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February 27, 2014

The Alabama Surface Mining Commission
P. O. Box 2390
Jasper, AL 35502-2390

Re: Petition for Review of the Alabama Surface Mining Commission's Denial of Riverkeeper's Petition to Designate Lands adjacent to the Mulberry Fork of the Black Warrior River as Unsuitable for Mining

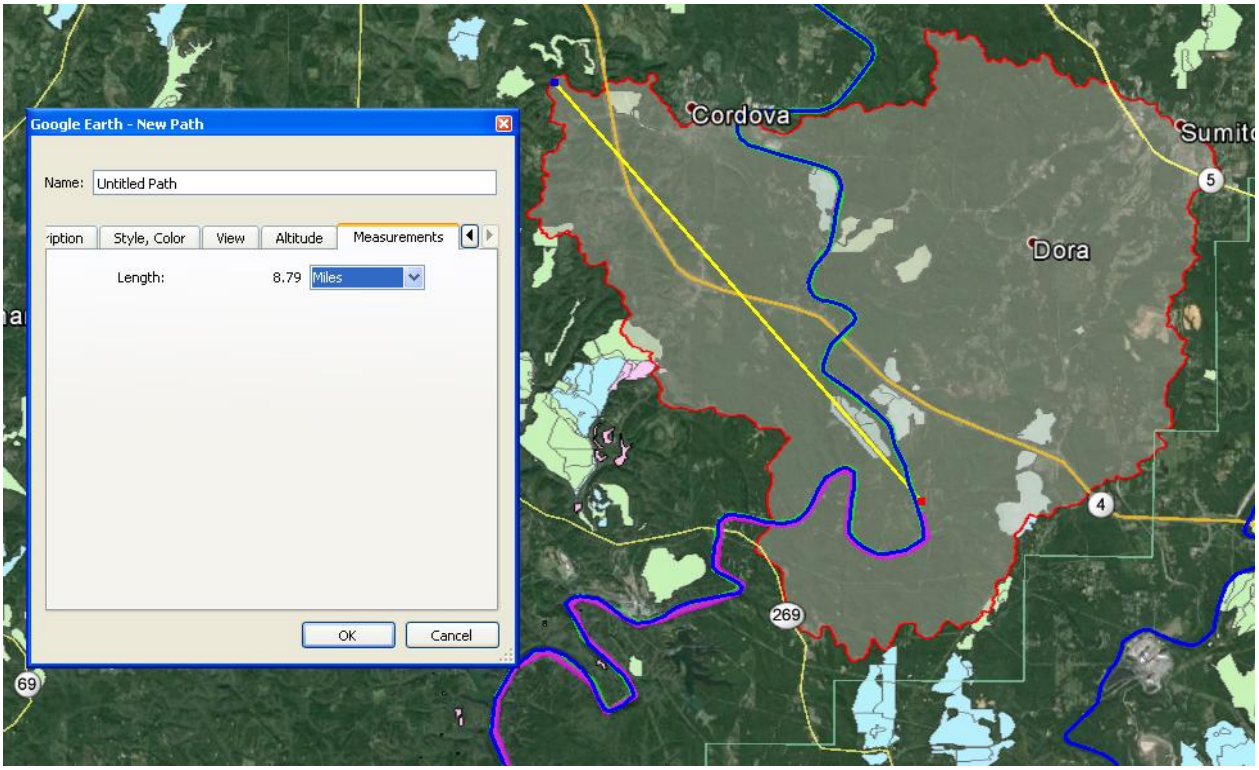
Via electronic mail only

Dear Commissioners:

Thank you for the opportunity to provide additional comments as a part of our petition for review of the Alabama Surface Mining Commission's ("ASMC") denial of our Petition to designate lands adjacent to the Mulberry Fork of the Black Warrior River as unsuitable for mining ("the Petition"). We write on behalf of Black Warrior Riverkeeper (Riverkeeper), a nonprofit organization dedicated to protecting and restoring the Black Warrior River and its tributaries. Riverkeeper filed the Petition on September 10, 2012 with one objective: to protect the drinking water source for 200,000 citizens of the greater Birmingham area.

I. Response to concerns raised by Commissioners and other presenters during the public hearing

First, to address Commissioner Stevens' concerns regarding the area proposed for protection, we would like to clarify that the petition area was based on the entire watershed that drains to the portion of the Mulberry Fork designated by the Alabama Department of Environmental Management ("ADEM") as a Public Water Supply (PWS), which is conceptually quite different from a setback, or a buffer. Based on that area, the greatest distance from the intake proposed for protection would be 8.8 miles (far less than the estimate of 20 miles that we provided during the hearing). Please note the image below as evidence of that fact. The watershed boundary defining the proposed lands unsuitable area ("LUM area") would be approximately 1.55 miles away at its closest point to the intake.



We would also like to address the testimony provided by CH2M Hill engineer J.P. Martin, who testified that Total Organic Carbon is not regulated by EPA primary or secondary drinking water standards. That statement is technically correct, which is why we made a point in our presentation to note that the standard of 4.0 mg/L for Total Organic Carbon is a Treatment Technique (TT) standard. But perhaps we should have provided more information as to exactly what that means.

The TT standard for TOC is actually promulgated by the state of Alabama in ADEM Reg. 335 Division 7, which governs the proper treatment and distribution of drinking water. The treatment technique standard was implemented by ADEM because "total organic carbon provides a medium for the formation of disinfection byproducts. These byproducts include trihalomethanes (THMs) and haloacetic acids (HAAs). Drinking water containing these byproducts in excess of the MCL may lead to adverse health effects, liver or kidney problems, or nervous system effects, and may lead to an increased risk of getting cancer." *See* Ala. Admin. Code r. 335-7-14.06 Appendix C. Contrary to Mr. Martin's testimony, the concentration of TOC in the river, and the exceedances of the TT standard are extremely relevant to the LUM petition.

We would also like to rebut the baseless charge by Patrick Cagle of the Jobkeeper Alliance that this petition has any agenda other than simply protecting the drinking water for 200,000 consumers and over 600,000 ratepayers. In the face of scores of NPDES permits for new coal mines over the course of the past several years, we have appealed only two, both of which presented great potential to affect

sources of drinking water. Our agenda is water quality and we have advocated for more protective permits at numerous facilities upstream of the intake, including the Vulcan Asphalt plant in Cordova, Sumiton Lagoon, Cordova Wastewater Treatment Plant, East Walker County Wastewater Treatment Plant, as well as the American Proteins chicken processing plant farther upstream. We are also actively engaged in helping municipalities in Alabama properly implement MS4 programs that govern non-point stormwater pollution, such as those from cities and roadways. However, all of these other sources are outside of the purview of the ASMC. We are certainly concerned with these other threats, but the only relevant information for your consideration relates to coal mining, because this is what the Commission regulates.

It is worth noting that among the data we provided to the ASMC staff as a part of our Petition were records of exceedances of drinking water standards in the Mulberry Fork and at the intake for other constituents including bacteria, and organics such as benzo(a)pyrene, and 1,2-dichlorobenzene. However, since there was no evidence directly relating these contaminants to coal mining, it would have been disingenuous to present these findings at the hearing. To be sure, coal mining is not the only threat to the BWWB drinking water intake. But in our estimation, it is the most substantial ongoing threat, and also happens to be the only threat that the ASMC has an obligation to stop. You can rest assured that Black Warrior Riverkeeper will work tirelessly to address any and all other threats to the drinking water withdrawn for consumers throughout the Black Warrior River watershed. It is also important to recognize that the fact other, additional threats to source drinking water may exist, that fact in no way stops or excuses the ASMC from using the powers it possesses to protect valuable community resources like drinking water.

Intervenors Shepherd Bend, LLC and Reed Minerals, Inc. have also obliged us to refute their February 20th, 2014 filing in which they effectively ignore almost all of the water sampling evidence submitted and made part of the record. While conceding that "aluminum, manganese and sulfate were . . . consistently higher in mined versus un-mined watersheds," they then deny that these pollutants have the ability to affect the long term productivity of the Mulberry Fork source water. Their comments conclude that there is no "factual or scientific basis for [Riverkeeper's] allegations" despite (1) the numerous peer reviewed scientific articles documenting the adverse effects of surface mining on human health and water quality in the record; (2) the scientists who submitted comment letters, including the Bernhardt, Palmer and Hendryx letter (discussed at p. 9) which states that "[a]ll of the accumulating body of research . . . demonstrates that surface coal mining leads to severe, persistent and far-reaching degradation of water quality and biodiversity" and that despite their extensive experience regarding permit applications in the coalfields of West Virginia and Kentucky, they have never seen a permit application immediately adjacent to a public drinking water supply as has occurred in Alabama; (3) the EPA, ADEM and the BWWB water quality data that demonstrates a direct correlation between surface mining and degraded water quality. Their only support for their comments is their own engineer who cites no evidence, but rather his bare belief that "[m]odern day surface mining . . . is not a source of

water quality impairment." Thus, the "stark absence of contrary evidence" in their submission makes their arguments unsupported and thus unpersuasive.

The entirety of the argument for the LUM designation rests upon data and scientific study. We have brought data to the discussion. The BWWB has brought data to the discussion. While we disagree with the ASMC staff's methods of selecting data, as well as their interpretation of that data and their conclusions, at least their decision was an attempt at approaching this process from a scientific point of view. We think it is telling that the only parties that have not presented any data or scientific evidence to support its arguments are intervenors Shepherd Bend and Reed Mineral.

II. The ASMC has the power and the responsibility to determine what lands should be off limits to mining.

This appeal is all about context. Surface coal mining may be a necessary and important activity for our region but so is access to safe and affordable drinking water for the public. It is the job of the ASMC and its Commissioners to balance these needs. It simply does not make sense to put coal mines close to and immediately upstream of a public drinking water intake. Congress mandated a specific process to remedy situations like this when it created the lands unsuitable petition process as a key part of the federal Surface Mining Control and Reclamation Act ("SMCRA").

SMCRA prescribes the mandatory requirements for state programs and also imposes certain key responsibilities on the ASMC and its Commissioners. Many of these requirements address what the ASMC must do to oversee mining. The ASMC program must prescribe performance standards as well as permit, bond, inspect and also enforce as a part of their regulatory program --- but just as important it is the responsibility of the ASMC to protect the public interest by deciding where mining should *not* occur. As you may know, applicable Alabama law already prohibits surface mining altogether on certain lands, such as in National Parks and Wilderness Areas, qualifying historical places as well as within 1000 feet of Smith Lake. In other words, the law already makes value judgments that surface mining must yield to other priorities in certain instances and we think that drinking water sources should be one of those priorities.

In enacting SMCRA, Congress explicitly found that surface mining operations can "burden and adversely affect the public welfare by polluting the water; degrading the quality of life in local communities; and counteracting governmental programs and efforts to conserve water and other natural resources." 30 U.S.C. § 1201(c). SMCRA and the state regulatory programs it authorizes were specifically designed "to assure that surface coal mining operations are so conducted as to protect the environment." 30 U.S.C. § 1202(d). The Petition addresses an issue of the ultimate social cost: polluting a source of drinking water for 200,000 people. Both Birmingham's health and economic prosperity depend upon an adequate and reliable source of drinking water --- and the ASMC "was created pursuant to [ASMCRA] to provide such regulation and control of surface coal mining as will reduce injurious effects to the resources and environment of the State" as well as to "exercise the full

reach of State constitutional powers to provide protection of the public interest through effective control of surface coal mining operations." *See April 13, 2009 ADEM – ASMC Memorandum of Understanding* at p. 1.

The lands unsuitable process was created as a check on the negative impacts of surface mining acknowledged by law. It gives the ASMC and its Commissioners the important task, as well as the power, to decide what important areas or resources must be off limits to mining to protect the public interest.

This process is unprecedented in terms of its approach because it emphasizes data and science over procedure. Just as importantly, it gives citizens a voice in determining what resources in their communities should be protected. The designation process is designed to facilitate "objective decisions" that are "based on competent, scientifically sound data and other relevant information." Ala. Admin. Code r. 880-X-7D-.04. Ultimately, the process must be "legislative and fact-finding." 30 C.F.R. 769.17(a); Ala. Admin Code. r. 880-X-7D-.07. So the ASMC and its Commissioners are not intended to act as a judge with the formality and presumptions typical of a court of law. Rather, the job of the ASMC and its Commissioners is to serve as a kind of super legislature to decide what is in the public interest. Based upon the evidence in the record, if surface mining operations "*could* result in a substantial loss or reduction of long-range productivity of water supply," the public interest requires you to designate the lands as unsuitable for mining. *See* Ala. Admin. Code r. 880-X-7C-.04(2)(c). Both courts and other state programs have consistently found that the protection of drinking water is a valid and necessary reason to apply the lands unsuitable designation. *See, e.g., Pleasant City v. Ohio DNR***,** 617 N.E.2d 1103 (Ohio 1993); *Appolo Fuels, Inc. v. US*, 381 F. 3d 1338 (D.C. Cir. 2004); *Pennsylvania Department of Environmental Protection Bureau of Mining and Reclamation* (Designated the following watersheds as unsuitable: Upper Powell Run; Bells Gap Run; Little Muddy Run; and Muddy Run. Petitions pending for the following watersheds: Silver and Big Creeks: Rasler Run; Lower Indian Creek; Laurel Run). Based upon the evidence in the record, the ASMC should apply the designation here.

III. The ASMC decision applies the wrong standard.

Instead of evaluating the evidence to determine whether mining operations *"could* result in a substantial loss or reduction of long-range productivity of the water supply, the ASMC decision document instead requires Riverkeeper to effectively prove that mining operations *would "*result in a substantial loss or reduction. The ASMC staff did not look at whether surface mining in the Mulberry Fork is degrading source water quality --- the proper standard. Instead, they looked at the maximum contaminant levels prescribed by EPA for drinking water. The ASMC decision assumed that if the raw water (untreated) concentrations exceeded these EPA standards then treatment difficulties or increased costs would be experienced --- and that a lands unsuitable designation might be appropriate. This approach is wrong in every respect.

First, a lands unsuitable designation is supposed to be both proactive and protective of the source --- if the ASMC waits until the raw water degrades to the point it violates the drinking water standards (where the ASMC decision document concedes there will be increased treatment costs), it is probably too late for the designation to be effective. Even so, data cited in the ASMC decision document specifically demonstrates that today, raw water concentrations in the Mulberry Fork frequently exceed the EPA drinking water standards. Despite this fact, the ASMC reaches the conclusion that current regulations sufficiently protect the source water (*ASMC Decision* at p.56), ignoring its own assumption that such exceedances would result in "treatment difficulties or increased costs" (ASMC Decision at p. 4). The ASMC's decision fails to adequately consider this data or to analyze the potential for these exceedances to increase when additional mining sources are permitted in the LUM area and close to the intake.

Second, the ASMC's decision document further ignores the fact that the two metals (aluminum and manganese) that show the strongest correlation to mining (when comparing mined versus un-mined watershed data) are also the two contaminants most likely to exceed the EPA drinking water standards at the BWWB Mulberry Intake. This establishes a direct correlation between mining and intake water quality, conclusively demonstrating that mining *could* result in a substantial loss or reduction of long-range productivity of the water supply.

Finally on this point, the ASMC's decision document appears to make an unfortunate (and wrong) distinction between the types of violations of the EPA drinking water standards. EPA divides drinking water standards into two categories. Primary standards regulate substances that have the potential to harm human health while secondary standards are concerned with aesthetic and technical effects, i.e., the taste, color, smell and suitability of the water for its intended purposes. While human health is of primary concern, the potential violation of secondary standards is very important to those who must rely on this intake every day for drinking water. If water does not taste good, who wants to drink it? If the water turns vegetables black when they are cooked, who wants to serve or eat them? If wash water stains clothing because higher iron or manganese levels are present, how will ratepayers clean their clothing? The BWWB cannot selectively choose which standards it will meet for its customers --- the water it provides at the tap must be safe and wholesome for *all* of its intended uses. The violations of both primary and secondary standards documented at the intake in the record before the ASMC should be concerning because they are a signal that the source water is not of the necessary quality. If (and absent the unsuitable designation, when) additional surface mines are permitted close to the drinking water intake, the cumulative impacts of these mines mean greater degradation of the source water --- perhaps to the point that the BWWB cannot treat the water with current treatment technology.

IV. The ASMC's decision fails to properly consider or address adequately all the statistics and data about mining impacts contained in the record.

The data in the record demonstrates that sulfate, aluminum, manganese, total dissolved solids ("TDS"), and thallium all occur in significantly greater concentrations in mined watersheds versus un-mined watersheds (ASMC Decision at pp. 10, 26, 36). (These are all constituents of mining that are potentially harmful to source water.) Unfortunately, the ASMC decision document arbitrarily disregards and dismisses the importance of substantial evidence demonstrating that concentrations of total dissolved solids (TDS) (with a secondary drinking water standard limit of 500 mg/L) are often elevated downstream of Alabama's active and reclaimed mining operations. The ASMC decision document discusses sulfate as a component of TDS, but ignores the fact that other constituents of concern --- namely heavy metals—also make up TDS. The decision offers no answer for the documented increase in TDS associated with surface mining. As the BWWB has testified, TDS are some of the most difficult contaminants to remove from the raw water and yet the ASMC decision fails to address their documented elevation as a result of surface mining and the fact that the permitting of additional mines along the Mulberry Fork will elevate TDS concentrations even more.

While discharge limitations in NPDES permits are intended to be protective of water quality, there is no guarantee that they actually will be protective, particular where, as here, the source water is already degraded and as additional mines are permitted. There is no guarantee any single NPDES permit will protect source water quality in the absence of cumulative mine outfall modeling during permitting. There is also no guarantee that NPDES permit limits will be adhered to, particularly given that mine operators who have historically operated coal mines in the LUM area, and who are currently operating mines within or upstream of the LUM area have a history of violating permit limits. Just as concerning is the fact that the ASMC decision document fails to anticipate the substantial possibility of a drought-busting storm or catastrophic failure that could send unacceptable, elevated concentrations of mining-related pollutants directly into the source water, in close proximity to the intake. The potential that mines in the Mulberry Fork drainage have to contaminate the drinking water of over 200,000 people in the greater Birmingham area should be of grave concern to the ASMC, particularly since the Commission has the responsibility and the means to protect this important public resource now, and for future generations.

Even if mines comply with applicable permits and regulations, the elevated levels of metals and suspended solids in the water at the intake resulting from even *legal* discharges or precipitation event exemptions would mean that the BWWB likely will not be able to meet applicable drinking water quality standards in the future, particularly given the Mulberry Fork's current degraded condition. *See generally ADEM's Surface Water Quality Screening Assessment of the Cahaba and Black Warrior River Basins – 2002* (June 10, 2004). That report states that this segment of the Mulberry Fork has a high potential for impairment, specifically due to mining activities. Moreover, this segment carries the highest sediment load of all subwatersheds in the Mulberry Fork. *Id.* Baker Creek, Blackwater Creek, Lost Creek and Wolf Creek (tributaries to the Mulberry Fork) were all assessed as impaired due to sedimentation primarily due to "mining activities." *Id.* The subwatershed directly across river from the intake (Baker Creek) carries the highest conductivity and concentration of TDS of any Black Warrior

River subwatershed. Additional mines will increase the concentrations of these harmful pollutants in the Mulberry Fork and again, would likely mean that the BWWB would have to invest in costly additional treatment technology, above and beyond its current conventional treatment system. Any related increases in treatment costs would not be borne by responsible mining operations, as should be the case, but would be passed on to the BWWB's 600,000 ratepayers (which obviously negates any putative economic benefits of the mining activity to the community).

Data produced by the BWWB specifically demonstrates that even today raw water concentrations at the Mulberry Intake frequently exceed applicable EPA drinking water standards. *See Birmingham Water Works Board Mulberry Fork Drinking Water Data October 2010 --- August 2013.* According to that data, aluminum exceeded EPA's secondary drinking water standards at least 17 times at the Mulberry Intake. *Id.* Manganese exceeded EPA's secondary drinking water standards at least 11 times at the intake. *Id.* Organic carbon exceeded the applicable Treatment Technique standard at least six times at the intake. *Id.* Iron exceeded the EPA's secondary drinking water standards at the intake on at least two occasions. *Id.* On September 13, 2011, the cadmium concentration at the intake measured 79.2 μg/L (more than 15 times the primary drinking water standard). *Id.* On August 6, 2013, the lead concentration at the intake measured 13.9 μg/L, just under the primary drinking water standard of 15 μg/L. *Id.*

Just as concerning are the number of exceedances documented at the three BWWB monitoring stations closest to the Mulberry Fork drinking water intake. The most recent data (2007-2013) from these three stations yields the following. Frog Ague Station had 27 exceedances of aluminum, 20 exceedances of manganese, 13 exceedances of Total Organic Carbon, and 7 exceedances of iron. Furthermore, the concentration of antimony at this station approached the primary drinking water standard on three separate occasions. Barney Tressel had 25 exceedances of aluminum, 15 exceedances of manganese, 7 exceedances of Total Organic Carbon, and 9 exceedances of iron. In addition, this station also had one exceedance each of lead, antimony and cadmium. Industrial Pump Station had 31 exceedances of aluminum, 15 exceedances of manganese, 11 exceedances of Total Organic Carbon and 9 exceedances of iron.

As the BWWB points out, neither the ASMC nor ADEM permits impose limitations on the discharge of pollutants at mine outfalls when harm is most likely to occur: during precipitation events. NPDES mining permits actually exempt mines from federal effluent guidelines as well as suspend permit limits based upon the reasonable potential analysis if the precipitation exemption is invoked. The only parameters that are restricted during qualifying precipitation events are pH (a prescribed range of 6.0 s.u. to 9.0 s.u.), iron (7.0 mg/L daily maximum) and settleable solids (.5 ml/L daily maximum). The ASMC states that outfalls discharge only during precipitation events (Decision p. 3) but current permits only require monitoring twice a month. According to the BWWB, as a result only 10% of mining discharges sampled yielded results, with mine operators reporting "no discharge" for 90% of the samples. For the eleven qualifying storm events from 2005-2013, the BWWB notes that only four

samples were collected --- out of 231 opportunities. As the BWWB observes, a monitoring program using this methodology does not protect downstream users and does nothing to aid the understanding of the environmental effects of mining-related discharges. The BWWB concludes that using non-storm related data to determine the probable hydrological consequences of future mines is "scientifically flawed and completely ignores the acute risks." Without this critical data, the truth is that the ASMC has no idea what concentrations of mining-related pollutants are actually being discharged into the Mulberry Fork.

If additional surface coal mines are permitted near the drinking water intake, the cumulative impacts of these mines will mean even greater degradation of the source water. In the absence of a robust, independent and comprehensive study on the cumulative impacts of surface mining on the Mulberry Fork drainage, particularly upstream of and within the LUM area, and a look at how the operations of additional mines will further contribute to these impacts, the ASMC cannot deny the Petition. This is especially so given that "recent efforts to complete this type of analysis in the coalfields of Central Appalachia have discovered that the impacts of surface coal mining are far more damaging and long-lasting than permit applicants would have one believe." *See* Exhibit 1 *(February 20, 2014 Comment Letter from Dr. Emily Bernhardt, et al., to the Alabama Surface Mining Commission)* at p. 2.

As stated by three of the leading national experts on the issue, "surface coal mining leads to severe, persistent and far-reaching degradation of water quality and biodiversity." *Id.* Just as concerning, permitting mines (like the proposed Shepherd Bend Mine) close to the Mulberry Intake is dangerous.

> Despite our extensive collective experience regarding permit applications in the coalfields of West Virginia and Kentucky, the **Shepherd's Bend mine is the first mining permit application that we have seen immediately adjacent to a public drinking water supply. Given the extensive literature linking surface coal mining to a variety of human health problems with enormous associated public health costs** (*see attached summary of this literature,* APPENDIX 2) **such activity seems particularly ill advised.**

Id. Moreover, "extensive research conducted in the central Appalachians makes it very clear that there are good reasons to be concerned about the water quality implications of surface coal mines and that "[w]ithout similar research and evidence to the contrary, the citizens and managers of Alabama would be prudent to assume that the same trends apply." *Id.*

So even though there is substantial evidence in the record which demonstrates real water quality impacts associated with surface coal mining in the Mulberry Fork and the risks that these impacts pose to the drinking water, the ASMC decision fails to address the merits of much of this evidence.

V. The ASMC decision erroneously assumes that all mines are compliant all of the time, when the record demonstrates they are not.

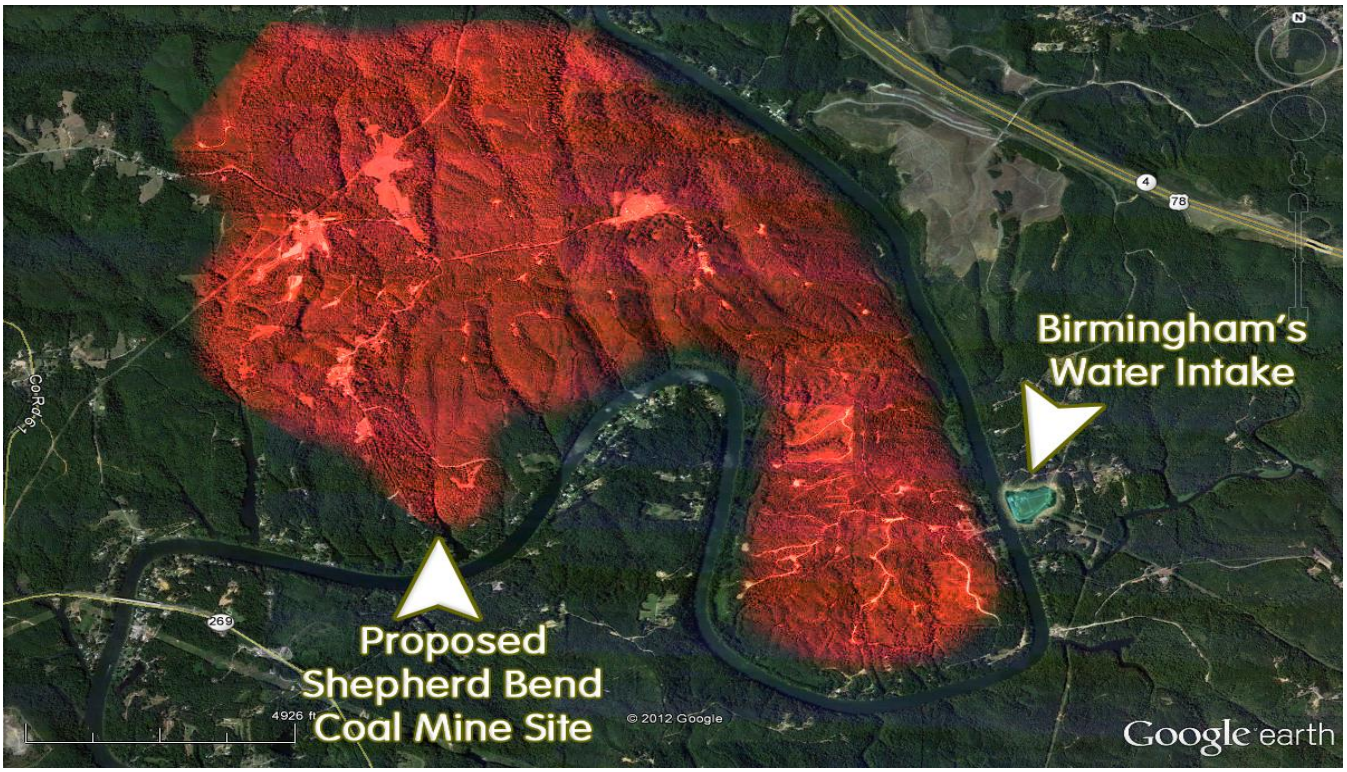
The ASMC's decision is premised upon a false assumption unsupported in the record (and not upon fact or data) that all coal mines rigidly adhere to all ASMC and ADEM regulations, which is simply not true. *See ASMC Decision* at p. 3. The ASMC neither considered nor addressed threats from mine(s) operating in violation of permit(s), or the substantial possibility that an accidental or catastrophic release or bypass could occur, even though the record contained evidence documenting these occurrences. *See, e.g.*, permitted bypass at Burton Mine (*Riverkeeper January 31, 2013 Public Comments* at pp. 35-37); violations at Quinton Mine, Horse Creek Mine, Manchester Mine, etc. (*Id*. at p. 34) The decision also fails to address the unlimited discharge of pollutants allowed when the precipitation event or manganese exemptions are invoked. While recognizing that mines occasionally pump from pit floors resulting in continuous discharges (*ASMC Decision* at p. 3), the ASMC fails to acknowledge that large numbers of treatment ponds built in existing stream beds may also result in continuous discharges. For example, at least ten of the proposed outfalls at Shepherd Bend would be built within the natural course of USGS-recognized ephemeral or intermittent streams according to the National Hydrography Dataset. Such ponds could reasonably be expected to discharge on a continuous basis for at least part of the year. Below are some of the images which further illustrate the unfortunate reality of mine noncompliance.

1. Polluted water from Sloan Mountain Mine being discharged into the Locust Fork after Tropical Storm Lee. (9/12/11)

2. Black Warrior Minerals had over 1,200 violations of their water pollution permit; polluted water from this mine discharges into tributaries of Hurricane Creek

3. Shannon, LLC had over 758 violations of their water pollution permit; polluted water from this mine is discharged into tributaries of Valley Creek

4. Coal fines in tributary of Burnt Cane Creek below Quinton Mine's outfall



5. Imagine an operation like Shannon Mine (Picture 3) or a discharge like the one from Sloan Mountain Mine (Picture 1) in such close proximity to the water intake

One prime example of how surface mines are not always compliant or that "modern" surface mining techniques are foolproof is presented by National Coal of Alabama. Riverkeeper's Enforcement Coordinator John Kinney performed a compliance review in April 2012 based upon National Coal's self-reporting to ADEM's "eFile" website. He documented and then updated NPDES permit violations at known National Coal mines in the Black Warrior watershed, some of which were addressed by an ADEM Consent Order, after Riverkeeper and other stakeholders brought these violations to light. During 2009 – August 2011 alone (the period covered by the Consent Order), National Coal had 12,373 violations at five mines in the watershed based upon the Clean Water Act counting methodology specified by federal law. During the pendency of that order, National Coal had another 2,903 violations at these same mines.

Moreover, even discharges from reclaimed mines can contribute elevated TDS, sulfate and conductivity in surface waters well after reclamation is finished. *See* Exhibit 2 attached (*Sulfate, Conductivity and TDS Measurements at Area Mines in Various Stages of Reclamation).* Three of these mines are in the in the Mulberry Fork drainage, within the proposed LUM area.

All of the foregoing well illustrate that the ASMC's assumption that mines are always complaint is simply not true. The many notices of violation contained in the ASMC's paper files also bear witness to this truth.

VI. *The ASMC has duty under Alabama law to maintain and protect "[e]xisting instream water uses and the level of water quality necessary to protect the existing uses."*

In sworn testimony the BWWB states that using current treatment technology they would be unable to adequately treat many of the metals and other pollutants in Mulberry Fork source water should current concentrations rise as a result of additional and cumulative surface coal mining impacts to the Mulberry Fork drainage. At certain concentrations or with certain pollutants, effective treatment is simply not possible with the BWWB's current conventional treatment process. The ASMC may be mining experts, but the BWWB are the drinking water experts. The BWWB states that the Mulberry source water is the most challenging of its four sources to treat and that the utility is reaching the tipping point where it will be unable to treat mining-related contaminants in the Mulberry Fork source water with current treatment systems. We ask the ASMC to listen to and heed these warnings. As you know, the ASMC has the explicit duty under Alabama law to maintain and protect "[e]xisting instream water uses and the level of water quality necessary to protect the existing uses." *See* Ala. Admin. Code r. 335-6-10-.04(2).

By law, the BWWB currently is only required to treat surface water according to conventional methods. *See* Ala. Admin. Code r. 335-7-6-.04. *See also* Ala. Admin. Code r. 335-6-10-.09(2)(b) ("PUBLIC WATER SUPPLY: Conditions related to best usage: the waters, if subjected to treatment approved by the Department equal to coagulation, sedimentation, filtration and disinfection, with

additional treatment if necessary to remove naturally present impurities, and which meet the requirements of the Department, will be considered safe for drinking or food-processing purposes.")

If concentrations of toxic pollutants increase as a result of mining, it is very likely that the BWWB will have to implement advanced water treatment technology not mandated by law, technology that it does not currently possess or use, and technology which would require significant additional capital costs. *See November 29, 2012 Testimony of BWWB Engineering Consultant Patrick Flannelly* at p. 15, pp. 32-34 (*Birmingham Water Works Board v. ASMC and Shepherd Bend Mine LLC)* ("*Flannelly"*) (Applicable regulation does not require BWWB to employ advanced treatment methods, but certain concentrations of metals in source water would require advanced treatment to meet applicable drinking water standards). Some mining-related contaminants are not removed by the treatment process at the Western Filter Plant. *See* BWWB's "Treatability of Potential Mining Contaminants at Western Filter Plant" (*Riverkeeper January 31, 2013 Public Comments* Appendix A) (Chromium, manganese, molybdenum, sulfates and total dissolved solids).

Other pollutants may be partially removed by treatment, but the effectiveness of that treatment depends upon maintaining certain minimum concentrations of those pollutants in the source water. *See id.* (Aluminum, antimony, arsenic, cadmium, copper, iron, lead, mercury, nickel, selenium, silver strontium, turbidity, total organic carbon, uranium and zinc). The identity and concentrations of these pollutants is a key factor in determining whether and by what treatment the Mulberry Fork source water can be made safe and wholesome for drinking and other uses. At certain concentrations or with certain pollutants, effective treatment is simply not possible with the BWWB's current conventional treatment process. *See* BWWB's "Potential Mining Contaminants with Drinking Water Standards" (*Riverkeeper January 31, 2013 Public Comments* Appendix B). As a result, where and under what circumstances mining occurs is especially critical for the protection of source water.

Conclusion

So what does all the foregoing evidence mean? The ASMC puts much emphasis on the conclusion that their decision about whether or not to designate part of the Mulberry Fork drainage as unsuitable for mining is entirely "discretionary," or not required, by the lands unsuitable process. However, where, as here, there is compelling evidence in the record to establish that mining operations are degrading source water quality to the point they "could result in a substantial loss or reduction of long-range productivity of the water supply" a decision on this issue by the ASMC should no longer be discretionary, but required. See Ala. Admin. Code r. 880-X-7C-.04. The evidence in the record proves that surface coal mines contribute certain concentrations of pollutants that harm source water. The BWWB states that for many of these pollutants, they will be unable to treat them without additional treatment technology --- or perhaps at all. Continuing to permit additional mines in the LUM Petition area proposed for designation as unsuitable will contribute even more of these pollutants. Some of these mines may be in such close proximity to the drinking water intake that noncompliant discharges or a

catastrophic event or failure could shut the intake down. Given these facts, the Mulberry Fork LUM area should be designated as off limits to coal mining.

In 2014, we have seen drinking water issues occupy a prominent place in the national discourse with the chemical spill into Charleston's drinking water source (the Elk River) and Duke Energy's coal ash spill into the Dan River (the source of Southside Virginia's drinking water). It would be difficult to find a bigger "friend of coal" than West Virginia U.S. Senator Joe Manchin, but here is what he said after Charleston [February 4, 2014 testimony before the Senate Environment and Public Works Subcommittee on Water and Wildlife]: "In our state, we have always worked hard to produce the energy and chemicals that power this country, but this cannot come at the cost of access to safe and clean drinking water." Similarly, N. C. State Rep. Chuck McGrady, is working on legislation to address the Duke Energy coal ash spill and he said "what happened on the Dan River was a wakeup call." WRAL February 11, 2014 (*Lawmakers to push legislation for coal ash cleanup*). Perhaps as never before, people are questioning what is happening along their waterways and close to their drinking water intakes.

We know that such a catastrophic event could affect the Mulberry Fork drinking water that is the subject of the Petition because it already has, although not with coal mining.

In 2006-2007, the BWWB had to shut down the Mulberry Intake for seven months to avoid having an enforceable violation for trihalomethanes, caused by bromide that contaminated the Mulberry Fork source water. The bromide was traced to Umicore Specialty Chemicals in Arab, some 90 miles upstream of the intake. The BWWB was forced to take legal action against the polluter to reduce the bromide contamination so that the source water could again be used. According to the BWWB, the amount of bromide represented "a very small concentration of that chemical that . . . was untreatable," but it nonetheless forced the BWWB to shut the intake down. With the Mulberry Intake shut down and the need for water "critical" due to major drought, the BWWB had to find a way to restore the Mulberry Fork to avert a water shortage.

This unfortunate event teaches two important lessons. First, the BWWB cannot consistently provide the region with an adequate supply of drinking water without relying on the Mulberry Intake, which is characterized as the "workhorse" of the system. Second, the Mulberry Fork lacks the assimilative capacity for bromide under low flow conditions, just as there is evidence in the record here from the BWWB that the source water similarly could not assimilate the metals or adequately treat sediment or TDS that would be released by a surface mine in close proximity to the drinking water intake.

As stated by the BWWB, "the best practice for risk management is to be proactive." *Flannelly* at 110-111. "If you look at operations that are designed [with] protection in mind, we have to consider that risk is a function of a probability that something will occur and the consequence that will happen when

that [occurs]. And where the consequences are high, then the operations should be designed to make sure that the probability is as low as is possible." *Id.* at 90. "Relying on something that has supposedly never happened before as a basis for saying it's never going to happen again is certainly not the best practice from a risk management perspective." *Id*. at 12.

In this case, where the substantial loss or reduction of the long-range productivity of a daily drinking water supply for over 200,000 Alabama citizens could be compromised by pollution from additional surface coal mining, neither the BWWB nor the ASMC can afford the luxury of an emergency, ad hoc and after-the-fact approach. The Petition gives the ASMC the opportunity to heed the wake up calls coming from other states. Given the clear relationship between surface coal mining and negative water quality impacts documented in the record, and the high stakes presented by contamination of a major drinking water supply, the only feasible way to manage the risk to the Mulberry Fork source water, and ultimately to a major Birmingham drinking water supply, is to designate the proposed LUM Petition area as unsuitable for coal mining.

Respectfully submitted,

Black Warrior **RIVERKEEPER**®

Nelson Brooke
Riverkeeper

John Kinney
Enforcement Coordinator

Eva Dillard
Staff Attorney

EXHIBIT 1

TO: Commissioners of the Alabama Surface Mining Commission: Mr. Rene' Williams, Chairman; Mr. John Stevens, Vice-Chairman; Mr. Jack Bergsieker; Mr. Bobby Humphrey; Mr. Richard C. Lopez; Mr. Russell Alan Runyan; and Mr. Steven A. Thomas

Staff members of the Alabama Surface Mining Commission: Dr. Randall C. Johnson, Director; Ann Miles, Executive Secretary; Carla D. Lightsey, Chief - Division of SMCR; and G. Milton McCarthy, Jr., Legal Division milton.mccarthy@asmc.alabama.gov

FROM: Dr. Emily S. Bernhardt, Associate Professor, Department of Biology and the Nicholas School of the Environment, Duke University

Dr. Margaret A. Palmer, Director, National Socio-Environmental Synthesis Center and Professor, Department of Entomology, University of Maryland

Dr. Michael Hendryx, Professor of Applied Health Science, Indiana University

RE: SMCRA Lands Unsuitable for Coal Mining Petition

CC: Nelson Brooke, Black Warrior Riverkeeper

We appreciate this opportunity to share with the Alabama Surface Mining Commission our expertise on the impacts of surface coal mining on water quality and ecological health. We have researched this issue extensively over the last five years, and published numerous papers on the topic. We have also each been involved in multiple court cases as well as briefings of both state agency and U.S. congressional staff. Our work has been concentrated in central Appalachia, but our findings are applicable to any surface coalmines in which coal residues and rock overburden are placed directly within stream channel networks, where coal derived sulfuric acid and soluble metals can be leached into surface waters. We include our professional resumes as an attachment to this letter to provide proof of our expertise.

All of the accumulating body of research on this topic demonstrates that **surface coal mining leads to severe, persistent and far-reaching degradation of water quality and biodiversity.** This conclusion is solidly grounded in the growing literature on this topic and has been demonstrated in our own empirical work and published papers. We provide a brief summary of the most relevant publications as an attachment to this letter along with complete copies of each of those publications for your reference (APPENDIX 1).

The basic problem of surface coal mining is that it leaves behind coal residues mixed with overburden, with all of this mineral material having vastly increased reactive surface areas exposed to air and water. As rainfall percolates through this regarded and filled material it picks up the sulfuric acid, selenium, soluble iron, manganese from the coal and weathers tremendous quantities of buffering ions from the surrounding bed material. While the

resulting leachate may not be acidic due to internal buffering, it is saltier and laden with a variety of trace metals that can be harmful for organisms and which entail more extensive treatment to comply with drinking water standards. Because surface mines continue to export these saline, metal rich waters for decades post reclamation (see US EPA 2011, Lindberg et al. 2011, Bernhardt et al. 2012), each new mine contributes more salts and metals on top of the already elevated background concentrations derived from historic mines. The impacts of surface mines thus accumulate in a highly predictable manner as a function of the total extent of surface mines.

Despite our extensive collective experience regarding permit applications in the coalfields of West Virginia and Kentucky, the Shepherd's Bend mine is the first mining permit application that we have seen immediately adjacent to a public drinking water supply. Given the extensive literature linking surface coal mining to a variety of human health problems with enormous associated public health costs (*see attached summary of this literature,* APPENDIX 2) such activity seems particularly ill advised.

We understand that the Surface Mining Commissions recently denied a request to designate a 40,000 acre portion of the Mulberry Fork watershed as "lands unsuitable for coal mining" to protect the drinking water supply for 200,000 residents of Birmingham, Alabama. In their petition, two very important issues are raised (see p. 7)

> *"The first is, despite the extensive coal mining that has occurred in the area both currently and historically, there has never been a comprehensive study of the cumulative impacts of mining on source drinking water in the Mulberry Fork, nor any meaningful consideration of how the operations of two (or even more) additional mines will further contribute to these impacts. Just as importantly, there have never been any scientific studies of how concentrated coal mining along the Mulberry Fork may affect the health of those who live nearby or who rely on this intake for their drinking water."*

We wholeheartedly support these critical points. In the absence of such study, we would urge the commission to consider that recent efforts to complete this type of analysis in the coalfields of Central Appalachia have discovered that the impacts of surface coal mining are far more damaging and far more long-lasting than permit applicants would have one believe.

Having read the May 2013 document in support of this decision, entitled **Inventory of Environmental, Economic and Coal Resources and Data for Evaluation of a Petition to Designate Lands Adjacent to the Mulberry Fork of the Black Warrior River as Unsuitable for Coal Minin** it appears that the commission's decision rests on several key conclusions in the absence of the data necessary to draw those conclusions. Although considerable energy was invested in preparing this report, it does not appear to represent a serious effort to address the important questions being posed which are: <u>How are existing surface mines (both active and reclaimed) altering the water quality at the water intake point?</u> and, <u>How will new mining activity in the contested area further alter water quality?</u> There cannot be any question that these proposed new coalmines will add mining derived pollution to the Mulberry Fork, as that is the inevitable result of rainfall on active and

reclaimed coal mines and filled valleys alongside rivers. The question before the commission should be the extent and the impact of that inevitable pollution increase.

We urge you to reconsider and reevaluate the following key statements in light of available evidence.

The authors state on p. 17 *"It can be seen from previous mining in this area as well as the overburden data that the overburden material does not contain acid-or toxic forming material that can lead to water quality problems."* This statement is not attached to any citation or any reference to data, and no reference is made to the acid or toxic forming material of the coal residue itself. In the decision document (Table 2 and figures 1,) it is clear that for multiple locations within the watershed, the average iron, manganese and lead concentrations regularly exceed DWS limits, strong evidence that coal derived pollutants are being generated and making their way into surface waters.

On p.22, the authors state *"Generally pre-mining data will show lower conductivity than during mining data. Specific Conductance is a measure of water's ability to conduct an electrical current. It can be used for approximating the total dissolved solids content of water by testing the capacity to carry an electrical current (U.S. Geological Survey- "Water Science School Glossary of Terms"). **Post mining water quality trends show a decrease in conductivity over time**."* (emphasis added). No evidence is provided in support of the statement that post mining water quality conductivity declines through time. If true, this conclusion would contradict recent published research on the topic. Because this flies in the face of what has been recently reported (US EPA 2011, Lindberg et al. 2011, Bernhardt et al. 2012) such a statement requires empirical support. No data are shown and no citations are provided in support of this statement.

The same critique can be leveled at the next paragraph on p. 22 where the authors state *"The iron concentrations from surface water sites are generally less than 1.00 mg/l, and mostly under 0.5 mg/l except for two sites on P-3860. The iron concentrations were high prior to, and during mining, however the concentrations have significantly decreased since reclamation activities have been implemented at this mine."* Again, this is inconsistent with recent reports from central Appalachia and requires some empirical proof.

A major point in the decision document is that the number of exceedances for Fe, Mn and SO4 are similar between mined and unmined streams. The study authors declare that the "unmined" stream category included some sites downstream of a reclaimed surface mine. Since it has been shown that mining pollution from surface mines can persist without decline for decades these sites should be eliminated from the comparison. If all the exceedances reported for the unmined watersheds are from sites impacted by reclaimed mines then the analysis is flawed. It is also disingenuous to compare the frequency of exceedances rather than the absolute concentrations of these pollutants of interest.

The reporting of water chemistry analyses from streams within the lands unacceptable for mining (LUM) area are not accompanied by any description of their watersheds and thus it

is difficult to draw strong conclusions from these data. It is clear from the NPDES permit reporting that there is significant mining derived pollution entering streams, as the conductivity data reported for these streams (beginning p. 265 of the Inventory document) range between 173-3124 uMhos cm^{-1}, while reference stream locations in the state are typically much lower (95% CI 91 ± 4.5 uMhos cm^{-1})[1]. This sort of comparison between state reference streams and pollutants of concern really ought to be done comprehensively within the Mulberry Fork basin.

In light of these critiques, we would reiterate the petitioners' request for a thorough analysis of existing data. Although a large amount of water quality data is presented in the Inventory document and Decision document the accompanying analysis is incomplete. It would be the work of only a day or two to map the chemical records from EPA and state databases onto the maps of mining for the watershed and to determine the extent to which mining derived pollutants like sulfate, iron, manganese, selenium and mining pollutant indicators such as elevated conductivity and alkalinity are predictable from the extent of upstream mining. Such an analysis would provide the simplest and best tool for evaluating the impact of expanding the mining footprint in the Mulberry Fork river and would be far more useful than the current simple comparisons between mined and unmined watersheds. The absence of such an obvious analysis, which could easily assess the impact of mining in the basin, is troubling. It is clear that the water intake in question (BBWB) is already frequently exceeding standards for both Al and Mn (Table 5, decision document). It is highly likely that the frequency and duration of exceedance will increase with additional mining immediately adjacent to the intake. It is also likely that additional constituents will become problematic, as higher Sulfates and Fe concentrations are likely to occur based on reported data from mined watersheds showing frequent high values of both constituents (Table 6, decision document).

In short, extensive research conducted in the central Appalachians makes it very clear that there are good reasons to be concerned about the water quality implications of surface coalmines. Without similar research and evidence to the contrary, the citizens and managers of Alabama would be prudent to assume that the same trends apply. The limited time and evidence available to us in the preparation of this comment give us no reason to conclude that the coal mines of Alabama are having markedly different impacts than the coal mines of West Virginia or Kentucky.

Submitted respectfully.
Emily S. Bernhardt, Ph.D.,
Michael Hendryx, Ph.D.
Margaret A. Palmer, Ph.D.

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[1] Based on data provided to ESB on Friday, February 14th from Lynn Sisk of the Alabama Department of Environmental Mangement.. Data are accessible through this web portal http://www.waterqualitydata.us/

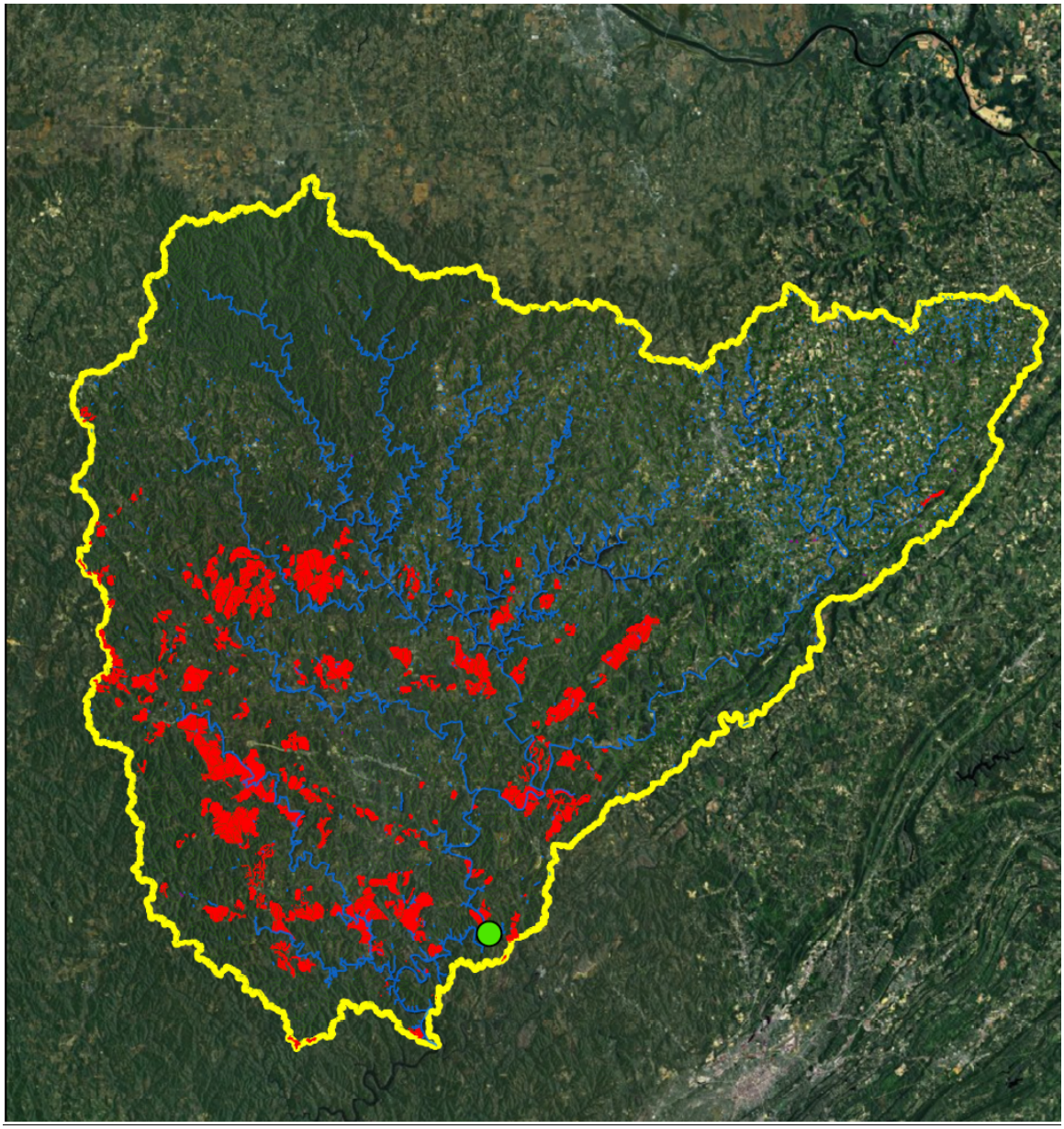

Figure 1 A map of the Mulberry Fork watershed (delineated in yellow) showing the stream network (in blue) and permitted surface mines (in red). The water intake station in question is indicated by the green dot. We estimate the area of the watershed to be 2369 mi^2 with mine permits encompassing 113 mi^2 (or ~5%) of the watershed area. Permit maps were obtained directly from the Alabama Surface Mining Commission (http://www.surface-mining.state.al.us/page3.html). Watershed boundaries and stream maps were obtained from the National Hydrography Database.

Attachment 1: A summary of recent research on surface coal mining impacts on surface water quality and biota

Literature Synthesis:

- The first comprehensive report on the effects of surface coal mining together with stream filling was the UE EPA's 2005 Environmental Impact Statement. Despite limited prior research on the topic, US EPA and USGS researchers clearly documented higher conductivity and sulfate concentrations in streamwaters directly downstream of mountaintop mines. The report found as well that streams with high conductivity and high sulfate concentrations almost never supported sensitive stream macroinvertebrates and that there was a consistent negative relationship between conductivity and a variety of commonly used biological indicators of water quality.

- *(Palmer et al. 2010 Science)* Our analysis of state records found that WV streams with high sulfate concentrations were also many times more likely to have high concentrations of a variety of trace elements including selenium, a contaminant with significant biological toxicity. In previous reports (especially the 2005 Environmental Impact Statement) sulfate concentrations above 50 mg L^{-1} were acknowledged to result from coal mining, so in this study we used sulfate as a proxy for mining impacts. This short review paper also highlighted new and important research documenting significant public health problems in surface coal mining counties in the region (see list of papers on this topic below).

- The weight of evidence documenting the harmful effects of surface coal mining on surface waters has accumulated through time with increased ability to map and monitor surface mining impacts and monitoring of stream water quality and biota. *In 2011*, we prepared a comprehensive literature review paper on the subject of the effect of mountaintop mining on aquatic ecosystems of the Central Appalachians (Bernhardt and Palmer 2011). We concluded that paper as follows:

  "In summary, the environmental impacts of MTVFs in the Central Appalachians are severe, large scale, and long lasting. In addition to the permanent burial and loss of headwater streams directly impacted by mining, many additional river miles are being degraded by the cumulative impacts of altered flows and increased pollutant from both past and present mining activities in the region. Whether or not individual component ions within mining-derived runoff reach streamwater concentrations that are individually lethal or toxic to aquatic life, the cumulative effect of elevated concentrations of multiple contaminants is clearly associated with a substantial reduction in water quality and biological integrity in streams and rivers below mine sites. All research to date indicates that conductivity is a robust measure of the cumulative or additive impacts of the elevated concentrations of multiple chemical stressors from mine sites that lead to biological impairment of streams. Each constituent pollutant increases conductivity and they may have additive or multiplicative ecological impacts. To

date, mitigation practices and restoration efforts have not been effective in ameliorating water pollution from MTVF sites. Furthermore, efforts to reclaim vegetation and restore the full diversity of plant species in mined watersheds have not proved successful to date."

- Later that same year, the USEPA published a comprehensive report on the environmental impacts of surface mining (US EPA 2011). Their report relied on both published literature and analysis of government agency datasets. Their conclusions mirrored our own. The major conclusions of the report are summarized below:
    - **Section 8.2.1 Loss of Headwater Resources**– more than 1900km of mid-Appalachian streams has been lost through burial
    - **Section 8.2.2 Impacts on Water Quality**- Effluent waters below valley fills were often alkaline and high in conductivity due to high concentrations of SO42−, HCO3−, Ca2+, and Mg^{2+}. Selenium and iron concentrations were elevated below mines, with more than half of surveyed sites exceeding the chronic AWQC for selenium.
    - **Section 8.2.3 Toxicity Impacts on Aquatic Organisms** - Se concentrations reported from waters in the study area were high enough to warrant concern. Other toxicants were also high enough to warrant further investigation. Fe and Mn deposits have been observed on macroinvertebrates. Ni and Zn concentrations in sediments are higher than empirical screening level values.
    - **Section 8.2.4 Impacts on Aquatic Ecosystems**– all surveys reported degraded biological conditions downstream of surface coal mines, with both fish and macroinvertebrate communities being affected.
    - **Section 8.2.5 Cumulative Impacts of Multiple Mining Operations**– the EPA concluded that there had been too little work on cumulative impacts, but cited a paper by Johnson et al. (2010) which found that conductivity in large streams could be accurately predicted by the conductivity of tributaries – suggesting that conductivity levels accumulate in concert with an increasing proportion of mining.
    - **Section 8.2.6 Effectiveness of Mining Reclamation and Mitigation Efforts** The results of the water quality studies indicate that reclamation efforts partially controlled the amount of soil erosion and fine sediments transported downstream. However, there is no evidence that reclamation efforts altered or reduced the ions or toxic chemicals downstream of valley fills. Ion concentrations have either remained constant or increased over time.

- (Lindberg et al. 2011 Proceedings of the National Academy of Sciences)
  Since 2010, Bernhardt together with a team of researchers from Duke University has been intensively monitoring water quality in the Mud River as if flows upstream of and then through the Hobet Mine complex. We find that while conductivity is consistent with state reference streams and Se concentrations are below detection upstream of the mine, the first mining impacted tributary raises the

conductivity of the Mud River above 500 µS and Se concentrations frequently exceed the toxicity threshold of 5 µg/L below this confluence. By the time the 8th mining impacted tributary enters the Mud River at the downstream end of the Hobet mine complex, conductivity is always >1000 uS and Se concentrations are 2-4X the toxicity threshold. Several of the tributaries to the Mud River are actively mined, and, contrary to suggestions that mining practices have significantly improved, we find through monthly sampling of these tributaries that they always have Se concentrations > 5 µg L^{-1} and conductivity >500µS. As a result the amount of surface mining (both past and present) within the watershed explains nearly all of the increase in streamwater conductivity, sulfate, selenium and a host of trace elements concentrations as you move downstream in the Mud River.

- *(Bernhardt et al. 2012 Environmental Science and Technology* reports our first estimate of the cumulative impacts of surface coal mining on freshwaters throughout heavily mined southern West Virginia. Using detailed maps of surface mining activity throughout southern WV since the mid 1970's together with location-specific water quality and biological data from the WVDEP, Bernhardt and colleagues found that the amount of mining in a streams watershed was the single best predictor of surface water conductivity, sulfate concentrations, calcium concentrations and magnesium concentrations. This variation in stream conductivity or underlying ion concentrations explains nearly half of the observed variation in the number of sensitive species of stream insects found across WV streams. Generalized additive models were used to estimate the amount of watershed mining, stream ionic strength, or sulfate concentrations beyond which biological impairment (based on state biocriteria) is likely. We fi nd this threshold is reached once surface coal mines occupy >5.4% of their contributing watershed area, ionic strength exceeds 308 **µ** S cm−1 , or sulfate concentrations exceed 50 mg L−1 . Signifi cant losses of many intolerant macroinvertebrate taxa occur when as little as 2.2% of contributing catchments are mined.

References Cited (all are attached for your reference):

Bernhardt, E. S., B. D. Lutz, R. S. King. C. A. Carter, J. P. Fay, D. Campagna, J. Amos. 2012. How many mountains can we mine? In review. Examining the cumulative impact of surface mining on freshwater ecosystems of the Central Appalachians. Environmental Science and Technology

Lindberg. T.T., E.S. Bernhardt, R. Bier, A. Helton, R. Merola, A.Vengosh, R.T. Di Giulio. 2011. Cumulative impacts of mountaintop mining on an Appalachian watershed. Proceedings of the National Academy of Sciences.

Bernhardt, E.S. and M.A. Palmer. 2011. Impacts of mountaintop mining and valley fill operations on aquatic ecosystems of the central Appalachians. Annual Review of Conservation and the Environment. Annals of the New York Academy of Sciences. 1223: 39-57.

Palmer, M.A., E.S. Bernhardt, W.H. Schlesinger, K.N. Eshleman, E. Foufoula-Georgiou, M.S. Hendryx, A.D. Lemly, G.E. Likens, O.L. Loucks, M.E. Power, P.S. White, and P.R. Wilcock. 2010. Environmental and Human Health Consequences of Mountaintop Removal Mining. Science 327:148-149.

U.S. EPA. 2005. Mountaintop Mining / Valley Fills in Appalachia. Final Programmatic Environmental Impact Statement.. EPA 9-03-R-05002.

U.S. EPA. The Effects of Mountaintop Mines and Valley Fills on Aquatic Ecosystems of the Central Appalachian Coalfields (2011 Final). U.S. Environmental Protection Agency, Washington, DC, EPA/600/R-09/138F, 2011.

Attachment 2: **Summaries of articles showing public health consequences of Appalachian coal mining**
(As of March 2013)
Prepared by Michael Hendryx, PhD

Executive Summary

Coal mining in Appalachia, especially in mountaintop mining areas of West Virginia and other central Appalachia areas, is associated with a set of serious public health problems, including:

- Higher cancer rates
- Higher heart and lung disease rates
- Higher kidney disease rates
- Higher rates of birth defects
- Higher levels of impaired functioning due to health problems

Data also show that the economic costs of health problems in Appalachian coal mining areas are more than 5 times greater than the economic benefits from mining.

These health problems are partly due to disadvantages in mining areas such as poverty and smoking. However, the pattern of results shows that:

- Health problems are present after statistical adjustment for age, smoking, obesity, poverty, education, availability of doctors, and other risks
- Health problems are most severe in areas where amounts of mining are greatest
- Health problems in mountaintop mining areas are worsening in more recent years versus earlier years
- Health problems are present for men, women and children and reflect more than occupational exposure.

Dust collected from residential areas near mountaintop mining has been analyzed in the lab. The dust contains primarily silica, sulfur, and organic carbon, with small amounts of aluminum, iron, and many other trace elements. This evidence indicates that the elevated dust originates from the surface mining sites. Laboratory animals that inhale MTM dust show impaired vascular function.

Most recently, environmental data from mountaintop mining communities show evidence that air and water quality are impaired in mining communities; and that the specific forms of impairment are consistent with mountaintop mining activity (e.g. dust in communities contains high levels of silica that seem to result from overburden removal.) Dust collected from mountaintop mining communities has been shown to be toxic to animal tissues. These studies have not yet been published but are going through the peer-review process.

Studies that directly measure environmental exposures for individual persons with biological impacts for those same persons have not yet been conducted. However, the overall pattern of results from this research, and from research conducted by other scientists, strongly suggests that mountaintop mining is destructive of local environments in ways that impair human health.

Summaries of research studies showing public health consequences of Appalachian coal mining
(As of March 2013)

1) Hospitalization Patterns Associated with Appalachian Coal Mining
In this study, researchers explored the relationship between quantity of coal mined in counties and hospitalizations for "coal exposure sensitive" ailments (those linked with coal mining in previous research) and "coal exposure insensitive" ailments (those that had not been shown to be associated with coal mining). After controlling for other risk-factors they found that hospitalization for Chronic Pulmonary Obstructive Disease (COPD) and high blood pressure, both coal exposure sensitive conditions, were linked with quantity of coal mined. The odds for a COPD hospitalization increased 1% for each 1462 tons of coal mined, and the odds for a high blood pressure hospitalization increased 1% for each 1873 tons of coal mined.

2) Relations between Health Indicators and Residential Proximity to Coal Mining in West Virginia
In this large survey study of West Virginia residents, researchers examined the relationship between amounts of coal mined in an area, levels of self-reported health, and rates of chronic disease conditions for residents. High levels of coal production were found to be associated with worse health status and with higher rates of cardiopulmonary disease, chronic obstructive pulmonary disease, high blood pressure, lung disease, and kidney disease.

3) Mortality Rates in Appalachian Coal Mining Counties: 24 Years behind the Nation
Appalachia has higher rates of death than the rest of the country, and this study investigated whether this trend was linked with the high rates of coal mining in this region. It found that coal mining areas do indeed have higher mortality rates than both other Appalachian counties and the rest of the country. The association between coal mining and higher mortality rates remained even after controlling for other risk factors such as smoking, poverty, education, rural-urban setting, and race/ethnicity. Mortality rates present currently in mining counties lag 24 years behind the rates found in non-mining counties.

4) Lung Cancer Mortality is Elevated in Coal-Mining Areas of Appalachia
Researchers in this study examined nationwide data to test whether living in coal-mining areas of Appalachia contributed to the higher rates of lung cancer deaths observed in Appalachia relative to the rest of the nation. Results show that lung cancer death rates for the years 2000—2004 are indeed higher in areas of heavy Appalachian coal mining even after controlling for smoking, poverty, education, age, sex, race and other risk factors. Higher mortality may be partly the result of exposure to environmental pollution associated with the coal-mining industry.

5) Mortality from Heart, Respiratory, and Kidney Disease in Coal Mining Areas of Appalachia

This study compared the mortality rates from heart, respiratory, and kidney disease in four groups of counties: Appalachian counties with more than 4 million tons of coal mined from 2000 to 2004; Appalachian counties with mining at less than 4 million tons; non-Appalachian counties with coal mining; and other non-coal mining counties across the nation. For both males and females, mortality rates in Appalachian counties with the highest level of coal mining were significantly higher relative to non-mining areas for chronic heart, respiratory and kidney disease, but were not higher for acute forms of illness.

6) Mortality in Appalachian Coal Mining Regions: the Value of Statistical Life Lost

Value of statistical life (VSL) is an estimate of the monetary value that society places on an abstract (or statistical) human life. VSL estimates are used to help decide how to allocate limited resources in order to maximize benefit to society, and are usually derived from studies on how much people are willing to pay to avoid risks to their life and health. This study found that, after other risk factors were controlled for, 2,347 to 2,889 yearly excess deaths are associated with living in an area in Appalachia with coal mining. Corresponding VSL estimates (which ranged from to $10.923 to $13.492 billion) exceeded the economic contributions of the coal mining industry. When the data was analyzed without controlling for other risk factors these numbers were much higher (8,840- 10,923 excess deaths, translating to VSL estimates of $41.283 to $51.010 billion.) The best point estimate for the mortality cost of Appalachian coal mining was $42 billion, while the benefits of coal mining for Appalachia totaled only $8 billion.

7) Higher Coronary Heart Disease and Heart Attack Morbidity in Appalachian Coal Mining Regions

This study tested whether self-reported cardiovascular disease rates were higher in Appalachian coal mining counties compared to other Appalachian counties and counties outside Appalachia with and without coal mining. Reported rates of cardiovascular disease, angina or coronary heart disease and heart attack were found to be significantly higher in Appalachian coal mining counties than in other counties. This trend was present among both men and women and held true even when other relevant risk factors, such as age and smoking rates, were controlled for. Cardiovascular diseases have been linked to both air and water contamination in ways consistent with toxicants found in coal and coal processing.

8) A Geographical Information System-Based Analysis of Cancer Mortality and Population Exposure to Coal Mining Activities in West Virginia, United States of America

This study used Geographical Information Systems (GIS) techniques to determine whether there is a link between how close people live to coal mining activities and cancer mortality rates. The results obtained from these techniques were contrasted with those from earlier similar studies examining the relationship between tons of coal mined per county and county cancer mortality rates. The GIS techniques yielded a stronger association between coal mining and cancer death rates, even after controlling for smoking and age, suggesting

that where people live in proximity to mining, not just the county they live in, contributes to cancer mortality.

9) Mountaintop Mining Consequences
This article, published in *Science*, discusses and summarizes the growing scientific evidence for the negative impacts of mountaintop mining with valley fill (MTM/VF). In this practice, upper elevation forests are cleared and stripped of topsoil, and explosives are used to break up rocks to get at buried coal. Extra rock is pushed into neighboring valleys, where it buries existing streams. Analyses of current studies and new water-quality data from West Virginia streams reveal that MTM/VF causes serious damage to the environment that cannot be repaired. Published studies also suggest strongly that human health is being negatively affected by such activities.

10) Residence in Coal-Mining Areas and Low Birth-Weight Outcomes
This study investigated whether mothers living in coal-mining areas were at greater risk for giving birth to babies with low birth-weights. After adjusting for other factors that influence birth-weight, there was a 16% higher risk of a low birth weight infant in areas with high mining levels, and a 14% higher risk in areas with lower mining levels, as compared to areas with no mining.

11) A Comparative Analysis of Health-Related Quality of Life for Residents of U.S. Counties with and without Coal Mining
This study compared health-related quality of life (HRQOL) in mining and non-mining counties in and out of Appalachia. Residents of coal-mining counties reported significantly fewer healthy days for both physical and mental health and poorer self-rated health, as compared to U.S. non-mining counties, but disparities were greatest for people living in Appalachian coal mining areas.

12) Learning Outcomes among Students in Relation to West Virginia Coal Mining: an Environmental "Riskscape" Approach
To evaluate the impact of coal mining environment on the cognitive development of West Virginia children, this study examined pass rates on standardized school performance tests in counties in West Virginia with and without coal mining. Pass rates for children in schools in coal-mining counties versus non-coal mining counties were significantly lower in all subject areas. Lower pass rates were partly related to socioeconomic disadvantage, but remained significantly lower after controlling for county high school education rates, percent of low-income students, percent of highly qualified teachers, number of students tested, and county smoking rates.

13) Ecological Integrity Streams Related to Human Cancer Mortality Rates
Ecological integrity refers to a balanced community of organisms with healthy composition, diversity, and functional organization. This study explored the relationship between the ecological integrity of streams and human health. It found that lower ecological integrity corresponded with higher overall rates of human cancer death and higher mortality rates from digestive, respiratory, urinary, and breast cancer. Coal mining was also linked with higher cancer mortality and low levels of environmental integrity.

14) Full Cost Accounting for the Life Cycle of Coal
This paper examines and summarizes the enormous body of research and information on the harmful impact that the stages of the life-cycle of coal- extraction, transport, processing, and combustion- have on health and the environment. It also considers the costs of such damages, which are assumed by the U.S. public rather than coal companies and amount to a third to over one-half of a trillion dollars annually. Accounting for the damages conservatively doubles to triples the price of electricity from coal per kWh generated, making wind, solar, and other forms of non-fossil fuel power generation, along with investments in efficiency and electricity conservation methods, economically competitive.

15) Health-Related Quality of Life among Central Appalachian Residents in Mountaintop Mining Counties
Researchers in this study evaluated the health-related quality of life of residents in mountaintop mining counties of Appalachia relative to residents of counties with other types of mining and with no mining. People living in mountaintop mining counties reported significantly more days of activity limitation (e.g. work loss days), poor physical and mental health, and poor self-rated health compared to residents of the other two types of counties. Results were similar among males and females and among people of different ages. On average people in mountaintop mining areas experience four extra years of poor lifetime health compared to non-mining residents.

16) Poverty and Mortality Disparities in Central Appalachia: Mountaintop Mining and Environmental Justice
This study investigated whether people in mountaintop coal mining areas in Appalachia experience greater rates of death and poverty as compared to inhabitants of other mining areas or non-mining areas. The answer was yes: mountaintop mining areas had significantly higher mortality rates, total poverty rates, and child poverty rates every year (2000-2007) in comparison with other counties in the same states. For example, the child poverty rate in 2007 was about 35% in mountaintop mining areas compared to 21% in non-mining areas.

17) Chronic Cardiovascular Disease Mortality in Mountaintop Mining Areas of Central Appalachian States
This study looked at whether chronic cardiovascular disease (CVD) death rates are higher among people living in mountaintop mining (MTM) areas than among those in mining and non-mining areas, and whether there is a relationship between rates of MTM surface mining and CVD death levels. CVD mortality rates in MTM areas were found to be significantly higher than those of other areas, and the greater the amount of surface mining in an area, the higher the CVD death rates.

18) The Association between Mountaintop Mining and Birth Defects among Live Births in Central Appalachia, 1996–2003
In this study birth defect rates in mountaintop coal mining areas in central Appalachia were examined and compared to rates of birth defects in other coal mining areas and in non-mining areas of central Appalachia. After controlling for relevant risk factors there

were 26% more birth defects in communities with mountaintop mining, as compared to non-mining communities. In earlier years (1996-1999) the increased risk was 13% higher, and grew more pronounced in recent years (2000-2003) to 42% higher. The mountaintop mining effect was most pronounced for defects of the cardiovascular and respiratory system, where the rate in more recent years was 181% higher than in non-mining areas.

19) Self-Reported Cancer Rates in Two Rural Areas of West Virginia with and without Mountaintop Coal Mining

Researchers in this study conducted door-to-door health interviews in one rural mountaintop mining area and in one rural non-mining area of West Virginia in order to compare cancer rates in the two communities. Self-reported cancer rates were two times higher in the mining versus the non-mining area after controlling for respondent age, sex, smoking, occupational history, and family cancer history, indicating that mountaintop mining is linked to increased community cancer risk.

20) Cancer Mortality Rates in Appalachian Mountaintop Mining Areas.

Researchers examined the association between cancer mortality rates in three types of counties in central Appalachia: those with mountaintop coal mining (MTM), those with other surface or underground mining, or those with no coal mining. County-level analyses examined the association between age-adjusted cancer mortality rates and MTM mining for two periods of time: 1999-2002 and 2003-2007. County-level covariates included smoking, health care access, adult obesity, poverty, and education. Mortality rates for leukemia and for lung, colon, and bladder cancer in MTM counties were significantly greater than those in non-mining areas in 2003-2007 (lung cancer mortality rates were also significantly greater than non-mining areas in 1999-2002). Kidney cancer mortality rates in MTM areas were marginally significantly greater ($p < .06$) than those in non-mining counties in 2003-2007. In conclusion, mortality rates from lung, colon, bladder, and kidney cancer and leukemia are significantly associated with MTM mining areas (vs. non-mining counties) in 2003-2007. Results may indicate either that exposures to water and air pollutants from MTM activity have accumulated, or that contamination in MTM counties may have worsened in more recent years in conjunction with increases in the extent of this activity.

21) Adult tooth loss for residents of US coal mining and Appalachian counties.

The authors compared rates of tooth loss between adult residents of Appalachian coal mining areas and other areas of the nation after control for covariate risks. Residents of Appalachian coal mining counties showed significantly elevated odds for any tooth loss, and for greater tooth loss measured by a 4-level tooth-loss severity scale. Greater risk of tooth loss among adult residents of Appalachian coal mining areas is present and is not explained by differences in reported receipt of dental care, fluoridation rates, supply of dentists or other behavioral or socioeconomic risks. Possible contributing factors include mining-specific disparities related to access, behavior or environmental exposures.

22) Public Drinking Water Violations in Mountaintop Coal Mining Areas of West Virginia, USA

Researchers analyzed the U.S. Environmental Protection Agency's Safe Drinking Water Information System to examine the number and type of public water treatment violations in West Virginia for the years 2001–2009. Violations were compared between three groups of water treatment facilities: those in counties with mountaintop coal mining (n = 161 facilities), coal mining other than mountaintop mining (n = 184 facilities), and with no coal mining (n = 137 facilities). Adjusting statistically for system size and water source, there were 73.0 violations per system in MTM areas, 16.7 violations per system in other mining areas, and 10.2 violations per system in non-mining areas. Excess violations in MTM counties were most often related to failure to conduct required sampling for organic compounds. Complete sampling and reporting of public drinking water quality in MTM areas is needed.

23) Air pollution particulate matter collected from an Appalachian mountaintop mining site induces microvascular dysfunction

Samples of ambient dust were collected from outside residential areas near mountaintop mining. The dust was analyzed for composition and used in a laboratory animal study. The dust consisted largely of sulfur (38% by weight) and silicon (24%). Rats received a dose of 300 µg of dust into their respiratory systems. The dust impaired normal microvascular function; such impairment is known to be a risk in the development of cardiovascular disease.

24) Personal and family health in rural areas of Kentucky with and without mountaintop coal mining

A community-based participatory research study was implemented to collect information from residents on health conditions and symptoms for themselves and other household members in a rural mountaintop mining area compared to a rural non-mining area of eastern Kentucky. A door-to-door health interview collected data from 952 adults. Adjusting for covariates, significantly poorer health conditions were observed in the mountaintop mining community on: self-rated health status, illness symptoms across multiple organ systems, lifetime and current asthma, COPD, and hypertension. Respondents in mountaintop mining communities were also significantly more likely to report that household members had experienced serious illness, or had died from cancer in the past five years.

<u>List of peer-reviewed studies showing public health problems in Appalachian coal mining areas, as of August 2012, in chronological order:</u>

1. Hendryx M, Ahern M, Nurkiewicz T. Hospitalization patterns associated with Appalachian coal mining. *Journal of Toxicology and Environmental Health Part A,* 2007, 70, 2064-2070.
2. Hendryx M, Ahern M. Relations between health indicators and residential proximity to coal mining in West Virginia. *American Journal of Public Health*, 2008, 98, 669-671.
3. Hendryx M. Mortality rates in Appalachian coal mining counties: 24 years behind the nation. *Environmental Justice*, 2008, 1, 5-11.

4. Hendryx M, O'Donnell K, Horn K. Lung cancer mortality is elevated in coal mining areas of Appalachia. *Lung Cancer*, 2008, 62, 1-7.

5. Hendryx M. Mortality from heart, respiratory and kidney disease in coal mining areas of Appalachia. *International Archives of Occupational and Environmental Health*, 2009, 82, 243-249.

6. Hendryx M, Ahern M. Mortality in Appalachian coal mining regions: the value of statistical life lost. *Public Health Reports*, 2009, 124, 541-550.

7. Hendryx M, Zullig K. Higher coronary heart disease and heart attack morbidity in Appalachian coal mining regions. *Preventive Medicine*, 2009, 49, 355-359.

8. Hendryx M, Fedorko E, Anesetti-Rothermel A. A geographical information system-based analysis of cancer mortality and population exposure to coal mining activities in West Virginia, United States of America. *Geospatial Health*, 2010, 4, 243-256.

9. Palmer MA, Bernhardt ES, Schlesinger WH, Eshleman KN, Foufoula-Georgiou E, Hendryx MS, Lemly AD, Likens GE, Loucks OL, Power ME, White PS, Wilcock PR. Consequences of mountaintop mining. *Science*, 2010, 327, 148-149.

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11. Zullig KJ, Hendryx M. A comparative analysis of health-related quality of life (HRQOL) for residents of US counties with and without coal mining. *Public Health Reports*, 2010, 125, 548-555.

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13. Hitt NP, Hendryx M. Ecological integrity of streams related to human cancer mortality rates. *EcoHealth*, 2010, 7, 91-104.

14. Epstein PR, Buonocore JJ, Eckerle K, Hendryx M, Stout BM, Heinberg R, Clapp RW, May B, Reinhart NL, Ahern MM, Doshi SK, Glustrom L. Full cost accounting for the life cycle of coal. *Annals of the New York Academy of Sciences,* 2011, 1219, 73-98.

15. Zullig K, Hendryx M. Health-related quality of life among central Appalachian residents in mountaintop mining counties. *American Journal of Public Health*, 2011, 101, 848-853.

16. Hendryx M. Poverty and mortality disparities in central Appalachia: mountaintop mining and environmental justice. *Journal of Health Disparities Research and Practice*, 2011, 4(3), 50-59.

17. Ahern M, Hendryx M, Conley J, Fedorko E, Ducatman A, Zullig K. The association between mountaintop mining and birth defects among live births in Central Appalachia, 1996-2003. *Environmental Research*, 2011, 111, 838-846.

18. Esch L, Hendryx M. Chronic cardiovascular disease mortality in mountaintop mining areas of central Appalachian states. *Journal of Rural Health*, 2011, 27, 350-357.

19. Hendryx M, Wolfe L, Luo J, Webb, B. Self-reported cancer rates in two rural areas of West Virginia with and without mountaintop coal mining. *Journal of Community Health*, 2012, 37, 320-327.

20. Ahern M, Hendryx M. Cancer mortality rates in Appalachian mountaintop mining areas. *Journal of Occupational and Environmental Science*, 2012, 1(2), 63-70.

21. Hendryx M, Ducatman AM, Zullig KJ, Ahern MM, Crout R. Adult tooth loss for residents of US coal mining and Appalachian counties. *Community Dentistry and Oral Epidemiology*, 2012, 40, 488-497..

22. Hendryx M, Fulk F, McGinley A. Public drinking water violations in mountaintop coal mining areas of West Virginia, USA. *Water Quality, Exposure and Health*, 2012, 4, 169-175.

23. Knuckles TL, Stapleton PA, Minarchick VC, Esch L, McCawley M, Hendryx M, Nurkiewicz TR. Air pollution particulate matter collected from an Appalachian mountaintop mining site induces microvascular dysfunction. *Microcirculation*, in press.

24. Hendryx M. Personal and family health in rural areas of Kentucky with and without mountaintop coal mining. *Journal of Rural Health*, in press.

EXHIBIT 2

Sulfate, Conductivity and TDS Measurements at Area Mines in Various Stages of Reclamation

Mine Name	Date	Outfall Number	Sulfate Concentration (mg/L)	Specific Conductance (µS/cm)	TDS (mg/L)
			Standard <250 mg/L	**Benchmark 300 µS/cm**	**Standard <500 mg/L**
Horse Creek Mine	1/4/2012	123	228.00	820.00	602.00
Red Star Mine	1/10/2012	006	FTR	2231.00	FTR
Red Star Mine	1/24/2012	006	FTR	1580.00	n/a
Red Star Mine	4/10/2012	009	484.00	1272.00	1018.40
Red Star Mine	4/10/2012	027	480.00	1271.00	763.60
Quinton Mine	7/11/2012	068	320.00	949.00	n/a
Quinton Mine	9/19/2012	068	204.00	822.00	n/a
Praco Mine (Post-Mining)	10/2/2012	001	420.00	1441.00	1352.40
Praco Mine (Post-Mining)	10/2/2012	058	450.00	1553.00	1604.40
Quinton Mine	10/3/2012	068	170.00	812.00	n/a
Horse Creek Mine	10/17/2012	123	127.00	667.00	n/a
Praco Mine	10/18/2012	057	620.00	2630.00	2200.00
Praco Mine	10/18/2012	087	560.00	1861.00	1512.00
Praco Mine	11/27/2012	057	550.00	1711.00	n/a
Praco Mine	11/27/2012	087	600.00	1359.00	n/a
Praco Mine	12/5/2012	047	530.00	1526.00	1460.00
Quinton Mine	12/19/2012	042	159.00	903.00	670.80

(All concentrations self-reported on Discharge Monitoring Reports on file with ADEM)