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

- 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.<sup>18</sup> 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.

<sup>17</sup> Munn, Ex. 6.

<sup>18</sup> Wyoming Surface Water Quality Standards, Implementation Policies for Antidegradation Mixing Zones Turbidity and Use Attainability Analysis, p. 16, 3<sup>rd</sup> draft, November, 2005. [http://deq.state.wy.us/wqd/surfacestandards/Triennial/Policies\\_3rd.pdf](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 hamstring 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.”<sup>19</sup> 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.<sup>20</sup>

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<sup>19</sup> 1/5/01 Reed letter to Krafft, Ex. 3.

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