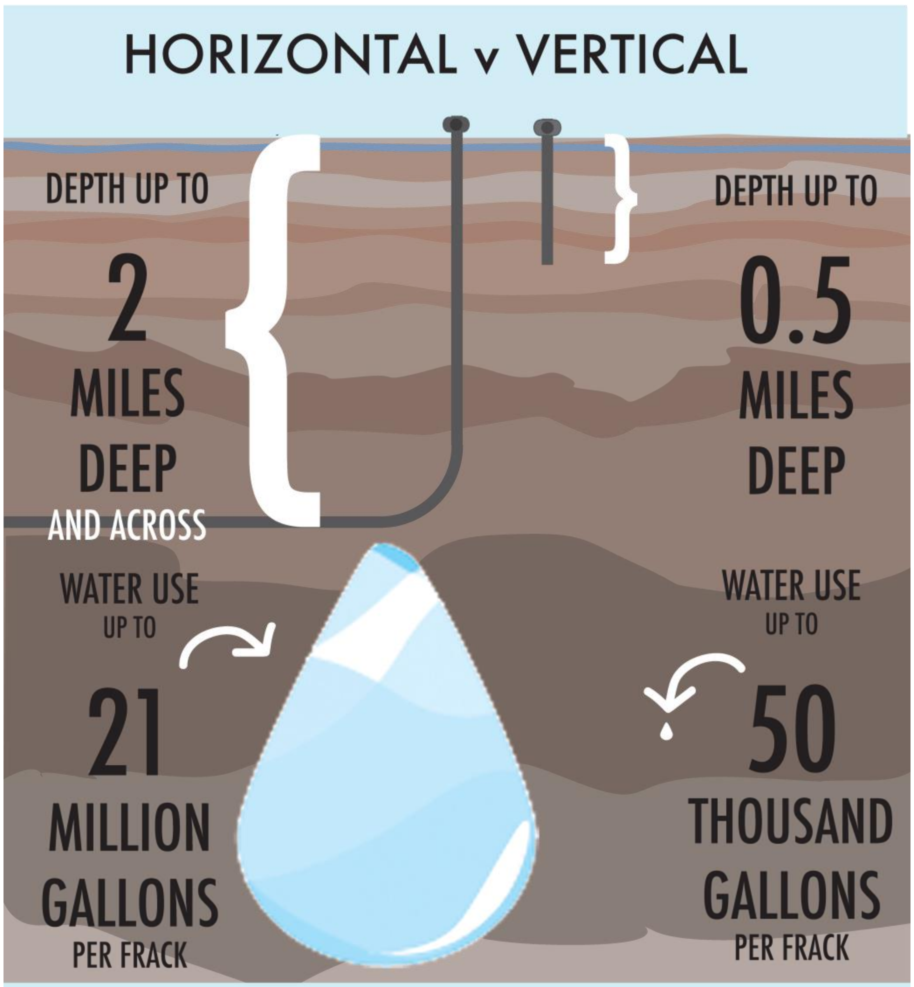
FRACKING FACTS FOR MICHIGAN



ANATOMY OF A FRACK PAD

Q: When was the first horizontal fracking well constructed in the United States?

A: The Barnett Shale Play in Texas was the first site for horizontal fracking in 2002. Fracking technology for shallow vertical wells was developed as early as the 1940s; however, its widespread use in combination with recent advances in horizontal drilling to extract oil and gas from deep underground shale formations has fueled the current U.S. energy boom.

Q: When was the first horizontal fracking well constructed in Michigan?

A: The Encana Company's State Pioneer Well in Missaukee County was the first horizontal fracking well in Michigan in 2010. Note: this well only operated for a few months and then shut down due to economic failure to produce at required rates.

Major differences between the shale gas formations found in Michigan:

MI Shale Play	Drilling Depth	Water Use	Land Impact	Waste Water Disposal
Antrim Shale (Vertical fracking)	0.6 mile	Up to 50,000 gallons	Less than 2 acres on 40	Class II injection well
Collingwood/Utica Shale (Horizontal fracking)	1-2 miles down 1-2 miles across	Up to 21 million gallons	5-10 acres on 640 acre pad	Class II injection well

Q: What are the risks associated with unconventional horizontal fracking?

(1) **Limited Public Disclosure of Chemicals**: Over 750 chemicals are used in the fracking process, including at least 29 of which are either known or possible carcinogens. Industry asserts "trade secret" protection over the injected chemical mixture, which impedes local communities from knowing potential human health and environmental risks associated with the use, handling, and disposal of fracking wastewater.

(2) **Massive Consumptive Water Withdrawals** (permanently lost): Fracking wells use up to 21 million gallons of water per well, per frack that is permanently removed from our lakes, streams, and groundwater sources.

(3) **Groundwater Loss and Contamination to Drinking Water**: Faulty well casings made of steel pipes and cement can create pathways for fracking fluid to migrate and contaminate groundwater aquifer supplies.

(4) **Surface Spills and Leaks**: Contamination can and has occurred due to mechanical failure (e.g., tanks, values, pipes, etc.) or operator error. Minimizing potentials spills is critical to protecting surface water resources and hydrologically connected groundwater sources.

(5) **Wastewater Handling and Disposal and Earthquakes**: Injected fracking water, or "flowback," returns to the surface as wastewater that can be 10 times saltier than seawater (brine) and can be contaminated with volatile organic materials, radioactive matter, and/or chemicals such as bromides released from the deep shale rock. In Michigan, the industry injects the contaminated wastewater into about 1,500 Class II deep injection across the state. Inherent risks in deep underground injection also include the potential for earthquakes as seen in Ohio (5.2 magnitude, 1986, and 10 smaller tremors there in 2011 and Youngstown, 4.0 magnitude, 2012), Oklahoma (5.6 magnitude, 2011), New Mexico, Colorado, and suspected instances in Texas and Arkansas.

(6) **Land Use Impacts**: Five acres or more are required for equipment, pipes, trucks, supplies, mixing tanks for water and chemicals, high-capacity pumps, waste handling or storage tanks, venting gases, flaring, treating, and disposal.

(7) **Air Pollution**: Polluting emissions including methane, ozone smog and particulate soot come from diesel engines, compressor stations, hauling trucks, venting of storage tanks, and flaring of excess natural gas from the wells themselves.

(8) **Truck Traffic**: Truck traffic to build and decommission the frack pad and to haul millions of gallons of wastewater represents a huge burden on local public road infrastructure, requires new road construction in rural areas, contributes to air pollution, dust, and noise, and increases the potential for surface spills.