Figure 1: IDEM macroinvertebrate and fish sampling locations within the eastern half of the Lower White watershed.

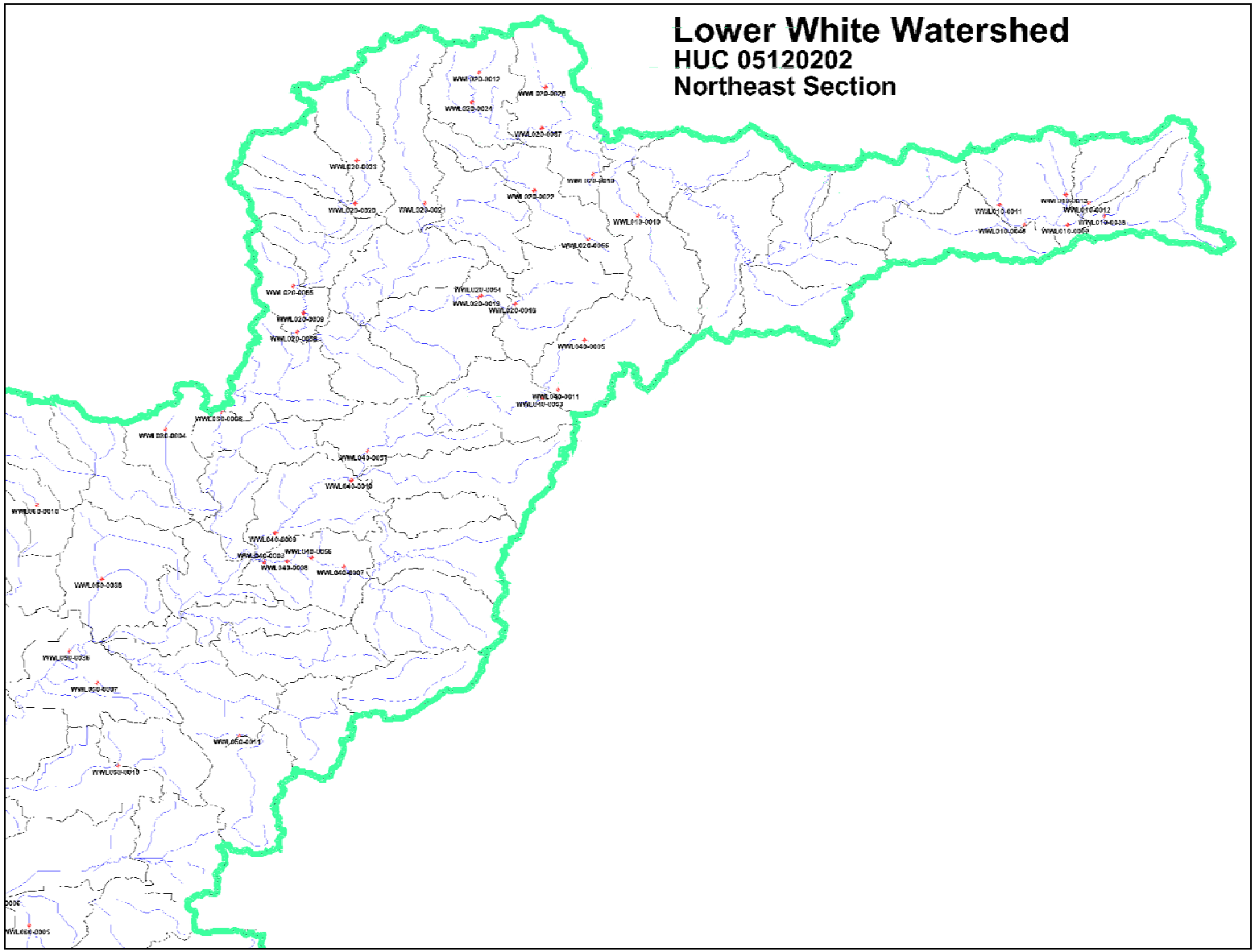
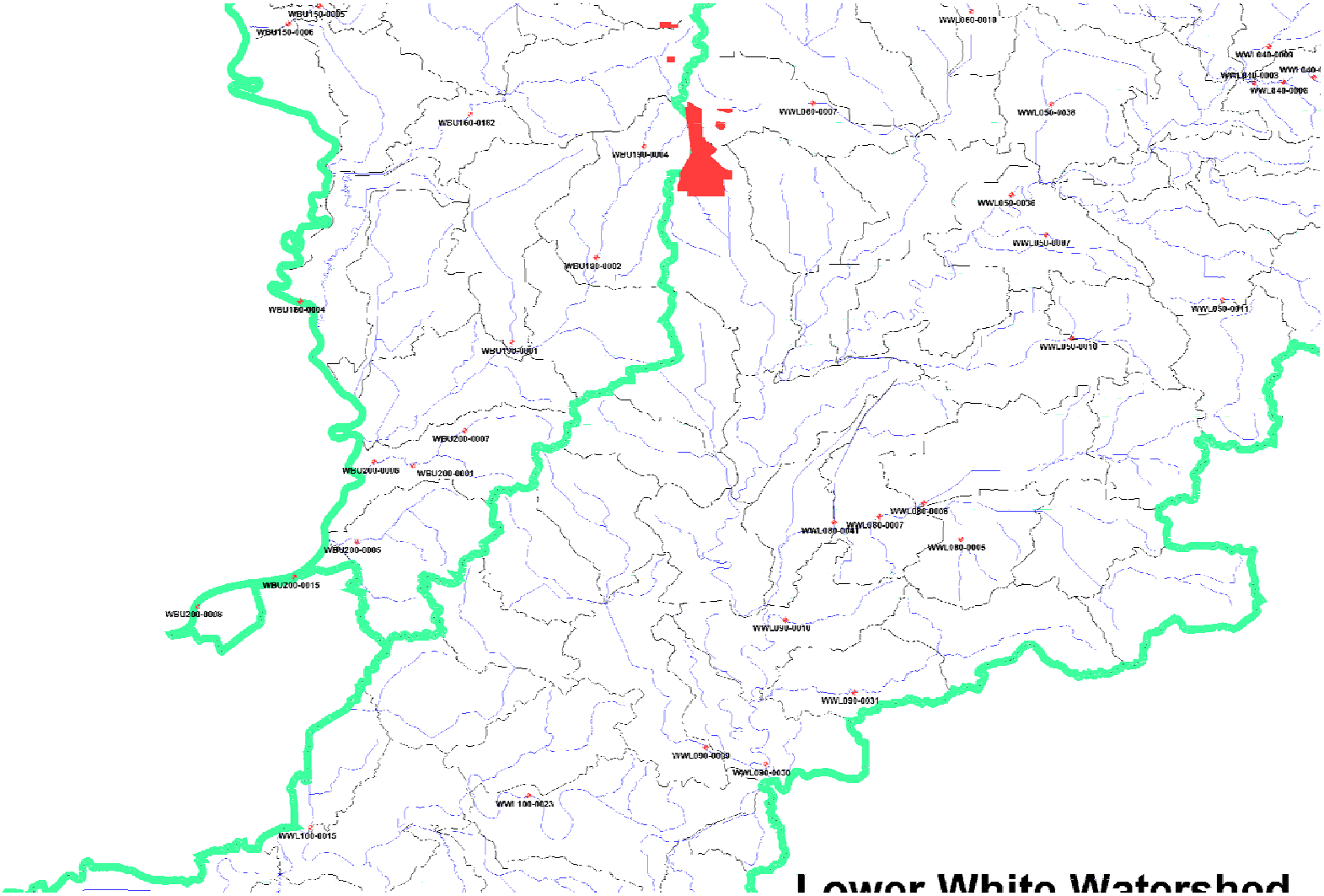


Figure 2: IDEM macroinvertebrate and fish sampling locations within the western half of the Lower White watershed. Bear Run permit area shown in red.



Melissa Gebien/R5/USEPA/US
11/19/2010 01:47 PM

To Christopher Hunter
cc Wendy Melgin, Peter Swenson
bcc
Subject Bear Run off-site mitigation

Appendix J to the permit includes details regarding the off-site mitigation proposed.

13_Appendix J_Buttermilk Creek Mitigation Plan_09-10-10.pdf

13_Appendix J_Buttermilk Creek Mitigation Plan Map_09-10-10.pdf

Bear Run Mine (AMDT 4) 404 ID No. LRL-2010-193-gjd
Supplemental Off-site Mitigation Plan for Buttermilk Creek
September 10, 2010

Introduction: To develop supplemental off-site mitigation to compensate for temporal impacts to wetlands and streams involved with operation of Bear Run Mine (AMDT 4) 404 permit ID No. LRL-2010-193-gjd. This plan was developed by Wetland Services and the Peabody Midwest Environmental Services Group in consultation with Dr. Jeff Barry of Arcadis U.S. who performed the HEC-RAZ floodway modeling and provided technical input (see attached memo).

Location: From U.S. Hwy 41N in Sullivan, Indiana proceed east on SR54 2.4 miles to CR200E. Proceed south on CR 200E 0.6 mile to the NE corner of the site (see attached aerial photo-based map).

Responsible Parties:

Applicant	Contact	Property Owner(s)
Peabody Midwest Mining LLC 7100 Eagle Crest Boulevard Evansville, IN 47715-8152	Bryce West 812-434-8580	American Land Holdings of Indiana LLC

Site Description: The Buttermilk Creek site is situated in the U.S.G.S. Middle Wabash-Busseron Watershed, 8-Digit HUC 05120111. This site is oriented as a cross-section of Buttermilk valley encompassing 5,500 feet of the abandoned original oxbow stream channel. The following information was derived by remote sensing, GIS, on-site reconnaissance, sampling and GPS and conventional based-surveying. Information was also gathered from local neighbors with extensive knowledge of the site and surrounding area.

1. **Land use:** The parent parcel is 355 acres. Land use on the larger parent area consists of approximately 220 acres of cropland, 1 acre of grain bins, 11 acres of dry woods, 123 acres of wet woods, drains, dredged channels and diversions. In 1971 an additional 34 acres of cropland were in production. Today these areas exist as wet woods, and were likely abandoned due to marginal productivity. On site this condition is evidenced by an even-aged monoculture of early-successional soft mast trees that are approximately 30 years old, as well as old ditches.

2. **Hydrology:** Extensive drainage efforts have been applied to this site over time. These hydrologic impacts include dredged channels, diversions and tile. These efforts are evidenced by deep, straight channels with steep spoil banks. Approximately 9,000 feet of excavated surface drains have been identified and targeted for some degree of removal. Hydrologic inputs to the site are mainly Buttermilk Creek with an upstream drainage area of 10 square miles. The main landuse in the upper watershed is reclaimed surface mine with many large basins surrounded by forest and wildlife plantings. Agriculture is limited in the upper watershed with all runoff passing through one or more impoundments. These impoundments store water and provide for a relatively strong, clean and consistent base flow. Storm surge on this site is ameliorated by these many surface impoundments as well as the adjacent forest with extensive floodplain. Just prior to entering the site, Buttermilk Creek flows through 2,200 feet of bottomland forest. Lastly with respect to hydrology, this site is the transition area or

interface between headwater flooding from upstream and backwater from Busseron Creek during significant flood events. This information was derived from several locals who knew that CR200 flooded frequently while CR275 had never flooded. This information also is consistent with the HEC-RAS model.

3. **Soils:** The majority of the site is developed in hydric soils. Stendal makes up the majority of the floodplain with Cuba immediately adjacent to Buttermilk Creek. Henshaw occurs in the upland drains with Ava and Iva on the upland slopes to the north and south.

4. **Climate** in the Illinois Basin South as of 2003 at 400'ASL: 45" rain, 14" snow, Mean annual temp is 55.6^{o}F, Average daily extreme temp is 87.3 ^{o}F and 22 ^{o}F.

5. **Aquatic Resource Functions** considered in this mitigation include water quality, sediment transport, habitat and nutrient cycling. Existing habitat and water quality functions are presented in the Bio-assessment report. Nutrient cycling, as a component of water quality can also be extrapolated from the Bio-assessment report. The projected stream velocity changes are detailed in a table with the profile drawings of each station.

6. **Timing:** Mitigation on this site will occur long before the vast majority of impacts occur on Bear Run 4 mining area, greatly off-setting temporal loss. The offset of temporal loss and the likelihood of success on this site are high. Mitigation will be completed by the end of the 2nd growing season following permit issuance.

Mitigation Objectives and Approach: The purpose of this section is to describe the general strategies that will be applied to the various site conditions and landuses. Total mitigation generated on this site includes 18,100 feet of stream, 60 acres of wetland and 8 acres of upland buffer mitigation. The objective is to produce a high level of stream and wetland function, with a high degree of stream and wetland interaction. This restoration approach maximizes the development of aquatic ecosystem area and function by orienting the individual hydrologic components – streams and wetlands in a manner conducive to landscape connectivity and complimentary function. Because the floodplain is prior converted cropland it is expected to develop strong wetland characteristics. With maturity the stream and wetland together will function more as a flowing aquatic ecosystem. Aside from being large and contiguous, many physical, chemical and biological aquatic ecosystem functions are enhanced by this design as the stream and wetland each provide their unique benefits simultaneously and complimentary.

1. **Stream** mitigation begins with the reactivation of the 5,500 feet of original stream oxbow adjacent to the existing channel. Reactivation will occur by reconnecting the upper on-site watershed to the original meandering oxbow channel and also directing the existing main channel into the oxbox channel using earthen and rock plugs (see attached conceptual design). On the map this can be seen at Plug 'A' where the upper on-site drainage flowpath color changes from dark blue to teal and for the redirected Buttermilk Creek drainage this can be seen where the flowpath channel becomes teal. Increased on-site drainage will also be redirected to the oxbow channel at the location of Plug 'B'. The additional and redirected flow will give a considerable increase in stream function produced in this mitigation site. It will also increase wetland hydrology across the floodplain, but not to an extent detrimental to the existing forest. Since abandonment, some limited areas of saplings and brush have grown up that should be removed. Stream mitigation continues with 12,000 feet of Priority 1 construction in cropland

valleys. About 2,000 feet will be higher gradient B-channels with the remaining 10,000 feet being lower gradient and larger C- and E-channels. These channels will exist within newly established PFO wetland. 600 feet of in-stream structure enhancement is proposed for an existing stream in the NE wooded corner. This section begins with mass wasting and instability below a larger culvert leading into the site.

2. **Wetland** mitigation includes 60 acres of PFO construction on existing cropland. A limited amount of excavation will be conducted to remove diversions and fill in old ditches. This excavation will be in conjunction with construction of the Priority 1 stream channels that will run through these areas. An additional 8 acres of Riparian buffer creation will occur as upland vegetation along higher gradient streams.

Mitigation Compensation and Timing:

Table 3: Wetland acres generated		**Table 3A: Stream linear footage generated**		**Table 3B: Upland Buffer acres generated**	
PFO Creation*	60 ac	Stream Creation	12,000 ft	Upland Riparian Buffer Creation	8 ac
		Buttermilk Restoration	5,500 ft		
		In-Stream Structure Enhancement	600 ft		
*Some created wetlands will also function as lowland riparian buffers.					
Plantings, Restoration, etc. will be completed by the end of the 2nd growing season following permit issuance.					

Construction must be completed under suitable field conditions.

1. **Excavation** during excessively wet or dry conditions reduces the quality of the end product and increases the risk of failure. In extreme circumstances (such as record wet or dry growing seasons) construction may have to be postponed until the following year. Operating heavy equipment in ecologically sensitive areas requires knowledge of heavy equipment operation, soil stratification, plant identification, and strict attention to detail. Well-trained personnel will be onsite during all phases of construction to ensure restoration objectives are met with minimum disturbance. Equipment used may include dozers, skidders, pumps, track hoes, back hoes, scrapers, pans, trucks and pay-loaders.

2. **Surface Roughening** is the use of a bog or crosscut disc to leave the land surface highly textured. This approach is effective when attempting to promote surface hydrology above pool margins or on flat plains. Surface roughening promotes ponding by reducing runoff and creating many micro-depressions intermixed with large clods. Clods provide shade and block wind to reduce evaporation. Clods also provide 360^0

aspect to promote plant diversity including mosses and lichens, especially in wet meadows. Surface roughening is also a good weed control technique when managing undesirable species between tree rows. It allows effective weed control while also enhancing hydrology. Herbaceous species rapidly recover and often in better condition.

3. **Soil conditioning** is necessary to reduce compaction, remove weeds, incorporate soil amendments and prepare a seedbed conducive to good seed to soil contact.

4. **Planting** is the most expensive and failure-prone step in restoration. Site-specific conditions of microtopography and hydroperiod will guide the final planting and management process. All plant materials will be maintained in proper conditions such as refrigeration, stratification, dormant, wet or dry as appropriate until planted. Planting will occur during optimum field conditions and in a manner suitable for establishment of the specific propagule type.

Challenges anticipated for mitigation success on this site are generally limited to excessively wet conditions and fertility and tilth of the growing substrate relevant to vegetation establishment and survival.

1. **Fertility:** Deep tillage and surface roughening will promote water storage in the upper soil profile. Soil amendments including lime and fertilizer will be applied to create a suitable growing environment for the target species.

2. **Non-Target Species (invasive, exotic or volunteer)** invasion and control should be limited as the planting sites are currently under intensive agriculture; they are essentially a blank pallet with no phragmites, etc. on site. Problems with the establishment of undesirable plant species in forested areas will typically be controlled with herbicide sprayed on the rows and mechanical removal between rows. Methods to control undesirable species include but are not limited to mechanical removal by logging, chopping, chipping, bush hogging, cutting, girdling, grinding, burning, herbicide, flooding and desiccation. Beneficial volunteer species may be maintained on site with approval from the ACOE.

3. **Hydrology** is expected to be very sufficient and periodically excessive. Head and backwater flooding, ponding and high water tables may sometimes delay certain activities while simultaneously promote vigorous establishment of target species. Temporary diversions may be used. Generally however, no problems are anticipated with hydrology.

4. **Erosion** in newly constructed streams will be ameliorated by maintaining low slopes via surface shaping in increased channel sinuosity. Erosion control blankets, hydromulch and mats may be used in conjunction with other bio-engineering methods. Timely establishment of vegetation will provide long-term stability.

Contingency Plan: Actions in Contingency are similar to those previously detailed in the Construction and Challenges sections. If other success criteria are not met for all or any portions of the compensatory mitigation project in any year, and/or if the success criteria are not satisfied, the permittee will prepare an analysis of the cause(s) of failure and propose remedial action for pre-approval. Ecologically this site is completely suited for establishment of the proposed mitigation. Should problems arise that compromise long-term success, the applicant

will report to the ACOE and based on available information revise the mitigation plan to facilitate successful conditions.

Vegetation plantings, monitoring, success criteria, long-term management and protection will be the same as those set forth in Bear Run Mine (AMDT 4) 404 permit application ID No. LRL-2010-193-gjd.

Stream Plan

Goal: To construct a natural stream channel that can develop free-form, self-sustaining conditions. This approach is derived from the best and most current Rosgen-based scientific methods. This program was modified specific to Midwestern reference conditions including Indiana.

Reference: This process is derived from a scientific approach to natural channel design. All design parameters are based on optimum reference conditions throughout the region. Channel sizing is based on the watershed area of the stream. Channel area is derived from Regional curve data and sized for a natural bankfull return interval. Channel area is applied to a specific width/depth ratio. All other parameters are set, by ratio, to either Wbkf or Dbkf.

Instructions:

1. **Alluvial Valley:** It is necessary that the valley be wide enough to accommodate the Wfpa which is generally 10X Wbkf. The lower gradients in alluvial valleys facilitate groundwater infiltration that drives intermittent stream conditions. The valley also provides a corridor for the stream to meander and develop free-form morphology. Stream design varies with channel slope; 0-1.3% for C-channels, 1.3-3% for B-channels.

2. **Materials:** Topsoil, rock and coarse woody debris (trees and root wads) should be logistically timed and placed on site for construction. Filter fabric, seed, mulch, erosion blanket, pins and rebar are also necessary. Never dig more open channel than can be quickly completed.

3. **Channel Construction:** Channel construction will be performed to accomplish: a). improved channel morphology within the original meandering oxbow and b). on-site stream drainages. To improve the original meandering channel morphology, some small trees and areas of excessive sediment deposition will need to be removed to create and enhance on-site streams; the basic channel will be constructed with a set width and depth that increases as the stream moves down valley. This step includes the construction of the basic channel. It is recommended that construction be conducted so as to make a precise cut with minimal peripheral disturbance. Once the stakes are set it is recommended that a hurricane ditcher be used to make the initial cut to grade depth. Hurricane ditchers are tractor mounted PTO driven devices that can be set to a precise depth. These units can be easily navigated around staked corners to produce sinuosity. Finally they discharge the cut material in a “rooster tail” manner that evenly distributes the cut material across the flood prone area without restricting the streams floodplain access or causing damage to established vegetation. An excavator can then be used to make final width and side slopes.

4. **Pool Construction:** Pools are deeper than the riffle sections of the stream. Pools should be excavated to design specs located in Step 3 – Profile. Excess material should be disposed offsite or graded flat in a manner that will not restrict floodplain access.

5. **Riffle Structures** serve the main function of grade control. As such, these features must be designed for sustainable scouring during high velocity flows. The design and installation of riffle structures varies between B-channels and C-channels.

    A. **B-channel** riffle structures consist of a log(s) keyed across the channel. Refer to the drawing in Step 3 Riffle Construction B-channels.
    B. **C-channel** riffle structures consist of the appropriate sized material (fine gravel, coarse gravel, etc.) as determined by shear-stress calculations. Refer to the drawings in Step 3 Riffle Construction C-channels.
6. **Coarse Woody Debris:** Install log vanes leading into meander bends and root wad revetments around the meander bends as detailed in Step 4.

7. **Planting and Erosion Control:** These steps occur simultaneously. Be prepared, the 100-year event will likely occur the day after construction.

    A. Apply lime, fertilizer and seed to exposed stream banks.
    B. Apply appropriate erosion control (mulch, blankets, matting, etc).
    C. Install live stakes at specified locations.
    D. Plant the riparian zone in trees only after the stream has established good bank vegetation and is stabilized. Stream maintenance activities will damage riparian trees if planted too early.
    E. Following construction the riparian buffer will be planted with hard mast bare root seedlings at a rate of 600 stems/acre, and the herbaceous understory rate and species listed in the Bear Run 4 permit.

8. **Monitoring Stations:** Establish monitoring stations according to criteria set forth in the Mitigation portion of this document.

Design Parameters: C-channel (meandering) 0-1.3% slope

Riffle cross-section:
Cross-sectional area: from regional curve regression equation, 43.474*A^0.5222, where A is the watershed area in square miles
Width/depth (W/D) ratio: 15
Channel side slope: 3:1
Bankfull (top) width: calculated from cross-sectional area and W/D ratio
Mean bankfull depth: calculated from cross-sectional area and W/D ratio
Maximum bankfull depth: calculated from channel width, side slope, and area
Bottom width: calculated from channel depth, side slope, and area

Pool cross-section:
Point bar slope: 6:1
Pool depth: 2X maximum riffle depth
Pool bottom width: same as riffle bottom width
Pool top width: calculated from bottom width, depth, side slope, and point bar slope

Longitudinal profile:
Riffle length: 2X bankfull width
Pool length: same as riffle length
Run length: half of riffle length
Glide length: half of riffle length
Depth at end of run: one-third of elevation change between riffle and pool depths
Depth at head of glide: two-thirds of elevation change between pool and riffle depths

Plan view:
Sinuosity: 1.3
Floodplain width: 10X bankfull width
Meander length: 9X bankfull width
Beltwidth: calculated from sinuosity, meander length, and bankfull width
Channel lining specifications:
Shear stress: product of channel slope, bankfull maximum depth, and weight of water (62.4 lbs/cubic foot)
Velocity: from Manning's equation, with Manning's n = 0.035
d100 particle size: estimated (in millimeters) from a Rosgen regression equation: 152.02*x^0.7355, where x equals the shear stress.

Design Parameters B-channel (Step Pool) 1.3-3% slope

Riffle cross-section:
Cross-sectional area: from regional curve regression equation, 43.474*A^0.5222, where A is the watershed area in square miles
Width/depth (W/D) ratio: 15
Channel side slope: 3:1
Bankfull (top) width: calculated from cross-sectional area and W/D ratio
Mean bankfull depth: calculated from cross-sectional area and W/D ratio
Maximum bankfull depth: calculated from channel width, side slope, and area
Bottom width: calculated from channel depth, side slope, and area

Pool cross-section:
Channel side slope: 2:1
Pool depth: 2X maximum riffle depth
Pool top width: same as riffle top width
Pool bottom width: calculated from pool top width, side slope, and depth

Longitudinal profile:
Step height: 0.33 feet
Riffle length: calculated from channel slope and step height
Pool length: same as riffle length

Plan view:
Sinuosity: 1.1
Floodplain width: 10X bankfull width
Meander length: calculated from sinuosity, pool length, and riffle length
Beltwidth: calculated from sinuosity, meander length, and bankfull width

Channel lining specifications:
Shear stress: product of channel slope, bankfull maximum depth, and weight of water (62.4 lbs/cubic foot)
Velocity: from Manning's equation, with Manning's n = 0.035
d100 particle size: estimated (in millimeters) from a regression equation from Rosgen: 152.02*x^0.7355, where x equals the shear stress

WETLAND PLAN

Wetland Specifics: This plan proposes to create 60 acres of PFO wetland.

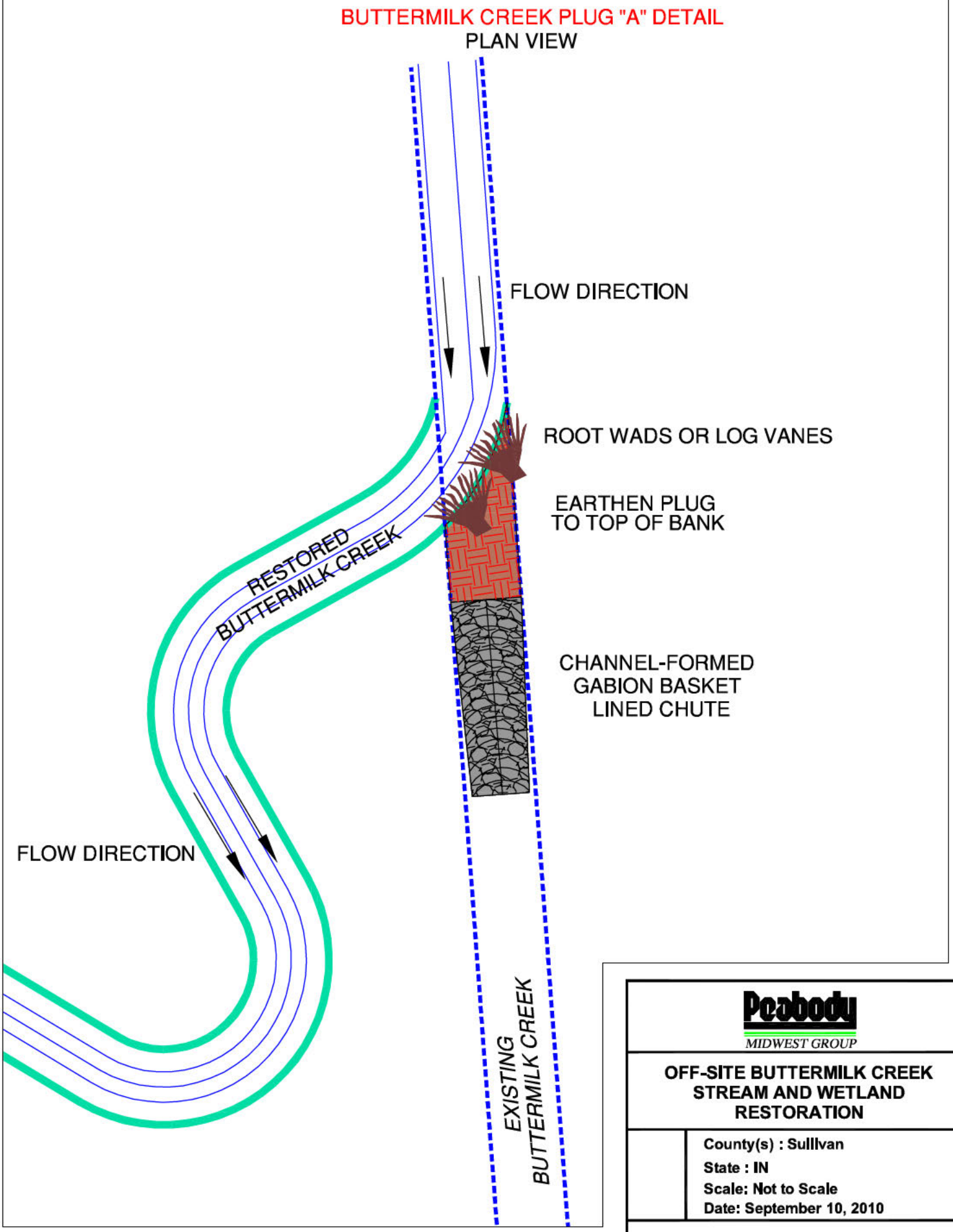
Mitigation Goals and Objectives: These wetland mitigation areas will be developed in the flood prone area of multiple low gradient mitigation streams. Overbank flooding will occupy the floodplain to service the adjacent wetlands. Overflow will be trapped and stored on the floodplain where it will then be cleaned up and metered back into the stream to help drive more intermittent stream flow conditions. The ultimate goal of the project is to restore a self-sustaining riparian system that is well developed in target native vegetation so as to provide clean water and high quality habitat.

1. **Site Selection and Justification:** This site was chosen because it provides the largest ecological lift in the watershed compared to other potential sites.

2. **Hydrology:** The combination of the following two sources will provide frequency and duration optimal to support hydrology levels A, B, C, D and E as defined by the Cowardin classification system. Plantings will be specific to this range of hydrology; with FAC+ species in the more temporarily flooded areas, OBL in the more seasonally flooded areas and FACW making up the transition

    A. **Runoff Retention Ratio:** With minor excavation to remove diversions and ditches, these mitigation areas will receive laminar upland runoff from a cumulative total of 188 acres. 60 acres of wetland supplied by 188 acres of runoff gives a runoff retention ratio of 3.1:1. Combined with overbank flooding and saturated conditions, this site will provide very suitable hydrology for PFO. Cumulative watershed total leaving the site at 6,750 acres.
    B. **Overbank Flooding** from the Oxbow and Priority 1 stream construction will occur on a frequency and distribution specific for development of PFO wetland.

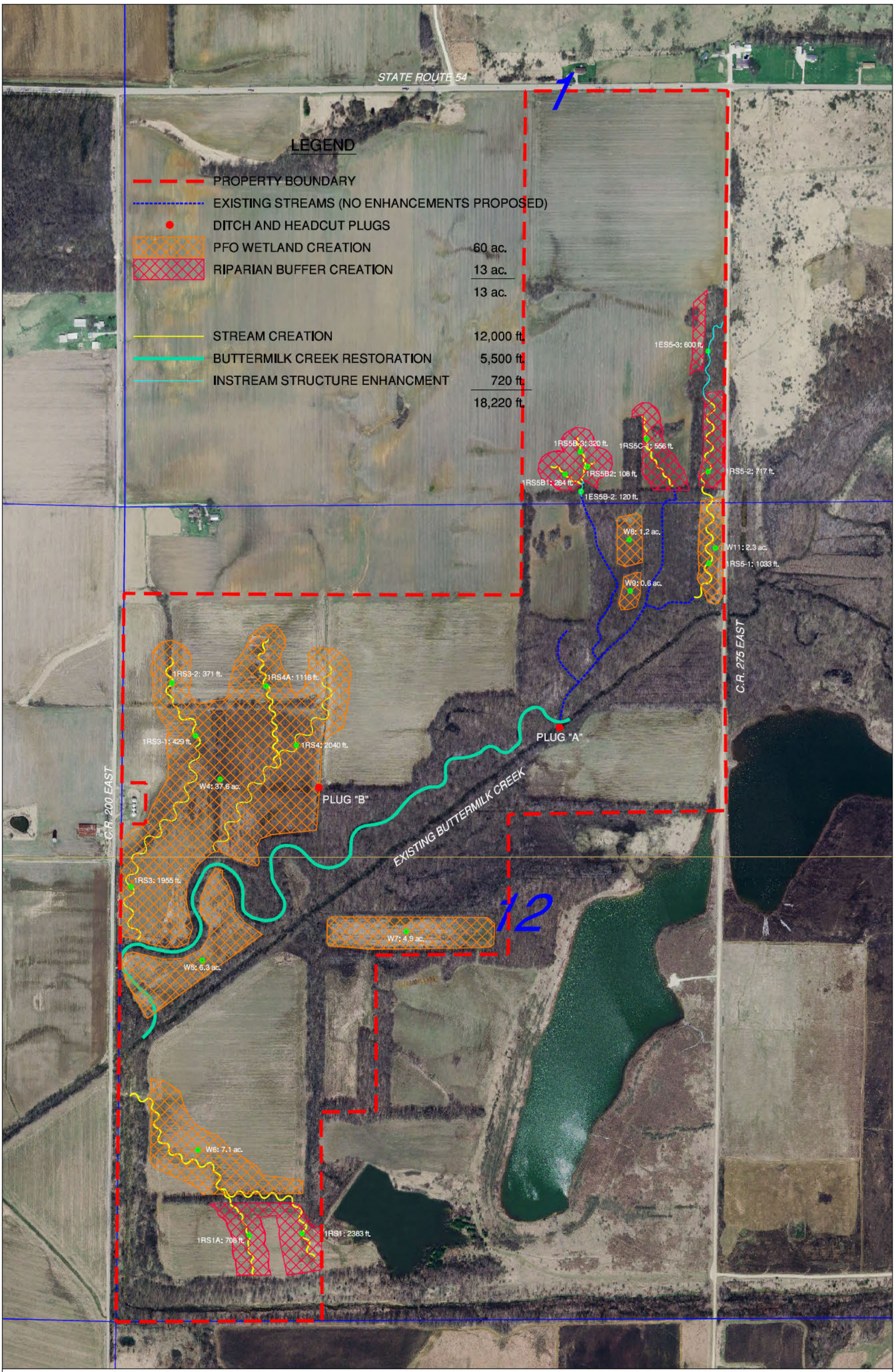
Schedule: Restoration activities will begin immediately with permit issuance. Following construction the wetland will be planted with hard mast bare root seedlings at a rate of 600 stems per acre, and the herbaceous understory species listed in Bear Run Mine (AMDT 4) 404 permit application ID No. LRL-2010-193-gjd.



Peabody
MIDWEST GROUP

OFF-SITE BUTTERMILK CREEK STREAM AND WETLAND RESTORATION

County(s) : Sulllvan
State : IN
Scale: Not to Scale
Date: September 10, 2010



STREAM NAME	CHANNEL TYPE	SINUOSITY	AVERAGE SLOPE	STREAM LENGTH (feet)	DRAINAGE AREA (acres)	WAVELENGTH (feet)	Xsec AREA (sq. ft.)	WIDTH	DEPTH	AVERAGE VELOCITY (ft/sec)	SHEAR STRESS (lbs/sq. ft.)	BANKFULL DISCHARGE (CFS)
1RS1	C (riffle-run-pool)	1.30	0.9%	2383	33	106.3	9.3	11.8	1.1	2.11	0.07	19.7
1RS1A	B (step-pool)	1.10	2.2%	708	7	70.1	4.0	7.8	0.7	2.91	0.14	11.8
1RS3	C (riffle-run-pool)	1.40	0.1%	1955	108	144.2	17.1	16.0	1.5	0.63	0.01	10.8
1RS3-1	C (riffle-run-pool)	1.30	0.7%	429	82	134.6	14.9	15.0	1.4	1.95	0.06	29.1
1RS3-2	C (riffle-run-pool)	1.30	0.6%	371	59	123.7	12.6	13.7	1.3	1.82	0.05	22.9
1RS4	C (riffle-run-pool)	1.40	0.2%	2040	114	146.4	17.6	16.3	1.5	1.17	0.02	20.7
1RS4A	C (riffle-run-pool)	1.30	0.2%	1116	13	84.3	5.8	9.4	0.9	0.80	0.01	4.7
1RS5-1	C (riffle-run-pool)	1.30	0.3%	1033	68	128.1	13.5	14.2	1.3	1.23	0.02	16.7
1RS5-2	C (riffle-run-pool)	1.30	1.0%	717	64	126.2	13.1	14.0	1.3	2.32	0.08	30.4
1RS5B1	B (step-pool)	1.10	2.3%	264	2	51.0	2.1	5.7	0.5	2.73	0.12	5.8
1RS5B2	B (step-pool)	1.10	3.9%	108	1	41.5	1.4	4.6	0.4	3.44	0.20	4.9
1RS5B-3	B (step-pool)	1.10	2.3%	320	3	59.0	2.9	6.6	0.6	2.83	0.13	8.1
1RS5C-1	B (step-pool)	1.10	3.9%	556	7	70.8	4.1	7.9	0.7	3.84	0.24	15.9

PEABODY MIDWEST MINING, LLC.

OFF-SITE BUTTERMILK CREEK
STREAM AND WETLAND RESTORATION PLAN

Jessica Martinsen/R3/USEPA/US
11/22/2010 09:58 AM

To Allison Graham
cc
bcc
Subject Fw: Release of GAO-11-101R, Surface Coal Mining: Information on Clean Water Act Section 404 Permit Reviews Under Enhanced Coordination Procedures in Applalachia, focusing on West Virginia

Allison,
I was wondering if you'd be willing to review too. Thanks!

Jessica Martinsen
U.S. EPA Region III
Office of Environmental Programs
1650 Arch St. (3EA30)
Philadelphia, PA 19103
215-814-5144 (office)
215-814-2783 (fax)

----- Forwarded by Jessica Martinsen/R3/USEPA/US on 11/22/2010 09:56 AM -----

From: Lorraine Fleury/R3/USEPA/US
To: John Pomponio/R3/USEPA/US@EPA, Jeffrey Lapp/R3/USEPA/US@EPA
Cc: Jessica Martinsen/R3/USEPA/US@EPA, Stefania Shamet/R3/USEPA/US@EPA
Date: 11/19/2010 11:20 AM
Subject: Fw: Release of GAO-11-101R, Surface Coal Mining: Information on Clean Water Act Section 404 Permit Reviews Under Enhanced Coordination Procedures in Applalachia, focusing on West Virginia

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Final slides and letter for GAO's review #361195. Let me know if you have any questions.

Lorraine Fleury
EPA Region III, Audit Follow-up Coordinator
215-814-2341

----- Forwarded by Lorraine Fleury/R3/USEPA/US on 11/19/2010 11:11 AM -----

From: OCFO-GAO
To: Marilyn Ramos/DC/USEPA/US@EPA, Michael Mason/DC/USEPA/US@EPA, Lorraine Fleury/R3/USEPA/US@EPA, Kathie Johnson/R4/USEPA/US@EPA, Eric Levy/R5/USEPA/US@EPA
Cc: MarkT Howard/DC/USEPA/US@EPA, trent.bobbie@epa.gov
Date: 11/19/2010 10:52 AM
Subject: Fw: Release of GAO-11-101R, Surface Coal Mining: Information on Clean Water Act Section 404 Permit Reviews Under Enhanced Coordination Procedures in Applalachia, focusing on West Virginia
Sent by: Bobbie Trent

Good Morning:

Please see the attached, GAO's final product on the engagement GAO Job Code 361195, EPA and Corps Section 404 Review. The product does not contain any recommendations for the Agency and I have archived the engagement in the database, thank you.

d11101r.pdf

Bob

Bob Trent, GAO Liaison Team Lead
OCFO-GAO@EPA.GOV
Office of Budget
202-566-0983 phone; 202-564-1839 fax
Trent.Bobbie@epa.gov

----- Forwarded by Bobbie Trent/DC/USEPA/US on 11/19/2010 10:49 AM -----

From:	GAOReports <GAOReports@gao.gov>
To:	GAOReports <GAOReports@gao.gov>
Cc:	"Brown, Andrea W" <BrownAW@gao.gov>, "Mittal, Anu K" <MittalA@gao.gov>, "Cleary, Stephen M" <ClearyS@gao.gov>, "Cline, Phylis D" <ClineP@gao.gov>
Date:	11/18/2010 02:51 PM
Subject:	Release of GAO-11-101R, Surface Coal Mining: Information on Clean Water Act Section 404 Permit Reviews Under Enhanced Coordination Procedures in Applalachia, focusing on West Virginia

Below is a link to the following product, which is being released today:

GAO-11-101R
Surface Coal Mining: Information on Clean Water Act Section 404 Permit Reviews Under Enhanced Coordination Procedures in Applalachia, focusing on West Virginia
http://www.gao.gov/Products/GAO-11-101R

Anu Mittal
Director, Natural Resources & Environment

GAO
Accountability * Integrity * Reliability
United States Government Accountability Office
Washington, DC 20548

October 19, 2010

The Honorable Nick J. Rahall, II
Chairman
Committee on Natural Resources
House of Representatives

Subject: *Surface Coal Mining: Information on Clean Water Act Section 404 Permit Reviews under Enhanced Coordination Procedures in Appalachia, Focusing on West Virginia*

Dear Mr. Chairman:

In 2009, West Virginia accounted for about 43 percent of the surface coal mining production in Appalachia.[1] Surface coal mining in the mountainous areas of Appalachia—a process often referred to as mountaintop mining—has generated opposition in recent years because of its impact on landscapes, streams, ecosystems, and communities. In mountaintop mining, before the underlying coal can be extracted, the land is cleared of forest and other vegetation. Explosives or other techniques are then used to break up the overlying solid rock, creating dislodged earth, rock, and other materials known as "spoil." Some or most of the spoil is placed back on the mined-out area; however, spoil that cannot be safely placed back is often placed as "fill" in adjacent valleys or hollows. In some cases, this fill buries the headwaters of streams.[2]

Activities associated with surface coal mining are regulated under both the Surface Mining Control and Reclamation Act (SMCRA) and the Clean Water Act (CWA).[3] SMCRA requires mine operators to obtain a permit before they begin mining. In West Virginia, the West Virginia Department of Environmental

[1]Surface coal mining production in Appalachia also includes areas in Alabama, Kentucky, Maryland, Ohio, Pennsylvania, Tennessee, and Virginia.

[2]For additional information on surface coal mining in Appalachia, see GAO, *Surface Coal Mining: Characteristics of Mining in Mountainous Areas of Kentucky and West Virginia*, GAO-10-21 (Washington, D.C.: Dec. 9, 2009) and GAO, *Surface Coal Mining: Financial Assurances for, and Long-Term Oversight of, Mines with Valley Fills in Four Appalachian States*, GAO-10-206 (Washington, D.C.: Jan. 14, 2010).

[3]Surface Mining Control and Reclamation Act, 30 U.S.C. §§ 1201-1328 (2006); Clean Water Act, 33 U.S.C. §§ 1251-1387 (2006).

Protection (WVDEP) administers the SMCRA permit program, subject to the Department of the Interior's (Interior) Office of Surface Mining Reclamation and Enforcement's (OSM) finding that the state program is in accordance with federal law.[4] OSM annually evaluates how well the state program is administered. To obtain a permit, operators must submit detailed plans describing the extent of proposed mining operations and how they will reclaim the mine site. If the proposed mining operation discharges pollutants into the waters of the United States, the operator also must obtain a CWA section 402 permit. WVDEP administers the section 402 permit program, subject to the Environmental Protection Agency's (EPA) authorization of the state's program.[5] EPA may review proposed state-issued permits and object to the issuance of a section 402 permit. In addition, if the operation discharges dredged or fill material into the waters of the United States, the operator must obtain a CWA section 404 permit. In West Virginia, the U.S. Army Corps of Engineers (Corps) is responsible for making permit decisions and issuing the section 404 permits; EPA may prohibit, withdraw, deny, or restrict section 404 permits.[6] Furthermore, any discharges into the waters of the United States resulting from activities conducted under a federal permit, including a section 404 permit, require a state certification under CWA section 401 that the discharges will comply with water quality standards.[7] In West Virginia, WVDEP is responsible for issuing this certification.

At the beginning of 2009, many CWA section 404 surface coal mining permit applications for operations in Appalachian states, including West Virginia, had been pending for over a year because of litigation and other issues, creating a backlog. A case challenging the adequacy of the Corps' analysis of environmental impacts on several section 404 permits was decided in the Corps' favor in February 2009.[8] In March 2009, at EPA's request, the Corps identified 48 pending permit applications that it anticipated would reach permitting decisions within 60 days. EPA reviewed these 48 applications and identified 6 for which it had substantial environmental concerns. The Corps processed the other 42 in accordance with existing procedures. For the 6 permit applications of concern, as of August 11, 2010, the Corps had issued section 404 permits for 2, EPA and the Corps were still reviewing 3, and the applicant had withdrawn 1. For the other 42

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[4]OSM approved West Virginia's SMRCA State Program in 1981.

[5]EPA authorized West Virginia's section 402 permit program in 1982. In 2009, EPA was petitioned under the CWA by citizens in West Virginia to withdraw the state's section 402 program based on concerns regarding permitting of mining activities.

[6]33 U.S.C. § 1344(c) (2006). The Administrator is authorized to prohibit the specification (including the withdrawal of specification) of any defined area as a disposal site, and he is authorized to deny or restrict the use of any defined area for specification (including the withdrawal of specification) as a disposal site in certain circumstances.

[7]33 U.S.C. § 1341 (2006).

[8]Ohio Valley Envtl. Coalition v. Aracoma Coal Co., 556 F.3d 177 (4th Cir. 2009).

permit applications, the Corps issued permits for 28, 3 were withdrawn, 7 were withdrawn but later resubmitted, and 4 were pending, as of September 3, 2010.

After EPA completed its review of these 48 permit applications, it, along with the Corps, worked together to develop enhanced coordination procedures (ECP) to review the remaining backlog of pending section 404 permit applications for the Appalachian states. The ECP was included as an element of an interagency action plan announced on June 11, 2009, through a memorandum of understanding signed by EPA, the U.S. Army, and Interior.[9] As the ECP states, its purpose is to

- expedite review and final decisions regarding pending section 404 permit applications for surface coal mining in Appalachia for which the Corps had issued a public notice or coordinated with EPA as of March 31, 2009;
- provide the timely resolution of issues for those permit applications about which EPA has raised substantial environmental concerns;
- ensure effective coordination among the agencies and consistent compliance with applicable CWA provisions, regulations, and relevant policy; and
- provide additional transparency to the public during the period the ECP is in effect.

In order to facilitate timely resolution of permit applications subject to the ECP, Corps districts and EPA regions are to discuss applications identified as requiring additional review and coordination before the beginning of the formal 60-day review process to reduce the total time necessary to reach agreement on each permit. When the Corps believes it has received complete information from the applicant, it is to provide written notice to the relevant EPA region to begin the 60-day review process. Upon receipt of notification from the Corps, each district and region is to begin immediately to discuss permit applications EPA has identified as having remaining concerns in an effort to reach timely resolution. If more time is needed, EPA or the Corps may seek a 15-day extension to the 60-day review process. Should the Corps choose to issue a section 404 permit after the 60-day review period ends, even if issues remain unresolved with EPA, the Corps will provide EPA, within 10 days, a written notice explaining how the Corps is

[9]U.S. Department of the Army, U.S. Department of the Interior, and U.S. Environmental Protection Agency, *Memorandum of Understanding Among the U.S. Department of the Army, U.S. Department of the Interior, and U.S. Environmental Protection Agency Implementing the Interagency Action Plan on Appalachian Surface Coal Mining*, Jun. 11, 2009. Lawsuits have been filed by the National Mining Association and the state of West Virginia that, among other things, challenge the ECP and an EPA guidance document concerning the review of surface coal mining operations under the CWA and other standards. National Mining Association v. Lisa Jackson, No. 1:10-cv-01220 (D. D.C. filed July 20, 2010); Randy C. Huffman v. United States Environmental Protection Agency, No. 2:10-cv-01189 (N.D. W. Va. filed October 6, 2010). Pursuant to its long-standing policy of not addressing issues in ongoing litigation, GAO has not evaluated the parties' claims and has not come to any conclusions on any matters in dispute in the pending cases.

responding to EPA's concerns.[10] Within 10 days of receiving the Corps' written notice, EPA is to decide whether it intends to veto or restrict a permit under its CWA section 404(c) authority or to allow the Corps to proceed with its permit decision.[11]

In this context, you asked us to determine (1) the number of surface coal mining permit applications at each stage of the ECP review process, (2) the extent to which EPA Region 3 and the Corps' Huntington District are coordinating during the stages of the review process, (3) how EPA has communicated the requirements an applicant needs to meet to receive a CWA section 404 permit in West Virginia, and (4) what EPA and the Corps' plans are for processing new permit applications that were not among those listed as of June 11, 2009. Our review focused on the Corps' Huntington District and EPA Region 3 based on congressional interest.

On September 16, 2010, we briefed your staff on the preliminary results of our work. This letter summarizes the information presented in that briefing and officially transmits the final briefing slides. (See encl. I.) This letter also provides additional information that your staff requested during the briefing on the status of the 28 CWA section 404 permit applications at the Corps' Huntington District undergoing the ECP review. (See encl. II.)

Summary

As of August 11, 2010, for the 79 CWA section 404 permit applications on the final ECP list, the Corps had issued permits for 6 applications, 1 application was undergoing the 60-day ECP review process, 36 applications were awaiting the start of this process, and 36 applications had been withdrawn. Federal agencies took the following steps to develop the final ECP list that EPA published on September 30, 2009. First, at the request of EPA and other federal agencies, the Corps initially identified a list of 108 permit applications at various stages of review for which it had issued a public notice or coordinated with EPA, as of March 31, 2009, that needed additional evaluation. According to Corps officials, this list was developed quickly and contained 31 permit applications that the Corps and EPA subsequently decided should not be considered for the ECP. As a result, the two agencies removed the 31 applications and added 2, reducing the final ECP list to 79 applications. EPA worked to develop a consistent approach for reviewing these applications to determine if they should be subject to the ECP review process. To make this determination, EPA used its Multi-criteria Integrated Resource Assessment (MIRA) tool to assess the 79 applications against four general areas of concern, which it derived from regulations: (1) minimization and avoidance of impacts to aquatic resources, (2) water quality impacts, (3)

[10]According to Corps officials, responses may include revisions, special conditions, and mitigation requirements.

[11]EPA has not yet vetoed any permit subject to the ECP.

cumulative impacts, and (4) mitigation measures.[12, 13] EPA concluded that all 79 applications had at least one area of concern, and it therefore included all 79 in the final ECP list that it published on September 30, 2009.[14] Of these 79 applications, the Corps' Huntington District is responsible for reviewing 28. As of August 11, 2010, the Corps' Huntington District had issued permits for 5 applications, 15 applications were awaiting the start of the 60-day ECP review process, and 8 applications had been withdrawn. (See encl. II for more details on these 28 permits.) For one of the eight applications that had been withdrawn, the applicant redesigned the operation, reapplied, and received a section 404 permit outside of the ECP process, and an additional three are redesigning their applications and will be reapplying for a section 404 permit, according to the Corps' Huntington District.

We could not evaluate the extent to which EPA Region 3 and the Corps' Huntington District had coordinated throughout the ECP review process because documentation of coordination efforts is limited and varies. For example, EPA did not document the concerns it presented to the applicants during the initial ECP meetings. Therefore, we could not comprehensively assess the applicant-specific concerns and had to rely on the notes that Corps officials took during the meetings. In addition, EPA and Corps officials sometimes met separately with applicants, but we could not ascertain the extent to which the agencies shared the information discussed during the meetings. According to the ECP, coordination between EPA and the Corps is to occur prior to and during the 60-day review process. No time limit has been established for coordination that occurs prior to the start of the 60-day review process, but EPA and Corps officials indicated that the majority of the effort to resolve concerns about an application occurs at this time. To coordinate their reviews of permit applications, officials at EPA Region 3 and the Corps' Huntington District told us that they have been relying on the following mechanisms:

- **Initial ECP meetings.** EPA, the Corps, WVDEP, and other agencies met with each applicant in January and February 2010. EPA presented its concerns to the applicant and requested that the applicant provide additional information to address these concerns.

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[12]MIRA is a tool that EPA has developed to help decision makers make more informed environmental decisions that include stakeholder concerns. It helps decision makers organize and rank decision criteria or indicators, link data to a policy decision, determine the relative importance of decision criteria, and explore alternative decision options.

[13]These regulations, known as the 404(b)(1) guidelines, can be found at 40 C.F.R. Part 230.

[14]According to EPA officials, all applications on the ECP list have been pending since the previous administration ended in January 2009, and several have been pending since 2004.

- **Monthly meetings.** Two days at the beginning of each month have been reserved for applicants to meet with all relevant federal and state agencies and to present new information to address their concerns.

- **Intermittent coordination.** Formal coordination, such as the Corps' notice to EPA to start the 60-day review process and EPA's final letters to the Corps, as well as informal coordination, such as e-mails, phone calls, and other meetings, are also used, as needed, to address identified concerns.

While we were unable to evaluate the extent of the coordination occurring between EPA Region 3 and the Corps' Huntington District, federal, state, and industry stakeholders with whom we spoke raised a number of concerns about the effectiveness of this coordination. First, officials and stakeholders said that coordination is hindered because EPA does not send decision makers to monthly meetings. Officials from the Corps and WVDEP and representatives from the West Virginia coal industry expressed frustration over EPA's failure to send officials who are authorized to make decisions about proposals that applicants present at the monthly meetings to address EPA's concerns. Second, according to WVDEP and Corps officials and industry representatives, changes made in response to EPA's concerns on a section 404 permit application often require changes to operations already approved under CWA section 402 or SMCRA permits. This results in the need for additional coordination among EPA, the Corps, applicants, and WVDEP. This additional coordination can sometimes add to the time and cost of obtaining a section 404 permit. For example, officials and industry representatives expressed concern that EPA is seeking to influence how fills are constructed, which is regulated by WVDEP under SMCRA. EPA officials, however, told us that they believe that coordination under the ECP has been regular and effective and that the additional coordination has resulted in surface coal mining projects with reduced environmental, water quality, and human health effects consistent with the requirements of the CWA. EPA officials also stated that some project costs have been reduced as a result of this coordination.

According to EPA officials, the agency communicates the requirements of section 404 and its associated data and information needs to permit applicants in West Virginia through the agency's regulations and guidance, by publishing the results of scientific studies and programmatic reviews, by contacting the applicant directly, and by placing information on its Web site. Specifically, according to EPA officials, the 404(b)(1) Guidelines formed the basis of the four areas of concern that the agency used to assess the 79 permit applications. In addition, EPA's April 1, 2010, Guidance further clarifies EPA's roles and expectations in reviewing CWA section 404 and section 402 permit applications and reflects evolving science on conductivity and review of states'

water quality permit programs.[15,16] EPA also communicates its data and information needs by referencing the results of scientific studies, such as federal studies examining elevated conductivity and selenium levels downstream from the surface coal mining activities that identified levels at which aquatic life is impaired, and programmatic reviews, such as its 2010 review of states' water quality permit programs, which identified weaknesses in states' CWA section 402 programs.[17] Furthermore, EPA answers applicants' questions directly through letters, meetings, phone calls, and e-mails, and posts information on how to apply for a section 404 permit on its Web site. Despite EPA's efforts, representatives of WVDEP and mining companies in West Virginia stated that EPA does not clearly communicate all the information the agency needs to satisfy its concerns for a particular application. As a result, they are frustrated by EPA's repeated requests for additional information and the uncertainty about the actions needed to obtain a permit. WVDEP and industry representatives told us that the uncertainty over the application process is further exacerbated by EPA's assertion that lessons learned from applicants' experiences cannot be transferred to other applicants. In response to these statements, EPA officials told us that the section 404 permitting process and the 404(b)(1) Guidelines require a case-by-case, detailed look at each permit application to reduce environmental, water quality, and human health impacts. EPA officials also stated that while some applicants have resisted opportunities to coordinate with the agencies about reducing project impacts and complying with the law, other applicants have effectively collaborated with EPA and the Corps to achieve positive permit outcomes.

For new permit applications that were not among those listed for the ECP, as of June 11, 2009, the federal agencies are coordinating and reviewing permit applications in accordance with the standard procedures that were in effect prior to implementation of the ECP process. These procedures are described in 33 C.F.R. Part 325, which describes the Corps' permit application review process, and a memorandum of agreement between EPA and the Department of the Army, pursuant to CWA Section 404(q), which describes the procedures for EPA and the Corps to follow when coordinating their reviews of section 404 permit

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[15]U.S. Environmental Protection Agency, *Detailed Guidance: Improving EPA Review of Appalachian Surface Coal Mining Operations under the Clean Water Act, National Environmental Policy Act, and the Environmental Justice Executive Order* (Washington, D.C.: Apr. 1, 2010). According to EPA, this guidance was developed in response to requests from states, congressional representatives, and industry.

[16]Conductivity is a measure of the ability of water to pass an electrical current. Conductivity in water is affected by the presence of inorganic dissolved solids, such as aluminum, calcium, chloride, iron, magnesium, nitrate, phosphate, sodium, and sulfate. EPA's April 1, 2010, Guidance states that numerous studies have shown that high levels of conductivity are a cause of water quality impairments downstream from mine discharges.

[17]Selenium is a chemical element associated with mine run-off. EPA's April 1, 2010, Guidance states that studies have shown that ecological losses downstream of coal mining valley fills are associated with increased levels of selenium.

applications.[18] While the procedures have not changed, in the post-ECP environment, EPA officials told us, they will now be fully exercising the agency's review authority consistent with the law, which EPA had not done consistently prior to the ECP. Accordingly, EPA officials told us, their reviews will now increasingly focus on water quality, including the evolving science on conductivity and selenium; public health, including drinking water; reducing cumulative impacts; and minimizing and avoiding impacts. In West Virginia, to help facilitate coordination among stakeholders, the Corps and EPA hold monthly pre-application meetings that are attended by WVDEP personnel to allow applicants to discuss their permit applications with federal and state agencies to help expedite the review process.

Agency Comments

We provided a draft of the enclosed briefing slides to the Corps, EPA, and OSM, and provided relevant portions of the slides to WVDEP and the West Virginia Coal Association. We also provided a draft of the additional information you requested at our September 16, 2010, briefing to the Corps for its review and comment. (See encl. II.) OSM and the West Virginia Coal Association provided no comments. In oral comments, EPA officials stated that coordination under the ECP has been regular and effective, and that the additional coordination has resulted in surface coal mining projects with reduced environmental, water quality, and human health effects consistent with the requirements of the CWA. EPA officials also told us that the section 404 permitting process and the 404(b)(1) Guidelines require a case-by-case, detailed look at each permit application, but applicants vary in their efforts to effectively collaborate with agency officials. We incorporated EPA's oral comments into this letter and updated the slides. The Corps, EPA, and WVDEP also provided technical comments, which we incorporated as appropriate.

Scope and Methodology

To determine the permit requirements for surface coal mining operations in Appalachia and the ECP and post-ECP review processes, we reviewed legislation, regulations, guidance, and interagency agreements, and spoke with officials at the Corps, EPA, OSM, and WVDEP, as well as with industry representatives. To determine the number of surface coal mining permit applications at each stage of the ECP review process, we obtained a status update of the 79 CWA section 404 permit applications from Corps' headquarters officials. We also conducted a detailed review of the Corps' Huntington District and EPA Region 3's review of ECP applications and confirmed the status of the 28 applications in the Corps' Huntington District with district officials and officials from EPA Region 3. The Corps' Huntington District was responsible for reviewing 35 percent of permit applications on the ECP list. The information presented on the Huntington District is not generalizable to the entire population of ECP permit applications.

[18] 33 U.S.C. § 1344(q) (2006).

To determine the extent to which EPA Region 3 and the Corps' Huntington District are coordinating and how EPA is communicating the requirements an applicant needs to meet to receive a section 404 permit in West Virginia, we met with officials from the Corps' Huntington District, EPA Region 3, WVDEP, Interior's OSM in West Virginia, and West Virginia Coal Association. We reviewed examples of coordination and communication, including withdrawal letters, documentation of ECP meetings, e-mails and notes documenting additional discussions with applicants, and letters requesting information from applicants.

We conducted this performance audit from May through October 2010, in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

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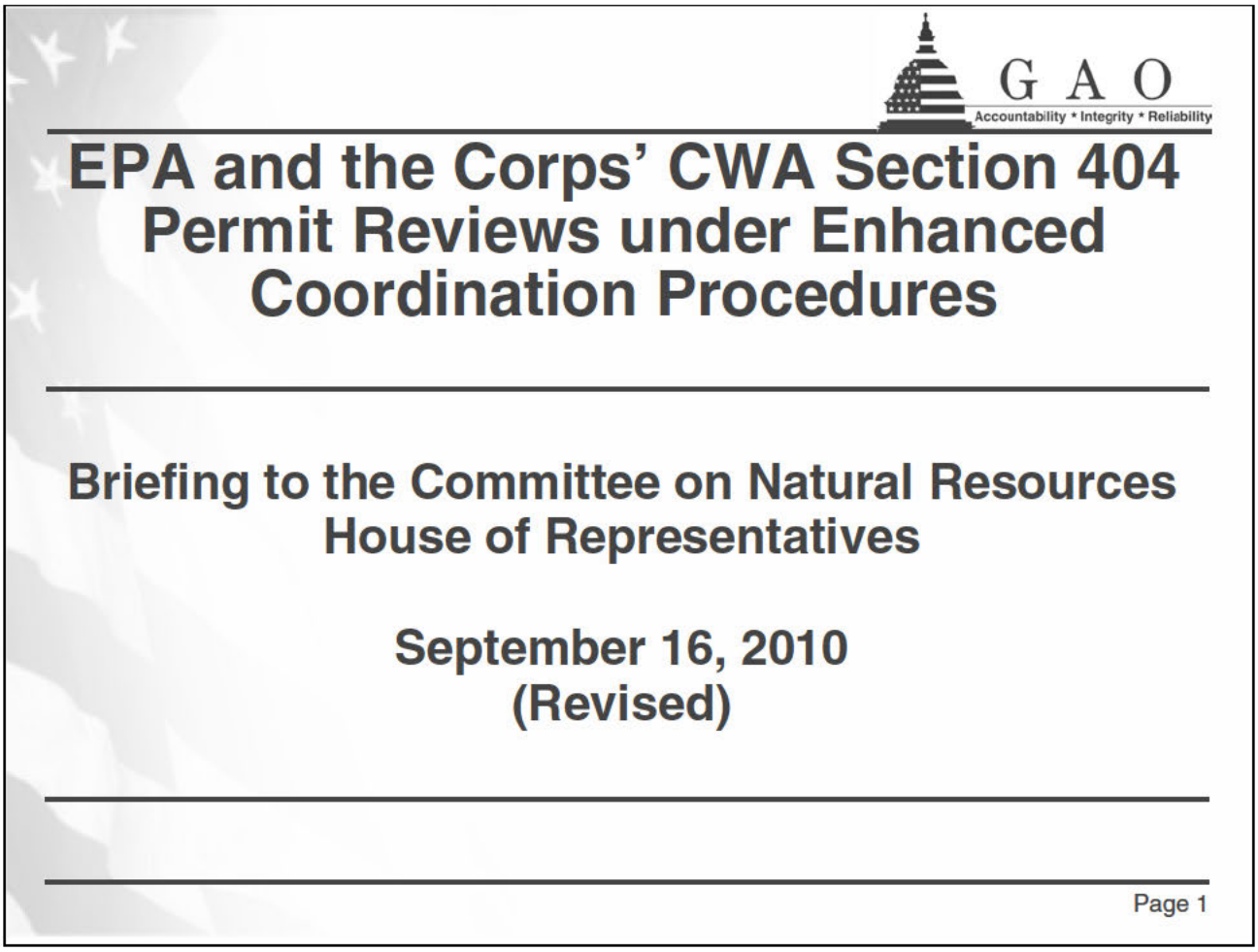
As agreed with your office, unless you publicly announce the contents of this report earlier, we plan no further distribution until 30 days from the report date. At that time, we will send copies of this report to the appropriate congressional committees, Secretaries of Defense and of the Interior, Administrator of the Environmental Protection Agency, Secretary for the West Virginia Department of Environmental Protection, and other interested parties. In addition, the report will be available at no charge on the GAO Web site at http://www.gao.gov.

If you or your staff have any questions about this report, please contact me at (202) 512-3841 or mittala@gao.gov. Contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page of this report. Major contributors to this report were Andrea Wamstad Brown (Assistant Director), Antoinette Capaccio, Stephen Cleary, Cheryl Harris, Richard Johnson, Rebecca Shea, and Carol Herrnstadt Shulman.

Sincerely yours,

Anu K. Mittal
Director, Natural Resources and Environment

Enclosures--2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EPA and the Corps' CWA Section 404 Permit Reviews under Enhanced Coordination Procedures
Briefing to the Committee on Natural Resources House of Representatives
September 16, 2010 (Revised)
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Background – Permits and Certifications Required for Surface Coal Mining Operations in West Virginia

- **Surface Mining Control and Reclamation Act (SMCRA) permit.**
  - West Virginia Department of Environmental Protection (WVDEP) administers the permit program, subject to Interior's Office of Surface Mining Reclamation and Enforcement's (OSM) finding that the state program is in accordance with federal law.
  - OSM annually evaluates how well the state program is administered.
- **Clean Water Act (CWA) section 402 permit if the operation discharges pollutants into the waters of the United States.**
  - WVDEP administers the permit program, subject to EPA's authorization of the state's program.
  - EPA may review proposed state-issued permits and object to the issuance of a permit.
- **CWA section 404 permit if the operation discharges dredged or fill material into the waters of the United States.**
  - The Corps is responsible for making permit decisions and issuing permits.
  - EPA may prohibit, withdraw, deny or restrict permits.
- **State certification under CWA section 401 that any discharges into the waters of the United States resulting from activities conducted under a federal permit, including a section 404 permit, will comply with water quality standards.**
  - WVDEP issues the certification.

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Background – Enhanced Coordination Procedures (ECP)

- ECP's stated purpose is to:
  - expedite review and final decisions regarding pending section 404 permit applications for surface coal mining in Appalachia for which the Corps had issued a public notice or coordinated with EPA as of March 31, 2009,
  - provide timely resolution of issues for those permit applications about which EPA has raised substantial environmental concerns,
  - ensure effective coordination among the agencies and consistent compliance with applicable CWA provisions, regulations, and relevant policy, and
  - provide additional transparency to the public during the period the ECP is in effect.
- ECP is an element of an interagency action plan announced on June 11, 2009, through a memorandum of understanding signed by EPA, the U.S. Army, and Interior.

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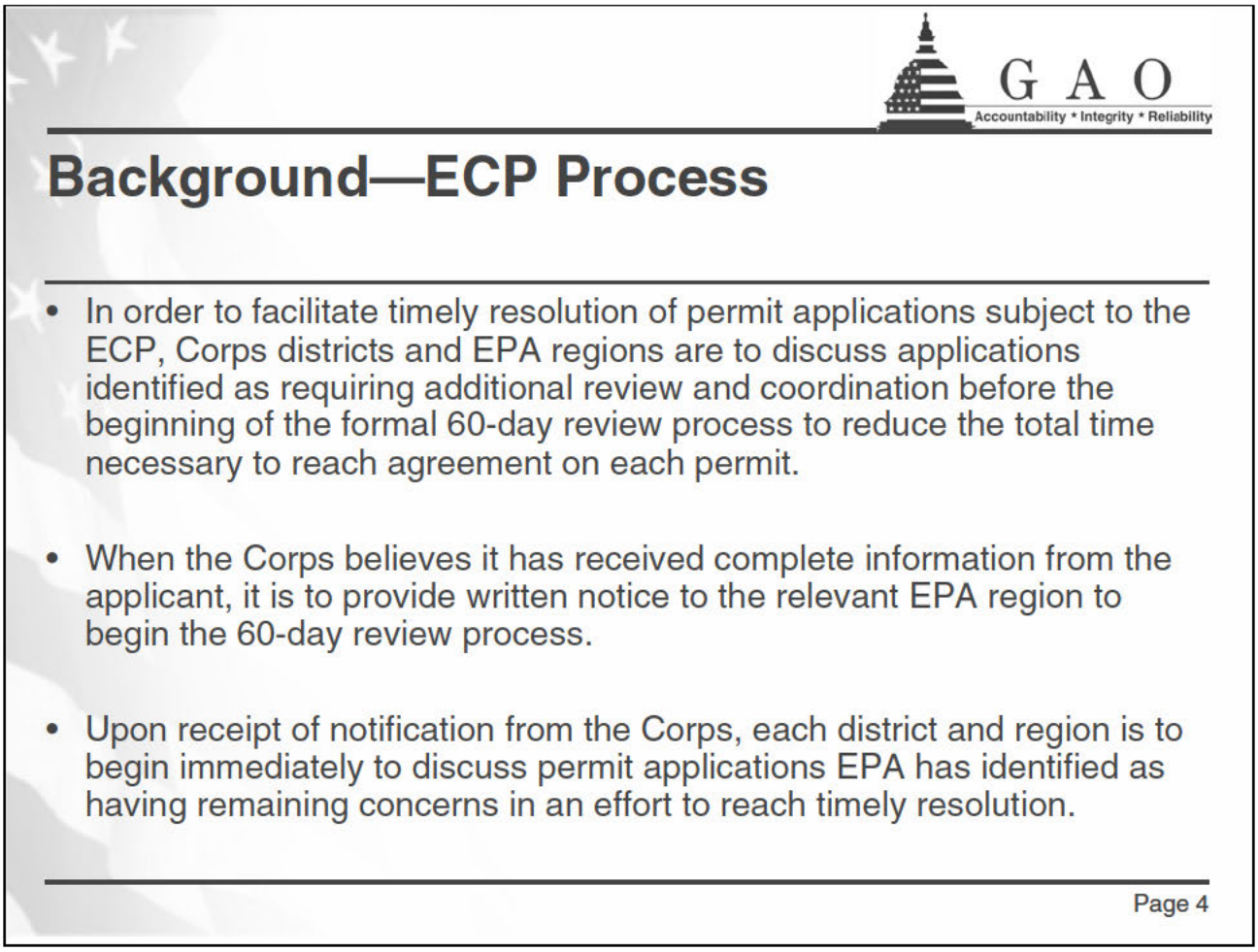
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Background—ECP Process
• In order to facilitate timely resolution of permit applications subject to the ECP, Corps districts and EPA regions are to discuss applications identified as requiring additional review and coordination before the beginning of the formal 60-day review process to reduce the total time necessary to reach agreement on each permit.
• When the Corps believes it has received complete information from the applicant, it is to provide written notice to the relevant EPA region to begin the 60-day review process.
• Upon receipt of notification from the Corps, each district and region is to begin immediately to discuss permit applications EPA has identified as having remaining concerns in an effort to reach timely resolution.
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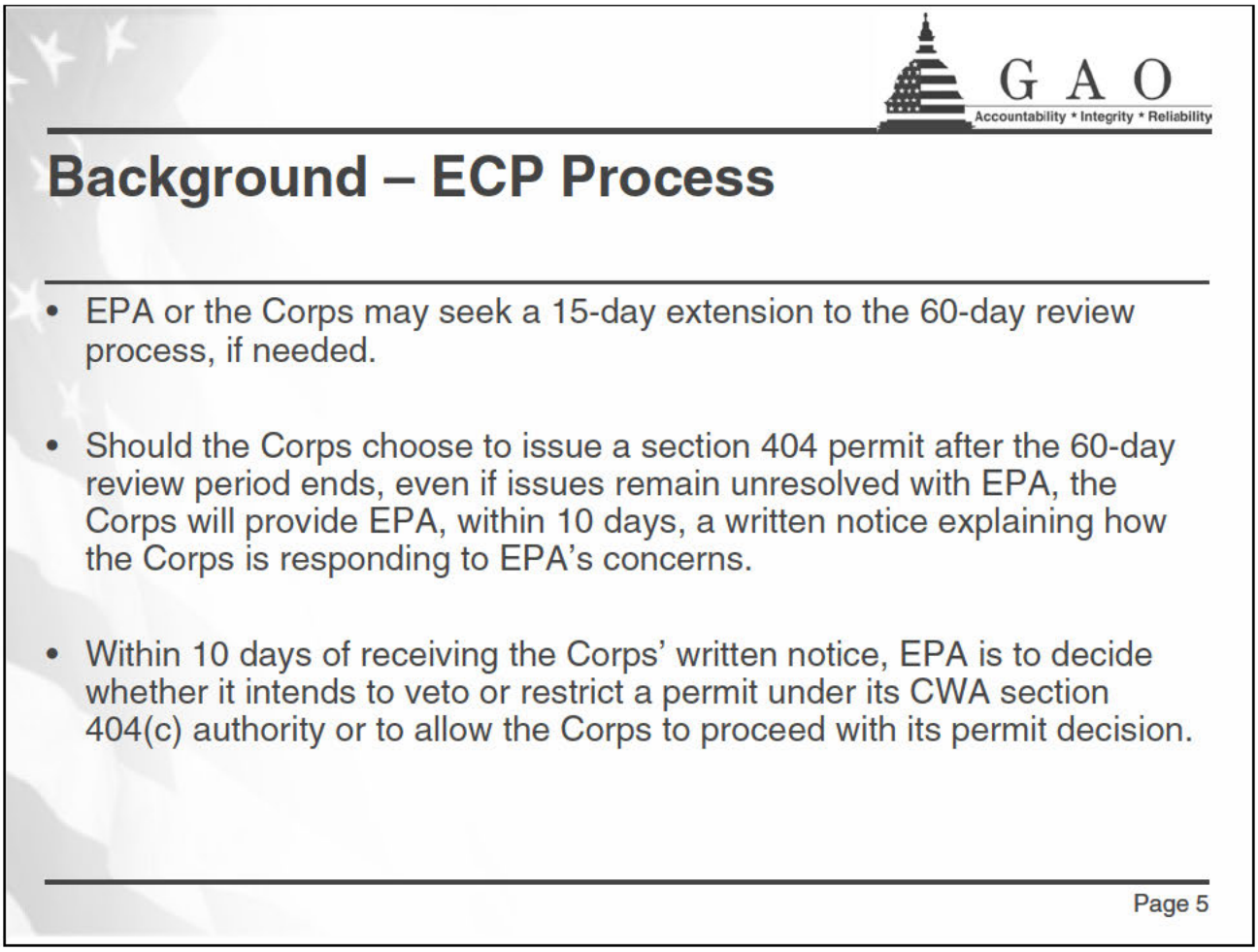
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Background – ECP Process
• EPA or the Corps may seek a 15-day extension to the 60-day review process, if needed.
• Should the Corps choose to issue a section 404 permit after the 60-day review period ends, even if issues remain unresolved with EPA, the Corps will provide EPA, within 10 days, a written notice explaining how the Corps is responding to EPA's concerns.
• Within 10 days of receiving the Corps' written notice, EPA is to decide whether it intends to veto or restrict a permit under its CWA section 404(c) authority or to allow the Corps to proceed with its permit decision.
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Background – Events Leading Up to ECP

- At the beginning of 2009, many CWA section 404 surface coal mining permit applications for operations in Appalachian states, including West Virginia, had been pending for over a year as a result of litigation and other issues, creating a backlog.
- A case challenging the adequacy of the Corps' analysis of environmental impacts on several section 404 permits was decided in the Corps' favor in February 2009. In March 2009, at EPA's request, the Corps identified 48 pending permit applications that it anticipated would reach permitting decisions within 60 days.
- EPA reviewed these 48 applications and identified 6 for which it had substantial environmental concerns. The Corps processed the other 42 in accordance with existing procedures.

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Background – Events Leading Up to ECP

- Status of the 6 permit applications of concern, as of August 11, 2010:
  - **2 applications:** The Corps had issued section 404 permits.
  - **3 applications:** EPA and the Corps continue to review.
  - **1 application:** Withdrawn by the applicant.
- For the other 42 permit applications: The Corps issued permits for 28, 3 were withdrawn, 7 were withdrawn and resubmitted, and 4 were pending, as of September 3, 2010.

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Objectives

1. How many surface coal mining permit applications are at each stage of the ECP review process?
2. To what extent are EPA Region 3 and the Corps' Huntington District coordinating during the stages of the review process?
3. How has EPA communicated the requirements an applicant needs to meet to receive a CWA section 404 permit in West Virginia?
4. What are EPA and the Corps' plans for processing new permit applications that were not among those listed as of June 11, 2009?

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Scope and Methodology

- Reviewed legislation, regulations, guidance, and interagency agreements.
- Focused on the Corps' Huntington District and EPA Region 3 based on congressional interest—35% of permit applications on the ECP list; information not generalizable to all ECP permit applications:
  - Obtained status update of CWA section 404 permit applications from the Corps. Confirmed status information with officials from the Corps' Huntington District and EPA Region 3.
  - Met with officials from the Corps' Huntington District, EPA Region 3, WVDEP, Interior's OSM in West Virginia, and West Virginia Coal Association.
  - Reviewed examples of coordination and communication, including withdrawal letters, documentation of ECP meetings, e-mails and notes documenting additional discussions with applicants, and letters requesting information from applicants.

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Objective 1: Applications at Each Stage of ECP Review Process

- At the request of EPA and other federal agencies, the Corps initially identified a list of 108 permit applications at various stages of review for which it had issued a public notice or coordinated with EPA, as of March 31, 2009, that needed additional evaluation.
- According to Corps officials, the initial list of 108 permit applications was developed quickly and contained several permit applications that should not have been considered for review under the ECP process.
- As a result, the Corps and EPA removed 31 applications and added 2 applications, reducing the ECP list to 79 applications.

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Objective 1: Applications at Each Stage of ECP Review Process

How the Corps and EPA Reduced the List of 108 CWA Section 404 Permit Applications to 79 Applications

Initial total	**108**
Permit application was subsequently withdrawn by the mining company	-14
Permit issuance was imminent and occurred prior to, or concurrent with, the publication of the list	-8
An ongoing enforcement action precluded a permit decision	-3
Permit application was not complete	-1
Underground mining operations EPA determined were inappropriate for ECP	-5
Additional applications added to the original list	+2
Final total number of applications to be considered for ECP	**79**

Source: GAO analysis of Corps' data.

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Objective 1: Applications at Each Stage of ECP Review Process

- EPA regions 3, 4, and 5 worked to develop a consistent approach for reviewing the 79 applications to determine if they should be subject to the ECP review process.
- EPA used its Multi-criteria Integrated Resource Assessment (MIRA) tool to assess the 79 applications against four general areas of concern which it derived from regulations:
    - Minimization and avoidance of impacts to aquatic resources
    - Water quality impacts
    - Cumulative impacts
    - Mitigation measures
- All 79 applications had at least 1 area of concern and were therefore included in the final ECP list that EPA published on September 30, 2009.

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Objective 1: Applications at Each Stage of ECP Review Process

Number of CWA Section 404 Permit Applications at Each Stage of ECP, by Corps District, as of August 11, 2010

	Status				
Corps district	Application withdrawn	Application awaiting start of 60-day review process	Application undergoing 60-day review process	Permit issued for application	Total
Huntington[a]	8	15	0	5	28
Louisville[a]	24	21	1	0	46
Nashville	2	0	0	1	3
Pittsburgh	2	0	0	0	2
Total	**36**	**36**	**1**	**6**	**79**

Source: GAO analysis of Corps' data.

[a]Three permit applications for operations located in Kentucky that were originally filed in the Corps' Huntington District were transferred to its Louisville District. One of these permit applications has been withdrawn and two are awaiting the start of the 60-day review process.

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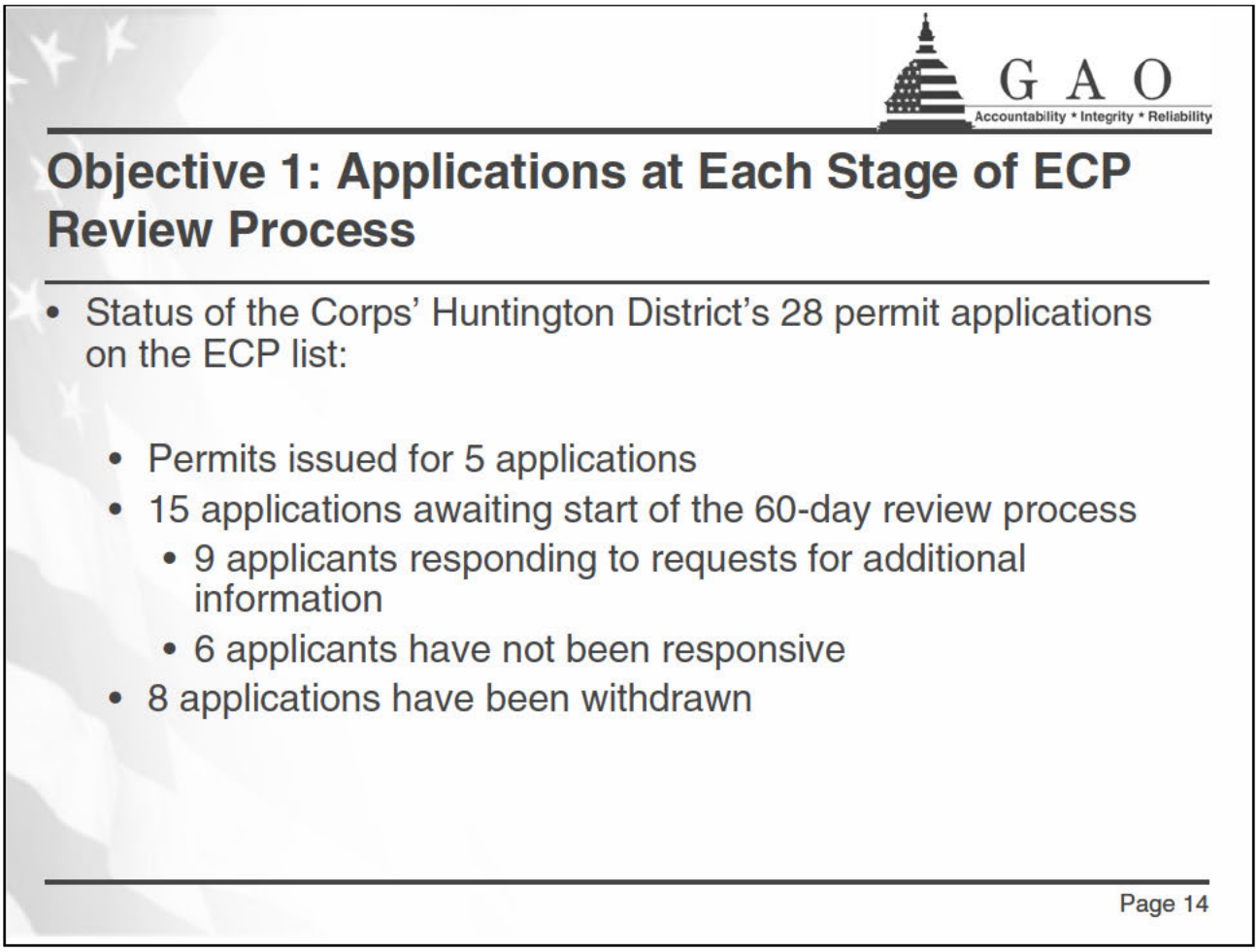
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Objective 1: Applications at Each Stage of ECP Review Process
• Status of the Corps' Huntington District's 28 permit applications on the ECP list:
• Permits issued for 5 applications
• 15 applications awaiting start of the 60-day review process
• 9 applicants responding to requests for additional information
• 6 applicants have not been responsive
• 8 applications have been withdrawn
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Objective 1: Applications at Each Stage of ECP Review Process

- Applicants decided to redesign and resubmit 4 of the 8 withdrawn applications at the Huntington District:
  - 1 applicant was issued a section 404 permit outside of the ECP process
  - 3 applicants are still in process of resubmitting applications for review
- 2 of the 8 withdrawn applications were administratively withdrawn by the Corps because requested information had not been received
- 2 others were withdrawn by the Corps at the request of the applicant

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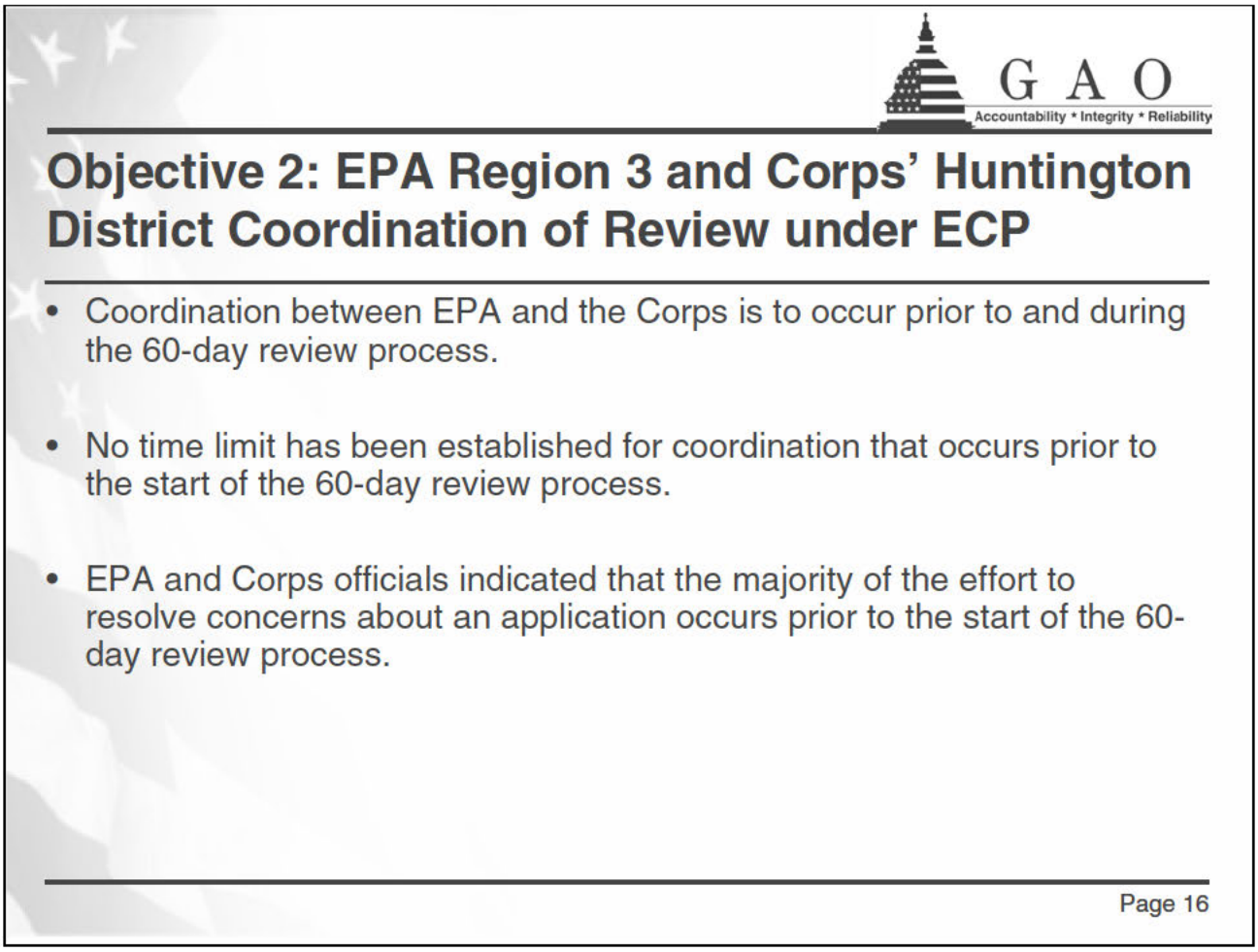
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Objective 2: EPA Region 3 and Corps' Huntington District Coordination of Review under ECP
• Coordination between EPA and the Corps is to occur prior to and during the 60-day review process.
• No time limit has been established for coordination that occurs prior to the start of the 60-day review process.
• EPA and Corps officials indicated that the majority of the effort to resolve concerns about an application occurs prior to the start of the 60-day review process.
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Objective 2: EPA Region 3 and Corps' Huntington District Coordination of Review under ECP

- EPA Region 3 and Corps' Huntington District officials told us that they have been relying on a variety of coordination mechanisms:
  - **Initial ECP meetings**—EPA, the Corps, WVDEP, and other agencies met with each applicant in January and February 2010. EPA presented its concerns to the applicant and requested the applicant provide additional information to address these concerns.
  - **Monthly meetings**—Two days at the beginning of each month have been reserved for applicants to meet with all relevant federal and state agencies and to present new information to address their concerns.
  - **Intermittent coordination**—Formal coordination, such as the Corps' notice to EPA to start the 60-day review process and EPA's final letters to the Corps, as well as informal coordination, such as e-mails, phone calls, and other meetings, as needed to address identified concerns.

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Objective 2: EPA Region 3 and Corps' Huntington District Coordination of Review under ECP

- We could not evaluate the extent to which EPA Region 3 and the Corps' Huntington District had coordinated throughout the process because documentation of coordination efforts is limited and varies.
  - EPA did not document the concerns it presented to the applicants during the initial ECP meetings. Therefore, we could not comprehensively assess the applicant-specific concerns and had to rely on the notes that Corps officials took during the meetings.
  - EPA and Corps officials sometimes meet separately with applicants, but we could not ascertain the extent to which the agencies shared the information discussed during the meetings.

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Objective 2: EPA Region 3 and Corps' Huntington District Coordination of Review under ECP

- Officials and stakeholders said that coordination is hindered because EPA does not send decision makers to monthly meetings. Officials from the Corps and WVDEP and representatives from the West Virginia coal industry expressed frustration over EPA's failure to send officials who are authorized to make decisions about proposals that applicants present at monthly meetings to address EPA's concerns.
- According to WVDEP and Corps officials and industry representatives, changes made in response to EPA's concerns on a section 404 permit application often require changes to operations already approved under CWA section 402 or SMCRA permits. This results in the need for additional coordination among EPA, the Corps, applicants, and WVDEP. This additional coordination can sometimes add to the time and cost of obtaining a section 404 permit. For example, officials and industry representatives expressed concern that EPA is seeking to influence how fills are constructed, which is regulated by WVDEP under SMCRA.
- EPA officials, however, told us they believe that coordination under the ECP has been regular and effective and that the additional coordination has resulted in surface coal mining projects with reduced environmental, water quality, and human health effects consistent with the requirements of the CWA. EPA officials also stated that some project costs have been reduced as a result of this coordination.

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Objective 3: EPA's Communication of Section 404 Requirements to Applicants in West Virginia

- According to EPA, it communicates the requirements of section 404 and its associated data and information needs to permit applicants in 3 ways:

  1. Regulations and agency guidance, such as:

     - 404(b)(1) Guidelines—these regulations form the basis of EPA's four areas of concern

     - April 1, 2010, Guidance—further clarifies EPA's roles and expectations in reviewing CWA section 404 and section 402 permit applications and reflects evolving science on conductivity and review of states' water quality permit programs

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Objective 3: EPA's Communication of Section 404 Requirements to Applicants in West Virginia

2. Results of studies, such as:
   - Federal studies examining elevated conductivity and selenium levels downstream from the surface coal mining activities—identified levels at which aquatic life is impaired
   - 2010 EPA review of states' water quality permit programs—identified weaknesses in states' programs under CWA section 402
3. Letters, meetings, phone calls, e-mails, and the agency's Web site

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Objective 3: EPA's Communication of Section 404 Requirements to Applicants in West Virginia

- However, representatives of WVDEP and mining companies in West Virginia stated that EPA does not clearly communicate all the information it needs to satisfy its concerns for a particular application. As a result, they are frustrated by EPA's repeated requests for additional information and the uncertainty about the actions needed to obtain a permit.
- WVDEP and industry representatives told us that the uncertainty over the application process is further exacerbated by EPA's assertion that lessons learned from applicants' experiences cannot be transferred to other applicants.
- In response to these statements, EPA officials told us that the section 404 permitting process and the 404(b)(1) Guidelines require a case-by-case, detailed look at each permit application to reduce environmental, water quality, and human health impacts. While some applicants have resisted opportunities to coordinate with the agencies about reducing project impacts and complying with the law, other applicants have effectively collaborated with EPA and the Corps to achieve positive permit outcomes.

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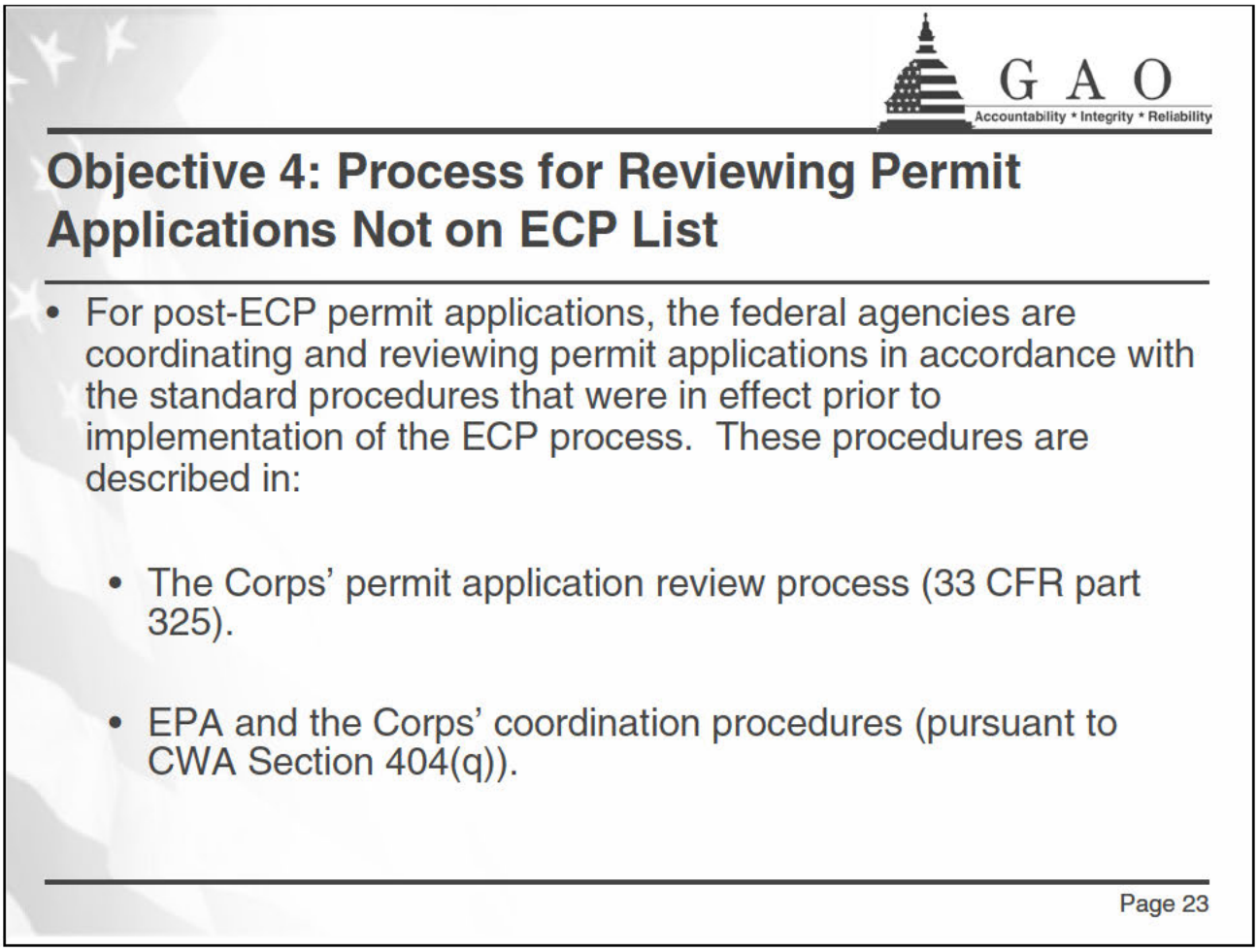
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Objective 4: Process for Reviewing Permit Applications Not on ECP List
• For post-ECP permit applications, the federal agencies are coordinating and reviewing permit applications in accordance with the standard procedures that were in effect prior to implementation of the ECP process. These procedures are described in:
• The Corps' permit application review process (33 CFR part 325).
• EPA and the Corps' coordination procedures (pursuant to CWA Section 404(q)).
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Objective 4: Process for Reviewing Permit Applications Not on the ECP List

- However, in the post-ECP environment, EPA officials told us, they will now be fully exercising the agency's review authority consistent with the law, which EPA had not done consistently prior to the ECP.
- Accordingly, EPA officials told us, their reviews will now increasingly focus on:
  - water quality, including evolving science on conductivity and selenium;
  - public health, including drinking water;
  - reducing cumulative impacts; and
  - minimizing and avoiding impacts.
- In West Virginia, the Corps and EPA hold monthly pre-application meetings that are attended by WVDEP personnel to allow applicants to discuss their permit applications with federal and state agencies to help expedite the review process.

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Status of the 28 Clean Water Act Section 404 Permit Applications at the Corps' Huntington District, as of August 11, 2010

Application number	Applicant	Project name	County	State	Status
Permits issued for application (5)					
LRH-2004-01152	Buckingham Coal	Buckingham Wash Plant	Perry	OH	Permit issued on 10/26/2009.
LRH-2005-01385	Oxford Mining Company, LLC	Halls Knob	Guernsey	OH	Permit issued on 7/12/2010.
LRH-2007-01021	Oxford Mining Company, LLC	Kaiser Mathias	Tuscarawas	OH	Permit issued on 3/8/2010.
LRH-2008-00791	Hobet Mining	Surface Mine No. 45	Lincoln	WV	Permit issued on 1/6/2010.
LRH-2008-00830	CoalMac, Inc.	Pine Creek Surface Mine	Logan	WV	Permit issued on 7/27/2010.
Applications awaiting start of 60-day ECP review process (15)					
LRH-2005-00217	Bluestone	Contour Auger 1	Wyoming	WV	Application awaiting start of 60-day review process, but applicant has not responded to requests for additional information.
LRH-2005-01115	Green Valley Coal Company	Blue Branch Refuse	Nicholas	WV	Application awaiting start of 60-day review process, and applicant responding to requests for additional information.
LRH-2005-01198	Consol	Taywood West & Marrowbone	Mingo	WV	Application awaiting start of 60-day review process, and applicant responding to requests for additional information.
LRH-2006-00100	ICG Eastern, LLC	Jenny Creek Surface Mine	Mingo	WV	Application awaiting start of 60-day review process, but applicant has not responded to requests for additional information.
LRH-2006-00760	Paynter Branch Mining	Paynter Branch South Surface Mine	Wyoming	WV	Application awaiting start of 60-day review process, but applicant has not responded to requests for additional information.
LRH-2006-02033	Wildcat	#2 Surface	Kanawha	WV	Application awaiting start of 60-day review process, but applicant has not responded to requests for additional information.

Application number	Applicant	Project name	County	State	Status
LRH-2007-00134	Atlantic Leasco	Muddlety Surface Mine No. 1	Nicholas	WV	Application awaiting start of 60-day review process, and applicant responding to requests for additional information.
LRH-2007-00182	Alex Energy, Inc.	Federal Surface Mine	Nicholas	WV	Application awaiting start of 60-day review process, but applicant has not responded to requests for additional information.
LRH-2007-00285	Alex Energy, Inc.	Lonestar Surface Mine	Nicholas	WV	Application awaiting start of 60-day review process, and applicant responding to requests for additional information.
LRH-2007-00286	Pioneer Fuel	MT5B	Raleigh	WV	Application awaiting start of 60-day review process, and applicant responding to requests for additional information.
LRH-2008-00491	CONSOL of Energy	Buffalo Mt. Surface Mine	Mingo	WV	Application awaiting start of 60-day review process, and applicant responding to requests for additional information.
LRH-2008-00562	Eastern Associated Coals	Huff Creek Surface Mine	Wyoming/ Logan	WV	Application awaiting start of 60-day review process, and applicant responding to requests for additional information.
LRH-2008-00805	Coyote Coal Company	Joes Creek Surface Mine	Boone/ Kanawha	WV	Application awaiting start of 60-day review process, but applicant has not responded to requests for additional information.
LRH-2008-01098	Frasure Creek Mining	Spring Fork Surface Mine No. 2	Mingo	WV	Application awaiting start of 60-day review process, and applicant responding to requests for additional information.
LRH-2009-00428	Consol of Kentucky	Spring Branch No. 3 Deep Mine	Mingo	WV	Application awaiting start of 60-day review process, and applicant responding to requests for additional information.
Applications withdrawn from ECP (8)					
LRH-2003-00065	Hobet Mining	Hewett	Boone	WV	Application withdrawn, but applicant is in the process of redesigning and resubmitting application for review.
LRH-2004-00624	Independence Coal Company	Constitution Surface Mine	Boone	WV	Application administratively withdrawn by the Corps.
LRH-2004-01155	Brooks Run Mining	Brandy St. & Cove Mtn.	Webster	WV	Application withdrawn by the applicant.
LRH-2004-01451	Independence Coal Company	Glory Surface Mine	Boone	WV	Application administratively withdrawn by the Corps.

Application number	Applicant	Project name	County	State	Status
LRH-2005-00421	Oxford Mining Company, LLC	Peabody 3	Coshocton/ Muskingum/ Guernsey	OH	Application withdrawn, but applicant redesigned and resubmitted application and was issued a permit.
LRH-2005-01211	Premium Energy, Inc.	Premium Mills Surface Mine	McDowell	WV	Application withdrawn, but applicant is in the process of redesigning and resubmitting application for review.
LRH-2006-00127	Consol of Kentucky	Slone Branch Mine	Knott	KY	Application withdrawn by the applicant.
LRH-2006-02290	Colony Bay Coal Co.	Colony Bay Surface Mine	Boone	WV	Application withdrawn, but applicant is in the process of redesigning and resubmitting application for review.

Source: GAO analysis of Corps' data.

Note: Three permit applications for operations located in Kentucky that were originally filed in the Corps' Huntington District were transferred to its Louisville District. One of these permit applications has been withdrawn and two are awaiting the start of the 60-day review process.

(361195)

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Christopher Hunter/DC/USEPA/US
11/22/2010 10:24 AM

To Cliff Rader
cc
bcc
Subject Fw: Bear Run Amendment 4 permit application

Chris Hunter
U.S. Environmental Protection Agency
Office of Wetlands, Oceans, & Watershed
(202) 566-1454
hunter.christopher@epa.gov

----- Forwarded by Christopher Hunter/DC/USEPA/US on 11/22/2010 10:24 AM -----

From: Melissa Gebien/R5/USEPA/US
To: Christopher Hunter/DC/USEPA/US@EPA
Cc: Wendy Melgin/R5/USEPA/US@EPA, Peter Swenson/R5/USEPA/US@EPA
Date: 11/19/2010 01:46 PM
Subject: Bear Run Amendment 4 permit application

Hi Chris-

Here's a copy of the Bear Run Amendment 4 permit application for your reference. The details regarding mitigation can be located at pages 58-86 of the permit. This will be followed by another e-mail that includes the detailed off-site mitigation plan.

*Part 1 of 9/10/10 revision of Bear Run Amendment 4 Permit

*Part 2 of 9/10/10 revision of Bear Run Amendment 4 Permit

03_ACOE Permit Data_Bear Run Mine _Amendment 4__09-10-10_BLUE .pdf

03_ACOE Permit Data_Bear Run Mine _Amendment 4__09-10-10_BLUE_pages 38-88 .pdf

Thanks and have a great weekend-

Melissa

Section 1: Baseline Information

I. Proposed Impact Site:

A. A brief **summary** of the proposed impacts and purpose of the project should be included as part of the mitigation plan. Wetland impacts should be defined in acres and stream channel impacts should be defined in linear feet.

The majority of the permit area for this disturbance is a surface coal mine with issued Indiana Department of Natural Resources (IDNR) permit number S-00256-4 located in Sullivan County, Indiana, approximately 5.0 miles southwest of the town of Dugger. A small portion of the permit area is located in an adjacent approved amendment area with IDNR permit number S-00256-1. This area totals 85.4 acres while the Amendment 4 permit area totals 2,581.1 acres. This permit application, which covers an area of 2,666.5 acres, will be named throughout the narrative and attachments as Bear Run Mine (Amendment 4). The purpose of this disturbance is to produce bituminous coal by surface mining methods to facilitate power production for this nation. See Map A in Appendix A for the general location of the permit areas.

For ease of discussion, this permit is broken into five areas. Area 1, which is located in the approved IDNR S-00256-1 permit, totals 85.4 acres. The majority of this area is situated in the watershed of Buttermilk Creek with a small portion draining to Middle Fork Creek. The remaining areas are located in the issued S-00256-4 permit. Area 2, which is in the watershed of Middle Fork Creek, totals 42.3 acres. Area 3, which drains to Maria Creek, Pollard Ditch, or Brewer Ditch, totals 2,423.3 acres. Area 4 and Area 5, which both drain to Brewer Ditch, total 64.4 and 51.1 acres, respectively. All of Area 4 and Area 5 and a portion of Area 3 were surface mined and reclaimed in the mid-1990s[13]. Those areas will be used as support areas to the surface mining operations.

The recovery of the coal seam requires the excavation of the overlying soil and rock materials, which involves mining through wetlands and streams as the operation advances across the landscape. Sediment basins will be developed as close to the mining area as possible to effectively control sedimentation and surface runoff for the area. Mining and reclamation occur simultaneously as pits are backfilled and resoiled as the next cut is made. The resoiled area is revegetated and returned to the approved post-mining land use. The temporary impacts covered by this permit include coal mining activities tentatively scheduled for 2010 to 2016.

Wetland delineations and stream assessments were conducted by Wetland Services, Inc. from Corydon, Kentucky from September 2008 through June 2009 and January and February 2010 on 82 wetlands and 372 streams within the proposed permit areas. The maximum acreage of jurisdictional wetlands that are planned for disturbance by mining or related activity is 10.42 acres of PFO, 0.80 acres of PSS, 10.85 acres of PEM, and 5.39 acres of PUB. The lengths of jurisdictional streams assessed for impact by mining or related activity are 83,324 linear feet (5.54 acres) of ephemeral streams and 43,362 linear feet (7.55 acres) of intermittent streams. See Map B in Appendix A for the locations of the existing streams and wetlands.

Although these activities qualify it for a Nationwide 21 Permit, we respectfully submit this permit application to the Army Corps of Engineers (ACOE) as an Individual Section 404 Permit.

1. **Adjacent Previously Approved Section 404 Permits**

An adjacent Section 404 permit (LRL-2006-1614-gjd), which includes surface coal mining and coal preparation impacts on 4,476.0 acres of the Bear Run Mine (East Pit) f/k/a Farmersburg Mine - Bear Run East Pit, was initially submitted on October 6, 2006 and approved on January 31, 2007. Mitigation has been proposed and approved for all impacts to streams and wetlands and shall adhere to the plan as outlined in Attachment 2 of "Farmersburg Mine - Bear Run East Pit" Section 404 permit application package revised September 14, 2007. This permit abuts the eastern edge of the Bear Run (Amendment 4) project area and is outside of the proposed impacts for this permit.

B. The **narrative description** should address:
1. Detailed location information.
a. Directions to the site using road names, highway numbers, and mileage distances.

The permit areas are located east of C.R. 600 East approximately 5.0 miles south of Dugger in Sullivan County, Indiana.

b. Site location map including quarter section, section, township, range and UTM coordinates.

Map A in Appendix A shows the general location of the permit areas. A description of the location of the permit areas are as follows:

Portions of Sections 21, 22, and 33 in Township 7 North, Range 8 West;
Portions of Sections 3, 10, 11, 14, 15, 22, 23, 26, and 27 in Township 6 North, Range 8 West all in Sullivan County, Indiana

UTM coordinates:	**X: 474589**	**Y: 4313580**	**Zone: 16**
Latitude:	**N 38.970833°**		
Longitude:	**W 87.293333°**		
7.5 Minute Quad:	**Dugger and Bucktown, Indiana**		

2. Relative geographic location within USGS 8-digit watershed (e.g., headwater, stream order, floodplain, etc.)

The permit areas are split across two 8-digit watersheds: the Middle Wabash - Busseron (05120111) and the Lower White (05120202). Area 1 and Area 2 drains to Busseron Creek through Buttermilk Creek or Middle Fork Creek. Buttermilk Creek is approximately 2.3 miles north of the Area 1, while Middle Fork Creek flows westerly just outside of Area 2. A large portion of Area 3 drains to the White River either by Pollard Ditch or Brewer Ditch through Black Creek with the remaining portion draining to Maria Creek which is a direct tributary to the Wabash River. Areas 4 and 5 both drain to the Black Creek through Brewer Ditch. The following table summarizes how the permit areas will impact the receiving watersheds.

Watershed Summary										
Receiving Stream[1]	Hydrologic Unit Code[1]	Area in Area 1	Area in Area 2	Area in Area 3	Area in Area 4	Area in Area 5	Total Area in Permit	Percent of Total Area	Receiving Stream Watershed Area[1]	Percent of Total Watershed Area
		(acre)	(acre)	(acre)	(acre)	(acre)	(acre)		(acre)	
Buttermilk Creek	14-digit HUC (05120111160090)	77.8	0	0	0	0	77.8	2.9%	13,364	0.58%
Middle Fork Creek (Sullivan)	14-digit HUC (05120111160120)	7.6	42.3	0	0	0	49.9	1.9%	15,821	0.32%
Maria Creek Headwaters	14-digit HUC (05120111190010)	0	0	342.0	0	0	342.0	12.8%	17,505	1.95%
White River - Pollard Ditch	14-digit HUC (05120202070010)	0	0	1,714.5	0	0	1,714.5	64.3%	17,493	9.80%
Black Creek - Brewer Ditch	14-digit HUC (05120202060020)	0	0	366.8	64.4	51.1	482.3	18.1%	12,799	3.77%
	Totals:	85.4	42.3	2,423.3	64.4	51.1	2,666.5	100%	76,982	3.46%
Busseron Creek	11-digit HUC (05120111160)	85.4	42.3	0	0	0	127.7		151,336	0.08%
Maria Creek	11-digit HUC (05120111190)	0	0	342.0	0	0	342.0		62,197	0.55%
Middle Wabash - Busseron	Indiana 8-digit HUC (05120111)	85.4	42.3	342.0	0	0	469.7		718,412	0.07%
Black Creek	11-digit HUC (05120202060)	0	0	366.8	64.4	51.1	482.3		87,870	0.55%
Lower White	8-digit HUC (05120202)	0	0	2,081.3	64.4	51.1	2,196.8		1,070,965	0.21%

3. Surrounding land use:
   a. Percentage of land use type(s) occurring within at least a 1000 ft band of the proposed impact area.

Pre-mine land uses in the permit area are consistent with a rural agricultural and wooded area with a portion reclaimed surface mined area. The major land use is cropland where topography allows, and clearing and improved drainage have been implemented. Forested areas have been limited to low-lying areas along streams and areas where topography does not facilitate agricultural practices. The forests have not been managed for timber production, but do provide wildlife habitat. A portion of Area 3 and the entire acreage of Area 4 and 5 contains land that was previously mined and reclaimed to modern standards. The following table categorizes the pre-mining land uses within the permit area.

Pre-Mine Land Use Summary										
Pre-Mining Land Use	Area 1		Area 2		Area 3		Area 4		Area 5	
	Area	Percent of Area 1	Area	Percent of Area 2	Area	Percent of Area 3	Area	Percent of Area 4	Area	Percent of Area 5
	(acre)	(%)	(acre)	(%)	(acre)	(%)	(acre)	(%)	(acre)	(%)
Cropland	27.8	32.5			905.9	37.5				
Pasture					131.9	5.4	24.4	37.9		
Forest	32.5	38.1	39.7	93.8	957.9	39.5	25.7	39.9	6.5	12.7
Wildlife	24.0	28.1	2.1	5.0	303.7	12.5	13.0	20.2	14.1	27.6
Water					96.0	4.0			30.5	59.7
Residential	0.6	0.7			7.9	0.3				
Industrial	0.5	0.6			4.2	0.2	0.4	0.6		
Public Roads			0.5	1.2	15.6	0.6	0.9	1.4		
Other					0.2	0.0				
Totals:	85.4	100	42.3	100	2,423.3	100	64.4	100	51.1	100
Natural	85.4	100	42.3	100	1,737.2	71.7	0	0	0	0
Reclaimed	0	0	0	0	686.1	28.3	64.4	100	51.1	100

Post-mine land uses in the permit area will be consistent with the surrounding land uses in the adjacent area. The following post-mine land uses are current as of June 12, 2009 and are subject to change due to property owner waivers and modifications to the mining plan.

Post-Mine Land Use Summary										
Post-Mining Land Use	Area 1		Area 2		Area 3		Area 4		Area 5	
	Area	Percent of Area 1	Area	Percent of Area 2	Area	Percent of Area 3	Area	Percent of Area 4	Area	Percent of Area 5
	(acre)	(%)	(acre)	(%)	(acre)	(%)	(acre)	(%)	(acre)	(%)
Cropland	27.8	32.5			905.9	37.5				
Pasture					131.9	5.4	24.4	37.9		
Forest	32.5	38.1	39.7	93.8	957.9	39.5	25.7	39.9	6.5	12.7
Wildlife	24.0	28.1	2.1	5.0	383.5	15.8	13.0	20.2	14.1	27.6
Water					16.2	0.7			30.5	59.7
Residential	0.6	0.7			7.9	0.3				
Industrial	0.5	0.6			4.2	0.2	0.4	0.6		
Public Roads			0.5	1.2	15.6	0.6	0.9	1.4		
Other					0.2	0.0				
Totals:	85.4	100	42.3	100	2,423.3	100	64.4	100	51.1	100

   b. Significant land uses(s) within the immediate watershed, which would affect the hydrological inputs or be affected by the hydrological outflows from the proposed impact area (including vegetated buffers/riparian corridors).

Coal mining in the Midwest flattens the existing topography thus lowering runoff velocity that significantly reduces erosion and transport of suspended solids as compared to typical runoff in areas with an agricultural land use. Site reclamation produces topographic relief consistent with the local area and incorporates many erosion control methods such as terracing and dry dam structures to control runoff velocity.

Mining and mine reclamation result in increased water infiltration. If the spoil used for reclamation is highly permeable, the amount of infiltration will be even greater. The infiltrated runoff increases the groundwater storage. Base flow in streams from groundwater will also increase. This extended base flow will improve water quality and offset the short-term effects of reduced shading. Mined overburden functions as a groundwater storage system that slowly releases infiltrated storm water resulting in diminished flooding downstream from storm water runoff.

The process of mining and reclamation typically yields no gain of base flow in higher elevations where the ephemeral streams are generally located. In the lower elevations, actual base flows could be sustained or elongated depending on the permeability of the spoil. Increased base flow allows for functional replacement and enhancement values to the intermittent stream reconstruction. Ephemeral stream mitigation will be located in the higher elevations and flow only during and immediately after precipitation. These streams have by definition no base flow component.

Generally as a result of federal and state regulatory reclamation requirements, reclaimed sites include mitigated wetlands and streams having increased species and habitat diversity, thereby enhancing the ecological function of the area. The additional range of aquatic habitat types (streams, wetlands, and open waters) as a result of reclamation will be an improvement over existing conditions.

c. Soils

The *Soil Survey of Sullivan County*[2] **maps the following soils within the permit area. The Alford (Af) series consists of deep, well-drained soils located on uplands and formed in loess. Permeability is moderate, surface runoff is medium to rapid, and available moisture capacity is high. The Ava (Al) series consists of deep, moderately well drained soils located on uplands and formed in loess over material weathered from till. A fragipan begins at a depth of 22 to 34 inches. Permeability is slow, surface runoff is slow to medium, and the available moisture capacity is medium. The Cincinnati (Cn) series consists of deep, well-drained soils located on uplands and formed in 10 to 40 inches of loess over weathered loam or clay loam till. A firm, brittle fragipan occurs at a depth of 26 to 32 inches. Permeability is slow, surface runoff is slow to rapid, and the available moisture capacity is medium.**

The Cuba (Cu) series consists of deep, well-drained soils located on bottom lands and formed in material washed from upland areas. Permeability is moderate, surface runoff is slow, and the available moisture capacity is high. Gullied land (Gu) occurs on uplands throughout the county. It has moderate to strong slopes. Runoff and erosion are the major hazards. The Hickory (Hk) series consists of deep, well-drained soils located on uplands that formed in a deposit of no more than 20 inches of loess and the underlying material weathered from till. Permeability is moderate, surface runoff is rapid, and the available moisture capacity is high.

The Iva (Iv) series consists of deep, somewhat poorly drained soils that are located on uplands and formed in silty loess. Permeability is slow, surface runoff is slow, and the available moisture capacity is high. The Markland (Ma) series consists of deep, well-drained and moderately well-drained soils that are located on terraces and formed in lacustrine material. Permeability is slow, surface runoff is medium to very rapid, and the available moisture capacity is high. The Muren (Mu) series consists of deep, moderately well-drained soils that located on uplands and formed in silty loess. Permeability is moderate, surface runoff is medium, and the available moisture capacity is high.

The Stendal (Sn) series consists of deep, somewhat poorly drained soils that are located on bottom lands and form in alluvium. Permeability is moderate, surface runoff is slow, and the available moisture capacity is high. The Vigo (Vg) series consist of deep, somewhat poorly drained soils located on uplands and formed in 40 to 60 inches of loess over material weathered from till. A very firm claypan starts at a depth of 18 to 24 inches. Permeability is very slow, surface runoff is slow, and the available moisture capacity is high.

The Wakeland (Wa) series consist of deep, somewhat poorly drained soils that are located on bottom lands and formed in alluvium. Permeability is moderate, surface runoff is slow, and the available moisture capacity high. The Wilbur (Ww) series consists of deep, moderately well drained soils that are located on bottom lands and formed in alluvium. Permeability is moderate, surface runoff is slow, and the available moisture capacity is high. A soil type labeled as Reclaimed (-) comprises approximately a quarter of the south area. This designation is applied to areas that contain soils that have been disturbed for the reclamation of coal mining operations. The thickness of the soil on top of the spoil varies from 1 to 4 feet in depth. The composition of the reclaimed soil also varies due to the mixing of the native soils as they were stripped off and stockpiled prior to the mining operation. Finally, water (W) is also located in the permit area.

The following table lists the soils and their acreages for each permit area and Map WS in Appendix A displays the soil type boundaries. In addition to the soil boundaries on the map, there are shaded areas that represent potentially hydric soils. None of the soils within the permit area are listed on the Indiana Hydric Soils List[5], but there are several soils that are located in bottom lands and have high moisture capacity which indicate these soils have the potential to easily turn hydric or have hydric inclusions. Within the permit area, the potentially hydric soils are the Cuba, Stendal, Wakeland, and Wilbur soil series. Area 2 has ~9.5 acres and Area 3 has ~113.8 acres of potentially hydric soils.

Soil Summary												
Soil Series	Map ID	Area 1		Area 2		Area 3		Area 4		Area 5		Slope
		Area	Percent of Area 1	Area	Percent of Area 2	Area	Percent of Area 3	Area	Percent of Area 4	Area	Percent of Area 5	
		(acre)	(%)	(acre)	(%)	(acre)	(%)	(acre)			(%)	(percent)
Alford	AfB2					5.7	0.2					2 - 6
	AfB3					1.3	0.1					2 - 6
	AfC3					2.1	0.1					6 - 12
	AfD2					1.0	0.0					12 - 18
	AfD3					2.4	0.1					12 - 18
	AfF					0.9	0.0					
Ava	AlA					11.8	0.5					0 - 2
	AlB2	32.6	38.2	14.5	34.3	395.1	16.3					2 - 6
	AlB3	9.5	11.1			69.8	2.9					2 - 6
Cincinnati	CnB2			0.4	0.9	177.0	7.3					2 -6
	CnC2					32.5	1.3					6 - 12
	CnC3	25.7	30.1	1.1	2.6	329.3	13.6					6 - 12
	CnD2			2.9	6.9	55.9	2.3					12 - 18
	CnD3	7.4	8.7	2.1	5.0	123.2	5.1					12 - 18
Cuba	Cu			9.5	22.4	0.6	0.0					
Gullied land	Gu					27.2	1.1					strong
Hickory	HkE	9.8	11.5			82.5	3.4					18 - 25
	HkF			11.6	27.4	19.8	0.8					25 - 35
	HkF3	0.2	0.2	0.2	0.5	45.6	1.9					25 - 35
Iva	IvA					1.9	0.1					0 - 2
Muren	MuB2					3.9	0.2					2 - 6
Stendal	Sn					6.8	0.3					
Vigo	VgA	0.2	0.2			123.4	5.1					0 - 2
	VgB2					12.7	0.5					2 - 4
Wakeland	Wa					36.9	1.5					
Wilbur	Ww					71.9	3.0					
Reclaimed	-					686.1	28.3	64.4	100	20.6	40.3	
Water	W					96.0	4.0			30.5	59.7	
Totals:		85.4	100	42.3	100	2,423.3	100	64.4	100	51.1	100	

Source: *Soil Survey of Sullivan County*[2]

There are approximately 15.2 acres of prime farmland in Area 1 and 517.1 acres in Area 3 for a total of 532.3 acres.

4. Classification:
   a. Wetlands:
      i. Hydrogeomorphic subclass and "first principles, or
      ii. Cowardin classification, and,
      iii. Landscape setting

Wetland delineations were completed by Wetland Services, Inc. on a total of 80 jurisdictional and 2 isolated wetland areas within the permit area utilizing the 1987 Corps of Engineers Wetland Delineation Manual[4] along with the Cowardin classification method. The delineations that were conducted in January-February 2010 utilized the Midwest Regional Supplement[28]. Representative determination points were selected within the small (<5 acre) area potential wetland sites and baseline establishment along with transects were selected within the larger (>5 acre) area potential wetland sites. Field observations and sampling were focused by distinct and often abrupt change in vegetative communities. Dominant vegetation for represented strata was noted, along with any evidence of wetland hydrology present at each determination point. Soil probes were examined for hydric soil characteristics. Soil matrix and mottle chroma were referenced from the Munsell Soil Color Chart. Delineation boundaries were established and flagged at the transition from field indicated non wetland - wetland sites based on vegetative, soil, and hydrological criteria at representative sample points. Delineation boundaries were extended between sample locations by following lines of distinct vegetation and hydrology while confirming soils conditions with periodic probing. See Appendix C for detailed wetland delineations and summary table and Map B in Appendix A for their locations.

   b. Streams:
      i. Rosgen stream classification method, or
      ii. Strahler order classification method, and
      iii. Flow regime (ephemeral, intermittent, perennial)

Streams assessments were conducted by Wetland Services, Inc. utilizing a modified Rosgen stream classification method and the USEPA Rapid Bioassessment Protocols (RBP)[29] for habitat assessment.

Typically, the Rosgen stream classification method is used to predict what adjustments a stream needs to achieve stability, which is the ability of a stream to transport sediment, in the present climate and streamflow regime to maintain dimension, profile, and pattern without aggrading or degrading. Because the stream mitigation for coal mining is predominately stream relocation rather than stream channel restoration, a modified Rosgen stream classification has been utilized in classifying the pre- and post-mining streams. This has been an ACOE accepted method for the low gradient streams in southern Indiana and Illinois. Level I, II, and III Rosgen stream parameters are visually assessed in the field and recorded on the stream assessment sheets along with photographs of the assessment point.

A total of 323 stream assessments were made with 254 classified as ephemeral and 69 classified as intermittent. See Appendix B for a summary table of stream assessments and the detailed geomorphic assessment with photographs, and Map B in Appendix A for the assessment locations.

There are several clarifications concerning the stream assessment worksheets that are being made at the request of the Louisville District West Section. These include the: 1) Missouri Stream Mitigation Method functionality parameters 2) Altered Channel Key and 3) Riparian Vegetation width.

The stream assessment worksheets that were developed from surveys completed from September 2008 to June 2009 include functionalities as ranked by the ACOE's Missouri Stream Mitigation Method. This method is not recognized by the Louisville District West Section as an appropriate mitigation method and therefore should not be considered when determining stream functionality associated with this application. The stream assessment worksheets completed or modified in January and February 2010 do not include Missouri Stream Mitigation Method functionality parameters.

The stream assessment worksheets that were developed from surveys completed from September 2008 to June 2009 include Altered Channel descriptions that have been removed, at the request of the Louisville District West Section, from the stream assessment worksheets completed or modified in January and

February 2010. The descriptions that have been removed are: AG = Agriculture, CC = Clear Cut, LS = Limestone Channel, MNG = Disturbed by Mining, RC = Road/Culvert Crossing, SE = Sewage, RCD = Rock Check Dam, RL = Recent Logging, RSD = Road Side Ditch, RSS = Road Side Stream, WD = Weir Dam and TR = Trash & Debris. These were replaced with: CV = Culvert, DAM = Weir, Dam, or Rock Checks, LWC = Low Water Crossing, NA = Not Applicable, OT = Other (See Comments), PI = Pipe and RSC = Road Side Channel. The most significant change concerns the deletion of the AG = Agriculture description. The original intent was to show that these streams may not have been directly (physically) altered for agriculture, but have been indirectly altered due to the increase sediment load, fertilizers and pesticides that have been transported from adjacent agricultural fields into the streams and by the drop in base level (head cutting) from downstream channelization.

As discussed with the Louisville District West Section, the Riparian Vegetation widths that are noted on the stream assessment worksheets may not represent the width of a defined 'riparian buffer' associated with each stream assessment. Wetland Service, Inc., who performed the assessments, recorded the type of adjacent riparian vegetation using the alpha-numeric descriptor from the noted methods as described by Dave Rosgen. The width was determined by visually assessing the distance the vegetation extended away from the stream regardless if the widths extended across watershed breaks. This method resulted in vast widths of upland vegetation being included and line of sight overlaps as streams converged at confluences. Overlaps are most evident in the wooded areas. For example, a deciduous overstory width of 200+ feet was recorded for both the right and left banks of Stream A. A width of 200+ feet means that the field delineator determined that trees extended as far as their line of sight allowed regardless of drainage breaks. Stream B parallels Stream A, by a stream centerline offset of 150 feet, in an adjoining valley. Stream B has also been determined by the field delineator to have a deciduous overstory width of 200+ feet for both the right and left banks, which results in an overlap of 125 feet for both streams. It should also be stressed that Wetland Services intent was to measure adjacent vegetation and not determine what may constitute a 'riparian buffer', the definition of which varies widely throughout sources of scientific and non-scientific literature.

Stream habitat evaluations were conducted using the USEPA Rapid Bioassessment Protocols (RBP)[29] and included on a compact disk in Appendix K. The streams at the Bear Run (Amendment 4) area are classified into four groups based on flow regime: ephemeral and intermittent and setting: natural and reclaimed. The following table summarizes the RBP scores from the Habitat Assessment Field Data Sheets for the four groups with addition classification by stream gradient.

Summary of RBP Scores					
Setting	Flow Regime	Gradient	Minimum Score	Maximum Score	Median Score
Natural	Ephemeral	Low Gradient	61	114	96
		High Gradient	60	127	95
Reclaimed	Ephemeral	Low Gradient	74	110	88
		High Gradient			81*
Natural	Intermittent	Low Gradient	76	129	102
		High Gradient	75	100	93
Reclaimed	Intermittent	Low Gradient	84	102	94
		High Gradient			**

*Denotes one high gradient reclaimed ephemeral stream assessed
**Denotes no high gradient reclaimed intermittent streams were assessed

Existing scores ranged from 60 to 127 in the upstream (high gradient) streams and 61 to 129 in the downstream (low gradient) portions. The natural ephemeral streams generated a higher median score than the reclaimed ephemeral streams primarily due to their having greater riparian vegetative widths and more vegetation established on the banks. The low score was obtained on Stream 8NS1K3-1 with the

high score obtained on Stream 4NS33. Stream 8NS1K3-1 is an ephemeral stream located in an agricultural field which has no riparian vegetation and very unstable banks. Stream 4NS3, which is a headwater stream located in the Maria Creek watershed, has stable banks, established vegetation on the banks, wide riparian buffer, and a natural pattern with no evidence of channelization or dredging.

The natural and reclaimed intermittent streams have comparable median habitat scores that vary from 93 to 102. The reclaimed intermittent streams scored higher due to the low number of samples. The low score was obtained on Stream 8NS1K3 with the high score generated from Stream 4NS14-16. Stream 8NS1K3 is immediately downstream of Stream 8NS1K3-1 (the low score ephemeral). Stream 4NS14-16 is a low gradient stream with stable banks and established vegetation on the banks.

c. Open Water:

Open water assessments were conducted by Wetland Services, Inc. to determine if the water body is isolated or jurisdictional, as well as the intended use. A total of 15 open water assessments were made. The waters are utilized for a wildlife or recreational purpose. Several of the large open waters in Area 3 of the permit are final cut impoundments from previous mining operations. See Appendix C for photographs and see Map B in Appendix A for locations.

d. Unit ID Labeling System:

Wetland Services, Inc. has developed a watershed approach in labeling the streams, wetlands, and open waters that are assessed within a permit area. A watershed has been defined as any stream that leaves the permit boundary on its own accord. For accurate record-keeping purposes, a unit specific labeling system has been developed as shown by the example below.

1NS2A1-1 = Unit ID

1 = Watershed (any single stream that leaves the permit boundary)
N = Land use (Natural, Reclaimed, Pre-law, Agriculture, Mixed, Logged, or Excavated)
S = Unit type (Stream, Wetland, Open Water)
2 = Unit number (2nd stream assessed in watershed 1)
A = 1st branch of stream 2
1 = 1st branch of stream 2A
-1 = Subsequent assessment on stream 2A1

5. Existing conditions: Landscape Setting/Ecosystem Context
   a. Wetlands: Briefly describe the physical setting of the site, including, but not limited to adjacent land uses, ecological types, topography, buffers, and hydrogeomorphic features. Provide information on type of soil present (include hue, value and chroma for each soil horizon) and soil series.

The wetland delineation survey identified 80 areas that met jurisdictional criteria. None are located in the Area 1 or Area 5. There are 4 jurisdictional wetlands located in Area 2 and Area 4, with the remaining wetlands located in Area 3.

Wetlands located in a natural setting were found in poorly drained areas along streams or around the fringe of open waters. Wetlands in a reclaimed setting that are not located around open waters have developed from the differential settling of the reclaimed soil. Reclaimed soils were placed in these areas with intense compaction which developed a shallow impermeable layer that has resulted in perched water tables throughout the reclaimed area producing a "pothole" community. Because the soils were homogenized during the mining process, any given sample of brown upland soil may contain low-chroma mottles. In dry areas, these mottles are derived from deep calcareous parent material brought up during the mining process and have no relevance to hydric soil development. In wet areas, mottling is a combination of ancient low-chroma parent material and the result of recent intense reducing conditions. Hydric inert calcareous material is readily distinguished by texture and structure and is subsequently disregarded. The wetlands range in size from 0.01 acre to 3.47 acres with an average size of 0.34 acre.

The following tables summarize the acreage and classification of the wetlands found within the permit areas. Please see Appendix C for detailed wetland delineations and Map B in Appendix A for the location of the wetlands.

Wetland Summary				
Setting	PFO	PSS	PEM	PUB
	(acre)	(acre)	(acre)	(acre)
Jurisdictional Natural				
Area 1	0	0	0	0
Area 2	0.47	0.53	0	0
Area 3	7.98	0	0.96	0.53
Area 4	0	0	0	0
Area 5	0	0	0	0
Natural Totals:	8.45	0.53	0.96	0.53
Jurisdictional Reclaimed				
Area 1	0	0	0	0
Area 2	0	0	0	0
Area 3	1.96	0.27	7.54	4.58
Area 4	0	0	2.35	0.28
Area 5	0	0	0	0
Reclaimed Totals:	1.97	0.27	9.89	4.86
Jurisdictional Totals:	10.42	0.80	10.85	5.39
Non-Jurisdictional Natural				
Area 1	0	0	0	0
Area 2	0	0	0	0
Area 3	0	0	0	0
Area 4	0	0	0	0
Area 5	0	0	0	0
Natural Totals:	0	0	0	0
Non-Jurisdictional Reclaimed				
Area 1	0	0	0	0
Area 2	0	0	0	0
Area 3	0	0	0.17	0
Area 4	0	0	0	0
Area 5	0	0	0	0
Reclaimed Totals:	0	0	0.17	0
Isolated Totals:	0	0	0.17	0

b. Streams:

i. Describe site geomorphology (Channel pattern, profile, and dimension), substrate particle size distribution, canopy cover, riparian vegetation structure and complexity, hydrology/flow regime(s), channel habitat types (e.g. percentage of reach composed of pools, riffles, etc.).

ii. Also describe stream functions such as, but not limited to, hydrology (i.e. efficient dissipation of energy) and biochemical processes (i.e. denitrification as indicated by presence of beds of organic matter).

iii. Landscape setting

The streams within the permit are physically differentiated by being located in a natural setting or in a reclaimed mining area. The streams to be impacted are predominately headwater ephemeral streams and low to moderate quality intermittent streams in the natural area and constructed or gullied areas in the reclaimed areas.

The following table summarizes the stream impacts for the permit areas. The summary tables in Appendix B display specific data for the individual streams.

Stream Summary				
Setting	Ephemeral		Intermittent	
	(linear feet)	(acre)	(linear feet)	(acre)
Jurisdictional Natural				
Area 1	4,576	0.26	2,790	0.24
Area 2	1,197	0.10	2,358	0.66
Area 3	75,260	5.05	37,442	6.54
Area 4	0	0	0	0
Area 5	0	0	0	0
Natural Totals:	81,033	5.41	42,590	7.44
Jurisdictional Reclaimed				
Area 1	0	0	0	0
Area 2	0	0	0	0
Area 3	2,291	0.13	772	0.12
Area 4	0	0	0	0
Area 5	0	0	0	0
Reclaimed Totals:	2,291	0.13	772	0.12
Jurisdictional Totals:	83,324	5.54	43,362	7.55

The following summary table shows the anticipated impacts by to the stream broken down by land use setting and flow regime. Effects to the waters were categorized into four primary types that occur at a surface coal mining operation: coal extraction activities (mine-through), spoil placement, sediment basins, and sediment/drainage control and support. Sediment/drainage control and support areas include soils stockpiles, berms, collection/diversion ditches, parking lots, buildings, freshwater return lakes, haul roads, etc., basically any area outside of the mining line and spoil placement areas. These effects are based on the currently approved operations map, which is subject to minor change as mining commences.

Impact by Effect Summary					
Setting	Flow Regime	Coal Extraction Activities	Spoil Placement	Sediment Basins	Sediment/ Drainage Control and Support
		(feet)	(feet)	(feet)	(feet)
Jurisdictional					
Natural	Ephemeral	74,950	2,725	810	2,548
Reclaimed	Ephemeral	983	1,161	0	147
Ephemeral Totals:		75,933	3,886	810	2,695
Natural	Intermittent	37,698	844	2,811	1,237
Reclaimed	Intermittent	0	299	0	473
Intermittent Totals:		37,698	1,143	2,811	1,710

Adjacent Vegetation Total Width Summary					
Setting	Flow Regime	No Adjacent Vegetation	0 to 10' Adjacent Vegetation	10' to 50' Adjacent Vegetation	> 50' Adjacent Vegetation
		(feet)	(feet)	(feet)	(feet)
Jurisdictional					
~~Entire Area~~	All Flow	~~6,594~~	~~0~~	~~5,415~~	~~114,667~~

See Map B in Appendix A for the locations of the existing streams and see the stream assessments in Appendix B for more detailed site information.

Overall, the site has been heavily impacted by almost two hundred years of anthropogenic activity. In 1896, a state ditching law was passed that manipulated the watersheds of Sullivan County. This law provided more of a benefit than just improving the lands for purposes of agriculture. It removed the stagnant pools and swamps that harbored insects that carried once deadly, but now treatable diseases[25]. The early settlers impacted the watersheds with extensive and ambitious ditches designed to increase drainage for farming, thereby initiating the first extensive siltation. The principal source of channelizing the larger floodplain perennial streams was the ACOE or other government funded or subsidized projects. This activity resulted in head cutting or "headcut creep" of connecting intermittent and ephemeral streams. This process generally occurs swiftly in the floodplain regions due to massive amounts of pooled floodwaters rapidly exiting the floodplain. The headcut creep then slows but continues up gradient. This process ultimately entrenches even the smallest of streams and in many cases creates erosional features that would have not existed in an undisturbed ecosystem. The steeper gradient caused by dredging combined with other anthropogenic headwater activities (agricultural, livestock, logging, etc.) has negatively impacted a substantial portion of the onsite streams.

The site has been moderately impacted by previous mining activities. According to the Indiana Geological Survey - Coal Mine Information System[13], the previously mined area adjacent to and included in Area 3, Area 4, and Area 5 was mined by the Hawthorn Mine. The Hawthorn Mine was in operation from 1965 to 1999. The reclamation in accordance with SMCRA focused on erosion and sediment control which resulted in the construction of terraces, swales, and water and sediment control basins (WASCOBs). These sediment and erosion control structures trapped sediment and runoff, reducing flooding and gully erosion, and improving the farmability of a field. Riprap was also used to line stream bottoms and sides to prevent erosion in the constructed ditches. Most of the reclaimed previously mined land use intermittent streams in the Bear Run (Amendment 4) area, were built to facilitate runoff from the area. Several of the reclaimed previously mined land use ephemeral streams are either gullies that have formed from baseline adjustment through head cutting or gullies that have formed in rills down unstable slopes.

Additionally, from a visual survey of the permit area, approximately 18 percent of all the streams flow into an open water before continuing on in the watershed. For each of the individual permit areas, the following is a breakdown of the stream lengths that flow into open waters.

Stream Through Open Water Summary		
Setting	Ephemeral (linear feet)	Intermittent (linear feet)
Area 1	0	0
Area 2	0	0
Area 3	21,082	8,157
Area 4	0	0
Area 5	0	0
Totals:	21,082	8,157

Area 1 does not have any streams that flow immediately into an open water body. All of the streams in Area 2 flow into an open water (the impoundment on Middle Fork Creek), located west of the permit area. Area 3 contains streams that flow into open waters consisting of final cut impoundments that were reclaimed once mining was completed. There is one open water in the natural area that appears to have been constructed for flood control (Open Water 9NO11). The length of streams that flow into open waters is approximately 21,852 linear feet or 18.4 percent of the total stream in the permit areas.

c. Open Waters:

Several small water impoundments and farm ponds are present in the natural area of the permit. These impoundments are small due to their watershed size and permeability of the surrounding soils and were constructed for primarily an agricultural land use. These farm ponds have been abandoned and are now wildlife habitat. Open waters with a wildlife land use are present in the reclaimed areas of the permit

area on a larger scale than the natural areas. These open waters may be reclaimed sediment basins or final cut lakes. The following table summarizes the open waters. See Map B in Appendix A for their locations and Appendix C for any photographs.

Open Water Summary		
Setting	Acreage (acre)	Comments
Jurisdictional Natural		
Area 1	0	
Area 2	0	
Area 3	4.38	
Area 4	0	
Area 5	0	
Natural Totals:	4.38	
Jurisdictional Reclaimed		
Area 1	0	
Area 2	0	
Area 3	107.55	
Area 4	0	
Area 5	0	
Reclaimed Totals:	107.55	
Jurisdictional Totals:	111.93	
Non-Jurisdictional Natural		
Area 1	0	
Area 2	0	
Area 3	0	
Area 4	0	
Area 5	0	
Natural Totals:	0	
Non-Jurisdictional Reclaimed		
Area 1	0	
Area 2	0	
Area 3	0	
Area 4	0	
Area 5	34.54	Covered by NPDES permit
Reclaimed Totals:	34.54	
Non-Jurisdictional Totals:	34.54	

6. Field observations (e.g. for wetlands use data sheets from the "Corps of Engineers Wetland Delineation Manual," Technical Report Y-87-1 or for streams use data sheets from EPA's Rapid Bioassessment Protocol, and show the location of the data points on a site map)

See the wetland delineations in Appendix C and the stream assessments in Appendix B for the field observations. Map B in Appendix A shows the location of the assessment points and boundaries.

7. Climate (This component should address normal circumstances as described in TR Y-87-1, including local and regional variability and extremes)

The permit area is located in Sullivan County, Indiana, which exhibits a continental climate influenced by cold polar air from the north and warm air from the south. The average annual rainfall is approximately 39 inches. Average annual runoff is approximately 12 inches. Precipitation is generally greatest in the late spring and early summer with an average cumulative precipitation slightly over 4 inches per month.

During the fall and winter seasons the average cumulative precipitation is less than 3 inches per month. The 24-hour precipitation event for the area ranges from 2.7 inches for a one year frequency event to 5.1 inches for a 25-year frequency. Two-hour rainfall intensity ranges from 1.5 inches for a one-year frequency to 2.9 inches for a 25-year frequency. In general, the highest mean monthly stream flows in southern Indiana occur from March through May when spring rains occur; the highest peak flows are typically in July as a result of thunderstorm activity.

The mean annual surface air temperature is approximately 53°F. July is usually the warmest month (~77°F) and January is usually the coldest (~31°F). Evapotranspiration is estimated to average approximately 27 inches annually. Maximum evapotranspiration typically occurs during June or July and the minimum is during December or January. Prevailing winds are typically from the southwest with an average velocity of 10 mph in the spring and 7 mph in late summer, except during the winter when they are westerly and northwesterly.

8. Water Quality (e.g. denitrification, conductivity, pH); identify any state listed CWA Section 303(d) impaired waterbodies within the watershed.

There are three 303(d) listed waters that are found within the immediate watersheds of the permit area. They are Buttermilk Creek (INB11G9_00), Maria Creek Headwaters (INB11K1_01), and Black Creek-Brewer Ditch (INW0262_00). For more details of the areas assessed and types of impairments, please refer to *Item 13. Cumulative Activity* on pages 20-21.

The following tables list the regional surface water quality as found in U.S. Geological Survey Open-File Report 81-498[7] for Area 32 which includes the White River watershed and U.S. Geological Survey Open-File Report 82-1005[12] for Area 30 which includes the Wabash River watershed.

Area 32 (White River) Regional Surface Water Quality[7]			
Parameter	Range	Median	Number of Stations
pH	2.4 - 8.9	7.4	293
Specific Conductance (µmhos /cm)	39.5 - 8,960	615	286
Sulfate (mg/l)	2.4 - 6,230	65	145
Total Iron (mg/l)	0.03 - 2,300	1.3	100
Total Manganese (mg/l)	0.01 - 33	0.62	98

Area 30 (Wabash River) Regional Surface Water Quality[12]			
Parameter	Range	Median	Number of Stations
pH	2.5 - 9.0	7.8	159
Specific Conductance (µmhos /cm)	90 - 4,920	623	159
Sulfate (mg/l)	20 - 3,379	69	134
Total Iron (mg/l)	0.09 - 1,200	0.95	114
Total Manganese (mg/l)	0.01 - 14.6	0.20	111

The following table lists the local surface water quality from baseline monitoring sites for the permit area. The locations of the sites are found on Map A in Appendix A.

Local Surface Water Quality[8]						
Parameter	21SW-N1		33SW-1		16SW-S5	
	Range	Mean	Range	Mean	Range	Mean
pH	7.24-7.52	7.38	7.58-7.91	7.75	7.75-7.80	7.78
TDS (mg/l)	259-298	279	263-344	300	201-274	238
Alkalinity (mg/l)	82-94	88	94-116	102	66-104	85
Total Iron (mg/l)	0.10-0.36	0.23	0.16-0.29	0.22	0.11-0.18	0.15

Total Manganese (mg/l)	0.10-0.20	0.15	0.43-1.24	0.83	0.04-0.05	0.05
Parameter	21SW-S7		28SW-S8		27SW-S13	
	Range	Mean	Range	Mean	Range	Mean
pH	7.56-7.67	7.62	7.83-7.86	7.85	7.74-7.65	7.70
TDS (mg/l)	225-327	276	152-250	201	182-229	206
Alkalinity (mg/l)	72-110	91	56-148	102	72-94	83
Total Iron (mg/l)	0.30-0.59	0.45	0.32-0.33	0.33	0.21-0.23	0.22
Total Manganese (mg/l)	0.11-0.23	0.17	0.06-0.06	0.06	0.06-0.12	0.09

Surface Water Sampling Plan for Streams and Wetlands

In addition to the baseline surface water quality data provided above, surface water samples will be collected from proposed sites and analyzed to further characterize water quality before (pre-mining) and after (post-mining) mitigation has been completed. Water sampling will be conducted at the following:

- SMCRA receiving stream sampling points
  - pH
  - Total dissolved solids
  - Alkalinity
  - Total iron
  - Total manganese
- Internal stream/wetland water quality sampling points
  - pH
  - Total dissolved solids
  - Total iron
  - Total manganese
- Bio-assessment sampling points
  - Temperature
  - Total dissolved solids
  - pH
  - Total iron
  - Total manganese

SMCRA receiving stream and Internal stream/wetland water quality sampling (pre- and post-mining) will be conducted on a quarterly basis to ensure adequate flow and representative water quality. Bio-assessment surface water sampling will be conducted annually. Pre-mining sample sites are located on Map G and post-mining sample sites are located on Map H.

9. Identify the Functional Assessment Tool that will be used to measure the development of the mitigation site and ultimately the successful compensation of lost function and value from the permitted impact.

Wetlands

The functional assessment tools that will be utilized to measure the successful development of the wetland mitigation are the Corps of Engineers Wetland Delineation Manual[4] and the Midwest Regional Supplement[28]. The wetlands will also be monitored yearly for positive trends using certain variables of the Corps of Engineers Hydrogeomorphic Method (HGM). Wetland success will be achieved by establishing an area that not only has wetland hydrology, hydric soils, and hydrophytic vegetation, but is also self-sustaining.

Streams

The functional assessment tools that will be utilized to measure the successful development of the stream mitigation include one based on the Rosgen[3] stream channel matrix as developed by Dave Rosgen and the USEPA Rapid Bioassessment Protocols (RBP) utilizing the Habitat Assessment Field Data Sheets for physical characterization and habitat. Stream success is achieved by establishing a natural stream channel that has a stable cross-section, stable meander pattern, and a stable profile such that over time, the stream channel features and stability are maintained.

The following table lists the types of channels that will be used in mitigation. The specific type will be dependent on the reclaimed slope of the stream and watershed size.

Rosgen Channel Morphology Matrix				
Stream Type	A	B	C	E
Bed Material and Designation	Silt-Clay (6) Sand (5) Gravel (4)	Silt-Clay (6) Sand (5) Gravel (4)	Silt-Clay (6) Sand (5) Gravel (4)	Silt-Clay (6) Sand (5) Gravel (4)
Entrenchment Ratio	<1.4	1.4-2.2	>2.2	>2.2
Width/Depth Ratio	<12	>12	>12	<12
Sinuosity	1.0-1.2	>1.2	>1.2	>1.5
Slope (percent)	4-10	2 -3.9	<2	<2

The term "entrenchment ratio" is the vertical containment of the stream. It is the ratio of the width of the flood-prone area to the surface width of the bankfull channel. The flood-prone area is determined by using the elevation of twice the maximum depth of the bankfull channel at bankfull stage. The width/depth ratio is defined as the ratio of the bankfull surface width to the mean depth of the bankfull channel at bankfull stage. This ratio is used to describe the energy and ability of various discharges to move sediment. It is also valuable for describing the channel cross-section shape. Sinuosity is the ratio of stream length to valley length. Meander geometry characteristics are directly related to sinuosity.

10. Geology

The proposed permit area consists of approximately 2,666.5 acres of rural forested, agricultural, and previously mined land located on the eastern shelf of the Illinois Basin in the Wabash Lowland physiographic province. The permit consists of five separate subareas: Area 1 is 85.4 acres, Area 2 is 42.3 acres, Area 3 is 2,423.3 acres, Area 4 is 64.4 acres, and Area 5 is 51.1 acres. Approximately 30 percent of the proposed permit area has been previously disturbed and reclaimed as a result of surface mining and related activities. These activities occurred in Area 3, Area 4, and Area 5. Natural landforms are the result of both Illinoian glaciation and normal degradation processing such as weathering, mass wasting, and stream erosion. The topography is characterized by generally flat ridge tops with moderately steep side slopes and broad, flat valley floors. The surface drainage pattern is dendritic, reflecting the horizontal regional bedrock structure. The maximum topographic relief of the site is approximately 130 feet, ranging from 470 feet to 600 feet above mean sea level. See Map A in Appendix A for a general reference of the permit area.

a. Unconsolidated materials

In the natural (un-mined) areas of the permit, a layer of unconsolidated earthen material exists between the soil layer and the bedrock surface. This unconsolidated layer typically ranges from 11 to 100 feet in thickness. It is the basic parent material of the overlying soil layer. This intermediate layer may contain blocks of consolidated rock that have become detached from the underlying bedrock surface. This intermediate layer of unconsolidated material is thought to represent till that was deposited between 140,000 and 300,000 years ago during the Illinoian glacial period and loess deposits. The Quaternary glacial till is composed of earth material that has been kneaded, pulverized, and transported by the glacier, potentially from areas up to hundreds of miles to the north. Bedding within the till zone is complex because of the multiple episodes of erosion and transport that occurred before its final deposition. Site-specific drill logs indicate that the bulk of the unconsolidated zone is composed of unsorted silty clay of variable thickness. Distinct lenses of sand and sand/gravel occur sporadically within this matrix. These lenses probably represent buried stream channels created by waters from melting ice or by storm events during and immediately after Illinoian time. The unconsolidated layer typically thins toward the uplands and thickens toward the valleys.

In the reclaimed areas of the permit, the unconsolidated layer between the soil and the bedrock surface is comprised of mine spoil. Mine spoil is composed of Quaternary unconsolidated material, fragmented bedrock, and coal. This material varies in thickness and composition through the reclaimed permit area.

b. Bedrock

The Pennsylvanian overburden interval to be disturbed by surface mining consists of the Lower Shelburn, Dugger, and Upper Petersburg Formations. These strata consist of cyclic sequences of shale, sandstone, limestone, and coal units associated with fluctuating shoreline environments of the Pennsylvanian Period. Such strata can be highly variable in thickness and continuity. The regional dip for Pennsylvanian rocks is to the southwest at a rate of approximately 25 feet per mile. Mississippian-aged rocks unconformably underlie the Pennsylvanian section. However, Mississippian rocks do not outcrop locally and were not penetrated during exploratory drilling.

The Indiana No. 7, No. 6, No. 5A, and No. 5 Coal seams are the seams targeted for extraction. Minor and/or thinly-bedded coal exists sporadically above the No. 7 seam, including the Pirtle and Ditney seams. The Ditney seam is a thinly-bedded, sporadically occurring bituminous coal seam, described by the Indiana Geological Survey as a banded, partly shaly coal, generally less than 1.0 foot thick. The Pirtle seam, also known as No. 7A Coal, is a thinly-bedded, sporadically occurring bituminous coal seam that is described as bright, banded, and shaly in places and ranges between 0 to 1.02 feet in thickness. These minor seams are generally considered to be of insufficient quality or thickness for economic extraction. Any coal not extracted for sale as a fuel resource will be handled as toxic overburden when possible. However, in the areas where any coal seam exhibits suitable thickness and quality, the applicant will attempt to recover said resource.

The No. 7 seam, according to the Indiana Geological Survey, is as a bright, banded, bituminous coal, containing thin partings of clay and shale, with films of clay in vertical joints, and local concentrations of pyrite and marcasite. The mean thickness of the No. 7 seam within the proposed amendment area is about 2.8 feet.

The No. 6 seam is described by the Indiana Geological Survey as a bright, banded, bituminous coal containing shale and pyrite partings. The mean thickness of the No. 6 seam within the proposed amendment area is about 3.7 feet.

The No. 5A Coal seam is described by the Indiana Geological Survey as a coal seam occupying the stratigraphic position between the top of the Alum Cave Limestone and the base of the Antioch Limestone. The No. 5A Coal seam ranges between 0 and 4.1 feet, and averages about 2.9 feet in thickness where present.

The No. 5 seam is described by the Indiana Geological Survey as a bright coal that dulls upward. The mean thickness of the No. 5 seam within the proposed amendment area is approximately 3.9 feet. The No. 5 seam will be the lowest coal seam to be mined within the proposed amendment area.

The following stratigraphic column is based upon Peabody Midwest Mining, LLC drill logs within the permit area:

Summary of Stratigraphy[8]		
Thickness Range (feet)	Average Thickness (feet)	Lithology
5.50 - 33.00		drift, sand with gravel, sandstone boulder, silt with gravel, silty to sandy clay, unconsolidated
0 - 50.00		black shale, limestone, sandstone, sandy shale, shale
0 - 0.75		Ditney Coal
0 - 68.31		limestone, limey sandstone, limey sandy shale, limey shale, sandstone, sandy shale, shale, shaly limestone, underclay
0 - 1.02		Pirtle Coal
0 - 118.60		coal, limestone, limey sandstone, limey sandy shale, limey shale, sandstone, sandy limestone, sandy shale, shale, underclay

0 - 4.04	2.8	Indiana No. 7 Coal
0 - 46.70		black shale, coal, limestone, limey sandstone, limey shale, sandstone, sandy shale, shale, underclay
0 - 9.45	3.7	Indiana No. 6 Coal
0 - 53.30		black shale, coal, limestone, limey sandstone, limey sandy shale, limey shale, sandstone, sandy limestone, sandy shale, shale, shaly limestone, underclay
0 - 4.10	2.9	Indiana No. 5A Coal
13.70 - 44.39		black shale, limestone, limey sandy shale, limey shale, sandstone, sandy shale, shale, shaly coal, shaly limestone, underclay
2.50 - 5.20	3.9	Indiana No. 5 Coal
???		sandstone, sandy shale, shale, underclay

The thickness ranges are based on a finite number of bore holes as represented by the Geologic Cross-Section found in the SMCRA mining permit S-00256-4. The average thickness is based on an expanded data base SurvCAD computer model of the geologic data across the permit area.

c. Geochemistry of Bedrock

No problems are expected from toxic (acidic) materials found at the site. Any such materials will be placed low in the spoil profile to eliminate potential oxidation. Placement will occur concurrently with the planned extraction and reclamation operations.

d. Aquifers

i. Unconsolidated Aquifers

No unconsolidated aquifers in the permit area are used for potable water supplies. Illinoian till is usually not considered an aquifer because of the fine grain size that produces low permeability and low yields. Water tables generally conform to topography and flow directions are primarily toward local drainages although there may be a minor component of flow downward to bedrock aquifers.

ii. Bedrock Aquifers

No consolidated aquifers in the permit area are used for potable water supplies. Consolidated bedrock aquifers in southern Indiana are composed primarily of sandstone of Pennsylvanian age and limestone of Mississippian age. Groundwater flows in fractures, along bedding planes, in the cleats of coal seams, and in unfractured sandstone with sufficient permeability. Shales, siltstones and underclays are generally considered confining layers. Fractures caused by jointing or faulting can reduce the confining effect of these units. Fracturing generally decreases with depth.

11. Alternatives Analysis

After careful consideration, no alternatives to the planned disturbance are available without leaving a large volume of high quality coal reserve and additionally incurring very large avoidance costs. The size of the area to be disturbed has been minimized to the highest degree possible considering the presence of mine-able coal reserves. Mitigation is proposed for all regulated disturbances. The temporary impacts covered by this permit include coal mining activities for a 4-5 year period. Current plans are to mine the Bear Run Mine (Amendment 4) reserve in the 2010 - 2015 time period. The nearby Farmersburg Mine has been downsizing in conjunction with the Bear Run start up and will close in the August-September 2010 timeframe. Remaining equipment and employees are being transferred to the Bear Run Mine.

The original Bear Run Mine is a multi-seam surface mine with a high quality economically feasible coal reserve consisting of ~ 19 million recoverable tons. This amendment will add an additional ~ 42.5 million recoverable tons, and will provide ~ 274 billion kilowatt hours of electricity. Facility construction of the original Bear Run reserve has been completed and is in operation. The mine will consist of open pits, haul roads, processing plant, sediment basins, etc. The planned impacts to the Amendment 4 permit area will consist almost entirely of coal extraction activities; since processing, maintenance, transportation and management facilities are in place and are not planned to be expanded. Perimeter impacts will be necessary for sediment control diversions and basins; however, disturbance for these required activities will be minimized by locating them as close to the coal extraction area as possible. Necessary haul roads for the Amendment 4 area will be constructed across previously mined areas and follow the coal extraction pits, thereby avoiding additional impacts outside of the mining area. The Bear Run Mine will provide a source of high quality coal for long term coal supply agreements with regional electric utility companies.

Peabody Midwest Mining, LLC has very significant resources invested in the acquisition of land, coal reserves, mining equipment, etc. Construction of a processing plant, shop, and rail loading facility has been completed and was located on previously mined land. The fact the area has already been mined will allow avoidance and minimization of disturbance to additional unmined areas. The mining operation will expand in production as the Farmersburg Mine in Vigo and Sullivan counties declines in production and ultimately closes. This additional mining area will facilitate an overall annual production increase to approximately 8 million tons by 2011-12 This will provide an uninterrupted supply of coal to the regional utilities, as well as, steady continuous employment to over 370 local and area residents (including some from recently closed mines such as the Farmersburg Mine) by the end of 2010. As production reaches its maximum, the direct employment level will exceed 460 at the mine with annual wages and benefits totaling $58 million. Additionally, the mine operation is estimated to generate $3.8 million in annual tax revenue to Sullivan County and the state of Indiana. Many private landowners have received and will continue to receive significant income from the mining operation in the form of royalty payments and/or acquisition proceeds. Please see Appendix L additional direct and indirect economic impact estimates. The economic impact model was completed using the U.S. Dept of Commerce's RIMS II techniques.

There essentially are no practical or economical alternatives to the proposed surface mining method of coal extraction. The coal reserve exists in four separate seams, with a unique distribution pattern and thickness. Alternative methods of mining including conventional underground, longwall mining, auger and highwall mining and pod mining have been reviewed, but are not feasible for the Bear Run project. Further explanation is provided below. Not mining the Bear Run Mine (Amendment 4) reserve would result in the loss of high paying jobs, important tax revenue, huge financial losses on investment to Peabody Midwest Mining, LLC and a significant interruption to the coal supply necessary for basic electricity production in the state of Indiana and the United States. Electricity-generating customer companies depend on specific coal qualities and committed tonnages to maintain adequate feedstock for reliable uninterrupted power generation for their millions of customers. The Summary of Alternatives table identifies the alternatives considered and their primary attributes. The table is followed by the comprehensive Alternatives Analysis narrative.

Four (4) alternatives were considered for the Bear Run Mine (Amendment 4) mining operation.

A. "No Action" Alternative (No surface mining)
B. "Preferred Action" Alternative (Conduct surface mining in the proposed location)
C. "Project Relocation" Alternative (Relocate to another site)
D. "Other Mining Techniques" Alternative (Conventional room and pillar, longwall, auger and highwall mining, pod mining)

Summary of Alternatives				
Alternative	**Description**	**Advantages**	**Disadvantages**	**Result of Implementing Alternative**
No Action Alternative	No Surface Mining at Bear Run Mine (Amendment 4) mine site	• Eliminates mining related disturbance of streams and wetlands at the Bear Run Mine (Amendment 4) mine site	• Without regulated mining activities, deforestation can occur without effective NPDES controls, without replanting and monitoring requirements and without proper Indiana Bat protection measures. • Expansion of agricultural fields are likely to occur. • Loss of ~460 direct jobs with annual wages and benefits of ~$58 million • Loss of ~$3.8 million in annual tax revenue for Sullivan County and State of Indiana • Loss on investments in the acquisition of the equipment, facilities, land, coal reserve and permitting that have been made in advance of mining. • Further degradation of existing jurisdictional waters from agriculture and downstream straightening. • Off site mitigation will not be completed. • No protection of restored streams/wetlands through proposed deed restrictions. • Threatens necessary coal supply for regional electric utilities.	• Fails to meet Peabody Midwest Mining, LLC's purpose and need of utilizing this viable energy reserve • Loss of high quality coal reserve for regional electric utilities • Does not meet project objective
Preferred Action Alternative	Surface Mining at Bear Run Mine (Amendment 4) mine site	• Allows Peabody Midwest Mining, LLC's to fully utilize this viable resource and supply to Regional utilities resulting in affordable electricity for the regional community. • Maximizes coal recovery of the reserve and minimizes impacts at other sites. • Provides ~460 direct jobs with a payroll of ~$58 million annually • Provides tax revenue to Sullivan County and the State of Indiana • Impacts to existing streams and wetlands will be mitigated on-site, with additional off-site mitigation.	• Staged, temporal loss of the functions of disturbed streams and wetlands at the Bear Run Mine (Amendment 4) mine site	• Meets Peabody Midwest Mining, LLC's purpose and need of utilizing this viable energy reserve • Provides high quality coal reserve for regional electric utilities

		• Disturbance minimized to maximum extent • Reclamation of the site will be closely monitored by multiple state and federal agencies. • Protection of streams/wetlands through proposed deed restrictions		
Project Relocation Alternative	Surface Mining at another location	• Eliminates disturbance of streams and wetlands at the Bear Run Mine (Amendment 4) mine site	• A comparable reserve in the Illinois basin does not likely exist, resulting in multiple sites being needed to replace the planned Bear Run production. • Does not utilize Bear Run (Amendment 4) viable reserve or existing facilities • Does not assure the site will not be significantly disturbed by activity now or in the future without the regulated requirements contained in SMCRA and CWA Section 404 permits. • Produces similar or greater impacts to another site with more disturbance likely needed to produce the same amount of coal. • Threatens needed coal supply to regional electric utilities while replacement supplies are located, acquired and permitted.	• Fails to meet Peabody Midwest Mining, LLC's purpose and need of utilizing this viable energy reserve • Loss of high quality coal reserve for regional electric utilities • Does not meet project objective

Other Mining Techniques Alternative	Conventional Room and Pillar or Longwall Mining	• Reduce surface disturbance of streams and wetlands at the Bear Run Mine (Amendment 4) mine site	• Geologic conditions are not conducive to longwall mining (individual coal seam too thin and thickness and composition of overburden) • Does not fully utilize Bear Run's viable reserve as recovery would be less than 50% (conventional) to 80% (long wall) of the seam longwall mined • Surface subsidence is immediate, which may considerably affect streams and wetlands • Does not assure the site will not be significantly disturbed by activity now or in the future • Does not eliminate surface disturbance of streams and wetlands at the Bear Run Mine (Amendment 4) mine site	• Operational cost and safety issues render this alternative impractical, as well as failing to fully utilize this viable energy reserve • Does not meet project objective
	Augering	• Reduce disturbance of streams and wetlands at the Bear Run Mine (Amendment 4) mine site	• Excavation and backfilling of numerous pits to maximize auger coal recovery • Does not fully utilize Bear Run's viable reserve as recovery would be less than 50% on the seam augered • Does not assure the site will not be significantly disturbed by activity now or in the future • Does not eliminate surface disturbance of streams and wetlands at the Bear Run Mine (Amendment 4) mine site • Not a viable method for continuous, consistent coal production	• Operational costs render this alternative impractical, as well as failing to fully utilize this viable energy reserve • Does not meet project objective
	Pod Mining	• Reduce disturbance of streams and wetlands at the Bear Run Mine (Amendment 4) mine site	• Excavation and backfilling of numerous pits to maximize pod recovery • • Does not fully utilize Bear Run's viable coal reserve and existing facilities • Recovery of reserves would be less than 50% on the coal seams pod mined • Does not assure the site will not be significantly disturbed by activity now or in the future • Does not eliminate surface disturbance of streams and wetlands at the Bear Run Mine (Amendment 4) mine site	• Operational costs render this alternative impractical, as well as failing to fully utilize this viable energy reserve • Does not meet project objective

A detailed description of each of the alternatives follows:

A. The "*No Action*" Alternative is to not continue or expand the existing mining operation, as well as other similar mining operations in the Midwest. The existing open pits and mine infrastructure would have to be reproduced in other similar sites to replace the lost coal reserve. The four coal seams to be mined by this operation on average generate 20,000 tons per acre. Most surface coal mines in the Midwest mine from one seam to three seams of coal. The Bear Run reserve represents one of the largest recoverable tons per acres of mineable coal in the Illinois Basin. For comparison, the Farmersburg Mine has been the largest-producing surface mine in the Illinois Basin for the past decade and averaged coal recovery of 7,800 tons per acre. To mine the same amount of coal, one acre of disturbance at Bear Run Mine would have required 2.6 acres at the Farmersburg Mine to meet the same tonnage. For the approximately 8,500 acres mined at Farmersburg; an additional 13,600 more acres would have been required. The "No Action" alternative would result in many negative side effects:

- **Loss of ~ 460 current and future direct jobs with a payroll of ~ $58 million annually when full production is reached. Many of the employees are long term employees in the mining industry and are not currently trained for other employment. The mining industry is vitally important to the local economy of Sullivan County, as well as to the region and state. Unemployment rates as of June 2010 were estimated at 9.8% for Sullivan County, 10% for Indiana and 9.7% for the United States[47].**

- **Over half of the electricity produced in the U.S. and over 95% of the electricity produced in Indiana comes from coal-fired power plants. The economical availability of high quality coal is paramount to the local, state and national economy and national security. Elimination of ~25% of the annual coal production in Indiana (based on the 30 million tons Indiana produces in a year) would result in a very serious supply deficit for Regional utilities. This is especially true at a time when supplies are interrupted in other coal producing regions of the U.S.**

- **The loss in tax revenue, both direct and indirect would be significant, particularly when the replacement industry is unknown, and most local, state and federal governments are operating under significant deficit spending.**

- **The economic losses to the company would be immense as huge investments in land, coal reserves, equipment and infrastructure have been made well in advance using a business plan dependent on maximizing recovery of the reserve. The majority of these things cannot be moved to other locations. Those items that can be relocated are at a significant additional cost and time, and will likely result in greater impacts at new unknown sites.**

B. The "*Preferred Action*" alternative is to follow the proposed surface mining plan. This will maximize coal recovery and ensure re-disturbance does not occur in the future when coal and overall energy demand is projected to increase. Steps will be taken, as always, to minimize effects to the aquatic resources by placing required sediment basins and diversions as close to the coal extraction area as possible.

The permit boundary has been restricted to the maximum extent possible to allow efficient and effective mining of the reserve. The eastern edge of the permit boundary abuts the previously approved Section 404 permit area for the Bear Run Mine (East Pit) where surface coal mining and coal preparation facilities will be located. Mining will be initiated in the Bear Run Mine (East Pit) and advance into the Bear Run (Amendment 4) area. The southern, northern, and western boundaries of the permit area are determined by the proposed mining plan. Previously mined and reclaimed area in Area 3 was included in the permit for boxcut spoil placement, drainage control and mine support. It is desirable to place the boxcut spoil in this area as it provides for suitable placement of the initial overburden for mining area in Area 3 due to the existing large open water impoundments and straightened streams and unplanned wetlands that have developed. The boxcut spoil area has already been mined. Soil stockpiles will also be placed in adjacent upland areas outside of the streams and wetlands. Large acreages of unmined land have been avoided through utilization of previously mined areas for the preparation plant, shop and offices, haul roads, plant make-up water, refuse disposal, box cut spoil placement and sediment control measures. Advance disturbance will be minimized and concurrent high quality reclamation will be ongoing to keep the disturbed area to a minimum at any given time. Best Management Practices will be utilized to guard against negative impacts to the aquatic ecosystem outside of the area planned for mining. Best Management Practices include retention and

monitoring of site run-off, use of quick growing cover crops, and silt fencing. In addition, temporary and permanent terracing and erosion control systems and filter strips will be employed in reclaimed agricultural fields. Stream and wetland mitigation will take place as quickly as practicable, employing the best techniques available to ensure successful mitigation. Mitigation areas will be monitored closely by well-trained staff and outside consultants will be utilized as needed (staff and consultant credentials provided in Section 5.D.)

The Bear Run (Amendment 4) project area has been selected for a number of factors making the site unique:

- **Coal quantity is the most important component of the site selection. The four coal seams to be mined by this operation on average generate 20,000 tons per acre. Most surface coal mine sites in the Midwest mine from one seam to three seams of coal. The Bear Run reserve represents one of the largest recoverable tons per acres of mineable coal in the Illinois Basin. For comparison, the Farmersburg Mine has been the largest-producing surface mine in the Illinois Basin for the past decade and averaged coal recovery of 7,800 tons per acre. To mine the same amount of coal, one acre of disturbance at Bear Run Mine would have required 2.6 acres at the Farmersburg Mine to meet the same tonnage. For the approximately 8,500 acres mined at Farmersburg; an additional 13,600 more acres would have been required. This could have potentially disturbed approximately 900,000 feet of streams and approximately 80 acres of wetlands utilizing the wetland and stream densities discussed in the Cumulative Analysis section for the Bear Run (Amendment 4) permit area. Surface mining is the only available method to safely and efficiently extract the extensive available coal reserve and eliminate future impacts. The unique features of the Bear Run coal reserve are discussed further in part D of the Alternatives Analysis.**

- **Property and mineral control – surface property and coal reserves were acquired at a substantial cost. It is not economically feasible to relocate this site to an uncontrolled area even if an acceptable reserve was available. The lost time and additional investment with an unknown conclusion eliminate this as an option from a practical business perspective. Property control/access must be acquired before aquatic resources can be evaluated.**

- **Existing land use and site location – land uses are primarily cropland, forest and previously mined areas. Topography is flat to rolling. The site occurs in a rural sparsely populated setting and is isolated from most nearby residences. Existing land uses on previously mined areas at the site have a long history of successful reclamation and reestablishment as post-mining land uses. Previously affected areas are being utilized to the extent possible for mining support facilities in order to avoid and minimize additional impacts to unmined lands.**

- **Coal quality – the coal seams to be mined by this operation are the Indiana No. 7, No. 6, No. 5A, and No. 5. These are needed, compatible fuel sources for existing coal-fired power plants which must continue to operate and produce electricity that is crucial to the economy and security of the United States. The average Btu content of the final saleable coal is ~11,000. While alternate sources of power generation are being developed on varying scale throughout the country, there is no viable, scaleable or economic replacement for coal in the foreseeable future.**

- **Marketability - the site location allows for efficient access to existing infrastructure that currently supports transportation of coal to customers for energy production. Indiana Rail Road has recently completed a rail spur into the Bear Run site that provides access to rail lines which are located strategically to coal-fired electric utilities. Rail delivery will be the primary method of delivery of coal to the mine's customers, thereby reducing potential traffic onto local public roads.**

C. The "*Project Relocation*" Alternative is not a viable alternative as essentially the same or more aquatic resources would be encountered at any mining location in the Midwest. Another location would, in fact, require additional disturbance of natural areas for infrastructure construction. In addition, the potential mining locations are dictated by the site specific geology. Unlike many other industries, coal mining cannot be relocated to more desirable areas if they exist. The mine must be located where the mineable reserve is located. Relocation would likely result in significant increased impacts at multiple sites to equal the planned production and available tons per acre of Bear Run. Economically mineable

surface coal reserves are declining in the Illinois Basin and will continue to do so in the future. The Bear run reserve is one of the last large surface mineable deposits left in the region. The Bear Run site was chosen because of the factors mentioned above.

D. The use of "*Other Mining Techniques***" to recover the coal reserve is considered during the planning and permitting processes. In most cases, a coal reserve is essentially either suitable for surface mining or underground mining.** *Underground mining***, either by longwall or room and pillar, auger and highwall mining and pod mining scenarios have been evaluated and rejected as alternatives to surface mining. Explanations are provided below.**

Past experience at Peabody's Illinois Basin room and pillar operations have resulted in conclusions that a minimum average coal thickness of 5 feet is needed before an underground operation is even considered for evaluation in the No. 5 or No. 6 coal seam due to economic factors, safety and an available workforce. Furthermore, in existing *underground mines* **owned or operated by Peabody, mining extents do not extend into areas where the No. 5 or No. 6 coal seam thickness is less than 4.5 feet. None of the existing coal seams meet either of these minimum requirements. The thickest seams are the No. 5 seam which is ~3.9 feet thick and the No. 6 seam which is 3.7 feet thick in the Amendment 4 area. The average depth to No. 6 seam is ~ 140 feet while the average depth to the No. 5 seam is 220 feet; however, the No. 5A seam is on average only ~21 feet above the No. 5 seam. The close proximity of the coal seams likely would cause weakened roof conditions, increased safety concerns, and further eliminate underground mining as an option. Based on seam thicknesses, if underground mining was feasible in the No. 5 or No. 6 seam, approximately 85% of the coal reserve would be left in place. If both the No. 5 and No. 6 seam could be mined from underground, 79% of the coal reserve would be left in place. This enormous reduction in reserve would not support the existing and future investment in the mining infrastructure. Furthermore, it would take several separate mines with associated infrastructure to replace the annual production planned at Bear Run. Thinner seams are mineable in the Appalachian coal region due to higher Btu and lower sulfur content and much different geological conditions.**

Longwall mining **has not been attempted in Indiana to date, but the same conditions described above would prohibit longwall mining as an option. In addition, longwall mining results in land subsidence which would have an unknown impact to the existing aquatic resources.**

Auger Mining **is only a supplement to surface mining in limited circumstances. There is less opportunity for auger mining in conditions similar to Bear Run where multiple seams will be mined to 220 foot depth. The order and organization of in-pit operations is critical to the efficient and safe operation of the mine. Auger mining requires pit areas to be idled from the normal stripping operation while augering occurs. This delays and increases the costs of reclamation by forcing rehandling of material to fill the voids that are left open for augering. In addition, the pit depth at Bear Run would require additional highwall laybacks to ensure safe working conditions for any auger mining crew below. Recovery is less than 50% on any coal seam, and auger penetration is limited to 300 feet in best cases. Rolling coal seams similar to those at Bear Run further limit recovery by augering operations. Peabody Midwest Mining, LLC includes augering options in its' SMCRA permits to provide options for maximizing coal recovery at pit ends and final pits, but historically augering activities have proven to not be cost effective in most circumstances. Use of a** *highwall miner* **allows deeper (800-900 feet) extraction than a conventional auger and slightly higher recovery (~55%), but it also creates even more complications from an operational and consistent productions standpoint. Even larger working areas are required to accommodate use of a highwall miner and further increases reclamation costs and prevents consistent production to meet utility needs.**

Pod mining **would consist of the excavation of smaller pits in between the aquatic resources since the coal reserve at the Bear Run Mine consists of four (4) separate seams; the Indiana No. 7, No. 6, No. 5A, and No. 5 seams down to a depth of approximately 220 feet. This technique would make mining economically unfeasible as mining costs would increase significantly while coal recovery would diminish dramatically. Furthermore, it would not be possible to physically extract all four seams in the smaller shorter pits. The lower two seams of coal would likely have to be left, but the mining ratio is too high to allow extraction of the upper seams. Additional lay backs would be needed to allow for construction of separate diversions and sediment basins for each pod area. The overburden from each pit would have to be stockpiled and then re-deposited into the pit after coal removal, as opposed to conventional surface mining where pits advance continuously with overburden being deposited into the previous pit.**

Coal recovery would be lost under each aquatic resource, the related pit and drainage control lay back areas and overburden stockpile area. Use of auger mining or highwall mining would increase coal recovery slightly, but further increase the operating costs and disjointed production.

Besides the uncommonly high coal tons per acre at Bear Run, another unique aspect is the depth and distribution of the coal seams and the resulting mining ratio. Based on historical data and the current coal market, Peabody's Midwest Operations use an average 20:1 mining ratio as its' basis for whether a reserve can be economically mined from a surface operation standpoint. The ratios of the Bear Run Mine (Amendment 4) reserve calculated from the surface to each seam is as follows: The No. 7 seam ratio is 40:1, the No. 6 seam ratio is 27:1, the No. 5A seam ratio is 25:1 and the No. 5 seam ratio is 19:1. This information is presented to illustrate that all 4 seams must be mined in order to be economically feasible. This fact coupled with the depth to the lowest seam cause avoidance of aquatic resources to be unfeasible. The only manner in which this mine can operate efficiently and safely is to open a pit once and advance consistently to the end of the mining. A cost analysis of avoiding intermittent streams and wetlands in close proximity is outlined below and illustrated on Map E in Appendix A.

Avoiding the intermittent streams and larger wetlands in close proximity to the intermittent streams creates many costly operating difficulties and inefficiencies. *Pod mining* **forces additional box cut excavations, additional final pit reclamation, interruptions in direct haulback reclamation, additional sediment basin and diversion construction, additional haul road construction and reclamation, decreased and inconsistent coal production, inconsistent equipment and workforce needs, as well as significantly reducing the coal reserve. The spoil generated from the additional box cut excavations will have to be hauled to the previous final pit for deposition once mining is completed in the previous pit. Sediment basins and diversion ditches will have to be constructed for active and post-mining drainage control requirements. Haul roads that otherwise would not be needed will have to be constructed to facilitate the additional box cut excavations.**

Diversions	**= 33,000 LF, 3' depth, 4' wide bottom w/ 3:1 side slopes** **= 47,600 cy X $1.25/cy**	**= $ 59,500**
Sed Basins	**= 8 basins, average 15 ac-ft each** **= 193,600 cy X $1.50/cy**	**= $ 290,400**
Add. Box Cut 1	**= 3,700 LF, 150' wide pit, 2.5 pits hauled, 205' depth** **Average haul distance 5,900 LF to final pits 1 & 3** **= 10,534,700 cy X $1.56 cy**	**= $16,434,000**
Add. Box Cut 2	**= 1,200 LF, 150' wide pit, 2.5 pits hauled, 205' depth** **Average haul distance 3,100 LF to final pit 2** **= 3,416,600 cy X $1.19/cy**	**= $ 4,065,000**
Add. Box Cut 3	**= 2,400 LF, 150' wide pit, 2.5 pits hauled, 205' depth** **Average haul distance 5,500 LF to final pit 4** **= 6,833,300 cy X $1.51/cy.**	**= $10,318,000**
Add. Box Cut 4	**= 2,400 LF, 150' wide pit, 2.5 pits hauled, 205' depth** **Average haul distance 2,700 LF to final pit 4** **= 6,833,300 cy X $1.19/cy**	**= $ 8,131,000**
Resoil Final Pits	**= Extra cost of stockpiling soil vs. normal direct placement (4' depth)** **= 248 acres (Final Pits 1,2,3,4 & 5) (9,000' L X 1,200' W)** **= 1,600,426 cy X $1.25/cy**	**=$ 2,000,533**

Reclamation of Additional Haul roads: (Assume construction is part of mining/box cut efforts and soil will be stockpiles adjacent to road) (Final grading at 1.5' depth, 4' depth of soil)
= Haul road width of 100', associated shoulders, ditches of 40'
= 17,200 LF X 140' width = 55.3 acres

Grading	**= 55.3 acres X 1.5' depth X $.70/cy**	**= $ 93,000**
Soil Replaced	**= 55.3 acres X 4' depth X $.70/cy**	**= $ 249,000**

Loss of Coal from intermittent streams, adjacent wetlands and additional isolated areas is estimated to 520 acres with ~20,000 tons/acre = 10.4 million tons or 67 billion kilowatt hours of electricity.
Lost Revenue estimate = $400,000,000

The primary additional costs outlined above that would be incurred by the Bear Run operation if it were required to avoid intermittent streams total $39,839,900. In addition, over 10 million tons of coal would be left in place and the lost revenue would equate to at least $400 million. These costs and lost revenue result prevent pod mining from being a viable option. The Amendment 4 area cannot be mined under this scenario for economic reasons. This example is presented to illustrate the extra costs, but it is also very likely coal recovery would be even less considering the depth and practical extraction capabilities in the avoidance distances given. Also, the current planned pit configuration to produce 8 million tons/year requires working pit lengths of at least 7,000 feet. The pod mining scenario only allows this minimum pit length in a few locations.

Also, not considered is the fragmented landscape that will result from the avoidance. The opportunity to reconstruct streams, wetlands and floodplains as complimentary components of a stable high value aquatic drainage system will not be available. Wetland mitigation will be minimal, and large blocks of hardwood forested wetlands will not be undertaken. In addition, the offered off-site wetland and stream mitigation would not be needed. Local public roads will also be fragmented as smaller portions will be mined through and decrease opportunities to improve public roads from a safety standpoint.

The proposed mining plan not only maximizes resource recovery but is also necessary if the area is to be mined at all. Although mining alternatives such as pod mining have been evaluated, they have been eliminated as viable options because of added cost, loss of revenue and operating limitations. As stated previously, there are no legitimate alternatives to the surface mining method of coal removal for the reserve. The only alternative would be to cease mining, resulting in the loss of high paying jobs, important tax revenue, ancillary economic growth, huge financial losses on investment to Peabody Midwest Mining, LLC and an interruption to the coal supply necessary for basic electricity production in Indiana and the nation. It should be noted that, mining returns the land to a natural state as opposed to other land uses such as commercial developments, housing developments, etc. which essentially alter the land use long term or permanently.

12. Social and Economic Importance

Mining is different from many other industries in that the mine and support facilities must be located where the resources occur. Other factors such as proximity to transportation, transmission lines, and reserve configuration dictate facility locations and are critically important to the viability and success of an operation. Reserves may be owned or controlled many years before mining occurs and involve a substantial long-term investment.

Coal mining is regarded to be of social and economic importance by Indiana Statute. *IC14-34-1-3 (7) Assure that the coal supply essential to the nation's energy requirements and economic and social well-being is provided and strike a balance between protection of the environment and agricultural productivity and the nation's need for coal as an essential source of energy.*

Further, an additional Indiana Statute requires that operations be conducted in a manner that <u>maximizes</u> the use of the coal resource. *IC 14-34-10-2 Duties of permittee …(b) In addition to other standards a permittee must meet under rules of the commission, a permittee shall do the following: …(2) Conduct the surface coal mining operation in a manner that maximizes the use and conservation of the solid fuel resource that is recovered so that re-affecting the land in the future through surface coal mining is minimized.*

Coal is Indiana's major energy source with 95 percent of its electricity generated from coal. Indiana coal mining provides not only many high paying jobs directly, but many ancillary jobs as well. A typical coal mine will contribute approximately 100 million dollars per year to the state economy. The cost of electricity is a major cost for industry and can affect the decision to locate new industries in Indiana. Approximately 50 percent of Indiana's electricity is consumed by industry. Even more fundamental, keeping the cost of electricity low helps to provide affordable energy to Indiana's citizens, especially those on fixed incomes. The social benefit of low cost energy is immeasurable.

Further, coal is a vital national resource and is crucial to the security of the nation. Coal constitutes 85 percent of America's fossil energy reserve and its consumption in the United Sates and the world is increasing.

13. Cumulative Activity: To assess cumulative impacts to the environment, the analysis should include the effect of the proposed activity, along with other activities that have occurred in the past, are occurring in the present, or will occur in the reasonable foreseeable future.

In assessing the cumulative impacts, both Bear Run permits (the pending Bear Run (Amendment 4) and the approved Bear Run (East Pit) will be combined and referred to as the Bear Run Project in the following sections. Cumulative surface effects for the Bear Run Reserve (Bear Run Project and any future amendments) begins on page 30 of this permit narrative. The sections that follow the watershed analysis describe the factors that may be impacted by the development of Bear Run Project. Two levels of cumulative impacts will be considered, where applicable: local impacts within the 14-digit HUC watersheds and the regional impacts within the 8-digit HUC watersheds.

An evaluation of the following information demonstrates that activity associated with the Bear Run Project has minimal impacts compared to the overall impacts to the cumulative watersheds.

The activities authorized for the Bear Run Project will occur within two 8-digit watersheds: the Middle Wabash - Busseron (05120111) and the Lower White (05120202). The Middle Wabash-Busseron drains west-central Indiana via Busseron Creek to the Wabash River. The Middle Wabash-Busseron watershed begins about 15 miles north of Terre Haute, near the Vermillion-Parke-Vigo County line. From there, the Wabash River flows to the southwest, forming the boundary between Indiana and Illinois just southwest of Terre Haute. Busseron Creek is located primarily in Sullivan County and flows to the southwest for about 30 miles before discharging into the Wabash River west of Carlisle. The Middle-Wabash-Busseron ends just south of Vincennes, where it becomes the Lower Wabash watershed. The main tributaries to Busseron Creek that will be impacted by the Bear Run Project will be Buttermilk Creek, Middle Fork Creek, and Maria Creek.

The Lower White watershed is the lower portion of the White River watershed (also known as the West Fork White River) located in west central Indiana. The Lower White watershed begins near Gosport, Indiana and flows southwest to its confluence with the Wabash River near the town of East Mount Carmel, in Gibson County. The watershed covers portions of Brown, Daviess, Gibson, Greene, Knox, Martin, Monroe, Owen, Pike, and Sullivan counties. The Lower White watershed receives flow from the Upper Whiter River, the East Fork White River, and the Eel River drainage basins. The main tributaries to the West Fork White River that will be impacted by the Bear Run Project are Pollard Ditch, Singer Ditch, and Black Creek.

The Bear Run Project will impact portions of seven 14-digit HUC watersheds: Buttermilk Creek, Middle Fork Creek (Sullivan), Maria Creek-Headwaters, White River-Pollard Ditch, Singer Ditch (upper)-Hill Ditch, Black Creek-Brewer Ditch, and Black Creek (Ditch)-Headwaters.

The following tables show the percentages of watershed that will be affected by the Bear Run Project.

14-Digit HUC Watershed Cumulative Impact Summary							
Watershed[1]	Watershed Area[1]	Bear Run (East Pit)	Percent of Watershed	Bear Run (Amendment 4)	Percent of Watershed	Bear Run Project	Percent of Watershed
	(acre)	(acre)	(percent)	(acre)	(percent)	(acre)	(percent)
Buttermilk Creek	13,364	12.3	0.1	77.8	0.6	90.1	0.7
Middle Fork Creek (Sullivan)	15,821	1,322.3	8.4	49.9	0.3	1,372.2	8.7
Maria Creek - Headwaters	17,505	0	0	342.0	2.0	342.0	2.0
White River - Pollard Ditch	17,493	237.6	1.4	1,714.5	9.8	1,952.1	11.2
Singer Ditch (upper)-Hill Ditch	12,147	19.7	0.2	0	0	19.7	0.2
Black Creek - Brewer Ditch	12,799	2,016.9	15.8	482.3	0.6	2,499.2	19.5
Black Creek Headwaters	22,083	2,083.6	9.4	0	0	2,083.6	9.4

8-Digit HUC Watershed Cumulative Impact Summary							
Watershed[1]	Watershed Area[1]	Bear Run (East Pit)	Percent of Watershed	Bear Run (Amendment 4)	Percent of Watershed	Bear Run Project	Percent of Watershed
	(acre)	(acre)	(percent)	(acre)	(percent)	(acre)	(percent)
Middle Wabash - Busseron (Indiana)	718,412	1,334.2	0.2	469.7	0.1	1,803.9	0.3
Lower White	1,070,965	3,141.8	0.3	2,196.8	0.2	5,338.6	0.5

In terms of percentages of watershed, Black Creek-Brewer Ditch potentially could be impacted the most by the Bear Run Project with approximately 19.5% of the watershed affected. The majority of the impacts will occur under the approved Bear Run (East Pit) permit (15.8%), but it should be noted that a large portion of this area has been previously surface mined and reclaimed as the Hawthorn Mine. The state-of-the-art coal preparation plant and rail loadout facilities for the Bear Run Project will be located in this local watershed which will be affected by these facilities for the life of the Bear Run Mine with coal stockpiles, haul trucks, and rail traffic. The other watersheds will be affected primarily by surface mining and reclamation during and after mining operations have ceased. The reclaimed lands will be returned to land uses commensurate with the pre-mine conditions. Reclaimed land will include agriculture, forests, pastures, wildlife habitat and open water.

Land Resources

The Bear Run Project is located in the Glaciated Wabash Lowlands ecoregion which is characterized by land that is often mantled by till or windblown silt and sand that are pre-Wisconsinan in age. This broad, undulating lowland was formed in non-resistant, non-calcareous sedimentary rock which was glaciated. Many wide, flat-bottomed, terraced valleys occur and are filled with alluvium as well as outwash, aeolian, and lacustrine deposits. Patterns of land use vary within the ecoregion. Drained alluvial soils are farmed while un-drained valleys are used for pasture or remain wooded. Upland soils are used for farming and livestock. The original vegetation included beech and oak-hickory forests with isolated prairies. Today, the productive soils support corn, soybean, wheat, and vegetable farming with scattered wooded areas. Coal mining has also occurred in this ecoregion as it is located along the rim of the Illinois Basin where coal deposits outcrop or occur at recoverable depths.

The following tables summarize the various land covers within the local 14-digit HUC watersheds covered by the Bear Run Project and the adjacent regional 8-digit HUC watersheds along with the acreage that has been previously affected by mining.

14-Digit HUC Watershed Land Cover Summary								
Watershed[1]	Watershed Area[1]	Previously Affected by Mining	Agriculture including Pasture	Forest / Wildlife	Developed	Water/ Wetlands	Undeveloped	Source of Information
	(acre)	(acre)	(percent)	(percent	(percent)	(percent)	(percent)	
Buttermilk Creek	13,364	6,323	27	60	4	8	1	Aerial Photo
Middle Fork Creek (Sullivan)	15,821	333	70	25	1	1	3	Aerial Photo
Maria Creek Headwaters	17,505	375	78	20	1	1	0	Aerial Photo
White River - Pollard Ditch	17,493	3,519	76	19	2	2	1	Aerial Photo
Singer Ditch (upper)-Hill Ditch	12,147	4,266	70	20	2	5	3	Aerial Photo
Black Creek - Brewer Ditch	12,799	5,336	35	58	1	5	1	Aerial Photo
Black Creek (Ditch)-Headwaters	22,083	5,541	40	51	0	7	2	Aerial Photo

8-Digit HUC Watershed Land Cover Summary								
Watershed[1]	Watershed Area[1]	Previously Affected by Mining	Agriculture including Pasture	Forest / Wildlife	Developed	Water/ Wetlands	Undeveloped	Source of Information
	(acre)	(acre)	(percent)	(percent	(percent)	(percent)	(percent)	
Middle Wabash - Busseron (Indiana)	718,412	57,536	70	19	4	7		[15]
Lower White	1,070,965	49,534	49	41	8	2		[16]

As shown by the above tables, agriculture is a significant land use in the Middle Wabash-Busseron watershed. The Lower White has a lower percentage of agriculture due to the watershed being dissected by two distinctly different ecoregions. The western half of the Lower White is primarily located in the Glaciated Wabash Lowlands ecoregion which is discussed above. The eastern half of the watershed is located across three minor ecoregions of the Interior Plateau: the Crawford Uplands, the Mitchell Plain, and the Norman Uplands. The Interior Plateau has rolling to deeply dissected, rugged terrain with areas of karst topography on the Mitchell Plain which does not support the scale of farming as in the Lowlands. The land cover is a mix of agriculture (both livestock and grain) and forest.

In the Glaciated Wabash Lowlands, crop and livestock production have impacted stream water quality and stream habitat due to erosion off the cultivated fields. A number of farmers incorporate soil conservation practices to retain topsoil, but the majority fails to do so. The following table shows the cropping conditions that were practiced in 2004 for Sullivan County, which has an area of 290,560 acres.

2004 Sullivan County Cropping Practices[17,18]		
Practice	Soybeans	Corn
	(acre)	(acre)
No Till	21,450	7,800
Mulch Till	18,200	2,600
Reduce Till	5,525	1,300
Conventional	13,975	52,324

As shown by the above table, the conventional farming practice is the predominate method used for corn and small grains production. This practice has impacted water quality ever since modern-day farming began utilizing larger tracts of land and modern machinery. Agricultural ditches were dug along field borders to facilitate farming while field tiles were installed to speed drainage of the fields. Runoff from exposed fields rapidly deposits sediment and soil amendments into adjacent streams affecting the overall water quality of the local watersheds and the region.

Baseline water quality in the local watersheds and region would greatly improve if more farmers would participate in conservation tillage practices. Conservation practices would reduce the amount of sediment introduced into the streams, decrease the amount of airborne dust, slow down runoff, and decrease the need for abundant field conditioners required for crop production. Recent trends point to an increase in conservation farming practices and a decrease in conventional tillage practices.

Coal mining associated with the Bear Run Project is a temporary use of the land. A reclamation plan which outlines the types and location of the post-mining land uses is required as a part of the SMCRA permit. The Indiana SMCRA program requires that no prime farmland be lost and that minimal forest loss occur. As such, impacts to these land uses will only be temporary. Reclamation activities will be conducted simultaneously with the mining operations to minimize the area of disturbance. All disturbed areas will drain to a sedimentation basin to ensure the appropriate quality of drainage from the Bear Run Project area.

Coal Resources

Along with agriculture, coal mining is another large part of the economy in southwest Indiana, although the aerial impacts are comparably minor. Statistics for Sullivan County show that 177,368 acres[27] (61.0%) of the

county is occupied by farms and used for crops or permanent pasture compared to the 28,690 acres (9.9%) that have been previously affected by mining.

Sullivan County has a rich heritage of coal mining. The earliest account of mining was mentioned by David Thomas during his travels along the Wabash River in 1816. Though there is evidence that coal mining was present in the county in the first half of the 19th century, coal mining as an industry began with the construction of the first railroads through the region. The first railroad was put into operation in 1854. The Indiana state geologist's report for 1898 provides some interesting statistics. Of the approximately 440 square miles of Sullivan County, it is estimated that all of it is underlain by coal and of this approximately 365 square miles (233,600 acres) is underlain by a recoverable reserve. The estimated total tons in these deposits was placed at 4.6 billion tons and at the time of the report the estimated amount of recoverable coal still unmined was 950 million tons[25].

Due to the geographic location in the Illinois Basin, both underground and surface mining have affected land in the receiving watersheds. The following table shows the approximate surface effects in acres for the respective watersheds. Areas Previously Affected by Mining are those that have been either reclaimed or abandoned by any company. Areas Currently Affected by Mining include the actively working open pit, locations of coal preparation and handling activity and areas that do not have topsoil yet placed over the spoil. Underground mining activities that include locations of surface support facilities and coal preparation and handling activity are also included. Areas Currently Affected by Mining includes operations by all companies in the area, not just Peabody subsidiaries. It should be noted that information on Potentially Affected by Mining acreages for other coal mine operators within the watersheds is not known. Only the permitted surface mine-able reserves are listed for Peabody subsidiaries.

Cumulative Surface Effects Summary							
Watershed	Watershed Area (acre)	Previously Affected by Mining (acre)	Percent of Watershed Previously Affected by Mining	Currently Affected by Mining (acre)	Percent of Watershed Currently Affected by Mining	Potentially Affected by Mining (acre)	Percent of Watershed Potentially Affected by Mining
Buttermilk Creek	13,364	6,323	47.31%	0	0.00%	58	0.43%
Middle Fork Creek (Sullivan)	15,821	333	2.10%	82	0.52%	50	0.32%
Maria Creek Headwaters	17,505	375	2.14%	0	0.00%	342	1.95%
White River - Pollard Ditch	17,493	3,519	20.12%	0	0.00%	1,049	6.00%
Black Creek - Brewer Ditch	12,799	5,336	41.69%	249	1.95%	331	2.59%
Total:	76,982	15,886	20.64%	331	0.43%	1,830	2.38%
Busseron Creek	151,336	27,062	17.88%	1,054	0.70%	1,064	0.70%
Maria Creek	62,197	375	0.60%	0	0.00%	342	0.55%
Middle Wabash - Busseron (Indiana)	718,412	57,536	8.01%	1,348	0.19%	2,362	0.33%
Black Creek	87,870	17,392	19.79%	249	0.28%	331	0.38%
Lower White	1,070,965	49,534	4.63%	1,118	0.10%	2,558	0.24%
White River	7,188,900	72,399	1.01%	1,283	0.02%	5,446	0.08%

The Bear Run reserve (Bear Run Project and foreseeable future mining) could exceed 200 million tons (approximately 20,000 tons per acre if coal thicknesses remain consistent). The actuality of mining this potential reserve is dependent on many variables including the ability to acquire property, future market conditions, public policy, and energy demand, coal quality and coal thickness, etc. Land and reserve acquisition is ongoing in the target expansion area which lies generally west of the Bear Run Project. The acquisition of land and coal contracts is a competitive business and very capital intensive. The further in advance capital is spent, the less return on investment is realized. Therefore, mining companies have attempted to manage land purchasing to coincide with needs for permitting and mining. Peabody is currently re-evaluating its strategies to determine the need for earlier purchases to accommodate changing permitting requirements and timeframes. In the present market, utility companies are less willing to make long term commitments as in the past. On average, the estimated impact to jurisdictional waters will be similar to or less than the Amendment 4 area, as

the ground flattens out and is occupied by more agriculture towards the west. The stream or wetland types should be similar to the Amendment 4 area with the majority of streams expected to be ephemeral. Where a higher percent of agricultural land is encountered, intermittent streams will likely be more prevalent, but overall stream length and quality would be expected to diminish. The majority of expansion would lie in the Middle Wabash-Busseron (Indiana) watershed with the remaining acreage located in the Lower White watershed. Based on the natural areas of the Amendment 4 area it is estimated that the expansion area would yield a factor of approximately 0.006 acre of wetland per acre and a stream factor of approximately 65 linear feet per acre. If assuming 200 million tons is eventually mined at the site during the next 20 - 30 years, and factors listed above hold true, an additional 400-500K linear feet of streams and 40-50 acres of wetlands could be impacted. These estimates are provided at the request of the Corps of Engineers; however, impacts could be much lower or higher due to the many unknowns discussed above.

Based on the computed natural area stream and wetland density of Bear Run (Amendment 4), the following table provides the estimated stream and wetland loss for the local watersheds based on the areas that have been previously affected by mining.

Estimated Stream and Wetland Impacts from Past Mining			
Watershed	Previously Affected by Mining	Estimated Stream Impacts	Estimated Wetland Impacts
	(acre)	(feet)	(acre)
Buttermilk Creek	6,323	411,000	38
Middle Fork Creek (Sullivan)	333	22,000	2
Maria Creek Headwaters	375	24,000	2
White River - Pollard Ditch	3,519	229,000	21
Singer Ditch (upper)-Hill Ditch	4,266	277,000	26
Black Creek - Brewer Ditch	5,336	347,000	32
Black Creek (Ditch)-Headwaters	5,541	360,000	33

The above acreage and footage impacts are estimated based on the approximately stream and wetland density calculated for the natural areas at Bear Run (Amendment 4) and cannot be verified. Before implementation of the Federal Surface Mining Control and Reclamation Act of 1977, little consideration was given to stream replacement. After 1977, reclamation was focused on reclaiming land to support a productive use which emphasized controlling sedimentation and erosion control through the use of terraces, swales, and WASCOB's. Past mining in Indiana appears to have decreased the overall stream length, but greatly increased wetland and open water acreages. Many of these areas like the Greene-Sullivan State Forest are now fish and wildlife areas and enjoyed by many citizens and visitors for recreation and nature activities. It has only been recently that natural stream design has been required by regulatory agencies.

A portion of the previously affected acreage in the Middle Wabash-Busseron and Lower White watersheds predates any law or regulation to reclaim the mined land to the standards of today. This lack of reclamation has resulted in discharge of sediment, acid mine drainage and other compounds into surface waters which has contributed to several of the receiving streams being listed on the 303(d) list for impairments (see 2010 Draft 303(d) list on page 35). It should be noted that Indiana coal operators pioneered strip mine reclamation in the United States when a group of early miners banded together to form the Indiana Coal Producers Association in 1918. They decided to revegetate the spoil banks they had created with the primary focus on reforestation to obtain a cash crop and for aesthetics. Most of the early plantings, starting in 1926 were primarily locust with some hardwoods. Not all coal companies adopted this reclamation practice until 1941 when the state of Indiana enacted the second strip mine legislation in the nation requiring that all companies make reclamation and reforestation efforts and requiring them to obtain permits and secure bonds to ensure compliance. The law included a provision for active coal companies to reforest an additional percent of previously stripped land than they mined each year to help in revegatating lands that had been abandoned without any attempt at reclamation or reforestation. The now defunct, Central Indiana Coal Company donated almost 1,400 acres of reforested lands in Sullivan and adjacent Greene County to the state of Indiana in 1935[31]. The Indiana Department of Natural Resources Division of Forestry created the Greene-Sullivan State Forest in 1936. Additional coal companies have donated or sold additional properties to the State. Several agreements have been made with

companies to trade mined land for unmined state-owned lands. As a result of the exchanges and donations, the Greene-Sullivan State Forest now covers almost 9,000 acres, of which over 50% has been surface mined and reforested or reclaimed. The State Forest is divided into two main areas. The forest unit, which straddles the Greene-Sullivan County line, has more than 120 lakes for fishing and boating. The Dugger unit, which is west of Dugger includes approximately 1,200 acres that was acquired from Peabody Coal Company in 1995.

According to the Indiana Geological Survey - Coal Mine Information System[13], the previously mined area adjacent to and included in Area 3, Area 4, and Area 5 was mined by the Hawthorn Mine. The Hawthorn Mine was in operation from 1965 to 1999. The areas within the permit boundary have all been reclaimed which included grading of the spoil, covering it with stockpiled soils, and revegetating it with the appropriate vegetation for the approved post-mining land use. The thickness of the soil on top of the mined areas varies from 1 to 4 feet. Early soil placement was conducted with intense compaction and a shallow impermeable layer has resulted in perched water tables throughout the reclaimed areas which have resulted in a "pothole" type community of small wetlands scattered across the landscape. In areas where intense compaction of the spoil and soil did not occur such as in forest and wildlife areas, surface water infiltration and horizontal migration from the surface water impoundments are enhancing the groundwater recharge and increasing base flow to receiving streams. The Kindill #3 Mine was in operation from 1991 to 2004. Portions of the mine have yet to be reclaimed. Within the permit area is an unreclaimed pit that will be utilized and then reclaimed when the mining operations begin in earnest.

Abandoned Mine Lands (AML)

Areas north and east of the Bear Run Mine has been heavily mined prior to 1970. Visible signs of historic mining such as spoil piles and pit lakes still exist throughout the region. A large percentage of this land area was previously mined prior to the Surface Coal Mine Control and Reclamation Act of 1977 resulting in ungraded spoil ridges which are now heavily vegetated.

While the State of Indiana has historically required reclamation of coal mined lands since 1941, these laws had varying requirements until the federal SMCRA law was passed. The Abandoned Mine Lands (AML) Program with the Indiana Department of Natural Resources Division of Reclamation has been in service since 1982 and has been responsible for the restoration of many acres of hazardous and unproductive land. SMCRA provided for the collection of fees on active coal mining to fund this restoration and elimination of these hazards. In Indiana, the program is funded by tonnage fees from underground (13.5 cents per ton) and surface (31.5 cents per ton) mines. Approximately 17 million dollars has been spent on AML reclamation projects in Sullivan and Greene Counties as of 2009[50].

The Office of Surface Mining ranks the AML sites into five categories based on the level of hazard the site poses. Priority 1 and 2 are the most serious AML problems which pose a threat to the health, safety, and general welfare of the public, Priority 3 are AML problems impacting the environment, Priority 4 involves public facilities, and Priority 5 includes the development of publicly-owned lands. Approximately 107 million dollars has been spent on AML projects in Indiana as of 2009. The Abandoned Mine Lands Program is actively working on plans and restoration projects in the area. Thousands of acres in southwest Indiana have been reclaimed and the area will only increase. These lands are being returned to a productive state while reducing sediment, erosion, and acid mine drainage into the receiving waters. The Bear Run Mine which at full production will produce 8 million tons of coal a year will contribute a minimum of $2.2 million per year to the AML fund to remedy those adverse effects of past coal mining conducted prior to SMCRA.

Water Quality

Within the Bear Run Project area, none of the waters are on the Outstanding Rivers List for Indiana[20]. The following table provides information on each of the receiving streams along with all the assessments on the waters downstream to either the Wabash or White Rivers.

2008 Indiana Department of Environmental Management 303(d) Combined Impaired Waters Summary[22]		
Waterbody Name/Segment	Status	Cause of Impairment
Buttermilk Creek (INB11G9_00)	Listed	Sulfates
		Total Dissolved Solids (TDS)
Maria Creek Headwaters (INB11K1_01)	Listed	Dissolved Oxygen
		E. coli
		Impaired Biotic Communities
Black Creek - Brewer Ditch (INW0262_00)	Listed	Sulfates
		Impaired Biotic Communities
		Total Dissolved Solids (TDS)
Singer Ditch (upper) - Hill Ditch (INW0266_00)	Listed	E. coli
Black Creek - Singer Ditch - White River Oxbows Tributaries (INW0267_00)	Listed	E. coli
Busseron Creek - Tanyard Branch (INB11GD_00)	Listed	Sulfates
		Total Dissolved Solids (TDS)

2010 Draft Indiana Department of Environmental Management 303(d) Combined Impaired Waters Summary[22]		
Waterbody Name/Segment	Status	Cause of Impairment
Buttermilk Creek (INB11G9_00, 01, 02, 03)	Listed	Sulfates
Maria Creek Headwaters (INB11K1_01)	Listed	Dissolved Oxygen
		E. coli
		Impaired Biotic Communities
Black Creek - Brewer Ditch (INW0262_00)	Listed	Sulfates*
		Impaired Biotic Communities
Singer Ditch (upper) - Hill Ditch (INW0266_00)	Listed	E. coli
Black Creek - Singer Ditch - White River Oxbows Tributaries (INW0267_00)	Listed	E. coli
Busseron Creek - Tanyard Branch (INB11GD_00)	Listed	Sulfates

*Data available from the Indiana Department of Environmental Management does not support that sulfate is cause of impairment.

Numerous substances can cause water pollution in the project area. These can include sediment from the erosion of exposed earth, nutrients from soil amendments, oxygen-demanding wastes from septic systems, acidic ions from improperly handled coal waste, toxic metals from illegal dumping, biological waste from septic systems and animal operations, and abandoned mine lands (AML) sites. Sources of pollutions can be divided into two categories: point source pollution and non-point pollution. Point source pollution is typically discharged from a pipe while non-point pollution is more widespread and cannot be pinpointed to one location. This pollution is discharged primarily in response to precipitation events.

Within the Middle Wabash-Busseron and Lower White watersheds, there are several known and regulated point sources of pollution. Dischargers must apply for and obtain a National Pollutant Discharge Elimination System (NPDES) permit from the State of Indiana. The primary pollutants being released through a pipe, ditch, or other well defined points can be oxygen demanding wastes, nutrients, sediment, and possible toxic materials. As of April 10, 2009, the following table tabulates the number of NPDES permits within the affected watersheds and notes how many are major. Major dischargers are facilities that discharge over one million gallons per day or sustain wastewater from a population greater than 10,000. There are no major dischargers within the smaller 14-digit watersheds of the permit area.

Active NPDES Permits[9]		
Watershed	Total NPDES Permits	Major Discharge Permits
Buttermilk Creek	1	0
Middle Fork Creek (Sullivan)	0	0
Maria Creek Headwaters	0	0
White River - Pollard Ditch	1	0
Black Creek - Brewer Ditch	0	0
Middle Wabash - Busseron	35	10
Lower White	58	9

Within the smaller 14-digit watersheds of the permit area, as well as the Middle Wabash-Busseron and Lower White watersheds, there are may be failing septic systems or septic systems that have been connected into field drainage tiles. Due to this area being rural in nature, homes within the area are almost entirely on septic systems. Failing septic systems are known sources of E. coli impairments in water bodies. Due to forested areas being concentrated along the stream corridors, wildlife can also cause impairments in water bodies. Many animals such as deer, geese, ducks, raccoons, and turkeys spend time in or around water bodies contributing to their potential impairment. There are also smaller livestock operations within these watersheds that are not regulated due to their small size under the confined animal feeding operation regulations. These operations may have an impact on the water quality.

Agricultural activities provide the majority of the non-point pollution within the affected watersheds. Land clearing and conventional tilling of the land makes soil susceptible to erosion. Soil amendments such as pesticides and fertilizers can also be washed from the fields. Conservation tillage along with vegetated buffer strips along the streams and ditches would greatly minimize sediment and nutrient loads into the streams. Runoff from urban and residential land use is not a large source of pollution for the immediate receiving waters of this permit as it is in largely a rural community. Runoff from impervious features such as roofs and roadways increases discharge to the receiving streams rather than allowing the rainfall event to soak into the ground. This increased discharge can accelerate stream bank erosion and sediment transport.

The Bear Run Project has an active NPDES permit that authorizes mine-related discharges. These discharges occur from sediment basins which are located as close to the disturbance area as practicable and are monitored for pH, suspended solids, settleable solids and iron, thereby preserving downstream habitats. All disturbed areas would drain to a sedimentation pond to ensure acceptable quality of any drainage from the site. Prior to initiating land clearing appropriate sedimentation ponds and upstream collection channels will be constructed. Sedimentation pond spillways will be protected to minimize soil erosion by utilizing riprap or quickly germinating vegetation. Upon completion of construction of the sedimentation ponds, affected areas would be graded to drain to the sediment. All discharges from the sedimentation ponds would be required to meet the numerical effluent limits for suspended solids, per the NPDES permit. Reclamation practices at coal mines such as the use of sediment basins and terraces and have proven successful in reducing erosion and sediment loss. Best Management Practices for erosion and sediment control will be implemented and no negative impacts to the waters outside of the area planned for mining should occur. Riparian buffers will be reestablished adjacent to the stream mitigation along and with conservation tillage practices will be recommended to tenant farmers.

Any effects of the Bear Run Project on surface water quality should be temporary and minimal. Effluent from NPDES discharge points is proposed to meet all applicable state and Federal standards and is compatible with that in the receiving stream. Adherence to these limits will ensure that adverse impacts will not occur to the surface water quality of the receiving stream as a result of the proposed operations.

Biological Quality

Biological quality was evaluated with assessments of regional watersheds by the Indiana Department of Environmental Management's Biological Studies Section and project specific streams by Wetland Services, Inc.

The Indiana Department of Environmental Management's Biological Studies Section conducts ecological assessments of Indiana surface waters. Surveys conducted assess aquatic habitat quality, fish community health, and invertebrate community health. The following summarizes assessments that were conducted within the

Middle Wabash - Busseron (Indiana) watershed (HUC 05120111) and the Lower White watershed (HUC 05120202). IDEM monitoring locations are shown in Figures 1-5.

IDEM uses the Qualitative Habitat Evaluation Index (QHEI) to assess habitat quality of a stream in conjunction with macroinvertebrate and fish sampling. The QHEI uses six metrics to score the habitat quality: 1) substrate, 2) instream cover, 3) channel morphology, 4) riparian zone and bank erosion, 5) pool/glide and riffle/run quality, and 6) gradient. IDEM has determined that a QHEI total score of <51 is poor for habitat. Results from IDEM's QHEI assessments are shown in Tables 1 and 2. The total scores ranged from 93 to 26 with an average score of 60 and a standard deviation of 13. This shows that the majority of sites are of relatively poor habitat quality with little variability across the watersheds. Average QHEI scores at sites located downstream of the Bear Run permit area included Maria Creek at 49 and 56.5 (two sites), Busseron Creek at 65, Marsh Creek at 38, and Brewer Ditch at 29.

Habitat quality is generally a reflection of the surrounding land uses and management practices. In the Middle Wabash - Busseron watershed, land use is predominantly agricultural vegetation (70 percent) followed by forest vegetation (19 percent), wetland vegetation and open water (7 percent), and urban (4 percent). In the Lower White watershed, land use is predominantly agricultural vegetation (49 percent), followed by forest vegetation (41 percent), urban (8 percent), and wetland vegetation and open water (2 percent). Numerous land management techniques occurred in the past that still impact the stream habitat quality today including, but not limited to, channelization of streams and removal of riparian buffers. These past management practices may be partially responsible for the low QHEI results.

For macroinvertebrate assessments, IDEM has developed a macroinvertebrate Index of Biotic Integrity (mIBI). Sampling methods follow the USEPA Rapid Bioassessment Protocols (RBP). In Indiana, a stream segment is non-supporting for aquatic life and considered "poor" or "very poor" use when the monitored macroinvertebrate community receives a mIBI score for multi-habitat samples of less than 36, for kick samples of less than 2.2, or for Hester/Dendy samples of less than 1.4. Results from IDEM's macroinvertebrate sampling are shown in Tables 3 and 4. Results show that of the 91 assessments, 17 show poor macroinvertebrate health and are non-supporting of the aquatic life use classification. Another 9 showed borderline results, with the mIBI result exactly equal to the threshold. Four of these sites, Busseron Creek, Marsh Creek, and Maria Creek (2 sites) are located downstream of the Bear Run permit area. These sites received scores as follows: Busseron Creek 3.4 (kick), Marsh Creek 2.6 and 4.8 (kick), Maria Creek 4.8 (kick), and Maria Creek 28 (multi-habitat).

When assessing fish community quality, IDEM uses the Index of Biotic Integrity (IBI) to define fish community characteristics. The IBI is based on 12 metrics that assess the community's species and trophic composition and fish condition and health. For IDEM's purposes of identifying impaired waters, an IBI score of less than 35 is considered non-supporting for aquatic life use. Results of IDEM's fish assessments are shown in Tables 5 and 6. Of the 54 assessments, 17 sites show poor fish community health and are non-supporting of the aquatic life use classification. Two of these sites, Maria Creek and Brewer Ditch, are located downstream of the Bear Run permit area. These streams received scores of 30 and 16, respectively, signifying poor fish community health.

The majority of IDEM's sampling results show poor quality habitat streams and as a result poor aquatic life community health. During active mining, impacts to these watersheds would be minimized through regulatory mechanisms. The NPDES permitting program regulates water quality of effluent to ensure protection of applicable uses of the receiving streams, including aquatic life. All runoff from areas affected by mining flows through NPDES permitted sediment basins prior to discharge. Following active mining, the affected streams and wetlands will be mitigated to a higher quality than what currently exists. Mitigated streams are typically sinuous with instream habitat structures, riffle/pool complexes, rock beds, and adequate riparian buffers. The mitigated streams and wetlands will provide high quality habitat for aquatic life, inevitably improving the fish and macroinvertebrate community health in the area.[24]

Figure 1: IDEM macroinvertebrate and fish sampling locations within the eastern half of the Lower White watershed.

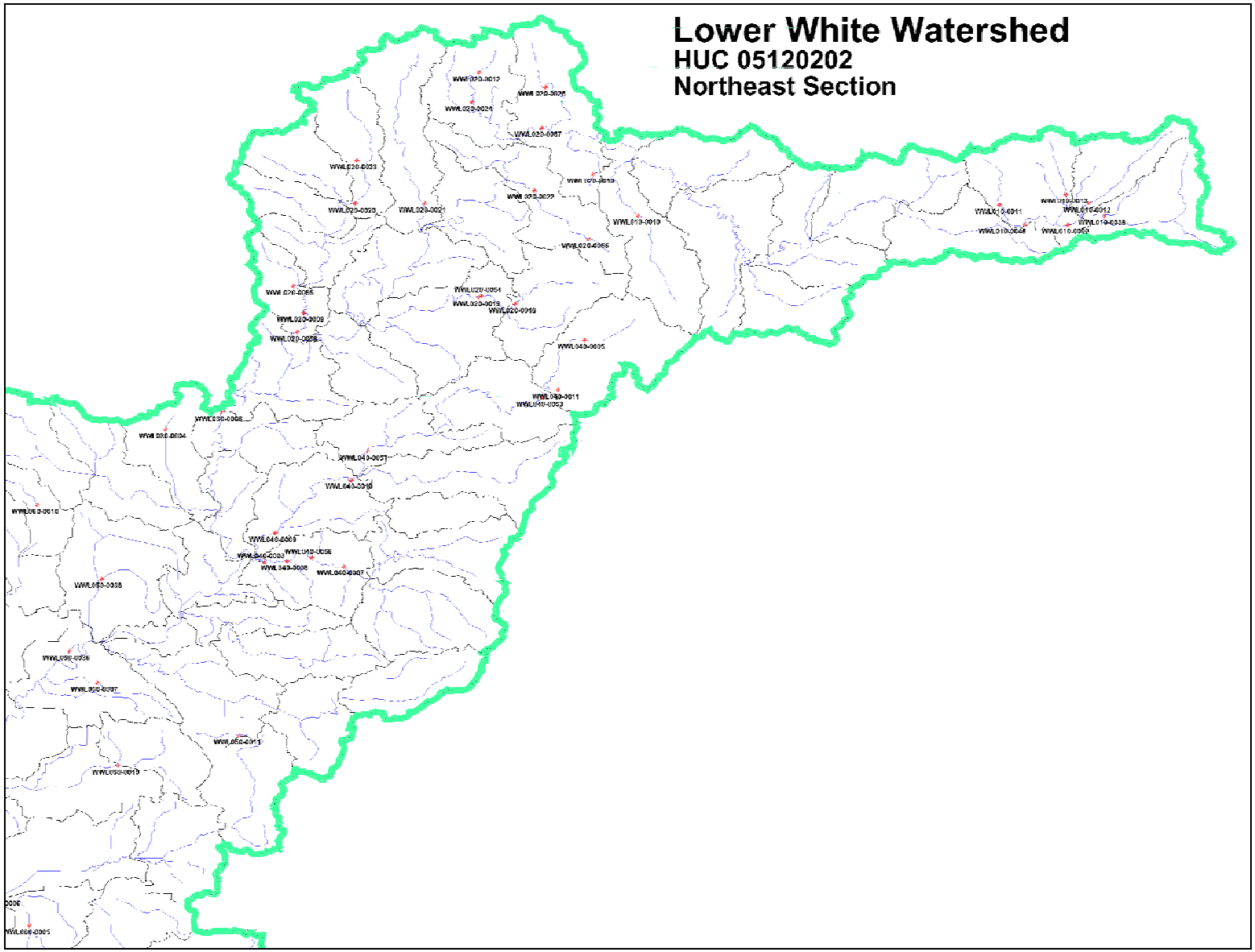

Figure 2: IDEM macroinvertebrate and fish sampling locations within the western half of the Lower White watershed. Bear Run permit area shown in red.

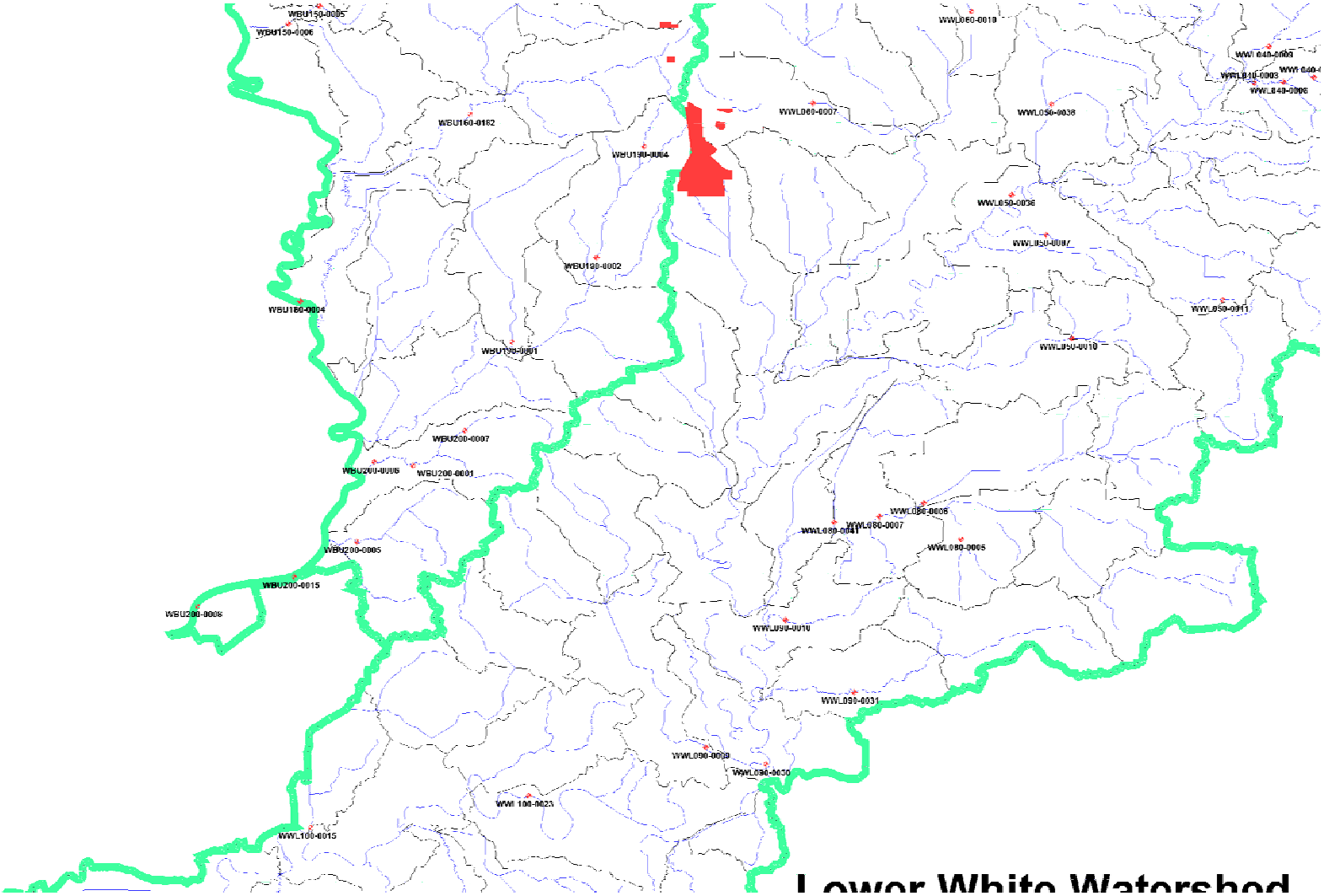

Figure 3: IDEM macroinvertebrate and fish sampling locations within the northern half of the Middle Wabash - Busseron watershed.

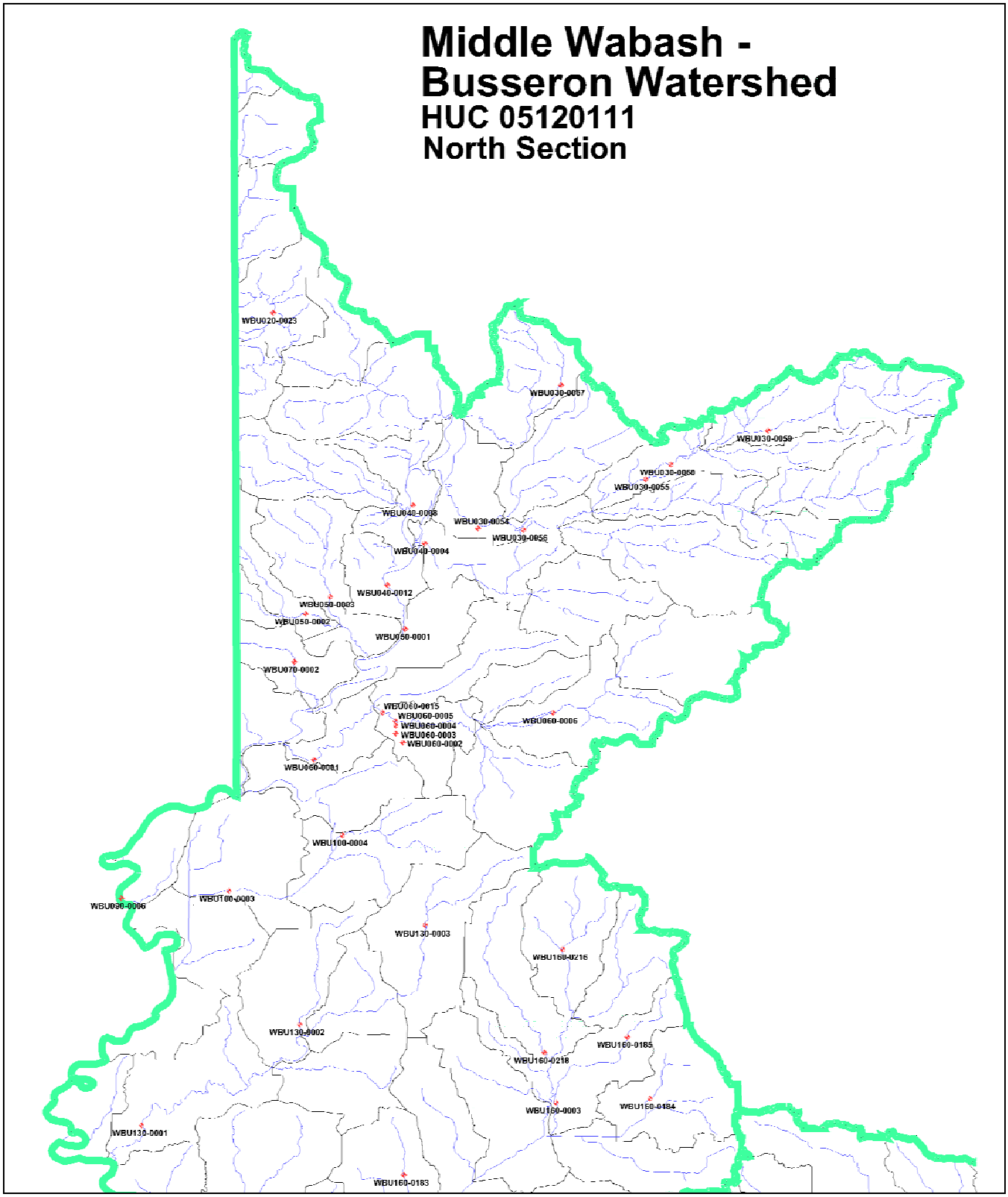

Figure 4: IDEM macroinvertebrate and fish sampling locations within the southern half of the Middle Wabash - Busseron watershed. Bear Run permit area shown in red.

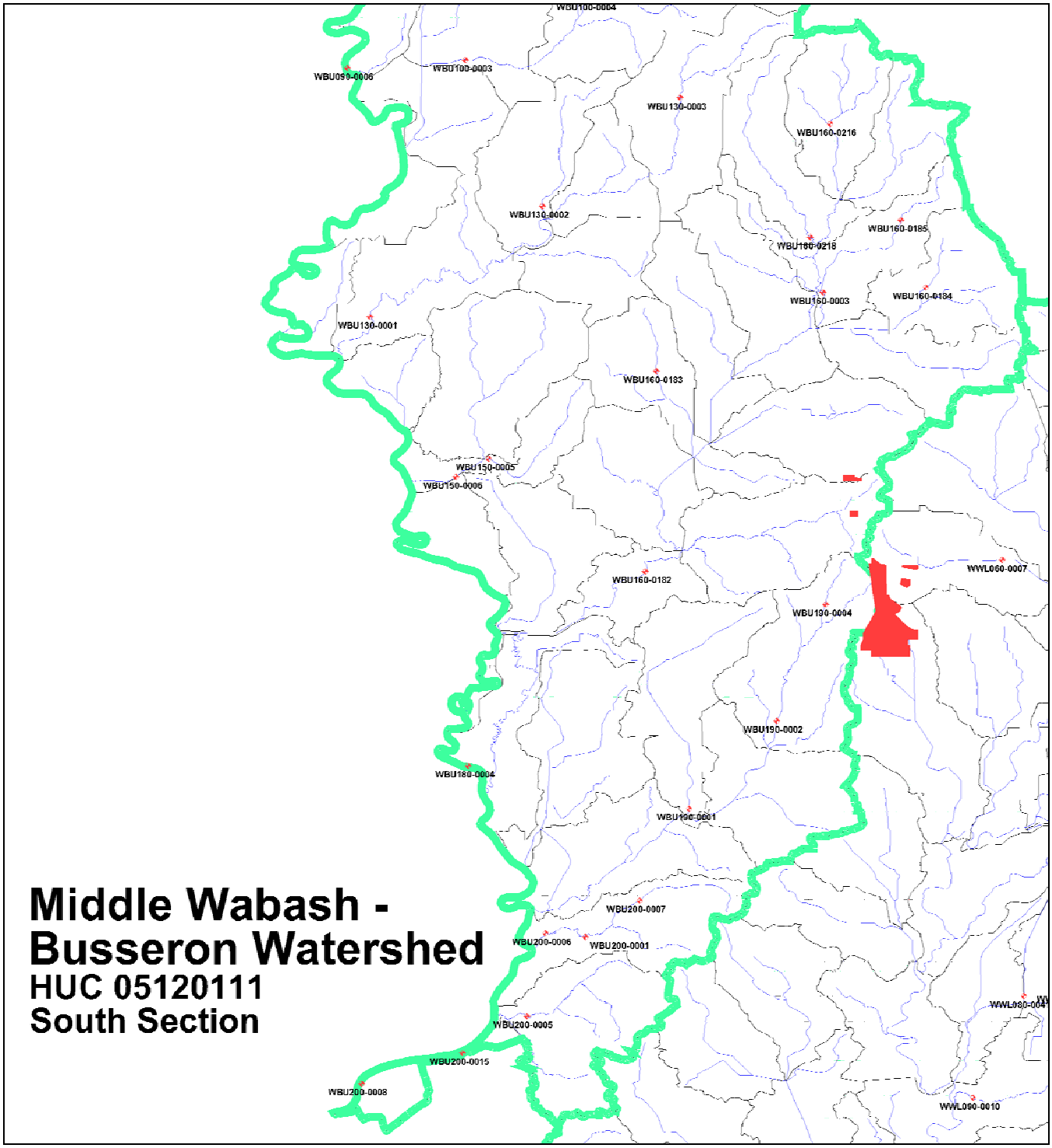

Figure 5: IDEM macroinvertebrate and fish sampling locations within the immediate vicinity of the Bear Run permit area.

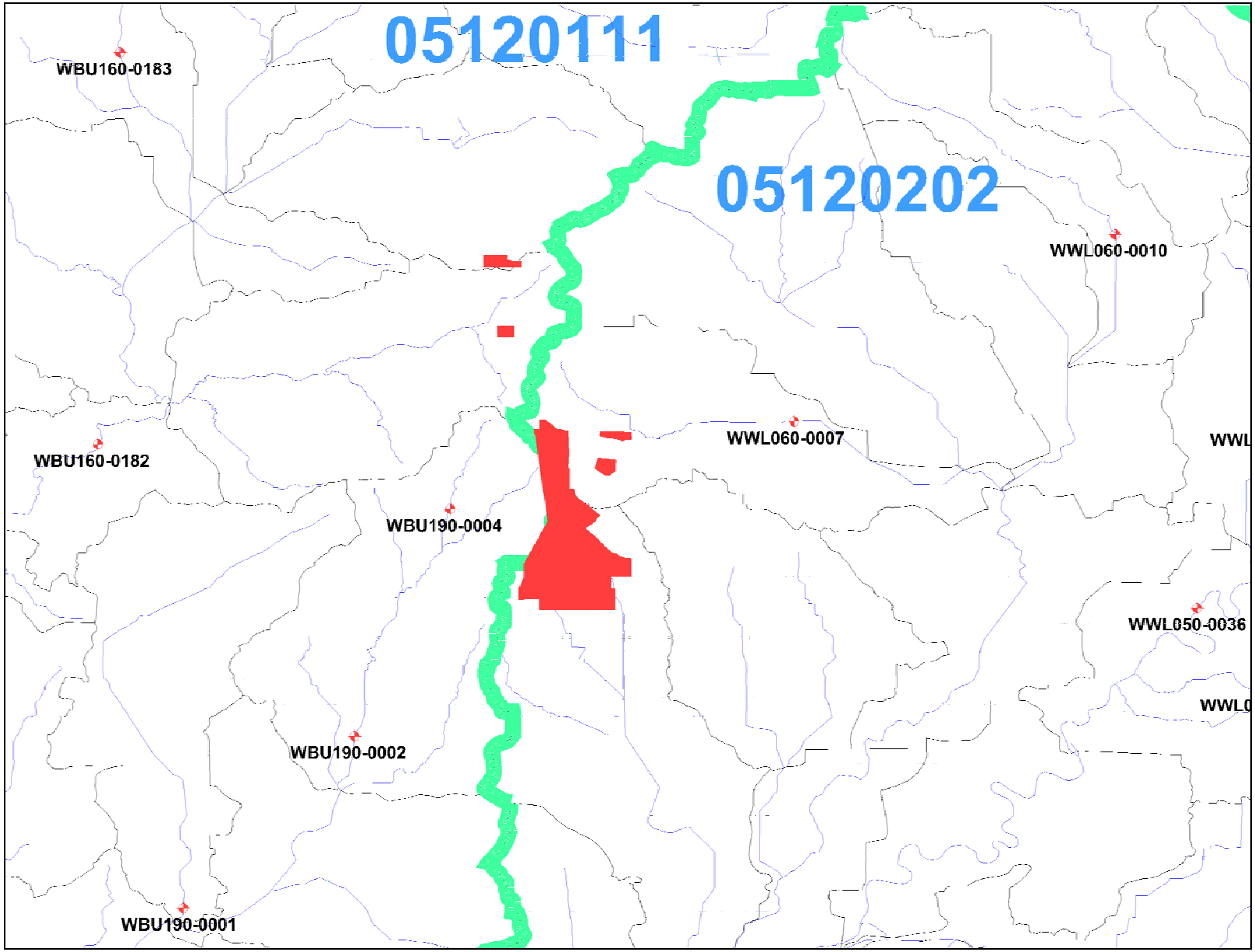

Table 1: IDEM QHEI assessment scores within the Middle Wabash - Busseron watershed. Sites identified by shade are located downstream of the Bear Run permit area.

IDEM Site ID	Sampling Section	Sample Date	Stream Name	HUC 14	Substrate Score	Stream Cover Score	Channel Score	Riparian Score	Pool Glide Score	Riffle Run Score	Gradient Score	QHEI Total Score
WBU020-0023	Fish	06/29/2004	Brouillets Creek	05120111020020	13	17	15	4	10	5	8	72
WBU030-0056	Fish	08/09/1999	Otter Creek	05120111030080	13	10	19	10	8	0	10	70
WBU030-0059	Fish	06/28/2004	North Branch Otter Creek	05120111030040	11	14	14	7	11	3	10	70
WBU030-0060	Fish	06/28/2004	North Branch Otter Creek	05120111030050	13	14	14	9	10	4	6	70
WBU030-0067	Fish	07/29/2004	Spring Creek	05120111030010	14	9	14	8	5	2	8	60
WBU030-0067	Fish	07/29/2004	Spring Creek	05120111030010	15	12	15	10	4	3	8	67
WBU040-0004	Fish	08/09/1999	Lost Creek	05120111040040	15	6	13	9	5	3	8	59
WBU040-0012	Fish	09/15/1999	Wabash River	05120111040050	15	7	14	8	10	0	6	60
WBU060-0015	Fish	07/06/2004	Honey Creek	05120111060050	13	13	16	10	10	5	6	73
WBU090-0006	Fish	09/27/2004	Wabash River	05120111090040	11	14	12	6	10	0	8	61
WBU090-0006	Fish	10/13/2004	Wabash River	05120111090040	11	14	12	6	10	0	8	61
WBU150-0006	Fish	08/09/1999	Turtle Creek	05120111150030	13	6	11	9	5	0	6	50
WBU160-0003	Fish	08/09/1999	Busseron Creek	05120111160040	3	17	16	9	9	0	6	60
WBU160-0003	Fish	09/01/1999	Busseron Creek	05120111160040	3	13	14	6	9	1	6	52
WBU160-0216	Fish	06/30/2004	Busseron Creek	05120111160010	16	12	12	5	3	2	8	58
WBU160-0218	Fish	06/30/2004	Busseron Creek West Fork	05120111160030	11	13	14	6	6	1	6	57
WBU180-0004	Fish	09/28/2004	Wabash River	05120111180010	14	14	12	5	10	0	6	61
WBU180-0004	Fish	10/14/2004	Wabash River	05120111180010	14	14	12	5	10	0	6	61
WBU190-0004	Fish	06/30/2004	Maria Creek	05120111190010	13	9	8	5	4	0	10	49
WBU200-0001	Fish	08/12/1999	Smalls Creek	05120111200010	6	7	12	9	8	0	6	48
WBU200-0008	Fish	09/15/1999	Wabash River	05120111200030	15	7	13	9	10	0	6	60
WBU200-0015	Fish	09/28/2004	Wabash River	05120111200030	13	15	11	7	10	0	8	64
WBU200-0015	Fish	10/13/2004	Wabash River	05120111200030	13	15	11	7	10	0	8	64
WBU030-0054	Macro	10/18/1991	Otter Creek	05120111030080	14	15	11	6	9	2	10	67
WBU030-0055	Macro	10/18/1991	North Branch Otter Creek	05120111030050	16	15	15	8	9	3	10	76
WBU040-0004	Macro	08/09/1999	Lost Creek	05120111040040	15	6	13	9	5	3	8	59
WBU040-0008	Macro	10/18/1991	Otter Creek	05120111040020	13	15	13	9	9	5	10	74
WBU050-0002	Macro	11/04/1993	Sugar Creek	05120111050040	9	5	11	8	7	2	10	52
WBU050-0003	Macro	11/04/1993	East Little Sugar Creek	05120111050050	14	7	14	4	5	2	10	56
WBU060-0001	Macro	11/10/1993	Honey Creek	05120111060070	13	8	13	6	10	3	6	59
WBU060-0001	Macro	08/31/1999	Honey Creek	05120111060070	10	8	13	3	8	0	6	48
WBU060-0002	Macro	10/07/1992	Unnamed Tributary of Honey Creek	05120111060050	17	13	12	5	11	6	10	74

Table 1 (continued): IDEM QHEI assessment scores within the Middle Wabash - Busseron watershed. Sites identified by shade are located downstream of the Bear Run permit area.

IDEM Site ID	Sampling Section	Sample Date	Stream Name	HUC 14	Substrate Score	Stream Cover Score	Channel Score	Riparian Score	Pool Glide Score	Riffle Run Score	Gradient Score	QHEI Total Score
WBU060-0002	Macro	08/31/1999	Unnamed Tributary of Honey Creek	05120111060050	4	12	13	2	5	5	6	47
WBU060-0003	Macro	08/10/1993	Unnamed Tributary of Honey Creek	05120111060050	14	10	13	3	5	1	8	54
WBU060-0003	Macro	08/31/1999	Unnamed Tributary of Honey Creek	05120111060050	4	6	4	2	5	2	8	31
WBU060-0005	Macro	10/07/1992	Honey Creek	05120111060050	14	7	14	5	7	4	8	59
WBU060-0005	Macro	08/31/1999	Honey Creek	05120111060050	12	12	11	4	10	1	8	58
WBU060-0006	Macro	11/10/1993	Honey Creek	05120111060020	9	6	14	4	5	2	10	50
WBU070-0002	Macro	11/04/1993	Clear Creek	05120111070030	13	7	16	5	7	2	10	60
WBU100-0003	Macro	11/10/1993	Prairie Creek	05120111100030	20	19	19	8	11	6	10	93
WBU100-0003	Macro	08/31/1999	Prairie Creek	05120111100030	15	11	16	5	6	3	10	66
WBU100-0004	Macro	11/10/1993	Prairie Creek	05120111100020	16	7	11	4	6	3	6	53
WBU130-0001	Macro	11/09/1993	Turman Creek	05120111130050	14	13	15	6	12	5	4	69
WBU130-0002	Macro	11/09/1993	West Fork Turman Creek	05120111130030	15	13	18	4	5	1	6	62
WBU130-0003	Macro	11/09/1993	Turman Creek	05120111130010	11	7	11	6	5	1	10	51
WBU150-0005	Macro	11/03/1993	Little Turtle Creek	05120111150030	14	6	14	5	5	2	6	52
WBU160-0182	Macro	11/02/1993	Busseron Creek	05120111160130	9	12	19	7	10	4	4	65
WBU160-0183	Macro	11/03/1993	Buck Creek	05120111160100	5	11	11	6	6	5	8	52
WBU160-0184	Macro	11/03/1993	Big Branch	05120111160050	14	11	15	7	8	3	6	64
WBU160-0185	Macro	11/03/1993	Sulphur Creek	05120111160040	9	6	14	4	5	2	8	48
WBU160-0185	Macro	09/14/2004	Sulphur Creek	05120111160040	11	15	13	8	4	0	8	59
WBU190-0001	Macro	11/03/1993	Marsh Creek	05120111190030	5	4	7	3	8	6	6	39
WBU190-0001	Macro	09/01/1999	Marsh Creek	05120111190030	12	5	6	3	4	1	6	37
WBU190-0002	Macro	11/02/1993	Maria Creek	05120111190010	13	8	8	3	5	5	6	48
WBU190-0002	Macro	09/15/2004	Maria Creek	05120111190010	19	15	9	5	7	4	6	65
WBU200-0005	Macro	11/04/1993	Snapp Creek	05120111200020	5	9	11	4	9	5	10	53
WBU200-0005	Macro	09/01/1999	Snapp Creek	05120111200020	5	6	11	5	4	1	10	42
WBU200-0005	Macro	09/15/2004	Snapp Creek	05120111200020	17	8	10	3	8	4	10	60
WBU200-0006	Macro	11/03/1993	Smalls Creek	05120111200010	14	11	8	6	5	4	6	54
WBU200-0006	Macro	09/15/2004	Smalls Creek	05120111200010	14	12	8	3	7	5	10	59
WBU200-0007	Macro	11/04/1993	Smalls Creek	05120111200010	6	6	7	3	5	3	8	38

Table 2: IDEM QHEI assessment scores within the Lower White watershed. Sites identified by shade are located downstream of the Bear Run permit area.

IDEM Site ID	Sampling Section	Sample Date	Stream Name	HUC 14	Substrate Score	Stream Cover Score	Channel Score	Riparian Score	Pool Glide Score	Riffle Run Score	Gradient Score	QHEI Total Score
WWL010-0038	Fish	10/17/1996	Bean Blossom Creek	05120202010010	12	14	13	6	5	4	10	64
WWL010-0045	Fish	06/14/2006	Bean Blossom Creek	05120202010030	11	13	15	9	9	0	10	67
WWL020-0009	Fish	10/03/1996	Fish Creek	05120202020140	11	6	11	5	8	0	10	51
WWL020-0010	Fish	10/22/1996	Big Creek	05120202020010	16	18	20	10	8	6	4	82
WWL020-0010	Fish	09/28/2001	Big Creek	05120202020010	15	10	17	10	5	4	4	65
WWL020-0012	Fish	10/03/1996	Little Mill Creek	05120202020020	14	14	16	6	10	3	6	69
WWL020-0054	Fish	06/13/2006	Raccoon Creek	05120202020080	20	18	19	10	10	6	8	91
WWL020-0054	Fish	09/20/2006	Raccoon Creek	05120202020080	13	14	13	10	11	7	8	76
WWL020-0055	Fish	06/07/2006	Fish Creek	05120202020140	12	11	12	6	10	3	6	60
WWL020-0056	Fish	06/19/2006	McCormicks Creek	05120202020030	7	6	18	7	4	1	8	51
WWL020-0057	Fish	10/10/2006	West Fork White River	05120202020010	14	12	13	3	10	0	10	62
WWL020-0058	Fish	06/06/2006	Fish Creek	05120202020140	9	13	12	4	9	0	6	53
WWL030-0004	Fish	07/05/2001	Sloan Ditch	05120202030040	1	13	6	5	4	0	4	33
WWL040-0005	Fish	07/24/2001	Richland Creek	05120202040010	17	8	16	9	5	5	10	70
WWL040-0053	Fish	10/03/1996	Richland Creek	05120202040020	18	10	14	7	10	4	6	69
WWL040-0056	Fish	06/12/2006	Plummer Creek	05120202040090	13	14	19	5	9	5	6	71
WWL040-0056	Fish	07/05/2006	Plummer Creek	05120202040090	13	12	16	6	11	5	6	69
WWL040-0057	Fish	06/07/2006	Richland Creek	05120202040030	13	13	13	5	11	5	6	66
WWL050-0007	Fish	10/21/1996	Weaver Ditch	05120202050090	11	2	5	4	0	0	6	28
WWL050-0010	Fish	08/01/2001	Kane Ditch	05120202050110	12	7	7	4	3	0	4	37
WWL050-0011	Fish	08/21/2001	Unnamed Tributary of First	05120202050070	12	11	19	6	3	3	8	62
WWL050-0036	Fish	10/02/2006	West Fork White River	05120202050090	15	7	14	4	11	4	8	63
WWL050-0038	Fish	06/12/2006	Timmons Ditch	05120202050080	7	8	6	4	6	0	6	37
WWL060-0007	Fish	07/24/2001	Brewer Ditch	05120202060020	0	10	7	5	3	0	4	29
WWL080-0005	Fish	07/31/2001	Eagan Ditch	05120202080060	3	6	7	3	3	0	4	26
WWL080-0006	Fish	08/21/2001	North Fork Prairie Creek	05120202080030	10	4	6	8	3	0	4	35
WWL080-0041	Fish	06/19/2006	Killion Canal	05120202080070	13	13	12	4	10	0	4	56
WWL090-0030	Fish	10/03/2006	West Fork White River	05120202090070	12	11	12	5	11	3	8	62
WWL090-0031	Fish	06/19/2006	Veale Creek	05120202090030	4	14	10	4	6	0	6	44
WWL100-0021	Fish	10/04/2006	White River	05120202100120	12	7	15	5	12	3	6	60
WWL100-0023	Fish	10/03/2006	White River	05120202100030	12	8	12	5	11	1	8	57
WWL010-0009	Macro	10/07/1993	Bean Blossom Creek	05120202010030	12	14	16	7	12	5	8	74

Table 2 (continued): IDEM QHEI assessment scores within the Lower White watershed. Sites identified by shade are located downstream of the Bear Run permit area.

IDEM Site ID	Sampling Section	Sample Date	Stream Name	HUC 14	Substrate Score	Stream Cover Score	Channel Score	Riparian Score	Pool Glide Score	Riffle Run Score	Gradient Score	QHEI Total Score
WWL010-0010	Macro	10/29/1992	Jacks Defeat Creek	05120202010100	15	16	15	8	7	5	8	74
WWL010-0011	Macro	10/12/1993	Bear Creek	05120202010030	18	15	18	6	8	5	8	78
WWL010-0012	Macro	10/12/1993	North Fork of Bean Blossom Creek	05120202010020	14	18	18	8	12	6	10	86
WWL010-0012	Macro	07/30/2001	North Fork of Bean Blossom Creek	05120202010020	15	15	20	9	11	3	10	83
WWL010-0013	Macro	10/12/1993	Lick Creek	05120202010030	15	13	18	7	6	5	8	72
WWL010-0045	Macro	07/27/2006	Bean Blossom Creek	05120202010030	9	14	14	8	10	0	10	65
WWL020-0018	Macro	10/23/1992	Raccoon Creek	05120202020070	20	17	17	8	7	7	10	86
WWL020-0019	Macro	10/22/1992	Raccoon Creek	05120202020080	17	19	17	10	9	6	10	88
WWL020-0019	Macro	07/18/2001	Raccoon Creek	05120202020080	20	10	20	10	11	5	10	86
WWL020-0020	Macro	10/27/1992	East Fork Fish Creek	05120202020100	12	17	16	8	7	4	10	74
WWL020-0021	Macro	10/23/1992	Rattlesnake Creek	05120202020050	13	11	15	4	7	3	10	63
WWL020-0022	Macro	10/28/1992	McCormicks Creek	05120202020030	19	11	16	10	7	6	4	73
WWL020-0023	Macro	10/27/1992	East Fork Fish Creek	05120202020100	15	18	18	10	5	3	8	77
WWL020-0024	Macro	10/27/1992	Little Mill Creek	05120202020020	16	14	17	9	7	5	8	76
WWL020-0024	Macro	07/18/2001	Little Mill Creek	05120202020020	20	8	20	8	4	4	10	74
WWL020-0024	Macro	09/13/2004	Little Mill Creek	05120202020020	19	6	19	10	3	0	10	67
WWL020-0025	Macro	10/28/1992	Limestone Creek	05120202020010	16	18	18	8	5	5	4	74
WWL020-0054	Macro	07/19/2006	Raccoon Creek	05120202020080	11	11	14	10	9	4	8	67
WWL020-0055	Macro	07/19/2006	Fish Creek	05120202020140	12	8	12	6	7	0	6	51
WWL020-0056	Macro	07/19/2006	McCormicks Creek	05120202020030	4	5	9	7	3	0	8	36
WWL020-0057	Macro	10/10/2006	West Fork White River	05120202020010	14	12	13	3	10	0	10	62
WWL020-0058	Macro	07/24/2006	Fish Creek	05120202020140	13	7	13	4	10	0	6	53
WWL040-0003	Macro	10/14/1992	Plummer Creek	05120202040090	13	9	17	8	7	5	6	65
WWL040-0007	Macro	10/14/1992	Plummer Creek	05120202040090	11	6	15	6	5	1	6	50
WWL040-0008	Macro	10/15/1992	Plummer Creek	05120202040090	14	15	16	7	7	5	6	70
WWL040-0009	Macro	10/15/1992	Richland Creek	05120202040050	14	8	16	8	7	4	8	65
WWL040-0009	Macro	08/27/1996	Richland Creek	05120202040050	14	13	16	7	10	2	6	68
WWL040-0010	Macro	10/21/1992	Richland Creek	05120202040050	13	12	16	10	9	4	10	74
WWL040-0011	Macro	10/23/1992	Little Richland Creek	05120202040010	11	12	14	5	5	4	4	55
WWL040-0011	Macro	07/18/2001	Little Richland Creek	05120202040010	5	6	13	3	4	3	4	38
WWL040-0056	Macro	07/24/2006	Plummer Creek	05120202040090	12	7	13	8	7	0	6	53
WWL040-0057	Macro	07/24/2006	Richland Creek	05120202040030	13	9	10	4	9	0	6	51

Table 2 (continued): IDEM QHEI assessment scores within the Lower White watershed. Sites identified by shade are located downstream of the Bear Run permit area.

IDEM Site ID	Sampling Section	Sample Date	Stream Name	HUC 14	Substrate Score	Stream Cover Score	Channel Score	Riparian Score	Pool Glide Score	Riffle Run Score	Gradient Score	QHEI Total Score
WWL050-0011	Macro	08/21/2001	Unnamed Tributary of First Creek	05120202050070	12	11	19	6	3	3	8	62
WWL050-0036	Macro	10/02/2006	West Fork White River	05120202050090	15	7	14	4	11	4	8	63
WWL050-0038	Macro	07/25/2006	Timmons Ditch	05120202050080	13	5	5	3	6	0	4	36
WWL060-0010	Macro	10/13/1992	Buck Creek	05120202060030	6	5	7	6	9	3	6	42
WWL060-0010	Macro	09/14/2004	Buck Creek	05120202060030	16	15	19	8	8	0	6	72
WWL080-0007	Macro	10/07/1992	Prairie Creek	05120202080070	5	14	6	3	9	0	4	41
WWL080-0041	Macro	07/25/2006	Killion Canal	05120202080070	14	9	10	3	4	2	4	46
WWL090-0009	Macro	10/07/1992	Kessinger Ditch	05120202090060	13	15	19	10	6	0	4	67
WWL090-0010	Macro	10/08/1992	Hawkins Creek	05120202090010	14	15	13	5	7	0	10	64
WWL090-0010	Macro	08/27/1996	Hawkins Creek	05120202090010	8	13	14	4	9	5	10	63
WWL090-0030	Macro	10/03/2006	West Fork White River	05120202090070	12	11	12	5	11	3	8	62
WWL090-0031	Macro	07/25/2006	Veale Creek	05120202090030	12	6	12	4	5	0	10	49
WWL100-0015	Macro	10/07/1992	Plass Ditch	05120202100090	16	7	9	5	3	0	6	46
WWL100-0015	Macro	08/26/1996	Plass Ditch	05120202100090	12	5	6	4	6	2	6	41
WWL100-0021	Macro	10/04/2006	White River	05120202100120	12	7	15	5	12	3	6	60
WWL100-0023	Macro	10/03/2006	White River	05120202100030	12	8	12	5	11	1	8	57

Table 3: IDEM macroinvertebrate IBI assessment scores within the Middle Wabash - Busseron watershed. Sites identified by shade are located downstream of the Bear Run permit area.

IDEM Site ID	Sample Date	Stream Name	HUC 14	Sample Type	mIBI Metric Score	Aquatic Life Use
WBU050-0001	10/11/1995	Wabash River	05120111050060	HD	3.6	
WBU030-0054	10/18/1991	Otter Creek	05120111030080	KICK	4.4	
WBU030-0055	10/18/1991	North Branch Otter Creek	05120111030050	KICK	5	
WBU040-0004	08/09/1999	Lost Creek	05120111040040	KICK	2.8	
WBU040-0008	10/18/1991	Otter Creek	05120111040020	KICK	4.8	
WBU050-0002	11/04/1993	Sugar Creek	05120111050040	KICK	2.2	
WBU050-0003	11/04/1993	East Little Sugar Creek	05120111050050	KICK	3.8	
WBU060-0001	11/10/1993	Honey Creek	05120111060070	KICK	1.4	Non-supporting
WBU060-0001	08/31/1999	Honey Creek	05120111060070	KICK	3.8	
WBU060-0002	10/07/1992	Unnamed Tributary of Honey Creek	05120111060050	KICK	3.6	
WBU060-0002	08/31/1999	Unnamed Tributary of Honey Creek	05120111060050	KICK	3.8	
WBU060-0003	08/10/1993	Unnamed Tributary of Honey Creek	05120111060050	KICK	1.4	Non-supporting
WBU060-0003	08/31/1999	Unnamed Tributary of Honey Creek	05120111060050	KICK	2.2	
WBU060-0004	08/10/1993	Unnamed Tributary of Honey Creek	05120111060050	KICK	1	Non-supporting
WBU060-0005	10/07/1992	Honey Creek	05120111060050	KICK	2.4	
WBU060-0005	08/31/1999	Honey Creek	05120111060050	KICK	3.8	
WBU060-0006	11/10/1993	Honey Creek	05120111060020	KICK	2.2	
WBU070-0002	11/04/1993	Clear Creek	05120111070030	KICK	2.2	
WBU100-0003	11/10/1993	Prairie Creek	05120111100030	KICK	4.6	
WBU100-0003	08/31/1999	Prairie Creek	05120111100030	KICK	4.8	
WBU100-0004	11/10/1993	Prairie Creek	05120111100020	KICK	1.4	Non-supporting
WBU130-0001	11/09/1993	Turman Creek	05120111130050	KICK	2	Non-supporting
WBU130-0002	11/09/1993	West Fork Turman Creek	05120111130030	KICK	2.6	
WBU130-0003	11/09/1993	Turman Creek	05120111130010	KICK	2.6	
WBU150-0005	11/03/1993	Little Turtle Creek	05120111150030	KICK	2.2	
WBU160-0182	11/02/1993	Busseron Creek	05120111160130	KICK	3.4	
WBU160-0183	11/03/1993	Buck Creek	05120111160100	KICK	2.2	
WBU160-0184	11/03/1993	Big Branch	05120111160050	KICK	4.4	
WBU160-0185	11/03/1993	Sulphur Creek	05120111160040	KICK	0.8	Non-supporting
WBU190-0001	11/03/1993	Marsh Creek	05120111190030	KICK	2.6	
WBU190-0001	09/01/1999	Marsh Creek	05120111190030	KICK	4.8	
WBU190-0002	11/02/1993	Maria Creek	05120111190010	KICK	4.8	
WBU200-0005	11/04/1993	Snapp Creek	05120111200020	KICK	1.6	Non-supporting
WBU200-0005	09/01/1999	Snapp Creek	05120111200020	KICK	5.4	
WBU200-0006	11/03/1993	Smalls Creek	05120111200010	KICK	3	
WBU200-0007	11/04/1993	Smalls Creek	05120111200010	KICK	3	
WBU160-0185	09/14/2004	Sulphur Creek	05120111160040	MHAB	36	
WBU190-0002	09/15/2004	Maria Creek	05120111190010	MHAB	28	Non-supporting
WBU200-0005	09/15/2004	Snapp Creek	05120111200020	MHAB	34	Non-supporting
WBU200-0006	09/15/2004	Smalls Creek	05120111200010	MHAB	46	

Table 4: IDEM macroinvertebrate IBI assessment scores within the Lower White watershed. Sites identified by shade are located downstream of the Bear Run permit area.

IDEM Site ID	Sample Date	Stream Name	HUC 14	Sample Type	mIBI Metric Score	Aquatic Life Use
WWL030-0006	10/11/2001	West Fork White River	05120202030010	HD	5	
WWL010-0009	10/07/1993	Bean Blossom Creek	05120202010030	KICK	4.4	
WWL010-0010	10/29/1992	Jacks Defeat Creek	05120202010100	KICK	3.2	
WWL010-0011	10/12/1993	Bear Creek	05120202010030	KICK	4.8	
WWL010-0012	10/12/1993	North Fork of Bean Blossom Creek	05120202010020	KICK	4.8	
WWL010-0012	07/30/2001	North Fork of Bean Blossom Creek	05120202010020	KICK	5.2	
WWL010-0013	10/12/1993	Lick Creek	05120202010030	KICK	4.8	
WWL020-0018	10/23/1992	Raccoon Creek	05120202020070	KICK	5.8	
WWL020-0019	10/22/1992	Raccoon Creek	05120202020080	KICK	4	
WWL020-0019	07/18/2001	Raccoon Creek	05120202020080	KICK	3.8	
WWL020-0020	10/27/1992	East Fork Fish Creek	05120202020100	KICK	2.2	
WWL020-0021	10/23/1992	Rattlesnake Creek	05120202020050	KICK	2.8	
WWL020-0022	10/28/1992	McCormicks Creek	05120202020030	KICK	2.4	
WWL020-0023	10/27/1992	East Fork Fish Creek	05120202020100	KICK	3.8	
WWL020-0024	10/27/1992	Little Mill Creek	05120202020020	KICK	5.4	
WWL020-0024	07/18/2001	Little Mill Creek	05120202020020	KICK	4.6	
WWL020-0025	10/28/1992	Limestone Creek	05120202020010	KICK	5.2	
WWL040-0003	10/14/1992	Plummer Creek	05120202040090	KICK	4.6	
WWL040-0005	07/03/2001	Richland Creek	05120202040010	KICK	4.2	
WWL040-0007	10/14/1992	Plummer Creek	05120202040090	KICK	2.4	
WWL040-0008	10/15/1992	Plummer Creek	05120202040090	KICK	3.8	
WWL040-0009	10/15/1992	Richland Creek	05120202040050	KICK	5	
WWL040-0009	08/27/1996	Richland Creek	05120202040050	KICK	4	
WWL040-0010	10/21/1992	Richland Creek	05120202040050	KICK	3	
WWL040-0011	10/23/1992	Little Richland Creek	05120202040010	KICK	4.4	
WWL040-0011	07/18/2001	Little Richland Creek	05120202040010	KICK	2.4	
WWL050-0011	08/21/2001	Unnamed Tributary of First Creek	05120202050070	KICK	4.6	
WWL060-0010	10/13/1992	Buck Creek	05120202060030	KICK	4	
WWL080-0007	10/07/1992	Prairie Creek	05120202080070	KICK	1.8	Non-supporting
WWL090-0009	10/07/1992	Kessinger Ditch	05120202090060	KICK	4	
WWL090-0010	10/08/1992	Hawkins Creek	05120202090010	KICK	1.8	Non-supporting
WWL090-0010	08/27/1996	Hawkins Creek	05120202090010	KICK	1.8	Non-supporting

Table 4 (continued): IDEM macroinvertebrate IBI assessment scores within the Lower White watershed. Sites identified by shade are located downstream of the Bear Run permit area.

IDEM Site ID	Sample Date	Stream Name	HUC 14	Sample Type	mIBI Metric Score	Aquatic Life Use
WWL100-0015	10/07/1992	Plass Ditch	05120202100090	KICK	4	
WWL100-0015	08/26/1996	Plass Ditch	05120202100090	KICK	3	
WWL010-0045	07/27/2006	Bean Blossom Creek	05120202010030	MHAB	38	
WWL020-0024	09/13/2004	Little Mill Creek	05120202020020	MHAB	40	
WWL020-0054	07/19/2006	Raccoon Creek	05120202020080	MHAB	36	
WWL020-0055	07/19/2006	Fish Creek	05120202020140	MHAB	36	
WWL020-0056	07/19/2006	McCormicks Creek	05120202020030	MHAB	32	Non-supporting
WWL020-0057	10/10/2006	West Fork White River	05120202020010	MHAB	38	
WWL020-0058	07/24/2006	Fish Creek	05120202020140	MHAB	34	Non-supporting
WWL040-0056	07/24/2006	Plummer Creek	05120202040090	MHAB	42	
WWL040-0057	07/24/2006	Richland Creek	05120202040030	MHAB	40	
WWL050-0036	10/02/2006	West Fork White River	05120202050090	MHAB	34	Non-supporting
WWL050-0038	07/25/2006	Timmons Ditch	05120202050080	MHAB	28	Non-supporting
WWL060-0010	09/14/2004	Buck Creek	05120202060030	MHAB	40	
WWL080-0041	07/25/2006	Killion Canal	05120202080070	MHAB	38	
WWL090-0030	10/03/2006	West Fork White River	05120202090070	MHAB	36	
WWL090-0031	07/25/2006	Veale Creek	05120202090030	MHAB	42	
WWL100-0021	10/04/2006	White River	05120202100120	MHAB	38	
WWL100-0023	10/03/2006	White River	05120202100030	MHAB	32	Non-supporting

Table 5: IDEM fish IBI assessment scores within the Middle Wabash - Busseron watershed. Sites identified by shade are located downstream of the Bear Run permit area.

IDEM Site ID	Sample Date	Stream Name	HUC 14	Total IBI Score	Aquatic Life Use
WBU020-0023	06/29/2004	Brouillets Creek	05120111020020	54	
WBU030-0056	08/09/1999	Otter Creek	05120111030080	44	
WBU030-0059	06/28/2004	North Branch Otter Creek	05120111030040	40	
WBU030-0060	06/28/2004	North Branch Otter Creek	05120111030050	38	
WBU030-0067	07/29/2004	Spring Creek	05120111030010	38	
WBU030-0067	07/29/2004	Spring Creek	05120111030010	42	
WBU040-0004	08/09/1999	Lost Creek	05120111040040	44	
WBU040-0012	09/15/1999	Wabash River	05120111040050	40	
WBU060-0015	07/06/2004	Honey Creek	05120111060050	48	
WBU090-0006	09/27/2004	Wabash River	05120111090040	38	
WBU090-0006	10/13/2004	Wabash River	05120111090040	42	
WBU150-0006	08/09/1999	Turtle Creek	05120111150030	28	Non-supporting
WBU160-0003	08/09/1999	Busseron Creek	05120111160040	44	
WBU160-0003	09/01/1999	Busseron Creek	05120111160040	24	Non-supporting
WBU160-0216	06/30/2004	Busseron Creek	05120111160010	38	
WBU160-0218	06/30/2004	Busseron Creek West Fork	05120111160030	42	
WBU180-0004	09/28/2004	Wabash River	05120111180010	38	
WBU180-0004	10/14/2004	Wabash River	05120111180010	36	
WBU190-0004	06/30/2004	Maria Creek	05120111190010	30	Non-supporting
WBU200-0001	08/12/1999	Smalls Creek	05120111200010	24	Non-supporting
WBU200-0008	09/15/1999	Wabash River	05120111200030	40	
WBU200-0015	09/28/2004	Wabash River	05120111200030	36	
WBU200-0015	10/13/2004	Wabash River	05120111200030	20	Non-supporting

Table 6: IDEM fish IBI assessment scores within the Lower White watershed. Sites identified by shade are located downstream of the Bear Run permit area.

IDEM Site ID	Sample Date	Stream Name	HUC 14	Total IBI Score	Aquatic Life Use
WWL010-0038	10/17/1996	Bean Blossom Creek	05120202010010	38	
WWL010-0045	06/14/2006	Bean Blossom Creek	05120202010030	46	
WWL020-0009	10/03/1996	Fish Creek	05120202020140	46	
WWL020-0010	10/22/1996	Big Creek	05120202020010	38	
WWL020-0010	09/28/2001	Big Creek	05120202020010	42	
WWL020-0012	10/03/1996	Little Mill Creek	05120202020020	24	Non-supporting
WWL020-0054	06/13/2006	Raccoon Creek	05120202020080	44	
WWL020-0054	09/20/2006	Raccoon Creek	05120202020080	46	
WWL020-0055	06/07/2006	Fish Creek	05120202020140	50	
WWL020-0056	06/19/2006	McCormicks Creek	05120202020030	32	Non-supporting
WWL020-0057	10/10/2006	West Fork White River	05120202020010	32	Non-supporting
WWL020-0058	06/06/2006	Fish Creek	05120202020140	26	Non-supporting
WWL030-0004	07/05/2001	Sloan Ditch	05120202030040	40	
WWL040-0005	07/24/2001	Richland Creek	05120202040010	54	
WWL040-0053	10/03/1996	Richland Creek	05120202040020	36	
WWL040-0056	06/12/2006	Plummer Creek	05120202040090	52	
WWL040-0056	07/05/2006	Plummer Creek	05120202040090	54	
WWL040-0057	06/07/2006	Richland Creek	05120202040030	54	
WWL050-0007	10/21/1996	Weaver Ditch	05120202050090	32	Non-supporting
WWL050-0010	08/01/2001	Kane Ditch	05120202050110	38	
WWL050-0011	08/21/2001	Unnamed Tributary of First Creek	05120202050070	36	
WWL050-0036	10/02/2006	West Fork White River	05120202050090	28	Non-supporting
WWL050-0038	06/12/2006	Timmons Ditch	05120202050080	22	Non-supporting
WWL060-0007	07/24/2001	Brewer Ditch	05120202060020	16	Non-supporting
WWL080-0005	07/31/2001	Eagan Ditch	05120202080060	40	
WWL080-0006	08/21/2001	North Fork Prairie Creek	05120202080030	18	Non-supporting
WWL080-0041	06/19/2006	Killion Canal	05120202080070	46	
WWL090-0030	10/03/2006	West Fork White River	05120202090070	22	Non-supporting
WWL090-0031	06/19/2006	Veale Creek	05120202090030	40	
WWL100-0021	10/04/2006	White River	05120202100120	20	Non-supporting
WWL100-0023	10/03/2006	White River	05120202100030	20	Non-supporting

Wetland Services, Inc. conducted ecological assessments of select surface waters within the permit area and summarized their results in the report Bear Run Bio-Assessment dated July 22, 2010 (updated from previously submitted July 7, 2009 report) which is located in Appendix I.

The following table summarizes a portion of the results conducted to evaluate macroinvertebrate community health, fish community health, aquatic habitat quality, and water quality at the Bear Run (Amendment 4) site. The macroinvertebrate, fish, and aquatic habitat were assessed using EPA's Rapid Bioassessment Protocols For Use in Streams and Wadeable Rivers: Periphyton, Benthic Macroinvertebrates, and Fish procedures using modifications as recommended by IDEM. Water quality was sampled for total dissolved solids (TDS), pH, total iron, and total manganese.

Bear Run (Amendment4) Bio-Assessment Results				
Sample Point	mIBI/ (INmIBI)	fIBI	RBP	TDS (mg/L)
8NS1	1.6	28	118	139.2
8NS1 (Duplicate)	0.6	-	109	482
18NS13-2	1.2	20	118	342
8NS1-1	1.0	-	105	184.9
8NS1I	1.2	-	94	118.9
9NS-7	1.0	-	119	129.5
25NS1	-	-	83	-
26NS1	(36)	0	113	215
18NS13A	-	-	97	-
15NS1	(30)	0	119	241
4NS29-1	(30)	0	125	68
4NS14-16	(20)	0	129	182
4NS14M-1	-	-	125	-
9NS-6	(36)	36	106	180.6

This table is meant to provide an overall view of the biological quality of the streams as well as the potential sources of impairments. According to the IDEM'S Assessment Branch listing methodology for the Indiana 303(d) impaired waters list, an mIBI score of less than 2.2 or an fIBI score of less than 36 indicates impaired biological communities. Two different protocols were used to assess the macroinvertebrate assemblages, the EPA's Benthic Macroinvertebrate Protocol (mIBI) for the samples collected in 2009 and IDEM Biological Studies Section mIBI (INmIBI). A score of equal to or greater than 36 for the INmIBI is supporting while a score of less than 36 is not supporting.

A recent study at a modern Midwestern coal mine found no significant effects on aquatic life associated with coal mine effluent.[42] The study was conducted at an active underground mine near Georgetown, Illinois which had both open and reclaimed gob/caked slurry coal waste facilities. Fayette Drain is a tributary to the Little Vermilion River, which is know to support populations of the Illinois state-listed endangered Little Spectaclecase mussel, *Villosa lienosa*, and the state-threatened Slippershell mussel, *Alasmidonta viridis*. Various Bioassessment techniques were used to determine if the NPDES permitted discharge was causing measurable impairment to instream communities, particularly to mussels. Based on the data generated from the study, including water chemistry, toxicity testing, benthic macroinvertebrate sampling, and bioaccumulation studies with transplanted freshwater mussels, it was concluded that the discharge from the mine did not have an adverse impact on the biota inhabiting the Fayette Drain. Benthic macroinvertebrate communities were more diverse downstream of the mine site and were dominated by mollusks, whereas the upstream site was dominated by rather tolerant midges (*Chironomidae*). None of the water or sediment samples collected were toxic to standard tests organisms. Furthermore, transplanted mussels did not accumulate significant levels of harmful metals in their tissues compared to upstream transplants after two months exposure, and their Tissue Condition Index (TCI) values were not significantly lower than those placed upstream of the mine site. Water column and sediment toxicity testing may represent snapshots, in that if they indicate toxicity or lack thereof, it is only for the moment at which samples were collected; however, benthic macroinvertebrate surveys and

mussel transplants are not. The data that was collected in the report supports the fact that the coal mine effluent is not a major factor in impairing aquatic communities.

Streams and Wetlands (Section 404 Impacts)

Two Section 404 permits have been submitted for the Bear Run Project area. The first Section 404 permit (LRL-2006-1614-gjd) was submitted in October 2006 and approved in January 2007. The second pending Section 404 permit (LRL-2010-193-gjd) was submitted in June 2009. Both permits were submitted to the ACOE and reviewed as Individual Permits which were evaluated under a public comment review.

The Section 404 permit for the Bear Run East Pit (LRL-2006-1614-gjd) covers effects to 4,476.0 acres for surface coal mining and coal preparation facilities. Approved impacts totaled 84,551 linear feet of ephemeral streams, 38,234 linear feet of intermittent streams, and 61.60 acres of wetlands. Compensatory mitigation for impacts within this permit area includes construction or restoration up to 68,995 linear feet of natural design streams with riparian buffers ranging from 25 to 150 feet on each side along with the construction of up to 119.7 acres of palustrine forested wetlands. This permit area covered effects to streams and wetlands and is located across six 14-digit HUC watersheds: Buttermilk Creek, Middle Fork Creek (Sullivan), Brewer Ditch-Black Creek, White River - Pollard Ditch, Black Creek Headwaters, and Singer Ditch (upper) - Hill Ditch.

The Section 404 permit application for the Bear Run (Amendment 4) area (LRL-2010-193-gjd) covers impacts to 2,666.5 acres and is located across five 14-digit HUC watersheds: Buttermilk Creek, Middle Fork Creek (Sullivan), Maria Creek Headwaters, White River - Pollard Ditch, and Brewer Ditch-Black Creek. Delineated impacts total 83,324 linear feet of ephemeral streams, 43,362 linear feet of intermittent streams, and 27.46 acres of wetlands. Compensatory mitigation is provided for these impacts and is included in this narrative.

The Bear Run Project is spread across seven 14-digit HUC watersheds with three draining to Busseron Creek and four draining to the White River. The drainage area for Busseron Creek at its confluence with the Wabash River is approximately 718,412 acres. The Bear Run Project has 1,803.9 acres within this watershed which is only 0.3 percent of the total drainage area of Busseron Creek. The drainage area for the White River at its confluence with the Wabash River is approximately 7,188,900 acres. The Bear Run Project has 5,338.6 acres within this watershed which is only 0.5 percent of the total drainage of the White River. It is not anticipated that the activities in the proposed Bear Run permit will impact the Busseron Creek and White River watersheds given their large size.

Surface water flow will be affected as a result of these operations. During mining, sedimentation basins will be used to collect storm water at the mine. Storm water will pass through the basins and control the release of storm water by retaining the influent drainage and detaining it for a sufficient amount of time for the required sediment to settle out in the pond and not be part of the discharged effluent water. This added detention time will have two effects. The first will decrease the peak flow from storm events and the second will be an increase in base flow of the receiving stream as the ponds slowly release water after rainfall events. Several permanent incised impoundments will remain after mining is completed. Surface water quantity will be benefited in other ways, as well. These same functions (increased detention times and increased base flows), will be provided by the cast overburden generated in the mining process. The higher porosity and permeability of the cast overburden will allow water to infiltrate and saturate following periods of heavy precipitation and then be released to surrounding streams more slowly. After reclamation operations are completed, replaced soil infiltration may be temporarily reduced as a result of compaction caused by the heavy equipment used to redistribute the earthen materials. Compaction will be minimized where possible by direct haul-back of soil and mechanical ripping after soil placement. The addition of these surface water impoundments is therefore considered beneficial to the hydrologic balance within and adjacent to the Project area. Because the Bear Run Project area comprises only a small portion of the Busseron Creek and White River watersheds, potential quantity impacts resulting from the proposed operation will be minimal.

Stream and wetland mitigation will take place as quickly as practicable employing the best techniques available to ensure success. Stream mitigation will be constructed utilizing natural channel design. Broad riparian buffers utilizing predominately hard-masted species will be planted adjacent to the stream mitigation enhancing both the habitat and water quality of the onsite, as well as downstream, streams. Wide floodplains will be incorporated adjacent to the stream mitigation, as post-mining land uses allow, which will benefit downstream property owners by providing flood control. Large forested wetlands will be constructed next to some of the streams providing wildlife habitat, water filtration, and flood control. Mitigation areas will be monitored closely by well trained staff. Stream mitigation is a developing science, training will be ongoing and consultants

employed as needed. These mitigation measures will provide great lift to the restored aquatic ecosystem and offset potential longer-term impacts.

Groundwater

There are no known residential groundwater wells or wellhead protection zones that exist in or within 1,000 feet of the proposed Amendment 4 area. The closest known groundwater user is approximately 2,500 feet west of the amendment area. The stratigraphic interval above and immediately below the lowest coal seam to be mined is not known to contain significant aquifers for potable water use. The underclay and shale permeability averages 10^{-6} to 10^{-7} cm/sec.[8]

Variables affecting soil recharge capacity include permeability of the underlying earth materials, ground slope, amount of vegetative cover, time of year, and evapotranspiration rate. The hydraulic conductivity of Illinoian till in west-central Indiana ranges from 10^{-8} cm/sec. to 10^{-5} cm/sec., with a median of 10^{-7} cm/sec.[45] After mining and reclamation operations are completed, replaced soil infiltration may be slightly reduced as a result of compaction caused by the heavy equipment used to redistribute the earthen materials. Compaction will be minimized where possible by direct haul-back of soil and mechanical ripping after soil placement. Post-mining land management practices such as terracing, moderation of slopes, revegetation, and production of crops are used to improve soil recharge capacity where applicable. Mine spoil generally exhibits higher recharge capacity than undisturbed material. Hydraulic conductivity of spoil in southern Indiana can range from 10^{-4} cm/sec. to 10^{-6} cm/sec[45].

SMCRA requires a detailed description of the groundwater monitoring program to be used during the mining and reclamation operations through the release of final bond. This data is evaluated to determine any effects of surface mining activities on the recharge capacity of reclaimed lands and on the quantity and quality of waters systems in and within 1,000 feet of the permit area. To comply with this requirement, groundwater wells are sampled and monitored within and adjacent to the permit to provide representative quality and quantity data for the following parameters: pH, total dissolved solids (TDS), total iron, total manganese, acidity, alkalinity, and water level.

The low permeability of these strata limit the probability that any aquifers that may exist beneath the lowest coal seam to be mined can be affected by operations proposed for the Bear Run Project. This conclusion is based on information obtained from a variety of sources including drilling, review of available water well records, extent of public water supply distribution lines, and talking with the local public. The local lithology above the coal seams to be mined consist of complexly interbedded and discontinuous shale and sandstone lenses exhibiting high clay content. Rocks displaying these characteristics are generally poorly suited for development as reliable sources of potable water.[35]

Areas of previous mining north and east of the Bear Run Mine have resulted in large acreages of saturated spoil and interconnected final pit impoundments. These hydrologic systems developed during the mining process when the overburden was broken up by blasting and removed to recover the coal. The disrupted overburden, or spoil, which was originally solid rock became a heterogeneous mixture of particles ranging in size from clays to boulders. The transition of low permeability consolidated rock to moderately permeable unconsolidated spoil has increased groundwater recharge and storage capacity. These spoil areas absorb considerable recharge from precipitation and slowly release it as base flow to streams and open water bodies. The net effect is an increase in base flow of the receiving streams and a decrease in peak flows.

An evaluation of the hydrologic consequences of surface mining at Bear Run has determined that the operations proposed herein are unlikely to produce reliably measurable permanent changes in the quantity and quality of groundwater existing within the unconsolidated media inside or adjacent to the permit area. The reclaimed area may exhibit a flattened water table because of the higher permeability of spoil material as compared to undisturbed overburden. Groundwater mounding may occur. Groundwater within the spoil interval may exhibit increased mineralization. This effect should be confined to the immediate mined area. The general chemical processes that occur as water moves through spoil are dissolution of calcite, dissolution of dolomite, consumption of oxygen, consumption and release of carbon dioxide, dissolution of pyrite and gypsum, precipitation of goethite (or iron hydroxide), and release of sodium ions by ion exchange (Hall and Davis,1986).[8]

Threatened and Endangered Species

As verified by state and federal agencies, there are no sitings or critical habitats known to occur within the permit area.[8] The Bear Run Mine complex is within the range of the federally-endangered Indiana bat (*Myotis sodalis*). The forested riparian corridors present within the permit area are potential habitat for the Indiana bat, but there are no current records of Indiana bats near the project site.[36]

Peabody Midwest Mining, LLC follows conservation measures to minimize the potential take of the Indiana bat by performing tree-clearing outside of the summer reproductive season. The appropriate season to clear trees is from October 1 to March 31. Typically, enough trees are cleared ahead of the active pit to ensure continuous mining through an area until the start of the next tree-clearing window.

The Bear Run Project may potentially impact the summer habitat of the Indiana bat, but reclamation of these forested areas will be comparable in size to pre-mining acreages and will include species suitable for Indiana bat nursery roosts. Species will include exfoliating bark trees such as various hickory, ash, oak, and elm species. Additionally, riparian buffers which will be planted adjacent to all the stream mitigation will provide additional habitat with access to water. The buffers will be comprised primarily of hard-masted hickory and oak species suitable for Indiana bat nursery roosts.

In addition to being in the range of the Indiana bat, the Indiana Natural Heritage Program mapped occurrences of the following state-listed species in the vicinity of the Bear Run Mine. These species are mostly grassland species associated with the Hawthorn Mine, but also a wetland species - American bittern.

Northern harrier (*Circus cyaneus*)
Henslow's sparrow (*Ammodramus henslowii*)
American bittern (*Botaurus lentiginosus*)
Short-eared Owl (*Asio flammeus*)
American badger (*Taxidea taxus*)

This area is not designated as critical habitat to any listed species, but the Northern harrier, Henslow's sparrow, and Short-eared owl are grassland species and have been known to thrive on mined land. American bittern is a wetland species and the additional wetland mitigation should enhance the habitat for this listed species.

The Indiana Department of Natural Resources have routinely sighted all of the above referenced species on mined sites with the exception the American badger, which was a road kill. The IDNR has concluded that the above listed species are capable of surviving surface coal mining conditions and demonstrated the ability to re-colonize during reclamation activities.

With the area northeast of the Bear Run Mine being heavily mined by both prior to 1977 and post 1977, there is a wide range of habitats. Prior to 1977, there are the numerous spoil piles and pit lakes in the Green-Sullivan State Forest and post 1977, there are large expanses of grasslands at the adjacent Hawthorne Mine. This mix of habitat provides opportunities for both species enrichment and expansion of critical habitats.

Goose Pond Fish and Wildlife Area

The Goose Pond Fish and Wildlife Area is located approximately 4.0 miles east of the Bear Run Mine. This glacial basin near Linton, Indiana was once an expansive wetland before it was drained early in the last century to support agriculture. Today, efforts are underway to restore wetlands. This is Indiana's largest wetland restoration done under the Natural Resources Conservation Service (NRCS), Wetlands Reserve Program (WRP), United States Department of Agriculture (USDA), and the 7th largest in the United States. The restoration covers a little over 8,000 acres in two sections, Goose Pond and Beehunter Marsh. The diverse habitat includes 4,000 acres of shallow open water, 400 acres of bottomland tree plantings, and 1,390 acre of tall and short grass prairies. Restoration began in 2000, with the construction of more than 30 miles of earthen levees and dikes to capture water from precipitation, runoff, and flooding events from the Black Creek - Brewer Ditch and Black Creek Headwaters watersheds. In 2005, the Indiana Department of Natural Resources signed a letter of intent to acquire 8,034 acres for approximately $8 million and form the Goose Pond Fish and Wildlife Area. The Goose Pond Fish and Wildlife Area will not be a self-sustaining wetland. It will need to be actively managed to keep habitats in early succession stages and to manipulate water levels to optimize habitats for shorebirds and waterfowl.

The wetlands will provide a natural resting site for waterfowl and shorebirds during spring and fall migrations, and a nursery for a variety of waterfowl and other wetland-dependent species. The area is ideally located along the eastern portion of the Mississippi Flyway and is becoming a regular stop for the Greater Sandhill Crane. In 2005, approximately 500 individuals stopped on their spring migration from Tennessee, Georgia, and parts south to breeding grounds in Michigan, Minnesota, Wisconsin, and Ontario. It was reported that in 2009, approximately 4,000 Greater Sandhill Cranes used the Goose Pond Fish and Wildlife Area. This is about a tenth of the entire Great Lakes population.

By restoring the Goose Pond Fish and Wildlife Area to its natural beauty and allowing public access will bring a number of environmental and economic benefits:

- **hunters, birders, and naturalists will be attracted to the area bringing their tourism dollars to the community,**
- **project will restore wetland and adjacent upland habitat for waterfowl, shorebirds, wading birds, and other wetland associated wildlife, and**
- **area will serve as a filter for water quality and a sponge to slow floodwaters.**

A portion of the Bear Run Mine is upstream of the Goose Pond Fish and Wildlife Area. The majority of the mine is buffered from the Goose Pond by previously mined in the Greene-Sullivan State Forest. The open water in Area 5 of the Bear Run (Amendment 4) permit outlets into a tributary of Brewer Ditch which flows along the southern edge of Goose Pond. All disturbed area at the Bear Run Mine would drain to sedimentation ponds to ensure acceptable quality of any drainage from the site. All discharges from the sedimentation ponds would be required to meet the numerical effluent limits for suspended solids, per the NPDES permit. Even though some sedimentation basins will also provide makeup water to the coal preparation plant, there will be no overall impact to downstream water supplies. For example the open water in Area 5 is a sedimentation basin that has an approximate drainage area of 1,775 acres. Downstream of the outfall is a composite drainage area of at least 57,500 acres of watershed upstream of and within the Goose Pond area. Specifically, there is approximately 13,050 acres of watershed, a large part which consists of highly permeable mine spoil and large impoundments created by surface mining (Green-Sullivan State Forest) between the open water in Area 5 of the Bear Run (Amendment 4) permit and the Goose Pond. This large reservoir of surface and groundwater provides a substantial volume of available base flow during drier months and there should be no temporal loss through the process. No negative impacts to the Goose Pond Fish and Wildlife Area will occur from the activities at the Bear Run Mine.

Air Quality

The temporary effects to air quality at surface coal mines are mainly due to the fugitive emissions of particulate matter. The major operations producing dust are drilling, blasting, hauling, loading, transporting, and crushing. Basically, dust sources in mines can be categorized as primary sources, actions that generate dust and secondary sources, actions that disperse the dust and carry it from place to place. Effects from dust are not allowed to pass beyond the facility or property line.

The Bear Run Project is regulated by the Indiana Department of Environmental Management Office of Air Quality. The Office of Air Quality is responsible for administering the Clean Air Act permitting, compliance and enforcement programs. There are very stringent procedures for obtaining the proper air permit and the Bear Run Mine has pursued and qualified for the Indiana Source Specific Operating Agreement by SSOA No. 153-26738-00011 permitting agreement which requires that measures will be taken to minimize the effects to air quality. The mine has also submitted an approved Fugitive Dust Control Plan which details Best Management Practices for controlling dust at the mine.

The Bear Run Project will employ a state-of-the-art coal preparation plant facility which will maintain the air quality of the region by removing impurities from the coal before it is burned at electrical generating plants. Mined coal is of variable quality and can include various chemical and mineral matter such as clays, sands, sulphur, and trace elements.

Traffic and Transport

Roads in the vicinity of the Bear Run Project consist primarily of county roads with either an asphalt or aggregate surface. They are all two-lane two-way roads with grades that vary from level to rolling. The nearest

Indiana State Road is SR 159 which begins at the Greene County line just east of the town of Pleasantville and ends at Dugger. Pleasantville, a small unincorporated town, is located east of the Bear Run Project. A commercial driveway entrance to the Bear Run complex has been constructed in conformance with Indiana Department of Transportation standards to accommodate service truck and employee traffic. A traffic impact study was completed for the new highway entrance which concluded that the new site access intersection at SR 159 is expected to operate at an acceptable Level of Service (LOS) and no adverse traffic impacts are expected due to the site generated traffic.[37]

Due to the rural location of the Bear Run Project, the increased traffic due to the facility employing approximately 400 skilled workers might have minimal to marginal impact with the local community traffic during the shift changes, but the service truck traffic is expected to be fairly consistent throughout the day with no particular peak arrival or departure pattern. It is expected that the majority of the employees will utilize the existing network of county roads to access Bear Run while service trucks will use SR 159. The new site access is located in the Black Creek - Brewer Ditch 14-digit HUC watershed with SR 159 traveling across the edge of the Black Creek (Ditch) Headwaters before ending in the Buttermilk Creek 14-digit HUC watershed at Dugger.

The majority of coal will be transported via rail on the Indiana Rail Road Company which provides access to regional rail lines and electric utilities. Rail transportation represents an important aspect of a cleaner energy supply chain. Trains are roughly three times more fuel efficient than trucks and can move one ton of freight nearly 450 miles on one gallon of diesel fuel. One coal train can do the work of 500 tri-axle dump trucks, while consuming two-thirds less fuel and produce 70 to 90 percent less emissions.[38]

Social

The social impacts from the Bear Run Project are expected to be very positive. Sullivan County has a rich heritage of coal mining. The earliest account of mining was mentioned by David Thomas during his travels along the Wabash River in 1816. Though there is evidence that coal mining was present in the county in the first half of the 19th century, coal mining as an industry began with the construction of the first railroads through the region. The nearby communities of Pleasantville, east of the Bear Run Project, and Dugger, north of the Project, are surrounded by mining, both pre- and post- SMCRA.

Linton is the largest town closest to the Bear Run Project. This town was officially chartered and named in 1850 and expanded rapidly in the late 1800s as underground mines began operating in the area. As the underground reserves were mined out and the technology evolved to profitably surface mine, the population declined to a stable population of 5,673 in 2009.[39] Mining is such an important industry to Linton, that the mascot of the local high school, Linton-Stockton High School, is the "Miners". This mascot was chosen to honor the industry that contributed to the growth and economics of early Linton.[40]

The operational workforce of the Bear Run Mine is estimated to be approximately 460 skilled workers. Existing skilled workers that transfer from other mines might impact the local demographic and population by choosing to take up residence in the local area and more importantly relocate with their families. It is likely that workers who are single or have young families would be more likely inclined to move. It is unlikely that any significant change in the overall age structure of the local resident population.

It is anticipated that skilled workers that first move to the area may seek short-term accommodations through apartments or rental houses. Those that choose to reside more permanently in the local community may choose to purchase an existing house or build a new house. This may promote development of new subdivisions in the neighboring communities and/or growth in the housing construction and support. Support may include the extension of utilities, installation of septic systems where no sanitary sewer access is available and home improvement services.

Economic

The economic impact of the Bear Run Project on the local and regional area has been, and is expected to continue to be, very positive and come from three main sources:

- **spending in local businesses by employees and their families;**
- **spending by the Peabody Midwest Mining, LLC on goods and services with local businesses; and**
- **local property taxes**

As production reaches its maximum, the direct employment level will exceed 460 at the mine with annual wages and fringes equaling $58 million. Additionally, the mine operation will provide significant tax revenue to Sullivan County and the state of Indiana. Many private landowners have received and will continue to receive significant income from the mining operation in the form of royalty payments and/or acquisition proceeds.

A report prepared by Harding, Shymanski and Company, P.S.C. of Evansville, Indiana is provided in Appendix L entitled *Economic Impact of Peabody Bear Run Mining, LLC on the Sullivan County Economy*. **An economic analysis was prepared to encompass both the direct and indirect economic impact of the Bear Run Project on businesses and households in Sullivan County. This estimate was based on projected year 2012 financial data. In performing their analysis, they used the Regional Input-Output Modeling System (RIMS II) as developed by the Bureau of Economic Analysis, U.S. Department of Commerce. The RIMS II measures the economic impact of a business operation by using location-specific multipliers to determine the total output, earnings, and employment generated within a geographic region. From this data, it has been estimated that:**

- **The Bear Run Project will have total sales of $376,179,000 with additional sales generated by other businesses as a result of the mine area estimated at $200,653,879. The total output impact for the Sullivan county (as well as surrounding counties) is estimated at $576,832,879.;**

- **The direct spending on local wages and benefits will total $58,361,000 in 2012. Additional wages and benefits generated by other businesses as a result of the mine are estimated at $40,858,636 for a total earnings impact of $99,219,536.;**

- **The company will employ 462 people in Sullivan County. Additional employment generated by other businesses a result of the mine's impact on the local economy is estimated at 768 jobs. The total employment impact for the area is estimated at 1,230 jobs.; and**

- **Peabody Midwest Mining, LLC will pay local property taxes totaling $3,769,000.**

In terms of cumulative economic impacts, the Bear Run Project will contribute to the basic electricity production in Indiana and surrounding states. Coal is Indiana's major energy source by generating 95 percent of its electricity. A study prepared for the Center for Coal Technology Research Energy Center at Discovery Park (Purdue University) entitled *Estimating the State and Regional Benefits of the Mining and Use of Illinois Basin Coals* **estimated the economic impact that coal has on the individual states of Illinois, Indiana, and Kentucky in the Illinois Basin for the year 2007 using RIMS II multipliers. In 2007, Indiana mined 34.8 million tons of coal. Of this amount:**

- **2.95 million tons were exported out of the state at an average price of $28.79/ton for a total export value of $84.8 million. By applying the Indiana coal mining multiplier, the total amount of economic activity arising from the mining of this coal was $166 million.;**

- **2.0 million tons were used by Indiana industry either to generate or co-generate electricity. The total estimated economic activity from mining this coal was $347 million.;**

- **29.4 million tons were converted into electricity in Indiana, resulting in the generation of an estimated 70 billion kwh with sales of $4,541 million. The estimated economic activity from mining this coal was $6,766 million.; and**

- **The total estimated amount of economic activity arising from these three uses of Indiana coal for Indiana is approximately $7,279 million, or 3 percent of Indiana Gross State Product.[41]**

Peabody Energy is investing approximately $400 million in capital to bring the Bear Run Project up to capacity and should contribute approximately $140 million in regional economic benefits. After the press release of the development of the Bear Run Mine, Indiana Governor Mitch Daniels made the following statement, "Coal is the key to American energy independence and to the affordable power in which Indiana's future prosperity depends. This is great job news in the near and long term."

Connected Activities

The Bear Run Mine has no connection to other activities including the Duke Energy Edwardsport Generating Station or any other utilities. The Bear Run Project is being developed to supply long-term contracts to area utilities. Existing major coal supply agreements are with Duke Energy and Hoosier Energy. Duke Energy has the prerogative of directing coal shipments to any of its local generating facilities. The Indiana Rail Road constructed a spur to the Bear Run loading facility for which impacts and mitigation of approximately 2 acres of wetlands were authorized by separate permits.

Existing Mitigation and Monitoring Sites

Peabody Midwest Mining, LLC is fully capable of and committed to constructing successful stream and wetland mitigation. All levels of management and field personnel are informed of the importance of successful stream and wetland mitigation and all of Peabody's active Midwest sites. Experience of trained company personnel is included in the credentials section of this application; those listed will continue receiving the latest training available. Additional personnel are also scheduled for training. Peabody's regional and corporate engineering and environmental staffs are dedicated to providing technical support to each of its mining operations.

Currently stream and wetland mitigation is being completed on several Peabody mine sites in the Midwest including Wildcat Hills Mine - Cottage Grove Pit, Wildcat Hills Mine - Eagle Valley Pit, Francisco Mine, Farmersburg Mine, Viking Mine - Corning Pit, Viking Mine - Knox Pit, Miller Creek Mine - Jenlin Pit, Air Quality Mine - Hart Street South Portal, Somerville South Mine, Somerville Central Mine, and Wild Boar Mine. Stream construction is in various stages within these sites with some fully constructed and being monitored while others are fully constructed but not formally monitored until the riparian buffers are planted. Other sites are having channels being constructed and structures installed. Some are in the floodplain grading and final channel design stage.

Peabody Midwest Mining, LLC utilizes the latest technology in GPS surveying to assist the stream and wetland construction efforts and has added additional dozer-mounted units to its reclamation fleets to further enhance the final reclamation product. This equipment is considered essential to successful mitigation. Annual mitigation field work is completed primarily during the late spring to early fall time period when soil conditions are driest. Final floodplain grading, channel construction, and installations of structures are targeted for completion during this time to allow for proper revegetation during the appropriate fall seeding period. In addition, Peabody has found it is best to temporarily divert surface runoff entering a new stream perpendicularly, in order to allow sufficient establishment of vegetation on the banks before returning normal flows. Temporary diversions are removed when adequate vegetative stability is achieved. Also, stabilization of new channels with erosion control blankets in critical areas is very important. Use of appropriate willow cuttings within the stream channels has proven to be very effective in aiding stabilization as well as providing an early shading benefit to streams. While initial structure placement is important in critical areas, it is also important to re-evaluate structure needs following several precipitation events. Initial erosion control seems to be the biggest initial challenge. Intense precipitation during construction or prior to vegetation establishment is problematic for any construction project. Repairs and maintenance are made as needed.

Peabody is committed to continue to develop Best Practices for stream and wetland mitigation and meet or exceed the requirements in all of its 404 permits. Much progress is being made in terms of on ground success at all locations. Some noted examples of successes that have been viewed and evaluated by government agency and independent consultant experts include ephemeral stream mitigation at the Viking Mine-Knox Pit, mitigation of West Fork Busseron Creek at the Farmersburg Mine. Much is being learned from all of the sites and best practices developed accordingly. Plans have not been made final, but several of Peabody's Indiana sites will be made part of the Office of Surface Mining (OSM) Stream Design Workshop to be held in Indiana and Illinois.

In terms of wetland mitigation, Peabody has completed successful mitigation both on-site and off-site. More history is available for off-site areas as the opportunity is available to complete these earlier. Noted examples of wetland mitigation success can be found at the Wildcat Hills Mine-Eagle Valley Pit and Cottage Grove Pit in Illinois, as well as, the Francisco and Jenlin sites in Indiana. Portions of the off-site mitigation in Illinois has met the final requirements and been released from further monitoring. Other wetland sites are in various stages of construction at several sites. It should be noted that wetland mitigation at all sites is being completed as hardwood forested wetlands, replacing many lower quality wetlands. Peabody has very extensive success in reforestation on mined lands from both a survival and growth standpoint. This vast experience will drive success in both the forested wetlands and stream riparian corridors.

West Fork Busseron Creek was reviewed in the field by Jeff Barry, PhD of ENVIRON International Corporation, in his technical memorandum concerning the restoration of Big Creek at the Wild Boar Mine and stream channel design recommendations. Based on Dr. Barry's observations, he states that, "it is clear that the "natural stream channel" design method was a success. The most significant observation was that in 2008 two extreme rainfall events occurred, both approximately equal to a 100-year event, flowing water across the floodplain was over 6 feet deep yet there is very little evidence of floodplain, bank, or channel erosion. This observation suggests a very dynamically stable stream network."[32]

George Anthanasakes, PE, a Principal of the Ecosystem Restoration Services for Stantec, Inc., in Louisville, Kentucky, visited several Peabody Midwest Mining, LLC stream mitigation sites in June of 2009. Mitigation sites at Somerville Central Mine, Viking Mine - Knox Pit and Corning Pit, and Farmersburg Mine were visited to get his professional opinion on how the mitigation is developing and any areas that need improvement. George who is the program manager of RIVERMorph and holds Bachelor's and Master's in Civil Engineering degrees from the University of Louisville. For over a decade, Mr. Anthansakes has served as the project manager and/or design engineer on numerous stream restoration and assessment projects incorporating natural channel design principals. George was pleased with the sites and thought the company is doing some great work. He was amazed by the natural migration of willows along the stream banks along the mitigated West Fork Busseron Creek at the Farmersburg Mine. The willows provided bank stability, shading, and habitat.

George provided several suggestions for improvement and suggested the mitigation could benefit from the development of regional curves for the mined sites, to help with sizing the channels. David Bidelspach, PE, a design engineer working for Stantec, Inc., in Raleigh, North Carolina came to Indiana and developed a mini-regional curve for Indiana, which is provided in Appendix M. Mr. Bidelspach has a master's degree in biological and agricultural engineering from The Pennsylvania State University and is currently working on a PhD in the Department of Biological and Agricultural Engineering at North Carolina State University. He has worked with the North Carolina Stream Restoration Institute at North Carolina State University, teaching educational courses in stream design.

C. Maps (8 ½" x 11") with project site clearly identified.
   1. County road map
   2. USGS quadrangle map
   3. NWI maps, if available
   4. FEMA floodplain maps, if available

See Map A in Appendix A for a portion of the Dugger and Bucktown 7.5 minute quadrangle maps with the permit areas clearly located. Map B in Appendix A shows the location of the existing streams and wetlands.

D. Aerial Photography, if available
E. USDA/NRCS County Soil survey sheet for site

See Map WS in Appendix A for the soils map.

F. Photographs of the site with a corresponding photo orientation map

See Map B in Appendix A for the location of the assessment points, Appendix B for stream photographs, Appendix C for wetland photographs, and Appendix D for open water photographs.

G. Identification of responsible parties: Provide names, titles, addresses, and phone numbers for the following:
   1. Applicant(s)

Peabody Midwest Mining, LLC f/k/a Black Beauty Coal Company, LLC
7100 Eagle Crest Boulevard, Suite 100
Evansville, Indiana 47715

   2. Contact person(s) if applicant is a company

Bryce West
Authorized Representative
Telephone: 812-434-8500

3. Consultant or agent preparing permit application

Not Applicable

4. Consultant or agent responsible for supervising or providing biological monitoring

Not Applicable

5. Property owner(s)

See Block 24 in Appendix G

II. Proposed Mitigation Site:

A. Briefly discuss the overall mitigation concept and purpose, and then provide the same information as requested for the **Proposed Impact Site** (listed above) following the same format. The data point taken on the proposed mitigation site should remain consistent with the permanent photo stations identified in the subsequent monitoring reports.

Wetlands

The jurisdictional wetlands that are disturbed by mining or related activities will be greatly enhanced and mitigated on-site. Those wetlands not presently classified as PFO will be mitigated with PFO bottomland hardwood wetlands. Wetlands presently classified as PFO will be mitigated with PFO bottomland hardwood wetlands regardless of the existing dominant tree type (i.e. existing PFO wetlands with dominant soft-mast tree species). Wetland mitigation will be located on property controlled by Peabody Midwest Mining, LLC. If any modification to the proposed mitigation language or mitigation locations is necessary, a request will be submitted to the ACOE for review and prior approval. Wetland species will consist of those listed in the planting plan in Section 3 under the Wetland Seeding and Planting Stock Summary table. Tree species will be managed for predominately hard-mast producing species. Flat topography will be constructed which will provide a desirable hydrologic environment for the creation of forested wetlands. The hydrology will be enhanced by stream mitigation designs which will include a wide floodplain at the bankfull depth in the area of the wetland mitigation. In Appendix A, see Map C for the proposed location of the mitigated wetlands and Map D6 for a typical plan view and cross-section.

Streams

The proposed mitigation will consist of stream creation with enhancements which will include: the creation of floodplains as land-use and topography allow; constructing appropriately designed channels; installation of in-stream structures that will allow for aquatic habitat, as well as provide erosion and grade control; and planting riparian vegetation to provide stability along the banks. Such improvements are intended to promote a positive biological response within the stream's aquatic communities.

As streams are being mined through, temporary diversion ditches will be built to direct the water around the pit facilitating the mining process. The use of diversion ditches allows the streams to be put back in planned locations where flood plain areas can be widened where necessary. The general topography and geomorphology will be similar to the pre-mining conditions, but will have some swell due to the handling of disturbed overburden material. The regraded watersheds will generally mimic the pre-mining conditions, and replaced streams will be designed and constructed so that pre-mining connectivity is maintained. Streams will be constructed in valleys and not along hillsides. Streams will be mitigated with a naturally designed channel that will provide a lift over the present conditions. This lift will be comprised of, but not limited to, an enhanced riparian buffer, natural channel configuration, reduced entrenchment, and engineered structures.

If any modification to the proposed mitigation language or mitigation locations is needed, a request will be submitted to the ACOE for review and prior approval. Riparian habitat buffers will be established for the natural design streams and will be comprised of a combination of plantings as shown in the table listed in the Planting Plan in Section 3 under Forest/Wildlife Habitat for Stream Buffer Areas. In Appendix A, see Map C for the proposed location of the mitigated streams and Maps D1 to D5 for generalized plan and profile views.

As additional enhancement, soil depths may be increased when constructing the mitigated streams. Required soil depth varies from 1-4 feet; however, actual replaced depths typically vary from 4-6 feet. Increased soil depths in formerly thin or devoid areas enhances many important terrestrial ecological functions including the

regulation and partition of water flow, the storage and cycling of nutrients, filtering and buffering of contaminants and nutrients, and the degradation of organic and inorganic materials. The following mitigation plan will not only enhance the quality of the immediate drainage area but also improve the quality of the receiving waters.

Buttermilk Creek Stream and Wetland Restoration

In addition to the on-site mitigation proposed above, off-site advance mitigation is proposed to compensate for temporal impacts created by mining. The site is located along Buttermilk Creek northwest of the permit area on property owned by American Land Holdings of Indiana LLC, a subsidiary of Peabody Energy. The property is west of Dugger and is bounded on the north by SR 54 and CR 200 East and CR 275 East. A comprehensive plan with mitigation details is provided in Appendix J.

B. Indicate who presently owns the proposed mitigation site. Availability of property must be clearly defined prior to final review. All easements and/or encroachments located on the proposed mitigation site must be identified. The applicant should own the mitigation site. The mitigation site should not be constructed on public lands unless the landowner is the responsible party.

Peabody Midwest Mining, LLC presently controls the proposed mitigation sites for the wetlands and streams. Controlled denotes that Peabody Energy or a subsidiary either owns the property or has a legal document with a property owner to enter the property and surface mine the reserve. Documents describing the legal rights to enter and engage in surface mining activities are comprised of deeds and leasehold instruments. These documents are recorded at the appropriate county courthouse offices and retained on file. The mitigated streams will traverse across the permit area collecting surface runoff and transporting it to the receiving watersheds of Buttermilk Creek, Middle Fork Creek, Maria Creek, Pollard Ditch, or Brewer Ditch.

C. Indicated expected ownership of the mitigation site following completion of the mitigation project. The responsible party for long-term management and protection of the site must be identified. A signed management agreement must be submitted if an entity other than the permitee will assume management responsibilities following completion of the mitigation project.

The property control of the mitigation sites for the permit area is not expected to change until final SMCRA bond release is approved. During acquisition procedures, property may be bought from the original owner or leased. On certain properties that are bought, a Right of First Refusal (ROFR) agreement may be made where the original property owner has the first right to buy back the property if the company decides to sell it. Peabody Energy or a subsidiary owns the majority of the permit area with only three parcels that have a ROFR agreement associated with them. There are ten lease properties in the permit area. Please see Map F in Appendix A which shows hatches for the properties not owned at this time. Portions of the permit area will revert back to the original owner and any future landowner will be subject to the conditions and requirements of Section 404 of the Clean Water Act for any impacts to the streams and wetlands and to any deed restrictions placed on the mitigation locations.

Please see Map F in Appendix A which shows the mitigation and the property tracts not owned at this time and which cannot legally be encumbered by a deed restriction due to the property being leased to a Peabody subsidiary or the previous landowner having signed an agreement with the company for ROFR. While deed restrictions can only be placed on properties owned by a Peabody subsidiary, mitigation has been located to maximize protection opportunity. Portions of the permit area that revert back to the original owner or are owned by any future landowner not affiliated with a Peabody subsidiary will be subject to the conditions and requirements of Section 404 of the Clean Water Act for any impacts to the streams and wetlands and to any deed restrictions placed on the mitigation locations. Where deed restrictions can be made, they will be placed prior to and in conjunction with approval to cease monitoring. A copy of the deed restrictive instrument is provided in Appendix N.

Section 2: Goals and Objectives of the Proposed Mitigation

I. Using the information gathered under Section 1: Baseline Information, conduct a resource comparison of the impact site and the proposed mitigation site. This documentation should follow the format outlined below:

A. Functions and Values
1. Narrative profile of existing functions and values
a. Site-specific discussion of the proposed impact site's functions and values
b. Watershed/Landscape Context (What functions/values does the aquatic resource at the impact site provide within the surrounding landscape and watershed? And in what context?)
c. If applicable, discuss the proposed project's impact on known functional impairments within the watershed (e.g. state listed CWA Section 303(d) impaired waterbodies).
d. Identify any rare or unique areas; including any know cultural resources, habitat designation and ecological types.

The existing functions and values of the streams within the permit area vary widely from stable (natural streams in wooded areas) to degraded (reclaimed permanent diversions in open areas). The streams within the natural wooded area have the greatest function and value in regards to the physical, biological, and chemical aspects while the streams in the reclaimed area could be considered to have the least by only functioning in regards to the physical aspect. All streams from fully functional to functional impaired provide some type of surface water storage and conveyance. All of the existing ephemeral reclaimed streams were not designed, but that occur from erosional features in response to precipitation events. Other types of physical stream functions in addition to surface water storage (either short term or long term) are subsurface water storage, variations in the energy gradient of the stream (riffles, pools, glides, runs, and step pools), sediment transport, and physical structures such as riffles and root wads that control velocity and provide spawning habitat and continued stream evolution. As the landscape setting changes from reclaimed to natural, the benefits from biological and chemical functions and values increase. The riparian buffer of the stream provides biological functions in the form of habitat; biomass which promotes organism growth, supplies nutrients, and maintains complex animal communities. Chemical functions provided by the stream riparian buffer are improving water quality and maintaining numerous nutrient cycles. In areas where the buffer has been removed for agricultural practices or logging, the water quality degrades significantly with excess sedimentation and decrease in wildlife habitat diversity. Although surface mining may temporarily remove buffers along the stream, compensatory mitigation replaces buffers along the natural design streams. The downstream water quality does not experience significant degradation due to excess sedimentation as it is controlled through NPDES requirements. The riparian buffer traps, retains, and removes dissolved and particulate matter from surface and overland flows into the streams.

The aquatic organisms resident to the site are determined by a combination of factors such as non-point source pollution including row crop agriculture and the small drainage areas. The most widespread stressors observed across the country are nitrogen, phosphorus, streambed sediments, and riparian disturbance. Sediment loading, another non-point source pollution linked to agriculture, can cause low dissolved oxygen levels which may explain the presence of blood worms and left-handed snails which differ from right-handed snails in their ability to live in low dissolved oxygen environments.

The families and genera that were to be dominate in the permit area are mosquitoes, mayflies, black flies, water louse and various types of midges from the bloodworm family, These particular genera typically occur in lentic habitats. Only discontinuous pools were present in the streams creating a more "lentic" habitat in the streams and after a rain event, the streams became continuous and a more "lotic" environment.

Invertebrates have different strategies for surviving in a drying stream. They can avoid desiccation by burrowing into saturated substrates, migrating to receding pools, having life history adaptations, or by having desiccation resistant forms, (Rosalie B. del Rosario and Vincent H. Resh 2000). The family Culicidae, some genera, (e.g. Aedes), have an incubation and hatching period that is highly variable. Embryonic development is 2-4 days after inundation and at the same time the eggs can withstand desiccation for at least one year, (R.W. Merritt, K.W. Cummins, M.B. Berg 2008). This allows for an ability to survive in periods of "drying" of the intermittent streams that occur in the permit area. Mayflies because of their adult winged stage and propensity for drift as nymphs, are often among the first macro invertebrates to colonize virgin habitats. Mayflies are also a major component of invertebrate drift in running waters and occurred throughout the streams sampled after a rain event.

The presence and abundance of stream fishes is strongly related to the physical and chemical characteristics of a stream. The number of minnow, darter, sculpin, and madtom species increase with higher quality streams.

Minnows are long-lived and sensitive to degradation. Simple lithophilic species are indicators of the degree of sedimentation and contamination. They require clean gravel or cobble to spawn and cannot reproduce in streams with high levels of sedimentation, contaminated, unstable, or frequently disturbed substrates.

The families and genera found to be present in the permit area were bluegill, largemouth bass, stonerollers, and several different species of minnows and darters. Some of the more dominant species sampled from the streams prefer shallow, riffle areas with gravel and sand substrates. Silverjaw minnows are found almost exclusively in areas with sand substrates while the orangethroat darter inhabits shallow gravel riffles. The bluegill and largemouth bass that are found in these stream systems primarily feed on macro-invertebrates and smaller fish species. There were only three sample sites found to support fish populations.

The existing functions and values for the wetlands within the permit area vary widely from fairly good (large natural PFO wetlands) to poor (isolated reclaimed wetlands in the reclaimed area). All the wetlands provide three broad types of function: habitat, water quality, and hydrologic. Wetlands provide habitat in the form of shelter, water, and food for plants, insects, amphibians, reptiles, fish, shellfish, birds, and mammals along with areas for breeding and nurseries. Wetlands provide water quality in the form of trapping sediment, controlling pollution, and supporting biochemical processes. Finally, wetlands support a hydrological function by recharging groundwater, reducing flow velocities of surface runoff, and influencing atmospheric processes. The wetlands in the Bear Run Mine (Amendment 4) permit perform the majority of these functions, but the size of the wetland dictates how large scale and effective the functions can be. For example, the small PUB wetlands within the reclaimed areas provide a greater habitat function than a water quality or hydrologic function, while the larger natural wetlands provide for all three.

Of the wetlands on site, those along the unnamed tributary to Pollard Ditch in Area 3, see Map B6 in Appendix A and delineations for Wetlands 8NW4, 8NW5, and 8NW7 in Appendix C, contain the most function and value. These functions and values are described as follows. The function of surface water storage helps prevent flooding by distributing and absorbing excess water. This will allow water to slowly release to surface drainages, soak into the ground, or evaporate. Temporary storage can help reduce peak water flows after a storm by slowing water movement into tributary streams which allows potential floodwaters to reach the receiving streams over a longer period of time, thus reducing flooding impacts. Water quality is also improved by absorbing nutrients, pesticides, and bacteria from surface waters as they soak in or are broken down by plants, animals, and chemical processes within the wetland. Wetlands promote the decomposition of organic matter, thus incorporating nutrients back into the food chain. By filtering out sediments and particles that are suspended in the surface waters, these wetlands help prevent rivers, lakes, and other streams from being affected by downstream sediment loading. This improves water quality and extends the life of water bodies by reducing sedimentation rates. These wetlands provide breeding, nesting, and feeding habitat for waterfowl, birds, fish, and other wildlife, and provide values including flood control, water quality improvement, and potential hunting and trapping opportunities.

The value of the remaining streams and wetlands depends on the benefit each provides to the environment and the community, although this may be regarded differently from one person or community to the next. Certain groups may value the ecological importance of wetlands while others may see the wetlands as having social or economic importance. Ecological importance includes pollution control, flood control, and wildlife habitat. Social importance of wetlands includes the benefit they provide to hunters, fisherman, or as outdoor recreation like bird watching. Economic importance may include timber production. The greatest value of the existing streams and wetlands within the Bear Run Mine (Amendment 4) permit is the wildlife habitat they provide.

The watersheds of the proposed permit have, are, and will be impacted by mining and agricultural activities for the foreseeable future. The topography of the land is such that agriculture will be the predominate land use where topography and drainage control are suitable. Both of these activities have been major factors on water quality in the watershed areas.

As discussed in *Section 1.I.B.3.b* on page 3, which explains the general benefits of coal mine reclamation at this site, erosion produces sediment, which negatively impacts and impairs the water quality of the project area's streams and wetlands as well as the receiving waters. During mining temporary sediment basins will be used to minimize sediment and water quality impacts to the receiving waters. Subsequent to reclamation, the mitigation will provide an enormous lift over the present conditions. This lift will be comprised of, but not limited to an enhanced riparian buffers placed along the length of the mitigated stream, natural design, engineered structure placement, and reduced entrenchment.

The Indiana Surface Mining Control and Reclamation Act (SMCRA) requires that any archaeological and historical issues be cleared by the IDNR in consultation with the Indiana State Historic Preservation officer. The cultural resources reviews for the permit area covered by IDNR permit S-00256 and approved amendments. Area 2, Area 3, Area 4, and Area 5 (covered by IDNR permit S-00256-4) are pending clearance and must be cleared before approval of the SMCRA application. Area 1 has already received clearance from the IDNR in consultation with the Indiana State Historic Preservation officer.

Indiana SMCRA requires that the state and federal fish and wildlife agencies must be contacted for their comments on the proposed permit application before approval. The state fish and wildlife agency must make a finding that the mining operation will not affect the continued existence of endangered or threatened species or result in destruction or adverse modifications of their critical habitats. This process is completed during the SMCRA permitting process.

2. Predicted future functions and values
   a. Site-specific discussion of the predicted future functions and values of the mitigation site.
   b. Watershed/Landscape Context: What functions/values would the proposed aquatic resource provide within the surrounding landscape and watershed? And in what context?)

The predicted future of the mitigation sites will be stable and self-sustaining. This is the ultimate goal for any mitigation. If something is altered, it should be restored to a condition that is just as good as or even better than it was initially. The future function of the natural design mitigated streams will be to convey surface water and provide functional habitat and support for terrestrial and aquatic animals. Habitat will be improved for the aquatic species by incorporating log vanes, utilizing riffles and pools and incorporating root wads in construction. Engineered structures which contribute to channel stability also provide habitat and refuge. Surface coal mining is not a long-term or permanent impact on jurisdictional waters or land function and productivity. Impacts to land and water resources are mitigated by planned reclamation that results in a sustainable resource.

Surface coal mining in the Illinois Basin naturally enhances drainage patterns by lowering runoff velocity that significantly reduces erosion and transport of suspended solids, particularly compared to typical runoff in areas with an agricultural land use, and extends the duration of runoff which improves water quality. Suspended solids loadings smother aquatic communities which destroy reproductive habitat. Site reclamation produces topographic relief consistent with the local area and incorporates many erosion control methods as exhibited on other reclaimed surface-mined areas. Reclaimed sites have increased species and habitat diversity thereby enhancing the ecological function of the area provided by additional wetlands and open water.

B. Function losses on Proposed Project Site verses Functional Gains on Proposed Mitigation Site
   1. Methodology of measurement
   2. Watershed Consequences (Although not required, providing information on a successful mitigation project or lessons learned on an unsuccessful project in the same watershed would be beneficial.)
   3. Debits/Credits
      a. Acreage/Linear Feet (in addition to functional units)
      b. Functional capacity (e.g., HGM Functional Capacity Units or Ecological Integrity Units)

<u>Wetland Mitigation</u>

Peabody Midwest Mining, LLC proposes a wetland mitigation plan that replaces all jurisdictional wetlands disturbed by mining activity at the ratios in the table below. The mitigated wetlands will be measured for success by following the 1987 Corps of Engineers Wetland Delineation Manual[4] along with the Midwest Regional Supplement[28].

Wetland Mitigation				
Setting	Wetland Type	Impacted Acreage (acre)	Mitigation Rate	Mitigation Acreage (acre)
Natural	PFO	8.45	3:1	25.35
	PSS	0.53	2:1	1.06
	PEM	0.96	2:1	1.92

	PUB	0.53	2:1	1.06
Reclaimed	PFO	1.96	2:1	3.92
	PSS	0.27	2:1	0.54
	PEM	9.89	1.5:1	14.84
	PUB	4.86	1.5:1	7.29
		Total Wetland Mitigation		56.00 (PFO1A)

A total of 56.00 acres of temporarily flooded broad-leaved deciduous forested wetlands (PFO1A) will be the mitigation acreage for all jurisdictional wetlands that are disturbed by mining activity. Wetland hydrology in the constructed PFO area(s) will be driven by connection with adjacent stream hydrology that supports water inflow, retention and outflow from the system and by groundwater recharge. The wetlands will be greatly enhanced by planting red and white oak, hickory, and pecan trees for wildlife; and other species as found in the wetland planting stock table. Construction of stream terraces between stream banks and wetlands will facilitate the development of necessary hydrology by ensuring that: 1) adequate runoff from upland areas will inundate the wetland following precipitation events and 2) retention of above bankfull flows from adjacent streams; allowing hydric soils to develop.

Stream Mitigation

Peabody Midwest Mining, LLC proposes a stream mitigation plan that restores all jurisdictional streams disturbed by mining and related activity at the ratios and lengths in the table below.

Stream Mitigation				
Setting	Flow Regime	Impacted Length (feet)	Mitigation Rate	Mitigation Length (feet)
Natural	Ephemeral	81,033	0.5:1	40,517
	Intermittent	42,590	1:1	42,590
Reclaimed	Ephemeral	2,291	0.5:1	1,146
	Intermittent	772	1:1	772
		Total Natural Design Ephemeral Stream Mitigation		41,663
		Total Natural Design Intermittent Stream Mitigation		43,362

All streams will be mitigated in length at the rates found on the above table and have a riparian buffers planted on each side of the mitigated stream. A minimum 50-foot riparian buffer will be planted on each side of the natural design ephemeral stream mitigation and a minimum 100-foot riparian buffer will be planted on each side of the natural design intermittent stream mitigation.

Enhancements will consist of, but not be limited to, broad hardwood riparian corridors with predominately hard-mast producing species, persimmon species for wildlife, expanded sinuosity, use of engineered structures to stabilize the streams, reduced entrenchment, replacement of any Rosgen[3] "G" or "F" channels, and adding a floodplain as post-mining land uses allow.

Rosgen[3] level II and III characteristics have been measured in the field for the existing streams. The stream assessment sheets are located in Appendix B with the locations shown on Map B in Appendix A. These classifications describe the existing geometry of the stream and provide a basis for the natural stream replacement design. Approximately 46 percent of all the existing streams have an impaired Rosgen "G" or "F" classification. These entrenched gully channels, which have incised enough to abandon their former floodplains, are dominated by degrading step/pool systems and will be replaced with stream mitigation that is approximately 80 percent, Rosgen "C" channel type, and approximately 20 percent, Rosgen "B" or "A" channel type depending on the slope.

All natural design streams will be constructed with a riparian buffer on either side of the stream, but only the Rosgen "C" channels will have an enhanced floodplain constructed. The "B" and "A" type streams by definition are found in gently sloping to steep narrow valleys with slopes ranging from 2 - 10% slope, while "C" channel

types are found in well developed floodplains with a channel slope of 2% or less. "B" and "A" type streams do not have floodplains associated with them, but a "C" type stream does. The entrenchment ratio range for each of the stream types indicates the degree of vertical containment of the stream. The term "enhanced floodplain" is used to indicate that the post-mine floodplain width will be increased over the pre-mine floodplain width. A critical element for successful "C" channel type stream mitigation is access to its floodplain and floodplain storage.

These designs will best retain the type and frequency of aquatic habitats that currently exist in the streams, and will provide similar stability and energy. The replacement design for existing natural design channels employs width to depth ratios, entrenchment ratios, and sinuosity ratios similar to, or better than, the current conditions. Replacement of trees, cultivation of diverse vegetation, and other enhancements that control erosion and runoff will enhance the quality of the existing stream and riparian habitats. Migration of aquatic species will come from upstream or downstream locations to ensure no loss in the gene pool of native species.

The proposed mitigation will consist of stream creation with enhancements which will include: the creation of floodplains as land-use and topography allow; constructing appropriately designed channels; installation of in-stream structures that will allow for aquatic habitat, as well as provide erosion and grade control; and planting riparian vegetation to provide stability along the banks. Such improvements are intended to promote a positive biological response within the stream's aquatic communities. All of the final mitigated streams will be designed to handle their respective drainage areas and will be measured for success by incorporating the principles for a stable stream channel as developed by Dave Rosgen. Added benefit will come with the selective planting of predominately hard-mast producing tree species, added structure to the streams, and floodplain creation as land use allows.

<u>Open Water</u>

The amount of post-mining open water will be at least 20.0 acres. The small open waters found in the permit may be replaced as contours allow, or incorporated into the final cut lakes. This increase in open water is beneficial to many terrestrial and aquatic communities. The stream mitigation will not be allowed to intersect open waters but side streams may be constructed at an elevation above the bankfull depth of the mitigated streams which will allow recharge of the open waters during substantial rainfall events by allowing greater than bankfull depths to flow into the open water body as depicted on Map D8 in Appendix A. The addition of open water will foster an increase in aquatic, terrestrial, and avian biological diversity. The open water will provide a refuge for aquatic biota during low and no-flow periods that may otherwise be detrimental to reproduction and migration. Open water bodies may also extend the annual base flow period and benefit migration and reproductive efforts of existing biota. Some permanent open waters will eventually develop into wetlands on a timetable that is dependent on the amount of siltation and the volume of the water body. These wetlands will further enhance and expand the existing aquatic and terrestrial habitat.

C. Functional Replacement
   1. In-Kind versus Out-of-Kind
   2. Holistic Aquatic Ecosystem Context (i.e. stream and wetland interactions)
   3. Watershed/Landscape Context

All mitigation will be in-kind and on-site except for the supplemental off-site Buttermilk Creek mitigation plan to compensate for temporal losses.

<u>Wetlands</u>

The wetland mitigation locations are shown on Map C in Appendix A. The mitigation locations will be in the flood plains of the stream mitigation which will ensure that wetland hydrology will be established. Any mitigated streams in the wetland areas will be constructed so the bankfull depth elevation is extended away from the channel towards the wetland forming a terrace which transitions into the wetland at a lower elevation. This will ensure adequate overbank flooding and provide the conditions for hydric soils to develop. The remaining criteria to be met will be the introduction of hydrophytic vegetation. See Map D6 in Appendix A for a typical plan and profile view of the wetland mitigation. The hydrophytic vegetation will consist of those species listed in the Wetland Seeding and Planting Stock Summary table in Section 3.

<u>Streams</u>

The stream mitigation locations are shown on Map C in Appendix A. The general topography and geomorphology will be similar to the pre-mining conditions, and replaced streams will be designed and constructed so that pre-mining connectivity is maintained. This design will best facilitate effective sinuosity and stream slope, and confine the streams to the center of the post-mine valley configurations, allowing for a plentiful belt width and providing adequate room for meanders and a wider flood plain. Channels will be vegetated with the herbaceous species listed in the Forest/Wildlife Habitat for Stream Buffer Planting Stock Summary table in Section 3.

The mitigation plan proposes to reconstruct and enhance a total of 85,024 linear feet of streams implementing natural design. Typical stream sections are located on Maps D1 through D5 in Appendix A. The bottom stream width is dependent on the reclaimed slope, watershed areas, the target bankfull discharge and preferred depth of flow. The wider bottom configuration will slow the water velocity and control down cutting. On some of the lesser sloped areas, the belt width of the stream will be as low in elevation as the bankfull depth, which will allow for more out of channel flows; aiding in energy dissipation, erosion control, and growth of the riparian buffer. Under certain conditions this design could lead to wetland development. The combination of a wider bottom, use of shallow to deep pools, planting riparian buffers on each side of the streams with hard-mast producing species, and construction of a wider floodplain in some areas will result in an enormous enhancement from this project. Various in-stream structures may be employed to further enhance the streams as shown in Appendix E. This mitigation will produce approximately 21.9 acres of jurisdictional waters and 294.7 acres of riparian habitat and replace all streams that are proposed to be impacted by the mining operation.

The incorporation of a riparian buffer along all the streams provides additional benefit. These buffers offer feeding, reproduction, and refuge habitat for invertebrates, fish, waterfowl, amphibians, birds, and mammals. Riparian buffers also provide the following functions to streams: 1) controls temperature which influences the content of dissolved oxygen of the water; 2) improves water quality: the vegetation retains sediment and pollutants from overland flow and during flood events and increases uptake, storage, and release of nutrients into and out of the aquatic environment; 3) retains waters during storm events and releases it slowly over time contributing to a longer base flow; 4) stabilizes stream banks and controls erosion and sedimentation; 5) furnishes a source of wood to the stream for cover and refuge habitat for fish and sediment storage areas; 6) provides near-bank cover; 7) provides a source of roughness to the stream; and 8) produces leaves, twigs, and insects to the stream, which is important as a food and nutrient source for fish and other aquatic animals. Riparian buffers that are located within a floodplain have additional benefits by reducing the depth of instream flow during flood events which lowers the sediment carry capacity of the stream. The flood velocities are also reduced which limits scour in the channel and promotes sediment deposition on the floodplain.

The following is a comparison of the existing floodplain to the estimated post construction floodplain. The two most critical elements for a successful stream are access to its floodplain and adequate floodplain storage. Floodplains function to convey floodwaters and provide storage. Reduction of flood velocities and normalizing of flood peaks aid in decreasing flood damage and soil erosion. Sedimentation is reduced by allowing suspended particles to be transported out of the channel banks and be deposited across the landscape. This "overflow" filters nutrients and impurities, facilitates infiltration and groundwater recharge, and reduces low surface flows. The following table provides a comparison of the existing floodplain for the streams in the permit to the proposed mitigated floodplain.

Floodplain Width Analysis						
Pre-Mine Floodplain Width with Post-Mine Floodplain Width	Area 1	Area 2	Area 3	Area 4	Area 5	Entire Area
Intermittent Streams						
Average Stream Pre-Mine Floodplain Width	5.3	13.4	13.3	0	0	12.8
Average Stream Post-Mine Floodplain Width	20.9	52.8	38.3	0	0	37.9
Ratio Increase	3.9:1	3.9:1	2.9:1	0	0	3.0:1
Post-Mine Estimated % Increase in Floodplain Width	291.0%	294.0%	186.9%	0	0	196.8%
Ephemeral Streams						
Average Stream Pre-Mine Floodplain Width	3.7	7.3	4.9	0	0	4.8
Average Stream Post-Mine Floodplain Width	16.3	31.8	17.1	0	0	17.1
Ratio Increase	4.4:1	4.4:1	3.5:1	0	0	3.6:1
Post-Mine Estimated % Increase in Floodplain Width	337.9%	338.6%	250.1%	0	0	255.1%
All Streams						

Average Stream Pre-Mine Floodplain Width	4.13	9.30	6.58	0	0	6.48
Average Stream Post-Mine Floodplain Width	17.46	38.80	21.37	0	0	21.45
Ratio Increase	4.23:1	4.17:1	3.24:1	0	0	3.31:1
Post-Mine Estimated % Increase in Floodplain Width	322.8%	317.2%	224.5%	0	0	231.1%

Floodplain Acreage Analysis						
Pre-Mine Floodplain Acres with Post-Mine Floodplain Acres	Area 1	Area 2	Area 3	Area 4	Area 5	Entire Area
Intermittent Streams						
Existing Acres of Floodplain	0.3	0.8	14.5	0	0	15.8
Post-Mine Estimated Acres of Floodplain	1.3	3.5	39.0	0	0	44.2
Ratio Increase	3.98:1	4.2:1	2.69:1	0	0	2.81:1
Post-Mine Estimated % Increase in Acres in Floodplain	297.5%	319.8%	169.2%	0	0	180.9%
Ephemeral Streams						
Existing Acres of Floodplain	0.4	0.2	8.7	0	0	9.2
Post-Mine Estimated Acres of Floodplain	1.6	1.1	32.0	0	0	34.1
Ratio Increase	4.4:1	4.4:1	3.7:1	0	0	3.7:1
Post-Mine Estimated % Increase in Acres in Floodplain	336.5%	338.2%	268.5%	0	0	272.1%
All Streams						
Existing Acres of Floodplain	0.7	1.1	23.2	0	0	24.9
Post-Mine Estimated Acres of Floodplain	2.8	4.5	71.0	0	0	78.3
Ratio Increase	4.18:1	4.24:1	3.06:1	0	0	3.14:1
Post-Mine Estimated % Increase in Acres in Floodplain	318.4%	323.9%	206.3%	0	0	214.4%

D. Identification of Potential Challenges

1. Identify the potential challenges to the mitigation plan such as flooding, drought, invasive species, seriously degraded conditions, adjacent property problems, animal/waterfowl degradation of planted species, etc., that could pose a risk to the proposed mitigation.

There will always be challenges to the proposed mitigation and corrective actions will be actively implemented should adverse situations occur. This will ensure that the success of the mitigation is achieved. Physical challenges such as seriously degraded land conditions contributing to bank instability resulting in erosion may occur, an example being that stream banks may become unstable due to the sparse vegetation during early stages of reclamation. This erosion causes an increase of sediment into the streams. Headcuts may also start at a nick point where the stream tries to adjust its energy gradient. This may lead to incision down to the spoil. There is potential for portions of the mitigated streams becoming non-jurisdictional which is largely a result of insufficient drainage areas to the headwater streams. Potential challenges for the wetland mitigation include the weather (either too much or too little precipitation), wildlife foraging on the newly planted woody species, and vigorous invasive species.

Under SMCRA regulations, coal companies are required to return the land to a productive state. Peabody Midwest Mining, LLC has received numerous awards for reclamation and has successfully minimized adverse impacts by using methods such as placing thick lifts of soil over the spoil, properly handling any acidic overburden, ripping the soil to minimize compaction, and revegetating shortly after regrading. Peabody Midwest Mining, LLC uses individuals who are skilled at planting and maintaining trees as well as constructing streams to ensure success of the mitigation.

A performance period up to 10 years will provide enough time to ensure the success of the mitigation areas.

2. Discuss how the mitigation plan accommodates these challenges along with potential remedial measures in the event that mitigation does not meet performance standards.

Peabody Midwest Mining, LLC will implement corrective measures as necessary to ensure the success of the mitigation. Corrective actions for the stream mitigation will include using engineered structures that redirect the flow away from the banks reducing erosion until the vegetation becomes firmly established along with replanting or overseeding areas where vegetation seems sparse. To control headcutting, grade control

structures such as cross vanes or constructed riffles will be utilized to prevent migration of the headcut into the spoil. If a stream becomes non-jurisdictional, attempts will be made to direct additional runoff to the stream. Corrective actions for wetland challenges will include replanting vegetation, eradicating invasive species, and performing minor earthwork to maintain the appropriate hydrologic balance.

II. Provide a written narrative of environmental goals and objectives. These goals and objectives should be directly produced from the information gathered under Section 1: Baseline Information for the proposed impact site. Explain the theory/rationale behind selection of different components of the mitigation site and how those components compensate for the proposed impacts. Include a statement concerning the viability of the mitigation at the proposed location.

Wherever possible, disturbance of jurisdictional wetlands and streams should be avoided. When disturbance is unavoidable, the disturbances should be minimized.

Goals

The goal of the mitigation is to provide a no net loss of wetland area while improving hydrologic and habitat functions and to replace stream and riparian buffer functions temporarily lost by the proposed project.

Objectives

1. **Reconstruct a total of 85,024 linear feet of a naturally designed channel at the mine site for the 126,686 linear feet of ephemeral and intermittent streams that will be impacted by the surface mining of the bituminous coal reserve at the Bear Run (Amendment 4) site.**
2. **Increase wetland area at the mine site by creating a total of 56.0 acres of palustrine forested wetlands for the 10.42 acres of PFO, 0.80 acre of PSS, 10.85 acres of PEM, and 5.39 acres of PUB wetland types that will be impacted by the surface mining of the bituminous coal reserve at the Bear Run (Amendment 4) site.**
3. **Objectives for the natural design stream mitigation include enhancements in stream stability and function over the existing streams at the Amendment 4 area by improving fish habitat and diversity, stabilizing bed and banks by using natural methods rather than armoring, adding riparian habitat, reducing flood levels by allowing access to a floodplain, developing riffle, run, and pool complexes, routing sediment, conveying surface water, and creating a natural look.**
4. **Improved wetland functions will include increasing wetland area and flood storage capacity, increasing vegetation cover, and promote hard-mast producing species.**

Section 3: Mitigation Work/Implementation Plan

I. Site Preparation:

A. Plans – Describe plans for the following criteria:
1. Grading
2. Hydrological changes
3. Water control structures, if any
4. Exotic vegetation control
5. Erosion control
6. Bank stabilization, if applicable
7. Equipment and procedures to be used
8. Site access control
9. Strategy for minimizing soil compaction
10. Stream Pattern, Profile, and Dimension
11. Other

As-built plans will be submitted with the annual monitoring report for any streams that were completed in the previous year. The following is general information that will be used, but any specific dimensions or distances will be developed for the site specific stream based on the reclaimed slope and watershed areas. The proposed natural design mitigated channels will achieve a natural dynamic equilibrium. This will ensure to the greatest degree possible, a stable mitigation effort. Designing mitigation to randomly traverse the landscape only invites the opportunity for failure from uncontrollable erosion.

The stream mitigation design will be dependent primarily on reclaimed slope criteria as well as watershed size and will be assessed utilizing the drainage types listed in the Rosgen Channel Morphology Matrix table found earlier in this permit application narrative. In areas of steeper slopes (4-10 percent), an "A" type channel will typically be utilized. In areas of moderate to flatter slopes (2-3.9 percent), a "B" type channel will typically be utilized. In areas of flatter slopes (<2 percent), a "C" type channel will typically be utilized in combination with a "B" type channel in areas that will not incorporate an enhanced floodplain. Also in areas of flatter slopes (<2 percent), an "E" type channel maybe utilized in areas that incorporate an enhanced floodplain. Typical post-mining profiles and typical cross-sections for the mitigated streams are provided in Map D1 in Appendix A. Sinuosity, meander lengths, and amplitudes, etc. are necessary components to successful construction of the proposed mitigation.

A combination of tools will be utilized for development of the natural design stream mitigation. Information is gathered from the reclaimed watershed which includes the drainage area, topography of the drainage area, valley slope, valley width, and valley length. The overall valley slope is used to determine the type of stream that will be reconstructed. A slope greater than 4% will typically utilize "A" type stream parameters, a slope that ranges from 2 to 4 percent will typically utilize "B" type stream parameters, and slopes less than 2 percent will typically utilize "C" or "E" type stream parameters. The parameters that will be used in the design include sinuosity, width/depth ratios, and entrenchment ratios. *Natural Regrade*[10]**, of the Carlson Survcadd product line, will be used to develop the plan form of the stream mitigation utilizing the appropriate sinuosity consistent with the Rosgen channel type being designed. The profile of the stream is adjusted within the limits of the Rosgen ranges to balance the cut/fill.** *Natural Regrade* **helps in landscape design to mimic the functions of a natural landscape. These evolve over time due to the physical and climatic conditions present at the site to establish water and sediment transport in a stable hydrologic equilibrium.**

Once *Natural Regrade* **has been used, the slope and length of the stream mitigation is used in** *Sedcad*[11] **or the drainage area is used in the mini-regional curves to design the bankfull cross-section.**

Sedcad[11] **is a hydrology and sedimentology program that is primarily used in the mining industry to design and evaluate surface water, erosion, and sediment control systems using established methodologies for hydrologic and hydraulic analysis. Drainage networks can be created to model how ditches, culverts, and sediment basins respond to various storm events. To determine the bankfull cross-section for the stream mitigation using** *Sedcad***, the following steps are performed: 1) design storm is entered, 2) network is entered, 3) watershed information is inputted for hydrograph and sedimentgraph modeling, and 4) control structure is entered (i.e. channel cross-section, pond, etc.). The output shows how the design storm discharge flowing through the network reacts in the control structure (i.e. cross-section) by providing the depth of flow, top width, velocity, cross-sectional area, and hydraulic radius. The bankfull cross-section is sized to accommodate the 2-year 1-hour precipitation event with the proper width-to-depth ratio for the designed stream type.**

Another tool to be used to aid in natural design stream mitigation will be the mini-regional curves that were developed in conjunction with Stantec Consulting Services Inc. from Jeffersonville, Indiana for southwestern Indiana and submitted in a report entitled, *Mini-Regional Curve Development Southern Indiana*[30]**, which can be found in Appendix M of this permit. Information collected throughout the region at reference streams in both mined and non-mined sites were used to develop regional curve relationships to primarily evaluate cross-sectional area (both bankfull area and inner berm area) versus drainage area. The resulting regional curve for bankfull cross-sectional area closely resembles the USGS curve produced for Ohio's Region A. Additional curves for bankfull width and mean depth were also produced. A regional curve for discharge was also developed although there would not be sufficient data to draw defensible conclusions regarding discharge due to the lack of suitable USGS gage sites within the study area. To determine the bankfull cross-section for the stream mitigation using mini-regional curves, the drainage area for the stream mitigation is used to estimate the cross-sectional area of both bankfull and the inner berm. The areas are engineered to have the proper width-to-depth ratio for the designed stream type. A properly designed and constructed inner berm feature will allow for channel adjustments (e.g. minor aggradation/degradation) without threatening the integrity of the project and will enhance low flow ecology.**

Engineered structures will be added to the mitigated stream to maintain stability. See Appendix E for details of structure installation. These structures could consist of, but not be limited to, rock or wood riffles, rock or wood j-hook vanes, rock or wood cross vanes, shallow to deep pools, root wad revetments, and large boulders. Structures that are typically utilized in stream mitigation are log vanes, root wads, and down-cut protection structures (cross-vanes). The down-cut protection structures provide protection from head-cutting until the immediate stream watershed is fully vegetated. Root wads are placed in the outer banks of the stream in the curves to protect it from erosion as well as helping in pool development. The pools develop adjacent as well as underneath these structures. The log vanes decrease the near bank stress by deflecting the stream flow energy back towards the center of the stream particularly in the curve and deflection areas. The engineered root wad revetments, log vanes, or strategically placed rocks located on the outer bank areas of the curves will be placed in the edge of the engineered pools to provide bank stabilization and shading of some of the pool area to provide water temperature control, as well as a safe haven for biological life. Geotextile fabric is keyed in with each stream structure to hinder erosion around and under a structure. The fabric prevents water and stream substrate from washing away causing the structure to fail. Correct geotextile fabric placement is essential to in-stream structure success. Willow cuttings or erosion control nets will also be utilized early in stream construction to protect the banks from erosion particularly in the curves as needed. It has been observed that willows, which are not on the approved riparian planting list, form dense stands at the stream water and bank interface. The willows migrate along the water's edge providing natural bank stability, shading of the stream, and biological habitat.

Riffle and pool complexes will be installed using nontoxic/nonacid forming mine rock of various sizes, commercial grade riprap and/or woody materials from previously downed trees and will be modified as necessary to achieve successful mitigation. As illustrated on Maps D2 to D5 in Appendix A and Appendix E, engineered riffle material will be embedded in the substrate and will provide energy dissipation and protection from down cutting. The pools will be constructed with shallow to deep areas primarily in the curve areas and secondarily in the straight stretches to provide energy dissipation and provide a suitable biological habitat area. The structures may need to be modified somewhat as the stream is constructed from the typical plans shown on Maps D2 to D5 in Appendix A.

Adjustments to the mitigated stream features (i.e. additional riffle structure, channel blockage, bank stability) will be implemented as needed for continued success. Additional riffles and pools will form naturally in response to channel hydraulics, storm events, and sediment bedload as the stream matures. The engineered structures and natural structures will provide stream stabilization, aquatic function, and help ensure the success of the mitigation.

Standing dead timber or other raptor perches will be placed along the edges of the riparian buffers. By providing perches, the rodent population within the riparian buffers can be moderated. Moles, field mice, and particularly, voles love to eat succulent root systems and will burrow under the bare root seedling and container trees and eat away until the plant is dead or crippled. If the stream mitigation abuts a forested area, the use of perches may not be necessary. The perches may be nothing more than restanding a tree obtained during the initial land clearing with the root ball in the ground with the tree branches up.

Additional aquatic and riparian habitat enhancement measures specified within the permit include:

- **placing a 50-foot riparian buffer on each side of the natural design ephemeral stream mitigation and a 100-foot riparian buffer on each side of the natural design intermittent stream mitigation to provide woody debris for habitat and allochthonous material downstream,**
- **replacement of brush, shrubs, and trees for stream cover and temperature control,**
  vanes and similar structure to re-direct flow energy and provide macro-invertebrate habitat,
- **riffles and similar structure to increase aeration,**
- **shallow and deep water areas to increase habitat diversity,**
  the spatial placement of large woody debris or rock piles adjacent or abutting the channel to provide important habitat structure during the riparian buffer maturation period, and
- **meanders in the stream to add fluid geomorphology**

Reconstructed streams will not be routed through impoundments after SMCRA final reclamation bond has been released, unless the streams previously flowed through impoundments. However, permanent or temporary impoundments may intersect the replaced stream channels prior to then. These impoundments will initially serve as a sediment control measure that will subsequently provide water storage, flood mitigation, and additional habitat diversity for breeding and shelter of aquatic life. The permanent structures may partially develop into wetlands that will further enhance and expand the existing aquatic and terrestrial habitat diversity. The addition of open water and expanded wetland features to the stream will likely foster an increase in aquatic, terrestrial, and avian biological diversity. The open water will provide a refuge for aquatic biota during low flow and no-flow periods that may otherwise be detrimental to reproduction and migration.

Prior to SMCRA final bond release, the temporary basins will be backfilled and the permanent basin drainages will be partially removed and rerouted around the open water. Streams may be connected to open waters at an elevation above the bankfull depth. This will allow the recharge of the permanent basin during substantial rainfall events by allowing greater than bankfull depths to flow into the water body, while maintaining the connectivity of jurisdictional waters. The proposed location of the mitigation for the streams, wetlands, and open waters is found on Map C in Appendix A. The locations of the mitigated waters and wetlands are subject to change, but the general language of this permit application will be followed. Any modifications to the proposed mitigation language will be submitted to the Newburgh ACOE field office for prior review and approval.

B. Soils/Substrate
   1. Wetlands:
      a. Indicate whether or not the site has been scraped, filled previously, tiled, plowed, etc.

Mitigated wetlands will be constructed in reclaimed areas once mining has been completed. Topsoil from any wetland over one (1.0) acre in size will be saved separately, stockpiled, and placed on any of the wetland mitigation areas. Any wetland soils that contain *Phragmites* or other invasive species will not be segregated for use on wetland mitigation areas. Soil replacement operations will be conducted to minimize compaction of the reclaimed soils.

      b. Identify the original source of any soil transported to the mitigation site. Soil origin is important if the applicant is proposing to use the seed bank from an impacted wetland.

All soil that will be replaced in the permit area will be obtained from the area. No additional material will be transported to the mitigation site. Standard soil testing and analysis will be performed very 2 years at a minimum spacing of one sample per 3 acres in areas of wetland mitigation. The results will be provided with the annual monitoring report.

   2. Streams:
      a. Identify type of substrate present (e.g., boulders, cobble, pebbles, etc.) and the particle size distribution (e.g., pebble counts); channel habitat types (pools, riffles, runs, etc.)

Mitigated streams will be constructed in reclaimed areas once mining has been completed, and the area has been resoiled. These soils have naturally occurring gravels mixed in them and will be used in conjunction with non-acidic/non-toxic mine-run rock to form the substrates. Riffle structures constructed of rock materials will be utilized to increase aeration, stabilize the substrates to prevent down-cutting, and help in the development of pool complexes. Pre-mine soils are mixed by heavy equipment during removal and replacement operations. Soil replacement operations will be conducted to minimize compaction of the reclaimed soils.

b. Identify the type(s) and original source of any substrate transported to the mitigation site.

All soil that will be replaced in the permit area will be obtained from the area. Material for j-hooks, riffles, etc. will be transported from rock quarries, etc. or will utilize non-acidic/non-toxic mine run rock. Standard soil testing and analysis will be performed very 2 years at a minimum spacing of one sample per 3 acres in areas of riparian mitigation. The results will be provided with the annual monitoring report.

C. Hydrology

1. Identify the source of hydrology/water supply, estimated size of the watershed and connections to existing waters and proximity to uplands. In some areas, a water budget may also be necessary. Designs that manipulate wetland and stream processes with engineered structures and features, which require maintenance intensive plans, should be avoided.
2. Provide general information on the average frequency, depth and duration of water available to the site under normal conditions.
3. Install ground water monitors/piezometers to help evaluate groundwater elevations and/or flow (*this will be determined on a case by case basis by the Louisville District).

All mitigated streams and wetlands will be located in valley areas with sufficient upstream drainage to provide surface runoff to maintain the wetland areas with hydric conditions and to maintain the streams appropriate pattern and profile. Reclamation that occurs in surface coal mining operations allows the land to be graded for suitable wetland and stream development.

Permanent post-mine impoundments (open water bodies) will help to provide some flood storage for surface runoff. Flood storage will reduce peak stream discharge and help maintain a longer base flow in streams and to wetland areas. Water in the permanent impoundments also recharges the groundwater table in the spoil. The addition of open water impoundments is an important aquatic habitat resource for the permit area.

Primary roadways will be reconstructed after mining per agreements with the Sullivan County commissioners. Each primary roadway will be designed in compliance with the following design standards. the embankment foundation shall be clear of all organic materials and shall be scarified, fill material shall be free of sod, large roots, and other vegetative matter and benched in if cross-section is steeper than 8:1, the fill shall be brought up in horizontal layers of such thickness as required to facilitate adequate compaction, side slopes shall be no steeper than 2:1, and embankments shall have a minimum top width of (h+35)/5, where "h" is the embankment height as measured from the natural ground at the downstream toe to the top of the embankment. Each primary roadway will be reconstructed to have adequate drainage control, using structures such as, but not limited to, the following: bridges, culverts, box culverts, and spans. The drainage control system will be designed to safely pass the peak run-off from a ten (10) year, six (6) hour precipitation event or greater event as specified by Sullivan County surveyor for county road crossings.

Typically, the same type of structure (bridge for a bridge, culvert for culvert) will be installed during reclamation. Safe and stable stream crossings that can accommodate wildlife and protect stream health will be evaluated for use when natural design stream mitigation is proposed on either side of a primary roadway. Effective crossings could include bridges, open bottom arches, and culverts that span, and are sunk into, the stream bottom. Culverts would be embedded at least one foot for box culverts and pipe arches, or at least 25% of the pipe diameter for pipe culverts. The primary road sections that are proposed to be affected by mining are segments of County Road (C.R.) 500 South, C.R. 750 South, C.R. 850 South, C.R., 900 South, C.R. 975 South, C.R. 700 East, and C.R. 600 East. Agreements will be negotiated with the county before the primary roads can be closed and mined through. Roadways will be reconstructed in the reclaimed spoil and specific plans have not been designed or approved. Approvals will be obtained incrementally.

D. Planting Plan – The planting plan and methods must be described in the proposed mitigation plan. The following information must be incorporated into the planting plan:

1. Provide a table of species to be planted, including numbers, spacing, types of propagules, pots sizes, etc. Scientific and common names must be used, as well as the appropriate indicator status for each species. Use the current regional U.S. Fish and Wildlife Service *National List of Plant Species that Occur in Wetlands*.
2. Indicate source-locale of seeds, plant plugs, cuttings, etc. Only native plant species may be used for the mitigation site. Hydrophytic vegetation may not consist of exotic or hybrid nursery species. Grass seed mix is commonly used to cover mitigation sites under construction. The use of **annual** non-native species will be considered. The species composition of the mix should be clearly documented, as well as any methods for eventually removing the temporary ground cover, if required (e.g. native, perennial greases).

3. Show planting locations on a base topographic map according to species. The map must include elevations and proposed water levels. Demonstrate, in an attached narrative, that the appropriate plant species are being planted in suitable areas (i.e. elevation, water depth, and soil type) and that the timing of planting will foster successful growth.
4. If transplanting is proposed, consider storage method and duration.
5. Describe any expected volunteer native vegetation that is included in mitigation planning.

The following table contains the plantings to be used for the riparian buffers along the streams. See Map C in Appendix A for the proposed stream and riparian buffer locations.

Forest/Wildlife Habitat for Stream Buffer Planting Stock Summary			
Scientific Name	Common Name	Seeding or Planting Rate	Method of Application
Dactylis glomerata	Orchard Grass	10 lb/ac	Broadcast
Trifolium pratense	Red Clover	4 lb/ac	Broadcast
Bromus spp.	Brome Grass	10 lb/ac	Broadcast
Agrostis alba	Red Top	2 lb/ac	Broadcast
Trifolium hybridum	Alsike Clover	3 lb/ac	Broadcast
Trifolium spp.	Ladino Clover	3 lb/ac	Broadcast
Lolium perenne	Perennial Rye Grass	10 lb/ac	Broadcast
Liriodendron tulipifera	Yellow Poplar	60 container trees or 600 seedlings/ac	Mechanical or Hand
Diospyros virginiana	Persimmon	60 container trees or 600 seedlings/ac	Mechanical or Hand
Quercus spp.	Red Oak species	60 container trees or 600 seedlings/ac	Mechanical or Hand
Quercus spp.	White Oak species	60 container trees or 600 seedlings/ac	Mechanical or Hand
Carya spp.	Hickory	60 container trees or 600 seedlings/ac	Mechanical or Hand
Juglans nigra	Black Walnut	60 container trees or 600 seedlings/ac	Mechanical or Hand

Note:

1. **For herbaceous plantings, a minimum of 5 species shall be selected for initial planting to ensure diversity. At the end of monitoring, 70% of ground cover will be the planted species and of that no one species will comprise more than 40% of that final cover.**
2. **For woody plantings, no one species will make up more than 20% of the initial planting. The woody species will be planted on a per acre basis to the total planting rates listed with no one planted species making up more than 25% of the surviving planted stock.**
3. **Monitoring will not begin until the trees are a minimum of 30" tall.**
4. **The herbaceous plantings will provide adequate ground cover to help protect from erosion and will be monitored and maintained on an as-needed basis.**
5. **Planting of the herbaceous vegetation will occur in the fall with the woody species being planted during the spring. These seasons are estimates and may be changed due to precipitation/flooding and/or mining plans.**
6. **Spacing of trees and shrubs will be ~8'x9' for seedlings and ~27'x27' for root production type container trees.**
7. **Alternate site appropriate species may be substituted dependent on nursery availability and the ACOE approval.**
8. **Prior to planting the woody species, a final species list will be submitted to the ACOE for prior review and approval.**
9. **The success standard for bare root seedlings will be 80% survivability of the initial planting list and rates, while the success standard for root production type container trees will be 90% survivability of the initial planting lists and rates.**

The following table is the plantings to be used in the wetland mitigation areas. See Map C in Appendix A for the proposed locations.

Wetland Seeding and Planting Stock Summary[6]			
Scientific Name	Common Name	Seeding or Planting Rate	Method of Application
Agrostis alba	Red Top	2 lb/ac	Drilled or Broadcast
Lolium perenne	Perennial Rye	5 lb/ac	Drilled or Broadcast
Echinochloa spp.	Barnyard Grass	5 lb/ac	Drilled or Broadcast
Carex spp.	Sedges [various]	Label Rate	Drilled or Broadcast
Trifolium hybridum	Alsike Clover	3 lb/ac	Drilled or Broadcast
Echinochloa spp.	Japanese Millet	5 lb/ac	Drilled or Broadcast
Astragalus cicer	Cicer Milk Vetch	3 lb/ac	Drilled or Broadcast
Lolium multiflorum	Annual Rye	4 lb/ac	Drilled or Broadcast
Quercus spp.	Red Oak [Obl, FacW or Fac species]	60 container trees or 600 seedlings/ac	Mechanical or Hand

Quercus spp.	**White Oak [Obl, FacW or Fac species]**	**60 container trees or 600 seedlings/ac**	**Mechanical or Hand**
Carya spp.	**Hickory [Obl, FacW or Fac species]**	**60 container trees or 600 seedlings/ac**	**Mechanical or Hand**
Carya illinoinensis	**Pecan [FacW]**	**60 container trees or 600 seedlings/ac**	**Mechanical or Hand**

Note:

1. **For herbaceous plantings, a minimum of 5 species shall be selected for initial planting to ensure diversity. At the end of monitoring, 70% of ground cover will be the planted species of that no one species will comprise more than 40% of that final cover.**
2. **For woody plantings, a minimum of 5 species shall be selected with no one species will make up more than 20% of the initial planting to assure diversity. The woody species will be planted on a per acre basis to the total planting rates listed with no one planted species making up more than 25% of the surviving planted stock.**
3. **Monitoring will not begin until the trees are a minimum of 30" tall.**
4. **Planting stock for woody plant species will be native species known to occur in southwest Indiana.**
5. **The herbaceous plantings will provide adequate ground cover to help protect from erosion and will be monitored and maintained on an as-needed basis.**
6. **Alternate site appropriate species may be substituted dependent on nursery availability and prior ACOE approval.**
7. **The success standard for bare root seedlings will be at least 50% survivability of the initial planting list and rates. The success standard for root production type container trees will be at least 90% survivability of the initial planting list and rates.**

E. Exotic and Undesirable Species Control – The plan must outline the methods proposed to prevent the introduction and/or establishment of invasive species such as Reed Canary Grass (*Phalaris arundinacea*), Cattails (*Typha sp.*), and Purple Loosestrife (*Lythrum salicaria*). The plan must also outline a management plan if any of these species are found.

Volunteer invasive, undesirable, and exotic species will be eradicated by several means during the monitoring period. Mowing or tilling can be employed to discourage and eradicate undesirable volunteer tree species. Herbicide treatment could be implemented following the manufacturers' instructions. The specific eradication measures will be determined by the specific site conditions. If the some volunteer species provide beneficial support that warrants them to remain in the mitigation site, a request to not remove those species will be submitted to the ACOE for approval.

F. Schedule – Time frames for construction of the mitigation site should be clearly documented within the proposal, as well as tentative monitoring times. The applicant should be aware that the *initial planting does not constitute the first monitoring period*. Monitoring of the site should commence in the first full growing season post initial planting.

Wetlands

The proposed timetable for construction of on-site wetland mitigation is the spring of 2016 with herbaceous plantings. Tree planting will occur the following spring. These timetables are subject to change due to the rate of coal extraction, weather conditions, etc., but the general plan will be followed.

The timetable for completion of the proposed off-site Buttermilk Creek wetland mitigation is by the end of the 2nd growing season following permit issuance. The mitigation at Buttermilk Creek will occur long before the vast majority of impacts occur at the Bear Run (Amendment 4) site.

Streams

The proposed timetable for construction of the on-site mitigated streams is for completion by the fall of 2018. Streams will be constructed as reclamation allows. This timetable is subject to change due to the rate of coal extraction, weather conditions, etc., but the general plan will be followed.

The timetable for completion of the proposed off-site Buttermilk Creek stream mitigation including Buttermilk Creek restoration, stream creation, and instream structure enhancement is by the end of the 2nd growing season following permit issuance. The mitigation at Buttermilk Creek will occur long before the vast majority of impacts occur at the Bear Run (Amendment 4) site.

G. Construction Monitoring – Monitor of the construction activities to ensure all aspects of the approved compensatory mitigation plan are completed without incident. This will normally require on-site management of the construction personnel by one or more of the permittee's representatives, who have complete knowledge of the plan and some understanding of soil science, hydrology, botany or plant ecology. The person(s) who prepared the mitigation plan should conduct the monitoring.

Wetlands

A performance period up to 10 years will be employed to monitor and evaluate success of the wetland mitigation. Appropriate species will be verified by assessing the ground cover type and quality. Woody species will be planted at a rate of 600 trees per acre for seedlings and 60 trees per acre for root production type container trees as listed in the above table titled Wetland Planting and Seeding Stock Summary. Container trees will be cultivated using root pruning methods and shall be 3 gallons in size. The final success standard for bare root seedlings will be at least 50 percent survivability of the initial planting rate of 600 trees per acre from the approved species list. The final success standard for root production type container trees will be at least 90 percent survivability of the initial planting rate of 60 trees per acre from the approved species list. The success standard and evaluation period coincides with the IDNR standards for a forest land use.

Hydrologic conditions will be assessed based upon overbank flooding and installing and monitoring groundwater table wells to verify saturation or inundation within the upper 12 inches of the soil horizon for 14 consecutive days of the growing season per Technical Standard for Water-Table Monitoring of Potential Wetland Sites[48]. Hydric soil conditions will be evaluated using wetland delineation criteria. The annual monitoring reports will document the status of the vegetation, soils and hydrology utilizing the data forms provided for in the Midwest Regional Supplement[28] and provide information to assess the status of the mitigation project.

Streams

A performance period up to 10 years will be employed to monitor and evaluate success of the stream mitigation. The geomorphic features of the streams will be assessed for their Rosgen[3] characteristics to determine if the natural design constructed is functioning. The streams will also have their physical habitat quality assessed utilizing the USEPA Rapid Bioassessment Protocols (RBP)[29]. Appropriate species will be verified by assessing the ground cover type and quality. For the natural design mitigation, woody species will be planted at a rate of 600 trees per acre for seedlings and 60 trees per acre for root production type container trees as listed in the above table titled Forest/Wildlife Habitat for Stream Buffer Areas. Container trees will be cultivated using root pruning methods and shall be 3 gallons in size. The final success standard for bare root seedlings will be 80 percent survivability of the initial planting rate of 600 trees per acre from the approved species list, while the final success standard for root production type container trees will be 90 percent survivability of the initial planting rate of 60 trees per acre from the approved species list. This success standard and evaluation period coincides with the IDNR standards for a forest or wildlife habitat land use.

II. As-Built Conditions:

The plan must specify that the applicant will:

A. Submit a report, including construction documents, to the Corps within six (6) weeks of completion of site preparation and planting, describing as-built status of the mitigation project. If avoidance of existing wetlands and streams is incorporated into the development project design, then describe the as-built status of the development project. Include any deviations from the original plan in the vicinity of, or that will affect the existing wetlands and streams. Submit separate reports for grading and planting work if not completed within six weeks of each other. *Initial planting reports are required but will not be considered as a monitoring report.*

B. Provide topographic maps showing as-built contours (for streams this would entail measurements of pattern, profile, and dimension) of the mitigation area. Indicate location of plantings and any other installations or structures. Hydrological tables should also be included illustrating the current and project water levels for the mitigation site.

C. Submit a plan outlining the short and long term management and maintenance of the mitigation site.

D. Adequately field mark the approved mitigation site with *permanent* signs identifying the mitigation boundaries.

As-built plans will be submitted with the annual monitoring report for any wetlands or streams that were completed in the previous year.

III. Financial Assurances:

The permittee or party responsible for accomplishing and maintaining the mitigation project, including contingency funds for adaptive management, is responsible for securing adequate funds to accomplish those responsibilities associated not only with the development and implementation of the project, but also its long-term management and protection.

SMCRA requires mining companies to post bonds sufficient enough to cover the cost of reclamation including backfilling the material, stabilizing, capping, regrading, placing cover soils, revegetation, and maintenance; all of which cover the mitigation proposed in this application. On-site mitigation will be utilized but if deemed

necessary to ensure success, off-site mitigation will be proposed and Peabody Midwest Mining, LLC will work with the ACOE to develop a plan for success.

Section 4: Success Criteria

I. Minimum Success Criteria:

A. Wetlands

Mitigated forested wetlands will be considered successful if the following conditions are met:

1. **The proposed jurisdictional wetland acreage will be met.**
2. **The final success standard for bare root seedlings will be at least 50 percent survivability of the initial planting rate of 600 trees per acre from the approved species list. The final success standard for root production type container trees will be at least 90 percent survivability of the initial planting rate of 60 trees per acre from the approved species list. This will consist of a minimum of 5 native species known to occur in southwestern Indiana to assure diversity.**
3. **No one species will make up more than 25 percent of the surviving plant stock.**
4. **The vegetation present in these areas meets the current federal delineation manual for hydrophytic vegetation.**
5. **The soils in the mitigated wetlands areas exhibit hydric conditions that must be sufficient to meet the criteria of wetland determination per the 1987 Corps of Engineers Wetland Delineation Manual[4] and the Midwest Regional Supplement[28].**
6. **The mitigated wetlands will have flood storage capacity providing sufficient hydrology so the soils are inundated or saturated for 14 consecutive days of the growing season as determined by the installation of groundwater table monitoring wells per Technical Standard for Water-Table Monitoring of Potential Wetland Sites [48].**
7. **The site is self-sustaining after the establishment of the approved permanent vegetation.**
8. **The site should meet the proposed plantings for the mitigated type. For forested wetlands, expected tree growth will not advance during the 5-year monitoring period to the point where it will qualify as a PFO1A; however, the trees shall be growing, healthy, and indicative of a future PFO1A wetland.**

B. Streams

Mitigated streams will be considered successful if the following conditions are met:

1. **The minimum riparian buffer widths are established.**
2. **The final success standard for woody species is 80 percent survivability of the initial planting rate of 600 trees per acre from the approved species list for bare root seedlings and 90 percent survivability of the initial planting rate of 60 trees per acre from the approved species list for root production type container trees of the initial planting lists and rates which will consist of a minimum of 5 native species known to occur in southwestern Indiana to assure diversity.**
3. **No one species will make up more than 25 percent of the surviving plant stock.**
4. **Rosgen[3] level II and III characteristics will be measured to ensure the development of stable channels for the appropriate slope and drainage area within the watershed. See the Rosgen Channel Morphology Matrix table in Section 1 for the conditions.**
5. **The stream is self-sustaining after the establishment of the approved permanent vegetation.**
6. **The streams are jurisdictional.**
7. **Utilizing the EPA's Rapid Bioassessment Protocol[29], specific natural streams as shown on the mitigation map shall meet the following minimum scores for success. The final assessed score shall be equal to or exceed 11 for the metrics of pool variability, channel flow status, and channel sinuosity. A minimum score of 6 for each bank shall be measured for bank stability.**

II. Project Specific Success Criteria for Wetlands and Streams:

Each compensatory mitigation plan shall include project specific success criteria that are:

A. Based on the targeted functions and values of the compensatory mitigation as compared to those identified from a functional assessment of the aquatic resource impacted at the development site.
B. Measurable
C. Achievable, based on the purpose of the compensatory mitigation, design of the site, and functional assessment criteria, by the end of the maintenance and monitoring period.

Mitigated Wetlands

The success criteria to track progress of the mitigated wetlands will be based on the 1987 Corps of Engineers Wetland Delineation Manual[4] along with the Midwest Regional Supplement[28] utilizing the Wetland Determination Form. Wetland success is achieved by developing an area that has wetland hydrology, hydric soils, and hydrophytic vegetation. These features are measurable and achievable for this permit area.

Mitigated Streams

The measurable performance standards to track progress of the mitigated streams will be based on Rosgen stream assessments as developed by Dave Rosgen. The type of stream will be based on Rosgen[3] stream classifications for the appropriate slope and drainage area for a stream. Enhancements to the streams such as adding sinuosity, decreasing entrenchment of the channel, developing riparian buffers, installing riffle, run, and pool complexes, and adding a floodplain as post-mining land uses allow are all measurable, achievable, and verifiable assessment criteria to obtain success.

III. Include measurable performance standards to track progress toward achieving the success criteria.

Mitigated Wetlands

The measurable performance standards to track progress of the mitigated wetlands will be based on the 1987 Corps of Engineers Wetland Delineation Manual[4] along with the Midwest Regional Supplement[28]. Wetland success is achieved by developing an area that has wetland hydrology, hydric soils, and hydrophytic vegetation.

Mitigated Streams

The measurable performance standards to track progress of the mitigated streams will be based on Rosgen stream assessments as developed by Dave Rosgen. Stream success is achieved by developing a natural stream channel that has a stable cross-section, stable meander pattern, and a stable profile such that over time, the channel features are maintained and the stream maintains stability. See the Rosgen Channel Morphology Matrix table in Section 1 for the parameters.

All of these performance standards will be addressed in the annual monitoring reports.

Section 5: Monitoring

I. Monitoring Reports:

Annual reports should be sufficient unless there are any unforeseen circumstances that might put the potential success of the project into question. In that case, biannual reports may be required. All annual reports will be submitted to the District by January 30th for the previous year.

A. Timing
B. On-Site Method
C. Documentation

Annual monitoring reports for the mitigated wetlands will be provided for each wetland and be based on information obtained at set monitoring points which will be clearly identified in the field. There will be a minimum of one monitoring point for each wetland or for every 3 acres of a larger wetland. Included in the reports will be wetland delineations utilizing the Midwest Regional Supplement[28], a narrative assessment describing the wetland and vegetation, photographs from each monitoring point, tree counts, groundwater table monitoring reports, soil testing results, water quality sampling data, and results from monitoring certain variables of the ACOE Hydrogeomorphic Method (HGM). As-built plan drawings of the areas constructed or planted will also be provided in the first report. Tree counts will be conducted using techniques appropriate to the site, i.e. one-fifth acre or twenty-foot or fifty-foot radius circular plot.

For each wetland site adjacent to stream mitigation, a row of 3 wells will be installed equidistant from one another between the top of the stream bank and the wetland/upland boundary. Approximate locations are shown on Map G in Appendix A. The water levels will be measured either manually or with automated equipment. At locations subject to flooding, depth of surface water will be noted in the measurements. Water table monitoring reports will chart the depth of saturation during the growing season (approximately March 15 - June 1) for the installed groundwater well. Standard soil testing and analysis will be performed at the monitoring point and submitted every 2 years. Internal stream/wetland water quality monitoring as detailed in the Surface Water Sampling Plan for Streams and Wetlands (Section 1.8) will be included in the annual report for the locations shown on Maps G (pre-mining) and H (post-mining), as applicable.

The variables that will be used to show a functional increase in the wetland mitigation using the ACOE Hydrogeomorphic Method (HGM) shall include amount of organic detritus on the ground, water table depth and steady water changes resulting in no flash events to flush out organic debris. Regional reference standards will be developed from existing wetland mitigation sites on both reclaimed and natural sites. Potential reference sites will be the wetlands at Wildcat Hills Mine - Cottage Grove Pit and Eagle Valley Pit, Jenlin Pit, Farmersburg Mine, and Francisco Mine. Information on the specific reference standards will be submitted as existing data is collected and the standards are set. Project targets will be set for the particular variables which are consistent with the restoration or creation goals, because it has been determined that these particular variables are necessary factors for the hydrologic, biochemical, or habitat functions to occur. Once success and acreage requirements have been achieved, final wetland delineation will be performed with a meets and bounds to determine the final acreage and a request to release the mitigated wetland from further monitoring will be submitted.

Annual monitoring reports for the mitigated streams will be provided for each stream once the majority of the riparian plantings reach a minimum of 30 inches in height. Assessment locations will be set every 1,500 linear feet of stream length and will be clearly identified in the field. Included in the reports will be a completed Rosgen Level II and III modified stream assessment along with the Habitat Assessment Field Data Sheet utilizing the USEPA Rapid Bioassessment Protocols (RBP). In addition to these assessments, the report will include a site map, stream cross-sections, stream profiles, a narrative description noting the total lengths and acreages constructed, any areas of instability along with any structures that have been placed or naturally developed in the channel along, and if the mitigation is meeting the mitigation goals, a description of the adjacent riparian buffer including widths and diversity of species, photographs from each assessment points, tree counts and soil testing results in the riparian buffer, biological sampling, and water quality sampling data. Internal stream/wetland water quality monitoring as detailed in the Surface Water Sampling Plan for Streams and Wetlands (Section 1.8) will be included in the annual report for the locations shown on Maps G (pre-mining) and H (post-mining), as applicable. As-built plans for streams that were constructed the previous year will be submitted. Evaluation of any enhancements will detail the added value over the pre-mining conditions (i.e. stable slopes, widened floodplain to dissipate energy and increase the riparian habitat value, etc.)

The success standard for the woody plantings will be verified by the appropriate tree counting technique, i.e. one-fifth acre or twenty-foot or fifty-foot radius circular plot. Tree counting techniques will be conducted for every 1,000 foot of riparian buffer. Standard soil testing and analysis will be performed at the monitoring point and submitted every 2 years. Biological sampling, at the locations shown on Map G, will be conducted to obtain a macroinvertebrate Index of Biotic Integrity (mIBI) and a fish Index of Biotic Integrity (fIBI). This yearly sampling will be conducted after the riparian buffers are planted and be performed at the locations shown on Map G (pre-mining) and H (post-mining). Once success and linear footage requirements have been achieved, a request to be released from monitoring will be submitted.

Annual monitoring reports will be submitted to the ACOE for a period up to 10 years by January 30th for the previous year and include information collected from biannual monitoring inspections. After the fifth year of annual monitoring, the ACOE will be petitioned for biennial monitoring. Biannual monitoring will consist of at least one complete inspection at each assessment point and at least one visual maintenance inspection for each stream reach or wetland area. Data collected during the complete inspection includes:

Component	Data Collection
Wetland Monitoring	
Cowardin	Midwest Regional Supplement
	Photographs
Hydrology	Groundwater Table Monitoring Wells
Habitat	HGM variables
Vegetation	Tree Counts
	Photographs
	Soil Testing
Chemical	Stream/Wetland Water Quality
Stream Monitoring	
Geomorphology	Rosgen Level II and III Assessment
	Plan and Profile/Cross-Sections
	Photographs
Habitat	RBP
Vegetation	Tree Counts
	Photographs
	Soil Testing
Biological	mIBI
	fIBI
Chemical	Stream/Wetland Water Quality

Note: The above schedule is repeated for monitoring years 6 through 10, unless mitigation is considered successful and monitoring is no longer required.

Data collected during visual maintenance monitoring includes an inspection for any significant changes since the last complete inspection and the need for any repairs that are compromising the mitigation success. Any issues identified by the maintenance monitoring will be documented and corrective measures taken.

D. Responsible Parties

Peabody Midwest Mining, LLC f/k/a Black Beauty Coal Company, LLC
7100 Eagle Crest Boulevard, Suite 100
Evansville, Indiana 47715
Contact: Bryce West
Phone: 812-434-8500

Several individuals are responsible for the design, construction, revegetation, and monitoring of the mitigation for Peabody Energy, but the primary designers will be Richard Williams and Ann Nelson, PE.

Richard Williams, Permit Specialist, has over 20 years experience in surveying, stream assessing, and wetland delineating. Mr. Williams responsibilities have involved wetland delineation, stream assessments, construction from grade staking to final structure placement. He is also involved in designing the plan and profile for the stream mitigation utilizing spoil grade topography provided by the mines.

Richard Williams
Education and Training

- **A.S. in Surveying, Vincennes University - Vincennes, IN 1990**
- **Wetland Delineation with Emphasis on Soils and Hydrology, Wetland Training Institute, Inc. - Whitefish, MT 2005**
- **Stream Geomorphology and Ecology, Ohio State University Technical Seminar - Columbus, OH 2005**
- **Plant Identification, Wetland Training Institute, Inc.- Indianapolis, IN 2005**
- **SEDCAD 4 Program Training, Evansville, IN 2007**
- **Plant Identification, Wetland Training Institute, Inc.- Indianapolis, IN 2007**
- **Applied Fluvial Geomorphology (Level I), Wildland Hydrology, Inc. - Fayetteville, AR 2007**
- **River Morphology and Application (Level II), Wildland Hydrology, Inc. - Fayetteville, AR 2007**
- **River Assessment and Monitoring (Level III), Wildland Hydrology, Inc.- Lubrecht Experimental Forest, MT 2008**
- **Geomorphic Reclamation and Natural Stream Design at Coal Mine: A Technical Interactive Forum - Bristol, TN 2009**
- **River Restoration and Natural Channel Design (Level IV), Wildland Hydrology, Inc.- Steamboat Springs, CO 2009**
- **Regional Supplement Seminar and Field Practicum, Wetland Training Institute, Inc.- Frankfort, KY 2010**

Ann Nelson, Environmental Engineer, has 4 years of experience in permitting and design experience and 6 years of additional engineering experience. Ms. Nelson will be the lead in developing the cross-sectional dimension of the stream mitigation

Ann Nelson, PE
Education and Training

- **B.S. in Geological Sciences, Indiana University - Bloomington, IN 1995**
- **B.S. in Civil Engineering Technology, University of Southern Indiana - Evansville, IN 1999**
- **SEDCAD 4 Program Training, Evansville, IN 2007**
- **Applied Fluvial Geomorphology (Level I), Wildland Hydrology, Inc. - Fayetteville, AR 2007**
- **River Morphology and Application (Level II), Wildland Hydrology, Inc. - Fayetteville, AR 2007**
- **River Assessment and Monitoring (Level III), Wildland Hydrology, Inc. - Dobson, NC 2008**
- **Regional Supplement Seminar and Field Practicum, Wetland Training Institute, Inc.- Frankfort, KY 2010**
- **Indiana Registered Professional Engineer - License No. 10606515**
- **Illinois Registered Professional Engineer - License No. 062-060721**

Dan Williamson, Environmental Specialist, has over 26 years of reclamation experience in wetland restoration, managing forests, and planting trees on surface coal mine sites. Mr. Williamson will manage the planting of riparian buffers and wetlands either by consultants or Peabody Energy employees at the mines.

Dan Williamson
Education and Training

- **B.S. in Forestry, University of Kentucky - Lexington, KY 1977**
- **A.S. in Reclamation Technology, Madisonville Community College - Madisonville, KY 1981**

- **District Forester, Kentucky Division of Forestry, 2001-2006**
- **Plant Identification, Wetland Training Institute, Inc.- Indianapolis, IN 2007**
- **Applied Fluvial Geomorphology (Level I), Wildland Hydrology, Inc. - Fayetteville, AR 2008**
- **River Morphology and Application (Level II), Wildland Hydrology, Inc. - Steamboat Springs, CO 2009**

Allen Eicher, Environmental Specialist, has over 31 years of reclamation experience. Mr. Eicher has received numerous awards for his reclamation accomplishments. These include the 2007 Indiana Department of Natural Resources Excellence in Mining and Reclamation award, 2008 U.S. Department of the Interior National Award for Excellence in Surface Mining Reclamation, and the 2009 Indiana Society of Mining and Reclamation (Vance "Pat" Wiram Award). Mr. Eicher will help in the oversight of the stream mitigation and along with being involved in making repairs.

Allen Eicher
Education and Training

- **B.S. in Biology, Indiana University - Bloomington, IN 1972**
- **Applied Fluvial Geomorphology (Level I), Wildland Hydrology, Inc. - Fayetteville, AR 2009**

Robert Pendleton, Environmental Specialist, has over 2 years of reclamation experience. Mr. Pendleton will help in the oversight of the stream and wetland mitigation and along with being involved in making repairs.

Robert Pendleton
Education and Training

- **B.A. in Business Administration - Finance, Transylvania University - Lexington, KY 2006**
- **B.S. in Wildlife Management, Eastern Kentucky University, Richmond, KY 2008**
- **Applied Fluvial Geomorphology (Level I), Wildland Hydrology, Inc. - Shephardstown, WV 2010**
- **Regional Supplement Seminar and Field Practicum, Wetland Training Institute, Inc.- Frankfort, KY 2010**

In addition, to the staff listed above, many other Peabody professionals in engineering and environmental are available, as needed. Several internal and contractor equipment operators have been trained in recent years in the needed techniques for constructing stream and wetland mitigation. These operators will continue to be utilized and build upon each year's experience.

Wetland Services, Inc. is utilized for stream, wetland and biological assessments, stream design and monitoring. Credentials follow:

Michael Sandefur
Education and Training

- **B.S. in Natural Resources/Environmental Protection, Ball State University – Muncie, IN 1991**
- **Wetland Delineation Certification Program, Wetland Training Institute – Frankfort, Ky. 2007**
- **N.C. State Stream Morphology Assessment, River Course 101 - Asheville, NC 2008**
- **N.C. State Natural Channel Design Principles, River Course 201 - Asheville, NC 2008**
- **Stream Morphology Engineering, Pilot View, Inc. –Asheville. NC 2008**
- **OSM, Mid Continent Region Technology Transfer, Acid Mine Drainage Workshop - Evansville, IN 2010**
- **Cypress Agricultural Services, LLC. Managing Partner, 2002 - present**
- **Indiana State Legislature, Environmental Service Council, Wetlands Committee - Indianapolis, IN 2002**
- **American Gas Association, Environmental Committee 2001**
- **Big Creek Wildlife Foundation, President, 1998-present**
- **Indiana Electric Association, Environmental Policy Group, Chairman, 1994 &1999**
- **ORSANCO Power Industry Advisory Committee 1994-1999**
- **Clean Cities - Evansville, IN 1995-1998**
- **Evansville Chamber Environmental Committee Co-Chairman,1995**
- **12-yrs professional experience**

Tim Sandefur
Education & Training

- **BS Wetland Ecology, University of Kentucky – Lexington, KY 2001**
- **Wetland Delineation Training, WTI - Jacksonville, FL 1997**
- **WRP Seminar, NRCS - Oakland City, IN 1998**

- **Regulatory Wetland Seminar, UKY - Lexington, KY 1999**
- **SWS Regional Conference – Little Rock, AR 2000**
- **Watershed Watch Training – Geneva, KY 2002**
- **National Wetlands Conference – Indianapolis, IN 2002**
- **Assn. of State Wetland Managers – Evansville, IN 2003**
- **Private Lands Management, KDFWR – Madisonville, KY 2004**
- **Mine Reclamation for Wildlife Summit – Louisville, KY 2005**
- **ACOE Stream Guidance – Newburgh, IN 2005**
- **Indiana Surface Mine Reclamation Technology Transfer Seminar – Jasper, IN 2006**
- **ACOE "Rapanos" Guidance – Newburgh, IN 2007**
- **N.C. State Stream Morphology Assessment, River Course 101 - Asheville, NC 2008**
- **N.C. State Natural Channel Design Principles, River Course 201 - Asheville, NC 2008**
- **Geomorphic Reclamation & Natural Stream Design on Coal Mines, Presenter – Bristol, VA 2009**
- **OSM, Mid Continent Region Technology Transfer, Acid Mine Drainage Workshop - Evansville, IN 2010**
- **Wetland Services President, Henderson, KY 1997-Present**
- **Pond Creek Watershed Conservancy District, Henderson, KY 2001-present**
- **Cypress Agricultural Services, LLC. Managing Partner, 2002 – present**
- **13-yrs professional experience**

Rick Liggett, DC
Education & Training

- **BS in Human Biology, Logan College - Chesterfield, MO 1999**
- **Doctorate of Human Biology, Logan College - Chesterfield, MO 2001**
- **N.C. State Stream Morphology Assessment, River Course 101 - Asheville, NC 2008**
- **N.C. State Natural Channel Design Principles, River Course 201 - Asheville, NC 2010**
- **Midwest Interim Regional Supplement for Wetland Delineation - Presented by the Illinois Soil Classifiers Association - Geneva, IL 2009**
- **OSM, Mid Continent Region Technology Transfer, Acid Mine Drainage Workshop - Evansville, IN 2010**
- **Indiana Society of Mining and Reclamation Annual Conference - Jasper, IN 2009**
- **3-yrs professional experience**

Stephen S. Jones
Education & Training

- **B.S. in Wildlife Management with emphasis in Freshwater Ecology, Eastern Kentucky University – Richmond, KY 2000.**
- **Three years conducting macroinvertebrate surveys, identification and technical reports 2008-2010.**
- **Two years training in fish surveys under Greg Bright of Commonwealth Bio-monitoring, 2009-2010.**
- **N.C. State Stream Morphology Assessment, River Course 101 - Asheville, NC 2008**
- **Bat Conservation & Management Workshop, Bat Conservation International – Barree, PA 2009.**
- **Indiana Society of Mining and Reclamation Annual Conference - Jasper, IN 2009.**
- **Myotis Sodalis Foraging Habits – Fort Knox, Shepherdsville, KY 2010.**
- **OSM, Mid Continent Region Technology Transfer, Acid Mine Drainage Workshop - Evansville, IN 2010**
- **Member of North American Benthological Society**
- **9-yrs professional experience**

Cody Thayer
Education & Training

- **B.S. in Biology, University of Southern Indiana - Evansville, IN 2007**
- **N.C. State Stream Morphology Assessment, River Course 101 - Asheville, NC 2008**
- **Indiana Society of Mining and Reclamation Annual Conference - Jasper, IN 2009.**
- **Regional Supplement Seminar and Field Practicum, Wetland Training Institute, Inc.- Frankfort, KY 2010**
- **3-yrs professional experience**

Kyle Bretl
Education & Training

- **B.S in General Resource Management, University of Wisconsin - Stevens Point 2009**
- **Minors include Soil Science, Wildlife Ecology, Natural Science**
- **Basic Wetland Delineation, UW-La Crosse Continuing Ed. & Ext. - Waupaca, WI 2008**
- **Adv. Wetland Delineation, UW-La Crosse Continuing Ed. & Ext. - La Crosse, WI 2009**
- **Basic Wetland Plants, UW-La Crosse Continuing Ed. & Ext. - La Crosse - WI 2009**
- **Regional Supplement Seminar and Field Practicum, Wetland Training Institute, Inc. - Frankfort, KY 2010**

- **Currently Working towards certification as a Wetland Professional in Training by Society of Wetland Scientists**
- **1-yr professional experience**

Other noted stream consultants from experienced consulting companies are utilized as needed to review and provide advice on construction and design techniques.

II. Assessment of Function/Value Replacement:

The mitigated wetlands will be enhanced over the existing wetlands by utilizing the ratios as found in Section 2 of this permit data. Enhancements over the existing conditions include consolidation of the small areas into a larger area, planting hard mast desirable species, and maintenance to ensure success and self-sustenance.

The mitigated streams are enhanced over the existing conditions and could contain enhanced features such as increasing sinuosity, decreasing entrenchment, establishing riparian buffers, installing riffle, run, and pool complexes, and adding a floodplain as the post-mining land uses will allow.

III. Release from Monitoring:

Monitoring will be completed for a period up to 10 years or upon success of the mitigation. Once mitigation is deemed successful, Peabody Midwest Mining, LLC will request release from further monitoring. The final report for the mitigated wetlands will include a final wetland delineation of the site to confirm not only that wetlands are present but also that the acreage requirements are present. The final report for the mitigated streams will include confirmation that the linear footage requirements are present and the riparian buffer widths area established.

Section 6: Contingency Plan

I. Reporting Protocol:

If the minimum success criteria are not met for all or part of the mitigation in any year, Peabody Midwest Mining, LLC will prepare an analysis listing the potential causes of failure and if determined necessary by the ACOE, propose remedial action for pre-approval.

II. Response to unsuccessful remediation:

Indicate course of action to be taken in the event that the Corps determines the compensatory mitigation cannot be successfully achieved at the intended site.

An adaptive management plan will be developed, if the mitigation fails to meet the environmental goals and objectives of the mitigation plan. If the stream mitigation and riparian buffers fail to achieve target success criteria in terms of channel stability, riparian buffer vegetation, or biological indicators, reasons for failure will be evaluated and adaptive management actions will be planned, approved, and implemented. Contingency measures may include modification of existing structures, addition of new structures, amending the substrate, supplementing tree plantings, and/or modifying post-reclamation contours. Similarly, if the wetland mitigation fails to meet the goals of hydrological regime or vegetative cover, remedial actions will be considered, such as planting alternative species of trees, introducing additional suitable wetland herbaceous plants, and/or modifying post-reclamation contours. Such measures will be addressed through discussions with the ACOE to provide aquatic functions comparable to those described in the mitigation plan objectives.

References

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Gregory Peck/DC/USEPA/US
11/22/2010 02:53 PM

To Matthew Klasen
cc
bcc
Subject Fw: Ken Ward: Seeking permit information

----- Forwarded by Gregory Peck/DC/USEPA/US on 11/22/2010 02:53 PM -----

From: Betsaida Alcantara/DC/USEPA/US
To: Gregory Peck/DC/USEPA/US@EPA
Date: 11/22/2010 02:40 PM
Subject: Ken Ward: Seeking permit information

See below. Not sure what he's asking for. Is this public info?
----- Forwarded by Betsaida Alcantara/DC/USEPA/US on 11/22/2010 02:40 PM -----

From: Brendan Gilfillan/DC/USEPA/US
To: "Betsaida Alcantara" <Alcantara.Betsaida@epamail.epa.gov>
Date: 11/22/2010 02:34 PM
Subject: Fw: Seeking permit information

----- Original Message -----
From: "Ken Ward Jr." [kward@wvgazette.com]
Sent: 11/22/2010 02:11 PM EST
To: Brendan Gilfillan
Subject: Seeking permit information

In following up on the recent GAO report on coal mining permits, I'm wondering if it's possible to get a copy of the list of the initial 48 permits EPA had identified with an indication of the status of each.

See page 2-3 of attached report.

Thanks.

Ken Ward Jr.
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Read my blog, Coal Tattoo at http://blogs.wvgazette.com/coaltattoo/ and follow me on Twitter, http://twitter.com/Kenwardjr
And check out Sustained Outrage, a Gazette watchdog journalism blog, http://blogs.wvgazette.com/watchdog/

d11101r.pdf

GAO
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United States Government Accountability Office
Washington, DC 20548

October 19, 2010

The Honorable Nick J. Rahall, II
Chairman
Committee on Natural Resources
House of Representatives

Subject: *Surface Coal Mining: Information on Clean Water Act Section 404 Permit Reviews under Enhanced Coordination Procedures in Appalachia, Focusing on West Virginia*

Dear Mr. Chairman:

In 2009, West Virginia accounted for about 43 percent of the surface coal mining production in Appalachia.[1] Surface coal mining in the mountainous areas of Appalachia—a process often referred to as mountaintop mining—has generated opposition in recent years because of its impact on landscapes, streams, ecosystems, and communities. In mountaintop mining, before the underlying coal can be extracted, the land is cleared of forest and other vegetation. Explosives or other techniques are then used to break up the overlying solid rock, creating dislodged earth, rock, and other materials known as "spoil." Some or most of the spoil is placed back on the mined-out area; however, spoil that cannot be safely placed back is often placed as "fill" in adjacent valleys or hollows. In some cases, this fill buries the headwaters of streams.[2]

Activities associated with surface coal mining are regulated under both the Surface Mining Control and Reclamation Act (SMCRA) and the Clean Water Act (CWA).[3] SMCRA requires mine operators to obtain a permit before they begin mining. In West Virginia, the West Virginia Department of Environmental

[1]Surface coal mining production in Appalachia also includes areas in Alabama, Kentucky, Maryland, Ohio, Pennsylvania, Tennessee, and Virginia.

[2]For additional information on surface coal mining in Appalachia, see GAO, *Surface Coal Mining: Characteristics of Mining in Mountainous Areas of Kentucky and West Virginia*, GAO-10-21 (Washington, D.C.: Dec. 9, 2009) and GAO, *Surface Coal Mining: Financial Assurances for, and Long-Term Oversight of, Mines with Valley Fills in Four Appalachian States*, GAO-10-206 (Washington, D.C.: Jan. 14, 2010).

[3]Surface Mining Control and Reclamation Act, 30 U.S.C. §§ 1201-1328 (2006); Clean Water Act, 33 U.S.C. §§ 1251-1387 (2006).

Protection (WVDEP) administers the SMCRA permit program, subject to the Department of the Interior's (Interior) Office of Surface Mining Reclamation and Enforcement's (OSM) finding that the state program is in accordance with federal law.[4] OSM annually evaluates how well the state program is administered. To obtain a permit, operators must submit detailed plans describing the extent of proposed mining operations and how they will reclaim the mine site. If the proposed mining operation discharges pollutants into the waters of the United States, the operator also must obtain a CWA section 402 permit. WVDEP administers the section 402 permit program, subject to the Environmental Protection Agency's (EPA) authorization of the state's program.[5] EPA may review proposed state-issued permits and object to the issuance of a section 402 permit. In addition, if the operation discharges dredged or fill material into the waters of the United States, the operator must obtain a CWA section 404 permit. In West Virginia, the U.S. Army Corps of Engineers (Corps) is responsible for making permit decisions and issuing the section 404 permits; EPA may prohibit, withdraw, deny, or restrict section 404 permits.[6] Furthermore, any discharges into the waters of the United States resulting from activities conducted under a federal permit, including a section 404 permit, require a state certification under CWA section 401 that the discharges will comply with water quality standards.[7] In West Virginia, WVDEP is responsible for issuing this certification.

At the beginning of 2009, many CWA section 404 surface coal mining permit applications for operations in Appalachian states, including West Virginia, had been pending for over a year because of litigation and other issues, creating a backlog. A case challenging the adequacy of the Corps' analysis of environmental impacts on several section 404 permits was decided in the Corps' favor in February 2009.[8] In March 2009, at EPA's request, the Corps identified 48 pending permit applications that it anticipated would reach permitting decisions within 60 days. EPA reviewed these 48 applications and identified 6 for which it had substantial environmental concerns. The Corps processed the other 42 in accordance with existing procedures. For the 6 permit applications of concern, as of August 11, 2010, the Corps had issued section 404 permits for 2, EPA and the Corps were still reviewing 3, and the applicant had withdrawn 1. For the other 42

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[4]OSM approved West Virginia's SMRCA State Program in 1981.

[5]EPA authorized West Virginia's section 402 permit program in 1982. In 2009, EPA was petitioned under the CWA by citizens in West Virginia to withdraw the state's section 402 program based on concerns regarding permitting of mining activities.

[6]33 U.S.C. § 1344(c) (2006). The Administrator is authorized to prohibit the specification (including the withdrawal of specification) of any defined area as a disposal site, and he is authorized to deny or restrict the use of any defined area for specification (including the withdrawal of specification) as a disposal site in certain circumstances.

[7]33 U.S.C. § 1341 (2006).

[8]Ohio Valley Envtl. Coalition v. Aracoma Coal Co., 556 F.3d 177 (4th Cir. 2009).

permit applications, the Corps issued permits for 28, 3 were withdrawn, 7 were withdrawn but later resubmitted, and 4 were pending, as of September 3, 2010.

After EPA completed its review of these 48 permit applications, it, along with the Corps, worked together to develop enhanced coordination procedures (ECP) to review the remaining backlog of pending section 404 permit applications for the Appalachian states. The ECP was included as an element of an interagency action plan announced on June 11, 2009, through a memorandum of understanding signed by EPA, the U.S. Army, and Interior.[9] As the ECP states, its purpose is to

- expedite review and final decisions regarding pending section 404 permit applications for surface coal mining in Appalachia for which the Corps had issued a public notice or coordinated with EPA as of March 31, 2009;
- provide the timely resolution of issues for those permit applications about which EPA has raised substantial environmental concerns;
- ensure effective coordination among the agencies and consistent compliance with applicable CWA provisions, regulations, and relevant policy; and
- provide additional transparency to the public during the period the ECP is in effect.

In order to facilitate timely resolution of permit applications subject to the ECP, Corps districts and EPA regions are to discuss applications identified as requiring additional review and coordination before the beginning of the formal 60-day review process to reduce the total time necessary to reach agreement on each permit. When the Corps believes it has received complete information from the applicant, it is to provide written notice to the relevant EPA region to begin the 60-day review process. Upon receipt of notification from the Corps, each district and region is to begin immediately to discuss permit applications EPA has identified as having remaining concerns in an effort to reach timely resolution. If more time is needed, EPA or the Corps may seek a 15-day extension to the 60-day review process. Should the Corps choose to issue a section 404 permit after the 60-day review period ends, even if issues remain unresolved with EPA, the Corps will provide EPA, within 10 days, a written notice explaining how the Corps is

[9]U.S. Department of the Army, U.S. Department of the Interior, and U.S. Environmental Protection Agency, *Memorandum of Understanding Among the U.S. Department of the Army, U.S. Department of the Interior, and U.S. Environmental Protection Agency Implementing the Interagency Action Plan on Appalachian Surface Coal Mining*, Jun. 11, 2009. Lawsuits have been filed by the National Mining Association and the state of West Virginia that, among other things, challenge the ECP and an EPA guidance document concerning the review of surface coal mining operations under the CWA and other standards. National Mining Association v. Lisa Jackson, No. 1:10-cv-01220 (D. D.C. filed July 20, 2010); Randy C. Huffman v. United States Environmental Protection Agency, No. 2:10-cv-01189 (N.D. W. Va. filed October 6, 2010). Pursuant to its long-standing policy of not addressing issues in ongoing litigation, GAO has not evaluated the parties' claims and has not come to any conclusions on any matters in dispute in the pending cases.

responding to EPA's concerns.[10] Within 10 days of receiving the Corps' written notice, EPA is to decide whether it intends to veto or restrict a permit under its CWA section 404(c) authority or to allow the Corps to proceed with its permit decision.[11]

In this context, you asked us to determine (1) the number of surface coal mining permit applications at each stage of the ECP review process, (2) the extent to which EPA Region 3 and the Corps' Huntington District are coordinating during the stages of the review process, (3) how EPA has communicated the requirements an applicant needs to meet to receive a CWA section 404 permit in West Virginia, and (4) what EPA and the Corps' plans are for processing new permit applications that were not among those listed as of June 11, 2009. Our review focused on the Corps' Huntington District and EPA Region 3 based on congressional interest.

On September 16, 2010, we briefed your staff on the preliminary results of our work. This letter summarizes the information presented in that briefing and officially transmits the final briefing slides. (See encl. I.) This letter also provides additional information that your staff requested during the briefing on the status of the 28 CWA section 404 permit applications at the Corps' Huntington District undergoing the ECP review. (See encl. II.)

Summary

As of August 11, 2010, for the 79 CWA section 404 permit applications on the final ECP list, the Corps had issued permits for 6 applications, 1 application was undergoing the 60-day ECP review process, 36 applications were awaiting the start of this process, and 36 applications had been withdrawn. Federal agencies took the following steps to develop the final ECP list that EPA published on September 30, 2009. First, at the request of EPA and other federal agencies, the Corps initially identified a list of 108 permit applications at various stages of review for which it had issued a public notice or coordinated with EPA, as of March 31, 2009, that needed additional evaluation. According to Corps officials, this list was developed quickly and contained 31 permit applications that the Corps and EPA subsequently decided should not be considered for the ECP. As a result, the two agencies removed the 31 applications and added 2, reducing the final ECP list to 79 applications. EPA worked to develop a consistent approach for reviewing these applications to determine if they should be subject to the ECP review process. To make this determination, EPA used its Multi-criteria Integrated Resource Assessment (MIRA) tool to assess the 79 applications against four general areas of concern, which it derived from regulations: (1) minimization and avoidance of impacts to aquatic resources, (2) water quality impacts, (3)

[10]According to Corps officials, responses may include revisions, special conditions, and mitigation requirements.

[11]EPA has not yet vetoed any permit subject to the ECP.

cumulative impacts, and (4) mitigation measures.[12, 13] EPA concluded that all 79 applications had at least one area of concern, and it therefore included all 79 in the final ECP list that it published on September 30, 2009.[14] Of these 79 applications, the Corps' Huntington District is responsible for reviewing 28. As of August 11, 2010, the Corps' Huntington District had issued permits for 5 applications, 15 applications were awaiting the start of the 60-day ECP review process, and 8 applications had been withdrawn. (See encl. II for more details on these 28 permits.) For one of the eight applications that had been withdrawn, the applicant redesigned the operation, reapplied, and received a section 404 permit outside of the ECP process, and an additional three are redesigning their applications and will be reapplying for a section 404 permit, according to the Corps' Huntington District.

We could not evaluate the extent to which EPA Region 3 and the Corps' Huntington District had coordinated throughout the ECP review process because documentation of coordination efforts is limited and varies. For example, EPA did not document the concerns it presented to the applicants during the initial ECP meetings. Therefore, we could not comprehensively assess the applicant-specific concerns and had to rely on the notes that Corps officials took during the meetings. In addition, EPA and Corps officials sometimes met separately with applicants, but we could not ascertain the extent to which the agencies shared the information discussed during the meetings. According to the ECP, coordination between EPA and the Corps is to occur prior to and during the 60-day review process. No time limit has been established for coordination that occurs prior to the start of the 60-day review process, but EPA and Corps officials indicated that the majority of the effort to resolve concerns about an application occurs at this time. To coordinate their reviews of permit applications, officials at EPA Region 3 and the Corps' Huntington District told us that they have been relying on the following mechanisms:

- **Initial ECP meetings.** EPA, the Corps, WVDEP, and other agencies met with each applicant in January and February 2010. EPA presented its concerns to the applicant and requested that the applicant provide additional information to address these concerns.

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[12]MIRA is a tool that EPA has developed to help decision makers make more informed environmental decisions that include stakeholder concerns. It helps decision makers organize and rank decision criteria or indicators, link data to a policy decision, determine the relative importance of decision criteria, and explore alternative decision options.

[13]These regulations, known as the 404(b)(1) guidelines, can be found at 40 C.F.R. Part 230.

[14]According to EPA officials, all applications on the ECP list have been pending since the previous administration ended in January 2009, and several have been pending since 2004.

- **Monthly meetings.** Two days at the beginning of each month have been reserved for applicants to meet with all relevant federal and state agencies and to present new information to address their concerns.

- **Intermittent coordination.** Formal coordination, such as the Corps' notice to EPA to start the 60-day review process and EPA's final letters to the Corps, as well as informal coordination, such as e-mails, phone calls, and other meetings, are also used, as needed, to address identified concerns.

While we were unable to evaluate the extent of the coordination occurring between EPA Region 3 and the Corps' Huntington District, federal, state, and industry stakeholders with whom we spoke raised a number of concerns about the effectiveness of this coordination. First, officials and stakeholders said that coordination is hindered because EPA does not send decision makers to monthly meetings. Officials from the Corps and WVDEP and representatives from the West Virginia coal industry expressed frustration over EPA's failure to send officials who are authorized to make decisions about proposals that applicants present at the monthly meetings to address EPA's concerns. Second, according to WVDEP and Corps officials and industry representatives, changes made in response to EPA's concerns on a section 404 permit application often require changes to operations already approved under CWA section 402 or SMCRA permits. This results in the need for additional coordination among EPA, the Corps, applicants, and WVDEP. This additional coordination can sometimes add to the time and cost of obtaining a section 404 permit. For example, officials and industry representatives expressed concern that EPA is seeking to influence how fills are constructed, which is regulated by WVDEP under SMCRA. EPA officials, however, told us that they believe that coordination under the ECP has been regular and effective and that the additional coordination has resulted in surface coal mining projects with reduced environmental, water quality, and human health effects consistent with the requirements of the CWA. EPA officials also stated that some project costs have been reduced as a result of this coordination.

According to EPA officials, the agency communicates the requirements of section 404 and its associated data and information needs to permit applicants in West Virginia through the agency's regulations and guidance, by publishing the results of scientific studies and programmatic reviews, by contacting the applicant directly, and by placing information on its Web site. Specifically, according to EPA officials, the 404(b)(1) Guidelines formed the basis of the four areas of concern that the agency used to assess the 79 permit applications. In addition, EPA's April 1, 2010, Guidance further clarifies EPA's roles and expectations in reviewing CWA section 404 and section 402 permit applications and reflects evolving science on conductivity and review of states'

water quality permit programs.[15,16] EPA also communicates its data and information needs by referencing the results of scientific studies, such as federal studies examining elevated conductivity and selenium levels downstream from the surface coal mining activities that identified levels at which aquatic life is impaired, and programmatic reviews, such as its 2010 review of states' water quality permit programs, which identified weaknesses in states' CWA section 402 programs.[17] Furthermore, EPA answers applicants' questions directly through letters, meetings, phone calls, and e-mails, and posts information on how to apply for a section 404 permit on its Web site. Despite EPA's efforts, representatives of WVDEP and mining companies in West Virginia stated that EPA does not clearly communicate all the information the agency needs to satisfy its concerns for a particular application. As a result, they are frustrated by EPA's repeated requests for additional information and the uncertainty about the actions needed to obtain a permit. WVDEP and industry representatives told us that the uncertainty over the application process is further exacerbated by EPA's assertion that lessons learned from applicants' experiences cannot be transferred to other applicants. In response to these statements, EPA officials told us that the section 404 permitting process and the 404(b)(1) Guidelines require a case-by-case, detailed look at each permit application to reduce environmental, water quality, and human health impacts. EPA officials also stated that while some applicants have resisted opportunities to coordinate with the agencies about reducing project impacts and complying with the law, other applicants have effectively collaborated with EPA and the Corps to achieve positive permit outcomes.

For new permit applications that were not among those listed for the ECP, as of June 11, 2009, the federal agencies are coordinating and reviewing permit applications in accordance with the standard procedures that were in effect prior to implementation of the ECP process. These procedures are described in 33 C.F.R. Part 325, which describes the Corps' permit application review process, and a memorandum of agreement between EPA and the Department of the Army, pursuant to CWA Section 404(q), which describes the procedures for EPA and the Corps to follow when coordinating their reviews of section 404 permit

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[15]U.S. Environmental Protection Agency, *Detailed Guidance: Improving EPA Review of Appalachian Surface Coal Mining Operations under the Clean Water Act, National Environmental Policy Act, and the Environmental Justice Executive Order* (Washington, D.C.: Apr. 1, 2010). According to EPA, this guidance was developed in response to requests from states, congressional representatives, and industry.

[16]Conductivity is a measure of the ability of water to pass an electrical current. Conductivity in water is affected by the presence of inorganic dissolved solids, such as aluminum, calcium, chloride, iron, magnesium, nitrate, phosphate, sodium, and sulfate. EPA's April 1, 2010, Guidance states that numerous studies have shown that high levels of conductivity are a cause of water quality impairments downstream from mine discharges.

[17]Selenium is a chemical element associated with mine run-off. EPA's April 1, 2010, Guidance states that studies have shown that ecological losses downstream of coal mining valley fills are associated with increased levels of selenium.

applications.[18] While the procedures have not changed, in the post-ECP environment, EPA officials told us, they will now be fully exercising the agency's review authority consistent with the law, which EPA had not done consistently prior to the ECP. Accordingly, EPA officials told us, their reviews will now increasingly focus on water quality, including the evolving science on conductivity and selenium; public health, including drinking water; reducing cumulative impacts; and minimizing and avoiding impacts. In West Virginia, to help facilitate coordination among stakeholders, the Corps and EPA hold monthly pre-application meetings that are attended by WVDEP personnel to allow applicants to discuss their permit applications with federal and state agencies to help expedite the review process.

Agency Comments

We provided a draft of the enclosed briefing slides to the Corps, EPA, and OSM, and provided relevant portions of the slides to WVDEP and the West Virginia Coal Association. We also provided a draft of the additional information you requested at our September 16, 2010, briefing to the Corps for its review and comment. (See encl. II.) OSM and the West Virginia Coal Association provided no comments. In oral comments, EPA officials stated that coordination under the ECP has been regular and effective, and that the additional coordination has resulted in surface coal mining projects with reduced environmental, water quality, and human health effects consistent with the requirements of the CWA. EPA officials also told us that the section 404 permitting process and the 404(b)(1) Guidelines require a case-by-case, detailed look at each permit application, but applicants vary in their efforts to effectively collaborate with agency officials. We incorporated EPA's oral comments into this letter and updated the slides. The Corps, EPA, and WVDEP also provided technical comments, which we incorporated as appropriate.

Scope and Methodology

To determine the permit requirements for surface coal mining operations in Appalachia and the ECP and post-ECP review processes, we reviewed legislation, regulations, guidance, and interagency agreements, and spoke with officials at the Corps, EPA, OSM, and WVDEP, as well as with industry representatives. To determine the number of surface coal mining permit applications at each stage of the ECP review process, we obtained a status update of the 79 CWA section 404 permit applications from Corps' headquarters officials. We also conducted a detailed review of the Corps' Huntington District and EPA Region 3's review of ECP applications and confirmed the status of the 28 applications in the Corps' Huntington District with district officials and officials from EPA Region 3. The Corps' Huntington District was responsible for reviewing 35 percent of permit applications on the ECP list. The information presented on the Huntington District is not generalizable to the entire population of ECP permit applications.

[18] 33 U.S.C. § 1344(q) (2006).

To determine the extent to which EPA Region 3 and the Corps' Huntington District are coordinating and how EPA is communicating the requirements an applicant needs to meet to receive a section 404 permit in West Virginia, we met with officials from the Corps' Huntington District, EPA Region 3, WVDEP, Interior's OSM in West Virginia, and West Virginia Coal Association. We reviewed examples of coordination and communication, including withdrawal letters, documentation of ECP meetings, e-mails and notes documenting additional discussions with applicants, and letters requesting information from applicants.

We conducted this performance audit from May through October 2010, in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

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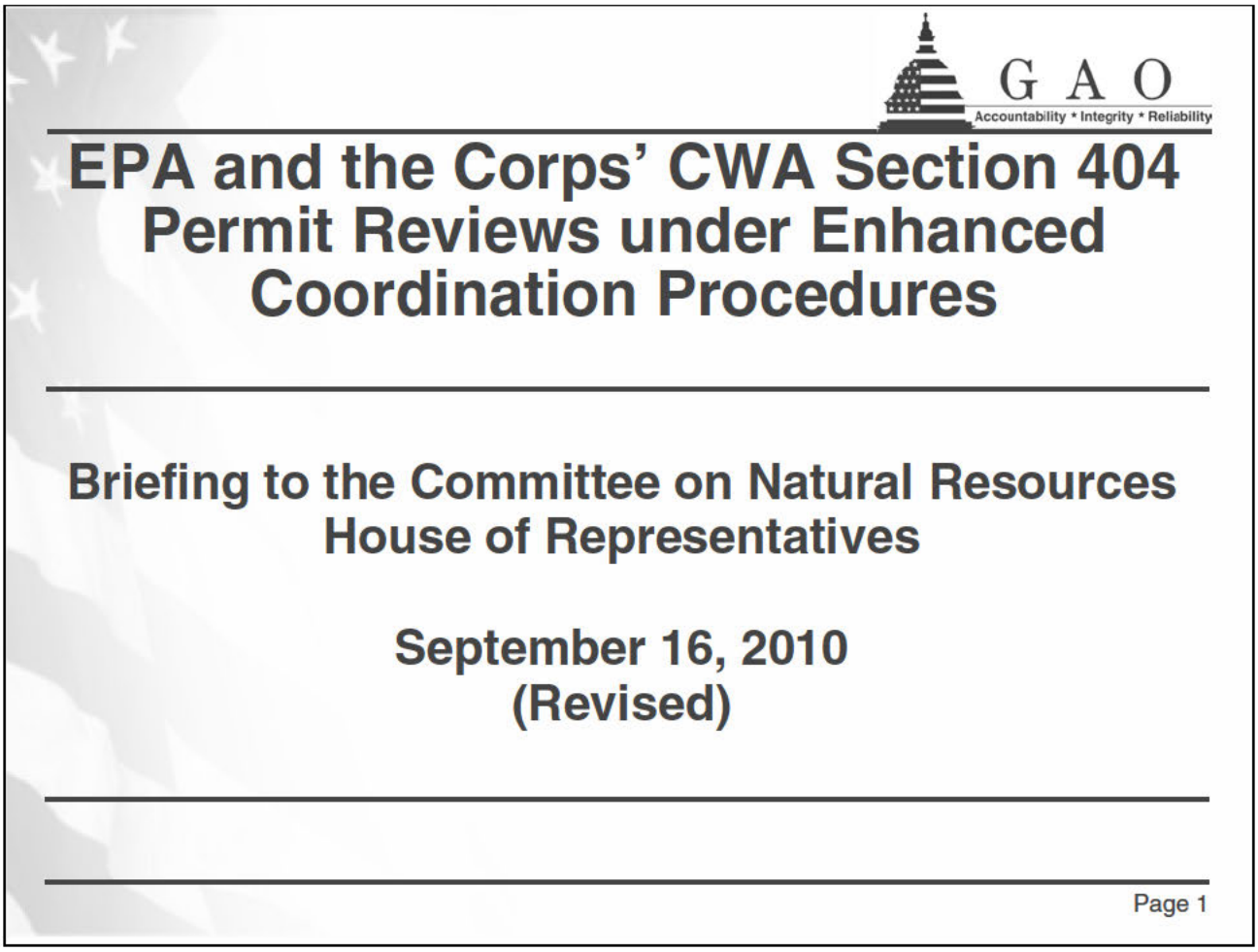
As agreed with your office, unless you publicly announce the contents of this report earlier, we plan no further distribution until 30 days from the report date. At that time, we will send copies of this report to the appropriate congressional committees, Secretaries of Defense and of the Interior, Administrator of the Environmental Protection Agency, Secretary for the West Virginia Department of Environmental Protection, and other interested parties. In addition, the report will be available at no charge on the GAO Web site at http://www.gao.gov.

If you or your staff have any questions about this report, please contact me at (202) 512-3841 or mittala@gao.gov. Contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page of this report. Major contributors to this report were Andrea Wamstad Brown (Assistant Director), Antoinette Capaccio, Stephen Cleary, Cheryl Harris, Richard Johnson, Rebecca Shea, and Carol Herrnstadt Shulman.

Sincerely yours,

Anu K. Mittal
Director, Natural Resources and Environment

Enclosures--2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EPA and the Corps' CWA Section 404 Permit Reviews under Enhanced Coordination Procedures
Briefing to the Committee on Natural Resources House of Representatives
September 16, 2010 (Revised)
Page 1

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Background – Permits and Certifications Required for Surface Coal Mining Operations in West Virginia

- **Surface Mining Control and Reclamation Act (SMCRA) permit.**
  - West Virginia Department of Environmental Protection (WVDEP) administers the permit program, subject to Interior's Office of Surface Mining Reclamation and Enforcement's (OSM) finding that the state program is in accordance with federal law.
  - OSM annually evaluates how well the state program is administered.
- **Clean Water Act (CWA) section 402 permit if the operation discharges pollutants into the waters of the United States.**
  - WVDEP administers the permit program, subject to EPA's authorization of the state's program.
  - EPA may review proposed state-issued permits and object to the issuance of a permit.
- **CWA section 404 permit if the operation discharges dredged or fill material into the waters of the United States.**
  - The Corps is responsible for making permit decisions and issuing permits.
  - EPA may prohibit, withdraw, deny or restrict permits.
- **State certification under CWA section 401 that any discharges into the waters of the United States resulting from activities conducted under a federal permit, including a section 404 permit, will comply with water quality standards.**
  - WVDEP issues the certification.

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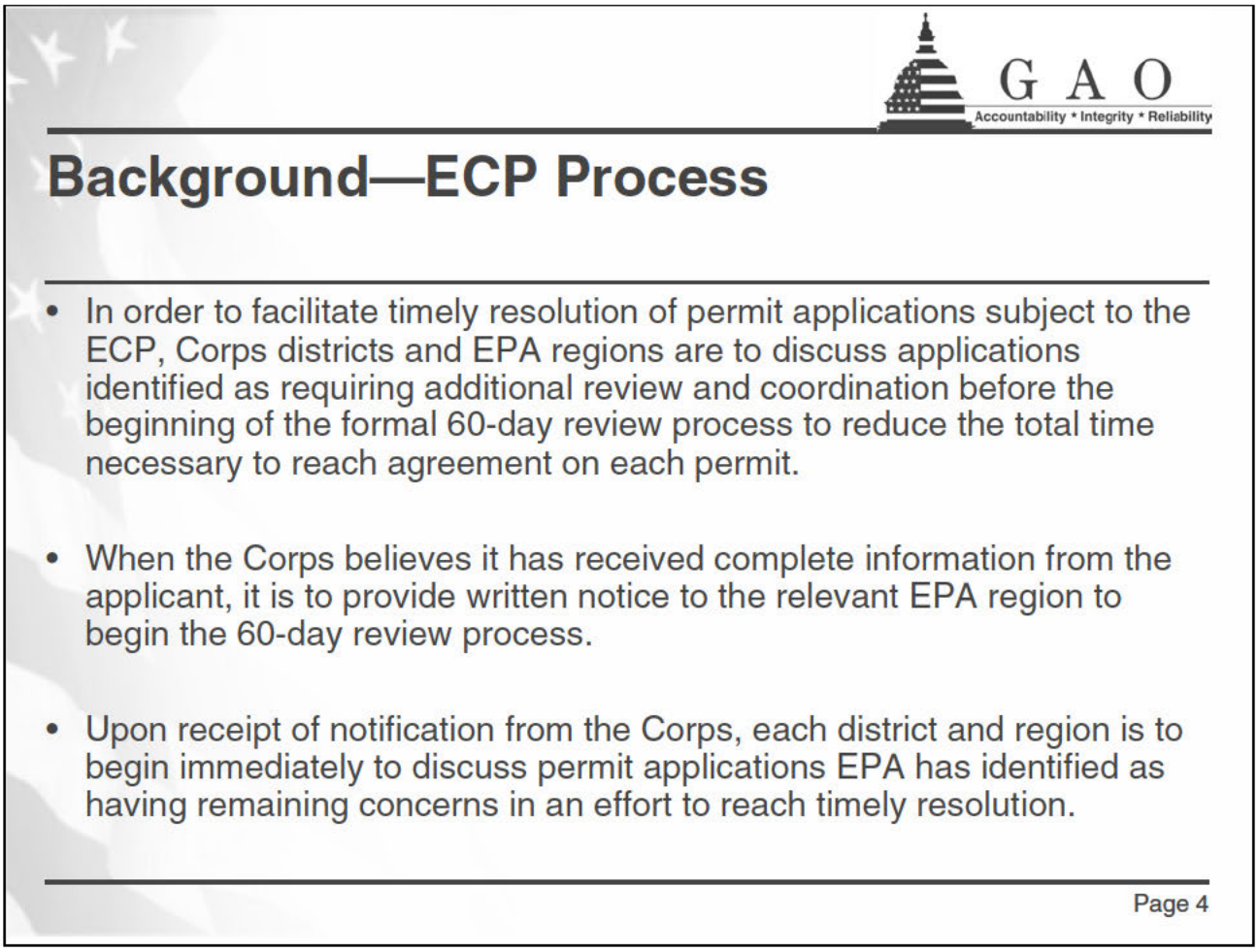
Background – Enhanced Coordination Procedures (ECP)

- ECP's stated purpose is to:
  - expedite review and final decisions regarding pending section 404 permit applications for surface coal mining in Appalachia for which the Corps had issued a public notice or coordinated with EPA as of March 31, 2009,
  - provide timely resolution of issues for those permit applications about which EPA has raised substantial environmental concerns,
  - ensure effective coordination among the agencies and consistent compliance with applicable CWA provisions, regulations, and relevant policy, and
  - provide additional transparency to the public during the period the ECP is in effect.
- ECP is an element of an interagency action plan announced on June 11, 2009, through a memorandum of understanding signed by EPA, the U.S. Army, and Interior.

Page 3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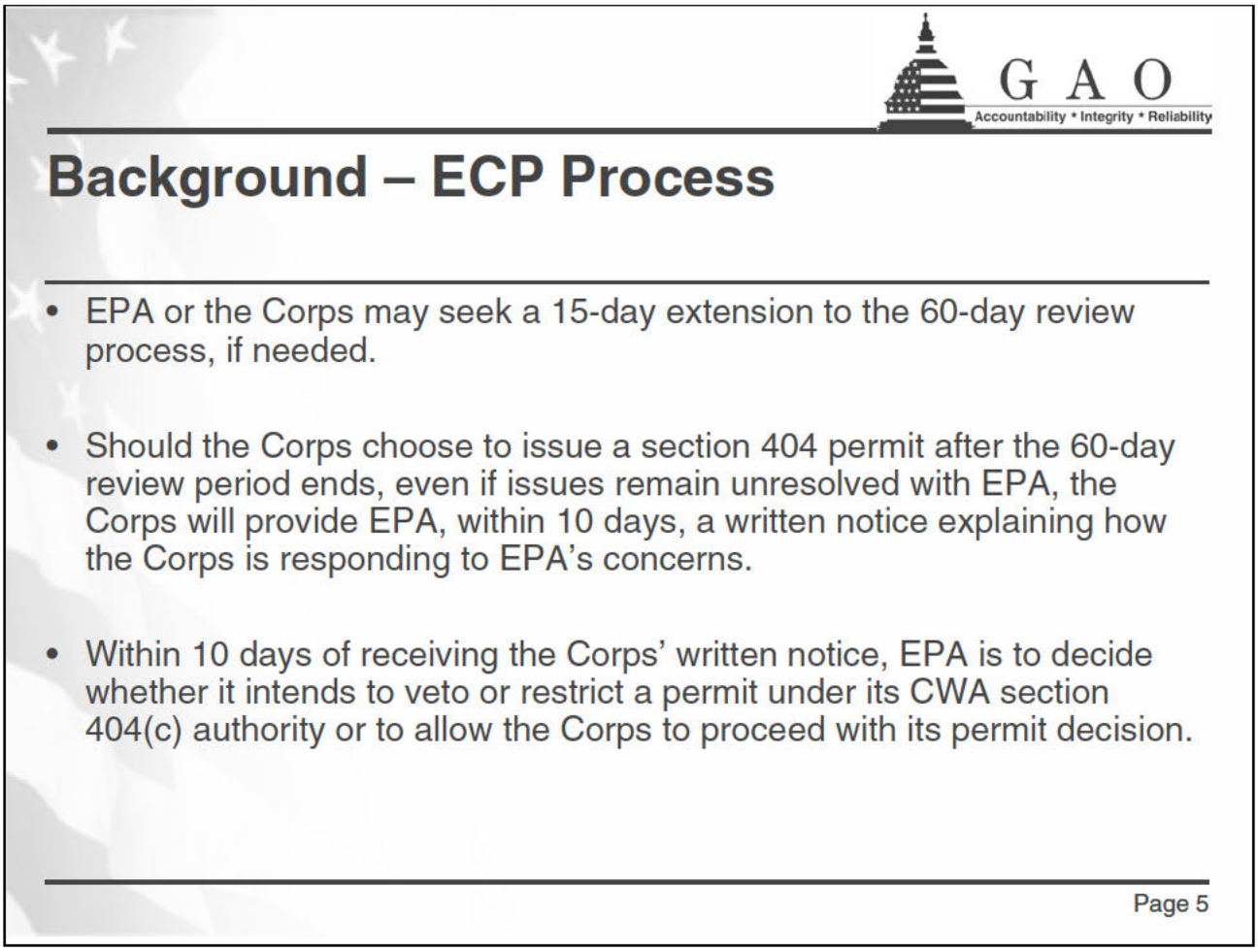
Background—ECP Process
• In order to facilitate timely resolution of permit applications subject to the ECP, Corps districts and EPA regions are to discuss applications identified as requiring additional review and coordination before the beginning of the formal 60-day review process to reduce the total time necessary to reach agreement on each permit.
• When the Corps believes it has received complete information from the applicant, it is to provide written notice to the relevant EPA region to begin the 60-day review process.
• Upon receipt of notification from the Corps, each district and region is to begin immediately to discuss permit applications EPA has identified as having remaining concerns in an effort to reach timely resolution.
Page 4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Background – ECP Process
• EPA or the Corps may seek a 15-day extension to the 60-day review process, if needed.
• Should the Corps choose to issue a section 404 permit after the 60-day review period ends, even if issues remain unresolved with EPA, the Corps will provide EPA, within 10 days, a written notice explaining how the Corps is responding to EPA's concerns.
• Within 10 days of receiving the Corps' written notice, EPA is to decide whether it intends to veto or restrict a permit under its CWA section 404(c) authority or to allow the Corps to proceed with its permit decision.
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Background – Events Leading Up to ECP

- At the beginning of 2009, many CWA section 404 surface coal mining permit applications for operations in Appalachian states, including West Virginia, had been pending for over a year as a result of litigation and other issues, creating a backlog.
- A case challenging the adequacy of the Corps' analysis of environmental impacts on several section 404 permits was decided in the Corps' favor in February 2009. In March 2009, at EPA's request, the Corps identified 48 pending permit applications that it anticipated would reach permitting decisions within 60 days.
- EPA reviewed these 48 applications and identified 6 for which it had substantial environmental concerns. The Corps processed the other 42 in accordance with existing procedures.

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Background – Events Leading Up to ECP

- Status of the 6 permit applications of concern, as of August 11, 2010:
  - **2 applications:** The Corps had issued section 404 permits.
  - **3 applications:** EPA and the Corps continue to review.
  - **1 application:** Withdrawn by the applicant.
- For the other 42 permit applications: The Corps issued permits for 28, 3 were withdrawn, 7 were withdrawn and resubmitted, and 4 were pending, as of September 3, 2010.

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Objectives

1. How many surface coal mining permit applications are at each stage of the ECP review process?
2. To what extent are EPA Region 3 and the Corps' Huntington District coordinating during the stages of the review process?
3. How has EPA communicated the requirements an applicant needs to meet to receive a CWA section 404 permit in West Virginia?
4. What are EPA and the Corps' plans for processing new permit applications that were not among those listed as of June 11, 2009?

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Scope and Methodology

- Reviewed legislation, regulations, guidance, and interagency agreements.
- Focused on the Corps' Huntington District and EPA Region 3 based on congressional interest—35% of permit applications on the ECP list; information not generalizable to all ECP permit applications:
  - Obtained status update of CWA section 404 permit applications from the Corps. Confirmed status information with officials from the Corps' Huntington District and EPA Region 3.
  - Met with officials from the Corps' Huntington District, EPA Region 3, WVDEP, Interior's OSM in West Virginia, and West Virginia Coal Association.
  - Reviewed examples of coordination and communication, including withdrawal letters, documentation of ECP meetings, e-mails and notes documenting additional discussions with applicants, and letters requesting information from applicants.

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Objective 1: Applications at Each Stage of ECP Review Process

- At the request of EPA and other federal agencies, the Corps initially identified a list of 108 permit applications at various stages of review for which it had issued a public notice or coordinated with EPA, as of March 31, 2009, that needed additional evaluation.
- According to Corps officials, the initial list of 108 permit applications was developed quickly and contained several permit applications that should not have been considered for review under the ECP process.
- As a result, the Corps and EPA removed 31 applications and added 2 applications, reducing the ECP list to 79 applications.

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Objective 1: Applications at Each Stage of ECP Review Process

How the Corps and EPA Reduced the List of 108 CWA Section 404 Permit Applications to 79 Applications

Initial total	**108**
Permit application was subsequently withdrawn by the mining company	-14
Permit issuance was imminent and occurred prior to, or concurrent with, the publication of the list	-8
An ongoing enforcement action precluded a permit decision	-3
Permit application was not complete	-1
Underground mining operations EPA determined were inappropriate for ECP	-5
Additional applications added to the original list	+2
Final total number of applications to be considered for ECP	**79**

Source: GAO analysis of Corps' data.

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Objective 1: Applications at Each Stage of ECP Review Process

- EPA regions 3, 4, and 5 worked to develop a consistent approach for reviewing the 79 applications to determine if they should be subject to the ECP review process.
- EPA used its Multi-criteria Integrated Resource Assessment (MIRA) tool to assess the 79 applications against four general areas of concern which it derived from regulations:
    - Minimization and avoidance of impacts to aquatic resources
    - Water quality impacts
    - Cumulative impacts
    - Mitigation measures
- All 79 applications had at least 1 area of concern and were therefore included in the final ECP list that EPA published on September 30, 2009.

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Objective 1: Applications at Each Stage of ECP Review Process

Number of CWA Section 404 Permit Applications at Each Stage of ECP, by Corps District, as of August 11, 2010

	Status				
Corps district	Application withdrawn	Application awaiting start of 60-day review process	Application undergoing 60-day review process	Permit issued for application	Total
Huntington[a]	8	15	0	5	28
Louisville[a]	24	21	1	0	46
Nashville	2	0	0	1	3
Pittsburgh	2	0	0	0	2
Total	**36**	**36**	**1**	**6**	**79**

Source: GAO analysis of Corps' data.

[a]Three permit applications for operations located in Kentucky that were originally filed in the Corps' Huntington District were transferred to its Louisville District. One of these permit applications has been withdrawn and two are awaiting the start of the 60-day review process.

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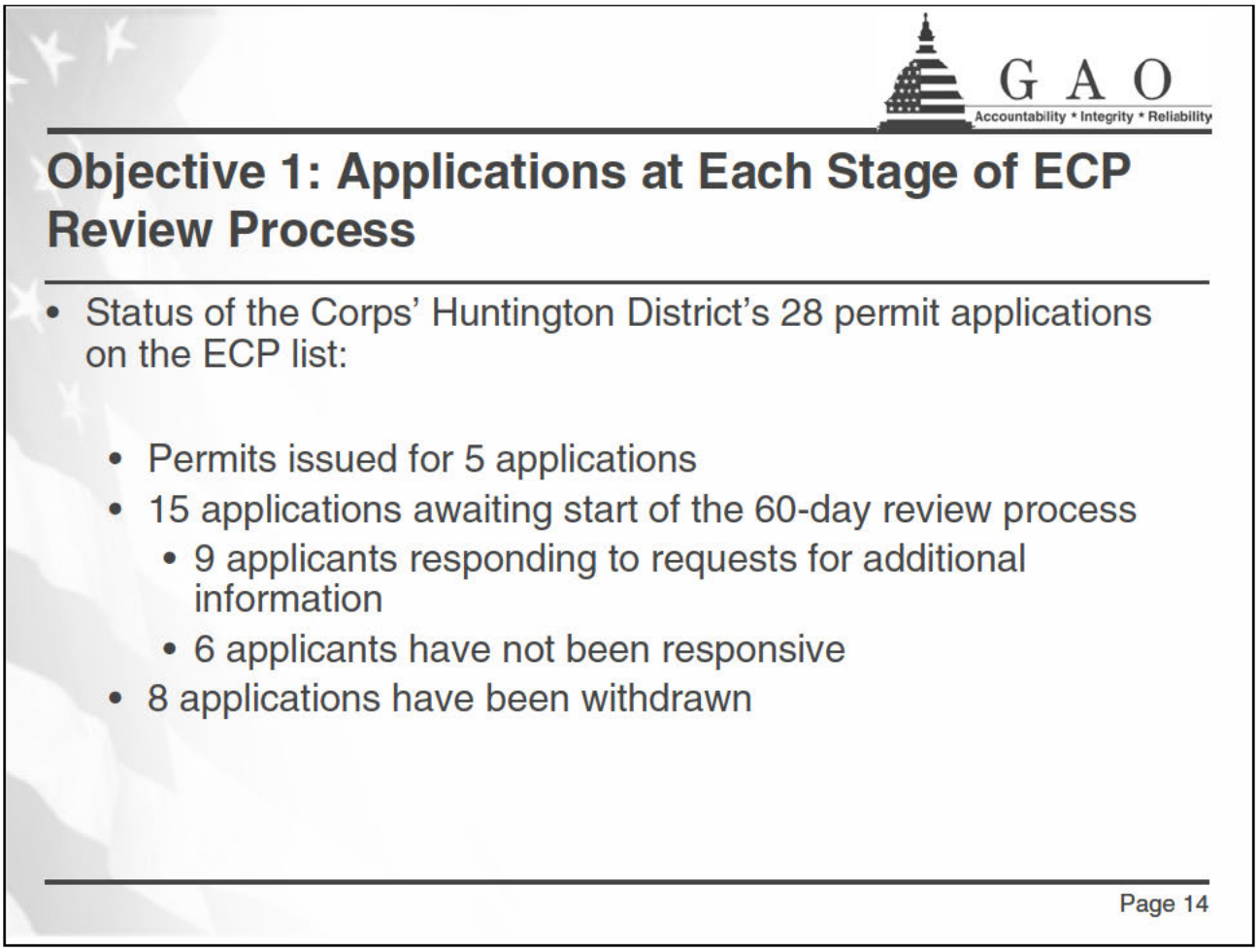
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Objective 1: Applications at Each Stage of ECP Review Process
• Status of the Corps' Huntington District's 28 permit applications on the ECP list:
• Permits issued for 5 applications
• 15 applications awaiting start of the 60-day review process
• 9 applicants responding to requests for additional information
• 6 applicants have not been responsive
• 8 applications have been withdrawn
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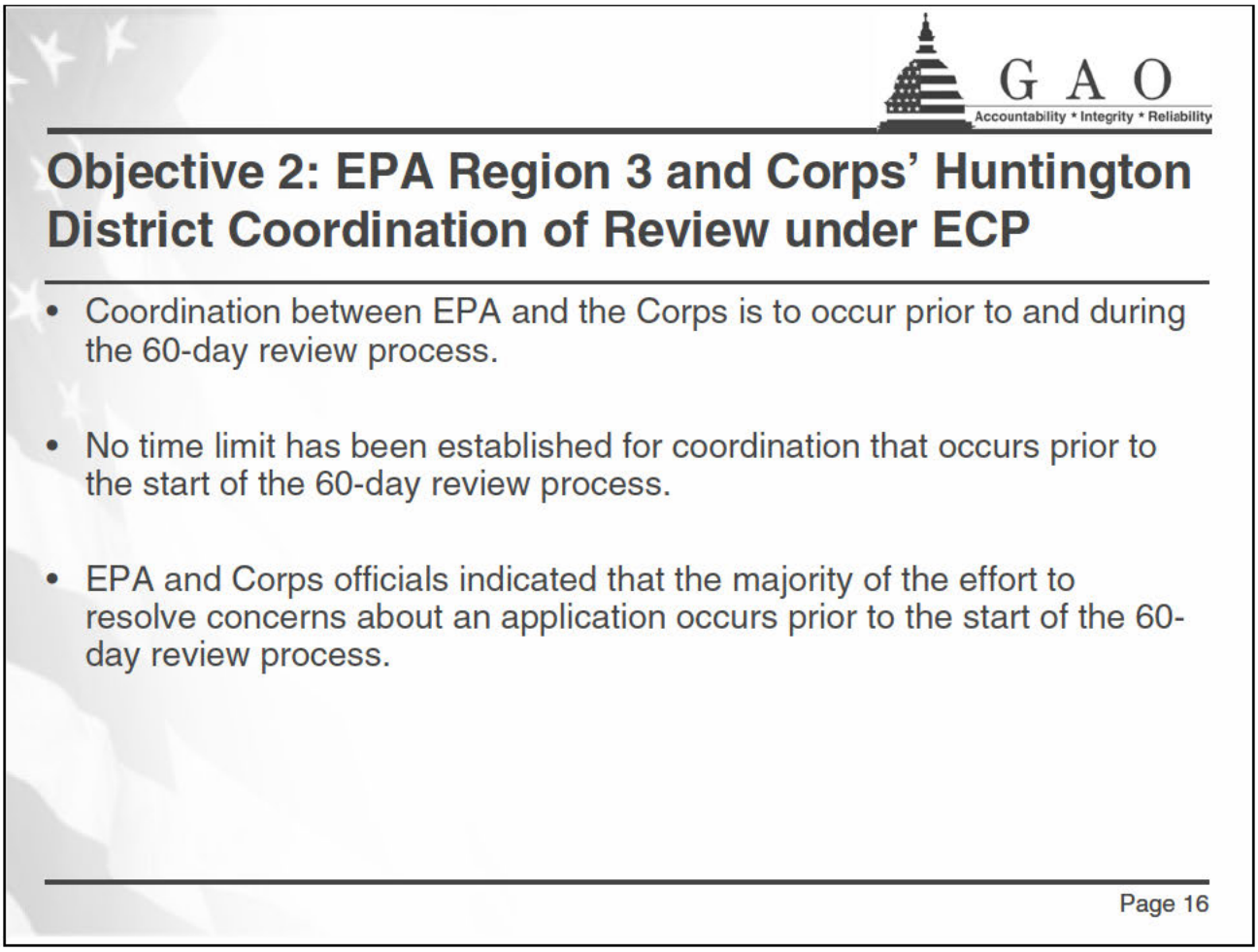
Objective 1: Applications at Each Stage of ECP Review Process

- Applicants decided to redesign and resubmit 4 of the 8 withdrawn applications at the Huntington District:
  - 1 applicant was issued a section 404 permit outside of the ECP process
  - 3 applicants are still in process of resubmitting applications for review
- 2 of the 8 withdrawn applications were administratively withdrawn by the Corps because requested information had not been received
- 2 others were withdrawn by the Corps at the request of the applicant

Page 15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Objective 2: EPA Region 3 and Corps' Huntington District Coordination of Review under ECP
• Coordination between EPA and the Corps is to occur prior to and during the 60-day review process.
• No time limit has been established for coordination that occurs prior to the start of the 60-day review process.
• EPA and Corps officials indicated that the majority of the effort to resolve concerns about an application occurs prior to the start of the 60-day review process.
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Objective 2: EPA Region 3 and Corps' Huntington District Coordination of Review under ECP

- EPA Region 3 and Corps' Huntington District officials told us that they have been relying on a variety of coordination mechanisms:
  - **Initial ECP meetings**—EPA, the Corps, WVDEP, and other agencies met with each applicant in January and February 2010. EPA presented its concerns to the applicant and requested the applicant provide additional information to address these concerns.
  - **Monthly meetings**—Two days at the beginning of each month have been reserved for applicants to meet with all relevant federal and state agencies and to present new information to address their concerns.
  - **Intermittent coordination**—Formal coordination, such as the Corps' notice to EPA to start the 60-day review process and EPA's final letters to the Corps, as well as informal coordination, such as e-mails, phone calls, and other meetings, as needed to address identified concerns.

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Objective 2: EPA Region 3 and Corps' Huntington District Coordination of Review under ECP

- We could not evaluate the extent to which EPA Region 3 and the Corps' Huntington District had coordinated throughout the process because documentation of coordination efforts is limited and varies.
  - EPA did not document the concerns it presented to the applicants during the initial ECP meetings. Therefore, we could not comprehensively assess the applicant-specific concerns and had to rely on the notes that Corps officials took during the meetings.
  - EPA and Corps officials sometimes meet separately with applicants, but we could not ascertain the extent to which the agencies shared the information discussed during the meetings.

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Objective 2: EPA Region 3 and Corps' Huntington District Coordination of Review under ECP

- Officials and stakeholders said that coordination is hindered because EPA does not send decision makers to monthly meetings. Officials from the Corps and WVDEP and representatives from the West Virginia coal industry expressed frustration over EPA's failure to send officials who are authorized to make decisions about proposals that applicants present at monthly meetings to address EPA's concerns.
- According to WVDEP and Corps officials and industry representatives, changes made in response to EPA's concerns on a section 404 permit application often require changes to operations already approved under CWA section 402 or SMCRA permits. This results in the need for additional coordination among EPA, the Corps, applicants, and WVDEP. This additional coordination can sometimes add to the time and cost of obtaining a section 404 permit. For example, officials and industry representatives expressed concern that EPA is seeking to influence how fills are constructed, which is regulated by WVDEP under SMCRA.
- EPA officials, however, told us they believe that coordination under the ECP has been regular and effective and that the additional coordination has resulted in surface coal mining projects with reduced environmental, water quality, and human health effects consistent with the requirements of the CWA. EPA officials also stated that some project costs have been reduced as a result of this coordination.

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Objective 3: EPA's Communication of Section 404 Requirements to Applicants in West Virginia

- According to EPA, it communicates the requirements of section 404 and its associated data and information needs to permit applicants in 3 ways:

  1. Regulations and agency guidance, such as:

     - 404(b)(1) Guidelines—these regulations form the basis of EPA's four areas of concern

     - April 1, 2010, Guidance—further clarifies EPA's roles and expectations in reviewing CWA section 404 and section 402 permit applications and reflects evolving science on conductivity and review of states' water quality permit programs

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Objective 3: EPA's Communication of Section 404 Requirements to Applicants in West Virginia

2. Results of studies, such as:
   - Federal studies examining elevated conductivity and selenium levels downstream from the surface coal mining activities—identified levels at which aquatic life is impaired
   - 2010 EPA review of states' water quality permit programs—identified weaknesses in states' programs under CWA section 402
3. Letters, meetings, phone calls, e-mails, and the agency's Web site

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Objective 3: EPA's Communication of Section 404 Requirements to Applicants in West Virginia

- However, representatives of WVDEP and mining companies in West Virginia stated that EPA does not clearly communicate all the information it needs to satisfy its concerns for a particular application. As a result, they are frustrated by EPA's repeated requests for additional information and the uncertainty about the actions needed to obtain a permit.
- WVDEP and industry representatives told us that the uncertainty over the application process is further exacerbated by EPA's assertion that lessons learned from applicants' experiences cannot be transferred to other applicants.
- In response to these statements, EPA officials told us that the section 404 permitting process and the 404(b)(1) Guidelines require a case-by-case, detailed look at each permit application to reduce environmental, water quality, and human health impacts. While some applicants have resisted opportunities to coordinate with the agencies about reducing project impacts and complying with the law, other applicants have effectively collaborated with EPA and the Corps to achieve positive permit outcomes.

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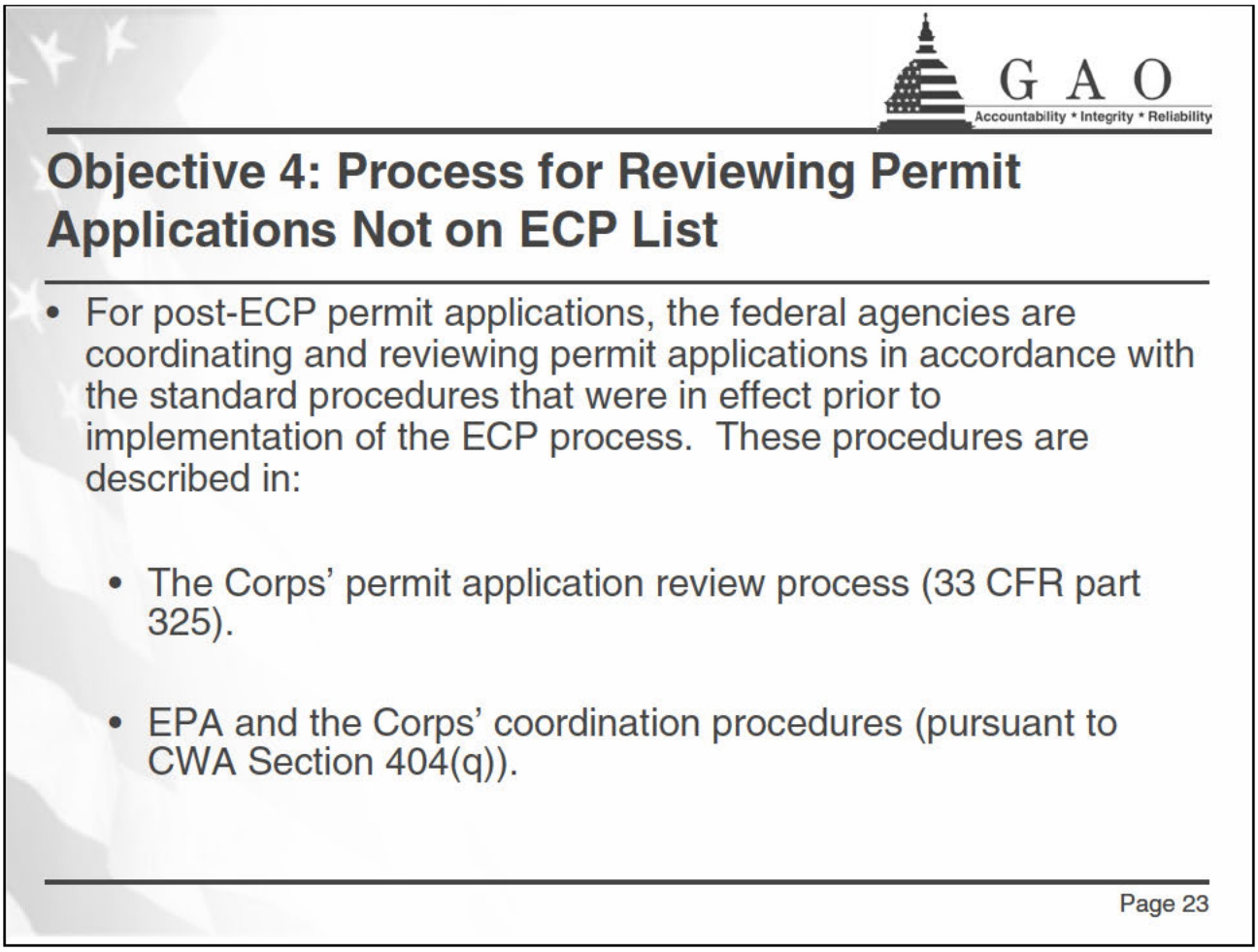
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Objective 4: Process for Reviewing Permit Applications Not on ECP List
• For post-ECP permit applications, the federal agencies are coordinating and reviewing permit applications in accordance with the standard procedures that were in effect prior to implementation of the ECP process. These procedures are described in:
• The Corps' permit application review process (33 CFR part 325).
• EPA and the Corps' coordination procedures (pursuant to CWA Section 404(q)).
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Objective 4: Process for Reviewing Permit Applications Not on the ECP List

- However, in the post-ECP environment, EPA officials told us, they will now be fully exercising the agency's review authority consistent with the law, which EPA had not done consistently prior to the ECP.
- Accordingly, EPA officials told us, their reviews will now increasingly focus on:
  - water quality, including evolving science on conductivity and selenium;
  - public health, including drinking water;
  - reducing cumulative impacts; and
  - minimizing and avoiding impacts.
- In West Virginia, the Corps and EPA hold monthly pre-application meetings that are attended by WVDEP personnel to allow applicants to discuss their permit applications with federal and state agencies to help expedite the review process.

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Status of the 28 Clean Water Act Section 404 Permit Applications at the Corps' Huntington District, as of August 11, 2010

Application number	Applicant	Project name	County	State	Status
Permits issued for application (5)					
LRH-2004-01152	Buckingham Coal	Buckingham Wash Plant	Perry	OH	Permit issued on 10/26/2009.
LRH-2005-01385	Oxford Mining Company, LLC	Halls Knob	Guernsey	OH	Permit issued on 7/12/2010.
LRH-2007-01021	Oxford Mining Company, LLC	Kaiser Mathias	Tuscarawas	OH	Permit issued on 3/8/2010.
LRH-2008-00791	Hobet Mining	Surface Mine No. 45	Lincoln	WV	Permit issued on 1/6/2010.
LRH-2008-00830	CoalMac, Inc.	Pine Creek Surface Mine	Logan	WV	Permit issued on 7/27/2010.
Applications awaiting start of 60-day ECP review process (15)					
LRH-2005-00217	Bluestone	Contour Auger 1	Wyoming	WV	Application awaiting start of 60-day review process, but applicant has not responded to requests for additional information.
LRH-2005-01115	Green Valley Coal Company	Blue Branch Refuse	Nicholas	WV	Application awaiting start of 60-day review process, and applicant responding to requests for additional information.
LRH-2005-01198	Consol	Taywood West & Marrowbone	Mingo	WV	Application awaiting start of 60-day review process, and applicant responding to requests for additional information.
LRH-2006-00100	ICG Eastern, LLC	Jenny Creek Surface Mine	Mingo	WV	Application awaiting start of 60-day review process, but applicant has not responded to requests for additional information.
LRH-2006-00760	Paynter Branch Mining	Paynter Branch South Surface Mine	Wyoming	WV	Application awaiting start of 60-day review process, but applicant has not responded to requests for additional information.
LRH-2006-02033	Wildcat	#2 Surface	Kanawha	WV	Application awaiting start of 60-day review process, but applicant has not responded to requests for additional information.

Application number	Applicant	Project name	County	State	Status
LRH-2007-00134	Atlantic Leasco	Muddlety Surface Mine No. 1	Nicholas	WV	Application awaiting start of 60-day review process, and applicant responding to requests for additional information.
LRH-2007-00182	Alex Energy, Inc.	Federal Surface Mine	Nicholas	WV	Application awaiting start of 60-day review process, but applicant has not responded to requests for additional information.
LRH-2007-00285	Alex Energy, Inc.	Lonestar Surface Mine	Nicholas	WV	Application awaiting start of 60-day review process, and applicant responding to requests for additional information.
LRH-2007-00286	Pioneer Fuel	MT5B	Raleigh	WV	Application awaiting start of 60-day review process, and applicant responding to requests for additional information.
LRH-2008-00491	CONSOL of Energy	Buffalo Mt. Surface Mine	Mingo	WV	Application awaiting start of 60-day review process, and applicant responding to requests for additional information.
LRH-2008-00562	Eastern Associated Coals	Huff Creek Surface Mine	Wyoming/ Logan	WV	Application awaiting start of 60-day review process, and applicant responding to requests for additional information.
LRH-2008-00805	Coyote Coal Company	Joes Creek Surface Mine	Boone/ Kanawha	WV	Application awaiting start of 60-day review process, but applicant has not responded to requests for additional information.
LRH-2008-01098	Frasure Creek Mining	Spring Fork Surface Mine No. 2	Mingo	WV	Application awaiting start of 60-day review process, and applicant responding to requests for additional information.
LRH-2009-00428	Consol of Kentucky	Spring Branch No. 3 Deep Mine	Mingo	WV	Application awaiting start of 60-day review process, and applicant responding to requests for additional information.
Applications withdrawn from ECP (8)					
LRH-2003-00065	Hobet Mining	Hewett	Boone	WV	Application withdrawn, but applicant is in the process of redesigning and resubmitting application for review.
LRH-2004-00624	Independence Coal Company	Constitution Surface Mine	Boone	WV	Application administratively withdrawn by the Corps.
LRH-2004-01155	Brooks Run Mining	Brandy St. & Cove Mtn.	Webster	WV	Application withdrawn by the applicant.
LRH-2004-01451	Independence Coal Company	Glory Surface Mine	Boone	WV	Application administratively withdrawn by the Corps.

Application number	Applicant	Project name	County	State	Status
LRH-2005-00421	Oxford Mining Company, LLC	Peabody 3	Coshocton/ Muskingum/ Guernsey	OH	Application withdrawn, but applicant redesigned and resubmitted application and was issued a permit.
LRH-2005-01211	Premium Energy, Inc.	Premium Mills Surface Mine	McDowell	WV	Application withdrawn, but applicant is in the process of redesigning and resubmitting application for review.
LRH-2006-00127	Consol of Kentucky	Slone Branch Mine	Knott	KY	Application withdrawn by the applicant.
LRH-2006-02290	Colony Bay Coal Co.	Colony Bay Surface Mine	Boone	WV	Application withdrawn, but applicant is in the process of redesigning and resubmitting application for review.

Source: GAO analysis of Corps' data.

Note: Three permit applications for operations located in Kentucky that were originally filed in the Corps' Huntington District were transferred to its Louisville District. One of these permit applications has been withdrawn and two are awaiting the start of the 60-day review process.

(361195)

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Matthew Klasen/DC/USEPA/US
11/22/2010 03:40 PM

To: Susan Cormier

cc: CynthiaN Johnson, David Pfeifer, Dean Maraldo, Glenn Suter, Jeff Frithsen, Kerryann Weaver, Linda Holst, Michael Griffith, Michael Slimak, Michael Troyer, Peter Jackson, Peter Swenson, pierard.kevin, Robert Pepin, Stephen Jann, Susan Cormier, Wendy Melgin

bcc:

Subject: Re: Revised Draft Internal EPA Deliberative Material for (b) (5) [redacted] proposed topic for tuesday mining call

Thanks Susan.

Unless there are any objections, let's plan to send around to the MTM agenda list later this afternoon so everyone can review and digest before tomorrow morning. Sending tomorrow AM probably wouldn't give people enough time.

Cynthia: Feel free to send around yourself, or I can do it if you'd like.

Thanks,
Matt

Matt Klasen
U.S. Environmental Protection Agency
Office of Water (IO)
202-566-0780
cell (202) 380-7229

Susan Cormier | Dear Linda and Kevin, Here is the slightly revise... | 11/22/2010 03:37:10 PM

From: Susan Cormier/CI/USEPA/US
To: Linda Holst/R5/USEPA/US@EPA, pierard.kevin@epa.gov, Matthew Klasen/DC/USEPA/US@EPA, CynthiaN Johnson/DC/USEPA/US@EPA
Cc: David Pfeifer/R5/USEPA/US@EPA, Dean Maraldo/R5/USEPA/US@EPA, Glenn Suter/CI/USEPA/US@EPA, Jeff Frithsen/DC/USEPA/US@EPA, Kerryann Weaver/R5/USEPA/US@EPA, Michael Slimak/DC/USEPA/US@EPA, Michael Troyer/CI/USEPA/US@EPA, Peter Jackson/R5/USEPA/US@EPA, Peter Swenson/R5/USEPA/US@EPA, Robert Pepin/R5/USEPA/US@EPA, Stephen Jann/R5/USEPA/US@EPA, Susan Cormier/CI/USEPA/US@EPA, Wendy Melgin/R5/USEPA/US@EPA, Glenn Suter/CI/USEPA/US@EPA, Michael Griffith/CI/USEPA/US@EPA
Date: 11/22/2010 03:37 PM
Subject: Revised Draft Internal EPA Deliberative Material for (b) (5) [redacted] - proposed topic for tuesday mining call

---

Dear Linda and Kevin,

Here is the slightly revised report.

Dear Matt or Cynthia,

I believe that Region 5 would like to discuss these deliberative materials on tomorrows call. Perhaps they could be sent to the usual participants.

Regards, Susan

[attachment "Discussion Ohio 20101118-reg5.docx" deleted by Matthew Klasen/DC/USEPA/US]

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Fax: 513-569-2540

Marcus Zobrist/DC/USEPA/US
11/22/2010 04:49 PM

To Christopher Hunter
cc Chris Thomas
bcc
Subject Fw: Docket ID No. EPA-HQ-OW-2010-0315

Chris,

Below are comments from enviros on the April 1 guidance forwarded on by R4. I assume these made it to the Docket, but just in case they have not, do you know whom should I forward to for inclusion in the docket?

Marcus Zobrist, Chief
Industrial Branch
Water Permits Division
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----- Forwarded by Marcus Zobrist/DC/USEPA/US on 11/22/2010 04:45 PM -----

From: Chris Thomas/R4/USEPA/US
To: Marcus Zobrist/DC/USEPA/US@EPA
Date: 11/22/2010 10:44 AM
Subject: Fw: Docket ID No. EPA-HQ-OW-2010-0315

Marcus

I'm assuming these comments have found their way to the appropriate place in DC, but just in case, please forward on to whoever needs to receive them. Thanks!

Chris Thomas, Chief
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From: Stan Meiburg/R4/USEPA/US
To: Jim Giattina/R4/USEPA/US@EPA, Tom Welborn, Chris Thomas/R4/USEPA/US@EPA
Date: 11/22/2010 07:42 AM
Subject: Fw: Docket ID No. EPA-HQ-OW-2010-0315

FYI

Stan

_____

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----- Forwarded by Stan Meiburg/R4/USEPA/US on 11/22/2010 07:42 AM -----

From:	Gwendolyn KeyesFleming/R4/USEPA/US
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Subject:	Fw: Docket ID No. EPA-HQ-OW-2010-0315

Fyi

From: Amanda Starbuck [astarbuck@ran.org]
Sent: 11/19/2010 11:48 AM PST
To: Gwendolyn KeyesFleming
Cc: Duncan Powell; Jim Giattina; KevinH Miller; Scott Gordon; Tom Welborn; Stephanie Fulton
Subject: Docket ID No. EPA-HQ-OW-2010-0315

Dear Regional Administrator Keyes-Fleming,

I write to share with you Rainforest Action Network's submission to the EPA's public comment period on the Mountaintop Removal Guidance memorandum.

Best Wishes

Amanda

Amanda Starbuck | Global Finance Campaign Director | **Rainforest Action Network**
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direct 415 659 0510 | cell 415 203-9952 | fax 415 398 2732

Dear EPA,

Please accept this as a submission of our comments on Federal Docket No. EPA-HQ-OW-2010-0315, titled "Guidance on Improving EPA Review of Appalachian Surface Coal Mining Operations under the Clean Water Act, National Environmental Policy Act, and the Environmental Justice Executive Order" (hereinafter referred to as "Guidance Memorandum").

Rainforest Action Network (RAN) has 200,000 supporters, the voices of whom we are representing with the submission of these comments. Additionally, RAN is involved in and supports various efforts led by communities and non-profits living and working in Central Appalachia who desire an end to the destructive practice of mountaintop removal coal mining and valley fills. We submit these comments with the hope that USEPA will set aside political concerns and employ sound science and a strong consideration of environmental justice concerns in the implementation of the April 1, 2010 Guidance Memorandum noted in the title of this letter. Through the Clean Water Act, the National Environmental Policy Act, and the Environmental Justice Executive Order, USEPA has the tools and justification your agency needs in order to protect Appalachian communities and the environmental resources they depend on from a continuation of the devastating impacts of mountaintop removal coal mining.

We applaud your efforts in achieving these goals, but we ask that you do more to ensure that your agency uphold its responsibilities to the environment and to Appalachian communities by upholding the intent of the Guidance Memorandum and the federal statutes and regulations the memorandum seeks to clarify.

To that end we offer the following recommendations:

1. USEPA must continue to strive to uphold its responsibilities under the CWA, NEPA, and Environmental Justice Executive Order

2. USEPA must support the continuation and expansion of scientific inquiry into the social, environmental, and economic impacts of MTR/VF operations

3. USEPA must work more closely with other federal agencies, such as the US Fish and Wildlife Service, to identify and protect species endangered by MTR operations.

4. USEPA must clarify how the agency, and all other agencies overseeing MTR/VF permits, will implement Environmental Justice considerations and integrate community concerns into the decision-making process

5. USEPA must enhance transparency by (1) providing the public with all documentation and communication between applicants, state permitting agencies, and federal permitting agencies that pertains to MTR/VF permit applications, and (2) providing documentation detailing the reasons underlying USEPA decision-making as it relates to MTR/VF permits

6. USEPA must reject outright "stream mitigation" as a viable practice, considering the findings that such practices fail to restore stream "function"

7. USEPA must strengthen its focus on the "elimination" and "avoidance" of environmental and human health impacts, and reject the traditional focus on "minimization," particularly considering the cumulative impacts of historical and proposed mining operations

8. USEPA must define a system of metrics for measuring cumulative impact, and strengthen its focus on cumulative impact when weighing the various impacts of a proposed mining

operation during the decision-making process

9. USEPA must enhance the use of regulatory tools provided by NEPA and require an Environmental Impact Statement (EIS) for all mining operations reviewed under CWA Section 404(c)

10. USEPA must uphold the intent of the Guidance Memorandum and the articles detailed within by making a Final Determination to veto the Spruce No. 1 mine permit.

The remainder of this letter provides additional comments pertaining to USEPA roles, responsibilities, and actions pertaining to the implementation of the Guidance Memorandum.

We thank you for your consideration,

Kind Regards,

Amanda

Amanda Starbuck | Global Finance Campaign Director | **Rainforest Action Network**
221 Pine Street, 5th Floor, San Francisco, CA 94104
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Comments supporting USEPA action relating to the Guidance Memorandum

We support and applaud the intent and principles informing the Guidance Memorandum and its implementation

In their Proposed Determination on the Spruce No. 1 surface mine in Logan County, West Virginia, USEPA explains that:

> *"an understanding of the adverse impacts of the proposed project requires an understanding of the nature and importance of headwater streams and their contribution to the overall health of the watershed and to wildlife living in the watershed. Headwater streams play a significant role in the ecology of the Appalachian region…The benefit of healthy headwaters are cumulative as the critical ecological functions of many small streams flowing into the same river system are necessary to maintain ecological integrity of the larger stream and river systems. Ecosystem functions performed by headwaters are lost when the headwater stream is buried or removed. These functions are lost not only to the headwater stream itself, but also to downstream ecosystems."*

We implore USEPA to keep this statement in mind when reviewing all aspects of proposed MTR/VF permits, especially in its determinations as to whether, as required and clarified by the Guidance Memorandum:

1. Mining activities will not cause or contribute to violations of water quality standards, contaminate drinking water supplies, or add toxic pollutants that kill or impair stream life,
2. Applicants have evaluated a full range of alternatives to discharging into waters of the US,
3. Mining companies have avoided and minimized their direct, indirect, and cumulative environmental impacts to streams, wetlands, watersheds, and other aquatic resources, and
4. Remaining mining-related aquatic impacts have been effectively mitigated by establishing, restoring, enhancing, or preserving streams and wetlands.

We support and applaud the scope and application of the Guidance Memorandum articles for

upholding USEPA responsibilities and supporting a strict application of federal statutes and regulations
USEPA regulations and CWA guidelines provide for the protection of public health, water quality, and other environmental resources, and the historical application of rules and regulations pertinent to Appalachian surface mining operations has failed to achieve the intended goals. Therefore, we applaud the Guidance Memorandum for:

1. Clarifying and holding federal and state permitting and oversight agencies accountable for their obligations to "prevent harmful public health, water quality, and other environmental impacts associated with Appalachian Surface Mining and to more effectively consider the voices of adversely affected communities in the Appalachian coalfields,"
2. Clarifying how CWA requirements "apply to the disposal of mining overburden in streams to reduce the size and number of valley fills, to limit water quality contamination of streams near mining operations, and to prevent significant environmental degradation of streams and wetlands," and
3. Setting "clear benchmarks for preventing significant and irreversible damage to Appalachian watersheds at risk from mining activity."

We recognize and remind USEPA of their responsibilities and commitments pertaining to the permitting of mountaintop removal mines and valley fills
In general, as it pertains to mountaintop removal coal mining and associated valley fills (MTR/VF), USEPA has the obligation to administer the Clean Water Act (CWA). USEPA regulations and CWA guidelines provide for the protection of public health, water quality, and other environmental resources.
The USEPA regulations associated with CWA Section 404 guidelines that are "particularly important in evaluating the unacceptability of environmental impacts" resulting from MTR/VF require an examination and consideration of:

1. Less environmentally damaging practicable alternatives,
2. Impacts to water quality,
3. Significant degradation of waters of the US,
4. Minimization of adverse impacts to aquatic ecosystems,
5. Impacts on existing indigenous aquatic organisms or communities,
6. Cumulative effects, and
7. Secondary effects (40 CFR 230.10(a-e, g)

Additionally, USEPA recognizes that the agency has a legal responsibility to address the environmental consequences of Appalachian surface coal mining, using best available science, and has committed to "preserve the *long-term* integrity of Appalachian watersheds [in order to] protect their ecological condition and maintain safe, clean, and abundant water for local communities." In the interagency Memorandum of Understanding released in 2009, USEPA further committed to providing greater public participation and transparency.
Finally, we recognize and remind USEPA of the availability of existing CWA and NEPA statutes for implementing the articles of the Guidance Memorandum, including the authority under CWA Section 404(c) "to prohibit, restrict, or deny the specification, or the use for specification," of Appalachian streams as disposal sites for mining waste if the Administrator determines that a discharge will have an unacceptable adverse effect on the environment or Appalachian communities.

We recognize, support, and remind USEPA of the scientific findings pertaining to impacts of mountaintop removal/valley fill (MTR/VF) operations on water quality and human health
Pertaining to adverse effects on the environment and/or Appalachian communities, USEPA recognizes and has produced a wealth of scientific literature that provides a deeper understanding of impacts resulting from MTR/VF operations. The findings, information, and data resulting from the numerous studies provides strong justification for stringent review of MTR/VF permits and a more strict application

of federal statutes and regulations, particularly those made available through the CWA. For instance, Pond, et al, found in 2008 that:

1. Mining causes shifts in "species assemblage," negatively impacting species richness, diversity, and composition on both the family- and genus-levels. Members of the *Ephemeroptera* taxa disappear entirely;
2. 93% of mined streams and 0% of unmined streams were biologically impaired by surface mining;
3. Mining has subtle to severe impacts on benthic macroinvertebrate communities; and
4. Mountaintop mining can be causally linked with biological impairment (Pond et al., 2008)

In 2009, Dr. Margaret Palmer and Dr. Emily Bernhardt issued a white paper summarizing key scientific findings on the effects of MTR/VF operations on local and regional aquatic ecosystems, finding that:

1. Mountaintop mining and valley fills "radically alter" the topography and hydrology of the affected area;
2. Mountaintop mining and valley fills damage stream headwaters by altering stream structure, function, geochemistry, hydrologic processes, and biota communities;
3. Cumulative impacts of mountaintop mining and valley fills include increased levels of conductivity, ions, trace elements, and total or dissolved solids, each of which are highly correlated with biological impairment; and,
4. Stream mitigation practices have been under-regulated, do little to restore stream habitat, and rarely attempt to restore stream function or reduce cumulative impacts.

Strengthening the science connecting mining discharges, levels of conductivity and dissolved solids, biological impairment and ecosystem function, USEPA's own research and review of scientific literature has found that:

1. Ecological losses downstream of coal mining valley fills are linked to increased levels of total dissolved solids and conductivity, sulfates, and selenium.
2. Increased conductivity levels have a significant impact on stream ecosystem health, and conductivity levels above 500 micro-Siemens per centimeter (µS/cm) are likely to be associated with significant degradation of the aquatic ecosystem.

And, further, that MTR/VF operations lead directly to five principal alterations of stream ecosystems:

1. Springs, intermittent streams, and small perennial streams are permanently lost;
2. Concentrations of major chemical ions are persistently elevated downstream;
3. Degraded water quality reaches levels that are acutely lethal to standard laboratory test organisms;
4. Selenium concentrations are elevated, to the point of causing toxic effects in fish and birds; and,
5. Macroinvertebrate and fish communities are consistently and significantly degraded.

These studies highlight the growing recognition of the severity and scope of the ecological impacts of MTR/VF, as well as the importance of conductivity levels on stream ecosystem function. We applaud USEPA for setting a conductivity standard of 300 µS/cm, given that peer-reviewed scientific studies show a strong relationship between conductivity of at least 300-500 µS/cm, and harm to aquatic life in the affected streams

We applaud USEPA's long-overdue focus on developing and implementing rules pertaining to a consideration of environmental justice concerns in the review of MTR/VF permit applications

USEPA defines environmental justice (EJ) as "the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies," and recognizes that surface mining can have adverse environmental and health impacts on communities in the vicinity of mining operations. USEPA further notes that federal statutes and regulations require, during the review of surface mine permits, "consideration of the full range of potential impacts on the environment,

human health, and communities," particularly low-income or minority populations. USEPA asserts that consideration must be given to:

1. the conditions nearby residents face in association with the proposed mining operation, including proximity to blasting, locations of valley fills, truck traffic, noise, fugitive dust, and habitat loss;
2. the mining activities' potential impacts on opportunities for and access to subsistence fishing, hunting, foraging, and gardening (USEPA, 2010a, p. 42);
3. potential impacts on sources of drinking water for the affected populations, including municipal water supplies and private sources such as streams and/or wells; and,
4. the cultural impacts of the destruction of the mountains and the various resources and uses made available by the mountains.

USEPA also commits to ensuring a transparent decision-making process, with increased opportunities for meaningful community input and broad access to information. We applaud USEPA's efforts toward clarifying and implementing articles of Environmental Justice in relation to mountaintop removal mining.

We applaud USEPA's action and decision-making on the Spruce No. 1 MTR mine

USEPA has performed its due diligence in analyzing the potential impacts from the Spruce No. 1 mine, and has correctly and justifiably recommended a veto of the mining permit based on their findings, particularly the findings showing that the permit will violate relevant federal statutes and regulations as clarified in the Guidance Memorandum. We ask that USEPA continue its strict application of the guidelines, not only in relation to Spruce No. 1, but in its review of all mining permits. Finally we hope that USEPA continues to hold a strong line on Spruce No. 1, and does not compromise the Guidance Memorandum for political purposes.

Comments critical of USEPA implementation of Guidance Memorandum articles

USEPA's implementation of the principles and articles set forth in the Guidance Memorandum has failed to uphold USEPA obligations under federal law, and has thus failed meet the full intent of the guidelines

As noted in the Federal Register notice calling for comments on the April 1, 2010 Guidance Memorandum, USEPA specifically asks for comments on "whether USEPA's implementation of its guidance in reviewing state Section 402 permits and permit applications under Section 404 of the Clean Water Act has been effective in achieving the goals of providing additional clarity and enhanced environmental and human health protection." While we believe that USEPA's application of the Guidance Memorandum and associated statutes and regulations has resulted in *fewer* impacts, and has "enhanced environmental and human health protection"—particularly in relation to the Hobet 45 and Pine Creek No. 1 mining permits—the protection that has been achieved can only be defined as "enhanced" when comparing current regulation to the lack of regulation and oversight that occurred over the past few decades.

Given the scale of the historical, cumulative impacts of MTR/VF in the Central Appalachian region, the approval of any new valley fills or 'mine through's' only contributes to the existing degradation of water quality and biological habitat that has already occurred. Hobet 45 and Pine Creek No. 1 are prime examples of how USEPA has compromised the intent and scope of the Guidance Memorandum by allowing new discharges of fill material into, or the mining through of Appalachian headwater streams.

We assert that USEPA has in no way maximized protection of human health and the environment through their actions on Hobet 45 and Pine Creek No. 1, and has in fact compromised the principles and articles of the Guidance Memorandum. While this has occurred in various ways, the primary issue is that USEPA's examination, consideration, and regulation of ***cumulative impacts*** has been vague and

insufficient.

Cumulative impacts are defined as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions" (40 CFR 1508.7). Additionally, "cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time" (40 CFR 1508.7). USEPA is well aware of the cumulative impacts of MTR/VF on the Central Appalachian mountains, ecosystems, streams, and communities. However, cumulative impacts have not been sufficiently weighted in the decision-making process.
In relation to the Spruce No. 1 mine, we hope that USEPA does not further compromise the intent of the Guidance Memorandum by allowing the construction of any valley fills in the Spruce Fork watershed, particularly given USEPA's own recognition of the existing impacts from historical mining within the watershed, and within the broader Coal River sub-basin.

Hobet 45

In relation to Hobet 45, USEPA worked with Patriot Coal to "reduce stream impacts by more than 16,000 linear feet," thereby eliminating "nearly 50 percent of stream impacts." However, the agreement still allows for impacts to 16,267 linear feet of stream that will result from the construction of sediment ponds and the mine through of some stream segments. While USEPA allows for these impacts given that they believe that water downstream of the mine site is at low risk of exceeding conductivity thresholds, nearly three miles of stream will still be permanently impacted, and the cumulative impact of the sprawling Hobet mining complex will increase.

Pine Creek No. 1

In relation to the Pine Creek No. 1 mine, in its approval of the final agreement with Coal-Mac, USEPA asserted that its recommendations are consistent with the Guidance Memorandum. However, an examination of the potential impact to the quantity and quality of streams within and downstream of the Pine Creek watershed raises some serious concerns with USEPA's assertion. Specifically, we believe that:

1. Coal-Mac failed to "clearly demonstrate how the permit [was] consistent with the [guidelines]"
2. The requirement for Coal-Mac to sequence valley fills, while consistent with the guidelines, provides no assurance that impacts from the first fill will achieve the intentions outlined in the guidelines.
3. USEPA did not provide the public any indication that, in order to protect against cumulative impacts to watersheds, it had required Coal-Mac to submit data and water quality and discharges from all "adjacent or similar projects" or their associated SMCRA and Section 404 permits. This is significant given the scale of existing impacts to the Pine Creek and other surrounding watersheds from past mining, most of which has been conducted by Coal-Mac.
4. The permanent elimination of three valley fills will avoid impacts to streams, and do represent a reduction of potential impacts; however, the elimination of three valley fills—that have yet to be constructed—while still approving a sequencing of valley fills, does not achieve the stated intent of the requirement to "avoid and minimize direct, indirect, and cumulative adverse enivornmental impacts." There are still existing impacts from multiple valley fills that have been previously constructed in the Pine Creek watershed, and any new valley fills will add to those impacts.
5. In relation to Environmental Justice considerations, USEPA neglected the fact that communities downstream of the proposed mining operation have experienced frequent and severe flooding which may have been the result of, or exacerbated by, previous surface mining

and clear-cutting activities. These events and their associated impacts on the low-income communities of the Pine Creek and Island Creek watersheds do not seem to have been considered in the review of the Pine Creek surface mine permit.

USEPA Regional Offices (Regions III and IV) lack consistency in their transparency and communication with stakeholder groups

In the Guidance Memorandum, USEPA commits to "communicat[ing] effectively with local communities and mining companies to provide the transparency, consistency, and efficiency expected of government agencies in dealing with issues of such importance to health, the environment, and the economy.

We applaud the Region IV office of USEPA for their commitment to transparency and for their willingness to exceed expectations in supporting the inclusion of community residents and stakeholder groups in the permit review and public comment processes. Officials in the Region IV office are always available to the public, and we and those we support and represent have been very grateful for their help and openness.

The Region III office, however, has provided very little support to residents and stakeholders concerned about the impacts of existing or pending MTR/VF operations on their homes, their health, and their environment. Often the reaction from Region III officials reflects a contempt for any attempts by residents and other stakeholders to obtain information on permit reviews and the review process in general. They have resisted returning phone calls and answering questions, and have failed to uphold the principle of transparency that USEPA has promised to the public.

We would ask that USEPA headquarters remedy this problem. The residents and other stakeholders have a right to be informed of federal activities pertaining to review of MTR/VF permits, and they do not deserve to be treated as an annoyance.

USEPA lacks clarity on how the agency will integrate Environmental Justice concerns in the permit review process

Executive Order 12898 and the Presidential Memorandum that accompanies it need to be addressed appropriately in the context of any federal action – such as federal permitting under the CWA and SMCRA – including federal actions that are subject to NEPA. The Order provides that: "To the greatest extent practicable and permitted by law…each Federal agency shall make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations." Additionally, the Order states that "Consideration of environmental justice concerns is vital to understanding the potential human health and environmental impacts of surface coal mining during the CWA and SMCRA permitting and NEPA review processes."

However, even while coal companies continue to apply for MTR permits, and even while USEPA continues to review permits that have been placed on the Enhanced Coordination Procedures list, there still is not a set of rules or guidelines for incorporating environmental justice considerations into the review of mining permits. Additionally, USEPA has failed, in its review of the Pine Creek No. 1 and Hobet 45 permits, for instance, to ensure a fully transparent review process, or to provide communities with greater access to information, and greater opportunity to participate in the review of the permit and in the decision-making process.

Finally, USEPA recommended that, for the Spruce No. 1 mine, "additional analysis of the potential for disproportionately high and adverse effects on the low-income populations needs to be conducted."

USEPA should have required the same standard of consideration for the Pine Creek No. 1 and Hobet 45 mining permits, and should require the same standard for all future permits reviewed.

Christopher Hunter/DC/USEPA/US
11/23/2010 11:21 AM

To Cliff Rader
cc
bcc
Subject Fw: Request for OEJ Assistance wtih the Spruce Mine 404(c) review

This just went out today. I had asked Denise to CC you, but didn't seem to happen.

Chris

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U.S. Environmental Protection Agency
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----- Forwarded by Christopher Hunter/DC/USEPA/US on 11/23/2010 11:21 AM -----

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Date: 11/23/2010 10:19 AM
Subject: Request for OEJ Assistance wtih the Spruce Mine 404(c) review

(b) (5) [redacted]

If you have any questions about the Spruce FD, please contact Chris Hunter or Brian Frazer in the Wetlands Division.

Thanks for your help,

Denise

Spruce RD 092410.doc Yazoo EJ.pdf

Denise Keehner
Director

Office of Wetlands, Oceans, and Watersheds
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Room 7130E

Recommended Determination of the U.S. Environmental Protection Agency Region III Pursuant to Section 404(c) of the Clean Water Act Concerning the Spruce No. 1 Mine, Logan County, West Virginia

U.S. Environmental Protection Agency
Region III

September 24, 2010

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I. Executive Summary

The Spruce No. 1 Mine as currently authorized Department of the Army (DA) Permit No. 199800436-3 (Section 10: Coal River), is one of the largest mountaintop mining projects ever authorized in West Virginia. If it is fully constructed, it will disturb approximately 2,278 acres and bury approximately 7.48 miles of streams.

As the phrase suggests, "mountaintop mining" involves removing the top of a mountain in order to recover coal seams contained within the mountain. Explosives are used to break apart the mountain's bedrock, and earth-moving equipment is used to remove the excess rock, soil, and debris (called "spoil") that formerly had composed the portions of the mountain above and immediately below the coal seams. The fractured material is larger in volume than when it was intact, fused bedrock within the mountain. The amount of spoil that may be placed on the mined area is also limited due to stability concerns. Hence mountaintop mining generates large quantities of "excess spoil" (i.e., volumes of rock, soil, and debris that cannot be placed back in the mined area) that are deposited in valleys, thereby burying streams that flow through those valleys. In this case, if the Spruce No. 1 Mine is constructed as currently authorized, it will bury headwater stream ecosystems under 110 million cubic yards of excess spoil.

The Spruce No. 1 Mine has a lengthy and complex history. The DA Permit No. 199800436-3 (Section 10: Coal River) (DA Permit) was issued by the US Army Corps of Engineers, Huntington District (Corps) in January 2007 authorizing the Mingo Logan Coal Company to construct six valley fills, associated sedimentation structures, and other discharges of fill material to the Right Fork of Seng Camp Creek, Pigeonroost Branch, Oldhouse Branch, and their tributaries. Due to litigation and an agreement with environmental groups, operations have been limited to the Seng Camp Creek watershed and as part of that agreement one valley fill is partially constructed.

Throughout review of the project, the U.S. Environmental Protection Agency has raised concerns regarding adverse impacts to the environment. Additionally, data and information have become available since permit issuance, which have confirmed EPA's earlier concerns regarding the potential for adverse water quality impacts, the potential for cumulative impacts, the availability of further avoidance and minimization measures and problems with the proposed mitigation measures.

On April 2, 2010, the U.S. Environmental Protection Agency Region III (EPA Region III or Region III) published in the Federal Register a Proposed Determination to prohibit, restrict or deny the specification or the use for specification (including withdrawal of specification) of certain waters at the project site as disposal sites for the discharge of dredged and/or fill material for the construction of the Spruce No. 1 Mine. Region III took this step because it believed, despite the regulatory review intended to protect the environment, that discharges authorized by DA Permit No. 199800436-3 (Section 10: Coal River) could destroy wildlife habitat and cause significant degradation of downstream aquatic ecosystems and therefore could have unacceptable adverse effects on wildlife.

A public hearing was conducted on May 18, 2010. Region III received over 100 oral comments and over 50,000 written comments both supporting and opposing its Proposed Determination. Region III has carefully considered the comments received and conducted additional analysis, which will be described herein, before rendering this Recommended Determination.

Based on the foregoing analysis and upon consideration of the public comments received in response to Region III's proposed determination, Region III believes that discharges of dredged and/or fill material to Pigeonroost Branch and Oldhouse Branch for the purpose of constructing the Spruce No. 1 Surface Mine as currently authorized by DA Permit would likely have unacceptable adverse effects on wildlife. For this reason, it is the recommendation of the Regional Administrator that the specification embodied in DA Permit No. 199800436-3 (Section 10: Coal River) of Pigeonroost Branch and Oldhouse Branch as disposal sites for discharges of dredged and/or fill material for construction of the Spruce No. 1 Surface Mine be withdrawn.

The goal of protecting water quality, plant and animal habitat, navigable waters, and other downstream resources requires as its first step the protection of headwater streams. Headwater streams perform services similar to those performed by capillaries in the human circulatory system. They are the largest network of waterbodies within our ecosystem and provide the most basic and fundamental building blocks to the remainder of the aquatic and human environment. As set forth herein, Pigeonroost Branch and Oldhouse Branch represent some of the very few remaining streams within the Spruce Fork sub-watershed and the Coal River sub-basin that represent “least degraded” conditions. They support diverse and healthy biological communities. As such, they are valuable in and of themselves and within the context of the Spruce Fork sub-watershed and Coal River sub-basin.

As currently authorized by DA Permit discharges of excess spoil to Pigeonroost Branch and Oldhouse Branch would bury those streams and their tributaries and the wildlife that live within them. Other wildlife would lose important headwater stream habitat on which they depend for all or part of their lifecycles.

In addition, the construction of valley fills, sedimentation ponds and other discharges into Pigeonroost Branch and Oldhouse Branch authorized by the DA Permit would likely have adverse impacts on downstream waters and wildlife living outside the footprint of the fill. These adverse impacts would be caused by the removal of functions performed by the buried resources and by transformation of the buried areas into sources that contribute contaminants to downstream waters. In addition, discharges to Pigeonroost Branch and Oldhouse Branch as currently authorized would likely contribute to conditions that would support blooms of golden algae that release toxins that kill fish and other aquatic life.

Based on these impacts, Region III has determined that discharges to Pigeonroost Branch and Oldhouse Branch as authorized by DA Permit No. 199800436-3 (Section 10: Coal

River) would likely have unacceptable adverse effects on wildlife. Particularly in light of the high quality of the impacted resources, it is unlikely that the compensatory mitigation plan (CMP) for the project would offset these impacts. The proposed on-site created streams would be unlikely to replace the physical, chemical, and especially biological functions of Pigeonroost Branch and Oldhouse Branch.

There are other impacts that, while not forming the basis of the Recommended Determination, are of concern to the Region. To the extent that discharge of excess spoil outside jurisdictional waters, deforestation, and other activities associated with the project depend upon specification of Pigeonroost Branch and Oldhouse Branch as disposal sites, there are likely to be other adverse impacts from those dependent activities. In addition, impacts from the project will contribute to cumulative impacts from multiple surface mining activities in the Coal River sub-basin. There are also concerns regarding environmental justice.

II. Introduction

This document explains the basis for the EPA Region III recommendation to withdraw the specification of Pigeonroost Branch, Oldhouse Branch and their tributaries (all of which are waters of the United States) within Logan County, West Virginia as a disposal site for dredged or fill material in connection with construction of the Spruce No. 1 Surface Mine (Spruce No. 1 Mine or the project) as currently authorized by DA Permit No. 199800436-3 (Section 10: Coal River)(DA Permit or permit) (See Figure 3). While the DA Permit also authorizes construction of valley fills and other discharges to the Right Fork of Seng Camp Creek and its tributaries, Region III is not recommending withdrawal of specification of those waters in part because some of those discharges have already occurred.

EPA Region III is recommending that action be taken under section 404(c) of the Clean Water Act (CWA) because the Region believes that the discharges to Pigeonroost Branch and Oldhouse Branch and their tributaries for the purpose of constructing Spruce No. 1 Mine as currently authorized by the DA Permit would likely have unacceptable adverse effects on wildlife. Pigeonroost Branch and Oldhouse Branch and their tributaries are some of the last remaining streams within the Spruce Fork sub-watershed and the larger Coal River sub-basin that represent "least degraded" conditions. As such, they perform important hydrologic and biological functions, support diverse and productive biological communities, contribute to prevention of further degradation of downstream waters, and play an important role within the context of the overall Spruce Fork sub-watershed and Coal River sub-basin. The Spruce No. 1 Mine as currently authorized would bury virtually all of Oldhouse Branch and its tributaries and much of Pigeonroost Branch and its tributaries under excess spoil generated by mountaintop removal surface coal mining operations. Region III does not believe that the anticipated effects of the burial of all of Oldhouse Branch and much of Pigeonroost Branch will be offset by the proposed mitigation because it will not replace the chemical, physical and biological functions of the lost aquatic resources.

In addition, this recommendation considers the adverse impacts from mining-related activities, such as deforestation, that are associated with the discharge of excess spoil to areas outside the jurisdictional waters to the extent that these activities necessarily depend upon specification of Pigeonroost Branch and Oldhouse Branch for the construction of valley fills and sedimentation ponds. Moreover, the discharges associated with the Spruce No. 1 Mine will contribute to a cumulative adverse impact to the Spruce Fork sub-watershed, the Little Coal River watershed and the Coal River sub-basin. Finally, the Region continues to be concerned that potential issues related to disproportionate and high impact on the local population from construction of the Spruce No. 1 Mine have not been fully considered.

The next Section provides an overview of the Section 404(c) procedures, describes the Spruce No. 1 Mine as authorized, and summarizes the history of the project. Section IV describes the environmental characteristics of the project area, specifically Pigeonroost Branch and Oldhouse Branch, and the overall Coal River sub-basin. Section V examines the anticipated impacts from the Spruce No. 1 Mine as currently authorized. Consistent with Section 404(c), this discussion will focus on impacts to wildlife. Section VI will discuss other considerations, including impacts from activities associated with the Spruce No. 1 Mine that do not include direct discharges of dredged and/or fill material to jurisdictional waters but which may depend upon authorization of such discharges, and that are likely to cause direct and cumulative impacts to the environment and to local communities. Section VII describes EPA Region III's conclusions and recommendations.

III. Background

A. Section 404(c) Procedures

The CWA, 33 U.S.C. §§ 1251 et seq., prohibits the discharge of pollutants, including dredged or fill material, into waters of the United States (including wetlands) except in compliance with, among other provisions, Section 404 of the CWA, 33 U.S.C. § 1344. Section 404 authorizes the Secretary of the Army (Secretary), acting through the Chief of Engineers, to authorize the discharge of dredged or fill material at specified disposal sites. This authorization is conducted, in part, through the application of environmental guidelines developed by EPA, in conjunction with the Secretary, under section 404(b) of the CWA, 33 U.S.C. § 1344(b) (Section 404(b)(1) Guidelines). Section 404(c) of the CWA, 33 U.S.C. § 1344(c), authorizes the EPA to prohibit the specification (including the withdrawal of specification) of any defined area as a disposal site. EPA is authorized to restrict or deny the use of any defined area for specification (including the withdrawal of specification) as a disposal site, whenever it determines, after notice and opportunity for public hearing, that the discharge of such materials into such area will have an unacceptable adverse effect on municipal water supplies, shellfish beds and fishery areas (including spawning and breeding areas), wildlife, or recreational areas.

The procedures for implementation of Section 404(c) are set forth in 40 CFR Part 231. Under those procedures, if the Regional Administrator has reason to believe that use of a site for the discharge of dredged or fill material may have an unacceptable adverse effect

on one or more of the aforementioned resources, he may initiate the section 404(c) process by notifying the U.S. Army Corps of Engineers (Corps) and the applicant (and/or project proponent) that he intends to issue a Proposed Determination. Each of those parties then has fifteen days to demonstrate to the satisfaction of the Regional Administrator that no unacceptable adverse effects will occur, or that corrective action to prevent an unacceptable adverse effect will be taken. If no such information is provided to the Regional Administrator, or if the Regional Administrator is not satisfied that no unacceptable adverse effect will occur, the Regional Administrator will publish a notice in the Federal Register of his Proposed Determination, soliciting public comment and offering an opportunity for a public hearing.

Following the public hearing and the close of the comment period, the Regional Administrator will decide whether to withdraw the Proposed Determination or prepare a Recommended Determination. A decision to withdraw may be reviewed at the discretion of the Assistant Administrator for Water at EPA Headquarters. If the Regional Administrator prepares a Recommended Determination, he then forwards it and the administrative record compiled in the Regional Office to the Assistant Administrator for Water at EPA Headquarters. The Assistant Administrator makes the Final Determination affirming, modifying, or rescinding the Recommended Determination.

This document represents the third step in the process and explains the basis for EPA Region III's Recommended Determination.

B. Project Description

The Spruce No. 1 Mine as currently authorized by DA Permit No. 199800436-3 (Section 10: Coal River), is one of the largest mountaintop mining projects ever authorized in West Virginia. As currently authorized, it will disturb approximately 2,278 acres (about 3.5 square miles) and bury approximately 7.48 miles of streams. By way of comparison, the project area would take up a sizeable portion of the downtown area of Pittsburgh, PA (Figure 1).

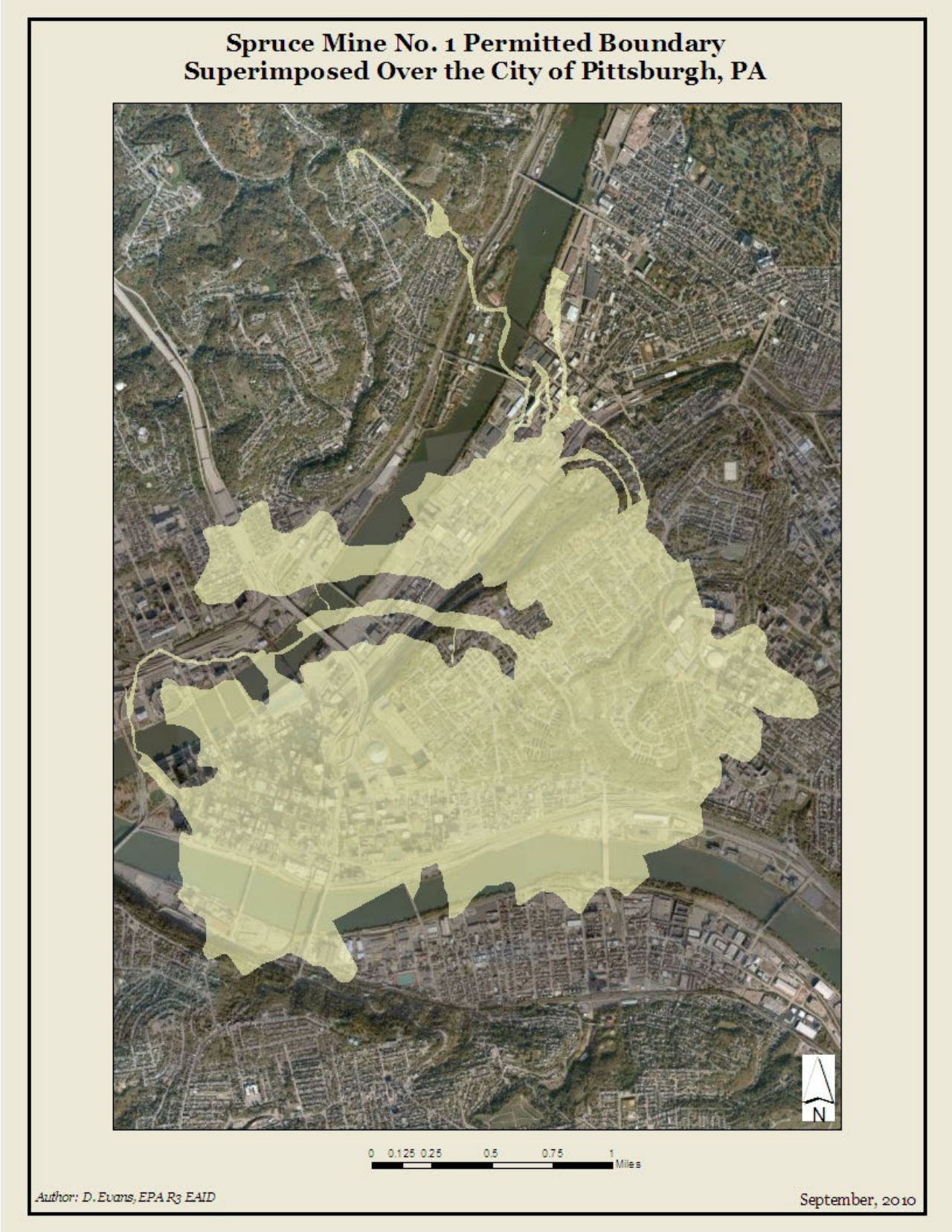

Figure 1 Spruce No. 1 Mine compared to downtown Pittsburgh, PA.

The project as authorized is located in the East District of Logan County, West Virginia at Latitude 38°52'39" and Longitude 81°47'52" depicted on the United States Geological Survey 7.5-minute Clothier and Amherstdale Quadrangles (Figure 2). The mine site is located approximately two miles northeast of Blair, in Logan County, West Virginia in the Central Appalachian ecoregion (Bryce, S.A., J.M. Omernik, and D.P. Larsen. 1999). http://www.epa.gov/wed/pages/ecoregions.htm

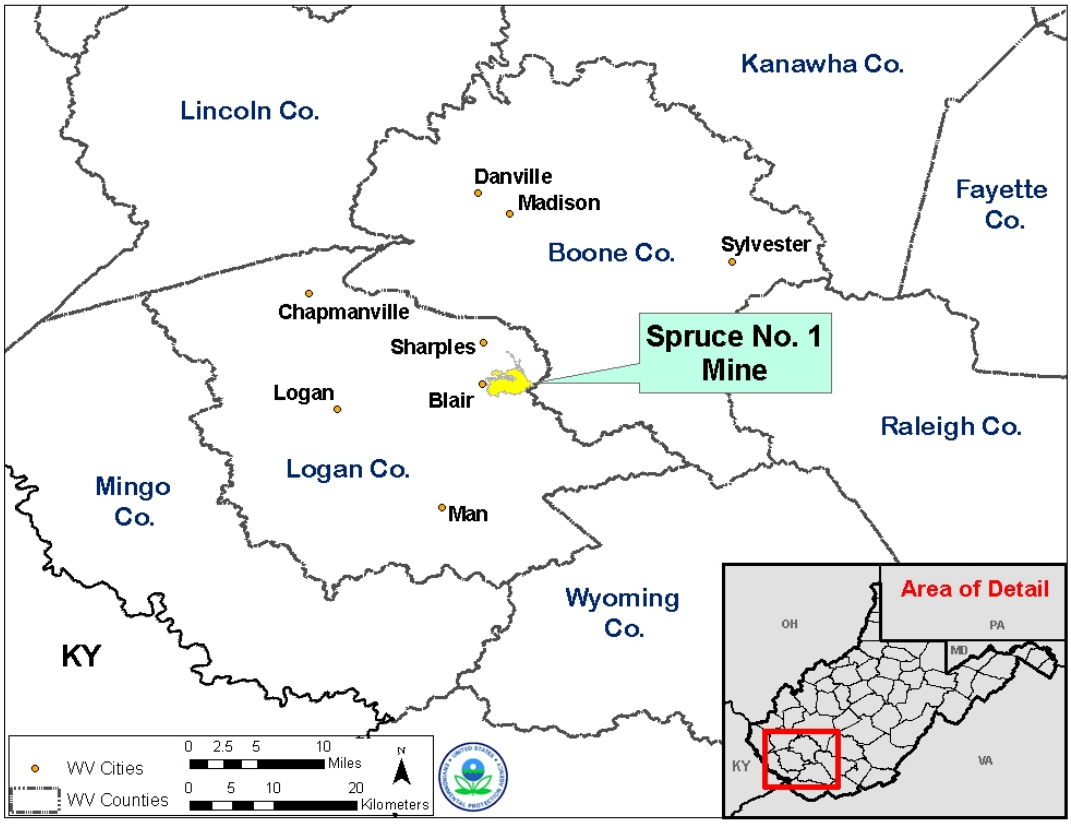

Figure 2: Spruce No. 1 mine location

According to the Environmental Impact Statement (EIS) prepared by the Corps in 2006 (Spruce No. 1 EIS) for the project, the Spruce No. 1 project is a mountaintop mining project targeting bituminous coal seams overlying and including the Middle Coalburg coal seam in the western portion of the project area. In the eastern portion of the project area, mountaintop mining would be limited to those seams including and overlying the Upper Stockton seam, with contour mining in conjunction with auger and/or highwall/thin-seam mining utilized to recover the Middle Coalburg seam.

As the phrase suggests, "mountaintop mining" involves removing the top of a mountain to recover coal seams contained within the mountain. Explosives are used to break apart the mountain's bedrock and earth-moving equipment is used to remove the excess rock, soil and debris (called “spoil”) that formerly had composed the portions of the mountain above and immediately below the coal seam. The fractured material is larger in volume

than when it was intact, fused bedrock within the mountain. The amount of spoil that may be placed back on the mined area is also limited due to stability concerns. Hence mountaintop mining generates large quantities of "excess spoil" that cannot be placed back in the mined area. The “spoil” is then deposited in valleys, thereby burying streams that flow through those valleys.

The Spruce No. 1 EIS describes the project impacts as a disturbance of a total of 2,278 acres to recover seventy-five percent (75%) of the coal reserve targeted for extraction within the project area during fifteen (15) phases. The mining process would remove 400 to 450 vertical feet from the height of the mountain, about 501 million cubic yards of overburden material. Nearly 391 million cubic yards of spoil would be placed within the mined area (i.e., back on the mountain) and the remaining 110 million cubic yards of excess spoil would be placed in six valley fills, burying all or portions of the Right Fork of Seng Camp Creek, Pigeonroost Branch, and Oldhouse Branch and their tributaries (hereafter, references to Seng Camp Creek, Pigeonroost Branch, and Oldhouse Branch also include all tributaries to those waters that would be impacted by the project as authorized). Specifically, the DA Permit authorizes construction of Valley Fills 1A and 1B in Seng Camp Creek; Valley Fills 2A, 2B, and 3 in Pigeonroost Branch; and Valley Fill 4 in Oldhouse Branch, and numerous sedimentation ponds, mined-through areas and other fills in waters of the U.S (Figure 3). A detailed discussion of Spruce No. 1 project can be found in the Spruce No. 1 EIS on pages 2-35 through 2-61.

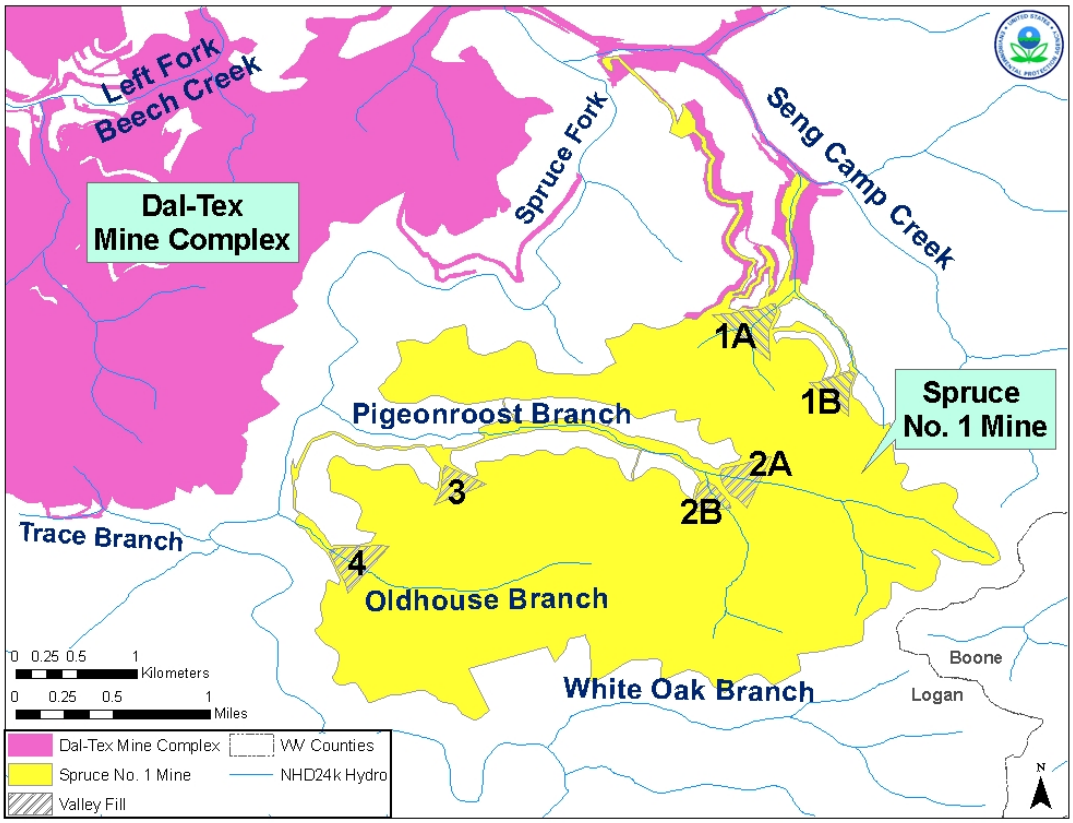

Figure 3. Spruce No. 1 Mine and associated valleyfills.

The Spruce No.1 Mine Surface Mining Control and Reclamation Act (SMCRA) Permit S-5013-97, Incidental Boundary Revision (IBR4, Modification 11) describes impacts from the project as including placement of dredged and fill material into approximately:

- 0.12 acre of emergent wetlands
- 10,630 linear feet (1.83 acres) of ephemeral stream channels (all permanent),
- 28,698 linear feet (6.12 acres) of intermittent stream channels
    - (26,184 linear feet [5.77 acres] permanent
    - 2,514 linear feet [0.35 acre] temporary)
- 165 linear feet (0.034 acre) of perennial stream channel (all temporary),

While Region III is providing the foregoing summary from the SMCRA Permit S-5013-97 IBR for descriptive purposes, as set forth in more detail in Section V.C.2. below, Region III believes that the description provided in the Spruce No. 1 SMCRA Permit and in the Spruce No. 1 EIS incorrectly characterizes stream resources that will be impacted, as described further below.

The project as authorized also includes compensatory mitigation to offset adverse project impacts. EPA's concerns with the November 2006 compensatory mitigation plan (CMP) submitted by the permittee will be described in Section V.C.

C. Project History

This project has a lengthy and complex regulatory history. The Spruce No. 1 Mine was originally advertised as operated by Hobet Mining Inc., a subsidiary of Arch Coal, Inc.[1] The project as originally proposed in 1998, was larger than the currently authorized project and would have directly impacted a total footprint area of 3,113 acres and 57,755 linear feet (more than ten miles) of stream (not including indirect impacts to remaining downstream waters). At that time, the Corps tendered and ultimately withdrew a nationwide permit for the project, and the permittee, Mingo Logan, advised the Corps it would submit an individual permit application. An Environmental Impact Statement was prepared for the Spruce No. 1 project by the Army Corps of Engineers Huntington District pursuant to the National Environmental Policy Act, 42 U.S.C. 4332(C). The original project application also launched events that led to the Interagency Mountaintop Mining/Valley Fills in Appalachia Programmatic Environmental Impact Statement which was finalized in October 2005 (PEIS). The PEIS is available at www.epa.gov/Region3/mtntop/eis2005.htm.

An initial 2002 Spruce No. 1 Draft Environmental Impact Statement (EIS) considered a proposed project that was similar in scope and size to the original project described above. Region III's review of the 2002 Draft Environmental Impact Statement found gaps in the analyses of the mine and related adverse environmental impacts. Region III was particularly concerned by the lack of information regarding the nature and extent of impacts to the high quality streams that would be buried under valley fills, and recommended additional evaluation to support the analysis of less environmentally damaging alternatives. EPA Region III, in a letter dated August 12, 2002, indicated the EIS contained inadequate information for public review and for decision-makers.

In 2006, a revised Spruce No. 1 Draft EIS was prepared. At that time, the project was reconfigured to reduce impacts. The Mingo Logan, revised the mine plan to eliminate construction of a valley fill in White Oak Branch, a high quality stream (see Section IV.A. below) and the project area was reduced from 3,113 to 2,278 acres with direct stream impacts reduced to 7.48 miles.

In our June 16, 2006, comment letter on the 2006 Draft EIS, EPA Region III recognized that impacts from the mine had been reduced and the quality of EIS information had improved. However, the letter also noted that EPA had remaining environmental concerns associated with the Spruce No. 1 Mine, including potential adverse impacts to water quality (specifically, the potential to discharge selenium and the known correlation between similar mining operations and degradation of downstream aquatic communities), uncertainties regarding the proposed mitigation, need for additional analysis of potential environmental justice issues, and lack of study related to the cumulative impact of multiple mining operations within the Little Coal River watershed. EPA continued to

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[1] Effective December 31, 2005, Arch Coal, Inc. transferred Spruce No. 1 Mine holdings and responsibilities to its Mingo Logan Coal Company (Mingo Logan) subsidiary.

stress its belief that corrective measures should be required to reduce environmental impacts and that other identified information, data, and analyses should be included in the final EIS.

Concerns regarding the Spruce No. 1 project were also raised by the U.S. Fish and Wildlife Service (USFWS), Ecological Services West Virginia Field Office in a letter dated May 30, 2006 from the Department of Interior, Philadelphia to the Huntington District Army Corps of Engineers. In that letter, the USFWS expressed concerns over the permittee's compensatory mitigation plan. The USFWS stated there was inadequate compensatory mitigation for the project because the assessment methodology used by the permittee to evaluate stream impacts considered only the physical characteristics of the impacted streams, without considering the equally important biological or chemical characteristics. The USFWS expressed concern the project would impact healthy, biologically functional streams and the mitigation included erosion control structures designed to convey water that would not replace the streams' lost ecological services.

The Corps issued the Spruce No. 1 Final EIS on September 22, 2006. On October 23, 2006, EPA commented on the Final EIS, noting that many of EPA's comments had not been adequately addressed. In a letter dated November 30, 2006, EPA offered its assistance to the Corps in developing a stream functional assessment protocol and willingness to work with Mingo Logan through EPA's Conflict Prevention and Resolution Center to develop a cumulative impact assessment and watershed restoration plan for the Little Coal River watershed.

Despite EPA and USFWS concerns on January 22, 2007, the Corps issued a Clean Water Act § 404 Permit (DA Permit No. 199800436-3 (Section 10: Coal River)) to Mingo Logan for the Spruce No. 1 Mine. That permit specified the Right Fork of Seng Camp Creek, Pigeonroost Branch and its tributaries, and Oldhouse Branch and its tributaries as disposal sites for the discharge of dredged and/or fill material from the Spruce No. 1 Mine.

On January 30, 2007, a number of environmental groups filed a complaint against the Corps in federal district court challenging its decision to issue the permit. That litigation was stayed for a period of time pending the U.S. Court of Appeals for the Fourth Circuit's decision in *Ohio Valley Environmental Coalition v. Aracoma Coal Co.,* 556 F. 3d 177 (4th Cir. 2009). Following that decision, the litigation related to the Spruce No. 1 permit was reactivated. The litigation was then stayed again until October 22, 2010 following Region III's publication of its Proposed Determination on April 2, 2010.

In early 2007, Mingo Logan commenced limited operations at Spruce No. 1 pursuant to their DA Permit No. 199800436-3 (Section 10: Coal River) subject to an agreement with the environmental groups who are plaintiffs in the litigation. Pursuant to that agreement, Mingo Logan has been operating in a portion of the project in the Seng Camp Creek drainage area, including construction of one valley fill (valley fill 1A). Under the agreement, Mingo Logan must give plaintiffs 20 days notice before expanding operations

beyond the area subject to the agreement, and has done so once without objection from the plaintiffs. Mingo Logan's operations in the Seng Camp Creek watershed have generated data related to impacts from the project as constructed, including discharge monitoring reports submitted to the West Virginia Department of Environmental Protection (WVDEP). These data have been reviewed by Region III.

While the litigation was pending, the scientific literature beagn to reflect a growing scientific consensus of the importance of headwater streams, a growing concern about the adverse effects of mountaintop removal mining, and concern that impacted streams cannot easily be replaced. Many of these studies are cited in this Recommended Determination. On June 11, 2009, EPA , the Department of the Army, and the Department of the Interior entered into a *Memorandum of Understanding Implementing the Interagency Action Plan on Appalachian Surface Coal Mining,* in which the agencies agreed to take steps to reduce the harmful environmental consequences of Appalachian surface coal mining. On April 1, 2010, the U.S. Environmental Protection Agency's Office of Research and Development made available for public comment two reports titled: *The Effects of Mountaintop Mines and Valley Fills on Aquatic Ecosystems of the Central Appalachian Coalfields* and *A Field-Based Aquatic Life Benchmark for Conductivity in Central Appalachian Streams.* On the same day, EPA also published interim guidance titled: *Guidance on Improving EPA Review of Appalachian Surface Coal Mining Operations under the Clean Water Act, National Environmental Policy Act, and the Environmental Justice Executive Order.*[2]

On September 3, 2009, Region III requested the Corps suspend, modify or revoke DA Permit No. 199800436-3 (Section 10: Coal River) for discharges associated with the Spruce No. 1 Mine. On September 30, 2009, the Corps of Engineers stated that it would not reconsider the permit authorization. As a result, Region III initiated the Clean Water Act Section 404(c) process on October 16, 2009. Region III communicated with representatives of Mingo Logan and the Corps both in person and by telephone and electronic mail on several occasions to determine whether corrective action would be taken to address Region III's concerns. On April 2, 2010, Region III published in the Federal Register a Proposed Determination to withdraw specification of Pigeonroost Branch and Oldhouse Branch pursuant to CWA section 404(c). Region III solicited public comments on the Proposed Determination and held a public hearing in Charleston, West Virginia on May 18, 2010. Region III received over 50,000 comments on the Proposed Determination. Of these approximately 70% of comment letters submitted to the docket generally supported EPA's Proposed Determination while 65% of public hearing participants generally opposed EPA's Proposed Determination.

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[2] Issuance of this guidance document is mentioned here solely for purposes of describing recent events related to EPA's understanding of impacts from Appalachian surface coal mine activities. The guidance provides a framework for EPA review of certain proposed surface coal mining applications. This Recommended Determination is based upon Region III's review of scientific and other information regarding the likely effects from the discharges to Pigeonroost Branch and Oldhouse Branch as authorized by DA Permit No. 199800436-3 (Section 10: Coal River). Region III did not rely upon the April 1 Guidance in making its Recommended Determination.

In addition to its DA Permit No. 199800436-3 (Section 10: Coal River), the project received authorizations from the WVDEP, including authorization pursuant to the State's surface mining program approved under the Surface Mining Control and Reclamation Act of 1977 (SMCRA), 30 U.S.C. 1201-1328 (SMCRA permit), and a National Pollutant Discharge Elimination System (NPDES) permit for discharges of pollutants pursuant to Section 402 of the Clean Water Act, 33 U.S.C. 1342. WVDEP also issued a Clean Water Act Section 401 water quality certification.

IV. Characteristics and Functions of the Impacted Resources[3]

The resources that will be impacted by the Spruce No. 1 Mine include Central Appalachian headwater stream ecosystems in Pigeonroost Branch and Oldhouse Branch. Those waters have surface connection and flow to Spruce Fork, which in turn flows to the Little Coal River, and the Coal River. Because of the connectivity between headwater systems and downstream waters, Spruce Fork, the Little Coal River and the Coal River also would be likely to be impacted by discharges to Pigeonroost Branch and Oldhouse Branch. Accordingly, the characteristics and functions of the resources that will be impacted by discharges of fill material associated with the Spruce No. 1 Mine are best viewed from the perspective of the ecologic functions performed by Appalachian headwater stream ecosystems and within the context of the larger Spruce Fork sub-watershed and Coal River sub-basin.

Headwater streams play an important role in the ecosystem far beyond the mere transport of water from one point to another. In many ways, headwater streams are like the capillaries within the human circulatory system. Headwater streams form the largest network of waterbodies within the ecosystem and, as the early stages of the river continuum, provide the most basic and fundamental building blocks to the remainder of the aquatic and human environment. Appalachian headwaters provide habitat for wildlife. They also are a locus of significant interface between the river system and the terrestrial environment. Appalachian headwater streams and their wildlife inhabitants convert organic matter from the surrounding landscape (such as leaf litter) and transform it into nutrients and energy that can be transported and consumed by downstream

[3] Region III derives its understanding of the potentially impacted resources and the predicted impacts of the project from several sources. The Draft (June 2003) and Final (October 2005) Interagency Mountaintop Mining/Valley Fills in Appalachia Programmatic EIS (PEIS) represent an important inter-agency effort designed to inform more environmentally sound decision-making for future permitting of mountaintop mining/valley fills. It had a geographic focus of 12 million acres encompassing most of eastern Kentucky, southern West Virginia, western Virginia, and scattered areas of eastern Tennessee, and included the Spruce No. 1 project area and the Coal River subbasin. EPA also consulted information gathered by the WVDEP, including an assessment of the Coal River sub-basin conducted in 1997, data collected to support the 2006 Coal River sub-basin total maximum daily load (TMDL), and WVDEP and nationally available GIS data. EPA also reviewed the 2006 Spruce No.1 EIS, and other sources of data including studies conducted by EPA scientists and discharge monitoring reports generated by Mingo Logan. In addition, EPA consulted a wide range of peer reviewed studies and literature. EPA Region III also communicated with the US Fish and Wildlife Service Elkins Field Office on impacts to fish and wildlife resources in the project area. Appendices to this Recommended Determination (RD) contain more detailed specific data, analysis and an index of references.

ecosystems. They also play an important role in storing, retaining and transporting nutrients, organic matter, and sediment. In addition they perform hydrologic functions related to downstream flow regimes, moderating flow rate and temperature. "Value of Headwater Streams: Results of a Workshop" from PEIS on MTM/VF (EPA 2003; http://www.epa.gov/region03/mtntop/pdf/appendices/d/value-of-headwater-streams/headwater.pdf); Fischenich, J.C. (2006), *Functional objectives for stream restoration.* EMRRP Technical Notes Collection (ERDC TN-eMRRP-SR-52 Vicksburg).

As authorized, the Spruce No. 1 Mine would bury under valley fills or impact through construction of sedimentation ponds substantially all of Oldhouse Branch and its tributaries and a substantial portion of Pigeonroost Branch and its tributaries. Oldhouse Branch and Pigeonroost Branch support ecosystems and conditions consistent with "least degraded" conditions in the Coal River sub-basin. As such, they are valuable in and of themselves and for the functions they perform within the context of the Spruce Fork sub-watershed and the Coal River sub-basin.

A. Watershed and Stream Conditions

1. Pigeonroost Branch and Oldhouse Branch

The stream systems that are the subject of this Recommended Determination, Pigeonroost Branch and Oldhouse Branch, are healthy stream systems supporting diverse aquatic communities as measured by their benthic macroinvertebrate populations.

In a body of water, benthic macroinvertebrates are the bottom-dwelling (benthic) organisms that are large enough to be seen without the aid of microscopes (macro) and do not have backbones (invertebrate). Freshwater macroinvertebrates, such as mayflies and stoneflies, serve as indicators of ecosystem health, and play a vital role in food webs and in the transfer of energy in river systems. These organisms convert plant material into fats and proteins, food sources critical for maintaining healthy fish and amphibian populations, as well as for foraging terrestrial vertebrates such as birds, bats, reptiles, and small mammals. In this ecological niche, macroinvertebrates deliver energy and nutrients along the stream continuum. They also clean excess living and nonliving organic material from freshwater systems, a service that contributes to the overall quality of the watershed. Because of these functions, macroinvertebrates are essential organisms within the food web, supporting the health of the entire aquatic ecosystem.

Macroinvertebrates are also good indicators of watershed health and are used by West Virginia and other states in the Mid-Atlantic region and across the U.S. to assess the quality of their waters. They are good indicators because they live in the water for all or most of their life cycle. Macroinvertebrates can be found in all streams, are relatively stationary and cannot escape pollution. They also differ in their tolerance to the amount and types of pollution. Macroinvertebrate communities integrate the effects of stressors over time and some taxa (i.e., taxonomic category or group such as phylum, class, family, genus, or species) are considered pollution-tolerant and will survive in degraded conditions. Other taxa are pollutant-intolerant and will die when exposed to certain levels

of pollution. Thus, the composition of tolerant and intolerant (i.e., sensitive) communities informs scientists about the quality of the water.

In a healthy stream, one would expect to find a high diversity of benthic macroinvertebrate taxa and a large number of different taxa including taxa that are more sensitive to stressors. Using the mayfly (Insecta: Ephemeroptera) as an example, some genera of mayfly are more sensitive than others. The presence of a large number of individuals from the more sensitive mayfly genera indicates good water quality conditions. Mayflies in particular have long been recognized as important indicators of stream ecosystem health. Mayflies are a very important part of the native organisms in Appalachian headwater streams and they routinely make up between 30%-50% of the insect assemblages in certain seasons. Numerous studies demonstrate that mayfly community structure reflects the chemical and physical environment of watercourses (e.g., Barber-James et al. 2008; Bauernfeind & Moog 2000). See Appendix 1 for more detail on macroinvertebrates as indicators of water quality.

According to Morse et al. (1997) , the Central Appalachian ecoregion has many endemic and rare species of benthic macroinvertebrates in the orders Ephemeroptera (mayflies), Plecoptera (stoneflies) and Trichoptera (caddisflies).[4] This diversity and unique assemblage has been attributed to the unique geological, climatic, and hydrological characteristics of this region. The Spruce No. 1 Mine project area has been found to be very rich in macroinvertebrates species. Data from the PEIS, the Spruce No. 1 EIS and from the WVDEP monitoring database indicate that high macroinvertebrate diversity exists in Pigeonroost Branch and Oldhouse Branch. Data from EPA, WVDEP, and the applicant's consultants (Sturm Env. Services, BMI, Inc.) reveal that collectively, Pigeonroost Branch, Seng Camp Creek, and Oldhouse Branch contain a high number of mayfly taxa and individuals. A total of 21 genera (Table 2) have been identified from these three headwater streams indicating these systems offer high water quality and optimal habitat.

Macroinvertebrate data collected in Oldhouse Branch indicates that the quality of the macroinvertebrate community in Oldhouse Branch is in the top 5% of all streams in the Central Appalachia ecoregion. In 1999-2000, EPA collected eighty-five (85) macroinvertebrate genera in riffle complexes[5] of Pigeonroost Branch and Oldhouse Branch.

With respect to mayfly taxa, as many as nine genera have been collected in Oldhouse Branch in any one season-specific sample, with an average of seven genera across multiple samples. This observation ranks in the 95th percentile of all samples taken in the Central Appalachian ecoregion (937 samples) by WVDEP. Out of more than 4000

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[4] The orders Ephemeroptera, Plecoptera and Trichoptera (EPT taxa) contain pollution sensitive groups and are used by natural resource agencies such as West Virginia Department of Environmental Protection to assess watershed health.

[5] Riffle and pool complexes are considered special aquatic sites under 40 CFR 230.1(d) and as such the degradation or destruction of these sites is considered to be among the most severe environmental impacts covered by the 404(b)(1) Guidelines.

samples collected statewide in West Virginia, Oldhouse Branch ranks in the 90th percentile. Pigeonroost Branch contained eight mayfly genera in a season-specific sample, ranking it among the 90th percentile in the Central Appalachians and 83rd percentile statewide from among more than 4000 single-sample observations.

The data are similar for stoneflies. Data compiled from EPA, WVDEP, and the applicant's consulting firms show that Oldhouse, Pigeonroost, and Seng Camp collectively yielded 16 genera of stoneflies (Table 3). Oldhouse and Pigeonroost both had 11 genera. A single collection in Oldhouse by EPA (Spring 2000) had 9 genera of stoneflies which ranks greater than the 98th percentile of all Central Appalachian streams sampled by WVDEP (937 samples). This means that only 2% of stream samples in this ecoregion had more stonefly taxa than Oldhouse within a single sampling event. Pigeonroost Branch had as many as six stonefly genera in any one season-specific sample, ranking it at the 83rd percentile among 937 Central Appalachian streams, and 72nd percentile statewide.

Water chemistry data for Pigeonroost Branch and Oldhouse Branch also reflect healthy streams with little human disturbance. Data from WVDEP indicate that average conductivity values for the unmined streams on the Spruce No. 1 project area are very low. Based on the WVDEP dataset (2002-2003), Oldhouse Branch had an average conductivity level of 90 µS/cm, which is below that of White Oak Branch, a nearby reference-quality stream, which had an average conductivity level of 118 µS/cm. Conductivity levels described above in Oldhouse Branch and White Oak Branch indicate excellent water quality, comparable to reference quality streams for this ecoregion. Sulfate concentrations in these streams are also low (28 mg/l in Oldhouse and 24 mg/l in White Oak Branch). Pigeonroost Branch had a conductivity level of 199 µS/cm and sulfate level of 99 mg/l. The slightly elevated average conductivity and sulfate values reflect the relatively small amount of historical mining landuse in the Pigeonroost watershed.

During the December 2008 to March 2010 time frame, discharge monitoring reports submitted by the permittee indicate 15 of the 16 selenium measurements at both Pigeonroost Branch and Oldhouse Branch were below the detection limit of 0.6 µg/L. The single detection of selenium on Oldhouse Branch was 0.9 µg/L during July 2009. The single detection of selenium on Pigeonroost Branch was 1.9 µg/L during August 2009. These readings are far below West Virginia's numeric chronic water quality criterion for selenium of 5 µg/L. These levels are also significantly lower than levels demonstrated immediately downstream of adjacent mining operations, as described below.

2. The Spruce Fork Sub-watershed and the Coal River Sub-basin

The Spruce No. 1 mine is located within the larger Spruce Fork sub-watershed (12-digit hydrologic unit code (HUC) and the Coal River sub-basin (8-digit HUC) (Figure 4). Pigeonroost Branch and Oldhouse Branch flow to Spruce Fork, which in turn flows into the Little Coal River and then into the Coal River. Oldhouse Branch and Pigeonroost

Branch are important within the context of the larger Coal River sub-basin and Spruce Fork sub-watershed because they represent some of the few stream systems supporting least-degraded conditions within those watersheds.

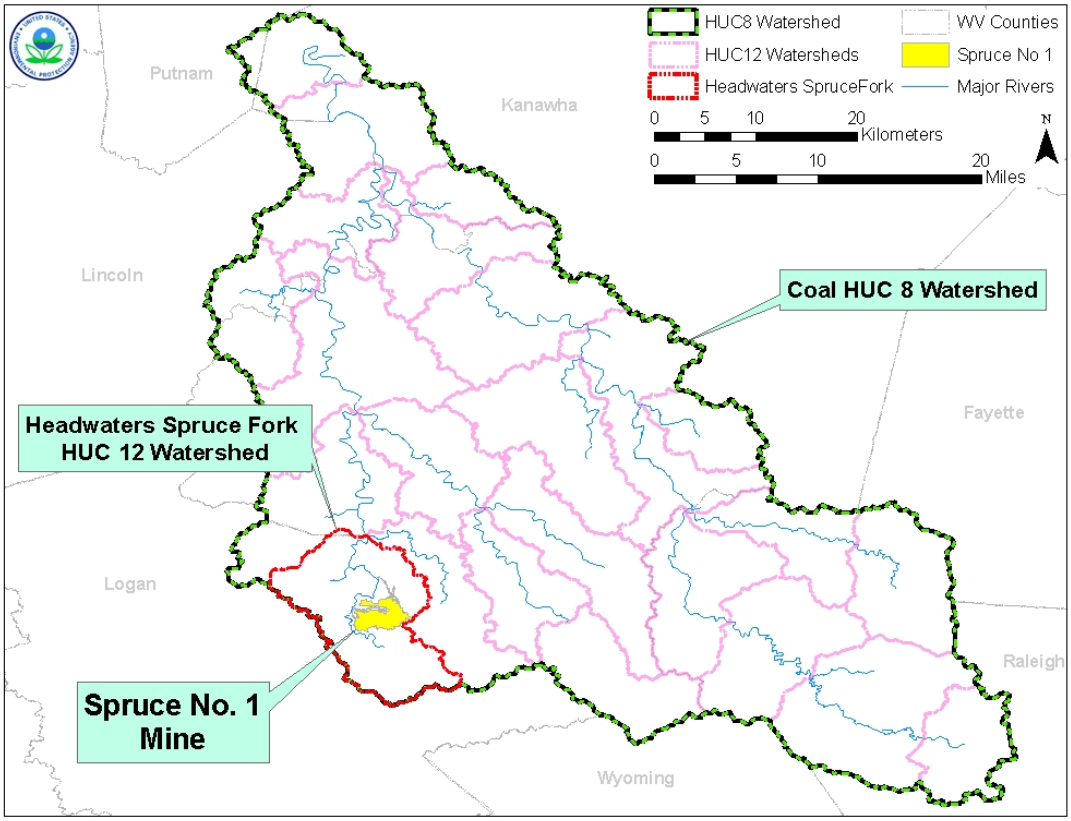

Figure 4 Spruce Fork sub-watershed (12-digit hydrologic unit code (HUC)) and the Coal River sub-basin (8-digit HUC)

The Coal River sub-basin encompasses nearly 891 square miles within West Virginia. Major tributaries within the Coal River sub-basin include Marsh Fork, Clear Fork, Pond Fork, Spruce Fork, and Little Coal River. Marsh Fork and Clear Fork join at Whitesville, WV to form the Big Coal River. Pond Fork and Spruce Fork join at Madison, WV to form the Little Coal River. Little Coal and Big Coal Rivers join to form the Coal River at Forks of the Coal, WV. The Coal River sub-basin has been impacted by past and present surface mining. Based upon the National Land Cover Database (NLCD) change product for 1992-2001 and WVDEP's Geographic Information System (GIS) mining files, more than 257 past and present surface mining permits have been issued in the Coal River sub-basin, which collectively occupy more than 13% of the land area. Some sub-watersheds in the Coal River sub-basin have more than 55% of the land occupied by surface mine permits.

The Spruce Fork sub-watershed, where the project is located, is a fourth order tributary that combines with Pond Fork to form the Little Coal River, which in turn flows into the Coal River. Spruce Fork is located in the southwestern portion of the Coal River watershed and drains approximately 126.4 square miles. The dominant landuse in the

Spruce Fork watershed is forest. Other important landuse types include urban/residential and barren/mining land. The Spruce Fork sub-watershed has been impacted by past and present surface mining activity. According to WVDEP Division of Mining and Reclamation permit maps, within the Headwaters Spruce Fork sub-watershed, where Spruce No. 1 is to be located, there are more than 34 past and present surface mine permits issued which collectively occupy more than 33% of the land area. Assuming full constructions of these projects in addition to known future surface mining permits, more than 40% of the land area of the sub-watershed will be affected.

In 1997, the WVDEP performed its first comprehensive ecological assessment of the Coal River sub-basin[6]. WVDEP assessed three major aspects of watershed health: water quality, habitat condition, and benthic macroinvertebrate community status. The subsequent report, An Ecological Assessment of the Coal River Watershed (1997), indicated that sediments, coal mining and inadequate sewage treatment were the major stressors on streams in this watershed. As a part of that assessment WVDEP stated:

> High quality streams with minimal human disturbances provide significant and even irreplaceable wildlife habitat. They also provide a tremendous recreational resource. No sites in the Coal River Watershed met the minimum criteria for reference site status. This is the first of 32 watersheds studied in West Virginia that produced no potential reference sites. Researchers conducting the EPA study on mountaintop mining, alluded to previously, have found a few small streams within the watershed that may meet the reference site criteria. The Program has since adopted one stream, White Oak Branch, (KC-10-T-22), as a reference site. Since reference sites reflect least-degraded conditions, it is vital that the WVDEP do its part in fulfilling the mission of preserving the high quality of these rare and important streams. It is also important that the agency make a concerted effort to find the apparently few remaining streams within the watershed that have not been significantly impacted by human disturbances.

White Oak Branch, referenced above in WVDEP's 1997 study, flows to Spruce Fork immediately upstream of Oldhouse Branch and Pigeonroost Branch. As noted above, WVDEP has adopted White Oak Branch as a reference site. WVDEP defines reference conditions as those conditions that "describe the characteristics of waterbody segments least impaired by human activities and are used to define attainable biological and habitat conditions. Final selection of reference sites depends on a determination of minimal disturbance, which is derived from physico-chemical and habitat data collected during the assessment of the stream sites." Reference sites are used to determine the score that represents the threshold between impaired and non-impaired sites.

Based on a comparison of their macroinvertebrate communities, Oldhouse Branch and Pigeonroost Branch are of comparable quality to White Oak Branch. Accordingly, Oldhouse Branch and Pigeonroost Branch reflect least–degraded conditions and represent

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[6] Report can be found at http://www.dep.wv.gov/WWE/watershed/wqmonitoring/Documents/EcologicalAssessments/EcoAssess_Coal_1997.pdf

some of the few remaining streams within the Coal River sub-basin that have not been significantly adversely impacted by human disturbances.

Oldhouse Branch flows into Spruce Fork immediately downstream of White Oak Branch and exhibits similar healthy biological diversity and water quality (EPA data). Using the West Virginia Stream Condition Index (WVSCI), an assessment method developed for use in West Virginia to help evaluate the health of benthic macroinvertebrate communities at the family level in wadeable streams,[7] both Oldhouse Branch and White Oak Branch scored comparably well, meaning that both were of similar quality and supporting similar aquatic communities.

Oldhouse Branch and White Oak Branch also score comparably well when the benthic macroinvertebrate community is considered at the more sensitive genus (as opposed to family) level. For instance, Oldhouse Branch shared 55 total genera (many of them pollution intolerant) with White Oak Branch (EPA data) indicating a diverse and healthy aquatic community in Oldhouse Branch similar to the high quality communities of White Oak Branch.

Pigeonroost Branch also shares many macroinvertebrate genera (many of them pollution intolerant) in common with the high quality community in White Oak Branch, indicating that the health of Pigeonroost Branch's aquatic community is similar. The WVSCI assessment of Pigeonroost indicates water quality is relatively good despite the presence of localized historic mining in the watershed. See Section IV.B.1. and Appendix 1 for more detail on macroinvertebrates at the Spruce No. 1 mine project site.

The relatively high quality of Oldhouse Branch and Pigeonroost Branch also can be demonstrated by comparison to other streams in the Spruce Fork sub-watershed that have been impacted by mining operations similar to the Spruce No. 1 Mine. Four such streams are directly northwest of the Spruce No. 1 project, on the west side of Spruce Fork, and in part, are impacted by the Mingo Logan Dal-Tex Mining Operation. Section V.B.2.a below compares the health of the relatively unimpacted macroinvertebrate communities in Pigeonroost Branch and Oldhouse Branch with the macroinvertebrate communities in streams elsewhere within the Spruce Fork sub-watershed that have been impacted by mining activity. By way of summary here, Oldhouse Branch and Pigeonroost Branch support a much healthier and more diverse assemblage of benthic macroinvertebrates than do the four comparison streams that are impacted by the Dal-Tex operation.

B. Wildlife

The ecoregion where the Spruce No. 1 project is be located (Figure 5) has some of the greatest aquatic animal diversity of any area in North America, especially for species of amphibians, fishes, mollusks, aquatic insects, and crayfishes. Salamanders in particular reach their highest North American diversity in the Central Appalachian ecoregion.

[7] For a more detailed discussion of WVSCI, see Section V.B.2.a.iii.

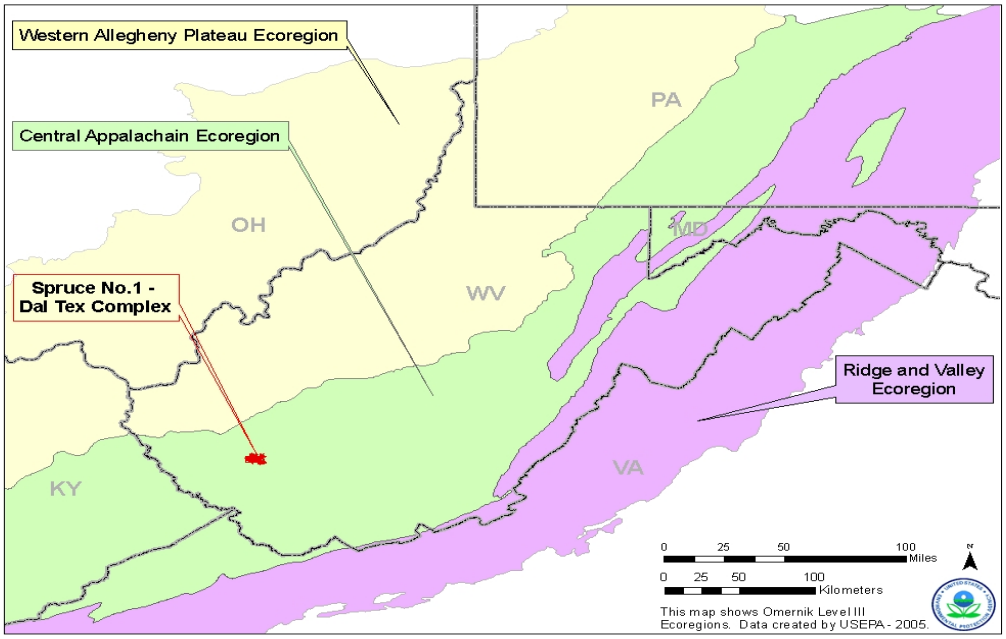

Figure 5 Central Appalachian Ecoregion

The ecoregion where the Spruce No. 1 project is located includes one of the most prominent biodiversity hot spots of rarity and richness identified by The Nature Conservancy (TNC) (Figure 6).

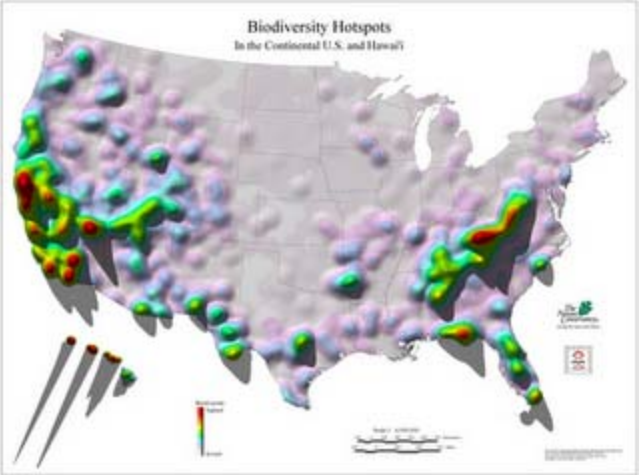

Figure 6: TNC Biodiversity Hotspots

Map adapted from Precious Heritage:
The Status of Biodiversity in the United States.
Data from State Natural Heritage Programs and their cooperators.
Map produced by TNC Eastern Conservation Science GIS, 5/19/00.
© The Nature Conservancy
http://www.nature.org/wherewework/northamerica/states/westvirginia/science/

Individual watersheds and peaks in the Appalachian chain, isolated for millions of years with benign environmental conditions, provided a perfect setting for the evolution of unique species of plants, invertebrates, salamanders, crayfishes, freshwater mussels, and fishes. These forests represent the center of the earth's salamander diversity. Not only are there numerous species, but salamanders also are incredibly abundant here, often accounting for the most vertebrate biomass in a given patch of forest (Stein et al, 2000). It has been documented that other specialized wildlife such as some neotropical migrant birds and forest amphibians rely on the natural headwater stream condition and adjacent forest types exhibited by Pigeonroost Branch and Oldhouse Branch for maintenance of their populations (Stein et al, 2000).

1. Invertebrates

As set forth above in Section IV.B.1. above, Pigeonroost Branch and Oldhouse Branch support diverse and healthy communities of benthic macroinvertebrates. In terms of its mayfly community, Oldhouse Branch ranks in the top 5% in the eco-region and the top 10% in the State. Oldhouse Branch's stonefly community ranks in the top 2% of the ecoregion. Pigeonroost Branch's mayfly community ranks among the top 10% in the co-region and the top 17 % in the State. Pigeonroost's stonefly community ranks in the top 17% in the eco-region and the top 28% third of the State.

As described above, benthic macroinvertebrates are the bottom-dwelling (benthic) organisms that are large enough to be seen without the aid of microscopes (macro), and are not equipped with backbones (invertebrate). Put simply, they are aquatic insects. In addition to serving as indicators of ecosystem health, freshwater macroinvertebrates, including mayflies and stoneflies, play a vital role in food webs and in the transfer of energy in river systems. These organisms essentially convert plant material into food sources (fats and proteins) essential for the maintenance of healthy fish and amphibian populations, and for foraging terrestrial vertebrates such as birds, bats, reptiles, and small mammals; serving as critical foodchain organisms, vital to the sustenance of healthy ecosystems. Because of their productivity and secondary position in the aquatic food chain, macroinvertebrates play a critical role in the delivery of energy and nutrients along the stream continuum. They also are instrumental in cleaning excess living and nonliving organic material from freshwater systems, a service that contributes to the overall quality of the watershed.

Macroinvertebrates are indigenous to central Appalachian streams and their naturally occurring communities are important components of stream ecosystems. Macroinvertebrates are recognized as wildlife by several organizations, including the US Fish and Wildlife Service (USFWS), USDA Forest Service, The Nature Conservancy, State Natural Heritage programs, and the West Virginia Department for Natural Resources (WVDNR). Currently, within the U.S., the USFWS lists 50 species of insects as endangered under the Endangered Species Act (ESA), and another 10 species as threatened under the ESA. Insects represent 10.4 percent of all currently-listed animals in the U.S. and 4.4 percent of all listed species, including plants (http://ecos.fws.gov/tess_public/pub/boxScore.jsp). Several dozen other insects are candidates for listing under the ESA, including the Sequatchie caddisfly (*Glyphopsyche sequatchie*), a trichopteran found in Tennessee.

The State of West Virginia also considers insects to be wildlife, and includes insects on its list of rare, threatened and endangered species. Many aquatic insects are listed, including: 12 species of stoneflies, two species of mayflies, and 73 species of dragonflies and damselflies (West Virginia Natural Heritage Program 2007). Scientists and environmental consultants who collect benthic macroinvertebrates in West Virginia must obtain a wildlife collection permit from WVDNR.

Mayflies are most popularly known among fly-fishermen, where anglers rely on the seasonal hatches of mayflies that coincide with catching trout and other game fish species. Not only do trout rely on mayflies and stoneflies, but a group of colorful benthic fishes known as Darters (Percidae) feed primarily on mayflies. A dietary study of small stream fishes in the Appalachian coalfields of Kentucky (Lotrich 1973) showed that gut contents of several darters contained mostly mayflies. Darters are an important part of the fish assemblage and many are hosts for mussel larvae. Several darter species inhabit Spruce Fork in the immediate vicinity of the project area. Table 1 identifies the mayfly genera that have been identified in the Spruce No. 1 mine permit area.

Table 1. Presence/absence of mayfly genera in the permit area.

Order	Family	Genus	Oldhouse	Pigeonroost	Seng Camp
Ephemeroptera	Ameletidae	*Ameletus*	X	X	
Ephemeroptera	Baetidae	*Acentrella*	X	X	
Ephemeroptera	Baetidae	*Baetis*	X	X	X
Ephemeroptera	Baetidae	*Diphetor*		X	
Ephemeroptera	Baetiscidae	*Baetisca*		X	X
Ephemeroptera	Caenidae	*Caenis*			X
Ephemeroptera	Ephemerellidae	*Attanella*		X	X
Ephemeroptera	Ephemerellidae	*Dannella*		X	X
Ephemeroptera	Ephemerellidae	*Drunella*	X	X	
Ephemeroptera	Ephemerellidae	*Ephemerella*	X	X	
Ephemeroptera	Ephemerellidae	*Eurylophella*	X	X	X
Ephemeroptera	Ephemeridae	*Ephemera*	X	X	X
Ephemeroptera	Heptageniidae	*Cinygmula*	X	X	
Ephemeroptera	Heptageniidae	*Epeorus*	X	X	
Ephemeroptera	Heptageniidae	*Heptagenia*		X	
Ephemeroptera	Heptageniidae	*Maccaffertium*	X	X	X
Ephemeroptera	Heptageniidae	*Stenacron*	X		X
Ephemeroptera	Isonychiidae	*Isonychia*		X	X
Ephemeroptera	Leptophlebiidae	*Choroterpes*	X		
Ephemeroptera	Leptophlebiidae	*Paraleptophlebia*	X		X

Note: Siphlonurus and Pseudocloeon reported by Sturm Env. are likely erroneous identifications. These genera have been excluded from this list.

Stoneflies (Plecoptera) also represent an important group of aquatic insects in the structure and functioning of stream ecosystems. Stoneflies also fill important trophic roles in stream ecosystems, as displayed by their detritivory (consumption of dead or decaying organic matter) and predatory functional feeding group designations. As with mayflies, stoneflies are valued and imitated by fly-fishermen and serve as an abundant food source for many salamanders and fishes. Stoneflies are primarily stenothermic, meaning they inhabit cool to cold waters which provide the higher dissolved oxygen concentrations required for their survival. Table 2 presents the stonefly genera identified in the Spruce No. 1 Mine area.

Table 2. Presence/absence of stonefly genera in the permit area.

Order	Family	Genus	Oldhouse	Pigeonroost	Seng Camp
Plecoptera	Capniidae	*Allocapnia*	X	X	X
Plecoptera	Chloroperlidae	*Alloperla*		X	
Plecoptera	Chloroperlidae	*Haploperla*	X		
Plecoptera	Chloroperlidae	*Sweltsa*	X		
Plecoptera	Leuctridae	*Leuctra*	X	X	X
Plecoptera	Nemouridae	*Amphinemura*	X	X	
Plecoptera	Nemouridae	*Ostrocerca*	X	X	
Plecoptera	Nemouridae	*Paranemoura*		X	
Plecoptera	Peltoperlidae	*Peltoperla*	X		X
Plecoptera	Perlidae	*Acroneuria*	X	X	X
Plecoptera	Perlodidae	*Isoperla*	X		X
Plecoptera	Perlodidae	*Remenus*		X	
Plecoptera	Perlodidae	*Yugus*	X		
Plecoptera	Pteronarcyidae	*Pteronarcys*	X	X	X
Plecoptera	Taeniopterygidae	*Taenionema*		X	
Plecoptera	Taeniopterygidae	*Taeniopteryx*		X	X

Note: Podmosta, Paraleuctra, Megaleuctra,and Beloneuria reported by Sturm Env. are likely erroneous identifications. These genera been excluded from this list.

2. Salamanders

The ecoregion where the Spruce No. 1 project is located contains one of the richest salamander fauna in the world (Petranka 1998, Stein et al., 2000). Nearly ten percent of global salamander diversity is found within streams in the ecoregion (Green and Pauley, 1987). Salamanders are a diverse and unique form of Appalachian wildlife that depend on forested headwater habitat and decline or disappear from surface mined areas. Many species of salamanders are aquatic or semi-aquatic and utilize headwater streams at some point in their life histories. Most of the species found in the project area are water-dependent and belong to the family Plethodontidae, the lungless salamanders, which require high moisture retaining leaf-litter, dense shade, and cool flowing streams to survive and reproduce. Typically, salamanders occupy small, high-gradient headwater streams while fish occur farther downstream.

Salamanders are an important ecological component in the mesic (medium precipitation) forests of the ecoregion and are often the most abundant group of vertebrates in both biomass and number (Burton and Lykens, 1975; Hairston, 1987). Ecologically, salamanders are intimately associated with forest ecosystems acting as predators of small invertebrates and serving as prey to larger predators (Pough et al., 1987). Some species of salamanders split their lives between forests and headwaters and depend on a close connection to move between the two (Petranka, 1998).

Moler and Franz (1987) cite the work of Burton and Likens (1975) and Gosz et al. (1978) in New Hampshire who suggest an important role for amphibians in energy cycling. Burton and Likens (1975) found that the biomass of salamanders was about double that of birds during the peak birding season and about equal to the biomass of small mammals. Gosz et al. (1978) found that salamanders and shrews were the most important vertebrates preying on the invertebrates of the forest floor. They estimated that birds consumed 6.5 times, and shrews 4.7 times, the amount of food energy consumed by the salamander community. However, because the warm-blooded birds and shrews expended 98% of their energy intake on metabolic maintenance compared to only 40% for the salamanders, salamanders contribute 4.6 (shrews) and 6.3 (birds) times as much biomass to the available prey base, making them an important component of the foodweb.

With respect to the immediate project area, stream-dwelling salamanders have been surveyed in White Oak Branch (USFWS, unpublished data, 2004). White Oak Branch had good numbers of Northern Dusky (9 adult, 7 larvae), Appalachian Seal (15 adult, 12 larvae), and Two Lined salamanders (1 adult and 15 larvae). These numbers represent densities in a 12 square meter plot that includes dry and wetted portions of the stream channel. Because Oldhouse Branch and Pigeonroost Branch are very close geographically and have similar features as White Oak Branch, salamander populations in Pigeonroost and Oldhouse Branch can be expected to be similar to those in White Oak Branch. Williams (2003) found mean densities within reference reaches of Pigeonroost, Bend Branch (another tributary of Spruce Fork), and Ash Fork (a tributary of Gauley River) at more than six salamanders per square meter. In the Williams' study, the majority of the total catch of salamanders was found in Pigeonroost.[8] Using these numbers from White Oak Branch and Pigeonroost, EPA estimates aquatic salamanders are indeed abundant (~5-6 per square meter) along stream channels in Pigeonroost Branch and Oldhouse Branch.

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[8] Williams (2003) data from the WV MTM region also showed that while more individuals were found in the lower 1st-2nd order reaches, slightly more species (8 spp.) were actually found in the upper intermittent reaches.

3. Fish

Fish communities change with watershed size and respond to gradients of physical habitat and chemistry. The fish assemblages in Pigeonroost Branch and Oldhouse Branch are typical of headwater streams, containing only a few species. The fish assemblages in Spruce Fork are in relatively good condition. Spruce Fork is a locally important rock bass and smallmouth bass fishery. These fish assemblages are not representative of pristine conditions and it is likely that some of the more sensitive species may have been historically extirpated from past anthropogenic activities, including mining.

In an analysis of fish community data from Spruce Fork, Region III assessed the small streams immediately impacted by the Spruce No. 1 permit and three reaches of Spruce Fork: 1) Upstream of Seng Camp, 2) Seng Camp to Spruce Laurel, and 3) Downstream of Spruce Laurel. Other data analyzed included data collected for the Programmatic Environmental Impact Statement (PEIS) for Mountaintop Mining/Valley Fills. (see Stauffer and Ferreri, 2002 and Fulk et al. 2003); unpublished data included in the West Virginia Department of Natural Resources database (including USEPA, WVDNR, and consulting firm data); and data from Decota Consulting (consultants for Mingo Logan) supplied to the WVDNR collecting permit program. The data consisted of samples that were intended for community assessment and were judged to have sufficient numbers of individuals to render a fair assessment. Fish community data can be difficult to analyze and oftentimes the absence of species may be due to zoogeography (how they were distributed in response to past geological events) or due to stressors over time in the watershed. Some of these stressors may still be apparent and some may not.

The fish found in Pigeonroost Branch, Oldhouse Branch, and White Oak Branch are typical of small streams in the Coal River Basin. They do not indicate impairment, nor do they indicate reference conditions. EPA compared samples collected for the PEIS in 1999 and more recent data collected by Decota Consuting from 2008 and 2009. When sampled for the PEIS, Pigeonroost Branch had been affected by drought and only blacknose dace and creek chubs were present. These species are tolerant of disturbance and are headwater species adapted to drought. White Oak Branch also was sampled for the PEIS at the same time. It too was drought-affected and contained only blacknose dace at the time of the PEIS sampling in 1999. No samples were collected in Oldhouse Branch for the PEIS.

More recent data indicates that Pigeonroost Branch also has a population of mottled sculpin, and at times smallmouth bass and stonerollers. More recent data from White Oak Branch indicates that creek chubs are also present in good numbers and mottled sculpin are rare (only 1 individual captured). Data from Oldhouse Branch indicates that blacknose dace and creekchubs are the only species present.

For the PEIS, Fulk et al. (2003) used the Mid-Atlantic Highlands (MAHA) Index of Biotic Integrity (IBI - a multi-metric index used to assess biotic health), with some minor modification, to assess the impacts of MTM/VF to fish assemblages. Using this same

index, the assemblage upstream of Seng Camp Creek ranged from fair to excellent condition.

The fish assemblage in the mainstem of Spruce Fork is in relatively good condition. Spruce Fork is a locally important rock bass and smallmouth bass fishery. Rock Bass and Smallmouth Bass are moderately sensitive gamefish species. While sampling Spruce Fork in 2010, recreational fishing was observed in the lower reaches of the stream and there was evidence of fishing in the upper reaches as well. Species present in Spruce Fork upstream and downstream of Seng Camp Creek are typical of streams of this size within the Coal River Basin and have not changed appreciably over the last 60 years.

4. Birds[9]

Many terrestrial bird species depend on the headwater streams like those of the Spruce Fork for their survival. The ecotone (transition area) between terrestrial and aquatic habitats results in diverse flora and fauna. For example, unique avifauna assemblages can be found along the riparian zone of headwater streams.

Among the many migratory birds likely to breed in the project area, there are six species that the USFWS has designated as Birds of Conservation Concern (BCC) within the Appalachian Mountains Bird Conservation Region (AMBCR). These include the cerulean, Kentucky, Swainson's and worm-eating warblers, the wood thrush, and the Louisiana waterthrush. The first five of these are also designated as BCC species within the USFWS's Northeast Region as a whole and nationally (USFWS 2008). The first four are also considered to be among the 100 most at-risk bird species in North America (Wells 2007).

The Louisiana waterthrush (*Seirus motacilla*), a neotropical migrant song bird, is considered an obligate headwater riparian songbird (an example of water-dependent wildlife) because its diet is comprised predominantly of immature and adult aquatic macroinvertebrates found in and alongside headwater streams and because it builds its nest in the stream banks. Breeding waterthrushes nest and forage primarily on the ground along medium- to high-gradient, first- to third-order, clear, perennial headwater streams flowing through closed-canopy forest. Good water quality is a key component of the species breeding habitat. Headwater streams like Pigeonroost Branch and Oldhouse Branch that support healthy macroinvertebrate communities are food sources for species such as the Louisiana waterthrush.

The Appalachian Mountain Bird Conservation Region (AMBCR), which extends from southeastern New York south to northern Alabama, is thought to support a substantial portion of the Louisiana waterthrush's breeding population, perhaps as much as 45 percent. West Virginia, the only state that lies entirely within the AMBCR, encompasses the largest contiguous area of high relative breeding abundance over the species' entire breeding range, based on North American Breeding Bird Survey (BBS) data from 1994-

[9] Much of the discussion related to avian and bat species is based upon communications with the U.S. Fish and Wildlife Service.

2003. The West Virginia population may serve as a source for populations elsewhere in the breeding range. The Louisiana waterthrush is also an area-sensitive species, requiring undisturbed forest tracts of 865 acres to sustain a population (Robbins, C.S., J.R. Sauer, RS. Greenburg**,** and S. Droege. 1989). The most effective management protocol for the Louisiana waterthrush would appear to be protection of forest tracts and water systems inhabited on both breeding and wintering areas particularly moderate- to high-gradient headwater streams, which compose 75-80% of stream length in a typical watershed.

Bird species that rely on mature forest habitats that are on the Audubon watch list as declining species and are listed as probable in the area include the Swainson warbler (*Limnothlypis swainsonii*), Kentucky warbler (*Oporornis formosus*), and Cerulean warbler (*Dendroica cerulean*).

The Cerulean warbler in particular is considered an area-sensitive species; it is thought to require large (greater than 30 sq miles) tracts of mature interior forest habitat to support stable breeding populations. This species is a canopy-foraging insectivorous neotropical migrant songbird that breeds in mature deciduous forests with broken, structurally-diverse canopies across much of the eastern United States and winters in middle elevations of the Andes Mountains of northern South America. Important among a number of breeding season constraints are the loss of mature deciduous forest, particularly along stream valleys, and fragmentation and increasing isolation of remaining mature deciduous forest. The cerulean warbler appears to be more sensitive than most other North American birds to landscape-level changes in habitat. The USFWS has designated the cerulean warbler a Species of Management Concern and a Species of Conservation Concern throughout its range. It has also been preliminarily designated by the Appalachian Mountains Joint Venture as a Species of Highest Conservation Priority within the Appalachian Mountains Bird Conservation Region, which encompasses West Virginia. The AMBCR is thought to support about 80 percent of the species' entire breeding population, and the AMBCR breeding population likely functions as a source for populations elsewhere in the breeding range.

The Acadian flycatcher (*Empidonax virescens*) is commonly encountered throughout the Central Appalachian Ecoregion, but despite the large expanse of existing forest habitat, it is primarily restricted to forested tracts with understory vegetation along small headwater streams, where it can feed on emergent aquatic insects. Spruce Fork and its tributaries meets these habitat requirements. Neotropical migrant songbirds are also often attracted to headwater streams for breeding areas because of the diversity of the habitat and the availability of emergent aquatic insects.

5. Bats

Thirteen species of bats are found in West Virginia. Most North American bats are insectivorous, which capture their prey by foraging in flight, catching flying insects from a perch, or collecting insects from plants.

Different species of bats often have distinct life history traits and behaviors. Some bats

are solitary and hang in tree foliage, attics, barns, and other protected places during the day. Other bats are colonial and cluster in caves and mine tunnels. Bats have one of the slowest reproductive rates for animals their size. Most bats in northeastern North America have only one or two pups a year and many females do not breed until their second year. This low reproductive rate is somewhat offset by a long life span, often over 20 years. The little brown bat, common in North America and in West Virginia, is the world's longest lived mammal for its size, with a maximum life-span over 32 years. During the winter, some bats migrate south in search of food, while others hibernate through the cold weather when insects are scarce. Bats that do migrate usually travel less than 200 miles, often following the same routes as migratory birds.

Species that have potential to be found in the area of south-Central West Virginia that encompasses the Spruce No. 1 Mine include the northern bat (*Myotis septentrionalis*), big brown bat (*Eptesicus fuscus*), red bat (*Lasiurus borealis*), eastern small-footed bat (*Myotis leibii*), Virginia big-eared bat (*Corynorhinus townsendii virginianus*), northern long-eared bats *(Myotis septentrionalis)* and the Indiana bat (*Myotis sodalis*).

Both the Indiana and Virginia big-eared bats are listed as endangered under the Endangered Species Act. The USFWS was also recently petitioned to list the eastern small-footed bats and the northern long-eared bats under the ESA. Five eastern small-footed bats and 16 northern long-eared bats were captured during mist net surveys conducted at the Spruce No. 1 project site in 2004, representing 7.6 and 24.2 percent, respectively, of all bats captured (U.S. Army Corps of Engineers Huntington District 2006, DEIS Spruce No. 1 Mine. Appendix M).

Indiana bats have been described as once one of the most common mammals in the Eastern United States. Between 1960 and 2004, biologists have documented a 56 percent population decline in Indiana bats. Indiana bats feed solely on emerged aquatic and terrestrial flying insects. They are habitat generalists and their selection of prey reflects the environment in which they forage. In a study in the Allegheny Mountains, activity in non-riparian upland forest and forests in which timber harvest had occurred was low relative to forested riparian areas. This evidence suggests that the forested riparian zones of the project area would be more suitable habitats for Indiana bat populations than active or restored mining sites.

Mist net surveys were conducted in the project area in 2000 and 2004, and no Federally-listed bats were captured. Although the capture of bats confirms their presence, failure to catch bats does not absolutely confirm their absence (U.S. Fish and Wildlife Service 2007, pg. 252). The project area occurs roughly half-way between known hibernacula in northeastern Kentucky and southeastern West Virginia. Since the most recent surveys at the Spruce No. 1 site, maternity roosts have been documented in central and north-central Boone County. Additionally, a juvenile Indiana bat was captured on August 9, 2010 in southwest Fayette County, indicating the presence of a maternity colony in that area.

C. Summary

Based on the foregoing, EPA Region III finds that Pigeonroost Branch and Oldhouse Branch contain important wildlife resources and habitat. The Region bases its conclusion on several factors including the similarity of Pigeonroost Branch and Oldhouse Branch to the reference quality White Oak Branch and therefore they support conditions representing some of the last remaining least degraded streams and riparian areas within the Spruce Fork sub-watershed and the Coal River sub-basin.

V. Basis for Recommended Determination

A. Section 404(c) Standards

Section 404(c) provides:

> The Administrator is authorized to prohibit the specification (including the withdrawal of specification) of any defined area as a disposal site, and he is authorized to deny or restrict the use of any defined area for specification (including the withdrawal of specification) as a disposal site, whenever he determines, after notice and opportunity for public hearings, that the discharge of such materials into such area will have an unacceptable adverse effect on municipal water supplies, shellfish beds and fishery areas (including spawning and breeding areas), wildlife, or recreational areas. Before making such determination, the Administrator shall consult with the Secretary. The Administrator shall set forth in writing and make public his findings and his reasons for making any determination under this subsection.

While EPA strongly prefers to initiate the Section 404(c) process prior to issuance of a permit, Section 404(c) and EPA's implementing regulations authorize EPA to initiate the Section 404(c) process after a permit has been issued by withdrawing specification of a disposal site. See 40 CFR 231.1(a); see also definition of "withdraw specification," 40 CFR 231.2(a). In this case, consistent with Section 404, Pigeonroost Branch and Oldhouse Branch were specified as disposal sites in DA Permit No. 199800436-3.

Section 404(c) does not define the term "unacceptable adverse effect." EPA's regulations at 40 CFR 231.2(e) define "unacceptable adverse effect" as:

> Impact on an aquatic or wetland ecosystem which is likely to result in significant degradation of municipal water supplies or significant loss of or damage to fisheries, shellfishing, or wildlife habitat or recreation areas. In evaluating the unacceptability of such impacts, consideration should be given to the relevant portions of the Section 404(b)(1) Guidelines (40 CFR Part 230).

For purposes of the Spruce No. 1 mine, the relevant portions of the Section 404(b)(1) Guidelines that are particularly important for assessing the unacceptability of environmental impacts include:

- Less environmentally damaging practicable alternatives (230.10(a))

- Water quality impacts (230.10(b))
- Significant degradation of waters of the United States (230.10(c))
- Minimization of adverse impacts to aquatic ecosystems (230.10(d))
- Cumulative effects (230.11(g)); and
- Secondary effects (230.11(h))

The purpose of the Clean Water Act is to "restore and maintain the physical, chemical, and biological integrity of the Nation's waters." 33 U.S.C. 1251(a). Part of the concept of protecting the "biological integrity" of the Nation's waters is protection of the indigenous, naturally occurring community. This goes beyond protecting the function performed by various members of the aquatic community and extends to protection of the quality of the aquatic community itself. *See Alameda Water & Sanitation District v. EPA*, 930 F. Supp.486 (D. Colo. 1996).

B. Adverse impacts from specification of Pigeonroost Branch and Oldhouse Branch as disposal sites for discharges of dredged and/or fill material from the Spruce No. 1 Mine

The impacts from the specification of Pigeonroost Branch and Oldhouse Branch as disposal sites for discharges of dredged and/or fill material from the Spruce No. 1 Mine will occur through several different pathways.

First, direct impacts will occur as a result of the discharge of fill (excess spoil, minethrough, and construction of valley fills), which will bury much of Pigeonroost Branch and Oldhouse Branch and eliminate the buried ecosystems, including all wildlife living in those streams. Burial of Pigeonroost Branch and Oldhouse Branch also will eliminate habitat for wildlife that depend upon those streams. Loss of the buried portions of Pigeonroost Branch and Oldhouse Branch will impact wildlife that depend on those headwater streams for all or part of their lifecycles and adversely affect adults, juveniles, larvae, and/or eggs.

In addition, adverse impacts will occur to wildlife that live outside the footprint of the fills and sedimentation ponds. Discharges of fill material into Pigeonroost Branch and Oldhouse Branch will have the effect of removing those streams as sources of freshwater dilution and adversely affect the delivery of headwater stream ecosystem functions to downstream waters. Studies have shown a strong correlation between the construction of valley fills for surface coal mining in Applachia and significant adverse impact on downstream macroinvertebrate communities.

There is also a likelihood that the discharges authorized by DA Permit No. 199800436-3 (Section 10: Coal River) into Pigeonroost Branch and Oldhouse Branch will transform those areas into sources of contaminants (particularly conductivity and selenium) contributing to degradation of downstream waters. The project as authorized also has the potential to contribute to conditions that would support blooms of golden algae that release toxins that can kill fish and other aquatic life.

To evaluate the impacts of the Spruce No. 1 project, Region III has consulted the PEIS and available data and literature documenting impacts from similar projects. Region III also has examined impacts caused by the portion of the Spruce No. 1 Mine that has already been

constructed in the Seng Camp Creek watershed (specifically, Valley Fill 1A). In addition, Region III reviewed the nearby Mingo Logan Dal-Tex operation. Based on location and similarity of geology and minerals, impacts from the Mingo Logan Dal-Tex operation are likely to be a good predictor of impacts from the Spruce No. 1 Mine. This was acknowledged by the Huntington District Corps of Engineers in the Spruce No. 1 EIS, which stated: "The past and present impacts to topography, geology, and mineral resources of the previous mining along the western side of Spruce Fork are similar to the anticipated impacts of the Spruce No. 1 Mine, as mining is to occur in the same strata."

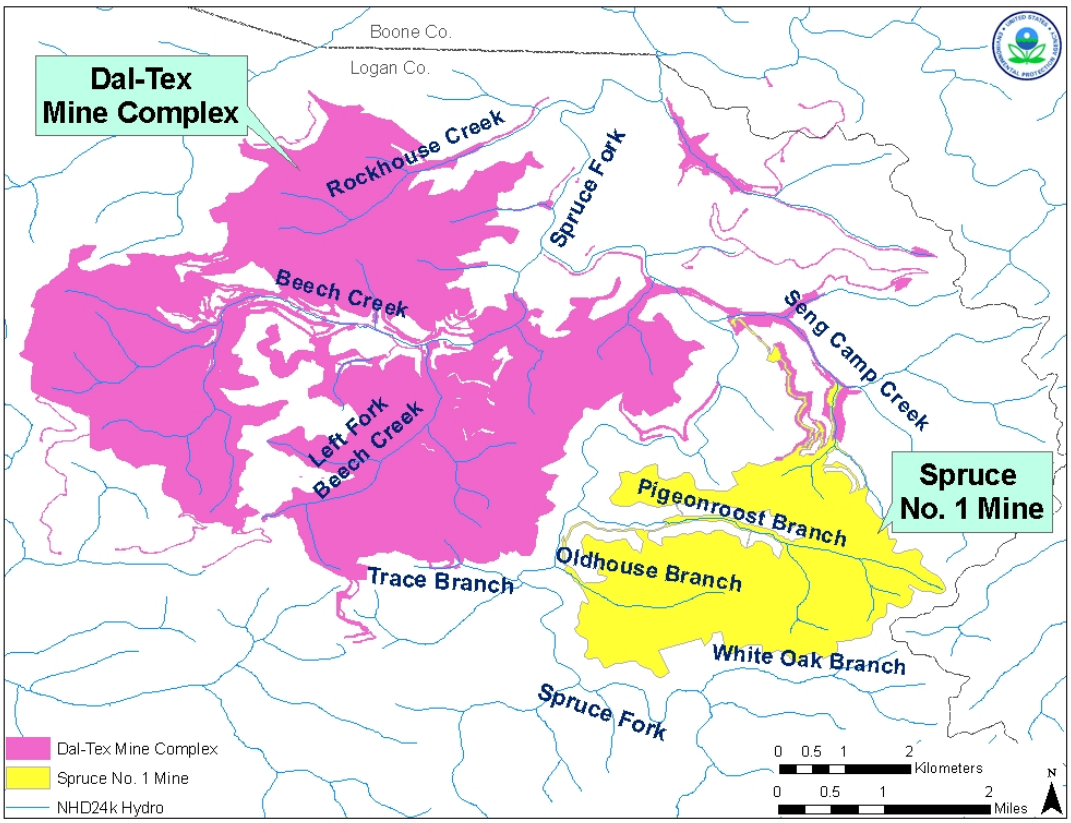

Figure 7 Spruce No. 1 Mine and the Dal-Tex Mine Operation

Region III completed a review of rock cores and corresponding cross sections for the Dal-Tex mines including the Gut Fork mine (immediately across Spruce Fork from Spruce No.1; Figure 7) and compared those to the Spruce No. 1 mine. This review, which is set forth in Appendix 4, indicates that, for the most part, the formations are repeated from the Dal-Tex mine complex to the Spruce No 1 mine location. Per the EIS, the same coal beds are to be developed for the Spruce No. 1 mine as for the Del-Tex mine. Also, these coal bed sequences are similar to those described in the literature for southern West Virginia coal bed sequences and the geologic column for the Spruce No 1 mine.

1. Effects on Water Chemistry

The Section 404(b)(1) Guidelines direct that no permit should issue if the discharge will cause or contribute to violations of applicable water quality standards or if the discharge will cause or contribute to significant degradation of the aquatic ecosystem, including but not limited to significant adverse effects on stages of aquatic life and other wildlife dependent upon aquatic ecosystems, including the transfer concentration, and spread of pollutants or their byproducts outside the disposal area. 40 C.F.R. §§230.10(b)(1) & 230.10(c). *See also* 40 C.F.R. §§ 230.31.

Adverse changes in water chemistry frequently have a corresponding impact on wildlife and fisheries that live in or depend upon the water. Potential impacts to water chemistry are considered because they may affect the native aquatic and water-dependent communities in the Spruce Fork watershed.

a. Selenium

Discharges from the Spruce No. 1 Mine Complex project are likely to increase selenium loading to the immediate receiving streams and downstream waters. The State of West Virginia has established a numeric chronic water quality criterion for selenium (5 µg/L) to protect instream aquatic life. Selenium is a naturally occurring chemical element that is an essential micronutrient, but excessive amounts of selenium can also have toxic effects. For aquatic animals, the concentration range between essential and toxic is very narrow, being only a few micrograms per liter in water. Selenium toxicity is primarily manifested as reproductive impairment and birth defects due to maternal transfer, resulting in embryotoxicity and teratogenicity in egglaying vertebrates (e.g., fish and ducks). The most sensitive toxicity endpoints in fish larvae are teratogenic deformities such as skeletal, craniofacial, and fin deformities, and various forms of edema. Embryo mortality and severe development abnormalities can result in impaired recruitment of individuals into populations (Chapman et al. 2009). A WV draft study indicates that elevated selenium concentrations in fish eggs, increased larval deformity rates and increased deformity rates in mature fish are occurring in the Mud River Reservoir, Boone County, WV due to mining activities. These adverse conditions were all associated with elevated water column selenium concentrations (WVDEP, 2009, draft).

In West Virginia, coals that contain the highest selenium concentrations are found in a region of south central West Virginia where the Allegheny and Upper Kanawha Formations of the Middle Pennsylvanian are mined (WVGES 2002). WVDEP reports that some of the highest coal selenium concentrations are found in the central portion of the Coal River watershed where significant active mining and selenium impaired streams are located, in the immediate vicinity of the Spruce No. 1 project. Selenium is discharged when surface mining activities expose selenium-bearing material that comes in contact with water and contaminated water drains from the mining area to surface waters. The sedimentation ponds that are the usual form of water treatment at mining sites generally are not effective at treating selenium before effluent is discharged from ponds to downstream waters.

To evaluate the impact of discharges into Pigeonroost Branch and Oldhouse Branch as authorized by the DA Permit, Region III has compared selenium levels in Pigeonroost Branch and Oldhouse Branch with selenium levels in waters that have been impacted by the nearby Dal-Tex operation.[10] In addition, Region III has reviewed data from discharge monitoring reports from mining outlets for the portion of the Spruce No. 1 Mine that has been constructed in the Seng Camp Creek watershed. Figure 8 shows mine outlet locations.

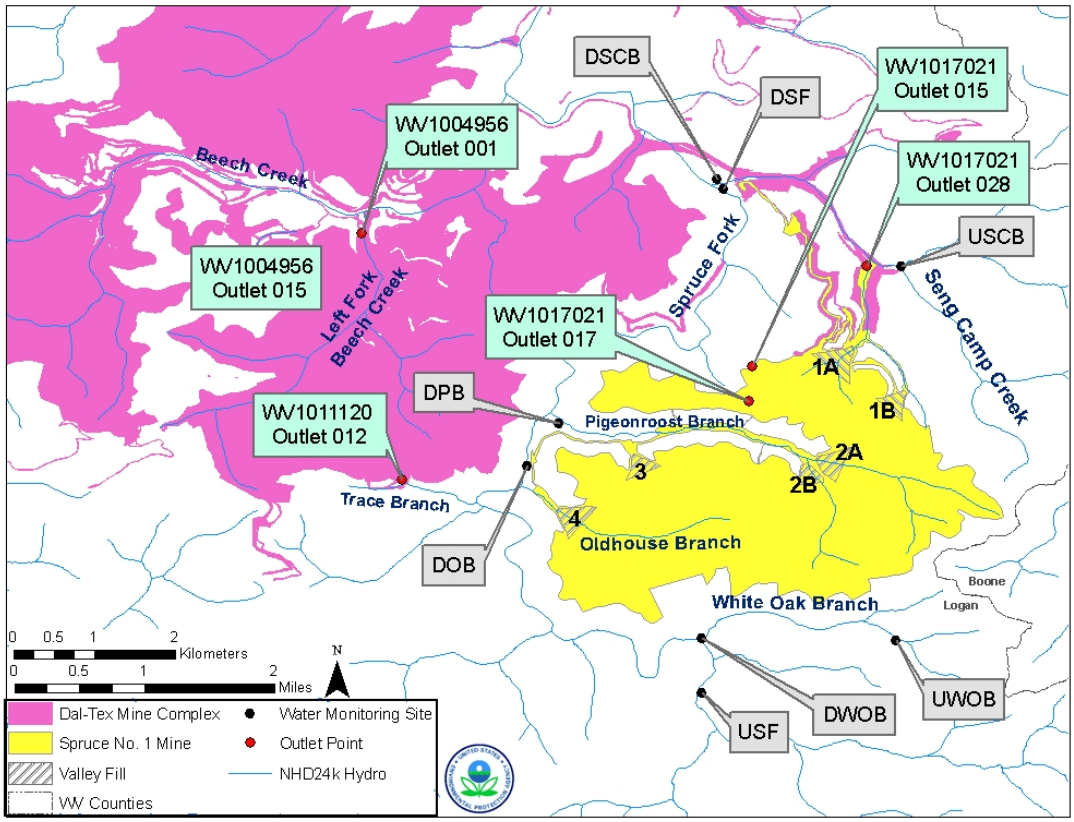

Figure 8: Dal-Tex and Spruce No. 1 Mine outlet locations.

[10] Levels of selenium in other nearby waters that have been impacted by surface coal mining activity and generally have similar geology also support a prediction that construction of the Spruce No. 1 Mine as currently authorized will result in elevated levels of selenium in downstream waters. Selenium concentrations have exceeded the Se criterion at least three times in six (6) other mined streams in the Coal River Sub-basin. These include White Oak Creek (a tributary to the Coal River), the left Fork of White Oak Creek, Seng Creek (another tributary to the Coal River); and Casey Creek, James Creek, and Beaver Pond Branch, all tributaries to Pond Fork. These elevated levels of selenium demonstrate that the geology in the area of the Spruce No. 1 mine is likely to release selenium during mining activities. See Appendix 2 for further details on selenium.

Table 3 provides a summary of selenium averages and ranges for Pigeonroost Branch and Oldhouse Branch and streams draining the nearby Dal-Tex operation (Left Fork Beech Creek, Beech Creek, and Trace Branch). The table also contains data for White Oak Branch (upstream of Spruce No. 1 as currently authorized) and Seng Camp Creek (receiving water for the portion of Spruce No. 1 that is under construction).

Summarizing the data in the following table, streams draining the nearby Dal-Tex operation have selenium concentrations exceeding the 5 ug/l chronic selenium numeric criterion. The data from the Dal-Tex mine complex do not indicate any decrease in selenium concentrations over the period of record. These data strongly suggest construction of valley fills and other discharges of fill material from the Spruce No. 1 Mine into Pigeonroost Branch and Oldhouse Branch would likely result in discharges of elevated levels of selenium in the receiving waters and lead to significant degradation of water quality of the receiving waters and downstream waters. Such degraded water quality would be likely to impact downstream wildlife populations, including fish population

Table 3. Selenium Concentrations (ug/l) Near Spruce No. 1 Project Area

Stream Name	Subbasin	Source and time period of data					
		PEIS (2000-2001)		WVDEP (2002-2003)		WVDEP (2005-	
		Se (avg)	Se (range)	Se (avg)	Se (range)	Se (avg)	Se (ran
Average and Range of Se in Tribs to Spruce Fork that drain Spruce No. 1 project area							
White Oak Branch	Spruce Fork	<3 ND		<5 ND		NS	
Oldhouse Branch	Spruce Fork	<3 ND		<5 ND		NS	
Pigeonroost Branch	Spruce Fork	<3 ND		<5 ND		NS	
Seng Camp Creek	Spruce Fork	NS		<5 ND		NS	
Average and Range of Se in Tribs to Spruce Fork draining Dal-Tex Operation							
Beech Creek[11]	Spruce Fork	7.5	5.6-9.5	6	5.0-9.0	12.3	6.0
Left Fork of Beech Creek	Spruce Fork	22.7	15.3-31.1	22	5.0-53.0	NS	
Trace Branch	Spruce Fork	NS	NS	7	5.0-10.0	NS	
Rockhouse Branch	Spruce Fork	5.3	3.8-8.0	< 5 ND	< 5 ND	NS	

ND: Se not detected. Detection limit shown.
NS: Not sampled. Stream was not sampled for the study shown.

Graphical trends of selenium concentrations from Discharge Monitoring Report (DMR) records for January 2007 to June 2010 from three outfalls from the Dal-Tex Mine Operations are shown in the following Figures 9-11. These demonstrate that the discharges from those outfalls consistently exceed West Virginia's chronic numeric water quality criterion for selenium (5 µg/L).

[11] In the WVDEP study on selenium bioconcentration factors, selenium was also found in fish tissue in Beech Creek (average 7.55 mg/kg).

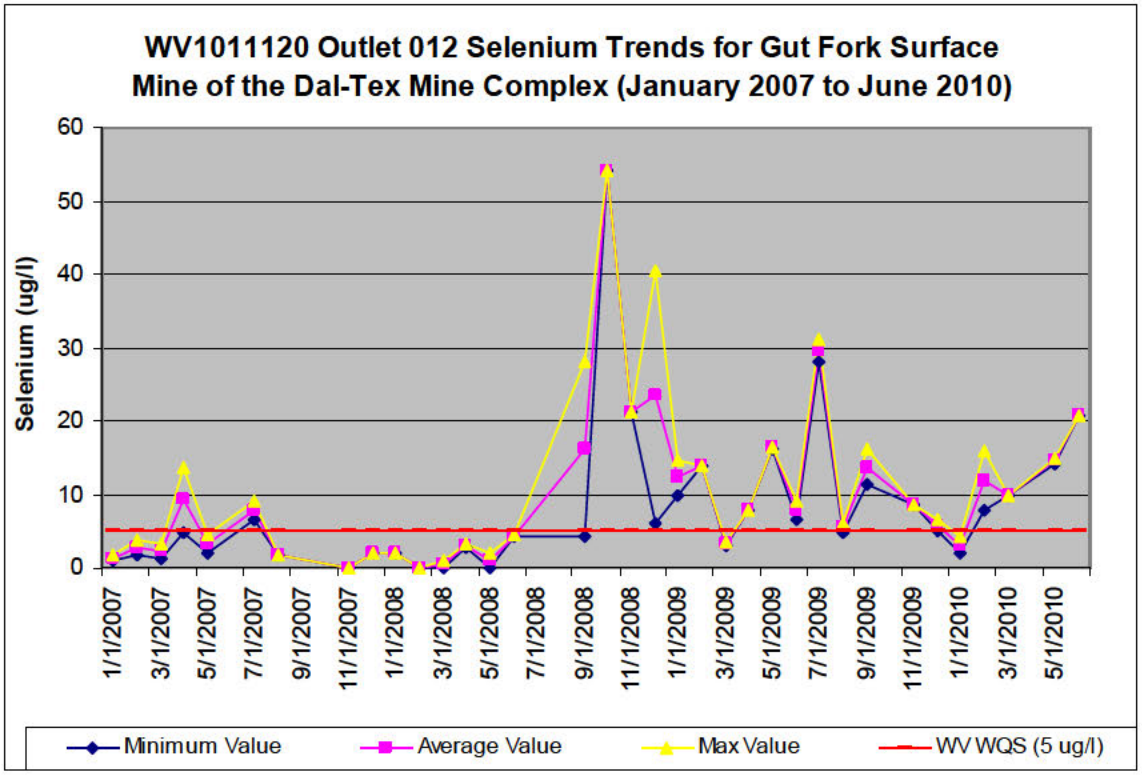

Figure 9: Selenium Trends (January 2007 to June 2010) for NPDES Permit WV1011120 – Outlet 012 (Mingo Logan Coal Company's Gut Fork Surface Mine of the Dal-Tex Mine Complex)

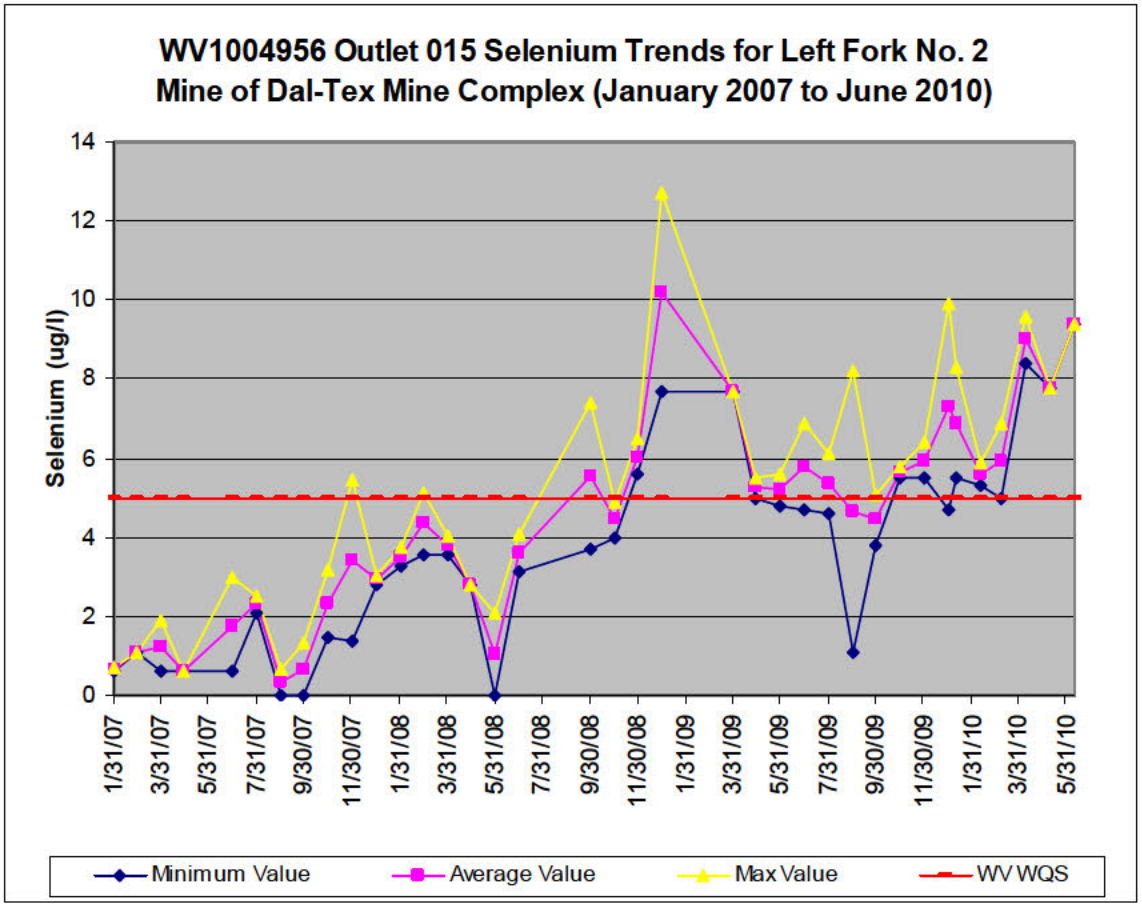

Figure 10: Selenium Trends (January 2007 to June 2010) for NPDES Permit WV1004956 – Outlet 015 (Mingo Logan Coal Company's Left Fork No. 2 Mine of the Dal-Tex Mine Complex)

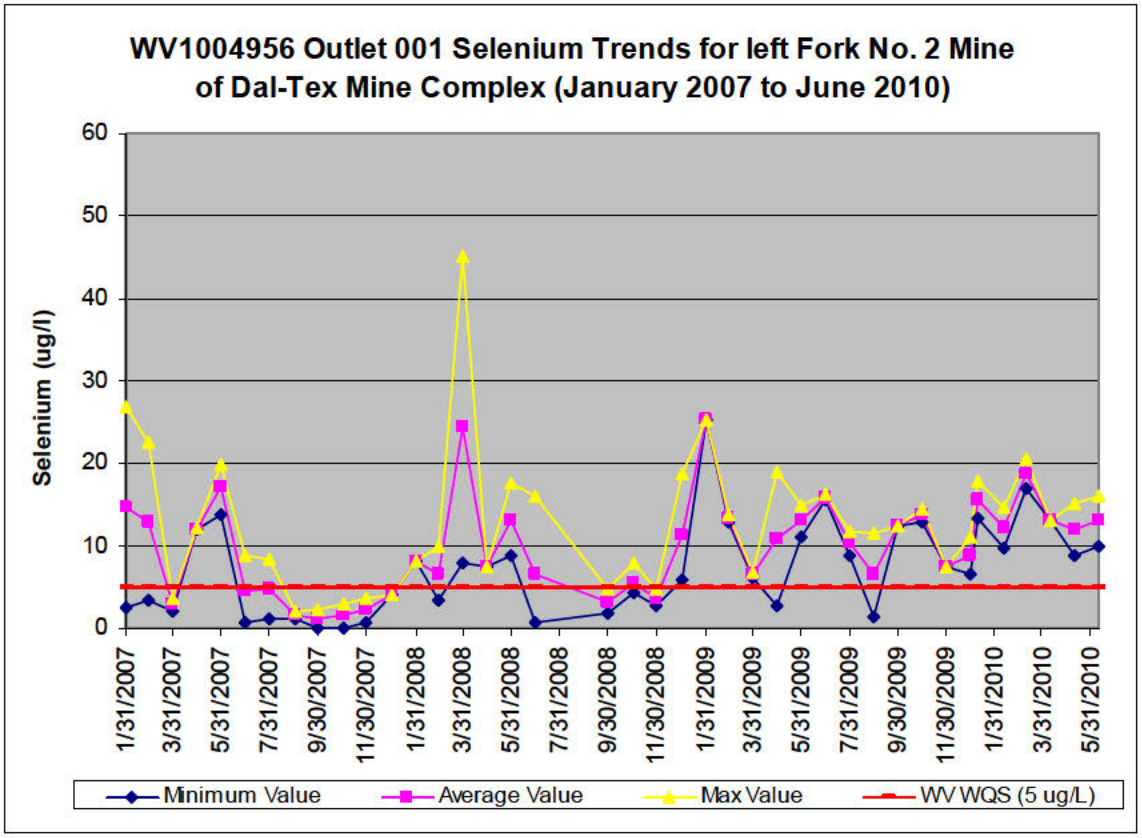

Figure 11: Selenium Trends (January 2007 to June 2010) for NPDES Permit WV1004956 – Outlet 001 (Mingo Logan Coal Company's Left Fork No. 2 Mine of the Dal-Tex Mine Complex)

Region III also reviewed data from the portion of the Spruce No. 1 Mine that is already constructed in Seng Camp Creek (Figure 12). These data also indicate that construction of valley fills in Pigeonroost Branch and Oldhouse Branch would likely result in discharges of elevated levels of selenium. The Spruce No. 1 project has active mining in the Right Fork of the Seng Camp Creek sub-watershed. Recent NPDES DMRs for a 16 month period (December 2008 to March 2010) show that the constructed portion of the Spruce No. 1 project (Outlet 028) is discharging selenium at concentrations that exceed West Virginia's chronic numeric water quality criterion (Table 4).[12] A technical review of the submitted 16 monthly DMR records for the Spruce No. 1 Outlet 028 document the maximum values exceeded the chronic selenium water quality criteria of 5 µg/L on six occasions (December 2008, January 2009, August 2009, September 2009, February 2010, and March 2010) representing a 37.5% exceedence rate. In addition, the average monthly measurements during this same time frame for Outlet 028 exceeded the chronic water quality criterion on 4 of the 16 monthly DMR reports (December 2008, January 2009, September 2009, and March 2010) representing a 25% exceedance rate of the WV

[12] The July 2009 DMR was not provided for review.

chronic water quality criterion for selenium. Selenium concentrations in excess of the chronic criterion were also reported from Outlet 017.[13]

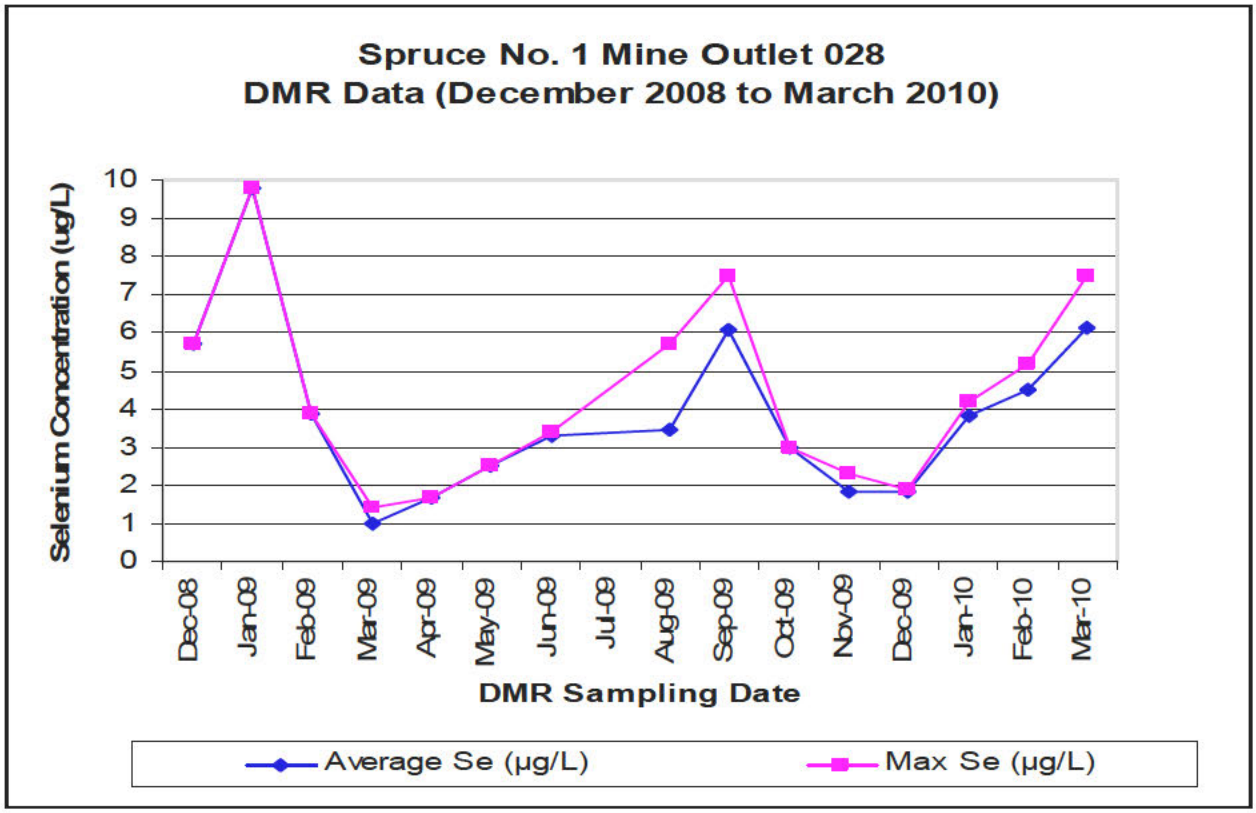

Figure 12: Selenium concentrations in discharge from outlet 028 on Spruce No. 1 Mine

[13] To the extent that commenters have stated that selenium discharges should be addressed only through the NPDES permit, the Section 404(b)(1) Guidelines provide an independent obligation to assure compliance with water quality standards (40 CFR 230.10(b)). Moreover, it is noted that the NPDES permit issued for the Spruce No. 1 project establishes effluent limitations for selenium in only three of the outfalls in the NPDES permit. The permit requires only monitoring at the remaining outfalls, including the outfalls in Seng Camp Creek discussed herein. To the extent the Company has commented that the impacts from the Dal-Tex operation are not a good predictor of selenium impacts from construction of Spruce No. 1 due to implementation of a materials handling plan at Spruce No. 1, it is noted that the materials plan as being implemented by Mingo Logan in the Seng Camp Creek watershed has not fully succeeded in preventing exceedance of the numeric water quality criterion for selenium at Outfalls 17 and 28. Moreover, the Arch corporate family, including Mingo Logan, has conceded that its efforts to control selenium at a number of its active surface coal mines in West Virginia have been unsuccessful. Arch's various subsidiaries recently have requested extensions of NPDES compliance schedules for selenium discharges at numerous facilities,further indicating challenges in meeting the WV chronic criterion.

Table 4. Total Recoverable Selenium (µg/L) for Outlets 015, 017 and 028 for NPDES Permit WV1017021, Mingo Logan Coal Company Spruce No. 1 Mine. Note: Shaded areas indicate exceedences of the selenium standard (5 µg/L).

Site Code	Site Location	Sample Date	Min Value	Ave. value	Max value
015	Outlet 015	12/31/2008	0.00	0.00	0.00
017	Outlet 017	12/31/2008	0.00	0.00	0.00
017	Outlet 017	9/30/2009	19.20	19.20	**19.20**
028	Outlet 028	12/31/2008	5.70	5.70	5.70
028	Outlet 028	1/31/2009	9.80	9.80	**9.80**
028	Outlet 028	2/28/2009	3.90	3.90	3.90
028	Outlet 028	3/31/2009	0.60	1.00	1.40
028	Outlet 028	4/30/2009	1.70	1.70	1.70
028	Outlet 028	5/31/2009	2.50	2.50	2.50
028	Outlet 028	6/30/2009	3.20	3.30	3.40
028	Outlet 028	8/31/2009	1.25	3.48	5.70
028	Outlet 028	9/30/2009	4.60	6.05	7.50
028	Outlet 028	10/31/2009	3.00	3.00	3.00
028	Outlet 028	11/30/2009	1.40	1.85	2.30
028	Outlet 028	12/31/2009	1.80	1.85	1.90
028	Outlet 028	1/31/2010	3.40	3.80	4.20
028	Outlet 028	2/28/2010	3.80	4.50	5.20
028	Outlet 028	3/31/2010	4.70	6.10	7.50

The Spruce Fork watershed upstream of Pigeonroost Branch and Oldhouse Branch has selenium concentrations elevated above the chronic water quality criterion based on the instream DMR data. See Appendix 2, Table 14. The downstream Spruce Fork (DSF) site does not have selenium concentrations above the water quality criterion. This suggests that Pigeonroost Branch and Oldhouse Branch provide clean dilution water to the mainstem of Spruce Fork (Appendix 2, Table 15). The proposed valley fills for Pigeonroost Branch and Oldhouse Branch will eliminate the freshwater dilution contributions from both of these tributaries. Based on the current during- and post-mining water quality conditions observed in Seng Camp Creek downstream of the Spruce No. 1 project, selenium values will likely also increase at both outlet points on Oldhouse and Pigeonroost Branch during and post-mining. The increased selenium concentrations combined with the elimination of the dilution from these two tributaries will likely cause the selenium concentrations in Spruce Fork to increase.

In summary, water quality from streams and discharges draining both the Dal-Tex Mine Complex and the current operational portions of the Spruce No. 1 Mine confirm EPA's concern that the Spruce No. 1 project would be likely to discharge levels of selenium exceeding the WV chronic water quality criterion for selenium (greater than 5 µg/l)

downstream of the filled streams and in Spruce Fork. [14] An important adverse impact of selenium residues in aquatic food chains is not just the direct toxicity to the organisms themselves, but rather the dietary source of selenium these organisms contribute to fish and wildlife species in the upper food web that feed on them.

b. Total Dissolved Solids/Conductivity

To understand the water quality impacts from increased total dissolved solids (TDS) and conductivity, it is helpful to understand the relationship between salinity, TDS, and specific conductivity, and the effect increases in conductivity have on native wildlife. For purposes of this action, when Region III discusses increased conductivity or TDS, we are referring to an increase in salinity in otherwise dilute freshwater, consistent with background levels in central Appalachian streams.

Salinity is the mass of salt in a given mass of water. While many of the elements that comprise mineral salts are essential nutrients, aquatic organisms are adapted to specific ranges of salinity and experience toxic effects from excess salinity.

Salinity reflects the amount of TDS in water. TDS is a measure of the combined content of all inorganic and organic substances contained in a solution in molecular, ionized or micro-granular (colloidal) suspended form and is normally reported in the units mg/l. The majority of TDS in many waters are simply salts.

Salinity is often expressed in terms of specific conductivity (hereafter referred to as conductivity). Conductivity is the ability of a solution to carry an electric current at a specific temperature (normally 25º C) and is normally reported in the units µS/cm (microsiemens per centimeter). Conductivity and TDS both increase as the concentration of ions in a solution increase and are very strongly correlated. Normally, conductivity is reported by state and federal monitoring agencies because it is an instantaneous measurement that can be collected in situ with a meter, that does not require a laboratory analysis, and that is precise and accurate. "Conductivity" refers to the measurement and resulting data; "salinity" refers to the environmental property that is being measured. Conductivity is an excellent indicator of the total concentration of all ions and is also a good predictor of aquatic life use impairment, especially in the ecoregion

[14] The concentrations of water column selenium observed at the Dal-Tex outlets and Seng Creek are significant in the fact that these concentrations have been associated with elevated fish tissue concentrations that are above the levels that cause teratogenic deformities in larval fish, leave fish with Se concentrations above the threshold for reproductive failure (4 ppm), and place birds at risk of reproductive failure through ingestion of fish with selenium concentrations greater than 7 ppm (Lemley 1997). According to the WVDEP's study on 'Selenium Bioaccumulation among select stream and lake fishes in West Virginia' (WVDEP 2009), Seng Camp had the highest average water column concentration (27.20 ppb) and a corresponding average fish tissue concentration of 8.16 ppm. While Beech Creek had a water concentration of 12.30 ppb with a corresponding average fish tissue concentration of 7.55 ppm. As outlined in the graphical trends of selenium concentrations from the DMR records for three permitted outlets for the Dal-Tex Mine Complex (WV1011120, WV1004956, WV1004956), these values are similar or greater than the Seng Camp and Beech Creek concentrations which supports our view that the corresponding fish tissue concentrations will be elevated to levels that cause fish and bird impairments.

69 in which the Spruce No. 1 project is located.

A recent study found that elevated conductivity greater than 500 µS/cm caused by alkaline mine effluents was strongly associated with high probability of degradation of native biota (Pond et al. 2008). In that study, 20 of 20 mined sites (100%) with conductivity levels greater than 500µS/cm reflected adverse impact to native macroinvertebrates using a genus-level multi-metric index, and 17 of those 20 sites (85%) reflected adverse impact to native macroinvertebrates using the family-level WVSCI index (using the less than 68 threshold). [15]

WVDEP ambient monitoring data confirm the high probability of adverse impact to aquatic life when conductivity levels are elevated to greater than 500µS/cm. WVDEP macroinvertebrate data from subecoregion 69d (the Cumberland Mountains of the Central Appalachians, the specific subecoregion where the project is located) were analyzed to determine the percentage of WVDEP sites that reflected adverse impact to aquatic life when the instream conductivity levels exceeded 500 µS/cm. This analysis indicates that a majority of the sites reflected adverse impact to aquatic life when conductivity levels were elevated above 500 µS/cm, even when accounting for the possible confounding effects of acidic pH and habitat degradation. For example, after removing low pH sites, only 100 sites out of 417 sites attained WVSCI scores greater than 68 when conductivity levels were greater than 500 µS/cm (76% of the sites reflected WVSCI scores less than 68). When the potential confounding effect of habitat degradation was completely removed (this subset includes only sites with Rapid Bioassessment Protocol habitat scores greater than 140, indicating reference quality habitat), 62% of the sites still had WVSCI scores less than 68. See Appendix 1 and 2 for further detail on macroinvertebrates and conductivity.

EPA's draft report, *A Field-Based Aquatic Life Benchmark for Conductivity in Central Appalachian Streams* (USEPA 2010a). also recognizes stream aquatic life impacts associated with conductivity. This study, which is publicly available and is undergoing external peer review by the EPA's Science Advisory Board, applies EPA's standard methodology for deriving water quality criteria to field data and concludes that genus-level macroinvertebrate impacts to the biological community occur at conductivity levels as low as 300 µS/cm.

Pond et al. 2008 showed that mayfly richness is significantly reduced to a few or zero genera, and that several stonefly and caddisfly taxa were also extirpated or reduced in abundance, when conductivity exceeds 500 µS/cm downstream of mining operations similar to Spruce No. 1. This mining-induced pattern was also documented in the eastern Kentucky coalfields (Pond 2010). Many mayfly, stonefly and caddisfly genera are extirpated from streams downstream of headwater valley fills, and this extirpation is strongly correlated to water quality degradation caused by mining. This extirpation is in

[15] As noted elsewhere, in its 2008 Section 303(d) List, WVDEP identified a WVSCI score of 68 as the lowest score at which a waterbody was considered to "fully support" aquatic life. Less than 68 indicates degradation of the aquatic life use.

addition to direct burial of these macroinvertebrates and other wildlife, as previously described. See Appendix 1 macroinvertebrates for further detail.

After evaluating confounding effects as described above, scientific evidence points to the conclusion that the extirpation of macroinvertebrate taxa documented in these studies is caused by water quality degradation and not habitat degradation. Conductivity is an excellent predictor of native taxa loss from Appalachian streams while habitat variables provide little ability to predict taxa loss. Using the WV spring null model applied to genus-level data from Pond et al. (2008), Observed/Expected (O/E) scores strongly responded negatively (R^2=0.63) to increasing conductivity. See Section V.B.2.a.ii. below for a further explanation of the Observed/Expected Index. Water quality degradation caused by elevated conductivity explained more than twice the variance in O/E scores than did RBP habitat scores (R^2=0.28), confirming that conductivity is an excellent predictor of native taxa loss from Appalachian streams. Sediment deposition, substrate embeddedness, channel alteration, riparian zone width, pH, or temperature had no significant influence on O/E scores. From this analysis it is apparent that habitat degradation offered little explanatory value in O/E variation in this dataset.[16]

Data from WVDEP indicate that average conductivity values for Pigeonroost Branch and Oldhouse Branch are very low and are consistent with dilute background conditions in central Appalachian headwater streams (Table 5). Construction of valley fills and other discharges from the Spruce No. 1 Mine into Pigeonroost Branch and Oldhouse Branch would likely cause an increase in conductivity and TDS in receiving waters. This will have two effects: first, it will eliminate Pigeonroost Branch and Oldhouse Branch as sources of freshwater dilution to downstream waters, including Spruce Fork; and second, it will transform Pigeonroost Branch and Oldhouse Branch into sources of increased conductivity and TDS to downstream waters.

Construction of valley fills in the ecoregion in which the Spruce No. 1 Mine is located is strongly correlated with an increase in conductivity levels in downstream waters. Sedimentation ponds, which are the usual form of water treatment for surface coal mines, appear to be ineffective in removing TDS and decreasing conductivity. For example, average conductivity and sulfate levels are highly elevated in other tributaries to Spruce Fork where historical mining has occurred. Table 5 provides the following average conductivity and sulfate values for streams draining mined areas to the west of Spruce Fork in comparison with Pigeonroost Branch and Oldhouse Branch.

[16] Sites downstream of MTM in Pond et al. 2008 were located in relatively natural stream reaches in order to help control for obvious habitat effects

Table 5. Average conductivity and sulfate values for streams in project area		
Stream	**Conductivity Values**	**Sulfate Values**
Rockhouse Creek	1012 uS/cm conductivity	407 mg/l sulfate
Left Fork of Beech Creek	2426 uS/cm conductivity	1019 mg/l sulfate
Beech Creek	1432 uS/cm conductivity	557 mg/l sulfate
Trace Branch	971 uS/cm conductivity	569 mg/l sulfate
Oldhouse Branch	90 uS/cm conductivity	28 mg/l sulfate
Pigeonroost Branch	199 uS/cm conductivity	99 mg/l sulfate

Average conductivity and sulfate concentrations in the mainstem of Spruce Fork to which Pigeonroost Branch and Oldhouse Branch flow are also strongly elevated to as much as ten times above natural background levels in Oldhouse Branch. Average conductivity at almost every monitoring site on the mainstem Spruce Fork exceeded 500 µS/cm. Only one site had an average conductivity of less than 500 µS/cm, which was located upstream of the project area, upstream of Adkins Fork, and southeast of Blair, WV.

Pigeonroost Branch and Oldhouse Branch are providing freshwater dilution to Spruce Fork thereby preventing conductivity levels in Spruce Fork from becoming even more elevated. Construction of valley fills and other discharges authorized by the DA Permit into Pigeonroost Branch and Oldhouse Branch would remove sources of freshwater dilution to Spruce Fork and contribute to existing water quality degradation.

In addition to removing Pigeonroost Branch and Oldhouse Branch as sources of freshwater dilution for Spruce Fork, construction of valley fills and other discharges authorized by the permit into those waters also would likely transform Pigeonroost Branch and Oldhouse Branch into sources of elevated conductivity and TDS to downstream waters. As described in Section V.B.2.a. below, there is a strong correlation between elevated levels of conductivity and extirpation of macroinvertebrate taxa. Spruce Fork mainstem has little, if any, remaining assimilative capacity for conductivity.

Post-mining conductivity levels in Spruce Fork downstream of the project area were modeled using a watershed area weighted deterministic model with two post-mining average (500 and 1000 µS/cm) and maximum (1000 and 1500 µS/cm) conductivity values for Oldhouse Branch, Pigeonroost Branch and Seng Camp Creek. These values are conservative and likely underestimate the post-mining conductivity values. For example, when compared to Left Fork Beech Creek, which is completely mined and filled, the average and maximum conductivity values are 2425 and 3000 µS/cm. In Beech Creek, which is partially mined and filled, the average and maximum conductivity values are 1432 and 1776 µS/cm (average and maximum values based on 2002-2003 WVDEP data). In every case, since the measured average and maximum conductivity levels in Spruce Fork are currently greater than 500 µS/cm pre-mining, the modeled post-mining conductivity values are also greater than 500 µS/cm. Using the more conservative post-mining values (average 500 and 1000 µS/cm and maximum 1000 and

1500 µS/cm), we estimate that average conductivity in Spruce Fork downstream of Seng Camp Branch could increase from 555 pre-mining to 745 µS/cm post-mining and maximum conductivity could increase from 965 pre-mining to 1226 µS/cm post-mining. EPA expects that these additional conductivity increases would likely further extirpate native aquatic macroinvertebrates (wildlife) that are not tolerant to increased conductivity. See Appendix 2 for further detail on conductivity.

2. Impacts to Wildlife

a. Macroinvertebrates

As set forth in Sections IV A.1 and I.B.1 above, benthic macroinvertebrates are diverse and healthy in the Spruce No. 1 project area and represent an important component of the aquatic community in Pigeonroost Branch and Oldhouse Branch. Furthermore, because of their productivity and secondary position in the aquatic food chain, they also play a critical role in the delivery of energy and nutrients to downstream reaches (in aquatic life stages) as well as to upland terrestrial habitats (in winged adult life stages).

Construction of valley fills and other discharges authorized by the DA Permit into Pigeonroost Branch and Oldhouse Branch will impact the native macroinvertebrate community in two ways. First, the macroinvertebrates that live in stream channels within the footprint of the valley fill will be destroyed. As set forth in Section V.C. below, it is not likely that the on-site stream creation proposed by the permittee as mitigation would support the quality of macroinvertebrate community that currently exists in Pigeonroost Branch and Oldhouse Branch. Second, construction of valley fills and other authorized discharges into Pigeonroost Branch and Oldhouse Branch would likely have an adverse impact on the macroinvertebrate communities in remaining downstream waters. Sensitive species of mayflies, stoneflies, and caddisflies currently inhabiting downstream waters will be impacted through increasing chemical loading of contaminants.

As set forth above, the 2006 Spruce No. 1 EIS states that impacts from the Spruce No. 1 Mine are expected to be similar to those from the Dal-Tex operation. Accordingly, conditions in streams impacted by the Dal-Tex operation will likely occur in the unfilled portions of the streams that will be impacted by the Spruce No. 1 Mine. To evaluate the impacts from the Spruce No. 1 Mine, Region III analyzed conditions in streams impacted by the Dal-Tex operation. Region III conducted three different analyses. First, Region III compared benthic macroinvertebrate collections from Pigeonroost Branch and Oldhouse Branch to benthic macroinvertebrate samples from streams that have been impacted by Mingo Logan's Dal-Tex operation. Second, Region III used an observed/expected approach. Third, Region III compared WVSCI scores in Pigeonroost Branch and Oldhouse Branch with streams impacted by the Dal-Tex operation. The following describes these three analyses.

i. Comparison of macroinvertebrate communities

To evaluate the impact of the project, EPA compared benthic collections from the Spruce No. 1 project area to Mingo Logan's Dal-Tex site (Table 1), using an equal number of

benthic samples collected at both locations. This analysis reveals that construction of valley fills and and other discharges authorized by the DA Permit into Pigeonroost Branch and Oldhouse Branch would likely result in degraded macroinvertebrate communities downstream of these discharges.

Considering the number of genera collected, the relatively unimpacted Pigeonroost Branch and Oldhouse Branch contain a far greater number and diversity of macroinvertebrate genera. Collectively, 85 different genera were collected from Pigeonroost Branch and Oldhouse Branch between 1999-2000, while only 56 different genera were collected from both Beech Fork and Left Fork Beech Fork, streams that drain the inactive Dal-Tex operations.

Region III further refined its analysis to a comparison of the Ephemeroptera, Plecoptera and Trichoptera (EPT: mayflies, stoneflies and caddisflies) taxa collected. In Pigeonroost and Oldhouse combined, 42 EPT taxa were collected, while at Dal-Tex (Beech and Left Fork Beech), only 12 EPT were found. Narrowing further to mayflies and stoneflies, there were 14 mayfly genera and 12 stonefly genera in Oldhouse Branch and Pigeonroost Branch but only two relatively pollution-tolerant mayfly genera and three pollution-tolerant stonefly genera were collected in streams draining the Dal-Tex mine.. EPA also found that caddisflies were rich (14 total genera) in Pigeonroost and Oldhouse, but only seven total genera were found in Beech and Left Fork Beech downstream of the Dal-Tex mine.

As set forth above in Section IV.A., macroinvertebrates are good indicators of watershed health, and differ in their tolerance to the amount and types of pollution. Macroinvertebrate communities integrate the effects of stressors over time and some taxa (i.e., taxonomic category or group such as phylum, class, family, genus, or species) are considered pollution-tolerant and will survive in degraded conditions. Some taxa are pollutant-intolerant and will die when exposed to certain levels of pollution. Thus, the composition of tolerant and intolerant (i.e., sensitive) communities informs scientists about the quality of the water. The presence of a large number of individuals from the more sensitive genera indicates good water quality conditions, whereas the presence of a large number of tolerant genera may indicate degraded conditions.

The data described above indicates a substantial reduction in taxa diversity in the mine-impacted waters. In addition, several tolerant taxa were found in the streams draining the Dal-Tex mine that were not found in the Spruce project area further indicating degradation and adverse impact to wildlife habitat (Table 1). Some of these taxa are highly tolerant snails that typically do not occupy healthy headwater streams in the Appalachians (Lymnaeidae*, Physella, Helisoma*). Other tolerant beetles and fly larvae found at Dal-Tex but not Pigeonroost or Oldhouse also indicate biological impacts and altered environmental conditions (i.e., atypical of Appalachian headwater streams) that foster the invasion of these tolerant taxa. Table 6 compares the macroinvertebrate taxa identified in Oldhouse Branch and Pigeonroost Branch with that found in streams that have been impacted by the Dal-Tex Mine.

Table 6. List of macroinvertebrate taxa identified from Spruce project and Dal-Tex.

Order	Family	Genus	Oldhouse +Pigeonroost Spruce No. 1	Beech+Left Fork Beech Dal-Tex Mine
Oligochaeta	Oligochaeta	Oligochaeta	X	X
Nematoda	Nematoda	Nematoda		X
Proseriataoela	Plagiostomidae	*Hydrolimax*	X	
Tricladida	Planariidae	Planariidae	X	
Basommatophora	Lymnaeidae	Lymnaeidae		X
Basommatophora	Physidae	Physella		X
Basommatophora	Planorbidae	*Helisoma*		X
Coleoptera	Dryopidae	*Helichus*	X	
Coleoptera	Elmidae	*Dubiraphia*		X
Coleoptera	Elmidae	*Macronychus*		X
Coleoptera	Elmidae	*Microcylloepus*		X
Coleoptera	Elmidae	*Optioservus*	X	X
Coleoptera	Elmidae	*Oulimnius*	X	X
Coleoptera	Psephenidae	*Ectopria*	X	
Coleoptera	Psephenidae	*Psephenus*	X	X
Decapoda	Cambaridae	*Cambarus*	X	
Diptera	Ceratopogonidae	*Atrichopogon*		X
Diptera	Ceratopogonidae	*Bezzia/Palpomyia*	X	X
Diptera	Ceratopogonidae	*Dasyhelea*	X	X
Diptera	Chironomidae	*Acricotopus*		X
Diptera	Chironomidae	*Chaetocladius*	X	X
Diptera	Chironomidae	*Corynoneura*	X	X
Diptera	Chironomidae	*Cricotopus*	X	X
Diptera	Chironomidae	*Diamesa*	X	X
Diptera	Chironomidae	*Eukiefferiella*	X	X
Diptera	Chironomidae	*Metriocnemus*		X
Diptera	Chironomidae	*Micropsectra*	X	X
Diptera	Chironomidae	*Microtendipes*	X	
Diptera	Chironomidae	*Orthocladius*	X	X
Diptera	Chironomidae	*Parachaetocladius*	X	
Diptera	Chironomidae	*Parametriocnemus*	X	X
Diptera	Chironomidae	*Paraphaenocladius*		X
Diptera	Chironomidae	*Paratanytarsus*		X
Diptera	Chironomidae	*Polypedilum*	X	X
Diptera	Chironomidae	*Rheotanytarsus*	X	X
Diptera	Chironomidae	*Smittia*		X
Diptera	Chironomidae	*Stempellinella*	X	
Diptera	Chironomidae	*Stenochironomus*		X
Diptera	Chironomidae	*Stilocladius*	X	
Diptera	Chironomidae	*Sympotthastia*	X	
Diptera	Chironomidae	*Tanytarsus*	X	
Diptera	Chironomidae	*Thienemanniella*		X
Diptera	Chironomidae	*Thienemannimyia*	X	X
Diptera	Chironomidae	*Tvetenia*	X	X
Diptera	Chironomidae	*Zavrelimyia*	X	
Diptera	Empididae	*Chelifera/Metachela*	X	X
Diptera	Empididae	*Clinocera*	X	
Diptera	Empididae	*Hemerodromia*		X
Diptera	Simuliidae	*Prosimulium*	X	
Diptera	Simuliidae	*Simulium*	X	X
Diptera	Tabanidae	Tabanidae		X
Diptera	Tipulidae	*Antocha*		X
Diptera	Tipulidae	*Cryptolabis*	X	
Diptera	Tipulidae	*Dicranota*	X	
Diptera	Tipulidae	*Hexatoma*	X	

Table 6. Continued.

Continued			Oldhouse +Pigeonroost	Beech+Left Fork Beech
Order	Family	Genus	Spruce No. 1	Dal-Tex Mine
Diptera	Tipulidae	*Limnophila*	X	
Diptera	Tipulidae	*Limonia*	X	X
Diptera	Tipulidae	*Pseudolimnophila*	X	
Diptera	Tipulidae	*Tipula*	X	X
Ephemeroptera	Ameletidae	*Ameletus*	X	
Ephemeroptera	Baetidae	*Acentrella*	X	
Ephemeroptera	Baetidae	*Baetis*	X	X
Ephemeroptera	Baetiscidae	*Baetisca*	X	
Ephemeroptera	Ephemerellidae	*Drunella*	X	
Ephemeroptera	Ephemerellidae	*Ephemerella*	X	
Ephemeroptera	Ephemerellidae	*Eurylophella*	X	
Ephemeroptera	Ephemeridae	*Ephemera*	X	
Ephemeroptera	Heptageniidae	*Cinygmula*	X	
Ephemeroptera	Heptageniidae	*Epeorus*	X	
Ephemeroptera	Heptageniidae	*Stenacron*	X	
Ephemeroptera	Heptageniidae	*Maccaffertium/Stenonema*	X	
Ephemeroptera	Isonychiidae	*Isonychia*	X	X
Ephemeroptera	Leptophlebiidae	*Paraleptophlebia*	X	
Megaloptera	Corydalidae	*Corydalus*		X
Megaloptera	Corydalidae	*Nigronia*	X	X
Odonata	Aeshnidae	*Boyeria*		X
Odonata	Gomphidae	*Lanthus*	X	X
Plecoptera	Capniidae	Capniidae	X	
Plecoptera	Chloroperlidae	*Haploperla*	X	
Plecoptera	Leuctridae	*Leuctra*	X	
Plecoptera	Nemouridae	*Amphinemura*	X	X
Plecoptera	Nemouridae	*Ostrocerca*	X	
Plecoptera	Nemouridae	*Prostoia*		X
Plecoptera	Peltoperlidae	*Peltoperla*	X	
Plecoptera	Perlidae	*Acroneuria*	X	
Plecoptera	Perlodidae	*Isoperla*	X	
Plecoptera	Perlodidae	*Remenus*	X	
Plecoptera	Perlodidae	*Yugus*	X	
Plecoptera	Pteronarcyidae	*Pteronarcys*	X	
Plecoptera	Taeniopterygidae	*Taenionema*	X	
Plecoptera	Taeniopterygidae	*Taeniopteryx*	X	X
Trichoptera	Glossosomatidae	*Agapetus*	X	
Trichoptera	Glossosomatidae	*Glossosoma*	X	
Trichoptera	Goeridae	*Goera*	X	
Trichoptera	Hydropsychidae	*Ceratopsyche*	X	
Trichoptera	Hydropsychidae	*Cheumatopsyche*	X	X
Trichoptera	Hydropsychidae	*Diplectrona*	X	X
Trichoptera	Hydropsychidae	*Hydropsyche*	X	X
Trichoptera	Hydroptilidae	*Hydroptila*		X
Trichoptera	Limnephilidae	*Pycnopsyche/Hydatophylax*	X	
Trichoptera	Philopotamidae	*Chimarra*	X	X
Trichoptera	Philopotamidae	*Dolophilodes*	X	
Trichoptera	Polycentropodidae	*Polycentropus*	X	
Trichoptera	Psychomyiidae	*Psychomyia*	X	X
Trichoptera	Rhyacophilidae	*Rhyacophila*	X	X
Trichoptera	Uenoidae	*Neophylax*	X	
Tricladida	Planariidae	Planariidae	X	
		Total Distinct Taxa	85	56
		Total EPT Taxa	42	12