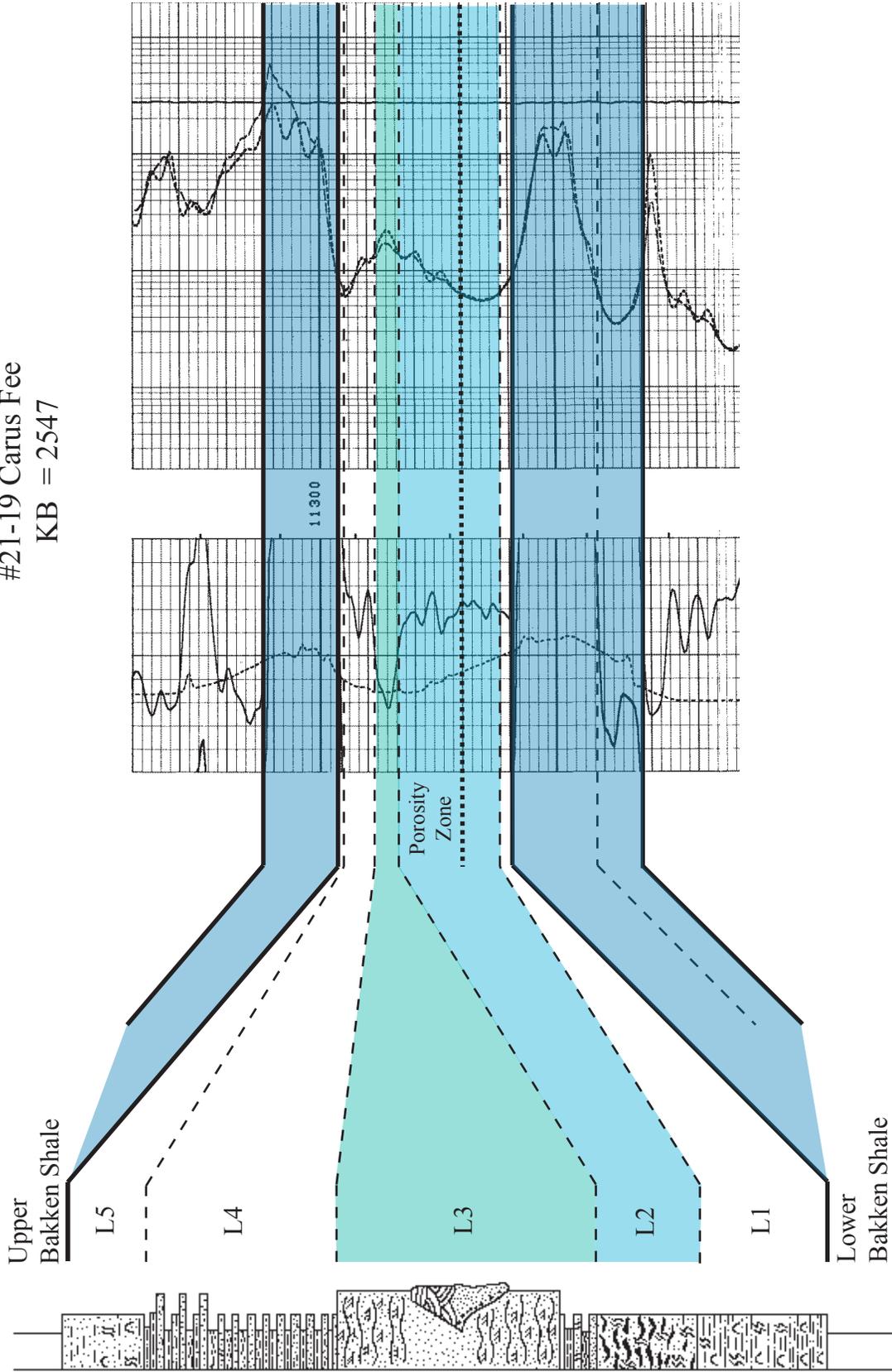


**Julie LeFever**  
**North Dakota Geological Survey**  
**Grand Forks, ND**

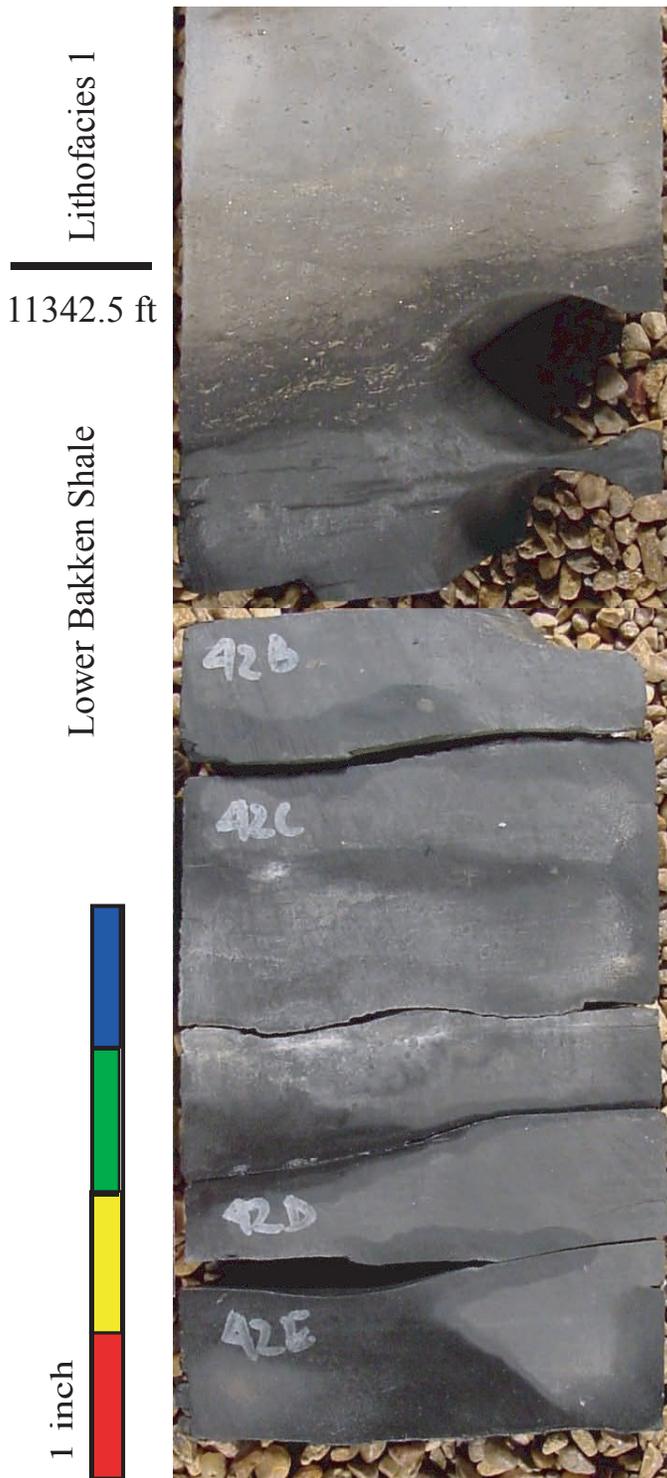
**Overview of Bakken Stratigraphy in**  
**North Dakota and**  
**“Mini” Core Workshop**

NENW Sec. 19, T.147N., R.96W.  
Maxus Exploration Co.  
#21-19 Carus Fee  
KB = 2547

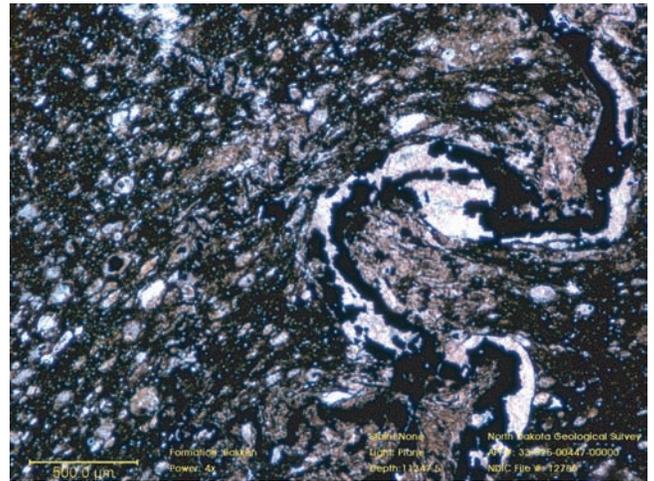


# Lower Bakken Shale

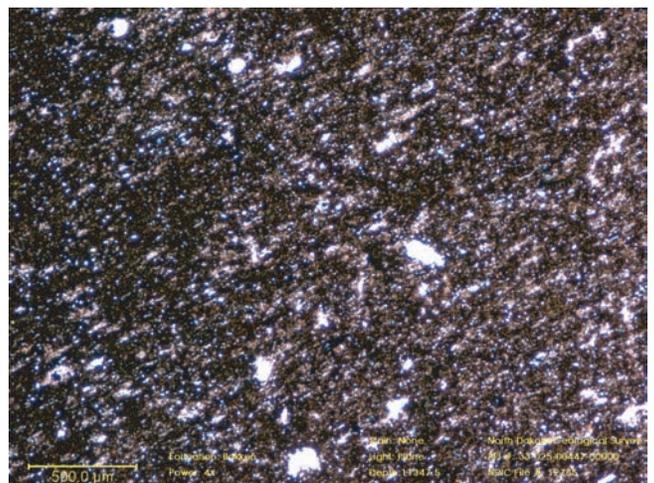
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 Maxus Exploration Co.  
 #21-19 Carus Fee  
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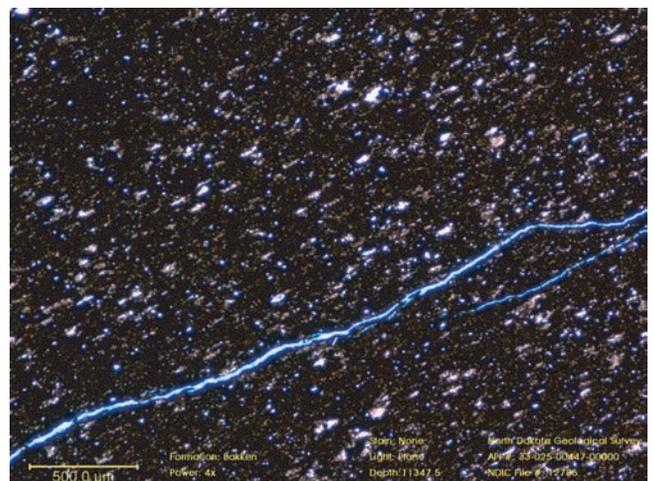
09/05 J.A. LeFever  
 North Dakota Geological Survey



Pyrite- and calcite-filled dewatering structure within the shale.



Typical Lower Bakken Shale - Calcite and pyrite grains are common



Microfractures within the shale

# Lithofacies 1

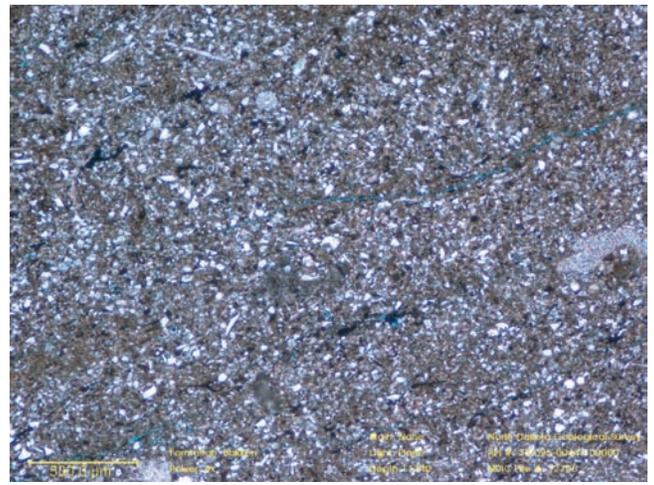
NENW Sec. 19, T.147N., R.96W.  
Maxus Exploration Co.  
#21-19 Carus Fee  
KB = 2547

11341.0 ft

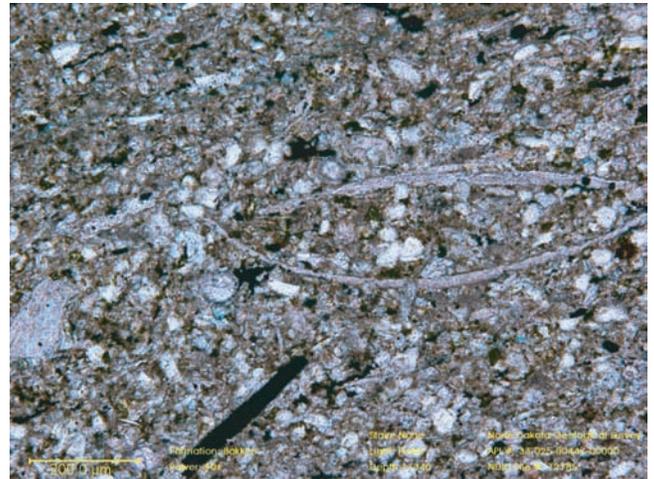


1 inch

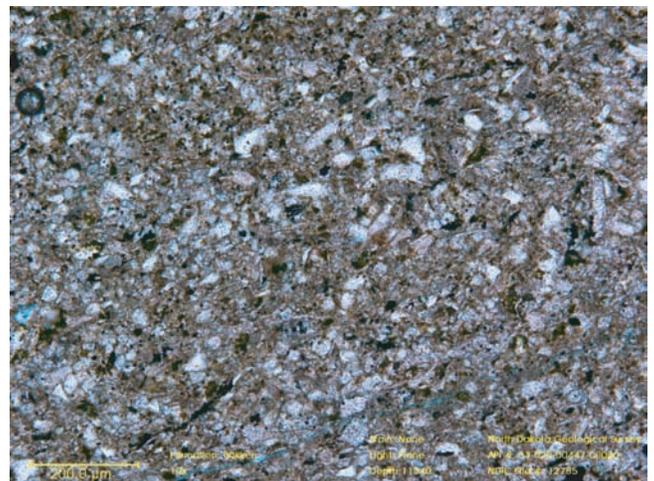
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North Dakota Geological Survey



Dolomitization has occurred along the microfractures present in the calcareous siltstone. Scattered fossil fragments are also present.



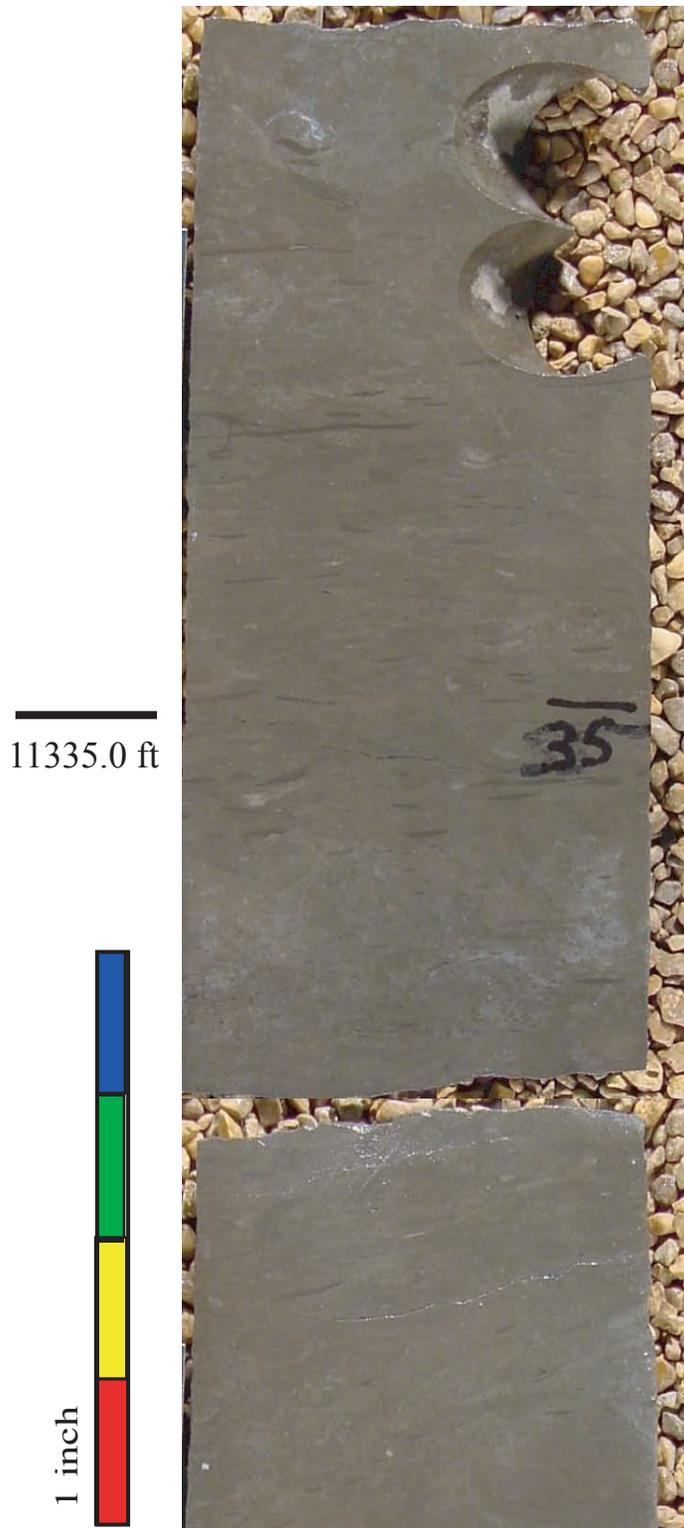
Brachiopod shells and spines within a calcareous siltstone. Locally calcite cement has been replaced with dolomite. Fossil fragments are commonly replaced with pyrite.



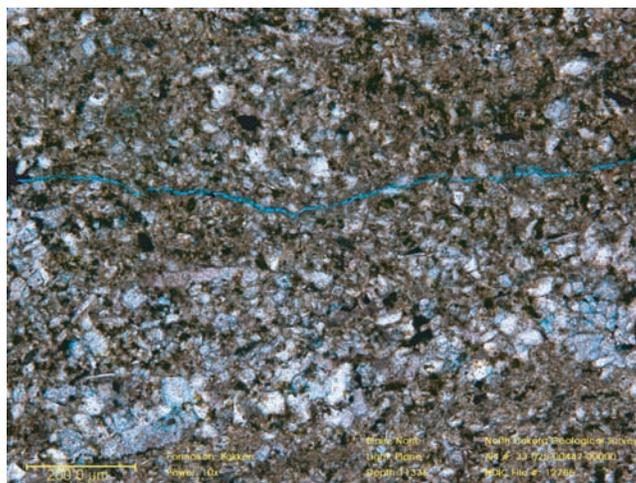
Microfractures and interparticle porosity within calcareous siltstone.

# Lower Lithofacies 2

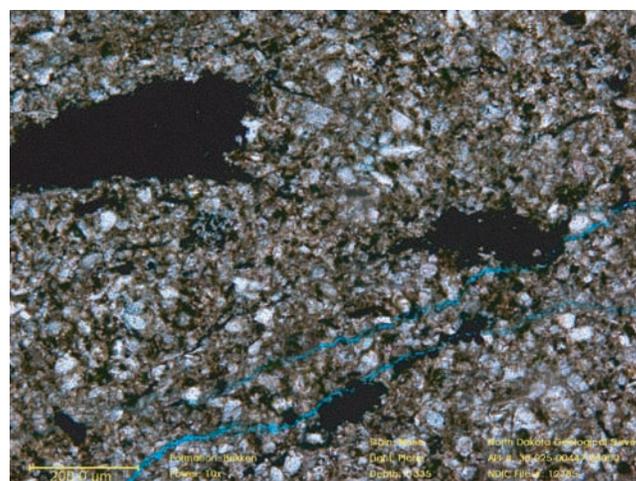
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Maxus Exploration Co.  
#21-19 Carus Fee  
KB = 2547



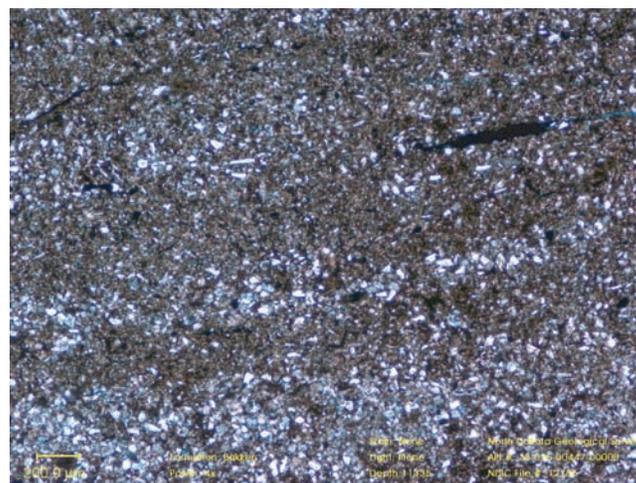
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Dolomitization has occurred along small lenses or thin laminae of calcite. Interparticle-intercrystalline and microfracture porosity are prevalent.



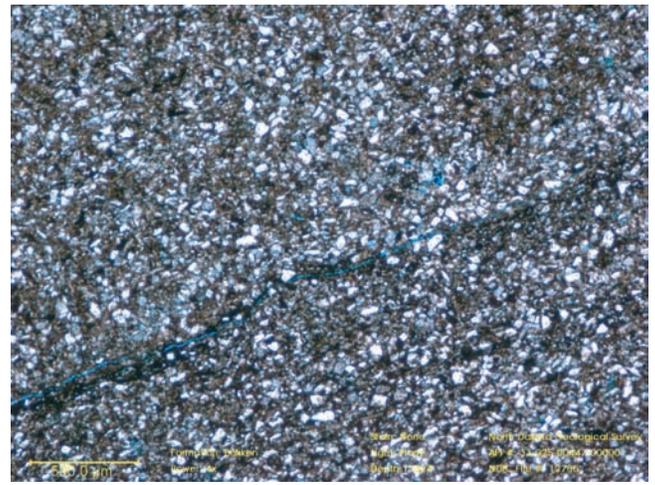
Open and pyrite cemented microfractures within clay draped sandstone-siltstone sequence. Some of the calcite cement exhibits dolomitization.



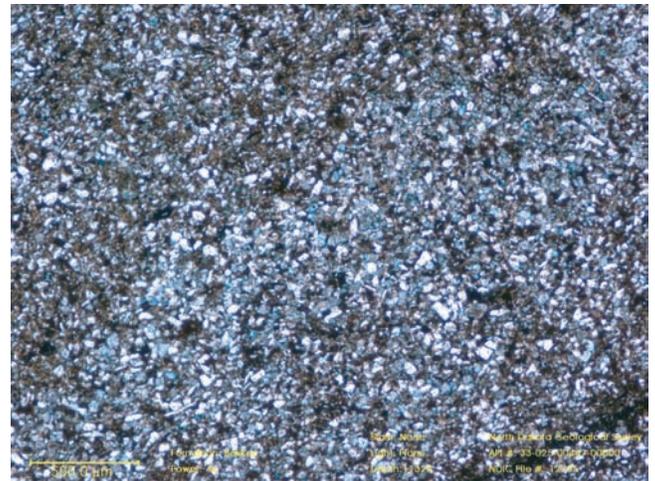
Very fine-grained sandstone-siltstone laminae overlain by clay drapes with pervasive interparticle and microfracture porosity.

# Upper Lithofacies 2

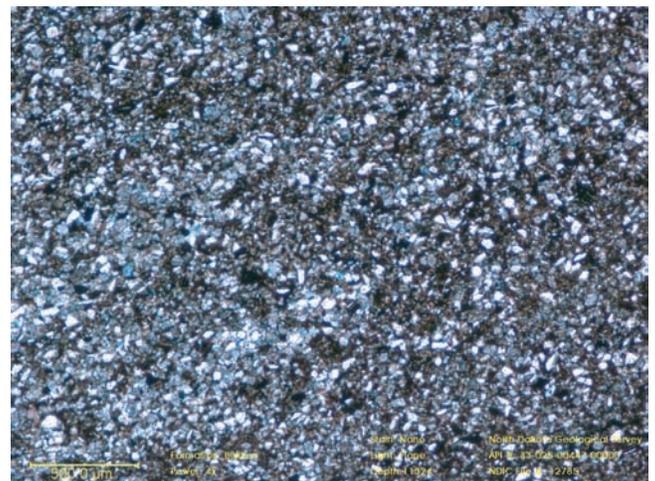
NENW Sec. 19, T.147N., R.96W.  
Maxus Exploration Co.  
#21-19 Carus Fee  
KB = 2547



Interparticle and microfracture porosity are prevalent in the very fine-grained sandstone to siltstone interbeds.



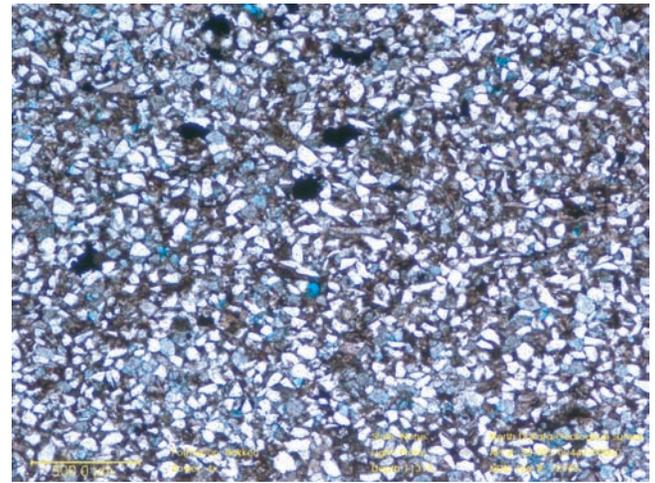
Pervasive interparticle porosity within thin dolomitic limestone beds.



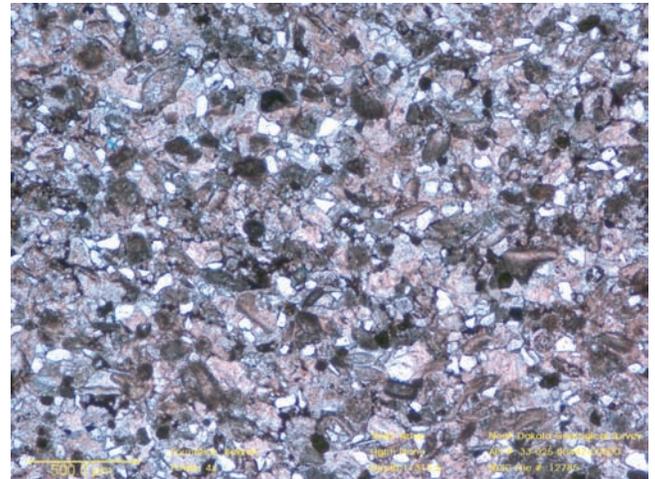
Interbedded dolomitic limestone with a very fine-grained sandstone-siltstone. Heavily burrowed with interparticle porosity.

# Lithofacies 3

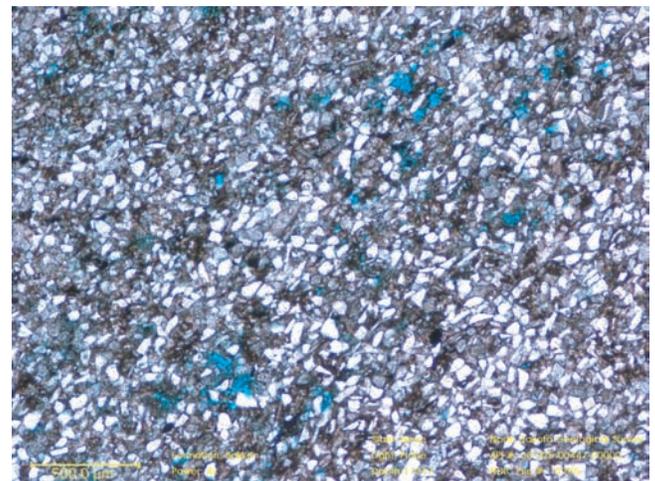
NENW Sec. 19, T.147N., R.96W.  
 Maxus Exploration Co.  
 #21-19 Carus Fee  
 KB = 2547



Very fine-grained sandstone to siltstone with well developed interparticle porosity. Microfractures are also present.



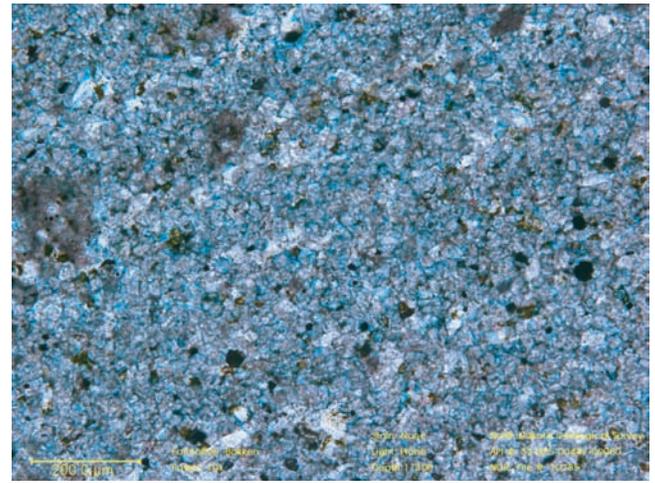
Silty limestone with bioclastic material. Porosity is minimal to non-existent.



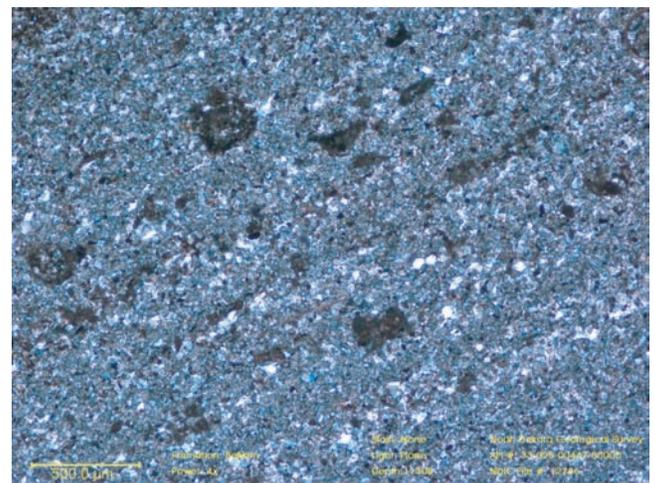
Calcareous siltstone to very fine-grained sandstone with abundant interparticle porosity

# Lithofacies 4

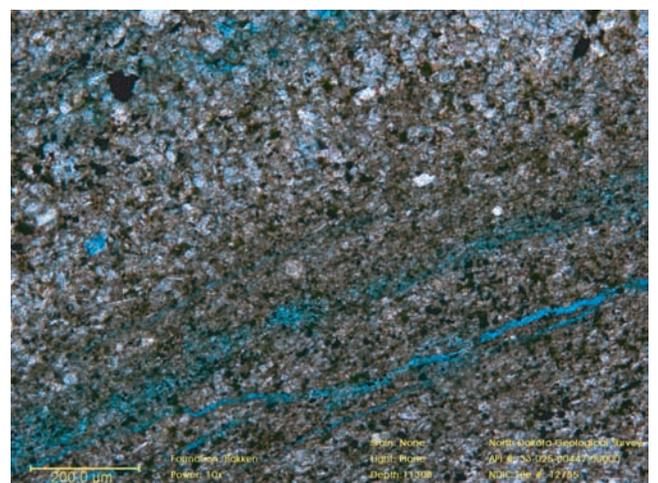
NENW Sec. 19, T.147N., R.96W.  
 Maxus Exploration Co.  
 #21-19 Carus Fee  
 KB = 2547



Dolostone bed with abundant interparticle porosity.



Silty dolomitic limestone with pervasive interparticle porosity.



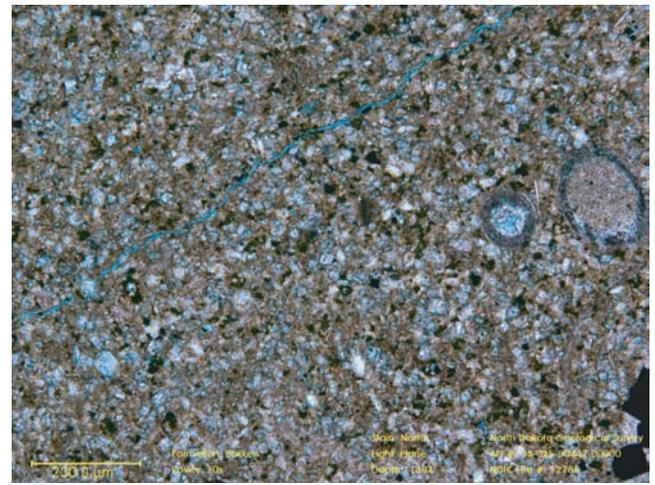
Calcareous siltstone to very fine-grained sandstone interbedded with thin dolomitic limestone beds. Microfracturing is prominent in siltstone-sandstone layers and with interparticle porosity in the carbonates.

1 inch

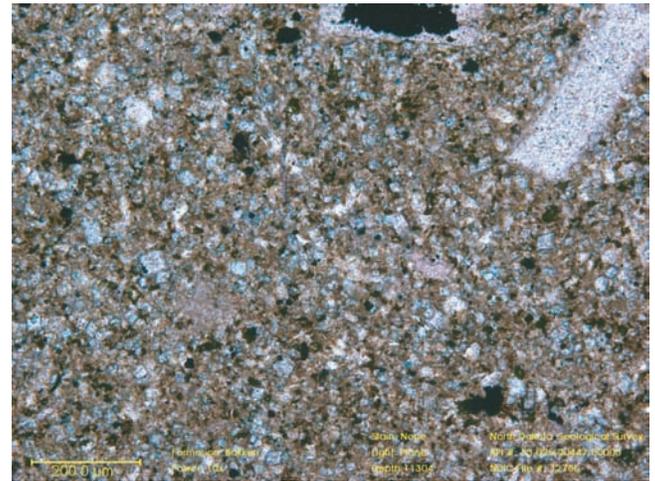
11309.0 ft

# Lithofacies 5

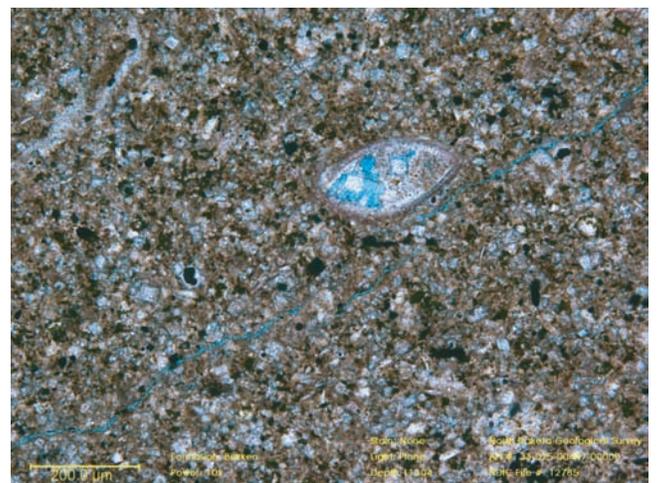
NENW Sec. 19, T.147N., R.96W.  
 Maxus Exploration Co.  
 #21-19 Carus Fee  
 KB = 2547



Dolostone with abundant interparticle porosity and some moldic and microfracture porosity.



Dolomitic limestone with pervasive interparticle porosity. Pyrite grains and replacement of fossil fragments by pyrite are common.



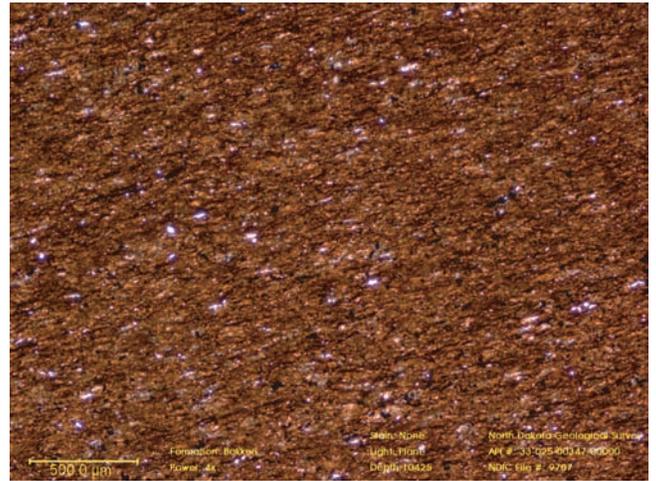
Silty dolomitic limestone with brachiopods and brachiopod fragments. Pyrite grains are also abundant through this lithofacies. This interval has abundant interparticle porosity and limited microfracture and moldic porosity.

# Upper Bakken Shale

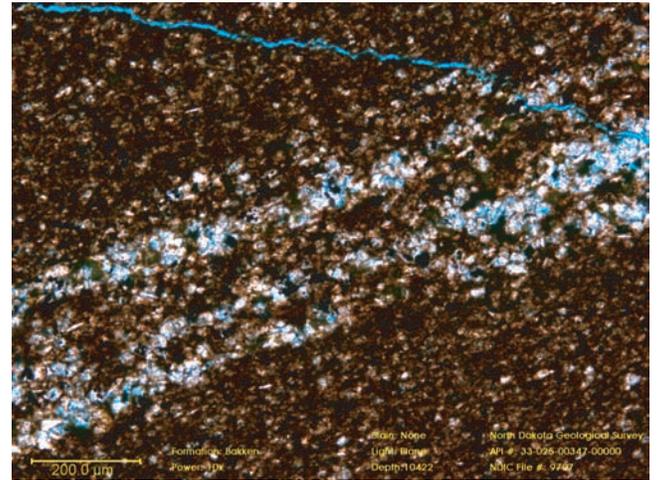
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Maxus Exploration Co.  
#21-19 Carus Fee  
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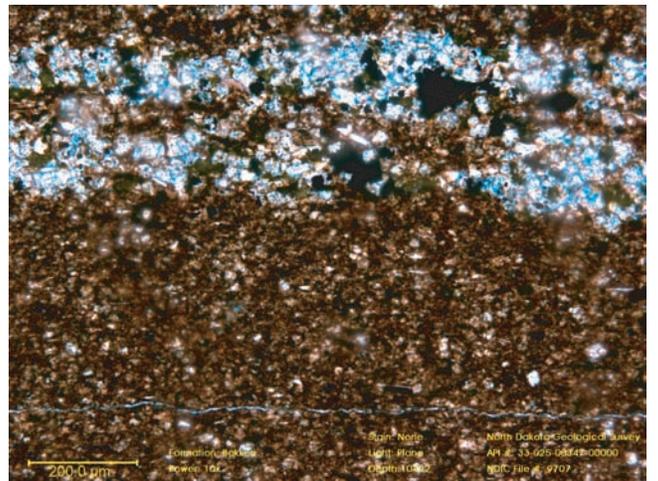
11301.0 ft



Organic shale.



Shale with thin laminae of calcite and cross-cutting microfracture.



Organic shale with thin calcareous laminae. Pyrite and dolomite grains are also present throughout the shale. Microfracture is present towards the bottom of the photograph.