

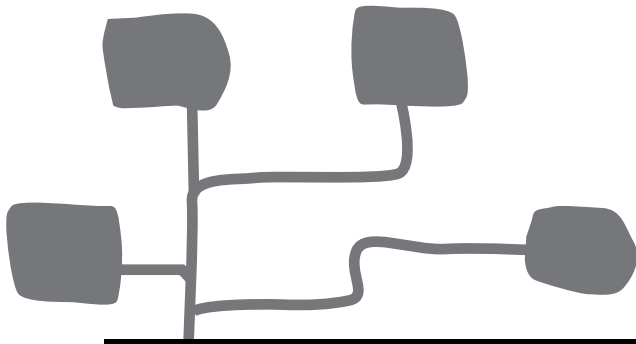


Coalbed Methane: Best Practices for British Columbia

Contents

Executive Summary	1
Introduction: BC's Commitment to World Class Coalbed Methane Practices	3
Why are Coalbed Methane Practices Important?	4
Overview of Proposed CBM Activities	5
BEST PRACTICES	7
A) Best Practices in Consultation	7
Recommendation 1: Place a province-wide temporary moratorium on CBM development	7
Recommendation 2: Allow the affected public to determine “No-Go” zones .	8
Recommendation 3: Improve consultation with First Nations	9
Recommendation 4: Legally require and clarify standards for public notice and consultation	11
Recommendation 5: Reform the governance and makeup of the OGC to ensure it is representative of, and accountable to, stakeholders other than oil and gas industry	13
Recommendation 6: Establish mechanisms to safeguard unbiased and transparent consultation	14
Recommendation 7: Give effect to recommendations from the public affected by CBM development	15
Recommendation 8: Provide support for landowners negotiating Surface Use Agreements that will safeguard their interests	17
B) Best Practices in Water Protection	20
Recommendation 9: Implement mandatory baseline testing and water management plans with monitoring before, during, and after CBM development and upgrade the standards for baseline testing to those in the Canadian Environmental Assessment Act	21
Recommendation 10: Implement regulations to eliminate chemical fracturing	23
C) Best Practices in Stopping Flaring and Associated Greenhouse Gas Emissions	25
Recommendation 11: Create incentives to decrease flaring	26
Recommendation 12: Encourage alternatives to flaring	27
Recommendation 13: Mandate Enhanced Coalbed Methane Recovery (ECBM)	28
D) Best Practices in Addressing Cumulative Impacts	29

Recommendation 14: Make environmental assessments (EA) and development plans mandatory	29
Recommendation 15: Require scrutiny of Approvals in Principle	31
E) Best Practices on Well Density	32
Recommendation 16: Enforce existing well-spacing requirements	33
Recommendation 17: Use directional drilling	33
F) Best Practices for Limiting Noise Impacts	34
Recommendation 18: Strengthen and enforce noise regulations	35
Recommendation 19: Require implementation of mandatory noise reduction plans	35
G) Best Practices for Limiting Visual Impacts	37
Recommendation 20: Make stringent visual impact mitigation plans mandatory	37
H) Best practices for Setback Regulation	39
Recommendation 21: Expand the scope of setback provisions	39
I) Best Practices on Royalties and Bonding	40
Recommendation 22: End royalty and tax breaks	42
Recommendation 23: Ensure adequate bonds are required from operators	42
J) Best Practices in Reclamation	43
Recommendation 24: Make interim reclamation mandatory.....	43
Recommendation 25: Require comprehensive reclamation plans.....	44
Conclusion	46
Appendix A: Best Practices	48
For More Information	55
Endnotes	58



Executive Summary

Coalbed methane (CBM) extraction is a new industry in British Columbia. There is therefore still time to develop regulatory frameworks to ensure the resource is managed for the best possible outcomes for the Province over the long term. The Government of British Columbia is holding an opportunity to move towards its stated goal of leading the world in sustainable environmental management. For CBM, the necessary step is readily apparent: In its 2007 Energy Plan, the Government specified that coalbed methane development here will be required to follow industry best practices.¹

To achieve this goal, both the public and legislators must become more familiar with a range of environmental, social, cultural, and economic aspects of CBM extraction. Most people in the Province, including those who will be directly affected by new CBM activity, know little about this resource. First Nations, landowners, citizens, other users of land and water resources, taxpayers, and environmental experts, among others, have not been engaged in open discussion of CBM access and development decisions. Active consultation on CBM resource management policies could protect a broad range of stakeholder values and should be a priority.

Luckily, the Province can call on the experiences of other communities. Jurisdictions from Texas to Alberta have built up important knowledge about the impacts of the CBM industry. They have developed frameworks to manage the range of adverse effects associated with this industry, while also maximizing local economic benefits. For instance, there are best practices for protecting communities and cultural values; safeguarding water resources, clean air and other environmental goods from a potentially high-risk industry; monitoring and reclamation of well-site land; and ensuring that individual landowners and the wider public are appropriately compensated for the extraction of the CBM resources from the land base. These practices have often been worked out at great cost and after much legal and political struggle. British Columbia can learn from these jurisdictions, and avoid repeating their struggles.

This guide has been developed to make a specific contribution to British Columbia's success in bringing CBM development in the Province up to a world standard of forethought and social and environmental responsibility. It provides background information on the resource extraction process and gives short profiles of relevant experiences elsewhere that have spurred regulatory responses. And the guide captures information on the best practices in nine key areas of coalbed methane development:

1. Consultation for multi-stakeholder input on whether and how CBM projects should proceed;
2. Water resource protection in view of the large quantities of potentially tainted water that the extraction process produces;

3. Elimination of flaring practices that add significant amounts of new greenhouse gases and toxic substances to the atmosphere;
4. Monitoring and control of cumulative impacts of long-lived CBM sites. Well-spacing and setback requirements that reduce a range of negative environmental impacts;
5. Noise control regulations with regard to extraction infrastructure and CBM production activities;
6. Regulation of visual effects that takes multiple use requirements into account;
7. Royalty, taxation, and bonding regulations that provide economic benefit for the general public and shelter taxpayers from the severe costs of improper development or abandonment of CBM wells; and
8. Reclamation requirements to remediate well sites on an ongoing basis so that when operations cease the land and water resources can be successfully returned to their original condition.

On the basis of information in these nine key areas, the guide offers 24 specific recommendations that, if adopted, will bring current government policy in British Columbia to the level of best practices in resource management. This is a first key step in elevating the Province to a position of world leadership.

The recommendations provide a way to assess the Province's current approach to handling CBM development. For instance, BC already has some elements of best practices for CBM written into existing legislation. However, the regulations are accompanied by wide discretionary powers for various decision-makers, so that in fact best practices are not guaranteed. For other aspects of CBM development, BC has no or minimal protections in place. This state of affairs increases the risk that environmental and economic costs will be offloaded from industry onto citizens and taxpayers.

It is also the case that coalbed methane extraction is largely untried in the kind of terrain that predominates in BC. Drawing on others' experience will not, alone, be sufficient. We will need to develop new best practices to safeguard the environment and the interests of people in affected areas as well as the wider public interest. This is a natural opportunity for BC to use knowledge growing from its specific environmental and cultural characteristics to contribute to world understanding of appropriate CBM development practices.



Introduction: BC's Commitment to World Class Coalbed Methane Practices

Above:

Skeena watershed,
an area under threat
of CBM development

Photo: Brian
Huntington

In the 2007 Throne Speech, Premier Gordon Campbell stated that no priority “is more important than the critical problem of global warming and climate change.”² Action on climate change “is central to the Great Goal of leading the world in sustainable environmental management.”³

To move towards this goal of leadership, the Government of British Columbia released the 2007 Energy Plan, which committed it to the following environmentally responsible oil and gas development policies:

- Eliminating all routine flaring at oil and gas producing wells and production facilities by 2016, with an interim goal of reducing flaring by 50 per cent by 2011;
- Having the best coalbed gas practices in North America;
- Fully engaging communities and First Nations in development decisions;
- Using the most advanced technology and practices that are commercially viable; and,
- Disallowing all surface discharge of coalbed-produced water, and requiring that water produced in CBM operations be re-injected into the earth well below aquifers.⁴

This is a good start. However, for some aspects of CBM development, no jurisdiction has yet created rules adequate to ensure safe, sustainable and widely beneficial use of coalbed methane. British Columbia has a chance to lead the world in crafting new standards as well as in consistently applying the best practice standards already in use in other jurisdictions.

Why Are Coalbed Methane Best Practices Important?

Coalbed methane exploration and drilling generally cause more significant impacts on the landscape, air, and water than conventional gas extraction. Oversight of the process is therefore of crucial importance to the long-term well-being of British Columbians.

Impacts specific to CBM extraction include:

- production of large amounts of potentially tainted water that cannot be allowed to contaminate groundwater and aquifers;
- very large numbers of wells per site, which produce significant environmental disturbances in the form of roads, pipelines, and well pads;
- human and animal health impacts from flaring of toxic materials; and
- operational noise hazards and severe visual impacts on the landscape.

Experience shows that a lot can be done through planning and careful resource management standards to mitigate these and other detrimental effects of the industry.

To provide the Province with the protection of the “best coalbed gas practices in North America”, the Government of British Columbia must:

- Develop a systematic consultation-based framework for deciding when, and under what conditions, coalbed methane projects are acceptable, and also when the economic and ecological costs are too high for CBM development to proceed; and
- Take legislative steps to codify the best practices in regulations.

Industry economics easily support this program of action. Depending on gas prices and production levels, an average well brings in \$600,000 to \$1.2 million over its productive life. The costs of establishing a producing well may be about \$65,000. In this economic scenario, the industry can well afford to invest in implementing best practices. Just as clearly, given the environmental and social risks involved, citizens of BC cannot afford any other approach.⁵

It is particularly important to note that most of the regions where coalbed methane drilling is being proposed have little or no history with oil and gas development. In this situation even greater care must be taken to consider explicitly and transparently whether any particular coalbed methane proposal should be authorized.⁶ The controversy surrounding CBM proposals in communities from Iskut to Fernie, and Cache Creek to Hudson’s Hope highlights the fact that much more needs to be done before we will have open and well-informed consideration of the challenges posed by CBM development. Community engagement must occur, the earlier in the development process the better. Public response to date raises fundamental questions about how licences and approvals are currently granted, and how that process needs to be improved.



Overview of Proposed CBM Activities

Above:

Gas wells encroaching on the Roan Plateau near the town of Rulison, Colorado

Photo: SkyTruth

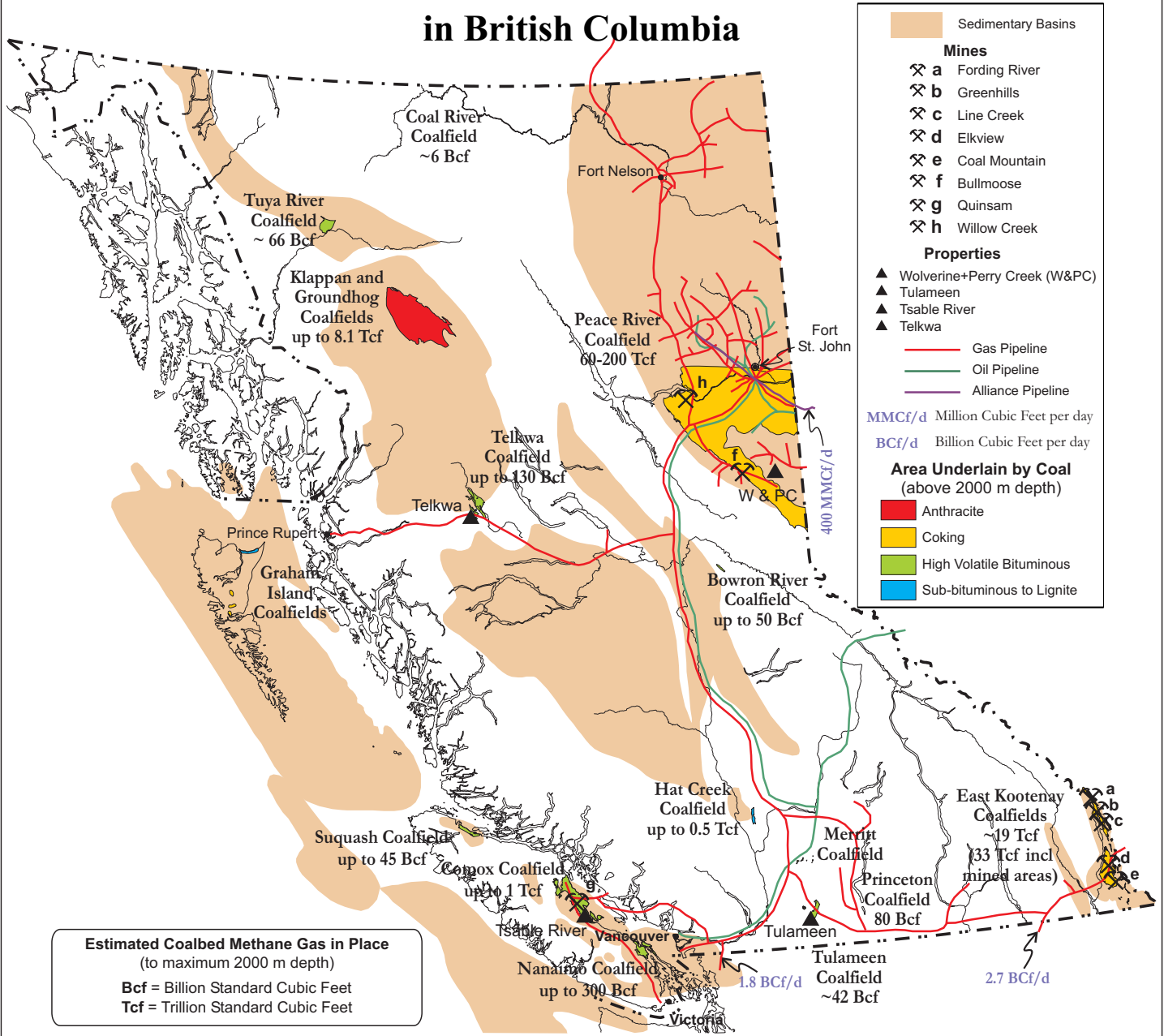
Some 98 per cent of the Province's potential coalbed methane operations are located in three areas:

- Peace River in the northeast (in the Gates, Gething and Minnes formations),
- the East Kootenays (in the Elk Valley, Crowsnest and Flathead formation),
- the remote Klappan-Groundhog field near the Sacred Headwaters of the Stikine, Nass, and Skeena watersheds.⁷

Smaller potential deposits of CBM are thought to be located near Telkwa, Hat Creek, Princeton, Tuya River, Tulameen, Merrit, Bowron River, Coal River, and on Vancouver Island near Nanaimo, Comox, Suquash, and Graham Island.⁸ BC has 250 billion tonnes of coal deposits lying within 2000 metres of the surface that are available for CBM exploration. Currently, British Columbia's CBM potential is estimated at 90 trillion cubic feet, but the percentage of this resource that may eventually be recoverable may be much less.⁹

The ecology and geology of some of these sites make them unlike any area where coalbed methane has been developed in the past. For example, coalbed methane has never been commercially extracted from sub-alpine and alpine regions, or from areas near salmon spawning grounds—all of which are conditions found in the Klappan at the headwaters of the Skeena River. When coalbed methane is being considered in sensitive environments, communities must be in a position to understand and assess potential impacts early, and be empowered to allow, alter, or fully disallow development.¹⁰

Coalfields and Coalbed Methane Potential in British Columbia



Best Practices

A) Best Practices in Consultation

The 2007 British Columbia Energy Plan sets an objective for ongoing, full engagement with communities and First Nations on CBM development. To achieve this in practice, government must put in place legislation that provides for citizens to be part of comprehensive and meaningful consultation. They must be informed of proposed activities, and input from the public must in turn be allowed to affect the outcome of the project deliberations.

Experience from elsewhere has shown that public engagement can *decrease* operating costs if concerns and priorities are identified early.¹¹ Input leads to better initial design and execution of projects. In addition, accommodating the needs of landowners, First Nations, and other communities, both up front and during development, decreases industry costs by reducing the reclamation needed at the end of the project.¹²

Eight key recommendations for best practices in the area of consultation about CBM development are listed below:

Recommendation 1: Place a province-wide temporary moratorium on CBM development

Until a firm regulatory framework for best practices for CBM development is in place, and until the public has been engaged in consultation on the benefits and risks presented by the industry at this time, a province-wide moratorium is a prudent step. The gas has been there for millions of years, and there is no obvious need to rush development. Caution is dictated by the knowledge that if CBM is not developed properly, it can have irreversible impacts on the health of citizens, on water resources, on the environment and on local economies.

In BC, First Nations have voted unanimously for a 10-year CBM moratorium, and the Union of BC Municipalities has also asked for a 10-year moratorium on CBM in BC. When moratoriums on CBM development were put in place in other jurisdictions, they provided an impetus for legislation to protect the public from the impacts of CBM operations.

Best Practice in North America:

Moratorium on CBM development – Valle Vidal, Rio Arriba, Santa Fe, and Mora County, New Mexico

Jurisdictions in the United States have declared moratoriums on CBM development to allow local governments to develop laws that protect the public from the adverse effects of CBM development.

Santa Fe County, New Mexico

In 2008, a six-month ban on drilling in the Galisteo Basin of Valle Vidal was issued. Santa Fe County followed with a year-long moratorium on drilling, to give the county time to prepare for the unfamiliar type of development.

Rio Arriba County, New Mexico

In 2008, Rio Arriba put in place a four-month moratorium on CBM development, to draft legislation to protect water resources. Rio Arriba County Commissioner Alfredo Montoya stated that “Rio Arriba may need to extend the moratorium to write new rules”, and that “we are committed to the protections of our water sources for our present and future generations of New Mexicans”.

Mora County, New Mexico

On May 20th, 2008, Mora County “passed an indefinite ban on oil and gas drilling.” The Mora County Commission chairman said the moratorium will stay in effect until the Development Guidance System is “revised and fitted to the county’s needs”.

Next Steps: It is clear that BC residents who have had a chance to make their views known feel they need time to consider the impact that CBM can have on their livelihoods. The Government of British Columbia should therefore not proceed with CBM development until it can assure the population that the industry will only proceed in the most environmentally prudent manner, protecting public health and local economies. In other words, as long as the BC government has yet to meet its commitments to have the leading North American standards for CBM, new development should not proceed.

Recommendation 2: Allow the affected public to determine “No-Go” zones

A framework for meaningful consultation must provide the public with the power to stop or limit CBM development by the establishment of “no-go zones”. In such areas, CBM development would not proceed if social, environmental, or health costs of the project are considered to be too high. Those affected by resource development must have the power to affect the outcome of the project planning.

In areas where fossil fuel exploitation is already under way, CBM development or additional exploration wells may be expected to cause incremental rather than dramatic new environmental impacts. However, in relatively undeveloped areas like the Klappan and the Kootenays, even exploration wells may lead to substantial changes in environmental quality. The Klappan, for instance, combines alpine, sub-alpine, and salmon-spawning areas. CBM has never been commercially extracted from any such regions. Environmental impacts associated with coalbed methane, such as effects on salmon spawning or loss of key wildlife habitat, may prove to be significant in such untested areas, even though they may not have been noted in other kinds of terrain.¹³

Best Practice in North America:

Creating No-go zones - Alberta and Vermejo Park Ranch, New Mexico

The CBM Agreement for Ted Turner's Vermejo Park Ranch includes a covenant of non-disturbance for areas of special sensitivity where CBM producers have absolutely no rights of use or occupancy. These sensitive areas include almost 30 per cent of the ranch property.

In Alberta, a Multi-Stakeholder Advisory Committee (MAC) process has been put in place to allow recommendations of the public to be implemented and monitored. The MAC is working to identify environmentally sensitive and threatened areas (including areas not yet designated) where CBM development is not appropriate and will not be allowed.

Next Steps: It is particularly important that when coalbed methane development is being considered in sensitive environments, communities are in a position to understand and assess potential impacts on their livelihoods and surroundings early in the process, and be empowered to allow or fully disallow development.¹⁴

Recommendation 3: Improve consultation with First Nations.

In September 2008, the First Nations Summit, which represents the majority of First Nations and Tribal councils in British Columbia who are engaged in the treaty process, passed a resolution calling for a 10-year moratorium on all CBM drilling in the Province. Debbie Pierre, Executive Director of the Office of the Wet'suwet'en, stated that "the coalbed methane industry is infringing on Aboriginal title and rights all over British Columbia ... our wildlife and wild salmon are threatened, and we are calling on Gordon Campbell to halt drilling until we have a better approvals system in place."¹⁵

Until such time as shared decision-making processes are developed, there should be a moratorium on CBM development in all First Nations Territory.

Government has a constitutional duty to consult in good faith with First Nations and to provide sufficient time for discussion of these important matters.¹⁶ The Province has produced general guidelines for consulting with First Nations.¹⁷ In addition, consultation agreements (memoranda of understanding) have been signed with many First Nations in the northeast (Treaty 8 Nations), establishing formal time-limited review processes for oil and gas activities. These agreements are proving to be inadequate for CBM consultation.

The current review process used by the Oil and Gas Commission (OGC) allows for First Nations to comment on an application within 10 working days for a standard designation and within 20 working days for a complex one. First Nations may, under particular circumstances, request a time extension for a discussion period in order to submit comments. However this provision does not work well since it provides insufficient time for First Nations to compile the evidence necessary to obtain an extended discussion that is substantial in nature.¹⁸ Ten to twenty working days is not enough to consider all of the implications of CBM development.

When the original memorandum of understanding was developed, First Nations were not informed that projects like CBM, with their huge cumulative impacts, would come under the purview of the agreement.¹⁹ Under such restrictive conditions, consultation is reduced to an "empty" procedural step that fails to allow First Nations to require sub-

stantive changes. For example, concerns that were brought up by West Moberly First Nations (southwest of Fort St. John) during consultation were dismissed, and the questions the Nation raised went unanswered. It appears that when First Nations attempt to use a process put in place by the government, their concerns are not seriously considered.²⁰ In consultation processes with First Nations on projects with potentially far-reaching impact, the fact or the perception of “tokenism” is unacceptable.

Many First Nations want adequate time to consider the costs and benefits of CBM operations and to decide whether to allow it. Although the courts have ruled that the Crown can’t delegate its duties to private industry, the current policy of the OGC encourages CBM companies to replace government in this role and to consult directly with First Nations about CBM projects and associated economic development opportunities.²¹ Company representatives do not have the constitutional responsibility for, or the necessary understanding of, First Nations rights and title.

Delegating consultation to gas companies is not an acceptable practice. It does not, in the words of the Supreme Court of Canada, satisfy the “honour of the Crown” and although not yet fully tested before the courts, is unlikely to withstand rigorous judicial examination.



Right:
Members of the
Tahltan First Nation
block the main access
road into the Sacred
Headwaters.
*Photo: Klabona
Keepers Society*

Best Practice in North America:*Moratorium in the Sacred Headwaters of Klappan, BC*

In the Klappan area, which First Nations call the “Sacred Headwaters,” the BC government announced a two-to-four year moratorium on Royal Dutch Shell’s controversial plan to drill for CBM. In response to the moratorium, Tahltan Central Council Chair, Annita McPhee, stated that “the Tahltan nation supports responsible and sustainable development; however, we feel that coalbed methane development is advancing without full and complete information or an established and agreed-upon framework for decision making that respects and recognizes Tahltan title and rights ... (T)he suspension will provide our nation with the time it needs to be well informed on all issues relating to CBM.”

Next Steps: To set the continental benchmark for CBM regulations in North America, the Crown must insist on full ongoing engagement with First Nations. The current time-constricted process is inadequate for this purpose. Among other things, the provincial government must ensure that:

- CBM exploration and drilling proposed in areas of disputed title or rights undergo rigorous assessment before any licences or permits are authorized to determine the potential impact on Aboriginal title or rights.
- CBM promoters are made fully aware of the uncertainty associated with the Crown’s authority to independently authorize resources development on disputed lands.
- First Nations have sufficient time and resources to evaluate individual projects and the cumulative impacts on lands subject to treaty, or upon which title or rights have been claimed.

Recommendation 4: Legally require and clarify standards for public notice and consultation.

So far, the Province has failed to clarify what constitutes adequate public notice and appropriate disclosure about CBM projects. New legislation on these standards needs to be developed.

The Oil and Gas Commission’s Public Engagement Guidelines do encourage CBM operators to engage the public. However, the public has no legally enforceable right to be adequately notified or consulted about CBM operations even when their lands, health, and environment may be affected. Operators remain free to select public engagement methods that they feel will best fit the circumstances.²² Appropriate legislation might include a requirement for operators to publish information in the local paper describing the development of any proposed CBM project. Such notice should detail the steps taken to comply with applicable air/water quality, health and safety regulations, and geographical/wildlife mapping. Notice should also disclose any violation by the operator in the last ten years of federal, provincial, or local laws pertaining to oil and gas activities in Canada or elsewhere.²³

Best Practice in North America:*Legislated Notification Requirements - New Mexico's Surface Protection Act*

New Mexico's extensive notification requirements are protected through legislation that provides affected landowners with legal recourse if full notification does not occur.

Section 5 of the *Surface Protection Act* requires that "no less than thirty days before first entering the surface of the land to conduct oil and gas operations, an operator shall, by certified mail or hand delivery, give the surface owner notice of the planned oil and gas operations".

The notice shall include:

- Sufficient disclosure of the planned oil and gas operations to enable the surface owner to evaluate the effect of the operations on the property;
- A copy of the *Surface Owner's Protection Act*;
- The name, address, telephone number, and, if available, facsimile number and e-mail address of the operator and the operator's authorized representatives; and
- A proposed Surface Use and Compensation Agreement addressing, at a minimum and to the extent known, the following issues:
 - The placement specifications, maintenance and design of the well pads, gathering pipelines and roads to be constructed for oil and gas operations;
 - Terms of ingress and egress upon the surface of the land for oil and gas operations;
 - Construction, maintenance and placement of all pits and equipment used or planned for oil and gas operations;
 - Use and storage of water on the surface of the land;
 - Removal and restoration of plant life;
 - Surface water drainage changes;
 - Actions to limit and effectively control precipitation runoff and erosion;
 - Control or management of noise, weeds, dust, traffic, trespass, litter, and interference with surface owner's use;
 - Interim and final reclamation of the landscape;
 - Actions to minimize surface damage to the property;
 - Operator indemnification for injury to persons caused by the operator; and
 - An offer of compensation for damages to the surface.

Next Steps: To date in BC, CBM operators are not required to meet specific standards for notification of affected landowners about planned CBM projects, and there are no requirements at all to notify the general public who live more than 1.5 km from the well site.²⁴ Having legally enforceable notification and engagement requirements is an important step in ensuring that public concerns are heard and addressed during the planning process. Clear standards are needed regarding what constitutes appropriate public notification about project plans and the records of the proponents in achieving sustainable development.

Upcoming Provincial Action:

A new Notification & Consultation Regulation is being drafted to support the *Oil and Gas Activities Act*. This new regulation sets out the notification and consultation operators are required to carry out before submitting a permit application to the OGC.

Notification and consultation requirements under this regulation may vary depending on the nature of the resource, the proposed oil and gas activities, and the various approvals, such as water use and disposal, required to undertake the activities.

MEMPR has also launched a Landowner Notification Program to provide registered surface owners with information about upcoming petroleum and natural gas rights sales.

Recommendation 5: Reform the governance and makeup of the OGC to ensure it is representative of, and accountable to, stakeholders other than oil and gas industry.

MEMPR and the OGC need to take steps to ensure that they engage with the public in a manner which balances competing concerns of several stakeholders and deals what is now perceived to be a bias in favour of oil and gas interests. For instance, the Landowner Liaison Inspector is currently a member of the OGC and as such is not seen to be an independent advocate. The inspector has a limited ability to provide impartial information and to ensure that landowners understand the legal aspects of CBM activities.

The BC Oil and Gas Commission has three members on the board of directors. The deputy minister who is the director and the chair of the commission, and two additional directors appointed by the Lieutenant Governor in Council, one of whom is the commissioner and the other the vice chair of the commission. Currently, all three board members have backgrounds in the oil and gas sector.

Other jurisdictions such as Colorado (see below) have restructured bodies similar to the OGC to address concerns about bias and ensure various stakeholder interests are represented.

Best Practice in North America:

Oil and Gas Commissions Which Reflect Community Interests – Colorado's Oil and Gas Commission

In 2007, the Colorado Oil and Gas Commission was overhauled to ensure that it was more representative of community interests. It “decreased the number of members with ‘substantial experience in the oil and gas industry’ from five of the previous seven-member panel, to three on the current nine-member panel.”

The reforms imposed new rigorous statutory requirements about the qualifications and demographic makeup of the commission: one member of the board has to be a local government official, one to have experience in environmental or wildlife protection, one to have experience in soil conservation or reclamation, and one to be actively engaged in agricultural production and be a mineral royalty owner, with a maximum of four from same political party.

Since the changes in the Colorado Oil and Gas Commission, new legislation has been developed which specifically addresses concerns relating to CBM, and the Commission is better equipped to address the range of concerns which emerge during CBM operations.

Next Step: The OGC should restructure its board of directors and decision making to become more accountable to and representative of the various stakeholders other than oil and gas interests.

As in Colorado, the OGC should decrease the number of members with ‘substantial experience in the oil and gas industry’ and impose more rigorous, and ‘demographic appropriate’ requirements, for who qualifies to be part of the commission. The board in Colorado, consists of a local government official, someone with experience in environmental and wildlife protection, someone with experience in soil conservation and remediation, someone engaged in agricultural production and a mineral royalty owner, with a maximum of four members from a single political party. Having representatives with a variety of backgrounds and from a variety of sectors would better equip the OGC to address a wide range of concerns and issues that may arise when evaluating and approving proposals and overseeing enforcement.

Recommendation 6: Establish mechanisms to safeguard unbiased and transparent consultation.

The OGC’s mandate is to regulate oil and gas activities by balancing a range environmental, economic, and social factors and values. The mandate of the Ministry of Energy, Mines and Petroleum Resources (MEMPR) is to manage oil and gas resources in a socially responsible manner in order to provide employment that sustains families, products, and economic benefits for all British Columbians. In recent experiences of CBM-related consultation, this standard has not been achieved. To date, when consultation has occurred the affected public has felt that MEMPR and the OGC were not acting as neutral third parties and were instead acting as promoters for CBM operators.²⁵

MEMPR and the OGC need to take steps to ensure that they engage with the public in a manner which balances competing concerns of several stakeholders and which gives no priority to oil and gas interests. For instance, the Landowner Liaison Inspector is currently a member of the OGC. As a result of this dual role many do believe the position to be an independent advocate. The inspector has a limited ability to provide impartial information and to ensure that landowners understand the legal aspects of CBM activities.

Best Practice in North America:

Independent Farmer’s Advocate - Alberta

In Alberta, the Farmer’s Advocate was created to maintain good relationships between companies, landowners, and government. The Farmer’s Advocate is independent of the Energy Resource Conservation Board. The position is housed in the Ministry of Agriculture and is in place to protect the interests of landowners without interference. The Farmer’s Advocate works to protect rural Albertans by assisting landowners with “managing their land assets, mitigating business risk and maximizing future economic opportunity as it relates to the interaction with the energy industry.” The Farmer’s Advocate helps with contract management and proactive pre-planning regarding land use concerns of Albertans.

Next Steps: Creating an Independent Land Liaison Inspector that does not report to a ministry or agency involved in oil and gas approvals can help ensure that citizens have an advocate who can assist in making consultation open and transparent.

It is also important to ensure that the employees of MEMPR and the OGC are knowledgeable in all aspects of oil and gas activities, from conservation concerns to extraction technologies. Only then can they ensure that the legislation and guidelines developed are able to address all concerns that emerge from CBM operations.

Upcoming Provincial Action:

MEMPR has informed Dogwood Initiative that it is establishing an Independent Farmer's Advocate.

This independent position will be created to work directly with private landowners to help them understand their property rights, potential agricultural implications of CBM, and how to negotiate with industry. It is expected the new Farmer's Advocate will provide direct information and support to landowners who are engaging industry.

MEMPR in co-operation with industry is implementing a regional "good neighbour" initiative between companies and landowners. Its focus will be on matters of community concern such as speed and dust control.

MEMPR is reviewing an enhanced role for the Mediation and Arbitration Board to further improve processes for landowners. This role may include allowing landowners to file for compensation from damage from an activity and assisting in resolving disputes arising from non-compliance with the surface lease agreement.



Right:
Community resistance
to CBM in the Bulkley Valley.
Photo: Pat Moss

Recommendation 7: Give effect to recommendations from the public affected by CBM development.

Public notification and participation in CBM project discussions is meaningless if the public's recommendations and concerns are not woven into the CBM development plan. Responsiveness to public concerns is the foundation of any claim that the CBM industry has a "social license" to operate in BC. The industry's practice in implementing recommendations from the public needs to be monitored and enforced.

Best Practice in North America:

Multi-Stakeholder Advisory Committee – Alberta

In Alberta, the Multi-Stakeholder Advisory Committee (MAC) provides not only a forum to consult with different stakeholders but also a mechanism to monitor and ensure that any concerns raised are addressed. It has been an essential part of public consultation on development in the Province. Participants in the MAC process represent environmental organizations, landowners, agriculture, local government, the energy industry, and departments of the provincial government. The various stakeholders participated in working groups to study issues related to CBM development.

The MAC working group creates recommendations to address concerns related to CBM development, which are then monitored through annual updates on the implementation of the recommendations.

An example of a recommendation from the MAC process is the agreement between Alberta Environment and the Energy Resource Conservation Board to work with industry to investigate the potential for methane migration to water wells as a result of CBM depressurization.

The implementation of this recommendation is on schedule. Alberta Environment's response to water well complaints is being enhanced, and the provincial groundwater monitoring system is being enhanced. Alberta Environment (AENV) has commissioned a consultant to provide background information on gas migration potential.

Next Step: Currently in BC, concerns of citizens are addressed only on an individual basis. A person must submit a *Notice of Unresolved Concern* to the OGC. These concerns are then dealt with one at a time and do not form part of a comprehensive review of public concerns about a project. Developing a multi-stakeholder engagement process in British Columbia would be a considerable improvement. It would allow the affected public to put forward their recommendations and concerns in an open and transparent process, before more CBM development occurs. Such a multi-stakeholder representation mechanism should work within a legislated framework to identify and address CBM concerns, including those of environmental stakeholders.

The MAC process in Alberta has had short-falls, which need to be addressed before a similar process is put in place in British Columbia. In particular there was concern that the MAC process was focused on streamlining old oil and gas regulations rather than developing new regulations for CBM. Another concern was that extensive CBM development began before the MAC process was initiated, which limits the effectiveness of the recommendations and of consultation affecting the outcome of projects.²⁶ This problem can be avoided in British Columbia if the proper safeguards were put in place from the beginning.

Environmental organizations in Alberta also felt that the MAC process was not effective for strong environmental management of the oil sands. They withdrew from the committee rather than “legitimize a process that both the oil sands industry and government have been using as a shield to deflect criticism about the cumulative environmental impacts of oil sands development.”²⁷ The experiences emerging from Alberta's MAC processes provide lessons for improving the process before it is implemented in British Columbia, to ensure that BC has the leading standard for implementing the concerns of citizens.²⁸

Recommendation 8: Provide support for landowners negotiating Surface Use Agreements that will safeguard their interests.

Protection needs to be put in place for landowners who suddenly find themselves in legal negotiations with CBM operators. Many landowners are not aware that they do not own subsurface rights to their property until the land agent is at their door telling them that the rights to the gas below their ground have been purchased. CBM operators may arrive with standard-form contracts, which landowners may feel compelled to sign if they are unaware of the types of information which can be included in an Surface Use Agreements (SUA) to protect their interests. Landowners generally do not have any experience with the oil and gas industry, and are not in a strong position to negotiate with experienced CBM operators. This power imbalance must be addressed. Landowners are unlikely even to be aware of the myriad ways CBM can affect their land, health, and livelihood.

However, a SUA can be an important form of leverage. A CBM operator must have an SUA with the landowner or have Mediation and Arbitration Board authorization²⁹ to enter land for exploration or development. Properly informed landowners can use SUAs to address compensation, damage payments, development plans, the timing of operations, construction requirements, reclamation requirements, water management, and access to property. They can also use the SUA negotiation to address water well protection, if the landowner has any wells in the vicinity.³⁰



Above: CBM wellpads, pipelines, compressor stations and roadways results in fragmented wilderness.

Best Practice in North America:*Comprehensive Surface Use Agreements – Vermejo Park Ranch and the Powder River Basin*

The following types of information are included in the comprehensive SUA drawn from Ted Turner's Vermejo Park Ranch (New Mexico) and the Powder River Basin (Wyoming/Montana).

The Vermejo Park Ranch CBM Mineral Extraction Agreement includes:

- A staffed environmental department which is responsible for managing CBM projects and assuring compliance with the Mineral Extraction Agreement;
- Covenant of non-disturbance;
- Total well cap (i.e. a cap on the total number of wells), and limits on well spacing;
- Mandatory groundwater re-injection;
- Annual general plan of development;
- Annual reclamation requirements;
- A construction review and formal approval process;
- Visual impact mitigation
- Notice and information requirements ;
- Joint groundwater monitoring program;
- Landowner's right to all the produced water at the ranch;
- Vehicle and personnel limits;
- Noise restrictions;
- Secured access;
- Accident/spill response and notification plan;
- Restrictions and limitations on producer activities;
- Development time line; and
- A breach-of-contract damage clause.

Powder River's sample SUA covers:

- Defining the land that is included in the agreement;
- Rights-of-way;
- Notification and consultation requirements;
- Termination of rights, non-exclusive rights, and limitations on rights;
- Payment amounts for: stratigraphic tests, well locations, roads, pipelines, gathering, metering and compression sites, and power lines;
- Locations of well sites, standards for operations and facilities;
- New road and fence construction, establishing cattleguards, and not cutting or damaging any improvements on the owner's property;
- First preference for work;
- Restoration and reseeding;
- Non-disturbance of the owner's land that is not included in the agreement;
- Testing and protection measures for Surface owner's water
- Repair or replacement of any water well or spring which is lost or diminished in productivity;
- A water well mitigation agreement; and
- Enforcement costs, indemnification, compliance with the law, and non-assignability.

Next Steps: A useful approach to supporting landowners is to provide them with sample SUAs that highlight some of the concerns regarding CBM operations. This helps landowners to understand all the implications of CBM extraction in order to address them. While the OGC has one model SUA on its website, the agency should also provide additional examples of more comprehensive SUAs for the protection and support of landowners.

Landowners also need support in establishing appropriate amounts of compensation for surface access to their land. CBM operators who enter and use land for CBM development are liable for any damages done to the land, and, if the Mediation and Arbitration Board orders it, to pay rent for the duration of occupation and use.³¹

Best Practice in North America: *Guidelines for Compensation – Alberta*

In Alberta, the Farmer's Advocate provides a pamphlet to assist landowners to negotiate surface use agreements. The pamphlet includes information regarding the landowner's rights and the responsibility of operators, and includes guidelines for what constitutes appropriate compensation for various oil and gas activities. The compensation guideline advises the following compensation amounts:

1. **Entry Fee:** The entry fee is equal to \$500 per acre of land granted to the company, to a maximum of \$5,000. For example, if the company needs a 4.25-acre site, the entry fee would be: $4.25 \text{ acres} \times \$500 = \$2,125$. The \$5,000 maximum applies when the area is 10 acres or larger. The minimum entry fee is \$250, paid when the area is half an acre or less.
2. **Land Value:** Usually the value of the land leased to the company is determined by the price expected if the land were sold on the open market by a willing seller to a willing buyer at the time when the lease was prepared or the Right-of-Entry Order issued. The value is also based on the highest approved use (agricultural, industrial, residential) for the land. The per-acre value for the well site is determined by dividing the value of the titled unit by the number of acres required.
3. **Initial Nuisance, Inconvenience and Noise:** This payment is for nuisance during the first year of the lease. For example, in the first year the landowner will likely have to spend time dealing with the company's representatives and surveyors, preparing documentation, negotiating with the company, and seeking advice from government agencies or lawyers. There may also be noise and inconvenience due to construction. The company should pay reasonable compensation to you for nuisance. The owner should keep a record of all time spent, phone calls made and expenses incurred.
4. **Loss of Use of the Land:** The company pays an annual compensation for the owner's loss of the normal use of the well site area during the well's life. The amount should approximate the value of the gross annual production reasonably expected from the area. To calculate the amount, you can use the greater of yield and price averages from the past five years, or today's street price. For example, assuming canola production at 35 bushels per acre on a well site and access road occupying four acres, the loss would be $4 \times 35 = 140$ bushels. At \$8.50 per bushel, the total annual loss would be \$1,190. Because the landowner is asked to agree on losses for the next five years, consideration should be given to future prices.
5. **Adverse Effect:** This payment is related to inconvenience, nuisance and extra costs on the rest of the quarter section where the well site is located. For instance, farming around the well site may require constantly turning corners, which can cause overlaps, extra strain on machinery, soil compaction, loss of seed and grain, and extra field and labour costs. Other factors related to adverse effect can be noise, dust, odour, additional traffic on the land, and proximity to a residence or farm site.
6. **Other Relevant Factors:** If there are other considerations specific to the landowner's situation, the owner should include them when negotiating compensation.

Next Steps: Although Alberta's recommended compensation figures have received criticism for being too low, having guidelines for what is considered an appropriate level of compensation for the many impacts of CBM development helps landowners negotiate effectively. Landowners may require legal counsel either in negotiating an SUA, or to prove the damage that triggers compensation under the SUA. If legal representation is needed to make negotiations equitable, or to seek compensation, the CBM operator should pay for lawyer's fees. The regulatory framework must ensure that landowners and First Nations have the information needed to make decisions about their land and to negotiate on equal footing with experienced CBM operators.

B) Best Practices in Water Protection

Coalbed methane is held in coal seams through pressure exerted by the water table. To extract it, the developer must first pump out the water.³² It is only after the water has been pumped out of the well that CBM can be produced. This is called the dewatering phase of CBM development, and experience from the US indicates that it can take 12 months or more before commercial volumes of gas are produced.³³ An individual CBM well can produce 63,595 litres of this "produced water" per day during this phase.³⁴ CBM wells can produce 10-100 times more water than conventional gas wells.³⁵ The quality of produced water varies from basin to basin, and is always at risk of contamination by the chemicals used in extraction.

The most significant chemical is the "fracing" (hydraulic fracturing) fluid that is often pumped into the well to fracture the coal seams and prop them open to allow the methane to be released. The chemicals used in fracing are often toxic and can contaminate groundwater and drinking water.³⁶

CBM production can also drain aquifers. The Bureau of Land Management (BLM) in the United States estimates that CBM can lower aquifer levels by 34 feet near a well. In the Powder River and the San Juan basins in the Southwestern US, the level of drinking water wells dropped by over 200 feet as a result of CBM development.³⁷ The decrease in groundwater can affect the temperature of streams and the earth, with further negative effects on soil productivity and wildlife.³⁸

Also, if the wells are not cased properly, methane can migrate into groundwater. If the methane stays in the ground, it can interrupt the flow of water and be an explosion hazard if it is allowed to concentrate inside enclosed structures and homes.³⁹

Managing the water issues associated with CBM is the most important factor in ensuring environmentally responsible development of this resource. The words of Bob Lieb, the County Commissioner in La Plata County, Colorado, are a wake-up call for all legislators: "I'm very nervous about making any concessions about anything having to do with water If we ruin the water ... we ruin it forever."⁴⁰

On the basis of best practices, two water protection recommendations follow.

Recommendation 9: Implement mandatory baseline testing and water management plans with monitoring before, during, and after CBM development and upgrade the standards for baseline testing to those in the *Canadian Environmental Assessment Act*

The use of groundwater in BC is currently unregulated and uncontrolled. Unlike other jurisdictions in North America, there is also no requirement for water management plans when drinking water could be implemented by industrial activities. This cannot continue, particularly in areas where there is pressure on limited water resources, and where economies are built around fishing and other water-based activities.⁴¹

A major hurdle is that there is inadequate information about groundwater resources in the Province, and comprehensive baseline standards are still lacking. Data is needed on actual and sustainable levels of aquifer drawdown and research must progress on water contamination due to fracking.⁴² Monitoring changes in groundwater quality provides key information about impacts of CBM development.

Currently in BC, baseline testing for water produced at CBM sites is only required when flow is greater than 75 litres of water a second. This quantity of water has been set as a threshold for triggering an environmental assessment.⁴³ However, even if an environmental assessment threshold is met, there is no guarantee that an assessment will be performed. This remains an internal decision within the Environmental Assessment Office. In Hudson's Hope, where CBM went into production in early 2009, no environmental assessment for produced water was required. This is a disturbing precedent for avoiding environmental assessment on baseline water quality.

When land under federal authority is affected, the extraction of groundwater may come under the purview of the *Canadian Environmental Assessment Act*. In BC this would include land where there are Aboriginal rights and title.⁴⁴ The *Canadian Environmental Assessment Act* is triggered when the rate of groundwater extracted exceeds about 7 litres per second or 200,000 cubic metres per year and also when modifications increase production capacity by more than 35 per cent.⁴⁵ This is a much higher standard of water protection than BC provincial legislation provides.

Best Practice in North America:

Mandatory Baseline Testing – Colorado

The Oil and Gas Conservation Commission's Practice and Procedure Act in the State of Colorado has mandatory initial baseline testing if a conventional gas well or plugged and abandoned well exists within 1/4 mile of a proposed CBM well, than the two closest water wells within a 1/2 mile radius of the conventional gas well (or P&A) are also sampled. Testing continues for six years after production to ensure there are no residual water concerns.

Initial baseline testing must "include all major cations and anions, total dissolved solids, iron, manganese, selenium, nitrates and nitrites, dissolved methane, field pH, sodium adsorption ratio, presence of bacteria (iron related, sulfate reducing, slime, and coliform), and specific conductance. Hydrogen sulfide shall also be measured using a field test method. Field observations such as odor, water color, sediment, bubbles, and effervescence shall also be included."

Best Practice in North America:*Comprehensive Water Management Plan – the Western Governors' Association (US)*

The Western Governors' Association's CBM Best Management Practices handbook recommends developing water management plans which are specifically designed for the basin or project in which the water is being produced. The water management plan should address:

- Landowner preferences and concerns;
- Quantity and quality of water to be discharged;
- Quality of the receiving water standards;
- Environmental/ecological impacts from surface discharge;
- Hydrological relationship between groundwater and surface water;
- Regulations and institutional framework;
- Downstream concerns;
- Economic feasibility/cost effectiveness;
- Beneficial use possibilities;
- Proximity to streams/ponds/reservoirs/wetlands/lakes;
- Proximity to springs;
- Long-term impacts on the environment; and
- Protection of groundwater, and evaluation of options for the management of produced water.

Next Steps: Baseline testing of groundwater is a first step in ensuring the Province's water resources are protected. Once a baseline has been established, the data can be used to develop plans to protect water resources and address the concerns of landowners, community members and First Nations who may be affected by water extraction.

The baseline testing for water produced at CBM sites in BC should be upgraded to the standards in the *Canadian Environmental Assessment Act*, which requires baseline testing when the rate of groundwater extraction exceeds about 7 liters per second. This would provide a much higher standard of water protection than BC provincial legislation.

Water management plans are important in ensuring that baseline tests consider all salient information for landowners, community members and First Nations who may be affected by the water extraction. Mandating this planning and monitoring requirement is essential to ensure that CBM development in British Columbia does not harm groundwater and drinking water.

Recommendation 10: Implement regulations to eliminate chemical fracturing

Fracing is a technology for enhancing the permeability of the coals, so that natural gas flows to the wellbore.⁴⁶ The technology involves injecting fluid (often containing toxic chemicals) into the drill hole at high pressure to fracture or crack the coal. Then a hard substance, “the proppant,” is mixed with the fluid to hold the cracks open once the pressure is lowered, allowing the natural gas to migrate to the wellbore.⁴⁷

There is a substantial risk of groundwater contamination from fracing fluids during the stimulation phase of well development. A study conducted in six American states found that in 50 per cent of CBM hydraulic fracturing procedures, the fracturing fluids moved out of the coals and into adjacent formations. Also, when wells are hydraulically fractured, a portion of the fracturing fluids remains stranded in the target formation. In some areas, hundreds or thousands of wells are hydraulically fractured, often several times, increasing the probability of fracing fluids contaminating water. Several chemicals used during fracturing operations (i.e., biocides, corrosion inhibitors, breakers, organic components such as benzene and naphthalene) “can be lethal at levels as low as 0.1 parts per million.”⁴⁸

In studies conducted by the EPA, it was found that many chemicals in hydraulic fracturing fluids adversely affect human health. Increased risks of birth defects, cancer, and liver, kidney, brain, respiratory, and skin disorders are among the health problems associated with this contamination.⁴⁹

In the United States, companies often refuse to disclose the chemicals included in fracing fluids, claiming that the information is proprietary. This silence means that when health concerns are raised, the agencies conducting follow-up water quality sampling do not have firm information about the chemicals to test for.⁵⁰

The impact of fracing fluids has been felt in Colorado, New Mexico, Virginia, West Virginia, Alabama, and Wyoming, where citizens have reported changes in water quality and quantity following hydraulic fracturing operations. Common complaints include: murky or cloudy water, black or gray sediments, iron precipitates, soaps, black jelly-like grease, floating particles, diesel-fuel or petroleum odours, increased methane in water, rashes from showering, gassy taste, and decreases in or complete loss of water flow.⁵¹



Right: CBM wellpads, pipelines, compressor stations and roadways results in fragmented wilderness.

Best Practice in North America:

Regulations in Colorado and Amoco's Use of Non-toxic Fracing Fluids

In the United States, hydraulic fracturing is exempt from regulation under the *Safe Drinking Water Act*, despite hydraulic fracturing's toxic effect on drinking water. Federal legislation has been introduced to repeal the exemption for hydraulic fracturing. However, it has yet to be passed and has been referred to the Subcommittee on Environment and Hazardous Materials.

Under Colorado's *Practice and Procedures Act*, a chemical inventory is required for proposed fracture stimulations. It must identify how much of each chemical product was used, how it was used, and when it is to be used. Beginning June 1, 2009, owners and operators are required to maintain a chemical inventory when they use chemical products exceeding five hundred pounds during any quarterly reporting period.

Amoco has found that water fracturing with no additives is more effective than using gel fracturing, which contains many harmful chemicals. Amoco compared gas production from water versus gel fracturing in the Oak Grove Field of the Warrior Basin, Alabama. Thirteen wells were gel fractured and 10 were water fractured. Water fractures outperformed gel fractures, producing approximately 115 thousand cubic feet (Mcf) of gas per day versus 80 Mcf per day, respectively. Moreover, water fractures cost less than gel fractures (\$28,000 per well versus \$50,000 per well, respectively). Water fracturing is less damaging to coal formations and does not decrease permeability of the coal. In addition, because it is non-toxic there are fewer costs associated with removing the fluids and treating water.

Next Steps: Currently, in BC the use of fracing fluids is barely regulated. The Oil and Gas Commission relies on the fact that fracing fluid is pumped back to the surface and collected at the well site, with a fluid recovery rate of 50-90 per cent.⁵² In some cases this fluid may be stored, treated and re-used. There is a very high risk of groundwater contamination from the current practice of putting used fracing fluids into disposal wells, but the disposal of fracing fluid is only regulated when companies apply to the OGC for deep well disposal.⁵³

Given the toxicity of hydraulic fracturing fluids and the likelihood they will contaminate groundwater, it is essential that the government put in place regulations to protect the public against adverse effects of hydraulic fracturing. The regulations should mandate that:

- Companies use water fracturing with no additives. This would satisfy the government's commitment to require the use of the most advanced technology and practices that are commercially viable.⁵⁴ In cases where a company claims it cannot use water fracturing, it must apply to the government for an exemption and justify its claim. If chemicals are used, there must be full disclosure of the substances used. Unless companies can produce data to prove that the fracturing fluids pose no threat to human health, the chemicals and mixtures should be banned from hydraulic fracturing operations.⁵⁵
- Proper disposal of fracing fluids in hazardous waste facilities must be mandatory, instead of disposal wells where groundwater contamination is probable.
- Specific regulations and guidelines must be developed to ensure that fracing liquids are safely removed and stored.

C) Best practices in stopping flaring and associated greenhouse gas emissions

Methane is a greenhouse gas with global warming potency over 20 times greater than carbon dioxide.⁵⁶ Flaring methane contributes to Canada's status as the world's third largest greenhouse gas-emitting nation per capita.⁵⁷ Overall, emissions from energy production and use account for almost 80 per cent of Canada's total greenhouse gas (GHG) emissions.

The BC government has publicized its intention to eliminate all routine flaring at oil and gas-producing wells and production facilities by 2016. Flaring from CBM operations in particular cannot continue if the government is to meet its commitment under the *Greenhouse Gas Act* to reduce GHG emissions by 33 per cent by 2020.⁵⁸ The provincial government recognizes that these emissions have contributed to climate change, which threatens temperature-sensitive sockeye salmon on the Fraser River.⁵⁹ They are also linked to infestations of forest-destroying bark beetles. Indeed, most natural ecosystems are extremely vulnerable to climate change, and continued emissions may lead to irreversible damage.⁶⁰

In addition to contributing to climate change, flaring fossil fuels releases a wide range of harmful substances into the air we breathe, including nitrogen oxide, sulfur dioxide, volatile organic chemicals, carbon monoxide, and benzene.⁶¹ A 1996 study by the Alberta Research Council found that flares that do not burn efficiently can leave anywhere from 16 to 38 percent of the gases intact.⁶²

Incomplete combustion can produce more than 250 hazardous emissions including carbon monoxide, unburned hydrocarbons, soot and ash, benzene, toluene, and xylene, organic compounds known as polycyclic aromatic hydrocarbons, and sulphur compounds such as carbon disulphide and carbonyl sulphide.⁶³ Chemicals produced by flaring can set off skin disorders, certain cancers, birth defects, and reproductive problems. Residents downwind of flaring in both BC and Alberta report premature births, cancer, sick or dead livestock, allergies, multiple sclerosis, bloody noses, and nausea.⁶⁴

Despite these well known hazards, it is common practice for CBM operators to burn well gas for several weeks or months during the first stages of development of CBM wells, as they decide whether the well is sufficiently productive to offset the cost of installing a pipeline.⁶⁵

In BC, the oil and gas sector flares about 60 million cubic metres of natural gas every year. That is a remarkable waste. It is enough gas to provide relatively clean heat to more than 300,000 Canadian homes annually. According to Steve Simons, corporate affairs director of BC's Oil and Gas Commission, BC flares about 2.9 percent of annual production. That means that in 2007, when BC produced about 33.1 billion cubic metres of gas, the industry wasted 300 million dollars worth of gas.⁶⁶ That waste also affects the public purse. A program including royalty payments for flared gas would have captured more than \$49 million in additional gas royalties for the government.⁶⁷

In British Columbia, flaring is covered under the *Oil and Gas Waste Regulation*, which allows owners or operators to discharge air contaminants from a processing facility if ambient concentrations of hydrogen sulfide (H₂S) do not exceed 10 parts per billion, and if the person who discharges the waste provides all information the *Waste Management Act* manager might require.⁶⁸ In order to maintain equipment and facilities, the *Oil and Gas Waste Regulation* also authorizes companies to vent natural

gas if it contains less than 230 mg of total sulphur per cubic metre. If it contains more, it may currently be combusted in a flare.⁶⁹ No royalty is charged on the gas that is flared.

Three recommendations follow for reducing the problem of flaring by the CBM industry:

Recommendation 11: Create incentives to decrease flaring.

Charge a royalty on all produced gas whether it is flared or not, in recognition that a CBM operator is removing valuable resources from public land. This approach provides a direct economic incentive for operators to focus on decreasing greenhouse gas emissions.

Best Practice in North America:

Charge Royalties on Produced Gas – Alberta

Alberta charges royalties on *all* produced gas, a move that has helped to reduce flaring by 72 per cent.

Alberta also set up incentive programs to encourage alternatives to flaring. Its “Otherwise Flared Solution Gas Royalty Waiver Program” began in December 1998. The program encourages productive use of gas produced at well sites as an alternative to flaring it. When gas is conserved rather than flared, the operator is not required to pay a royalty on it. The Alberta Department of Energy developed criteria to “waive royalty on otherwise flared solution gas and associated by-products when used in a manner that would normally require payment of royalty.”

Next Steps: Charging a royalty on flared gas brings more revenue into the Province and encourages companies to use alternative technologies (see below), thus limiting adverse health impacts. Such a program would help the Province meet its interim goal to reduce flaring by 50 per cent by 2011 and come closer to meeting its greenhouse gas reduction targets.⁷⁰

In the *Flaring, Incinerating and Venting Reduction Guideline for British Columbia*, the OGC states that it expects a Royalty Waiver Program similar to Alberta’s *Otherwise Flared Solution Gas Royalty Program* to be introduced at some point in the future.⁷¹ However, the high economic cost of flaring gas combined with the health and environmental costs of this wasteful practice makes regulation to limit flaring a pressing issue.

Recommendation 12: Encourage alternatives to flaring.

The BC Government has committed to mandating the most advanced technology and practices that are commercially viable for CBM development. Commercially viable alternatives to flaring are known as “green completion.”

Green or flareless completion involves separating gas that comes to the surface from fluids and, by using a series of separators, cycling the gas back through the well bore, or sending it to a pipeline to be sold, rather than vented or flared.⁷²

Industry experience shows that green completion is economical. Methane that would otherwise be flared can be captured and used to run a generator which powers the pump used in the dewatering phase of CBM well development. Propane or diesel can be used for start-up and as back-up if the volume of methane is not sufficient.⁷³

Industry Experience: BP

In Wyoming BP (formerly British Petroleum) began using green completion in 2000, which cut flaring in half. The company estimates that, in a year, the new technique prevented as much carbon dioxide from entering the atmosphere as would result from taking all the cars in Wyoming off the road for a year and a half.⁷⁴ It was estimated that the cost of this technology would pay for itself in 1.5 years based on BP’s prices for natural gas and condensate. In 2005, through using green completion, BP saved 118 million cubic metres of gas and 53,000 barrels of condensate.⁷⁵

Industry Experience: Devon Energy

Devon Energy saved 258 million cubic metres of methane from being flared using green completion in the Fort Worth Basin (Barnet Shale) in Texas. The technique resulted in a 78 per cent decrease in Devon’s methane emissions in 2005. In addition, it led to additional revenue of \$58,784 per well.⁷⁶

- According to the Environmental Protection Agency (EPA), benefits of flareless completion include:
- Elimination or reduction in flaring,
- Sale of the gas and condensate to provide the operator with an immediate revenue stream,
- Reduction in solid waste and water pollution,
- Safer operating practices, and
- A 70-90 per cent reduction in natural gas emissions.⁷⁷

The capital cost for companies to implement flareless completion is approximately \$180,000 and includes the use of separators, sand traps, and tanks. The equipment can be moved from site to site, which reduces the cost of the equipment per well. The EPA estimates that green completion pays for itself within one to three years.⁷⁸ Encouraging green completion would allow for a significant decrease in the adverse impact of flaring at little or no cost to the gas industry. This approach should be mandatory.

In-line testing carried out through a pipeline or processing facility can in some cases also eliminate the need to flare. Frequent checking and recording of the status of pipeline equipment, instrumentation and the use of existing reservoir data can substantially shorten the time necessary for testing.⁷⁹

Best Practice in North America:*Legislation that Encourages Use of Technologies to Decrease Flaring – Colorado and Alberta*

Colorado's Oil and Gas Conservation Commission *Rules and Procedures Act* requires that marketable gas either be sold or left in the ground."

The legislation also requires green completion practices on oil and gas wells that emit hydrocarbon gas above specified pressure thresholds.

The legislation does not mandate green completion for exploratory wells or when it is not technically or economically feasible. In addition, green completion is not mandatory when the wells are not sufficiently near pipelines that can transport the gas to market.

Colorado's regulations require companies to make efforts to use green completion, and if this is not possible, to use other best management practices to decrease flaring.

If an operator does not implement green completion, a variance must be requested from the Director.

The Alberta Energy Resources Conservation Board (ERCB) encourages the use of in-line testing. When in-line testing is not possible, operators must design completions and well testing programs to minimize emissions.

Next Steps: Technologies exist to minimize flaring; however, operators will only implement such programs when there is a regulatory or economic incentive to do so. BC should adopt regulations that encourage the use of flare reducing technologies that mirror those used in Colorado. Additionally, in-line testing should be used when possible. When it is not, design completions and well testing programs should be in place to reduce emissions.

Recommendation 13: Mandate Enhanced Coalbed Methane Recovery (ECBM)

Greenhouse gas production and other air pollution associated with CBM operations can be reduced through the use of enhanced CBM recovery (ECBM).

ECBM is achieved by injecting CO₂ into the coal bed to drive out methane while sequestering CO₂ and nitrogen. This procedure is possible because CO₂ accumulates preferentially on the coal surface, is absorbed by the coal, and displaces the methane.⁸⁰

Using ECBM could result in less CO₂ in the atmosphere—and an emissions reduction credit—in addition to increased CBM recovery.⁸¹ This technique can also reduce costs. CBM is normally recovered by the costly and time-consuming process of removing water to decrease pressure in the reservoir. Using ECBM can produce higher yields without the need to pump out the water.⁸²

ECBM is still being researched and has only been implemented in pilot projects. However, it presents an important opportunity to reduce greenhouse gas emissions and to protect water resources in British Columbia, potentially in the near future.

D) Best Practices in addressing cumulative Impacts

CBM sites may have hundreds or even thousands of wells. Each well is likely to disturb 3-4 acres of land with pipelines, roads, compressor stations, flare stacks and well pads. They are typically in production for 40 years, and bring to the surface large quantities of produced water.⁸³

The number of wells in close proximity, the associated flaring from each of them, and the lengthy duration of CBM extraction create a significant cumulative impact on the surrounding environment. Land, water, wildlife, biodiversity, and human health are all affected. There are also impacts from extensive seismic testing and industrial noise along with visual impacts.

Despite the cumulative effects specific to CBM development, the industry still falls under the same regulations as other types of gas extraction, even though other types may involve only a single well. CBM operations are not subject to environmental assessments. The considerable risks associated with such significant well installation projects need to be considered carefully before development proceeds.⁸⁴

Two recommendations for limiting cumulative impacts follow:

Recommendation 14: Make environmental assessments (EA) and development plans mandatory.

In BC, the environmental assessment process generally includes four main elements:

- Opportunities for all interested parties, including First Nations and neighbouring jurisdictions, to identify issues and provide input;
- Technical studies of the relevant environmental, social, economic, heritage, and health effects of the proposed project;
- Identification of ways to prevent or minimize undesirable effects and enhance desirable effects; and
- Consideration of the input of all interested parties in compiling the assessment findings and making recommendations about project acceptability.⁸⁵

Given their large cumulative impact and the problems with CBM in the United States, logic and forethought dictate that all CBM projects should trigger automatic and mandatory environmental assessments. However, CBM development is not subject to environmental assessment here. It is only when aspects of the project come under the purview of the *BC Reviewable Projects Regulation* that the government will consider an assessment of certain aspects of the project. Under this regulation there are four triggers of an internal review to decide whether to conduct an environmental assessment:

- Production of water at a rate greater than 75L a second;
- Pipeline diameter less than 114mm and length greater than 60km;
- Diameter between 114mm – 323mm and length greater than 50km; or,
- Diameter greater than 323mm and length greater than 40km.⁸⁶

When one of these conditions is met, an internal review begins on whether to conduct an assessment, but an actual assessment is not guaranteed.⁸⁷ CBM operations at Hudson's Hope, the only productive well in BC at this point, were not subject to an assessment. Since the trigger and internal review process is not transparent, we do not know whether this well met any of the triggers in terms of produced water or pipeline characteristics.

Best Practice in North America:*Mandatory Development Plan – the Western Governors’ Association*

Development plans should include the nature of the proposed CBM development for the specific area and comprehensive descriptions of geographic and cultural characteristics of the area. The Western Governors’ Association’s *Best Management Practices* provides a US example of what should be in a development plan:

- Identification of land ownership;
- Identification of existing and accepted surface uses – i.e. spacing of wells, roads, pipelines and water disposal facilities;
- Identification of existing and required infrastructure;
- Map of the area with existing facilities and potential location for future facilities – including geographic features;
- Opportunities to reduce adverse impacts;
- Regulatory requirements;
- Waste management plan;
- Strategies for interim and final reclamation;
- Conflict resolution procedures;
- Strategy for establishing a baseline and monitoring;
- Steps to address public safety through participation with local emergency preparedness committees;
- Use of multiple drilling options to encourage a more comprehensive environmental review, especially with respect to identifying and analyzing cumulative impacts; and
- Proactive and early engagement with local government.

Next Steps: The potential for CBM projects to affect communities and the environment adversely and cumulatively can be limited if development is planned well.⁸⁸ Comprehensive plans provide an indication of the overall and long-term impact of a CBM project and can be used to plan mitigation measures. The plans are an important tool in environmental assessment and should be mandatory for all CBM projects by virtue of the high impact profile of this resource.

Recommendation 15: Require scrutiny of Approvals in Principle.

In 2002, the Province changed the *Petroleum and Natural Gas Act* to give the Oil and Gas Commission the power to issue “approvals in principle” for oil and gas activities in a specific area under s. 17.1 of the *Oil and Gas Commission Act*.⁸⁹ In the Province’s wording:

(a) “general development permit” (GDP) is “an application tool that allows for project level review, consultation and approvals in principle for works in a given project area. This process will allow for enhanced First Nations consultation, improve cumulative impact management and reduce processing times for permits and authorizations.”⁹⁰

Environmental or land use terms and conditions for the GDP are to be established through discussions with the company, First Nations, and the Commission. To speed things up, there would however be less scrutiny of applications for subsequent approvals under the *Petroleum and Natural Gas Act*, *Pipeline Act*, *Waste Management Act*, *Water Act*, or *Forest Act*. Depending on the initial scrutiny of the general permit application, the process could result in less site-specific environmental scrutiny of the approvals a company needs to drill for oil and gas in BC.⁹¹

Best Practice in North America:

Annual Analysis of the Cumulative Impacts – Vermejo Park Ranch

At Ted Turner’s Vermejo Park Ranch (VPR) in New Mexico, a general plan for development must be submitted annually to measure the cumulative impacts of CBM development. The mineral extraction agreement for the ranch states that prior to August 15th of each year, the producer is required to meet with VPR to review and discuss all proposed or contemplated plans for work at VPR in the following calendar year.

Prior to October 1st of each year, the producer must submit to VPR an Annual General Plan of Development for the following year. This plan must have sufficient detail to allow VPR to evaluate the effect of the proposed activities on the ranch and to assess the producer’s compliance with the Mineral Extraction Agreement. VPR has 45 days from the receipt of a development plan to give the producer comments and to request in writing changes to the proposed plan.

The plan must include information regarding compliance with the Mineral Extraction Agreement which provides for:

- Limiting the size of well pads to 0.6 acres; the plan must also include limits on well spacing, facility locations (2-4 acres), roads (20 feet) and pipeline corridors (10-30 feet) to limit surface disturbance;
- A total well cap, so there are a limited number of wells producing at one time;
- Mandatory groundwater re-injection;
- Reclamation bonding, interim reclamation;
- Limits on noise, visual impact mitigation, and number of vehicles and personnel;
- Accident/spill response and notification plan; and
- Ranch ownership of water rights.

Next Steps: British Columbia's assessment process is far from meeting best CBM development practices. Currently, the "approvals in principle" described above are the only mechanism in place for reviewing the cumulative impact of CBM operations. However, they do not provide for any kind of annual review of development impacts. In fact, it is likely that this regulatory provision will lead to reduced industry oversight. Once a project gets a "general development permit" it may be subject to less scrutiny as it seeks subsequent approvals under various statutes which pertain to CBM.

To meet North American standards, British Columbia must implement an annual review of all aspects of CBM operations including those which fall under the general development plans. This is the best way to monitor and take timely action on the cumulative impact of CBM development.

E) Best practices on well density

Coalbed methane wells are spaced much more densely than conventional gas wells, and infrastructure components, including roads, compressor stations, gas flares, and pipeline rights-of-way are correspondingly dense. These have the potential to dramatically alter the land, create a large amount of surface disturbance, and displace wildlife.⁹²

Each CBM well is likely to disturb three to four acres of land and affect surface use dramatically. The US Bureau of Land Management estimates that one CBM well can lower aquifer levels by 34 feet near wells. In the Powder River and San Juan Basins in the Southwestern US, the levels of drinking water wells near CBM development have reportedly dropped by over 200 feet.⁹³

Enforcing well-spacing requirements is an important strategy in limiting surface disturbance and reducing cumulative impacts of long-term operation, and BC currently has the leading well-spacing requirements in North America. Density is set at one well per section (2.6 square kilometres)⁹⁴ under the *Petroleum and Natural Gas Act* (PNGA). In contrast, in Colorado and Wyoming, well spacing of one well every 40 acres (0.16 sq km) is allowed, although Wyoming has changed the rule to one every 80 acres (0.32 sq km) for the Powder River Basin.⁹⁵

However, the problem is that if the Minister of Energy and Mines feels it will facilitate gas development the Minister can allow "other than normal" spacing (i.e. more densely spaced wells), in which case no minimum spacing requirements apply.

It is easy for CBM operators to get permission to space wells more densely. Section 65.1 of the PNGA allows the Minister and the Oil and Gas Commission to allow other than normal spacing if the Minister is satisfied that this would facilitate natural gas exploration. The Minister has the discretion both to make regulations specifying other than normal spacing in an area of BC or to order other than normal spacing in specific sites, on the Minister's initiative.⁹⁶ In effect, wells can be spaced at any density which the Minister feels will assist CBM development. This leaves British Columbians vulnerable to extensive surface disturbance and drops in drinking water levels.

There are however proven technological options for maintaining appropriate well spacing even under abnormal conditions, without relaxing the rules. For instance, directional drilling can be required of operators to ensure they meet BC's well-spacing rules.

Two well-spacing recommendations follow:

Recommendation 16: Enforce existing well-spacing requirements.

Best Practice in North America:

Well Spacing of One Well Per 2.6 Square Kilometres – British Columbia

British Columbia already has the best well-spacing requirements in North America, which helps limit the cumulative impact of CBM operations. Making these maximum density limits mandatory and enforceable is essential.

Since it is likely that CBM operators will apply for higher density, the threshold for other than normal spacing must be raised so that practice corresponds to the intent of the *Petroleum and Natural Gas Act* (PNGA) to minimize surface disturbance. Allowing an order for other than normal spacing should only be permitted in exigent circumstances with written reasons for the decision made public.

Next Steps: Before the Minister allows other than normal spacing, public input should be solicited to ensure that communities that will be affected by the change in spacing have their concerns taken into account and protected.

Recommendation 17: Use directional drilling.

Oil and natural gas-bearing formations typically have a small “vertical profile” (i.e. are shallow), but are spread over a large horizontal area. Wellbores that intersect with the oil-producing formation at an angle can therefore drain more of the formation than vertical ones, reducing the number of wells needed. Directional drilling can extract two to 25 times more gas than vertical wells drilled in the same gas field.⁹⁷ Another advantage of the effectiveness of directional drilling is that it can remove the need to fracture the beds, decreasing potential groundwater contamination from fracturing chemicals.

Perhaps the greatest advantage for landowners and the public is a reduced impact on the land. By decreasing the number of wells needed, directional drilling means fewer well pads, roads, pipelines, compressor stations, and flares.⁹⁸ Directional drilling also makes it easier to build well sites farther from residences, important heritage areas, and other areas that surface owners do not want disturbed.

Drilling a directional well can be more costly than drilling a vertical well, because it requires advanced geological equipment, constant attention to the placement of the drill bit, and takes several days longer. However, the increased costs of directional drilling are often more than offset by increased production and reduced need for drilling multiple wells.⁹⁹

Best Practice in North America:*Ignacio-Blanco Field Rules for Directional Drilling – Colorado*

In the Ignacio-Blanco field of San Juan Basin, Colorado, CBM operators wanted to increase well-spacing density to one well per 80 acres, instead of one well per 160-320 acres. Rather than increasing the well density to allow more wells, the Colorado Oil and Gas Conservation Commission permitted operators to have 80-acre “downhole spacing” (i.e. separation of wells below the surface), but on the surface, the companies had to maintain surface spacing of one well per 160 acres. When companies wanted to drill more wells, they had to directionally drill from existing well pads, which decreased surface disturbance and the proliferation of well heads.

These field rules provide an important example of how legislation can be used to encourage the use of directional drilling to increase productivity rather than increasing well density.

Next Steps: Ensuring that CBM operators consider using directional drilling is an important way to limit the cumulative impacts and surface disturbance associated with densely spaced CBM wells, especially in untested terrain such as alpine and sub-alpine, and salmon spawning grounds. It should be mandatory where it is feasible.¹⁰⁰

For BC to be a leader in the field, it should make directional drilling the default requirement for all CBM operations. Operators should have the obligation to prove an exception should be made—e.g. if geological structure and the depth of the coal seam being accessed limit the application of directional drilling technology—with the government’s reasons for approving all exceptions made public.

F) Best practices for limiting noise impacts

Noise from CBM development comes from a number of sources: truck traffic, drilling and completion activities, well pumps and compressors. According to the Powder River Basin Resource Council in Wyoming, “depending on the wind direction, the roar of a field compressor can be heard three to four miles from the site. Near the compressor stations, people need to shout to be heard over the sound of the engines.”¹⁰¹

There are serious adverse physical and mental effects from noise. Prolonged exposure to 65 A-weighted decibels (dBA) can cause mental and bodily fatigue. Noise can affect the quantity and quality of sleep, cause permanent hearing damage, contribute to the development or aggravation of heart and circulatory diseases, and transform a person’s initial annoyance into more extreme emotional responses and behaviour.¹⁰² For some landowners, noise from CBM operations is so loud or so out of place in that area that they feel as if they are living in an industrial zone.¹⁰³

The OGC put in place noise reduction guidelines in March 2009. The guidelines are modelled on Alberta’s leading noise reduction guidelines. These guidelines provide an important first step in regulating noise from the gas industry. However, on the upper end of the sliding scale of permissible noise, noise from gas operations in Alberta is still allowed to reach 81 dBA.¹⁰⁴ This is significant noise pollution. More stringent noise standards should be adopted and enforced to protect the public.

Two recommendations to limit the impact of noise follow:

Recommendation 18: Strengthen and enforce noise regulations.

In BC, compliance with guidelines has been primarily left to the oil and gas industry, which is permitted to police its operations and report its findings to the OGC. Not surprisingly, the BC government's own multi-agency oil and gas compliance review has shown persistent problems with compliance. Ironically, the BC government has laid off compliance and monitoring staff. There are now fewer employees to perform audits of oil and gas operations, and therefore greater reliance on the oil and gas industry's self-policing and reporting.

A second problem is that the mechanisms to enforce noise reduction guidelines provide almost no incentive to comply. In a 2003 compliance review, it was noted that the government issued 49 tickets, with penalties ranging from \$230 to \$575. This small fine is absorbed into the industry's cost of doing business and does not provide an effective incentive to adhere to the guidelines.

Best Practice in North America:

Comprehensive Noise Regulations – Alberta

The Alberta Energy Resources Conservation Board (ERCB) noise regulations, on which BC modeled its guidelines, are the most comprehensive for the oil and gas industry across North America.

The ERCB has a sliding scale noise standard whereby acceptable noise levels vary with the ambient noise. For example, if a citizen lives in an area where ambient noise is low (e.g., where housing density and traffic noise are low), then the oil and gas operator must ensure that noise reaching the receptor is no louder than 40 dBA at night.

As ambient noise conditions increase, the allowable noise level increases. The highest allowable level in a residential neighborhood is 56 dBA at night. This noise level applies when there are more than 160 dwellings in a quarter-mile radius, and there is a major traffic source (road, rail, air) within 30 m (90 feet) of any of the dwellings.

The new noise guidelines need to be enforced to ensure that BC and Alberta have the leading noise reduction guidelines in North America.¹⁰⁵ As long as it is cheaper for the oil and gas industry to pay the fines rather than to implement the OGC's guidelines, it is unlikely that the gas industry will adopt best noise reduction practices.

Recommendation 19: Require implementation of mandatory noise reduction plans.

Under the OGC's new noise guidelines, operators are required to complete an NIA (noise impact assessment) to show that facilities meet the requirements of the noise guidelines.

NIAs must identify:

- Permissible Sound Level (PSL);
- The major sources of noise from the facility and their associated sound and power pressure levels;

- The actual operating conditions of the facilities, (i.e. whether compressor buildings operate with open or closed doors);
- The technical parameters of the noise model, including the standards selected, ground absorption conditions, meteorological parameters, terrain parameters, reflection parameters, and any adjustments made;
- The predicted sound level at the nearest or most affected dwelling; and
- Attenuation measures, if sound levels are inconsistent with the guideline.

The NIA provides an important first step in leading operators to meet the noise objectives. However the guidelines fail to mandate the use of technology and practices for noise reduction, and so fail against BC's own commitment to require the CBM industry to apply the most advanced technology and practices that are commercially viable.

Best Practice in North America:

Noise Reduction Technologies – The New Mexico Model County Regulations

The Oil and Gas Accountability Project (OGAP) has prepared a set of model regulations to provide county governments in New Mexico and Colorado with a framework for enacting new and more stringent oil and gas regulations. The model county guidelines specify leading noise reduction technologies that CBM operators can use. They include:

- Venting exhaust from all engines, motors, coolers and other mechanized equipment away from the closest existing residences and businesses;
- Equipping all facilities with non-electric engines or motors with mufflers that meet a 40 dBA noise standard, when measured at the nearest dwelling or public facility;
- Anchoring or mounting all mechanized equipment on vibration dampeners to minimize transmission of vibration through the ground;
- Placing all facilities that have compressors, engines, or motors which generate sound and are located within 150 metres of an existing residence, office, institutional, commercial or industrial structure; or within 150 metres of known wildlife habitat or migration routes; or within 150 metres of recreational areas, behind a maintained, acoustically insulated housing or a cover enclosing the motor or engine to further reduce sound and lessen visual impact; and
- Using additional noise abatement techniques including:
 - Vegetative screens of trees and shrubs;
 - Surrounding the facility with a solid wall or fence of acoustically insulating material; and
 - Enclosing the facility within an acoustically insulated building.

Next Steps: To strengthen protection against noise pollution, the BC government should require the use of electric pumps (such as the pneumatic pumping device or the progressive cavity pump) to reduce noise levels. Pneumatic pumping devices do not require an engine and produce little or no noise. If pneumatic pumps cannot be used, then progressive cavity pumps can also help reduce noise. Progressive cavity pumps come in various shapes and sizes and can run on an electric motor, making them much quieter than conventional pumps.¹⁰⁶

The BC Oil and Gas Commission's current regulations do not require that operators prepare noise mitigation plans, or specify the use of advanced noise abatement practices and technology, and must therefore be strengthened. OGAP (The Oil and Gas

Accountability Project) prepared rules and regulations for New Mexico and Colorado that should be included in BC's OGC's noise mitigation plans. These include venting exhaust from mechanized equipment away from residents and businesses, equipping facilities with non-electric engines/ motors with mufflers that meet a 40 dBA noise standard, anchoring or mounting all mechanized equipment on vibration dampeners, Placing all facilities that have compressors, engines, or motors which generate sound and are located within 150 meters of areas that may be disturbed by noise behind a maintained, acoustically insulated housing or a cover enclosing the motor or engine to further reduce sound and lessen visual impact and the use of additional noise abatement techniques such as trees and shrubs.

G) Best practices for limiting visual impact

CBM activities can result in the industrialization of the landscape.¹⁰⁷ The changes to landscape resulting from CBM operations can have profound impacts on local populations, particularly those who rely on their pristine environments to attract tourists. If CBM projects are not designed to limit their visual impact, they can be very intrusive, given that hundreds or thousands of wells can be drilled at one well site. Visual impact mitigation planning is an element of best practice in other jurisdictions and is recommended for BC:

Recommendation 20: Make stringent visual impact mitigation plans mandatory.¹⁰⁸

The OGC's current recommendations for limiting the visual impact of CBM development include:

- Clearing only the area needed to operate safely and efficiently;
- Maintaining a clean and orderly well site;
- Having minimal buildings and tanks on the site of the producing wells;
- Using low-impact seismic techniques, including having narrower seismic lines; and
- Minimizing unnatural characteristics such as right angles, straight edges, symmetrical shapes, and long straight lines.¹⁰⁹

While these requirements acknowledge the problem of visual impact of CBM development, they need to be extended to incorporate best practices from other jurisdictions.

Best Practice in North America:

Techniques to Limit Visual Impact – US Bureau of Land Management & New Mexico Model

Design techniques can be used to reduce the visual impacts of surface-disturbing projects. BLM recommends:

- Ensuring proper siting and location. Choosing the proper location for a proposed project is one of the easiest techniques to limit the visual impacts.
- Reducing unnecessary disturbance. Techniques that reduce surface disturbance include: co-locating several projects within the same rights-of-way; establishing the minimum area required for construction; planning projects to use

existing infrastructure whenever possible; constructing projects in less visually sensitive areas; and requiring restoration of disturbed areas after construction is complete.

- Repeating elements of form, line, colour, and texture. Colour selection will often have the greatest effect on the visual impact of a project. Natural colours that blend with the surrounding landscape in both summer and winter should be used. Proper earthworks can also limit the visual impact, such as fitting the proposed development to the existing landforms to minimize the size of cuts, and retaining existing rock formations, vegetation, and drainage whenever possible. Vegetation can also be used to screen the development from view.

THE NEW MEXICO MODEL COUNTY GUIDELINES

The Oil and Gas Accountability Project (OGAP) worked with local governments to prepare a set of model regulations to provide county governments, such as those in New Mexico and Colorado, with a framework for enacting new and more stringent oil and gas regulations. In the New Mexico model, visual impact mitigation plans must:

- Locate all facilities away from prominent natural features, such as distinctive rock and land forms, vegetative patterns, river crossings, and other landmarks;
- Avoid placing facilities across hills and ridges (silhouetting);
- Locate facilities at the base of slopes to provide a background of topography or natural color;
- Design structures at the minimum size needed to satisfy present and future functional requirements;
- Minimize damage to existing trees, forage, vegetation, and crops; and, where clearing of trees and vegetation is required in the construction of the facility, feather and thin edges of vegetation;
- Replace earth and all natural surface materials adjacent to water crossings at slopes less than the natural angle of repose for the soil type of the site;
- Paint equipment in a uniform, non-contrasting, non-glare, non-chalking, non-reflective colour tone, and in a colour to match the landscape and not the sky. Paint safety rails, bollards or other safety devices with safety yellow, orange, or other comparable colour;
- Within six months of well completion, reseed the pad area with native grasses or existing vegetation acceptable to the surface owner, or, in accord with local, state, and federal requirements, apply the following landscape practices:
 - Planting of ground covers, shrubs, and trees;
 - Shaping cuts and fills to appear as natural forms;
 - Cutting rock areas to create irregular forms;
 - Designing the facility to utilize natural screens; and
 - Building fences of woven wood or rock for use with, or in place of, landscaping.
- Enclose the areas to be occupied by the producing equipment in a locked, fenced enclosure. Landscape the fenced area in a manner that provides a physical buffer or screen that blocks the interior area of the facility from the neighboring areas;
- Direct exterior lighting away from residential areas, or shield it from such areas.
- A final way of limiting visual impacts in the model guidelines is to switch to small equipment such as pneumatic pumps or progressive cavity pumps.

Next Steps: Current standards in OGC regulations for limiting the visual impacts of CBM development do not represent the best coalbed methane practices in North America. They must be strengthened to ensure that communities are affected as little as possible by the industrialization of their landscape. BC should Incorporate New Mexico and the US Bureau of Land Management's *Techniques to Limit Visual Impacts*.

H) Best practices for setback regulation

Setbacks ensure there is a minimum distance between CBM operations and other buildings and structures. Adequate setbacks are an important tool for limiting noise and visual impacts. They can also limit environmental degradation and the contamination of water.

A recommendation on minimum setback provisions follows:

Recommendation 21: Expand the scope of setback provisions.

In general, the setback distances in British Columbia are some of the best in North America, but they can be improved.

Under the *Drilling and Production Regulation (D&PR)*, a company cannot drill a well within 80 metres of a permanent building or place of public concourse unless the OGC considers there to be special circumstances.¹¹⁰

A company also cannot drill a well within 100 metres of a body of water or permanent stream without building structures to contain escapes, submitting a spill-limiting and recovery plan, and installing automatic shut-off equipment. Operators cannot drill within 200 metres of water wells without written approval from the OGC.¹¹¹

Best Practice in North America:

Strengthening Setback Standards – New Mexico and British Columbia

BC has leading setback requirements. However, as yet nothing addresses setbacks from locations of cultural, scenic, or environmental significance.

The Oil and Gas Accountability Project (OGAP) (New Mexico) has worked with local government in New Mexico and elsewhere to develop stringent standards regarding the impact of CBM development.

These include increased setback distances for locations of cultural, scenic or environmental significance. In the New Mexico guidelines, a setback of 1,000 feet or approximately 300 metres is required for areas of cultural, scenic and environmental significance.

Next Steps: Setback legislation in British Columbia should be extended to protect areas of special significance.

l) Best Practices on Royalties and Bonding

Every year BC taxpayers are actually passing on about \$260 million in royalty breaks to the oil and gas sector, and this is slated to increase to \$327 million.¹¹² In other words, BC taxpayers are subsidizing CBM activity while at the same time bearing the environmental costs associated with production.

OVERVIEW OF ROYALTY PROGRAMS IN BRITISH COLUMBIA

Royalties are a way to recognize that CBM operators are removing valuable resources from public land for their own profit. The public is entitled to payment for this lost value and to a share of corporate profits through taxation. And in view of the high environmental and health risks of CBM development, there is even more reason to retain amounts collected as royalties so that government can offset the costs of some of the detrimental impacts of the industry.

Currently the situation is reversed: The industry is subsidized by royalty credits that support already lucrative CBM operations. Royalty credits are subsidizing global warming and short-changing the public purse.¹¹³ The industry currently benefits from:

- \$50,000 for each coalbed methane well completed on Crown land. In addition, the produced-water handling costs can be included in the producer's cost-of-service allowance to address the added water management costs;¹¹⁴
- \$100,000 dollars in royalty credits for each well drilled in the "summer" between April 1st and November 1st;¹¹⁵
- A marginal well royalty program that allows royalty breaks for low productivity wells and for ultra marginal wells, allowing wells which are not economically viable to be developed;¹¹⁶
- A royalty credit of approximately 23 per cent of the drilling and completion costs for a deep well, including deep re-entry wells;¹¹⁷
- An 11 per cent cut in BC corporate income taxes and exemption from corporate capital tax;
- No requirement to remit social service tax on production machinery and equipment; and
- Eligibility for reductions on motor fuel tax for many of the vehicles used in CBM operations.¹¹⁸

NECESSITY OF ADEQUATE BONDING, AND BC'S REQUIREMENTS

As a matter of basic fairness, when a CBM company's actions result in damages to land, water supplies, and other natural resources, the burden of cleanup should be borne by the company, not taxpayers or landowners.¹¹⁹ Before it can earn a "social licence," the CBM industry must assure citizens that operators have put aside financial resources to restore land if problems occur.

There is considerable experience of problems arising from insufficient bonding for CBM projects.¹²⁰ For instance, in the United States, the Bureau of Land Management requires a blanket bond of only \$25,000 to cover an operator's statewide activities, or \$150,000 in the case of a nationwide bond. To get some perspective on the adequacy of these amounts: liabilities for individual projects range from \$100,000 to \$6,000,000 or more. Total industry-wide liability ranks in the billions of dollars and represents a huge potential risk to tax-payers.¹²¹

For instance, in 2001, Emerald Restoration & Production abandoned 120 oil wells in Campbell County, Wyoming. Plugging and reclaiming these 120 wells will cost the Bureau of Land Management and State of Wyoming an estimated \$4 million, or approximately \$33,000 per well. The company's financial assurance was a blanket bond of \$125,000—some \$3.875 million short of actual reclamation costs. The Wyoming Conservation Fund supplied \$2.6 million for plugging costs for the wells covered by the company's bond. More than 60 of Emerald's wells on federal lands have yet to be plugged because of the lack of federal funds.¹²²

In Colorado, Encana Oil & Gas, Inc. has 3,652 wells on record. The company's statewide blanket bond amount is \$235,000, or \$64 per well, a mockery of bonding considering the actual costs of plugging a well or performing other reclamation activities. In the Western States, it can cost between \$19,000 and \$75,000 to properly plug and abandon a single orphan well.

The danger of improperly plugged wells is significant. For example, in a 2005 incident in La Plata County, Colorado, Charles Yoakum turned on his stove and the four walls of his trailer blew apart while the roof flew into the air. An orphan gas well, located about 250 feet from Yoakum's trailer, was determined to be the most likely source of methane that fueled the explosion. The orphan well had a history of leaking methane and fouling the groundwater in the County. In 1994, the Colorado Oil and Gas Conservation Commission (COGCC) spent \$200,000 trying to plug the well. After the explosion, the COGCC pledged to spend \$200,000 more to identify the exact location of the well and of another orphan well in the area, and identify any abandoned pipelines, utility corridors, or other potential conduits for gas migration.¹²³

Current financial assurances required of CBM operators in BC include:

- A drilling deposit for well authorization in British Columbia. Effective April 1, 2009, it was changed from \$7,500 to \$10,300, plus an additional \$8,000 if the applicant has not applied for a well authorization in the past. The drilling deposit acts as a security for proper drilling, control, completion, suspension, abandonment, reclamation, and restoration of the well site.¹²⁴ However, the drilling deposit is also used to cover the operating costs of the Oil and Gas Commission, so the amount of money actually available for reclamation of a well site may be much less than the drilling deposit. The OGC's own statement suggests the increase does not affect the deposit: "[T]he changes in fees and levies are in response to the increase in the Commission's expenses and reflect the higher operating costs at the Commission."¹²⁵
- An *Orphan Site Reclamation Fund* tax to help cover reclamation costs if a company becomes insolvent. The orphan fund tax also increased as of April 1, 2009, from \$0.47 to \$0.55 per 1,000 cubic metres of marketable gas produced in a CBM operation. According to the OGC, the increase in the levy, like the increase in the drilling deposit, was to help cover fund operational costs (rather than reclamation costs).¹²⁶ The orphan fund tax is expected to raise approximately \$1 million per year.¹²⁷ The orphan fund reclamation levy is an important step to help ensure that wells are not abandoned and left unplugged. Landowners can apply for compensation from the reclamation fund, provided that they include copies of their SUAs, evidence of when the last payment was made, a claim for the overdue payments owed under the SUA, and evidence showing the efforts made by the landowner to obtain payments of outstanding amounts under the SUA.¹²⁸
- The comprehensive general liability insurance of \$1,000,000 that all operators need in order to hold a surface tenure document.¹²⁹

Two recommendations for improving the royalty and bonding scenario in the Province follow:

Recommendation 22: End royalty and tax breaks.

The royalty reduction and incentive programs appear to be intended to make BC more competitive with other jurisdictions. Yet funding an already lucrative industry with what should be taxpayers' money while expecting taxpayers to shoulder the burden of the environmental and health risks of CBM operations is an ethically and politically inappropriate policy.

The economics of the CBM industry demonstrate that operators can afford to develop the resource according to best practices and still be profitable. Given that there are hundreds of wells per site, each of which can bring in from \$600,000 to \$1.2 million, it is clear the industry is not in need of royalty credits or tax breaks and should not be permitted to pass environmental costs associated with its operations on to the taxpayer.

Given the threat of climate change, the BC government should be investing its money to move away from a dependence on acutely environmentally destructive forms of energy and towards more sustainable options. From this perspective, subsidizing CBM is a step backwards for British Columbia's economy.

Minimally, the government should direct royalty revenues to enable citizens to address environmental degradation caused by CBM.

Recommendation 23: Ensure adequate bonds are required from operators.

Best Practice in North America:

Bonding Requirements – Alaska and California

The leading standards for bonding in North America are found in Alaska, where oil and gas operators are required to post a bond of between \$100,000 and \$200,000 per well site, and in California, where they are required to post a blanket bond of \$1 million for all onshore and offshore wells. These costs of bonding for individual wells and for blanket bonds are reflective of the high cost of plugging and reclaiming wells. However, the Alaska maximum still does not reflect costs associated with the multiple wells usually found on CBM sites.

Next Steps: The current required financial assurances from oil and gas operators are insufficient to ensure that abandoned wells are reclaimed. Bonding requirement needs to be substantially raised in BC.

Industry claims that the actual cost of reclamation to be between \$19,000 and \$75,000 per well, although this figure is disputed as being too low. Multiply the obvious shortfall per well by the hundreds or thousands of wells anticipated on CBM sites, and it is clear taxpayers are facing a huge expense if CBM operators default on reclamation. The economic, health and safety costs of failing to require adequate bonding are too great a burden to place on taxpayers' shoulders.

Best Practice in North America:

Using Gas Revenues to Move Towards a Diversified Economy Focused on Renewable Energy – Alberta, Alaska, and Norway

Other jurisdictions have recognized the finite nature of fossil fuel revenues and have been accumulating funds to protect future generations of citizens. For example, since 1976, Alaska has placed 25 per cent of oil and gas revenues into a Permanent Fund now valued at 27 billion dollars. Alberta has managed to set aside 12 billion dollars of oil and gas revenues for future economic diversification. Even the large sums set aside by Alaska and Alberta do not compare to Norway's State Petroleum Fund, which has over 100 billion dollars of oil and gas revenues set aside to protect Norwegian citizens.

Next Steps: BC should also be working towards using revenue from oil and gas operations to provide for the energy future and long-term prosperity of our economy, as has been done in Alberta, Alaska, and Norway.¹³⁰

J) Best practices in reclamation

High quality well site reclamation is essential in order to limit the long-term impact of CBM development on BC's wildlife, biodiversity and human public health, and environment. Experience has shown that in improperly abandoned wells, gas can flow through the well casing to contaminate groundwater.¹³¹ Abandoned pipelines can erode and leak over time. Long-term structural deterioration of a pipeline may lead may cause the ground to sink or cave in, creating the potential for water channeling, erosion, and topsoil loss, which would negatively affect land use and land aesthetics.¹³²

Under the current BC regulatory environment, there is little economic incentive for a CBM operator to reclaim well sites after production ceases. If a CBM operator becomes insolvent, the abandoned well is classified as an orphaned well, and the government (the taxpayer) has to pay the reclamation costs. In Alberta, it is estimated that 20,000 wells have been abandoned but are not yet certified as reclaimed.¹³³

Two best practices recommendations regarding reclamation follow:

Recommendation 24: Make interim reclamation mandatory.

Wells can operate for up to 40 years, but it is not appropriate for citizens living near these operations to wait that long for site improvements and remediation. Interim reclamation significantly decreases the visual impacts and improves the long-term outlook for CBM sites.

In BC, there is no specific legislation to mandate comprehensive interim reclamation. Currently, very minimal interim reclamation is covered under the *Pipeline Act*. Section 16 of this legislation requires that, "every company must root out and destroy each year, thistles and noxious weeds growing on its land adjacent to its pipelines." In addition, "operators must make every reasonable effort to prevent spillage. If spillage occurs, they must promptly remedy the cause or source of the spillage, contain and eliminate the spillage, and restore and reclaim any land or watercourse affected by the spillage."¹³⁴

Most aspects of reclamation are not covered by any regulatory framework. This *ad hoc* approach to reclamation, with only pipelines being subject to interim reclamation, leaves British Columbians vulnerable to the impact of CBM for unnecessarily prolonged

periods of time. Interim reclamation should apply to all aspects of CBM development. Without ongoing site maintenance, land, water, and surrounding landscape may be too damaged to be restored by the time the well ceases operation and reclamation is begun.

Best Practice in North America:

Mandatory Interim Reclamation – the Vermejo Park Ranch

At the Vermejo Park Ranch in New Mexico, interim reclamation is mandatory. Operators are required to restore disturbances by September 1st each year. Restoration includes grading, top soil replacement, hydro seeding with a native seed mixture that is certified weed-free, and the control of noxious weeds.

In addition sites at Vermejo must be continually reclaimed before operators can move on to a new location, so the entire basin is not at one state of development at the same time.

A key requirement is the recycling of drilling fluids. Drilling solids are stripped from the mud during drilling, and the remaining fluids are transported to the next drill site. This closed-loop system virtually eliminates drilling water, reserve pits, and water consumption, and reduces vehicle traffic associated with drilling operations. In addition, the system decreases the risk of harming the integrity of the soil and helps restore native plant communities.

Next Steps: British Columbia should work towards making interim reclamation mandatory as it is in New Mexico. Disturbances should be restored by a set date each year. Restoration should include only native seeds/plants and replacement of as many original components of the environment as possible.

Sites should be reclaimed before operations can move onto another location.

Drilling fluids should be recycled, with fluids transported to the next drill site, creating a closed-loop system that would prevent harming local flora, soil, unnecessary water consumption, drill pit development and vehicle traffic.

Recommendation 25: Require comprehensive reclamation plans.

While CBM operations may have a short- or long-term effect on the land, proper reclamation can help ensure that the effect is not permanent,¹³⁵ and public lands and resources can be returned to other uses.

Planning for reclamation before CBM operations begin is critical to successful results. Plans developed before operations begin can ensure, for instance, that sufficient top soil is salvaged, and well pads and roads are built in a fashion to minimize reclamation needs. The process is more difficult, more expensive and less successful if no comprehensive plan is in place at the start, and if regular interim reclamation practices are ignored.

In British Columbia, there are as yet no regulations in place to require operators to develop a comprehensive reclamation plan before well site development begins. Reclamation requirements are only addressed at the end of CBM operations, when CBM operators apply for a Certificate of Restoration (COR) in order to end their financial liabilities for the well.

A minimum of two years must pass following the initial cleanup before a Certificate of Restoration (COR) can be approved. It is assumed— without government inspection or even explicit confirmation from the operator—that secondary restoration work (spreading of topsoil, seeding, etc.) has been completed on schedule, one year after the initial work. Applications for a COR must be accompanied by a waste management site profile, wherever there is potential for contamination.¹³⁶

The OGC's reclamation regulation requires:

- The drilling area must be cleared of all refuse material;
- Waste petroleum must be removed;
- Unused concrete bases, machinery, and materials must be removed;
- Excavations must be drained and filled;
- All excavations and cut-and-fill slopes are to be returned as closely as possible to original contour, unless otherwise authorized by the Commission;
- Surface drainage should be diverted around disturbed areas; where this is not possible, unconsolidated material must be protected by rip-rap or some other acceptable means;
- Topsoil is to be spread across the lease and the site re-vegetated, but only after all excavations have settled and are level;
- Erosion control measures are to be taken;
- The surface must be leveled and the site left in a condition as close as is reasonable to its condition when operations commenced;
- On Crown land, a 1.5-metre signpost must be welded to the casing stub of an abandoned well. The sign must be legible and show the well's surface location and the operator's name. On private land, this requirement may be waived at the landowner's discretion;¹³⁷ and

The site will also have to meet the *Contaminated Sites Regulation*.¹³⁸

Best Practice in North America:

Comprehensive Reclamation Plans Prior to Operations – The Bureau of Land Management (BLM)

In the United States, the BLM requires that a reclamation plan be included in the Surface Use Plan of Operations, when CBM operators submit their Application for Permit to Drill. This requirement helps to ensure that CBM operators plan their development in a manner that facilitates reclamation. The BLM requires that the reclamation plan include plans for both interim and final reclamation.

Earthwork for interim and final reclamation must be completed within 6 months of well completion or plugging (weather permitting).

Next Steps: The OGC's reclamation requirements are an important first step in limiting the long-term impact of CBM development. However, since the requirements do not make comprehensive reclamation planning by operators mandatory, they fail to meet the leading North American standard. The BC government should require that the reclamation plan be included in the 'Surface Use Plan of Operations', when the CBM operators apply for their permit to drill. The plan should also include interim and final reclamation plans, with a deadline for completion, to ensure that development proceeds in a way that will allow for optimal reclamation.

Conclusion

CBM development is just beginning in British Columbia. It is a critical time for the Government to move actively towards implementation of best practices for this potentially high-risk industry. In some cases regulations can be modelled on initiatives already in place in other jurisdictions, while in other cases BC should consistently apply high-level home-grown standards. This guide provides a compilation of the best CBM practices, and recommendations on how they can be applied and maintained in BC. In summary, to reach its goal of implementing the best CBM practices in North America, the Government of BC must:

1. Place a moratorium on CBM development until legislation is established which addresses the economic, environmental, and social concerns regarding CBM development.
2. Develop a framework to allow the public to stop or limit CBM development if the public feels the social, environmental, and health costs are too high.
3. Ensure that consultation with First Nations meets the constitutional requirements of consultation in good faith, with the intention of substantively addressing Aboriginal concerns.
4. Develop legislation to require adequate public notice of proposed CBM activities. Adequate public notice requires full disclosure of the potential impacts of CBM, and ample notice of proposed CBM activities to the general public.
5. Reform the governance and makeup of the OGC to ensure it is representative of, and accountable to, stakeholders other than oil and gas industry..
6. Ensure the OGC and MEMPR conduct open and transparent consultation. These agencies must act as neutral parties to find mutually agreeable resolutions to public concerns, rather than acting as advocates for oil and gas operators.
7. Implement the recommendations made by the affected public. A multi-stakeholder process similar to the Multi-stakeholder Advisory Committee (MAC) in Alberta would be useful in BC to ensure that when public concerns or recommendations are expressed there is a process through which they can be addressed.
8. Put in place protection for landowners who are negotiating with CBM operators. Landowners should be provided with tools to negotiate Surface Use Agreements which address all their concerns, and legal counsel should be available if they need assistance to negotiate a SUA or seek compensation.
9. Implement mandatory baseline testing and water management plans with monitoring before, during, and after CBM development and upgrade the standards for baseline testing to those in the Canadian Environmental Assessment Act.
10. Require operators to use water-based fracturing fluids with no potentially toxic additives.
11. Create incentives to decrease flaring by charging a royalty on all produced gas.
12. Encourage operators to use alternatives to flaring. There are many technologies which have been developed to limit flaring, such as green completion, in-line testing, and using the produced gas in operations. Regulations that create incentives to reduce flaring will encourage companies to use flare-reducing technologies.

13. Consider the viability of using Enhanced CBM Recovery to reduce air pollution—injecting CO₂ into wells to release the methane from coal seams. When the CO₂ is sequestered in the CBM well, air pollution is reduced while CBM recovery is increased.
14. Require mandatory environmental assessments for coalbed methane development, and comprehensive development plans to ensure that the cumulative impacts of CBM activities do not exceed the social licence for the project or lead to irreversible damage.
15. Ensure that the “approval in principle” takes into account the unique aspects of CBM development and that the approval-in-principle process is subject to close scrutiny.
16. Ensure that the well-spacing requirement of one well per section (260 hectares/2.6 square km) is enforced. If the Minister wants to allow other than normal well spacing, then the public must be consulted.
17. Mandate the use directional drilling whenever feasible in order to decrease the number of wells that need to be drilled, thereby decreasing surface disturbance.
18. Ensure the OGC enforces its new noise guidelines to limit the adverse impact of noise from CBM operations.
19. Require CBM operators to use the most advanced noise reduction technologies that are commercially viable. Using the most advanced technologies and practices in CBM operations is a commitment made by the BC government in the 2007 Energy Plan.
20. Develop legislation to require visual impact mitigation plans for all new facilities.
21. Increase minimum setback distances in areas of special significance for the benefit of communities in BC.
22. End royalty breaks given to CBM operators, which subsidize an already lucrative industry.
23. Ensure there is adequate bonding to cover reclamation costs and any other environmental or health costs which arise from CBM development.
24. Make interim reclamation mandatory.
25. Require operators to submit comprehensive reclamation plans before a well is drilled.

Appendix A: Best Practices

Concern	Best Practice in North America	BC's Practice	Recommendation
CONSULTATION			
Developing CBM without sufficient legislation to protect the public from the adverse impacts resulting from CBM development.	In Valle Vidal, Rio Arriba, Santa Fe, and Mora County, New Mexico, governments have put in place moratoriums on CBM development until legislation is developed to protect the public from the adverse impacts of CBM.	In BC, CBM development is proceeding without a moratorium in place. A moratorium would give space to develop legislation which specifically protects the public from the impacts of CBM. The only exception is that there is a two-year moratorium on CBM development in the Sacred Headwaters of the Klappan.	Place a moratorium on all CBM development in the Province until legislation is established which addresses the economic, environmental, and social concerns arising from CBM development.
First Nations do not have adequate time to consider the impacts of CBM on their territory.	In BC, there is a moratorium on CBM development in the Sacred Headwaters for two years, to allow meaningful consultation with the Tahltan First Nation to occur.	In Northeastern BC there is a Memorandum of Understanding signed with the Treaty 8 First Nations which allows Treaty 8 Nations 10-20 business days to review and respond to pending CBM activities. Groups outside the Northeast and non-treaty First Nations are consulted in accordance with the principles of consultation set out in case law.	A moratorium on CBM should be put in place in all areas where Aboriginal rights and title will be affected by CBM, in order to allow for consultation with affected First Nations.
The public has no power to stop CBM development if it feels the social, economic, and health costs are too high.	At Vermejo Park Ranch in New Mexico, 30 per cent of the property is designated as areas of special sensitivity where CBM development cannot occur. The Multi-Stakeholder Advisory Committee in Alberta is also working to identify areas where CBM development should not proceed.	In BC, if the public feels the social, economic and environmental cost of CBM are too high, there is no process through which it can designate areas where CBM operations should not proceed.	Develop a framework to allow the public to stop or limit CBM development if the public feels the social, environmental, and health costs are too high.

<p>There are no mechanisms in place to monitor and implement recommendations of concerned citizens.</p>	<p>In Alberta, the Multi-stakeholder Advisory Committee works to implement and monitor recommendations from diverse stakeholders, including the public.</p>	<p>The affected public is only alerted about CBM operations after subsurface rights have been granted to operators. At this point the operators choose whatever public engagement model they feel is appropriate, and there are no guarantees that the public will have its recommendations implemented.</p>	<p>A process similar to Alberta's Multi-stakeholder Advisory Committee should be implemented in BC to ensure that when public concerns or recommendations are expressed there is a process through which they can be addressed and implemented.</p>
<p>Landowners are expected to negotiate Surface Use Agreements with CBM operators, despite the power imbalance between landowners, who are often unfamiliar with oil and gas development and negotiations, and experienced CBM representatives.</p>	<p>In Alberta, the Farmer's Advocate provides independent support for landowners to help them understand the impacts of oil and gas development on their property and negotiate with companies.</p> <p>The Farmer's Advocate provides guidelines for compensation so that operators have an idea of what they should receive compensation for, and in what amount.</p>	<p>In BC, the Landowner Liaison is a member of the OGC and is not in a position to independently represent landowners. In addition, there are no guidelines for compensation and limited examples of what might be included in a Surface Use Agreement.</p>	<p>BC should make the Landowner Liaison position independent from the OGC to better protect the concerns of landowners.</p> <p>In addition, BC should develop guidelines for compensation for landowners, and provide more assistance in negotiating surface use agreements.</p>

<p>WATER</p>			
<p>Baseline testing of water is needed to adequately measure whether contamination has occurred.</p>	<p>In Colorado, the Oil and Gas Commission's Practices and Procedures Act requires initial baseline testing of wells. The testing must continue for 6 years and can only cease if there are no residual water concerns. The Act includes testing the water for specific mineral content to determine whether it has been contaminated.</p>	<p>In BC, there are currently no baseline testing requirements for produced water to measure if the water becomes contaminated.</p>	<p>Concerned citizens should contact the BC government to request mandatory baseline testing of water.</p>

<p>Fracturing chemicals can contaminate water and harm human health.</p>	<p>Colorado's Practice and Procedures Act requires an inventory to be made of fracture stimulations. The chemical inventory must include how much of the chemical product was used, and how and when it was used.</p> <p>The inventory is a first step towards protecting the public from toxic fracturing fluids, because companies often refuse to disclose the chemicals in fracturing fluids.</p>	<p>In BC, fracturing fluids are regulated by the OGC. The OGC relies on gas companies to pump the fracturing fluids back out of the well. However, with only 50-90% of chemicals being recovered, there is significant potential for drinking water contamination, especially because some fracturing chemicals can be lethal at levels as low as 0.1 parts per million.</p>	<p>Studies by Amoco have shown that using water fracturing with no additives is more effective than gel fracturing, which contains many harmful chemicals.</p> <p>The government of BC should develop regulations for fracturing, to mandate water fracturing with no additives and to protect drinking water.</p>
FLARING			
<p>Methane flared during CBM operations is harmful to human health and contributes to greenhouse gas emissions.</p>	<p>Alberta charges a royalty on all produced gas.</p>	<p>BC does not require operators to pay a royalty on gas which is flared.</p>	<p>BC should charge a royalty on all produced gas, even if it is flared. This will decrease greenhouse gas emissions and adverse health effects, and will help the government meet its commitment to eliminate flaring by 2016.</p>
<p>There are many technologies which can economically be used to decrease flaring, yet they are not used in BC.</p>	<p>In Colorado, operators are required to use green completions, which substantially eliminate the need to flare. If green completions are not possible, operators must use best management practices.</p> <p>In Alberta, operators must use in-line testing on wells, which decreases the need to flare. If they don't, they must explain why in-line testing was not possible.</p>	<p>In BC, there are no requirements that operators use flare-reducing technologies.</p>	<p>BC should require operators to use flare-reduction technologies. This is in line with the government's commitment to use the most advanced technology that is commercially viable and to eliminate flaring by 2016.</p>

<p>Methane’s global warming potency is more than 20 times greater than the global warming potency of CO₂, and flaring releases the carbon into the atmosphere.</p>	<p>Enhanced coalbed methane recovery is being developed to extract CBM through injecting CO₂ into coal seams. CO₂ is more readily absorbed than methane, so it is captured in the coal seams while methane is extracted.</p>	<p>Enhanced coalbed methane recovery is in its pilot stages and is not used in BC.</p>	<p>The BC government should research the possibility of using enhanced coalbed methane recovery in the future to help meet its greenhouse gas reduction targets.</p>
CUMULATIVE IMPACTS			
<p>Coalbed methane projects are not built well by well. A site is typically developed with hundreds or thousands of wells or none at all, creating surface disturbance, affecting water quality, and generating noise and visual impacts.</p>	<p>The Western Governors’ Association requires operators to produce development plans to assess the cumulative impact of CBM projects, and assess measures to mitigate the cumulative impact.</p>	<p>In BC, the environmental assessment process is used to assess the cumulative impacts of major projects, yet CBM projects are not required to undergo environmental assessments.</p>	<p>Given the massive cumulative impact of CBM projects on citizens’ health and the environment, environmental assessments should be performed on all CBM operations.</p>
<p>To assess the impact of a CBM project, it is essential to monitor projects on an ongoing basis to identify any problems as early as possible.</p>	<p>At the Vermejo Park Ranch, operators are required to submit an annual general plan for development to measure the cumulative impacts of CBM development. The plan must have sufficient detail to allow the ranch to evaluate the effect of the proposed activities, and ensure compliance with the extraction agreement.</p>	<p>In BC, CBM operators can apply for an approval in principle for their projects. Approvals in principle are supposed to allow project-level review and consultation on all projects in a project area. If an approval in principle is granted, then operators receive a general development permit, which may lead to less scrutiny on subsequent approvals under other statutes relevant to oil and gas development.</p>	<p>The approval in principle and general development permit process in BC needs to be strengthened to ensure it takes into account the full cumulative impact of CBM by exercising adequate scrutiny.</p> <p>In addition, annual general plans should be required to ensure that operators are complying with regulations and taking steps to mitigate the cumulative impacts of the project.</p>

WELL SPACING

<p>Coalbed methane wells require much denser spacing than conventional gas wells. The increased density of wells results in increased density of other infrastructure, including roads, compressor stations, gas flares, and pipeline rights-of-way.</p>	<p>BC's spacing for gas wells is one well per 2.6 sq/km. This spacing requirement is the best in North America, if it is enforced.</p>	<p>Although BC has the best well-spacing requirements in North America, the Minister can allow other than normal spacing to facilitate natural gas exploration. With other than normal spacing, there are no minimum spacing requirements, thus BC would go from having the leading well-spacing requirements to no requirements at all.</p>	<p>The threshold for allowing other than normal well spacing is set very low. It can occur any time the Minister feels it will facilitate exploration. If the Minister wants to allow other than normal well spacing, then at minimum the public should be consulted.</p>
<p>Densely spaced wells can lead to the proliferation of well heads.</p>	<p>In Colorado's Ignacio-Blanco field, CBM operators wanted to have denser well spacing. Rather than allowing denser well spacing, the Colorado Oil and Gas Conservation Commission permitted operators to have 80-acre "downhole spacing" (i.e. separation of wells below the surface), but required operators to directionally drill from existing pads to maintain the surface spacing of one per 160 acres.</p>	<p>In BC, there are no requirements that operators use directional drilling to decrease the surface impact of CBM activities, and to comply with BC's leading well-spacing requirements.</p>	<p>BC should require that operators look into the feasibility of using directional drilling to meet BC's well-spacing requirements before they apply for other than normal spacing. In addition, directional drilling can be used to locate wells away from residences, important heritage areas, and other areas that surface owners do not want to be disturbed.</p>

NOISE IMPACTS

<p>Noise from CBM operations—including noise from drilling and completion activities, increased traffic, well pumps, and compressors—often disturbs citizens located near well sites.</p>	<p>Alberta's Noise Reduction Regulations have a sliding scale noise standard whereby acceptable noise levels vary with ambient noise in an area. For example, if a citizen lives in an area where ambient noise is low (e.g., where housing density and traffic noise are low), then the oil and gas operator must ensure that noise reaching the receptor is no louder than 40 dBA at night.</p>	<p>In March 2009, BC adopted most of Alberta's noise reduction guidelines. BC must ensure its new guidelines are enforced.</p>	<p>BC should strengthen its enforcement mechanisms. Rather than have operators self-enforce regulations, there should be more audits and inspections by OGC staff, especially given the persistent non-compliance of the industry with BC's oil and gas regulations.</p>
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VISUAL IMPACTS

<p>The visual impact of CBM operations can lead to the industrialization of landscapes.</p>	<p>The US Bureau of Land Management’s Techniques to Limit Visual Impacts are very comprehensive and include ensuring that there is proper siting and location, taking steps to avoid unnecessary disturbance and repeating elements of form, line, colour and texture.</p>	<p>In BC, the requirements to reduce visual impacts are less stringent and include less specific information than the Bureau of Land Management’s visual reduction plans.</p>	<p>The OGC should strengthen its requirements to reduce the visual impact of CBM operations. The New Mexico Model County Guidelines provide an excellent starting point for developing comprehensive visual mitigation requirements. The model county regulations are available at: http://www.earthworksaction.org/pubs/NMmodelregs.pdf</p>
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ROYALTIES AND BONDING

<p>Royalty breaks to the lucrative oil and gas industry short-change the public purse at the expense of taxpayers.</p>		<p>In BC, the oil and gas industry received about \$260 million in royalty breaks, and this amount is slated to increase to \$327 million.</p>	<p>The BC government should end royalty breaks and subsidies to the oil and gas industry.</p>
<p>Bonding amounts often do not cover the actual cost of reclaiming wells, leaving taxpayers bearing the cost of reclamation if the operator becomes insolvent.</p>	<p>It can cost from \$19,000 to more than \$75,000 to reclaim a well and restore the land to its condition prior to CBM development. In Alaska, oil and gas operators are required to provide a \$100,000 bond per well to ensure adequate reclamation. In California, a blanket bond of one million dollars is required to cover all of a gas operator’s wells.</p>	<p>In BC, CBM operators are only required to pay a \$10,300 drilling deposit, plus an \$8,000 deposit if it’s an operator’s first well. There is also the Orphan Site Reclamation Fund which can provide money for reclamation, and in some cases operators are required to get insurance. However, it is unlikely that these programs provide enough financial assurance to ensure adequate reclamation, because the money is also used the OGC’s operating expenses.</p>	<p>BC should increase the bonding amount in BC to ensure it covers the actual cost of reclamation. In particular, there should be a dedicated fund for reclamation of wells, rather than having drilling deposits and the reclamation fund be used for the OGC’s general operations.</p>

RECLAMATION

<p>Reclamation helps limit the impact of CBM on wildlife, the landscape, public health, and the environment. Because CBM wells often operate for up to 40 years, waiting until a well is done producing is too long to wait for successful reclamation to occur.</p>	<p>Interim reclamation can be used to ensure the land is returned to its condition prior to development. At the Vermejo Park Ranch, interim reclamation is mandatory. Operators are required to restore disturbances from CBM operations by September 1st of each year.</p>	<p>In BC, there is no legislation which requires comprehensive interim reclamation, which means that British Columbians will be vulnerable to the impact of CBM for unnecessarily prolonged periods of time—perhaps permanently, if the land becomes so degraded that reclamation is not possible.</p>	<p>Legislation should be developed in BC to require interim reclamation. This is especially important given the length of time CBM operations remain in production</p>
<p>Planning reclamation before a project begins is critical to having successful reclamation.</p>	<p>In the United States, the Bureau of Land Management (BLM) requires that reclamation plans be submitted with the application to drill a well. The Bureau of Land Management also requires interim reclamation and final reclamation to be completed within six months of well completion or plugging.</p>	<p>In BC, reclamation is not addressed until operators are preparing to abandon a well and want to apply for a Certificate of Restoration. Applying for a Certificate of Restoration at the end of a wells life significantly decreases the chances for successful reclamation because the environment around the well has been degraded for so long.</p>	<p>Legislation should be developed to require operators to submit reclamation plans when they apply for authorization to drill a well. This helps ensure the well site is developed in a fashion which facilitates reclamation.</p>

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Please contact us for additional copies of this guide:

Dogwood Initiative
PO Box 8701 Victoria BC V8W 3S3
Phone: 250.370.9930
Fax: 250.370.9990
Email: info@dogwoodinitiative.org
www.dogwoodinitiative.org



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