

## Comments - Chapter 1 Appendix H Agricultural Protection Rule



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Environmental Quality Council  
Rulemaking Hearing  
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**Marathon**

Mr. Chairman and members of the Council, my name is Mike Williams and I have the pleasure of providing comments on the proposed Agricultural Protection Rule on behalf of Marathon Oil Company.

I have more than 20 years experience applying my hydrogeologic expertise to environmental and water management challenges throughout the Rocky Mountain States. I am a Wyoming Professional Geologist and am representing Marathon's Powder River, Big Horn, and Wind River Basin assets.

## Agricultural Use of Produced Water

For several years Marathon Oil Company / Pennaco Energy have operated within the provisions of the proposed Ag-Use Rule in our conventional oil and gas (Big Horn Basin) and coalbed methane (Powder River Basin) operations. We generally support the rule as written and wish to comment on several aspects of significant consequence:

1. Suitability of current water quality standards for livestock
2. Scientifically based approach for protection of naturally irrigated lands
3. Preservation of the Grandfather provision, livestock watering and irrigation waivers
4. Demonstrated environmental benefits of produced water



Marathon has applied the tools of the proposed Ag-Use Rule to our conventional oil and gas and coalbed methane operations in Wyoming. We support the rule generally as it is written and wish to comment on several aspects of particular importance:

1. The oil industry and the overwhelming majority of ranchers strongly believe that the current water quality standards are adequately protective of livestock. On behalf of PAW, Ms. Hunter summarized peer-reviewed publications that indicate the current standards are adequately protective of livestock and wildlife in Wyoming.
2. Based on the tools provided by the Tier II and Tier III decision making process, a multi-disciplinary and sound scientific approach has evolved to adequately protect naturally irrigated lands and lands onto which surface water is diverted.
3. Decades of superimposed agriculture and conventional oil and gas development illustrates how the two industries have learned to appropriately utilize Wyoming's precious resources.
4. The beneficial use of produced water is critically important to many agricultural operations, wildlife, and the ecosystem of this arid land.

## Livestock Utilization of Produced Water

1. Marathon supports the current Livestock Watering Limits as proposed by the WWAB and WDEQ
  1. TDS = 5,000 mg/l
  2. Sulfate = 3,000 mg/l
  3. Chloride = 2,000 mg/l
2. Historical data, production statistics, and overwhelming landowner testimony support the conclusion that these standards are protective of agricultural use in the Big Horn Basin
3. Any reduction from the current standards would result in less produced water available for agricultural use and wildlife resources in the arid Big Horn Basin
4. Any further consideration of a sodium limit must adopt a scientifically defensible threshold (3,500 mg/l), which would result in "no measurable decrease" in livestock production

Penny Hunter 10/24/08 Testimony



Based on decades of beneficial use, agricultural production statistics, and the enduring relationships that have been created, the current Livestock Watering Limits are empirically well-suited for the protection of livestock. Marathon believes that the Water and Waste Advisory Board and the Department of Environmental Quality recommended limits for TDS, sulfate, and chloride are sufficiently conservative to preserve beneficial agricultural use.

The Council has been presented with overwhelming landowner testimony, livestock production statistics, and scientific citations to support the conclusion that no measurable decrease in livestock production will occur under these limits.

Any reduction in these limits would result in significantly less water available to the ranches, wildlife and the ecosystem that have grown to depend on the regularity of this water supply. Marathon employs underground injection of produced water to balance reservoir pressures and enhance hydrocarbon recovery; if the current limits are reduced, the surplus water presently discharged to the surface would be directed to disposal wells where the opportunity for any beneficial use is lost forever. Please consider that any reduction in the stated limits would consequently result in a very significant decrease in livestock production for the local cattle industry, as there would be less water available to support forage and direct consumption.

Marathon strongly opposes the addition of a sodium limit, unless a threshold consistent (3,500 mg/l) with the peer-reviewed research presented by Ms. Hunter in her excellent testimony of October 24, 2008 is adopted.

## Protection of Naturally Irrigated Lands

- ♦ NIL are an isolated and geologically uncommon occurrence in the PRB
- ♦ The proposed Tier I EC and SAR effluent limits are extremely conservative.
  - ASDA Bridger Plant Materials Center cites EC=2,700 and SAR=16 as adequately protective for soils of the Powder River Basin
  - This aspect of the rule works only in conjunction with the sound scientific methods applied to Tier II and Tier III decision making.
- ♦ This aspect of the Rule is acceptable only with the inclusion of a non-severability clause



The testimony provided by Mr. Strike illustrates the isolated and uncommon occurrence of naturally irrigated lands in the Powder River Basin. His testimony underscores the need to develop a site-specific hydrogeologic model to appropriately identify and protect such occurrences and the attendant environmental benefits.

It is Marathon's opinion that the Tier I default limits for EC (1,300 uS/cm) and SAR (10) limits are extremely conservative.

- Alternatively, we support the USDA Bridger Plant Materials Center findings that an EC=2,700 uS/cm and SAR=16 are adequately protective for soils of the Powder River Basin.
- However, the conservative limits presented in the Rule are acceptable only in conjunction with the scientifically defensible techniques applied to the Tier II and Tier III decision making process.

The proposed Ag-Use Rule is acceptable only if all components remain intact. Thus, a non-severability clause must be included.

## Grandfather Provision and Waivers

- Decades of agricultural use have been superimposed on effluent dominated drainages of the Big Horn Basin. Therefore, “no measurable decrease” assumes that there was already an agricultural use... which wouldn't be possible without produced water.
- The pre-January 1, 1998 exclusion is critical to the sustainability of the agricultural and energy industry.
- Livestock watering and irrigation waivers are inherent to private property rights and enable the Landowner to make effective decisions to manage their operation's production.
- These provisions must be preserved in the final rule and shall be non-severable



More than 70 years of beneficial agricultural use have been superimposed on the effluent dominated drainages of the Big Horn and Wind River Basins. Therefore, “no measurable decrease” assumes that there was already an agricultural use...which wouldn't be possible without produced water.

Because of the demonstrated no adverse effect on agricultural use, the pre-January 1, 1998 effluent limit exclusion is critical to the sustainability of today's agricultural and conventional oil and gas industries. Without this exclusion, wells would be shut-in, water discharge volumes significantly reduced, and our energy independence goals eroded.

Industry clearly supports the agricultural use of produced water and ranchers are skilled in overall risk management for their operations. For this reason, Livestock Watering and Irrigation Waivers are instrumental to facilitate beneficial use, enhance agricultural productivity, and preserve private property rights.

Again, for the continued viability of the energy and agricultural industries, these provisions must be preserved in the final rule and shall be non-severable.

## Conclusions

Produced water discharge benefits the environment and fosters the Wyoming experience...

1. Sustains riparian vegetation, which stabilize the banks of erodible channels
2. Provides a dependable source of water for livestock and wildlife
3. Has created wetlands that provide habitat for plants, insects, birds, and mammals
4. Is essential for continued viability of many agricultural operations in arid lands

Marathon generally supports the rule as written and the use of sound science to translate the narrative goals of the Ag-Use Rule into appropriate WYPDES permit limits.



Produced water discharges have clearly resulted in significant environmental benefits in all of Marathon's Wyoming operations. The water made available has abundant socio-economic benefits, helps to sustain wildlife, and fosters the Wyoming experience. Produced water discharge:

1. Sustains riparian vegetation, which stabilizes the banks of erodible channels and provides forage and cover for animals;
2. Provides a dependable source of water for livestock and wildlife during all seasons, as the water is warm and free-flowing all winter;
3. Has helped to create wetlands, preserve species, and provide habitat for plants, insects, birds, and mammals. For example, it is widely recognized that the wild horse population of the Big Horn Basin is dependent on produced water, and;
4. Is essential for continued viability of many agricultural operations in these arid lands.

In conclusion, Marathon generally supports the rule as written and the scientific methods which have been employed to translate the narrative goals of the Ag-Use Rule into appropriate WYPDES permit limits. Thank you Mr. Chairman for this opportunity to express our concerns and comments in support of the Rule.

# The Sulfur Cycle and Microbial Activity

- An interesting diurnal variation in the color of produced water is sometimes observed in warm waters derived from hydrocarbon bearing strata. During early morning, cloudy conditions, or Winter days produced water can have a milky appearance. However, by late morning when the sun is high the water is clear the cloudiness disappears.
- This phenomena is due to the metabolism of sulfide and elemental sulfur by two competing microbial regimes and the oxidation of sulfide to elemental sulfur, and ultimately, sulfate.
- When photosynthetic and phototropic bacteria are dormant during the night and on cloudy days, elemental sulfur builds up in the effluent as a colloid giving the water a milky appearance. Then, as the photosynthetic processes become vigorous during the day, these bacteria oxidize the elemental sulfur to, precipitate sulfate minerals or reduce sulfate to assimilate organic sulfur into amino acids where it is immobilized. Because these photosynthetic processes proceed more rapidly than the system can introduce elemental sulfur, the water clears.

P.C. Caswell - Colorado School of Mines (1992)

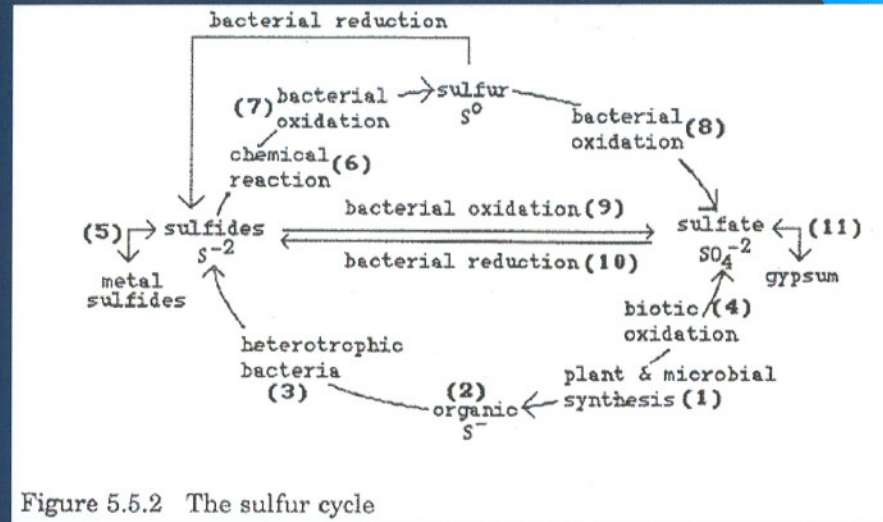


Figure 5.5.2 The sulfur cycle

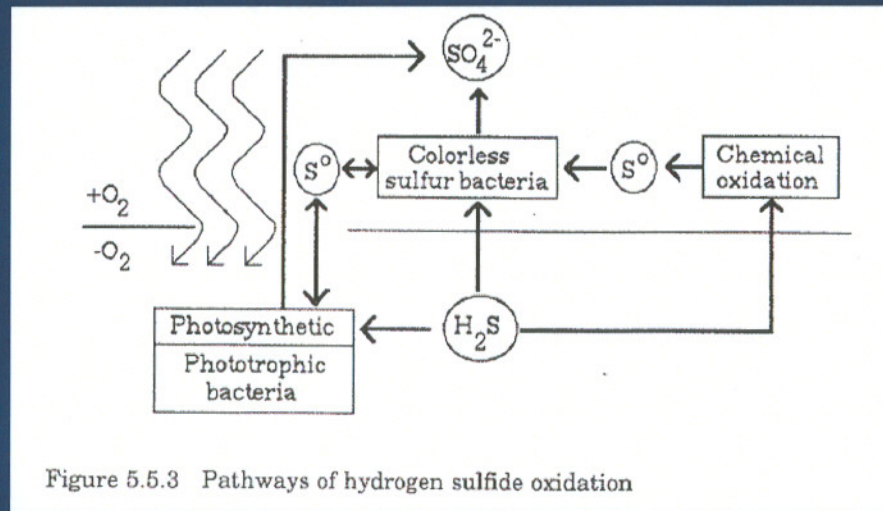


Figure 5.5.3 Pathways of hydrogen sulfide oxidation