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The Adverse Impact of Banning Hydraulic Fracturing in the City of Denton on Business Activity and Tax Receipts in the City and State

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Introduction and Overview

A ban on hydraulic fracturing in the City of Denton has been proposed. Hydraulic fracturing, or “fracking,” is a recovery technique which is essential to unlocking oil and natural gas in certain types of formations, including the Barnett Shale. **Banning fracking would have substantial adverse effects on the economy and tax revenues to local entities and the state.**

Adverse Effects of a Ban on Fracking in the City of Denton

Banning hydraulic fracturing in the City of Denton would lead to significant economic and fiscal harm for individuals, businesses, schools, local governments, and other public and private entities.*

- **Much of the potential future development of the Barnett Shale and associated economic activity and opportunities in the City would be eliminated.**
 - Potential losses in the City of Denton include **\$251.4 million** in gross product and **2,077 person-years of employment** over the next 10 years.
 - Losses for Denton County and Texas (including those in the City of Denton) would be even higher, with losses to the state estimated to be **\$354.8 million** in gross product and **2,718 person-years of employment**.
- **A ban on hydraulic fracturing in the City of Denton would also lead to a sizable decrease in tax receipts to local entities and the State.**
 - Local entities would forego an estimated **\$10.7 million** over the next 10 years due to a fracking ban which could otherwise have been used to fund local priorities and education. These losses include **\$5.1 million** for the City of Denton, about **\$1.0 million** for Denton County, and **\$4.6 million** for Denton Independent School District.
 - The State of Texas tax losses would be about **\$17.1 million** over the 10-year period.
- **Royalties to individuals, businesses, public schools, the University of North Texas, and other public and private entities with interests within the City would decline** without the addition of new wells and the potential to rejuvenate production in existing wells. These millions of dollars in losses would negatively affect budgets and resources.
- Without the ability to “refrack” wells as needed to sustain production, the amount of **oil and gas recoverable from existing wells within this important source of fuel for the nation would be reduced.**

* The Perryman Group estimated the cumulative economic and fiscal effects of a fracking ban in the City of Denton over the next 10 years (2014-2023) including multiplier effects. Dollar amounts are expressed in constant 2013 terms to eliminate the effects of inflation. Additional information regarding assumptions and methods used is included in this report and the accompanying Appendices.

Denton is located over the core of the Barnett Shale, which is a large oil and natural gas bearing formation known to cover more than 5,000 square miles of North Texas. Discovered in the early 1980s, substantial development began in approximately 2001 as a result of a combination of technological improvements in recovery methods and a favorable price environment for natural gas.

In the years that followed, natural gas production from the Barnett Shale greatly exceeded even the most optimistic expectations. Lower natural gas prices and the national recession temporarily slowed development, but changing market conditions have more recently led to a modest increase in activity and an emphasis on drilling for oil where possible. In addition, ongoing production continues to provide a variety of benefits, and drilling and exploration activity for both natural gas and oil is likely to increase in the future as price and market conditions change.

The Barnett Shale has generated thousands of jobs and tens of billions of dollars in investment over time. Moreover, direct spending for exploration and production activity related to the Barnett Shale leads to multiplier effects through the economy which, in turn, initiate a chain of spillover business stimulus throughout the area.

The Perryman Group (TPG) was recently asked to quantify the economic and fiscal harms of a ban on hydraulic fracturing in the City of Denton for the City as well as the County and state. **The overall economic harms (including multiplier effects) were found to be substantial, including the loss of thousands of job-years over the next 10 years and millions of dollars annually for relevant taxing entities.**

The Barnett Shale

As noted, the Barnett Shale lies under much of North Texas, including the Dallas-Fort Worth Metroplex and the surrounding area. Since drilling activity began to escalate in the early 2000s, more than 17,500 wells have been drilled. Natural gas production from the Shale exceeds five billion cubic feet per day. Oil production in 2013 averaged 7,081 barrels per day.

The Texas Railroad Commission (RRC) denotes four counties as “core” production areas: Denton, Johnson, Tarrant, and Wise. Non-core counties include Archer, Bosque, Clay, Comanche, Cooke, Coryell, Dallas, Eastland, Ellis, Erath, Hamilton, Hill, Hood, Jack, Montague, Palo Pinto, Parker, Shackelford, Somervell, Stephens, and Young.

The Perryman Group has studied the economic effects of the Barnett Shale on multiple occasions. **A significant portion of the incremental growth in the economy of the region (almost 40% over some time periods of intense development) has been the result of Barnett Shale activity.** Moreover, the overall economic contribution of this phenomenon is significant even within the context of an economy the size of the Metroplex.

Barnett Shale activity also benefits both state and local governments through property taxes, severance taxes, enhanced retail sales and real estate development, permits and fees, and other types of levies such as hotel/motel occupancy taxes and receipts stemming from various taxable activities. Furthermore, money received by local governments, schools, universities, businesses, and individuals in the form of royalties and bonuses paid by natural gas operators has been significant in many areas, enhancing the quality of life as well as economic opportunities.

Much of the past and potential future development is dependent on the use of hydraulic fracturing, and a ban on fracking would drastically curtail future activity in the affected areas. In addition, such a ban would limit recovery from existing wells.

Study Parameters and Methods Used

As an initial step in assessing the harm from a fracking ban, The Perryman Group analyzed oil and gas drilling activity in the City of Denton to determine the current and potential future economic and fiscal benefits for (1) the City of Denton, (2) Denton County, and (3) the State of Texas. Results for this phase of the analysis are provided in the Appendices. The next step was to quantify the segment of these potential gains which would be foregone under a fracking ban.

Methods used in this analysis are summarized below, with additional methodology and industry-level detail in the Appendices.

Summary of Methods Used

Any economic stimulus (whether positive or negative) generates multiplier effects throughout the economy. The Perryman Group developed a dynamic input-output assessment model (the US Multi-Regional Impact Assessment System, which is described in further detail in the Appendices to this report) some 30 years ago to measure these multiplier effects in order to determine total economic benefits or harms. The model has been consistently maintained and updated and has been used in hundreds of analyses throughout the country for clients ranging from major corporations to government agencies.

The system uses a variety of data (from surveys, industry information, and other sources) to describe the various goods and services (known as resources or inputs) required to produce another good/service. This process allows for estimation of the total economic harms (including multiplier effects) of foregoing potential oil and gas exploration activity by imposing a fracking ban.

The submodels used in the current analysis reflect the specific industrial composition and characteristics of Denton County and are localized to the City of Denton using a “gravity” approach based on capabilities within the City. Total economic benefits are quantified for key measures of business activity, which are different, common ways of looking at changes in the economy (such as in terms of total spending, output, income, or jobs). These measures are briefly described below and explained in further detail in the Appendices.

- **Total expenditures** (or total spending) measure the dollars changing hands as a result of the economic stimulus. In this instance, it represents the reduction in total spending due to the fracking ban.
- **Gross product** (or output) is production of goods and services that will come about in each area as a result of the activity. This measure is parallel to the gross domestic product numbers commonly reported by various media outlets and is a subset of total expenditures. Here, it measures the reduction in gross product from what would otherwise have occurred.
- **Personal income** is dollars that end up in the hands of people in the area; the vast majority of this aggregate derives from the earnings of employees, but payments such as interest and rents are also included. Again, the figures in this report indicate personal income losses.
- **Job gains/losses** are expressed as (1) person-years of employment for a transitory construction or multi-year cumulative estimates and (2) permanent jobs for ongoing effects that persist.

Monetary values were quantified on a constant basis (in 2013 dollars) to eliminate the effects of inflation. See the Appendices to this report for additional information regarding the methods used in this analysis.

The Perryman Group also estimated the likely effects of the ban on tax receipts to local entities. Economic activity generates related tax revenue, and banning fracking would reduce future economic growth. For example, retail sales are enhanced through business purchasing and consumer spending, thereby adding to retail sales tax collections. Property values (and, thus, property tax collections) would also expand as a result of increases in the tax base stemming from the drilling activity as well as general growth in the economy and population of the area. Banning fracking and, thus, reducing drilling and production activity would lower future tax collections by area taxing entities.

Input Assumptions and Losses Measured

In order to estimate losses under a fracking ban, it was first necessary to quantify **current and potential future economic activity** stemming from oil and natural gas exploration and production. The Perryman Group quantified the economic effects of oil and gas activity in the

City of Denton associated with (1) drilling and production; (2) royalties; and (3) pipeline and delivery system construction, maintenance, and operation.

The Perryman Group quantified the economic benefits currently (2013, the last year of complete data) and projected future patterns over the next 10 years (2014-2023). The process for quantifying input information is described in a subsequent section. For the 2013 estimate for drilling and production, data from the Texas Railroad Commission regarding permits and completions were utilized to determine the number of wells, and data from the US Bureau of Labor Statistics (BLS) were compiled regarding related employment in Denton County. The values were localized to the City of Denton based on the number of wells drilled within the City (the relationships are comparable in other counties in the region). The 2014-2023 forecast assumes drilling activity over time responds to projected prices in the baseline forecast of the Energy Information Administration in a manner reflective of recent comprehensive academic research regarding the elasticity of demand for natural gas¹ (which understates the responsiveness that has been historically observed within the region). Based on likely future prices, drilling is expected to increase to some extent, and the overall 10-year potential benefits are somewhat more than 10 times current effects. (If prices were to rise substantially beyond baseline expectations, which is plausible given current market conditions, the increases would be much larger.)

Current royalties were estimated based on production levels and typical payment levels. Future royalties were calculated utilizing a decline curve based on historical production patterns. Amounts for future wells were added assuming wells performed as typical for the area. Estimated royalties were converted to 2013 dollars using The Perryman Group's Texas CPI projections and were adjusted for both out-of-area ownership and leakages from the local expenditure stream. Because of the net decline in production in existing wells, the 10-year royalty totals are only about 6.3 times the current level even with some additional wells coming online.

For the pipeline/gathering system, activity is expected to be relatively modest and assumed to be essentially limited to maintenance, operations, and adding new wells to the gathering system. A current estimate of these amounts was derived from employment data for the sector from the BLS. Because there is excess capacity, it is unlikely that the added wells will materially change the annual outlays.

¹ Ponce, Micaela and Anne Neumann, "Elasticities of Supply for the US Natural Gas Market," (April 2, 2014) DIW Berlin, German Institute for Economic Research.

These major sources of economic benefits were summed to obtain an overall total estimate of current and potential gains in business activity stemming from oil and gas activity in Denton County and the City of Denton.

The next step in the analysis involved estimating the **portion of this activity which would be foregone** under a ban on hydraulic fracturing in the City of Denton. Initially, the entire benefits associated with incremental drilling activity would be lost. In addition, royalty payments would be lower because the new wells would not be added. Moreover, existing wells would decline in production (and, hence, royalties) more rapidly because it would not be possible to re-enter them to rejuvenate production. This latter phenomenon was estimated through a steeper decline curve which accounts for the more rapid production loss in a typical fashion. It is assumed that the pipeline activity (essentially operations and maintenance) would not be impacted by the drilling ban. Through the implementation of the above process relative to the benefits as quantified in the Appendices to this report, an estimate of the economic harms of a ban on hydraulic fracturing in the City of Denton was derived.

Projected Economic and Fiscal Harms Stemming from a Ban on Hydraulic Fracturing in the City of Denton

As noted, projected pricing patterns for oil and natural gas would likely lead to a moderate increase in drilling activity over time if historically observed relationships persist. However, **if hydraulic fracturing is prohibited, these potential benefits would be foregone.** In addition, the production from existing wells would be curtailed without the ability to refracture as needed.

Economic Harms Over 10 Years

When foregone exploration, drilling and operations, and royalties and lease payments are considered, The Perryman Group estimates that **the cumulative economic harms (including multiplier effects) stemming from a ban on hydraulic fracturing in the City of Denton over the next 10 years total a loss of \$251.4 million in gross product (in constant 2013 dollars) and 2,077 person-years of employment in the City of Denton.**

Estimated Lost City of Denton Business Activity Over the Next 10 Years Stemming from a Ban on Hydraulic Fracturing in the City of Denton* (Monetary Values in Millions of Constant 2013 Dollars)			
	Exploration, Drilling, and Operations	Royalty and Lease Payments	TOTAL
Total Expenditures	(\$746.8)	(\$6.6)	(\$753.3)
Gross Product	(\$247.8)	(\$3.5)	(\$251.4)
Personal Income	(\$137.8)	(\$2.2)	(\$140.0)
Retail Sales	(\$69.7)	(\$2.5)	(\$72.2)
Employment (Person-Years)	(2,035)	(42)	(2,077)
SOURCE: The Perryman Group * Estimated impact of a ban on hydraulic fracturing in the City of Denton on (1) exploration, drilling, and operations; and (2) royalties and lease payments on business activity in the City of Denton over the 2014 to 2023 period.			

A ban on hydraulic fracturing in Denton would also have a negative impact on Denton County. **The Perryman Group estimates that over the next 10 years, losses can be expected to total \$315.3 million in gross product and 2,402 fewer person-years of employment in Denton County.** Note that these totals include effects within the City of Denton as well as spillover to other parts of the county.

Estimated Lost Denton County Business Activity Over the Next 10 Years Stemming from a Ban on Hydraulic Fracturing in the City of Denton* (Monetary Values in Millions of Constant 2013 Dollars)			
	Exploration, Drilling and Operations	Royalty and Lease Payments	TOTAL
Total Expenditures	(\$931.1)	(\$8.5)	(\$939.6)
Gross Product	(\$311.1)	(\$4.2)	(\$315.3)
Personal Income	(\$169.2)	(\$2.6)	(\$171.8)
Retail Sales	(\$69.7)	(\$2.5)	(\$72.2)
Employment (Person-Years)	(2,358)	(44)	(2,402)
SOURCE: The Perryman Group * Estimated impact of a ban on hydraulic fracturing in the City of Denton on (1) exploration, drilling, and operations; and (2) royalties and lease payments on business activity in Denton County over the 2014 to 2023 period			

A hydraulic fracturing ban in the City of Denton would also have a negative impact on other parts of Texas. The impacts on Texas (including those within the City of Denton and Denton County) over the ten-year period are outlined below.

Estimated Lost Texas Business Activity Over the Next 10 Years Stemming from a Ban on Hydraulic Fracturing in the City of Denton* (Monetary Values in Millions of Constant 2013 Dollars)			
	Exploration, Drilling and Operations	Royalty and Lease Payments	TOTAL
Total Expenditures	(\$1,034.5)	(\$12.0)	(\$1,046.5)
Gross Product	(\$349.0)	(\$5.8)	(\$354.8)
Personal Income	(\$191.1)	(\$3.6)	(\$194.6)
Retail Sales	(\$74.0)	(\$3.2)	(\$77.2)
Employment (Person-Years)	(2,661)	(56)	(2,718)
SOURCE: The Perryman Group * Estimated impact of a ban on hydraulic fracturing in the City of Denton on (1) exploration, drilling, and operations; and (2) royalties and lease payments on business activity in Texas over the 2014 to 2023 period.			

Lost Tax Revenue Over 10 Years

A ban on hydraulic fracturing in the City of Denton would lead to a sizable decrease in tax receipts to local entities and the state. For the City of Denton, the cumulative tax losses over the next 10 years (2014-2023) are projected to total **\$5.1 million** (in constant 2013 dollars). For Denton County, the tax losses would total about \$1.0 million. For Denton Independent School District, the losses over the period are estimated to be approximately \$4.6 million, while the state of Texas tax losses would be about \$17.1 million over the 10-year period. It should be noted that the City currently receives over \$1 million per year in royalty and lease payments. In the absence of drilling and well rejuvenation, this amount will fall rapidly in the future. Other public entities, including the University of North Texas, also receive royalties from lands within the City and would face a similar fate. To the extent these funds are a part of operations, they will have to be recovered through higher taxes, fees, tuition, or other revenue sources.

Conclusion

The development of the Barnett Shale would not have been possible without technological advances such as hydraulic fracturing (fracking). There has recently been extensive discussion of a potential ban on fracking within the City of Denton. Such an action would lead to the loss of a significant portion of potential future economic and fiscal benefits (all of the benefits of drilling and a portion of those for royalties).

The Perryman Group estimates that the **potential losses of a ban on fracking in the City of Denton include \$251.4 million in gross product over the next 10 years as well as 2,077 person-years of employment in the City of Denton.** Losses for Denton County and Texas (including those in the City of Denton) would be even higher. **Local entities (the City, County, and School District) would also forego an estimated \$10.7 million in potential tax receipts due to a fracking ban, while the State loses \$17.1 million.** These taxes could otherwise have been used to fund local priorities and education.

The Barnett Shale can continue to serve as an important source of economic stimulus and opportunity for the local area and state for decades to come. However, hydraulic fracturing is essential to this future development. **A ban on fracking would cause a notable decrease in business activity and opportunities for local residents as well as a reduction in tax revenue to local entities and the state.**

APPENDICES

Appendix A: About The Perryman Group

- The Perryman Group (TPG) is an economic research and analysis firm based in Waco, Texas. The firm has more than 30 years of experience in assessing the economic impact of corporate expansions, regulatory changes, real estate developments, public policy initiatives, and myriad other factors affecting business activity. TPG has conducted hundreds of impact analyses for local areas, regions, and states throughout the United States. Impact studies have been performed for hundreds of clients including many of the largest corporations in the world, governmental entities at all levels, educational institutions, major health care systems, utilities, and economic development organizations.
- Dr. M. Ray Perryman, founder and President of the firm, developed the US Multi-Regional Impact Assessment System (USMRIAS—used in this study) in the early 1980s and has consistently maintained, expanded, and updated it since that time. The model has been used in hundreds of diverse applications and has an excellent reputation for reliability.
- The firm has also conducted numerous investigations related to the oil and gas industry. These analyses include an assessment of the effects of offshore drilling for the US Department of the Interior, several studies of specific production areas, and projections of natural gas prices and output. Information has been prepared for the Interstate Oil Compact Commission, the US Department of Energy, the Texas Railroad Commission, and numerous legislative committees regarding energy policy. Additionally, over the past several years, TPG has performed multiple comprehensive assessments of the impact of the Barnett Shale on the local area, as well the impact of Barnett Shale-related activity on local and state taxing authorities.

Appendix B: Methods Used

- The basic modeling technique employed in this study is known as dynamic input-output analysis. This methodology essentially uses extensive survey data, industry information, and a variety of corroborative source materials to create a matrix describing the various goods and services (known as resources or inputs) required to produce one unit (a dollar's worth) of output for a given sector. Once the base information is compiled, it can be mathematically simulated to generate evaluations of the magnitude of successive rounds of activity involved in the overall production process.
- There are two essential steps in conducting an input-output analysis once the system is operational. The first major endeavor is to accurately define the levels of direct activity to be evaluated; this process was described within the report. In the case of a prospective evaluation, it is necessary to first calculate reasonable estimates of the direct activity. The process used to determine the input information was described within the report.
- The second major phase of the analysis is the simulation of the input-output system to measure overall economic effects of the oil and gas related stimulus. The present study was conducted within the context of the USMRIAS which was developed and is maintained by The Perryman Group. This model has been used in hundreds of diverse applications across the country and has an excellent reputation for accuracy and credibility. The systems used in the current simulations reflect the unique industrial structures of the economies of (1) Denton County and (2) Texas.
- The proportion of activity assumed to occur within the City of Denton (as opposed to other parts of Denton County) was based on patterns in business activity by industry occurring in the City and County, as well as "gravity" modeling of the likely location of indirect and induced spending. This technique is a widely used and accepted method to allocate activity within and across geographic boundaries. Data for this process were obtained from the US Bureau of the Census.
- The USMRIAS is somewhat similar in format to the Input-Output Model of the United States and the Regional Input-Output Modeling System, both of which are maintained by the US Department of Commerce. The model developed by TPG, however, incorporates several important enhancements and refinements. Specifically, the expanded system includes (1) comprehensive 500-sector coverage for any county, multi-county, or urban region; (2) calculation of both total expenditures and value-added by industry and region; (3) direct estimation of expenditures for multiple basic input choices (expenditures, output, income, or employment); (4) extensive parameter localization; (5) price adjustments for real and nominal assessments by sectors and areas; (6) measurement of the induced impacts associated with payrolls and consumer spending; (7) embedded modules to estimate multi-sectoral direct

spending effects; (8) estimation of retail spending activity by consumers; and (9) comprehensive linkage and integration capabilities with a wide variety of econometric, real estate, occupational, and fiscal impact models. Moreover, the model uses specific local taxing patterns to estimate the fiscal effects of activity on a detailed sectoral basis. The models used for the present investigation have been thoroughly tested for reasonableness and historical reliability.

- The impact assessment (input-output) process essentially estimates the amounts of all types of goods and services required to produce one unit (a dollar's worth) of a specific type of output. For purposes of illustrating the nature of the system, it is useful to think of inputs and outputs in dollar (rather than physical) terms. As an example, the construction of a new building will require specific dollar amounts of lumber, glass, concrete, hand tools, architectural services, interior design services, paint, plumbing, and numerous other elements. Each of these suppliers must, in turn, purchase additional dollar amounts of inputs. This process continues through multiple rounds of production, thus generating subsequent increments to business activity. The initial process of building the facility is known as the *direct effect*. The ensuing transactions in the output chain constitute the *indirect effect*.
- Another pattern that arises in response to any direct economic activity comes from the payroll dollars received by employees at each stage of the production cycle. As workers are compensated, they use some of their income for taxes, savings, and purchases from external markets. A substantial portion, however, is spent locally on food, clothing, health care services, utilities, housing, recreation, and other items. Typical purchasing patterns in the relevant areas are obtained from the *ACCRA Cost of Living Index*, a privately compiled inter-regional measure which has been widely used for several decades, and the *Consumer Expenditure Survey* of the US Department of Labor. These initial outlays by area residents generate further secondary activity as local providers acquire inputs to meet this consumer demand. These consumer spending impacts are known as the *induced effect*. The USMRIAS is designed to provide realistic, yet conservative, estimates of these phenomena.
- Sources for information used in this process include the Bureau of the Census, the Bureau of Labor Statistics, the Regional Economic Information System of the US Department of Commerce, and other public and private sources. The pricing data are compiled from the US Department of Labor and the US Department of Commerce. The verification and testing procedures make use of extensive public and private sources.
- Impacts were measured in constant 2013 dollars (the last year for which complete data was available) to eliminate the effects of inflation. Note that totals may not add due to rounding.
- The USMRIAS generates estimates of the effects on several measures of business activity. The most comprehensive measure of economic activity used in this study is **Total Expenditures**. This measure incorporates every dollar that changes hands in any transaction. For example, suppose a farmer sells wheat to a miller for \$0.50; the miller then sells flour to a baker for \$0.75; the

baker, in turn, sells bread to a customer for \$1.25. The Total Expenditures recorded in this instance would be \$2.50, that is, \$0.50 + \$0.75 + \$1.25. This measure is quite broad, but is useful in that (1) it reflects the overall interplay of all industries in the economy, and (2) some key fiscal variables such as sales taxes are linked to aggregate spending.

- A second measure of business activity frequently employed in this analysis is that of **Gross Product**. This indicator represents the regional equivalent of Gross Domestic Product, the most commonly reported statistic regarding national economic performance. In other words, the Gross Product of Texas is the amount of US output that is produced in that state; it is defined as the value of all final goods produced in a given region for a specific period of time. Stated differently, it captures the amount of value-added (gross area product) over intermediate goods and services at each stage of the production process, that is, it eliminates the double counting in the Total Expenditures concept. Using the example above, the Gross Product is \$1.25 (the value of the bread) rather than \$2.50. Alternatively, it may be viewed as the sum of the value-added by the farmer, \$0.50; the miller, \$0.25 (\$0.75 - \$0.50); and the baker, \$0.50 (\$1.25 - \$0.75). The total value-added is, therefore, \$1.25, which is equivalent to the final value of the bread. In many industries, the primary component of value-added is the wage and salary payments to employees.
- The third gauge of economic activity used in this evaluation is **Personal Income**. As the name implies, Personal Income is simply the income received by individuals, whether in the form of wages, salaries, interest, dividends, proprietors' profits, or other sources. It may thus be viewed as the segment of overall impacts which flows directly to the citizenry.
- The fourth measure, **Retail Sales**, represents the component of Total Expenditures which occurs in retail outlets (general merchandise stores, automobile dealers and service stations, building materials stores, food stores, drugstores, restaurants, and so forth). Retail Sales is a commonly used measure of consumer activity.
- The final aggregates used are **Permanent Jobs and Person-Years of Employment**. The Person-Years of Employment measure reveals the full-time equivalent jobs generated by an activity. It should be noted that, unlike the dollar values described above, Permanent Jobs is a "stock" rather than a "flow." In other words, if an area produces \$1 million in output in 2010 and \$1 million in 2011, it is appropriate to say that \$2 million was achieved in the 2010-2011 period. If the same area has 100 people working in 2010 and 100 in 2011, it only has 100 Permanent Jobs. When a flow of jobs is measured, such as in a construction project or a cumulative assessment over multiple years, it is appropriate to measure employment in Person-Years (a person working for a year). This concept is distinct from Permanent Jobs, which anticipates that the relevant positions will be maintained on a continuing basis.

Appendix C: Estimated Current and Potential Future Economic and Fiscal Effects of Oil and Gas Exploration Activity in Denton

Current Economic Benefits

The Perryman Group estimated the total gains in business activity in the City of Denton stemming from oil and gas exploration and production and related operations in the City and found that they include \$26.9 million in gross product and 246 permanent jobs.

Estimated Current Impact of Oil and Gas Drilling; Royalties; and Pipeline Construction, Maintenance, and Operations within the City of Denton on Business Activity in the City of Denton (Monetary Values in Millions of Constant 2013 Dollars)				
	Drilling	Royalties	Pipeline	TOTAL
Total Expenditures	\$60.4	\$10.6	\$2.6	\$73.5
Gross Product	\$20.0	\$5.7	\$1.2	\$26.9
Personal Income	\$11.1	\$3.6	\$0.8	\$15.5
Retail Sales	\$5.6	\$4.1	\$0.4	\$10.1
Employment (Permanent Jobs)	164	67	14	246
SOURCE: The Perryman Group				

The increase in business activity in Texas was found to be \$39.1 million in gross product and 323 permanent jobs.

Estimated Current Impact of Oil and Gas Drilling; Royalties; and Pipeline Construction, Maintenance, and Operations within the City of Denton on Business Activity in Texas (Monetary Values in Millions of Constant 2013 Dollars)				
	Drilling	Royalties	Pipeline	TOTAL
Total Expenditures	\$83.6	\$19.3	\$3.7	\$106.6
Gross Product	\$28.2	\$9.2	\$1.6	\$39.1
Personal Income	\$15.4	\$5.7	\$1.1	\$22.3
Retail Sales	\$6.0	\$5.2	\$0.4	\$11.6
Employment (Permanent Jobs)	215	90	18	323
SOURCE: The Perryman Group				

Although the primary focus of this analysis is the City of Denton, the effects of drilling activity throughout Denton County on county business activity were also quantified and are summarized below.

Estimated Current Impact of Oil and Gas Drilling; Royalties; and Pipeline Construction, Maintenance, and Operations on Business Activity in Denton County (Monetary Values in Millions of Constant 2013 Dollars)				
	Drilling	Royalties	Pipeline	TOTAL
Total Expenditures	\$351.2	\$155.7	\$33.2	\$540.2
Gross Product	\$117.3	\$76.7	\$15.0	\$209.0
Personal Income	\$63.8	\$47.5	\$10.2	\$121.5
Retail Sales	\$26.3	\$46.6	\$4.0	\$76.9
Employment (Permanent Jobs)	890	800	166	1,855
SOURCE: The Perryman Group				

Current Fiscal Effects

This significant incremental business activity also involves an increase in dynamic tax receipts to taxing authorities at the state and local levels. The City of Denton sees annual benefits of about **\$1.1 million** (in constant 2013 dollars), while the State of Texas gains **\$2.3 million** per annum from activity within the City. Activity within the Denton Independent School District (DISD) yields about \$2.4 million yearly at present levels of activity within the district, while Denton County receives about \$4.4 million each year.

Potential Economic Benefits Over 10 Years

Projected pricing patterns for oil and natural gas would likely lead to a moderate increase in drilling activity over time if historically observed relationships persist. The Perryman Group estimates that the cumulative economic benefits (including multiplier effects) stemming from

oil and gas and related activity in the City of Denton over the next 10 years include \$295.8 million in gross product and 2,603 person-years of employment in the City of Denton.

Estimated Impact of Oil and Gas Drilling; Royalties; and Pipeline Construction, Maintenance, and Operations within the City of Denton on Business Activity in the City of Denton Over the Next 10 Years (2014-2023) (Monetary Values in Millions of Constant 2013 Dollars)				
	Drilling	Royalties	Pipeline	TOTAL
Total Expenditures	\$746.8	\$67.1	\$25.7	\$839.5
Gross Product	\$247.8	\$36.1	\$11.9	\$295.8
Personal Income	\$137.8	\$22.7	\$8.3	\$168.8
Retail Sales	\$69.7	\$25.9	\$3.8	\$99.4
Employment (Person-Years)	2,035	427	141	2,603
SOURCE: The Perryman Group				

Oil and gas activity within the Denton city limits will also lead to notable gains in business activity for the state as a whole. The Perryman Group estimates that over the next 10 years, these gains can be expected to total \$424.2 million in gross product and 3,413 person-years of employment in Texas. Note that these totals include effects within the City of Denton as well as spillover to other areas of the state.

Estimated Impact of Oil and Gas Drilling; Royalties; and Pipeline Construction, Maintenance, and Operations within the City of Denton on Business Activity in Texas Over the Next 10 Years (2014-2023) (Monetary Values in Millions of Constant 2013 Dollars)				
	Drilling	Royalties	Pipeline	TOTAL
Total Expenditures	\$1,034.5	\$122.4	\$37.0	\$1,193.9
Gross Product	\$349.0	\$58.7	\$16.4	\$424.2
Personal Income	\$191.1	\$36.3	\$11.1	\$238.4
Retail Sales	\$74.0	\$33.0	\$4.1	\$111.1
Employment (Person-Years)	2,661	574	177	3,413
SOURCE: The Perryman Group				

The overall potential benefits of activity throughout Denton County over the ten-year period are outlined below.

Estimated Impact of Oil and Gas Drilling; Royalties; and Pipeline Construction, Maintenance, and Operations on Business Activity in Denton County Over the Next 10 Years (2014-2023) (Monetary Values in Millions of Constant 2013 Dollars)				
	Drilling	Royalties	Pipeline	TOTAL
Total Expenditures	\$4,345.4	\$989.6	\$332.5	\$5,667.4
Gross Product	\$1,451.7	\$487.4	\$149.9	\$2,089.0
Personal Income	\$137.8	\$301.7	\$102.0	\$1,193.3
Retail Sales	\$325.1	\$296.2	\$40.1	\$661.4
Employment (Person-Years)	11,005	5,084	1,657	17,746
SOURCE: The Perryman Group				

Potential Fiscal Effects Over 10 Years

This economic activity would lead to a sizable increase in tax receipts to local entities and the state. For the City of Denton, the cumulative tax benefits over the next 10 years (2014-2023) were found to total **\$12.3 million** (in constant 2013 dollars); the State of Texas gains **\$23.2 million** over the period from activity within the City. For DISD, the benefits over the period are estimated to be approximately \$28.6 million, and Denton County has the potential to receive about \$49.1 million over the 10-year period.

Appendix D: Detailed Sectoral Results for Current and Potential Future Economic Benefits

Current Impacts

City of Denton
(Based on Barnett Shale Activity in the City of Denton)

Estimated Current Annual Impact (as of 2013) of Exploration, Drilling, and Operations in the Barnett Shale within the City of Denton on Business Activity in the City of Denton

Sector	Total Expenditures <i>(2013 Dollars)</i>	Real Gross Product <i>(2013 Dollars)</i>	Personal Income <i>(2013 Dollars)</i>	Employment <i>(Permanent Jobs)</i>
Agriculture	\$287,802	\$80,429	\$54,640	1
Mining	\$36,139,902	\$7,921,034	\$3,653,340	17
Construction	\$2,571,184	\$1,388,876	\$1,144,521	16
Nondurable Manufacturing	\$2,775,874	\$807,507	\$419,547	7
Durable Manufacturing	\$1,392,614	\$576,694	\$369,112	5
Transportation and Utilities	\$2,142,347	\$719,879	\$396,229	4
Information	\$445,897	\$273,803	\$118,951	1
Wholesale Trade	\$418,348	\$282,700	\$163,007	2
Retail Trade	\$5,631,439	\$4,190,609	\$2,429,293	73
Finance, Insurance, and Real Estate	\$4,215,121	\$1,310,395	\$346,757	3
Business Services	\$908,561	\$529,453	\$431,898	5
Health Services	\$1,290,222	\$900,848	\$761,676	12
Other Services	\$2,142,169	\$1,051,082	\$846,212	19
TOTAL	\$60,361,480	\$20,033,308	\$11,135,184	164

SOURCE: US Multi-Regional Impact Assessment System, The Perryman Group

Estimated Current Annual Impact (as of 2013) of Royalty and Lease Payments Associated with Activity in the Barnett Shale within the City of Denton on Business Activity in the City of Denton

Sector	Total Expenditures <i>(2013 Dollars)</i>	Real Gross Product <i>(2013 Dollars)</i>	Personal Income <i>(2013 Dollars)</i>	Employment <i>(Permanent Jobs)</i>
Agriculture	\$120,769	\$32,980	\$22,391	0
Mining	\$6,703	\$1,519	\$735	0
Construction	\$284,804	\$145,950	\$120,277	1
Nondurable Manufacturing	\$825,346	\$250,135	\$131,704	0
Durable Manufacturing	\$242,421	\$97,637	\$62,076	0
Transportation and Utilities	\$941,255	\$310,024	\$168,139	0
Information	\$232,661	\$142,806	\$62,234	0
Wholesale Trade	\$113,351	\$76,700	\$44,228	0
Retail Trade	\$4,071,696	\$3,074,554	\$1,790,955	51
Finance, Insurance, and Real Estate	\$1,389,126	\$197,824	\$67,323	0
Business Services	\$302,365	\$174,170	\$142,083	1
Health Services	\$786,684	\$557,585	\$471,454	7
Other Services	\$1,238,222	\$623,890	\$493,401	7
TOTAL	\$10,555,403	\$5,685,773	\$3,577,002	67
SOURCE: US Multi-Regional Impact Assessment System, The Perryman Group				

Estimated Current Annual Impact (as of 2013) of Pipeline Development, Maintenance, and Operations Associated with Activity in the Barnett Shale within the City of Denton on Business Activity in the City of Denton

Sector	Total Expenditures	Real Gross Product	Personal Income	Employment
	<i>(2013 Dollars)</i>	<i>(2013 Dollars)</i>	<i>(2013 Dollars)</i>	<i>(Permanent Jobs)</i>
Agriculture	\$19,568	\$5,415	\$3,681	0
Mining	\$1,566	\$370	\$184	0
Construction	\$820,364	\$376,572	\$310,319	4
Nondurable Manufacturing	\$174,639	\$51,224	\$26,757	0
Durable Manufacturing	\$149,417	\$61,127	\$38,448	1
Transportation and Utilities	\$427,283	\$110,123	\$67,236	1
Information	\$30,838	\$18,939	\$8,240	0
Wholesale Trade	\$31,150	\$21,084	\$12,157	0
Retail Trade	\$382,205	\$286,637	\$166,621	5
Finance, Insurance, and Real Estate	\$166,063	\$38,288	\$14,718	0
Business Services	\$120,489	\$77,061	\$62,862	1
Health Services	\$91,694	\$64,089	\$54,188	1
Other Services	\$154,180	\$75,460	\$60,659	1
TOTAL	\$2,569,455	\$1,186,390	\$826,069	14

SOURCE: US Multi-Regional Impact Assessment System, The Perryman Group

Estimated Current Annual Impact of All Major Sources of Stimulus Associated with the Barnett Shale within the City of Denton on Business Activity in the City of Denton

Sector	Total Expenditures	Real Gross Product	Personal Income	Employment
	<i>(2013 Dollars)</i>	<i>(2013 Dollars)</i>	<i>(2013 Dollars)</i>	<i>(Permanent Jobs)</i>
Agriculture	\$428,139	\$118,824	\$80,713	1
Mining	\$36,148,171	\$7,922,923	\$3,654,259	17
Construction	\$3,676,352	\$1,911,399	\$1,575,117	21
Nondurable Manufacturing	\$3,775,859	\$1,108,866	\$578,009	7
Durable Manufacturing	\$1,784,452	\$735,457	\$469,636	5
Transportation and Utilities	\$3,510,884	\$1,140,026	\$631,604	5
Information	\$709,396	\$435,547	\$189,425	1
Wholesale Trade	\$562,850	\$380,485	\$219,393	2
Retail Trade	\$10,085,340	\$7,551,800	\$4,386,869	129
Finance, Insurance, and Real Estate	\$5,770,310	\$1,546,506	\$428,798	3
Business Services	\$1,331,415	\$780,683	\$636,843	7
Health Services	\$2,168,600	\$1,522,522	\$1,287,318	20
Other Services	\$3,534,571	\$1,750,432	\$1,400,271	27
TOTAL	\$73,486,338	\$26,905,472	\$15,538,254	246

SOURCE: US Multi-Regional Impact Assessment System, The Perryman Group

Texas

(Based on Barnett Shale Activity within the City of Denton)

Estimated Current Annual Impact (as of 2013) of Exploration, Drilling, and Operations in the Barnett Shale within the City of Denton on Business Activity in Texas

Sector	Total Expenditures	Real Gross Product	Personal Income	Employment
	<i>(2013 Dollars)</i>	<i>(2013 Dollars)</i>	<i>(2013 Dollars)</i>	<i>(Permanent Jobs)</i>
Agriculture	\$704,491	\$209,500	\$137,199	2
Mining	\$43,562,803	\$9,562,323	\$4,428,759	21
Construction	\$3,326,790	\$1,796,159	\$1,480,147	20
Nondurable Manufacturing	\$4,899,729	\$1,358,862	\$706,733	11
Durable Manufacturing	\$2,380,401	\$951,829	\$628,423	8
Transportation and Utilities	\$4,083,217	\$1,462,596	\$825,963	8
Information	\$919,806	\$566,180	\$244,207	2
Wholesale Trade	\$1,734,036	\$1,171,820	\$675,682	7
Retail Trade	\$5,981,737	\$4,454,202	\$2,582,675	78
Finance, Insurance, and Real Estate	\$10,172,969	\$3,287,022	\$955,309	9
Business Services	\$1,941,845	\$1,138,637	\$928,837	11
Health Services	\$1,358,624	\$949,330	\$802,668	13
Other Services	\$2,551,889	\$1,302,253	\$1,047,364	24
TOTAL	\$83,618,337	\$28,210,712	\$15,443,965	215

SOURCE: US Multi-Regional Impact Assessment System, The Perryman Group

Estimated Current Annual Impact (as of 2013) of Barnett Shale Royalty and Lease Payments Associated with Activity within the City of Denton on Business Activity in Texas

Sector	Total Expenditures <i>(2013 Dollars)</i>	Real Gross Product <i>(2013 Dollars)</i>	Personal Income <i>(2013 Dollars)</i>	Employment <i>(Permanent Jobs)</i>
Agriculture	\$364,708	\$106,208	\$69,089	0
Mining	\$310,891	\$70,777	\$40,812	0
Construction	\$465,459	\$238,528	\$196,571	1
Nondurable Manufacturing	\$1,837,240	\$523,943	\$275,151	1
Durable Manufacturing	\$453,043	\$177,777	\$114,717	0
Transportation and Utilities	\$1,927,722	\$684,817	\$383,054	1
Information	\$582,293	\$358,472	\$154,767	1
Wholesale Trade	\$584,594	\$395,572	\$228,100	1
Retail Trade	\$5,192,229	\$3,920,673	\$2,283,827	65
Finance, Insurance, and Real Estate	\$3,962,252	\$664,376	\$250,301	0
Business Services	\$755,537	\$444,747	\$362,812	2
Health Services	\$1,003,180	\$711,033	\$601,199	9
Other Services	\$1,814,397	\$945,625	\$747,723	10
TOTAL	\$19,253,546	\$9,242,550	\$5,708,122	90

SOURCE: US Multi-Regional Impact Assessment System, The Perryman Group

Estimated Current Annual Impact (as of 2013) of Pipeline Development, Maintenance, and Operations Associated with Activity in the Barnett Shale within the City of Denton on Business Activity in Texas

Sector	Total Expenditures <i>(2013 Dollars)</i>	Real Gross Product <i>(2013 Dollars)</i>	Personal Income <i>(2013 Dollars)</i>	Employment <i>(Permanent Jobs)</i>
Agriculture	\$48,174	\$13,967	\$9,215	0
Mining	\$56,917	\$13,556	\$7,740	0
Construction	\$839,413	\$386,405	\$318,421	4
Nondurable Manufacturing	\$312,203	\$86,736	\$45,321	1
Durable Manufacturing	\$246,615	\$96,044	\$62,439	1
Transportation and Utilities	\$641,376	\$178,599	\$108,177	1
Information	\$63,928	\$39,364	\$16,993	0
Wholesale Trade	\$129,301	\$87,518	\$50,464	1
Retail Trade	\$409,822	\$307,418	\$178,714	5
Finance, Insurance, and Real Estate	\$417,538	\$107,175	\$44,621	0
Business Services	\$257,358	\$165,035	\$134,626	2
Health Services	\$97,087	\$67,911	\$57,420	1
Other Services	\$184,744	\$94,055	\$75,529	2
TOTAL	\$3,704,476	\$1,643,783	\$1,109,680	18

SOURCE: US Multi-Regional Impact Assessment System, The Perryman Group

Estimated Current Annual Impact of All Major Sources of Stimulus Associated with the Barnett Shale within the City of Denton on Business Activity in Texas

Sector	Total Expenditures	Real Gross Product	Personal Income	Employment
	<i>(2013 Dollars)</i>	<i>(2013 Dollars)</i>	<i>(2013 Dollars)</i>	<i>(Permanent Jobs)</i>
Agriculture	\$1,117,373	\$329,676	\$215,502	3
Mining	\$43,930,611	\$9,646,656	\$4,477,311	21
Construction	\$4,631,662	\$2,421,092	\$1,995,139	26
Nondurable Manufacturing	\$7,049,171	\$1,969,541	\$1,027,205	12
Durable Manufacturing	\$3,080,059	\$1,225,650	\$805,578	9
Transportation and Utilities	\$6,652,315	\$2,326,011	\$1,317,194	11
Information	\$1,566,027	\$964,017	\$415,967	3
Wholesale Trade	\$2,447,931	\$1,654,910	\$954,246	9
Retail Trade	\$11,583,789	\$8,682,293	\$5,045,216	148
Finance, Insurance, and Real Estate	\$14,552,760	\$4,058,573	\$1,250,232	9
Business Services	\$2,954,740	\$1,748,419	\$1,426,276	14
Health Services	\$2,458,891	\$1,728,275	\$1,461,287	22
Other Services	\$4,551,030	\$2,341,934	\$1,870,615	36
TOTAL	\$106,576,359	\$39,097,045	\$22,261,767	323

SOURCE: US Multi-Regional Impact Assessment System, The Perryman Group

Denton County
(Based on Barnett Shale Activity throughout Denton County)

Estimated Current Annual Impact (as of 2013) of Exploration, Drilling, and Operations in the Barnett Shale throughout Denton County on Business Activity in Denton County

Sector	Total Expenditures	Real Gross Product	Personal Income	Employment
	<i>(2013 Dollars)</i>	<i>(2013 Dollars)</i>	<i>(2013 Dollars)</i>	<i>(Permanent Jobs)</i>
Agriculture	\$3,102,138	\$866,925	\$588,954	9
Mining	\$194,782,673	\$42,693,981	\$19,692,235	94
Construction	\$15,377,915	\$8,306,689	\$6,845,230	94
Nondurable Manufacturing	\$15,484,720	\$4,504,533	\$2,340,370	37
Durable Manufacturing	\$7,768,447	\$3,216,985	\$2,059,025	26
Transportation and Utilities	\$12,641,949	\$4,247,995	\$2,338,138	23
Information	\$4,091,241	\$2,519,510	\$1,085,255	10
Wholesale Trade	\$7,895,770	\$5,335,591	\$3,076,549	33
Retail Trade	\$26,280,051	\$19,556,176	\$11,336,703	342
Finance, Insurance, and Real Estate	\$40,153,244	\$12,482,818	\$3,303,210	30
Business Services	\$6,709,925	\$3,910,124	\$3,189,663	38
Health Services	\$6,021,036	\$4,203,959	\$3,554,486	57
Other Services	\$10,936,056	\$5,498,041	\$4,417,284	97
TOTAL	\$351,245,166	\$117,343,326	\$63,827,101	890

SOURCE: US Multi-Regional Impact Assessment System, The Perryman Group

Estimated Current Annual Impact (as of 2013) of Royalty and Lease Payments Associated with Activity in the Barnett Shale throughout Denton County on Business Activity in Denton County

Sector	Total Expenditures <i>(2013 Dollars)</i>	Real Gross Product <i>(2013 Dollars)</i>	Personal Income <i>(2013 Dollars)</i>	Employment <i>(Permanent Jobs)</i>
Agriculture	\$3,192,130	\$871,707	\$591,843	4
Mining	\$93,707	\$21,808	\$11,061	0
Construction	\$4,177,027	\$2,140,552	\$1,764,027	13
Nondurable Manufacturing	\$11,290,076	\$3,421,652	\$1,801,611	4
Durable Manufacturing	\$3,316,130	\$1,335,590	\$849,144	0
Transportation and Utilities	\$13,620,367	\$4,486,178	\$2,433,048	4
Information	\$5,216,834	\$3,212,468	\$1,385,951	5
Wholesale Trade	\$5,246,140	\$3,549,863	\$2,046,971	8
Retail Trade	\$46,595,007	\$35,184,074	\$20,495,033	579
Finance, Insurance, and Real Estate	\$32,449,605	\$4,621,113	\$1,572,654	0
Business Services	\$5,475,850	\$3,154,233	\$2,573,137	13
Health Services	\$9,002,522	\$6,380,804	\$5,395,153	78
Other Services	\$16,009,880	\$8,293,367	\$6,548,904	92
TOTAL	\$155,685,275	\$76,673,407	\$47,468,536	800
SOURCE: US Multi-Regional Impact Assessment System, The Perryman Group				

Estimated Current Annual Impact (as of 2013) of Pipeline Development, Maintenance, and Operations Associated with Activity in the Barnett Shale throughout Denton County on Business Activity in Denton County

Sector	Total Expenditures <i>(2013 Dollars)</i>	Real Gross Product <i>(2013 Dollars)</i>	Personal Income <i>(2013 Dollars)</i>	Employment <i>(Permanent Jobs)</i>
Agriculture	\$473,965	\$131,165	\$89,153	1
Mining	\$20,929	\$5,281	\$2,756	0
Construction	\$8,776,691	\$4,038,787	\$3,328,211	46
Nondurable Manufacturing	\$2,189,177	\$642,119	\$335,409	5
Durable Manufacturing	\$1,873,009	\$766,251	\$481,965	7
Transportation and Utilities	\$5,665,987	\$1,460,289	\$891,586	10
Information	\$634,799	\$391,094	\$168,586	1
Wholesale Trade	\$1,321,161	\$894,238	\$515,623	6
Retail Trade	\$4,008,102	\$3,005,902	\$1,747,317	52
Finance, Insurance, and Real Estate	\$3,554,828	\$819,610	\$315,052	3
Business Services	\$1,999,620	\$1,278,889	\$1,043,249	12
Health Services	\$961,577	\$672,086	\$568,256	9
Other Services	\$1,768,144	\$886,448	\$711,239	15
TOTAL	\$33,247,989	\$14,992,159	\$10,198,401	166
SOURCE: US Multi-Regional Impact Assessment System, The Perryman Group				

Estimated Current Annual Impact of All Major Sources of Stimulus Associated with the Barnett Shale throughout Denton County on Business Activity in Denton County

Sector	Total Expenditures <i>(2013 Dollars)</i>	Real Gross Product <i>(2013 Dollars)</i>	Personal Income <i>(2013 Dollars)</i>	Employment <i>(Permanent Jobs)</i>
Agriculture	\$6,768,233	\$1,869,797	\$1,269,950	15
Mining	\$194,897,309	\$42,721,070	\$19,706,052	94
Construction	\$28,331,633	\$14,486,028	\$11,937,469	152
Nondurable Manufacturing	\$28,963,973	\$8,568,304	\$4,477,390	45
Durable Manufacturing	\$12,957,586	\$5,318,827	\$3,390,133	33
Transportation and Utilities	\$31,928,303	\$10,194,462	\$5,662,772	38
Information	\$9,942,874	\$6,123,071	\$2,639,791	16
Wholesale Trade	\$14,463,071	\$9,779,692	\$5,639,142	47
Retail Trade	\$76,883,160	\$57,746,152	\$33,579,053	972
Finance, Insurance, and Real Estate	\$76,157,677	\$17,923,541	\$5,190,916	33
Business Services	\$14,185,396	\$8,343,246	\$6,806,049	63
Health Services	\$15,985,136	\$11,256,849	\$9,517,895	144
Other Services	\$28,714,080	\$14,677,855	\$11,677,427	204
TOTAL	\$540,178,430	\$209,008,892	\$121,494,039	1,855

SOURCE: US Multi-Regional Impact Assessment System, The Perryman Group

Ten-Year Impacts

City of Denton

(Based on Barnett Shale Activity within the City of Denton)

Projected 10-Year Impact (2014-2023) of Exploration, Drilling, and Operations in the Barnett Shale within the City of Denton on Business Activity in the City of Denton

Sector	Total Expenditures <i>(2013 Dollars)</i>	Real Gross Product <i>(2013 Dollars)</i>	Personal Income <i>(2013 Dollars)</i>	Employment <i>(Person-Years)</i>
Agriculture	\$3,560,490	\$995,017	\$675,974	10
Mining	\$447,098,026	\$97,993,582	\$45,196,615	215
Construction	\$31,808,919	\$17,182,225	\$14,159,226	194
Nondurable Manufacturing	\$34,341,205	\$9,989,918	\$5,190,352	82
Durable Manufacturing	\$17,228,458	\$7,134,462	\$4,566,397	58
Transportation and Utilities	\$26,503,638	\$8,905,852	\$4,901,867	48
Information	\$5,516,330	\$3,387,298	\$1,471,581	14
Wholesale Trade	\$5,175,515	\$3,497,370	\$2,016,615	22
Retail Trade	\$69,668,298	\$51,843,335	\$30,053,549	906
Finance, Insurance, and Real Estate	\$52,146,585	\$16,211,301	\$4,289,843	39
Business Services	\$11,240,095	\$6,550,024	\$5,343,147	63
Health Services	\$15,961,740	\$11,144,676	\$9,422,926	151
Other Services	\$26,501,439	\$13,003,259	\$10,468,748	232
TOTAL	\$746,750,740	\$247,838,319	\$137,756,841	2,035

SOURCE: US Multi-Regional Impact Assessment System, The Perryman Group

NOTE: Assumes drilling activity over time responds to projected prices in the baseline forecast of the Energy Information Administration in a manner reflective of recent academic research (which understates the responsiveness that has been historically observed within the region).

Projected 10-Year Impact (2014-2023) of Royalty and Lease Payments Associated with Barnett Shale Activity within the City of Denton on Business Activity in the City of Denton

Sector	Total Expenditures <i>(2013 Dollars)</i>	Real Gross Product <i>(2013 Dollars)</i>	Personal Income <i>(2013 Dollars)</i>	Employment <i>(Person-Years)</i>
Agriculture	\$767,640	\$209,627	\$142,326	1
Mining	\$42,606	\$9,658	\$4,670	0
Construction	\$1,810,285	\$927,696	\$764,513	6
Nondurable Manufacturing	\$5,246,109	\$1,589,924	\$837,146	2
Durable Manufacturing	\$1,540,891	\$620,603	\$394,568	0
Transportation and Utilities	\$5,982,856	\$1,970,590	\$1,068,736	2
Information	\$1,478,855	\$907,709	\$395,578	2
Wholesale Trade	\$720,489	\$487,527	\$281,125	1
Retail Trade	\$25,880,738	\$19,542,648	\$11,383,765	322
Finance, Insurance, and Real Estate	\$8,829,639	\$1,257,419	\$427,924	0
Business Services	\$1,921,906	\$1,107,068	\$903,116	4
Health Services	\$5,000,362	\$3,544,155	\$2,996,685	43
Other Services	\$7,870,456	\$3,965,605	\$3,136,184	45
TOTAL	\$67,092,833	\$36,140,227	\$22,736,336	427

SOURCE: US Multi-Regional Impact Assessment System, The Perryman Group

NOTE: Assumes that established patterns of decline in well output continue and that new wells are of those observed in the area. Projected royalties are converted to 2013 dollars using projections of the Texas Consumer Price Index derived from the current baseline forecast from the Texas Econometric Model. Effects are fully adjusted for external ownership and leakages from the expenditure stream.

Projected 10-Year Impact (2014-2023) of Pipeline Development, Maintenance, and Operations Associated with Barnett Shale Activity within the City of Denton on Business Activity in the City of Denton

Sector	Total Expenditures <i>(2013 Dollars)</i>	Real Gross Product <i>(2013 Dollars)</i>	Personal Income <i>(2013 Dollars)</i>	Employment <i>(Person-Years)</i>
Agriculture	\$195,678	\$54,152	\$36,807	0
Mining	\$15,658	\$3,704	\$1,841	0
Construction	\$8,203,639	\$3,765,723	\$3,103,189	43
Nondurable Manufacturing	\$1,746,391	\$512,243	\$267,569	4
Durable Manufacturing	\$1,494,171	\$611,268	\$384,482	5
Transportation and Utilities	\$4,272,827	\$1,101,232	\$672,362	8
Information	\$308,379	\$189,391	\$82,396	1
Wholesale Trade	\$311,504	\$210,844	\$121,574	1
Retail Trade	\$3,822,048	\$2,866,370	\$1,666,207	49
Finance, Insurance, and Real Estate	\$1,660,627	\$382,878	\$147,176	1
Business Services	\$1,204,892	\$770,608	\$628,620	7
Health Services	\$916,941	\$640,888	\$541,878	9
Other Services	\$1,541,798	\$754,601	\$606,586	13
TOTAL	\$25,694,554	\$11,863,901	\$8,260,687	141

SOURCE: US Multi-Regional Impact Assessment System, The Perryman Group

NOTE: Assumes that current annual patterns in pipeline and gathering system maintenance and operations are sufficient to accommodate the additional wells that are projected to be added in the future.

Projected 10-Year Impact (2014-2023) of All Major Sources of Stimulus Associated with Barnett Shale Activity within the City of Denton on Business Activity in the City of Denton

Sector	Total Expenditures <i>(2013 Dollars)</i>	Real Gross Product <i>(2013 Dollars)</i>	Personal Income <i>(2013 Dollars)</i>	Employment <i>(Person-Years)</i>
Agriculture	\$4,523,808	\$1,258,796	\$855,107	12
Mining	\$447,156,290	\$98,006,944	\$45,203,127	215
Construction	\$41,822,844	\$21,875,643	\$18,026,928	242
Nondurable Manufacturing	\$41,333,705	\$12,092,085	\$6,295,067	87
Durable Manufacturing	\$20,263,520	\$8,366,333	\$5,345,447	63
Transportation and Utilities	\$36,759,322	\$11,977,673	\$6,642,965	58
Information	\$7,303,564	\$4,484,398	\$1,949,556	16
Wholesale Trade	\$6,207,508	\$4,195,741	\$2,419,313	24
Retail Trade	\$99,371,085	\$74,252,352	\$43,103,521	1,277
Finance, Insurance, and Real Estate	\$62,636,851	\$17,851,599	\$4,864,943	41
Business Services	\$14,366,894	\$8,427,700	\$6,874,884	75
Health Services	\$21,879,044	\$15,329,719	\$12,961,489	203
Other Services	\$35,913,694	\$17,723,465	\$14,211,519	290
TOTAL	\$839,538,128	\$295,842,448	\$168,753,864	2,603

SOURCE: US Multi-Regional Impact Assessment System, The Perryman Group

Texas

(Based on Barnett Shale Activity within the City of Denton)

Projected 10-Year Impact (2014-2023) of Barnett Shale Exploration, Drilling, and Operations within the City of Denton on Business Activity in Texas				
Sector	Total Expenditures	Real Gross Product	Personal Income	Employment
	<i>(2013 Dollars)</i>	<i>(2013 Dollars)</i>	<i>(2013 Dollars)</i>	<i>(Person-Years)</i>
Agriculture	\$8,715,478	\$2,591,789	\$1,697,328	25
Mining	\$538,929,058	\$118,298,482	\$54,789,560	259
Construction	\$41,156,755	\$22,220,840	\$18,311,359	251
Nondurable Manufacturing	\$60,616,076	\$16,810,906	\$8,743,215	134
Durable Manufacturing	\$29,448,689	\$11,775,368	\$7,774,417	98
Transportation and Utilities	\$50,514,755	\$18,094,228	\$10,218,244	105
Information	\$11,379,206	\$7,004,395	\$3,021,160	27
Wholesale Trade	\$21,452,295	\$14,496,949	\$8,359,068	91
Retail Trade	\$74,001,944	\$55,104,321	\$31,951,084	962
Finance, Insurance, and Real Estate	\$125,852,978	\$40,664,780	\$11,818,423	112
Business Services	\$24,023,170	\$14,086,438	\$11,490,937	136
Health Services	\$16,807,968	\$11,744,464	\$9,930,053	159
Other Services	\$31,570,216	\$16,110,582	\$12,957,267	302
TOTAL	\$1,034,468,589	\$349,003,541	\$191,062,116	2,661
<p>SOURCE: US Multi-Regional Impact Assessment System, The Perryman Group</p> <p>NOTE: Assumes drilling activity over time responds to projected prices in the baseline forecast of the Energy Information Administration in a manner reflective of recent academic research (which understates the responsiveness that has been historically observed within the region).</p>				

Projected 10-Year Impact (2014-2023) of Royalty and Lease Payments Associated with Barnett Shale Activity within the City of Denton on Business Activity in Texas

Sector	Total Expenditures <i>(2013 Dollars)</i>	Real Gross Product <i>(2013 Dollars)</i>	Personal Income <i>(2013 Dollars)</i>	Employment <i>(Person-Years)</i>
Agriculture	\$2,318,178	\$675,087	\$439,144	3
Mining	\$1,976,104	\$449,878	\$259,410	0
Construction	\$2,958,578	\$1,516,148	\$1,249,456	9
Nondurable Manufacturing	\$11,677,963	\$3,330,318	\$1,748,931	6
Durable Manufacturing	\$2,879,657	\$1,129,996	\$729,168	0
Transportation and Utilities	\$12,253,094	\$4,352,869	\$2,434,789	5
Information	\$3,701,205	\$2,278,542	\$983,737	3
Wholesale Trade	\$3,715,829	\$2,514,360	\$1,449,864	6
Retail Trade	\$33,003,135	\$24,920,798	\$14,516,584	410
Finance, Insurance, and Real Estate	\$25,185,088	\$4,222,942	\$1,590,980	0
Business Services	\$4,802,386	\$2,826,924	\$2,306,127	11
Health Services	\$6,376,466	\$4,519,509	\$3,821,374	55
Other Services	\$11,532,768	\$6,010,637	\$4,752,716	66
TOTAL	\$122,380,451	\$58,748,006	\$36,282,282	574

SOURCE: US Multi-Regional Impact Assessment System, The Perryman Group

NOTE: Assumes that established patterns of decline in well output continue and that new wells are of those observed in the area. Projected royalties are converted to 2013 dollars using projections of the Texas Consumer Price Index derived from the current baseline forecast from the Texas Econometric Model. Effects are fully adjusted for external ownership and leakages from the expenditure stream.

Projected 10-Year Impact (2014-2023) of Pipeline Development, Maintenance, and Operations Associated with Barnett Shale Activity within the City of Denton on Business Activity in Texas

Sector	Total Expenditures <i>(2013 Dollars)</i>	Real Gross Product <i>(2013 Dollars)</i>	Personal Income <i>(2013 Dollars)</i>	Employment <i>(Person-Years)</i>
Agriculture	\$481,740	\$139,675	\$92,151	1
Mining	\$569,169	\$135,561	\$77,400	0
Construction	\$8,394,129	\$3,864,046	\$3,184,211	44
Nondurable Manufacturing	\$3,122,028	\$867,360	\$453,205	7
Durable Manufacturing	\$2,466,147	\$960,443	\$624,387	7
Transportation and Utilities	\$6,413,755	\$1,785,985	\$1,081,775	12
Information	\$639,276	\$393,644	\$169,932	1
Wholesale Trade	\$1,293,014	\$875,176	\$504,638	5
Retail Trade	\$4,098,220	\$3,074,180	\$1,787,138	53
Finance, Insurance, and Real Estate	\$4,175,385	\$1,071,748	\$446,214	4
Business Services	\$2,573,583	\$1,650,351	\$1,346,264	16
Health Services	\$970,871	\$679,112	\$574,199	9
Other Services	\$1,847,440	\$940,549	\$755,286	17
TOTAL	\$37,044,759	\$16,437,831	\$11,096,800	177

SOURCE: US Multi-Regional Impact Assessment System, The Perryman Group

NOTE: Assumes that current annual patterns in pipeline and gathering system maintenance and operations are sufficient to accommodate the additional wells that are projected to be added in the future.

Projected 10-Year Impact (2014-2023) of All Major Sources of Stimulus Associated with Barnett Shale Activity within the City of Denton on Business Activity in Texas

Sector	Total Expenditures <i>(2013 Dollars)</i>	Real Gross Product <i>(2013 Dollars)</i>	Personal Income <i>(2013 Dollars)</i>	Employment <i>(Person-Years)</i>
Agriculture	\$11,515,397	\$3,406,551	\$2,228,624	29
Mining	\$541,474,330	\$118,883,921	\$55,126,370	259
Construction	\$52,509,463	\$27,601,034	\$22,745,026	304
Nondurable Manufacturing	\$75,416,067	\$21,008,585	\$10,945,352	147
Durable Manufacturing	\$34,794,494	\$13,865,808	\$9,127,972	105
Transportation and Utilities	\$69,181,604	\$24,233,082	\$13,734,807	123
Information	\$15,719,687	\$9,676,580	\$4,174,829	32
Wholesale Trade	\$26,461,138	\$17,886,485	\$10,313,571	102
Retail Trade	\$111,103,300	\$83,099,299	\$48,254,806	1,425
Finance, Insurance, and Real Estate	\$155,213,450	\$45,959,470	\$13,855,618	116
Business Services	\$31,399,138	\$18,563,713	\$15,143,328	164
Health Services	\$24,155,305	\$16,943,085	\$14,325,626	223
Other Services	\$44,950,424	\$23,061,767	\$18,465,269	385
TOTAL	\$1,193,893,798	\$424,189,379	\$238,441,198	3,413

SOURCE: US Multi-Regional Impact Assessment System, The Perryman Group

Denton County
(Based on Barnett Shale Activity throughout Denton County)

Projected 10-Year Impact (2014-2023) of Exploration, Drilling, and Operations in the Barnett Shale throughout Denton County on Business Activity in Denton County

Sector	Total Expenditures <i>(2013 Dollars)</i>	Real Gross Product <i>(2013 Dollars)</i>	Personal Income <i>(2013 Dollars)</i>	Employment <i>(Person-Years)</i>
Agriculture	\$38,377,518	\$10,725,004	\$675,974	113
Mining	\$2,409,717,338	\$528,180,584	\$45,196,615	1,161
Construction	\$190,244,996	\$102,764,644	\$14,159,226	1,160
Nondurable Manufacturing	\$191,566,312	\$55,726,984	\$5,190,352	457
Durable Manufacturing	\$96,105,891	\$39,798,328	\$4,566,397	324
Transportation and Utilities	\$156,397,505	\$52,553,275	\$4,901,867	282
Information	\$50,614,028	\$31,169,643	\$1,471,581	119
Wholesale Trade	\$97,681,035	\$66,008,261	\$2,016,615	414
Retail Trade	\$325,118,726	\$241,935,561	\$30,053,549	4,228
Finance, Insurance, and Real Estate	\$496,748,339	\$154,428,845	\$4,289,843	375
Business Services	\$83,010,579	\$48,373,370	\$5,343,147	469
Health Services	\$74,488,120	\$52,008,490	\$9,422,926	705
Other Services	\$135,293,365	\$68,017,980	\$10,468,748	1,199
TOTAL	\$4,345,363,751	\$1,451,690,970	\$137,756,841	11,005

SOURCE: US Multi-Regional Impact Assessment System, The Perryman Group

NOTE: Assumes drilling activity over time responds to projected prices in the baseline forecast of the Energy Information Administration in a manner reflective of recent academic research (which understates the responsiveness that has been historically observed within the region).

Projected 10-Year Impact (2014-2023) of Royalty and Lease Payments Associated with Barnett Shale Activity throughout Denton County on Business Activity in Denton County

Sector	Total Expenditures <i>(2013 Dollars)</i>	Real Gross Product <i>(2013 Dollars)</i>	Personal Income <i>(2013 Dollars)</i>	Employment <i>(Person-Years)</i>
Agriculture	\$20,289,994	\$5,540,789	\$3,761,904	27
Mining	\$595,625	\$138,620	\$70,308	0
Construction	\$26,550,247	\$13,605,893	\$11,212,608	83
Nondurable Manufacturing	\$71,762,607	\$21,748,896	\$11,451,497	24
Durable Manufacturing	\$21,078,168	\$8,489,352	\$5,397,376	0
Transportation and Utilities	\$86,574,530	\$28,515,290	\$15,465,073	28
Information	\$33,159,526	\$20,419,266	\$8,809,455	31
Wholesale Trade	\$33,345,803	\$22,563,835	\$13,011,067	52
Retail Trade	\$296,169,759	\$223,638,952	\$130,271,662	3,680
Finance, Insurance, and Real Estate	\$206,257,972	\$29,372,973	\$9,996,191	0
Business Services	\$34,805,903	\$20,049,108	\$16,355,515	80
Health Services	\$57,222,330	\$40,558,017	\$34,292,970	493
Other Services	\$101,762,884	\$52,714,756	\$41,626,506	587
TOTAL	\$989,575,346	\$487,355,745	\$301,722,133	5,084

SOURCE: US Multi-Regional Impact Assessment System, The Perryman Group

NOTE: Assumes that established patterns of decline in well output continue and that new wells are of those observed in the area. Projected royalties are converted to 2013 dollars using projections of the Texas Consumer Price Index derived from the current baseline forecast from the Texas Econometric Model. Effects are fully adjusted for external ownership and leakages from the expenditure stream.

Projected 10-Year Impact (2014-2023) of Pipeline Development, Maintenance, and Operations Associated with Barnett Shale Activity throughout Denton County on Business Activity in Denton County

Sector	Total Expenditures <i>(2013 Dollars)</i>	Real Gross Product <i>(2013 Dollars)</i>	Personal Income <i>(2013 Dollars)</i>	Employment <i>(Person-Years)</i>
Agriculture	\$4,739,649	\$1,311,651	\$891,534	12
Mining	\$209,294	\$52,808	\$27,557	0
Construction	\$87,766,911	\$40,387,872	\$33,282,112	456
Nondurable Manufacturing	\$21,891,772	\$6,421,185	\$3,354,092	48
Durable Manufacturing	\$18,730,089	\$7,662,514	\$4,819,646	66
Transportation and Utilities	\$56,659,866	\$14,602,893	\$8,915,861	104
Information	\$6,347,985	\$3,910,938	\$1,685,857	12
Wholesale Trade	\$13,211,615	\$8,942,382	\$5,156,226	56
Retail Trade	\$40,081,023	\$30,059,025	\$17,473,169	518
Finance, Insurance, and Real Estate	\$35,548,277	\$8,196,098	\$3,150,519	25
Business Services	\$19,996,203	\$12,788,891	\$10,432,486	121
Health Services	\$9,615,774	\$6,720,859	\$5,682,561	90
Other Services	\$17,681,438	\$8,864,476	\$7,112,390	149
TOTAL	\$332,479,895	\$149,921,593	\$101,984,013	1,657

SOURCE: US Multi-Regional Impact Assessment System, The Perryman Group

NOTE: Assumes that current annual patterns in pipeline and gathering system maintenance and operations are sufficient to accommodate the additional wells that are projected to be added in the future.

Projected 10-Year Impact (2014-2023) of All Major Sources of Stimulus Associated with Barnett Shale Activity throughout Denton County on Business Activity in Denton County

Sector	Total Expenditures <i>(2013 Dollars)</i>	Real Gross Product <i>(2013 Dollars)</i>	Personal Income <i>(2013 Dollars)</i>	Employment <i>(Person-Years)</i>
Agriculture	\$63,407,160	\$17,577,444	\$11,939,572	152
Mining	\$2,410,522,256	\$528,372,012	\$243,716,664	1,161
Construction	\$304,562,154	\$156,758,409	\$129,179,200	1,699
Nondurable Manufacturing	\$285,220,690	\$83,897,065	\$43,759,043	529
Durable Manufacturing	\$135,914,148	\$55,950,194	\$35,689,859	390
Transportation and Utilities	\$299,631,901	\$95,671,458	\$53,306,766	414
Information	\$90,121,538	\$55,499,847	\$23,921,340	162
Wholesale Trade	\$144,238,453	\$97,514,479	\$56,228,237	522
Retail Trade	\$661,369,508	\$495,633,538	\$287,994,726	8,425
Finance, Insurance, and Real Estate	\$738,554,588	\$191,997,916	\$54,011,756	400
Business Services	\$137,812,685	\$81,211,369	\$66,248,322	669
Health Services	\$141,326,224	\$99,287,366	\$83,949,189	1,289
Other Services	\$254,737,687	\$129,597,212	\$103,386,496	1,934
TOTAL	\$5,667,418,992	\$2,088,968,308	\$1,193,331,170	17,746

SOURCE: US Multi-Regional Impact Assessment System, The Perryman Group

Appendix E: Detailed Sectoral Results for Losses Stemming from a Ban on Hydraulic Fracturing in the City of Denton

City of Denton

(Based on Barnett Shale Activity within the City of Denton)

Projected 10-Year Impact (2014-2023) of a Ban on Hydraulic Fracturing in the City of Denton on Exploration, Drilling, and Operations Associated with the Barnett Shale on Business Activity in the City of Denton

Sector	Total Expenditures <i>(2013 Dollars)</i>	Real Gross Product <i>(2013 Dollars)</i>	Personal Income <i>(2013 Dollars)</i>	Employment <i>(Person-Years)</i>
Agriculture	(\$3,560,490)	(\$995,017)	(\$675,974)	(10)
Mining	(\$447,098,026)	(\$97,993,582)	(\$45,196,615)	(215)
Construction	(\$31,808,919)	(\$17,182,225)	(\$14,159,226)	(194)
Nondurable Manufacturing	(\$34,341,205)	(\$9,989,918)	(\$5,190,352)	(82)
Durable Manufacturing	(\$17,228,458)	(\$7,134,462)	(\$4,566,397)	(58)
Transportation and Utilities	(\$26,503,638)	(\$8,905,852)	(\$4,901,867)	(48)
Information	(\$5,516,330)	(\$3,387,298)	(\$1,471,581)	(14)
Wholesale Trade	(\$5,175,515)	(\$3,497,370)	(\$2,016,615)	(22)
Retail Trade	(\$69,668,298)	(\$51,843,335)	(\$30,053,549)	(906)
Finance, Insurance, and Real Estate	(\$52,146,585)	(\$16,211,301)	(\$4,289,843)	(39)
Business Services	(\$11,240,095)	(\$6,550,024)	(\$5,343,147)	(63)
Health Services	(\$15,961,740)	(\$11,144,676)	(\$9,422,926)	(151)
Other Services	(\$26,501,439)	(\$13,003,259)	(\$10,468,748)	(232)
TOTAL	(\$746,750,740)	(\$247,838,319)	(\$137,756,841)	(2,035)

SOURCE: US Multi-Regional Impact Assessment System, The Perryman Group

NOTE: Assumes drilling activity over time responds to projected prices in the baseline forecast of the Energy Information Administration in a manner reflective of recent academic research (which understates the responsiveness that has been historically observed within the region).

Projected 10-Year Impact (2014-2023) of a Ban on Hydraulic Fracturing in the City of Denton on Royalty and Lease Payments Associated with the Barnett Shale on Business Activity in the City of Denton

Sector	Total Expenditures <i>(2013 Dollars)</i>	Real Gross Product <i>(2013 Dollars)</i>	Personal Income <i>(2013 Dollars)</i>	Employment <i>(Person-Years)</i>
Agriculture	(\$75,324)	(\$20,569)	(\$13,966)	(0)
Mining	(\$4,181)	(\$948)	(\$458)	0
Construction	(\$177,633)	(\$91,029)	(\$75,017)	(1)
Nondurable Manufacturing	(\$514,770)	(\$156,010)	(\$82,144)	(0)
Durable Manufacturing	(\$151,199)	(\$60,896)	(\$38,717)	0
Transportation and Utilities	(\$587,063)	(\$193,362)	(\$104,869)	(0)
Information	(\$145,111)	(\$89,068)	(\$38,816)	(0)
Wholesale Trade	(\$70,697)	(\$47,838)	(\$27,585)	(0)
Retail Trade	(\$2,539,525)	(\$1,917,605)	(\$1,117,022)	(32)
Finance, Insurance, and Real Estate	(\$866,401)	(\$123,383)	(\$41,990)	0
Business Services	(\$188,585)	(\$108,630)	(\$88,617)	(0)
Health Services	(\$490,656)	(\$347,767)	(\$294,047)	(4)
Other Services	(\$772,282)	(\$389,122)	(\$307,735)	(4)
TOTAL	(\$6,583,426)	(\$3,546,228)	(\$2,230,983)	(42)

SOURCE: US Multi-Regional Impact Assessment System, The Perryman Group

NOTE: Assumes that established patterns of decline in well output continue and that new wells are of those observed in the area. Projected royalties are converted to 2013 dollars using projections of the Texas Consumer Price Index derived from the current baseline forecast from the Texas Econometric Model. Effects are fully adjusted for external ownership and leakages from the expenditure stream.

Projected 10-Year Impact (2014-2023) of a Ban on Hydraulic Fracturing in the City of Denton on All Major Sources of Stimulus Associated with the Barnett Shale on Business Activity in the City Of Denton

Sector	Total Expenditures <i>(2013 Dollars)</i>	Real Gross Product <i>(2013 Dollars)</i>	Personal Income <i>(2013 Dollars)</i>	Employment <i>(Person-Years)</i>
Agriculture	(\$3,635,814)	(\$1,015,586)	(\$689,940)	(11)
Mining	(\$447,102,207)	(\$97,994,530)	(\$45,197,074)	(215)
Construction	(\$31,986,552)	(\$17,273,254)	(\$14,234,243)	(195)
Nondurable Manufacturing	(\$34,855,975)	(\$10,145,928)	(\$5,272,496)	(82)
Durable Manufacturing	(\$17,379,656)	(\$7,195,358)	(\$4,605,114)	(58)
Transportation and Utilities	(\$27,090,701)	(\$9,099,214)	(\$5,006,736)	(48)
Information	(\$5,661,442)	(\$3,476,366)	(\$1,510,397)	(14)
Wholesale Trade	(\$5,246,213)	(\$3,545,209)	(\$2,044,200)	(22)
Retail Trade	(\$72,207,823)	(\$53,760,940)	(\$31,170,571)	(937)
Finance, Insurance, and Real Estate	(\$53,012,986)	(\$16,334,684)	(\$4,331,833)	(39)
Business Services	(\$11,428,681)	(\$6,658,654)	(\$5,431,765)	(64)
Health Services	(\$16,452,396)	(\$11,492,444)	(\$9,716,974)	(155)
Other Services	(\$27,273,721)	(\$13,392,381)	(\$10,776,484)	(236)
TOTAL	(\$753,334,166)	(\$251,384,547)	(\$139,987,824)	(2,077)

SOURCE: US Multi-Regional Impact Assessment System, The Perryman Group

Texas

(Based on Barnett Shale Activity within the City of Denton)

Projected 10-Year Impact (2014-2023) of a Ban on Hydraulic Fracturing in the City of Denton on Exploration, Drilling, and Operations Associated with the Barnett Shale on Business Activity in Texas

Sector	Total Expenditures <i>(2013 Dollars)</i>	Real Gross Product <i>(2013 Dollars)</i>	Personal Income <i>(2013 Dollars)</i>	Employment <i>(Person-Years)</i>
Agriculture	(\$8,715,478)	(\$2,591,789)	(\$1,697,328)	(25)
Mining	(\$538,929,058)	(\$118,298,482)	(\$54,789,560)	(259)
Construction	(\$41,156,755)	(\$22,220,840)	(\$18,311,359)	(251)
Nondurable Manufacturing	(\$60,616,076)	(\$16,810,906)	(\$8,743,215)	(134)
Durable Manufacturing	(\$29,448,689)	(\$11,775,368)	(\$7,774,417)	(98)
Transportation and Utilities	(\$50,514,755)	(\$18,094,228)	(\$10,218,244)	(105)
Information	(\$11,379,206)	(\$7,004,395)	(\$3,021,160)	(27)
Wholesale Trade	(\$21,452,295)	(\$14,496,949)	(\$8,359,068)	(91)
Retail Trade	(\$74,001,944)	(\$55,104,321)	(\$31,951,084)	(962)
Finance, Insurance, and Real Estate	(\$125,852,978)	(\$40,664,780)	(\$11,818,423)	(112)
Business Services	(\$24,023,170)	(\$14,086,438)	(\$11,490,937)	(136)
Health Services	(\$16,807,968)	(\$11,744,464)	(\$9,930,053)	(159)
Other Services	(\$31,570,216)	(\$16,110,582)	(\$12,957,267)	(302)
TOTAL	(\$1,034,468,589)	(\$349,003,541)	(\$191,062,116)	(2,661)

SOURCE: US Multi-Regional Impact Assessment System, The Perryman Group

NOTE: Assumes drilling activity over time responds to projected prices in the baseline forecast of the Energy Information Administration in a manner reflective of recent academic research (which understates the responsiveness that has been historically observed within the region).

Projected 10-Year Impact (2014-2023) of a Ban on Hydraulic Fracturing in the City of Denton on Royalty and Lease Payments Associated with the Barnett Shale on Business Activity in Texas

Sector	Total Expenditures <i>(2013 Dollars)</i>	Real Gross Product <i>(2013 Dollars)</i>	Personal Income <i>(2013 Dollars)</i>	Employment <i>(Person-Years)</i>
Agriculture	(\$227,469)	(\$66,242)	(\$43,091)	(0)
Mining	(\$193,903)	(\$44,144)	(\$25,454)	0
Construction	(\$290,308)	(\$148,771)	(\$122,602)	(1)
Nondurable Manufacturing	(\$1,145,890)	(\$326,785)	(\$171,612)	(1)
Durable Manufacturing	(\$282,564)	(\$110,880)	(\$71,549)	0
Transportation and Utilities	(\$1,202,324)	(\$427,121)	(\$238,912)	(0)
Information	(\$363,178)	(\$223,580)	(\$96,528)	(0)
Wholesale Trade	(\$364,612)	(\$246,719)	(\$142,267)	(1)
Retail Trade	(\$3,238,404)	(\$2,445,331)	(\$1,424,427)	(40)
Finance, Insurance, and Real Estate	(\$2,471,265)	(\$414,373)	(\$156,114)	0
Business Services	(\$471,230)	(\$277,389)	(\$226,287)	(1)
Health Services	(\$625,685)	(\$443,473)	(\$374,969)	(5)
Other Services	(\$1,131,643)	(\$589,788)	(\$466,356)	(6)
TOTAL	(\$12,008,475)	(\$5,764,597)	(\$3,560,167)	(56)

SOURCE: US Multi-Regional Impact Assessment System, The Perryman Group

NOTE: Assumes that established patterns of decline in well output continue and that new wells are of those observed in the area. Projected royalties are converted to 2013 dollars using projections of the Texas Consumer Price Index derived from the current baseline forecast from the Texas Econometric Model. Effects are fully adjusted for external ownership and leakages from the expenditure stream.

Projected 10-Year Impact (2014-2023) of a Ban on Hydraulic Fracturing in the City of Denton on All Major Sources of Stimulus Associated with the Barnett Shale on Business Activity in Texas

Sector	Total Expenditures <i>(2013 Dollars)</i>	Real Gross Product <i>(2013 Dollars)</i>	Personal Income <i>(2013 Dollars)</i>	Employment <i>(Person-Years)</i>
Agriculture	(\$8,942,948)	(\$2,658,032)	(\$1,740,419)	(25)
Mining	(\$539,122,961)	(\$118,342,625)	(\$54,815,015)	(259)
Construction	(\$41,447,063)	(\$22,369,610)	(\$18,433,961)	(252)
Nondurable Manufacturing	(\$61,761,966)	(\$17,137,691)	(\$8,914,828)	(135)
Durable Manufacturing	(\$29,731,253)	(\$11,886,248)	(\$7,845,966)	(98)
Transportation and Utilities	(\$51,717,079)	(\$18,521,349)	(\$10,457,155)	(106)
Information	(\$11,742,383)	(\$7,227,975)	(\$3,117,688)	(27)
Wholesale Trade	(\$21,816,908)	(\$14,743,669)	(\$8,501,335)	(92)
Retail Trade	(\$77,240,348)	(\$57,549,653)	(\$33,375,511)	(1,002)
Finance, Insurance, and Real Estate	(\$128,324,243)	(\$41,079,152)	(\$11,974,537)	(112)
Business Services	(\$24,494,399)	(\$14,363,827)	(\$11,717,223)	(138)
Health Services	(\$17,433,653)	(\$12,187,937)	(\$10,305,022)	(165)
Other Services	(\$32,701,859)	(\$16,700,370)	(\$13,423,623)	(308)
TOTAL	(\$1,046,477,064)	(\$354,768,138)	(\$194,622,283)	(2,718)

SOURCE: US Multi-Regional Impact Assessment System, The Perryman Group

Denton County

(Based on Barnett Shale Activity within the City of Denton)

Projected 10-Year Impact (2014-2023) of a Ban on Hydraulic Fracturing in the City of Denton on Exploration, Drilling, and Operations Associated with the Barnett Shale on Business Activity in Denton County

Sector	Total Expenditures <i>(2013 Dollars)</i>	Real Gross Product <i>(2013 Dollars)</i>	Personal Income <i>(2013 Dollars)</i>	Employment <i>(Person-Years)</i>
Agriculture	(\$8,223,754)	(\$2,298,215)	(\$1,561,314)	(24)
Mining	(\$516,368,001)	(\$113,181,554)	(\$52,204,028)	(249)
Construction	(\$40,766,785)	(\$22,020,995)	(\$18,146,674)	(249)
Nondurable Manufacturing	(\$41,049,924)	(\$11,941,497)	(\$6,204,312)	(98)
Durable Manufacturing	(\$20,594,119)	(\$8,528,213)	(\$5,458,465)	(69)
Transportation and Utilities	(\$33,513,751)	(\$11,261,416)	(\$6,198,392)	(60)
Information	(\$10,845,863)	(\$6,679,209)	(\$2,877,006)	(26)
Wholesale Trade	(\$20,931,650)	(\$14,144,627)	(\$8,155,917)	(89)
Retail Trade	(\$69,668,298)	(\$51,843,335)	(\$30,053,549)	(906)
Finance, Insurance, and Real Estate	(\$106,446,073)	(\$33,091,895)	(\$8,756,796)	(80)
Business Services	(\$17,787,981)	(\$10,365,722)	(\$8,455,783)	(100)
Health Services	(\$15,961,740)	(\$11,144,676)	(\$9,422,926)	(151)
Other Services	(\$28,991,435)	(\$14,575,282)	(\$11,710,200)	(257)
TOTAL	(\$931,149,375)	(\$311,076,636)	(\$169,205,362)	(2,358)

SOURCE: US Multi-Regional Impact Assessment System, The Perryman Group

NOTE: Assumes drilling activity over time responds to projected prices in the baseline forecast of the Energy Information Administration in a manner reflective of recent academic research (which understates the responsiveness that has been historically observed within the region).

Projected 10-Year Impact (2014-2023) of a Ban on Hydraulic Fracturing in the City of Denton on Royalty and Lease Payments Associated with the Barnett Shale on Business Activity in Denton County

Sector	Total Expenditures <i>(2013 Dollars)</i>	Real Gross Product <i>(2013 Dollars)</i>	Personal Income <i>(2013 Dollars)</i>	Employment <i>(Person-Years)</i>
Agriculture	(\$173,978)	(\$47,510)	(\$32,257)	(0)
Mining	(\$5,107)	(\$1,189)	(\$603)	0
Construction	(\$227,657)	(\$116,665)	(\$96,143)	(1)
Nondurable Manufacturing	(\$615,333)	(\$186,487)	(\$98,192)	(0)
Durable Manufacturing	(\$180,736)	(\$72,792)	(\$46,280)	0
Transportation and Utilities	(\$742,338)	(\$244,506)	(\$132,606)	(0)
Information	(\$284,328)	(\$175,086)	(\$75,537)	(0)
Wholesale Trade	(\$285,926)	(\$193,475)	(\$111,564)	(0)
Retail Trade	(\$2,539,525)	(\$1,917,605)	(\$1,117,022)	(32)
Finance, Insurance, and Real Estate	(\$1,768,571)	(\$251,860)	(\$85,713)	0
Business Services	(\$298,445)	(\$171,912)	(\$140,241)	(1)
Health Services	(\$490,656)	(\$347,767)	(\$294,047)	(4)
Other Services	(\$872,572)	(\$452,006)	(\$356,929)	(5)
TOTAL	(\$8,485,171)	(\$4,178,860)	(\$2,587,134)	(44)

SOURCE: US Multi-Regional Impact Assessment System, The Perryman Group

NOTE: Assumes that established patterns of decline in well output continue and that new wells are of those observed in the area. Projected royalties are converted to 2013 dollars using projections of the Texas Consumer Price Index derived from the current baseline forecast from the Texas Econometric Model. Effects are fully adjusted for external ownership and leakages from the expenditure stream.

Projected 10-Year Impact (2014-2023) of a Ban on Hydraulic Fracturing in the City of Denton on All Major Sources of Stimulus Associated with the Barnett Shale on Business Activity in Denton County

Sector	Total Expenditures <i>(2013 Dollars)</i>	Real Gross Product <i>(2013 Dollars)</i>	Personal Income <i>(2013 Dollars)</i>	Employment <i>(Person-Years)</i>
Agriculture	(\$8,397,732)	(\$2,345,725)	(\$1,593,571)	(24)
Mining	(\$516,373,108)	(\$113,182,742)	(\$52,204,631)	(249)
Construction	(\$40,994,442)	(\$22,137,660)	(\$18,242,817)	(249)
Nondurable Manufacturing	(\$41,665,257)	(\$12,127,984)	(\$6,302,503)	(98)
Durable Manufacturing	(\$20,774,855)	(\$8,601,006)	(\$5,504,745)	(69)
Transportation and Utilities	(\$34,256,089)	(\$11,505,922)	(\$6,330,999)	(61)
Information	(\$11,130,191)	(\$6,854,296)	(\$2,952,543)	(26)
Wholesale Trade	(\$21,217,576)	(\$14,338,102)	(\$8,267,481)	(89)
Retail Trade	(\$72,207,823)	(\$53,760,940)	(\$31,170,571)	(937)
Finance, Insurance, and Real Estate	(\$108,214,644)	(\$33,343,756)	(\$8,842,509)	(80)
Business Services	(\$18,086,426)	(\$10,537,634)	(\$8,596,024)	(101)
Health Services	(\$16,452,396)	(\$11,492,444)	(\$9,716,974)	(155)
Other Services	(\$29,864,007)	(\$15,027,287)	(\$12,067,129)	(262)
TOTAL	(\$939,634,547)	(\$315,255,497)	(\$171,792,496)	(2,402)

SOURCE: US Multi-Regional Impact Assessment System, The Perryman Group