HYDROLOGY APPENDIX

Summary of Water Resources Technical Report

Introduction

During the second half of the 1990s, coal bed methane (CBM) production increased dramatically nationwide to represent a significant new source of natural gas to meet ever-growing energy demands. In Montana, oil & gas development has been growing since the first oil wells were drilled in the early 20th century. There are currently more than 200 commercially producing CBM wells in the state of Montana, all of which are located in the Powder River Basin near the town of Decker, Montana. CBM development in the Montana portion of the Powder River Basin (PRB) is in part a result of successful development in the Wyoming portion of the basin where CBM activity started as early as 1993 (Flores et al. 2001).

A primary intent of the Montana CBM Environmental Impact Statement (EIS) is to provide an overall projection of impacts associated with CBM development for the planning areas and to address issues raised as part of the public scoping process. Of primary consideration for the EIS are water resources. Due to the extraction methods required for CBM production, impacts to surface water and groundwater can potentially result from CBM development. The purpose of the Water Resources Technical Report (WRTR) (ALL 2001b) is to serve as one of many supporting documents for the subject EIS. Following is a short summary of the WRTR.

Public Scoping Issues

During the scoping process for the Montana CBM EIS, the public was provided with the opportunity to review and comment on resource issues identified as important by the Bureau of Land Management (BLM) and the State of Montana. The public was also provided an opportunity to identify new issues and comment on the Draft Planning Criteria. Water issues raised through the public scoping process include groundwater quality and quantity, surface water quality and availability, produced water management, water conservation, water rights, and groundwater resource assessment.

Study Area

The planning area for the EIS is defined as the area where oil and gas decisions will be made by the BLM and the State of Montana. The BLM's planning area is the oil and gas estate administered by the BLM in the Powder River and Billings Resource Management Planning (RMP) areas. The State of Montana's planning area is statewide, with emphasis on the state-administered oil and gas within the BLM planning area and in Blaine, Park and Gallatin counties. The planning area excludes those lands administered by other agencies (for example, Forest Service and Tribal Councils). For ease of reference, the Billings and Powder River RMP areas, and Blaine, Park, and Gallatin counties, are referred to in the document as the BLM and State "CBM emphasis area." This is the 16-county area within the BLM and state planning area where CBM development interest has been identified.

CBM Production Operations

During CBM production, water is pumped up a tubing string to be put into a water flow-line for handling or discharge. At the only producing CBM field in the Montana portion of the PRB, the water is either used in drilling new wells, pumped into ponds for use by the land owner, or discharged to the Tongue River through a MDEQ discharge permit. Assessment of management alternatives requires an accurate estimate of the amount of produced water to be produced from each well. CBM wells must pump water from the reservoir to lower pressure within the coal, to augment the formation of cleat, and to allow the natural gas to break out as a discrete phase. The amount of water that must be pumped off appears to vary not only from reservoir to reservoir, but also during the history of each individual producing well according to the specific coal bed reservoir it is producing from, and its proximity to other producing wells. The WRTR compiles average water production rates for approximately 200 wells in the CX field normalized to the age of each well (MBOGC oil and gas database). This data was prepared by averaging the water production rates from active CBM wells during each month dating from the

date of first production. The exponential trend line is extrapolated from this data is: $Q = 14.661e^{-0.0242t}$ When Q is discharge per well in gallons per minute (gpm), and t is time in months. This indicates that initial discharges are approximately 15 gpm per well, and the 20-year average discharge would be 2.5 gpm. It should be noted that although the average initial discharge is approximately 15 gpm, some wells have discharges as high as 20-25 gpm.

Regional Geology

The planning area of the EIS centers on the Powder River RMP area and the Billings RMP area. The planning area contains three major basinal features – Powder River, Big Horn, and Bull Mountains – and surrounding uplifted areas. The asymmetric basins are the result of sedimentary deposition and structural subsidence with most of the fill consisting of the Fort Union Formation. The Fort Union Formation also contains most of the coals occurring in these three basins.

Fort Union Formation

The Fort Union Formation encloses the various coal seams within the Montana portion of the PRB; these coals function as the source and reservoir for the CBM, as well as aquifers carrying groundwater of varying quantity and quality. Depth to coal seams in the Montana portion of the PRB range from exposure at ground surface to 1,000 feet or more below land surface. Coal thickness varies from thin stringers to over 50 feet and can form aggregate thicknesses that exceed 100 feet. Coal seams in the Fort Union do not have significant matrix porosity and permeability; they can act as aquifers because fluids such as water and methane are contained within the coal's fracture system, known as cleat. The fractures accumulate the fluids and allow the fluids to move horizontally and vertically.

Quaternary Alluvium

Quaternary age sediments are those that are Pleistocene (the latest glacial episode) and Recent (post-glacial episode) in age; the sequence is dominated by events and effects associated with continental glaciation, including glacial till and exaggerated peri-glacial valley fill. Quaternary sediments in the PRB and most of the state are present as variable fill in stream and river valleys. Quaternary Alluvium consists of unconsolidated sand, silt, and gravel that make up the floodplains and stream terraces of creek valleys in the PRB. Alluvium aquifers are largely unconfined and connected to active river flow. Because alluvial aquifers can deliver large quantities of water-to-water supply wells, they are important stratigraphic features. Alluvial aquifers can be impacted by surface activity and can act as a conduit to carry those impacts to valuable surface water resources.

Hydrology

Hydrology identifies aquifers (porous units containing water) and aquitards (non-porous strata that serve to confine and separate aquifers) in a geographic and vertical sense. Aquifers can contain drinkable water, brackish water of limited usability, or salt water. In the EIS planning area, several formations contain drinking water but show variable reservoir quality and water quality. The Montana portion of the PRB includes many aquifers that represent different hydrologic flow regimes. The basin includes unconfined aquifers as well as confined, bedrock aquifers. Aquifers range from the unconfined Quaternary alluvium in the streambeds of rivers and creeks to the Mississippian Age Madison Formation in excess of 10,000 feet below the surface. The water quality within these aquifers ranges from less than 300 mg/L TDS to more than 30,000 mg/L TDS. The aquifers also vary in depth from the basin center to the margin. Coal aquifers are widespread, supply large numbers of water wells, and will be impacted most by CBM production. Alluvial aquifers are commonly unconfined and in direct contact with surface water and can, therefore, be impacted by surface discharge of CBM water.

Watersheds

Watersheds are important to predicting the impacts from CBM development in Montana. Water resource factors such as water quality, water use, and potential impacts are discussed throughout the report in terms of watersheds. Each watershed is drained by a single stream or river and each is bounded by a no-flow topographic boundary. Streams and rivers are profoundly influenced by their watersheds; in particular water volume and water quality vary from base flow conditions to high-flow conditions under the control of runoff from land

surfaces and recharge to rivers by aquifers. The WRTR highlights the watersheds in the PRB along with potential CBM areas.

Groundwater Quality

Quality of groundwater resources are detailed in the WRTR. The report lists quality statistics for the major aquifers from various parts of the CBM emphasis area with emphasis on the coal seam aquifers.

Water Resources Impact Issues

Groundwater Drawdown from CBM Development

Groundwater drawdown from CBM production has been documented inside and adjacent to existing production in Montana. CBM production in the PRB requires drawdown of coal aquifers within the producing field in order to liberate methane. Water wells and springs to but outside of a producing CBM field may also be impacted. Drawdown can be documented by way of dedicated monitoring wells or by gauging private water wells. In Montana's CX Ranch CBM field, the MBMG has installed monitoring wells designed to track drawdown due to the coal mines in the area as well as CBM development.

Surface Water Impact from Discharge

Impacts to surface water from discharge of CBM water can be severe depending upon the quality of the CBM water. Some watersheds may be able to absorb the discharged water while others are sensitive to large amounts of low-quality CBM water. Surface water quality in the watersheds is tabulated in the WRTR. Water quality data is from stream gauging points maintained by the USGS; these multi-year collections of water quality data illustrate changes within the stream from times of high run-off (typically June for the PRB) when the river is the highest and water is mostly the result of precipitation from spring rains and melting snow. During periods of high flow the streams and rivers contain higher quality water. The USGS data also contains data on base-flow conditions (typically winter in the PRB) when streams are at their lowest flow and water quality is the lowest since much of the water is recharge from alluvial and bedrock aquifers where groundwater is often of low quality. Discharge scenarios are described and resultant water quality is computed on a watershed basis.

Mitigation

CBM production in the Montana PRB will certainly impact groundwater. Impacts to groundwater resources may however be mitigated through the use of water well agreements, limits placed on discharge and monitoring programs. Furthermore, a predictive model may be helpful as an approximation of future impacts. Groundwater rights will be protected through the use of spring/water well mitigation agreements and an approved monitoring plan to aid in the identification of potentially significant drawdown impacts. Surface water resources can be protected by limiting discharge through alternative management techniques.

Conclusions and Attachments

The WRTR concludes with a list of key water resource factors that are important to the subject of impacts. The appendices contain several pertinent documents as well as groundwater drawdown data from monitoring wells in the vicinity of the CX Ranch field, decline analysis from the CX Ranch field, and groundwater quality data from coal seam aquifers.

TMDL Schedule for CBM Emphasis Area of Montana

Section 303 (d) of the Federal Clean Water Act and Sections 75-5-701 MCA, et.seq. of the Montana Water Quality Act require Montana to develop "Total Maximum Daily Loads" (TMDLs) for lakes, rivers, and streams that are not meeting water quality standards. A TMDL is the amount of a pollutant that a waterbody can assimilate from point, non-point and natural sources and still meet water quality standards. In short, TMDLs guide the development of discharge targets for contributing sources that once implemented will restore or protect water quality.

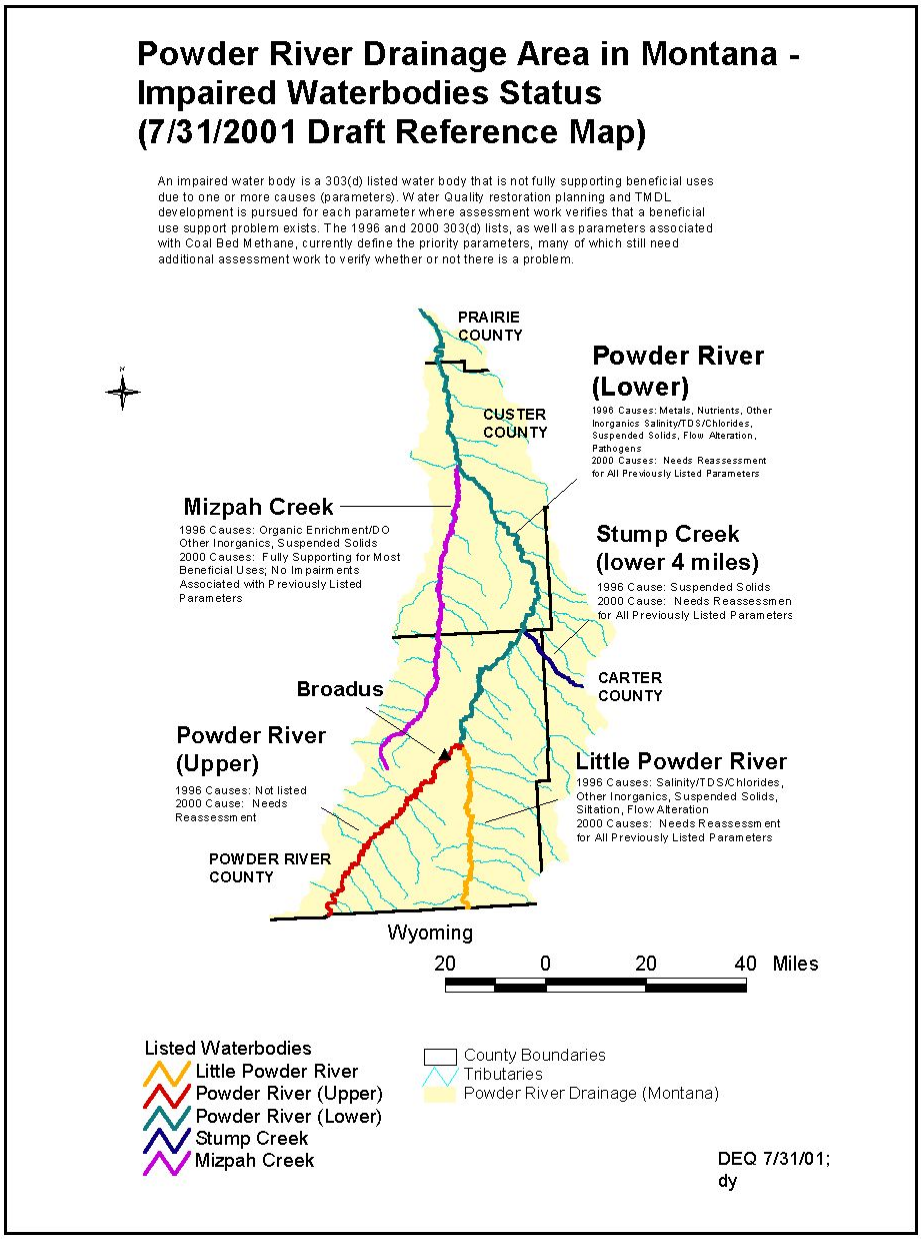
All waters in Montana have been assigned to one of nine classifications based upon their presumed ability to support certain beneficial uses (i.e. drinking water, recreation, fisheries and aquatic life, agriculture, and industrial uses). Each classification has specific water quality standards including numerical and narrative limits. Waters that fail to meet the numerical or narrative standards are considered impaired. Montana must develop one or more TMDLs for each impaired waterbody.

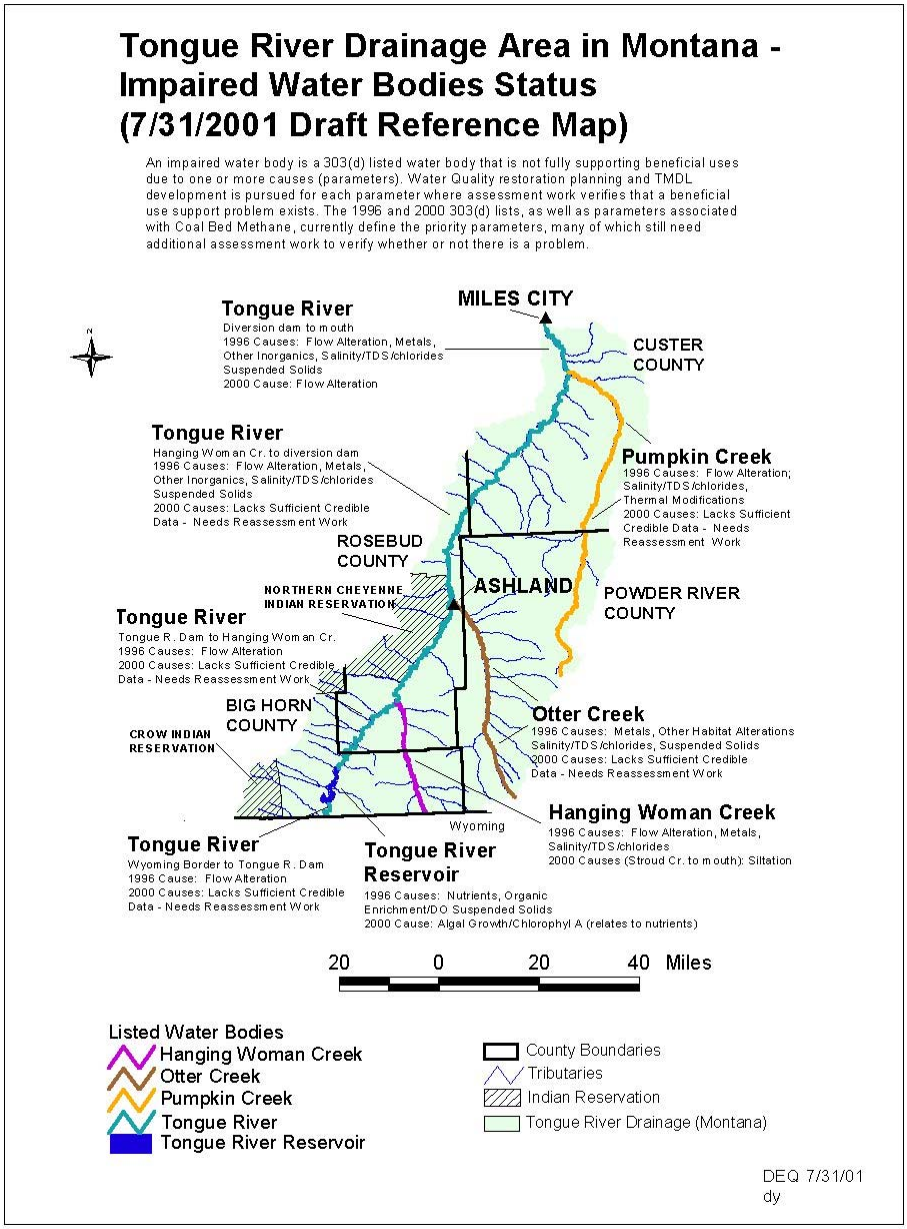
In accordance with Section 303(d) of the Federal Clean Water Act, the Montana Department of Environmental Quality (MDEQ) has prepared a list of impaired and threatened waters every two years since 1992. This so called "303(d) list" identifies lakes, rivers and streams that are not meeting water quality standards and establishes priorities for TMDL development. However, Montana like the rest of the nation was slow to develop TMDLs.

On June 21, 2000, the United States District Court of Montana ordered EPA to work with the State of Montana to develop and adopt a schedule that would result in developing all necessary TMDLs for waters on Montana's 1996 Section 303(d) list (EIS Table 3-5) by May 5, 2007. On November 1, 2000, MDEQ and EPA published a schedule that was based upon a watershed or planning area approach. MDEQ divided the state into 91 TMDL Planning Areas each with a deadline for completing all necessary TMDLs. The surface waters likely to be affected by coal bed methane (CBM) development are located in the Tongue and Powder TMDL Planning Areas. The TMDL completion dates for these planning areas are 2005 and 2006, respectively.

Independent of the court order, but as required by the Federal Clean Water Act and the Montana Water Quality Act, MDEQ prepared a 303(d) list in 2000. The 2000 list was approved by EPA on January 29, 2001 and is superior to earlier lists for several reasons. First, significantly more data was available for making listing decisions. Second, the public review process was substantially expanded including a lengthy comment period and 17 public meetings around the state. Third, MDEQ significantly improved the methods for making listing decisions. Fourth, MDEQ dramatically improved the supporting documentation for all listing decisions and made the information easily accessible by the public.

Although the court order mandates the 1996 list (EIS Table 3-5) as the starting point, both the 1996 and the 2000 lists should be consulted when making TMDL decisions. Figures 1 and 2 provide a summary of the waters in the Tongue and Powder river basins that are on the 1996 and 2000 lists. The figures identify the pollutants of concern, summarize the reasons for the listings, and explain the differences between the two lists.


Powder River Drainage Area in Montana - Impaired Waterbodies Status (7/31/2001 Draft Reference Map)
An impaired water body is a 303(d) listed water body that is not fully supporting beneficial uses due to one or more causes (parameters). Water Quality restoration planning and TMDL development is pursued for each parameter where assessment work verifies that a beneficial use support problem exists. The 1996 and 2000 303(d) lists, as well as parameters associated with Coal Bed Methane, currently define the priority parameters, many of which still need additional assessment work to verify whether or not there is a problem.
PRAIRIE COUNTY
CUSTER COUNTY
Powder River (Lower)
1996 Causes: Metals, Nutrients, Other Inorganics Salinity/TDS/Chlorides, Suspended Solids, Flow Alteration, Pathogens
2000 Causes: Needs Reassessment for All Previously Listed Parameters
Mizpah Creek
1996 Causes: Organic Enrichment/DO Other Inorganics, Suspended Solids
2000 Causes: Fully Supporting for Most Beneficial Uses; No Impairments Associated with Previously Listed Parameters
Stump Creek (lower 4 miles)
1996 Cause: Suspended Solids
2000 Cause: Needs Reassessmen for All Previously Listed Parameters
CARTER COUNTY
Broadus
Powder River (Upper)
1996 Causes: Not listed
2000 Cause: Needs Reassessment
Little Powder River
1996 Causes: Salinity/TDS/Chlorides, Other Inorganics, Suspended Solids, Siltation, Flow Alteration
2000 Causes: Needs Reassessment for All Previously Listed Parameters
POWDER RIVER COUNTY
Wyoming
20 0 20 40 Miles
Listed Waterbodies
Little Powder River
Powder River (Upper)
Powder River (Lower)
Stump Creek
Mizpah Creek
County Boundaries
Tributaries
Powder River Drainage (Montana)
DEQ 7/31/01; dy



The 2000 list provides substantially more and better information concerning the impairments and the sources that may be contributing to the problem. However, MDEQ or EPA is required to develop *all necessary* TMDLs for each waterbody and pollutant identified as impaired or threatened on the 1996 list. A TMDL may not be necessary for a waterbody listed on the 1996 list for a couple of reasons. First, a TMDL is unnecessary if further assessment, such as was done for the 2000 list, determines that the waterbody is meeting water quality standards for the particular pollutant. During the development of the 2000 list, MDEQ determined that several waters in the Tongue, Powder, and Little Powder river basins that were listed as impaired on the 1996 list, were actually meeting water quality standards for some of the listed pollutants (i.e., Mizpah Creek was found to be fully supporting for nutrients, dissolved oxygen, inorganics and suspended solids). Second, EPA has determined that TMDLs are not necessary for "pollution" that is not associated with a specific pollutant (i.e., flow or habitat alteration). EPA described their position on this issue to MDEQ in a July 23, 2001 letter concerning a flow alteration TMDL for Big Creek, a tributary of the Upper Yellowstone River. It should be noted however,

that further assessment frequently shows that flow or habitat alterations cause high levels of pollutants (i.e., flow and habitat alteration can cause violations of temperature standards).

Although, during the 2000 listing process MDEQ determined that several waterbodies on the 1996 list were meeting the water quality standards for some of the listed pollutants, it was far more common for MDEQ to determine that there was insufficient credible data to make a listing decision. MDEQ determined that many segments of the Tongue and Powder rivers and some tributaries lacked sufficient credible data to determine whether the waters are impaired, threatened, or fully supporting the numerical and narrative water quality standards. These waters are scheduled for additional assessment prior to developing TMDLs for the associated TMDL Planning Areas. The reassessment work is already underway and it is possible that MDEQ will determine that additional waterbodies are meeting the standards for listed pollutants. If so, a TMDL will not be necessary, even though the waterbody and the pollutant were listed on the 1996 list. Conversely, additional TMDLs may be necessary if the assessment demonstrates that a waterbody is impaired for other pollutants that were not originally identified on either the 1996 or 2000 lists.

The 1996 list identified many waters within the Tongue and Powder TMDL planning areas as impaired by salinity, total dissolved solids, chlorides, metals, inorganics, suspended solids, siltation, nutrients, low dissolved oxygen, pathogens, flow alteration, thermal modification, and habitat alteration. Of these pollutants, salinity, total dissolved solids, metals, and nutrients are frequently associated with produced water from CBM development. CBM development may also cause flow alterations and associated pollutants to exceed standards (i.e., total suspended solids). MDEQ is conducting a reassessment of the Tongue, Powder, and Little Powder rivers and their tributaries concurrent with this environmental impact study. The results will be used to determine whether TMDLs are necessary for these pollutants and, if so, facilitate development.

In addition, MDEQ intends to ask the Board of Environmental Review (BER) to promulgate numerical standards for electric conductivity (surrogate for total dissolved solids), sodium adsorption ratio (SAR) and bicarbonates. This environmental document proposes a range of numerical criteria for each of these pollutants strictly for the purpose of evaluating the various alternatives. It is important to understand that the BER has the responsibility to set the standards and they will base their decision on written and oral testimony presented at a public hearing and during a public comment period. The stringency of the final standards will determine whether assimilative capacity exists or if a TMDL is necessary.

The court order prohibits MDEQ from issuing any new Montana Pollutant Discharge Elimination System (MPDES) permits or renewals that would increase permitted discharges until all necessary TMDLs are established. In light of the programmatic needs associated with CBM development, MDEQ has rescheduled the TMDLs for pollutants associated with CBM discharges in the Tongue and Powder TMDL planning areas for December 2002.

As mentioned earlier, the court order prohibits MDEQ from issuing any new MPDES permits or renewals that would increase permitted discharges until all necessary TMDLs are established for a particular impaired waterbody. This provision of the court order has a direct bearing on CBM development. Unless producers choose a no discharge option, such as reinjection, MPDES permits will be required for CBM development. MDEQ and EPA are applying the court order on a pollutant-specific basis. For example, if the water is listed for nutrients and the new source will not discharge nutrients, a permit can be issued. Likewise, a permit can be renewed, if an existing source intends to increase its discharge but the effluent limit for nutrients will remain the same. Under some circumstances a permit can be issued even when the new discharge contains the pollutant of concern. By regulation, such permits must contain water quality based effluent limits that insure that the water quality standards will be met downstream of the discharge. For example, if the water quality standard is expressed as an in-stream concentration and the concentration in the discharge is less than the standard, the new source may actually improve water quality.

MDEQ is prohibited from issuing permits for discharges that would cause exceedances of a state water quality standard (i.e., where there is no assimilative capacity). This will be the case for many impaired waterbodies. Therefore, MDEQ will frequently not be able to issue a permit until a TMDL is developed for the entire

watershed. A watershed TMDL will identify the major point and non-point sources contributing to the impairment and establish discharge targets for the pollutant of concern. In combination, the limits for all the sources must insure that water quality will improve to the point where the standards are met. The Montana Water Quality Act requires MDEQ to work with local landowners to implement voluntary measures (reasonable land soil and water conservation practices) to reduce pollutant loads from non-point sources. The Act also requires targets for point sources to be incorporated into MPDES permits in the form of effluent limits. The changes would normally be made during the next scheduled permit renewal and could include permits issued between now and the final development of the watershed TMDL. A watershed TMDL may include an allocation for growth to allow for new or increased discharges in the future and facilitate permitting. To provide for growth existing point and non-point sources would need to reduce their discharges even further.

As mentioned earlier, MDEQ advanced the schedule for developing watershed TMDLs for pollutants associated with produced water from CBM development to December 2002. The revised date was selected based upon an assumption that at least one TMDL will be necessary. Developing a TMDL takes time and involves completing the ongoing assessments; coordinating with landowners and CBM producers in Montana, on tribal lands, and perhaps in Wyoming; assigning allocations for point and non-point sources; drafting the TMDL and a technical support document; conducting public meetings; and obtaining EPA approval. If this environmental impact statement is completed on time, the TMDLs will follow six months later. During the interim period MDEQ will review applications for new MPDES permits or renewals on a case-by-case basis. Water quality based effluent limits may be feasible for some discharges while not possible for others. In short, CBM development may be delayed on some waters for an additional six months unless nondischarging options are employed.

MONTANA AND WYOMING POWDER RIVER INTERIM WATER QUALITY CRITERIA MEMORANDUM OF COOPERATION

WHEREAS, the State of Montana and the State of Wyoming recognize a. responsibility and an opportunity to work collaboratively to protect water quality in the Powder River Basin and to facilitate the development of Coal Bed Methane (CBM) activities in the respective states, and

WHEREAS, the State of Montana and the State of Wyoming will pursue a process that would establish respective responsibilities for managing and controlling salinity, SAR, and other pollutants of concern; and

WHEREAS, the States of Montana and Wyoming have met in several meetings to work out the technical details of this cooperative approach; and

WHEREAS, the State of Montana and the State of Wyoming realize that an interim effort is necessary until more stream flow and water quality data can be collected and analyzed to determine the assimilative capacity of waters in the Powder River drainage, and until the effects of CBM development are better known, and Montana completes the development and adoption of water quality standards, an EIS and a Total Maximum Daily Load (TMDL) plan for the basin; and

WHEREAS, the State of Wyoming recognizes Montana's downstream interests and has committed to apply certain limits on the development of CBM activities, during the term of this cooperative effort; and

WHEREAS, the State of Montana has recognized Wyoming's desire to continue to cautiously grant NPDES permits during this interim period; and

WHEREAS, the State of Wyoming will work with and support Montana's efforts to develop long-term water quality standards and an equitable allocation of the assimilative capacity if one exists.

NOW THEREFORE, the parties enter into this Memorandum of Cooperation (MOC).

I. Parties.

The parties to this MOC are the signatories as set forth on Page 4. The director of the Wyoming Department of Environmental Quality is entering into this MOC to further the purposes of the Wyoming Environmental Quality Act, W.S. 35-11-109(a)(ii). The director of the Montana Department of Environmental Quality is entering into the MOC to further the purposes of – the Montana Water Quality Act, Title 75, Chapter 5, Montana Code Annotated.

II. Purpose of MOC

The purpose of this MOC is to document the parties' commitments and their intent to protect and maintain water quality conditions within Montana during an interim period while new CBM discharges in Wyoming are cautiously allowed. At the conclusion of this interim period, the parties shall negotiate a final MOC that will include recognition of protective water quality standards and allocation of any assimilative capacity.

III. Interim Threshold Criteria for Salinity and Sodium

1. Powder River

The two states will use the highest sampled monthly values of electrical conductivity (EC) from 1990 through 1999 for the Powder River at the Moorhead gauging station as interim upper threshold criteria. Montana shall monitor the Moorhead data and report to Wyoming the average monthly EC and its comparability to the appropriate monthly value. If in any given month the average EC exceeds the threshold criteria, as listed herein, Wyoming will use its ongoing monitoring of sodium levels to determine the potential source and cause of the exceedance. The results of this investigation will be reported to Montana in a timely manner. If the exceedance is found to be attributable to CBM discharges, Wyoming

will initiate appropriate steps through its regulatory mechanisms to return salinity levels into conformity with this MOC.

The Upper Threshold Salinity Monthly Values (EC in pmhos/cm) for the Powder River at the Moorhead, Montana gauging station, based on the data from the 1990's are:

January 2200
February 2300
March 2300
April 1700
May 2100
June 2200
July 2800
August 2400
September 2600
October 1900
November 2000
December 1800

The two states recognize that sodium levels and the Sodium Adsorption Ratio (SAR) may have an effect on water uses. However, at this time no clear threshold can be developed due to a lack of data. The State of Wyoming will, through its monitoring program, track sodium concentrations in the Powder River above the state line, evaluate the source of changes through various modeling techniques and report the results of these evaluations to Montana.

2. Little Powder River

The states will use statistical step tests and 90" percentile, 90% confidence limits (90/90) for EC, SAR, and Total Dissolved Solids (TDS) derived from monthly flow weighted historic data as threshold criteria to indicate whether a change has occurred. Montana shall monitor the data from the Little Powder above Dry Creek, near Weston, and report the flow-weighted results to Wyoming. The step tests and 90/90 criteria will be based on a continuous and cumulative evaluation of available data from 1985 forward. Pre-1985 data will not be used because baseline conditions delineated by the older data sets differ from post-1984 conditions. If a step test shows a significant difference or the 90/90 confidence limit is exceeded, Wyoming will conduct an evaluation as to the possible source of the trend or exceedance and report the results to Montana in a timely manner. If the difference or exceedance is found to be attributable to CBM discharges, Wyoming will initiate appropriate steps through its regulatory mechanisms to return salinity levels into conformity with this MOC.

IV. Other Pollutants of Concern

Montana accepts Wyoming's antidegradation policy as protective of Montana's water quality standards. However, should Wyoming consider an application to degrade, Montana will be included as a participant in the waiver review process so that the states may equitably allocate any assimilative capacity.

V. Monitoring Program

Wyoming and Montana are committed to the development of a monitoring program to implement this MOC and to the development of a final MOC.

VI. Standard Frequency of Data Review and Evaluation

The parties will meet periodically and review the results of their respective monitoring programs, to promptly report evaluations and results, and review the overall success of the program.

VII. Term of MOC

It is the intent of the parties that this interim MOC is for a period of 18 months from its' effective date. During the fall of 2002 the parties anticipate re- negotiating a final MOC that will address meeting downstream standards for the Powder and Little Powder Rivers and TMDLs.

VIII. Public Participation

Opportunity for public participation was provided during the technical sessions that led up to this MOC. The parties are committed to keeping the public informed about the implementation and success of this MOC. All technical information and evaluations resulting from this MOC will be available to the public.

IX. Dispute Resolution

The parties agree that disputes that arise as a result of this MOC shall be resolved through communication and cooperative problem solving involving the parties

X. Amendment

This MOC may be amended or modified at any time upon the consent of all parties.

XI. Vacating MOC

Any party may withdraw from this MOC by providing written notice to the other parties.

XII. Effective Date

This MOC is effective upon the last date of signature by a party, as listed below.

1. MONTANA DEPARTMENT OF ENVIRONMENTAL QUALITY

_____

Jan Sensibaugh, Director Sept. 5, 2001

2. WYOMING DEPARTMENT OF ENVIRONMENTAL QUALITY

_____

Dennis Hemmer, Director Date

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GENERAL DISCHARGE PERMIT
COAL BED METHANE PRODUCED WATER

MONTANA DEPARTMENT OF ENVIRONMENTAL QUALITY

AUTHORIZATION TO DISCHARGE UNDER THE

MONTANA POLLUTANT DISCHARGE ELIMINATION SYSTEM

In compliance with Section 75-5-101 et seq., MCA, and ARM Title 17, Chapter 30, Subchapters 6, 7, 12, and 13. Applicants with an authorization letter for this "Coal Bed Methane Produced Water General Discharge Permit", are permitted to discharge wastewater resulting from Coal Bed Methane natural gas production wells to holding ponds for the purpose of the prescribed beneficial use. Discharges are not authorized to state surface waters other than in the event of a 25-year, 24-hour rainfall event. The use of holding ponds for the prescribed beneficial use shall be in accordance with effluent limitations, monitoring requirements, and other conditions set forth herein.

This permit shall become effective on the date of issuance.

A written authorization letter from the Department is required before an applicant is authorized to discharge under the Coal Bed Methane Produced Water-General Discharge Permit.

This permit and the authorization to discharge shall expire at midnight, 5 years after the date of issuance.

FOR THE MONTANA DEPARTMENT OF
ENVIRONMENTAL QUALITY

_____
Jan P. Sensibaugh, Director
Department of Environmental Quality

Dated this _____day of _____

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I. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

A. Definitions.

1. "Bypass" means the intentional diversion of waste streams from any portion of a treatment facility.
2. "Department" means the Montana Department of Environmental Quality.
3. A "grab" sample, for monitoring requirements, is defined as a single "dip and take" sample collected at a representative point in the discharge stream.
4. "Instantaneous Maximum" is the maximum value allowable in any single sample or instantaneous measurement.
5. An "instantaneous" measurement, for monitoring requirements, is defined as a single reading, observation, or measurement.
6. "Petroleum-related water cleanup" is groundwater or collected stormwater in contact with petroleum-related spills or leaking underground storage tanks that contain petroleum-related products.
7. "Coal Bed Methane Produced Water" is the separated wastewater resulting from coal bed methane natural gas producing wells.
8. "Severe property damage" means substantial physical damage to property, damage to the treatment facilities which causes them to become inoperable, or substantial and permanent loss of natural resources which can reasonably be expected to occur in the absence of a bypass. Severe property damage does not mean economic loss caused by delays in production.
9. "Ephemeral Stream" means a stream or a part of a stream, which flows only in direct response to precipitation in the immediate watershed or in response to the melting of a cover of snow and ice and whose channel bottom is always above the local water table.
10. "Intermittent Stream" means a stream or reach of a stream that is below the local water table for at least some part of the year, and obtains its flow from both surface run-off and groundwater discharge.
11. “Continuous” is the measurement of effluent flow, which occurs without interruption throughout the operating hours of the facility, except for infrequent shutdowns for maintenance process changes, or other similar activities.

B. Effluent Limitations and Self-Monitoring Requirements

During the period beginning immediately and lasting through the duration of the permit, the permittee is authorized to discharge from the outfall(s) as specified in the authorization letter. Discharges at any location not authorized under an MPDES permit is a violation of the Montana Water Quality Act and could subject the person(s) responsible for such discharge to penalties under the Act. Knowingly discharging from an unauthorized location or failing to report an unauthorized discharge within a reasonable time from first learning of an unauthorized discharge could subject such person to criminal penalties as provided under Section 75-5-632 of the Montana Water Quality Act.

The discharged water must be utilized for the beneficial use as prescribed in the permittee's beneficial use letter(s) submitted with the application. No discharge is authorized by this general permit to state surface waters. All discharges must be to holding ponds for the purpose of the prescribed beneficial use.

1. Final Wastewater Effluent Limitations

Effective immediately and lasting through the present permit cycle of five years, the quality of effluent discharged through the authorized outfall shall, as a minimum, meet the limitations as set forth below:

Results shall be reported to the Department according to the procedures in Part III of the permit.

These limits have been established to ensure the beneficial use for wildlife or livestock watering and in accordance with water quality standards.

TABLE 1: FINAL NUMERIC EFFLUENT LIMITATIONS

Parameter	Concentration (mg/*l*) [1]	
	Annual Average	Daily Maximum
Total Dissolved Solids(TDS)	5,000	Not Applicable
Oil and Grease, total recoverable[2]	10	Not Applicable

(1) See the definitions in Part I.A. of the permit.
(2) Gravimetric extraction (EPA Method 413.1)

2. Other Conditions

a. Impoundments constructed for the purposes of holding CBM produced water shall not cause excessive salinity of underlying soils. If the soil salinity, as measured by electrical conductivity (EC) in a paste extract, exceeds 20 millimhos/cm in the impoundment sediments, a reclamation plan must be submitted to the Department and landowner to ensure the land is returned to its previous utility and stability. A sample must be collected whenever the annual average TDS exceed 5,000 mg/L.

b. Impoundments constructed for the purposes of holding and storing produced water from CBM development must not be located in ephemeral, intermittent, or perennial drainages as defined in Section I.A of the permit. For purposes of this permit, ephemeral, intermittent, or perennial streams are those identified as such on a 7.5 minute U.S. Geological Survey topographic map.

c. There shall be no discharge of water from the impoundment except whenever rainfall events, either chronic or catastrophic, cause an overflow of water from the impoundment designed, constructed, and operated to contain a normal volume of produced water plus runoff from a 25-year, 24 hour precipitation event.

d. An impoundment constructed for the purposes of this permit shall be designed, constructed, and operated such that an amount of "freeboard" or available volume in the impoundment will be maintained at all times to retain the volume of water resulting from a 25-year, 24 hour precipitation event. Freeboard must be based on the surface area of the impoundment and those all areas that contribute runoff to the impoundment.

e. A map showing the 25-year, 24-hour rainfall for Montana is given in Attachment A to the permit. The 25-year, 24-hour event for the location of the CBM produced water impoundment structure covered by this permit must be determined from this map.

f. For purposes of determining compliance with the effluent limitations of this permit, the amount of precipitation that occurred must be based on the data from the nearest weather station with a precipitation gauge. The permittee has the option of maintaining a functional and reliable precipitation gauge at the facility.

g. The permittee shall monitor the quality of the water in the impoundment for the parameters and at the frequency listed in Table 3. If the quality of the water, based on the annual average, exceeds the upper bound criteria listed in Table 4, the permittee shall cease discharging to the impoundment and submit a plan to dispose of the water in the impoundment.

3. Self-monitoring Requirements

As a minimum, upon the effective date of this permit, the following constituents shall be monitored at the frequency and with the type of measurement indicated; samples or measurements shall be representative of the volume and nature of the monitored discharge. If no discharge occurs during the entire monitoring period, it shall be stated on the Discharge Monitoring Report Form (EPA No. 3320-1) that no discharge or overflow occurred.

A. Effluent Monitoring

The permittee shall sample the quality of the effluent from each source discharging to the storage impoundment for the parameters and at the frequency listed in Table 2. The results of these analyses shall be reported to the Department according to the procedures in Part III of the permit.

TABLE 2: EFFLUENT MONITORING REQUIREMENTS

Parameter	**Frequency**	**Type** (1)
Effluent Flow Rate, gpm(2)	Semiannual	Continuous
Total Dissolved Solids (TDS), mg/L	Semiannual	Grab
Oil and Grease, mg/L (3)	Semiannual	Grab

(1) See the definitions in Part I.A. of the permit.
(2) If no discharge occurs during the reporting period, **"no discharge"** must be recorded on the DMR form.
(3) Gravimetric extraction (EPA Method 413.1)

B. INSTREAM (IMPOUNDMENT) MONITORING

The permittee shall sample the quality of the water in the storage impoundment for the parameters and at the frequency listed in Table 3. The results of these analyses must be reported to the Department according to the procedures in Part III of the permit.

TABLE 3: IMPOUNDMENT MONITORING REQUIREMENTS

Parameter	**Frequency**	**Type** (1)
Impoundment Freeboard, feet (2)	Semiannual	Instantaneous
Total Dissolved Solids (TDS), mg/L	Semiannual	Grab
Sodium, mg/L	Semiannual	Grab
Calcium, mg/L	Semiannual	Grab
Magnesium, mg/L	Semiannual	Grab
Sodium Adsorption Ration (SAR)	Semiannual	Calculated
Specific Electrical Conductivity (EC), uS/cm	Semiannual	Grab
Oil and Grease, mg/L(3)	Semiannual	Grab
Iron, mg/L	Semiannual	Grab
Barium, mg/L	Semiannual	Grab
Chloride, mg/L	Semiannual	Grab
Sulfate, mg/L	Semiannual	Grab

(1) See the definitions in Part I.A. of the permit.
(2) If no discharge occurs during the reporting period, **"no discharge"** must be recorded on the DMR form.
(3) Gravimetric extraction (EPA Method 413.1)

II. MONITORING, RECORDING AND REPORTING REQUIREMENTS

A. Representative Sampling.

Samples taken in compliance with the monitoring requirements established under Part I shall be collected from the wastewater prior to discharging from the permittee's property. Samples and measurements shall be representative of the volume and nature of the monitored discharge.

B. Monitoring Procedures.

Monitoring must be conducted according to test procedures approved under Part 136, Title 40 of the Code of Federal Regulations, unless other test procedures have been specified in this permit. All flow-measuring and flow-recording devices used in obtaining data submitted in self-monitoring reports must indicate values within 10 percent of the actual flow being measured.

C. Penalties for Tampering.

The Montana Water Quality Act provides that any person who falsifies, tampers with, or knowingly renders inaccurate, any monitoring device or method required to be maintained under this permit shall, upon conviction, be punished by a fine of not more than $25,000, or by imprisonment for not more than six months, or both.

D. Reporting of Monitoring Results.

Results of the self-monitoring shall be reported semiannually on the Discharge Monitoring Report form (EPA 3320-1) to the Department (see address below), postmarked no later than the 28th day of the month following the reporting period; the due date of the first semiannual report is July 28th and the second semiannual report is January 28th.

Montana Department of Environmental Quality
Water Protection Bureau
P.O. Box 200901
Helena, Montana 59620-0901
Phone: (406) 444-3080

All reports, notifications and inquires regarding the conditions of this permit shall be submitted to the Department at the above address.

E. Additional Monitoring by the Permittee

If the permittee monitors any pollutant more frequently than required by this permit, using approved analytical methods as specified in this permit, the results of this monitoring shall be included in the calculation and reporting of the data submitted in the Discharge Monitoring Report. Such increased frequency shall also be indicated.

F. Records Contents. Records of monitoring information shall include:

1. The date, exact place, and time of sampling or measurements;
2. The initials or name(s) of the individual(s) who performed the sampling or measurements;
3. The date(s) analyses were performed;
4. The time analyses was initiated;
5. The initials or name(s) of individual(s) who performed the analyses;
6. References and written procedures, when available, for the analytical techniques or methods used; and,

7. The results of such analyses, including the bench sheets, instrument readouts, computer disks or tapes, etc., used to determine these results.

G. Retention of Records.

The permittee shall retain records of all monitoring information, including all calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation, copies of all reports required by this permit, and records of all data used to complete the application for this permit, for a period of at least three years from the date of sample, measurement, report or application. This period may be extended by request of the Department at any time.

H. Twenty-four Hour Notice of Noncompliance Reporting.

1. The permittee shall report any noncompliance, which may endanger health or the environment as soon as possible, but no later than twenty-four (24) hours from the time the permittee first became aware of the circumstances. The report shall be made to the Water Quality Division at (406) 444-3080.

2. The following occurrences of noncompliance shall be reported by telephone to the Water Quality Division at (406) 444-3080 by the first workday (8:00 A.M.- 4:30 P.M. Mountain Time) following the day the permittee became aware of the circumstances any unanticipated bypass which exceeds any effluent limitation in the permit (See Part III.G., Bypass of Treatment Facilities.);

3. A written submission shall also be provided within five days of the time that the permittee becomes aware of the circumstances. The written submission shall contain:

   a. A description of the noncompliance and its cause;

   b. The period of noncompliance, including exact dates and times;

   c. The estimated time noncompliance is expected to continue if it has not been corrected; and,

   d. Steps taken or planned to reduce, eliminate, and prevent reoccurrence of the noncompliance.

4. The Department may waive the written report on a case-by-case basis if the oral report has been received within 24 hours by the Water Quality Division, by phone, (406) 444-3080.

5. Reports shall be submitted to the addresses in Part II.D., Reporting of Monitoring Results.

I. Other Noncompliance Reporting.

Instances of noncompliance not required to be reported within 24 hours shall be reported at the time that monitoring reports for Part II.D. are submitted. The reports shall contain the information listed in Part II.H.3.

J. Inspection and Entry

The permittee shall allow the head of the Department or the Regional Administrator, or authorized representative thereof, upon the presentation of credentials and other documents as may be required by law, to:

1. Enter upon the permittee's premises where a regulated facility or activity is located or conducted, or where records must be kept under the conditions of this permit;

2. Have access to and copy, at reasonable times, any records that must be kept under the conditions of this permit;

3. Inspect at reasonable times any facilities, equipment (including monitoring and control equipment), practices, or operations regulated or required under this permit; and,

4. Sample or monitor at reasonable times, for the purpose of assuring permit compliance, any substances or parameters at any location.

III. COMPLIANCE RESPONSIBILITIES

A. Duty to Comply

The permittee must comply with all conditions of this permit. Any permit noncompliance constitutes a violation of the Act and is grounds for enforcement action; for permit termination, revocation and reissuance, or modification; or for denial of a permit renewal application. The permittee shall give the Department advance notice of any planned changes at the permitted facility or of an activity, which may result in permit noncompliance.

B. Penalties for Violations of Permit Conditions. The Montana Water Quality Act provides that any person who violates a permit condition of the Act is subject to a civil penalty not to exceed $25,000 per day or one year in prison, or both, for the first conviction, and $50,000 per day of violation or by imprisonment for not more than two years, or both, for subsequent convictions. Except as provided in permit conditions on Part III.G., Bypass of Treatment Facilities, nothing in this permit shall be construed to relieve the permittee of the civil or criminal penalties for noncompliance.

C. Need to Halt or Reduce Activity not a Defense

It shall not be a defense for a permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit.

D. Duty to Mitigate

The permittee shall take all reasonable steps to minimize or prevent any discharge in violation of this permit, which has a reasonable likelihood of adversely affecting human health or the environment.

E. Proper Operation and Maintenance

The permittee shall at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) which are installed or used by the permittee to achieve compliance with the conditions of this permit. Proper operation and maintenance also includes adequate laboratory controls and appropriate quality assurance procedures.

F. Removed Substances

Collected screenings, grit, solids, sludges, or other pollutants removed in the course of treatment shall be disposed of in such a manner so as to prevent any pollutant from entering any waters of the state or creating a health hazard.

G. Bypass of Treatment Facilities:

1. Bypass not exceeding limitations. The permittee may allow any bypass to occur which does not cause effluent limitations to be exceeded, but only if it also is for essential maintenance to assure efficient operation. These bypasses are not subject to the provisions of paragraphs 2. and 3. of this section.

2. Notice:

a. Anticipated bypass. If the permittee knows in advance of the need for a bypass, it shall submit prior notice, if possible at least 10 days before the date of the bypass.

b. Unanticipated bypass. The permittee shall submit notice of an unanticipated bypass as required under Part II.I., Twenty-four Hour Reporting.

3. Prohibition of bypass.

a. Bypass is prohibited and the Department may take enforcement action against a permittee for a bypass, unless:

(1) The bypass was unavoidable to prevent loss of life, personal injury, or severe property damage;

(2) There were no feasible alternatives to the bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes, or maintenance during normal periods of equipment downtime. This condition is not satisfied if adequate back-up equipment should have been installed in the exercise of reasonable engineering judgement to prevent a bypass which occurred during normal periods of equipment downtime or preventive maintenance; and,

(3) The permittee submitted notices as required under paragraph 2. of this section.

b. The Department may approve an anticipated bypass, after considering its adverse effects, if the Department determines that it will meet the three conditions listed above in paragraph 3.a. of this section.

IV. GENERAL REQUIREMENTS

A. Planned Changes

The permittee shall give notice to the Department as soon as possible of any planned physical alterations or additions to the permitted facility. Notice is required only when the alteration or addition could significantly change the nature or increase the quantity of pollutant discharged. This notification applies to pollutants, which are not subject to effluent limitations in the permit.

B. Anticipated Noncompliance

The permittee shall give advance notice to the Department of any planned changes in the permitted facility or activity, which may result in noncompliance with permit requirements.

C. Permit Actions

This permit may be modified, revoked and reissued, or terminated for cause. The filing of a request by the permittee for a permit modification, revocation and reissuance, or termination, or a notification of planned changes or anticipated noncompliance, does not stay any permit condition.

D. Duty to Reapply

If the permittee wishes to continue an activity regulated by this permit after the expiration date of this permit, the permittee must apply for and obtain a new permit. The application form and fee should be submitted at least 180 days before the expiration date of this permit.

E. Duty to Provide Information

The permittee shall furnish to the Department, within a reasonable time, any information which the Department may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this permit, or to determine compliance with this permit. The permittee shall also furnish to the Department, upon request, copies of records required to be kept by this permit.

F. Other Information

When the permittee becomes aware that it failed to submit any relevant facts in a permit application, or submitted incorrect information in a permit application or any report to the Department, it shall promptly submit such facts or information.

G. Signatory Requirements

All applications, reports or information submitted to the Department shall be signed and certified.

1. All permit applications shall be signed as follows:

   a. For a corporation: by a responsible corporate officer;

   b. For a partnership or sole proprietorship: by a general partner or the proprietor, respectively;

   c. For a municipality, State, Federal, or other public agency: by either a principal executive officer or ranking elected official.

2. All reports required by the permit and other information requested by the Department shall be signed by a person described above or by a duly authorized representative of that person. A person is a duly authorized representative only if:

   a. The authorization is made in writing by a person described above and submitted to the Department, and,

   b. The authorization specified either an individual or a position having responsibility for the overall operation of the regulated facility or activity, such as the position of plant manager, operator of a well or a well field, superintendent, position of equivalent responsibility, or an individual or position having overall responsibility for environmental matters for the company. (A duly authorized representative may thus be either a named individual or any individual occupying a named position.)

3. Changes to authorization. If an authorization under paragraph IV.G.2. is no longer accurate because a different individual or position has responsibility for the overall operation of the facility, a new authorization satisfying the requirements of paragraph IV.G.2. must be submitted to the Department prior to or together with any reports, information, or applications to be signed by an authorized representative.

4. Certification. Any person signing a document under this section shall make the following certification:

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

H. Penalties for Falsification of Reports

The Montana Water Quality Act provides that any person who knowingly makes any false statement, representation, or certification in any record or other document submitted or required to be maintained under this permit, including monitoring reports or reports of compliance or noncompliance shall, upon conviction be punished by a fine of not more than $25,000 per violation, or by imprisonment for not more than six months per violation, or both.

I. Availability of Reports

Except for data determined to be confidential under 40 CFR Part 2, all reports prepared in accordance with the terms of this permit shall be available for public inspection at the offices of the Department. As required by the Clean Water Act, permit applications, permits and effluent data shall not be considered confidential.

J. Oil and Hazardous Substance Liability

Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties to which the permittee is or may be subject under Section 311 of the Clean Water Act.

K. Property Rights or Water Rights

The issuance of this permit does not convey any property or water rights of any sort, or any exclusive privileges, nor does it authorize any injury to private property or any invasion of personal rights, nor any infringement of federal, state or local laws or regulations.

The permittee and adjacent landowner using produced water must comply with applicable water rights statutes under MCA, 85-2-306, before any beneficial water use commences. Information and assistance on the water rights statutes can be obtained from the Department of Natural Resources and Conservation, Water Resources Division at (406) 444-6601.

L. Severability

The provisions of this permit are severable, and if any provision of this permit, or the application of any provision of this permit to any circumstance, is held invalid, the application of such provision to other circumstances, and the remainder of this permit, shall not be affected thereby.

M. Transfers

This permit can not be transferred to a new permittee. A new owner or operator of a facility must apply according to the application procedures in Part IV.D of this permit 30 days prior to taking responsibility for the facility.

N. Fees

The permittee is required to submit payment of an annual fee as set forth in ARM 17.30.201. If the permittee fails to pay the annual fee within 90 days after the due date for the payment, the Department may:

1. Impose an additional assessment consisting of 15% of the fee plus interest on the required fee computed at the rate established under 15-31-510(3), MCA, or

2. Suspend the processing of the application for a permit or authorization or, if the nonpayment involves an annual permit fee, suspend the permit, certificate or authorization for which the fee is required. The Department may lift suspension at any time up to one year after the suspension occurs if the holder has paid all outstanding fees, including all penalties, assessments and interest imposed under this sub-section. Suspensions are limited to one year, after which the permit will be terminated.

O. Reopener Provision

This permit may be reopened and modified (following proper administrative procedures) to include the appropriate effluent limitations (and compliance schedule, if necessary), or other appropriate requirements if one or more of the following events occurs:

1. Water Quality Standards:

   The water quality standards of the receiving water(s) to which the permittee discharges are modified in such a manner as to require different effluent limits than contained in this permit.

2. Wasteload Allocation:

   A wasteload allocation is developed and approved by the Department and/or EPA for incorporation in this permit.

3. Water Quality Management Plan:

   A revision to the current water quality management plan is approved and adopted which calls for different effluent limitations than contained in this permit.

V. SPECIAL REQUIREMENTS

A. Authorization Letter. A written authorization letter from the Department is required before an applicant is authorized to discharge under the Coal Bed Methane Produced Water General Discharge Permit.

B. The following prerequisites must be met before an applicant can be authorized to discharge under the CBMPW-GDP.

1. The applicant shall submit a current beneficial use letter from the surface landowner(s) stating the discharged produced water will be used for wildlife or livestock watering. Landowners that receive CBM produced water must request the water and document its beneficial use. Irrigation with coal bed methane produced water to agriculture fields or rangeland is not considered a beneficial use of coal bed methane produced water.

2. The applicant shall submit a topographic map showing the exact location of the impoundment and identifying all sources and volumes of water and wastewater that contribute to the impoundment. The map must identify all surface waters and groundwater wells within a 1-mile radius of the impoundment.

3. The applicant must submit a line drawing of the proposed CBM produced water impoundment showing the location of the CBM produced water wells, collection system, inlet and outfall structure, and sample locations.

4. The applicant shall submit a chemical analysis of the proposed discharge as specified in Table 4 below. The application may be denied if the analysis indicates the water is not fit for livestock or wildlife consumption as per the maximum recommended concentrations listed below

TABLE 4: APPLICATION MONITORING REQUIREMENTS

Parameter	Type [1]	Recommended Maximum Levels	Required Detection Level
Effluent Flow Rate [2], gpm	Instantaneous		NA
Total Dissolved Solids (TDS), mg/L	Grab	5,000	5 mg/L
Total Suspended Solids (TSS), mg/L	Grab	None	10 mg/L
Specific Conductance, µmhos/cm	Grab	3,000[2]	5 µmhos/cm
pH, standard units	Grab	6 –9	0.1 standard units
Oil and Grease, mg/L[6]	Grab	10	1 mg/L
Total Alkalinity, mg/L	Grab	2,000[2]	1 mg/L as $CaCO_3$
Bicarbonate, mg/L	Grab	1,000[2]	1 mg/L
Calcium, mg/L	Grab	1,000[2]	1 mg/L
Chloride, mg/L	Grab	1,000[2]	5 mg/L
Nitrate (NO_3+NO_2), mg/L	Grab	100[3]	0.5 mg/L
Potassium, mg/L	Grab	20[2]	1 mg/L
Radium 226 228, and 222, picocuries/L	Grab	1 pCi/L[2]	0.2 pCi/L
Sodium, mg/L	Grab	800[2]	1 mg/L
Sulfate, mg/L	Grab	2500[4][5]	10 mg/L
ARSENIC, TOTAL RECOVERABLE, MG/L	Grab	0.2-0.5[2]	0.003 mg/L
Beryllium, total recoverable, mg/L	Grab	1[2]	0.001 mg/L
Lead, total recoverable, mg/L	Grab	0.1[2]	0.003 mg/L
Magnesium, total recoverable, mg/L	Grab	250[2]	1 mg/L
Selenium, total recoverable, mg/L	Grab	0.05[2]	0.01 mg/L
Sodium Adsorption Ratio (SAR)	Calculated	None	NA

(1) See the definitions in Part I.A. of the permit.
(2) Puls, 1988
(3) Meyer, 1990
(4) This limit may vary based on other parameters present such as elemental sulfur and the amount of sulfate ingested with feed.
(5) Veenhuizen, 1992
(6) Gravimetric extraction (EPA Method 413.1)