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## Depositional Environment Of The Top Four Members Of The Three Forks Formation In Northwestern North Dakota, Williston Basin And Its Relation To Variables In Oil Production

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DEPOSITIONAL ENVIRONMENT OF THE TOP FOUR MEMBERS OF THE THREE  
FORKS FORMATION IN NORTHWESTERN NORTH DAKOTA, WILLISTON  
BASIN AND ITS RELATION TO VARIABLES IN OIL PRODUCTION

by

Kilynn Fay Sandberg  
Bachelor of Science, North Dakota State University, 2014

A Thesis  
Submitted to the Graduate Faculty  
of the  
University of North Dakota  
in partial fulfillment of the requirements

for the degree of  
Master of Science  
Grand Forks, North Dakota

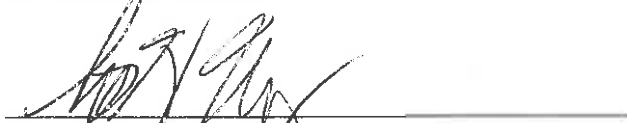
May  
2016

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This thesis submitted by Kilynn Sandberg in partial fulfillment of the requirements for the Degree of Master of Science from the University of North Dakota, has been read by the Faculty Advisory Committee under whom the work has been done and is hereby approved.



Dr. Richard LeFever



Dr. Stephan Nordeng

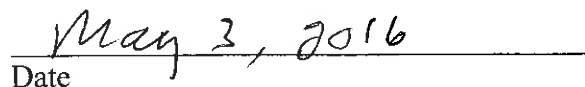


Dr. Will Gosnold

This thesis is being submitted by the appointed advisory committee as having met all of the requirements of the School of Graduate Studies at the University of North Dakota and is hereby approved.



Wayne Swisher  
Dean of the School of Graduate Studies



Date

Title Depositional Environment of the Top Four Members of the Three Forks Formation in Northwestern North Dakota, Williston Basin and its Relation to Variables in Oil Production

Department Geology

Degree Master of Science

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## ABSTRACT

The Three Forks Formation (Upper Devonian) is present in the subsurface in the western two-third of North Dakota and conformably overlies the Birdbear Formation and underlies the Bakken Formation. The Formation reaches its maximum thickness of 270 feet (82 meters) in the center of the basin.

The Three Forks Formation is composed of dolostone, mud, fine sand, and limestone. This research included a detailed study of core samples and some petrographic analysis of thin sections. Six lithologic units were recognized in the subsurface including: laminated beds, massive mudstone, massive sandstone, brecciated beds, mottled beds, and massive limestone.

Groundwater controlled dolomitization caused magnesium to replace calcium resulting in the large amount of dolomite. This is common in sabkha environments. Pyrite, derived from sulphate reducing bacteria in hypersaline waters, contributed to the colors and the patterns in the dolomite.

Six fining upward sequences occur in the formation and constitute the six members of the Three Forks Formation. These members involved fluctuating waters depositing sandy dolomite and mud in alternating layers. Longer periods of mud deposits occur due to lack of sand supply. Overall the environment was likely an evaporite tidal flat-sabkha with hypersaline warm waters.

The Three Forks is economically important formation due to oil production. Different variables such as natural fracture zone, oil saturation, diagenesis, and pyrite concentration can contribute to locating more profitable locations. The areas recommended for drilling based on these factors include member 6 of Divide County, northeastern McKenzie County and southeastern Williams.

# **CHAPTER I**

## **INTRODUCTION**

### **General**

The Three Forks Formation was deposited in the Late Devonian, and is present in the subsurface of North Dakota, Montana, South Dakota, and Canada. It conformably lies over the Birdbear Formation and unconformably underlies the Bakken Formation (Figure 1). The maximum thickness is approximately 270 feet (82 meters) in western North Dakota. (J. LeFever, LeFever, & Nordeng, 2011) It consists of green, orange, brown, and red dolostones, sandstones, mudstones, and limestones.

The nomenclature for the formation has multiple interpretations on how the Three Forks members should be divided (Figure 2). Christopher (1961) divided the Torquay, the Canadian equivalent of the Three Forks Formation, into six members based on lithology and well logs. Dumonceaux (1984) took Christopher's (1961) divisions and reorganized it into three members below an unconformity cap. Bottjer et al. (2011) altered the nomenclature of Dumonceaux (1984) by adding the Pronghorn from LeFever et al. (2010). The common informal division is often used in the area of petroleum companies. In this study, the six unit division proposed by LeFever et al. (2010) was used (Figure 3).

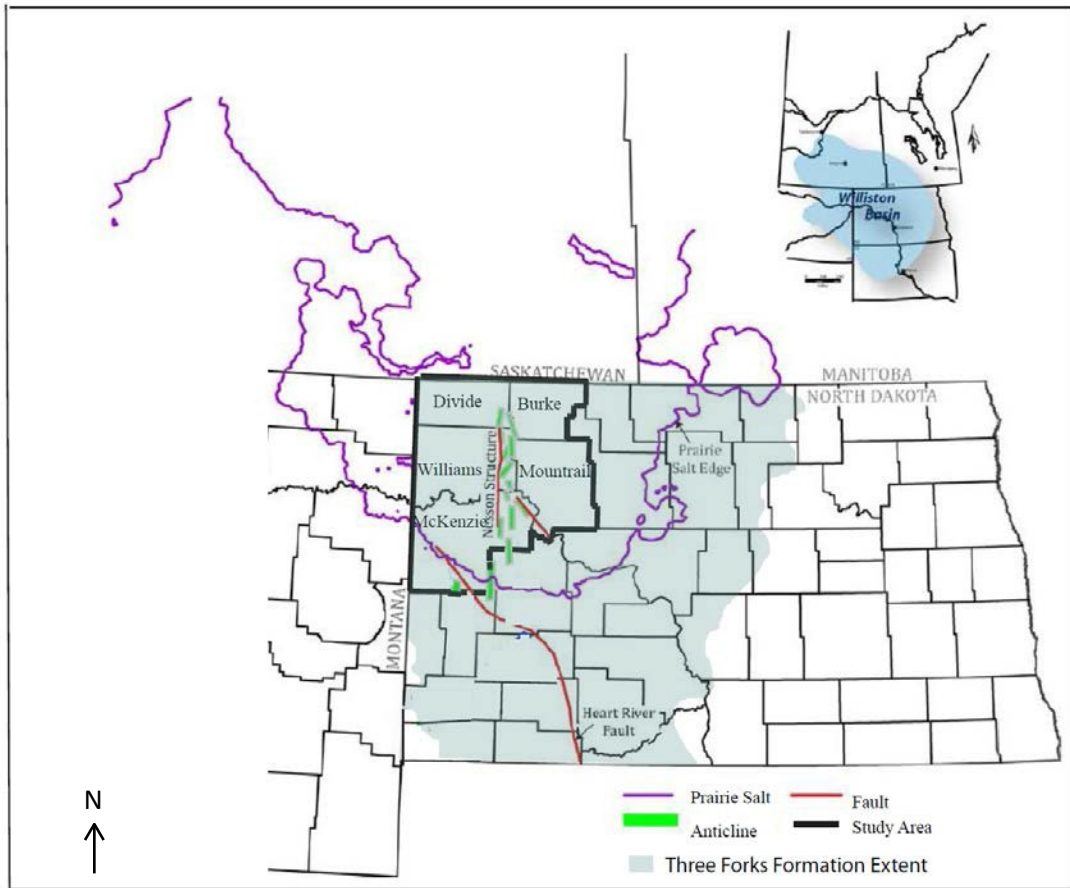


Figure 1. Index Map of the Williston Basin. Map displays the study area and extent of the Three Forks Formation for North Dakota (modified LeFever, LeFever, & Nordeng, 2011).

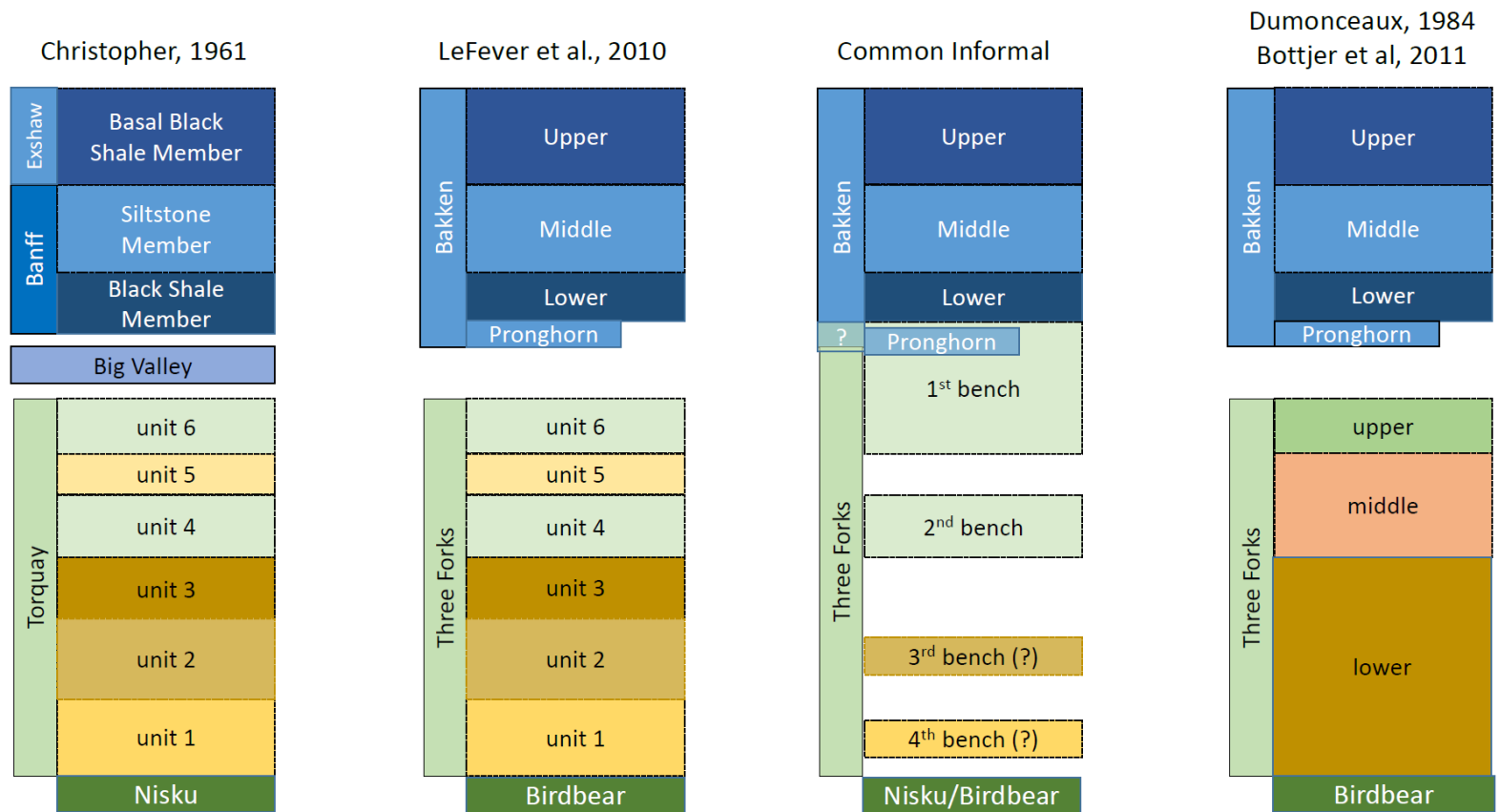


Figure 2. Nomenclature of the Three Forks Formation. Interpretations for the Three Forks Formation and its members (Nordeng & LeFever, 2015).



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 NDIC # 17808  
 SE SW Sec 14.T141N, R96W  
 Anschutz Exploration Corporation  
 #24-14H Sadosky  
 KB = 783 m (2569 ft)

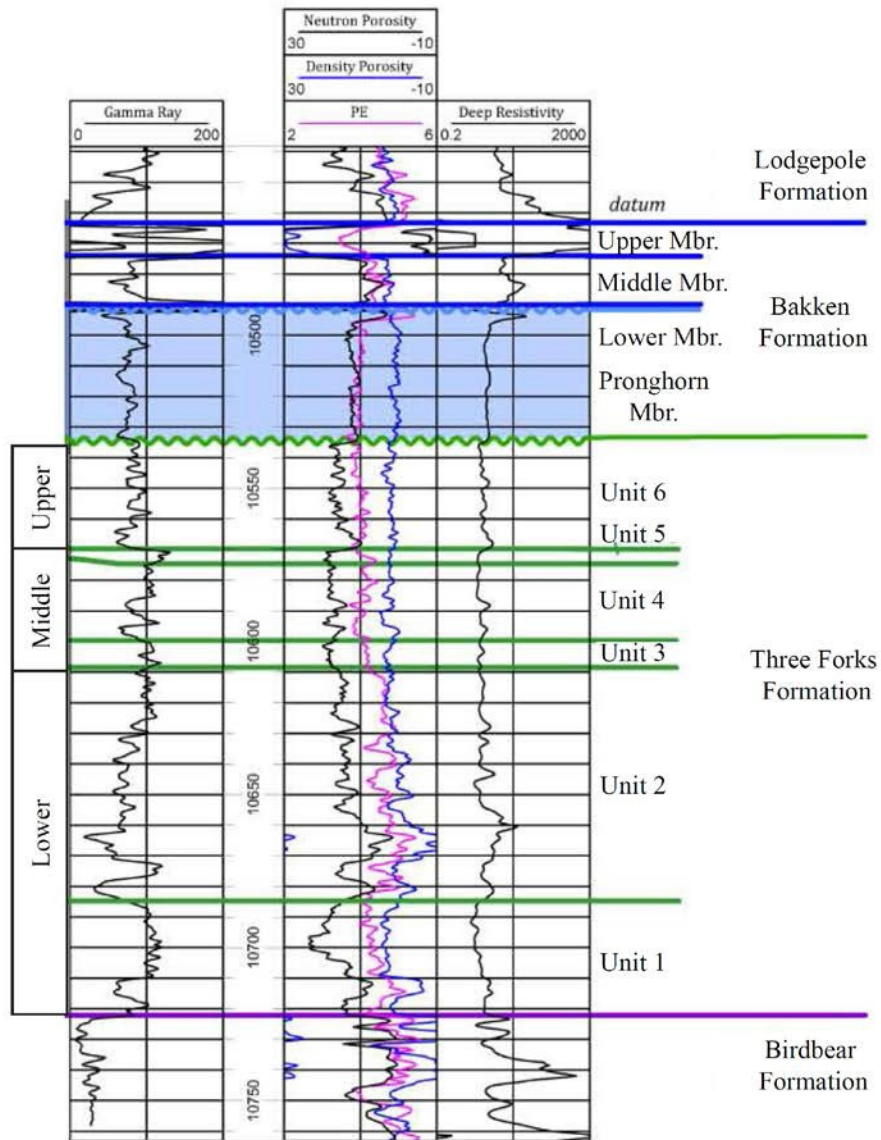


Figure 3. Well Log of Three Forks Formation. Log displays the division used for this study and Dumonceaux (1984) nomenclature. (Modified LeFever, LeFever, & Nordeng, 2011).

Within the Williston Basin of northwestern North Dakota, the Three Forks Formation consists mainly of greyish-green mudstones interbedded tan sandy dolostones in member 6; massive green mudstone or tan sandy dolostones in member 5; greyish-green mudstones interbedded with tan sandy dolostone containing more structures in member 6; massive red dolostones or limestone in member 3; red and green alternating mudstones with anhydrite nodules in member 2; and tan, green, and red mudstones mix with siltstone with breccia and sand lenses along with anhydrite nodules in member 1. Fossils are absent in the Three Forks Formation in North Dakota (Dumonceaux, 1984)

Currently, the Three Forks Formation is a major contender in the petroleum industry in the North Dakota. According to the 2013 USGS assessment the Three Forks Formation it has an estimated mean resource of recoverable oil of 3.73 BBO with Bakken Formation at 3.65 BBO (Gaswirth et al., 2013). This factor makes the formation economically important.

Previous work has interpreted the depositional environment of the Three Forks Formation by dividing it up into a variety of different facies or units and sometimes relating it to oil properties such as reservoir quality. This study will take a different approach by expanding the number of cores examined in the study area and looking at it from an economical aspect in relation to depositional environment.

### **Purpose of Study**

The purpose of this study is: 1) to interpret the depositional environment of members three through six of the Three Forks Formation in western North Dakota; 2) to construct a fence diagram to correlate the structural units that are defined in the core study; 3) to compare the lithologic units that are defined and environment interpretation

to variables that contribute to oil production such as natural fractures, oil saturation, and lithological properties.

### **Geologic Setting**

The Three Forks Formation occurs within the Williston Basin (Figure 1), an intracratonic sag basin extending over 51,600 square miles (133,600 square kilometers) that developed on the North American craton during the Ordovician period. It is a slightly irregular depression that covers eastern Montana, western North Dakota, northwestern South Dakota, Saskatchewan, and Manitoba. The Williston Basin consists of approximately 16,000 feet (4900 meters) of sedimentary rocks from Cambrian to Eocene in age that are dominantly carbonate material, with some clastic rocks deposited by several marine global transgression sequences. (Gerhard, 1982) The Kaskaskia sequence deposited material during the Devonian to Mississippian when North Dakota was near the equator and surrounded by water (Figure 4), containing two transgressive cycles that were limestone and evaporites. The area has been affected by tectonic activity around the time of the deposition of the Three Forks Formation. During the Ordovician the basin uplifted from the transcontinental arch. (Sloss, 1963) This caused the Williston Basin to tilt northwards opening the basin to the Elk Point Basin in the north. The environment was now primarily shallow marine with subtidal and intertidal conditions in the basins center and sabkha deposits along the edge. (Gerhard, 1982) The major structures within the basin include the Poplar Dome and the Nesson, Cedar Creek, Little Knife, Billings, and Antelope anticlines.

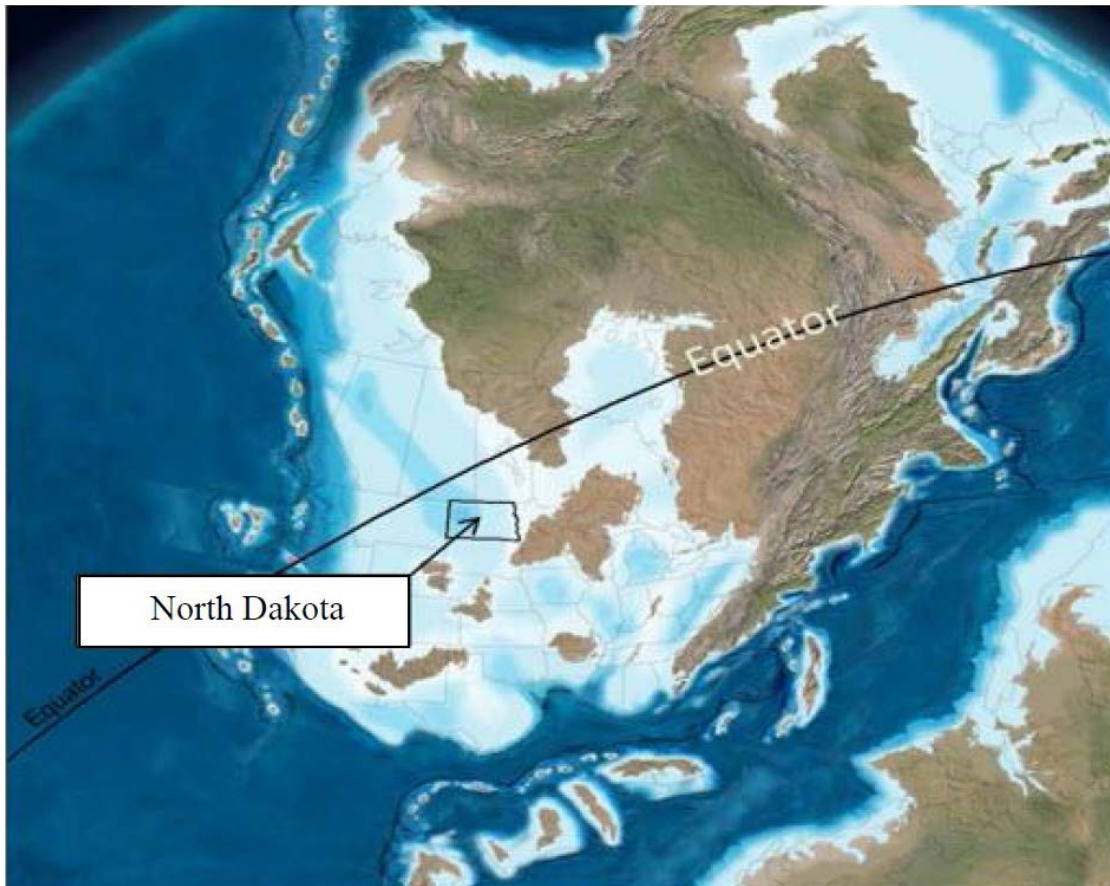


Figure 4. Paleogeography Map during the Devonian Period. Map showing the placement of North Dakota during the Devonian (<http://jan.ucc.nau.edu/~rcb7/regionaltxt.html>).

## Previous Research

The Three Forks Formation was originally described by Peale (1893) from an outcrop in Logan, Montana. Its name derived from the junction of the Three Forks Formation of the Missouri River near Three Forks, Montana. He described the section as a red to brownish shale overlain by a greyish brown limestone. A substantial amount of work has been done on the Three Forks Formation since then, mainly in Canada, and more recently in thesis or dissertations for graduate students.

Two reports from (Christopher, 1961; 1963) wrote extensively on the lithology, the weathering, and oxidation of the Formation in Saskatchewan by using cores, drill cuttings, and well logs. However, instead of a single Formation, he proposed it to be introduced as a group containing the Torquay, Bakken, and Big Valley Formations. The Torquay Formation was interpreted to have been laid down in a shallow reducing environment often interrupted by periods of intense weathering and oxidation or deduction of iron serves as a source to the red and green coloration.

Dumoncaux (1984) described the depositional environment of the Three Forks thesis based on core samples and petrographic analysis. She divided the formation into five lithofacies representing a supralittoral, littoral, and low-energy sublittoral environments. The constituents present include micrite, dolomicrite, argillaceous micrite, argillaceous dolomicrite, and argillaceous biomicrite. The material was interpreted to be deposited in an arid fluctuating epeiric sea setting in a suprlittoral, littoral, ans sublittoral environment.

Berwick (2008) described 16 cores and identified four lithofacies (A-D) in the Upper Three Forks Formation in Divide, McKenzie, Mountrail, and Williams Counties,

later writing a follow-up paper on his work (Berwick and Hendricks, 2011). He focused on interpreting depositional environment and the lithofacies he created for the formation. Based on the research the depositional environment was suggested as a continental sabkha environment that transitioned into a very shallow marine to a tidal flat sabkha environment.

Gantyno (2010) described 21 cores to determine lithofacies and microfacies in a sequence stratigraphic framework for the Three Forks Formation in North Dakota and Montana. He divided the formation into it into eleven facies (A-K) and nine microfacies. The research concluded that Three Forks deposition occurred in a tidal flat sabkha under arid conditions.

Gutierrez and Sonnenberg (2013) described the Three Forks Formation using 6 cores from Burke, Williams, Dunn, McKenzie, and Mountrail County. Six facies (F-A) were identified for the Formation to interpret a depositional environment. It was proposed the lower member represents a sabkha setting; middle member was an inner shelf deposit or transition zone; and the upper member was between an inner and mid shelf.

Bazzell (2014) interpreted 7 cores for the Three Forks Formation focused on brecciation intervals, extent of reservoir using petrophysical analysis, and depositional environment. The formation was divided into four lithofacies based on the core descriptions. The interpretation of the environment included supratidal to restricted and basinal mudstone in a low energy tidal dominant area. The middle section was caused by storms based on the brecciation observed.

## Methods

The area of study was confined to Burke, Williams, McKenzie, Mountrail, and Divide County of northwestern (Figure 1), North Dakota for the Three Forks Formation. The top four members of the formation were focused on due to complexity. The source of most of the lithologic data collected in this study came from describing cores from the Wilson M. Laird Core and Sample Library of the North Dakota Geologic Survey, North Dakota. A total of 46 cores (Figure 5) were examined using 10% Hydrochloric acid to denote the presence of dolomite and limestone within the cores; 10x hand lens for primary and secondary structures; and Munsell Color chart to describe color of material. Data from these descriptions were imported into the Petra program to create stratigraphic sections and then transferred to Adobe Illustrator to produce fence diagrams for correlation across the study area. The correlation was based on five structural lithologic units defined in the cores; these include: laminated beds, massive mudstone, massive sandstone, brecciated beds, and mottled beds.

Thin sections were collected to examine lithology, grain size, diagenesis, and other unique features. Further analysis on these samples was done using X-ray diffraction and Scanning Electron Microscope.

A variety of maps were created in Surfer (Surfer®, 2013) for each of the members that were studied, in order to compare variables that could affect oil production including isopach, natural fractures, oil saturation, pyrite concentration, and other characteristics found in the lithology such as patterned dolomite and anhydrite.

Depth for formation tops for the member of the Three Forks Formation were picked for over 900 wells (Figure 5) and compiled together to form isopach maps for

each of the 4 members and the Three Forks Formation as a whole. North Dakota Industrial Commission (NDIC) website provided well file data that was used to retrieve oil saturation values for the cores that were examined. These values were averaged for each member for the cores and mapped. The Wyllie equation (equation 1), was used to calculate sonic porosity for 87 wells and subtracted the value from resistivity logs in order to locate possible natural fracture zones. Neutron porosity values collected from well logs were subtracted from sonic porosity calculated from equation 1. Natural fracture zones were determined if the value is above six percent. The averages were

$$(1) \Phi = (\Delta t_{log} - \Delta t_{ma}) / (\Delta t_f - \Delta t_{ma})$$

then calculated for each of the members in a well and mapped. This equation compares the rock density with sonic logs and total density with neutron logs.



## **CHAPTER II**

### **LITHOLOGY AND SEDIMENTARY STRUCTURES**

#### **Introduction**

Previous work done on the Three Forks Formation has classified the formation into a variety of different number of facies based on core descriptions. In this study, 46 cores were described and divided into one of six different lithologic units that were observed within the formation. The units were used to interpret the formations depositional environment and history. These include: 1) laminated beds; 2) massive mudstone; 3) sandstone; 4) brecciated beds; 5) mottled beds; and 6) massive limestone.

Based on the study of core samples and petrographic analysis on thin section from each of the represented units, a detailed description was produced. A stratigraphic column was built for the cores depicting where the units occur. All cores were mapped out by constructing a fence diagram to allow easy correlation of the units for the northwestern North Dakota. Each unit had its own characteristic such as color, structures, location, thickness, and formation.

#### **Lithologic units**

##### **Laminated beds**

The laminated bed (Figure 6, Figure 7) unit has a composition of fine sandstone, dolostones, and mudstone. Colors in the sediments alternate in greens and browns, ranging in thicknesses of 1mm to 10mm that are planar, wavy, flaser or lenticular beds. This unit contains the largest variety of sedimentary structures such as mud cracks

WELL AND CORE LOCATION MAP

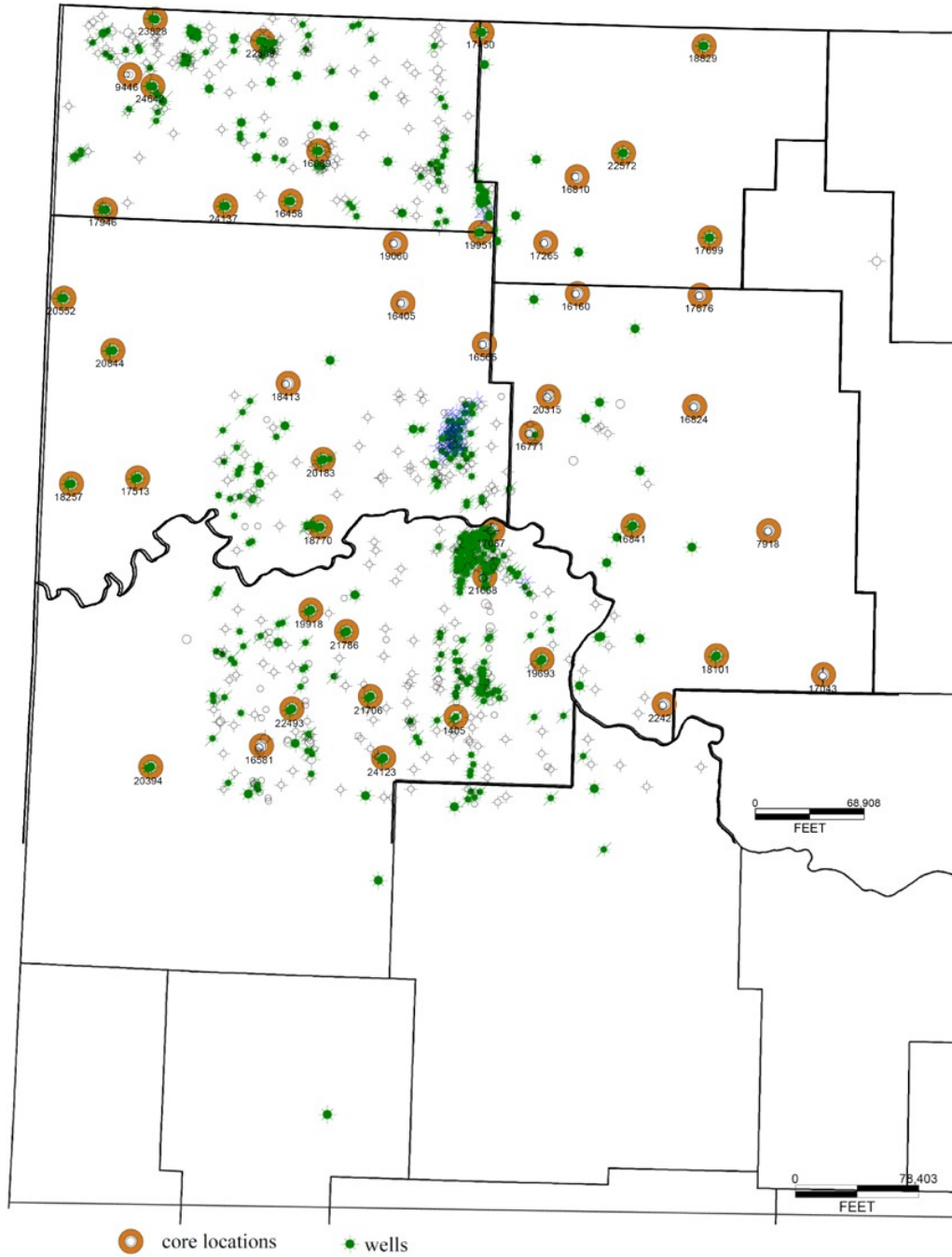


Figure 5. Well and Core Location Map. Map of northwestern North Dakota well locations used to pick tops for the Three Forks members and the cores that were described for the study.



Figure 6. Laminated Beds. Laminated bed unit from the North Plains Energy, LLC Sorenson 160-100-27--34-4a (48.661817 N 103.596372 W) at 9139 ft (photo courtesy of the NDIC).

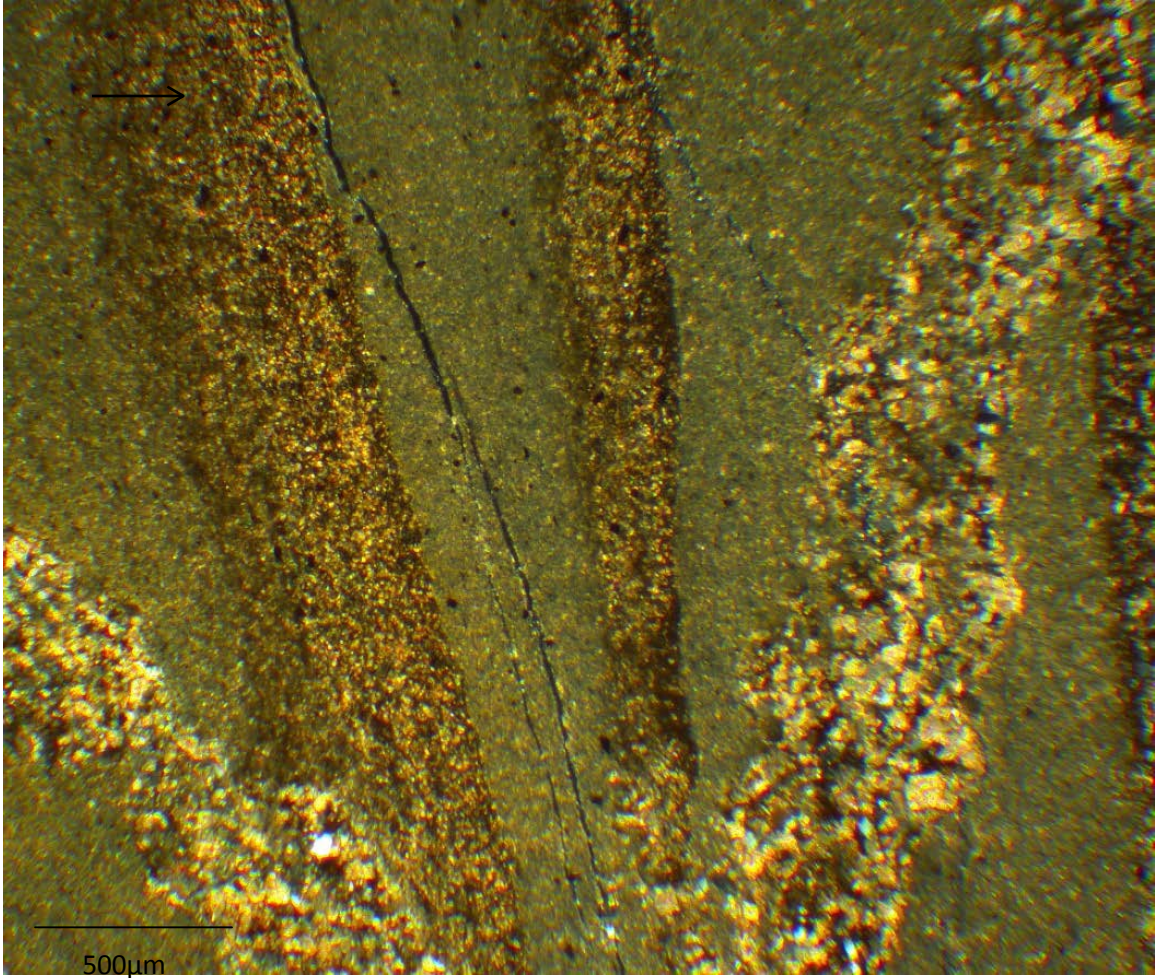


Figure 7. Thin Section of Laminated Beds. Thin section photograph representing the laminated beds of Hess Corporation, EN-Person Observation- 11-22 (48.350127 N 102.733725 W) at 10177.8 ft. The section is composed of clastic material to fine to see, quartz, dolomite, and pyrite.

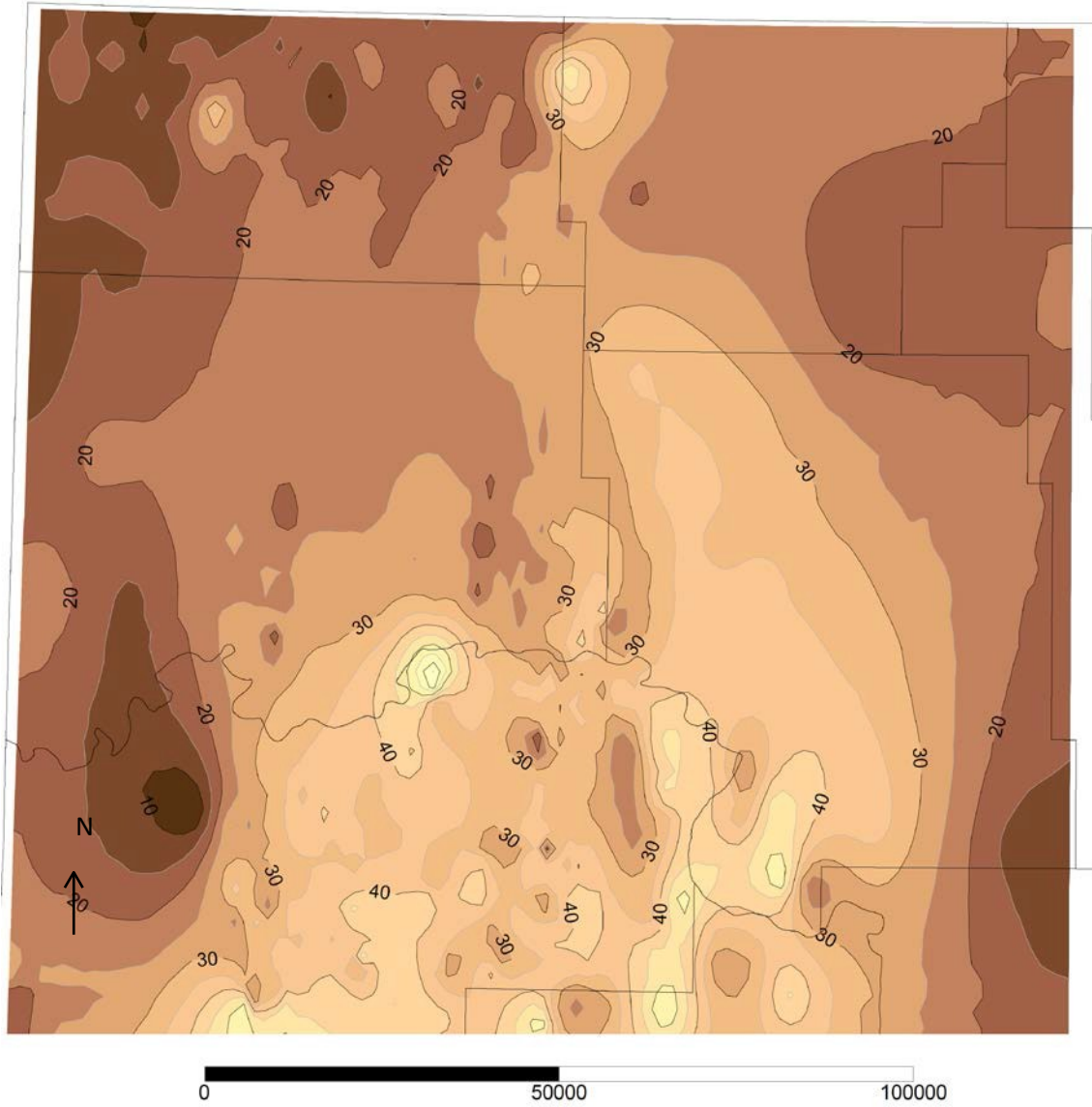


Figure 8. Isopach Map of Member 6 of the Three Forks Formation. Isopach map for the study area measured in feet.

FENCE DIAGRAM OF STUDY AREA

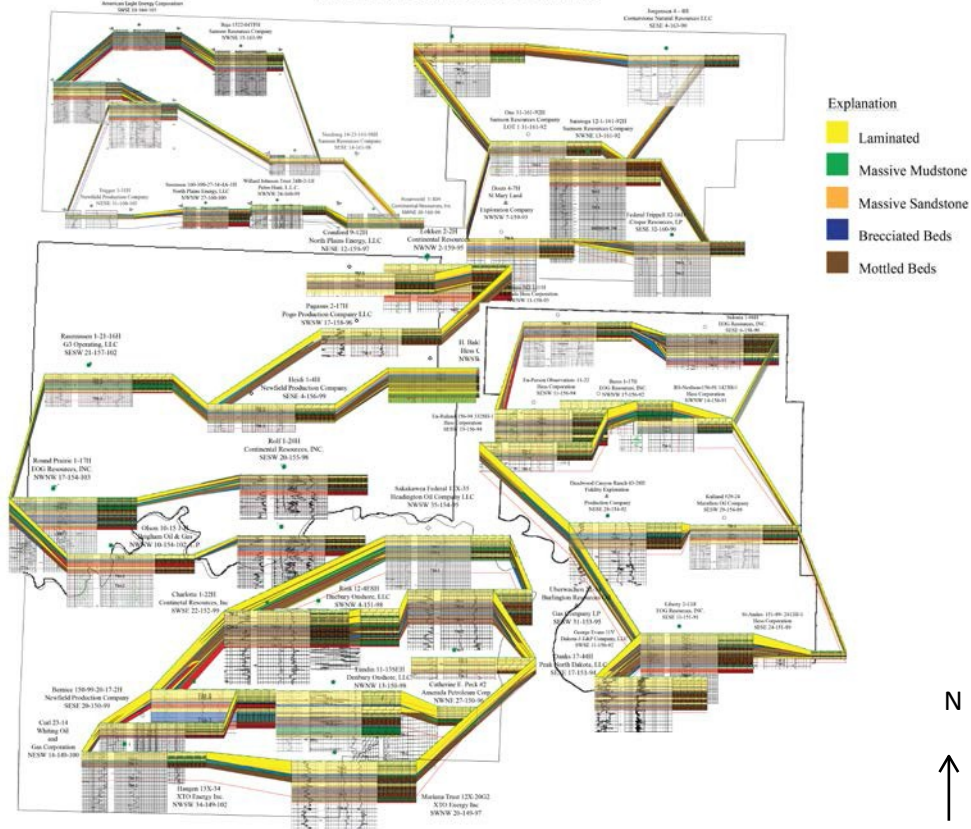


Figure 9. Fence Diagram. A fence diagram depicting the lithologic units described in the study for the area of interest for the Three Forks Formation.



Figure 10. Massive Green Mudstone Beds. The massive green mudstone unit from the North Plains Energy, LLC Sorenson 160-100-27--34-4a (48.661817 N 103.596372 W) at 9113 ft (photo courtesy of the NDIC)

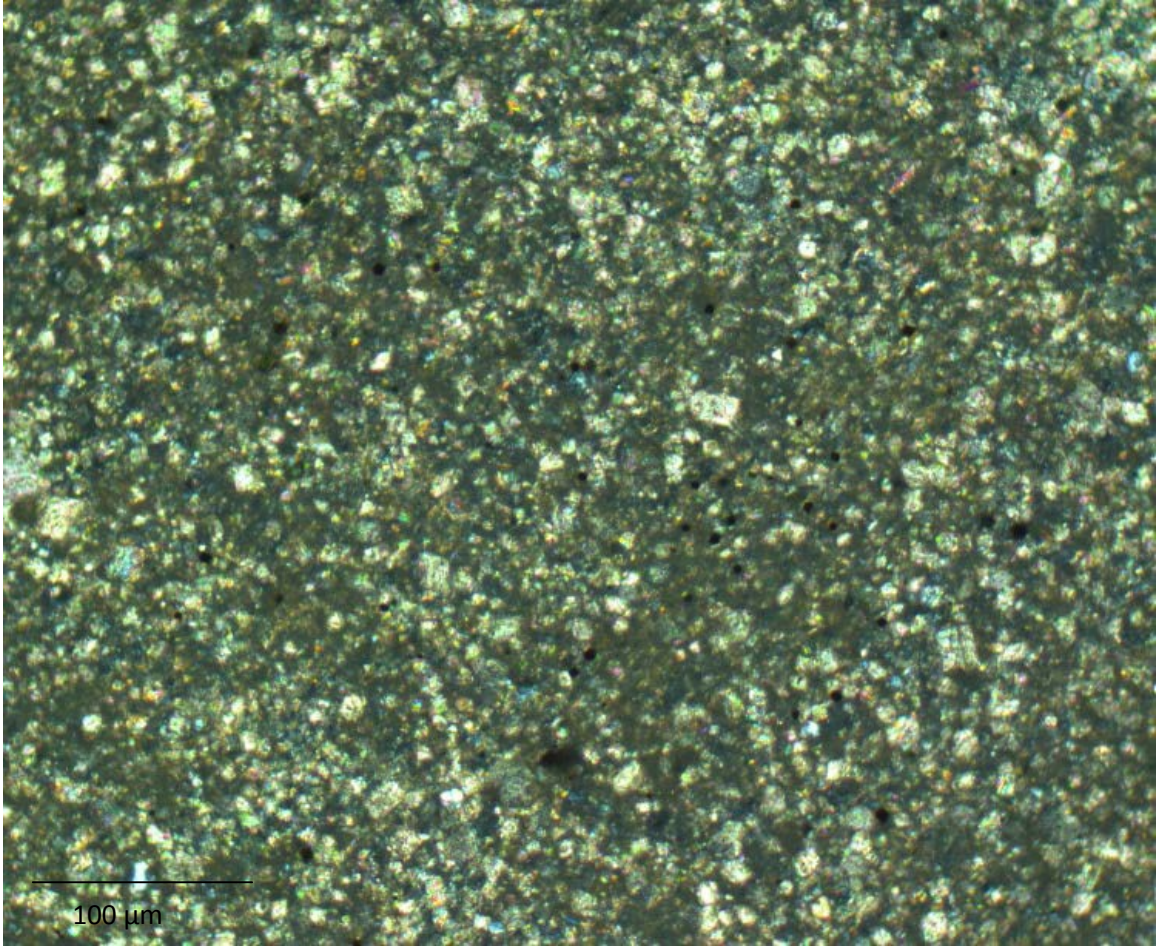


Figure 11. Thin Section of the Massive Green Mudstone Bed. Thin section of green mudstone from G3 Operating, LLC Rasmussen 1-21-16H (48.402809 N 103.876436 W) at 10276. The section contains quartz, dolomite, and pyrite.



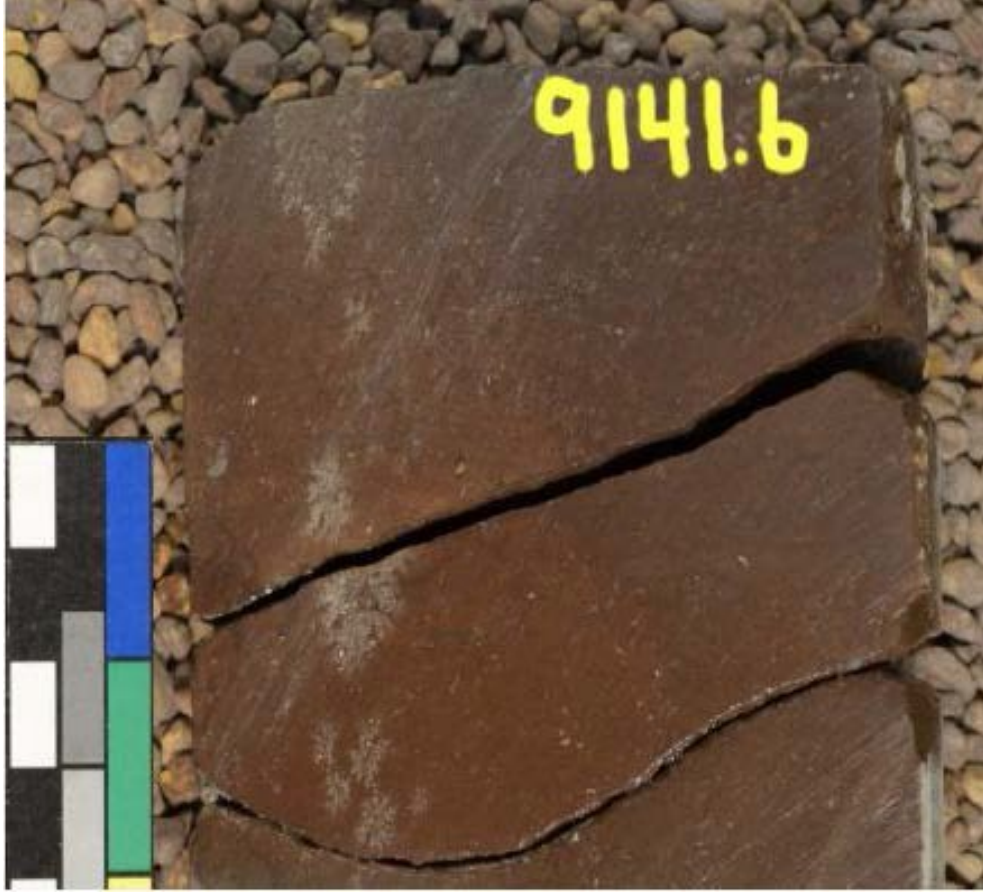


Figure 12. Massive Red Mudstone Beds. Red massive mudstone from the North Plains Energy, LLC Sorenson 160-100-27--34-4a (48.661817 N 103.596372 W) at 9141.6 ft (photo courtesy of the NDIC)

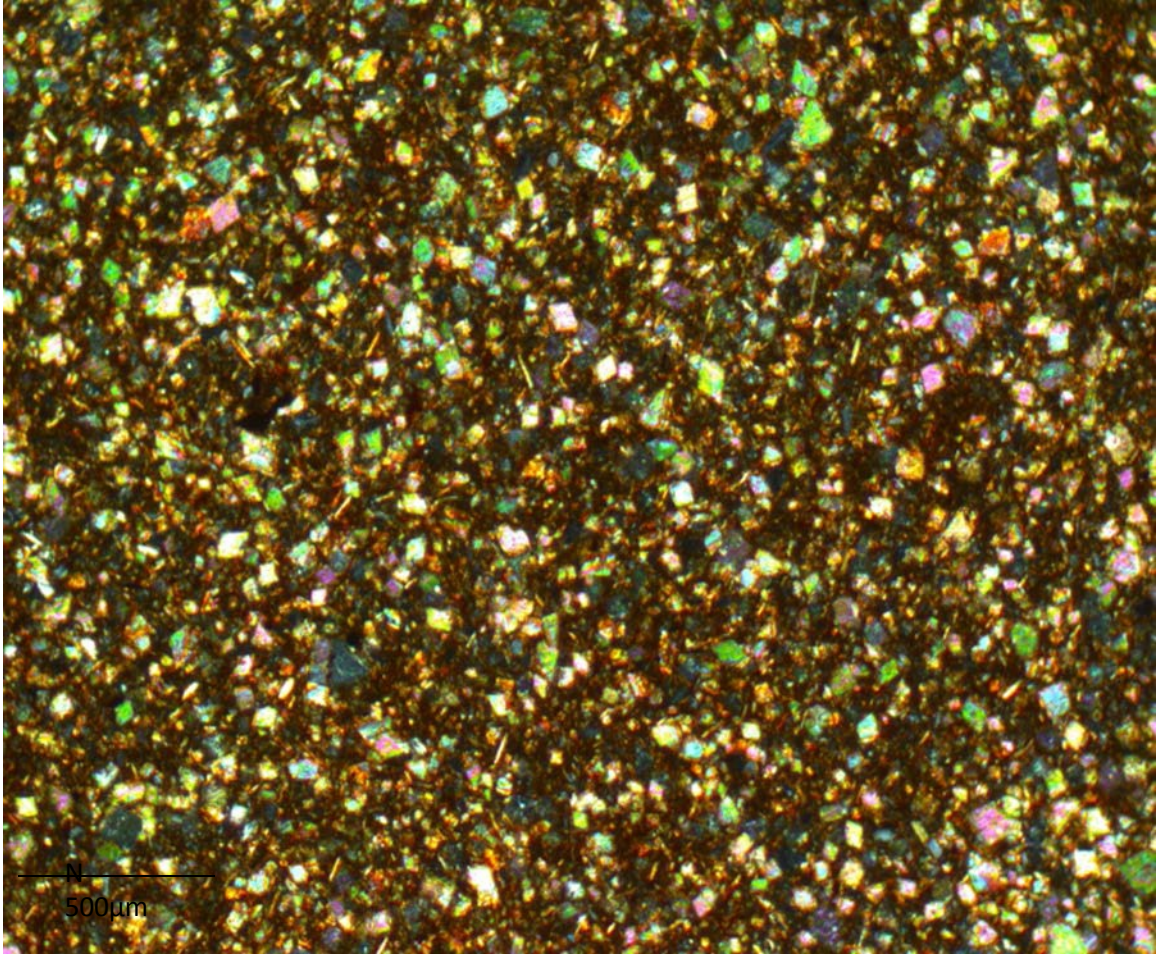


Figure 13. Thin Section of the Massive Red Mudstone Beds. Thin section of red mudstone from Hess Corporation, EN-Person Observation- 11-22 (48.350127 N 102.733725 W) at 10274. Section contains quartz and dolomite grains.

## **Massive Mudstone Beds**

Massive mudstones occur either as a dusky greyish green color (Figure 10, Figure 11), red (Figure 12, Figure 13), or occasional brown in the formation. There are no apparent structures found in this unit besides minor brecciation or diagenetic features. Pyrite layers or veins are commonly seen in the green mudstone unit and reduction spots in the red mudstone sections. Green massive mudstone is common in member 5 and in thin sections in member 4 and in member 3 for southern McKenzie County (Figure 9). The thickest part of the member is located in northern Williams County and in southern County and in southern Mountrail County on the border (Figure 14). Red mudstones are found in member 3 of the Three Forks formation and in member 4 of western Williams County (Figure 9). The thickest area for these mudstones is on the border of Mountrail County with Williams and McKenzie County (Figure 15). They were deposited in a reducing and oxidizing environment during slack water periods (Weimer, Howard, & Lindsay, 1983) where ironing in sediments oxidize into hematite. (Dumonceaux, 1984)

## **Sandstone Beds**

This unit contains fine limey sandstone that has a greyish orange color (Figure 16, Figure 17). Structures within this unit include ripples, cross-bedding and minor soft sediment deformation. This unit can be seen dominantly in Divide County in member 6 and 5. In the southern part of the study area thin layers are found in member 4. Sand was brought in to the environment most likely by storms due to the higher energies in the waters being able to carry the sediment. These sediments could derive from adjacent offshore sediments (Walker, 1982). This unit was deposited when sand brought in moved across the area when waters were shallow with higher energy producing the common

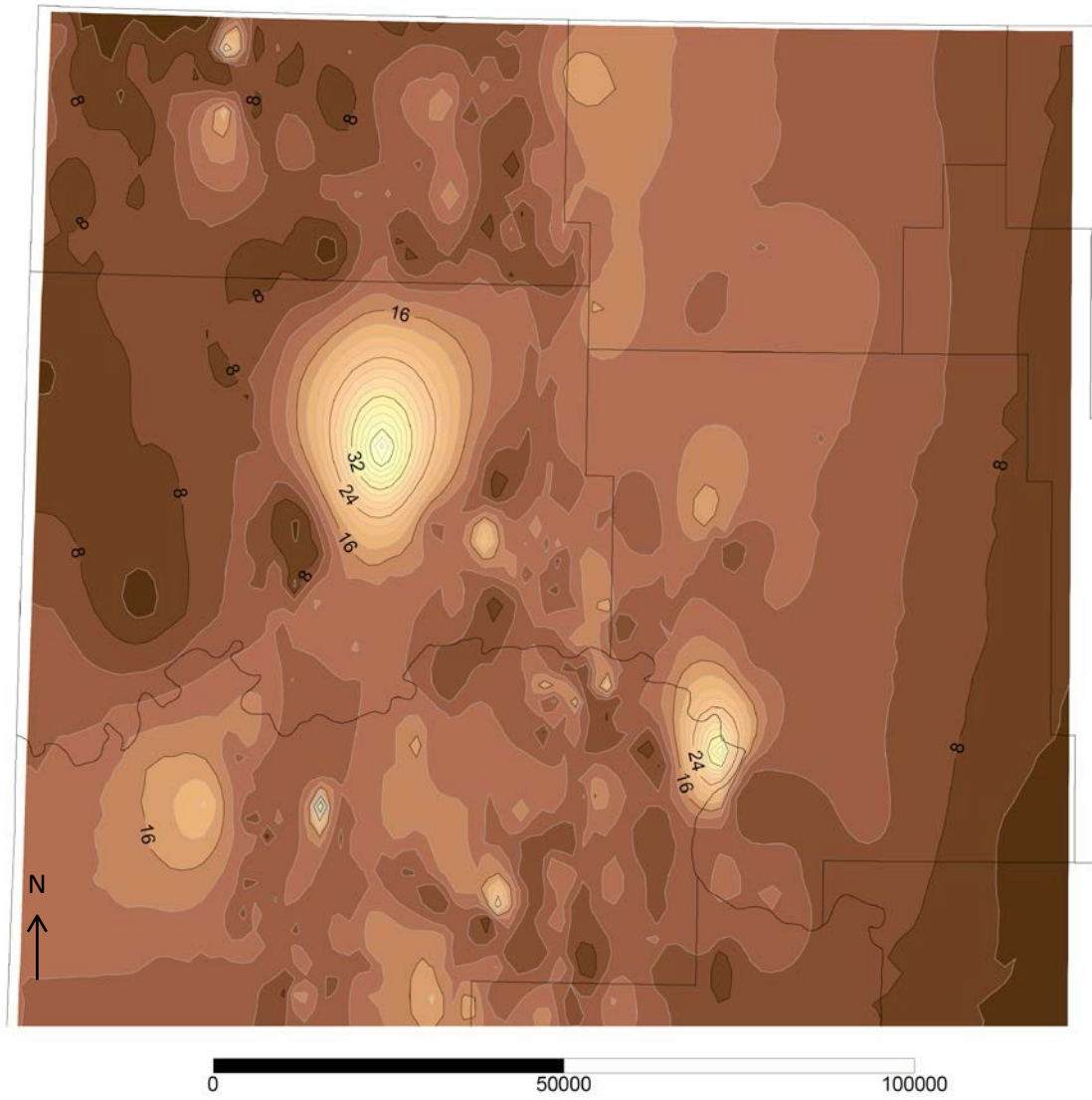


Figure 14. Isopach Map of Member 5 of the Three Forks Formation. Isopach map for the study area measured in feet.

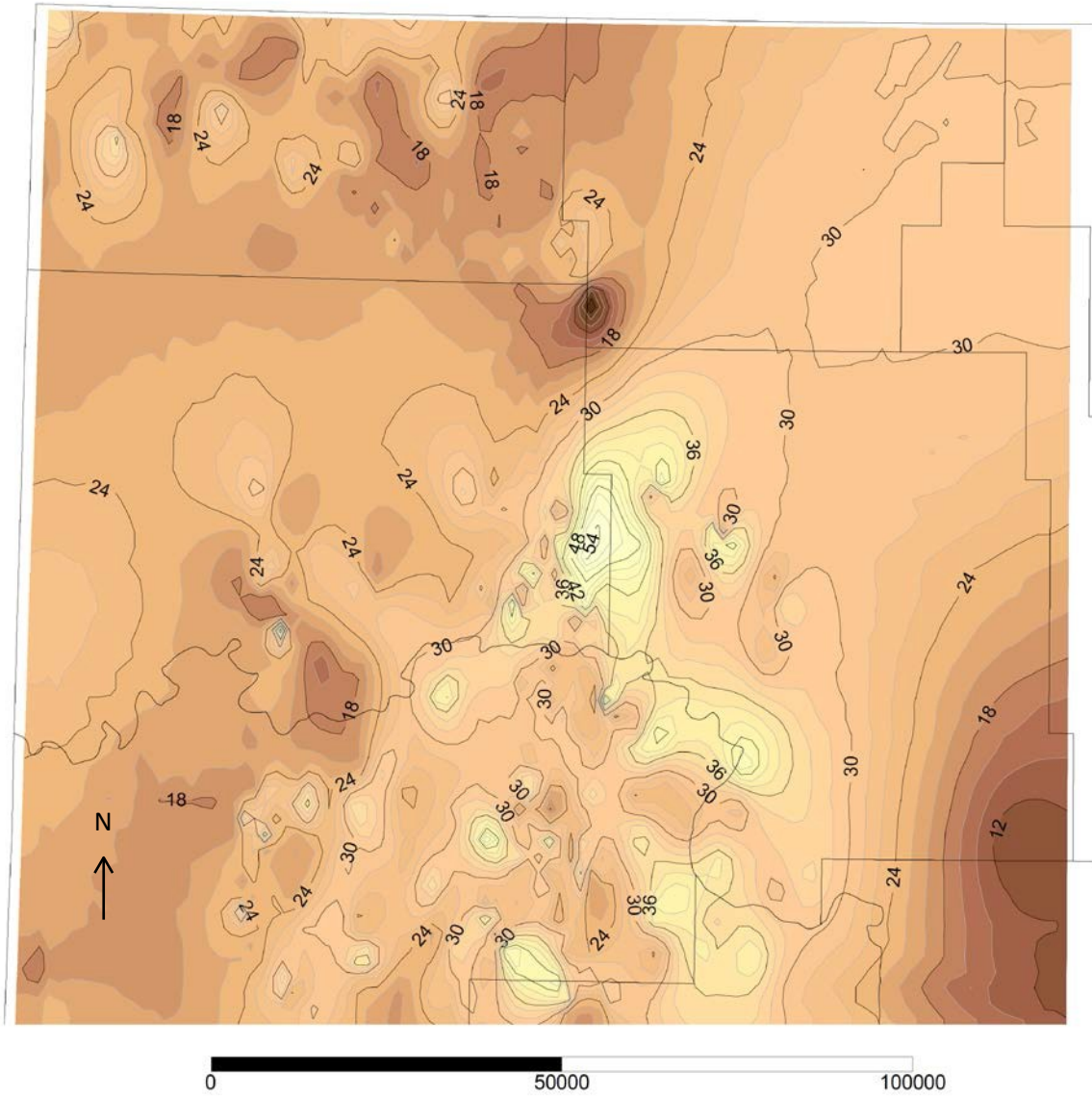


Figure 15. Isopach Map of Member 3 of the Three Forks Formation. Isopach map for the study area measured in feet.

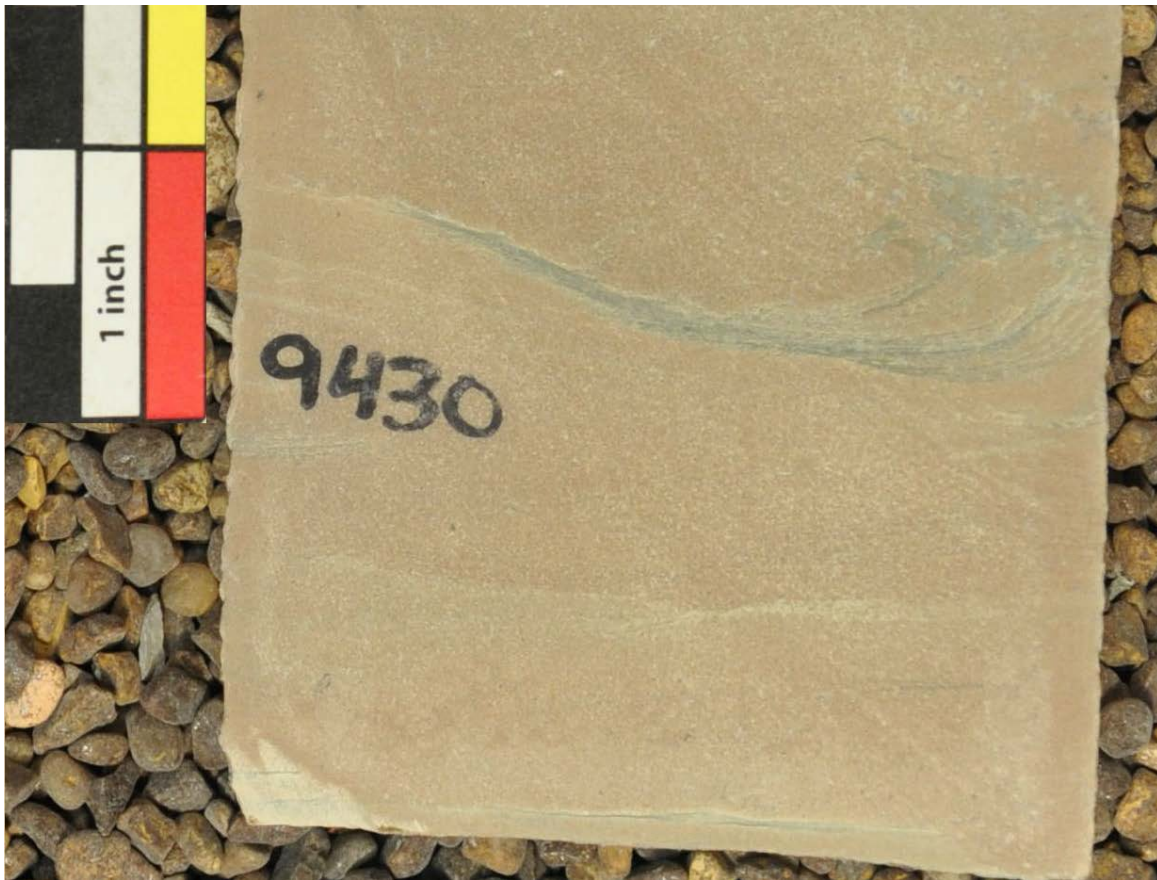


Figure 16. Sandstone Beds. Sandstone section from Continental Resources, INC. Rosenvold 1-30 (48.661666N 103.132496W) at 9430 ft (photo courtesy of the NDIC)

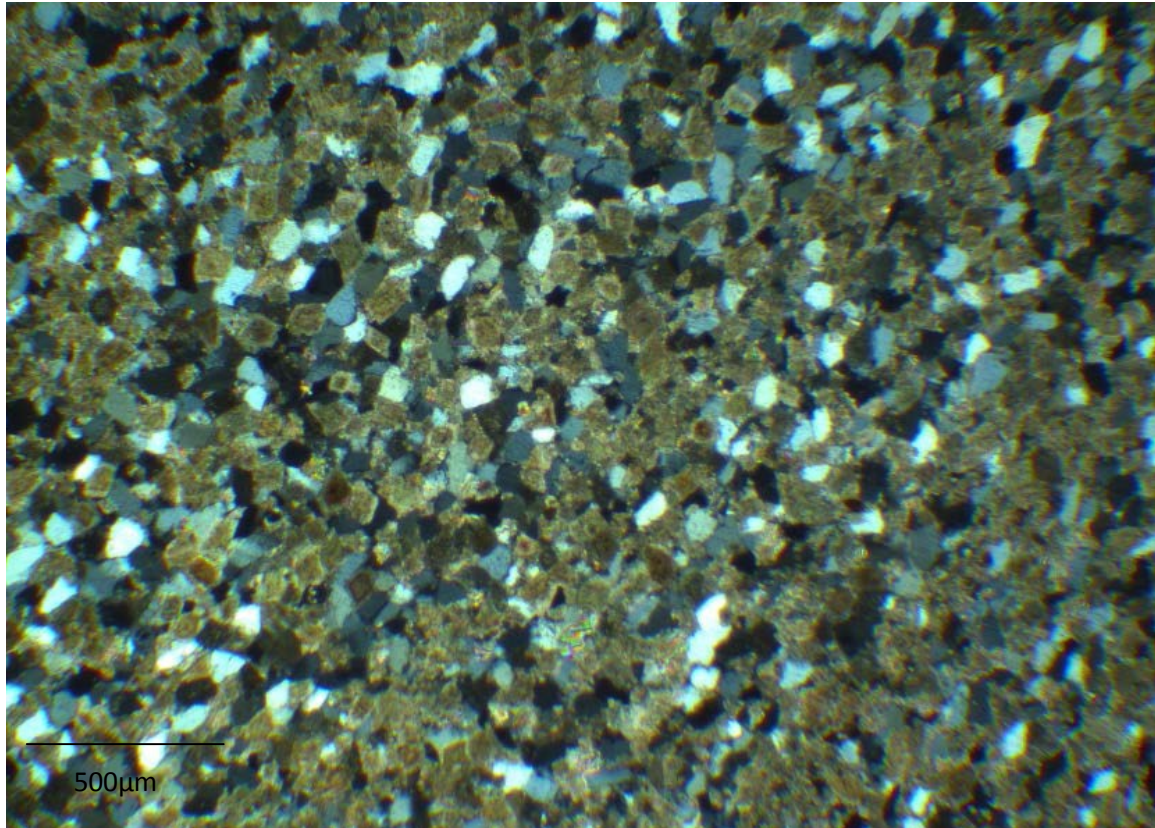


Figure 17. Thin Section of the Sandstone Bed. Thin section of sandstone unit photograph from Hess Corporation, EN-Person Observation- 11-22 (48.350127 N 102.733725 W) at 10254.5. This unit contains mostly dolomite and some quartz, making it a limey sandstone due to the clastic and carbonate sediments mixing.

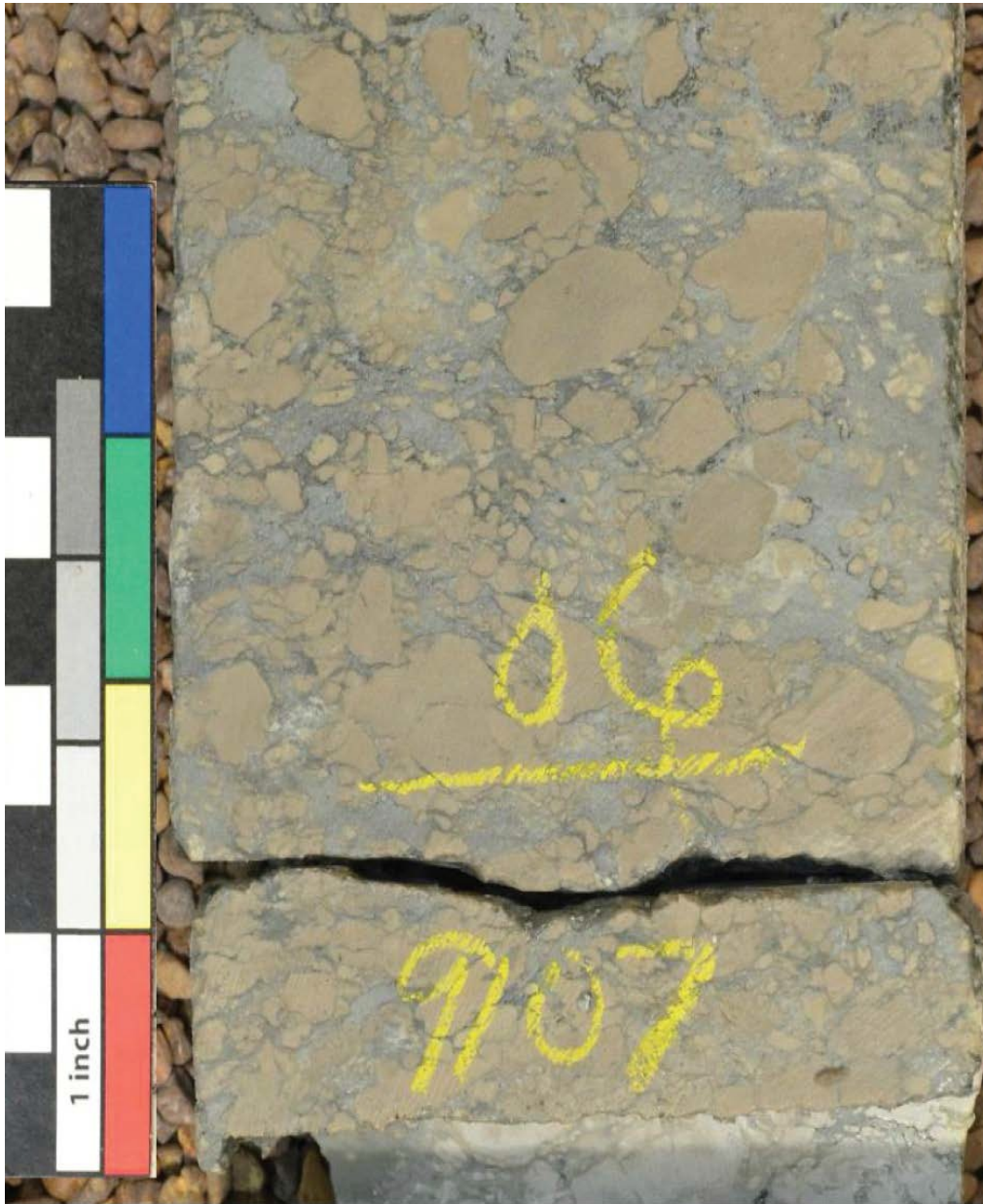


Figure 18. Brecciated Beds. Brecciated bed unit from the North Plains Energy, LLC Sorenson 160-100-27--34-4a (48.661817 N 103.596372 W) at 9107 ft (photo courtesy of the NDIC)



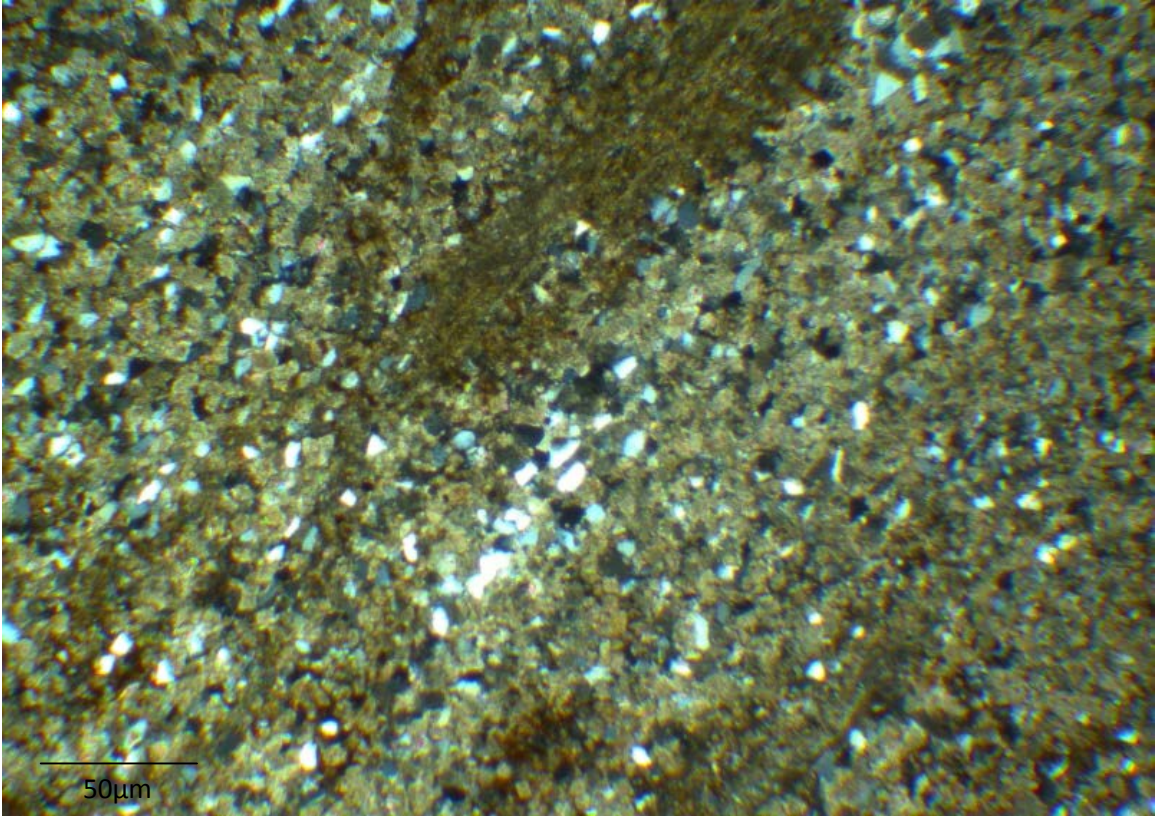


Figure 19. Thin Section of the Brecciated Beds. Thin section of brecciated unit from Hess Corporation, EN-Person Observation- 11-22 (48.350127 N 102.733725 W) at 10211.1. Contains dolomite and quartz.

brecciation, ripples, cross-beds, flame structures, syneresis crack, desiccation cracks, water-escape pipes, and soft sediment deformation. Pyrite is a common mineral found in the unit and in specific locations anhydrite nodules have formed.

This unit dominantly occurs in member 6 of the formation, but it can also be found in small layers of member 4. Across the study area this unit increases in thickness closer to the basin center or south (Figure 8) with some thick areas located throughout the Williams and southern Mountrail County (Figure 9). Laminated beds are deposited by fluctuating sea levels laying down alternating layers of sand and mud in over an area. (Collinson & Thompson, 1982) structures in the northern study area, while the southern part had a slight difference in tidal and induced flow. (Walker, 1984)

### **Brecciated Beds**

Brecciated beds color resemble the greens and brown that occurs in the laminated bed unit (Figure 18, Figure 19) and is composed of dolostone, fine sand, and mud. The structures seen are brecciation and water-escape structures

Member 4 contains this unit and a few lower parts of member 6. Mountrail County contains a lot of this unit along with southern McKenzie in east Burke County and northwestern Divide County smaller sections are seen of the brecciated component (Figure 9). This unit relates with water expulsion or dewatering the sediment casing mud to flow through the sand breaking apart forming the brecciated patterns seen in the cores. Compared to laminated beds the thin section of brecciated has larger grains and less mudstone.



Figure 20. Mottled Beds. Mottled bed unit from the North Plains Energy, LLC Sorenson 160-100-27--34-4a (48.661817 N 103.596372 W) at 9144 ft (photo courtesy of the NDIC)

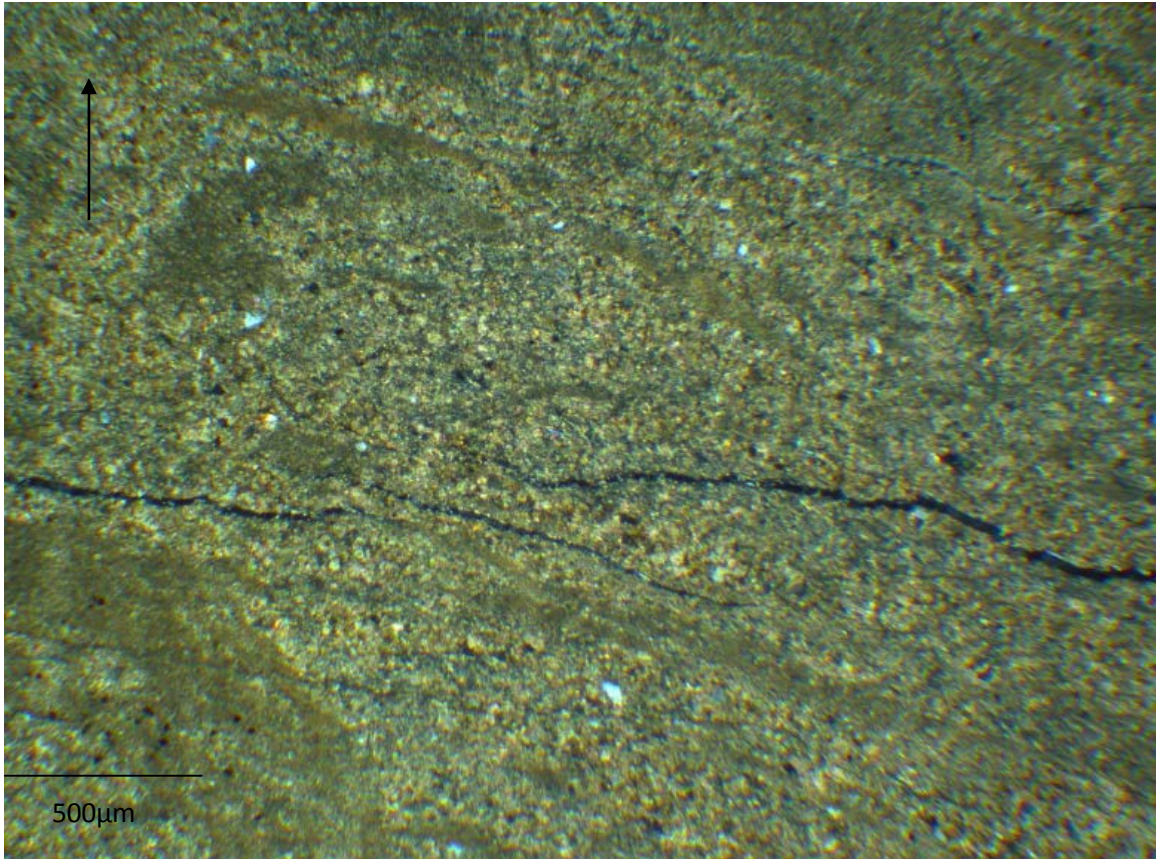


Figure 21. Thin Section of the Mottled Beds. Thin section of mottled beds from Hess Corporation, EN-Person Observation- 11-22 (48.350127 N 102.733725 W) at 10216.8. Composed of dolomite, quartz, fine clays, and minor pyrite grains.



Figure 22. Massive Limestone Bed. Limestone unit from Hess Corporation, EN-Person Observation- 11-22 (48.350127 N 102.733725 W) at 10270.65

### **Mottled Beds**

The rocks in the mottled beds unit share the green and tan colors (Figure 20 Figure 21) that are common in the formation. Sediments in the unit include dolostone, fine sand, and mud. Structures within the unit comprise brecciation. Pyrite clusters are occasionally found in the beds. The mottled unit is common in the member 4 and in thin layers in member 6. These beds are found within all areas in the study area for this unit similar to the laminated unit, although it is the thickest in McKenzie County (Figure 9). This unit was originally deposited in alternating layers, and then was broken up by dewatering. Over time overburden compressed the sediments causing the water to disfigure the sediments even more and flatten

### **Massive Limestone**

The massive limestone unit (Figure 22) is commonly a dusky red color in member 3 of the Three Forks Formation. Within the study area this unit it occurs in McKenzie County, the south part of Williams County and western Divide County (Figure 9). This unit was deposited in a quiet oxidizing environment where dolomitization did not occur. The unit received its color from oxidation of iron, similar to the red mudstone unit.

**CHAPTER III**  
**DIAGENESIS AND OTHER LITHOLOGIC PROPERTIES**

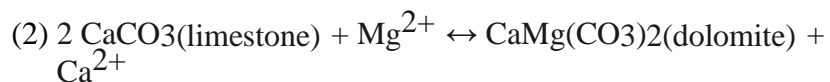
**Introduction**

Diagenesis and other lithological properties in the Three Forks formation including dolomitization, anhydrite nodules, pattern dolomite, and pyrite.

Dolomitization is the most prominent feature that occurs in the members under study for the formation. All these features are important due to the relationship and the information they can provide to further information on the environmental conditions during the time of deposition for the formation.

**Dolomitization**

Intense carbonate production occurs in environments that are clear, warm, and in shallow waters with normal salinities at latitudes between 30 degrees N and 30 degrees S (Figure 4). This type of environment precipitates calcium carbonate and leads to evaporation by near-surface brines. (Dumonceaux, 1984). Magnesium replaces calcium ions through the process of dolomitization forming dolomite (2). A common environment where this replacement occurs is in a sabkha.



Dolomitization is occurs in all units besides the limestone beds where the calcium was not replaced. (Prothero and Schwab, 2004) These brines are prevented from percolating by permeability barriers leading to the process of dolomitization.

Dumonceaux (1984) described an appropriate model for how dolomitization occurs in the

Three Forks Formation, McKenzie et al. (1980) evaporate pumping model. This model involves three hydrological processes. Flood recharge from wind generated waves or storm waves cause the water table to rise and pore space to be filled by sea water but only lasts a short time; evaporation concentrates ion from the evaporating seawater and lowers the water table. Evaporite pumping maintains water table level by an upward flow of groundwater replacing lost water. (Dumonceaux, 1984)

### **Anhydrite**

Anhydrite is another common evaporate caused by early diagenesis (Collinson and Thompson, 1982), but is common in the lower part of the Three Forks formation, in member 1 and 2. However, in this study, member 6 contained anhydrite nodules (Figure 23) within the interbedded sediments in a few cores. These areas are located in the northern center of McKenzie County and one well in Mountrail County (Figure 24). This may be caused by ephemeral waters beneath the surface of supratidal flat in arid conditions (Collinson and Thompson, 1982) or a small evaporate lake.

### **Pyrite Concentration**

Pyrite is a common visible iron mineral in the Three Forks Formation that plays a hand in the coloration and the pattern dolomite. As part of the study the minerals concentration was looked at to get a general idea of the role it plays in depositional environment and how it could affect oil production. Pyrite forms in sulphates in hypersaline environments, commonly occurs in mudstone units, induces reducing conditions causing sulphate reducing bacteria to thrive, removal of oxygen that later precipitates carbonates and pyrite (3). “The physico-chemical properties of tidal flats in





Figure 23. Anhydrite Nodules in Member 6. Anhydrite nodules from Continental Resources, INC. Charlette 1-22H (47.964578 N 103.333939 W at 11356 ft (photo courtesy of the NDIC)

### Anhydrite in Member 6 Location Map

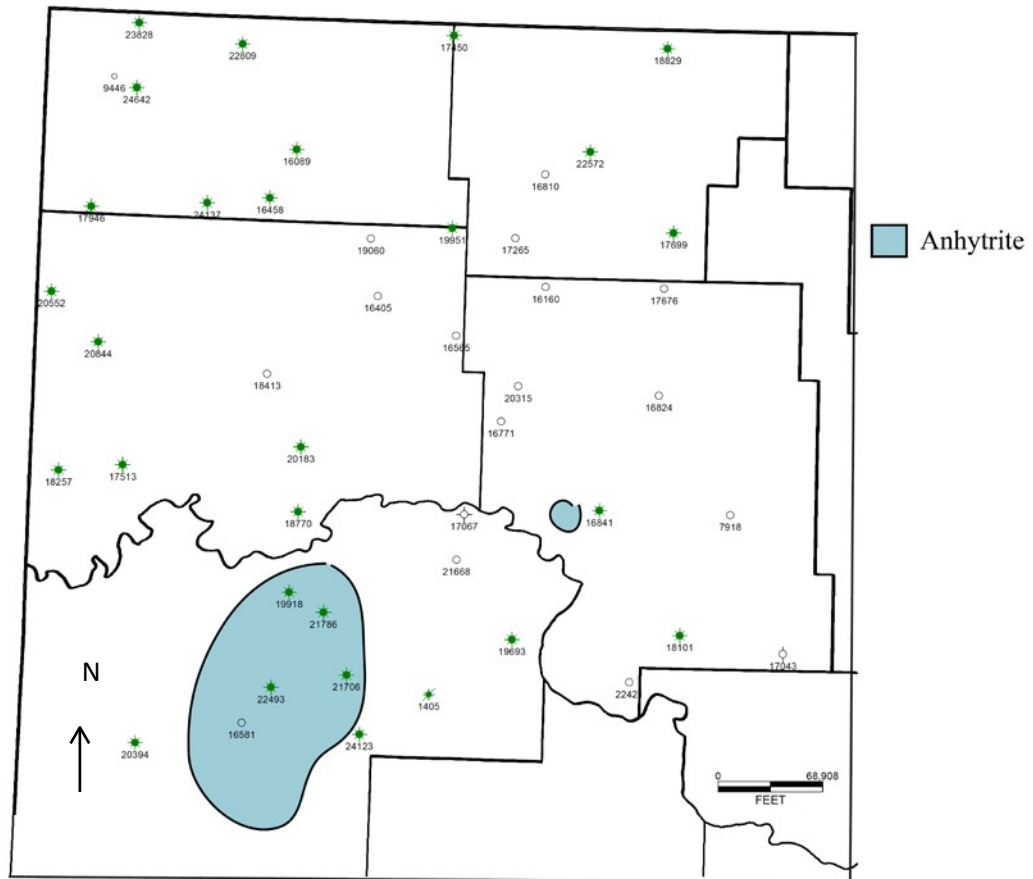
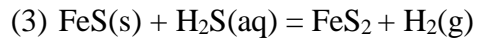


Figure 24. Anhydrite Location Map for Member 6. Anhydrite concentration Map of the Three Forks Formation for the study area displaying areas where anhydrite nodules occurs in member 6 of the Three Forks Formation based on cores.

carbonate environments favor the early formation of pyrite.” (Dixon, 1976)



The reducing environment and pyrite lead to the green coloration that occurs in the sediments.

A general concentration map (Figure 25) gives a rough estimate on where to find areas with the most pyrite based on observed cores. According to the map the western half contains the greatest amount. The amount of pyrite formed in sediments is limited by the rates of supply of dissolved sulfate and reactive detrital iron minerals, meaning the eastern portion had a larger supply (Prothero and Schwab, 2004). One location in the eastern half contains a highly concentrated layer of pyrite (Figure 26).

The main affect that pyrite could have on oil production relates more to profit. The more pyrite concentration the greater possible drill bits would have to be replaced, costing more money (Warren & Sinor, 1994).

### **Patterned dolomite**

Pattern dolomite is a term used to describe a diagenetic feature in dolostones that are laminated beds in an intertidal and supratidal environment. It consists of light and dark green varying irregular shapes (Figure 27, Figure 28), the color difference is proposed to be related to pyrite crystals amount, with the darker colors consisting of more pyrite. (Kendall, 1977) The areas containing this feature are Divide County and northern Mountrail County in the laminates bed unit in member 6 of the Three Forks. Based on the

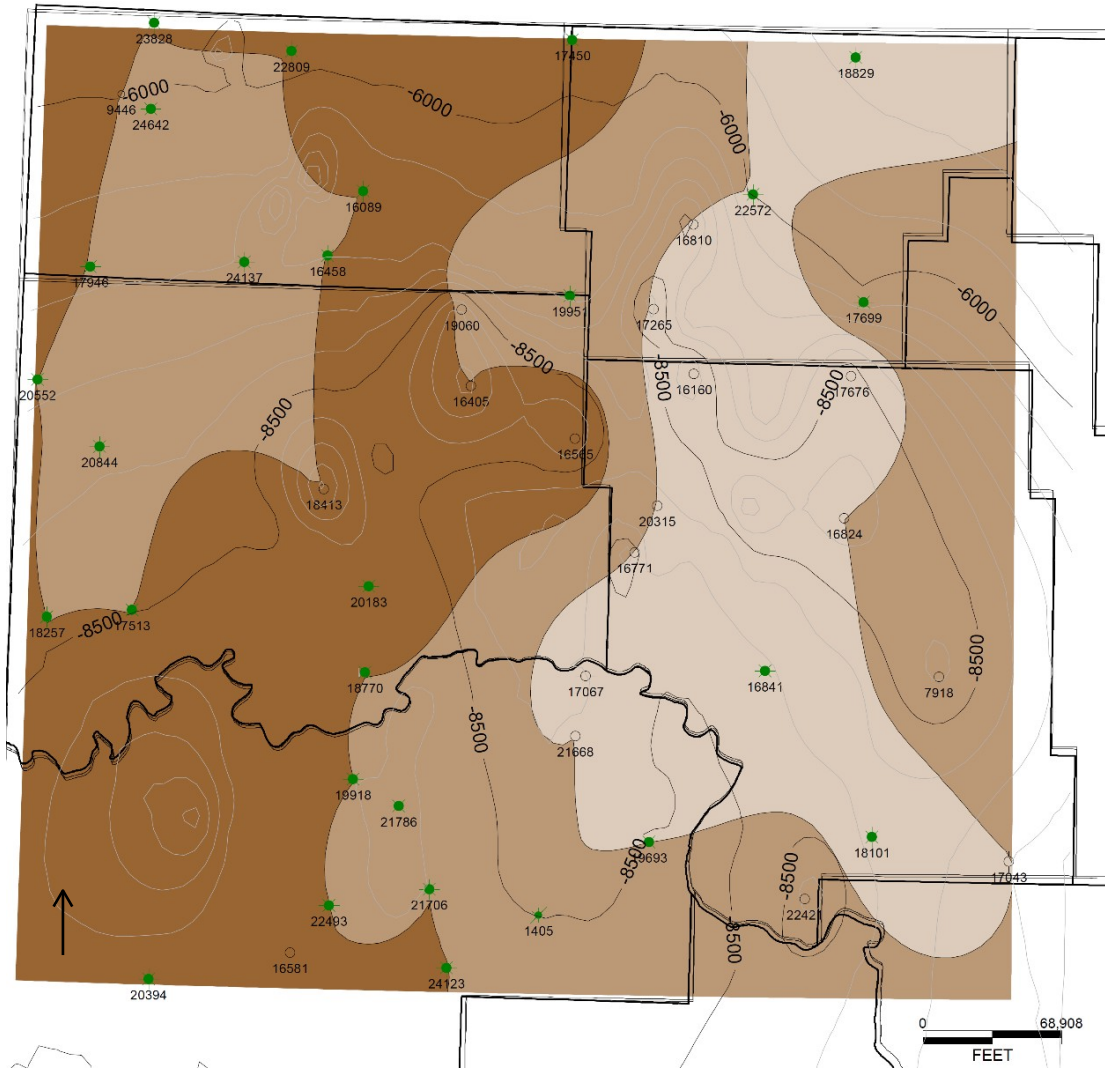


Figure 25. Pyrite Concentration Map. Map showing wher high amounts of pyrite are found (light brown) and lower concetrations (dark brown) based on core observation. Structure contours for Three Forks Formation shown in black



Figure 26. Pattern Dolomite. Pattern dolomite from the SM Energy Company Willard Johnson Trust 24B-2-1H (48.674960 N 103.426239 W at 9218 ft (photo courtesy of the NDIC)

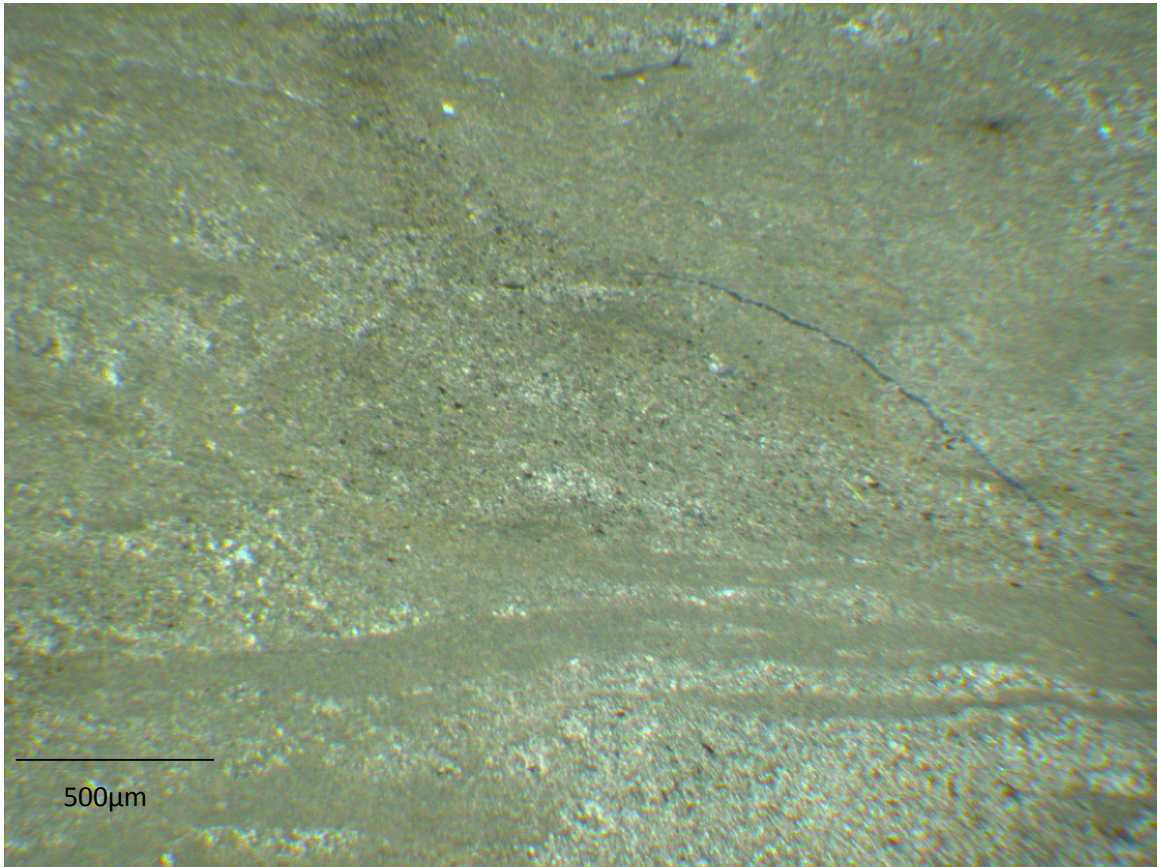
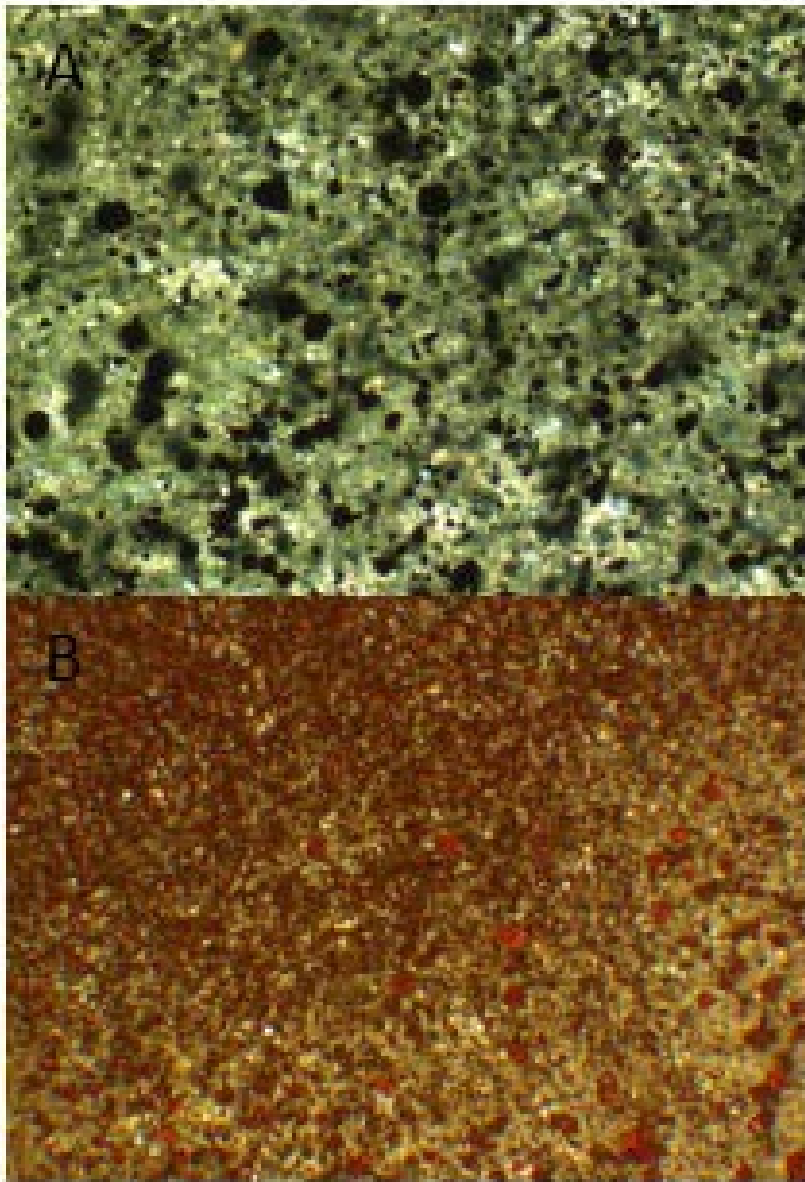


Figure 26. Thin Section of Pattern Dolomite. Thin section of pattern dolomite from North Plains Energy, LLC Sorenson 4A-27-1H (48.661817 N 103.596372 W) at 9091 ft.



500 $\mu$ m

Figure 27. High Concentrated Pyrite. Pyrite section from Fidelity Exploration & Production Company Deadwood Canyon Ranch 43-28H (48.129138 N 102.504910 W)  
A. Pyrite thin section under the polarized scope B. Pyrite thin section under a scope with light reflecting off of it.

findings a general location of these features can be drawn out for the study area (Figure 28). Divide County contains the largest amount of pattern dolomite concentrating itself in the center of the county; it is also an area that contains higher amounts of pyrite (Figure24). This process is commonly associated with evaporitic environments sulfate-rich reducing environments. However due to little research done on this feature not much is known.



### PATTERN DOLOMITE CONCENTRATION MAP

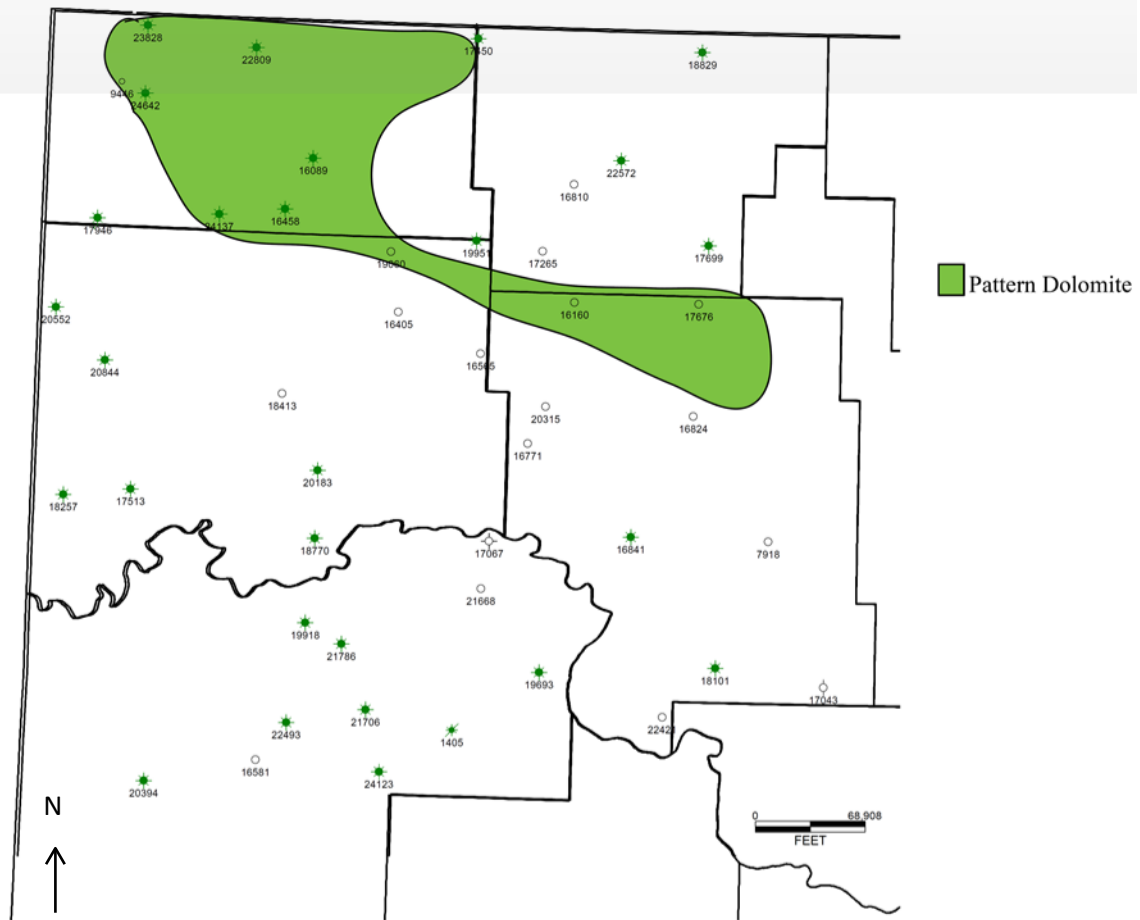


Figure 28. Pattern Dolomite Location Map. Map showing the locations of where pattern dolomite occurs in cores.

## **CHAPTER IV**

### **DEPOSITIONAL ENVIRONMENT**

#### **Environmental interpretation**

Interpreting the depositional environment of the Three Forks Formation resulted from detailed core analysis and correlation of the sediments, structures, and diagenetic processes. Based on the data the depositional environment was interpreted as a hypersaline tidal flat-sabkha that is intertidal to supratidal (Figure 29). The climate was arid to semi-arid conditions depositing sediments along a broad epeiric sea during several fluctuations in sea level that covered the North Dakota area (J. LeFever & Nordeng, 2008.). That is a product of deposition, diagenetic processes, and groundwater control.

The waters were warm and shallow during time of deposition for the area of interest and located close to the equator (Figure 4). It contained high salinity, that caused little to no life in the waters and is supported by lack of fossils found within the Three Forks Formation in North Dakota. (Dumonceaux, 1984) It typically forms at the surface of supratidal flats (Shinn, 1983) Sulphate reducing bacteria thrived in the environment and produce free sulphide ions and the mineral pyrite formed as a product. Pyrite in reducing environments uses up free oxygen and produced sulfide ions because the pyrite dissolves. (Prothero and Schwab, 2004) Clastic sediments in the formation are mixed in by storms that deposit the fine sand. Peritidal or tidal flats lithofacies are organized

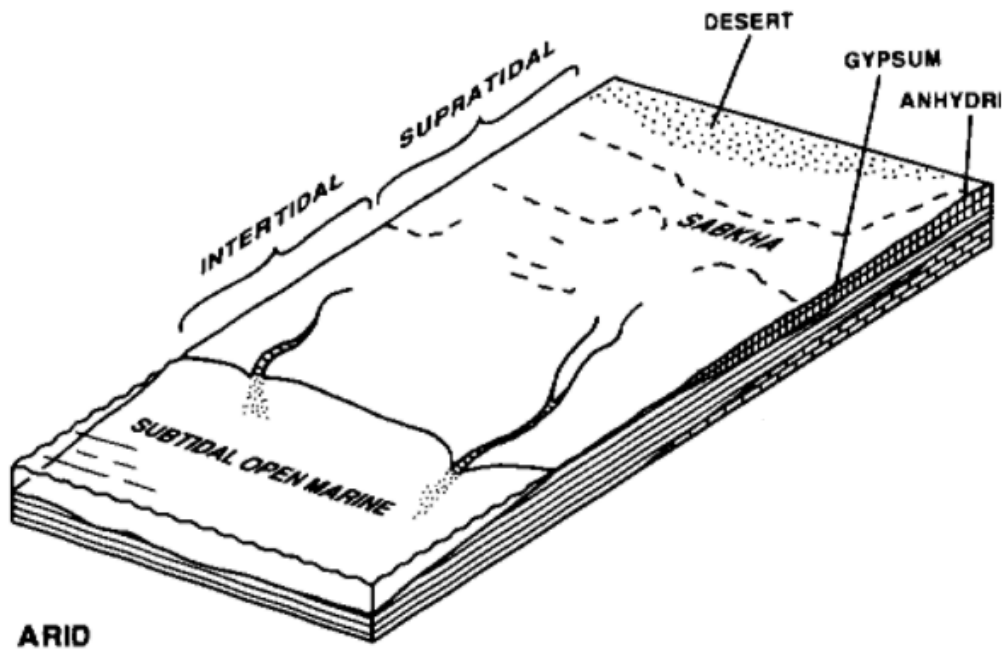


Figure 29. Block Diagram of Carbonate Tidal Flat. Block diagram showing morphologic elements that are in a carbonate tidal flat that relates to hypersaline waters (Walker, 198

stratigraphically into shallowing upward sequences. The Three Forks Formation consists of six of these sequences that correlate with the members of the formation. Regular cycles of rising and falling of sea level deposited mud and sand in fluctuating current.

The advancing sands moved across the mudflat producing cross-beds, ripples, and other structures. Vary periods of exposure leads to erosion and periods intense weather (Christopher 1963)

### **Depositional History**

Member 3 of the Three Forks Formation was laid down as a sequence of carbonates materials and clastics such as potassic feldspar mixed in with gray mud in a moderate reducing environment. Weathering later caused the sediment to change color from oxidization into a red. (Christopher, 1963) This is dependent on the Eh -pH and the presence of carbonates acting as a buffer. Low energy caused little to no structures.

Ground water flow altered the carbonate material through replacement and caused recrystallization into dolomite, but not affecting the southwestern portion of the study area until later on. This resulted in that area along with a few other small areas having red muddy limestone layers followed by red muddy dolostone.

Member 4 was deposited as a mixture of calcium carbonate, mud, and fine sands brought in by storms. Fluctuating sea levels caused laminated beds to form alternating between the sand and mud. Some areas received more sand sediments at points in time specifically in Divide County. This could represent an upper part of the tidal flat while the minor layers relate with more intense storms.

Dewatering or water expulsion forces water through the laminated beds breaking up the sandstone layers. This created the brecciated unit seen in sections of member 4. Overburden from the above sediments caused these brecciated layers to compress resulting in the mottled bed unit that is dominant in member 4.

Member 5 is composed of carbonates materials and mud in a reducing environment where sulphate reducing bacteria removal of oxygen leading pyrite to precipitate. Although the previous member contained some pyrite, high concentrations were created during the deposition of member 5.

Member 6 contains alternating layers of sand and mud from fluctuating sea levels similar to member 4 but not as much dewatering due to the age of deposition. Water had higher energy due to the amount of cross-bedding displayed in the sediment. The bacteria produced pyrite that in some areas such as Divide County developed a diagenetic feature known as pattern dolomite that opened up pores for the sections containing the feature. (Collinson and Thompson, 1982)

**CHAPTER V**  
**VARIABLES RELATING TO OIL**  
**PRODUCTION**

**Natural Fracture Zones**

Fracking is a costly operation for opening fractures within formations to receive higher amounts of oil recovery. The average cost according to Bakken.net for fracking the Three Forks Formation can cost between 1.5 and 2 Million U.S. dollars (Hefley & Seydor, 2011). Knowing where possibly natural fracture zones were located would be a solution to help bring down the cost and lead to easier recovery. Maps were generated for each of the different members of the Three Forks Formation (Figure 30-33). Numbers above 0.6 have been denoted to be natural fracture zones based on data from sonic logs, resistivity logs, and using the Wyllie equation (1). All the members in Williams County contain the highest values for the study area. This could relate to the Nesson Anticline that runs through the area. Member 5 and 3 contain the overall greatest values when breaking it up by members. This might relate to those members being composed of the mudstone units.

**Oil Saturation**

Oil saturation is an important component when looking at oil production, since higher saturation can lead to higher production rate (Figure 30-33). Due to

lack of data only members 6, 5, and 4 were examined and maps were developed. Member 6 of the Three Forks displays two areas with the higher values in Divide and northern McKenzie County. Member 5 the values increase southward towards the center of the basin similar.

to member 4. The highest values for oil saturation overall is in the center of the basin in northeast McKenzie County. Divide County's higher oil saturation in member 6 could relate to that member containing a large amount of pattern dolomite for the county causing the pores to be larger and more oil generation. The sections with this carbonate pattern individually contain the highest oil saturation values for the wells. This may be due to pores being larger because of the diagenesis.

### **Recommended Areas for Drilling**

Previous research of involving reservoir quality interpreted the upper Three Forks Formation to be best as stated in Gutierrez (2010) and Bazzell (2014). Berwick (2008) concluded his lithofacies C and D contained good petroleum reservoirs.

Based on these two variables that effect oil production profit yield there are a few locations that would be in high favor in the study area. These include member 6 in Divide County where pattern dolomite is found and the border of northeastern McKenzie County and southeastern Williams County. Member 6 in the McKenzie County area contains thicker units from being located near the center r of the basin so may have an even higher potential of higher production.

The pyrite concentration that was mentioned in an earlier section can have an effect on production when it relates to equipment. During drilling pyritic section can slow down drilling time and cause drilling bits to be replaced. The lower concentrations of pyrite (Figure 24) are in the western half of the study area, supporting the recommended locations. Although Divide contains larger amounts the diagenesis created a more suitable reservoir by opening the pores allowing for higher oil saturation.



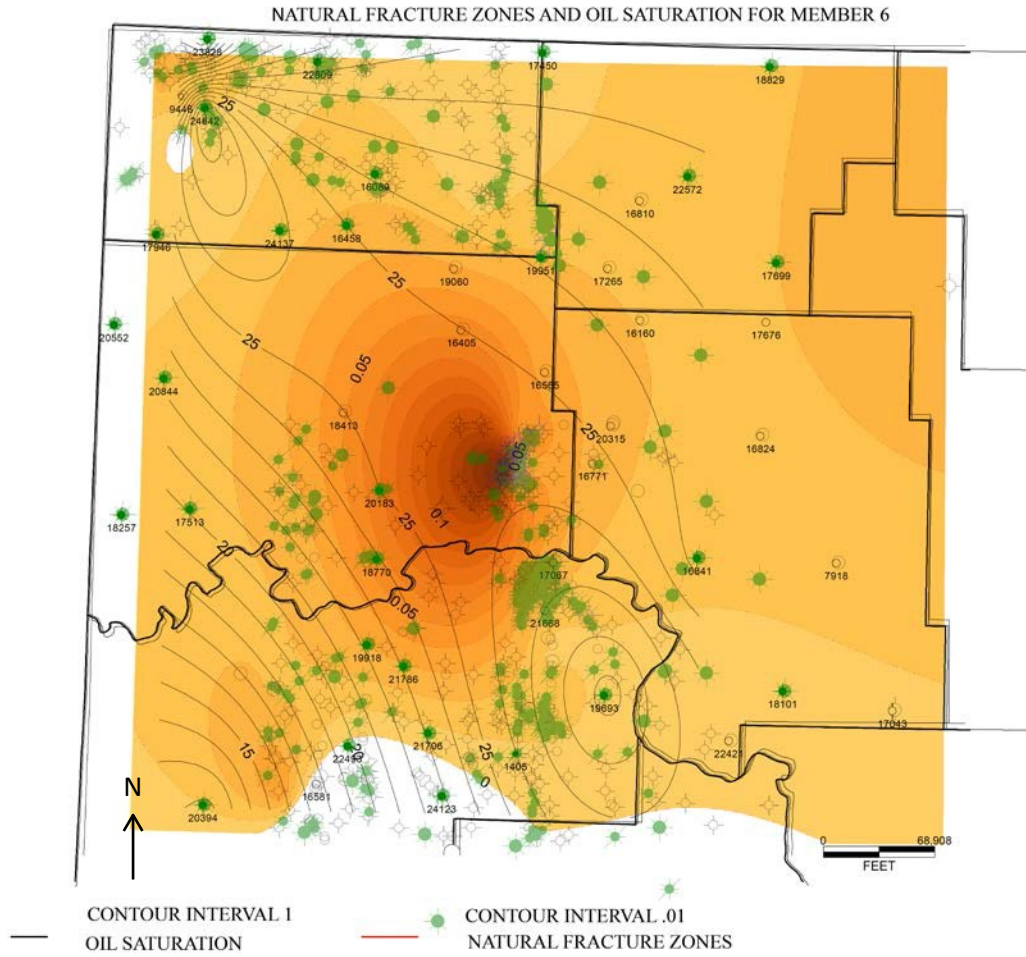


Figure 30. Natural Fracture Zones and Oil Saturation for Member 6. Map of member 6 of the study area showing natural fracture and oil saturation values.

NATURAL FRACTURE ZONES AND OIL SATURATION FOR MEMBER 5

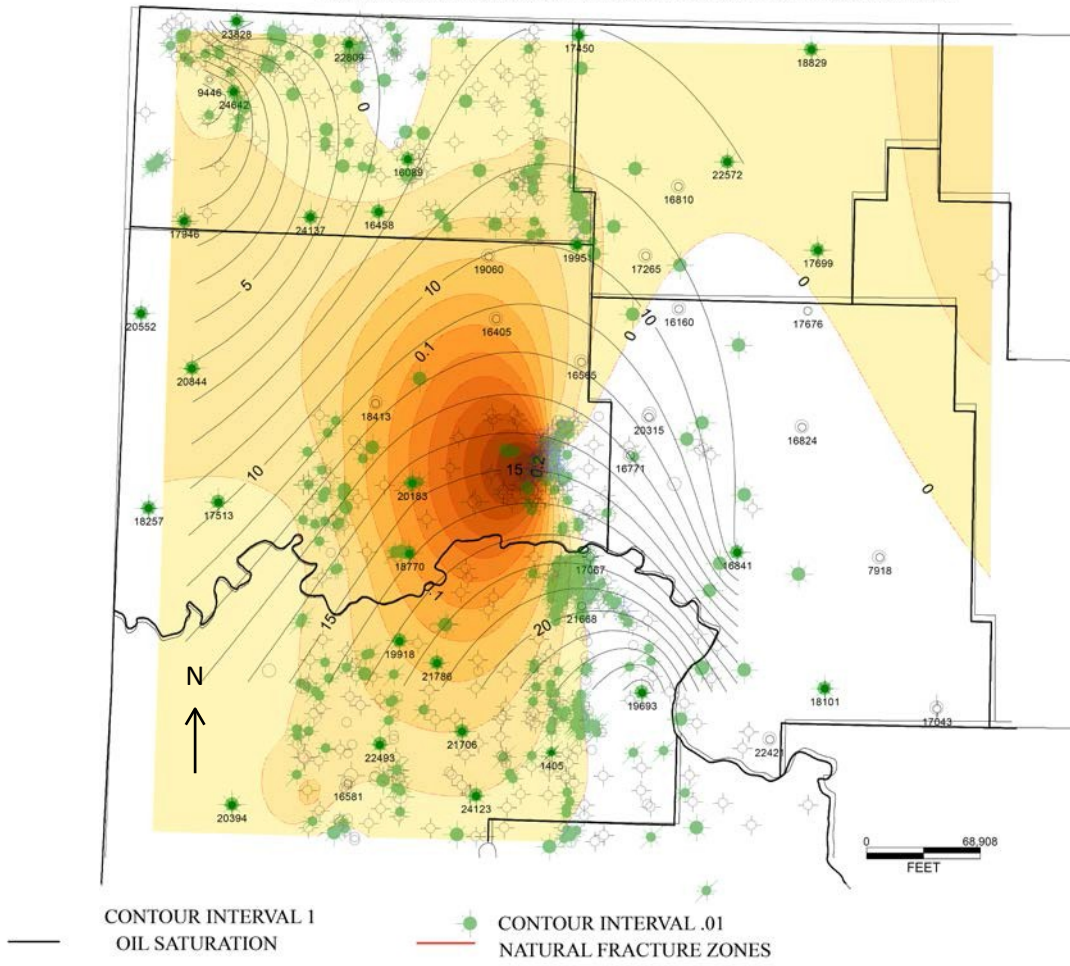


Figure 31. Natural Fracture Zones and Oil Saturation for Member 5. Map of member 5 of the study area showing natural fracture and oil saturation values.

NATURAL FRACTURE ZONES AND OIL SATURATION FOR MEMBER 4

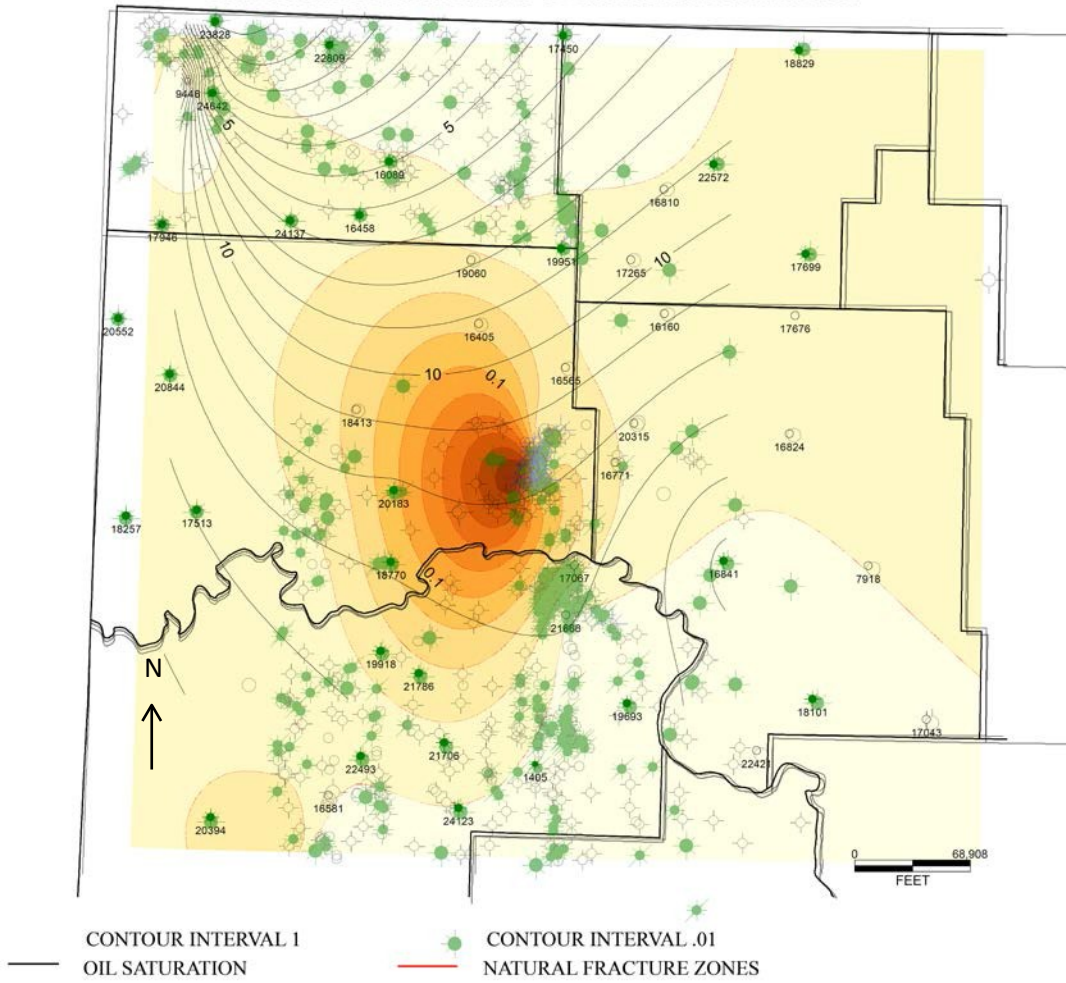


Figure 32. Natural Fracture Zones and Oil Saturation for Member 4. Map of member 4 of the study area showing natural fracture and oil saturation values.

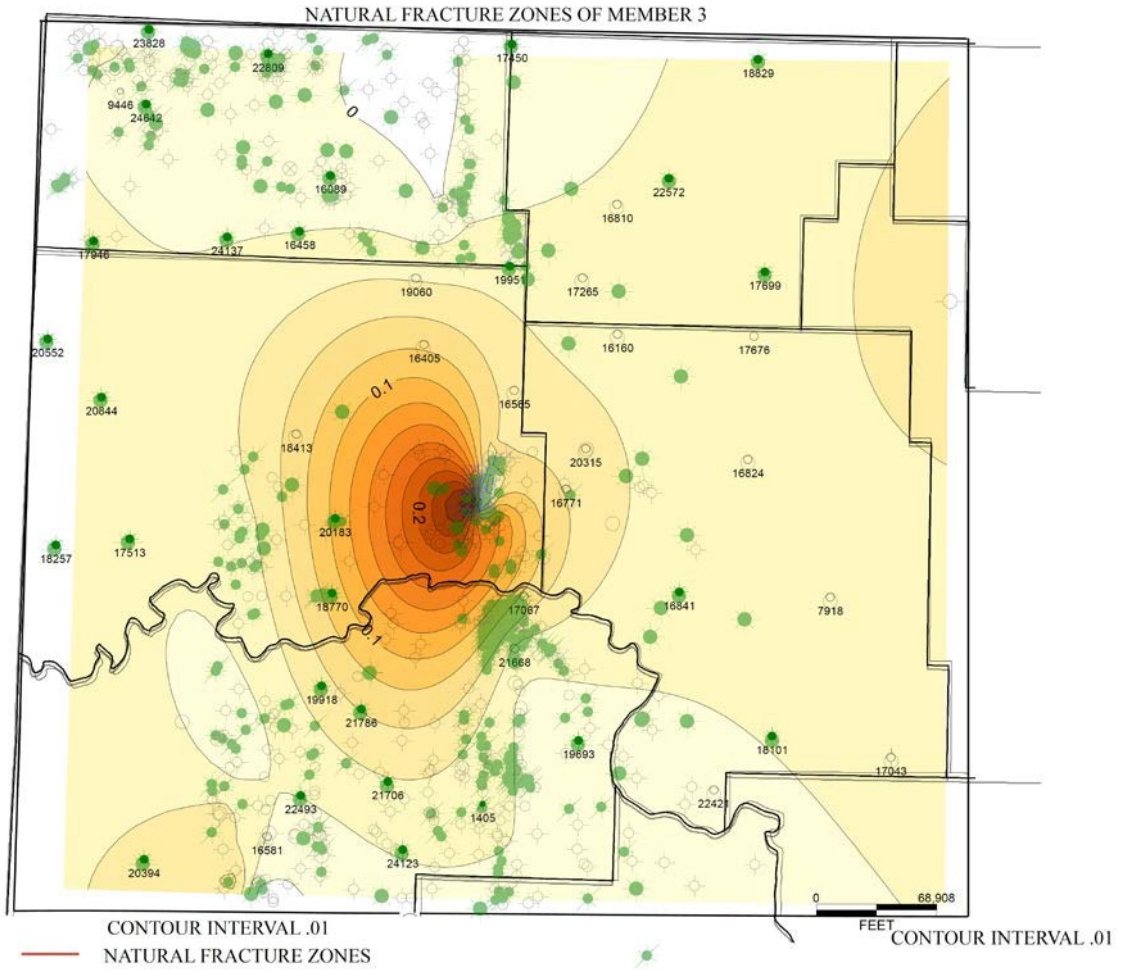


Figure 33. Natural Fracture Zones Member 3. Map of member 3 of the study area showing natural fracture and oil saturation values.

## **CHAPTER VI**

### **CONCLUSION**

- 1.) The Three Forks contains six lithologic units that occur within the six members that can be correlated in the study area including: laminated beds, massive mudstone, sandstone, brecciated beds, mottled beds, and massive limestone
- 2.) The formation was deposited in a supratidal and intertidal environment in semi-arid to arid conditions in hypersaline shallow waters on a tidal flat-sabkha.
- 3.) Carbonates precipitated forming calcite that was replaced by magnesium ions through dolomitization and mixed with clastic sediments brought in by storms. These sediments deposit as massive beds or laminated beds. Fluctuating sea levels lead to alternating between carbonate sand and mud. Later on dewatering deforms the beds along with compression from overburden materials.
- 4.) Three Forks formation members alternate between mudstone and laminated beds of sand and mud.
- 5.) Three Forks formation members alternate between mudstone and laminated beds of sandstone and mudstone.
- 6.) Pyrite is a common mineral in the Three Forks that derived from sulphate reducing bacteria in hypersaline waters. This contributed to the colors of the sediments and pattern dolomite in Divide County and the western portion of the study area.
- 7.) The area that could result in a higher profit yield and production values based on natural fracture zone, oil saturation, diagenesis, and pyrite concentration in the study

area would be in member 6 of Divide County, northeastern McKenzie County and southeastern Williams County.

## **APPENDICES**

## APPENDIX A.

### Formation Tops

API	WELLNAME	SURFLAT	SURFLON	Member 6	Member 5	Member 4	Member 3
3310500770	DAVIDSON SWD	48.347577	-102.857548	9912.26	9936.32	9948.82	9985.48
3305301114	BRADSHAW FEDERAL	47.72722	-103.166894	11110.82	11149.03	11165.22	11205.37
3310501324	NELS ANDERSON	48.339467	-102.959252	9921.54	9947.02	9959.52	9989.65
3305302224	DELMER RINK 1	47.787651	-102.910281	11016.65	11054.76	11068.76	11108.77
3305302248	TANK 12-35	47.856271	-102.937755	10842.64	10876.97	10884.47	10925.89
3305301585	R. L. OLSON 1	47.835876	-102.850767	10634.54	10676.88	10685.88	10719.89
3305302193	C. M. LOOMER	47.843718	-102.871178	10722.89	10748.07	10757.57	10803.58
3305301892	C. LOVAAS (NCT-1)	47.837083	-102.889959				
3305301430	R. L. OLSON 9	47.830994	-102.85801	10706.82	10727.88	10741.88	10786.11
3305301501	R. L. OLSON 1	47.829299	-102.850035	10725.5	10764.14	10772.64	10815.64
3305301451	ELISABET SIVERTSO	47.884561	-102.880522	10701.72	10732.63	10744.63	10787.13
3305302059	SKAVENGER 11-	47.924246	-102.953796	10629.46	10667.07	10680.07	10711.07
3305302018	W.C. DODGE TRUST	47.895398	-102.991948	10685.5	10724.55	10736.04	10769.35
3305301691	WHITE EAGLE 4	47.885377	-102.943634	10794.59	10832.88	10842.68	10882.08
3305301382	GEORGE TANK 2	47.867342	-102.949074	10742.22	10778.88	10788.88	10825.63
3305302043	W. C. DODGE TRUST	47.889045	-102.996692	10693.15	10732.89	10746.89	10777.09
3305301468	EVERETT FELDMAN N	47.87445	-102.901164	10772.9	10809.64	10817.64	10858.14
3305301959	OSCAR JONSRUD	47.932429	-102.997317				
3305301187	MOSHOLDER 4	47.828511	-102.884094	10725.28	10764.72	10772.72	10812.26
3305300730	C.C.O.C. FEDERAL	47.705786	-102.900231	11064.85	11098.97	11106.47	11151.98
3305301629	E. C. OLSON 3	47.834759	-102.841482	10646.88	10684.16	10695.66	10730.16
3302500208	LOST BRIDGE STATE	47.644714	-102.910859	11057.91	11085.44	11095.15	11149
3302500124	DEEP CREEK 1	47.652126	-102.814049	11106.31	11134.26	11148.74	11198.28
3302500014	U.S.A. REED 1	47.641112	-102.835185	11137.72	11165.97	11177.72	11237.47
3302500055	SIGNALNESS 1	47.658018	-102.880625	10732.68	10754.48	10765.48	10824.48
3302500165	SIGNALNESS FEDERA	47.658343	-102.904329	10707.53	10732.07	10739.57	10798.83
3302500348	BIA HALE 1-7	47.651066	-102.697863	11014.25	11070.83	11080.83	11116.01
3302500018	SIGNALNESS UNIT A	47.637483	-102.89436	10957.83	10982.89	10990.64	11052.65
3302500378	SIGNALNESS FEE	47.657467	-102.893588	10640.7	10664.22	10674.72	10739.18
3302500214	HANNA 1-4	47.662854	-102.913101	10602.3	10629.94	10640.44	10670.15
3305300548	U.S.A. DORIS UNIT	47.74971	-103.05046	10859.95	10889.94	10898.24	10931.55
3305302079	ANDERSON 10-1	47.722126	-102.906352	11043.18	11084.34	11095.34	11140.34
3305301042	FEDERAL 12-12	47.741471	-103.042254	10820.49	10847.68	10859.4	10921.19
3305301580	BERG 1	47.728057	-102.724872	11051.24	11099.57	11113.07	11147.52
3305301564	LYLE HENDERSON TR	47.750998	-102.81926	11009.36	11035.66	11049.75	
3305300310	WHERELY-RISSER-OL	47.73737	-102.890232	11003.2			
3305301424	FETTIG 1	47.705239	-102.70947	10995.85	11038.57	11045.07	11086.07
3305300673	NELSEN 1-29	47.701137	-102.86398	10951.35	10991.22	10997.72	11047.72
3305301111	KATRINA 1	47.683583	-102.863231	11124.2	11153.89	11160.49	11183.41
3305301899	BELLIN 1-1	47.748644	-102.912947	10915.35	10953.67	10969.67	11011.17
3305301454	ANDERSON 1	47.755337	-102.954443	10935.07	10976.25	10988.25	11033.75
3305301483	CROFF FIELD SWD S	47.744074	-102.911612	10886.52	10927.76	10937.26	10985.27
3305301794	CONOCO FEDERAL 19	47.715509	-103.021856	10777.82	10804.44	10812.24	10843.48
3305301295	FEDERAL BURNT CRE	47.715623	-102.952797	11069.79	11102.15	11110.66	11162.66
3305302146	BEAR DEN FEDERAL	47.694153	-102.907571	11092.64	11134	11150	11187.5
3305300850	KELLY 1	47.714878	-103.147635	11142.3	11183.5	11197.5	11242.1
3305301215	BEAR DEN 1	47.795094	-102.671626	10950.73	11004.82	11016.32	11052.82
3305300528	AUDREY RABBIT HEA	47.766555	-102.725472	10977.65	11010.22	11019.22	11061.66



Table 1 Continued

3305302081	C. LOVAAS NCT-1	47.842407	-102.883873	10665.84	10703.59	10717.59	10750.84
3305301888	J. S. RICE 1HR	47.831105	-102.891004	10727.11	10764.05	10778.61	10811.25
3305301534	C. M. LOOMER	47.827974	-102.869618	10667.63	10708.63	10720.14	10749.64
3305301676	BLUE BUTTES-MADIS	47.822766	-102.838341	10700.14	10742.07	10753.27	10788.47
3305301711	L. WHEELER 10	47.822684	-102.825474	10780.41	10815.67	10829.67	10870.67
3305301449	G. V. LEVANG 1 H	47.81479	-102.862782	10757.76	10802.02	10810.02	10841.77
3305301535	G. V. LEVANG B	47.816606	-102.879302	10724.64	10760.14	10772.14	10809.14
3305300790	JOHN PHELPS 1	47.791823	-102.885167	10821.54	10866.29	10873.79	10900.04
3305301989	BERWALD FEDERAL	47.793304	-102.849825	10780.38	10823.13	10835.13	10866.64
3305301336	MCKENZIE DRILLING	47.844621	-102.904594	10821.39	10851.39	10863.39	10908.39
3305301739	C. LOVAAS NCT-2	47.845614	-102.922773	10880.11	10918.61	10929.61	10964.61
3305301527	TANK 1-3	47.838897	-102.94763	10810.07	10845.57	10858.57	10889.58
3305300653	KERR 2	47.838517	-103.002099	10834.69	10860.2	10867.2	10908.2
3305301360	KERR 1-5	47.835291	-102.991462	10781.26	10822.51	10830.51	10870.01
3305301835	L. SIGNALNESS 1X	47.828628	-102.952091	10740.08	10783.58	10795.58	10828.58
3305301902	TEXACO ET AL STAT	47.823223	-102.950475	10811.82	10846.07	10860.08	10898.58
3305301144	LILLIBRIDGE 1	47.813065	-102.949003	10752.82	10789.32	10799.82	10837.33
3305300226	CATHERINE E. PECK	47.78788	-102.949065	10823.97	10839.47	10848.97	10901.97
3305300919	LUCKING 1-27	47.780196	-102.949672	10834.07	10868.32	10878.32	10917.07
3305301839	KIRKLAND STATE	47.766192	-102.954441	10906.71	10940.2	10951.2	10995.71
3305301099	WINALICO 32-1	47.762711	-102.997241	10999.76	11039.01	11048.01	11091.27
3305302016	SIVERTSON 15-	47.809703	-103.076703	10801.82	10845.33	10860.33	10894.83
3305301421	H AND M GIERKE	47.798762	-103.12995	11059.9	11099.9	11115.4	11156.9
3305300545	SKJELVIK UNIT	47.777201	-103.060219	10869.71		10905.22	10939.72
3305301396	FLYING J STATE	47.777213	-103.066	10907.34	10947.6	10959.49	10998.85
3305300285	JORE 1-35	47.766384	-103.060704	10979.62	11007.12	11016.12	11066.12
3305301266	SKJELVIK 4-35	47.773595	-103.066026	10973.08	11009.58	11020.08	11059.08
3305300569	DRAGS WOLF 1	47.918509	-102.703997	10427.42	10458.92	10468.92	10514.92
3305301448	F. P. KEOGH 6	47.923639	-102.868124	10657.32	10691.33	10703.83	10742.82
3305301931	A. N. NELSON (NCT)	47.92909	-102.866977	10629.67	10659.42	10677.43	10712.93
3305301173	SIVERTSON 29-23	47.865779	-102.869797	10660.94	10698.94	10711.44	10747.45
3305301253	O. J. ANDERSON	47.864527	-102.890044	10850.38	10890.39	10900.39	10932.89
3305301263	JOHNSON 3	47.87219	-102.882162	10611.07	10648.32	10657.82	10693.57
3305302230	R. E. REITSCH NCT	47.85915	-102.882815	10781.75	10813	10826	10864.26
3305301707	TANK EXCHANGE	47.92191	-102.938109	10668.4	10700.16	10714.16	10753.41
3305301760	SILURIAN 19-1	48.08622	-102.868197	10298.84	10333.39	10342.39	10390
3305302020	HARLEY OLSON	47.925057	-102.997317	10543.11	10578.6	10591.6	10629.61
3305301789	DODGE A-1	47.916913	-102.998442	10596.35	10627.85	10645.35	10684.35
3305301708	ANDERSON STATE	47.89983	-102.956255	10689.16	10723.16	10733.66	10771.66
3305301199	TANK 22-22-S	47.885443	-102.954461	10729.44	10764.44	10774.94	10809.44
3305300536	JACK SKARDA 1	47.863751	-102.932742	10830.98	10850.23	10860.73	10901.49
3305300535	MUIRHEAD-HELSETH	47.875057	-102.944508	10763.22	10791.47	10797.22	10840.72
3305300551	SIGNALNESS-TANK U	47.849318	-102.944302	10806.47	10835.22	10843.47	10881.97
3305301414	ELLESTAD 9-35	47.85127	-102.924908	10956.08	10989.77	10999.27	11040.08
3305301663	SIGNALNESS 13-35	47.850175	-102.938146	10838.34	10879.1	10893.1	10929.6
3305301210	STATE 13-36(S)	47.849657	-102.916825	10865.14	10900.64	10911.64	10949.65
3305301630	STATE 5-36	47.856468	-102.916302	10910.45	10951.2	10958.7	10995.7
3310500667	CLIFFORD MARMON	48.183941	-102.868185	10021.5	10056.75	10071.75	10116.5
3306100268	THOMPSON 4-1	48.282558	-102.765766	10359.27	10390.19	10399.59	10443.66

Table 1 Continued

3306100242	GRONDALE 1-9	48.268116	-102.76556	10243.47	10270.55	10283.55	10327.2
3310500540	BEAVER LODGE-DEVO	48.280435	-102.941425	9863.12	9891.94	9907.94	9935.12
3310501003	HEEN 10-10	48.260372	-102.879304	10160.89	10192.44	10207.94	10241.38
3310500954	R. A. PEARSON	48.245123	-102.929813	9799.01	9822.6	9832.1	9855.98
3310500765	BLDU G-303	48.244234	-102.951416	9867.56	9887.56	9900.06	9936.56
3310500894	KROGEN 1-19D	48.237641	-102.942013	9805.85	9831.45	9842.25	9884.46
3310501024	R. H. ANDERSON	48.22936	-102.952143	9857.38	9881.38	9891.88	9932.38
3310501047	E. ANDERSON 2	48.229471	-102.929251	9758.42	9786.62	9798.13	9841.58
3310501002	KOROM 10-25	48.217141	-102.835767	10359.69	10398.19	10412.7	10459.45
3310501035	D. L. ANDERSON	48.216175	-102.951584	9703.14	9728.89	9737.64	9761.14
3310500728	BEAVER LODGE-DEVO	48.280474	-102.973997	9783.21	9809.97	9818.22	9866.22
3310500709	BEAVER LODGE-DEVO	48.280387	-102.9947	9763.96	9788.46	9803.46	9834.96
3310500718	BEAVER LODGE-DEVO	48.272555	-102.995551	9701.71	9729.72	9740.22	9774.22
3310500656	BEAVER LODGE-DEVO	48.280386	-103.008262	9780.97	9800.97	9811.97	9846.47
3310500580	BEAVER LODGE-SILU	48.26573	-103.005937	9712.68	9739.43	9751.93	9785.93
3310500703	BEAVER LODGE-DEVO	48.264908	-103.006584	9711.2	9738.2	9749.7	9781.7
3310500702	BEAVER LODGE-DEVO	48.25878	-102.984023	9862.22	9884.22	9897.22	9941.22
3310500575	BEAVER LODGE-DEVO	48.258639	-102.972565				
3310500706	BEAVER LODGE-DEVO	48.265734	-102.973427	9831.96	9855.97	9869.47	9908.97
3310500570	BEAVER LODGE-DEVO	48.244637	-102.973254	9880.88	9908.13	9919.88	9948.39
3310500704	BEAVER LODGE-DEVO	48.251544	-102.973249	9880.47	9907.72	9919.72	9953.97
3310500578	BEAVER LODGE-DEVO	48.24447	-102.994713	9741.94	9763.94	9775.44	9804.44
3310500730	BEAVER LODGE-DEVO	48.251883	-102.994119	9765.72	9789.97	9801.22	9845.22
3310500519	BEAVER LODGE-DEVO	48.250525	-103.007169	9674.9	9694.9	9709.5	9748.3
3310500751	MATTSON 1-20	48.230019	-103.047924	9852.91	9881.42	9894.42	9923.92
3310500711	BEAVER LODGE-DEVO	48.237939	-103.00495	9664.96	9692.22	9700.22	9740.47
3310500555	BEAVER LODGE-DEVO	48.237046	-102.984006	9848.69	9869.94	9881.69	9909.69
3310500567	UDLAND HEIRS	48.230197	-102.994823	9748.96	9769.46	9784.46	9821.46
3310501104	WILLISTON PROJECT	48.223432	-102.960964	9744.18	9770.93	9780.18	9819.68
3310501096	HANSON 27-22	48.22085	-103.013672	9711.55	9741.05	9754.55	9785.05
3310500694	WOODROW N. SVEEN	48.199149	-103.067621	9880.61	9907.11	9913.61	9941.11
3310501192	MORTENSON 33-	48.199155	-103.024513	9617.79	9649.56	9641.8	9679.8
3310500699	LOWELL ALLEN	48.206479	-103.013165	9753.19	9772.44	9785.19	9827.7
3310500766	ROBERTS 35-32	48.208084	-102.984961	9653.96	9685.47	9698.97	9725.47
3310500804	WALTER H. GRONDAL	48.246469	-103.121987	10430.82	10460.07	10471.57	10510.07
3310501227	ROSE BOE A 1	48.213759	-103.089385	9980.81	9998.56	10008.56	10053.32
3306100246	ORTLOFF 13-28	48.300191	-102.780077	10383.04	10412.04	10423.04	10469.46
3310500518	BLMU T-25 HR	48.330861	-102.908685	9872.52	9903.49	9915.99	9944.53
3310500557	BEAVER LODGE-MADI	48.337952	-102.941603				
3310500563	BEAVER LODGE-DEVO	48.316682	-102.952381	9891.75	9920.19	9934.19	9966.19
3310500581	BEAVER LODGE-DEVO	48.316578	-102.931217	9905.84	9933.35	9946.85	9977.35
3310500794	OLSON 13-26	48.300262	-102.86774	10220.05	10255.35	10266.85	10291.75
3310500577	BLDU G-311D	48.302003	-102.951043	9886.94	9942.44	9914.44	9955.44
3310500654	BEAVER LODGE-DEVO	48.309617	-102.942456	9856.3	9878.69	9890.19	9933.2
3310500710	BEAVER LODGE-DEVO	48.294903	-102.953671	9834.96	9862.34	9872.94	9907.74
3310500012	ELMER TANK 1	48.347708	-103.067954	10162.08	10179.08	10184.58	10231.59
3310500833	ERICKSON STATE	48.336826	-103.062036	10088.07	10113.82	10123.82	10156.57
3310500579	BEAVER LODGE-DEVO	48.316601	-102.994546	9901.2	9929.7	9942.7	9972.7
3310500542	BEAVER LODGE-DEVO	48.316718	-102.972971	9904.37			

Table 1 Continued

3310500330	BEAVER LODGE-DEVO	48.303962	-102.964804	9912.26	9929.46	9938.27	9980.67
3310500546	BEAVER LODGE-DEVO	48.302168	-102.972972				
3310500552	BEAVER LODGE-DEVO	48.301965	-102.993982	9849.38			
3310500707	BEAVER LODGE-DEVO	48.302175	-102.983828	9821.21	9847.46	9861.96	9887.72
3310501097	KERBAUGH STATE	48.286032	-103.062462	9942.24	9963.25	9976.75	10017.75
3310500529	BEAVER LODGE-DEVO	48.294596	-103.004969	9876.83			
3310500719	BEAVER LODGE-DEVO	48.28769	-102.983977	9750.2	9789.7	9779.2	9821.21
3310500743	BEAVER LODGE-ORDO	48.289469	-102.989829	9747.27	9771.77	9782.77	9816.28
3310500715	BEAVER LODGE-DEVO	48.294246	-102.973033	9800.4	9825.67	9840.97	9885.52
3310500717	BEAVER LODGE-DEVO	48.287703	-102.962277	9818.72	9846.47	9860.97	9888.72
3310501039	STATE 1-11	48.346286	-103.12441	10240.31	10266.06	10279.56	10306.06
3310500907	WITTRUCK 22-1	48.336928	-103.122054	10260.09	10289.59	10298.09	10326.09
3310501036	GORDON E. TANK	48.304308	-103.203996	10910.02	10936.87	10948.37	10991.37
3310500805	MARMON 9-1	48.187836	-102.829839	10499.62	10542.62	10560.62	10591.13
3310500830	HMU 9-34XHR	48.170453	-102.900287	10077.9	10112.34	10123.84	10172.22
3310501222	GOLDEN BUTTE	48.177349	-102.88924	10133.92	10171.5	10182.9	10223.1
3310500778	STATE E 3	48.163549	-102.899561	10095.58	10129.59	10148.59	10198.59
3305300900	CMNU C-134	48.114407	-102.88743	9992.57	10029.16	10038.66	10056.44
3310501150	W. KAMP 3-21	48.194608	-103.014601	9585.13	9607.43	9617.43	9665.93
3310500753	HOVE 42-3	48.191995	-102.874509	10005.61	10042.53	10058.03	10094.1
3310500757	H. C. SMITH 5	48.162465	-102.938427	9825.24	9858.49	9872.49	9914.75
3305300649	FEDERAL 33-1	48.113376	-102.897834	9760.96	9791.72	9802.22	9851
3310501220	SVEEN 2-22	48.195225	-102.997292	9612.86	9634.42	9647.42	9690.37
3310501194	HARTSOCH 3-13	48.188173	-103.017224	9583.11	9604.86	9615.86	9647.62
3305300406	HARRY MENDENHALL	48.111925	-103.00857	10161.94	10193.2	10205.7	10252
3305300393	U.S.A. - THOMAS	48.076139	-102.825022	10599.47	10639.47	10650.47	10691.97
3305300480	DORIS SLAATEN	48.048127	-102.820849	10376.14	10401.39	10408.89	10454.15
3305300515	ANTELOPE UNIT E	48.035668	-102.804424	10355.65	10375.9	10385.15	10439.15
3305300558	ANTELOPE-DEVONIAN	48.028515	-102.795707	10377.72	10402.47	10411.47	10442.72
3305301135	DEVONIAN 2-2	48.108209	-102.911322	9889	9920.33	9931.33	9982
3305301167	CHARLSON USA	48.09998	-102.931646	9830	9865.02	9878.52	9926
3305302157	USA 5D-4-4HR	48.098592	-102.91936	9999.07	10029.9	10043.4	10088
3305300648	DEVONIAN UNIT	48.099864	-102.941314	10007.04	10031.23	10037	10102
3305301617	CMNU B-306X	48.103711	-102.942405	9960	9997	10005.5	10057
3305301919	CMNU D-407X	48.083618	-102.938317	10200	10234.35	10251.85	10293
3305302008	SILURIAN 39-1	48.084963	-102.949429	10160	10197.1	10210.6	10252
3305302007	SILURIAN 41-1	48.090518	-102.917684	9939	9973.6	9984.6	10033
3305302144	CMNU B-108	48.091375	-102.932965	10140	10174.13	10188.63	10232
3305302151	PROSPER-ISAACSON	48.084128	-102.911194	10278	10310.63	10324.63	10369
3305301166	SILURIAN 14-1	48.085607	-102.875286	10337.08	10372.1	10382.1	10431
3305301763	SILURIAN 18-1	48.08617	-102.884464	10345	10379.1	10387.7	10438
3305301906	SILURIAN 26-1	48.081088	-102.865983	10258	10292.57	10299.17	10350
3305301783	SILURIAN UNIT	48.078446	-102.857172	10247.74	10282.73	10295.33	10340
3305302012	STATE 16-12	48.07609	-102.91094	10336.18	10368.63	10379.63	10424
3305302143	STATE 16-31	48.079293	-102.900606	10387	10419.05	10430.55	10475
3305301773	FEDERAL 17-32	48.076096	-102.922206	10282	10313.79	10326.99	10370
3305301826	DORIS SLAATEN	48.0761	-102.930708	10204	10238.43	10249.43	10288.93
3305301908	DEVONIAN 11-1	48.076109	-102.939325	10163	10196.84	10210.84	10251
3305301958	SILURIAN 37-1	48.079745	-102.949007	10149	10186.35	10200.85	10245

Table 1 Continued

3305301750	SULLIVAN 4-19	48.055797	-102.937773	10192	10227.07	10236.87	10280.07
3305301860	GLADYS 2-19	48.062709	-102.949322	10190	10224.9	10237.9	10277
3305301669	NORBY STATE 1	48.057465	-102.921605	10318			
3305301724	ALMA 1-20	48.063794	-102.921853	10300	10328.44	10341.03	10383
3305301903	SILURIAN 38-1	48.057761	-102.911334				
3305301920	CMSU C-421	48.05802	-102.895508	10330	10367.11	10380.61	10419
3305300754	SILURIAN 2-1	48.054553	-102.885215	10358.48	10397.66	10408.66	10443
3305301426	P.S. THORLACKSON	48.058052	-102.878228	10376.14	10409.07	10421.07	10460
3305300755	SIGUARDSON 42	48.061574	-102.853844	10388	10419.58	10428.08	10479
3305301878	W. J. DINWOODIE	48.062735	-102.863207	10428	10460.95	10471.59	10512
3305300686	SIGUARDSON TRUST	48.048962	-102.8465	10423.5	10453.37	10460.37	10511
3305301395	TIPCO 1-15	48.07247	-102.889798	10345.62	10380.62	10390.62	10436
3305300778	THORLACKSON 1	48.050795	-102.868012	10411	10449.14	10456.14	10502
3305302027	SLAATEN 26-1	48.050775	-102.857301	10400	10433.67	10446.67	10489
3305301836	SHERVEN 27-34	48.041181	-102.878881	10341	10378.46	10390.06	10431
3305302113	TEMPLE-HAUGEN	48.049011	-102.87613	10372	10409.37	10422.37	10463
3305300844	E. O. AND G.	48.043576	-102.8952	10330	10362.67	10373.24	10422
3305301729	ERNEST 1-29	48.050518	-102.920915	10269	10300.4	10312.6	10359.2
3305301749	OLSON 1-29	48.043724	-102.922347	10220	10253.14	10264.95	10310.55
3305301481	T. K. UNIT 1-	48.04776	-102.938843	10222	10258.28	10270.28	10317
3305302216	SILURIAN 61-1	48.04356	-102.949114	10232	10267.34	10284.34	10322
3305301051	QUALE 3X	48.025485	-102.943687	10313	10346.36	10357.36	10403
3305300798	STATE 43-36	48.029107	-102.830362	10557.35	10592.35	10600.85	10635.85
3305300567	MOGEN 1	48.08297	-103.003617	10086.46	10122.71	10133.71	10176
3305302135	MISSOURI BREAKS U	48.083354	-103.008269	10040	10080.81	10090.81	10130
3305302111	CHARLSON FEDERAL	48.071325	-102.96011	10218	10253.85	10265.85	10306
3305301203	FEDERAL 15-1	48.076088	-103.013694	10094	10125.96	10137.46	10181
3305301951	SILURIAN 36-1	48.063085	-102.959846	10177	10211.65	10221.65	10263
3305301747	WEST NESSON FEDER	48.041621	-103.104563	10809.18	10846.69	10859.69	10897.88
3305300469	ANNA M. HOLT	48.087392	-103.175765	11092.95	11165.95	11130.45	11175.95
3305300961	TOBACCO GARDEN	48.072787	-103.170927	11050.69	11081.16	11088.66	11125.06
3305301512	BRODERSON 29-	48.047797	-103.186153	11075.74	11112.26	11125.76	11163.03
3305302210	SILURIAN 63-1	48.041225	-102.959283	10324	10356.84	10369.35	10412.85
3305300560	ANTELOPE-DEVONIAN	48.0258	-102.781046	10372.2	10391.2	10403.2	10451.71
3305300561	ANTELOPE-DEVONIAN	48.00192	-102.75948	10297.22	10326.47	10331.22	10372.22
3302500440	TWO CROW 1-5	47.755611	-102.606705	10874.32	10909.32	10920.82	10962.82
3305300559	AMU H-517HR	48.006408	-102.768556	10312.71	10333.22	10342.72	10384.72
3305300556	ANTELOPE-MADISON	48.017526	-102.781592	10275.96	10301.22	10311.72	10342.97
3305300557	ANTELOPE-DEVONIAN	48.01061	-102.775916	10249.46	10265.96	10276.97	10324.97
3305301190	HAWKEYE-MADISON U	48.012168	-102.878212	10439	10467.03	10478.04	10524
3305301937	SWENSON 20-22ST2	47.972692	-102.86848	10600.78	10636.53	10650.53	10686.28
3305301531	L. L. CHAPIN	47.938263	-102.869993	10665.76	10694.51	10704.51	10747.27
3305301795	WISNESS 1	48.01558	-102.943594	10346.98	10381.49	10393.49	10430
3305302078	ROLFSRUD UNIT	47.974765	-102.988966	10614.13	10646.89	10659.89	10699.14
3305302034	STATE OF NORTH DA	47.937524	-102.991319	10577.63	10607.89	10619.89	10644.64
3305301634	L. J. GRANTIER A	48.020582	-103.11668	10667.33	10701.23	10714.23	10750.13
3305301579	VAN DYKE 1	47.936879	-103.138915	11000.07	11038.57	11051.07	11088.57
3305300426	THOMAS YELLOWFACE	47.878255	-102.758284	10727.72	10750.72	10759.22	10810.22
3305302250	HYSTAD 4-11	47.918069	-103.4503	11148.72	11183.73	11196.23	11227.23

Table 1 Continued

3305302242	TRAVIS LEE 1	47.662295	-103.458619	11038.56	11081.51	11092.91	11132.71
3305302260	NELSON STATE 7	47.658683	-103.463993	10993.78	11012.77	11029.97	11084.17
3305302082	SILURIAN UNIT	48.076415	-102.960022	10146	10180.6	10198.6	10235
3305301320	TED UNIT 1	48.047214	-102.938855	10220	10252.33	10265.33	10307
3305300771	SUGAR BUTTE 2	48.029068	-102.885011	10302	10340.17	10349.67	10392.17
3305302268	ISABEL-BRYANT	47.844486	-103.071861	10889.86	10929.86	10944.86	10980.36
3305302269	STATE OF NORTH DA	48.034545	-102.959341	10330	10359.26	10371.26	10416
3305302267	MCKEEN 30-23	48.042956	-102.820481	10406.78	10437.03	10448.53	10498.53
3305302295	GILBERTSON NCT-2	48.070335	-102.865848	10377.24	10411.45	10422.45	10472
3305302314	C. M. LOOMER	47.836218	-102.881709	10644.75	10684.25	10697.25	10732.25
3310501381	EIDE 1	48.152623	-103.482422	11007.27	11035.02	11048.53	11082.03
3305302335	O. J. ANDERSON	47.871883	-102.889292	10699.38	10735.38	10746.88	10783.89
3310501397	BEAVER LODGE-DEVO	48.318378	-102.933323	9900.25	9933.01	9947.01	9977.86
3305302342	SILURIAN UNIT 23	48.072523	-102.95053	10175	10212.65	10227.15	10264
3310501389	NELSON 22-44	48.316263	-103.004936	9940.4	9967.4	9979.4	10009.9
3305302357	STENEHJEM HD 27	47.77926	-103.072174	11004.25	11042.5	11058	11097.25
3305302293	SCHULTZ 8 3	47.653273	-103.456476	11042.01	11089.1	11106.1	11140.1
3305301422	HEGGEN 1	47.807617	-103.548517	11058.2	11090.45	11099.95	11131.71
3305301353	BERGE C 1	47.810327	-103.578827	10979.09	11013.59	11025.09	11055.6
3305300652	HEGGEN 33R-29	47.78136	-103.504974	11117.51	11138.76	11148.26	11192.02
3305301495	MOEN 1-35 SWD	47.773943	-103.451365	11239.84	11277.34	11286.84	11318.84
3305301904	D.A. WOLD A 1	47.83868	-103.189167	11040.45	11076.46	11089.96	11155.46
3305301359	ROLFSON 1	47.835228	-103.23751	11131.14	11167.14	11176.14	11224.14
3305301105	KENNEDY 1-3	47.839093	-103.076018	10845.47	10885.97	10898.97	10933.47
3305302298	O. V. STENEHJEM	47.777777	-103.071371	11007.59	11046.35	11059.35	11091.1
3305301350	J. W. FISKETJON	47.84282	-103.341802	11159.58	11190.33	11203.83	11241.08
3305301405	A. JOHNSRUD A	47.830702	-103.353314	11239.17	11276.42	11285.92	11319.17
3305301092	SHAFFER STATE	47.795314	-103.178402	10970.52	11015.77	11023.27	11061.27
3305301411	COOPER PETROLEUM	47.77732	-103.161912	10955.77	10995.17	11002.77	11049.57
3305301176	ROGNESS 1-34	47.770903	-103.332795	11039.83	11088.33	11075.83	11127.33
3305301400	HOVDE 1-6	47.846931	-103.521573	10990.34	11020.34	11032.34	11063.84
3305301140	FELLAND A 1	47.806513	-103.33961	11105.99	11142.99	11154.49	11191
3305301278	JOHN FELLAND	47.799256	-103.339112	11100.83	11140.83	11151.33	11185.84
3305301113	SANDERS 1-6	47.837851	-103.53789	10996.84	11027.34	11039.34	11068.84
3305301416	FLECK 1	47.824759	-103.457021	11166.75	11200.25	11212.5	11244.26
3305301273	HAROLD J. ROGNESS	47.788615	-103.440774	11196.07	11230.57	11242.57	11278.08
3305301597	H. J. DAHL 1	47.779519	-103.469084	11168.84	11203.84	11217.84	11246.84
3305301592	LINDVIG DAVIDSON	47.995231	-103.576387	10864.91	10890.92	10906.92	10931.49
3305301569	LINDVIG DAVIDSON	47.987669	-103.580903	10809.11	10834.67	10845.17	10874.31
3305301366	HYSTAD 11-31	47.940647	-103.405985	11159.54	11195.54	11208.04	11241.54
3305301349	STATE OF NORTH DA	47.960106	-103.288092	11141.58	11175.08	11189.08	11224.58
3305301543	SYVERSON 7-34	47.943492	-103.461524	11076.2	11112.6	11123.4	11156.8
3305301599	SCHMITZ 8-30	47.960366	-103.523677	10911.59	10943.09	10954.09	10982.09
3305301471	STATE OF NORTH DA	47.938513	-103.415659	11219.83	11256.34	11269.84	11296.84
3305301084	MATTHEW 1-20	47.791118	-102.747231	10813.38	10845.88	10855.88	10893.38
3306100179	FORT BERTHOLD ALL	47.842165	-102.591499	10742.17	10787.67	10800.67	10839.17
3305301237	C. M. LOOMER	47.8447	-102.87401	10690.47	10730.72	10742.72	10775.97
3305301435	SIGNALNESS 1-	47.828409	-102.952377	10739.75	10780.25	10788.76	10825.26
3305302112	EISENLOHR TRUST	47.780352	-102.997245				

Table 1 Continued

3305301986	POGO STATE 1	47.763739	-103.558534	11157.31	11180.06	11188.06	11220.81
3305301284	BERGE 1	47.802706	-103.568984	11061.54	11099.04	11108.54	11143.04
3305301137	NYGAARD STATE	47.799965	-103.576791	11030.09	11064.09	11077.09	11104.09
3305301293	JACOBSON 1-26	47.785365	-103.575409	11047.72	11080.22	11091.22	11125.72
3305302397	BRENNA-LACEY 1	48.01858	-102.776308	10260.63	10291.13	10302.13	10330.64
3310501411	BEAVER LODGE-ORDO	48.277675	-102.982126	9739.88	9766.38	9778.88	9816.38
3310501414	IVERSON 1-30	48.224263	-102.942008	9819.62	9849.37	9858.12	9902.12
3305302407	G. L. THOMPSON	48.086969	-102.942312				
3310501418	BEAVER LODGE-DEVO	48.317096	-102.949225	9875.06	9905.71	9917.21	9950.21
3310501417	BEAVER LODGE-DEVO	48.331604	-102.949487	9821.46	9850.96	9865.46	9892.12
3305301488	BECKEN 1	47.918132	-103.135881	11091.26	11130.26	11145.76	11174.76
3305300903	ROLFSRUD 1	47.918066	-103.065686	10894.89	10927.64	10939.14	10984.39
3305301844	G.L. NELSON A	47.889094	-103.141642	11007.57	11042.37	11057.37	11094.97
3305300320	R. KOESER (NCT-1)	47.860319	-103.065997	11015.42	11041.93	11052.93	11100.93
3305301467	DAVID ROLFSON	47.883154	-103.255785	11099.23	11132.33	11147.83	11180.33
3305302080	JOHNSRUD 1-31	47.850643	-103.268446	11119.9	11154.5	11165.9	11210.71
3305301071	HENRY TORSTENSON	47.861113	-103.349791	11019.69	11057.31	11070.81	11099.06
3305301408	HYSTAD SWD 1	47.923986	-103.439931	11124.86	11157.86	11170.86	11200.36
3305301191	R. T. LATTIN	47.871634	-103.333847	11212.31	11249.31	11261.81	11296.81
3305301485	WALLA 1	47.865712	-103.376774	11099.83	11133.08	11142.08	11179.58
3305301544	CLOUSE 7-18	47.902425	-103.396867	11159.33	11202.34	11213.84	11245.84
3305301516	BRATCHER 1-5R	47.92286	-103.516047	10935.01	10962.76	10972.76	10999.26
3305302070	FORT BERTHOLD TRI	47.893607	-102.660907	10629.97	10672.77	10684.77	10727.37
3305300995	OLIVE WELLS 1	47.932955	-102.762151	10577.89	10602.39	10613.39	10664.9
3305301559	L. M. STENEHJEM	47.914247	-103.469045	11057.08	11091.84	11102.84	11136.59
3305301720	WRIGHT 1-5	47.671906	-103.319804	11218.59	11257.59	11272.59	11316.09
3305301429	KNUTE HAGEN 1	47.654502	-103.240306	11346.55	11392.04	11407.04	11449.04
3306100290	STROBECK 1-35	48.202268	-102.469053	10070.1	10105.3	10117.3	10153.81
3302500147	BULL FAMILY 1	47.675836	-102.452182	10583.81	10630.76	10640.26	10679.66
3305301551	EIDE 35-11	47.680099	-103.317048	11190.29	11216.79	11225.79	11263.29
3306100238	GRACE 1-20	47.802772	-102.478417	10457.56	10501.57	10514.07	10558.07
3306100333	SANISH 1-23	47.971356	-102.547303	10532.98	10555.37	10565.97	10630.49
3310500957	SLETTE-STANGELAND	48.080293	-103.493098	10968.8	10998.08	11007.58	11040.48
3310501041	SLETTE-STANGELAND	48.077312	-103.500099	11035.08	11064.08	11076.59	11106.09
3310501177	STOKKE 22-22	48.063607	-103.531498	10906.3	10934.16	10947.96	10971.36
3310501416	ANDERSON 24-2	48.232822	-102.973047	9835.08	9860.08	9871.58	9907.58
3306100177	JOHNSON 1	47.918064	-102.559206	10712.7	10742.25	10750.7	10783.7
3302500407	DSEC CLEMETS-OLSO	47.659098	-103.059796	11121.29	11156.33	11165.8	11221.1
3305301602	LADD-HART-JOYCE A	47.64432	-103.128555	11387.97	11429.08	11441.68	11488.76
3305302072	TURNQUIST 10	47.647816	-103.54202	10910.7	10964.71	10975.71	11016.71
3305301254	NYGAARD 1-24	47.709422	-103.546586	11110.3	11139.3	11151.8	11198.3
3305301170	MORK 1	47.737921	-103.381983	11061.83	11100.34	11112.84	11149.84
3305300946	WILBUR CAMPBELL	47.723083	-103.311646	11137.74	11171.74	11189.24	11229.24
3305301143	STATE-ROGNESS	47.716287	-103.456883	11005.36	11044.11	11056.61	11090.36
3305301213	MCGREGOR 12B-23	47.713597	-103.450134	11007.34	11043.84	11058.84	11095.84
3305302145	GUNDERSON 1-1	47.994416	-103.216602	11161.83	11204.08	11217.58	11245.33
3310500967	LONG CREEK 4-	48.10925	-103.352566	11217.25	11247.33	11260.83	11290.25
3310501182	BROGGER 21-4	48.109324	-103.423364	11266.75	11298.11	11310.11	11348.61
3310501012	BRATLIEN 1 41	48.123522	-103.541797	10877.57	10906.1	10918.71	10951.56

Table 1 Continued

3310500885	FEDORENKO 1-2	48.152386	-103.553847	10725.45	10752.21	10763.71	10795.21
3310500802	LONG CREEK 1	48.112869	-103.353212	11177.59	11209.35	11221.35	11251.6
3310500944	FEDERAL 1-5	48.184907	-103.563882	10824.33	10851.08	10862.58	10898.58
3310501031	HANSON 24-15	48.157417	-103.529059	10837.28	10862.64	10876.05	10908.25
3310500823	ND STATE 1-16	48.156106	-103.541606	10779.92	10806.33	10817.83	10851.33
3310500810	LEE 1	48.158363	-103.584632	10683.28	10711.03	10721.53	10753.03
3306100190	MORROW 44X-26	48.300607	-102.594723	10216.87	10251.37	10266.37	10323.87
3306100187	L. TEXEL 21-3	48.296464	-102.603761	10301.61	10332.61	10342.11	10383.62
3310500868	NCGA 14-33	48.19974	-103.165234	10809.28	10836.79	10848.29	10897.79
3310500886	SOLBERG STATE	48.25375	-103.224133	11097.97	11122.72	11137.22	11178.73
3310501145	GREENGARD 1-2	48.22154	-103.385427	11161.57	11188.58	11202.58	11229.97
3305300546	GRADY HEIRS F	47.990616	-102.596743	10527.32		10565.36	10605.72
3305302030	MOBY DICK FEDERAL	47.693667	-103.05406	10749.26	10791.81	10806.94	10848.77
3305301447	JOHNSRUD 1-3	47.748409	-103.199586	11181.33	11222.83	11236.33	11280.84
3305301847	NEER 11-1	47.734839	-103.574929	11061.3	11087.04	11099.04	11137.55
3306100163	JOSEPHINE DANCING	47.830908	-102.463469	10437.31	10493.97	10504.97	10538.97
3306100344	SUN MARATHON SHOB	47.87458	-102.623896	10670.01	10712.51	10722.01	10766.51
3305301202	C. L. STENBERG A	47.907837	-103.344406	11373.56	11408.56	11421.06	11455.56
3305301432	STATE 1-36	47.853969	-103.424115	11184.28	11219.28	11233.28	11267.28
3310500910	TOFTE 1-1R	48.10761	-103.479444				
3310500866	SEATON 14-30	48.214147	-103.336659	11105.6	11131.6	11144.1	11170.37
3310500848	ROLFSTAD STATE	48.246556	-103.541972	10538.83	10560.08	10568.58	10597.83
3305302460	STEVENS STATE	47.676348	-103.514552	10970.34	11005.84	11017.34	11058.85
3310501423	BEAVER LODGE-SILU	48.307385	-102.989784	9820.99	9847	9859.5	9894.5
3310501429	BROWNELL 34-1	48.208628	-103.018903	9705.32	9726.32	9734.82	9783.33
3305302502	EIDE 35-11R	47.679565	-103.317312	11222.05	11262.55	11271.55	11316.06
3305302501	STATE 1-36A	47.686614	-102.907507	10900.5	10937.16	10949	11000
3305302492	LOVAAS 6-32	47.843557	-102.88424	10690.26	10730.18	10743.68	10774.76
3310501452	BEAVER LODGE-SILU	48.272804	-102.973529	9817.18	9843.43	9856.43	9888.18
3310501459	TIOGA SOUTH 1	48.220982	-103.089284	9954.53	9972.78	9982.78	10029.78
3310501477	BLDU EE-310	48.297998	-102.968303	9835.68	9860.42	9875.42	9909.92
3310501475	BLDU DD-309	48.289976	-102.980237	9751.18	9777.68	9791.18	9835.68
3305302508	THOMPSON 6-32	48.106283	-102.941527	9810	9847.58	9862.58	9900
3310501454	BEAVER LODGE-DEVO	48.258443	-102.96399	9909.46	9932.96	9945.96	9983.96
3310501481	BLDU DD-310	48.29786	-102.979458	9806.29	9836.93	9850.43	9878.34
3310501484	BLSU E-405A	48.262183	-102.968916	9880.65	9906.9	9919.4	9959.65
3305302524	CHARLSON USA	48.108284	-102.868111	9973	10006.6	10018.6	10059
3310501480	BLDU DD-308	48.283395	-102.979648	9740.45	9764.95	9775.45	9818.45
3302500003	ANGUS KENNEDY	47.711593	-102.522114	10604.99	10634.49	10644.99	10693.49
3302500179	PACKINEAU BIA	47.725993	-102.617307	10892.82	10928.82	10939.82	10980.32
3302500268	HARMON 1	47.712002	-102.596835	10776.57	10802.82	10809.57	10864.58
3305300004	NORTH DAKOTA B	47.769667	-102.906134	10925.45	10958.45	10966.96	11010.46
3305300026	ROUGH CREEK UNIT-	47.643287	-103.107322	11293.5	11329.5	11349	11387
3305300477	BLUE BUTTES-MADIS	47.925045	-102.873516	10657.25	10690.75	10701.75	10739.75
3305300492	ANGUS KENNEDY	47.870472	-102.997526	10674.94	10697.95	10705.95	10757.95
3305300665	ROBERT PETERSON	47.738166	-103.32253	11086.53	11127.03	11139.53	11180.54
3305300757	PETERSON 1-10	47.741827	-103.328185	11018.93	11056.94	11068.44	11108.94
3305300884	NORSTOG 1-3	47.748708	-103.328245	11000.08	11022.58	11031.58	11068.08
3305300956	MINNESOTA FARMS	47.684021	-103.365718	11113.59	11155.09	11165.09	11207.09

Table 1 Continued

3305301055	REITSCH NCT-2	47.856454	-102.884772	10774.79	10807.32	10813.29	10858.29
3305301155	HAMRE 1	47.714357	-103.317525	11250.08	11323.39	11283.89	11334.89
3305301186	C. M. LOOMER	47.83836	-102.87939	10644.95	10686.2	10694.2	10730.46
3305301205	THOMPSON 1	47.759141	-103.521959	11170.15	11206.65	11218.15	11247.65
3305301220	LARSON 1	47.658628	-103.530645	11113.3	11126.3	11135.3	11192.81
3305301246	C. M. LOOMER	47.850227	-102.872228	10714.63	10756.39	10770.89	10798.64
3305301260	JOHNSON 1-4	47.75266	-103.361176	11069.21	11102.71	11115.21	11182.21
3305301335	A. N. NELSON NCT-	47.929086	-102.86812	10624.89	10659.14	10669.64	10708.89
3305301394	NELSON 1-7	47.658684	-103.464643	10950.69	10970.69	10978.69	11019.19
3305301409	BRUINS 1	47.868547	-103.452312	11168.35	11204.36	11216.36	11244.86
3305301436	SKEDSVOLD 23-	47.886693	-103.57491	10833.71	10865.91	10877.71	10905.32
3305301445	FORTHUM 1-1	47.9264	-103.553277	10849.79	10875.29	10887.79	10919.29
3305301453	NELSON STATE 6	47.663813	-103.467556	10973.7			
3305301492	CIMARRON FEE	47.712647	-103.145924	11078.02	11104.28	11114.28	11170.03
3305301500	BIA-WOLF 1-27	47.70119	-102.70071	10991.95	11040.71	11049.21	11087.96
3305301505	JOHNSRUD AND SONS	47.85093	-103.265186	11108.36	11144.53	11158.53	11201.03
3305301510	BETTY BERG 1-	47.744516	-103.193253	11195.58	11234.09	11248.09	11291.09
3305301513	NELSON STATE 7	47.659121	-103.46336	10989.34	11023.84	11032.84	11083.35
3305301541	BOLKEN 24-12	47.882622	-103.558708	10829.92	10850.32	10861.12	10890.92
3305301557	SCHULTZ 1	47.657329	-103.455636	11045.34	11081.84	11094.34	11138.35
3305301568	BERTINUSON 11	47.874046	-103.535759	10950.86	10981.36	10994.86	11028.86
3305301608	CEYNAR 1	47.649476	-103.452051	11071.04	11110.55	11123.05	11170.05
3305301667	JOHNSEN 1	47.650854	-103.464859	10999.59	11042.59	11053.59	11121.1
3305301732	GUDMUNSEN FEDERAL	47.64424	-103.448033	11067.29	11112.31	11128.71	11190.11
3305301766	HAMRE 1-15	47.719721	-103.329146	11289.21	11323.71	11336.72	11377.72
3305301774	ANDERSON 1	47.665402	-103.445384	11014.34	11053.84	11065.34	11107.34
3305301932	NORSTOG 2-13	47.748706	-103.322871	11037.64	11077.45	11091.45	11130.45
3305301939	STATE ROGNESS	47.635064	-103.42629	11131.59	11171.09	11186.09	11225.6
3305301970	BULLY FEDERAL (ND)	47.629679	-103.42527	11172.54	11219.54	11231.04	11270.55
3305301978	PHILLIP MOEN	47.901874	-103.43859	11186.47	11223.47	11236.47	11264.97
3305302076	HAGEN 1-13	48.070247	-102.83862	10449.48	10450.49	10488.33	10544.35
3305302171	IVER SELLESETH	47.86554	-102.882151	10739.66	10775.16	10787.66	10824.67
3305302190	WESTHOMA A 1	47.897211	-103.504926	11020.27	11053.78	11067.28	11097.28
3305302196	NORTH STOCK BUTTE	47.658625	-103.393751	11226.7	11269.46	11278.46	11317.71
3305302271	JOHNSRUD 1-32	47.852622	-102.997723	10838.54	10872.79	10884.3	10924.05
3305302302	GOVT. T. G. DOROU	47.909016	-102.869011	10770.28	10801.03	10812.53	10860.04
3310500591	L. J. HOVDE 1	48.167336	-103.277684	11144.72	11176.22	11189.22	11232.22
3310501498	BLDU CC-308	48.283388	-102.990052	9750.93	9777.18	9791.68	9822.43
3310501482	BLDU EE-308	48.285085	-102.967815	9785.4	9811.2	9825.74	9860.79
3310501510	BLDU DD-307	48.277205	-102.977523	9779.2	9805.45	9817.96	9853.71
3310501507	BLDU FF-310	48.300221	-102.957428	9866.55	9895.2	9910.7	9937.52
3305300688	DINWOODIE 22-	48.062126	-102.862662	10420	10455.53	10464.03	10510
3305301496	CHARLSON (DEEP) U	48.107795	-102.885168	10038	10068.57	10082.07	10133.07
3310500151	BEAVER LODGE-DEVO	48.32206	-102.944207	9839.56	9865.56	9881.06	9912.07
3310500696	BEAVER LODGE-ORDO	48.294931	-102.973023	9810.75	9833.9	9843.9	9889.03
3310501426	KAMP SWD 34-2	48.202068	-103.011996	9771.62	9792.12	9805.12	9849.62
3305302488	STATE 4-24	48.010829	-102.720286	10812.24	10858.36	10869.36	10895.32
3310501430	BEAVER LODGE-DEVO	48.258563	-102.983616	9868.45	9896.2	9910.2	9947.95
3310501435	BEAVER LODGE-DEVO	48.290779	-102.968476	9808.35	9838.6	9852.1	9881.92



Table 1 Continued

3305300531	RALPH SLAATEN	48.058032	-102.868032				
3305300562	DEVONIAN 5-1	48.107239	-102.885574	10037.91	10060.67	10070.17	10123
3310500686	BEAVER LODGE-ORDO	48.266011	-102.994801	9755.79	9785.54	9793.54	9829.29
3305300579	THOMPSON 1	48.036313	-102.932813	10230.46	10246.96	10255	10311
3310500708	BEAVER LODGE-DEVO	48.273234	-102.962396	9870.47	9901.47	9910.47	9950.47
3305300620	DEVONIAN 6-1	48.104951	-102.899961	10134.23		10167	10228
3305300629	DEVONIAN 7-1	48.113145	-102.88712	9767.37		9801	9859
3305300630	DEVONIAN UNIT 8	48.10664	-102.876499	9899.5		9930	9991
3305300650	CMNU D-104	48.098869	-102.911813	10100.71	10127.96	10137.96	10187
3305300655	USA-YTTREDAHL BAK	48.11561	-102.893129	10135.71	10171.71	10181.71	10234
3305300669	FEDERAL 33 2	48.115611	-102.893743	10022.46	10050.46	10059.46	10123
3310500744	ANNA MENDENHALL	48.155641	-102.938406	9692.7	9724.95	9735.45	9779.96
3305300682	KNIGHT 1-30	48.047191	-102.949038	10225.75	10250.97	10262.97	10315
3305300697	B. J. WESTDAL	48.06163	-102.876902	10360	10393.08	10403.08	10455
3305300705	DINWOODIE 12-	48.061586	-102.868061	10410	10443.33	10450.83	10498
3305300706	P.S. THORLACKSON	48.054436	-102.874192	10407	10451.41	10439	10493
3305300708	HAUGEN 1	48.049975	-102.87882	10381.44	10398.47	10407.76	10462
3305300710	THORLACKSON 2	48.050785	-102.862611	10411.9	10442.87	10450.37	10495
3305300718	USA-VOLKMANN	48.092419	-102.942023	9918.12	9951.18	9959.14	10014
3305300729	CMSU B-227A	48.047947	-102.885238	10336.41	10369.76	10376.56	10422
3305300743	SIGUARDSON TRUST	48.057107	-102.857272	10425	10457.08	10466.58	10517.08
3305300744	MARIE SHERVEN	48.043585	-102.868062	10415.15	10451.41	10461.41	10500
3305300758	CARL FROHOLM	48.063188	-102.833412	10361.58	10394.25	10402.75	10450.74
3305300761	SHERVEN 27-1	48.043155	-102.878212	10368.58	10405.66	10416.16	10454
3305300769	SUGAR BUTTE 1	48.035917	-102.878884	10335	10368.66	10377.16	10418
3305300785	JENS ROBERTSON	48.043394	-102.885176	10314.1	10352.08	10356.28	10403
3305300889	T.G. DOROUGH C	48.099169	-102.87518	10140	10167.96	10174.16	10230
3305300901	SILURIAN 6-1	48.098163	-102.887051	10149.64	10181.5	10191	10243
3305300910	SILURIAN 8-1	48.114487	-102.876946	9795	9827.35	9835.85	9888
3305300911	SILURIAN 9-1	48.093083	-102.875404	10250	10283.38	10292.38	10340
3305300912	CMNU C-404	48.09985	-102.896765	10198	10226.67	10234.17	10291
3305300913	SILURIAN 10-1	48.093787	-102.887862	10208	10242.36	10251.36	10303
3305300921	HAMRE 1-14	47.719286	-103.321117	11238.58	11259.08	11267.58	11311.09
3305300940	C. LOVAAS NCT-1	47.84218	-102.884374	10661.75	10694.75	10704.25	10739.75
3305300953	SWENSON 1-34	48.035443	-102.886224	10310	10346.5	10357.5	10402
3305300958	SONDROL 1	47.744701	-103.338279	11093.28	11131.78	11141.28	11181.79
3310500821	LONG CREEK 2	48.102416	-103.347862	11265.91	11300.65	11312.65	11349.16
3305301053	T. P. RIGGS 1	47.849204	-102.884364	10721.39	10745.89	10754.89	10805.89
3305301056	C. M. LOOMER 10H	47.849141	-102.874009	10714.28	10756.28	10765.79	10804.29
3305301061	CMNU C134X	48.114853	-102.889767	9720.35	9750.66	9761.16	9813
3305301066	FEDERAL 33 3	48.111937	-102.897806	9814.55	9847.77	9858.77	9907
3305301080	NORSTOG 1A-3	47.749256	-103.328262	10821.94	10856.94	10869.94	10911.94
3305301087	SILURIAN 7-1X	48.109278	-102.879655	9812.75	9843.65	9852.45	9904
3310500845	GJORVEN 14-21	48.228952	-103.299936	11078.1	11105.85	11119.35	11156.6
3305301121	CMNU B-304	48.105926	-102.899356	10128	10159.88	10170.38	10220
3305301128	C. M. LOOMER	47.836042	-102.87132	10652.63	10691.63	10703.63	10736.14
3305301141	BLUE BUTTES-MADIS	47.83735	-102.893466	10693.44	10734.19	10744.19	10773.44
3305301169	BLUE BUTTES-MADIS	47.858198	-102.860357	10638.13	10675.38	10685.38	10726.14
3305301177	ANTELOPE TRIBAL	47.968799	-102.755378	10532.78	10560.03	10571.03	10586.28

Table 1 Continued

3310500912	WILLIAMS COUNTY	48.158932	-102.889708	9854.37	9900.37	9884.87	9913.88
3305301334	ENDERUD 1-17 RE	47.987411	-103.248269	11325.11	11367.74	11381.74	11410.74
3305301428	RIGGS 10-31	47.851698	-102.884446	10797.07	10822.07	10831.07	10872.08
3305301540	NORBY 2A-20HR	48.054746	-102.92805	10293	10328.06	10338.09	10384
3305301626	WILSON 1-20	48.061631	-102.927704	10319	10353.59	10365.6	10408
3305301668	SULLIVAN 3-29	48.050836	-102.931818	10252.28	10286.59	10297.79	10339
3305301688	THOMPSON-FEDERAL	48.061665	-102.937801	10228	10261.5	10269.1	10319
3305301705	KNIGHT UNIT 2	48.042987	-102.93325	10078.32	10110.31	10121.91	10162.51
3305301706	DEVONIAN 10-1	48.068892	-102.921182	10240	10272.82	10284.08	10326
3305301742	SILURIAN 21-1	48.068899	-102.938302	10226.92	10262.04	10273.04	10314
3305301753	SILURIAN 22-1	48.068896	-102.930196	10241	10278.03	10287.99	10338
3305301757	SILURIAN 23-1	48.068904	-102.949082	10253.4	10286.65	10298.15	10343
3305301772	L THOMPSON 8	48.083332	-102.921688	10290	10325.38	10341.88	10383
3305301843	SILURIAN 30-1	48.064333	-102.91138	10177.83	10209.63	10226.83	10271.84
3305301895	STATE 16-14	48.069227	-102.911398	10271	10306.26	10320.26	10366
3305301915	SILURIAN UNIT 32	48.057416	-102.948962	10178	10212.19	10224.99	10268
3310501130	FERGUSON 32-2	48.20717	-102.927705	9694.92	9721.15	9732.15	9758.12
3305301933	CMNU D-208X	48.083335	-102.928323	10262	10293.6	10304.2	10359
3305301974	WISNESS A 27-	47.951423	-102.959582	10550.65	10587.9	10600.9	10628.65
3305302063	THORLACKSON 2	48.050788	-102.863961	10419	10450.76	10464.26	10504
3305302088	SILURIAN UNIT	48.083391	-102.959815				
3305302129	SILURIAN UNIT	48.072482	-102.900606	10300	10335.11	10347.61	10394
3305302140	MCKENZIE COUNTY	48.093885	-102.953238	10120	10157.09	10170.59	10215
3305302149	HENRY TORSTENSON	47.864803	-103.343448	11129.77	11171.53	11183.53	11211.78
3305302163	ROSE 1	47.943286	-102.709395	10603.4	10652.44	10664.84	10693.41
3305302166	W.H. HUNT SILURIA	48.079411	-102.97051	10144.34	10182.1	10200.1	10230
3305302167	SILURIAN 54-1	48.088714	-102.912172	10116.16	10149.05	10161.06	10213
3305302175	SILURIAN UNIT 55	48.056234	-102.959752	10102	10137.1	10149.5	10187
3305302186	CMSU A-421	48.065241	-102.89823	10316.59	10353.85	10375.35	10400
3305302191	SILURIAN UNIT 58	48.050484	-102.949551	10118	10150.1	10164.1	10205
3305302195	SILURIAN UNIT 57	48.050803	-102.959125	10252	10283.38	10297.89	10338
3305302198	USA PETERSON	48.113532	-102.930279	9745.73	9768.98	9778	9844
3305302201	HAWKEYE-MADISON U	47.982996	-102.873194	10565.21	10596.23	10603.23	10652.23
3310501346	BEAVER LODGE-ORDO	48.270478	-102.980449	9803.36	9823.85	9837.35	9879.36
3310501369	BEAVER LODGE-ORDO	48.332867	-102.950813	9823.87	9850.96	9861.96	9893.61
3306100581	DEADWOOD CANYON R	48.129139	-102.50491	10200.48	10239.48	10250.98	10290.49
3310500945	KUNKLE 1-12	48.170605	-103.492893	11005.5	11031	11044.5	11083.5
3310501657	BLSU D-408C	48.277313	-102.987045	9802	9828.25	9841.25	9868
3302500794	JANE FEDERAL 11	47.63097	-102.946064	10767.95	10822.7	10838.2	10882.96
3305301107	YTTREDAHL MINNELU	48.115495	-102.894644	9990	10027.33	10038.84	10096
3305302164	SILURIAN UNIT	48.079901	-102.905192	10617	10649.33	10664.84	10721
3305302552	SINCLAIR NORTON	47.737634	-103.440586	11114.53	11149.03	11160.53	11193.54
3310500142	BEAVER LODGE-DEVO	48.25686	-102.954579	9921.75	9950.25	9960.75	10000.75
3310500319	BEAVER LODGE-DEVO	48.271374	-103.00832	9711.25	9732.25	9747.75	9788.25
3310500536	BEAVER LODGE-DEVO	48.251469	-102.962322	9875.94	9896.94	9910.44	9952.44
3310500539	BEAVER LODGE-DEVO	48.294911	-102.962177	9841.59	9869.87	9883.37	9915.37
3310500541	BEAVER LODGE-DEVO	48.287635	-102.994623	9768.37	9790.62	9809.12	9836.87
3310500544	BEAVER LODGE-DEVO	48.288454	-102.974223	9760			
3310500545	BEAVER LODGE-DEVO	48.265715	-102.962393				

Table 1 Continued

3310500556	BEAVER LODGE-SILU	48.258671	-102.951058	9928.3	9948.5	9957.7	10007.1
3310500558	BEAVER LODGE-DEVO	48.294939	-102.983877				
3310500562	BEAVER LODGE-DEVO	48.280193	-102.962763	9840.69			
3310500569	BEAVER LODGE-DEVO	48.251561	-102.983477	9850.88	9874.13	9884.13	9927.13
3310500573	BEAVER LODGE-DEVO	48.258842	-102.994645	9749.63	9775.38	9789.38	9823.13
3310500637	BEAVER LODGE-DEVO	48.278997	-102.984764	9749.19	9772.67	9786.89	9828.56
3310500776	ROLFSTAD 1	48.217583	-103.574309	10536.41	10556.12	10565.62	10602.12
3310500796	ROLFSTAD STATE	48.242937	-103.541932	10553.26	10577.76	10585.26	10614.27
3310500817	FRANCIS PRICE ET	48.202717	-103.536319	10819.92	10843.17	10852.17	10875.42
3310500897	LONG CREEK 3	48.113143	-103.353212	11167.84	11199.93	11214.43	11244.43
3310500948	BROKAW 1-22	48.230562	-103.520711	10799.86	10826.77	10839.37	10862.47
3310501578	BLDU G-314	48.324755	-102.952568	9876.5	9907.5	9919	9954
3305300577	FEDERAL LAND BANK	47.887541	-103.554262	10847	10868.61	10876.01	10912.21
3305301211	SKEDSVOLD 1	47.886207	-103.564745	10786.31	10815.81	10824.81	10857.82
3305301476	BERTINUSON 1-	47.867155	-103.526465	10882.71	10906.81	10913.71	10943.71
3305302156	L. M. STENEHEM	47.916686	-103.461932	11151.6	11189.6	11202.1	11232.11
3305302794	CURL 23-14	47.72498	-103.44835	11046.82	11079.64	11085.13	11129.54
3310500423	JOSEPH M. DONAHUE	48.148847	-103.503996	11010.39	11024.89	11035.39	11085.39
3310500768	SHAIDE-FLB 1	48.271874	-103.580273	10430.73	10457.03	10467.03	10504.53
3310500797	WILLISTON SWD	48.217554	-103.587774	10531.08	10554.33	10564.83	10600.33
3310500803	EARL HEFFLEFINGER	48.196358	-103.536939	10862.08	10886.08	10896.58	10932.09
3310500819	BROWN 1-8	48.264272	-103.440784	10776.77	10803.77	10810.27	10844.91
3310500829	HEFFLEFINGER	48.207226	-103.531005	10819.83	10844.59	10855.09	10891.09
3310500879	SPRINGBROOK-BIBLE	48.196214	-103.449447	10979.33	11005.58	11020.08	11055.33
3310500895	SOC MINERALS	48.156152	-103.493155	11001.58	11028.83	11041.83	11067.08
3310500930	DONAHUE 1-23	48.152045	-103.498606	11095.25	11124.5	11136	11163.25
3310500947	HIEPLER SWD 1	48.293191	-103.466718	10826.53	10845.52	10850.52	10899.02
3310500977	KNOSHAUG 1-14	48.160245	-103.509281	10972.33	10999.33	11010.83	11044.83
3310500999	STATE 16 1	48.333785	-103.553412	10427.23	10450.46	10461.46	10498.33
3310501101	IRGENS 1-27	48.304331	-103.530921				
3310501110	STOKKE SWD 5300	48.105612	-103.512597	11030.17	11054.71	11067.21	11103.71
3310501141	NELSON 1-23	48.324494	-103.512411	10555.6	10574.85	10581.85	10626.85
3310501166	THORNESS 5-12	48.279216	-103.450325	10806.35	10832.61	10841.61	10876.36
3310501234	ROLFSTAD TRUST	48.223934	-103.574886	10541.08	10563.08	10574.58	10610.58
3310501308	STATE 23-36	48.201704	-103.4876	10829.8	10851.6	10862.6	10897.6
3305303149	ANDERSON 12-18H	47.640664	-103.477452	10976.47	11021.79	11029.79	11100.19
3306100590	DEADWOOD CANYON R	48.108761	-102.545957	10273	10311.25	10323.25	10357
3306100807	MELL 44-21H	48.314261	-102.635557	10357.47	10393.98	10411.98	10493.48
3310501641	BLSU D-405	48.261692	-102.981229	9890	9916	9929	9968
3310501705	SMOUSE 31X-28	48.225489	-103.027465	9783.71	9806.24	9821.74	9854.72
3310501787	BLOU 12	48.251822	-103.005869	9702.98	9729.06	9741.56	9774.59
3305300509	W. QUALE 1	48.025584	-102.949201				
3305303358	CHARLOTTE 1-22H	47.964579	-103.333939	11356	11392.5	11405.5	11434.5
3305303819	UBERWACHEN 22-34	48.03333	-102.886133	10323.23	10360.23	10373.74	10408.23
3305303829	LUNDIN 11-13SEH	47.817941	-103.171862	11174.49	11200.49	11214.49	11264.99
3305303843	RINK 12-4ESH	47.930117	-103.239485	11185.99	11224.99	11238.99	11268.99
3306101664	EN-PERSON OBSERVA	48.350128	-102.733726	10186.98	10220.83	10232.81	10265.63
3310502100	ROLF 1-20H	48.227326	-103.316261	11140.25	11166.25	11182.25	11219.25
3306101668	EN-PERSON OBSERVA	48.354399	-102.730416	10124.43	10160.73	10172.73	10207.24

Table 1 Continued

3305303987	HA-SWENSON OBSERV	47.985578	-102.881592	10650.23	10685.74	10696.24	10738.24
3302500005	SOLOMON BIRD BEAR	47.712111	-102.313085	10078.05			
3302500232	BURBANK BIA 2	47.564431	-102.558049	10581.14	10607.74	10615.88	10708.06
3302300212	REISTAD 1-1R	48.883272	-103.863794	8177.39	8189.17	8194.44	8234.25
3306100490	SARA G. BARSTAD	48.183933	-102.825859	10609.69	10624.29	10632.09	10655.3
3302300489	NORDSTOG 14-23-1	48.764564	-103.357934	8703.49	8722.79	8734.89	8761.69
3302300503	WILLARD JOHNSON T	48.67496	-103.426239	9235.99	9257.55	9261.56	9296.77
3302300522	UNHJEM 5-162-98H	48.893901	-103.423228	8563.33	8571.13	8576.54	8612.56
3305302858	SAKAKAWEA FEDERAL	48.11513	-102.868751	9870.74	9906.74	9921.25	9967.25
3306100641	BRAAFLAT 11-11H	48.094893	-102.350748	9974.5	10010	10021	10068.5
3306100653	ST-ANDES-151-89-	47.877299	-102.001518	9137	9150	9155.5	9170
3301301416	THORLAKSEN 11-14	48.60289	-102.666214	9189.47	9218.47	9229.97	9269.48
3301301432	AV-WRIGLEY-163-94	48.980231	-102.937519	7444.75	7460.75	7474.25	7509.25
3301301434	OLSON 11-20H	48.761562	-102.78431	8867.75	8886.25	8900.25	8939.25
3310100475	BREKHUS 12-14H	48.598976	-101.883234	7123.13	7143.63	7150.14	7189.64
3305302927	WIL E. COYOTE 9-	47.993981	-103.221344	11159	11198	11217	11241
3306100863	GROVE 11-36H	48.472616	-102.513169	9506	9536.5	9549.5	9592
3310501693	OLSON 10-15 1-H	48.18274	-103.796775	10667.62	10680.42	10685.22	10729.11
3300701632	CHRUSZCH 43X-29F	47.088015	-103.244706	10919.96	10929.46	10933.46	10991.46
3301301444	FEDERAL TRIPPELL	48.634112	-102.321929	8400.99	8415.99	8428.49	8468.49
3301301459	THORSON 159-94-7	48.617967	-102.881529	9401	9428.75	9445.75	
3302300557	TRIGGER 1-31H	48.646563	-103.911874	8997.95	9011.82	9018	9054.48
3306101027	LIBERTY 2-11H	47.906539	-102.279724	9692.49	9730.74	9741.24	9793.24
3310501748	ROUND PRAIRIE 1-	48.167862	-103.96855	10635.23	10658.23	10668.24	10704.24
3301301491	JORGENSEN 4 - 4H	48.96712	-102.349941	6842.99	6867.5	6878.5	
3302300581	MYERS 2-162-99H	48.881203	-103.490549				
3306101294	JERICHO 2-5H-TF	47.933571	-102.478771	10219	10268	10277.5	10323.5
3310501803	SCANLAN 3-5H	48.110271	-103.317477	11100.47	11131.11	11142.53	11176.29
3301301497	AV-HANSEN-163-94-	48.924294	-102.928938	7872.75	7925.75	7943.75	7983.25
3302300630	NAVIGATOR 13-24-	48.863476	-103.217687	8192.1	8207.74	8222.24	8256.25
3305303280	HOGAN 1-16H	47.645105	-103.175159	11475.25	11516.75	11535.75	11578.75
3306101415	JORGENSON 158-9	48.5185	-102.780247	9805.5	9841.5	9854.5	9887.5
3310501890	STATE 36-1 #2TFH	48.211188	-103.483953	10816.5	10840.5	10845.5	10886.5
3302300658	ROSENVOLD 1-30H	48.661667	-103.132496	9379.36	9399.7	9411.28	9446.85
3302300664	LAKESWOOD 1-20H	48.749758	-103.175428	9100.5	9121.5	9137.5	9171
3305303296	DANKS 17-44H	47.892059	-102.730537	10679.86	10691.67	10697.92	10720.14
3305303379	JAYNES 16-12H	47.906723	-103.416089	11149.5	11185.5	11228.5	11268.5
3310502037	LOKKEN 2-2H	48.632247	-102.925528	9267.07	9294.8	9303.81	9341.94
3305303468	HAUGEN 13X-34	47.6813	-103.731292	10943.25	10969.75	10981.25	11017.75
3301301560	GROTE 1-21H	48.663157	-102.834025	9300.5	9328	9342.5	9376
3302300737	OLSON 15-22-162-1	48.864845	-103.652749	8462.06	8500.07	8520.07	8578.57
3306101789	CASPIAN 5693 43-	48.342335	-102.599571				
3310502157	MULLER 1-21-16H	48.489876	-104.009671	9665.89	9678.09	9683.69	9733.89
3310502204	RASMUSSEN 1-21-1	48.40281	-103.876436	10271.19	10292.39	10300.19	10339.19
3306101870	PENNINGTON 31-4T	47.933222	-102.585334	10940.75	10978.75	10996.75	
3306101882	JAHNKE USA 24-31	47.848174	-102.632709	11002.28			
3302501509	HUMPBAC 148-93-	47.669637	-102.586464				
3305303872	POJORLIE 21-2-1	47.498317	-103.134651	11375.25	11404.54	11413.34	11435.93
3310502460	GO-BIWER-157-98-	48.400691	-103.307518	10742.25	10766.25	10812.25	10835.75

Table 1 Continued

3306101951	STROBECK 27-34	48.224897	-102.490253	10079.22	10115.72	10128.72	10169.73
3306102032	GEORGE EVANS 11V	47.820123	-102.412039	11414.48	11433.73	11443.23	11515.49
3305304011	BERNICE 150-99-2	47.791458	-103.373165	11197	11222	11228.5	11285.5
3301301667	SARATOGA 12-1-16	48.777326	-102.554802	8068.49	8090.49	8102.49	8142.74
3302300836	BAJA 1522-04TFH	48.951491	-103.516702	7989.97	8000.47	8010.47	8053.97
3310502671	SC-NORMAN 154-98	48.112151	-103.337356	11410.87			
3302300831	M. JOHNSON 35-26-	48.808641	-103.364343	8732.08	8813.08	8851.09	8999.1
3302300832	MARJORIE 6-7-161-	48.808433	-103.319888	8629.08	8662.08	8688.08	8817.09
3306102049	MILDRED ROGGENBUC	48.063909	-102.570028	10382.18			
3305304068	CHERRY STATE 21-	47.731468	-103.362034	11042.5	11077	11092	
3302300907	MUZZY 15-33S-164	48.982273	-103.802174	7952.76	7960.99	7965.81	8009.99
3306102183	CHARLIE SORENSON	48.239619	-102.664046	10600.25	10638.25	10650.25	10683.75
3310502825	ROSE 12-13 2TFH	48.182044	-103.478425	10909.73	10934.23	10943.73	10985.23
3302300932	SORENSON 160-100	48.661818	-103.596372	9100.73	9120.23	9127.23	9163.29
3302300975	JENNIFER ABIGAIL	48.864956	-103.801612	8299.49	8316.49	8324.49	8356.6
3305304498	MARIANA TRUST 12	47.711981	-103.131792	11146.25	11172.25	11183.25	11239.75
3302301017	PULV 32-29-162-9	48.808503	-103.564448				
3302301088	NELSON 7-6-161-98	48.777606	-103.451514	8925.58			
3302301125	MOLANDER 27-34-16	48.748602	-103.520241	8950.54			
3306102913	GROVER 11-3TFH	47.935168	-102.580821	10766.54	10811.75	10823.25	10855.75
3310503166	OLSON 14-31TFH	48.286284	-103.084601		10133.23	10146.73	10172.73
3310503263	P IRGENS 155-99-	48.283778	-103.418929	10778.47			
3302301190	TORGESON 2-15HS	48.951477	-103.648983	7979.79	7995.79	8005.59	8042.99
3305305858	GAJEWSKI 31-18T	47.905557	-103.652994	10771.49	10784.49	10788.99	10809.86
3302300008	HAROLD E. JACOBSON	48.888878	-103.188371	7853.79	7880.79	7896.79	7958.79
3302300010	ARLOT JOHNSON	48.820446	-103.785086	8546.11	8559.61	8569.61	8597.11
3302300024	DALLAS D. MOORE	48.965473	-103.977541	7753.56	7765.56	7776.56	7832.07
3302300075	GEORGE ANDERSON	48.740629	-103.988244	8541.98	8552.98	8561.49	8592.99
3302300081	JOSEPH THVEDT	48.681887	-103.283874	9307.71	9321.21	9327.71	9368.71
3302300092	A. LEGEIN 1	48.848991	-103.02973	8183.7	8199.2	8207.2	8246.2
3302300100	R. W. REDLIN (NCT	48.751189	-103.308863	8852.25	8871.25	8883.75	8918.25
3302300103	ORVILLE C. RAAUM	48.827646	-103.768459	8555.7	8570.7	8579.2	8615.7
3302300109	OLE HELLEN 1	48.936416	-103.796043	8081.98	8092.48	8098.48	8134.48
3302300123	F. FENSTER 1-	48.745455	-103.043527	8768.84	8793.85	8803.35	8836.35
3302300124	A. B. ERICSON	48.717727	-102.933229	8953.57	8976.57	8989.57	9026.07
3302300125	VERNON TANBERG	48.805962	-103.029115	8578.4	8592.9	8602.9	8641.9
3302300127	MATHEWS 1-23	48.928752	-103.494603	8140.91	8161.91	8168.41	8204.41
3302300130	VATNE ET AL 1	48.667678	-103.034167	9101.45	9126.95	9136.95	9171.45
3302300143	KEBA OIL AND GAS	48.98659	-103.051354	7489.84	7508.84	7517.84	7558.34
3302300150	SKABO 1	48.824076	-104.021035	8284.78	8297.28	8308.28	8342.78
3302300152	OLSEN 1	48.859838	-103.598865	8514.85	8534.35	8541.35	8575.85
3302300156	STATE OF NORTH DA	48.635569	-103.033407	9236.7	9265.7	9279.7	9313.7
3302300157	ORVILLE RAAUM	48.827691	-103.790521	8454.57	8470.17	8476.77	8510.37
3302300158	NELSON 1	48.653701	-103.919825	8963.61	8974.61	8983.11	9015.11
3302300161	GEORGE C. ANDERSON	48.737319	-103.998725	8531.32	8544.32	8550.82	8578.82
3302300163	JOHNSON 1	48.805575	-103.788618	8576.62	8586.12	8594.62	8631.13
3302300167	RINDEL 43-16	48.856657	-103.138235	8208.28	8225.28	8235.78	8272.28
3302300168	ANDERSON-STATE	48.743976	-103.988239	8528.35	8543.85	8551.35	8580.35
3302300170	HAROLD HAUGEN	48.73661	-104.003635	8495.35	8509.85	8517.85	8548.85

Table 1 Continued

3302300177	VAALER 1-24	48.925096	-103.220304	7748.09	7766.09	7776.59	7811.6
3302300178	STATE RAAUM 1	48.853046	-103.790557	8289.62	8304.62	8310.62	8346.62
3302300179	KJELSHUS 25-1	48.740348	-102.9421	8987.73	9012.73	9027.73	9061.74
3302300181	LEONARD ROSTEN	48.667862	-103.262321	9356.75	9380.75	9387.75	9420.75
3302300184	FORTUNA STATE SWD	48.857072	-103.796035	8296.74	8311.74	8320.74	8352.74
3302300187	GERALD FISCHER	48.642392	-103.908509	8994	9010.5	9018.5	9049.5
3302300188	BAKKE 1	48.939548	-103.494542	8054.79	8073.29	8081.29	8118.29
3302300189	GERALD RAAUM	48.849855	-103.787889	8309.16	8321.16	8329.66	8364.66
3302300191	RIVELAND 1-12	48.784347	-103.741662	8721.56	8734.06	8744.56	8776.06
3302300192	LADD PETROLEUM ST	48.733083	-103.997962	8541.13	8556.13	8563.63	8596.63
3302300193	KJELSHUS 2	48.744415	-102.953024	8991.2	9016.7	9028.7	9065.21
3302300194	WEHRMAN 1-19	48.925486	-103.840147	8135.62	8148.62	8159.12	8194.12
3302300195	GORDON HALL 1	48.74581	-103.4498	8700.12	8717.12	8727.62	8756.62
3302300196	STORSETH 1	48.660382	-103.85535	9039.81	9051.82	9061.32	9098.32
3302300199	CONOCO WINDFALDET	48.913789	-103.48908	8265.93	8284.43	8293.43	8329.43
3302300202	MORK 17-1	48.682853	-103.506602	9026.81	9052.31	9060.31	9089.81
3302300203	IBARRA 11-13	48.787488	-103.505994	8640.31	8659.82	8669.82	8698.82
3302300205	REUBEN HALL 1	48.791017	-103.379927	8676.12	8694.62	8703.12	8740.13
3302300210	STATE 16 1	48.940303	-103.796372	8116.78	8130.78	8138.78	8172.28
3302300211	HAUGLAND 1	48.940118	-103.401274	7953.77	7973.77	7981.78	8021.78
3302300213	FEDERAL LAND BANK	48.824002	-103.045379	8419.11	8438.61	8447.11	8482.61
3302300216	CONOCO MOORE 20	48.936133	-103.96536	7943.79	7957.29	7964.29	7995.79
3302300217	UNHJEM 1	48.934262	-103.394314	7978.61	7998.11	8007.61	8046.12
3302300219	DAHL 22-3 1	48.889003	-103.653605	8382.99	8402.99	8410.99	8446
3302300220	LAVERNE HAUGEN	48.932757	-103.843767	8023.87	8039.87	8049.87	8083.37
3302300221	ARNOLD HAGEN STAT	48.965007	-103.396198	7773.52	7794.02	7802.02	7839.52
3302300222	D. J. CHRISTIANSO	48.943306	-103.3943	7908.54	7927.54	7937.04	7973.54
3302300223	G. C. HAUGLAND	48.936037	-103.407228	8023.11	8039.61	8048.61	8085.12
3302300224	CANDAK-HANSON	48.983119	-103.412821	7676.34	7691.84	7701.84	7741.84
3302300227	CONOCO MOORE 18	48.940436	-103.971432	7892.98	7910.48	7918.98	7949.98
3302300229	C. G. FORTIER A	48.682105	-103.094261	9100.86	9127.45	9136.09	9169.33
3302300231	NESS 41-23	48.934932	-103.489528	8095.58	8110.79	8117.19	8158.79
3302300232	MICHAEL KOSTEK	48.98862	-103.434922	7675.29	7694.79	7703.29	7739.8
3302300233	GIN HAN PARTNERSH	48.961441	-103.231163	7581.6	7600.6	7613.6	7649.1
3302300234	P. A. LANDSTROM	48.983078	-103.280747	7582.39	7600.39	7607.39	7645.89
3302300235	WILDROSE 36-5	48.729343	-103.352364	8871.49	8895.49	8906.49	8937.49
3302300237	LEGAARD 14-33	48.89675	-103.811341	8148.62	8161.12	8167.12	8205.12
3302300238	ANDERSON-STATE 30	48.741648	-103.982666	8547.82	8564.32	8571.32	8599.32
3302300239	ALMOS 11-23	48.935825	-103.504867	8057.31	8076.81	8085.81	8119.81
3302300240	POINTS-KOSTEK	48.97049	-103.231794	7559.1	7572.1	7578.6	7623.61
3302300242	TXC-WITTMAYER	48.746909	-103.965175	8526.83	8544.33	8551.33	8582.33
3302300244	TANGSRUD 12-1	48.703852	-103.023203	9024.46	9053.46	9063.46	9099.46
3302300246	BORGEN 11-24	48.935034	-103.482157	8072.69	8090.29	8096.69	8139.49
3302300252	TORGESON 34-1	48.939407	-103.514255	8061.76	8080.57	8089.17	8125.37
3302300253	F. R. GREGORY	48.972292	-103.51651	7794.11	7811.61	7820.11	7859.11
3302300254	HENNING 14-13	48.939829	-103.483386	8061.44	8081.44	8089.44	8123.44
3302300255	ANDERSON-STATE 30	48.747841	-103.983538	8538.81	8550.82	8556.82	8592.32
3302300256	CONSTANTINE 4	48.905572	-103.82099	8171.3	8182.3	8191.8	8229.31
3302300257	GERMANY 34-14	48.679362	-103.305847	9228.33	9246.33	9258.83	9287.83

Table 1 Continued

3302300258	WILDROSE C 35	48.73213	-103.357753	8810.66	8834.67	8845.17	8873.17
3302300259	JOHNSON 1	48.78068	-103.566066	8796.81	8815.31	8825.31	8856.81
3302300260	GLASOE 1-36	48.725737	-103.087503	9060.89	9085.39	9090.89	9127.89
3302300261	GJESDAL 28 1	48.918213	-103.929793	8008.15	8024.65	8031.15	8066.16
3302300263	NESS 13-24 2	48.929078	-103.484279	8178.45	8196.45	8205.46	8236.96
3302300264	STATE OF NORTH DA	48.731311	-103.079008	9036.69	9060.19	9071.19	9106.7
3302300265	TEXACO-REDLIN	48.739899	-103.314308	8895.3	8918.3	8928.3	8958.81
3302300266	LEININGER 24-18	48.939955	-103.850458	7944.56	7962.06	7969.56	8001.06
3302300268	N. B. ANDERSON	48.986803	-103.264925	7522.6	7541.1	7550.1	7588.6
3302300269	BLUE ROCK 29-	48.740554	-103.828915	8783.84	8802.84	8810.34	8838.84
3302300271	TXPOC-NORRIS	48.824046	-103.861629	8399.02	8411.52	8418.52	8450.52
3302300272	PEDERSON 29 1	48.918214	-103.949521	7991.24	8009.24	8015.24	8049.24
3302300273	JOHNSON 22-8	48.788041	-103.566747	8752.47	8772.97	8781.97	8812.47
3302300274	DRAWBOND 9 3	48.958008	-103.927548	7846.39	7859.79	7867.99	7902.39
3302300275	DRAWBOND 27 2	48.912653	-103.917311	8019.65	8036.16	8043.66	8077.16
3302300276	THOMPSON 1-24	48.664318	-103.148239	9382.53	9406.89	9416.1	9447.71
3302300277	LEININGER 44-9	48.954331	-103.796155	8172.61	8188.07	8193.56	8231.46
3302300279	T. L. MONTGOMERY	48.809216	-103.122422	8591.29	8613.29	8623.29	8659.8
3302300280	TANGEDAL 33 4	48.98356	-103.944045	7798.23	7815.73	7820.73	7849.73
3302300281	BAKKE 23-14 2	48.943146	-103.499967	8060.47	8078.97	8087.47	8120.97
3302300282	WEHRMAN 14-24	48.925795	-103.877387	7969.82	7989.82	7995.32	8027.32
3302300284	HALL STATE 1-	48.732809	-103.423722	8790.99	8813.49	8822.99	8849.99
3302300285	HALVORSON 31-	48.906847	-103.714152	8200.07	8211.08	8220.08	8256.58
3302300286	NORBY 42-15 1	48.946875	-103.511036	8027.22	8045.72	8052.72	8090.22
3302300287	THOMTE 44-8 1	48.954204	-103.554848	7950.5	7968	7979	8016
3302300291	CONOCO DRAWBOND 2	48.918157	-103.913617	7950.62	7964.12	7970.62	8001.62
3302300292	CONOCO WISER 21	48.928025	-103.929824	7928.32	7946.32	7954.32	7986.83
3302300293	CONOCO STATE 16	48.949621	-103.941017	7897.55	7913.05	7920.55	7953.05
3302300294	HAGEN 21-4 1	48.891588	-103.808594	8219.16	8233.16	8243.16	8275.16
3302300295	CENERGY-BERCO-HAN	48.736619	-103.346915	8813.39	8833.4	8844.9	8878.4
3302300296	A.T. HEIDE A	48.919345	-103.132792	7711.1	7728.6	7738.1	7776.11
3302300297	STATE 1-44-6	48.969993	-103.710115	7926.06	7938.56	7944.06	7983.07
3302300298	AHAB 23-30 1	48.91456	-103.719262	8181.58	8199.08	8204.58	8233.58
3302300299	CONOCO STATE HANS	48.904917	-103.898253	8043.5	8055.5	8062.5	8098.5
3302300303	PEDERSON 3-33	48.710453	-103.066052	9235.31	9259.31	9270.31	9299.81
3302300304	JEGLUM 1 SWD	48.907331	-103.703009	8193.22	8207.72	8216.72	8250.72
3302300305	CONOCO MURPHY 32	48.900108	-103.703051	8233.46	8249.46	8258.46	8291.46
3302300307	CONOCO LEININGER	48.921572	-103.790639	8135.57	8149.58	8155.58	8193.08
3302300308	CONOCO MOE 35	48.907118	-103.626248	8230.1	8250.1	8259.1	8292.11
3302300309	ROUSE WILSON 17-	48.863342	-103.040696	8066.96	8084.46	8092.96	8133.47
3302300310	SMITHBERG 1	48.874345	-103.054397	7979.5	8007.5	8017	8042
3302300311	TXPO-MEYER 1-	48.818623	-103.865232	8449.01	8462.51	8472.51	8505.51
3302300312	CITY HENNING 11-1	48.949482	-103.484219	7977.16	7997.56	8006.96	8040.97
3302300313	BROCKMIER 11-25	48.920327	-103.877307	7982.32	7999.32	8007.32	8038.82
3302300314	ENERSON 11-34	48.954128	-103.500143	7939.75	7959.25	7967.75	8002.75
3302300315	BOE 42-17 1	48.773697	-103.555536	8745.57	8765.97	8775.97	8804.57
3302300317	WEHRMAN 1	48.950838	-103.861447	7893.55	7906.05	7915.55	7948.05
3302300318	NIERENGARTEN	48.972524	-103.965918	7799.68	7814.19	7819.69	7853.69
3302300319	MOEN 32-35 1	48.991814	-103.492206	7712.9	7728.9	7737.4	7771.4

Table 1 Continued

3302300320	J. MYERS 1-14	48.949577	-103.500641	7988.43	8005.93	8012.43	8051.44
3302300321	BUBLITZ 42-22	48.932334	-103.510635	8065.53	8084.94	8091.94	8127.34
3302300322	CLARA KOSTEK NCT-	48.954003	-103.062421	7511.6	7530.1	7540.1	7578.1
3302300324	OAKMONT STATE	48.950059	-103.800918	8108.8	8116.8	8123.8	8165.81
3302300325	STATE-WIGNESS 41-	48.907347	-103.752233	8280.06	8292.56	8303.06	8361.56
3302300326	PEDERSON 11-1	48.950551	-103.593248	7969.31	7986.81	7993.31	8030.82
3302300327	MOSSER 32-30-	48.918475	-103.711789	8165.38	8182.38	8189.98	8225.79
3302300328	SWAMPY-MOSSER	48.928651	-103.665086	8085.75	8099.95	8107.75	8149.75
3302300332	SUSAN 3-25-1	48.912752	-103.732992	8234.27	8245.87	8253.67	8291.87
3302300333	CLEGG 30	48.912755	-103.711417	8149.45	8168.45	8175.95	8207.45
3302300334	OTTESON 12-19	48.758475	-103.330501	8716.12	8738.62	8749.12	8777.63
3302300335	BUBLITZ 34-22	48.926106	-103.515917	8161.93	8180.93	8185.93	8220.33
3302300338	EVENSON FEE 2	48.656934	-103.09509	9252.23	9278.74	9290.24	9322.74
3302300339	BARSTAD 1-30-	48.920069	-103.722008	8178.93	8195.93	8203.93	8236.34
3302300340	ARCHIE S. PETERSO	48.902926	-103.330893	8043.41	8063.91	8075.41	8109.41
3302300341	RUD 1-19	48.92533	-103.718899	8152.45	8167.46	8175.46	8210.46
3302300342	OBRIEN SWD 1-7	48.781341	-103.330424	8674.41	8694.91	8704.91	8740.91
3302300343	NORBY 3-12 2	48.95586	-103.469696	7939.97	7958.47	7967.47	8002.97
3302300344	WANDA 2-25 1	48.920087	-103.732992	8183.47	8200.47	8209.97	8239.97
3302300346	HALVORSON 31-	48.907623	-103.725223	8224.72	8235.22	8241.72	8281.72
3302300347	HEUER 41-20 1	48.762176	-103.029637	8812.38	8841.88	8852.38	8886.39
3302300349	CLEGG 29 11	48.912757	-103.700433	8172.22	8190.72	8196.72	8229.72
3302300351	FOSSUM 12-15	48.946894	-103.396415	7877.23	7895.23	7905.73	7943.23
3302300352	ANDERSON 21-27	48.920447	-103.521982	8198.47	8218.47	8224.97	8257.97
3302300353	COOVER 13-8 1	48.957664	-103.045889	7523.43	7539.43	7549.43	7589.43
3302300355	GRUNDSTAD 22-	48.875183	-103.541586	8463.1	8481.1	8490.6	8525.6
3302300356	KNUDSVIG 14-1	48.794814	-103.61516	8722.44	8741.95	8755.45	8782.95
3302300357	STATE LACHER 13-3	48.972012	-103.658934	7902.47	7913.97	7924.97	7961.97
3302300358	PEDERSON 12-19	48.932773	-103.591815	8073.96	8091.96	8100.46	8137.46
3302300359	NYGAARD 41-35	48.645817	-103.040111	9206.14	9230.64	9236.14	9276.65
3302300360	BUBLITZ 1-22	48.927955	-103.526012	8125.71	8143.21	8149.71	8187.71
3302300363	P. E. ROSENQUIST	48.905751	-103.111268	7763.85	7776.85	7789.85	7834.36
3302300364	BAKKEN 1	48.732669	-103.040792	8841.28	8872.48	8882.08	8916.68
3302300365	WILDROSE STATE	48.731799	-103.34627	8844.95	8868.45	8878.95	8904.45
3302300367	BERNICE 1	48.740287	-103.044356	8802.88	8827.38	8835.88	8874.38
3302300368	MARTIN 1	48.725864	-103.040792	8869.19	8897.19	8905.69	8940.69
3302300369	RIVERS 1	48.744887	-103.033958	8826.32	8851.82	8862.32	8898.82
3302300370	OSBORNE 1	48.739793	-103.056049	8834.82	8858.82	8869.82	8902.32
3302300371	LLOYD 1	48.736922	-103.032573	8850.22	8879.03	8885.63	8921.63
3302300373	WSP 21-30	48.747963	-103.062123	8819.88	8844.38	8855.38	8890.89
3302300374	FLB - FREDRICKSON	48.781925	-103.032329	8700.36	8724.86	8732.86	8766.36
3302300375	SKOR 1	48.719074	-103.039584	8908.94	8932.94	8947.44	8980.44
3302300377	BAKKEN 19-15	48.751165	-103.054679	8779.36	8802.86	8812.86	8845.37
3302300378	WITTY FEE 41-	48.83447	-102.966279	8441.11	8463.61	8475.11	8515.61
3302300379	ROESTEL 1	48.742096	-103.065048	8895.94	8922.94	8929.44	8964.44
3302300381	TEAL 13-2	48.795006	-103.242232	8720.86	8739.86	8749.36	8787.86
3302300382	GADWALL STATE SWD	48.772908	-103.327396	8663.3	8685.31	8696.31	8725.81
3302300384	BHP KERMIT 13	48.89557	-103.04557	7811.4	7827.9	7837.9	7878.9
3302300387	STOKKE 11-6	48.972282	-103.061703	7461.3	7478.3	7489.3	7521.8



Table 1 Continued

3302300388	WILDROSE STATE	48.732927	-103.342043	8850.83	8870.83	8881.33	8917.84
3302300389	20401 JV-P SSU 1	48.667639	-102.926217	9072.39	9099.4	9108.4	9146.9
3302300390	VERNON TANBERG	48.803719	-103.022125	8578.64	8595.14	8608.14	8644.64
3302300392	FENSTER 1	48.73253	-103.052524	8896.48	8922.89	8933.09	8969.29
3302300393	BEKKEDAHL 44-	48.649544	-103.017659	9312.38	9343.38	9350.38	9387.88
3302300396	STONEVIEW-STONEWA	48.685782	-102.909934	9018.37	9045.37	9055.37	9090.37
3302300398	BERCO-MARKWEST JA	48.776538	-103.385327	8650.14	8672.14	8682.64	8715.64
3302300400	OTIS 1	48.736808	-103.08722	9004.93	9029.43	9040.43	9075.43
3302300401	20401 JV-P OLSON	48.678362	-102.904466	9013.38	9040.88	9054.38	9089.88
3302300403	STONEVIEW-STONEWA	48.693034	-102.914347	8980.36	9003.36	9015.36	9050.86
3302300405	20401 JV-P SSU 1	48.683193	-102.922994	9005.3	9034.3	9042.81	9078.81
3302300406	STONEVIEW-STONEWA	48.671648	-102.89895	9108.78	9136.28	9148.28	9186.28
3302300407	SKARPHOL D 5	48.708913	-102.898789	9045.03	9073.53	9085.53	9121.03
3302300410	STONEVIEW-STONEWA	48.671757	-102.914115	9009.51	9038.51	9048.01	9085.01
3302300411	GOLDAL 1-25	48.739149	-103.346892	8810.42	8834.42	8844.42	8870.42
3302300413	HACKENBERG 19	48.687942	-102.932728	8976.61	9006.61	9019.11	9052.11
3302300415	STONEVIEW-STONEWA	48.659457	-102.91006	9122.32	9151.32	9160.82	9198.32
3302300417	STONEVIEW-STONEWA	48.7024	-102.932975	8933.93	8960.43	8975.43	9005.93
3302300419	ANKER 1	48.711075	-103.028631	8938.8	8965.8	8974.3	9009.8
3302300420	A. B. ERICSON	48.717858	-102.931734	8948.12	8971.12	8985.62	9018.12
3302300421	STONEVIEW-STONEWA	48.666157	-102.904229	9108.82	9135.82	9148.82	9186.32
3302300422	CAMP DAVIS STATE	48.772612	-103.024577	8718.32	8748.33	8758.83	8794.33
3302300424	9405 JV-P UPLAND	48.739826	-103.100672	9010.16	9033.66	9041.66	9078.66
3302300425	RJL DUDLEY KIMBER	48.939582	-103.061891	7588.22	7608.72	7616.73	7656.23
3302300426	AALUND 4-35	48.819424	-103.504645	8627.86	8648.36	8660.36	8693.86
3302300429	NELSON 1-5	48.794309	-103.029823	8663.54	8681.35	8686.15	8731.15
3302300431	WOLTER 1-22	48.936139	-103.647953	8043.7	8059.7	8068.2	8103.7
3302300433	CANYON ENERGY BIN	48.906991	-103.336661	8016.97	8038.47	8047.47	8085.47
3302300437	JOHNSON 2-4	48.794577	-103.024636	8693.66	8718.73	8731.27	8774.82
3302300439	PLUMER-LUNDQUIST	48.749069	-103.471471	8696.03	8717.03	8725.53	8751.53
3302300442	RIVERS 33-1	48.905243	-103.272687	8005.21	8023.71	8035.71	8074.21
3302300445	RINDEL 15-9	48.865656	-103.145096	8089.04	8109.04	8116.54	8155.04
3302300446	STONEVIEW-STONEWA	48.694517	-102.923591	8954.29	8982.29	8990.79	9026.29
3302300448	BURTMAN 19-1	48.674564	-103.272881	9332.24	9354.74	9364.75	9394.75
3302300452	STONEVIEW-STONEWA	48.683274	-102.916105	9017.5	9039	9052.5	9088.5
3302300453	ROSTEN 29-1	48.653166	-103.251968	9363.28	9386.78	9395.28	9425.28
3302300451	STONEVIEW-STONEWA	48.693555	-102.931056	8961.8	8984.3	9001.8	9031.8
3302300454	STONEVIEW-STONEWA	48.657525	-102.910225	9129.86	9160.87	9170.37	9204.37
3302300455	STATE 1-36H	48.637412	-102.8876	9226.05	9251.55	9263.05	9299.56
3302300456	PRINCE 1-20	48.751777	-103.046387	8778.7	8803.2	8814.2	8846.7
3302300460	OAKMONT 7-1	48.955397	-103.591844	7941.45	7954.05	7958.25	8002.65
3302300459	SPYGLASS 8-1	48.963468	-103.699666	7925.45	7941.95	7950.46	7985.96
3302300461	SPYGLASS 7-1	48.961216	-103.707822	7332.23	7348.23	7357.23	7391.23
3302300471	LOUCKS 44-30	48.911526	-103.051526	7724.37	7740.38	7750.88	7789.89
3302300462	SSU 4303H	48.709651	-102.930522	8930.57	8952.57	8966.57	9001.08
3302300463	SSU 1314H	48.682006	-102.926221	9017.01	9043.01	9055.51	9091.02
3302300470	SPYGLASS 8-2	48.956186	-103.700308	7979.71	7992.21	7999.71	8035.71
3302300466	20401 JV-P NESS	48.659853	-102.904202	9143.96	9171.96	9184.47	9221.97
3302300480	PEDERSON 14-9H	48.953448	-103.938382	7860.35	7876.35	7884.35	7914.35

Table 1 Continued

3302300481	NIELSEN 14-12	48.955971	-103.872555	7909.16	7924.66	7930.16	7965.16
3302300483	HANISCH 26-1	48.738383	-103.358405	8799.75	8820.75	8834.75	8867.25
3302300486	SPYGLASS 3-8	48.962144	-103.691332	7964.25	7974.05	7978.85	8025.65
3302300510	DRAWBOND 11-10	48.958027	-103.916555	7882.6	7891.1	7895.1	7939.6
3302300688	PIONEER 1	48.839747	-103.773942	8473.86	8488.36	8499.86	8530.36
3302300740	SPYGLASS 17-1	48.950286	-103.697565	8018.21	8036.22	8043.22	8078.22
3302300741	SPYGLASS 8-4	48.95435	-103.689897	7986.7	8008.7	8016.2	8045.21
3302301245	SSU 22-11H	48.700968	-102.917266	8966.75	8991.75	9000.75	9035.25
3.3061E+13	KULLAND 29-24	48.126453	-102.150824	9173.35	9182.6	9185.77	9209.04
3.3061E+13	NELSON 1-11H	48.530775	-102.666356	9539.06	9568.75	9579.17	9621.38
3.3105E+13	PEGASUS 2-17H	48.504655	-103.122107	10220.94	10239.38	10244.37	10288.73
3.3105E+13	H. BAKKEN 12-07H	48.437495	-102.905808	9741.67	9764.14	9776.13	9807.09
3.3061E+13	ROSS 7-17H	48.340544	-102.545948	9899.88	9930.63	9944.7	9979.62
3.3061E+13	EN-RULAND-156-94	48.28509	-102.776438	10436.69	10468.35	10476.13	10519.21
3.3013E+13	OAS 31-161-92H	48.733911	-102.676234	8798.43	8820.97	8832.59	8873.06
3.3061E+13	RS-NELSON-156-91	48.339908	-102.351351	9288.98	9321.24	9332.69	9374.32
3.3013E+13	DOULTS 4-7H	48.617372	-102.753023	9375.54	9379.92	9382.42	9410.12
3.3061E+13	SIDONIA 1-06H	48.533032	-102.344392	8795.83	8822.4	8828.65	8869.79
3.3105E+13	HEIDI 1-4H	48.357621	-103.414932	10765.38	10782.16	10788.28	10826.9
3.3105E+13	COMFORD 9-12H	48.608225	-103.146814	9741.96	9748.1	9750.9	9766.51

## **Appendix B.**

### **CORE DESCRIPTIONS**

#### **Divide County**

Muzzy 15-33S-164-101

American Eagle Energy Corporation

Well # 23828 (3302300907)

SWSE 33-164-101

**7947.3 – 7947.5** Dolostone mud sand: Pale Yellowish Brown (10YR 6/2); slight wavy laminae layers of a darker brown; minor soft sediment deformation and mud cracks; pyrite clusters

**7947.5 – 7952.0** Dolostone mud sand: Pale Yellowish Brown (10YR 6/2) and Dusky Yellow Green (5 GY 5/2); alternating sections of a massive green and wavy thin laminae, minor mottled section, brecciation, and cross-bedding

**7952.0 – 7956.0** Dolostone sand mud: Greyish Orange (10YR 7/4) and Moderate Yellow Green (5G 5/2); brecciated beds; pyrite clusters

**7956.0 – 7959.0** Mudstone dolomitic: Dusky Yellow Green (5 GY 5/2); massive with minor mottling section; pyrite clusters

**7959.0 – 7965.0** Dolostone mud sand: Greyish Orange (10YR 7/4) and Greyish Olive Green (5GY 3/2); mottled and poorly sorted brecciation; pyrite clusters

**7965.0 – 7969.1** Dolostone mud sand: Dusky Yellow (5Y 6/4); mottled, minor small brecciation, and desiccation; pyrite clusters

**7969.1 – 7972.0** Dolostone mud sand: Yellowish Grey (5Y 7/2); mottled with small brecciation; pyrite clusters

**7972.0 – 7973.1** Dolostone sand mud: Greyish Orange (10YR 7/4) interbedded with Greyish Olive Green (5GY 3/2); wavy thin to medium laminae; bed dominated; minor cross-bedding and mottling

**7973.1 – 7974.0** Dolostone sand mud: Dusky Yellow Brown (10YR 2/2); mottled with small brecciation

**7974.0 – 7975.0** Dolostone sand mud: Greyish Orange (10YR 7/4) interbedded with Greyish Olive Green (5GY 3/2); wavy to planar thin to medium laminae; bed dominated;

water-escape pipes, syneresis cracks, false beds, mud cracks, and soft sediment deformation

**7975.0 – 7978.0** Dolostone mud sand: Greyish Brown (5Y 3/2); mottled with small brecciation

**7978.0 – 7979.0** Dolostone mud sand: Dusky Brown (5YR 3/2); mottled with scattered brecciation

**7979.0 – 7980.8** Dolostone sand: Greyish Orange (10YR 7/4); massive with minor discontinuous wavy green layers

**7980.8 – 7982.7** Dolostone sand mud: Greyish Orange (10YR 7/4) interbedded with Greyish Olive Green (5GY 3/2); wavy thin to medium laminae; bed dominated; soft sediment deformation, minor cross-beds

**7982.7 – 7985.0** Dolostone mud sand: Greyish Olive Green (5GY 3/2); mottled

**7985.0 – 7986.0** Dolostone mud sand: Dusky Green (5G 3/2); brecciated beds

**7986.0 – 7989.0** Dolostone sand mud: Greyish Orange (10YR 7/4) interbedded Dusky Green (5G 3/2); with wavy thin to medium laminae; bed dominated; false beds, cross-beds, ripples, minor water escape features

**7989.0 – 7991.0** Dolostone mud sand: Dusky Yellow Green (5GY 5/2) and Greyish Orange (10YR 7/4); mottled to massive then brecciated

**7991.0 – 7993.0** Dolostone sand mud: Greyish Orange (10YR 7/4) interbedded with Greyish Olive Green (5GY 3/2); wavy thin to thick laminae; soft sediment deformation and water-escape structure

**7993.0 – 7995.0** Dolostone mud sand: Greyish Orange (10YR 7/4) and Greyish Olive Green (5GY 3/2); mottled

**7995.0 – 7997.0** Dolostone mud sand: Greyish Orange (10YR 7/4) and Greyish Olive Green (5GY 3/2); brecciated beds

**7997.0 – 8002.5** Dolostone mud sand: Greyish Orange (10YR 7/4) and Greyish Olive Green (5GY 3/2); brecciated beds

**8002.5 – 8003.1** Mudstone dolomitic: Dusky Red (5R 3/4); massive

**8003.1 – 8003.8** Dolostone sand mud: Greyish Orange (10YR 7/4) interbedded with Moderate Yellow Green (5G 5/2); massive and wavy medium laminae at end of unit; bed dominated;

**8003.8 – 8015.0** Mudstone dolomitic: Dusky Red (5R 3/4); massive

**8015.0 – 8017.0** Limestone: Dusky Red (5R 3/4); massive

Baja 15-22-163-99H

Samson Resources Company

Well # 22809 (3302300836)

NWNE 15-163-99

**7982.0 – 7990.0** Dolostone sand mud: Dark Yellowish Brown (10YR 4/2) interbedded with Greyish Blue Green (5BG 5/2); wavy thin laminae and false beds; ripples, flame structures, syneresis cracks, brecciation, and soft sediment deformation; microbial layers 7985 ft.; pyrite clusters

**7990.0 – 7994.4** Dolostone mud sand: Dark Yellowish Brown (10YR 4/2) and Greyish Blue Green (5BG 5/2); mottled; small brecciation

**7994.4 – 8000.8** Dolostone mud sand: Moderate Yellow Green (5G 5/3); massive and minor mottled section

**8000.8 – 8004.1** Dolostone mud sand: Pale Olive (10Y 6/2) and Yellowish Grey (5Y 7/2); mottled; small brecciation; pyrite veins

**8004.1 – 8007.1** Dolostone mud sand: Moderate Yellow Green (5G 5/3) and Yellowish Grey (5Y 7/2); mottled; small brecciation

**8007.1 – 8013.2** Dolostone mud sand: Olive Grey (5Y 4/4) and Yellowish Grey (5Y 7/2); mottled; small brecciation

**8013.2 – 8014.0** Dolostone sand mud: Moderate Orange Pink (10R 7/4) interbedded with Dusky Green (5G 3/2); ripples and soft sediment deformation

**8014.0 – 8016.0** Dolostone sand mud: Greyish Orange (5Y 8/4) interbedded with Greyish Olive (10Y 5/4); planar thin to very thin laminae; soft sediment deformation, cross-bedding, syneresis cracks, and water-escape pipes.

**8016.0 – 8018.6** Dolostone mud sand: Greyish Orange (10YR 7/4) and Greyish Olive Grey (5GY 3/2); mottled; small brecciation

**8018.6 – 8020.0** Dolostone sand mud: Moderate Orange Pink (10R 7/4) interbedded with Greyish Olive Green (5GY 3/2); wavy medium to thick laminae; soft sediment deformation and minor mud cracks.

**8020.0 – 8024.6** Dolostone sand mud: Moderate Orange Pink (10R 7/4) interbedded with Greyish Olive Green (5GY 3/2); wavy thin to thick laminae; bed dominant and switched to interbedded dominant half way down; minor mottled sections

**8024.6 – 8027.0** Dolostone sand mud: Greyish Orange (10YR 7/4) interbedded with Greyish Green (10G 4/2); wavy medium to thick laminae; ripples and minor soft sediment deformation

**8027.0 – 8029.0** Dolostone sand mud: Greyish Orange (10YR 7/4) interbedded with Dusky Red (5R 3/4); wavy to planar fine to very fine laminae; synaeresis cracks, cross-beds, soft sediment deformation, and water-escape pipes

**8029.0 – 8031.0** Dolostone mud sand: Greyish Orange (10YR 7/4) and Greyish Olive Green (5GY 3/2); brecciated beds;

**8031.0 – 8034.0** Dolomitic sand mud: Moderate Orange Pink (10R 7/4) interbedded with Dusky Red (5R 3/4) and minor Greyish Olive Green (5GY 3/2) alternating sections; wavy medium to thick laminae and false beds; synaeresis cracks, and soft sediment deformation

**8034.0 – 8039.8** Dolostone sand mud: Moderate Orange Pink (10R 7/4) interbedded with Greyish Olive Green (5GY 3/2); wavy medium to thick laminae, false beds, and minor mottled sections; ripples and soft sediment deformation,

**8039.8 – 8047.5** Dolostone mud sand: Greyish Orange (10YR 7/4) and Olive Grey (5Y 3/2); poorly sorted brecciated beds; minor oxidation sections

**8047.5 – 8057.0** Mudstone dolomitic: Dusky Red (5 R 3/4); massive; minor reduction spots

**8057.0 – 8059.0** Limestone: Dusky Red (5R 3/4); massive; minor reduction spots

Reistad #1-1

Tenneco Oil CO.

Well # 9446 (3302300212)

SESE 1-162-102

**8174.5 – 8176.9** Dolostone sand mud: Pale Yellow Grey (10YR 6/4) interbedded with Greyish Olive Grey (5GY 3/2); wavy and some planar thick laminae; synaeresis cracks, soft sediment deformation, alternating sections of heavy soft sediment deformation and interbedded mud cracks section, and water-escape pipes

**8176.9 – 8178.0** Dolostone mud sand: Dusky Yellow Green (5GY 5/2) and minor Greyish Orange (10YR 7/4); massive; minor brecciation at end of unit; pattern dolomite

**8178.0 – 8181.0** Dolostone mud sand: Greyish Orange (10YR 7/4) and Moderate Yellow Green (5GY 5/2); brecciated beds; soft sediment deformation

**8181.0 – 8184.5** Mudstone dolomitic: Moderate Yellow Green (5GY 5/2); massive; minor small brecciation; pyrite veins

**8184.5 – 8187.0** Mudstone dolomitic: Dusky Yellow Green (5GY 5/2) and Pale Yellow Brown (10YR 6/2); brecciated beds; soft sediment deformation

**8187.0 – 8187.9** Mudstone dolomitic: Dusky Yellow Green (5GY 5/2); massive

**8187.9 – 8192.0** Dolostone mud sand: Greyish Orange (10YR 7/4) and Moderate Yellow Green (5GY 5/2); mottled; minor brecciation

**8192.0 – 1894.0** Mudstone dolomitic: Moderate Yellow Green (5GY 5/2); massive; small brecciation decreasing downwards; pyrite veins

**8194.0 – 8197.8** Dolostone sand mud: Greyish Orange (10YR 7/4) interbedded with Light Olive Grey (5Y 5/2); mottling in upper part of unit then planar thick laminae; bed dominant

**8197.8 – 8199.9** Mudstone dolomitic: Greyish Green (10GY 5/2); massive, minor brecciation; pyrite veins

**8199.9 – 8201.0** Dolostone mud sand: Greyish Orange (10YR 7/4) and Greyish Green (10GY 5/2); mottled; small brecciation

**8201.0 – 8201.5** Dolostone sand mud Moderate Orange Pink (10R 7/4) interbedded with Light Olive Grey (5Y 5/2); wavy thin to medium laminae and falser beds; minor brecciation

**8201.5 – 8209.0** Dolostone mud sand: Dusky Green (5G 3/2) and Greyish Orange (10YR 7/4); mottled; small brecciation

**8209.0 – 8210.0** Dolostone mud sand: Greyish Orange (10YR 7/4) alternating with and Greyish Green (10GY 5/2); massive sections; soft sediment deformation

**8210.0 – 8211.7** Mudstone dolomitic: Moderate Brown (5YR 3/4); massive

**8211.7 – 8215.0** Dolostone sand mud Light Brown (5YR 6/4) interbedded with Greyish Green (10GY 5/2); wavy thin to medium laminae; bed dominated; soft sediment deformation, ripples, and minor brecciation

**2115.0 – 8216.0** Dolostone mud sand: Greyish Orange (10YR 7/4) interbedded with Dusky Yellow Green (5GY 7/4); wavy to planar thin laminae; soft sediment deformation, water-escape pipes, ripples, and small brecciation at end of unit; salt build up

**8216.0 – 8219.0** Mudstone dolomitic: Greyish Green (10GY 5/2); massive

**8219.0 – 8220.0** Dolostone sand mud Greyish Orange (10YR 7/4) and Dusky Yellow Green (5GY 7/4); brecciated beds

**8220.0 – 8221.0** Dolostone sand: Greyish Orange (10YR 7/4); massive with minor Greyish Green (10GY 5/2) layers

**8221.0 – 8222.9** Dolostone mud sand: Greyish Orange (10YR 7/4) interbedded with Moderate Yellow Green (5G 5/2); planar with some wavy thin to medium laminae; ripples and synaeresis cracks

**8222.9 – 8225.9** Dolostone mud sand: Greyish Orange (10YR 7/4) interbedded with Moderate brown; wavy thin to medium laminae, false beds, and minor mottling; synaeresis cracks, soft sediment deformation

**8225.9 – 8227.0** Dolostone sand mud Greyish Orange (10YR 7/4) interbedded with Moderate Yellow Green (5G 5/2); wavy thin to thick laminae and minor mottling; bed dominated; soft sediment deformation and flame structures

**8227.0 – 8232.0** Dolostone mud sand: Moderate Yellow Green (5G 5/2), Greyish Orange (10YR 7/4), and minor Dusky Red (5R 3/4); minor mottling, and massive sections brecciated layers in between sections

**8232.0 – 8248.0** Mudstone dolomitic: Dusky Red (5R 3/4); massive; minor reduction spots

Jennifer Abigail16-21H

Murex Petroleum Corporation

Well# 24642 (3302300975)

NWNE 16-162-101

**8295.7 – 8298.0** Dolostone sand mud: Yellowish Grey (5Y 7/2) interbedded with Greyish Blue Green (5BG 5/2); wavy thin to thick laminae and false beds; heavy soft sediment deformation at beginning, water-escape pipes, and ripples; pattern dolomite; pyrite clusters

**8298.0 – 8299.5** Mudstone dolomitic: Yellowish Grey (5Y 7/2) and Light Olive Grey (5Y 5/2); massive; small brecciation and soft sediment deformation

**8299.5 – 8301.8** Dolostone sand mud: Greyish Orange (10YR 7/4) interbedded with Moderate Yellow Green (5G 5/2); wavy thin to thick laminae and false beds; soft sediment deformation, ripples, and poorly sorted brecciation at end of unit; pyrite clusters

**8301.8 – 8303.3** Dolostone sand: Greyish Orange (10YR 7/4) and minor wavy Moderate Yellow Green (5G 5/2); massive

**8303.3 – 8306.0** Dolostone mud sand: Greyish Orange (10YR 7/4) and Greyish Blue Green (5BG 5/2); brecciated beds

**8306.0 – 8306.6** Mudstone dolomitic: Moderate Yellow Green (5G 5/2); massive



**8306.6 – 8308.4** Mudstone dolomitic: Dusky Yellow Green (5GY 5/2) and Greyish Orange (10YR 7/4); mottled; small brecciation at end

**8308.4 – 8309.0** Mudstone dolomitic: Moderate Yellow Green (5G 5/2); massive

**8309.0 – 8311.0** Dolostone mud sand: Light Olive Grey (5Y 5/2) and Yellowish Grey (5Y 7/2); brecciation and soft sediment deformation

**8311.0 – 8313.0** Mudstone dolomitic: Moderate Yellow Green (5G 5/2); massive with minor mottling

**8313.0 – 8319.0** Dolostone mud sand: Light Olive Grey (5Y 5/2) and Pale Yellow Brown (10YR 6/2); mottled; brecciation

**8319.0 – 8322.0** Mudstone dolomitic: Yellowish Grey (5Y 7/2) and Light Olive Grey (5Y 5/2); mottled; small brecciation

**8322.0 – 8323.2** Dolostone sand mud: Greyish Orange (10YR 7/4) interbedded with Moderate Yellow Green (5G 5/2); wavy medium laminae and false beds; soft sediment deformation and minor ripples; pyrite clusters

**8323.2 – 8324.0** Mudstone dolomitic: Dusky Yellowish Grey (5GY 5/2) and Very Pale Orange (5YR 8/2). Mottling and small brecciation

**8324.0 – 8325.0** Dolostone sand mud: Greyish Orange (10YR 7/4) interbedded with Pale Green (5G 7/2); mottled; small to medium brecciation

**8325 – 8326.4** Dolostone mud sand: Dusky Brown (5YR 2/2) and Greyish Orange (10YR 7/4); mottled; increase brecciation downwards

**8326.4 – 8329.0** Dolostone sand mud: Greyish Orange (10YR 7/4) interbedded with Dusky Yellow Green (5GY 5/2); wavy medium to thick laminae, false beds, and minor mottling; soft sediment deformation

**8329.0 – 8331.0** Mudstone dolomitic: Olive Green (5Y 3/2); massive and minor mottling in upper part of the unit; minor small brecciation in lower part of unit

**8331.0 – 8331.6** Dolostone sand: Greyish Orange (10YR 7/4); massive

**8331.6 – 8336.0** Dolostone mud sand: Greyish Orange (10YR 7/4) and Greyish Olive Green (5GY 3/2); brecciated beds;

**8336.0 – 8336.5** Mudstone dolomitic: Olive Grey (5Y 3/2); massive

**8336.5 – 8339.4** Dolostone sand mud: Greyish Orange (10YR 7/4) interbedded with Dusky Yellow Green (5GY 5/2); wavy to planar thin to thick laminae; ripples and minor brecciation

**8339.4 – 8339.9** Dolostone mud sand: Dusky Green (5G 3/2) and Greyish Orange (10YR 7/4); mottled; elongated brecciation

**8339.9 – 8340.1** Mudstone dolomitic: Dusky Yellow (5Y 5/2); massive and minor brecciated beds at end of unit

**8340.1 – 8340.7** Dolostone mud sand: Dusky Yellow Green (5 GY 5/2) and Greyish Orange (10YR 7/4); mottled and minor thin laminae

**8340.7 – 8347.2** Dolostone sand mud: Greyish Orange (10YR 7/4) interbedded with Greyish Olive (10Y 4/2) and Greyish Red (10R 4/2); wavy medium to thick laminae and minor mottling; ripples, cross-beds, and minor brecciation

**8347.2 – 8352.4** Dolostone mud sand: Greyish Olive Green (5GY 3/2) and Greyish Orange (10YR 7/4); brecciated beds that increase in size downward

**8352.4 – 8352.8** Dolostone mud sand: Moderate Reddish Brown (10R 4/6), Light Olive Grey (5Y 5/2), and Greyish Orange (10YR 7/4); brecciated beds and minor massive sections

**8352.8 – 8354.3** Mudstone dolomitic: Moderate Yellow Green (5G 5/2); massive

**8354.3 – 8365.0** Mudstone dolomitic: Dark Reddish Brown (10R 3/4); massive

**8365.0 – 8368.0** Limestone: Dark Reddish Brown (10R 3/4); massive

Nordstag 14-23-161-98H

Samson Resources Company

Well #16089 (3302300489)

SESE 14-161-98

**8710 – 8720** Dolostone sand mud: Greyish Orange (10YR 7/4) interbedded with Moderate Yellow Green (5G 5/2); wavy thin to thick laminae, minor false beds, and minor mottling; soft sediment deformation, ripples, mud cracks, and brecciation; pattern dolomite; pyrite clusters

**8720 – 8726.8** Dolostone sand: Greyish Orange (10YR 7/4) and minor Moderate Yellow Green (5G 5/2); massive and minor false beds; minor desiccation cracks; pyrite clusters

**8726.8 – 8729.4** Dolostone sand mud: Greyish Orange (10YR 7/4), Dark Yellow Brown (10R 4/2), and Dusky Yellow Green (5GY 5/2); mottled; brecciation

**8729.4 – 8733.0** Mudstone dolomitic: Moderate Yellow Green (5G 5/2); massive

**8733.0 – 8736.0** Mudstone dolomitic: Moderate Yellow Green (5G 5/2); mottled; small to medium brecciation

**8736 – 8737.0** Mudstone dolomitic: Moderate Yellow Green (5G 5/2); massive;

**8737.0 – 8737.6** Mudstone dolomitic: Pale Olive (10Y 6/2); mottled; small brecciation

Trigger 1-31H

Newfield Production Company

Well # 17946 (3302300557)

NENE 31-160-102

**9004.0 – 9006.0** Dolostone sand mud: Greyish Orange (10YR 7/4) interbedded with Moderate Yellow Green (5G 5/2); wavy thin to medium laminae and falser beds; soft sediment deformation, water-escape pipes, synaeresis cracks, and muddy wave humps; pyrite clusters

**9006.0 – 9008.0** Dolostone sand mud: Greyish Orange (10YR 7/4) interbedded with Moderate Yellow Green (5G 5/2); wavy thin to medium laminae and falser beds; ripples and soft sediment deformation; pyrite clusters

**9008.0 – 9009.6** Dolostone mud sand: Pale Olive (10Y 6/2) and Greyish Orange (10YR 7/4); mottled

**9009.6 – 9013.0** Dolostone sand mud Greyish Orange (10YR 7/4) interbedded with Greyish Blue Green (5BG 5/2); wavy medium to thick laminae and falser beds; ripples, water movement, stacks, and minor flame structures; pyrite clusters

**9013.0 – 9014.0** Dolostone sand: Greyish Orange (10YR 7/4); massive; minor soft sediment deformation

**9014.0 – 9017.0** Dolostone sand mud: Greyish Orange (10YR 7/4) and Greyish Blue Green (5BG 5/2); brecciated beds

**9017.0 – 9019.0** Mudstone dolomitic: Greyish Blue Green (5BG 5/2); massive

**9019.0 – 9021.0** Dolostone mud sand: Moderate Yellow Green (5G 5/2) and Greyish Orange (10YR 7/4); mottled; minor brecciation

Sorenson 160-100-27-1H

North Plains Energy, LLC

Well # 24137 (3302300932)

NWNW 27-160-100

**9090.4 - 9090.9** Mudstone dolomitic: Greyish Orange (10YR 7/4) and Dusky Yellowish Green (5GY 3/2); no distinct bedding; mud cracks, and soft sediment deformation; pyrite clusters

**9090.9 – 9092.8** Mudstone dolomitic: Dusky Yellowish Green (5GY 3/2); massive and minor thin wavy laminae; cross-bedding; pattern dolomite

**9092.8 – 9098.7** Mudstone dolomitic: Light Brown (5YR 6/4) interbedded with Yellowish Green (5GY 3/2); wavy thin to thick laminae, falser beds, and minor massive section; synaeresis cracks, ripples, cross-bedding, small brecciation, soft sediment deformation, and mud cracks

**9098.7 – 9105.0** Mudstone dolomitic: Greyish Orange (10YR 7/4) with minor Greyish Green (10G 4/2); thin to medium wavy laminae, falser beds, and massive, minor soft sediment deformation

**9105.0 – 9110.9** Mudstone dolomitic: Greyish Orange (10YR 7/4) and Dusky Yellowish Green (5GY 3/2); poorly sorted brecciated beds

**9110.9 – 9116.0** Mudstone dolomitic: Moderate Yellow Green (5G 5/2) and Greyish Green (10YR 7/4); mottled with minor massive section

**9116.0 – 9120.0** Mudstone dolomitic: Greyish Orange (5Y 7/4) and Moderate Yellow Green (5G 5/2); brecciation

**9120.0 – 9126.0** Mudstone dolomitic: Dusky Brown (5YR 2/2) and Greyish Orange (10YR 7/4); mottled; small brecciation

**9126.0 – 9127.0** Mudstone dolomitic: Pale Yellow Brown (10YR 7/4) interbedded with Moderate Yellow Green (5G 5/2); wavy thin to thick laminae; bed dominant

**9127.0 – 9129.3** Mudstone dolomitic: Pale Yellow Brown (10YR 7/4) interbedded with Moderate Yellow Green (5G 5/2); mottled

**9129.3 – 9131.0** Mudstone dolomitic: Pale Yellow Brown (10YR 6/2) interbedded with Greyish Olive Green (5GY 3/2); wavy to planar thin to thick laminae, falser beds, and minor mottling; ripples, soft sediment deformation, and minor cross-bedding

**9131.0 – 9134.7** Mudstone dolomitic: Moderate Yellow Brown (10YR 5/4) and Greyish Olive Green (5GY 3/2); mottled; minor mud cracks

**9134.7 – 9136.5** Mudstone dolomitic: Greyish Orange (10YR 7/4) interbedded with Greyish Olive Green (5GY 3/2); wavy thin to medium laminae, falser beds, and minor mottling; soft sediment deformation, and brecciation at the end of unit

**9136.5 – 9138.0** Mudstone dolomitic: Dusky Red (5R 3/4) and Greyish Olive Green (5GY 3/2); massive at top of unit and mottled; small brecciation

**9138.0 – 9139.0** Mudstone dolomitic: Greyish Orange (10YR 7/4) interbedded with Grayish Green (10G 4/2); wavy thin laminae and falser beds; ripples

**9139.0 – 9141.0** Mudstone dolomitic: Greyish Orange (10YR 7/4) and Grayish Green (10G 4/2); poorly sorted brecciated beds

**9141.0 – 9143.0** Mudstone dolomitic: Greyish Orange (10YR 7/4) interbedded with Grayish Green and Dusky Red (5R 3/4); medium to thick laminae and minor mottling; soft sediment deformation

**9143.0 – 9145.0** Mudstone dolomitic: Greyish Orange (10YR 7/4) and Grayish Green (10G 4/2); mottled and minor massive section at end of unit; small brecciation that decreases downward

**9145.0 – 9146.0** Mudstone dolomitic: Greyish Orange (10YR 7/4) interbedded with Light Olive Green (5Y 5/2); wavy to planar thin to medium laminae, falsed beds, and minor massive section at top of unit; soft sediment deformation

**9146.0 – 9150.0** Mudstone dolomitic: Greyish Orange (10YR 7/4) interbedded with Dusky Yellow Grey (5GY 5/2); wavy medium to thick laminae and falsed bed; syneresis cracks, soft sediment deformation, and brecciation at end of unit

**9150.0 – 9152.0** Mudstone dolomitic: Yellowish Grey (5Y 7/2) and Greyish Orange (10YR 7/4); brecciated beds and minor mottling; soft sediment deformation

**9152.0 – 9153.3** Mudstone dolomitic: Dusky Yellow (5Y 6/4); massive; minor brecciation

**9153.3 – 9171.0** Mudstone dolomitic: Dusky Red (5R 3/4); massive and minor reduction spots

**9171 – 9173** Limestone: Dusky Red (5R 3/4); massive and minor reduction spots

Willard Johnson Trust 24B-2-1H

Petro-Hunt, LLC

Well # 16458 (3302300503)

NWNW 24-160-99

**9218.0 – 9225.0** Dolostone sand mud: Dark Yellowish Brown (10YR 4/2) interbedded with Pale Olive (10Y 6/2); wavy thin to medium laminae and falsed beds; flame structures, climbing ripples, water-escape pipes, syneresis cracks, and ripples; pattern dolomite; pyrite clusters

**9225.0 – 9228.0** Dolostone sand mud: Dark Yellowish Brown (10YR 4/2) interbedded with Pale Olive (10Y 6/2); wavy thin laminae, falsed beds, and minor massive section; ripples; pyrite clusters

**9228.0 – 9230.0** Mudstone dolomitic: Pale Olive (10Y 6/2); massive

**9230.0 – 9234.0** Dolostone sand mud: Dark Yellowish Brown (10YR 4/2) interbedded with Pale Olive (10Y 6/2); wavy medium to thick laminae; mud cracks, soft sediment deformation, and minor brecciation

**9234.0 – 9240.0** Dolostone sand mud: Light Brown (5YR 5/6) and Pale Olive (10Y 6/2); brecciated beds and minor massive sections

**9240.0 – 9241.9** Dolostone sand: Greyish Orange (10YR 7/4); massive

**9241.9 – 9243.0** Mudstone dolomitic: Dusky Yellow Green (5GY 5/2); massive

**9243.0 – 9245.0** Dolostone mud sand: Dusky Yellow (5Y 5/2) and Greyish Orange (10YR 7/4); mottled; poorly sorted brecciation

**9245.0 – 9253.0** Dolostone mud sand: Moderate Yellow Green (5G 5/2) and Greyish Orange (10YR 7/4); mottled; small brecciation and minor elongated brecciation

**9253.0 – 9255.5** Dolostone mud sand: Dark Yellowish Brown (10YR 4/2); mottled, small brecciation

**9255.5 – 9256.0** Dolostone sand mud: Greyish Orange (10YR 7/4) interbedded with Moderate Yellow Green (5G 5/2); wavy thin laminae and minor mottling

**9256.0 – 9258.0** Dolostone mud sand: Greyish Brown (5Y 3/2) and Greyish Orange (10YR 7/4); mottled; small brecciation

### **Burke County**

AV-Wrigley-163-94-0607H-1

Hess Corporation

Well# 17450 (3301301432)

LOT 4 6-163-94

**7434.2 – 7440.3** Dolostone mud sand: Light Brown (5YR 5/6) interbedded with Greyish Blue Green (5BG 6/2); wavy thin laminae and falser beds; synaeresis cracks, soft sediment deformation, and cross-bedding

**7440.3 – 7444.2** Dolostone mud sand: Light Brown (5YR 5/6) and Light Olive Grey (5Y 5/2); massive and minor wavy thin laminae; minor soft sediment deformation; pyrite clusters.

**7444.2 – 7446.8** Dolostone sand mud: Greyish Orange (10YR 7/4) interbedded with Greyish Blue Green (5BG 5/2); wavy medium to thick laminae and falser beds; brecciation and soft sediment deformation

**7446.8 – 7455.6** Dolostone sand mud: Greyish Orange (10YR 7/4); massive; soft sediment deformation and mud cracks.

**7455.6 – 7469.6** Dolostone mud sand: Greyish Orange (10YR 7/4) interbedded with Greyish Blue Green (5BG 5/2); mottled; brecciated; pyrite clusters that decrease downwards

**7469.6 – 7473.0** Mudstone dolomitic: Dusky Yellow Brown (10YR 2/2) and Greyish Orange (10YR 7/4); massive; brecciation and soft sediment deformation

**7473.0 – 7475.2** Dolostone mud sand: Greyish Orange (10YR 7/4) interbedded with Greyish Blue Green (5BG 5/2); wavy to minor planar thin to medium laminae and falser beds; synaeresis cracks, brecciation near top of unit, and minor soft sediment deformation

**7475.2 – 7478.0** Dolostone mud sand: Greyish orange (10YR 7/4) interbedded with Light Olive Grey (5Y 5/2); wavy thin laminae and falser beds; heavy brecciated

**7478.0 – 7479.6** Dolostone mud sand: Greyish Orange (10YR 7/4) and Light Olive Grey (5Y 5/2); wavy thin laminae, falser beds, and minor mottling at end of unit; soft sediment deformation

**7479.6 – 7480.3** Mudstone dolomitic: Dusky Green (5G 3/2) and Greyish Orange (10YR 7/4); mottled

**7480.3 – 7483.0** Dolostone mud sand: Greyish Orange (10YR 4/4) interbedded Light Olive Grey (5Y 5/2); wavy to planar very thin to thin laminae and falser beds

**7483.0 – 7483.6** Dolostone sand mud: Greyish Orange (10YR 7/4) interbedded Light Olive Grey (5Y 5/2); wavy thin laminae and falser beds; soft sediment deformation and ripples

**7483.6 – 7486.3** Dolostone mud sand: Greyish Orange (10YR 7/4) and Light Olive Grey (5Y 5/2); mottled

**7486.3 – 7487.0** Dolostone sand mud: Greyish Orange (10YR 7/4) interbedded Light Olive Grey (5Y 5/2); wavy thin laminae and falser beds; bed dominant

**7487.0 – 7488.0** Dolostone mud sand: Greyish Orange (10YR 7/4) and Light Olive Grey (5Y 5/2); mottled

**7488.0 – 7492.0** Dolostone sand mud: Moderate Orange Pink (10R 3/4) interbedded Greyish Green (10G 4/2); wavy to planar thin laminae and falser beds; soft sediment deformation

Jorgensen 4-4H

Cornerstone Natural Resources LLC

Well # 18829 (3301301491)

SESE 4-163-90

**6848.0 – 6849.5** Dolostone sand mud: Moderate Brown (5YR 6/4) and Moderate Yellow Green (5GY 7/4); massive and minor mottling; soft sediment deformation; pyrite clusters

**6849.5 – 6851.3** Dolostone mud sand: Greyish Orange (10YR 7/4) and Dusky Yellow Green (5GY 5/2); mottled, wavy thin laminae, and falser beds; water-escape pipes and small brecciation; pyrite clusters

**6851.3 – 6855.6** Dolostone sand mud: Greyish Orange (10YR 7/4) interbedded with Greyish Green (10G 4/2); wavy thin to medium laminae; small brecciation, soft sediment deformation, and synaeresis cracks; pyrite clusters

**6855.6 – 6859.0** Dolostone sand mud: Greyish Orange (10YR 7/4) interbedded with Greyish Green (10G 4/2); medium laminae to thick beds and minor falser beds; soft sediment deformation, desiccation cracks, small brecciation, and minor cross-beds; pyrite clusters

**6859.0 – 6863.2** Dolostone sand: Greyish Orange (10YR 7/4) and minor Greyish Green (10G 4/2); no distinct bedding and minor falser beds; soft sediment deformation features, water-escape pipes, and minor brecciation; pyrite clusters

**6863.2 – 6864.2** Dolostone sand: Greyish Orange (10YR 7/4) and minor Greyish Green (10G 4/2); no distinct bedding and minor falser beds; minor soft sediment deformation; dense pyrite clusters

**6864.2 – 6868.4** Dolostone sand mud: Greyish Orange (10YR 7/4) and Greyish Green (10G 4/2); brecciated beds; pyrite clusters

**6868.4 – 6869.5** Mudstone dolomitic: Dusky Yellow Green (5GY 5/2); massive; pyrite clusters

**6869.5 – 6872.1** Dolostone mud sand: Greyish Orange (10YR 7/4) and Greyish Green (10G 4/2); poorly sorted brecciated beds; small brecciation; pyrite clusters

**6872.1 – 6873.8** Mudstone dolomitic: Greyish Green (10G 4/2); massive; pyrite clusters

**6873.8 – 6876.0** Dolostone mud sand: Greyish Orange (10YR 7/4) and Dusky Yellow Green (5GY 5/2); mottled; small brecciation and minor elongated brecciation; pyrite clusters

**6876.0 – 6877.0** Dolostone mud sand: Greyish Orange (10YR 7/4) and Dusky Yellow Green (5GY 5/2); mottled and minor brecciated beds

**6877.0 – 6879.0** Dolostone mud sand: Greyish Orange (10YR 7/4) and Moderate Yellow Green (5GY 7/4); mottled; small brecciation



**6879.0 – 6882.0** Dolostone mud sand: Greyish Orange (10YR 7/4) and Dusky Yellow Green (5GY 5/2); mottled; small brecciation

Saratoga 12-1-161-92H

Samson Resources Company

Well # 18829 (3301301667)

NWNE 13-161-92

**8066.2 – 8072.3** Dolostone mud sand: Greyish Orange (10YR 7/4) interbedded with Greyish Green (10YG 5/2); wavy to planar very thin to thin laminae; soft sediment deformation, syneresis cracks, water escape pipe, cross-beds, ripples, and minor flame structures; pyrite clusters

**8072.3 – 8075.3** Dolostone sand mud: Moderate Brown (5YR 3/4) and Greyish Orange (10YR 7/4); wavy medium to thick laminae and false beds; bed dominated; soft sediment deformation, syneresis cracks, and minor brecciation; pyrite clusters

**8075.3 – 8078** Dolostone mud sand: Greyish Orange (10YR 7/4) and Moderate Brown (5YR 3/4); massive and minor mottled section; brecciation and soft sediment deformation; pyrite clusters

**8078 – 8088.6** Dolostone sand mud: Greyish Orange (10YR 7/4) and Moderate Brown (5YR 3/4); mottled; water-escape pipes, heavy brecciated at end of unit, and minor mud cracks

**8088.6 – 8090.4** Mudstone dolomitic: Light Olive Grey (5Y 5/2) and Greyish Orange (10YR 7/4); mottled; pyrite clusters

**8090.4 – 8091.3** Mudstone dolomitic: Light Olive Grey (5Y 5/2) and Greyish Orange (10YR 7/4); poorly sorted brecciated beds;

**8091.3 – 8098.6** Mudstone dolomitic: Greyish Green (10GY 5/2) and Greyish Orange (10YR 7/4); mottled; small brecciation; pyrite clusters

**8098.6 – 8103.5** Dolostone mud sand: Greyish Brown (5 Y 3/2) and Greyish Orange (10YR 7/4); mottled; small brecciation

**8103.5 – 8106** Dolostone mud sand: Greyish Orange (10YR 7/4) interbedded with Greyish Green (10G 4/2); wavy thin to medium laminae. And false beds; soft sediment deformation, syneresis cracks, water-escape pipes, ripples, and minor brecciation

**8106 – 8109.3** Dolostone mud sand: Greyish Orange (10YR 7/4) interbedded with Greyish Green (10G 4/2); mottled; small brecciation

**8109.3 – 8113.3** Dolostone sand mud: Greyish Orange (10YR 7/4 and minor Grayish Green (10G 4/2); massive; synaeresis cracks

**8113.3 – 8114.3** Dolostone mud sand: Greyish Orange (10YR 7/4) interbedded with Greyish Green (10G 4/2); mottled; brecciated increases downwards

**8114.3 – 8116** Dolostone mud sand: Dark Reddish Brown (10R 3/4), Greyish Green (10G 4/2), and Greyish Orange (10YR 7/4); mottled; small brecciation and soft sediment deformation.

**8116 – 8117** Dolostone mud sand: Light Brown (5YR 6/4) interbedded with Dusky Blue Green (5BG 3/2); wavy thin to medium laminae and falser beds; synaeresis cracks, water-escape pipe, and soft sediment deformation

**8117 – 8118.8** Mudstone dolomitic: Dusky Red Brown (10R 3/4) and Greyish Green (10G 4/2); mottled

**8118.8 – 8121.6** Dolostone sand mud: Greyish Orange (10YR 7/4) interbedded with Greyish Green (10G 4/2); wavy to planar very thin to thick laminae and minor falser beds; soft sediment deformation, synaeresis cracks, and cross-beds

**8121.6 – 8127** Dolostone mud sand: Moderate Reddish Orange (10R 6/6) interbedded with Greyish Green (10G 4/2); wavy thin to medium laminae and falser beds; bed dominated; soft sediment deformation, ripples, water escape structures, and minor cross-bedding

**8127 – 8130** Dolostone mud sand: Moderate Reddish Orange (10R 6/6) interbedded with Dusky Red (5R 3/4); wavy thin to thick laminae and falser beds; synaeresis cracks and soft sediment deformation.

**8130 – 8134.2** Dolostone sand mud: Moderate Red (5R 5/4) interbedded with Dusky Blue Green (5BG 3/2); wavy to planar medium to thick laminae and falser beds; water-escape pipes, soft sediment deformation, cross-beds, and micro faults

**8134.2 – 8140.7** Dolostone mud sand: Dusky Yellowish Green (5GY 5/2) and Light Brown (5YR 6/4); mottled; soft sediment deformation and small brecciation

**8140.7 - 8144** Mudstone dolomitic: Dark Reddish Brown (10R 3/4), Light Olive Brown (5YR 5/2), and Greyish Orange (10YR 7/4); massive alternating beds of red and green; minor small brecciation

**8144 – 8145** Limestone: Dark Reddish Brown (10R 3/4); massive

Oas 31-161-92H

Samson Resources Company

Well # 16810 (3301301383)

LOT 1 31-161-92

**9796.0 – 9799.0** Dolostone sand mud: Light Brown (5YR 6/4) interbedded with Greyish Green (10G 4/2); wavy thin to thick laminae and falser beds; ripples, water-escape pipes, mud cracks, and soft sediment deformation; pyrite clusters

**9799.0 – 8800.5** Dolostone mud sand: Light Brown (5YR 6/4) interbedded with Greyish Green (10G 4/2); wavy thin laminae and falser beds; inter mud cracks and small brecciation; pyrite clusters

**8800.5 – 8809.5** Dolostone sand mud: Light Brown (5YR 6/4) interbedded with Greyish Green (10G 4/2); wavy thin to thick laminae and falser beds; water-escape pipes, cross-beds, soft sediment deformation, small brecciation, and ripples; pyrite clusters

**8809.5 – 8814.0** Dolostone sand: Light Brown (5YR 6/4) and minor Greyish Green (10G 4/2); massive

**8014.0 – 8818.8** Dolostone sand mud: Light Brown (5YR 6/4) and Greyish Green (10G 4/2); brecciated beds, massive, and minor mottling; soft sediment deformation; pyrite clusters

**8818.8 – 8820.8** Mudstone dolomitic: Greyish Green (10G 4/2); massive; pyrite clusters

**8820.0 – 8824.5** Dolostone mud sand: Greyish Green (10G 4/2) and Light Brown (5YR 6/4); mottled; small brecciation and small elongated brecciation; pyrite clusters

**8824.5 – 8826.1** Dolostone mud sand: Moderate Yellow Green (5G 5/2) and Greyish Orange (10YR 7/4); mottled; small brecciation

**8826.1 – 8828.0** Dolostone mud sand: Moderate Yellow Green (5G 5/2) and Greyish Orange (10YR 7/4); mottled; minor small brecciation

**8828.0 – 8830.5** Dolostone mud sand: Moderate Yellow Green (5G 5/2) and Greyish Orange (10YR 7/4); mottled and massive; small brecciation; pyrite clusters

**8830.5 – 8833.4** Dolostone mud sand: Olive Grey (5Y 3/2) and Light Brown (5YR 6/4); mottled; brecciation

**8833.4 – 8835.0** Dolostone sand mud: Greyish Orange (10YR 7/4) interbedded with Olive Grey (5Y 3/2); wavy to planar thin to medium laminae and falser beds; synaeresis cracks, water-escape pipes, soft sediment deformation, minor cross-beds, and minor ripples

**8835.0 – 8838.0** Dolostone mud sand: Olive Grey (5Y 3/2) and Greyish Orange (10YR 7/4); mottled; small brecciation and minor elongated brecciation

Douts 4-7H

St Mary Land & Exploration Company

Well # 17265 (3301301412)

NWNW 7-159-93

**9376.3 – 9380.7** Dolostone sand mud: Light Brown (5YR 6/4) interbedded with Greyish Green (10G 4/2); wavy thin to medium laminae and falser beds; small brecciation, synaeresis cracks, soft sediment deformation, mud cracks, cross-beds, and ripples at end of unit; pyrite clusters

**9380.7 – 9382.0** Dolostone sand mud: Light Brown (5YR 6/4) and minor Moderate Brown (5YR 3/4); no distinct bedding; soft sediment deformation features, mud cracks, desiccation cracks, and brecciation; pyrite clusters

**9382.0 – 9383.0** Dolostone sand mud: Light Brown (5YR 6/4) interbedded with Greyish Green (10G 4/2); wavy medium laminae and falser beds; soft sediment deformation, climbing ripples; water-escape pipes, and mud cracks; pyrite clusters

**9383.0 – 9385.8** Dolostone mud sand: Light Brown (5YR 6/4) and Greyish Green (10G 4/2); massive and wavy medium laminae; water-escape pipes and cross-beds

**9385.8 – 9390.3** Dolostone sand mud: Light Brown (5YR 6/4) interbedded with Greyish Green (10G 4/2); wavy thin to medium laminae and falser beds; desiccation cracks, brecciation, water-escape pipes, mud cracks, soft sediment deformation, and minor ripples

**9390.3 – 9396.0** Dolostone sand mud: Light Brown (5YR 6/4) and minor Greyish Green (10G 4/2); no distinct bedding and minor falser beds; soft sediment deformation features

**9396.0 – 9403.0** Dolostone sand: Light Brown (5YR 6/4) and Greyish Green (10G 4/2); poorly sorted brecciated beds that increase in sized downwards

**9403.0 – 9404.5** Mudstone dolomitic: Greyish Green (10G 4/2); massive

**9404.5 – 9407.6** Dolostone mud sand: Light Brown (5YR 6/4) and Greyish Green (10G 4/2); mottled; minor small brecciation at top of unit

**9407.6 – 9409.3** Dolostone sand mud: Greyish Orange (10YR 7/4) and Greyish Green (10G 4/2); brecciated beds and mottled; pyrite clusters

**9409.3 – 9414.0** Dolostone mud sand: Greyish Orange (10YR 7/4) and Moderate Yellow Green (5G 5/2); mottled; small brecciation and minor elongated brecciation; pyrite clusters

**9414.0 – 9418.0** Dolostone mud sand: Greyish Olive Green (5GY 3/2) and Greyish Orange (10YR 7/4); mottled; small brecciation

**9418.0 – 9422.0** Dolostone sand mud: Greyish Orange (10YR 7/4) interbedded with Greyish Green (10G 4/2); wavy thin to medium laminae, falser beds, and minor mottling; small brecciation, soft sediment deformation, mud cracks, and water-escape pipes

**9422.0 – 9427.0** Dolostone mud sand: Greyish Orange (10YR 7/4) and Greyish Green (10G 4/2); mottled; small brecciation, elongated brecciation, and soft sediment deformation

**9427.0 – 9430.0** Dolostone sand mud: Greyish Orange (10YR 7/4) interbedded with Greyish Green (10G 4/2); wavy medium to thick laminae and falser beds; ripples, water-escape pipes, mud cracks, and synaeresis cracks

**9430.0 – 9431.0** Dolostone mud sand: Greyish Orange (10YR 7/4) and Dusky Yellowish Green (10GY 3/2); mottled

Trippell 32-16H

Cirque Resources, LP

Well # 17699 (3301301444)

SESE 32-160-90

**8401-8404.8** Dolostone sand mud: Greyish Orange (10YR 7/4) interbedded with Greyish Green (10G 4/2); wavy thin laminae and falser beds; water-escape pipes, hummocky cross-beds, soft sediment deformation, and minor brecciation; pyrite clusters

**8404.8-8408.5** Missing

**8405.5 – 8406.6** Mudstone dolomitic: Dusky Yellow Green (5GY 5/2); massive

**8406.6 -8408.0** Dolostone sand mud: Greyish Orange (10YR 7/4) interbedded with Greyish Green (10G 4/2); wavy thin laminae and falser beds; soft sediment deformation

**8408.0 – 8412.2** Dolostone sand: Greyish Orange (10YR 7/4); massive

**8412.2 – 8413.0** Missing

**8413.0 – 8415.0** Dolostone sand mud: Greyish Orange (10YR 7/4) and Grayish Green (10G 4/2); brecciated beds

**8415.0 – 8417.5** Dolostone sand: Greyish Orange (10YR 7/4); massive

**8417.5 – 8420.0** Mudstone dolomitic: Greyish Green (10G 4/2); massive

**8420.0 – 8427.0** Dolostone mud sand: Greyish Orange (10YR 7/4) and Greyish Green (10G 4/2); mottled; small brecciation

**8427.0 – 8431.0** Dolostone sand mud: Greyish Orange (10YR 7/4) and Greyish Green (10G 4/2); brecciated beds

**8431.0 – 8432.0** Dolostone sand mud Greyish Orange (10YR 7/4) interbedded with Greyish Green (10G 4/2); wavy thin laminae and falser beds; minor soft sediment deformation and minor brecciation

**8432.0 – 8435.0** Dolostone mud sand: Greyish Green (10G 4/2) and Greyish Orange (10YR 7/4); mottled

**8435.0 -8436.0** Dolostone sand mud: Greyish Orange (10YR 7/4) interbedded with Greyish Green (10G 4/2); wavy thin laminae and falser beds; soft sediment deformation and minor water-escape pipes

**8436.0 – 8440.0** Dolostone mud sand: Moderate Brown (5YR 3/4) and Greyish Green (10G 4/2); mottled; small brecciation that increases downwards

**8440.0 – 8444.0** Dolostone sand mud: Greyish Orange (10YR 7/4) interbedded with Greyish Green (10G 4/2); wavy thin laminae and falser beds; soft sediment deformation and small brecciation

**8444.0 – 8447.0** Dolostone mud sand: Greyish Orange (10YR 7/4), Moderate Brown (5YR 3/4) and Greyish Green (10G 4/2); mottled; small brecciation

### **Williams County**

Lokken 2-2H

Continental Resources, INC.

Well # 19951 (3310502037)

NWNW 2-159-95

**9247.9 – 9251.6** Dolostone sand mud: Light Brown (5YR 6/4) interbedded with Greyish Green (10G 4/2); wavy thin to medium laminae and falser beds; water-escape pipes; soft sediment deformation, ripples, brecciation, syneresis cracks, and desiccation cracks; pyrite clusters

**9251.6 – 9251.9** Mudstone dolomitic: Greyish Green (10G 4/2); massive

**9251.9 – 9253.0** Dolostone sand mud: Light Brown (5YR 6/4) interbedded with Greyish Green (10G 4/2); wavy thin laminae and falser beds; soft sediment deformation and water-escape pipes; pyrite clusters

**9253.0 – 9253.9** Dolostone sand: Light Brown (5YR 6/4); no distinct bedding; syneresis cracks, water-escape pipes, and small brecciation

**9253.9 – 9254.5** Dolostone sand mud: Light Brown (5YR 6/4) interbedded with Greyish Green (10G 4/2); wavy medium laminae and falser beds; soft sediment deformation

**9254.5 – 9257.0** Dolostone sand mud: Light Brown (5YR 6/4) interbedded with Greyish Green (10G 4/2); wavy thin laminae and falser beds; cross-beds, soft sediment deformation, water-escape pipes, and climbing ripples at end of unit

**9257.0 – 9257.8** Mudstone dolomitic: Greyish Green (10G 4/2); massive

**9257.8 – 9265.0** Dolostone sand mud: Light Brown (5YR 6/4) interbedded with Greyish Green (10G 4/2); wavy thin to thick laminae, falser beds, and minor massive sections; synaeresis cracks, soft sediment deformation, small brecciation, mud cracks, water-escape pipes, cross-beds, and climbing ripples; pyrite clusters

**9265.0 – 9266.0** Dolostone sand: Light Brown (5YR 6/4); massive; minor brecciation; minor pyrite clusters

**9266.0 – 9267.0** Dolostone mud sand: Greyish Green (10G 4/2) and Light Brown (5YR 6/4); falser beds and brecciated beds alternating

**9267.0 – 9270.4** Dolostone sand: Light Brown (5YR 6/4); no distinct bedding; water-escape pipes, soft sediment deformation features, desiccation, and minor small brecciation

**9270.4 – 9272.1** Dolostone mud sand: Light Brown (5YR 6/4) and Greyish Green (10G 4/2); mottled; small brecciation

**9272.1 – 9273.5** Missing

**9273.5 – 9274.8** Dolostone sand mud: Greyish Orange (10YR 7/4) and Greyish Green (10G 4/2); brecciated beds; soft sediment deformation

**9274.8 – 9276.5** Mudstone dolomitic: Dusky Yellow Green (5GY 5/2); pattern dolomite; pyrite clusters

**9276.5 – 9280.0** Dolostone mud sand: Greyish Green (10G 4/2) and Moderate Brown (5YR 3/4); mottled; pyrite clusters

**9280.0 – 9283.5** Dolostone mud sand: Dusky Yellow Green (5GY 5/2) and Greyish Orange (10YR 7/4); mottled; pyrite clusters

**9283.5 – 9285.0** Dolostone mud sand: Greyish Orange (10YR 7/4) and Olive Grey (5Y 3/2); mottled small brecciation

**9285.0 – 9292.5** Dolostone mud sand: Greyish Orange (10YR 7/4) and Dusky Yellow Green (5GY 5/2); mottled; poorly sorted brecciation

**9292.5 – 9295.4** Dolostone sand mud: Greyish Orange (10YR 7/4) interbedded with Moderate Yellow Green (10GY 6/4); thin wavy laminae and falser beds; brecciation, soft sediment deformation, cross-beds, water-escape pipes, mud cracks, and synaeresis cracks

**9295.4 – 9299.0** Dolostone mud sand: Greyish Orange (10YR 7/4) and Dusky Yellow Green (5GY 5/2); mottled and brecciated beds alternating sections

**9299.0 – 9301.0** Dolostone sand mud: Greyish Orange (10YR 7/4) interbedded with Greyish Olive (10Y 4/2); wavy thin laminae and falser beds; synaeresis cracks and small brecciation

**9301.0 – 9303.0** Dolostone sand mud: Greyish Orange (10YR 7/4) interbedded with Greyish Olive (10Y 4/2); mottled; small brecciation, elongated brecciation, and soft sediment deformation

**9303.0 – 9304.5** Dolostone mud sand: Greyish Orange (10YR 7/4) and Dusky Yellow Green (5GY 5/2); mottled; small brecciation

**9304.5 – 9306.4** Dolostone sand mud: Greyish Orange (10YR 7/4) and Olive Grey (5Y 3/2); mottled; small elongated brecciation

**9306.4 – 9307.3** Dolostone mud sand: Olive Grey (5Y 3/2); massive and minor mottling

**9307.3 – 9309.5** Dolostone sand mud: Light Brown (5YR 6/4) and Olive Grey (5Y 3/2); mottled; elongated brecciation

**9309.5 – 9311.0** Dolostone sand mud: Greyish Orange (10YR 7/4) interbedded with Greyish Green (10G 4/2); wavy medium to thick laminae and falser beds; soft sediment deformation, small brecciation, and water-escape pipes

**9311.0 – 9312.4** Dolostone mud sand: Greyish Orange (10YR 7/4) and Olive Grey (5Y 3/2); mottled; small elongated brecciation

**9315.4 – 9316.1** Dolostone sand mud: Greyish Orange (10YR 7/4) interbedded with Olive Grey (5Y 3/2); wavy medium laminae to thin beds and falser beds; cross-beds, climbing ripples, small brecciation, and soft sediment deformation

**9316.1 – 9321.0** Dolostone mud sand: Greyish Orange (10YR 7/4) and Olive Grey (5Y 3/2); mottled; small brecciation, elongated brecciation, and soft sediment deformation

**9321.0 – 9322.0** Dolostone sand mud: Greyish Orange (10YR 7/4) and Dusky Yellow Green (5GY 5/2); poorly sorted brecciated beds

**9322.0 – 9325.4** Dolostone mud sand: Greyish Orange (10YR 7/4) and Dusky Yellow Green (5GY 5/2); mottled; elongated brecciation

**9325.4 – 9340.0** Mudstone dolomitic: Dusky Red (5R 3/4); massive

Comford 9-12H

North Plains Energy, LLC

Well# 19060 (3310501854)

NESE 12-159-97



**9742.0 – 9745.0** Dolostone sand mud: Light Brown (5YR 6/4) interbedded Dusky Yellowish Green (10GY 6/4); wavy thin to medium laminae and falser beds; water-escape pipes, synaeresis cracks, mud cracks, soft sediment deformation, and minor ripples

**9745.0 – 9746.0** Dolostone mud sand: Moderate Brown (5YR 3/4) and Dusky Yellow Green (10GY 6/4); wavy medium laminae and falser beds; soft sediment deformation

**9746.0 – 9752.0** Dolostone sand mud: Light Brown (5YR 6/4) interbedded Dusky Yellowish Green (10GY 6/4); wavy thin to medium laminae and falser beds; water-escape pipes, soft sediment deformation features, cross-beds, synaeresis cracks, mud cracks, climbing ripples, and minor brecciation

**9752.0 – 9756.0** Dolostone sand mud: Light Brown (5YR 6/4) interbedded Dusky Yellowish Green (10GY 6/4); wavy thin to medium laminae and falser beds; wavy thin beds and minor falser beds; brecciation at beginning of unit, synaeresis cracks, soft sediment deformation features, and desiccation cracks

**9756.0 – 9756.8** Dolostone mud sand: Moderate Brown (5YR 3/4) interbedded Dusky Yellow Green (10GY 6/4); wavy thin laminae and falser beds; minor cross-beds

**9756.8 – 9760.0** Dolostone sand mud: Greyish Orange (10YR 6/4), Moderate Brown (5YR 3/4), and Dusky Yellow Green (10GY 6/4); massive alternating sections and minor falser beds; soft sediment deformation, and desiccation cracks

**9760.0 – 9763.0** Dolostone sand: Light Brown (5YR 6/4) and Moderate Brown (5YR 3/4); no distinct bedding; desiccation cracks

**9763.0 – 9765.5** Dolostone sand mud: Greyish Orange (10YR 7/4) and Moderate Brown (5YR 3/4); brecciated beds and minor mottling; soft sediment deformation

**9765.5 – 9766.0** Mudstone dolomitic: Dusky Yellowish Green (10G 6/4); massive

**9766.0 – 9767.4** Dolostone mud sand: Greyish Olive (10Y 4/2) and Greyish Orange (10YR 7/4); massive; small brecciation

**9767.4 – 9770.0** Dolostone mud sand: Moderate Brown (5YR 3/4), Greyish Green (10G 4/2), and Greyish Orange (10YR 6/4); mottled; brecciation and elongated brecciation

**9770.0 – 9771.0** Mudstone dolomitic: Greyish Olive (10Y 4/2); massive

**9771.0 – 9774.0** Dolostone mud sand: Moderate Brown (5YR 3/4) and minor Greyish Orange (10YR 7/4); mottled; small brecciation and minor elongated brecciation

**9774.0 – 9777.0** Dolostone mud sand: Dusky Yellowish Green (10G 6/4) and minor Greyish Orange (10YR 7/4); massive and mottled; minor small brecciation

**9777.0 – 9779.9** Dolostone mud sand: Moderate Brown (5YR 3/4) and Greyish Orange (10YR 7/4); mottled; small brecciation and elongated brecciation

**9779.9 – 9780.8** Dolostone sand mud: Greyish Orange (10YR 7/4) interbedded with Dusky Yellowish Green (10G 6/4); wavy thin to medium laminae, falser beds, and minor mottling; syneresis cracks and minor small brecciation

**9780.8 – 9781.4** Dolostone sand mud: Greyish Orange (10YR 7/4) and Moderate Brown (5YR 3/4); elongated brecciated beds

**9781.4 – 9783.0** Dolostone mud sand: Moderate Brown (5YR 3/4) and Greyish Orange (10YR 7/4); mottled; brecciation

**9783.0 – 9786.5** Dolostone sand mud: Greyish Orange (10YR 7/4) interbedded with Dusky Yellowish Green (10G 6/4); wavy thin to medium laminae and falser beds; soft sediment deformation, syneresis cracks, water-escape pipes, and minor brecciation

**9786.5 – 9789.0** Dolostone mud sand: Greyish Orange (10YR 7/4) and Dusky Yellowish Green (10G 6/4); mottled and poorly sorted brecciated beds; brecciation

**9789.0 – 9791.0** Dolostone sand mud: Greyish Orange (10YR 7/4) and Greyish Green (10G 4/2); wavy medium laminae, falser beds, and minor massive section; minor brecciation

**9791.0 – 9792.0** Dolostone mud sand: Greyish Orange (10YR 7/4) and Dusky Yellowish Green (10G 6/4); mottled and minor wavy thin laminae; small brecciation and soft sediment deformation

**9792.0 – 9793.3** Dolostone sand mud: Greyish Orange (10YR 7/4) interbedded with Greyish Green (10G 4/2); wavy thin to thick laminae and falser beds; small brecciation and minor soft sediment deformation

**9793.3 – 9794.0** Dolostone sand mud: Greyish Orange (10YR 7/4) and Greyish Green (10G 4/2); poorly sorted brecciated beds; minor elongated brecciation

**9794.0 – 9795** Dolostone mud sand: Greyish Orange (10YR 7/4) and Dusky Yellowish Green (10G 6/4); mottled

Pegasus 2-17H

Pogo Producing Company LLC

Well # 16405 (3310501598)

SWSW 17-158-96

**10205.5 – 10209.3** Dolostone sand mud: Light Brown (5YR 6/4) interbedded with Greyish Green (10G 4/2); wavy thin to medium laminae and falser beds; water-escape pipes, mud cracks, cross-beds, ripples, and small brecciation at end of unit; pyrite clusters

**10209.3 – 10210.6** Dolostone sand: Light Brown (5YR 6/4); no distinct bedding; water-escape pipes, soft sediment deformation, and desiccation cracks

**10210.6 – 10214.5** Dolostone sand mud: Moderate Brown (5YR 3/4) interbedded with Greyish Green (10G 4/2); wavy thin to thick laminae and falser beds; water-escape pipes, soft sediment deformation, mud cracks, climbing ripples, and minor brecciation

**10214.5 – 10216.0** Dolostone sand mud: Light Brown (5YR 6/4) and Greyish Green (10G 4/2); massive mudstone at beginning followed by sandstone with minor mud layers; soft sediment deformation, ripples, and minor small brecciation; pyrite clusters

**10216.0 – 10217.3** Dolostone mud sand: Moderate Brown (5YR 3/4) interbedded with Greyish Green (10G 4/2); wavy thin laminae; and falser beds; water-escape pipes

**10217.3 – 10219.0** Dolostone sand mud: Greyish Orange (10YR 7/4) and minor Moderate Brown (5YR 6/4); no distinct bedding; brecciation, desiccation cracks, and soft sediment deformation; pyrite clusters

**10219.0 – 10220.2** Dolostone mud sand: Moderate Brown (5YR 3/4) and Greyish Green (10G 4/2); falser beds; soft sediment deformation and water-escape pipes

**10220.2 – 10223.5** Dolostone sand mud Greyish Orange (10YR 7/4) interbedded with Moderate Brown (5YR 3/4) and Greyish Green (10G 4/2); wavy thin to medium laminae and falser beds; soft sediment deformation, water-escape pipes, desiccation cracks, syneresis cracks, large brecciated section, and minor brecciation

**10223.5 – 10225.0** Dolostone sand: Light Brown (5YR 6/4); no distinct bedding; desiccation cracks, cross-beds, and soft sediment deformation at end of unit

**10225.0 – 10226.4** Dolostone mud sand: Moderate Brown (5YR 3/4) and Light Brown (5YR 6/4); no distinct bedding, massive, falser beds, and minor brecciated beds

**10226.4 – 10228.4** Mudstone dolomitic: Greyish Green (10G 4/2); massive

**10228.4 – 10230.5** Dolostone sand: Moderate Brown (5YR 3/4); massive; minor brecciation near top

**10230.5 – 10232.1** Dolostone mud sand: Light Brown (5YR 6/4) and Moderate Brown (5YR 3/4); mottled; soft sediment deformation and elongated brecciation

**10232.1 – 10234.0** Mudstone dolomitic: Moderate Yellow Green (10GY 6/4); massive

**10234.0 – 10236.0** Dolostone mud sand: Olive Grey (5Y 3/2) and Greyish Orange (10YR 7/4); brecciation

**10236.0 – 10242.0** Dolostone sand mud Dusky Yellowish Green (10GY 3/2) and Greyish Orange (10YR 7/4); mottled and minor massive section; small brecciation

**10242.0 – 10248.0** Dolostone sand mud Greyish Olive Green (5GY 3/2) and Light Brown (5YR 6/4); mottled; small brecciation, and elongated brecciation

Rasmussen 1-12-16H

G3 Operating, LLC

Well # 20844 (3310502204)

SESW 21-157-102

**10270.6 – 10285.4** Mudstone dolomitic: Light Brown (5YR 6/4) interbedded with Greyish Green (10YR 4/2); wavy thin laminae and falser beds; water-escape pipes, ripples, mud cracks, soft sediment deformation, and minor brecciation

**10285.4- 10290.0** Mudstone dolomitic: Greyish Orange (10YR 7/4), Light Brown, (5YR 6/4) and Greyish Green (10G 4/2); wavy thin to medium laminae and falser beds; soft sediment deformation and minor water-escapes pipes.

**10290.0 – 10292.0** Mudstone dolomitic: Greyish Green (10G 4/2); massive

**10292.0-10297.5** Dolostone mud sand: Greyish orange (10YR 7/4) and Greyish Green (10G 4/2); mottled and minor massive section; small brecciation; pyrite clusters

**10297.5- 10307.2** Mudstone dolomitic: Dusky brown (5YR 2/2); massive; minor small brecciation

**10307.2 – 10311.8** Dolostone mud sand: Greyish Orange (10Y 7/4) and Greyish Green (10G 4/2); mottled

**10311.8 – 10315.8** Dolostone mud sand: Greyish Orange (10Y 7/4) and Greyish Green (10G 4/2); wavy thin laminae and falser beds; soft sediment deformation and minor brecciation

**10315.8 – 10319.0** Mudstone dolomitic: Pale Reddish Brown (10R 5/4); massive with minor mottled and minor brecciated beds

H. Bakken 12-07H

Hess Corporation

Well # 16565 (3310501618)

NWSW 12-157-95

**9724.0 – 9727.0** Dolostone sand mud: Moderate Brown (5YR 3/4) interbedded with Dusky Yellow Green (10GY 6/4); wavy medium laminae and falser beds; heavy soft sediment deformation, mud cracks, water-escape pipes, and minor cross-beds

**9727.0 – 9729.0** Dolostone sand mud: Light Brown (5YR 6/4) interbedded with Greyish Green (10G 4/2); wavy thin to medium laminae, false beds, and minor mottling; small brecciation, soft sediment deformation, water-escape pipes, and ripples

**9729.0 – 9731.9** Dolostone sand mud: Light Brown (5YR 6/4) interbedded with Greyish Green (10G 4/2); wavy medium to thick laminae and false beds; soft sediment deformation, small brecciation, mud cracks, and climbing ripples

**9731.9 – 9733.0** Dolostone sand mud: Greyish Orange (10YR 7/4) interbedded with Greyish Green (10G 4/2); wavy thin to medium and false beds; cross-beds, water-escape pipes, and mud cracks

**9733.0 – 9738.0** Dolostone sand mud: Greyish Orange (10YR 7/4) and minor Greyish Green (10G 4/2); no distinct bedding; cross-beds, small brecciation, soft sediment deformation features, ripples, and desiccation cracks

**9738.0 – 9739.0** Dolostone mud sand: Greyish Green (10G 4/2) and Light Brown (5YR 6/4); water deformed beds and minor massive section

**9739.0 – 9741.4** Dolostone sand: Light Brown (5YR 6/4); massive; minor small brecciation

**9741.1 – 9746.0** Dolostone sand mud: Light Brown (5YR 6/4) and Greyish Green (10G 4/2); poorly sorted brecciated beds

**9746.0 – 9747.0** Mudstone dolomitic: Greyish Green (10G 4/2); massive

**9747.0 – 9751.3** Dolostone mud sand: Dusky Yellow Green (10GY 6/4) and Greyish Green (10G 4/2); mottled; brecciation and elongated brecciation

**9751.0 – 9755.0** Dolostone mud sand: Greyish Orange (10YR 7/4) and Dusky Yellow Green (10GY 6/4); mottled; small elongated brecciation; pyrite clusters

**9755.0 – 9756.6** Mudstone dolomitic: Greyish Green (10G 4/2); massive; minor small brecciation

**9756.6 – 9758.0** Dolostone mud sand: Greyish Orange (10YR 7/4) and Greyish Olive (10Y 4/2); mottled; small brecciation

**9758.0 – 9760.0** Dolostone mud sand: Greyish Olive (10Y 4/2) and Greyish Orange (10YR 7/4); mottled; small brecciation

**9760.0 – 9761.0** Dolostone sand mud: Greyish Orange (10YR 7/4) and Moderate Yellow Green (10GY 6/4); mottled and minor wavy thin laminae; small brecciation, syneresis cracks, and soft sediment deformation

**9761.0 – 9763.5** Dolostone mud sand: Light Brown (5YR 6/4) and Dusky Yellow Green (10GY 6/4); mottled; small elongated brecciation

**9763.5 – 9766.5** Dolostone sand mud: Greyish Orange (10YR 7/4) interbedded with Moderate Yellow Green (10GY6/4); wavy thin laminae and falser beds; ripples, water-escape pipes, syneresis cracks, mud cracks, and soft sediment deformation

**9766.5 – 9770.0** Dolostone mud sand: Greyish Orange (10YR 7/4) and Greyish Green (10G 4/2); mottled; small brecciation, elongated brecciation, and minor desiccation cracks

**9770.0 – 9770.5** Mudstone dolomitic: Olive Grey (5Y 3/2); massive

**9770.5 – 9771.5** Dolostone sand mud: Greyish Orange (10YR 7/4) interbedded with Dusky Yellow Green (10GY 6/4); wavy medium to thick laminae and falser beds; soft sediment deformation and minor desiccation cracks

**9771.5 – 9773.5** Dolostone sand mud: Greyish Orange (10YR 7/4) and Dusky Yellow Green (10GY 6/4); mottled; water-escape pipes; minor small brecciation, and minor elongated brecciation

**9773.5 – 9775.0** Dolostone mud sand: Greyish Green (10G 4/2) and Greyish Orange (10YR 7/4); mottled; small elongated brecciation

**9775.0 – 9776.1** Dolostone sand mud: Greyish Orange (10YR 7/4) interbedded with Dusky Yellow Green (10GY 6/4); wavy thin laminae, falser beds, and minor mottling; water-escape pipes, syneresis cracks, and minor soft sediment deformation

**9776.1 – 9778.0** Mudstone dolomitic: Dusky Yellow Green (10GY 6/4); massive; minor brecciation at top of unit

**9778.0 – 9780.3** Dolostone sand mud: Greyish Orange (10YR 7/4) and Greyish Green (10G 4/2); mottled; small elongated brecciation and soft sediment deformation

**9780.3 – 9782.3** Dolostone sand mud: Greyish Orange (10YR 7/4) interbedded with Greyish Green (10G 4/2); wavy medium laminae, falser beds, and minor mottling; soft sediment deformation, minor syneresis cracks, and brecciation

**9782.3 – 9783.3** Dolostone mud sand: Dusky Yellow Green (10GY 6/4) and Greyish Orange (10YR 7/4); mottled; minor small elongated brecciation

**9783.3 – 9788.5** Dolostone sand mud Greyish Orange (10YR 7/4) interbedded with Greyish Green (10G 4/2); wavy medium to thick laminae and falser beds; soft sediment deformation, climbing ripples, brecciation, syneresis cracks, cross-beds, minor flame structures, and minor water-escape pipes

**9788.5 – 9794.8** Dolostone mud sand: Greyish Orange (10YR 7/4) interbedded and Dusky Yellow Green (10GY 6/4); massive and brecciated beds; soft sediment deformation, and minor convoluted beds

**9794.8 – 9799.5** Limestone: Dusky Red (5R 3/4); massive

Heidi 1-4H

Newfield Production Company

Well # 18413 (3310501756)

SESE 4-156-99

**10732.0 – 10734.0** Dolostone sand mud Light Brown (5YR 6/4) interbedded with Moderate Brown (5YR 3/4); wavy thin laminae and falser beds; desiccation cracks and heavy brecciation at beginning of unit, mud cracks, soft sediment deformation, synaeresis cracks, water-escape pipes, and minor cross-beds; pyrite clusters

**10734.0 – 10745.0** Dolostone sand mud Light Brown (5YR 6/4) interbedded with Greyish Green (10G 4/2); wavy thin to medium laminae and falser; brecciation, mud cracks, climbing ripples, soft sediment deformation features, water-escape pipes, and minor flame structures; pyrite clusters

**10745.0 – 10747.0** Dolostone mud sand: Moderate Brown (5YR 3/4), Greyish Green (10G 4/2), and Light Brown (5YR 6/4); massive, wavy thin laminae, and falser beds; mud cracks, and small brecciation; pyrite clusters

**10747.0 – 10748.4** Dolostone sand: Light Brown (5YR 6/4) and minor Moderate Brown (5YR 3/4); no distinct bedding; soft sediment deformation features, small brecciation, water-escape pipes, and minor mud cracks

**10748.4 – 10751.0** Dolostone sand mud Light Brown (5YR 6/4) interbedded with Greyish Green (10G 4/2); wavy medium laminae and falser beds; soft sediment deformation features, mud cracks, desiccation cracks, and brecciation

**10751.0 – 10752.0** Dolostone sand: Light Brown (5YR 6/4); no distinct bedding; soft sediment deformation

**10752.0 – 10755.3** Dolostone sand mud Light Brown (5YR 6/4) and Greyish Green (10G 4/2); poorly sorted brecciated beds; minor pyrite clusters at end of unit

**10755.3 – 10757.5** Mudstone dolomitic: Dusky Yellow Green (5GY 5/2); massive; pyrite clusters

**10757.5 – 10759.0** Dolostone mud sand: Moderate Yellow (5Y 7/6) and Greyish Green (10G 4/2); mottled; brecciation

**10759.0 – 10759.5** Mudstone dolomitic: Moderate Yellow Green (10GY 6/4); massive; small brecciation

**10759.5 – 10763.5** Dolostone mud sand: Moderate Yellow (5Y 7/6), Greyish Green (10G 4/2), and minor Light Brown (5YR 6/4); mottled; minor small brecciation

**10763.5 – 10767.2** Dolostone mud sand: Dark Yellowish Green (10GY 4/4) and Greyish Orange (10YR 7/4); mottled; small brecciation

**10767.2 – 10768.0** Dolostone mud sand: Dark Yellowish Green (10GY 4/4) and Greyish Orange (10YR 7/4); massive; small brecciation

**10768.0 – 10771.0** Dolostone mud sand: Moderate Yellow Green (10GY 6/4), Dusky Yellowish Green (10GY 3/2), and Greyish Orange (10YR 7/4); mottled; small brecciation

**10771.0 – 10772.5** Dolostone mud sand: Light Brown (5YR 6/4) interbedded with Dusky Yellowish Green (10GY 3/2); wavy thin laminae, falser beds, and minor mottling; small brecciation and soft sediment deformation

**10772.5 – 10774.6** Dolostone mud sand: Dusky Yellow Green (5GY 5/2) and Light Brown (5YR 6/4); mottled; small elongated brecciation

**10774.6 – 10778.0** Dolostone sand mud: Greyish Orange (10YR 7/4) interbedded with Moderate Yellow Green (10GY 6/4); wavy thin laminae and falser beds; water-escape pipes, small brecciation, cross-beds at end of unit, and minor mud cracks

**10778.0 – 1-770.0** Dolostone mud sand: Greyish Orange (10YR 7/4) and Dusky Yellowish Green (10GY 3/2); mottled; water-escape pipes

Round Prairie 1-17H

EOG Resources, INC.

Well # 18257 (3310501748)

NWNW 17-154-103

**10646.9 – 10647.8** Dolostone sand mud: Greyish Orange (10YR 7/4) interbedded with Greyish Green (10G 4/2); wavy thin laminae and falser beds; mud cracks and water-escape pipes

**10647.8 – 10649.5** Dolostone sand mud: Moderate Brown (5YR 3/4) interbedded with Moderate Yellowish Green (10GY 6/4); wavy thin to medium laminae and falser beds; minor convoluted beds, cross-beds, soft sediment deformation, and climbing ripples

**10649.5 – 10652.2** Mudstone dolomitic: Greyish Green (10G 4/2); massive; possible pyrite layers and clusters

**10652.2 – 10654.2** Dolostone sand mud: Light Brown (5YR 6/4) interbedded with Greyish Green (10G 4/3); wavy thin laminae and falser beds; soft sediment deformation, minor water-escape structures, and syneresis cracks; pyrite clusters

**10654.2 – 10656.9** Dolostone sand mud: Greyish Orange (10YR 7/4) interbedded with Greyish Green (10G 4/2); wavy thin to medium laminae and falser beds; bed dominated; ripples, and brecciation



**10656.9 – 10658.0** Dolostone mud sand: Light Brown (5YR 6/4) and Greyish Green (10G 4/2); mottled; water-escape pipe; pyrite clusters

**10658.0 – 10659.0** Mudstone dolomitic: Greyish Green (10G 4/2); massive

**10659.0 – 10662.0** Dolostone sand mud: Greyish Orange (10YR 7/4) interbedded with Greyish Green (10G 4/2); wavy thick laminae to thin beds; soft sediment deformation and large climbing ripples; pyrite clusters

**10662.0 – 10665.5** Dolostone sand mud: Greyish Orange (10YR 7/4) and Greyish Green (10G 4/2); brecciated beds

**10665.5 – 10668.0** Mudstone dolomitic: Greyish Green (10G 4/2); massive

**10668.0 – 10669.9** Dolostone mud sand: Greyish Orange (10YR 7/4) and Greyish Olive (10Y 4/2); mottled; small brecciation

**10669.9 – 10671.1** Dolostone mud sand: Greyish Orange (10YR 7/4) and Moderate Yellowish Green (10GY 5/2); mottled and poorly sorted brecciation

**10671.1 – 10676.8** Mudstone dolomitic: Greyish Olive (10Y 4/2); massive

**10676.8 – 10679.3** Dolostone mud sand: Moderate Yellow Green (10GY 5/2) and minor Greyish Orange (10YR 7/4); mottled; small brecciation and minor elongated brecciation

**10679.3 – 10683.3** Dolostone mud sand: Moderate Reddish Brown (10R 4/6) and Greyish Orange (10YR 7/4); mottled, small brecciation that increases then decreases

**10683.3 – 10685.0** Greyish Orange (10YR 7/4); cross-bedding at beginning then mottled with minor elongated brecciation

**10685.0 – 10687.0** Dolostone mud sand: Moderate Reddish Brown (10R 4/6) and Greyish Orange (10YR 7/4); mottled; minor elongated brecciation

**10687.0 – 10689.5** Dolostone sand mud: Greyish Orange (10YR 7/4) interbedded Greyish Green (10G 4/2); wavy thin to medium laminae and falser beds; soft sediment deformation

**10689.5 – 10693.0** Dolostone mud sand: Moderate Red Brown (10R 4/6) and Greyish Orange (10YR 7/4); mottled; elongated beds and minor reduction spots

**10693.0 – 10698.0** Dolostone sand mud: Greyish Orange (10YR 7/4) and Greyish Green (10G 4/2); brecciated beds

**10698.0 – 10703.2** Dolostone mud sand: Moderate Red Brown (10R 4/6) and Greyish Orange (10YR 7/4); mottled; small brecciation that increases downwards and minor elongated brecciation

**10703.2 – 10704.0** Dolostone sand mud: Greyish Orange (10YR 7/4) interbedded with Greyish Green (10G 4/2); wavy medium laminae and falser beds

**10704.0 – 10705.0** Missing

**10705.0 – 10708.4** Dolostone sand mud: Greyish Orange (10YR 7/4) and Greyish Green (10G 4/2); poorly sorted brecciated beds that increases downwards in size; minor elongated brecciation

**10708.4 – 10710.2** Dolostone mud sand: Greyish Green (10G 4/2) and Greyish Orange (10YR 7/4); mottled; small brecciation at end of unit

**10710.2 – 10711.5** Dolostone sand mud: Pale Yellow Brown (10YR 6/2) interbedded with Dusky Yellowish Green (10GY 3/2); planar very thin to thin laminae; minor desiccation

**10711.5 – 17013.6** Dolostone mud sand: Greyish Orange (10YR 7/4) and Greyish Green (10G 4/2); brecciated beds and minor mottling

**10713.6 – 10714.4** Dolostone sand mud: Greyish Orange (10YR 7/4) and minor Moderate Reddish Brown (10R 4/6); poorly sorted brecciated beds

**10714.4 – 10715.5** Dolostone mud sand: Greyish Orange (10YR 7/4) and Greyish Green (10G 4/2); mottled and minor massive section; minor small brecciation

**10715.5 – 10716.5** Mudstone dolomitic: Moderate Reddish Brown (10R 4/6); massive

**10716.5 – 10717.0** Dolostone sand mud: Greyish Orange (10YR 7/4) interbedded with Greyish Green (10G 4/2); wavy very thin to thin laminae and falser beds; minor soft sediment deformation and brecciation at end of unit

**10717.0 – 10717.5** Mudstone dolomitic: Moderate Reddish Brown (10R 4/6); massive

**1017.5 – 10720.0** Mudstone dolomitic: Greyish Green (10G 4/2); massive

**10720.0 – 10728.0** Mudstone dolomitic: Moderate Reddish Brown (10R 4/6); massive

Olson 10-15 1-H

Brigham Oil & Gas, L.P.

Well # 17513 (3310501693)

NWNW 10-154-102

**10680.3 – 10683.1** Dolostone sand mud: Greyish Orange (10YR 7/4) interbedded with Moderate Yellow Green (5GY 7/4); wavy thin to medium laminae and falser beds; minor draping

**10683.1 – 10691.8** Dolostone sand mud: Greyish Orange (10YR 7/4) interbedded with Moderate Yellow Green (5GY 7/4); medium to thick wavy laminae and falser beds; soft sediment deformation, brecciation, cross-beds; pyrite clusters

**10691.8 – 10693.3** Dolostone sand mud Greyish Orange (10YR 7/4) and Moderate Yellow Green (5GY 7/4); massive and minor falser beds; pyrite clusters

**10693.3 – 10693.8** Missing

**10693.8 – 10696.0** Dolostone sand mud: Greyish Orange (10YR 7/4) and Moderate Yellow Green (5GY 7/4); brecciated beds; pyrite clusters

**10696.0 – 10697.2** Mudstone dolomitic: Dusky Yellow Green (10GY 3/2); massive

**10697.2 – 10700.7** Dolostone mud sand: Greyish Olive Green (5GY 3/2) and Greyish Orange (10YR 7/4); mottled; minor small brecciation

**10700.7 – 10703.5** Dolostone mud sand: Dusky Yellow Green (10GY 3/2) and Greyish Orange (10YR 7/4); mottled; small brecciation and minor elongated brecciation

**10703.5 – 10713.5** Mudstone dolomitic: Dusky Red (5R 3/4); massive and minor mottling; minor small brecciation

**10713.5 – 10716.0** Dolostone mud sand: Greyish Orange (10YR 7/4), Greyish Green (10G 4/2), and minor Dusky Red (5R 3/4); wavy thin laminae, falser beds, and mottled; small brecciation

**10716.0 – 10717.0** Dolostone sand mud: Greyish Orange (10YR 7/4) interbedded with Moderate Yellow Green (5GY 7/4); wavy thin to medium laminae and falser beds; minor draping

**10717.0 – 10718.6** Dolostone sand mud: Greyish Orange (10YR 7/4) interbedded with Dusky Red (5R 3/4); wavy thin to thick laminae and falser beds; water-escape pipes, soft sediment deformation, minor cross-beds, and minor small brecciation

**10718.6 – 10719.5** Dolostone sand mud: Greyish Orange (10YR 7/4) interbedded with Greyish Green (10G 4/2); wavy thin to medium laminae and falser beds; minor soft sediment deformation

**10719.5 – 10721.5** Dolostone mud sand: Dusky Red (5R 3/4) and Greyish Orange (10YR 7/4); mottled; brecciation

**10721.5 – 10723.0** Mudstone dolomitic: Dusky Red (5R 3/4); massive; minor small brecciation

**10723.0 – 10725.8** Dolostone mud sand: Dusky Red (5R 3/4) and minor Greyish Orange (10YR 7/4); mottled and minor massive section; small brecciation

**10725.8 – 10727.1** Dolomitic Muddy Sandstone Greyish Orange (10YR 7/4) interbedded with Dusky Red (5R 3/4) and Greyish Green (10G 4/2); wavy thin to medium laminae and falser beds

**10727.1 – 10728.0** Dolostone mud sand: Greyish Orange (10YR 7/4) and Greyish Green (10G 4/2); poorly sorted brecciated beds

**10728.0 – 10728.9** Mudstone dolomitic: Dusky Red (5R 3/4); massive

**1-728.9 – 10729.4** Dolostone sand mud: Greyish Orange (10YR 7/4) and Greyish Green (10G 4/2); poorly sorted elongated brecciated beds

Rolf 1-20H

Continental Resources, INC.

Well # 20183 (3310502100)

SESW 20-155-98

**11161.6 – 11162.7** Dolostone mud sand: Moderate Yellow Green (10GY 6/4) and Greyish Yellow Green (5GY 5/2); no distinct bedding; soft sediment deformation and brecciation

**11162.7 – 11165.0** Dolostone mud sand: Greyish Orange (10YR 7/4) and Dusky Yellow Green (5GY 5/2); mottled; small elongated brecciation

**11165.0 – 11170.0** Dolostone sand mud: Light Brown (5YR 6/4) interbedded with Greyish Green (10G 4/2); wavy thin to medium laminae and false beds; water-escape pipes, brecciation, and mud cracks

**11170.0 – 11172.0** Dolostone sand mud: Greyish Orange (10YR 7/4) and Greyish Green (10G 4/2); mottled and minor brecciated beds at top of unit; elongated brecciation that decreases downward

**11172.0 – 11172.5** Missing

**11172.5 – 11174.8** Dolostone sand mud: Light Brown (5YR 6/4) and Greyish Green (10G 4/2); mottled; small brecciation

**11174.8 – 11176.0** Dolostone sand mud: Greyish Orange (10YR 7/4) interbedded with Greyish Green (10G 4/2); wavy medium to thick laminae and minor false beds; soft sediment deformation and minor flame structures

**11176.0 – 11178.0** Dolostone mud sand: Greyish Orange (10YR 7/4) and Greyish Green (10G 4/2); brecciated beds and minor mottling; minor elongated beds

**11178.0 – 11179.0** Dolostone mud sand: Greyish Orange (10YR 7/4) and Greyish Green (10G 4/2); mottled; minor small brecciation

**11179.0 – 11180.0** Dolostone sand mud: Greyish Orange (10YR 7/4) and Greyish Green (10G 4/2); poorly sorted brecciation

**11180.0 – 11181.0** Dolostone mud sand: Dusky Yellow Green (5GY 5/2); massive; minor small brecciation

**11181.0 – 11181.5** Missing

**11181.5 – 11184.7** Dolostone sand mud: Greyish Orange (10YR 7/4) interbedded with Greyish Green (10G 4/2); wavy thin to medium laminae and falser beds; small brecciation, cross-beds, soft sediment deformation, water-escape pipes near the end of unit, and minor synaeresis cracks

**11184.7 – 11187.3** Dolostone mud sand: Greyish Orange (10YR 7/4) and Dusky Yellow Green (5GY 5/2); mottled; large brecciation at beginning of unit, small brecciation, and elongated brecciation

**11187.3 – 11188.7** Dolostone sand mud: Greyish Orange (10YR 7/4) interbedded with Greyish Green (10G 4/2); mottled; elongated brecciation

**11188.7 – 11190.0** Dolostone mud sand: Dusky Yellow Green (5GY 5/2) and Greyish Green (10G 4/2); mottled; elongated brecciation

**11190.0 – 11193.0** Dolostone sand mud: Light Brown (5YR 6/4) and Greyish Green (10G 4/2); mottled

**11193.0 – 11193.5** Missing

**11193.5 – 11194.5** Dolostone sand mud: Greyish Orange (10YR 7/4) and Olive Grey (5Y 3/2); mottled and minor brecciated beds

**11194.5 – 11198.0** Dolostone sand mud: Light Brown (5YR 6/4) and Greyish Green (10G 4/2); brecciated beds

**11198.0 – 11199.5** Limestone: Dusky Yellow Green (5GY 5/2); massive

**11199.5 – 11200.0** Limestone: Dusky Red (5R 3/4); massive

**11200.0 – 11201.0** Limestone: Dusky Yellow Green (5GY 5/2); massive; minor small brecciation

**11201.0 – 11205.0** Limestone: Dusky Red (5R 3/4); massive

**11205.0 – 11207.1** Mudstone dolomitic: Dusky Red (5R 3/4); massive

**11207.1 – 11213.0** Limestone: Dusky Red (5R 3/4); massive; minor small brecciation and reduction spots

Scanlan 3-5H

North Plains Energy, LLC

Well # 18770 (3310501803)

NENW 5-153-98

**11093.0 – 11099.0** Dolostone sand mud: Light Brown (5YR 6/4) interbedded with Moderate Yellowish Green (10GY 6/4); wavy thin to medium laminae and falser beds; water-escape pipes, synaeresis cracks, soft sediment deformation feature, cross-beds, and mud cracks; pyrite clusters

**11099.0 – 11101.0** Dolostone sand mud: Light Brown (5YR 6/4) interbedded with Moderate Yellowish Green (10GY 6/4); planar thin laminae; mud cracks and cross-bedding

**11101.0 – 11106.5** Dolostone sand mud: Light Brown (5YR 6/4) and minor Greyish Green (10G 4/2); wavy thin beds; synaeresis cracks, cross-beds, soft sediment deformation, minor ripples, and minor water-escape pipes

**11106.5 – 11107.0** Dolostone sand mud: Light Brown (5YR 6/4) interbedded with Greyish Green (10G 4/2); wavy thin to thick laminae and falser beds; synaeresis cracks, water-escape pipes, and minor brecciation

**11107.0 – 11108.0** Dolostone sand: Light Brown (5YR 6/4); massive; pyrite clusters

**11108.0 – 1111.4** Dolostone sand mud: Light Brown (5YR 6/4) interbedded with Greyish Green (10G 4/2); wavy thin laminae to thin beds and falser beds; soft sediment deformation, synaeresis cracks, minor cross-beds, and brecciation at end of unit

**1111.4 – 11115.0** Dolostone sand mud: Light Brown (5YR 6/4) interbedded with Greyish Green (10G 4/2); wavy thin laminae to thin beds and falser beds; soft sediment deformation at top of unit, synaeresis cracks and minor cross-beds

**11115.0 – 11116.5** Dolostone mud sand: Light Brown (5YR 6/4) interbedded with Greyish Green (10G 4/2); wavy thin laminae and falser beds; inter mud cracks

**11116.5 – 11120.4** Dolostone sand mud: Light Brown (5YR 6/4), Greyish Green (10G 4/2), and Moderate Brown (5YR 3/4); no distinct bedding and minor falser beds; brecciation, water-escape pipes, soft sediment deformation, and minor cross-beds

**11120.4 – 11124.0** Dolostone mud sand: Light Brown (5YR 6/4), Moderate Brown (5YR 3/4), and Greyish Green (10G 4/2); falser beds; soft sediment deformation

**11124.0 – 11126.0** Dolostone mud sand: Light Brown (5YR 6/4), Moderate Brown (5YR 3/4), and Greyish Green (10G 4/2); poorly sorted brecciated beds

**11126.0 – 11127.0** Mudstone dolomitic: Greyish Green (10G 4/2); massive

**11127.0 – 11129.0** Mudstone dolomitic: Moderate Brown (5YR 3/4); massive; minor brecciation at end of unit

**11129.0 – 11138.0** Dolostone mud sand: Light Brown (5YR 6/4), Moderate Brown (5YR 3/4), and Moderate Reddish Brown (10R 4/6); mottled; small brecciation and minor elongated brecciation

**11138.0 – 11143.0** Dolostone mud sand: Light Brown (5YR 6/4) and Dusky Yellowish Green (10GY 3/2); mottled; small brecciation that decreases downwards

**11143.0 – 11144.0** Dolostone sand mud: Light Brown (5YR 6/4) interbedded with Dusky Yellowish Green (10GY 3/2); wavy thin to medium laminae, falses beds, and minor mottled section; small brecciation

**11144.0 – 11145.0** Dolostone sand mud: Light Brown (5YR 6/4) and Dusky Yellowish Green (10GY 3/2); mottled; elongated brecciation

**11145.0 – 11146.0** Dolostone mud sand: Light Brown (5YR 6/4) interbedded with Dusky Yellowish Green (10GY 3/2); mottled; medium elongated brecciation

**11146.0 – 11149.1** Dolostone sand mud: Greyish Orange (10YR 7/4) interbedded with Greyish Olive (10Y 4/2); wavy thin to medium laminae and falses beds; mud cracks, and minor brecciation

**11149.1 – 11149.5** Dolostone mud sand: Greyish Orange (10YR 7/4) and Greyish Olive (10Y 4/2); mottled; small brecciation

**11149.5 – 11152.0** Dolostone mud sand: Greyish Orange (10YR 7/4) and Greyish Olive (10Y 4/2); mottled; elongated brecciation, minor desiccation cracks, and minor soft sediment deformation

**11152.0 – 11154.0** Dolostone mud sand: Greyish Orange (10YR 7/4) and Greyish Olive (10Y 4/2); mottled;

**11154.0 – 11156.0** Dolostone mud sand: Greyish Orange (10YR 7/4) and Greyish Olive (10Y 4/2); mottled; small brecciation

**11156.0 – 11157.0** Dolostone sand mud: Greyish Orange (10YR 7/4) interbedded with Greyish Green (10G 4/2); wavy medium to thick laminae and falses beds

**11157.0 – 11158.0** Dolostone mud sand: Greyish Orange (10YR 7/4) and Greyish Green (10G 4/2); mottled; minor soft sediment deformation

**11158.0 – 11158.8** Dolostone mud sand: Light Brown (5YR 6/4) and Dusky Yellowish Green (10GY 3/2); brecciated beds; soft sediment deformation

**11158.8 – 11162.0** Dolostone mud sand: Light Brown (5YR 6/4) and Dusky Yellowish Green (10GY 3/2); mottled; small brecciation and minor elongated brecciation

**11162.0 – 11164.8** Dolostone sand mud: Greyish Orange (10YR 7/4) interbedded with Greyish Green (10G 4/2); wavy thin to medium laminae, falses beds, and massive sandstone at beginning of unit; soft sediment deformation and minor cross-beds

**11164.8 – 11168.0** Dolostone sand mud: Greyish Orange (10YR 7/4) and Greyish Green (10G 4/2); mottled and brecciated beds; soft sediment deformation and desiccation cracks

**11168.0 – 11170.0** Dolostone mud sand: Greyish Orange (10YR 7/4) and Greyish Green (10G 4/2); mottled; elongated brecciation

**11170 – 11170.5** Dolostone mud sand: Moderate Yellow Green (5G 5/2) and Greyish Orange (10YR 7/4); mottled

**11170.5 – 11174.3** Mudstone dolomitic: Dusky Yellowish Green (10GY 3/2); massive; small brecciation

**11174.3 – 11176.6** Mudstone dolomitic: Dusky Red (5R 3/4); massive

**11176.6 – 11177.8** Mudstone dolomitic: Greyish Green (10G 4/2); massive

**11177.8 -** Mudstone dolomitic: Dusky Red (5R 3/4); massive

### **Mountrail County**

Sidonia 1-06H

EOG Resources, INC

Well # 17676 (3306100884)

SESE 6-158-90

**8794.5 – 9795.4** Dolostone mud sand: Greyish Green (10G 4/2) and Greyish Orange (10YR 7/4); massive and wavy thin laminae; soft sediment deformation, and water-escape pipes; pattern dolomite; pyrite clusters

**9795.4 – 8799.0** Dolostone sand mud: Greyish Orange (10YR 7/4) interbedded with Greyish Green (10G 4/2); wavy medium laminae and false beds; brecciation, synaeresis cracks, mud cracks, cross-beds, and soft sediment deformation; pyrite clusters

**8799.0 – 8800.9** Dolostone sand mud: Greyish Orange (10YR 7/4) interbedded with Greyish Green (10G 4/2); wavy thin laminae, false beds, and lenticular beds; synaeresis cracks, mud cracks, water-escape pipes, and minor brecciation; pyrite clusters

**8800.9 – 8802.0** Dolostone sand: Greyish Orange (10YR 7/4) and minor Greyish Green (10G 4/2); massive; minor soft sediment deformation; minor pyrite clusters

**8802.0 – 8803.2** Dolostone mud sand: Greyish Green (10G 4/2) and minor Greyish Orange (10YR 7/4); massive; minor brecciation and minor synaeresis cracks

**8803.2 – 8805.4** Dolostone sand mud: Greyish Orange (10YR 7/4) and Greyish Green (10G 4/2); mottled; brecciation, mud cracks, soft sediment deformation, and minor cross-beds; pyrite clusters

**8805.4 – 8809.2** Dolostone sand: Greyish Orange (10YR 7/4) and minor Greyish Green (10G 4/2); massive; minor brecciation; pyrite clusters



**8809.2 – 8812.5** Dolostone sand mud: Greyish Orange (10YR 7/4) and Greyish Green (10G 4/2); brecciated beds; pyrite clusters

**8812.5 – 8815.0** Dolostone sand mud: Greyish Orange (10YR 7/4) and Greyish Green (10G 4/2); brecciated beds; pyrite clusters

**8815.0 – 8816.0** Mudstone dolomitic: Greyish Green (10G 4/2); massive; pyrite clusters

**8816.0 – 8820.9** Dolostone mud sand: Greyish Green (10G 4/2) and Greyish Orange (10YR 7/4); mottled; brecciation

**8820.9 – 8821.5** Mudstone dolomitic: Greyish Green (10G 4/2); massive

**8821.5 – 8828.5** Dolostone mud sand: Greyish Orange (10YR 7/4), Moderate Yellow Green (5G 5/2), and Greyish Green (10G 4/2); mottled; brecciation and minor elongated brecciation; pyrite clusters

**8828.5 – 8829.7** Dolostone sand mud: Greyish Orange (10YR 7/4) interbedded with Greyish Green (10G 4/2); wavy medium laminae to thin beds and falsar beds; soft sediment deformation; pyrite clusters

**8829.7 – 8830.1** Dolostone sand: Greyish Orange (10YR 7/4) and minor Greyish Green (10G 4/2); massive; brecciation

**8830.1 – 8830.8** Dolostone mud sand: Greyish Orange (10YR 7/4) interbedded with Greyish Green (10G 4/2); wavy medium to thick laminae; minor synaeresis cracks

**8830.8 – 8831.2** Dolostone mud sand: Greyish Green (10G 4/2) and minor Greyish Orange (10YR 7/4); massive; brecciation

**8831.2 – 8831.7** Dolostone sand mud: Greyish Orange (10YR 7/4) interbedded with Greyish Green (10G 4/2); wavy medium to thick laminae and falsar beds; minor synaeresis cracks

**8831.7 – 8832.4** Dolostone sand mud: Greyish Green (10G 4/2) and Greyish Orange (10YR 7/4); massive and minor mottling; brecciation

**8832.4 – 8834.5** Dolostone mud sand: Greyish Orange (10YR 7/4) interbedded with Greyish Green (10G 4/2); wavy thin to medium laminae and falsar beds; soft sediment deformation, water-escape pipes, and ripples; pyrite clusters

**8834.5 – 8839.2** Dolostone mud sand: Moderate Yellow Green (5G 5/2) and Greyish Orange (10YR 7/4); mottled; brecciation; pyrite clusters

**8839.2 – 8840.8** Dolostone mud sand: Greyish Green (10G 4/2) and Greyish Orange (10YR 7/4); mottled; soft sediment deformation; synaeresis cracks

**8840.8 – 8842.4** Dolostone sand mud: Greyish Orange (10YR 7/4) interbedded with Greyish Green (10G 4/2); wavy medium to thick laminae and falsar beds; water-escape pipes, brecciation, soft sediment deformation, and mud cracks

**8842.8 – 8844.0** Dolostone mud sand: Dusky Yellow Green (5GY 5/2) and Greyish Orange (10YR 7/4); mottled; brecciation and soft sediment deformation

**8844.0 – 8846.8** Dolostone sand mud: Greyish Orange (10YR 7/4) and Dusky Yellow Green (5GY 5/2); mottled and minor wavy medium laminae; brecciation and water-escape pipes

**8846.8 – 8848.0** Mudstone dolomitic: Olive Grey (5Y 3/2); massive; minor brecciation

**8848.0 – 8849.5** Dolostone mud sand: Greyish Orange (10YR 7/4) interbedded with Dusky Yellow Green (5GY 5/2); wavy thin to medium laminae, false beds, and minor massive section; water-escape pipes, soft sediment deformation, brecciation, and minor mud cracks

**8849.5 – 8853.6** Dolostone sand mud: Greyish Orange (10YR 7/4) interbedded with Greyish Green (10G 4/2); wavy medium laminae and false beds; water-escape pipes, cross-beds, soft sediment deformation, and desiccation cracks

**8853.6 – 8855.2** Dolostone mud sand: Greyish Orange (10YR 7/4), Greyish Green (10G 4/2), and minor Moderate Reddish Brown (10R 4/6); mottled and brecciated beds; water-escape pipes, brecciation, soft sediment deformation, and minor brecciation

**8855.2 – 8862.5** Dolostone sand mud: Greyish Orange (10YR 7/4) interbedded with Greyish Green (10G 4/2); wavy medium to thick laminae and false beds; cross-beds, desiccation cracks, syneresis cracks, brecciation, and soft sediment deformation

**8862.5 – 8870.8** Dolostone sand mud: Greyish Orange (10YR 7/4), minor Greyish Green (10G 4/2), and Dusky Red (5R 3/4); poorly sorted brecciated beds; minor elongated brecciated beds

**8870.8 – 8872.0** Mudstone dolomitic: Dusky Red (5R 3/4); massive

**8870.2 – 8873.8** Dolostone sand mud: Greyish Orange (10YR 7/4) and Greyish Green (10G 4/2); brecciated beds

**8873.8 – 8878.5** Limestone: Dusky Red (5R 3/4); massive

**8878.5 – 8880.0** Mudstone dolomitic: Dusky Red (5R 3/4); massive

**8880.0 – 8883.5** Limestone: Dusky Red (5R 3/4); massive

En-Person Observation -11-22

Hess Corporation

Well # 20315 (3306101664)

SENW 11-156-94

**10174.0 – 10187.0** Dolostone mud sand: Light Tan (5YR 6/4) interbedded with Moderate Brown (5YR 3/4), and Greyish Green (10G 4/2); wavy thin laminae and falser beds; soft sediment deformation, water-escape pipes, mud cracks, synaeresis cracks, brecciation, and cross-beds; pyrite clusters

**10187.0 – 10190.0** Dolostone sand mud: Greyish Orange (10YR 7/4), Greyish Green (10G 4/2), and minor Moderate Brown (5YR 3/4); massive and mottled beds; mud cracks, soft sediment deformation, brecciation, and minor cross-beds; pyrite clusters

**10190.0 – 10191.0** Dolostone sand mud: Greyish Orange (10YR 7/4), Greyish Green (10G 4/2), and minor Moderate Brown (5YR 3/4); mottled; water-escape pipes, and brecciation; pyrite clusters

**10191.0 – 10192.5** Dolostone mud sand: Moderate Brown (5YR 3/4) interbedded with Greyish Green (10G 4/2) and minor Greyish Orange (10YR 7/4); wavy thin laminae and falser beds; mud cracks, water-escape pipes, soft sediment deformation, and minor brecciation

**10192.5 – 10196.7** Dolostone sand mud: Greyish Orange (10YR 7/4) interbedded with Greyish Green (10G 4/2) and minor Moderate Brown (5YR 3/4); wavy medium to thick laminae and falser beds; water-escape pipes, cross-beds, brecciation, soft sediment deformation, and mud cracks; pyrite clusters

**10196.7 – 10198.2** Dolostone mud sand: Greyish Orange (10YR 7/4) interbedded with Greyish Green (10G 4/2) and minor Moderate Brown (5YR 3/4); wavy thin laminae and falser beds, brecciation, cross-beds, synaeresis cracks, water-escape pipes, and mud cracks; pyrite clusters

**10198.2 – 10199.1** Dolostone sand mud: Greyish Orange (10YR 7/4) interbedded with Greyish Green (10G 4/2) and minor Moderate Brown (5YR 3/4); wavy thin laminae and falser beds; water-escape pipes, mud cracks, and cross-beds

**10199.1 – 10200.5** Dolostone mud sand: Greyish Green (10G 4/2), minor Moderate Brown (5YR 3/4), and minor Greyish Orange (10YR 7/4); massive and minor mottling; water-escape pipes, soft sediment deformation, and minor synaeresis cracks; pyrite clusters

**10200.5 – 10201.0** Dolostone sand mud: Greyish Orange (10YR 7/4), minor Moderate Brown (5YR 3/4), and minor Greyish Green (10G 4/2); massive and minor mottled; cross-beds, water-escape pipes, soft sediment deformation

**10201.0 – 10202.6** Dolostone sand mud: Greyish Orange (10YR 7/4) interbedded with Greyish Green (10G 4/2); wavy thin laminae and falser beds; soft sediment deformation, water-escape pipes, and minor brecciation

**10202.6 – 10204.0** Dolostone sand: Greyish Orange (10YR 7/4) and minor Moderate Brown (5YR 3/4); massive; soft sediment deformation, minor brecciation, and minor synaeresis cracks; pyrite clusters

**10204.0 – 10204.5** Mudstone dolomitic: Greyish Green (10G 4/2); massive; pyrite clusters

**10204.5 – 10207.1** Dolostone sand: Greyish Orange (10YR 7/4) and Moderate Brown (5YR 3/4); massive; mud cracks; pyrite clusters

**10207.1 – 10212.0** Dolostone sand mud: Greyish Orange (10YR 7/4), Moderate Brown (5YR 3/4), and minor Greyish Green (10G 4/2); poorly sorted brecciated beds

**10212.0 – 10213.5** Mudstone dolomitic: Moderate Yellow Green (5GY 7/4); massive; brecciation; pyrite clusters

**10213.5 – 10218.0** Dolostone mud sand: Greyish Green (10G 4/2), Moderate Brown (5YR 3/4), and minor Greyish Orange (10YR 7/4); mottled; pyrite clusters

**10218.0 – 10219.9** Dolostone mud sand: Greyish Olive (10Y 4/2) and Greyish Orange (10YR 7/4); mottled; brecciation

**10219.9 – 10220.6** Dolostone mud sand: Greyish Green (10G 4/2), Moderate Brown (5YR 3/4), and minor Greyish Orange (10YR 7/4); mottled; pyrite clusters

**10220.6 – 10224.4** Dolostone mud sand: Dusky Yellowish Green (5GY 5/2) and Greyish Orange (10YR 7/4); mottled; brecciation

**10224.4 – 10227.6** Dolostone sand mud: Greyish Orange (10YR 7/4) interbedded with Greyish Green (10G 4/2) and minor Moderate Brown (5YR 3/4); wavy thin to medium laminae, falser beds, and minor mottling; soft sediment deformation, synaeresis cracks, and brecciation

**10227.6 – 10229.9** Dolostone mud sand: Moderate Yellow Green (5GY 7/4) and Greyish Orange (10YR 7/4); mottled; brecciation;

**10229.9 – 10232.7** Dolostone sand mud: Greyish Orange (10YR 7/4) interbedded with Greyish Green (10G 4/2) and minor Moderate Brown (5YR 3/4); wavy thin to medium laminae, falser beds, and minor lenticular beds; soft sediment deformation, water-escape pipes, and synaeresis cracks

**10232.7 – 10234.0** Dolostone mud sand: Greyish Green (10G 4/2) and Greyish Orange (10YR 7/4); mottled; brecciation and minor water-escape pipes

**10234.0 – 10235.5** Mudstone dolomitic: Greyish Green (10G 4/2); massive, falser beds, and wavy medium laminae; brecciation

**10235.5 – 10238.2** Dolostone sand mud: Greyish Orange (10YR 7/4) interbedded with Greyish Green (10G 4/2); wavy medium to thick laminae and falser beds; soft sediment deformation

**10238.2 – 10239.2** Dolostone mud sand: Greyish Orange (10YR 7/4) and Dusky Yellowish Green (5GY 5/2); mottled; brecciation and water-escape pipes

**10239.2 – 10240.8** Dolostone sand mud: Greyish Orange (10YR 7/4) and Greyish Green (10G 4/2); poorly sorted brecciated beds; water-escape pipes

**10240.8 – 10241.8** Dolostone mud sand: Greyish Orange (10YR 7/4) and Greyish Green (10G 4/2); mottled; brecciation

**10241.8 – 10244.3** Dolostone mud sand: Dusky Yellowish Green (5GY 5/2) and Greyish Orange (10YR 7/4); mottled and minor wavy thin laminae; brecciation and synaeresis cracks

**10244.3 – 10246.3** Dolostone sand mud: Greyish Orange (10YR 7/4) interbedded with Greyish Green (10G 4/2); wavy thin to medium laminae and false beds; minor cross-beds

**10246.3 – 10247.3** Dolostone sand mud: Greyish Orange (10YR 7/4) and Greyish Green (10G 4/2); mottled; brecciation and soft sediment deformation

**10247.3 – 10247.9** Mudstone dolomitic: Greyish Green (10G 4/2); massive

**10247.9 – 10248.5** Waxed

**10248.5 – 10255.5** Dolostone sand mud: Greyish Orange (10YR 7/4) interbedded with Greyish Green (10G 4/2); wavy thin to thick laminae, false beds, and minor mottling; soft sediment deformation, brecciation, water-escape pipes, minor cross-beds, and minor ripple marks

**10255.5 – 10257.5** Dolostone mud sand: Greyish Orange (10YR 7/4) and Greyish Green (10G 4/2); mottled; minor brecciation

**10257.5 – 10259.1** Mudstone dolomitic: Greyish Green (10G 4/2); massive; minor brecciation

**10259.1 – 10261.0** Dolostone sand mud: Greyish Orange (10YR 7/4) and Greyish Green (10G 4/2); slanted wavy thick laminae

**10261.0 – 10262.1** Mudstone dolomitic: Greyish Green (10G 4/2); massive

**10262.1 – 10263.0** Mudstone dolomitic: Dusky Red (5R 3/4); massive

**10263.0 – 10264.0** Mudstone dolomitic: Greyish Green (10G 4/2); massive

**10264.0 – 10265.0** Dolostone sand: Greyish Orange (10YR 7/4); massive

**10265.0 – 10267.4** Mudstone dolomitic: Greyish Green (10G 4/2); massive

**10267.4 – 10278.7** Mudstone dolomitic: Dusky Red (5R 3/4); massive

RS-Nelson-156-91 1423H-1

Hess Corporation

Well # 16824 (3306100577)

NWNW 14-156-91

**9287.0 – 9303.0** Dolostone sand mud: Greyish Orange (10YR 7/4) interbedded with Greyish Green (10G 4/2); wavy thin to medium laminae and falser beds; water-escape pipes, brecciation, mud cracks, soft sediment deformation, cross-beds, syneresis cracks, and minor ripples; pyrite clusters

**9303.0 – 9304.0** Dolostone sand mud: Greyish Orange (10YR 7/4) interbedded with Greyish Green (10G 4/2); wavy medium to thick laminae and falser beds; brecciation and soft sediment deformation; minor pyrite clusters

**9304.0 – 9304.7** Dolostone mud sand: Greyish Green (10G 4/2) and Greyish Orange (10YR 7/4); mottled and massive; small brecciation

**9304.7 – 9308.0** Dolostone sand mud: Greyish Orange (10YR 7/4) interbedded with Greyish Green (10G 4/2); wavy thin to medium laminae and falser beds; soft sediment deformation, brecciation, water-escape pipes, and mud cracks

**9308.0 – 9311.4** Dolostone sand mud: Greyish Orange (10YR 7/4) and minor Greyish Green (10G 4/2); massive and minor falser beds; minor soft sediment deformation, minor pyrite clusters

**9311.4 – 9317.5** Dolostone sand mud: Greyish Orange (10YR 7/4) and Greyish Green (10G 4/2); poorly sorted elongated brecciated beds, increase in size and becomes more round downwards

**9317.5 – 9319.0** Dolostone mud sand: Greyish Green (10G 4/2) and Dusky Green (5G 3/2); small brecciation; pattern dolomite; pyrite clusters

**9319.0 – 9322.4** Dolostone mud sand: Greyish Green (10G 4/2) and Greyish Orange (10YR 7/4); mottled, brecciated beds, and massive; pyrite clusters

**9322.4 – 9324.0** Dolostone sand mud: Greyish Orange (10YR 7/4) and Greyish Green (10G 4/2); poorly sorted brecciation beds; soft sediment deformation

**9324.0 – 9326.6** Dolostone mud sand: Greyish Green (10G 4/2) and minor Greyish Orange (10YR 7/4); massive and minor mottling; minor small brecciation; pyrite clusters

**9326.6 -9330.0** Dolostone mud sand: Dark Greenish Yellow (10Y 6/6), Dusky Yellow Green (5GY 5/2), and Greyish Orange (10YR 7/4); mottled; brecciated

En-Ruland-156-94 3328H-1

Hess Corporation

Well # 16771 (3306100562)

**10414.5 – 10420.5** Dolostone mud sand: Light Brown (5YR 6/4) interbedded with Moderate Brown (5YR 3/4) and Dusky Yellowish Green (10GY 3/2); thin wavy laminae and falser beds; synaeresis cracks, mud cracks, water-escape pipes, and cross-beds

**10420.5 – 10421.7** Dolostone mud sand: Light Brown (5YR 6/4) interbedded Greyish Green (10GY 5/2) and Moderate Brown (5YR 3/4); wavy thin to medium laminae and falser beds; inter mud cracks

**10421.7 – 10425.5** Dolostone mud sand: Light Brown (5YR 6/4) interbedded with Moderate Brown (5YR 3/4) and minor Greyish Green (10GY 5/2); wavy thin to medium laminae and falser beds; soft sediment deformation features, cross-beds, water-escape pipes, and minor synaeresis cracks; pyrite clusters

**10425.5 – 10427.1** Dolostone mud sand: Moderate Brown (5YR 3/4) interbedded with Greyish Green (10GY 5/2) and Light Brown (5YR 6/4); wavy medium to thick laminae, minor falser beds, and minor massive sections; pyrite clusters

**10427.1 – 10429.0** Dolostone sand mud: Light Brown (5YR 6/4) interbedded with Moderate Brown (5YR 3/4) and minor Greyish Green (10G 4/2); wavy thin to medium laminae, falser beds, and minor massive sand section; desiccation cracks, brecciation, and mud stacks

**10431.4 – 10432.7** Dolostone mud sand: Moderate Brown (5YR 3/4) interbedded with Greyish Green (10GY 5/2) and minor Light Brown (5YR 6/4); wavy thin laminae and falser beds; minor pyrite clusters

**10432.7 – 10437.3** Dolostone sand mud: Greyish Orange (10YR 7/4) interbedded Greyish Green (10G 4/2) and minor Moderate Brown (5YR 3/4); wavy thin to medium laminae and falser beds; climbing ripples, synaeresis cracks, small brecciation, soft sediment deformation features, convolute beds, water-escape pipes, and minor mud cracks; pyrite clusters

**10437.3 – 10439.5** Dolostone mud sand: Greyish Green (10G 4/2) interbedded with Light Brown (5YR 6/4) and Moderate Brown (5YR 3/4); wavy thin laminae and falser beds; brecciation, mud cracks, and cross-beds; minor pyrite clusters

**10439.5 – 10441.8** Dolostone sand mud: Greyish Orange (10YR 7/4) and minor Greyish Green (10G 4/2); massive and falser beds; soft sediment deformation and minor water-escape pipes

**10441.8 – 10442.4** Dolostone mud sand: Moderate Brown (5YR 3/4) interbedded with Greyish Green (10G 4/2) and minor Greyish Orange (10YR 7/4); wavy thin laminae and falser beds; soft sediment deformation, and brecciation; minor pyrite clusters

**10442.4 – 10445.5** Dolostone sand mud: Greyish Orange (10YR 7/4) and Moderate Brown (5YR 3/4); no distinct bedding; brecciation, mud cracks, and minor water-escape pipes; pyrite clusters

**10445.5 – 10448.0** Mudstone dolomitic: Greyish Green (10G 4/2), minor Moderate Brown (5YR 3/4), and minor Greyish Orange (10YR 7/4); massive; minor brecciation; pyrite clusters

**10448.0 – 10451.0** Dolostone mud sand: Moderate Brown (5YR 3/4), Greyish Orange (10YR 7/4), and minor Greyish Green (10G 4/2); wavy thin laminae and minor water deformed beds; small brecciation

**10451.0 – 10451.7** Dolostone mud sand: Greyish Orange (10YR 7/4), Moderate Brown (5YR 3/4), and Greyish Green (10G 4/2); water deformed beds; water-escape pipes and brecciation

**10451.7 – 10453.8** Mudstone dolomitic: Moderate Brown (5YR 3/4); massive; minor small brecciation

**10453.8 – 10455.3** Dolostone sand mud: Greyish Orange (10YR 7/4) and Moderate Brown (5YR 3/4); brecciated beds

**10455.3 – 10456.5** Mudstone dolomitic: Moderate Yellow Green (5GY 7/4); massive

**10456.5 – 10462.9** Dolostone mud sand: Greyish Olive (10Y 4/2) and Greyish Orange (10YR 7/4); mottled; minor small brecciation; pyrite clusters

**10462.9 – 10465.0** Dolostone mud sand: Dusky Yellow Green (5GY 5/2) and Greyish Orange (10YR 7/4); mottled; small brecciation

**10465.0 – 10467.0** Dolostone mud sand: Greyish Orange (10YR 7/4) interbedded with Moderate Yellow Green (5GY 7/4); mottled, wavy thin laminae, and falser beds; small brecciation and minor soft sediment deformation

Deadwood Canyon Ranch 43-28H

Fidelity Exploration & Production Company

Well # 16841 (3306100581)

NESE 28-154-92

**10192.3 – 10197.8** Dolostone sand mud: Light Brown (5YR 6/4) interbedded with Moderate Brown (5YR 3/4), and Greyish Green (10G 4/2); wavy thin laminae and falser beds; brecciation, cross-beds, soft sediment deformation, water-escape pipes, and minor synaeresis cracks; anhydrite nodules; pyrite clusters



**10197.8 – 10201.7** Dolostone sand mud: Greyish Orange (10YR 7/4) interbedded with Light Brown (5YR 6/4) and Greyish Green (10G 4/2); wavy thin laminae and falser beds; synaeresis cracks, water-escape pipes, cross-beds, soft sediment deformation, and minor desiccation cracks; pyrite clusters

**10201.7 – 10206.0** Dolostone mud sand: Light Brown (5YR 6/4) interbedded with Moderate Brown (5YR 3/4), and Greyish Green (10G 4/2); wavy thin laminae, falser beds, and minor lenticular beds; soft sediment deformation, mud cracks, brecciation, water-escape pipes, minor cross-beds, and minor synaeresis cracks; pyrite clusters

**10206.0 – 10206.5** Dolostone sand mud: Greyish Orange (10YR 7/4) and Greyish Green (10G 4/2); water deformed wavy thin laminae and falser beds; brecciation, water-escape pipes, desiccation cracks, minor synaeresis cracks, and minor cross-beds; pyrite clusters

**10206.5 – 10214.0** Dolostone sand mud: Greyish Orange (10YR 7/4) interbedded with Greyish Green (10G 4/2); wavy thin to medium laminae and falser beds; water-escape pipes, mud cracks, brecciation, minor synaeresis cracks, and minor cross-beds; pyrite cluster

**10214.0 – 10217.9** Dolostone sand mud: Greyish Orange (10YR 7/4) interbedded with Greyish Green (10G 4/2); wavy medium to thick laminae and falser beds; synaeresis cracks, water-escape pipes, brecciation, soft sediment deformation feature, minor mud cracks, and minor ripples; pyrite clusters

**10217.9 – 10219.0** Dolostone sand mud: Greyish Orange (10YR 7/4) and Greyish Green (10G 4/2); massive and minor falser beds; brecciation and minor water-escape pipes; pyrite clusters

**10219.0 – 10220.7** Dolostone sand mud: Greyish Orange (10YR 7/4) interbedded with Greyish Green (10G 4/2); wavy thin to medium laminae and falser beds; synaeresis cracks, soft sediment deformation, and minor brecciation

**10220.7 – 10222.0** Dolostone mud sand: Greyish Green (10G 4/2) and Greyish Orange (10YR 7/4); water deformed beds, water-escape pipes, mud cracks, and minor synaeresis cracks; pyrite clusters

**10222.0 – 10223.0** Dolostone sand mud: Greyish Orange (10YR 7/4) and minor Greyish Green (10G 4/2); massive and minor water deformed beds; pyrite clusters

**10223.0 – 10231.0** Dolostone sand mud: Greyish Orange (10YR 7/4) and minor Greyish Green (10G 4/2); poorly sorted brecciated beds; pyrite clusters

**10231.0 – 10234.0** Dolostone mud sand: Greyish Green (10G 4/2) and Greyish Orange (10YR 7/4); massive; brecciation; pyrite clusters

**10234.0 – 10234.5** Dolostone mud sand: Moderate Yellow Green (5G 5/2); massive; small brecciation

**10234.5 – 10236.3** Dolostone mud sand: Greyish Green (10G 4/2) and Dusky Yellow Green (5GY 5/2); massive; small brecciation; pyrite clusters

**10236.3 – 10237.3** Dolostone mud sand: Greyish Green (10G 4/2) and Greyish Orange (10YR 7/4); mottled; small brecciation

**10237.3 – 10242.9** Dolostone mud sand: Olive Grey (5Y 3/2) and Greyish Orange (10YR 7/4); mottled; brecciation

**10242.9 – 10244.2** Dolostone sand mud: Greyish Orange (10YR 7/4) interbedded with Greyish Green (10G 4/2); wavy medium to thick laminae and falser beds; minor brecciation, minor mud cracks, and minor water-escape pipes

**10244.2 – 10246.0** Dolostone mud sand: Greyish Orange (10YR 7/4) and Greyish Green (10G 4/2); mottled and minor brecciated beds

**10246.0 – 10248.4** Dolostone mud sand: Dusky Yellowish Green (10GY 4/4) and Greyish Orange (10GY 7/4); mottled; brecciation

**10248.4 – 10249.3** Dolostone sand mud: Greyish Orange (10YR 7/4) interbedded with Dusky Yellow Green (5GY 5/2); wavy thin laminae and falser beds; synaeresis cracks, water-escape pipes, and minor soft sediment deformation

**10249.3 – 10252.8** Dolostone sand mud: Greyish Orange (10YR 7/4) and Greyish Green (10G 4/2); mottled, massive, and water deformed beds; brecciation, synaeresis cracks, and mud cracks

**10252.8 – 10254.0** Dolostone mud sand: Greyish Green (10G 4/2) and Greyish Orange (10YR 7/4); mottled; small brecciation

**10254.0 – 10255.2** Dolostone sand mud: Greyish Green (10G 4/2) and Greyish Orange (10YR 7/4); mottled and minor massive at end of unit; small brecciation

**10255.2 – 10258.5** Dolostone sand mud: Greyish Orange (10YR 7/4) interbedded with Dusky Yellow Green (5GY 5/2); wavy medium laminae to thin beds and falser beds; water-escape pipes, small brecciation, soft sediment deformation, and synaeresis cracks

**10258.5 – 10261.7** Dolostone sand mud: Greyish Orange (10YR 7/4) and Greyish Green (10G 4/2); mottled; soft sediment deformation and small brecciation

**10261.7 – 10262.4** Mudstone dolomitic: Dusky Red (5R 3/4), massive

**10262.4 – 10268.0** Dolostone mud sand: Greyish Orange (10YR 7/4) and Greyish Green (10G 4/2); mottled and minor massive red sections; brecciation

Kulland #29-24

Marathon Oil Company

Well # 7918 (3306100255)

SESW 29-154-89

**9173.0 – 9175.0** Dolostone mud sand: Greyish Orange (10YR 7/4) interbedded with Greyish Blue Green (5BG 5/2); wavy thin laminae and falser beds; inter water-escape pipes, small brecciation, mud cracks, and small cross-beds

**9175.0 – 9178.0** Dolostone sand mud: Greyish Orange (10YR 7/4) interbedded with Greyish Blue Green (5BG 5/2); wavy thin to medium laminae and falser beds; brecciation, syneresis cracks, mud cracks, soft sediment deformation, and minor cross-beds

**9178.0 – 9181.0** Dolostone mud sand: Greyish Orange (10YR 7/4) interbedded with Greyish Blue Green (5BG 5/2); wavy very thin to thin laminae and falser beds; small brecciation, water-escape pipes, mud cracks, and minor syneresis cracks

**9181.0 – 9183.3** Dolostone sand mud: Greyish Orange (10YR 7/4) interbedded with Greyish Blue Green (5BG 5/2); wavy thin laminae, falser beds, and water deformed beds; mud cracks, water-escape pipes, small brecciation, minor cross-beds, and minor syneresis cracks

**9183.3 – 9184.0** Mudstone dolomitic: Greyish Green (10G 4/2); massive

**9184.0 – 9188.2** Dolostone sand mud: Greyish Orange (10YR 7/4) interbedded with Greyish Green (10G 4/2); wavy thin to thick laminae and falser beds; desiccation cracks, brecciation, mud cracks, water-escape pipes, soft sediment deformation, and minor cross-beds; minor pyrite clusters

**9188.2 – 9189.0** Dolostone mud sand: Greyish Orange (10YR 7/4) interbedded with Greyish Green (10G 4/2); wavy very thin to thin laminae and minor falser beds; brecciation and water-escape pipes

**9189.0 – 9189.8** Mudstone dolomitic: Greyish Green (10G 4/2); massive

**9189.8 – 9193.0** Dolostone mud sand: Greyish Orange (10YR 7/4) and Greyish Green (10G 4/2); mottled and wavy medium laminae; brecciation, water-escape pipes, and soft sediment deformation

**9193.0 -9193.7** Dolostone sand: Greyish Orange (10YR 7/4); massive

**9193.7 -9196.6** Dolostone sand mud: Greyish Orange (10YR 7/4) interbedded with Greyish Green (10G 4/2); wavy thin laminae and falser beds; water-escape pipes, brecciation, syneresis cracks, soft sediment deformation, and minor cross-beds

**9196.6 – 9199.2** Dolostone sand mud: Greyish Orange (10YR 7/4) and minor Greyish Green (10G 4/2); massive and minor falser beds; minor small brecciation; pyrite clusters

**9199.2 – 9205.7** Dolostone sand mud: Greyish Orange (10YR 7/4) and Greyish Green (10G 4/2); brecciated beds; pyrite clusters

**9205.7 – 9209.3** Mudstone dolomitic: Dusky Yellowish Green (10GY 3/2); massive; minor small brecciation; pyrite clusters

**9209.3 – 9210.8** Dolostone mud sand: Dusky Green (5G 3/2) and minor Greyish Orange (10YR 3/2); massive; minor small brecciation

**9210.8 – 9213.3** Dolostone mud sand: Olive Grey (5Y 3/2) and minor Greyish Orange (10YR 7/4); mottled and massive; small brecciation

**9213.3 – 9217.5** Dolostone mud sand: Dusky Red (5R 3/4) and Greyish Orange (10YR 7/4); massive; brecciation

**9217.5 – 9224.3** Dolostone sand mud: Greyish Orange (10YR 7/4) interbedded with Greyish Green (10G 4/2); wavy thin to medium laminae, falser beds, and minor mottling with Dusky Red (5R 3/4); cross-beds, mud cracks, brecciation, water-escape pipes, minor soft sediment deformation

**9224.3 – 9226.7** Dolostone mud sand: Greyish Orange (10YR 7/4) interbedded with Dusky Red (5R 3/4); wavy thin to medium laminae and falser beds; synaeresis cracks, mud cracks, cross-beds, soft sediment deformation, and water-escape pipes

**9226.7 – 9228.0** Dolostone mud sand: Dusky Red (5R 3/4) and Greyish Orange (10YR 7/4); mottled; small brecciation

Liberty 2-11H

EOG Resources, INC.

Well # (3306101027)

SESE 11-151-91

**9698.0 – 9702.5** Dolostone sand mud: Greyish Orange (10YR 7/4) interbedded with Greyish Green (10G 4/2); wavy very thin to thin laminae and falser beds; mud cracks, small brecciation, minor cross-beds, and minor water-escape pipes; microbial rollup structures 9698.0 to 9698.3; pyrite clusters

**9702.5 – 9705.4** Dolostone sand mud: Greyish Orange (10YR 7/4) interbedded with Greyish Olive Green (5GY 3/2); wavy thin to medium laminae and falser beds; synaeresis cracks, mud cracks, small brecciation, water-escape pipes, and soft sediment deformation; minor pyrite clusters

**9705.4 – 9710.8** Dolostone sand mud: Greyish Orange (10YR 7/4) interbedded with Greyish Olive Green (5GY 3/2); wavy thin to thick laminae that decreases downwards and falser beds; water-escape pipes, brecciation, minor mud cracks, minor synaeresis cracks, and minor cross-beds; minor pyrite clusters

**9710.8 – 9715.0** Dolostone sand mud: Greyish Orange (10YR 7/4) interbedded with Greyish Green (10G 4/2); wavy thin to thick laminae and falser beds; water-escape pipes, small brecciation, soft sediment deformation, minor synaeresis cracks, and minor cross-beds; pyrite clusters

**9715.0 – 9717.7** Dolostone mud sand: Greyish Orange (10YR 7/4) interbedded with Greyish Green (10G 4/2); falser beds, lenticular beds, and minor wavy thin laminae; mud cracks, and water-escape pipes; pyrite clusters

**9717.7 – 9718.8** Dolostone sand mud: Greyish Orange (10YR 7/4) interbedded with Greyish Green (10G 4/2); wavy medium to thick laminae and falser beds; soft sediment deformation, water-escape pipes, and minor small brecciation; minor pyrite clusters

**9718.8 – 9720.0** Dolostone mud sand: Greyish Green (10G 4/2) interbedded with minor Greyish Orange (10YR 7/4); massive and minor wavy thin laminae; pyrite clusters

**9720.0 – 9723.2** Dolostone mud sand: Greyish Orange (10YR 7/4) interbedded with Greyish Green (10G 4/2); falser beds and medium laminae; water-escape pipes, cross-beds, soft sediment deformation, minor small brecciation, and minor synaeresis cracks; pyrite clusters

**9723.2 – 9725.9** Dolostone sand mud: Greyish Orange (10YR 7/4) interbedded with Greyish Green (10G 4/2); wavy thin to thick laminae and falser beds; brecciation, water-escape pipes, and minor synaeresis cracks; pyrite clusters

**9725.9 – 9728.3** Dolostone sand mud: Greyish Orange (10YR 7/4) and minor Greyish Green (10G 4/2); massive, wavy medium to thick laminae, and falser beds; soft sediment deformation, small brecciation, and minor flame structures; pyrite clusters

**9728.3 – 9730.2** Dolostone sand: Greyish Orange (10YR 7/4) and minor Greyish Green (10G 4/2); massive; pyrite clusters

**9730.2 – 9735.9** Dolostone sand mud: Greyish Orange (10YR 7/4) and Greyish Green (10G 4/2); brecciated beds more poorly sorted downwards; minor pyrite clusters at end of unit

**9735.9 – 9737.7** Mudstone dolomitic: Dusky Yellow Green (5GY 5/2); massive; single sand chunk

**9737.7 – 9739.5** Dolostone mud sand: Greyish Olive (10Y 4/2) and Greyish Orange (10YR 7/4); mottled; small brecciation

**9739.5 – 9740.6** Mudstone dolomitic: Light Olive Grey (5Y 5/2); massive

**9740.6 – 9743.1** Dolostone mud sand: Dusky Green (5G 3/2) and Greyish Orange (10YR 7/4); mottled; small brecciation

**9743.1 – 9747.9** Dolostone mud sand: Moderate Reddish Brown (10R 4/6); massive

**9747.9 – 9751.1** Dolostone sand mud: Greyish Orange (10YR 7/4) interbedded with Greyish Green (10G 4/2); wavy medium laminae and falser beds; beds dominant; soft sediment deformation, water-escape pipes, synaeresis cracks, and small brecciation

**9751.1 – 9751.9** Dolostone mud sand: Greyish Green (10G 4/2), Dark Reddish Brown (10R 3/4), and Greyish Orange (10YR 7/4); mottled; small brecciation

**9751.9 – 9753.4** Dolostone sand mud: Greyish Orange (10YR 7/4), Greyish Green (10G 4/2), and Moderate Reddish Brown (10R 4/6); mottled, poorly sorted brecciation, elongated brecciation, and water-escape pipes at top of unit

**9753.4 – 9755.1** Dolostone sand mud: Greyish Orange (10YR 7/4) interbedded with Greyish Green (10G 4/2); wavy very thin to medium laminae and falser beds; water-escape pipes; synaeresis cracks, and micro fault

**9755.1 – 9758.5** Dolostone mud sand: Greyish Orange (10YR 7/4), dark Reddish Brown (10R 3/4), and minor Greyish Green (10G 4/2); mottled; soft sediment deformation, water-escape pipes, mud cracks, and minor small brecciation

**9758.5 – 9760.5** Dolostone mud sand: Greyish Orange (10YR 7/4) and Dusky Red (5R 3/4); mottled and minor massive sections; brecciation and elongated brecciation

**9760.5 – 9762.5** Dolostone mud sand: Greyish Orange (10YR 7/4), Dusky Red (5R 3/4), and minor Greyish Green (10G 4/2); wavy medium laminae and falser beds; water-escape pipes, small brecciation, and synaeresis cracks

**9762.5 – 9766.8** Dolostone sand mud: Greyish Orange (10YR 7/4) and Greyish Green (10G 4/2); mottled and water deformed beds; brecciation

**9766.8 – 9768.2** Dolostone sand mud: Greyish Orange (10YR 7/4) and Greyish Green (10G 4/2); poorly sorted brecciated beds; minor elongated brecciation

**9768.2 – 9777.2** Dolostone mud sand: Dusky Red (5R 3/4), Greyish Orange (10YR 7/4), and minor Greyish Green (10G 4/2); mottled; brecciation and minor elongated brecciation

**9777.2 – 9781.7** Dolostone mud sand: Greyish Orange (10YR 7/4) and Greyish Green (10G 4/2); mottled; small brecciation and minor soft sediment deformation

**9781.7 – 9784.3** Dolostone mud sand: Greyish Orange (10YR 7/4) and Dusky Red (5R 3/4); mottled; small brecciation

**9784.3 – 9786.0** Dolostone sand mud: Greyish Orange (10YR 7/4) and Greyish Green (10G 4/2); mottled and brecciated beds

**9786.0 – 9787.5** Dolostone mud sand: Dusky Red (5R 3/4) and Greyish Orange (10YR 7/4); mottled; small brecciation

**9787.5 – 9790.5** Dolostone mud sand: Greyish Orange (10YR 7/4) and Greyish Green (10G 4/2); poorly sorted brecciated beds;

**9790.5 – 9795.0** Dolostone mud sand: Greyish Orange (10YR 7/4) and Greyish Green (10G 4/2); elongated brecciated beds; small brecciation

**9795.0 - 9799.4** Dolostone sand mud: Greyish Orange (10YR 7/4) interbedded with Greyish Green (10G 4/2); wavy thin to medium laminae that are slanted (slump); minor brecciation

**9799.4 - 9811.3** Mudstone dolomitic: Darkish Red Brown (10R 3/4); massive and minor grayish green reduction spots

St-Andes-151-89-2413H-1

Hess Corporation

Well # 17043 (3306100653)

SESE 24-151-89

**9131.4 – 9133.8** Dolostone sand mud: Greyish Orange (10YR 7/4) interbedded with Greyish Green (10G 4/2); wavy thin to thick laminae, minor falser beds, and minor brecciated beds; soft sediment deformation, water-escape pipes, brecciation, and mud cracks; pyrite clusters

**9133.8 – 9136.3** Dolostone sand mud: Greyish Orange (10YR 7/4) interbedded with Greyish Green (10G 4/2); wavy thin laminae and falser beds; synaeresis cracks, water-escape pipes, minor soft sediment deformation, minor small brecciation, and minor mud cracks

**9136.3 – 9137.4** Dolostone sand mud: Greyish Orange (10YR 7/4) interbedded with Greyish Green (10G 4/2); wavy medium to thick laminae and falser beds; soft sediment deformation and minor small brecciation; pyrite clusters

**9137.4 – 9138.0** Mudstone dolomitic: Greyish Blue Green (5BG 5/2); massive; pyrite clusters

**9138.0 – 9143.0** Dolostone sand mud: Greyish Orange (10YR 7/4) interbedded with Greyish Green (10G 4/2); wavy thin to medium laminae and falser beds; soft sediment deformation, small brecciation, mud cracks, water-escape pipes, cross-beds, and mud cracks; pyrite clusters at end of unit

**9143.0 – 9145.0** Dolostone mud sand: Greyish Orange (10YR 7/4) and Greyish Green (10G 4/2); mottled and minor wavy thin laminae; small brecciation, and minor soft sediment deformation; pyrite clusters

**9145.0 – 9146.5** Dolostone mud sand: Greyish Orange (10YR 7/4) interbedded with Greyish Green (10G 4/2); wavy medium laminae, falser beds, and minor massive sections; water-escape pipes, soft sediment deformation, small brecciation, and minor synaeresis cracks

**9146.5 – 9147.5** Dolostone sand mud: Greyish Orange (10YR 7/4) and Greyish Green (10G 4/2); massive and minor falser beds; minor water-escape pipes

**9147.5 – 9148.7** Dolostone mud sand: Greyish Orange (10YR 7/4) and Greyish Green (10G 4/2); mottled and lenticular beds; minor mud cracks, and minor small brecciation

**9148.7 – 9153.4** Dolostone sand mud: Greyish Orange (10YR 7/4) interbedded with Greyish Green (10G 4/2); wavy thin to medium laminae and falser beds; water-escape pipes, soft sediment deformation, small brecciation, and minor synaeresis cracks

**9153.4 – 9155.3** Dolostone sand mud: Greyish Orange (10YR 7/4) and minor Greyish Green (10G 4/2); massive and minor falser beds; soft sediment deformation, small brecciation, and minor mud cracks; minor pyrite clusters

George Evans 11V

Dakota-3 E&P Company, LLC

Well # 22421 (3306102032)

SWSE 11-150-92

**11414.0 – 11427.7** Dolostone sand mud: Greyish Orange (10YR 7/4) interbedded with Greyish Green (10G 4/2); wavy thin to thick laminae and falser beds; synaeresis cracks, mud cracks, cross-beds, soft sediment deformation, small brecciation, desiccation cracks, and minor draping; pyrite clusters

**11427 – 11435.4** Dolostone sand mud: Greyish Orange (10YR 7/4) interbedded with Greyish Green (10G 4/2); planar to wavy thin to thick laminae and falser beds; synaeresis cracks, water-escape pipes, and minor brecciation

**11435.4 – 11446.4** Dolostone sand mud: Greyish Orange (10YR 7/4) interbedded with Greyish Green (10G 4/2); wavy thin laminae and falser beds; water-escape pipes, cross-bedding, synaeresis cracks, and soft sediment deformation; pyrite clusters

**11446.4 – 11452.3** Dolostone sand mud: Greyish Orange (10YR 7/4) interbedded with Greyish Green (10G 4/2); wavy thin to thick laminae; water-escape pipes, ripples, soft sediment deformation, synaeresis cracks, and minor brecciation

**11452.3 – 11455.0** Dolostone sand: Light Brown (5YR 5/2); massive; minor soft sediment deformation

**11455.0 – 11460.0** Dolostone mud sand: Greyish Orange (10YR 7/4) and Greyish Green (10G 4/2); poorly sorted brecciated beds

**11460 – 11473.5** Dolostone mud sand: Dusky Yellow (5Y 6/4) and Dusky Yellowish Brown (10YR 2/2); mottled with minor massive sections, minor brecciation



**11473.5- 11475.9** Dolostone mud sand: Yellowish Grey (5Y 7/2) interbedded Light Olive Grey (5Y 5/2); wavy thin to thick laminae and falser bed; cross-bedding

**11475.9 - 11478.2** Dolomite Muddy Sandstone: Greyish Green (10 G 5/2) interbedded with Yellow Grey (5Y 7/2); thin laminae; cross-beds and synaeresis cracks

**11478.2 – 11484** Dolostone mud sand: Light Brown (5 YR 6/4) and Greyish Green (10 G 5/2); mottled brecciation at end of unit and minor soft sediment deformation feature

**11484 – 11486.7** Dolostone mud sand: Pale Reddish Brown (10R 5/4) and Light Brown (5YR 6/4); mottled; brecciation that increases downwards

**11486.7 – 11491.5** Dolostone mud sand: Greyish Orange (10 YR 7/4) interbedded with Greyish Green (10 G 4/2); wavy to planar thin to thick laminae and falser beds; ripples and minor synaeresis cracks

**11491.5 – 11494.7** Dolostone mud sand: Pale Reddish Brown (10R 5/4) and Greyish Green (10 G 4/2); poorly sorted brecciated beds

**11494.7- 11507.7** Dolostone mud sand: Light Brown (5YR 6/4), Pale Reddish Brown (10R 5/4) and Greyish Green (10 G 4/2) alternating sections; mottled; soft sediment deformation and minor brecciation

**11507.7 – 11509** Mudstone dolomitic: Light Brown (5 YR 6/4) and Greyish Green (10 G 4/2); mottled; brecciation

State ND 1-11H

Amerada Hess Corporation

Well # 16160 (3306100498)

NWNW 11-158-93

**9539.2 – 9542.5** Dolostone mud sand: Moderate Brown (5YR 3/4) interbedded with Light Brown (5YR 6/4) and Greyish Green (10G 4/2); wavy thin to medium laminae and falser beds; desiccation cracks, water-escape pipes, mud cracks, brecciation, soft sediment deformation, and cross-beds; pyrite clusters

**9542.5 – 9544.3** Dolostone sand mud: Light Brown (5YR 6/4), Moderate Brown (5YR 3/4), and minor Greyish Green (10G 4/2); wavy medium to thick laminae and minor falser beds; brecciation, soft sediment deformation, cross-beds, and mud cracks; pyrite clusters

**9544.3 – 9547.0** Dolostone sand mud: Light Brown (5YR 6/4), Moderate Brown (5YR 3/4), and Greyish Green (10G 4/2); wavy thin to medium laminae and falser beds; water-escape pipes, cross-beds, soft sediment deformation, brecciation, and minor synaeresis cracks; pyrite clusters

**9547.0 – 9548.5** Dolostone mud sand: Greyish Green (10G 4/2), Light Brown (5YR 6/4), and Moderate Brown (5YR 3/4); no distinct bedding; water-escape pipes, and small brecciation; pyrite clusters

**9548.5 – 9550.0** Dolostone sand mud: Light Brown (5YR 6/4), minor Moderate Brown (5YR 3/4), and minor Greyish Green (10G 4/2); massive and false beds; soft sediment deformation features, brecciation, mud cracks, water-escape pipes, and minor sphaerulitic cracks; minor pyrite clusters

**9550.0 – 9551.0** Dolostone sand: Light Brown (5YR 6/4) and minor Moderate Brown (5YR 3/4) no distinct bedding; minor brecciation and minor soft sediment deformation

**9551.0 – 9554.3** Dolostone sand mud: Light Brown (5YR 6/4) interbedded with Greyish Green (10G 4/2) and minor Moderate Brown (5YR 3/4); wavy thin to medium laminae and false beds; water-escape pipes, brecciation, cross-beds, soft sediment deformation, mud cracks, and minor ripples; pyrite clusters

**9554.3 – 9556.3** Dolostone sand mud Light Brown (5YR 6/4) interbedded with Greyish Green (10G 4/2) and minor Moderate Brown (5YR 3/4); wavy thin to medium laminae and false beds; mud cracks, brecciation, soft sediment deformation at end of unit, minor cross-beds, and minor sphaerulitic cracks

**9556.3 -9556.9** Dolostone sand mud: Greyish Orange (10YR 7/4) and Greyish Green (10G 4/2); mottled; brecciation and soft sediment deformation

**9556.9 – 9562.5** Dolostone sand: Light Brown (5YR 6/4), minor Moderate Brown (5YR 3/4), and minor Greyish Green (10G 4/2) at end of unit; no distinct bedding; soft sediment deformation and minor brecciation at top of unit; pyrite clusters

**9562.5 -9568.6** Dolostone sand mud: Light Brown (5YR 6/4), Moderate Brown (5YR 3/4), and minor Greyish Green (10G 4/2); poorly sorted water deformed brecciated beds; minor pyrite clusters

**9568.6 -9569.3** Mudstone dolomitic: Greyish Green (10G 4/2); massive; pyrite clusters and rings

**9569.3 – 9569.6** Dolostone mud sand: Moderate Yellow Green (5GY 7/4) and Greyish Blue Green (5BG 5/2); no distinct bedding and minor mottling; start of pattern dolomite

**9569.6 -9571.0** Dolostone mud sand: Dusky Yellow Green (5GY 5/2) and Light Brown (5YR 6/4); mottled; small brecciation

**9571.0 – 9574.2** Dolostone mud sand: Greyish Green (10G 4/2) and Moderate Yellow Green (5GY 7/4); mottled; minor small brecciation

**9574.2 – 9576.4** Dolostone sand mud: Moderate Yellow Green (5GY 7/4), Greyish Green (10G 4/2), and Greyish Orange (10YR 7/4); mottled; small brecciation; pyrite clusters

**9576.4 -9579.0** Dolostone mud sand: Moderate Yellow Green (5GY 7/4) and Greyish Orange (10YR 7/4); mottled; small brecciation; pyrite clusters

**9579.0 – 9581.0** Dolostone mud sand: Greyish Olive (10Y 4/2) and Greyish Orange (10YR 7/4); mottled; small brecciation

**9581.0 – 9583.0** Dolostone sand mud: Greyish Orange (10YR 7/4) and Greyish Green (10G 4/2); wavy medium to thick laminae and falser beds; cross-beds, small brecciation, and synaeresis cracks

**9583.0 -9584.9** Dolostone mud sand: Olive Grey (5Y 3/2) and Greyish Orange (10YR 7/4); mottled; brecciation, elongated brecciation, and soft sediment deformation at end of unit

**9584.9 – 9586.8** Dolostone sand mud: Greyish Orange (10YR 7/4) and Dusky Green (5G 3/2); wavy thin to medium laminae and falser beds; synaeresis cracks, small brecciation, cross-beds, and soft sediment deformation

**9586.8 – 9587.9** Dolostone mud sand: Greyish Orange (10YR 7/4) and Dusky Green (5G 3/2); mottled and water deformed beds; brecciation, elongated brecciation, and minor water-escape pipes

**9587.9 -9589.8** Dolostone sand mud: Light Brown (5YR 6/4), minor Moderate Brown (5YR 3/4), and minor Greyish Green (10G 4/2); no distinct bedding and minor falser beds; climbing ripples, water escape pipes, soft sediment deformation at end of unit, and minor small brecciation; pyrite clusters

Bures 1-17H

EOG Resources, INC

Well # 16586 (3306100530)

NWNW 17-156-92

**9896.0 – 9907.4** Dolostone mud sand: Light Brown (5YR 6/4) interbedded with Greyish Green (10G 4/2); wavy thin to medium wavy laminae and falser beds; soft sediment deformation, water-escape pipes, brecciation, synaeresis cracks, minor cross-beds, and minor mud cracks; pyrite clusters

**9907.4 – 9909.9** Dolostone sand mud: Light Brown (5YR 6/4) interbedded with Greyish Green (10G 4/2); wavy medium to thick laminae and falser beds; water-escape pipes, brecciation, minor synaeresis cracks, minor mud cracks, and minor soft sediment deformation

**9909.9 – 9912.6** Dolostone mud sand: Light Brown (5YR 6/4) interbedded with Greyish Green (10G 4/2); wavy thin to medium laminae and falser beds; soft sediment deformation, mud cracks, brecciation, and minor cross-beds; minor pyrite clusters

**9912.6 – 9914.0** Dolostone sand mud: Light Brown (5YR 6/4) interbedded with Greyish Green (10G 4/2); wavy medium to thick laminae and falser beds; water-escape pipes, brecciation, mud cracks, and soft sediment deformation

**9914.0 – 9917.6** Dolostone mud sand: Greyish Orange (10YR 7/4) interbedded with Greyish Green (10G 4/2); wavy thin laminae and falser beds; water-escape pipes, brecciation, soft sediment deformation, minor cross-beds, and minor synaeresis cracks

**9917.6 – 9918.0** Mudstone dolomitic: Greyish Green (10G 4/2) and minor Greyish Orange (10YR 7/4); massive; pyrite clusters

**9918.0 – 9920.1** Dolostone mud sand: Greyish Orange (10YR 7/4) interbedded with Greyish Green (10G 4/2); wavy thin laminae and falser beds; brecciation, soft sediment deformation, minor cross-beds, and minor water-escape pipes

**9920.1 – 9922.9** Dolostone sand mud: Greyish Orange (10YR 7/4) and minor Greyish Green (10G 4/2); massive, minor wavy medium laminae, and falser beds; soft sediment deformation, water-escape pipes, brecciation, climbing ripples, minor mud draping, and minor mud cracks

**9922.9 – 9925.1** Dolostone sand: Greyish Orange (10YR 7/4) and minor Greyish Green (10G 4/2); massive; soft sediment deformation and minor mud cracks; pyrite clusters

**9925.1 – 9929.0** Dolostone sand mud: Greyish Orange (10YR 7/4), Moderate Brown (5YR 3/4), and Greyish Green (10G 4/2); poorly sorted brecciated beds

**9929.0 – 9936.2** Mudstone dolomitic: Greyish Green (10G 4/2); massive; pyrite clusters

**9936.2 – 9938.0** Dolostone mud sand: Moderate Yellow Green (5G 5/2) and Greyish Orange (10YR 7/4); mottled

**9938.0 – 9939.2** Mudstone dolomitic: Olive Grey (5Y 3/2); massive;

**9939.2 – 9943.8** Dolostone mud sand: Greyish Olive (5GY 3/2) and Greyish Orange (10YR 7/4); massive; brecciation

**9943.8 – 9944.9** Dolostone sand mud: Light Brown (5YR 6/4) interbedded with Moderate Yellow Green (5G 5/2); wavy medium to thick laminae and falser beds; soft sediment deformation and brecciation

**9944.9 – 9948.0** Dolostone mud sand: Dusky Yellowish Green (10GY 3/2) and Greyish Orange (10YR 7/4); mottled; brecciation

**9948.0 – 9950.0** Dolostone sand mud: Greyish Orange (10YR 7/4) interbedded with Greyish Green (10G 4/2); wavy thin laminae and falser beds; minor soft sediment deformation, minor synaeresis cracks, and minor water-escape pipes

**9950.0 – 9952.6** Dolostone mud sand: Greyish Orange (10YR 7/4) and Dusky Yellowish Green; mottled; minor brecciation

**9952.6 – 9953.3** Mudstone dolomitic: Dusky Yellowish Green (10GY 3/2); massive

**McKenzie County**

Sakakawea Federal 13X-35

Headington Oil Company LLC

Well # 17067 (3305302858)

NWSW 35-154-95

**9861.5 – 9876.3** Dolostone sand mud: Light Brown (5YR 6/4) interbedded with Dark Yellow Green (10GY 4/4) and Moderate Brown (5YR 3/4); wavy thin laminae and falser beds; water-escape pipes, mud cracks, syneresis cracks, small brecciation, cross-beds, soft sediment deformation features, and minor ripples; pyrite clusters

**9876.3 – 9877.5** Dolostone sand: Light Brown (5YR 6/4) and minor Moderate Brown (5YR 3/4); no distinct bedding; soft sediment deformation, small brecciation, minor desiccation cracks, and minor ripples; pyrite clusters

**9877.5 – 9881.0** Dolostone sand mud: Moderate Brown (5YR 3/4) interbedded with Dark Yellow Green (10GY 4/4) and Light Brown (5YR 6/4); falser beds and minor wavy thin laminae; soft sediment deformation, small brecciation, ripples, and syneresis cracks; pyrite clusters

**9881.0 – 9884.7** Dolostone sand mud: Light Brown (5YR 6/4) interbedded with Moderate Brown (5YR 3/4) and minor Dark Yellow Green (10GY 4/4); wavy medium laminae and falser beds; brecciation, climbing ripples, soft sediment deformation features, mud cracks, desiccation cracks, and minor cross-beds; pyrite clusters

**9884.7 – 9886.2** Dolostone mud sand: Moderate Brown (5YR 3/4) interbedded with Dark Yellow Green (10GY 4/4) and Greyish Orange (10YR 7/4); wavy thin laminae and falser beds; small brecciation, ripples, mud cracks, soft sediment deformation, and minor syneresis cracks

**9886.2 – 9889.5** Dolostone sand mud: Light Brown (5YR 6/4) interbedded with Dark Yellow Green (10GY 4/4) and minor Moderate Brown (5YR 3/4); wavy thin to medium laminae and falser beds; desiccation cracks, ripples, small brecciation, soft sediment deformation, and syneresis cracks

**9889.5 – 9891.0** Dolostone sand mud: Light Brown (5YR 6/4); no distinct bedding; soft sediment deformation, cross-beds, minor brecciation, and minor water-escape pipes

**9891.0 – 9895.0** Dolostone sand mud: Light Brown (5YR 6/4) and Moderate Brown (5YR 3/4); poorly sorted brecciated beds; soft sediment deformation and water-escape pipes

**9895.0 – 9898.0** Mudstone dolomitic: Moderate Brown (5YR 3/4) and Dark Yellow Green (10GY 4/4); massive and false beds; mud cracks

**9898.0 – 9902.0** Dolostone mud sand: Greyish Olive Green (5GY 3/2) and Greyish Yellow (5Y 8/4); massive and minor mottling; minor brecciation

**9902.0 – 9908.0** Dolostone mud sand: Dusky Yellow Green (5GY 5/2) and Greyish Yellow (5Y 8/4); mottled; small brecciation

**9908.0 – 9911.5** Dolostone sand mud: Greyish Yellow (5Y 8/4) interbedded with Moderate Brown (5YR 3/4) and Greyish Olive Green (5GY 3/2); massive, wavy thin laminae, and false beds; ripples, water-escape pipes, syneresis cracks, small brecciation, and soft sediment deformation

**9911.5 – 9916.0** Dolostone sand mud: Light Brown (5YR 6/4) interbedded with Moderate Brown (5YR 3/4) and Dusky Yellow Green (5GY 5/2); wavy thin laminae and false beds; small brecciation, water-escape pipes, syneresis cracks, and minor cross-beds

**9916.0 – 9918.0** Dolostone mud sand: Light Brown (5YR 6/4) and Moderate Brown (5YR 3/4); mottled and minor brecciated beds; soft sediment deformation

**9918.0 – 9919.5** Dolostone sand mud: Light Brown (5YR 6/4) and Moderate Brown (5YR 3/4); mottled; small brecciation and elongated brecciation

**9919.5 – 9922.0** Dolostone mud sand: Olive Grey (5Y 3/2) and Greyish Yellow (5Y 8/4); massive and minor mottling; brecciation

**9922.0 – 9925.0** Dolostone mud sand: Light Brown (5YR 6/4) interbedded with Moderate Brown (5YR 3/4) and Greyish Olive Green (5GY 3/2); wavy thin to medium laminae, false beds, and small massive green section; cross-beds, soft sediment deformation, micro fault, minor ripples, and minor syneresis cracks

**9925.0 – 9927.0** Dolostone sand mud: Light Brown (5YR 6/4) and Moderate Brown (5YR 3/4); elongated brecciated beds

Überwachen 22-34

Burlington Resources Oil & Gas Company LP

Well # 21668 (3305303819)

SENW 34-153-95

**10295.1 – 10305.3** Dolostone sand mud: Pale Yellowish Brown (10YR 6/2) interbedded with Moderate Brown (5YR 3/4) and Dusky Yellowish Green (10GY 3/2); wavy thin to

medium laminae and falser beds; cross-beds, small brecciation, water-escape pipes, soft sediment deformation features, ripples, and minor mud cracks; pyrite clusters

**10305.3 – 10305.8 Waxed**

**10305.8 – 10309.9** Dolostone sand mud: Pale Yellowish Brown (10YR 6/2) interbedded with Dark Yellowish Green (10GY 4/4) and minor Moderate Brown (5YR 3/4); wavy thin to medium laminae and falser beds; soft sediment deformation, small brecciation, cross-beds, minor mud cracks, and minor synaeresis cracks; pyrite clusters

**10309.9 – 10310.5 Waxed**

**10310.5 – 10312.0** Dolostone sand mud: Light Brown (5YR 6/4) interbedded with Dusky Yellowish Green (10GY 3/2) and minor Moderate Brown (5YR 3/4); wavy thin laminae and falser beds; water-escape pipes, mud cracks, and small brecciation; pyrite clusters

**10312.0 – 10313.0 Missing**

**10313.0 – 10316.5** Dolostone sand mud: Light Brown (5YR 6/4) interbedded with Dusky Yellowish Green (10GY 3/2) and Moderate Brown (5YR 3/4); wavy medium to thick laminae and falser beds; ripples, water-escape pipes, mud cracks, and minor small brecciation

**10316.5 – 10319.0** Dolostone sand mud: Light Brown (5YR 6/4) interbedded with Greyish Green (10G 4/2); wavy thin to medium laminae and falser beds; synaeresis cracks, soft sediment deformation, small brecciation, and minor cross-bedding

**10319.0 – 10319.6** Dolostone mud sand: Moderate Brown (5YR 3/4) interbedded with Greyish Green (10G 4/2); wavy medium laminae and falser beds; minor brecciation

**10319.6 – 10321.7** Dolostone sand mud: Light Brown (5YR 6/4) interbedded with Greyish Green (10G 4/2); wavy medium laminae and falser beds; cross-beds, mud cracks, and minor water-escape pipes

**10321.7 – 10324.6** Dolostone mud sand: Moderate Brown (5YR 3/4) interbedded with Greyish Green (10G 4/2); wavy thin laminae and falser beds; soft sediment deformation and synaeresis cracks

**10324.6 – 10325.2 Waxed**

**10325.2 – 10326.2** Dolostone sand mud: Light Brown (5YR 6/4) interbedded with Greyish Green (10G 4/2); wavy thin laminae and falser beds; water-escape pipes

**10326.2 – 10329.8** Dolostone sand mud: Light Brown (5YR 6/4) and minor Greyish Green (10G 4/2); no distinct bedding and minor green laminations; soft sediment deformation and minor cross-beds; pyrite clusters

**10329.8 – 10330.5** Dolostone mud sand: Light Brown (5YR 6/4), Moderate Brown (5YR 3/4) and minor Greyish Green (10G 4/2); brecciated beds

**10330.5 – 10331.0** Waxed

**10331.0 – 10333.0** Dolostone sand mud: Light Brown (5YR 6/4) and Moderate Brown (5YR 3/4); poorly sorted brecciated beds; soft sediment deformation

**10333.0 – 10335.0** Mudstone dolomitic: Moderate Yellow Green (5G 5/2); massive

**10335.0 – 10347.0** Dolostone mud sand: Olive Grey (5Y 3/2) and Light Brown (5YR 6/4); mottled and massive; small brecciation

**10347.0 – 10348.8** Dolostone sand mud: Light Brown (5YR 6/4) interbedded with Moderate Brown (5YR 3/4); wavy thin to medium laminae, false beds, and minor mottling; soft sediment deformation and small brecciation

**10348.8 – 10351.0** Dolostone mud sand: Moderate Brown (5YR 3/4) and Light Brown (5YR 6/4); mottled and minor wavy thin laminae; soft sediment deformation and minor small brecciation

**10351.0 – 10353.0** Dolostone sand mud: Light Brown (5YR 6/4) interbedded with Greyish Green (10G 4/2); wavy very thin to thin laminae and false beds; soft sediment deformation, syneresis cracks, and mud cracks

**10353.0 – 10358.0** Dolostone sand mud: Light Brown (5YR 6/4) and Moderate Brown (5YR 3/4); poorly sorted brecciated beds and mottled; soft sediment deformation

**10358.0 – 10359.0** Dolostone mud sand: Greyish Green (10G 4/2) and Light Brown (5YR 6/4); mottled; elongated brecciation

**10359.0 – 10360.6** Dolostone mud sand: Dark Yellowish Green (10GY 4/4) and Light Brown (5YR 6/4); mottled and massive; minor small brecciation

**10360.6 – 10368.7** Dolostone mud sand: Moderate Brown (5YR 3/4) and Light Brown (5YR 6/4); mottled; small brecciation, and minor soft sediment deformation

**10368.7 – 10369.3** Mudstone dolomitic: Olive Grey (5Y 3/2); massive

**10369.3 – 10381.2** Dolostone mud sand: Dusky Yellow Green (10GY 3/2), Light Brown (5YR 6/4), and minor Greyish Orange (10YR 7/4); mottled and minor massive section; small brecciation, and soft sediment deformation,

**10381.2 – 10382.0** Dolostone mud sand: Olive Grey (5Y 3/2), Greyish Green (10G 4/2), and Pale Yellowish Brown (10YR 6/2); mottled; large brecciation and soft sediment deformation

**10382.0 – 10383.5** Mudstone dolomitic: Olive Grey (5Y 3/2), massive

**10383.5 – 10383.9** Waxed

**10383.9 – 10386.9** Dolostone mud sand: Olive Grey (5Y 3/2) and Pale Yellowish Brown (10YR 6/2); mottled and brecciated beds; soft sediment deformation



**10386.9 – 10386.7** Waxed

**10386.7 – 10388.0** Mudstone dolomitic: Dusky Yellow Green (10GY 3/2), massive

Charlotte 1-22H

Continental Resources, INC

Well # 19918 (3305303358)

SWSE 22-152-99

**11350.1 – 11355.0** Dolostone sand mud: Light Brown (5YR 6/4) interbedded with Greyish Green (10G 4/2) and Moderate Brown (5YR 3/4); wavy thin to medium laminae and falser beds; mud cracks, water-escape pipes, cross-beds, soft sediment deformation, synaeresis cracks, and minor brecciation

**11355.0 – 11356.9** Dolostone mud sand: Light Brown (5YR 6/4), Greyish Green (10G 4/2), and Moderate Brown (5YR 3/4); water deformed brecciated beds; small brecciation; anhydrite nodules

**11356.9 – 11358.0** Dolostone sand mud: Light Brown (5YR 6/4) interbedded with Greyish Green (10G 4/2) and Moderate Brown (5YR 3/4); wavy thin laminae and falser beds; water-escape pipes, minor mud crack, and minor cross-beds; minor anhydrite nodules

**11358.0 – 11358.5** Missing

**11358.5 – 11359.0** Dolostone mud sand: Moderate Brown (5YR 3/4) interbedded with Greyish Green (10G 4/2) and minor Light Brown (5YR 6/4); wavy thin to medium laminae and falser beds; water-escape pipes and mud cracks; anhydrite nodules

**11359.0 – 11359.6** Missing

**11359.6 – 11360.5** Dolostone mud sand: Moderate Brown (5YR 3/4) interbedded with Greyish Green (10G 4/2); wavy medium laminae and falser beds; minor cross-beds

**11360.5 – 11361.0** Dolostone mud sand: Greyish Green (10G 4/2) interbedded with Moderate Brown (5YR 3/4) and minor Light Brown (5YR 6/4); falser beds; minor mud cracks

**11361.0 – 11366.3** Dolostone sand mud: Light Brown (5YR 6/4) interbedded with Greyish Green (10G 4/2) and Moderate Brown (5YR 3/4); wavy thin to medium laminae and falser beds; water-escape pipes, mud cracks, small brecciation, cross-beds, minor soft sediment deformation, and minor ripples

**11366.3 – 11366.8** Missing

**11366.8 – 11368.0** Dolostone sand mud: Moderate Brown (5YR 3/4) interbedded with Light Brown (5YR 6/4) and Greyish Green (10G 4/2); falser beds and minor wavy thin laminae; minor water-escape pipes

**11368.0 – 11369.8** Dolostone sand mud: Light Brown (5YR 6/4) and Moderate Brown (5YR 3/4); no distinct bedding; mud cracks, desiccation cracks, minor small brecciation, minor cross-beds, and minor ripples,

**11369.8 – 11372.3** Dolostone mud sand: Moderate Brown (5YR 3/4) interbedded Greyish Green 910G 4/2) and minor Light Brown (5YR 6/4); falser beds and minor thin wavy laminae; water-escape pipes, mud cracks, small brecciation, soft sediment deformation, and minor cross-beds

**11372.3 – 11373.0** Dolostone sand mud: Light Brown (5YR 6/4) interbedded with Moderate Brown (5YR 3/4); planar to wavy medium laminae; cross-beds, syneresis cracks, small brecciation, and ripples

**11373.0 – 11375.1** Dolostone mud sand: Light Brown (5YR 6/4) interbedded with Moderate Brown (5YR 3/4) and Greyish Green (10G 4/2); wavy thin to medium laminae and falser beds; syneresis cracks, cross-beds, small brecciation, and water-escape pipes

**11375.1 – 11375.6** Missing

**11375.6 – 11377.0** Dolostone mud sand: Light Brown (5YR 6/4), Moderate Brown (5YR 3/4), and minor Greyish Green (10G 4/2); water deformed beds, wavy medium laminae, and minor falser beds; soft sediment deformation, small brecciation, cross-beds, ripples, and water-escape pipes

**11377.0 – 11378.8** Dolostone mud sand: Moderate Brown (5YR 3/4) interbedded with Greyish Green (10G 4/2); wavy thin laminae and thick falser beds; mud cracks, and cross-beds; pyrite clusters

**11378.8 – 11380.3** Dolostone sand mud: Greyish Orange (10YR 7/4) and Moderate Brown (5YR 3/4); no distinct bedding and minor planar thin laminae; soft sediment deformation and cross-beds

**11380.3 – 11381.2** Dolostone mud sand: Moderate Brown (5YR 3/4) interbedded with Greyish Green (10G4/2); wavy thin laminae and falser beds; soft sediment deformation, cross-beds, and minor brecciation

**11381.2 – 11384.2** Dolostone sand mud: Greyish Orange (10YR 7/4) and Moderate Brown (5YR 3/4); wavy thin to medium laminae and falser beds; cross-beds, mud cracks, and soft sediment deformation

**11384.2 – 11386.0** Dolostone mud sand: Greyish Orange (10YR 7/4) interbedded with Greyish Green (10G 4/2) and Moderate Brown (5YR 3/4); wavy thin to thick laminae and falser beds; cross-beds, soft sediment deformation, and minor water-escape pipes

**11386.0 – 11387.8** Dolostone mud sand: Olive Grey (5Y 3/2) and Greyish Orange (10YR 7/4); mottled; elongated brecciation

**11387.8 – 11391.0** Mudstone dolomitic: Greyish Olive (10Y 4/2); massive; minor small brecciation

**11391.0 – 11391.6** Missing

**11391.6 – 11392.4** Dolostone mud sand: Greyish Olive (10Y 4/2) and Greyish Orange (10YR 7/4); mottled; small brecciation

**11392.4 – 11398.9** Dolostone mud sand: Greyish Olive (10Y 4/2) and Greyish Orange (10YR 7/4); mottled; small brecciation and minor elongated brecciation

**11398.9 – 11399.4** Missing

**11399.4 – 11400.2** Dolostone mud sand: Light Olive Grey (5Y 5/2) and Light Brown (5YR 6/4); mottled and false beds; small brecciation and minor cross-beds

**11400.2 – 11402.0** Dolostone mud sand: Greyish Olive (10Y 4/2) and Light Brown (5YR 6/4); false beds and mottled; small brecciation and elongated brecciation

**11402.0 – 11404.0** Dolostone sand mud: Dark Yellowish Orange (10YR 6/6) and Greyish Olive (10YR 4/2); mottled and minor brecciated beds; brecciation and minor elongated brecciation

**11404.0 – 11406.3** Dolostone sand mud: Greyish Orange (10YR 7/4) interbedded with Dusky Yellow Green (5GY 5/2); wavy thin to medium laminae and false beds; water-escape pipes and minor desiccation cracks

**11406.3 – 11406.8** Missing

**11406.8 – 11407.4** Dolostone mud sand: Dusky Yellow Green (5GY 5/2) and minor Greyish Orange (10YR 7/4); massive and minor mottling at end of unit

**11407.4 – 11408.5** Dolostone sand mud: Greyish Orange (10YR 7/4) interbedded with Greyish Green (10G 4/2); wavy medium to thick laminae and false beds

**11408.5 – 11411.0** Dolostone sand mud: Greyish Orange (10YR 7/4) and Greyish Green (10G 4/2); mottled; elongated brecciation that increases in size downwards

**11411.0 – 11412.0** Dolostone mud sand: Greyish Green (10G 4/2) and Greyish Orange (10YR 7/4); mottled; elongated brecciation and minor soft sediment deformation

**11412.0 – 11412.5** Mudstone dolomitic: Dusky Yellow Green (5Y 5/2); massive

**11412.5 – 11413.5** Dolostone sand mud: Greyish Orange (10YR 7/4) and Dusky Yellow Green (5Y 5/2); mottled; minor elongated brecciation

**11413.5 – 11414.8** Dolostone mud sand: Dusky Yellow Green (5Y 5/2) and Greyish Orange (10YR 7/4); mottled

**11414.8 – 11416.0** Dolostone sand mud: Greyish Orange (10YR 7/4) and Dusky Yellow Green (5Y 5/2); brecciated beds

**11416.0 – 11417.3** Dolostone mud sand: Greyish Green (10G 4/2) and Greyish Orange (10YR 7/4); mottled; elongated brecciation

**11417.3 – 11417.8** Missing

**11417.8 – 11418.5** Dolostone mud sand: Greyish Green (10G 4/2) and Greyish Orange (10YR 7/4); mottled; elongated brecciation

**11418.5 – 11419.0** Dolostone sand mud: Greyish Orange (10YR 7/4) and Greyish Green (10G 4/2); mottled; small elongated brecciation

**11419.0 – 11420.1** Dolostone sand mud: Greyish Orange (10YR 7/4) and Greyish Green (10G 4/2); brecciated beds decreases in size downwards

**11420.1 – 11420.9** Mudstone dolomitic: Greyish Olive Green (5GY 3/2); massive

**11420.9 – 11422.3** Dolostone sand mud: Greyish Orange (10YR 7/4) interbedded with Greyish Green (10G 4/2); wavy medium to thick laminae and minor false beds; cross-beds, water-escape pipes, and minor soft sediment deformation

**11422.3 – 11422.7** Missing

**11422.7 – 11423.5** Dolostone sand mud: Greyish Orange (10YR 7/4) and Greyish Green (10G 4/2); brecciated beds and mottled; elongated brecciated beds

**11423.5 – 11424.0** Dolostone mud sand: Greyish Green (10G 4/2) and Greyish Orange (10YR 7/4); mottled; elongated beds

**11424.0 – 11427.0** Dolostone sand mud: Greyish Orange (10YR 7/4) and Greyish Green (10G 4/2); mottled and minor brecciated beds; small brecciation and elongated brecciation

**11427.0 – 11428.0** Dolostone sand mud: Greyish Orange (10YR 7/4); no distinct bedding with minor laminations; mud cracks; anhydrite nodules

**11428.0 – 11430.0** Dolostone mud sand: Greyish Green (10G 4/2), Greyish Orange (10YR 7/4), and minor Dusky Yellow Green (5GY 5/2); mottled; small brecciation

**11430.0 – 11435.6** Limestone: Dusky Yellow Green (5GY 5/2) and minor Greyish Green (10G 4/2); massive

**11435.6 – 11437.0** Limestone: Dusky Red (5R 3/4); massive

**11437.0 – 11443.0** Mudstone dolomitic: Dusky Red (5R 3/4); massive

**11443.0 – 11445.0** Limestone: Dusky Red (5R 3/4); massive

Rink 12-4ESH

Denbury Onshore, LLC

Well # 21786 (3305303843)

SWNW 4-151-98

**11187.2 – 11205.0** Dolostone mud sand: Moderate Brown (5YR 3/4) interbedded with Greyish Green (10G 4/2); wavy thin to medium laminae and falser beds; water-escape pipes, soft sediment deformation, synaeresis cracks, cross-beds, minor climbing ripples, and minor mud cracks; anhydrite nodules and pyrite clusters

**11205.0 – 11206.5** Dolostone mud sand: Greyish Green (10G 4/2) and minor Moderate Brown (5YR 3/4); massive and minor falser beds; brecciation and soft sediment deformation

**11206.5 – 11208.2** Dolostone sand mud: Light Brown (5YR 6/4) interbedded with Greyish Green (10G 4/2); wavy medium to thick laminae and minor falser beds; cross-beds, soft sediment deformation, water-escape pipes, and minor brecciation; pyrite clusters

**11208.2 – 11210.0** Dolostone mud sand: Moderate Brown (5YR 3/4) interbedded with Greyish Green (10G 4/2); wavy thin laminae and falser beds; water-escape pipes, ripples, and soft sediment deformation

**11210.0 – 11211.0** Mudstone dolomitic: Moderate Yellow Green (5G 5/2), massive

**11211.0 – 11216.0** Dolostone sand mud: Light Brown (5YR 6/4) interbedded with Greyish Green (10G 4/2) and minor Moderate Brown (5YR 3/4) laminations; soft sediment deformation, brecciation, synaeresis cracks, and minor cross-beds; minor pyrite clusters

**11216.0 – 11217.0** Mudstone dolomitic: Greyish Green (10G 4/2) and minor Moderate Brown (5YR 3/4); massive and minor brown laminations

**11217.0 – 11223.0** Dolostone sand mud: Greyish Orange (10YR 7/4) interbedded with Moderate Brown (5YR 3/4) and Greyish Green (10G 4/2); wavy medium to thick laminae and falser beds; soft sediment deformation features, water-escape-pipes, cross-beds, synaeresis cracks, and minor stacks; pyrite clusters

**11223.0 – 11226.4** Dolostone mud sand: Greyish Orange (10YR 7/4) and Moderate Brown (5YR 3/4); mottled and minor brecciated beds; small brecciation and elongated brecciation

**11226.4 – 11233.0** Mudstone dolomitic: Dark Yellowish Green (10GY 4/4); massive and minor mottling; minor small brecciation

**11233.0 – 11241.5** Dolostone mud sand: Greyish Olive (10Y 4/2) and Greyish Orange (10YR 7/4); mottled; brecciation and elongated brecciation

**11241.5 – 11243.0** Dolostone mud sand: Greyish Orange (10YR 7/4) interbedded with Moderate Yellow Green (5GY 7/4); wavy medium laminae and falser beds; cross-beds, ripples, and small brecciation

**11243.0 – 11244.0** Dolostone mud sand: Greyish Orange (10YR 7/4) and Dusky Yellowish Green (10GY 3/2); mottled; elongated brecciation

**11244.0 – 11247.0** Dolostone sand mud: Greyish Orange (10YR 7/4) interbedded with Greyish Green (10G 4/2); wavy thin to medium laminae and falser beds; water-escape pipes, mud cracks, soft sediment deformation, and minor brecciation

**11247.0 – 11249.5** Dolostone sand mud: Greyish Orange (10YR 7/4) interbedded with Greyish Green (10G 4/2); wavy thin to medium laminae, falser beds, and minor mottling; soft sediment deformation, minor brecciation, and minor cross-bedding

**11249.5 – 11251.7** Dolostone mud sand: Greyish Orange (10YR 7/4) and Dusky Yellowish Green (10GY 3/2); mottled; elongated brecciation and minor soft sediment deformation

**11251.7 – 11253.3** Mudstone dolomitic: Dusky Yellowish Green (10GY 3/2) and Greyish Orange (10YR 7/4); mottled and minor massive sections

**11253.3 – 11255.0** Dolostone sand mud: Greyish Orange (10YR 7/4) and Greyish Green (10G 4/2); mottled, wavy medium laminae, and falser beds; brecciation

**11255.0 – 11258.7** Dolostone sand mud: Greyish Orange (10YR 7/4) and Greyish Green (10G 4/2); brecciated beds and minor mottling; minor soft sediment deformation

**11258.7 – 11259.8** Mudstone dolomitic: Moderate Yellow Green (5GY 7/4); massive

**11259.8 – 11261.1** Dolostone mud sand: Greyish Orange (10YR 7/4) and Greyish Green (10G 4/2); mottled; minor elongated brecciation

**11261.1- 11262.0** Mudstone dolomitic: Greyish Green (10G 4/2); massive

**11262.0 – 11264.2** Dolostone sand mud: Greyish Orange (10YR 7/4) interbedded with Greyish Green (10G 4/2); wavy thin laminae, falser beds, and minor mottling; cross-beds, water-escape pipes, soft sediment deformation, and elongated brecciation at end of unit

**11264.2 – 11269.0** Dolostone mud sand: Greyish Orange (10YR 7/4) interbedded with Moderate Yellow Green (5GY 7/4); mottled; elongated brecciation and minor small brecciation

**11269.0 – 11269.4** Mudstone dolomitic: Dusky Yellow Green (5GY 5/2); mottled; anhydrite nodules

**11269.4 – 11270.0** Mudstone dolomitic: Greyish Olive (10Y 4/2); massive

**11270.0 – 11279.5** Dolostone mud sand: Greyish Olive (10Y 4/2) and Olive Grey (5Y 3/2); massive and minor wavy thin laminae; minor brecciation

**11279.5 – 11285.0** Mudstone dolomitic: Dusky Red (5R 3/4), massive

Danks 17-44H

Peak North Dakota, LLC

Well # 19693 (3305303296)

SESE 17-151-94

**10680.0 – 10688.8** Dolostone sand mud: Greyish Red (10R 4/2) interbedded with Greyish Blue Green (5BG 5/2); wavy thin laminae; ripples, soft sediment deformation, cross-beds, and minor water-escape pipes; pyrite clusters

**10688.8 – 10711.3** Dolostone sand mud: Light Brown (5YR 5/6) interbedded with Pale Green (10YG 6/2) and minor Dusky Yellow Brown (10YR 2/2); wavy thin laminae, false beds, and minor massive section; large water-escape pipes, small brecciation, and minor cross-bedding; pyrite clusters

**10711.3 – 10714.5** Dolostone sand: Light Brown (5YR 5/6) and minor Pale Green (10YG 6/2); no distinct bedding; small brecciation, and minor soft sediment deformation

**10714.5 – 10719.0** Dolostone sand mud: Greyish Orange (10YR 7/4) and minor Pale Green (10YG 6/2); mottled; elongated brecciation and minor brecciation

**10719.0 – 10721.8** Mudstone dolomitic: Dusky Yellow (5Y 6/4); massive

Lundin 11-13SEH

Denbury Onshore, LLC

Well # 21706 (3305303829)

NWNW 13-150-98

**11163.7 – 11167.5** Dolostone mud sand: Moderate Brown (5YR 3/4) interbedded with Greyish Green (10G 4/2) and minor Light Brown (5YR 6/4); wavy thin laminae and false beds; synaeresis cracks, water-escape pipes, cross-beds, and soft sediment deformation

**11167.5 – 11169.5** Dolostone sand mud: Light Brown (5YR 6/4) interbedded with Moderate Brown (5YR 3/4) and minor Greyish Green (10G 4/2); wavy thin laminae; ripples, water-escape pipes, cross-beds, soft sediment deformation, and synaeresis cracks; pyrite clusters

**11169.5 – 11177.9** Dolostone mud sand: Moderate Brown (5YR 3/4) interbedded with Greyish Green (10G 4/2) and minor Light Brown (5YR 6/4); wavy thin to medium

laminae and falser beds; water-escape pipes, cross-beds, syneresis cracks, and minor convolute beds; anhydrite nodules

**11177.9 – 11180.0** Dolostone mud sand: Moderate Brown (5YR 3/4) interbedded with Greyish Green (10G 4/2) and Light Brown (5YR 6/4); wavy thin laminae and falser beds; water-escape pipes and minor cross-beds; anhydrite nodules

**11180.0 – 11184.4** Dolostone mud sand: Moderate Brown (5YR 3/4) interbedded with Greyish Green (10G 4/2) and Light Brown (5YR 6/4); wavy thin to medium laminae and falser beds; water-escape pipes, small brecciation, soft sediment deformation, minor ripples, and minor cross-beds

**11184.4 – 11188.0** Dolostone sand mud: Light Brown (5YR 6/4), minor Moderate Brown (5YR 3/4), and minor Greyish Green (10G 4/2); no distinct bedding and falser beds; cross-beds, water-escape pipes, small brecciation, and soft sediment deformation at end of unit

**11188.0 – 11191.0** Dolostone mud sand: Greyish Green (10G 4/2) interbedded with Moderate Brown (5YR 3/4) and minor Light Brown (5YR 6/4); wavy thin to medium, falser beds, and minor massive section at end of unit; cross-beds, desiccation cracks, water-escape pipes, and minor soft sediment deformation; pyrite clusters

**11191.0 – 11194.0** Dolostone sand mud: Greyish Orange (10YR 7/4) interbedded with Moderate Brown (5YR 3/4) and minor Greyish Green (10G 4/2); wavy medium to thick laminae and minor falser beds; cross-beds, water-escape pipes, soft sediment deformation features, and minor syneresis cracks; minor pyrite clusters

**11194.0 – 11197.7** Dolostone mud sand: Greyish Green (10G 4/2) interbedded with Moderate Brown (5YR 3/4) and minor Light Brown (5YR 6/4); falser beds and wavy thin laminae; water-escape pipes, soft sediment deformation, small brecciation, and minor cross-beds; pyrite clusters

**11197.7 – 11199.5** Dolostone mud sand: Light Brown (5YR 6/4) interbedded with Moderate Brown (5YR 3/4), and Greyish Green (10G 4/2); wavy thin laminae and falser beds; soft sediment deformation, water-escape pipes, syneresis cracks, and cross-beds

**11199.5 – 11203.0** Dolostone sand mud: Greyish Orange (10YR 7/4) interbedded with Moderate Brown (5YR 3/4) and minor Greyish Green (10G 4/2); falser beds and section with no distinct bedding; soft sediment deformations, and minor cross-beds

**11203.0 – 11204.6** Dolostone mud sand: Greyish Green (10G 4/2), Moderate Brown (5YR 3/4), and Greyish Orange (10YR 7/4); falser beds and brecciated beds; soft sediment deformation and minor elongated brecciation at end of unit

**11204.6 – 11221.4** Dolostone mud sand: Olive Grey (5G 3/2) and Light Brown (5YR 6/4); mottled and minor massive sections; small brecciation that increases downwards, elongated brecciation, and minor soft sediment deformation



**11221.4 – 11223.0** Dolostone sand mud: Light Brown (5YR 6/4) interbedded with Moderate Brown (5YR 3/4) and minor Greyish Green (10G 4/2); wavy thin to medium laminae and falsers beds; ripples, cross-beds, water-escape pipes, soft sediment deformation, and minor synaeresis cracks

**11223.0 – 11224.6** Dolostone mud sand: Olive Grey (5G 3/2) and Light Brown (5YR 6/4); mottled; small brecciation

**11224.6 – 11226.7** Dolostone sand mud: Greyish Orange (10YR 7/4) interbedded with Greyish Green (10G 4/2); wavy thin laminae and falsers beds; cross-beds, water-escape pipes, and minor mud cracks

**11226.7 – 11228.0** Dolostone mud sand: Olive Grey (5G 3/2) and Light Brown (5YR 6/4); mottled; minor elongated brecciation

**11228.0 – 11232.0** Dolostone sand mud: Moderate Brown (5YR 3/4) interbedded with Light Brown (5YR 6/4); wavy thin laminae and falsers beds; soft sediment deformation, small brecciation, and water-escape pipes

**11232.0 – 11233.5** Dolostone sand mud: Greyish Orange (10YR 7/4) and Greyish Olive Grey (5GY 3/2); poorly sorted elongated brecciated beds

**11233.5 – 11236.5** Mudstone dolomitic: Dark Yellowish Brown (10YR 4/2); massive

**11236.5 – 11241.0** Dolostone mud sand: Pale Olive (10Y 6/2) and Greyish Green (10G 4/2); mottled; minor small brecciation

**11241.0 – 11244.0** Dolostone mud sand: Dark Yellowish Brown (10YR 4/2), Greyish Orange (10YR 7/4), and Greyish Green (10G 4/2); mottled; brecciation

**11244.0 – 11245.4** Dolostone mud sand: Greyish Green (10G 4/2), Moderate Brown (5YR 3/4), and minor Greyish Orange (10YR 7/4); mottled, alternating sections of dominance; brecciation decreases downwards

**11245.4 – 11252.0** Dolostone mud sand: Moderate Brown (5YR 3/4), Greyish Green (10G 4/2), and minor Greyish Orange (10YR 7/4); mottled; brecciation and soft sediment deformation

**11252.0 – 11254.0** Dolostone mud sand: Moderate Brown (5YR 3/4), Light Brown (5YR 6/4), and minor Greyish Green (10G 4/2); poorly sorted brecciation

**11254.0 – 11257.0** Dolostone mud sand: Pale Green (5G 7/2), Moderate Brown (5YR 3/4), and Light Brown (5YR 6/4); brecciated beds and water deformed thick laminae; soft sediment deformation, and minor water-escape pipes

**11257.0 – 11259.4** Mudstone dolomitic: Olive Grey (5Y 3/2); massive; minor small brecciation

**11259.4 – 11261.0** Limestone: Greyish Olive Green (5GY 3/2); massive; minor small brecciation

**11261.0 – 11269.0** Mudstone dolomitic: Olive Grey (5Y 3/2); massive; anhydrite nodules

**11269.0 – 11272.0** Limestone: Olive Grey (5Y 3/2); massive; minor small brecciation

**11272.0 – 11275.0** Limestone: Greyish Green (10G 4/2) and Greyish Orange (10YR 7/4); massive; small brecciation

**11275.0 – 11278.0** Muddy Limestone: Greyish Green (10G 4/2), Greyish Green (10GY 5/2), and minor Light Brown (5YR 6/4); mottled; small brecciation

**11278.0 – 11280.0** Mudstone dolomitic: Dusky Yellow Green (5GY 5/2) and minor Greyish Green (10G 4/2); massive and minor wavy thin laminae; minor soft sediment deformation

**11280.0 – 11283.0** Muddy Sandy Limestone: Greyish Green (10G 4/2) interbedded with Greyish Green (10GY 5/2) and minor Light Brown (5YR 6/4); wavy thin laminae and false beds; small brecciation, water-escape pipes, and soft sediment deformation

**11283.0 – 11284.0** Mudstone dolomitic: Greyish Green (10G 4/2); massive; anhydrite nodules

Bernice 150-99-20-17-2H

Newfield Production Company

Well # 22493 (3305304011)

SESE 20-150-99

**11190.8 – 11195.0** Dolostone mud sand: Moderate Brown (5YR 5/4) interbedded with Greyish Green (10G 4/2) and Light Brown (5YR 6/4); wavy thin laminae and false beds; cross-beds, water-escape pipes, small brecciation, soft sediment deformation, and ripples

**11195.0 – 11199.0** Dolostone mud sand: Greyish Green (10G 4/2) interbedded with Moderate Brown (5YR 5/4) and minor Light Brown (5YR 6/4); wavy thin laminae and false beds; inter water-escape pipes, syneresis cracks, and cross-beds; pyrite clusters

**11199.0 – 11205.0** Dolostone sand mud: Light Brown (5YR 6/4) interbedded with Greyish Green (10G 4/2) and Moderate Brown (5YR 5/4); wavy thin laminae and false beds; syneresis cracks, soft sediment deformation, small brecciation, cross-beds, and ripples

**11205.0 – 11208.0** Dolostone mud sand: Greyish Orange (10YR 7/4) interbedded with Greyish Green (10G 4/2); wavy medium to thick laminae and falser beds; synaeresis cracks, soft sediment deformation, and minor cross-beds

**11208.0 – 11210.0** Dolostone mud sand: Greyish Olive Green (5GY 3/2) interbedded with Light Brown (5YR 6/4); falser beds and minor wavy thin laminae; synaeresis cracks, water-escape pipes, soft sediment deformation, small brecciation, and cross-beds

**11210.0 – 11211.5** Dolostone sand mud: Greyish Orange (10YR 7/4) interbedded with Greyish Green (10G 4/2); wavy thick laminae and minor falser beds; water-escape pipes, and brecciation at end of unit

**11211.5 – 11214.2** Dolostone sand mud: Greyish Orange (10YR 7/4) interbedded with Greyish Green (10G 4/2); wavy thin laminae, falser beds, and minor mottling; brecciation, soft sediment deformation, synaeresis cracks, cross-beds, and mud cracks

**11214.2 – 11215.5** Dolostone mud sand: Greyish Olive Green (5GY 3/2) and Greyish Orange (10YR 7/4); mottled and minor massive sections

**11215.5 – 11217.5** Dolostone sand mud: Greyish Orange (10YR 7/4) interbedded with Greyish Green (10G 4/2); wavy medium to thick laminae and falser beds; cross-beds, small brecciation, minor water-escape pipes, and minor soft sediment deformation

**11217.5 – 11219.0** Dolostone sand mud: Greyish Orange (10YR 7/4) interbedded with Greyish Green (10G 4/2); wavy thin laminae and minor beds; small brecciation, water-escape pipes, minor cross-beds, and minor synaeresis cracks

**11219.0 – 11221.0** Dolostone sand mud: Greyish Orange (10YR 7/4) interbedded with Dusky Yellow Green (5GY 5/2); wavy thin to medium laminae and falser beds; cross-beds

**11221.0 – 11222.0** Dolostone mud sand: Dusky Yellow Green (5GY 5/2) and Greyish Green (10G 4/2); mottled; elongated brecciation and small brecciation

**11222.0 – 11224.2** Dolostone mud sand: Greyish Orange (10YR 7/4) and Greyish Green (10G 4/2); brecciated beds; elongated brecciation at beginning of unit

**11224.2 – 11225.0** Dolostone mud sand: Dusky Yellow Green (5GY 5/2) and Greyish Orange (10YR 7/4); mottled; small elongated brecciation

**11225.0 – 11227.0** Missing

**11227.0 – 11228.0** Dolostone mud sand: Moderate Brown (5YR 3/4), Pale Green (5G 7/2), and Light Brown (5YR 6/4); mottled; small brecciation

**11228.0 – 11237.9** Mudstone dolomitic: Dusky Red (5R 3/2) and minor Dusky Yellow Green (5GY 5/2); massive; minor brecciation and reduction spots

**11237.9 – 11240.0** Dolostone sand mud: Light Brown (5YR 6/4) interbedded with Dusky Yellow Green (5GY 5/2); wavy medium to thick laminae and falser beds; cross-beds, water-escape pipes, and soft sediment deformation

**11240.0 – 11243.7** Dolostone sand mud: Greyish Orange (10YR 7/4) interbedded with Dusky Yellow Green (5GY 5/2); wavy thin laminae, falser beds, and minor mottling; brecciation, soft sediment deformation, and mud cracks

**11243.7 – 11244.5** Mudstone dolomitic: Dusky Red (5R 3/2); massive; brecciation

**11244.5 – 11247.9** Dolostone sand mud: Greyish Orange (10YR 7/4) interbedded with Dusky Yellow Green (5GY 5/2); wavy thin laminae and falser beds; water-escape pipes

**11247.9 – 11249.9** Dolostone mud sand: Greyish Orange (10YR 7/4) and Greyish Green (10G 4/2); poorly sorted brecciation; minor elongated brecciation

**11249.9 – 11255.0** Dolostone sand mud: Greyish Orange (10YR 7/4) and Dusky Yellow Green (5GY 5/2); poorly sorted brecciated beds

**11255.0 – 11257.0** Dolostone sand mud: Greyish Orange (10YR 7/4) and Greyish Green (10G 4/2); poorly sorted brecciation; elongated brecciation

**11257.0 – 11257.7** Dolostone mud sand: Dusky Red (5R 3/2), Dusky Yellow Green (5GY 5/2), and Greyish Orange (10YR 7/4); mottled and minor massive sections; small brecciation

**11257.7 – 11264.0** Dolostone sand mud: Greyish Orange (10YR 7/4) and Dusky Yellow Green (5GY 5/2); poorly sorted brecciated beds, minor mottling, and minor wavy thin laminae; soft sediment deformation

**11264.0 – 11270.4** Dolostone mud sand: Light Brown (5YR 6/4), Greyish Green (10G 4/2), and minor Dusky Yellow Green (5GY 5/2); poorly sorted brecciated beds and minor mottling; soft sediment deformation and elongated brecciation; anhydrite nodules

**11270.4 – 11272.1** Dolostone sand mud: Moderate Yellowish Brown (5GY 5/2), Light Brown (5YR 6/4), and Greyish Green (10G 4/2); massive and elongated brecciated beds; soft sediment deformation; anhydrite nodules

**11272.1 – 11273.0** Mudstone dolomitic: Dusky Yellow Green (5GY 5/2) and minor Greyish Green (10G 4/2); massive

**11273.0 – 11274.3** Dolostone mud sand: Greyish Orange (10YR 7/4) and Greyish Green (10G 4/2); large brecciated beds and minor wavy thin laminae at end of unit

**11274.3 – 11275.8** Mudstone dolomitic: Dusky Yellow Green (5GY 5/2); massive

**11275.8 – 11281.9** Limestone: Dusky Red (5R 3/2); massive

**11281.9 – 11284.8** Mudstone dolomitic: Dusky Red (5R 3/2); massive

**11284.8 – 11289.8** Limestone: Dusky Red (5R 3/2); massive

Catherine E. Peck #2

Amerada Petroleum Corp.

Well # 1405 (3305300226)

NWNE 27-150-96

**10825 – 10830.1** Dolostone mud sand: Moderate Brown (5YR 3/4) interbedded with Greyish Green (10G 4/2); falser beds and wavy medium laminae; water-escape pipes, soft sediment deformation, and ripples at end of unit; minor pyrite clusters

**10830.1 – 10834.3** Dolostone mud sand: Moderate Brown (5YR 3/4) interbedded with Pale Olive (10Y 6/2); falser beds and wavy thin laminae; minor water-escape pipes and minor ripples; pyrite clusters

**10834.3 – 10837.7** Dolostone sand mud: Light Brown (5YR 6/4) interbedded with Moderate Brown (5YR 3/4) and Greyish Green (10G 4/2); wavy medium laminae and falser beds; soft sediment deformation and a large water-escape pipe

**10837.7 – 10843** Dolostone sand mud: Light Brown (5YR 6/4) interbedded with Greyish Green (10G 4/2) and Moderate Brown (5YR 3/4); wavy thin to medium laminae and falser beds; cross-beds, soft sediment deformation, water-escape pipes, syneresis cracks, minor mud cracks, and ripples at end of unit

**10843 – 10847.7** Dolostone mud sand: Moderate Brown (5YR 3/4) interbedded with Greyish Green (10G 4/2); falser beds and wavy thin to medium laminae; water-escape pipes, ripples, mud cracks, and minor soft sediment deformation; pyrite clusters

**10847.7 – 10850.0** Dolostone mud sand: Light Brown (5YR 6/4) interbedded with Greyish Green (10G 4/2) and minor Moderate Brown (5YR 3/4); wavy thin laminae and falser beds; mud cracks, soft sediment deformation, and minor cross-beds

**10850.0 – 10855.5** Dolostone sand mud: Light Brown (5YR 6/4) interbedded with Pale Yellowish Green (10GY 7/2); wavy thin laminae to thin beds and falser beds; syneresis cracks and soft sediment deformation; pyrite clusters

**10855.5 – 10856.5** Dolostone sand mud: Greyish Orange (10YR 7/4) and Moderate Brown (5YR 3/4); water deformed beds and brecciated beds; water-escape pipes

**10856.5 – 10859.5** Dolostone mud sand: Greyish Orange (10YR 7/4), Moderate Brown (5YR 3/4), and Greyish Green (10G 4/2); brecciated beds and mottled; brecciation

**10859.5 – 10866.2** Mudstone dolomitic: Olive Grey (5Y 3/2); massive; minor brecciation

**10866.2 – 10874.0** Dolostone mud sand: Olive Grey (5Y 3/2) and Light brown (5YR 6/4); mottled and minor massive sections; small brecciation that decreases downwards

Curl 23-14

Whiting Oil and Gas Corporation

Well # 16581 (3305302794)

NESW 14-149-100

**11056.4 – 11057.2** Dolostone sand mud: Greyish Orange (10YR 7/4) interbedded with Greyish Green (10G 4/2); wavy thin laminae and falser beds; water-escape pipes, synaeresis cracks, mud cracks, cross-beds, and small brecciation; pyrite clusters

**11057.2 – 11058.0** Dolostone sand mud: Greyish Orange (10YR 7/4) interbedded with Pale Green (10G 6/2); wavy medium laminae and falser beds; brecciation, soft sediment deformation, minor cross-beds, and minor synaeresis cracks

**11058.0 – 11062.3** Dolostone sand mud: Greyish Orange (10YR 7/4) interbedded with Greyish Green (10G 4/2); wavy thin to medium laminae and falser beds; brecciation, water-escape pipes, ripples, cross-beds, mud cracks, and water-escape pipes; pyrite clusters

**11062.8 – 11064.5** Dolostone sand mud: Greyish Orange (10YR 7/4) interbedded with Greyish Green (10G 4/2); wavy thin to medium laminae and falser beds; small brecciation, water-escape pipes, mud cracks, and minor cross-beds; pyrite clusters

**11064.5 – 11066.0** Dolostone sand mud: Greyish Orange (10YR 7/4) interbedded with Greyish Green (10G 4/2); wavy very thin to thin laminae and falser beds; mud cracks, water-escape pipes, soft sediment deformation, small brecciation, and synaeresis cracks; pyrite clusters

**11066.0 – 11069.7** Dolostone mud sand: Greyish Orange (10YR 7/4) interbedded with Greyish Green (10G 4/2); planar to wavy thin laminae and minor falser beds; water-escape pipes, soft sediment deformation, synaeresis cracks, cross-beds, and mud cracks; pyrite clusters

**11069.7 – 11073.0** Dolostone sand mud: Greyish Orange (10YR 7/4) interbedded with Greyish Green (10G 4/2); wavy medium laminae, falser beds, and minor mottling; small brecciation, minor cross-bedding, and minor mud cracks;

**11073.0 – 11075.0** Dolostone mud sand: Olive Grey (5Y 3/2) and Greyish Orange (10YR 7/4); mottled and wavy thin laminae; small brecciation, minor water-escape pipes, and minor cross-beds

- 11075.0 – 11078.0** Dolostone sand mud: Greyish Orange (10YR 7/4) interbedded with Greyish Green (10G 4/2); wavy medium laminae and falser beds; desiccation cracks, brecciation, soft sediment deformation, and minor cross-beds
- 11078.0 – 11079.0** Dolostone mud sand: Greyish Orange (10YR 7/4) interbedded with Greyish Green (10G 4/2); planar to wavy thin laminae; small brecciation, synaeresis cracks, mud cracks, and minor water-escape pipes
- 11079.0 – 11081.0** Dolostone mud sand: Olive Grey (5Y 3/2) and Greyish Orange (10YR 7/4); massive and mottled
- 11081.0 – 11082.5** Dolostone sand mud: Greyish Orange (10YR 7/4) and minor Greyish Green (10G 4/2); massive and minor green layers; synaeresis cracks and minor soft sediment deformation
- 11082.5 – 11084.0** Dolostone sand mud: Moderate Brown (5YR 3/4) interbedded with Greyish Green (10G 4/2); wavy thin laminae and falser beds; water-escape pipes, small brecciation, soft sediment deformation, and minor synaeresis cracks
- 11084.0 – 11087.1** Dolostone sand mud: Greyish Orange (10YR 7/4) interbedded with Greyish Green (10G 4/2); wavy medium to thick laminae and minor falser beds; cross-beds, soft sediment deformation, synaeresis cracks, and mud cracks
- 11087.1 – 11088.5** Dolostone mud sand: Greyish Orange (10YR 7/4) and Greyish Green (10G 4/2); elongated brecciated beds; soft sediment deformation
- 11088.5 – 11089.0** Mudstone: Dusky Yellow (5Y 6/4); massive
- 11089.0 – 11091.9** Mudstone dolomitic: Dusky Red (5R 3/4); massive
- 11091.9 – 11092.5** Dolostone mud sand: Pale Green (5G 7/2) and Greyish Orange (10YR 7/4); massive and brecciation
- 11092.5 – 11094.0** Dolostone mud sand: Dusky Red (5R 3/4) and Pale Green (5G 7/2); massive; brecciated
- 11094.0 – 11096.0** Mudstone dolomitic: Dusky Red (5R 3/4); massive

Mariana Trust 12X-20G2

XTO Energy INC.

Well # 24123 (3305304498)

SWNW 20-149-97

- 11134.5 – 11135.5** Dolostone mud sand: Moderate Brown (5YR 3/4) interbedded with Greyish Green (10G 4/2), and minor Light Brown (5YR 6/4); wavy thin laminae and

falsar beds; water-escape pipes, mud cracks, soft sediment deformation, and small brecciation

**11135.5 – 11136.7** Dolostone mud sand: Moderate Brown (5YR 3/4), minor Light Brown (5YR 6/4), and Greyish Green (10G 4/2); massive with minor green and light brown laminations near the top of unit; synaeresis cracks, cross-beds, water-escape pipes, and soft sediment deformation

**11136.7 – 11144.2** Dolostone mud sand: Moderate Brown (5YR 3/4) interbedded with Greyish Green (10G 4/2), and minor Light Brown (5YR 6/4); wavy thin laminae and falsar beds; mud cracks, soft sediment deformation, water-escape pipes, minor cross-beds, and minor ripples; pyrite clusters

**11144.2 – 11146.5** Dolostone sand mud: Light Brown (5YR 6/4) interbedded with Moderate Brown (5YR 3/4) and minor Greyish Green (10G 4/2); wavy thin laminae and falsar beds; soft sediment deformation, mud cracks, and minor cross-beds

**11146.5 – 11148.9** Dolostone mud sand: Moderate Brown (5YR 3/4) interbedded with Greyish Green (10G 4/2), and minor Light Brown (5YR 6/4); wavy thin laminae and falsar beds; mud cracks, soft sediment deformation, water-escape pipes, minor cross-beds, and minor synaeresis cracks

**11148.9 – 11149.8** Dolostone sand mud: Light Brown (5YR 6/4), Moderate Brown (5YR 3/4), and minor Greyish Green (10G 4/2); no distinct bedding, soft sediment deformation, water-escape pipes, and minor cross-beds; pyrite clusters

**11149.8 – 11152.3** Dolostone mud sand: Moderate Brown (5YR 3/4) interbedded with Greyish Green (10G 4/2), and Light Brown (5YR 6/4); wavy thin laminae and falsar beds; mud cracks, water-escape pipes, soft sediment deformation features, and minor cross-beds

**11152.3 – 11152.8** Mudstone dolomitic: Greyish Green (10G 4/2); massive

**11152.8 – 11155.2** Dolostone sand mud: Light Brown (5YR 6/4) interbedded Greyish Green (10G 4/2) and minor Moderate Brown (5YR 3/4); wavy thin laminae and falsar beds; water-escape pipes, mud cracks, small brecciation, synaeresis cracks, and minor cross-beds

**11155.2- 11157.8** Dolostone mud sand: Greyish Green (10G 4/2) interbedded with Moderate Brown (5YR 3/4) and minor Light Brown (5YR 6/4); wavy thin laminae, falsar beds, massive green at top of unit and minor light brown section; mud cracks, soft sediment deformation, water-escape pipes, and minor cross-beds

**11157.8 – 11158.5** Mudstone dolomitic: Greyish Green (10G 4/2); massive

**11158.5 – 11160.9** Dolostone sand mud: Light Brown (5YR 6/4) interbedded Greyish Green (10G 4/2) and minor Moderate Brown (5YR 3/4); wavy thin to medium laminae



and false beds; ripples at top of unit, small brecciation, water-escape pipes, soft sediment deformation, and syneresis cracks

**11160.9 – 11162.0** Dolostone mud sand: Greyish Green (10G 4/2) interbedded with Greyish Orange (10YR 7/4); wavy thin laminae and false beds; cross-beds, syneresis, and minor brecciation

**11162.0 – 11164.7** Dolostone mud sand: Dusky Blue Green (5BG 3/2) interbedded with Light Brown (5YR 6/4); wavy thin laminae, false beds, and minor mottling; small brecciation, ripples, syneresis cracks, soft sediment deformation cracks, and cross-beds

**11164.7 – 11169.0** Dolostone sand mud: Light Brown (5YR 6/4) interbedded with Greyish Green (10G 4/2), minor Greyish Orange (10YR 7/4), and Moderate Brown (5YR 3/4); wavy thin to medium laminae and false beds; soft sediment deformation, water-escape pipes, and small brecciations

**11169.0 – 11171.2** Dolostone sand mud: Greyish Orange (10YR 7/4), Greyish Green (10G 4/2), and Moderate Brown (5YR 3/4); wavy thin laminae and false beds; soft sediment deformation, water-escape pipes, cross-beds, and syneresis cracks

**11171.2 – 11173.7** Dolostone mud sand: Greyish Orange (10YR 7/4), Greyish Green (10G 4/2), and Moderate Brown (5YR 3/4); poorly sorted brecciated; soft sediment deformation

**11173.7 – 11177.0** Dolostone mud sand: Olive Grey (5Y 3/2) and minor Greyish Orange (10YR 7/4); massive; small brecciation

**11177.0 – 11186.5** Dolostone mud sand: Olive Grey (5Y 3/2) and Dusky Yellow Green (5GY 5/2); mottled; small brecciation, elongated brecciation, and soft sediment deformation

**11186.5 – 11189.0** Dolostone mud sand: Olive Grey (5Y 3/2) and Greyish Orange (10YR 7/4); mottled; poorly sorted brecciation

**11189.0 – 11191.0** Dolostone mud sand: Olive Grey (5Y 3/2) and Greyish Orange (10YR 7/4); mottled; small brecciation

**11191.0 – 11193.0** Dolostone sand mud: Greyish Orange (10YR 7/4) and Greyish Olive Green (5GY 3/2); elongated brecciated beds

**11193.0 – 11193.7** Dolostone mud sand: Olive Grey (5Y 3/2) and Greyish Orange (10YR 7/4); mottled and minor massive section; elongated brecciation

**11193.7 – 11196.9** Dolostone sand mud: Greyish Orange (10YR 7/4) interbedded with Greyish Olive Green (5GY 3/2); wavy thin to medium laminae and false beds; cross-beds, soft sediment deformation, syneresis cracks, water-escape pipes, and minor brecciation

**11196.9 – 11198.2** Dolostone mud sand: Olive Grey (5Y 3/2) and Greyish Orange (10YR 7/4); mottled; minor small brecciation

**11198.2 – 11201.0** Dolostone sand mud: Greyish Orange (10YR 7/4) interbedded with Dusky Yellow Green (5GY 5/2); wavy thin to medium laminae and false beds; soft sediment deformation, minor cross-beds, and minor water-escape pipes

**11201.0 – 11203.0** Dolostone sand mud: Greyish Orange (10YR 7/4) and Dusky Yellow Green (5GY 5/2); mottled; elongated brecciation and minor soft sediment deformation

**11203.0 – 11205.7** Dolostone mud sand: Greyish Orange (10YR 7/4) and Greyish Olive Green (5GY 3/2); mottled; elongated brecciation and brecciation

**11205.7 – 11211.4** Dolostone mud sand: Greyish Orange (10YR 7/4) and Pale Olive (10Y 6/2); mottled; small brecciation

**11211.4 – 11215.0** Dolostone sand mud: Light Brown (5YR 6/4) and Greyish Green (10G 3/4); brecciated beds and minor mottling; minor soft sediment deformation

**11215.0 – 11218.6** Dolostone mud sand: Olive Grey (5Y 3/2) and Light Brown (5YR 6/4); mottled; small brecciation and minor elongated brecciation

**11218.6 – 11226.4** Dolostone mud sand: Greyish Orange (10YR 7/4) and Dusky Yellow Green (5GY 5/2); mottled; brecciation and elongated brecciation,

**11226.4 – 11228.2** Dolostone mud sand: Moderate Yellow Green (5G 5/2) and Greyish Orange (10YR 7/4); massive and minor mottling; small brecciation

**11228.2 – 11230.0** Dolostone sand mud: Greyish Orange (10YR 7/4) and Pale Green (5G 7/2); mottled and minor massive section; large to medium brecciation and minor elongated brecciation

**11230.0 – 11231.2** Limestone: Moderate Yellow Green (5G 5/2); massive

**11231.2 – 11236.7** Limestone: Olive Grey (5Y 3/2) and minor Light Brown (5YR 6/4); massive; minor small brecciation

**11236.7 – 11243.0** Mudstone dolomitic: Dusky Red (5R 3/4); massive

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**10933 – 10937.5** Dolostone sand mud: Moderate Brown (5YR 3/4) interbedded with Greyish Green (10G 4/2); wavy medium to thick laminae and falser beds; synaeresis cracks, water-escape pipes, soft sediment deformation, minor cross-beds; small anhydrite nodules

**10937.5 – 10944.0** Dolostone sand mud: Light Brown (5YR 6/4) interbedded with Greyish Green (10G 4/2) and Moderate Brown (5YR 3/4); wavy thin to medium laminae and falser beds; mud cracks, water-escape pipes, soft sediment deformation, synaeresis cracks, cross-beds, and ripples

**10944.0 – 10945.7** Dolostone mud sand: Moderate Brown (5YR 3/4) interbedded with Greyish Green (10G 4/2); wavy thick laminae and minor; minor synaeresis cracks

**10945.7 – 10947.0** Dolostone sand mud: Greyish Orange (10YR 7/4) interbedded with Greyish Green (10G 4/2) and Moderate Brown (5YR 3/4); wavy thin and medium and falser beds; water-escape pipes, cross-beds, soft sediment deformation, and synaeresis cracks

**10947.0 – 10948.0** Dolostone mud sand: Light Brown (5YR 6/4) interbedded with Greyish Green (10G 4/2); wavy thin laminae and falser beds; inter water-escape pipes, and minor soft sediment deformation

**10948.0 – 10949.5** Dolostone sand mud: Light Brown (5YR 6/4) interbedded with Greyish Green (10G 4/2); wavy thin laminae and falser beds; water-escape pipes, soft sediment deformation, ripples, small brecciation, desiccation cracks, and minor cross-beds

**10949.5 – 10951.0** Mudstone dolomitic: Greyish Green (10G 4/2) and minor Light Brown (5YR 6/4); massive and minor mottling

**10951.0 – 10952.0** Dolostone sand mud: Greyish Orange (10YR 7/4) and Moderate Brown (5YR 3/4); no distinct bedding; soft sediment deformation and mud cracks

**10952.0 – 10955.3** Dolostone mud sand: Greyish Orange (10YR 7/4) interbedded with Moderate Brown (5YR 3/4) and Greyish Green (10G 4/2); wavy thin to medium laminae, falser beds, and minor mottling at the beginning of unit; soft sediment deformation, cross-beds, desiccation cracks, mud cracks, and minor water-escape pipes

**10955.3 – 10958.0** Dolostone mud sand: Greyish Orange (10YR 7/4), Greyish Green (10G 4/2) and minor Moderate Brown (5YR 3/4); brecciated beds and minor mottling; soft sediment deformation

**10958.0 – 10962.0** Mudstone dolomitic: Dusky Yellow Green and minor Very Pale Orange (10YR 8/2); massive; small brecciation; pyrite clusters

**10962.0 – 10963.0** Dolostone mud sand: Pale Olive (10Y 6/2) and Greyish Orange (10YR 7/4); mottled; small brecciation

**10963.0 – 10968.5** Dolostone mud sand: Greyish Olive Green (5GY 3/2) and Greyish Orange (10YR 7/4); mottled and minor massive section; small brecciation that increases at end of unit

**10968.5 – 10974.0** Dolostone mud sand: Dusky Yellowish Brown (10YR 2/2) and Greyish Orange (10YR 7/4); mottled; brecciation

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