INDUSTRIAL AND COMMERCIAL ACTIVITY IN THE MILK RIVER WATERSHED

DRAFT DISCUSSION PAPER FOR THE MILK RIVER INTEGRATED WATERSHED MANAGEMENT PLAN

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Compiled by: S. Riemersma,
Palliser Environmental Services Ltd.

Note to Reader:

This is a working document. You will note that there are areas highlighted in red, some areas where question marks remain etc. or thoughts are not well developed. Your comments and feedback will be considered in the final version of this document.

- **Recommendations may be dated -**
- **Targets and Thresholds for commercial/industrial activity have not been identified.**
- **Should discuss fragmentation, linear disturbance, number of oil/gas wells, in relationship to biodiversity and land use (e.g., Footprint)**
- **Please add in your comments!**

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Simon Brookes, AESRD
Terry Clayton, AESRD
Brandy Downey, AESRD
Lynn Fitzpatrick, AESRD
Darrin Britton, AESRD
Brian Hills, AESRD
Tim Romanow, MRWCC

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1.0 INTRODUCTION

The Milk River watershed provides a number of commercial and industrial opportunities to residents and landowners in the form of agriculture and resource extraction. The economy in the Milk River watershed is largely driven by the agricultural sector, with 59% of all employment in this sector and some employment in the oil and gas sector. Almost all the remaining employment is in the agricultural service (tertiary) sector including retail businesses, transportation and utilities, health, education and social services (SOW 2008).

Industrial activities within the Milk River watershed are led by the development of oil and gas resources. A well density of up to 4 wells per section for each production zone is typically allowed on any given landscape. Each of these well sites will have associated linear developments which generally include access structures and pipelines. Applications by industry for reduced spacing can result in higher well site densities for specific high production landscapes. To a lesser degree, surface mineral development of gravel resources is also a significant industrial activity within the watershed and exploration for base metal, rare earth, fissile, semiprecious and diamond resources hints at possible future industrial development. Currently, the surrounding area is experiencing a major upswing in the development of wind power and areas within the watershed are surely being assessed for wind power potential.

This short paper provides an overview of the oil and gas industry in the Milk River watershed, and provides a draft set of recommendations to consider when discussing watershed management outcomes (Appendix A).

1.1 Objective

Oil, gas and other resource extraction industries are valued for the contribution they make to the local economy . Within the Milk River Integrated Watershed Management Plan planning area, oil and gas activity is associated with water conservation objectives and land use objective described below.

Objective 3. Recommend water conservation strategies that promote the efficient use of water for all sectors (i.e., municipal, industrial, irrigation).

Objective 7. Recommend land use and development practices which are congruent with the objectives and resource management strategies for the Milk River watershed and its unique semi-arid environment.

Outcome/Policy Statements

Specific: The Milk River watershed provides for oil and gas development while:

1) protecting the ecological, scenic and historic values of this unique landscape, and
2) **preserving the existing surface rights of landowners and leaseholders with respect to production value and commercial value of their land.**

General: Innovative and sustainable land use and development practices take place in the watershed.

General: A healthy, vibrant economy that will attract people and investment to the watershed.

2.0 OIL AND GAS ACTIVITY IN THE MILK RIVER WATERSHED

2.1 Background

The oil and gas industry in Alberta contributes significantly to the Alberta economy. By the end of 2000, more than 260,000 oil and gas wells had been drilled in the province (Sinton 2001).

In recent years, there has been increased activity in the oil and gas sector in the Milk River watershed. Some of the local concerns include flaring, potential impacts on groundwater and impacts on surface water where pipelines cross waterbodies. Flaring may have severe impacts on human and animal/wildlife health (reference). Improved practices such as incineration can prevent the release of harmful gasses to the atmosphere by returning bi-products to the subsurface.

Landowners are also concerned about energy drilling and resource development activity along the edge of the Sunburst pool that is within 2 miles of the Milk River. This formation becomes shallower (? as you move northward) and oil/gas wells that are now being contemplated are at or near the Whisky Valley Aquifer – an important water source for human and animal consumption. Three water co-ops rely on the Whisky Valley Aquifer as their water source and increased oil and gas development around this aquifer increases the risk of contamination of the aquifer. Golder (2004) noted that the Whisky Valley Aquifer and the Milk River are hydraulically connected (refer to the Groundwater Management Discussion Paper for more detailed information on groundwater).

A new oil and gas resource that is currently being developed within the watershed is the so-called "Alberta Bakken". The development involves a shale oil formation (Banff/Exshaw) similar in many ways to the Bakken oil play in North Dakota, Eastern Montana and Southern Saskatchewan. The technology and drilling approach employed in the "Alberta Bakken", along with development density, may be similar to what exists in the larger Bakken oil play. It is anticipated that there will be a significant upswing in energy development within the Milk River basin in the future as a result of this new oil development (an increase in drilling activity is already underway).

According to the 2008 SOW report, there are six instances where oil/gas pipelines cross the Milk River and an estimated five instances where pipelines cross tributaries to the Milk River (Figure 1). The legislative standards for pipeline crossings have not changed since the 1980s, when the *Water Resources Act* (now the *Water Act*) have required that polluting pipelines (e.g., oil, sour gas, wastewater, etc.) must be buried below the 1:100-year flood scour depth and non-polluting (sweet natural gas) below the 1:50 year flood scour depth of the watercourse. Generally, that usually means 1.5 m to 2.0 m below the bed of a watercourse (B. Hills, pers. comm) (is that true for the Milk River as well?). However, improvements in technology now allows for deeper burial of pipelines below the watercourse and the ability to start the crossing further back from the stream bank. Current horizontal drilling technology allows pipelines to be placed well-below the river bed (e.g., at least 15 m below surface) reducing the risk of pipelines failures due to scour and erosion by natural river processes. Most ruptures occur as a result of bank erosion and migration to a location where the pipeline is not buried as deep (B. Hills, pers. comm.). This could be a concern for a highly mobile and erosive river such as the Milk River.

Electrolysis within aging pipe can cause corrosion that may result in pipeline failure. As new pools of oil come on stream, chemical constituents may change within the pipe and increase the risk of corrosion and thus pipeline failure. Regularly scheduled inspections of pipeline crossings along the Milk River should be a priority for energy developers and land managers alike.

Although wide ranging economic opportunities exist within the basin, future resource development within the Milk River watershed may be constrained by various factors:

- limited water supplies (lack of sufficient quantities or absence of water at certain times)
- absence of a suitable infrastructure and services in more remote areas of the basin
- presence of rare, sensitive and “at risk” species (requires special management practices)
- drought and extreme climate fluctuations
- development thresholds and cumulative effects considerations

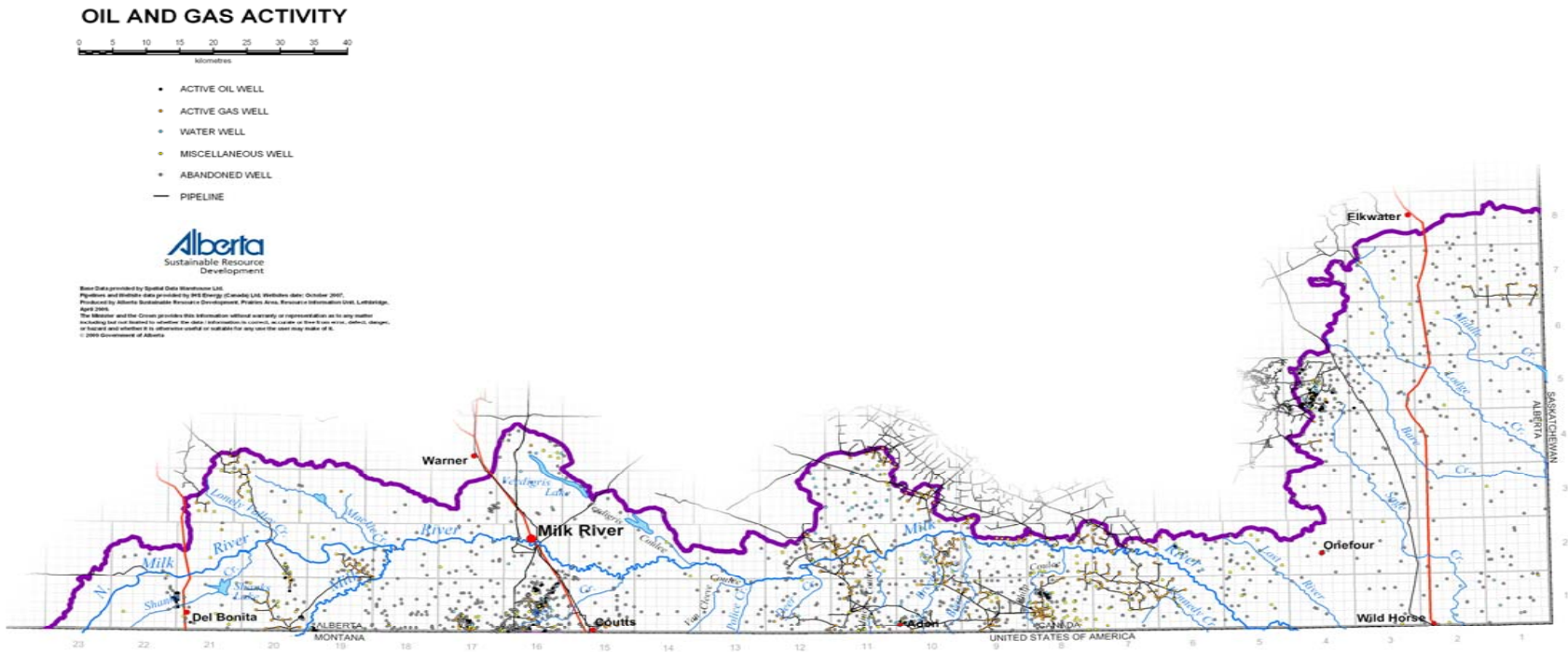

Figure 1. Oil and gas map for the Milk River watershed (SOW 2008).

Table 1.Summary of information for pipelines that cross the Milk River or its tributaries. (Table to be completed)

Waterbody	Legal Land Location	License #	Owner	Date Pipeline Installed	Depth of Pipeline	Type of Pipeline (Oil/Gas)	Date of Last Inspection
Milk River							
North Milk River –South of Lonely Valley Creek	SE 28-2-20-W4 or NW 21-2-20-W4						
Milk River West of the Town of Milk River	NW 29-2-16-W4	4912* (3 lines)	Pipeline Management Inc.	May 26, 1986	PL 100 – Pipeline summary - $ 11.00		
Milk River – East of the Town of Milk River	NW 22-2-16-W4 (maybe SW 27-2-16-W4	22216	Bonavista	March 26, 1986			
Milk River East of Deer Creek 1	NW 11-2-12-W4						
Milk River East of Deer Creek 2	SE 18-2-11-W4						
Milk River North Kennedy Coulee	NW 16-2-7-W4						
Tributaries of the Milk River							
Lonely Valley Creek Crossing	?? 33-2-20-W4						
Sage Creek	NE 12-2-3-W4						
Tributary to Sage Creek	NW 36-2-3-W4						
Verdigris Coulee (NW)							
Verdigris Coulee (SW)							

*License 4912 joins to License 4932 (Atco Gas and Pipelines Inc., August 6, 1996) south of the Milk River.

2.2 Oil and Gas Development on Public Lands

Industrial and commercial development on Alberta's public lands must occur in accordance with provisions that are found in applicable statutes, regulations and policies. These include (but are not limited to) *Public Lands Act, Wildlife Act, Land Stewardship Act, Water Act* and Enhanced Approval Process (EAP) for Upstream Oil and Gas Development. Note that the upcoming Regulatory Enhancement Project will change the Regulatory Framework from multi-agency review to a single regulator to handle all approvals related to the oil and gas industry (See Appendix B for more information). All efforts should be employed to ensure that the new single regulator manages surface resources in the integrated manner currently utilized in managing the watershed.

Industrial and commercial development on public land must adhere to the requirements, standards, conditions, codes of practice, directives and guidelines that are in effect at the time that development approvals are obtained. Necessary dispositions, approvals, permits and licences must be obtained from relevant government agencies (municipal, provincial and federal) before resource development can commence.

Development applications that pertain to public land and natural resources are reviewed by GoA staff using various guidance documents. These documents identify industry requirements, standards, and best management practices. Industry guidelines and requirements are periodically reviewed and updated. Guidance documents exist for the upstream oil and gas development sector and for other land and resource use sectors that depend on public land and natural resources (e.g., coal, minerals, sand and gravel, recreation/tourism, linear corridors, etc.). In addition, area and site specific resource management approaches that are identified in protective notations for public land must be taken into account. These notations cover a wide range of landscape values including species at risk, rare plants, unique terrain features and water resources.

In 2010, SRD instituted a new Enhanced Approval Process (EAP) for the upstream oil and gas sector – which is an online application process for the issuance of surface land dispositions on public land. Further information on EAP can be accessed online at:
http://srd.alberta.ca/FormsOnlineServices/EnhancedApprovalProcess/Default.aspx

The goal outlined by the province for public land is that public (provincial Crown) land will be managed in accordance with existing GoA policies and regulations to provide wide-ranging benefits and opportunities.

2.3 Oil and Gas Development on Private Lands

Oil and gas activity also occurs on private lands and affects landowners in the Milk River watershed. As with public land, the necessary dispositions, approvals, permits and licences must be obtained from relevant government agencies (municipal, provincial and federal) before resource development can commence. However, on private lands landowners must be aware of the rights they possess with regard to activities such as access and how to minimize disturbance impacts to their operations.

Oil and gas activity is an intensive land use and can increase in intensity at various stages of development. Road building can impact on valuable pasture or cropland, and truck traffic can disturb livestock and increase ambient noise and light levels. Trucks and drilling equipment may bring invasive weeds to the site which could affect crops or land. At the well site, land needs to be cleared and leveled

to accommodate a drilling rig, fresh water well, sump, pipe, heavy equipment and other equipment like compressors and crew trailers.

In addition, drilling muds, which are used to lubricate the drill bit when drilling through rock, are usually stored in surface sumps (NOTE: although this is now usually addressed through the use of steel containment vessels). Limiting access by any cattle or animals to the well site, where they might lick drilling equipment or drink contaminated drilling muds from the sump, is important. Drilling also requires use of water, which can raise concerns about depletion of local groundwater or surface water for domestic, agricultural or ranching uses.

Once a natural gas well is drilled, the company will often let the natural gas flow for up to 21 days to test it for rate, pressure and chemical contents of the gas reservoir. During this time they "flare", or burn, the gas that is drawn up through the well. While this burns off most of the gas, it also releases a host of chemicals into the air that may cause a decrease in local air quality and have adverse impacts on humans and other life forms.

Landowners have the authority to decide specifics about an oil and gas development on private land that include how, when, where and at what cost. These decisions are important and can help protect the quality and function of land, riparian areas and water resources.

2.4 DRAFT Targets and Thresholds Pertaining to the Oil and Gas Industry

Footprint

2.5 Draft Recommendations Pertaining to the Oil and Gas Industry

The draft recommendations presented here are divided into two parts. Part 1 is presented in Table 2, which contains a list of suggested industry practices on public lands, contained in the *Best Management Guidelines* document of the Enhanced Approval Process (May 30, 2011), that should be observed when developing oil and gas resources in the Milk River watershed. These listed objectives and recommendations also generally apply to non-oil and gas developments, including (but not limited to) surface mineral leases, recreational leases, linear power easements, telecommunication towers and wind development sites – amongst others. The listed recommendations below do not eliminate the responsibility of developers and resource users to comply with any and all applicable conditions, standards and requirements that are contained in other EAP online documents (for example, developers must observe any prescribed industry set back distances or any seasonal timing constraints that may exist).

While the recommendations in Table 2 pertain to public land in the Milk River watershed, all landowners are encouraged to follow these recommendations. Additional recommendations are provided in Part 2 (i.e., Section 2.4.3) to augment recommendations found in the Government of Alberta's Enhanced Approval Process. These additional recommendations also pertain to public and private lands in the watershed. The adoption of these recommendations on public and private land will contribute to the conservation of natural resources and the reduction of impacts associated with industrial land disturbance.

2.5.1 Part 1: Enhanced Approval Process Recommendations

Table 2: Enhanced Approval Process recommendations. The recommendations apply a minimum disturbance development philosophy (See Appendix C for description of minimum disturbance development, integrated resource management (IRM) and Integrated Land Management (ILM).

Objective	EAP Recommendations
1. Apply an overall land management strategy that emphasizes IRM while allowing compatible industrial and commercial development to occur.	1. Utilize the concept of IRM[1] and ILM[2] when making decisions on the suitability and extent of industrial and commercial development within the watershed.
	Activities should be planned in a manner that minimizes disturbance and adverse environmental effects. Areas that need special consideration include: sensitive soils, unstable slopes, waterbodies, wetlands, streams, areas where rare plants or animals are found, breeding grounds, nesting areas or winter range.
	2. Minimize fragmentation of the landscape and the number of linear features by using shared corridors.
	3. Development should be located to minimize the amount of borrowed material (i.e., subsoil, sand and gravel) needed.
	4. Road design should consider the following: minimize the number of watercourse crossings; minimize the total footprint; minimize new clearings; minimize the grade of roads, and; avoid loop roads.
	5. Minimal disturbance (no strip) access roads/trails should be utilized whenever possible.
	6. Access routes should be planned such that future corridor requirements are considered and integrated.
	7. Industrial activity should be sequenced to avoid repeat operations or multiple entries into an area.
	8. Exploration activity should only utilize minimal disturbance access while keeping corridor width to a minimum.
	9. New development/disturbance must take into account impacts to other users (human and non-human) of the landscape.
	10. Existing sites where on-site contamination issues are present should be avoided for future development.
	11. Selected linear development routes should allow for future field expansion.
	12. Regardless of approved widths, attempts should be made to utilize the least-width for linear features.
	13. Pipeline ROW should not be used as access shortcuts during construction.
	14. Attempts should be made to locate any borrow pits as close to the development as possible and spoil piles

[1] IRM – Integrated Resource Management

[2] ILM – Integrated Land Management

Objective	EAP Recommendations
	from existing dugouts should be utilized where ever possible.
	15. Where multiple pipelines are planned, utilize a common trench and corridor to minimize the industrial footprint.
	16. Utilize existing leases and directional, slant and horizontal drilling techniques to reach subsurface targets and minimize the development footprint.
	17. Constant and ongoing monitoring of industrial developments must occur to ensure negative impacts do not affect landscape resources.
	18. Development planning should consider viewscapes and landscape aesthetics when locating industrial and commercial activities within sensitive or valued landscapes.
2. Maintain and protect water quality, waterbodies and watercourses while allowing for industrial and commercial development.	1. Avoid locating parallel, all-weather access routes within 500m of any waterbody/watercourse.
	2. Where topography limits the ability to locate roads away from riparian areas, access roads should be located as far from the bed and shore as possible.
	3. Pipelines should be bored through watercourses and waterbodies where possible. If an open trench is deemed less risky, consideration should be given to installing a second pipeline at the crossing point to accommodate future capacity needs.
	4. Stream crossings should be located at stable channel locations, not actively eroding areas. All equipment should be kept clean and not be a source of sediment or contaminants.
	5. Snow fills may be used on ephemeral watercourses during frozen conditions provided that: sufficient snow exists to fill the creek channel, any soil cap on the snow is remove prior to breakup, measures are in place to prevent soil or other debris from entering the watercourse channel, and suitable measures are taken during deactivation to ensure flow is not impeded.
	6. Ice bridges may be used during frozen conditions provided that: no capping of soil or organic material takes place, winter flows are not impeded, snow and ice approaches are sufficiently thick to protect the bed and shore, and measures are taken during deactivation to ensure flows are not impeded.
	7. Culverts can be installed on watercourses provided the following is taken into account: culverts must be maintained and repaired to ensure the integrity of the structure is not compromised, culverts are clearly flagged to identify them and prevent damage by road maintenance activities, culverts must be regularly cleaned to clear blockages of soil/vegetation that might restrict flow.
3. Maintain and protect the soil resource while allowing for industrial and commercial development to occur.	1. Industrial and commercial activities should be routed around sensitive terrain and soils. Sensitive terrain types include: dunes, eroding slopes, coulee breaks and wet, shallow or salt effected soils.
	2. In areas where development cannot avoid sensitive terrain or soils, minimal disturbance (no strip) techniques should be utilized.

Objective	EAP Recommendations
	3. Utilize minimal disturbance techniques to minimize damage to the vegetation that anchors and protects the soil resource.
	4. Some soil conditions may require the use of "three-lift stripping" techniques (i.e., separation of: top soil, B and other intermediate horizons, parent material). In order to prevent long term storage and erosion, replacement of the soil should be done within a reasonable time period.
4. Maintain and protect the native vegetation resource while allowing for industrial and commercial development to occur.	1. Utilize minimal disturbance (no strip) techniques to preserve native vegetation.
	2. Where vegetation control is needed, utilize mechanical over chemical control techniques to prevent chemical migration. Chemical control should only be used when spot application treatments are undertaken.
	3. Industrial proponents must have a fire control plan with all necessary fire fighting equipment readily available or on-site. All staff must be trained to use fire fighting equipment.
5. Maintain and protect established grazing operations within the watershed while allowing for industrial and commercial development to occur.	1. New development will make full and preferential use of existing access and development leases.
	2. After development completion final cleanup of industrial and commercial sites should occur prior to cattle entry in the affected field(s).
	3. Existing access corridors should be used. Fences should not be cut and access should be gained through existing gates.
	4. Pipelines or underground power lines that intersect buffers between roads and fields should be avoided or bored to maintain winter cover.
	5. Gates that receive high levels of use resulting from the industrial activity should be replaced with Texas gates where appropriate and supported by the grazing Lessee.
	6. Consider hanging swing gates over Texas gates where adjacent to high traffic livestock areas.
	7. In order to reduce generation of airborne dust, industrial traffic speed should be kept to a minimum (30-50kph) where the access is located in close proximity to livestock.
	8. Always fence out borrow pits to eliminate livestock injury.
	9. To avoid injury to livestock, eliminate the use of horns and sirens when in close proximity to livestock.

2.5.2 Reclamation on Public Lands

Alberta Environment and Sustainable Resource Development is responsible for administering reclamation activities on Alberta's public lands (as of June 2013, the single regulator will handle all the upstream oil and gas reclamation). This responsibility includes ensuring that industry achieves reclamation goals which result in site conditions that meet or exceed pre-development site conditions.

Reclamation for most industrial activities falls under Alberta's *Environmental Protection and Enhancement Act*. Activities that fall under this *Act* include the following land uses:

- coal operations
- mine, pit, borrow, excavation, and peat operations
- oil sands and oil sands exploration
- railways
- sand and gravel operations
- telecom tower
- transmission lines
- upstream oil and gas development

For most public lands in southern Alberta proponents of industrial activities must achieve a level of reclamation that results in the site achieving or exceeding site conditions that existed prior to the development. Site conditions generally include the following: vegetation type and density; soil productivity; water quality and quantity, and range productivity. If industry reclamation is successful, then natural environmental and ecological processes can take over to bring about the eventual restoration of disturbed areas.

All dispositions that are linked to activities on public lands cannot be cancelled until the development proponent has achieved the required reclamation goals. AESRD monitors and enforces reclamation efforts to ensure that Alberta public lands are maintained for future generations.

2.5.3 Part 2: Additional Recommendations

2.5.3.1 Access

a) Because seismic activity occurs on the land surface, landowners are not obliged to provide access to their deeded land for this to occur. Landowners are free to negotiate with a company to allow access to land, and the conditions under which access is to occur, to conduct seismic surveys. (Refer to "Seismic operations and landowner rights" for more information: http://www1.agric.gov.ab.ca/$department/deptdocs.nsf/all/agdex11511).

b) Signed surface lease agreements negotiated between energy companies and landowners for resource drilling and development operations should include, but not be limited to (see also Appendix D):
   - Well and road location and use,
   - How road and well site will be managed,
   - How to prevent the spread of weeds, and
   - Flare testing.

2.5.3.2 Biodiversity

a) All companies conducting oil/gas exploration and pipeline transmission development on private land should complete a biodiversity site assessment and submit a Wildlife Habitat and Protection Plan to municipalities for review. (Adapted from Cardston County 2009)

b) The spread of invasive plants should be prevented by taking the following precautions:
   - Remain a minimum of 1.6 km from all known restricted weed patches or areas of crop diseases,
   - Contact local Agricultural Fieldmen regarding weed species or crop diseases present in proposed work areas and develop a jobsite plan to ensure minimal disturbance,
   - Create secondary containment dykes for all operations that include the onsite storage of drilling products and other hazardous materials to prevent contamination, and
   - Steam clean all equipment and vehicles pre- and post- moves across property boundaries to prevent the spread of invasive weed seeds and crop diseases. (Adapted from Cardston County 2009)

c) **EAP Objective 4:** Include recommendations related to reclamation using native vegetation. *(Reclamation must meet the guidelines that have been established – see* http://environment.alberta.ca/01884.html for the most recent guidelines*)*

2.5.3.3 Water Supply

a) Water shortages in the Milk River watershed occur regularly. Water used in the drilling process is often sourced from private landowners, dugouts and ponds. When water is plentiful, excess water may be provided to industry by the landowner. In times of shortages, water should/must be sourced from larger waterbodies like Chin Reservoir or Milk River Ridge Reservoir.

b) Develop recommendations regarding TDLs (Temporary Diversion Licences), which are obtained by the O&G industry from ESRD to take surface water from the Milk to put on gravel roads to control dust. It should be fairly easy to obtain the number of TDLs issued in the last few years to the industry to see if this is still an issue. Historically it had been an issue during non-augmented periods when there wasn't much water in the Milk to begin with. I had a particular issue with this during the 2001 drought, when the St. Mary Canal was shut down for repairs.

c) Increase awareness of water shortages in the watershed among industries, including the oil and gas sectors.

d) Address the disposal of waste water associated with drilling operations or saline/brackish water brought to the surface from producing wells? Yes – but don't fully understand the issue.

2.5.3.4 Water Quality

a) The Milk River Watershed Council Canada should work toward understanding the oil and water separation process to determine risks to surface water and groundwater quality.

b) Require all potentially affected wells, springs and aquifers be monitored within a 1.6 km radius of a well site. In the absence of domestic water wells within the testing radius (1.6 km), the drilling and testing of shallow aquifer monitoring wells may be required prior to any resource development activity occurring to provide a baseline of water quantity and a quality[3]. (Adapted from Cardston County 2009)

c) Shallow aquifer test monitoring wells are to be installed downstream of oil and gas wells and impacted domestic water wells. Test wells must be monitored for a period of at least 12 months after drilling or seismic has been completed. (Adapted from Cardston County 2009)

d) Oil and gas developments should not occur in areas where aquifer vulnerability is high (See Figure 2). QUESTION – when you say "high" vulnerability, are you only referring to the areas shown in dark red (i.e., the uppermost category, or the 2 uppermost categories, in the legend) in Figure 2? The two upper most categories and the hatched area provided in the Golder 2004 assessment.

[3]Current regulations require all potentially affected wells (e.g., within an 800 m radius of drilling or seismic) be tested that are within an 800 m radius of drilling or seismic activity (Cardston County 2009).

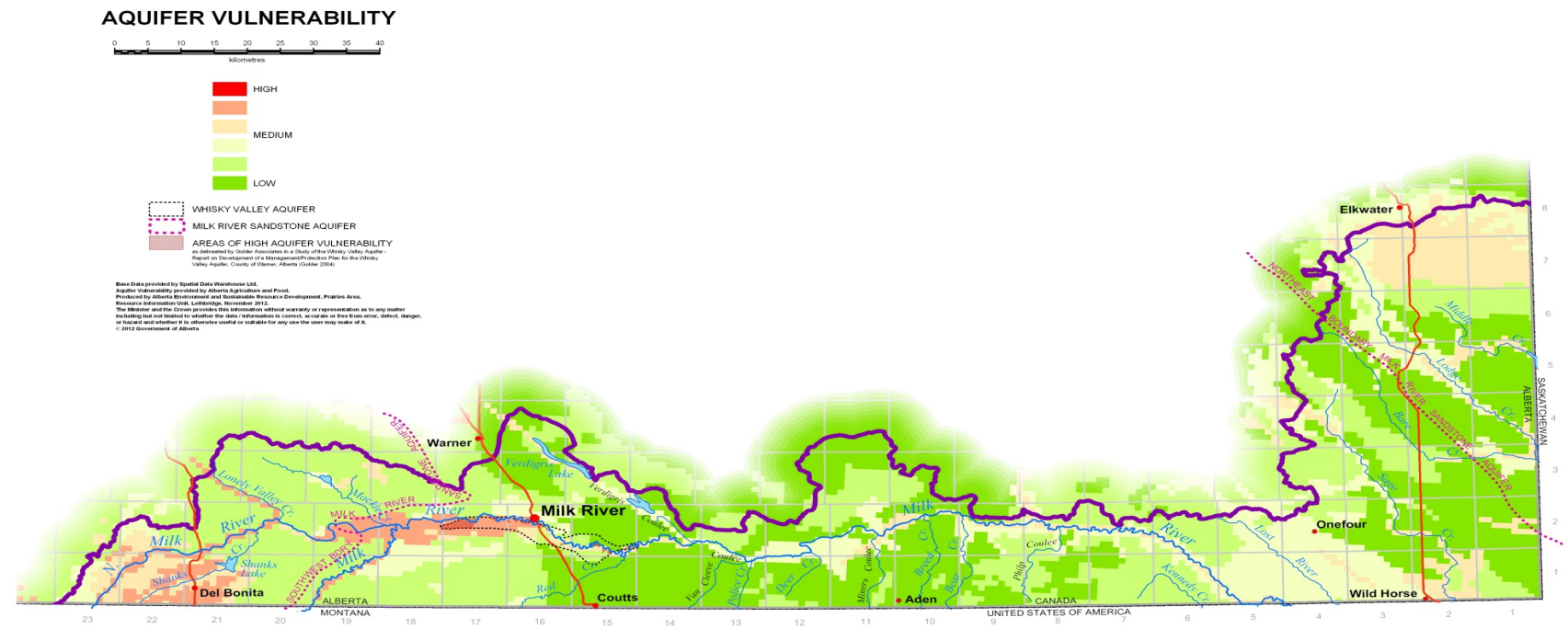

Figure 2. Milk River watershed aquifer vulnerability map.

2.5.3.5 Riparian Areas and Wetlands

a) The wording for Recommendations 2, 3 and 7 written for Objective 2 of GoA's EAP (Table 2) should be revised to more accurately support the Milk River watersheds goals:

Objective 2, Recommendation 2: "Where topography limits the ability to locate roads away from riparian areas, access roads should be located as far from the bed and shore as possible." No access roads should be located within riparian areas. See Section XX: Permitted and Restricted Activity in riparian areas. NOTE: Current land management policy provides setback protection for riparian areas and waterbodies.

Objective 2, Recommendation 3: "Pipelines should be bored through watercourses and waterbodies where possible. If an open trench is deemed less risky, consideration should be given to installing a second pipeline at the crossing point to accommodate future capacity needs." All pipelines should be bored within the watershed, unless technically unfeasible. *(all crossings are site specific and depends on classification of the waterbody it may be a better option in some cases to allow minimal disturbance crossings instead of creating extra disturbance for bell holes. Especially when dealing with ephemeral type areas)* **timing restrictions?**

Objective 2, Recommendation 7: "Culverts can be installed on watercourses provided the following is taken into account: culverts must be maintained and repaired to ensure the integrity of the structure is not compromised, culverts are clearly flagged to identify them and prevent damage by road maintenance activities, culverts must be regularly cleaned to clear blockages of soil/vegetation that might restrict flow." Culverts should be properly sized and installed correctly so as not to affect the natural flow of water.

2.5.3.6 Flaring, Venting and Incineration

a) In the interest of air quality and resource conservation, flaring should not be permitted within the Milk River watershed. All companies should be required to do drill stem testing with closed chamber testing to confirm reserves and measure flow rates. All hydrocarbons should be captured and disposed of in an environmentally safe manner off site. Inline production tests may be considered post-completion. (Adapted from Cardston County 2009).

b) Companies should have a reliable emergency plan in place in the event of a sour gas leak, and the resources to implement that plan. The emergency plan should be communicated to landowners and communities in order that they understand how the company will communicate a sour gas leak, and how evacuations will occur in the event of a leak.

2.5.3.7 Environmental Protection and Reclamation

a) All companies conducting seismic surveys and developing wells and pipelines *on private lands* should have an environmental protection and reclamation plan that is signed off by the municipality. Specifics of weed control, stripping and grading, soil stockpiling, seed mixes used in reclamation, restrictions on drilling in sensitive areas near creeks and wetlands should be included in the plan (Adapted from Cardston County 2009).

b) Drill sites and pipelines should be assessed a minimum of one year following reclamation by an independent soil scientist, agrologist or other qualified professional who should then apply for a reclamation certificate from a Conservation and Reclamation Inspector for Environmental Services, AESRD (Adapted from Cardston County 2009). *(pipelines do not require Reclamation Certificates)*

c) Standard practices should include:
   - surface conductive piping in the top 2 to 400 feet,
   - installation of an additional larger diameter drill casing to insure against leakage of oil and fluids, especially during drilling.

2.5.3.8 Education and Awareness

a) The Milk River Watershed Council Canada should strive to form a greater partnership with the oil and gas industry in order to share in achieving common goals for the watershed.

b) Municipalities should request and the oil and gas industry should provide build-out plans including potential pipelines, compressors, and well-sites to residents, landowners and other stakeholders in the Milk River watershed.

c) Investigate what the municipalities currently have in place for guidelines on oil and gas development and get feedback from the Energy Resources Conservation Board on these guidelines.

d) Adopt/adapt "The Cardston County Protocol for Seismic Surveying, Drilling, Construction and Operation of Oil and Gas Facilities in Cardston County" as standard protocol in all municipalities within the whole basin. Consider revising Cardston County's protocol to include consistent road and access policies applicable to all municipalities in the watershed.

e) Encourage the Energy Resources Conservation Board to develop user-friendly guidance documents and improved resources for landowners.

2.5.3.9 Monitoring

a) Confirm the age and number of pipelines crossing the Milk River (See Table 1). Determine when these were last inspected, by whom, and how frequently inspections occur. Have there been any pipeline failures in the basin? What is the likelihood of a future failure? One known pipeline failure that exports oil from the tank farm to Montana, located at SW9 and NW 4-2-16 W4

b) Update the oil and gas map for the Milk River watershed (as presented in the 2008 SOW report), including new projected well and pipeline developments (See Figure 1).

c) Develop a systematic approach to review the threat of a pipeline failure/incident and develop a proactive preventative process to address incidents. At the very least, a remediation and response plan that takes into consideration the remote nature, unique watershed conditions, and localized industry best practices should be created.

d) Abandoned wells make up 66% of the wells associated with oil and gas activity in the watershed. Further studies should be undertaken to understand the status of abandoned wells and if there are any issues associated with these. (little is known about the condition the abandoned wells are in – there are historical wells that may have pre-dated the registration system, potential for aquifer contamination, potential for release of hydrocarbons due to improperly reclaimed wells, abandoned wells may be re-pressurized and leakage may occur, potential for localized explosions)

e) Address reclamation of abandoned wells prior to a new activity being developed. Put forward a bond to pay for abandoned wells.

f) Address economics – similar to the conservation directives where property values are compensated for, could a similar model be applied to adverse effects experience by property owners (e.g., loss of productivity from setbacks, loss of property value due to loss of view scapes) aside from the actual loss of acreage of the lease.

3.0 LITERATURE CITED

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APPENDIX A. SUMMARY OF MRWCC GOALS, IWMP OBJECTIVES AND ENVIRONMENTAL OUTCOMES FOR THE MILK RIVER WATERSHED.

MRWCC GOALS	IWMP OBJECTIVES	ENVIRONMENTAL OUTCOMES
A. Water Supply (including C. Groundwater)		
Water Supply and Management To foster the sustainable use and integrated management of land and water resources.	Objective 1. Recommend Water Conservation Objectives[4] (WCOs) for the Milk River that include minimum and maximum flows.	Water is managed in a manner that benefits communities while meeting the needs of the aquatic and riparian environment. Water sharing disputes are resolved. Groundwater is mapped, interactions are understood and the resource is properly managed. An improved economy in the Milk River watershed due to a secure supply of water. Information on water use in the Milk River watershed is available to the public.
	Objective 2. Recommend the matters and factors which should be considered by federal and provincial decision makers[5] prior to approving a transfer of an allocation of water under a license or issuing an approval for work that may impact on the quality of land and water resources.	
	Objective 3. Recommend strategies that enhance the delivery of apportioned shares of water while maintaining environmental integrity in Milk River watershed for both Alberta and Montana.	
	Objective 4. Recommend water conservation strategies that promote the efficient use of water for all sectors (i.e., municipal, industrial, irrigation).	

[4] A WCO pertains to the amount and quality of water established by the Director [under the *Water Act*] to be necessary for the:
- protection of a natural water body or its aquatic environment, or any part of them;
- protection of tourism, recreational, transportation or waste assimilation uses of water;
- or management of fish or wildlife,

and may include water necessary for the rate of flow of water or water level requirements.
[4] Valued ecosystem components are appraised, evaluated or estimated elements of a biological community and its non-living environmental surroundings.

[5] Fisheries and Oceans Canada, Navigable Waters, Environment Canada, Alberta Agriculture and Food, Alberta Environment, Sustainable Resource Development, Alberta Transportation

MRWCC GOALS	IWMP OBJECTIVES	ENVIRONMENTAL OUTCOMES
	Objective 7. Recommend groundwater protection and conservation measures for vulnerable areas, including the Whisky Valley and Milk River aquifers.	
B. Water Quality, Streambank and Riparian Protection		
Quality Water To monitor the quality of water in the Milk River and its tributaries, and promote quality domestic water supplies.	Objective 5. Recommend water quality objectives (WQOs) for four reaches of the Milk River (i.e., North Fork Milk River, Milk River gravel bed reach, Milk River sand bed reach and Milk River proper (South Fork)).	Quality water provides for communities, terrestrial and aquatic life, recreation and industry in the Milk River watershed. Baseline water quality information is available to the public. Water quality and quantity information is used to achieve sustainable use and integrated management of water resources.
Riparian Protection To support and initiate programs that protect, maintain and improve riparian areas.	Objective 6. Recommend minimum setback requirements for development from the Milk River and its tributaries to protect and/or enhance riparian and aquatic ecosystems.	Healthy, functioning riparian areas contribute to streambank stability, good water quality, forage, shelter and biodiversity in the Milk River watershed.
D. Land Use		
Economic Development To encourage economic development in the watershed.	Objective 8. Recommend land use and development practices which are congruent with the objectives and resource management strategies for the Milk River watershed and its unique semi-arid environment.	Innovative and sustainable land use and development practices take place in the watershed. A healthy, vibrant economy that will attract

MRWCC GOALS	IWMP OBJECTIVES	ENVIRONMENTAL OUTCOMES
		people and investment to the watershed.
E. Biodiversity		
Biodiversity To increase knowledge and awareness of conservation initiatives in the watershed and facilitate partnerships that will conserve wildlife and plant species diversity.	Objective 9. Recommend strategies to conserve and enhance native wildlife and plant species diversity found within the watershed.	A diverse native wildlife and plant community is present in the Milk River watershed through habitat protection and enhancement efforts.
ADDITIONAL MRWCC GOALS		
Informed Community To increase community awareness of the watershed.		A community that is informed and actively involved in the Milk River Watershed Council Canada and its initiatives.
National/International Issues To maintain open and accurate dialogue among the Milk River Watershed Council Canada and counterparts in Saskatchewan and Montana.		Good working relationships with Saskatchewan and Montana that create a process and forum to address transboundary watershed concerns.

APPENDIX B: BACKGROUND REGULATORY ENHANCEMENT PROJECT

Regulatory Enhancement Project
(http://www.energy.alberta.ca/Initiatives/RegulatoryEnhancement.asp Accessed November 11, 2012)

Alberta is embarking on a bold vision to regulate our energy resources in a new and innovative way. Through Bill 2, the *Responsible Energy Development Act*, which was tabled October 24, 2012, the province is creating a single regulator for all oil, gas, oil sands and coal projects in the province. This new regulator, the Alberta Energy Regulator, will be responsible for all projects from application to reclamation. It will bring together the regulatory functions from the Energy Resources Conservation Board and the Ministry of Environment and Sustainable Resource Development into a one-stop shop. Project proponents, landowners, industry and Albertans will know where to go when they have a question about energy regulations in this province.

The new regulator is expected to be in operation by June 2013.

How we got here

The need for a single regulator was identified by a Regulatory Enhancement Task Force two years ago. The Task Force completed a comprehensive oil and gas regulatory review. That work included numerous consultations with industry, landowners, environmental groups and First Nations, and an online survey inviting Albertans' feedback.

The Task Force released a report, **Enhancing Assurance: Report and Recommendations of the Regulatory Enhancement Task Force to the Minister of Energy**, which made six recommendations to ensure Alberta's energy regulatory system is modern, efficient, competitive and effective.

Recommendations included:

- Establish a Policy Management Office;
- Establish a single upstream oil, gas, oil sands and coal regulator;
- Provide a clear public engagement process;
- Establish a common risk assessment and management approach;
- Establish a performance measurement framework and public reporting mechanism;
- Develop an effective mechanism to address landowner concerns.

The Government of Alberta adopted all six recommendations.

Where we're going

Under the proposed legislation, the new regulator will operate at arm's length from the Government of Alberta, under the direction of an appointed board of directors and chief executive officer. The legislation also gives the regulator the authority to administer the *Public Lands Act*, the *Environmental Protection and Enhancement Act* and the *Water Act*, with regards to energy development.

In addition to the single regulator, the Government of Alberta is making improvements to how it sets energy-related policy. Policy direction for the province will continue to be set by the Government of Alberta, through a newly-created Policy Management Office.

The office will be responsible for providing clear policy guidance to the new regulator. The Policy Management Office is also tasked with creating an effective process to engage Albertans in the policy-making process earlier, rather than after decisions are made. The office is also tasked with developing performance measures.

The single regulator is one part of the province's commitment to improve integration of its resource system. This integration sets and achieves the environmental, economic and social outcomes Albertans expect from resource development, while maintaining the social licence to develop resources.
In addition to creating the single regulator, the province is completing and implementing regional plans. In August, the province released its first land-use plan for the Lower Athabasca Region. On Oct. 17, 2012, the province announced another component of its integrated resource system – an environmental monitoring system.

APPENDIX C. MINIMAL DISTURBANCE DEVELOPMENT, INTEGRATED RESOURCE MANAGEMENT (IRM) AND INTEGRATED LAND MANAGEMENT (ILM) DESCRIBED

Minimal Disturbance Development

Minimal disturbance industrial development on public land is a philosophy applied to a wide range of industrial activities that helps ensure the retention and protection of native vegetation, habitat, cultural features, landscape features and soils. The premise of minimal disturbance is that if less damage is done to the land surface and to landscape resources during the development phase of an activity, then less time and effort will be needed to achieve reclamation requirements for the given activity. Key principles of minimal disturbance include: confining the foot print of an activity to the smallest area possible and reducing disturbance (contact with the ground) wherever possible. The proactive and up-front preservation of land resource values means that those values do not need to be restored or re-established during the reclamation phase.

Minimal disturbance requires that any development impacts to soils, vegetation and habitat occur only to the extent that is absolutely necessary (i.e., impacts are kept the very minimum) for the development to occur in a safe manner. Minimal disturbance can be applied to a wide range of activities that includes, but is not limited to, the following: well sites, pipelines, access roads/trails, power lines, tower sites and agricultural infrastructure.

The use of minimal disturbance techniques protect and maintain multiple land resource values which include, but are not limited to, the following: native prairie, species at risk, rare plants, water resources (water quality and quantity), soils, habitat and cultural resources.

Some minimal disturbance techniques are:

- no strip development (i.e., leave the soil intact and the overlying vegetation in place – disturbance of the sod layer is restricted)
- 2 strip gravel prairie trails and roads (i.e., leave topsoil and vegetation in place; apply 2 strips of gravel so vehicle tracks are level with the prairie)
- utilize plough-in or narrow width trench pipeline installations
- utilize low ground-pressure or specialized equipment
- avoid activities during certain seasons and conditions to minimize impacts (i.e., rutting, soil compaction, admixing of soils)

A useful resource on minimal disturbance is: *Prairie Oil and Gas: A Lighter Footprint*.

Integrated Resource Management

The Government of Alberta adopted “Integrated Resource Management” (IRM) as the preferred approach for land use planning and the management of provincial Crown lands in the late 1970s. IRM continues to be the GoA’s public land and natural resource management philosophy and decision making model. It guides GoA staff when making decisions about whether or not a proposed development is appropriate, sustainable and environmentally sound. IRM has been defined as:

a strategic, collaborative, inter-disciplinary and interactive approach to the management of natural resources that attempts to take into account the largest number of social needs and values within the decision-making process. The aim of IRM is to ensure that the optimal use of natural resources is achieved while maintaining the integrity of the environment. A decision regarding the use of any given resource will invariably preclude other options for the use of that resource. As well, decisions concerning the use of a particular resource often have consequences for the use or management of other resource values in the geographic area of interest. As a result, IRM stresses the need for achieving high levels of co-ordination when making resource management decisions. Co-ordination entails the involvement of affected stakeholders to ensure that issues associated with the allocation, use and management of natural resources are co-operatively resolved.

Integrated Land Management

More recently, the GoA has also adopted Integrated Land Management (ILM). ILM is an initiative which encourages cooperation among all land users to lessen impacts, reduce disturbance activities, and minimize the extent of human activity on the land base. Among other things, the government's ILM program focuses on: managing and reducing the industrial, recreational and other footprints; reclaiming disturbed land, and providing an appropriate level of access for all users.

APPENDIX D: LANDOWNER GUIDE TO WORKING WITH THE OIL AND GAS INDUSTRY (CAMPBELL AND HOWARD 2004)

The amount of compensation that you receive for use of your land is an important issue, and is dealt with in detail below. This section deals with other issues aside from money. Oil and gas development can affect your enjoyment and use of your property. Before agreeing to a lease, you should get as much information from the company as possible. Some of this information may be important enough for you to ask that it be included as a specific term of the lease.

1. **Well and road location and use**. Where will the road and well site be located? If those locations are not the best from your perspective, ask the landman to sketch out the reserve area and discuss alternative places to locate the well or road. This is a key issue that should be clearly identified in the lease.

2. **Start and duration of work**. When does the company expect to start drilling, and how long do they expect to drill for? Do they intend to drill 24/7? Drilling close to your home can be very disruptive, and you should try and negotiate a livable drilling schedule if that is the case, and include it in the lease.

3. **How will the road and well site be managed?** If you have cattle, you want to make sure that the company is not exposing them to harm from truck traffic or contaminants on the well site. You should discuss the use of cattle guards and fencing, as well as site maintenance and cleanliness.

4. **How will the spread of weeds onto your property be avoided?** Drilling equipment and crew trucks can transport invasive weeds onto your property. If this is a concern, you should discuss a way to limit the spread of weeds, such as requiring vehicles be cleaned or requiring the company to put down gravel.

5. **Flare testing**. Does the company expect to be flare testing? If so, at a minimum they should give you advance notice of the composition of the gas, the timing and expected duration of the testing.

6. **Is the well likely to be a sour gas well?** This is a critical issue. Companies are required to calculate the area around a well site that could be impacted by an emergency. You need to know if your house or other buildings are in that zone, and if so, discuss the company's emergency plan and satisfy yourself that it is adequate. This is particularly important with sour gas wells, as sour gas is fatal if released in sufficient quantities. You need to be fully satisfied that the company has a clear plan for dealing with the eventuality that the gas is sour. This plan must include a feasible method of alerting you to any danger, and evacuating your property if it is in the zone that could be affected by any leak or blow out.

7. **Water use.** Will the company be drilling a well, and if so how will they ensure that it will not impact your water use? You can ask for a guarantee of compensation, or "indemnity", against any harm to or reduction in your well supply caused by the well. You should also consider whether water is in such scarce supply in some seasons, that the company's water use should be restricted. Testing of water quality and pressure before and after drilling maybe desirable.

8. **What is the full potential development plan for the site?** While the company may not know until the well has been tested, you should get an idea of how big they think the reserve is and how many well sites and pipelines they may be planning for. You want to get a sense of the long term development potential –will there be a desire to drill additional wells, or construct batteries, compressor stations or power lines on your land in the future?

9. **Will the proposed development impair your use of your land outside the development site?** The location of a well site can impact access to and use of the land around it. A large field broken up into small parcels may require more time to harvest, well sites may change water flows

and cause ponding, or patches of land between well sites and roadways may be inaccessible to machinery.

10. **What types of hazards might the drilling create?** If the company is putting drilling waste into a sump, you want the sump fenced off from any animals and you want to know how that waste will be cleaned up. If it is fracturing the rock, is it using fracturing (fraccing) fluids, which could be highly toxic? You want to know how they responsibly manage those liquids, including their removal from the site. Ideally companies should use water-based fluids instead of toxic fraccing fluids.

11. **How does the company plan to restore the site?** The company should be able to describe to you how they will dismantle, clean and restore a site. The lease should include a term dealing with restoration, and aim at having the site restored as nearly as possible to its original condition. If this term is in your lease, it gives you an independent right to require proper clean up that does not depend on the government or the small bond posted by the company.

12. **Other issues.** Perhaps you want to provide some sub-contracting services to the company, like snow plowing or tree cutting. You could ask for a first right of refusal on that work. If you're negotiating a second lease or a lease extension, you want to make sure that any outstanding issues are dealt with before you sign the new one. Perhaps you want to build the fencing, or you want the right to inspect the well site on a regular basis. All these types of details unique to your needs (sometimes called "side benefits") can be included in the Schedule to the lease, if you are successful in negotiating them.

13. A surface lease can also give you a degree of control over how the site is used. Some companies negotiate for a single well site, and then move batteries, dehydrators and pipe storage racks on site. Others use water when it wasn't part of the deal, or drill all night when you thought it was a daytime operation. You can try and control these activities, by including specific terms in the lease such as:
    a. Only the identified activity (such as one well) can occur on the site. Any further uses, or changes in use, require your consent, and may require further compensation.
    b. The company's hours of operation are clearly stated and limited.
    c. 24-hour advance notice of drilling, flaring and other significant events must be given.
    d. If it is a sour gas well, an H_2S sensor could be installed between your house and the well site.

    These are only a few examples, and you should negotiate for the outcomes that are important to you.