field Data Sheet

Within streams that contained sufficient amounts of water that were identified within the Project area and mitigation sites, CEC also used a Horiba U-52 multiparameter water quality meter to measure temperature, specific conductivity, dissolved oxygen, pH, and turbidity.

In addition to the above outlined forms, CEC and/or Stantec also completed field data sheets for streams following the methodology outlined in the USACE’s *Operational Draft Regional Guidebook for the Functional Assessment of High-gradient Ephemeral and Intermittent Headwater Streams in Western West Virginia and Eastern Kentucky* (USACE 2010). These forms were not completed for streams which were identified by CEC and/or Stantec within the Project study areas but outside of the planned limits of disturbance.



In addition to these forms completed for all streams assessed, CEC documented the average ordinary high water mark (OHWM) width, average bankfull width, average depth of flowing water and/or pools (if present), and dominant substrates for each stream assessed.

The limit of each distinct stream segment was located in the field using a Trimble GeoXT GPS unit. The total stream segment lengths and stream designations are summarized in Section 3.2 and Tables 3 and 4 of this report. Representative photographs of the streams are included in the referenced jurisdictional waters delineation report documents. Additionally, scores assigned to each stream segment sampled following the USEPA and/or USACE high gradient stream sampling methodology are provided in Tables 3 and 4.

Based upon correspondence from the USACE dated July 14, 2008 (Appendix E of the Jurisdictional Waters Delineation Report for the Mitchell Landfill Phase II Haul Road Project), and preliminary discussions with the USACE during the March 21, 2012, JD site visit conducted within the Phase II Haul Road portion of the Project area, AEP and CEC anticipate that the waters within the Phase II Haul Road portion of the Project area will not be considered jurisdictional waters of the U.S. as there is no significant nexus to traditional navigable waters due to the presence of the Conner Run Impoundment.

No perennial streams were identified within the Project area.



3.0 PROPOSED IMPACTS

The Project consists of two areas that will be impacted during construction and operation of the Mitchell Landfill Proposed Site Plan - Minimum Degradation Alternative Limits of Disturbance (162 acres) and the Proposed Mitchell Landfill Phase II Haul Road Additional Limits of Disturbance (45 acres), which together comprise the Minimum Degradation Alternative/Proposed Site Plan (Minimum Degradation Plan). The Proposed Site Plan would impact two separate subwatersheds to Lower Fish Creek (12-digit hydrologic unit code 050301061208), including unnamed tributaries to Conner Run, specifically the Conner Run Impoundment, and unnamed tributaries to Fish Creek and Little Tribble Creek.

Under the Proposed Site Plan, approximately 0.01 acre of wetland would be impacted. Under the Proposed Site Plan, approximately 13,626 linear feet of stream would be filled or otherwise impacted by construction and operation activities, including 8,527 linear feet of ephemeral stream and 5,099 linear feet of intermittent stream. Approximately 3,578 linear feet of the total ephemeral stream impacts and 1,338 linear feet of the total intermittent stream impacts are associated with the proposed Phase II Haul Road portion of the Project area and the Conner Run Impoundment and therefore are assumed to not represent impacts to jurisdictional waters of the U.S.

3.1 PROPOSED WETLAND IMPACTS

Approximately 0.01 acre of wetland, Wetland B, will be filled within the Project area. Wetland B is classified as a palustrine, emergent, seasonally flooded/saturated (PEM1E) wetland (Cowardin 1979) and is located within the southeastern portion of the Project area. Table 1 provides a summary of the wetland characteristics and proposed impact.



TABLE 1
WETLAND CHARACTERISTICS
Proposed Mitchell Landfill Project
Cresap, Marshall County, West Virginia

Wetland Identifier	Acreage	USFWS Classification	Hydrological Status
B	0.01	Palustrine Emergent Wetland	Connected/Adjacent

To compensate for the loss of 0.01 acre of a PEM wetland, AEP proposes to pay in-lieu fees to the West Virginia Department of Environmental Protection’s in-lieu fee program. Based on the West Virginia Stream & Wetland Valuation Metric (SWVM) protocol produced by the West Virginia Interagency Review Team (WVIRT 2010), an in-lieu fee of \$1,200 would be required to compensate for the loss of 0.01 acre of Wetland B within the Project area.

3.2 PROPOSED STREAM IMPACTS

Nineteen jurisdictional streams totaling approximately 8,710 linear feet, (3,761 linear feet of ephemeral stream and 4,949 linear feet of intermittent stream), are proposed to be impacted by the Project (Figure 2). The streams will be impacted as a result of their location within the Project area and the proposed limits of construction. As stated, approximately 3,578 linear feet of the total ephemeral stream impacts and 1,338 linear feet of the total intermittent stream impacts are associated with the proposed Phase II Haul Road portion of the Project area and the Conner Run Impoundment and therefore are assumed to not represent impacts to jurisdictional waters of the U.S. Therefore, the total impacts to streams that are jurisdictional waters of the U.S include 3,761 linear feet of intermittent stream and 4,949 linear feet of ephemeral stream.

Detailed descriptions of the streams are provided in the April 11, 2012 Proposed Mitchell Landfill Project Jurisdictional Waters Delineation Report and the April 2, 2012 Proposed Mitchell Landfill Phase II Haul Road Project Jurisdictional Waters Delineation Report prepared by CEC (Appendix A of the Individual CWA Section 404 Permit/CWA Section 401 WQC application). The USEPA Rapid Bioassessment Protocols (RBP) Stream Data Forms and USACE High-Gradient Headwater Stream Data Forms for the streams identified within the



Project area are provided in Appendices C and D of the April 2012 jurisdictional waters delineation reports.

The following tables provide summaries of the proposed stream impacts.



**TABLE 2
STREAM IMPACT SUMMARY
Proposed Mitchell Landfill Project
Cresap, Marshall County, West Virginia**

Stream Segment Identifier	Classification	Approximate Length Within Project Area ¹	USEPA High Gradient Stream Score	USACE Functional Capacity Units (FCU)		
				Hydrology	Biogeochemical Cycling	Habitat
Stream 1	Intermittent	3,465	131	97	93	88
Stream 1	Intermittent		146	95	90	89
Stream 1	Intermittent		154	98	93	94
Stream 1	Ephemeral	78	96	93	85	74
Stream 1a	Ephemeral	327	103	98	96	97
Stream 1b	Ephemeral	70	75	94	85	61
Stream 1c	Ephemeral	79	73	67	48	42
Stream 1d	Ephemeral	151	102	93	92	73
Stream 2	Intermittent	372	130	98	94	89
Stream 2a	Ephemeral	70	92	98	88	71
Stream 2a	Intermittent	413	82	93	80	61
Stream 2a-1	Ephemeral	298	82	98	91	74
Stream 2a-2	Ephemeral	51	89	66	63	62
Stream 2a-3	Ephemeral	92	86	74	84	81
Stream 2b	Ephemeral	550	109	94	85	75
Stream 3	Ephemeral	375	103	94	85	84
Stream 3	Intermittent	216	118	100	94	82
Stream 3a	Ephemeral	178	109	89	85	77
Stream 3b	Ephemeral	119	103	93	81	79
Stream 4	Ephemeral	495	111	91	78	85
Stream 5	Ephemeral	383	110	87	89	78
Stream 6	Ephemeral	51	77	79	89	92
Stream 6	Intermittent	292	116	92	90	87
Stream 7	Ephemeral	394	107	94	84	72
Stream 16	Intermittent	191	91	59	72	55
Total Intermittent Stream Impacts				4,949		
Total Ephemeral Stream Impacts				3,761		
Total Stream Impacts				8,710		

¹ All lengths are approximate.



**TABLE 3
STREAM IMPACT SUMMARY
Proposed Mitchell Landfill Phase II Haul Road Project
Cresap, Marshall County, West Virginia**

Stream Segment Identifier	Classification	Approximate Length Within Project Area (Feet)	USEPA High Gradient Stream Score	USACE Functional Capacity Units (FCU)		
				Hydrology	Biogeo-chemical Cycling	Habitat
Stream 17	Ephemeral	97	108	0.95	0.98	0.98
Stream 18	Ephemeral	73	95	0.71	0.69	0.65
Stream 19	Ephemeral	159	96	0.81	0.96	0.87
Stream 20	Ephemeral	178	108	0.75	0.88	0.85
Stream 20	Intermittent	97	119	0.74	0.83	0.84
Stream 21	Ephemeral	157	105	0.78	0.81	0.74
Stream I-4	Intermittent	234	95	0.54	0.82	0.74
Stream E-14	Ephemeral	91	65	0.57	0.48	0.63
Stream E-14a	Ephemeral	169	90	0.66	0.82	0.59
Stream 22	Intermittent	511	110	0.60	0.82	0.64
Stream E-9	Ephemeral	421	105	0.63	0.80	0.64
Stream 24	Intermittent	424	124	0.63	0.77	0.73
Stream E-7	Ephemeral	313	112	0.60	0.78	0.83
Stream 25a	Ephemeral	94	88	0.48	0.60	0.68
Stream 26	Ephemeral	95	75	0.48	0.75	0.74
Stream 27	Ephemeral	37	95	0.71	0.81	0.86
Stream E-3	Ephemeral	609	104	0.65	0.66	0.57
Stream I-2	Intermittent	72	93	0.71	0.63	0.75
Stream E-4	Ephemeral	90	95	0.67	0.54	0.61
Stream E-5	Ephemeral	109	97	0.65	0.76	0.50
Stream E-5a	Ephemeral	59	82	0.61	0.45	0.63
Stream E-5b	Ephemeral	53	88	0.55	0.55	0.68
Stream E-6	Ephemeral	320	85	0.60	0.66	0.45
Stream E-8	Ephemeral	58	76	0.62	0.72	0.54
Stream E-10	Ephemeral	134	111	0.70	0.64	0.63
Stream E-11	Ephemeral	99	87	0.91	0.80	0.81
Stream E-12	Ephemeral	101	92	0.62	0.70	0.65
Stream E-13	Ephemeral	62	85	0.74	0.82	0.84
Total Intermittent Stream Impacts				1,338¹		
Total Ephemeral Stream Impacts				3,578¹		
Total Stream Impacts				4,916¹		

¹ These stream impacts are not considered impacts to jurisdictional waters of the U.S.



4.0 WETLAND AND STREAM VALUES AND FUNCTIONS

The wetland and the streams within the Project area provide some benefit for wildlife such as rearing, resting, and feeding habitat for certain terrestrial and aquatic species not dependent on a permanent source of water. Based on observations of animal tracks and plant life, the wetland, streams, and surrounding woodlands provide foraging and feeding habitat, water sources, resting areas and escape cover for small vertebrates, snakes, eastern cottontail rabbits (*Sylvilagus floridanus*), wild turkey (*Meleagris gallopavo*), ruffed grouse (*Bonasa umbellus*), American woodcock (*Scolopax minor*), and white-tailed deer (*Odocoileus virginianus*). Additional functions provided by the wetland located with the Project area include water retention and filtering. Additional stream functions include peak storm flow attenuation, groundwater recharge, and nutrient cycling. As indicated on the USEPA Rapid Bioassessment Protocol data forms, a limited number of streams within the Project area provide habitat for benthic macroinvertebrates and stream salamanders that are not dependent on a permanent source of water.

The streams within the Project area are typical of headwater aquatic resources found within the Lower Fish Creek watershed (hydrologic unit code 050301061208). There are approximately 4,949 linear feet of jurisdictional ephemeral streams within the Project area. Ephemeral streams within the Project area receive the majority of their base flow from surface water runoff from the adjacent upland areas, which include second growth deciduous forest, mixed second growth/early successional forest, old fields, and pasture land. According to the West Virginia Department of Natural Resources (WVDNR) and United States Fish & Wildlife Service (USFWS), the streams proposed to be impacted are not known to provide critical or unique habitats for federally listed threatened or endangered species (see Appendix B of the Individual CWA Section 404 Permit/CWA Section 401 WQC application).

The primary physical habitat distinction between ephemeral streams and intermittent streams is the presence of flowing water or isolated pools for extended periods of time in intermittent stream channels during summer months. As previously stated, ephemeral streams flow during periods of precipitation or due to infiltration from snow melt and either have no species of



aquatic life present or, if present, it is of relatively poor biological diversity. Intermittent streams in the West Virginia Piedmont region have native fauna adapted to seasonal flowing water, often of spring or seep origin. Intermittent streams are characterized by a community of aquatic life that is not adapted to a continual supply of water on an annual basis. Intermittent streams are usually found to have a moderately diverse community of native fauna either present seasonally or on an annual basis. The native fauna of these streams is characterized by species of vertebrates (fish or stream salamanders) and/or benthic macroinvertebrates that are pioneering, headwater, temporary, and/or temperature facultative. Approximately 3,761 linear feet of jurisdictional intermittent streams are present within the Project area.

No perennial streams were identified within the Project area.

The stream and wetland mitigation presented in this plan will provide comparable and/or improved stream values and functions compared to the aquatic resources proposed to be impacted.



5.0 METHODS FOR DETERMINATION OF MITIGATION CREDITS

To compensate for the loss of headwater ephemeral and intermittent streams, AEP proposes to restore, enhance, and preserve headwater intermittent streams as well as second and third order perennial streams off-site. The West Virginia Stream & Wetland Valuation Metric (SWVM; WVIRT 2010) was utilized as the method to evaluate stream impacts and compensatory mitigation requirements for the Project. The SWVM is an automated debit/credit program that integrates individual stream assessments and key parameters for chemical, physical and biological components to assess stream conditions. The SWVM does not produce a linear stream footage ratio. Instead, it produces a debit/credit score for each stream that will be impacted. The stream impact debits must be offset by stream mitigation credits and/or payments of in-lieu fee amounts determined by the SWVM. Based on the SWVM, and assuming the streams present within the Phase II Haul Road portion of the project area are not jurisdictional waters of the U.S., approximately 9,911 stream mitigation credits will need to be obtained to offset the loss of 8,710 linear feet of ephemeral and intermittent streams within the Project area. Table 4 provides a summary of stream impact debits associated with the Proposed Site Plan and a summary of the stream mitigation credits associated with stream mitigation areas identified to date. The actual number of linear feet of stream mitigation required to obtain the applicable number of stream mitigation debits is dependent upon several variables, such as the type of mitigation activities that will take place, the type of protection mechanisms proposed, and the quality of the streams where mitigation will take place. Using the SWVM, many more mitigation credits are issued for stream mitigation activities that involve protection in perpetuity of streams and their riparian buffers via environmental covenants or conservation easements than are issued for stream mitigation activities that do not involve protection in perpetuity.



TABLE 4
STREAM IMPACT DEBIT AND STREAM MITIGATION CREDIT SUMMARY
Proposed Mitchell Landfill Project
Cresap, Marshall County, West Virginia

Site	Linear Length	Stream Impact Debit Score	Stream Mitigation Credit Score	Balance (debit or credit)
French Run	8,225		3,070	3,070
North Fork Grave Creek	8,881		3,662	6,732
Proposed Site Plan	8,710	8,862		-2,130



6.0 CONCEPTUAL MITIGATION GOALS AND SUCCESS CRITERIA

6.1 CONCEPTUAL MITIGATION GOALS

Mitigation goals serve as the basis for designing a mitigation project and measuring success. The overall goal of the stream mitigation is to complete restoration, enhancement and preservation of streams that will contribute to an overall improvement of watershed water quality when compared to those streams proposed to be impacted. This will be accomplished by offsetting the loss of 8,710 linear feet of jurisdictional stream, consisting of 4,949 linear feet of ephemeral streams and 3,761 linear feet of intermittent streams that will be impacted as a result of their location within the proposed limits of disturbance associated with constructing and operating the Mitchell Landfill, with the restoration/enhancement and preservation of intermittent and perennial streams within Marshall County, West Virginia. An overview map showing the locations of the proposed stream mitigation properties relative to the Project area is provided as Figure 2. At this time, AEP has identified approximately 17,106 linear feet of stream for mitigation. AEP is continuing to coordinate with property owners to obtain additional stream mitigation areas to acquire the credits required per the SWVM to off-set the loss of 8,710 linear feet of stream within the Project area. The primary mitigation goal for stream mitigation is obtaining a minimum of 8,862 stream mitigation credits at the end of the 5-year mitigation monitoring period.

As stated, to compensate for the loss of 0.01 acre of a PEM wetland, AEP proposes to pay in-lieu fees to the WVDEP's in-lieu fee program. Based on the SWVM protocol (WVIRT 2010), the goal of the wetland mitigation is the successful payment of an in-lieu fee of \$1,200 to the WVDEP to compensate for the loss of 0.01 acre of PEM wetland within the Project area.

6.2 CONCEPTUAL MITIGATION SUCCESS CRITERIA

The mitigation success criteria measure the success or failure of the project in meeting the defined mitigation goals. The following criteria will be used to measure the success of the



proposed mitigation in compensating for impacts to streams and wetlands by the proposed Project.

1. An appropriate number of linear feet of intermittent and perennial stream is restored/enhanced and preserved within the French Run and North Fork Grave Creek watersheds, and possibly other watersheds in Marshall County, West Virginia, so that a minimum of 8,862 stream mitigation credits (following the SWVM protocol) are obtained at the end of the 5-year mitigation monitoring period.
2. Restoration within the stream mitigation areas will be considered successful when reshaped, stabilized, and/or restored stream banks are determined to be stable at the end of the 5-year mitigation monitoring period. Restoration within the stream mitigation areas will also be considered successful when installed in-stream structures (cross vanes, J-hook vanes, etc.) are in place and stable at the end of the 5-year mitigation monitoring period.
3. Stream enhancement activities within the riparian corridors along applicable mitigation streams will be considered successful by the establishment of planted and volunteer tree, shrub, and herbaceous species native to northern West Virginia in the riparian corridors present within the limits of the environmental covenants/conservation easements of applicable streams currently lacking riparian corridors with native vegetation. To date, a total of approximately 17,106 linear feet of perennial and intermittent streams have been identified and proposed for riparian planting and approximately 14 acres have been identified to be included in the native riparian planting/re-establishment areas. A list of tree and shrub species proposed for planting within the applicable riparian corridors is provided in Table 5. A list of the herbaceous species proposed for planting within the applicable riparian corridors is provided in Table 6 (and associated approximate ounces of seed per acre). The riparian corridor planting areas shall be allowed to become natural areas, i.e., there shall be no mowing or other vegetation maintenance activities within these areas except those which are beneficial to remove dead, diseased, or invasive vegetation. Invasive species that are removed shall be replaced with native non-invasive vegetation. The locations of the proposed riparian planting/native vegetation re-establishment areas are shown on the Stream Mitigation Areas Maps (Figures 4a through 4d; Figures 5a through 5d) associated with applicable properties containing streams, or portions of streams, currently lacking riparian corridors with riparian forest and/or native vegetation. Woody vegetation plantings in the riparian forest planting/native vegetation re-establishment areas will be considered successful if a minimum of 200 living trees/shrubs per acre, (including planted and volunteer trees/shrubs) are present within those areas at the end of the 5-year mitigation monitoring and maintenance period. Approximately 75 percent or greater of the vegetation within the stream mitigation monitoring plots will consist of planted and/or native species at the end of the 5-year mitigation monitoring period.
4. The stream restoration activities will also be considered successful when miscellaneous debris, trash, and junk are removed within applicable portions of the stream mitigation areas environmental covenants/conservation easements. A total of approximately 0.5 acres and 413 linear feet of stream channel and/or riparian corridor have been



identified to date to be included within the debris removal areas. The approximate locations of the proposed debris/junk/trash removal areas are shown on the Stream Mitigation Areas Maps (Figures 4b through 4d and Figures 5b through 5d) associated with applicable properties containing streams, or portions of streams, currently containing significant amounts of debris/trash/junk within the stream channels or riparian corridors.

5. The wetland mitigation will be considered successful when the successful payment of an in-lieu fee of \$1,200 to the WVDEP has taken place to compensate for the loss of 0.01 acre of PEM wetland within the Project area.

Mitigation monitoring described in Section 8.1 will be conducted on an annual basis for 5 years to evaluate the success in achieving the criteria set forth in this plan.



TABLE 5
RIPARIAN CORRIDOR TREE AND SHRUB PLANTING LIST
Proposed Mitchell Landfill Project Stream Mitigation Areas
Marshall County, West Virginia

Scientific Name	Common Name	Size
Acer saccharinum	Silver maple	1-gallon or 3-gallon
Acer rubrum	Red maple	1-gallon or 3-gallon
Aesculus glabra	Ohio buckeye	1-gallon or 3-gallon
Celtis occidentalis	Common hackberry	1-gallon or 3-gallon
Cercis canadensis	Eastern redbud	1-gallon or 3-gallon
Cornus stolonifera	Red-osier dogwood	1-gallon or 3-gallon
Ilex verticillata	Common winterberry	1-gallon or 3-gallon
Sambucus canadensis	Black elderberry	1-gallon or 3-gallon
Juglans nigra	Black walnut	1-gallon or 3-gallon
Lindera benzoin	Spicebush	1-gallon or 3-gallon
Liriodendron tulipifera	Tuliptree	1-gallon or 3-gallon
Nyssa sylvatica	Blackgum	1-gallon or 3-gallon
Platanus occidentalis	American sycamore	1-gallon or 3-gallon
Quercus palustris	Pin oak	1-gallon or 3-gallon
Viburnum lentago	Nannyberry	1-gallon or 3-gallon

TABLE 6
RIPARIAN CORRIDOR HERBACEOUS SPECIES SEED MIX
Proposed Mitchell Landfill Project Stream Mitigation Areas
Marshall County, West Virginia

Scientific Name	Common Name	Oz./Acre
Actinomeris alternifolia	Wingstem	1.0
Agrostis alba	Redtop	64.0
Dichanthelium clandestinum	Deertongue	12.0
Carex vulpinoidea	Fox sedge	12.0
Elymus riparius	Riverbank wildrye	52.0
Elymus virginicus	Virginia wildrye	52.0
Helenium autumnale	Sneezeweed	6.0
Heliopsis helianthoides	False sunflower	2.0
Juncus effusus	Common rush	2.0
Lolium multiflorum	Annual ryegrass	200.0
Mertensia virginica	Virginia bluebells	2.0
Penstemon calycosus	Smooth penstemon	2.0
Solidago flexicaulis	Zigzag goldenrod	2.0



7.0 PROPOSED STREAM MITIGATION

7.1 SITE SELECTION

In order to provide adequate compensation for the proposed stream impacts, CEC, on behalf of AEP, performed an extensive search for stream mitigation areas. The search for stream mitigation areas began within the Project area vicinity and expanded into additional areas of Marshall County, within the Upper Ohio South Watershed (HUC 5030106). CEC is in the process of contacting landowners within Marshall County, in order to identify additional stream mitigation areas where restoration and/or enhancement activities can take place and where environmental covenants/conservation easements can be established.

CEC investigated numerous potential stream mitigation sites on privately-owned property. Potential mitigation sites investigated included streams listed on, hydrologically connected to, the 303d (impaired streams) list for Marshall County, streams in open pastures, residential areas and city parks/schools with minimal riparian buffers, streams with steep eroding banks, degraded streams containing garbage and/or lacking a forested riparian corridor, and, to a lesser extent, high quality and/or natural streams that would be preserved in their current state. CEC completed USEPA Rapid Bioassessment forms as well as USACE High-gradient Ephemeral and Intermittent Headwater Stream forms as previously stated for high-gradient headwater streams present within these potential mitigation sites. All forms completed for each potential mitigation stream assessed are provided in Appendix B.

CEC surveyed potential stream mitigation sites throughout December 2011, as well as during the months of January through April 2012. As stated, CEC is continuing to investigate sites for potential stream mitigation areas. Three main factors will contribute to the stream mitigation selection: (1) whether the property owner is amenable to establishment of an environmental covenant or conservation easement; (2) the amount of linear footage of streams in need of restoration/enhancement within the property; and (3) the quality of the stream and degree of stream impairment on the property. This conceptual mitigation plan includes potential stream mitigation sites located within the French Run and North Fork Grave Creek watersheds in



Marshall County. CEC is currently working with the West Virginia Conservation Agency (WVCA) to identify additional property owners in Marshall County with properties containing streams in need of restoration and/or enhancement and willing to allow establishment of environmental covenants or conservation easements along streams located within their properties. Lists of property owners and the relevant stream information for their property are provided in Table 7.

TABLE 7 PROPOSED MITCHELL LANDFILL PROJECT POTENTIAL MITIGATION PROPERTIES SUMMARY Marshall County, West Virginia						
French Run Drainage						
Property Owner(s)	Classification	Stream Name	Linear Feet within Property¹	Total Linear Feet of Stream Per Property¹	Total Environmental Covenant/ Conservation Easement Acreage Per Property	Mitigation Type
Kuhn/ Yoders	Perennial	French Run	1,777	1,842	2.1	Restoration/ Enhancement
Kuhn	Intermittent	Unnamed Tributary to French Run (FR-UNT1)	65			
Lyons	Perennial	French Run	1,630	1,864	2.1	Restoration/ Enhancement
Lyons	Intermittent	Unnamed Tributary to French Run (FR-UNT1)	324			
Whipkey	Perennial	French Run	847	870	0.9	Restoration/ Enhancement
Whipkey	Intermittent	Unnamed Tributary to French Run (FR-UNT2)	23			



**TABLE 7
PROPOSED MITCHELL LANDFILL PROJECT POTENTIAL MITIGATION
PROPERTIES SUMMARY
Marshall County, West Virginia**

French Run Drainage						
Property Owner(s)	Classification	Stream Name	Linear Feet within Property¹	Total Linear Feet of Stream Per Property¹	Total Environmental Covenant/ Conservation Easement Acreage Per Property	Mitigation Type
Aston	Perennial	French Run	546	1,567	1.7	Restoration/ Enhancement
Aston	Intermittent	Unnamed Tributary to French Run (FR-UNT2)	787	2,078	2.4	Restoration / Enhancement
Aston	Intermittent	Unnamed Tributary to French Run (FR-UNT3)	234			Restoration/ Enhancement
Hall	Perennial	French Run	1,829			Restoration/ Enhancement
Hall	Intermittent	Unnamed Tributary to French Run (FR-UNT3)	249			

¹ The length of the mitigation streams are approximate at this time and based upon available property boundary information. These stream lengths will be verified prior to the preparation and submittal of the final mitigation plan.



**TABLE 7
PROPOSED MITCHELL LANDFILL PROJECT POTENTIAL MITIGATION
PROPERTIES SUMMARY
Marshall County, West Virginia**

North Fork Grave Creek Properties						
Property Owner(s)	Classification	Stream Name	Linear Feet within Property¹	Total Linear Feet of Stream Per Property¹	Total Environmental Covenant/Conservation Easement Acreage Per Property	Mitigation Type
Hackathorn/Robinson	Perennial	North Fork Grave Creek	1,230	1,230	0.22	Restoration/Enhancement
Cumpston	Perennial	North Fork Grave Creek	620	2,537	0.38	Restoration/Enhancement
Cumpston	Perennial	Unnamed Tributary to North Fork Grave Creek (NFGC-UNT1)	1,917		1.74	
Lewis/Robinson	Perennial	North Fork Grave Creek	530	530	0.24	Restoration/Enhancement
Simmons	Perennial	North Fork Grave Creek	767	767	0.4	Restoration/Enhancement
Roskelly	Intermittent	Unnamed Tributary to North Fork Grave Creek (NFGC-UNT2)	992	992	0.2	Restoration/Enhancement
Cox	Perennial	Unnamed Tributary to North Fork Grave Creek (NFGC-UNT2)	137	137	0.03	Restoration/Enhancement
Scherich	Perennial	Unnamed Tributary to North Fork Grave Creek (NFGC-UNT2)	490	490	0.1	Restoration/Enhancement
Suarez	Perennial	Unnamed Tributary to North Fork Grave Creek (NFGC-UNT2)	292	292	0.1	Restoration/Enhancement
Magers	Perennial	North Fork Grave Creek	1,906	1,906	1.1	Restoration/Enhancement
Lilley	Perennial	Tributary to North Fork Grave Creek (NFGC-UNT3)	3,962	4,934	TBD	Restoration/Enhancement
Lilley	Perennial	North Fork Grave Creek	972		TBD	Restoration/Enhancement



¹ The length of the mitigation streams are approximate at this time and based upon available property boundary information. These stream lengths will be verified prior to the preparation and submittal of the final mitigation plan.

As discussed in the following sections, AEP anticipates that restoration and enhancement, as well as preservation, of the mitigation streams within the environmental covenants/conservation easements will have a significant positive impact on regional water quality. AEP has determined that the proposed compensatory mitigation activities will provide the required compensation for the unavoidable impacts to aquatic resources resulting from the Mitchell Landfill Project because of the following reasons:

- The resources to be restored/enhanced/preserved provide important physical, chemical, and biological functions for the watershed.
- Many of the mitigation streams are currently located in active pasture, have significant amounts of siltation and/or bank erosion, and lack riparian corridors with native vegetation.
- The majority of mitigation streams were on the list of 303d impaired streams in West Virginia (WVDEP 2008) or are within the same watershed as streams on this list.
- The mitigation streams are perennial and intermittent headwater streams or are hydrologically connected to perennial streams.
- Headwater streams play a critical role in the hydrological and ecological functions of downstream reaches. They contribute to the functional integrity of watersheds and downstream reaches by providing energy and nutrients (organic carbon, nitrogen, and organisms), processing pollutants, trapping sediments, etc. Headwater streams also provide regional ground-water recharge.
- The stream mitigation areas are hydrologically connected to the portion of the Ohio River South watershed in which the proposed Mitchell Landfill project is located.

7.2 EXISTING CONDITIONS

7.2.1 French Run Drainage

The French Run drainage is located in the east-central portion of Marshall County, east of the Mitchell Landfill Project area (Figure 3, Figure 4, and Figures 5a through 5d). French Run drains to North Fork Grave Creek. Both French Run and North Fork Grave Creek are listed on the 303d impaired streams list within the 2008 West Virginia Integrated Water Quality Monitoring and Assessment Report (WVDEP 2008). Both of the streams entire lengths,



2.9 miles and 5 miles respectively, are listed as biologically impaired due to fecal coliform. According to the 2010 West Virginia Integrated Water Quality Monitoring and Assessment Report (WVDEP 2010), both streams have Total Maximum Daily Loads (TMDLs) developed and were therefore, removed from the 2010 303d list of impaired streams.

The drainage area of French Run is approximately 741 acres (approximately one square mile). Land use along French Run consists primarily of open pasture and woodland. The majority of the riparian area along the upper reaches of the stream has been heavily grazed and there are several natural gas pipelines crossing the stream. Several property owners listed in Tables 7 and 8 have agreed in principle to stream restoration and/or enhancement activities and the establishment of environmental covenants or conservation easements. Due to the contiguous nature of potential stream mitigation properties along French Run and general similarity of the potential stream mitigation areas, sample reaches were chosen based on representative stream habitat types. Sample reaches were not assessed on each individual property. The results of the biological assessments conducted within potential mitigation streams within the French Run drainage are provided in Table 8.



TABLE 8
FRENCH RUN DRAINAGE STREAMS BIOLOGICAL ASSESSMENT SUMMARY
Proposed Mitchell Landfill Project Potential Stream Mitigation Properties
Marshall County, West Virginia

Stream Segment Name/USGS Stream Name	Property Owner(s)	Classification	Linear Feet ¹	USEPA Score	SCP Score	USACE FCI Score			Mitigation Type
						Hydrology	Biogeochemical Cycling	Habitat	
FR-1/French Run	Kuhn/Yoders	Perennial	671	104	30	0.42	0.57	0.55	Restoration/Enhancement
FR-2/French Run	Kuhn/Yoders	Perennial	1,106	101	24	0.41	0.58	0.49	Restoration/Enhancement
FR-3/French Run	Lyons/Whipkey/Aston	Perennial	3,022	85	34	0.36	0.36	0.26	Restoration/Enhancement
FR-4/Unnamed Tributary to French Run	Aston/Whipkey	Intermittent	811	48	20	0.25	0.24	0.14	Restoration/Enhancement
FR-5/French Run	Hall	Perennial	1,832	96	20	0.40	0.50	0.53	Restoration/Enhancement
FR-6/Unnamed Tributary to French Run	Kuhn/Yoders/Lyons	Intermittent	299	TBD	TBD	TBD	TBD	TBD	Restoration/Enhancement
FR-7/Unnamed Tributary to French Run	Hall/Aston	Intermittent	484	91	38	0.41	0.42	0.50	Restoration/Enhancement
TOTAL			8,225					--	

¹ The length of the mitigation streams are approximate at this time and based upon available property boundary information. These stream lengths will be verified prior to the preparation and submittal of the final mitigation plan.

² West Virginia Stream Condition Index (SCI) is a tool developed by Tetra Tech in 2000 utilized by the WVDEP that uses 6 benthic community metrics combined into a single multimetric index. The WVDEP defines a metric score greater than 60.6 as unimpaired.

Flowing water ranging from approximately 4 inches to 24 inches deep was observed throughout the assessed portions of French Run. Pools were observed throughout the entire stream length that was assessed as well. Pool depth varied from 6 inches to 16 inches. Aquatic biota observed throughout French Run consisted of fish, stream salamanders, and benthic macroinvertebrates. The fish observed within the assessed stream segments were of the family Percidae. Stream salamanders observed within the assessed stream segments included northern dusky salamanders (*Desmognathus fuscus*) and two-lined salamanders (*Eurycea bislineata*). Benthic macroinvertebrates observed within the assessed stream segments of French Run included



crayfish (Order Decapoda), aquatic worms (Subclass Oligochaeta), leeches (Subclass Hirudinea), mayflies (Order Ephemeroptera), stoneflies (Order Plecoptera), caddisflies (Order Trichoptera), dobsonflies (Order Megaloptera), aquatic beetles (Order Coleoptera), and flies (Order Diptera). Overall aquatic biota was marginally present and of limited diversity and density.

All completed USEPA RBP forms and USACE high gradient stream forms for each stream assessed are provided in Appendix B. Appendix A contains representative photographs documenting stream conditions during the site visits.

7.2.1.1 Kuhn/Yoders Properties

Approximately 1,777 linear feet of perennial mitigation stream (French Run) and 65 feet of an unnamed intermittent mitigation stream (FR-UNT1) are present within the Kuhn and Yoders properties (Figures 4, 5a, and 5b). Per the property owners, French Run is the property boundary between these the two properties. However, the property tax maps indicate the stream lies completely on the Kuhn property. CEC will determine the actual property boundaries prior to preparation and submittal of the final mitigation plan. CEC sampled two representative stream segments, Segments FR-1 and FR-2, along the portion of French Run that drains these two properties. The results of these biological assessments are provided in Table 8. Segment FR-1 of French Run was characterized by an OHWM width of approximately 8 feet and a bankfull width of approximately 9 feet. Water filled approximately 75 percent of the channel and was approximately 5 inches deep. The substrates of this stream segment consisted of cobble, gravel, sand, silt, and a minimal amount of boulders. Leaf litter/woody debris covered approximately 5 percent of the channel. The USEPA Low Gradient Stream score for this section of French Run was 104/marginal. The SCI score was 30/marginal.

The majority of French Run within these properties is located within open active pasture with a marginal riparian buffer. There are two natural gas pipelines crossing French Run upstream approximately 500 feet of Segment FR-1. Additionally, there is an unstable in-stream ford within this portion of French Run.



The results of the biological assessments indicate that French Run along Segment FR-1 likely supports marginal benthic macroinvertebrate, stream salamander, and fish communities. No fish or stream salamanders were observed during the biological assessment. Benthic macroinvertebrates including patterned stoneflies (family Perlidae), brush-legged mayflies (family Isonychiidae), non-biting midges (family Chironomidae), black flies (family Simuliidae), crane flies (family Tipulidae), as well as members of the order crayfish, and members of the subclass aquatic worms were observed during the stream assessment.

Segment FR-2 of French Run was characterized by an OHWM width of approximately 4.5 feet and a bankfull width of approximately 5.5 feet. Water filled approximately 75 percent of the channel and was approximately 4 inches deep. The substrates of this stream segment consisted primarily of gravel, cobble, and sand, with lesser amounts of boulders. Leaf litter/woody debris covered approximately 20 percent of the channel. The USEPA Low Gradient Stream score for this section of French Run was 101/marginal. The SCI score was 24/marginal.

The results of the biological assessments indicate that French Run along Segment FR-2 likely supports marginal benthic macroinvertebrate, stream salamander, and fish communities, although no fish were observed during the biological assessment sampling activities. One larval northern dusky salamander was observed within the stream segment during sampling activities. Benthic macroinvertebrates including flatheaded mayflies (family Heptageniidae), winter stoneflies (family Capniidae), patterned stoneflies, brush-legged mayflies, case-building caddisflies (family Glossosomatidae), common netspinner caddisflies (family Hydropsychidae), non-biting midges, black flies, crane flies, as well as members of the order crayfish and members of the subclass aquatic worms were observed during the stream assessment site visit.

Stream FR-UNT1 (Segment FR-6), an unnamed tributary to French Run, is an intermittent stream on the Kuhn and Yoders properties that was recently identified as a potential stream mitigation area. Biological sampling activities have not been completed for this stream segment to date but will be completed prior to submittal of the final mitigation plan. The location of this stream is shown on Figures 4, 5a, and 5b.



Approximately 2.1 acres of proposed environmental covenant/conservation easement has been identified along French Run within the Kuhn and Yoders properties. This area is used as open pasture and several sections of the stream banks have been impaired due to livestock use. Approximately 1,842 linear feet of stream are in need of bank stabilization, riparian forest planting/re-establishment, and debris removal. Fences are proposed to be installed to exclude cattle from the stream and a low water crossing is also proposed to be established. AEP will also likely pay for the installation of self-watering troughs and/or construction of a cattle water pond within the Kuhn and/or Yoders properties due to cattle no longer having access to the stream once fences are installed. Debris removal is also proposed within approximately 53 linear feet and 0.11 acres along French Run located within the Kuhn and/or Yoders properties.

7.2.1.2 Lyons Property

Approximately 1,630 linear feet of perennial stream (French Run) and 312 linear feet of an unnamed intermittent tributary to French Run (FR-UNT1) are present on the Lyons Property (Figures 4, 5a, and 5c). CEC conducted one biological stream assessment (Segment FR-3) along the portion of French Run that is located on the Lyons Property. No biological stream assessments have taken place within FR-UNT1 to date. These activities will occur prior to submittal of the final mitigation plan. Figure 5b shows the locations of potential stream mitigation areas on the Lyons Property. The results of the stream assessments are provided in Table 8.

Segment FR-3, was characterized by an OHWM width of approximately 4.75 feet and a bankfull width of approximately 5 feet. Water filled approximately 100 percent of the channel. The substrates of this section consisted of cobble, gravel, sand, silt, and boulders. Leaf litter/woody debris covered approximately 30 percent of the channel. The USEPA Low Gradient Stream score for this section of French Run was 84/marginal. The SCI score was 34/marginal.

Stream FR-UNT1 (Segment FR-6), an unnamed tributary to French Run, is an intermittent stream on the Lyons Property that was recently identified as a potential stream mitigation area. Biological sampling activities have not been completed for this stream segment to date but will



be completed prior to submittal of the final mitigation plan. The location of this stream is shown on Figures 4, 5a, and 5b.

The results of the biological assessment indicate that French Run within the Lyons Property supports marginal benthic macroinvertebrate and stream salamander communities. No fish were observed within the sampling reach. Three larval northern dusky salamanders were observed during the biological assessment sampling activities. Benthic macroinvertebrates identified within the sample reach included flatheaded mayflies, winter stoneflies, patterned stoneflies, brush-legged mayflies, case-building caddisflies, common netspinner caddisflies, non-biting midges, black flies, crane flies, crayfish, riffle beetles (family Elmidae), darners (family Aeshnidae), dobsonflies (family Corydalidae), and aquatic worms. The majority of French Run and the unnamed tributary within this property drain open pasture with no riparian buffer. The livestock have caused mechanical damage (sloughing, shearing) to the stream banks. There is an unstable in-stream ford within this portion of French Run. There is also a large garbage/debris pile located along the left stream bank below the property owners home and outbuildings.

Approximately 2.1 acres of proposed environmental covenant/conservation easement have been identified along this section of French Run. Approximately 1,942 linear feet of stream are in need of bank stabilization, as well as riparian forest planting/native vegetation re-establishment. Cattle exclusion fences should be installed to keep the cattle out of the streams and a low water crossing needs to be established. AEP will also likely pay for the installation of self-watering troughs and/or construction of a cattle water pond within the Lyons Property due to cattle no longer having access to the stream once fences are installed. Additionally, approximately 360 linear feet (0.4 acres) of debris removal is proposed for this portion of French Run.

7.2.1.3 Aston/Whipkey Properties

Approximately 2,437 linear feet of perennial and intermittent mitigation streams, including approximately 1,044 linear feet of unnamed intermittent tributaries to French Run (FR-UNT2 and FR-UNT3) and approximately 1,393 linear feet of French Run, are present on the Aston and Whipkey properties (Figures 4, 5a, and 5c). CEC conducted one biological stream assessment



(Segment FR-4) along FR-UNT2 and within these properties. The biological stream assessment (Segment FR-5) along FR-UNT3, conducted within the Hall Property, is also representative of the conditions of the portion of FR-UNT3 that is located within the Aston and Whipkey properties. The biological stream assessment conducted within Segment FR-3, completed on the Lyons Property, is also representative of the conditions of the portion of French Run that is present within the Aston and Whipkey properties. The results of the biological assessment activities are provided in Table 8.

Segment FR-4 sampled along FR-UNT1 was characterized by an OHWM width of approximately 2.4 to 4 feet and a bankfull width of approximately 5.6 feet. Water filled approximately 70 percent of the channel. The substrates of this section consisted of silt, gravel, sand, and small amounts of cobble. There was no leaf litter or woody debris. The USEPA Low Gradient Stream score for this section of FR-UNT2 was 48/poor. The SCI score was 20/poor.

The results of the biological assessment indicate that the unnamed intermittent tributary of French Run (FR-UNT2) within the Aston and Whipkey properties supports less than marginal benthic macroinvertebrate, fish, and stream salamander communities. There were no fish or stream salamanders observed during the biological assessment within Segment FR-4 on the Aston Property. Benthic macroinvertebrates identified within the sample reach included flatheaded mayflies, patterned stoneflies, non-biting midges, black flies, crane flies, darners as well as aquatic worms were observed during the stream assessment. The majority of the unnamed tributary on both properties drain open pasture and have little to no riparian buffer. The stream banks are sloughing along the unnamed tributary on Aston's property and are incised along the unnamed tributary located on the Whipkey Property.

There are several areas where French Run is incised and with eroding banks within the Whipkey and Aston properties. A riparian buffer is present along the majority of the left bank of French Run within these two properties, but the right bank of French Run has no riparian buffer within these two properties.



There are approximately 2.6 acres of proposed environmental covenants/conservation easements that have been identified along French Run, FR-UNT2, and FR-UNT3 within the Aston and Whipkey properties. Approximately 2,437 linear feet of stream are in need of restoration and native vegetation planting/re-establishment. Fences need to be constructed to exclude cattle from the streams, self-watering troughs will be required, and a low water crossing needs to be established.

7.2.1.4 Hall Property

Approximately 2,078 linear feet of potential mitigation streams are present within the Hall Property, including approximately 1,829 linear feet of perennial stream (French Run) and approximately 249 linear feet of intermittent stream (FR-UNT3). CEC conducted two biological stream assessments within the Hall property. One assessment (Segment FR-5) was conducted within French Run and one (Segment FR-7) was conducted within an unnamed intermittent tributary to French Run (FR-UNT3). A natural gas pipeline was under construction while CEC biologists conducted the stream assessment on French Run. The stream assessment (Segment FR-5) was conducted approximately 2,000 feet downstream of the natural gas pipeline right-of-way. The results of these biological stream assessments are provided in Table 8.

Segment FR-5 of French Run was characterized by an OHWM width of approximately 6.5 feet and a bankfull width of approximately 12 feet. Water filled approximately 80 percent of the channel. The substrates of this section consisted of cobble, gravel, boulders, sand, and silt. Leaf litter/woody debris covered approximately 30 percent of the channel. An in-stream ford crossed the stream within the sampling reach. The USEPA Low Gradient Stream score for this section of French Run was 96/marginal. The SCI score was 20/poor.

The results of the biological assessment indicate that French Run located within the Hall Property minimally supports benthic macroinvertebrate, stream salamander, and fish communities. No fish were observed during the sampling event. Larval northern dusky salamanders were observed within the sample reach. Benthic macroinvertebrate families observed within the Segment FR-5 sample reach consisted of flatheaded mayflies, patterned



stoneflies, case-building caddisflies, non-biting midges, black flies, crane flies, water pennies (family Psephenidae) as well as members of the subclass aquatic worms.

Approximately 249 linear feet of an unnamed intermittent tributary to French Run (FR-UNT3) was sampled within the Hall Property (represented by Segment FR-7). FR-UNT3 flows through wooded pasture prior to reaching the open pasture within the Hall Property.

Segment FR-7 of Stream FR-UNT3 was characterized by an OHWM width of approximately 4 feet and a bankfull width of approximately 7 feet. Water filled about 80 percent of the channel. Approximately 90 percent of the channel is deeply incised and 10 percent of the channel substrate was hardpan. An approximate 3 foot drop in channel elevation within the sampling segment was observed approximately 100 feet upstream of its confluence with French Run. The substrates of this section consisted of hardpan, gravel, cobble, silt, boulders, and sand. Leaf litter/woody debris covered approximately 10 percent of the channel. The USEPA Low Gradient Stream score for this section of FR-UNT3 was 91/marginal. The SCI score was 38/suboptimal.

The results of the biological assessment within Segment FR-7 indicate that the Stream FR-UNT3 marginally supports benthic macroinvertebrates, stream salamander, and fish communities. Benthic macroinvertebrates of the families: spring stoneflies (family Nemouridae), patterned stoneflies (family Perlodidae), roach-like stoneflies (family Pletoperlidae), case-building caddisflies, northern caddisflies (family Limnephilidae), casemaker caddisflies (family Goeridae), non-biting midges, black flies, crane flies as well as members of the subclass leeches were identified within the stream sample reach. There were no fish observed during the stream sampling site visit. A two-lined salamander and a northern dusky salamander were observed and identified within the stream during the biological assessment. An existing riparian buffer exists on the right bank of this stream, while the left bank is primarily open pasture.

Approximately 2.4 acres of proposed environmental covenants/conservation easements have been identified within the Hall Property. Approximately 2,078 linear feet of stream are in need of restoration and riparian forest planting/native vegetation re-establishment. Fences need to be



installed to exclude cattle from the mitigation streams, self-watering troughs will likely need to be installed, and a low water crossing needs to be established.

7.2.2 North Fork Grave Creek Drainage

The drainage area of North Fork Grave Creek is approximately 3,604 acres (approximately 6 square miles). Land use along North Fork Grave Creek consists of residential, open pasture, and woodland. The majority of North Fork Grave Creek lacks riparian buffers and natural stream channel flow patterns due to anthropogenic activities. Many areas along the North Fork Grave Creek and tributaries of North Fork Grave Creek have been heavily grazed. Several property owners have agreed to the establishment of environmental covenants or conservation easements.

Flowing water ranging from approximately 4 inches to 4 feet deep was observed within North Fork Grave Creek and its unnamed tributaries. Pools were observed throughout the stream lengths that were assessed as well. Pool depths varied from 8 inches to 4 feet. Aquatic biota observed throughout North Fork Grave Creek and its unnamed tributaries consisted of fish, stream salamanders, and benthic macroinvertebrates. The fish observed within the assessed stream segments were of the families Percidae and Cyprinidae. Stream salamanders observed within the assessed stream segments included the northern dusky salamander and the two-lined salamander. Benthic macroinvertebrates observed within the assessed stream segments of North Fork Grave Creek and its unnamed tributaries included crayfish, round worms, leeches, mayflies, stoneflies, caddisflies, dobsonflies, aquatic beetles, clams (Order Pelecypoda), fly larvae and members of the dragonflies and damselflies (order Odonata). Overall, aquatic biota was marginally present and of limited diversity and density throughout the sample reaches within North Fork Grave Creek and the sample reaches within the unnamed tributaries to North Fork Grave Creek.

Due to the contiguous nature of potential stream mitigation properties within the North Fork Grave Creek drainage and general similarity of the potential stream mitigation areas, sample reaches were chosen based on representative stream habitat types. Sample reaches were not assessed on each individual property. The results of the biological assessments conducted within



potential mitigation streams within the North Fork Grave Creek drainage are provided in Table 8. Completed USEPA stream sampling forms and USACE stream sampling forms for each stream assessed are provided in Appendix B. Appendix A contains representative photographs documenting stream conditions observed during the site visits.

7.2.2.1 Hackathorn/Robinson Properties

Approximately 1,230 linear feet of perennial stream (North Fork Grave Creek) are present within the Hackathorn/Robinson Properties. The property tax maps indicate that Mr. Robinson owns portions of this section of North Fork Grave Creek. Mr. Hackathorn stated that the property tax maps have not been updated and are incorrect. He stated he owns all of said property in question along North Fork Grave Creek. CEC will determine the actual property boundaries prior to preparation and submittal of the final mitigation plan. CEC conducted one biological stream assessment (Segment NFGC-1) within North Fork Grave Creek on the Hackathorn/Robinson Properties. The results of the biological assessment are provided in Table 9.

The section of North Fork Grave Creek within the Hackathorn/Robinson Properties was characterized by an OHWM width of approximately 8.5 feet and a bankfull width of approximately 10 feet. Water filled approximately 100 percent of the channel. The substrates of Segment NFGC-1 consisted of cobble, gravel, boulders, and sand. Very little leaf litter/woody debris was observed within the sampled stream segment. Mr. Hackathorn stated he removes leaf litter and woody debris frequently. The USEPA Low Gradient Stream score for this section of North Fork Grave Creek was 92/marginal. The SCI score was 22/poor.

The banks of North Fork Grave Creek are incised and unstable throughout the Hackathorn/Robinson Properties. Approximately 80 percent of the stream on the Hackathorn/Robinson Properties lacks a forested riparian buffer. Benthic macroinvertebrates identified within the sample reach included, case-building caddisflies, common netspinner caddisflies, patterned stoneflies, flatheaded mayflies, non-biting midges, crane flies, water pennies, black flies and fingernail clams (family Sphaeriidae) as well as aquatic worms were identified within the stream reach. One fantail darter (*Etheostoma flabellare*) and a juvenile



northern dusky salamander were observed within the sample reach during the biological assessment site visit.

The results of the biological assessment activities indicate that this portion of North Fork Grave Creek located within the Hackathorn/Robinson Properties is biologically poor and minimally supports benthic macroinvertebrate, fish, and stream salamander communities.

There are approximately 0.22 acres of proposed environmental covenant/conservation easement have been identified along North Fork Grave Creek within the Hackathorn/Robinson Properties. Approximately 1,230 linear feet of stream are in need of stream bank restoration and riparian forest planting/native vegetation re-establishment.

**TABLE 9
NORTH FORK GRAVE CREEK DRAINAGE BIOLOGICAL ASSESSMENT SUMMARY
Proposed Mitchell Landfill Project Potential Mitigation Properties
Marshall County, West Virginia**

Stream Segment Name/USGS Stream Name	Property Owner(s)	Classification	Linear Feet ¹	USEPA Score	SCI Score ²	USACE FCI Score			Mitigation Type
						Hydrology	Biogeochemical Cycling	Habitat	
NFGC-1	Hackathorn/Robinson	Perennial	1,230	92	22	0.28	0.30	0.22	Restoration/Enhancement
NFGC-3	Cumpston	Perennial	620	92	14	0.21	0.47	0.13	Restoration/Enhancement
NFGC-4	Lewis/Simmons/Robinson	Perennial	1,297	114	28	0.54	0.55	0.50	Restoration/Enhancement
NFGC-5	Cumpston	Perennial	1,917	75	30	0.19	0.13	0.09	Restoration/Enhancement
NFGC-6	Roskelly	Intermittent	992	48	16	0.23	0.12	0.09	Restoration/Enhancement
NFGC-7	Cox/Scherich/Suarez	Perennial	919	81	18	0.52	0.56	0.62	Restoration/Enhancement
NFGC-8	Magers	Perennial	1,906	75	36	0.41	0.47	0.49	Restoration/Enhancement
NFGC-9	Lilley	Perennial	TBD	TBD	TBD	TBD	TBD	TBD	Restoration/Enhancement
NFGC-10	Lilley	Perennial	TBD	TBD	TBD	TBD	TBD	TBD	Restoration/Enhancement
	TOTAL	--	8,881	--	--				--

¹ The length of the mitigation streams are approximate at this time and based upon available property boundary information. These stream lengths will be verified prior to the preparation and submittal of the final mitigation plan.



² West Virginia Stream Condition Index (SCI) is a tool developed by Tetra Tech in 2000 utilized by the WVDEP that uses 6 benthic community metrics combined into a single multimetric index. The WVDEP defines a metric score greater than 60.6 as unimpaired.

7.2.2.2 Cumpston Property

Approximately 2,537 linear feet of perennial stream is present within the Cumpston Property, including approximately 620 linear feet of North Fork Grave Creek and approximately 1,917 linear feet of an unnamed tributary to North Fork Grave Creek (NFGC-UNT1).

CEC conducted one biological stream assessment (Segment NFGC-3) within North Fork Grave Creek on the Cumpston Property and one biological stream assessment (Segment NFGC-5) within NFGC-UNT1. The results of these assessments are provided in Table 9. Segment NFGC-3 was characterized by an OHWM width of approximately 14 feet and a bankfull width of approximately 15 feet. Water filled approximately 100 percent of the channel. The substrates of this section consisted primarily of bedrock, with lesser amounts of boulders, cobble, gravel, sand, and silt. Approximately 100 percent of the bedrock was covered with algae and slime. An upstream unnamed tributary located in an open pasture on the Cumpston Property is likely the source for the excess nutrients in North Fork Grave Creek within the Cumpston Property. Leaf litter/woody debris covered approximately 1 percent of the channel. The USEPA Low Gradient Stream score for this section of North Fork Grave Creek was 92/marginal. The SCI score was 14/poor.

The left descending bank of North Fork Grave Creek has a well developed riparian buffer, while the right bank is a mowed lawn and the Cumpston Property leach field. Portions of the right creek bank are unstable and eroding. Mr. Cumpston stated he previously placed large boulders in the creek along the bank to keep the bank from eroding into his yard.

The results of the biological assessments indicate that this portion of North Fork Grave Creek located within the Cumpston Property is biologically poor and minimally supports benthic macroinvertebrate, fish, and stream salamander communities. Benthic macroinvertebrates identified within the sample reach included patterned stoneflies, case-building caddisflies,



flatheaded mayflies, riffle beetles and non-biting midges. No fish or stream salamanders were observed within the Segment NFGC-3 sample reach during the biological assessment. Approximately 620 linear feet of North Fork Grave Creek are in need of bank restoration and riparian forest/native vegetation re-establishment.

An unnamed tributary that drains to North Fork Grave Creek is also located on the Cumpston Property. This unnamed tributary was located within a pasture/feed lot. Approximately forty percent of the reach banks were covered in manure and the stream banks have lost definition due to trampling by livestock. CEC completed one biological assessment (Segment NFGC-5) within this unnamed tributary. The results of these assessments are provided in Table 6.

Segment NFGC-5 was characterized by an OHWM width of approximately 9 feet and a bankfull width of approximately 10 feet. Water filled approximately 80 percent of the channel. The substrates of this section consisted of cobble, sand, silt, gravel, and minimal amounts of boulders. Leaf litter/woody debris covered approximately 30 percent of the channel. An in-stream ford crossed the stream within the sampling reach. The USEPA Low Gradient Stream score for NFGC-5 was 75/marginal. The SCI score was 30/marginal.

The results of the biological assessments indicate that the unnamed intermittent tributary of North Fork Grave Creek located within the Cumpston Property supports marginal benthic macroinvertebrate, fish, and stream salamander communities. Several fish were observed within the sample reach, including fantail darter and two species of minnows. No stream salamanders were observed within the sample reach. Benthic macroinvertebrates observed within Segment NFGC-5 consisted of flatheaded mayflies, combmouthed minnow mayflies (family Ameletidae), patterned stoneflies, winter stoneflies, case-building caddisflies, non-biting midges, and crane flies.

Approximately 1,917 linear feet of NFGC-UNT1 are in need of stream bank restoration, natural channel design, and riparian forest/native vegetation re-establishment. Fences need to be installed to exclude cattle from the stream and a low water crossing needs to be established. Self-watering troughs will be necessary once cattle no longer have access to the stream.



Approximately 2.0 acres of proposed environmental covenant/conservation easement have been identified within the Cumpston Property along North Fork Grave Creek and the unnamed tributary to North Fork Grave Creek (NFGC-UNT1).

7.2.2.3 Lewis/Robinson Properties

Approximately 530 linear feet of perennial stream (North Fork Grave Creek) are present within the Lewis/Robinson Properties. The property tax maps indicate that Mr. Robinson owns portions of this section of North Fork Grave Creek. Mr. Lewis stated that the property tax maps have not been updated and are incorrect. He stated he owns all of the property in question along North Fork Grave Creek. CEC will determine the actual property boundaries prior to preparation and submittal of the final mitigation plan.

The section of North Fork Grave Creek (Segment NFGC-4) within the Lewis/Robinson Properties was characterized by an OHWM width of approximately 22 feet and a bankfull width of approximately 30 feet. Water filled approximately 100 percent of the channel and was approximately 12 inches deep within runs and approximately 3 to 4 feet deep in the pools. The substrates of this sample reach consisted primarily of bedrock within the runs and sand within the pools. One riffle was located within the sampling reach. The substrates within the riffle consisted of cobble, boulders, and gravel. Approximately 75 percent of the bedrock was covered with algae and slime. Leaf litter/woody debris covered approximately 5 percent of the channel. The USEPA Low Gradient Stream score for this section of North Fork Grave Creek was 114/suboptimal. The SCI score was 28/marginal.

Two existing ponds are located on the right bank of North Fork Grave Creek within the Lewis Property. One of the ponds partially lies within the Hackathorn Property. The stream is eroding the banks of both of these ponds and one of the pond's banks has failed. Japanese knotweed (*Polygonum cuspidatum*) was growing along approximately 60 percent of the right descending bank within the Lewis/Robinson Properties. A well developed riparian buffer is present along the left descending bank.



The results of the biological assessment indicated that this portion of North Fork Grave Creek supports marginal benthic macroinvertebrate, fish, and stream salamander communities. Benthic macroinvertebrates identified within the sample reach included patterned stoneflies, case-building caddisflies, casemaker caddisflies, netspinner caddisflies, non-biting midges, crane flies, broad-winged damselflies (family Calypterigidae), and aquatic worms. Several Asiatic Clams, (*Corbicula fluminea*) were also observed within Segment NFGC-4. Fantail darters and common shiner (*Luxilus cornutus*) were also observed during the sampling event. No stream salamanders were observed within the reach during the biological assessment site visit.

Approximately 0.2 acres of proposed environmental covenant/conservation easement have been identified along North Fork Grave Creek within the Lewis/Robinson Properties. This section of North Fork Grave Creek would benefit from removal of the ponds and restoration of those areas. Both, Mr. Lewis and Mr. Hackathorn appear amenable to removal of the ponds and restoration of those areas. Approximately 530 linear feet of North Fork Grave Creek are in need of bank stabilization and riparian forest/native vegetation re-establishment activities, including the removal of invasive vegetation.

7.2.2.4 Simmons Property

Approximately 767 linear feet of perennial stream (North Fork Grave Creek) area present within the Simmons Property. A biological assessment has not been conducted on the section of North Fork Grave Creek that flows through the Simmons Property. However, the biological assessment completed within North Fork Grave Creek (Segment NFGC-4) on the Lewis/Robinson Properties was completed in a very similar reach of this stream as that present on the Simmons Property.

Approximately 0.4 acres of proposed environmental covenant/conservation easement have been identified along this section of North Fork Grave Creek. Approximately 767 linear feet of North Fork Grave Creek are in need of bank restoration and riparian forest/native vegetation re-establishment.



7.2.2.5 Roskelly Property

The Roskelly Property contains approximately 992 linear feet of an unnamed intermittent tributary to North Fork Grave Creek (NFGC-UNT2). The stream flows between Highway 250 and a residential area and the riparian buffer is minimal along the entire length of NFGC-UNT2 within the Roskelly Property. CEC completed one biological assessment (Segment NFGC-6) within this stream on the Roskelly Property. Segment NFGC-6 was characterized by an OHWM width of approximately 2 feet and a bankfull width of approximately 2.5 feet. Water filled approximately 100 percent of the channel and was approximately 2 inches deep within the riffles. No pools or runs were observed. The substrates of the sample reach primarily consisted of cobble, gravel, and sand, with a minimal amount of boulders also present. Approximately 100 percent of the substrates within the sample reach were covered with slime and algae. Leaf litter/woody debris covered approximately 5 percent of the channel. The USEPA Low Gradient Stream score for this section of stream was 48/poor. The SCI score was 16/poor.

The results of the biological assessments indicate that this portion of the unnamed tributary to North Fork Grave Creek (NFGC-UNT2) is biologically impaired and minimally supports benthic macroinvertebrates, fish, and stream salamanders. Benthic macroinvertebrates identified within the sample reach included patterned stoneflies, casebuilding caddisflies, flatheaded mayflies, mouthcombed minnow mayflies, water pennies, non-biting midges, aquatic worms and crayfish. Two fantail darters were observed during the site visit. No stream salamanders were observed within the reach during the biological assessment.

Approximately 0.2 acres of proposed environmental covenant/conservation easement have been identified along this section of North Fork Grave Creek within the Roskelly Property. Approximately 363 linear feet of stream are in need of bank stabilization and riparian buffer establishment.



7.2.2.6 Cox Property

The Cox Property contains approximately 137 linear feet of an unnamed perennial tributary to North Fork Grave Creek (NFGC-UNT2). CEC completed one biological assessment (Segment NFGC-7) within the portion of NFGC-UNT2 that is located on the Cox Property. Within the sample reach this stream was characterized by an OHWM width of approximately 8 feet and a bankfull width of approximately 10 feet. Water filled approximately 100 percent of the channel and was approximately 4 to 8 inches deep within the runs and approximately 3 to 4 feet deep in a pool beneath the bridge. The substrates of the stream within the sample reach consisted of cobble, gravel, silt, and sand, with minimal amounts of boulders also present within the riffles. Substrates within the pool consisted primarily of gravel and sand, with minimal amounts of cobble and boulders also present. One hundred percent of the channel was covered with attached algae and slime. Leaf litter/woody debris covered approximately 15 percent of the channel. The USEPA Low Gradient Stream score for the sample reach located along NFGC-UNT2 within the Cox Property was 81/marginal, while the SCI score was 18/poor.

A narrow riparian buffer was present along the left/descending bank. Highway 250 is located approximately 50 feet from the stream. The right/descending bank consisted of a mowed lawn. Both banks were moderately unstable and contained areas of erosion. Benthic macroinvertebrates identified within the sample reach included flatheaded mayflies, square-gilled mayflies (family Caenidae), patterned stoneflies, winter stoneflies, case-building caddisflies, common net-spinner caddisflies, aquatic worms, non-biting midges and crane flies. Fantail darters were also observed during the site visit. No stream salamanders were observed within the sample reach during the biological assessment site visit.

The results of the biological assessment indicate that this portion of the unnamed tributary to North Fork Grave Creek located within the Cox Property is biologically poor and minimally supports benthic macroinvertebrates, fish, and stream salamander communities.

Approximately 0.03 acres of proposed environmental covenant/conservation easement has been identified along NFGC-UNT2 within the Cox Property. Approximately 137 linear feet of stream



are in need of bank stabilization and/or riparian forest planting/native vegetation re-establishment activities within the Cox Property.

7.2.2.7 Scherich Property

The Scherich Property contains approximately 490 linear feet of an unnamed perennial tributary to North Fork Grave Creek (NFGC-UNT2). A biological assessment has not been conducted on the section of NFGC-UNT2 that flows through the Scherich Property. However, the biological assessment completed within NFGC-UNT2 on the Cox Property (Segment NFGC-7) was completed in a very similar reach of this stream as that present on the Scherich Property.

Approximately 0.1 acres of proposed environmental covenant/conservation easement has been identified along NFGC-UNT2 within the Scherich Property. Approximately 490 linear feet of stream are in need of bank stabilization and/or riparian forest planting/native vegetation re-establishment activities within the Scherich Property.

7.2.2.8 Suarez Property

The Suarez Property contains approximately 292 linear feet of an unnamed perennial tributary to North Fork Grave Creek (NFGC-UNT2). A biological assessment has not been conducted on the section of NFGC-UNT2 that flows through the Suarez Property. However, the biological assessment completed within NFGC-UNT2 on the Cox Property (Segment NFGC-7) was completed in a very similar reach of this stream as that present on the Suarez Property.

Approximately 0.1 acres of proposed environmental covenant/conservation easement has been identified along NFGC-UNT2 within the Suarez Property. Approximately 292 linear feet of stream are in need of bank stabilization and/or riparian forest planting/native vegetation re-establishment activities within the Suarez Property.



7.2.2.9 Magers Property

Approximately 1,906 linear feet of perennial stream (North Fork Grave Creek) are present within the Magers Property. CEC conducted one biological stream assessment (Segment NFGC-8) within North Fork Grave Creek on the Magers property. The results of these assessments are provided in Table 9. Segment NFGC-8 was characterized by an OHWM width of approximately 4 feet and a bankfull width of approximately 5 feet. Water filled approximately 75 percent of the channel. The substrates within the sample reach consisted primarily of silt, bedrock, and gravel, with lesser amounts of boulders and cobble also present. Approximately 90 percent of the channel was covered with algae. Leaf litter/woody debris covered approximately 2 percent of the channel. The USEPA Low Gradient Stream score for this section of North Fork Grave Creek was 75/marginal, while the SCI score was 36/poor.

The right/descending bank of this stream consists of open pasture dominated by tall fescue (*Schedonorus phoenix*). The right/descending bank also has several areas of bank instability and erosion due to cattle use. The left/descending bank contains a width of approximately 30 feet of native woodland on an approximate 40 percent slope. Beyond the wooded area land along the left/descending bank is pasture/fallow field. Approximately 45 percent of the left/descending bank within the sample reach was unstable and eroding during the site visit.

The results of the biological assessments indicate that this portion of North Fork Grave Creek located within the Magers Property supports limited benthic macroinvertebrate, fish, and stream salamander communities. Benthic macroinvertebrates identified within the sample reach included: flatheaded mayflies, burrowing mayflies (family Ephemeridae), mouthcombed minnow mayflies, spiny crawler mayflies (family Ephemerellidae), patterned stoneflies, green stoneflies (family Chloroperlidae), winter stoneflies, common netspinner caddisflies, case-builder caddisflies, free-living caddisflies (family Rhyacophilidae), riffle beetles, water pennies, predacious diving beetles (family Dytiscidae), crane flies, non-biting midges, dragonfly larvae as well as crayfish. No fish were observed within the sample reach during the biological assessment site visit, but approximately 30 northern dusky salamanders (one larval and 29 juvenile) were observed within the sample reach.



Approximately 1,906 linear feet of North Fork Grace Creek are in need of stream bank restoration, natural channel design, and riparian forest/native vegetation re-establishment. Fences need to be installed to exclude cattle from the stream and a low water crossing needs to be established. Self-watering troughs will be necessary once cattle no longer have access to the stream.

Approximately 1.1 acres of proposed environmental covenant/conservation easement have been identified within the Magers Property along North Fork Grave Creek.

7.2.2.10 Lilley Property

Approximately 972 linear feet of North Fork Grave Creek and approximately 3,962 linear feet of an unnamed perennial tributary to North Fork Grave Creek (NFGC-UNT3) are located within the Lilley Property. The streams are located within open cattle and/or horse pastures. The streams are incised, there is little to no riparian buffer along the streams, and the banks are unstable and eroding. To date, CEC has not identified the extent of stream mitigation reaches nor has CEC conducted any stream sampling activities within the Lilley Property or received confirmation from the Lilleys regarding their agreement with establishing environmental covenants or conservation easements along the potential mitigation streams located within their properties. CEC is actively coordinating with the WVCA and the Lilleys regarding the details of the stream restoration/mitigation and/or their commitment to allowing CEC and AEP with moving forward with these activities.

7.3 PROPOSED STREAM RESTORATION AND ENHANCEMENT ACTIVITIES

Approximately 17,106 linear feet of perennial and intermittent stream have been identified to date for potential stream restoration and enhancement activities along French Run, North Fork Grave Creek, and unnamed intermittent and perennial tributaries of those streams. Additionally, AEP and CEC will continue to identify and secure other linear footage of stream mitigation areas within the French Run, North Fork Grave Creek, or other drainages in need of stream restoration



activities within Marshall County, West Virginia, in order to obtain the appropriate number of stream mitigation credits (minimum of 8,862 credits) using the SVWM protocol. Mitigation streams and riparian corridors along them will be protected in perpetuity through the establishment of environmental covenants and/or conservation easements.

Based on our cursory review of the potential stream mitigation areas, we anticipate that stream restoration/mitigation activities would be beneficial to the environment by reducing erosion and sediment input, protecting and restoring water quality and wildlife habitat, and minimizing the effects of flooding. Stream restoration and enhancement activities may consist of such activities as bank reshaping and stabilization, installation of a native plant species seed mix and erosion control blankets, installation of live willow stakes or brush layering, installation of exclusion fences, riparian forest planting/re-establishment, and/or the installation of in-stream features such as J-hook vanes and cross vanes. Representative photos of potential mitigation streams identified for restoration and/or enhancement activities are included in Appendix A.

Re-establishment of riparian forest/native vegetation within the riparian corridors along applicable streams will be accomplished by planting tree, shrub, and herbaceous species native to northern West Virginia in the riparian corridors present within the limits of the environmental covenants/conservation easements of applicable streams currently lacking riparian forest and/or native vegetation. A total of approximately 12.5 acres have been identified to date as being included in the riparian forest planting/native vegetation re-establishment areas. A list of tree and shrub species proposed for planting within the applicable riparian corridors was provided in Table 5. A list of the herbaceous species proposed for planting within the applicable riparian corridors was provided in Table 6. The riparian corridor planting areas will be allowed to become natural areas, i.e., there shall be no mowing or other vegetation maintenance activities within these areas except those which are beneficial to remove dead, diseased, or invasive vegetation. Invasive species that are removed shall be replaced with native non-invasive vegetation. The locations of the proposed riparian forest planting/native vegetation re-establishment areas are shown on the Stream Mitigation Areas Maps (Figures 5b through 5d; Figures 7b through 7e) associated with applicable properties containing streams, or portions of



streams, currently lacking forested riparian corridors and/or areas dominated by native vegetation.

Miscellaneous debris, trash, and junk will be removed within applicable portions of the stream mitigation area environmental covenants/conservation easements. A total of approximately 0.5 acres and 413 linear feet of stream channel and/or riparian corridor will be included within the debris removal areas. The locations of the proposed debris/junk/trash removal areas are shown on the Stream Mitigation Areas Maps associated with applicable properties containing streams, or portions of streams, currently containing significant amounts of debris/trash/junk within the mitigation stream channels and/or their riparian corridors.

Environmental covenants or conservation easements will be established and typically centered along the mitigation stream channels, but will vary in width depending upon property boundaries and other anthropogenic restrictions.

Prior to submittal of the final mitigation plan, detailed site civil survey drawings will be prepared to show existing conditions within the stream mitigation areas, as well as proposed conditions within those areas upon completion of the restoration and enhancement activities. These drawings will be included in the final mitigation plan.

The following guidelines will be followed to provide for adequate erosion and sedimentation control measures during stream restoration/mitigation activities specified by this plan:

- Limit the amount of disturbed area exposed at any one time.
- Stabilize disturbed areas by seeding and mulching promptly following completion of grading or land-disturbing activities in the area.
- Adhere to the design plans and specifications contained within the final mitigation plan.
- Install erosion control blankets, silt socks, and other erosion control measures where necessary.
- If areas of significant bank erosion are observed, additional erosion control measures may include bank re-grading and/or installation of erosion control blankets, coir logs, native seed mix, live willow stakes, brush layering, or other suitable erosion control materials.



7.4 SCHEDULE FOR STREAM MITIGATION

It is anticipated that stream mitigation activities identified in this mitigation plan will be initiated upon receipt of Individual CWA 401 WQC from the WVDEP and the Individual CWA Section 404 permit from the USACE. Due to the significant length of stream to be restored and/or enhanced, it is anticipated that bank stabilization, installation of in-stream structures, and planting of native trees, shrubs, and herbaceous species will be completed within approximately 2 years of the date of issuance of the CWA Section 404 Permit from the USACE. AEP will establish the environmental covenants/conservation easements within the stream mitigation properties within 5 years of receipt of the Individual CWA Section 404 Permit from the USACE. AEP will install signage at key locations in the stream mitigation properties within approximately 2 years of receipt of the CWA Section 404 permit from the USACE to indicate that the applicable areas are part of a protected stream mitigation project that prohibits mowing, dumping, or other activities that degrade the stream without prior authorization from the WVDEP and USACE.

Debris removal activities and riparian corridor planting activities will be completed in the applicable stream mitigation areas within approximately 2 years of receipt of the CWA Section 404 Permit from the USACE. It is anticipated that these activities will occur in phases over the course of the approximately 2-year period.

7.5 CONSERVATION OF ON-SITE RESOURCES

AEP will establish environmental covenants or conservation easements within the stream mitigation properties within 5 years of receipt of the Individual CWA Section 404 Permit from the USACE, in order to protect the mitigation areas in perpetuity. AEP will install exclusionary fencing around the stream mitigation areas, where applicable, to protect the mitigation areas from livestock grazing, defecating, or trampling activities, which could lead to further stream degradation. AEP will install signage at key locations in the stream mitigation properties within approximately 2 years of receipt of the CWA Section 404 permit from the USACE to indicate that the applicable areas are part of a protected stream mitigation project that prohibits mowing,



dumping, or other activities that degrade the stream without prior authorization from the WVDEP and USACE.

It is the intention of AEP to identify parties, which may include AEP itself, which will be responsible for long-term management of the environmental covenants/conservation easements established within the properties to ensure the environmental covenants/conservation easements remain protected in perpetuity. Those parties responsible for long-term management of the mitigation areas and their environmental covenants/conservation easements will be outlined in the final mitigation plan.



8.0 MONITORING AND MAINTENANCE PLAN

8.1 STREAM MITIGATION MONITORING

Stream mitigation monitoring will be conducted during the growing season for a period of 5 years. USEPA and USACE data forms will be completed during years 2, 4, and 5 for the stream mitigation areas. Specific monitoring data to be collected will be in accordance with the WVDEP CWA Section 401 WQC conditions as well as the USACE CWA Section 404 Permit conditions. The results will be reported by December 31st of each year of the monitoring events to both the WVDEP and the USACE. The first annual report will be completed by December 31st of the first full year following initiation of stream restoration and enhancement activities. The stream mitigation monitoring reports will contain the following, at a minimum:

- Drawings of the as-built streams updated during the 2nd and 5th years. The drawings will show existing conditions within the stream restoration and enhancement areas, in order to demonstrate the stability of stream banks, stream channels, and in-stream features installed within those locations, as applicable. The drawings will also show water level elevations, riparian corridor planting areas, and areas where fences and/or signs have been installed. Actual vegetation present in the buffer zone will also be shown. These drawings will be included within the years 2 and 5 mitigation monitoring reports.
- Tree and shrub planting, survivorship, and density information for the riparian corridor planting areas. A representative number of the planted trees and shrubs will be marked with uniquely numbered metal tree tags and the location of each marked tree and shrub will be recorded with a sub-meter accuracy Trimble GeoXT Global Positioning System (GPS) unit. The health and survivorship of each of the marked trees and shrubs will be recorded during each of the annual monitoring events. The height of the planted and marked trees and shrubs will be recorded, in addition to the diameter of their trunks, during years 2, 4, and 5 of the mitigation monitoring and maintenance period.
- Herbaceous species sampling plot data for the riparian corridor planting/establishment areas. An appropriate number of 1 m x 1 m sampling plots will be established within the riparian corridor planting/native vegetation re-establishment areas. The southwest corner of each of these sampling plots will be marked with metal rebar or other semi-permanent markers and the location of each sampling plot will be recorded with a Trimble GeoXT GPS unit. The herbaceous species sampling plots will be sampled during years 2, 4, and 5 of the mitigation monitoring and maintenance period.
- Documentation of the establishment of conservation easements/environmental covenants within the mitigation areas.



- Documentation of the installation of conservation easement/environmental covenant signage installed within the mitigation areas.
- Current contact information for the permittee, agent, and conservation easements holders/owners or entity responsible for long-term oversight of the environmental covenants.
- A summary of current mitigation status as compared to the previous year's monitoring information and/or as compared to the mitigation success criteria with the current report including graphs and/or tables showing trends, etc.
- The Year 1 mitigation monitoring report will include a full copy of the final USACE CWA Section 404 permit and final CWA Section 401 WQC Permit.
- USACE and USEPA forms for the stream mitigation areas will be completed during years 2, 4, and 5, and compared against baseline data collected by CEC in 2011 and 2012 within the mitigation streams.
- Observed deficiencies and/or corrective actions.
- Each mitigation monitoring report will include photographs collected as follows:
 - An adequate number of fixed photograph points will be selected within the stream mitigation areas, to provide representative overviews of the stream mitigation areas.
 - The fixed photograph points will be staked, assigned permanent/unique numbers, and their locations will be recorded with a Trimble GeoXT GPS unit and shown on base maps.
 - Photographs will be taken from the fixed photograph points at the same position and angle during the growing season of each monitoring year.
 - Representative photographs of conservation easement/environmental covenant signage.
 - Information regarding areas where bank erosion or other significant instability issues are observed.
 - Information regarding the stability and status of the in-stream features (cross vanes, J-hook vanes, etc.) installed within the mitigation streams.
 - Additional photographs will be taken of areas of interest within the stream mitigation areas, including plant communities, pools, areas dominated by invasive species, unvegetated areas, erosional areas, unstable banks, developing shrub/forest areas, wildlife usage, conservation easement/environmental covenant encroachments, sediment deposition, floodplain development, habitat development, etc. These additional photographs will be marked on the base maps and provided in the annual mitigation monitoring reports.



8.2 ANNUAL MITIGATION UPDATE REPORTS

Annual mitigation update reports will be submitted to the WVDEP and USACE by December 31 of each year until the mitigation is complete. The first annual mitigation update report will be submitted at the end of the first full calendar year after implementation of the mitigation activities. Based on the anticipated CWA Section 401 WQC permit conditions and anticipated CWA Section 404 permit conditions, the following information will be included in each annual mitigation update report:

- The status of mitigation required for the Project, including payment of in-lieu fees for wetland mitigation (and payment of in-lieu fees for stream mitigation, if applicable) and the filing of the required conservation easements/environmental covenants.
- Mitigation activity start dates, completion dates, or expected start/completion dates.
- A discussion of the extent to which the mitigation has been completed according to the timelines outlined in the CWA Section 401 WQC permit and CWA Section 404 permit.
- Current contact information for responsible parties, including the permittee, agent, environmental covenant/conservation easement holder, and environmental covenant/conservation easement owner.

8.3 STREAM MITIGATION MAINTENANCE

Initial stream mitigation maintenance will be conducted for a period of 5 years. On a minimum biannual basis, AEP/AEP's authorized contractor and/or the WVCA will review the mitigation areas. During these site visits, AEP/AEP's authorized contractor and/or the WVCA will verify that the conservation easement/environmental covenant signs are still in place and in reasonably good condition. AEP/AEP's authorized contractor and/or the WVCA will conduct a pedestrian reconnaissance of the mitigation areas to verify that no significant infestations of non-native/invasive species have become established and to verify that no mowing or other vegetation clearing activities are taking place within the limits of the conservation easement/environmental covenant areas. If significant infestations of non-native/invasive species are found to be present within the conservation/environmental covenant areas, AEP/AEP's authorized contractor will remove those plants and replace them with appropriate native species seed mix and/or appropriate native trees/shrubs, if necessary. If mowing or other



vegetation clearing activities, other than removal of invasive species, is found to be occurring within the conservation easement/environmental covenant areas, AEP will be notified immediately and AEP/AEP's authorized contractor will install additional temporary "do not mow/do not disturb" signage to discourage such activities.

Also during these mitigation review site visits, AEP/AEP's authorized contractor and/or the WVCA will observe the stream channels, stream banks, installed in-stream features, installed fences, stream/upland drainage feature confluences, and other applicable areas of potential concern. If areas of significant bank erosion are noted within the stream mitigation areas, AEP/AEP's authorized contractor and/or the WVCA, will restore those stream banks and stabilize them with appropriate erosion control materials, such as erosion control blankets, coir logs, live willow stakes, brush layering etc. If areas of significant erosion are observed in the vicinity of culverts or stream/upland drainage feature confluences, AEP/AEP's authorized contractor and/or the WVCA, restore and stabilize those areas using the most appropriate method practicable.

AEP will replace planted trees and shrubs that die, where necessary, within the riparian forest planting/native vegetation re-establishment areas in order to meet the success criteria of a minimum density of 200 living/healthy native trees and shrubs per acre at the end of the mitigation monitoring period. Additionally, AEP will plant additional quantities of the native seed mix specified in Table 6, if necessary, in order to meet the success criteria of 75 percent or greater of the vegetation within the stream mitigation monitoring plots consisting of planted and/or native species. If areas of severe bank erosion are noted within the stream mitigation areas, AEP will restore those stream banks and stabilize them with appropriate erosion control materials, such as erosion control blankets, coir logs, live willow stakes, brush layering etc.

If significant amounts (greater than 10 percent areal cover) of invasive/non-native species [such as Amur honeysuckle (*Lonicera maackii*), Japanese knotweed, autumn olive (*Eleagnus umbellata*), Japanese honeysuckle (*Lonicera japonica*), etc.] are found within the riparian forest planting/native vegetation re-establishment areas during the mitigation monitoring period, AEP will remove the invasive species to the extent practicable and replace them with native trees and



shrubs outlined in Table 5, where necessary, in order to meet the success criteria of a minimum density of 200 living/healthy native trees and shrubs per acre and/or 75 percent or greater of the vegetation consisting of planted and/or native species at the end of the mitigation monitoring period.



9.0 ADAPTIVE MANAGEMENT PLAN

It is anticipated that the proposed mitigation will meet the desired performance standards; however, if this does not occur, the conditions will be noted in the annual mitigation monitoring reports and corrective actions will be taken to correct problems.

If the stream mitigation areas within the aforementioned properties do not meet the success criteria defined in this plan and attempts to correct deficiencies have failed, then AEP will coordinate with the agencies to first attempt to create additional restoration or enhancement activities within the stream mitigation areas before finding replacement mitigation sites. Changes or additions to the planned mitigation activities will be coordinated through the USACE and WVDEP. If the USACE and WVDEP determine that the mitigation activities are unsuccessful based on the success criteria outlined in this mitigation plan, AEP will coordinate with these agencies to determine if other mitigation activities need to be undertaken.

AEP will replace planted trees and shrubs that die, where necessary, within the riparian forest planting/native vegetation re-establishment areas in order to meet the success criteria of a minimum density of 200 living/healthy native trees and shrubs per acre at the end of the mitigation monitoring period. Additionally, AEP will plant additional quantities of the native seed mix specified in Table 6, if necessary, in order to meet the success criteria of 75 percent or greater of the vegetation within the stream mitigation monitoring plots consisting of planted and/or native species. If areas of severe bank erosion are noted within the stream mitigation areas, AEP will restore those stream banks and stabilize them with appropriate erosion control materials, such as erosion control blankets, coir logs, live willow stakes, brush layering etc.

If significant amounts (greater than 10 percent areal cover) of invasive/non-native species [such as Amur honeysuckle, Japanese knotweed, autumn olive, Japanese honeysuckle, etc.] are found within the riparian forest planting/native vegetation re-establishment areas during the mitigation monitoring period, AEP will remove the invasive species to the extent practicable and replace them with native trees and shrubs outlined in Table 5 or the native herbaceous species seed mix outlined in Table 6, where necessary, in order to meet the success criteria.



10.0 SUMMARY AND CONCLUSIONS

This mitigation plan has been prepared to describe the stream and wetland mitigation proposed as compensation for impacts to streams that will result from the development of the proposed AEP Mitchell Landfill Project located in Marshall County, near Cresap, West Virginia.

Nineteen jurisdictional streams totaling approximately 8,710 linear feet, (3,761 linear feet of ephemeral stream and 4,949 linear feet of intermittent stream), are proposed to be impacted by the Project (Figure 2). Using the SWVM, this equates to approximately 8,862 stream impact debits. The streams will be impacted as a result of their location within the Project area and the proposed limits of construction. To obtain a minimum of 8,862 stream mitigation credits using the SWVM, AEP proposes to restore/enhance an appropriate number of linear feet of perennial and intermittent stream within the French Run, North Fork Grave Creek, and other applicable watersheds within Marshall County, West Virginia. To date, AEP has not identified and secured a sufficient number of linear feet of stream mitigation to obtain the minimum of 8,862 stream mitigation credits using the SWVM. However, AEP will continue to work with CEC and the WVCA to identify additional landowners in Marshall County that are willing to allow stream mitigation activities and the establishments of environmental covenants/conservation easements on their properties in order to obtain the minimum number of stream mitigation credits using the SWVM. It is possible that some of these credits may be obtained through the payment of in-lieu fees to the WVDEP, if this is determined to be acceptable to the USACE and WVDEP.

Approximately 0.01 acre of PEM wetland will be impacted by the proposed Project (Figure 2). To mitigate for the loss of this wetland, AEP will pay in-lieu fees in the amount of \$1,200 to the WVDEP. This in-lieu fee amount was determined using the SWVM protocol (WVIRT 2010).

The stream mitigation areas will be protected in perpetuity through the establishment of environmental covenants/conservation easements along the mitigation streams. Streams located within active livestock pastures will be fenced to exclude livestock from the mitigation areas. Streams not located within livestock pastures will have conservation signage installed to exclude such activities as mowing, tree and shrub removal, damage from vehicles, etc.



Riparian corridors with native vegetation will be established along applicable streams by planting tree, shrub, and herbaceous species native to northern West Virginia in the riparian corridors present within the limits of the environmental covenants/conservation easements of applicable streams currently lacking native riparian vegetation.

Removal of junk, trash, and other miscellaneous debris will take place within applicable stream channels and/or their riparian corridors. The acreage and number of linear feet of stream where these activities will take place will be identified in the final mitigation plan.

The width of the environmental covenants/conservation easements will be variable. However, the majority of the mitigation streams will be placed within a minimum 50-foot wide environmental covenant/conservation easement centered along the stream channel.



12.0 REFERENCES

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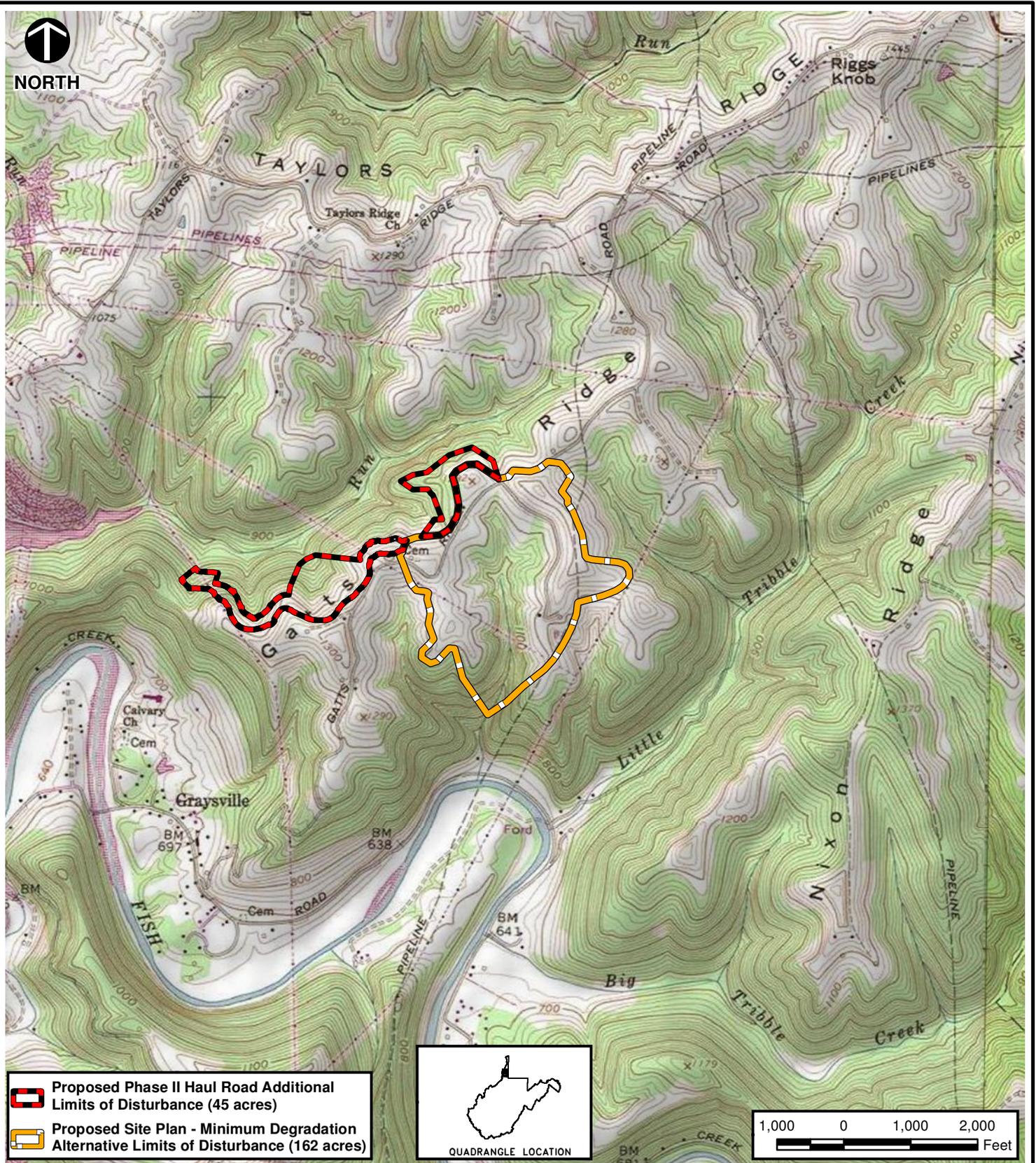
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FIGURES



NORTH



- Proposed Phase II Haul Road Additional Limits of Disturbance (45 acres)
- Proposed Site Plan - Minimum Degradation Alternative Limits of Disturbance (162 acres)



SOURCE: PORTION OF THE USGS 7.5-MINUTE SERIES TOPOGRAPHIC QUADRANGLE MAPS - GLEN EASTON, WV - 1978 AND POWHATAN POINT, WV - 1978.



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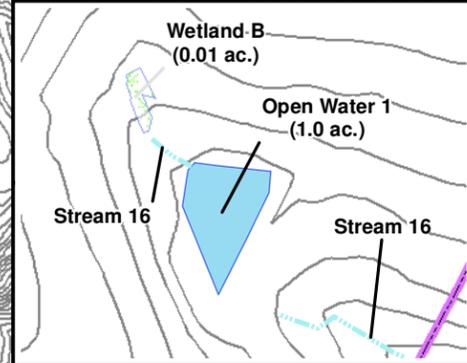
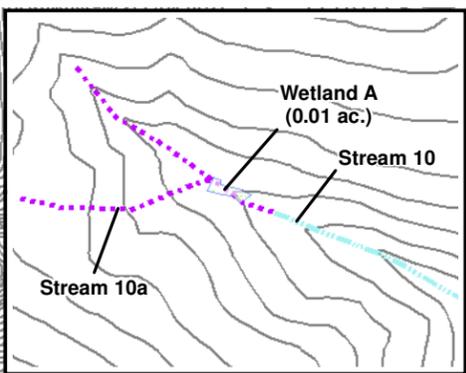
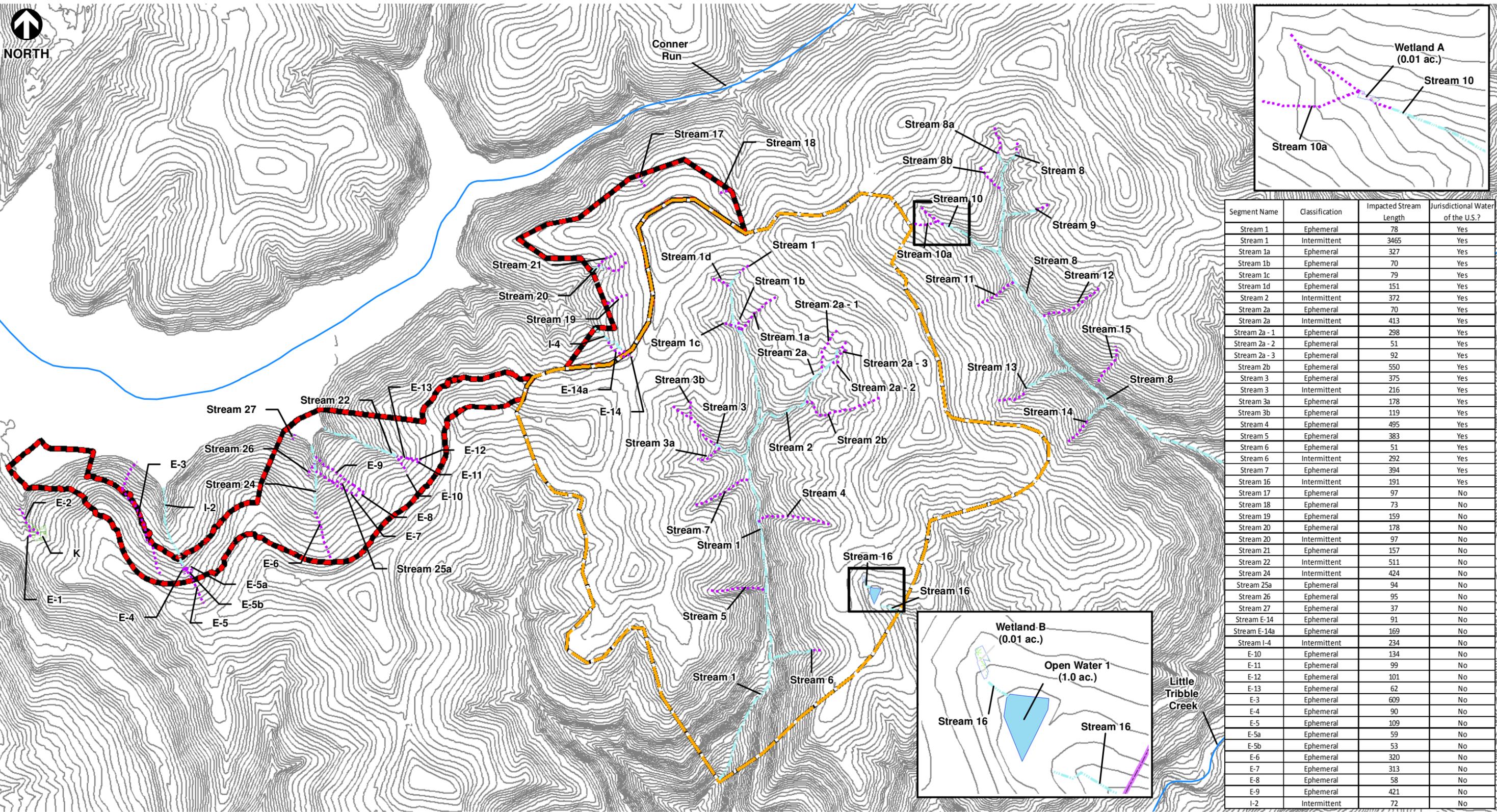
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SITE LOCATION MAP

DRAWN BY: MJB	CHECKED BY: DJG	APPROVED BY: JEZ*	FIGURE NO: 1
DATE: APRIL 18, 2012	DWG SCALE: 1" = 2,000'	PROJECT NO: 110-416.8000	

Signature on File *



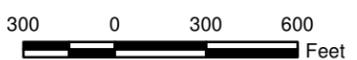
Segment Name	Classification	Impacted Stream Length	Jurisdictional Water of the U.S.?
Stream 1	Ephemeral	78	Yes
Stream 1	Intermittent	3465	Yes
Stream 1a	Ephemeral	327	Yes
Stream 1b	Ephemeral	70	Yes
Stream 1c	Ephemeral	79	Yes
Stream 1d	Ephemeral	151	Yes
Stream 2	Intermittent	372	Yes
Stream 2a	Ephemeral	70	Yes
Stream 2a	Intermittent	413	Yes
Stream 2a - 1	Ephemeral	298	Yes
Stream 2a - 2	Ephemeral	51	Yes
Stream 2a - 3	Ephemeral	92	Yes
Stream 2b	Ephemeral	550	Yes
Stream 3	Ephemeral	375	Yes
Stream 3	Intermittent	216	Yes
Stream 3a	Ephemeral	178	Yes
Stream 3b	Ephemeral	119	Yes
Stream 4	Ephemeral	495	Yes
Stream 5	Ephemeral	383	Yes
Stream 6	Ephemeral	51	Yes
Stream 6	Intermittent	292	Yes
Stream 7	Ephemeral	394	Yes
Stream 16	Intermittent	191	Yes
Stream 17	Ephemeral	97	No
Stream 18	Ephemeral	73	No
Stream 19	Ephemeral	159	No
Stream 20	Ephemeral	178	No
Stream 20	Intermittent	97	No
Stream 21	Ephemeral	157	No
Stream 22	Intermittent	511	No
Stream 24	Intermittent	424	No
Stream 25a	Ephemeral	94	No
Stream 26	Ephemeral	95	No
Stream 27	Ephemeral	37	No
Stream E-14	Ephemeral	91	No
Stream E-14a	Ephemeral	169	No
Stream I-4	Intermittent	234	No
E-10	Ephemeral	134	No
E-11	Ephemeral	99	No
E-12	Ephemeral	101	No
E-13	Ephemeral	62	No
E-3	Ephemeral	609	No
E-4	Ephemeral	90	No
E-5	Ephemeral	109	No
E-5a	Ephemeral	59	No
E-5b	Ephemeral	53	No
E-6	Ephemeral	320	No
E-7	Ephemeral	313	No
E-8	Ephemeral	58	No
E-9	Ephemeral	421	No
I-2	Intermittent	72	No

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- Intermittent Stream
- Ephemeral Stream
- Open Water
- Wetland Feature
- Wetland Features (Stantec 2011)
- Proposed Phase II Haul Road Additional Limits of Disturbance (45 acres)
- Proposed Site Plan - Minimum Degradation Alternative Limits of Disturbance (162 acres)

NOTES:
 - All CEC stream locations are approximate and based off of topographic interpretation from the AutoCAD file titled - "ML_ConnerRun&Plant_11-10-10_8388SF.dwg", June 26, 2011, and GPS data collected during CEC's August 11-15, 2011, February 14, 15, & 28, and March 20 & 21, 2012 wetland and waterbody delineation site visits.
 - Streams E-1, E-2 and Wetland K shown within Stantec's Phase II Haul Road Stream and Wetland Study Area are for informational purposes only and have not been verified by CEC.

SOURCE: PORTION OF THE ESRI ARCGIS ONLINE MAPPING SERVICE - "WORLD_IMAGERY" - AERIALS EXPRESS - "NORTHERNWV2010" COLOR AERIAL MOSAIC, 2010.



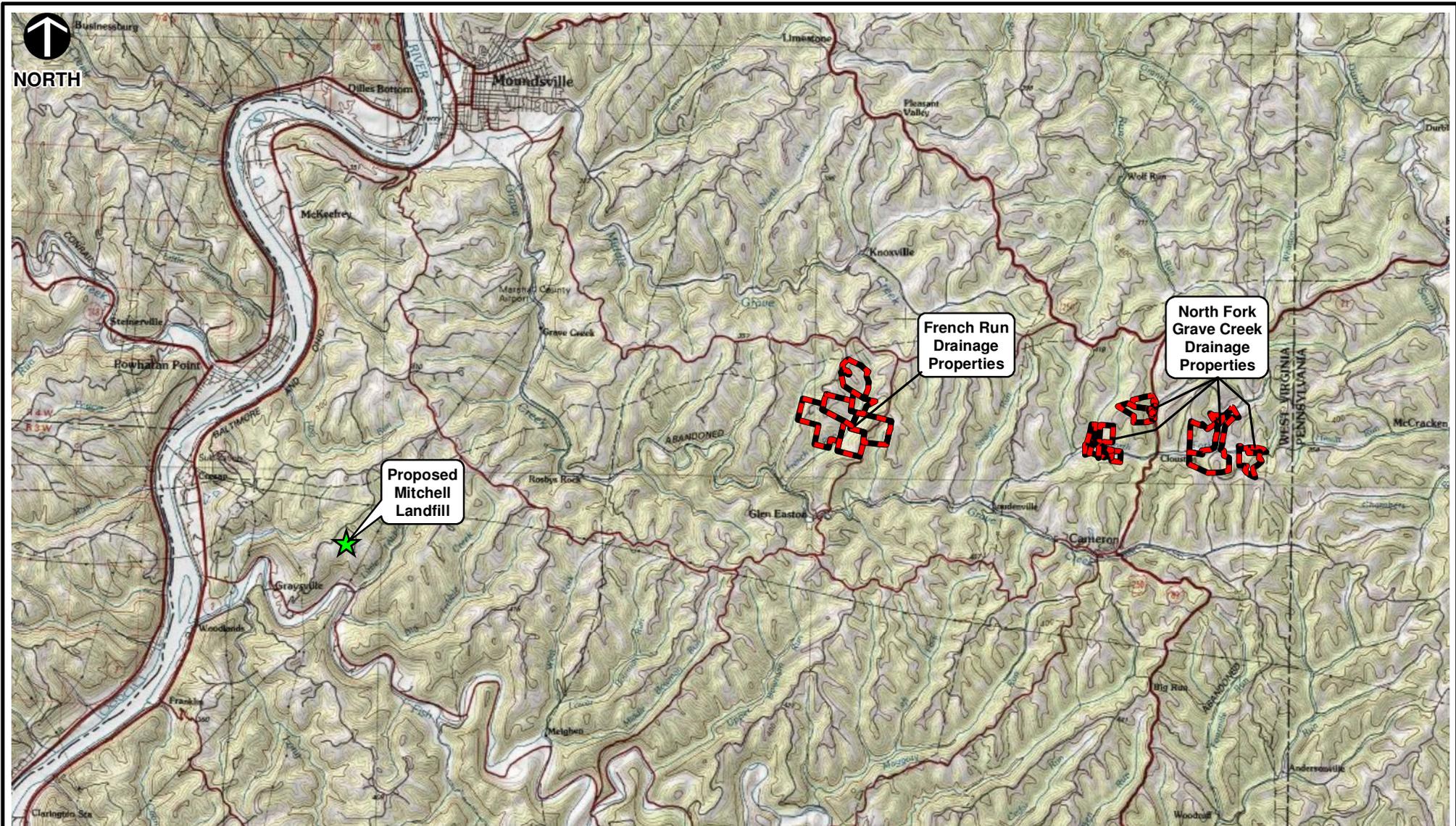
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STREAM IMPACT MAP - PROPOSED SITE PLAN/MINIMUM DEGRADATION ALTERNATIVE

DRAWN BY: MJB CHECKED BY: DJG
 DATE: APRIL 18, 2012 DWG SCALE: 1" = 600'

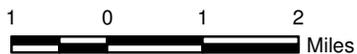
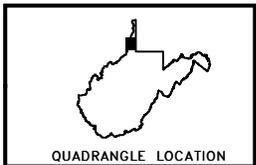
APPROVED BY: JEZ* FIGURE NO: 2
 PROJECT NO: 110-416.8400

Signature on File *



SOURCE: PORTION OF THE USGS 7.5-MINUTE SERIES TOPOGRAPHIC QUADRANGLE MAPS - BUSINESSBURG, OH/WV - 1978, CAMERON, WV/PA - 1977, GLEN EASTON, WV - 1978, LANSING, OH - 1985, MAJORSVILLE, WV/PA - 1976, MOUNDSVILLE, WV/OH - 1978, POWHATAN POINT, WV - 1978, VALLEY GROVE, WV/PA - 1982, AND WHEELING, WV/OH - 1985.

 Proposed Properties for Mitigation



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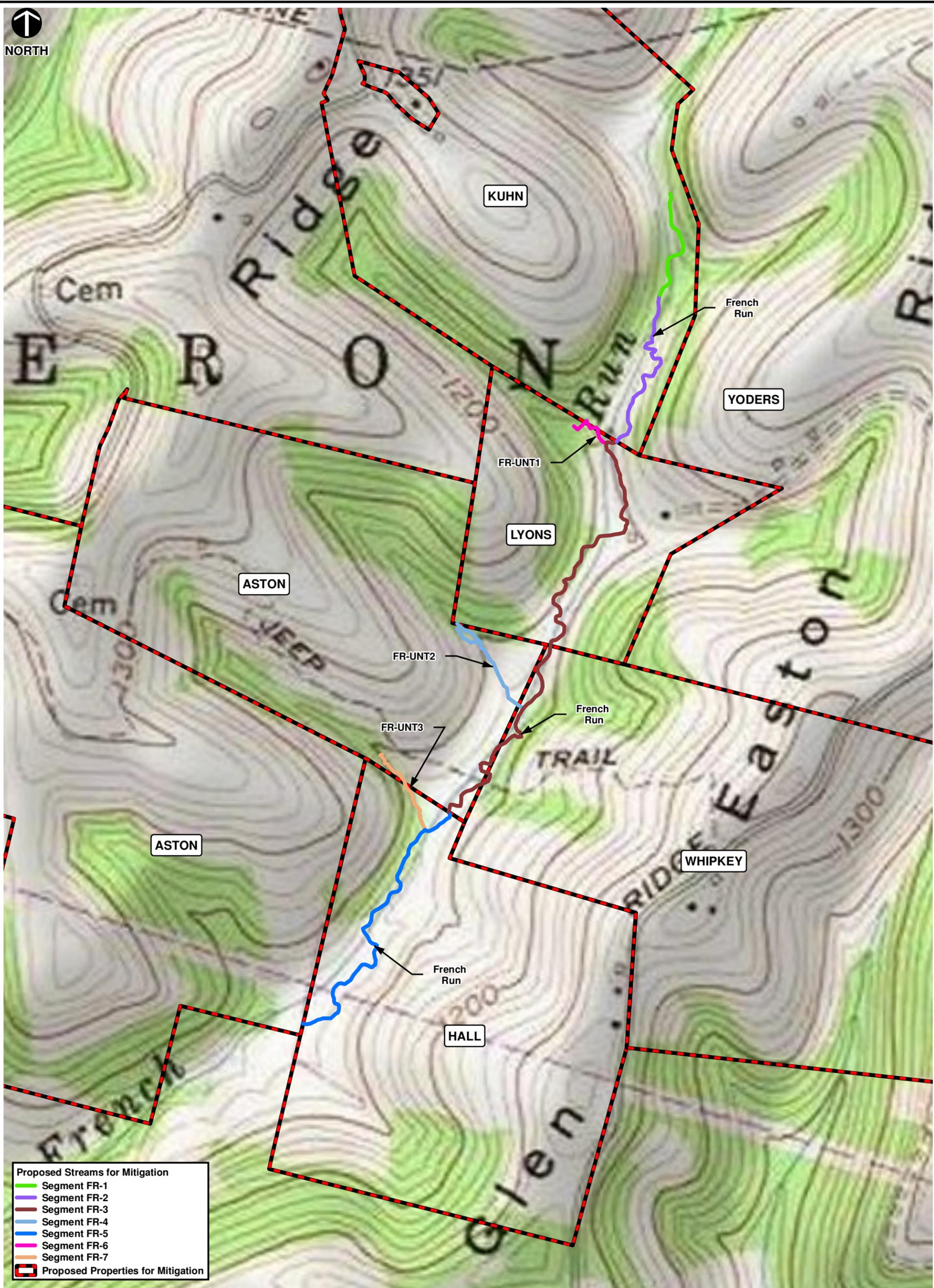
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POTENTIAL MITIGATION
AREA OVERVIEW MAP

DRAWN BY:	MJB	CHECKED BY:	DJG	APPROVED BY:	JEZ*
DATE:	APRIL 18, 2012	DWG SCALE:	1" = 2 miles	PROJECT NO:	110-416.8000

FIGURE NO:

3



SOURCE: PORTION OF THE USGS 7.5-MINUTE SERIES TOPOGRAPHIC QUADRANGLE MAP - GLEN EASTON, WV - 1978.



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POTENTIAL STREAM MITIGATION AREA
 MAP - FRENCH RUN DRAINAGE

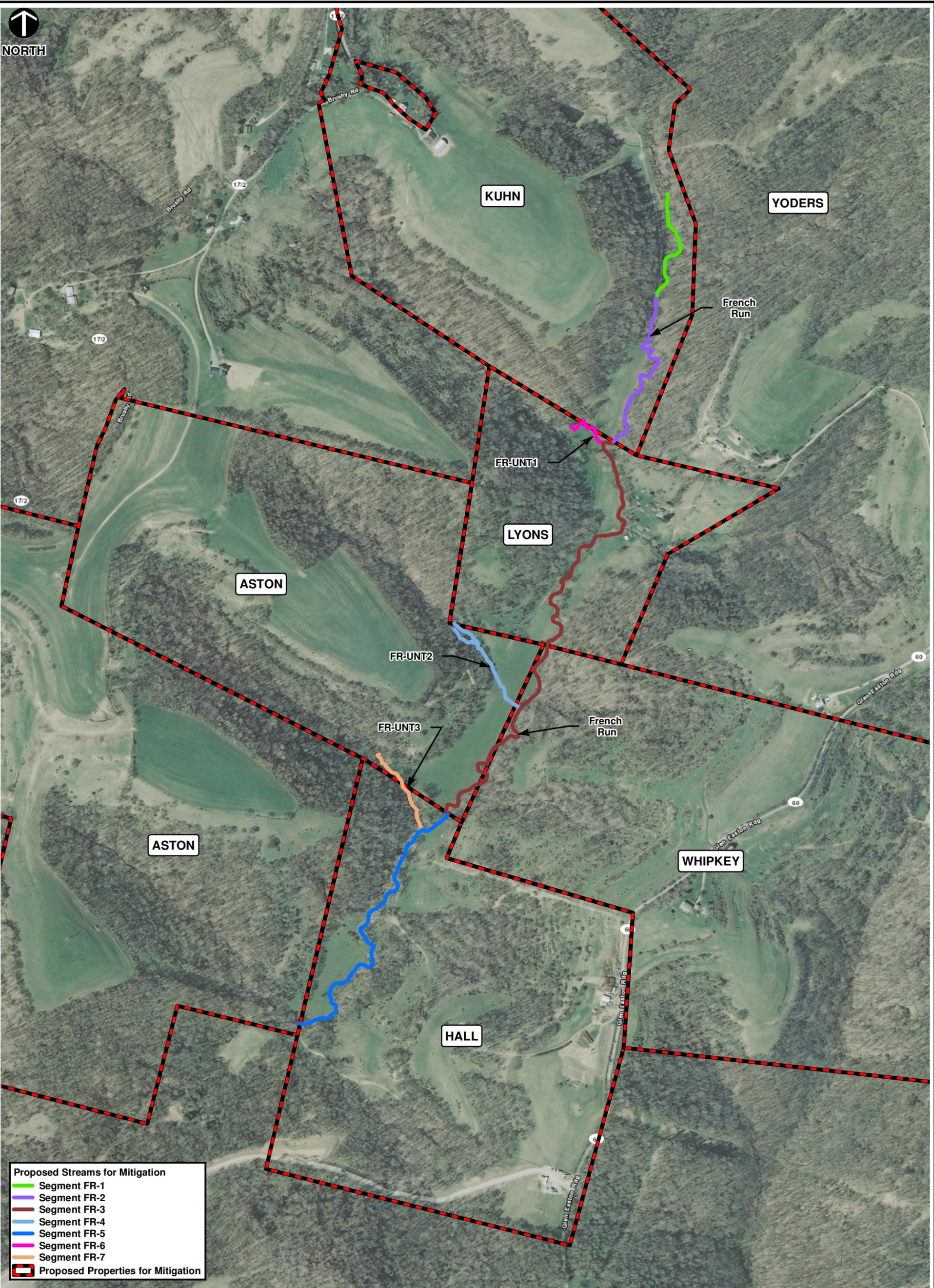
NOTE:
 Property Boundaries are to be assumed approximate until an official property survey is conducted.



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DATE: APRIL 18, 2012	DWG SCALE: 1" = 500'	PROJECT NO: 110-416.8500	

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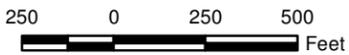
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- Proposed Streams for Mitigation**
- Segment FR-1
 - Segment FR-2
 - Segment FR-3
 - Segment FR-4
 - Segment FR-5
 - Segment FR-6
 - Segment FR-7
 - Proposed Properties for Mitigation

SOURCE: PORTION OF THE ESRI ARCGIS ONLINE MAPPING SERVICE - "WORLD_IMAGERY" - AERIALS EXPRESS - "NORTHERNWV2010" COLOR AERIAL MOSAIC, 2010.

NOTE:
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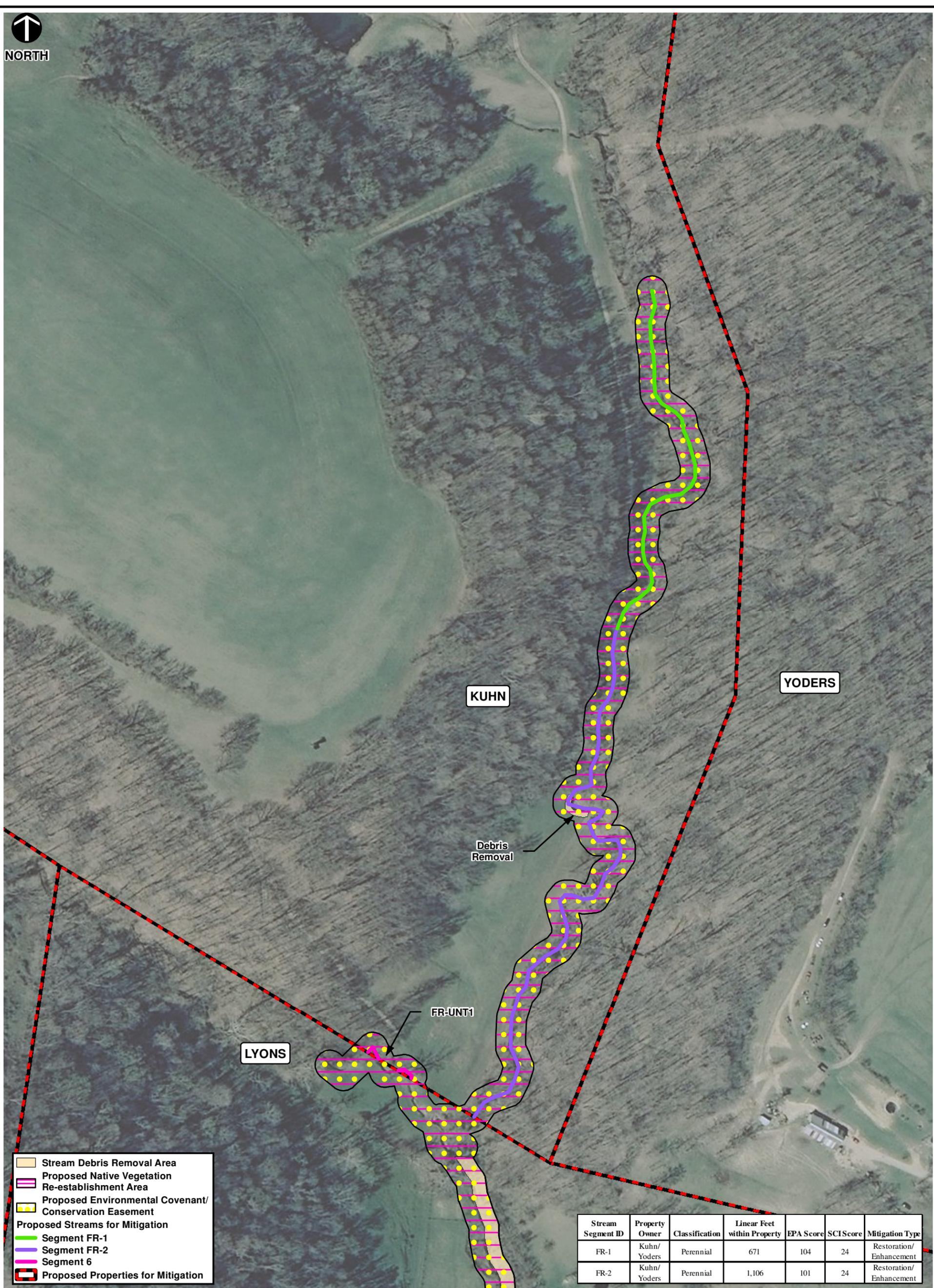
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MARSHALL COUNTY, WEST VIRGINIA
POTENTIAL STREAM MITIGATION AREA
MAP - FRENCH RUN DRAINAGE

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DATE: APRIL 18, 2012	DWG SCALE: 1" = 500'	PROJECT NO: 110-416.8500	

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NORTH



-  Stream Debris Removal Area
-  Proposed Native Vegetation Re-establishment Area
-  Proposed Environmental Covenant/Conservation Easement
- Proposed Streams for Mitigation**
-  Segment FR-1
-  Segment FR-2
-  Segment 6
-  Proposed Properties for Mitigation

Stream Segment ID	Property Owner	Classification	Linear Feet within Property	EPA Score	SCIScore	Mitigation Type
FR-1	Kuhn/Yoders	Perennial	671	104	24	Restoration/Enhancement
FR-2	Kuhn/Yoders	Perennial	1,106	101	24	Restoration/Enhancement

SOURCE: PORTION OF THE ESRI ARCGIS ONLINE MAPPING SERVICE - "WORLD_IMAGERY" - AERIALS EXPRESS - "NORTHERNWX2010" COLOR AERIAL MOSAIC, 2010.

NOTE:
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POTENTIAL STREAM MITIGATION AREA
MAP - FRENCH RUN DRAINAGE

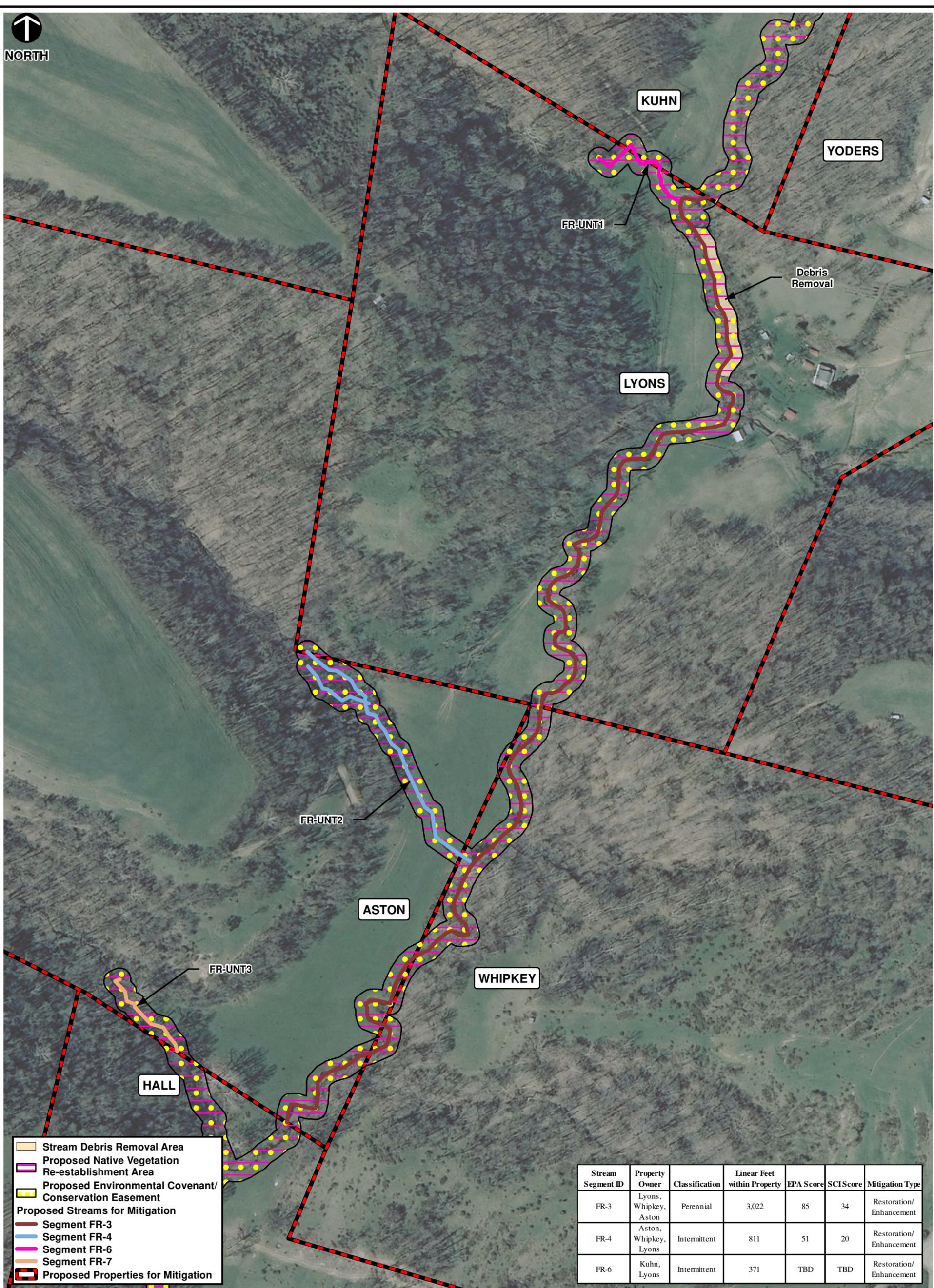
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- Stream Debris Removal Area
- Proposed Native Vegetation Re-establishment Area
- Proposed Environmental Covenant/Conservation Easement
- Proposed Streams for Mitigation**
- Segment FR-3
- Segment FR-4
- Segment FR-6
- Segment FR-7
- Proposed Properties for Mitigation

Stream Segment ID	Property Owner	Classification	Linear Feet within Property	EPA Score	SCIScore	Mitigation Type
FR-3	Lyons, Whipkey, Aston	Perennial	3,022	85	34	Restoration/Enhancement
FR-4	Aston, Whipkey, Lyons	Intermittent	811	51	20	Restoration/Enhancement
FR-6	Kuhn, Lyons	Intermittent	371	TBD	TBD	Restoration/Enhancement

SOURCE: PORTION OF THE ESRI ARCGIS ONLINE MAPPING SERVICE - "WORLD_IMAGERY" - AERIALS EXPRESS - "NORTHERNWV2010" COLOR AERIAL MOSAIC, 2010.

NOTE:
Property Boundaries are to be assumed approximate until an official property survey is conducted.



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POTENTIAL STREAM MITIGATION AREA
MAP - FRENCH RUN DRAINAGE

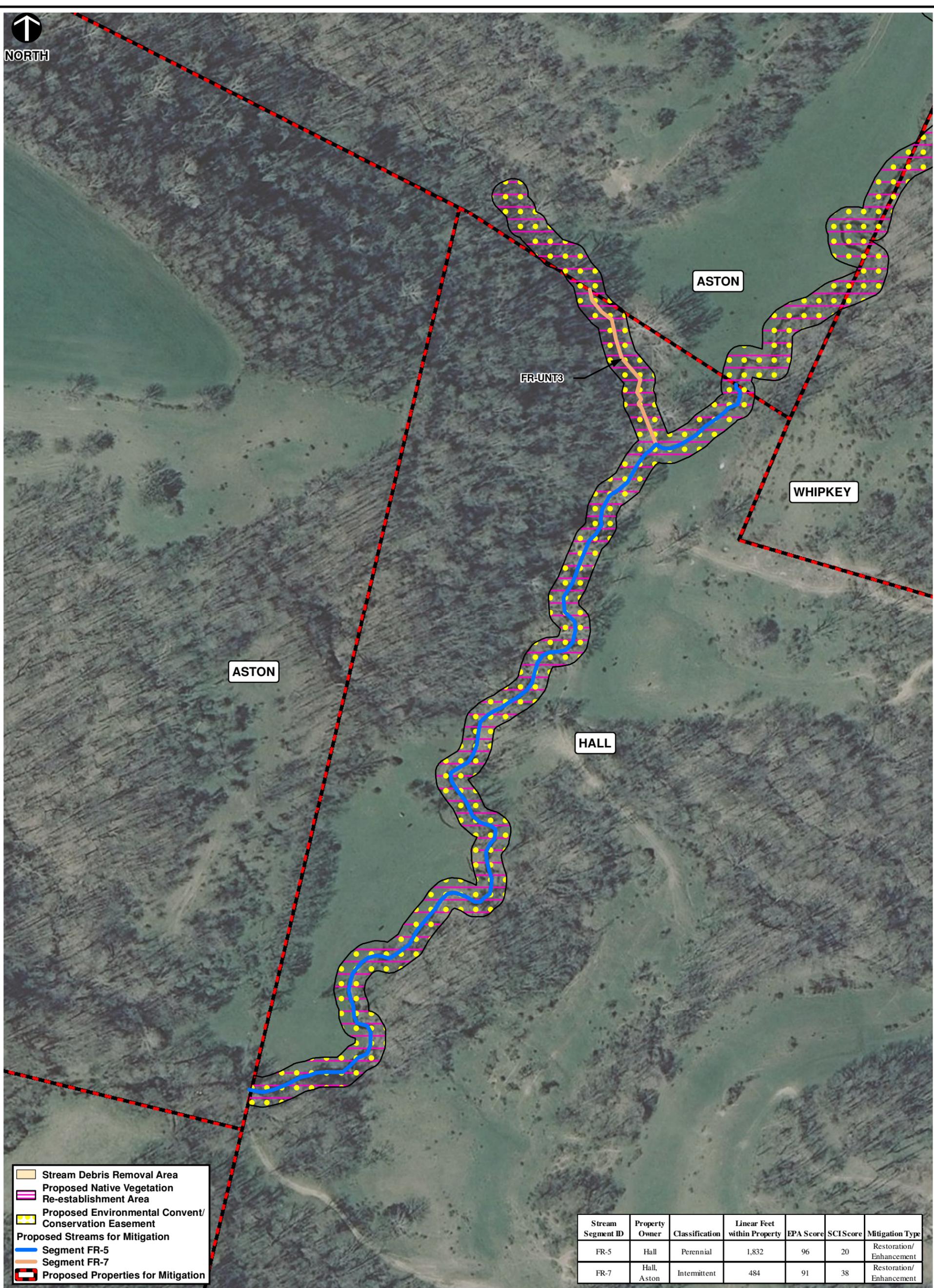
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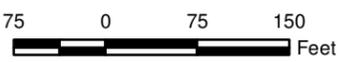


- Stream Debris Removal Area
- Proposed Native Vegetation Re-establishment Area
- Proposed Environmental Convent/Conservation Easement
- Proposed Streams for Mitigation**
- Segment FR-5
- Segment FR-7
- Proposed Properties for Mitigation

Stream Segment ID	Property Owner	Classification	Linear Feet within Property	EPA Score	SCIScore	Mitigation Type
FR-5	Hall	Perennial	1,832	96	20	Restoration/Enhancement
FR-7	Hall, Aston	Intermittent	484	91	38	Restoration/Enhancement

SOURCE: PORTION OF THE ESRI ARCGIS ONLINE MAPPING SERVICE - "WORLD_IMAGERY" - AERIALS EXPRESS - "NORTHERN WV 2010" COLOR AERIAL MOSAIC, 2010.

NOTE:
Property Boundaries are to be assumed approximate until an official property survey is conducted.



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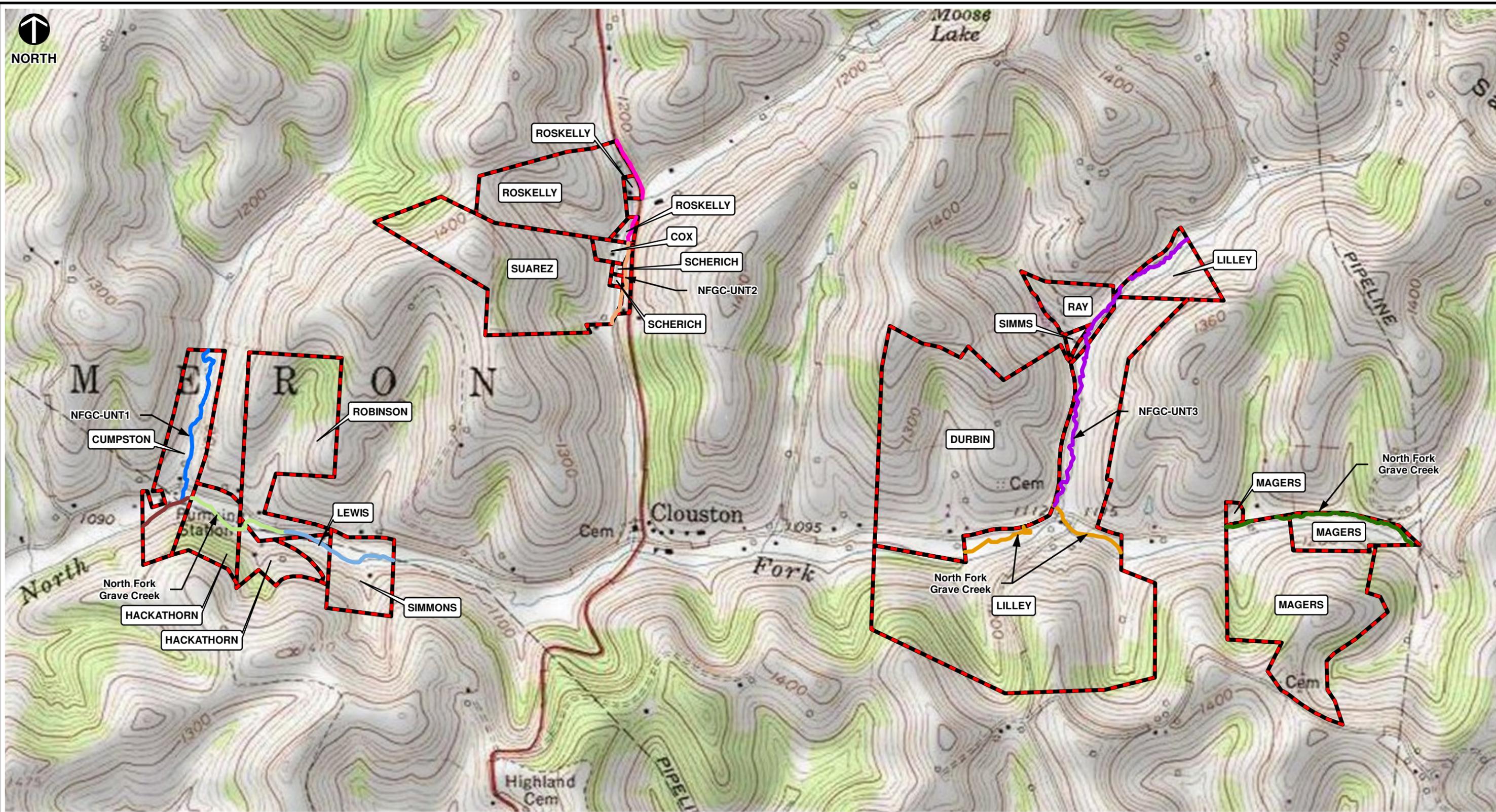
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MARSHALL COUNTY, WEST VIRGINIA

POTENTIAL STREAM MITIGATION AREA
MAP - FRENCH RUN DRAINAGE

DRAWN BY: MJB	CHECKED BY: DJG	APPROVED BY: JEZ*	FIGURE NO: 5D
DATE: APRIL 18, 2012	DWG SCALE: 1" = 150'	PROJECT NO: 110-416.8500	

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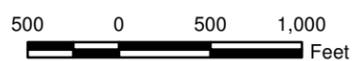
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- Proposed Streams for Mitigation Proposed Properties for Mitigation
- Segment NFGC-1
 - Segment NFGC-3
 - Segment NFGC-4
 - Segment NFGC-5
 - Segment NFGC-6
 - Segment NFGC-7
 - Segment NFGC-8
 - Segment NFGC-9
 - Segment NFGC-10

NOTE:
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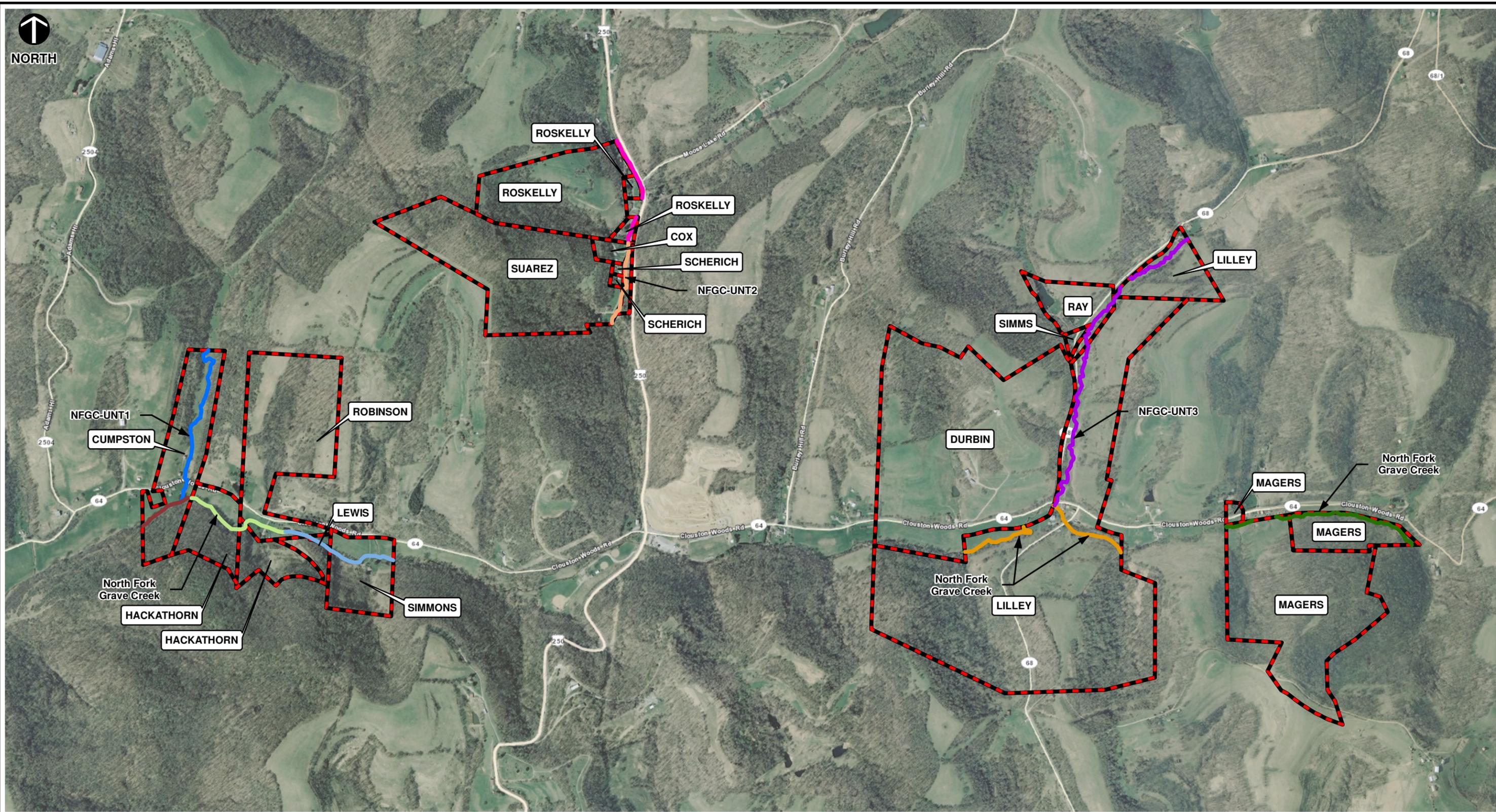
SOURCE: PORTION OF THE USGS 7.5-MINUTE SERIES TOPOGRAPHIC QUADRANGLE MAPS - CAMERON, WV/PA - 1977.

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<p>POTENTIAL STREAM MITIGATION AREA MAP - NORTH FORK GRAVE CREEK DRAINAGE</p>		<p>POTENTIAL STREAM MITIGATION AREA MAP - NORTH FORK GRAVE CREEK DRAINAGE</p>	
<p>DRAWN BY: MJB DATE: APRIL 18, 2012</p>	<p>CHECKED BY: DJG DWG SCALE: 1" = 1,000'</p>	<p>APPROVED BY: JEZ*</p> <p>PROJECT NO: 110-416.8500</p>	<p>FIGURE NO: 6</p> <p>Signature on File *</p>



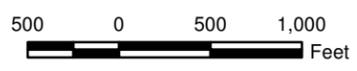
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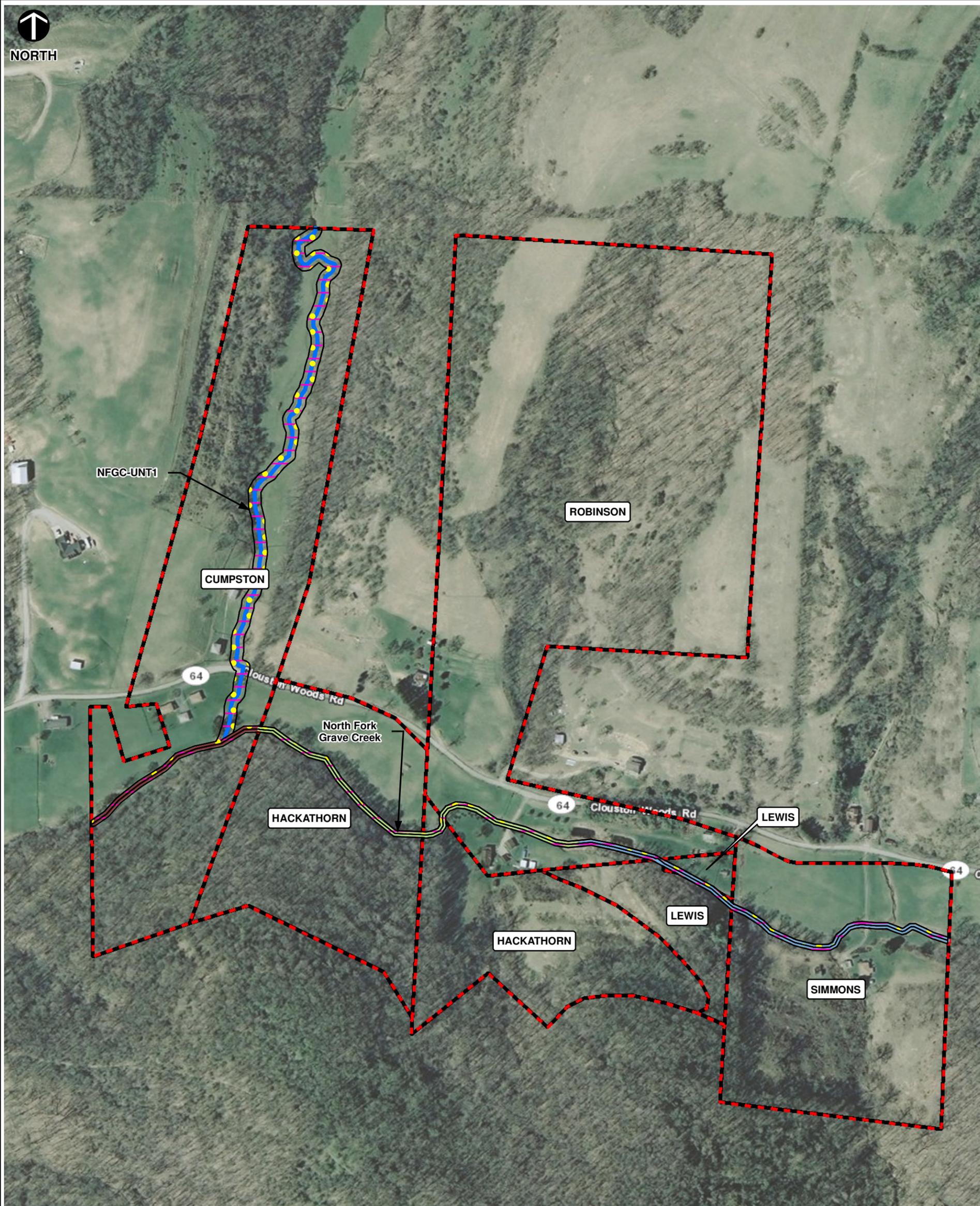
- Proposed Streams for Mitigation  Proposed Properties for Mitigation
-  Segment NFGC-1
 -  Segment NFGC-3
 -  Segment NFGC-4
 -  Segment NFGC-5
 -  Segment NFGC-6
 -  Segment NFGC-7
 -  Segment NFGC-8
 -  Segment NFGC-9
 -  Segment NFGC-10

NOTE:
Property Boundaries are to be assumed approximate until an official property survey is conducted.



SOURCE: PORTION OF THE USGS 7.5-MINUTE SERIES TOPOGRAPHIC QUADRANGLE MAPS - CAMERON, WV/PA - 1977.

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Civil & Environmental Consultants, Inc. 4274 Glendale-Milford Road - Cincinnati, OH 45242 513-985-0226 - 800-759-5614 www.cecinc.com		POTENTIAL STREAM MITIGATION AREA MAP - NORTH FORK GRAVE CREEK DRAINAGE	
DRAWN BY: MJB	CHECKED BY: DJG	APPROVED BY: JEZ*	FIGURE NO: 7A
DATE: APRIL 18, 2012	DWG SCALE: 1" = 1,000'	PROJECT NO: 110-416.8500	Signature on File *



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- | | |
|---|--|
| Stream Debris Removal Area | Proposed Streams for Mitigation |
| Proposed Native Vegetation Re-establishment Area | Segment NFGC-1 |
| Proposed Environmental Covenant/Conservation Easement | Segment NFGC-3 |
| Proposed Properties for Mitigation | Segment NFGC-4 |
| | Segment NFGC-5 |

Stream Segment ID	Property Owner	Classification	Linear Feet within Property	EPA Score	SCI Score	Mitigation Type
NFGC-1	Hackathorn	Perennial	1,230	92	22	Restoration/Enhancement
NFGC-3	Cumpston	Perennial	620	92	14	Restoration/Enhancement
NFGC-4	Lewis, Simmons, Robinson	Perennial	1,297	115	28	Restoration/Enhancement
NFGC-5	Cumpston	Perennial	1,917	75	30	Restoration/Enhancement

SOURCE: PORTION OF THE ESRI ARCGIS ONLINE MAPPING SERVICE - "WORLD_IMAGERY" - AERIALS EXPRESS - "NORTHERNWV2010" COLOR AERIAL MOSAIC, 2010.

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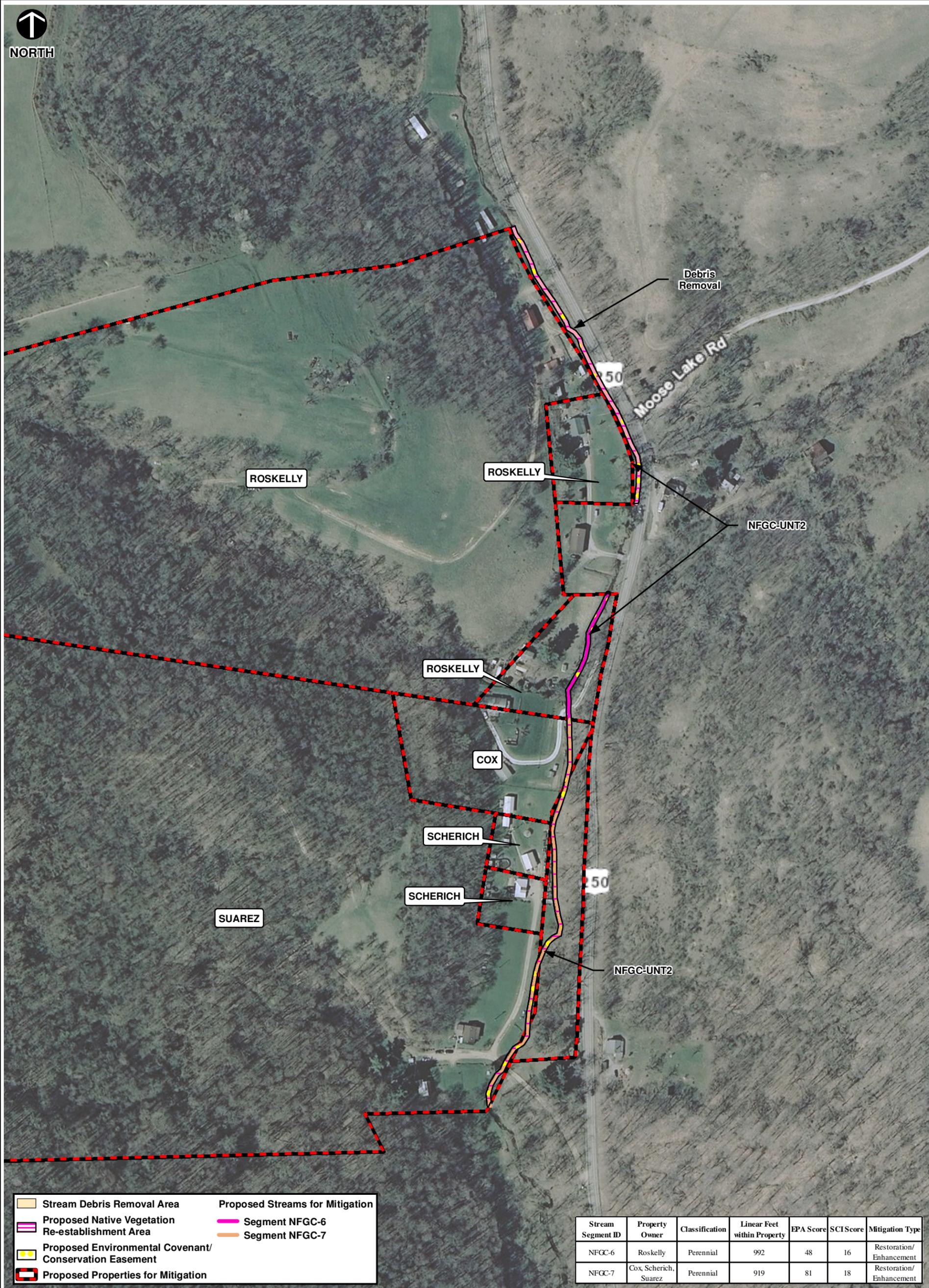
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DATE:	APRIL 16, 2012	DWG SCALE:	1" = 300'

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**POTENTIAL STREAM MITIGATION AREA
MAP - NORTH FORK GRAVE CREEK DRAINAGE**

APPROVED BY:	JEZ*	FIGURE NO:
PROJECT NO:	110-416.8500	7B

Signature on File



Stream Debris Removal Area	Proposed Native Vegetation Re-establishment Area	Proposed Streams for Mitigation
Proposed Environmental Covenant/Conservation Easement	Segment NFGC-6	Segment NFGC-7
Proposed Properties for Mitigation		

Stream Segment ID	Property Owner	Classification	Linear Feet within Property	EPA Score	SCI Score	Mitigation Type
NFGC-6	Roskelly	Perennial	992	48	16	Restoration/Enhancement
NFGC-7	Cox, Scherich, Suarez	Perennial	919	81	18	Restoration/Enhancement

SOURCE: PORTION OF THE ESRI ARCGIS ONLINE MAPPING SERVICE - "WORLD_IMAGERY" - AERIALS EXPRESS - "NORTHERNWV2010" COLOR AERIAL MOSAIC, 2010.

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GATTS RIDGE ROAD
MARSHALL COUNTY, WEST VIRGINIA
POTENTIAL STREAM MITIGATION AREA
MAP - NORTH FORK GRAVE CREEK DRAINAGE

APPROVED BY: JEZ*	FIGURE NO: 7C
PROJECT NO: 110-416.8500	

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NORTH



Stream Segment ID	Property Owner	Classification	Linear Feet within Property	EPA Score	SCI Score	Mitigation Type
NFGC-8	Magers	Perennial	1906	75	32	Restoration/Enhancement

SOURCE: PORTION OF THE ESRI ARCGIS ONLINE MAPPING SERVICE - "WORLD_IMAGERY" - AERIALS EXPRESS - "NORTHERNWV2010" COLOR AERIAL MOSAIC, 2010.

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- Stream Debris Removal Area
- Proposed Environmental Covenant/Conservation Easement
- Proposed Native Vegetation Re-establishment Area
- Proposed Properties for Mitigation
- Proposed Streams for Mitigation Segment NFGC-8

NOTE:
Property Boundaries are to be assumed approximate until an official property survey is conducted.

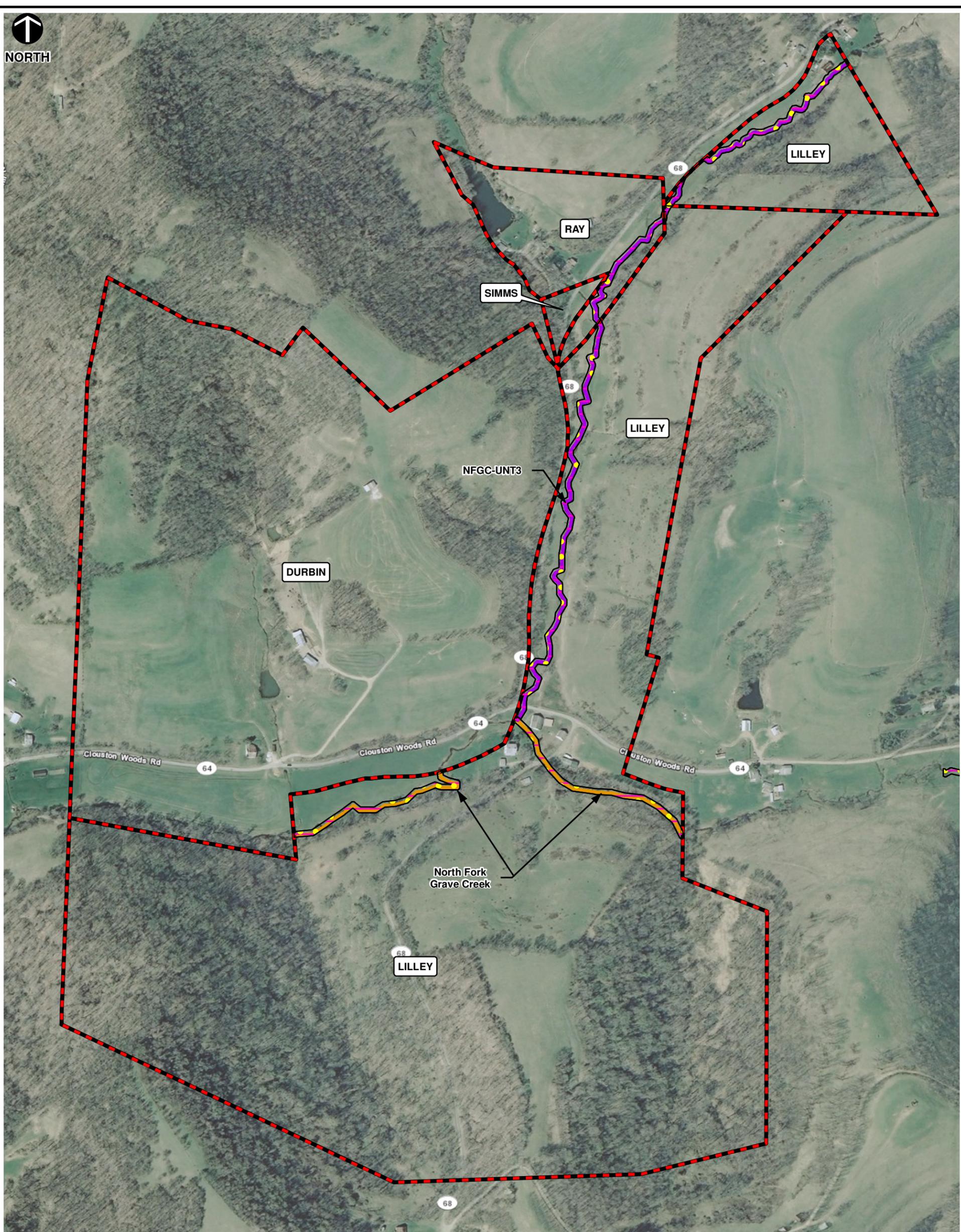


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MAP - NORTH FORK GRAVE CREEK DRAINAGE		FIGURE NO: 7D	
DRAWN BY: MJB	CHECKED BY: DJG	APPROVED BY: JEZ*	PROJECT NO: 110-416.8500
DATE: APRIL 18, 2012	DWG SCALE: 1" = 300'		

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	Stream Debris Removal Area		Proposed Streams for Mitigation
	Proposed Environmental Covenant/ Conservation Easement		Strm_Sgmnt Segment NFGC-9
	Proposed Native Vegetation Re-establishment Area		Segment NFGC-10
	Proposed Properties for Mitigation		

Stream Segment ID	Property Owner	Classification	Linear Feet within Property	EPA Score	SCI Score	Mitigation Type
NFGC-9	Lilley	TBD	3962	TBD	TBD	Restoration/ Enhancement
NFGC-10	Lilley	TBD	972	TBD	TBD	Restoration/ Enhancement

SOURCE: PORTION OF THE ESRI ARCGIS ONLINE MAPPING SERVICE - "WORLD_IMAGERY" - AERIALS EXPRESS - "NORTHERNWV2010" COLOR AERIAL MOSAIC, 2010.

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POTENTIAL STREAM MITIGATION AREA
MAP - NORTH FORK GRAVE CREEK DRAINAGE

DRAWN BY: MJB	CHECKED BY: DJG	APPROVED BY: JEZ*	FIGURE NO:
DATE: APRIL 18, 2012	DWG SCALE: 1" = 400'	PROJECT NO: 110-416.8500	7E

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APPENDIX A

PHOTOGRAPHS OF POTENTIAL STREAM MITIGATION AREAS



**FRENCH RUN DRAINAGE POTENTIAL STREAM MITIGATION AREA
PHOTOGRAPHS**



Photograph 1. View of French Run at stream assessment Segment FR-1. Photograph taken facing upstream.



Photograph 2. View of French Run at stream assessment Segment FR-1. Photograph taken facing downstream.

American Electric Power Co., Inc.
French Run Drainage Properties Potential Stream Mitigation Areas
Marshall County, West Virginia
CEC Project No. 110-416
Photographs Taken on January 25 and 26, 2012, and March 1, 2012



Photograph 3. View of French Run at stream assessment Segment FR-2. Photograph taken facing upstream.



Photograph 4. View of French Run at stream assessment Segment FR-2. Photograph taken facing downstream.

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French Run Drainage Properties Potential Stream Mitigation Areas
Marshall County, West Virginia
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Photographs Taken on January 25 and 26, 2012, and March 1, 2012



Photograph 5. View of tires used for bank stabilization within French Run. Photograph taken facing downstream.



Photograph 6. View of tires along French Run. Photograph taken facing southeast.

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French Run Drainage Properties Potential Stream Mitigation Areas
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Photographs Taken on January 25 and 26, 2012, and March 1, 2012



Photograph 7. View of unnamed tributary to French Run (FR-UNT1) within the Lyons Property.
Photograph taken facing downstream.



Photograph 8. View of unnamed tributary to French Run (FR-UNT1) within the Lyons Property.
Photograph taken facing upstream.

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Photographs Taken on January 25 and 26, 2012, and March 1, 2012



Photograph 9. View of unnamed tributary to French Run (FR-UNT1) within the Lyons Property.
Photograph taken facing downstream.



Photograph 10. View of unnamed tributary to French Run (FR-UNT1) within the Lyons
Property. Photograph taken facing downstream.

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Photographs Taken on January 25 and 26, 2012, and March 1, 2012



Photograph 11. View of the upstream side of a culvert within unnamed tributary to French Run (FR-UNT1) on the Lyons Property. Photograph taken facing downstream.



Photograph 12. View of a road crossing through unnamed tributary to French Run (FR-UNT1) located on the Lyons Property. Photograph taken facing south.

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Photographs Taken on January 25 and 26, 2012, and March 1, 2012



Photograph 13 View of the downstream side of the culvert within unnamed tributary to French Run (FR-UNT1) located on the Lyons Property. Photograph taken facing southwest.



Photograph 14. View of the confluence of unnamed tributary to French Run (FR-UNT1) and French Run on the Lyons Property. Photograph taken facing downstream.

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Photographs Taken on January 25 and 26, 2012, and March 1, 2012



Photograph 15. View of French Run within the Lyons Property. Photograph taken facing downstream.



Photograph 16. View of garbage located on the left/descending bank of French Run within the Lyons Property. Photograph taken facing southeast.

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French Run Drainage Properties Potential Stream Mitigation Areas
Marshall County, West Virginia
CEC Project No. 110-416
Photographs Taken on January 25 and 26, 2012, and March 1, 2012



Photograph 17. View of garbage located on the left/descending bank of French Run within the Lyons Property. Photograph taken facing east/southeast.



Photograph 18. View of French Run at stream assessment Segment FR-3 on the Lyons Property. Photograph taken facing upstream.

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French Run Drainage Properties Potential Stream Mitigation Areas
Marshall County, West Virginia
CEC Project No. 110-416
Photographs Taken on January 25 and 26, 2012, and March 1, 2012



Photograph 19. View of French Run at stream assessment Segment FR-3 on the Lyons Property. Photograph taken facing downstream.



Photograph 20. View of unnamed tributary to French Run (FR-UNT2) at stream assessment Segment FR-4 on the Aston Property. Photograph taken facing upstream.



Photograph 21. View of unnamed tributary to French Run (FR-UNT2) at stream assessment Segment FR-4 on the Aston Property. Photograph taken facing downstream.



Photograph 22. View of unnamed tributary to French Run (FR-UNT2) upstream of stream assessment Segment FR-4 on the Aston Property. Photograph taken facing upstream.



Photograph 23. View of unnamed tributary to French Run (FR-UNT2) upstream of stream assessment Segment FR-4 on the Aston Property. Photograph taken facing downstream.



Photograph 24. View of unnamed tributary to French Run (FR-UNT2) upstream of stream assessment Segment FR-4 on the Aston Property. Photograph taken facing upstream.



Photograph 25. View of unnamed tributary to French Run (FR-UNT2) upstream of stream assessment Segment FR-4. Photograph taken facing upstream.



Photograph 26. View of unnamed tributary to French Run (FR-UNT2) upstream of stream assessment Segment FR-4. Photograph taken facing downstream.



Photograph 27. View of French Run at stream assessment Segment FR-5. Photograph taken facing upstream.



Photograph 27. View of French Run at stream assessment Segment FR-5. Photograph taken facing downstream.

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French Run Drainage Properties Potential Stream Mitigation Areas
Marshall County, West Virginia
CEC Project No. 110-416
Photographs Taken on January 25 and 26, 2012, and March 1, 2012



Photograph 28. View of unnamed tributary to French Run (FR-UNT3) at stream assessment Segment FR-7. Photograph taken facing upstream.



Photograph 29. View of unnamed tributary to French Run (FR-UNT3) at stream assessment Segment FR-7. Photograph taken facing downstream.

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French Run Drainage Properties Potential Stream Mitigation Areas
Marshall County, West Virginia
CEC Project No. 110-416
Photographs Taken on January 25 and 26, 2012, and March 1, 2012



Photograph 30. View of unnamed tributary to French Run (FR-UNT3) on the Hall Property upstream of stream assessment Segment FR-7. Photograph taken facing downstream.



Photograph 31. View of unnamed tributary to French Run (FR-UNT3) on the Hall Property upstream of stream assessment Segment FR-7. Photograph taken facing downstream.



Photograph 32. View of unnamed tributary to French Run (FR-UNT3) on the Hall Property at stream assessment Segment FR-7. Photograph taken facing downstream.



Photograph 33. View of unnamed tributary to French Run (FR-UNT3) on the Hall Property at stream assessment Segment FR-7. Photograph taken facing upstream.



Photograph 34. View of sediment laden runoff within French Run at stream assessment Segment FR-5. Photograph taken facing upstream.



Photograph 35. View of sediment laden runoff within French Run at stream assessment Segment FR-5. Photograph taken facing downstream.

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French Run Drainage Properties Potential Stream Mitigation Areas
Marshall County, West Virginia
CEC Project No. 110-416
Photographs Taken on January 25 and 26, 2012, and March 1, 2012



**NORTH FORK GRAVE CREEK DRAINAGE POTENTIAL STREAM
MITIGATION AREA PHOTOGRAPHS**



Photograph 1. View of North Fork Grave Creek within the Hackathorn Property at stream assessment Segment NFGC-1. Photograph taken facing upstream.



Photograph 2. View of North Fork Grave Creek within the Hackathorn Property at stream assessment Segment NFGC-1. Photograph taken facing downstream.

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North Fork Grave Creek Drainage Properties Potential Stream Mitigation Areas
Marshall County, West Virginia
CEC Project No. 110-416

Photographs Taken on January 19, 2012, February 6 - 7, 16, and 28, 2012, March 1, 2012 and April 12, 2012



Photograph 3. View of North Fork Grave Creek within the Cumpston Property at stream assessment Segment NFGC-3. Photograph taken facing upstream.



Photograph 4. View of North Fork Grave Creek within the Cumpston Property at stream assessment Segment NFGC-3. Photograph taken facing downstream.

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Photographs Taken on January 19, 2012, February 6 - 7, 16, and 28, 2012, March 1, 2012 and April 12, 2012



Photograph 5. View of the left/descending bank of North Fork Grave Creek within the Cumpston Property at stream assessment Segment NFGC-3. Photograph taken facing south.



Photograph 6. View of the right/descending bank of North Fork Grave Creek within the Cumpston Property at stream assessment Segment NFGC-3. Photograph taken facing north.

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Marshall County, West Virginia
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Photographs Taken on January 19, 2012, February 6 - 7, 16, and 28, 2012, March 1, 2012 and April 12, 2012



Photograph 7. View of the confluence of unnamed tributary to North Fork Grave Creek (NFGC-UNT1) and North Fork Grave Creek within the Cumpston Property. Photograph taken facing upstream above stream assessment Segment NFGC-3.



Photograph 8. View of confluence of unnamed tributary to North Fork Grave Creek (NFGC-UNT1) and North Fork Grave Creek within the Cumpston Property. Photograph taken facing downstream above stream assessment Segment NFGC-3.

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Photographs Taken on January 19, 2012, February 6 - 7, 16, and 28, 2012, March 1, 2012 and April 12, 2012



Photograph 9. View of unnamed tributary to North Fork Grave Creek (NFGC-UNT1) within the Cumpston Property. Photograph taken facing upstream.



Photograph 10. View of powerline right-of-way crossing North Fork Grave Creek on the Cumpston Property. Photograph taken facing south.

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North Fork Grave Creek Drainage Properties Potential Stream Mitigation Areas
Marshall County, West Virginia
CEC Project No. 110-416

Photographs Taken on January 19, 2012, February 6 - 7, 16, and 28, 2012, March 1, 2012 and April 12, 2012



Photograph 11. View of North Fork Grave Creek at the Hackathorn/Cumpston Property line. Photograph taken facing upstream.



Photograph 12. View of unnamed tributary to North Fork Grave Creek (NFGC-UNT1) within open pasture on the Cumpston Property. Photograph taken facing downstream.

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North Fork Grave Creek Drainage Properties Potential Stream Mitigation Areas
Marshall County, West Virginia
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Photographs Taken on January 19, 2012, February 6 - 7, 16, and 28, 2012, March 1, 2012 and April 12, 2012



Photograph 13. View of unnamed tributary to North Fork Grave Creek (NFGC-UNT1) within open pasture on the Cumpston Property. Photograph taken facing downstream.



Photograph 14. View of unnamed tributary to North Fork Grave Creek (NFGC-UNT1) within open pasture on the Cumpston Property. Photograph taken facing downstream.

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North Fork Grave Creek Drainage Properties Potential Stream Mitigation Areas
Marshall County, West Virginia
CEC Project No. 110-416

Photographs Taken on January 19, 2012, February 6 - 7, 16, and 28, 2012, March 1, 2012 and April 12, 2012



Photograph 15. View of unnamed tributary to North Fork Grave Creek (NFGC-UNT1) within open pasture on the Cumpston Property at stream assessment Segment NFGC-5. Photograph taken facing downstream.



Photograph 16. View of unnamed tributary to North Fork Grave Creek (NFGC-UNT1) within open pasture on the Cumpston Property at stream assessment Segment NFGC-5. Photograph taken facing upstream.

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North Fork Grave Creek Drainage Properties Potential Stream Mitigation Areas
Marshall County, West Virginia
CEC Project No. 110-416

Photographs Taken on January 19, 2012, February 6 - 7, 16, and 28, 2012, March 1, 2012 and April 12, 2012



Photograph 17. View of an unnamed tributary to North Fork Grave Creek (NFGC-UNT1) within open pasture on the Cumpston Property at stream assessment Segment NFGC-5. Photograph taken facing downstream.



Photograph 18. View of unnamed tributary to North Fork Grave Creek (NFGC-UNT1) within open pasture on the Cumpston Property at stream assessment location Segment NFGC-5. Photograph taken facing upstream.

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North Fork Grave Creek Drainage Properties Potential Stream Mitigation Areas
Marshall County, West Virginia
CEC Project No. 110-416

Photographs Taken on January 19, 2012, February 6 - 7, 16, and 28, 2012, March 1, 2012 and April 12, 2012



Photograph 19. View of unnamed tributary to North Fork Grave Creek (NFGC-UNT1) at Clouston Woods Road. Photograph taken facing downstream.



Photograph 20. View of North Fork Grave Creek within the Lewis Property at stream assessment Segment NFGC-4. Photograph taken facing upstream.

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North Fork Grave Creek Drainage Properties Potential Stream Mitigation Areas
Marshall County, West Virginia
CEC Project No. 110-416

Photographs Taken on January 19, 2012, February 6 - 7, 16, and 28, 2012, March 1, 2012 and April 12, 2012



Photograph 21. View of North Fork Grave Creek within the Lewis Property at stream assessment Segment NFGC-4. Photograph taken facing downstream.



Photograph 22. View of pond located on the Lewis Property adjacent to North Grave Creek. Photograph taken facing west and downstream.

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North Fork Grave Creek Drainage Properties Potential Stream Mitigation Areas
Marshall County, West Virginia
CEC Project No. 110-416

Photographs Taken on January 19, 2012, February 6 - 7, 16, and 28, 2012, March 1, 2012 and April 12, 2012



Photograph 23. View of North Fork Grave Creek within the Lewis Property at stream assessment Segment NFGC-4. The right/descending bank is covered with the invasive Japanese knotweed. Photograph taken facing upstream.



Photograph 24. View of one of the ponds located adjacent to North Fork Grave Creek on the Lewis Property. Photograph taken facing west.

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North Fork Grave Creek Drainage Properties Potential Stream Mitigation Areas
Marshall County, West Virginia
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Photographs Taken on January 19, 2012, February 6 - 7, 16, and 28, 2012, March 1, 2012 and April 12, 2012



Photograph 25. View of unnamed tributary to North Fork Grave Creek (NFGC-UNT2) at stream assessment Segment NFGC-7 within the Cox Property. Photograph taken facing upstream.



Photograph 26. View of unnamed tributary to North Fork Grave Creek (NFGC-UNT2) at stream assessment Segment NFGC-7 within the Cox Property. Photograph taken facing downstream.

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North Fork Grave Creek Drainage Properties Potential Stream Mitigation Areas
Marshall County, West Virginia
CEC Project No. 110-416

Photographs Taken on January 19, 2012, February 6 - 7, 16, and 28, 2012, March 1, 2012 and April 12, 2012



Photograph 27. View of mowed lawn on right/descending bank of NFGC-UNT2 at stream assessment Segment NFGC-7 on Cox Property. Photograph taken facing west.



Photograph 28. View of left/descending bank of NFGC-UNT2 at stream assessment Segment NFGC-7 on Cox Property. Highway 250 is located approximately 30 feet from the stream. Photograph taken facing east.

American Electric Power Co., Inc.
North Fork Grave Creek Drainage Properties Potential Stream Mitigation Areas
Marshall County, West Virginia
CEC Project No. 110-416

Photographs Taken on January 19, 2012, February 6 - 7, 16, and 28, 2012, March 1, 2012 and April 12, 2012



Photograph 29. View of unnamed tributary to North Fork Grave Creek (NFGC-UNT2) within Roskelly Property at stream assessment Segment NFGC-6. Photograph taken facing upstream.



Photograph 30. View of unnamed tributary to North Fork Grave Creek (NFGC-UNT2) within Roskelly Property at stream assessment Segment NFGC-6. Photograph taken facing downstream.

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Photograph 31. View of North Fork Grave Creek within the Magers Property at stream assessment Segment NFGC-8. Photograph taken facing upstream.



Photograph 32. View of North Fork Grave Creek within the Magers Property at stream assessment Segment NFGC-8. Photograph taken facing downstream.

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Photograph 33. View of the right/descending bank of North Fork Grave Creek at stream assessment Segment NFGC-8. Photograph taken facing north.



Photograph 34. View of the left/descending bank of North Fork Grave Creek at stream assessment Segment NFGC-8. Photograph taken facing south.

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Photograph 35. View of North Fork Grave Creek within the Magers Property. Photograph taken facing upstream.



Photograph 36. View of North Fork Grave Creek within the Magers Property. Photograph taken facing downstream.

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North Fork Grave Creek Drainage Properties Potential Stream Mitigation Areas
Marshall County, West Virginia
CEC Project No. 110-416

Photographs Taken on January 19, 2012, February 6 - 7, 16, and 28, 2012, March 1, 2012 and April 12, 2012



APPENDIX B

**POTENTIAL STREAM MITIGATION AREAS USEPA AND USACE
DATA FORMS**



**FRENCH RUN DRAINAGE POTENTIAL STREAM MITIGATION AREAS
USEPA AND USACE DATA FORMS**

AEP Mitche II Landfill Project

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (FRONT)

STREAM NAME <i>French Run</i>	LOCATION <i>Marshall CO, WV</i>	
STATION # <i>Boq FR-1</i> RIVERMILE	STREAM CLASS <i>Perennial</i>	
LAT <i>39 51 38.135</i> LONG <i>80 38 04.102</i>	RIVER BASIN <i>Ohio</i>	
STORET #	AGENCY	
INVESTIGATORS <i>Dawn York / Mary Gilmore</i>		
FORM COMPLETED BY <i>D. York</i>	DATE <i>25 Jan 2012</i> TIME <i>1000</i> <input checked="" type="radio"/> AM <input type="radio"/> PM	REASON FOR SURVEY <i>Potential Mitigation Site</i>

	Habitat Parameter	Condition Category			
		Optimal	Suboptimal	Marginal	Poor
Parameters to be evaluated in sampling reach	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 not new fall and not transient). SCORE 9	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.	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. SCORE 8	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.	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. SCORE 5	Majority of pools large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent.	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. SCORE 8	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.	20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0
	5. Channel Flow Status Water reaches base of both lower banks, and minimal amount of channel substrate is exposed. SCORE 13	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.	20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (BACK)

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE 19	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Channel Sinuosity	The bends in the stream increase the stream length 3 to 4 times longer than if it 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.	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long distance.
SCORE 9	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)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE 3 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 2 (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 macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally. Note: determine left or right side by facing downstream.	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 6 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 3 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
SCORE 9 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 5 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0

Total Score 104

Marginal

AEP Mitchell Landfill Project

39.840593
-80.634473

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (FRONT)

STREAM NAME <u>French Run</u>	LOCATION <u>Vander Prep / Marshall Co, WV</u>
STATION # <u>229 RR</u> RIVERMILE _____	STREAM CLASS <u>Perennial</u>
LAT <u>39° 01' 38.135" N</u> LONG <u>80° 38' 04.102" W</u>	RIVER BASIN <u>OH10</u>
STORET # _____	AGENCY _____
INVESTIGATORS <u>M. Gilmore / D. York</u>	
FORM COMPLETED BY <u>D. York</u>	DATE <u>25 Jan</u> TIME <u>11:54</u> <input checked="" type="radio"/> AM <input type="radio"/> PM
	REASON FOR SURVEY <u>Potential Mitigation Site</u>

23 Jan. 42 in
22 11.13 in
21 0.01 in
20 0.95 in
19 0.10 in
18 0.02 in
17 0.10 in

WEATHER CONDITIONS	Now	Past 24 hours	Has there been a heavy rain in the last 7 days? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
	<input type="checkbox"/> storm (heavy rain) <input type="checkbox"/> rain (steady rain) <input checked="" type="checkbox"/> 95% showers (intermittent) <input type="checkbox"/> %cloud cover <input type="checkbox"/> clear/sunny	<input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> 20% <input type="checkbox"/>	Air Temperature <u>33</u> °F Other _____

SITE LOCATION/MAP	Draw a map of the site and indicate the areas sampled (or attach a photograph) <p> <input type="checkbox"/> P - pool <input type="checkbox"/> T - tree w/ exposed roots <input type="checkbox"/> R - riffle <input type="checkbox"/> ~ run <input type="checkbox"/> → flow </p> <p> Entire stream consisted of riffles There were 4 small pools below tree roots. (woodland) </p>
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STREAM CHARACTERIZATION	Stream Subsystem <input checked="" type="checkbox"/> Perennial <input type="checkbox"/> Intermittent <input type="checkbox"/> Tidal	Stream Type <input checked="" type="checkbox"/> Coldwater <input type="checkbox"/> Warmwater
	Stream Origin <input type="checkbox"/> Glacial <input checked="" type="checkbox"/> Spring-fed <input type="checkbox"/> Non-glacial montane <input type="checkbox"/> Mixture of origins <input type="checkbox"/> Swamp and bog <input checked="" type="checkbox"/> Other	Catchment Area _____ km ²

Segment FR1 P6.2
French Run.

01-25-2012

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET
(BACK)

AEP Mitchell Landfill Project

WATERSHED FEATURES	Predominant Surrounding Landuse <input type="checkbox"/> Forest <input type="checkbox"/> Commercial <input checked="" type="checkbox"/> Field/Pasture <input type="checkbox"/> Industrial <input type="checkbox"/> Agricultural <input type="checkbox"/> Other <input type="checkbox"/> Residential	Local Watershed NPS Pollution <input type="checkbox"/> No evidence <input type="checkbox"/> Some potential sources <input checked="" type="checkbox"/> Obvious sources - <i>E. coli / open pasture</i> Local Watershed Erosion <input type="checkbox"/> None <input type="checkbox"/> Moderate <input checked="" type="checkbox"/> Heavy - <i>Topography</i>
RIPARIAN VEGETATION (18 meter buffer)	Indicate the dominant type and record the dominant species present <input checked="" type="checkbox"/> Trees <input type="checkbox"/> Shrubs <input checked="" type="checkbox"/> Grasses <input type="checkbox"/> Herbaceous dominant species present <i>50/50 - N. Red oak</i>	
INSTREAM FEATURES	Estimated Reach Length <i>30.48 m 100'</i> Estimated Stream Width <i>2.74 m 9'</i> Sampling Reach Area <i>83.61 m²</i> Area in km ² (m ² x 1000) <i>83612.73 km²</i> Estimated Stream Depth <i>.127 m 5"</i> Surface Velocity <i>NA m/sec</i> (at thalweg) <i>slow</i>	
LARGE WOODY DEBRIS	LWD <i>0 m²</i> Density of LWD <i>0 m²/km²</i> (LWD/ reach area)	
AQUATIC VEGETATION	Indicate the dominant type and record the dominant species present <input type="checkbox"/> Rooted emergent <input type="checkbox"/> Rooted submergent <input type="checkbox"/> Rooted floating <input type="checkbox"/> Free floating <input type="checkbox"/> Floating Algae <input type="checkbox"/> Attached Algae dominant species present <i>∅</i> Portion of the reach with aquatic vegetation <i>∅ %</i>	
WATER QUALITY	Temperature <i>6.57 °C</i> Specific Conductance <i>211</i> Dissolved Oxygen <i>9.08</i> pH <i>7.43</i> Turbidity <i>2.9</i> WQ Instrument Used <i>Horiba</i>	
SEDIMENT/SUBSTRATE	Odors <input checked="" type="checkbox"/> Normal <input type="checkbox"/> Sewage <input type="checkbox"/> Petroleum <input type="checkbox"/> Chemical <input type="checkbox"/> Anaerobic <input type="checkbox"/> None <input type="checkbox"/> Other Oils <input checked="" type="checkbox"/> Absent <input type="checkbox"/> Slight <input type="checkbox"/> Moderate <input type="checkbox"/> Profuse Deposits <input type="checkbox"/> Sludge <input type="checkbox"/> Sawdust <input type="checkbox"/> Paper fiber <input type="checkbox"/> Sand <input type="checkbox"/> Relict shells <input type="checkbox"/> Other Looking at stones which are not deeply embedded, are the undersides black in color? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	

ends to heavy

15 Feb 2012

Stream is embedded

INORGANIC SUBSTRATE COMPONENTS (should add up to 100%)			ORGANIC SUBSTRATE COMPONENTS (does not necessarily add up to 100%)		
Substrate Type	Diameter	% Composition in Sampling Reach	Substrate Type	Characteristic	% Composition in Sampling Area
Bedrock		—	Detritus	sticks, wood, coarse plant materials (CPOM)	5%
Boulder	> 256 mm (10")	5%			
Cobble	64-256 mm (2.5"-10")	56%	Muck-Mud	black, very fine organic (FPOM)	30%
Gravel	2-64 mm (0.1"-2.5")	25%			
Sand	0.06-2mm (gritty)	15%	Marl	grey, shell fragments	0%
Silt	0.004-0.06 mm	5%			
Clay	< 0.004 mm (slick)	—			

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BENTHIC MACROINVERTEBRATE FIELD DATA SHEET

STREAM NAME <i>French Run</i>	LOCATION <i>Yoders Prop. Marshall Co WV</i>
STATION # <i>Seg FR</i> RIVERMILE _____	STREAM CLASS <i>Perennial</i>
LAT <i>39.860593</i> LONG <i>80.634473</i>	RIVER BASIN <i>OHIO</i>
STORET # _____	AGENCY _____
INVESTIGATORS <i>M. Gilmore / D. York</i>	LOT NUMBER _____
FORM COMPLETED BY <i>M. Gilmore / D. York</i>	DATE <i>8/11/2012</i> TIME <i>0730 AM</i> PM
	REASON FOR SURVEY <i>Potential Mitigation Site</i>

Water Temp
33°F

HABITAT TYPES	Indicate the percentage of each habitat type present <input type="checkbox"/> Cobble <i>85%</i> <input type="checkbox"/> Snags <i>5%</i> <input type="checkbox"/> Vegetated Banks <i>90%</i> <input type="checkbox"/> Sand <i>5%</i> <input type="checkbox"/> Submerged Macrophytes <i>0%</i> <input type="checkbox"/> Other () %
SAMPLE COLLECTION	Gear used <input type="checkbox"/> D-frame <input checked="" type="checkbox"/> Kick-net <input type="checkbox"/> Other _____ How were the samples collected? <input checked="" type="checkbox"/> wading <input type="checkbox"/> from bank <input type="checkbox"/> from boat Indicate the number of jabs/kicks taken in each habitat type. <input checked="" type="checkbox"/> Cobble <i>6</i> <input checked="" type="checkbox"/> Snags <i>1</i> <input type="checkbox"/> Vegetated Banks _____ <input type="checkbox"/> Sand _____ <input type="checkbox"/> Submerged Macrophytes _____ <input type="checkbox"/> Other () _____
GENERAL COMMENTS	<i>1 m² area sampled.</i>

QUALITATIVE LISTING OF AQUATIC BIOTA

Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare, 2 = Common, 3 = Abundant, 4 = Dominant

Periphyton	<i>(1)</i> 2 3 4	Slimes	0 1 2 3 4
Filamentous Algae	0 1 2 3 4	Macroinvertebrates	0 1 2 3 <i>(4)</i>
Macrophytes	0 1 2 3 4	Fish	0 1 2 3 4

FIELD OBSERVATIONS OF MACROBENTHOS

Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare (1-3 organisms), 2 = Common (3-9 organisms), 3 = Abundant (>10 organisms), 4 = Dominant (>50 organisms)

Porifera	0 1 2 3 4	Anisoptera	0 1 2 3 4	Chironomidae	0 1 2 <i>(3)</i> 4
Hydrozoa	0 1 2 3 4	Zygoptera	0 1 2 3 4	Ephemeroptera	0 1 2 <i>(3)</i> <i>(4)</i>
Platyhelminthes	0 1 2 3 4	Hemiptera	0 1 2 3 4	Trichoptera	0 1 2 <i>(3)</i> <i>(4)</i>
Turbellaria	0 1 2 3 4	Coleoptera	0 1 2 3 4	Other	0 1 2 3 4
Hirudinea	0 1 2 3 4	Lepidoptera	0 1 2 3 4	<i>Plecoptera</i>	<i>(3)</i> <i>(4)</i>
Oligochaeta	0 1 2 <i>(3)</i> 4	Sialidae	0 1 2 3 4		
Isopoda	0 1 2 3 4	Corydalidae	0 1 2 3 4		
Amphipoda	0 1 2 3 4	Tipulidae	0 1 2 <i>(3)</i> <i>(4)</i>		
Decapoda	0 <i>(1)</i> 2 3 4	Empididae	0 1 2 3 4		
Gastropoda	0 1 2 3 4	Simuliidae	0 1 2 3 <i>(4)</i>		
Bivalvia	0 1 2 3 4	Tabinidae	0 1 2 3 4		
		Culcidae	0 1 2 3 4		

FCI Calculator for the High-Gradient Headwater Streams in eastern Kentucky and western West Virginia HGM Guidebook

To ensure accurate calculations, the **UPPERMOST STRATUM** of the plant community is determined based on the calculated value for $V_{CCANOPY}$ ($\geq 20\%$ cover is required for tree/sapling strata). Go to the SAR Data Entry tab and enter site characteristics and data in the yellow cells. For information on determining how to split a project into SARs, see Chapter 5 of the Operational Draft Regional Guidebook for the Functional Assessment of High-gradient Ephemeral and Intermittent Headwater Streams in Western West Virginia and Eastern Kentucky (Environmental Laboratory U.S. Army Corps of Engineers 2010).

Project Name: AEP Mitchell Landfill Project
Location: Yoders Property, Marshall CO, WV, Segment 1
Sampling Date: 01-26-2012

Mitigation Site Before Project

Subclass for this SAR:

Intermittent Stream
Perennial
 Uppermost stratum present at this SAR:
 Tree/Sapling Strata

SAR number: Seg FR-1

Functional Results Summary:

Enter Results in Section C of the Mitigation Sufficiency Calculator

Function	Functional Capacity Index
Hydrology	0.42
Biogeochemical Cycling	0.57
Habitat	0.55

Variable Measure and Subindex Summary:

Variable	Name	Average Measure	Subindex
$V_{CCANOPY}$	Percent canopy over channel.	36.50	0.32
V_{EMBED}	Average embeddedness of channel.	2.23	0.54
$V_{SUBSTRATE}$	Median stream channel substrate particle size.	2.10	1.00
V_{BERO}	Total percent of eroded stream channel bank.	125.00	0.40
V_{LWD}	Number of down woody stems per 100 feet of stream.	4.00	0.50
V_{TDBH}	Average dbh of trees.	10.58	1.00
V_{SNAG}	Number of snags per 100 feet of stream.	1.00	1.00
V_{SSD}	Number of saplings and shrubs per 100 feet of stream.	Not Used	Not Used
V_{SRICH}	Riparian vegetation species richness.	4.50	1.00
$V_{DETRITUS}$	Average percent cover of leaves, sticks, etc.	71.88	0.88
V_{HERB}	Average percent cover of herbaceous vegetation.	Not Used	Not Used
V_{WLUSE}	Weighted Average of Runoff Score for Catchment.	0.37	0.39

High-Gradient Headwater Streams in eastern Kentucky and western West Virginia Field Data Sheet and Calculator

Team: M. Gilmore / D. York Latitude/UTM Northing: 39° 51' 38.135" N
 Project Name: A&P M. Mitchell Landfill Proj / Sapping / 1 Longitude/UTM Easting: 80° 38' 04.102" W
 Location: Jokers Property, Marshall Co, WV, Sig 1 Sampling Date: 25 Jan 2012
 SAR Number: Sag FR-1 Reach Length (ft): 100 Stream Type: Perennial
 Top Strata: (determined from percent calculated in $V_{CCANOPY}$)
 Site and Timing: Project/Wetland Site (circle one) Before/After Project (Circle One)

Sample Variables 1-4 in stream channel

1 $V_{CCANOPY}$ Average percent cover over channel by tree and sapling canopy. Measure at no fewer than 10 roughly equidistant points along the stream. Measure only if tree/sapling cover is at least 20%. (If less than 20%, enter at least one value between 0 and 19 to trigger Top Strata choice.)

List the percent cover measurements at each point below:

20	25	45	65	65	70	50	10	15	10
----	----	----	----	----	----	----	----	----	----

2 V_{EMBED} Average embeddedness of the stream channel. Measure at no fewer than 30 roughly equidistant points along the stream. Select a particle from the bed. Before moving it, determine the percentage of the surface and area surrounding the particle that is covered by fine sediment, and enter the rating according to the following table. If the bed is an artificial surface, or composed of fine sediments, use a rating score of 1. If the bed is composed of bedrock, use a rating score of 5.

Embeddedness rating for gravel, cobble and boulder particles (rescaled from Platts, Megahan, and Minshall 1983)

Rating	Rating Description
5	<5 percent of surface covered, surrounded, or buried by fine sediment (or bedrock)
4	5 to 25 percent of surface covered, surrounded, or buried by fine sediment
3	26 to 50 percent of surface covered, surrounded, or buried by fine sediment
2	51 to 75 percent of surface covered, surrounded, or buried by fine sediment
1	>75 percent of surface covered, surrounded, or buried by fine sediment (or artificial surface)

List the ratings at each point below:

4	3	2	3	2	2				
3	2	3	2	2	3				
3	2	2	2	1	3				
2	4	2	1	3	2				
2	2	2	1	1	1				

3 $V_{SUBSTRATE}$ Median stream channel substrate particle size. Measure at no fewer than 30 roughly equidistant points along the stream; use the same points and particles as used in V_{EMBED} .

Enter particle size in inches to the nearest 0.1 inch at each point below (bedrock should be counted as 99 in, asphalt or concrete as 0.0 in, sand or finer particles as 0.08 in):

2.45	0.7	2.1	3.75	4.0	1.5				
0.5	2.25	1.4	0.75	2.1	5				
10.2	7.1	5.5	1.25	0.5	9.5				
1.0	2.25	3	1.0	1.5	1.25				
3.0	3.5	1.75	1.5	0.70	3.75				

4 V_{BERO} Total percent of eroded stream channel bank. Enter the total number of feet of eroded bank on each side and the total percentage will be calculated. If both banks are eroded, total erosion for the stream may be up to 200%.

Left Bank: 70 Right Bank: 55

Sample Variables 5-9 within the entire riparian/buffer zone adjacent to the stream channel (25 feet from each bank).

5 V_{LWD} Number of down woody stems (at least 4 inches in diameter and 36 inches in length) per 100 feet of stream reach. Enter the number from the entire 50'-wide buffer and within the channel, and the amount per 100 feet of stream will be calculated.

4

Number of downed woody stems: 4

6 V_{TDBH} Average dbh of trees (measure only if $V_{CCANOPY}$ tree/sapling cover is at least 20%). Trees are at least 4 inches (10 cm) in diameter. Enter tree DBHs in inches.

List the dbh measurements of individual trees (at least 4 in) within the buffer on each side of the stream below:

Left Side					Right Side				
42.5					7.5				
4.5									
4.5									
7.75									
4.5									
8.0									
9.0									
9.5									
8.0									

7 V_{SNAG} Number of snags (at least 4" dbh and 36" tall) per 100 feet of stream. Enter number of snags on each side of the stream, and the amount per 100 feet will be calculated.

Left Side: 1

Right Side: 0

8 V_{SSD} Number of saplings and shrubs (woody stems up to 4 inches dbh) per 100 feet of stream (measure only if tree cover is <20%). Enter number of saplings and shrubs on each side of the stream, and the amount per 100 ft of stream will be calculated.

Left Side: 29

Right Side: 3

9 V_{SRICH} Riparian vegetation species richness per 100 feet of stream reach. Check all species present from Group 1 in the tallest stratum. Check all exotic and invasive species present in all strata. Species richness per 100 feet and the subindex will be calculated from these data.

Group 1 = 1.0

Group 2 (-1.0)

- Acer rubrum*
- Acer saccharum*
- Aesculus flava*
- Asimina triloba*
- Betula alleghaniensis*
- Betula lenta*
- Carya alba*
- Carya glabra*
- Carya ovalis*
- Carya ovata*
- Comus florida*
- Fagus grandifolia*
- Fraxinus americana*
- Liriodendron tulipifera*
- Magnolia acuminata*

- Magnolia tripetala*
- Nyssa sylvatica*
- Oxydendrum arboreum*
- Prunus serotina*
- Quercus alba*
- Quercus coccinea*
- Quercus imbricaria*
- Quercus prinus*
- Quercus rubra*
- Quercus velutina*
- Sassafras albidum*
- Tilia americana*
- Tsuga canadensis*
- Ulmus americana*

- Ailanthus altissima*
- Albizia julibrissin*
- Alliaria petiolata*
- Alternanthera philoxeroides*
- Aster tataricus*
- Cerastium fontanum*
- Coronilla varia*
- Elaeagnus umbellata*
- Lespedeza bicolor*
- Lespedeza cuneata*
- Ligustrum obtusifolium*
- Ligustrum sinense*
- Lonicera japonica*
- Lonicera tatarica*
- Lotus corniculatus*
- Lythrum salicaria*
- Microstegium vimineum*
- Paulownia tomentosa*
- Polygonum cuspidatum*
- Pueraria montana*
- Rosa multiflora*
- Sorghum halepense*
- Verbena brasiliensis*

0 Species in Group 1

0 Species in Group 2

Sample Variables 10-11 within at least 8 subplots (40" x 40", or 1m x 1m) in the riparian/buffer zone within 25 feet from each bank. The four subplots should be placed roughly equidistantly along each side of the stream.

10 $V_{DETRITUS}$ Average percent cover of leaves, sticks, or other organic material. Woody debris <4" diameter and <36" long are include. Enter the percent cover of the detrital layer at each subplot.

Left Side				Right Side			
90	95	0	0	95	95	100	100

11 V_{HERB} Average percentage cover of herbaceous vegetation (measure only if tree cover is <20%). Do not include woody stems at least 4" dbh and 36" tall. Because there may be several layers of ground cover vegetation percentages up through 200% are accepted. Enter the percent cover of ground vegetation at each subplot.

Left Side				Right Side			
90				0			

Sample Variable 12 within the entire catchment of the stream.

12 V_{WLUSE} Weighted Average of Runoff Score for watershed:

Land Use (Choose From Drop List)	Runoff Score	% in Catchment	Running Percent (not >100)
Partially open pasture / Partially wood land / farmland			

Summary			Notes:
Variable	Value	VSI	
$V_{CCANOPY}$			<p>Flow water crossing through stream Sample reach</p> <p>- 2 pipelines upstream (one in place, one proposed).</p> <p>- dammed trib, upstream at sample area and runs</p>
V_{EMBED}			
$V_{SUBSTRATE}$			
V_{BERO}			
V_{LWD}			
V_{TDBH}			
V_{SNAG}			
V_{SSD}			
V_{SRICH}			
$V_{DETRITUS}$			
V_{HERB}			
V_{WLUSE}			

AEP Mitchell Landfill Project

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (FRONT)

STREAM NAME <u>French Run</u>		LOCATION <u>Marshall Co, WV Under Property</u>	
STATION # <u>89FR2</u> RIVERMILE		STREAM CLASS <u>Perennial</u>	
LAT <u>39.51844</u> LONG <u>80.3805.513</u>		RIVER BASIN <u>OHIO</u>	
STORET #		AGENCY	
INVESTIGATORS <u>Mary Gilmore / Dawn York</u>			
FORM COMPLETED BY <u>D. York</u>		DATE <u>25 Jan 2011</u> TIME <u>11:20</u> <input checked="" type="radio"/> AM <input type="radio"/> PM	REASON FOR SURVEY <u>Potential Mitigation Site</u>

	Habitat Parameter	Condition Category			
		Optimal	Suboptimal	Marginal	Poor
Parameters to be evaluated in sampling reach	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 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.	
	SCORE <u>7</u>	20 19 18 17 16	15 14 13 12 11	10 9 8 <u>7</u> 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 <u>10</u>	20 19 18 17 16	15 14 13 12 <u>11</u>	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 <u>5</u>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	<u>5</u> 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.	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 <u>10</u>	20 19 18 17 16	15 14 13 12 <u>11</u>	<u>10</u> 9 8 7 6	5 4 3 2 1 0	
5. Channel Flow Status Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.		
SCORE <u>18</u>	20 19 <u>18</u> 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (BACK)

Habitat Parameter	Condition Category									
	Optimal	Suboptimal	Marginal	Poor						
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.						
	SCORE 18	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0					
7. Channel Sinuosity	The bends in the stream increase the stream length 3 to 4 times longer than if it 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.	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long distance.						
	SCORE 7	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)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.						
					SCORE 8 (LB)	Left Bank	10 9	8 7 6	5 4 3	2 1 0
					SCORE 1 (RB)	Right Bank	10 9	8 7 6	5 4 3	2 1 0
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 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 8 (LB)	Left Bank	10 9	8 7 6	5 4 3	2 1 0
					SCORE 8 (RB)	Right Bank	10 9	8 7 6	5 4 3	2 1 0
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 3 (LB)	Left Bank	10 9	8 7 6	5 4 3	2 1 0
					SCORE 2 (RB)	Right Bank	10 9	8 7 6	5 4 3	2 1 0

Total Score 101

Marginal

AEP Mitchell Landfill Project

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (FRONT)

STREAM NAME <u>French Run</u>	LOCATION <u>Marshall County WV</u>	
STATION # <u>Seg FR 0.5</u> VERMILE	STREAM CLASS <u>Perennial</u>	
LAT <u>39° 51' 34.400" N</u> LONG <u>78° 05' 51.3" W</u>	RIVER BASIN <u>Ohio</u>	
STORET #	AGENCY	
INVESTIGATORS <u>D York / M Gilmore</u>		
FORM COMPLETED BY <u>D York / Gilmore</u>	DATE <u>25 Jan 2010</u> TIME <u>11:20</u> <input checked="" type="checkbox"/> AM <input type="checkbox"/> PM	REASON FOR SURVEY <u>Potential Mitigation Site</u>

WEATHER CONDITIONS	<table style="width: 100%;"> <tr> <td style="width: 50%;"> Now <input type="checkbox"/> storm (heavy rain) <input type="checkbox"/> rain (steady rain) <input type="checkbox"/> showers (intermittent) <input type="checkbox"/> %cloud cover <input type="checkbox"/> clear/sunny </td> <td style="width: 50%;"> Past 24 hours <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> 30% <input type="checkbox"/> </td> </tr> </table>	Now <input type="checkbox"/> storm (heavy rain) <input type="checkbox"/> rain (steady rain) <input type="checkbox"/> showers (intermittent) <input type="checkbox"/> %cloud cover <input type="checkbox"/> clear/sunny	Past 24 hours <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> 30% <input type="checkbox"/>	Has there been a heavy rain in the last 7 days? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No Air Temperature <u>11.1</u> °C Other _____				
Now <input type="checkbox"/> storm (heavy rain) <input type="checkbox"/> rain (steady rain) <input type="checkbox"/> showers (intermittent) <input type="checkbox"/> %cloud cover <input type="checkbox"/> clear/sunny	Past 24 hours <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> 30% <input type="checkbox"/>							
SITE LOCATION/MAP	Draw a map of the site and indicate the areas sampled (or attach a photograph)							
→ flow ⊙ pool ~ riffle ~ run steep slope (Woodland) steep slope	<p>The map shows a stream flowing from left to right. On the left bank, there is a 'pile of tires' and a 'steep slope' labeled '(Woodland)'. The stream has an 'exposed bank' and a 'scour bank - 4\''. A 'dirt road' crosses the stream. On the right bank, there is a 'steep slope' labeled '(Woodland)', a '3m wetland', and another 'steep slope'. The surrounding area is labeled 'Open pasture'.</p>							
STREAM CHARACTERIZATION	<table style="width: 100%;"> <tr> <td style="width: 50%;"> Stream Subsystem <input checked="" type="checkbox"/> Perennial <input type="checkbox"/> Intermittent <input type="checkbox"/> Tidal </td> <td style="width: 50%;"> Stream Type <input checked="" type="checkbox"/> Coldwater <input type="checkbox"/> Warmwater </td> </tr> <tr> <td> Stream Origin <input type="checkbox"/> Glacial <input type="checkbox"/> Non-glacial montane <input type="checkbox"/> Swamp and bog </td> <td> <input checked="" type="checkbox"/> Spring-fed <input type="checkbox"/> Mixture of origins <input checked="" type="checkbox"/> Other _____ </td> </tr> <tr> <td colspan="2"> Catchment Area _____ km² </td> </tr> </table>		Stream Subsystem <input checked="" type="checkbox"/> Perennial <input type="checkbox"/> Intermittent <input type="checkbox"/> Tidal	Stream Type <input checked="" type="checkbox"/> Coldwater <input type="checkbox"/> Warmwater	Stream Origin <input type="checkbox"/> Glacial <input type="checkbox"/> Non-glacial montane <input type="checkbox"/> Swamp and bog	<input checked="" type="checkbox"/> Spring-fed <input type="checkbox"/> Mixture of origins <input checked="" type="checkbox"/> Other _____	Catchment Area _____ km ²	
Stream Subsystem <input checked="" type="checkbox"/> Perennial <input type="checkbox"/> Intermittent <input type="checkbox"/> Tidal	Stream Type <input checked="" type="checkbox"/> Coldwater <input type="checkbox"/> Warmwater							
Stream Origin <input type="checkbox"/> Glacial <input type="checkbox"/> Non-glacial montane <input type="checkbox"/> Swamp and bog	<input checked="" type="checkbox"/> Spring-fed <input type="checkbox"/> Mixture of origins <input checked="" type="checkbox"/> Other _____							
Catchment Area _____ km ²								

Marshall CO, Yoders Property
 Segment FER-2
 French Run

AEP Mitchell Landfill
 Project

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET
 (BACK)

Page #2

WATERSHED FEATURES	Predominant Surrounding Landuse <input type="checkbox"/> Forest <input type="checkbox"/> Commercial <input checked="" type="checkbox"/> Field/Pasture <input type="checkbox"/> Industrial <input type="checkbox"/> Agricultural <input type="checkbox"/> Other _____ <input type="checkbox"/> Residential	Local Watershed NPS Pollution <input type="checkbox"/> No evidence <input type="checkbox"/> Some potential sources <input checked="" type="checkbox"/> Obvious sources Local Watershed Erosion <input type="checkbox"/> None <input type="checkbox"/> Moderate <input checked="" type="checkbox"/> Heavy
RIPARIAN VEGETATION (18 meter buffer)	Indicate the dominant type and record the dominant species present <input checked="" type="checkbox"/> Trees <input checked="" type="checkbox"/> Shrubs <input type="checkbox"/> Grasses <input type="checkbox"/> Herbaceous dominant species present <u>Sycamore / Fescue</u>	
INSTREAM FEATURES	Estimated Reach Length <u>3040 m 100'</u> Estimated Stream Width <u>1.60 m 5.5'</u> Sampling Reach Area <u>51.21 m² 580'</u> Area in km ² (m ² x1000) <u>51206.4 km²</u> Estimated Stream Depth <u>0.10 m</u> Surface Velocity _____ m/sec (at thalweg) <u>~ 1 m/sec / slow</u>	
	Canopy Cover <input type="checkbox"/> Partly open <input checked="" type="checkbox"/> Partly shaded <input type="checkbox"/> Shaded High Water Mark _____ m <u>5.5'</u> Proportion of Reach Represented by Stream Morphology Types <input type="checkbox"/> Riffle <u>80</u> % <input type="checkbox"/> Run <u>10</u> % <input type="checkbox"/> Pool <u>10</u> %	
	Channelized <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No Dam Present <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
LARGE WOODY DEBRIS	LWD <u>1.03 m²</u> Density of LWD <u>.02 m²/km²</u> (LWD/ reach area) <u>2%</u>	
AQUATIC VEGETATION	Indicate the dominant type and record the dominant species present <input type="checkbox"/> Rooted emergent <input type="checkbox"/> Rooted submergent <input type="checkbox"/> Rooted floating <input type="checkbox"/> Free floating <input type="checkbox"/> Floating Algae <input type="checkbox"/> Attached Algae dominant species present <u>None</u> Portion of the reach with aquatic vegetation <u>0</u> %	
WATER QUALITY	Temperature <u>6.09</u> °C Specific Conductance <u>.205</u> Dissolved Oxygen <u>10.6</u> pH <u>7.68</u> Turbidity <u>1.8</u> WQ Instrument Used <u>Horibu U-52</u>	
	Water Odors <input checked="" type="checkbox"/> Normal/None <input type="checkbox"/> Sewage <input type="checkbox"/> Petroleum <input type="checkbox"/> Chemical <input type="checkbox"/> Fishy <input type="checkbox"/> Other _____ Water Surface Oils <input type="checkbox"/> Slick <input type="checkbox"/> Sheen <input type="checkbox"/> Globbs <input type="checkbox"/> Flecks <input checked="" type="checkbox"/> None <input type="checkbox"/> Other _____ Turbidity (if not measured) <input checked="" type="checkbox"/> Clear <input type="checkbox"/> Slightly turbid <input type="checkbox"/> Turbid <input type="checkbox"/> Opaque <input type="checkbox"/> Stained <input type="checkbox"/> Other _____	
SEDIMENT/ SUBSTRATE	Odors <input checked="" type="checkbox"/> Normal <input type="checkbox"/> Sewage <input type="checkbox"/> Petroleum <input type="checkbox"/> Chemical <input type="checkbox"/> Anaerobic <input type="checkbox"/> None <input type="checkbox"/> Other _____ Deposits <input type="checkbox"/> Sludge <input type="checkbox"/> Sawdust <input type="checkbox"/> Paper fiber <input type="checkbox"/> Sand <input type="checkbox"/> Relict shells <input type="checkbox"/> Other _____ Oils <input checked="" type="checkbox"/> Absent <input type="checkbox"/> Slight <input type="checkbox"/> Moderate <input type="checkbox"/> Profuse Looking at stones which are not deeply embedded, are the undersides black in color? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	

15 Feb 2012

INORGANIC SUBSTRATE COMPONENTS (should add up to 100%)			ORGANIC SUBSTRATE COMPONENTS (does not necessarily add up to 100%)		
Substrate Type	Diameter	% Composition in Sampling Reach	Substrate Type	Characteristic	% Composition in Sampling Area
Bedrock		—	Detritus	sticks, wood, coarse plant materials (CPOM)	2%
Boulder	>256 mm (10")	5%			
Cobble	64-256 mm (2.5"-10")	46%	Muck-Mud	black, very fine organic (FPOM)	10%
Gravel	2-64 mm (0.1"-2.5")	45			
Sand	0.06-2mm (gritty)	3	Marl	grey, shell fragments	0
Silt	0.004-0.06 mm	7			
Clay	<0.004 mm (slick)	—			

AEP Mitchell Landfill Project

(6)

BENTHIC MACROINVERTEBRATE FIELD DATA SHEET

STREAM NAME <i>French Run</i>	LOCATION <i>Yoders Prop. Marshall co, WV</i>
STATION # <i>9</i> <i>FR</i> RIVER MILE	STREAM CLASS <i>Perennial</i>
LAT <i>39° 51' 34.4" N</i> LONG <i>80° 38' 05.53" W</i>	RIVER BASIN <i>OHIO</i>
STORET #	AGENCY
INVESTIGATORS <i>D. York M. Gilmore</i>	LOT NUMBER
FORM COMPLETED BY <i>D. York / M. Gilmore</i>	DATE <i>8 Feb 2012</i> TIME <i>10:30</i> <input checked="" type="radio"/> AM <input type="radio"/> PM
	REASON FOR SURVEY <i>Potential Mitigation Site</i>

HABITAT TYPES	Indicate the percentage of each habitat type present <input checked="" type="checkbox"/> Cobble <i>15</i> % <input checked="" type="checkbox"/> Snags <i>10</i> % <input checked="" type="checkbox"/> Vegetated Banks <i>20</i> % <input checked="" type="checkbox"/> Sand <i>5</i> % <input type="checkbox"/> Submerged Macrophytes <i>0</i> % <input type="checkbox"/> Other () %
SAMPLE COLLECTION	Gear used <input type="checkbox"/> D-frame <input checked="" type="checkbox"/> Kick-net <input type="checkbox"/> Other _____ How were the samples collected? <input checked="" type="checkbox"/> Wading <input type="checkbox"/> from bank <input type="checkbox"/> from boat Indicate the number of jabs/kicks taken in each habitat type. <input checked="" type="checkbox"/> Cobble <i>6</i> <input type="checkbox"/> Snags _____ <input checked="" type="checkbox"/> Vegetated Banks <i>6</i> <input type="checkbox"/> Sand _____ <input type="checkbox"/> Submerged Macrophytes _____ <input type="checkbox"/> Other () _____
GENERAL COMMENTS	<i>- 1 m² area sampled.</i>

*A. juv salamanders
A. dusky
A. larval*

QUALITATIVE LISTING OF AQUATIC BIOTA

Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare, 2 = Common, 3 = Abundant, 4 = Dominant

Periphyton	1 1 2 3 4	Slimes	0 1 2 3 4
Filamentous Algae	1 1 2 3 4	Macroinvertebrates	0 1 2 3 4
Macrophytes	0 1 2 3 4	Fish	0 1 2 3 4

FIELD OBSERVATIONS OF MACROBENTHOS

Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare (1-3 organisms), 2 = Common (3-9 organisms), 3 = Abundant (>10 organisms), 4 = Dominant (>50 organisms)

Porifera	0 1 2 3 4	Anisoptera	0 1 2 3 4	Chironomidae	0 1 2 3 4
Hydrozoa	0 1 2 3 4	Zygoptera	0 1 2 3 4	Ephemeroptera	0 1 2 3 4
Platyhelminthes	0 1 2 3 4	Hemiptera	0 1 2 3 4	Trichoptera	0 1 2 3 4
Turbellaria	0 1 2 3 4	Coleoptera	0 1 2 3 4	Other	0 1 2 3 4
Hirudinea	0 1 2 3 4	Lepidoptera	0 1 2 3 4	<i>plecoptera</i>	4
Oligochaeta	0 1 2 3 4	Sialidae	0 1 2 3 4		
Isopoda	0 1 2 3 4	Corydalidae	0 1 2 3 4		
Amphipoda	0 1 2 3 4	Tipulidae	0 1 2 3 4		
Decapoda	0 1 2 3 4	Empididae	0 1 2 3 4		
Gastropoda	0 1 2 3 4	Simuliidae	0 1 2 3 4		
Bivalvia	0 1 2 3 4	Tabinidae	0 1 2 3 4		
		Culicidae	0 1 2 3 4		

AEP Mitchell Land-Fill Project

PRELIMINARY ASSESSMENT SCORE SHEET (PASS)

page 1 of 1

STREAM NAME <i>French Run</i>	LOCATION <i>Yoders Prop. / Marshall CO, WV</i>
STATION # <i>Seq. FR-2</i> RIVERMILE	STREAM CLASS <i>Perennial</i>
LAT <i>39°51'34.4"N</i> LONG <i>80°38'55.13"W</i>	RIVER BASIN <i>OH</i>
STORET #	AGENCY
COLLECTED BY <i>D. York</i> DATE <i>8/12</i>	LOT # _____ NUMBER OF SWEEPS <i>Sample d</i>
HABITATS: <input checked="" type="checkbox"/> COBBLE <input type="checkbox"/> SHOREZONE <input type="checkbox"/> SNAGS <input checked="" type="checkbox"/> VEGETATION	

*159
meters*

Enter Family and/or Genus and Species name on blank line.

Organisms	No.	LS	TI	TCR	Organisms	No.	LS	TI	TCR
Oligochaeta	12	A	DY		Megaloptera				
Hirudinea					Coleoptera				
Isopoda									
Amphipoda					Diptera	<i>Tipulidae 15</i>	<i>±</i>	<i>DY</i>	<i>1</i>
Decapoda	<i>Immature 10</i>	<i>I</i>	<i>DY</i>			<i>Simuliidae 100†</i>	<i>±</i>	<i>DY</i>	<i>1</i>
Ephemeroptera	<i>Heptageniidae 30</i>	<i>I</i>	<i>DY</i>	<i>1</i>		<i>Chironomidae 100†</i>	<i>±</i>	<i>DY</i>	<i>1</i>
	<i>Caenidae 3</i>	<i>I</i>	<i>DY</i>	<i>1</i>	Gastropoda				
	<i>Ameletidae 8</i>	<i>I</i>	<i>DY</i>	<i>1</i>					
Plecoptera	<i>Perlidae 25</i>	<i>I</i>	<i>DY</i>	<i>1</i>	Pelecypoda				
	<i>Perlodidae 10</i>	<i>±</i>	<i>DY</i>	<i>1</i>	Other				
Trichoptera	<i>Glossosomatidae 30</i>	<i>I</i>	<i>DY</i>	<i>1</i>					
	<i>Hydropsychidae 30</i>	<i>±</i>	<i>DY</i>	<i>1</i>					
					Taxonomic certainty rating (TCR) 1-5: 1=most certain, 5=least certain. If rating is 3-5, give reason (e.g., missing gills). LS=life stage: I=immature; P=pupa; A=adult TI=Taxonomists initials				
Hemiptera									

	Site Value	Target Threshold	If 2 or more metrics are ≥ target threshold, site is
Total No. Taxa	<i>11</i>		HEALTHY
EPT Taxa	<i>7</i>		If less than 2 metrics are within target range, site is
Tolerance Index			SUSPECTED IMPAIRED

WV score: 24 - Marginal
Total tolerance - 63.3 / Marginal

FCI Calculator for the High-Gradient Headwater Streams in eastern Kentucky and western West Virginia HGM Guidebook

To ensure accurate calculations, the **UPPERMOST STRATUM** of the plant community is determined based on the calculated value for V_{CANOPY} ($\geq 20\%$ cover is required for tree/sapling strata). Go to the SAR Data Entry tab and enter site characteristics and data in the yellow cells. For information on determining how to split a project into SARs, see Chapter 5 of the Operational Draft Regional Guidebook for the Functional Assessment of High-gradient Ephemeral and Intermittent Headwater Streams in Western West Virginia and Eastern Kentucky (Environmental Laboratory U.S. Army Corps of Engineers 2010).

Project Name: AEP Mitchell Landfill Mitigation

Location: Yoders Property, Marshall CO, WV , Segment 2

Sampling Date: 01-26-2012

Mitigation Site Before Project

Subclass for this SAR:

Intermittent Stream

Perennial

Uppermost stratum present at this SAR:

Tree/Sapling Strata

SAR number: Seg FR-2

Functional Results Summary:

Enter Results in Section C of the Mitigation Sufficiency Calculator

Function	Functional Capacity Index
Hydrology	0.41
Biogeochemical Cycling	0.58
Habitat	0.49

Variable Measure and Subindex Summary:

Variable	Name	Average Measure	Subindex
V_{CANOPY}	Percent canopy over channel.	34.90	0.30
V_{EMBED}	Average embeddedness of channel.	2.57	0.66
$V_{\text{SUBSTRATE}}$	Median stream channel substrate particle size.	3.80	1.00
V_{BERO}	Total percent of eroded stream channel bank.	105.00	0.51
V_{LWD}	Number of down woody stems per 100 feet of stream.	2.00	0.25
V_{TDBH}	Average dbh of trees.	7.39	0.75
V_{SNAG}	Number of snags per 100 feet of stream.	2.00	1.00
V_{SSD}	Number of saplings and shrubs per 100 feet of stream.	Not Used	Not Used
V_{SRICH}	Riparian vegetation species richness.	0.00	0.00
V_{DETRITUS}	Average percent cover of leaves, sticks, etc.	61.25	0.75
V_{HERB}	Average percent cover of herbaceous vegetation.	Not Used	Not Used
V_{WLUSE}	Weighted Average of Runoff Score for Catchment.	0.41	0.43

High-Gradient Headwater Streams in eastern Kentucky and western West Virginia Field Data Sheet and Calculator

Team: M. Calmore / D. York Latitude/UTM Northing: 39° 51' 34.4" N
 Project Name: ACP mitigation Landfill Longitude/UTM Easting: 80° 38' 05.513" W
 Location: Marshall Co, W.V. Yoders Property / Seg 2 Sampling Date: 25 Jan 2012
 SAR Number: Segment FR-2 Reach Length (ft): 100 Stream Type: Ephemeral/Intermittent (circle one) Perennial
 Top Strata: _____ (determined from percent calculated in $V_{CCANOPY}$)
 Site and Timing: Project/Mitigation Site (circle one) Before/After Project (Circle One)

Sample Variables 1-4 in stream channel

1 $V_{CCANOPY}$ Average percent cover over channel by tree and sapling canopy. Measure at no fewer than 10 roughly equidistant points along the stream. Measure only if tree/sapling cover is at least 20%. (If less than 20%, enter at least one value between 0 and 19 to trigger Top Strata choice.)

List the percent cover measurements at each point below:

0	0	2	50	50	50	50	40	45	60
---	---	---	----	----	----	----	----	----	----

2 V_{EMBED} Average embeddedness of the stream channel. Measure at no fewer than 30 roughly equidistant points along the stream. Select a particle from the bed. Before moving it, determine the percentage of the surface and area surrounding the particle that is covered by fine sediment, and enter the rating according to the following table. If the bed is an artificial surface, or composed of fine sediments, use a rating score of 1. If the bed is composed of bedrock, use a rating score of 5.

Embeddedness rating for gravel, cobble and boulder particles (rescaled from Platts, Megahan, and Minshall 1983)

Rating	Rating Description
5	<5 percent of surface covered, surrounded, or buried by fine sediment (or bedrock)
4	5 to 25 percent of surface covered, surrounded, or buried by fine sediment
3	26 to 50 percent of surface covered, surrounded, or buried by fine sediment
2	51 to 75 percent of surface covered, surrounded, or buried by fine sediment
1	>75 percent of surface covered, surrounded, or buried by fine sediment (or artificial surface)

List the ratings at each point below:

3.6	3	3	4	2	4				
2	2	4	4	2	3				
4	2	2	1	1	3				
3	3	3	1	1	3				
2	3	3	1	2	3				

3 $V_{SUBSTRATE}$ Median stream channel substrate particle size. Measure at no fewer than 30 roughly equidistant points along the stream; use the same points and particles as used in V_{EMBED} .

Enter particle size in inches to the nearest 0.1 inch at each point below (bedrock should be counted as 99 in, asphalt or concrete as 0.0 in, sand or finer particles as 0.08 in):

3.6	4.5	2.9	2.5	2.4	3.0				
5	4.4	3	6	5.1	4				
1.1	9.3	3.6	6.5	2.5	18				
1.6	1.75	3.25	5.0	1	2.25				
5.75	3.1	8.9	8	6.5	3.4				

4 V_{BERO} Total percent of eroded stream channel bank. Enter the total number of feet of eroded bank on each side and the total percentage will be calculated. If both banks are eroded, total erosion for the stream may be up to 200%.

Left Bank: 15' Right Bank: 90'

Sample Variables 10-11 within at least 8 subplots (40" x 40", or 1m x 1m) in the riparian/buffer zone within 25 feet from each bank. The four subplots should be placed roughly equidistantly along each side of the stream.

10 $V_{DETRITUS}$ Average percent cover of leaves, sticks, or other organic material. Woody debris <4" diameter and <36" long are include. Enter the percent cover of the detrital layer at each subplot.

Left Side				Right Side			
100	100	100	10	90	0	5	95

11 V_{HERB} Average percentage cover of herbaceous vegetation (measure only if tree cover is <20%). Do not include woody stems at least 4" dbh and 36" tall. Because there may be several layers of ground cover vegetation percentages up through 200% are accepted. Enter the percent cover of ground vegetation at each subplot.

Left Side				Right Side			
95	95	0	95				

Sample Variable 12 within the entire catchment of the stream.

12 V_{WLUSE} Weighted Average of Runoff Score for watershed:

Land Use (Choose From Drop List)	Runoff Score	% in Catchment	Running Percent (not >100)
Farmland / Partial Open Pasture, + Hay / Partial Woodland			

Summary			Notes:
Variable	Value	VSI	
$V_{CCANOPY}$			
V_{EMBED}			
$V_{SUBSTRATE}$			
V_{BERO}			
V_{LWD}			
V_{TDBH}			
V_{SNAG}			
V_{SSD}			
V_{SRICH}			
$V_{DETRITUS}$			
V_{HERB}			
V_{WLUSE}			

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HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (FRONT)

STREAM NAME <u>French Run</u>		LOCATION <u>Marshall Co. WV, Lyon's Property</u>	
STATION # <u>Sta # 23</u> RIVERMILE		STREAM CLASS <u>Perennial</u>	
LAT <u>39.5123.508</u> LONG <u>80.3809.332</u>		RIVER BASIN <u>Ohio</u>	
STORET #		AGENCY	
INVESTIGATORS <u>D. York / M. Gilmore</u>			
FORM COMPLETED BY <u>D. York / M. Gilmore</u>		DATE <u>25 Jan 2012</u> TIME <u>1200</u> AM () PM ()	REASON FOR SURVEY <u>Potential Mitigation Site</u>

	Habitat Parameter	Condition Category			
		Optimal	Suboptimal	Marginal	Poor
Parameters to be evaluated in sampling reach	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 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.
	SCORE <u>8</u>	20 19 18 17 16	15 14 13 12 11	10 <u>(9)</u> <u>(8)</u> 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 <u>11</u>	20 19 18 17 16	<u>(15)</u> 14 <u>(13)</u> 12 <u>(11)</u>	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 <u>9</u>	20 19 18 17 16	15 14 13 12 11	10 9 8 <u>(7)</u> 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.	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 <u>8</u>	20 19 18 17 16	15 14 13 12 11	10 9 <u>(8)</u> 7 6	5 4 3 2 1 0	
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.	
SCORE <u>18</u>	20 19 <u>(18)</u> 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	

Pg 2
 Seq FR. 3
 Lyons Property

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HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (BACK)

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
6. Channel Alteration SCORE 18	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
	20 19 (18) 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Channel Sinuosity SCORE 6	The bends in the stream increase the stream length 3 to 4 times longer than if it 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.	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long distance.
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 (6) 5	5 4 3 2 1 0
8. Bank Stability (score each bank) SCORE 1 (LB) SCORE 4 (RB)	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.
	Left Bank 10 9	8 7 6	5 4 3	2 1 (0) 0
	Right Bank 10 9	8 7 6	5 (4) 3	2 1 0
9. Vegetative Protection (score each bank) Note: determine left or right side by facing downstream.	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.
	Left Bank 10 9	8 7 6	5 4 3	(2) 1 0
	Right Bank 10 9	8 7 6	(5) 4 3	(2) 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone) SCORE 0 (LB) SCORE 0 (RB)	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.
	Left Bank 10 9	8 7 6	5 4 3	2 1 (0)
	Right Bank 10 9	8 7 6	5 4 3	2 1 (0)

Parameters to be evaluated broader than sampling reach

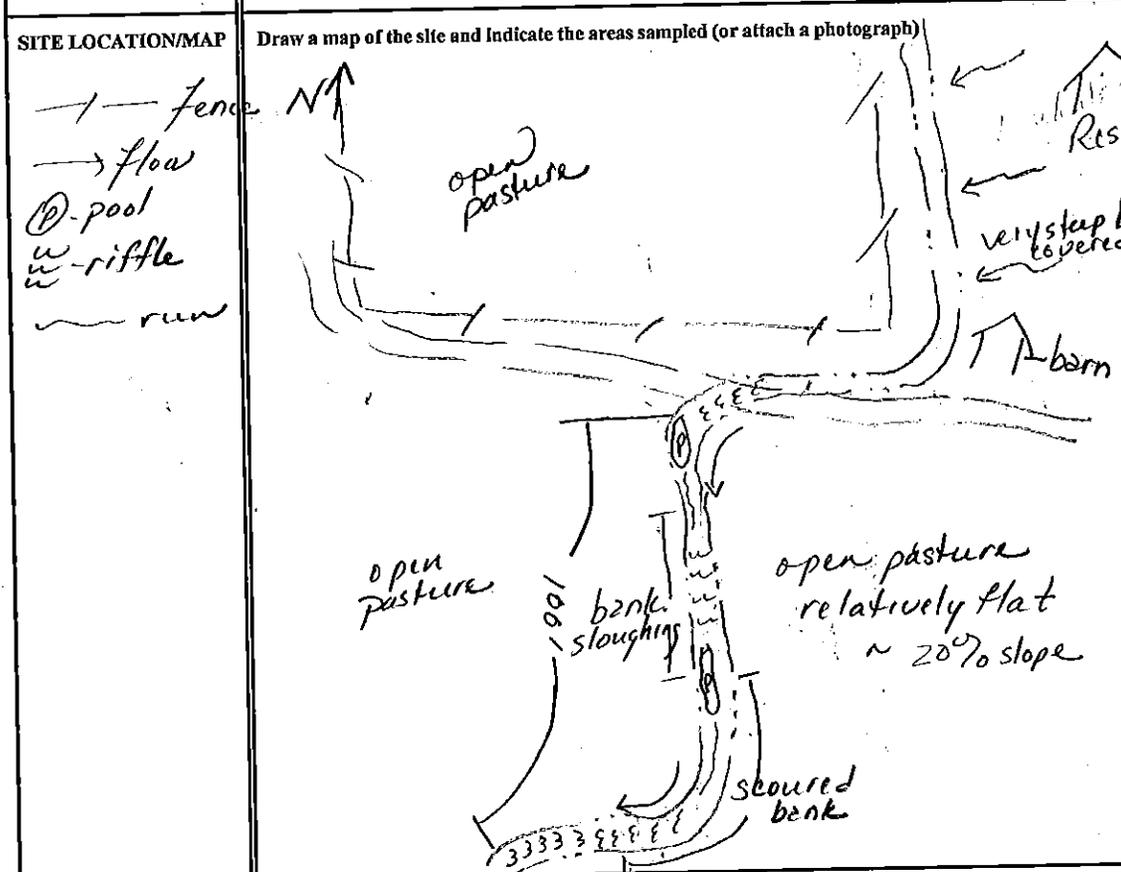
Total Score 8.5
Marginal

AEP Mitchell Landfill Project

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (FRONT)

STREAM NAME: <u>Ferret Run</u>	LOCATION: <u>Lyons Prop. Marshall Co.</u>
STATION # <u>Seg ER 3</u> VERMILE _____	STREAM CLASS: <u>Perennial</u>
LAT <u>39 51 23.508</u> LONG <u>80 32 09.332</u>	RIVER BASIN: <u>0110</u>
STORET # _____	AGENCY _____
INVESTIGATORS: <u>M. Gilmore / D. York</u>	
FORM COMPLETED BY: <u>D. York / M. Gilmore</u>	DATE: <u>25 Jan</u> TIME: <u>1:20</u> AM <input checked="" type="radio"/> PM <input type="radio"/>
REASON FOR SURVEY: <u>Potential Mitigation Site</u>	

WEATHER CONDITIONS	Now	Past 24 hours	Has there been a heavy rain in the last 7 days? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
	<input type="checkbox"/> storm (heavy rain)	<input type="checkbox"/>	Air Temperature: <u>11.1</u> °C <u>34</u> °F
	<input type="checkbox"/> rain (steady rain)	<input type="checkbox"/>	Other _____
	<input checked="" type="checkbox"/> 30% showers (intermittent)	<input checked="" type="checkbox"/> 90%	
	<input type="checkbox"/> %cloud cover	<input type="checkbox"/>	
	<input type="checkbox"/> clear/sunny	<input type="checkbox"/>	



STREAM CHARACTERIZATION	Stream Subsystem <input checked="" type="checkbox"/> Perennial <input type="checkbox"/> Intermittent <input type="checkbox"/> Tidal	Stream Type <input checked="" type="checkbox"/> Coldwater <input type="checkbox"/> Warmwater
	Stream Origin <input type="checkbox"/> Glacial <input checked="" type="checkbox"/> Spring-fed <input type="checkbox"/> Non-glacial montane <input type="checkbox"/> Mixture of origins <input type="checkbox"/> Swamp and bog <input checked="" type="checkbox"/> Other	Catchment Area _____ km ²

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET
(BACK)

WATERSHED FEATURES	Predominant Surrounding Landuse <input type="checkbox"/> Forest <input type="checkbox"/> Commercial <input checked="" type="checkbox"/> Field/Pasture <input type="checkbox"/> Industrial <input type="checkbox"/> Agricultural <input type="checkbox"/> Other <input type="checkbox"/> Residential	Local Watershed NPS Pollution <input type="checkbox"/> No evidence <input type="checkbox"/> Some potential sources <input checked="" type="checkbox"/> Obvious sources
		Local Watershed Erosion <input type="checkbox"/> None <input type="checkbox"/> Moderate <input type="checkbox"/> Heavy
RIPARIAN VEGETATION (18 meter buffer)	Indicate the dominant type and record the dominant species present <input type="checkbox"/> Trees <input type="checkbox"/> Shrubs <input checked="" type="checkbox"/> Grasses <input type="checkbox"/> Herbaceous dominant species present <u>FESCUE (no trees)</u>	
INSTREAM FEATURES	Estimated Reach Length <u>30.48</u> m Estimated Stream Width <u>1.524</u> m Sampling Reach Area <u>46.45</u> m ² Area in km ² (m ² x1000) <u>4645/52</u> km ² Estimated Stream Depth <u>1.78</u> m	Canopy Cover <input checked="" type="checkbox"/> Fully open <input type="checkbox"/> Partly shaded <input type="checkbox"/> Shaded High Water Mark <u>1.22</u> m Proportion of Reach Represented by Stream Morphology Types <input checked="" type="checkbox"/> Riffle <u>36</u> % <input checked="" type="checkbox"/> Run <u>60</u> % <input checked="" type="checkbox"/> Pool <u>10</u> %
	Surface Velocity <u>NA</u> m/sec (at thalweg) <u>slow</u>	Channelized <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No Dam Present <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
LARGE WOODY DEBRIS	LWD <u>0</u> m ² Density of LWD <u>0</u> m ² /km ² (LWD/ reach area)	
AQUATIC VEGETATION	Indicate the dominant type and record the dominant species present <input type="checkbox"/> Rooted emergent <input type="checkbox"/> Rooted submergent <input type="checkbox"/> Rooted floating <input type="checkbox"/> Free floating <input type="checkbox"/> Floating Algae <input type="checkbox"/> Attached Algae dominant species present <u>N/A</u> Portion of the reach with aquatic vegetation <u>—</u> %	
WATER QUALITY	Temperature <u>5.89</u> °C Specific Conductance <u>211</u> Dissolved Oxygen <u>9.22</u> pH <u>7.62</u> Turbidity <u>2.6</u> WQ Instrument Used <u>HORIBA US2</u>	Water Odors <input checked="" type="checkbox"/> Normal/None <input type="checkbox"/> Sewage <input type="checkbox"/> Petroleum <input type="checkbox"/> Chemical <input type="checkbox"/> Fishy <input type="checkbox"/> Other Water Surface Oils <input type="checkbox"/> Slick <input type="checkbox"/> Sheen <input type="checkbox"/> Globbs <input type="checkbox"/> Flecks <input checked="" type="checkbox"/> None <input type="checkbox"/> Other Turbidity (if not measured) <input checked="" type="checkbox"/> Clear <input type="checkbox"/> Slightly turbid <input type="checkbox"/> Turbid <input type="checkbox"/> Opaque <input type="checkbox"/> Stained <input type="checkbox"/> Other
SEDIMENT/ SUBSTRATE	<input checked="" type="checkbox"/> Odors <input type="checkbox"/> Normal <input type="checkbox"/> Sewage <input type="checkbox"/> Petroleum <input type="checkbox"/> Chemical <input type="checkbox"/> Anaerobic <input type="checkbox"/> None <input type="checkbox"/> Other	Deposits <input type="checkbox"/> Sludge <input type="checkbox"/> Sawdust <input type="checkbox"/> Paper fiber <input type="checkbox"/> Sand <input type="checkbox"/> Relict shells <input type="checkbox"/> Other Looking at stones which are not deeply embedded, are the undersides black in color? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No

INORGANIC SUBSTRATE COMPONENTS (should add up to 100%)			ORGANIC SUBSTRATE COMPONENTS (does not necessarily add up to 100%)		
Substrate Type	Diameter	% Composition in Sampling Reach	Substrate Type	Characteristic	% Composition in Sampling Area
Bedrock		—	Detritus	sticks, wood, coarse plant materials (CPOM)	3
Boulder	> 256 mm (10")	2			
Cobble	64-256 mm (2.5"-10")	50	Muck-Mud	black, very fine organic (FPOM)	10
Gravel	2-64 mm (0.1"-2.5")	30			
Sand	0.06-2mm (gritty)	8	Marl	grey, shell fragments	0
Silt	0.004-0.06 mm	10			
Clay	< 0.004 mm (slick)	—			

AEP Mitchell Landfill Project

BENTHIC MACROINVERTEBRATE FIELD DATA SHEET

STREAM NAME <i>French Run</i>	LOCATION <i>Lyon's Prop. Marshall Co, WV</i>
STATION # <i>Seg FR3</i> RIVERMILE	STREAM CLASS <i>Perennial</i>
LAT <i>39°51'25.508" N</i> LONG <i>80°38'9.330" W</i>	RIVER BASIN <i>OHIO</i>
STORET #	AGENCY
INVESTIGATORS <i>D. York/Gilmore</i>	LOT NUMBER
FORM COMPLETED BY <i>D. York/Gilmore</i>	DATE TIME <i>8 Feb 2012 11:15 AM</i> PM
	REASON FOR SURVEY <i>Potential Mitigation Site</i>

HABITAT TYPES	Indicate the percentage of each habitat type present <input checked="" type="checkbox"/> Cobble <i>65</i> % <input type="checkbox"/> Snags <i>0</i> % <input type="checkbox"/> Vegetated Banks <i>0</i> % <input checked="" type="checkbox"/> Sand <i>10</i> % <input type="checkbox"/> Submerged Macrophytes <i>0</i> % <input type="checkbox"/> Other () %
SAMPLE COLLECTION	Gear used <input type="checkbox"/> D-frame <input checked="" type="checkbox"/> Kick-net <input type="checkbox"/> Other _____ How were the samples collected? <input checked="" type="checkbox"/> wading <input type="checkbox"/> from bank <input type="checkbox"/> from boat Indicate the number of jabs/kicks taken in each habitat type. <input checked="" type="checkbox"/> Cobble _____ <input type="checkbox"/> Snags _____ <input type="checkbox"/> Vegetated Banks _____ <input type="checkbox"/> Sand _____ <input type="checkbox"/> Submerged Macrophytes _____ <input type="checkbox"/> Other () _____
GENERAL COMMENTS	<i>1 m² area sampled.</i>

*5 larval salamanders
11. June*

QUALITATIVE LISTING OF AQUATIC BIOTA

Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare, 2 = Common, 3 = Abundant, 4 = Dominant

Periphyton	<input type="radio"/> 0	<input type="radio"/> 1	<input type="radio"/> 2	<input type="radio"/> 3	<input type="radio"/> 4	Slimes	<input type="radio"/> 0	<input type="radio"/> 1	<input type="radio"/> 2	<input type="radio"/> 3	<input type="radio"/> 4
Filamentous Algae	<input type="radio"/> 0	<input type="radio"/> 1	<input type="radio"/> 2	<input type="radio"/> 3	<input type="radio"/> 4	Macroinvertebrates	<input checked="" type="radio"/> 4	<input type="radio"/> 1	<input type="radio"/> 2	<input type="radio"/> 3	<input type="radio"/> 4
Macrophytes	<input type="radio"/> 0	<input type="radio"/> 1	<input type="radio"/> 2	<input type="radio"/> 3	<input type="radio"/> 4	Fish	<input type="radio"/> 0	<input type="radio"/> 1	<input type="radio"/> 2	<input type="radio"/> 3	<input type="radio"/> 4

FIELD OBSERVATIONS OF MACROBENTHOS

Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare (1-3 organisms), 2 = Common (3-9 organisms), 3 = Abundant (>10 organisms), 4 = Dominant (>50 organisms)

Porifera	0	1	2	3	4	Anisoptera <i>Aeschnidae</i>	0	<input checked="" type="radio"/> 1	2	3	4	Chironomidae	0	1	2	3	<input checked="" type="radio"/> 4
Hydrozoa	0	1	2	3	4	Zygoptera	0	1	2	3	4	Ephemeroptera	0	1	2	3	<input checked="" type="radio"/> 4
Platyhelminthes	0	1	2	3	4	Hemiptera	0	1	2	3	4	Trichoptera	0	1	2	3	<input checked="" type="radio"/> 4
Turbellaria	0	1	2	3	4	Coleoptera <i>Elmidae</i>	0	<input checked="" type="radio"/> 1	2	3	4	Other	0	1	2	3	4
Hirudinea	0	1	2	3	4	Lepidoptera	0	1	2	3	4	<i>Plecoptera</i>	<input checked="" type="radio"/> 4				
Oligochaeta	0	1	2	<input checked="" type="radio"/> 3	4	Sialidae	0	<input checked="" type="radio"/> 1	2	3	4						
Isopoda	0	1	2	3	4	Corydalidae (3)	0	<input checked="" type="radio"/> 1	2	3	4						
Amphipoda	0	1	2	3	4	Tipulidae	0	<input checked="" type="radio"/> 1	2	3	4						
Decapoda	0	1	<input checked="" type="radio"/> 2	3	4	Empididae	0	1	2	3	4						
Gastropoda	0	1	2	3	4	Simuliidae	0	1	2	3	<input checked="" type="radio"/> 4						
Bivalvia	0	1	2	3	4	Tabinidae	0	1	2	3	4						
						Culcidae	0	1	2	3	4						

34-Marginal

AEP Mitchell Landfill Project

PRELIMINARY ASSESSMENT SCORE SHEET (PASS)

page 1 of 1

STREAM NAME <i>French Run</i>		LOCATION <i>Lyon's Property, Marshall Co, WV</i>	
STATION # <i>Seq FR-3</i>	RIVERMILE	STREAM CLASS <i>Perennial</i>	
LAT <i>39°51'23.508"N</i>	LONG <i>80°38'9.330"W</i>	RIVER BASIN <i>OH</i>	
STORET #		AGENCY	
COLLECTED BY <i>DJ</i>	DATE <i>8 FEB 12</i>	LOT #	NUMBER OF SWEEPS <i>Sample 1 sq meter</i>
HABITATS: <input checked="" type="checkbox"/> COBBLE <input type="checkbox"/> SHOREZONE <input type="checkbox"/> SNAGS <input type="checkbox"/> VEGETATION			

Enter Family and/or Genus and Species name on blank line.

Organisms	No.	LS	TI	TCR	Organisms	No.	LS	TI	TCR		
Oligochaeta	<i>Roundworm</i>	13	A	DY	1	Megaloptera	<i>Corecolidae</i>	3	I	DY	1
Hirudinea						Coleoptera	<i>Elmidae</i>	1	I	DY	1
Isopoda											
Amphipoda					Diptera	<i>Chironomidae</i>	100+	I	DY	1	
Decapoda	<i>Immature?</i>	4	I	DY	1	<i>Simuliidae</i>	100+	I	DY	1	
	<i>small!</i>					<i>Tipulidae</i>	3	I	DY	1	
Ephemeroptera	<i>Heptageniidae</i>	50+	I	DY	1						
	<i>Ameletidae</i>	10	I	DY	1	Gastropoda					
	<i>Isonychiidae</i>	10	I	DY	1						
Plecoptera	<i>Perlidae</i>	50+	I	DY	1	Pelecypoda					
	<i>Capniidae</i>	10	I	DY	2						
					Other	<i>Aeshnidae</i>	1	I	DY	1	
Trichoptera	<i>Glossosomatidae</i>	40+									
	<i>Hydropsychidae</i>	30+									
					Taxonomic certainty rating (TCR) 1-5: 1=most certain, 5=least certain. If rating is 3-5, give reason (e.g., missing gills). LS=life stage: I = immature; P = pupa; A = adult TI = Taxonomists initials						
Hemiptera											

	Site Value	Target Threshold	If 2 or more metrics are ≥ target threshold, site is HEALTHY
Total No. Taxa	15		
EPT Taxa	7		If less than 2 metrics are within target range, site is SUSPECTED IMPAIRED
Tolerance Index			

*WV Scores: 34 - Marginal
TT - 70 / suboptimal*

FCI Calculator for the High-Gradient Headwater Streams in eastern Kentucky and western West Virginia HGM Guidebook

To ensure accurate calculations, the **UPPERMOST STRATUM** of the plant community is determined based on the calculated value for V_{CCANOPY} ($\geq 20\%$ cover is required for tree/sapling strata). Go to the SAR Data Entry tab and enter site characteristics and data in the yellow cells. For information on determining how to split a project into SARs, see Chapter 5 of the Operational Draft Regional Guidebook for the Functional Assessment of High-gradient Ephemeral and Intermittent Headwater Streams in Western West Virginia and Eastern Kentucky (Environmental Laboratory U.S. Army Corps of Engineers 2010).

Project Name: AEP Mitchell Landfill Mitigation

Location: Lyons Property, Marshall CO, WV. Segment 3

Sampling Date: 01-26-2012

Mitigation Site Before Project

Subclass for this SAR:

~~Intermittent Stream~~

Perennial

Uppermost stratum present at this SAR:

Shrub/Herb Strata

SAR number: Seg FR-3

Functional Results Summary:

Enter Results in Section C of the Mitigation Sufficiency Calculator

Function	Functional Capacity Index
Hydrology	0.36
Biogeochemical Cycling	0.36
Habitat	0.26

Variable Measure and Subindex Summary:

Variable	Name	Average Measure	Subindex
V_{CCANOPY}	Percent canopy over channel.	Not Used, <20%	Not Used
V_{EMBED}	Average embeddedness of channel.	2.77	0.74
$V_{\text{SUBSTRATE}}$	Median stream channel substrate particle size.	2.03	1.00
V_{BERO}	Total percent of eroded stream channel bank.	90.00	0.59
V_{LWD}	Number of down woody stems per 100 feet of stream.	0.00	0.00
V_{TDBH}	Average dbh of trees.	Not Used	Not Used
V_{SNAG}	Number of snags per 100 feet of stream.	0.00	0.10
V_{SSD}	Number of saplings and shrubs per 100 feet of stream.	0.00	0.00
V_{SRICH}	Riparian vegetation species richness.	0.00	0.00
V_{DETRITUS}	Average percent cover of leaves, sticks, etc.	5.38	0.07
V_{HERB}	Average percent cover of herbaceous vegetation.	86.63	1.00
V_{WLUSE}	Weighted Average of Runoff Score for Catchment.	0.41	0.43

High-Gradient Headwater Streams in eastern Kentucky and western West Virginia Field Data Sheet and Calculator

Team: Gilmore/Work Latitude/UTM Northing: 39 51 23.508
 Project Name: AEP Mitchell Landfill Mitigation Longitude/UTM Easting: 80 38 09.330
 Location: Segment 3- Marshall Co. Lyons Property W V Sampling Date: 25 Jan 2012
 SAR Number: 02/FR-3 Reach Length (ft): 100 Stream Type: Ephemeral/Intermittent (circle one) Perennial
 Top Strata: _____ (determined from percent calculated in $V_{CCANOPY}$)
 Site and Timing: Project/Mitigation Site (circle one) Before/After Project (Circle One)

Sample Variables 1-4 in stream channel

1 $V_{CCANOPY}$ Average percent cover over channel by tree and sapling canopy. Measure at no fewer than 10 roughly equidistant points along the stream. Measure only if tree/sapling cover is at least 20%. (If less than 20%, enter at least one value between 0 and 19 to trigger Top Strata choice.)

List the percent cover measurements at each point below:

0	0	0	0	0	0	0	0	0	0
---	---	---	---	---	---	---	---	---	---

2 V_{EMBED} Average embeddedness of the stream channel. Measure at no fewer than 30 roughly equidistant points along the stream. Select a particle from the bed. Before moving it, determine the percentage of the surface and area surrounding the particle that is covered by fine sediment, and enter the rating according to the following table. If the bed is an artificial surface, or composed of fine sediments, use a rating score of 1. If the bed is composed of bedrock, use a rating score of 5.

Embeddedness rating for gravel, cobble and boulder particles (rescaled from Platts, Megahan, and Minshall 1983)

Rating	Rating Description
5	<5 percent of surface covered, surrounded, or buried by fine sediment (or bedrock)
4	5 to 25 percent of surface covered, surrounded, or buried by fine sediment
3	26 to 50 percent of surface covered, surrounded, or buried by fine sediment
2	51 to 75 percent of surface covered, surrounded, or buried by fine sediment
1	>75 percent of surface covered, surrounded, or buried by fine sediment (or artificial surface)

List the ratings at each point below:

3	3	3	1	5	1				
3	3	3	2	3	1				
4	2	2	4	4	3				
2	4	3	1	4	2				
4	2	3	3	2	3				

3 $V_{SUBSTRATE}$ Median stream channel substrate particle size. Measure at no fewer than 30 roughly equidistant points along the stream; use the same points and particles as used in V_{EMBED} .

Enter particle size in inches to the nearest 0.1 inch at each point below (bedrock should be counted as 99 in, asphalt or concrete as 0.0 in, sand or finer particles as 0.08 in):

2.75	3.3	.8	3.75	3.25	7.0				
.6	4	.6	1.35	2.25	1.25				
3.5	3.9	1.0	.9	1.3	5.5				
2.5	1.0	.6	2.0	9.0	2.75				
1.8	4.19, 2.8	1.5	1.3	1.0	3.8				

4 V_{BERO} Total percent of eroded stream channel bank. Enter the total number of feet of eroded bank on each side and the total percentage will be calculated. If both banks are eroded, total erosion for the stream may be up to 200%.

Left Bank: 40% Right Bank: 50%

Sample Variables 10-11 within at least 8 subplots (40" x 40", or 1m x 1m) in the riparian/buffer zone within 25 feet from each bank. The four subplots should be placed roughly equidistantly along each side of the stream.

10 $V_{DETRITUS}$ Average percent cover of leaves, sticks, or other organic material. Woody debris <4" diameter and <36" long are include. Enter the percent cover of the detrital layer at each subplot.

Left Side				Right Side			
10	5	2	5	10	5	3	3

11 V_{HERB} Average percentage cover of herbaceous vegetation (measure only if tree cover is <20%). Do not include woody stems at least 4" dbh and 36" tall. Because there may be several layers of ground cover vegetation percentages up through 200% are accepted. Enter the percent cover of ground vegetation at each subplot.

Left Side				Right Side			
80	90	65	98	95	80	95	90

Sample Variable 12 within the entire catchment of the stream.

12 V_{WLUSE} Weighted Average of Runoff Score for watershed:

Land Use (Choose From Drop List)	Runoff Score	% in Catchment	Running Percent (not >100)
Pasture / Farmland - Partial Pasture + Woodland			

Summary			Notes:
Variable	Value	VSI	
$V_{CCANOPY}$			
V_{EMBED}			
$V_{SUBSTRATE}$			
V_{BERO}			
V_{LWD}			
V_{TDBH}			
V_{SNAG}			
V_{SSD}			
V_{SRICH}			
$V_{DETRITUS}$			
V_{HERB}			
V_{WLUSE}			

AEP Mitchell Landfill Project

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (FRONT)

STREAM NAME <u>French Run</u>	LOCATION <u>Marshall Co, WV, Aiston Property</u>
STATION # <u>Seq. FC-4</u> RIVERMILE	STREAM CLASS <u>Intermittent</u>
LAT <u>39.5114.814</u> LONG <u>80.3815.033</u>	RIVER BASIN <u>OHIO</u>
STORET #	AGENCY
INVESTIGATORS <u>D. York / M. Gilmore</u>	
FORM COMPLETED BY <u>D. York / M. Gilmore</u>	DATE <u>23 Jan 2011</u> TIME <u>1415</u> AM <input checked="" type="radio"/> PM
REASON FOR SURVEY <u>Potential Mitigation Site</u>	

	Habitat Parameter	Condition Category			
		Optimal	Suboptimal	Marginal	Poor
Parameters to be evaluated in sampling reach	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 not new fall and not transient). SCORE <u>1</u>	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. SCORE <u>6</u>	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. SCORE <u>0</u>	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. SCORE <u>1</u>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	5. Channel Flow Status Water reaches base of both lower banks, and minimal amount of channel substrate is exposed. SCORE <u>18</u>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

pg 2
 Seg. FR-4
 Astoria Property

AEP Mitchell Landfill Project

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (BACK)

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
6. Channel Alteration Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.	
SCORE 10	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Channel Sinuosity The bends in the stream increase the stream length 3 to 4 times longer than if it 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.	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long distance.	
SCORE 2	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) Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.	
SCORE 1 (LB) SCORE 5 (RB)	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 downstream.	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 2 (LB) SCORE 2 (RB)	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
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
SCORE 0 (LB) SCORE 0 (RB)	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

Parameters to be evaluated broader than sampling reach

Total Score 48
 Poor

AEP Mitchell Landfill Project

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (FRONT)

STREAM NAME <u>Trib + French Run</u>	LOCATION <u>Marshall Co, WV, Van Aston Property</u>	
STATION # <u>Sample 4</u> RIVERMILE _____	STREAM CLASS <u>Intermittent</u>	
LAT <u>39°51'14.814</u> LONG <u>80°38'15.033</u>	RIVER BASIN <u>Ohio</u>	
STORET # _____	AGENCY _____	
INVESTIGATORS <u>Dawn York + Mari Gilmore</u>		
FORM COMPLETED BY <u>YORK/GILMORE</u>	DATE <u>1/25/12</u> TIME <u>4:15</u> AM <input checked="" type="radio"/> PM	REASON FOR SURVEY <u>Potential Mitigation Area</u>

WEATHER CONDITIONS	Now <input type="checkbox"/> storm (heavy rain) <input type="checkbox"/> rain (steady rain) <input checked="" type="checkbox"/> 90% showers (intermittent) <input type="checkbox"/> %cloud cover <input type="checkbox"/> clear/sunny	Past 24 hours <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> 90% <input type="checkbox"/>	Has there been a heavy rain in the last 7 days? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No Air Temperature <u>11.1 °C 34 °F</u> Other _____
--------------------	--	--	---

SITE LOCATION/MAP	Draw a map of the site and indicate the areas sampled (or attach a photograph)
-------------------	--

STREAM CHARACTERIZATION	Stream Subsystem <input checked="" type="checkbox"/> Perennial <input type="checkbox"/> Intermittent <input type="checkbox"/> Tidal ?	Stream Type <input checked="" type="checkbox"/> Coldwater <input type="checkbox"/> Warmwater Catchment Area _____ km ²
	Stream Origin <input type="checkbox"/> Glacial <input checked="" type="checkbox"/> Spring-fed <input type="checkbox"/> Non-glacial montane <input type="checkbox"/> Mixture of origins <input type="checkbox"/> Swamp and bog <input checked="" type="checkbox"/> Other _____	

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (BACK)

WATERSHED FEATURES	Predominant Surrounding Landuse <input type="checkbox"/> Forest <input type="checkbox"/> Commercial <input checked="" type="checkbox"/> Field/Pasture <input type="checkbox"/> Industrial <input type="checkbox"/> Agricultural <input type="checkbox"/> Other _____ <input type="checkbox"/> Residential	Local Watershed NPS Pollution <input type="checkbox"/> No evidence <input type="checkbox"/> Some potential sources <input checked="" type="checkbox"/> Obvious sources
		Local Watershed Erosion <input type="checkbox"/> None <input checked="" type="checkbox"/> Moderate <input type="checkbox"/> Heavy
RIPARIAN VEGETATION (18 meter buffer)	Indicate the dominant type and record the dominant species present <input type="checkbox"/> Trees <input type="checkbox"/> Shrubs <input checked="" type="checkbox"/> Grasses <input type="checkbox"/> Herbaceous dominant species present <u>FESCUE</u>	
INSTREAM FEATURES	Estimated Reach Length <u>30.40</u> m Estimated Stream Width <u>1.71</u> m Sampling Reach Area <u>52.12</u> m ² Area in km ² (m ² x 1000) <u>52120.8</u> km ² Estimated Stream Depth <u>0.851</u> m	Canopy Cover <input checked="" type="checkbox"/> Fully open <input type="checkbox"/> Partly shaded <input type="checkbox"/> Shaded High Water Mark _____ m Proportion of Reach Represented by Stream Morphology Types <input type="checkbox"/> Riffle _____ % <input type="checkbox"/> Run _____ % <input type="checkbox"/> Pool _____ %
	Surface Velocity (at thalweg) _____ m/sec <u>slow</u>	Channelized <input type="checkbox"/> Yes <input type="checkbox"/> No Dam Present <input type="checkbox"/> Yes <input type="checkbox"/> No
LARGE WOODY DEBRIS	LWD <u>0</u> m ² Density of LWD <u>0</u> m ² /km ² (LWD/ reach area)	
AQUATIC VEGETATION	Indicate the dominant type and record the dominant species present <input type="checkbox"/> Rooted emergent <input type="checkbox"/> Rooted submergent <input type="checkbox"/> Rooted floating <input type="checkbox"/> Free floating <input type="checkbox"/> Floating Algae <input type="checkbox"/> Attached Algae dominant species present <u>N/A</u> Portion of the reach with aquatic vegetation _____ %	
WATER QUALITY	Temperature <u>6.33</u> °C Specific Conductance <u>210</u> Dissolved Oxygen <u>9.04</u> pH <u>7.96</u> Turbidity <u>3.0</u> WQ Instrument Used <u>Hori ba USA</u>	Water Odors <input checked="" type="checkbox"/> Normal/None <input type="checkbox"/> Sewage <input type="checkbox"/> Petroleum <input type="checkbox"/> Chemical <input type="checkbox"/> Fishy <input type="checkbox"/> Other _____ Water Surface Oils <input type="checkbox"/> Slick <input type="checkbox"/> Sheen <input type="checkbox"/> Globbs <input type="checkbox"/> Flecks <input checked="" type="checkbox"/> None <input type="checkbox"/> Other _____ Turbidity (if not measured) <input type="checkbox"/> Clear <input checked="" type="checkbox"/> Slightly turbid <input type="checkbox"/> Turbid <input type="checkbox"/> Opaque <input type="checkbox"/> Stained <input type="checkbox"/> Other _____
SEDIMENT/ SUBSTRATE	Odors <input type="checkbox"/> Normal <input checked="" type="checkbox"/> Sewage <input type="checkbox"/> Petroleum <input type="checkbox"/> Chemical <input type="checkbox"/> Anaerobic <input type="checkbox"/> None <input type="checkbox"/> Other _____	Deposits <input type="checkbox"/> Sludge <input type="checkbox"/> Sawdust <input type="checkbox"/> Paper fiber <input type="checkbox"/> Sand <input type="checkbox"/> Relict shells <input type="checkbox"/> Other _____ Looking at stones which are not deeply embedded, are the undersides black in color? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No

INORGANIC SUBSTRATE COMPONENTS (should add up to 100%)			ORGANIC SUBSTRATE COMPONENTS (does not necessarily add up to 100%)		
Substrate Type	Diameter	% Composition in Sampling Reach	Substrate Type	Characteristic	% Composition in Sampling Area
Bedrock			Detritus	sticks, wood, coarse plant materials (CPOM)	
Boulder	> 256 mm (10")	1			
Cobble	64-256 mm (2.5"-10")	2	Muck-Mud	black, very fine organic (FPOM)	
Gravel	2-64 mm (0.1"-2.5")	15			
Sand	0.06-2mm (gritty)	1	Marl	grey, shell fragments	
Silt	0.004-0.06 mm	80			
Clay	< 0.004 mm (slick)	3			

AEP Mitchell Landfill Project

BENTHIC MACROINVERTEBRATE FIELD DATA SHEET

STREAM NAME <i>French Run</i>		LOCATION <i>Van Arden Marshall Co, WV</i>	
STATION # <i>Seg FR 4</i> RIVER MILE		STREAM CLASS <i>Perennial</i>	
LAT <i>39° 51' 14.014"</i> LONG <i>80° 38' 15.033"</i>		RIVER BASIN <i>OHIO</i>	
STORET #		AGENCY	
INVESTIGATORS <i>M. Gilmore / D. York</i>		LOT NUMBER	
FORM COMPLETED BY <i>D. York / M. Gilmore</i>		DATE <i>8 Feb 2018</i> TIME <i>1:20</i> AM PM	REASON FOR SURVEY <i>Potential Mitigation Site</i>

HABITAT TYPES	Indicate the percentage of each habitat type present <input checked="" type="checkbox"/> Cobble <i>2</i> % <input type="checkbox"/> Snags <i>0</i> % <input type="checkbox"/> Vegetated Banks <i>0</i> % <input checked="" type="checkbox"/> Sand <i>20</i> % <i>77 silt</i> % <input type="checkbox"/> Submerged Macrophytes <i>0</i> % <input checked="" type="checkbox"/> Other (<i>boulders</i>) <i>1</i> %
SAMPLE COLLECTION	Gear used <input type="checkbox"/> D-frame <input checked="" type="checkbox"/> Kick-net <input type="checkbox"/> Other _____ How were the samples collected? <input checked="" type="checkbox"/> wading <input type="checkbox"/> from bank <input type="checkbox"/> from boat Indicate the number of jabs/kicks taken in each habitat type. <input checked="" type="checkbox"/> Cobble _____ <input type="checkbox"/> Snags _____ <input type="checkbox"/> Vegetated Banks _____ <input type="checkbox"/> Sand _____ <input type="checkbox"/> Submerged Macrophytes _____ <input type="checkbox"/> Other (_____) _____
GENERAL COMMENTS	<i>1 juv N. dusky salamander</i> <i>This stream is w/in open pasture / straight - very soft/silty substrate / low 1' banks unstable + sloughing into creek.</i> <i>spring fed stream!</i>

1 m² sampled

Salamanders
1 juv

QUALITATIVE LISTING OF AQUATIC BIOTA

Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare, 2 = Common, 3 = Abundant, 4 = Dominant

Periphyton	0	1	2	3	4	Slimes	0	1	2	3	4
Filamentous Algae	0	1	2	3	4	Macroinvertebrates	0	1	2	3	4
Macrophytes	0	1	2	3	4	Fish	0	1	2	3	4

FIELD OBSERVATIONS OF MACROBENTHOS

Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare (1-3 organisms), 2 = Common (3-9 organisms), 3 = Abundant (>10 organisms), 4 = Dominant (>50 organisms)

Porifera	0	1	2	3	4	Anisoptera	0	1	2	3	4	Chironomidae	0	1	2	3	4
Hydrozoa	0	1	2	3	4	Zygoptera	0	1	2	3	4	Ephemeroptera	0	1	2	3	4
Platyhelminthes	0	1	2	3	4	Hemiptera	0	1	2	3	4	Trichoptera	0	1	2	3	4
Turbellaria	0	1	2	3	4	Coleoptera	0	1	2	3	4	Other	0	1	2	3	4
Hirudinea	0	1	2	3	4	Lepidoptera	0	1	2	3	4	<i>Precoptera</i>	2	3	4	4	
Oligochaeta	0	1	2	3	4	Sialidae	0	1	2	3	4						
Isopoda	0	1	2	3	4	Corydalidae	0	1	2	3	4						
Amphipoda	0	1	2	3	4	Tipulidae	0	1	2	3	4						
Decapoda	0	1	2	3	4	Empididae	0	1	2	3	4						
Gastropoda	0	1	2	3	4	Simuliidae	0	1	2	3	4						
Bivalvia	0	1	2	3	4	Tabinidae	0	1	2	3	4						
						Culicidae	0	1	2	3	4						

FCI Calculator for the High-Gradient Headwater Streams in eastern Kentucky and western West Virginia HGM Guidebook

To ensure accurate calculations, the **UPPERMOST STRATUM** of the plant community is determined based on the calculated value for $V_{CCANOPY}$ ($\geq 20\%$ cover is required for tree/sapling strata). Go to the SAR Data Entry tab and enter site characteristics and data in the yellow cells. For information on determining how to split a project into SARs, see Chapter 5 of the Operational Draft Regional Guidebook for the Functional Assessment of High-gradient Ephemeral and Intermittent Headwater Streams in Western West Virginia and Eastern Kentucky (Environmental Laboratory U.S. Army Corps of Engineers 2010).

Project Name: AEP Mitchell Landfill Mitigation
Location: Aston Property, Marshall CO, WV , Segment 4
Sampling Date: 01-26-2012

Mitigation Site Before Project

Subclass for this SAR:

Intermittent Stream

Uppermost stratum present at this SAR:
 Shrub/Herb Strata

SAR number: Seg FR-4

Functional Results Summary:

Enter Results in Section C of the Mitigation Sufficiency Calculator

Function	Functional Capacity Index
Hydrology	0.25
Biogeochemical Cycling	0.24
Habitat	0.14

Variable Measure and Subindex Summary:

Variable	Name	Average Measure	Subindex
$V_{CCANOPY}$	Percent canopy over channel.	Not Used, <20%	Not Used
V_{EMBED}	Average embeddedness of channel.	1.67	0.34
$V_{SUBSTRATE}$	Median stream channel substrate particle size.	0.30	0.15
V_{BERO}	Total percent of eroded stream channel bank.	100.00	0.54
V_{LWD}	Number of down woody stems per 100 feet of stream.	0.00	0.00
V_{TDBH}	Average dbh of trees.	Not Used	Not Used
V_{SNAG}	Number of snags per 100 feet of stream.	0.00	0.10
V_{SSD}	Number of saplings and shrubs per 100 feet of stream.	0.00	0.00
V_{SRICH}	Riparian vegetation species richness.	0.00	0.00
$V_{DETRITUS}$	Average percent cover of leaves, sticks, etc.	18.88	0.23
V_{HERB}	Average percent cover of herbaceous vegetation.	59.38	0.79
V_{WLUSE}	Weighted Average of Runoff Score for Catchment.	0.41	0.43

High-Gradient Headwater Streams in eastern Kentucky and western West Virginia Field Data Sheet and Calculator

Team: Dawn York, Mary Gilmore Latitude/UTM Northing: 39°51'14.814"N
 Project Name: Mitchell Landfill Project Longitude/UTM Easting: 80°38'15.033"W
 Location: Van Asten Prop. Trib to French Run Sampling Date: 8 Feb 2012
 SAR Number: Seg FR-4 Reach Length (ft): 100 Stream Type: Ephemeral/Intermittent (circle one) ▼
 Top Strata: _____ (determined from percent calculated in V_{CCANOPY})
 Site and Timing: Project/Mitigation Site (circle one) ▼ Before/After Project (Circle One) ▼

Sample Variables 1-4 in stream channel

1 V_{CCANOPY} Average percent cover over channel by tree and sapling canopy. Measure at no fewer than 10 roughly equidistant points along the stream. Measure only if tree/sapling cover is at least 20%. (If less than 20%, enter at least one value between 0 and 19 to trigger Top Strata choice.) NO TREE COVER

List the percent cover measurements at each point below:

0	0	0	0	0	0	0	0	0	0
---	---	---	---	---	---	---	---	---	---

2 V_{EMBED} Average embeddedness of the stream channel. Measure at no fewer than 30 roughly equidistant points along the stream. Select a particle from the bed. Before moving it, determine the percentage of the surface and area surrounding the particle that is covered by fine sediment, and enter the rating according to the following table. If the bed is an artificial surface, or composed of fine sediments, use a rating score of 1. If the bed is composed of bedrock, use a rating score of 5.

Embeddedness rating for gravel, cobble and boulder particles (rescaled from Platts, Megahan, and Minshall 1983)

Rating	Rating Description
5	<5 percent of surface covered, surrounded, or buried by fine sediment (or bedrock)
4	5 to 25 percent of surface covered, surrounded, or buried by fine sediment
3	26 to 50 percent of surface covered, surrounded, or buried by fine sediment
2	51 to 75 percent of surface covered, surrounded, or buried by fine sediment
1	>75 percent of surface covered, surrounded, or buried by fine sediment (or artificial surface)

List the ratings at each point below:

5	1	1	1	3	1				
1	1		2	3	1				
3	3	1	1	2	1				
2	2	1	1	2	2				
1	1	1	1	1	3				

3 V_{SUBSTRATE} Median stream channel substrate particle size. Measure at no fewer than 30 roughly equidistant points along the stream; use the same points and particles as used in V_{EMBED}.

Enter particle size in inches to the nearest 0.1 inch at each point below (bedrock should be counted as 99 in, asphalt or concrete as 0.0 in, sand or finer particles as 0.08 in):

2.5	.21	0.2	0.08	0.6	0.2				
0.25	.4	0.08	1.5	1.45	0.25				
0.3	1.2	0.08	0.3	0.3	0.5				
0.75	1.0	0.08	0.08	1.0	0.6				
0.8	0.75	0.08	0.25	0.08	8.25/3/4				

4 V_{BERO} Total percent of eroded stream channel bank. Enter the total number of feet of eroded bank on each side and the total percentage will be calculated. If both banks are eroded, total erosion for the stream may be up to 200%.

Left Bank: 50 Right Bank: 50

Sample Variables 5-9 within the entire riparian/buffer zone adjacent to the stream channel (25 feet from each bank).

5 V_{LWD} Number of down woody stems (at least 4 inches in diameter and 36 inches in length) per 100 feet of stream reach. Enter the number from the entire 50'-wide buffer and within the channel, and the amount per 100 feet of stream will be calculated.

Number of downed woody stems: 0

6 V_{TDBH} Average dbh of trees (measure only if $V_{CCANOPY}$ tree/sapling cover is at least 20%). Trees are at least 4 inches (10 cm) in diameter. Enter tree DBHs in inches.

List the dbh measurements of individual trees (at least 4 in) within the buffer on each side of the stream below:

Left Side					Right Side				

7 V_{SNAG} Number of snags (at least 4" dbh and 36" tall) per 100 feet of stream. Enter number of snags on each side of the stream, and the amount per 100 feet will be calculated.

Left Side: 0

Right Side: 0

8 V_{SSD} Number of saplings and shrubs (woody stems up to 4 inches dbh) per 100 feet of stream (measure only if tree cover is <20%). Enter number of saplings and shrubs on each side of the stream, and the amount per 100 ft of stream will be calculated.

Left Side: 0

Right Side: 0

9 V_{SRICH} Riparian vegetation species richness per 100 feet of stream reach. Check all species present from Group 1 in the tallest stratum. Check all exotic and invasive species present in all strata. Species richness per 100 feet and the subindex will be calculated from these data.

Group 1 = 1.0

Group 2 (-1.0)

- | | | | |
|---|---|--|---|
| <input type="checkbox"/> <i>Acer rubrum</i> | <input type="checkbox"/> <i>Magnolia tripetala</i> | <input type="checkbox"/> <i>Ailanthus altissima</i> | <input type="checkbox"/> <i>Lonicera japonica</i> |
| <input type="checkbox"/> <i>Acer saccharum</i> | <input type="checkbox"/> <i>Nyssa sylvatica</i> | <input type="checkbox"/> <i>Albizia julibrissin</i> | <input type="checkbox"/> <i>Lonicera tatarica</i> |
| <input type="checkbox"/> <i>Aesculus flava</i> | <input type="checkbox"/> <i>Oxydendrum arboreum</i> | <input type="checkbox"/> <i>Alliaria petiolata</i> | <input type="checkbox"/> <i>Lotus corniculatus</i> |
| <input type="checkbox"/> <i>Asimina triloba</i> | <input type="checkbox"/> <i>Prunus serotina</i> | <input type="checkbox"/> <i>Altemanthera philoxeroides</i> | <input type="checkbox"/> <i>Lythrum salicaria</i> |
| <input type="checkbox"/> <i>Betula alleghaniensis</i> | <input type="checkbox"/> <i>Quercus alba</i> | <input type="checkbox"/> <i>Aster tataricus</i> | <input type="checkbox"/> <i>Microstegium vimineum</i> |
| <input type="checkbox"/> <i>Betula lenta</i> | <input type="checkbox"/> <i>Quercus coccinea</i> | <input type="checkbox"/> <i>Cerastium fontanum</i> | <input type="checkbox"/> <i>Paulownia tomentosa</i> |
| <input type="checkbox"/> <i>Carya alba</i> | <input type="checkbox"/> <i>Quercus imbricaria</i> | <input type="checkbox"/> <i>Coronilla varia</i> | <input type="checkbox"/> <i>Polygonum cuspidatum</i> |
| <input type="checkbox"/> <i>Carya glabra</i> | <input type="checkbox"/> <i>Quercus prinus</i> | <input type="checkbox"/> <i>Elaeagnus umbellata</i> | <input type="checkbox"/> <i>Pueraria montana</i> |
| <input type="checkbox"/> <i>Carya ovalis</i> | <input type="checkbox"/> <i>Quercus rubra</i> | <input type="checkbox"/> <i>Lespedeza bicolor</i> | <input type="checkbox"/> <i>Rosa multiflora</i> |
| <input type="checkbox"/> <i>Carya ovata</i> | <input type="checkbox"/> <i>Quercus velutina</i> | <input type="checkbox"/> <i>Lespedeza cuneata</i> | <input type="checkbox"/> <i>Sorghum halepense</i> |
| <input type="checkbox"/> <i>Cornus florida</i> | <input type="checkbox"/> <i>Sassafras albidum</i> | <input type="checkbox"/> <i>Ligustrum obtusifolium</i> | <input type="checkbox"/> <i>Verbena brasiliensis</i> |
| <input type="checkbox"/> <i>Fagus grandifolia</i> | <input type="checkbox"/> <i>Tilia americana</i> | <input type="checkbox"/> <i>Ligustrum sinense</i> | |
| <input type="checkbox"/> <i>Fraxinus americana</i> | <input type="checkbox"/> <i>Tsuga canadensis</i> | | |
| <input type="checkbox"/> <i>Liriodendron tulipifera</i> | <input type="checkbox"/> <i>Ulmus americana</i> | | |
| <input type="checkbox"/> <i>Magnolia acuminata</i> | | | |

0 Species in Group 1

0 Species in Group 2

AEP Mitchell Landfill Project, Seg FR-4, page 4

Sample Variables 10-11 within at least 8 subplots (40" x 40", or 1m x 1m) in the riparian/buffer zone within 25 feet from each bank. The four subplots should be placed roughly equidistantly along each side of the stream.

10	$V_{DETRITUS}$	Average percent cover of leaves, sticks, or other organic material. Woody debris <4" diameter and <36" long are include. Enter the percent cover of the detrital layer at each subplot.																	
		<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th colspan="4">Left Side</th> <th colspan="4">Right Side</th> </tr> <tr> <td style="text-align: center;">60</td> <td style="text-align: center;">10</td> <td style="text-align: center;">5</td> <td style="text-align: center;">2</td> <td style="text-align: center;">60</td> <td style="text-align: center;">2</td> <td style="text-align: center;">10</td> <td style="text-align: center;">2</td> </tr> </table>	Left Side				Right Side				60	10	5	2	60	2	10	2	
Left Side				Right Side															
60	10	5	2	60	2	10	2												

11	V_{HERB}	Average percentage cover of herbaceous vegetation (measure only if tree cover is <20%). Do not include woody stems at least 4" dbh and 36" tall. Because there may be several layers of ground cover vegetation percentages up through 200% are accepted. Enter the percent cover of ground vegetation at each subplot.																	
		<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th colspan="4">Left Side</th> <th colspan="4">Right Side</th> </tr> <tr> <td style="text-align: center;">35</td> <td style="text-align: center;">70</td> <td style="text-align: center;">75</td> <td style="text-align: center;">85</td> <td style="text-align: center;">20</td> <td style="text-align: center;">60</td> <td style="text-align: center;">80</td> <td style="text-align: center;">50</td> </tr> </table>	Left Side				Right Side				35	70	75	85	20	60	80	50	
Left Side				Right Side															
35	70	75	85	20	60	80	50												

Sample Variable 12 within the entire catchment of the stream.

12	V_{WLUSE}	Weighted Average of Runoff Score for watershed:																																					
<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 70%;">Land Use (Choose From Drop List)</th> <th style="width: 10%;">Runoff Score</th> <th style="width: 10%;">% in Catchment</th> <th style="width: 10%;">Running Percent (not >100)</th> </tr> </thead> <tbody> <tr> <td>Open pasture / Partial Pasture Partial Woodland</td> <td style="text-align: center;">▼</td> <td></td> <td></td> </tr> <tr> <td></td> <td style="text-align: center;">▼</td> <td></td> <td></td> </tr> </tbody> </table>				Land Use (Choose From Drop List)	Runoff Score	% in Catchment	Running Percent (not >100)	Open pasture / Partial Pasture Partial Woodland	▼				▼				▼				▼				▼				▼				▼				▼		
Land Use (Choose From Drop List)	Runoff Score	% in Catchment	Running Percent (not >100)																																				
Open pasture / Partial Pasture Partial Woodland	▼																																						
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Summary			Notes:
Variable	Value	VSI	
V_{CANOPY}			
V_{EMBED}			
$V_{SUBSTRATE}$			
V_{BERO}			
V_{LWD}			
V_{TDBH}			
V_{SNAG}			
V_{SSD}			
V_{SRICH}			
$V_{DETRITUS}$			
V_{HERB}			
V_{WLUSE}			

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HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (FRONT)

STREAM NAME <u>French Run</u>		LOCATION <u>Marshall Co, WV, Hall Property</u>	
STATION # <u>Sig RR-5</u> RIVERMILE		STREAM CLASS <u>Perennial</u>	
LAT <u>39.5056.905</u> LONG <u>80.3829.112</u>		RIVER BASIN <u>OHIO</u>	
STORET #		AGENCY	
INVESTIGATORS <u>D. York / M. Gilmore</u>			
FORM COMPLETED BY <u>D. York / M. Gilmore</u>		DATE <u>25 Jan 2018</u> TIME <u>1530</u> AM (PM)	REASON FOR SURVEY <u>Potential Mitigation Site</u>

	Habitat Parameter	Condition Category			
		Optimal	Suboptimal	Marginal	Poor
Parameters to be evaluated in sampling reach	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 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.
	SCORE <u>8</u>	20 19 18 17 16	15 14 13 12 11	10 9 <u>8</u> 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 <u>11</u>	20 19 18 17 16	15 14 13 12 <u>11</u>	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 <u>10</u>	20 19 18 17 16	15 14 13 12 11	10 9 8 <u>7</u> 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.	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 <u>11</u>	20 19 18 17 16	15 14 13 12 <u>11</u>	<u>10</u> 9 8 7 6	5 4 3 2 1 0	
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.	
SCORE <u>17</u>	20 19 18 <u>17</u> 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	

Pg 2 Sieg PR-5
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HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (BACK)

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE 18	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Channel Sinuosity	The bends in the stream increase the stream length 3 to 4 times longer than if it 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.	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long distance.
SCORE 8	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
8. Bank Stability (score each bank)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE 5 (LB) SCORE 0 (RB)	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)	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 6 (LB) SCORE 1 (RB)	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
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
SCORE 5 (LB) SCORE 0 (RB)	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

Parameters to be evaluated broader than sampling reach

Total Score 90
Marginal

AEP Mitchell Landfill Proj

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (FRONT)

STREAM NAME <u>French Run</u>	LOCATION <u>Hill Prop, Marshall Co, WV</u>	
STATION # <u>99FR.5</u> RIVERMILE _____	STREAM CLASS <u>Perennial</u>	
LAT <u>39°50'56.905</u> LONG <u>80°38'29.112</u>	RIVER BASIN <u>Ohio</u>	
STORET # _____	AGENCY _____	
INVESTIGATORS <u>Dawn York / Mary Gilmore</u>		
FORM COMPLETED BY <u>DY/MG</u>	DATE <u>1/25/12</u> TIME <u>1530</u> AM <input checked="" type="radio"/> PM	REASON FOR SURVEY <u>Potential Mitigation Site</u>

WEATHER CONDITIONS	Now	Past 24 hours	Has there been a heavy rain in the last 7 days? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
	<input type="checkbox"/> storm (heavy rain) <input type="checkbox"/> rain (steady rain) <input type="checkbox"/> showers (intermittent) <input type="checkbox"/> %cloud cover <input type="checkbox"/> clear/sunny	<input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> 50% <input type="checkbox"/>	Air Temperature Δ <u>5°C</u> <u>33°F</u> Other _____

SITE LOCATION/MAP w-riffle @-pool ~ run → flow	Draw a map of the site and indicate the areas sampled (or attach a photograph) <div style="text-align: right;">N ↑</div> <p style="text-align: right;">pasture</p>
--	--

STREAM CHARACTERIZATION	Stream Subsystem <input checked="" type="checkbox"/> Perennial <input type="checkbox"/> Intermittent <input type="checkbox"/> Tidal	Stream Type <input checked="" type="checkbox"/> Coldwater <input type="checkbox"/> Warmwater
	Stream Origin <input type="checkbox"/> Glacial <input checked="" type="checkbox"/> Spring-fed <input type="checkbox"/> Non-glacial montane <input type="checkbox"/> Mixture of origins <input type="checkbox"/> Swamp and bog <input checked="" type="checkbox"/> Other	Catchment Area _____ km ²

AEP Mitchell Landfill Proj. p. 2 - seg. FR-5 Hall Property

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (BACK)

WATERSHED FEATURES	<input checked="" type="checkbox"/> Forest <input type="checkbox"/> Field/Pasture <input type="checkbox"/> Agricultural <input type="checkbox"/> Residential <input type="checkbox"/> Commercial <input type="checkbox"/> Industrial <input type="checkbox"/> Other	Local Watershed NPS Pollution <input type="checkbox"/> No evidence <input type="checkbox"/> Some potential sources <input checked="" type="checkbox"/> Obvious sources Local Watershed Erosion <input type="checkbox"/> None <input checked="" type="checkbox"/> Moderate <input type="checkbox"/> Heavy
RIPARIAN VEGETATION (18 meter buffer)	Indicate the dominant type and record the dominant species present <input checked="" type="checkbox"/> Trees <input type="checkbox"/> Shrubs <input type="checkbox"/> Grasses <input type="checkbox"/> Herbaceous dominant species present <u>Fagus grandifolia / Fescue</u>	
INSTREAM FEATURES	Estimated Reach Length <u>3048</u> m Estimated Stream Width <u>3.66</u> m <u>12'</u> Sampling Reach Area <u>111.56</u> m ² Area in km ² (m ² x1000) <u>111,556.8</u> km ² Estimated Stream Depth <u>.1524</u> m <u>6"</u> Surface Velocity <u>N/A</u> m/sec (at thalweg) <u>Moderate</u>	
LARGE WOODY DEBRIS	LWD <u>0</u> m ² Density of LWD <u>0</u> m ² /km ² (LWD/ reach area)	
AQUATIC VEGETATION	Indicate the dominant type and record the dominant species present <input type="checkbox"/> Rooted emergent <input type="checkbox"/> Rooted submergent <input type="checkbox"/> Floating Algae <input type="checkbox"/> Rooted floating <input type="checkbox"/> Free floating <input checked="" type="checkbox"/> Attached Algae dominant species present _____ Portion of the reach with aquatic vegetation <u>2</u> %	
WATER QUALITY	Temperature <u>5.69</u> °C Specific Conductance <u>215</u> Dissolved Oxygen <u>11.38</u> pH <u>7.68</u> Turbidity <u>1.1</u> WQ Instrument Used <u>HORIBA USA</u>	
SEDIMENT/ SUBSTRATE	Odors <input checked="" type="checkbox"/> Normal <input type="checkbox"/> Chemical <input type="checkbox"/> Sewage <input type="checkbox"/> Anaerobic <input type="checkbox"/> Petroleum <input type="checkbox"/> None <input type="checkbox"/> Other Deposits <input type="checkbox"/> Sludge <input type="checkbox"/> Sawdust <input type="checkbox"/> Relict shells <input type="checkbox"/> Paper fiber <input type="checkbox"/> Sand <input type="checkbox"/> Other Oils <input checked="" type="checkbox"/> Absent <input type="checkbox"/> Slight <input type="checkbox"/> Moderate <input type="checkbox"/> Profuse Turbidity (if not measured) <input type="checkbox"/> Clear <input type="checkbox"/> Slightly turbid <input type="checkbox"/> Opaque <input checked="" type="checkbox"/> Turbid <input type="checkbox"/> Other Looking at stones which are not deeply embedded, are the undersides black in color? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	

heavy construction upstream active @ crossing.

INORGANIC SUBSTRATE COMPONENTS (should add up to 100%)			ORGANIC SUBSTRATE COMPONENTS (does not necessarily add up to 100%)		
Substrate Type	Diameter	% Composition in Sampling Reach	Substrate Type	Characteristic	% Composition in Sampling Area
Bedrock		—	Detritus	sticks, wood, coarse plant materials (CPOM)	3.0
Boulder	> 256 mm (10")	5	Muck-Mud	black, very fine organic (FPOM)	0
Cobble	64-256 mm (2.5"-10")	35	Marl	grey, shell fragments	0
Gravel	2-64 mm (0.1"-2.5")	45			
Sand	0.06-2mm (gritty)	5			
Silt	0.004-0.06 mm	5			
Clay	< 0.004 mm (slick)	—			

AEP Mitchell Landfill Project

BENTHIC MACROINVERTEBRATE FIELD DATA SHEET

STREAM NAME <u>French Run</u>		LOCATION <u>Hall Property, Marshall Co., WV</u>	
STATION # <u>Seq. FR 5 RIVERMILE</u>		STREAM CLASS <u>Pesentical</u>	
LAT <u>39°50'56.905"</u> LONG <u>80°38'29.112"</u>		RIVER BASIN <u>0110</u>	
STORET #		AGENCY	
INVESTIGATORS <u>D. York / M. Gilmore</u>			LOT NUMBER
FORM COMPLETED BY <u>D. York / M. Gilmore</u>		DATE <u>8 Feb 2012</u> TIME <u>11:40 AM</u>	REASON FOR SURVEY <u>Potential Mitigation Site</u>

HABITAT TYPES	Indicate the percentage of each habitat type present <input checked="" type="checkbox"/> Cobble <u>90</u> % <input type="checkbox"/> Snags <u>0</u> % <input type="checkbox"/> Vegetated Banks <u>0</u> % <input type="checkbox"/> Sand <u>5</u> % <input type="checkbox"/> Submerged Macrophytes <u>0</u> % <input type="checkbox"/> Other () %
SAMPLE COLLECTION	Gear used <input type="checkbox"/> D-frame <input checked="" type="checkbox"/> Kick-net <input type="checkbox"/> Other _____ How were the samples collected? <input checked="" type="checkbox"/> wading <input type="checkbox"/> from bank <input type="checkbox"/> from boat Indicate the number of jabs/kicks taken in each habitat type. <input checked="" type="checkbox"/> Cobble <u>6</u> <input type="checkbox"/> Snags _____ <input checked="" type="checkbox"/> Vegetated Banks <u>6</u> <input type="checkbox"/> Sand _____ <input type="checkbox"/> Submerged Macrophytes _____ <input type="checkbox"/> Other () _____
GENERAL COMMENTS	<u>3 larval dusky salamanders</u> <u># 1 m² sampled</u> <u>0 fish</u>

QUALITATIVE LISTING OF AQUATIC BIOTA

Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare, 2 = Common, 3 = Abundant, 4 = Dominant

Periphyton	0	1	2	3	4	Slimes	0	1	2	3	4
Filamentous Algae	0	1	2	3	4	Macroinvertebrates	0	1	2	3	4
Macrophytes	0	1	2	3	4	Fish	0	1	2	3	4

FIELD OBSERVATIONS OF MACROBENTHOS

Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare (1-3 organisms), 2 = Common (3-9 organisms), 3 = Abundant (>10 organisms), 4 = Dominant (>50 organisms)

Porifera	0	1	2	3	4	Anisoptera	0	1	2	3	4	Chironomidae	0	1	2	3	4
Hydrozoa	0	1	2	3	4	Zygotera	0	1	2	3	4	Ephemeroptera	0	1	2	3	4
Platyhelminthes	0	1	2	3	4	Hemiptera	0	1	2	3	4	Trichoptera	0	1	2	3	4
Turbellaria	0	1	2	3	4	Coleoptera	0	1	2	3	4	Other	0	1	2	3	4
Hirudinea	0	1	2	3	4	Lepidoptera	0	1	2	3	4	<u>Allecoptera</u>	2	3	4	5	
Oligochaeta	0	1	2	3	4	Sialidae	0	1	2	3	4	<u>Empididae</u>	1	2	3	4	
Isopoda	0	1	2	3	4	Corydalidae	0	1	2	3	4	<u>Simuliidae</u>	4	5	6	7	
Amphipoda	0	1	2	3	4	Tipulidae	0	1	2	3	4	<u>Tabinidae</u>	0	1	2	3	
Decapoda	0	1	2	3	4	Empididae	0	1	2	3	4	<u>Calciidae</u>	0	1	2	3	
Gastropoda	0	1	2	3	4	Simuliidae	0	1	2	3	4						
Bivalvia	0	1	2	3	4	Tabinidae	0	1	2	3	4						
						Calciidae	0	1	2	3	4						

3 larval dusky

FCI Calculator for the High-Gradient Headwater Streams in eastern Kentucky and western West Virginia HGM Guidebook

To ensure accurate calculations, the **UPPERMOST STRATUM** of the plant community is determined based on the calculated value for $V_{CCANOPY}$ ($\geq 20\%$ cover is required for tree/sapling strata). Go to the SAR Data Entry tab and enter site characteristics and data in the yellow cells. For information on determining how to split a project into SARs, see Chapter 5 of the Operational Draft Regional Guidebook for the Functional Assessment of High-gradient Ephemeral and Intermittent Headwater Streams in Western West Virginia and Eastern Kentucky (Environmental Laboratory U.S. Army Corps of Engineers 2010).

Project Name: AEP Mitchell Landfill Mitigation
Location: Dale Hill Property, Marshall CO, WV, Segment 5
Sampling Date: 01-26-2012

Mitigation Site Before Project

Subclass for this SAR:

Intermittent Stream
Perennial
 Uppermost stratum present at this SAR:
 Tree/Sapling Strata

SAR number: Seg FR-5

Functional Results Summary:

Enter Results in Section C of the Mitigation Sufficiency Calculator

Function	Functional Capacity Index
Hydrology	0.40
Biogeochemical Cycling	0.50
Habitat	0.53

Variable Measure and Subindex Summary:

Variable	Name	Average Measure	Subindex
$V_{CCANOPY}$	Percent canopy over channel.	54.50	0.56
V_{EMBED}	Average embeddedness of channel.	2.30	0.57
$V_{SUBSTRATE}$	Median stream channel substrate particle size.	1.25	0.63
V_{BERO}	Total percent of eroded stream channel bank.	135.00	0.35
V_{LWD}	Number of down woody stems per 100 feet of stream.	3.00	0.38
V_{TDBH}	Average dbh of trees.	6.77	0.63
V_{SNAG}	Number of snags per 100 feet of stream.	4.00	0.90
V_{SSD}	Number of saplings and shrubs per 100 feet of stream.	Not Used	Not Used
V_{SRICH}	Riparian vegetation species richness.	2.70	1.00
$V_{DETRITUS}$	Average percent cover of leaves, sticks, etc.	26.88	0.33
V_{HERB}	Average percent cover of herbaceous vegetation.	Not Used	Not Used
V_{WLUSE}	Weighted Average of Runoff Score for Catchment.	0.41	0.43

High-Gradient Headwater Streams in eastern Kentucky and western West Virginia Field Data Sheet and Calculator

Team: Dawn York, Mary Gilmore
 Project Name: Mitchell Landfill Project
 Location: Hill Property, Marshall Co., WV
 SAR Number: Seg FR-5 Reach Length (ft): 100 Stream Type: Ephemeral/Intermittent (circle one) Perennial

Latitude/UTM Northing: 31° 50' 56.905" N
 Longitude/UTM Easting: 80° 38' 29.112" W
 Sampling Date: 25 Jan 2012

Top Strata: _____ (determined from percent calculated in $V_{CCANOPY}$)

Site and Timing: Project/Mitigation Site (circle one) Before/After Project (Circle One)

Sample Variables 1-4 in stream channel

1 $V_{CCANOPY}$ Average percent cover over channel by tree and sapling canopy. Measure at no fewer than 10 roughly equidistant points along the stream. Measure only if tree/sapling cover is at least 20%. (If less than 20%, enter at least one value between 0 and 19 to trigger Top Strata choice.)

List the percent cover measurements at each point below:

0	40	35	50	50	60	80	70	80	80
---	----	----	----	----	----	----	----	----	----

2 V_{EMBED} Average embeddedness of the stream channel. Measure at no fewer than 30 roughly equidistant points along the stream. Select a particle from the bed. Before moving it, determine the percentage of the surface and area surrounding the particle that is covered by fine sediment, and enter the rating according to the following table. If the bed is an artificial surface, or composed of fine sediments, use a rating score of 1. If the bed is composed of bedrock, use a rating score of 5.

Embeddedness rating for gravel, cobble and boulder particles (rescaled from Platts, Megahan, and Minshall 1983)

Rating	Rating Description
5	<5 percent of surface covered, surrounded, or buried by fine sediment (or bedrock)
4	5 to 25 percent of surface covered, surrounded, or buried by fine sediment
3	26 to 50 percent of surface covered, surrounded, or buried by fine sediment
2	51 to 75 percent of surface covered, surrounded, or buried by fine sediment
1	>75 percent of surface covered, surrounded, or buried by fine sediment (or artificial surface)

List the ratings at each point below:

2	1	3	2	5	4				
2	2	2	2	5	1				
1	1	1	3	3	1				
1	3	2	4	3	1				
1	2	3	2	3	2				

3 $V_{SUBSTRATE}$ Median stream channel substrate particle size. Measure at no fewer than 30 roughly equidistant points along the stream; use the same points and particles as used in V_{EMBED} .

Enter particle size in inches to the nearest 0.1 inch at each point below (bedrock should be counted as 99 in, asphalt or concrete as 0.0 in, sand or finer particles as 0.08 in):

1.25	0.08	3.3	1.5	4.25	2.3				
1.0	4.2	1.25	.81	1.5	1.25				
1.6	0.5	0.9	1.61	0.5	0.3				
0.08	5/2.75/1.25	.75	.6	0.5	0.3				
1.3	0.8	6.25/3/3	1.5	5.25	0.5/3/1.3				

4 V_{BERO} Total percent of eroded stream channel bank. Enter the total number of feet of eroded bank on each side and the total percentage will be calculated. If both banks are eroded, total erosion for the stream may be up to 200%.

Left Bank: 40 Right Bank: 95

Sample Variables 5-9 within the entire riparian/buffer zone adjacent to the stream channel (25 feet from each bank).

5 V_{LWD} Number of down woody stems (at least 4 inches in diameter and 36 inches in length) per 100 feet of stream reach. Enter the number from the entire 50'-wide buffer and within the channel, and the amount per 100 feet of stream will be calculated.

3

Number of downed woody stems: 11

6 V_{TOBH} Average dbh of trees (measure only if $V_{CCANOPY}$ tree/sapling cover is at least 20%). Trees are at least 4 inches (10 cm) in diameter. Enter tree DBHs in inches.

List the dbh measurements of individual trees (at least 4 in) within the buffer on each side of the stream below:

	Left Side					Right Side				
	7	6.5	4.5	4.5	4					
	6	10	6.0	13.5	7.5					
clump	7.5	6.0	4.0	10.0	4.0					
	5.0	5.5	11.5	9.25	4.5					
	4.5	7.75								

7 V_{SNAG} Number of snags (at least 4" dbh and 36" tall) per 100 feet of stream. Enter number of snags on each side of the stream, and the amount per 100 feet will be calculated.

Left Side: 4 Right Side: 0

8 V_{SSD} Number of saplings and shrubs (woody stems up to 4 inches dbh) per 100 feet of stream (measure only if tree cover is <20%). Enter number of saplings and shrubs on each side of the stream, and the amount per 100 ft of stream will be calculated.

Left Side: 27 Right Side: 0

9 V_{SRICH} Riparian vegetation species richness per 100 feet of stream reach. Check all species present from Group 1 in the tallest stratum. Check all exotic and invasive species present in all strata. Species richness per 100 feet and the subindex will be calculated from these data.

Group 1 = 1.0				Group 2 (-1.0)			
<input type="checkbox"/>	<i>Acer rubrum</i>	<input type="checkbox"/>	<i>Magnolia tripetala</i>	<input type="checkbox"/>	<i>Ailanthus altissima</i>	<input type="checkbox"/>	<i>Lonicera japonica</i>
<input checked="" type="checkbox"/>	<i>Acer saccharum</i>	<input type="checkbox"/>	<i>Nyssa sylvatica</i>	<input type="checkbox"/>	<i>Albizia julibrissin</i>	<input type="checkbox"/>	<i>Lonicera tatarica</i>
<input type="checkbox"/>	<i>Aesculus flava</i>	<input type="checkbox"/>	<i>Oxydendrum arboreum</i>	<input type="checkbox"/>	<i>Alliaria petiolata</i>	<input type="checkbox"/>	<i>Lotus corniculatus</i>
<input type="checkbox"/>	<i>Asimina triloba</i>	<input type="checkbox"/>	<i>Prunus serotina</i>	<input type="checkbox"/>	<i>Altemanthera philoxeroides</i>	<input type="checkbox"/>	<i>Lythrum salicaria</i>
<input type="checkbox"/>	<i>Betula alleghaniensis</i>	<input type="checkbox"/>	<i>Quercus alba</i>	<input type="checkbox"/>	<i>Aster tataricus</i>	<input type="checkbox"/>	<i>Microstegium vimineum</i>
<input type="checkbox"/>	<i>Betula lenta</i>	<input type="checkbox"/>	<i>Quercus coccinea</i>	<input type="checkbox"/>	<i>Cerastium fontanum</i>	<input type="checkbox"/>	<i>Paulownia tomentosa</i>
<input type="checkbox"/>	<i>Carya alba</i>	<input type="checkbox"/>	<i>Quercus imbricaria</i>	<input type="checkbox"/>	<i>Coronilla varia</i>	<input type="checkbox"/>	<i>Pueraria montana</i>
<input type="checkbox"/>	<i>Carya glabra</i>	<input type="checkbox"/>	<i>Quercus prinus</i>	<input type="checkbox"/>	<i>Elaeagnus umbellata</i>	<input checked="" type="checkbox"/>	<i>Rosa multiflora</i>
<input type="checkbox"/>	<i>Carya ovalis</i>	<input type="checkbox"/>	<i>Quercus rubra</i>	<input type="checkbox"/>	<i>Lespedeza bicolor</i>	<input type="checkbox"/>	<i>Sorghum halepense</i>
<input checked="" type="checkbox"/>	<i>Carya ovata</i>	<input type="checkbox"/>	<i>Quercus velutina</i>	<input type="checkbox"/>	<i>Lespedeza cuneata</i>	<input type="checkbox"/>	<i>Verbena brasiliensis</i>
<input type="checkbox"/>	<i>Comus florida</i>	<input type="checkbox"/>	<i>Sassafras albidum</i>	<input type="checkbox"/>	<i>Ligustrum obtusifolium</i>		
<input checked="" type="checkbox"/>	<i>Fagus grandifolia</i>	<input type="checkbox"/>	<i>Tilia americana</i>	<input type="checkbox"/>	<i>Ligustrum sinense</i>		
<input type="checkbox"/>	<i>Fraxinus americana</i>	<input type="checkbox"/>	<i>Tsuga canadensis</i>				
<input type="checkbox"/>	<i>Liriodendron tulipifera</i>	<input checked="" type="checkbox"/>	<i>Ulmus americana</i>				
<input type="checkbox"/>	<i>Magnolia acuminata</i>						
0 Species in Group 1				0 Species in Group 2			

Sample Variables 10-11 within at least 8 subplots (40" x 40", or 1m x 1m) in the riparian/buffer zone within 25 feet from each bank. The four subplots should be placed roughly equidistantly along each side of the stream.

10 V_{DETRITUS} Average percent cover of leaves, sticks, or other organic material. Woody debris <4" diameter and <36" long are include. Enter the percent cover of the detrital layer at each subplot.

Left Side				Right Side			
90	60	5	5	15	15	25	0

11 V_{HERB} Average percentage cover of herbaceous vegetation (measure only if tree cover is <20%). Do not include woody stems at least 4" dbh and 36" tall. Because there may be several layers of ground cover vegetation percentages up through 200% are accepted. Enter the percent cover of ground vegetation at each subplot.

Left Side				Right Side			
				70	75	60	0

no trees on Right

Sample Variable 12 within the entire catchment of the stream.

12 V_{WLUSE} Weighted Average of Runoff Score for watershed:

Land Use (Choose From Drop List)	Runoff Score	% in Catchment	Running Percent (not >100)
▼			
▼			
▼			
▼			
▼			
▼			
▼			
▼			
▼			

Summary			Notes:
Variable	Value	VSI	
V_{CCANOPY}			3' - height buffer 12' - B to B low water / Road crossing across stream, big mud puddle area caused from vehicles directly adjacent to stream. - heavy turbidity due to active pipeline construction across stream upstream of survey area
V_{EMBED}			
$V_{\text{SUBSTRATE}}$			
V_{BERO}			
V_{LWD}			
V_{TDBH}			
V_{SNAG}			
V_{SSD}			
V_{SRICH}			
V_{DETRITUS}			
V_{HERB}			
V_{WLUSE}			

Sey FR-7

AEP Mitchell Landfill Project

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (FRONT)

STREAM NAME <u>Crib to French Run</u>	LOCATION <u>Hill Prop. French Run, Glen Easton, Marshall Co. WV</u>
STATION # <u>FR-7</u> RIVERMILE	STREAM CLASS <u>Intermittent</u>
LAT <u>39°51'08.771"</u> LONG <u>80°38'21.673"</u>	RIVER BASIN <u>OH</u>
STORET #	AGENCY
INVESTIGATORS <u>D. York / M. Gilmore</u>	
FORM COMPLETED BY <u>M. Gilmore / D. York</u>	DATE <u>10 Mar 2012</u> TIME <u>11:20</u> AM <input checked="" type="radio"/> PM
REASON FOR SURVEY <u>Potential Mitigation Site</u>	

Habitat Parameter	Condition 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 not new fall and not transient). SCORE <u>10</u>	20 19 18 17 16	15 14 13 12 11	<u>10</u> 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. SCORE <u>7</u>	20 19 18 17 16	15 14 13 12 11	10 9 8 <u>7</u> 6
3. Pool Variability Even mix of large-shallow, large-deep, small-shallow, small-deep pools present. SCORE <u>6</u>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 <u>6</u>	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. SCORE <u>7</u>	20 19 18 17 16	15 14 13 12 11	10 9 8 <u>7</u> 6
5. Channel Flow Status Water reaches base of both lower banks, and minimal amount of channel substrate is exposed. SCORE <u>14</u>	20 19 18 17 16	15 <u>14</u> 13 12 11	10 9 8 7 6	5 4 3 2 1 0

Parameters to be evaluated in sampling reach

Pg. 2
 seg. FR-7

AEP Mitchell Landfill Property

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (BACK)

Hall Property

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE 48	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Channel Sinuosity	The bends in the stream increase the stream length 3 to 4 times longer than if it 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.	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long distance.
SCORE 15	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)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE 1 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 1 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
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 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 1 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 1 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
SCORE 3 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 2 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0

Parameters to be evaluated broader than sampling reach

Keep notes
 for each

Total Score 91

6/18/20'

Seg. FR 7

39.852436
80.639354

AEP Mitchell
Land Use Project

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET
(FRONT)

STREAM NAME <u>Fribto French Run</u>	LOCATION <u>Hall Property, French Run, Glendaston, Marshfield Co., WV</u>
STATION # <u>Seg FR 7</u> RIVERMILE _____	STREAM CLASS <u>Intermittent</u>
LAT <u>39°51'8.77"</u> LONG <u>80°38'21.673"</u>	RIVER BASIN <u>OH</u>
STORET # _____	AGENCY _____
INVESTIGATORS <u>M. Gilmore / D. York</u>	
FORM COMPLETED BY <u>D. York / M. Gilmore</u>	DATE <u>11/10/2012</u> TIME <u>11:18</u> AM <input checked="" type="radio"/> PM
REASON FOR SURVEY <u>Potential Mitigation Site</u>	

WEATHER CONDITIONS	Now	Past 24 hours	Has there been a heavy rain in the last 7 days? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
	<input type="checkbox"/> storm (heavy rain) <input type="checkbox"/> rain (steady rain) <input type="checkbox"/> showers (intermittent) <input checked="" type="checkbox"/> 100% %cloud cover <input type="checkbox"/> clear/sunny	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> 100% <input type="checkbox"/>	Air Temperature _____ °C <u>44°F</u> Other _____

SITE LOCATION/MAP	Draw a map of the site and indicate the areas sampled (or attach a photograph)
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STREAM CHARACTERIZATION	Stream Subsystem <input checked="" type="checkbox"/> Perennial <input type="checkbox"/> Intermittent <input type="checkbox"/> Tidal	Stream Type <input checked="" type="checkbox"/> Coldwater <input type="checkbox"/> Warmwater
	Stream Origin <input type="checkbox"/> Glacial <input checked="" type="checkbox"/> Spring-fed <input type="checkbox"/> Non-glacial montane <input type="checkbox"/> Mixture of origins <input type="checkbox"/> Swamp and bog <input type="checkbox"/> Other _____	Catchment Area _____ km ²

Seg FR-7

Pg 2
Seg FR-7
(Habitat)

AEP Mitchell Landfill Project

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (BACK)

WATERSHED FEATURES	Predominant Surrounding Landuse <input type="checkbox"/> Forest <input type="checkbox"/> Commercial <input checked="" type="checkbox"/> Field/Pasture <input type="checkbox"/> Industrial <input type="checkbox"/> Agricultural <input type="checkbox"/> Other _____ <input type="checkbox"/> Residential		Local Watershed NPS Pollution <input type="checkbox"/> No evidence <input type="checkbox"/> Some potential sources <input checked="" type="checkbox"/> Obvious sources
			Local Watershed Erosion <input type="checkbox"/> None <input checked="" type="checkbox"/> Moderate <input type="checkbox"/> Heavy
RIPARIAN VEGETATION (18 meter buffer)	Indicate the dominant type and record the dominant species present <input checked="" type="checkbox"/> Trees <input checked="" type="checkbox"/> Shrubs <input type="checkbox"/> Grasses <input type="checkbox"/> Herbaceous dominant species present <u>Multiflora rose, sycamore, ash, walnut, maple</u>		
INSTREAM FEATURES	Estimated Reach Length <u>30.48 m</u> Estimated Stream Width <u>2.26 m</u> 89" Sampling Reach Area <u>68.9 m²</u> Area in km ² (m ² x1000) <u>68,903.088 km²</u> Estimated Stream Depth <u>0.14 m</u> 3" riffle - 8" pool		Canopy Cover <input checked="" type="checkbox"/> Partly open <input type="checkbox"/> Partly shaded <input type="checkbox"/> Shaded High Water Mark <u>1407 m</u> 42" Proportion of Reach Represented by Stream Morphology Types <input checked="" type="checkbox"/> Riffle <u>75</u> % <input type="checkbox"/> Run <u>0</u> % <input checked="" type="checkbox"/> Pool <u>25</u> %
	Surface Velocity (at thalweg) <u>show</u> m/sec <u>5.5</u>		Channelized <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No Dam Present <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
LARGE WOODY DEBRIS	LWD <u>.5 m²</u> / piece - 5% Density of LWD <u>0.01 m²/km²</u> (LWD/ reach area)		
AQUATIC VEGETATION	Indicate the dominant type and record the dominant species present <input type="checkbox"/> Rooted emergent <input type="checkbox"/> Rooted submergent <input type="checkbox"/> Rooted floating <input type="checkbox"/> Free floating <input type="checkbox"/> Floating Algae <input type="checkbox"/> Attached Algae dominant species present <u>N/A</u> Portion of the reach with aquatic vegetation <u>0</u> %		
WATER QUALITY	Temperature <u>6.87</u> °C Specific Conductance <u>291</u> µS/cm Dissolved Oxygen <u>10.23</u> mg/L pH <u>6.59</u> Turbidity <u>9.6</u> WQ Instrument Used <u>HDRiba US2</u>		Water Odors <input checked="" type="checkbox"/> Normal/None <input type="checkbox"/> Sewage <input type="checkbox"/> Petroleum <input type="checkbox"/> Chemical <input type="checkbox"/> Fishy <input type="checkbox"/> Other _____ Water Surface Oils <input type="checkbox"/> Slick <input type="checkbox"/> Sheen <input type="checkbox"/> Globs <input type="checkbox"/> Flecks <input checked="" type="checkbox"/> None <input type="checkbox"/> Other _____ Turbidity (if not measured) <input checked="" type="checkbox"/> Clear <input type="checkbox"/> Slightly turbid <input type="checkbox"/> Turbid <input type="checkbox"/> Opaque <input type="checkbox"/> Stained <input type="checkbox"/> Other _____
SEDIMENT/SUBSTRATE	Odors <input checked="" type="checkbox"/> Normal <input type="checkbox"/> Sewage <input type="checkbox"/> Petroleum <input type="checkbox"/> Chemical <input type="checkbox"/> Anaerobic <input type="checkbox"/> None <input type="checkbox"/> Other _____ Oils <input checked="" type="checkbox"/> Absent <input type="checkbox"/> Slight <input type="checkbox"/> Moderate <input type="checkbox"/> Profuse		Deposits <input type="checkbox"/> Sludge <input type="checkbox"/> Sawdust <input type="checkbox"/> Paper fiber <input type="checkbox"/> Sand <input type="checkbox"/> Relict shells <input type="checkbox"/> Other _____ Looking at stones which are not deeply embedded, are the undersides black in color? <input type="checkbox"/> Yes <input type="checkbox"/> No

B-B-89"
Top B-B=94"

INORGANIC SUBSTRATE COMPONENTS (should add up to 100%)			ORGANIC SUBSTRATE COMPONENTS (does not necessarily add up to 100%)		
Substrate Type	Diameter	% Composition in Sampling Reach	Substrate Type	Characteristic	% Composition in Sampling Area
Bedrock		—	Detritus	sticks, wood, coarse plant materials (CPOM)	10
Boulder	> 256 mm (10")	2			
Cobble	64-256 mm (2.5"-10")	30	Muck-Mud	black, very fine organic (FPOM)	0
Gravel	2-64 mm (0.1"-2.5")	40			
Sand	0.06-2mm (gritty)	20	Marl	grey, shell fragments	—
Silt	0.004-0.06 mm	20			
Clay	< 0.004 mm (slick)	—			

hardpan ~10% of reach

Seg FR-77

AEP Mitchell Landfill Project

BENTHIC MACROINVERTEBRATE FIELD DATA SHEET

STREAM NAME <i>Trib to French Run</i>	LOCATION <i>Hill, French Run, Glen Easton, Marshall Co. WV</i>	
STATION # <i>Seg FR-7</i> RIVERMILE	STREAM CLASS <i>Intermittent</i>	
LAT <i>37°51'8.711"</i> LONG <i>80°30'21.673"</i>	RIVER BASIN <i>OH</i>	
STORET #	AGENCY	
INVESTIGATORS <i>M. Gilmore / D. York</i>	LOT NUMBER	
FORM COMPLETED BY <i>D. York / M. Gilmore</i>	DATE <i>1/11/2012</i> TIME <i>1318</i> AM PM	REASON FOR SURVEY <i>Potential Mitigation Site</i>

HABITAT TYPES	Indicate the percentage of each habitat type present <input checked="" type="checkbox"/> Cobble <i>60%</i> <input type="checkbox"/> Snags <i>5%</i> <input type="checkbox"/> Vegetated Banks <i>0%</i> <input checked="" type="checkbox"/> Sand <i>20%</i> <i>Hardpan 10%</i> <input type="checkbox"/> Submerged Macrophytes <i>0%</i> <input type="checkbox"/> Other () %
SAMPLE COLLECTION	Gear used <input type="checkbox"/> D-frame <input checked="" type="checkbox"/> Kick-net <input type="checkbox"/> Other _____ How were the samples collected? <input checked="" type="checkbox"/> wading <input type="checkbox"/> from bank <input type="checkbox"/> from boat Indicate the number of jabs/kicks taken in each habitat type. <input type="checkbox"/> Cobble <i>9</i> <input checked="" type="checkbox"/> Snags <i>3</i> <input type="checkbox"/> Vegetated Banks <i>0</i> <input type="checkbox"/> Sand <i>6</i> <input type="checkbox"/> Submerged Macrophytes <i>0</i> <input type="checkbox"/> Other ()
GENERAL COMMENTS	<i>- Hardpan within approx 10% of reach. Macros indicate a higher quality habitat at one time. Area is open pasture, banks are unstable + eroded/some areas incised w/ 4" Stream is spring fed.</i>

QUALITATIVE LISTING OF AQUATIC BIOTA

Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare, 2 = Common, 3 = Abundant, 4 = Dominant

Periphyton	0	1	2	3	4	Slimes	0	1	2	3	4
Filamentous Algae	0	1	2	3	4	Macroinvertebrates	0	1	2	3	4
Macrophytes	0	1	2	3	4	Fish	0	1	2	3	4

FIELD OBSERVATIONS OF MACROBENTHOS

Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare (1-3 organisms), 2 = Common (3-9 organisms), 3 = Abundant (>10 organisms), 4 = Dominant (>50 organisms)

Porifera	0	1	2	3	4	Anisoptera	0	1	2	3	4	Chironomidae	###	0	1	2	3	4
Hydrozoa	0	1	2	3	4	Zygoptera	0	1	2	3	4	Ephemeroptera	###	0	1	2	3	4
Platyhelminthes	0	1	2	3	4	Hemiptera	0	1	2	3	4	Trichoptera	###	0	1	2	3	4
Turbellaria	0	1	2	3	4	Coleoptera	0	1	2	3	4	Other	0	1	2	3	4	
Hirudinea	0	1	2	3	4	Lepidoptera	0	1	2	3	4	Plachoptera	###	###	###	###	###	###
Oligochaeta	0	1	2	3	4	Sialidae	0	1	2	3	4	perid	###	###	###	###	###	###
Isopoda	0	1	2	3	4	Corydalidae	0	1	2	3	4	pettoperlid	###	###	###	###	###	###
Amphipoda	0	1	2	3	4	Tipulidae	###	###	###	###	###	hydroscichidae	###	###	###	###	###	###
Decapoda	0	1	2	3	4	Empididae	0	1	2	3	4	Ephemereitidae	###	###	###	###	###	###
Gastropoda	0	1	2	3	4	Simuliidae	0	1	2	3	4	Amelidi	###	###	###	###	###	###
Bivalvia	0	1	2	3	4	Tabinidae	0	1	2	3	4	Heptagenid	###	###	###	###	###	###
diptera-A-1						Culicidae	0	1	2	3	4	Gaeridae	3					

mayfly-1
mayfly-3
addisfly-3

no black fly larvae observed

2 lined salamander - A - 1
N. Dusky - J - 1

Adult black fly - 1

Segy FR-7

AEP Mitchell Land Reel Project

PRELIMINARY ASSESSMENT SCORE SHEET (PASS)

page 1 of 1

STREAM NAME <i>Trib to French Run</i>	LOCATION <i>Hill Top French Run Glen Easton Marshall Co. WV</i>
STATION # <i>Segy FR-7</i> RIVERMILE _____	STREAM CLASS <i>Intermittent</i>
LAT <i>39° 51' 8.77"</i> LONG <i>80° 38' 21.63"</i>	RIVER BASIN <i>OHIO</i>
STORET # _____	AGENCY _____
COLLECTED BY <i>D. York</i> DATE <i>28 Feb 2017</i>	LOT # _____ NUMBER OF SWEEPS <i>Sampled 1 sq meter</i>
HABITATS: <input checked="" type="checkbox"/> COBBLE <input type="checkbox"/> SHOREZONE <input checked="" type="checkbox"/> SNAGS <input type="checkbox"/> VEGETATION <i>(10% hardpan)</i>	

Enter Family and/or Genus and Species name on blank line.

Organisms	No.	LS	TI	TCR	Organisms	No.	LS	TI	TCR		
Oligochaeta	<i>Roundworm</i>	4	A	DY	1	Megaloptera					
Hirudinea	<i>leech</i>	5	A	DY	1	Coleoptera					
Isopoda											
Amphipoda					Diptera	<i>Chironomid</i>	30	L	DY	1	
Decapoda						<i>Black fly</i>	2	A	DY	3	
Ephemeroptera	<i>Amelotid</i>	16	L	DY	1		<i>Tipulid</i>	8	L	DY	1
	<i>Neptomyid</i>	30	L	DY	1	Gastropoda					
	<i>Phenacellid</i>	15	L	DY	1						
Plecoptera	<i>Perlid</i>	8	L	DY	1	Pelecypoda					
	<i>Petaliche</i>	40	L	DY	1						
	<i>Peltoperlid</i>	3	L	DY	1	Other					
Trichoptera	<i>Glossosomatid</i>	12	L	DY	1						
	<i>Hydropsychid</i>	9	L	DY	1						
	<i>Lemniphiloch</i>	6	L	DY	1						
	<i>Coaridid</i>	3	L	DY	1						
Hemiptera											

Taxonomic certainty rating (TCR) 1-5: 1=most certain, 5=least certain. If rating is 3-5, give reason (e.g., missing gills). LS= life stage: I=immature; P=pupa; A=adult TI=Taxonomists initials

	Site Value	Target Threshold	If 2 or more metrics are ≥ target threshold, site is
Total No. Taxa	15		HEALTHY
EPT Taxa	10		If less than 2 metrics are within target-range, site is
Tolerance Index			SUSPECTED IMPAIRED

Also found 1 2-lined salamander
 1- N. dusky salamander & fish.
 Score: 38 - Suboptimal

FCI Calculator for the High-Gradient Headwater Streams in eastern Kentucky and western West Virginia HGM Guidebook

To ensure accurate calculations, the **UPPERMOST STRATUM** of the plant community is determined based on the calculated value for $V_{CCANOPY}$ ($\geq 20\%$ cover is required for tree/sapling strata). Go to the SAR Data Entry tab and enter site characteristics and data in the yellow cells. For information on determining how to split a project into SARs, see Chapter 5 of the Operational Draft Regional Guidebook for the Functional Assessment of High-gradient Ephemeral and Intermittent Headwater Streams in Western West Virginia and Eastern Kentucky (Environmental Laboratory U.S. Army Corps of Engineers 2010).

Project Name: AEP Mitchell Landfill Mitigation
Location: Dale Hall Prop, Marshall CO, WV Seg 7
Sampling Date: 03-01-2012

Mitigation Site Before Project

Subclass for this SAR:

Intermittent Stream

Uppermost stratum present at this SAR:
 Tree/Sapling Strata

SAR number: Seg FR-7

Functional Results Summary:

Enter Results in Section C of the Mitigation Sufficiency Calculator

Function	Functional Capacity Index
Hydrology	0.41
Biogeochemical Cycling	0.42
Habitat	0.50

Variable Measure and Subindex Summary:

Variable	Name	Average Measure	Subindex
$V_{CCANOPY}$	Percent canopy over channel.	47.00	0.46
V_{EMBED}	Average embeddedness of channel.	1.50	0.28
$V_{SUBSTRATE}$	Median stream channel substrate particle size.	0.84	0.42
V_{BERO}	Total percent of eroded stream channel bank.	200.00	0.00
V_{LWD}	Number of down woody stems per 100 feet of stream.	6.00	0.75
V_{TDBH}	Average dbh of trees.	12.19	1.00
V_{SNAG}	Number of snags per 100 feet of stream.	1.00	1.00
V_{SSD}	Number of saplings and shrubs per 100 feet of stream.	Not Used	Not Used
V_{SRICH}	Riparian vegetation species richness.	0.90	0.43
$V_{DETRITUS}$	Average percent cover of leaves, sticks, etc.	59.38	0.72
V_{HERB}	Average percent cover of herbaceous vegetation.	Not Used	Not Used
V_{WLUSE}	Weighted Average of Runoff Score for Catchment.	0.42	0.44

Seg. FR-7

FCI .41
.42
.50

ACP Mitchell Landfill Project

Version 1-25-11

High-Gradient Headwater Streams in eastern Kentucky and western West Virginia Field Data Sheet and Calculator

Team: York/Calmore Latitude/UTM Northing: 39°51'08.771"N
 Project Name: ACP Mitchell Landfill Proj Longitude/UTM Easting: 80°38'21.673"W
 Location: Hall Prop Glen Easton, Marshall Co. WV Sampling Date: 1/16/2012
 SAR Number: Seg FR 7 Reach Length (ft): 100 Stream Type: Ephemeral/Intermittent (Circle one)
 Top Strata: (determined from percent calculated in V_{CCANOPY})
 Site and Timing: Project/Mitigation Site (Circle one) Before/After Project (Circle One)

Sample Variables 1-4 in stream channel

1 V_{CCANOPY} Average percent cover over channel by tree and sapling canopy. Measure at no fewer than 10 roughly equidistant points along the stream. Measure only if tree/sapling cover is at least 20%. (If less than 20%, enter at least one value between 0 and 19 to trigger Top Strata choice.)

List the percent cover measurements at each point below:

40	35	30	50	25	10	30	60	90	100
----	----	----	----	----	----	----	----	----	-----

2 V_{EMBED} Average embeddedness of the stream channel. Measure at no fewer than 30 roughly equidistant points along the stream. Select a particle from the bed. Before moving it, determine the percentage of the surface and area surrounding the particle that is covered by fine sediment, and enter the rating according to the following table. If the bed is an artificial surface, or composed of fine sediments, use a rating score of 1. If the bed is composed of bedrock, use a rating score of 5.

Embeddedness rating for gravel, cobble and boulder particles (rescaled from Platts, Megahan, and Minshall 1983)

Rating	Rating Description
5	<5 percent of surface covered, surrounded, or buried by fine sediment (or bedrock)
4	5 to 25 percent of surface covered, surrounded, or buried by fine sediment
3	26 to 50 percent of surface covered, surrounded, or buried by fine sediment
2	51 to 75 percent of surface covered, surrounded, or buried by fine sediment
1	>75 percent of surface covered, surrounded, or buried by fine sediment (or artificial surface)

List the ratings at each point below:

2	1	2	2	1	3				
1	5	1	1	3	1				
1	2	2	1	1	1				
1	1	1	1	1	1				
3	1	1	1	1	1				

3 V_{SUBSTRATE} Median stream channel substrate particle size. Measure at no fewer than 30 roughly equidistant points along the stream; use the same points and particles as used in V_{EMBED}.

Enter particle size in inches to the nearest 0.1 inch at each point below (bedrock should be counted as 99 in, asphalt or concrete as 0.0 in, sand or finer particles as 0.08 in):

2.0	0.08	1.3/1.45	2.75	0.5	7.0				
1.0	.12	.45	1.5	2.25	hardpan				
1.75	1.75	4/1.95/5	0.6	1.0	0.75				
0.5	0.08	0.08	0.75	2.25	0.08				
1.5	0.08	0.08	2.15	0.08	hardpan				

4 V_{BERO} Total percent of eroded stream channel bank. Enter the total number of feet of eroded bank on each side and the total percentage will be calculated. If both banks are eroded, total erosion for the stream may be up to 200%.

Left Bank: 100

Right Bank: 100

2.15

Sample Variables 5-9 within the entire riparian/buffer zone adjacent to the stream channel (25 feet from each bank).

5 V_{LWD} Number of down woody stems (at least 4 inches in diameter and 36 inches in length) per 100 feet of stream reach. Enter the number from the entire 50'-wide buffer and within the channel, and the amount per 100 feet of stream will be calculated.
 Number of downed woody stems: ~~111~~ - 6

6 V_{TOBH} Average dbh of trees (measure only if $V_{CCANOPY}$ tree/sapling cover is at least 20%). Trees are at least 4 inches (10 cm) in diameter. Enter tree DBHs in inches.
 List the dbh measurements of individual trees (at least 4 in) within the buffer on each side of the stream below:

Left Side					Right Side				
12.75					15				
11.5					9.5				

7 V_{SNAG} Number of snags (at least 4" dbh and 36" tall) per 100 feet of stream. Enter number of snags on each side of the stream, and the amount per 100 feet will be calculated.
 Left Side: 1 Right Side: 0

8 V_{SSD} Number of saplings and shrubs (woody stems up to 4 inches dbh) per 100 feet of stream (measure only if tree cover is <20%). Enter number of saplings and shrubs on each side of the stream, and the amount per 100 ft of stream will be calculated.
 Left Side: Right Side:

9 V_{SRICH} Riparian vegetation species richness per 100 feet of stream reach. Check all species present from Group 1 in the tallest stratum. Check all exotic and invasive species present in all strata. Species richness per 100 feet and the subindex will be calculated from these data.

Group 1 = 1.0				Group 2 (-1.0)			
<input type="checkbox"/>	<i>Acer rubrum</i>	<input type="checkbox"/>	<i>Magnolia tripetala</i>	<input type="checkbox"/>	<i>Ailanthus altissima</i>	<input type="checkbox"/>	<i>Lonicera japonica</i>
<input checked="" type="checkbox"/>	<i>Acer saccharum</i>	<input type="checkbox"/>	<i>Nyssa sylvatica</i>	<input type="checkbox"/>	<i>Albizia julibrissin</i>	<input type="checkbox"/>	<i>Lonicera tatarica</i>
<input type="checkbox"/>	<i>Aesculus flava</i>	<input type="checkbox"/>	<i>Oxydendrum arboreum</i>	<input type="checkbox"/>	<i>Alliaria petiolata</i>	<input type="checkbox"/>	<i>Lotus comiculatus</i>
<input type="checkbox"/>	<i>Asimina triloba</i>	<input type="checkbox"/>	<i>Prunus serotina</i>	<input type="checkbox"/>	<i>Alternanthera philoxeroides</i>	<input type="checkbox"/>	<i>Lythrum salicaria</i>
<input type="checkbox"/>	<i>Betula alleghaniensis</i>	<input type="checkbox"/>	<i>Quercus alba</i>	<input type="checkbox"/>	<i>Aster tataricus</i>	<input type="checkbox"/>	<i>Microstegium vimineum</i>
<input type="checkbox"/>	<i>Betula lenta</i>	<input type="checkbox"/>	<i>Quercus coccinea</i>	<input type="checkbox"/>	<i>Cerastium fontanum</i>	<input type="checkbox"/>	<i>Paulownia tomentosa</i>
<input type="checkbox"/>	<i>Carya alba</i>	<input type="checkbox"/>	<i>Quercus imbricaria</i>	<input type="checkbox"/>	<i>Coronilla varia</i>	<input type="checkbox"/>	<i>Polygonum cuspidatum</i>
<input type="checkbox"/>	<i>Carya glabra</i>	<input type="checkbox"/>	<i>Quercus prinus</i>	<input type="checkbox"/>	<i>Elaeagnus umbellata</i>	<input checked="" type="checkbox"/>	<i>Pueraria montana</i>
<input type="checkbox"/>	<i>Carya ovalis</i>	<input type="checkbox"/>	<i>Quercus rubra</i>	<input type="checkbox"/>	<i>Lespedeza bicolor</i>	<input type="checkbox"/>	<i>Rosa multiflora !!</i>
<input type="checkbox"/>	<i>Carya ovata</i>	<input type="checkbox"/>	<i>Quercus velutina</i>	<input type="checkbox"/>	<i>Lespedeza cuneata</i>	<input type="checkbox"/>	<i>Sorghum halepense</i>
<input type="checkbox"/>	<i>Cornus florida</i>	<input type="checkbox"/>	<i>Sassafras albidum</i>	<input type="checkbox"/>	<i>Ligustrum obtusifolium</i>	<input type="checkbox"/>	<i>Verbena brasiliensis</i>
<input type="checkbox"/>	<i>Fagus grandifolia</i>	<input type="checkbox"/>	<i>Tilia americana</i>	<input type="checkbox"/>	<i>Ligustrum sinense</i>		
<input checked="" type="checkbox"/>	<i>Fraxinus americana</i>	<input type="checkbox"/>	<i>Tsuga canadensis</i>				
<input type="checkbox"/>	<i>Liriodendron tulipifera</i>	<input type="checkbox"/>	<i>Ulmus americana</i>				
<input type="checkbox"/>	<i>Magnolia acuminata</i>		<i>Lycamore Walnut</i>				
0 Species in Group 1				0 Species in Group 2			

Sample Variables 10-11 within at least 8 subplots (40" x 40", or 1m x 1m) in the riparian/buffer zone within 25 feet from each bank. The four subplots should be placed roughly equidistantly along each side of the stream.

10 $V_{DETRITUS}$ Average percent cover of leaves, sticks, or other organic material. Woody debris <4" diameter and <36" long are include. Enter the percent cover of the detrital layer at each subplot.

Left Side				Right Side			
45	20	45	35	60	35	45	90

11 V_{HERB} Average percentage cover of herbaceous vegetation (measure only if tree cover is <20%). Do not include woody stems at least 4" dbh and 36" tall. Because there may be several layers of ground cover vegetation percentages up through 200% are accepted. Enter the percent cover of ground vegetation at each subplot.

Left Side				Right Side			

Sample Variable 12 within the entire catchment of the stream.

12 V_{WLUSE} Weighted Average of Runoff Score for watershed:

Land Use (Choose From Drop List)	Runoff Score	% in Catchment	Running Percent (not >100)
Residential 10	▼		
Farm/Pasture 60	▼		
Forest 30	▼		
	▼		
	▼		
	▼		
	▼		
	▼		

Summary			Notes:
Variable	Value	VSI	
V_{CANOPY}			
V_{EMBED}			
$V_{SUBSTRATE}$			
V_{BERO}			
V_{LWD}			
V_{TDBH}			
V_{SNAG}			
V_{SSD}			
V_{SRICH}			
$V_{DETRITUS}$			
V_{HERB}			
V_{WLUSE}			



**NORTH FORK GRAVE CREEK DRAINAGE POTENTIAL STREAM
MITIGATION AREAS USEPA AND USACE DATA FORMS**

Seg. MFGC-1

AEP Mitchell Landfill Project
 HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (FRONT)

STREAM NAME <i>N. Fork Grave Creek</i>		LOCATION <i>Hackathorn Prop. Cameron, Marshall Co. WV</i>	
STATION # <i>NF6C</i> RIVERMILE _____		STREAM CLASS <i>Perennial</i>	
LAT <i>39.5653038</i> LONG <i>80.3414.649</i>		RIVER BASIN <i>Ohio</i>	
STORET # _____		AGENCY _____	
INVESTIGATORS <i>D. York / M. Gilman</i>			
FORM COMPLETED BY <i>D/MG</i>		DATE <i>2/6/18</i> TIME <i>1730</i> AM PM	REASON FOR SURVEY <i>Potential Mitigation Site</i>

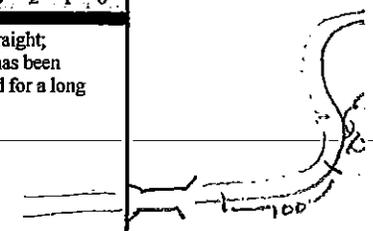
Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 50% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are <u>not</u> new fall and 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.
	SCORE <i>12</i>	20 19 18 17 16	15 14 13 (12) 11	10 9 8 7 6
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 <i>6</i>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 (6)
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 <i>13</i>	20 19 18 17 16	15 14 (13) 12 11	10 9 8 7 6
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.	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 30% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
	SCORE <i>14</i>	20 19 18 17 16	15 (14) 13 12 11	10 9 8 7 6
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
	SCORE <i>19</i>	20 (19) 18 17 16	15 14 13 12 11	10 9 8 7 6

Parameters to be evaluated in sampling reach

(not in wooded)
 yard
 deep
 bank
 deep
 most sterile
 stream I've
 seen -
 mows cobble
 bars!
 fairly deep
 pools -
 sandy/
 slightly
 muddy

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE 13	20 19 18 17 16	15 14 (13) 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Channel Sinuosity	The bends in the stream increase the stream length 3 to 4 times longer than if it 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.	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long distance.
SCORE 6	20 19 18 17 16	15 14 13 12 11	10 9 8 7 (6)	5 4 3 2 1 0
8. Bank Stability (score each bank)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE 8 (LB) SCORE 1 (RB)	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)	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 0 (LB) SCORE 0 (RB)	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)
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
SCORE 0 (LB) SCORE 1 (RB)	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)

Parameters to be evaluated broader than sampling reach



Total Score 92
 marginal

6m = 20'

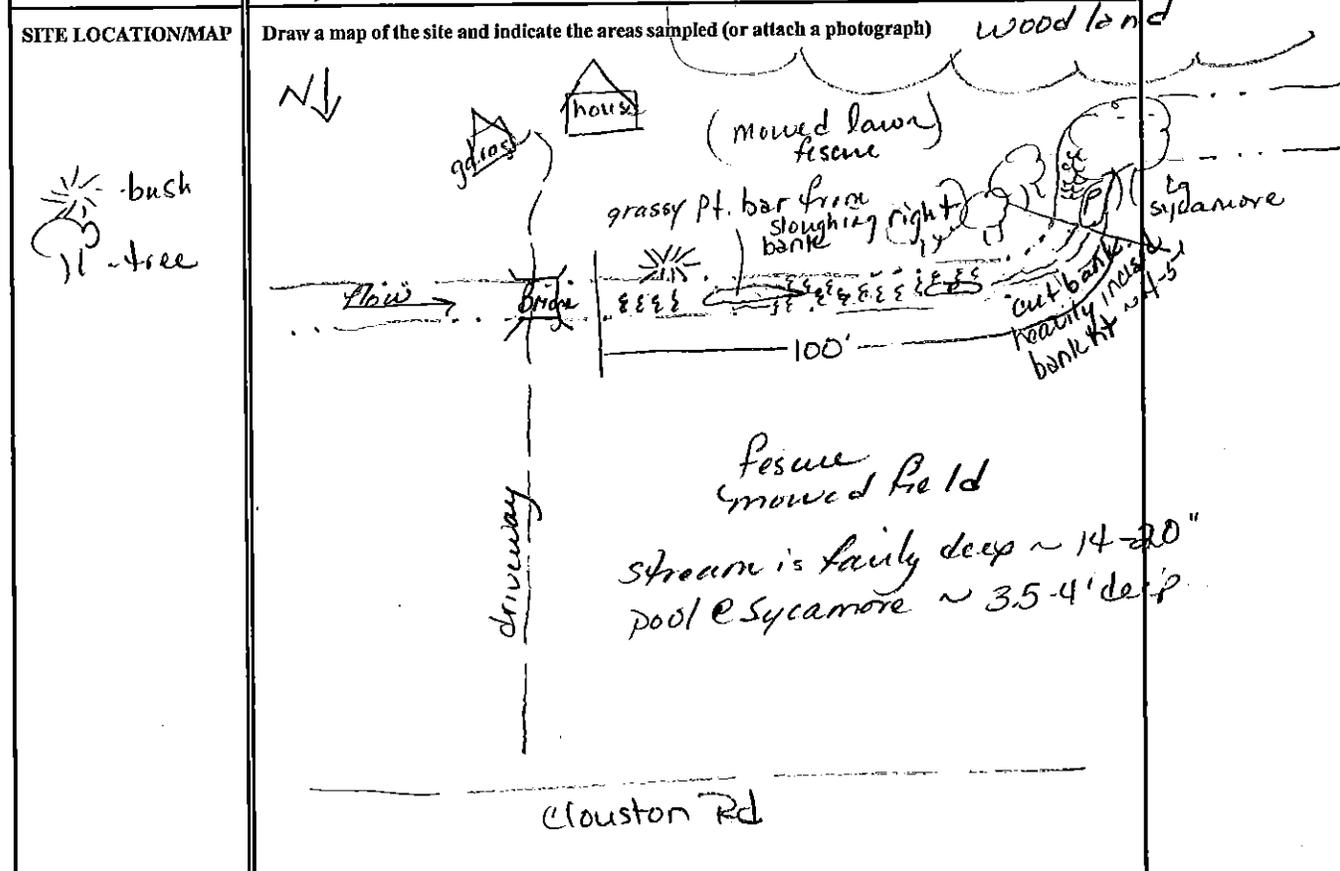
Seg. MFGC-1

AEP Mitchell Land All Project

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (FRONT)

STREAM NAME <u>N. Fork Grove Creek</u>	LOCATION <u>Hackathorn Prop, Cameron, Marshall Co, WV.</u>	
STATION # <u>AFSC 2</u> RIVERMILE _____	STREAM CLASS <u>Perennial</u>	
LAT <u>39°50'53.038"N</u> LONG <u>80°34'14.641"W</u>	RIVER BASIN <u>OHIO</u>	
STORET # _____	AGENCY _____	
INVESTIGATORS <u>Dawn York / Mary Gilmore</u>		
FORM COMPLETED BY <u>DY / MB</u>	DATE <u>2/6/12</u> TIME <u>7:30</u> AM <input type="radio"/> PM <input checked="" type="radio"/>	REASON FOR SURVEY <u>Potential Mitigation Site</u>

WEATHER CONDITIONS	Now	Past 24 hours	Has there been a heavy rain in the last 7 days? <u>0.56"</u>
	<input type="checkbox"/> storm (heavy rain) <input type="checkbox"/> rain (steady rain) <input type="checkbox"/> showers (intermittent) <input type="checkbox"/> % cloud cover <input checked="" type="checkbox"/> clear/sunny	<input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> 40% <input type="checkbox"/>	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No Air Temperature <u>0°C 32°F</u> Other _____



STREAM CHARACTERIZATION	Stream Subsystem <input checked="" type="checkbox"/> Perennial <input type="checkbox"/> Intermittent <input type="checkbox"/> Tidal	Stream Type <input checked="" type="checkbox"/> Coldwater <input type="checkbox"/> Warmwater
	Stream Origin <input type="checkbox"/> Glacial <input type="checkbox"/> Non-glacial montane <input type="checkbox"/> Swamp and bog	<input checked="" type="checkbox"/> Spring-fed <input type="checkbox"/> Mixture of origins <input type="checkbox"/> Other _____
Catchment Area _____ km ²		

Pg. A
NFGC-I
Hackathon Prop.
12/6/11

Forest on Slope (steep)

MOWED LAWN

heavily eroded bank
27" deep x
280" wide

11 ft deep
197" wide
75" deep

100ft

MOWED LAWN

13.75" deep

31
119

14.3' wide

14" deep
119" wide



Riffle

Grassy island

HOUSE

BRIDGE

Garry 1

Yard

Seg. NFGC-1

Segment 1, NFGC
2/6/12
Hackathorn Pnp

AEP Mitchell Landfill Project

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (BACK)

WATERSHED FEATURES	Predominant Surrounding Landuse <input type="checkbox"/> Forest <input type="checkbox"/> Commercial <input type="checkbox"/> Field/Pasture <input type="checkbox"/> Industrial <input type="checkbox"/> Agricultural <input type="checkbox"/> Other _____ <input checked="" type="checkbox"/> Residential	Local Watershed NPS Pollution <input type="checkbox"/> No evidence <input type="checkbox"/> Some potential sources <input checked="" type="checkbox"/> Obvious sources Local Watershed Erosion <input type="checkbox"/> None <input type="checkbox"/> Moderate <input type="checkbox"/> Heavy
RIPARIAN VEGETATION (18 meter buffer)	Indicate the dominant type and record the dominant species present <input type="checkbox"/> Trees <input type="checkbox"/> Shrubs <input checked="" type="checkbox"/> Grasses <input type="checkbox"/> Herbaceous dominant species present <u>Mowed LAWN</u>	
INSTREAM FEATURES	Estimated Reach Length <u>30.48 m 100ft</u> Canopy Cover <u>open 100%</u> <input checked="" type="checkbox"/> open <input type="checkbox"/> Partly shaded <input type="checkbox"/> Shaded Estimated Stream Width <u>3.02 m 119" 9.9'</u> Sampling Reach Area <u>92.05 m²</u> High Water Mark _____ m Area in km ² (m ² x 1000) <u>92049.6 km²</u> Proportion of Reach Represented by Stream Estimated Stream Depth _____ m (<u>16" pools</u>) Morphology Types <input type="checkbox"/> Riffle <u>70%</u> <input type="checkbox"/> Run <u>25%</u> <input type="checkbox"/> Pool <u>5%</u> Surface Velocity <u>NA</u> m/sec Channelized <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <i>esp. Near bridge</i> (at thalweg) <u>moderate</u> Dam Present <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
LARGE WOODY DEBRIS	LWD <u>0</u> m ² Density of LWD <u>0</u> m ² /km ² (LWD/ reach area)	
AQUATIC VEGETATION	Indicate the dominant type and record the dominant species present <input type="checkbox"/> Rooted emergent <input type="checkbox"/> Rooted submergent <input type="checkbox"/> Rooted floating <input type="checkbox"/> Free floating <input type="checkbox"/> Floating Algae <input checked="" type="checkbox"/> Attached Algae dominant species present _____ Portion of the reach with aquatic vegetation <u>0</u> %	
WATER QUALITY	Temperature <u>4.44</u> °C Specific Conductance <u>304</u> Dissolved Oxygen <u>11.12</u> pH <u>8.03</u> Turbidity <u>160</u> WQ Instrument Used <u>Horiba U52</u> Water Odors <input checked="" type="checkbox"/> Normal/None <input type="checkbox"/> Sewage <input type="checkbox"/> Petroleum <input type="checkbox"/> Chemical <input type="checkbox"/> Fishy <input type="checkbox"/> Other _____ Water Surface Oils <input type="checkbox"/> Slick <input type="checkbox"/> Sheen <input type="checkbox"/> Globs <input type="checkbox"/> Flecks <input type="checkbox"/> None <input type="checkbox"/> Other _____ Turbidity (if not measured) <input type="checkbox"/> Clear <input type="checkbox"/> Slightly turbid <input checked="" type="checkbox"/> Turbid <input type="checkbox"/> Opaque <input type="checkbox"/> Stained <input type="checkbox"/> Other _____	
SEDIMENT/SUBSTRATE	Odors <input checked="" type="checkbox"/> Normal <input type="checkbox"/> Sewage <input type="checkbox"/> Petroleum <input type="checkbox"/> Chemical <input type="checkbox"/> Anaerobic <input type="checkbox"/> None <input type="checkbox"/> Other _____ <input checked="" type="checkbox"/> Absent <input type="checkbox"/> Slight <input type="checkbox"/> Moderate <input type="checkbox"/> Profuse Deposits <input type="checkbox"/> Sludge <input type="checkbox"/> Sawdust <input type="checkbox"/> Paper fiber <input type="checkbox"/> Sand <input type="checkbox"/> Relict shells <input type="checkbox"/> Other _____ Looking at stones which are not deeply embedded, are the undersides black in color? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	

OHW = 8.5'
TQB, TQB = 10'

INORGANIC SUBSTRATE COMPONENTS (should add up to 100%)			ORGANIC SUBSTRATE COMPONENTS (does not necessarily add up to 100%)		
Substrate Type	Diameter	% Composition in Sampling Reach	Substrate Type	Characteristic	% Composition in Sampling Area
Bedrock		-	Detritus	sticks, wood, coarse plant materials (CPOM)	0
Boulder	> 256 mm (10")	3			
Cobble	64-256 mm (2.5"-10")	70	Muck-Mud	black, very fine organic (FPOM)	0
Gravel	2-64 mm (0.1"-2.5")	20			
Sand	0.06-2mm (gritty)	7	Marl	grey, shell fragments	0
Silt	0.004-0.06 mm	0			
Clay	< 0.004 mm (slick)	0			

Seg. NFGC-1

AEP Mitchell Land Use Project

BENTHIC MACROINVERTEBRATE FIELD DATA SHEET

STREAM NAME <u>N Fork Cross Creek</u>		LOCATION <u>Hackathorn Prop, Cameron, Marshall Co, WV</u>	
STATION # <u>1136</u> TRIVERMILE _____		STREAM CLASS <u>Perennial</u>	
LAT <u>39 50 53.038</u> LONG <u>80 31 14.141</u>		RIVER BASIN <u>OH</u>	
STORET # _____		AGENCY _____	
INVESTIGATORS <u>D York / M Gilmore</u>		LOT NUMBER _____	
FORM COMPLETED BY <u>D York / M Gilmore</u>		DATE <u>2/8/12</u> TIME <u>1545</u> AM <input checked="" type="checkbox"/> PM	REASON FOR SURVEY <u>Potential Mitigation Site</u>

HABITAT TYPES	Indicate the percentage of each habitat type present <input checked="" type="checkbox"/> Cobble <u>80</u> % <input checked="" type="checkbox"/> Snags <u>0</u> % <input type="checkbox"/> Vegetated Banks _____ % <input checked="" type="checkbox"/> Sand <u>5</u> % <input type="checkbox"/> Submerged Macrophytes <u>0</u> % <input type="checkbox"/> Other (_____) _____ %
	Gear used <input type="checkbox"/> D-frame <input checked="" type="checkbox"/> Kick-net <input type="checkbox"/> Other _____ How were the samples collected? <input type="checkbox"/> wading <input type="checkbox"/> from bank <input type="checkbox"/> from boat Indicate the number of jabs/kicks taken in each habitat type. <input checked="" type="checkbox"/> Cobble <u>6</u> <input type="checkbox"/> Snags _____ <input type="checkbox"/> Vegetated Banks _____ <input type="checkbox"/> Sand _____ <input type="checkbox"/> Submerged Macrophytes _____ <input type="checkbox"/> Other (_____) _____
SAMPLE COLLECTION	} 1 m ² area sampled.
GENERAL COMMENTS	Stream is fairly deep - 14" - 20" / Surrounded by manicured lawn - Property owner does not want "weedy" look. Owner frequently cleans stream of debris.

QUALITATIVE LISTING OF AQUATIC BIOTA

Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare, 2 = Common, 3 = Abundant, 4 = Dominant

Periphyton	0	1	2	3	4	Slimes	0	1	2	3	4
Filamentous Algae	0	1	2	3	4	Macroinvertebrates	0	1	2	3	4
Macrophytes	0	1	2	3	4	Fish	0	1	2	3	4

FIELD OBSERVATIONS OF MACROBENTHOS

Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare (1-3 organisms), 2 = Common (3-9 organisms), 3 = Abundant (>10 organisms), 4 = Dominant (>50 organisms)

Porifera	0	1	2	3	4	Anisoptera	0	1	2	3	4	Chironomidae	0	1	2	3	4
Hydrozoa	0	1	2	3	4	Zygoptera	0	1	2	3	4	Ephemeroptera	0	1	2	3	4
Platyhelminthes	0	1	2	3	4	Hemiptera	0	1	2	3	4	Trichoptera	0	1	2	3	4
Turbellaria	0	1	2	3	4	Colleoptera	0	1	2	3	4	Other	0	1	2	3	4
Hirudinea	0	1	2	3	4	Lepidoptera	0	1	2	3	4	Water Penny //	0	1	2	3	4
Oligochaeta	0	1	2	3	4	Sialidae	0	1	2	3	4	Plecoptera	0	1	2	3	4
Isopoda	0	1	2	3	4	Corydalidae	0	1	2	3	4						
Amphipoda	0	1	2	3	4	Tipulidae //	0	1	2	3	4						
Decapoda	0	1	2	3	4	Empididae	0	1	2	3	4						
Gastropoda	0	1	2	3	4	Simuliidae	0	1	2	3	4						
Bivalvia	0	1	2	3	4	Tabinidae	0	1	2	3	4						
						Culcidae	0	1	2	3	4						

finger nail clam // paper shell HL

fan tailed - 1
N. DUSKY JUVY - 1

Seg. NFGC-1

AEP Mitchell Land Ltd Project

PRELIMINARY ASSESSMENT SCORE SHEET (PASS)

page 1 of 1

STREAM NAME <i>N. Fork Grave Creek</i>		LOCATION <i>Laekathorn Property, Marsh Hill Co, W.V.</i>	
STATION # <i>Seg 1 (NFGC-1)</i>	RIVERMILE _____	STREAM CLASS <i>Perennial</i>	
LAT <i>39 50 53.038</i>	LONG <i>80 34 14.64</i>	RIVER BASIN <i>OH</i>	
STORET # _____		AGENCY _____	
COLLECTED BY <i>D. York</i>	DATE <i>8 Feb 12</i>	LOT # _____	NUMBER OF SWEEPS <i>Sampled 1 sq meter</i>
HABITATS: <input checked="" type="checkbox"/> COBBLE <input type="checkbox"/> SHOREZONE <input type="checkbox"/> SNAGS <input type="checkbox"/> VEGETATION			

Enter Family and/or Genus and Species name on blank line.

Organisms	No.	LS	TI	TCR	Organisms	No.	LS	TI	TCR
Oligochaeta	<i>Roundworm</i>	<i>1</i>	<i>A</i>	<i>DY</i>	<i>1</i>	Megaloptera			
Hirudinea					Coleoptera	<i>Beptenidae</i>	<i>2</i>	<i>I</i>	<i>DY</i>
Isopoda									
Amphipoda					Diptera	<i>Tipulidae</i>	<i>3</i>	<i>I</i>	<i>DY</i>
Decapoda	<i>Immature ♀</i>	<i>3</i>	<i>I</i>	<i>DY</i>	<i>3</i>	<i>Chironomidae</i>	<i>50</i>	<i>I</i>	<i>DY</i>
Ephemeroptera	<i>Heptageniidae</i>	<i>4</i>	<i>I</i>	<i>DY</i>	<i>1</i>				
					Gastropoda				
Plecoptera	<i>Perlidae</i>	<i>15</i>	<i>I</i>	<i>DY</i>	<i>1</i>				
					Pelecypoda	<i>Sphaeriidae</i>	<i>3</i>	<i>I</i>	<i>DY</i>
Trichoptera	<i>Glossosomatidae</i>	<i>30</i>	<i>I</i>	<i>DY</i>	<i>1</i>				
	<i>Hydropsychidae</i>	<i>20</i>	<i>I</i>	<i>DY</i>	<i>1</i>				
					Other				
Hemiptera									

Taxonomic certainty rating (TCR) 1-5: 1=most certain, 5=least certain. If rating is 3-5, give reason (e.g., missing gills). LS=life stage: I=immature; P=pupa; A=adult TI=Taxonomists initials

	Site Value	Target Threshold	If 2 or more metrics are ≥ target threshold, site is
Total No. Taxa			HEALTHY
EPT Taxa			If less than 2 metrics are within target range, site is
Tolerance Index			

- (1) Fairy darter - *E. flabellum*
- (2) *N. dustey* juv. - *Dismognathus fusus*

Lingernail clam - *Sphaeriidae*
W. sphaeri - 22

FCI Calculator for the High-Gradient Headwater Streams in eastern Kentucky and western West Virginia HGM Guidebook

To ensure accurate calculations, the **UPPERMOST STRATUM** of the plant community is determined based on the calculated value for $V_{CCANOPY}$ ($\geq 20\%$ cover is required for tree/sapling strata). Go to the SAR Data Entry tab and enter site characteristics and data in the yellow cells. For information on determining how to split a project into SARs, see Chapter 5 of the Operational Draft Regional Guidebook for the Functional Assessment of High-gradient Ephemeral and Intermittent Headwater Streams in Western West Virginia and Eastern Kentucky (Environmental Laboratory U.S. Army Corps of Engineers 2010).

Project Name: AEP, Mitchell Landfill Project

Location: Hackathorn Property, Marshall County, WV Segment 1

Sampling Date: 02-6-2012

Mitigation Site Before Project

Subclass for this SAR:

Intermittent Stream

Uppermost stratum present at this SAR:

Shrub/Herb Strata

SAR number: Seg NFGC-1

Functional Results Summary:

Enter Results in Section C of the Mitigation Sufficiency Calculator

Function	Functional Capacity Index
Hydrology	0.28
Biogeochemical Cycling	0.30
Habitat	0.22

Variable Measure and Subindex Summary:

Variable	Name	Average Measure	Subindex
$V_{CCANOPY}$	Percent canopy over channel.	Not Used, <20%	Not Used
V_{EMBED}	Average embeddedness of channel.	1.90	0.42
$V_{SUBSTRATE}$	Median stream channel substrate particle size.	2.50	1.00
V_{BERO}	Total percent of eroded stream channel bank.	100.00	0.54
V_{LWD}	Number of down woody stems per 100 feet of stream.	0.00	0.00
V_{TDBH}	Average dbh of trees.	Not Used	Not Used
V_{SNAG}	Number of snags per 100 feet of stream.	5.00	0.80
V_{SSD}	Number of saplings and shrubs per 100 feet of stream.	65.00	1.00
V_{SRICH}	Riparian vegetation species richness.	1.00	0.48
$V_{DETRITUS}$	Average percent cover of leaves, sticks, etc.	0.88	0.01
V_{HERB}	Average percent cover of herbaceous vegetation.	76.88	1.00
V_{WLUSE}	Weighted Average of Runoff Score for Catchment.	0.33	0.35

Sample Variables 10-11 within at least 8 subplots (40" x 40", or 1m x 1m) in the riparian/buffer zone within 25 feet from each bank. The four subplots should be placed roughly equidistantly along each side of the stream.

10 V_{DETRITUS} Average percent cover of leaves, sticks, or other organic material. Woody debris <4" diameter and <36" long are include. Enter the percent cover of the detrital layer at each subplot.

Left Side				Right Side			
1	0	0	1	0	0	5	0

11 V_{HERB} Average percentage cover of herbaceous vegetation (measure only if tree cover is <20%). Do not include woody stems at least 4" dbh and 36" tall. Because there may be several layers of ground cover vegetation percentages up through 200% are accepted. Enter the percent cover of ground vegetation at each subplot.

Left Side				Right Side			
90	90	80	75	50	80	75	75

Sample Variable 12 within the entire catchment of the stream.

12 V_{WLUSE} Weighted Average of Runoff Score for watershed:

Land Use (Choose From Drop List)	Runoff Score	% in Catchment	Running Percent (not >100)
Residential (homes, school, church, farms)			
forest			

Summary			Notes:
Variable	Value	VSI	
V _{CANOPY}			Riparian zone is manicured lawn. photo 264 - ↑ 265 - ↓ 14.3' wide 13.75" deep.
V _{EMBED}			
V _{SUBSTRATE}			
V _{BERO}			
V _{LWD}			
V _{TDBH}			
V _{SNAG}			
V _{SSD}			
V _{SRICH}			
V _{DETRITUS}			
V _{HERB}			
V _{WLUSE}			

Seg MFGC-3

AEP Mitchell Landfill Project

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (FRONT)

STREAM NAME <i>N. Fork Grave Creek</i>		LOCATION <i>Cumpstons, Camern, Marshall Co, WV</i>	
STATION # <i>NP60</i> RIVERMILE		STREAM CLASS <i>Perennial</i>	
LAT <i>39°50'54.876"</i> LONG <i>83°25'6.899"</i>		RIVER BASIN <i>OH</i>	
STORET #		AGENCY	
INVESTIGATORS <i>D. York / M. Gilmore</i>			
FORM COMPLETED BY <i>D. York / M. Gilmore</i>		DATE <i>2/16/12</i> TIME <i>1007</i> AM PM	REASON FOR SURVEY <i>Potential Mitigation Site</i>

Habitat Parameter	Condition 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 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.
SCORE <i>5</i>	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 <i>4</i>	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 <i>11</i>	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.	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 <i>18</i>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE <i>18/19</i>	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

bedrock!
basically one pool @ RB - due to erosion -
deep fast
1 type - deep fast

some new sandy deposition in between bedrock - one pool consists of sandy substrate

yes - however RB is fence/dam & debris input LB is wooded -

rgo - 14700 -
Cumpston

ACP Mitchell Land PLLC Project

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (BACK)

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
6. Channel Alteration Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.	
SCORE <u>13</u>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Channel Sinuosity The bends in the stream increase the stream length 3 to 4 times longer than if it 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.	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long distance.	
SCORE <u>16</u>	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) Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.	
SCORE <u>4</u> (LB) SCORE <u>1</u> (RB)	Left Bank <u>10</u> 9 Right Bank <u>10</u> 9	8 7 6 5 4 3	2 1 0 2 1 0	2 1 0 2 1 0
9. Vegetative Protection (score each bank) Note: determine left or right side by facing downstream.	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 <u>9</u> (LB) SCORE <u>1</u> (RB)	Left Bank <u>10</u> 9 Right Bank <u>10</u> 9	8 7 6 5 4 3	2 1 0 2 1 0	2 1 0 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 <u>10</u> (LB) SCORE <u>1</u> (RB)	Left Bank <u>10</u> 9 Right Bank <u>10</u> 9	8 7 6 8 7 6	5 4 3 5 4 3	2 1 0 2 1 0

Parameters to be evaluated broader than sampling reach

Channel is confined w/ woodland in Residence RB

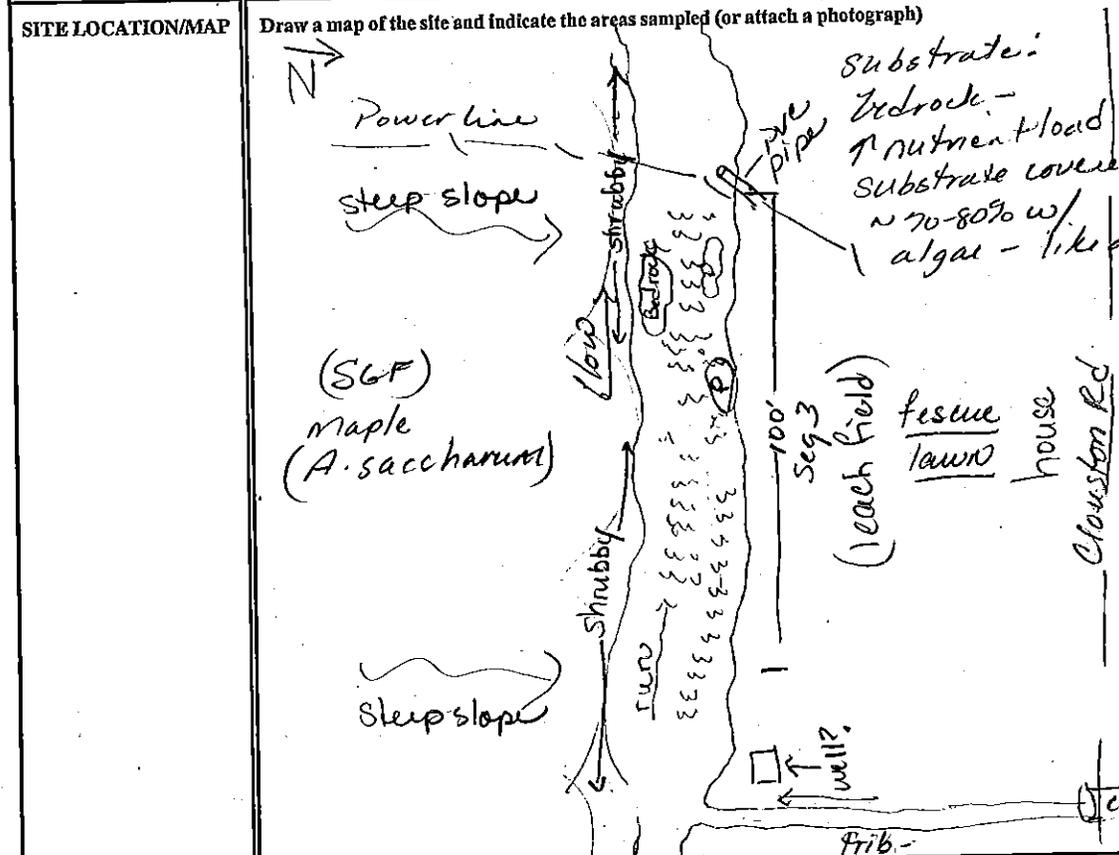
Total Score 92

lim ~ 20'

Seg. WFGC-3 AEP Mitchell land LLC Project
PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET
 (FRONT)

STREAM NAME <i>N. Fork Grave Creek</i>	LOCATION <i>Cumpton Property, Marshall CO, WV</i>
STATION # <i>WFGC-3</i> RIVERMILE	STREAM CLASS <i>Perennial</i>
LAT <i>39 50 54.87</i> LONG <i>80 34 25.67</i>	RIVER BASIN <i>OHIO</i>
STORET #	AGENCY
INVESTIGATORS <i>M. Gilmore / D. York</i>	
FORM COMPLETED BY <i>YORK/GILMORE</i>	DATE <i>16 Feb 2012</i> TIME <i>1007</i> <input checked="" type="checkbox"/> AM <input type="checkbox"/> PM
	REASON FOR SURVEY <i>Potential Mitigation Site</i>

WEATHER CONDITIONS	Now	Past 24 hours	Has there been a heavy rain in the last 7 days?
	<input type="checkbox"/> storm (heavy rain) <input type="checkbox"/> rain (steady rain) <input checked="" type="checkbox"/> showers (intermittent) <input type="checkbox"/> %cloud cover <input type="checkbox"/> clear/sunny	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> 100%	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No Air Temperature <i>11°C 34°C</i> Other _____



STREAM CHARACTERIZATION	Stream Subsystem <input checked="" type="checkbox"/> Perennial <input type="checkbox"/> Intermittent <input type="checkbox"/> Tidal	Stream Type <input checked="" type="checkbox"/> Coldwater <input type="checkbox"/> Warmwater
	Stream Origin <input type="checkbox"/> Glacial <input checked="" type="checkbox"/> Spring-fed <input type="checkbox"/> Non-glacial montane <input type="checkbox"/> Mixture of origins <input type="checkbox"/> Swamp and bog <input type="checkbox"/> Other	Catchment Area _____ km ² <i>(Hackathorn Property)</i>

P92
 NFBC-3
 Campston Property

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET
 (BACK)

WATERSHED FEATURES	Predominant Surrounding Landuse <input type="checkbox"/> Forest <input type="checkbox"/> Commercial <input type="checkbox"/> Field/Pasture <input type="checkbox"/> Industrial <input checked="" type="checkbox"/> Agricultural <input type="checkbox"/> Other _____ <input checked="" type="checkbox"/> Residential	Local Watershed NPS Pollution <input type="checkbox"/> No evidence <input type="checkbox"/> Some potential sources <input checked="" type="checkbox"/> Obvious sources Local Watershed Erosion <input type="checkbox"/> None <input type="checkbox"/> Moderate <input checked="" type="checkbox"/> Heavy
RIPARIAN VEGETATION (18 meter buffer)	Indicate the dominant type and record the dominant species present <input type="checkbox"/> Trees <input type="checkbox"/> Shrubs <input checked="" type="checkbox"/> Grasses <input type="checkbox"/> Herbaceous dominant species present <u>Fescue on right bank / Made oak left bank</u>	
INSTREAM FEATURES	Estimated Reach Length <u>3048</u> m <u>100</u> <input checked="" type="checkbox"/> Canopy Cover <input checked="" type="checkbox"/> Partly open <input type="checkbox"/> Partly shaded <input type="checkbox"/> Shaded Estimated Stream Width <u>5.52</u> m High Water Mark <u>4.27</u> m Sampling Reach Area <u>168.2</u> m ² Area in km ² (m ² x 1000) <u>168249.6</u> km ² Proportion of Reach Represented by Stream Morphology Types <input type="checkbox"/> Riffle <u>80</u> % <input type="checkbox"/> Run <u>10</u> % <input type="checkbox"/> Pool <u>10</u> % Estimated Stream Depth _____ m Surface Velocity <u>0.2</u> m/sec Channelized <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No (at thalweg) <u>Moderate</u> Dam Present <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
LARGE WOODY DEBRIS	LWD <u>0</u> m ² Density of LWD <u>0</u> m ² /km ² (LWD/reach area) <u>0</u>	
AQUATIC VEGETATION	Indicate the dominant type and record the dominant species present <input type="checkbox"/> Rooted emergent <input type="checkbox"/> Rooted submergent <input type="checkbox"/> Rooted floating <input type="checkbox"/> Free floating <input type="checkbox"/> Floating Algae <input checked="" type="checkbox"/> Attached Algae dominant species present _____ Portion of the reach with aquatic vegetation <u>90</u> %	
WATER QUALITY	Temperature <u>4.26</u> °C Water Odors <input checked="" type="checkbox"/> Normal/None <input type="checkbox"/> Sewage <input type="checkbox"/> Petroleum <input type="checkbox"/> Chemical <input type="checkbox"/> Fishy <input type="checkbox"/> Other _____ Specific Conductance <u>260</u> Dissolved Oxygen <u>11.83</u> ORP <u>245</u> pH <u>7.94</u> Turbidity <u>3.1</u> WQ Instrument Used <u>Horiba U52</u> Water Surface Oils <input type="checkbox"/> Slick <input type="checkbox"/> Sheen <input type="checkbox"/> Globs <input type="checkbox"/> Flecks <input checked="" type="checkbox"/> None <input type="checkbox"/> Other _____ Turbidity (if not measured) <input type="checkbox"/> Clear <input type="checkbox"/> Slightly turbid <input type="checkbox"/> Turbid <input type="checkbox"/> Opaque <input type="checkbox"/> Stained <input type="checkbox"/> Other _____	
SEDIMENT/SUBSTRATE	Odors <input type="checkbox"/> Normal <input checked="" type="checkbox"/> Sewage <input type="checkbox"/> Petroleum <input type="checkbox"/> Chemical <input type="checkbox"/> Anaerobic <input type="checkbox"/> None <input type="checkbox"/> Other _____ Deposits <input checked="" type="checkbox"/> Sludge <input type="checkbox"/> Sawdust <input type="checkbox"/> Paper fiber <input type="checkbox"/> Sand <input type="checkbox"/> Relict shells <input type="checkbox"/> Other _____ Oils <input checked="" type="checkbox"/> Absent <input type="checkbox"/> Slight <input type="checkbox"/> Moderate <input type="checkbox"/> Profuse Looking at stones which are not deeply embedded, are the undersides black in color? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	

INORGANIC SUBSTRATE COMPONENTS (should add up to 100%)			ORGANIC SUBSTRATE COMPONENTS (does not necessarily add up to 100%)		
Substrate Type	Diameter	% Composition in Sampling Reach	Substrate Type	Characteristic	% Composition in Sampling Area
Bedrock		<u>90</u> %	Detritus	sticks, wood, coarse plant materials (QPOM)	<u>10</u> %
Boulder	> 256 mm (10")	<u>2</u>			
Cobble	64-256 mm (2.5"-10")	<u>1</u>	Muck-Mud	black, very fine organic (FPOM)	<u>0</u> %
Gravel	2-64 mm (0.1"-2.5")	<u>2</u>			
Sand	0.06-2mm (gritty)	<u>—</u>	Marl	grey, shell fragments	<u>0</u> %
Silt	0.004-0.06 mm	<u>5</u>			
Clay	< 0.004 mm (slick)	<u>—</u>			

Seg. NFG-C-3

AEP Mitchell Landfill Project

BENTHIC MACROINVERTEBRATE FIELD DATA SHEET

STREAM NAME <u>N. Fork Grave Creek</u>		LOCATION <u>Campston's, Cameron Marshall Co, WV</u>	
STATION # <u>ARR-3</u> RIVER MILE		STREAM CLASS <u>Perennial</u>	
LAT <u>37°50'54.076"</u> LONG <u>80°34'25.687"</u>		RIVER BASIN <u>Ohio</u>	
STORET #		AGENCY	
INVESTIGATORS <u>M. Gilmore / D. York</u>		LOT NUMBER	
FORM COMPLETED BY <u>M. Gilmore / D. York</u>		DATE <u>2/16/2012</u> TIME <u>1615</u> <input checked="" type="radio"/> AM <input type="radio"/> PM	REASON FOR SURVEY <u>Potential Mitigation Site</u>

HABITAT TYPES	Indicate the percentage of each habitat type present <input type="checkbox"/> Cobble ___ % <input type="checkbox"/> Snags <u>0</u> % <input type="checkbox"/> Vegetated Banks ___ % <input type="checkbox"/> Sand ___ % <input type="checkbox"/> Submerged Macrophytes ___ % <input checked="" type="checkbox"/> Other (<u>bedrock</u>) <u>90</u> %
SAMPLE COLLECTION	Gear used <input type="checkbox"/> D-frame <input checked="" type="checkbox"/> Kick-net <input type="checkbox"/> Other _____ How were the samples collected? <input checked="" type="checkbox"/> wading <input type="checkbox"/> from bank <input type="checkbox"/> from boat Indicate the number of jabs/kicks taken in each habitat type. <input type="checkbox"/> Cobble ___ <input type="checkbox"/> Snags ___ <input type="checkbox"/> Vegetated Banks ___ <input type="checkbox"/> Sand ___ <input type="checkbox"/> Submerged Macrophytes ___ <input type="checkbox"/> Other () ___
GENERAL COMMENTS	- dominantly bed rock, heavy nutrient load, thick algae w/in stream reach - 2 jabs - root bank - kick - 1 riffle - kick - pool

} 1 m² sampled

QUALITATIVE LISTING OF AQUATIC BIOTA

Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare, 2 = Common, 3 = Abundant, 4 = Dominant

Periphyton	0	1	2	3	4	Slimes	0	1	2	3	4
Filamentous Algae	0	1	2	3	4	Macroinvertebrates	0	1	2	3	4
Macrophytes	0	1	2	3	4	Fish	0	1	2	3	4

FIELD OBSERVATIONS OF MACROBENTHOS

Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare (1-3 organisms), 2 = Common (3-9 organisms), 3 = Abundant (>10 organisms), 4 = Dominant (>50 organisms)

Porifera	0	1	2	3	4	Anisoptera	0	1	2	3	4	Chironomidae	0	1	2	3	4
Hydrozoa	0	1	2	3	4	Zygoptera	0	1	2	3	4	Ephemeroptera	0	1	2	3	4
Platyhelminthes	0	1	2	3	4	Hemiptera	0	1	2	3	4	Trichoptera	0	1	2	3	4
Turbellaria	0	1	2	3	4	Coleoptera	0	1	2	3	4	Other	0	1	2	3	4
Hirudinea	0	1	2	3	4	Lepidoptera	0	1	2	3	4	Tracheoptera	0	1	2	3	4
Oligochaeta	0	1	2	3	4	Sialidae	0	1	2	3	4						
Isopoda	0	1	2	3	4	Corydalidae	0	1	2	3	4						
Amphipoda	0	1	2	3	4	Tipulidae	0	1	2	3	4						
Decapoda	0	1	2	3	4	Empididae	0	1	2	3	4						
Gastropoda	0	1	2	3	4	Simuliidae	0	1	2	3	4						
Bivalvia	0	1	2	3	4	Tabinidae	0	1	2	3	4						
						Culicidae	0	1	2	3	4						

FCI Calculator for the High-Gradient Headwater Streams in eastern Kentucky and western West Virginia HGM Guidebook

To ensure accurate calculations, the **UPPERMOST STRATUM** of the plant community is determined based on the calculated value for $V_{CCANOPY}$ ($\geq 20\%$ cover is required for tree/sapling strata). Go to the SAR Data Entry tab and enter site characteristics and data in the yellow cells. For information on determining how to split a project into SARs, see Chapter 5 of the Operational Draft Regional Guidebook for the Functional Assessment of High-gradient Ephemeral and Intermittent Headwater Streams in Western West Virginia and Eastern Kentucky (Environmental Laboratory U.S. Army Corps of Engineers 2010).

Project Name: AEP, Mitchell Landfill Project

Location: Cumpston Property, Marshall CO, WV Segment 3

Sampling Date: 02-16-2012

Mitigation Site Before Project

Subclass for this SAR:

Intermittent Stream

Uppermost stratum present at this SAR:

Shrub/Herb Strata

SAR number: Seg NFGC-3

Functional Results Summary:

Enter Results in Section C of the Mitigation Sufficiency Calculator

Function	Functional Capacity Index
Hydrology	0.21
Biogeochemical Cycling	0.47
Habitat	0.13

Variable Measure and Subindex Summary:

Variable	Name	Average Measure	Subindex
$V_{CCANOPY}$	Percent canopy over channel.	Not Used, <20%	Not Used
V_{EMBED}	Average embeddedness of channel.	4.10	0.95
$V_{SUBSTRATE}$	Median stream channel substrate particle size.	99.00	0.10
V_{BERO}	Total percent of eroded stream channel bank.	140.00	0.32
V_{LWD}	Number of down woody stems per 100 feet of stream.	0.00	0.00
V_{TDBH}	Average dbh of trees.	Not Used	Not Used
V_{SNAG}	Number of snags per 100 feet of stream.	5.00	0.80
V_{SSD}	Number of saplings and shrubs per 100 feet of stream.	65.00	1.00
V_{SRICH}	Riparian vegetation species richness.	0.00	0.00
$V_{DETRITUS}$	Average percent cover of leaves, sticks, etc.	20.00	0.24
V_{HERB}	Average percent cover of herbaceous vegetation.	68.75	0.92
V_{WLUSE}	Weighted Average of Runoff Score for Catchment.	0.36	0.38

ACP. Mitchell Landfill Project
 See: MFGC-3
 FCY - 0.21
 0.22
 0.13

High-Gradient Headwater Streams in eastern Kentucky and western West Virginia Field Data Sheet and Calculator

Team: M. Gil / D. York Latitude/UTM Northing: 39° 50' 54.876"
 Project Name: Mitchell Landfill Project Longitude/UTM Easting: 80° 34' 25.689"
 Location: Cumpston, Cameron WV Marshall Co Sampling Date: 16 Feb 2012
 SAR Number: 3 Reach Length (ft): 100 Stream Type: Ephemeral/Intermittent (circle one)
 Top Strata: (determined from percent calculated in $V_{CCANOPY}$) Per
 Site and Timing: Project/Mitigation Site (circle one) Before/After Project (Circle One)

Sample Variables 1-4 in stream channel

1 $V_{CCANOPY}$ Average percent cover over channel by tree and sapling canopy. Measure at no fewer than 10 roughly equidistant points along the stream. Measure only if tree/sapling cover is at least 20%. (If less than 20%, enter at least one value between 0 and 19 to trigger Top Strata choice.)

List the percent cover measurements at each point below:

0	0	0	0	0	0	0	0	0	0
---	---	---	---	---	---	---	---	---	---

2 V_{EMBED} Average embeddedness of the stream channel. Measure at no fewer than 30 roughly equidistant points along the stream. Select a particle from the bed. Before moving it, determine the percentage of the surface and area surrounding the particle that is covered by fine sediment, and enter the rating according to the following table. If the bed is an artificial surface, or composed of fine sediments, use a rating score of 1. If the bed is composed of bedrock, use a rating score of 5.

Embeddedness rating for gravel, cobble and boulder particles (rescaled from Platts, Megahan, and Minshall 1983)

Rating	Rating Description
5	<5 percent of surface covered, surrounded, or buried by fine sediment (or bedrock)
4	5 to 25 percent of surface covered, surrounded, or buried by fine sediment
3	26 to 50 percent of surface covered, surrounded, or buried by fine sediment
2	51 to 75 percent of surface covered, surrounded, or buried by fine sediment
1	>75 percent of surface covered, surrounded, or buried by fine sediment (or artificial surface)

List the ratings at each point below:

1	1	1	4	1	1	1	1	1	1
1	1	1	1	4	1	1	1	1	1
1	1	2	1	1	1	1	1	1	1
1	3	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1	1

3 $V_{SUBSTRATE}$ Median stream channel substrate particle size. Measure at no fewer than 30 roughly equidistant points along the stream; use the same points and particles as used in V_{EMBED} .

Enter particle size in inches to the nearest 0.1 inch at each point below (bedrock should be counted as 99 in, asphalt or concrete as 0.0 in, sand or finer particles as 0.08 in):

99	0.08	.35	7.0	99	99				
99	99	99	99	12.25	99				
99	99	282	99	99	.5				
99	382.6/22	0.25	99	99	99				
0.08	99	99	99	99	99				

4 V_{BERO} Total percent of eroded stream channel bank. Enter the total number of feet of eroded bank on each side and the total percentage will be calculated. If both banks are eroded, total erosion for the stream may be up to 200%.

Left Bank: 45 Right Bank: 95

with over bedrock

2.88

Seg NFGC-3

AEP Mitchell Landfill Project

Sample Variables 5-9 within the entire riparian/buffer zone adjacent to the stream channel (25 feet from each bank).

5 V_{LWD} Number of down woody stems (at least 4 inches in diameter and 36 inches in length) per 100 feet of stream reach. Enter the number from the entire 50'-wide buffer and within the channel, and the amount per 100 feet of stream will be calculated.
 Number of downed woody stems: 0

6 V_{TOBH} Average dbh of trees (measure only if $V_{CCANOPY}$ tree/sapling cover is at least 20%). Trees are at least 4 inches (10 cm) in diameter. Enter tree DBHs in inches.
 List the dbh measurements of individual trees (at least 4 in) within the buffer on each side of the stream below:

Left Side					Right Side				
7.5	5.5	9.75	5.0	5.25					
5.0	5.25	10.0	12.25	5.0					
7.0	7.0	10.0							

7 V_{SNAG} Number of snags (at least 4" dbh and 36" tall) per 100 feet of stream. Enter number of snags on each side of the stream, and the amount per 100 feet will be calculated.
 Left Side: 11 Right Side: 0

8 V_{SSD} Number of saplings and shrubs (woody stems up to 4 inches dbh) per 100 feet of stream (measure only if tree cover is <20%). Enter number of saplings and shrubs on each side of the stream, and the amount per 100 ft of stream will be calculated.
 Left Side: 65 Right Side: 0

9 V_{SRICH} Riparian vegetation species richness per 100 feet of stream reach. Check all species present from Group 1 in the tallest stratum. Check all exotic and invasive species present in all strata. Species richness per 100 feet and the subindex will be calculated from these data.

Group 1 = 1.0			Group 2 (-1.0)		
<input type="checkbox"/> <i>Acer rubrum</i>	<input type="checkbox"/> <i>Magnolia tripetala</i>	<input type="checkbox"/> <i>Allanthurus altissima</i>	<input checked="" type="checkbox"/> <i>Lonicera japonica</i>		
<input checked="" type="checkbox"/> <i>Acer saccharum</i>	<input type="checkbox"/> <i>Nyssa sylvatica</i>	<input type="checkbox"/> <i>Albizia julibrissin</i>	<input type="checkbox"/> <i>Lonicera tatarica</i>		
<input type="checkbox"/> <i>Aesculus flava</i>	<input type="checkbox"/> <i>Oxydendrum arboreum</i>	<input type="checkbox"/> <i>Alliaria petiolata</i>	<input type="checkbox"/> <i>Lotus comiculatus</i>		
<input type="checkbox"/> <i>Asimina triloba</i>	<input checked="" type="checkbox"/> <i>Prunus serotina</i>	<input type="checkbox"/> <i>Altemanthera philoxeroides</i>	<input type="checkbox"/> <i>Lythrum salicaria</i>		
<input type="checkbox"/> <i>Betula alleghaniensis</i>	<input type="checkbox"/> <i>Quercus alba</i>	<input type="checkbox"/> <i>Aster tataricus</i>	<input type="checkbox"/> <i>Microstegium vimineum</i>		
<input type="checkbox"/> <i>Betula lenta</i>	<input type="checkbox"/> <i>Quercus coccinea</i>	<input type="checkbox"/> <i>Cerastium fontanum</i>	<input type="checkbox"/> <i>Paulownia tomentosa</i>		
<input type="checkbox"/> <i>Carya alba</i>	<input type="checkbox"/> <i>Quercus imbricaria</i>	<input type="checkbox"/> <i>Coronilla varia</i>	<input type="checkbox"/> <i>Polygonum cuspidatum</i>		
<input type="checkbox"/> <i>Carya glabra</i>	<input type="checkbox"/> <i>Quercus prinus</i>	<input type="checkbox"/> <i>Elaeagnus umbellata</i>	<input checked="" type="checkbox"/> <i>Pueraria montana</i>		
<input type="checkbox"/> <i>Carya ovalis</i>	<input type="checkbox"/> <i>Quercus rubra</i>	<input type="checkbox"/> <i>Lespedeza bicolor</i>	<input checked="" type="checkbox"/> <i>Rosa multiflora</i>		
<input type="checkbox"/> <i>Carya ovata</i>	<input type="checkbox"/> <i>Quercus velutina</i>	<input type="checkbox"/> <i>Lespedeza cuneata</i>	<input type="checkbox"/> <i>Sorghum halepense</i>		
<input type="checkbox"/> <i>Comus florida</i>	<input type="checkbox"/> <i>Sassafras albidum</i>	<input type="checkbox"/> <i>Ligustrum obtusifolium</i>	<input type="checkbox"/> <i>Verbena brasiliensis</i>		
<input type="checkbox"/> <i>Fagus grandifolia</i>	<input type="checkbox"/> <i>Tilia americana</i>	<input type="checkbox"/> <i>Ligustrum sinense</i>			
<input type="checkbox"/> <i>Fraxinus americana</i>	<input type="checkbox"/> <i>Tsuga canadensis</i>				
<input type="checkbox"/> <i>Liriodendron tulipifera</i>	<input type="checkbox"/> <i>Ulmus americana</i>				
<input type="checkbox"/> <i>Magnolia acuminata</i>	<i>Syringa</i>				
0 Species in Group 1		0 Species in Group 2			

Seg: NFGC-3

AEP Mitchell LandCell Project

Sample Variables 10-11 within at least 8 subplots (40" x 40", or 1m x 1m) in the riparian/buffer zone within 25 feet from each bank. The four subplots should be placed roughly equidistantly along each side of the stream.

10 $V_{DETRITUS}$ Average percent cover of leaves, sticks, or other organic material. Woody debris <4" diameter and <36" long are include. Enter the percent cover of the detrital layer at each subplot.

Left Side				Right Side			
90	60	5		2	2	10	0

11 V_{HERB} Average percentage cover of herbaceous vegetation (measure only if tree cover is <20%). Do not include woody stems at least 4" dbh and 36" tall. Because there may be several layers of ground cover vegetation percentages up through 200% are accepted. Enter the percent cover of ground vegetation at each subplot.

Left Side				Right Side			
10	30	90	100	95	80	85	90
			80				

Sample Variable 12 within the entire catchment of the stream.

12 V_{WLUSE} Weighted Average of Runoff Score for watershed:

Land Use (Choose From Drop List)	Runoff Score	% in Catchment	Running Percent (not >100)
residential / school / town	▼	40%	
pasture	▼	30%	
forest	▼	30%	
	▼		
	▼		
	▼		
	▼		

Summary			Notes:
Variable	Value	VSI	
V_{CANOPY}			R bank - mowed lawn immediately adjacent to bank - Septic leach field also along right bank - Utility pool + well next to right bank
V_{EMBED}			
$V_{SUBSTRATE}$			
V_{BERO}			
V_{LWD}			
V_{TDBH}			
V_{SNAG}			
V_{SSD}			
V_{SRICH}			
$V_{DETRITUS}$			
V_{HERB}			
V_{WLUSE}			

Seg NFGC-4 Grade ~20%

NAP Mitchell Land C&D Project

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (FRONT)

STREAM NAME <u>North Fork Grave Creek</u>		LOCATION <u>Lewis Prop, Cameron, Marsha II co, WV</u>	
STATION # <u>NBCL 4</u> RIVERMILE _____		STREAM CLASS <u>Perennial</u>	
LAT <u>39°50'51.796"</u> LONG <u>80°34'7.679"</u>		RIVER BASIN <u>Ohio</u>	
STORET # _____		AGENCY _____	
INVESTIGATORS <u>GILMORE/YORK</u>			
FORM COMPLETED BY <u>gilmoryork</u>		DATE <u>3/1/2012</u> TIME <u>5:45</u> AM () PM (X)	REASON FOR SURVEY <u>Potential Mitigation Site</u>

Habitat Parameter	Condition 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 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.
	SCORE <u>13</u>	20 19 18 17 16	15 14 (13) 12 11	10 9 8 7 6
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 <u>9</u>	20 19 18 17 16	15 14 13 12 11	10 (9) 8 7 6
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 <u>14</u>	20 19 18 17 16	(15) (14) 13 12 11	10 9 8 7 6
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.	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 <u>10</u>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
	SCORE <u>19</u>	20 (19) 18 17 16	15 14 13 12 11	10 9 8 7 6

Parameters to be evaluated in sampling reach

deep pools
wood (lead)
Sandy
Residence
Polygonum cuspidatum

P92
NFG64-Lewis Property

AEP Mitchell Landfill
Project

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (BACK)

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE 13	20 19 18 17 16	15 14 (13) 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Channel Sinuosity	The bends in the stream increase the stream length 3 to 4 times longer than if it 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.	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long distance.
SCORE 5	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)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE 3 (LB) SCORE 2 (RB)	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)	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.
Note: determine left or right side by facing downstream.				
SCORE 10 (LB) SCORE 9 (RB)	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 (6)
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 10 (LB) SCORE 1 (RB)	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

Parameters to be evaluated broader than sampling reach

Total Score 114
Suboptimal

ACEP Mitchell Landfill Project

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (FRONT)

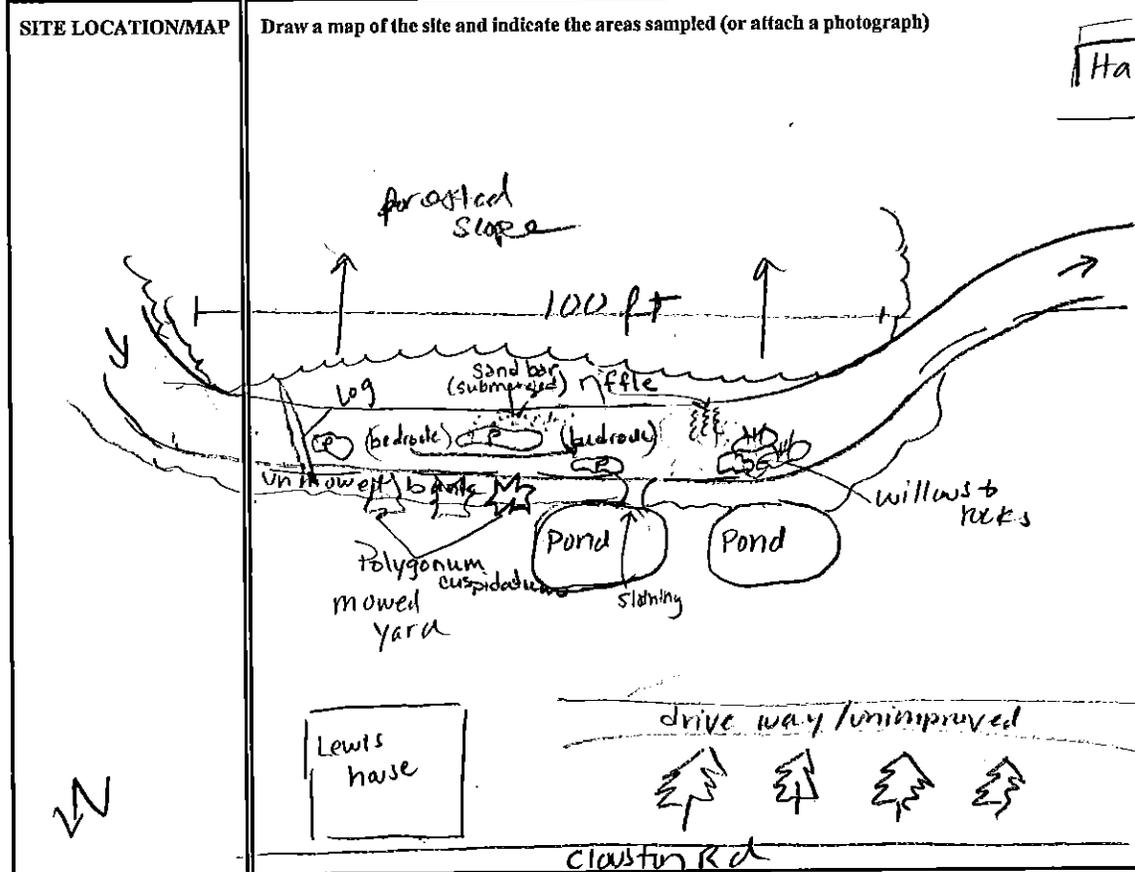
Seg NFERC-4

STREAM NAME <u>North Fork Grass Creek</u>	LOCATION <u>Lewis Property, Clouston Rd, Marshall Co, WV</u>
STATION # <u>NFERC-4</u> RIVERMILE _____	STREAM CLASS <u>Perennial</u>
LAT <u>39.5051796</u> LONG <u>80.2471679</u>	RIVER BASIN <u>OH</u>
STORET # _____	AGENCY _____
INVESTIGATORS <u>M. Calmore, D. York</u>	
FORM COMPLETED BY <u>M. Calmore/D. York</u>	DATE <u>3/1/12</u> TIME <u>1000</u> AM <input checked="" type="radio"/> PM <input type="radio"/>
	REASON FOR SURVEY <u>Potential Mitigation Site</u>

Moundsville

WEATHER CONDITIONS	Now	Past 24 hours	Has there been a heavy rain in the last 7 days? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
	<input type="checkbox"/> storm (heavy rain) <input type="checkbox"/> rain (steady rain) <input type="checkbox"/> showers (intermittent) <input checked="" type="checkbox"/> %cloud cover <input checked="" type="checkbox"/> clear/sunny	<input checked="" type="checkbox"/> storm (heavy rain) <input checked="" type="checkbox"/> rain (steady rain) <input type="checkbox"/> showers (intermittent) <input type="checkbox"/> %cloud cover <input type="checkbox"/> clear/sunny	Air Temperature <u>16.7°C 35°F</u> Other _____

2/23 - 0.08
 2/24 - 0.08
 2/25 - 0.07
 2/26 - 0.07
 2/28 - 0.07
 2/28 - 0.08
 2/29 - 0.07
 3/01 - 0.06



STREAM CHARACTERIZATION	Stream Subsystem <input checked="" type="checkbox"/> Perennial <input type="checkbox"/> Intermittent <input type="checkbox"/> Tidal	Stream Type <input checked="" type="checkbox"/> Coldwater <input type="checkbox"/> Warmwater
	Stream Origin <input type="checkbox"/> Glacial <input checked="" type="checkbox"/> Spring-fed <input type="checkbox"/> Non-glacial montane <input type="checkbox"/> Mixture of origins <input type="checkbox"/> Swamp and bog <input checked="" type="checkbox"/> Other <u>precip</u>	Catchment Area _____ km ²

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PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (BACK)

Pg 2
Sig 4, Lewis
Property

6
18
48

WATERSHED FEATURES	Predominant Surrounding Landuse <input checked="" type="checkbox"/> Forest <input type="checkbox"/> Commercial <input checked="" type="checkbox"/> Field/Pasture <input type="checkbox"/> Industrial <input checked="" type="checkbox"/> Agricultural <input type="checkbox"/> Other _____ <input type="checkbox"/> Residential		Local Watershed NPS Pollution <input type="checkbox"/> No evidence <input type="checkbox"/> Some potential sources <input checked="" type="checkbox"/> Obvious sources	
			Local Watershed Erosion <input type="checkbox"/> None <input checked="" type="checkbox"/> Moderate <input type="checkbox"/> Heavy	
RIPARIAN VEGETATION (18 meter buffer)	Indicate the dominant type and record the dominant species present <input checked="" type="checkbox"/> Trees <input type="checkbox"/> Shrubs <input type="checkbox"/> Grasses <input type="checkbox"/> Herbaceous dominant species present <u>Sycamore</u>			
INSTREAM FEATURES	Estimated Reach Length <u>30.48</u> m Estimated Stream Width <u>9.02</u> m <u>29.6'</u> Sampling Reach Area <u>274.9</u> m ² Area in km ² (m ² x1000) <u>274.929</u> km ² Estimated Stream Depth <u>0.53</u> m <u>6"-19"</u> Surface Velocity (at thalweg) <u>moderate</u> m/sec		Canopy Cover <input checked="" type="checkbox"/> Partly open <input type="checkbox"/> Partly shaded <input type="checkbox"/> Shaded High Water Mark <u>6.71</u> m <u>22'</u> Proportion of Reach Represented by Stream Morphology Types <input type="checkbox"/> Riffle <u>5</u> % <input type="checkbox"/> Run <u>80</u> % <input type="checkbox"/> Pool <u>15</u> %	
			Channelized <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No Dam Present <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
LARGE WOODY DEBRIS	LWD <u>2</u> m ² Density of LWD <u>.22</u> m ² /km ² (LWD/ reach area)		<u>comprised ~ 2% of reach</u>	
AQUATIC VEGETATION	Indicate the dominant type and record the dominant species present <input type="checkbox"/> Rooted emergent <input type="checkbox"/> Rooted submergent <input type="checkbox"/> Rooted floating <input type="checkbox"/> Free floating <input type="checkbox"/> Floating Algae <input checked="" type="checkbox"/> Attached Algae dominant species present _____ Portion of the reach with aquatic vegetation <u>40</u> %			
WATER QUALITY	Temperature <u>6.86</u> °C Specific Conductance <u>248</u> Dissolved Oxygen <u>17.17</u> pH <u>6.68</u> Turbidity <u>12.0</u> WQ Instrument Used <u>Horiba U52</u>		Water Odors <input checked="" type="checkbox"/> Normal/None <input type="checkbox"/> Sewage <input type="checkbox"/> Petroleum <input type="checkbox"/> Chemical <input type="checkbox"/> Fishy <input type="checkbox"/> Other _____ Water Surface Oils <input type="checkbox"/> Slick <input type="checkbox"/> Sheen <input type="checkbox"/> Globs <input type="checkbox"/> Flecks <input checked="" type="checkbox"/> None <input type="checkbox"/> Other _____ Turbidity (if not measured) <input checked="" type="checkbox"/> Clear <input type="checkbox"/> Slightly turbid <input type="checkbox"/> Turbid <input type="checkbox"/> Opaque <input type="checkbox"/> Stained <input type="checkbox"/> Other _____	
SEDIMENT/SUBSTRATE	Odors <input checked="" type="checkbox"/> Normal <input type="checkbox"/> Sewage <input type="checkbox"/> Petroleum <input type="checkbox"/> Chemical <input type="checkbox"/> Anaerobic <input type="checkbox"/> None <input type="checkbox"/> Other _____ Oils <input checked="" type="checkbox"/> Absent <input type="checkbox"/> Slight <input type="checkbox"/> Moderate <input type="checkbox"/> Profuse		Deposits <input type="checkbox"/> Sludge <input type="checkbox"/> Sawdust <input type="checkbox"/> Paper fiber <input type="checkbox"/> Sand <input type="checkbox"/> Relict shells <input type="checkbox"/> Other _____ Looking at stones which are not deeply embedded, are the undersides black in color? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	

INORGANIC SUBSTRATE COMPONENTS (should add up to 100%)			ORGANIC SUBSTRATE COMPONENTS (does not necessarily add up to 100%)		
Substrate Type	Diameter	% Composition in Sampling Reach	Substrate Type	Characteristic	% Composition in Sampling Area
Bedrock		<u>55</u>	Detritus	sticks, wood, coarse plant materials (CPOM)	<u>5</u>
Boulder	>256 mm (10")	<u>—</u>			
Cobble	64-256 mm (2.5"-10")	<u>20</u>	Muck-Mud	black, very fine organic (FPOM)	<u>—</u>
Gravel	2-64 mm (0.1"-2.5")	<u>5</u>			
Sand	0.06-2mm (gritty)	<u>10</u>	Marl	grey, shell fragments	<u>—</u>
Silt	0.004-0.06 mm	<u>10</u>			
Clay	<0.004 mm (slick)	<u>—</u>			

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Seg. NFGC = 4

BENTHIC MACROINVERTEBRATE FIELD DATA SHEET

STREAM NAME <u>N. Fork Graves</u>		LOCATION <u>Lewis Property Cloustone Rd, Marshall Co. WV</u>	
STATION # <u>NFGC-4</u> RIVERMILE		STREAM CLASS <u>Perennial</u>	
LAT <u>39°50'51.796"</u> LONG <u>80°34'7.679"</u>		RIVER BASIN <u>OTTD</u>	
STORET #		AGENCY	
INVESTIGATORS <u>Gilmore/York</u>		LOT NUMBER	
FORM COMPLETED BY <u>Gilmore/York</u>		DATE <u>3/11/2012</u> TIME <u>5:45</u> AM <input checked="" type="radio"/> PM	REASON FOR SURVEY <u>Potential Mitigation Site</u>

HABITAT TYPES	Indicate the percentage of each habitat type present <input checked="" type="checkbox"/> Cobble <u>20</u> % <input type="checkbox"/> Snags _____ % <input type="checkbox"/> Vegetated Banks _____ % <input checked="" type="checkbox"/> Sand <u>10</u> % <input type="checkbox"/> Submerged Macrophytes _____ % <input type="checkbox"/> Other (_____) _____ %
SAMPLE COLLECTION	Gear used <input type="checkbox"/> D-frame <input checked="" type="checkbox"/> kick-net <input type="checkbox"/> Other _____ How were the samples collected? <input checked="" type="checkbox"/> wading <input type="checkbox"/> from bank <input type="checkbox"/> from boat Indicate the number of jabs/kicks taken in each habitat type. <input checked="" type="checkbox"/> Cobble <u>9</u> <input checked="" type="checkbox"/> Snags <u>3</u> <input type="checkbox"/> Vegetated Banks _____ <input checked="" type="checkbox"/> Sand <u>6</u> <input type="checkbox"/> Submerged Macrophytes _____ <input checked="" type="checkbox"/> Other (<u>leaf pack</u>) <u>2</u>
GENERAL COMMENTS	<u>Stream was mostly bedrock - slimy surface/very slick due to sediment + periphyton. Some attached algae observed w/in ~20-30% of reaches. Pools were fairly deep ~3-4 feet/very sandy + silty/1 lg log across stream</u>

QUALITATIVE LISTING OF AQUATIC BIOTA

Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare, 2 = Common, 3 = Abundant, 4 = Dominant

Periphyton	0	1	2	3	4	Slimes	0	1	2	3	4
Filamentous Algae	0	1	2	3	4	Macroinvertebrates	0	1	2	3	4
Macrophytes	0	1	2	3	4	Fish	0	1	2	3	4

Dams of FM 2 striped tail

FIELD OBSERVATIONS OF MACROBENTHOS

Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare (1-3 organisms), 2 = Common (3-9 organisms), 3 = Abundant (>10 organisms), 4 = Dominant (>50 organisms)

Porifera	0	1	2	3	4	Anisoptera	0	1	2	3	4	Chironomidae	0	1	2	3	4	
Hydrozoa	0	1	2	3	4	Zygoptera	1	0	1	2	3	4	Ephemeroptera	0	1	2	3	4
Platyhelminthes	0	1	2	3	4	Hemiptera	0	1	2	3	4	Trichoptera	1	0	1	2	3	4
Turbellaria	0	1	2	3	4	Coleoptera	0	1	2	3	4	Other	0	1	2	3	4	
Hirudinea	0	1	2	3	4	Lepidoptera	0	1	2	3	4	Heptageniidae	1	1	1	1	1	
Oligochaeta	1	0	1	2	3	Sialidae	0	1	2	3	4	Asiatic clam	1	1	1	1	1	
Isopoda	0	1	2	3	4	Corydalidae	0	1	2	3	4	Hydrocyadidae	1	1	1	1	1	
Amphipoda	0	1	2	3	4	Tipulidae	1	1	1	1	1	Lymnaphidillae	1	1	1	1	1	
Decapoda	0	1	2	3	4	Empididae	0	1	2	3	4	Glossomoidid	1	1	1	1	1	
Gastropoda	0	1	2	3	4	Simuliidae	0	1	2	3	4	perlid/perloidae	1	1	1	1	1	
Bivalvia	0	1	2	3	4	Tabinidae	0	1	2	3	4	Ameletus	1	1	1	1	1	
						Culicidae	0	1	2	3	4							

fan tailed darter - 1
common minnow - 2

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Seg. NFGC-4

PRELIMINARY ASSESSMENT SCORE SHEET (PASS)

page 1 of 1

STREAM NAME <u>Northfork Grove Creek</u>		LOCATION <u>Lewis Property Clouston Rd Marshall co, WV</u>	
STATION # <u>NFGC-4</u>	RIVERMILE	STREAM CLASS <u>Perennial</u>	
LAT <u>39°50'51.796"</u>	LONG <u>80°34'7.679"</u>	RIVER BASIN <u>OH</u>	
STORET #		AGENCY	
COLLECTED BY <u>D. York</u>	DATE <u>29 Feb 12</u>	LOT #	NUMBER OF SWEEPS <u>17 - Sampled 1 sq meter</u>
HABITATS: <input checked="" type="checkbox"/> COBBLE <input type="checkbox"/> SHOREZONE <input checked="" type="checkbox"/> SNAGS <input type="checkbox"/> VEGETATION			

Enter Family and/or Genus and Species name on blank line.

Organisms	No.	LS	TI	TCR	Organisms	No.	LS	TI	TCR		
Oligochaeta	<u>Roundworm</u>	<u>2</u>	<u>A</u>	<u>DY</u>	<u>1</u>	Megaloptera					
Hirudinea						Coleoptera					
Isopoda											
Amphipoda						Diptera	<u>Chironomid</u>	<u>150</u>	<u>L</u>	<u>DY</u>	<u>1</u>
Decapoda							<u>Tipulid</u>	<u>8</u>	<u>L</u>	<u>DY</u>	<u>1</u>
Ephemeroptera	<u>Heptageniid</u>	<u>48</u>	<u>L</u>	<u>DY</u>	<u>1</u>						
	<u>Ameletid</u>	<u>3</u>	<u>L</u>	<u>DY</u>	<u>1</u>	Gastropoda					
Plecoptera	<u>Perlid</u>	<u>3</u>	<u>L</u>	<u>DY</u>	<u>1</u>	Pelecypoda	<u>Corbicula fluminea</u>	<u>2</u>	<u>A</u>	<u>DY</u>	<u>1</u>
	<u>Perlolid</u>	<u>8</u>	<u>L</u>	<u>DY</u>	<u>1</u>						
						Other	<u>Calypsopterigid</u>	<u>1</u>	<u>L</u>	<u>DY</u>	<u>1</u>
Trichoptera	<u>Glossosomatid</u>	<u>6</u>	<u>L</u>	<u>DY</u>	<u>1</u>						
	<u>Hydropsychid</u>	<u>6</u>	<u>L</u>	<u>DY</u>	<u>1</u>						
	<u>Limnephilid</u>	<u>3</u>	<u>L</u>	<u>DY</u>	<u>1</u>						
Hemiptera											

Corbicula fluminea

Taxonomic certainty rating (TCR) 1-5: 1=most certain, 5=least certain. If rating is 3-5, give reason (e.g., missing gills). LS=life stage: I = immature; P = pupa; A = adult TI = Taxonomists initials

	Site Value	Target Threshold	If 2 or more metrics are ≥ target threshold, site is HEALTHY
Total No. Taxa	<u>12</u>		
EPT Taxa	<u>7</u>		If less than 2 metrics are within target range, site is SUSPECTED IMPAIRED
Tolerance Index	<u>5</u>		

Score 28 / Marginal

FCI Calculator for the High-Gradient Headwater Streams in eastern Kentucky and western West Virginia HGM Guidebook

To ensure accurate calculations, the **UPPERMOST STRATUM** of the plant community is determined based on the calculated value for $V_{CCANOPY}$ ($\geq 20\%$ cover is required for tree/sapling strata). Go to the SAR Data Entry tab and enter site characteristics and data in the yellow cells. For information on determining how to split a project into SARs, see Chapter 5 of the Operational Draft Regional Guidebook for the Functional Assessment of High-gradient Ephemeral and Intermittent Headwater Streams in Western West Virginia and Eastern Kentucky (Environmental Laboratory U.S. Army Corps of Engineers 2010).

Project Name: AEP, Mitchell Landfill Project
 Location: Lewis Property, Marshall CO, WV Segment 4
 Sampling Date: 03-01-2012

Mitigation Site Before Project

Subclass for this SAR:

Intermittent Stream

Uppermost stratum present at this SAR:
 Tree/Sapling Strata

SAR number: Seg NFGC-4

Functional Results Summary:

Enter Results in Section C of the Mitigation Sufficiency Calculator

Function	Functional Capacity Index
Hydrology	0.54
Biogeochemical Cycling	0.55
Habitat	0.50

Variable Measure and Subindex Summary:

Variable	Name	Average Measure	Subindex
$V_{CCANOPY}$	Percent canopy over channel.	40.50	0.37
V_{EMBED}	Average embeddedness of channel.	2.20	0.53
$V_{SUBSTRATE}$	Median stream channel substrate particle size.	3.89	1.00
V_{BERO}	Total percent of eroded stream channel bank.	50.00	0.81
V_{LWD}	Number of down woody stems per 100 feet of stream.	6.00	0.75
V_{TDBH}	Average dbh of trees.	8.86	1.00
V_{SNAG}	Number of snags per 100 feet of stream.	1.00	1.00
V_{SSD}	Number of saplings and shrubs per 100 feet of stream.	Not Used	Not Used
V_{SRICH}	Riparian vegetation species richness.	0.00	0.00
$V_{DETRITUS}$	Average percent cover of leaves, sticks, etc.	28.13	0.34
V_{HERB}	Average percent cover of herbaceous vegetation.	Not Used	Not Used
V_{WLUSE}	Weighted Average of Runoff Score for Catchment.	0.42	0.44

Seg. NFGC-4

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39.847721
80.5788

FCI - 043
0.24
0.36
Version 1-25-11

High-Gradient Headwater Streams in eastern Kentucky and western West Virginia Field Data Sheet and Calculator

Team: York/Gilmore Latitude/UTM Northing: 39°50'51.796"
 Project Name: AEP Mitchell Landfill Longitude/UTM Easting: 80°34'07.679"
 Location: Lewis Trp. Clouster Rd, Marshall Co, WV Sampling Date: 3/1/2010
 SAR Number: NFGC4 Reach Length (ft): 100 Stream Type: Perennial (Ephemeral/Intermittent (circle one))
 Top Strata: (determined from percent calculated in V_{CCANOPY})
 Site and Timing: Project/Mitigation Site (circle one) Before (circle one) After Project (Circle One)

Sample Variables 1-4 in stream channel

1 V_{CCANOPY} Average percent cover over channel by tree and sapling canopy. Measure at no fewer than 10 roughly equidistant points along the stream. Measure only if tree/sapling cover is at least 20%. (If less than 20%, enter at least one value between 0 and 19 to trigger Top Strata choice.)

List the percent cover measurements at each point below:

60	70	60	25	20	10	30	30	50	50
----	----	----	----	----	----	----	----	----	----

2 V_{EMBED} Average embeddedness of the stream channel. Measure at no fewer than 30 roughly equidistant points along the stream. Select a particle from the bed. Before moving it, determine the percentage of the surface and area surrounding the particle that is covered by fine sediment, and enter the rating according to the following table. If the bed is an artificial surface, or composed of fine sediments, use a rating score of 1. If the bed is composed of bedrock, use a rating score of 5.

Embeddedness rating for gravel, cobble and boulder particles (rescaled from Platts, Megahan, and Minshall 1983)

Rating	Rating Description
5	<5 percent of surface covered, surrounded, or buried by fine sediment (or bedrock)
4	5 to 25 percent of surface covered, surrounded, or buried by fine sediment
3	26 to 50 percent of surface covered, surrounded, or buried by fine sediment
2	51 to 75 percent of surface covered, surrounded, or buried by fine sediment
1	>75 percent of surface covered, surrounded, or buried by fine sediment (or artificial surface)

List the ratings at each point below:

1	1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1	1

3 V_{SUBSTRATE} Median stream channel substrate particle size. Measure at no fewer than 30 roughly equidistant points along the stream; use the same points and particles as used in V_{EMBED}.

Enter particle size in inches to the nearest 0.1 inch at each point below (bedrock should be counted as 99 in, asphalt or concrete as 0.0 in, sand or finer particles as 0.08 in):

3.75	.65	17.1	99	.5	0.08				
3.25	0.08	.3	99	1.15	99				
4.5/4.1/3.8	0.08	.6	99	99	99				
10.5	11.25/8.1/6.5	20	2.75	99	99				
0.08	0.08	11.25/9.1/6.5	99	1.75	0.08				

4 V_{BERO} Total percent of eroded stream channel bank. Enter the total number of feet of eroded bank on each side and the total percentage will be calculated. If both banks are eroded, total erosion for the stream may be up to 200%.

Left Bank: 0 Right Bank: 950

4.003

8.7

6.98

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Sample Variables 5-9 within the entire riparian/buffer zone adjacent to the stream channel (25 feet from each bank).

5 V_{LWD} Number of down woody stems (at least 4 inches in diameter and 36 inches in length) per 100 feet of stream reach. Enter the number from the entire 50'-wide buffer and within the channel, and the amount per 100 feet of stream will be calculated.

Number of downed woody stems: ~~11~~ 6

6 V_{TDBH} Average dbh of trees (measure only if V_{CANOPY} tree/sapling cover is at least 20%). Trees are at least 4 inches (10 cm) in diameter. Enter tree DBHs in inches.

List the dbh measurements of individual trees (at least 4 in) within the buffer on each side of the stream below:

Left Side			Right Side		
11.5	10.0	12.8			
5	7.5	9.5			
5.5	13.25	11.7			
4.25	12				
5.25	11.5				
4.5	5.75				
19	10.25				
8.5	5.6				
6	6.25				

7 V_{SNAG} Number of snags (at least 4" dbh and 36" tall) per 100 feet of stream. Enter number of snags on each side of the stream, and the amount per 100 feet will be calculated.

Left Side: 1 Right Side: 0

8 V_{SSD} Number of saplings and shrubs (woody stems up to 4 inches dbh) per 100 feet of stream (measure only if tree cover is <20%). Enter number of saplings and shrubs on each side of the stream, and the amount per 100 ft of stream will be calculated.

Left Side: Right Side:

9 V_{SRICH} Riparian vegetation species richness per 100 feet of stream reach. Check all species present from Group 1 in the tallest stratum. Check all exotic and invasive species present in all strata. Species richness per 100 feet and the subindex will be calculated from these data.

Group 1 = 1.0

Group 2 (-1.0)

- | | | | |
|--|---|--|---|
| <input type="checkbox"/> <i>Acer rubrum</i> | <input type="checkbox"/> <i>Magnolia tripetala</i> | <input checked="" type="checkbox"/> <i>Ailanthus altissima</i> | <input checked="" type="checkbox"/> <i>Lonicera japonica</i> |
| <input checked="" type="checkbox"/> <i>Acer saccharum</i> | <input type="checkbox"/> <i>Nyssa sylvatica</i> | <input type="checkbox"/> <i>Albizia julibrissin</i> | <input type="checkbox"/> <i>Lonicera tatarica</i> |
| <input type="checkbox"/> <i>Aesculus flava</i> | <input type="checkbox"/> <i>Oxydendrum arboreum</i> | <input type="checkbox"/> <i>Alliaria petiolata</i> | <input type="checkbox"/> <i>Lotus corniculatus</i> |
| <input type="checkbox"/> <i>Asimina triloba</i> | <input type="checkbox"/> <i>Prunus serotina</i> | <input type="checkbox"/> <i>Alternanthera philoxeroides</i> | <input type="checkbox"/> <i>Lythrum salicaria</i> |
| <input type="checkbox"/> <i>Betula alleghaniensis</i> | <input type="checkbox"/> <i>Quercus alba</i> | <input type="checkbox"/> <i>Aster tataricus</i> | <input type="checkbox"/> <i>Microstegium vimineum</i> |
| <input type="checkbox"/> <i>Betula lenta</i> | <input type="checkbox"/> <i>Quercus coccinea</i> | <input type="checkbox"/> <i>Cerastium fontanum</i> | <input type="checkbox"/> <i>Paulownia tomentosa</i> |
| <input type="checkbox"/> <i>Carya alba</i> | <input type="checkbox"/> <i>Quercus imbricaria</i> | <input type="checkbox"/> <i>Coronilla varia</i> | <input checked="" type="checkbox"/> <i>Polygonum cuspidatum</i> |
| <input type="checkbox"/> <i>Carya glabra</i> | <input type="checkbox"/> <i>Quercus prinus</i> | <input type="checkbox"/> <i>Elaeagnus umbellata</i> | <input type="checkbox"/> <i>Pueraria montana</i> |
| <input type="checkbox"/> <i>Carya ovalis</i> | <input type="checkbox"/> <i>Quercus rubra</i> | <input checked="" type="checkbox"/> <i>Lespedeza bicolor</i> | <input checked="" type="checkbox"/> <i>Rosa multiflora</i> |
| <input type="checkbox"/> <i>Carya ovata</i> | <input type="checkbox"/> <i>Quercus velutina</i> | <input type="checkbox"/> <i>Lespedeza cuneata</i> | <input type="checkbox"/> <i>Sorghum halepense</i> |
| <input type="checkbox"/> <i>Comus florida</i> | <input type="checkbox"/> <i>Sassafras albidum</i> | <input type="checkbox"/> <i>Ligustrum obtusifolium</i> | <input type="checkbox"/> <i>Verbena brasiliensis</i> |
| <input checked="" type="checkbox"/> <i>Fagus grandifolia</i> | <input type="checkbox"/> <i>Tilia americana</i> | <input type="checkbox"/> <i>Ligustrum sinense</i> | |
| <input type="checkbox"/> <i>Fraxinus americana</i> | <input type="checkbox"/> <i>Tsuga canadensis</i> | | |
| <input checked="" type="checkbox"/> <i>Liriodendron tulipifera</i> | <input type="checkbox"/> <i>Ulmus americana</i> | | |
| <input type="checkbox"/> <i>Magnolia acuminata</i> | <input checked="" type="checkbox"/> <i>Carpinus caroliniana</i> | | |

0 Species in Group 1

0 Species in Group 2

Celtis occidentalis

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Sample Variables 10-11 within at least 8 subplots (40" x 40", or 1m x 1m) in the riparian/buffer zone within 25 feet from each bank. The four subplots should be placed roughly equidistantly along each side of the stream.

10 $V_{DETRITUS}$ Average percent cover of leaves, sticks, or other organic material. Woody debris <4" diameter and <36" long are include. Enter the percent cover of the detrital layer at each subplot.

Left Side				Right Side			
60	100	5	5	50	5	0	0

open H2O

11 V_{HERB} Average percentage cover of herbaceous vegetation (measure only if tree cover is <20%). Do not include woody stems at least 4" dbh and 36" tall. Because there may be several layers of ground cover vegetation percentages up through 200% are accepted. Enter the percent cover of ground vegetation at each subplot.

Left Side				Right Side			

Sample Variable 12 within the entire catchment of the stream.

12 V_{WLUSE} Weighted Average of Runoff Score for watershed:

Land Use (Choose From Drop List)	Runoff Score	% in Catchment	Running Percent (not >100)
Residential -	▼		
Pasture/Ag -	▼		
FOREST -	▼		
	▼		
	▼		
	▼		
	▼		
	▼		

Summary			Notes:
Variable	Value	VSI	
V_{CANOPY}			→ both ponds could be removed
V_{EMBED}			
$V_{SUBSTRATE}$			
V_{BERO}			
V_{LWD}			
V_{TDBH}			
V_{SNAG}			
V_{SSD}			
V_{SRICH}			
$V_{DETRITUS}$			
V_{HERB}			
V_{WLUSE}			

Seg. NFGC-5

ACP Mitchell Landfill Project

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (FRONT)

STREAM NAME <u>Trib to N Forkerata Creek</u>		LOCATION <u>Marshall Co, WV (Cumpston Top)</u>	
STATION # <u>NFGC 5</u> RIVERMILE		STREAM CLASS <u>Perennial</u>	
LAT <u>39.5100.495</u> LONG <u>80.3423.103</u>		RIVER BASIN <u>MD</u>	
STORET #		AGENCY	
INVESTIGATORS <u>Dawn York / Mary Gilmore</u>			
FORM COMPLETED BY <u>Dawn York / Mary Gilmore</u>		DATE <u>2/7/12</u> TIME <u>1700</u> AM <input checked="" type="radio"/> PM	REASON FOR SURVEY <u>Potential Mitigation Area</u>

Open inactive pasture

Habitat Parameter	Condition 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 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.
	SCORE <u>7</u>	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; <u>no submerged vegetation</u> .	Hard-pan clay or bedrock; no root mat or vegetation.
	SCORE <u>7</u>	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 <u>3</u>	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.	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 <u>6</u>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 (6) 5 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
	SCORE <u>14</u>	20 19 18 17 16	15 (14) 13 12 11	10 9 8 7 6 5 4 3 2 1 0

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (BACK)

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
6. Channel Alteration Channelization or dredging absent or minimal; stream with normal pattern. SCORE <u>18</u>	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
	20 19 (18) 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Channel Sinuosity The bends in the stream increase the stream length 3 to 4 times longer than if it 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.) SCORE <u>3</u>	The bends in the stream increase the stream length 3 to 4 times longer than if it 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.	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long distance. <i>Straight but not as channelized as the rest of the reach</i>
	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) SCORE <u>1</u> (LB) SCORE <u>1</u> (RB)	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.
	Left Bank 10 9	8 7 6	5 4 3	2 1 0
	Right Bank 10 9	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank) Note: determine left or right side by facing downstream. SCORE <u>0</u> (LB) SCORE <u>0</u> (RB)	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.
	Left Bank 10 9	8 7 6	5 4 3	2 1 (0)
	Right Bank 10 9	8 7 6	5 4 3	2 1 (0)
10. Riparian Vegetative Zone Width (score each bank riparian zone) SCORE <u>0</u> (LB) SCORE <u>0</u> (RB)	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.
	Left Bank 10 9	8 7 6	5 4 3	2 1 (0)
	Right Bank 10 9	8 7 6	5 4 3	2 1 (0)

Total Score 59
 Poor

len = 20'

ACP Mitchell Landfill Project

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (FRONT)

Seq. NFGC-5

STREAM NAME <u>Trib to N. Fork Grave CK</u>	LOCATION <u>Campston, Cammon, Marlinton, WV</u>	
STATION # <u>55 NFGC RIVER MILE</u>	STREAM CLASS <u>Perennial</u>	
LAT <u>39 51 00.499</u> LONG <u>80 34 23.103</u>	RIVER BASIN <u>Ohio</u>	
STORET #	AGENCY	
INVESTIGATORS <u>Dawn York / M. Gilmore</u>		
FORM COMPLETED BY <u>D. York / M. Gilmore</u>	DATE <u>2-7-12</u> TIME <u>1:00</u> AM <input type="radio"/> PM <input checked="" type="radio"/>	REASON FOR SURVEY <u>Potential Mitigation Area</u>

WEATHER CONDITIONS	<table style="width: 100%;"> <tr> <td style="width: 33%;"> Now <input type="checkbox"/> storm (heavy rain) <input type="checkbox"/> rain (steady rain) <input type="checkbox"/> showers (intermittent) <input checked="" type="checkbox"/> 10% %cloud cover <input checked="" type="checkbox"/> clear/sunny </td> <td style="width: 33%;"> Past 24 hours <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> % <input checked="" type="checkbox"/> </td> <td style="width: 33%;"> Has there been a heavy rain in the last 7 days? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <u>(0 in)</u> Air Temperature <u>0°C 32°F</u> Other _____ </td> </tr> </table>	Now <input type="checkbox"/> storm (heavy rain) <input type="checkbox"/> rain (steady rain) <input type="checkbox"/> showers (intermittent) <input checked="" type="checkbox"/> 10% %cloud cover <input checked="" type="checkbox"/> clear/sunny	Past 24 hours <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> % <input checked="" type="checkbox"/>	Has there been a heavy rain in the last 7 days? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <u>(0 in)</u> Air Temperature <u>0°C 32°F</u> Other _____	
Now <input type="checkbox"/> storm (heavy rain) <input type="checkbox"/> rain (steady rain) <input type="checkbox"/> showers (intermittent) <input checked="" type="checkbox"/> 10% %cloud cover <input checked="" type="checkbox"/> clear/sunny	Past 24 hours <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> % <input checked="" type="checkbox"/>	Has there been a heavy rain in the last 7 days? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <u>(0 in)</u> Air Temperature <u>0°C 32°F</u> Other _____			
SITE LOCATION/MAP	Draw a map of the site and indicate the areas sampled (or attach a photograph) <div style="text-align: center; margin-top: 10px;"> </div>				
STREAM CHARACTERIZATION	<table style="width: 100%;"> <tr> <td> Stream Subsystem <input checked="" type="checkbox"/> Perennial <input type="checkbox"/> Intermittent <input type="checkbox"/> Tidal </td> <td> Stream Type <input checked="" type="checkbox"/> Coldwater <input type="checkbox"/> Warmwater </td> </tr> <tr> <td> Stream Origin <input type="checkbox"/> Glacial <input checked="" type="checkbox"/> Spring-fed <input type="checkbox"/> Non-glacial montane <input type="checkbox"/> Mixture of origins <input type="checkbox"/> Swamp and bog <input type="checkbox"/> Other _____ </td> <td> Catchment Area _____ km² </td> </tr> </table>	Stream Subsystem <input checked="" type="checkbox"/> Perennial <input type="checkbox"/> Intermittent <input type="checkbox"/> Tidal	Stream Type <input checked="" type="checkbox"/> Coldwater <input type="checkbox"/> Warmwater	Stream Origin <input type="checkbox"/> Glacial <input checked="" type="checkbox"/> Spring-fed <input type="checkbox"/> Non-glacial montane <input type="checkbox"/> Mixture of origins <input type="checkbox"/> Swamp and bog <input type="checkbox"/> Other _____	Catchment Area _____ km ²
Stream Subsystem <input checked="" type="checkbox"/> Perennial <input type="checkbox"/> Intermittent <input type="checkbox"/> Tidal	Stream Type <input checked="" type="checkbox"/> Coldwater <input type="checkbox"/> Warmwater				
Stream Origin <input type="checkbox"/> Glacial <input checked="" type="checkbox"/> Spring-fed <input type="checkbox"/> Non-glacial montane <input type="checkbox"/> Mixture of origins <input type="checkbox"/> Swamp and bog <input type="checkbox"/> Other _____	Catchment Area _____ km ²				

AEP Mitchell Landfill Project

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET

(BACK) - Trib 2 to N. Fork 2-7-12
- Campston Prop. Cameroh, WV.

WATERSHED FEATURES	Predominant Surrounding Landuse <input type="checkbox"/> Forest <input checked="" type="checkbox"/> Field/Pasture <input type="checkbox"/> Agricultural <input type="checkbox"/> Residential <input type="checkbox"/> Commercial <input type="checkbox"/> Industrial <input type="checkbox"/> Other	Local Watershed NPS Pollution <input type="checkbox"/> No evidence <input type="checkbox"/> Some potential sources <input checked="" type="checkbox"/> Obvious sources Local Watershed Erosion <input type="checkbox"/> None <input checked="" type="checkbox"/> Moderate <input type="checkbox"/> Heavy
RIPARIAN VEGETATION (18 meter buffer)	Indicate the dominant type and record the dominant species present <input type="checkbox"/> Trees <input type="checkbox"/> Shrubs <input checked="" type="checkbox"/> Grasses <input checked="" type="checkbox"/> Herbaceous dominant species present _____	
INSTREAM FEATURES	Estimated Reach Length <u>30.48 m 100'</u> Estimated Stream Width <u>2.794 m 110"</u> Sampling Reach Area <u>85.16 m²</u> Area in km ² (m ² x 1000) <u>85.161 km²</u> Estimated Stream Depth <u>0.1143 m</u> Surface Velocity <u>< 1 m/sec</u> (at thalweg) <u>slow</u>	
LARGE WOODY DEBRIS	LWD <u>0 m²</u> Density of LWD <u>0 m²/km²</u> (LWD/ reach area)	
AQUATIC VEGETATION	Indicate the dominant type and record the dominant species present <input type="checkbox"/> Rooted emergent <input type="checkbox"/> Floating Algae <input type="checkbox"/> Rooted submergent <input checked="" type="checkbox"/> Attached Algae <input type="checkbox"/> Rooted floating <input type="checkbox"/> Free floating dominant species present _____ Portion of the reach with aquatic vegetation _____%	
WATER QUALITY	Temperature <u>4.29 °C</u> Specific Conductance <u>.242</u> Dissolved Oxygen <u>12.8</u> pH <u>6.21</u> Turbidity <u>.4</u> WQ Instrument Used <u>Horiba U52</u>	
SEDIMENT/SUBSTRATE	Odors <input type="checkbox"/> Normal <input type="checkbox"/> Sewage <input type="checkbox"/> Chemical <input type="checkbox"/> Anaerobic <input type="checkbox"/> Petroleum <input type="checkbox"/> None <input checked="" type="checkbox"/> Other <u>Manure</u> Deposits <input checked="" type="checkbox"/> Sludge <input type="checkbox"/> Sawdust <input type="checkbox"/> Relict shells <input type="checkbox"/> Paper fiber <input type="checkbox"/> Sand <input checked="" type="checkbox"/> Other <u>Manure</u> Looking at stones which are not deeply embedded, are the undersides black in color? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	

Bank } 26" Height
OHW = 110"
B to B = 121"
H2O depth = 4.5"
OLW = 40"

INORGANIC SUBSTRATE COMPONENTS (should add up to 100%)			ORGANIC SUBSTRATE COMPONENTS (does not necessarily add up to 100%)		
Substrate Type	Diameter	% Composition in Sampling Reach	Substrate Type	Characteristic	% Composition in Sampling Area
Bedrock			Detritus	sticks, wood, coarse plant materials (CPOM)	30%
Boulder	> 256 mm (10")	5			
Cobble	64-256 mm (2.5"-10")	30	Muck-Mud	black, very fine organic (FPOM)	0
Gravel	2-64 mm (0.1"-2.5")	15			
Sand	0.06-2mm (gritty)	25	Marl	grey, shell fragments	0
Silt	0.004-0.06 mm	25			
Clay	< 0.004 mm (slick)				

open/active pasture

Seg. NFGC-5

AEP Mitchell Landfill Project

BENTHIC MACROINVERTEBRATE FIELD DATA SHEET

STREAM NAME <u>Trib to N. Fork Grange Ct</u>	LOCATION <u>Cumpston Property Marshall Co. W.V.</u>
STATION <u>NFGC-5</u> RIVERMILE	STREAM CLASS <u>Perennial</u>
LAT. <u>39°51'00.49S</u> LONG <u>80°34'23.103</u>	RIVER BASIN <u>Ohio</u>
STORET #	AGENCY
INVESTIGATORS <u>Dawn York / Mary Gilmore</u>	LOT NUMBER
FORM COMPLETED BY <u>Dawn York / Mary Gilmore</u>	DATE <u>2/7/12</u> TIME <u>1:00</u> AM <input checked="" type="radio"/> PM
	REASON FOR SURVEY <u>Potential Mitigation Site</u>

HABITAT TYPES	Indicate the percentage of each habitat type present <input type="checkbox"/> Cobble ___% <input type="checkbox"/> Snags ___% <input type="checkbox"/> Vegetated Banks ___% <input type="checkbox"/> Sand ___% <input type="checkbox"/> Submerged Macrophytes ___% <input type="checkbox"/> Other (<u>Riffle</u>) <u>75</u> % <u>Pool</u> <u>20</u> %
SAMPLE COLLECTION	Gear used <input type="checkbox"/> D-frame <input checked="" type="checkbox"/> Kick-net <input type="checkbox"/> Other _____ How were the samples collected? <input type="checkbox"/> wading <input type="checkbox"/> from bank <input type="checkbox"/> from boat Indicate the number of jabs/kicks taken in each habitat type. <input type="checkbox"/> Cobble ___ <input type="checkbox"/> Snags ___ <input type="checkbox"/> Vegetated Banks ___ <input type="checkbox"/> Sand ___ <input type="checkbox"/> Submerged Macrophytes ___ <input checked="" type="checkbox"/> Other (<u>Riffle</u>) <u>6</u>
GENERAL COMMENTS	<u>Open pasture, active</u> <u>→ 1 m² area sampled</u> <u>6. single habitat. Riffle</u>

QUALITATIVE LISTING OF AQUATIC BIOTA

Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare, 2 = Common, 3 = Abundant, 4 = Dominant

Periphyton	0	1	2	3	4	Slimes	0	1	2	3	4
Filamentous Algae	0	1	2	3	4	Macroinvertebrates	0	1	2	3	4
Macrophytes	0	1	2	3	4	Fish	0	1	2	3	4

FIELD OBSERVATIONS OF MACROBENTHOS

Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare (1-3 organisms), 2 = Common (3-9 organisms), 3 = Abundant (>10 organisms), 4 = Dominant (>50 organisms)

Porifera	0	1	2	3	4	Anisoptera	0	1	2	3	4	Chironomidae	0	1	2	3	4
Hydrozoa	0	1	2	3	4	Zygotera	0	1	2	3	4	Ephemeroptera	0	1	2	3	4
Platyhelminthes	0	1	2	3	4	Hemiptera	0	1	2	3	4	Trichoptera	0	1	2	3	4
Turbellaria	0	1	2	3	4	Coleoptera	0	1	2	3	4	Other	0	1	2	3	4
Hirudinea	0	1	2	3	4	Lepidoptera	0	1	2	3	4	Perliidae	0	1	2	3	4
Oligochaeta	0	1	2	3	4	Sialidae	0	1	2	3	4		0	1	2	3	4
Isopoda	0	1	2	3	4	Corydalidae	0	1	2	3	4		0	1	2	3	4
Amphipoda	0	1	2	3	4	Tipulidae	0	1	2	3	4		0	1	2	3	4
Decapoda	0	1	2	3	4	Empididae	0	1	2	3	4		0	1	2	3	4
Gastropoda	0	1	2	3	4	Simuliidae	0	1	2	3	4		0	1	2	3	4
Bivalvia	0	1	2	3	4	Tabinidae	0	1	2	3	4		0	1	2	3	4
						Culcidae	0	1	2	3	4		0	1	2	3	4

other minnow - 3
 (common shiner)
 bluegill - 1

Fantail - 1

Seg. NFGC-6 AEP Mitchell Landfill Project

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (FRONT)

STREAM NAME <i>Trib N. Fork Grave Creek</i>	LOCATION <i>Roskelly, Hwy 250 Marshall Co. WV</i>
STATION # <i>Seg 6</i> RIVERMILE	STREAM CLASS <i>Intermittent</i>
LAT <i>39° 51' 29.533"</i> LONG <i>80° 33' 21.447"</i>	RIVER BASIN <i>OH</i>
STORET #	AGENCY
INVESTIGATORS <i>D York / M Gilmore</i>	
FORM COMPLETED BY <i>D York / M Gilmore</i>	DATE <i>8 Feb 2012</i> TIME <i>4:30</i> AM <input checked="" type="radio"/> PM <input type="radio"/>
	REASON FOR SURVEY <i>Potential Mitigation Site</i>

Habitat Parameter	Condition 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 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.
SCORE <i>2</i>	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 <i>10</i>	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 <i>7</i>	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.	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 <i>0</i>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE <i>18</i>	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

entire channel covered w/ slimy sediment

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (BACK)

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
6. Channel Alteration Channelization or dredging absent or minimal; stream with normal pattern. SCORE <u>5</u>	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Channel Sinuosity The bends in the stream increase the stream length 3 to 4 times longer than if it 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.) SCORE <u>0</u>	The bends in the stream increase the stream length 3 to 4 times longer than if it 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.	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long distance.
	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) SCORE <u>5</u> (LB) SCORE <u>5</u> (RB)	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.
	Left Bank 10 9	8 7 6	5 4 3	2 1 0
	Right Bank 10 9	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank) Note: determine left or right side by facing downstream. SCORE <u>3</u> (LB) SCORE <u>3</u> (RB)	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.
	Left Bank 10 9	8 7 6	5 4 3	2 1 0
	Right Bank 10 9	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone) SCORE <u>0</u> (LB) SCORE <u>0</u> (RB)	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.
	Left Bank 10 9	8 7 6	5 4 3	2 1 0
	Right Bank 10 9	8 7 6	5 4 3	2 1 0

Total Score 40
 Poor

ACP Mitchell Landfill Project

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (FRONT)

385 NFGC-6

STREAM NAME <i>Tri b to N. Fork Grave</i>	LOCATION <i>Roskelly Prop. Hwy 250 Marshall Co, WV</i>
STATION # <i>NFGC-6</i> RIVERMILE _____	STREAM CLASS <i>Intermittent</i>
LAT. <i>39° 51' 24" S</i> LONG <i>80° 33' 21" W</i>	RIVER BASIN <i>OHIO</i>
STORET # _____	AGENCY _____
INVESTIGATORS <i>M. Gilmore, Dyork</i>	
FORM COMPLETED BY <i>Dyork M. Gilmore</i>	DATE <i>28 Feb 2012</i> TIME <i>9:30 AM</i> REASON FOR SURVEY <i>Potential Mitigation Site</i>

WEATHER CONDITIONS	Now	Past 24 hours	Has there been a heavy rain in the last 7 days? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
	<input type="checkbox"/> storm (heavy rain) <input type="checkbox"/> rain (steady rain) <input checked="" type="checkbox"/> showers (intermittent) 5 % cloud cover <input type="checkbox"/> clear/sunny	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> %	Air Temperature <i>45°F</i> Other _____

SITE LOCATION/MAP Draw a map of the site and indicate the areas sampled (or attach a photograph)

The map shows a stream flowing from the top right towards the bottom left. Key features include:

- Stream:** Labeled 'Tri b to N. Fork Grave'. Notes describe it as 'very shallow', '100% embedded', 'very straight', and 'cobble w/ bldgen silt'. A 'woodland steep' slope is noted on the right bank.
- Infrastructure:** A 'Residence - measured lawn' and a 'catalpa trees' area are marked near the stream.
- Topography:** 'SGF wooded steep slope' and 'open pasture' are noted on the left side.
- Orientation:** A north arrow points up and slightly left. A 'steep hill' is circled on the left.
- Other:** A 'bridge' is indicated over the stream.

STREAM CHARACTERIZATION	Stream Subsystem <input checked="" type="checkbox"/> Perennial <input type="checkbox"/> Intermittent <input type="checkbox"/> Tidal	Stream Type <input checked="" type="checkbox"/> Coldwater <input type="checkbox"/> Warmwater
	Stream Origin <input type="checkbox"/> Glacial <input checked="" type="checkbox"/> Spring-fed <input type="checkbox"/> Non-glacial montane <input type="checkbox"/> Mixture of origins <input type="checkbox"/> Swamp and bog <input type="checkbox"/> Other _____	Catchment Area _____ km ²

Seg NFGC-6

AEP Mitchell Land EIS Project

BENTHIC MACROINVERTEBRATE FIELD DATA SHEET

STREAM NAME <i>Trib to N Fork Grove</i>	LOCATION <i>Wende, Roskelly Prop, Marshall Co, WV</i>	
STATION # <i>NFGC-6</i> RIVERMILE	STREAM CLASS <i>Intermittent</i>	
LAT <i>39°51'29.535" N</i> LONG <i>80°33'21.617" W</i>	RIVER BASIN <i>OH</i>	
STORET #	AGENCY	
INVESTIGATORS <i>M. Gilmore, D. York</i>	LOT NUMBER	
FORM COMPLETED BY	DATE <i>28 Feb 2012</i> TIME <i>4:40</i> AM <input checked="" type="checkbox"/> PM	REASON FOR SURVEY <i>Potential mitigation site</i>

HABITAT TYPES	Indicate the percentage of each habitat type present <input checked="" type="checkbox"/> Cobble _____ % <input type="checkbox"/> Snags _____ % <input type="checkbox"/> Vegetated Banks _____ % <input type="checkbox"/> Sand _____ % <input type="checkbox"/> Submerged Macrophytes _____ % <input type="checkbox"/> Other (_____) _____ %
	Gear used <input type="checkbox"/> D-frame <input checked="" type="checkbox"/> kick-net <input type="checkbox"/> Other _____ How were the samples collected? <input checked="" type="checkbox"/> wading <input type="checkbox"/> from bank <input type="checkbox"/> from boat Indicate the number of jabs/kicks taken in each habitat type. <input type="checkbox"/> Cobble _____ <input type="checkbox"/> Snags _____ <input type="checkbox"/> Vegetated Banks _____ <input type="checkbox"/> Sand _____ <input type="checkbox"/> Submerged Macrophytes _____ <input type="checkbox"/> Other (_____) _____
GENERAL COMMENTS	<u>heavily embedded.</u>

QUALITATIVE LISTING OF AQUATIC BIOTA

Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare, 2 = Common, 3 = Abundant, 4 = Dominant

Periphyton	0	1	2	3	4	Slimes	0	1	2	3	4
Filamentous Algae	0	1	2	3	4	Macroinvertebrates	0	1	2	3	4
Macrophytes	0	1	2	3	4	Fish	0	1	2	3	4

FIELD OBSERVATIONS OF MACROBENTHOS

Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare (1-3 organisms), 2 = Common (3-9 organisms), 3 = Abundant (>10 organisms), 4 = Dominant (>50 organisms)

Porifera	0	1	2	3	4	Anisoptera	0	1	2	3	4	Chironomidae	0	1	2	3	4
Hydrozoa	0	1	2	3	4	Zygoptera	0	1	2	3	4	Ephemeroptera	0	1	2	3	4
Platyhelminthes	0	1	2	3	4	Hemiptera	0	1	2	3	4	Trichoptera III	0	1	2	3	4
Turbellaria	0	1	2	3	4	Coleoptera	0	1	2	3	4	Other	0	1	2	3	4
Hirudinea	0	1	2	3	4	Lepidoptera	0	1	2	3	4	water penny III	0	1	2	3	4
Oligochaeta II	0	1	2	3	4	Sialidae	0	1	2	3	4	diptera I	0	1	2	3	4
Isopoda	0	1	2	3	4	Corydalidae	0	1	2	3	4	mayfly I	0	1	2	3	4
Amphipoda	0	1	2	3	4	Tipulidae LIT	0	1	2	3	4	heptageniid I	0	1	2	3	4
Decapoda I	0	1	2	3	4	Empididae	0	1	2	3	4	plecoptera 4	0	1	2	3	4
Gastropoda	0	1	2	3	4	Simuliidae	0	1	2	3	4	→ Pellid Perleto	0	1	2	3	4
Bivalvia	0	1	2	3	4	Tabinidae	0	1	2	3	4		0	1	2	3	4
						Culicidae	0	1	2	3	4		0	1	2	3	4

fan tail darter - 11

FCI Calculator for the High-Gradient Headwater Streams in eastern Kentucky and western West Virginia HGM Guidebook

To ensure accurate calculations, the **UPPERMOST STRATUM** of the plant community is determined based on the calculated value for $V_{CCANOPY}$ ($\geq 20\%$ cover is required for tree/sapling strata). Go to the SAR Data Entry tab and enter site characteristics and data in the yellow cells. For information on determining how to split a project into SARs, see Chapter 5 of the Operational Draft Regional Guidebook for the Functional Assessment of High-gradient Ephemeral and Intermittent Headwater Streams in Western West Virginia and Eastern Kentucky (Environmental Laboratory U.S. Army Corps of Engineers 2010).

Project Name: AEP, Mitchell Landfill Project

Location: Trib to NFGC, Segment 6, Roskelly Property

Sampling Date: 02-28-2012

Mitigation Site Before Project

Subclass for this SAR:

Intermittent Stream

Uppermost stratum present at this SAR:

Shrub/Herb Strata

SAR number: SEG NFGC 6

Functional Results Summary:

Enter Results in Section C of the Mitigation Sufficiency Calculator

Function	Functional Capacity Index
Hydrology	0.23
Biogeochemical Cycling	0.12
Habitat	0.09

Variable Measure and Subindex Summary:

Variable	Name	Average Measure	Subindex
$V_{CCANOPY}$	Percent canopy over channel.	Not Used, <20%	Not Used
V_{EMBED}	Average embeddedness of channel.	1.00	0.10
$V_{SUBSTRATE}$	Median stream channel substrate particle size.	1.83	0.91
V_{BERO}	Total percent of eroded stream channel bank.	10.00	1.00
V_{LWD}	Number of down woody stems per 100 feet of stream.	0.00	0.00
V_{TDBH}	Average dbh of trees.	Not Used	Not Used
V_{SNAG}	Number of snags per 100 feet of stream.	0.00	0.10
V_{SSD}	Number of saplings and shrubs per 100 feet of stream.	12.00	0.18
V_{SRICH}	Riparian vegetation species richness.	0.00	0.00
$V_{DETRITUS}$	Average percent cover of leaves, sticks, etc.	2.25	0.03
V_{HERB}	Average percent cover of herbaceous vegetation.	44.38	0.59
V_{WLUSE}	Weighted Average of Runoff Score for Catchment.	0.38	0.40

AEP Mitchell Land Cell Project

Sample Variables 10-11 within at least 8 subplots (40" x 40", or 1m x 1m) in the riparian/buffer zone within 25 feet from each bank. The four subplots should be placed roughly equidistantly along each side of the stream.

10 $V_{DETRITUS}$ Average percent cover of leaves, sticks, or other organic material. Woody debris <4" diameter and <36" long are include. Enter the percent cover of the detrital layer at each subplot.

(US 250) is left bank)

Left Side				Right Side			
0	0	0	0	5	3	5	5

11 V_{HERB} Average percentage cover of herbaceous vegetation (measure only if tree cover is <20%). Do not include woody stems at least 4" dbh and 36" tall. Because there may be several layers of ground cover vegetation percentages up through 200% are accepted. Enter the percent cover of ground vegetation at each subplot.

(US 250 is left bank)

Left Side				Right Side			
0	0	0	0	5	90	95	95

(mowed lawn)

Sample Variable 12 within the entire catchment of the stream.

12 V_{WLUSE} Weighted Average of Runoff Score for watershed:

Land Use (Choose From Drop List)	Runoff Score	% in Catchment	Running Percent (not >100)
Residential	▼		
Industrial (drilling) pad/coal	▼		
forest	▼		
	▼		
	▼		
	▼		
	▼		
	▼		

Summary			Notes:
Variable	Value	VSI	
$V_{CCANOPY}$			Heavily embedded!
V_{EMBED}			
$V_{SUBSTRATE}$			
V_{BERO}			
V_{LWD}			
V_{TDBH}			
V_{SNAG}			
V_{SSD}			
V_{SRICH}			
$V_{DETRITUS}$			
V_{HERB}			
V_{WLUSE}			

AEP Mitchell Landfill Project

39.856213
80.554176

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (FRONT)

Trib to North Fork Grave Creek

Property

STREAM NAME Trib to N. Fork Grave Creek		LOCATION Marshall Co. WV - Hwy 250, N. Cox	
STATION # NFCC 2 RIVERMILE		STREAM CLASS Perennial	
LAT 39.856213 LONG 80.554176		RIVER BASIN Ohio	
STORET #		AGENCY	
INVESTIGATORS M. Gilmore / D. York			
FORM COMPLETED BY D. York		DATE 1/19/12 TIME 4:45 hr AM PM	REASON FOR SURVEY Potential Mitigation Site

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover SCORE 10	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 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.
	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 SCORE 8	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.
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Pool Variability SCORE 3	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.
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
4. Sediment Deposition SCORE 8	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.
	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 SCORE 16	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.
	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

1 pool
No other

PS 2
 Seg. NFGC - 7

HEP Mitchell Landfill Project

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (BACK)

55' riffle

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE 18	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Channel Sinuosity	The bends in the stream increase the stream length 3 to 4 times longer than if it 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.	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long distance.
SCORE 3	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)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE 8 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 9 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank)	More than 90% of the 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 7 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 3 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
SCORE 0 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 0 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0

Parameters to be evaluated broader than sampling reach

Total Score 81
 Marginal

Mr. Cox said to heavy equipment across this bridge

(NFGC-7) AEP Mitchell Landfill Project

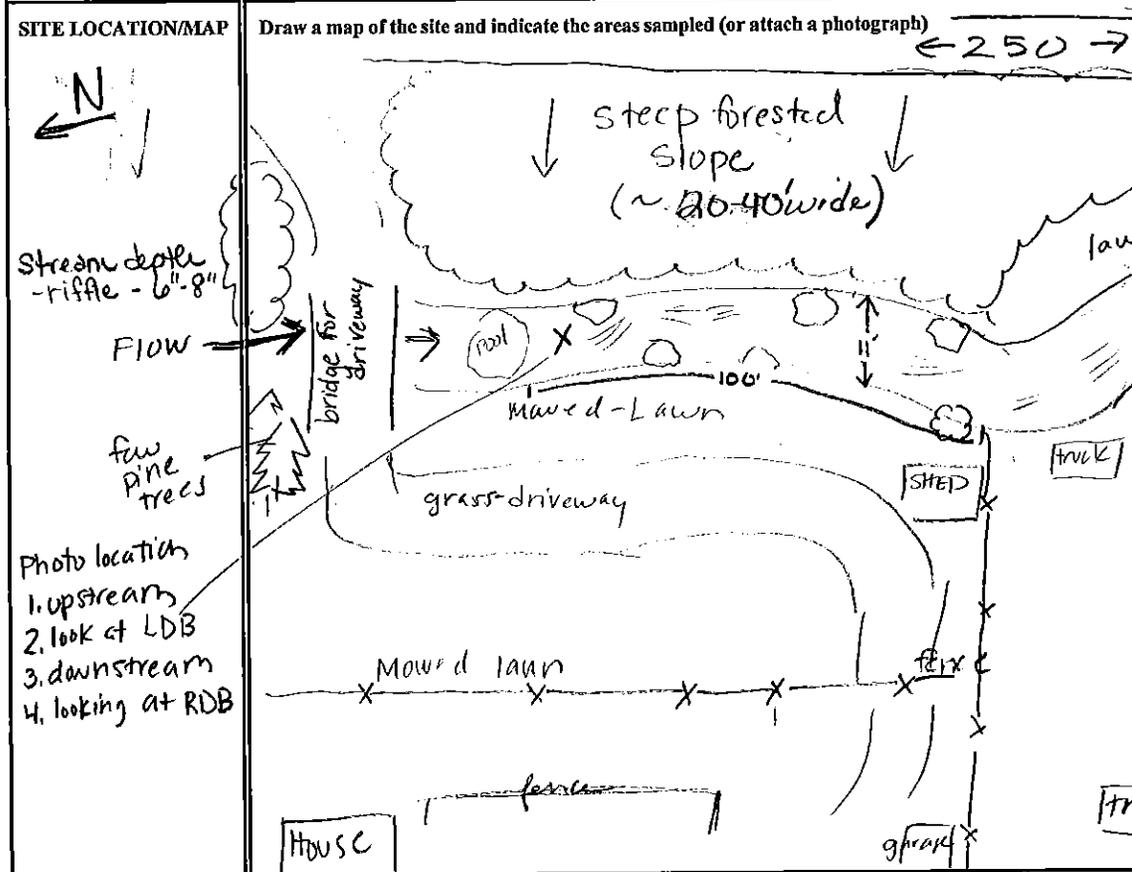
PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (FRONT)

(NFGC-7)

19 Jan 0.10"
18 " 0.02"
17 Jan 0.10"
16 Jan 0.08"
15 Jan 0
14 " 0
13 Jan 0.02

STREAM NAME Trib + N Fork GC	LOCATION Cox Prop, Cameron, WV Marshall Co.
STATION # 85-NFGC-7	STREAM CLASS Perennial
LAT 39° 51' 22.36" LONG 80° 33' 23.04"	RIVER BASIN Ohio
STORET #	AGENCY X, CEU
INVESTIGATORS Dawn York, Mary Gilmore	
FORM COMPLETED BY Dawn York / Mary Gilmore	DATE 1/19/12 TIME 1345 AM <input checked="" type="checkbox"/> PM
	REASON FOR SURVEY Potential Mitigation Site

WEATHER CONDITIONS	Now	Past 24 hours	Has there been a heavy rain in the last 7 days? <input checked="" type="checkbox"/> Yes <input checked="" type="checkbox"/> No
	<input type="checkbox"/> storm (heavy rain) <input type="checkbox"/> rain (steady rain) <input checked="" type="checkbox"/> showers (intermittent) <input type="checkbox"/> %cloud cover <input type="checkbox"/> clear/sunny	<input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> 45% <input type="checkbox"/>	Air Temperature -11 °C / 20 F Other _____



STREAM CHARACTERIZATION	Stream Subsystem <input checked="" type="checkbox"/> Perennial <input type="checkbox"/> Intermittent <input type="checkbox"/> Tidal	Stream Type <input type="checkbox"/> Coldwater <input type="checkbox"/> Warmwater
	Stream Origin <input type="checkbox"/> Glacial <input type="checkbox"/> Non-glacial montane <input type="checkbox"/> Swamp and bog	Catchment Area _____ km ² <input checked="" type="checkbox"/> Spring-fed <input checked="" type="checkbox"/> Mixture of origins <input type="checkbox"/> Other Precip.

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET
(BACK)

WATERSHED FEATURES	Predominant Surrounding Landuse <input checked="" type="checkbox"/> Forest <input type="checkbox"/> Commercial <input type="checkbox"/> Field/Pasture <input checked="" type="checkbox"/> Industrial - Coal/Gas <input type="checkbox"/> Agricultural <input checked="" type="checkbox"/> Other HW 250 <input checked="" type="checkbox"/> Residential	Local Watershed NPS Pollution <input type="checkbox"/> No evidence <input type="checkbox"/> Some potential sources <input checked="" type="checkbox"/> Obvious sources
RIPARIAN VEGETATION (18 meter buffer)	Indicate the dominant type and record the dominant species present <input checked="" type="checkbox"/> Trees <input type="checkbox"/> Shrubs <input type="checkbox"/> Grasses <input type="checkbox"/> Herbaceous dominant species present - L bank - oak / Right bank - fescue	
INSTREAM FEATURES	Estimated Reach Length 30.48 m 100' Estimated Stream Width 2.99 m 98-11" Sampling Reach Area 91.14 m ² Area in km ² (m ² x 1000) 91,135.2 km ² Estimated Stream Depth 0.9243 m 4.5'	Canopy Cover <input type="checkbox"/> Partly open <input checked="" type="checkbox"/> Partly shaded <input type="checkbox"/> Shaded High Water Mark 335 m Proportion of Reach Represented by Stream Morphology Types <input checked="" type="checkbox"/> Riffle 80% <input type="checkbox"/> Run 10% <input type="checkbox"/> Pool 5%
	Surface Velocity \geq / m/sec (at thalweg) slow	Channelized <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No Dam Present <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
LARGE WOODY DEBRIS	LWD 1 m ² Density of LWD _____ m ² /km ² (LWD/ reach area)	
AQUATIC VEGETATION	Indicate the dominant type and record the dominant species present <input type="checkbox"/> Rooted emergent <input type="checkbox"/> Rooted submergent <input type="checkbox"/> Rooted floating <input type="checkbox"/> Free floating <input type="checkbox"/> Floating Algae <input checked="" type="checkbox"/> Attached Algae dominant species present _____ Portion of the reach with aquatic vegetation 90%	
WATER QUALITY	Temperature 5.74 °C Specific Conductance 0.386 nS/cm Dissolved Oxygen 11.28 mg/L pH 8.52 ORP - 207 mV Turbidity 39.1 NTU WQ Instrument Used Horiba U52	Water Odors <input type="checkbox"/> Normal/None <input checked="" type="checkbox"/> Sewage <input type="checkbox"/> Petroleum <input type="checkbox"/> Chemical <input type="checkbox"/> Fishy <input type="checkbox"/> Other _____ Water Surface Oils <input checked="" type="checkbox"/> Slick <input type="checkbox"/> Sheen <input type="checkbox"/> Globbs <input type="checkbox"/> Flecks <input type="checkbox"/> None <input type="checkbox"/> Other _____ Turbidity (if not measured) <input type="checkbox"/> Clear <input type="checkbox"/> Slightly turbid <input checked="" type="checkbox"/> Turbid <input type="checkbox"/> Opaque <input type="checkbox"/> Stained <input type="checkbox"/> Other _____
SEDIMENT/SUBSTRATE	Odors <input type="checkbox"/> Normal <input checked="" type="checkbox"/> Sewage <input type="checkbox"/> Petroleum <input type="checkbox"/> Chemical <input type="checkbox"/> Anaerobic <input type="checkbox"/> None <input type="checkbox"/> Other _____ Oils <input checked="" type="checkbox"/> Absent <input type="checkbox"/> Slight <input type="checkbox"/> Moderate <input type="checkbox"/> Profuse	Deposits <input type="checkbox"/> Sludge <input type="checkbox"/> Sawdust <input type="checkbox"/> Paper fiber <input type="checkbox"/> Sand <input type="checkbox"/> Relict shells <input type="checkbox"/> Other _____ Looking at stones which are not deeply embedded, are the undersides black in color? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No

Collected
16 Feb 2012

INORGANIC SUBSTRATE COMPONENTS (should add up to 100%)			ORGANIC SUBSTRATE COMPONENTS (does not necessarily add up to 100%)		
Substrate Type	Diameter	% Composition in Sampling Reach	Substrate Type	Characteristic	% Composition in Sampling Area
Bedrock		0	Detritus	sticks, wood, coarse plant materials (CPOM)	15
Boulder	> 256 mm (10")	10			
Cobble	64-256 mm (2.5"-10")	50	Muck-Mud	black, very fine organic (FPOM)	10
Gravel	2-64 mm (0.1"-2.5")	25			
Sand	0.06-2mm (gritty)	5	Marl	grey, shell fragments	0
Silt	0.004-0.06 mm	10			
Clay	< 0.004 mm (slick)	0			

AEP Mitchell Landfill Project

BENTHIC MACROINVERTEBRATE FIELD DATA SHEET

STREAM NAME <u>Trib to N. Fork</u>	LOCATION <u>COX Property, Cameron WV NC</u>	
STATION <u>WFA 7</u> RIVERMILE _____	STREAM CLASS <u>Perennial</u>	
LAT <u>39 51 22.367</u> LONG <u>81 33 23.045</u>	RIVER BASIN <u>OH</u>	
STORET # _____	AGENCY _____	
INVESTIGATORS <u>DYORK / M. GILMORE</u>	LOT NUMBER _____	
FORM COMPLETED BY <u>DYORK / M. GILMORE</u>	DATE <u>2/16/2012</u> TIME <u>12:30</u> AM (PM)	REASON FOR SURVEY <u>Potential Mitigation Area</u>

HABITAT TYPES	Indicate the percentage of each habitat type present <input type="checkbox"/> Cobble <u>70%</u> <input type="checkbox"/> Snags <u>0%</u> <input type="checkbox"/> Vegetated Banks <u>10%</u> <input type="checkbox"/> Sand _____ % <input type="checkbox"/> Submerged Macrophytes <u>0%</u> <input checked="" type="checkbox"/> Other (boulder) <u>10%</u>
SAMPLE COLLECTION	Gear used <input type="checkbox"/> D-frame <input checked="" type="checkbox"/> kick-net <input type="checkbox"/> Other _____ How were the samples collected? <input checked="" type="checkbox"/> wading <input type="checkbox"/> from bank <input type="checkbox"/> from boat Indicate the number of jabs/kicks taken in each habitat type. <input type="checkbox"/> Cobble _____ <input type="checkbox"/> Snags _____ <input type="checkbox"/> Vegetated Banks _____ <input type="checkbox"/> Sand _____ <input type="checkbox"/> Submerged Macrophytes _____ <input checked="" type="checkbox"/> Other (riffle) <u>6</u>
GENERAL COMMENTS	<u>6 Riffle samples = (1 sq meter) → 1 m² area sampled.</u> <u>(3 kicks/sample)</u> <u>Attached algae, sewage over</u>

QUALITATIVE LISTING OF AQUATIC BIOTA

Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare, 2 = Common, 3 = Abundant, 4 = Dominant

Periphyton	0	1	2	3	4	Slimes	0	1	2	3	4
Filamentous Algae	0	1	2	3	4	Macroinvertebrates	0	1	2	3	4
Macrophytes	0	1	2	3	4	Fish	0	1	2	3	4

FIELD OBSERVATIONS OF MACROBENTHOS

Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare (1-3 organisms), 2 = Common (3-9 organisms), 3 = Abundant (>10 organisms), 4 = Dominant (>50 organisms)

Porifera	0	1	2	3	4	Anisoptera	0	1	2	3	4	Chironomidae	0	1	2	3	4
Hydrozoa	0	1	2	3	4	Zygoptera	0	1	2	3	4	Ephemeroptera	0	1	2	3	4
Platyhelminthes	0	1	2	3	4	Hemiptera	0	1	2	3	4	Trichoptera	0	1	2	3	4
Turbellaria	0	1	2	3	4	Coleoptera	0	1	2	3	4	Other	0	1	2	3	4
Hirudinea	0	1	2	3	4	Lepidoptera	0	1	2	3	4	Planchoptera	0	1	2	3	4
Oligochaeta	0	1	2	3	4	Sialidae	0	1	2	3	4	<i>glossosomatidae - case</i> <i>hydropsychidae - net</i> <i>1/5</i>					
Isopoda	0	1	2	3	4	Corydalidae	0	1	2	3	4						
Amphipoda	0	1	2	3	4	Tipulidae	0	1	2	3	4						
Decapoda	0	1	2	3	4	Empididae	0	1	2	3	4						
Gastropoda	0	1	2	3	4	Simuliidae	0	1	2	3	4						
Bivalvia	0	1	2	3	4	Tabanidae	0	1	2	3	4						
						Culicidae	0	1	2	3	4						

A > 50
 C B = 50
 R < 5
 A = 6
 C = 3
 R = 1

fan tail darter - III (*E. flabellare*) minnow - common shrimp (*Desmussurus cornutus*)
 Adult 2 lined salamander - 1 (*Eurycea bislineata*)

AEP Mitchell Landfill Project

PRELIMINARY ASSESSMENT SCORE SHEET (PASS)

page 1 of 1

STREAM NAME <u>Trib. to N. Fork Grave Creek</u>		LOCATION <u>Cox Property, Marshall Co, WV</u>	
STATION # <u>Ses. NFGC-7</u>	RIVER MILE _____	STREAM CLASS <u>Perennial</u>	
LAT <u>39°51'22.367"N</u>	LONG <u>80°33'23.045"W</u>	RIVER BASIN <u>OH10</u>	
STORET # _____		AGENCY _____	
COLLECTED BY <u>N/A</u>	DATE <u>16 Feb '12</u>	LOT # _____	NUMBER OF SWEEPS <u>6</u>
HABITATS: <input checked="" type="checkbox"/> COBBLE <input type="checkbox"/> SHOREZONE <input type="checkbox"/> SNAGS <input type="checkbox"/> VEGETATION			

Enter Family and/or Genus and Species name on blank line.

Organisms	No.	LS	TI	TCR	Organisms	No.	LS	TI	TCR		
Oligochaeta	<u>Roundworm</u>	<u>1</u>	<u>A</u>	<u>DY</u>	<u>1</u>	Megaloptera					
Hirudinea						Coleoptera					
Isopoda											
Amphipoda						Diptera	<u>Chironomidae</u>	<u>150</u>	<u>I</u>	<u>DY</u>	<u>1</u>
Decapoda							<u>Tipulidae</u>	<u>18</u>	<u>I</u>	<u>DY</u>	<u>1</u>
Ephemeroptera	<u>Hestageniidae</u>	<u>9</u>	<u>I</u>	<u>DY</u>	<u>1</u>						
	<u>Coenidae</u>	<u>3</u>	<u>I</u>	<u>DY</u>	<u>2</u>	Gastropoda					
Plecoptera	<u>Pteridae</u>	<u>15</u>	<u>I</u>	<u>DY</u>	<u>1</u>						
	<u>Almonidae</u>	<u>5</u>	<u>I</u>	<u>DY</u>	<u>2</u>	Pelecypoda					
Trichoptera	<u>Glossosomatidae</u>	<u>20</u>	<u>I</u>	<u>DY</u>	<u>1</u>	Other					
	<u>Hydropsychidae</u>	<u>15</u>	<u>I</u>	<u>DY</u>	<u>1</u>						
Hemiptera											

Taxonomic certainty rating (TCR) 1-5: 1=most certain, 5=least certain. If rating is 3-5, give reason (e.g., missing gills). LS=life stage: I=immature; P=pupa; A=adult TI=Taxonomists initials

	Site Value	Target Threshold	If 2 or more metrics are ≥ target threshold, site is
Total No. Taxa	<u>9</u>		HEALTHY
EPT Taxa	<u>6</u>		If less than 2 metrics are within target range, site is SUSPECTED IMPAIRED
Tolerance Index			

TT - 41.0 / Poor
Score 18 / Poor

FCI Calculator for the High-Gradient Headwater Streams in eastern Kentucky and western West Virginia HGM Guidebook

To ensure accurate calculations, the **UPPERMOST STRATUM** of the plant community is determined based on the calculated value for $V_{CCANOPY}$ ($\geq 20\%$ cover is required for tree/sapling strata). Go to the SAR Data Entry tab and enter site characteristics and data in the yellow cells. For information on determining how to split a project into SARs, see Chapter 5 of the Operational Draft Regional Guidebook for the Functional Assessment of High-gradient Ephemeral and Intermittent Headwater Streams In Western West Virginia and Eastern Kentucky (Environmental Laboratory U.S. Army Corps of Engineers 2010).

Project Name: AEP, Mitchell Landfill Project
 Location: Cox Property, Marshall CO, WV Segment 7
 Sampling Date: 02-28-2012

Mitigation Site Before Project

Subclass for this SAR:

Intermittent Stream

Uppermost stratum present at this SAR:
 Tree/Sapling Strata

SAR number: Seg NFGC-7

Functional Results Summary:

Enter Results in Section C of the Mitigation Sufficiency Calculator

Function	Functional Capacity Index
Hydrology	0.52
Biogeochemical Cycling	0.56
Habitat	0.62

Variable Measure and Subindex Summary:

Variable	Name	Average Measure	Subindex
$V_{CCANOPY}$	Percent canopy over channel.	60.00	0.63
V_{EMBED}	Average embeddedness of channel.	2.43	0.62
$V_{SUBSTRATE}$	Median stream channel substrate particle size.	3.80	1.00
V_{BERO}	Total percent of eroded stream channel bank.	62.00	0.74
V_{LWD}	Number of down woody stems per 100 feet of stream.	6.00	0.75
V_{TDBH}	Average dbh of trees.	7.89	0.85
V_{SNAG}	Number of snags per 100 feet of stream.	3.00	1.00
V_{SSD}	Number of saplings and shrubs per 100 feet of stream.	Not Used	Not Used
V_{SRICH}	Riparian vegetation species richness.	2.40	1.00
$V_{DETRITUS}$	Average percent cover of leaves, sticks, etc.	33.13	0.40
V_{HERB}	Average percent cover of herbaceous vegetation.	Not Used	Not Used
V_{WLUSE}	Weighted Average of Runoff Score for Catchment.	0.33	0.35

AEP Mitchell Landfill Project

Version 1-25-11

High-Gradient Headwater Streams in eastern Kentucky and western West Virginia Field Data Sheet and Calculator

Team: Dawn York / Mary Gilmore Latitude/UTM Northing: 39°51'22.367"N
 Project Name: Mitchell Landfill Project, AEP Longitude/UTM Easting: 80°33'23.045"W
 Location: Camden, Marshall Co, WV, Coe Property Sampling Date: 01/19/2012
 SAR Number: NFGC-7 Reach Length (ft): (100) Stream Type: Perennial
 Top Strata: (determined from percent calculated in $V_{CCANOPY}$)
 Site and Timing: Project/Mitigation Site (circle one) Before/After Project (Circle One)

Sample Variables 1-4 in stream channel

1 $V_{CCANOPY}$ Average percent cover over channel by tree and sapling canopy. Measure at no fewer than 10 roughly equidistant points along the stream. Measure only if tree/sapling cover is at least 20%. (If less than 20%, enter at least one value between 0 and 19 to trigger Top Strata choice.)

List the percent cover measurements at each point below:

75	65	75	60	55	65	50	60	45	50
----	----	----	----	----	----	----	----	----	----

2 V_{EMBED} Average embeddedness of the stream channel. Measure at no fewer than 30 roughly equidistant points along the stream. Select a particle from the bed. Before moving it, determine the percentage of the surface and area surrounding the particle that is covered by fine sediment, and enter the rating according to the following table. If the bed is an artificial surface, or composed of fine sediments, use a rating score of 1. If the bed is composed of bedrock, use a rating score of 5.

Embeddedness rating for gravel, cobble and boulder particles (rescaled from Platts, Megahan, and Minshall 1983)

Rating	Rating Description
5	<5 percent of surface covered, surrounded, or buried by fine sediment (or bedrock)
4	5 to 25 percent of surface covered, surrounded, or buried by fine sediment
3	26 to 50 percent of surface covered, surrounded, or buried by fine sediment
2	51 to 75 percent of surface covered, surrounded, or buried by fine sediment
1	>75 percent of surface covered, surrounded, or buried by fine sediment (or artificial surface)

List the ratings at each point below:

3	3	4	3	1	2				
3	2	3	2	1	2				
4	3	2	3	2	3				
3	3	2	1	2	2				
3	3	2	2	3	1				

3 $V_{SUBSTRATE}$ Median stream channel substrate particle size. Measure at no fewer than 30 roughly equidistant points along the stream; use the same points and particles as used in V_{EMBED} .

Enter particle size in inches to the nearest 0.1 inch at each point below (bedrock should be counted as 99 in, asphalt or concrete as 0.0 in, sand or finer particles as 0.08 in):

Convert first row from cm to in

45/105/35	3.75 in	5.5	1/2.1/5	1.0	3.1				
23 cm	4.8 in	1.5	2.5	3.25	3.0				
22 cm	6.25	2.25	4/8.5/7.8	4.25	7.2				
17 cm	2.1/6.5/1.5	6.1	2.1	2	3.5				
9.38 cm	3.5	1.78	5.5	3.25	2.1				

4 V_{BERO} Total percent of eroded stream channel bank. Enter the total number of feet of eroded bank on each side and the total percentage will be calculated. If both banks are eroded, total erosion for the stream may be up to 200%.

Left Bank: 2 Right Bank: 60

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Sample Variables 5-9 within the entire riparian/buffer zone adjacent to the stream channel (25 feet from each bank).

5 V_{LWD} Number of down woody stems (at least 4 inches in diameter and 36 inches in length) per 100 feet of stream reach. Enter the number from the entire 50'-wide buffer and within the channel, and the amount per 100 feet of stream will be calculated. 6

Number of downed woody stems: _____

6 V_{TOBH} Average dbh of trees (measure only if V_{CANOPY} tree/sapling cover is at least 20%). Trees are at least 4 inches (10 cm) in diameter. Enter tree DBHs in inches.

List the dbh measurements of individual trees (at least 4 in) within the buffer on each side of the stream below:

Left Side					Right Side				
10.5	9	9	5	7	14				
13	7.5	4.5	7.5						
12	4	7	14						
9	6	8	10.5						
6	4	8	4						
5	12	10	7.5						
10	5	9	7						
4	8	9.5	5.5						
8	10	4.5	5.5						

7 V_{SNAG} Number of snags (at least 4" dbh and 36" tall) per 100 feet of stream. Enter number of snags on each side of the stream, and the amount per 100 feet will be calculated. 3

Left Side: 111 Right Side: 0

8 V_{SSD} Number of saplings and shrubs (woody stems up to 4 inches dbh) per 100 feet of stream (measure only if tree cover is <20%). Enter number of saplings and shrubs on each side of the stream, and the amount per 100 ft of stream will be calculated. 62

Left Side: 62 Right Side: 0

9 V_{SRICH} Riparian vegetation species richness per 100 feet of stream reach. Check all species present from Group 1 in the tallest stratum. Check all exotic and invasive species present in all strata. Species richness per 100 feet and the subindex will be calculated from these data.

Group 1 = 1.0		Group 2 (-1.0)	
<input type="checkbox"/> <i>Acer rubrum</i>	<input type="checkbox"/> <i>Magnolia tripetala</i>	<input type="checkbox"/> <i>Ailanthus altissima</i>	<input checked="" type="checkbox"/> <i>Lonicera japonica</i>
<input type="checkbox"/> <i>Acer saccharum</i>	<input type="checkbox"/> <i>Nyssa sylvatica</i>	<input type="checkbox"/> <i>Albizia julibrissin</i>	<input type="checkbox"/> <i>Lonicera tatarica</i>
<input type="checkbox"/> <i>Aesculus flava</i>	<input type="checkbox"/> <i>Oxydendrum arboreum</i>	<input type="checkbox"/> <i>Alliaria petiolata</i>	<input type="checkbox"/> <i>Lotus corniculatus</i>
<input type="checkbox"/> <i>Asimina triloba</i>	<input type="checkbox"/> <i>Prunus serotina</i>	<input type="checkbox"/> <i>Alternanthera philoxeroides</i>	<input checked="" type="checkbox"/> <i>Lythrum salicaria</i>
<input type="checkbox"/> <i>Betula alleghaniensis</i>	<input checked="" type="checkbox"/> <i>Quercus alba</i>	<input type="checkbox"/> <i>Aster tataricus</i>	<input type="checkbox"/> <i>Microstegium vimineum</i>
<input type="checkbox"/> <i>Betula lenta</i>	<input type="checkbox"/> <i>Quercus coccinea</i>	<input type="checkbox"/> <i>Cerastium fontanum</i>	<input type="checkbox"/> <i>Paulownia tomentosa</i>
<input type="checkbox"/> <i>Carya alba</i>	<input type="checkbox"/> <i>Quercus imbricaria</i>	<input type="checkbox"/> <i>Coronilla varia</i>	<input type="checkbox"/> <i>Polygonum cuspidatum</i>
<input type="checkbox"/> <i>Carya glabra</i>	<input type="checkbox"/> <i>Quercus prinus</i>	<input type="checkbox"/> <i>Elaeagnus umbellata</i>	<input type="checkbox"/> <i>Pueraria montana</i>
<input type="checkbox"/> <i>Carya ovalis</i>	<input checked="" type="checkbox"/> <i>Quercus rubra</i>	<input type="checkbox"/> <i>Lespedeza bicolor</i>	<input checked="" type="checkbox"/> <i>Rosa multiflora</i>
<input checked="" type="checkbox"/> <i>Carya ovata</i>	<input type="checkbox"/> <i>Quercus velutina</i>	<input type="checkbox"/> <i>Lespedeza cuneata</i>	<input type="checkbox"/> <i>Sorghum halepense</i>
<input type="checkbox"/> <i>Cornus florida</i>	<input type="checkbox"/> <i>Sassafras albidum</i>	<input type="checkbox"/> <i>Ligustrum obtusifolium</i>	<input type="checkbox"/> <i>Verbena brasiliensis</i>
<input checked="" type="checkbox"/> <i>Fagus grandifolia</i>	<input type="checkbox"/> <i>Tilia americana</i>	<input type="checkbox"/> <i>Ligustrum sinense</i>	
<input type="checkbox"/> <i>Fraxinus americana</i>	<input type="checkbox"/> <i>Tsuga canadensis</i>		
<input type="checkbox"/> <i>Linodendron tulipifera</i>	<input checked="" type="checkbox"/> <i>Ulmus americana</i>		
<input type="checkbox"/> <i>Magnolia acuminata</i>			

Lolium arundinaceae

0 Species in Group 1

0 Species in Group 2

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Sample Variables 10-11 within at least 8 subplots (40" x 40", or 1m x 1m) in the riparian/buffer zone within 25 feet from each bank. The four subplots should be placed roughly equidistantly along each side of the stream.

10	V_{DETRITUS}	Average percent cover of leaves, sticks, or other organic material. Woody debris <4" diameter and <36" long are include. Enter the percent cover of the detrital layer at each subplot.																	
		<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th colspan="4">Left Side</th> <th colspan="4">Right Side</th> </tr> <tr> <td style="text-align: center;">85</td> <td style="text-align: center;">20</td> <td style="text-align: center;">70</td> <td style="text-align: center;">60</td> <td style="text-align: center;">5</td> <td style="text-align: center;">10</td> <td style="text-align: center;">10</td> <td style="text-align: center;">5</td> </tr> </table>	Left Side				Right Side				85	20	70	60	5	10	10	5	
Left Side				Right Side															
85	20	70	60	5	10	10	5												

11	V_{HERB}	Average percentage cover of herbaceous vegetation (measure only if tree cover is <20%). Do not include woody stems at least 4" dbh and 36" tall. Because there may be several layers of ground cover vegetation percentages up through 200% are accepted. Enter the percent cover of ground vegetation at each subplot.																	
		<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th colspan="4">Left Side</th> <th colspan="4">Right Side</th> </tr> <tr> <td style="text-align: center;"> </td> </tr> </table>	Left Side				Right Side												(mowed lawn)
Left Side				Right Side															

Sample Variable 12 within the entire catchment of the stream.

12	V_{WLUSE}	Weighted Average of Runoff Score for watershed:																																					
		<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 70%;">Land Use (Choose From Drop List)</th> <th style="width: 10%;">Runoff Score</th> <th style="width: 10%;">% in Catchment</th> <th style="width: 10%;">Running Percent (not >100)</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">Residential</td> <td style="text-align: center;">▼</td> <td></td> <td></td> </tr> <tr> <td></td> <td style="text-align: center;">▼</td> <td></td> <td></td> </tr> </tbody> </table>	Land Use (Choose From Drop List)	Runoff Score	% in Catchment	Running Percent (not >100)	Residential	▼				▼				▼				▼				▼				▼				▼				▼			
Land Use (Choose From Drop List)	Runoff Score	% in Catchment	Running Percent (not >100)																																				
Residential	▼																																						
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Summary		
Variable	Value	VSI
V_{CCANOPY}	60%	0.63
V_{EMBED}	2.4	0.62
$V_{\text{SUBSTRATE}}$	3.80m	1.00
V_{BERO}	62%	0.74
V_{LWD}	6.0	0.75
V_{TDBH}	8.1	0.88
V_{SNAG}	3.0	1.00
V_{SSD}		
V_{SRICH}	1.00	1.76
V_{DETRITUS}	33.1	0.40
V_{HERB}	Not used	Not used
V_{WLUSE}		

Notes:

left bank step (Road 250 above), forested
 R. bank flat, driveway along stream w/
 bridge crossing stream. No vegetation along
 R. bank along driveway

X = Photo location

F-1 X → 3
↓ 4

AEP Mitchell
Landfill Proj.

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (FRONT)

STREAM NAME <i>North Fork Grave Creek</i>	LOCATION <i>Magers Property</i>
STATION # <i>Seg 1 FCG</i> RIVERMILE	STREAM CLASS <i>Perennial</i>
LAT <i>39 50 54.897</i> LONG <i>80 31 52.42</i>	RIVER BASIN <i>OHIO</i>
STORET #	AGENCY
INVESTIGATORS <i>DY + JS</i>	
FORM COMPLETED BY <i>DY + JS</i>	DATE <i>12 Apr 2012</i> TIME <i>2:21</i> AM <input checked="" type="radio"/> PM
	REASON FOR SURVEY <i>Potential Mitigation Site</i>

Habitat Parameter	Condition 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 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.
	SCORE <i>10</i>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6
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 <i>2</i>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6
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 <i>2</i>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6
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.	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 <i>2</i>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
	SCORE <i>14</i>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6

Small pool in reach

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (BACK)

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE <u>11</u>	20 19 18 17 16	15 14 13 12 <u>11</u>	10 9 8 7 6	5 4 3 2 1 0
7. Channel Sinuosity	The bends in the stream increase the stream length 3 to 4 times longer than if it 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.	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long distance.
SCORE <u>6</u>	20 19 18 17 16	15 14 13 12 <u>11</u>	10 9 8 7 <u>6</u>	5 4 3 2 1 0
8. 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 frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE <u>6</u> (LB)	Left Bank 10 <u>9</u>	8 7 <u>6</u>	5 4 3	2 1 0
SCORE <u>9</u> (RB)	Right Bank 10 <u>9</u>	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 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 <u>2</u> (LB)	Left Bank 10 <u>9</u>	8 7 6	5 4 3	<u>2</u> 1 0
SCORE <u>4</u> (RB)	Right Bank 10 <u>9</u>	8 7 6	5 <u>4</u> 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 <u>4</u> (LB)	Left Bank 10 9	8 7 6	5 <u>4</u> 3	2 1 0
SCORE <u>1</u> (RB)	Right Bank 10 9	8 7 6	5 4 3	2 <u>1</u> 0

Parameters to be evaluated broader than sampling reach

Total Score 75 / Marginal

AEP Mitchell Landfill Project

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET
(FRONT)

STREAM NAME <u>N/FGC</u>	LOCATION <u>Magis Property</u>
STATION # <u>89</u> / <u>FGC-DRIVERMILE</u>	STREAM CLASS <u>Perennial</u>
LAT <u>36° 50' 34.89</u> LONG <u>80° 31' 52.42</u>	RIVER BASIN <u>Ohio</u>
STORET # <u>89</u>	AGENCY
INVESTIGATORS <u>JV/DY</u>	
FORM COMPLETED BY <u>JV/DY</u>	DATE <u>04/12/12</u> TIME <u>2:33</u> AM <input type="radio"/> PM <input checked="" type="radio"/>
	REASON FOR SURVEY <u>Potential Mitigation Site</u>

WEATHER CONDITIONS	Now	Past 24 hours	Has there been a heavy rain in the last 7 days? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
	<input type="checkbox"/> storm (heavy rain) <input type="checkbox"/> rain (steady rain) <input checked="" type="checkbox"/> showers (intermittent) <input type="checkbox"/> %cloud cover <u>50</u> <input type="checkbox"/> clear/sunny	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> %	Air Temperature <u>52</u> °F Other _____

SITE LOCATION/MAP	Draw a map of the site and indicate the areas sampled (or attach a photograph)
-------------------	--

STREAM CHARACTERIZATION	Stream Subsystem <input checked="" type="checkbox"/> Perennial <input type="checkbox"/> Intermittent <input type="checkbox"/> Tidal	Stream Type <input type="checkbox"/> Coldwater <input checked="" type="checkbox"/> Warmwater
	Stream Origin <input type="checkbox"/> Glacial <input type="checkbox"/> Spring-fed <input checked="" type="checkbox"/> Non-glacial montane <input checked="" type="checkbox"/> Mixture of origins <input type="checkbox"/> Swamp and bog <input type="checkbox"/> Other _____	Catchment Area _____ km ²

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET
(BACK)

WATERSHED FEATURES	Predominant Surrounding Landuse <input type="checkbox"/> Forest <input type="checkbox"/> Commercial <input checked="" type="checkbox"/> Field/Pasture <input type="checkbox"/> Industrial <input type="checkbox"/> Agricultural <input type="checkbox"/> Other _____ <input type="checkbox"/> Residential	Local Watershed NPS Pollution <input type="checkbox"/> No evidence <input type="checkbox"/> Some potential sources <input checked="" type="checkbox"/> Obvious sources Local Watershed Erosion <input type="checkbox"/> None <input type="checkbox"/> Moderate <input checked="" type="checkbox"/> Heavy
RIPARIAN VEGETATION (18 meter buffer)	Indicate the dominant type and record the dominant species present <input type="checkbox"/> Trees <input type="checkbox"/> Shrubs <input checked="" type="checkbox"/> Grasses <input type="checkbox"/> Herbaceous dominant species present <u>lespedeza sp.</u>	
INSTREAM FEATURES	Estimated Reach Length <u>100'</u> m Estimated Stream Width <u>5'</u> m Sampling Reach Area _____ m ² Area in km ² (m ² x1000) _____ km ² Estimated Stream Depth <u>3 1/2"</u> m	Canopy Cover <input type="checkbox"/> Partly open <input checked="" type="checkbox"/> Partly shaded <input type="checkbox"/> Shaded High Water Mark _____ m Proportion of Reach Represented by Stream Morphology Types <input checked="" type="checkbox"/> Rillle <u>80</u> % <input checked="" type="checkbox"/> Run <u>20</u> % <input type="checkbox"/> Pool <u>0</u> %
	Surface Velocity <u>> 1</u> m/sec (at thalweg) <u>slow</u>	Channelized <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No Dam Present <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
LARGE WOODY DEBRIS	LWD _____ m ² Density of LWD _____ m ² /km ² (LWD/ reach area)	
AQUATIC VEGETATION	Indicate the dominant type and record the dominant species present <input type="checkbox"/> Rooted emergent <input type="checkbox"/> Rooted submergent <input type="checkbox"/> Rooted floating <input type="checkbox"/> Free floating <input type="checkbox"/> Floating Algae <input checked="" type="checkbox"/> Attached Algae dominant species present _____ Portion of the reach with aquatic vegetation <u>100% (algae)</u>	
WATER QUALITY	Temperature <u>10.40</u> °C <u>1210RP</u> Specific Conductance <u>185</u> Dissolved Oxygen <u>18</u> pH <u>8.06</u> Turbidity <u>4NTU</u> WQ Instrument Used <u>Horiba</u>	Water Odors <input checked="" type="checkbox"/> Normal/None <input type="checkbox"/> Sewage <input type="checkbox"/> Petroleum <input type="checkbox"/> Chemical <input type="checkbox"/> Fishy <input type="checkbox"/> Other _____ Water Surface Oils <input type="checkbox"/> Slick <input type="checkbox"/> Sheen <input type="checkbox"/> Globbs <input type="checkbox"/> Flecks <input checked="" type="checkbox"/> None <input type="checkbox"/> Other _____ Turbidity (if not measured) <input type="checkbox"/> Clear <input type="checkbox"/> Slightly turbid <input type="checkbox"/> Turbid <input type="checkbox"/> Opaque <input type="checkbox"/> Stained <input type="checkbox"/> Other _____
SEDIMENT/SUBSTRATE	Odors <input type="checkbox"/> Normal <input type="checkbox"/> Sewage <input type="checkbox"/> Petroleum <input type="checkbox"/> Chemical <input type="checkbox"/> Anaerobic <input type="checkbox"/> None <input checked="" type="checkbox"/> Other <u>cow feed</u>	Deposits <input type="checkbox"/> Sludge <input type="checkbox"/> Sawdust <input type="checkbox"/> Paper fiber <input type="checkbox"/> Sand <input type="checkbox"/> Relict shells <input type="checkbox"/> Other _____ Looking at stones which are not deeply embedded, are the undersides black in color? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No

INORGANIC SUBSTRATE COMPONENTS (should add up to 100%)			ORGANIC SUBSTRATE COMPONENTS (does not necessarily add up to 100%)		
Substrate Type	Diameter	% Composition in Sampling Reach	Substrate Type	Characteristic	% Composition in Sampling Area
Bedrock <input checked="" type="checkbox"/>		20	Detritus	sticks, wood, coarse plant materials (CPOM)	2
Boulder <input checked="" type="checkbox"/>	> 256 mm (10")	5			
Cobble <input checked="" type="checkbox"/>	64-256 mm (2.5"-10")	10	Muck-Mud	black, very fine organic (FPOM)	
Gravel <input checked="" type="checkbox"/>	2-64 mm (0.1"-2.5")	20			
Sand	0.06-2mm (gritty)		Marl	grey, shell fragments	
Silt <input checked="" type="checkbox"/>	0.004-0.06 mm	45			
Clay	< 0.004 mm (slick)				

AEP Mitchell Landfill Proj.
Magers Property

BENTHIC MACROINVERTEBRATE FIELD DATA SHEET

STREAM NAME <u>NFGC</u>		LOCATION <u>AEP Mitchell Landfill Haul Road</u>	
STATION # <u>SN NFGC</u> RIVER MILE		STREAM CLASS <u>Perennial</u>	
LAT <u>36° 50' 54"</u> LONG <u>80° 31' 52.47"</u>		RIVER BASIN <u>Ohio</u>	
STORET # <u>8989</u>		AGENCY	
INVESTIGATORS <u>DV/JS</u>		LOT NUMBER	
FORM COMPLETED BY <u>DV/JS</u>		DATE <u>13 Apr 2012</u> TIME <u>3:22</u> AM <input checked="" type="checkbox"/> PM	REASON FOR SURVEY <u>Potential Mitigation Site</u>

HABITAT TYPES	Indicate the percentage of each habitat type present <input type="checkbox"/> Cobble ___ % <input type="checkbox"/> Snags ___ % <input type="checkbox"/> Vegetated Banks ___ % <input type="checkbox"/> Sand ___ % <input type="checkbox"/> Submerged Macrophytes ___ % <input type="checkbox"/> Other () ___ %
SAMPLE COLLECTION	Gear used <input type="checkbox"/> D-frame <input checked="" type="checkbox"/> kick-net <input type="checkbox"/> Other _____ How were the samples collected? <input checked="" type="checkbox"/> wading <input type="checkbox"/> from bank <input type="checkbox"/> from boat Indicate the number of jabs/kicks taken in each habitat type. <input checked="" type="checkbox"/> Cobble <u>16</u> <input checked="" type="checkbox"/> Snags <u>1</u> <input checked="" type="checkbox"/> Vegetated Banks <u>1</u> <input checked="" type="checkbox"/> Sand <u>3</u> - very shallow pool <input type="checkbox"/> Submerged Macrophytes <u>1</u> <input type="checkbox"/> Other () _____
GENERAL COMMENTS	<u>Stream is located in a pasture - The left riparian area is narrow - ~2.5 feet - (Native trees) beyond that is another pasture/fallow field. There is minimal herb shearing by the right bank. Right riparian zone is null, + planted in grasses.</u>

QUALITATIVE LISTING OF AQUATIC BIOTA

Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare, 2 = Common, 3 = Abundant, 4 = Dominant

Periphyton	0	1	2	3	4	Slimes	0	1	2	3	4
Filamentous Algae	0	1	2	3	4	Macroinvertebrates	0	1	2	3	4
Macrophytes	0	1	2	3	4	Fish	0	1	2	3	4

very embedded!

FIELD OBSERVATIONS OF MACROBENTHOS

Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare (1-3 organisms), 2 = Common (3-9 organisms), 3 = Abundant (>10 organisms), 4 = Dominant (>50 organisms)

<u>Plecoptera</u> <input checked="" type="checkbox"/>																		
Porifera	0	1	2	3	4	Anisoptera	0	1	2	3	4	Chironomidae	0	1	2	3	4	<u>444 <100+</u>
Hydrozoa	0	1	2	3	4	Zygoptera	0	1	2	3	4	Ephemeroptera	0	1	2	3	4	<u>11 6</u>
Platyhelminthes	0	1	2	3	4	Hemiptera	0	1	2	3	4	Trichoptera	0	1	2	3	4	
Turbellaria	0	1	2	3	4	Coleoptera	0	1	2	3	4	Other	0	1	2	3	4	
Hirudinea	0	1	2	3	4	Lepidoptera	0	1	2	3	4	Epmeuillidae - III						
Oligochaeta	0	1	2	3	4	Sialidae	0	1	2	3	4	Ryacophilidae III						<u>Amolfitidae - III</u>
Isopoda	0	1	2	3	4	Corydalidae	0	1	2	3	4	Chloroperlidae - III/III						<u>Ephemeridae - I</u>
Amphipoda	0	1	2	3	4	Tipulidae I	0	1	2	3	4	Heptageniidae - III/III/III						<u>Hydropsychidae - I</u>
Decapoda	0	1	2	3	4	Empididae	0	1	2	3	4	Pertlid - III						
Gastropoda	0	1	2	3	4	Simuliidae	0	1	2	3	4	Pertolid - III						
Bivalvia	0	1	2	3	4	Tabinidae	0	1	2	3	4	Pertolid - III/III/III/III/III						<u><10 <50 444</u>
						Culicidae	0	1	2	3	4							<u>+ <35 111</u>

Dragonfly larvae (Libellulidae)

Decapoda - III/III/III

Salamanders - III/III/III/III
N. Dusky - 5/VI III/III/III/III

I larval

Oligochaeta - III/III

winter stonefly - III
Glossosomatidae - I
Nemouridae - (3)

Psephenidae - I

Round worms - II
(night crawler - on edge)
(Earth worms - Lumbricus terrestris)

AEP Mitchell Landfill Project

PRELIMINARY ASSESSMENT SCORE SHEET (PASS)

page 1 of 1

STREAM NAME <u>North Fork Grave Creek</u>		LOCATION <u>Magers Property,</u>	
STATION # <u>Seq NFGC-8</u>	RIVERMILE _____	STREAM CLASS <u>Perennial</u>	
LAT <u>39.848583</u>	LONG <u>80.531212</u>	RIVER BASIN <u>Ohio</u>	
STORET # _____		AGENCY _____	
COLLECTED BY <u>D. York / G. VanSkut</u>		DATE <u>04/12/12</u>	LOT # _____ NUMBER OF SWEEPS <u>18</u>
HABITATS: <input checked="" type="checkbox"/> COBBLE <input type="checkbox"/> SHOREZONE <input type="checkbox"/> SNAGS <input type="checkbox"/> VEGETATION			

Enter Family and/or Genus and Species name on blank line.

Organisms	No.	LS	TI	TCR	Organisms	No.	LS	TI	TCR	
Oligochaeta	<u>did not key</u>	<u>11</u>	<u>A</u>	<u>DY</u>	Megaloptera					
Hirudinea					Coleoptera	<u>Elmidae</u>	<u>2</u>	<u>A</u>	<u>DY</u>	<u>1</u>
						<u>Psophenidae</u>	<u>1</u>	<u>I</u>	<u>DY</u>	<u>1</u>
Isopoda						<u>Dytiscidae</u>	<u>1</u>	<u>A</u>	<u>DY</u>	<u>1</u>
						<u>Dytiscidae</u>	<u>1</u>	<u>I</u>	<u>DY</u>	<u>1</u>
Amphipoda					Diptera	<u>Chironomidae</u>	<u>100</u>	<u>I</u>	<u>DY</u>	<u>1</u>
						<u>Tipulidae</u>	<u>1</u>	<u>I</u>	<u>DY</u>	<u>1</u>
Decapoda	<u>Immature</u>	<u>12</u>	<u>I</u>	<u>DY</u>						
	<u>specimens</u>									
Ephemeroptera	<u>Heptageniidae</u>	<u>15</u>	<u>I</u>	<u>DY</u>	Gastropoda					
	<u>Ephemeridae</u>	<u>2</u>	<u>I</u>	<u>DY</u>						
	<u>Ameletidae</u>	<u>3</u>	<u>I</u>	<u>DY</u>						
	<u>Ephemerellidae</u>	<u>2</u>	<u>I</u>	<u>DY</u>						
Plecoptera	<u>Perlidae</u>	<u>3</u>	<u>I</u>	<u>DY</u>	Pelecypoda					
	<u>Perlidae</u>	<u>128</u>	<u>I</u>	<u>DY</u>						
	<u>Chloroperlidae</u>	<u>10</u>	<u>I</u>	<u>DY</u>	Other	<u>Anisoptera</u>				
	<u>Nemouridae</u>	<u>1</u>	<u>I</u>	<u>DY</u>		<u>Libellulidae</u>	<u>1</u>	<u>I</u>	<u>DY</u>	<u>1</u>
Trichoptera	<u>Hydropsychidae</u>	<u>1</u>	<u>I</u>	<u>DY</u>						
	<u>Glossosomatidae</u>	<u>1</u>	<u>I</u>	<u>DY</u>						
	<u>Rhyacophidae</u>	<u>3</u>	<u>I</u>	<u>DY</u>						
Hemiptera					Taxonomic certainty rating (TCR) 1-5: 1=most certain, 5=least certain. If rating is 3-5, give reason (e.g., missing gills). LS=life stage: I = immature; P = pupa; A = adult TI = Taxonomists initials					

	Site Value	Target Threshold	If 2 or more metrics are ≥ target threshold, site is HEALTHY
Total No. Taxa	<u>19</u>	<u>unknown</u>	
EPT Taxa	<u>11</u>	<u>''</u>	If less than 2 metrics are within target range, site is SUSPECTED IMPAIRED
Tolerance Index	<u>72.7</u>		

77 - 72.7 - Suboptimal
Score 36 / Marginal

FCI Calculator for the High-Gradient Headwater Streams in eastern Kentucky and western West Virginia HGM Guidebook

To ensure accurate calculations, the **UPPERMOST STRATUM** of the plant community is determined based on the calculated value for $V_{CCANOPY}$ ($\geq 20\%$ cover is required for tree/sapling strata). Go to the SAR Data Entry tab and enter site characteristics and data in the yellow cells. For information on determining how to split a project into SARs, see Chapter 5 of the Operational Draft Regional Guidebook for the Functional Assessment of High-gradient Ephemeral and Intermittent Headwater Streams in Western West Virginia and Eastern Kentucky (Environmental Laboratory U.S. Army Corps of Engineers 2010).

Project Name: AEP, Mitchell Landfill Project

Location: Magers Property, Marshall CO, WV Segment 8

Sampling Date: 04-12-2012

Mitigation Site Before Project

Subclass for this SAR:

Intermittent Stream

Uppermost stratum present at this SAR:

Tree/Sapling Strata

SAR number: Seg NFGC-8

Functional Results Summary:

Enter Results in Section C of the Mitigation Sufficiency Calculator

Function	Functional Capacity Index
Hydrology	0.41
Biogeochemical Cycling	0.47
Habitat	0.49

Variable Measure and Subindex Summary:

Variable	Name	Average Measure	Subindex
$V_{CCANOPY}$	Percent canopy over channel.	59.00	0.62
V_{EMBED}	Average embeddedness of channel.	2.00	0.46
$V_{SUBSTRATE}$	Median stream channel substrate particle size.	1.92	0.96
V_{BERO}	Total percent of eroded stream channel bank.	50.00	0.81
V_{LWD}	Number of down woody stems per 100 feet of stream.	4.00	0.50
V_{TDBH}	Average dbh of trees.	10.00	1.00
V_{SNAG}	Number of snags per 100 feet of stream.	9.00	0.50
V_{SSD}	Number of saplings and shrubs per 100 feet of stream.	Not Used	Not Used
V_{SRICH}	Riparian vegetation species richness.	0.90	0.43
$V_{DETRITUS}$	Average percent cover of leaves, sticks, etc.	26.25	0.32
V_{HERB}	Average percent cover of herbaceous vegetation.	Not Used	Not Used
V_{WLUSE}	Weighted Average of Runoff Score for Catchment.	0.32	0.34

High-Gradient Headwater Streams in eastern Kentucky and western West Virginia Field Data Sheet and Calculator

Team: D. York / G. Van Skarik Latitude/UTM Northing: 39.848583
 Project Name: ADP Mitchell Landfill Project Longitude/UTM Easting: 80.531242
 Location: Mager Property, Marshall Co, Cameron WV Sampling Date: 12 Apr 2012
 SAR Number: Seq N1F6C-B Reach Length (ft): 100 Stream Type: Perennial (circle one) Ephemeral/Intermittent (circle one)
 Top Strata: _____ (determined from percent calculated in $V_{CCANOPY}$)
 Site and Timing: Project/Mitigation Site (circle one) Before/After Project (Circle One)

Sample Variables 1-4 In stream channel

1 $V_{CCANOPY}$ Average percent cover over channel by tree and sapling canopy. Measure at no fewer than 10 roughly equidistant points along the stream. Measure only if tree/sapling cover is at least 20%. (If less than 20%, enter at least one value between 0 and 19 to trigger Top Strata choice.)

List the percent cover measurements at each point below:

10	60	60	60	80	90	60	70	50	50
----	----	----	----	----	----	----	----	----	----

2 V_{EMBED} Average embeddedness of the stream channel. Measure at no fewer than 30 roughly equidistant points along the stream. Select a particle from the bed. Before moving it, determine the percentage of the surface and area surrounding the particle that is covered by fine sediment, and enter the rating according to the following table. If the bed is an artificial surface, or composed of fine sediments, use a rating score of 1. If the bed is composed of bedrock, use a rating score of 5.

Embeddedness rating for gravel, cobble and boulder particles (rescaled from Platts, Megahan, and Minshall 1983)

Rating	Rating Description
5	<5 percent of surface covered, surrounded, or buried by fine sediment (or bedrock)
4	5 to 25 percent of surface covered, surrounded, or buried by fine sediment
3	26 to 50 percent of surface covered, surrounded, or buried by fine sediment
2	51 to 75 percent of surface covered, surrounded, or buried by fine sediment
1	>75 percent of surface covered, surrounded, or buried by fine sediment (or artificial surface)

List the ratings at each point below:

1	1	1	5	3	1				
1	1	2	1	2	2				
1	1	1	1	3	1				
1	1	5	5	1	3				
1	1	1	5	2	5				

3 $V_{SUBSTRATE}$ Median stream channel substrate particle size. Measure at no fewer than 30 roughly equidistant points along the stream; use the same points and particles as used in V_{EMBED} .

Enter particle size in inches to the nearest 0.1 inch at each point below (bedrock should be counted as 99 in, asphalt or concrete as 0.0 in, sand or finer particles as 0.08 in):

11	1.63	2.95	99	1.25	0.08				
4.33	6.08	1.83	1.75	6.25	3				
.6	0.08	3.57	0.08	5.75	.25				
2.5	0.08	99	99	1.85	9.25				
2.9	0.08	0.08	2	.75	99				

4 V_{BERO} Total percent of eroded stream channel bank. Enter the total number of feet of eroded bank on each side and the total percentage will be calculated. If both banks are eroded, total erosion for the stream may be up to 200%.

Left Bank: 45 Right Bank: 5

Sample Variables 5-9 within the entire riparian/buffer zone adjacent to the stream channel (25 feet from each bank).

5 V_{LWD} Number of down woody stems (at least 4 inches in diameter and 36 inches in length) per 100 feet of stream reach. Enter the number from the entire 50'-wide buffer and within the channel, and the amount per 100 feet of stream will be calculated.

Number of downed woody stems: 1111

6 V_{TDBH} Average dbh of trees (measure only if $V_{CCANOPY}$ tree/sapling cover is at least 20%). Trees are at least 4 inches (10 cm) in diameter. Enter tree DBHs in inches.

List the dbh measurements of individual trees (at least 4 in) within the buffer on each side of the stream below:

Left Side				Right Side			
33.5		8.25					
1.0		8	1 tree				
9.5		5					
8.25							
2.25							
5							
8.5	1 tree						
8.75							

7 V_{SNAG} Number of snags (at least 4" dbh and 36" tall) per 100 feet of stream. Enter number of snags on each side of the stream, and the amount per 100 feet will be calculated.

Left Side: 9 Right Side: 0

8 V_{SSD} Number of saplings and shrubs (woody stems up to 4 inches dbh) per 100 feet of stream (measure only if tree cover is <20%). Enter number of saplings and shrubs on each side of the stream, and the amount per 100 ft of stream will be calculated.

Left Side: 55 Right Side: 0

9 V_{SRICH} Riparian vegetation species richness per 100 feet of stream reach. Check all species present from Group 1 in the tallest stratum. Check all exotic and invasive species present in all strata. Species richness per 100 feet and the subindex will be calculated from these data.

Group 1 = 1.0

Group 2 (-1.0)

- | | |
|--|--|
| <input type="checkbox"/> <i>Acer rubrum</i>
<input checked="" type="checkbox"/> <i>Acer saccharum</i>
<input type="checkbox"/> <i>Aesculus flava</i>
<input type="checkbox"/> <i>Asimina triloba</i>
<input type="checkbox"/> <i>Betula alleghaniensis</i>
<input type="checkbox"/> <i>Betula lenta</i>
<input type="checkbox"/> <i>Carya alba</i>
<input type="checkbox"/> <i>Carya glabra</i>
<input type="checkbox"/> <i>Carya ovalis</i>
<input type="checkbox"/> <i>Carya ovata</i>
<input type="checkbox"/> <i>Comus florida</i>
<input type="checkbox"/> <i>Fagus grandifolia</i>
<input type="checkbox"/> <i>Fraxinus americana</i>
<input type="checkbox"/> <i>Liriodendron tulipifera</i>
<input type="checkbox"/> <i>Magnolia acuminata</i> | <input type="checkbox"/> <i>Magnolia tripetala</i>
<input type="checkbox"/> <i>Nyssa sylvatica</i>
<input type="checkbox"/> <i>Oxydendrum arboreum</i>
<input checked="" type="checkbox"/> <i>Prunus serotina</i>
<input type="checkbox"/> <i>Quercus alba</i>
<input type="checkbox"/> <i>Quercus coccinea</i>
<input type="checkbox"/> <i>Quercus imbricaria</i>
<input type="checkbox"/> <i>Quercus prinus</i>
<input type="checkbox"/> <i>Quercus rubra</i>
<input type="checkbox"/> <i>Quercus velutina</i>
<input type="checkbox"/> <i>Sassafras albidum</i>
<input type="checkbox"/> <i>Tilia americana</i>
<input type="checkbox"/> <i>Tsuga canadensis</i>
<input type="checkbox"/> <i>Ulmus americana</i> |
| <input type="checkbox"/> <i>Allanthus altissima</i>
<input type="checkbox"/> <i>Albizia julibrissin</i>
<input type="checkbox"/> <i>Alliaria petiolata</i>
<input type="checkbox"/> <i>Alternanthera philoxeroides</i>
<input type="checkbox"/> <i>Aster tataricus</i>
<input type="checkbox"/> <i>Cerastium fontanum</i>
<input type="checkbox"/> <i>Coronilla varia</i>
<input type="checkbox"/> <i>Elaeagnus umbellata</i>
<input type="checkbox"/> <i>Lespedeza bicolor</i>
<input type="checkbox"/> <i>Lespedeza cuneata</i>
<input type="checkbox"/> <i>Ligustrum obtusifolium</i>
<input type="checkbox"/> <i>Ligustrum sinense</i> | <input type="checkbox"/> <i>Lonicera japonica</i>
<input type="checkbox"/> <i>Lonicera tatarica</i>
<input type="checkbox"/> <i>Lotus comiculatus</i>
<input type="checkbox"/> <i>Lythrum salicaria</i>
<input type="checkbox"/> <i>Microstegium vimineum</i>
<input type="checkbox"/> <i>Paulownia tomentosa</i>
<input type="checkbox"/> <i>Polygonum cuspidatum</i>
<input type="checkbox"/> <i>Pueraria montana</i>
<input checked="" type="checkbox"/> <i>Rosa multiflora</i>
<input type="checkbox"/> <i>Sorghum halepense</i>
<input type="checkbox"/> <i>Verbena brasiliensis</i> |

0 Species in Group 1

0 Species in Group 2

AEP Mitchell Landfill Project

D93 - 12 Apr. 2012 / NFGC-8 (Magers)

Sample Variables 10-11 within at least 8 subplots (40" x 40", or 1m x 1m) in the riparian/buffer zone within 25 feet from each bank. The four subplots should be placed roughly equidistantly along each side of the stream.

10 V_{DETRITUS} Average percent cover of leaves, sticks, or other organic material. Woody debris <4" diameter and <36" long are include. Enter the percent cover of the detrital layer at each subplot.

Left Side				Right Side			
5	99	5	90	2	5	3	1

11 V_{HERB} Average percentage cover of herbaceous vegetation (measure only if tree cover is <20%). Do not include woody stems at least 4" dbh and 36" tall. Because there may be several layers of ground cover vegetation percentages up through 200% are accepted. Enter the percent cover of ground vegetation at each subplot.

Left Side				Right Side			
5	15	2	20	100	100	100	100

Sample Variable 12 within the entire catchment of the stream.

12 V_{WLUSE} Weighted Average of Runoff Score for watershed:

Land Use (Choose From Drop List)	Runoff Score	% in Catchment	Running Percent (not >100)
Open Pasture ▼			
Woodland ▼			
Residential ▼			
Impervious surface ▼			

Summary			Notes:
Variable	Value	VSI	
V_{CCANOPY}			
V_{EMBED}			
$V_{\text{SUBSTRATE}}$			
V_{BERO}			
V_{LWD}			
V_{TDBH}			
V_{SNAG}			
V_{SSD}			
V_{SRICH}			
V_{DETRITUS}			
V_{HERB}			
V_{WLUSE}			