

Initial report to Stratex Oil and Gas concerning:

Hydrocarbon Potential of the Red River, Tyler, and Heath Formations Beneath Stratex Leased Land in Southwestern North Dakota

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Stratex Oil and Gas owns acreage in Williston Basin, North Dakota in the Golden Valley area, containing potential petroleum reservoir targets of three formations with multiple objectives that have reduced the risk factors significantly.

1. The Tyler Formation; a channel sand—70 to 100 feet thick
2. The Heath Formation; originally rich, thermally mature limestone
3. The Red River Formation; productive in and adjacent fault-block

The petroleum potential is based on near historic petroleum production. Wells in the Tyler and the Red River are capable of 300,000 and 199,000 barrels cumulatively. The potential can only be fully exploited with the proper placement of wells using the diagenetic and seismic models. The resistivity values of the shale beneath the land leased by Stratex Oil and Gas are in the 35 ohm-m-range. This value was the value used to determine if the Bakken shale was mature. If this relationship holds true for the Tyler formation, then this map suggests that the area leased by Stratex Oil and Gas is thermally mature and may contain oil. Interestingly, the resistivity of the shale beneath the land leased by Stratex Oil and Gas is higher than the resistivity values of Billings, Stark and Slope counties; where significant quantities of oil have been produced from the Tyler formation. This too, strongly suggests that these shale are thermally mature

and may have produced oil. Thirty five miles to the north, 83 million barrels of oil has been produced from the Tyler suggesting widespread organic maturities.

Unconventional drilling techniques, focused on the Heath formation, offer new potential in this area.

Overall multiple potential pay zones combined with new advances in seismic and drilling techniques may offer attractive economic potential.



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1. Red River Formation Overview:

The Red River formation in southwestern North Dakota was deposited as shallow marine and peritidal carbonates during the Ordovician period. The formation is over 700 feet thick in the center of the basin, in Dunn County, North Dakota. The Red River is divided into both upper and lower parts. The upper unit is further subdivided, in descending order, into “A”, “B”, “C” and “D” zones (Fig. 1). These zones have been interpreted to have formed as a series of “shallowing-upward” sequences deposited in increasingly restrictive environments. Restrictive environments are often anoxic environments, which is excellent for the preservation of the organic matter that will later be converted to hydrocarbons. The “A” zone is made up of non-fossiliferous, laminated dolomitic wackestone and packstone, overlain by a thin anhydrite layer. The “B” and “C” zones are both made up of a lower burrowed layer containing non-porous, fossiliferous and bioturbated lime mudstones and wackestones; an overlying laminated layer composed of porous, microsucrosic dolomite, or a slightly porous, fossiliferous limestone and a top layer of nodular anhydrite. These anhydrite beds form vertical caprocks preventing the loss of hydrocarbons. The “D” zone contains beds of black kerogen rich dolomite, up to 20 cm thick that contain up to 59% total organic carbon. This kerogen rich dolomite is found throughout the Williston Basin and is thought to be a source rock for the Red River formation.

Reservoirs in the Red River formation are found where microsucrosic dolomite has replaced original lime wackestones and packstones, resulting in intercrystalline porosity. Dolomitization can be highly localized and may produce zones of high quality reservoir rock that are separated from each other by zones of impermeable rock, this is especially true in the “C” zone. Some of these dolomitized zones can be up to a hundred feet in thickness and up to a mile in diameter, which would form an excellent hydrocarbon reservoir. Hydrocarbons have been produced from all four of these layers, but mainly from the “B”, “C” and “D” layers.

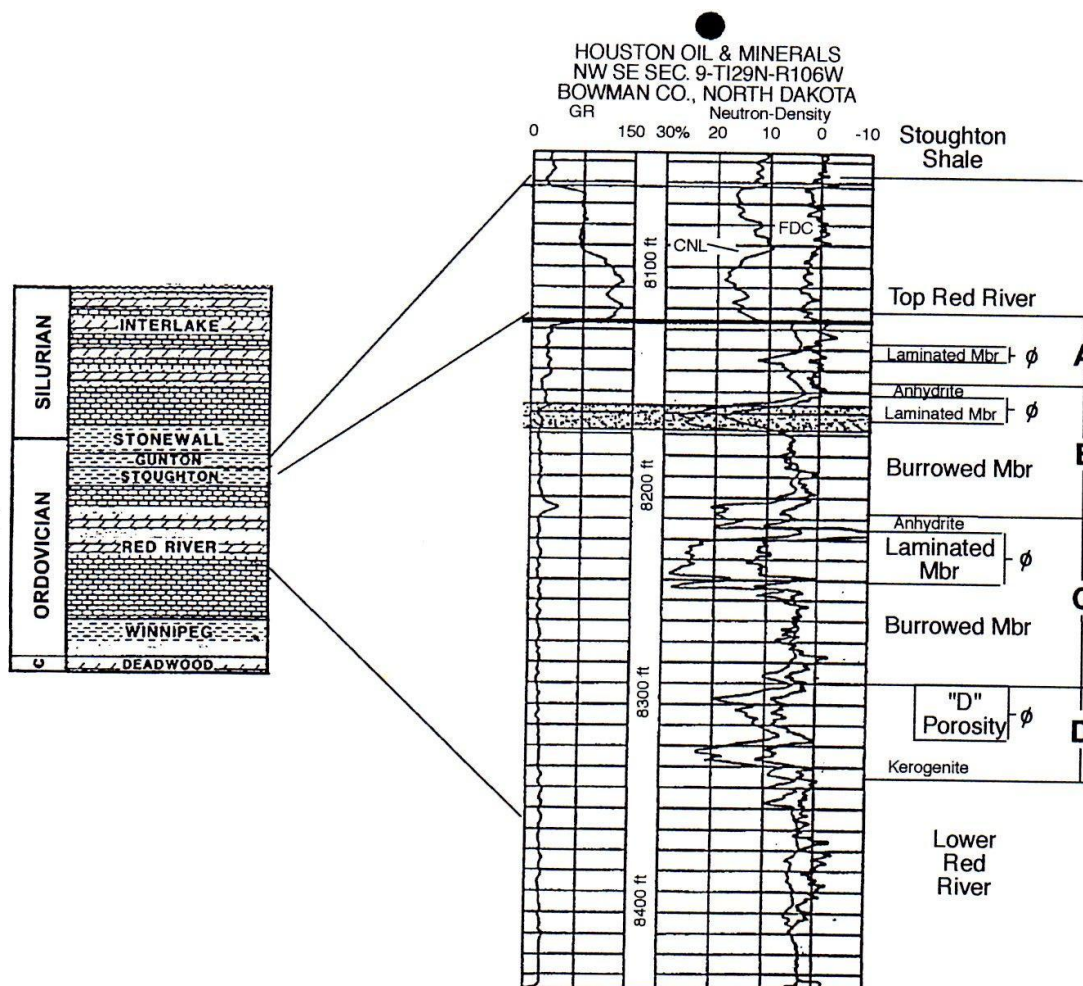


Fig. 1. Red River well log from Bowman County, North Dakota. This well is approximately 50 miles to the south of the land leased by Stratex Oil and Gas. Porosity in the "B" and "C" zones is in the mid to upper 20% range. Porosity in the "D" zone is as high as 20%. Vertical wells in this area are drilled to depths of approximately 8,200 feet. Anhydrite layers on top of the porous zones act as vertical seals preventing the vertical loss of hydrocarbons. These porous zones are widespread and extend to the land leased by Stratex Oil and Gas.

Source: Montgomery, 1997.

The “B” porosity zone is a particularly important reservoir in the Red River formation since it is laterally pervasive over much of the Williston Basin (Fig. 2 and 3). The pervasive nature of this porosity zone strongly suggests that it is also present beneath the land leased by Stratex Oil and Gas. The lateral extent of the “C” porosity zone is variable and strongly affected by the type of dolomitization that has occurred within it. Production from and surrounding the land leased by Stratex Oil and Gas comes mainly from the “B” zone from the following oil fields; the Bull Run field in T136N R106W; the Williams Creek field in T137N R106W; the Cash field in T135N R106W and the Cannonball field in T135N R106W (Table 1).

Table 1: Red River oil production from wells on and immediately adjacent to the land leased by Stratex Oil and Gas. The Bull Run field is on Stratex land, the Williams Creek field is just to the north and just to the west of Stratex land, the Cash and Cannonball fields are just to the south of Stratex land. See figure 2 for well locations.

Well file number (feet)	Field Name (BBLs)	Well Name	Perforation Depth (mcf)	Cumulative Oil Production	Cumulative Gas Production
7425 (V)	Bull Run	Northrup #1 – 25	10,353 to 10,360	739,035	451,860
7784 (V)	Bull Run	Stark #33 – 23	10,358 to 10,368	20,257	0
12227 (H)	Williams Creek	Geary #1	10,524 to 11,905	145,111	51,368
6272 (V)	Williams Creek	Kremers #21 – 22	10,479 to 10,580	199,782	97,083
9209 (V) #1	Cash 9,957	Federal A	9,948 to	224,333	151,648
9883 (V)	Cannonball	Tennant #A-1	9,658 to 9,756	80,032	113,138

V = vertical well

H = horizontal well

Source: NDIC oil and gas division, 2011

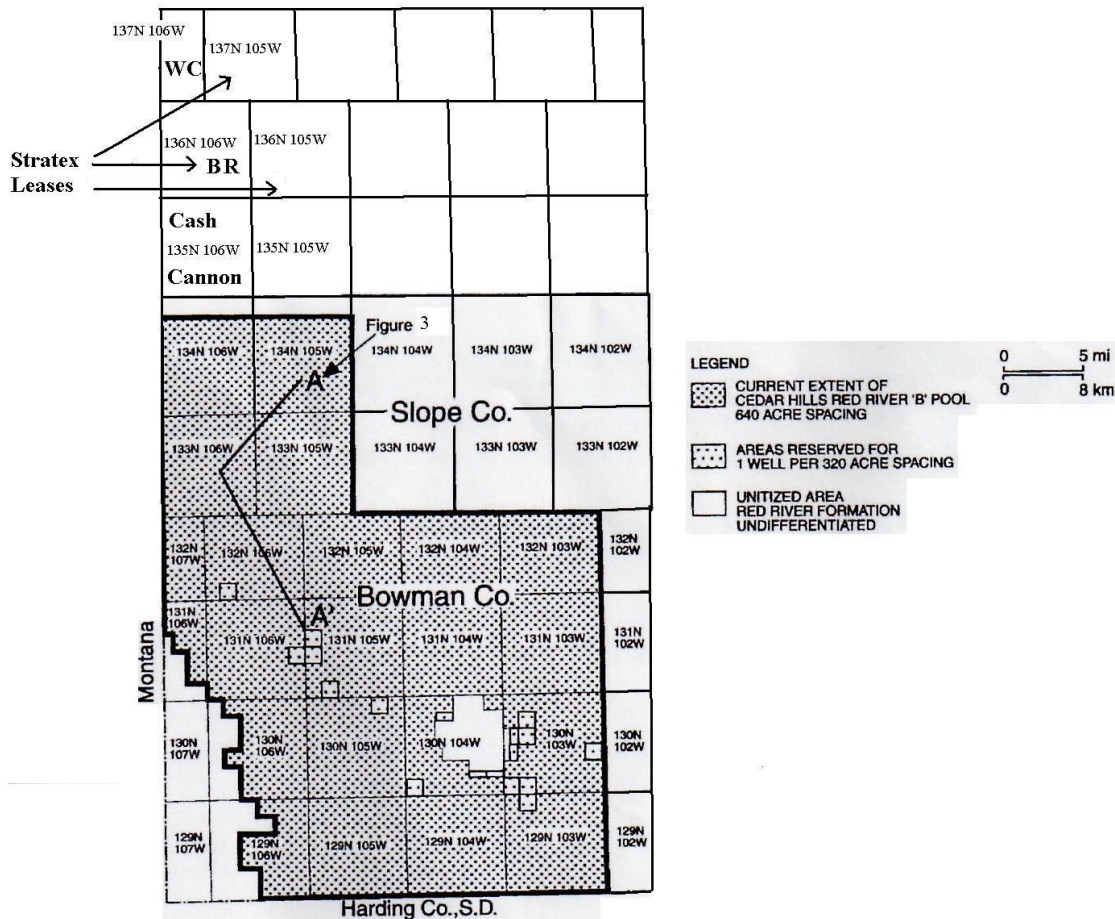


Fig. 2. The locations of the areas (stippled areas) in Bowman County where horizontal drilling in the Red River "B" porosity zone yielded good results. The land leased by Stratex Oil and Gas is just to the north (20 to 35 miles) of this land. Oil has been produced from the following fields on and around the land leased by Stratex oil and Gas; **BR** = Bull Run; **WC** = Williams Creek field (T137N R106W) **Cash** = Cash field (T135N R106W) and **Cannon** = Cannonball field (T135N R106W). See table 1 for volumes of hydrocarbons produced. The cross section of line A-A' is found in figure 3.

Source: Montgomery, 1997.

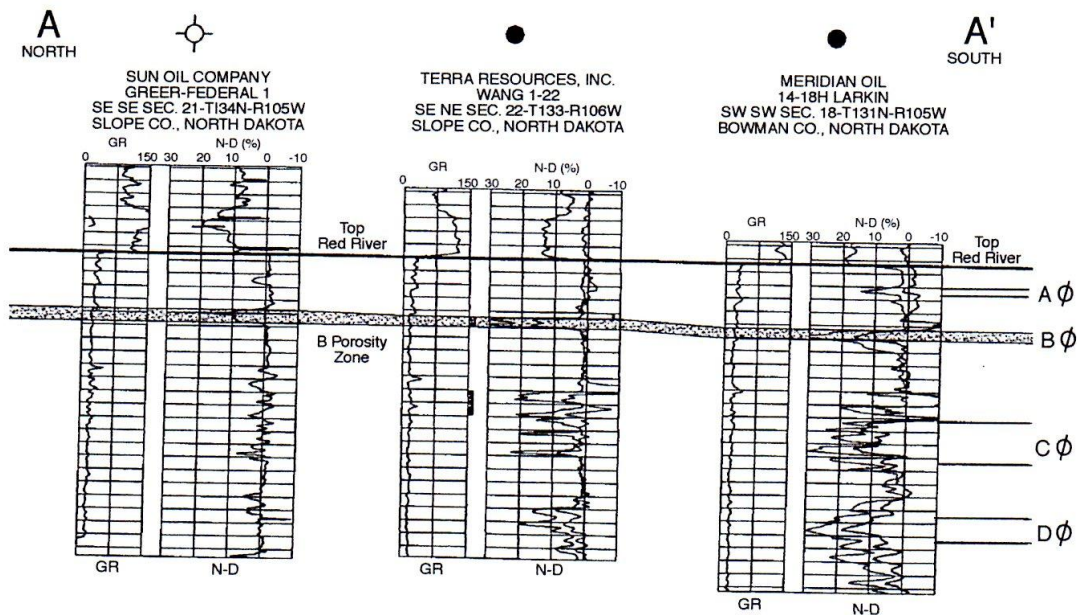


Fig. 3. Well logs from line A – A' in figure 2 showing the lateral pervasive nature of the "B" porosity zone in the Red River formation. The pervasive nature of this porosity zone strongly suggests that it extends northward into the land leased by Stratex Oil and Gas. Productive oil fields in and around the land leased by Stratex Oil and Gas also strongly suggest that this is the case. The "C" and "D" porosity zones also form important reservoirs in the Red River formation, but are more heterogeneous in nature.

Source: Montgomery, 1997.

2. Red River Formation Oil Production Near Land Leased by Stratex Oil and Gas

Understanding how and why oil was produced from the Red River porosity zones, particularly the “B” zone, both in and around the land leased by Stratex Oil and Gas will help Stratex Oil and gas plan and exploration strategy for its land. The “B” porosity zone in the southern part of the Williston Basin is usually around 10 feet thick. The upper part of the “B” zone tends to have lower porosity, but higher permeability and a higher degree of oil saturation, when compared to the lower part of the “B” zone, making it the preferred target for oil exploration.

Traditionally, seismic work was done in southwestern North Dakota to identify structural highs, which were then drilled with vertical wells. These structural highs are usually low relief highs, usually less than 100 feet, and fairly small, up to a mile in diameter. The Bull Run, Williams Creek, Cash and Cannonball fields were all discovered and produced using this technology (Figs. 4, 5 and 6). The gentle ($<1^{\circ}$) regional dip of the Red River in Southwestern North Dakota is to the northeast, as a result, oil migrating updip (from the northwest) will become trapped in both structural and stratigraphic traps. Structural traps (structural highs) and stratigraphic traps have both produced oil from the “B”, “C” and “D” zones. Structural traps are usually water drive reservoirs; stratigraphic traps are usually depletion drive reservoirs. Anhydrite beds form excellent cap rocks preventing the vertical loss of hydrocarbons from these traps. Oil, taken from the Williams Creek field had an API value of 34, indicating that the sediments are thermally mature, so thermal maturity is not as great an issue as it is with shallower formations, where the sediments may have only reached a low level of thermal maturity, or may not have reached thermal maturity.

The structural highs in Bowman County, 20 to 40 miles directly south of land leased by Stratex Oil and Gas, are much like the ones described above, in Golden Valley County. They have low relief and are relatively small in diameter. The stratigraphic traps in the “D” zone in the Horse Creek and South Horse Creek fields are in dolomite lenses that have impermeable limestone updip, acting as an updip seal (Fig. 2 and 7).

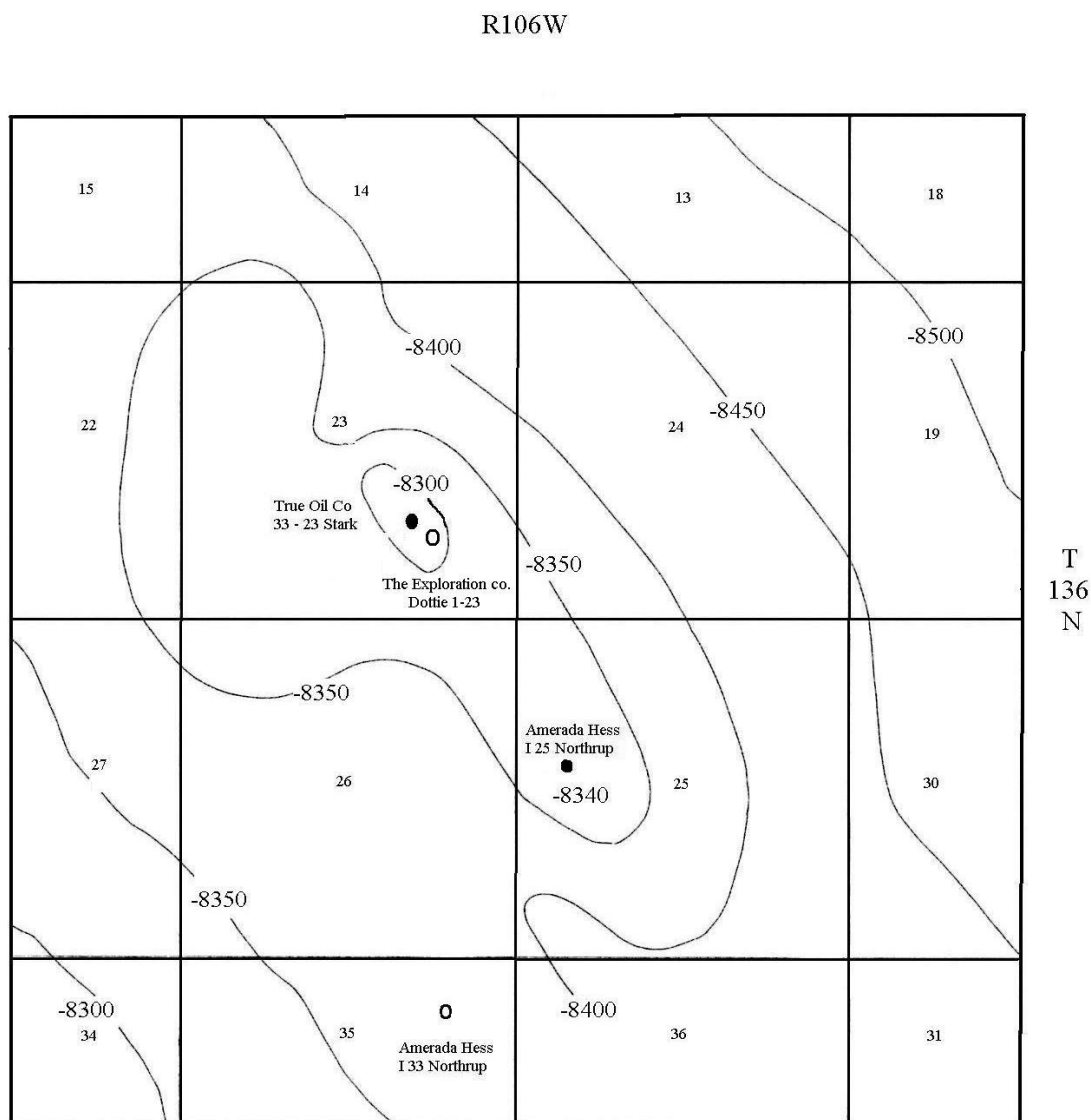


Fig. 4. The Bull Run Oil field on the land leased by Stratex Oil and Gas. This is a structural contour map of the top of the Red River formation indicating two areas of structural highs, one in section 23 and the other in section 25. Solid circles indicate producing well, open circles indicate dry holes. The True Oil 33-23 Stark and Hess 1-25 Northrup wells were productive (see table 1 for production details). Wells produced from the Red River "B" porosity zone at a depth of approximately 10,360 feet.

Source: NDIC oil and gas division, 2011.

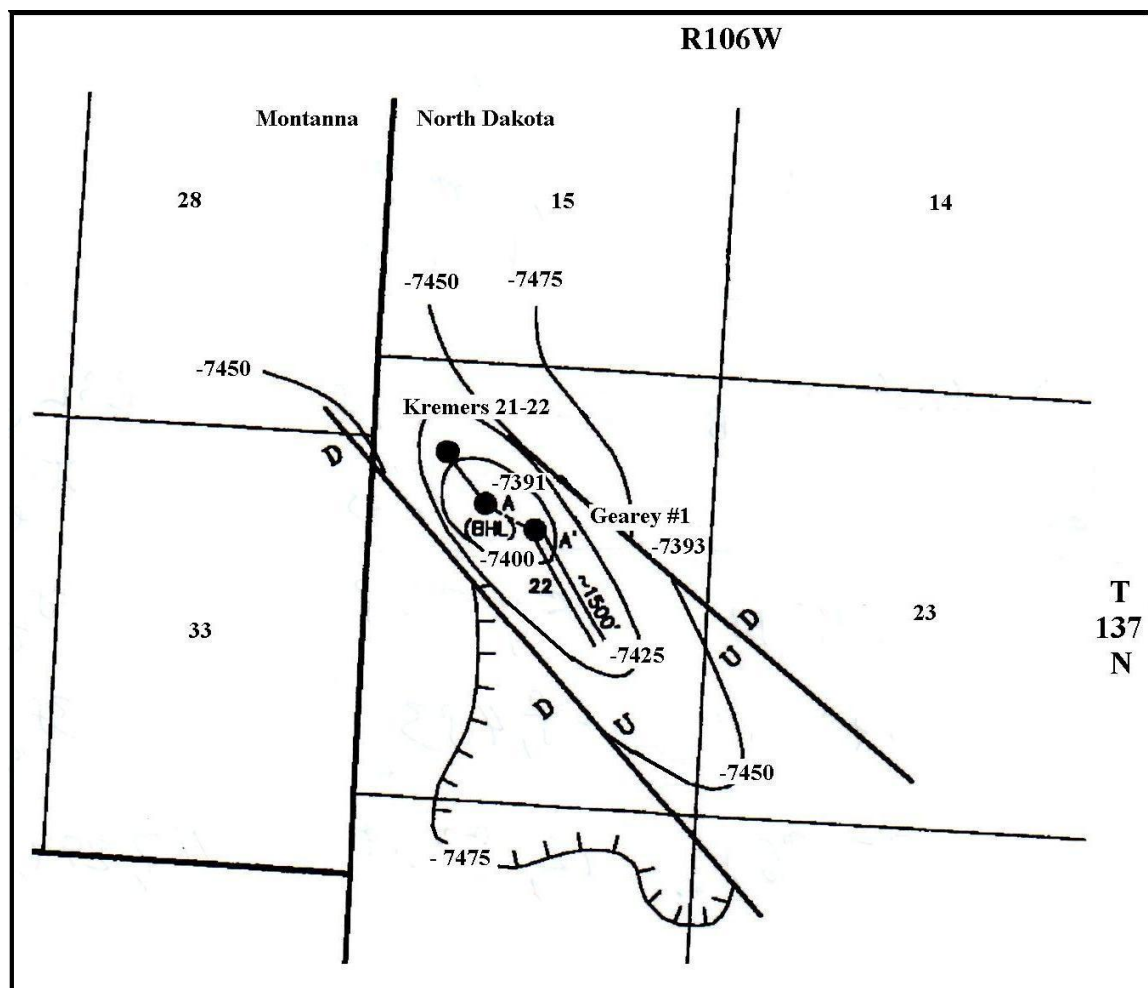


Fig. 5. The Williams Creek Oil field, located just to the north and west of the land leased by Stratex Oil and Gas. This is a structural contour map of the top of the Red River formation (in feet below sea level, depth below the land surface approximately 10,450 feet) indicating a structural high, in section 22, on an upthrown fault block (horst). Solid circle indicates producing wells. The Kremers 21-22 and Gearey #1 wells were productive from the Red River "B" porosity zone, See table 1 for production details.

Source: NDIC oil and gas division, 2011.

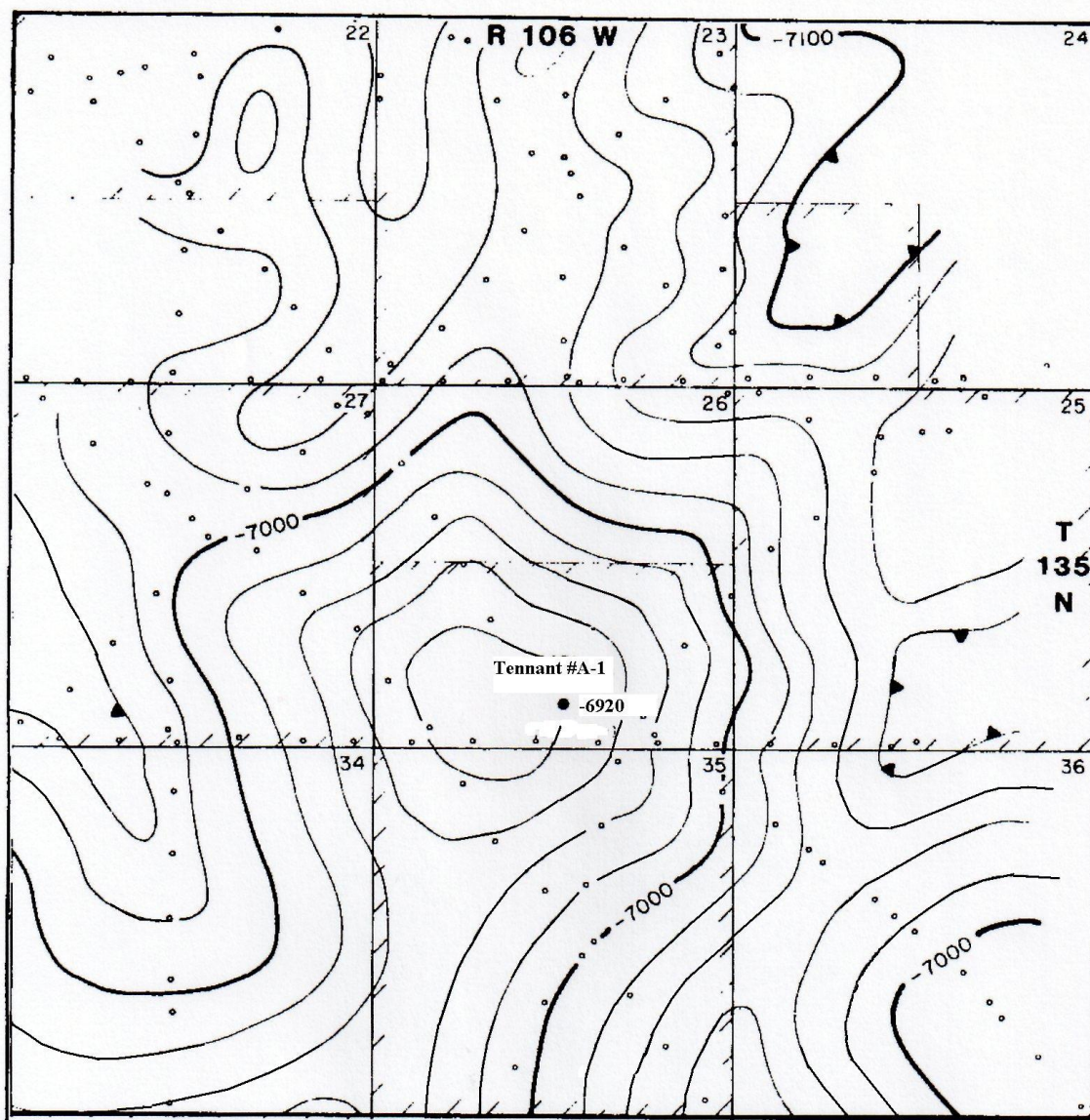


Fig. 6. The Cannonball Oil field, located just to the south of the land leased by Stratex Oil and Gas. This is a structural contour map of the top of the Red River formation (in feet below sea level, depth below the land surface approximately 9,650 feet) indicating a structural high, in section 26. The Tennant #A-1 well was productive from the Red River “B” interval, See table 1 for production details.

Source: NDIC oil and gas division, 2011.

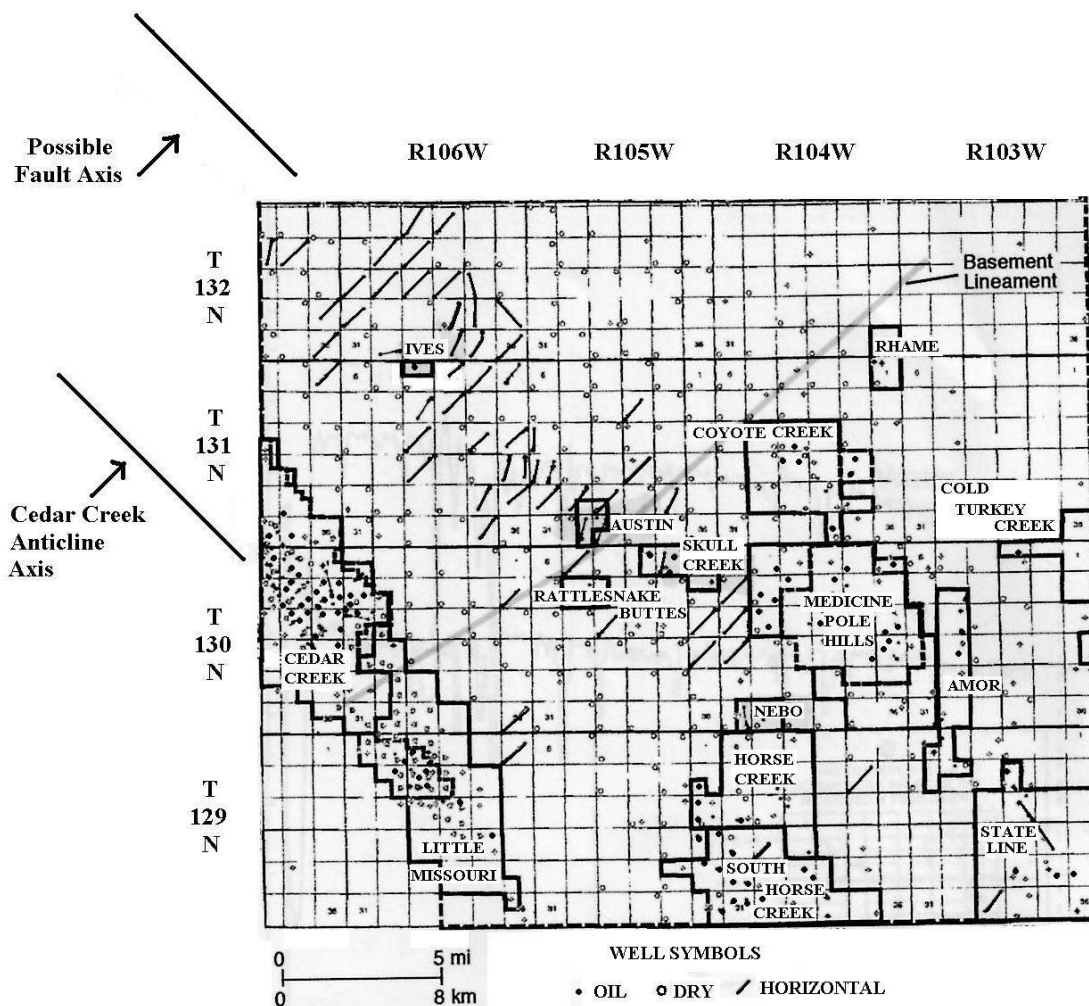


Fig. 7. Map showing the distribution of oil fields and oil wells in Bowman County, 20 to 40 miles south of the land leased by Stratex Oil and Gas. Horizontal wells are primarily drilled with a northeast azimuth ($20^{\circ} - 45^{\circ}$). A fault and accompanying fracture zone, downdip and parallel to the Cedar Creek anticline, is intersected by horizontal wells resulting in higher well recovery (see figure 8 for location of excellent versus poor performing wells).

Source: Montgomery, 1997.

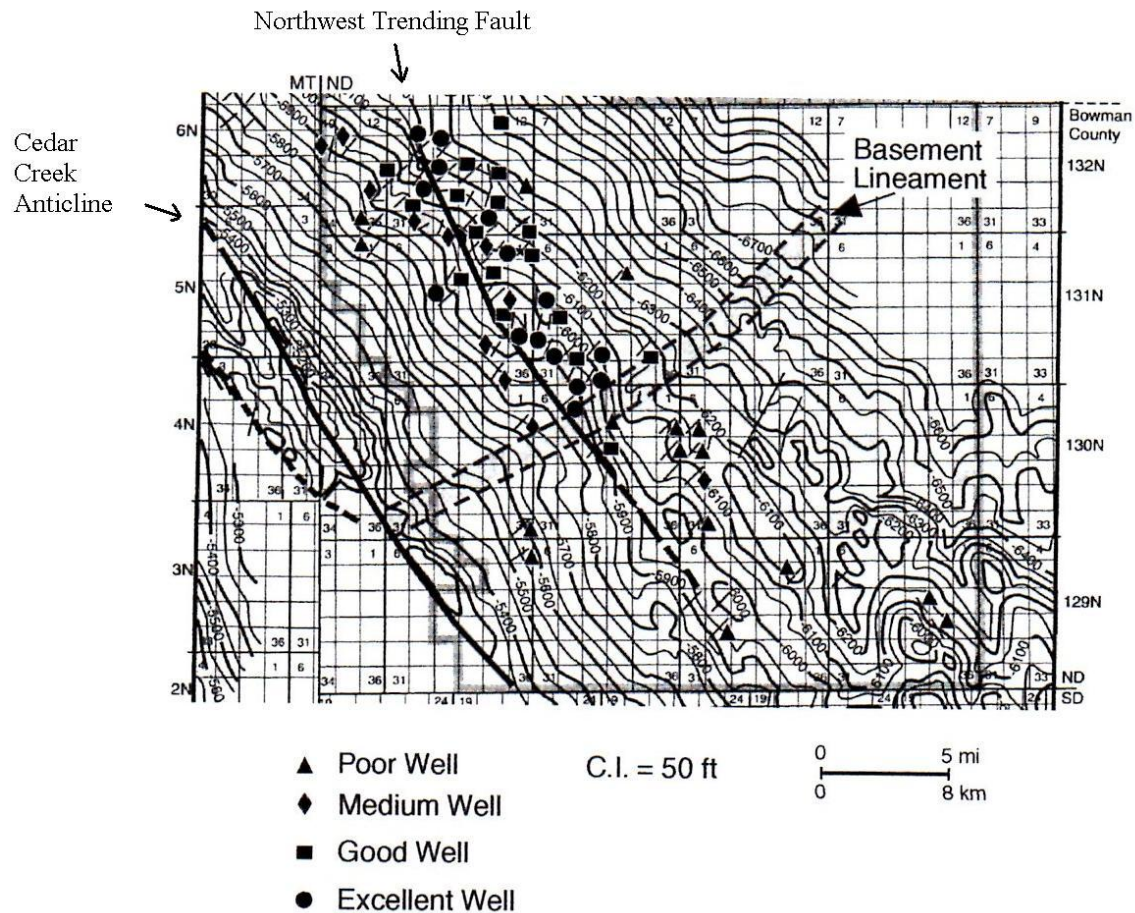


Fig. 8. The locations of excellent and poor performing wells in Bowman County and their relationship to the northwest-southeast trending fault through the area. Excellent producing wells are closer to the fault and accompanying fracture zone, which acts as a conduit for oil migration to the well.

Source: Montgomery, 1997.

In the mid 1990's, horizontal drilling techniques were used to produce oil from areas that previously were considered uneconomical to produce. A major area for using horizontal drilling techniques in the Red River formation was in Bowman County 20 to 40 miles directly south of the land leased by Stratex Oil and Gas (Fig. 2, 7 and 8). Decline rates for many horizontal wells in the Red River formation are in the 30% to 45% range. It is important to note that the best producing wells were closest to the fault and accompanying fracture zone. Montgomery (1997) indicated that many of these wells had annual decline rates that averaged 5%, as opposed to the 30% to 45% decline rates seen elsewhere, suggesting that oil production was supported by mobile oil moving toward the well bore. The fracture zones associated with the fault in this area is the most probable explanation as to the existence of mobile oil. These fractures act as conduits for fluid flow, in this case oil, which allowed the wells to drain larger areas than they would have from unfractured bedrock. Figures 9 and 10 illustrates the relationship between fractures and faults in carbonate bedrock and illustrates how these fractures can act as conduits for fluid flow perpendicular to a horizontal well bore for better oil recovery.

The Williams Creek field, just to the north and west of the land leased by Stratex Oil and Gas was drilled on an upthrown fault block (Fig. 5 and 11). The presence of this northwest-southeast trending fault makes the land to the southeast of this field similar to the land in Bowman County that has some very productive horizontal wells drilled perpendicular to the fault axis (Figs. 7 and 8). If this fault extends to the southeast, into the land leased by Stratex Oil and Gas, then this area may be very productive as well and should be one of the first areas targeted for exploration. In addition, if sections 25, 26, 35 and 36 are available in T137N - R106W, consideration should be given to leasing them if the fault does pass through them.

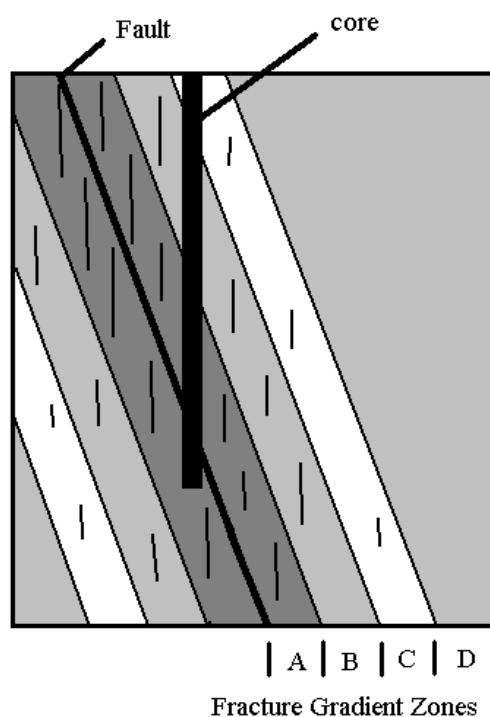


Fig. 9. Fracture gradient zones parallel to a normal fault in the Sauk Sequence carbonates of eastern New York State. Zones A, B and C, have a decreasing amount of fracturing with distance from the fault. Zone D is the relatively unfractured bedrock surrounding the fault and fracture zone. Fractures tend to be parallel or subparallel to the fault. Fracture zones extend for 8 to 25 meters (24 to 75 feet), perpendicular to the fault, on either side of the fault zone. It is anticipated that a similar network of fracture zones are present around the faults that are found in the Red River carbonates of southwestern North Dakota.

Source: Clark and Friedman, 2005.

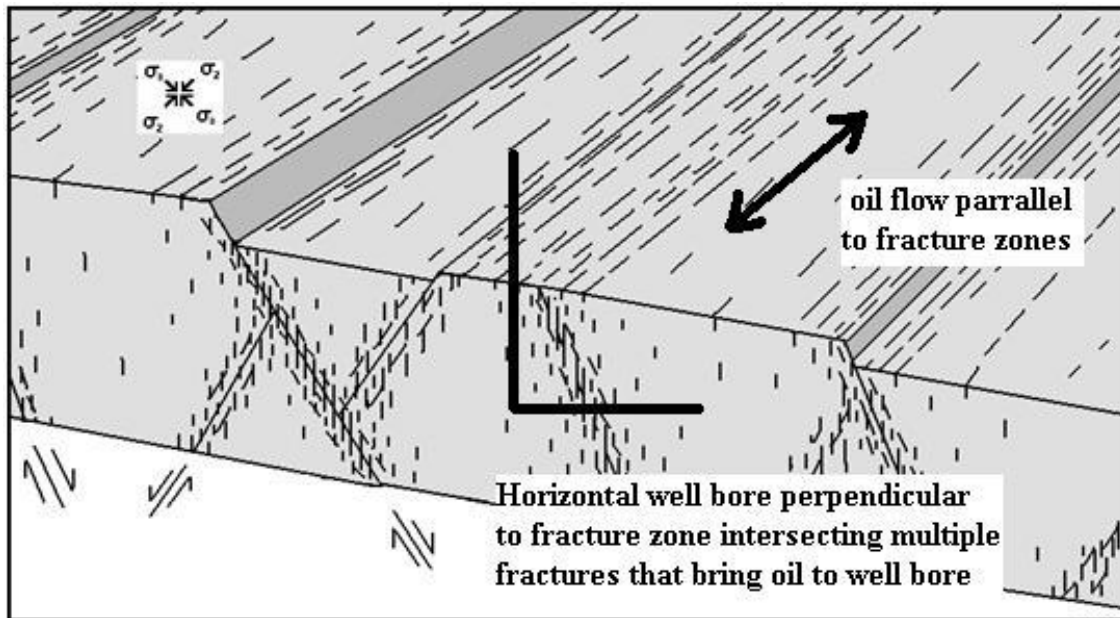


Fig. 10. A cross section of the Sauk Sequence carbonates of eastern New York State showing the development of fault and fracture zones. Present day east is to the right. Fractures tend to form prior to faulting (fault process zones) and are parallel or subparallel to the fault zones. Fracturing continues during movement along the fault plane. Fracture zones extend for 8 to 25 meters (24 to 75 feet) on either side of the fault zone. These fractures can act as conduits for hydrocarbon flow to horizontal wells drilled perpendicular to the fault and fracture zones. It is anticipated that a similar network of fracture zones are present around the faults that are found in the Red River carbonates of southwestern North Dakota.

Source: Modified from Clark and Friedman, 2005.

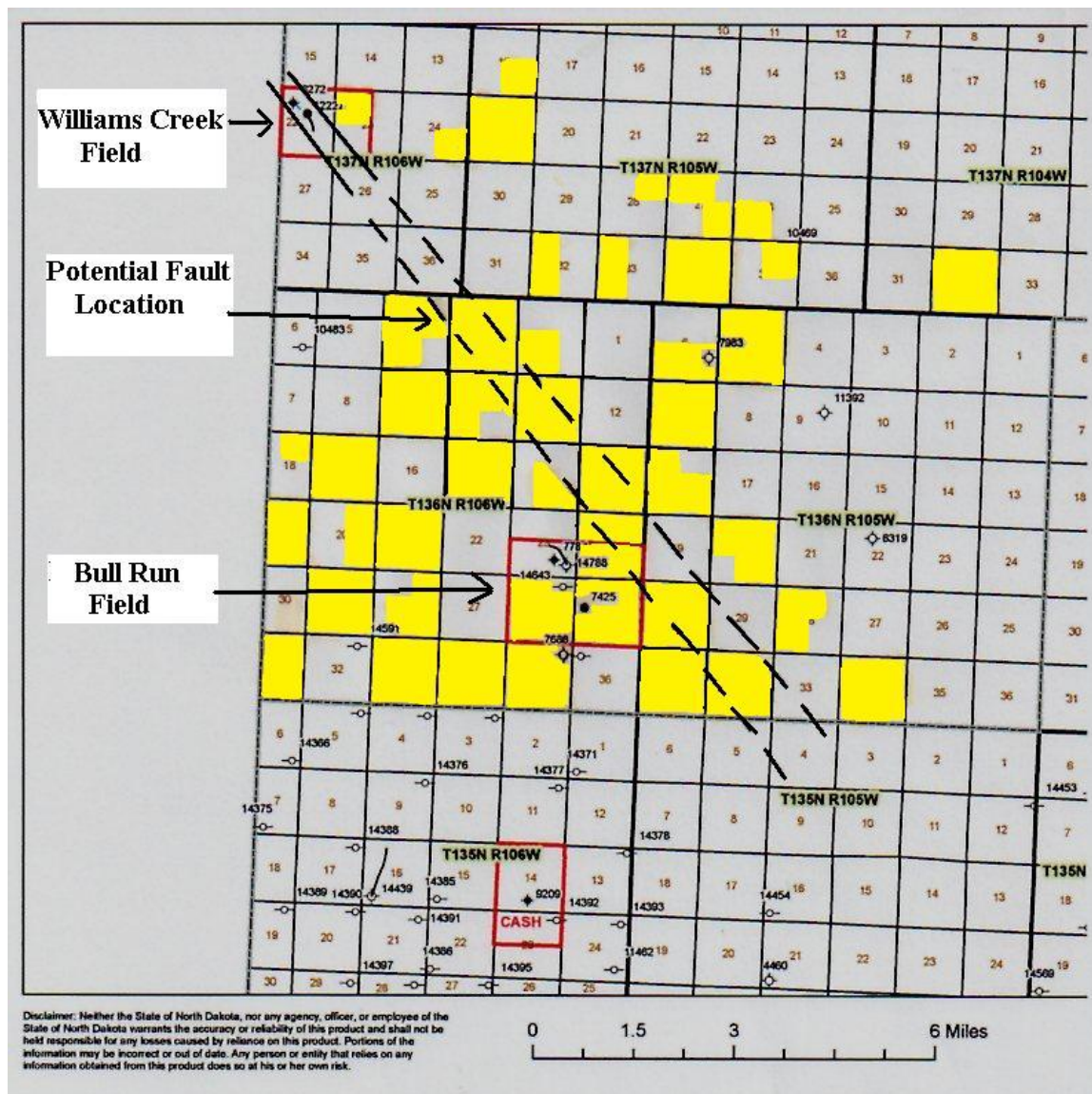


Fig. 11. The land leased by Stratex Oil and Gas is highlighted in yellow. If the fault in the Williams Creek field (fig. 5) extends to the southeast, through the land leased by Stratex Oil and Gas, then this land may be similar to the land in Bowman County where horizontal wells through the "B" zone are productive (figs. 7 and 8). If a fault is present, horizontal drilling with a northeast azimuth will run through the fault and fracture zone, perpendicular to the fracture zone, increasing the amount of oil available to the wells.

Source: Modified from NDIC oil and gas division, 2011.

3. Red River Formation and the Winnipeg Shale as a Source Rock

There may be several source rocks for the Red River formation reservoirs. Dow (1974) has indicated that the Ordovician Winnipeg shale has been geochemically identified as the source of the oil in the Red River formation. This shale is about 100 feet thick beneath the land leased by Stratex Oil and Gas. The Winnipeg shale is vertically below the Red River formation and migration of oil from the Winnipeg into the Red River is thought to have occurred through fracture and fault zones. This may be one of the reasons that the Cedar Creek anticline, the fault downdip and parallel to the Cedar Creek anticline in Bowman County and the Williams Creek field in Golden Valley County all produce oil. These faults and the fracture zones associated with these faults act as pathways for the vertical migration of oil.

In addition to the Winnipeg shale, the black kerogen rich dolomite in the "D" zone, whose beds are up to 20 cm thick may be a source of hydrocarbons. The total organic carbon within these beds is up to 59%. This kerogen rich dolomite is found throughout the Williston Basin.

4. Thermal Maturity of the Winnipeg and Red River Source Rocks

Both the Red River and the Winnipeg source rocks are buried to depths in excess of 9,000 feet. This depth of burial insures that these formations have reached a depth where thermal maturity is not an issue regarding the formation of hydrocarbons.

5. Summary

1) The Red River formation in southern North Dakota has multiple porosity zones that have all produced oil and natural gas. Some of these porosity zones have produced oil in and around the land currently leased by Stratex Oil and Gas. Porosity within these zones ranges from 6% to 25%.

2) Of these multiple porosity zones, the “B” zone is the most pervasive and should be present under most of the land leased by Stratex Oil and Gas. The “B” zone tends to be 10 feet thick in southern North Dakota. Production usually comes from the upper section of the “B” zone, where permeability and oil saturation are higher than in the lower section.

3) Horizontal drilling normal to a fault zone in Bowman County, 20 to 40 miles south of the land leased by Stratex Oil and Gas, has produced some relatively high production wells in the “B” zone that have a lower rate of decline than horizontal wells drilled through unfractured bedrock.

4) The fault that runs through the Williams Creek field may extend through the land leased by Stratex Oil and Gas. If this is the case, then the land leased by Stratex Oil and Gas may be successfully developed using horizontal drilling through the “B” zone, as was done in Bowman County to the south.

5) Porosity zones “C” and “D” are not as pervasive as the “B” zone, but are attractive targets where dolomitization has produced porous zones.

6) Anhydrite layers vertically above all the porosity zones act as barriers to the vertical loss of hydrocarbons from these layers.

7) Updip migration (northwest to southeast) of hydrocarbons from deeper in the basin (Dunne County) has resulted in the collection of both oil and natural gas in both structural and stratigraphic traps. These traditional objectives, the structural and stratigraphic traps, should also be objectives for exploration work performed by Stratex Oil and Gas.

8) Seismic work can, and should be used to try and identify structural highs in the Red River formation under the land leased by Stratex Oil and Gas. Seismic work should also be used to determine if the Williams Creek fault runs through Stratex land.

9) Fault and fracture zones may act as vertical migration pathways for oil coming from deeper formation (Winnipeg shale or the “D” zone kerogen rich dolomite).

Potential limitations to economic hydrocarbon production from the Red River formation beneath the land leased by Stratex Oil and Gas include...

1) Reservoir heterogeneity in the “C” and “D” porosity zones may act to compartmentalize reservoirs within these layers.

2) Water may be trapped in structural highs and may take up space that could hold oil and natural gas.

3) Faulting and fracturing may have breached the anhydrite seals allowing hydrocarbons to vertically escape.

4) The fault that is present in the Williams Creek field does not extend to the land leased by Stratex Oil and Gas.

Concerning potential limitation #1: The “B” zone is known to be very pervasive throughout the basin and should be the first objective for any exploration beneath the land leased by Stratex Oil and Gas. If subsequent exploration work is done in the “C” and “D” zones, well log information can help to determine where any low porosity and permeability zones are. In addition, horizontal drilling may act to bypass any low porosity and permeability zones and link good reservoir rock together.

Concerning potential limitation #2: Water has been found to occupy some structural traps in the Williston basin and there is always the possibility that a well will hit water instead of hydrocarbons during exploration drilling. It should be noted though, that there are a significant amount of structural and stratigraphic

traps close to the land leased by Stratex Oil and Gas that hold oil and natural gas, so clearly oil and natural gas migrating updip has displaced water (due to differences in density) in many structural highs.

Concerning potential limitation #3: Anhydrite seals are high quality, ductile seals that are preventing vertical loss of hydrocarbons in many Red River fields in the Williston Basin. The ductile nature of the anhydrite strongly suggests that faulting has not breached the seal to any great degree in this area.

Concerning potential limitation #4: Seismic work is suggested to determine if the fault does extend into the land leased by Stratex Oil and Gas. It should be noted that other fault zones may exist beneath the leased land.

6. Tyler Formation Overview:

The Tyler formation in North Dakota is made up of a lower unit and an upper unit. The lower unit is composed of sandstones, siltstones, shales and thin coal beds. The upper unit is broken down into two subunits, the lower subunit is composed of argillaceous limestone and calcareous shales whereas the upper subunit is composed of calcareous shales, anhydritic limestone and anhydrite beds. The lower unit was deposited on a progradational delta plain, whereas the upper unit was deposited as an east-west trending delta front and a series of barrier islands.

The argillaceous dark gray limestones, calcareous shales and algal mats in the lower subunit of the upper Tyler indicate shallow marine and sometimes restrictive and possibly anoxic shallow marine conditions. The upper subunit of the upper Tyler contains grayish red, anhydritic lime mudstones reddish brown calcareous shales and thin beds of anhydrite. The reddish coloration and the anhydrite indicate shallow, oxygenated and highly evaporitic conditions. The well sorted, white to light gray sandstone near the base of the upper Tyler has been identified as barrier island sands and typically appear as lensoid bodies that are 10 to 15 feet thick. These sands are referred to as the "Fryburg" pay sands (Fig. 12).

Northward progradation of this system during the Pennsylvanian would suggest that additional barrier islands would be found to the north of the existing reservoirs found in central portion of Golden Valley and Billings counties and the upper portion of Stark county. The land leased by Stratex is to the south of the existing east-west trending barrier island complex that contains the Square Butte, Medora, Fryburg, Zenith Green River and Dickenson fields (Fig. 13). For this reason I would concentrate exploratory efforts on the lower unit of the Tyler formation.

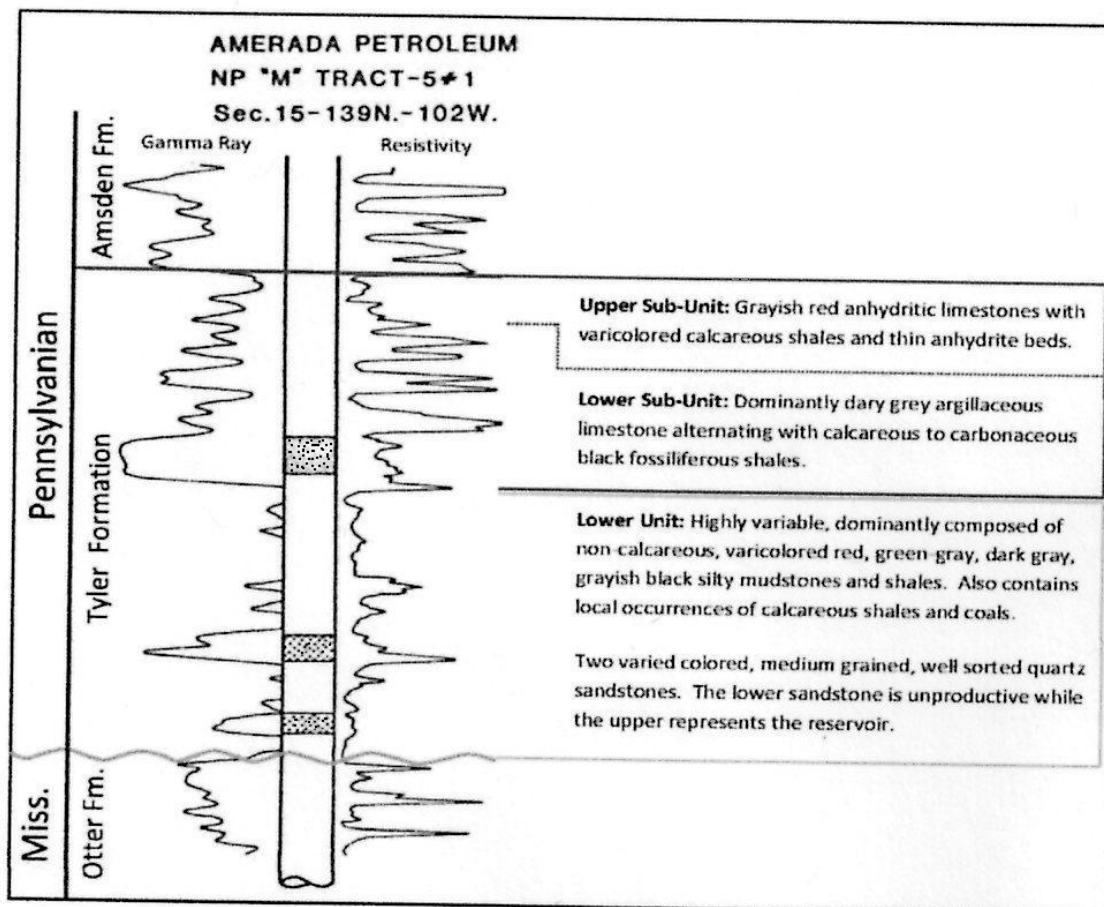


Fig.12. Typical well log for the Tyler formation of southwestern North Dakota. The top of Tyler formation beneath the land leased by Stratex Oil and Gas is approximately 7,500 to 8,000 feet below the land surface. The sandstone in the lower subunit of the upper Tyler unit is the “Fryburg” pay zone (barrier island sands). The upper sandstone layer in the lower Tyler unit is the productive “Fritz” pay zone in the Rocky Ridge field (filled in incised valley). This sand layer has the potential for oil in the land leased by Stratex Oil and Gas if an incised valley is found beneath the property. In the Rocky Ridge field, the pay sands are at a depth of approximately 7,850 feet.

Source: Nesheim and Nordeng, 2010

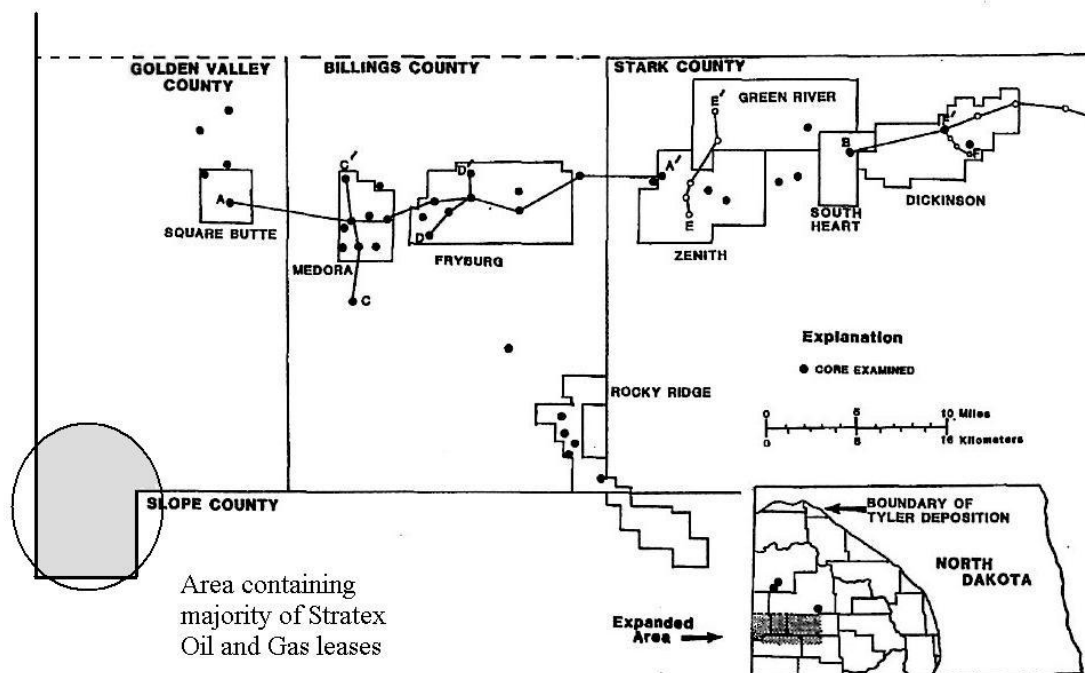


Fig.13. Map of southwestern North Dakota showing the east-west linear trend of the oil fields (Square Butte to Dickinson Fields) found in the barrier island sands, the Fryburg sands; the northwest-southeast linear Rocky Ridge field containing the in-filled incised valley sands, the Fritz sands, and the location (shaded) of the majority of the land leased by the Stratex Oil and Gas Co. It is important to note that the leased land is south of the east-west trending barrier island complex, but along the same latitude as the Rocky Ridge field, which is approximately 25 to 30 miles to the east.

Source: Sturm, 1987.

The lithology of the lower unit of the Tyler formation is highly variable due to the geologically rapid rate of change in the delta plain environment. The shales in the lower Tyler vary in color from red to orange, indicating an oxygen rich environment, to dark gray to black, indicating an anoxic environment. Organic rich muds, peat and coal landward of the barrier island complex indicate an estuarine to lagoonal environment.

The Tyler formation was deposited during a time when there was a cyclic rise and fall in the Tyler Sea (Fig. 14). The lower Tyler formation was deposited during the first two of these cycles. Each of the three cycles started with a regression of the Tyler Sea that resulted in the formation of northwest-southeast trending incised erosional valleys. These incised valleys may run above existing fault zones in the basement rock. Fault zones are zones of weakened bedrock that are more easily eroded than the surrounding rock, so often form river and stream channels. Subsequent transgression of the Tyler Sea resulted in the aggradational filling of these valleys with sands and gravels. These sands and gravels range in thickness from 10 to 50 feet. These sands are referred to as the "Fritz" pay sands. Some of the sands and gravels within these filled in erosional valleys can display poor porosity and permeability due to the presence of authigenic clay.

Within the lower unit of the Tyler formation, at the intersection of Billings, Stark and Slope counties there is a distributary channel that has been filled with medium grained, poorly to moderately sorted quartz arenites. This is the Rocky Ridge field (Figs. 13 and 15). Production in the Rocky Ridge field has been variable in the past, probably due to problems with a loss in porosity and permeability due to the presence of authigenic clay in these sands (Table 1). This field runs through T136N R100W and T137N R100W which is approximately 30 miles to the east of the land leased by Stratex Oil and Gas (mostly in T136N R105W T136N R106W and T137N R105W). A seismic study of the land leased by Stratex Oil and Gas would indicate if a similar incised valley is present in it. One indication that this may be the case is the presence of a northwest-southeast trending fault beneath the Williams Creek field (T137N R106W). As stated above, rivers and streams often follow fault zones, so the presence of this fault zone, close to the leased property, suggests that a similar incised valley may run through the leased property.

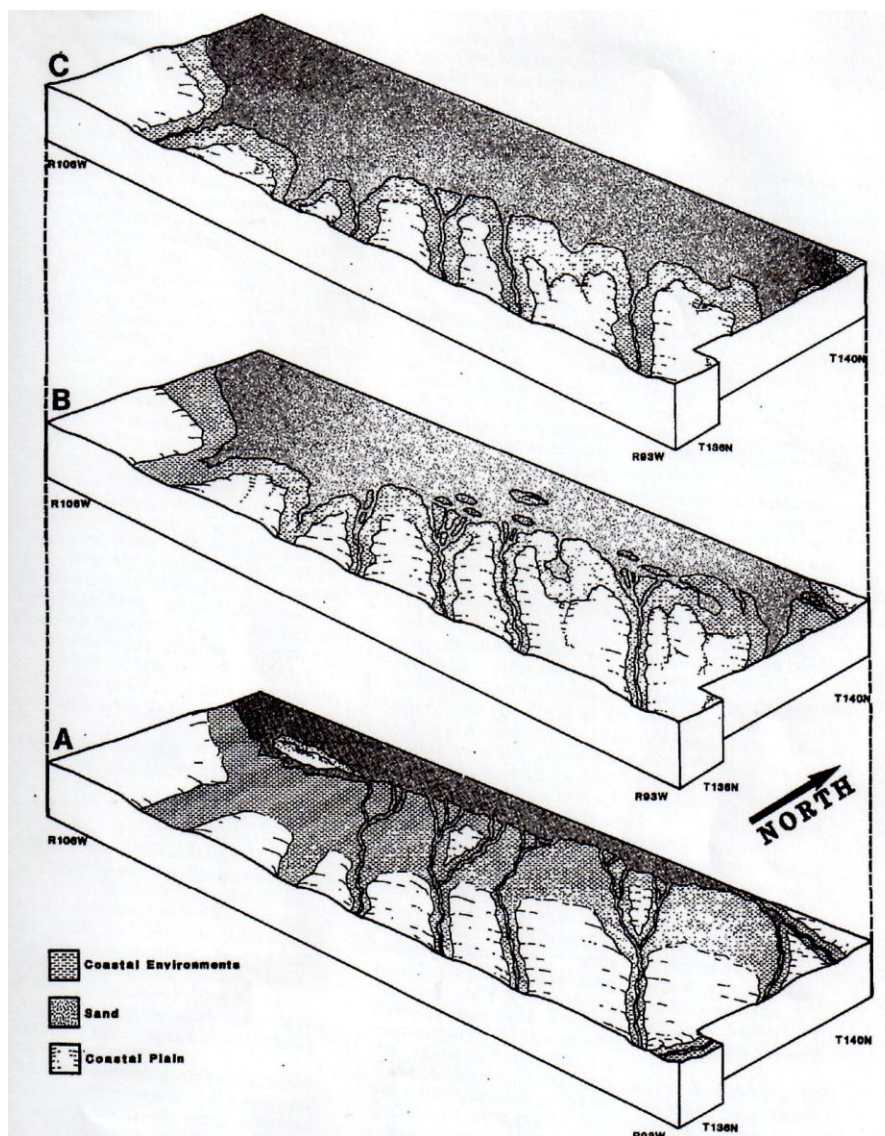


Fig. 14. Schematic representation of A) erosional downcutting of streams and rivers during the regressive phase of the Tyler Sea, B) the initial transgression of Tyler Sea with deposition of aggradational sand and coastal deposits and C) the later stages of transgression of the Tyler Sea and continued deposition of sand and coastal deposits.

Source: Sturm, 1987.

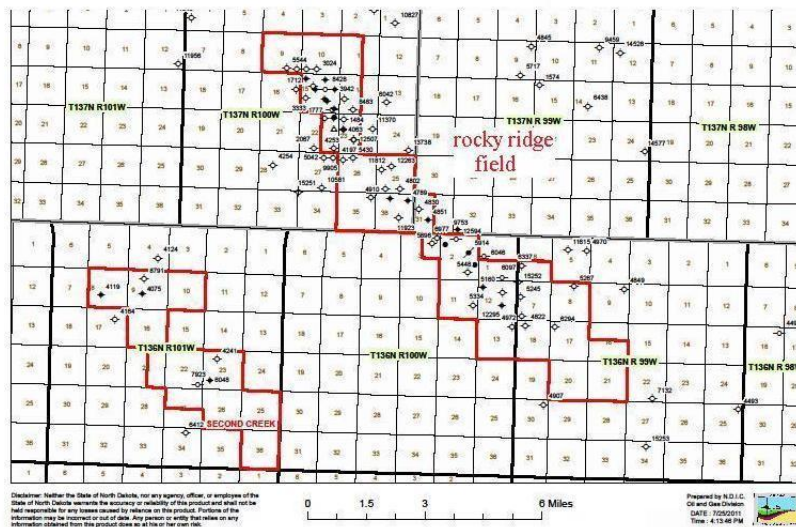


Fig 15. This is a map of the Rocky Ridge field, which is approximately 30 miles to the east of the land leased by Stratex Oil and Gas. Solid circles indicate productive wells, open circles indicate dry holes, number are NDIC well file numbers. Each section (square box) within each township and range is one square mile.

Source: NDIC oil and gas division, 2011

Table 3. Production from select wells in the Rocky Ridge field

Well File Number	Cumulative Oil Production (BBLs)
9753	919
3942	2,667
5160	24,846
5914	50,404
12295	90,267
4063	311,721

See figure 4 for well locations.

Source: NDIC oil and gas division, 2011

7. Tyler Formation Thermal Maturity

The Time-Temperature Index (TTI) is an indication of the thermal maturity of a rock unit. TTI values have been calculated for the Tyler formation in North Dakota (Fig. 16). TTI values greater than 65 indicate peak oil generation. TTI values between 65 and 15 indicate that oil generation has occurred, but this oil is generated in the early mature to mid mature oil generation window. The Tyler formation beneath the land leased by Stratex Oil and Gas has TTI values that range from 30 to 50 indicating that oil could have been generated in this formation.

Another measure of the thermal maturity of a rock formation is the resistivity value of the rock formation. Formation waters are typically saline, so when the pore space in a rock is filled with formation water the overall resistivity is low. As a rock unit thermally matures, formation waters are driven out and replaced by oil, which is a low conductor of electrical currents. When the pores are filled with oil, or if the formation has low porosity, the overall resistivity will be high. High resistivity values may indicate an oil bearing formation. Shales typically have high porosities, so resistivity values in these rock types are important indications of the possible presence, or absence of oil. Resistivity values in the Bakken Shale, which correspond to the generation of hydrocarbons, are resistivity values of 35 ohm-m and greater.

The resistivity values for the Tyler formation shales in North Dakota have been mapped (Fig. 17). The highest resistivity values are centered over McKenzie county, indicating that the highest level of thermal maturity for the Tyler formation is in that area. The resistivity values of the shales beneath the land leased by Stratex Oil and Gas are in the 35 ohm-m range. As stated above, this value was the value used to determine if the Bakken shale was mature. If this same relationship holds true for the Tyler formation, then the area leased by Stratex Oil and Gas appears to be mature. Significantly, the resistivity of the land leased by Stratex Oil and Gas is higher than the resistivity values of Billings, Stark and Slope counties, where significant quantities of oil have been produced (Figs. 15 and 17 and Table 3). This strongly suggests that the land leased by Stratex Oil and Gas is thermally mature enough to have produced hydrocarbons and may contain hydrocarbons.

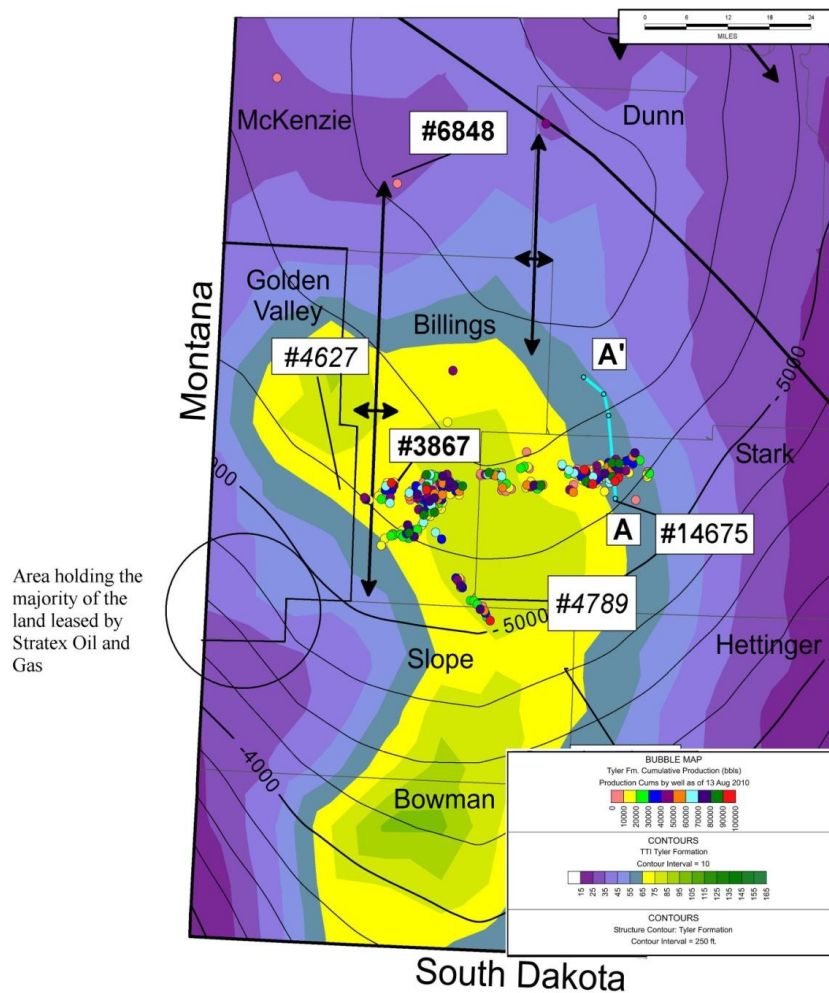


Fig. 16. Time-Temperature Index (TTI) for the Tyler formation of North Dakota. Shades of yellow and green (values greater than 65) represent the TTI values that correspond with peak oil generation. TTI values in shades of blue and purple (values between 65 and 15) represent conditions that could generate oil. A TTI value of 15 is the minimum level of maturation that could generate oil. It should be noted that highly productive oil wells (as per the bubble map of cumulative well production) are found in areas outside of the ideal TTI range of 65 and higher. The linear east-west bubbles correspond to the barrier island reservoirs whereas the northwest-southeast series of bubbles (intersection of Slope, Billings and Stark counties) correspond to the Rocky Ridge field. The land leased by Stratex Oil and Gas have TTI values that range from 30 to 50, indicating that the Tyler formation in this area is in the oil window.

Source: Nordeng and Nesheim, 2010.

Area holding the
majority of the
land leased by
Stratex Oil and
Gas

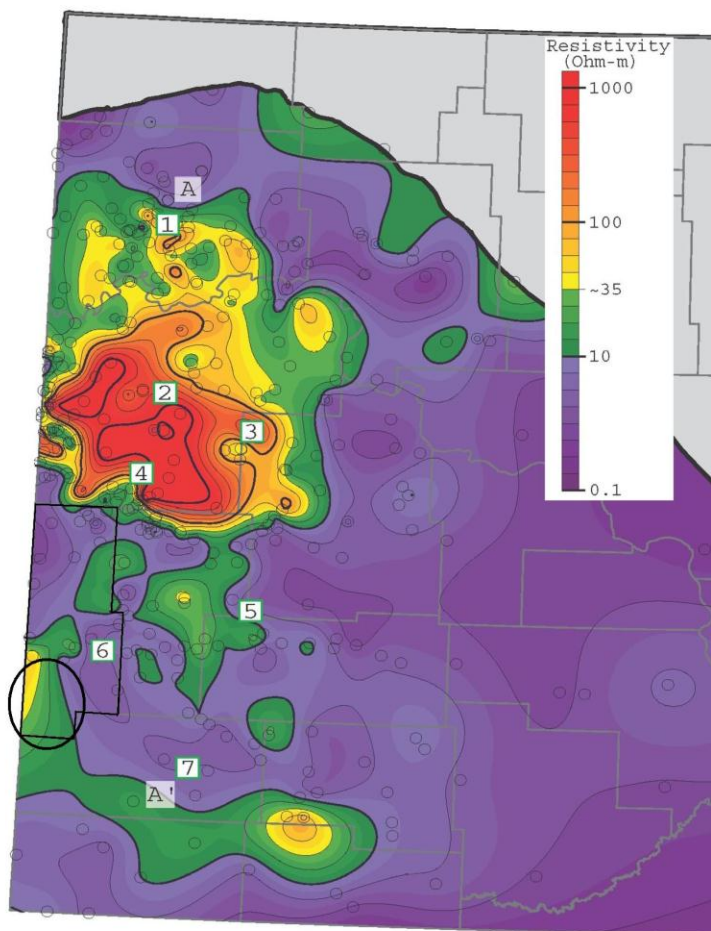


Fig. 17. The resistivity map of the Tyler formation in Northern Dakota. The resistivity values of the shales beneath the land leased by Stratex Oil and Gas are in the 35 ohm-m range. This value was the value used to determine if the Bakken shale was mature. If this relationship holds true for the Tyler formation, then this map suggests that the area leased by Stratex Oil and Gas is thermally mature and may contain oil. Interestingly, the resistivity of the shale beneath the land leased by Stratex Oil and Gas is higher than the resistivity values of Billings, Stark and Slope counties, where significant quantities of oil have been produced from the Tyler formation. This too, strongly suggests that these shales are thermally mature and may have produced oil.

Source: Nesheim and Nordeng, 2011.

8. Tyler Formation as a Source Rock

Black and dark gray shales are shales that usually formed in anoxic depositional environments. Anoxic depositional environments are crucial to the preservation of the organic matter that will eventually become kerogen and ultimately natural gas and oil in thermally mature formations. These black and dark gray shales are the source rocks in the Tyler formation. A modified Van Krevelen diagram is used to classify the kerogen in the source rock. Kerogen data from two wells, close to the land leased by Stratex Oil and Gas, has been published (Fig. 18). These two wells are the Government Taylor A-1 well (NDIC #4627) taken from the Square Butte field in Golden Valley county and the State of North Dakota #41-36 well (NDIC #4789) taken from the Rocky Ridge field in Billings county. Kerogen from both wells is a mixture of marine derived (Type I and II) and terrestrial derived (Type III) kerogen. Type I and II kerogen is more likely to produce oil upon thermal maturation, whereas Type III kerogen is more likely to produce natural gas upon thermal maturation. The mixture of both marine and terrestrial derived kerogen in these two wells is consistent with the fact that the depositional environment in these two areas was a coastal to deltaic environment that was affected by a cyclic change in sea level.

Good source rocks usually contain over 1.0% total organic carbon (TOC). TOC values for the Tyler formation for the two wells mentioned above, the Government Taylor A-1 well and the State of North Dakota #41-36 well, are as high as 10%. A kerogen quality diagram constructed by plotting TOC against the mass of existing hydrocarbons (S1) and the mass of potential hydrocarbons (S2) for these two wells indicates that a significant amount of the kerogen from these two wells plot in the good to excellent range (Fig. 19). The Tyler formation source rocks from the State of

North Dakota #41-36 well produced 257,158 barrels of oil and 5,506 mcf of natural gas. This is a good confirmation of the validity of the modified Van Krevelen diagram and the kerogen quality diagram for the Tyler formation in North Dakota, discussed above.

The lower Tyler formation ranges from 70 to 100 feet thick where Stratex Oil and Gas has leased their land (Fig. 20). As discussed above, the lithology of the lower unit of the Tyler formation is variable and contains silts, both red and black shale, sandstone, limestone and coal.

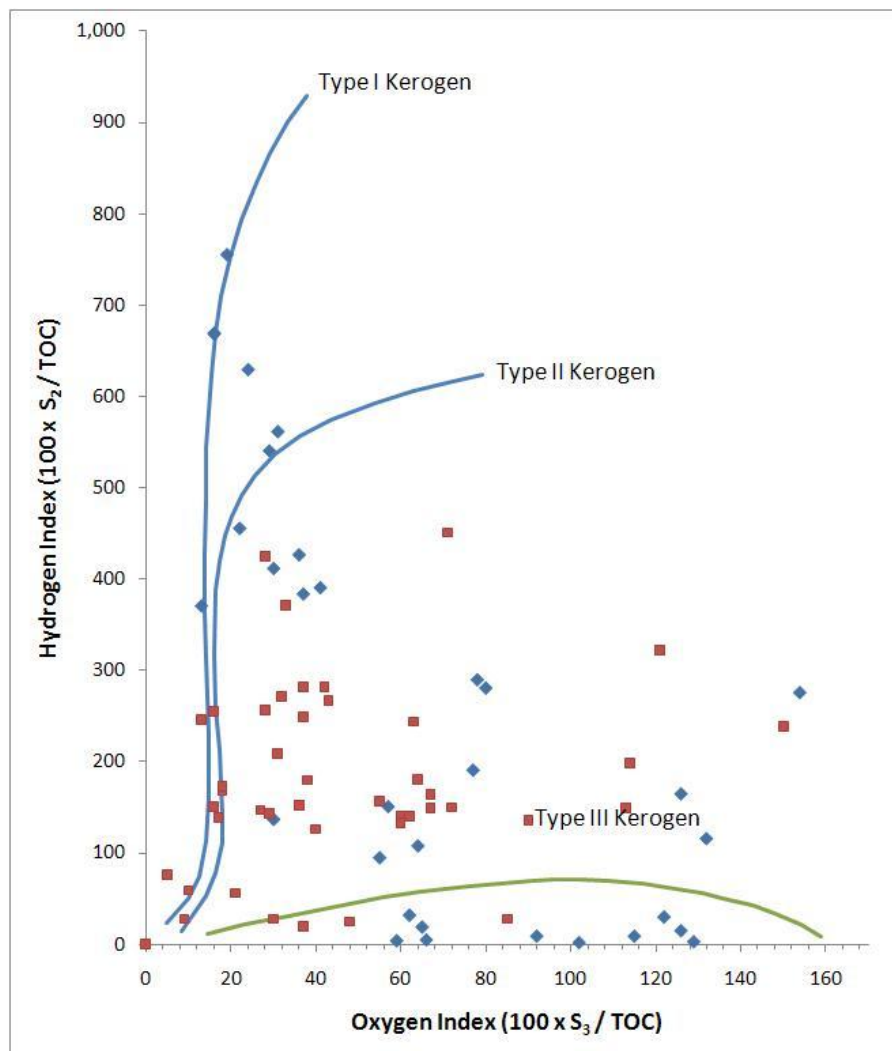


Fig. 18. A modified Van Krevelen diagram using two wells close to the land leased by Stratex Oil and Gas. The data derived from the Government Taylor A-1 well is represented by blue diamonds, the data from the State of North Dakota #41-36 well is represented by red squares. Kerogen from both samples is a mixture of marine derived (Type I and II) and terrestrial derived (Type III) kerogen.

Source: Nordeng and Nesheim, 2010.

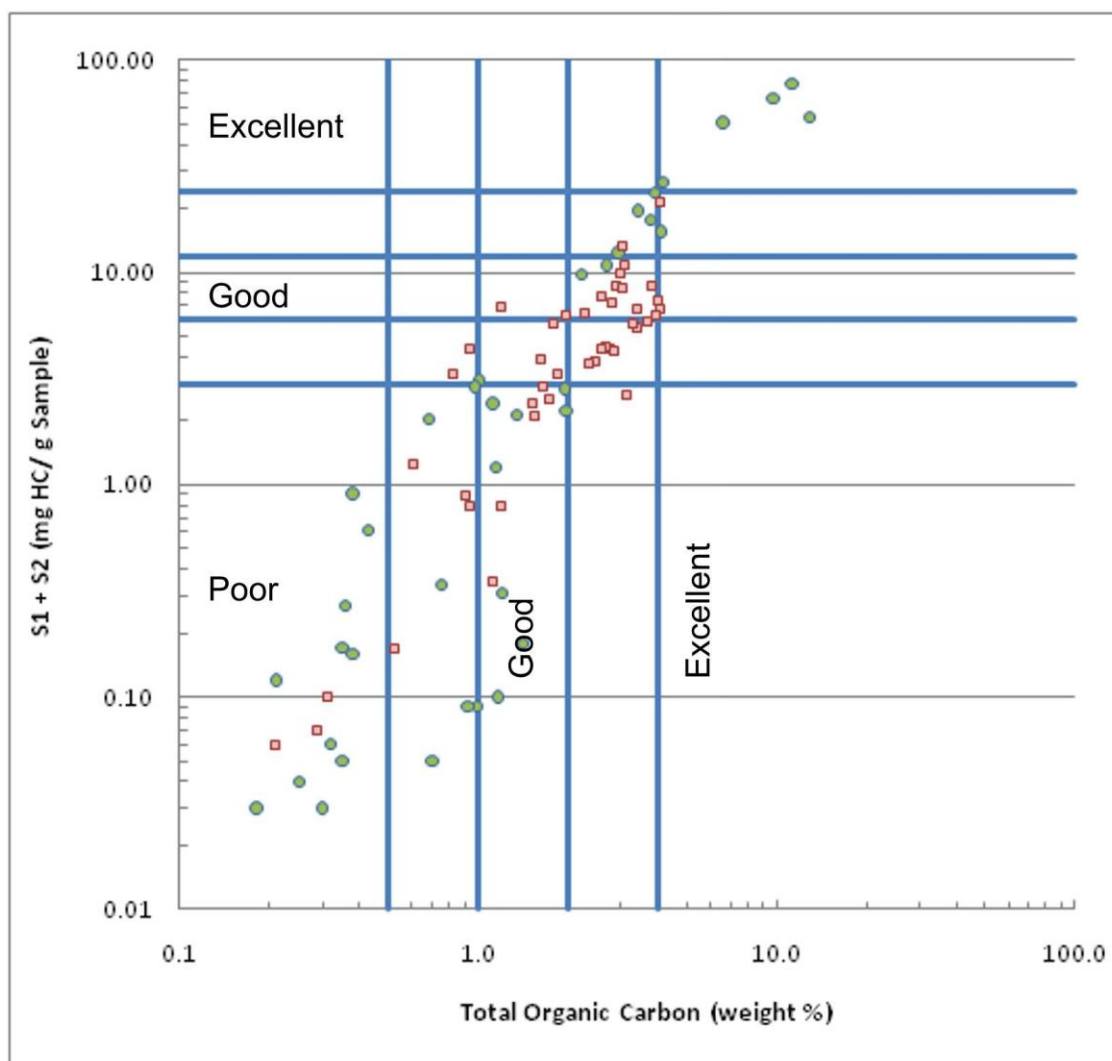


Fig. 19. A Tyler formation kerogen quality diagram constructed by plotting total organic carbon (TOC) against the mass of existing hydrocarbons in the sample (S1) and potential hydrocarbons in the sample (S2). The data from the samples from the Government Taylor A-1 well are represented by green circles; the data from the samples from the State of North Dakota #41-36 well are represented by red squares. Most of the kerogen from these two wells plot in the good to excellent range.

Source: Nordeng and Nesheim, 2010.

Area holding the
majority of the land
leased by Stratex
Oil and Gas

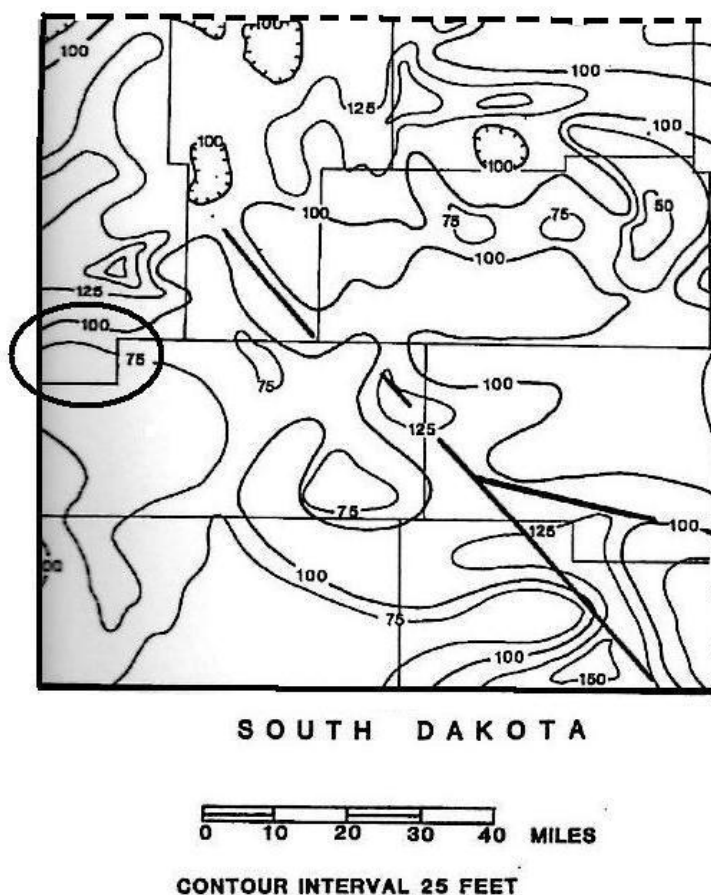


Fig. 20. Isopach map of the lower unit of the Tyler formation in Southwestern North Dakota. The thickness of the lower Tyler formation in the majority of the land leased by Stratex Oil and Gas ranges from approximately 70 to 100 feet. The shale thickens northward (basinward). The dark lines indicate areas where the Tyler formation is thicker. The dark line just to the northeast of the land leased by Stratex Oil and Gas is the location of the incised valley that was filled with Tyler sand. This is the location of the Rocky Ridge field (Figs. 13 and 15). This field is approximately 25 miles to the east of the land leased by Stratex Oil and Gas.

Source: Strum, 1987.

Many of the well logs surrounding the land leased by Stratex Oil and Gas were reviewed to determine if they contained organic rich black shales. A significant number of the wells did (Table 4). Given the thickness of the lower Tyler formation in the area leased by Stratex Oil and Gas, there is a very good possibility that there is a significant amount of organic rich source rocks beneath their land.

Table 4. Wells containing dark gray to black shale (Tyler formation) near the land leased by Stratex Oil and Gas

Well File Number	Township	Range	Approximate Cumulative Thickness
9883	135N	106W	80
10443	138N	104W	30
7842	137N	103W	35
6361	137N	104W	80
9814	136N	104W	60 (w/some coal)

Source: NDIC oil and gas division, 2011

9. Heath Formation as a Source Rock

The Heath formation in southwestern North Dakota lies directly below the Tyler formation in many areas. The contact between the Heath formation and the overlying Tyler formation is erosional. Therefore, the Heath formation may be missing in some areas of southwestern North Dakota due to erosion. The Heath formation is described as a predominantly light gray to brown to black limestone, often cryptocrystalline and argillaceous, interbedded with dark gray to black shale. Many of the well logs surrounding the land leased by Stratex Oil and Gas were reviewed to determine if they contained the organic rich black limestone of the Heath formation. Several of these

wells did (Table 5).

Both Maughan (1984) and Kranzler (1966) have identified the dark gray to brown to black limestone of the Heath formation as the source of the oil that is found in the overlying sandstones within the Tyler formation in Montana. The Heath formation may also be a hydrocarbon source rock for the Tyler formation sandstone in southwestern North Dakota.

Table 5. Wells containing dark brown to dark gray to black limestone (Heath formation) near the land leased by Stratex Oil and Gas

Well File Number	Township	Range	Approximate Cumulative Thickness
10434	138N	104W	30
9814	136N	104W	40

Source: NDIC oil and gas division, 2011

10. Summary

The Tyler formation of North Dakota has produced over 83 million barrels of oil (as of 2010). Most of this oil has been extracted from marine delta front and barrier island sands in the upper Tyler formation and from infilling sand in incised valleys that were created during low sea stands in the lower Tyler formation.

Although there is still a limited amount of published data concerning the Tyler formation under the land leased by Stratex Oil and Gas, it appears that many of the conditions needed for hydrocarbon production are in place. These include...

1) Suitably thick (up to 100 ft) potential source rocks, the Tyler formation black shales and the Heath formation black limestones, beneath the leased land.

2) The presence of high quality Type I and Type II oil prone kerogen, as well as the presence of Type III kerogen very close to the leased land.

3) Evidence that the Tyler formation beneath the leased land has been heated up to the degree that hydrocarbon generation can occur. The Tyler formation in southwestern North Dakota typically has produced oil with API values that average 34.6 (Nordeng, 2011) this is consistent with moderate levels of thermal maturity.

4) In addition to the presence of shale, anhydrite is also present in the Tyler formation. Both anhydrite and shale can form effective cap rocks, which will prevent the loss of hydrocarbons through vertical migration. The Tyler formation is known to be self sourced, which is a good indication that the shales and anhydrites are effective caprocks for this formation.

5) The Tyler formation has several different types of sand lenses. The most probable type of sand lens that may be found beneath the leased land is an aggradational sand that has infilled an incised stream. Seismic work can help to determine if such an incised stream exists beneath the leased land.

6) Potentially productive zones of the Tyler formation beneath the land leased by Stratex Oil and gas will be found at depths of approximately 7,500 to 7,800 feet.

7) In North Dakota, wells are drilled on spacing units of various sizes. A spacing unit is the area within which all mineral owners share the revenues from a particular well, from a particular producing interval (field and pool). Many vertical wells in North Dakota were historically drilled on 40 acre spacing units. Horizontal wells are drilled on larger spacing units, such as 640 and 1280 acre spacing units (640 acres per square mile), since they drain larger areas of the reservoir. The North Dakota Industrial Commission (NDIC) is the state authority that determines the spacing unit. If a particular spacing unit is highly productive, several wells can be drilled on that spacing unit, subject to the approval of the NDIC.

Stratex Oil and Gas has leased approximately 15 sections in township and range 136N 106W. Each of these sections is 640 acres (1 square mile). If the NDIC approves a 640 acre spacing for a horizontal well, then Stratex Oil and Gas will have 15 areas in that township and range where they can drill wells. If a well comes on line and is very productive, Stratex Oil and Gas may ask for approval from the NDIC to drill several more wells in that 640 acre section.

Stratex Oil and Gas has 22,000 acres, this is equal to 34 separate 640 acre spacing units.

Potential limitations to economic hydrocarbon production from the Tyler formation beneath the leased land include...

1) The presence of more red shale than black shale beneath the leased land indicating that the depositional environment was oxidizing rather than anoxic.

2) The lack of sand lenses beneath the leased land which would act as reservoirs.

3) Poor porosity and permeability within any existing sandstone as a result of the presence of authigenic clay.

4) The absence of the Heath formation, due to erosion, beneath the leased land.

Concerning potential limitation #1: During the preparation of this report, it was found that multiple well logs recorded the presence of dark gray to black shales in the Tyler formation adjacent to the leased land. This strongly suggests that organic black shales are present beneath the leased land as well. Further work needs to be done to better define the lateral extent and thickness of any black shales beneath the leased land.

Concerning potential limitation #2: The leased land is south of the east-west trending delta front and barrier island complex that contains the "Fryburg" pay sands. A more probable type of sand lens would be similar to the "Fritz" pay sands that are found

in the infilled incised valley beneath the Rocky Ridge field at depths of approximately 7,800 feet. Seismic work is recommended as a means of determining if such incised valleys are present beneath the leased land. As discussed above, the presence of a northwest-southeast striking fault beneath the Williams Creek field (T137N R106W) may indicate that an erosional valley may be present beneath the leased land. If sand lenses are not present beneath the leased land, it may be possible to successfully produce hydrocarbons from the Tyler formation shales using unconventional means (horizontal drilling and fracing) which has been proven to be successful in the Bakken shales.

Concerning potential limitation 3: If low porosity and permeability sands are present beneath the leased land, it may be possible to successfully produce hydrocarbons from them using unconventional means (horizontal drilling and fracing). In addition, low permeability zones may act to compartmentalize elongate sandstone reservoirs. Horizontal drilling would also work to bypass any low permeability zones acting as barriers between porous and productive reservoirs.

Concerning potential limitation 4: If the Heath Dark gray to black limestones are absent beneath the leased land, there is still the possibility that sufficient quantities of Tyler formation black shales are in place as a source rock.

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12. Supplemental report to Stratex Oil and Gas concerning the Hydrocarbon Potential beneath Stratex leased land in Golden Valley County, North Dakota

In the initial report concerning the hydrocarbon potential of the Red River formation beneath the land leased by Stratex Oil and Gas, I indicated that seismic work (by others) showed that there were several faults that ran through the Williams Creek field that have a high probability of being beneath Stratex leased land to the southeast of the Williams Creek field (Figs. 1 and 2).

Lineaments on the Earth's surface often form as a result of basement faulting (Fig. 3). Lineaments often have the same, or similar orientation at the Earth's surface as the basement faults. These lineaments may be laterally offset from the basement faults, so the surface location of the lineaments may be offset from the true location of the basement fault. Lineament maps are constructed using satellite imagery, aerial imagery, historical data or from elevation maps. Lineament maps constructed from data taken from different sources often display different lineament features. This is usually a function of the scale from which the data was collected, satellite imagery versus aerial imagery, for example. Two such lineament maps are presented below (Figs. 4 and 5). What is immediately apparent is the fact that lineaments, present on both the LANDSAT and shaded relief image lineament maps, are roughly parallel to the axis of the fault that runs through the Williams Creek field (Figs. 1, 2, 4 and 5). This strongly suggests that these faults extend southeastward, beneath the land leased by Stratex Oil and Gas.

The Winnipeg shale (source rock) is vertically below the Red River formation and migration of oil from the Winnipeg into the Red River is thought to have occurred through fracture and fault zones. The faults and the fracture zones associated with these faults act as pathways for the vertical migration of oil to the Williams Creek, Bull Run and Cash fields.

Anderson (2011) indicated that productive wells in North Dakota were closer to individual lineaments and to zones with high lineament density. The Cash field, to the south of the land leased by Stratex Oil and Gas, is located in a high lineament density zone that extends northward into the land leased by Stratex Oil and Gas (Fig. 6). This high lineament density zone may be an attractive exploration target for Red River horizontal drilling.

Concerning the Tyler formation in this area: Fault zones are zones of weakened bedrock that often turn into stream and river beds as a result of the relative ease that these zones can be eroded by flowing water. This fault zone has the potential for being an incised valley (additional seismic work will confirm) that may be infilled with sands and gravels as was found in the Rocky Ridge field to the east (Fig. 7). If an incised valley is not present beneath the land leased by Stratex Oil and Gas, the zone of high lineament density may be an attractive target for horizontal drilling and fracking in the Tyler as is done in the Bakken shale (Fig. 6). The high lineament density may enhance the permeability of the Tyler black shales and improve the productivity of any horizontal wells drilled in the area.

13. Summary

1) Lineament maps, constructed from data obtained from both LANDSAT and shaded relief imagery, strongly suggest that the faults that pass through the Williams Creek field also pass through the land leased by Stratex Oil and Gas.

2) Fault and fracture zones act as conduits for hydrocarbon flow from the underlying Winnipeg source rock into the Red River reservoir rock. Potential Red River targets beneath the leased land are structural highs and horizontal drilling in porous zones ("B" or "C" porous zones).

3) High lineament density zones have been shown to enhance the production of wells throughout North Dakota. The presence of a high density lineament zone beneath the land leased by Stratex Oil and Gas suggests that any productive well in this area may be enhanced by the lineament as well.

4) The high number of parallel lineaments in this area may indicate that additional faults, with the same orientation as the fault that runs through the Williams Creek field, may be present beneath the land leased by Stratex Oil and Gas. Seismic work is needed to confirm if this is true.

5) The fault zone that runs through the Stratex leased land may have become an incised valley during the time that the Tyler formation was being deposited. If this is the case (seismic work will be needed to determine if an incised valley exists in this area) then it would be a good target for Tyler sand reservoirs.

6) The high lineament density zone that runs through the property leased by Stratex Oil and Gas may be a good location for a horizontal drilling program for the Tyler formation black shales.

14. References

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Sturm, S.D., 1987, Depositional History and Cyclity in the Tyler Formation (Pennsylvanian) Southwestern North Dakota, in Williston Basin: An Anatomy of a Cratonic Province.

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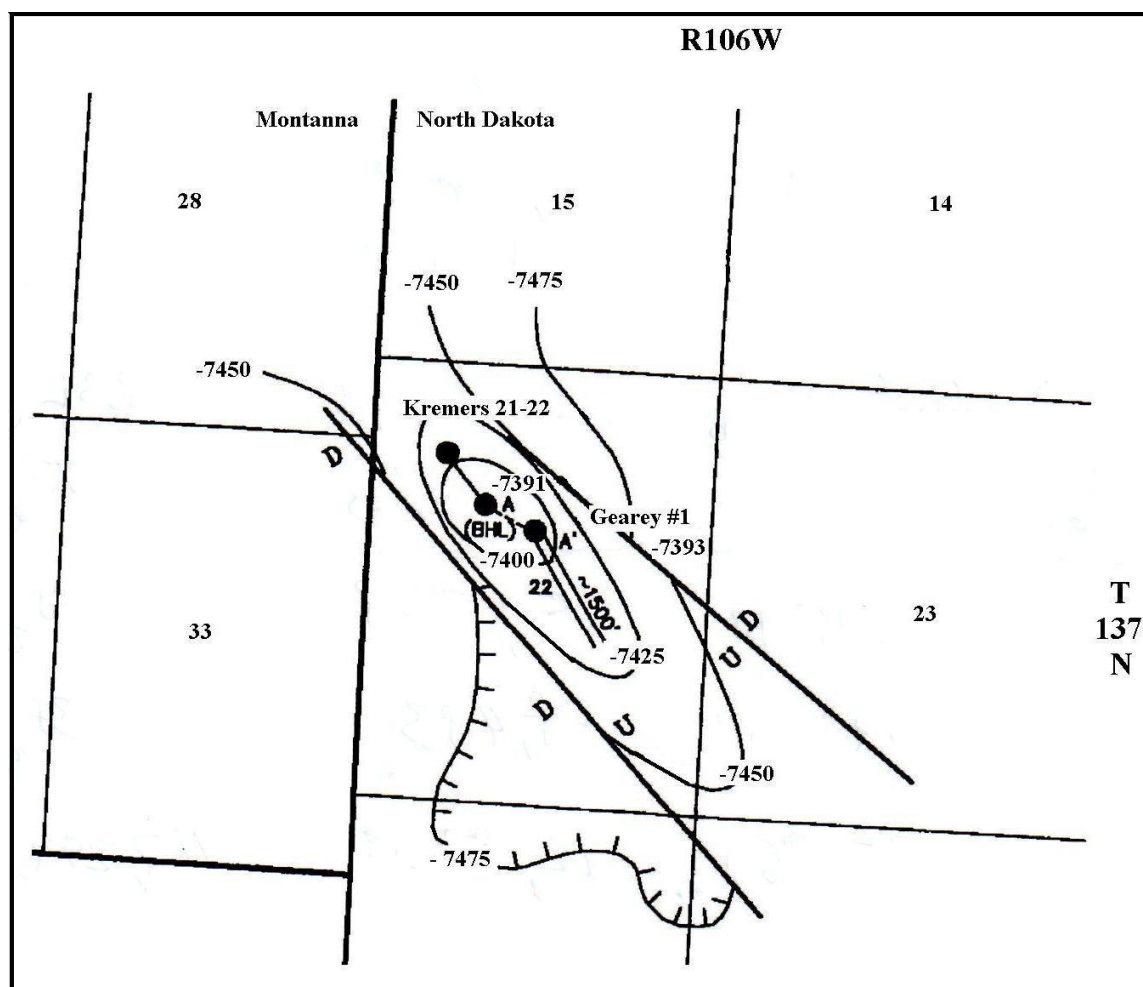


Fig. 1. The Williams Creek Oil field, located just to the north and west of the land leased by Stratex Oil and Gas. This is a structural contour map of the top of the Red River formation (in feet below sea level) indicating a structural high, in section 22, on an upthrown fault block (horst). Solid circle indicates producing wells. The Kremers 21-22 and Gearey #1 wells were productive from the Red River "B" porosity zone.

Source: NDIC oil and gas division, 2011.

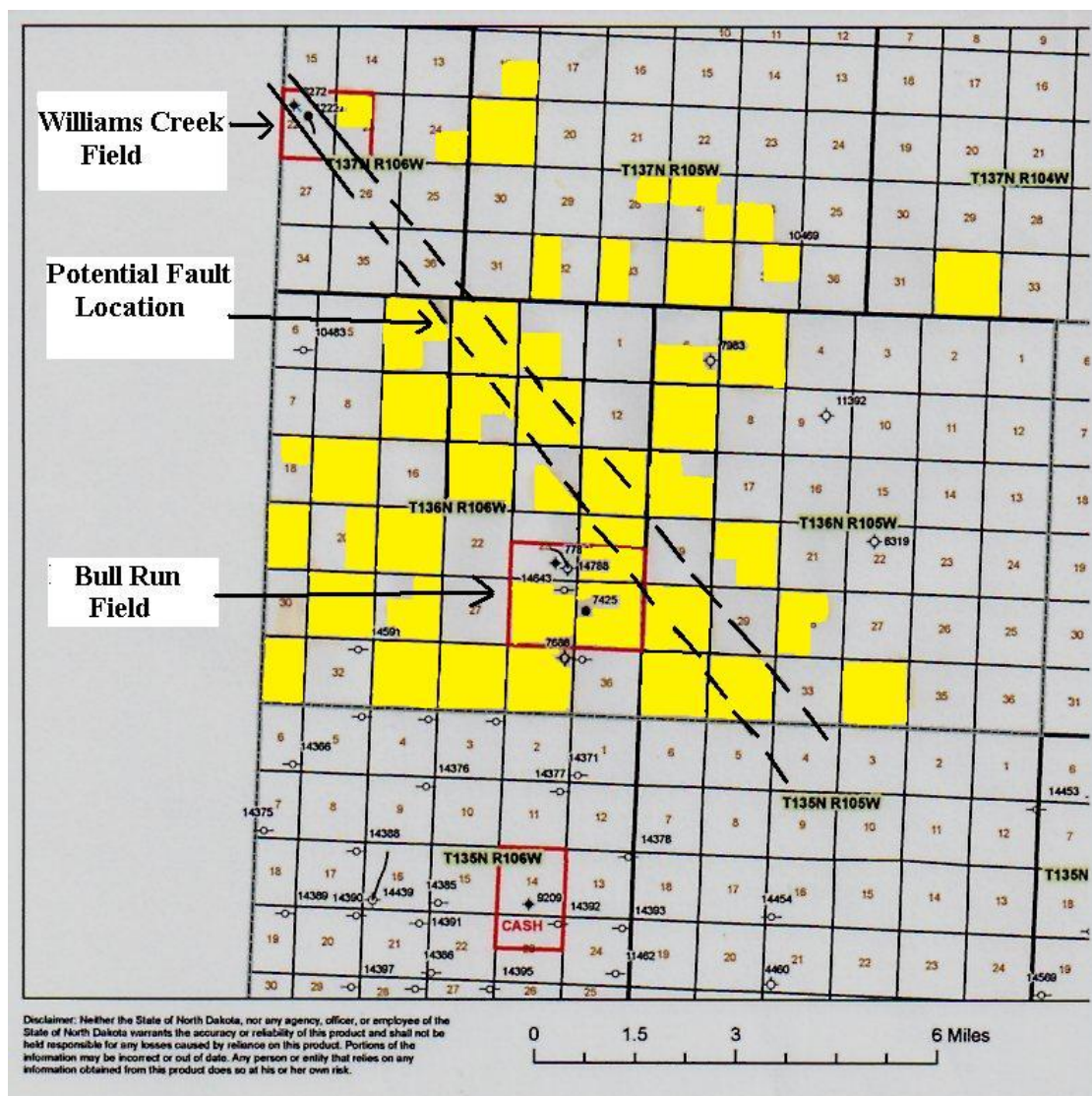


Fig. 2. The land leased by Stratex Oil and Gas is highlighted in yellow. If the fault in the Williams Creek field (Fig. 1) extends to the southeast, through the land leased by Stratex Oil and Gas, then this land may be similar to the land in Bowman County where horizontal wells through the “B” zone are productive. If a fault is present, horizontal drilling with a northeast azimuth will run through the fault and fracture zone, perpendicular to the fracture zone, increasing the amount of oil available to the wells.

Source: Modified from NDIC oil and gas division, 2011.

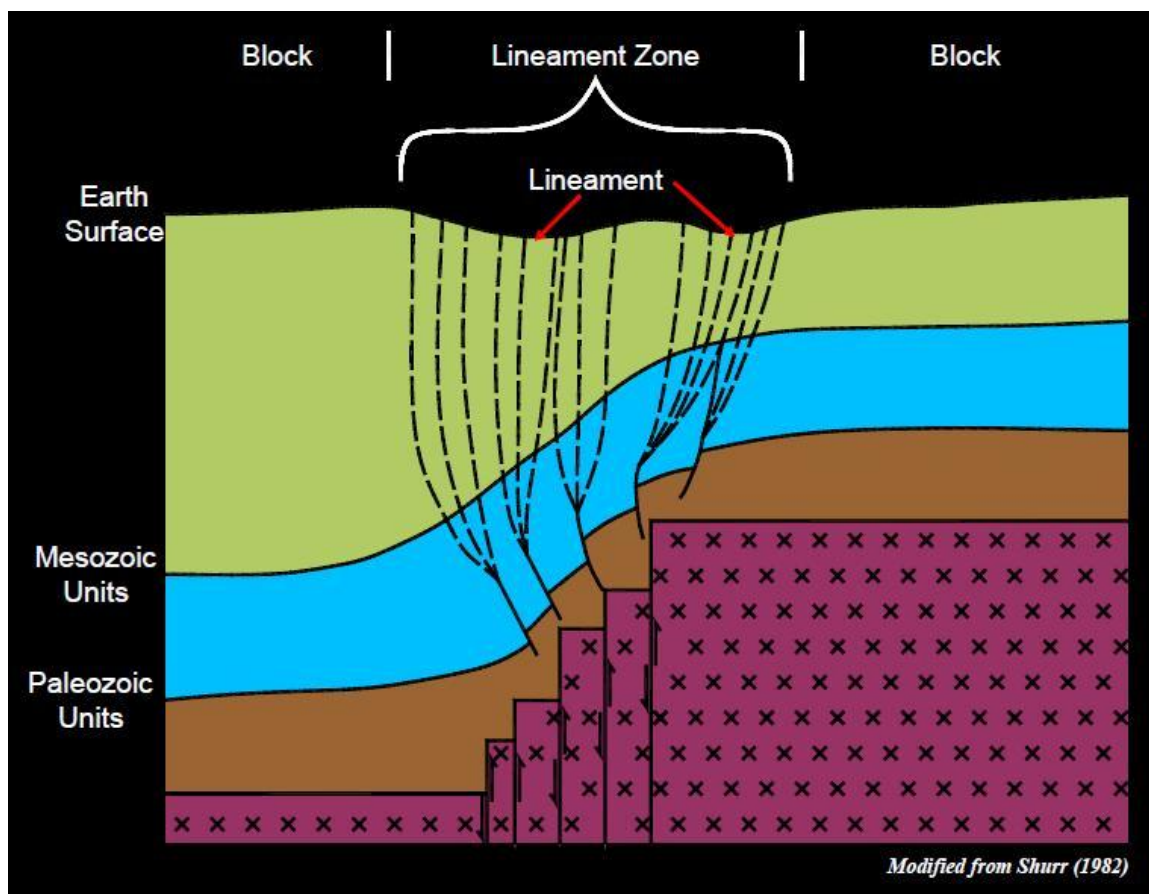


Fig. 3. Lineaments may extend upward from basement faults and have the same or similar orientation at the earth's surface as the basement faults. The lineaments may be laterally offset from the basement faults so the surface location of the lineaments may be offset from the true location of the basement fault.

Source: Anderson, 2011.

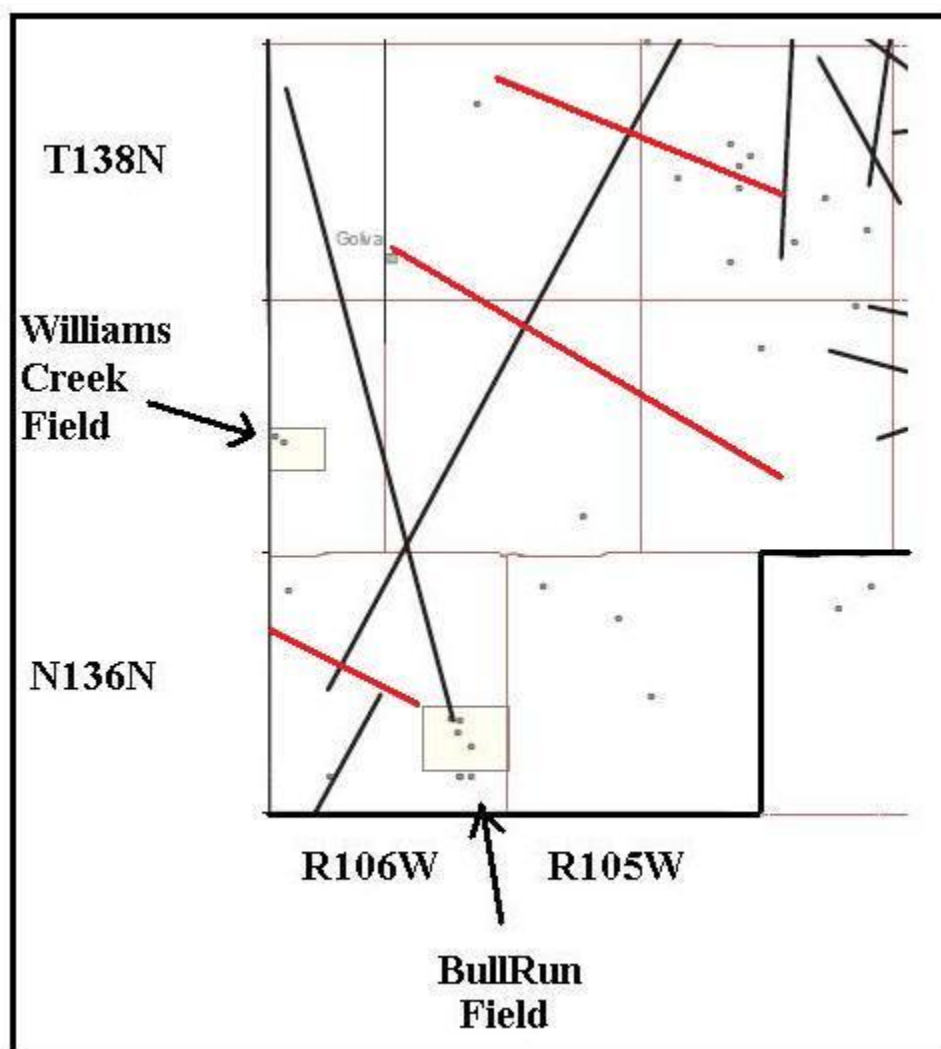


Fig. 4. Lineament map constructed from data obtained from LANDSAT-7 Enhanced Thematic Mapper. The lineaments highlighted in red have the same orientation as the faults that runs through the Williams Creek field and may have formed as a result of this faulting (Figs. 1 and 2).

Source: Anderson, 2011.

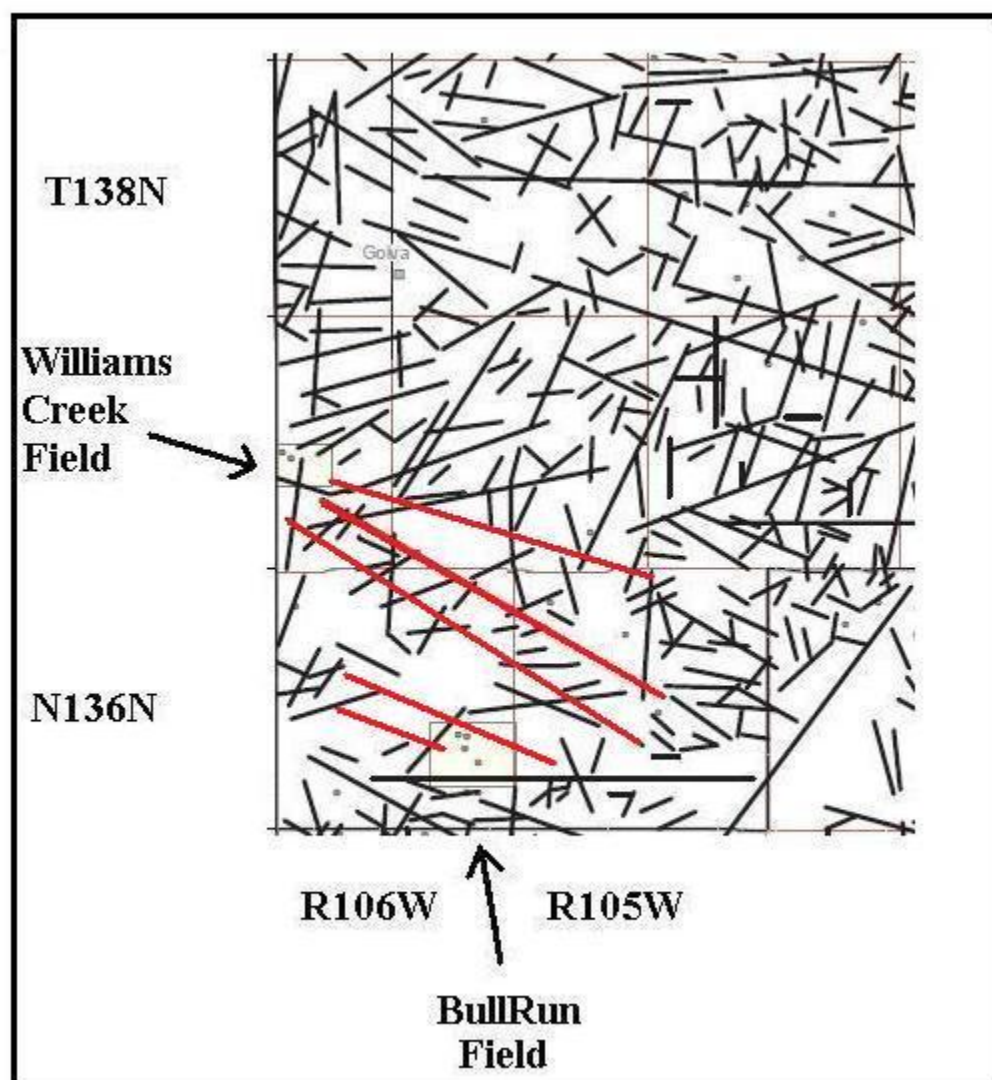
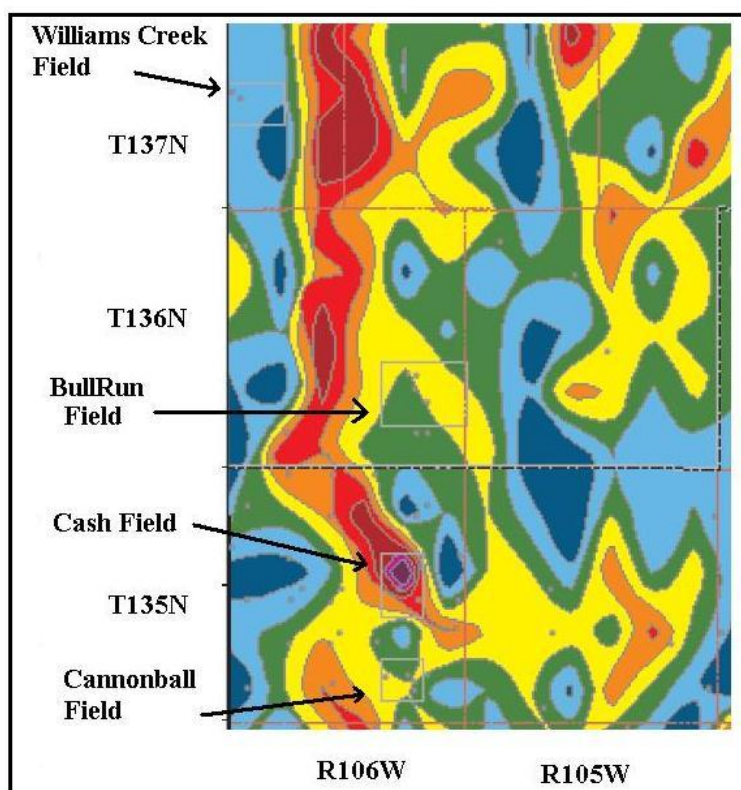


Fig. 5. Lineaments mapped from USGS National Elevation Data (NED) shaded relief image sets with vertical exaggeration of 9X. The lineaments highlighted in red have the same orientation as the faults that runs through the Williams Creek field (Figs. 1 and 2). Their close proximity to the Williams Creek field strongly suggests that they were formed by the fault that runs through the field.

Source: Anderson, 2011.



Lineament Density Class	Lineament Density Range (Lpsm)	Map Area Covered (mi ²)
Class-I	8.5 – 9.5	21
Class-II	7.6 – 8.5	35
Class-III	6.6 – 7.6	110
Class-IV	5.7 – 6.6	305
Class-V	4.7 – 5.7	804
Class-VI	3.8 – 4.7	191
Class-VII	2.8 – 3.8	2,083
Class-VIII	1.9 – 2.8	1,677
Class-IX	0 – 1.9	584
		Total = 7,110

Lpsm: Total of all lineament lengths (mi)
per square mile

Fig. 6. Lineament density map for the land leased by Stratex Oil and Gas. The Cash field was productive from a zone with high lineament density that extends northward into Stratex land.

Source: Anderson, 2011.

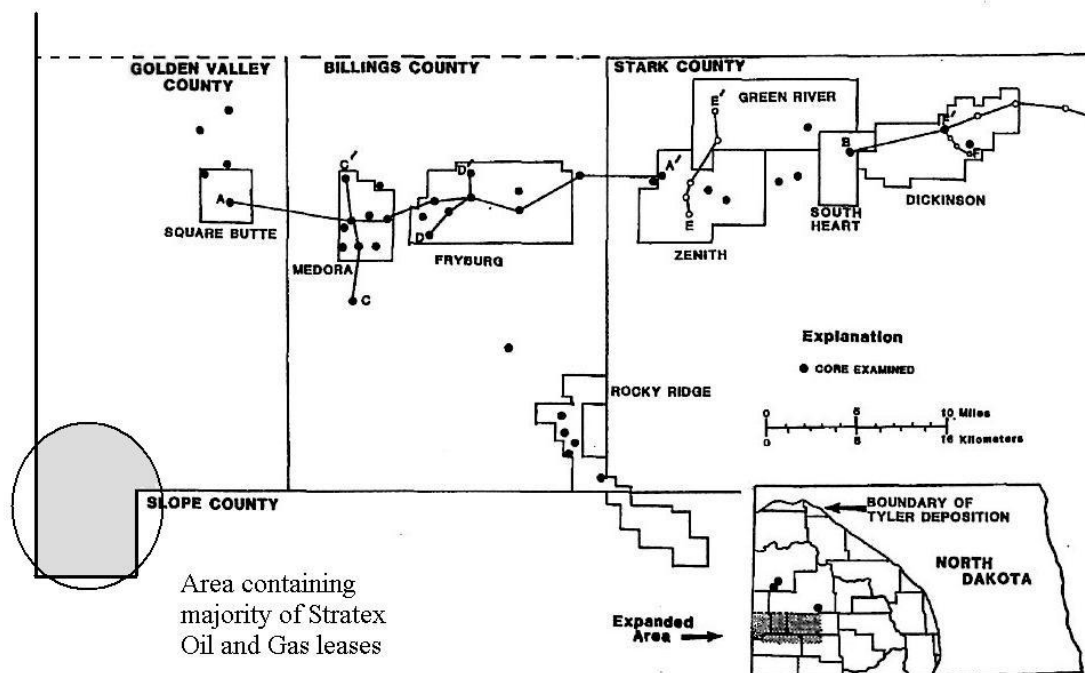


Fig. 7. Map of southwestern North Dakota showing the northwest-southeast linear Rocky Ridge field containing the in-filled incised valley sands, the Fritz sands, and the location (shaded) of the majority of the land leased by the Stratex Oil and Gas Co. The Rocky Ridge field is approximately 25 to 30 miles to the east of the Stratex leased land.

Source: Sturm, 1987.