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MORE PROOF Mining Bill Is Fatally Flawed: Geologist from Lawrence University Confirms Sulfide Present Will Lead To Acid Drainage

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Layers of ore from the proposed open pit iron ore site contain pyrite, now being redefined in the new mining bill

Chairman Wiggins, Mr. Stoddard and Ms. Soltis,

Thank you for your eloquent and authoritative statements at Wednesday's hearing about the mining bill.

I was at the [December 11, 2011 West Allis] hearing until 4 PM and had hoped to speak from my perspective as a 'hard rock' geologist. I am a professor of geology and environmental studies at Lawrence University in Appleton with a PhD (1987) in Structural Geology and Rock Mechanics from UW- Madison. I have studied the geology of the Lake Superior region since I was in graduate school (>25 years) and have had an ongoing research project in the Penokee range for the past 10 years (it is a perfect teaching laboratory for students because such a variety of rock types can be seen in a small area). Last spring, together with a colleague from the US Geological Survey (William Cannon), I led a group of 60 geologists on a field trip just west of Mellen, WI as part of the annual Institute of Lake Superior Geology. Two of my most recently published papers have been about the geology of the Penokee range.

I also served as an expert witness for the National Wildlife Federation and the Keweenaw Bay Indian Community in a 2008 contested case hearing in Michigan regarding the Kennecott/Rio Tinto Eagle Rock sulfide mine northwest of Marquette, MI. I know that GLIFWC was also involved in this case.

Like you, I find the restrictions for the review process absurd and antiscientific, and the provisions for wetlands 'mitigation' absurd, but I wanted in particular to contribute information about the 'overburden' waste rock that will have to be removed if the proposed mine were created.

Namely, there ARE sulfide minerals (mainly pyrite) in the rock unit that lies immediately above the banded iron formation (the Ironwood iron formation) that is the target rock of the proposed mine. The sulfide-bearing layer is called the Tyler Formation, and it is a black shale, locally baked to a slate, that was laid down under low-oxygen (reducing) conditions, so the iron in it occurs as FeCO_3 (siderite) and FeS_2 (pyrite) rather than hematite (Fe_2O_3) or magnetite (Fe_3O_4) as in the iron ore body.

Because the rock layers dip, or tilt, steeply to the northwest, a very large volume of the Tyler Formation would have to be removed to create stable benches or terraces on the northwest wall of an open pit mine. There is no use for this weak, clayey material, and so it would simply be stored in tailings piles. The disseminated pyrite in the fragmented rock would over time be oxidized and interact with rain and snow leading to acid drainage.

There is a recent USGS Professional Paper (#1730) by Bill Cannon and others that has lots of information about the geology of the area: "The Gogebic Iron Range: A sample of the northern margin of the Penokean fold and thrust belt." It is available for download at <http://pubs.usgs.gov/pp/pp1730/> The most concise description of the Tyler formation is on the legend for the accompanying map and includes the words "black pyritic shale and slate".

So I emphatically agree with Ms. Soltis' suggestion that that the dichotomy between ferrous and sulfide mines is artificial and the mining bill is flawed in its very conception.

Please feel free to cite me as the source of this information, share it with others, and let me know if I can help in any way with your work.

Sincerely
Marcia Bjornerud
Professor of Geology
Schober Professor of Environmental Studies
Lawrence University
Appleton Wi 54911