

Roadway Degradation Costs Due to Mass Fracking Industrialization

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Focus of Fracking in Illinois has been on Selling Benefits

On May 31, 2013, the Illinois Senate passed SB1715, the Hydraulic Fracturing Regulation Act, by a vote of 52-3, the day after it passed the House by a vote of 108-9. The passage of this bill, signed by Governor Pat Quinn into law on June 17, 2013, will open the doors to massive fracking industrialization of Southern Illinois once regulations and the regulatory infrastructure are in place. Draft fracking regulations, which were drafted without the benefit a single scientific study, are currently in the public comment part of the process, which ends on January 3, 2014.

While the potential benefits of mass fracking industrialization for Southern Illinois have been frequently highlighted by the oil & gas industry, Illinois politicians, and mainstream media (jobs, lease fees, severance tax revenues, energy independence, etc.), the potential negative impacts of mass fracking industrialization on Southern Illinois have been at best de-emphasized, and at worst completely denied. This politically facilitated industry-driven initiative does not particularly have popular public support either in Southern Illinois, with 40.7% supporting it, 39.7% opposed, and 19.6% no opinion (Leonard, 2013) or nationwide, with 44% favoring increased fracking and 49% being opposed. In the six-month period from March to September, 2013 public opposition to fracking grew by 11% (Pew Research Center, 2013).



Fracking's Liabilities

This shift is at least in part due to increased public awareness of the many potential negative impacts that accompanies mass fracking industrialization, which include (but are not limited to): air pollution due to methane leakage and industrial equipment operation; water contamination from methane migration and leaks, spills and intentional dumping of frack fluid; toxic and radioactive fracking flowback and produced water; fracking wastewater disposal induced earthquakes; infrastructure destruction and roadway degradation; increased greenhouse gas emissions; habitat segmentation and ecosystem degradation; permanent destruction of water; social ills including increased crime, drugs, prostitution, homelessness; and the most dangerous workplace in the United States.

Though readily monetizable, general efforts to attach price tags to these various economic, environmental and social ills have lagged immensely behind efforts to project potential revenues from mass fracking industrialization. However, several state departments of transportation have more recently raised important concerns regarding damage to infrastructure, and roadway degradation in particular, due to the immense drilling and fracking-related truck traffic.

The issue of roadway degradation touches upon a number of extremely important public interests, including economic concerns (are taxpayers responsible for road repairs and reconstruction in generally rural counties with relatively small road budgets?), safety concerns (dangerous degraded roadway and bridge conditions, along with an increasing gravelization of rural U.S.) and quality of life concerns (dust, traffic, noise and air pollution). As mass fracking industrialization continues to proliferate around the United States, these concerns are starting to become more and more of an issue nationwide.

Scale of Mass Fracking Industrialization

The most comprehensive list of total HVHF (fracking) wells by state has been compiled by Ridlington and Rumpler (2013), who found that between 2005 and 2012 more than 82,000 fracking wells were drilled or permitted in 17 states, with 22,326 fracking wells being drilled in 2012, 13,540 of which were drilled in Texas.

Current industry plans for continued mass fracking industrialization nationwide includes the drilling of one to two million wells over the next 10 to 20 years, with production at each well running for approximately 30 years. Estimated total projected wells for individual states include 100,000 in Pennsylvania (Yeoman, 2013), 50,000 in North Dakota (Scheyder, 2013), and 40,000 for the State of New York (Kennedy & Gallay, 2012). In terms of total fracking wells already drilled, Texas has more than 33,000 wells, followed by Colorado with in excess of 18,000, and Pennsylvania with nearly 7,000 (Ridlington and Rumpler, 2013).

With more than \$250 million invested in buying up drilling leases on a half million acres of private land in southeastern Illinois (Yeagle, 2013), the oil and gas industry is planning on fracking 50,000 to 100,000 wells in a 19-county area of state's southeast corner including Jasper, Crawford, Clay, Richland, Lawrence, Wayne, Edwards, Wabash, Franklin, Hamilton, White, Williamson, Saline, Gallatin, Johnson, Pope, Hardin, Pulaski and Massac Counties (Bieneman, 2013).

High Density of Well Placement

The cause of greatest harm is not particularly the high volume hydraulic fracturing (HVHF) or fracking technology itself, as it is the scale of industrialization required to engage in this form of fossil fuel extraction. As Columbia University's Dr. Anthony Ingraffea relates, the problem with shale gas and oil is that it is fundamentally distributed everywhere equally throughout a shale play, which means that the industry has to drill *everywhere* to access it.

Everywhere can mean a five to fifteen-acre drilling pad, with each one supporting six to twelve wells and spacing of one well for every 40 (in the Marcellus Shale Play) to 65-acre (in the Eagle Ford Shale Play) area in a given county to be fracked. With the industry standard of fracking 70% of targeted counties, individual rural counties in southeastern Illinois in the *sweet spot* of the New Albany Shale Play could conservatively be looking at upwards of 3,500 wells each. This total is based upon one well for every 65-acres, clustered in 6-well drilling pads over 70% of a county, with an average of 14 townships per county and each township averaging 36 square miles in area (Podulka & Podulka, 2010).

Intensity of Fracking-Related Truck Traffic

The amount of truck traffic required to service each individual fracking well is immense. Podulka and Podulka (2010) estimate that it takes between 1,760 and 1,904 truck trips hauling equipment, materials and water to build, drill and high volume hydraulically fracture a single well. A typical Marcellus fracked well requires 5.6 millions gallons of water during the hydraulic fracturing of the shale, of which approximately half returns to the surface as flowback and produced wastewater, which is summarily shipped away in tanker trucks to disposal wells. Currently more than 95% of fracking wastewater produced in the United States is injected into deep disposal wells (Clark and Veil, 2009).

Moss (2008) estimates that it can require more than 3,000 truck trips to bring water to and remove waste from a single typical fracking well, with an additional 220 to 364 trips being necessary for hauling equipment, materials and employees. The New York State Department of Transportation (2011) found that while the drilling phase can require 290 truck trips over a 28 day period, due to total water and waste needs the hydraulic fracturing of a single well can require more than 2,300 truck trips in just a 3 day period. The New York State Department of Environmental Conservation [NYDEC] estimates a single well requires 1,800 to 2,600 total truck drive-bys (truck trips) through all phases, with an 8 well site requiring 14,400 to 20,800 total truck trips.

A comprehensive study prepared by Underbrink (2012) for the DeWitt County Texas Commissioners utilized Equivalent Axle Load Factors (EALF), roughly equivalent to both a truck trip and an Equivalent Single Axle Load (ESAL), to define traffic demand in the Eagle Ford Shale region. A typical country road will last about twenty years when being subjected to about 500 EALF's per year, requiring reconstruction after a total of 10,000 EALF's. Underbrink estimates that the total EALF's in the first year of a single fracking well's development and production is 2,430, with annual EALF total of 1,250 thereafter, for a total of 26,680 for one single well in production over 20 years.

Known Roadway Degradation Costs Due to Mass Fracking Industrialization

The New York State of Transportation estimated that the total road maintenance costs to mitigate impacts from truck traffic to 40,000 proposed wells across New York State would total as much as \$378 million annually. This total is based upon state roads having an estimated cost between \$90 million and \$156 million per year, and local roads and bridges having an estimated cost between \$121 million to \$222 million per year (Barth, 2013; Kennedy and Gallay, 2012; New York State Department of Transportation, 2011).

Arkansas estimates that the costs from road damage due to fracking truck traffic are \$450 million, finding that roads designed to last 20 years require major repairs after only 5 years due to fracking's constant stream of overweight vehicles ferrying water and equipment to and from well sites (Heinberg, 2013; Rogers, 2013).

According to David Flynn, the Director of the University of North Dakota Bureau of Business and Economic Research, North Dakota allocated nearly \$1 billion for infrastructure, primarily for roads damaged by heavy energy-related truck traffic (Gunderson, 2012; White, 2013). Alan Dybing, a researcher at the Upper Great Plains Transportation Institute, states, "Simply put, the roads are falling apart in many cases," as each new well requires more than 2,000 truck trips, and the massive trucking rigs are demolishing the state's roadways (Holeywell, 2011).

Pennsylvania Department of Transportation officials reported that in 2010 more than \$265 million was needed to repair roads damaged due to Marcellus Shale drilling (Christie, 2010; Dutzik et al., 2012). Additionally, state officials reported that as their rural roads were not designed to withstand the volume or weight of the level of truck traffic, they have sometimes been degraded into impassability (Randall, 2010). By 2013, the state estimated that it would cost \$3.5 billion just to maintain the states existing roadway assets, and an additional \$8.7 billion for necessary bridge repairs (Rogers, 2013), with fewer than 7,000 existing wells.

An engineering study from the Eagle Ford Shale Task Force regarding anticipated fracking-related truck traffic in DeWitt county Texas indicated that with an estimated 3,250 wells that will be accessed by county roads, the total cost for DeWitt County to provide a road system (331 miles) to meet projected industry and public needs would be approximately \$432 million, or almost \$133,000 per well (Underbrink, 2012).

The Texas Department of Transportation [TDOT] has estimated that the cost of maintaining the roadway infrastructure degraded by the fracking traffic statewide is \$4 billion a year (Heinberg, 2013; Rogers, 2013). That includes \$1 billion for farm-to-market roads, \$1 billion for local roads, and \$2 billion for interstate and state highways (Barth, 2013). TDOT additionally estimates that \$2 billion of that total is road damages to the East Ford Shale region of South Texas alone (Remington, 2013). Due to the overwhelming extent and expense of the destruction in that area, the TDOT plans to convert at least 83 miles of asphalt roads into gravel roads in those areas experiencing increased fracking-related truck traffic (Batheja, 2013).

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