

VIOLATIONS ANALYSIS OF SHELL OIL CO.'s SHALE GAS DEVELOPMENT IN PENNSYLVANIA

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About the Authors

Tia Kordell – Tia is a senior at Indiana University of Pennsylvania, dual majoring in Environmental Biology and Journalism with a focus on Public Relations. Tia started as a research fellow with Energy Justice Network in late spring 2013 and has continued with us through her fall semester. Her contributions to this report include methods development, data analysis, and the presentation of results. At IUP, Tia is the President of the Environmentally Conscious Organization, Vice President of Administration of IUP Ambassadors and an active member of IUP's chapter of Public Relations Student Society of America. As an Indiana native, she has a vested interest in the beauty and integrity of her rural community.

Paula Pryor – Paula is a senior at Juniata College in Huntingdon, PA. She is pursuing a Bachelor of Science degree in Geology, with an expected graduation date of May 2014. Paula worked as a research fellow for Energy Justice Network during her spring 2013 semester. Paula's contributions to this report include initial dataset accumulation, preliminary analysis, and background research regarding Shell Oil Co in Pennsylvania. At Juniata, Paula is involved in the student geology club, Andrew Lawson Geological Society. Her interest in environmental issues began early on in her youth, exploring the more rural areas of New York. After graduating from Juniata, Paula hopes to pursue a master's degree in geomorphology and hydrology.

Alex Lotorto - Alex is the project director of Frack University and Campus and Community Organizer for the Energy Justice Network. He received his bachelor's degree from Muhlenberg College in 2009 in Political Science and Film Studies with a minor in Economics. Alex's contributions to this report include supervision, training, parameter design, and conclusions. Currently, Alex provides support for campuses and communities impacted by Marcellus Shale development, coordinates our intern program, and assists with public comment and regulatory appeals. Professionally, he has completed a Political Economy internship at the Institute for Policy Studies in Washington DC, a multi-year human resources internship with Altec Lansing, an Americorps term with Public Allies Pittsburgh, and an apprenticeship with Mon Valley Unemployed Committee as an Unemployment Compensation Advocate. As a union delegate for the Industrial Workers of the World, he brings a strong social justice commitment to his environmental work. As a hunter and sportsman, Alex is grounded in his rural heritage that he wishes to preserve for future generations.

Executive Summary



This report analyzes data provided by the Pennsylvania Department of Environmental Protection regarding violations cited for shale gas development by Shell Oil Co's subsidiaries through the end of 2012.

Key findings include:

Shell has a 5:6 violation to well ratio. Out of 603 wells drilled, we found that Shell's subsidiaries East Resources Inc., East Resources Mgmt. LLC and SWEPI were cited 494 violations by PA DEP.

Ninety percent of Shell's violations were environmental in nature. Out of 494 violations, we identified 443 that were environmental in nature, which have or are likely to cause harm to the environment.

Shell has been cited for a casing failure rate of about one percent of wells for a total of six citations. It is important to note that well casings are meant to protect aquifers from contamination by chemicals used in the hydraulic fracturing, or "fracking" process.

Shell was cited violations 45 times for Improper Construction of Waste impoundments, 37 times for Faulty Pollution Prevention Practices, 25 times for Discharge of Industrial Waste. This presents imminent danger to surface and ground water supplies.

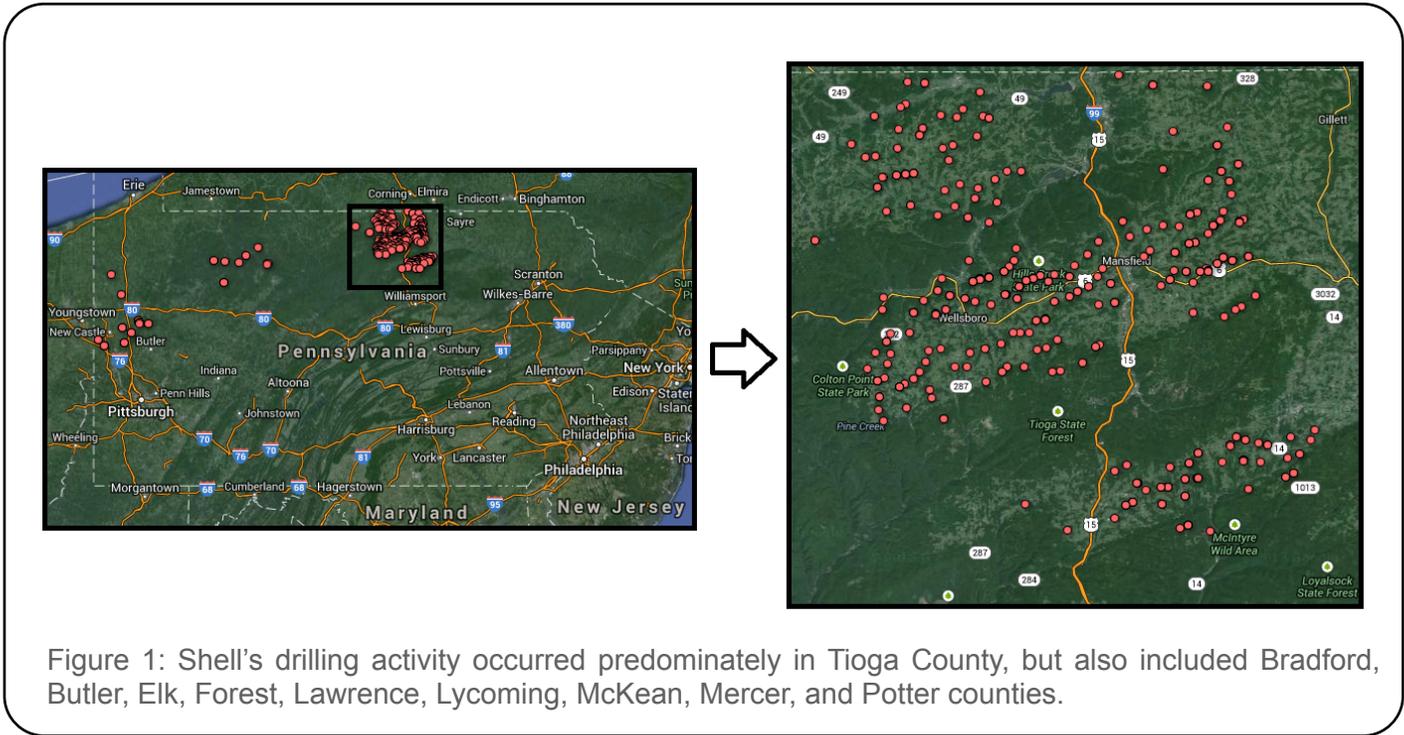


Figure 1: Shell's drilling activity occurred predominately in Tioga County, but also included Bradford, Butler, Elk, Forest, Lawrence, Lycoming, McKean, Mercer, and Potter counties.

The PA DEP classifies violations using two categories, “Environmental Health and Safety” and “Administrative”. Shell’s Environmental Health and Safety violations in Pennsylvania through December 31, 2012 totaled 298.

Of the 196 violations PA DEP classified as Administrative, 145 were environmental in nature (Table 1). In other words, nearly three quarters of Administrative violations addressed issues capable of negatively affecting the environment (Figure 2).

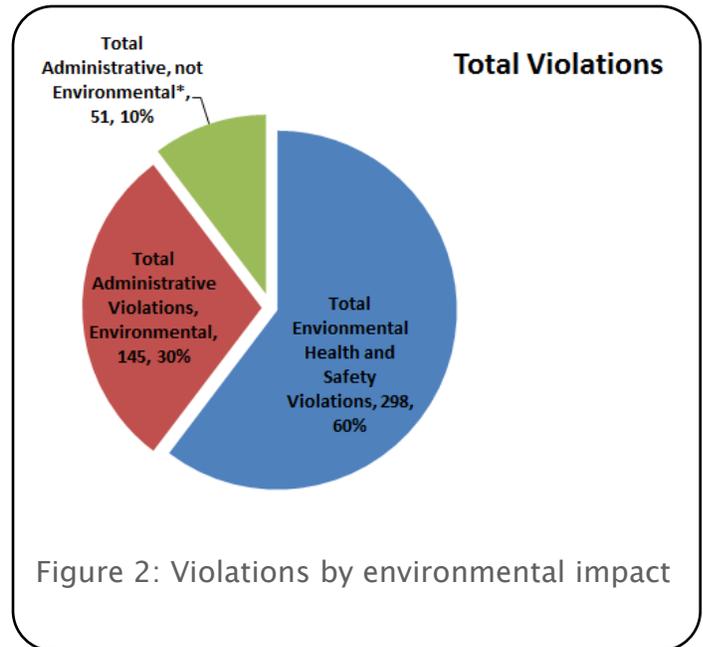


Figure 2: Violations by environmental impact

ADMINISTRATIVE VIOLATIONS	
Improper Construction of Waste Impoundments	45
Faulty Pollution Prevention Practices	37
Failure to Post Necessary Information at Drill Site (permit number, drill log)	27
Discharge of Industrial Waste	25
Violations of PA Clean Stream Law	16
Improper Erosion and Sediment Control Plan Developed/Implemented	12
General	11
Failure to Notify Landowners/PA DEP of Activity Prior to Commencement of Drilling	10
Improper Well-Casing Construction	6
Improper Restoration of Extraction Site	4
Operating Without the Proper Permits	3
TOTAL	196

Table 1: Shown is a categorical breakdown of Shell’s Administrative violations in Pennsylvania through Dec. 31, 2012.

The goal of this report is to provide a frame for decision makers at an institutional, local, state, and federal level to review the frequency and categories of violations Shell Oil Co.’s subsidiaries have accrued in Pennsylvania. It does not take into account air quality, microeconomic, macroeconomic, public health, midstream, or downstream concerns related to the gas industry.

Most urgently, Shell is drilling in proximity to state universities like Slippery Rock and Mansfield where university presidents now hold discretion whether or not to lease campus land for drilling. We hope that this report informs those campus communities, as well as our neighbors, about the risks of doing business with Shell.

Introduction

Royal Dutch Shell is the largest corporation in the world, landing at the top of the Fortune 500 List in 2012 (CNN, 2013). Size does not come without consequence, as Shell is embroiled in conflicts, controversy, and mishaps around the world in Nigeria (Sekularac and Deutsch, 2013), the Arctic (Shell), and especially, the United States.

The United States division, Shell Oil Co., is pursuing massive shale gas exploration and infrastructure. Shell states that it has nearly 900,000 gross acres of Pennsylvania Marcellus rights, developing Pennsylvania's Marcellus and Utica Shale at a steady pace. Marcellus shale is a common formation in Pennsylvania, extending into New York, Ohio, West Virginia and Maryland. Shell acquired East Resources and merged those operations with their subsidiary SWEPI LP in 2011. This followed the trend set by their competitors, Chevron and Exxon Mobil, who have acquired Pennsylvania drillers, Atlas Energy and XTO, respectively.

The development of shale gas requires the use of hydraulic fracturing, a process that releases natural gas reserves about a mile under the Earth's surface. Before hydraulic fracturing can occur, a five to ten acre well pad is constructed. Then, a bore hole is drilled to great depths, through the aquifer. When the desired depth is reached, the drill turns 90 degrees and drills horizontally, through natural gas deposits. The bore hole is enveloped in a steel and cement casing to prevent leaks. After the well is drilled and cased, explosives are set off downhole in the horizontal lateral to open fractures in the shale. Finally, the hydraulic fracturing, or "fracking" process begins. A mixture of chemicals, water, and silica sand are forced down the well at a pressure exceeding 10,000 pounds per square inch. The silica sand or acts to prop open the cracks in the shale as the gas flows up the well. Up to half of the water and chemicals return as waste, which is stored onsite. (Jennings Jr and Sprunt, 1995).

Shell's innovations in oil and gas technology have driven their share price to near record highs due to their strategic footholds in the production sector. Combining hydraulic fracturing and deep horizontal drilling is certainly *clever*. However, given the external costs passed on to the public, the temporary nature of fossil fuel reserves and the propensity for clean energy alternatives to succeed, we ask, is it *wise*?

Dispute surrounding issues of regulation, sustainability of the practice, long-term economic benefits and homeowner rights have risen amidst the spike of attention unconventional natural gas drilling has received. One of the most prevalent concerns related to this practice is the environmental impact.

According to their website, the Pennsylvania Department of Environmental Protection (PA DEP) "is responsible for reviewing and issuing drilling permits, inspecting drilling operations and responding to complaints about water quality problems. PA DEP inspectors conduct routine and unannounced inspections of drilling sites and wells statewide" (PA DEP, 2013). Within Pennsylvania, the Oil and Gas Act, Coal and Gas Resource Coordination Act and Oil and Gas Conservation Law must be adhered to when participating in activities associated with Marcellus Shale exploration. In regard to environmental regulation, Marcellus Shale operators must also abide by the Clean Streams Law, the Dam Safety and Encroachments Act, the Solid Waste Management Act and the Water Resources Planning Act (PA DEP, 2011).

When a driller disobeys any of these laws, the PA DEP issues violations, filed either under "Administrative" or "Environmental Health and Safety." A PA DEP Environmental Program Manager described an Administrative violation to be more like paperwork violations. Our cursory review and final results showed that nearly three quarters of Administrative violations were not, in fact, simply involving a lack of proper paperwork or

permits. Environmental Health and Safety violations are environmental-type violations, involving acts like impacting streams, air quality and soil, according to the PA DEP employee.

We chose to investigate Shell because of its vested interest in Marcellus Shale development in Pennsylvania. As local citizens, we wish to be vigilant when such a large-scale company alters the land we know as home.

Where Shell's interest in natural gas extraction lies, public disregard for environmental impacts and significant violations follow.

One example of a Shell mishap is a 30-foot-tall methane and water geyser that shot through the air in Tioga County for more than a week in June 2012 after hydraulic fracturing operations occurred nearby (Detrow, 2012). A mile wide evacuation of residents was advised initially, presenting a crisis for local emergency responders.

A cursory review of the PA DEP compliance reports for Shell's subsidiaries in Pennsylvania also reveals a very negligent past. As an operator Shell has failed in a range of compliance issues, from simple paperwork related problems to major spills and groundwater contamination.

Shell's Tioga County Methane Geyser Captured On Video

June 28, 2012 Scott Detrow
State Impact NPR

A group called the Responsible Drilling Alliance has obtained video of the geyser of water and methane that shot out of the ground last week at near a Shell natural gas drilling site in Union Township, Tioga County. Due to the geyser, methane bubbling into a nearby creek and gas spotted in a private water well, Shell issued a voluntary evacuation request to people living within a mile of the well. The Department of Environmental Protection is investigating the incident.

The video was taken on Tuesday, June 19th. RDA's Ralph Kisberg said the person who filmed the footage wants to remain anonymous, but identified one of the men speaking in the video as Canton Fire Chief Kim Jennings. In a brief phone interview with StateImpact Pennsylvania, Jennings confirmed that fact.

"I've never seen a geyser like that," he said.

The flume gradually decreased in size over the course of the week, as Shell flared off gas at three nearby well clusters to bring down subsurface pressure. Company spokeswoman Kelly op de Weegh said the flow has now completely stopped.



An incident on September 12, 2011 occurred in Canton Township, Bradford County when, according to the inspector notes, “~250-900 gallons” of hydrochloric acid spilled. Shell did not resolve the issue to the inspector’s satisfaction until nearly four months later, on January 3, 2012.

Shell was cited three violations for that incident classified as Environmental, Health & Safety. Those included “Discharge of industrial waste to waters of Commonwealth without a permit”, “Failure to adopt pollution prevention measures required or prescribed by DEP by handling materials that create a danger of pollution”, and “Failure to properly store, transport, process or dispose of a residual waste”. An administrative violation for that incident was cited as “Pit and tanks not constructed with sufficient capacity to contain polluttional substances”.

On January 26, 2012, an instance of groundwater contamination was cited in Shippen Township, Tioga County when an inspector found methane venting outside of the production casing during a routine inspection. The inspector wrote, “Gas venting outside btw surface and conductor. Cited 78.81(2) - failure to prevent migration of gas or other fluids into sources of fresh groundwater.” and cited Shell for an Administrative violation, “Failure to case and cement properly through storage reservoir or storage horizon”.

On February 28, 2012, during hydraulic fracturing of six wells at a well pad in Jackson Township, Tioga County, Shell was cited four violations for a failed waste pit liner. The comments from the PA DEP inspector included, “plastic tote and plastic liner failed, allowing frack fluid to spill on ground”, “potential for frack fluid to enter water way and/or groundwater”, and “Did not report leaking frack fluid.” A note at the bottom of the entry says “No Related Enforcements”.

The Appendix of our report includes a data export from the PA DEP compliance reports for Shell’s subsidiaries. There are many more examples included there for an expeditious reader to review.

From Royal Dutch Shell’s Form 20-F filing with the US Securities and Exchange Commission:

The nature of our operations exposes us to a wide range of health, safety, security and environment risks.

The health, safety, security and environment risks to which we are potentially exposed cover a wide spectrum, given the geographic range, operational diversity and technical complexity of Shell’s daily operations. ... If a major health, safety, security, or environmental risk materialises, such as an explosion or hydrocarbon spill, this could result in injuries, loss of life, environmental harm, disruption to business activities and, depending on their cause and severity, material damage to our reputation and eventually loss of licence to operate. (Shell, 2012)

We modeled our study and objectives after the Pennsylvania Land Trust Association review of Marcellus Shale violations from 2008 to 2010. We extensively examined the Administrative class of violations as issued by the PA DEP to understand the implications of each incident, in addition to our tally of Environmental, Health & Safety violations.

Environmental safety is of the utmost importance in Marcellus Shale development, as well as the reassurance that drilling and fracking mishaps are prevented and corrected effectively.

Methods

The violations data was obtained from the Pennsylvania Department of Environmental Protection website, <http://www.depweb.state.pa.us>, Oil and Gas Compliance Reports. Data for Shell's subsidiaries (East Resources Inc., East Resources Mgmt LLC and SWEPI) was found using the criteria for unconventional drilling from Jan. 1, 2000, to Dec. 31, 2012 in all counties.

The PA DEP SPUD report, also found on PA DEP's oil and gas reports website, was used to determine a total of 603 wells drilled through December 31, 2012. "Spud" is the industry term for breaking ground with a drill bit.

After exporting the compliance data, Administrative violations and Environmental Health & Safety violations were sorted into separate spreadsheet files. The categories used for Shell's administrative violations were based on the categories used by the Pennsylvania Land Trust Association's report "Marcellus Shale Drillers in Pennsylvania Amass 1614 Violations Since 2008 - 1056 Identified as Most Likely to Harm the Environment" (PA Land Trust, 2010).

Administrative categories "General", "Failure to Notify Landowners/PA DEP of Activity Prior to Commencement of Drilling", and "Operating Without the Proper Permits" were counted as not environmental in nature. Although they still present objectionable circumstances regarding Shell's operations, the primary focus of this report is environmental impact.

Improper Construction of Waste Impoundments

- During the fracturing process, millions of gallons of water and other chemicals are injected into the ground. About 20 percent of this fluid returns to the surface, additionally carrying heavy salts and minerals collected during the fracturing process. This "flowback" is stored in tanks or open pits until transported to treatment or disposal facilities. This category encompasses improperly lined flowback

pits, impoundments not constructed correctly or not being structurally sound.

Failure to Notify Landowners/PA DEP of Activity Prior to Commencement of Drilling -

As described in Act 13 and the Pennsylvania Oil and Gas Act, it is required that notifications are issued to landowners prior to drilling and hydraulic fracturing. In cases with unconventional wells, pre-drilling notifications must be given to landowners, water purveyors, coal owners and operators, the municipality and adjacent municipalities within 3,000 feet of the proposed well. The purpose of such requirements is to allow the public stakeholders to comment on the proposed activity. Violations sorted into this category directly breach such requirements.

Operating without the Proper Permits - The PA DEP requires operators to obtain permits for various activities related to hydraulic fracturing to ensure drilling activities are done in a manner that best protects the environment. Violations in this category include drilling, altering or operating a well without a permit and failure to comply with the terms and conditions of a permit.

Improper Erosion and Sediment Control Plan Developed/Implemented -

Earth disturbing activities involved with Marcellus Shale natural gas well construction include constructing roads and drill pads and installing pipelines. Acceleration of erosion processes and displacement of sediments can occur because of these disturbances. Erosion and Sediment Control Plans, developed and implemented to minimize disturbance that could affect freshwater, are required. Violations in this category include inadequate development and implementation of Erosion and Sediment Control Plans or failure to develop or implement such plans.

Failure to Post Necessary Information at Drill Site (permit number, drill log) -

It is required by PA DEP for any well operator to properly post its permit number and emergency contact information on signage visible from the public right of way

entrance to a well pad. The drill log, erosion and sediment monitoring documentation, site plans, and copies of the permit must be available to PA DEP inspectors in a mailbox at the entry to the well pad. Violations in this category pertain to those issues.

General - The violation codes 601.101 - O&G Act 223-General and 51017 - Administrative Code-General are used when specific codes do not apply. However, many of the violations cited as General have environmental implications, as described in the violation or inspection comments. Examples include polluting substances not being contained in pit or tank (Perm. # 105-21434, Viol. ID 582045), failure to minimize erosion and stabilize disturbance in high quality watersheds (Perm # 105-21633, Viol. ID 584190) and allowing residual waste to enter a drainage swale, potentially endangering the waters of the Commonwealth. General violations with environmental implications were categorized under the most serious violation cited in the inspection or violation comments. If the General violations were not environmental in nature, they were categorized under General.

Improper Well-Casing Construction - Marcellus Shale wells are drilled deep through groundwater. Well casings, made up of steel and cement, surround the underground well to protect groundwater supplies from the wastewater, natural gas and drilling chemicals that flow through the well. Violations in this category include problems with the cement and well casings.

Discharge of Industrial Waste - Violations in this category include discharge of industrial waste onto the ground, such as wastewater, drilling fluid, brine and drilling mud and cement. An example of a violation in this category is Permit # 117-10439, Violation ID 590851, filed under Act 223 - General because the "Production tank line leaked estimated

1000 gallons of brine water onto well pad. Fluid migrated off well pad."

Improper Restoration of Extraction Site - A operator must plug the well and restore the site within nine months of plugging the well once it stops producing. Violations in this category include improperly plugged wells or failure to plug well or restore site, which can cause health, safety, and environmental problems and unrestored sites leave Pennsylvania's landscape scarred and plant and wildlife habitat damaged.

Faulty Pollution Prevention Practices - The drilling process in Marcellus Shale drilling uses toxic chemicals and produces toxic waste that could potentially pollute land, surface and groundwater and the air. Specific precautions must be taken by drillers to prevent pollution. Violations in this category include exceeding the level of wastewater in the impoundment that is needed to prevent wastewater overflow when it rains and failure to take all necessary measures to prevent spills.

Violations of PA Clean Streams Law - Pennsylvania has the right to protect its streams from pollution through the Clean Streams Law. This law enables the government to regulate discharges of the sewage and industrial waste. The goal is to preserve and improve the purity of the waters of the Commonwealth for public health, aquatic and animals life, and recreation.. It includes the ability to regulate discharges of sewage and industrial wastes.

Results

TOTAL VIOLATIONS	
Total Environmental Health and Safety Violations	298
Total Administrative Violations, Environmental	145
Total Administrative, not Environmental*	51
TOTAL ENVIRONMENTAL	443

Table 2: Shown is a breakdown of violations based on environmental criteria described in our Methods section. *Categories include “General”, Failure to Notify Landowners/PA DEP of Activity Prior to Commencement of Drilling”, and “Operating Without the Proper Permits”.

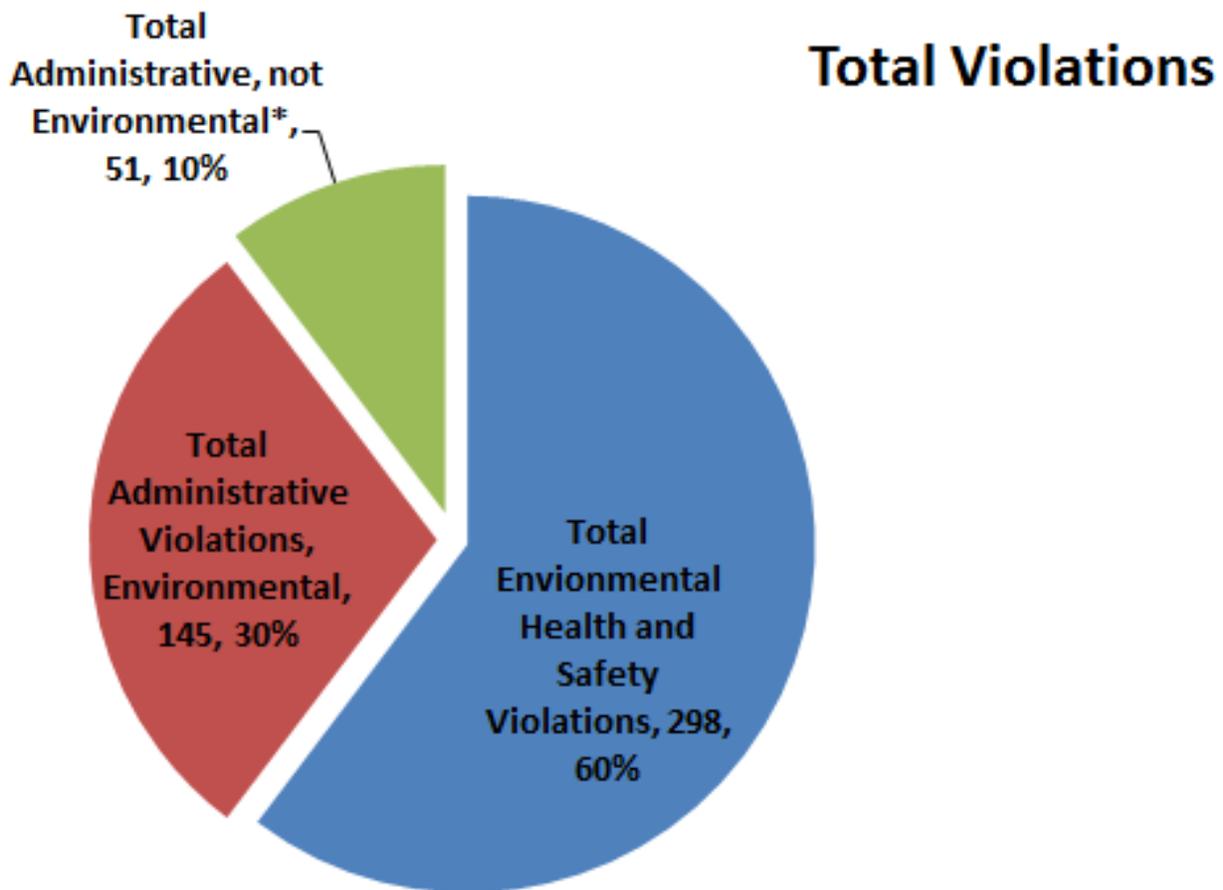


Figure 3: *Categories include “General”, Failure to Notify Landowners/PA DEP of Activity Prior to Commencement of Drilling”, and “Operating Without the Proper Permits”.

Results (cont.)

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Table 3: Shown is a categorical breakdown of Shell's Administrative violations in Pennsylvania through Dec. 31, 2012.

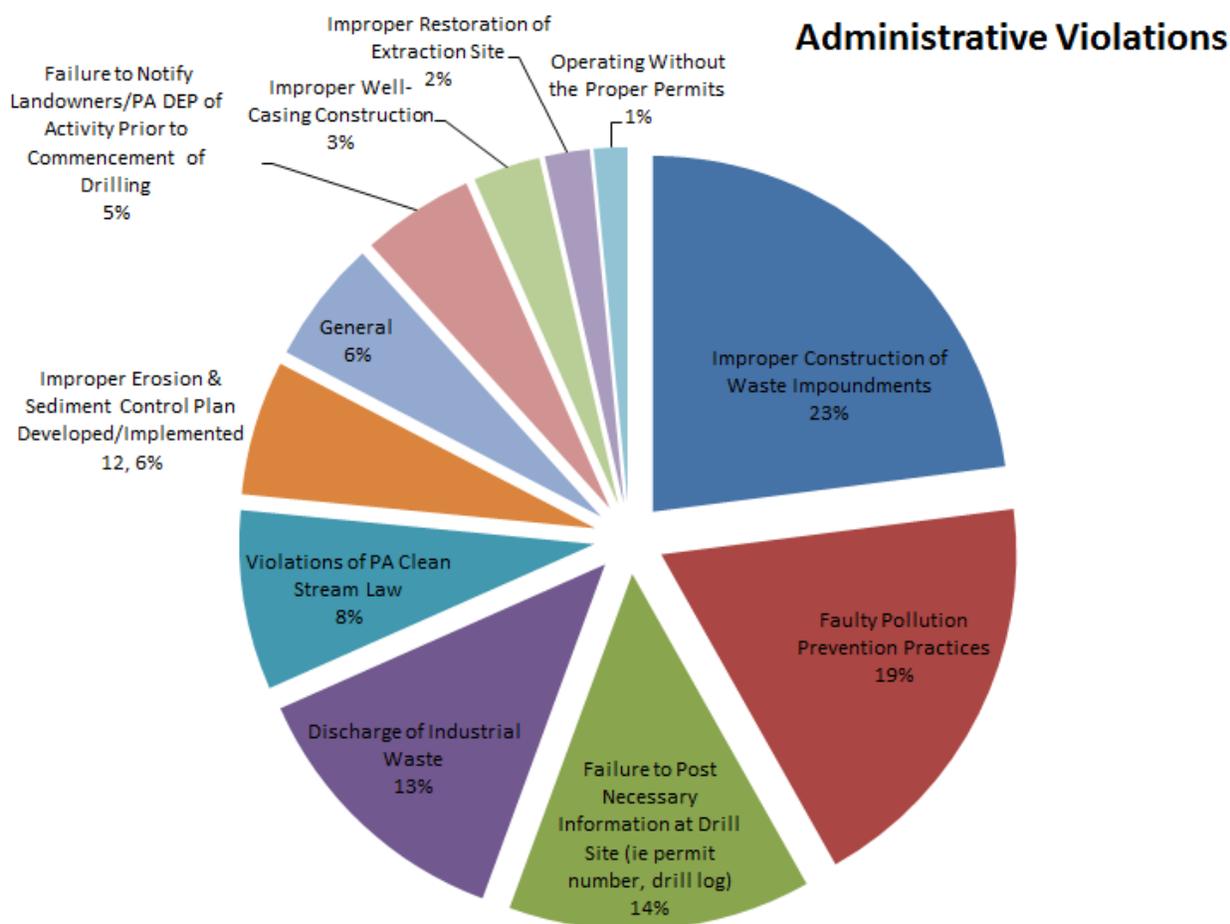


Figure 4

Analysis

Shell has a 5:6 violation to well ratio. Out of 603 wells drilled (SPUD Report), we found that Shell's subsidiaries East Resources Inc., East Resources Mgmt. LLC and SWEPI were cited 494 violations by PA DEP.

Ninety percent of Shell's violations were environmental in nature. Out of 494 violations, we identified 443 that were environmental in nature, which have or are likely to cause harm to the environment.

Shell has been cited for a casing failure rate of about one percent of wells for a total of six citations. It is important to note that well casings are meant to protect aquifers from contamination by chemicals used in the hydraulic fracturing, or "fracking" process.

Shell was cited violations 45 times for Improper Construction of Waste impoundments, 37 times for Faulty Pollution Prevention Practices, 25 times for Discharge of Industrial Waste. This presents imminent danger to surface and ground water supplies.

Shell accrued a total of 298 "Environmental Health and Safety" violations in Pennsylvania through December 31, 2012. These range from toxic spills to failed erosion and sediment controls.

PA DEP's use of "Administrative" to classify violations does not mean simply "paperwork related" as we were led to believe by department officials. Of the 196 PA DEP violations classified as Administrative, 145 were environmental in nature, approximately 75 percent. Categories we did not include as environmental were "General", "Failure to Notify Landowners/PA DEP of Activity Prior to Commencement of Drilling", and "Operating Without the Proper Permits".

PA DEP sometimes cited Shell multiple violations for the same incident. We tallied violations instead of incidents to reflect the scale and level of enforcement actions by state regulators.

The SPUD reports and Compliance reports present a 25-well discrepancy between Shell's subsidiaries' total wells drilled through December 31, 2012. We explicitly limited our sampling to December 31, 2012 to allow time for PA DEP to complete and maintain the integrity of their data sets. However, exported data from the Compliance reports reveals that 628 SWEPI wells were "inspected" but the SPUD report only says 603 wells were drilled by Shell's subsidiaries. Based on familiarities we have with industry presentations, we decided to use the SPUD reports as our official tally of wells.

Conclusion

We conclude that Shell is a bad actor when it comes to shale gas development. We implore decision makers to decide if it is wise to do business with Shell, whether or not one approves of shale gas development. Our research reveals a significant risk of negative environmental consequences.

Their most serious violations should make it clear there is always a clear and present danger involved with Shell operations. The smallest environmental violations like failed erosion and sediment controls show that Shell cannot even abide by basic construction best management practices.

The scope of impacts related to this activity reaches far beyond the well pad. While

applying the information presented in this report, it is important to understand these violations only apply to errors at the well pad itself. These do not take into account air quality, consequences of the presence of pipelines and pipeline construction, compressor stations, construction of facilities, road quality, traffic implications and other indirect effects of Marcellus Shale development.

Shell is the largest company globally and has been paying Pennsylvania acute attention because of our position above the Marcellus and Utica Shales. Shell is only one of the dozens of companies who have taken interest in Pennsylvania's prospects, and their record reveals significant impacts on the environment a vast majority of the time.

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Appendix

Data provided by PA DEP Oil & Gas Compliance and SPUD reports through December 31, 2012 are downloadable here:

<http://www.fracku.org/2013/10/know-your-driller-shell-report.html>

To obtain hard copies of data used for this report, please contact:

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