Overview for Landowners

What to Expect When You're Expecting a Well

If there's an unconventional oil or gas well in your future, you probably have questions. This brochure is designed to give you general information – and an overview of the life cycle of a typical well. Your well might be in production for 10 to 40 years. However, most of the activity on your land will occur in the very early stages.



Canada's Oil and Natural Gas Producers



12 MONTHS



Consultation and Resource Identification

TIMING 12 MONTHS

DISRUPTION LEVEL

Production companies identify well locations like yours based on favourable geologic and seismic data. But before any activity begins, they must consult with you to negotiate

access to your land. They must also secure mineral rights, notify and consult the community, conduct any necessary environmental assessments, and prepare a detailed drilling plan. Safety and emergency-response procedures must also be in place.

Throughout this – and every phase in the life cycle of a well – strict regulations are in effect to ensure resources are accessed safely, efficiently and with minimal environmental impact.



1 - 3 MONTHS



Preparation of your site may include an evaluation of sour gas probability, construction of access roads, site excavation, installation of the well pad and drilling rig, and drilling

Site Preparation

TIMING 1 - 3 MONTHS DISRUPTION LEVEL

MEDIUM

of the initial pilot hole. During this phase, there will be increased traffic and noise on your property. However, every effort will be made to mitigate disturbance, and rig setup will emphasize safety and environmental protection.

DISRUPTION LEVEL



3 - 6 MONTHS



Drilling and Resource Evaluation

TIMING 3 - 6 MONTHS

DISRUPTION LEVEL HIGH A drilling rig will be erected, a well will be drilled, and surface casing installed and cemented in place to protect water resources. Production casing and cement are

installed as the well is drilled to its full depth and length – far below freshwater sources. Experts evaluate your well's potential by logging, testing and taking core and cutting samples as drilling proceeds. The drilling process could be repeated if the decision is made to drill multiple wells from the same pad.

During drilling, the profile and footprint of your site will increase, and you'll notice a spike in activity.



2 - 3 MONTHS



Completion and Optimization

TIMING 2 - 3 MONTHS DISRUPTION LEVEL HIGH If your well shows potential, the drilling rig is removed and production tubing is inserted to accommodate flow from the production zone to the wellhead, while protecting

water resources. The casing is perforated and fluids are injected at high pressure through the perforations, causing adjacent rock to fracture. This stimulation technique, known as hydraulic fracturing, allows oil or gas to flow to the wellbore more easily. If your well does not show production potential, it will be sealed (often referred to as plugged) and the land reclaimed (see phase six).



~30 YEARS



After completing the well, surface equipment will be installed to safely gather and handle the oil and gas. The nature of the equipment varies. You may see pumps, vessels,

Production and Maintenance

TIMING ~30 YEARS

DISRUPTION LEVEL

piping, tanks and emergency shutdown valves, some or all of which will remain on your property. Over the life of the well – up to 40 years – a crew will visit your site routinely to conduct safety checks and perform necessary maintenance.

DISRUPTION LEVEL



5 YEARS



When your well is no longer producing, a series of cement plugs are set into the wellbore. This permanently contains and isolates the fluids. Testing is performed to confirm that

Closure and Reclamation

TIMING 5 YEARS

DISRUPTION LEVEL

fluids will not migrate to other geologic zones through the wellbore.

Your operator will then return your land to its original state. Within a few months, you'll see activities like replacement of topsoil and revegetation or reforestation. Government regulators will inspect your land to certify that reclamation has been properly completed.

DISRUPTION LEVEL





Who owns the oil and gas on my property?

In Canada, most mineral and subsurface rights are held by provincial and federal governments. Exploration and production companies acquire these time-limited rights at government auctions.

Do I have to allow access to my land?

A land agent representing the company will negotiate a surface lease agreement with you. Talks cover everything from well locations to compensation for land disturbance and the presence of facilities. Discussions may also cover livestock, crops, buildings, roads, fences and steps that will be taken to minimize impact.

If negotiations fail, the company may approach the Surface Rights Board to help resolve the conflict.

What if I have tenants on my property?

The company must consult with you and any occupants of your property. However, only the landowner negotiates legal agreements.

Will my neighbours be consulted?

Engaging in oil and gas activity means engaging your community. Prior to launching any project, exploration and production companies must notify and consult with you and your neighbours so that anyone who might potentially be affected has an opportunity to ask questions or voice concerns in accordance with regulatory requirements.

What about the environment?

Regulations protect you and the environment by ensuring the safe, responsible and efficient development of energy resources. Before starting a project, a company must prepare an assessment of the property, including an evaluation of potential impacts to wildlife, and surface and subsurface water resources.

What happens first?

Producers assess a site's potential by using seismic data to map underground rock formations and create detailed models of the underlying geologic structure. Geophysicists may already have archived seismic data for your region, along with subsurface information from existing wells. However, if more information is needed, they'll negotiate access for a seismic survey of your property.

What does a seismic survey entail?

Lines of sensitive receivers called geophones will be laid out along a grid. Vibrations are created at shot points on the surface. The energy is reflected back as seismic waves and recorded by the geophones.

Will my land be disturbed?

Today's seismic operations are geared to minimal disturbance. Companies often work with local conservation groups to plan surveys that make optimal use of existing trails.





If my site shows potential, what happens next?

A land agent representing the company will meet with you with a view to negotiating a surface lease. Once access to your site is settled, along with permits and a detailed drilling plan, your site will be prepared for the drilling of a well. If negotiations fail, the company may approach the Surface Rights Board to resolve the conflict.

What can I expect during site preparation?

This phase includes construction of roads, excavation, installation of a well pad for the rig, drilling of an initial pilot hole and placement of conductor/string pipe. You'll notice increased traffic, and more dust and noise.

How do companies minimize the impact?

First and foremost, companies will keep you informed. They'll also locate equipment and manage work activities to reduce disruption and mitigate noise. Dustsuppression techniques will be employed and matting will be used to protect sensitive landscapes. Sensitive species and habitats will be identified and avoided or impacts mitigated.





What happens during drilling?

Once the drilling rig has been erected, a well will be drilled to evaluate the potential of the resource, with data collection, testing and core-sampling conducted as drilling proceeds. Production casing and cement are installed, and the well is drilled to full depth. Multiple wells may be drilled from the same well pad.

Will this be an "unconventional" well? What exactly is an unconventional well?

When a pool of oil or natural gas flows naturally, or can be easily pumped to the surface, it's referred to as conventional. When oil and natural gas are trapped in rock with low permeability, techniques like horizontal drilling and hydraulic fracturing allow producers to access these "unconventional" resources.

After decades of production, there has been a decline in conventional resources, and most new wells are unconventional.

How much disturbance will there be during drilling?

You and your neighbours will notice a significant increase in activity and noise as equipment is installed and commissioned. Traffic will also increase as personnel and supplies are transported to and from the site. However, the time period is relatively short, and service companies will plan their activities to minimize disturbance and mitigate traffic.

Will the drilling rig be on my land permanently?

The drilling equipment for the initial well is bulky, but it's only in place temporarily. Production equipment is far less obtrusive. The well's footprint – and the activity level – will decrease considerably when production begins.





What will I see next?

After the steel casing and a permanent wellhead have been installed, drilling equipment will be removed. The site's footprint and activity will then spike as fracturing equipment and materials are trucked in – pipe, pumpers, tanks, water and drilling fluids – and waste is hauled away. In addition to an increase in traffic, noise and dust, accommodating the workforce may put pressure on local infrastructure.

What is fracturing?

To encourage oil and gas to flow, water mixed with sand and a small percentage of chemicals is pumped down the wellbore at high pressure, enlarging perforations in the wellbore casing and causing adjacent rock to fracture. The sand props open the fractures, providing a pathway for the natural gas or oil.

Is fracturing safe?

It's a safe, proven technology. Over the past 60 years, more than 175,000 wells in western Canada have been safely stimulated using hydraulic fracturing.

What stops fluids from getting into my groundwater?

Unconventional wells are typically two to three kilometres deep hundreds of metres pelow the deepest drinkable groundwater. Fracturing takes place only in oil or natural gas zones, well below aquifers, and wells are designed and constructed to prevent fluids from migrating outside the wellbore. There are multiple layers of steel and external cementing above and below the aquifers. Wellbore integrity is tested before and after fracturing.

Does fracturing pollute the air?

During drilling and fracturing, most emissions are created by rig and equipment engines. Methane and carbon dioxide emissions can also occur due to flowback following a fracture or during production.

To minimize emissions, companies often apply techniques to recover flared or vented emissions. They also ensure that leaks are located and stopped quickly.

Does fracturing involve dangerous chemicals?

Nearly 99% of the fluid is composed of water and sand, which is mixed with chemicals to produce the fracturing fluid that reduces friction and bacteria in the well. While a few of these chemicals are classified as hazardous, most are concentrates of chemicals found in household products.

Disclosure of hydraulic fluid additives is a regulatory requirement of industry in Alberta and British Columbia. These disclosures can be found at the Frac Focus Chemical Disclosure Registry (www.fracfocus.ca).

Does fracturing use a lot of water?

Fracturing requires large volumes of water. Many companies employ water-saving or recycling techniques.

What happens to the water and fluid used in fracturing?

The water that flows back from the well is recycled wherever possible. It is sometimes injected into underground formations thousands of feet below drinking-water aquifers. If injection is not possible, evaporation ponds may be used. Impermeable liners prevent pond water from seeping into the soil. Water may also be transported to an authorized disposal site.

Does fracturing cause the ground to shake?

The risk of a tremor is assessed before drilling begins. Wells are rarely drilled in an area where there is a natural fault. If a fault does exist, fracturing might create a vibration similar to what you experience when a heavy truck drives by.

Does the fracturing equipment stay on my land?

Fracturing equipment will be removed, along with all drilling and completion equipment, dramatically reducing the footprint of the site.





Am I responsible for keeping the site tidy?

No. The production company is responsible for maintenance for the duration of the lease.

If the well is successful, what equipment will be installed?

There will be a short period of construction typically a few weeks - to install surface equipment, and gathering and handling systems. Surface equipment depends on whether your well is producing natural gas or oil. Your site might require a pumpjack or an assembly of valves and pipes connected to the wellhead. The handling system might involve tanks and an underground pipeline.

Once gathering and handling systems are in place, your site will remain relatively quiet and disturbance will be minimal. You can expect to see a crew on site periodically to conduct routine safety checks and maintenance.





What happens when the well stops producing?

When the well reaches the end of its commercial life, a crew will decommission it. They'll remove the equipment and install a series of cement plugs to prevent fluid from migrating outside the abandoned well. The well casing will be cut off below ground level and a steel plate welded on.

Will any equipment remain on site?

At ground level, there will be no evidence of the well ever having been there. Details of your well's location are kept in provincial government records for future reference.

How soon will my land be restored?

When a well finishes producing – anywhere from 10 to 40 years – the operator must, as soon as is practical, take action to restore the land. You should notice reclamation activity a few months after the well is closed.

What does reclamation involve?

Reclamation plans may include:

- » Reintroducing appropriate vegetation to create a functional, aesthetically pleasing landscape.
- » Replacing topsoil that has been lost during operations.
- » Revegetation or reforestation using appropriate native species.
- » Assessing seedling plants one year after planting and then at five-year intervals. Soil is also assessed for chemical and physical properties.
- » Certification by government regulators, confirming that reclamation has been properly completed.

What if I notice problems on the site after reclamation is complete?

Certification releases exploration and production companies from their land leases. However, in Alberta operators are held to a 25-year liability for surface reclamation issues and a lifetime liability for contamination. In B.C., there is no time limit on liability, which means any future reclamation or contamination issues are the responsibility of the operator, not the landowner.



About CAPP

The Canadian Association of Petroleum Producers (CAPP) represents companies, large and small, that explore for, develop and produce natural gas and crude oil throughout Canada. CAPP's member companies produce about

90 per cent of Canada's natural gas and crude oil. CAPP's associate members provide a wide range of services that support the upstream crude oil and natural gas industry. Together CAPP's members and associate members are an important part of a national industry with revenues of about \$110 billion a year. CAPP's Mission, on behalf of the Canadian upstream oil and gas industry, is to advocate for and enable economic competitiveness and safe, environmentally and socially responsible performance.

Need More Answers?

Government/Regulator Resources

Alberta Energy Regulator (AER) www.aer.ca

Alberta Environment and Sustainable Resource Development (AESRD) www.environment.alberta.ca

Alberta Surface Rights Board www.surfacerights.alberta.ca

BC Oil and Gas Commission (BCOGC) www.bcogc.com

Environment Canada www.ec.gc.ca

FracFocus/FracFocus Chemical Disclosure Registry www.fracfocus.ca Government of British Columbia Ministry of Energy and Mines www.gov.bc.ca/ener

Manitoba Mineral Resources (MMR) www.manitoba.ca/iem/ petroleum/index

National Energy Board (NEB) www.neb-one.gc.ca

Natural Resources Canada www.nrcan.gc.ca

Saskatchewan Ministry of the Economy www.economy.gov.sk.ca/ OilGas

Saskatchewan Publications Centre www.publications.gov.sk.ca/

legislation.cfm

Surface Rights Board (B.C.) www.surfacerightsboard.bc.ca

Surface Rights Board of Arbitration (Saskatchewan) www.economy.gov.sk.ca/ SurfaceRights

Surface Rights Board of Manitoba www.manitoba.ca/iem/ board/srboard

Industry Resources

Cambridge Energy Research Associates (CERA) www.cera.com

Canadian Association of Energy and Pipeline Landowner Associations www.landownerassociation.ca

Canadian Association of Petroleum Producers (CAPP) www.capp.ca

Canadian Energy Research Institute (CERI) www.ceri.com

Canadian Gas Association

Canadian Society for Unconventional Resources (CSUR) www.csur.ca

Clean Air Strategic Alliance (CASA) www.casahome.org

International Energy Agency (IEA) www.iea.org

Glossary

Additive: Any substance or combination of substances comprised of chemical ingredients found in hydraulic fracturing fluid which is added to a base fluid in the context of a hydraulic fracturing treatment. Each additive performs a certain function and is selected depending on the properties required.

Base fluid: The base fluid type, such as water or nitrogen foam, used in a particular hydraulic fracturing treatment. Water includes fresh water, brackish or saline water, recycled water or produced water.

Flowback: The flow of fracturing fluid back to the wellbore after treatment is completed.

Fracturing fluid: The fluid used to perform a particular hydraulic fracturing treatment and includes the applicable base fluid and all additives.

Fracturing fluid waste:

An unwanted substance or mixture of substances that results from the hydraulic fracturing operation, not including flowback.

Free natural gas: Free gas is defined as gas that readily comes out of solution at atmospheric pressure and ambient temperature.

Fresh (non-saline) groundwater:

Groundwater that has a total dissolved solids (TDS) content less than or equal to 4,000 mg/L or as defined by the jurisdiction.

Gas migration: A flow of gas that is detectable at surface outside of the outermost casing string. It refers to all possible routes for annular gas entry and propagation through and around the cement sheath.

Induced seismicity:

Seismic events that can be attributed to human activity. Seismicity can be induced by geothermal energy extraction, mining, dam building and hydraulic fracturing.

Produced water: Water naturally present in the reservoir or injected into the reservoir to enhance production. Produced as a co-product when gas or oil is produced.

Producing zone: The zone or formation from which natural gas or oil is produced.

Propping agent

(proppant): Typically noncompressible material, most commonly sand, added to the fracturing fluid and pumped into the open fractures to prop them open once the fracturing pressures are removed.

Saline groundwater:

Groundwater that has a total dissolved solids (TDS) content more than 4,000 mg/L or as defined by the jurisdiction.

Seismicity: The frequency and magnitude of seismic activity in a given area.

Shale gas, tight gas and

tight oil: For the purposes of this document, shale gas, tight gas and tight oil refer to unconventional resources from lowpermeability reservoirs being developed using horizontal wells with multi-stage hydraulic fracturing.

Surface water: Water collecting on the ground or in a stream, river, lake, sea or ocean, as opposed to groundwater.

Waste water: Spent or used water with dissolved or suspended solids, discharged from homes, commercial establishments, farms and industries.

Wellbore: For the purposes of this document, a wellbore is defined as the open hole that is drilled prior to the installation of casing and cement.

CAPP CANADIAN ASSOCIATION OF PETROLEUM PRODUCERS

Canada's Oil and Natural Gas Producers

2100 350 7 Avenue SW Calgary Alberta Canada T2P 3N9 T: 403 267 1100 F: 403 261 4622

capp.ca

Disclaimer: This brochure does not provide legal advice and landowners are responsible to know their rights. This brochure provides general information of what is typical and actual activities may differ.

This publication was prepared by the Canadian Association of Petroleum Producers (CAPP). While it is believed that the information contained herein is reliable under the conditions and subject to the limitations set out, CAPP does not guarantee the accuracy or completeness of the information. The use of this brochure or any information contained will be at the user's sole risk, regardless of any fault or negligence of CAPP.

[®] Material may be reproduced for public non-commercial use provided due diligence is exercised in ensuring accuracy of information reproduced; CAPP is identified as the source; and reproduction is not represented as an official version of the information reproduced nor as any affiliation.



Printed on 100% post consumer waste recycled paper

2014 - 0017 June 2014