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FATHER'S DAY

DEPLOYED DAD

Army Spc. Michael Johnson is celebrating his first Father's Day in Iraq, sharing the love of his wife, Heather, and infant daughter, Rachel, via the Internet. Read their truly heart-warming story and those of a dozen other dads in the area. **A3**



NATION & WORLD

Tony takes a break

As if he hadn't done enough to infuriate Gulf Coast residents, BP CEO Tony Hayward took Saturday off to see his 52-foot yacht "Bob" compete in a glitzy race off the coast of England. **B1**



PERSPECTIVE

Cool story for a hot day

History columnist Cheryl Kashuba takes us back to an amazingly vibrant time in Scranton — the summer of 1927, when the city not only opened three new Olympic-size swimming pools, but had three of the world's best swimmers dedicate them and show off their elite skills in the water. **D1**



PEOPLE

A century of service

Meet Dorothea Metz, right, and Helen Kilcullen, who have given a combined 100 years of volunteer service to Mercy Hospital in addition to their busy careers outside the facility. **F1**



LIFESTYLES

Natural, versatile cork

Designers are finding beautiful new uses for cork in furniture, tile and home accessories. Eco-friendly cork is durable, lightweight, naturally insulating, fire and rot resistant, and has a soft, pliable quality. It can be shaved thin enough to be used as a fabric or kept thick for furniture and building materials. **G1**



BUSINESS WEEKLY

Tweeting an old beer

Among the beers the Yuengling family has been brewing since 1829 is Lord Chesterfield Ale. The Pottsville brewer is reviving interest in that beer and its Yuengling Porter with an ad campaign that uses Twitter and Facebook. **H1**

Partly cloudy
high 83
See Page B12

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Around the towns...A4 Horoscope.....F2
Brides.....F4 Lifestyles.....G1
Business.....H1 Lottery.....A2
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Editorial.....D3 Obituaries...A13-15
Fugitives.....A4 Perspectives.....D1
Health&Science...G6 Puzzles.....G5



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SPECIAL
REPORT:
GAS DRILLING
IN NEPA

TROUBLED PROMISE

Investigation: little oversight, looming problems

BY LAURA LEGERE
STAFF WRITER

As the nation remains riveted by the deadly explosion and ongoing environmental catastrophe of a deep-water oil rig accident in the Gulf of Mexico, the need for oversight, public information and disaster-response plans in efforts to extract the Earth's fuel resources has come into sharp focus.

In Pennsylvania, the troubled promise is in the Marcellus Shale, a natural gas-rich geological formation below three-fifths of the state that holds enough recoverable gas to satisfy all of America's gas needs for more than a decade.

A six-month investigation by The Times-Tribune, including a review of thousands of pages of Department of Environmental Protection documents made available through a Right-to-Know request and interviews with regulators, citizens and scientists, shows the limits of the current regulatory environment to prevent contamination of the state's land and water during deep gas drilling in the shale.

It reveals costly environmental and safety

Continued on Page A10



TODAY
Scientists warn of the impact gas drilling will have. **A11**

MONDAY
Review of records shows hundreds of problems since 2005.

TUESDAY
Chemicals used to coax gas from shale a mystery.

WEDNESDAY
Woes in western Pa. offer lesson for region.

For past stories about gas drilling and DEP violations database visit: thetimes-tribune.com/gas

Lackawanna: About 38,000 acres leased in county

BY LAURA LEGERE
STAFF WRITER

One natural gas well has been drilled into the Marcellus Shale in Lackawanna County, but much more development is on the county's doorstep.

Already more than an eighth of the county's land has been leased to companies planning to drill in the Marcellus Shale, according to deeds recorded with the county.

The total land leased — about 38,000 acres — amounts to an area roughly twice the size of Scranton.

Those leases carry a soft deadline for drilling: Many of them have a primary term of five or seven years, which means the companies have to make some progress to develop the gas within that time or renegotiate to extend the agreement and risk losing the lease to a competitor.

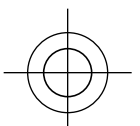
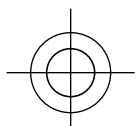
Because the vast majority of the leases in the county — 816 of them — were recorded in 2008, the incentive for developing the gas is approaching.

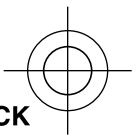
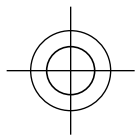
The land rush has touched a vast area of the county. Land in 20 of Lackawanna's 40 municipalities has been leased, with the larg-

Please see **LACKAWANNA**, Page A11

ABOVE: A natural gas drilling rig operates in Dimock Twp., Susquehanna County.

PHOTO BY BUTCH COMEGYS / STAFF PHOTOGRAPHER





'WE'RE LEARNING FROM YOUR MISTAKES. YOU'RE THE GUINEA PIGS'

ANTHONY INGRAFFEA, Cornell University engineering professor, speaking about New York watching what is happening with gas drilling in Pennsylvania

FROM PAGE A1

errors made by a growing industry that has become the state's economic hope, and details the often frustrated efforts of regulators to police it using outdated laws and incomplete information.

The investigation found: ■ There have been hundreds of spills at natural gas well sites in the commonwealth over the last five years, the vast majority of which have never been publicized by the DEP.

■ The massive effort to exploit the shale has left an indelible mark on the landscape, with communities in the state's Northern Tier and southwestern region bearing both economic benefits and environmental costs.

Experiences in those regions offer a preview of gas development in the seven counties of Northeast Pennsylvania, where a dozen Marcellus Shale operators hold leases to drill.

■ Despite industry claims that it discloses all of the chemicals it uses in the gas-extraction process, DEP documents from a series of spills in Susquehanna County show the industry's disclosure is incomplete and insufficient for determining contamination in soil and water.

■ A growing chorus of scientists is arguing that not enough is known about the effect widespread gas drilling will have on water supplies, air quality and human health to justify the intensive development of the resource already taking place.

"There's a massive industrialization experiment happening in West Virginia and Pennsylvania right now," said Anthony Ingraffea, a Cornell University engineering professor who has studied rock fractures in oil and gas wells for two decades.

"It might sound cruel to say this, but people in New York are very happy to see that West Virginia and Pennsylvania jumped in with both feet, eyes closed, as quickly as they could.

"We're learning from your mistakes. You're the guinea pigs."

Two goals

Among the six states underlain with Marcellus Shale, Pennsylvania has the largest portion of the gas-bearing rock and the most current wells. It will be wedded to the industry for the century and the 380,000 to 760,000 wells the industry estimates it may take to drain the shale's promised reserves.

The state has already benefited from a tremendous investment, including \$1.8 billion in upfront lease bonuses paid to property owners in 2009 alone in exchange for the right to prospect below their land.

But Pennsylvania has never performed a comprehensive study of the accumulated impacts of drilling on a community or a watershed.

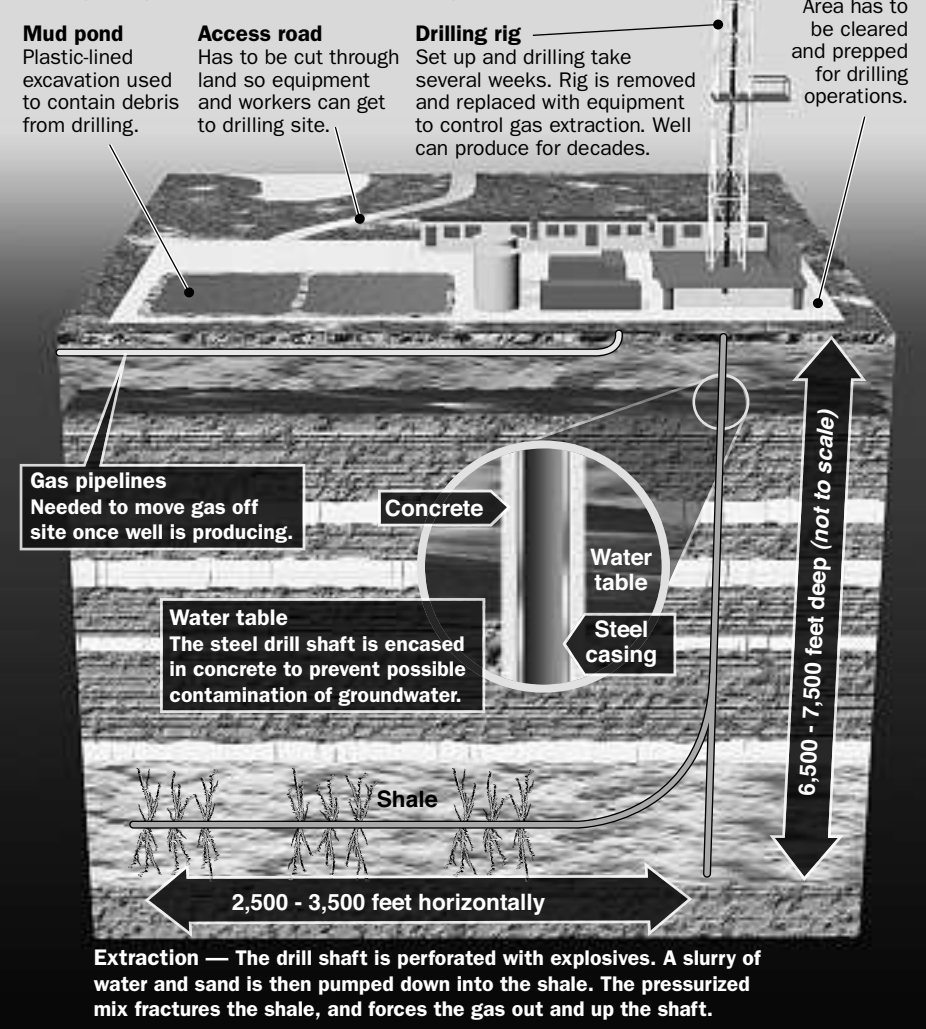
It has never declared a high-value watershed — like those around the reservoirs that feed Syracuse and New York City — off limits to gas extraction, as New York state has effectively done.

And Pennsylvania has never attempted to stop or slow the deep drilling since the first Marcellus well was sunk six years ago, unlike New York, which has imposed a moratorium on Marcellus Shale drilling as the state crafts an environmental impact statement, and unlike the interstate commission that regulates water quality in the Delaware River Basin.

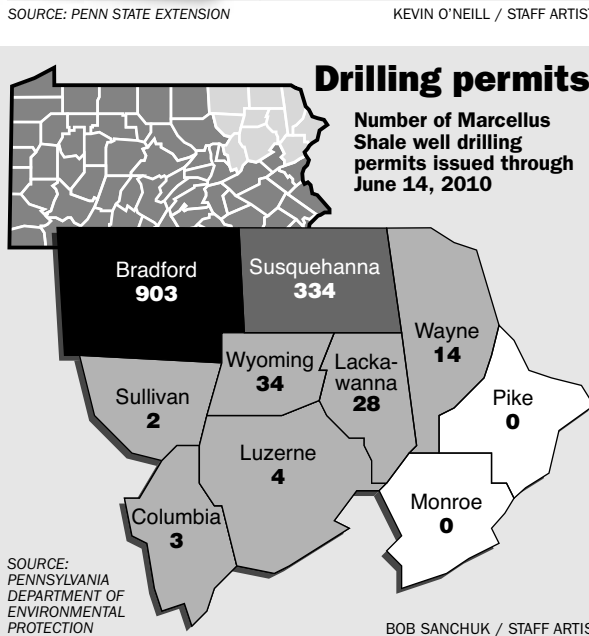
Calls for caution have increased after a Marcellus Shale well in Clearfield County blew gas and waste fluids uncontrollably for 16 hours on June 3. State Sen. Jim Ferlo, D-38, Allegheny County, introduced legislation last week to pause drilling on

Drilling in the Marcellus Shale

In North Pennsylvania, the shale is 7,000 feet deep. Horizontal drilling reaches the shale and then follows the layer a couple thousand feet. It can give a greater return than vertical drilling.



KEVIN O'NEILL / STAFF ARTIST



both private and public lands in the state for a year.

Industry groups say calls for a moratorium are misguided. They emphasize that the gas companies' economic interests are naturally aligned with environmental interests.

"The only thing that differentiates you as a corporation is your image, your reputation, your costs and work force, and innovation," Kathryn Klaber, the head of the Marcellus Shale Coalition, said. "Environmental compliance is a much bigger part of who you are."

Matt Pitzarella, a spokesman for Range Resources, one of the largest Marcellus Shale leaseholders in the state, simplified the equation: "We will make more money if we do it the right way," he said.

But last week, at a hearing about the Clearfield County well accident, DEP Secretary John Hanger said he is "not pleased" with the industry's environmental performance and that his own agency is not yet up to his highest standards. "This industry's got to be better," he said. "There's too many leaks, too many spills, too many incidents of gas migration."

He has a goal for the indus-

try and his regulatory agency to be world class, he added. "We're not there."

The commonwealth's environmental regulator must balance two simultaneous aims: "to produce the gas and protect the environment as we do that," Mr. Hanger often repeats.

In the field, those directives can become more complicated.

In early 2009, after witnessing a string of diesel spills at Cabot Oil and Gas Corp. drilling sites in her small Susquehanna County township, resident Victoria Switzer appealed to one of the state's environmental regulators to impose stiff fines and stop the accidents before they worsened.

At the time, there were two inspectors to police the proliferating wells being drilled in Northeast Pennsylvania. Then as now, drillers were expected to report any spills to DEP, as required by law.

But as he stood near her home in Dimock Twp. the regulator told Mrs. Switzer that the agency had to moderate its penalties or risk being sued by the gas companies — taking inspectors out of the field and into courtrooms to defend their decisions.

Worse, he said, the agency

feared that if it was too hard on the gas companies, they might stop reporting their spills.

'We could stand to catch our breath'

Difficult decisions about how and when to curb an industry that is acclimating to the state's current and changing laws have become commonplace for the state's environmental oversight agency.

According to Scott Perry, head of DEP's Bureau of Oil and Gas Management, the regulatory agency does not have the legal right to hit the brakes on the whole industry the way New York has done.

Instead, the agency can restrict individual companies that have committed particularly severe violations after the fact — a tool it infrequently uses.

In April, the department selectively halted drilling operations by Cabot in a 9-square-mile area, and stopped issuing permits for it to drill elsewhere, after it found the company failed to correct problems with its wells that caused methane to seep into residents' drinking water in Dimock Twp.

In his testimony last week, Mr. Hanger asked the legislators to craft a law with "crystal clear language" giving DEP the authority to withhold permits from operators with unsafe practices, since its current authority could be open to challenge by companies.

Even without a law, "We don't hesitate to take those actions when they are required," he said.

But last fall, legal hurdles apparently contributed to DEP officials' decision to reject the most stringent options for stopping Cabot's operations, even as the company experienced its 19th, 20th and 21st spills at its drilling sites in the rural township in less than two years.

Over two days in September, pipes and hoses carrying a water and chemical mixture across a steep hayfield breached three times, dumping about 8,400 gallons of the fluid around a Cabot well site and allowing up to 1,900 gallons of it to leak into a wetland and creek.

In internal e-mails in the days after the spills, Jennifer Means, the oil and gas program manager in DEP's Williamsport office, wrote that she "wholeheartedly endorsed" either revoking drilling permits the company was already issued or halting pending permits "to slow

down their future activity."

"It would go a long way with the public" whose "biggest frustration ... is the rate at which they are allowed to continue given all these incidents," she wrote.

"Also — we could certainly stand to catch our breath."

But after the agency's top attorney warned about procedural hurdles to suspending permits under state law, the department decided not to take that step.

It opted instead to issue a narrower order that curtailed — but did not halt — the company's operations, and allowed Cabot to resume full development after three weeks.

'Self-regulation doesn't work'

Like the offshore oil rigs that have come under national scrutiny, Marcellus Shale drilling operations are regulated by laws and agencies that rely heavily on the industry's cooperation in policing itself.

In Pennsylvania, Marcellus Shale gas producers are responsible not only for reporting their own spills, but for leading their cleanup operations and, with guidance from state regulators, for assessing the damage done by their mistakes.

At the Marcellus Shale Policy Conference in Pittsburgh last month, Mr. Hanger called for stronger rules to help prevent drilling from polluting the state's streams and air. "Self-regulation doesn't work," he said.

But even proposed rules to improve the requirements of the cement and steel casing that protects an aquifer from a natural gas well will still rely on the companies to perform their own quarterly inspections of the integrity of their wells.

Shortly before those new regulations were prepared for public comment, Mr. Hanger said a mixture of company reporting and department inspection is appropriate.

"We make it very clear to companies that hold permits that filing misinformation or wrong information or deliberately inaccurate information is a very serious matter," he said. "Any company that is sloppy or, even worse, deliberately false, is almost surely going to get itself into very deep and hot water. They don't want to go there."

'We're changing lives'

Marcellus Shale gas operators, many of which have national or international operations and are publicly traded companies, frequently surpass the state's safety and environmental requirements — a fact state regulators often mention to calm public concern about the safety of the process.

At twilight on a May evening, George Stark stood wearing a hard hat and safety glasses at the foot of a state-of-the-art drilling rig ablaze with stadium light in a Dimock field.

Cabot's newly hired public relations manager pointed out the safety features on the rig, contracted from Patterson-UTI Drilling Co., including a system of tanks and filtration devices, called a "closed-loop" system, that makes it so used fluids and mud can be reused on-site without ever flowing into a lined earthen pit. The pits are prone to leak, like the one at a Cabot site in the same township that DEP found contaminating groundwater weeks earlier.

Pits at 29 of the 364 Marcellus wells drilled in the state this year were improperly constructed or maintained,

according to DEP records.

Cabot has been operating in Dimock since 2006, but the series of wells being drilled with the Patterson rig are the first the company developed using a closed-loop system — a best practice that is not required by Pennsylvania law.

Beneath the rig, workers placed a giant mat of black, heavy plastic on the acres of flat earth — a guarantee that most anything spilled onsite would not hit the ground. The company had been using that best practice for about eight months.

Earlier in the evening, on a tour of a reclaimed well site where deer nibbled on clover near tanks hooked up to a completed well, Mr. Stark listed highlights of the investment Cabot has made in Susquehanna County: The company has leased more than a third of the county's total acreage. It paid property owners \$75 million in 2009 alone to acquire the right to drill on their land. Between 2006 and 2009, the company spent \$500 million on its operations in the county. In 2010, it expects to spend \$400 million more.

"We're changing lives," he said, "in a positive way."

Tough love and tough rules

Not everyone agrees with Mr. Stark.

After speaking with Dimock residents who have experienced water contamination from Cabot's drilling, Robert F. Kennedy Jr. drove through the township's winding roads to a barbecue stand in a trailer parked on the side of Route 29 — one of the businesses in the township that has been born or altered to cater to the industry workers.

Mr. Kennedy, president of Waterkeeper Alliance and a professor at Pace University School of Law's Environmental Litigation Clinic, drew a comparison between the confused and apparently insufficient regulation of offshore oil drilling with the regulation of onshore energy extraction, like Marcellus Shale production.

Unfortunately, he said, "I think that's a template for what's happening all across the country."

The best technologies and enforcement practices necessary to minimize mistakes by natural gas drillers are well known, he said, but they are rarely adopted by governments and imposed on the industry.

"What they need is tough love from the regulators and from themselves," he said as he drove. "They need restraint. They need tough rules that allow them to make money, and big money, but force them to do it in a way that's not going to penalize the public."

Mr. Kennedy said the gas industry's record of mistakes is contributing to a growing public reaction against gas extraction in Pennsylvania and drilling regions across the country. That is unfortunate, he said, because natural gas is a cleaner-burning alternative to traditional fossil fuels and will play a critical role in leading the country away from oil and coal and toward green energy solutions.

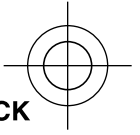
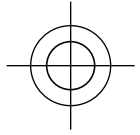
"Nobody's going to believe that about them when they're doing these kind of shenanigans," he said.

"Nobody's going to believe that they're good guys when they're blowing up people's houses and poisoning their wells."

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"We're changing lives in a positive way."

George Stark
Cabot Oil and Gas
public relations
manager



DO WE REALLY KNOW WHAT EFFECT DRILLING WILL HAVE?

Many scientists will tell you there is no way to predict industry's impact

BY LAURA LEGERE
STAFF WRITER

Michel Boufadel began a recent presentation about Marcellus Shale drilling with a photo of the ruptured Exxon Valdez oil tanker spilling into Alaskan waters, a disaster whose remnants the Temple University engineering professor has been studying for years.

He flipped to a photo of himself and some graduate students standing around a pool of oil in a hole in the sand of an Alaskan beach.

"Everyone assumed in 1992" that the oil from the spill had been properly remediated and was "going to disappear," he said. "Yet it is still there. That is the problem with groundwater pollution. It doesn't go away that fast."

Dr. Boufadel is one of the scientists who study the rocks, water and people directly affected by Marcellus Shale drilling who caution that everything from the way the rock breaks underground to the way contaminated water travels through an aquifer has not been — or cannot be — thoroughly considered.

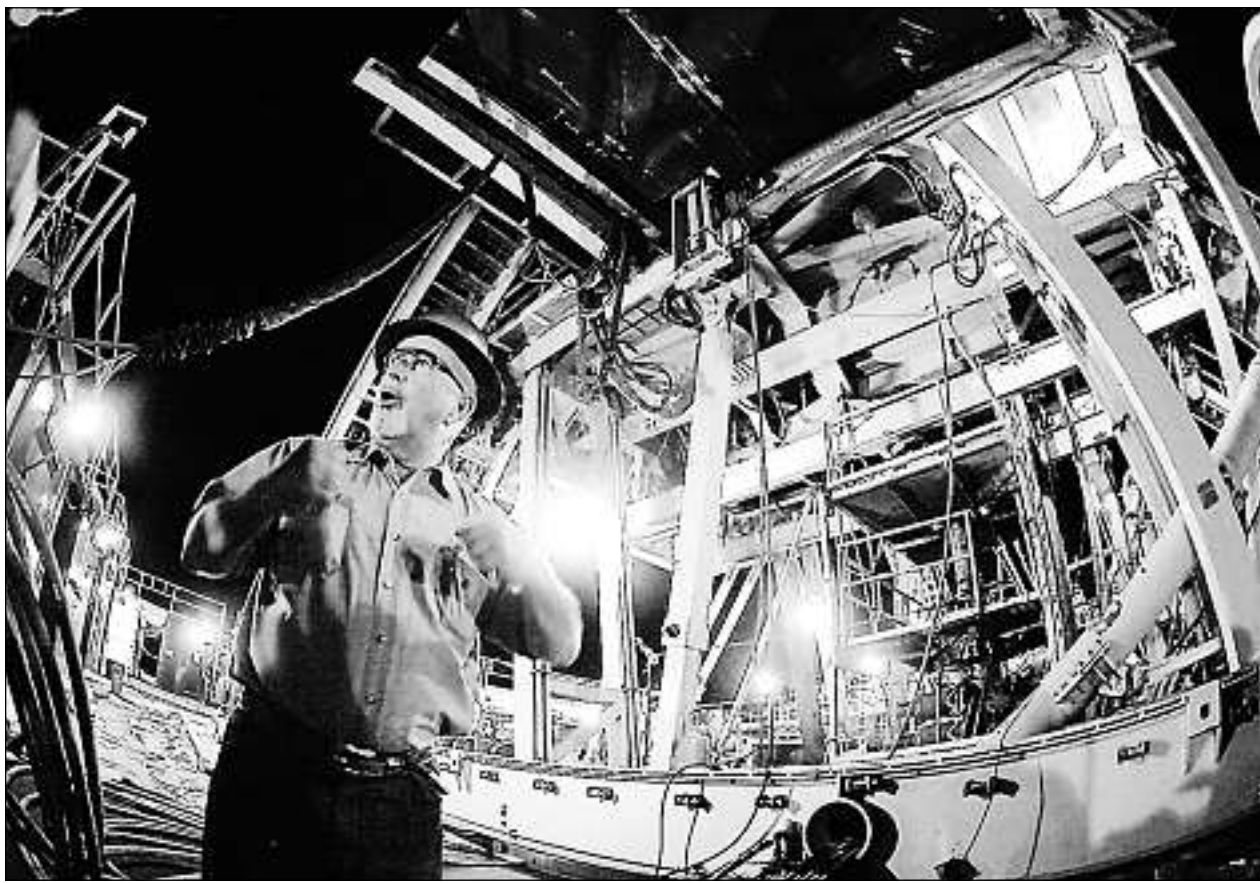
Much of the attention about the environmental risks of natural gas drilling in the Marcellus Shale has focused on the potential for hydraulic fracturing to contaminate drinking water aquifers.

According to the industry and both state and federal regulators, there has never been a confirmed case of contamination being caused by the fracturing — a process of injecting millions of gallons of water, sand and chemical additives underground at high pressure to break apart the rock.

The industry takes a narrow view of what such contamination would mean, limiting it to what they say would be an impossible instance of the toxic mixture migrating through the new cracks caused by the fracturing operation, up a mile of rock, and into a drinking water aquifer.

But legislators and federal regulators are increasingly looking at hydraulic fracturing as more than the isolated act of breaking apart the gas-bearing rock; they see it as part of an interconnected series of often hazardous steps, from trucking and storing toxic chemicals on a well site to disposing of the fluid laced with salt, metals and radiation that comes back out of the wells.

In March, the Environmental Protection Agency announced plans for a study of hydraulic fracturing that would consider all of those



BUTCH COMEGYS / STAFF PHOTOGRAPHER

Jerry Dugas, originally from Louisiana now living in Tunkhannock, a drilling superintendent for Cabot Oil & Gas Corp. North Region, works at a natural gas drilling rig in Dimock Twp., Susquehanna County.



MICHAEL J. MULLEN / STAFF PHOTOGRAPHER

A gas drilling rig rises above the trees in rural Susquehanna County.

factors — the whole life-cycle of a well.

Kathryn Klaber, the head of the Marcellus Shale Coalition, a Pennsylvania-based gas drilling cooperative, said the industry supports the EPA study, as long as it does not halt or slow the pace of drilling.

"I don't think you have to stop something in order to study it," she said.

The industry also points to a previous EPA study of

hydraulic fracturing that did not find any instances of the practice causing water contamination, but which was limited to only one type of hydraulic fracturing, in coal-bed methane wells.

"What we're missing is that definitive, absolutely unquestionable, science-based, non-politically influenced study," said Dr. Anthony Ingraffea, a Cornell University engineering professor who has two decades of experience work-

"What we're missing is that definitive, absolutely unquestionable, science-based, non-politically influenced study."

Dr. Anthony Ingraffea
Cornell University engineering professor
who studies hydraulic fracturing

ing on computer simulation of hydraulic fracturing in oil and gas wells. "And that is what everybody is hoping that the EPA will do."

'What can we live with?'

Many scientists, including Dr. Ingraffea, acknowledge that there are limits to the usefulness of the EPA study, no matter how ambitious the final scope, because it must be completed by 2012, a relatively short amount of time.

"There shouldn't only be one study or awaiting the EPA study," said Dr. Boufadel, who advocates for risk-assessment studies tailored to individual communities near gas drilling. "There should be 10 or 20 studies. That would allow the truth to come out."

He proposes studies that would measure and assign a value to the relative risk of living among a certain number of wells, compressor stations, pipelines, wastewater impoundments and the other infrastructure necessary for drilling and production.

Evaluating risk, he said,

is "how insurance companies make decisions. That's how we, as people, make decisions."

"It is not yes or no. It is what can we live with."

Asked if he knew of anyone conducting a study like that he said, "No. Not to my knowledge."

Dr. Boufadel also suggests that several practices that are standard in Pennsylvania for measuring contamination from drilling are questionable.

The weight of any water contaminated with the salty waste produced by Marcellus Shale wells will cause it to sink in an aquifer, he said, below the reach of conventional measuring tools, like groundwater monitoring wells.

"We really need more advanced models than we are talking about now," he said, or the state will risk misjudging the scope of a contamination incident until a "whole aquifer is polluted."

'Nobody knows; no one can know'

Conrad Dan Volz, director of the Center for Healthy Environments and Commu-

nities at the University of Pittsburgh, also argues that science has been missing in much of the consideration of long-term or cumulative effects of shale gas exploration.

He lists a number of elements of the drilling process that require further study, and plans to begin researching some of them this summer in southwestern Pennsylvania. His work will include baseline testing of rivers and comparisons of drinking water wells in areas full or free of gas drilling.

"The question is, why didn't we do the science beforehand on this?" he said.

"What we're really bad at — and we have the tools to do this — is anticipate problems. And I don't see where anyone has done much anticipatory work."

Even the most straightforward assurance about the hydraulic fracturing process — that aquifers are protected from fracturing by thousands of feet of layered, solid rock — is not as certain as the industry insists, Dr. Ingraffea, of Cornell, said.

Although he does agree that the chance of contamination through those layers is minuscule, he also knows from experience that the work to predict and measure where fractures go is necessarily inexact, and the rock "unfortunately" is not solid or impermeable.

To say that hydraulic fracturing contamination through direct communication with an aquifer is impossible is "nonsense," he said. "To say that it is inevitable is nonsense."

"We're dealing with a highly probabilistic underground system, where nobody knows, no one can ever know, exactly the geology that's down there, exactly the geometry of what's down there."

Add the very remote risk of fractures causing direct contamination, to the larger risks of well casing failures and human errors on the surface and the total probability of failure during Marcellus Shale gas production "starts looking, to me, high," he said. "Very risky."

Gas drilling companies have financial incentives to avoid mistakes, he said, but the experience of Marcellus Shale exploration so far — what he calls "ground truth" — has been a series of mistakes followed belatedly by attempts at improvement.

"They could have done this totally differently if they weren't in a hurry," he said.

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LACKAWANNA: Widespread drilling on doorstep of county

FROM PAGE A1

est concentration of leases in northern municipalities, including Scott, Benton and Greenfield townships, as well as areas of the Abingtons.

Many of the county's most prominent farmers, including the Manning, Eckel, Roba and Pallman families, have signed leases.

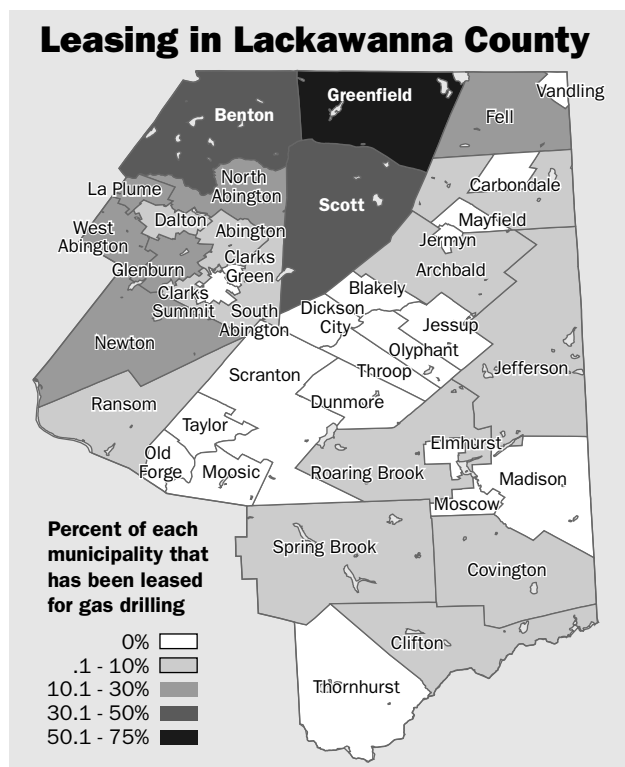
Although much of the land has been leased outside of the population centers along the Lackawanna Valley, leased parcels are not strictly on farms or in rural areas.

Baptist Bible College leased 114 acres on its South Abington Twp. campus.

The Abington Hill Cemetery Association leased 120 acres in South Abington along the Morgan Highway.

Leases also have been agreed to on land near residential areas. For example, 38 acres have been leased along the 900 and 1000 blocks of Fairview Road in South Abington Twp.

Property owners with leases include private individuals, but also churches, golf courses, businesses and com-



BOB SANCHUK / STAFF ARTIST

munity associations. The Greenfield Twp. Sewer Authority leased 7.3 acres; the Fleetville Volunteer Fire Company leased 65 acres in Benton.

The Newton Lake Associa-

tion and the Associates at Chapman Lake, two community associations that own their namesake lakes and the area around them, both signed leases.

Religious organizations

have also signed on, including the Harmony Heart church camp in Scott Twp., a 59-acre parcel owned by Parker Hill Community Church, the Evangelical Free Bible Church in North Abington Twp. and Community Bible Church in Greenfield Twp.

Three national energy companies, Oklahoma-based Chesapeake Appalachia, Texas-based Exco Resources and Texas-based Southwestern Energy, hold nearly all of the leases.

The amount of Lackawanna County land leased for gas development surprised even people who have followed the subject closely for years.

Lee Jamison, a leader of the multimunicipal Abington Council of Governments, which has hosted educational events and speakers regarding Marcellus Shale drilling since 2008, did not know the extent of the leasing or its reach to areas outside of the rural northwest of the county.

He said despite educational events and active gas drilling in nearby communities, Lackawanna County municipalities have to do more to follow changing legislation

On the Web

Check out our searchable Lackawanna and Luzerne counties database on natural gas drilling leased land at thetimes-tribune.com/gas

and precedent-setting court cases to prepare for the coming development.

"I still think there's quite a lack of preparedness on the part of the local municipal officials," he said. "Often times you get conflicting reports and confusing stories."

Mr. Jamison, who recently lost in the Republican primary race for state representative in the 114th House District, made Marcellus Shale a central part of his platform.

"Over 90 percent of the people I've spoken to are in favor of developing the Marcellus resource," he said, "but they want it done correctly. With that caveat."

Mary Felley, the open space coordinator of the Country-side Conservancy and a representative of Dalton in the

Scranton-Abingtons Planning Association, said residents and municipal officials are "aware that it's coming but not quite here."

"I come to my local borough meetings, and people ask what can we do as a borough to regulate this, and we don't know," she said.

Because of unsettled case law regarding what role municipalities can take in regulated drilling, "we're not getting a whole lot of clear guidance on what we can and cannot do here," she said. "That's kind of scary."

There has also been a dearth of local training specifically targeting municipal officials on preparing for gas development. Even if there were such meetings, "my concern is people may not attend those until there's a lot more activity in the county," she said.

"This is the way we've evolved apparently: You respond to urgent threats you can see. You don't respond to slow, impending threats that are over the hill somewhere."

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