

BEST MANAGEMENT PRACTICES HANDBOOK

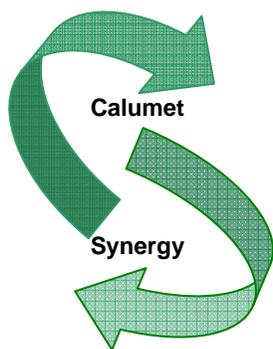
INTRODUCTION

Calumet Synergy Group has compiled these Best Management Practices (BMP's) to benefit all stakeholders. While they are geared towards shallow gas and Coalbed Methane developments, they may also be relevant to other oil and gas exploration, development and production activities. These BMP's are "living documents" and may be revised as more information becomes known, and as a result of feedback from Landowners, industry, and the public. BMP's are "area expectations" and are not necessarily designed to be executed verbatim. BMP's should be used by Operators and Landowners as a method of engaging in initial and on-going discussions regarding the spirit, intent and mutual understanding of desired behaviours when undertaking various activities.

When you are approached by an energy company, utilize this document as a resource or reference. It is the hope of the Calumet Synergy Group (CSG) that these BMP's will aid you in the preparation of your discussion regarding proposed developments on your lands. It is equally important that you advise of and share this document with the energy company, in order that they too can be prepared to address any questions or concerns you may have.

CSG Mission: "To constructively share information and knowledge relating to existing and proposed energy development, and communicate with area stakeholders in an open, honest and cooperative manner."

CSG Vision: "A positive relationship between the community and the energy industry by way of open and honest exchange of information."



* People outside the map boundary are welcome to attend.

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Community Engagement

Concerns

This practice is intended to address concerns regarding consultation and community input into the operator Development Plans, Project Plans and Design and Work Practices. In particular it strives to balance the need for local communities to have input into managing the potential impact the operator has in their community to the need for the operator to maximize the recovery of hydrocarbons in the interests of its shareholders and the public good.

Practices

- On at least an annual basis, the operator is advised to hold a public information meeting that communicates short and long term Development Plans. These meetings will be publicly advertised and synergy groups and other interested parties known to the operator will be specifically invited. Group open houses with other local area operators should also be advocated and actionable, so far as such coordination is possible.
- The operator will endeavor to establish a single contact phone number and email address through which members of the public can ask questions and express their concerns. Logs of calls and the response from the operator should be maintained by both parties for future reference and appropriate follow up. Callers using the single contact phone number may then be able to request a unique tracking reference for their call, if the company is large enough to administer this.
- The operator will use open houses to communicate Project Plans. 'Open mike' question and answer sessions should be incorporated into Project Plan open houses.
- The operator will provide and/or make available these BMP's to stakeholders. As a minimum, copies will be available at open houses and public information meetings, and from Land Agents.
- In its public consultation efforts for projects, the operator will provide the opportunity for a two-way dialogue with affected parties. The operator will seek input on and, provide answers to, relevant questions regarding timing, technical and regulatory issues during the design of a project. The operator will ensure that there is sufficient time and information available to allow a meaningful dialogue with the affected parties and allow for projects to be adjusted if required. For all communication opportunities it is expected that operators, as well as Landowners and other members of the public, will engage in dialogue that is open, respectful, appropriate and constructive.
- The operator will establish a dialogue and seriously consider input from parties that are directly and adversely affected regarding its Practices. This includes ongoing dialogue with associations such as synergy groups when such dialogue is relevant and desired by the association. When this input is not incorporated into the operator's Practices, the operator will provide the rationale for its decision.
- The operator will notify local synergy groups of open houses and public forums and invite them to participate appropriately.
- The operator will participate in multi-stakeholder processes and committees (where consensus principles apply) to address general concerns with oil and gas development.
- The operator will work in good faith with parties that are interested and affected to try to reduce the impact of hydrocarbon development, and expects the same in kind. The operator will provide the rationale for its decisions and expects the same from parties it is dealing with. The operator will make use of processes established by the regulators to resolve disagreements in a timely fashion. During these processes, the operator and other stakeholders will continue to dialogue with parties that are affected and interested.

Background

Oil and Gas Activity

Oil and Gas Activities in an area can generally be split up into three phases – exploration, piloting and development. Oil and Gas (hydrocarbons) are located in many different vertically stacked layers or 'zones'. Technology or price changes might make the hydrocarbons in a particular 'zone' newly accessible and therefore a single geographic area may go through these three phases many times as new 'plays' emerge.

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The exploration phase typically consists of a few (sometimes only one) individual wells spread over large geographic areas, usually tens of miles apart. 'Piloting' is typically done using a small cluster of wells, with the intent of determining longer term production characteristics of wells in the new play, experimenting with different ways of constructing wells and help determine well spacing requirements. There are often confidential aspects surrounding this phase.

The development phase is the "high activity" phase where local communities will experience the most significant impacts. Development is usually split up into multiple Projects, with each Project focused on developing a single "play" in a specific geographic area. A single Project will typically include: a single type of gas (e.g. a shallow gas project would be often be separate from a deep gas project, even if they are in the same geographic area), several and sometimes tens of wells (more than 100 would be unusual), geographic areas of a single section to a township (more than a township would be rare), pipeline and facility (compression) installation.

Planning and Practices

Development Plans cover large geographic areas (usually several townships) and incorporate the operator's expectations for capital spending and the type of geological feature or play that is to be explored for or developed. There may be one or more different projects within the overall development plan for an area, each with unique characteristics and timing of execution. Typically there is a short-term plan (i.e. one year, or budget year) and a longer-term plan (i.e. two to five years). Development Plans always incorporate contingencies to allow flexibility – in particular the timing regarding when specific projects are developed and are subject to change in both the one-year and five-year time frames. Development Plans are highly vulnerable to corporate capital spending decisions where more or less money is made available to the development teams and may affect the timing of projects.

A Project Plan incorporates the operator's expectations for a single play in a specific geographic area. A Project Plan will take into account all existing infrastructure and to some degree future infrastructure requirements – although this is highly limited due to the lack of knowledge about what future plays may look like in the area. The Project Plan includes the well spacing, pipeline requirements (size), compressor and gas processing requirements. Potential or proposed locations of wells, pipelines and compressors are usually part of the overall Project Plan. Final selection of site specific locations may vary, as they are subject to negotiations with land owners and may change several times during the project.

Area operators are encouraged to incorporate both community and industry best practices and standards into their respective Project planning.

The way in which operators execute their work is outlined in a separate BMP such as public consultation, weed management, dust control, etc.

The Operator and Local Communities

The operator is committed to involving members of the local community and Landowners in decisions that may potentially affect them. Operators will work with interested parties to reach solutions that take into consideration the knowledge, values and needs of all groups involved.

The operator recognizes that in some cases mutually agreed upon solutions will not be possible and in such cases will use processes established by the regulators to resolve these issues in an expedient fashion.

The operator is committed to accepting and responding to concerns raised after the main development work (drilling, completions, and construction) is completed. It records concerns that are raised, and investigates and takes action as appropriate. The operator makes extensive use of independent, qualified third parties during investigations of complex concerns.

References

EUB Directive 56

CAPP – Guide for Effective Public Involvement

Pembina Institute – "When the Oil Patch Comes to Your Backyard"

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Survey

Concerns

This practice is intended to address public concerns and questions regarding the activities, behaviours and processes involved during surveying operations. For this document, surveying refers to the survey required to locate existing plans or evidence, and for the establishment of new Right-of-Ways, Riser Sites, Access Roads, Lease sites, Power Lines and/or other dispositions.

Background

In the process of performing surveys, Alberta Land Surveyors are often required to excavate the ground in order to find buried monuments. These survey monuments govern the property boundary between adjacent Landowners and/or the municipality. Before a company decides exactly where to drill a well or construct a pipeline, surveyors are utilized to find the best location for the well and access roads. The surveyor must attempt to give reasonable notice to the Landowner/occupant that a survey is to be conducted. In instances where the Surveyor has been unable to contact the Landowner, the representative should at all times leave a notice [*While You Were Out*] for the Landowner if they have entered or crossed their property. The notice should indicate the reason for entry, the name of the survey company and the oil company requesting the work. *The Surveys Act* and the *Surface Rights Act* allow a registered land surveyor to enter and conduct surveys on private land: "A surveyor and the surveyor's authorized assistants may, using reasonable care, pass over, measure along and ascertain the bearings of any line or boundary, and for those purposes may pass over and through the land of any person, but the surveyor is liable for any damage that the surveyor or the surveyor's assistants may cause." The Landowner/occupant cannot refuse access for the purpose of surveying.

The Alberta Land Surveyors' Association (ALSA) is a self-governing professional association legislated under the *Land Surveyors Act*. The Association regulates the practice of land surveying for the protection of the public and administration of the profession. All surveyors are bound by a "Code of Ethics" and "Standard Practices" as administered by the ALSA. Surveyors carry their own liability insurance and will have executed a "Master Service and Supply Agreement" with their client. Any person may make a complaint about the conduct of an Alberta Land Surveyor. The Association encourages you to speak with the Surveyor and/or the oil company before contacting the ALSA, as many concerns are often resolved before a formal complaint needs to be filed.

Ultimately, including the Landowner throughout the survey process is vital to everyone's best interests, and all parties will benefit. Lack of communication usually results in re-work, delays and a poor start to ongoing relationships.

Key Points

- Obtain a business card or contact information from the *Alberta Land Surveyor*.
- Ensure that the Surveyor documents any concerns or specific requests you may have.
- Determine where field access points are situated and restrictions of use if any.
- Discuss vehicular access requirements (quads, snowmobiles, trucks, or foot only).
- Discuss whether staking should occur during survey or immediately prior to construction, and ensure that nothing is left behind that will cause damage to equipment or livestock.
- Discuss the location and proximity of livestock and whether moving the animals may be warranted.
- Discuss whether access is required on adjacent lands and offer to share contact information for neighbouring lands.
- Share and discuss your knowledge of existing survey evidence in the vicinity.
- Advise of and discuss the potential needs of other users (occupants, renters), if any.
- Advise of locations of special interest that may not be readily visible (springs, underground utilities, water lines, seasonal water courses, wildlife sensitivities).
- Discuss any seasonal agricultural requirements, activities and timing (seeding, haying, fertilizing, rotational pasturing, herbicide/pesticide applications).

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- Discuss common concerns with respect to the use of flagging/lath, filling post holes, counter sinking posts/spikes, visibility of stakes in crops, and cutting requirements in treed areas.
- Landowners and occupants have a responsibility to inform the energy company and/or its contractors if situations arise which may affect the company's work (e.g. farmer may require survey flags to be removed so crops can be harvested efficiently, therefore farmer will ask company to remove flags).

Practices

- An oil company representative will contact the Landowner and/or occupant to request permission to survey. Discussions should include the scope and nature of proposed development, and a mutually convenient time frame in which to conduct the survey.
- The oil company representative (Construction Supervisor) and the Landowner are encouraged to be present on-site at the time of the survey to discuss any specific requirements, issues, concerns or questions that may arise with respect to site selection/routing.
- CSG strongly encourages and stresses the importance of good communication between the oil company, the Landowner and the survey crews throughout the survey process.
- Alberta Land Surveyors will act as good stewards of the land, and ensure that the land is left as close to its original condition as possible. This includes proper respect and care of all property that is entered upon on, and avoiding unnecessary damage while performing a survey.
- The surveyor shall leave notification and contact information with the Landowner and/or adjacent Landowners, in instances where entry was taken onto lands when reasonable attempts to contact Landowner have been unsuccessful.
- Surveyors shall ensure that all gates and access points are maintained "as found, as left".
- Surveyors shall ensure that all survey evidence is placed in such a manner as not to cause immediate or future harm to equipment and livestock.
- Where practical and feasible, all survey evidence (not required to be left in place by law) shall be cleared from the lands in a timely manner. For example if a well application is cancelled or withdrawn by the company, they should return and pick up/remove all stakes and ribbons.

References

Land Surveyors Act

Surveys Act

Expropriation Act

Surface Right Act

Land Titles Act Alberta Land Surveyors Association (www.alsa.ab.ca)

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Land Agent

Purpose:

- To help a Landowner understand what he or she can expect when contacted by a Land Agent regarding proposed oil or gas activity.
- This guideline refers to proposed new oil and gas activity including but not limited to wells, pipelines and associated facilities which will result in Leases Sites, Lease Access, Pipeline Right-of-Way, Power Lines and/or other land requirements.

Background:

- One of the most important activities in the Oil and Gas Industry is ensuring legal access to the surface of the land in order to explore for and produce the underlying minerals. In almost all cases in Alberta, surface land ownership is different than mineral land ownership. Both the surface owner and the mineral owner have certain rights and obligations, each of which must be understood and respected.
- A key player in the Oil and Gas Industry in Alberta is the Licenced Land Agent. The Land Agent is usually the first point of contact between the Landowner and the oil and gas company. It is the responsibility of the Land Agent to carry out public consultation and negotiations to secure an interest in land for project specific surface leases, pipeline right-of-way and other surface land requirements.

Practice:

- The Landowner will receive a telephone call from a Land Agent who is working on behalf of a specific oil and gas company. The Land Agent will be calling to ask for Landowner consent to allow a survey company to enter upon certain lands for the purpose of completing a land survey for a drilling lease, pipeline right-of-way or other requirement.
- Land Agents will identify both themselves and the oil and gas company they are working for. Basic project information will be provided including: type of project (well or pipeline etc.); substance (oil or gas and sweet or sour); specific land location including proposed coordinates (if a well); overall project scope and timing.
- Please advise the Land Agent of any special conditions at this time and advise if there are any occupants of the land other than the Landowner.
- The Land Agent will offer the Landowner the opportunity to discuss and meet with the construction supervisor to review well location, pipeline routing, facilities, etc. The importance of the Landowner attending the onsite meeting will be stressed.
- The Land Agent will advise that once the survey is complete and survey plans prepared, he or she will call the Landowner to set up an appointment to further discuss the project, lease or right-of way survey, legal documentation and compensation. The Land Agent will provide a contact number should any concerns or questions arise in the meantime.
- Once the acquisition package is prepared, the Land Agent will contact the Landowner to set up an appointment to discuss the project, lease or right-of way survey, legal documentation and compensation. In an effort to promote continuity, this will usually be the same Land Agent that called initially for survey consent, however it may be a different Land Agent due to availability of personnel
- At the meeting with the Land Agent, the Landowner will review the site-specific survey plan, receive a detailed project information package, and review proposed lease documentation and proposed compensation. Upon completion of all relevant discussion including compensation, the Landowner will be advised that he or she can take a *minimum of 48 hours* (not including statutory holidays) before signing any documents relating to the project. The Landowner will also be advised that they have a right to waive the 48 hour period if they are prepared to sign a specific waiver form as prescribed under Section 17 of the Land Agent's Licensing Act.
- If the Landowner chooses to take a minimum of 48 hours, the Land Agent will leave a specific compensation offer and plan a follow up meeting time with the Landowner. There is no 48-hour waiver requirement period required at the second or any additional meetings.

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- When an agreement has been reached, the Landowner will be left with a copy of the agreement and advised that a fully executed copy will be either delivered along with full payment prior to any entry on the land/or that the document will be forwarded by regular mail. In any case, the Landowner will receive payment in full prior to any entry upon the land.
- Landowners are not required to sign any lease agreement, regardless of the number of meetings. If an agreement cannot be reached and the only issue is compensation, the Land Agent may offer to the Landowner an option to execute a confirmation of non-objection for the lease location or pipeline routing. This will allow the company to apply for a well licence or pipeline permit to the EUB. The company will then proceed with the project by way of a Right of Entry through the Alberta Surface Rights Board and the Landowner will receive a payment of 80% of the final *written* offer (prior to entry on the land). In this case, final compensation will be determined at a hearing of the Alberta Surface Rights Board.
- If an agreement cannot be reached for any reason after good faith negotiation with the Land Agent (if contract) has concluded, advise the Land Agent you wish to speak directly with the oil and gas company representative in charge of the specific project in question.

Key Points/Checklist

- Write down the Land Agent name and number when you are called for survey consent, and any questions you have about the proposed project; don't hesitate to call the Land Agent back if you forget something.
- Plan to be at the onsite meeting for at least part of the survey; ask the construction representative what the best time to attend would be, so you don't waste your time.
- Do as much homework as you can in regards to compensation (especially land value) before the Land Agent meeting. Ask the Land Agent, neighbours, appraisal firms, etc., about any comparable land appraisals or recent Surface Rights Board decisions that may have been completed in the immediate area.
- If you are not familiar with documents such as Surface Leases and Right of Way Agreements, make sure the Land Agent explains them to your satisfaction. Seek additional advice if you require further clarification.
- If an agreement cannot be reached, or if Landowners do not feel comfortable negotiating on their own behalf, a Landowner may seek assistance from licenced Land Agents, legal counsel, Farmers Advocate, EUB Field Centre (field facilitation / ADR process), etc. Costs associated with Landowner representation should be discussed with a Land Agent or an authorized company representative prior to retaining outside assistance.
- Remember the importance of good communication between the energy company, the Landowner, the Land Agent, and with all those involved in the specific project. For example it may be valuable for the construction supervisor to be at the site meeting with the Landowner and surveyor.
- Landowners are strongly encouraged to obtain all commitments and agreements in writing.

Reference

Alberta Land Agent Licensing Act

AEUB Directive 56

AEUB Website – Appropriate Dispute Resolution Process [ADR]

Alberta Farmers Advocate Office

Alberta Surface Rights Board

Legal Counsel

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Drilling

Purpose

These recommended practices have been established by CSG to help stakeholders understand the steps involved when drilling a shallow gas well or Natural Gas from Coal (NGC) well, and how groundwater resources are conserved and protected. These practices refer to shallow gas wells targeting Horseshoe Canyon coal formations, but may be applicable to other, deeper formations as well, and well-types other than CBM/NGC.

Background

The reservoirs that are being targeted in this general area are sand and coal reservoirs within the Edmonton and Belly River formations, including the Horseshoe Canyon coals. These reservoirs produce sweet natural gas and are low pressure and typically low productivity. In this area these reservoirs typically occur at depths ranging approximately from 200 – 800 metres.

Wells targeting these reservoirs are typically drilled as vertical wells. Occasionally, directional drilling may be undertaken in instances where a suitable (vertical) surface location cannot be accessed. The same practices apply whether a well is drilled vertically or directionally. These types of shallow gas / NGC wells are typically drilled with water / drilling fluid, however air drilling may also be used. With the shallow depths of the reservoirs, drilling will typically take between one and three days to complete.

The Alberta Energy and Utilities Board (EUB) regulates the drilling of hydrocarbon wells within Alberta and in all cases companies are required to meet or exceed the EUB requirements. Where applicable these regulations are referred to in this BMP, however not all requirements are fully defined in these practices.

Practice

- Prior to drilling, a third party survey company surveys a wellsite and access route, and a licenced land agent acquires the applicable land for the well and access. The Landowner and/or occupants are involved in these processes, ensuring the well location and lease agreements are satisfactory to all parties involved. (See *“Surveying”* and *“Land Agent”* BMP's.)
- The company will undertake a review of the water wells in the general area and will offer to conduct baseline testing of any water wells within 400 m of the proposed drilling location (or as requested by a Landowner for a water well in reasonably close proximity), testing both the quantity (well yield) and quality (water chemistry). Operators wishing to drill a new well or complete (or recomplete) wells for the purpose of producing CBM above the base of groundwater protection (BGWP), must offer to test any active water wells or observation wells within a 600 m radius of the proposed CBM well. If no such wells are identified within a 600 m radius, the operator must offer to test the nearest water well or observation well within a 600 to 800 m radius. This pre-drilling test will provide suitable baseline information to understand the well's capability and quality before any industry activity occurs nearby. If cause for concern arise after drilling and other well activities have occurred, a post-drilling test may be requested and will be performed by the company. In the event damage occurs to the water well as a result of the companies activities, investigation will be performed and compensation or remedial actions may be taken as appropriate.
- Prior to drilling, a source of suitable water to be used for drilling fluid must be located and secured. Companies will generally attempt to locate water within close proximity to the proposed drilling site, and often access to the water source can be negotiated with the Landowner or others nearby. Depending on the water source, a temporary water diversion licence may be required to be obtained from Alberta Environment prior to removing the water. Typically, town water is not used as a source for drilling fluid.
- Once all required documentation is in place and a well licence is obtained from the Alberta Energy and Utilities Board, construction of the wellsite will commence. Lease construction activities for shallow gas wells are typically performed with minimal disturbance practices. Minimal disturbance will normally only involve the installation of an approach from the municipal road and suitable livestock containments (gates and/or cattle guards). Minimum disturbances differ from conventional or “full build” construction activities, whereby the access road and well site area is stripped of top soils and sub-soils and where “all weather” access is required. Operators are still required to ensure that good soil conservation practices are undertaken. Landowners and operators are advised to discuss and gain mutual understanding and agreement of the proposed method of construction during initial consultations.

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- Surface hole is drilled in a very similar manner to drilling water wells. The drilling of the surface hole and subsequent installation of surface casing may be completed by a “pre-set” rig (conventional water well drilling rig modified for the oil and gas industry), or by the drilling rig itself. The primary purpose of the surface casing is to provide well control and to ensure the protection of shallow ground water aquifers. Minimum surface casing setting depths are stipulated by EUB regulations (Guide 8 and Statistical Series 55). The depth to which surface casing is run is calculated based on sub-surface pressures expected to be encountered during drilling. Sufficient surface casing is run in order to maintain well control at surface in the unlikely event that a blowout occurs. Surface casing is then cemented full length into place using high-strength cement that is pumped down the inside of the casing and back up the annular space between the outside of the casing and the drilled hole.
- A conventional drilling rig or coiled-tubing rig will be used to drill the main hole of the well. During the drilling process, the drilling fluid is returned to surface where volumes are carefully monitored, allowing for any losses to be detected while drilling through shallow groundwater aquifers.
- Loss of circulation may occur when a formation being drilled through breaks down and the drilling fluid migrates into it. Formations in which lost circulation occurs are weak and cannot support the pressure in the column of fluid in the well. To rectify this problem, lost circulation material, composed of non-toxic material such as untreated sawdust, non-toxic cellulose material, or grit (untreated calcium carbonate or limestone) is added to the drilling fluid to “seal up” the area of concern in the wellbore.
- When the main hole has been drilled to total depth, production casing is then installed to the bottom of the well and is cemented throughout the full length, back to surface. This practice ensures that the hydraulic isolation of the entire wellbore (from all reservoirs) is obtained and that all associated groundwater aquifers are protected from any wellbore activity and isolated from hydrocarbon sources.
- As drilling fluids are comprised of non-toxic and environmentally approved components, the fluids are disposed of via one of two methods: landspraying or hauling off-site. Landspraying on farmland, where agreed to by the Landowner, is most common, however, some fluids that are part of the drilling process (such as cement returns) cannot be landsprayed and must then be disposed of in an appropriate offsite location such as a containment site or a disposal facility. Drilling waste management and disposal is regulated by the EUB and is covered further in EUB Directive 50. **If a Landowner is concerned about landspraying fluid composition, he should ask the operator about this, including testing verifications.**
- Upon completion of drilling operations, a wellhead will be installed and the well will now be ready for completions operations.
- Oil and gas companies are required by the EUB and Alberta Disaster Services to have an area Corporate Emergency Response Plan (ERP) in place in the unlikely event that an emergency occurs. Typically, given that reservoirs being targeted in this area are in the Horseshoe Canyon/Edmonton/Belly River formations and that sweet gas is produced, operators do not require a site-specific ERP. If a Landowner is concerned, he or she should ask the land agent for the company's toll-free emergency phone number in advance or operations.

FAQ's

Why isn't town water typically used as the water source for drilling fluids?

- Towns or municipalities have limited water supplies and may not be able to supply the quantities required for the drilling operations. Supplying these quantities would also take away from the supply of suitable water for urban users.
- Use of a town's water facilities would increase traffic within town limits.
- There are large costs incurred by Municipal facilities to treat water volumes.
- Kinds of bacteria and other organisms present in surface water would not be able to survive in underground aquifers, and using untreated surface water supplies do not present a risk in contaminating ground water resources.

What is the composition of drilling fluid?

- The drilling fluid consists of water and bentonite clay, which swells when it comes into contact with water.
- Components are non-toxic and undergo environmental testing criteria to ensure suitability for landspraying after usage.

What is the function of drilling fluid?

- Carry drill cuttings to the surface.
- Control subsurface pressures.
- Cool and lubricate the drill bit.

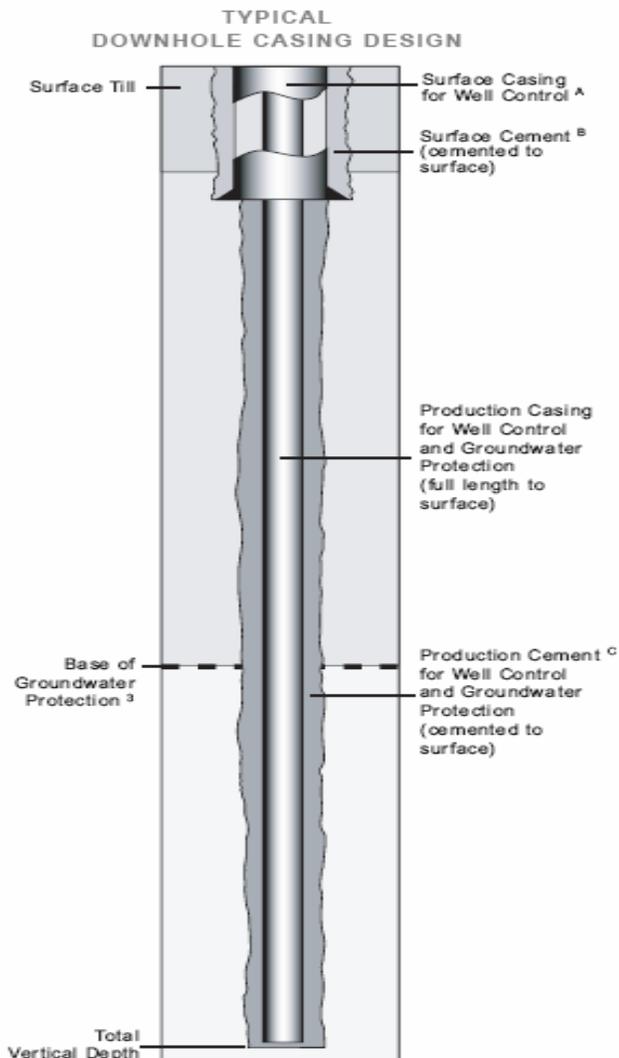
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- o Provide a low permeable filter cake on the wellbore, i.e. a layer of thick semi-solid mud that forms on the wall of the borehole preventing the seepage of fluids into Formations].
- o Minimize damage to subsurface formations.

References

EUB Directive 8	Oil and Gas Conservation Act
EUB Directive 9	AENV Water Act
EUB Directive 10	Environmental Protection and Enhancement Act
EUB Directive 35	Statistical Series 55
EUB Directive 50	Directive 27
EUB Directive 56	

Well Diagram



- A) Casing Depths as per AEUB Guide G-8 Surface Casing Requirements
B) Cementing as per AEUB Guide G-9 Casing Cementing Minimum Requirements
C) As per Alberta Environment & AEUB 55-55 Alberta's Usable Groundwater Base of Groundwater Protection Database

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Project Planning and Design

Concerns

This practice is intended to address public concerns regarding the basis for placement and design of well-sites, pipelines and compressors.

Practices

- As required the operator will work with the EUB to obtain commingling approvals for multiple zones – both sand and coals to allow multiple production zones to be developed within a single wellbore.
- The operator will show existing, and proposed, wells, pipelines and facilities on Project maps. These maps should be shared with Landowners and will help provide the rationale to respond to Landowner queries when it appears that maximum use is not being made of existing infrastructure.
- Project maps are important for Landowners to view before negotiating a surface lease, pipeline or facility.
- The tentative Project layout indicates where proposed wells, pipelines and facilities will be located before Landowner negotiations commence. In this layout The operator will preferentially endeavor to:
 - route pipelines on or beside existing pipeline Right-Of-Ways
 - structure pipeline systems within 'pipeline corridors'
 - place pipeline corridors parallel to roads and quarter section lines
 - locate access trails, wells, pipelines and facilities, in a manner that will minimize the impact to all affected Landowners
 - locate new facilities on existing locations
 - locate new facilities to minimize visual and noise impact
 - locate wells beside existing pipeline corridors
- The Landowner is advised to ask the operator for a reasonable timeframe to allow for the opportunity to discuss the proposed projects with adjacent Landowners and residents.
- The operator will not unreasonably withhold approval, when a person or municipality has requested relaxation from the setback requirement of the Subdivision and Development Regulation.

Background

The overall objective in the placement and design of well-sites, pipelines and compressors is to try and maintain a balance that not only minimizes the surface disturbance but also takes into consideration safety concerns, environmental sensitivities, and Landowner requests; in addition to efficient and effective hydrocarbon resource recovery.

In keeping with the above, significant consideration is given to selecting a well location that will potentially allow the wellbore to intersect and produce from multiple production zones. The production zones are thin slices of hydrocarbon bearing reservoir separated by large layers of non-reservoir, ranging in depths from 200 – 800 metres. It is vitally important that each wellbore penetrates a given zone at a sufficient distance from any other adjacent wellbore producing from the same zone, so that the largest possible radial area of the reservoir is drained. Large distances between wellbores may leave valuable hydrocarbons unrecovered. In addition, some wells may be targeted at specific locations, as identified by seismic information and geological interpretation. As a consequence it is not desirable to drill new wells from existing leases and a new lease will be required.

In determining the placement of wells, the operator considers the following:

- well location is appropriately spaced from adjacent wells in the same target zones;
- an existing well can be used;
- a new well can be drilled from an existing lease (pad drilling);
- a new well can be directionally drilled from an existing lease (pad drilling);
- a new well (lease) can be located next to an existing pipeline;
- a new well (lease) can be located next to existing access.
- setback considerations / restrictions
- environmental sensitivity – setbacks from water bodies [wetlands, fens, bogs, sloughs]
- Landowner preferences

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Pipeline and compressor locations also face technical constraints. Longer distances between wells and the compressor will result in a need for larger compression requirements. This can be offset somewhat by increasing the diameter of the pipelines, which in some cases may also increase the width of the pipeline easement needed. Project compressor and pipeline layouts are designed to make use of existing facilities and then optimize the balance between the amount of compression required and the pipeline configuration. In locating compressors, the natural terrain and the proximity of residents will be taken into account in efforts to minimize potential impacts. The plan is then modified to accommodate topographical constraints and specific location requests made by the Landowners.

Operators are encouraged to undertake development strategies that make optimal use of existing area infrastructures (wellbores, pipelines, Right-of-Ways [ROWs] and facilities) to recover resources, regardless of operator ownership. **Area operators are encouraged to plan their developments jointly in efforts to utilize existing excess capacities and share infrastructures.**

Setbacks

A setback is the absolute minimum distance that must be maintained between any energy facility and a dwelling, rural housing development, urban centre, or public facility. Setbacks vary according to the type of development and whether the well, facility or pipeline contains sour gas. In addition, there are specific setback requirements and instances where approvals may be required with respect to environmentally sensitive areas.

AEUB regulations and Municipal Land Use By-Laws govern surface improvement setbacks for oil and gas facilities once the oil and gas facility is constructed. The 100 m setback, which is often referred to, not only applies to the construction of the oil and gas facility, but also to the subsequent construction of surface improvements within a specified radius. Any surface improvement within a setback may require permission from the operator, the AEUB and the local Municipality. The operator will work with Landowners if there is a need to have the Municipal Government Act 100 m setback relaxed. The following are examples of Landowner developments and how setbacks affect them:

- If a Landowner wants to build non-permanent surface improvements within 100m of a operator's sweet gas well (but NOT on the lease), there are no restrictions related to the well; however, the Landowner is advised to contact the local Municipality for any required building permits or advice and/or to inquire about any additional municipal setbacks.
- If a Landowner wants to build permanent surface improvements (such as a house, barn, grain bins, corral, quonset) within 100 m of an operator's sweet gas well (but NOT on the lease):
 - Contact the operator, and the operator will conduct a risk assessment
 - If the risk assessment indicates this is acceptable the operator will assist the Landowner in approaching the AEUB and the local Municipality to have the setback relaxed.

The setback for sweet pipeline is restricted to the pipeline right-of-way itself. Depending on the release volumes of pipelines containing sour gas, the setbacks may be greater than 100 metres.

The Public Highways Development Act, Highway Development Control Regulation prohibits pipelines from being placed (parallel to) "within 30 metres from any limit of a controlled highway or 60 metres from the centre line of the roadway of a controlled highway, whichever distance is greater".

Local and special provincial bylaws or regulations can modify these for specific situations.

References

Municipal Government Act, Subdivision and Development Regulation
The Public Highways Development Act, Highway Development Control Regulation
Local Municipal Land Use By-Laws
EUB EnerFAQ's No. 5 – Explaining EUB Setbacks
AENV Water Act and Regulations
AENV Guide for Wetland Mitigation
Directive 56

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Pipeline Design and Construction

Concerns

This practice is intended to address public concerns regarding the construction of pipelines. Routing of pipelines is covered in Project Planning and Design.

Practices

- The operator will not unreasonably withhold approvals for crossings of pipelines. The operator requires persons unfamiliar with the procedures for undertaking a hydrocarbon pipeline crossing to contact the operator prior to initiating the proposed ground disturbance. The operator will provide guidance on appropriate procedures for the crossing.
- The operator will appropriately compensate the Landowner for damages due to pipeline construction. In cases where damages cannot be agreed upon, the operator will engage a third party to assess damages.
- Upon request, the operator will confirm the operational status of any pipeline for which the operator is the licensee.
- The operator will remove registered encumbrances associated with pipelines within 12 months of all the pipelines in the right-of-way being recognized by the AEUB as being abandoned. Removal of registered encumbrances is a standard clause in Alberta pipeline right-of-way agreements and can only be removed when a reclamation certificate is issued by Alberta Environment. This certificate does not release the licensee from the financial responsibility for any environmental issues that arise after the certificate is issued. Under the Pipeline Regulations, the licensee (i.e. the company who owns the pipeline) is responsible for all abandonment or other operations of a pipeline or part of a pipeline that may become necessary. **Note:** There is an associated risk of line strikes (accidental contact with pipelines) when undertaking future activities involving ground disturbance, when there is no evidence of underground facilities registered on the land title.
- Upon request the operator will provide to any Landowner directly affected by the pipeline a copy of any application and/or approvals issued for the construction of the pipeline. In addition the Landowner may also request a copy of any post construction reclamation assessment report.
- Where reasonably required, the operator will undertake the costs associated with agricultural related crossings, lowering or pipeline relocations. Landowners are advised to contact the operator to discuss potential cost sharing initiatives associated with non-agricultural activities requiring crossings, lowering or pipeline relocation projects.
- "New" pipeline installations that cross existing foreign pipelines must be constructed underneath the existing pipeline and maintain a separation distance of no less than 30 centimetres.
- "Padding" or "ramping" of pipeline crossings that requires placing additional soils over the crossing shall consist of material acquired from the same lands, or from similar or adjacent lands, and will be subject to Landowner approval prior to placement. Operators are encouraged to cap the crossing with black dirt and seed to prevent erosion and the growth of weeds.
- Landowners are advised to take the following into consideration when discussing proposed pipeline routings with the operator:
 - Do present or will future agriculture operations require ground disturbances to depths greater than 0.8 m?
 - Are there current or future plans for additional residences or structures on this parcel of land?
 - Is there a requirement to significantly alter the topography (such as land leveling, dug-outs, silage pits)?
 - Do you have any current or future plans to install irrigation or drainage activities?

Background

Pipelines for gas gathering systems are buried to a minimum depth of 0.8 m. This minimum allows for the plowing of lines up to 10 inches (plastic), minimizes the width of right-of-ways (deeper burial results in larger workspace requirements), enhances worker safety (lowers chance of a worker getting buried) while keeping the pipeline at an adequate depth to protect it once it is in operation.

For significant pipeline installations, or pipelines with an index (length in km x outside diameter in mm) of 2690 or more, a Conservation and Reclamation Application (CandR) must be submitted to Alberta Environment and approved before construction is permitted. The application includes descriptions of: pipeline route selection with rationale;

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public consultation undertaken; surface geology, soils, water course, vegetation, wildlife, land use, historical resources, and the potential environmental/historical impacts. Operators must address all of these components and submit mitigation plans as required. The bulk of the work associated with CandR applications in cultivated areas deals mainly with soil surveys and proper soil handling procedures.

Alberta Environment regulates all soil handling and reclamation efforts associated with pipeline construction, in addition to periodical inspections of work sites. All reclamation and clean-up activities undertaken by the operator during and after construction must meet stringent requirements. When Alberta Environment inspectors identify operators that are not properly conserving or reclaiming sites according to the requirements of the *Environmental Protection and Enhancement Act*, compliance or enforcement actions may be taken.

Compensations for pipeline installations are calculated similar to wells and facilities. In instances where parties are unable to resolve outstanding claims related to damages caused during pipeline construction, parties can seek the assistance of either the Farmers Advocate or Alberta Surface Rights Board, or participate in an arbitration process.

References

Alberta Pipeline Act; Pipeline Regulation

Alberta 1 - Call

EUB Bulletin 2005-11 Proposed changes to pipeline regulations:

<http://www.eub.gov.ab.ca/bbs/documents/bulletins/Bulletin-2005-11.pdf>

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Compressor Management

Concerns

This practice is intended to address public concerns regarding visual and noise management for the operator of oil and gas facilities.

Practices

- In designing its Project Layouts (i.e. the position of pipelines and compressors for a project), the operator will take into account existing facilities, existing residents, information regarding construction of potential future residence sites, prevailing winds and local terrain, and try to locate facilities to minimize the noise to residents. The operator's ongoing community consultation will provide additional information on when and how Project Layouts will be reviewed with affected parties.
- The operator will record and investigate all noise complaints. The operator will either mitigate the noise or for persistent noise, provide a Noise Survey done in accordance with Directive 38. Compressor operators will conduct baseline testing of any residence within 1.6 km before a compressor is installed. All residents within 1.5 km of a proposed compressor shall be consulted and informed of noise control measures undertaken at the compressor site.
- The operator is required to select new compressors such that they have a maximum noise contour of 40 dBA Leq or less, when measured at the nearest resident.
- If a new residence is planned after a compressor is installed, the Landowner is encouraged to contact the operator to discuss potential noise impacts. Sound levels will be monitored and further mitigation efforts will be reviewed by the operator and may be implemented as required.
- Project layouts, and their review with affected parties, may also include components related to the visual impact of compressors. There are many ways to change the visual impact of compressors. Examples include remote locations, facades on the buildings, berms and tree belts. The operator will establish dialogue with the landowner, and is strongly encouraged to consider input from parties and communities who are interested and affected regarding the visual impact of its compressors. These communications need to take place throughout the life cycle of the development.

Background

- Noise is measured in decibels (dB). For Noise Management in Alberta the basis of measurement is dBA Leq – it is a "time averaged" sound level adjusted (for the characteristics of the human ear). A typical human can hear noises of 0 dB up to more than 120 dB (130 dB is the "threshold of pain"). See the attached chart for dB levels associated with everyday sounds.
- In general, when the windows are closed, noise levels inside a house will typically be 10 dB lower than outside. Noise levels are NOT directly additive – in other words, if the ambient noise level is 35 dBA Leq and a piece of equipment that makes 30 dB is added, the total noise level will NOT be 65 dBA Leq, it will stay close to 35 dBA Leq. This is why new pieces of equipment can often be added in places that already generate noise without significantly increasing the noise level – the existing equipment "drowns out" the new noise. As a rule of thumb, for point sources of noise, there will be 6 dBA loss for every doubling of the distance from the source. So, for example if a drilling rig noise is measured as 50 dBA at 200 metres from the rig, the noise level will be approximately 44 dBA at 400 metres.
- Noise levels for industrial facilities are strictly governed by regulation. For facilities under jurisdiction of the Alberta Energy and Utilities Board, including oil and gas, the requirements are stated in the Noise Control Directive (Directive 38).
- Directive 38 contains a large amount of information regarding how noise levels are determined and what the noise limits are for various situations. Noise limits are dictated by factors such as current housing density, proximity to extraneous noise sources such as roads and airplane flight paths and seasonal and time of day variants. The strictest limit is a Permissible Sound Level of 40 dBA Leq during the nighttime (22:00 – 07:00) and 50 dBA Leq during the daytime, measured at the nearest or most impacted residence.
- The operator recognizes that oil and gas facilities will have a noise impact. It supports the AEUB's statement in Directive 38: "While residents, particularly in rural areas, would generally prefer no increase in sound levels resulting from energy-related developments, it is sometimes not possible to eliminate these increases. However, if

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proper sound control features are incorporated into facility design in the planning stages, increases in sound levels can be kept to acceptable minimums.” The operator undertakes a number of activities with regard to this directive during the planning stage. The operator preferentially locates new compressor facilities near locations that already have high background noise, such as existing industrial sites and roads. When this is not possible locations as remote as possible from residents are chosen. There are strong incentives for the operator to do this since there are cost advantages to sharing surface locations and noise concerns are challenging to deal with. Note: As defined in EUB Directive 38, a heavily traveled road “generally includes primary and secondary highways and any other road where the average traffic count is at least 10 vehicles/hour over the nighttime period”.

References

EUB Directive 38

Interim Directive ID 99-08

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Dust and Traffic Management

Concerns

This practice is intended to address public concerns regarding the management of the impacts from dust and traffic during high activity periods.

Practices

- The operator will designate (through signage) road sections that limit the operator traffic to 50 km/h. The designated road sections will be determined through consultation with local municipal officials and residents and past operator experience.
- If the operator has long term, heavy haul routes, they will identify them on a map that will be shared with local residents (example: Major or Core Facilities).
- The operator will communicate to the community its desire to consult with local residents to identify “speed posted” and “dust sensitive” road sections during high activity periods. As a minimum it will: provide a phone number with the operator contact; create a hand-out that describes the operator’s traffic and dust management practices with the contact phone number, make this hand-out available to local community groups and at open houses, and include it in notification and consultation packages; take out advertisements that provide the contact number in local newspapers or similar publications at least twice per year; post signs in areas during high activity periods that provide a contact number for traffic and dust concerns.
- Dust control measures employed by the operator will use environmentally friendly and municipally (or other governing body) approved materials.
- The operator will not move heavy equipment during school bus hours on school bus routes. In the event a school bus is encountered during movement of heavy equipment, they will pull to the right as much as possible and stop – so long as this is deemed the safest course of action for all parties concerned.
- The operator will preferentially perform heavy equipment moves between 0600 and 2300 hours. During freeze/thaw periods, road use restrictions may require the operator to move equipment outside this timeframe. Even in these circumstances the operator will not move heavy equipment during school bus hours on school bus routes.
- The operator will employ water spraying for dust suppression for traffic moves that involve a heavy equipment convoy of 6 vehicles or more on dry gravel roads.
- Contractors and third party services working in the area on behalf of the operator are strongly encouraged to prominently display placards, logos, and/or unit numbers on vehicles, in an effort to visually identify the vehicle ownership. Where practical and feasible, contract operations staff is strongly encouraged to identify the operator they are under contract for.
- Landowners who witness or experience undesired behaviours of oil field related traffic should first contact the respective owner of the vehicle and/or company directly. If concerns remain unaddressed, the Landowner can contact a local energy company or police department of jurisdiction and report the incident. The operator can then assist in contacting the respective company, and follow up as required.

Background

County, MD and Alberta Transportation regulations dictate what roads the operator can utilize in moving equipment on and off lease. For the operator, heavy equipment moves include rig moves, completion equipment moves and occasionally the move of a facilities building. Permits issued by the Municipality and/or Alberta Transportation are required for moving heavy equipment and in periods where road conditions are rapidly changing, the route for moving equipment may be designated only minutes before the move is made (typically this is early in the morning after county inspectors have been able to access road conditions).

With minimum disturbance practices where roads are not constructed to well-sites, the operator makes a strong effort to minimize damage to surface land. Regulatory requirements as well as road and lease conditions limit the operator’s flexibility regarding timing of equipment moves.

References

Municipal Road Use Agreements

Municipal Land Use By-Laws

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Flaring

Concerns

This practice is intended to address public concerns regarding the use of flaring/venting and the resulting emissions, light and noise. Consistent with regulation, for this document “flaring” refers to all methods of waste gas combustion, including both flare stacks and incineration.

Practices

- The operator will only flare wells when or where “in-line” testing or “incineration” is not practical or feasible.
- On CBM wells the operator’s practice is to vent the well to remove the nitrogen (N₂) used to stimulate the coals. The well may then undergo a short period of production testing (typically flared). The well is then shut-in until a pipeline is constructed.
- The operator will give notice of all planned flaring in accordance with AEUB Directive 60. If the operator intends to flare:
 - for less than 4 hours and flare less than 30 e³m³ no notice will be given
 - for between 4 hours and 12 hours and less than 30 e³m³ the operator will give 24 hours notice to AEUB and residents within 1.5 km of the flare.
- Additional “Good Neighbour” notification, including notice for short duration events, should be conducted where members of the public have identified themselves as sensitive to emissions from the facility or as interested in receiving notice of planned flaring for other reasons.
- The operator will include in its flare notification a contact number for the operator and onsite personnel to use if they are concerned.
- The operator will investigate alternatives to flaring if requested as a result of personal consultation or discussions with those expressing hyper-sensitivity to emissions (health related) after flare notification.

Background

Flaring is the controlled burning of the produced natural gas that can’t be conserved or sold. Flaring uses a valuable natural resource and the company minimizes this practice to reduce its losses and minimize environmental impact. Flaring decisions are made judiciously and based on necessity.

The Alberta Energy and Utilities Board has strict rules regarding flaring. Of particular note is the requirement to provide notice of planned flaring activity.

Wellsite flaring is conducted when a well needs to be tested to determine if a pipeline and surface facilities should be constructed for the well. Under most circumstances, this type of flaring has a maximum duration of 72 hours. However, for CBM wells, flaring may extend beyond 72 hours. Other flaring events may be required to safely perform well maintenance / re-completion / work-over activities, or in case of emergencies.

Wellsite flaring is also conducted when the produced gas cannot be sold due to quality issues, most commonly from contamination by Nitrogen / CO₂ or Sand following the completion phase of downhole operations.

On occasion, flaring is used for emergency and maintenance depressuring of gas plants, compressor stations and pipelines. These situations are normally handled with permanent flare stacks located at the facilities. Such flare stacks will have a permanently lit pilot flame that is sometimes visible.

Incinerators and flare stacks do produce varying amounts of noise. Under normal conditions the flame in an incinerator would not be directly visible.

References

Alberta Energy and Utilities Board (EUB) Directive 60

EUB EnerFAQs No. 6

Alberta Ambient Air Quality Guidelines

University of Alberta Flare Research Project (Final Report Sep 2004)

CASA: March 2005 Flaring and Venting Recommendations for CBM Final Report March 2005 (www.casahome.org)

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Weed Control

Concerns

This practice is intended to address public concerns regarding proliferation of weed species, weed contamination from operator's lease sites and pipeline rights-of-way to off lease sites and aesthetics. This practice also addresses communication between the public and the operator with respect to weed management.

Practices

- The operator will manage weed control consistent with good agricultural practices, using qualified, and certified, persons to assist in the design and execution of weed control programs.
- It is strongly recommended that all members of the community, and members of the CSG, bring attention to identifying the emergence of problematic areas of weed infestations. Joint efforts within the group will help combat local weed propagation and control concerns.
- The operator will communicate the weed control practices to rural residents by making the practice available with handouts at open houses, and inclusion of weed control practices in their initial discussion with Landowners regarding development, and/or in Notification Packages.
- The operator will work closely with the local Municipal Agricultural Field representative to proactively identify and mitigate any potential for the propagation and spread of weeds.
- The operator will contact land users to discuss and inform them of weed control methods and measures, and timing of any proposed herbicide applications.
- Soil sterilants shall not be used.

Background

Weed control on the operator's sites must be consistent with good agricultural practice and responsible environmental protection. This includes appropriately selected herbicides by qualified persons and record keeping in order to ensure that overuse of herbicides does not occur. Overuse of herbicides can result in weed resistance and build up of residual chemicals in the soil profile and watersheds.

References

Alberta Weed Control Act

Applicable Municipal Legislation

Local Municipal Agricultural Field Representative

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Landowner Liability Management

Concerns

This practice is intended to address public concerns regarding potential liability and financial impacts as a result of the operator's development.

Practices

- The operator will investigate direct environmental damage claims. The operator will utilize appropriate experts to determine the type and extent of the damage. The investigating expert will advise the operator and the Landowner on the necessary reclamation methods to clean-up the damage, ensuring that the appropriate steps are taken to repair any off lease damage and prevent further damage both on and off lease. Timing for remediation will be discussed with the Landowner after the assessment is completed.
- The operator will thoroughly review and discuss any request from a Landowner or third party with respect to the undertaking (including cost) of an environmental assessment. In order to obtain the assessment, requesting parties must be able to provide or demonstrate direct and reasonable cause for the request (e.g.: a written request from a financial institution as part of loan / mortgage application, or purchase agreement).

Background

The operator has a strong commitment towards protecting and reducing the impact on the environment. In addition, this commitment extends into appropriate reclamation and remediation programs, where environmental damage is a result of oil and gas development activities. This commitment is reinforced by environmental law, which ultimately holds those responsible for environmental damage liable, regardless of any ownership change or changes in the environmental standards. Essentially, the government will track the historical changes in ownership (liability chain) until it finds a previous licensee with sufficient funds to remediate environmental damages. Current legislation and regulatory requirements are in place to ensure that Landowners and the Alberta public are well protected from financial losses due to environmental damage.

References

ILOR – Industry Landowner Relations Committee
Farmers Advocate

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Glossary

Abandonment: The permanent deactivation of a well, pipeline or seismic shot hole, ensuring there is no potential for damage to the hydrocarbon reservoir, soil, groundwater or the environment.

Acidizing: The injection of acids under pressure into the rock formation to create channels that allow the hydrocarbons to flow more easily into the wellbore.

Air drilling: The use of compressed air instead of mud as a drilling fluid to remove the cuttings: air drilling increases penetration rates but offers no control over downhole gas pressure or water in the subsurface formations or downhole gas pressure.

Annulus: The space between two concentric lengths of pipe or between pipe and the hole in which it is located.

Associated gas: Gas that is produced from the same reservoir along with crude oil, either as free gas or in solution.

Ambient Sound Level: The existing sound level in an area, including background noise from nature and traffic, but excluding noise caused by energy industry operations.

Basic Sound Level: Assumed to be 5 decibels above the ambient sound level, to allow for sound from industrial activities. It is the sound level commonly observed in designated land use areas that have industrial activities.

Benzene: A volatile organic compound that occurs naturally in petroleum and is also produced by the combustion of petroleum product.

Blowout: An uncontrolled flow of gas, oil or other fluids from a well.

Blowout Preventer (BOP): Equipment that is installed at the wellhead to control pressures and fluids during drilling, completion and certain remedial operation to restore production.

Bonus Payment: The amount paid at land auctions for Crown mineral rights.

BOP Stack: Several blowout preventers used in combination.

Cathodic Protection: A technique for preventing corrosion in metal pipelines and tanks that uses weak electric currents to offset the current associated with metal corrosion.

Cement Bond Log: A measurement that provides information on the height and efficiency of the cement layer that lies between the casing and the surrounding earth. It is measured with an acoustic device lowered into the well on a wire line.

Coalbed Methane: Natural gas generated and trapped in coal seams. Also referred to as natural gas from coal (NGC).

Coiled Tubing: A continuous, jointless hollow steel cylinder that is stored on a reel and can be uncoiled or coiled repeatedly as required; coiled tubing is increasingly being used in drilling, well completion and servicing instead of traditional tubing, which is made up of jointed sections of pipe.

Commingled Gas: A homogeneous mix of natural gas from various physical (or contractual) sources, or the combined production from two or more production zones.

Completion: The process of finishing a well so that it is ready to produce oil or gas. (perforating, fracturing, stimulating)

Compressor: A machine used to create, boost and maintain pressure in a gas pipeline. Compressors are driven by gas or electric engines designed to apply pressure to gas so that it will flow through process units and pipelines. Compressors may be located at the wellhead, battery, gas plant or along a pipeline. Long pipelines may require a series of compressor stations along the pipeline to boost pressure.

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Condensate: Hydrocarbons, usually produced with natural gas, which are liquid at normal pressure and temperature.

Conservation: The planning, management and implementation of an activity with the objective of protecting the essential physical, chemical and biological characteristics of the environment against degradation.

Crown land: mineral rights that are owned by the federal or provincial governments in Canada.

Decibel: A unit of measurement for sounds traveling through the air.

Decommissioning: The removal or neutralization of chemical substances or hazardous material from a facility or site to prevent, minimize or mitigate any current or future adverse environmental effects.

Deliverability: The amount of natural gas a well, field, gathering, transmission or distribution system can supply in a given period of time.

Directional (deviated) Drilling: A well drilled at an angle from the vertical by using a slanted drilling rig or by deflecting the drill bit; directional wells are used to drill multiple wells from a common drilling pad or to reach a subsurface location beneath land/or water where drilling cannot be done.

Drilling Mud: The fluid circulated down the drill pipe and up the annulus during drilling to remove cuttings, cool and lubricate the bit, and maintain desired pressure in the well.

Dry Gas: Natural gas from the well that is free of liquid hydrocarbons or water; gas that has been treated to remove all liquids.

Easement: A right-of-way or similar right over another's land.

Equivalent Land Capability: The ability of land that had been conserved or reclaimed to support various land uses similar to those that existed prior to an activity being conducted on the land, but not necessarily identical.

Facilitation: An informal process for resolving problems that involves a third party (person) who helps to guide discussions between two parties in dispute about an issue.

Farmout: An arrangement whereby the owner of a lease assigns some portion (or all) of the lease to another company for drilling.

Flaring: The burning of unwanted gases from a well or processing facility. It may be routine or occur due to an upset.

Formation: A designated subsurface layer that is composed throughout of substantially the same kind of rock or rock types.

Fracturing (fracing): The practice of pumping special fluids down the well under high pressure; fracturing causes the formation to crack open, creating passages for the reservoir fluids to allow more easily into the wellbore.

Gathering System: The system of pipelines, compressor stations and other related facilities that move raw petroleum products (oil, gas and water) from wellheads to processing plants and transmission facilities.

Groundwater: All water under the surface of the ground.

Intervenor: A person, business entity or other organization that is granted the right to participate in a regulatory hearing.

Landowner: A person whose name is on the Certificate of Title to the land issued under the Land Titles Act.

Land Reclamation: Reconditioning of the land to a state fit for some future use. It includes the stabilization, contouring, maintenance, conditioning, reconstruction and revegetation of the surface of the land.

Landspraying-while-drilling (LSWD): Either spraying drill cuttings onto cultivated land and cultivating to mix the cuttings with the top soil or spraying onto vegetated land and not incorporating it.

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Lease: An agreement between two or more parties where the owner of the surface and/or mineral rights grants another party the right to drill and produce petroleum substances in exchange for payment.

Lessee: The person or company that leases land from the lessor.

Lessor: The person who leases lands to the lessee.

Logs: Detailed depth-related records of certain significant details of an oil or gas well; usually obtained by lowering measurement instruments into a well.

Mediation: Required when those involved in a dispute are assisted by a neutral and impartial third party-the mediator. Mediators work out a process to minimize conflict and help the parties make their own, mutually acceptable decisions.

Migration: The movement of natural gas, crude oil and /or water through porous and permeable rock.

Mineral Rights: The rights to explore for and produce the resources below the surface. In the petroleum industry, mineral rights can also be referred to as "land".

Occupant: A person, other than the owner, who is in actual possession of the land, or to be shown as a person who has an interest in the land on a Certificate of Title.

Operator: A company that is carrying out some activity. It includes the holder of a licence, approval, registration, or holder of a permit.

Perforate: A method that creates small holes through the casing, cement and into the producing formation of a well. The holes provide channels for gas and/or oil to flow into the well.

Permeability: The capacity of a reservoir rock to transmit fluids; how easily fluids can pass through rock.

Permissible Sound Level: The maximum sound level coming from a facility that is allowed. It is measured 15 metres from the nearest or most affected dwelling. The permissible sound level is based on the basic sound level, adjusted for specific aspects relating to the facility or environment and the duration of the noise.

Porosity: The volume of spaces within rock that might contain oil and gas; the open or void space within rock – usually expressed as a percentage of the total rock volume. Thus porosity measures the capacity of the rock to hold natural gas, crude oil or water.

Production Casing: The lining put into a well. The last string of casing set in a well is the production casing-a tubular steel pipe threaded on each end and connected with couplings. It extends the total length of the wellbore to ensure safe control of production, protects against ground water contamination, isolates the wellbore and keeps rock formations from slumping into the well bore.

Production Tubing: Steel pipe inside the production casing used to flow the petroleum from the producing zone to the surface.

Public Consultation: The process of involving all affected parties in the design, planning and operation of oil and gas exploration and development activities.

Public Land: Lands administered under the *Public Lands Act*, such as a grazing lease disposition.

Reclamation: The removal of equipment or buildings or other structures; the decontamination of buildings or other structures or land/or water; the stabilization, contouring, maintenance, conditioning or reconstruction of the surface of the land; any other procedure, operation or requirement specified in the regulation under the *Environmental Protection and Enhancement Act*.

Reclamation Certificate: The certificate issued by an inspector authorized by Alberta Environment to indicate that the reclamation of an oil or gas well, facility site or pipeline has been carried out satisfactorily.

Remediation: The removal or neutralization of chemical substances from a site to mitigate or prevent any adverse effects. (Decommissioning or Decontamination)

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Reservoir (Pool): A porous and permeable underground rock formation containing a natural accumulation of crude oil or natural gas that is confined by impermeable rock or water barriers, and is separate from other reservoirs.

Right-of-Entry Order: An order of the Surface Rights Board granting an operator the use of certain area of the land surface for operations such as drilling and roadway construction.

Right-of-Way: A legal right to pass through land owned by another. A term used for land set aside for a road, pipeline, or other infrastructure.

Roach: Excess soil placed over the ditch line to compensate for soil settlement.

Royalty: The owner's share of production or revenues retained by government or freehold mineral rights holders. The royalty is usually based on a percentage of the total production and the rate may vary according to the selling price.

Setback: The distance required to separate a project, such as a well or pipeline, from another activity, such as human settlement, water well or water course.

Stakeholder: A person with an interest in an issue. This may include nearby residents, recreational users of land, local business, environmental groups and various government agencies as well as the company, its staff and contractors.

Stimulating: A technique for improving production from a reservoir; stimulation may involve acidizing, fracturing or simply cleaning the wellbore.

Subsoil: A common term used to describe the horizon of soil below the topsoil.

Surface Casing: The first string of casing put into a well; it is cemented into place and serves to shut out shallow water formations and as a foundation for well control.

Surface Rights: The rights to work on the surface of the land.

Suspended Well: A well site that for economic, environmental or other reasons, is not operating, but may have the potential to operate in the future. The well will still have the wellhead equipment present and may or may not have produced in the past.

Synergy Group: A generic term used to describe a community-based group of people representing Landowners and residents, local industry operators, government regulatory agencies and municipal officials who meet to identify and address issues related to oil and gas development and to reach mutually acceptable solutions.

Topsoil: The dark colored organic surface horizon of soil.

Unconventional Gas: Natural gas that requires specialized technology to remove it from the ground. Unconventional gas sources are generally categorized as tight sands gas, shale gas or natural gas from coal.

Wellbore: A hole drilled or bored into the earth, cased with pipe, for the production of oil or gas.

Wellhead: the equipment used to maintain surface control of a well.

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Appendix 2 Sound Levels of Familiar Noise Sources

Source ¹	Sound Level (dBA)	Source ²	Sound level at 1 m (dBA)
Bedroom of a country home	30	Freezer.....	38-45
Soft whisper at 1.5 m	30	Refrigerator	34-53
Quiet office or living room.....	40	Electric heater	47
Moderate rainfall	50	Hair clipper.....	50
Inside average urban home.....	50	Electric toothbrush	48-57
Quiet street	50	Humidifier	41-54
Normal conversation at 1 m	60	Clothes dryer.....	51-65
Noisy office.....	60	Air conditioner	50-67
Noisy restaurant.....	70	Electric shaver.....	47-68
Highway traffic at 15 m.....	75	Water faucet.....	62
Loud singing at 1 m.....	75	Hair dryer	58-64
Tractor at 15 m.....	78-95	Clothes washer	48-73
Busy traffic intersection	80	Dishwasher	59-71
Electric typewriter	80	Electric can opener	60-70
Bus or heavy truck at 15 m.....	88-94	Food mixer	59-75
Jackhammer.....	88-98	Electric knife.....	65-75
Loud shout	90	Electric knife sharpener.....	72
Freight train at 15 m	95	Sewing machine	70-74
Modified motorcycle	95	Vacuum cleaner	65-80
Jet taking off at 600 m.....	100	Food blender.....	65-85
Amplified rock music	110	Coffee mill	75-79
Jet taking off at 60 m.....	120	Food waste disposer	69-90
Air-raid siren.....	130	Edger and trimmer	81
		Home shop tools	64-95
		Hedge clippers	85
		Electric lawn mower	80-90

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