Combined 2000 - 2001 Annual Reports
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) implement 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. The 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, the 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 the TAC and the impacts of CBM development on ground-water resources during 2000 and 2001.

Summary of TAC Meetings

The TAC met twice during both 2000 and 2001 at the US Bureau of Land Management (BLM) offices in Billings and three times during 2001 via conference call.

March 2, 2000 Meeting

The TAC held its first meeting on Thursday, March 2, 2000 to discuss the permitting processes of the MBOGC and BLM, and the monitoring needs for the CX Field operated by Redstone Gas Partners, LLC (Redstone). The committee discussed their responsibility to provide recommendations to MBOGC for ground-water characterization, monitoring, and evaluation for CBM field developments, and to review ground-water data and provide an annual report on impacts of CBM development on ground-water resources.

The committee requested that Redstone provide information including maps of targeted coal beds, geologic cross sections, and potentiometric surface data for the CX Field. The committee decided to reconvene to make formal recommendations for monitoring at the CX Field after Redstone Gas Partners provided the requested materials.

October 12, 2000 Meeting

The principal purpose of the October 2000 meeting was to discuss ground water monitoring for the CX Field operated by Redstone. Michael Bergstrom, a committee member and also representing Redstone, proposed a general plan, and sought comments from the committee. The committee compared the proposed plan with the ground-water monitoring guidelines attached to the Department of Natural Resources and Conservation (DNRC) Final Order creating the controlled ground-water area. Redstone's monitoring plan was largely acceptable to the TAC,

however, they withheld approval until remaining issues were resolved. The primary unresolved issues were the need for monitoring outside the area of prospective CBM development and water quality sampling at all monitoring locations. Redstone anticipated assembling a final monitoring plan for committee review in time to present an approved monitoring plan to MBOGC in December 2000.

Redstone submitted their monitoring plan to MBOGC with their application for permanent field spacing on December 14, 2000. MBOGC approved Redstone's application based on the requirements of MBOGC Order 99-99 and without approval by the TAC.

April 12, 2001 Conference Call
The TAC met by conference call on Thursday, April 12, 2001 to discuss the CX Field monitoring and evaluation plan, regional ground-water monitoring, and the need for a technical guidance document describing monitoring requirements.

The TAC representative from Fidelity Exploration and Production Co. (formerly Redstone) explained that the monitoring and evaluation plan for the CX Field was approved by the MBOGC (Board Order No. 174-2000) following a hearing on permanent well spacing and field rules held in December 2000. Fidelity's plan did not receive formal approval by the TAC prior to the MBOGC action. Committee members reiterated concerns from the previous meeting, however, because of the action by the MBOGC, and because of their general satisfaction with Fidelity's plan, the committee decided not to discuss the plan further or to submit a formal review to the MBOGC.

The TAC industry representative expressed the need for simplified procedures for complying with requirements of the PRBCGA and MBOGC Order 99-99. Confusion regarding different requirements between agencies and states, and duplicate reporting were identified as specific concerns. The industry representative advocated streamlined reporting and a "data clearinghouse" approach to information management. Cooperation between different agencies and education on their different requirements also were advocated.

Committee members generally supported future plans that focus on evaluating off-lease impacts through regional monitoring. A ground-water monitoring program in Wyoming that is operated by the BLM and Wyoming State Engineer's Office (SEO) was discussed as a regional monitoring approach that could be applied in Montana. Under this program, up to two dedicated monitoring wells per township are installed by CBM operators for inclusion in a regional monitoring network.

The committee agreed to develop a technical guidance document to assist coal bed methane operators comply with requirements of the PRBCGA and MBOGC Order 99-99, and to encourage consistency in characterization, monitoring, and evaluation plans. An outline of the coal bed methane technical guidance document was proposed (see following text box) and a draft document was prepared pursuant to the 4/12/2001 conference call.

Outline for Coal Bed Methane Technical Guidance Document

Overview - Powder River Basin Controlled Groundwater Area

Baseline Hydrogeologic Conditions

- Well and Spring Inventory
- Lithology and Structural Geology
- Aquifer Properties
- Potentiometric Surface
- Spring Flows
- Water Quality

Ground Water Monitoring

- Coal Bed Methane Well Production
- Static Water Levels
- Spring Flows
- Water Quality

Regional Monitoring

- Static Water Levels
- Spring and Surface Water Flows
- Water Quality

Groundwater Mitigation Agreements

- Coverage Area
- Agreement Requirements
- Dispute Resolution

Reporting and Verification

- Reporting Frequency and Standards
- Technical Advisory Committee Review
- Board of Oil and Gas Conservation Review

September 26, 2001 Meeting
John Wheaton and John Metesh of the Montana Bureau of Mines and Geology (MBMG) attended at the TAC's request and described ground-water modeling they are conducting for inclusion in the Statewide Oil and Gas EIS. Next, the TAC reviewed preliminary potentiometric surface and drawdown contour maps for each coal zone targeted for CBM at the CX Field. Ground-water modeling and CX Field monitoring results were discussed, and the TAC concluded that regional-scale monitoring was needed to identify impacts outside CBM fields.

October 23, 2001 Conference Call
The TAC discussed monitoring strategies further and planned a meeting for November 1st and 2nd to draft a regional-scale monitoring plan intended for inclusion in the Statewide Oil and Gas EIS.

November 1-2, 2001 Meeting
In addition to TAC members, John Wheaton participated in planning, and provided maps of coal outcrops and descriptions of current monitoring being conducted by MBMG. A document entitled Regional-Scale Monitoring of Potential Effects of Coal Bed Methane Development on Water Resources in the Powder River Basin was outlined during this meeting.

November 19, 2001 Conference Call
An initial draft of the Regional-Scale Monitoring of Potential Effects of Coal Bed Methane Development on Water Resources in the Powder River Basin was discussed during a conference call held on November 19th, and the final document was submitted to the lead agencies for the EIS on November 23rd. The purpose of this document is to establish design criteria for water resources monitoring intended to detect potential effects of CBM development on existing water users outside operating CBM fields. The objectives of the plan are to ensure that baseline hydrologic conditions are characterized, changes in ground-water levels and flows of springs are detected, and recovery of ground-water levels after CBM development ends is verified.

CBM Development
The CX Field operated by Fidelity Exploration & Production Company (formerly Redstone) in the Squirrel Creek Drainage near Decker, Montana was the only CBM field producing in Montana during 2000 and 2001. The 2000 and 2001 Annual Groundwater Monitoring reports for the CX Field were submitted to the MBOGC during May 2002 and June 2002, respectively. Fidelity's reports contain information on development and monitoring activities, coal bed hydrogeology, ground-water conditions, and proposed changes to their monitoring plan. The reports include lists of wells and springs included in Fidelity's inventory at the end of each year, structural contour maps for the Dietz, Carney, and Monarch coals based on the latest drilling information, potentiometric surface and drawdown maps, and lists of cumulative water production by CBM well.

Table 1 is a summary of volumes of water produced and Figure 1 is a map showing the estimated extent of drawdown in the three coal beds being developed at the CX Field. The 10-foot drawdown contours shown in Figure 1 are based on maps presented in Fidelity's 2001 annual report and are intended to illustrate the extent of detectable impacts from CBM development at the CX Field. A number of assumptions were made in preparing Figure 1. First, a northeast trending fault shown in Figure 1 is assumed to limit drawdowns in the northwest corner of the CX Field. The few wells monitored by Fidelity northwest of this fault show limited or no drawdown, however no wells completed in the Monarch or Carney coals were monitored in this area. Secondly, because of limited monitoring data, the extent of drawdown in the Carney coal northeast from producing CBM wells was extrapolated based on a logarithmic distance-drawdown relationship derived from maximum drawdowns and distances to the 10-foot drawdown contours for the Dietz and Monarch coals.

Table 1. Summary of water produced from CBM production wells in 2000 and 2001.

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
	Monarch 2000	53	5,235,357	219,884,994
	Monarch 2001	75	10,237,672	429,982,224
	Carney 2000	48	5,599,865	235,194,330
	Carney 2001	74	10,371,528	435,604,176
Totals	2000	163	20,169,638	847,124,796
	2001	235	38,762,807	1,628,037,894

Water production from the Dietz, Monarch, and Carney coals averaged 17 gpm, 10.9 gpm, and 11.2 gpm per well respectively during 2001. Average water production per well for each coal was less during 2000 than 2001, however comparisons are deceiving because many of the wells began producing during 2000 and produced for only part of the year. Data available from the MBOGC Internet site show that water production per well is declining for most wells. CBM production has lowered water levels in all three coals beneath the southeastern 2/3 of the CX Field and extending beneath Fidelity leases in Wyoming. In addition, drawdowns in the Carney coal probably extend northwest from the CX Field, possibly as much as several miles.

Regional Montoring

MBMG monitor ground-water levels and chemistry in dedicated monitoring wells installed beginning in the 1970s to investigate potential impacts of proposed coal mines (see Figure 2 for distribution of monitoring wells around the CX Field near Decker). Additional wells will be installed under the regional monitoring plan developed by the TAC in areas where monitoring wells are not now available. The first regional monitoring wells will be completed in coal zones near their outcrops in areas most likely to be developed for CBM. Areas where water from coal-beds is heavily used and the vicinity of the Wyoming border are other priority areas for monitoring coal zones. As CBM fields mature, abandoned producing wells or monitoring wells completed in coal zones and monitoring wells completed in sandstone aquifers within CBM fields will be incorporated into the regional monitoring program.