BEFORE THE ENVIRONMENTAL QUALITY COUNCIL

PETITION TO AMEND WYOMING	)
WATER QUALITY RULE, CHAPTER 2,	)
APPENDIX H	)

COME NOW, Petitioners, and on this 7th day of December, 2005, hereby petition pursuant to W.S. §§ 16-3-106 to amend Wyoming Water Quality Rules, Chapter 2, Permit Regulations for Discharges to Wyoming Surface Waters to remove the language that allows huge volumes of salty CBM water to be discharged and disposed of onto the land and into the waters of Wyoming under the guise of "beneficial use."[1]

PETITIONERS

Eric and Bernadette Barlow own and operate Barlow Ranch, which has been in the family for four generations. The Barlows' ranch consists of over 18,000 privately owned acres of mixed-grass rangeland on which they run several hundred head of cattle. Their ranching operation relies primarily on native grasses as forage for their cattle, with the subirrigated meadows along Dead Horse Creek providing the substantial portion of their cattle feed. CBM discharge water coming down Dead Horse Creek has already altered the ephemeral nature of the stream, damaged their meadows, and caused foot rot in their cattle.

Gary and Sue Packard own and operate Packard Ranch which has been in the family for four generations. The ranch lies along Crazy Woman Creek near the confluence of the Powder River. Crazy Woman creek is a perennial stream with irrigation quality water. The ranch is a cow calf operation and consists of several thousand acres of native rangeland with irrigation rights along Crazy Woman Creek. CBM development is taking place both upstream, on and around the Packard Ranch.

Ken and Glessie Clabaugh own and operate Clabaugh Ranch, Inc. along Wild Horse Creek. The ranch consists of several thousand acres, including bottomland meadows along Wild Horse Creek that provide critical grazing and calving grounds, and native upland areas. The ranch has been inundated by CBM discharge water flowing down Wild Horse Creek causing serious problems with flooding, soil and vegetation damage and problems with moving cattle and calves.

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[1] Appendix H showing the proposed changes is attached as Exhibit 1.

Steve and Mona Mitzel own and operate Mitzel Ranch along Clear Creek. Mitzel Ranch is a cow calf operation, with irrigated alfalfa meadows and a commercial vegetable garden. Clear Creek is a perennial stream with historically high water quality, upon which the ranch and farm operation depends. CBM development has begun in the Clear Creek drainage, and significant further development is planned.

Bob and Carol LeResche own and operate Clear Creek Ranch and Prariana Farms along Clear Creek, with irrigated meadows, irrigated alfalfa and grass hay fields, a commercial vegetable garden and grazing lands. The ranch also provides important bird and fish habitat along Clear Creek. The entire 1,124 acre ranch property is subject to a Conservation Easement owned by The Nature Conservancy.

Tooter and Jo Rogers own and operate Rogers Ranch, which consists of about 2,000 acres along SA Creek and Dead Horse Creek. The ranch is a cow calf operation, has valuable alfalfa meadows and native grass along the creeks. CBM discharge water in SA Creek is altering the nature of these ephemeral streams, impacting irrigation rights and threatening the alfalfa meadows.

Clay and Gayla Rowley own the Rowley Ranch along Clear Creek near the confluence of the Powder River. The ranch was homesteaded by Clay's grandfather and is currently leased for a cow calf operation. The ranch is dependent upon high quality water from Clear Creek for irrigation of the alfalfa meadows. There is CBM development planned both on and around the ranch.

Nancy and Robert Sorenson own and operate the Sorenson Ranch at the head of a tributary of LX Bar Creek. The ranch consists of a registered Angus seed stock operation and over 3,000 acres of dry land hay, grain farming and rangeland. There is extensive CBM development on and around the ranch.

Bill and Marge West have owned and operated the West Ranch for 50 years. This 13,000-acre ranch, where they grow dry land wheat and raise cattle, was homesteaded by Bill's father. The ranch has hay meadows along Spotted Horse Creek which have been severely impacted by CBM discharges which killed trees and vegetation and damaged the soil.

Steve Adami owns and operates Adami Ranch along the Schoonover divide at the head of Indian Creek. The ranch supports over 150 head of cattle, and has extensive CBM development going in, on and around the ranch.

The Powder River Basin Resource Council ("Powder River") was founded in 1973 by ranchers and citizens dedicated to ensuring the viability of Wyoming's agricultural heritage and rural lifestyle. Powder River is also dedicated to working for the careful and responsible development of Wyoming's valuable and important mineral resources. The organization was instrumental in the passage of reasonable state and federal laws and regulations in the mid-seventies that provided for responsible development of coal strip mines. Today, Powder River has over 1000 members. Over the past several years, many

of our members have been negatively impacted by coalbed methane development and many more will be directly and indirectly affected by the ongoing and expanding development of coalbed methane wells in the Powder River Basin.

The Petitioners and Powder River's members have historically strived to be careful and attentive stewards of the abundant natural resources on their ranches. Over generations they have learned that stewardship is necessary for maintaining a sustainable agricultural enterprise for the next generation. Every ranch and farm operation is threatened by CBM discharge water. The Powder River Basin Resource Council and the petitioners are supportive of responsible mineral and energy development in Wyoming, and recognize the importance of CBM development in the Powder River Basin – they oppose, however, discharge of CBM produced water that unnecessarily and unreasonably damages Wyoming's natural resources and its citizens' ranch lands and farms.

Applicants are represented by:

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INTRODUCTION

1. "Beneficial use" of produced water must include a quantity parameter

Appendix H of Water Quality Rules Chapter 2, Permit Regulations for Discharges to Wyoming Surface Waters, allows discharge of produced water into the surface waters of the state when "[t]he produced water is of good enough quality to be used for wildlife or livestock watering or other agricultural use and [is] actually put to such use during periods of discharge." As applied by the DEQ, this means that, if the produced water meets a base quality standard (see below), ***any amount*** can be discharged into the watersheds, ephemeral streams, and rivers of Wyoming, so long as some portion of the water is actually put to wildlife or livestock watering or agricultural use. The goal of this

Petition is to amend the regulatory language so that water discharged for "beneficial use" is truly used, and not simply flushed down Wyoming's watersheds.

CBM production in Wyoming has produced 380,392 acre-feet of water. (1987-2004). To put it in perspective, Lake DeSmet stores 239,000 acre-feet. It is estimated that 95% of the Wyoming CBM resource remains to be developed, along with the associated water. At current discharge rates, that would be 7 million acre-feet of water to be disposed of.[2] Wyoming CBM production to date is just a fraction of what is to come. There is still time to get it right.

Already, numerous concerns and conflicts from the impact of produced water on Wyoming waterways and ranch lands have arisen. Yet DEQ continues to ignore many of those impacts and to abdicate its duty under the Environmental Quality Act to preserve and enhance the water and land of Wyoming.[3] A prime example of that is found in the Appendix H loophole, which allows discharge of limitless quantities of water based on an assumption that DEQ knows to be incorrect – the assumption that the water will be put to

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[2] **DRAFT** *Water Production from Coalbed Methane Development in Wyoming: A Summary of Quantity, Quality and Management Options*, University of Wyoming Ruckelshaus Institute of Environment and Natural Resources, August, 2005, pp. 10, 16. [hereinafter "IENR Report."] Exhibit 2.

[3] Whereas pollution of the air, water and land of this state will imperil public health and welfare, create public or private nuisances, be harmful to wildlife, fish and aquatic life, and impair domestic, agricultural, industrial, recreational and other beneficial uses; it is hereby declared to be the policy and purpose of this act to enable the state to prevent, reduce and eliminate pollution; to preserve, and enhance the air, water and reclaim the land of Wyoming; to plan the development, use, reclamation, preservation and enhancement of the air, land and water resources of the state; to preserve and exercise the primary responsibilities and rights of the state of Wyoming; to retain for the state the control over its air, land and water and to secure cooperation between agencies of the state, agencies of other states, interstate agencies, and the federal government in carrying out these objectives.
Wyo. Stat. § 35-11-102.

beneficial use. DEQ attempts to justify its failure by drawing an artificial line between water quantity and water quality, and then announcing that it cannot cross that line. The water quality and water quantity distinction is not supported in the law, and only serves to make DEQ's regulation of CBM produced water ineffective. The language in Chapter 2, Appendix H should be modified to recognize that effective regulation of CBM produced water cannot occur without consideration of water quantity, as well as water quality.

2. Effluent limits must be amended to be protective of stock and wildlife

Appendix H effluent limits currently set for sulfates and total dissolved solids are too high to meet the basic threshold of protection of stock and wildlife. There are currently no limits for barium (although some limits are imposed in permits), and a limit for barium should be added to Chapter 2, Appendix H(a)(vii).

Background

Congress adopted the Clean Water Act (CWA, also known as the Federal Water Pollution Control Act Amendments of 1972), with the intent to "restore and maintain the chemical, physical, and biological integrity of the Nation's waters." 33 U.S.C. § 1251(a). The Act prohibits the discharge of pollutants into the waters of the United States unless such discharge is in compliance with a permit. National Pollutant Discharge Elimination System ("NPDES") permits may be issued by either the EPA or a state agency authorized to administer the program. The Wyoming DEQ is authorized to issue WYPDES permits, under the standards set forth in the CWA.

Water Quality Rules Chapter 2, Permit Regulations for Discharges to Wyoming Surface Waters, sets forth many of the criteria for issuance of a WYPDES permit. The "beneficial use" exclusion in Appendix H has its origins in the Environmental Protection Agency's (EPA) Effluent Limitation Guidelines (ELGs) for the Oil and Gas Point Source Category (40 CFR 435). As the EPA and DEQ recognize, "EPA did not consider CBM facilities when developing [the ELGs]." [4] EPA has stated that it does not believe the Oil and Gas ELGs are the best method for regulating CBM water, because CBM "has very different economics and technical considerations, generates different volumes of produced waters, and has different water-quality constituent characteristics."[5] The general rule set forth in 40 CFR 435 is that there be ***no discharge*** of water in conjunction with gas and oil production. Subpart E of that rule "allows the discharge of produced water from facilities west of the 98th meridian for use in agriculture and wildlife propagation." The logic behind this exclusion is apparent – if water is being produced in the arid American west that could be put to use for agriculture or wildlife production, then its discharge should not be prohibited. DEQ recognizes this rationale in its April 25, 2005 memo attempting to justify its use of the 40 CFR 435 ELG: "For oil and gas discharges, including CBNG permits issued from 1974 through 2000 by Wyoming, it was assumed that in the arid west region, the produced water would be used for agricultural or wildlife propagation so long as water quality standards and effluent limitations were

[4] *See* 1/5/01 letter from Mike Reed at EPA to Leah Krafft at DEQ. Exhibit 3; Sample NPDES permit. Exhibit 4.

[5] EPA Guidance for Developing Technology-Based Limits for Coalbed Methane Operations: Economic Analysis of the Powder River Basin, February, 2003. Interagency Draft Report. 1-4. Because this document is voluminous, it is not attached. It can be viewed at http://www.northernplains.org/documents/CBMEPAReport0203.pdf

met."[6] That is no longer a valid assumption, and the DEQ must manage CBM discharge water by recognizing that it is not generally being used; it is being disposed of. The exclusion has become a loophole stretched so far that in application it has lost all relation to logic.

The Appendix H changes to close the loophole are simple.[7] Four words are deleted from Appendix H(a)(i) to clarify that discharged water must actually, and not theoretically, be put to beneficial use. Thus:

> The produced water discharged into surface waters of the state shall have use in agriculture or wildlife propagation. The produced water shall be of good enough quality to be used for wildlife or livestock watering or other agricultural uses and actually be put to such use. ~~during periods of discharge.~~

Paragraph (d)(i) is revised as follows:

> ~~Where~~ To the extent discharge water is ~~accessible to~~ actually used by livestock and/or wildlife; meets the effluent limitations as specified in this appendix; and meets the criteria for the protection of livestock and wildlife as specified in Wyoming Water Quality Rules and Regulations Chapter 1, Wyoming Surface Water Quality Standards, the discharge will be considered in compliance with the requirements of Appendix H (a) (i) of these regulations.

Paragraph (c)(i), allowing "grandfathering" for some beneficial uses of water, will have language imposing a quantity limitation: "This exemption shall be limited to that quantity of water that can be demonstrated to have actually been put to beneficial use."

Faced with the huge amounts of water being produced with CBM, the Wyoming DEQ has allowed the unrestrained production, and waste, of unimaginable quantities of Wyoming water, without any adequate evaluation of the impact to, or protection of, the

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[6] *Wyoming Pollutant Discharge Elimination System (WYPDES) Program Basis for Technology-Based Effluent Limits in Coal Bed Methane (Natural Gas) WYPDES Permits*, attached to 4/25/2005 letter from John Corra to Mr. Stephen Tuber, EPA, p. 4. Exhibit 5.

[7] Appendix H containing the proposed changes is attached as Ex. 1.

quality of the groundwater,[8] surface water, and the agricultural and livestock production that depend upon water.

When the permit applicant can show that water discharged is of sufficient quality (the standard is not high and can generally be met) for a cow or antelope to drink, then the DEQ will not question ***how much*** the cows or antelope will actually drink. Huge quantities of water are then disposed of, that is, flushed down Wyoming's waterways, in the guise of "beneficial use." The truth is that only a fraction of the CBM water discharged is actually used.

The pretense of "beneficial use" of CBM produced water must be abandoned. This is purely water disposal, and its disposal has impacts on the soils, crops and waterways of Wyoming that must no longer be ignored by the DEQ.

REASONS FOR RULE CHANGE

The law

DEQ attempts to justify its failure to regulate CBM produced water by arguing that the law does not authorize it to regulate water quantity. It is wrong.

DEQ's enabling statute authorizes it, and obligates it, to "prevent, reduce and eliminate pollution; to preserve, and enhance the air, water and reclaim the land of Wyoming; to plan the development, use, reclamation, preservation and enhancement of the air, land and water resources of the state. . ." Wyo. Stat. § 35-11-102. Nothing in the statutory language requires DEQ to tie one hand behind its back by ignoring the impacts

[8] The DEQ has recently instituted "policies" for requiring groundwater monitoring, which is a recognition of the potential for adverse groundwater impacts. However, these "policies" are of questionable efficacy, as they lack the force and effect of law of rules promulgated under the WAPA.

to land and water that result of quantity, rather than quality, of discharged water.[9] Rather, the language of the statute recognizes the importance of preserving and enhancing air, water and land, and implies recognition that they are all interconnected. Wyoming Statutes also recognize that water quantity is a parameter of water pollution.[10]

The Clean Water Act prohibits discharge of any pollutant from a point source into navigable waters of the United States without an NPDES permit. 33 U.S.C. §§ 1311(a), 1342. The Ninth Circuit Court of Appeals, in Northern Plains Resource Council v. Fidelity Exploration and Development Co., 325 F.3d 1155, 1161 (9th Cir. 2003), *cert. denied*, 540 U.S. 967 (2003), determined that, "because CBM water is an unwanted byproduct of the extraction process, CBM water falls squarely within the ordinary meaning of 'industrial waste.'" For that reason and others, CBM water is a "pollutant" under the CWA. The Wyoming DEQ has recognized that CBM byproduct water is a pollutant, and has required a WYPDES permit for its discharge. As discussed below, DEQ already recognizes the importance of the water quantity parameter to water quality

[9] Some have argued that regulation of quantity by DEQ would infringe upon the Board of Control's constitutional authority to "have the supervision of the waters of the state and their appropriation, distribution and diversion. . ." Wyo. Const. art. 8, § 2. Certainly the DEQ should defer to water rights administration, and the proposed rule change that recognizes environmental impacts result from both quality and quantity of water do not change the rule of deference.

[10] "Pollution" means contamination or other alteration of the physical, chemical or biological properties of any waters of the state, including change in temperature, taste, color, turbidity or odor of the waters or any discharge of any acid or toxic material, chemical or chemical compound, whether it be liquid, gaseous, solid, radioactive or other substance, including wastes, into any waters of the state which creates a nuisance or renders any waters harmful, detrimental or injurious to public health, safety or welfare, to domestic, commercial, industrial, agricultural, recreational or other legitimate beneficial uses, or to livestock, wildlife or aquatic life, or which degrades the water for its intended use, or adversely affects the environment.

Wyo. Stat. § 35-11-103(c)(i)

in many contexts. Case law interpreting the Clean Water Act further compels regulatory consideration of quantity in conjunction with quality.

The United States Supreme Court addressed an attempt to draw a line between water quantity and water quality under the CWA in PUD No. 1 of Jefferson County and City of Tacoma, Petitioners v. Washington Department of Ecology, et al. 511 U.S. 700;114 S. Ct. 1900;128 L. Ed. 2d 716 (1994), and held:

> Petitioners also assert more generally that the Clean Water Act is only concerned with water "quality," and does not allow the regulation of water "quantity." This is an artificial distinction. In many cases, water quantity is closely related to water quality; a sufficient lowering of the water quantity in a body of water could destroy all of its designated uses, be it for drinking water, recreation, navigation or, as here, as a fishery. In any event, there is recognition in the Clean Water Act itself that reduced stream flow, i.e., diminishment of water quantity, can constitute water pollution. First, the Act's definition of pollution as "the man-made or man induced alteration of the chemical, physical, biological, and radiological integrity of water" encompasses the effects of reduced water quantity. 33 U.S.C. § 1362(19). This broad conception of pollution – one which expressly evinces Congress' concern with the physical and biological integrity of water – refutes petitioners' assertion that the Act draws a sharp distinction between the regulation of water "quantity" and water "quality." Moreover, §304 of the Act expressly recognizes that water "pollution" may result from "changes in the movement, flow, or circulation of any navigable waters. . .,"

PUD No. 1, 511 U.S. at 719-20.

Cases applying the Clean Water Act in the Tenth Circuit (which includes Wyoming) have reached the same result. Quivira Mining Co. v. United States EPA, 765 F.2d 126, 129 (10th Cir. 1985)(quoting United States v. Earth Sciences, Inc., 599 F.2d 368, 373 (10th Cir. 1979)("The touchstone of the regulatory scheme is that those needing to use the waters for waste distribution must seek and obtain a permit to discharge that waste, with the **quantity** and **quality** of the discharge regulated."); Riverside Irrigation District v. Andrews, 758 F.2d 508, 512 (10th Cir. 1985)("both the statute and the

regulations authorize the Corps to consider downstream effects of changes in water **quantity** as well as on-site changes in water **quality**. . .”); Alameda Water & Sanitation v. Reilly, 930 F.Supp. 486, 491 (D.Colo. 1996)(citing PUD No. 1 in rejecting plaintiff’s contention “that in enacting the CWA Congress was concerned only with water **quality** impacts, such as pollution, and not effects relating to water **quantity**. . .”).

The law on this point is aligned with the facts and with common sense – water quantity must be a factor in regulation of water quality.

2. The “beneficial use” loophole – why quantity matters

CBM water *quality* has been of particular concern because it is salty, measured by total dissolved solids and specific conductance. Water high in TDS or specific conductance will reduce crop production. High salinity in the water results in high salinity in the soil, and reduces the ability of most plants to extract water from the soil. “There is a greater energy cost to the plant to remove water from salt effected soils, and plants will typically wilt earlier in the day on salt effected soils, thereby decreasing photosynthesis and ultimately plant production. Salinity may also cause micro-nutrient deficiencies in crop plants. At very high levels, salinity may cause direct toxicity to plants.”[11] Sodium Adsorption Ratio (SAR) is also a concern, because water high in SAR will cause soils to disperse, swell and form crusts, reducing the soil’s ability to drain water.[12] Recent studies tracking soils irrigated with CBM water over a period of years,

[11] Munn, Larry, *Interactions between Coal Bed Methane Product Water and Soils, Vegetation, Agriculture and Riparian Systems in the Powder River Basin*, Feb. 8, 2002. Exhibit 6.

[12] For a report of how CBM water can affect one small draw in Wyoming, see the CBMC Coalition Report on Burger Draw, June, 2001. Exhibit 7.

and comparing them to soils not irrigated with CBM water, conclude that CBM water results in salt buildup in soils to levels that are greater than threshold values for sensitive to moderately sensitive crops, and that "trends of increasing sodicity with extended periods of irrigation with CBNG water were apparent."[13] DEQ has recognized these quality concerns and made attempts (albeit inadequate[14]) to address them. But if you don't know **how much** water is being disposed of, you only know half the story.

- Water of any quality, when applied to the type of soils that are found in the Powder River Basin, can mobilize salts from the soils and produce water with specific conductance and SARs that are damaging to soils and crops. "In a semi-arid climate, regular additions of even small increments of water may redistribute natural salinity on the landscape. . ."[15]
- Increased flows erode stream beds.
- Increased flows freeze in winter and cause ice damming and flooding of land with poor quality water.
- The quality of water that any given soil/crop can tolerate is directly related to the ability to leach excess salts from the root zone.[16] Salinity builds up in soil over

[13] Ganjegunte, G. K., G. F. Vance, and L. A. King. 2005. *Soil chemical changes resulting from irrigation with water co-produced with coalbed natural gas.* Journal of Environmental Quality 34:2217-2227. Exhibit 8 (Galley Proof).

[14] For example, DEQ permits discharges of CBM water with SARs over 20, justifying this by determining that the high EC would maintain adequate infiltration, according to the Hanson chart. However, this ignores the fact high SAR in water will result in even higher SAR buildup in soils that will ultimately cause degradation in the form of reduced infiltration, limited root growth, and reduced gas permeability.

[15] Munn, note 10. *See also*, Ganjegunte, Ex. 8 p. 6, "Increase in SAR_e values is partially due to the accumulation of Na in irrigated soils due to dissolution and mobilization of Na salts in soils apart from addition of Na through CBNG water."

[16] The percentage of applied water that passes through the soil is called the leaching fraction. The salinity of the irrigation water and the leaching

time. To sustain irrigation, irrigators must add additional water above the needs of the crop to leach excess salt from the root zone.[17]

- Increased flows can raise local ground water tables and slow infiltration that is crucial to leaching salts from soils.
- Timing of flows, regardless of quality, is important for seedling growth and soil leaching.
- Salt loading is the effect of quality times volume. For example, if a billion gallons of water is produced per day, and it contains 2000 ppm salts, then 8,000 tons of salt per day will be generated. The salt will go either into the soil or down the creek, where there will be significant adverse consequences to crops or aquatic habitat.

DEQ recognizes the interplay of water quantity and water quality in many contexts. Consider, for example, the Mixing Zone and Dilution Allowances Implementation Policy, which can only be calculated if one of the factors is the mean daily flow.[18] The majority of WYPDES permit applications in the Powder River Basin

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> fraction are the most important factors affecting the salinity of the soil water. The salinity of the soil water is important, since the salinity of the soil water, rather than the salinity of the irrigation water itself, is the critical factor resulting in any decrease in crop yield. Continued irrigation will result in the salinity of the soil water coming into equilibrium with the salinity of the irrigation water. The actual relationship will be dependent on the average salinity of the irrigation water and the actual leaching fraction.

Horpestad, Abe, *Water Quality Technical Report, Water Quality Impacts from Coal Bed Methane Development in the Powder River Basin, Wyoming and Montana*, Dec. 10, 2001. Exhibit 9.

[17] Munn, Ex. 6.

[18] Wyoming Surface Water Quality Standards, Implementation Policies for Antidegradation Mixing Zones Turbidity and Use Attainability Analysis, p. 16, 3rd draft, November, 2005. http://deq.state.wy.us./wqd/surfacestandards/Triennial/Policies_3rd.pdf

are submitted with mixing calculations and water budgets. This is because they count on natural flows for dilution, and none of those calculations can be made without considering the quantity factor. WYPDES permits do in fact contain a limit to the quantity of water discharged under the permits. This is because the concentration of a particular constituent is only one factor in determination of the total load – quantity is essential to that calculation. DEQ is in the process of implementing a new policy to control total salt load in order to meet limits in flows to Montana. The Powder River Basin sodium management plan allocates total sodium discharges to producers, calculated by TDS (quality) times quantity. Here again, DEQ cannot regulate load without regulating water quantity. Yet DEQ turns a blind eye to quantity in Chapter 2, Appendix H, and in doing so it hamstrings its own ability to effectively regulate CBM water.

EPA has also recognized the various impacts that can result from both quantity and quality of CBM water, and advised DEQ that "large quantities of produced water discharged to small tributaries with erosive soils and geology can have unanticipated adverse impacts on wildlife habitat and/or agriculture."[19] EPA has further explained:

> The many potential environmental impacts from CBM operations are diverse. Possible impacts include: reduced flow or loss of domestic water wells, mortality and reduced growth and vigor of vegetation, erosion, soil compaction, and loss of topsoil. One of the major concerns associated with CBM production in the Powder River Basin is disposal of the produced water. The surface disposal of CBM-produced water may result in erosion or damage to drainages and associated vegetation within the area. Even though CBM discharge is essentially sediment-free, discharge to streams and creeks can increase sediment loading due to increased erosion.[20]

[19] 1/5/01 Reed letter to Krafft, Ex. 3.

[20] EPA Guidance for Developing Technology-Based Limits for Coalbed Methane Operations: Economic Analysis of the Powder River Basin, February, 2003. Interagency

The Appendix H beneficial use loophole allows for the disposal of huge quantities of CBM water, to the detriment of Wyoming's soils, rangelands, rivers, and to the wildlife and people who live there. This is contrary to the spirit and the letter of the law and contrary to sound State policy. Currently the most common CBM water disposal methods are impoundments, land application, and direct discharge to surface waters. Other methods which are less common include injection and treatment and release.

A. On- and off-channel impoundments

Often surface discharge entails water storage in reservoirs both on and off-channel. Impacts from these include the creation of saline seeps, unauthorized discharges into surface waters during overflows, and unauthorized discharges into surface waters during impoundment failure.[21] The University of Wyoming's Larry Munn has pointed out that:

> The effects of lateral seepage and movement of water along faults resulting from the dependency upon infiltration impoundments will cause significant impairment of surface water quality, both locally and for main stems such as the Tongue and Powder Rivers. Infiltrating water only moves straight down if the substrate is uniform; this is clearly not the case for sedimentary strata such as the Ft. Union formation. In particular the

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Draft Report. 1-5. Because this document is voluminous, it is not attached. It can be viewed at http://www.northernplains.org/documents/CBMEPAReport0203.pdf

[21] DEQ does not have enough enforcement personnel to police CBM water discharges. However, there are a number of documented examples of violations that have been. See, e.g.,; Dec. 4, 2002 NOV (WY0046841) for unauthorized discharge of 20,417 gallons of wastewater into the Tongue River; Dec. 23, 2002 NOV (Impoundment #24-3082) for the unauthorized discharge of 504,000 gallons of wastewater into Badger Creek, a tributary of the Tongue River; Oct. 22, 2003 NOV (#WY0049280) for unauthorized discharge of wastewater via seeps into tributaries of Coutant Creek and Little Badger Creek, tributaries of the Tongue River. A list of NOVs issued by DEQ for CBM violations in 2004 and 2005 (as of November 21, 2005) is attached as Exhibit 10. This list of course does not include undetected violations or violations for which no NOVs were issued.

> negative effects of sodium which is generally higher in concentration in the northern PRB will be difficult to mitigate.[22]

On-channel impoundments capture natural runoff, interfere with the hydrologic cycle, and interfere with downstream senior water rights. The primary purpose of constructing on-channel reservoirs for storage of CBM water is to take advantage of the dilution provided by natural flows – by definition a degradation of the natural flows that historically supported wildlife and crop and livestock production. Impoundments rely on infiltration to dispose of water, which is then likely to degrade shallow alluvial aquifers.

The Final Environmental Impact Statement for Montana's Powder River Basin recognizes that "soils under impoundments may require extensive reclamation because of the accumulation of salts during infiltration of water. The soils structure could be damaged severely, plant growth would be minimal, and accumulation of salts in the soils would likely lead to the soil being removed and disposed."[23] (DEQ adopted "Implementation guidance" in August, 2005, requiring permit applicants to post a bond for reclamation of lands under impoundment. The "guidance" is of doubtful utility, since it lacks the force and effect of law that rules promulgated under the Administrative Procedures Act have; and further, the bonding guidance addresses only potential damage to surface soils, and does not address degradation of the shallow aquifers or return flows into water sources.)

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[22] Munn, Larry, *Comments on Wyoming Powder River Basin EIS,* February 17, 2003. Exhibit 11.

[23] Final Statewide Oil and Gas Environmental Impact Statement and Proposed Amendment of the Powder River and Billings Resource Management Plans, January, 2003, 4 -136. Because this document is voluminous, it is not attached. It can be viewed at http://www.mt.blm.gov/mcfo/cbm/eis

B. Land Application

Land application is another surface disposal method favored by industry, which also has adverse impacts on the environment. Land applications "risk disruption of natural soil water balances with subsequent impacts on soil ecological, physical, chemical and hydrological characteristics, all of which strongly influence vegetation communities and reclamation potentials."[24] Studies have shown that "long term irrigation resulted in accumulation of significant amounts of salt and sodium in the soils. . ." and "exhibited decreased macro-porosity and reduced soil hydraulic conductivity."[25] A recent study which tracked the impacts of CBM water on soils over several years concluded that "Results of this study suggest CBNG waters used for irrigation in northwestern PRB, Wyoming, are generally unsuitable for direct land application."[26]

C. Surface discharge- impacts to tributaries

Discharges onto the surface and down the existing channels also adversely impact the environment. In the Powder River Basin, where most of the CBM discharges have been occurring, most of the small drainages are ephemeral streams that run only with snowmelt or thunderstorms. Ecosystems and ranching operations depend upon the ephemeral stream system. Grass grows in the channel bottoms for forage; ranchers drive their tractors and herd their cattle across the dry stream beds. When the occasional flows from snowmelt or thunderstorms do occur, the water overflows (sometimes with the aid

[24] King, L.A., *Land Application of Coalbed Methane Waters: Water Management Strategies and Impacts*, Exhibit 12.
[25] Bauder, *Quality and Characteristics of Saline and Sodic Water Affect Irrigation Sustainability*. Exhibit 13.
[26] Ganjegunte, Ex. 8, p. 10.

of spreader dams) and provides irrigation. The water supplied by the big floods provides another invaluable service – it penetrates the soil in sufficient quantities and to a sufficient depth to leach the salt beneath the root zone, so that plants can grow unimpeded by salt buildup. This system is disrupted by CBM-augmented flows, in conjunction with the damage that occurs as a result of water quality degradation.

To turn ephemeral streams into perennial, or nearly perennial streams, upsets the balance that has supported plant and animal life as well as ranching in northeast Wyoming. CBM produced water discharged to the surface creates return flows, which return to the stream with even higher salinity. Augmented flows cause erosion.[27] To augment the flows of perennial streams, and alter their water quality, further degrades the hydrologic system and the wildlife, agriculture and livestock use that have evolved to depend upon them.

D. Impacts to mainstem

When CBM flows reach the mainstems, the Powder River, the Little Powder, and the Tongue, more adverse impacts can be expected. In a letter to DEQ commenting on a particular permit, the Wyoming Game & Fish expressed concern about impacts of CBM water to both the quality and the quantity of fish habitat:

> Change in Water Quality
>
> . . . Changes in the conductivity and sodium absorptium ratio may occur as increased flows move sediment from channel bottoms and increase erosion of floodplains. Confluence Consulting reported high salinities and electrical conductivities, possibly due to CBNG water, for the Spotted Horse drainage in their recently released report on the Powder

[27] Wilkerson, G.V., *Risk assessment methodology using a regional channel erosion potential model,* Exhibit 14.

> River. This report indicates that CBNG discharges could affect native species in the drainage.
>
> Change in Water Quantity
>
> Native fauna in the Powder River drainage have evolved and adapted to a very dynamic hydrograph with high sediment loads. Changes in this flow regime (i.e. perennial flows) may seriously impact native fauna by altering their use of historical habitats for spawning, rearing, and reproduction. Alterations that impact channel morphology is an issue, and will have impacts to the aquatic biota due to changes in sediment loads, loss of habitat, and possible disruption of migration movements due to barriers created by culverts and/or headcuts. . . .[28]

Augmentation of flows has been shown to deplete macroinvertebrate populations, and ultimately lead to the decline in fish populations.[29] Species that have evolved under a certain hydrograph are likely to be adversely affected when that hydrograph is dramatically altered by the addition of CBM water.

3. What are the alternatives?

There are a number of alternatives to surface discharge of CBM produced water. Industry will say the sky is falling, but when gas is selling for more than $9 an mcf,[30] that cry rings hollow. First of all, there must be reasonable limits to the amount of water discharged. The assumption that discharged water is an inevitable consequence of gas production is an incorrect assumption that allows regulators and industry to overlook the first-line defense to the problems of CBM produced water – that is, reduction or elimination of produced water.

[28] Wichers, Bill, Wyoming Game & Fish Deputy Director, Sept. 10, 2004 letter to Leah Krafft. Exhibit 15.
[29] Gore, James A. , May 14, 2002 letter to Paul Beels of BLM. Exhibit 16.
[30] As of November 18, 2005, Enerfax.com reported natural gas prices were $9.05 at Opal/Kern River; $9.06 Wyoming Pool; and $11.03 Henry Hub.

Only where there is actual use for the water should surface discharge be permitted. Actual use can be maximized in some cases by water treatment (such as reverse osmosis), which generally reduces salinity and makes the water useable for irrigation.[31]

All of these are being done in Wyoming today, and the technology to do them more and more cost-effectively will certainly develop with demand.

A. Minimize water production

New technologies are being developed to aid in minimizing water produced with CBM. They include:

a. Downhole water/gas separation – a permeable membrane separates water from gas, an approach which does not require dewatering of the aquifer. Roughrider Water is currently marketing a system that uses microscopic filters to separate methane from water, so that very little water is extracted, while gas is produced.

b. Alternative wellbore completion methods – testing for vertical fracturing could indicate alternative approaches during water-enhancement that would significantly reduce the volume of water discharged.

c. Raman optical spectrometer tool – a proprietary downhole tool has been developed that aids in predicting methane saturation, so that more gas can be produced with less water.[32]

d. Directional drilling can be effective in reducing water production.

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[31] See, for example, Fidelity's Wrench Ranch project (WY0047066, WY0047074, WY0051471, and WY0051772) and Williams' Bowman Flat (WY0051357) and SG Palo 31 (WY0051594) projects.

[32] *IENR Report*, Ex. 2 pp. 28-29. *See* Welldog.com, describing a reservoir analysis service that identifies wells "that will produce natural gas with the least amount of dewatering."

B. Reinjection

Wyoming had permitted 308 CBM Class V injection wells as of July 7, 2005. Of that total, 60 wells were "active and injecting a combined 14,592,692 barrels/year (1.68 million gallons per day). This is approximately 3% of the total water produced."[33] Reinjection can present challenges, but they are certainly not insurmountable – they are only more costly. The proof that reinjection can be cost-effective is in such projects as the Anadarko Petroleum plan to pipe water from the Powder River Basin to the Midwest area for reinjection.[34]

C. Water treatment

Water treatment technology is rapidly improving, as are numbers of permit applications involving water treatment. To date, most treatment plans are a variation on ion exchange, with about 60 cfs permitted to be treated and discharged into the Powder River.[35] Reverse osmosis is another method currently in use. Sulfur burners are beginning to be used to acidify CBM water. Additional land applications, particularly for irrigation, would be available with treated water that did not have the disadvantage of

[33] Corra, John, July 7, 2005 letter to Joe Russell, Montana Board of Environmental Review. Exhibit 17.
[34] *Coalbed Methane Water Gets New Look*, Cheyenne Tribune-Eagle, August 8, 2005. Exhibit 18.
[35] Oct. 24, 2005, personal conversation with Jason Thomas, DEQ/WQD.

high salinity and sodium adsorption ratios.[36] The City of Gillette has used CBM water to replenish its water supply, and Sheridan and Buffalo are contemplating similar uses.

D. Soil treatment

Addition of gypsum has met with some success in counteracting high sodium concentrations from CBM water.[37]

E. Other

Various other possible approaches can be seriously considered if the State and industry are required to do more than pay lip service to the problems of CBM water. They include discharge to surface reservoirs such as Keyhole and Lake DeSmet or into the Platte River; cooling water for coal-fired electrical plants or other industries such as coal liquification; coal slurry pipelines.

4. Effluent Limits

Limits currently set in Appendix H are intended to be protective for stock and wildlife consumption. They are not. Limits for sulfates and total dissolved solids must be lowered, and limits for barium must be set to conform with the data establishing limits that are protective of stock and wildlife.

[36] Pilot projects for irrigation with treated water are already underway. See note 31.
[37] Ganjegunte, Ex. 8, p. 10.

A. Sulfates

The current limit for sulfates is 3,000mg/l in any single grab sample. The University of Utah Extension service recommends the maximum sulfate level for calves is less than 500 mg/l; for adult cattle it is 1,000/mg/l.[38] Sulfates impart a bitter taste to water, which animals can acclimate to, however, high levels of sulfate produce diarrhea in cattle. The Wyoming Department of Agriculture Analytical Services report says that good quality livestock water should have sulfates of 500 milligrams per liter and that sulfates over 1000 mg/l are "unsuitable" for livestock.[39] The Wyoming limit should be 500mg/l.

B. Total Dissolved Solids

TDS is a measure of salinity, which can have toxic effects on cattle. Animal tolerance varies with species, age, water requirement, season, and condition. Salinity impacts can vary depending on whether increased salinity is abrupt or gradual, and on the duration of exposure. Generally, water intake will increase with increased salinity, until animals refuse to drink at very high salinity. When water intake decreases, so does feed intake. "Sudden changes from good quality livestock water to poor, high salinity livestock water may prove fatal to the animals."[40]

The current standard states:

[38] University of Utah Analysis of Water Quality for Livestock, July, 1997. Exhibit 19.
[39] Wyoming Department of Agriculture Analytical Services Explanation of Standard Potable "Water Supply Series" of Analyses. Exhibit 20. *See also*, Ex. 21.
[40] Wyo. Dept of Ag, Ex. 20. *See also,* Ex. 21.

> The total dissolved solids content of any produced water discharge shall not exceed 5,000 mg/l for total dissolved solid or 7500 umhos/cm for specific conductance in any single properly preserved grab sample . . .

The South Dakota State University Extension service advises that a TDS between 2,000 and 3,000 mg/l may reduce performance, and over 3,000 mg/l "may reduce performance and affect health."[41] The University of Utah recommends a "fair" TDS concentration for cattle at 2000-4000; "good" is 1000-2000.[42] The Wyoming limit should not exceed 2,000 mg/l.

Barium

There is currently no limit for barium. Barium salts "are highly toxic, causing severe hypokalemia (reduction of phosphorus in blood.). . . Signs in livestock include profuse salivation, sweating, violent peristalsis and convulsions, cardiac arrhythmias, palpitations, and sometimes paralysis."[43] The University of Utah Extension Service reports the U.S. EPA upper limit of Barium for livestock is .2 mg/l.[44] Colorado State University says anything over .3 mg/l is "unacceptable" for livestock.[45] The Wyoming limit for Barium in drinking water for livestock should be set at .2 mg/l.

Conclusion

Of course CBM operators prefer surface discharge to other alternatives; it is less costly. That is not the issue. Wyoming's budget surplus should not drive DEQ's

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[41] Nixon, Lance, *Total Dissolved Solids, Sulfates Pose Risk In Livestock Drinking*, South Dakota State University, July, 2002. Exhibit 21.
[42] Uof U Analysis. Ex. 19.
[43] Lewis, Robert, CRC Dictionary of Agricultural Sciences, p. 171 (2005). Exhibit 22.
[44] U of U Analysis. Ex. 19.
[45] *Interpretations of Livestock Water Quality*, Colorado State University Cooperative Extension. Exhibit 23.

promulgation of rules necessary and legally required to protect the environment, Wyoming water, and other traditional land uses such as ranching. CBM production can continue to be profitable for producers in Wyoming and can continue to fill the State's coffers. If 95% of CBM in Wyoming remains to be produced, then it is not too late for DEQ to do its job, and to insure that CBM production not proceed at the cost of all other values, including the protection of water and land entrusted to the Wyoming Department of Environmental Quality and the Environmental Quality Council. Responsible production requires setting effluent limits that are truly protective of livestock and wildlife, and it requires the elimination of the "beneficial use" loophole, so that surface discharge of CBM water proceeds with due regard for land and water, wildlife and agricultural uses that are required by the Clean Water Act, the Wyoming Environmental Quality Act, and thoughtful state policy.

Petitioners respectfully request that the Environmental Quality Council set this Petition for Rulemaking for hearing as expeditiously as possible under the Wyoming Administrative Procedures Act, receive comments and information, and adopt the amended Appendix H to Chapter 2 of the Wyoming Water Quality Rules attached hereto as Exhibit 1.

Dated this ____ day of December, 2005.

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CERTIFICATE OF SERVICE

I hereby certify that I served, via hand delivery, a true and correct copy of the foregoing Petition this ____ day of December, 2005, addressed as follows:

Counsel for DEQ
Mike Barrash
Assistant Attorney General
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