

BEFORE THE DEPARTMENT OF
NATURAL RESOURCES AND CONSERVATION
OF THE STATE OF MONTANA

IN THE MATTER OF THE DESIGNATION OF)
THE POWDER RIVER BASIN CONTROLLED) **FINAL**
GROUNDWATER AREA) **ORDER**

Pursuant to the Montana Water Use Act, Mont. Code Ann. § 85-2-506, and after notice required by law, public hearings were held on September 22 and 23 in Lodge Grass, Colstrip, Miles City, and Broadus to consider the Montana Department of Natural Resources and Conservation's proposal to designate a controlled groundwater area for the Powder River Basin in anticipation of expected groundwater withdrawals associated with coal bed methane development in the area. Comments were accepted into the record at the hearings and written comments were accepted through October 8, 1999. Based on the information gathered by the Department, the input of other agencies, and the public comment received the Department has modified its proposed findings, conclusion, and order as will follow. The public comment is addressed in the Memorandum that appears at the end of this order.

FINDINGS OF FACT

1. Coal bed methane extraction technology requires groundwater withdrawal to lower groundwater levels and reduce water pressures in the coal beds. Wells may be placed at regular intervals over large areas covering many square miles. The wells are pumped continuously with the specific intent of lowering water pressures in the coal bed. Lowering water pressures will lower water levels in the aquifer.
2. During coal bed methane development, water is removed only from coal aquifers. Other aquifers in an area in a coalbed methane development area may or may not be affected depending upon connections between aquifers.
3. Coal beds are important regional aquifers in water-scarce southeastern Montana. The coal aquifers are often the only practical source of fresh water for domestic, stock, and agricultural uses by the people in the area.
4. The complexities of geology and hydrogeology and the uncertainty about the extent and precise location of future coal bed methane development do not allow an accurate assessment of conflicts with existing and future beneficial water use. However, there is

considerable data available showing significant effects on water levels in coal aquifers from extensive and continuous pumping of water from coal mines in the Decker area.

5. Since coal bed methane development is of limited duration, 20 to 30 years, in any particular field, and because the aquifer is not otherwise disturbed, water in the aquifer most likely will recover to its pre-development level. However, even if an aquifer were to recover rapidly after development, the long period of development could cause severe hardship to local water users. Moreover, interrelationships among aquifers along with future precipitation patterns could cause unpredictable results.
6. Assessment of localized effects of coal bed methane development on water availability would require compiling baseline data from existing wells, before methane gas development, along with data from test wells and coal bed methane production wells. Monitoring of water levels, water pressures and pumping rates during development would also be necessary to determine the effects.
7. The Department of Natural Resources and Conservation usually considers a one-half mile radius from any particular water well as the zone of possible influence from the well. When the Department receives an application for a water well the owners of all existing wells within that radius are notified. Available information does not justify an assumption that wells for coal bed methane development should be considered any different. However, neither does the information justify any assumption that wells or springs over a half a mile from coal bed methane development will not be affected. Baseline information should be gathered for any well within the general location of coal bed methane development so that the effects can be monitored.
8. Although withdrawing groundwater is integral to the coal bed methane extraction method, water is not a desired product of the operation, and must be disposed. Since the withdrawal of the water is not a use of the water per se, a water use permit from the DNRC is not required for withdrawing the water. Public authorities do not otherwise regulate the withdrawal of ground water in the area except as it relates to coal mining.
9. Water withdrawn during coal bed methane withdrawal may be suitable for use by local residents, agriculture, and business. Wells drilled for coal bed methane development could in some cases be developed as water sources for local residents, agriculture, and business.
10. Wells that are inadequately sealed present a hazard of contaminating water in one aquifer with contaminants from another aquifer or introducing methane into non-coal aquifers. The Board of Oil and Gas Conservation regulates well construction and enforces standards for sealing gas wells. These standards are in excess of the standards of sealing water wells enforced by the Montana Board of Water Well Contractors.
11. Since water withdrawn from the aquifers is not otherwise consumed, the water must be discharged in some manner. Any applicable water discharge permits must be obtained, and

water disposal requirements must be met, before groundwater may be discharged, re-injected, or disposed in the Controlled Groundwater Area. Water discharge permits may include the Montana Pollutant Discharge Elimination System (MPDES) permit from the Department of Environmental Quality (DEQ), for discharge to surface water, and the Underground Injection Control (UIC) permit from the Board of Oil and Gas Conservation, for discharge re-injected to groundwater.

12. Extensive coal bed methane development has occurred from coal-bearing strata within the Powder River Basin geologic structure in Wyoming and some development has occurred in Montana near Decker. The Powder River Basin geologic structure and associated coal-bearing strata extends north into southeastern Montana. Consequently, coal bed methane development will likely extend further north into southeastern Montana in the near future.
13. The proposed controlled groundwater area includes the Wasatch Formation and the Tongue River Member of the Fort Union Formation. The formations are the two principle coal-bearing strata in southeastern Montana. The area forms a generally contiguous block of these coal-bearing formations within the Montana part of the Powder River Basin (see Map 1). According to the Montana Bureau of Mines and Geology (MBMG), the area includes all known strippable sub-bituminous coal deposits greater than 30 inches thick in southeastern Montana. (MBMG SP28, Figure 10).
14. Montanans have a right to a clean and healthful environment.

CONCLUSIONS OF LAW

1. Excessive groundwater withdrawals are very likely to occur in the near future because of consistent and significant increases in withdrawals from within the area proposed for controlled ground water designation. By "excessive", the Department means that water levels in targeted aquifers could be reduced near project areas for long periods of time in a water-scarce area.
2. The public health, safety, and welfare require that such extensive water withdrawals in a water-scarce area are monitored and the water withdrawals be controlled where existing beneficial uses of water are adversely affected. Without this designation of a controlled ground water area the extensive withdrawals of ground water anticipated may proceed uncontrolled.
3. With this designation of a controlled groundwater area the withdrawal of groundwater associated with coal bed methane production will be under the prior jurisdiction of the Montana Board of Oil and Gas. However, water rights matters and hydrogeologic issues are not within the ordinary technical expertise and area of concern to the Board. These are matters ordinarily dealt with by the Montana Department of Natural Resources and Conservation and the Montana Bureau of Mines and Geology. The Montana Department of Natural Resources may petition the Board for hearings in regard to the production, use, and

disposal of water from coal bed methane development wells that could include effect on existing water rights in the area based upon information gathered concerning water withdrawals.

4. This controlled groundwater designation will not affect regulation of new water rights for conventional water uses. If local interests wish to acquire water rights to wells constructed during coal bed methane development, a beneficial use permit will be required. Standard exceptions to permit requirement will still apply. For example, a permit will not be required for appropriations of 35 gallons per minute or less and not exceeding 10 acre-feet per year on wells developed for beneficial use. Laws for ground water withdrawals that do not require a water use permit such as conventional oil and gas activities, mining, or agricultural drainage, will remain in effect as in other parts of the state.
5. Discharges of water during coal bed methane development, and well sealing to prevent leakage and contamination are sufficiently regulated by the DEQ and Board of Oil and Gas.
6. The designation of a controlled groundwater area does not infringe on the rights of Montana citizens to a clean and healthful environment.

ORDER

The following described area, as also delineated on Map 1 attached, is designated a Controlled Groundwater Area under Mont. Code Ann. § 85-2-506: all sections in Township 06 North, Ranges 45 East and 46 East; all sections in Township 05 North, Ranges 40 East – 47 East; all sections in Township 04 North, Ranges 38 East, 39 East, 41 East – 46 East, and 48 East; all sections in Township 03 North, Ranges 37 East – 49 East; all sections in Township 02 North, Ranges 36 East – 50 East; all sections in Township 01 North, Ranges 36 East – 50 East; all sections in Township 01 South, Ranges 37 East – 50 East; all sections in Township 02 South, Ranges 37 East – 51 East; all sections in Township 03 South, Ranges 37 East – 51 East; all sections in Township 04 South, Ranges 37 East – 51 East; all sections in Township 05 South, Ranges 36 East – 50 East; all sections in Township 06 South, Ranges 36 East – 51 East; all sections in Township 07 South, Ranges 37 East – 51 East; all sections in Township 08 South, Ranges 37 East – 51 East; and all sections in Township 09 South, Ranges 37 East – 51 East. The controlled groundwater area includes all formations above the Lebo member of the Fort Union Formation.

I. Applicability to coalbed methane wells only.

This controlled groundwater area designation shall apply only to wells designed and installed for the extraction of coalbed methane (CBM).

2. Standards for Permitting, Drilling, and Producing Coalbed Methane Wells

CBM development within the controlled groundwater area must follow the standards for drilling, completing, testing, and production of CBM wells as adopted by the Board of Oil and Gas Conservation. Standards include: field development proposals including initial test wells and development plans; maps of the targeted coalbed; an inventory and hydrologic assessment of existing wells, springs, and streamflow that could be impacted by the operation; and means to mitigate water resource impacts. The Board of Oil and Gas Conservation shall consider applications for each coalbed methane production field. Approval of specific field rules may include requirements and restrictions in addition to the general operating standards.

3. Water Source Mitigation Contract

Coal bed methane operators must offer water mitigation agreements to owners of water wells or natural springs within one-half mile of a CBM field proposed for approval by the Board or within the area that the operator reasonably believes may be impacted by a CBM production operation, whichever is greater. This area will be automatically extended one-half mile beyond any well adversely affected. The mitigation agreement must provide for prompt supplementation or replacement of water from any natural spring or water well adversely affected by the CBM project and shall be under such conditions as the parties mutually agree upon. Mitigation agreements are intended to address the reduction or loss of water resources and may exclude mechanical, electrical, or similar loss of productivity not resulting from a reduction in the amount of available water due to production from CBM wells. The areas covered by mitigation agreements will be considered in review of field development proposals. The Technical Advisory Committee (TAC) will make recommendations to the Board of Oil and Gas Conservation if it identifies a need to increase the required mitigation area.

4. Technical Advisory Committee

The DNRC will designate a Technical Advisory Committee (TAC) with specific expertise in coal aquifer hydrology and shallow groundwater systems. The committee will oversee the groundwater characteristics and monitoring, and the reporting requirements identified in items 5 and 6 below. The TAC will also review groundwater data and scientific evidence related to the Powder River Basin Controlled Groundwater Area and advise the agencies on administration of the area.

The committee will consist of qualified scientists with experience related to the hydrogeology of coal aquifers and CBM extraction operations. The appointments and selections shall be to ensure, to the extent possible, that the committee includes members with expertise in hydrogeology, water quality, and CBM extraction systems and operations.

The TAC will periodically review groundwater data gathered from CBM development. This TAC will prepare an annual report each year, of their findings regarding the impact to the groundwater resource from CBM activities and any mitigation recommendations they may develop. The TAC may submit reports more often if they find it appropriate. Additionally, the TAC will make recommendations to the Board of Oil and Gas Conservation regarding development of specific groundwater characterization, monitoring, and reporting requirements for field developments.

5. Groundwater Characterization, Monitoring, and Reporting

Hydrologic conditions in the targeted coal beds must be assessed prior to field development to establish baseline conditions. Specific requirements of the field rules will dictate that groundwater pressure is monitored in appropriate locations using dedicated monitoring wells, and that groundwater monitoring and reporting is conducted in a manner consistent with the recommendations outlined in the attached memorandum (Attachment A). In addition to all forms required by the Board of Oil and Gas Conservation Completion, a Montana Well Log Report, DNRC Form 603, must be completed for both production and monitoring wells when the wells are drilled and sent to DNRC at the address on the form within 60 days of the well completion.

The specific requirements for each production field will be developed with consideration of recommendations from the TAC. The procedures will include dedicated groundwater monitoring wells outside of, and surrounding the production field. The operator will be required to seek landowner approval to install such wells at appropriate distances from the field. State or federal lands should be considered. If the operator demonstrates that no site is available at appropriate distance, a well at the extreme outer limit of the operator's lease area may suffice. Dedicated groundwater monitoring wells must be placed in the next aquifer above and below the targeted coal seam, if applicable, within the production field. Also, as a minimum requirement, at least one 24-hour aquifer test must be conducted using at least one observation well, and baseline groundwater pressures and water quality data must be obtained from the monitoring wells prior to production.

6. Data Collection and Notice Procedures

Data collected from testing and production of CBM wells and any groundwater monitoring wells and springs required by the Board of Oil and Gas Conservation will be available to the public and provided to the Montana Bureau of Mines and Geology. The Board of Oil and Gas Conservation will notify DNRC of applications relating to CBM field development proposals so that the Department may supply a mailing list of potentially affected water right holders within one-half mile of the proposed field area. The Board will publish notice in accordance with its existing procedures and will additionally require the developer to send individual notices to the water right holders listed by the DNRC.

NOTICES

1. Precautions in Coalbed Methane Areas

Water well developers and drillers must exercise caution when drilling water wells in or near coalbed methane projects as free methane gas may be encountered in one or more coal beds. Drillers should contact the Board of Oil and Gas Conservation Office at (406) 656-0040 for information about coalbed methane activities in their area of interest.

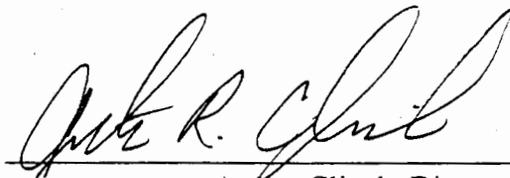
2. Beneficial Use of Water

Beneficial uses of water produced from CBM operations, such as for stock ponds, wildlife ponds, or irrigation requires a water right issued by DNRC as provided by law.

3. Water Discharge and Re-injection

The DEQ Water Protection Bureau at (406) 444-3080 administers the Montana Pollution Discharge Elimination System permit. The Board of Oil and Gas Conservation at (406) 656-0040 administers the Underground Injection Control permit.

Dated this 15th day of December, 1999.



Arthur Clinch, Director
Department of Natural Resources
and Conservation

MEMORANDUM

The public hearings on the establishment of the Powder River Basin Controlled Groundwater Area were well attended and the Water Resources Division received substantial written comment. The public comment was unanimous in its concern that scarce water resources and existing water uses in the area be protected and overwhelmingly favored establishing a controlled groundwater area. The only dissent to the DNRC proposal did not object so much to the underlying goal of protecting the groundwater resource, but was more concerned that existing regulation was being duplicated.

Local public support for a controlled groundwater area is critical. The Powder River Basin situation is unique in its vast area, its water scarcity, the volume of withdrawals contemplated,

and the immediacy of those withdrawals. The DNRC therefore initiated the process for establishing the area on its own motion rather than waiting for a local petition. If, however, it had appeared during the information-gathering period that the public was not interested in or did not favor establishing the area, the DNRC would not have gone forward with the proposal. After all, it is local water users that a controlled groundwater area is designed to protect.

The comment generally expressed concerns about a lack of information about the possible impacts of, and lack of government control and coordination over, water withdrawals and discharges during coal bed methane development. The DNRC has attempted to address these concerns with the modified findings, conclusion, and order.

The most important component of the modified order is the requirement to record and gather baseline and monitoring data so that problems and impacts can be detected as they occur. Of equal importance may be the establishment of a technical advisory committee to review, analyze, and make recommendations concerning the information gathered. The technical advisory committee can also review information provided by local water users. Judging from the public comment, the local land owners will be more than willing to provide any information they might have that will help the committee to track the impacts of the water withdrawals. Without such information and review, attempts to mitigate any adverse impact and to implement any necessary control over the development would be difficult. Individual water users generally do not have the resources to put together the information required to implement controls or mitigate impacts.

The modified order has also attempted to address concerns about the lack of coordination and duplication of regulation between government agencies. For example, the modified order recognizes the jurisdiction of the Montana Department of Environmental Quality over water discharges. The public comments expressed grave concern about the quality of the water and the DEQ has been apprized of that concern. The DNRC, however, will not be regulating in that area. It has also been determined that the Montana Board of Oil and Gas already has sealing standards for wells that will protect aquifers from contamination so that there is no reason to apply such standards as a condition of the controlled groundwater area.

One notable addition to the findings and conclusions concerns a Montana citizen's right to a clean and healthful environment guaranteed by Article II, Section 3 of the Montana Constitution. A recent Montana Supreme Court Decision, *Montana Environmental Information Center et al. v. Department of Environmental Quality*, 1999 MT 248, holds that the right to a clean and healthful environment is fundamental. Since water is vital, it would seem then that the Department would be remiss not to consider the environmental implications of establishing this controlled groundwater area. The Department believes that establishing the area will not intrude on the right to a clean and healthful environment, but rather will help to establish a means by which that right can be protected.

In conclusion, the DNRC was gratified by the interest and support expressed for the controlled groundwater area. When the community center in Broadus is filled to capacity and a petition with over 150 signatures from that sparsely populated area is submitted it cannot be ignored. The

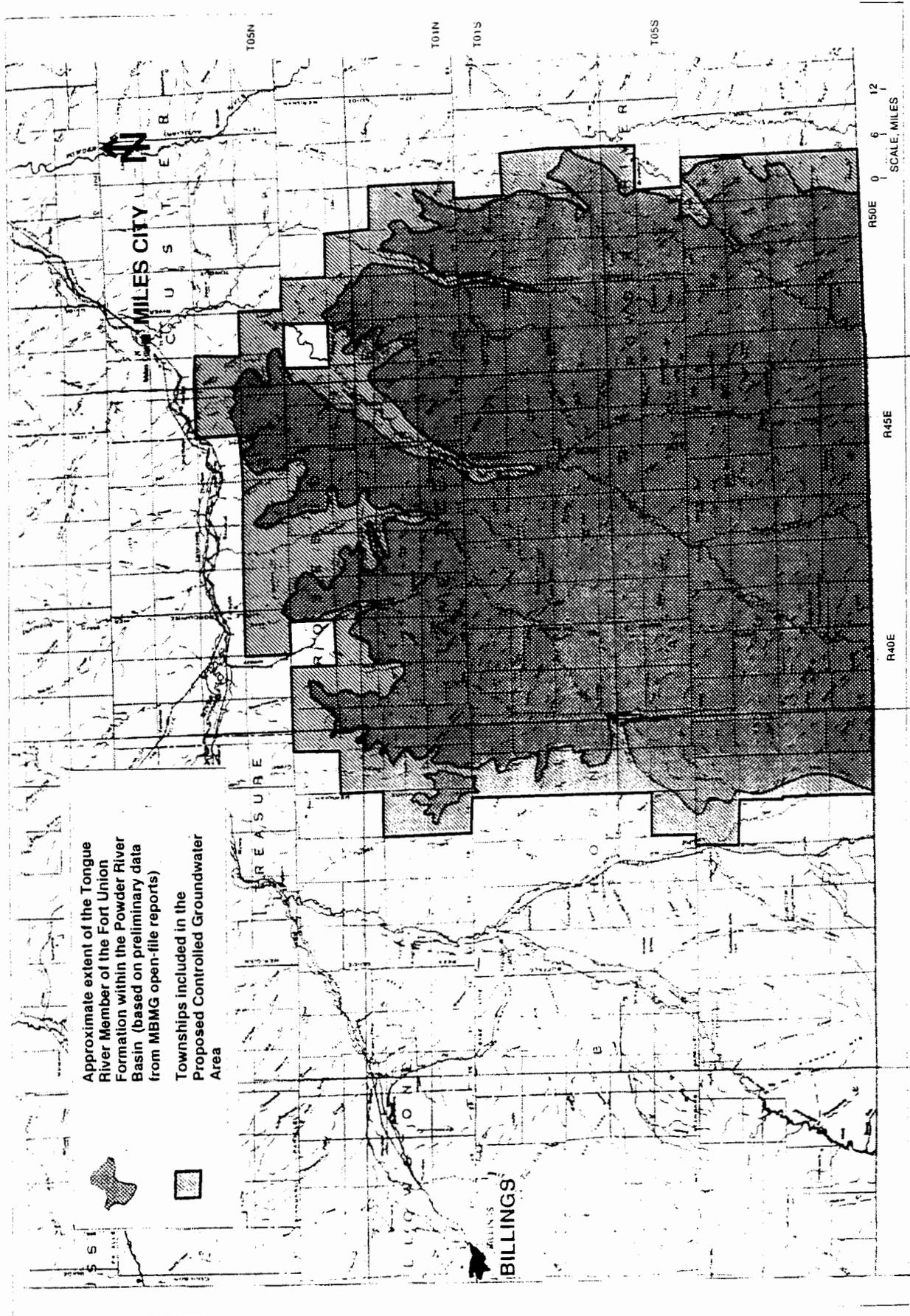
DNRC will reciprocate by keeping the public informed of all developments. The DNRC also appreciates the attendance by Redstone Gas Partners at each of the public meetings and the cooperation they have shown throughout this process. The DNRC has considered the comments of all the participants and those comments have entered into the fashioning of this final order.

CERTIFICATE OF SERVICE

This certifies a true and correct copy of the Final Order was served upon all parties on the attached lists this 20th day of December, 1999.



Nancy Andersen, Chief
Water Rights Bureau



Map 1. Location of the Powder River Basin Controlled Groundwater Area

Notes: This map shows the approximate boundary of the Tongue River Member of the Fort Union Formation where it makes up a nearly contiguous block within the Powder River Basin geologic structure in southeastern Montana. This map does not show all additional exposures of the formation that exist in adjacent areas. The boundary is based on data derived from Montana Bureau of Mines and Geology Open File Reports 280, 281, 285, 286, 287, 288, 289, 290, and 291, all of which are preliminary and subject to revision.

DEPARTMENT OF NATURAL
RESOURCES AND CONSERVATION



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MEMORANDUM

TO: Jack Stults, Administrator
Water Resources Division

FROM: Kirk Waren, Hydrogeologist *KW*
Water Management Bureau

DATE: October 4, 1999

RE: Groundwater assessment, monitoring, and reporting recommendations for
coalbed methane operations

The type of hydrologic assessment and monitoring that is needed for a particular coalbed methane project would best be determined on a case-by-case basis. It is imperative that hydrogeologists are involved with assessing the targeted coal beds, or aquifers, and in determining an appropriate monitoring scheme. This would be beneficial to producers, the Board of Oil and Gas Conservation, and any other party interested in knowing what is happening to aquifer pressures in the vicinity of coalbed methane operations and its relevance to water problems or issues that arise. A qualified review board, having expertise both in natural gas operations and in hydrogeology, is recommended to approve groundwater assessment and monitoring plans, evaluate monitoring results, and to recommend modifications if necessary.

The following is a general description of the type of assessment and monitoring that could be used to track groundwater conditions near coalbed methane operations. These are provided with the idea in mind that enough information would be available to confidently ascertain the impacts of coalbed methane operations on the potentiometric surface, or pressure, in the coal around the periphery of the operation. This may not be an all-inclusive description, but should provide a starting point for what type of assessment and monitoring should be required for coalbed methane projects.

Qualified personnel must conduct assessment and monitoring activities. Unless some public or private agency comes forth with funding or services, it must be conducted at the expense of the coalbed methane operators. The operators can hire qualified staff, use consultants, or contract with a public agency such as MBMG, US Bureau of Land Management, or US Geological Survey to acquire data. Regardless of who does the work, certain reporting criteria must be

maintained. Groundwater level or pressure measurements reported through required monitoring activities must be stored at the Ground Water Information Center at the Montana Bureau of Mines and Geology (MBMG) in Butte.

Groundwater Assessment

In the Controlled Groundwater Area Proposed Order, we specified that hydrogeologic conditions must be evaluated before extensive groundwater pumping is implemented to reduce aquifer pressures. Such evaluation should include maps of the natural potentiometric surface of the targeted coal bed, and an assessment of existing wells, springs, and streamflow that could be impacted by the operation. The basic goal of such an evaluation or assessment is to determine the natural conditions in the area before extensive pumping of groundwater and lowering of pressure in coal beds gets underway. It is imperative to have such information to determine what changes take place as a result of groundwater pumping associated with coalbed methane operations.

In an area about to be tested or developed for coalbed methane, a group of test wells could be drilled at a density of about one per section to determine the potentiometric surface elevations in the coal bed in the area before any production activity is started. These wells would later be converted to methane extraction wells. The predevelopment potentiometric surface of targeted coal beds would then be mapped, and some data describing baseline conditions would be generated. Ideally, the potentiometric surface should be monitored for a year, to determine natural seasonal fluctuations, however because of the time involved, this may not be practical.

Dedicated monitoring wells should be placed outside of the operating area. Initially, these wells would be used to assess conditions outside of the coalbed methane operation. They would provide information on the structure and thickness of the coal beyond the area of exploration required for the methane project. These wells would provide baseline static potentiometric surface data for areas adjacent to, but just outside of the project limits. These should be completed as permanent, dedicated monitoring wells, fitted with an access port for water level measurements, or in the case of flowing artesian conditions, set up so that accurate pressure readings can be made.

For each targeted coal bed, a minimum of four such wells should be drilled in four different directions, e.g. north, south, east and west. Ideally, the orientation of the four monitoring wells or clusters of wells should be shifted to align with the predominant potentiometric surface gradient as shown in Figure 1. In addition to the dedicated coal bed monitoring wells, at least one dedicated monitoring well should be drilled to assess baseline conditions in the first significant aquifer both overlying and underlying the coal bed, unless none exist within some reasonable distance, say 500 vertical feet. These wells would best be placed within the area of operations, for example near one of the methane extraction wells.

For larger projects, or for a number of adjacent projects in the same coal bed creating essentially a larger coalbed methane operation, more than four wells would be needed. The monitoring network should include wells outside of the operating area at a distance of about 1 to 2 miles

from the nearest operating methane extraction well, and such wells should be placed so that nowhere along the periphery of the operations does the distance between dedicated monitoring wells exceed about 4 miles.

An inventory should be conducted on all wells and springs within at least three miles distance from the outer bounds of a proposed methane operation. The inventory should include research of MBMG and DNRC records and topographic maps, as well as interviews with local landowners.

The inventory of wells should consist of a standard hydrogeologic well inventory such as that conducted by MBMG. A set of minimum data requirements needs to be assembled, and would include basic data such as owner, location, static water level or pressure, depth, well log if available, and specific conductance. The inventory of springs would have special requirements, such as flow measurement or estimates, and photographs to accompany the inventory should be considered.

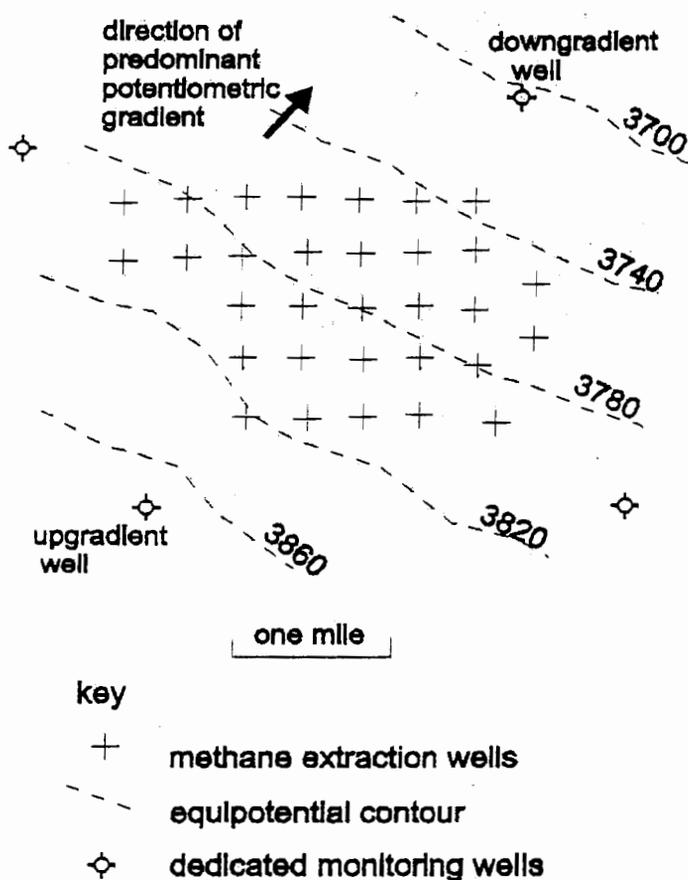


Figure 1. Ideal configuration of dedicated monitoring wells around a coalbed methane operation

The coal bed structure should be compared with the topography of the area to determine where the coal crops out or forms subcrops beneath alluvium in the area, regardless of distance from the operation. Any such areas should be evaluated to determine whether the pressure reductions could impact springs or groundwater discharge. Distance, the potentiometric gradient, and hydraulic properties of the coal will be factors that influence the potential for reducing discharges at springs or alluvial discharge areas. Such an evaluation would then form the basis for appropriate mitigation plans.

One standard, 24-hour, constant-rate aquifer test should be performed at the site to determine aquifer parameters. As with monitoring wells, if the project is unusually large, an additional test or tests may be needed, especially if the thickness or hydraulic properties of the coal appear to vary considerably in the area. Aquifer parameters of transmissivity and storage coefficient must be determined from data collected in an observation well. The test, data collection, and reports need to follow conventional, hydrogeologic standards. This test would have various applications such as determining the radius of influence of the well, estimating well interference, and use in analytical evaluations or groundwater models.

Initial, baseline water quality tests must be conducted for the peripheral monitoring wells and for those adjacent aquifers above and below the coal seam. These tests should include all major ions, and should follow a standard groundwater sampling protocol.

Groundwater Monitoring

Groundwater pumped for coalbed methane operations should be measured, and volumes of water pumped recorded and reported on a quarterly basis. Discharge of the groundwater is under the authority of the Department of Environmental Quality, and sampling and other requirements of that agency.

Groundwater monitoring plans should be designed to track drawdown outside of the area of operations. Dedicated monitoring wells to be placed outside of the coalbed methane extraction well grid, as described above, would be ideally suited to monitor conditions in the coal bed just outside of the area of operations. The same data collected for the nearest overlying and underlying aquifers would provide information concerning conditions in other strata sandwiching the coal beds right in the area of operations, and would therefore likely indicate the worst-case impacts to other aquifers. Pumping water levels should be reported for all coal bed methane extraction wells, or if impractical, at least some subset of the wells that provides a representative indication of the pumping levels within the area of operations.

Although subject to modification, a quarterly monitoring scheme is recommended, in which groundwater levels or pressures in the dedicated monitoring wells and pumping water levels in selected coal bed methane wells are reported. Regardless of who gets such reports, a copy of the data must be delivered to the Ground Water Information Center at MBMG.

In addition to the dedicated monitoring wells, any existing wells within 3 miles of the project and completed in the same coal seam should be considered potential monitoring locations, and any

such well should be subject to required monitoring with landowner permission. Without details on the locations and density of such wells, selection would best be made on a project-specific basis. However, the basic idea would be to monitor more distant wells to determine if any measurable change occurs in areas away from the operation. As a guideline, existing wells a few miles apart would be sufficient, and such activities should initially extend about 3 miles away from the coalbed methane operations. If significant, or unexpectedly large drawdown occurs at the most distant wells, the monitoring could be expanded outward. Depending on conditions observed in adjacent, underlying and overlying aquifers at the operation area, groundwater monitoring in those materials should also be subject to expansion if a potential for problems is found.

The water-level or pressure information collected would be used to map and track changes in the potentiometric surface. This information would serve a variety of purposes. It would be used to determine drawdowns attributable to a particular project. It can be used to estimate potential impacts to springs. It can be used to evaluate how expansion of operations or a second project may affect groundwater levels. It provides the operators and the Board of Oil and Gas Conservation with reliable data that can be used in dealing with complaints.

Groundwater quality samples should be taken periodically in the dedicated monitoring wells to determine whether the coalbed methane operations are affecting water quality in the coal. There are a variety of ways this could happen, such as migration of more mineralized water into the coal from adjacent aquitards. This sampling could probably be infrequent, perhaps every 2 years, unless it appears to be a significant problem.

Reporting and Verification

A standard reporting mechanism should be designed. One method would be to have operators responsible for quarterly reports that provide the data. Such reports would best include both raw data, and interpreted data. The reports should contain project summaries in regards to water, including amounts pumped, groundwater level or pressure measurements for all designated monitoring and pumping wells, and water quality data if applicable. Ideally, the reports would provide maps of the drawdown impacts outside of the operation, if any. If multiple operators are running projects near each other, the data should be presented without regard to which company's operation might be responsible for observed changes, as that may be impossible to determine. However, the presence of adjacent operations should be noted in the reports. Regardless of format, the data and reports must be compatible with, and provided to, the MBMG Ground Water Information Center.

A system of verification is recommended. This could be accomplished through access agreements that allow MBMG, DNRC, or other agencies to take measurements in dedicated monitoring wells. Some type of funding mechanism may be required if the coal bed methane operations expand significantly.