

WATER USE FOR HYDRAULIC FRACTURING IN ALBERTA



WATER USE IN HYDRAULIC FRACTURING

Hydraulic fracturing is a government-regulated technology used safely for more than 60 years to recover tight oil and natural gas that is trapped in deep underground rock. After a well has been drilled, a mixture of mainly water and sand, and a small amount of additives is injected into the well at high pressure to create tiny, finger-like fractures in the rock. The fractures are propped open by the grains of sand so that the oil or natural gas can flow to the surface. The additives perform different functions such as, limiting bacterial growth or preventing corrosion. Alberta regulations require producers to publicly disclose the additives used in hydraulic fracturing on a well-by-well basis, which can be found on: <http://fracfocus.ca>.

REGULATING WATER USE

In Alberta, the Alberta Energy Regulator (AER) regulates the use of water for tight oil and natural gas development. The AER will issue a licence to withdraw surface water or groundwater for use in oil and natural gas development. A well is typically only fractured once and will produce for 20 to 30 years without additional water requirements.

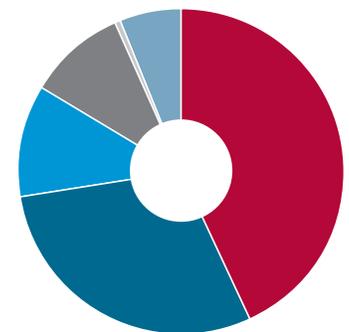
Operators are required to report water withdrawals to the AER and monitor the water source to ensure they are sustainable. The AER may suspend water withdrawals to protect the integrity of the water system during low flow periods or drought.

QUANTITY OF WATER USED

About 7 million cubic metres of non-saline water, 93 per cent of which was sourced from surface water and fresh groundwater, was used to hydraulically fracture wells in Alberta in 2016. The remainder of water used was from recycled water (six per cent) and alternative sources (one per cent), such as saline groundwater, flowback, produced water, and municipal wastewater. *Source: AER, 2018*

AER data shows that water allocation for hydraulic fracturing is less than one percent of the total amount of water allocated each year to all sectors. Just 11 percent of all water allocated for fracturing was actually used. *Source: AER, 2018*

ALBERTA WATER ALLOCATIONS BY SECTOR (2016)



● Agriculture/Irrigation	44%
● Commercial	28%
● Municipal	11%
● Other Oil & Gas*	9.3%
● Hydraulic Fracturing	0.7%
● Other	7%

*Other Oil & Gas includes oil sands, waterfloods, gas plants, downstream refineries, drilling, construction and field offices.

Source: AER

MINIMIZING WATER USE

Industry is focusing on increasing use of alternatives and reducing the amount of surface water and fresh groundwater used in hydraulic fracturing. Low-quality or otherwise unusable sources of water, such as saline groundwater, flowback, produced water and municipal wastewater are used where appropriate. New hydraulic fracturing technologies are also being developed that require less water.

An example of industry best practices for effective water management is the work done by Shell Canada Energy. Shell is reducing its overall fresh water footprint and ensuring minimal impact to other water users of the watershed and community from its oil and natural gas operations. In addition to continually looking at ways to reduce overall water demand through completion design and water reuse, Shell entered into an agreement with the Town of Fox Creek to use the town's treated wastewater in its completions operations. In return for the use of the water, Shell funded the engineering and design to upgrade the town's raw water facilities. This alternative source of water is a key component of Shell's overall water strategy in the Fox Creek area and replaces the use of approximately 400,000 cubic metres of fresh water a year.

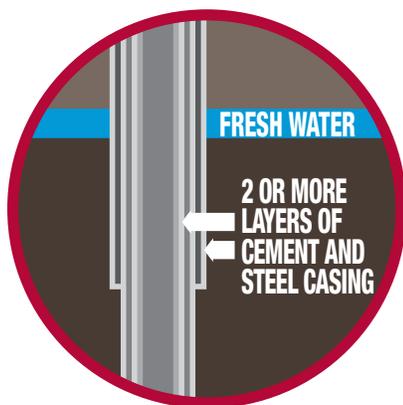
PROTECTING ALBERTA'S WATER RESOURCES

When a well is hydraulically fractured, the tight oil or natural gas is typically found one to four kilometres below the surface (1,000 - 4,000 metres). By contrast, drinking water aquifers are typically less than 300 metres from the surface. Wells are constructed to prevent drinking water contamination, with multiple layers of steel casing cemented in place.

The transportation, handling, storage and disposal of all fracturing fluids and produced water are conducted according to regulations to protect the environment.

In addition to following regulations governing hydraulic fracturing operations, water use and water protection, Canada's oil and natural gas industry is guided by CAPP's *Guiding Principles for Hydraulic Fracturing and Operating Practices*.

Visit: www.capp.ca/responsible-development/water



A SOLID BARRIER

A properly constructed natural gas well protects water. Each wellbore includes multiple layers of steel casing that is cemented in place to prevent gas or liquid from migrating into groundwater sources.

Protecting water resources during sourcing, use and handling is a priority for Canada's oil and natural gas industry.

Flowback:

Fracturing fluid that flows back to the wellbore after hydraulic fracturing is completed.

Groundwater:

Water contained in underground natural aquifers.

Produced Water:

Water naturally present in the reservoir that is recovered along with the hydrocarbon.

Surface Water:

Water collecting on the ground or in a stream, river, lake, sea or ocean.

Tight Oil or Natural Gas:

Oil or natural gas developed from low permeability reservoirs using horizontal wells with multi-stage hydraulic fracturing.

Waterfloods:

Water injected into wells to move oil to the surface as part of enhanced oil recovery.