Transportation Policy Brief #5

Potential Use of Highway Rights-of-Way for Oil and Natural Gas Pipelines

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FOREWORD

The Lyndon B. Johnson School of Public Affairs, The University of Texas at Austin, has established interdisciplinary research on policy problems as the core of its educational program. A major part of this program is the nine-month policy research project (PRP), in the course of which two or more faculty members from different disciplines direct the research of 10 to 20 graduate students of diverse backgrounds on a policy issue of concern to a government or nonprofit agency.

During the 2013–2014 academic year, the Texas Department of Transportation (TxDOT) funded, through the Center of Transportation Research (CTR), a policy research project addressing seven key policy issues.

The research team interacted with TxDOT officials throughout the course of the academic year. Overall direction and guidance was provided by Mr. Phil Wilson, former Executive Director of TxDOT. Mr. Wilson participated in an October 10, 2013 workshop to determine the scope of the study. As a consequence, the following policy issues were selected for study:

- Air Transportation in Texas
- Autonomous Vehicles in Texas
- North Carolina's Strategic Mobility Formula
- Oregon's Voluntary Road User Charge Program
- Potential Use of Highway Rights-of-Way for Oil and Natural Gas Pipelines
- State Energy Severance Taxes and Comparative Tax Revenues
- U.S.–Mexico Transportation and Logistics

The findings of each policy issue are presented within the context of separate transportation policy briefs. This particular policy brief, "Potential Use of Highway Rights-of-Way for Oil and Natural Gas Pipelines," was researched and written by Benjamin Moriarty and Kyle McNew.

The following template was also approved for each of the above-mentioned briefs:

- Executive Summary
- Background
- Key Issues
- Lessons Learned
- Relevance to Texas
- Appendices

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This policy research project would not have been possible without the generous contributions of assistance of a great number of individuals and organizations. Useful contacts are provided in Appendix 1 of each of the respective transportation policy briefs. As previously mentioned, overall direction and guidance was provided by Mr. Phil Wilson, former Executive Director of TxDOT. We are also indebted to the following TxDOT officials for participating in weekly class presentations or scheduled interviews, sharing information and data, and suggesting useful contacts:

- John Barton, P.E., Deputy Executive Director/Chief Engineer
- James Bass, Chief Financial Officer
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EXECUTIVE SUMMARY

Hydraulic fracturing (fracking) and horizontal drilling have led to a successful expansion in energy production in Texas. Increased oil and gas extraction has created net economic gains statewide, and job growth has risen accordingly. Projections indicate that fracking will continue to play a large role in the Texas energy industry, especially as natural gas slowly displaces coal in national energy standards. The effects, both positive and negative, of hydrocarbons production will be felt throughout the state for decades to come.

An unintended side effect of fracking has been the reliance on trucks to transport water and wastewater from oil and gas production sites to disposal injection wells. Truck traffic related to the energy boom causes billions of dollars per year in damage to both the Texas highway system and to county and municipal roads.[1] Many of these county roads were built in the 1950s and were not designed to handle the weight and frequency of the wastewater trucks. Moreover, as maintenance costs have risen to the point where proper maintenance is unsustainable, road safety has also become a major concern. According to TxDOT data, traffic fatalities have increased over 10% across the state. In areas such as the Eagle Ford shale, they are up 40%.[2]

In order to control maintenance costs and alleviate the need for trucks on the road, TxDOT can support and help fully implement several policy mechanisms. Senate Bill 514 grants right-of-way (ROW) access to saltwater pipelines that could drastically reduce road deterioration if used in place of trucks. This outcome can be achieved both through the use of above- and below-ground pipelines. House Bill 2767 encourages private firms to recycle fracking wastewater used in the production process, further reducing the reliance on trucks. Achieving similar legislation by creating incentives to encourage on-site recycling of water would be even more beneficial for road preservation. By working with both energy firms and regulatory agencies like the Railroad Commission of Texas, TxDOT can take positive steps to lower the prohibitive costs of maintaining state and local highways. Promoting innovative legislation in tandem with private sector cooperation will help TxDOT to preserve both roads and roadway users' lives.

BACKGROUND

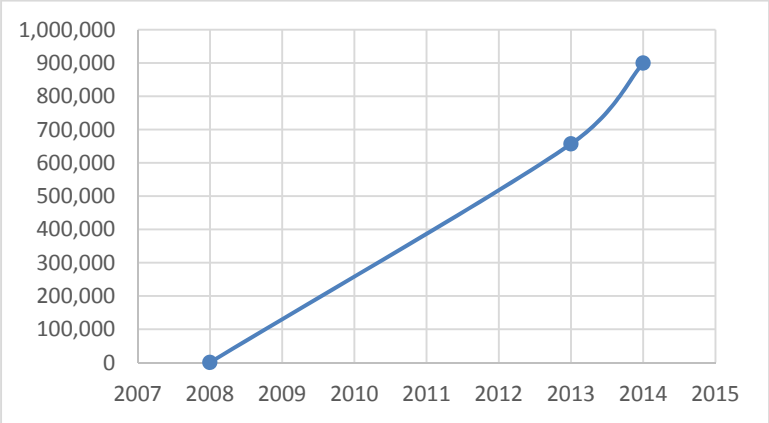
While the oil and gas industry has always been important and influential in Texas, over the past decade exploration and production (E&P) have expanded tremendously. Technological developments have increased the number of viable shale plays all across the state. This growth has led to a rapid development in E&P. Industry experts estimate that current production levels will continue for several decades, if not longer.[3]

As Texas has seen, technological advancements in hydraulic fracturing (fracking) have allowed companies to extract more oil than was once previously possible. Fracking is the

[1] Henry, 2013.
[2] Ibid.
[3] Campoy, 2012.

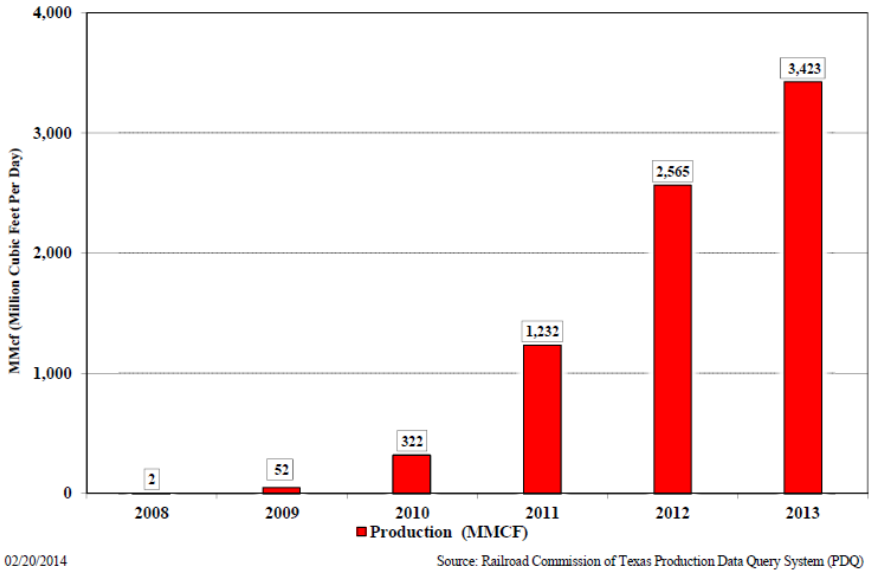
process of using hydraulic fracturing fluid (under high pressure) to promote fracturing in the earth's geological formations.[4] Initially consisting of just primary and secondary recoveries of oil for production companies, enhanced oil recovery as a result of fracking has allowed exploration and production (E&P) companies to extract more oil using tertiary and even quaternary recoveries, increasing the extraction and production of oil across the state (Figure 1).

FIGURE 1: Daily Texas Oil Production (barrels per day) [5]



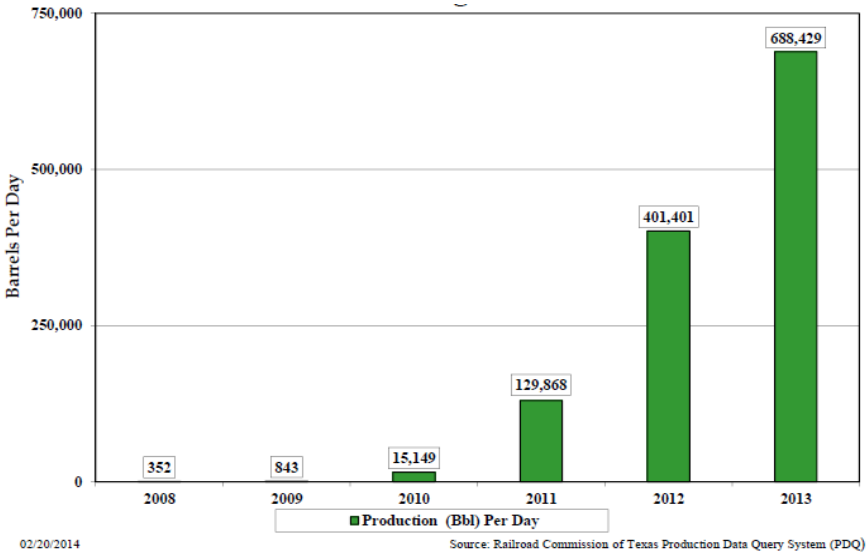
The Eagle Ford Shale formation in particular has grown exponentially since 2008. As seen in the following graphs, both natural gas and oil production in Eagle Ford Shale are increasing at rates never before experienced in that area (Figures 2–3).

FIGURE 2: Texas Eagle Ford Shale Total Natural Gas Production (2008-2013)[6]



[4] Railroad Commission of Texas, 2014a.
[5] Shauk, 2013.
[6] Railroad Commission of Texas. 2014c.

FIGURE 3: Texas Eagle Ford Shale Oil Production (2008 – 2013)[7]



Increased E&P requires increased trucking and use of the state's roadways. This increased usage has caused the breakdown of roadway far faster than TxDOT's models had previously predicted. In late 2012, TxDOT formed the Texas' Energy Sector Roadway Needs task force to address this problem and to identify possible solutions. This task force concluded that trucking from the energy sectors was causing $2 billion dollars in damage to the state's highway system, as well as an equal amount of monetary damage on county roads.[8]

Another effect of widespread heavy trucking associated with energy production is the increase in crashes and fatalities on roadways. While statewide fatalities on Texas roads increased by 10.82% from 2011 to 2012,[9] in the Eagle Ford region, fatalities have increased by over 40%.[10] In light of these statistics, it is clear that fracking-related trucking creates a safety hazard in rural areas.

While there are many proactive and reactive ways to address this issue, the main focus of this report is to address how TxDOT can use highway ROWs in order to alleviate two of the significant negative effects from trucking as a result of the energy boom (specifically, roadway damage and increased fatalities). In particular, this policy brief looks at how TxDOT can help facilitate an increase of oil and saltwater pipelines on their ROWs in order to combat the negative effects resulting from the increased occurrence of fracking and its parallel increase in trucking.

Fracking can be either horizontal or vertical, with each requiring different amounts of hydraulic fracturing fluid in the process of building and completing the well. As seen in the graph, depending on the type of well, the amount of water used in the process can greatly vary.

[7] Railroad Commission of Texas, 2014b.
[8] Texas Department of Transportation, 2012.
[9] Texas Department of Transportation, 2013.
[10] Gordon, 2013.

Hydraulic fracturing fluid is around 99 % water, with specific additives that are decided upon in the engineering process (salt being the most common additive).[11] These additive combinations are seldom the same and are chosen depending upon the nature of the geological formations which are being fractured. The process requires millions of gallons of water per well, with horizontal wells using roughly 3.5 million gallons and vertical wells using one to 1.5 million.[12] The primary means of transporting the water have been trucks. Once the wells are drilled, much of the water returns to the surface and is known as flowback water. While some of this waste water is recycled, the majority of flowback and waste water is disposed of in disposal injection wells. This once again requires trucks to move water from one site to another, further exacerbating road deterioration.

On June 14, 2013, Senate Bill (SB) 514 was signed into law. This bill amended Chapter 91 of the Natural Resources Code and gave companies the right and ability to install and operate pipelines on ROWs[13]. Senator Wendy Davis introduced the bill on the grounds that allowing companies to install and operate these pipelines on state ROWs would reduce the trucking of flowback water from wells to disposal and injection wells.

House Bill (HB) 2767, enacted into law on May 28, 2013, clarifies the ownership of the waste produced as a result of fracking.[14] This bill encourages companies to be proactive in their attempt to recycle waste water by clarifying the "ownership" of the waste and defining waste as follows: "containing salt or other mineralized substances, brine, hydraulic fracturing fluid, flowback water, produced water, or other fluid that arises out of or is incidental to the drilling for or production of oil or gas."[15] By clarifying the ownership and establishing a legal basis for the point at which this transfer of ownership occurs, companies may be more willing to sell and give their waste water to private companies that will then recycle that water.

KEY POLICY ISSUES

One of the key policy issues regarding the increased trucking on TxDOT highways is that TxDOT has limited policy options. It also lacks the authority in policy areas that could directly reduce the amount of trucking traffic on its roads.

For the most part, energy firms have two options in regards for transporting waste water: using pipelines or transporting it by trucks. Both options have advantages and disadvantages in price and risk, as outlined in Table 1.

[11] Railroad Commission of Texas, 2014a.
[12] Railroad Commission of Texas, 2014a.
[13] U.S. Senate, 2014.
[14] Texas House of Representatives, 2013.
[15] Ibid.

TABLE 1: Industry Costs for Transporting Water[16]

	Trucking	Pipelines
Capital Cost	Low	High
Maintenance Costs	High	Low

The method of transportation that an energy firm chooses is often based primarily on profit maximization, which is variable but ultimately dependent on well water usage and its respective transportation costs. The cost factors of transportation include:

- Initial water purchase
- Cost of transportation to well
- Cost of transportation to disposal site
- Disposal costs
- Additional taxes[17]

Companies run estimates of potential water usage and potential disposal amounts, and based on these figures can and will decide if building a pipeline or trucking the water will be cheaper.

As an example, in the Eagle Ford Shale , estimates of using a third-party fees for disposal has fees of $.80+/barrel (42 gallons) with hauling costs of $3.00 - $6.00/barrel.[18] The estimated water usage in the Eagle Ford Shale for one well, in the process of drilling and fracturing, is 116,000 barrels.[19] Thus, average costs run approximately $500,000 and higher solely to remove and dispose of the water from a single well. In contrast, installing pipeline costs $35,000 per inch of diameter per mile.[20] As such, the number of wells, and location of and distance to transfer stations, factor into this highly variable equation.

Since the goal of TxDOT is to alleviate road deterioration, TxDOT needs to alter the "cost formula" to have companies favor pipelines over trucking. This alteration can be done in several ways: increase disposal costs, increase costs associated with road usage, or reduce the high capital costs of implementing pipelines. Unfortunately, many of these solutions are beyond the scope of TxDOT's authority. Without working in conjunction with other state agencies that have authority over oil, gas, drilling, and water disposal, or enacting new legislation, incentivizing companies to install pipelines is difficult to achieve.

One potential fix is to allow the use of temporary above-ground salt water lines on ROW. This approach was used in Florida as a temporary fix to address a saltwater leak that was spilling into wetlands.[21] While this is not a permanent fix, because well water production changes over time, making ROW available may be a possible solution in incentivizing companies to use pipelines over trucking.

[16] MuleShoe Engineering, 2006.
[17] Ibid.
[18] Schaefer, 2012.
[19] Railroad Commission of Texas, 2013a.
[20] MuleShoe Engineering, 2006.
[21] Andres, 2009.

Above-ground temporary water lines are a lower-cost alternative to the relatively permanent underground pipelines. This is due to cheaper installation and operating costs. Moreover, when pipelines are placed above-ground, firms do not need to vie for space in ROWs with other utility companies such as telecommunication firms. The competition for ROW space among utilities, which is known as co-mingling, is a reason why underground pipelines are expensive.

Just as TxDOT lacks authority over certain policy areas that affect the amount of trucking on state-maintained roads, another policy concern is that trucking affects county and municipal roads as well. Because oil wells and injection wells are spread throughout the state and occur mostly in rural areas, rarely do trucking patterns and routes occur only on TxDOT-maintained roads. Instead, trucks transporting water and waste water drive on both state and local roads. As a result, in order for TxDOT to fully maximize ROWs in order to reduce truck traffic, TxDOT would need to work in conjunction with counties and towns to create and install saltwater pipelines. By working with counties, towns and E&P companies, pipelines could be networked in a way which would reduce trucking. This would be beneficial for TxDOT, counties, and municipalities.

Several local governments have also begun attempting to ban fracking within municipal and county boundaries. The reasons for these limits or bans vary from region to region. Some believe fracking to be environmentally harmful, while some have political, social, and economic reasons. Regardless, attempted fracking bans have become more common throughout the country.

Organizers in Colorado have begun the process of trying to implement a proposal entitled "Community Rights Amendment," which would alter the state constitution to grant them

> "the inherent and inalienable right to local self-government.'[22] This amendment grants residents the right and ability to: 'enact local laws protecting health, safety, and welfare by recognizing the fundamental rights of people, communities, and the natural environment…and the power to enact local laws establishing, defining, altering, or eliminating the rights, powers, and duties of for-profit business entities.'"[23]

This amendment would essentially allow local municipalities to ban fracking or other E&P they deem harmful to their residents or to the environment. Thus, these communities would be able to protect themselves from the negative externalities of this industry, such as road deterioration, decreased air quality, and so on.

This type of policy regulation could be a viable option in some Texas communities. Denton, which is located above the Barnett Shale, has already tried to initiate a similar process. In February 2012, the Denton city council approved a moratorium on new permits for drilling, and in January 2013 the city banned fracking within 1,200 feet of homes.[24] However, the legality of this policy has been called into question as companies have a right to use their property as they wish, per land ownership and mineral rights in Texas.[25] Despite this ongoing legal battle, the Denton Drilling Awareness Group announced that it received enough

[22] Community Environmental Legal Defense Fund, 2014.
[23] Ibid.
[24] Lewis, 2014.
[25] Ibid.

signatures on its petition to put to vote in November 2014 a ban on fracking within Denton city limits.[26]

Attempts by local governments to completely ban fracking and production in Texas, one of the biggest oil producing regions in the world, will be difficult. However, this policy issue will most likely recur, especially if municipalities and counties seek protection from the costs resulting from fracking and trucking traffic.

LESSONS LEARNED

By allowing companies to install and operate pipelines for salt water, waste water, and oil/natural gas on ROW, TxDOT should see a decrease in maintenance and repair costs. Allowing and aiding companies to install new pipelines for salt water as a result of the recently passed SB 514 will help to diminish trucking traffic. Both above-ground and below-ground pipelines have specific challenges to their installation and operation, yet both would yield results in the area of trucking reduction.

The use of pipelines on ROWs, however, is not the sole solution to the trucking and road deterioration issue. As TxDOT's Task Force on Texas' Energy Sector Roadway Needs noted, there are many possible additional fixes need to be deployed in concert, including road user maintenance agreements, private-public roadway partnerships, overweight/oversize truck fees, severance taxes, and temporary water lines.[27]

TxDOT also needs to work more with municipalities in shale play areas to determine the most effective way to plan and install these pipelines. Working with companies to develop a plan to form a hybrid system of trucking and pipelines (thus reducing the total amount of trucking), would be beneficial to all parties.

Lastly, enacting more legislation in conjunction with other agencies that have regulatory authority over the industry, such as the Railroad Commission of Texas and the Texas Commission on Environmental Quality, would be beneficial. A collaboration between TxDOT and regulatory commissions could motivate E&P companies to start recycling more water in order to reduce trucking. HB 2767 will likely aid in this process. However, several bills that could have provided additional benefit to TxDOT were introduced and never passed. These bills encouraged recycling of fracking water (SB 1779) and regulated the use of recycled water (HB 3315).

Creating legislation that would enable and incentivize companies to perform on-site recycling is one of the key policy points for Texas. In the last legislative session, HBs 2992 and 3537 sought to require firms to treat wastewater to a degree that would allow the fluid to be reused on another oil or gas well, or for another beneficial purpose. As mentioned, these initiatives did not pass. As a result, any mandate on recycling will have to wait until the next legislative session starting in January 2015. However, other state agencies are seeking alternative means to encourage wastewater recycling.

[26] Malewitz, 2014.
[27] Texas Department of Transportation, 2012.

The Railroad Commission of Texas is currently amending its water recycling rules. Existing rules define two types of commercial recycling facilities: mobile and stationary. Since 2006, however, an increasing number of applications for permits have failed to meet the specifications for either category. To meet this growing demand, Railroad Commission staff have begun changing the rules to include five additional categories of commercial recycling activities. The overall goal is to encourage water recycling, streamline the permitting process, and support technological advancements. [28]

Apache Corp has been one of the pioneers in recycling both flowback and produced water on-site. Based primarily in the Permian Basin, Apache recycles 100% of its water at $.29/barrel, as compared to the $2.50/barrel for disposal using a third-party.[29] As with pipelines, the capital cost of implementing water recycling treatment facilities is high, which inhibits their construction. Since a well's production life is finite, the amount of water decreases over time. As such, the cost building permanent water recycling plants is not only prohibitive, but unlikely to amortize over the life of the well. Portable water treatment facilities, which are not ubiquitous in the industry but are being closely looked at now, would ease introductory implementation costs.

Using legislation to create proper funding to combat road deterioration is essential. By enacting new legislation during the 2015 session, TxDOT could create solutions now to address the developments of the next few decades as E&P increases, road maintenance costs increase, and the repair of these roads becomes more costly. The main area of concern regarding policy implementation is encouraging on-site water recycling. If on-site water recycling is available, the need for pipelines on TxDOT ROWs decreases exponentially as flowback and waste water would not be trucked out for disposal, nor would millions of gallons of fresh water be trucked in for use.

RELEVANCE TO TEXAS

Texas is a major oil and gas producing state and will be for decades to come. As such, the expansion and creation of saltwater pipelines through ROW acquisition is a relevant topic of exploration for TxDOT. Pipeline expansion in TxDOT ROWs presents three possibilities: encourage above-ground pipelines, encourage below-ground pipelines, or do nothing. Each scenario entails costs and benefits. If TxDOT does nothing, road deterioration on the scale of billions of dollars a year will continue and will likely increase over time. This deterioration will result in an increase of traffic fatalities as well as overwhelming road damage. If TxDOT encourages the use of underground pipelines, pipeline implementation needs to be made cheaper and easier. The fragmented underground mapping of utilities increases the risk of spills or leaks. Furthermore, because the wells' output of water decreases over time, companies are reluctant to invest in high-cost capital projects like pipelines. Lastly, above-ground pipelines pose their own set of concerns. Unlike underground pipelines, they are cheaper to install, operate, and move. However, they pose an increased safety risk of crashes and spills.

[28] Railroad Commission of Texas, 2013a.
[29] Driver and Wade, 2013.

A more extensive pipeline network on ROWs can help alleviate the reliance on heavy trucks in the energy industry. TxDOT's revenue stream is not sufficient to spend billions of dollars' annually repairing roads that will then be destroyed the next year. Whichever methods the Texas government decides to employ, they must be used in conjunction with other policy mechanisms such as road user maintenance agreements and severance taxes. This perennial need for maintenance exacerbates the need for more pipelines.

Texas is now producing more than twice the oil that it did three years ago, and more than one-third of all U.S. production.[30] This unprecedented growth indicates that TxDOT must immediately recommend positive legislation and infrastructure solutions. Economic growth stemming from oil and gas production does not have to be at the expense of the Texas highway infrastructure. Ultimately, the increased construction of saltwater pipelines, coupled with the recycling of fracking fluids, can help to ease maintenance costs.

As a major hydrocarbons producer, Texas is in a unique position to create efficient policies that could be copied by other mineral-rich states. ROW acquisition is just one lever among many that TxDOT can pull to ease the burden on its highways. In light of helpful legislation such as SB 514, and with the assistance of private firms mindful of corporate social responsibility, TxDOT can reduce maintenance costs and improve driver safety.

[30] U.S. Energy Information Administration, 2014.

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