HB

531

(File 3 of 3)

HOUSE COMMITTEE REPORT

(7)

Date Referred to Committee: March 4, 2004 **FURTHER REFERRALS: Resources Finance**

Date of Committee Action: April 1 2004

The HOUSE SPECIAL COMMITTEE ON OIL AND GAS considered: **HB 531**

HOUSE BILL NO. 531 **CONVENTIONAL & NONCONVENTIONAL GAS LEASES**

"An Act relating to natural gas exploration and development and to nonconventional gas, and amending the section under which shallow natural gas leases may be issued; and providing for an effective date."

Recommends it be replaced with [ ] HCS *or* [✓] CS for HB 531 (O&G)

For Senate Bills with new title: [ ] Technical Title [ ] New Title: HCR_____ [✓] Same Title [ ] New Title

[ ] attach amendments
[ ] add new referral to _____Committee
[ ] Letter of Intent_____Committee

List of Abbrev for Depts.:
ADM
CED
COR
CRT
EED
DEC
DFG
GOV
HSS
LEG
LAW
LWF
MVA
DNR
DPS
REV
DOT
UA

NEW FISCAL NOTES *Assigned by Chief Clerk's Office				
List by Dept(s):	*FN#	Fiscal	Indet.	Zero
DNR			✓	

PREVIOUS FISCAL NOTES				
List by Dept(s):	FN#	Fiscal	Indet.	Zero

Signing with recommendations	Printed Last Name	DP	DNP	NR	AM
	Holm				✓
Bryn Kerttula	Kerttula				✓
Reo McGuire	McGuire				✓
Vic Rokeberg	Rokeberg				✓
Harry Crawford	CRAWFORD				✓
Chris Heinze	HEINZE				✓
Chair: Kurt Kohring	Kohring				X
Chair:					

Alaska Oil and Gas Association

AOGA

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April 22, 2004

Via Facsimile: (907)465-4822

The Honorable Beverly Masek
Alaska State House of Representatives
State Capitol, Room 403
Juneau, AK 99801-1182

AOGA Concerns on Shallow Gas Legislation
(CSHB 531 and CSHB 395)

Dear Representative Masek:

The Alaska Oil & Gas Association (AOGA) shares your interest in Alaska's shallow gas leasing/coalbed methane program and your concern for its future. We have been following the proposed legislation pertaining to the shallow gas program and the public meetings undertaken by the Department of Natural Resources (DNR). We note that the Department has just released the public draft review of the Coalbed Methane Development Standards.

AOGA supports repealing the present, separate shallow gas leasing/coalbed methane program and incorporating it into Alaska's competitive oil and gas system with its required Best Interest Finding as proposed in CSHB 531. Simply stated, we believe many of the issues raised in this proposed legislation could, and should, be addressed by a Best Interest Finding. AOGA also recommends that CSHB 531 and CSHB 395 be revised to incorporate the same surface protection rights, including payment of damages and bonding requirements for nonconventional gas and coalbed methane, as the state demands for its conventional oil and gas leasing program. Alaska's current bonding requirements are based on legal precedent, are legally defensible, protect the state's dominant subsurface interest in the oil and gas that belongs to all Alaskans while assuring the surface owner of the right to negotiate a fair agreement for surface damages, should there be any. Finally, we have made recommendations on other provisions of CSHB 531 and CSHB 395.

AOGA is a private, nonprofit trade association whose 19 member companies represent the majority of oil and gas operations in the state. Our interest, as an association, is the same as the State of Alaska's: oil and gas leasing programs that have clear standards that are legally defensible and environmentally and technically sound, and that respect the rights of the public, the lessees and individual property owners.

We appreciate the willingness of policy makers to understand the complex legal and political challenges inherent in Alaska's "split estate" heritage. While Alaska's ownership of the subsurface mineral estate on state-selected oil and gas lands is the basis for the state's wealth and its Permanent Fund, this same ownership sometimes causes concerns with private surface owners and managers. Both CSHB 531 and CSHB 395 address unconventional gas leasing in those instances where the state owns the subsurface and a private individual owns the surface.

The historical record of split estate transactions, both in other states and in Alaska, shows that most transactions between companies and individual landowners involve mutual respect, accommodation and agreement. For those transactions for which no agreement can be reached, there is a history of court decisions, including those in Alaska, which lay the foundation for resolving any such disputes today.

In 1996 the shallow gas leasing/coalbed methane program was viewed as a positive opportunity for the people of the state. In a bi-partisan vote the Legislature established the shallow gas leasing program with a vote of 57 yeas and 3 nays. Governor Knowles signed it into law.

The support for the program was based on its potential to bring new sources of clean, efficient energy to the state as well as providing jobs and taxes for local economies, and that in light of the tightening gas market in the Cook Inlet area, this new source could provide much needed gas reserves. It was believed the state had regulations in place to assure it could be done in an environmentally safe manner while protecting the rights of surface owners.

AOGA believes that shallow gas leasing and coalbed methane development is still a positive opportunity. The state does have regulations in place to assure environmentally safe development of coalbed methane and the state has the legal means of protecting both the surface and subsurface owners.

However, it has become clear that there is a lack of understanding of Alaska's split estate heritage as well as a variety of homeowner concerns that must be addressed if the future of the program is to be assured.

Most, if not all, of the present concerns being expressed by homeowners would have been aired, discussed and addressed had the program included a Best Interest Finding in the beginning.

AOGA agrees with concerned legislators and the administration that it will be in the best interest of all parties for the state to have the same leasing, public notice requirements, environmental protections, Best Interest Finding requirements, and bonding and surface use protections for nonconventional gas as it does for conventional oil and gas.

Alaska's conventional oil and gas leasing program is comprehensive, timely and legally defensible. It meets the public criteria for fair notice, local involvement, environmental protection, bonding and damage requirements. A Best Interest Finding:

- provides extensive public notice;
- provides for public hearings;

- provides written responses to all concerns raised;
- provides the opportunity for experts from all agencies, the Departments of Environmental Conservation, Fish & Game and Natural Resources, as well as local governments, private organizations and individuals to provide input;
- provides a method for responding to special circumstances with special mitigation measures; and
- provides a legally defensible, comprehensive finding on which all parties can rely.

Recommendations for CSHB 531

1. AOGA supports repealing the present, separate shallow gas leasing/coalbed methane program and incorporating it into Alaska's competitive oil and gas system with its required Best Interest Finding as proposed in CSHB 531.

We believe that such an action will restore the faith of the public in these programs.

2. We support that provision of CSHB 531 that clearly identifies the role of the Alaska Oil & Gas Conservation Commission (AOGCC) in protecting water rights for nonconventional gas.(AS 31.05.030(j)).

This is the same role the Commission plays in conventional oil and gas leasing and therefore meets our recommendation that nonconventional oil and gas must be subject to the same environmental criteria as conventional oil and gas.

3. AOGA recommends that CSHB 531 be revised to incorporate the same surface protection rights, including payment of damages and bonding requirements for nonconventional gas and coalbed methane, as the state demands for its conventional oil and gas leasing program.

Alaska has strict surface damage requirements to protect the rights of surface owners.

Since Statehood there have been many cases of split estate negotiations in the Matanuska and the Kenai Boroughs. Only two cases have gone to DNR for resolution.

A straightforward approach would be to include a provision making it clear that existing state law governing damages and bonds also applies to gas only leases. Recommended language for CSHB 531(RES), Version V, is suggested below, along with language that clarifies the process. This language replaces the language included in Section 41, AS 38.05.180(ff)(3)(A) and (B):

> (3) the provisions of AS 38.05.130 apply to gas only leases and shall be implemented as follows:
>
> **(A) Damages and posting of bond.** A developer may not exercise a right of entry until the developer makes provision to pay the surface owner full payment for all damages sustained by the surface owner by reason of entering upon the land. If the surface owner, for any cause, refuses or

neglects to settle the damages, the developer may enter upon the land after posting a surety bond determined by the Department of Natural Resources using a procedure similar to the procedure used to administer AS 38.05.130, including notice and an opportunity to be heard. The bond must be sufficient as to form, amount, and security to secure the surface owner payment for damages. The surface owner may institute legal proceedings in a court where the land is located as may be necessary to determine the damages that the surface owner may suffer.

(B) Before the amount of the surety bond to be posted is determined by the director, the director, after notice and an opportunity to be heard, shall review the lessee's proposed Plan of Operations to determine if use of the surface is reasonably necessary to remove the minerals.

(C) If the lessee holds a statewide bond, the amount determined by the director may be imposed against such bond and no separate additional bond will be required.

4. AOGA is strongly advising that there be no added requirement, special to shallow gas leasing or coalbed methane, concerning bonding/damages. Both CSHB 531 and CSHB 395 propose that, if the land owner and the lessee do not come to an agreement on use of the land, the director, in determining the amount of surety bond, shall make a finding that the lessee "has no other reasonable means of entry than access and entry on the land of the owner". Further, that in addition to the coverage of actual damages a surface owner be paid "reasonable compensation ...for any loss by the owner of the owner's use and enjoyment of the property." (Proposed language in CSHB 531AS 38.05.180 (ff)(3); CSHB 395AS 38.05.177(k)(3)).

As to the requirement that there be a finding that the lessee has no other reasonable means of entry, the legislature's attorney, Jack Chenoweth, pointed out his concern in a March 30 memo that, insofar as the new bonding provisions in CSHB 531 and CSHB 395 limit access to the subsurface estate, they would therefore "call into question compliance with the statutory reservation" of the state's subsurface reservation of mineral rights.

The new bonding and damages proposals in CSHB 531 and in CSHB 395 raise serious legal and practical issues for all of Alaska's oil and gas leasing programs by making the dominant mineral estate into the subservient estate. Case law on surface estate is very clear that the mineral estate is the dominant estate, carrying with it the right to make such use of the surface as is reasonably necessary to remove the minerals.

Alaska's current bonding requirements are based on legal precedent, are legally defensible, protect the state's dominant subsurface interest in the oil and gas that belongs to all Alaskans while assuring the surface owner of the right to negotiate a fair agreement for surface damages, should there be any.

Alaska is not unique in having different owners of the surface and subsurface or mineral estate. Alaska is unique in that the state's mineral estate was deemed so important to the state's future that the Alaska Statehood Act imposed restrictions on the state's ability to alienate its mineral estate.

Under 6(i) of the Statehood Act, the state must reserve to itself the mineral rights of all lands granted to it and must continue to do so even when the state sells, grants, deeds or patents these lands to third parties. If the state does not do so, the state lands "shall be forfeited to the United States...".

This restriction has implications for what rights the state can and cannot grant to surface owners when the state owns the subsurface. Quite simply, the state cannot transfer to a private surface owner a right that is inherent in the mineral state.

The combination of long-standing legal precedent in the resolutions of rights between surface and subsurface owners along with the restrictions in 6(i) of the Statehood Act means that care must be taken in responding to the challenge of protecting rights.

With the changes proposed above, nonconventional gas (shallow gas and coalbed methane) would be subject to the same process, notice, environmental and surface protection requirements as the conventional oil and gas leasing program in Alaska.

Recommendations on CSHB 395

1. AOGA supports the direction to the AOGCC on the protection of water in the proposed amendment of AS 31.05.030(j). AOGCC's role should be the same for conventional and unconventional oil and gas leasing.

2. We question the purpose and workability of the proposed AOGCC public forum process for shallow gas proposed in the section on AS 31.05.098. If the shallow gas program is incorporated into a Best Interest Finding, which we believe is the most comprehensive answer to concerns being expressed, this section will not be necessary.

If, this section is retained in lieu of a Best Interest Finding, the following should be considered:

- Tighten up the language to reflect that only matters within AOGCC's jurisdiction will be addressed in the hearings. (See especially lines 28-30 on page 3.)
- Determine who can complain and in what time period. As written, anyone, anywhere, at any time can file a complaint and expect a public process 60 days later. Due process to the lessee is lost.
- This section also seems to be making the AOGCC the gatekeeper for all complaints to the Department of Environmental Conservation, the Department of Public Safety, the Department of Natural Resources. Is the intent to add a new layer of hearings on these departments based on complaints?

3. It is noted that in the proposed amendment for private, non-state lands, the state's "damages and posting of bond" is almost identical to that provided for conventional oil and gas leasing (Chapter 90 Mineral Interests: Sec. 34.90.020) and yet for nonconventional leasing, additional requirements are proposed. (AS 38.05.177 (k)(3). (See also Section 12.)

The first issue is whether the legislature wants to impose these requirements on private lands.

The second issue has to do with imposing additional bonding and damage requirements for nonconventional leases. We have expressed our concern with this approach in our comments on CSHB 531 (See comments 3 and 4.) AOGA believes that conventional and nonconventional oil and gas leasing programs should be bound by the same historic case law pertaining to damages and surface use. We believe these laws provide the protection that Alaskans expect. We recommend that the same language we've proposed in Section 41 of HB 531 be substituted in this legislation for the same reasons.

We emphasize that the proposed additional requirements for damages have serious implications both for the legal precedents that have governed split estate matters for years and for the implications to Alaska's conventional oil and gas leasing program. They are the single largest impediment in both CSHB 395 and CSHB 531.

4. Additional water testing, this time a requirement that each private water well within a quarter mile circle be tested by the lessee, is included in a new subsection, AS 38.05.177(f). It may be desirable to baseline test, but the size of area required to be tested is going to present some problems, aside from the obvious cost. It is our understanding that many Alaskans do not register their wells nor are all wells that are not registered logged. Further, some owners may not want them tested. There should be consideration given as to how a lessee could comply with this requirement.

5. The sections pertaining to appropriate setbacks and reasonable and appropriate noise mitigation would be more appropriately addressed in a Best Interest Finding, as would the lease abandonment requirement. All of these issues are commonly addressed in Best Interest Findings.

This concludes AOGA's comments. We hope they are helpful. We would be glad to work with you to ensure that the unconventional gas leasing program offers the same level of protection and assurance to the lessees, the public and the State as does Alaska's conventional oil and gas program.

Sincerely,

JUDITH BRADY
Executive Director

FISCAL NOTE

updated

STATE OF ALASKA
2004 LEGISLATIVE SESSION

Fiscal Note Number:
Bill Version: HB531CS(FIN)-DNR-O&G-0
() Publish Date:

Revision Date/Time (Note if correction): 4/29/2004
Dept. Affected: Natural Resources

Title: Conventional & Non-conventional Gas Leasing
RDU: Resource Development
Component: Oil and Gas Development

Sponsor: House Resources
Requester: House Rules
Component No.: 439

Expenditures/Revenues (Thousands of Dollars)

Note: Amounts do not include inflation unless otherwise noted below.

OPERATING EXPENDITURES	FY 2005	FY 2006	FY 2007	FY 2008	FY 2009	FY 2010
Personal Services	80.0					
Travel	4.0					
Contractual	165.5					
Supplies	3.1					
Equipment						
Land & Structures						
Grants & Claims						
Miscellaneous						
TOTAL OPERATING	252.6	0.0	0.0	0.0	0.0	0.0
CAPITAL EXPENDITURES						
CHANGE IN REVENUES ( )	**Indeterminate Amount **					

FUND SOURCE (Thousands of Dollars)

1002 Federal Receipts						
1003 GF Match						
1004 GF	252.6					
1005 GF/Program Receipts						
1037 GF/Mental Health						
Other (Specify Type--Do not abbreviate)						
TOTAL	252.6	0.0	0.0	0.0	0.0	0.0

Estimate of any current year (FY2004) cost: 0.0
Check this box (X) if funding for this bill is included in the Governor's FY 2005 budget proposal:

POSITIONS

Full-time						
Part-time						
Temporary	1					

ANALYSIS: *(Attach a separate page if necessary)*

This bill would eliminate the current over-the-counter shallow natural gas program. HB 531 would create a new gas only option under the competitive leasing and exploration licensing programs.

**Indeterminate positive revenue: Moving from an over-the-counter program to a competitive program will result in increased revenue to the state. The commissioner will be able to set minimum rentals and bonus bid amounts based on technical analysis of the potential resources and economics of the lease or license area. While a best interest finding process will cost more up front, that cost will be more than offset by the gains in going to a competitive process. Also, having a best interest finding process at the leasing and licensing stage will facilitate a more efficient progression to exploration and development and provide the state with royalties and other revenues from development sooner.

Prepared by: Mark D. Myers
Phone 269-8800
Division: Oil and Gas
Date/Time 4/29/04

Approved by: Thomas Irwin, Commissioner
Date 4/29/04
Agency: Natural Resources

(Revised 9/2003 OMB)

FISCAL NOTE

STATE OF ALASKA
2004 LEGISLATIVE SESSION

BILL NO. HB531CS(FIN)-DNR-O&G-0

ANALYSIS CONTINUATION

Section 60 would allow all pending shallow natural gas applicants a one-time opportunity to convert to a noncompetitive exploration license application upon payment of an application fee of $1 per acre and with a 3-year work commitment equal to $3 per acre. This section would also require DNR to conduct a best interest finding process prior to issuing the license.

In order to convert pending shallow natural gas applications to exploration licenses, DNR would need to simultaneously work on at least three additional best interest findings. In order to do so, it will be necessary to add one additional temporary best interest finding writer and contract out major portions of at least three findings. DNR anticipates after completing these findings that additional funding will not be needed.

DNR anticipates that there would be three separate best interest findings to cover conversion of the shallow natural gas applications to exploration licenses.

Expenditures:
Natural Resource Sp. III ($80,000 Personal Services, $4,300 Contractual, $3,000 Supplies).
Travel for public hearings: $4,000.
Outside Contracts for portions of three best interest findings: $150,000
Expenses Associated with public notice and printing best interest findings:
Printing findings: $1,400
Postage $1,600
Envelopes: $69
Public Notice (legal ads and display ads): $8,231
(The Anchorage Daily News has general circulation in all areas of the state. The cost for a legal notice in the Anchorage Daily News is $404 per day (weekday). 9 x $404 = $3,636. Publication cost in a local paper is estimated at $225. 9 x $225 = $2,025. Display ad in the Anchorage Daily News = $614.70 x 3 = $1,844.10. Display ad in a local paper = $242.00 x 3 = $726)

FISCAL NOTE

STATE OF ALASKA
2004 LEGISLATIVE SESSION

Fiscal Note Number:
Bill Version: HB531-DNR-O&G-03-12-04
() Publish Date:

Revision Date/Time (Note if correction):
Dept. Affected: Natural Resources
Title: Conventional & Non-conventional Gas Leasing
RDU: Resource Development
Component: Oil and Gas Development

Sponsor: House Resources
Requester: House Oil and Gas
Component No.: 439

Expenditures/Revenues (Thousands of Dollars)

Note: Amounts do not include inflation unless otherwise noted below.

OPERATING EXPENDITURES	FY 2005	FY 2006	FY 2007	FY 2008	FY 2009	FY 201[illegible]
Personal Services						
Travel						
Contractual						
Supplies						
Equipment						
Land & Structures						
Grants & Claims						
Miscellaneous						
TOTAL OPERATING	0.0	0.0	0.0	0.0	0.0	0.0
CAPITAL EXPENDITURES						
CHANGE IN REVENUES (1004 GF) +	**Indeterminate Positive Amount**					

FUND SOURCE (Thousands of Dollars)

1002 Federal Receipts						
1003 GF Match						
1004 GF						
1005 GF/Program Receipts						
1037 GF/Mental Health						
Other (Specify Type–Do not abbreviate)						
TOTAL	0.0	0.0	0.0	0.0	0.0	0.0

Estimate of any current year (FY2004) cost: 0.0
Mark this box (X) If funding for this bill is included in the Governor's FY 2005 budget proposal:

POSITIONS

Full-time						
Part-time						
Temporary						

ANALYSIS: *(Attach a separate page if necessary)*

This bill would eliminate the current over-the-counter shallow natural gas program. HB 531 would create a new gas only option under the competitive leasing and exploration licensing programs.

**Indeterminate positive fiscal note: Moving from an over-the-counter program to a competitive program will result in increased revenue to the state. The commissioner will be able to set minimum rentals and bonus bid amounts based on technical analysis of the potential resources and economics of the lease or license area. While a best interest finding process will cost more up front, that cost will be more than offset by the gains in going to a competitive process. Also, having a best interest finding process at the leasing stage will facilitate a more efficient progression to exploration and development and provide the state with royalties and other revenues from development sooner.

Prepared by: Mark D. Myers
Phone 269-8800
Division: Oil and Gas
Date/Time 3/11/04

Approved by: Thomas Irwin, Commissioner
Date 3/12/04
Agency: Natural Resources

(Revised 8/2003 OMB)

U.S. Environmental Protection Agency

Underground Injection Control Program

What is the UIC program?

Critical Initiatives

Classes of Injection Wells
- Class I
- Class II
- Class III
- Class IV
- Class V

State UIC Programs

Regulations & Guidance

Study of Potential Impacts of Hydraulic Fracturing of Coalbed Methane Wells on Underground Sources of Drinking Water

EPA is completing a study of the possible impacts of hydraulic fracturing on underground sources of drinking water (USDWs). The Agency prepared a draft report on the preliminary results of its investigation which focuses on hydraulic fracturing used specifically for enhancing coalbed methane production. That report was published in August 2002. EPA used existing sources of information, and consolidated pertinent data into a summary report to serve as the basis for the study. Based on an analysis of the information collected, EPA has preliminarily found that the potential threats to public health posed by hydraulic fracturing of coalbed methane wells appear to be small and do not justify additional study.

- Read the Federal Register Notice for directions on how to submit comments
- Executive Summary (PDF 6 MB) - this is the corrected version
- Read/Print The Complete Study Online

EPA received over 100 sets of comment from citizens, industry, and states. We have reviewed and addressed those comments. The final report will reflect changes resulting from public comment. Please check this site periodically for the final report.

Contents

Document Collection
Download background documents on the Study.

Related Web Sites
Visit other Web sites with information on hydraulic fracturing.

Submit Information
Submit information on potential effects of hydraulic fracturing.

Peer Review Panelists
Background information on the expert peer review panelists and their qualifications.

11th Circuit Court Decision
Information on the December 21, 2001 decision in support of EPA's approval of Alabama's program under Section 1425 of the Safe Drinking Water Act.

BACKGROUND

Prior to 1997, EPA had not considered regulating hydraulic fracturing because the Agency believed that this well production stimulation process did not fall under the Underground Injection Control (UIC) program's purview, nor under the jurisdiction of the Safe Drinking Water Act (SDWA).

In 1994, the Legal Environmental Assistance Foundation (LEAF) challenged that interpretation because LEAF believed the State of Alabama should regulate hydraulic fracturing for coalbed methane development as underground injection. LEAF petitioned EPA to withdraw Alabama's SDWA Section 1425 UIC program. EPA rejected LEAF's petition, and LEAF litigated. In 1997, the 11th Circuit Court of Appeals ruled that hydraulic fracturing of coalbeds in Alabama should be regulated under the SDWA as underground injection (LEAF v. EPA, 118 F. 3d 1467). The State was required to modify its UIC program, and in December 1999, EPA

approved this revision.

Since the 11th Circuit Court's decision, EPA has contacted and been contacted by citizens who expressed concern that practices associated with methane gas production from coalbeds has resulted in contamination of USDWs. EPA has been asked to support legislation which would exempt hydraulic fracturing from SDWA.

For more information, contact: Leslie Cronkhite, Drinking Water Protection Division, Environmental Protection Agency, Mail Code 4606, Ariel Rios Building, 1200 Pennsylvania Avenue, NW., Washington, DC 20460; Phone: (202) 564-3878; E-Mail: cronkhite.leslie@epa.gov.

You will need Adobe Acrobat Reader to view the Adobe PDF files on this page. See EPA's PDF page for more information about getting and using the free Acrobat Reader.

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Last updated on Wednesday, March 3rd, 2004
URL: http://www.epa.gov/safewater/uic/cbmstudy.html

Executive Summary

This report summarizes findings from the US Environmental Protection Agency's (EPA) hydraulic fracturing study. The goal of this first phase of the study was to determine if a threat to public health as a result of underground sources of drinking water (USDW) contamination from hydraulic fracturing of coalbed methane (CBM) wells (herein known as hydraulic fracturing) exists, and if so, is it high enough to warrant further study. Based on the information collected, the potential threats to USDWs posed by hydraulic fracturing of CBM wells appear to be low and do not justify additional study.

This study is the most thorough effort conducted to review any impacts to public health as a result of USDW contamination from hydraulic fracturing. If risks from hydraulic fracturing of CBM wells were significant, we would expect to find instances of water well contamination from the practice. Instead, thousands of CBM wells are fractured annually and yet EPA did not find persuasive evidence that any drinking water wells had been contaminated by CBM hydraulic fracturing.

EPA also evaluated the theoretical potential for hydraulic fracturing to impact drinking water wells. In some cases, constituents of concern (see section ES-7) are injected into USDWs during the course of normal fracturing operations. However, EPA's determination is that the threat of contamination of drinking water supplies is low because concentrations are diminished by the ground water production aspect of coalbed methane development. Studies have found no observed breach of confining layers from hydraulically created fractures, consistent with theoretical understanding of fracturing behavior.

Although the threat to public health from hydraulic fracturing appears to be low, it may be feasible and prudent for industry to remove any threat whatsoever from injection of fluids. The use of diesel fuel in fracturing fluids by some companies introduces the majority of constituents of concern to USDWs. Water-based alternatives exist and from an environmental perspective, these water-based products are preferable.

ES-1 How Does CBM Play a Role in the Nation's Energy Demands?

Coalbed methane mining began as a safety measure in underground coalmines to reduce the explosion hazard posed by methane gas (Elder and Deul, 1974). In 1980, the U.S. Congress enacted a tax credit for non-conventional fuels production, including coalbed methane production, as part of the Crude Oil Windfall Profit Act. In 1984, there were fewer than 100 coalbed wells in the U.S. By 1990, almost 8,000 coalbed wells had been drilled nationwide (Pashin and Hinkle, 1997). In 1996, coalbed methane production in 12 states totaled about 1,252 billion cubic feet, accounting for approximately seven percent of U.S. gas production (U.S. Department of Energy, 1999). According to the U.S. Department of Energy, natural gas demand is expected to increase at least 45% in the next 20 years (U.S. Department of Energy, 1999). The rate of coalbed methane production is also expected to increase in response to the growing demand.

EPA reviewed geology in eleven basins, illustrated in Figure ES-1, throughout the U.S. The most actively producing basins are highlighted in red on the map and include the Powder River Basin in Wyoming and Montana, the San Juan Basin in Colorado and New Mexico, and the Black Warrior Basin in Alabama. Hydraulic fracturing is or has been used to stimulate CBM wells in all basins, although not frequently in the Powder River Basin. Table ES-1 lists the estimated number of active producing wells, production volume of methane gas, and our understanding of hydraulic fracturing activity in each of the eleven basins reviewed.

ES-2 What Is Hydraulic Fracturing?

Figure ES-2 illustrates a typical hydraulic fracturing event within a coalbed methane well. This diagram shows the fracture creation and propagation, as well as the proppant placement and fracturing fluid recovery stages.

A hydraulically created fracture acts as a conduit in the rock or coal formation that allows the oil or coalbed methane (one source of natural gas) to travel more freely from the rock pores to the production well that can bring it to the surface.

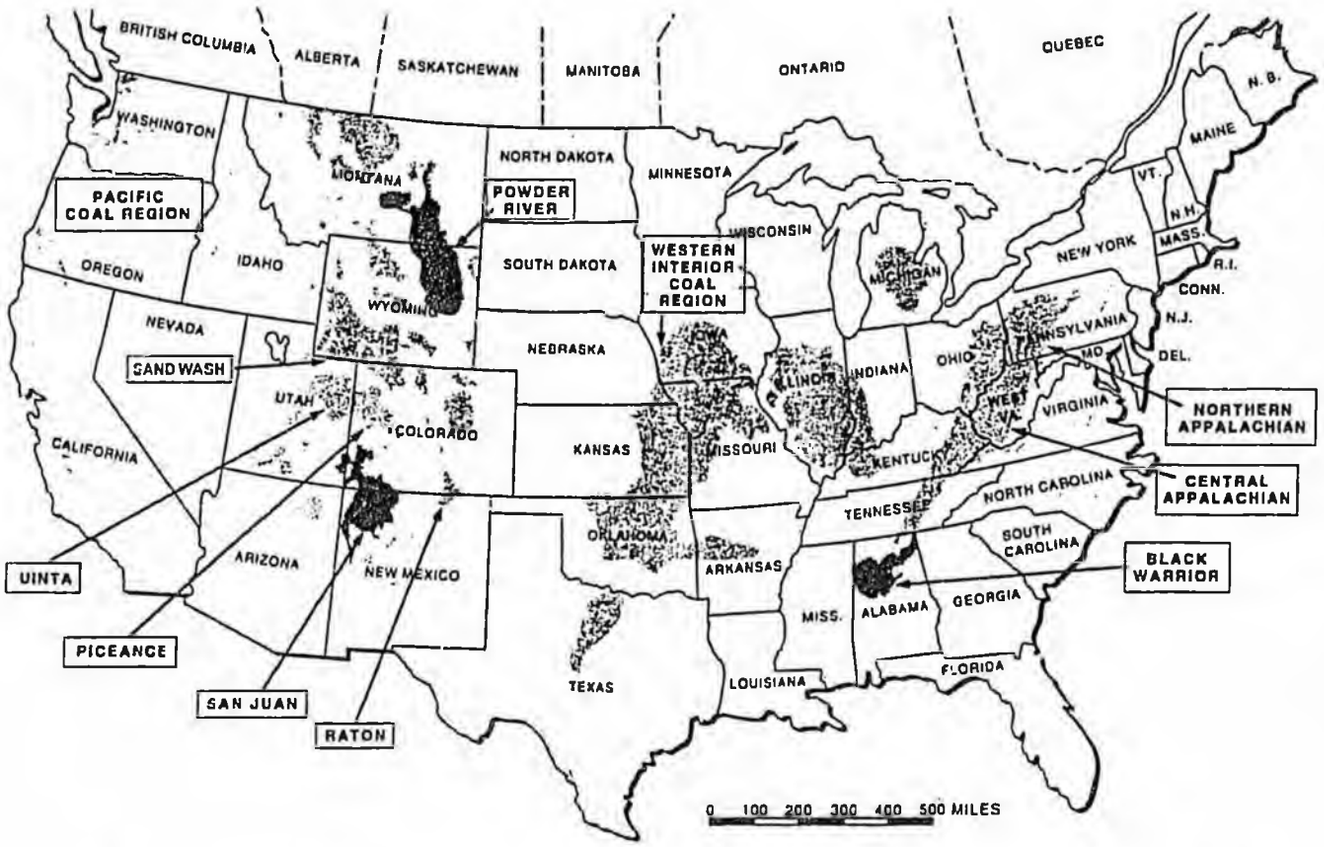
In the case of coalbed methane production, the gas is trapped in tiny, disconnected clusters of fractures (called "cleats") within a coal layer. The coal layer is typically sandwiched between

Table ES-1. U.S. Coal Basins Production Statistics and Activity Information

Basin	*Number of Producing Wells (Year 2000)	*Production of CBM in Billions of Cubic Feet (Year 2000)	Does Hydraulic Fracturing Occur?
San Juan	3,051	925	Yes
Black Warrior	3,086	112	Yes
Piceance	50	1.2	Yes
Uinta	494	75.7	Yes
Powder River	4,200	147	Yes (in the past)
Central Appalachian	1,924	52.9	Yes
Northern Appalachian	134	1.41	Yes
Western Interior	420	6.5	Yes
Raton Basin	614	30.8	Yes
Sand Wash	0	0	Yes (in the past)
Pacific Central	0	0	Yes (in the past)

*Data provided by GTI and EPA Region Offices

Figure ES-1. Locus Map of Major U.S. Coal Basins



layers of dense rock, such as shale, sandstone or limestone, which prevents the coalbed methane from migrating up and away from the coal. To extract the coalbed methane, a production well is drilled through the rock layers to intersect the coal seam containing the gas. Next, a fracture must be created in the coal seam to intersect the tiny, gas-bearing fractures and create a pipeline through which the coalbed methane can travel to the well so it can be brought to the surface.

To create such a fracture, a thick, water-based fluid is pumped into the coal seam at a gradually increasing rate. At a certain point, the coal seam will not be able to accommodate the fluid as quickly as it is being injected. When this occurs, the pressure is high enough that a fracture is created. A propping agent, usually sand (commonly known as "proppant"), is pumped into the fracture so that when the pumping pressure holding the fracture open is released, the fracture does not close completely because the proppant is "propping" it open. The resulting fracture filled with proppant is a conduit through which coalbed methane trapped in the formation can flow to the well.

Production begins when pumping of the well begins. Ground water is produced from the coal seam, decreasing the pressure and allowing methane to de-sorb from the coal matrix itself (Gray, 1987). Contrary to conventional gas production, the percentage of water produced declines with increasing coalbed methane production. In some basins, huge volumes of ground water are produced from the production well.

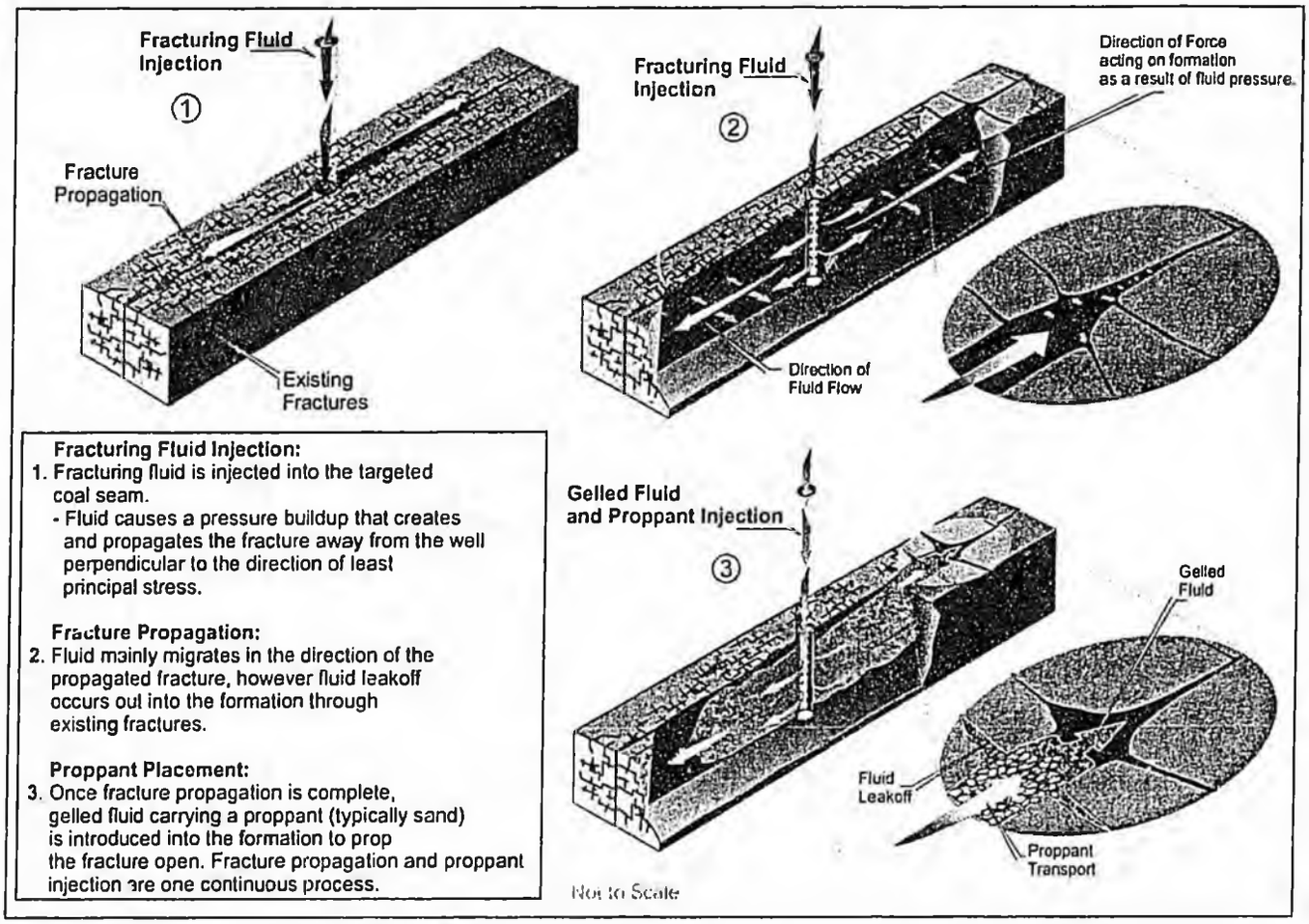
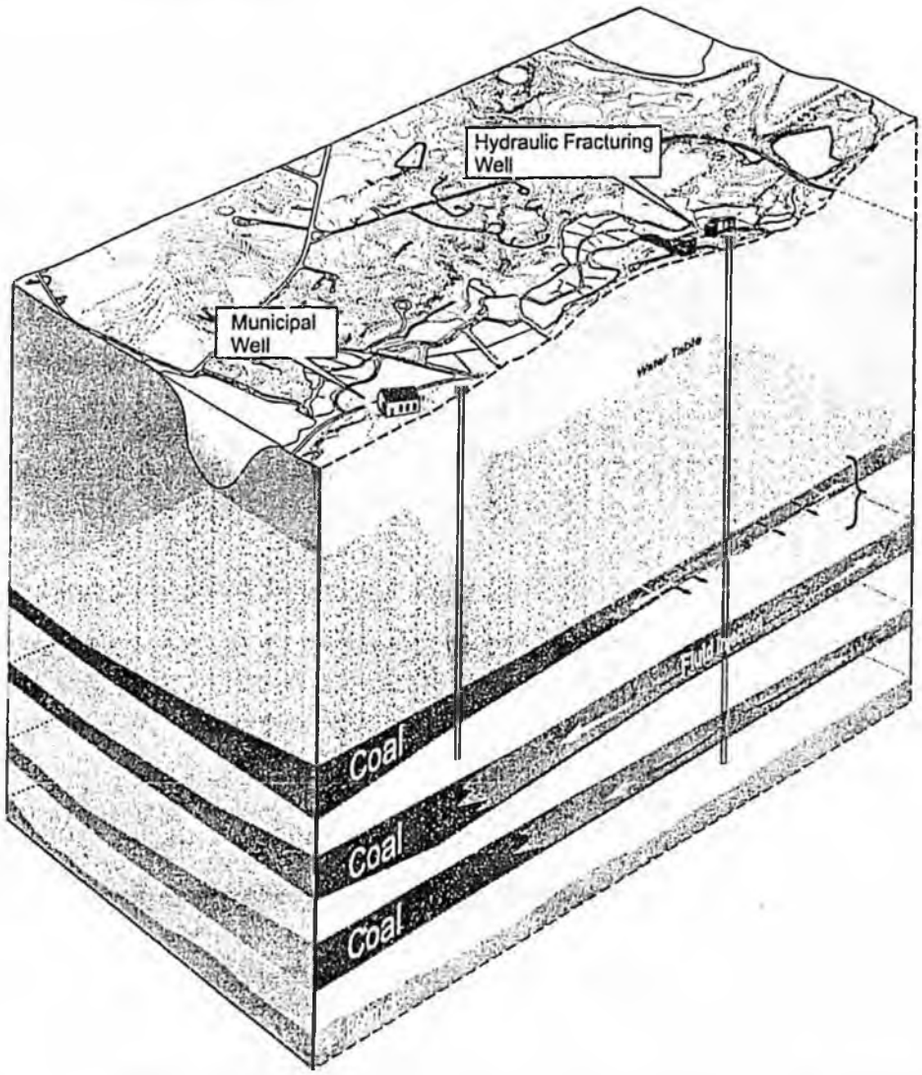
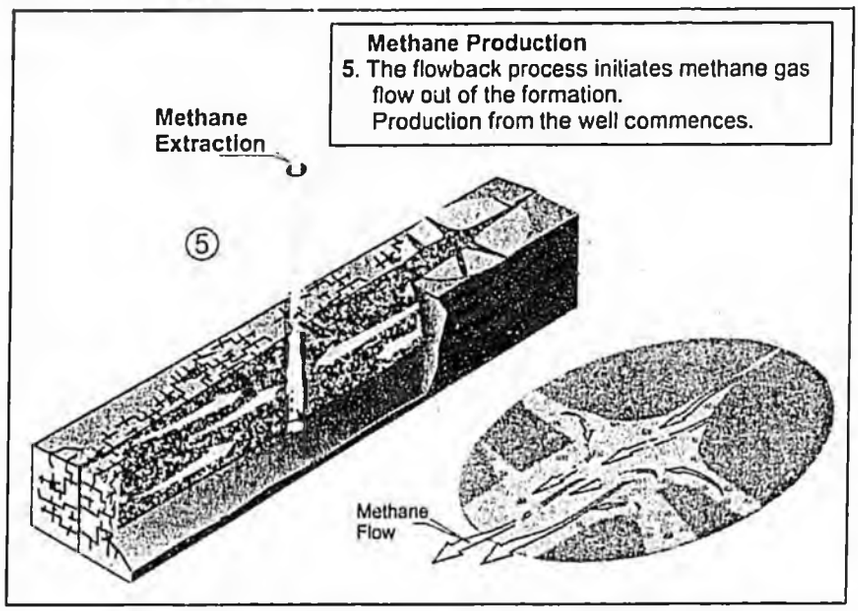


Figure ES-2. A Graphical Representation of the Hydraulic Fracturing Process in Coalbed Methane Wells


Hydraulic Fracturing Well
Municipal Well
Water Table
Fault
Coal
Coal
Coal


Methane Production
5. The flowback process initiates methane gas flow out of the formation. Production from the well commences.
Methane Extraction
⑤
Methane Flow

ES-3 Why Is EPA Evaluating Hydraulic Fracturing?

EPA's Underground Injection Control (UIC) Program is authorized by the Safe Drinking Water Act (SDWA) to protect public health from threats arising from contamination of USDWs resulting from underground injection activities. Underground injection is the subsurface emplacement of fluids through a well bore. However, SDWA does not authorize EPA to regulate oil and gas production practices.

A USDW is defined as an aquifer or it's portion that:

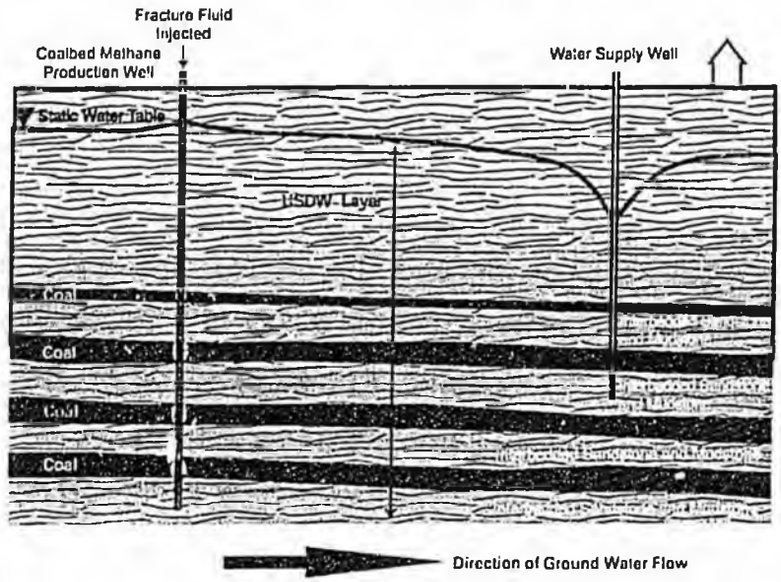
A.
1. supplies any public water system;
or
2. contains sufficient quantity of ground water to supply a public water system; and
i. currently supplies drinking water for human consumption; or
ii. contains fewer than 10,000 milligrams per liter (mg/L) total dissolved solids (TDS);
and
B. is not an exempted aquifer.

Although aquifers with greater than 500 mg/L TDS are rarely used for drinking water supplies, it is believed that imposing protection for waters with less than 10,000 mg/L TDS will ensure an adequate supply (through treatment) for present and future generations.

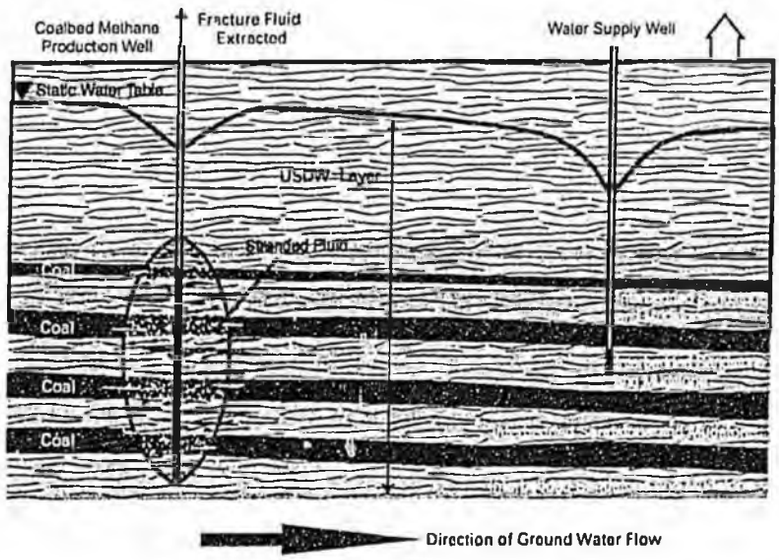
EPA initiated the hydraulic fracturing study in response to concerned citizens and the 11th Circuit Court's decision in LEAF v. EPA, 118F.3d 1467, which ruled that the State of Alabama must regulate hydraulic fracturing in order to retain authority of its State UIC Program. Members of Congress also wanted EPA to collect more information to evaluate any public health risks associated with hydraulic fracturing.

Figure ES-3. Direct Fluid Injection into a USDW (Coal within USDW)

Step 1:
Fracture Fluid is Injected into Coalbed Seams

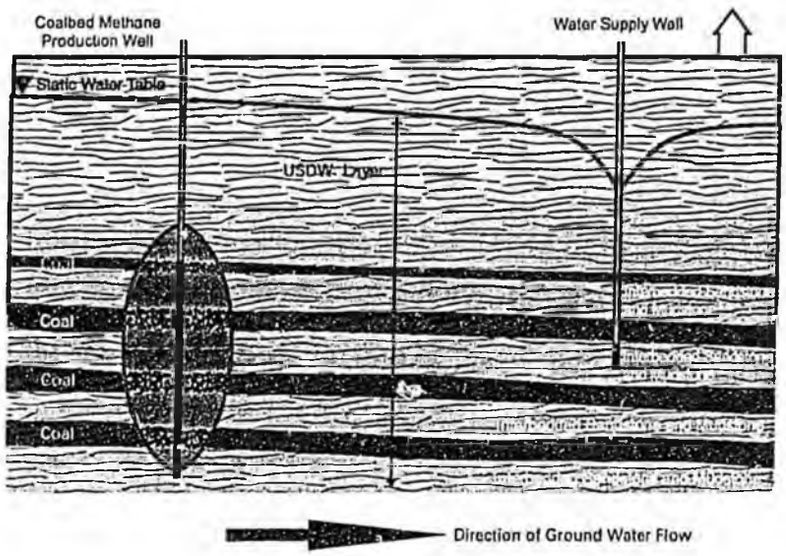


Step 3:
Fluid Stranded as Production Resumes

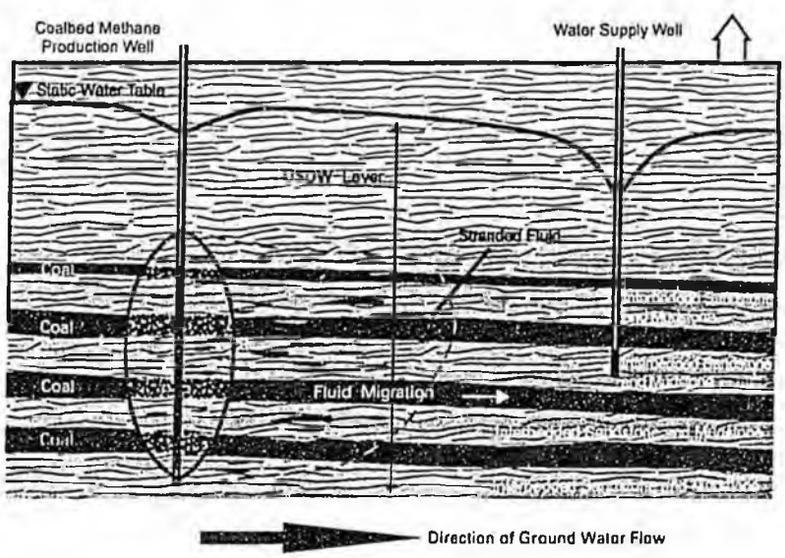


This study is narrowly focused to address hydraulic fracturing of CBM wells. It does not address all hydraulic fracturing practices, because (1) the 11th Circuit Court's decision was specific to CBM production; (2) CBM wells tend to be more shallow and closer to USDWs than conventional oil and gas production wells (1,000s of feet below ground surface [bgs] rather than 10,000s of feet bgs); and (3) EPA has not heard concerns from citizens regarding any other type of hydraulic fracturing. The study also does not address other concerns surrounding CBM production such as ground water removal or production water discharge

Step 2:
Fracture Created



Step 4:
Stranded Fluid Migration



ES-4 What Was EPA's Project Approach?

EPA designed the hydraulic fracturing study to have three possible phases, narrowing the focus from general to more specific as findings warrant. This report describes the findings from the Phase I efforts, a limited-scope assessment of potential threats posed from hydraulic fracturing using existing information.

The goal of EPA's hydraulic fracturing Phase I study is to determine if a threat to public health as a result of USDW contamination from hydraulic fracturing exists, and if so, is high enough to warrant further study. The threat to public health from USDW contamination was defined by the presence or absence of documented contamination cases stemming from hydraulic fracturing, or a clear immediate contamination threat to drinking water wells.

EPA's approach for evaluating the threat to public health was to review claimed incidents of drinking water well contamination as well as evaluate the theoretical potential for hydraulic fracturing to impact drinking water wells. We evaluated two potential mechanisms, illustrated in Figures ES-3 and ES-4, by which

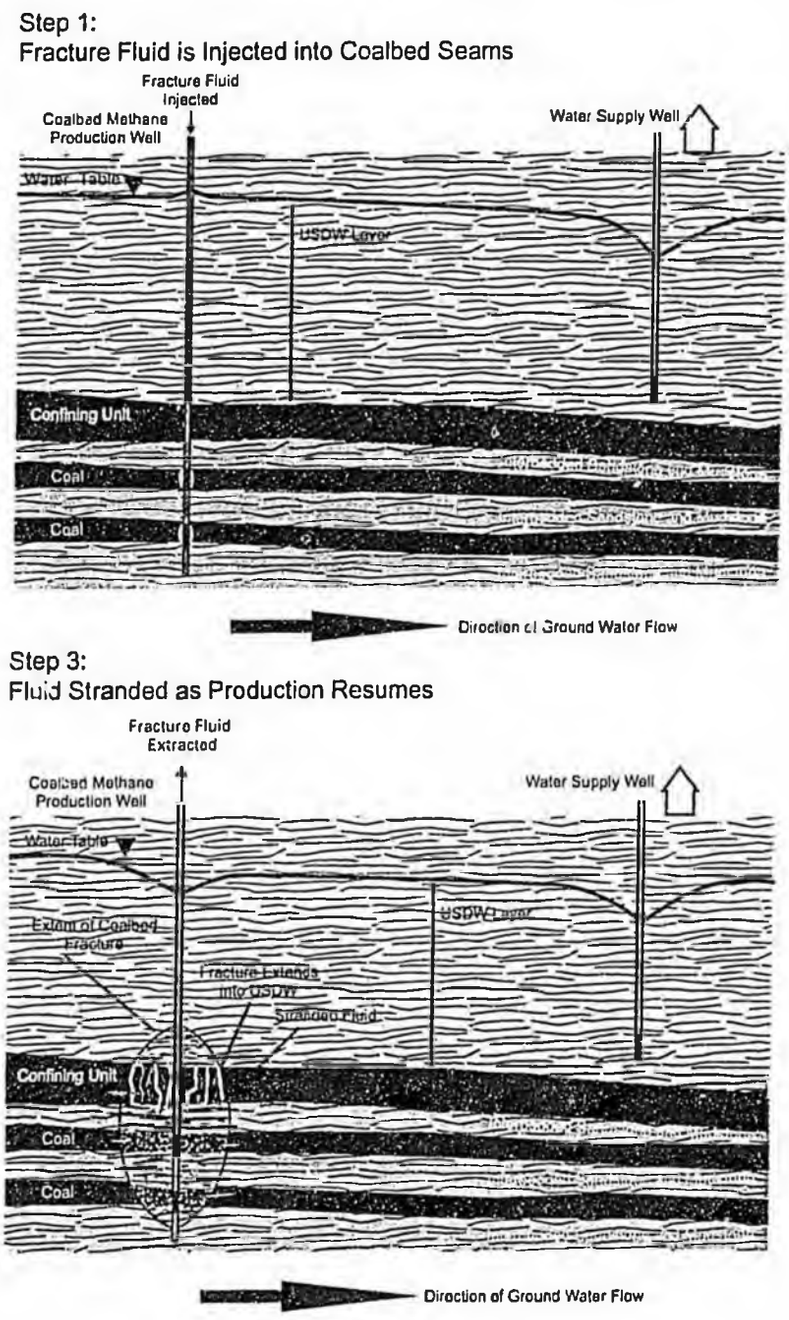
hydraulic fracturing may threaten USDWs: (1) the injection of fracturing fluids directly into a USDW, and (2) the creation of a hydraulic communication through a confining layer between the target coalbed formation and adjacent USDWs located either above or below.

ES-5 How Do Fractures Grow?

In many coalbed methane-producing regions, the target coalbeds occur within USDWs, and the fracturing process injects stimulation fluids directly into the USDWs. In other production regions, target coalbeds are adjacent to the USDWs that exist either higher or lower in the geologic section. Vertical fracture heights in coalbeds have been measured in excess of 500 feet and lengths can reportedly reach up to 1,500 feet. Fracture heights vary widely depending on the basin geology. For instance, in the Central Appalachian basin, fracture heights can be as small as two feet and lengths are typically in the range of 200 to 300 feet from the well bore (Halliburton, Inc., 2001). Hydraulic fracturing in coalbed methane formations in the Black Warrior basin can create fractures that are taller than they are long depending on the number of coal seams targeted and the strength of the intervening layers (Morales et al., 1990; Zuber et al., 1990; Holditch et al., 1989; Palmer et al., 1991, 1991a, 1993). The potential exists for fractures to extend from coalbeds into adjacent USDWs, which could increase communication between stratigraphic sections. Fractures generally will not penetrate confining layers separating coalbeds and overlying aquifers.

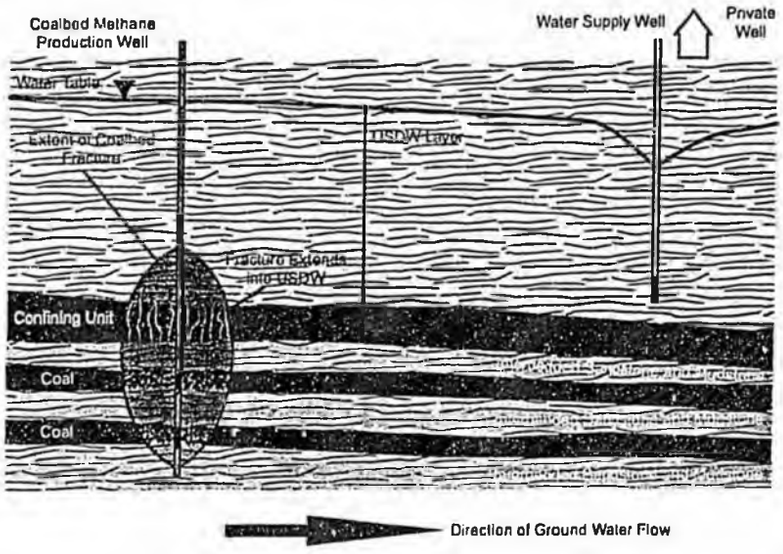
Once fracturing fluids are injected, either directly or indirectly, local geologic conditions may interfere with their

Figure ES-4. Fracture Creates Connection to USDW

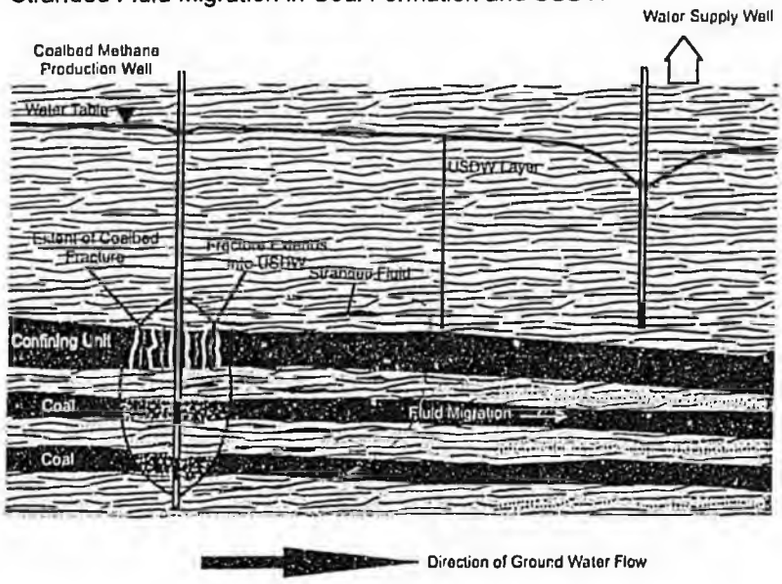


complete recovery. This may result in fracturing fluids being "stranded" in a USDW. Subsequent coalbed methane production creates a flow back regime that should contain ground water flow within the zone of influence surrounding the well. Any fluids not captured during production are presumably trapped due to low permeability within the formation. Low permeability limits ground water flow in both directions – toward the production well, which pulls ground water toward it and away from the production well.

Step 2:
Fracture Created (Breaking Through Confining Unit)



Step 4:
Stranded Fluid Migration in Coal Formation and USDW



The extent of a fracture is controlled by the characteristics of the geologic formation, the fracturing fluid type used, the pumping pressure, and the depth at which the fracturing is being performed. The fracture initiates from the well and extends out as two separate wings in opposite directions. Whether the fracture grows higher or longer is determined by the surrounding rock properties. A hydraulically created fracture will always take the path of least resistance through the coal seam and surrounding formations.

ES-6 What Is In Hydraulic Fracturing Fluids?

Fracturing fluids consist of primarily water or inert foam, such as nitrogen or carbon dioxide. Fluids also usually contain additives designed to improve performance of the fluid. Components of fracturing fluids are stored and mixed on site (Figures ES-5 and ES-6 show fluids stored in tanks at CBM well locations.) Table ES-2 lists additives available and any constituents of concern that may be in the additives. This information was obtained from material safety data sheets (MSDS) by EPA. Diesel fuel is the additive which contains most of the constituents of concern. It is used as an alternative to a water-based polymer gel. Much

more gel can be dissolved in diesel as compared to water, reducing the cost required to transport the fracturing fluids. Water and any additives are typically pumped from the storage tanks to a manifold system placed on the production wells where they are mixed and then injected into the coal formation (Figure ES-6). Coalbed fracture treatments typically use 50,000 to 350,000 gallons of various fracturing fluids, and from 75,000 to 320,000 pounds of sand as proppant (Holditch et al., 1988 and 1989; Jeu et al., 1988; Hinkel et al., 1991; Holditch, 1993; Palmer et al., 1991, 1993, and 1993a). The volumes of constituents of concern and the ultimate concentration at which they are injected into the ground vary, but chemical additives make up only a small fraction of the overall fluid mixture. EPA estimated the concentrations of chemicals of concern in fracturing fluids at the point of injection using mid-range volumes reported by service companies. Table ES-3 presents the estimated concentrations and compares them to drinking water or ground water standards.

Studies observed that for fracture stimulations in conventional production formations, 25 to 65 percent of fracturing fluids are recovered during flowback (Mukhergee et al. 1995; Samuel et al. 1997; Willberg et al. 1997 and 1998). In a study specific to coalbed methane production, Palmer et al. (1991a) reported a 61 percent recovery of fracturing fluids after 20 days of production and projected that 20 to 30 percent would remain in the formation. To inform our decision, EPA estimated the concentrations of constituents of concern at the edge of a fracture considering only dilution effects and assuming 60 percent of fluid was recovered. We estimated concentrations decreased to 30 times less than those at point of injection – a significant drop at a relatively short distance from the production well. Any constituent of concern would have to migrate long distances, both vertically and horizontally, before reaching an exposure point.

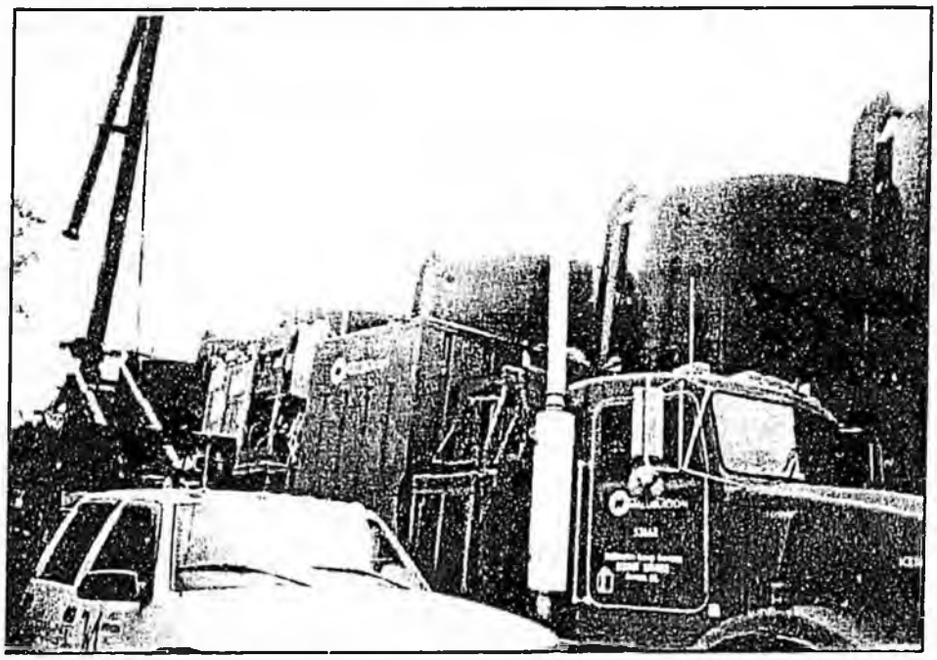


Figure ES-5. The fracturing fluids are stored on site in large, upright storage tanks and in truck-mounted tanks.

Methane production requires the removal of ground water; thus, in active coalbed methane wells the lowest pressure is typically in the CBM production well. Ground water will flow in the direction of the lowest pressure. This pressure dynamic should prevent un-recovered fracturing fluids from migrating beyond the influence of the CBM well.

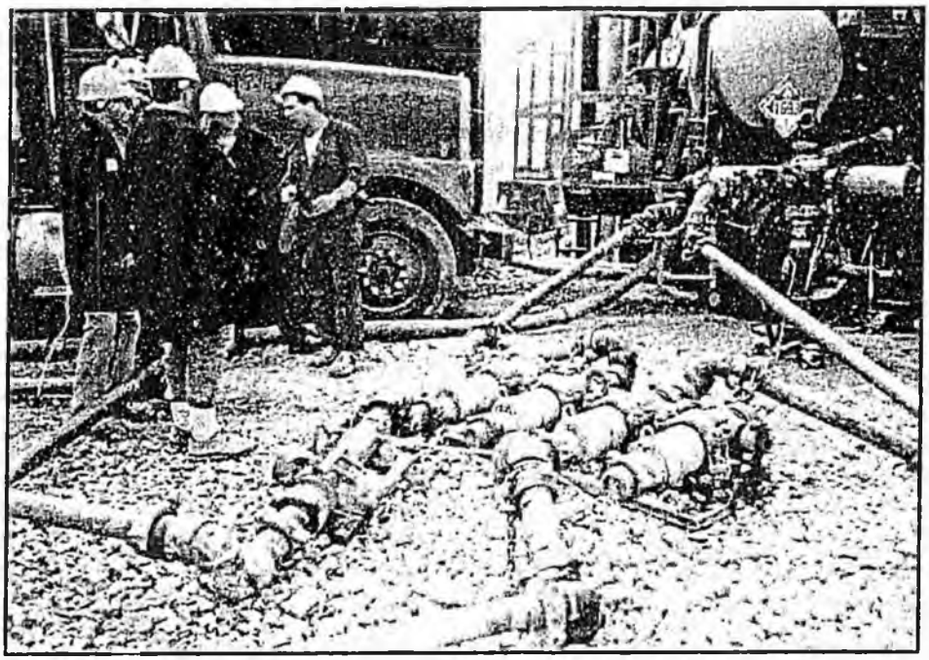


Figure ES-6. The fracturing fluids, additives, and proppant are pumped from the storage tanks to a manifold system placed on the wellhead where they are mixed just prior to injection.

ES-7 Are Coalbeds Located within USDWs?

EPA reviewed the geology of eleven basins to determine if coalbeds are co-located with USDWs and to understand the coalbed methane activity in the area. If coalbeds are located within USDWs, then any fracturing fluids injected into coalbeds have the potential to contaminate the USDW. As described previously, a USDW is not necessarily currently used for drinking water and may contain ground water not suitable for drinking without treatment. EPA found that ten of the eleven basins likely lie, at least in part, within USDWs. Table ES-4 identifies coalbed basin locations in relation to USDWs, and summarizes evidence used as the basis for the conclusions.

ES-8 Did EPA Find Any Cases of Contaminated Drinking Water Wells Caused by Hydraulic Fracturing in CBM Wells?

EPA reviewed studies and follow-up investigations conducted by State oil and gas agencies in response to citizen reports that CBM production resulted in water quality and quantity incidents. EPA found no confirmed cases of drinking water well contamination or water loss as the result of the hydraulic fracturing process.

EPA received reports of drinking water well problems associated with coalbed methane development (see Table ES-5) from:

- San Juan Basin (Colorado and New Mexico)
- Powder River Basin (Wyoming and Montana)
- Black Warrior Basin (Alabama)
- Central Appalachian Basin (Virginia and West Virginia).

Table ES-2. Summary of MSDSs[1] for Hydraulic Fracturing Fluid Additives

Product	Hazards Information	Toxicological Information	Ecological Information
Linear gel delivery system	-Harmful if swallowed -Combustible	- Chronic effects/Carcinogenicity - Contains diesel, a petroleum distillate (known carcinogen) - Causes eye, skin, respiratory irritation - Can cause skin disorders - Can be fatal if ingested	- Slowly biodegradable
Water gelling agent	- None	- May be mildly irritating to eyes	- Biodegradable
Linear gel polymer	- Flammable vapors	- Can cause eye, skin and respiratory tract irritation	- Not determined
Linear gel polymer slurry	- Causes irritation if swallowed - Flammable	- Carcinogenicity - Possible cancer hazard based on animal data; diesel is listed as a category 3 carcinogen in EC Annex 1 - May cause pain, redness, dermatitis	- Partially biodegradable
Crosslinker	-Harmful if swallowed -Combustible	-Chronic effects/Carcinogenicity D5 may cause liver, heart, brain reproductive system and kidney damage, birth defects (embryo and fetus toxicity) -Causes eye, skin, respiratory irritation -Can cause skin disorders and eye ailments	- Not determined
Crosslinker	- may be mildly irritating to eyes and skin - may be mildly irritating if swallowed	- May be mildly irritating	- Partially biodegradable - Low toxicity to fish
Foaming agent	- Harmful if swallowed - Highly flammable	- Chronic effects/Carcinogenicity - May cause liver and kidney effects - Causes eye, skin, respiratory irritation - Can cause skin disorders and eye ailments	- Not determined
Foaming agent	- Harmful if swallowed or absorbed through skin	- May cause nausea, headache, narcosis - May be mildly irritating	- Harmful to aquatic organisms
Acid treatment - hydrochloric acid	- May cause eye, skin and respiratory burns - Harmful if swallowed	- Chronic effects/Carcinogenicity - Prolonged exposure can cause erosion of teeth - Causes severe burns - Causes skin disorders	- Not determined
Acid treatment - formic acid	- May cause mouth, throat, stomach, skin and respiratory tract burns - May cause genetic changes	- May cause heritable genetic damage in humans - Causes severe burns - Causes tissue damage	- Not determined
Breaker Fluid	-May cause respiratory tract, eye or skin irritation - Harmful if swallowed	- May cause redness, discomfort, pain, coughing, dermatitis	- Not determined
Microbicide	- May cause eye and skin irritation	- Chronic effects/Carcinogenicity - Not determined - Can cause permanent eye damage, skin disorders, abdominal pain, nausea, and diarrhea if ingested	- Not determined
Biocide	- Causes severe burns - Harmful if swallowed - May cause skin irritation - May cause allergic reaction upon repeated skin exposure	-Harmful if swallowed; large amounts may cause illness - Irritant; may cause pain or discomfort to mouth, throat, stomach; may cause pain, redness, dermatitis	- Not determined
Acid corrosion inhibitor	- May cause eye and skin irritation, headache, dizziness, blindness and central nervous system effects - May be fatal if swallowed - Flammable	- Chronic effects/Carcinogenicity – may cause eye, blood, lung, liver, kidney, heart, central nervous system and spleen damage - Causes severe eye, skin, respiratory irritation - Can cause skin disorders	- Not determined
Acid corrosion inhibitor	- Cancer hazard (risk depends on duration and level of exposure) - Causes severe burns to respiratory tract, eyes, skin - Harmful if swallowed or absorbed through the skin	- Carcinogenicity – Thiourea is known to cause cancer in animals, and possibly causes cancer in humans - Corrosive - short exposure can injure lungs, throat, and mucous membranes; can cause burns, pain, redness swelling and tissue damage	- Toxic to aquatic organisms - Partially biodegradeable

[1] MSDS = Material Safety Data Sheets, lists of hazardous chemical constituents in industrial products.
They provide both workers and emergency personnel with the proper procedures for handling or working with a particular substance.
MSDS's include information such as physical data (melting point, boiling point, flash point etc.), toxicity, health effects, first aid, reactivity, storage, disposal, protective equipment, andspill/leak procedures.

Table ES-3. Estimated Concentrations at the Point of Injection of Constituents of Concern in Hydraulic Fracturing Fluids

Product	Chemical Composition of Existing Products	Concentrations of Interest (ug/L)	
	Chemical Compound	Injection Concentration	MCL or RBC or MCP
Linear gel delivery system	guar gum derivative		
	diesel		
	benzene	313.20	5.00
	toluene	522.00	1,000.00
	ethylbenzene	522.00	700.00
	xylene	522.00	10,000.00
	napthalene	14,094.00	20.00
	1-methylnapthalene	71,340.00	20 / 6,000
	2-methylnapthalene	34,974.00	121.67
	dimethylnapthalenes	270,570.00	na
	trimethylnapthalenes	160,080.00	na
	fluorenes	31,320.00	2,190.00
	phenanthrenes	7,830.00	300 / 50
	aromatics	574,200.00	200 / 30,000
Water gelling agent	guar gum		
	water	495,049.50	na
	fumaric acid	132,337.87	na
Linear gel polymer	fumaric acid	529,351.49	na
	adipic acid	366,257.43	na
Gelling agents (BLM Lists)	benzene		5.00
	ethylbenzene		700.00
	methyl tert-butyl ether		2.64
	napthalene		20.00
	polynuclear aromatic hydrocarbons (PAHs)		na
	polycyclic organic matter (POM)		na
	sodium hydroxide		na
	toluene		1,000.00
	xylene		10,000.00
Crosslinker	boric acid	170,993.00	na
	ethylene glycol	285,788.42	73,000.00
	monoethanolamine	na	na
Crosslinker	sodium tetraborate decahydrate	na	na
Crosslinkers (BLM Lists)	ammonium chloride		na
	potassium hydroxide		na
	zirconium nitrate		na
	zirconium sulfate		na
Foaming agent	isopropanol	234,945.16	na
	salt of alkyl amines	na	na
	diethanolamine	na	na
Foaming agent	ethanol	236,081.75	na
	2-butoxyethanol	269,641.08	na
	ester salt	na	na
	polyglycol ether	na	na
	water		na
Foamers (BLM Lists)	glycol ethers		na
Acid treatment - hydrochloric acid	hydrochloric acid	na	na
Acid treatment - formic acid	formic acid	na	73,000.00
Breaker Fluid	diammonium peroxidisulphate	na	na
Breaker Fluids (BLM Lists)	ammonium persulfate		na
	ammonium sulphate		na
	copper compounds		1,460.00
	ethylene glycol		na
	glycol ethers		na
Microbicide	2-bromo-2nitro1,3-propanediol	na	na
Biocide	2, 2-dibromo-3-nitrilo propionamide	na	na
	2-bromo-3-nitrilopropionamide	na	na
Bactericides	polycyclic organic matter (POM)	na	na
	polynuclear aromatic hydrocarbons (PAHs)	na	na
Acid corrosion inhibitor	methanol	236,070,000.00	10,250.00
	propargyl alcohol	47,425,000.00	na
Acid corrosion inhibitor	pyridinium, 1-(phenylmethyl)-, ethyl methyl derivitives, ch	na	na
	thiourea	210,750,000.00	na
	propan-2-ol	39,275,000.00	na
	poly(oxy-1,2-ethanediyl)-nonylphenyl-hydroxy	na	na
	water		na

= 2 numbers given (1. Drinking water standard 2. Groundwater discharging to surface water standard)
= Exceeds regulatory standard

MCL = Maximum Contaminant Level - The highest level of a contaminant that is allowed in drinking water.
RBC = EPA's Risk Based Concentration Tables. www.epa.gov/reg3hwmd/risk/index.html, developed by Region 3 (serving: Delaware, District of Columbia, Maryland, Pennsylvania, Virginia, West Virginia)
MCP = Massachusetts Contingency Plan - Risk-based ground water standards for drinking water protection - chosen because Massachusetts has developed standards for many constituents in diesel fuel.

Table ES-4. Evidence In Support Of Coal-USDW Co-Location In U.S. Coal Basins

Basin	Is coal found within the USDW?	Explanation and/or evidence
San Juan	Yes	A large area of the Fruitland system produces water containing less than 10,000 mg/L TDS, the water quality criteria for a USDW. Analyses taken from a selected coal well area show that the majority of wells (16 of 27 wells) produce water containing less than 10,000 mg/L TDS (Kaiser et al., 1994).
Black Warrior	Yes	Almost all waters of the Pottsville aquifer contain less than 10,000 mg/L TDS, and most waters in the Pottsville flow systems contain less than 3,000 mg/L TDS, even within the deeper, methane-target coal seams such as the Mary Lee beds (Pashin et al., 1991; Pashin and Hinkle, 1997).In the early 1990's, several authors reported fresh water production from coalbed wells at rates up to 30 gallons per minute (summarized in Pashin et al., 1991; Ellard et al., 1992).
Piceance	Unlikely	The stratigraphic separation between the coal gas bearing zone and the lower aquifer system in the Green River Formation is approximately 6,400 feet. The major coalbed methane target, the Cameo-Wheeler-Fairfield coal zone lies roughly 6,000 feet below the ground surface in a large portion of the basin (Tyler et al., 1998). A composite water quality sample taken from 4,637 to 5,430 feet deep within the Cameo Coal Group in the Williams Fork Formation exhibited a TDS level of 15,500 mg/L (Graham, CDWR, personal communication 2001). The produced water from coalbed methane extraction in the Piceance Basin is of such low quality that it must be disposed of in evaporation ponds or re-injected into the formation from which it came, or at even greater depths (Tessen, 2001)
Uinta	Likely	Production waters from coal seams at the higher elevation Castlegate Field within the Blackhawk Formation appear to have TDS levels of about 5,000 mg/L (Quarterly Review, 1993).
Powder River	Yes	A report prepared by the US Geological Survey showed that samples of water co-produced from 47 CBM wells in the Powder River Basin all had a TDS of less than 10,000 mg/L (Rice et al., 2000). The water produced by coalbed methane wells in the Powder River Coal Field commonly meets drinking water standards. In fact, production waters such as these have been proposed as a separate or supplemental source for municipal drinking water in some areas (DeBruin et al., 2000).
Central Appalachian	Likely	Depths of coal groups are coincident with fresh water in at least two of the states within the overall basin (Kelafant et al., 1988; Wilson, 2001; Foster, 1980; Hopkins, 1966 and USGS, 1973). Anecdotal information suggests that private wells in Virginia are screened within coal seams (Wilson, VDMME, 2001).
Northern Appalachian	Yes	The depth of each coal group within the basin is coincident with the depths of USDWs (Kelafant et al., 1988; Platt, 2001; Foster, 1980; Hopkins, 1966; USGS, 1973; Sedam and Stein, 1970; USGS, 1971; Duigon, 1985). Water quality data from eight historic Northern Appalachian Coal Basin projects show that TDS levels were below 10,000 mg/L (Zobrowitz et al., 1991)
Western Interior *Arkoma*	Yes (in Arkansas) Unlikely (in Oklahoma)	The depths of coal beds within the State of Arkansas are coincident with depths to fresh water (Andrews et al., 1998; Cordova, 1963; Friedman, 1982; Quarterly Review, 1993). Based on maps provided by the Oklahoma Corporation Commission (2001) as to the depths of the 10,000 mg/L of TDS ground water quality boundary in Oklahoma, the location of coalbed methane wells and USDWs would most likely not coincide in Oklahoma. This is based on depths to coals typically greater than 1,000 feet (Andrews et al, 1998) and depths to the base of the USDW typically shallower than 900 feet (OCC Depth to Base of Treatable Water Map Series, 2001).
Cherokee	Yes	The depths of coal beds within the State of Kansas are coincident with depths to fresh water (Quarterly Review, 1993; McFarlane, 2001; DASC, 2000).
Forest City	Unlikely	The shallow thickness of the aquifer suggests that there is significant separation from the deeper coalbeds within the basin (Bastic et al, 1993; DASC, 2001; Condra and Reed, 1959; Flowerday et al., 1998).
Raton Basin	Yes	Water quality results from coalbed methane wells in the Raton Basin demonstrate TDS content of less than 10,000 mg/L. Nearly all wells surveyed show a TDS of less than 2,500 mg/L, and more than half had TDS of less than 1,000 mg/L (Nat. Wat. Sum., 1984).
Sand Wash	Yes	Two gas companies produced water from coals that showed TDS levels below 10,000 mg/L. At Craig Dome in Moffat County, Cockrell Oil Corporation drilled 16 coalbed methane wells. The wells yielded large volumes of fresh water with TDS <1,000 mg/L (Colorado Oil and Gas Commission web site, 2001). Fuelco was operating 11 wells along Cherokee arch. Water pumped from the wells contained 1,800 mg/L of TDS and was discharged to the ground with a NPDES permit (Quarterly Review, 1993).
Pacific Central	Yes	Data demonstrating the co-location of a coal seam and a USDW was found for Pierce County. Water quality information from four gas test wells indicates TDS levels between 1330 and 1660 mg/L, well below 10,000 mg/L (Dion, 1984). Wells in the Basalts commonly yield 150 to 3,000 gallons per minute. Total dissolved solids in the water produced generally range from 250 to 500 mg/L (Dion, 1984).

Water quantity complaints are the most predominant cause for complaint by private well owners. EPA received reports from concerned citizens from each area with significant coalbed methane development. Taken on a case-by-case basis, investigations of water well contamination incidents conducted by the states do not provide evidence that hydraulic fracturing of CBM wells has impacted drinking water wells. Several other factors may contribute to ground water problems such as various aspects of resource development, naturally-occurring conditions, population growth and historical practices.

ES-9 What Are EPA's Conclusions and Recommendations?

EPA's approach for evaluating the threat to public health was an extensive information collection and review of empirical and theoretical data.

Based on the information collected, the threats posed by hydraulic fracturing of CBM wells to USDWs are low, and do not justify additional study. A Phase II effort would not likely provide any new information that would redirect the Phase I findings – those being a lack of contamination incidents and low potential for hydraulic fracturing to threaten human health through the contamination of USDWs. Therefore, the apparent risk to public health from hydraulic fracturing is not compelling enough to warrant expending resources on a Phase II effort.

Finally, it is important to note that States with primacy for their UIC programs enforce and have the authority to place controls on any injection activities that may threaten USDWs. With the expected increase in CBM production, additional data collection may become valuable in the future, if development leads to injection of fracturing fluids into USDWs that are simultaneously used as drinking water sources. The Agency is committed to working with states to collect relevant data to monitor this issue.

Table ES-5. Summary of Reported Incidents that Associate Water Quality/Quantity with Coalbed Methane (CBM) Activity

Basin	Water Contamination Associated with Methane	Water Contamination Associated with Fracturing Fluids
San Juan Basin (New Mexico, Colorado)	• Increased methane and hydrogen sulfide in water wells, pumphouses, and homes. • Claims of data showing methane concentrations in wells increased by 1000 ppm. • Improperly abandoned wells lead to methane migration from deep coal seams to shallow soils.	Information not available
Powder River (Wyoming, Montana)	• Methane causes drinking water to froth and bubble.	Information not available
Black Warrior (Alabama)	• Drinking water well was hissing due to a high concentration of methane gas. Water also had a strong, unpleasant odor.	• Citizen believes drinking water well became contaminated with a brown, slimy, petroleum-smelling fluid after recovered fracturing fluid drained from a CBM well site to an area near this homeowner's house.
Central Appalachian (Virginia, West Virginia)	• Well water contaminated by methane gas had bad taste and odor.	• Fish kills believed to be a result of fracturing fluid discharged into streams. • VA DMME states that soap bubbles in residential water fixtures are linked with production well drilling.

Water Contamination Reported Without Specific Mention of CBM Activity	Water Depletion or Loss Associated with CBM Activity	Non-Water Related Impacts Associated with CBM Activity
• Appearance of anaerobic bacteria in wells and transient appearance of particulates. • Black water believed to be due to pulverized coal. • Cloudy water with grayish sediment found 2 days after fracturing.	• Complaints of loss of water due to CBM development.	• Impacted vegetation.
Information not available	• Loss of water in wells from CBM development. • Aquifer dropped up to 200 feet in some areas.	• Discharged water creates artificial ponds and swamps not indigenous to region. • Coal ignites from lightning and creates underground fires that burn because of dewatered aquifer. This creates toxins and carcinogens that could contaminate water.
• Well water with milky white substance and strong odor. • Well water with black fines, globs of black jellied grease and smelled of petroleum. • Well water turned brown and had long, slimy tags of floating gunk.	Information not available	• Citizen believed recovered hydraulic fracturing fluid was allowed to run off-site. She noticed animal/plant life impacted.
• Private well contamination by oily films, soaps, iron oxides precipitates, black sediments, bad odor and taste, diesel fuel smells, and murky water. • Soap bubbles flowing from residential household fixtures. • Resident provided EPA with well water sample that was translucent with dark gray color and dark black sediments.	• Average of 10-12 complaints per year to Virginia Dept of Mines, Minerals, and Energy involve reports of water supplies diminishing or disappearing entirely. • Over 380 homes in Buchanan County without potable water as a result of CBM development.	• Residents develop rashes from showering. • Miner burned from acid that seeped into mine shaft.

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COAL BED METHANE

BEST MANAGEMENT PRACTICES

DRAFT HANDBOOK
3/19/04

("Clean Version" – changes not shown)

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I. INTRODUCTION AND OVERVIEW

A. Introduction

The development of this Handbook was initiated by the Western Governors' Association, (WGA) which believes that Coal Bed Methane (CBM) represents a key component of our nation's energy supply and accordingly should continue to be developed. WGA recognizes the importance of CBM and the need by private industry, and state, local and federal officials to develop this critical resource in an environmentally sound manner. The Western Governors therefore called for coordination and sharing of information that promotes the sound, efficient and environmentally responsible development of CBM. The Governors believe that many issues might be alleviated through sharing of information and active implementation of best management practices across the states and the private sector. The Governors called for the use of the Enlibra principles in addressing CBM conflicts. (See Appendix B). Based on the presentations and the facilitated discussion at a breakout session during the WGA and Council on Environmental Quality Environmental Summit on the West II, held in Salt Lake City in April 2002, a set of consensus recommendations were developed that WGA later incorporated into a policy resolution on CBM. [1]

With this guidance, the WGA sought funding to engage the CBM industry, all levels of government, and other stakeholders to build a Handbook of Best Management Practices (BMPs). The US Environmental Protection Agency (EPA), the William and Flora Hewlett Foundation, and the US Department of the Interior, Bureau of Land Management (BLM) provided the funding to bring together a diverse group of stakeholders with an interest in CBM to guide the development of the Handbook (the WGA Coal Bed Methane Advisory Committee). The members of the Committee are listed in Appendix C.

B. Purpose and Assumptions

The purpose of this Handbook is to share and encourage the use of best practices that will promote the sound, efficient, and environmentally appropriate development of coal bed methane

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[1] Western Governors' Association Policy Resolution 02-27 (June 2002). The WGA resolution also states that "Western Governors believe that state and federal government should work with the private sector and academia to determine the best way to pool existing natural gas research and data that may aid in the development of improved techniques and to identify what issues require further research. Establishing a central database for critical CBM research should be considered." The WGA CBM Advisory Committee heard a briefing on the Wyoming CBM Clearinghouse maintained by the University of Wyoming's William D. Ruckelshaus Institute and the School of Environment and Natural Resources. http://www.cbmclearinghouse.info/. The clearinghouse is a centralized Internet-based clearinghouse for textual, tabular, photographic, and spatially-referenced information pertaining to CBM resource development and related management issues in Wyoming. The ultimate goal of the CBM Clearinghouse is to create and maintain a single, up-to-date, and easy-to-use entry point for accessing data and information on all aspects of CBM-related issues in Wyoming. The WGA CBM Advisory Committee believes the CBM Clearinghouse at the University of Wyoming is a model that should be considered in the development of a central database for CBM across the region and that it might also be an appropriate location to co host the Best Practices Handbook.

resources. The document provides site specific considerations, tools, and practices that, when appropriately applied, encourage excellence in environmentally sound energy resource development in concert with economic realities. The audience for the Handbook is diverse, and includes operators, agencies, surface owners, mineral owners, and other land users.

It is hoped that by applying BMPs, we will reduce conflicts, encourage environmental stewardship, and provide for efficient resource development. Adoption of these practices may require more work early in CBM development; however, the expected benefits are reduced environmental and socio-economic impacts; improved relations between gas well operators and surface owners; less time invested in surface use negotiations and litigation; and increased economic efficiencies. Other benefits and opportunities arising from CBM development such as job creation, tax revenue, royalty payments, and physical improvements for landowners (e.g., installation of cattle guards, fence replacement, on-going road maintenance, etc.) were also noted.

CBM development can have both positive and negative effects on the environment and communities. Development will produce jobs and revenues and contribute to meeting the Nation's energy needs, but should not compromise a healthy environment. Adopting BMPs in CBM development promotes a healthy environment that also produces jobs, revenues, and benefits to society.

Key assumptions in constructing the Handbook are:

- It is not a regulatory document.[2]
- Use of one or more practices is voluntary.
- BMPs do not replace local, state, federal and Tribal requirements.
- The Handbook is a "living" document that can be updated and amended to reflect the results of monitoring implementation of BMPs as well as advances in technology that may lead to new BMPs.
- The Handbook is intended to be broadly applicable unless otherwise noted. Differences among geologic basins create different challenges, and some or all of the BMPs documented herein may or may not be suitable for some locations. The decision to adopt a particular BMP may be site specific.

C. Context

Coal bed methane (CBM) (natural gas derived from coal beds) is a valuable energy resource in the Western United States. The natural gas that results from CBM development is an important element of the national goal of a secure supply of energy.[3] CBM production has progressed rapidly from a few dozen wells in the 1980s to approximately 22,000 wells in the Rocky Mountain Region in 2003.

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[2] The Handbook is not intended to have legal consequences or to bind any participants or persons affected.

[3] Coal Bed Methane Development in the Intermountain West, Natural Resources Law Center, University of Colorado, p.1, July 2002. (add web addresses to footnotes)

CBM development entails the construction of new roads, pipelines, compressors, water impoundments, and other facilities and can change landscapes. The development of the CBM resources may cover extensive areas, and under certain geologic conditions requires the extraction of large amounts of water from coal seams before the gas can be collected. Planned and likely CBM development in the West (primarily New Mexico, Wyoming, Colorado, Montana, Utah, and North Dakota) is a matter of local, regional, and national interest.

Widely differing viewpoints on CBM development have polarized some of the communities where the development is occurring. Such difficulties may be exacerbated by split estate ownership, where the mineral resource is owned by one entity and the surface by another. Concerns that have provided impetus for development of the handbook include:

- Management of produced water
- Groundwater quantity and quality
- Surface water quality and quantity
- Visual impacts
- Effects of noise
- Impacts to air quality
- Fish, wildlife and wildlife habitat
- Changes to soil and vegetation
- Social and economic impacts on communities and states
- Surface owner issues, especially in split estate cases

Handbook topics reflect these issues by providing BMPs in the categories of planning, water, landowner relations, and infrastructure.

D. Best Management Practices (How Used, Definitions, Application, Suitability)

For purposes of this Handbook, a Best Management Practice (BMP) is a proven way of conducting CBM operations which eliminates or minimizes adverse impacts from CBM development to public health and the environment, land owners, and to natural resources; enhances the value of natural and land owner resources; and reduces conflict.

BMPs are dynamic, and intended to promote excellence in how CBM is developed while still maintaining efficiency, cost effectiveness and competitiveness in producing the CBM resource. Adopting BMPs can increase efficiency and/or effectiveness for producers and at times has actually lowered costs (which are necessary considerations for operators). BMPs in the context of this project are not minimum standards (i.e., baseline under statutes or rules) or "down the hole" engineering practices.

II. PLANNING

Introduction

Planning is essential to successful CBM development and provides significant environmental and economic benefits. Careful, objective CBM project planning that includes various interests in the planning process is essential to effectively address aspects of a project that could otherwise become challenging issues. Careful and inclusive planning provides opportunity for thorough implementation of development practices that will enhance environmental protection.

A. Development Plans

BMP: Prepare a development plan. A development plan identifies a specific area (e.g., leasehold or watershed) in which development is expected. It provides a comprehensive description of geographic and cultural characteristics of the area, along with the anticipated nature of CBM development. Planning needs may differ by basin and be applied in different ways, depending on such things as subsurface geology, terrain, and land use. As a result, development plans could be complex or simple depending upon the circumstances, and will need to be customized to fit the individual conditions within a CBM basin or project.

Discussion: The following items could be included in the plan:

- Identification of land ownership
- Identification of existing and expected surface uses (including number and spacing of wells, roads, pipelines, water disposal facilitaties, treatment facilities, compression facilities, gathering and transmission pipelines, etc.)
- Identification of existing and required infrastructure and utility corridors
- Map of the area with location of existing facilities (i.e., wells) and potential (optimal) locations for future facilities, including production facilities (wellsites, processing units, etc.), roads, flowlines, and utility corridors. The map can also include geographic features such as streams and other water bodies, and special ecosystems.
- Development strategy that addresses environmental and economic objectives
- Identification of opportunities to reduce adverse impacts
- Identification of regulatory requirements
- Water management plan (strategy) - See Section A in Chapter III
- Identification of strategies for interim and final reclamation of disturbed areas and for final abandonment
- Conflict resolution procedures
- Strategy for establishing a baseline and monitoring (surface and subsurface water quality, wildlife and fish, air quality, etc.) and steps to apply monitoring information to existing and future actions
- Steps to address public safety through participation with local emergency preparedness committees

The development plan is based on existing and expected surface use, geologic, engineering, and scientific information about the natural gas reservoir and the environment of the area. Collection

of baseline information on such things as surface uses and surface owner preferences, pre-development noise levels, air quality, surface and groundwater quality, and biological resources can assist in identifying critical data or information gaps. Thorough knowledge about existing information and information gaps is necessary for developing an effective monitoring strategy, while thoroughly understanding the commitment of resources that will be necessary to acquire baseline information.

Oil and gas operators, government agencies, elected officials, affected surface and mineral owners, community representatives, and other concerned citizens working together to plan for anticipated field development can produce development plans that reflect environmental responsibility, respect for the land, efficient energy resource development, and productive relationships among diverse interests while at the same time permitting extraction of CBM.

A development plan established during the early stages of anticipated development provides the framework for avoiding or minimizing surface disturbance, protecting other resources, mitigating environmental impacts, and alleviating or addressing concerns of landowners and communities. It serves as a tool for comprehensive, coordinated planning to guide strategic, development. It can also assist in meeting the requirements of the Clean Water Act, the Clean Air Act, the Endangered Species Act, and other applicable federal, state, and local laws.

B. Permitting

In order for a project to be approved and go forward, certain agreements and permits, along with valid oil and gas leases, need to be in place. It is imperative that an oil or gas company contact mineral and surface owners and permitting agencies early to minimize timeframe conflicts. Appendix D provides an example of a regulatory checklist (for Wyoming), including regulatory requirements of federal, tribal, state, and local jurisdictions.

BMP: Master Drilling Plan for Multiple Applications for Permit to Drill (Multiple APD Package): Master Drilling Plans involve multiple wells (two or more) in an identified area, and contain drilling and surface use procedures common to all wells in the package, and are used in the federal APD review and approval process.

Discussion: The Master Drilling Plan can encompass a planned cluster of wells and facilities in close proximity, sometimes referred to as a "pod", or can be prepared for multiple in-fill wells scattered throughout a field. Each well under a Master Drilling Plan must have a survey plat and an APD that references the Master Drilling Plan. Information contained in the Master Drilling Plan does not have to be repeated within the individual APDs that it covers. Differences in the drilling or surface use programs that may be unique to individual wells are clearly addressed and identified within the Master Drilling Plan and/or individual well APDs.

Multiple APD packages are suitable for areas that have known surface and subsurface characteristics that give an operator the technical certainty to propose multiple wells. Areas suitable for this practice typically have similar reservoir characteristics, subsurface geology, and producing zones.

A multiple APD package under a Master Drilling Plan within a specified area achieves more efficient permitting, provides for more effective protection of other resources, and is a valuable tool for future planning. It can result in reduced paperwork and cost for both the operator and permitting agency, improved development planning, and more comprehensive environmental review, especially with respect to identifying and analyzing cumulative effects.

C. Community and County Services

BMP: Proactive and early engagement with local governmental entities.

Discussion: Proactive and early engagement with local governmental entities is beneficial in gaining an understanding of applicable regulations as well as in establishing positive and important working relationships. State and local government rules and regulations may also have a significant impact on CBM development. Local issues related to air quality, noise abatement, traffic flow, etc. can be better addressed by early coordination with local government.

D. Other Resources

Proposed BMP: Review existing publications regarding information on CBM development.

Discussion: An overview document on coalbed methane is ALL Consulting's "Coal Bed Methane Primer", a US DOE Fossil Energy project addressing education and public relations for public meetings, coordination between developers and local stakeholders, and general orientation on this subject. The Primer is in the final revision stage but a draft can be found on http://www.all-llc.com/CBM/.

III. WATER

Introduction

Coal bed methane development can present complex water-related challenges as well as possible beneficial uses. Extracting CBM generally requires the withdrawal of groundwater to release the pressure within a coal seam thus allowing the methane gas to begin flowing. Because CBM production generally begins by withdrawing a high volume of water, this has raised significant issues, including the potential wasting of valued water resources; concerns about groundwater, specifically on the effects of lowering the water table, potential impacts on residential and agricultural wells, and possible contamination, and; produced water disposal or management, including downstream impacts on both water quantity and quality. In some cases, landowners are very interested in putting the water to beneficial use when appropriate and consider it an asset. Adoption of BMPs can help address these and other water related concerns, and potentially reduce conflicts with landowners, conservationists, anglers, and other land and water users, but must be customized to deal with a variety of considerations that vary by basin or project

Water Best Management Practices

A. Water Management Planning

BMP 1: Prepare a Water Management Plan. Water management plans must be specifically designed for the basin or project in which they are being used, and are typically applicable to surface discharge of CBM produced water. As part of preparation for the plan:

- **Consult surface owner(s)** (as well as downstream stakeholders and affected water users) early in the planning process and throughout the development of Water Management Plans (WMPs).

- **Understanding and Application of Laws, Regulations, and Policy.** Develop an understanding of the laws, regulations and policies that would apply to the development of the operation. These will vary by State and locality. For example, when considering underground injection, ensure that the components of the Underground Injection Control Program can be met whether the EPA is administering the program or an individual state has received primacy for the program. Certain design and operating requirements should be researched through the appropriate jurisdictional agency (either the EPA or the primacy state) to ensure a complete application for approval is submitted. (See the sample Regulatory Compliance Checklist in Appendix D).

- **Consider Planning on a Watershed Basis.** Watershed Planning in the CBM context is an emerging practice that involves coordinating with other companies, surface owners and permitting agencies within, and potentially downstream, of the watershed, and entails baseline monitoring and an assessment of quantity, quality, water rights, and downstream

landowners concerns. The State of Wyoming is in the process of developing a CBM watershed planning program which may eventually serve as a model for other locales.

- **Mitigation of Surface Water Discharge Effects**, i.e., headcuts, road crossing, impoundments, channel stability.

Discussion: Initial planning before a project begins and refinement of the water management variables in that plan during development of a CBM prospect are critical to the overall success of a project. To design an effective system for managing produced water, it is necessary to know the following: i) likely quality of produced water; ii) estimated water production rates at various phases of the project; iii) evaluation of the hydrologic relationship between ground and surface water; iv) nature and existing use of any proposed receiving waters, including seasonal flow rates flora, fauna and soils associated with surface discharge; v) current or proposed permitting and regulatory restrictions; and vi) the institutional framework governing groundwater within the project area. With the need to maintain flexibility and provide for contingencies, the initial plan may change as data is collected from actual operations.

BMP 2: Produced Water Options. Take the following factors into consideration when evaluating options for managing CBM produced water:

- Landowner preference and concerns
- Quantity and quality of water to be discharged
- Quality of the receiving water standards
- Environmental/ecological effects from surface discharge
- Downstream concerns
- Economic feasibility/cost effectiveness
- Beneficial use possibilities
- Proximity to streams/ponds/reservoirs/wetlands/lakes
- Proximity to clinker/scoria and gravel deposits
- Proximity to springs
- Long-term impacts to the environment
- Protection of groundwater

Discussion: There are a variety of options for managing produced water, including reinjection (either for disposal, or for storage and later retrieval), and surface discharge, which involves release of produced CBM water onto the earth's surface, either to surface water or surface soil. One way to group alternatives for surface discharge is into the following three general categories: i) discharge to surface water, ii) discharge to land surface with possible runoff, and iii) discharge to land surface with possible infiltration into subsurface aquifers and surface water.

Decisions and use of tools for managing produced water will also involve regulatory and technical considerations including geology, and economic and engineering factors as well as surface owner needs. Evaluation of water management options and produced water use alternatives will require planning, data gathering, and analysis. Planning should include a detailed understanding of water classifications, standards, water rights, and any other compacts or laws that may exist. Where CBM development is proposed adjacent to or near important fisheries habitat, hydrologic mapping and analysis, and other related research is essential to gain

a better understanding of ground and surface water interactions, and potential impacts of CBM development on water quality and quantity.

BMP 3: Understanding the Capacity of the Receiving Aquifer. When considering underground injection, ensure that the capacity of the receiving aquifer is adequate to handle the anticipated volume of water to be injected.

Discussion: Underground injection is a management option for produced water in some, but not all, places. It can be used for storage and retrieval (of high quality water), or for disposal. Injection is generally viewed as the emplacement of water into a zone or formation that is capable of receiving and storing water. Several important factors can influence the feasibility of injection including availability of an injection zone, depth of the injection zone, injection pressures, needs for transportation of water, the rate of injection, the quality of water being injected, the quality of water in the receiving formation, and the ultimate storage capacity of the receiving formation(s).

B. Beneficial Use

BMP: Information for landowners. When the landowner is interested in possibly using CBM produced water, provide information about options for beneficial use and about potential problems and liability.[4]

Discussion: Water extracted during CBM development presents challenges but may also offer opportunities for beneficial use of produced water. (See Appendix E for Beneficial Use Alternatives for CBM Produced Water.) However, the quality of the water extracted influences how this water can be managed and whether it can be used for beneficial purposes. The quality of water that is produced will vary from basin to basin, within a particular basin, and over the lifetime of a CBM well.[5] There are a variety of technologies existing and evolving that may be applied to improve the quality of the water and consequently the options available for use. (See Appendix F for a discussion of Water Treatment Technologies.)

Decisions about beneficial use also need to factor in the reality that the availability of CBM produced water is not sustained over time. The volume of produced water is typically very high for a short time after production starts and then drops off rapidly. For this reason, long-term reliance on produced water should not be encouraged. This also applies to the use of the produced water to enhance wildlife habitat. The Rocky Mountain west is characterized by semi-arid to arid conditions. It is not realistic to think that ecological conditions that are related to areas with significantly more water can be sustained in these arid areas.

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[4] It is very important that beneficial use of produced water is consistent and meets the requirements of water rights within a given state. In addition, the need to obtain a NPDES (National Pollutant Discharge Elimination System) permit may be necessary in some cases. These are important considerations that requires the ultimate user of the produced water to research all legal and regulatory aspects thoroughly in order to make informed decisions about beneficially using CBM produced water.

[5] As an example of the differences between basins, CBM produced water quality in the Colorado River drainage area of Utah is very poor compared to some other places, and consequently the only currently approved surface water options are: a) no discharge, or b) reverse osmosis type treatment.

C. Water Quality:

Land application of produced water can be of benefit to the surface owners in some cases, but also has the potential to produce negative long-term impacts to soil physical and chemical properties if not properly managed. Water quality can be also be affected by the construction and maintenance of ponds, impoundments and infiltration systems. These are generally an excavation or diked area that is can be used for a variety of water management options, including treatment, storage, evaporation leakage, or disposal of liquids, storage prior to another water management option including injection or irrigation; or for beneficial use such as a fishpond, livestock and wildlife watering ponds or a recreational pond, and can vary from less than one acre in size to several acres. Non-infiltration impoundments are usually constructed in low permeable soils, to prevent or decrease raw water loss due to subsurface infiltration or percolation. (See Appendix G for a description of impoundment options.)[6]

BMP 1: Establishing a Baseline. As mentioned elsewhere, it is important to establish a baseline for ground and surface water quality in the area where development will occur, relying as much as possible on existing information.

BMP 2: Monitoring Data. Provide assistance to landowners who want monitoring data, either by providing the data, or directing them to the appropriate source such as a regulatory agency that maintains the information.[7]

BMP 3: Distance from Outcrops. When drilling near outcrops of coal formations, understand the hydrology of the basin to determine a sufficient distance for well placement to avoid contamination of water wells and methane seepage at the outcrop of coal formations.

BMP 4: Fracturing Fluids. Discontinue the use of diesel fuel in hydraulic fracturing fluids injected directly into formations which contain underground sources of drinking water (USDW).

Discussion: Water-based alternatives exist and from an environmental perspective, these water-based products are preferable compared to diesel fuel. The EPA signed an agreement in December 2003 with three major companies that provide approximately 95 percent of the hydraulic fracturing services performed in the United States. The agreement calls for the voluntary removal of diesel fuel from hydraulic fracturing fluids injected directly into formations which contain USDWs during hydraulic fracturing for CBM production. Included in the agreement are assurances from the companies that fluids used to replace diesel fuel will not endanger USDWs. The Memorandum of Understanding is available at http://www.epa.gov/safewater/uic.html.

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[6] It was noted by some CBM Advisory Committee members that the beneficial use of water is perceived as a positive by many in Wyoming's Powder River Basin.

[7] Individual NPDES permits dictate what type of monitoring will be required.

D. Protection of Wetland/Riparian Areas

BMP 1: Location of Non-Linear Features. To protect the biological and hydrologic features of riparian areas, woody draws, wetlands, and floodplains, locate all well pads, compressors, and other non-linear facilities to the maximum extent possible outside of these areas.

BMP 2: Crossings by Linear Features. Avoid crossings of wetland/riparian areas by linear features, such as pipelines, roads, and power lines to the extent practicable. Where crossings cannot be avoided, impacts can be minimized through use of the following measures and others that may be consistent with the Corps of Engineers nationwide permit program.[8]

- Developing site-specific mitigation plans during the permit approval process for all proposed disturbance to wetland/riparian areas
- Constructing crossings perpendicular to wetland/riparian areas
- For power lines, using the minimum number of poles necessary to cross the area
- Scheduling construction in wetland areas to minimize the duration of construction activity within the wetland, and, if possible, to concentrate such activity during dry conditions (that is, during late summer or fall), or when the ground is frozen during the winter
- Not depositing waste material below high water lines in riparian areas, flood plains, or in natural drainage ways
- Locating the lower edge of soil or other material stockpiles outside the active floodplain
- Locating drilling mud pits outside of riparian areas, wetlands, and floodplains, where practical
- Re-shaping disturbed channels to their approximate original configuration or other geomorphological configuration and ensuring they are properly stabilized
- Beginning reclamation of disturbed wetland/riparian areas as soon as possible after project activities are complete
- Conducting stream channel monitoring for erosion, degradation, and riparian health

Resources

Handbook on Coal Bed Methane Produced Water: Management and Beneficial Use Alternatives Prepared by: ALL Consulting, Tulsa, OK for the Ground Water Protection Research Foundation, U.S. Department of Energy, National Petroleum Technology Office, and Bureau of Land Management. ***[Insert web address]***

[8] See 33 CFR Parts 330.1-330.6 including Appendix A Part 330-Nationwide permits and conditions.

IV. LANDOWNER AND OPERATOR RELATIONS

Introduction

Positive relations between landowners and CBM operators are an important aspect of successful development of the resource. As development expands in the Western states, there is increased interaction between the public, the CBM service industry, and local communities. While communities and states receive revenue from CBM development, this interaction can become sensitive in some split estate situations (where the surface and minerals are owned by different entities). Development of a strong relationship between the operator and landowner early in the process allows the operator to tailor operations to complement the landowner's uses. Adoption of BMPs is often helpful in addressing interaction challenges related to a range of land owner issues, including: location of wells, pipelines roads and facilities to accommodate surface uses; reclamation; topsoil preservation; privacy; noise; compensation for surface occupancy; effects and beneficial use of produced water; impacts from infrastructure development;; livestock issues; potential loss of groundwater wells; and safety concerns. These practices, combined with open communications and respect for the land and the rights and values of the involved parties, can promote cooperative relationships as well as responsive and responsible CBM development. Use of best surface use management practices is good business.

Landowner and Operator Relations Best Management Practices

A. Communication and Notification

It is critically important for operators to develop a relationship early with the surface owner and surface occupant. This relationship should be based on both parties respecting and accommodating each other's property rights and interests, with open and consistent communication. Both parties should negotiate in good faith.[9]

On-site visits by the operator for the purposes of planning the development of the oil and gas resources are an important opportunity for coordination and cooperation with surface owners, permitting agencies and other affected parties. The onsite visit provides the opportunity for representatives of the affected entities to discuss and evaluate the proposed activities as well as alternatives for improved operations that consider the needs and rights of everyone. Onsite visits with different representatives can be conducted at different times. For instance, site visits with company representatives and the surface owner can occur when the well sites and access road are being considered and staked. Other site visits can occur after the well sites and access roads have been staked.

BMP 1: The operator and the landowner should each establish a single point of contact.

[9] Oil and Gas at Your Door? A Landowner's Guide to Oil and Gas Development "http://www.ogap.org contains useful information.

Issue that was discussed but upon which there was not agreement:

The CBM Advisory Committee discussed whether, how, when, and by whom surface owners might be notified about a CBM lease under their property, but the group did not reach agreement. The following BMP was proposed: "Provide the surface owner with a copy of the mineral lease or other publicly filed documents within 180 days of acquiring the lease either through purchase or assignment".

The perspective of some CBM Advisory Committee members was that surface owners need to know when the mineral estate under their property is leased in order to make informed decisions about management of the surface. They acknowledged that lease information is publicly available, but said it is extremely difficult for individual landowners to find and track the information. At one point in the discussion it was suggested that county governments might be enlisted to assist in notifying surface owners of leasehold ownership changes.

The perspective of others was that landowners have access to this information as public record and therefore do not need additional notification. Furthermore they expressed a concern that the proposed BMP could infringe on proprietary information that could affect the competitiveness of an operator. They also pointed to the emphasis elsewhere in the Handbook on early and frequent communication with landowners, which in their view precludes the need for the proposed BMP.

There was a sense in the group that this important issue merits further discussion, and that finding a satisfactory resolution would contribute substantially to improving landowner operator relations.

B. Plans, Agreements, and Bonds

BMP 1: Surface Use Agreements (SUAs), (sometimes also called Surface Owner Agreements, SOAs). Once an operator decides to undertake operations under a valid lease, immediately notify the landowner so there is adequate time to understand the proposed operations. This would include notice to the surface owner of record based upon the last known address, which is found in county records, and a minimum set of details about anticipated operations within the notice (e.g., tentative well, road, pipeline and facilities) and a request that the landowner provide input regarding locations which reduce adverse impacts of surface use. Thereafter, the operator and landowner should proceed in good faith to develop a mutually agreeable SUA.[10]

Discussion: Operators and landowners could benefit by negotiating a mutually agreeable SUA. The SUA should address all relevant concerns, including such items as compensation for use of

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[10] It was suggested by some that a Master Surface Use Agreement might also be employed where the development involves a large ranch or related tracts (i.e. joint ventures or associations) and contains drilling and surface use procedures common to all wells, and where there is agreement on well and facility locations (or a procedure for determining locations), minimum footprints, reclamation criteria, and surface use compensation prior to drilling individual wells. It is believed by some that where numerous wells are contemplated, such Master Surface Use Agreements could significantly speed up well drilling, virtually eliminate well by well negotiations, mitigate adverse surface impacts, insure good reclamation practices, and reduce operator/surface owner conflicts.

the surface, damage payments, and development plans that address facility and road locations, timing of operations, construction and reclamation requirements, water management, and access to the property. See the WGA CBM website for sample SUAs.

BMP 2: Water Well Mitigation Agreements. During CBM planning, operators should determine who has appropriated water wells within the vicinity of its proposed operations. Operators should determine whether their operations could impair the capability of these water wells and take appropriate actions to mitigate such impacts when CBM development is occurring within the same aquifer. A Water Well Mitigation Agreement should be offered to owners of wells and springs that could potentially be affected by CBM operations. Such an Agreement provides a method to determine operator responsibility for any damage to wells or springs and provides an opportunity to an owner of a well or spring affected by CBM operations to obtain repair, replacement or compensation by the operator. Surface owners and the operator should inventory existing, water wells prior to the commencement of operations, to have baseline data on the quantity and quality of the applicable wells. See the WGA CBM website for a sample Water Well Mitigation Agreement.

C. Dispute Resolution

BMP 1: Dispute Resolution Services. Alternative Dispute Resolution services (ADR) should be considered to resolve disputes. An ADR process such as mediation that encourages good communication and development of working relationships, and that allows parties to retain control over the ultimate solution would be preferable.

BMP 2: Payment Mechanisms. Unless otherwise mutually agreed, the costs should usually initially be covered 50% by the Operator and 50% by the surface owner. Costs and attorney's/mediator's fees may be allocated as part of an agreement.

Resources

A Model Agreement Approach to Resolving Conflicts over CBM in the Powder River Basin" (Institute for Environmental Conflict Resolution), (March 2003).
http://www.ecr.gov/s_publications.htm

Wyoming Split Estate Initiative – Petroleum Association of WY, WY Stock Growers Association, WY Farm Bureau Federation, and WY Wool Growers Association.
http://www.wysei.com

Wyoming Agriculture and Natural Resource Mediation Program. To receive additional information on the program, or to receive a list of available mediators, contact: Mediation Coordinator, WY Dept. of Agriculture, 2219 Carey Ave., Cheyenne, WY 82002, 307-777-7323, or the WY Agriculture Mediation Board, Department of Agricultural Economics, University of WY, P.O. Box 3354, Laramie, WY 82071-3354, 307-766-5133.

V. INFRASTRUCTURE

Introduction

CBM development can impact the environment by affecting soils, land use, wildlife, aesthetics, and surface drainages as construction of roads, utility corridors, compressors, wells, and other facilities occur. When properly managed, CBM development may also enhance the use and value of a landowner's property. BMPs for this infrastructure can complement local regulations, influence how development proceeds, and can determine what will be impacted and the extent of the impacts. The impact on communities, the landscape, habitat, and air can be minimized through careful practices and infrastructure design considerations. These practices and design considerations can minimize surface disturbances, view shed impacts, noise levels, emissions, and erosion. This in turn has a direct bearing on the quality of life of the communities and can affect the success of the development project.

Infrastructure Best Management Practices

Guiding principles for infrastructure best practice operational standards can be summarized as follows:

- Use the means of operation that minimize adverse impacts while still maintaining efficient and cost effective operations.
- The surface owner, as a vested stakeholder should be consulted early on decisions regarding siting for wells, roads and other facilities.
- In general, there needs to be a heightened awareness of habitat fragmentation in sensitive areas where there are high levels of biodiversity, or sensitive, and critical habitats.
- During development, landowners should be kept informed of the ongoing schedule of activities to prevent serious use conflicts, and operators should communicate with each other regarding land use activities that could result in conflict.

The following BMPs are suggested as means to minimize impact of operations. It should be noted that some of the BMPs in other sections of the document also relate to infrastructure.

A. Roads and Transportation

BMP 1: Minimizing Road Development. Where it is operationally feasible and safe, encourage the use of two-track roads into well locations. Suitable locations for two-track roads typically have the following features: low "average daily traffic" for wells being drilled, wells equipped with remote monitoring/telemetry, low maintenance traffic during production; flat to gently rolling country; stable soils; road use primarily during dry conditions.

BMP 2: Siting. Utilize existing roads to gas facilities to the maximum extent possible. Locate new roads in areas that will optimize year-round, all-weather access, and minimize surface disturbance and environmental impacts. Road location should be selected in consultation with the surface owner, and should consider future development plans.

BMP 3: Inclement Weather and Wet Ground Conditions. If using unimproved two-track roads, limit use during inclement weather and wet ground conditions when severe rutting and other resource impacts might occur.

BMP 4: Road Construction and Reclamation. Plan, maintain and construct all roads in conformance with road standards established by the local jurisdictional agency (i.e., BLM or the County). In select cases such as major access roads to the general development area or in individual circumstances, a higher standard of road is necessary.[11] Practices that can enhance reclamation include:

- Reclaim and revegetate all disturbed surface that will not be used for oil and gas operations in a manner that restores topsoil and minimizes erosion.
- Following well plugging and abandonment, the access road should be left in the condition prescribed by the surface owner. If complete reclamation is required, the access road should be recontoured back to the original contour, topsoil replaced, and revegetated so that the reclaimed areas blend with the surrounding land and revegetation establishes either the agricultural crop desired by the surface owner or, over time migrates toward the local native plant community.
- Use only certified and state inspected seed that is free of noxious weeds for reclamation/revegetation.

BMP 5: Bypass Routes. When feasible, heavy equipment and trucks should use bypass routes to avoid municipalities, schools, rural residential or other sensitive areas.

BMP 6: Service Industry Traffic. Enter into discussions with surface owners, local and other government agencies for road maintenance and traffic about potential problems and solutions related to increased CBM service industry traffic to ensure safety and minimize problems such as with dust, compaction, and debris.

B. Pipelines and Power Lines (Gas, Water, and Power)

BMP 1: Corridors. Use existing disturbance corridors whenever possible (ideally following access routes or existing pipeline routes).

BMP 2: Trenches. Locate all lines (i.e. gas and water disposal) in the same trenches (or immediately parallel to), and at the same time, if possible.

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[11] Consider guidelines such as the "Gold Book" (Surface Use Standards for Oil and Gas Exploration and Development, which is available at http://www.blm.gov/nhp/300/wo310/O&G/Ops/GoldBook.pdf), the BLM Road Standards Manual 9113 for designing roads, applicable county or state design criteria, or similar high quality engineering standards.

BMP 3: Equipment. Use ditch witches or wheel trenchers (versus back hoes) wherever practical for installation of buried lines.

C. Habitat and Species Protection.

The following measures help protect habitat and sensitive species:

BMP 1: Whenever practical, bury utilities, particularly in grouse habitat and in and near areas of sensitive species critical habitat such as prairie dog towns. Minimize the disturbance footprint by burying utilities along the road to the extent possible rather than cross-country.[12]

BMP 2: Aerial power line should be designed, and existing power poles should be modified if possible, to prevent or minimize raptor perching and mortalities.

BMP 3: Reclaim and revegetate all disturbed surfaces as soon as possible after completion of pipelines or well abandonment pursuant to regulations and surface owner preference. Use native plants from local seed sources whenever possible.

BMP 4: Long Term Production Pits. Long term production pits should be netted and fenced to prevent entry by birds, wildlife, and livestock, in accordance with applicable regulations.

BMP 5: Impacts to Environmentally Sensitive Areas. To the extent possible, minimize traffic and disturbance in and near wildlife habitat, wetlands, winter range, birthing and rutting areas, and other environmentally sensitive areas. Examples of ways to accomplish this objective are to minimize access and to use telemetry to monitor wells.

Resources

Avian Power Line Interaction Committee (APLIC). 1996. Suggested Practices for Raptor Protection on Power Lines: The State of the Art in 1996. Edison Electric Institute/Raptor Research Foundation Washington, D.C. [Include website]

D. Wells

BMP 1: Surface Disturbance Minimization. The use of alternative techniques, for example, directional drilling, drilling multiple wells from the same pad, commingling, recompletion, using existing well pads, are encouraged to minimize surface impacts if technically feasible and not economically prohibitive. .

BMP 2: Equipment Removal. Remove all equipment not necessary for well operations.

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[12] It has been shown through research that utility poles cause great disturbance in grouse leks and wintering populations because prairie grouse avoid vertical structures (i.e., will abandon the lek or area) regardless of raptor protection placed on poles.

BMP 3: Landowner Involvement in Siting Decisions. Contact the surface owner before staking access routes and well facility sites.[13]

BMP 4: Siting and Construction Considerations. Where feasible, site and construct wells with the following considerations:

- Locate well sites in stable, non-erosive soil areas, with grass or brush cover and on relatively level areas that minimize pad construction. Choose sites that avoid steep slopes, unstable soils, stream bottoms, wetlands, and floodplains.
- Where no code exists, locate facilities and roads away from occupied dwellings.
- Locate in visually acceptable areas (avoid dwelling view sheds) and paint facilities colors that blend in with the natural environment.
- Locate where safe access can be maintained year round.
- Avoid sensitive wildlife habitat and migration corridors. Consultation with the State wildlife agency can help determine areas to avoid.

BMP 5: Reclamation. As soon as reasonably possible after drilling is completed, conduct interim reclamation to reduce the drill site to the minimum area required for production operations and to restore the disturbed areas to their pre-disturbance condition, or better, pursuant to landowner preference. Interim reclamation should include the following:

- Recontour disturbed areas to be compatible with existing grades, including for agricultural purposes.
- Depending on landowner preferences, replace topsoil to at least the depth and quality which existed prior to disturbance for final reclamation of the site upon abandonment of the well.
- Revegetate disturbed areas using a seed mixture to match native vegetation.
- Remove all chemicals, equipment, materials, and waste not necessary for sustaining production from the well pad.
- Use only certified and state inspected seed that is free of noxious weeds for reclamation.

BMP 6: Multiple Seam Completions. In areas where multiple seam completions are conducted, development plans should account for increased water production and the necessary disposal/management options and variations in water quality in the coal seams.[14]

E. Central Gas Gathering Treatment, Compression, and Metering Facilities.

BMP 1: Route Identification and Description. Contact the surface owner before staking routes and facility sites.[15] This provides an opportunity for mutual agreement about proposed locations and reclamation. Off lease gathering and transmission pipelines can often be located in existing utility or transportation corridors.

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[13] See also the Landowner and Operator Relations Chapter.

[14] It was noted that multiple seam wells should be, and are most often, drilled from the same well site or utilizing multiple completions in the same well. In the Powder River Basin, multiple seam wells are routinely enclosed in the same small winterized box.

[15] See also the Landowner and Operator Relations Chapter.

BMP 2: Co-locating Water and Gas Gathering Lines and Roads. Locate roads and water and gas gathering lines in the same easement along a route agreed to with the surface owner. In general, for smaller tracts of land (160 acres or less) and tracts which may be later subdivided, roads and gathering lines should be located in designated utility easements or along property boundary lines to avoid splitting off unuseable tracts.

BMP 3: Right of Way Width and Line Depth. Minimize the width of gathering line rights-of-way. Bury the top of each gathering line below the surface[16], unless local rock outcrops and terrain prohibit such burial, and the exception is agreed to by the surface owner.

BMP 4: Reclamation. Each gathering line should be double ditched and topsoil should be restored in each disturbed location to at least the depth and quality that existed prior to such disturbance. Pipeline trenches should be compacted during back-filling. After installation, repair or other surface disturbance, the operator should promptly reclaim the surface, re-contouring to conform to existing grade, revegetating with a seed mixture specified by the surface owner, and filling of any settled areas with comparable quality topsoil. Use only certified and state inspected seed free of noxious weeds for reclamation.

BMP 5: Pipeline Agreements. Pipeline agreements should routinely permit the overlap of pipeline rights-of-way. .[17]

BMP 6: Roads. Use the same standards/criteria as noted above for constructing roads to metering and compressor sites.

Resources

Coal Bed Natural Gas Well Application for Permit to Drill and Plan of Development Preparation Guide. Bureau of Land Management. Buffalo Field Office. May 9, 2003. [Insert website]

F. Pests and Noxious Weeds

BMP 1: Integrated Pest Management. Discuss proposed pest and weed management plans with the surface owner and permitting agency as part of the planning process. Application of and use of herbicides for weed control must follow applicable local and state regulations. Approved permits must be obtained before implementing plans as required.

BMP 2: Mulch. Mulch used for reclamation should be certified weed free.

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[16] There were two suggestions regarding depth: One was to bury the top of each gathering line "48 inches "below the surface" and the other was "below plow depth".

[17] There were three alternate suggestions regarding the placement of subsequent pipelines. The suggestions were that they should be placed: a) within ten feet or less of existing pipelines, b) "as close as possible to" existing pipelines, or c) pursuant to industry standards for installation.

BMP 3: Education. Review weed educational material during pre-construction on-site meetings with operators, subcontractors, and landowners.

BMP 4: Revegetaton. Moist soils near wetlands, streams, lakes, or springs in the project area should be promptly revegetated if construction activities impact the vegetation in these areas. Revegetation should be designed to avoid the establishment of noxious weeds. As noted with reclamation, use only certified and state inspected seed that is free of noxious weeds in any revegetation operation.

BMP 5: Pests. Waste handling, construction practices, and operations should take into consideration pests such as mosquitoes (which can potentially transmit West Nile Virus – of significant concern for sage grouse and other wildlife as well as humans), rodents (which can potentially transmit hantavirus), flies, and other pests that can cause problems. It was pointed out that at this time (Spring 2004) there is no proven connection between CBM development and these pests.[18]

BMP 6: Vehicles/Heavy Equipment. Vehicles and machinery contaminated with soil can be sources of non-native noxious weed seed, which can seriously degrade native habitats. When moving vehicles and machinery from areas containing populations of noxious weeds, consider washing vehicles prior to entering CBM development areas.

BMP 7: Long-term weed infestation issues. It is important for companies to plan for the condition of the surface lands after holding ponds no longer hold water. It is likely that the ponds will have changed the soils and habitat characteristics of that immediate land and when water is no longer there, non-native weed infestation is very likely. Reclamation plans should include post-pond weed and soil restoration considerations.

G. Visual Impacts

BMP 1: Minimize Footprint and Use Existing Facilities. Minimize the footprint of well locations, access roads, and utilities, and use existing well pads where feasible. Avoid creating large cut and fill slopes, minimize clearing, taking into consideration state well spacing requirements.

BMP 2: Color Selection and Screening. Use vegetative and topographic screening when siting well and facility locations, avoid highwall cuts, and reclaim all portions of the location not needed for production facilities. All well facilities should be painted a color which allows the facilities to blend with the background, typically a vegetated background.

BMP 3: Ridgelines. Avoid locating wells, equipment, and facilities on highly visible ridgelines.

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[18] The University of Montana is entering the second year of a three year study on the affects of West Nile Virus on Sage-grouse populations.

H. Noise Abatement

BMP 1: Noise Levels. Where CBM operations generate noise that can impact established receptors (for example residences, churches, schools, established campgrounds, or sensitive wildlife) control of noise is good practice.[19] If low frequency noise becomes an issue then it should be addressed in consultation with those being affected.

BMP 2: Distance. Provide the appropriate distance between a CBM facility and an existing noise-sensitive receptor (residences, schools, medical facilities, sensitive wildlife habitat areas, and recreational areas). [20]

BMP 3: Features. Consider utilizing obstacles as a noise abatement measure.

Discussion: Noise can be reduced by construction of obstacles in the direct path from the noise source to a receiver. These obstacles can be tightly spaced wood fences (no gaps in the wood panels), engineered noise barriers, concrete fences, earth berms, structures, straw bale "zig-zag" design structures, or naturally occurring hills. Care must be taken even with a tightly spaced wood fence. Even a small opening between the individual slats on a fence can allow a pathway for noise to propagate through the opening. In fact, the noise can actually be enhanced through a small opening because the noise energy is channeled through the opening. To mitigate this problem, wood fences are generally constructed with two faces with the slats on one face overlapping the adjacent face.

BMP 4: Compressor and Pumpjack Equipment Noise Abatement. The following measures can help abate compressor and pumpjack equipment noise:

- Utilize compression equipment which reduce or alleviate noise (e.g., properly selected hospital grade mufflers matched to the noise reduction sought);
- Use design retrofits to reduce or alleviate noise associated with older compression equipment;
- Locate equipment to take advantage of surface topography to aid in noise abatement, etc.

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[19] Two versions of additional specific noise reduction guidance were suggested. Version one: In the absence of local ordinances or state laws, a general guideline of 55 dBA for outdoor residential, farms, and outdoor areas where people spend significant amounts of time can be considered as published by the U.S. Environmental Protection Agency entitled "Information On Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety". Version two: Noise should be mitigated to the satisfaction of the receptor. Noise in excess of 50 decibals measured 200 feet from the equipment or at a property line or an established receptor (for example residences, churches, schools, established campgrounds or sensitive wildlife) is normally unacceptable. For residential areas, the BLM has established a maximum standard of 48.6 dB(A)Leq at any structure. CBM wells, facilities, and equipment can often be cost effectively quieted below these maximum standards using "hospital grade" mufflers (which may be buried), sound panels (or hay bales), sound insulated buildings, and other methods.

[20] There were two alternative suggestions regarding appropriate distance. Version one: Provide the appropriate distance... to comply with an Ldn of 55 dBa. In otherwise quiet rural areas, even low level sound can be heard for long distances. Version two: Provide the appropriate distance...to minimize noise impacts. Prescribing a specific noise standard may conflict with local ordinances and state laws.

- Install high grade mufflers on the exhaust of compressor engines, wellsite, and facility engines to reduce the exhaust noise.[21]
- Consider the use of multi-blade fan configuration on the cooling fan.
- Electric power should be utilized when possible (rather than diesel).
- Use progressive cavity pumps or other quiet running artificial lift equipment in place of conventional pumpjacks/rocker arms to reduce noise and visual impacts.

Discussion: Noise abatement measures are applicable in areas where grouse are present (as well as in areas of human concern) because data indicate that grouse avoid large areas around noise sources. [Cite research – Note if we don't get the cite in time for publication then this discussion will be moved into the "future considerations" document]

I. Air Quality

BMP 1: Reduce Emissions. Operators should strive to reduce total emissions in CBM operations.

Discussion: EPA has joined with companies across all sectors of the natural gas industry to reduce methane emissions through a voluntary partnership known as the EPA Natural Gas STAR Program. (See the Natural Gas STAR web site, http://www.epa.gov/gasstar/index.htm for further information.) For larger internal combustion engine, lean burn technology is recommended. [22]

BMP 2: Particulates. Emissions of particulate matter from construction and road use can be minimized with various techniques such as the application of water, gravel, or other dust suppressants, with at least 50 percent control efficiency. Companies should contact the counties to ascertain the procedures to be followed on county roads, and should post and obey speed limits set by local authorities.

BMP 3: Air Quality Management/Coordination with Local Stakeholders. In some jurisdictions, city, county and regional air quality oversight entities are now being established in addition to the State and Federal air quality regulatory agencies to deal with possible exceedances of air quality standards. Operators should contact the appropriate regulatory agency to ensure compliance and coordination of air quality requirements. Other BMP examples include: establishment of cooperative boards to ensure air quality performance which meet local, regional, state and national requirements; increased monitoring resources due to the involvement of a wider body of participants; need for effective coordination to avoid conflicting efforts or duplicative performance requirements for CBM operators.

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[21] It was noted that mufflers can be buried to further reduce noise levels.

[22] Catalytic converters were discussed as a proven measure for helping to reduce air emissions by up to 95% from CBM operations, but various members of the group differed on the advisability of suggesting their use as a BMP at this time.

J. Public Safety Around CBM Infrastucture

BMP 1: Operational Awareness and Signs. Unless otherwise required by state or federal requirements, provide operational information and post necessary signs to minimize accidents. Post telephone number for emergencies.

BMP 2: Site Security. In consideration of the landowner's land use, and as necessary in high-risk areas, minimize entrance by unauthorized personnel through effective site security or barriers.[23]

BMP 3: Flare Fire Prevention. In CBM basins where cavitation is used as a completion technique (instead of hydraulic fracturing) flaring can be a safety and fire hazard. In addition to complying with local regulations regarding fire prevention, specific precautions should be taken to prevent fires including wetting down areas and ensuring adequate berming of flares. Flare pits used in cavitation should not be constructed adjacent to public roadways.

BMP 4: Coal Fires. In the San Juan Basin, dewatering of Fruitland Coals may contribute to coal fires burning at the outcrop. While control of such coal fires has proven to be extremely difficult, during dry periods, areas near underground coal fires should be monitored for grass and forest fires.

BMP 5: Education. Educate schools and communities about the dangers of going near CBM activities

BMP 6: Emergency Management Plans. Residents should be made aware of emergency procedures and be supplied with emergency phone numbers for fire departments and operators. Each operator should have an emergency management plan in place that is shared with state and local emergency management authorities.

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[23] On private lands, landowners often prefer to lock property boundary gates which will increase site security. On public lands, limitation of non-gas field access on gas field roads will increase security and promote damage avoidance while mitigating adverse impacts on wildlife use and habitat.

COAL BED METHANE
BEST MANAGEMENT PRACTICES HANDBOOK

PROPOSED BMPS, ALTERNATIVE LANGUAGE AND ADDITIONAL INFORMATION FOR FUTURE CONSIDERATION (4/12/04)

These are proposed Best Management Practices (BMPs), alternative language for portions of the WGA Coal Bed Methane BMP Handbook, and other comments and additional ideas/sources of information that were suggested too late in the process for full group consideration. **They have not been discussed and were not agreed to by the full CBM Advisory Committee.** However, it is hoped that they will be reviewed and considered in the future.

INTRODUCTION AND OVERVIEW

Introduction

Proposed Alternative Language for the Introduction, Second Paragraph:
Current Language: "With this guidance, the WGA sought funding to engage the CBM industry, all levels of government, and other stakeholders to build a Handbook of Best Management Practices (BMPs)."
Proposed Language: "With this guidance, the WGA sought funding to engage members of the CBM industry..."

Purpose and Assumptions

Comment on Existing Handbook Language, Purpose and Assumptions, Second Paragraph: Omit the following sentence "Other benefits and opportunities arising from CBM development such as job creation, tax revenue, royalty payments, and physical improvements for landowners (e.g., installation of cattle guards, fence replacement, on-going road maintenance, etc.) were also noted." because it sounds like CBM industry self promotion rather than a BMP.

Proposed Alternative Language, Purpose and Assumptions, Third Paragraph, Second Sentence:
Existing Language: "Development will produce jobs and revenues and contribute to meeting the Nation's energy needs, but should not compromise a healthy environment."
Proposed Language "Development will produce reliable, affordable clean burning energy, jobs and revenues and contribute to meeting the Nation's energy needs, but should not compromise a healthy environment".

Best Management Practices: How Used, Definitions, Applications, and Suitability

Comment on Existing Handbook Language, BMP Definitions, First Sentence: The word "proven" seems a bit strong.

I. PLANNING

Development Plans

Comment on Existing Handbook Language in Development Plans, Discussion Bullet Regarding Baseline Monitoring: The Handbook discusses "Strategies for establishing a baseline and monitoring." The concept of "baseline monitoring" is a red herring. Some baseline monitoring programs are established by law (for example in other extractive industry regulations or certain environmental protection requirements) and mandate a minimum of one year's worth of monitoring data. Such a mandate may not exist in oil and gas law at the state or local government level. When it is required, many professionals cannot agree on what is adequate baseline monitoring. In the future, WGA might want to consider: a) substituting a term such as "scientific monitoring sufficient to understand pre-CBM activity conditions" for establishing a baseline or collecting baseline information, b) clarifying additional descriptions or criteria for baseline monitoring, or c) eliminating this part of the discussion entirely.

Proposed Alternative Language in Development Plans, Discussion Bullet Regarding Maps:
Existing Language: "The map can also include geographic features such as streams and other water bodies, and special ecosystems."
Proposed Language: "The map can also include geographic features such as streams and other water bodies, and special sensitive areas".

Proposed Alternative Language In Development Plans Discussion Bullet Regarding Baseline Information:
Existing Language: "Collection of baseline information on such things as surface uses and surface owner preferences, pre-development noise levels, air quality, surface and groundwater quality, and biological resources can assist in identifying critical data or information gaps."
Proposed Language: "Collection of baseline information on such things as surface uses and surface owner preferences, pre-development noise levels in sensitive areas, air quality, surface and groundwater quality where the groundwater is a used resource, and biological resources can assist in identifying critical data or information gaps."

Comment on Existing Handbook Language in Development Plan Discussion: Delete following sentence: "Oil and gas operators, government agencies, elected officials, affected surface and mineral owners, community representatives, and other concerned citizens working together to plan for anticipated field development can produce development plans that reflect environmental responsibility, respect for the land, efficient

energy resource development, and productive relationships among diverse interests while at the same time permitting extraction of CBM."

Proposed Additions for the Planning Chapter

Proposed BPM: ***Surface Use Standards.*** For each operational area, each gas well operator should develop and constantly improve its own BMPs.

Discussion: For each operational area gas well operators should strive to proactively implement good surface use practices adapted to the area and the requirements of its operations. For a comprehensive example of such practices see: Williams i) Standard Surface Use Plan, ii) Ten Point Plan for Drilling; and iii) Standard and Site Specific Mitigation Measures used in Garfield County, Colorado.

II. WATER

Introduction

Proposed Alternative Language in the Water Introduction:
Existing Language: "Because CBM production generally begins by withdrawing a high volume of water, this has raised significant issues, including the potential wasting of valued water resources; concerns about groundwater, specifically on the effects of lowering the water table, potential impacts on residential and agricultural wells, and possible contamination, and; produced water disposal or management, including downstream impacts on both water quantity and quality."
Proposed Language: "Because CBM production generally begins by withdrawing a high volume of water, this has raised significant issues, including the potential wasting of valued water resources; concerns about groundwater, specifically on the effects on residential and agricultural wells, and; produced water disposal or management, including downstream impacts on both water quantity and quality."

Water Management Planning

Proposed Alternative Language in the Water Management Planning Discussion, Point i):
Existing Language: "likely quality of produced water"
Proposed Language: "estimated quality of produced water"

Produced Water Options:

Proposed Alternative Language for Produced Water Option, Factors for Consideration Bullets:
Existing Language: "Long-term impacts to the environment"
Proposed Language: "Long-term effects to the environment"

Proposed Additions to the Water Chapter

Proposed BMP (somewhere in the Water Chapter or in the Infrastructure Chapter): ***Storm water management practices.*** Control runoff and minimize sediment production from disturbed areas (roads, pads, pipelines, etc.) due to storm runoff.

Proposed BMP: ***Gas Companies Have Primary Responsibility for Solving Problems Caused by Produced Water From CBM Wells.***

Discussion: Without the production of water from CBM wells the water problems discussed below would not exist. The apparent profitability of CBM development is driving a boom in gas well drilling. It is the responsibility of the parties who are profiting from and pressing for this rapid development to promptly solve and pay for the problems caused by that rapid development. In keeping with Enlibra Principle Seven, (see Appendix B in the Handbook) gas companies should not increase their profits by reaping the benefits of CBM development while imposing its adverse consequences and the costs of solutions on other stakeholders.

Proposed BMP: ***Water Injection.*** If satisfactory solutions to surface water disposal and water quality issues cannot be implemented in a timely way in a field or portion thereof, water should be injected into appropriate geologic reservoirs.

Discussion: At present, stakeholders are searching for effective solutions to water issues caused by current levels of produced water discharge from CBM wells in Wyoming. At the same time rapid drilling continues. Variations in conditions, particularly water quality and soil types may well result in identification of different Best Practices for specific areas. However, it is clear that the prompt identification and implementation of actual best practice solutions to these water issues is a pressing priority.

Proposed Additional Language: The role of State Engineers and applicable state water law should be included in the discussion of water management. In many western states the State Engineer's Office is the agency responsible for determining "beneficial use", and that role should be understood in any discussion of beneficial use related to CBM produced water.

III. LANDOWNER RELATIONS

Introduction

Proposed Alternative Language in the Landowner Relations Introduction:
Existing Language: "Adoption of BMPs is often helpful in addressing interaction challenges related to a range of land owner issues, including: ....compensation for surface occupancy..."
Proposed Language: "Adoption of BMPs...compensation for damages..."

Communication and Notification:

Proposed Alternative Language for the Communication and Notification Section:
Existing Language: "This relationship should be based on both parties respecting and accommodating each other's property rights and interests, with open and consistent communication".
Proposed Language: "This relationship should be based on all parties respecting and accommodating each other's property rights and interests, with open and consistent communication."

Comment on Existing Handbook Language in the Communication and Notification Section: The comments on encouraging early and frequent communication between operator and surface owner are sound practices. Early and frequent communication as necessary will help alleviate problems on split estate when both parties act in good faith. Heading B. Plans, Agreements and Bonds – BMP 1, is a good example of what open and respectful communication between surface and mineral operators could accomplish. Also, the discussion of this BMP references a sample Surface Use Agreement available on the WGA website. A model SUA could actually be a BMP in and of itself, providing that the conditions in such an agreement do not violate regulatory permitting and other legal requirements. WGA should be cautious to avoid BMPs that mandate specific operator responsibilities on split estate given the extensive legal precedent that currently accrues to mineral owners and operators.

Comment on Existing Handbook Language in Communication and Notification Section: Delete the discussion of notification.

Plans Agreements and Bonds

Comment on Existing Handbook Language in the Plans, Agreements and Bonds Introduction: Add property values and wildlife impacts to the sentence that reads: Adoption of BMPs is often helpful in addressing interaction challenges related to a range of land owner issues, including: location of wells…"

Comment on the Footnote regarding Master Surface Use Agreements: Delete the footnote and show a list of sites where to obtain such information.

Comments on Surface Use Agreements BMP:
First Comment: Use the term "Surface Owner Agreement" instead of "Surface Use Agreement".

Second Comment: Change the sentence that now reads: "This would include notice to the surface owner of record…" to "This would include a personal visit with the surface owner to discuss the preliminary plan. If the surface owner is not available for an initial face-to-face meeting, then the operator should send a notice to the surface owner of record …"

Third Comment: Change the sentence in the discussion that now reads: "The SUA should address all relevant concerns, including such items as compensation for use of the surface, damage payments, and development plans that address facility and road locations, timing of operations, construction and reclamation requirements, water management, and access to the property." to read "The SOA should address all relevant concerns, including such items as compensation for damages and development plans that address facility and road locations, timing of operations, construction and reclamation requirements, and water management."

Comments on the Water Well Mitigation Agreement BMP:

First Comment: Delete "when CBM development is occurring within the same aquifer" from the sentence that currently reads: "Operators should determine whether their operations could impair the capability of these water wells and take appropriate actions to mitigate such impacts when CBM development is occurring within the same aquifer".

Second Comment: Change the sentence that now reads "A Water Well Mitigation Agreement should be offered to owners of wells and springs that could potentially be affected by CBM operations." to "A Water Well Mitigation Agreement should be offered to appropriated owners of wells and springs..."

Third Comment: Add the following language to the Water Well Mitigation Agreement BMP: "The operator should promptly and voluntarily remedy any damage to water sources caused by its operations and any doubts should be resolved in favor of the landowner, at least where water is derived from or above the coal formation from which gas and water is being produced."

Proposed Additions for the Landowner and Operator Relations Chapter

Proposed BMP: ***Surface Owner Selection Of Reasonable Facility Locations*****:** The surface owner is best able to select wellsites and facility locations together with road and pipeline routes which will minimize adverse impacts on existing and proposed surface uses, and to preserve the value of the surface, (Third Restatement of the Law of Property, Servitudes §4.8 (2000)). Landowners should be informed of the reasonable needs and alternatives available to the gas well operator so that a reasonable location may be selected within the drilling window for required operations. The fact that CBM fields are extensive and that any locations in the drilling window will generally result in similar production of gas allows surface use considerations to control the siting of wells, roads, pipelines, and other facilities.

Proposed BMP: ***Landowner Indemnification Provisions.*** SUAs Should Contain Landowner Indemnification Provisions.

Discussion: A typical indemnification provision might read: "The gas well operator hereby covenants and agrees to indemnify, defend and hold the Surface Owner harmless against any and all loss, damage, claims, injury, demands and suits which Surface Owner

may suffer as a result of or related to the gas well operator's operations on the Subject Property, excluding any portion of such loss, damage or claim caused by the negligence or willful misconduct of the Surface Owner." The indemnity provision simply assures the surface owner that the gas well operator will be responsible for loss and damage resulting from gas well operations.

Proposed BMP: SUAs should specifically identify the well, road, pipeline and other agreed upon facilities on a detailed attached plat. Buried pipelines should be well and permanently marked. Within sixty days after completion of construction, the operator should provide to the surface owner and record an "as built" survey so that successors, the parties themselves, and surveyors and planners can accurately locate the facilities and understand the extent of the agreed use.

Discussion: SUAs which generally reference the area to be used and permit multiple unspecified wells, road use or pipelines, or do not utilize the minimum reasonable footprint, constitute over reaching by the gas well operator and, as an unreasonable use, constitute a trespass. *Gerrity v. Magness, 946P.2d 913 (Colo. 1997).*

IV. INFRASTRUCTURE

Introduction

Comment on Existing Handbook Language: In the Infrastructure Chapter Introduction delete the sentence that reads: "When properly managed, CBM development may also enhance the use and value of a landowner's property" because it seems like self promotion by the CBM industry.

Suggested as Additional Guiding Principles for Infrastructure Best Practice Operational Standards:

- Within identified drilling windows and on leases, the landowner should select reasonable sites wells, roads and other facilities which accommodate existing and anticipated surface uses to the maximum extent possible.

- Tight control of contractors and agents to insure that best surface use practices are followed, agreements are complied with, and good surface owner relations are maintained.

- In general, well and facility footprints should be minimized to the maximum extent possible consistent with safe operating practices.

- In general, reclamation, including recontouring, topsoil replacement, and revegetation, should occur as early as possible with interim reclamation of disturbed areas not actually used for production operations being reclaimed upon completion of construction. See e.g. Colorado Oil and Gas Conservation Commission Rule 1003.

Roads and Transportation

Proposed BMP: ***Anterial Roads.*** Existing ranch roads should generally be utilized as anterial roads to access two track well roads. Such roads should be adequately crowned, graveled, and drained by the operator to bear up under gas field traffic under adverse weather conditions, and the operator should maintain such roads in good and passable condition for the life of the field.

Proposed BMP: ***Limiting Road Use.*** Particularly on public lands in areas of sensitive wildlife habitat, birthing areas or winter range, etc., roads can be fenced and gated and closed to non-gas well personnel. Oil and gas traffic should be kept to a minimum and remote sensing and control systems utilized. Private lands are normally required to be gated and locked to preclude access to the general public. Reasonable landowner requests for gating and locking private lands should be complied with. Gas field traffic should stay on the roads at all times. On private lands, all road easements should be non-exclusive and limited to access to defined oil and gas facilities. The surface owner, rather than the gas company, has the right to grant access to the surface owner's property, including access roads.

Proposed Alternate Language for the Road Siting BMP in the Current Handbook.
Current Language: Utilize and improve existing roads to gas field requirements to the maximum extent possible. Locate roads in areas that will optimize year-round, all-weather access, and minimize surface disturbance and environmental impacts. Road location should be selected in consultation with the surface owner, and should consider future development plans.
Proposed Language: Locate roads where landowners want them, where they will serve both gas field and surface owner needs, and in areas that will optimize year-round, all-weather access, and minimize surface disturbance and environmental impacts. Road location should be reasonably selected by the surface owner.

Proposed Additional Language for the Service Industry Traffic BMP in the Current Handbook: It is the operator's responsibility to ensure service company compliance with surface use agreements and permit requirements.

Pipelines and Power Lines (Gas, Water, and Power)

Proposed Alternate Language for the Corridors BMP in the Current Handbook.
Current Language: Use existing disturbance corridors whenever possible (ideally following access routes or existing pipeline routes).
Proposed Language: Use existing disturbance corridors and utility corridors to the maximum extent possible (ideally following utility easements, utility access corridors or existing pipeline routes). Rights-of-way should overlap with pipelines placed as close as possible to other utilities in the corridor. On relatively level ground, gathering lines can often be placed within ten feet of each other (in Houston, major pipelines are sometimes placed in corridors within one foot of each other).

Proposed Discussion: Gathering pipelines can have a significant unnecessary adverse impact on the usefulness and value of the surface. If gathering lines crisscross each other, they may define significant areas of non-use and divide the real property in small pieces which are unuseable for many valued purposes, such as residential or commercial development and siting of agricultural structures.

Proposed Alternate Language for the Trenches BMP:
Current Language: Locate all lines (i.e. gas and water disposal) in the same trenches (or immediately parallel to), and at the same time, if possible.
Proposed Language: Locate all lines (i.e. gas and water disposal) in the same corridors (or immediately parallel to), and at the same time, if possible.

Proposed BMP: ***Location.*** Outside of existing utility corridors, pipelines should be located along routes selected by the surface owner which reasonably accomplish the purpose of the gas well operator. Pipelines located in road rights-of-way or under roads or within ten feet of property boundaries will minimize adverse surface impacts. To the maximum extent possible, pipelines should be buried at least 48 inches deep to get below plow depth and reduce the risk of inadvertent excavation.

Proposed BMP: ***Safety.*** Pipeline markers should include one-call notices and contact numbers. Surface owners and others grading and excavating on the property should make use of the one-call system to locate pipelines prior to any excavation in the area of the pipeline. Steel pipelines should be properly fitted with cathodic protection to reduce the risk of corrosion and related gas leakage.

Proposed BMP: ***Reclamation.*** Pipeline should be double ditched with soil compaction and restoration of topsoil to the surface. Subsidence should be anticipated and mitigated using compaction and mounding of topsoil. If the ground settles over the trench, fill should be topsoil of like quality and free of noxious weeds. Foreign soil (from other properties) should be introduced onto the property only with prior written permission of the surface owner. The refilled trench should be contoured to conform to the terrain and revegetated utilizing a seed mixture agreed to by the surface owner and, as necessary, mulch and fertilizer. On agricultural lands, rocks of two inches or more in diameter should be "picked" by the operator at least three times over the ensuing two years to reduce the damage to agricultural equipment working over the excavated pipeline.

<u>Habitat and Species Protection</u>

Proposed BMP: ***Survey areas for rare plants before building well pads.*** At a minimum operators should review BLM and Forest Service sensitive species lists prior to siting infrastructure (e.g., well pads), and avoid locations where sensitive species are found. G1 and G3 plants represent the groups of most imperiled species as ranked by the NatureService and the Heritage Program network

Wells

Proposed BMP: ***Footprint.*** The well footprint should be as small as possible. Use of a small well or facility footprint avoids trespass by unreasonable and unnecessary use.

Proposed alternative language to precede the bullets under Siting and Construction Considerations for Wells
Current Language: Where feasible, site and construct wells with the following considerations:
Proposed Language: Within the applicable drilling window, the Landowner should be permitted to select a reasonable well location which accommodates surface use. To the extent possible, construct wells as follows:

Proposed Additional Consideration under Siting and Construction Considerations for Wells:

- Choose and construct sites with reclamation in mind; i.e., if possible, avoid cutting trees and other long lived, slow growing vegetation, minimize cut and fill, and store topsoil and preserve it from erosion.

- Production facilities and equipment should be consolidated in as small an area as possible, a separate facilities location may be unnecessary or quite small for shallow CBM wells and is often 1,500 square feet or less for conventional wells. Production facilities should be bermed and fenced to preclude domestic and wild animals from entering the area. The wellhead is often fenced using a ten by ten pipe fence or, for Powder River CBM wells, may be winterized and enclosed is a steel container.

- Where no code exists, locate facilities and roads away from occupied dwellings. Add: (in addition to dwellings) agricultural and commercial buildings, schools, water sources, and other significant areas of surface use.

- Locate well sites no closer than one-half mile from homes and other domestic structures.

- Utilize closed-loop drilling systems to achieve pitless drilling and minimize truck traffic and water usage.

Proposed Alternative Language for the Reclamation BMP under Wells:
Current Language: ***Reclamation.*** As soon as reasonably possible after drilling is completed, conduct interim reclamation to reduce the drill site to the minimum area required for production operations and to restore the disturbed areas to their pre-disturbance condition, or better, pursuant to landowner preference. Interim reclamation should include the following:

- Recontour disturbed areas to be compatible with existing grades, including for agricultural purposes.

- Depending on landowner preferences, replace topsoil to at least the depth and quality which existed prior to disturbance for final reclamation of the site upon abandonment of the well.

- Revegetate disturbed areas using a seed mixture to match native vegetation.

- Remove all chemicals, equipment, materials, and waste not necessary for sustaining production from the well pad.

- Use only certified and state inspected seed that is free of noxious weeds for reclamation.

Proposed Language (Read in context of the proposed BMPs that follow below): ***Interim Reclamation.*** As soon as reasonably possible after drilling is completed, conduct interim reclamation to reduce the drill site to the minimum area required for production operations and to restore the disturbed areas to their pre-disturbance condition, or better. Interim reclamation should include the following:

- Remove all chemicals, foreign substances, pit liners, contaminated soil and trash, together with all equipment which is not required to sustain production from the well.

- Fill and compact any pits.

- Recontour disturbed areas to be compatible with existing grades, including for agricultural and irrigation purposes.

- Replace topsoil on the reclaimed area to at least the depth and quality which existed prior to disturbance .

- Revegetate the reclaimed area using a weed free seed mixture selected by the surface owner to establish the desired crop or match native vegetation. Use only certified and state inspected seed that is free of noxious weeds for reclamation.

- Remove all chemicals, equipment, materials, and waste not necessary for sustaining production from the well pad.

Proposed BMP: ***Final Reclamation:*** Plug and abandon the well in accordance with regulatory requirements and good and safe operating practices. Promptly remove all equipment to below plow depth and promptly reclaim the entire well pad and any other disturbed areas in accordance with the BMP above.

Proposed BMP: ***Equipment Removal.*** Remove all equipment not necessary for well operations.

Proposed BMP: ***Centralized Well Sites.*** Centralized well sites, in certain circumstances, can reduce capital and operating costs and at the same time reduce adverse surface impacts, including the well site footrprint, roads and pipelines. For example, the Colorado Oil and Gas Conservation Commission has determined that centralized well sites accomplish all of these savings with respect to drilling to the Williams Fork Formation in Mesa and Garfield Counties, Colorado. See COGCC website. However, centralized well sites should be expected to be impractical in shallow coalbeds until shallow, long reach directional drilling technology is proven. Some companies are working to develop the required techniques, which some expect to lower costs and improve production; but it will likely take some time.

Central Gas Gathering, Treatment, Compression, and Metering Facilities

Proposed BMP: ***Water Gathering Systems.*** Where produced water is not discharged or injected at the wellsite, particularly for typically closely spaced CBM wells, water should be gathered using water gathering pipelines co-located with gas gathering lines. Such a water gathering system is often less expensive over the life of the field than water hauling by truck, and avoids the significant road damage and community disruption that results from constant heavy truck traffic often necessary to move large volumes of CBM water by truck.

Proposed BMP: ***Gas Gathering Systems.*** Low pressure gas gathering systems constructed utilizing centralized compression and treating facilities should be used. CBM normally requires low bottom hole pressures to dewater and to flow at an economical rate from the CBM well. Without such low pressure, little or no CBN gas from the coal formation can be recovered. Centralizing compressor facilities efficiently increase the gas pressure from gathering line inlet pressure (perhaps 50 psig) up to long distance transmission line pressure (often greater than 1000 psig). Centralized compression, as opposed to a compressor at every well, will normally save capital and operating costs, dramatically reduce adverse surface impacts (i.e., noise and unnecessary use of more land) and reduce system down time while achieving low bottom hold pressures at wells connected to the system. Centralized compressors can normally be quieted more cost effectively (on a per mmbtu basis) than small wellsite compressors.

Proposed BMP: ***Centralized Treatment and Processing.*** Centralized treatment (removal of impurities) and processing (removal and sale of natural gas liquids or helium) should be used. CBM often requires treating to remove CO2, nitrogen, or other impurities, and CBM infrequently may contain sufficient NGLs to warrant processing. With respect to generally low volume CBN wells, centralized facilities will normally save capital and operating costs, dramatically reduce adverse surface impacts, and reduce system downtime. Centralized treatment and processing facilities are often placed on property purchased by the facility operator and are normally subject to county and state regulatory and land use processes.

Pests and Noxious Weeds

Proposed Additional Language for the Integrated Pest Management BMP: Each operator should have a pest and weed control procedure, and should be fully responsible for pest and weed control problems which result from or are aggregated by its operations. Control contractors should be supervised to ensure that control measures are effectively implemented, and at the optimum time.

Proposed Additional Language for the Revegetation BMP: Revegetation of disturbed areas not required for production should occur promptly following the completion of pipeline, road, well, and facility construction. This practice reduces erosion and establishes vegetation to hold topsoil. As compared to final reclamation, interim reclamation and revegetation provides a 30 to 50 year head start on plant growth, allows reestablishment of surface use, and normally ensures that a large portion of the reclamation will be completed by a responsible operator. (Toward the end of their productive life, gas wells may be transferred to "stripper" operators who may not adequately reclaim well and facilities sites.)

Visual Impacts

Proposed Additional Language for the Minimize Footprint BMP: Consolidate equipment in a compact area which may often be effectively screened by placement on the cut side of the pad. Excessive or unnecessary use of the surface constitutes trespass.

Noise Abatement

Proposed Additional Measure to Help Abate Compressor and Pumpjack Equipment Noise: Enclose compressors in sound insulated buildings with adequate ventilation to permit doors to be closed in the summer months.

For Possible Inclusion in a Future Handbook Version as Additional Research Data Becomes Available: Noise abatement measures may be applicable in areas where grouse are present (as well as in areas of human concern) because anecdotal information indicate that grouse avoid large areas around noise sources.

V. EMERGING TECHNOLOGIES

The technologies and practices described in this section offer potential, but have not yet been tested sufficiently or utilized broadly and successfully enough to be characterized as best management practices. They may, however, become BMPs in the future.

Microhole Drilling Technology: Microhole drilling technology allows the drilling of wells using smaller diameter drill holes than are generally used for oil and gas wells. A hole diameter of 2-3/8 inch is characteristic. The technology involves coiled tubing, which spools from the drilling unit into the drill hole. The relatively small and light

drilling unit can be hauled with a light truck. Accordingly, microhole drilling offers the potential of decreased drilling costs as well as restricting disturbed environments to a smaller area during drilling. Collateral benefits include reduced impacts due to lighter equipment moving on access roads. Current investigations are focusing on drilling to relatively shallow formations (less than approximately 5,000 ft depth), however DOE considers deeper drilling to be achievable.

APPENDIX A

ACRONYMS

ADR – Alternative Dispute Resolution

APD – Application for Permit to Drill

BLM – Bureau of Land Management

BMP – Best Management Practice

CBM – Coal Bed Methane

EPA – Environmental Protection Agency

NEPA – National Environmental Policy Act

NPDES – National Pollution Discharge Elimination System

RMP – Resource Management Plan

SOA – Surface Owner Agreement

SOP Agreement – Standard Operating Practices Agreement

SUA - Surface Use Agreement

SN – Sundry Notice

USDW – Underground Source of Drinking Water

USFS - United States Forest Service

USF&WS - United States Fish & Wildlife Service

WMP – Water Management Plan

APPENDIX B

ENLIBRA PRINCIPLES

WGA uses a set of principles to guide its work on complex environmental and natural resource issues. Based on successful problem solving experiences, the Enlibra principles were articulated and endorsed by the western governors to serve as a guide to policy development and decision-making in the West. Enlibra is a hybrid word with Latin roots created to mean balance and stewardship. Enlibra is based upon the following eight interdependent principles:

One: National Standards, Neighborhood Solutions - Assign Responsibilities at the Right Level

Two: Collaboration, Not Polarization - Use Collaborative Processes to Break Down Barriers and Find Solutions

Three: Reward Results, Not Programs - Move to a Performance-Based System

Four: Science For Facts, Process for Priorities - Separate Subjective Choices from Objective Data Gathering

Five: Markets Before Mandates - Pursue Economic Incentives Whenever Appropriate

Six: Change a Heart, Change a Nation - Environmental Understanding is Crucial

Seven: Recognition of Benefits and Costs - Make Sure All Decisions Affecting Infrastructure, Development and Environment are Fully Informed

Eight: Solutions Transcend Political Boundaries - Use Appropriate Geographic boundaries for Environmental Problems. [1]

[1] "Principles for Environmental Management in the West," WGA policy resolution 02-07 (June 2002).

APPENDIX C

WESTERN GOVERNOR'S ASSOCIATION COAL BED METHANE
CBM ADVISORY COMMITTEE MEMBERS

The CBM Best Practices Handbook represents a working collaboration between a number of individuals from federal, state, tribal, and local government. The Western Governors also consulted with and utilized input from a broader group of interested stakeholders and experts. The following individuals were participants in this process and receive tremendous thanks from WGA for lending their time and expertise.

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APPENDIX D

REGULATORY COMPLIANCE CHECKLIST - WYOMING EXAMPLE

Federal, State, and County Permits, Approvals, and Authorizing Actions - Wyoming Example

Agency	Permit, Approval or Action	Authority
U.S. Forest Service (USFS)	Decision Record for Proposed Action. Evaluate environmental impacts of Proposed Action	National Environmental Policy Act of 1969 (42 U.S.C. 4321 et seq.) Council on Environmental Quality, 40 CFR 1501, 1502
	Approval of Plan of Development for surface use of well pad	FSM 1950
	Concurrence with BLM's APD approval process on USFS administered land	FSM 1500
	Special Use Permit for access road ROW, road decommissioning, and pipeline	Forest Service Handbook (FSH) 1509.11
	Special Use Permit to utility company for installation and operation of powerline	Federal Register Notice 5-22-95
	Antiquities and cultural resource permits on USFS-administered land	Antiquities Act of 1906, as amended (16 U.S.C. 431-433); Archaeological Resources Protection Act of 1979, as amended (16 U.S.C. Sections 470aa-470ll); Preservation of American Antiquities, as amended (43 CFR 3)
Bureau of Land Management (BLM)	Decision Record for Proposed Action. Evaluate environmental impacts of Proposed Action	National Environmental Policy Act of 1969 (42 U.S.C. 4321 et seq.) Council on Environmental Quality, 40 CFR 1501, 1502
	Permit to drill, deepen, or plug back on BLM-managed land or minerals (APD process)	Mineral Leasing Act of 1920, as amended (30 U.S.C. 181 et seq.) Requirements for Operating Rights Owners and Operators, as amended (43 CFR 3162)

Agency	Permit, Approval or Action	Authority
	Rights-of-way grants and temporary use permits for pipelines and central tank battery on BLM-managed land	Mineral Leasing Act of 1920, as amended (30 U.S.C 185); 43 CFR 3180
	Rights-of-way grants for access roads on BLM-managed land	FLPMA (43 U.S.C. 1761-1771); 43 CFR 2800
	Authorization for flaring and venting of natural gas on BLM-managed land or minerals	Mineral Leasing Act of 1920, as amended (30 U.S.C. 181 et seq.); Requirements for Operating Rights Owners and Operators, as amended (43 CFR 3162)
	Plugging and abandonment of a well on BLM-managed land or minerals	Mineral Leasing Act of 1920, as amended (30 U.S.C. 181 et seq.); Requirements for Operating Rights Owners and Operators, as amended (43 CFR 3162)
	Antiquities and cultural resource permits on BLM-managed land	Antiquities Act of 1906 (16 U.S.C. Section 431-433); Archaeological Resources Public Protection Act of 1979 (16 U.S.C. Sections 470aa-47011); 43 CFR 3
	Approval to dispose of produced water on BLM-managed land	Mineral Leasing Act of 1920 (30 U.S.C. 181 et seq.); 43 CFR 3164; Onshore Oil and Gas Order No. 7
	Use only BLM Approved Formulations of Herbicides on BLM lands. Ensure that a Pesticide Use Proposal is submitted and approved by the proper BLM authority. Ensure that a Pesticide Application Record is completed within 24 hours after the completion of the herbicide application on BLM lands and submitted to the proper BLM Office.	Requirements by the BLM Vegetation Treatment on BLM Lands in the Thirteen Western Station Final Environmental Impact Statement 1991 and BLM Manual 9011 Chemical Pest Control, BLM Handbook H-9011-1 Chemical Pest Control, and BLM Manual 9015 Integrated Weed Management
Bureau of Indian Affairs (BIA) and/or Tribe	Approval of Utilization - Provide for efficient and timely development and production of tribal oil and gas leases	Indian Minerals Leasing Act of May 11, 1938, 25 U.S.C. 396a-396q, 25 CFR, Part 211. Act of March 3, 1909, 25 U.S.C. 396, 25 CFR, Part 212. Indian Mineral Development Act of December 22, 1982, 25 U.S.C. 21-02-2108, 25 CFR, Part 225

Agency	Permit, Approval or Action	Authority
	Rights of Way - Grant rights-of-way and issue temporary permits	Act of March 3, 1901, c.832 ss4.31.Stat.1084. Also 209DM8 Secretaries Order 3150 and 3177, as amended, 10 BIAM, bulletin 13, as amended, and Albuquerque Area Addendum Release 9401
	Archaeological Clearance - Issue antiquities or archaeological resource permits to remove or excavate archaeological resources on land administered by BIA	Antiquities Act of 1906, 16 USC Secs. 431-433; Archaeological Resources Protection Act of 1979 (16 USC Secs. 470a-47011), 43 CFR, Parts 3 and 7; National Historic Preservation Act, Section 106 and 36 CFR Part 800
	Air emissions inventory data - Accumulating emissions data	Clean Air Act
U.S. Army Corps of Engineers (COE)	Section 404 permits and coordination regarding placement of dredged or fill material in area waters and adjacent wetlands	Section 404 of the Clean Water Act of 1972, as amended (33 U.S.C. 1344); EPA-administered Permit Programs: The National Pollutant Discharge Elimination System (NPDES), as amended (40 CFR 122); state program requirements (40 CFR 123); Section 404(b)(1) Guidelines for Specific Disposal Sites for Dredged or Filled Material, as amended (40 CFR 230)
U.S. Fish and Wildlife Service (USFWS)	Coordination, consultation, and impact review on federally listed threatened and endangered (T&E) species	Fish and Wildlife Coordination Act (16 U.S.C. 661-666c), Section 7 of the Endangered Species Act of 1973, as amended (16 U.S.C. 1536); Bald Eagle Protection Act (16 U.S.C. 668-668dd)
	Migratory bird impact coordination	Migratory Bird Treaty Act (16 U.S.C. 704)
U.S. Department of Transportation (DOT)	Control pipeline maintenance and operation	Transportation of Natural and Other Gas by Pipeline, Annual Reports, Incident Reports, and Safety Related Condition Reports, as amended (49 CFR 191); Transportation of Natural

Agency	Permit, Approval or Action	Authority
		and Other Gases by Pipeline: Minimum Safety Standards, as amended (49 CFR 192)
U.S. Environmental Protection Agency (EPA)	Spill Prevention Control and Countermeasure Plans (SPCCPs)	40 CFR 112
	Regulation of hazardous waste treatment, storage, and/or disposal	Resource Conservation and Recovery Act (42 U.S.C. Section 6901)
	Produced-Water Disposal - Issue permit to allow for underground injection of produced water	Safe Drinking Water Act (42 U.S.C. 300F-300-9), 40 CFR Parts 144 and 147
Wyoming Department of Environmental Quality - Water Quality Division (WDEQ-WQD)	Permits to construct settling ponds and waste water treatment systems, including groundwater injection and disposal wells	Wyoming Environmental Quality Act, Article 3, Water Quality, as amended (W.S. 35-11-301 through 35-11-311)
	Regulate disposal of drilling fluids from abandoned reserve pits *[Should be under WY Oil & Gas]*	Wyoming Environmental Quality Act, Article 3, Water Quality, as amended (W.S. 35-11-301 through 35-11-311)
	NPDES permits for discharging produced water and stormwater runoff if greater than five acres of disturbance	WDEQ-WQD Rules and Regulations, Chapter 18; Wyoming Environmental Quality Act, Article 3, Water Quality, as amended (W.S. 35-11-301 through 35-11-311); Section 405 of the Federal Water Pollution Control Act (Clean Water Act) (codified at 33 U.S.C. 1345); EPA-administered Permit Programs: NPDES, as amended (40 CFR 122); State Program Requirements (40 CFR 123); EPA Water Program Procedures for Decision-making, as amended (40 CFR 124)
	Approval for discharge of hydrostatic test water *[This takes authorization under a general discharge permit]*	Wyoming Environmental Quality Act, Article 3, Water Quality, as amended (W.S. 35-11-301 through 35-11-311) .
Wyoming Department of Environmental Quality - Air Quality Division (WDEQ-AQD)	Permits to construct and permits to operate	Clean Air Act, as amended (42 U.S.C. 7401 et seq.); Wyoming Environmental Quality Act, Article 2, Air Quality, as amended (W.S.

Agency	Permit, Approval or Action	Authority
		35-11-201 through 35-11-212)
Wyoming Department of Environmental Quality - Land Quality Division (WDEQ-LQD)	Mine permits, mine impoundments, and drill hole plugging on state lands	Wyoming Environmental Quality Act, Article 4, Land Quality, as amended (W.S. 35-11-401 through 35-11-437)
Wyoming Department of Environmental Quality - Solid Waste Division (WDEQ-SWD)	Construction fill permits and industrial waste facility permits for solid waste disposal during construction and operations	Wyoming Environmental Quality Act, Article 5, Solid Waste Management, as amended (W.S. 35-11-501 through 35-11-520)
Wyoming Department of Transportation (WDOT)	Permits for oversize, overlength, and overweight loads	Chapters 17 and 20 of the Wyoming Highway Department Rules and Regulations
	Access permits to state highways	Chapter 13 of the Wyoming Highway Department Rules and Regulations
Wyoming Board of Land Commissioners/ Land and Farm Loan Office	Approval of oil and gas leases, ROWs for long-term or permanent off-lease/off-unit roads and pipelines, temporary use permits, and developments on state lands	Public Utilities, W.S. 37-1-101 et seq.
Wyoming Oil and Gas Conservation Commission (WOGCC)	Permit to drill, deepen, or plug back (APD process)	WOGCC Regulations, Chapter 3, Operational and Drilling Rules, Section 2 Location of Wells
	Permit to use earthen pit (reserve pits)	WOGCC Regulations, Chapter 4, Environmental Rules, Including Underground Injection Control Program Rules for Enhanced Recovery and Disposal Projects, Section 1, Pollution and Surface Damage (Forms 14A and 14B)
	Authorization for flaring or venting of gas	WOGCC Regulations, Chapter 3, Operational and Drilling Rules, Section 45 Authorization for Flaring or Venting of gas

Agency	Permit, Approval or Action	Authority
	Permit for Class II underground injection wells	Underground Injection Control Program: Criteria and Standards, as amended (40 CFR 146); state Underground Injection Control Programs, State-administered program - Class II Wells, as amended (40 C.F. R. 147.2551)
	Well plugging and abandonment	WOGCC Regulations, Chapter 3, Section 14, Reporting (Form 4); Section 15, Plugging of Wells, Stratigraphic Tests, Core, or Other Exploratory Holes (Form 4)
	Change in depletion plans	Wyoming Oil and Gas Act, as amended (Form W.S. 30-5-110)
Wyoming State Engineer's Office (WSEO)	Permits to appropriate groundwater (use, storage, wells, dewatering)	W.S. 41-3-901 through 41-3-938, as amended (Form U.W. 5)
	Permits to construct dams and reservoirs	W.S. 41-3-301 et seq., as amended (Forms SW3, SW4)
Wyoming State Historic Preservation Office (SHPO)	Cultural resource protection, programmatic agreements, consultation	Section 106 of National Historic Preservation Act of 1966, as amended (16 U.S.C. 470 et seq.) and Advisory Council Regulations on the Protection of Historic and Cultural Properties, as amended (36 CFR 800)
County (representative)	Construction/use permits	County Code and Zoning Resolution
	Conditional use permits	County Code and Zoning Resolution
	Road use agreements/oversize trip permits	County Code
	County road crossing/access permits	County Code/Engineering Department
	Small wastewater permits	County Health Department
	Hazardous material recordation and storage	County Code
	Zone changes	Zoning Resolution
	Filing Fees	County Code
	Noxious weed control	County Code

APPENDIX E

BENEFICIAL USE ALTERNATIVES FOR CBM PRODUCED WATER

Produced water quality, applicable regulations, and cost will generally dictate potential beneficial use of produced water. In some cases, produced water can be treated to make it suitable for a particular use, and treatment technologies are discussed in the next section. However, in accordance with 40 CFR, Part 435, produced water must be put to some use for livestock, wildlife, or agriculture. Otherwise, it is not to be discharged to surface waters of the Nation.

Agricultural Uses

The water provided by CBM discharge is a temporary and potentially valuable resource for agriculture, particularly in arid regions. CBM produced water has the potential for beneficial use in agricultural livestock and irrigation applications, depending on the quality. Livestock benefits have been realized with increased cattle density, increased weight gain in cattle, and subsequent improvement in range use when water is made available in otherwise dry areas. New water sources may also increase aquatic habitat and provide new fisheries. However, water law and compact requirements vary between states, so a full understanding of water issues is critical.

Alternative 1 - Stock Watering

The layout of many CBM projects is particularly conducive to stock watering because CBM wells are spread out on 80 acre spacing, or greater. Stock watering may be handled in several ways, including discharge to reservoirs and stream drainages, or discharge to small containment vessels, such as tire tanks. In either case, overflow of water from the containment ponds or tanks can provide water to livestock over a distance. Water impounded at the head of a drainage, if allowed to overflow from a small tank or reservoir, distributes water over a larger linear distance, potentially up to several miles. The result is an improved distribution of the herd, and ultimately an improved utilization of the grazing lease or ranch. Loss of the water in this scenario is largely a function of infiltration through the streambed and consumption by plant species along the banks, rather than direct consumption by livestock and wildlife.

The overflow of water into streams constitutes a discharge to surface waters thus to discharge the water as described would in most cases require a NPDES permit. There is also the potential to impact soils by allowing the water to run along the surface, depending on the water quality and soil types.

Alternative 2 - Irrigation

CBM produced water can be used for irrigation purposes when water quality, soil type, crop type and irrigation method are conducive for irrigation. The appropriateness of irrigation with CBM water is dependent on the site specific conditions (water quality,

soils, vegetation, etc.) and the proposed management practices (application rates, soil amendments, treatment, etc.).

Industrial Uses

Other water management options for CBM produced water include the supply of CBM water to other industries for use in operational activities. A variety of existing industries could benefit from this water supply including: coal mines, animal feeding operations, cooling tower water for various industrial applications, car wash facilities, commercial fisheries, enhanced oil recovery, and fire protection. Industrial applications which may be less commonly considered but would still have the potential for the use of CBM produced water include: sod farming, bottled drinking water, brewery water, and solution mining of minerals. Each of the existing industries and emerging industrial applications would use produced water of varying quantities and quality.

Alternative 1 - Coal Mine Use

Coal mining in the United States is generally at or near the land surface. Mining related activities that require water include: dust suppression, slurry activities, and post mining restoration efforts.

Alternative 2 - Animal Feeding Operations

CBM produced water could be supplied to Animal Feeding Operations (AFOs) and Concentrated Animal Feeding Operations (CAFOs) for livestock watering and the management of animal wastes. Livestock watering applications in a CAFO would be similar to that previously discussed in the Agricultural Use. In addition to livestock watering at CAFOs, produced water could be used to assist in waste management activities. The EPA, as defined in 40 CFR 122.23, Appendix B, regulates NPDES permitted discharges from CAFO's for animal waste.

Alternative 3 - Cooling Tower Water

Numerous industrial activities and chemical plants use water as a cooling agent. Towers are a common means of removing heat from cooling water that has been heated through thermal exchange. Cold water enters the plant's heat exchanger that causes a thermal exchange of heat from within the plant to the water in the cooling loop; this water is then sent to the cooling tower where it flows over fill surfaces. As the water flows over the fill surfaces, air is passed through the tower either by natural flow or by electric fans, cooling the water by contact with the air. Once the water is cooled, it is recycled through the system; make-up water is usually added due to losses from evaporation. High quality CBM produced water can be used as make-up water in a cooling tower system. The produced water would need to be low TDS water because mineralization generally leads to clogging of the cooling system.

Alternative 4 - Field and Car Wash Facilities

Construction activities and other land disturbing activities are a concern because vehicles accessing land with noxious plants can cause them to spread. The problems associated with spreading noxious weeds include making site reclamation more difficult, as well as impacts to ecosystems, farmland and grazing land. One way to reduce the spread of

noxious weeds is to wash vehicles and equipment before and after entering these areas. The construction of field equipment wash facilities and rural car washes supplied with produced water reduces the potential for distribution of noxious weeds by vehicles and equipment. These temporary wash facilities constructed near CBM development could be supplied with produced water. The field wash facilities are temporary and used to clean vehicles and equipment entering and leaving construction sites, recreational off road vehicles, farm and ranch equipment, and oil and gas equipment. Many state and federal agencies (for instance USFS, BLM) recommend these facilities as part of their BMPs for controlling the spread of noxious weeds.

Alternative 5 - Enhanced Oil Recovery

Another management option of CBM produced water is to inject the water into a secondary or enhanced recovery well into conventional oil producing horizons. Primary recovery of oil is driven by the natural energy of the reservoir and can be supplemented by pumping. When primary recovery ends, secondary recovery begins and may be followed by enhanced recovery. Secondary and enhanced recovery is the process of injecting a fluid into a reservoir creating a waterflood that displaces the oil causing it to flow to the producing well (Collins and Carroll, 1987). Water is the fluid most commonly used in secondary and enhanced recovery of oil in non-CBM fields; CBM produced water could, therefore, be of beneficial use in secondary and enhanced oil recovery.

Alternative 6 - Fisheries

Commercial fisheries in the western United States could also benefit from available CBM produced water supplies. These fisheries have to obtain water rights to divert water into their operational ponds for surface waters; therefore, CBM produced water could be used in place of diverted surface water or groundwater. Produced water could also be used during dry summer months or droughts to supply water when traditional surface supplies have been drained or are dry.

Alternative 7 - Fire Protection

In municipal areas, fire hydrants and sprinkler systems are supplied with drinking quality water from municipal supply systems. In areas where CBM development is near a municipality, produced water could be used to supply both fire hydrants and sprinkler systems. Fighting fires does not require high quality water and could benefit from the use of produced water by not depleting drinking water supplies. Wildfires in the western United States are becoming larger and more dangerous during the current drought conditions that exist in many states. The normal supplies of water that are used for fighting fires are also being depleted by the drought. The supplies of CBM produced water stored in impoundments or stored in tanks at disposal wells could provide an accessible option for fighting fires in remote areas in states such as Colorado, Wyoming, New Mexico, Montana, and Utah.

Alternative 8 - Other Industrial Uses

Aside from those uses listed above which are either currently in practice or have been researched to show potential as a use for produced water, other options which have been

considered, but not analyzed in detail. Some of these potential uses include options that have the potential to use large quantities of produced water. The potential industrial uses which are being mentioned here include: sod farming, solution mining for minerals, bottled drinking water, and brewery water.

Domestic and Municipal Water Use

Produced water associated with CBM development can be a valuable commodity, especially for arid regions in the western United States. CBM produced water is of greater value when it meets drinking water standards, or is near drinking water quality, because of the broad variety of uses high quality water provides. This water management alternative includes the use of CBM produced water for domestic (e.g., public or residential) and municipal (e.g., city or county) water use and supply. Alternatives under this water management group include: the supply of high quality water from CBM production areas to rural landowners and municipalities; the use of lesser quality CBM produced water for recharge water systems; make-up water; and other residential non-potable water uses.

Alternative 1 - Domestic Use

Because of its overall high quality in many areas, produced water from CBM wells has the potential to be used by residences for potable and non-potable uses. Descriptions of these uses are provided below:

Potable Water Use: High-quality produced water that meets drinking water standards can be used for human consumption, although limited treatment may be required (e.g., chlorination). Depending on the circumstances, quality of the produced water, treatment requirements, and other factors, it may be feasible to use produced water as a sole source for residential or domestic use. It may likewise be feasible for use in supplementing existing supplies continuously or on a periodic basis.

Non-Potable Water Use: Non-potable produced water could be supplied to individual homes, perhaps using a dual water system, for uses such as lawn and garden irrigation, bathing, dishwasher and washing machine uses, vehicle washing, residential maintenance, and toilet flushing.

Alternative 2 - Municipal Water Use

In addition to supplying water to rural landowners, CBM produced water could be used to augment municipal water supplies both for potable and for non-potable uses, including:

Potable Water Use: Similar to domestic supply, high-quality produced water that meets drinking water standards could be used for human consumption. High quality water could be supplied upstream of the existing water treatment facilities and distributed through the existing infrastructure with some modifications (such as gas separators). Depending on the circumstances such as quality of the produced water, treatment requirements, and other factors, using produced water as a sole source may be feasible for a certain portion of the municipality, in mixed distribution with the existing supply, or as a seasonal or period augmentation of over appropriated supplies.

Non-Potable Water Use: The potential for the distribution of lesser quality produced water for non-potable uses within a municipality may be greater than potable use. The potential non-potable use for produced water in a municipality includes a dual water system for household uses as described in the previous section: showering, bathing, lawn and garden watering, and washing clothes and cars. In addition, municipalities could use produced water to supply water to fire hydrants, street cleaning equipment, and certain industries including commercial car washes. It may also be used to recharge depleted aquifers.

APPENDIX F

WATER TREATMENT TECHNOLOGIES

There are a variety of potential beneficial uses for CBM produced water that can be implemented by CBM operators to manage this resource but the quality of the produced water can be a deciding criterion for what option is chosen. The potential also exists for this water to be treated by a variety of technologies to improve the quality of this water and allow for increased beneficial use. However, there are cases, particularly in the Powder River Basin where no advantage relative to permit requirements is gained in treating the water. This should be carefully assessed when evaluating treatment.

To design an effective system for treating or disposing produced water it is necessary to know the following: likely quality of produced water; estimated water production rates at various phases of the project; nature of any proposed receiving waters in terms of seasonal flow rates, existing water quality, and aquatic flora and fauna; and current or proposed permitting and regulatory restrictions.

The following section presents a discussion of some of the treatment options that may be utilized. However, this list is not all-inclusive nor is it intended to show preferred treatment methods. Instead, this section is intended to provide a description of several treatment technologies that are currently being evaluated or utilized for the treatment of CBM produced water prior to beneficial use.

Freeze-Thaw/Evaporation

The Freeze-Thaw/Evaporation (FTE) process involves lowering the freezing point of water containing salts or other constituents below the freezing point of pure water (32°F). Partial freezing of the solution results in the formation of higher quality ice crystals than the water from which it was derived, and the concentration of the higher density dissolved solids and other constituents in the unfrozen liquid. The ice crystals can then be collected and thawed, providing a source of high quality water with more management options, or in appropriate regions, the crystals can be allowed to evaporate. This process can be repeated until the more concentrated effluent is of a manageable volume. The smaller volume of effluent, though more concentrated, can be more easily disposed of and/or discharged with an appropriate NPDES permit, if necessary.

Reverse Osmosis

Reverse Osmosis (RO), or hyperfiltration, is a proven treatment process for the removal of TDS and other constituents such as arsenic. RO water treatment has been used extensively to convert brackish water/seawater or brine to drinking water, reclaim wastewater, and recover dissolved salts from various industrial processes. The RO treatment process separates dissolved solids or other constituents from water by passing the water solution through a semi-permeable cellophane-like membrane. Most RO technologies utilize a cross-flow process to allow the membrane to continually clean

itself. As some of the solution passes through the membrane, the remaining fluid is flushed down stream to remove constituents away from the membrane.

Ultraviolet Light

Ultraviolet (UV) sterilization is a proven technology for the treatment of water and the removal of unwanted free-floating constituents. UV light is a form of energy located in the electromagnetic spectrum region of shorter wavelength, high-energy light. UV light exists in a region between visible light and x-rays, occupying a spatial spectrum between 1 to 400 nanometers (1 nm = 10^{-9} meters). UV energy absorbed by bacteria, viruses, fungi, algae, and protozoa disrupts nucleic acids found in their cells preventing the cell's ability to multiply (Muskoka-Parry South Health Unit, 2002). The amount of UV light necessary to kill microbes depends on the type of microbe, but the minimum recommended dosage considered acceptable for treatment is 16,000 microwatts per second at a wavelength of 253.7 nm at maximum flow (Muskoka-Parry Sound Health Unit, 2002).

Chemical Treatment

Chlorination – Chlorine has been the principal water disinfectant of public water supplies, sewage, and industrial effluent for several decades. The active form of chlorine present in treated water is a hydrolysis product, hypochlorous acid (HOCL), which is formed when chlorine and water molecules interact (Committee on Groundwater Recharge, National Research Council. 1994). Chlorination effectively removes disease-causing bacteria, viruses, protozoa, and other organisms, and can be used to oxidize iron, manganese and hydrogen sulfide so these minerals can be filtered from the water. Other treatment technologies, such as UV light and RO, are often used in tandem with the chlorination process.

Iodine – Iodine water treatment is commonly used to remove pathogens, with the exception of cryptsporida, from water. Iodine is less sensitive to pH and the organic content of water, is safe for long-term exposure, and is considered effective in lower doses. Experts however, are reluctant to recommend iodine for long-term use because the range of the average American iodine intake (0.24 to 0.74 mg/day) includes levels higher than the recommended daily allowance (0.4 mg/day) (Turner, 2002).

Silver – The use of silver to kill water pathogens has been considered, but because of the EPA's establishment of 50 ppb MCL limit on silver, its use for water treatment has been very limited. The MCL was established to prevent argyrosis, a silver specific disease characterized by staining of the eyes, skin, and mucous membranes.

Additional chemicals used to treat water include potassium permanganate, hydrogen peroxide, and coagulation/flocculation agents. Historically these reagents have been used on a very limited basis because of potential health concerns and/or cost efficiency. For the purpose of this study, as with iodine and silver, these chemicals are not considered a practical solution for treating produced water for beneficial uses.

Ion Exchange (Resin Extraction)

The process of ion exchange historically has been used to soften water for residential purposes by replacing hardness ions such as calcium and magnesium with Na+ and Cl-

ions (Filters, Water & Instrumentation, Inc., 2002). Ion exchange is also commonly used to deionize water by replacing ions, such as conductive salts (desalination), with H+ and OH- when extremely pure water is required. The ion exchange process works by charging resins with the replacement ions, e.g., Na+, Cl-, H+ or OH-. Ions in the water are attracted to the resin and attach themselves to the resin, replacing the ions that are already attached. Once the replacement ions are exhausted, the resin is regenerated with a concentrated solution of the replacement ions. This process removes the ions concentrated in the water and effectively regenerates the resin (Osmonics, 2002b).

A residual brine containing the ions removed by this process is formed by this method. This brine is typically 1-5% of the original produced water volume. The management of this brine must be considered in advance if this technology is to be used.

Capacitive Desalination (CD) or Deionization

According to the inventor, Joe Farmer, this relatively new high water recovery treatment process has the potential to use one-thousandth to one-hundredth the energy required by typical distillation methods. Water with concentrations of salts, heavy metals, and/or radioactive isotopes is pumped through thin sheets of carbon aerogel. Each porous aerogel sheet is 3 in^2 with the effective surface area of a football field (600 to 900 m^2/g) (Envirosense, 1996). Non-polluting electricity is applied to the aerogel sheets (electrodes) trapping ions and allowing pure water to pass through. Since the capacitive deionization process does not require the regeneration of ion exchangers with acids and bases, as with the conventional ion exchange process, any associated secondary waste would be eliminated (Lawrence Livermore National Laboratory, 1994b).

Electrodialysis Reversal (EDR)

Traditionally, electrodialysis treatment of water has been used to desalt brackish water to produce higher quality water (Damien (Solarweb), 1998). The basic principles of this treatment process are similar to ion exchange in that ions will dissolve in water and will posses either a positive charge (cation) or negative charge (anion) and will be attracted to electrodes of an opposite electrical charge. Electrodialysis differs from a normal ion exchange process by utilizing both cation and anion selective membranes to segregate charged ions from a water solution (AWWA, 1996). These membranes are arranged alternatively (cation and anion) to selectively collect charged ions. The arrangement of two membranes creates spaces of concentrated and diluted solutions and collectively is referred to as a cell (Shuler and Kargi, 1992). A typical dialysis system consists of hundreds of adjacent cells with electrodes on the outside and is referred to as a membrane stack (Damien (Solarweb), 1998). As with RO, energy, such as a small pump, is required to move the water through the membranes.

Distillation

The distillation process is capable of removing 99.5% of the impurities concentrated in raw water (Derickson, et al 1992). The distillation process is commonly used to remove nitrates, bacteria, sodium, hardness, dissolved solids, many organics, heavy metals, and in some cases, radioneucleides. Distillation involves boiling water into steam, which is then passed through a cooling chamber and subsequently condensed into a purified form. The boiling process segregates water impurities from the purified product for collection and

disposal. Constituents having similar boiling points of water are not effectively removed during the distillation process. Such impurities include many volatile organic contaminants, certain pesticides, and volatile solvents (Derickson, et al, 1992).

Artificial Wetlands

Constructed wetlands were developed approximately 40 years ago to exploit the biodegradation ability of plants (Shutes, 2001). The advantage of these systems includes low construction and operation costs (Cooper, et al., 1996), approximately 1 to 2 cents/bbl, although relative to other wastewater treatment technologies these systems have a slow rate of operation and require a large area.

Table
Treatment Technologies and their Effectiveness on Reducing Certain Constituent Types Present in CBM Produced Water

Treatment Technology	Heavy Metals	SAR	TDS	Ba	Fe	EC	Organics	Na	HCO_3	Bio
FTE	√		√	√	√	√		√		
RO	√	√ [2]	√	√	√	√		√	√ [1]	
UV Light							√ [3]			√
Chemical										√
Ion Exchange	√	√	√	√	√	√		√	√ [1]	
CD	√	√ [2]	√	√	√	√		√	√ [1]	
EDR	√	√ [2]	√	√	√	√		√	√ [1]	
Distillation	√		√	√	√	√	√ [3]	√		√
Wetlands	√		√	√	√	√				√

Source: ALL Consulting
√ - indicates treatment process can reduce constituent type.
1 - pH adjustment would be required prior to treatment
2 - water adjustment by addition of calcium and magnesium would be required.
3 – limited to certain organics based on volatility, boiling point, chemical composition, etc.

APPENDIX G

IMPOUNDMENT ALTERNATIVES

Alternative 1 - Wildlife and Livestock Watering Impoundments

Wildlife watering ponds are typically small reservoirs that are used to help supplement wildlife or livestock water demands in semi-arid to arid regions. There are many types of watering facility designs available. Choosing the correct one would depend on proper evaluation of the situation to ensure landowner needs are satisfied. Watering facilities can have simple designs, such as PVC pipe facilities capable of holding four gallons, or relatively complex designs like asphalt impregnated fabric catchment systems capable of supporting large herds or wildlife species. The Natural Resource Conservation Service (NRCS) provides nationwide standards and technical guidelines for wildlife watering facilities (Ponds – Planning, Design, Construction, Agriculture Handbook 590) to help facilitate the decision process and assure proper recommendations are presented to land owners. State NRCS offices in some cases have customized these standards to meet the demands or requirements for their particular region.

Alternative 2 - Fisheries

Constructed fisheries are water catchment systems designed to sustain healthy fish and other aquatic organism populations. Fishponds are typically small to medium sized privately owned reservoirs that are stocked by state agencies or individual landowners for recreational use. Designs for such ponds are simple and often depend on the water source and volume, topography (Missouri Department of Conservation, 1995), climate (temperature), and specific use. Commercial fisheries are, in general, large, complex aquaculture facilities designed to sustain large fish or other aquatic organism populations for resale and consumption. The operation of a commercial fishery requires significant investment capital, time, and management skills.

Alternative 3 - Recharge Ponds

Recharge ponds, also known as storm water ponds, retention ponds, or wet extended detention ponds, are constructed reservoirs typically containing a permanent pool of water, especially during regional wet seasons (Stormwatercenter.net, 2002). Recharge ponds are traditionally used to restore depleted groundwater sources by water infiltration into subsurface aquifers, whereas retention ponds are permanent pools constructed to improve water quality, attenuate peak flows, and minimize flooding (Kantrowitz and Woodham, 1995). Recharge ponds also have some treatment function to lower TDS by a settling removal mechanism (Stormwatercenter.net, 2002) or by water infiltration through a pre-fabricated pond liner. Nutrient uptake is also possible through various biological processes that could facilitate additional uses.

The infiltration of water in areas that had historically little infiltration of water will cause the soluble salts that have accumulated over time to be dissolved and moved down through the soil and bedrock. These may change the chemistry of the underlying groundwater, or, if intercepted by an impermeable layer, result in the formation of saline seeps.

Alternative 4 - Recreation

Traditionally, artificial lakes have been created to augment urban and industrial water supplies; uses for recreation have been considered a secondary benefit (Bennett, 1962). The conceptual use of artificial lakes has changed through the years, however, and is now commonly used in the Midwest for fishing, swimming, and boating. CBM produced water could be used to supply artificially constructed surface impoundments for recreational use. Depending on the quality of water, size of the production facility, and subsequent volume of pumped water, available lands could be converted into large artificial lakes and used for boating or canoeing. The lakes could also be stocked with native warm and possibly cold-water fish to increase local populations and/or used to accentuate camping grounds by providing swimming areas for local residents.

Alternative 5 - Evaporation Ponds

Evaporation ponds are usually off-channel; constructed impoundments designed to store water at the surface so that natural evaporative processes can move the water from the land surface into the atmosphere. They are either lined or placed on impermeable soils. These basins may include nebulizers or other technology to enhance the evaporation process. As evaporation occurs water is removed from the pond while the salts are left behind. This results in an increase in the TDS for the remaining water. Over time as more water is lost to the atmosphere, the water remaining in the pond can become a concentrated brine and eventual salt precipitation will occur. The disposal of this residual salt must be considered in advance if evaporation processes are to be used.

Alternative 6 - Constructed Wetlands

The U.S. Army Corps of Engineers (USACE) and the EPA define wetlands as areas that are inundated or saturated by surface or groundwater at a frequency and duration to support vegetation adapted for life in saturated soil conditions. According to USACE (1987), wetlands are characterized by three criteria: vegetation, soils, and hydrology.

APPENDIX H

EMERGING TECHNOLOGIES AND PRACTICES

The technologies and practices described in this section offer potential, but have not yet been tested sufficiently or utilized broadly and successfully enough to be characterized as best management practices. They may, however, become BMPs in the future.

Microhole Drilling Technology. Microhole drilling technology allows the drilling of wells using smaller diameter drill holes than are generally used for oil and gas wells. A hole diameter of 2-3/8 inch is characteristic. The technology involves coiled tubing, which spools from the drilling unit into the drill hole. The relatively small and light drilling unit can be hauled with a light truck. Accordingly, microhole drilling offers the potential of decreased drilling costs as well as restricting disturbed environments to a smaller area during drilling. Collateral benefits include reduced impacts due to lighter equipment moving on access roads. Current investigations are focusing on drilling to relatively shallow formations (less than approximately 5,000 ft depth), however DOE considers deeper drilling to be achievable.

APPENDIX I

TOPIC INDEX

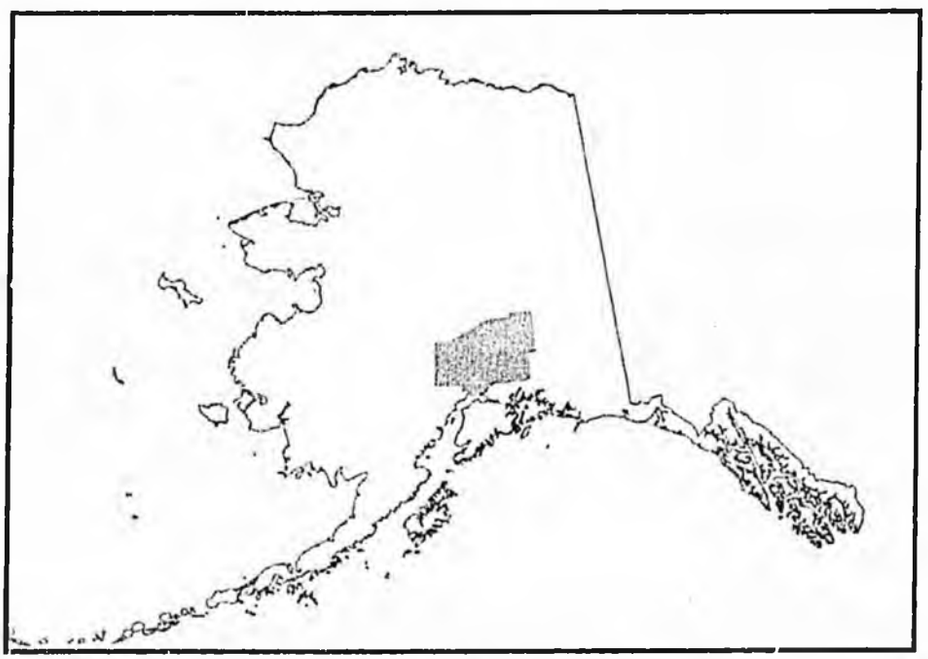
[Insert once the document is finalized]

Public Review Draft

Enforceable Standards for Coalbed Methane Development Of State Owned Resources in the Matanuska-Susitna Borough

April 2004

Volume 1



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- Summary of Small Workgroup Water Management Recommendations
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Appendix H. General Coalbed Methane Comments H-1

List of Acronyms

ADEC	Alaska Department of Environmental Conservation
ADF&G	Alaska Department of Fish and Game
ADNR	Alaska Department of Natural Resources
AOGCC	Alaska Oil and Gas Conservation Commission
CBM	Coalbed Methane
DGC	Division of Governmental Coordination
DO&G	ADNR, Division of Oil and Gas
DOT/PF	Alaska Department of Transportation and Public Facilities
EPA	U.S. Environmental Protection Agency
Mat-Su	Matanuska-Susitna
MSDS	Material Safety Data Sheet
OHMP	Office of Habitat Management and Permitting
OPMP	Office of Project Management and Permitting
SHPO	State Historic Preservation Office
USDA	U.S. Department of Agriculture

SECTION 1

INTRODUCTION

SECTION 1 INTRODUCTION

Summary of Purpose

Enforceable standards for coalbed methane development in the Mat-Su Borough are necessary to establish public confidence in the management of public lands in the affected area. These standards will be implemented by ADNR when making decisions related to coalbed methane development in the Mat-Su Borough. These decisions may include issuing oil and gas leases or licenses, reviewing proposed plans of operations, or reviewing applications for the formation or alteration of oil and gas units. In addition to the enforceable standards, this document includes recommendations for similar standards to be considered by the Matanuska-Susitna Borough, and the Alaska Oil and Gas Conservation Commission.

How This Document Is Organized

To present the coalbed methane standards, this document is organized into four sections, which are supported by extensive appendices.

Section 1 provides a brief explanation of why enforceable standards are necessary for coalbed methane development in the Mat-Su Borough, and provides a brief history of the events that preceded the public process to establish these standards. It also includes a discussion of how these standards will be implemented, and how they can be modified in the future.

Section 2 presents a report from the workshops held in the Mat-Su Borough in January and February 2004.

Section 3 presents the enforceable standards for coalbed methane development on public lands in the Mat-Su Borough.

Section 4 presents the recommendations for the Matanuska-Susitna Borough, and the Alaska Oil and Gas Conservation Commission.

Appendices. These include detailed responses to the comments and suggestions received by ADNR throughout the process of developing these enforceable standards, and extensive information on the coalbed methane workshops.

Why Adopt Enforceable Standards for Coalbed Methane Development in the Mat-Su Borough?

The potential development of coalbed methane in the Mat-Su Borough has been the source of tremendous public debate since the summer of 2003 when ADNR announced that applications had been received for Shallow Natural Gas leases in the area. The public discussion of these applications led to a discussion of the extensive oil and gas leases already in existence in the valley. This was new information for many area residents. A series of public information meetings sponsored by the borough raised additional issues regarding the shallow gas leasing program and the regulations governing coalbed methane development in Alaska. In October 2003, ADNR Commissioner Tom Irwin announced that ADNR was initiating a public process to establish enforceable standards for coalbed methane development in the Mat-Su Borough. Commissioner Irwin said that ADNR has an obligation to take public concern into consideration before proceeding with further decisions associated with full coalbed methane development. The adoption of enforceable standards will provide the public with confidence that future decisions regarding coalbed methane development are being made with an understanding of what is required to protect the interests of the residents of the state.

What Lands are Affected by The Enforceable Standards?

These enforceable standards will apply to decisions made by ADNR, and therefore will apply to lands subject to a state oil and gas lease or contained within an oil and gas unit. State oil and gas leases are issued only when the state owns the oil and gas resources for the land. The remainder of the estate (i.e. everything other than oil and gas and other minerals) may be owned by a private party (i.e. the "surface owner"). These standards apply to state leases regardless of whether there is a private surface owner or not. ADNR will also apply these standards when making decisions related to oil and gas units. A unit is a large area containing many leases that are collected together to manage a field in an efficient manner. A unit may include lands not covered by a state oil and gas lease, but ADNR will apply these standards to all activities occurring within the unit.

History of Coalbed Methane in the Mat-Su Borough

Since the early 1950s, some 30 wells have been drilled in the Mat-Su Borough in search of oil and gas. The current oil and gas leases in the Mat-Su Borough date back to 1991. These conventional oil and gas leases may contain traditional oil and gas resources as well as coal bed methane resources. The Pioneer Unit was formed in the Mat-Su Borough in 1998, and includes only conventional oil and gas leases although exploration of coal bed methane is the primary intent of the unit operator. The oil and gas resources in the Pioneer Unit are owned by many different entities; with only about 50% of the oil and gas in the unit owned by the State of Alaska. Evergreen is the current operator in the Pioneer Unit. Two four-well pilot productions sites were developed in the unit area by Evergreen in 2002; three separate exploratory wells were drilled earlier by Ocean Energy the previous unit operator along Vine Road; and one well that was drilled even prior to formation of the unit along Big Lake Road was re-entered and tested by Ocean. Testing at the pilot production sites in the unit by Evergreen is still underway..

In addition to the activities within the Pioneer Unit, several core holes have been drilled in recent years in the Borough to evaluate coal bed methane resources. One core hole was drilled by the State near Wasilla in 1994, and several core holes have been drilled this year by Evergreen. Also, GRI, Inc. drilled three coalbed methane wells in the Borough and production tested one of them in the Houston area in the 1990s.

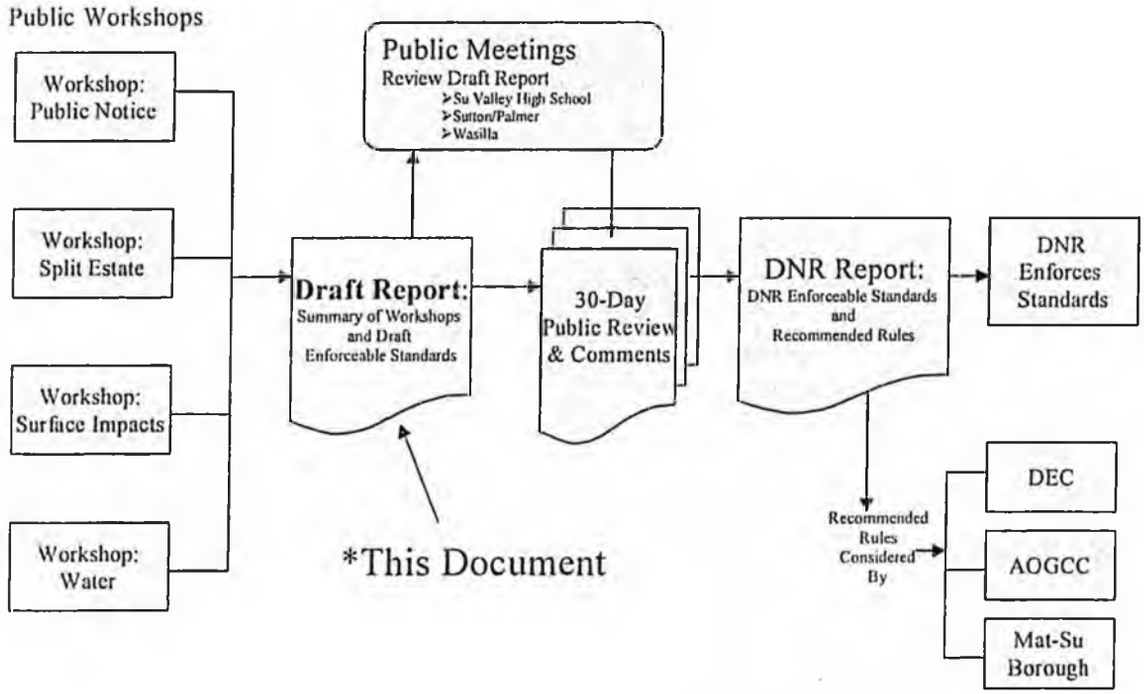
In 1996, the Alaska Legislature passed legislation authorizing a shallow natural gas leasing program (AS 38.05.177). The shallow gas leasing program is non-competitive. ADNR is mandated to issue the leases if "the discover of a local source of natural gas would benefit the residents of an area." In September of 1999, the Commissioner of ADNR issued a decision authorizing the Division of Oil and Gas to accept shallow natural gas lease applications for all eligible state land.

After issuing public notice and mailing application materials to parties that had expressed interest, the Division began accepting shallow natural gas lease applications on February 29, 2000. Thirty-six applicants applied for a total of 270 leases in various regions of the state during the first two weeks of opening. A total of 162 applications were submitted for the Mat-Su Borough. Among the applications received on February 29, 2000, many overlapped with each other. In order to determine priority among the applications, ADNR drew lots and assigned a control number to each lease application such that an application had precedence over applications with a lower control number.

The legislature enacted revisions to the shallow natural gas leasing statute in 2002, resulting in applications pending at that time being adjudicated and issued under the revised program. In February 2004, a decision was issued regarding the Mat-Su applications. Of the 162 applications 60 were issued. The other applications were denied because of overlap with approved applications having a higher control number, no available state land in the application area, or denied for other reasons.

Public Participation

The process to establish the enforceable standards contained in this document involves tremendous public participation, as indicated in the following diagram of the process:



A series of public workshops were held in the Mat-Su Borough in January and February 2004. A report from those workshops can be found in Section 2, below. Hundreds of area residents participated in the workshops. The information from the workshops was used to develop this draft document.

This document will be distributed for public comment with a minimum of 30 days to comment. At least three public meetings will be held in the Mat-Su Borough to review this draft document. The public comments received will be used to develop the final enforceable standards.

Implementation of the Enforceable Standards

This document will be signed by the Commissioner of the Department of Natural Resources and will be state policy for the management of state lands within the Mat-Su Borough as it relates to coalbed methane development. All ADNR decisions related to coalbed methane development shall comply with the standards contained in this document. Possible decisions controlled by these standards include whether to issue oil and gas leases or licenses, and whether to approve proposed plans of operations. Two

important methods of implementation will be imposing mitigation measures on leases and licenses to require compliance with these standards, and to impose conditions on plan of operations approvals.

Modification of the Enforceable Standards

Standards can never be so comprehensive and visionary as to provide solutions to all possible future conflicts, nor should they be inflexible. Therefore, the standards in this document may be changed if conditions warrant. The standards will be reviewed periodically as new data become available and as changing social and economic conditions place different demands on public lands. The periodic review will include meetings with all interested groups and the general public.

Amendments

The standards may be amended. An amendment adds to or modifies the basic intent of a standard. Amendments must be approved by the Commissioner of ADNR. Amendments require public notice and consultation with affected agencies and may require public hearings if the Commissioner decides the level of controversy warrants. Agencies, municipalities, or members of the public may propose amendments.

Minor Changes

A minor change is one that does not modify or add to the basic intent of a standard. Minor changes may be necessary for clarification, consistency, or to facilitate implementation of the standards. Minor changes are made at the discretion of the Director of the Division of Oil and Gas. Agencies, municipalities, or members of the public may propose minor changes. The Director will provide notice and opportunity to comment on any proposed minor changes.

SECTION 2

REPORT ON COALBED METHANE WORKSHOPS

SECTION 2 REPORT ON COALBED METHANE WORKSHOPS

The public workshops were held as follows:

January 28, 2004	Public Notice and Public Information	Teeland Middle School, Wasilla
February 4, 2004	Private Property Rights	Teeland Middle School, Wasilla
February 18, 2004	Surface Impacts, Part 1	Teeland Middle School, Wasilla
February 25, 2004	Surface Impacts, Part 2	Cottonwood Creek Elementary, Wasilla
February 28, 2004	Water Management and Water Protection	Willow Community Center, Willow

Workshop Format

Attendance at the workshops ranged from approximately 80 to 140 people, with the first two workshops being the most heavily attended. The format of the workshops was intended to facilitate discussion and provide greater opportunity for involvement by all participants. This was done by breaking into small groups, mostly consisting of less than twelve people.

For each workshop, materials were provided to assist the groups in their discussion (see appendices). Materials consisted of an issue paper and a questionnaire. The issue papers were presented in a matrix format intended to break down the issues and facilitate comparisons. The questionnaires, one for each group, had spaces for them to write their consensus response. The questions were intended to ensure that all relevant topics were covered during the discussions, but also included space for "other comments" on the workshop's topic. In addition to the questionnaires given to the groups, all individuals were provided similar forms so that they would have an opportunity to express their own preferences.

The materials for each workshop were made available on the Division of Oil and Gas web site prior to each respective workshop and remained there for the rest of the workshop process. This enabled persons that didn't attend the workshops to review them and provide comments, either by filling out the questionnaire and mailing it in, or sending their comments in any manner they preferred.

During each workshop, the small groups discussed the issues for approximately two hours, and prepared written recommendations using the questionnaires. The groups were given the option of using state agency staff as moderators or moderating their own

discussions. Most groups chose to moderate their own discussions. In addition, representatives from various agencies were available to answer questions. After discussion, each group submitted their written recommendations, and provided an oral summary of their recommendations to the large group. Individuals were given the option of either submitting their forms at the workshop or mailing them in later.

Following are brief summaries of the discussions and recommendations from each workshop. These summaries are not intended to be a comprehensive representation of the recommendations, but rather to provide an overview. For a complete list of comments, see Appendices A through F. Many of the recommendations and comments reflected those that had been made by the public prior to initiation of the public workshop process.

Overall Impression From Workshops

* important note to go back to

The overwhelming majority of workshop participants were opposed to any coalbed methane development in the Mat-Su Borough. They expressed frustration that the workshops did not address such topics as buying back all shallow gas leases and requiring a best interest finding prior to issuing additional shallow gas leases. Most participants expressed distrust toward ADNR and skepticism that the process would result in legitimate standards. The participants in the first two workshops, in particular, devoted many of their responses to calls for bans on coalbed methane in residential areas and non-developed areas of the Mat-Su Borough, repeated calls for lease buybacks, and complaints that the current shallow gas leases were issued without proper public notice. At subsequent workshops, participants freely stated their general opposition to coalbed methane development, and their reluctant participation in the process of developing standards for that development, preferring an outright ban on coalbed methane activities.

January 28 Workshop - Public Notice and Public Information

Generally, participants felt that more should be done to provide public notice, especially for leasing. It was recommended that notice be distributed to a larger area or on a watershed basis, more advance notice to allow additional time for review and comment, and that better information be included. There was strong sentiment that public notice requirements be the same for all subsurface owners and managing entities, and there were recommendations that ADNR be responsible for notice on all subsurface. Recommendations were also provided on how public comments should be reviewed, and how leasing and permitting decisions should be made based on those comments.

Regarding public information, many expressed the opinion that better information should be provided about the leasing and permitting process, and that there should be full public disclosure of all information, including proprietary data. There were also recommendations that if proprietary information could not be released, that an independent body review it. Many commenters stressed the importance of making sure that information about hazardous materials, fire hazard, and other safety concerns is available to the public and appropriate agencies.

February 4 Workshop - Private Property Rights

During this workshop, many participants stated that the surface estate should be dominant over subsurface estate. It was strongly recommended that laws be changed so that persons that acquired their surface estate from the State of Alaska could also acquire the subsurface estate.

Many recommendations were made regarding negotiations between the surface owner and developer, bonding and damages. Included were standards for how contact should be made by the developer, and what kind of information should be provided. Commenters felt that other parties should be involved in the initial contact, and that more information should be submitted to the surface owner.

Regarding surface use agreements, there was strong consensus that there should be a standard form for this purpose, and that it should come out of a collaborative effort among agencies and citizen organizations. It was also recommended that in negotiation of surface use agreements, the surface owner should have the ability to deny access, and that negotiations should be done collectively with multiple surface owners. Some commenters stated that the developer should bear the cost of the surface owner's legal services and creation of a citizens' advocacy group.

There was a great deal of discussion on the bonding process and how bond amounts and damages are determined. It was recommended that adjacent surface owners be involved in the bonding process, and that a third party determine whether adequate time and good faith effort had gone into negotiations prior to bond hearings. Recommendations were made for factors that should be included in determination of bond amounts, such as neighboring water wells, health impacts, quality of life, economic return on property, and the surface owner's legal costs. Specific amounts in relation to property value were also recommended. Similar recommendations were made regarding the determination of damages. For resolution of disputes, it was recommended that mediation be done by an independent third party, and that legal expenditures be capped in order to ensure equity.

* can't define quality of life.

Most everyone was in agreement with the need to develop an information packet or pamphlet on property rights, split estate issues and coalbed methane development, and that it should be produced jointly by agencies and citizen groups. It was also recommended that a citizen advisory group and citizen advocacy group be formed.

February 18 Workshop - Surface Impacts, Part 1

For drill pads and compressor stations, participants recommended requiring a visual mitigation plan, facility siting requirements, setbacks, and measures to minimize visual impacts of buildings and vegetation removal. Standards were also recommended for minimizing erosion and sedimentation, including erosion control plans, temporary and permanent erosion control measures and setbacks from streams. Recommendations for noise mitigation included requirements for enclosures for motors, decibel limits, limits

on hours of operation, setbacks and electric motors. Other recommendations for drill pads and compressor stations included prohibiting them from residential areas (subdivisions containing lots below a certain size) and requiring directional drilling.

Recommendations for temporary storage and permanent disposal of solid waste from drilling operations mostly involved modification of existing regulations, adding requirements for independent testing and monitoring, public notification and prohibition of open pits.

A number of standards were recommended for use of hazardous materials, including secondary containment and setbacks from waterbodies. Participants also stressed the importance of requiring emergency preparedness plans, and ensuring that spill response equipment, procedures and training be in place prior to development.

February 25 Workshop - Surface Impacts, Part 2

Many recommendations were made regarding roads and public access. These included requiring the use of existing infrastructure as much as possible, and that any expansion of infrastructure be part of a phased road and pipeline plan. It was recommended that roads meet Borough and DOT/PF standards, that approval of new roads involve a public process, and that erosion and sedimentation, habitat fragmentation, dust abatement, traffic safety, road congestion, emergency access, and maintenance be addressed. It was strongly recommended that public access not be restricted, and if any road closures do become necessary, public notice be required.

Recommendations for addressing the impacts of routing and construction of pipelines were similar to those for roads. Other recommendations included the need to combine routing with roads as much as possible, assuring integrity against climatic conditions and geophysical hazards, and emergency preparedness for leaks.

Well spacing and field development planning was also discussed during this workshop. Participants expressed concern with the potential for increasing well density to be allowed over time. It was recommended that an absolute limit be placed on well density, such as one or two wells per section. Other recommendations addressed how requests for increased density are processed. These included notice to all surface owners within the section, interagency review, a public hearing and minimum waiting periods. There were also recommendations on the information that should be submitted with such requests.

Recommendations related to air quality included requirements for motors that operate on natural gas or electricity, and that baseline air quality studies be conducted. For geologic hazards, recommendations were made for geologic studies and modeling, methane seepage studies, and minimum setbacks from faults.

February 28 Workshop - Water Management and Water Protection

There was strong consensus that a groundwater resource study be conducted to determine hydrologic connections between surface and groundwater, and between shallow and deep aquifers. It was also recommended that baseline data be established for methane seeps and water wells, and that a cumulative impact study be completed.

Recommendations made for surface casing included requirements for cement bond logs and double casing to an appropriate depth based on hydrogeologic data. There were many recommendations that fracturing fluids be limited only to water or other non-toxic material, and that their composition be fully disclosed to the public. It was also recommended that no hydraulic fracturing occur within a certain distance of a water well, and that monitoring be conducted of all fracturing operations.

The majority of participants said that reinjection should be required at all times, but some recommended that a private surface owner should have the option of discharging on surface if the water meets DEC and CWA standards. Various depths for reinjection were recommended, and many recommended that water quality testing be done by a third party.

Participants said that water quantity should be monitored with hydraulic impact (static level) prior to testing or drilling, and that there be no drilling in recharge zones. It was also recommended that watershed management plans be developed, and that industry should bear the costs of such a study.

Surface water issues were also discussed. It was recommended that produced water should be disposed of as toxic waste and that no mixing zones be allowed. Various setbacks from streams were recommended.

For all water management issues, it was recommended that testing and monitoring be done by a third party, and also that testing be done at least one year prior to any development. Recommendations were made to test for specific factors and substances such as pH, salinity, hydrocarbons, heavy metals and methane. Various radii and time intervals were recommended for monitoring. Participants said that the state should design and implement a complete enforcement and monitoring program.

Commenters recommended that contingency plans be developed, but that much effort needs to be put into both prevention and response. They also said that developers need to be held responsible, and that private individuals shouldn't bear the burden of proof that contamination has occured. There were recommendations that criminal charges be brought against negligent developers and operators, and that proceeds from development be used to establish funds for legal costs, compensation and creation of a citizens' oversight group.

SECTION 3

ENFORCEABLE STANDARDS

SECTION 3. ENFORCEABLE STANDARDS

Based on the results of the workshops, ADNR has developed the following list of enforceable standards for coalbed methane activities in the Mat-Su Borough. These standards are divided into two groups, enforceable standards for activities on state-managed lands to be implemented by DNR, and recommended standards for other state agencies and the Mat-Su Borough to implement through their respective authorities.

Public Notice

1. **Public Notice For Oil and Gas Leasing.** In addition to the public notice required by AS 38.05.945[1], ADNR will provide public notice of a shallow gas lease application or initiation of a best interest finding review of an oil and gas license or lease sale by the following methods, with a comment period of at least 90 days:
    a. Display ads in both the Anchorage Daily News and the Frontiersman with maps clearly identifying the proposed lease area;
    b. Public service announcements on radio stations within or adjacent to the proposed lease area;
    c. Public notice distributed to libraries and post offices within or adjacent to the proposed lease area;
    d. Public notice distributed to any community councils whose boundaries are within or adjacent to the proposed lease area; and
    e. All residents and organizations that have submitted a written request for notice of proposed leases in that area will be notified electronically or, if requested, by regular mail.

2. **Public Notice For Oil and Gas at the Exploration, Development and Transportation Phases.** ADNR will provide at least a 30-day public notice and review/comment period for each phase of CBM development requiring a plan of operation (exploration, development and transportation) by the following methods:
    a. ADNR will require the applicant to provide notice by certified mail or personal delivery to all owners of surface lands within ½-mile of the proposed activity who can be reasonably identified and located based on records at the state Recorder's office and the borough tax records;
    b. Legal notice in the Anchorage Daily News and the Frontiersman;
    c. Public notice distributed to municipalities, regional and village corporations, libraries, and post offices within or adjacent to the proposed activity area;
    d. Public notice distributed to any community councils whose boundaries are within or adjacent to the proposed activity area; and

[1] AS 38.05.945 requires, among other things, for notice to be given to an affected municipality and regional and village corporation, and any affected community council or nonprofit community organization that has requested notice in writing and provided a map of its boundaries.

e. All residents and organizations that have submitted a written request for notice of proposed coalbed methane activities within the area of the proposed activity will be notified electronically or, if requested, by regular mail.

The plan of operation, which requires ADNR approval prior to the operator performing any activity on a state oil and gas lease or exploration license, is referenced throughout this document. The operator submits an application to ADNR that must include statements and maps or drawings setting out the following:

- *the sequence and schedule of the operations to be conducted in the lease area, including the date operations are proposed to begin and their proposed duration;*
- *projected use requirements directly associated with the proposed operations, including but not limited to the location and design of well sites, material sites, water supplies, solid waste sites, buildings, roads, utilities, airstrips, and all facilities and equipment necessary to conduct the proposed operations;*
- *plans for rehabilitation of the affected area after completion of operations or phases of those operations; and*
- *a description of operating procedures designed to prevent or minimize adverse effects on other natural resources and other uses of the lease area and adjacent areas, including fish and wildlife habitats, historic and archeological sites, and public use areas. 11 AAC 83.158(d).*

ADNR often requires other stipulations, in addition to those necessary to meet the mitigation measures developed for the lease. These stipulations address site-specific concerns directly associated with the proposed project and/or issues raised in public comment on the proposed plan. The mitigation measures are part of the terms and conditions of the lease and are attached to the plan of operations approval and are binding on the operator. Activities are field-monitored by ADNR to ensure compliance with the terms of plan approval. The lease contract requires that the operator keep the lease area open for inspection by authorized state officials.

Public Information

3. **Disclosure of Fracturing Materials.** A plan of operations will include a general disclosure of the components in any hydraulic fracturing materials to be used, the volume and depths at which such fluids will be used, and the volume capacity of the vessels to be used to store such materials.

4. **Information on Hazardous Materials.** The operator will post Material Safety Data Sheet (MSDS) information at each drill site of all hazardous substances currently on the site. The operator will ensure local emergency response teams are provided specific information concerning the use or transport of any

hazardous substances associated with CBM exploration and development. The operator will post information at each drill site of possible safety hazards located at the site.

5. **Emergency Planning.** The operator will provide a written emergency preparedness and response plan for potential emergencies that may be associated with the operation of facilities. This may include explosions, fires, gas or water pipeline leaks or ruptures, earthquake or flood events, or hazardous material spills. The operator will conduct annual or periodic training/drills for response personnel.

6. **As-Built Survey Required.** ADNR will require as-built surveys upon completion of any permanent CBM facility.

Setbacks

7. **Setbacks.**
   a. The operator will construct drill pads at least 500 feet and compressor stations at least 1,500 feet from any residential structure or public facility. Residential structure means a building used regularly as a residence. Public facility means a hospital, school, public library, rest home, or court building;
   b. An exception may be granted from this requirement if the operator obtains the consent of the owner of the residential structure, or demonstrates that the drill pad and/or compressor station will be substantially hidden from view from the public facility, and that the noise levels experienced by the public facility will not exceed ambient noise levels.

8. **Subdivisions.** The operator will not construct drill pads or compressor stations in any subdivision containing lots predominantly sized at five acres or less.

Surface Impacts

9. **Noise Mitigation.** The plan of operations will include the measures to be used to mitigate potential noise impacts associated with facilities and compressor stations. The operator will provide an analysis of the noise impacts on residential, commercial, and recreational users of the proposed project area. Measures to mitigate noise impacts will include but are not limited to:
   a. Venting exhaust in a direction away from the closest existing residences of platted subdivision;
   b. Using quiet design mufflers on non-electric motors;
   c. Limiting the hours of noise-generating operation to daytime hours;
   d. Using sound insulating enclosures where facilities would otherwise create noise impacts because of proximity, population density, other adjacent land uses sensitive to adverse impacts from noise; and

e. Siting facilities and compressor stations in locations that use geographic features to buffer noise.

10. **Visual Mitigation.** A plan of operations will include the measures to be used to mitigate visual impacts associated with drill pads, buildings and compressor stations. Measures to mitigate visual impacts include:
    - Minimizing the size of structures;
    - Minimizing damage to vegetation and the use of vegetation to buffer visual impacts;
    - Minimizing the work pad size to only that area necessary to provide a safe work area;
    - Locating facilities away from prominent features and hills and ridges;
    - Locating facilities at the base of slopes;
    - Matching paint schemes of buildings to local landscape;
    - Applying one or more of the following landscape practices for permanent facilities:
        a. Establishing berms, ground covers, shrubs and trees;
        b. Placing vegetation clusters 10-15 feet apart along the edge of the permanent pad site in residential areas;
        c. Shaping cuts and fills to appear as natural forms;
        d. Cutting rock areas to appear as natural forms;
        e. Designing the facility to utilize natural screens; and
        f. Constructing fences, such as woven wood or rock, for use with or instead of landscaping.

11. **Light Shielding.** The operator will direct exterior lighting, when required, away from residential areas, or effectively shield the light from such areas.

12. **Solid Waste Storage - Temporary.** Temporary storage of waste will not be permitted for longer than six months. Open pit solid waste storage is not allowed in residential areas. In these areas, solid waste must be stored in a closed container.

13. **Solid Waste Storage – Fencing.** The operator will exclude people, livestock, and wildlife from solid waste disposal areas using fencing or other barriers approved by DO&G.

14. **Erosion Control Plan.** A plan of operations will include measures to be used to mitigate soil erosion and sedimentation during all activities associated with exploration and development.

15. **Permanent Erosion Control.** The operator, after construction of a permanent facility, will replace temporary erosion control structures with permanent structures within 30 days of project completion or, if seasonal conditions dictate timing constraints, within 30 days after seasonal conditions permit the activity.

16. **Timber Harvesting.** Timber harvested as part of exploration and development activities (including right-of-way and pad clearing slash) will be processed and disposed of in a manner approved by the Division of Forestry to avoid spruce bark beetle infestation.

17. **Weed Control.** The operator will conduct weed/vegetation control. Techniques and materials to be used will be reviewed in consultation with ADEC, the Plant Materials Center, local Soil Conservation District, and Mat-Su Borough.

Split Estate

18. **Good Faith Negotiations.** Operators are required to make contact with the surface owner of lands upon which activities are proposed, and make good-faith efforts to negotiate a surface use agreement. If agreement cannot be reached, ADNR will initiate bond proceedings pursuant to AS 38.05.130 only if 60 days has passed from the initial contact between the surface owner and operator.

19. **Split Estate Brochure.** ADNR will develop an informational brochure describing split estate issues. The brochure will include a discussion on the right of access to the subsurface estate, surface owner rights, and general provisions of a surface use agreement.

20. **Bond Amount.** When determining the damage bond amount under AS 38.05.130, ADNR shall consider the current market value of the property, the potential duration of operations, the potential future value of the property, the loss of use of the property during operations, potential cost of damage to existing surface improvements, crops, and timber.

Water Management

21. **Baseline Water Quantity Information.** Where ADNR determines that water withdrawal has significant potential to unduly affect waters currently used by others, such as an individual owner's well or a drinking water aquifer, ADNR will require a CBM applicant for a temporary water use authorization or water right to provide baseline information concerning water quantity. The information will be designed to document the pre-withdrawal conditions in case the withdrawal causes a change in water availability to current users. The baseline information may include one or more measurements of water table depth or piezometric head. It may also include testing individual wells or other information as appropriate.

22. **Surface Disposal of Produced Waters.** Surface disposal of produced water will not be allowed unless ADEC determines that the discharge will meet state water quality standards and the discharge will result in no negative environmental impacts.

23. **Water Quantity Monitoring**. Where ADNR determines that water withdrawal has significant potential to unduly affect waters currently used by others, such as an individual owner's well or a drinking water aquifer, the Department will condition temporary water use authorizations or water rights with the requirement to monitor the water availability in the area of concern. The conditions may include the requirement to establish a monitoring well, monitor existing wells, or other measures as appropriate.

Hydraulic Fracturing

24. **Diesel-Based Fracturing Materials**. The operator will not use diesel-based fracturing materials.

Roads and Pipelines

25. **Transportation Plan**. A plan of operations will include an analysis of road and access issues associated with site development. All aspects of transportation related to the proposed activity and possible effects to existing uses and mitigation measures will be considered. The plan will address, at minimum:
    a. The adequacy of existing roads and access to the site. Operator activities must utilize existing road systems, if available;
    b. The operator's measures to minimize damage to the surface for approved off-road access;
    c. The operator's measures to ensure that road improvements meet state Department of Transportation and Public Facilities and Mat-Su Borough standards;
    d. The operator's measures to ensure that new roads are constructed to allow for emergency access and egress for residents, occupants, and emergency equipment;
    e. The operator measures to avoid use of residential roads; and
    f. The operator's consideration of public access granted under RS 2477, recreational trails, section lines, and other established rights-of-way.

26. **Consolidate Infrastructure**. Exploration activities must utilize existing road systems, ice roads, air or boat service, or vehicles that do not cause significant damage to the ground surface or vegetation. Construction of temporary roads may be allowed. Construction of permanent roads will be prohibited during the exploration phase.

27. **Disturbance Along Right-of-Way**. The operator will minimize disturbance of vegetation within rights-of-way during construction, maintenance and operational activities.

28. **Pipelines and Fishstreams**. The operator will construct pipelines beneath fish streams using directional drilling techniques, unless the Director approves an alternative method, in consultation with OHMP.

29. **Buried Pipelines.** The operator will bury pipelines unless safety, seismic, or other conditions dictate otherwise. The operator must minimize duplication of existing transportation corridors when planning a pipeline route.

30. **Public Access.** The operator will not restrict public access within a pipeline right-of-way on public land unless approved by ADNR to avoid unreasonable conflict with construction, maintenance, operation or termination of the pipeline.

Monitoring

31. **Monitoring.** Plan of operations approvals will include monitoring requirements. The monitoring requirements will be tailored to the specific situation and potential impacts. In approving a monitoring plan, ADNR will consider the following factors: potential impacts to water quality and quantity, potential noise and/or visual impacts to adjacent users, magnitude of proposed ground disturbance, and proximity to sensitive habitat or use areas.

Well Spacing

32. **Well Spacing.** Well spacing will be reviewed and approved as part of a Unit plan of development. The decision whether to allow a well spacing proposal will be based upon a balancing of the gas pool management needs and the anticipated surface impact and surface conflicts.

Geophysical Hazards

33. **Geophysical Hazards.** A plan of operations will identify any geophysical hazards in the area of operations. A plan of operations for proposed development in the vicinity of a geophysical hazard must include siting, design, and construction measures for minimizing property damage and protecting against loss of life.

Relation with Other State Requirements

34. **Compliance with Use Area Plans.** Operators must comply with all current or future ADNR area plans and recreation rivers plans; and ADF&G game refuge plans, critical habitat area plans, and sanctuary area plans within which operations are located.

35. **Prehistoric, Historic and Archeological Sites.** Operators will comply with ADNR's standard stipulations concerning protection of prehistoric, historic and archeological sites. (See sample mitigation measures in Appendix B).

36. **Local Hire, Communication and Training.** Operators will comply with ADNR's standard stipulations concerning local hire, working with local

constituencies, and cultural sensitivity. (See sample mitigation measures in Appendix B).

37. **Fish and Wildlife Resources.** The operator will comply with all standard mitigation measures designed to protect fish and wildlife and their habitat. (See sample mitigation measures in Appendix B).

38. **Hazardous Substances.** The operator will comply with ADNR's standard stipulations for handling hazardous substances (See sample mitigation measures in Appendix B).

39. **Definitions.** In this document

a. "Facilities" means any structure, equipment, or improvement to the surface, whether temporary or permanent, including, but not limited to, roads, pads, pits, pipelines, power lines, generators, utilities, airstrips, wells, compressors, drill rigs, camps and buildings;
b. "Feasible and prudent" means consistent with sound engineering practice and not causing environmental, social, or economic costs that outweigh the public benefit to be derived from compliance with the standard;
c. "Minimize" means to reduce adverse impacts to the smallest amount, extent, duration, size, or degree reasonable in light of the environmental, social, or economic costs of further reduction; and
d. "Plan of operations" means a license plan of operations under 11 AAC 83.158 and a unit plan of operations under 11 AAC 83.346.

SECTION 4

RECOMMENDATIONS TO OTHER AGENCIES

SECTION 4. RECOMMENDATIONS TO OTHER AGENCIES

ADNR recommends that Alaska Oil and Gas Conservation Commission and the Mat-Su Borough consider the following actions:

1. The Mat-Su Borough adopt an ordinance to establish standards similar to those adopted here by ADNR to be applied by the borough on non-state managed lands.

2. AOGCC adopt regulations to prevent the production of CBM from coal seams that serve as a current source of drinking water.

3. AOGCC continue its efforts to develop a public notice procedure for permits to drill CBM wells.

4. AOGCC continue its efforts to develop requirements for proposed CBM wells of baseline testing and on-going monitoring for water quality of any existing drinking water well that may be negatively affected by the CBM production. The testing to include methane content to identify any potential risk of methane seepage.

APPENDIX A. RESPONSE TO COMMENTS AND SUGGESTIONS

	COMMENT OR SUGGESTION	RESPONSE
	PUBLIC NOTICE- General Recommendations	
1	Notice requirements should be the same for both ADNR and non-ADNR managed subsurface.	As a public land manager, ADNR's notice requirements are significantly greater than those for private landowners. Transactions such as mineral leases or land transfers between private parties regarding private lands are generally not subject to any public notice, while activities on private lands that require local permitting approval will generally require public notice. The establishment of public notice requirements on non-ADNR lands would have to come from the AOGCC or from a borough ordinance, since ADNR does not have authority to require such notice on non-ADNR lands. AOGCC is currently considering a public notice requirement as part of their permit to drill approval process. However, it must be noted that AOGCC's authority is generally limited to belowground drilling operation procedures. AOGCC will not consider public comments related to potential conflicts occurring on the surface with other users. If the borough considers such a public notice requirement, ADNR recommends notice requirements be comparable to those requirements on ADNR managed lands.
2	Should have consistent notice (same amount of time) throughout the leasing and permitting process.	The length of time for a comment period is established in statutes or regulations and may vary based on a number of factors such as magnitude of the potential impact from the decision, complexity of the issues involved, and level of public interest in the decision. Also, these required comment periods establish the minimum periods allowed. When a proposed decision involves issues or raises concerns the cannot be adequately addressed during the standard comment period, the period will be extended to provide an appropriate period for comment.

bought length of time extended

	COMMENT OR SUGGESTION	RESPONSE
3	All notification requirements should apply to transfers of leases.	The review and approval of transfers of oil and gas lease is generally an administrative function with little policy or discretionary input. ADNR receives hundreds of lease assignments per year. Requiring public notice and input for these assignments would be expensive with little increase in the public's involvement in oil and gas resource management, and would likely mislead the public regarding the significance of the decision to be made. Also, it should be noted that the public is primarily interested in who will be operating on the state leases, and not as much with who owns the lease. For example, the shallow gas leases in the Mat-Su are held by many individuals, but these leaseholders have contracted with Evergreen Resources to explore for coalbed methane on their lease. ADNR will likely not be aware of who will operate on a specific lease until it receives an application for approval of a plan of operation, or an application to form an exploration or development unit. Either one of these processes will involve a public notice and comment period.
	PUBLIC NOTICE - Area of Notification	
4	At the leasing stage, notice should be given to all surface owners within the boundary of the lease application, and also within an established distance from that boundary. Distance recommendations included: ½-mile, 1-mile, 1.5-miles, 5-miles and 25-miles.	ADNR agrees that public notification related to CBM lease activities should have broad distribution within the affected area, however ADNR does not believe that individual notice to surface owners is necessary. ADNR has engaged in oil and gas leasing of inhabited areas for decades, including Kenai and Anchorage. The public notice procedures throughout this time have not caused the level of concern that we now see in the Mat-Su. ADNR believes that most of the discontent over the notice procedures used in the Mat-Su is primarily due to the lack of a best interest finding and its associated public evaluation of whether to issue leases in the Mat-Su. ADNR supports legislation to restore a best interest finding to all oil and gas leasing, and that doing so will significantly reduce the public discontent over the notice procedures.

	COMMENT OR SUGGESTION	RESPONSE
		However, ADNR also recognizes that additional steps much be taken to restore public confidence in the desires of ADNR to fully engage the public in the leasing decisions ADNR makes. Therefore, Standard #1 represents significant additional notice requirements that ADNR will employ in future leasing decisions involving CBM in the Mat-Su. Finally, the cost associated with individual notice is significant, and a change in ADNR policy that would significantly increase the cost of the leasing program should be initiated by the legislature.
5	For exploration and development stages, notify all surface owners within a defined area. Recommended areas of notice included: • Within the entire lease area. • Within a specific radius from the well - ½ mile, 1 mile, 5 miles, 25 miles. • Within 1 mile from well and corridor, but ½ mile from corridor may be adequate depending on definition of "corridor." • Along right of way of road used to access project. • Within area defined by watershed, bioregion, or aquifer. • Within 5 miles until further data on aquifers and other baseline data has been developed that suggest a larger area of notification.	Standard #2 addresses this comment for ADNR managed lands and requires direct notice to landowners within ½-mile of operations. The Mat-Su Borough or AOGCC may have the ability to require the same public notice standards on non-state managed lands. ADNR recommends that these entities investigate a mechanism to adopt public notice requirements.
	PUBLIC NOTICE - Methods	
6	Notice should be provided by mail. Recommendations included regular mail and certified mail.	At the leasing stage, organizations and individuals will be notified if they have requested it in writing. When activities are proposed, landowners within ½-mile will be notified by certified mail or personal delivery.

	COMMENT OR SUGGESTION	RESPONSE
7	Notice should be given in local and weekly newspapers a minimum of two times per week over one month, and should consist of display ads, not just legal notices. Should also print names of all surface owners in newspaper notice.	At the leasing stage, ADNR will place display ads in both the Anchorage Daily News and Frontiersman. The ads will include a map of the proposed lease boundaries. ADNR believes this is sufficient, and that including the names of property owners would be unnecessary. When activities are proposed, legal ads will be used, and landowners within ½-mile will be notified by certified mail or personal delivery.
8	Notice should be provided by radio, television, and posting of signs.	The public notification process is addressed in Standard #1 and 2. It includes public service announcements and posting notices in libraries and post offices.
9	Flyers should be posted in gas stations, grocery stores, post offices and other public places.	See response # 8.
10	Provide a database on the website of all permits from all involved agencies (on one website).	ADNR supports the advancement of information technology in permitting decisions. Many efforts are underway to better use information technology to integrate permitting information between agencies and make it more accessible to the public. These efforts will continue and will include CBM activities in their products.
	PUBLIC NOTICE - Responsibility	
11	Require the lease applicant to be responsible for making (after ADNR review) and distributing accurate maps of leased area to all property owners.	For leasing, ADNR is responsible for creating maps of the proposed lease areas. An applicant for a plan of operations approval is responsible for providing an accurate map of the project area, such a map would be included in the notice of the operations provided to landowners.

	COMMENT OR SUGGESTION	RESPONSE
12	To address leasing on non-ADNR managed subsurface, the applicant should be required to register with ADNR. ADNR would then be responsible for notification of property owners within 5-mile radius AND Borough permit for subsurface development with Borough notification (public notice) to property owners. Comments would go to ADNR and the Borough.	This request is beyond ADNR's current statutory authority. ADNR recommends that the notification process used for state managed land be applied to private land through borough authorities.
13	All agencies should work together to get public notices out. ADNR should be the coordinator of the information that needs to go to the public. Reinstate the Division of Governmental Coordination.	ADNR, AOGCC, ADEC and the Mat-Su Borough have cooperated throughout the Mat-Su Coalbed Methane Standards process and will continue to coordinate on CBM activities. The Division of Governmental Coordination (DGC) functions were transferred to the Office of Project Management and Permitting (OPMP) within ADNR. Like DGC, OPMP is responsible for coordination among state agencies for certain activities. However, OPMP's method of coordinating the permitting activities is through the Alaska Coastal Management Program. CBM activities are exempt from ACMP review by statute.
	PUBLIC NOTICE - Review of Public Comments	
14	Individuals with scientific background and/or an interagency panel should review comments. Create a panel to address comments and review permits, with citizens on the panel.	ADNR, AOGCC, ADEC and the Mat-Su Borough house technical expertise in the fields of geology, hydrology, engineering, biology, planning, and other disciplines associated with land and resource management. Where required, these staff will be asked to review public comments and participate in developing a response.
15	Web response to comments is not sufficient. Letter should be sent to all providing comments. Written comments summary should be mailed to those who comment.	Copies of final decision documents are mailed to those who commented.

	COMMENT OR SUGGESTION	RESPONSE
	PUBLIC NOTICE - Effect of Public Comments on Decisions regarding Lease Applications, Permits to Drill and Plans of Operation	
16	A public hearing should be required under certain circumstances. Recommendations included: • More than 25 percent of the population comment. • Level of development changes. • After every comment period for every decision. • Prior to any lease, on state or private subsurface.	At the leasing stage, there is an opportunity for a public hearing (AS 38.05.946). Requests for public hearings are reviewed on a case-by-case basis. If there is significant public interest or concern expressed regarding a pending ADNR decision, there is ordinarily a public hearing to hear those concerns.
17	A lease application, well permit, or plan of operations should be denied under certain circumstances. Recommendations included: • The majority of comments received are opposed (if opposed, allow surface owner option to lease subsurface at current rate). • Numerically tally comments, give weight to comment volume.	Lease applications and plans of operations are denied when they do not meet the decisional requirements (i.e. in the best interest of the state). Although local concerns are considered and can affect the decision, resource decisions by ADNR are based on the state's interests.
	PUBLIC INFORMATION - Information that Should be Available to the Public	
18	Information regarding the leasing and permitting process should be presented in a clear, easier to understand format.	ADNR provides information to the public at the leasing, exploration, development, production, and transportation phases of CBM activities. ADNR continually strives to improve the quality of the information we provide to the public. One of the motivations to initiate this standards process was the frustration with the lack of public understanding of what ADNR does and how we protect the public's interests. We will continue to look for ways to make the information we provide more easily understood.

	COMMENT OR SUGGESTION	RESPONSE
19	Non-proprietary information specific to permits and plans of operation should be available to the public: • Surface and bottom hole locations, prior to permitting. • Surface cement casings, cement bond logs. • Content and disposition of drilling mud. • Ingredients (not formulas or proportions) of materials used in hydraulic fracturing. • Other chemicals or materials used for surface and subsurface operations. • Results of water testing before, during and after operations. • Monitoring well data.	These concerns are addressed in Standards #3, 4, 5, 6, 12, and 21.
20	Proprietary information specific to permits and plans of operation: • Core sample data. • Drill logs. • Complete information on hydraulic fracturing fluids.	See Standard #3 regarding fracturing fluids. State statutes require the confidentiality of certain information. All other information is available for public review.
21	Haz-Mat response teams need to know what materials are being transported and used (for spill occurrences).	See Standards #3 - 6.
	PROPERTY RIGHTS / SPLIT ESTATE **General Recommendations**	
22	Surface owner should have dominant estate, not the subsurface owner. Landowners should be allowed to say no. No access without surface owner's approval. Using Surface Mining and Coal Reclamation Act as an example, state should work to establish parity between the estates to give balance to all values.	The relationship between the surface and subsurface has been established through a process of legal precedence. ADNR has no control over this process.

	COMMENT OR SUGGESTION	RESPONSE
23	Federal law should be changed to allow state transfer of subsurface to surface owners. Otherwise, give property owner the right to lease or purchase the state's mineral estate under their property. Surface owners should have right of first refusal for property owner before lease happens. Surface owners should be able to get "best deal" before subsurface party exists.	ADNR cannot change federal law. Section 6(i) of the Alaska Statehood Act specifically requires the State to retain the mineral interests when conveying the surface estate. If Alaska conveyed its mineral estate contrary to the Act, that estate would be forfeited to the federal government
	PROPERTY RIGHTS - Information that Developer should provide to Surface Owner in Addition to Plan of Operations	
24	Flow chart for the process of reaching agreement, conflict resolution, and legal recourse if unsatisfactory contract.	During negotiations, the surface owner can request this information from the developer. In addition, see Standard #19 for a description of the brochure ADNR will prepare regarding surface owner rights.
25	Driller (company) should provide qualifications, bonding, and performance and work history (including violations, etc.).	During negotiations, the surface owner can request this information from the operator.
26	Area-wide "development plan."	The existence of such a plan would depend on whether unitization has occurred To address issues on a broader scale, a unit could be formed by lessees in an area, if determined and certified by the commissioner to be necessary and advisable in the public interest (AS 38.05.180 (p)). Decisions would be guided by a plan of development specific to that unit. The plan must adequately protect all parties in interest, including the state.

	COMMENT OR SUGGESTION	RESPONSE
27	Plan of operations, which should include: • As-built type of plan for development that graphically defines placement of structures. • Standards for road and pad construction • Oversight and enforcement protocols, which should stipulate having compliance official on-site. • Provisions for plan amendments and protocol for evaluating any changes.	Applications for plan of operations approval are already required to include a graphic depiction of where facilities will be located, how they will be constructed, etc. Modifications of the plan of operations require ADNR approval, and unless the modification is minor, the modification would require a public notice and comment period. See Standard #31 regarding monitoring requirements.
28	Require an impact statement for public comment. Detailed plan with timeline and environmental impact statement approved by local government. 90-day public notice period for Environmental Impact Statement.	An Environmental Impact Statement is a federal document. The state develops Best Interest Findings, but these are not allowed for shallow natural gas leasing.
29	Every new driller should be required to submit a new plan of operation.	A plan of operation is required for all drilling activity on state managed lands.
	PROPERTY RIGHTS - Standard Surface Use Agreement	
30	Experienced land use attorneys should craft a third party agreement to be used as a template.	ADNR would support an effort by attorneys to draft a template surface use agreement.
31	Establish a citizen advisory group or a task force to include government, property owners, and private companies that will provide expertise for different topics (example water quality, property law issues, agriculture).	ADNR intends to monitor the implementation success of these Standards, and assess the need for this suggestion if CBM exploration is successful and development is proposed.

	COMMENT OR SUGGESTION	RESPONSE
	PROPERTY RIGHTS - Negotiation of Surface Use Agreement	
32	Surface owner should be paid fair market value for the land if they do not want to be a participant in the program.	ADNR does not have the authority to address this suggestion. It would require new legislation.
33	Need a pre-determined bond value before negotiations start.	Standard #20 addresses bond valuation. There will be no need for a bond determination if negotiations on a surface use agreement are successful.
34	Remove limitations on confidentiality. User agreements on state subsurface must be public.	Agreements between private surface owners and operators are private contracts and not public documents.
35	Terms of agreement should transfer to subsequent developers.	The terms of the private surface use agreement will establish whether the agreement can be assigned to a new operator without the other party's consent.
36	A watershed unit should be established and that unit should negotiate the "agreement" and have the same rights as above.	Watershed planning groups have been established in other areas of Alaska. They meet and discuss issues affecting the watershed and make recommendations on proposed activities. Watershed planning groups can be a valuable resource for landowners; however, they do not have the legal standing to accomplish what is being proposed. Watershed planning groups typically work through local municipalities, a state agency or federal agency to implement planning objectives.
37	State foots the bill for the agreement.	The cost associated with development of a surface-use agreement is the responsibility of the participants. Standards # 18 - 20 are intended to assist the landowner in surface-use negotiations.

	COMMENT OR SUGGESTION	RESPONSE
38	Subsurface lessee and/or state should pay for: • All legal costs incurred by surface owner, including legal assistance to draft any agreements. • A citizens advocacy group (e.g., Prince William Sound) • A group of attorneys, from which citizens should be able to pick (the state should include this cost when figuring out royalties). • A fund to compensate for decreased property values. • Complete water testing before, during and after operations, done by a third party (to be chosen by surface owner).	These suggestions would require legislation to accomplish, and are beyond ADNR's authority to consider.
39	There should be a law to require a driller to comply with a standard agreement made by the group negotiations between private owners and the state.	These suggestions would require legislation to accomplish, and are beyond ADNR's authority to consider.
40	For non-ADNR managed subsurface, the same requirements should apply.	ADNR supports legislation to bring similar split-estate requirements to non-ADNR managed lands as are required on ADNR managed lands.
	PROPERTY RIGHTS - Bonding Process	
41	Adjacent property owners should have right to bond hearings.	A bond is intended to ensure there are funds available to dismantle and remove equipment, and rehabilitate lands at the termination of activities. Adjacent lands will not require such funds.

	COMMENT OR SUGGESTION	RESPONSE
42	If negotiations of a Surface Use Agreement are not working out and it is necessary to establish a bond, a minimum period of time should elapse and the developer should demonstrate good faith efforts to reach agreement with the surface owner prior to a bond hearing. • For ADNR managed subsurface, "Good faith" is needed regarding terms of abandonment of facility per company; must be set prior to commencement. • Third party must evaluate these "good-faith efforts." • Establish, define and agree on what determines whether there have been adequate negotiations prior to driller going to the state for a bond. • Recommendations for time period included: 30, 90, 180 days, one year.	See Standard #18.
	PROPERTY RIGHTS - Bond Amounts	
43	Recommendations for bond amounts included: • 60% of property value. • Full property value, plus any and all reclamation. • Two times the fair market value. • In order to make the negotiation more fair and even, the driller could have a choice of the following: buy out surface owner at 2 times the fair market value, or purchase at the owner's named price.	Ordinarily the surface use agreement will establish the bond amount, if any, and the surface owner is able to negotiate that amount. If a surface use agreement cannot be negotiated, then state statutes give this authority to ADNR. See Standard #20 regarding the calculation of potential damages.
44	Bond should cover neighbors' water wells.	See response # 41.

	COMMENT OR SUGGESTION	RESPONSE
45	Bond should pay for all damages to public resources, such as public water or spills on rights of way, and maintenance and repair of public roads (if they are using infrastructure, they should pay for it).	See response # 41.
46	Bonds should include total "actual" value of property, not just portion used by driller, and should be based on replacement or resale values.	See Standard #20.
47	Bonds held by "driller" to include compensation differences in property taxes.	See Standard #20.
48	Two percent of property value should be added to the bond amount annually.	See Standard #20.
	PROPERTY RIGHTS - Other Recommendations regarding Determination of Bond Amounts	
49	Surface owner should determine the bond amount.	See Response #43.
50	Address health impacts, quality of life, economic return, trees and soil (value of physical assets), and incorporate these into a "trespass fee/access surcharge."	See Standard #20.
51	Statewide bond of $5 million for 50 years with bond held in interest bearing account.	In addition to the bond that may be established to protect the surface owner, ADNR requires a bond to protect state land and resources from damage. Typically operators will put up a statewide bond of $500,000.
52	The state should have ultimate responsibility if bond proves to be insufficient.	This suggestion would require legislation, and is beyond ADNR's authority to consider.

	COMMENT OR SUGGESTION	RESPONSE
	PROPERTY RIGHTS - Factors that should be accounted for in Determination of Damages	
53	Need to factor and quantify any impact that the landowner deems negative, including: degradation of air quality, degradation of water quality and quantity, noise, visual impacts, impacts to vegetation and soil, produced water damages, subsurface impacts, roads, weeds, wildlife poaching, damage to soil, vegetation, fences and roads, livestock and agricultural losses, temporary loss of use of surface, loss or impairment of access, loss of recreational values in surrounding land, decreased property value, short-term and long-term damages, damage to surface improvements, any harm to property, loss of wages, increased price of heating fuel, loss of business (tourism, etc.), reduced economic return on property (present and projected), loss of property taxes to the community, possible increases in property taxes if assessment rises because of road building, loss of privacy, diminished quality of life, pain and suffering, right of quiet enjoyment, health and well-being, infliction of emotional distress.	See Standard #20.
	PROPERTY RIGHTS - Other Recommendations regarding Determination of Damages	
54	Burden of proof should not fall on the damaged.	If a landowner is not satisfied by the actions of an operator, state statutes require the landowner to go to court to establish damages. Once damages have been assessed by the court, if the operator is unable or unwilling to pay the damages, then the bond is available to the landowner to recover the damages. Any change in the burden to prove damages would require a change in state statutes through legislation.

	COMMENT OR SUGGESTION	RESPONSE
55	ADNR should develop regulations that define "damage."	See Standard #20
56	Compensation should be to all affected, not just the landowner.	See Responses #41 and 54.
57	The surface owner should determine price.	See Response # 43.
58	Intentional misconduct and damage to property should be subject to criminal penalties.	To the extent that the intentional misconduct violates state law, the guilty party may be liable for either criminal or civil penalties. Intentional misconduct associated with violation with conditions of the lease may result in lease termination.
59	Professional appraisers selected by the surface owner should establish values. Driller/subsurface developer to cover costs of pre-access appraisal and after access drilling appraisals (no MAI appraisals).	See Response #54. When the landowner goes to court to establish damages, the suggested methods could be used to establish the amount of damages.
60	Roads and pipelines deemed reasonable for production are not currently considered "damage." This needs to be reversed.	This is not an accurate statement. Any change to the property that is not desired by the property owner could be considered damage. Ordinarily a surface use agreement will establish what will remain after operations are complete, such as roads or driveways; anything else would likely be considered damage if it were not removed. Ultimately, it is up to the court to determine what is damage.

	COMMENT OR SUGGESTION	RESPONSE
	PROPERTY RIGHTS - Mediation / Dispute Resolution	
61	• ADNR is not impartial. Instead of ADNR being involved in mediation, it should be an independent commission. State and industry should pay for citizen's CBM commission. • Establish a mediator or ombudsman to provide assistant to surface owner to avoid having courts being the only recourse. • The developer should pay for an independent landsman/attorney picked by the surface owner. • Cap legal expenditures to ensure equity between driller and property owner. • Adjacent surface owners should have the same rights to have an attorney represent them and paid for by lessee. • For non-ADNR managed subsurface, the same requirements should apply.	These suggestions would require legislation to accomplish and are beyond ADNR's authority to consider.
	PROPERTY RIGHTS - Information Packet or Pamphlet / Advisory Group	
62	Collaborative team of public and private individuals (community councils, ADNR, DEC, AOGCC, borough, etc.) should provide a packet to all owners that may be affected by CBM impacts – include (in layman terms) descriptions of rights and make people aware of timelines, buffer areas (distance from structures, setbacks, etc).	See Standard #19.
63	Citizen advocacy office should be established to give surface owners information and advice.	This suggestion would require legislation to accomplish and is beyond ADNR's authority to consider.

	COMMENT OR SUGGESTION	RESPONSE
64	Standard form should be given to landowners at real estate closings and a warning that an attorney should be contacted. The form should include information of possible adverse impacts of CBM development.	This suggestion would require legislation to accomplish and is beyond ADNR's authority to consider.
	SURFACE IMPACTS - Recommended Standards for Drill Pads, Compressor Stations and Buildings	
65	A visual mitigation plan must be submitted and approved by all impacted landowners, landscape architects and authorizing agencies prior to approval of a plan of operations. The plan must include specific requirements related to surface and vegetation impacts and approved by the surface owner.	See Standard # 10.
66	The applicant shall use structures of minimal size, and only as described, to satisfy present and future functional requirements. Design of structures must be approved by the surface owner, citizen's board, and the Borough Public Works Department, Legal Department, and Planning Commission.	For state managed land, ADNR will require the lessee to address facility and structure design through the plan of operation process. Interested parties will be able to review and comment during the public process. ADNR recommends that the borough adopt similar provisions and can determine who should review and approve the plan.
67	If clearing trees and vegetation for construction of facilities, the applicant shall feather and thin edges of vegetation, and comply with a reclamation plan that has been approved by the landowner and is consistent with habitat preservation and current wildlife uses.	See Standards #14, 15, 16, and 37.
68	Facilities shall be located no closer than ¼-mile from prominent natural features such as distinctive rock and landforms, wetlands, all waterways, culturally sensitive features, and other landmarks.	See Standards # 7, 8, 10, 35 and 37.

Local input

	COMMENT OR SUGGESTION	RESPONSE
69	Facilities shall be located to avoid crossing hills and ridges or silhouetting.	See Standard # 10.
70	The applicant shall locate facilities, as soil conditions allow, at the base of slopes to provide a background of topography and/or natural cover.	See Standard # 10.
71	No structures within viewshed of scenic byway or highway.	See Standard # 10.
72	A stormwater prevention plan and soil erosion and sedimentation control plan shall be prepared by a registered professional soils engineer or the DEC. Best practices, DEC standards or soil conservation district standards are to be used in preparing the soil erosion and sedimentation control plan. Plan must be approved by the surface owner, reviewed by ADNR/DEC prior to start and inspected by ADNR/DEC during operations.	Disturbances of greater than one acre (roads, pads, staging areas, etc.) are subject to the EPA stormwater program. In this situation, EPA issues a National Pollutant Discharge Elimination System (NPDES) General Permit for Storm Water Discharge from Large and Small Construction Activities (General Construction Permit or GCP). This permit requires a Stormwater Pollution Prevention Plan (SWPPP), which includes methods to prevent stormwater run-off and site monitoring. ADEC must certify that this permit meets state water quality standards. The permit is not subject to landowner approval. In addition, see Standards # 14 and 15.
73	In addition to permanent provisions, temporary erosion and sediment control measures are also required during construction operations. Construction schedules are to be programmed to permit installation of required permanent sediment and erosion control structures as soon as possible.	See response to # 72.
74	Sediment shall not reach drainage structures. Implement best management practices under the Clean Water Act to prevent sedimentation.	See response to # 72.

	COMMENT OR SUGGESTION	RESPONSE
75	Data available through the local National Resource Conservation Service, stormwater pollution prevention plan (1 acre or more), DEC, Mat-Su Borough, ADNR, Corp of Engineers and EPA shall be used as a supplemental guideline for soil and water conservation practices pending USDA review. Consult with the Plant Materials Center.	See response to # 72.
76	Applicant must process cut spruce material to avoid bark beetle infestation (per landowner's desires).	See Standard # 16.
77	A 200-foot minimum buffer from flowing waterways to minimize impacts.	Standard #37 incorporates the Fish and Wildlife protection measures on oil and gas leases, including either a 300 or 500-foot setback from fishbearing waters.
78	Exhaust from all motors shall be vented in a direction away from all existing residences or platted subdivision lots.	See Standard # 9.
79	Electric motors should be used for all pumps and other stationary equipment. All facilities with motors that are not electrically operated shall be equipped with quiet design mufflers (hospital grade) or better.	See Standard # 9.
80	Construction of soundproof buildings or other enclosures shall be required where facilities create noise and visual impacts non-mitigatable because of proximity, density, and/or intensity of adjacent land use.	See Standard # 9.
81	Noise levels are not to exceed 50 decibels (day or night) at 50 feet.	ADNR has decided to use a noise mitigation plan standard, rather than a decibel level standard. See Standard #9.

	COMMENT OR SUGGESTION	RESPONSE
82	Activity at the drill pad should only occur during business hours, Monday through Friday (8 am to 5 pm).	ADNR has decided to use a noise mitigation plan standard, rather than an operating hours standard. See Standard #9.
83	Determine effect of noise on wildlife.	Many wildlife species have shown surprising tolerance for noise associated with human behavior. Disturbances of habitat or from people would likely have more impact than equipment noise.
84	Require a minimum setback from the site perimeter, any lot line, and any residential structure. Recommendations included 2000 feet. ½ mile, 2 miles, and ½ mile for wells, 2 miles for compressor stations.	See Standard # 7 for setback requirements.
85	Require a minimum setback from any school, hospital, institution of learning, court, or rest home. Recommendations included ½-mile, 2 miles, and 2 miles from compressor stations.	See Standard # 7 for setback requirements.
86	Require that facilities not be located in subdivisions that contain any lots smaller than certain acreage, or on parcels of land smaller than certain acreage. Recommendations included 10 acres, 20 acres, 40 acres, 50 acres, 160 acres, 500 acres.	See Standard # 8.
87	Setbacks from sensitive habitat (nesting, calving, bear denning, etc.) of a minimum of ½-mile as approved by ADF&G.	Standard #37 incorporates the Fish and Wildlife protection measures on oil and gas leases, including numerous setbacks from fish, bird, and wildlife habitat.
88	Require directional drilling to avoid impacts to streams.	See Standard #28 and 37.

	COMMENT OR SUGGESTION	RESPONSE
89	All disturbed areas are to be restored to original or better condition with indigenous plant species to the satisfaction of the landowner (both surface and subsurface) and per the visual mitigation plan submitted and approved during the initial permit.	State leases require the land to be restored to the satisfaction of the ADNR Commissioner. A surface use agreement will usually establish the surface owner's standards for restoration. Restoration to the original condition is usually not possible, nor preferable. There are usually improvements that can be made to the property in the scope of restoration.
90	The permitting authority for shallow natural gas leasing and other development for the entire region shall develop an overall master plan prioritizing preservation of large tracts to avoid fragmentation (patchwork) disturbance of habitat. This plan shall comply with existing forest and park management plans.	ADNR intends to meet this suggestion through a variety of means. First, any full-scale development will be done after the leases to be developed have been formed into a production unit. The production unit will require a plan of development. This plan will serve as a "master plan" for evaluating the cumulative impact of the proposed development. Further, Standards #25 –30, and 32 will minimize habitat fragmentation and other negative impacts of roads and pipelines.
91	Facilities shall be painted as follows: • Uniform, noncontrasting, non-reflective color tones, similar to Munsell Soil Color coding system. • Color matched to land, not sky, slightly darker than adjacent landscape.	See Standard #10.
92	All of the following landscape practices shall be applied, consistent with natural and existing habitat, on a site specific basis: a. Establishment of berms, ground covers, shrubs and trees. Landscaping shall follow the guidelines as established in this code. Vegetation clusters shall be placed 10-15 feet apart along the edge of the permanent pad site. b. Shaping cuts and fills to appear as natural forms. c. Cutting rock areas to appear as natural forms. d. Designing the facility to utilize natural screens. e. Construction of fences such as woven wood or rock for use with or instead of landscaping.	See Standard #10.

	COMMENT OR SUGGESTION	RESPONSE
	SURFACE IMPACTS - Recommended Standards for Lighting	
93	Exterior lighting, when required, shall be directed away from residential areas, or effectively shielded from such areas and shall only be on from 8 am to 5 pm. Light generators will be turned off one hour before dusk or 7 pm in the winter. Where possible, lighting should be switched so they can be turned off when not needed.	See Standards #10 and 11.
	SURFACE IMPACTS - Recommended Standards for Solid Waste - Temporary Storage	
94	Temporary storage plans must be submitted and approved by DEC. DEC will approve temporary storage of drilling waste for up to one to two months. Require independent testing and monitoring by third party. Require public notification, how, when and where.	ADEC regulates wastewater and solid waste disposal of CBM drilling by products. In addition, see Standards 12 and 13.
95	Open pits can be used for temporary storage. Open pits are required to be lined and meet strict construction and operational standards. This may include steps to mitigate any odors that might emanate from the stored materials.	See response # 94.

	COMMENT OR SUGGESTION	RESPONSE
	SURFACE IMPACTS - Recommended Standards for Solid Waste - Permanent Disposal	
96	Drilling waste generators shall submit an engineered plan to DEC Solid Waste that describes how they will perform the on-site disposal or reuse. The generator shall not perform any disposal or reuse activities until DEC approves the plan. At minimum, the plan shall include the following elements: • Landowner letter of acceptance that disposal can occur on their land; Design drawings that show how the on-site disposal cell will be constructed or how the drilling waste will be reused on the site following testing and determination of non-contaminants; • A description of the characteristics of the waste that will be disposed or reused, including a list of drilling fluid additives that will be used; and, • An estimate of the quantity of waste that will be disposed or reused.	See response # 94.
97	After completing the disposal or reuse activity, DEC needs a proof that a deed notice has been filed with the appropriate state or municipal agency and engineered as-built drawings for each site that include the following information: • Whether the cells have a top liner, and if so, how it was installed; The thickness of the waste cover and what type of material used for covering the cell; • The type(s) of waste are disposed in each cell; and, • Surveyed coordinates that show the location of each disposal site. At minimum, this should include the coordinates of the four corners of each cell.	See response # 94.

	COMMENT OR SUGGESTION	RESPONSE
98	There should be requirements for transport of waste, including limitations on hours.	See Standard # 9 which includes consideration of hour of operation for noise mitigation.
	SURFACE IMPACTS - Recommended Standards for Solid Waste - Hazard to wildlife and livestock	
99	Adequate fencing or other barriers must be provided around pits to exclude livestock and wildlife.	See Standard # 13.
	SURFACE IMPACTS - Recommended Standards for Use of Hazardous Materials	
100	Secondary containment shall be provided for the storage of fuel or hazardous substances.	Standard #38 incorporates the Hazardous Substance measures on oil and gas leases, including the requirement for secondary containment.
101	Operator must prepare an emergency preparedness and response plan that must be approved by DEC and the Borough. A copy of the plan must be provided to the surface owner and local emergency response managers.	See Standard #5.
102	Sufficient personnel onsite to handle worse case accident by developer. Mock drills must be performed monthly.	See Standard #5.
103	Surface owner should be empowered to initiate private enforcement actions regarding violation of rules or regulations and, if successful, receive reimbursement of all legal expenses plus three times value of actual damages.	This suggestion would require legislation to accomplish and is beyond ADNR's authority to consider. The surface owner may notify the jurisdictional agency regarding the violation of lease conditions or laws. It will then be the responsibility of that agency to take further action.

	COMMENT OR SUGGESTION	RESPONSE
104	Every affected landowner and property owner shall go through the following process: 1. Each property plan shall include a comprehensive plan submitted by the drilling company to be received by and approved by a local citizens board, the property owner, the borough, and the state; 2. Development shall only be allowed if approved by all parties; 3. If the plan is not strictly adhered to, the permit shall be revoked and the bond given to the property owner for reclamation; 4. The plan shall identify long-term funding sources for monitoring and enforcement; 5. If the permit is sold, the new permit holder must adhere to the previously approved comprehensive plan as outlined above.	A plan of operation is required for drilling on state managed land. The plan is subject to all local and state laws and the conditions of the lease. The plan is subject to a 30-day public review period during which time all parties may comment. The plan is approved by ADNR.
105	MSDS must be posted on site for review by property owner and adjoining property owners.	See Standard # 4.
	SURFACE IMPACTS - Recommended Standards for Roads and Public Access	
106	CBM activities must utilize existing road systems or air or boat service. Any approved off-road access for exploration or development activities, including the use of gravel, shall be part of a phased road and pipeline plan designed to minimize and mitigate damage and impacts to private property and public resources.	See Standards # 25 – 30.

	COMMENT OR SUGGESTION	RESPONSE
107	Existing roads shall be used to minimize land disturbance unless traffic safety, visual or noise concerns, or other adverse surface impacts clearly dictate otherwise.	See Standard # 26.
108	If new roads are necessary, they shall be designed to Borough or DOT/PF standards, and arranged with appropriate regard for private and public resources, including wetlands, fish, wildlife, sensitive areas, topography, creeks, wooded areas, and other natural features which would enhance attractive development.	See Standards # 25.
109	Production water should not be used for dust control, unless it passes CWA standards.	Using produced water for dust control would require a permit from ADEC (18 AAC 72.500), and would have to meet state water quality standards.
110	The state has no means to address non-point source pollution.	See Response #72.
111	The applicant shall be responsible for ongoing weed control during construction and operation of an access road or facility, through completion of the approved reclamation plan. The appropriate weed control methods and species to be controlled shall be determined through review and recommendation by the Plant Materials Center, the Soil and Water Conservation District, NRCS and the Borough. Develop plan for proper chemical use.	See Standard #17.
112	Public access to, or use of, the leased area on public land may not be restricted except within the immediate vicinity of drill sites, buildings, and other related facilities.	See Standard #30.

	COMMENT OR SUGGESTION	RESPONSE
	SURFACE IMPACTS - Recommended Standards for Pipelines	
113	Pipelines must utilize existing transportation corridors and be buried, unless seismic or other concerns prohibit burial.	See Standard # 29.
	SURFACE IMPACTS - Recommended Standards for Well Spacing	
114	There must be a limit to well density, and if a temporary or permanent exception is requested, all surface owners in the section must receive written notice, with local and interagency review, a public hearing and minimum waiting period prior to approval. Density recommendations included one well per section and two wells per section. Waiting period recommendations included 30, 60, 90, 180 days.	See Standard # 32.
	SURFACE IMPACTS - Recommended Standards for Air Quality	
115	Pumps, compressor stations and vehicles shall be operated on natural gas. Require a catalytic converter on natural gas powered engines.	Air quality is regulated by ADEC. At this time, ADEC does not anticipate air quality issues associated with CBM development in the Mat-Su Valley.
116	Pumps and compressor stations shall be operated on electric power from the grid, or electricity generated from renewable energy resources. Use electric pump motors within one mile of a power line.	See Response # 115.

	COMMENT OR SUGGESTION	RESPONSE
117	Baseline air quality must be determined and annually or periodically monitored by DEC. Effects of dust and other air pollutants must be studied and monitored.	See response # 115
	SURFACE IMPACTS - Recommended Standards for Geologic Hazards	
118	Baseline study on methane seepage must be conducted and monitored annually throughout the lease period. This needs to be accomplished prior to exploration and development and paid for by the developer.	The standards do not include measures to monitor or test for methane seepage. This is an area regulated by AOGCC. ADNR defers to AOGCC's expertise on this matter. AOGCC is considering a monitoring program for proposed drilling activities that will include the methane content of drinking water wells near the proposed CBM well.
119	Geologic studies and models must be conducted to determine subsidence potential, paid for by developer.	There are no documented instances of subsidence associated with CBM development. ADNR does not find that this is an issue that requires additional standards.
120	Establish non-development perimeter near geologic hazards. For example, no drilling within ½-mile of a fault.	See Standard #33.
121	Industry established compensatory fund for seep damaged property owners.	See Response # 118.
	WATER MANAGEMENT - Baseline Studies	
122	Conduct a groundwater resource study using existing data available, gather all this data, determine gaps in information and perform the necessary baseline studies to fill the gaps. The study should investigate hydrologic connections between surface water and groundwater, and between shallow and deep aquifers.	See Standard #21, and Recommendation # 4.

	COMMENT OR SUGGESTION	RESPONSE
123	Prior to approval of specific exploration or development activities, require certain baseline data for the affected area. Recommendations included: • Baseline surface and groundwater testing within one mile of any well. • Test quality and quantity of all wells within a certain distance of potential CBM wells for baseline chemical (including hydrocarbons, metals, etc.) and flow/depth characteristics.	See Standard #21, and Recommendation # 4. Also, water quality is regulated by AOGCC and ADEC. ADNR defers to their expertise on these issues. ADEC has developed environmental quality standards and discharge authorization procedures through the state's regulatory rulemaking process. ADEC has established water quality sampling and testing protocols for drinking water wells.
	WATER MANAGEMENT - Cumulative Effects	
124	Must initiate a cumulative effects and impact study prior to further exploration and development. A multidisciplinary team would address social, cultural, economic and other issues.	The review of any proposed plan of operation will address the impacts associate with the proposed activity. If development is proposed, then the cumulative impacts can be reviewed in association with the plan of development review.
	WATER MANAGEMENT - Recommended Standards for Water Quality and Quantity	
125	Recommendations for fracturing fluids: • All fluids used for fracturing in Alaska should be standardized and a part of the public record (including MSDS sheets). • Use only water for fracturing, or only non-toxic material. • Hydraulic fracturing fluids must meet water quality standards. • Require a cement well bond log.	See Standards # 3, 4, and 24.

	COMMENT OR SUGGESTION	RESPONSE
126	Recommendations for produced water and reinjection: When: • Reinjection should be required at all times. • On privately owned surface lands, owner may apply to have water discharged on surface if water meets DEC and CWA standards. Must notify neighbors within one-mile radius of this action. Where: • Water produced from coal seam dewatering must be reinjected below known impermeable subsurface strata, effectively segregating reinjected water from known surface and subsurface waters used by humans and wildlife. • No injection wells in aquifer recharge zones. • Reinjection in all cases to a Class II well. • Inject to 4,000 feet. • At or below original level. Water Quality • Third party will test and report on each well bi-monthly. • Reinjected (produced) water should be tested for chemical characteristics. All standards should be required for reinjected water, same quality or better. • Conduct a reinjection study prior to development to determine if the aquifer can accept it and if it cannot, their production stops and the permit period is stopped at that point and all activity terminated. • Use closed loop systems.	See Standard #22. ADNR does not find that a strict prohibition of surface discharge is appropriate. There may be instances where the produced water meets state water quality standards, and surface discharge will cause no negative surface impacts. As for the re-injection of produced water, it is required to be disposed of in an injection well approved by AOGCC. AOGCC will ensure that the re-injected produced water does not contaminate a source of drinking water.

	COMMENT OR SUGGESTION	RESPONSE
127	No drilling or dewatering in recharge zones.	AOGCC regulations require casing and cementing to protect sources of drinking water (20 AAC 25.030). These requirements will protect recharge zones.
128	Water quantity shall be monitored with hydraulic impact (static level) one year prior to testing or any drilling and continuously throughout drilling and 20-25 years after completion of drilling.	ADNR believes that the Standards #21 – 23, in conjunction with AOGCC permitting requirements properly protect water, and that this recommendation is unnecessary.
129	Develop a penalty for drillers who fail to submit well logs.	Penalties are imposed on oil and gas drillers who do not provide this information. ADNR does not have the statutory authority to impose such penalties on water well drillers who fail to provide drill logs.
130	No hydraulic fracturing within a certain distance of wells. Ensure adequate core samples taken so the subsurface hydrology is well understood. Needs to be overseen by the state and a certified hydrologist.	AOGCC regulates hydraulic fracturing and must ensure that such activities will not ne tively affect drinking water sources. Standard #21 requires baseline information on water wells in the area.
131	AOGCC must monitor any fracturing operations and determine safety of water quantity.	AOGCC does this, and ADNR will also determine safety of water quantity. See Standard # 21.
	WATER MANAGEMENT - Recommended Standards for Surface Water	
132	Setbacks. Assuming waterbodies are defined as any lake, river, stream, marsh, wetland, floodplain or spring, setbacks should be consistent across all ownership types. Should take into consideration watershed characteristics. Distance recommendations included ½ mile, ¾ mile, 1 mile, 5 miles.	The setbacks from waterbodies are contained in the typical Fish and Wildlife and Hazardous Substance mitigation measures referenced in Standards #37 and 38.

Lack of power

	COMMENT OR SUGGESTION	RESPONSE
	WATER MANAGEMENT - Recommended Standards for Monitoring and Enforcement	
133	Recommendations for monitoring and enforcement: Responsibility: • All testing on wells should be conducted by an independent third party and paid for by the operator. Area of Monitoring: • Within one mile of any wellhead prior to drilling. • Within the CBM vicinity (five miles). Timing: • At least one year prior to any testing or dri ling. • Prior to any development, on a prescribed basis for five years, then after startup using best management practices. • Continuously • Once a month. • Semi-annually and upon special request. • Require random sampling for all four seasons. Substances to monitor for: • Static water level and contaminants (such as heavy metals and total dissolved solids) • pH, salinity, hydrocarbons, heavy metals, methane, and any substance used in CBM development. • Conventional/non-conventional and toxic parameters	See Standard # 23 and Recommendation #4 regarding water monitoring. Water quality protection is within the expertise of AOGCC and ADEC. See Response #123.

	COMMENT OR SUGGESTION	RESPONSE
	WATER MANAGEMENT - Recommended Standards for Contingency Plans	
134	Contingency plans for produced water and hazardous chemical spill must include both prevention and response. They should be formulated at state and local levels with deference to the more restrictive plan. The following should be required of the developer: • Emergency containment plan or hazardous materials plan. • Provide emergency response equipment and staff, money to train and perform drills once a month for every area they operate in. • Local EMS should be appraised of this and trained also. • Must consider context and environment of the area, such as snowmelt, icing, runoff, flooding, etc. • If contaminated, the well must be shut down until the problem is fixed/cleaned up.	See Standard #5 regarding Emergency Planning. There is no state statutory requirement for a contingency spill plan associated with produced water. With oil spill contingency planning, the primary concern is with uncontrolled blowout situations. There is no risk of a similar event regarding CBM produced water. It must be pumped to the surface, and if the pumps are shut down, the water stops.
	WATER MANAGEMENT - Recommended Standards for Penalties and Rectifying Damage	
135	Developer should be financially responsible for all damages, and restore, repair and rectify all damages done.	Operators are responsible for damages they cause.

	COMMENT OR SUGGESTION	RESPONSE
136	Create a presumption of liability for water degradation within five miles of a CBM well.	If a holder of a water right believes that an operator has damaged that water right by either contaminating the water or depleting the water, then the water right holder must go to court to establish the damage. ADNR does not have the authority to alter the burden placed on the water right holder to prove damage to the water right, such a change in state law would require legislation.
137	Permit and leases revoked in perpetuity within Alaska.	Specific action associated with non-compliance of a permit, authorization, ordinance, lease, license or other provision of law is within the purview of the administering agency. ADNR is not recommending any changes to existing conditions.
138	Set up legal and compensation funds to pay for litigation, and a reclamation fund for rectifying a contaminated water supply.	This suggestion would require legislation to accomplish and is beyond ADNR's authority to consider.
139	Developer should supply potable water to replace needed water and then provide a long-term supply of water to the areas. If this is not possible, developer should purchase property at prior to drilling values adjusted for inflation.	If damage to a water right have been established, the court will determine the appropriate remedy. ADNR has no authority to require the developer to purchase the property.
140	In the event that the company cannot monetarily recompense the injured parties, it defaults to the responsibility of the State of Alaska.	This suggestion would require legislation to accomplish and is beyond ADNR's authority to consider.
141	Create a citizens watchdog group to be funded by a deposit from the initial license and then as a percentage of the gross revenue during development to ensure this group will be properly funded to ensure the function it is intended to serve.	This suggestion would require legislation to accomplish and is beyond ADNR's authority to consider.

Sample Oil and Gas Lease Mitigation Measures

(Taken from Shallow Gas Leases and Susitna Exploration Licenses)

Abbreviations mean: Alaska Department of Environmental Conservation (ADEC), Alaska Department of Fish and Game (ADF&G), Alaska Department of Natural Resources (ADNR), Alaska Oil and Gas Conservation Commission (AOGCC), Director (Director, Division of Oil and Gas), Division of Oil and Gas (DO&G), Office of Habitat Management and Permitting (OHMP), Matanuska-Susitna Borough (MSB), and State Historic Preservation Officer (SHPO).

Fish and Wildlife Habitat

1. The siting of facilities, other than docks, or road, utility, or pipeline crossings, will be prohibited within 500 feet of all fish bearing waterbodies *(Note: For Shallow Gas Leases, it is 300 feet)*. Additionally, siting of facilities will be prohibited within one-half mile of the banks of Alexander, Lake, Peters, and Cache Creeks, and the Susitna, Deshka, Kahiltna, Talachulitna, and Yentna rivers. Facilities may be sited within these buffers if the operator demonstrates to the satisfaction of the Director, after consultation with OHMP, that site locations outside these buffers are not feasible or prudent or that a location inside the buffer is environmentally preferred. Road, utility, and pipeline crossings must be aligned perpendicular or near perpendicular to watercourses.

2. Impacts to important wetlands must be minimized to the satisfaction of the Director, in consultation with OHMP and ADEC. The Director will consider whether facilities are sited in the least sensitive areas.

3. Facilities and operations shall avoid unreasonable conflicts with subsistence harvests. When reviewing a proposed plan of operations, the Director will work with other agencies and the public to assure that unreasonable conflicts with subsistence harvests are identified and avoided.

Fishbearing Streams

4. Detonation of explosives within or in close proximity to fishbearing waters must not produce instantaneous pressure changes that exceed 2.7 pounds per square inch in the swim bladder of a fish. Detonation of explosives within or in close proximity to a fish spawning bed during the early stages of egg incubation must not produce a peak particle velocity greater than 0.5 inches per second. Blasting criteria have been developed by ADF&G and are available upon request along with the location of fishbearing waters within the project area.

5. Compaction or removal of snow cover overlying fishbearing waterbodies is prohibited except for approved crossings. If ice thickness is not sufficient to facilitate a crossing, ice or snow bridges may be required.

6. Water intake pipes used to remove water from fishbearing waterbodies must be surrounded by a screened enclosure to prevent fish entrainment and impingement. Screen mesh size shall be no greater than 0.1 inches unless another size has been approved by OHMP. The maximum water velocity at the surface of the screen enclosure may be no greater than 0.2 feet per second.

Bear Habitat

8. Before commencement of any activities, operators shall consult data provided by the ADF&G identifying the locations of bear den sites that are actually occupied in the season of the proposed activities. Exploration and development activities begun between October 15 and April 31, may not be conducted within ½-mile of occupied brown bear dens, unless alternative mitigation measures are approved by ADF&G. An operator who encounters an occupied bear den not previously identified in the data provided by ADF&G must report it to the Division of Wildlife Conservation, ADF&G, within 24 hours. Mobile activities shall avoid such discovered occupied dens by ½-mile unless alternative mitigation measures are approved by DO&G with concurrence from ADF&G. Non-mobile facilities will not be required to be relocated.

Bald Eagle and Trumpeter Swan Habitats

12. Permanent facilities may be prohibited within ¼-mile and will be prohibited within 330 feet of bald eagle nests, active or inactive. Temporary activities within 330 feet of nesting sites may be allowed between September 1 and March 31 if they will not alter bald eagle habitat. Surface entry will be prohibited within 330 feet of active nests between April 1 and August 31. Maps identifying documented nest sites will be made available by ADF&G upon request.

13. If the operator discovers a previously unreported active or inactive bald eagle nest, the operator must report the nest location to the Director as soon as possible. Operators are advised that activities likely to disturb nesting eagles are subject to the provisions of the Bald Eagle Act of 1940, as amended.

14. Surface entry will be prohibited within ¼-mile of trumpeter swan nesting sites from April 1 through August 31. The siting of permanent facilities, including roads, material sites, storage areas, powerlines, and above-ground pipelines are prohibited within ¼-mile of known nesting sites. ADF&G will identify trumpeter swan nesting sites at the request of the operator.

Tule Goose Habitat

15. The special measures listed below will be imposed to preserve Tule white-fronted goose habitat along the Kahiltna and Yentna rivers. Mitigation measure 15 shall

apply to activities within the "Tule Goose Habitat Area." Mitigation measure 16 shall apply to activities within the "Tule Goose Core Nesting and Molting Area."

a. The two locations that comprise the "Tule Goose Habitat Area" are identified in Figure 3.1 in the final best interest finding and are described as:

   i. All of T19N R8W, T19N R9W, and T20N R9W; and the west half of T20N 8W, Seward Meridian.
   ii. The western third of T23N R8W and T24N R8W; all of T23N R9W and T24N R9W; and the east half of T23N R10W and T24N R10W, Seward Meridian.

b. The location that comprises the "Tule Goose Core Nesting and Molting Area" is identified in Figure 3.1 and is described as:

   T25N R9W
   Section 4, 5, 6, 7, 8, 9, 15, 16, 17, 18, 19, 20, 21, 22, 27, 28, 29, 30, 32, 33, 34;

   T25N R10W
   Section 1, 2, 3, 11, 12, 13, 24;

   T26N R9W
   Section 19, 29, 30, 31, 32;

   T26N R10W
   Section 3, 4, 5, 6, 7, 8, 9, 10, 11, 13, 14, 15, 16, 17, 18, 20, 21, 22, 23, 24, 25, 26, 27, 28, 33, 34, 35, 36; and

   T26N R11W
   Section 1, Seward Meridian.

16. Within the "Tule Goose Habitat Area":
   a. exploratory drilling, development, and major maintenance will be allowed only between August 16 and March 31, unless an extension is approved by the Director, in consultation with OHMP;
   b. during the production phase, routine maintenance and emergency repairs on a year-round basis will be permitted within this area, following approval of a detailed plan describing routine maintenance activities to be conducted between April 1 and August 15;
   c. the director will approve a routine maintenance plan following consultation with OHMP;
   d. gravel pads, wellheads, pipelines and drillsite-related facilities are the only permanent aboveground structures that will be allowed;
   e. temporary roads may be allowed as provided in Measure 17; and

1. permanent roads connecting pads may be allowed if the Director determines, in consultation with OHMP, that the road will have no significant impact on Tule geese during nesting and molting.

17. Within the "Tule Goose Core Nesting and Molting Area":
    a. surface entry for drilling, and above ground lease-related facilities and structures, with the exception of pipelines, will be prohibited;
    b. seismic exploration will be allowed only between August 16 and March 31;
    c. geologic fieldwork may be conducted year round;
    d. helicopter landings within this area during the nesting and molting season may be restricted; and
    e. pipelines may be sited within this area only if the Director determines, in consultation with OHMP, that the proposed pipeline will have no significant impact on Tule geese (buried pipelines are preferred).

Fuel and Hazardous Substances

1. Secondary containment shall be provided for the storage of fuel or hazardous substances.

2. Containers with a total storage capacity of greater than 55 gallons which contain fuel or hazardous substances shall not be stored within 100 feet of a waterbody.

3. During equipment storage or maintenance, the site shall be protected from leaking or dripping fuel and hazardous substances by the placement of drip pans or other surface liners designed to catch and hold fluids under the equipment, or by creating an area for storage or maintenance using an impermeable liner or other suitable containment mechanism.

4. During fuel or hazardous substance transfer, secondary containment or a surface liner must be placed under all container or vehicle fuel tank inlet and outlet points, hose connections, and hose ends. Appropriate spill response equipment, sufficient to respond to a spill of up to five gallons, must be on hand during any transfer or handling of fuel or hazardous substances. Transfer operations shall be attended by trained personnel at all times.

5. Vehicle refueling shall not occur within the annual floodplain. This measure does not apply to water-borne vessels, provided no more than 30 gallons of fuel is transferred at any give time.

6. All independent fuel and hazardous substance containers shall be marked with the contents and the operator's name using paint or a permanent label.

Prehistoric, Historic and Archeological Sites

1. Before commencing construction or placement of a road, structure, or facility, the operator must conduct an inventory of prehistoric, historic, and archeological sites within the area affected by the activity. The inventory must include consideration of literature provided by the MSB and local residents; documentation of oral history regarding prehistoric and historic uses of such sites; evidence of consultation with the Alaska Heritage Resources Survey and the National Register of Historic Places; and site surveys. The inventory must include an analysis of the effects on any prehistoric, historic, and archeological site that might result from the proposed activity.

2. The inventory of prehistoric, historic, and archeological sites must be submitted to the Director and SHPO for review and comment. If a prehistoric, historic, or archeological site or area could be adversely affected by a lease activity, the Director, after consultation with SHPO and the MSB, will direct the operator as to the course of action to take to avoid or minimize adverse effects.

3. If a site, structure, or object of prehistoric, historic, or archaeological significance is discovered during lease operations, the operator must report the discovery to the Director as soon as possible. The operator must make reasonable efforts to preserve and protect the discovered site, structure, or object from damage until the Director, after consultation with the SHPO, has directed the operator as to the course of action to take for its preservation.

Local Hire, Communication and Training

1. To the extent available and qualified, the operator is encouraged to employ local and Alaska residents and contractors for work performed on the leased area. Operators shall submit, as part of a plan of operations application, a proposal detailing the means by which the operator will comply with this measure. The proposal must include a description of the operator's plans for partnering with local communities to recruit and hire local and Alaska residents and contractors. The operator is encouraged, in formulating this proposal, to coordinate with employment services offered by the state of Alaska and local communities and to recruit employees from local communities.

2. A plan of operations application must describe the operator's past and prospective efforts to communicate with local communities and interested local community groups.

3. A plan of operations application must include a training program for all personnel, including contractors and subcontractors. The program must be designed to inform each person working on the project of environmental, social, and cultural concerns that relate to that person's job. The program must use methods to ensure that personnel understand and use techniques necessary to

preserve geological, archeological, and biological resources. In addition, the program must be designed to help personnel increase their sensitivity and understanding of community values, customs, and lifestyles in areas where they will be operating.

Definitions

In this document

a. "Facilities" means any structure, equipment, or improvement to the surface, whether temporary or permanent, including, but not limited to, roads, pads, pits, pipelines, power lines, generators, utilities, airstrips, wells, compressors, drill rigs, camps and buildings;

b. "Feasible and prudent" means consistent with sound engineering practice and not causing environmental, social, or economic costs that outweigh the public benefit to be derived from compliance with the standard;

c. "Important wetlands" means those wetlands that are of high value to fish, waterfowl, and shorebirds because of their unique characteristics or scarcity in the region or that have been determined to function at a high level using the hydrogeomorphic approach;

d. "Minimize" means to reduce adverse impacts to the smallest amount, extent, duration, size, or degree reasonable in light of the environmental, social, or economic costs of further reduction;

e. "Secondary containment" means an impermeable diked area or portable impermeable containment structure capable of containing 110 percent of the volume of the largest independent container plus 12 inches of freeboard. Double walled tanks do not qualify as secondary containment unless an exception is granted for a particular tank.

Matanuska-Susitna Borough Planning
Coal Bed Methane Conditional Use Permit

Executive Summary

Chapter 62 is drafted to require a two stage conditional use permit; one permit for CBM exploration and a second permit for CBM development and processing. The code requires detailed plans as part of the application:

- **Master Plan for CBM development and processing.**
- **Emergency Response Plan**
- **Archaeological and Historic Preservation Plan**
- **Fish and Wildlife Mitigation Plan**
- **Groundwater and Surface Water Monitoring Plan**

Code also requires a Surface Use Agreement between the landowner and developer when the CBM developer does not also own the surface rights.

The Planning Commission evaluates the application for compliance with:

- **Existing Comprehensive Plans.**
- **Land Use Standards.**
- **Environmental Quality Standards.**
- **Surface Disturbance Standards**

Land use standards for CBM permits include:

- **Minimum well spacing of one per 360 acres;**
- **Minimum 10 acre lot size;**
- **Minimum 1,320 feet from structures, property lines, anadromous streams, public facilities, schools, hospitals or churches;**
- **Prohibited in residential areas with one dwelling per acre;**
- **Minimize noise and visual impacts;**
- **Minimize environmental impacts and surface disturbances.**
- **Developer must implement an approved restoration plan.**

DRAFT ORDINANCE

By: Borough Mayor
Introduced:
Public Hearing:
Action:

MATANUSKA-SUSITNA BOROUGH
ORDINANCE SERIAL NO. 04-

AN ORDINANCE OF THE MATANUSKA-SUSITNA BOROUGH ASSEMBLY ADOPTING MSB 17.XX. ESTABLISHING A CONDITIONAL USE PERMIT FOR COAL BED METHANE EXPLORATION AND DEVELOPMENT.

BE IT ENACTED:

Section 1. Classification. This ordinance is of a general and permanent nature and shall become a part of the borough code.

Section 2. Adoption of section. MSB 17.XX is hereby adopted to read as follows:

SECTION

17.XX.010 Intent of Chapter

17.XX.015 Jurisdiction of Chapter Provisions

17.XX.020 General Procedures

17.XX.030 Exploration Permit Application Requirements

17.XX.040 Development and Production Application Requirements

17.XX.050 Review and Referrals

17.XX.060 Duration, Modification and Preexisting Uses

17.XX.070 Construction or Installation Of Unapproved Coal Bed Methane Facilities

17.XX.080 Penalty

17.XX.090 Civil Action

17.XX.100 Liability Insurance

17.XX.110 Performance Security

17.XX.120 Right to Enter

17.XX.130 Emergency Response Plan Required

17.XX.140 Archaeological and Historic Preservation Plan Required

17.XX.150 Fish and Wildlife Mitigation Plan Required

17.XX.160 Groundwater and Surface Water Monitoring Plan Required

17.XX.170 Master Plan Required

17.XX.180 Surface Use Agreement Requirement

17.XX.190 Review of Applications; Action by Planning Commission

17.XX.200 Application; Submittal Procedure

17.XX.210 Determination of Completeness

17.XX.220 Public Notice

17.XX.230 Notice Upon Request

17.XX.240 Permit Standards

17.XX.250 Appeals of Planning Commission Decisions

17.XX.260 Appeals of Enforcement Actions

17.XX.270 Compliance

17.XX.280 Land Use Standards

17.XX.290 Environmental Quality Standards

17.XX.300 Surface Disturbance Standards

17.XX.310 Definitions

17.XX.010 INTENT OF CHAPTER.

(A) It is the Borough's intent to facilitate the development of coal bed methane resources within the Borough while mitigating potential land use and private property conflicts between such development and existing, as well as planned, land uses. In addition, it is the intent of this ordinance to protect private and public property, and the health, safety, and welfare of Borough residents.

17.XX.015 JURISDICTION OF CHAPTER PROVISIONS.

(A) This Chapter shall apply to all lands within the Borough with the exception of those lands within the cities of Houston, Palmer, and Wasilla.

17.XX.020 GENERAL PROCEDURES.

(A) Exploration, development, and production of coal bed methane facilities within the Borough shall be subject to the provisions of this Chapter and any other applicable regulations of the Borough, as well as any state or federal entities or agencies having jurisdiction over such development.

(B) Construction, installation and operation of coal bed methane facilities shall not commence until approval has been granted by the Planning Commission. The Borough Planning Director shall serve as the authorized representative of the Planning Commission.

(C) A conditional use permit for coal bed methane development shall consist of two separate permits: one permit for exploration activities and one permit for development and production activities. Each of the permits requires a separate application, public notice, public hearing, and Planning Commission approval.

17.XX.030 EXPLORATION PERMIT APPLICATION REQUIREMENTS.

(A) An application for a conditional use permit for coal bed methane exploration activities and related facilities shall be filed by the company seeking to explore for coal bed methane.

(B) Application for a conditional use permit shall be made in writing on a form or forms provided by the Matanuska-Susitna Borough Planning and Land Use Department, and shall include:

(1) A narrative description of the company and its subcontractors seeking to undertake coal bed methane exploration activities. The narrative should include the history of the firm, its experience in coal bed methane exploration, e.g., number of projects, location, key contacts, size of project, number of wells, etc., its technical and financial ability to undertake the proposed exploration activities, its ability to complete reclamation requirements, and a listing of any judgments, fines, or penalties received that are associated with

coal bed methane exploration.

(2) A legal description of the properties involved.

(3) Documentation of property ownership.

(4) A detailed site plan drawn to scale depicting proposed coal bed methane facilities, including, but not limited to:

(a) Existing site conditions of proposed exploration sites, including topography, watercourses, flood plains, other natural hazards and features, vegetation, land use, and access;

(b) The location and floor area size of all existing and proposed building structures and other improvements, if any; including a description of the type of land use proposed to occupy the land and structures;

(c) The existing and proposed pedestrian and vehicular circulation system to be used at proposed exploration site(s) and relationship of that circulation system to the surrounding area. This will include parking areas, service areas, loading areas and all points of access to the site(s);

(d) Proposed utility systems;

(e) Exploration wells;

(f) Waste pits;

(g) Injection wells,

(h) Collection and distribution systems, if any; and

(i) Other ancillary structures, if any.

(5) A statement identifying the land uses on adjacent properties;

(6) A development schedule indicating the approximate date when exploration shall begin and be completed;

(7) A statement of how the proposed project conforms with applicable Comprehensive Plans;

(8) A non-refundable application fee as prescribed in MSB 17.99 is due at the time of application.

(C) The name of the operator of the proposed exploration activities.

(D) A description of how all waste materials will be handled and disposed;

(E) A proposed site plan drawn to scale depicting existing conditions at each proposed exploration site;

(F) A description of planned exploration activities, including the following: schedule and duration of exploration activities, site buffering and screening plan; operational vehicular access and circulation plan; fencing and security measures;

(G) A copy of the approved emergency response plan as provided in 17.XX.130;

(H) A copy of the archaeological and historic preservation plan as described in 17.XX.140;

(I) A copy of the fish and wildlife mitigation plan as described in 17.XX.150;

(J) A copy of the groundwater and surface water monitoring plan as described in 17.XX.160;

(K) A methane seepage testing plan that establishes the level of methane present in the vicinity prior to, during, and following the exploration activities; and

(L) A detailed reclamation plan describing all reclamation activities, including schedule for completion, plans for well capping, and the conditions of each exploration site upon completion of the reclamation activities, including finished contours, a revegetation plan, finished drainage plan and finished access points.

17.XX.040 DEVELOPMENT AND PRODUCTION APPLICATION REQUIREMENTS

(A) An application for a conditional use permit for coal bed methane development and production shall be filed by the owner of the affected property or by an authorized agent.

(B) Application for a conditional use permit shall be in writing on a form or forms provided by the

Matanuska-Susitna Borough Planning and Land Use Department. All applications shall include:

(1) A narrative description of the company and its subcontractors seeking to undertake coal bed methane development and production activities. The narrative should include the history of the firm, its experience in coal bed methane development and production, e.g., number of projects, location, key contacts, size of project, number of wells, etc., its technical and financial ability to undertake the proposed development and production activities, its ability to complete reclamation requirements, and a listing of any judgments, fines, or penalties received that are associated with coal bed methane development and production.

(2) A legal description of the properties involved.

(3) Documentation of property ownership.

(4) A detailed site plan drawn to scale depicting coal bed methane development facilities, including, but not limited to:

(a) Existing site conditions of proposed development and production sites, including topography, watercourses, flood plains, other natural hazards and features, vegetation, land use, and access;

(b) The location and floor area size of all existing and proposed building structures and other improvements, if any; including a description of the type of land use proposed to occupy the land and structures;

(c) The existing and proposed pedestrian and vehicular circulation system to be used at proposed development and production sites and relationship of the circulation systems to the surrounding area. This will include parking areas, service areas, loading areas and all points of access to the site(s);

(d) Proposed utility systems;

(e) Waste pits;

(f) Extraction and injection wells;

(g) Compressor stations;

(h) Collection and distribution systems; and

(i) Other ancillary structures.

(e) A statement identifying the land uses on adjacent properties;

(f) A development schedule indicating the approximate date when development or natural resource extraction shall begin and be completed;

(g) A statement of how the proposed project conforms with applicable Comprehensive Plans;

(h) A non-refundable application fee as prescribed in MSB 17.99 is due at the time of application.

(2) The name of the operator of the proposed development and production activities.

(3) A description of how all waste materials will be handled and disposed.

(4) A proposed site plan drawn to scale depicting existing conditions at each proposed development and production site.

(5) A description of planned development and production activities, including the following: schedule and duration of development and production activities, site buffering and screening plan; operational vehicular access and circulation plan; fencing and/or security measures.

(6) A copy of the master plan as described in 17.XX.170.

(7) A copy of the approved emergency response plan as provided in 17.XX.130.

(8) A copy of the archaeological and historic preservation plan as described in 17.XX.140.

(9) A copy of the fish and wildlife mitigation

plan as described in 17.XX.150.

(10) A copy of the groundwater and surface water monitoring plan as described in 17.XX.160.

(11) A methane seepage testing plan that establishes the level of methane present in the vicinity prior to, during, and following the development and production activities.

(12) A detailed reclamation plan describing all reclamation activities, including schedule for completion, plans for well capping, and the conditions of each development and production site upon completion of the reclamation activities, including the following: finished contours; revegetation plan; finished drainage plan; and finished access points.

17.XX.050. REVIEW AND REFERRALS;

(A) The Planning Director shall refer the exploration and development and production applications to the State of Alaska Oil and Gas Conservation Commission, Alaska Department of Environmental Conservation, Alaska Department of Natural Resources and Alaska Department Fish and Game and the United States Environmental Protection Agency, United States Geological Survey, United States Fish and Wildlife Service, and other government agencies or entities for review and comment. Any comments received from other agencies shall

be forwarded to the Planning Commission as part of the application(s) packet materials.

(B) Coal bed methane facilities shall also be reviewed for general consistency with the standards and policies set forth in the following documents:

(1) Borough land use regulations;

(2) The Borough Comprehensive Plan;

(3) Plans and regulations of municipalities in the Borough, if applicable;

(4) Other applicable local, Borough, state and federal plans, policies and regulations.

17.XX.060. DURATION, MODIFICATIONS AND PREEXISTING USES.

(A) Approval granted for coal bed methane exploration and development and production activities shall expire or be considered revoked if such activities are not initiated within one year of the date of approval.

(B) Where an exploration or development and production permit has been approved and the applicant desires to modify the subject permit by changes to equipment, site layout, well spacing, approved emergency response plan, etc., an amendment to the original application shall be required if the level of impact will be increased as a result of the modification.

(1) The activity described in the amendment

shall be granted by the Planning Director if it complies with the standards and conditions of this Chapter.

(2) Modifications which the applicant determines in good faith are required in order for the exploration or development and production activities to continue operating in a safe manner and which must be done immediately in order to maintain the existing level of production or operation, may be done on an emergency basis, without prior notice or approval by planning, provided that such modifications do not include the addition of equipment or operations.

(3) The applicant shall provide the Planning Director with notification of such emergency modifications by filing a written amendment to the application, specifying the modifications made, within one week of their completion.

(C) This Chapter shall become effective on the date specified in the ordinance adopted by the Borough Assembly. The provisions of this Chapter shall apply to all facilities for which construction has not commenced or a permit has not been issued as of the effective date. This Chapter shall apply to all facilities for which A.O.G.C.C. approval has not been obtained as of the effective date. All uses completed prior to the date of Assembly adoption shall be considered nonconforming uses.

17.XX.070. CONSTRUCTION OR INSTALLATION OF UNAPPROVED COAL BED METHANE FACILITIES.

(A) It is unlawful to construct, install, or cause to be constructed or installed, any coal bed methane facility within the Borough, unless prior approval has been granted by Planning Commission.

17.XX.080. PENALTY.

(A) Any person, firm, corporation or legal entity which owns, leases or operates a coal bed methane facility, and which constructs, installs or uses, or which causes to be constructed, installed or used without first receiving approval from Planning Commission shall be guilty of a misdemeanor and, upon conviction, shall be punished by a fine of not more than $500.00 per day for each day operated in non-compliance with this chapter.

17.XX.090. CIVIL ACTION.

(A) In case any coal bed methane facility is or is proposed to be erected, constructed, reconstructed, altered or used, or any land is proposed to be used, in violation of any provision of this Chapter, the Borough attorney, in addition to the other remedies provided by law, ordinance or resolution, may institute an injunction, mandamus, abatement or other appropriate action or proceeding to prevent, enjoin, abate or remove such unlawful erection, construction, reconstruction,

alteration or use.

17.XX.100. LIABILITY INSURANCE.

(A) For any coal bed methane facility permitted under this Chapter, the applicant shall submit a certificate of insurance to the Planning Director, showing that a policy of comprehensive general liability insurance or a self-insurance program approved by the Alaska Insurance Commission, in the amount of no less than $5,000,000 per occurrence, insuring the applicant against all claims or causes of action made against the applicant for damages arising out of the drilling, maintenance, operation or other work done with respect to such proposed facilities.

(B) The policy shall be written by a company authorized to do business in Alaska, unless the applicant is self-insured. The certificate shall require at least 30 days notice to the Borough prior to termination of coverage for any reason. If the insurance policy lapses or becomes void for any reason whatsoever, the Borough permit shall cease to be valid until a new insurance certificate is provided and filed with the Director of Planning and Land Use Department. All approved or related activity shall cease, consistent with safety considerations, until the applicant provides evidence that insurance coverage in the prescribed amount is in

effect.

17.XX.110. PERFORMANCE SECURITY.

(A) The applicant shall provide one form of the following security to ensure compliance with mitigation requirements set forth in this Chapter and specific conditions of approval for facilities: $20,000.00 performance bond for each facility; $500,000.00 Borough wide blanket bond for all facilities operated by the applicant within the Borough; irrevocable letter of credit; or equivalent financial security acceptable to the Borough. Conditions of approval covered by this performance security shall consist of mitigation measures addressing specific impacts affecting the general public and/or adjacent landowners by the applicable performance standards contained in this section. Reclamation activities which fall under A.O.G.C.C. jurisdiction are exempted from this performance security coverage.

17.XX.120. RIGHT TO ENTER.

(A) For the purpose of implementing and enforcing this Chapter, Borough personnel may enter onto subject property upon telephonic, facsimile, or other electronic notification of the permittee, lessee or other party holding a legal interest in the property; if such entry is denied, the Borough shall have the right to obtain an order from a court of competent jurisdiction to obtain

entry.

17.XX.130. EMERGENCY RESPONSE PLAN REQUIRED.

(A) Each operator with coal bed methane facilities in the Borough is required to provide the Borough with a written emergency response plan as part of the permit application. No applications for exploration or development and production permits shall be considered complete until the operator has provided such plan to the Borough.

(B) Upon approval by the Borough Director of Emergency Services, the plan shall be filed with the Borough and updated on an annual basis or as conditions change (responsible field personnel change, ownership changes, etc.). Failure to provide an annual update to the emergency response plan is cause of revocation of approved condition use permit(s).

(C) The emergency response plan shall consist of the following information, at a minimum:

(1) Name, address and phone number, including an emergency number of at least two persons responsible for emergency field operations who are available 24 hours a day, seven days a week.

(2) An as-built facilities map showing the name, location and description of all facilities, including the size and type of all pipelines.

(3) Provide a written emergency response plan for the potential emergencies that may be associated with the operation of the facilities. The emergency response plan shall identify procedures for addressing all of the following: explosions, fires, gas or water pipeline leaks or ruptures, hydrogen sulfide or other toxic gas emissions, or hazardous material accidents or spills. The emergency response plan shall also include provisions for notifying the Borough and State of Alaska Fire Marshall of all emergencies.

17.XX.140. ARCHAEOLOGICAL AND HISTORIC PRESERVATION PLAN REQUIRED.

(A) Each applicant for an exploration and/or development and production conditional permit application under this chapter is required to provide an archaeological and historic preservation plan. No conditional use permit application(s) for coal bed methane exploration or development and production conditional use permit(s) shall be considered complete until the operator has provided such plan to the Borough.

(B) The plan shall identify sites of archeological and historic importance and identify proposed actions to eliminate, reduce, or mitigate disturbance to such sites. A copy of the archeological and historic preservation plan shall be filed with State Historic Preservation

Officer for review and comment and all comments received shall be made a part of the conditional use permit application file under this chapter.

17.XX.150. FISH AND WILDLIFE MITIGATION PLAN REQUIRED.

(A) Each applicant for an exploration or development and production conditional permit application under this chapter is required to provide a fish and wildlife mitigation plan. No conditional use permit application(s) for coal bed methane exploration or development and production conditional use permit(s) shall be considered complete until the operator has provided such plan to the Borough.

(B) The plan shall identify areas of fish and wildlife habitat and wildlife migration routes and identify proposed actions to eliminate, reduce, or mitigate disturbance to such areas. A copy of the fish and wildlife mitigation plan shall be filed with State of Alaska Department of Fish and Game and the United States Fish and Wildlife Service for review and comment. All comments received from these agencies shall be made a part of the conditional use permit application file under this chapter.

17.XX.160. GROUNDWATER AND SURFACE WATER MONITORING PLAN REQUIRED.

(A) Each operator with exploration or resource development activities or facilities in the Borough is required to provide a groundwater and surface water monitoring plan. No conditional use permit application(s) for coal bed methane exploration or development and production conditional use permit(s) shall be considered complete until the operator has provided such plan to the Borough.

(B) The plan shall be filed with the Borough and updated on an annual basis or as conditions change (responsible field personnel change, ownership changes, monitoring modifications, etc.). Failure to provide an annual update shall be cause for permit revocation.

(C) The plan shall consist of the following information, at a minimum:

(1) Name, address and phone number, including an emergency number of at least two persons responsible for water monitoring field operations who are available 24 hours a day, seven days a week.

(2) An as-built facilities map showing the name, location and description of all facilities, including the size and type of all pipelines.

(3) Provide a written groundwater and surface water monitoring plan for the monitoring of the groundwater and surface water supplies that may be

affected by the operation of the coal bed methane exploration, development, or distribution facilities. This shall include the effects, if any, of the following: explosions, fracturing, fracturing fluids, waste handling and storage, fires, gas or water pipeline leaks or ruptures, hydrogen sulfide or other toxic gas emissions, or hazardous material vehicle accidents or spills.

(4) Undertake testing of groundwater supplies through the use of groundwater monitoring wells, and undertake and provide copies of all water monitoring test results to the Borough. Such tests shall occur no less than once a month at each site and shall monitor for all materials introduced by the coal bed methane exploration, development, production, and distribution activities, including but not limited to, fracturing fluids and drilling muds.

17.XX.170. MASTER PLAN REQUIRED.

(A) Each operator with coal bed methane facilities in the Borough is required to provide a master plan for development and production activities. No applications for a conditional use permit for development and production shall be considered complete until the operator has provided such plans to the Borough.

(B) The master plan is to provide the Borough with an understanding of the total amount of development that

is likely to occur during development and production of coal bed methane resources. The master plan is also to provide an understanding of the cumulative effects and impacts of the proposed development and production activities.

(C) The master plan shall be filed with the Borough and updated on an annual basis or as conditions change (responsible field personnel change, ownership changes, etc.). Failure to provide an updated master plan on an annual basis is cause for revocation of any exploration, development, or production permit.

(D) The master plan shall consist of the following information, at a minimum:

(1) Name, address, and phone number, including a 24-hour emergency number, for the individual responsible for the overall management of all permitted and proposed activities;

(2) Name, address, and phone number, including a 24-hour emergency number, for the individual responsible for the overall emergency response;

(3) An as-built facilities map showing the location and description of all proposed facilities;

(4) A map depicting all earthquake faults within the area where proposed exploration or development and production facilities are to be located and a

narrative statement describing those actions and activities, if any, that will be undertaken to reduce the negative impacts and hazards associated with developing coal bed methane exploration and development and production facilities in earthquake zones.

(5) The plan shall describe the propose plans for additional exploration and ongoing development and production activities including the proposed number of wells and their location, well spacing distances for all wells, identification of wells by type(e.g., core drilling, water injection, etc.), location of all access roads and points of access, methods and sites for waste disposal handling and storage, proposed method and location of the distribution system, groundwater protection efforts, water injection systems and sites, location and building size of all compressor stations, location of all collection systems and pipelines, and location and construction standards of all roads, driveways, and points of access and egress.

(6) The type, ingredients, and amounts of all fracturing fluids and drilling muds used in exploration and development activities.

(7) The plan shall describe those actions that will be taken to protect sites of archaeological and historic preservation importance.

(8) The plan shall describe those actions that will be taken to protect fish and wildlife, fish and wildlife habitat, and fish and wildlife migration routes.

(9) The plan shall describe those actions that will be taken to protect groundwater and surface water supplies with particular attention paid to anadromous streams, drinking water supplies and recreational use of surface waters. A watershed approach should be used to describe how groundwater and surface water supplies will be addressed as part of the proposed coal bed methane activities.

17.XX.180 SURFACE USE AGREEMENT REQUIREMENT

(A) Each operator with coal bed methane facilities in the Borough is required to enter into, to the extent practical and feasible, a surface use agreement with all property owners where coal bed methane exploration, development and distribution systems are located. The surface use agreement shall, at a minimum, consist of the following:

(1) An access agreement between the lessee and landowner that establishes access rights, compensation rates, maintenance responsibility, and liabilities.

(2) A water well mitigation agreement that establishes water quality measures, monitoring, and mitigation procedures that protect the surface property

owners existing water wells.

(3) A contract between the lessee and the landowner that provides for compensation to the landowner for damages as a result of exploration or development activities. Damages include but are not limited to:

(a) Loss of privacy,

(b) Noise from compressor stations, screw compressors, generators, wells or other coal bed methane facilities.

(c) Lower property values resulting from land encumbrances or easements resulting from exploration or operations.

(d) Damages from water discharged to the surface.

(e) Water damage to adjoining property.

(f) Soil erosion

(g) Noxious weeds

(h) Damage from construction of gas gathering pipelines, and electrical stations

(i) Damage from construction of well heads, pumps and compressor stations resulting in increased noise and exhaust emissions.

(j) Damage resulting from storage of construction materials.

(k) Loss of established well capacity or depth for the surface property owner resulting from exploration or operational drilling.

(l) Loss of domestic or farm animals resulting from damage to fences.

(m) Litter

(n) Fire damage from construction or operation of the facility.

(o) Damage as a result of contamination from discharge of hazardous materials and/or hazardous substances.

(p) Damage to the surface property owner's property due to trespass or vandalism associated with improperly or negligently operated, monitored, or managed coal bed methane facilities.

17.XX.190. REVIEW OF APPLICATIONS; ACTION BY PLANNING COMMISSION

(A) The Planning Director shall review such applications and forward a recommendation for approval, conditional approval, or denial with appropriate findings

to the Planning Commission for final action. Final actions of the Planning Commission shall contain appropriate findings based upon evidence in the record before the Planning Commission.

17.XX.200. APPLICATION; SUBMITTAL PROCEDURE.

(A) The application shall consist of all items identified in section 17.XX.040. Prior to formal submittal of the application, the Planning Director shall meet with the applicant to discuss and identify any additional information required to adequately review the proposed facility.

17.XX.210. DETERMINATION OF COMPLETENESS.

(A) The Planning Director will review the application for completeness. If the Director determines the application is complete, the Planning Commission will commence project review as described in sections 17.XX.040, 17.XX.050 and 17.XX.240. If the application is incomplete, the applicant will be notified of the deficiency and the application shall be withdrawn from the review process until the required information is submitted

(B) The Planning Commission shall conduct a noticed public meeting for review of the proposed facility.

17.XX.220. PUBLIC NOTICE.

(A) A legal notice of the public meeting before the

Planning Commission shall be published in a newspaper of general circulation within the Borough not less than 30 days prior to the public meeting and written notice shall be given individually to the following:

(1) The owners, as recorded in the records of the Borough, of any land adjacent to or located within 1,320 feet of any portion of the subject leasehold: such notice to be sent by Planning Director at the applicant's expense.

(2) The public notice of Planning Commission review shall take a form prescribed by Planning Director and shall include the following:

(a) A description of the location (including a legal and practical location description), applicant/operator and proposed activity under review.

(b) Time and place of the commission's public meeting.

(c) The name and address of the applicant or designated agent and a statement that additional information may be obtained from the Planning Director.

17.XX.230. NOTICE UPON REQUEST.

(A) Notice shall be sent to any other person, agency or organization that has filed a request with Planning Director to receive notice of facilities undergoing public review; such notice to be sent by Planning

Director.

17.XX.240. PERMIT STANDARDS

(A) The Planning Commission decision to approve or deny an application for a coal bed methane permit shall be made and determined based on compliance with the following standards:

(1) The degree of compatibility of the proposed site plan and land uses with established borough plans.

(2) The compatibility of the project and the site design with surrounding buildings, land uses, ownership and physical characteristics;

(3) The adequacy of access to and from the project and the effect on pedestrian and vehicular circulation and safety;

(4) The impact that the proposed project may have on the need and availability of public services within the area;

(5) The sensitivity of the project to its site conditions and environmental setting;

(6) The impact of noise, fumes and dust associated with the project;

(7) The adequacy of the utility plans and the effect of the project on reasonable and economic extension of public utilities and facilities;

(8) The effect of the proposed project on property values of adjacent lands.

(9) The effect of the proposed project on groundwater and surface water quantity and quality.

(10) The effect of the proposed project on public health, safety and welfare.

(11) The effect of the proposed project on fish and wildlife, fish and wildlife habitat, and fish and wildlife migration routes.

(B) All standards contained in this chapter are minimum standards. More restrictive conditions may be imposed by the Planning Commission where necessary to ensure compliance with the comprehensive development plan, to protect the public health, safety, or welfare, or the purpose and intent of the zoning regulations.

(C) The Planning Commission shall apply the following criteria to the evidence in the record of proceedings as a basis for decision:

(1) The demonstrated need for the facility, in the location proposed, to serve the applicant's existing and projected coal bed methane exploration, and/or development and production requirements.

(2) Suitability of the location of the proposed facility given its size, design and operational characteristics. Factors to be considered include noise

levels, impacts upon air and water quality, vibration and odor levels, fire protection and access requirements, visual impacts, wildlife impacts and public safety. These factors will be evaluated in accordance with applicable state, Borough and federal standards and criteria.

(3) Existing and proposed road alignment, intersections, condition, structure and site distances; traffic volumes and types of equipment; dust control; and existing road uses.

(4) Topography, natural hazards (landslides, earthquakes, flooding, and wildfire), current resource values open space corridors, prime farmland (as designated by Soil Conversation Service) and wildlife habitat.

(5) Compatibility with existing and projected future uses based upon present subdivision and land use approvals for properties located within the surrounding affected area. A facility's compatibility with land uses in the surrounding area shall include the effect of the proposed coal bed methane facilities on community development, established residential areas, recreational uses, environmental quality, groundwater and surface water supplies and quality, fish and wildlife, fish and wildlife habitat and migrations routes.

(6) The Planning Commission shall consider the

facility's estimated or projected ability to mitigate the impacts which it generates, as set forth in the facility operational plan, and in accordance with applicable Borough, state and federal rules, regulations and standards.

(D) The Planning Commission decision shall be based upon evidence in the record. Following the conclusion of the public hearing, a written resolution shall be adopted as its decision on the application. The resolution shall set forth findings based upon evidence in the record of proceedings before the Planning Commission and any applicable federal, state or Borough statutes, rules, regulations or policies. For the purposes of judicial review, the Planning Commission decision on an application shall be deemed to have been made as of the date upon which the Planning Commission executes the written resolution.

17.XX.250 APPEALS OF PLANNING COMMISSION DECISIONS.

(A) Appeals from a decision of the Planning Commission shall be made to the Board of Adjustments and Appeals in accordance with MSB 15.39

17.XX.260 APPEALS OF ENFORCEMENT ACTIONS.

(A) Appeals from an enforcement action(s) of a Borough administrative unit shall be heard by an administrative hearing officer, in accordance with MSB

02.39.

17.XX.270 COMPLIANCE.

(A) All coal bed methane facilities must comply with the standards contained in this section. Failure to comply with this section shall be grounds for denial.

17.XX.280 LAND USE STANDARDS.

(A) Coal bed methane wellheads are restricted to a minimum spacing of 360 acres.

(B) Minimum setbacks are as follows:

(1) A setback of at least 1,320 feet shall be required between the site perimeter of a facility and the closest existing residential structure, unless notarized written consent is obtained from the affected surface property owner(s) to a waiver of this standard.

(2) A setback of at least 1,320 feet shall be required between the site perimeter of a facility and the closest platted subdivision lot line, unless verified written consent is obtained from the affected property owner(s).

(3) Setbacks between a facility and the closest existing residence or platted subdivision lot line shall be determined on a site specific basis, based on the review criteria identified in section 17.XX.240(C).

(4) A setback of at least 1,320 feet from all

water bodies containing anadromous fish.

(5) A setback of at least 1,320 feet from any educational facility.

(6) A setback of at least 600 feet from any water body.

(7) A setback of at least 1,320 feet from any conservation easement that restricts the subject property from development.

(8) A setback of at least 1,320 feet from any state licensed hospital, residential treatment center or psychiatric facility.

(9) A setback of 1,320 feet from any religious facility including churches, synagogues, or other places of worship.

(C) Residential Area Prohibitions:

(1) Coal bed methane exploration and development facilities shall not be located within residential areas having one (1) or more dwelling units per acre.

(2) Facilities shall not be located in platted residential subdivisions containing any lots of five acres or less.

(D) Sound mitigation measures shall include:

(1) The exhaust and other emissions from all engines, motors, coolers, compressors, and other

mechanized equipment shall be vented in a direction away from the closest existing residences or platted subdivision lots.

(2) All facilities with engines or motors which are not electrically operated shall be equipped with quiet design mufflers (also referred to as hospital grade or dual dissipative) or equivalent. Such equipment mufflers shall be properly installed and maintained in proper working order.

(3) All mechanized equipment associated with facilities shall be anchored so as to minimize transmission of vibration through the ground.

(4) Coal bed methane facilities shall be located outside of a designated quiet zone.

(5) The maximum sound level as measured at the property line of the coal bed methane facility shall be no higher than 55dba.

(E) Safety standards shall include at a minimum:

(1) Security fencing and a locked gate for facilities sufficient to reduce the likelihood of the facilities becoming attractive nuisances is required at all exploration and development sites.

(2) Safety practices generally accepted by the coal bed methane industry shall be used at all times during drilling and production to minimize the danger to

the general public.

(3) Open-ended discharge valves on all storage tanks, pipelines and other containers shall be secured where the facility site is unattended or accessible to the general public.

(4) All land within 25 feet of any tank, pit or other structure containing flammable or combustible materials shall be kept free of dry weeds, grass or rubbish.

(5) Where the applicant's visual mitigation plan specifies alternative security fencing, the alternative fencing shall apply.

(f) No exploration or development facility shall be located on property that is subject to a conservation easement that restricts the property to development.

17.XX.290. ENVIRONMENTAL QUALITY STANDARDS.

(A) Recognizing the need to avoid operational conflicts, yet recognizing the rights of surface owners, the right of the Borough to determine land uses and the right of the mineral estate to extract minerals, the following criteria shall be used in siting coal bed methane facilities on private property:

(1) The siting of a facility shall adhere to the standards outlined in this section to the maximum extent practical,

(2) The standards in this code shall not cause the operator to site the facility in:

(a) geologic hazard areas,

(b) an area with slopes exceeding 30 percent;

(c) an area of wetlands under the jurisdiction of the U.S. Army Corps of Engineers;

(d) an area within a floodway of a stream or river as shown on the Flood Insurance Rate Maps (FIRM) or as determined by a state licensed professional engineer.

(B) The Planning Commission shall determine the compliance of the proposal using the following standards. Where conflicts between standards occur the more restrictive standard will be used:

(1) Facilities shall be sited to minimize the impact to existing residences, commercial structures, public buildings, and Borough approved platted building envelopes.

(2) Facilities shall be constructed using existing infrastructure. This includes, but is not limited to, the use of existing roads, pipeline routes, and well pads.

(3) Facilities shall be sited to minimize the impact to agricultural operations.

(4) Facilities shall be sited in areas that maximize the amount of natural screening available for the facility. Natural screening includes, but is not limited to, the use of existing vegetation as a background, the construction of the facility near mature stands of vegetation, the construction of the facility in canyons or behind ridges and natural rock formations.

(5) Facilities shall be sited at the base of slopes to provide a background of topography and/or natural cover.

(6) Facilities shall be sited to avoid crossing hills and ridges or silhouetting.

(7) Facilities shall be sited in order to minimize the amount of cut and fill needed to construct the facility.

(8) Facilities shall be sited away from prominent natural features such as distinctive rock and land forms, vegetative patterns, river crossings and other landmarks.

(9) Facilities shall be located to avoid or minimize impacts to archaeological sites and properties of historic significance.

(10) Facilities shall be located, developed, and operated to avoid or minimize negative impacts to groundwater and surface water supplies.

(11) Facilities shall be located, developed, and operated to avoid or minimize negative impacts to fish and wildlife, fish and wildlife habitat, and fish and wildlife migration routes.

(12) The provisions of any existing surface use agreement should be taken into consideration regarding the siting of a facility.

(C) A visual mitigation plan shall be required for all facilities. The plan shall incorporate the appropriate design elements of this section. The requirement for a visual mitigation plan may be waived by the Planning Director if a plan is deemed unnecessary. The visual mitigation plan minimum requirements are as follows:

(1) Scaled drawing.

(2) Site boundary dimensions and descriptions.

(3) Existing and proposed contours and pad elevations.

(4) Existing conditions and site features that incorporate and surround such site to be developed.

(5) Existing and proposed access.

(6) Cross section of existing and proposed contours, if applicable.

(7) Orientation and dimensions of facilities (pump jacks, buildings, etc.).

(8) Description of existing and proposed vegetation.

(9) Location, height and extent of perimeter berms, if applicable.

(10) Type, location and amount of mulch materials, if applicable.

(11) Type, location and height of fencing, if applicable.

(12) Delineate drainage and runoff patterns and mitigation.

(13) Direction and type of lighting, if applicable.

(14) Written maintenance plan for at least one year after revegetation.

(15) Title block:

(a) Name of development;

(b) Name of applicant or developers;

(c) Project number;

(e) Date of preparation; and

(f) Section, township and range.

(16) Vicinity map:

(a) Major roads, adjacent subdivisions and town boundaries;

(b) Section, township and range; and

(c) Rivers, streams, ponds and wetlands.

(17) For sites requiring a visual mitigation plan, performance security shall remain in place for at least one year after installation of the plant and landscape materials. The performance security shall be of an amount sufficient to cover the costs of the proposed improvements or the amount required by section 17.XX.110, whichever is greater.

(D) To the maximum extent possible, the applicant shall use structures of minimal size to satisfy present and future functional requirements.

(E) When clearing trees and vegetation for construction of facilities, the applicant shall feather and thin edges of vegetation while keeping overall clearing to a minimum.

(F) The applicant shall replace earth adjacent to water crossings at slopes less than the natural angle of repose for the soil type of the site.

(G) To the maximum extent possible, the applicant shall align access roads to follow existing grades and minimize cuts and fills.

(H) Facilities shall be painted as follows:

(1) Uniform, non-contrasting, non-reflective

color tones, similar to Munsell Soil Color coding system.

(2) Color matched to land, not sky, slightly darker than adjacent landscape.

(I) The applicant shall minimize damage to existing trees and vegetation.

(J) Pad dimensions shall be the minimum size necessary to provide a safe work area and minimize surface disturbance.

(K) Within six months after well completion, the pad area (except the main access road and the immediate areas within 25 feet of the aboveground facilities) shall be reseeded with native grasses or existing vegetation acceptable to the surface owner.

(L) One or more of the following landscape practices shall be applied, on a site specific basis:

(1) Establishment of berms, ground covers, shrubs and trees. Vegetation clusters shall be placed 10-15 feet apart along the edge of the permanent pad site.

(2) Shaping cuts and fills to appear as natural forms.

(3) Cutting rock areas to create irregular forms.

(4) Designing the facility to utilize natural screens.

(5) Construction of fences such as woven wood or rock for use with or instead of landscaping.

(M) Exterior lighting, when required, shall be directed away from residential areas and the evening sky, or effectively shielded from such areas.

(N) The applicant shall consult with the appropriate state and federal wildlife management agencies to obtain recommendations for appropriate site specific and cumulative impact mitigation procedures. Facility and cumulative impact recommendations shall be submitted for review and approval by the Planning Director.

(1) The following mitigation measures shall be included as appropriate in the site specific wildlife mitigation procedures required under section, as appropriate:

(a) Avoid conducting drilling and construction activities during critical use periods.

(b) Avoid conducting onsite operation and maintenance activities during critical use hours.

(c) Confine vehicular access to established roads except under emergency circumstances.

(d) Forbid use of firearms in project areas.

(e) Install gates which can be locked at

the first property boundary crossed when accessing a facility from the closest public road.

(f) Conduct work in streams in a manner that eliminates or minimizes siltation and erosion and at a period of little or no flow.

(g) Place all pipe below the channel scour depths in streams and rivers to avoid partial diversion or channel discharges.

(h) Stabilize excess material at stream and river crossings in place or remove off the site.

(i) Complete the fueling and lubrication of construction equipment away from aquatic environments.

(2) In lieu of a site specific mitigation review for each facility, the applicant may submit to planning a multisite plan addressing cumulative impacts to fish and wildlife from the estimated total number of facilities. The multisite plan shall include, but not be limited to, all items under subsection 62.150 of this chapter.

(O) If fresh water is required for facility operation, the applicant shall identify the proposed source of such water.

(1) Onsite containment and disposal of water associated with the facility shall be in accordance with any applicable federal and state requirements.

(P) Facilities shall not be located in geologic hazard areas.

(Q) Facilities shall comply with the adopted Borough floodplain ordinance when they are located in a 100-year floodplain area.

17.XX.300. SURFACE DISTURBANCE STANDARDS.

(A) The purpose of this section is to encourage minimal damage to surface activities and surface conditions.

(B) Facilities shall be located so as to use only as much of the surface as is reasonably necessary for the operation of the facility and to avoid the unreasonable loss of agricultural land. This standard may be waived if verified written consent is obtained from the surface owner.

(C) Installation of facilities which are accessible by non-maintained roads included in the Borough road system, which the Borough engineer determines are inadequate to safely accommodate the additional traffic associated with the operation of the facility, shall be permitted only if such roads are improved and maintained by the applicant to a level which the Borough engineer determines is necessary to allow such traffic to use such roads in accordance with applicable state and Borough standards.

(D) When a facility becomes operational, all construction-related debris and slash shall be removed from the site. The site shall be maintained free of debris and excess materials at all times during operation.

(E) No burning of trash shall occur on the site without prior notice to the surface owner and fire district. All burning of trash shall be done within a container such as a wire cage or excavated pit covered with wire.

(F) The applicant shall be responsible for ongoing facility sites and access road weed and noxious weed control during construction and operation of the facility, until abandonment is filed with the A.O.G.C.C. All weed control shall be preformed by mechanical means and shall not include the use of pesticides.

(G) Upon abandonment of the site, as defined by the A.O.G.C.C. reclamation shall be conducted in accordance with A.O.G.C.C regulations.

17.XX.310. DEFINITIONS.

The following words, terms and phrases, when used in this Chapter, shall have the meanings ascribed to them in this section, except where the context clearly indicates a different meaning:

- **"Abandonment"** means that the presumption of permanent abandonment of a well based on the operator's filing with the A.O.G.C.C. Presumption of permanent abandonment of a major facility shall be based upon nonuse for one year without notification of the intent to resume operations.

- **"A.O.G.C.C"** means the Alaska Oil and Gas Conservation Commission.

- **"Agricultural"** means currently in use for farm or ranch purposes, including pasture.

- **"Applicant"** means that person, corporation or other legal entity possessing the legal right to develop the mineral resource or any other use proposed in connection thereof for the site in question; generally, the applicant will be the owner or lessee of the mineral estate.

- **"Collection line"** means a pipeline to a well designed to collect produced or wastewater and transport it to a central disposal area (evaporation pit or injection well).

- **"Compatible"** means able to exist or act together harmoniously, considering noise levels, odors, potential fire hazard, visual impacts, effects to surface water and groundwater quality/quantity, adequacy of the

road system, air quality fish and wildlife, character of residential areas and surrounding land uses.

- **"Compressor station"** means an installation consisting of one or more individual compressors, located on a gathering or transmission line, or both.

- **"Corridor"** means the route within which a pipeline right-of-way is located.

- **"Critical use hours"** means that time of day when disturbance is most likely to increase stress to and negatively impact wildlife.

- **"Critical use period"** means that portion of the year (weeks or months) when disturbance is most likely to increase stress to and negatively impact wildlife.

- **"Designated agent"** means an agent designated by the owner or lessee, as defined by the A.O.G.C.C

- **"Developable"** means land for residential purposes if it does not have slopes exceeding 30 percent, and is not located within a geologic hazard area, federally defined floodway, drainage channel or wetland area greater than one acre. (See Residential.)

- **"Easement"** means authorization by a property owner for the use of a designated portion of his property by another, for a specified purpose.

- **"Exploration"** means all activities associated with the identification of coal bed methane sources, quantities, and preferred methods of production.

- **"Evaporation"** pit means an excavated pit used for storing and evaporating wastewater produced in degasification activities, during drilling or production, or both, sometimes lined.

- **"Development"** and Production means all activities associated with the extraction, collection, compression, distribution, and transportation of coal bed methane.

- **"Gas well"** means a well having a pressure and volume of natural gas; specifically, producing methane, often in combination with a variety of other substances such as butane, propane and carbon dioxide.

- **"Gathering system"** means a system consisting of well (or gathering), lateral, and trunk pipelines transporting oil, gas or other products derived from coal bed methane production to a central facility or transmission line, and so classified under the DOT regulations. For the purposes of this chapter a gathering systems is synonymous with collection and distribution systems.

- **"Lessee"** means the individual or firm leasing mineral rights for development purposes from the owner. The lessee may also be the permittee, for the purposes of this Chapter.

- **"Master Plan"** means a plan that describes the complete build-out (consisting of all phases) and the associated cumulative impacts of the exploration and/or development and production stages of coal bed methane development including all phases.

- **"Methane facilities"** means:

  o An individual well site built and operated to produce petroleum and/or natural gas (methane), including auxiliary equipment required for such production, i.e., separators, dehydrators, pumping units, tank batteries, and other equipment.

  o Gas gathering lines and water collection lines serving coal bed methane facilities, including trunk and lateral lines, shall not be subject to the setback standards required for such facilities, but shall comply with other applicable standards in this Chapter.

  o Facilities associated with gas gathering lines and water collection lines, such as: drip stations, vent stations, pigging facilities, chemical injection stations, transfer pump stations and valve box, which

comply with all applicable standards and requirements in this Chapter.

o An individual well head compression and multiple well compression facility which complies with all applicable standards and requirements in this Chapter.

o Storage yards or construction staging areas occupying one acre or less, and which comply with all applicable standards.

o Gas treating facilities which serve multiple wells or gathering systems.

o Pipelines for which the power of eminent domain is available.

- **"Multiple completion well"** means a well equipped to produce oil and/or gas separately from more than one reservoir.

- **"Nuisance"** means a facility which is not being constructed, operated or installed in substantial compliance with the regulations of this Chapter and any applicable conditions of approval and as to which the applicant has failed or refused to abate, correct or discontinue the violation of this Chapter after being ordered to do so by the Planning Commission.

- **"Operating plan"** means a general description of all associated coal bed methane facilities identifying

purpose, use, typical staffing pattern, seasonal or periodic considerations, routine hours of operating, source of services/infrastructure, and any other information related to regular functioning of that facility.

- **"Operator"** means that individual or firm engaged in all or a portion of the extraction operations at a well or other facility; usually the lessee of the mineral estate, although day-to-day operations may be contracted to another firm.

- **"Platted subdivision lot"** means any lot created pursuant to state law, which has been recorded with the state.

- **"Pollution"** means the contamination or other degradation of the physical, chemical or biological properties of water or air, including change in temperature, taste, color, turbidity or odor, or such discharge of any liquid, gaseous, solid, radioactive or other substance into water or air as will or is likely to create a nuisance or render such water or air harmful, detrimental or injurious to public health, safety or welfare, or to domestic, commercial, industrial, agricultural, recreational or other beneficial uses, or to livestock, wild animals, birds, fish or other aquatic life.

- **"Producing (in production)"** means the development stage in which marketable coal bed methane are extracted from a well; may also signify the extraction level at which the quantitative terms of the lease are fulfilled.

- **"Quiet zone"** means the area within one-half mile of a school, hospital, institution of learning, court, rest home or other designated area where exceptional quiet is necessary, while such places are in use.

- **"Residential"** means having an existing residence or platted subdivision lot.

- **"Security fencing"** means a six-foot chain link fence topped by three strands of barbed wire, or the equivalent, with a gate that can be secured.

- **"Spacing"** means acreage dedicated to each well producing from the same formation.

- **"Transmission line"** means a pipeline transporting oil, natural gas or any other products derived from coal bed methane production, which is defined as a transmission line by the Department of Transportation regulations under the Natural Gas Pipeline Safety Act of 1968, as amended.

Section 3. Effective date. This ordinance shall take effect

upon adoption by the Matanuska-Susitna Borough Assembly.

ADOPTED by the Matanuska-Susitna Borough Assembly this - day of -, 2004.

TIMOTHY L. ANDERSON, Borough Mayor

ATTEST:

SANDRA A. DILLON, Borough Clerk

(SEAL)