

**Department of Land Resources and Environmental Sciences**

334 Leon Johnson Hall
MSU • Bozeman
P.O. Box 173120
Bozeman, MT 59717-3120
Telephone (406) 994-7060
Fax (406) 994-3933

**Mr. Brent Esplin
USDI-Bureau of Reclamation
Great Plains Regional Office
P.O. Box 30137
Billings, MT 59107-0137**

November 13, 2007

Subject: Potential Impacts of Coal Bed Methane Development to the Buffalo Rapids Project; draft agreement between Montana and Wyoming

Dear Brent:

This correspondence constitutes a response to your inquiry MT – 750, RES 3.20, dated October 25, 2007. Specifically, the following constitutes my thoughts and opinions regarding a proposed agreement between the States of Montana and Wyoming related to the development of the coalbed methane extraction industry in the Powder River basin.

Your correspondence specifically requested my professional opinion of the potential impacts to the Buffalo Rapids Project as a result of implementation of the agreement referenced above. I have reviewed the details of the agreement. I have also discussed the details of this agreement with irrigators along the Powder River in Montana and with the manager for the Tongue River Water Users group.

Initially, I wish to advise you that it is my understanding that the Tongue River Water Users (TRWU) have filed a formal notification with the Montana Department of Environmental Quality (MT-DEQ) and have met with Governor Schweitzer, challenging the "lawfulness of this Process", i.e., the procedure used to develop this agreement. Additionally, the TRWU have expressed concern about the MT-DEQ lack of attention to appropriate protocol affording "Montana 'citizens' fundamental right to participate in governmental proceedings guaranteed by the Montana Constitution".

You may wish to contact Mr. Art Hayes, Jr., Birney, MT, on this matter. Art is the TRWU project manager. The other contact would be Ms. Brenda Lindlief Hall, attorney representing TRWU, for specific details of their complaint.

With that said, I wish to offer my professional opinion of the potential impacts to the Buffalo Rapids project as a result of implementation of the draft agreement.

As you know, in 2003 the Montana Board of Environmental Review (BER) established numeric water quality standards for salinity (as EC) and sodicity (as SAR) for the Powder

I wish to bring to your attention a peer-reviewed science journal article recently appearing in the Journal of the American Water Resources Association. The article "Water Quality Changes as a Result of Coalbed Methane Development in a Rocky Mountain Watershed" reports on studies to examine changes in stream water quality, specifically sodicity and salinity, in the Powder River. (Wang, Melesse, McClain, and Yang; JAWRA 43(5): 1-17; October 2007.) This study, using USGS data from 1946 to 2002, concluded "that the CBM development adversely affected the water quality in the Powder River". The researchers reported a significant increase in SAR, but only a minor influence on instream salinity as a result of CBM development. Additionally, they reported that the increases in SAR in the Powder River as a result of CBM development in WY were amplified at downstream locations. In an earlier study by Kurz et al. (2005), a similar conclusion was presented, based on various scenarios of flow, well development, and discharges to the Powder River. (Kurz, Sorensen, Wang, and Williams; US DOE NETL contract report DE-FC26-98FT40320, 2005). Kurz et al. (2005) reported that SAR would significantly increase at Locate, MT but EC was likely to have a negligible change or be only slightly decreased.

The projected increases in SAR and decreases (or no changes) in EC down-gradient of coalbed methane development is a reflection of the signature chemistry of coalbed methane production water in the northern portion of the Powder River basin, i.e., relatively high sodicity but relatively modest salinity.

Results of these studies lead me to the opinion that there is a greater likelihood that discharges of CBM production water into the Powder River will have the potential to have greater impact on irrigators sourcing water from the Powder River than those sourcing water from the Yellowstone River. I correspondingly am of the opinion that a time series analyses of the Tongue River water quality, similar to the analysis completed by Wang et al. (2007) for the Powder River, would result in the conclusion that both the EC and SAR of Tongue River water down stream of the MT-WY border are elevated above pre-CBM development conditions.

Two additional points I wish to present on this matter are: 1) elevated EC and SAR conditions are likely to be amplified during conditions of low flow, combined with high in-channel evapoconcentration. This would occur most likely during July and August, when irrigation is most critical. 2) The analysis presented by Wang et al. (2007) took into consideration Powder River water quality only through 2002. CBM development in the Powder River basin was actually in a relatively new stage (infancy) of development at that time and substantial development and expansion has occurred since that time. This development has likely resulted in additional discharges to the Powder River. One can only assume that such expansion has resulted in magnification of the conclusions presented by Wang et al. (2007).

2. With regard to additional specifics of the agreement, I will readily admit that I don't fully understand the mechanism of application of the non-degradation rules to the MT standards. Consequently, my assessment of the agreement may, in fact, reflect my lack of understanding on this topic.

Paragraph 5.b. addresses the issue of assimilative capacity, which is defined in the agreement as the 'difference between baseline EC and SAR concentration values and the corresponding Montana EC and SAR water quality and anti-degradation standards.' I would propose that an actual presentation or declaration of numeric values, flow-weighted, pre-CBM development, for baseline EC and SAR be included in the agreement for selected gaging locations along the Tongue and Powder Rivers.

This would offer some clearly defined benchmarks by which discharge planning and permitting and compliance monitoring could be standardized. As the agreement is presently written, there is little clarity as to what will constitute 'trigger' or 'action point' water quality conditions requiring detailed assessment. In short, it is my professional opinion that the 'narrative' standard declared in Paragraph 5.a., and assimilative capacity conceded as 'available in Wyoming' and which 'may be used by WYPDES permits that are managed, issued, and renewed ...' (referenced in Paragraph 5.b) be defined in numeric terms, on the basis of seasonal flow conditions.

Additionally, it is my professional opinion that inclusion of specificity regarding the mechanism of application of the non-degradation rules to the considerations of assimilative capacity available to WY be clearly defined in either Paragraph 5.a., or 5.b.

3. Paragraph 7.a. Reference is made to management of coalbed methane discharges when available assimilative capacity has been fully accounted for. It is not clear whether the circumstances addressed in Paragraph 7.a. apply to immediate conditions or future circumstances. Additionally, it is not clear from Paragraph 7.a., 8, 9, or 10 whether existing discharges will be excluded or included in the consideration for adoption of reasonable anti-degradation alternatives.
4. Paragraph 13. Term of agreement. It is my professional opinion that the initial term of this agreement should not exceed two years. During this initial 2-year period, the implementation and functionality of the agreement should be evaluated. Before conclusion of the initial 2-year period, a thorough analysis of water quality trends within the Powder, Tongue, and Yellowstone Rivers (below the confluence with the Powder River) should be completed.
5. General comments: Considering the significance of the circumstances of this agreement, it would seem to me that there are numerous entities beyond the DEQ offices of MT and WY which have a sincere and vested interest in the provisions and application of this agreement. That being the case, it would seem appropriate

that significant additional representation be involved in the drafting of this settlement. It is my professional opinion that a collaborative, multi-party effort be convened to formalize the agreement, including representation by irrigators, water managers, other natural resources agency representatives.

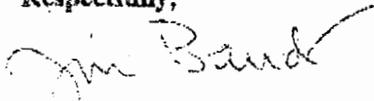
6. Other comments: The settlement agreement lacks specificity with regard to multi-agency involvement, monitoring protocols, reporting protocols, enforcement and/or compliance mechanisms, penalties, recovery mechanisms, cease and desist provisions, and moratoriums.
7. Finally, it appears to me that the terms of this agreement present two possible scenarios for irrigators, individuals, and potential CBM development entities into the MT portion of the Powder River basin:

a. it is my professional opinion that the settlement agreement as written – and when applied to MT – creates a highly likely circumstance that MT will find itself in jeopardy of its own water quality standards, when non-degradation rules are applied to the Tongue and Powder Rivers downstream of the MT-WY border;

b. it is my professional opinion that the assignment of assimilative capacity in total and as defined in the agreement to WY: i) puts an unequal burden of responsibility and implementation of reasonable anti-degradation alternatives on MT and/or; ii) essentially excludes entities in MT from reasonable discharge of CBM production water to either the Tongue or Powder River.

The above hereby concludes my professional opinion at the present time, pertaining to the referenced agreement between MT and WY. This is purely my own opinion and I stand to be corrected on any of these issues, in the event I am mis-interpreting the agreement as written. I reserve the right to add to, delete, or modify my opinions on this matter. Please feel free to contact me if you have questions regarding my opinions.

Respectfully,



James W. Bauder, Professor

File Esplin110607.doc

cc. Art Hayes, Jr.
Roger Muggli
Art Compton
Shanny Spang Gion