

**2006 Annual Report  
Powder River Basin Controlled Groundwater Area  
Technical Advisory Committee**

**Introduction**

The Powder River Basin Controlled Groundwater Area (PRBCGA) was established to protect existing water users from impacts resulting from coal bed methane (CBM) development. The Montana Board of Oil and Gas Conservation (MBOGC) implements the PRBCGA through regulations that require characterization, monitoring, and evaluation of ground-water conditions, and mitigation of impacts to existing water users.

A technical advisory committee (TAC) was established to oversee the ground-water characterization, monitoring, and evaluation requirements of the PRBCGA. TAC consists of five members selected by DNRC for their expertise in the Powder River Basin coal region, ground-water hydrology, and/or the CBM industry. In addition to overseeing monitoring and reporting requirements for individual fields, TAC is assigned to review ground-water data and scientific evidence related to the PRBCGA and make recommendations to the MBOGC regarding mitigation of impacts.

The purpose of this report is to describe the activities of TAC during 2006 and the impacts of CBM development on ground-water resources during 2005.

**Summary of TAC Annual Meeting**

The TAC met on July 11, 2006 to discuss progress of regional monitoring by the Montana Bureau of Mines and Geology, current and prospective CBM activity, the 2005 Ground-Water Monitoring report for CX Field, and ground-water monitoring plans for projects by Pinnacle Gas Resources, Inc. Attending the meeting were TAC members Peter Bierbach, John Wheaton, John Kilpatrick, Angela McDannel and Russell Levens. TAC member Michael Bergstrom participated by phone. Also attending were, Tom Richmond of the Montana Board of Oil and Gas Conservation, Keith Kerbel of the DNRC regional office, Brian Johnston and Mike Trout of Pinnacle Gas Resources, Inc. and Boe Gregson and Allen Jones of Western Land Services, representing Pinnacle Gas Resources, Inc.

John Wheaton described progress of the regional monitoring well network and discussed regional monitoring data. John discussed evidence of gas migration from west to east along the Wyoming border, evidence of impacts on ground-water levels resulting from water production from CBM wells in Hanging Woman Creek within Wyoming and the Coal Creek field near the Tongue River, and recovery of ground-water levels on the west side of the CX Field. John also discussed a proposal by MBMG for RDGP funding of continued monitoring. Data and interpretations through 2005 are presented in MBMG Open-File Report 538 (Wheaton et al, 2006).

Tom Richmond described the current and prospective CBM activity in the Montana portion of the Powder River Basin. Fidelity Exploration and Production Company has applied to MBOGC to increase well density in their Badger Hill Project. Pinnacle Gas

Resources, Inc. is applying for permits for their Black Eagle Butte Project to be developed on state land in Rosebud County and their Fourmile West Project located northwest of the Coal Creek Project in Big Horn County. Nance Petroleum drilled one well for drainage purposes and Petro-Canada drilled an exploration well. There is no action on the Powder River Gas Castle Rock project. Mike Bergstrom briefly discussed the supplemental EIS on federal minerals leasing and anticipated record of decision and resumed drilling on federal leases in 2007.

Michael Bergstrom described activities on Fidelity leases near Decker during 2005. Fidelity amended their operating permits to allow infill of the Badger Hills, Coal Creek, and Deer Creek projects to increase well spacing on fee and state leases from one well per 160 acres to one well per 80 acres. In addition, Mike discussed DEQ renewal of Fidelity's permits for discharging untreated and treated water. Fidelity's discharge permit allows them to discharge from 1,600 gpm to 2,500 gpm of untreated water depending on the time of year. Fidelity is allowed to discharge treated water up to 1,700 gpm with average daily SAR < 3.0 and EC < 1,000 between July 1 and October 31. CBM water is treated using the EMMITT strong acid cation exchange process followed by air stripping to increase pH and addition of gypsum to adjust SAR. They are allowed to blend up to 14% raw water with treated water as long as they stay within these limits. Mike discussed Fidelity's applications for rights to market water in Montana and Wyoming. They plan to use the water for irrigation in Wyoming and a pilot injection project. In addition, Fidelity has an interim permit from DNRC to deliver 300 gpm to Spring Creek Coal and up to 100 gpm to Decker Coal. Current total water production is 2,200 to 2,300 gpm.

In addition to infilling and plans to begin drilling federal leases, Fidelity plans to evaluate deeper coals (e.g. Wall) near the Spring Creek Mine as they reach the limits of the CX Field. Mike Bergstrom stated there is no existing monitoring of the Wall. Angela McDannel stated there are private wells completed in the Wall east of Spring Creek mine that Fidelity could consider monitoring.

Brian Johnston and Mike Trout of Pinnacle Gas Resources, Inc. and Boe Gregson and Allen Jones of Western Land Services discussed groundwater monitoring and evaluation plans for Pinnacle's Coal Creek and Dietz fields. In addition, Pinnacle representatives discussed monitoring and reporting for the proposed Black Eagle Butte and Fourmile West projects. Pursuant to a request by the TAC, Pinnacle submitted completion diagrams for typical well installations for the Coal Creek and Dietz fields via e-mail after the meeting.

### **2006 CBM Development**

The CX Field operated by Fidelity Exploration & Production Company near Decker Montana and the Coal Creek and Dietz fields operated by Pinnacle Oil and Gas Inc. were in production in Montana during 2005. The 2005 Annual Groundwater Monitoring report for the CX Field was submitted to the MBOGC in April 2006. Fidelity's report contains information on development and monitoring activities, coal bed hydrogeology, ground-water conditions, and proposed changes to their monitoring plan. The report includes a list of wells and springs included in Fidelity's inventory at the end of 2005,

structural contour maps for the Dietz, Carney, and Monarch coals based on the latest drilling information, potentiometric surface and drawdown maps, hydrographs and lists of cumulative water production by well. Table 1 is a summary of volumes of produced water reported for the CX, Coal Creek, and Dietz fields.

Table 1. Summary of water produced from CBM production wells.

Field	Coal Seam	# Wells	Total Water Production	
			Barrels	Gallons
CX	Dietz 2000	62	9,334,416	392,045,472
	Dietz 2001	85	18,089,198	759,746,316
	Dietz 2002	91	7,314,850	307,223,688
	Dietz 2003	133	4,496,207	188,840,693
	Dietz 2004	159	7,038,114	295,600,799
	Dietz 2005	249	7,261,177	304,969,428
	Monarch 2000	53	5,235,357	219,884,994
	Monarch 2001	75	10,237,672	429,982,224
	Monarch 2002	77	4,152,860	174,420,133
	Monarch 2003	89	2,998,966	125,956,551
	Monarch 2004	90	3,943,355	165,620,897
	Monarch 2005	123	4,287,534	180,076,414
	Carney 2000	48	5,599,865	235,194,330
	Carney 2001	74	10,371,528	435,604,176
	Carney 2002	75	4,831,076	202,905,178
	Carney 2003	86	3,920,378	164,655,878
	Carney 2004	107	4,408,829	185,170,811
	Carney 2005	132	5,822,537	244,546,545
	Roberts 2004	2	6,844	287,448
	Roberts 2005	2	94,229	3,957,597
	King 2004	2	28,938	1,215,396
King 2005	2	260,164	10,926,896	
Wall 2005	4	22,526	946,094	
Monarch, Carney 2004	1	13,660	573,720	
Monarch, Carney 2005	1	12,323	517,566	
Coal Creek	Wall 2005	9	1,418,193	59,564,106
	Flowers-Goodale 2005	2	247,185	10,381,770
Dietz	Wall 2005	1	426	17,892
	Cook 2005	1	135	5,670
Totals	2000	165	20,169,638	847,124,796
	2001	236	38,756,615	1,627,777,830
	2002	244	16,299,771	684,590,369
	2003	327	11,415,551	479,453,122
	2004	423	15,426,082	647,895,458
	2005	529	19,426,428	815,909,976

MBMG monitors ground-water levels and chemistry in dedicated monitoring wells installed beginning in the 1970s to investigate potential impacts of proposed coal mines. Monitoring wells installed during 2004 are located according to the regional monitoring plan developed by the TAC. These wells are located in coal zones near their outcrops, in areas where water from coal beds is heavily used, and along the Wyoming border. Locations of regional monitoring wells, and data and interpretations from monitoring conducted through 2005 can be found in Wheaton et al (2005).

### **References**

Wheaton, J, T. Donato, S. Reddish, and L. Hammer, 2006. 2005 Annual coalbed methane regional ground-water monitoring report: Montana portion of the Powder River Basin, Montana Bureau of Mines and Geology, Open-File Report 528, 70 pp.