



BAKKEN FORMATION TOUR REPORT

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INTRODUCTION

The Eagle Ford Shale Play region in Texas is experiencing rapid population growth in certain communities in response to an overwhelming increase in oil production due to new extraction methods. Representatives from the Eagle Ford Consortium have been tracking progress in a similar region in North Dakota, the Bakken. The Bakken is approximately one year ahead of Eagle Ford in terms of growth and the associated growing pains and therefore provides a helpful forecast and source of lessons learned for Eagle Ford. A group of representatives from the Eagle Ford Consortium conducted a tour and interviews of key stakeholders in 2012 and another group of representatives conducted a similar tour in November 2013. Participants in the 2013 tour were: Ken Becker, Executive Director Sweetwater Economic Development; Monty Small, CEO Atascosa Health Center, Inc.; Kathy Stokes, Regional Business Coordinator West Texas Energy Consortium; Alyssa Yingst, Regional Outreach Coordinator West Texas Energy Consortium; Jeff Labenz-Hough, Associate Vice-President HDR; and Sheila Elijah-Barnwell, Director of Research HDR. Interviews were conducted with state and community leaders in the North Dakota cities of Bismark, Dickenson, Watford City, and Williston. The following report outlines the findings from this tour.

EXECUTIVE SUMMARY

A tour of the Bakken Region in North Dakota was conducted November 6-8, 2013. Al Anderson Commissioner of the North Dakota Department of Commerce was interviewed in Bismarck. City officials in Dickenson, Watford City, and Williston also participated in focus group discussions. Representatives from the Healthcare industry were also interviewed including hospital administrators, a healthcare planner and an emergency medical responder. While the focus group participants offered very diverse perspectives, they all identified similar challenges in their communities resulting from the influx of population and disposable income. Key themes that emerged from the tour are: Change in community culture and population demographics; City planning, zoning and infrastructure; City, County and State infrastructure including roadways; Staff shortage, recruiting and competitive wages; and Housing availability and affordability. Participants in the interview shared ways that these challenges impacted their ability to deliver service in their communities and ways in which they have been able to mitigate the difficulties that they have faced.

The Bakken success has had great impact on its small communities in terms of changing local culture almost over night. Sleepy, quiet towns where people are naturally closely connected and possess a sense of security are transformed into bustling cities with transient populations, a richer mix of racial and ethnic diversity, and fortune seekers from many industries. As with population anywhere, more people equates to more crime, more accidents, and more disease. Elements of behavioral health including substance abuse and domestic violence were reported to have increased in the Bakken. Some of this was attributed to a greater population base and some was attributed to

the demographics of the community shifting to more young, single men. The shift in demographic to youth was accounted for largely because of the oil industry and associated work force. As the new work force becomes more permanent, young families follow. Another explanation for a generational shift was that long-time residents who had planned to retire in their small communities were not pleased with the rapid growth and change in culture and therefore elected to leave to seek that type of environment elsewhere. Finally, the cost of living increase became too much for some on fixed incomes to manage.

Communities that had well established Planning and Zoning regulations felt more adequately prepared for the rapid growth in their cities. They were able to manage growth and infrastructure expansion. Those who didn't have strong Planning and Zoning regulations in place struggled with haphazard development and difficulty implementing ordinances. Traffic volumes have also had an adverse effect on these communities, impacting law enforcement and emergency response times and increasing the incident and severity of accidents.

The State and County joined forces with the cities in this region to help resolve issues associated with truck traffic. This was or is being done through widening of state highways and construction of bypass roads. In some cases, expanded rail use and extended pipelines are helping to reduce truck volumes on the road. The counties and State have also been called upon to help regulate waste disposal and seek ways to safely recycle water used in fracking.

The service industries such as law enforcement, emergency personnel, and healthcare are essential in any community. In oil-rich communities, staff shortages occur in these types of industries because employers can't compete with the inflated wages that arise in oil-industry communities. Budgets in the not-for-profit healthcare sector for example are typically fixed due to reimbursement regulations. These employers are further crippled by the fact that patient populations in these communities demonstrate a decrease in Medicaid and Medicare insured and an increase in self pay patients. Unfortunately, self-pay typically leads to an increase in bad debt. Cities and healthcare providers must become creative in recruiting by offering benefits and incentives to offset non-competitive wages. Examples of this include signing bonuses, shorter work weeks, and daycare.

Compounding the wage issue is the overall rise in cost of living. Groceries and entertainment costs rise, but housing becomes exorbitant and scarce. Rent costs were reported as high as \$3000 a month for a two-bedroom apartment. This is another avenue that employers can use to help compensate their staff. Some chose to subsidize their workforce housing, while others have gone as far as purchasing mobile homes for physician recruits to live in while finding permanent housing. Here again, the State provided support in some instances with low-rate loans, grants and housing subsidies.

BACKGROUND

The Bakken Shale Oil field, stretching down from Canada into North Dakota and Montana, is a rich oil deposit which the U.S. Geological Survey (USGS) calls the largest continuous oil accumulation it has ever assessed. The name “Bakken” has come to represent this entire 8 million acre Williston Basin area of North Dakota and Montana. (Helman, 2011)

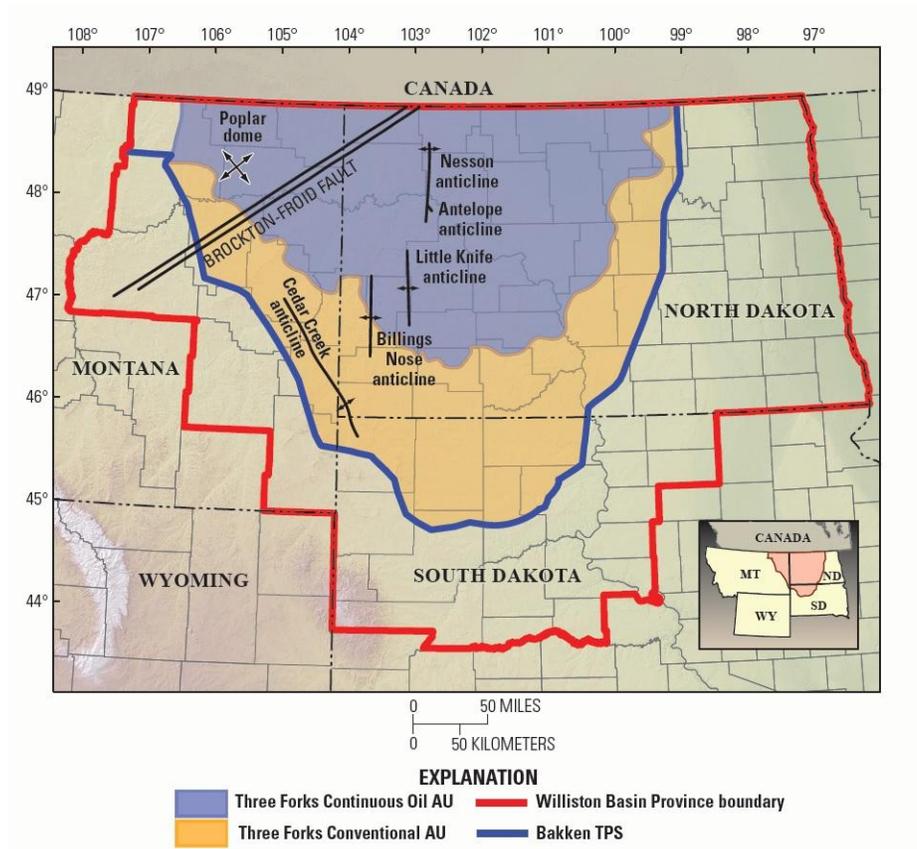


Figure 1: Map showing Williston basin Province boundary (red boundary) and the Bakken Total Petroleum System (blue boundary) Image source: <http://www.usgs.gov/blogs/features/files/2013/04/Bakken-Map.jpg>
Image Credit: U.S. Geological Survey Department of the Interior/USGS

In April 2013, the USGS released an updated oil and gas resource assessment for the Bakken Formation and a new assessment for the Three Forks Formation in North Dakota, South Dakota and Montana. The USGS assessment found that the Bakken Formation has an estimated mean oil resource of 3.65 billion barrels of oil (BBO) and the Three Forks Formation has an estimated mean resource of 3.73 BBO, for a total of 7.38 BBO, with a range of 4.42 (95 percent chance) to 11.43 BBO (5 percent chance). (Gaswirth, et. al. 2013) Oil production in the Bakken Shale region of North Dakota has risen from 400,000 barrels per day in 2011 to 1 million barrels per day in 2013 with North Dakota now producing more oil than Alaska. (Katsenelson, 2013)

HISTORY

According to the University of North Dakota Energy and Environmental Research Center (UND EERC), the Bakken formation was discovered in 1953 and oil was first produced in 1955. The beginning of vertical well development began in 1976, followed by the beginning of horizontal drilling in 1987 by the Meridian Resource Corporation. Hydraulic fracturing technology in horizontal wells steadily improved throughout the late 1980s and early 1990s, and in the late 1990s mass application of large multistage hydraulic fracturing gained popularity. In 2000, Lyco Energy Corporation drilled the first horizontal pilot well into the Montana Elm Coulee and since then more than 600 horizontal wells covering 450 square miles have been developed in that region with estimated recoveries of 300,000 to 750,000 barrels of oil. (UND EERC) Elm Coulee was key to later Bakken development because it combined horizontal wells and hydraulic fracturing, and targeted the dolomitic middle Bakken member rather than the shales of the upper or lower Bakken. (Pollastro, et. al. 2008) Further interest developed in 2006 when EOG reported that a single well it had drilled into an oil-rich layer of shale near Parshall, ND was anticipated to produce 700,000 barrels of oil. The Parshall oil field discovery combined with other factors, including an oil-drilling tax break enacted by the state of North Dakota in 2007, shifted attention in the Bakken from Montana to the North Dakota side. The number of wells drilled in the North Dakota Bakken jumped from 300 in 2006 to 457 in 2007. (Pollastro, et. al. 2008) The advent of fracturing sleeve systems has greatly enhanced the time and cost efficiency of well completions. Of the 20 oil-producing geological formations in the Williston Basin, the Bakken Formation now accounts for 91 percent of North Dakota's oil production. (Brown 2013)

EMPLOYMENT AND POPULATION

The number of workers in North Dakota's oil fields has more than quintupled from 2005 to 2012, growing from 4,500 to 35,000. (Robeznieks 2013) This energy boom has also attributed to the state's 3.1% unemployment rate. According to the U.S. Census Bureau North Dakota ranked the highest in the U.S. population growth rate in 2012 at 2.17%. The data, based off of births, deaths, administrative records and survey data, reflects the rate of population growth over the 12 months ending July 1, 2012. At nearly three times the national rate, it was the only state with a rate above 2%. Additionally, North Dakota ranked only 37th in growth rate during the decade between 2000 and 2010. It then jumped to sixth between 2010 and 2011. (Brennan 2012)

The town of Dickinson, North Dakota has been called by the U.S. Census Bureau the nation's fourth fastest-growing "micropolitan" community, defined as areas with an urban core of at least 10,000 but fewer than 50,000 people. Two other towns, Williston and Minot, are the first and eighth on the fastest-growing list. (Robeznieks 2013) In its current biennium budget, the North Dakota Land Board has awarded \$124 million to

help the state's small towns adjust to fast growth, with the money used to widen roads, enhance emergency services and help schools facing rapid increases in enrollment. (Brennan 2012)

According to Walsh (2012) "towns like Williston and Watford City are growing so rapidly that construction crews can't build homes fast enough to shelter the swelling population. Rents and home prices have skyrocketed, hotels are fully booked out for years and folks without digs have been sleeping in their cars at the local Wal-Marts." Crime rates have also risen, landfills are overflowing and so many modular "man camps" have popped up that cities are enforcing moratoriums on building more.

TOUR REPORT

The tour began in Bismarck at the North Dakota Department of Commerce with Al Anderson, Commissioner. North Dakota has become the focus of many countries due to its success in the oil and gas industry. North Dakota had experienced seven decades of out migration since its pinnacle in 1930, but just since the year 2000 the population has risen to a near peak high of 700,000. They also boast top honors in several state indexes including Fastest Growing Economy, top producer in 14 agriculture commodities, second in oil production, and is ranked the second best State for Business. These accolades suggest that the state is realizing its mission to "Attract, retain and expand wealth". North Dakota posted a 13.4% economic growth rate in 2012 which was in sharp contrast to the national average of 2.5%. The Commissioner attributes much of the success to their strategies for economic development which are 1) low taxes, 2) early incentives and then graduate to independence, and 3) balance between development and environmental responsibility. The state has created a site for ND Building a Strong Future with oil and gas tax revenues. They also have a Legacy Fund which was created to help fund education, infrastructure and energy conservation starting in 2015.

Although North Dakota is experiencing financial success due to the oil and gas industry, they still face some challenges that impede their growth. Commissioner Anderson identified those difficulties as infrastructure, research and development, workforce, and the regulatory environment. State infrastructure was designed for a rural and agricultural industry and has not been adequate for recent growth and demand. Truck traffic around growing communities has adversely affected travel time and safety. Water usage in fracking has not been a concern as drilling uses surface water and natural repletion far exceeds consumption, however oil companies are seeking ways in which to recycle water. This, along with expansion of pipeline corridors and more extensive use of railways, would help reduce truck traffic on overburdened roads.

Rapid population growth correlates to an increase in regular commuter traffic, crime, drug use and greater demands on law enforcement, emergency response and

healthcare provision, schools and housing. The state is addressing rapid growth impacts through grants to critical access hospitals, law enforcement, and a Housing Incentive Fund for affordable housing development.

Subsequent interviews echoed much of what Commissioner Anderson shared. Dickenson has a current census of 25,000 which has increased by more than 7,000 people since 2010 and is expected to peak at 50,000 before leveling off at 42,500. A larger population has increased traffic, work related theft, violent crime, and substance abuse. The City has been able to grow law enforcement accordingly through grants. However, recruiting has been challenged by the oil industry but the City has created incentives like a four-day work week to remain competitive. They have also built a new law enforcement center.

The City has been debt-free for years due to phenomenal tax revenues. Although they are not able to tax man camps because they are temporary in nature, the state has given the city permission to charge a set up fee at \$400 per person each year. Temporary housing is carefully zoned and utilities monitored. Communication with the County has been essential in making this a successful strategy. Dickenson has wisely invested in infrastructure expansion and a new elementary school. They have also carefully planned for commercial and permanent housing expansion. The ratio of single family dwelling and multi-unit residential is monitored very closely. The change in population includes a shift to younger residents and families.

The younger population has led to an increase in births at the local hospital. It was reported that St. Joseph Hospital saw approximately 250 births in 2010 and is projecting about 700 in 2014. This growth, in addition to expansion of other services like rehabilitation has led the critical access hospital to construct a new facility with twenty-five inpatient beds. Concurrent with the increase in violent crime and traffic-related accidents, the emergency department is seeing approximately 1200 visits per month. EMS and the helicopter are both privately owned and most cases are taken directly to Bismarck.

The McKenzie County EMS in Watford City has also seen response volumes increase significantly. They recorded approximately 28 calls per month in 2007-2008 but had 145 calls in October of 2013 alone. A typical response would take 20-30 minutes, but because of the rural setting and great distances between an accident site and Minot, a call can take seven to eight hours. Response time is also impacted when a call comes in from one of the many camps as addresses can be non-existent and the repetitive nature of camp layout can be confusing. Dispatch has migrated from being local to being State radio. This poses problems as state personnel are not familiar with local directions and roads. As elsewhere, traffic accidents have increased due to poor roads, increased traffic, drunk driving, and aging and non-compliant drivers on the road. Most trauma and mass casualties are caused by traffic accidents and occur primarily during the oil-

field shift changes. Trauma cases are often met in route by a helicopter in good weather or a fixed wing if weather is non-cooperative.

The local hospital in Watford City, McKenzie County Health Systems has plans to build a new critical-access hospital with the help of State-funded low interest loans. The CEO, Dan Kelly, believes the 25-bed hospital will be appropriate for current and future population. The 2010 census reported 1500 but the current population lands somewhere between 6500 – 10,000. Inpatient volumes are not projected to increase but they are seeing more Emergency Department visits due to violence and substance abuse. They are also expanding therapies and diagnostic imaging. The hospital struggles here too as the payer mix has changed. Medicare and Medicaid numbers have declined due to an increase in self pay patients. Unfortunately, this type of payer is often associated with bad debt.

Watford City fell behind as the population ballooned in terms of planning, zoning and regulation. Housing is the largest shortfall. Existing housing is exorbitantly expensive and before zoning was in place, dozens of RV parks and man camps were constructed outside of the city limits. It was reported that 40 children are picked up daily on the school bus from one indoor RV park alone. Zoning is now in place and they are now expanding water and sewer infrastructure based on a population estimate of 25,000. McKenzie county boasts 70-80 of North Dakota's 180 active rigs during 2012 and 2013. The oil and gas tax formula has been favorable, but hasn't been enough to overcome demands placed on the local infrastructure. However, the courthouse and airport are both being expanded, a new school is being built, and businesses are growing. The city is planning a bypass and the state is helping expand the highway from two lanes to four which will help with some of the consequences of heavy traffic. Contaminated waste disposal from fracking has become an issue as it is not allowed at the municipal landfill, but is being dumped there illegally. The county and state are working together to regain control.

Staffing for all of these services is challenged by the demand for higher wages due to competition and cost of living. Much of the workforce had been two-income family that no longer need both incomes. Unfortunately, these industries have fixed fees and reimbursement so have to be creative with benefits and incentives. EMS prefers to hire part-time medics to help with the cost of insurance and benefits. The hospital has reduced physician call schedules by eliminating weekend call, employed physicians and increased their compensation, and engaged a recruiting firm to improve their odds. They have also acquired five 3-bedroom mobile homes to provide transitional housing for their physician recruits and are building affordable apartment housing for other hospital staff. Finally, they have provided day-care services for their employees.

Williston in Williams County was the final stop on the Bakken tour. Here staff and housing shortages were also reported. The population in Williston was approximately 14,000 in 2010 and is now calculated around 35,000. Open man camps and transient

populations have made it difficult to obtain an accurate census count. The population is estimated to top out at 50,000. Here as in Watford City, city officials and community leaders lamented not having rigorous planning and zoning in place prior to the boom. Expansion has been fragmented in multiple directions with little control over the development. Without ordinances and regulation on land utilization, some developers have sat on open property, leasing it to RV parks for greater revenue; meanwhile commercial/industrial development has been located on inappropriate sites. Planning and upgrading infrastructure has been a game of catch-up. The city has now invested in water and sewer infrastructure to accommodate the projected population growth. They have also begun street expansion and a truck bypass to relieve traffic within the city. Although Williams County sends five to six million dollars daily to the state in oil and gas tax revenue, the cities bond their own improvements.

Exorbitant cost of living and housing has been an issue for city agencies and the healthcare industry in Williston. The city staff has doubled in the past six years and will soon have housing allowances and subsidized apartments from the City. Trinity Health Clinic also faces staff recruiting and retention challenges as they also compete with the oil industry for positions such as front-desk and reception where they have seen a 75% turnover. Nursing turnover is around 30% but those losses typically move between healthcare institutions. While they struggle to compete with wages, they have remained attractive by offering benefits including eye care, through their work environment which includes attractive hours and a new facility, and signing bonuses when needed. The clinic has been successful in recruiting physicians due to steady patient volumes and full schedules.

Patient volumes at the nearby Mercy Medical Hospital emergency room are on the rise as well. They are experiencing 1500 visits per month where 2 years ago they were only at 1000. Much of this increase is being attributed to substance abuse and violence as in the other cities. The young, male, oil-industry based population is also believed to have contributed to the increase in security issues that the hospital is experiencing. The physical layout of the hospital is also a factor as it is all on one level with thirty entrance points and multiple parking lots. Similar to the rest, the increased number of young men in the population is now leading to an increase in number of young families. The hospital is delivering between 70-75 babies per month, up from 20-30 per month only a couple of years ago. The Obstetrics practice is growing at the hospital, however high-risk patients have to go to Minot for care. Families are expected to further increase emergency department volumes as well as clinic volumes at Trinity.

Both the clinic and the hospital have planned expansion to accommodate their projected growth in volumes.

CONCLUSIONS

The Bakken Region has experienced tremendous growth and opportunity due to the richness of the resources in that play. It is anticipated that this wave of exploration and extraction will last for many decades, unlike the last boom that western North Dakota experienced. Wealth has not come to the region without complications. Leaders of the communities on the Bakken Region tour have been generous in sharing their experiences and lessons learned so that Eagle Ford can better anticipate and prepare for the changes they will face as a result of the influx of population and disposable income. Eagle Ford cities can anticipate a drastic change in community culture and population demographics. They will be best equipped if they have well-established City planning and zoning regulations and a plan for infrastructure expansion. Roadways, including city, county, and state, need to be sized for increased traffic volume including trucks. Alternative resource transportation should be considered where possible to help reduce truck traffic overall. Staff recruiting and retention strategies should be in place for civil service and healthcare industries as competitive wages in the oil-rich market will be difficult to provide. Finally, considerations for providing affordable housing alternatives for employees should be considered as part of the overall recruiting and retention plan.

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