

How to Drill a Gas Well  
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In 1821 William Hart used a shovel to dig the first gas well in New York. The industry has evolved since then, developing technology to exploit deeper reserves of gas and – in the past few decades – exploiting horizontal drilling and fracturing techniques. As the drilling processes have changed, so have the laws regulating the extraction of resources.

“People worry a lot about groundwater protection,” said Brad Gill in a telephone interview. But given the regulations and the way wells are drilled, he sees little chance for groundwater contamination.

Gill is the executive director of the Independent Oil and Gas Association of New York (IOGANY), a trade association formed to protect the interests of its members. He described the process of drilling for natural gas.

Wells are drilled section by section, and after each section is drilled it is lined with casings. The first hole that’s drilled is a wide “conductor” hole. “Size varies,” Gill said, “but think about 20 inches in diameter as an example.” (A large pizza is about 16 inches in diameter.)

This hole goes through loose material such as topsoil and gravel until it reaches bedrock. In some places this hole will be only a few feet deep; in others it may extend hundreds of feet.

The NY Department of Environmental Conservation (DEC) regulations require that wells be constructed and operated in a manner that prevents the movement of oil or gas from one zone, or strata, to another. Current drilling practices meet DEC regulations says Gill.

“We put in a steel casing to ensure the integrity of the hole,” Gill explained. When the steel casing is secure, cement is poured through the hole and forced back up to the surface through the space that is left between the casing and the rock. Once the cement has dried – a process that may take eight hours more or less depending on the type of cement used, the next section is drilled.

A smaller drill bit is used to extend the well through the water zone – the aquifers that homeowners tap for drinking water. This hole is narrower – maybe 17 inches in diameter. Once they’ve gone through the potential water zones, the drillers slide in a steel surface casing for that section and follow that with cement.

“You’ve got a half-inch steel casing surrounded by a couple inches of cement encasing the hole,” Gill explained. “This protects the groundwater.” Depending on how deep the target formation is, the drillers may drill one or two more sections. Those are enclosed in casings as well.

“Ideally there should be no gaps,” Gill said, referring to the cement ring separating the well from the rock and soil strata. “Also, most water zones are fairly shallow, eighty to a couple hundred feet. The productive zones are at least a mile down, so there are thousands of feet separating the gas from the water,” Gill added.

Gill also explained that, though the process of horizontal drilling may seem new to people in the southern tier, “it’s been around for years and drillers have pin-point accuracy.” Recording devices in the drill bit relay measurement data to the driller. So an experienced horizontal driller can maintain his well bore through a six-foot thick layer of shale to a target some 1700 feet away.

“Hydrofracturing was developed in the 1950s,” Gill said. “Nearly all the wells drilled in the last 30 years have been fracked.” Gill explained that the major difference between a vertical well and a horizontal well is the amount of water used in the drilling process. “Otherwise the process is the same; the fracking fluids are the same.”

When asked what went into fracking fluids, Gill admitted that he was a geologist, not a chemical engineer. “DEC will know what is in the fracking additives,” he said adding, “most of it is benign. Ninety-nine percent is sand and water.”

The fracking ingredients are hauled in closed containers and mixed on-site in a blender truck, Gill said. They are pumped directly into the well and, given the casings; there is little opportunity for fracking chemicals to contaminate groundwater. After they are extracted from the well, the fracking fluids are stored in a lined pit and later taken to a treatment plant, Gill said.

If there’s an Achilles heel for gas wells it’s the storage pit. This is where water contamination is most likely to happen, says Wendy Walsh, district field manager for the Tioga County Soil and Water Conservation District. Her concern is storm water runoff. While the likelihood of chemicals migrating up through thousands of feet of rock is slim, fracking chemicals that spill onto the ground during a heavy rain can leach through the soil and migrate through an aquifer.

Sidebar: Further reading

For a slide show on “how a gas well is drilled down into the ground, and what can go wrong” go to [http://www.wvsoro.org/resources/how\\_a\\_well\\_is\\_drilled/index.html](http://www.wvsoro.org/resources/how_a_well_is_drilled/index.html)

To see how casings are used to protect groundwater go to [http://www.dec.ny.gov/docs/materials\\_minerals\\_pdf/gwprotection.pdf](http://www.dec.ny.gov/docs/materials_minerals_pdf/gwprotection.pdf)

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