ABSTRACT

Cost/Benefit Analysis and Ad Valorem Tax Benefits of Oil and Gas Drilling in the DFW Barnett Shale of Urban and Suburban North Texas

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Oil and gas drilling and production have increased greatly throughout the U.S. due to higher oil and gas prices as well as improvement in technologies that are both economic and reduce negative impacts to the surface estate. The Barnett Shale gas field has become the largest and most productive in Texas over a four year period with 3,800 wells being completed; however, the gas field is located in the DFW Metropolitan area, which is one of the fastest growing real estate markets in the United States. The cost-benefit analysis of urban/suburban drilling from the standpoint of land use efficiencies, economic impact, environmental impact and property taxes is considered. The paper concludes that variable long-term financial and environmental benefits to communities, surface owners, mineral/royalty owners and oil companies far exceed the direct and indirect costs of gas wells that are professionally planned and operated. Key words/concepts: oil and gas valuation methods, need for education by real estate related professionals, planners and city administrators, city drilling ordinances, land-use efficiencies.

*This is a draft.

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Introduction:

The Barnett Shale gas field has resulted in approximately 3800 deep (7,000-9,000 feet) gas wells being drilled within the City of Fort Worth and surrounding suburbs within a four (4) year period. Some citizens and cities oppose any drilling in their areas for various reasons. (Figure 1)

The purpose of this research is to offer a balanced view of the quantifiable financial benefits of urban oil and gas drilling (Figure 2). While quantifiable financial costs of poorly-planned drilling operations (Figure 3) can be real, generally the landowner is compensated by private treaty or negotiated agreement in advance of any drilling activity on the surface estate. This is not always the case in rural areas where owners are often without mineral or leasing rights. In general, the more urban the location, the more likely the landowner will be fully involved in drilling pad-site design, location of the drill-site and compensation negotiations involving cash or additional royalties or "over-ride" ownership in the gross income of well(s) located on the land. It is not uncommon for a surface owner without mineral rights to accept $20,000 - $40,000 in federal tax free "surface damages" and a 2-3% royalty/override in the well. Another benefit is that the surface owner continues to own and utilize the majority of the pad-site for other uses.

Many cities pass ordinances as part of their gas well permitting process. Some cities are reasonable and are enjoying the benefits of additional master plan land-use taxes generated from oil and gas production, while other communities vote to pass oil and gas drilling ordinances and permitting requirements that are onerous, unreasonable and exclusionary.

NOTE: 2 million cubic feet of gas/day with a 3% override @$5.00 per cubic feet =$10,000/Day of $300 per day in a well that may last 30 years with unknown future gas prices.

In Texas, the surface estate and mineral/oil and gas estate are often separate and owned by different parties. Minerals are the superior estate (over the surface estate) in Texas, and some cities are being threatened and sued for "taking" the present value (PV) of the minerals due to overrestrictive regulations and well-permitting processes. U.S. domestic oil and gas prices are likely to get higher, and political and economic pressure will likely increase on cities to be more reasonable. (Figure 4)

Justification for Research and Literature Review

Cost benefit analysis of oil and gas prospects is widely publicized and is standard practice in the industry; however, it only considers risk factors and rates of return for individual wells being attempted from the standpoint of return on capital, rather than examining the cost/benefit to the surrounding community. This research looks at the impacts on the wider community and society.

A theoretical model of estimation of both subjective and objective costs and benefits to surface and mineral rights owners was presented by Baen (1988) who considered negative factors, which collectively and individually are difficult to quantify such as dust, smells, visual detractors, title issues, environmental land exposure, stigma, etc. This paper assumes the industry standard that surface owners are compensated for all costs by private treaty (a land-use agreement) for financial and environmental factors either with a one-time damage payment and/or a carried interest or overriding royalty in the gross income of a proposed well. Insurance, bonds and all "costs" generally encapsulate the costs and all risks to the land owner.

Beyond the boundaries of the drill-site, it is even more difficult to quantify those environmental factors beyond the subject property. Baen (1996) also published research on various types of negative factors or "costs" that could affect individual well-sites and strongly urged appraisers to consider mineral rights and activities in their valuations. Many appraisers continue to fail to do so.

Contemporary drilling methods and well placements to reduce surface disruptions and damage costs through drilling innovations were presented by Baen (2004). Conflicts between oil companies and cities over access to their mineral rights/leases as a "taking" issue due to unreasonable drilling ordinances, prohibitions and/or moratoriums were litigated in several Texas cities including Reno and Roanoke (2004 Wise County Messenger). The oil companies generally prevailed or settlements were reached without trials.

After reviewing their harsh policies and their first annual share of property taxes, several budget-minded cities revised their anti-drilling attitudes and became aggressive in seeking both additional tax bases and wanting to lease

city/school owned minerals (2004 Denton Record Chronicle).

Current Status of Urban Development Activity (2001-2005)

The greater metropolitan Dallas-Fort Worth (DFW) area has seen rapid development of all classes of real estate from 2001-2005. The most rapidly developing areas have been Tarrant, Denton, Wise, Parker and Johnson counties to the north, west and south of the city of Fort Worth, Texas. These rapidly growing suburban counties are located exactly in the heart of the largest and most successful natural gas fields in the state of Texas. Over the last five (5) years there has been a race between single family/commercial land developers and oil and gas companies to compete for who might use the land first.

Current Status of Oil and Gas Development Activity (2001 – 2005)

The DFW metropolitan area is the center of the newest and largest natural gas field in Texas. The U.S. Geological Survey (USGS) has estimated that the Barnett Shale contains undiscovered resources of 26.2 trillion cubic feet (TCF) of gas along with 1 billion barrels of oil or gas liquids (Williams, 2005). The liquids alone represent over $54 billion at today's market value ($54/bbl) and are less than 10% of the economic value of the wells, as the wells are classified primarily as natural gas wells.

Currently there are estimated to be eighty (80) drilling rigs active in the DFW area and approximately 3,700 new wells have been drilled since 2001 (Texas Railroad Commission Records, Drilling information.com). New wells cost between $800,000 -$2,400,000) with an economic life of thirty (30) years with less than ten (10) dry holes being drilled to date yielding an unprecedented economic success rate of 99.9% for oil and gas companies. More wells are not being drilled for two (2) primary reasons:

-A shortage of drilling rigs (There are 46 companies competing for 80 Drilling rigs (Table 1)
-Various City Ordinances which severely limit drilling to the extent that the additional costs and/or "criteria," rules, regulations, red tape and approval processes amount to an effective moratorium on drilling and a "taking" without compensation of the present value of the minerals/royalty estate [Barnett Shale PV=$13,500/acre in the "core area" assuming an "average" vertical well and decline curve (see figure 5 spread sheet)] Barnett Shale urban drilling ordinances, restrictions and permit fees in North Texas metropolitan areas are generally reasonable and economical.

The rapid increase in drilling in the Dallas-Fort Worth metropolitan area and surrounding counties (figure 6) represents only wells drilled using technologically advanced horizontal wells in 2003. As of October 1, 2004, only 101 horizontal wells had been drilled while 2,990 traditional vertical wells had been drilled (Powell and Company 10-13-2004). Therefore, the density and

location of the horizontal wells found on Figure 6 represent less than 3% of oil and gas wells actually drilled (101:3091) but clearly indicates the areas. Table 2 indicates location and intensity of drilling activity.

The areas of the highest density represent both urban areas and the fastest growing suburban areas surrounding the city of Fort Worth, Texas. As a result of the "invasion" of 60 drilling rigs, many cities most which had never had any oil and gas activity in their history, rapidly responded with over-protective drilling ordinances to try to "control" development of the subsurface resources. Most of the attempts to overregulate, restrict, or prohibit drilling was a result of the general population not understanding oil and gas operations, unfounded safety issues, general lack of understanding of compensation negotiations, and fear of being treated unfairly by oil and gas companies. Many of the municipalities are very small and have very small budgets/tax-bases with little extra money to fight lawsuits that the cities would most likely lose in court. Minerals in Texas generally have a superior right over the surface estate.

Examples of over restrictive ordinances and reactions by some cities in the time period of 2002 – 2004 include but are not limited to the following:

A. Roanoke, Texas imposed a "change of land use" due to wells drilled having spacing of one (1) well per forty (40) acres. Attempted "roll-back tax" penalties and imposed parkland dedication or equivalent cash contributions for developing the land as "industrial use" were forced on the oil company. A reversal of fines and parkland/cash equivalent fees being returned to the oil company settled the matter.
B. Reno, Texas required drilling to occur only in "industrial" areas. The oil company purchased an "industrial" tract of land and was still denied a drilling permit. After education and further legal research occurred, the City reversed its policy and granted the drilling permit.
C. The City of Fort Worth, Texas imposed a moratorium on all drilling until a new, less arbitrary and capricious city ordinance was adopted. Now the City of Fort Worth has some wells being drilled while trying to lease every mineral acre they own to generate new income for the city. Land is being leased under parks, recreation centers, libraries and vacant land.

Table-1A indicates various areas and provisions that many drilling ordinances consider in the North Texas area as well as examples of what this researcher considers, obvious, arbitrary and capricious provisions which are in fact restrictive to the point of making the drilling of wells prohibitive all together.

New technologies that raise the benefits and lower the cost of urban/coastal oil and gas drilling from the DFW Barnett Shale Gas Field are presented in Table 2 and Table 3. Land use efficiency is presented in Table 4 by types of wells drilled to date.

Inner-city and suburban land values are high in the core area of the Barnett Shale Gas Field and vary between $20,000 - $40,000 per acre. Some innovative cities in the area allow carefully planned drilling in lower valued lands or on the boundary of the 100 year flood plain (Denton, Fort Worth). Other cities require unreasonable distances for drilling/pad-sites and dry creek beds (Flower Mound). Cities in the latter category are in effect altering otherwise prime land and other types of land uses and dedicating or forcing said lands not in or near the flood plains to be used for oil and gas production, therefore robbing the surface owner of higher valued land and "chopping up" otherwise importantly sized/shaped tracts of land for real estate/surface development projects.

The Barnett Shale Gas Field originally had Texas Railroad Commission oil and gas well spacing rules of one (1) vertical well per forty (40) acre tract with distances between wells of 1250 feet and no wells drilled closer than 350 feet from any property/lease boundary line. This, in effect, resulted in wells blanketing the core area with a gas well and surface disruption every forty (40) acres. (See Figure 7)

In the five (5) year period of discovery and improvements in drilling and completion techniques, over 3,091 Barnett Shale wells have been successfully completed (Powell and Company, May 1, 2004). Of these, only 101 were "land-use efficient" horizontal wells utilizing fewer net acres per developed mineral acre and resulting in vastly greater gas production.

The huge economic impact of wells drilled to date in the DFW metropolitan area is presented in Table 5. This theoretical urban Barnett Shale project develops 2000 acres of minerals from 28 acres of surface land which is totally developed for mixed use (Figure 8).

Valuation Techniques for Mineral Estates and Assessment

In classic valuation theory there are only three (3) approaches to be considered in valuing the surface estate of land and the various associated estates and components: market, income and replacement. While the income approach to valuation of minerals and royalty estates is perhaps the most appropriate, there is a strong market and demand for the sale price of mineral rights, although few sales are made public and are generally confidential in the normal course of business. Texas is a non-disclosure state, and no sales price details of land or minerals being sold are found in the public records.

There are six (6) valuation approaches or indications of market value for mineral royalty rights or interests in land located in areas having "proven" reserves and/or income from oil and gas production (1988, Baen, Appraisal Journal, pp.205-216). Theoretically, the value of oil and gas wells can be estimated and correlated for determining market value and/or assessed value as follows:

I. Residual values or values by extraction of mineral rights from comparable sales of working interests and/or royalty interest.
II. Comparable sales of mineral and royalty rights by deeds or assignments.
III. Sale of undeveloped wells and/or underdeveloped reserves by oil and gas companies who must publish or disclose the purchase or sale price (SEC regulation)
IV. The use of cash flow analysis of existing well performances, productivity, decline curves and allocation of values to producing and/or proven but non-producing mineral acres using a reasonable or market discount rate.
V. The use of assessed values by local tax appraisal boards which follow state laws and utilize a combination of methods I-IV while utilizing oil and gas reserve engineers and publicly available production reports and mineral sales.
VI. The replacement cost approach in valuing an oil and gas well for estimating its "market value" or value for property assessment purchase can add insight into the valuation process. However, cost does not necessarily relate to value as there are many variables, even when a well is "successful" that can ultimately determine if it is economic [i.e. leasing bonus/acre, title work cost, cost of road, pad-site, permit fees, engineering drilling, geo-physical studies, equipment, completion costs, amount of produce water, oil and gas prices, productivity of the individual well and technology used to create the well (vertical vs horizontal, etc.) competency of the operating company, etc., etc.].

If urban or coastal wells are not permitted to be drilled due to overly restricted local ordinances, the value of the mineral estates on local tax rolls and to the owners of the mineral is zero (0) and should not be taxed. However, failure to allow drilling in an urban environment with reasonable ordinances with cost effective and economically reasonable guidelines amounts to an economic loss of millions of dollars per year in taxes on productive wells at $3-5 million per well head, with as many as five wells per 2-4 acre pad-site and a further loss of $13,500+/mineral acre for royalty/mineral owners. (Barnett Shale Core Area Analysis, see Figure 5).

Interesting Urban Barnett Shale Gas Well Drilling Questions

1. Should cities, which have anti-drilling or tough drilling ordinances, be able to annex land which has oil and gas wells drilled and operated by prevailing industry standards? Is this a "pre-existing condition" at the time of annexation, or is this discrimination against citizens inside the existing city limits?
2. If a 3200 foot horizontal lateral well is drilled 1600 feet (50%) outside the city limits and half the equipment, pad-site etc., are also located outside the city limits, to what percent of assessed value of taxable value should the city be entitled?
    a. Are there pressure gradients due to friction and therefore production

differences?
   b. Different formation characteristics? Porosity? Permissibility? Faulting? Etc. along the length of the lateral making the 50% out of the city more or less valuable?
   c. If a bridge plug is set at the city limit line do they lose all taxes?
   d. How does the appraisal district allocate a fair split of taxes?
3. What is the fair value for tax purposes of commercial disposal wells in which variable costs, locations, injection pressures, land owner payments/well, and all financial records are considered "trade secrets"?
4. If a progressive city wants more wells drilled within their city limits to increase their tax-base, is the consideration of four (4) acre pad-sites an appropriate use of eminent domain? (Benefits to city, citizens, state for property taxes and/or royalty from public owned land/mineral).
5. How will urban seismic surveys be conducted in fully developed areas if not down public streets' utility corridors?
6. Will some cities having impossible drilling ordinances wait too long to become educated and miss the economic benefits for their municipal financing and citizens with mineral rights? Oil and gas drilling bonuses always occurs in cycles with technology and the price of oil and gas.

Conclusions of Research

Urban, suburban, and coastal oil and gas drilling become more probable as petroleum prices escalate. Through innovative uses of technology, reasonable drilling ordinances, and safety standards, local governments can add to their tax base and realize benefits that far exceed the costs to the urban environment or quality of life. The Barnett Shale gas field in Texas is offering new and innovative ways to allow both development and/or use ofthe urban surface estate, while allowing the development of the subsurface mineral estate to maximize the overall rate of return, highest and best use and return on both public and private assets.

Table 6: Education is needed by the general public, and professional and civic leaders to better understand the cost/benefit analysis and impact of oil and gas wells on the local economy (Table 5). With wise land-use planning and reasonable drilling ordinances, there is no reason why the surface and subsurface estates can not be fully developed to maximize the return on assets while maintaining the quality of life and the environment.

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Figure 1: Why Some U.S. Citizens and Cities Oppose Oil and Gas Drilling In the DFW Barnett Shale Gas Field of North Texas

By John S. Baen, Ph.D., College of Business Administration, University of North Texas 2005

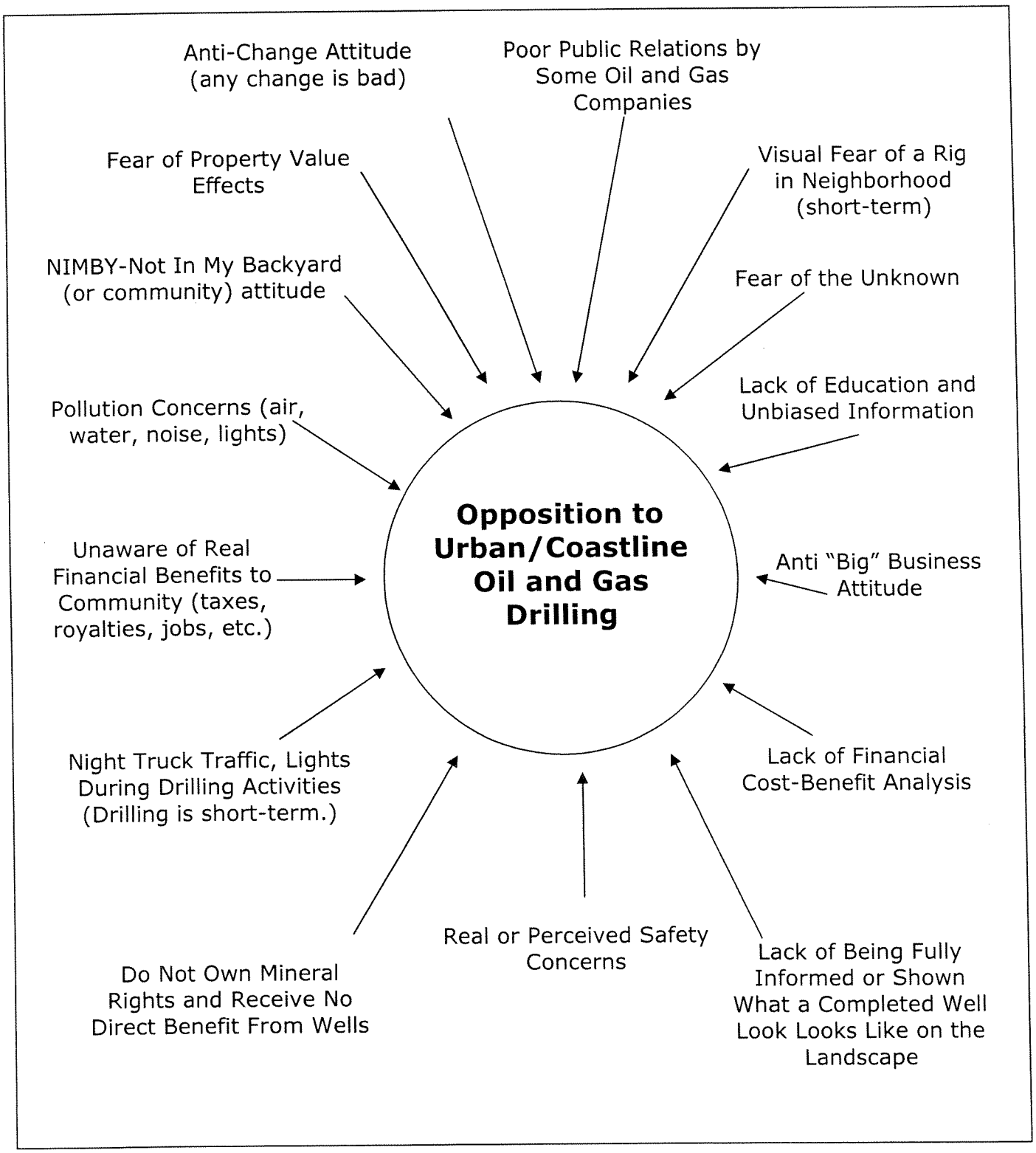

Figure 2: Quantifiable Financial Benefits of DFW Barnett Shale Oil and Gas Drilling in North Texas

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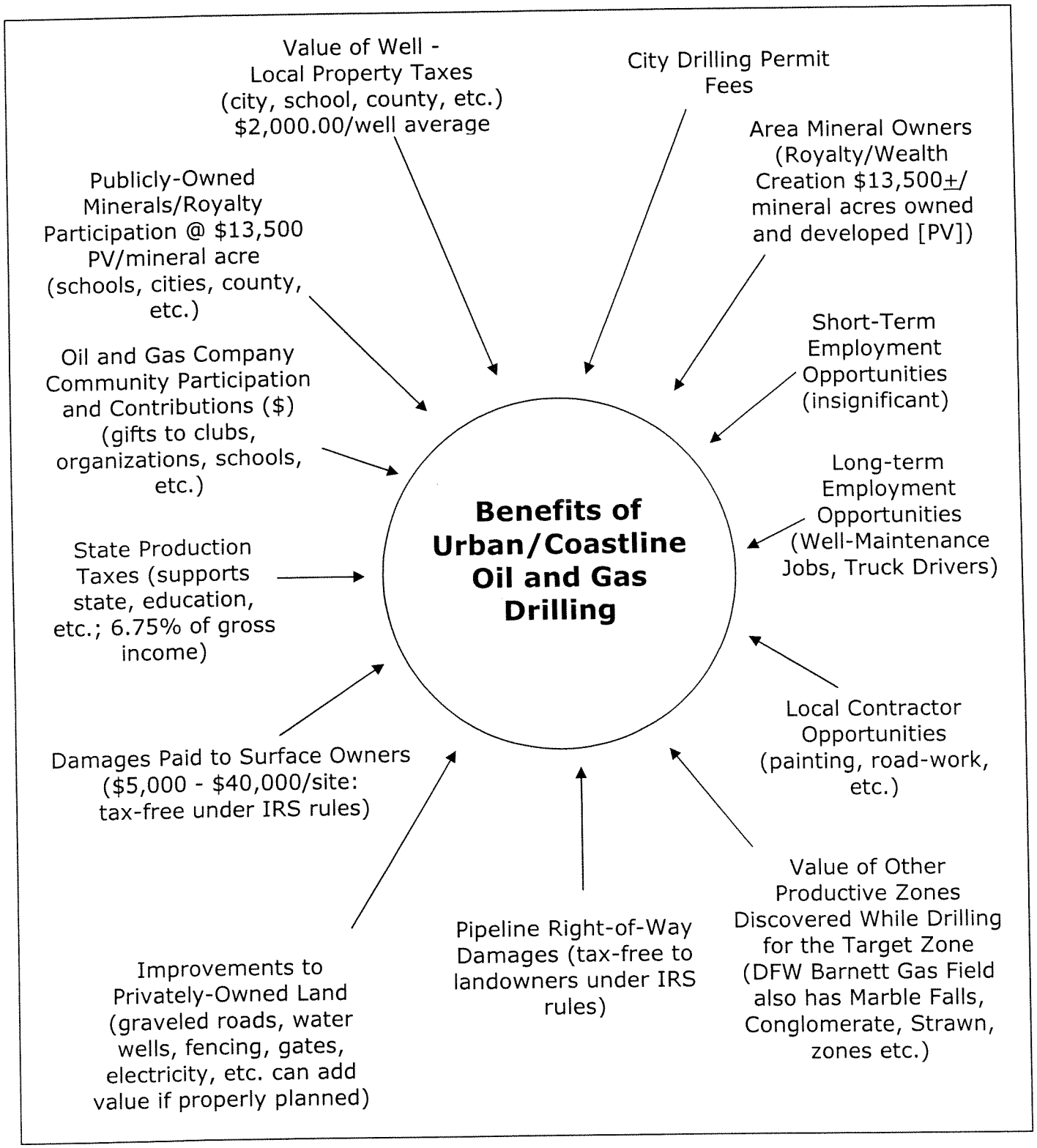

Figure 3: Quantifiable Financial Costs of Poorly-Planned Urban/Coastline Oil and Gas Drilling

By John S. Baen, Ph.D., College of Business Administration, University of North Texas 2005

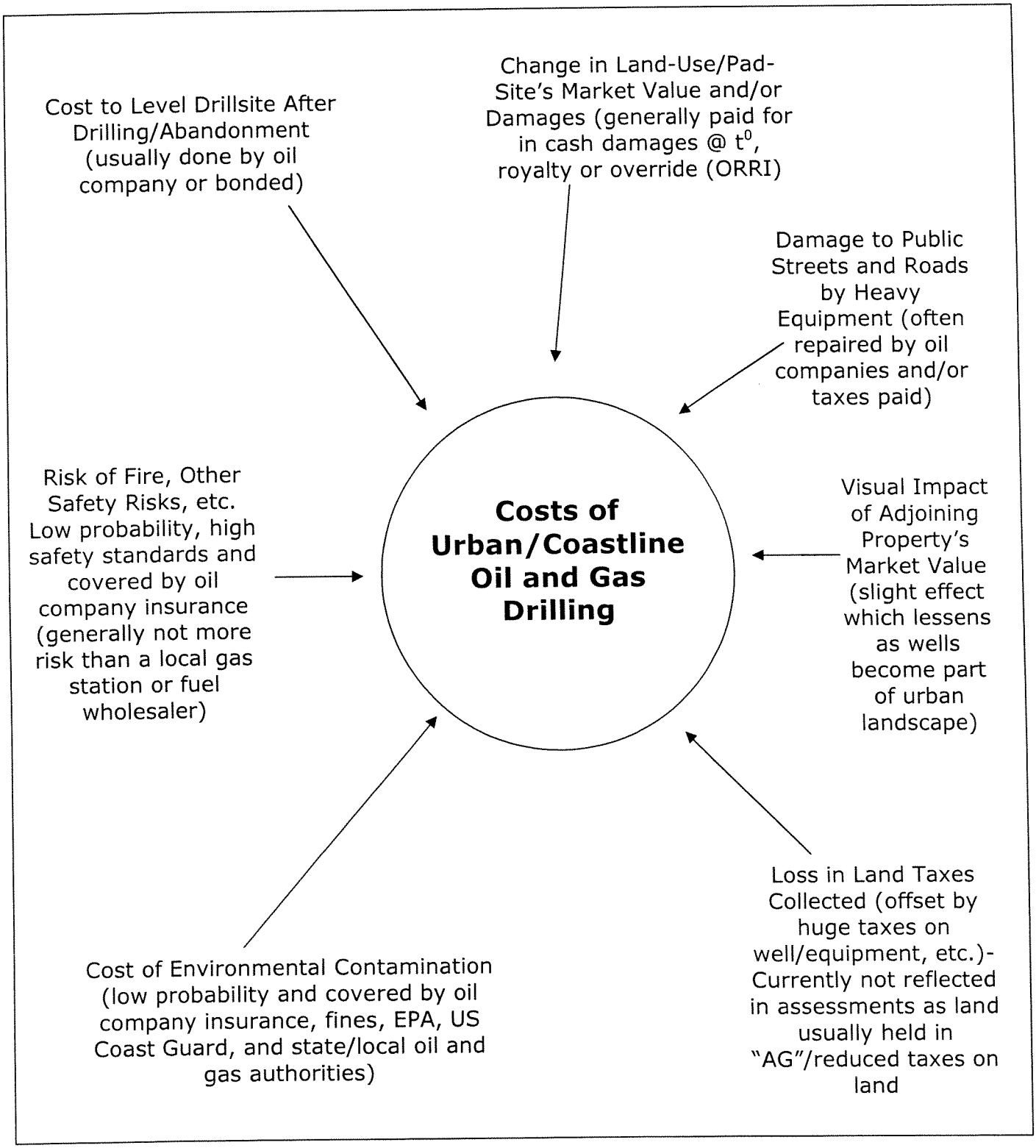

Figure 4: Why High Domestic Oil and Gas Prices Will Not Go Away

By John S. Baen, Ph.D., College of Business Administration, University of North Texas 2005. *[Partial Source (50%): Drilling Contractor, November/December 2004]*

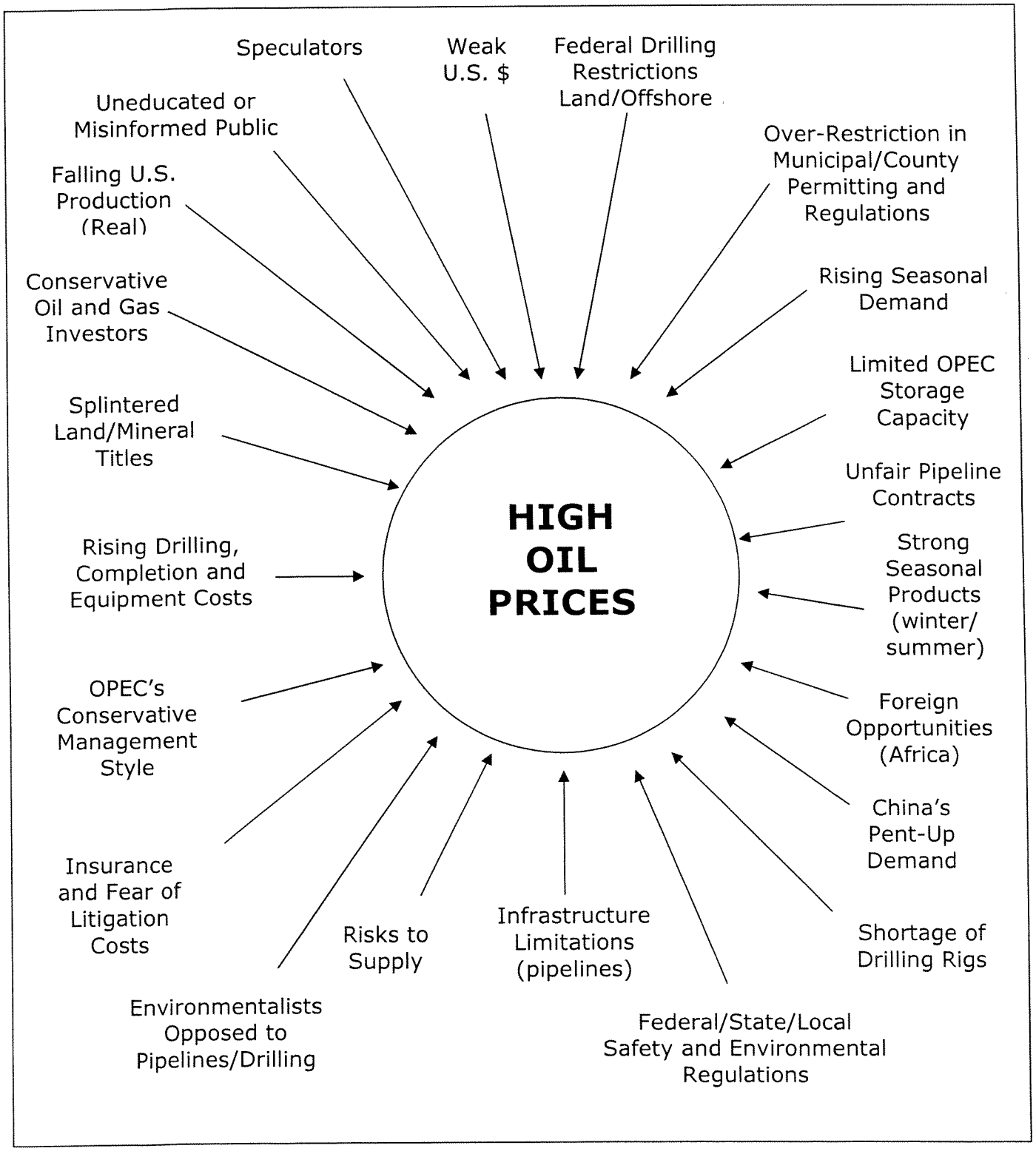

TABLE 4

Baen's Barnett Productivity / "Cash Flows"
Oil and Gas Reserve and Cashflow Analysis

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Oil and Gas Leasing
Lease Negotiating
Land/Well Planning
Estate Planning/Mineral Valuation/Appraisal

				DECLINES		ESCALATION			
						PRICES:		EXPENSES:	
CASE:	N/A	SER.TAX, O:	4.61%	GAS, YR1:	50%	GAS, YR2:	3.25%	EXP, YR2:	3.25%
FIELD		SER.TAX, G:	7.50%	GAS, YR2:	25%	GAS, YR3:	3.25%	EXP, YR3:	3.25%
COUNTY:	Denton	AD Valor:	2.40%	GAS, YR3:	10%	GAS, YR4:	3.25%	EXP, YR4:	3.25%
STATE:	Texas	OP EXP/MO:	$1000	GAS, YR4:	10%	AFTER:	3.25%	AFTER:	3.25%
OPER:		# WELLS:	1	AFTER:	10%				
OWNER:		OIL, $/BO:	$25.00						
NCPD:	1.0	OIL, MAX$:	$40.00	OIL, YR1:	50%	OIL, YR2:	3.25%		
NCFD:	577	GAS, $/MCF:	$4.00	OIL, YR2:	25%	OIL, YR3:	3.25%		
WI:	0.000%	GAS, MAX$:	$10.00	OIL, YR3:	10%	OIL, YR4:	3.25%		
% NRI:	0.000%	CAP EXPS:	$750,000	OIL, YR4:	10%	AFTER:	3.25%		
ORRI:(*)	18.750%	DISC FACT:	10.00%	AFTER:	10%				

YEAR	OIL BARRELS GROSS	OIL BARRELS NET(*)	GAS MCF DAILYAVG	GAS MCF GROSSYR	GAS MCF NET(*)	REVENUE OIL	REVENUE GAS	EXPENSES TAXES	EXPENSES LOE	EXPENSES ADVAL/TAX	NET INCOME NET C/FLW/YR	NET INCOME CUM C/FLW	DISCOUNT C/FLW NET 10%	DISCOUNT C/FLW CUM 10%	PRICES OIL $/BO	PRICES GAS $/CF
1	263	49	577	210,605	39,488	1,233	157,954	11,903	0	3,375	143,908	143,908	130,826	130,826	$25.00	$4.00
2	132	25	289	105,303	19,744	636	81,544	6,145	0	1,688	74,347	218,256	61,444	192,270	$25.81	$4.13
3	99	18	216	78,977	14,808	493	63,145	4,759	0	1,266	57,614	275,870	43,286	235,556	$26.65	$4.26
4	89	17	195	71,079	13,327	458	58,678	4,422	0	1,139	53,575	329,444	36,592	272,148	$27.52	$4.40
5	80	15	175	63,971	11,995	426	54,526	4,109	0	1,025	49,818	379,262	30,933	303,081	$28.41	$4.55
6	72	13	158	57,574	10,795	395	50,669	3,818	0	923	46,323	425,585	26,148	329,229	$29.34	$4.69
7	65	12	142	51,817	9,716	367	47,084	3,548	0	830	43,073	468,658	22,103	351,332	$30.29	$4.85
8	58	11	128	46,635	8,744	341	43,753	3,297	0	747	40,050	508,707	18,683	370,016	$31.27	$5.00
9	52	10	115	41,972	7,870	317	40,657	3,064	0	673	37,238	545,945	15,793	385,808	$32.29	$5.17
10	47	9	103	37,774	7,083	295	37,781	2,847	0	605	34,623	580,568	13,349	399,157	$33.34	$5.33
11	42	8	93	33,997	6,374	274	35,108	2,646	0	545	32,191	612,760	11,283	410,440	$34.42	$5.51
12	38	7	84	30,597	5,737	255	32,624	2,459	0	490	29,930	642,689	9,536	419,976	$35.54	$5.69
13	34	6	75	27,538	5,163	237	30,316	2,285	0	441	27,826	670,515	8,060	428,037	$36.70	$5.87
14	31	6	68	24,784	4,647	220	28,171	2,123	0	397	25,871	696,386	6,813	434,849	$37.89	$6.06
15	28	5	61	22,305	4,182	204	26,178	1,973	0	357	24,052	720,438	5,758	440,607	$39.12	$6.26
16	25	5	55	20,075	3,764	188	24,326	1,833	0	322	22,359	742,797	4,866	445,473	$40.00	$6.46
17	23	4	49	18,067	3,388	169	22,605	1,703	0	290	20,781	763,578	4,111	449,584	$40.00	$6.67
18	20	4	45	16,261	3,049	152	21,005	1,582	0	261	19,315	782,893	3,474	453,058	$40.00	$6.89
19	18	3	40	14,635	2,744	137	19,519	1,470	0	235	17,952	800,844	2,935	455,994	$40.00	$7.11
20	16	3	36	13,171	2,470	123	18,138	1,366	0	211	16,684	817,529	2,480	458,474	$40.00	$7.34
21	15	3	32	11,854	2,223	111	16,855	1,269	0	190	15,507	833,035	2,095	460,569	$40.00	$7.58
22	13	2	29	10,669	2,000	100	15,662	1,179	0	171	14,412	847,447	1,770	462,339	$40.00	$7.83
23	12	2	26	9,602	1,800	90	14,554	1,096	0	154	13,395	860,842	1,496	463,835	$40.00	$8.08
24	11	2	24	8,642	1,620	81	13,525	1,018	0	138	12,449	873,291	1,264	465,099	$40.00	$8.35
25	10	2	21	7,777	1,458	73	12,568	946	0	125	11,570	884,861	1,068	466,167	$40.00	$8.62
26	9	2	19	7,000	1,312	66	11,679	879	0	112	10,753	895,614	902	467,069	$40.00	$8.90
27	8	1	17	6,300	1,181	59	10,852	817	0	101	9,994	905,608	762	467,832	$40.00	$9.19
28	7	1	16	5,670	1,063	53	10,085	759	0	91	9,288	914,896	644	468,476	$40.00	$9.49
29	6	1	14	5,103	957	48	9,371	705	0	82	8,632	923,528	544	469,020	$40.00	$9.79
30	6	1	13	4,592	861	43	8,611	648	0	74	7,933	931,461	455	469,474	$40.00	$10.00
Total	1329	249	2916	1064344	199564	$7,645	$1,017,540	$76,668	$0	$17,056	$931,461	$19,997,216	$469,474	$12,025,797		

***$469,474/40AcUnits=$11,736/Ac**
Value of Minerals

**No future profits may be promised and productivity varies widely*
*** Projections only, based on "average" to "above average well"*
****All wells are "different", perform "differently" and are unique*
*****Variables over time are significant and can alter results (gas prices, gas contracts, line pressure, BTU content and supply/demand for gas)*

Figure 5: Baen's Barnett Productivity

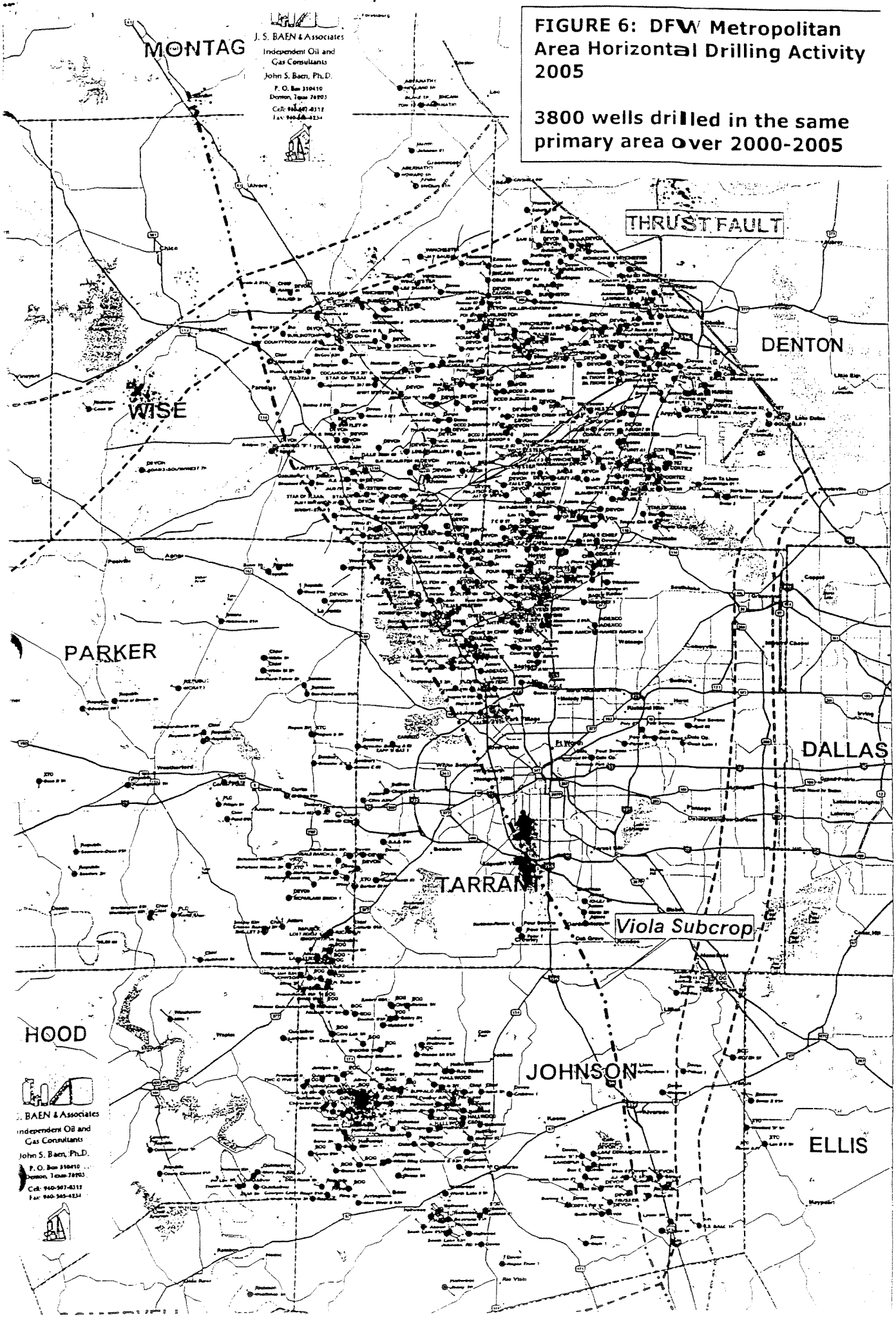

FIGURE 6: DFW Metropolitan Area Horizontal Drilling Activity 2005

3800 wells drilled in the same primary area over 2000-2005

FIGURE 7

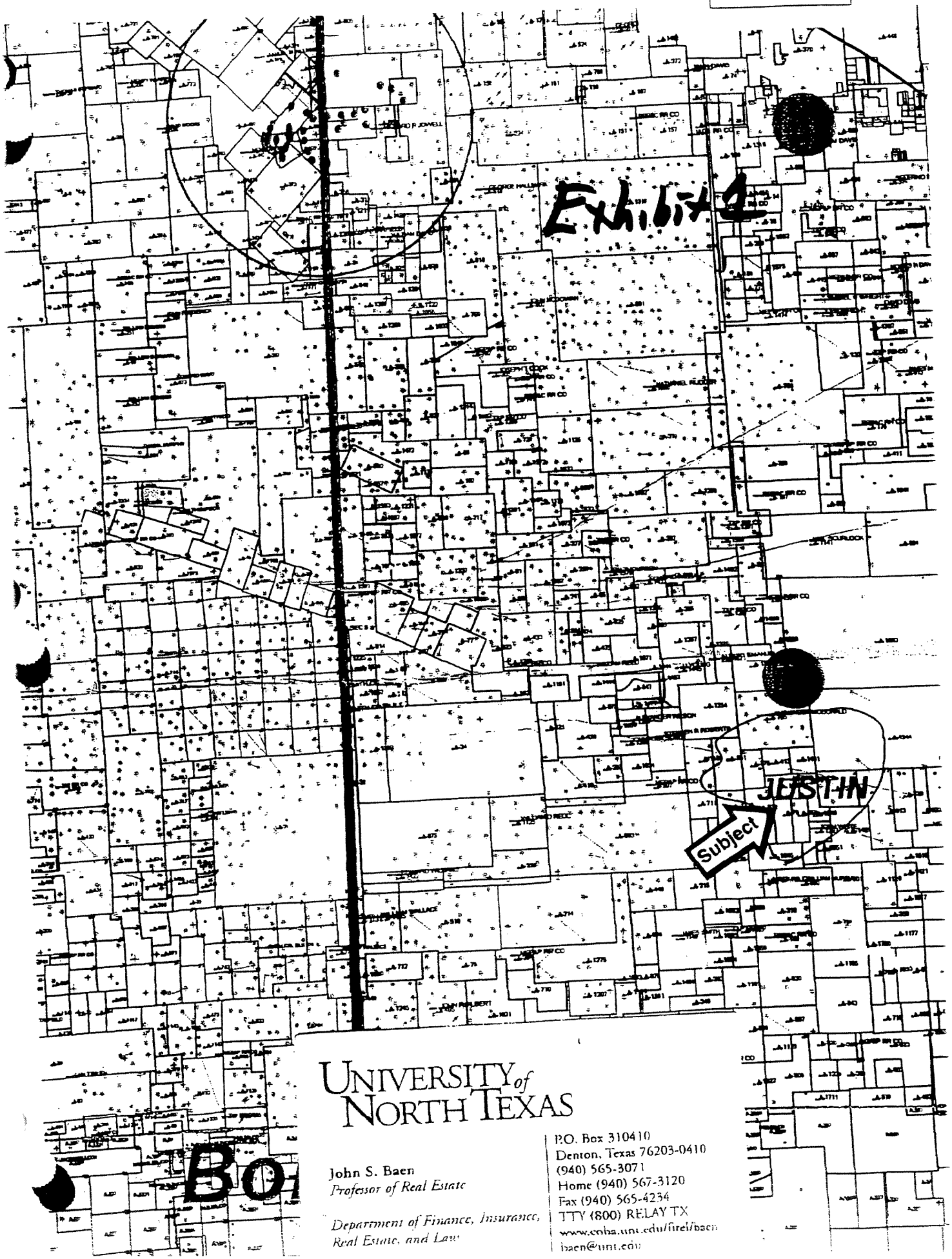

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Figure 8: Theoretical Urban Barnett Shale Project: South of Fort Worth, Texas

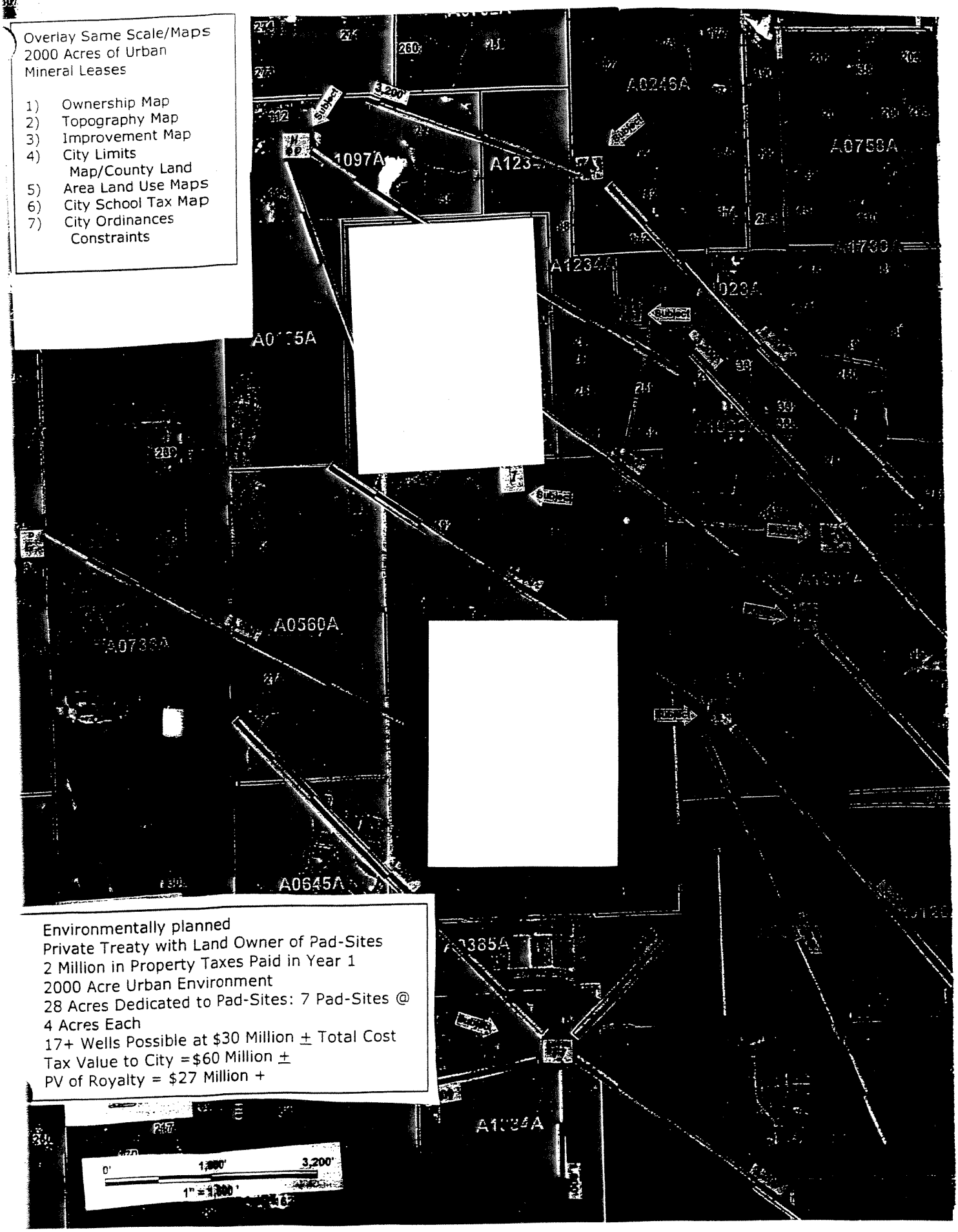

Table 1: Major Barnett Shale Gas Well Operators in the DFW North Texas Field

By John S. Baen, Ph.D., College of Business Administration, University of North Texas 2005.

1. Devon (Oklahoma City, OK) / 545,000 acres of producing leases / reserves held
2. Burlington Resources (Midland, TX) [buying reserves in 2003] / 25,000± acres of production held
3. Chief Oil and Gas (Dallas, TX)
4. J.W. Operating [buying reserves in 2003]
5. EOG Resources (Houston, TX)
6. EnCana Corp. (Calgary Alberta)
7. Hallwood Energy Corp. (sold to Chesapeake in 2004)
   *Approximately 55-60 drilling rigs working at all times.
8. XTO (Fort Worth, TX)
9. Quicksilver (Fort Worth, TX)
10. Progress Energy (North Carolina) [buying reserves in 2003] / 20,000 ± acres of production held (Sold to EnCana in 2004)
11. Swift Energy
12. Republic Energy (Dallas, TX) [sold reserves in 2003 to Progress/Winchester]
13. Dallas Production (Dallas, TX) [sold reserves in 2003 to Burlington Resources]
14. Harding Company
15. Burnett Oil
16. Cortez Operating
17. Llano Royalty (Amarillo, TX)
18. Denbury Resources (Dallas, TX)
19. Argali Resources (Dallas, TX)
20. Winchester Operating
21. Dark Horse Oil and Gas (Denton, TX)
22. Antero Resources (Denver, CO) (Sold in 2005 to XTO)
23. Threshold Development [sold reserves in 2003 to EnCana]
24. Sinclair Oil Company
25. Mid-Continent
26. Eagle (Dallas, TX)
27. Lynx (Denton, TX)
28. NationsGas (Dallas, TX)
29. Bravo Natural Resources [sold reserves in 2003]
30. Tejas Western Gas [sold reserves in 2003 to EnCana]
31. Adexco Production [sold reserves in 2003]
32. Best Petroleum Exploration (Jacksboro, TX)
33. Swan Production (Jacksboro, TX)

34. Trio Consulting and Management LLC (Wichita Falls, TX)
35. EnRe Oil and Gas (San Antonio, TX) [went into bankruptcy in 2003]
36. WB Osborn Oil and Gas (San Antonio, TX)
37. Sunray Oil and Gas
38. Mereken Energy
39. Star of Texas (San Antonio, TX)
40. Vicars Oil and Gas (Bowie, TX)
41. Chesapeake
42. Carrizo Oil and Gas (Houston, TX)
43. Stroud Energy Ltd. (Fort Worth, TX)
44. Infinity Inc. (Denver, CO)
45. Louis Dreyfus Energy (Houston, TX)
46. Five States Energy LLC (Dallas, TX)

Table 1-A: City Ordinances: Typical vs. Unreasonable Constraint During 30-Day Drilling/Completion Phase

By John S. Baen, Ph.D.; College of Business Administation; University of North Texas; 2005.

CATEGORY	TYPICAL	UNREASONABLE
Permit Fee	$5,000	Should be based on cost to city to monitor/grant permit; $25,000 is onerous
Distance to Nearest Residence	250 feet	1,000 feet is onerous, arbitrary and capricious
Distance to Parks, Churches, Schools	250-500 feet	800 feet is onerous, arbitrary and capricious
Distance to Water Well	350-400 feet	1000-1500 feet is onerous, arbitrary and capricious
Fencing and Security	8' Cyclone Fence	Masony walls are generally unreasonable
Venting/Flaring Gas	Limited should be allowed	Prohibition is unreasonable and, under emergency conditions, unsafe
Noise Standards	Limited to 200 dB?	85 dB is unreasonable, arbitrary and capricious; equivalent to vacuum cleaner in a home
Financial Guarantees - Bonds	Limited to $25,000-$1,000,000 or actual cost in case of emergency	Greater than $1,000,000 is unreasonable, arbitrary and capricious
Closed Drilling Systems vs. Temporary Earthen Pit	Temporary earthen pit	Closed drilling system
City Street Tonnage Limit	Limited to actual damages to be repaired by oil company	Less than 3 tons is unreasonable, arbitrary and capricious
Control of Well Insurance	Limited to actual damages/cost to city	A minimum of $10 million is is unreasonable, arbitrary and capricious
Daily Fines for Infractions	Should be reasonable and not based on retroactive number of days if a violation occurred	$2000 per day is unreasonable
City Permit Times	60 days is reasonable; many permits take 6 months-1 year	Less than 60 days is unreasonable.

Table 2: Examples of Technology Reducing or Eliminating Environmental and Financial Costs of Drilling DFW Barnett Shale Wells in North Texas *(must be cost-effective to all parties)*

By John S. Baen, Ph.D.; College of Business Administation; University of North Texas; 2005.

1	3-D Seismic Survey Technology	Reduces dry holes and surface disruption to less than 1-2% of 3800 wells drilled
2	Superior Downhole Logging Technology and Correlation	Creates better information and more productive gas wells
3	Directional Gas Wells	Allows development of gas resources at distant locations and under urban developments
4	Horizontal Wells	Allows maximum development and production of gas from 4000-6000 feet laterally from a distant location and saves surface disruption of more vertical wells
5	Multiple wells from one four-acre pad site	Allows up to five (5) wells to be drilled from one location in various directions; raises efficiencies and reduces maintenance and work areas
6	Use of super-quiet, gas or electric pumping units	95% of the gas wells flow without assistance on natural pressure - zero noise, except during workover and refracking (2-5 days every 1-6 years)
7	Downhole drill-bits that drive like a car and yield real-time, digital geologic information	Reduces dry holes and formation water produced
8	24-hour well production surveillance by radio waves	Good well monitoring is more efficient and safe
9	Gas compressors/collection areas housed in building and noise-proofed or reduction techniques	Reduces noise levels and raises profitability, royalties, taxes generated, etc.
10	Recycling of frack water and water production for re-use (Devon 2005)	Requires less water and less trucking of water on roads and streets
11	Shorter storage tanks for "oil" and water (8' vs. 16')	Lower profile on the urban/suburban landscape; painting with natural or camoflage colors is standard practice by most oil compaines (2005)
12	Security fencing can be attractive in highly-developed urban areas	Masonry, concrete, and chain-link fencing with redwood slats are sometimes justified
13	Lease signs which are "air brushed" and professionally designed with multiple wells listed on one sign	First impressions and the public's viewing of entrances to leases is important. Some leases have 15 individual signs that are stark and unprofessional. [State law requires operators to post name, lease name, RRC#, and well(s).]

TABLE 3: Economic Tax Value and Income Implications of One (1) Four-Acre DFW Barnett Shale Gas Well Drill-Site

By John S. Baen, Ph.D.; College of Business Administation; University of North Texas; 2005.

Assume the average pad-site of four (4) acres is both geographically (surface) and geologically (subsurface) situated to have four (4) wells drilled 50 feet apart with one long-term surface production/equipment location of one (1) acre. Two (2) wells are directional or vertical and two (2) wells are drilled horizontally northwest and southeast. The following assumes one operator controls or has leased all the acreage and an "Average Well and Decline Curve" exists.

Size of Pad-Site 4 acres (417' x 417')	Subsurface Gas Resource 340 acres / spacing	Cost of Each Well	Ad Valorum Tax Value	Present Value of Royalty to Owners	Cash Flow of Royalty Years 1-30
	Horizontal Well #1 = 130 Ac	$1,300,000	$3,000,000	$1,627,470	$3,228,940
	Horizontal Well #2 = 130 Ac	$1,300,000	$3,000,000	$1,627,470	$3,228,940
	Vertical Well #1 = 40 Ac	$900,000	$2,000,000	$500,760	$993,520
	Directional Well #2 = 40 Ac	$900,000	$2,000,000	$500,760	$993,520
TOTALS	**340 Acres**	**$ 4,400,000**	**$10,000,000**	**$4,256,460**	**$8,444,920***

Example of Taxing Unit/North TX City			
City	0.42969	= $42,969/yr	
County	0.25193	= $25,193/yr	
School District	1.83481	= $183,481/yr	
Special Districts	0	NA	
Total Effective Rate	2.51643	= $251,643/yr	Paid by Oil and Gas Company
Taxed at Same Rate as Operator Annually			

* All numbers are estimated using average well information in the immediate area and asuume stable gas prices.

** Some have suggested that wells drilled under the city, outside the city limits but leases configurations and geology generally prohibit this.

TABLE 4: DFW North Texas Barnett Shale Land-Use Efficiency by Well-Type and Location, 2001-2004

By John S. Baen, Ph.D.; College of Business Administation; University of North Texas; 2005.

Location/ County	Horizontal Wells (H)	Vertical Wells (V)	Size of Pad-Site	Size of Unit/Well	Total Mineral Acres	Surface Land Use (Acres)	Undisturbed Land/Efficiency Factor Surface Use Efficiency Factor
Denton		1392	3 AcV	40 Acres	55,680	4,176	V=92%
	32		5 AcH	120 Acres+	3,840	160	H=96%
Johnson		25	3 AcV	40 Acres	1,000	75	V=92%
	12		5 AcH	120 Acres+	1,440	60	H=96%
Parker		30	3 AcV	40 Acres	1,200	90	V=92%
	4		5 AcH	120 Acres+	480	20	H=96%
Tarrant		306	3 AcV	40 Acres	12,240	918	V=92%
	22		5 AcH	120 Acres+	2,640	110	H=96%
Wise		1237	3 AcV	40 Acres	49,480	3,711	V=92%
	31		5 AcH	120 Acres+	3,720	155	H=96%
Totals	**101**	**2990**	-	-	**131,720**	**9,475**	-

Horizontal wells use 44% less surface land than vertical wells/developed mineral acre.
Quite often horizontal pad-sites have multiple wells drilled (2-5) per pad-site and save even more land that would otherwise be available for other land uses.

A four-acre pad-site with four wells drilled directionally on one, 320 acre oil and gas lease only utilizes 1.25% of the surface estate during drilling and completion. This is reduced to one-half percent (0.50%) during production phase (1-30 years).

***Number of wells and location data provided by Powell & Company, oil and gas consulting and research;mepowell@charter.net*

Table 5: Dallas Ft. Worth Metropolitan Area Barnett Shale Oil and Gas Economic Analysis 2001-2005

By John S. Baen, Ph.D.; College of Business Administation; University of North Texas; 2005.

Value Impact 3,800 Wells	$3.4 Billion @ $900,000/well @ Cost (± 20%) (Cost of Wells)	$5.3 Billion @ $5/MCF Gas (Gross)/Cumulative (Gas Sales/Total)	$75 Million @ $50/BBL (Gross) (Oil Sales/Total)	$1.6 Million per day @ $5.00/MCF (Gross) (Av/Day)	$31,000/day @ $32/BBL (Gross) (Av Income/Day)
Damages paid to Landowner @ $10,000/well	$38 Million				
Water Purchaser/Landowner @ 6000/well	$22.8 Million				
Mineral Royalties Paid @ 20% to individual land/ mineral owner	N/A	$1.06 Billion	$19 Million	$2.7 Million/day	$5,812/day
Total Acres @ "40" Acres/ Well Leased (Horizontal @ 120± Acre/ well)	152,000 Acres Minimum (Held by Production- Units vary 40-690 Ac)				
Federal Tax Benefits @ 80% / Unit Fed Income Tax @ 30%		$1.3 Billion/year			
Royalty Owner @ 30% Federal Income Tax		$320 Million	$5.71 Million	$122,400/day	$1,743/day
Texas Severance Tax State Gas Taxes @ 6.75%/MCF	N/A	$292.5 Million	N/A	$ 120,000/day	N/A
State Oil Taxes @ 4.615/BBL	N/A	N/A	$4.7 Million	N/A	$1,429
Ad Valorem Taxes County, City, School Taxes Assume 2.8% Average (Not all in cities) assumes @ cost)	$95.2 Million/year	(Varies, assumed in Operator's tax)	(Varies, assumed in Operator's tax)	N/A	N/A
Jobs "created" or imported for 80 Drilling Rigs @ 12 onsite/ or Admin Jobs per Rig	960 New Jobs	N/A	N/A	N/A	N/A
160 Work over and servicing rigs @ 4 persons/Rig	640 New Jobs				
Multiplier Effect and Total New Jobs (5X)	3,200 Total New Jobs	(5x Multiplier Effect Estimated Pipelines, Compressors, Pampers, Accounting, parts, supplies, etc.)			
Total Salary (Impact to Dallas/ Ft. Worth Economic/year @ $60,000/year	$192 Million/ Year				

NOTE (1): Table above created by Baen based on 3,800 Barnett Shale wells drilled (Williams, April 2005); production data provided by Powell & Company from Texas Railroad Commission reports through May 1, 2004, and expanded to reflect more wells drilled in 11 months. The "average" new well is much more productive due to horizontal drilling, new frack techniques, and seismic data. Results are therfore understated.

Table 6: Professional Real Estate/Land Use Related Designations and Associations that Need Cost-Benefit Information and Education on Mineral Rights, Oil and Gas Lease Activities in Urban and Coastal Areas

By John S. Baen, Ph.D.; College of Business Administation; University of North Texas; 2005.

	Profession	Designation/Organization	Areas of Concern and Education
1	Real Estate Brokers	Realtor/National Association of Realtors; Licensed by State	General lack of knowledge-mineral rights, cost-benefit analysis for communities
2	Real Estate Appraisers	Certified Appraiser/MAI; Licensed by State	Failure to consider value of minerals in appraisals
3	Right-of-Way Agents	Certified ROW Agents; Licensed by State; International Right-of-Way Association	Can be insensitive to long-term land value effects of easements and proper placement
4	Mortgage Lenders	Licensed Loan Officers; Licensed by State	Need general education on oil and gas royalties and low impacts on residential home
5	Title Company Closers and Examiners	Licensed by Texas Insurance Commission; Texas Land Title Association	In new productive areas, fail to include mineral clauses in deeds (many lawsuits)
6	Urban Planners	City Planners, Zoning Officers, American Institute of Planners	General lack of information and failure to plan for sites as part of urban master plans
7	City Administrators, City Councils and P&Z Boards	American Society for Public Administration	General lack of knowledge-mineral rights, cost-benefit analysis
8	Tax Assessors/Collectors	Registered Professional Appraisers (RPA); Registered Tax Assessors (RTA); National Association of Tax Assesor Collectors	Need general education on valuation of royalty, working interest, economic values and effects on surface values
9	Environmental Site Inspectors, Phase I, II, III	TBA	Environmental inspections required on bank loans often overstate effects of O&G activity
10	Mayors	TBA	General lack of knowledge-mineral rights, cost-benefit analysis for O&G activities
11	Attorneys-at-Law	Licensed by State (very few authorized oil and gas attorneys)	In need of refresher courses or information on oil and gas basics, estate planning, leases and mineral deeds

Table 7: Professional Real Estate/Land Use Related Designations and Associations that Need Cost-Benefit Information and Education on Mineral Rights, Oil and Gas Lease Activities in Urban and Coastal Areas

By John S. Baen, Ph.D.; College of Business Administation; University of North Texas; 2005.

	Profession	Designation/Organization	Areas of Concern and Education
1	Real Estate Bankers	Realtor/National Association of Realtors; Licensed by State	General lack of knowledge-mineral rights, cost-benefit analysis for communities
2	Real Estate Appraisers	Certified Appraiser/MAI; Licensed by State	Failure to consider value of minerals in appraisals
3	Right-of-Way Agents	Certified ROW Agents; Licensed by State; International Right-of-Way Association	Can be insensitive to long-term land value effects of easements and proper placement
4	Mortgage Lenders	Licensed Loan Officers; Licensed by State	Need general education on oil and gas royalties and low impacts on residential home
5	Title Company Closers and Examiners	Licensed by Texas Insurance Commission; Texas Land Title Association	In new productive areas, fail to include mineral clauses in deeds (many lawsuits)
6	Urban Planners	City Planners, Zoning Officers, American Institute of Planners	General lack of information and failure to plan for sites as part of urban master plans
7	City Administrators, City Councils and P&Z Boards	American Society for Public Administration	General lack of knowledge-mineral rights, cost-benefit analysis
8	Tax Assessors/Collectors	Registered Professional Appraisers (RPA); Registered Tax Assessors (RTA); National Association of Tax Assesor Collectors	Need general education on valuation of royalty, working interest, economic values and effects on surface values
9	Environmental Site Inspectors, Phase I, II, III	TBA	Environmental inspections required on bank loans often overstate effects of O&G activity
10	Mayors	TBA	General lack of knowledge-mineral rights, cost-benefit analysis for O&G activities
11	Attorneys-at-Law	Licensed by State (very few authorized oil and gas attorneys)	In need of refresher courses or information on oil and gas basics, estate planning, leases and mineral deeds