



OIL AND GAS EXPLORATION, PRODUCTION AND LEGISLATION ON ONTARIO FARMS

Petroleum Resources Centre (Ministry of Natural Resources)

INTRODUCTION

Most of the crude oil and natural gas used in Ontario comes from western Canada, but significant quantities are also produced from wells located in southern Ontario. Oil and gas are valuable resources and their production can be a source of revenue for landowners.

The North American petroleum industry began in 1858 in Lambton County. In the resulting rush of fortune-seekers, thousands of wells were drilled. As many as 50,000 wells may have been drilled in Ontario, although records are available for only 20,000. Currently 1100 oil wells and 1200 gas wells produce in commercial quantities. There are also some *private gas wells* used for non-commercial purposes in parts of southern Ontario.

ORIGIN AND OCCURRENCE OF OIL AND NATURAL GAS

Oil and gas are found in sedimentary basins; rocks formed under ancient seas. There are four sedimentary basins in Ontario: the Appalachian, Michigan, Hudson Bay and Moose River basins. Although all of these basins have potential for oil and natural gas exploration, current commercial production occurs only in southern Ontario. There is no oil or natural gas contained in the crystalline rocks of the Canadian Shield.

Water may be trapped along with hydrocarbons. This *formation water* contains dissolved minerals and in Ontario is usually very salty. Some formation water also may contain large concentrations of dissolved hydrogen sulphide. In southern Ontario, fresh water is usually confined to the glacial sediments overlying the bedrock or the uppermost few metres of bedrock. Wells drilled too deep into the bedrock are likely to encounter salty and/or mineralized formation water.

Oil and natural gas accumulations in sedimentary rock, either alone or in combination with each other or with water, are known as reservoirs or pools (spaces or "pores" trapped by layers of impermeable rock). Some common oil and gas

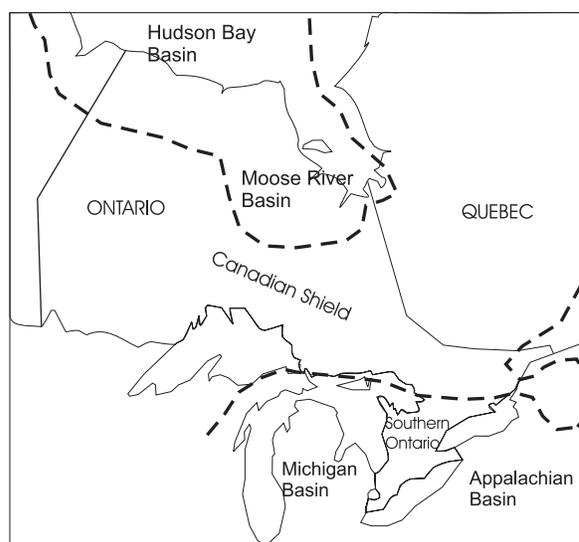


Figure 1. Sedimentary basins and potential petroleum and salt resource areas of Ontario.

pools or "traps" are illustrated in Figure 2. In southern Ontario, commercial oil and gas pools have been discovered in several different subsurface layers, at depths varying from 100 m (328 ft) to over 1100 m (3600 ft).

LEASING OF MINERAL RIGHTS

In most of southwestern Ontario, the landowner owns the rights to any minerals, including oil and gas, beneath his property. Individuals rarely drill on their own property due to the speculative nature, high cost, and technical complexity of drilling. Resource companies carry out most of the exploration. To obtain the right to search for oil and gas or other minerals, companies usually lease the mineral rights from the landowner. Most petroleum companies in Ontario use professional land leasing companies to act on their behalf. Legal ownership of mineral rights may be determined by searching the title at the local Land Registry Office.

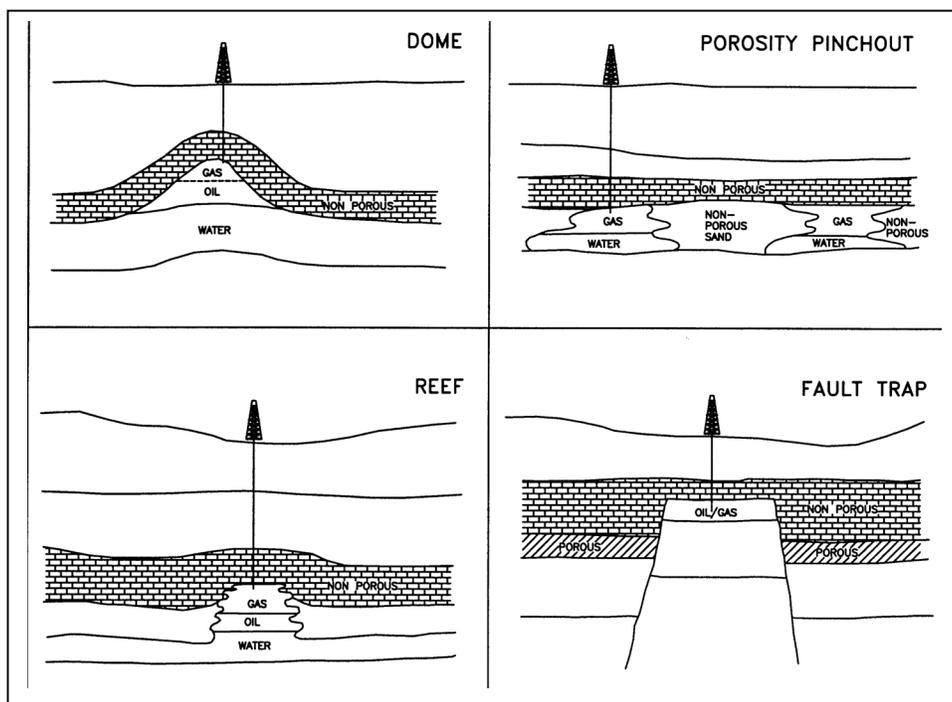


Figure 2. Common types of traps in which oil and gas are found in southern Ontario.

A *Petroleum and Natural Gas Lease* allows for the exploration and production of oil and/or natural gas. A *Gas Storage Lease* allows for natural gas, usually from western Canada, to be stored in underground natural gas reservoirs for future use. A *Gas Storage Lease* is generally different from a *Petroleum and Natural Gas Lease*. Leases are legal agreements and prior to signing the landowner may wish to consult with legal counsel familiar with oil and gas issues.

In some areas of the Niagara Peninsula, especially the southern portions of the regional Municipalities of Haldimand-Norfolk and Niagara, the probability of finding natural gas is known to be quite high. In these areas some landowners have drilled their own gas wells or have taken over ownership and operation of commercial gas wells that are no longer economically viable. **These owner-operators are responsible to properly plug the wells when gas is no longer being produced, and to ensure compliance with applicable government regulations and standards.**

EXPLORATION

Exploration for oil and natural gas is a very risky expensive and technically complex business. The typical cost of drilling and completing a commercial gas or oil well in Ontario ranges from \$100,000 to \$500,000.

Oil and gas wells drilled in Ontario must comply with the *Oil, Gas and Salt Resources Act* and its Regulations and Operating Standards. These regulations outline the

application process and the requirements for all drilling, production, suspension and abandonment of oil and gas wells in Ontario.

When drilling a well, measures must be taken for safety, environmental protection and resource management. These include use of appropriate equipment, design of the wellbore and the construction of the well. When a commercial oil or gas zone is encountered, the well is completed for production with casings, tubings, cement and wellhead assembly as shown in Figure 3 on the next page.

The surface installation or wellhead for gas wells consists of a series of valves that control the flow of gas from the reservoir. A

gathering pipeline will transport the gas to a larger *transmission pipeline*, operated by a natural gas utility. At most oil wells, a pump jack is installed and one or more tanks are also installed to store the production. Large tanker trucks pick up the oil for shipment to the oil terminals.

SOME OPERATIONAL CONCERNS WITH A GAS WELL

Natural gas produced from a pool is usually colourless, odourless and tasteless. Commercially distributed natural gas has a mercaptan added to give it a distinctive odour. Sometimes hydrogen sulphide (rotten eggs odour) may be present. Hydrogen sulphide is poisonous and should be treated with great caution. It is fatal to humans in small concentrations and causes rapid corrosion in pipes.

Since the initial pressure in reservoirs may be up to several thousand kilopascals, (hundred pounds per square inch) properly trained and qualified individuals must make all connections and choose the correct materials for the situation.

Many of the natural gas reservoirs in Ontario contain small amounts of water. Care must be used to dispose of any such water where it will not contaminate any fresh water aquifers or surface water sources, and does not create a hazard or cause a problem for others.

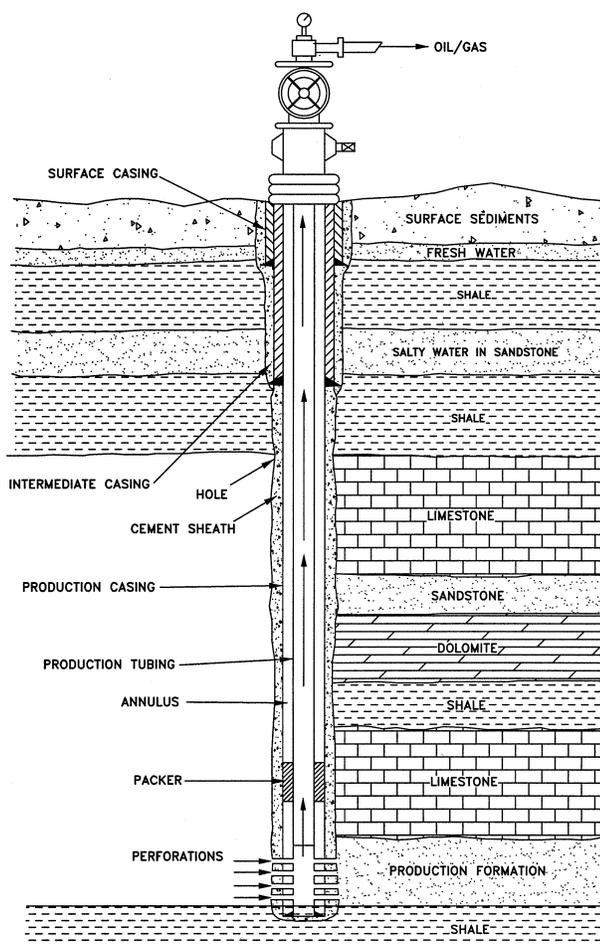


Figure 3. Typical well construction.

OIL, GAS AND SALT RESOURCES ACT

The *Oil, Gas and Salt Resources Act* (OGSRA) sets out the regulatory requirements for oil and gas wells, oilfield fluid disposal, hydrocarbon storage, and salt solution mining in the province of Ontario. This includes private gas wells that are used by some landowners for a non-commercial purpose i.e. home heating. The *Act*, its regulations and standards became law June 27, 1997. It is illegal to drill, operate or engage in any activity on a well except in accordance with a licence issued by the Ministry of Natural Resources (MNR). Commercial well operators must pay annual licence fees and establish a trust fund to ensure eventual plugging of the well and rehabilitation of the site.

All unplugged wells must be registered with the MNR. A registration application must include the following – the name and status of well(s), location of well(s) by lot, concession and geographic township, and the name, address and telephone number of the operator (owner). The application for registration also includes a scaled map showing the location of the well and associated works, such as dehydrator equipment and pipelines, relative to lot and concession boundaries and the buildings where the gas is in use.

In addition to registration, all wells must be licenced. Wells with a permit under the former *Petroleum Resources Act* are deemed to be licenced, and the landowner needs only to provide the permit number on the scaled map with the registration application. If no permit number is available, a licence application must be completed for each well.

Licence fees and security do not apply to private gas wells. A private gas well is a “licenced gas well located on land for which the operator owns both the surface rights and the mineral rights and the gas produced from the well is and remains for the operator’s private use, is not used in relation to a business or commercial enterprise of the operator and is not sold by the operator.”

Plugging and Abandonment

Wells no longer used for the purpose for which they were drilled or wells that did not produce oil or gas must be plugged according to provincial standards under the Oil, Gas and Salt Resources Act and the surface must be rehabilitated. Plugging should be done as soon as possible after the well is taken out of service. Prolonged delays may increase plugging costs due to deterioration of well equipment and problems caused by debris falling into or thrown down the well bore. The Ministry of Natural Resources has the authority to order the plugging of wells.

Plugging consists of the placement of cement plugs at intervals in the well bore to prevent the movement of fluid up or down the well, thus preventing ground water contamination and potentially hazardous discharge to the surface. During plugging, some of the well casing may be removed and salvaged. An alternative plugging procedure, requiring more cement but sometimes technically simpler, is filling the entire well bore with cement by injecting cement under pressure from the bottom of the well upwards.

If fluids are escaping from the well there will probably be surface indications including staining of the soil, vegetation die-off, unusual wetness, and possibly a hydrogen sulphide odor from leaking sulphur water. If there is no leakage, there will often not be any surface evidence of the presence of a former well and a more exhaustive search may not be justified. If the site is intended for development, any former wells will be uncovered during excavation of the site and can usually be identified by the presence of old casing in the old well bore.

Properly plugged and abandoned wells do not pose a hazard to non-structural uses of the land surface. However it is recommended that buildings not be constructed directly over a plugged well without undertaking further technical evaluations.

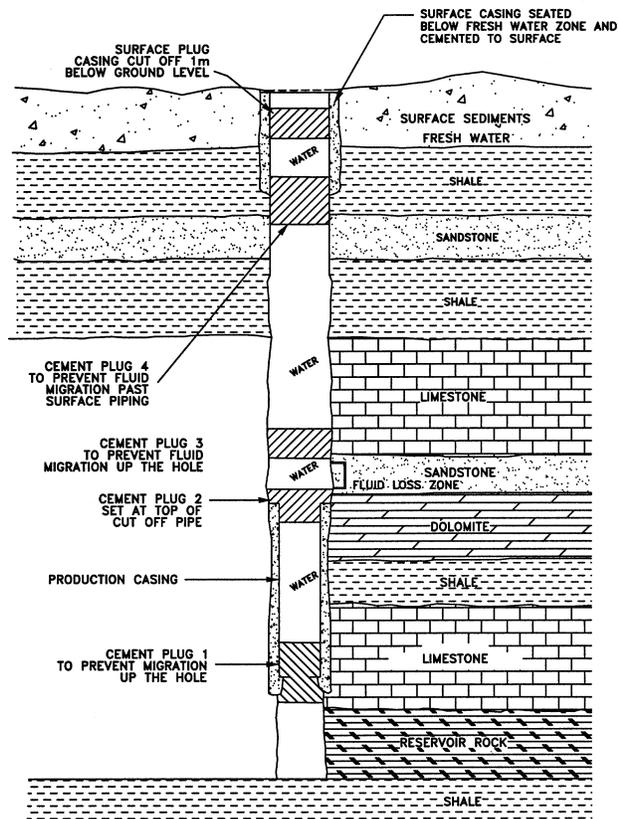


Figure 4. Typical plugged well.

SUMMARY

Mineral rights in most of Southern Ontario are owned by the surface rights owner. If oil or gas is present under the property, the owner may profit from their use by either leasing the rights and collecting a royalty for any production or, in the case of gas, he may produce the gas for his own use on the property. The requirements for all the oil and gas wells are covered by the Oil, Gas and Salt Resources Act (OGSRA). This act also requires all unplugged wells to be licenced and *works* associated with a well must be registered with the Ministry of Natural Resources. Wells that are no longer in use must be plugged in accordance with the standards of the OGSRA.

Sources of Information

Ontario Ministry of Natural Resources
 Petroleum Resources Centre
 659 Exeter Road
 London, Ontario N6E 1L3
 Telephone 519-873-4633
 Facsimile 519-873-4645

The Petroleum Resources Centre of the Ministry of Natural Resources employs operational, geological, engineering, inspection, and support staff. In addition to their regulatory functions, staff also provide information relevant to oil, gas and salt resources in the province, including maps showing location of existing oil and gas related wells.

Ontario Petroleum Institute
 555 Southdale Road East, Suite 104
 London, Ontario N6E 1A2
 Telephone 519-680-1620
 Facsimile 519-680-1621

The Ontario Petroleum Institute is a non-profit organization formed in 1964 to foster and advance the interests of those who are engaged in, or who are directly or indirectly connected with the oil, gas and gas storage industries.

Oil, Gas and Salt Resources Library
 669 Exeter Road
 London, Ontario N6E 1L3
 Telephone 519-686-2772
 Facsimile 519-686-7225

The library is a repository of public information on oil, gas, hydrocarbon storage, salt solution mining and related wells in Ontario. It includes core and cuttings samples from drilling operations, file information on over 20,000 wells, well location maps, and an extensive collection of published papers and reports on the subsurface geology and oil, gas and salt resources of Ontario. The library is open 8:15 a.m to 4:30 p.m., Monday through Friday. Modest fees are charged for the use of the facilities.

Acknowledgements

This document was prepared by **Jug Manocha**, P.Eng, and **Terry Carter**, Geologist at the Petroleum Resources Centre of the Ministry of Natural Resources. Special thanks to the **Ontario Federation of Agriculture** for their review and comments. Reviewed by **James P. Mysli**, P.Eng, Engineer, Water Management Specialist, Agricultural and Rural Division, OMAFRA, Fergus.

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ISSN 1198-712X

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