

October 28, 2008

To: Environmental Quality Council

Fr: Jill Morrison

RE: Proposed Agricultural Protection Policy Tier 2 Results in Permits

CBM discharges in 2 drainages and ever increasing EC (salinity) and SAR (sodium) limits in permits:

Wildhorse Creek

Middle Prong of Wildhorse Creek

Permit #54585 – Williams – Based on a 2006 KC Harvey soil study conducted under DEQ's proposed Tier 2, an SAR of 24 and an EC of 6100 was established in this permit as protective of the irrigated fields or bottomlands on the Middle Prong of Wildhorse Creek.

http://deq.state.wy.us/wqd/WYPDES_Permitting/WYPDES_PNs_and_appr_permits/FinalPermits_Apps/F P_0052001-0054000/WY0052361_Maj_Mod_APP_5-19-06.pdf

http://deq.state.wy.us/wqd/WYPDES_Permitting/WYPDES_PNs_and_appr_permits/WYPDES_PNs/WYPDES_PNs_2006/August_2006_PN/WY0052361_DP_%20Major%20Modification%2005-15-06.pdf

http://deq.state.wy.us/wqd/WYPDES_Permitting/WYPDES_PNs_and_appr_permits/FinalPermits_Apps/F P_0054001-0056000/WY0054585_NEW_APP_3_1_06.pdf

http://deq.state.wy.us/wqd/WYPDES_Permitting/WYPDES_PNs_and_appr_permits/WYPDES_PNs/WYPDES_PNs_2006/March_2006_PN/WY0054585_dp_new_%203-1-2006.pdf

Mainstem of Wildhorse Creek

Permit # WY0039870 - Prima Oil and Gas to Petro Canada

http://deq.state.wy.us/wqd/WYPDES_Permitting/WYPDES_PNs_and_appr_permits/WYPDES_PNs/WYPDES_PNs_2005/6-15-05/WY0039870%20DP%20Maj%20mod%20%205-17-05.pdf

From 2002 to 2006 – This permit had ongoing documented violations from DEQ in this permit for the failure to meet limits for barium, pH, failure to do the required monitoring and repeated failures to meet the EC of 2,000 and the SAR of 6. DEQ gives the company several compliance schedules which they extend more than once since the company cannot meet the compliance schedule.

As a result of continued failures to meet the permit limits for this permit and another 39853. Petro Canada gets a new permit that combines them all into permit # 51985 and uses the Kevin Harvey soil study to come into compliance with the permit by raising the permit limits to an

SAR of 15 and EC of 2350. The DEQ approved more than doubling the SAR and increasing the EC in order to be in compliance.

http://deq.state.wy.us/wqd/WYPDES_Permitting/WYPDES_PNs_and_appr_permits/FinalPermits_Apps/FP_0050001-0052000/WY0051985_MajMOD_12-20-07_dec-feb.pdf

http://deq.state.wy.us/wqd/WYPDES_Permitting/WYPDES_PNs_and_appr_permits/WYPDES_PNs/WYPDES_PNs_2008/February_2008/WY0051985-DP-MajMod-12-20-08-Feb%20.pdf

Pennaco CBM permits 39616 and 48461 – These permits are on the same Wildhorse drainage and also had repeated problems with meeting the EC and SAR limits of 6 and 2000. In fact on permit 39616 and 48461 Pennaco could not meet the end of pipe effluent limit for SAR of even 15 and so in a permit issued in August of 2008, DEQ agreed to remove that end of pipe limit altogether and now only calls for monitoring the SAR at the irrigation monitoring point. Since Pennaco could also not meet the EC limit of 2000 DEQ also raised the EC at the end of pipe, based on a Kevin Harvey study done for Petro Canada, and another done for Williams Permit 56031 which according to DEQ justified raising the EC in this drainage to 2560 at the end of pipe and over 2800 at the Irrigation Monitoring Point.

Dozens of permits for Yates, Williams, Petro Canada and Lance have also used these same KC Harvey studies to increase SAR and EC limits in the Wildhorse Creek drainage.

Pennaco Permit 48361 states:

http://deq.state.wy.us/wqd/WYPDES_Permitting/WYPDES_PNs_and_appr_permits/WYPDES_PNs/WYPDES_PNs_2007/Apr_2007/WY0048461_DP_Renew_1-18-07%20april%20.pdf

“Irrigation Use Protection

In order to monitor and regulate coal bed methane discharge for compliance with Chapter 1, Section 20 of the Wyoming Water Quality Rules and Regulations (protection of agricultural water supply), effluent limits for sodium adsorption ratio (SAR) and specific conductance (EC) are included in this permit. The Wyoming DEQ has determined that an SAR effluent limit of 15 and a specific conductance effluent limit of 2,350 micromhos/cm are appropriate for protection of agriculture use in the Wild Horse Creek drainage. These effluent limits for EC and SAR were derived using information obtained in the application for this permit (*Section 20 Compliance Analysis for Proposed Discharges by Petro-Canada to Wild Horse Creek, Campbell County, WY*; KC Harvey, LLC, November 2005). The specific conductance limit of 2,350 micromhos/cm was derived through evaluation of the average root zone salinity in the downstream irrigated hay meadows (Floyd Ranch in Section 1 of Township 52 North, Range 76 West, Section 6 of Township 52 North, Range 75 WY0046264 RENEWAL 05-17-2006.doc CBM Statement of Basis - Page 4

West, and Sections 25, 26, and 36 of Township 53 North, Range 76 West). As indicated in the above referenced report, the average root zone salinity within the downstream irrigated area was measured at 4,084 micromhos c/m, with a 95 % confidence interval of +/- 552 micromhos/cm (based on the 32 samples analyzed). This means that while the sampled population indicates a mean root zone salinity of 4,084 micromhos/cm, the actual mean root zone salinity for the whole field likely falls within the range of 3,532 to 4,636 micromhos/cm. For the purpose of introducing a margin of conservatism to the calculation of irrigation effluent limits for this permit, the lower value (3,532 micromhos/cm) was assumed to be the actual mean root zone salinity for the downstream irrigated fields. In calculating an effluent limit for EC

that will maintain a mean root zone salinity of 3,532 micromhos/cm in the downstream irrigated fields, USDA recommends dividing the soil EC by 1.5 to estimate allowable salinity in the applied water (*Agricultural Salinity and Drainage, Hanson et al., 1999 revision*). This results in a specific conductance effluent limit of 2,350 micromhos/cm at the outfall. Again using the recommended method established by the USDA, the total dissolved solids limit is calculated by dividing the calculated EC limit of 2350 µg/l by 1.5, which results in a total dissolved solids effluent limit of 1560 mg/l.

The SAR limit of 15 was derived by analyzing the relationship between background sodium adsorption ratio (SAR) levels and exchangeable sodium percentage (ESP) levels within the downstream irrigated soils. The mean background SAR of the downstream irrigated soils was measured at 5. The mean background ESP of the downstream irrigated soils was measured at 3.9%. With regard to sodicity, the general goal in protecting irrigated soils is to maintain ESP levels at or below 15% (*Agricultural Salinity Assessment and Management, American Society of Civil Engineers, 1996*). For the various analyzed soil samples, the correlation between background SAR and ESP was found to be $ESP = [(0.0366 \times SAR^2) + (0.1194 \times SAR) + 2.008]$, with a correlation value of $R^2 = 0.84$. Therefore, in order to maintain ESP levels at or below 15% in these irrigated soils, SAR of the irrigated soils should be maintained at or below 17. Again, for the purpose of introducing a margin of conservatism, the permit limits SAR to 15, rather than 17. Continued irrigation with water containing an SAR level of 15 would theoretically increase the ESP of the downstream irrigated soils from 3.9% to around 12%, which is well below the accepted 15% maximum ESP threshold necessary for maintaining soil permeability. The above described effluent limits for specific conductance and sodium adsorption ratio are established at each outfall authorized under this permit, and are effective year-round.”

Spotted Horse Creek permits

http://deq.state.wy.us/wgd/WYPDES_Permitting/WYPDES_PNs_and_appr_permits/WYPDES_PNs/WYPDES_PNs_2007/Jun_2007/WY0038377_DP_MajMod-06-07-07%20june%20.pdf

http://deq.state.wy.us/wgd/WYPDES_Permitting/WYPDES_PNs_and_appr_permits/Final_Permits_Apps/FP_0037501-0040000/WY0038377_REN_APP_%208-15-06%20may-June%20PN%20.pdf

Original CBM discharge permit limits that were to meet SAR 6 and EC of 2000. The permits were not in compliance with the Irrigation Compliance point and in the last couple of years Devon has requested permit limits be raised on the following permits after a Section 20 analysis.

Some outfalls in the permit were raised to 2,680 EC no SAR

2 outfalls were granted an EC of 7,500 and an ICP of 5,000 and an SAR of 6 until May 31, 2008-10-22 – by June 1, 2008 they were to meet an end of pipe EC of 1,330 and SAR of 7

Another series of outfalls had an EC of 7,500

The Irrigation Compliance Point which had original EC of 2000 and SAR of 6 where changed to a monitoring point with an EC of 3,126 and SAR with the equation of $SAR < 7.10x EC^{-2.48}$. Which is an SAR of 19. Then the sampling had to meet these limits during “four or more sampling months in any calendar year.”

Other Drainages with Section 20 studies and proposed limits:

Beaver Creek General Permit – Based on a recent KC Harvey soil study of this drainage DEQ is proposing a general watershed permit for the drainage that permits an EC of 5070 and an SAR using the same incorrect equation $SAR < 7.10 x EC^{-2.48}$. This is an SAR of 33.

Deadhorse Creek General Permit – Based on DEQ soil study with KC Harvey assisting goes from an SAR of 6 and EC of 2000 to an EC of 2310 and the SAR calculation which comes out to an SAR of about 14.

See DEQ slideshow and Tier 2 studies at this link:

http://deq.state.wy.us/wqd/WYPDES_Permitting/WYPDES_cbm/Pages/CBM_Watershed_Permitting/Dead%20Horse/wypdes_cbm_wsperm_DeadHorseCreek.asp

DEQ training link on Section 20 Tier 2 and athering soil samples, etc.

http://deq.state.wy.us/wqd/WYPDES_Permitting/WYPDES_cbm/downloads/Training/2_Sec20_Training.pdf