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Geological Wellsite Report - Talisman Energy, Saint-Edouard No 1

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GEOLOGICAL WELLSITE REPORT

TALISMAN SAINT EDOUARD No. 1

700/1/46/52637/071/77769/0

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GEOLOGICAL WELLSITE REPORT

TALISMAN SAINT EDOUARD No. 1

700/1/46/52637/071/77769/0

Prepared For: Jean Yves Chatellier; Talisman Energy

By: Daniel Rota, April 10, 2009

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WELL SUMMARY

WELL NAME:	**TALISMAN SAINT EDOUARD NO. 1**
LOCATION:	N 46deg 31' 35.4" / W 71deg 46' 40.4"
UWI:	**700/1/46/52637/071/7769/0**
COORDINATES:	W 72deg 50' 31.1" / N 45deg 57' 05.1"
WELL LICENSE:	2008 FA 267 AFE: # 69413
ELEVATIONS:	Ground: 88.7m KB: 93.35 m
OPERATOR:	Talisman Energy
DRILL CONTRACTOR:	Horizon Rig #701
WELLSITE SUPERVISION:	Engineer: William Carthwright / John Vander Heide
	Geologist: Daniel Rota
WELL SPUDDED:	19:00 hrs; 21-2-2009
DRILLING COMPLETED:	07:15 hrs; 1-4-2009
BOTTOM HOLE FORM:	Chazy / Beekmanton
TOTAL DEPTH:	Driller: 2585m Logger: 2586m
BIT SIZES:	Surface: 311mm
	Intermediate: 222mm
	Core: 200mm
	Main: 156mm
CASING SIZES:	Surface: 244.5mm (Set @ 447 m)
	Intermediate: 177.8 mm (Set @ 1761.3)
CORES CUT:	1740m -1950m
LOGS RUN:	Log: 1st decent: Platform Express, Spontaneous Potential , Laterolog Array Gamma-Ray Spectroscopy, Lithodensity, Sonde 90 degree offset, Elemental Capture Sonde;2nd decent: Formation Micro-Imager, Dipole Shear Sonic, Powered Positioning Caliper; 3rd decent: Vertical Seismic Profile
	Interval: 2585.9 to 50 meters
DRILL STEM TESTS:	None
RIG RELEASE:	23:59 hrs; 11-4-2009 (Estimated)
WELL STATUS:	Potential Lorraine/Utica gas well
MUD TYPE:	Gel Chem.
SAMPLE REQUIREMENTS:	Company: Interval: 25m - 2995m
	Government Interval: 25m-2995m (vials plus sample bags)

DAILY SUMMARY

(Reports as at 24:00 hrs.)

21-2-2009
Depth: 62m; **Progress:** 62m; **Status:** drilling surface hole
Complete rigging-up
Spud at 09:00
Drill 311mm surface hole to 62m
Trouble shoot Baker's directional tools.

22-2-2009
Depth: 252m **Progress:** 252m; **Status:** drilling surface hole
Drill and survey to 252m

23-2-2009
Depth: 405m; **Progress:** 153m; **Status:** drilling surface hole
Drill and survey to 336m
Repair drawwork converter
Drill and survey to 405m

24-2-2009
Depth: 531m; **Progress: 126**m; **Status:** drilling surface hole
Drill and survey to 531m

25-2-2009
Depth: 545m; **Progress:** 14m; **Status:** surface casing point
Drill and survey to 532m
Wiper trip back ream to 27m
Run into the hole
Wash from 378 to 532m
Drill to 545m surface casing point

26-2-2009
Depth: 545m; **Progress: 0**m; **Status:** wait on cement
Condition and case the hole
cement 244.5mm casing
Wait on cement
Nipple down diverter

27-2-2009
Depth: 545m; **Progress:** 0m; **Status:** running into the hole to drill
Cut casing and weld on casing bowl
Pressure test the well, Handle directional tools ,
Ran into the well to 276m

28-2-2009
Depth: 789m; **Progress:** 234m; **Status:** drill and survey 222mm hole
Drill out Wiper plug and float shoe
Tag top of cement 529.75
Drill and survey main hole to 789m

1-3-2009
Depth: 1167m; **Progress:** 378m; **Status:** drill and survey 222mm hole
Drill and survey 222mm intermediate hole to 1167m

2-3-2009
Depth: 1378m; **Progress:** 211m; **Status:** drill and survey 222mm hole
Drill ad survey to 1378m

3-3-2009
Depth: 1527m; **Progress:** 191m; **Status:** drill and survey 222mm hole
Drill and survey to 1527m

4-3-2009
Depth: 1718m; **Progress:** 191m; **Status:** drill and survey 222mm hole
Drill and survey 222mm main hole to 1718m

5-3-2009
Depth: 1740m; **Progress:** 22m; **Status:** drill and survey 222mm hole
Drill and survey 222mm main hole to 1740m
Pull out lay down vertitrak
Pick up coring tools
Install rotating head
Receive order to lay coring tools.
Pull out rotating head.

6-3-2009
Depth: 1740m; **Progress:** 0m; **Status:** wiper trip
Wiper trip.

7-3-2009
Depth: 1740m; **Progress:** 0m; **Status:** rig repair
Pull out of the hole
Pressure test
Assemble coring tools
Was down 1237-1600
Trip down encounter fill from 1714-1725

8-3-2009
Depth: 1747m; **Progress:** 7m; **Status:** coring
Trip down to core point 1740
Start coring
Core to 1747

9-3-2009
Depth: 1765m; **Progress:** 18m; **Status:** coring
Core and retrieve core to 1765.5m

10-3-2009
Depth: 1765m; **Progress:** 0m; **Status:** trip down with directional tools
Pull out with wireline
Rig out wireline and prepare to trip
Trip out pressure testing
Pull to surface and lay down core assembly
Trip and wash to 1635 with directional tools

11-3-2009
Depth: 1868m; **Progress:** 103m; **Status:** directional drilling vertically
Wash to bottom with directional tools
Drill and survey 1868m

12-3-2009
Depth: 1882m; **Progress:** 14m; **Status:** tripping out
Drill to 1882m
Trip out to 155m

13-3-2009
Depth: 1882m; **Progress:** 0m **Status:** ready to core
Trip out
Lay down directional tools
Assemble coring tools
Trip down to bottom
Rig up wireline

14-3-2009
Depth: 1911m; **Progress:** 29m; **Status:** coring
Cut and retrieve core to 1911m

15-3-2009
Depth: 1930m; **Progress:** 19m; **Status:** coring
Cut and retrieve core to 1930.8m

16-3-2009
Depth: 1934 m; **Progress:** 4m; **Status:** wireline survey
Cut and retrieve core 1934.8
Circulate gas out and wireline survey 2deg

17-3-2008
Depth: 1964m; **Progress:** 30m; **Status:** coring
Drill 222mm hole with insert to 1950m
Resume coring
core and retrieve core to 1964.6m

18-3-2009
Depth: 1987m; **Progress:** 23m; **Status:** coring
Cut and retrieve core to 1987m

19-3-2009
Depth: 2011m; **Progress:** 28m; **Status:** coring
Cut and retrieve core to 2011m

20-3-2009
Depth: 2030m; **Progress:** 19m; **Status:** coring
Cut and retrieve core from 2011 to 2030.3m
Rig up wireline and run into the hole
Ream 2028 to 2030.1m
Drill 2030.1 to 2030.3

21-3-2009
Depth: 2031m; **Progress:** 1m; **Status:** pulling out to check bit
Retrieve core
Core from 2030.3-2031.24
Bit pressuring stop coring
Retrieve core barrel
Pull out check bit
Pull out to 727m

22-3-2009
Depth: 2058m; **Progress:** 27m; **Status:** drill and survey 222mm hole
Pull out surface
Make up directional tools
Run and wash to the bottom
Directional drill to 2058m

23-3-2009
Depth: 2137m; **Progress:** 79m; **Status:** drill and survey 222mm hole
Directional drill to 2137m

24-3-2009
Depth: 2208m; **Progress:** 72m; **Status:** condition well to log
Drill and survey to 2208,
Circulate up sample
Wiper trip wash down 2208-2030m

25-3-2009
Depth: 2208m; **Progress:** 0m; **Status:** condition well to log
Pull to surface lay down directional tools
Shut down for press release conference with minister and others?
Hand over to Schlumberger
Run wireline run 1 PEX,HRLA,ECS,HGS.
Bridge of at 1785m
Log 1785- surface
Lay down Schlumberger wire line and make up clean up bit
Run to 214m

26-3-2009
Depth: 2208m; **Progress:** 0m; **Status:** condition well to log
Continue to run into the hole, wash down to bottom
Pull out with flow check
Rig up Schlumberger.
Hit bridge at same spot 1785m
Lay down logging tools

27-3-2009
Depth: 2208m; **Progress:** 0m; **Status:** condition well to log
Make up cleaning bit
Run into the hole
Work up pipes between 1778 and 1791m
Run down to bottom and pull out to 1117
Flow checks

28-3-2009
Depth: 2208m; **Progress:** 0m; **Status:** clean hole to run VSP
Complete clean up trip
Rig up loggers
Run into the hole with FMI & DSI tools cable cut at 2085m
Pull out rig up run #1PEX, HRLA, ECS, MNGS
Try to log below 1785, tag bridge at 2152m
Tool stuck at 2152, held on max tension for 1 & 1/2 hr tool come free
Log to surface
Clean up trip

29-3-2009
Depth: 2208m; **Progress:** 0m; **Status:** logging with VSP
Complete clan p trip
Rig VSP tool

30-3-2009
Depth: 2208m; **Progress:** 0m; **Status:** condition well for casing
Continue VSP log
Rig out and release Schlumberger
Condition well for casing

31-3-2009
Depth: 2208m; **Progress:** 0m; **Status:** cementing casing/ WOC
Condition hole for casing and run
Rig up cementers casing
Cement casing
WOC

1-4-2009
Depth: 2208m; **Progress:** 0m; **Status:** run into the hole to resume drilling
Complete cementing casing
Pressure testing
Run into the hole to 781m

2-4-2009
Depth: 2277m; **Progress:** 69m; **Status:** run into the hole to resume drilling
Run into the hole and drill to 2277m

3-4-2009
Depth: 2419m; **Progress:** 142m; **Status:** drilling 156mm production hole
Drill to 2419m

4-4-2009
Depth: 2419m; **Progress:** 142m; **Status:** bit trip
Drill to 2527m
Tripping for bit

5-4-2009
Depth: 2542m; **Progress:** 15m; **Status:** drilling 156mm production hole
Complete bit trip
Drill to 2542m

6-4-2009
Depth: 2584m; **Progress:** 15m; **Status:** Total Depth – conditioning well
Condition well to log

7-4-2009
Depth: 2584m; **Progress:** 0m; **Status:** Total Depth - logging
Pull out to log
Logging with Schlumberger
Run 1 PEX, HNLA, HNGS, HRMS, SP
Run 2 DSI, FMI, SGTN

8-4-2009
Depth: 2584m; **Progress:** 0m; **Status:** Total Depth - circulating
Complete logging run 2
Rig up to run bridge plug with wire line
Set bridge plug at 2150m
Lay down wireline equipment
Fill pipes circulate and pressure test.
Run into the hole

9-4-2009
Depth: 2584m; **Progress:** 0m; **Status:** Total Depth – rigging out
Continue to run into the hole to 2000m
Fill the hole with fresh water
Pull out and begin to rig out

CASING SUMMARY

Surface Casing
Ran 42 joints of 244.5mm, 53.6kg/m, Tenaris J55 surface casing. Cemented by Schlumberger with 30 tonnes of RFC" + 0.2 % D046. Cement set from 4.65 to 545 .Landed at 5.45m. Plug down at 17:30 hrs; 26 - 2 - 2009 with $9m^3$ cement returns to surface.

Intermediate Casing
Ran 161 joints of 177.8mm, 38.69kg/m, Tenaris P-110 production casing. Cemented by Schlumberger with 96 tonnes of class "G" 1950kg/m3 4%D-167+2%D-46+1% D-65+101/m3F04/m3" Landed at 2208m. Plug down at 02;30 hrs; 1 -4 - 2009 with $21m^3$ cement returns to surface.

Production Casing
Well plugged pending further testing

GEOLOGICAL SUMMARY

The well **TALISMAN SAINT EDOUARD NO. 1** was situated at the end of rang Leclerc 8km south of Saint Edouard Lotbiniere County, Quebec. The well was drilled between the Februare 21, 2009 and the April 1, 2009. Saint Edouard 1 was drilled principally to detect possible hydrocarbon zones in the Lorraine and Utica shales and the Trenton limestone formation. It was terminated at 2584 meters in the Beekmanton formation.
Five meters samples were collected and washed during the drilling of the entire well. One of the sets was collected for Talisman Energy and the second for the Quebec Ministry of Natural Resources. Five meter unwashed samples were also collected for the Quebec Government during the entire drilling of the well. Ten meters samples were collected from the surface casing shoe and to core point. They were sent to Petrocraft in Calgary for bio stratigraphic analysis.

BioJar mud and cutting samples were collected every 100m. One second set of BioJar samples was collected every 200m and analyzed to verify the reliability of the analysis. Nine Isotubes were collected for gas analysis. All GeoJars and Isotubes were sent for analysis to Geomark Research, Lafayette, Louisiana.
Reed / Hycalog / Corion completed three phases of coring totaling 160.2m. Of that, 157.7m were recovered. The average recovery rate was 98.4%. The core handling and descriptions was executed by Terratek (Schlumberger, Calgary) and all the core was subsequently shipped free of freezing to the INRS lab in Quebec City.
The results and conclusion of these studies are not available at this time.
Gas values was and composites was monitored by a chromatograph from Continental Laboratories. Total Gas, Heavy gas and CO2 curves were incorporated in the WellSight striplog. Both equipment and personnel were flawless producing very reliable data.
Two separated periods of logging were performed by Schlumberger, Halifax. Again the log interpretation proved to be very difficult due to the lack of contrast of the various formations intersected. While the presence of gas was obvious during the drilling the observed porosity was practically non-existent and no evidence of appreciable permeability was detected in the drilling samples. The interpretation was, as usual, very difficult with the only apparent porosity being restricted to the Trenton where identified porosity was generally around 5% or less.

The Lorraine formation. Saint Edouard No. 1 was started in the Lorraine Formation which consisted of gray shale gray, occasionally black, calcareous, in part carbonaceous with common organic coating. The Lorraine shale was slightly micromicaceous, silty, moderately hard and blocky. Occasionally sub fissile, rare clear and white calcite crystals was present and trace of relic bedding was present throughout the entire Lorraine shale. Sandstone: light gray, dark gray, salt and pepper was commonly interbeded with the shale. The sandstone was quartzose, occasionally carbonaceous, micaceous and, lithic with rare of pyrite. It was silty, fine silt to very fine grained , poorly sorted, hard, occasionally slightly bedded with calcareous cement and mainly with tight porosity. Oil staining could not be identified. Rare Siltstone: gray, calcareous, coarse silt, sandy, hard, blocky, no stain was also present . The Lorraine formation was frequently faulted. Faulting could be identified by the presence of numerous micro fractures filled by white calcite and the obvious presence of slickensides. The gas background of the Lorraine shale was generally high especially between 1370-1430m were the highest value 8844 units was recorded at 1391m. A second anomalous zone was also identified between 1710 and 1740m. The maximum gas value reached 9291units. The mud density was 1795kg/m3.

Trenton? *Utica (Dodgeville)* was drilled between 1857m MD, 1857m TVD, -1754.7m SS and 1869m MD, 1869m TVD, -1766.7mSS. The Limestone was white to light gray, very fine to medium grained, occasional crystalline hard massive with calcareous cement. The porosity could not be seen. Shale: dark gray, black, commonly carbonaceous, slightly calcareous and partly micromicaceous was interbeded with the Limestone. The shale was hard, blocky with abundant disseminated calcite and micritic calcite stringers. Occasional loose calcite fragments were common. Gas was not present with the sliver of Trenton Limestone.

Faulted Utica 1869md, 1869mtvd, -1766.7mSS. The Faulted Marlstone: dark gray, very calcareous, silty, faulted, common slickensides coated with black organic material was the main component of the Faulted Utica. The Utica showed fractured fragments with calcite and siltstone inclusion, common calcite veins and trace of relic bedding. The shale was hard and blocky. Siltstone, light brown grey was common. It was calcareous, coarse silt, soft, brittle and blocky with abundant loose white calcite fragments. The gas background of the Utica was very high with peaks values of 5487, 4787 and 9433 units recorded at 1911, 1918 and 1931m respectively. The mud density was 1805kg/m3.The bottom of the Lorraine formation was intersected at 1936md, 1936mtvd, -1842.7mSS

Utica *(allocht Dodgeville)* 1936md, 1936mtvd, -1842.7mSS The Utica consisted of a monotonous package of Marlstone: dark black, very calcareous, occasional carbonaceous, rare micaceous, hard, predominantly blocky. The Marlstone was generally sub fissile with common black organic material, rare slickensides with organic coating and occasional very thin calcite lamination. Roughly 120 meters; 40meters of the upper faulted Utica and 80m of the Utica were cored and taken to the INRS in Quebec City for detailed stratigraphic and petrographic study. The gas background of the Utica Shale hovered around 100 units. Numerous highly anomalous values were recorded while coring . The highest anomaly recorded at 2031m reached 4450 units.

Trenton Formation 2195md, 2191.9mTVD, -2098.6mSS. Limestone: white, light gray, chalky, micritic, micro granular, soft to moderately hard was the predominant unit of the Trenton formation. The Limestone was blocky with occasional

bedding and shear. The porosity fluctuated between t tight to poor porosity. Staining could not be seen. Minor Marlstone: dark gray, very calcareous, in part micromicaceous, hard, blocky was interbeded with the Limestone. Common very fine disseminated calcite, thin calcite vein and calcite inclusion was common in the marlstone. Despite the apparent lack of porosity of the Trenton formation the total gas values recorded were consistently very high. Gas started appearing at 2237m with 2026 units and remained with a 1500 units background throughout the entire Trenton formation. The highest gas values recorded as follow: 2252m 4432 units, 2367m 5601 units, 2377m 4412 units, 2390m 4530units, 2445m 4198 units and 3452m 4450 units.

The well was terminated in the Beekmanton Formation (2519md, 2515.8mtvd, -2422.5mSS) The Beekmanton Formation consisted of Sandstone: white with clear quartz, medium to coarse grained, rounded, well sorted, unconsolidated without cement. The porosity was inferred good intergranular porosity without oil stain, Shale: dark gray and black, slightly calcareous, hard, blocky was interbeded with the sand. Various remnants of Limestone: white and gray, micritic, very fine grained, hard, banded with slickensides: abundant large angular clear quartz fragments was also present at the top of the Beekmanton formation

Saint Edouard No.1was terminated at 2584m, 2580.9mtvd, -2487.5mSS in the Beekmanton Formation. It was plugged and will be tested as a possible gas producer from the Utica and Trenton formations.

FORMATION TOPS
(KB: 93.35 m)

The original prognosis was based on the Quebec Saint Lawrence stratigraphy however the final interpretation used the more detailed Upper New York Finger Lake table of formations. This is a best effort to reconcile the two. The final compilation while being workable could present some discrepancies.

FORMATION	PROGNOSED(m)		SAMPLE(m)			LOGS		
	MD (md)	SS (mSS)	MD	TVD	SS	MD (md)	TVD	SS
Glacial drift	0	92.7						
Queenston	4	88.7						
Lorraine	280	-187.3	278	278	-184.7			
Faulted to Lorraine	650	-557.3						
Faulted Lorraine	1750	-1657.3						
Trenton? *Utica (Dodgeville)*	1850	-1757.3	1857	1857	-1763.7	1868	1868	-1774.7
Faulted Lorraine			1916	1916	-1822.7	1916	1916	-1822.7
Utica *(allocht Dodgeville)*	1900		1936	1936	-1842.7	1959	1959	-1865.7
Lower Dodgeville						2003	2003	-1909.7
Lower Utica (Flat Creek)						2045	2045	-1951.7
Trenton Black River	2040	-1947.3	2195	2191.9	-2098.6	2162	2162	-1968.7
Chazy	2200	-2107.3						
Beekmantown	2220	-2127.3	2519	2515.8	-2422.5	2518	2514.8	-2423.5
TD	2260	-2167.3	2584	2580.8	-2487.5	2585	2581.8	-2488.5

Normal font indicates Saint Lawrence Lowlands original prognosis.
Italicized case indicates the final interpretation using New York stratigraphy for the log interpretation

SAMPLE DESCRIPTIONS

55-70	**Shale:** gray, occasional black, calcareous, occasional carbonaceous with common organic coating, minor micromicaceous, silty, moderately hard, blocky, occasional sub fissile, common coarse calcite clear and white crystals, trace relic bedding.
70-85	**Shale:** gray, occasional black, calcareous, occasional carbonaceous with common organic coating, minor micromicaceous, silty, moderately hard, blocky, occasional sub fissile, rare clear and white calcite crystals, trace relic bedding.
85-95	**Sandstone:** gray, salt and pepper, quartzose, lithic with common coal grains, very fine silt to very fine, poorly sorted, hard, calcareous cement, tight porosity, no stain, Shale: gray, occasional black, calcareous, occasional carbonaceous with common organic coating, minor micromicaceous, silty, moderately hard, blocky, occasional sub fissile, rare clear and white calcite crystals.
95-100	**Shale:** gray, occasional black, calcareous, occasional carbonaceous with common organic coating, minor micromicaceous, silty, moderately hard, blocky, occasional sub fissile, rare clear and white calcite crystals, common relic bedding, trace slickenside.
100-105	**Shale:** gray, black, calcareous, carbonaceous with common organic coating, in part micromicaceous, silty, hard, predominant blocky, rare fissile, relic bedding, trace slickenside, minor white calcite.
105-115	**Sandstone:** gray, salt and pepper, quartzose, lithic with common coal grains, silty, very fine silt to very fine, poor sorted, hard, calcareous cement, tight porosity, no stain, Shale: gray, black, calcareous, carbonaceous with common organic coating, in part micromicaceous, silty, hard, predominant blocky, rare fissile, relic bedding, trace slickenside, minor white calcite.
115-135	**Sandstone:** gray, salt and pepper, occasional white, quartzose, lithic with common coal grains, silty, very fine silt to very fine, poor sorted, hard, calcareous cement, tight porosity, no stain, Shale: gray, black, calcareous, carbonaceous with common organic coating, in part micromicaceous, silty, hard, predominant blocky, rare fissile, relic bedding, trace slickenside, minor white calcite.
135-140	**Sandstone:** gray, salt and pepper, occasional white, quartzose, lithic with common coal grains, silty, very fine silt to very fine, poor sorted, hard, calcareous cement, tight porosity, no stain, Shale: gray, black, calcareous, carbonaceous with common organic coating, in part micromicaceous, silty, hard, predominant blocky, rare fissile, relic bedding, trace slickenside, minor white calcite, trace pyrite.
140-155	**Sandstone:** gray, salt and pepper, occasional white, quartzose, lithic with common coal grains, very fine silt to very fine, poor sorted, hard, calcareous cement, tight porosity, no stain, Shale: gray, black, calcareous, carbonaceous with common organic coating, in part micromicaceous, silty, hard, predominant blocky, rare fissile, relic bedding, trace slickenside, minor white calcite.
155-160	**Sandstone:** gray, salt and pepper, occasional white, quartzose, lithic with common coal grains, very fine silt to very fine, poor sorted, hard, calcareous cement, tight porosity, no stain, Shale: gray, black, calcareous, carbonaceous with common organic coating, in part micromicaceous, silty, hard, predominant blocky, rare fissile, relic bedding, minor white calcite, rare calcite vein.
160-180	**Sandstone:** gray, salt and pepper, occasional white, quartzose, lithic with common coal grains, silty, very fine silt to very fine, poor sorted, hard, calcareous cement, tight porosity, no stain, Shale: gray, black, calcareous, carbonaceous with common organic coating, in part micromicaceous, silty, hard, predominant blocky, rare fissile, relic bedding, minor white calcite.
180-200	**Sandstone:** gray, salt and pepper, occasional white, quartzose, lithic with common coal grains, silty, very fine silt to very fine, poor sorted, hard, calcareous cement, tight porosity, no stain, Shale: gray, black, calcareous, carbonaceous with common organic coating, in part micromicaceous, silty, hard, predominant blocky, rare fissile, relic bedding, minor white calcite, trace white calcite stringers.

200-225	**Sandstone:** gray, salt and pepper, occasional white, quartzose, lithic with common coal grains, silty, very fine silt to very fine, poor sorted, hard, calcareous cement, tight porosity, no stain, Shale: gray, black, calcareous, carbonaceous with common organic coating, in part micromicaceous, silty, hard, predominant blocky, rare fissile, relic bedding, minor white calcite, trace white calcite stringers.
225-250	**Sandstone:** gray, salt and pepper, occasional white, quartzose, lithic with common coal grains, micaceous, silty, very fine silt to very fine, poor sorted, hard, calcareous cement, tight porosity, no stain, Shale: gray, black, calcareous, carbonaceous with common organic coating, in part micromicaceous, silty, hard, predominant blocky, rare fissile, occasional relic bedding, minor white calcite, trace white calcite stringers.

250-260	**Siltstone:** gray, calcareous, quartzose, very fine silt, sandy, hard, blocky, Shale: gray, dark gray and black, calcareous, carbonaceous, common organic material, in part micromicaceous, silty, hard, blocky, common micritic calcite stringers, trace loose calcite.
260-275	**Sandstone:** gray, dark gray, occasional white, quartzose with coal grains, very fine silt to very fine grained, rounded, silty, hard, calcareous cement, tight porosity, no stain, Shale: gray, dark gray and black, calcareous, carbonaceous, common organic material, in part micromicaceous, silty, hard, blocky, rare fissile, trace relic bedding, common micritic calcite stringers, trace loose calcite.
	Faulted to Lorraine 278md, 278mtvd, -184.7mSS
275-280	**Sandstone:** gray, dark gray, occasional white, quartzose with coal grains, micaceous, very fine silt to very fine grained, rounded, silty, hard, calcareous cement, tight porosity, no stain, Shale: gray, dark gray and black, calcareous, carbonaceous, common organic material, in part micromicaceous, silty, hard, blocky, rare fissile, trace relic bedding, common micritic calcite stringers, trace loose calcite, trace loose clear quartz.
280-290	**Shale:** gray, dark gray, black, slightly calcareous, carbonaceous, micromicaceous, hard, blocky, trace bedding, common micritic calcite stringers. Sandstone: gray, dark gray, occasional white, quartzose with coal grains, micaceous, very fine silt to very fine grained, rounded, silty, hard, calcareous cement, tight porosity, no stain. rare loose coarse white calcite.
290-295	**Shale:** gray, dark gray, black, slightly calcareous, carbonaceous, micromicaceous, hard, blocky, trace bedding, common micritic calcite stringers. Sandstone: gray, dark gray, occasional white, quartzose with coal grains, micaceous, very fine silt to very fine grained, rounded, silty, hard, calcareous cement, tight porosity, no stain. rare loose coarse white calcite, trace red chert grained.
295-300	**Shale:** gray, dark gray, black, slightly calcareous, carbonaceous, micromicaceous, hard, blocky, trace bedding, common micritic calcite stringers, Sandstone: gray, quartzose, minor coal grains, micaceous, very fine grained, well sorted, rounded, hard, calcareous cement, tight porosity, no stain.
300-315	**Shale:** gray, dark gray, black, slightly calcareous, carbonaceous, micromicaceous, hard, blocky, trace bedding, common micritic calcite stringers, Sandstone: light grey, gray, quartzose, minor coal grains, micaceous, very fine grained, well sorted, rounded, occasional sheared, hard, calcareous cement, tight porosity, no stain.
315-320	**Shale:** gray, dark gray, black, slightly calcareous, carbonaceous, micromicaceous, hard, blocky, trace bedding, common micritic calcite stringers, Sandstone: gray, dark gray, quartzose, carbonaceous, micaceous, fine silt to very fine grained, poor sorted, hard, calcareous cement, tight porosity, no stain.
320-325	**Shale:** gray, dark gray, black, slightly calcareous, carbonaceous, micromicaceous, hard, blocky, trace bedding, common micritic calcite stringers, Sandstone: gray, dark gray, quartzose, carbonaceous, micaceous, fine silt to very fine grained, poor sorted, hard, calcareous cement, tight porosity, no stain, trace loose white calcite.
325-330	**Shale:** gray, dark gray, black, slightly calcareous, carbonaceous, micromicaceous, hard, blocky, trace bedding, common micritic calcite stringers, Sandstone: light gray,dark gray, quartzose, carbonaceous, micaceous, occasional sheared, coarse silt to very fine grade, poor sorted, hard, calcareous cement, tight porosity, no stain.
330-350	**Sandstone:** light gray, dark gray, quartzose, carbonaceous, micaceous, occasional sheared, coarse silt to very fine grade, poor sorted, hard, calcareous cement, tight porosity, no stain. Shale: gray, dark gray, black, slightly calcareous, carbonaceous, micromicaceous, hard, blocky, trace bedding, common micritic calcite stringers.

350-360	**Sandstone:** light gray, dark gray, quartzose, carbonaceous, micaceous, occasional sheared, coarse silt to very fine grade, poor sorted, hard, calcareous cement, tight porosity, no stain. Shale: gray, dark gray, black, slightly calcareous, carbonaceous, micromicaceous, hard, blocky, trace bedding, common micritic calcite stringers.
360-375	**Siltstone:** gray, carbonaceous, calcareous, sandy, hard, blocky, Shale: gray, black, slightly calcareous, carbonaceous, in part micromicaceous, silty, rare bedding, blocky, occasional sub fissile, trace slickenside, micritic calcite stringers.
375-380	**Sandstone:** light gray, dark gray, salt and pepper, quartzose, occasional pyritic and carbonaceous, micaceous, fine silt to very fine grade, poor sorted, hard, calcareous cement, tight porosity, no oil stain, Shale: gray, black, slightly calcareous, carbonaceous, in part micromicaceous, silty, rare bedding, blocky, occasional sub fissile, trace slickenside, micritic calcite stringers.
380-390	**Sandstone:** light gray, dark gray, salt and pepper, quartzose, occasional carbonaceous, micaceous, silty, fine silt to very fine grade, poor sorted, hard, slightly bedding, calcareous cement, tight porosity, no oil stain, Shale: gray, black, slightly calcareous, carbonaceous, in part micromicaceous, silty, rare bedding, blocky, occasional sub fissile, trace slickenside, micritic calcite stringers.
390-415	**Sandstone:** light gray, dark gray, salt and pepper, quartzose, occasional carbonaceous, micaceous, lithic, silty, fine silt to very fine grade, poor sorted, hard, slightly bedding, calcareous cement, tight porosity, no oil stain, Shale: gray, black, slightly calcareous, carbonaceous, in part micromicaceous, silty, rare bedding, blocky, occasional sub fissile, trace slickenside, micritic calcite stringers.
415-425	**Sandstone:** light gray, dark gray, salt and pepper, quartzose, occasional carbonaceous, micaceous, lithic, silty, fine silt to very fine grade, poor sorted, hard, slightly bedding, calcareous cement, tight porosity, no oil stain, Shale: gray, black, slightly calcareous, carbonaceous, in part micromicaceous, silty, rare bedding, blocky, occasional sub fissile, trace slickenside, micritic calcite stringers.
425-435	**Sandstone:** light gray, dark gray, salt and pepper, quartzose, occasional carbonaceous, micaceous, trace pyritic, lithic, silty, fine silt to very fine grade, poor sorted, hard, slightly bedding, calcareous cement, tight porosity, no oil stain, Shale: gray, black, slightly calcareous, carbonaceous, in part micromicaceous, silty, rare bedding, blocky, occasional sub fissile, trace slickenside, micritic calcite stringers.
435-440	**Sandstone:** light gray, dark gray, salt and pepper, quartzose, occasional carbonaceous, micaceous, lithic, silty, fine silt to very fine grade, poor sorted, hard, slightly bedding, calcareous cement, tight porosity, no oil stain, Shale: gray, black, slightly calcareous, carbonaceous, in part micromicaceous, silty, rare bedding, blocky, occasional sub fissile, trace slickenside, micritic calcite stringers, trace quartz crystalline.
440-450	**Sandstone:** light gray, dark gray, salt and pepper, quartzose, occasional carbonaceous, micaceous, lithic, silty, fine silt to very fine grade, poor sorted, hard, slightly bedding, calcareous cement, tight porosity, no oil stain, Shale: gray, black, slightly calcareous, carbonaceous, in part micromicaceous, silty, rare bedding, blocky, occasional sub fissile, trace slickenside, micritic calcite stringers.
450-455	**Sandstone:** light gray, dark gray, salt and pepper, quartzose, occasional carbonaceous, micaceous, lithic, rare pyritic, silty, fine silt to very fine grade, poor sorted, hard, slightly bedding, calcareous cement, tight porosity, no oil stain, Shale: gray, black, slightly calcareous, carbonaceous, in part micromicaceous, silty, rare bedding, blocky, occasional sub fissile, trace slickenside, micritic calcite stringers.

455- 460	**Sandstone:** light gray, dark gray, salt and pepper, quartzose, occasional carbonaceous, micaceous, lithic, silty, fine silt to very fine grade, poor sorted, hard, slightly bedding, calcareous cement, tight porosity, no oil stain, Shale: gray, black, slightly calcareous, carbonaceous, in part micromicaceous, silty, rare bedding, blocky, occasional sub fissile, trace slickenside, micritic calcite stringers.
460-465	**Sandstone:** light gray, dark gray, salt and pepper, quartzose, occasional carbonaceous, micaceous, lithic, trace pyritic, silty, fine silt to very fine grade, poor sorted, hard, slightly bedding, calcareous cement, tight porosity, no oil stain, Shale: gray, black, slightly calcareous, carbonaceous, in part micromicaceous, silty, rare bedding, blocky, occasional sub fissile, trace slickenside, micritic calcite stringers.
465-475	**Sandstone:** light gray, dark gray, salt and pepper, quartzose, occasional carbonaceous, micaceous, lithic, silty, fine silt to very fine grade, poor sorted, hard, slightly bedding, rare slickensides, calcareous cement, tight porosity, no oil stain, Shale: gray, black, slightly calcareous, carbonaceous, in part micromicaceous, silty, rare bedding, blocky, occasional sub fissile, trace slickensides, micritic calcite stringers.
475-480	**Shale:** gray, black, slightly calcareous, carbonaceous, in part micromicaceous, silty, rare bedding, blocky, occasional sub fissile, trace slickensides, micritic calcite stringers.
480-500	**Sandstone:** light gray, dark gray, salt and pepper, quartzose, occasional carbonaceous, micaceous, lithic, silty, fine silt to very fine grade, poor sorted, hard, slightly bedding, rare slickensides, calcareous cement, tight porosity, no oil stain, Shale: gray, black, slightly calcareous, carbonaceous, in part micromicaceous, silty, rare bedding, blocky, occasional sub fissile, trace slickensides, micritic calcite stringers.
500-510	**Shale:** gray to black, carbonaceous, slightly calcareous, in part micromicaceous, silty, predominant blocky, rare sub fissile, common micritic calcite stringers, Sandstone: light gray, quartzose with coal and lithic grains, micaceous, silty, very fine silt to very fine grade, poor sorted, hard, calcareous cement, tight porosity, no stain.
510-515	**Shale:** gray to black, carbonaceous, slightly calcareous, in part micromicaceous, silty, predominant blocky, rare sub fissile, common micritic calcite stringers, Sandstone: light gray, quartzose with coal and lithic grains, micaceous, silty, very fine silt to very fine grade, poor sorted, hard, calcareous cement, tight porosity, no stain, trace white calcite.
515-520	**Shale:** gray to black, carbonaceous, slightly calcareous, in part micromicaceous, silty, predominant blocky, rare sub fissile, common micritic calcite stringers, Sandstone: light gray, quartzose with coal and lithic grains, micaceous, silty, very fine silt to very fine grade, poor sorted, hard, calcareous cement, tight porosity, no stain.
520-545	**Shale:** gray to black, carbonaceous, slightly calcareous, in part micromicaceous, silty, predominant blocky, rare sub fissile, common micritic calcite stringers, Sandstone: light gray, quartzose with coal and lithic grains, micaceous, silty, very fine silt to very fine grade, poor sorted, hard, calcareous cement, tight porosity, no stain, trace slickensides.
545-555	**Shale:** gray, dark gray, black, slightly calcareous, occasional carbonaceous, micromicaceous, silty, blocky, rare sub fissile, common micritic calcite stringers, Sandstone:, white, gray, quartzose with coal grains, micaceous, coarse silt, very fine grade, blocky, hard, calcareous cement, tight porosity, no oil stain, no cut, trace loose white calcite .
555-565	**Shale:** gray, dark gray, black, slightly calcareous, occasional carbonaceous, micromicaceous, silty, blocky, rare sub fissile, common micritic calcite stringers, interbedded with Sandstone:, white, gray, quartzose with coal grains, micaceous, coarse silt, very fine grade, blocky, hard, calcareous cement, tight porosity, no oil stain, no cut, trace loose white calcite, trace slickensides.

565-575	**Shale:** gray, dark gray, black, slightly calcareous, occasional carbonaceous, micromicaceous, silty, blocky, rare sub fissile, common micritic calcite stringers, interbedded with Sandstone:, white, gray, quartzose with coal grains, micaceous, coarse silt, very fine grade, blocky, hard, calcareous cement, tight porosity, no oil stain, no cut, trace loose white calcite.
575-585	**Shale:** gray, dark gray, black, slightly calcareous, occasional carbonaceous, micromicaceous, silty, blocky, rare sub fissile, common micritic calcite stringers, interbedded with Sandstone:, white, gray, quartzose with coal grains, micaceous, coarse silt, very fine grade, blocky, hard, calcareous cement, tight porosity, no oil stain, no cut, trace loose white calcite, trace very fine pyrite.
585-590	**Shale:** gray, dark gray, black, slightly calcareous, occasional carbonaceous, micromicaceous, silty, blocky, rare sub fissile, common micritic calcite stringers, interbedded with Sandstone:, white, gray, quartzose with coal grains, micaceous, coarse silt, very fine grade, blocky, hard, calcareous cement, tight porosity, no oil stain, no cut, trace loose white calcite, rare slickensides.
590-600	**Shale:** gray, dark gray, black, slightly calcareous, occasional carbonaceous, micromicaceous, silty, blocky, rare sub fissile, common micritic calcite stringers, Siltstone: gray, calcareous, coarse silt, hard, blocky, common white calcite fill, trace slickensides with organic coating.
600-615	**Shale:** gray, dark gray, black, slightly calcareous, occasional carbonaceous, micromicaceous, silty, blocky, rare sub fissile, common micritic calcite stringers, Siltstone: gray, calcareous, coarse silt, sandy, hard, blocky, in part bedded, common white calcite fill.
615-630	**Shale:** gray, dark gray, black, slightly calcareous, occasional carbonaceous, micromicaceous, silty, blocky, rare sub fissile, common micritic calcite stringers, calcite vein, calcite fill, Siltstone: gray, calcareous, coarse silt, sandy, hard, blocky, in part bedded, abundant calcite.
630-635	**Shale:** gray, dark gray, black, slightly calcareous, occasional carbonaceous, micromicaceous, silty, blocky, rare sub fissile, common micritic calcite stringers, calcite vein, calcite fill, Sandstone: gray, quartzose, carbonaceous, micaceous, s silt very fine grained, rounded, poor sorted, hard, calcareous cement, tight porosity, no stain, abundant calcite.
635-655	**Shale:** gray, dark gray, black, slightly calcareous, occasional carbonaceous, micromicaceous, silty, blocky, rare sub fissile, common micritic calcite stringers, calcite vein, calcite fill, Sandstone: gray, quartzose, carbonaceous, micaceous, slightly silt very fine grained, rounded, poor sorted, hard, calcareous cement, tight porosity, no stain, abundant calcite, trace slickensides with black organic coating, rare bedding.
655-665	**Shale:** gray, dark gray, black, slightly calcareous, occasional carbonaceous, micromicaceous, silty, blocky, rare sub fissile, common micritic calcite stringers, rare calcite fill, Sandstone: gray, quartzose, carbonaceous, micaceous, slightly silt very fine grained, rounded, poor sorted, hard, calcareous cement, tight porosity, no stain, trace slickensides with black organic coating, rare bedding
665-675	**Shale:** gray, occasional black, slightly calcareous and carbonaceous, micromicaceous, silty, hard, blocky, rare sub fissile, abundant, micritic calcite stringers, Siltstone: gray, calcareous, micaceous, carbonaceous, sandy, hard, blocky, common slickensides with calcite and organic fill, loose white and clear calcite fill, trace loose calcite.
675-680	**Shale:** gray, occasional black, slightly calcareous and carbonaceous, micromicaceous, silty, hard, blocky, rare sub fissile, abundant, micritic calcite stringers, rare slickensides organic coating, loose white and clear calcite fill, trace loose calcite.

680-685	**Shale:** gray, occasional black, slightly calcareous and carbonaceous, micromicaceous, silty, hard, blocky, rare sub fissile, abundant, micritic calcite stringers, rare slickensides with calcite vein fill and black organic coating, loose white and clear calcite fill, trace loose calcite, trace loose very fine crystalline pyrite.
685-700	**Shale:** gray, occasional black, slightly calcareous and carbonaceous, micromicaceous, silty, hard, blocky, common sub fissile, abundant, micritic calcite stringers, rare slickensides with organic coating, loose white and clear calcite, abundant flour calcite, common loose calcite.
700-715	**Siltstone:** gray, calcareous, coarse silt, sandy, hard, blocky, no stain, shale: gray, occasional black, slightly calcareous and carbonaceous, micromicaceous, silty, hard, blocky, common sub fissile, abundant, micritic calcite stringers, rare slickensides with organic coating, loose white and clear calcite, abundant flour calcite, loose white calcite.
715-725	**Siltstone:** gray, quartzose, slightly calcareous, coarse silt, sandy, hard, blocky, no stain, shale: gray, occasional black, slightly calcareous and carbonaceous, micromicaceous, silty, hard, blocky, common sub fissile, abundant, micritic calcite stringers, rare slickensides with organic coating, abundant flour calcite.
725-730	**Siltstone:** gray, quartzose, slightly calcareous, coarse silt, sandy, hard, blocky, no stain, shale: gray, occasional black, slightly calcareous and carbonaceous, micromicaceous, silty, hard, blocky, common sub fissile, abundant, micritic calcite stringers, rare slickensides with organic coating, abundant flour calcite, trace loose crystalline pyrite.
730-735	**Siltstone:** gray, quartzose, slightly calcareous, coarse silt, sandy, hard, blocky, no stain, shale: gray, occasional black, slightly calcareous and carbonaceous, micromicaceous, silty, hard, blocky, rare sub fissile, abundant micritic calcite stringers, abundant flour calcite.
735-740	**no sample**
740-750	**Siltstone:** gray, quartzose, slightly calcareous, with occasional calcite fill, coarse silt, sandy, hard, blocky, no stain, shale: gray, occasional black, slightly calcareous and carbonaceous, micromicaceous, silty, hard, blocky, rare sub fissile, abundant micritic calcite stringers, abundant flour calcite, rare calcite vein with black organic coating.
750-770	**Siltstone:** gray, quartzose, from slightly to coarse calcareous, with occasional calcite fill, coarse silt, sandy, hard, blocky, no stain, shale: gray, occasional black, slightly calcareous and carbonaceous, micromicaceous, silty, hard, blocky, rare sub fissile, abundant micritic calcite stringers, abundant flour calcite, rare calcite vein with black organic coating.
770-780	**Siltstone:** gray, quartzose, from slightly to coarse calcareous, with occasional calcite fill, coarse silt, sandy, hard, blocky, no stain, Shale: gray, occasional black, slightly calcareous and carbonaceous, micromicaceous, silty, hard, blocky, rare sub fissile, abundant micritic calcite stringers, abundant disseminated flour and white calcite.
780- 815	**Sandstone:** gray, quartzose, white calcite, micaceous, lithic with coal grains, silty, fine silt to very fine grained, poor sorted, hard, calcareous cement, tight porosity, no stain, Shale: gray, occasional black, slightly calcareous and carbonaceous, micromicaceous, silty, hard, blocky, rare sub fissile, abundant micritic calcite stringers, abundant disseminated flour and white calcite.
815-850	**Sandstone:** gray, quartzose, white calcite, micaceous, lithic with coal grains, silty, fine silt to very fine grained, poor sorted, hard, calcareous cement, tight porosity, no stain, Shale: gray, occasional black, slightly calcareous and carbonaceous, micromicaceous, silty, hard, blocky, rare sub fissile, abundant micritic calcite stringers, abundant disseminated flour and white calcite, trace slickensides with black organic coating

850-880	**Shale:** gray, dark gray, slightly calcareous, occasional micromicaceous, hard, blocky, common micritic calcite stringers.
880-900	**Shale:** light gray, dark gray, slightly calcareous, micromicaceous, hard, blocky, common calcite fill and micritic calcite stringers.
900-925	**Shale:** gray, slightly calcareous, micromicaceous, silty, hard, blocky, common micritic calcite stringers, Sandstone: white and gray, quartzose, micaceous, occasional micritic with coal grains, fine silt to very fine grade, silty, hard, slightly calcareous cement, tight porosity, no stain, rare black organic material, minor fine calcite fill.
925-950	**Shale:** gray, slightly calcareous, micromicaceous, silty, hard, blocky, common micritic calcite stringers, Sandstone: white and gray, quartzose, micaceous, occasional micritic with coal grains, fine silt to very fine grade, silty, hard, slightly calcareous cement, tight porosity, no stain, rare black organic material, minor fine calcite fill, trace slickensides.
950-960	**Shale:** gray, slightly calcareous, micromicaceous, silty, hard, blocky, common micritic calcite stringers, Sandstone: white and gray, quartzose, micaceous, occasional micritic with coal grains, fine silt to very fine grade, silty, hard, slightly calcareous cement, tight porosity, no stain, rare black organic material, minor fine calcite fill.
960-965	**Shale:** gray, slightly calcareous, micromicaceous, silty, hard, blocky, common micritic calcite stringers, Sandstone: white and gray, quartzose, micaceous, occasional micritic with coal grains, fine silt to very fine grade, silty, hard, slightly calcareous cement, tight porosity, no stain, rare black organic material, common fine calcite fill and loose calcite fragments.
965-970	**Shale:** gray, slightly calcareous, micromicaceous, silty, hard, blocky, common micritic calcite stringers, Sandstone: white and gray, quartzose, micaceous, occasional micritic with coal grains, fine silt to very fine grade, silty, hard, slightly calcareous cement, tight porosity, no stain, rare black organic material, minor fine calcite fill.
970-980	**Shale:** gray, slightly calcareous, micromicaceous, silty, hard, blocky, common micritic calcite stringers, Siltstone: white, gray, quartzose, slightly calcareous, sandy, hard, blocky, rare black organic material, common fine calcite fill and occasional loose calcite fragments.
980-985	**Shale:** gray, slightly calcareous, micromicaceous, silty, hard, blocky, common micritic calcite stringers, Siltstone: white, gray, quartzose, slightly calcareous, sandy, hard, blocky, rare black organic material, abundant fine flour calcite fill and common loose calcite fragments.
985-1000	**Shale:** gray, slightly calcareous, micromicaceous, silty, hard, blocky, common micritic calcite stringers, Siltstone: white, gray, quartzose, slightly calcareous, micaceous, sandy, hard, blocky, rare black organic material, abundant fine flour calcite fill.
1000-1015	**Siltstone:** light gray, calcareous, coarse silt, rare sandy, hard, blocky, Shale: gray to black, slightly calcareous and micromicaceous, occasional silty, hard, blocky, rare organic material, common disseminated very fine flour calcite.
1015-1020	**Siltstone:** light gray, slightly calcareous, coarse silt, rare sandy, hard, blocky, Shale: gray to black, slightly calcareous and micromicaceous, occasional silty, hard, blocky, rare black organic material, common disseminated very fine flour calcite.

1020-1050	**Siltstone:** light gray, calcareous, micaceous, coarse silt, rare sandy, hard, blocky, Shale: gray to black, slightly calcareous and micromicaceous, occasional silty, hard, blocky, rare black organic material, common disseminated very fine flour calcite.
1050-1065	**Shale:** light gray, dark gray, slightly calcareous, in part micromicaceous, hard, silty, blocky, rare sub fissile, rare black organic material, common micritic calcite stringers, common disseminated very fine flour calcite.
1065-1070	**Shale:** light gray, dark gray, slightly calcareous, in part micromicaceous, hard, silty, blocky, trace bedding, rare sub fissile, rare black organic material, common micritic calcite stringers, common disseminated very fine flour calcite.
1070-1090	**Siltstone:** white, light gray, quartzose, occasional micromicaceous, hard, blocky, Shale: light gray, dark gray, slightly calcareous, in part micromicaceous, hard, silty, blocky, well bedded, rare sub fissile, rare black organic material, common micritic calcite stringers, common disseminated very fine flour calcite.
1090- 1100	**Siltstone:** white, light gray, quartzose, occasional micromicaceous, hard, blocky, interbedded with Shale: light gray, dark gray, slightly calcareous, in part micromicaceous, hard, silty, blocky, well bedded, rare sub fissile, rare black organic material, common micritic calcite stringers, abundant loose white calcite, common disseminated very fine flour calcite.
1100-1130	**Siltstone:** white, light gray, quartzose, occasional micromicaceous, hard, blocky, interbedded with Shale: light gray, dark gray, slightly calcareous, in part micromicaceous, hard, silty, blocky, rare sub fissile, rare black organic material, common micritic calcite stringers, occasional loose white calcite, common disseminated very fine flour calcite.
1130-1140	**Shale:** white, light gray, siliceous, slightly calcareous, rare micromicaceous, finely bedded, hard, sub fissile, common disseminated white calcite.
1140-1145	**Shale:** white, light gray, siliceous, slightly calcareous, rare micromicaceous, finely bedded, hard, sub fissile, common disseminated white calcite, occasional fractured drill cutting.
1145-1150	**Shale:** white, light gray, siliceous, slightly calcareous, rare micromicaceous, finely bedded, hard, sub fissile, common disseminated white calcite.
1150-1160	**Siltstone:** white, light gray, quartzose, calcareous, fine silt, very fine grained, blocky, Shale: white, light gray, slightly calcareous, rare micromicaceous, bedded, hard, sub fissile, common disseminated white calcite.
1160-1170	**Siltstone:** white, light gray, quartzose, calcareous, fine silt, very fine grained, blocky interbedded with Shale: white, light gray, slightly calcareous, rare micromicaceous, bedded, in part fractured, hard, sub fissile, common disseminated very fine white calcite.
1170-1085	**Sandstone:** white, light gray, quartzose, calcareous, coal and lithic grains, silty, fine silt, very fine grained, poor sorted, hard, calcareous cement, tight porosity, no stain, interbedded with Shale: white, light gray, slightly calcareous, rare micromicaceous, bedded, in part fractured, hard, sub fissile, common disseminated very fine white calcite.
1185-1195	**Siltstone:** white, light gray, quartzose, calcareous, occasional black organic coating beds, fine silt, very fine grained, blocky interbedded with Shale: white, light gray, slightly calcareous, rare micromicaceous, bedded, in part fractured, hard, sub fissile, common disseminated very fine white calcite.

1195-1225	**Shale:** white, light gray, slightly calcareous, rare micromicaceous, bedded, common black organic beds, in part fractured, hard, sub fissile, abundant disseminated very fine white calcite.
1225-1230	**Siltstone:** white light gray, quartzose, hard, blocky, Shale: white, light gray, slightly calcareous, rare micromicaceous, bedded, common black organic beds, in part fractured, hard, sub fissile, abundant disseminated very fine white calcite.
1230-1250	**Siltstone:** white light gray, quartzose, micaceous, calcareous, hard, blocky, Shale: white, light gray, slightly calcareous, rare micromicaceous, bedded, common black organic beds, in part fractured, hard, sub fissile, abundant disseminated very fine white calcite.
1250-1255	**Shale:** gray, dark gray, slightly calcareous, moderately micromicaceous, occasional black with organic coated bedding, silty, hard, blocky, abundant micritic calcite veins, interbedded with Siltstone: white, light gray, very calcareous, micromicaceous, hard, blocky.
1255-1280	**Shale:** gray, dark gray, slightly calcareous, moderately micromicaceous, occasional black with organic coated bedding, silty, hard, blocky, abundant micritic calcite veins, interbedded with Sandstone: white, gray, quartzose, carbonaceous, lithic, micaceous, silty, coarse silt, very fine grade, poor sorted, hard, calcareous cement, tight porosity, no stain, common disseminated white flour calcite.
1280 1290	**Shale:** gray, dark gray, slightly calcareous, moderately micromicaceous, occasional black with organic coated bedding, silty, hard, blocky, abundant micritic calcite veins, interbedded with Sandstone: white, gray, quartzose, carbonaceous, lithic, micaceous, silty, coarse silt, very fine grade, poor sorted, hard, calcareous cement, tight porosity, no stain, common disseminated white flour calcite, calcite vein, loose white calcite.
1290-1305	**Shale:** gray, dark gray, slightly calcareous, moderately micromicaceous, occasional black with organic coated bedding, silty, hard, blocky, abundant micritic calcite veins, interbedded with Sandstone: white, gray, quartzose, carbonaceous, lithic, micaceous, silty, coarse silt, very fine grade, poor sorted, hard, calcareous cement, tight porosity, no stain, common disseminated white flour calcite.
1305-1315	**Shale:** gray, dark gray, slightly calcareous, moderately micromicaceous, occasional black with organic coated bedding, silty, hard, blocky, abundant micritic calcite veins.
1315-1335	**Shale:** gray, dark gray, occasional black, slightly calcareous, micromicaceous, silty, hard, predominant in part bedded, blocky, rare sub fissile, abundant white calcareous and micritic calcite stringers, common black organic material.
1335-1355	**Shale:** gray, dark gray, occasional black, slightly calcareous, micromicaceous, silty, hard, predominant in part bedded, blocky, rare sub fissile, abundant white calcareous and micritic calcite stringers, common black organic material. rare interbedded with Siltstone: gray, calcareous, micaceous, fine silt, hard, blocky.
1355-1365	**Shale:** gray, dark gray, occasional black, slightly calcareous, micromicaceous, silty, hard, predominant in part bedded, blocky, rare sub fissile, abundant white calcareous and micritic calcite stringers, rare interbedded with Siltstone: gray, calcareous, micaceous, fine silt, hard, blocky, common bedding with black organic material, trace loose white calcite.
1365-1370	**Shale:** gray, dark gray, occasional black, slightly calcareous, micromicaceous, silty, hard, predominant in part bedded, blocky, rare sub fissile, abundant white calcareous and micritic calcite stringers, common bedding with black organic material, trace loose white calcite.

1370-1385	**Shale:** gray, dark gray, occasional black, slightly calcareous, micromicaceous, silty, hard, predominant in part bedded, blocky, rare sub fissile, abundant white calcareous and micritic calcite stringers, common bedding with black organic material, common frace calcite fill, common slickensides, loose white calcite.
1385-1390	**Shale:** gray, dark gray, occasional black, slightly calcareous, micromicaceous, silty, hard, predominant in part bedded, blocky, rare sub fissile, abundant white calcareous and micritic calcite stringers, common bedding with black organic material, common fractures calcite fill, loose white calcite.
1390-1425	**Siltstone:** gray, calcareous, coarse silt, hard, blocky, Shale: gray, dark gray, occasional black, slightly calcareous, micromicaceous, silty, hard, in part bedded, predominant blocky, rare sub fissile, abundant white calcareous and micritic calcite stringers, common bedding with black organic material.
1425-1445	**Siltstone:** gray, calcareous, coarse silt, hard, blocky, Shale: gray, dark gray, occasional black, slightly calcareous, micromicaceous, silty, hard, in part bedded, predominant blocky, rare sub fissile, abundant white calcareous and micritic calcite stringers, common bedding with black organic material, trace loose clear, pink and white quartz grains.
1445-1450	**no sample**
1450-1460	**Siltstone:** gray, calcareous, coarse silt, hard, blocky, Shale: gray, dark gray, occasional black, slightly calcareous, micromicaceous, silty, hard, in part bedded, blocky, rare sub fissile, abundant white calcareous and micritic calcite stringers, common bedding with black organic material.
1460-1475	**Siltstone:** gray, calcareous, coarse silt, hard, blocky, Shale: gray, dark gray, occasional black, slightly calcareous, micromicaceous, silty, hard, in part bedded, blocky, rare sub fissile, abundant white calcareous and micritic calcite stringers, common bedding with black organic material, trace loose white calcite.
1475-1485	**Shale:** gray, dark gray, occasional black, slightly calcareous, micromicaceous, silty, hard, in part bedded, blocky, rare sub fissile, abundant white calcareous and micritic calcite stringers, common bedding with black organic material, trace loose white calcite.
1485-1500	**Siltstone:** gray, calcareous, coarse silt, hard, blocky, Shale: gray, dark gray, occasional black, slightly calcareous, micromicaceous, silty, hard, in part bedded, blocky, rare sub fissile, abundant white calcareous and micritic calcite stringers, common bedding with black organic material, trace loose white calcite.
1500-1525	**Siltstone:** light gray, calcareous, micaceous, sandy, coarse silt, hard, blocky, Shale: gray, light gray, slightly calcareous, micromicaceous, silty, hard, blocky, rare sub fissile, trace bedding, abundant micritic calcite stringers, occasional calcite inclusion and loose white calcite, common black organic material.
1525-1550	**Siltstone:** light gray, calcareous, micaceous, sandy, coarse silt, hard, blocky, Shale: gray, light gray, slightly calcareous, micromicaceous, silty, hard, blocky, rare sub fissile, trace bedding, abundant micritic calcite stringers, occasional calcite inclusion and loose white calcite, common black organic material on bedding.
1550-1575	**Siltstone:** light gray, calcareous, micaceous, sandy, coarse silt, hard, blocky, Shale: gray, light gray, slightly calcareous, micromicaceous, silty, hard, blocky, rare sub fissile, trace bedding, fractured, abundant micritic calcite stringers, occasional calcite inclusion and loose white calcite, common black organic material on bedding.

1575-1580	**Siltstone:** light gray, calcareous, micaceous, sandy, coarse silt, hard, blocky, Shale: gray, light gray, slightly calcareous, micromicaceous, silty, hard, blocky, rare sub fissile, trace bedding, fractured, abundant micritic calcite stringers, occasional calcite inclusion and loose white calcite, abundant black organic material on bedding.
1580-1600	**Siltstone:** light gray, calcareous, micaceous, sandy, coarse silt, hard, blocky, Shale: gray, light gray, slightly calcareous, micromicaceous, silty, hard, blocky, rare sub fissile, trace bedding, fractured, abundant micritic calcite stringers, occasional calcite inclusion and loose white calcite, common black organic material on bedding.
1600-1625	**Siltstone:** light gray, calcareous, micaceous, sandy, coarse silt, hard, blocky, Shale: gray, light gray, slightly calcareous, micromicaceous, silty, hard, blocky, rare sub fissile, trace bedding, fractured, abundant micritic calcite stringers, occasional calcite inclusion and loose white calcite, common black organic material on bedding.
1625-1645	**Siltstone:** light gray, calcareous, micaceous, sandy, coarse silt, hard, blocky, Shale: gray, light gray, slightly calcareous, micromicaceous, silty, hard, blocky, rare sub fissile, trace bedding, fractured, abundant micritic calcite stringers, occasional calcite inclusion and loose white calcite, common black organic material on bedding.
1645-1655	**Siltstone:** light gray, calcareous, micaceous, sandy, coarse silt, hard, blocky, Shale: gray, light gray, slightly calcareous, micromicaceous, silty, hard, blocky, rare sub fissile, trace bedding, fractured, abundant micritic calcite stringers, occasional calcite inclusion and loose white calcite, common black organic material on bedding, trace slickensides.
1655-1675	**Siltstone:** light gray, calcareous, micaceous, sandy, coarse silt, hard, blocky, Shale: gray, light gray, slightly calcareous, micromicaceous, silty, hard, blocky, rare sub fissile, trace bedding, fractured, abundant micritic calcite stringers, occasional calcite inclusion and loose white calcite, common black organic material on bedding.
1675-1690	**Siltstone:** light gray, calcareous, micaceous, sandy, coarse silt, hard, blocky, Shale: gray, light gray, slightly calcareous, micromicaceous, silty, hard, blocky, rare sub fissile, trace bedding, fractured, abundant micritic calcite stringers, occasional calcite inclusion and loose white calcite, common black organic material on bedding.
1690-1715	**Siltstone:** light gray, calcareous, micaceous, sandy, coarse silt, hard, blocky, Shale: gray, light gray, slightly calcareous, micromicaceous, silty, hard, blocky, rare sub fissile, trace bedding, fractured, abundant micritic calcite stringers, occasional calcite inclusion and loose white calcite, abundant white flour calcite, common black organic material on bedding.
1710-1715	**Shale:** dark gray, black, calcareous, carbonaceous, micromicaceous, silty, fractured, predominant blocky, abundant micritic calcite stringers, occasional loose white and clear calcite.
1715-1725	**Shale:** gray, dark gray and black, poor calcareous to calcareous, carbonaceous, micromicaceous, silty, fractured with abundant micritic calcite stringers, blocky, rare sub fissile, trace white calcite.
1725-1730	**Shale:** dark gray and black, s calcareous, carbonaceous, micromicaceous, silty, hard, sub fissile to blocky, fractured, abundant irregular micritic calcite stringers, common disseminated very fine calcite.
1730-1735	**Shale:** dark gray to black, calcareous, carbonaceous, micromicaceous, silty, sub fissile to blocky, common fractures filled with micritic calcite stringers, disseminated very fine white calcite.

1735-1740	**Shale:** gray, dark gray, black, slightly calcareous to very calcareous, common carbonaceous, micromicaceous, silty, hard, sub fissile to blocky, abundant fractures fill with white micritic calcite stringers, common very fine disseminated white calcite.
1740-1745	**Shale:** light gray, dark gray, black, slightly calcareous and micromicaceous with carbonaceous beds, hard, predominant blocky, rare sub fissile, abundant micritic calcite stgrs, trace loose clear quartz grains.
1765-1770	**Shale:** light gray, dark gray, slightly calcareous, in part micromicaceous, occasional black organic material, silty, hard, blocky, common fine disseminated calcite, common very fine calcite stringers, relic bedding
1770-1780	**Shale:** light gray, gray occasional dark gray, slightly calcareous, micromicaceous, abundant very fine disseminated calcite and micritic calcite stringers, occasional black organic material, hard, blocky, rare sub fissile.
1780-1790	**Shale:** light gray, gray occasional dark gray, slightly calcareous, carbonaceous, micromicaceous, abundant very fine disseminated calcite and micritic calcite stringers, rare loose white calcite fragments, trace calcite vein, common black organic material, hard, blocky, rare sub fissile.
1790-1800	**Shale:** light gray, gray occasional dark gray, slightly calcareous, carbonaceous, micromicaceous, abundant very fine disseminated calcite and micritic calcite stringers, rare loose white calcite fragments, trace calcite vein, common black organic coating, hard, blocky, rare sub fissile.
1800-1805	**Shale:** light gray to dark gray, common black, calcareous, carbonaceous, micromicaceous, predominant blocky, abundant very fine disseminated calcite, abundant micritic calcite vein, occasional calcite with black organic coating.
1805- 1810	**Shale:** gray, dark gray, calcareous, micromicaceous, occasional carbonaceous, silty, predominant blocky, rare sub fissile, common calcite and black organic material.
1810-1825	**Shale:** light gray, dark gray, black, calcareous, carbonaceous, micromicaceous, silty, hard, blocky, abundant calcite, micritic calcite stringers, occasional loose white calcite fragments, fractures with black organic coating.
1825-1835	**Shale:** light gray, dark gray, black, calcareous, carbonaceous, micromicaceous, silty, hard, blocky, abundant calcite, micritic calcite stringers, occasional loose white calcite fragments, fractures with black organic coating.
1835-1840	**Siltstone:** light gray, calcareous, quartzose, micaceous, coarse silt, hard, blocky, Shale: light gray, dark gray, black, slightly calcareous, common carbonaceous, in part micromicaceous, hard, blocky, abundant disseminated calcite and micritic calcite stringers, occasional loose calcite fragments.
1845-1850	**Shale:** light gray, dark gray, black, slightly calcareous, common carbonaceous, in part micromicaceous, silty, hard, blocky, abundant disseminated calcite and micritic calcite stringers, occasional loose calcite fragments.
1850-1855	**Shale:** light gray, dark gray, black, slightly calcareous, common carbonaceous, in part micromicaceous, hard, blocky, abundant disseminated calcite and micritic calcite stringers, occasional loose calcite fragments.

Trenton? *Utica (Dodgeville)*1857m, 1857mtvd, -1754.7mSS

1855-1860 **Limestone:** white, light gray, very fine to medium grained, occasional crystalline, calcareous cement, hard, tight porosity, blocky, Shale: dark gray, black, slightly calcareous, common carbonaceous, in part micromicaceous, hard, blocky, abundant disseminated calcite and micritic calcite stringers, occasional loose calcite fragments.

1865-1870 **Limestone:** white, light gray, very fine to medium grained, occasional crystalline, calcareous cement, hard, tight porosity, blocky, Shale: dark gray, black, calcareous, carbonaceous, in part micromicaceous, hard, blocky, common disseminated calcite and micritic calcite stringers, occasional loose calcite fragments.

Faulted Utica 1869md, 1869mtvd, -1766.7mSS

1865-1875 **Marlstone:** gray, dark gray, very calcareous, slightly micromicaceous, hard, brittle, blocky, occasional very thin bedding, occasional micritic calcite vein, Limestone: white, light gray, very fine to medium grained, occasional crystalline, calcareous cement, hard, tight porosity, blocky,

1875-1880 **Marlstone:** gray, dark gray, black, very calcareous, occasional micromicaceous, common carbonaceous, hard, brittle, common calcite.

1880-1890 **Marlstone:** dark gray, very calcareous, silty, faulted, common slickensides coated with black organic material, fractured fragments, calcite and siltstone inclusion. common calcite vein and inclusion, trace relic bedding, hard, blocky. Siltstone, light brown gray, calcareous, coarse silt, soft, brittle, blocky, abundant loose white calcite fragments.

1890- 1895 **Marlstone:** dark gray, very calcareous, silty, faulted, common slickensides coated with black organic material, fractured fragments, calcite and siltstone inclusion. common calcite vein and inclusion, trace relic bedding, hard, blocky. Siltstone, light brown gray, calcareous, coarse silt, soft, brittle, blocky, abundant loose white calcite fragments, abundant pieces of metal.

1895-1910 **Marlstone:** dark gray, very calcareous, silty, faulted, common slickensides coated with black organic material, fractured fragments, occasional calcite vein and inclusion, hard, blocky. Siltstone, light brown gray, calcareous, coarse silt, soft, brittle, blocky, occasional loose white calcite fragments, trace very fine crystalline pyrite.

1910-1920 **Marlstone:** dark gray, very calcareous, silty, abundant faulted, common slickensides coated with black organic material, fractured fragments, occasional calcite vein and inclusion, hard, blocky, occasional loose white calcite fragments, trace very fine crystalline pyrite.

Lorraine formation 1923m, 1923mtvd, -1829.7mSS

1920-1925 **Marlstone:** dark gray, very calcareous, faulted, slickensides, Shale: light, dark gray, slightly calcareous, micro mica, hard blocky, abundant calcite inclusion, calcite vein and occasional loose calcite grains, common black argillaceous coating.

1925-1930 **Shale:** gray, dark gray, occasional black, slightly calcareous, in part carbonaceous, micromicaceous, hard, blocky, abundant white calcite fill and vein, loose white calcite, occasional slickensides with black organic coating, rare Marlstone as above.

1930-1935 **Shale:** gray, dark gray, occasional black, slightly calcareous, in part carbonaceous, micromicaceous, hard, blocky, abundant white calcite fill and vein, loose white calcite, occasional slickensides with black organic coating, 10% predominant coarse, clear, angular quartz fragments.

Utica *(allochthonous Dodgeville)* 1936md, 1936mtvd, -1842.7mSS

1935-1940	**Marlstone:** dark gray, very calcareous, micromicaceous, carbonaceous, silty, very hard, predominant fissile, sub fid, rare blocky, abundant very fine disseminated calcite, common loose, white, very fine grained calcite, Shale: gray, dark gray, occasional black, slightly calcareous, in part carbonaceous, micromicaceous, hard, blocky, abundant white calcite fill and vein, loose white calcite, occasional slickenside with black organic coating, occasional black very thin organic coating.
1940-1945	**Marlstone:** gray, dark gray, very calcareous, micromicaceous, occasional carbonaceous, silty, hard, brittle, predominant fissile and sub fissile, rare blocky, common black organic bed, common very fine disseminated calcite, calcite vein and fill, occasional loose white calcite.
1945-1950	**Marlstone:** gray, dark gray, very calcareous, micromicaceous, occasional carbonaceous, silty, hard, brittle, predominant blocky, rare sub fissile, common black organic bed, common very fine disseminated calcite, calcite vein and fill, occasional loose white calcite.
1950-1955	**Marlstone:** gray, dark gray black, very calcareous, micromicaceous, occasional carbonaceous, silty, hard, blocky, rare sub fissile, common very fine disseminated calcite, trace calcite vein, rare loose white calcite, common black organic coating.
1955-1960	**Siltstone:** beds, light gray, calcareous, coarse silt, hard, blocky, Marlstone: gray, dark gray black, very calcareous, micromicaceous, occasional carbonaceous, silty, hard, blocky, rare sub fissile, common very fine disseminated calcite, trace calcite vein, rare loose white calcite, common black organic coating.
1960-1965	**Marlstone:** gray, dark gray black, very calcareous, micromicaceous, occasional carbonaceous, silty, hard, blocky, rare sub fissile, common very fine disseminated calcite, trace calcite vein, rare loose white calcite, common black organic coating.
1965-1970	**Marlstone:** dark black, very calcareous, carbonaceous, hard, predominant blocky, trace sub fissile, abundant black organic material, trace micaceous, very fine disseminated calcite, trace very fine crystalline pyrite.
1970-1980	**Marlstone:** dark black, very calcareous, occasional carbonaceous, rare micaceous, hard, predominant blocky, trace sub fissile, common black organic material, rare slickensides with organic coating.
1980-1985	**Marlstone:** dark black, very calcareous, occasional carbonaceous, rare micaceous, hard, predominant blocky, trace sub fissile, common black organic material, rare slickensides with organic coating, occasional very thin calcite lamination and black organic material.
1985-1990	**Marlstone:** dark black, very calcareous, occasional carbonaceous, rare micaceous, hard, predominant blocky, trace sub fissile, common black organic material, rare slickensides with organic coating.
1990-2000	**Marlstone:** gray, dark gray, black, very calcareous, carbonaceous, hard, sub fissile to blocky, common very fine disseminated calcite, occasional loose white calcite and calcite inclusion, trace thin calcite vein.
2000-2005	**Marlstone:** dark gray, black, very calcareous, carbonaceous, rare micromicaceous, silty, hard, sub fissile to blocky, abundant very fine disseminated calcite, rare loose white calcite, trace calcite vein, common slickensides with black organic coating, trace very fine crystalline pyrite.
2005-2010	**Marlstone:** dark gray, black, very calcareous, carbonaceous, rare micromicaceous, silty, hard, sub fissile to blocky, abundant very fine disseminated calcite, rare loose white calcite, common thin calcite vein, common slickensides with black organic coating, trace very fine crystalline pyrite.

2010-2030	**Marlstone:** light gray, dark gray, black, very calcareous, carbonaceous, rare micromicaceous, silty, hard, sub fissile to blocky, abundant very fine disseminated calcite, common loose white calcite, trace thin calcite vein, common slickensides with black organic coating.
2030-2035	**Marlstone:** dark gray, very calcareous, 20 % very fine disseminated white calcite, occasional carbonaceous, very hard, blocky, common loose white calcite fragments, calcite vein, occasional very fine crystalline pyrite.
2035-2040	**Marlstone:** dark gray, very calcareous, 20 % very fine disseminated white calcite, occasional carbonaceous, very hard, blocky, common loose white calcite fragments, calcite vein, common slickensides with organic coating
2040-2045	**Marlstone:** dark gray, very calcareous, 20 % very fine disseminated white calcite, occasional carbonaceous, very hard, blocky, common loose white calcite fragments, calcite vein, occasional very fine crystalline pyrite, common slickensides with black organic coating.
2045-2055	**Marlstone:** dark gray very calcareous, slightly micromicaceous, common very fine des calcite, hard, blocky, trace white calcite vein, common loose white and occasional clear calcite.
2055-2065	**Marlstone:** dark gray very calcareous, slightly micromicaceous, common very fine des calcite, hard, blocky, rare white calcite vein, common loose white and occasional clear calcite.
2065-2075	**Marlstone:** dark gray, black, coarse calcareous, carbonaceous, rare micromicaceous, hard, blocky, 20% very fine disseminated calcite, interbedded very th calcite and black organic material, common loose white calcite fragment.
2075-2080	**Marlstone:** dark gray, black, coarse calcareous, common carbonaceous, rare micromicaceous, hard, blocky, 20% very fine disseminated calcite, occasional interbedded very th calcite and black organic material, common loose white calcite fragment.
2080-2090	**Marlstone:** gray, dark gray, occasional black, very calcareous, occasional carbonaceous, hard, blocky, common 20% very fine disseminated calcite, common slickensides with black organic coating.
2090-2095	**Marlstone:** dark gray, black, very calcareous, occasional carbonaceous, trace micromicaceous, silty, hard, blocky, abundant very fine disseminated calcite, occasional slickensides with black organic coating, trace loose very fine crystalline pyrite.
2095-2105	**Marlstone:** dark gray, black, very calcareous, occasional carbonaceous, trace micromicaceous, silty, hard, blocky, abundant very fine disseminated calcite, occasional slickensides with black organic coating.
2105-2110	**Marlstone:** dark gray, black, very calcareous, occasional carbonaceous, trace micromicaceous, silty, hard, blocky, abundant very fine disseminated calcite, occasional slickensides with black organic coating, common loose white calcite fragments.
2110-2115	**Marlstone:** dark gray, black, very calcareous, occasional carbonaceous, trace micromicaceous, silty, hard, blocky, abundant very fine disseminated calcite, occasional slickensides with black organic coating, trace loose white calcite and fine white calcite vein.
2115-2120	**Marlstone:** dark gray, black, very calcareous, occasional carbonaceous, trace micromicaceous, silty, hard, blocky, abundant very fine disseminated calcite, occasional slickensides with black organic coating, trace very fine crystalline pyrite with white calcite.

2120-2135	**Marlstone:** dark gray, black, very calcareous, occasional carbonaceous, trace micromicaceous, silty, hard, blocky, abundant very fine disseminated calcite, common slickensides with black organic coating, occasional loose white calcite fragment.
2135-2145	**Marlstone:** dark gray, black, very calcareous, occasional carbonaceous, trace micromicaceous, silty, hard, blocky, abundant very fine disseminated calcite, common slickensides with black organic coating, trace loose very fine crystalline pyrite.
2145-2150	**Marlstone:** dark gray, black, very calcareous, occasional carbonaceous, trace micromicaceous, silty, hard, blocky, abundant very fine disseminated calcite, common slickensides with black organic coating.
2150-2160	**Marlstone:** dark gray, black, very calcareous, micromicaceous, in part carbonaceous, hard, blocky occasional slickensided, common very fine disseminated calcareous, rare loose, white calcite fragments.
2160-2170	**Marlstone:** dark gray, black, very calcareous, micromicaceous, carbonaceous, silty, hard, blocky occasional slickensided with black organic coating, common very fine disseminated calcareous, rare loose, white calcite fragments, occasional thin calcite and black organic lamination.
2170-2175	**Marlstone:** dark gray, black, very calcareous, micromicaceous, carbonaceous, silty, hard, blocky occasional slickensided with black organic coating, common very fine disseminated calcareous, trace loose white calcite.
2175-2180	**Marlstone:** dark gray, black, very calcareous, micromicaceous, carbonaceous, silty, hard, blocky occasional slickensided with black organic coating, common very fine disseminated calcareous, trace disseminated very fine crystalline pyrite.
2180-2195	**Marlstone:** dark gray, black, very calcareous, micromicaceous, carbonaceous, silty, hard, blocky occasional slickensided with black organic coating, very fine disseminated calcareous, loose white calcite fragment.
	Trenton formation 2195md, 2191.9mTVD, -2098.6mSS
2195-2200	**Limestone:** white and coarse light gray, chalky, micritic very fine grained, altered and soft, poor porosity, no stain, Marlstone: dark gray, black, very calcareous, micromicaceous, carbonaceous, silty, hard, blocky occasional slickensided with black organic coating, very fine disseminated calcareous.
2200-2205	**Limestone:** white and coarse light gray, chalky, micritic very fine grained, altered and soft, common slickensided, poor porosity, no stain, Marlstone: dark gray, black, very calcareous, micromicaceous, carbonaceous, silty, hard, blocky occasional slickensided with black organic coating, very fine disseminated calcareous
2205-2215	**Limestone:** white, light gray, chalky, micritic, micro granular, soft, moderately hard, blocky, poor porosity, no stain, Marlstone: light gray, very calcareous, occasional black organic material, hard, blocky, contaminated very fine disseminated calcite, occasional slickensides.
2215-2230	**Limestone:** white, light gray, chalky, micritic, micro granular, soft, moderately hard, predominant blocky with occasional bedding and shear, tight to poor porosity, no stain, Marlstone: light gray, very calcareous, occasional black organic material, hard, blocky, contaminated very fine disseminated calcite, occasional slickensides.
2230-2235	**Limestone:** white, light gray, chalky, micritic, micro granular, soft, moderately hard, predominant blocky with occasional bedding and shear, tight to poor porosity, no stain, Marlstone: light gray, very calcareous, occasional black organic material, hard, blocky, contaminated very fine disseminated calcite, occasional slickensides.

2235-2240	**Limestone:** white, light gray, micritic, micro granular, chalky lustre, soft, altered to moderately hard, predominant blocky, tight and poor porosity, no stain, no cut, Marlstone: light gray, very calcareous, occasional black organic material, hard, blocky, contaminated very fine disseminated calcite, occasional slickensides.
2240-2245	**Limestone:** white, slightly sandy, micritic to very fine grained, predominant soft altered to hard, blocky trace bedding, tight to poor porosity, no oil stain, very weak white massive cut, minor Marlstone: light gray, very calcareous, occasional black organic material, hard, blocky, contaminated very fine disseminated calcite.
2245-2250	**Limestone:** white, slightly sandy, micritic to very fine grained, predominant soft altered to hard, blocky trace bedding, tight to poor porosity, no oil stain, minor Marlstone: light gray, very calcareous, occasional black organic material, hard, blocky, contaminated very fine disseminated calcite.
2250-2260	**Limestone:** white, silty, altered, micritic to micro granular, chalky lustre, soft to moderately hard, blocky, tight to poor intergranular porosity, very weak white massive fluorescence, Marlstone: gray, dark gray, very calcareous, common black organic material predominant on slickensides, hard, sub fissile to blocky.
2260-2275	**Limestone:** white, cream, light gray, micritic, micro granular, chalky, silty, altered, very soft, predominant very soft, rare hard, poor porosity? predominant blocky, trace very fine bedding, coarse fractures and slickensides, Marlstone: dark gray, very calcareous, slightly micromicaceous, very hard, blocky, common very fine disseminated calcite.
2275-2280	**Limestone:** white, cream, light gray, micritic, micro granular, chalky, silty, altered, very soft, predominant very soft, rare hard, poor porosity? predominant blocky, trace very fine bedding, coarse fractures and slickensides Marlstone: dark gray, very calcareous, slightly micromicaceous, very hard, blocky, common very fine disseminated calcite, rare black organic material.
2280-2285	**Limestone:** white, cream, light gray, micritic, micro granular, chalky, silty, altered, very soft, predominant very soft, rare hard, poor porosity? predominant blocky, trace very fine bedding, coarse fractures and slickensides . Marlstone: dark gray, very calcareous, slightly micromicaceous, very hard, blocky, common very fine disseminated calcite, rare black organic material, Brachiopod.
2285-2295	**Limestone:** white, cream, light gray, micritic, micro granular, chalky, silty, altered, very soft, predominant very soft, rare hard, poor porosity? predominant blocky, trace very fine bedding, coarse fractures and slickensides. Marlstone: dark gray, very calcareous, slightly micromicaceous, very hard, blocky, common very fine disseminated calcite, black organic material predominantly on slickensides planes.
2295-2310	**Limestone:** white, cream, light gray, micritic, micro granular, rare micro crystalline, chalky, silty lustre, altered, very soft, predominant very soft, occasional hard brittle, poor porosity? predominant blocky, trace very fine bedding, coarse fractures and slickensides. Marlstone: dark gray, very calcareous, slightly micromicaceous, very hard, blocky, common very fine disseminated calcite, minor black organic material.
2310-2315	**Limestone:** white, cream, light gray, micritic, micro granular, rare micro crystalline, chalky, silty lustre, altered, very soft, predominant very soft, occasional hard brittle, poor porosity? predominant blocky, trace very fine bedding, coarse fractures and slickensides. Marlstone: dark gray, very calcareous, slightly micromicaceous, very hard, blocky, common very fine disseminated calcite, minor black organic material. fractures fill with white hard calcite.
2315-2325	**Limestone:** white, cream, light gray, micritic, micro granular, rare micro crystalline, chalky, silty lustre, altered, very soft, predominant very soft, occasional hard brittle, poor porosity? predominant blocky,

trace very fine bedding, coarse fractures and slickensides. Marlstone: dark gray, very calcareous, slightly micromicaceous, very hard, blocky, common very fine disseminated calcite, minor black organic material, trace clear vitreous angular quartz fragments.

2325-2330 **Limestone:** white, cream, light gray, micritic, micro granular, rare micro crystalline, chalky, silty lustre, altered, very soft, predominant very soft, occasional hard brittle, poor porosity? predominant blocky, trace very fine bedding, coarse fractures and slickensides. Marlstone: dark gray, very calcareous, slightly micromicaceous, very hard, blocky, common very fine disseminated calcite, minor black organic material

2330-2335 **No sample**

2335-2340 **Limestone:** white, cream, light gray, micritic, micro granular, rare micro crystalline, chalky, silty lustre, altered, very soft, predominant very soft, occasional hard brittle, poor porosity? predominant blocky, trace very fine bedding, coarse fractures and slickensides Marlstone: dark gray, very calcareous, slightly micromicaceous, very hard, blocky, common very fine disseminated calcite, minor black organic material, Brachiopod.

2340-2360 **Limestone:** white, cream, light gray, micritic, micro granular, rare micro crystalline, chalky, silty lustre, altered, very soft, predominant very soft, occasional hard brittle, poor porosity? predominant blocky, trace very fine bedding, coarse fractures and slickensides. Marlstone: dark gray, very calcareous, slightly micromicaceous, very hard, blocky, common very fine disseminated calcite, hard white calcite vein, white calcite inclusion.

2360-2375 **Limestone:** white, cream, light gray, micritic, micro granular, rare micro crystalline, chalky, silty lustre, altered, very soft, predominant very soft, occasional hard brittle, poor porosity? predominant blocky, trace very fine bedding, coarse fractures and slickensides. Marlstone: dark gray, very calcareous, slightly micromicaceous, very hard, blocky, common very fine disseminated calcite, white calcite inclusion.

2375-2380 **Limestone:** white, cream and gray, calcareous, waxy and chalky lustre, micritic, micro granular, altered, soft to moderately hard, brittle, blocky, poor intergranular porosity, no oil stain, no cut, rare Marlstone: dark gray, calcareous, hard, blocky, common fine disseminated calcite.

2380-2390 **Limestone:** white, cream and gray, calcareous, waxy and chalky lustre, micritic, micro granular, altered, soft to moderately hard, brittle, blocky, poor intergranular porosity, no oil stain, no cut, rare Marlstone: dark gray, calcareous, hard, blocky, common fine disseminated calcite, trace Limestone: black micritic, micro granular, very hard, with clear calcite inclusion, fossils? blocky.

2390-2400 **Limestone:** white, cream, light gray, micritic, micro granular, rare micro crystalline, calcareous, waxy and silty and chalky lustre, occasional very thin bedding and slickensides, altered, very soft to moderately hard, no oil stain, Marlstone: dark gray, very calcareous, in part micromicaceous, hard, blocky, common very fine des calcite.

2400-2420 **Limestone:** white, cream, light gray, micritic, micro granular, rare micro crystalline, calcareous, waxy and silty and chalky lustre, occasional very thin bedding and slickensides, altered, very soft to moderately hard, no oil stain, Marlstone: dark gray, very calcareous, in part micromicaceous, hard, blocky, common very fine des calcite, thin calcite vein.

2420-2435 **Limestone:** white, cream, light gray, micritic, micro granular, rare micro crystalline, calcareous, waxy and silty and chalky lustre, occasional very thin bedding and slickensides, altered, very soft to moderately hard, no oil stain, Marlstone: dark gray, very calcareous, in part micromicaceous, hard, blocky, common very fine des calcite, thin calcite vein and calcite inclusion.

2435-2460	**Limestone:** white, cream, light gray, micritic, micro granular, rare micro crystalline, calcareous, waxy and silty and chalky lustre, occasional very thin bedding and slickensides, altered, very soft to hard, no oil stain, Marlstone: dark gray, very calcareous, in part micromicaceous, hard, blocky, common very fine des calcite, common thin calcite vein and calcite inclusion.
2460-2485	**Limestone:** white, cream, light gray, micritic, micro granular, rare micro crystalline, calcareous, waxy and silty and chalky lustre, occasional very thin bedding and slickensides, altered, very soft to hard, no oil stain, Marlstone: dark gray, very calcareous, in part micromicaceous, hard, blocky, common very fine des calcite, rare thin calcite vein and calcite inclusion.
2485-2490	**Limestone:** white, cream, light gray, micritic, micro granular, predominant soft, brittle, common cleavage no predominant orientation, possible slickensides, poor intergranular porosity, no oil stain, no cut.
2490-2495	**Limestone:** white, cream, gray, micritic, micro granular, chalky, silty lustre, rare gray vitreous and very hard, predominant soft, brittle, common cleavage no predominant orientation, possible slickensides, poor intergranular porosity, no oil stain, no cut.
2495-2500	**Limestone:** dark brown gray, gray, very hard, glassy, very hard, tight porosity, Limestone: white, cream, gray, micritic, micro granular, chalky, silty lustre, rare gray vitreous and very hard, predominant soft, brittle, common cleavage no predominant orientation, possible slickensides, poor intergranular porosity, no oil stain, no cut.
2500-2505	**Limestone:** white, cream, gray, micritic, micro granular, chalky, silty lustre, rare gray vitreous and very hard, predominant soft, brittle, common cleavage no predominant orientation, possible slickensides, poor intergranular porosity, no oil stain, no cut.
2505-2510	**Limestone:** white and gray, micritic, very fine grained, hard, banded, slickensides: common angular clear quartz fragments, silicified slickensides surface, Marlstone: dark gray, very calcareous, hard, blocky.
2510-2515	**Limestone:** white and gray, micritic, very fine grained, hard, banded, slickensides: abundant large angular clear quartz fragments, silicified slickensides surface, Marlstone: dark gray, very calcareous, hard, blocky.
	Beekmanton formation 2519md, 2515.8mtvd, -2422.5mSS
2515-2520	**Sandstone:** white, clear quartz, medium to coarse grained, rounded, well sorted, unconsolidated, oil cement, inferred good intergranular porosity, no oil stain, Shale: dark gray and black, slightly calcareous, hard, blocky, Limestone: white and gray, micritic, very fine grained, hard, banded, slickensides: abundant large angular clear quartz fragments, silicified slickensides surface, trace pyrite, occasional brown gray angular chert.
2520-2525	**Shale:** dark gray and black, slightly calcareous, hard, blocky, Limestone: white and gray, micritic, very fine grained, hard, banded, slickensides: abundant large angular clear quartz fragments, silicified slickensides surface, trace pyrite, occasional brown clear angular quartz fragment.
2525-2530	**Shale:** black, calcareous, silty, hard, blocky, Sandstone: white, clear quartz, very fine grained, sub rounded, well sorted, unconsolidated, no cement, inferred good intergranular porosity, no oil stain, Limestone: white and gray, micritic, very fine grained, hard, banded, slickensides: abundant large angular clear quartz fragments, silicified slickensides surface, trace pyrite.
2530-2540	**Shale:** dark gray, black, slightly to very calcareous, silty, hard, blocky, Sandstone: white, clear quartz, very fine to coarse grained, sub angular to rounded, poor sorted, unconsolidated, inferred good intergranular porosity, no oil stain, Limestone: white light gray, micritic, very fine grained, altered, very soft, poor porosity? no stain, minor disseminated pyrite.

2540-2545	**Conglomerate:** dark gray, quartzose, dark gray chert, very coarse grained, rounded well sorted, hard, calcareous cement, tight porosity, no oil stain, Sandstone: white, clear and milky quartz, fine to medium grained, angular to rounded, poor sorted, unconsolidated, no cement, inferred good intergranular porosity, no stain, Shale: black, slightly calcareous, very hard, blocky, Limestone:, white, light gray, micritic to very fine grained, hard, very soft, calcareous cement, poor porosity, no stain, occasional loose angular gray and red chert fragments, common clear quartz fragments.
2445-2550	**Siltstone:** light gray, calcareous, slightly sandy, hard, blocky, Sandstone: white, clear and mlky quartz, fine to medium grained, angular to rounded, poor sorted, unconsolidated, no cement, inferred good intergranular porosity, no stain, Shale: black, slightly calcareous, very hard, blocky, Limestone: white, light gray, micritic to very fine grained, hard, very soft, calcareous cement, poor porosity, no stain, occasional loose angular gray and red chert fragments, common clear quartz fragments.
2550- 2560	**Shale:** black, slightly calcareous, very hard, blocky, Limestone: white, light gray, micritic to very fine grained, hard, very soft, calcareous cement, poor porosity, no stain, Siltstone: light gray, calcareous, slightly sandy, hard, blocky, Sandstone: white, clear and milky quartz, fine to medium grained, angular to rounded, poor sorted, unconsolidated, no cement, inferred good intergranular porosity, no stain, occasional loose angular gray and red chert fragments, common clear quartz fragments.
2560-2570	**Shale:** light gray, black, slightly calcareous, silty, hard, blocky, Limestone: white light gray, micritic, very fine grained, altered, very soft, poor porosity? no stain, trace loose clear angular quartz fragments, trace red chert fragments.
2570-2584	**Siltstone:** light gray, slightly calcareous, hard, blocky, Shale: black, slightly calcareous, hard, blocky, Limestone: white light gray, micritic, very fine grained, altered, very soft, poor porosity? no stain, minor disseminated pyrite.

TD: 2584md, 2580.8mtvd, -2487.5mSS

DETAILED CORE DESCRIPTIONS

Phase #1

Coring performed by Reed Hycalog coring services

Core #1:1740.0m –1740.2 m	FM: Lorraine	Cut: 2.0m	Recv'd: 1.4m.	Coring times: 96min/m
Core #2:1742.0 m – 1748.0m	FM: Lorraine	Cut: 6.0m	Recv'd: 6.8m.	Coring times: 101min/m
Core #3: 1748.0m – 1755.5m	FM: Lorraine	Cut: 7.5m	Recv'd 7.5m.	Coring times: 15.6 min/m
Core #4: 1755.5m – 1758.6m	FM: Lorraine	Cut: 3.1mm	Recv'd 2.4m.	Coring times: 11.6min./m
Core #5: 1758.6m – 1765.5m	FM: Lorraine	Cut: 6.9m	Recv'd 7.3m.	Coring times: 31.2min/m

Summary cut 25.3m Recovered 25.4m Recovery 100%

Phase #2

Depth discrepancy: driller depth, Reed hycalog depth 1881m

Core #6: 1881.0m – 1182.6m	FM: Utica	Cut: 1.6m	Recv'd 0.9m.	Coring times: 44.3min/m
Core #7: 1882.6m – 1889.4m	FM: Utica	Cut: 6.8m	Recv'd 7.3m	Coring Times: 32.2min/m
Core #8: 1889.4m – 1896.7m	FM: Utica	Cut: 7.3m	Recv'd 7.0m	Coring Times: 21.5min/m
Core #9: 1896.7m – 1903.7m	FM: Utica	Cut: 7.0m	Recv'd 7.0m	Coring Times: 20.1min/m
Core #10: 1903.7m – 1911.0m	FM: Utica	Cut: 7.3m	Recv'd 7.3m	Coring Times: 15.1min/ m
Core #11: 1911.0m – 1918.0m	FM: Utica	Cut: 7.0m	Recv'd 6.7m	Coring Times: 8.9min/ m
Core #12: 1918.om – 1918.5m	FM: Utica	Cut: 0.5m	Recv'd 0.8m	Coring Times: 24.0min/ m
Core #13: 1918.5m – 1925.1m	FM: Utica/Lorraine	Cut: 6.6mm	Recv'd 6.4m	Coring Times: 20.6min/ m
Core #14: 1925.1m – 1930.8m	FM: Lorraine	Cut: 5.7m	Recv'd 5.2m	Coring Times: 35.4min./ m
Core #15: 1930.8m – 1931.2m	FM: Lorraine	Cut: .4m	Recv'd 0.3m	Coring Times: 150min./ m
Core #16 1931.2m – 1934.3m	FM: Lorraine	Cut: 3.1m	Recv'd 2.9m	Coring Times: 63.5min/ m
Core #17: 1934.3m – 1934.8m	FM: Lorraine	Cut: 0.5m	Recv'd 0.7m	Coring Times: 40.0min/ m

Summary cut 53.8m Recovered 53.8m Recovery 100%

Phase #3

Core #18: 1950.0m – 1957.4m	FM: Utica	Cut: 7.4m	Recv'd 7.4m	Coring Times: 13.6min/ m
Core #19: 1957.4m – 1964.6:	FM: Utica	Cut: 7.2	Recv'd 7.1	Coring Times: 23.2min/ m
Core #20: 1964.6m – 1971.8m	FM: Utica	Cut: 7.2m	Recv'd 7.4m	Coring Times: 29.2min/ m
Core #21: 1971.8m – 1979.0m	FM: Utica	Cut: 7.2m	Recv'd 6.9m	Coring Times: 15.7min/ m

Core #22: 1979.0m – 1985.5m FM: Utica Cut: 6.5m Recv'd 6.5m Coring Times: 26.3min/ m

Core #23: 1985.5m – 1985.8m FM: Utica Cut: 0.3m Recv'd 0.1m Coring Times: .203.3min/ m

Core #24: 1985.8m – 1992.8m FM: Utica Cut: 7.0m Recv'd 7.3m Coring Times: 60.4.0min/ m

Core #25: 1992.8m – 2000.2m M: Utica Cut: 7.4m Recv'd 7.4m Coring Times: 39.2min/ m

Core #26: 2000.2m – 2007.6m FM: Utica Cut: 7.4m Recv'd 7.5m Coring Times: 24.9min/ m

Core #27: 2007.6m – 2015.0 M: Utica Cut: 7.4m Recv'd 7.1m Coring Times: 29.2min/ m

Core #28: 2015.0m – 2022.0m FM: Utica Cut: 7.0m Recv'd 6.9m Coring Times: 23.8min/ m

Core #29: 2022.0m – 2029.2m FM: Utica Cut: 7.2m Recv'd 6.8m Coring Times: 21.2min/ m

Core #30: 2029.2m – 2030.3m FM: Utica Cut: 0.9m Recv'd 0.2m Coring Times: 31.1min/ m

Core #31: 2030.3m – 2031.2m M: Utica Cut: 0.9m Recv'd 0.2m Coring Times: 30.0min/ m

Summary cut 81.2m Recovered 78.8m Recovery 97.0%

Core handling by Terratek; consult Terratek final report or detailed core description

BIT INFORMATION

Bit	Size	Make	Type	In	Out	Hrs	total m	Avg ROP
1	311mm	Smith	HAT117GC	0	54.0	6.5		8.3m
2	311mm	Hughes	MXR2OGDD	54m	545.0	61.7	491.0	9.9m/hr
3	222mm	United Diamond	UD 513	545m	1740.0	84.0	1195.0	14.3m/hr
4	222mm	Reed	PX513	1740m	1765m	19hrs	25m	1.3m/hr
5	222mm	United Diamond	UD 513	1765m	1882m	22,2hrs	117m	5.2m/hr
6	222mm	Reed	PX513	1882m	2031m	62hrs	150m	2.3m/hr
RR5	222mm	United Diamond	UD 513	2031m	2208.0	27.7m	177m	6.3m/hr
8	156mm	Reed	DSX908M-A2	2208m	2527.0	54.5	318.5	5.8m/hr
9	156mm	Reed	DSX711	2527m	2584.0	22.8	57m	2.5m/hr

DIRECTIONAL SURVEYS

Job Number: 09091
Company: TALISMAN ENERGY INC.
Lease/Well: TALISMAN ST. EDOUARD #1
Location: 46-31-35.348N / 71-46-40.528W
Rig Name: HORIZON 701
RKB: 93.35

State/Country: QUEBEC, CANADA
Declination: -16.35
Grid: TRUE NORTH
File name: C:\WINSERVE\09091.SVY
Date/Time: 05-Apr-09 / 06:19
Curve Name: TALISMAN ST. EDOUARD #1
G.L. or M.S.L.: 88.70

CHOICE DIRECTIONAL SERVICES LTD.

WINSERVE SURVEY CALCULATIONS
Minimum Curvature Method
Vertical Section Plane .00
Vertical Section Referenced to Wellhead
Rectangular Coordinates Referenced to Wellhead

Measured Depth Meters	Incl Angle Deg	Drift Direction Deg	True Vertical Depth	N-S Meters	E-W Meters	Vertical Section Meters	Subsea TVD Meters	CLOSURE Distance Meters	CLOSURE Direction Deg	Dogleg Severity Deg/30
.00	.00	.00	.00	.00	.00	.00	93.35	.00	.00	.00	
Surface Casing Shoe										
545.35	.00	.00	545.35	.00	.00	.00	-452.00	.00	.00	.00
2018.41	5.70	327.30	2015.98	61.61	-39.55	61.61	-1922.63	73.21	327.30	.12
2029.88	6.30	327.50	2027.39	62.62	-40.20	62.62	-1934.04	74.41	327.30	1.57
2038.96	6.50	329.80	2036.41	63.48	-40.72	63.48	-1943.06	75.42	327.32	1.07
2047.00	6.80	334.80	2044.40	64.31	-41.16	64.31	-1951.05	76.35	327.38	2.43
2058.14	6.20	329.50	2055.47	65.42	-41.74	65.42	-1962.12	77.60	327.46	2.28
2071.39	5.50	320.60	2068.65	66.53	-42.51	66.53	-1975.30	78.95	327.42	2.59
2084.62	5.60	318.60	2081.82	67.50	-43.34	67.50	-1988.47	80.22	327.30	.49
2097.87	5.80	315.10	2095.00	68.46	-44.24	68.46	-2001.65	81.51	327.13	.91
2111.13	5.40	310.70	2108.20	69.34	-45.18	69.34	-2014.85	82.77	326.91	1.33
2124.38	4.70	300.80	2121.40	70.03	-46.12	70.03	-2028.05	83.85	326.63	2.53
2137.63	4.20	297.30	2134.61	70.53	-47.02	70.53	-2041.26	84.77	326.31	1.29
2150.88	4.10	293.10	2147.82	70.94	-47.89	70.94	-2054.47	85.59	325.98	.72
2164.14	3.60	299.90	2161.05	71.33	-48.68	71.33	-2067.70	86.36	325.69	1.53
2177.39	3.60	300.70	2174.27	71.75	-49.40	71.75	-2080.92	87.11	325.45	.11
2190.63	3.70	296.60	2187.49	72.15	-50.14	72.15	-2094.14	87.87	325.20	.63
2203.14	4.00	295.50	2199.97	72.52	-50.90	72.52	-2106.62	88.60	324.94	.74
2216.39	3.40	294.50	2213.19	72.89	-51.67	72.89	-2119.84	89.34	324.67	1.37
2229.63	1.90	265.50	2226.42	73.03	-52.25	73.03	-2133.07	89.80	324.42	4.46

Measured Depth Meters	Incl Angle Deg	Drift Direction Deg	True Vertical Depth	N-S Meters	E-W Meters	Vertical Section Meters	Subsea TVD Meters	CLOSURE Distance Meters	CLOSURE Direction Deg	Dogleg Severity Deg/30
2242.87	.70	227.00	2239.65	72.96	-52.53	72.96	-2146.30	89.90	324.25	3.22
2256.12	.80	241.60	2252.90	72.86	-52.67	72.86	-2159.55	89.90	324.14	.49
2269.37	.80	235.70	2266.15	72.76	-52.82	72.76	-2172.80	89.92	324.02	.19
2282.62	.40	234.40	2279.40	72.68	-52.94	72.68	-2186.05	89.92	323.93	.91
2295.86	.80	207.40	2292.64	72.58	-53.02	72.58	-2199.29	89.88	323.85	1.09
2309.11	.60	235.10	2305.89	72.45	-53.12	72.45	-2212.54	89.84	323.75	.88
2322.36	.60	174.40	2319.14	72.34	-53.17	72.34	-2225.79	89.78	323.69	1.37
2335.60	.50	157.20	2332.38	72.22	-53.14	72.22	-2239.03	89.66	323.66	.43
2348.85	.60	205.30	2345.63	72.11	-53.15	72.11	-2252.28	89.58	323.61	1.04
2362.10	.50	159.30	2358.88	71.99	-53.15	71.99	-2265.53	89.49	323.56	1.00
2375.35	.60	201.20	2372.13	71.87	-53.16	71.87	-2278.78	89.39	323.51	.92
2388.60	.80	170.40	2385.38	71.71	-53.17	71.71	-2292.03	89.27	323.45	.95
2401.85	.70	155.00	2398.62	71.55	-53.12	71.55	-2305.27	89.11	323.41	.51
2415.09	.40	155.30	2411.86	71.43	-53.07	71.43	-2318.51	88.99	323.39	.68
2428.34	.40	172.60	2425.11	71.35	-53.04	71.35	-2331.76	88.90	323.37	.27
2441.59	.60	142.20	2438.36	71.25	-52.99	71.25	-2345.01	88.79	323.36	.74
2454.85	.80	177.60	2451.62	71.10	-52.95	71.10	-2358.27	88.65	323.33	1.06
2468.10	.60	147.10	2464.87	70.95	-52.90	70.95	-2371.52	88.50	323.29	.94
2481.35	1.00	169.00	2478.12	70.78	-52.84	70.78	-2384.77	88.33	323.25	1.12
2494.60	.70	146.50	2491.37	70.60	-52.78	70.60	-2398.02	88.14	323.22	1.00
2507.85	.60	152.10	2504.62	70.47	-52.70	70.47	-2411.27	87.99	323.21	.27
EXTRAPOLATION TO THE BIT										
2527.45	.60	152.10	2524.22	70.29	-52.60	70.29	-2430.87	87.79	323.19	.00