

Shale Gas Roundup



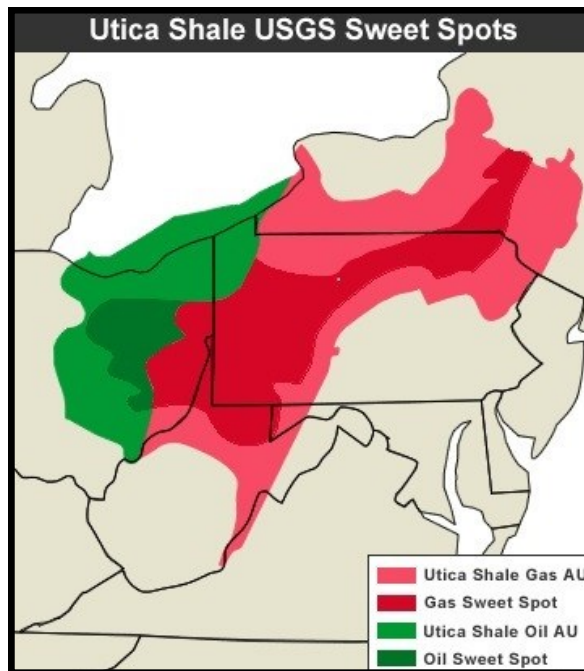
Potter County, Pa.

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JKLM activity highlights 2016 developments

While most shale gas drillers stayed out of Potter County in 2016 as an extended industry recession continued, JKLM Energy continued moving forward with an ambitious plan to deliver natural gas found in the Utica Shale formation far underground in the region to the national pipeline network.

The company revealed that it plans to have more than a dozen wells drilled from pads in four Potter County locations by the end of 2017 and began activity at several of its sites. JKLM officials said they're pleased with the volume of gas that is being found in the deep shale layers and the company expects to have a presence in the county for years to come.



This map depicts the Utica Shale USGS "sweet spots," according to an assessment by the U.S. Geological Survey. Generally, the dark red areas are where the total organic carbon content of the Utica Shale is the highest.

For several years, the word "Marcellus" was associated with local shale gas activity. However, as drilling techniques have been refined, geological studies conducted and experimental drilling completed, companies are finding that the Utica shale – found anywhere from 3,000-5,000 feet deeper than the Marcellus – will likely be even more productive. And, there are other layers that could hold bountiful gas reserves.

In recent months, JKLM has been drilling on privately owned forest land off Pa. Rt. 44, not far from Patterson State Park in Summit Township and close to another well the company already has in that area.

The company is also moving forward with a shale gas development in the Fox Hill area of Ulysses Township with two pads and multiple wells planned.

A third JKLM development area is located in Sweden and Eulalia Townships in the Reese Hollow area. Pa. DEP permit data indicates that these wells are not located at the same

site as the September 2015 surfactant release. The company also has future plans to develop wells at other locations in Sweden, Summit, Ulysses and Eulalia townships.

Shale gas development has been slowed by lingering low prices in the natural gas marketplace and a lack of pipeline infrastructure. Industry analysts say it is only a matter of time before prices rise and the gas transportation networks are in place to usher Pennsylvania's shale gas to market.

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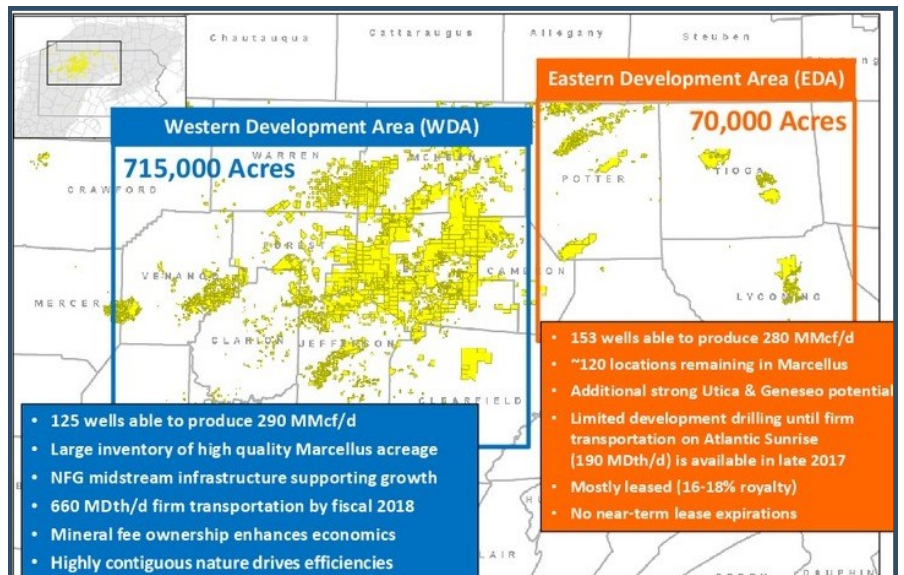
Seneca looks to resume drilling in region

Seneca Resources expects to re-start its shale gas-drilling activities in the region, but it's impossible to forecast when. "The year 2016 has been a challenge, but 2017 is showing positive signs," said Rob Boulware, manager of stakeholder relations.

Seneca had been active in Cameron, Potter and five other Pennsylvania counties. However, as gas prices fell and remained low, the company scaled back its operations. It now has just one drilling rig operating across the Appalachian Basin.

Seneca, a wholly owned subsidiary of National Fuel Gas Company, drilled about two dozen wells

across the northwest part of Cameron County, where it owns 20,000 acres of rights, much of it on state forest land. Seneca has capped many of its wells, holding billions of cubic feet of gas in anticipation of better market conditions and increased pipeline capacity. "We gas companies are a victim of our own success," said spokesman Dave Reed of Emporium. "Prices are really impacting the industry right now, but we'll drill again once they rebound."



Seneca Resources released this map showing its holdings for gas/oil production in the Appalachian Basin. Seneca has paid nearly \$223 million in royalty payments across Cameron, Potter, McKean, Tioga, Elk, Lycoming and Clarion counties since 2012.

Groundwater study moving forward



A research project of historic proportions is on the plate of the Triple Divide Watershed Coalition. Members moved forward on the lofty project during their recent quarterly meeting. Mark Stephens, a geologist from the Pa. Dept. of Environmental Protection (DEP), attended to advise TDWC members on logistics.

A state grant has been approved to cover the bulk of expenses in a detailed groundwater study across Potter County. When it's concluded, a database will be available that details where much of the county's groundwater comes from, as well as its characteristics and movement patterns. The information will be invaluable for public policy-makers, certain industries, regulatory agencies and many others. Through the testing of more than 60 water wells in strategic locations, the U.S. Geological Survey (USGS) will be able to amass and share detailed data.

"This will be an extremely valuable tool for protecting our water when we're choosing sites for certain types of development," said John McLaughlin, TDWC chairman. "There is much we simply do not know about our ground water supplies, movements, and other characteristics."

Well data will be assembled and analyzed in a cumulative fashion, with the identity of individual well owners protected. Confidential findings from the analysis will be provided to each owner. Groundwater can contain a variety of suspended and dissolved substances such as bacteria, minerals and gases. These elements are often naturally occurring, but can also be influenced by activities occurring on the land surface. A comprehensive list of water quality parameters will be analyzed for each well.

Wastewater treatment plant proposed

A company is proposing construction of shale gas drilling waste-water treatment plant on Coudersport's western border. Discussions are being held between members of the Coudersport Area Municipal Authority and two businesses, Epiphany Environmental and JKLM Energy.

Under the proposal, the Pittsburgh-based Epiphany would build the plant close to the sewage treatment plant off Toles Hollow Road. JKLM would have a financial stake in the project and use the facility to recycle wastewater from its gas well hydrofracturing.

Epiphany has been working on the technical aspects of cleaning gas field wastewater since 2010. Its process removes minerals and heavy metals from the fluid in the first stage. Solids are contained, dried and disposed of in state-licensed landfills. Clean brine that remains is processed in the second stage. The by-products include salt, which can be sold for commercial use such as road application, and distilled water. The water can be reused for hydrofracturing or discharged into a conventional sewage treatment plant.

Hydrofracturing of a shale gas well typically requires between 3 million and 5 million gallons of water, much of which returns back to the surface with heavy salt concentrations and metals.



Epiphany was founded in 2006 by New Castle engineer Tom Joseph. The company has attracted attention for its mobile water purification system that uses concentrated solar power to turn salt water into distilled water that's safe to drink.

Local bridge projects funded through Act 13



A work group comprised of the Potter County Commissioners, representatives of the Potter County Association of Township Officials and Potter County Planning Department convened to review applications for funding to support bridge repairs.

As a result of the meeting, the team proposed awarding a \$40,000 grant for the Atkins East Bridge rehabilitation in Roulette Township, and \$20,000 for the Erickson Road Bridge rehabilitation project in Ulysses Township.

Each year, the commissioners invite townships and boroughs to apply for a share of the Pa. Act 13 Bridge Improvement Restricted Use Fund received by Potter County through a state fee on shale gas wells. Under Act 13, county commissioners have the authority to distribute the funds as they see fit, as long as they address at-risk bridges. Commissioners Doug Morley, Susan Keferover and Paul Heimel developed a system whereby the money is expended according to an evaluation/ranking framework to address the most critical needs, as reported by township supervisors and borough councils. Some other counties have adopted the Potter County system as a model. Under Act 13, Potter County receives \$40,000 annually in the Restricted Use Fund.

More drilling likely on state forest land

While a moratorium on new gas and oil leasing of state forest and park lands is likely to remain in place for many years, thousands of new shale gas wells could still be drilled on public lands on Potter and other counties. Pennsylvania's new five-year forest management plan nixes new oil and gas leasing and drilling in state forests and parks where the state controls subsurface mineral rights. However, 300,000 acres are already under lease. There has been no drilling yet on roughly 80 percent of that land.

Pennsylvania General Energy holds a grandfathered lease on 8,525 acres of state forest land in Potter County's Wharton and Eulalia townships. Seneca Resources is leasing 320 acres in Keating Township. CNX leases 4,032 acres in Wharton, Portage and Lumber townships (Potter and Cameron counties).

Another 287,000 state-owned acres could be drilled at any time because private interests own the gas, oil and mineral rights. A significant number of those vulnerable parcels lie in Potter County. Industry experts believe that, once gas prices rise to make drilling profitable and pipelines are in place to market the gas, there will be a significant amount of activity on state land.

Pa. Dept. of Conservation and Natural Resources (DCNR) analysts recently confirmed

that a full "drill-out" of state forests under the current ownership structure could include more than 2,000 additional shale gas wells. Area of forest fragmentation and surface impact would expand beyond the well pads due to the need for pipelines, compressor stations, and related facilities.

For the leased property, the state imposes provisions to protect natural resources and wildlife while limiting the impact of energy production. However, under state law, owners of subsurface rights have the authority to pursue those resources as they see fit. Their rights have primacy over the surface owners' rights.

DCNR's new 234-page plan was discussed by Seth Cassel, chief of the department's Forest Resource Planning Section. "We recognize that while there is a lot of forest in shale gas areas that could be developed, the leased land has not been fully developed and there's already a lot of opportunity to do so," Mr. Cassel said. "We want to use this five-year leasing moratorium to monitor gas development impacts on other forest values." Cassel added that the ban was supported by many of the more than 300 people who attended 12 public meetings held to gather input on DCNR's draft management plan, and also in the 4,800 comments on the plan received by the bureau.

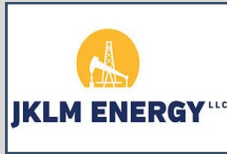
The plan also details the potential impacts of climate change on state forests and the role those forests can play in mitigating the changes. Stresses are forecasted to come from invasive plants, pests and insects, as well as drought and extreme weather events, different frost cycles and longer growing seasons.



State forest land is shown in green. Areas that have been leased for gas/oil drilling are marked in yellow. Gas, oil and mineral rights on 287,000 acres of state forest land are privately owned.

DEP Fines JKLM for contamination

Pa. Dept. of Environmental Protection (DEP) has fined JKLM Energy \$472,000 for groundwater contamination that affected six private water wells in Sweden and Eulalia townships in September 2015. A separate \$100,000 penalty, to be administered by Potter County, will be used to install 24/7 monitors on 11 public water supplies across Potter County. These will log water quality data and serve as an early-warning system in the event of contamination from any source.



JKLM began drilling a well off North Hollow Road when a bit became stuck approximately 570 feet below the ground. A contractor illegally used about 100 gallons of a drilling surfactant, known as F-485, mixed with water to lubricate the bore and allow the expensive bit to be retrieved. That chemical-laced substance migrated into the groundwater via subsurface fractures.



Marcus Kohl from DEP discussed the investigation during a public meeting in Coudersport.

DEP said 17 complaints were received by owners of private water supplies. Six were found to have been impacted. JKLM provided alternate water sources and has since installed treatment systems on the affected water supplies. DEP also said that four public water supply wells operated by the Coudersport Borough Water Authority and Cole Hospital were sampled and monitored. “Although they were all temporarily taken off-line as a precautionary measure, none appear to have been impacted,” the department reported.

JKLM has installed four groundwater monitoring wells; plugged the three gas wells at the site; continued to monitor the affected private water wells and the monitoring wells with no findings of contamination; and agreed not to drill on the site where the rock fracture was discovered.

Drilling rules held up in court

A court ruling has temporarily blocked sections of new gas drilling regulations in Pennsylvania, but the Dept. of Environmental Protection (DEP) has appealed the ruling to the Pa. Supreme Court. DEP said rules (Chapter 78a) are designed to protect the public and took years to develop with the help of the industry. They cover public resource protections, monitoring for orphaned and abandoned wells, well-site restoration, and standards for water storage impoundments.

Commonwealth Court Judge Kevin Brobson ruled in favor of a gas industry trade group, the Marcellus Shale Coalition, which argued that the rules are onerous, costly, and offer little environmental benefit. Brobson let stand rules dealing with spill cleanups, onsite waste processing, and a new requirement to file monthly waste reports.

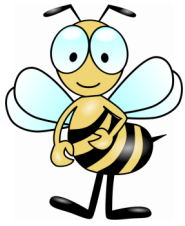


DEP looks to curb methane emissions

Pa. Dept. of Environmental Protection is taking steps to curb air emissions from natural gas sites. At an advisory committee meeting in early December, regulators unveiled new draft permit requirements. Draft documents will appear in the Pennsylvania Bulletin, which will trigger a 45-day comment period for the public and industry.

State regulators are targeting methane emissions, which DEP says contribute to global climate change. DEP has created new draft general permit requirements for oil and gas exploration, development, and production facilities. They will require the industry to use best available technology, keep better records, and have quarterly monitoring inspections. Companies must attempt to repair a leak within five days. The department is also revising the current general permit, to require more stringent leak detection and repair.

DEP plans to create new emissions rules for existing oil and gas sources. The regulations won't cover orphaned and abandoned wells, which can also be a significant source of air pollution.



Shale gas developments:

What's the buzz??



Major pipeline approved



The Federal Energy Regulatory Commission has given Tennessee Gas Pipeline Co. the green light for its \$156 million Susquehanna West Project, which involves a pipeline and compression facilities located in Tioga and Bradford counties. Tennessee owns and operates a 14,000-mile pipeline system which extends northeast from Texas, Louisiana, and the Gulf of Mexico through Pennsylvania, New York, New Jersey, Massachusetts, New Hampshire, Rhode Island, and Connecticut. Susquehanna West will increase east-to-west capacity on its 300 Line in Pennsylvania to provide gas for Statoil to meet market needs in the Northeast. Tennessee will transport gas for Statoil on the 300 Line from Susquehanna County to the Rose Lake Meter Station near Andrews Settlement in Potter County, Tennessee's existing interconnection with the interstate pipeline system of National Fuel Gas Supply Corp. The estimated cost of the project is \$156.4 million.

EPA report confirms impacts

U.S. Environmental Protection Agency has issued results from its multi-year study of hydraulic fracturing for oil and gas, concluding that the process can adversely affect water supplies "under some circumstances." EPA said the problems it found were, for the most part, associated with well integrity, subsurface migration of natural gas, and poorly treated wastewater and wastewater spills. Eric Milito, spokesman for the American Petroleum Institute, said that because burning natural gas instead of coal leads to reduced air pollution and greenhouse gas emissions, it should be embraced. He added, "This is a technology that has been around a long time, it's been successfully deployed, the risks are low, it's a very safe technology."



More pipelines coming



Pennsylvania is beginning to see a pipeline building boom that includes an estimated 4,600 miles of new interstate pipes, tunneling under Pennsylvania's farms, wetlands, waterways, and backyards. That's on top of 6,800 miles of existing interstate natural gas pipes, according to the Energy Information Administration. At the beginning of the decade, 2 billion cubic feet of shale gas was being produced from Pennsylvania wells. Today that's jumped to more than 19 billion cubic feet every day. By 2020, there will be an estimated 30 billion cubic feet of gas coming out of the state.



This publication is produced by the Natural Gas Resource Center in Coudersport, Pennsylvania. Previous editions are available on the website, pottercountypa.net. Anyone with story ideas or comments should contact Paul Heimel (pheimel@pottercountypa.net).