

## Well History

Piceance Creek Unit FRU 197-33A2  
Rio Blanco County, Colorado  
API # 05-103-11098-00

EPOCH Well Services, Inc.  
New Iberia, Louisiana

**ExxonMobil**  
*Development*

 **EPOCH**

# **Well History**

## **ExxonMobil Production Company**

**Piceance Creek Unit FRU 197-33A2  
Rio Blanco County, Colorado**



**EPOCH Well Services, Inc.**

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# **General Overview and Geology ExxonMobil Production Company**

**Piceance Creek Unit FRU 197-33A2  
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## Introduction

Epoch Well Services (Epoch) of New Iberia, LA has been providing mud logging and contract geology services to the ExxonMobil Drilling Group (ExxonMobil) in the Piceance Basin of northwestern Colorado since late 2002. As part of these services, Epoch was requested to provide mudlogging and geologic services for the Freedom Ranch Unit (FRU) 197-33A2 production well. The well was drilled as the fifth hole in a series of directional wells for production on the Piceance Creek Unit pad. The well is located in the Piceance Basin at the following coordinates:

- Latitude 39.915658
- Longitude 108.285631

The well was spudded on Jun 25, 2009. Drilling operations were conducted from spud through to a total depth of 12,297' (MD) on July 10, 2009. Drilling operations were conducted by Helmerich & Payne using a Flex 3 rig (#239). Epoch personnel logged and collected samples starting at 4000' through to 12,295' MD. Drilling fluid engineering services were provided by Halliburton. The well was drilled with conventional water-based mud (Low Solids Non-Dispersed) from intermediate through TD.

The well was cased and cemented according to the following:

- 16-inch casing from surface to 130 feet;
- 10.75-inch casing at 3,956 feet;
- 7-inch casing at 8,536 feet.
- 4.5-inch casing at 12,290 feet

Epoch provided the following services for this drilling operation:

- General mudlogging and geologic services including sample collection and description, and preparation of a lithologic log;
- Determination of total gas recovered using a QGM™ gas trap and quantified using a proprietary Epoch Total Hydrocarbon Analyzer equipped with a Flame Ionization Detector;
- Determination of gas chromatography using a proprietary Epoch Gas Chromatography unit also equipped with a Flame Ionization Detector which quantified the hydrocarbon species of methane, ethane, propane, iso- and normal butane, and iso- and normal pentane;
- CO<sub>2</sub> determination;
- Interaction with ExxonMobil on-site and Houston-based personnel to determine formation tops and provide support as required through drilling.

## General Geology

The Piceance Creek Basin is a discrete basin of sediments formed as a result of uplift associated with late-Cretaceous to Tertiary Laramide orogenic activity. The Piceance Creek Basin encompasses late Cretaceous and Tertiary continental rocks that are assigned to a variety of stratigraphic units. These units form a complex system characterized by early deposition of primarily marine and marginal-marine sediments associated with transgression-regression of a large inland sea followed by intricate inter-fingering of fluvial, marginal lacustrine and lacustrine environments. The stratigraphic nomenclature used for the FRU 197-33A2 well incorporates terminology as developed by ExxonMobil and provided to Epoch.

Geologically, Epoch encountered 4 separate formations ranging in age from Eocene to Cretaceous. These formations, in order of their occurrence from surface, along with their assigned age periods are listed as follows:

- Wasatch Formation – Eocene;
- Ohio Creek Formation - Paleocene
- Williams Fork Formation – Cretaceous;
- Iles Formation – Cretaceous.

The Williams Fork and Iles Formations are assigned to the Mesaverde Group.

The Wasatch, Williams Fork, and Iles Formations can be broken down into constituent members as follows:

- Wasatch A, B, C, D, F, G, and I Members;
- Williams Fork 850, 800, 700, 600, 500, 400, 300, 200 and Cameo Members;
- Rollins, Cozzette, and Corcoran Members of the Iles Formation.

According to ExxonMobil nomenclature, below the Wasatch Formation the various formations and members are combined into 6 separate stratigraphic groups for classification of general reservoir type. The groupings are described as follows:

- Williams Fork 800 Member to Ohio Creek – Proximal Braided Reservoirs
- Williams Fork 200 to Williams Fork 700 Members – Distal Braided Reservoirs;
- Cameo Member – Meandering Stream Reservoirs;
- Rollins Member – Marine Reservoirs;
- Corcoran Coastal Plain and Cozzette Members – Meandering Stream Reservoirs;
- Corcoran Marine and Sego Members – Marine Reservoirs.

ExxonMobil has further defined the stratigraphic sequence within the Piceance Basin according to sequence type classification. The relevant classifications are described as follows:

- AS – Abandonment Surface
- SB – Sequence Boundary
- FS – Flooding Surface
- MFS – Maximum Flooding Surface

In accordance with this classification scheme, the sequence tops and correlated stratigraphic name are presented in the table on the following page. All formation and member tops were identified from the mudlog and are presented in measured depth (MD). It will be noted that some of the stratigraphic units as identified by ExxonMobil are not included in this table. Those units omitted from this presentation occur within formations or members and, for reasons of simplicity, were not included.

## FRU 197-33A2 Formation Tops

Formation/Member Name	Stratigraphic Unit Top	Depth (MD/TVD)
<b>Wasatch Formation</b>		
Wasatch "G"		5436' / 5214'
Wasatch "I"		5728' / 5506'
<b>Ohio Creek Formation</b>		
	950 Abandonment Surface (AS)	7205' / 6983'
<b>Williams Fork Formation</b>		
WF 850	900 Sequence Boundary (SB)	7475' / 7253'
WF 800	850 Abandonment Surface (AS)	7656' / 7434'
WF 700	800 Sequence Boundary (SB)	7992' / 7770'
WF 600	690 Abandonment Surface (AS)	8112' / 7890'
WF 500	600 Sequence Boundary (SB)	8392' / 8170'
WF 400	490 Abandonment Surface (AS)	8940' / 8718'
WF 300	400 Sequence Boundary (SB)	9592' / 9370'
WF 200	290 Abandonment Surface (AS)	10712' / 10490'
Cameo	210 Sequence Boundary (SB)	10969' / 10747'
<b>Iles Formation</b>		
Rollins Member	200 Sequence Boundary (SB)	11247' / 11025'
Cozette Member	180 Flooding Surface (FS)	11430' / 11208'
Corcoran Coastal Plain	140 Flooding Surface (FS)	11752' / 11530'
Corcoran Marine	140 Sequence Boundary (SB)	12280' / 12058'

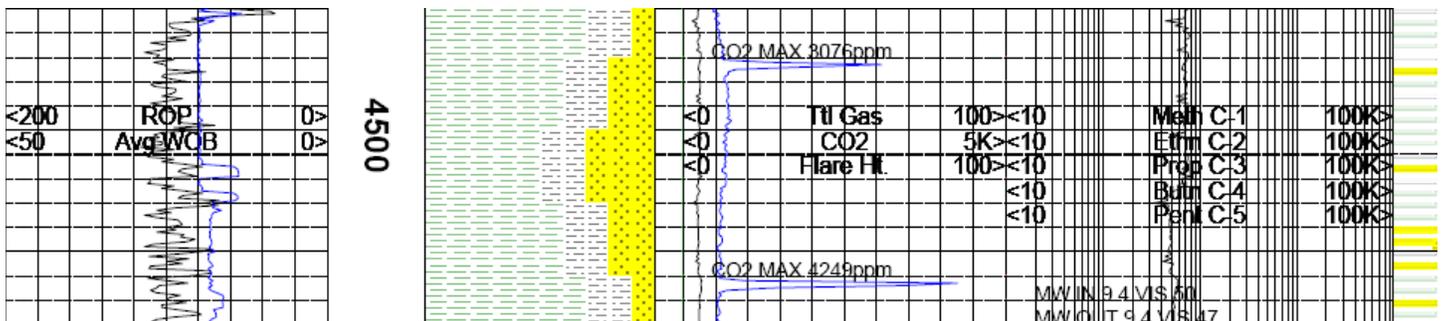
## Upper Wasatch Formation

The Upper Wasatch Formation was encountered from the point of drilling out of surface casing (3956' MD). Overall, the Upper Wasatch Formation consists of variably colored shale, sandstone, siltstone, and carbonates with a claystone presence near the upper portion of the section.

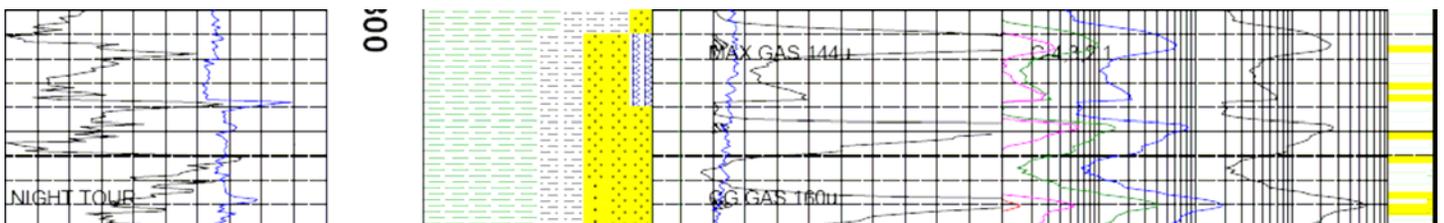
Relevant data concerning drilling of the Upper Wasatch are presented as follows:

### Upper Wasatch Statistics

	ROP (Ft/Hr)	CO2 (ppm)	Total Gas (Units)
Maximum	205.714	4249.931	195.706
Minimum	17.278	330.000	1.703
Average	90.874	724.407	9.672
Standard Deviation	25.446	397.219	19.763



The first signs of gas came in CO2 form at 4473' and was 3076 ppm followed by a CO2 reading of 4249 ppm at 4563'.



There was a maximum drilling gas of 149 units at 5314' in a kaolinitic sandstone layer followed by a connection gas of 160 units at 5380'.

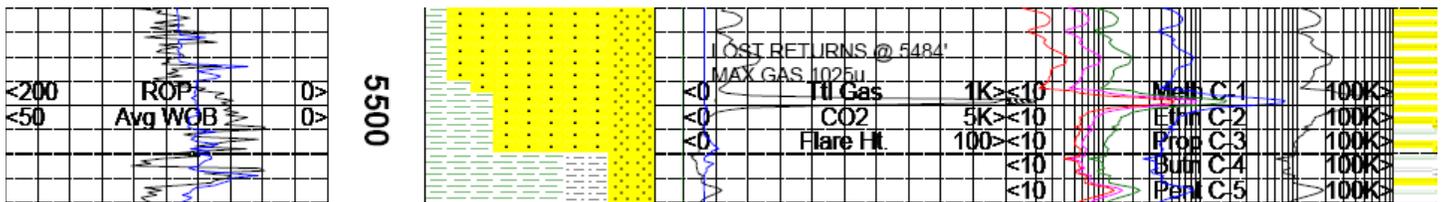
Chromatography for the section was C – 2, 1.

## Lower Wasatch Formation

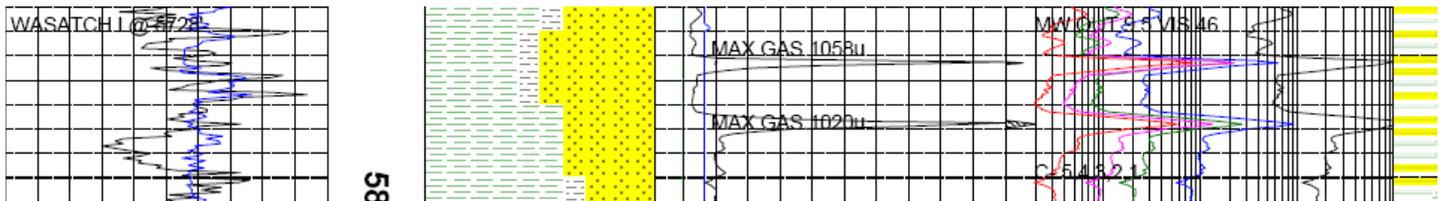
The lower Wasatch Formation is assigned from the occurrence of the top of the Wasatch "G" (5436' MD), to the Wasatch "I" (5728' MD), through to the top of the Ohio Creek Formation (7205' MD). The Wasatch "G" consists mainly of variably colored shale and sandstone near the upper portion of the formation and increases in siltstone and carbonaceous shale percentage near the lower portion with some thin layers of coal beds in the Wasatch "I". There was a loss of partial returns near the Wasatch "G" formation top at 5484' MD. Background, drilling, and connection gases all increased during the Wasatch "I" Formation while drilling.

### Lower Wasatch Statistics

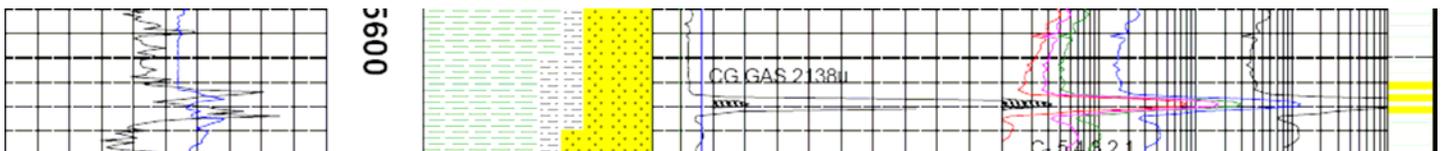
	ROP (Ft/Hr)	CO2 (ppm)	Total Gas (Units)
Maximum	153.087	2223.352	2137.799
Minimum	9.767	330.000	11.270
Mean	74.779	465.752	70.048
Standard Deviation	26.756	244.425	115.600



The first maximum gas show appeared upon entering the Wasatch G at 5498' and was 1025 units.



There were two maximum drilling gases of 1058 and 1020 units at 5743' and 5768' respectively.



The high gas of the section was a connection gas of 2138 units and was observed at 5630'.

Chromatography for this section was C – 5, 4, 3, 2, 1.

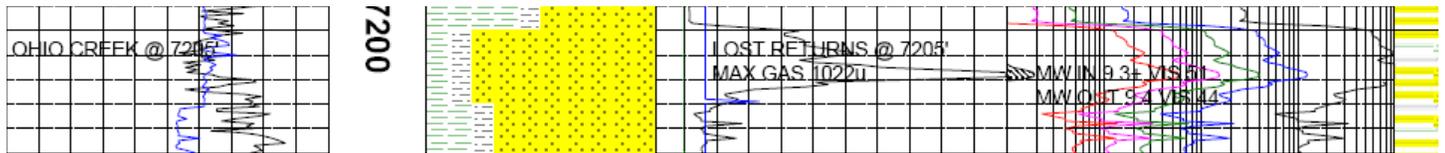
## Ohio Creek Formation/950 Abandonment Surface

The Ohio Creek Formation top was encountered at 7205' MD and is considered to mark the boundary between the Tertiary Wasatch Formation and the Cretaceous Mesaverde Group. It is interpreted as an erosion surface and consists of a slightly to strongly kaolinitic sandstone where kaolinite occurs as a component in the matrix. A second sandstone unit encountered below the kaolinitic sandstone displays a general paucity of kaolinite and is characterized as a firm to hard, grain supported, dominantly quartz sandstone.

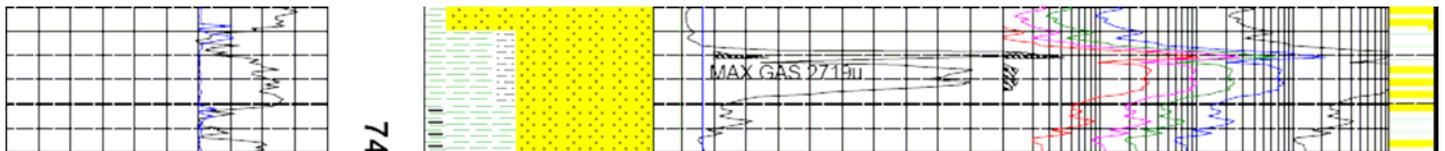
Relevant data concerning the Ohio Creek are presented as follows:

### Ohio Creek Formation Statistics

	ROP (Ft/Hr)	CO2 (ppm)	Total Gas (Units)
Maximum	92.717	3873.310	2719.875
Minimum	16.498	330.000	13.522
Mean	51.138	359.520	200.348
Standard Deviation	18.346	243.064	298.865



Upon entering the Ohio Creek there was a formation gas reading 1022 units at 7218' just after partial returns were lost.



The high gas of the section was a formation gas reading 2719 units observed at 7361'.

Chromatography for this section was C – 5, 4, 3, 2, 1.

## 900 Sequence Boundary/Williams Fork 850

The 900 sequence boundary, marking the top of the Mesaverde Group and the Williams Fork 850 Formation occurred at 7475' MD. The Williams Fork 850 is dominated by sandstone, with lesser amounts of shale and siltstone. The sandstone encountered through this unit varies from grayish-white through grayish-green and dark gray and displays the following general characteristics:

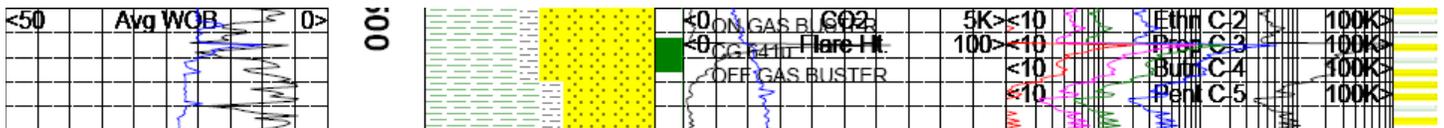
- Fine to medium grained;
- Grain supported with carbonate-clay matrix;
- Surrounded to sub angular, clear to translucent quartz with moderate sphericity overall;
- Occasionally to commonly kaolinitic;
- Occasional dis-aggregation to loose sand grains in the sample tray.

The sandstones encountered in this unit are typical of other sandstones found throughout the entire Mesaverde Group section.

Rates of Penetration, Total Gas, and CO<sub>2</sub> data for the WF 850 are presented as follows:

### Williams Fork 850 Formation Statistics

	ROP (Ft/Hr)	CO <sub>2</sub> (ppm)	Total Gas (Units)
Maximum	101.274	2984.280	641.892
Minimum	10.254	368.431	11.270
Mean	48.678	1166.968	44.145
Standard Deviation	20.331	306.141	62.827



The high gas of this section was a connection gas of 641 units at 7515'.

Chromatography for the Williams Fork 850 Formation returned C-1 through C-5 during most of the drilled interval, with few instances of C-5 dropping out near the top of the section.

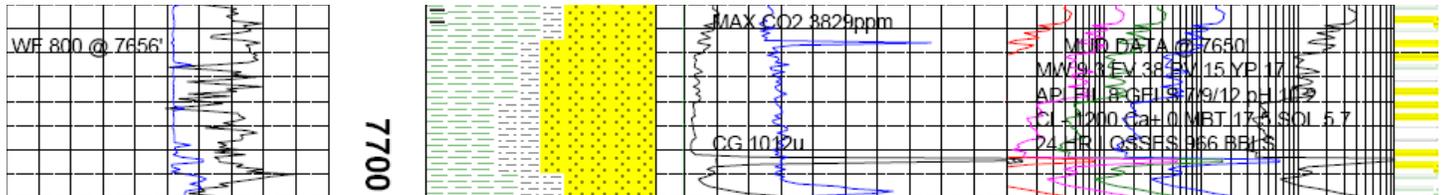
## 850 Abandonment Surface/Williams Fork 800

The 850 AS, which marks the top of the Williams Fork 800 was encountered at a depth of 7656' MD. A sandstone unit marks the upper contact along with an increase in background gas while drilling.

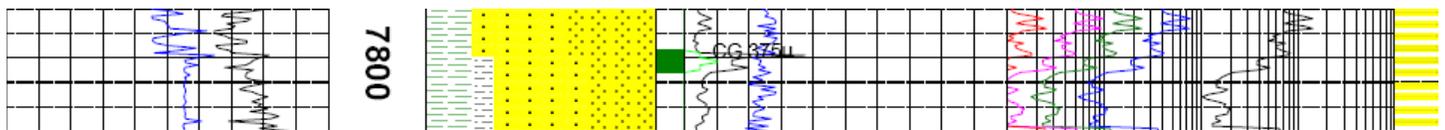
Relevant statistics for the WF 800 are listed below:

### Williams Fork 800 Formation Statistics

	ROP (Ft/Hr)	CO2 (ppm)	Total Gas (Units)
Maximum	113.497	3829.755	1012.819
Minimum	20.571	330.000	19.388
Mean	59.084	1039.062	130.913
Standard Deviation	17.702	490.755	150.176



The maximum gas while drilling the Williams fork 800 was a connection gas of 1012 units at 7704' preceded by a CO2 gas peak measuring 3829 ppm at 7656'.



The second connection gas of the section occurred at 7799' with a value of 375 units and produced a 10' flare when sent through the mud-gas separator.

Chromatography for the Williams Fork 800 Formation returned C-1 through C-5 for the drilled interval.

## 800 Sequence Boundary/Williams Fork 700

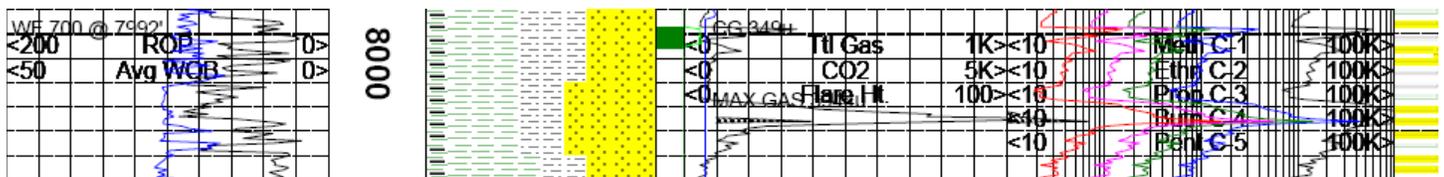
The 800 SB was encountered at 7992' MD. Like the Williams Fork 800, this sequence consists of dominantly shale with sandstone and siltstone interbedded down the section with occasional stringers of carbonaceous shale. The following features characterized the Shales that interbedded through this unit:

- Dark gray to light gray color;
- Soft to slightly firm to crunchy;
- Dull, earthy luster with occasional waxy zones;
- Occasional silty zones.

Data for the WF 700 are summarized as follows:

### Williams Fork 700 Formation Statistics

	ROP (Ft/Hr)	CO2 (ppm)	Total Gas (Units)
Maximum	92.717	345.372	3944.670
Minimum	16.879	330.000	33.789
Mean	56.804	330.128	156.440
Standard Deviation	20.745	1.403	385.599



The major gas show of the Williams Fork 700 was a drilling gas at 8026' with a gas reading of 3944 units.

The chromatography of this section was C-1 through C-5.

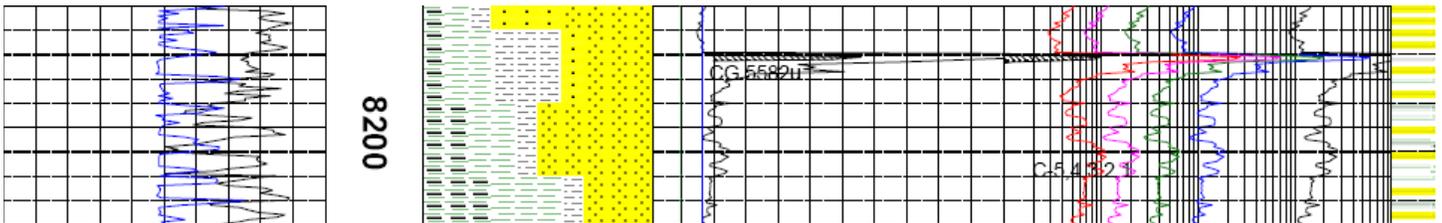
## 690 Abandonment Surface/Williams Fork 600

The 690 AS, marking the top of the Williams Fork 600 Member was encountered at 8112' MD. The WF 600 was logged as sandstone near the upper and lower portion with moderate amounts of shale and siltstone found throughout the formation samples and carbonaceous shales found in the middle of the section.

Relevant data for the WF 600 are summarized as follows:

### Williams Fork 600 Formation Statistics

	ROP (Ft/Hr)	CO2 (ppm)	Total Gas (Units)
Maximum	107.91	2986.842	5582.444
Minimum	19.89	330.000	47.038
Mean	50.73	480.488	177.425
Standard Deviation	20.103	432.714	515.150



The highest gas reading of the Williams Fork 600 was a connection gas at 8171' and was 5582 units.

The chromatography for this section mostly exhibited C-1 through C-5 present.

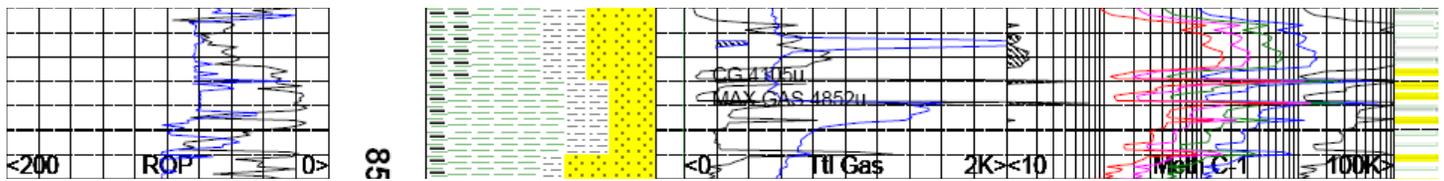
## 600 Sequence Boundary/Williams Fork 500

The Williams Fork 500 Formation occurred at a depth of 8392' MD. As with previous Williams Fork units, this unit is also dominated by sandstone, but showed a significant increase in shale and siltstone percentage in the middle of the section followed by a rare occurrence of carbonaceous shale and kaolinitic sandstone.

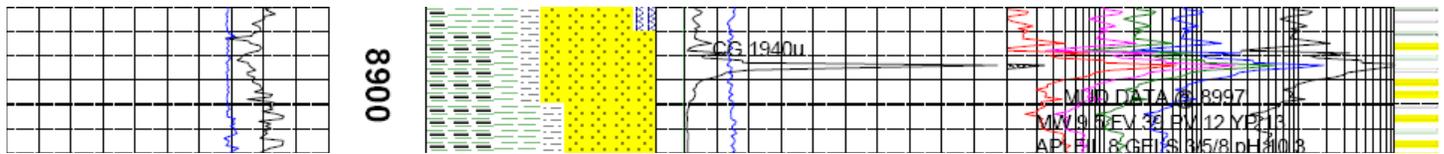
Data for the WF 500 are summarized as follows:

### Williams Fork 500 Formation Statistics

	ROP (Ft/Hr)	CO2 (ppm)	Total Gas (Units)
Maximum	117.551	9876.184	4852.374
Minimum	11.214	529.840	9.259
Mean	43.498	1206.281	144.370
Standard Deviation	16.275	765.996	351.778



The first high gas of the Williams Fork 500 was at 8460' and was a connection gas of 4105 units followed by a drilling gas of 4852 units at 8469'.



Another connection gas was recorded at 8894' reading 1940 units just below a kaolinitic layer.

Chromatography through the WF 500 displayed C-1 through C-5 gas shows.

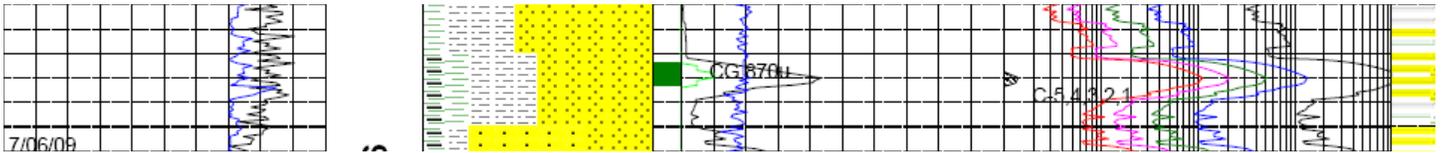
**490 Abandonment Surface/ Williams Fork 400**

The top of the Williams Fork 400 member was encountered at 8940' MD. Sandstone, kaolinitic sandstone, shale, and siltstone are common through the WF400 with 10%-20% of carbonaceous shale appearing near the upper and lower portions of the section.

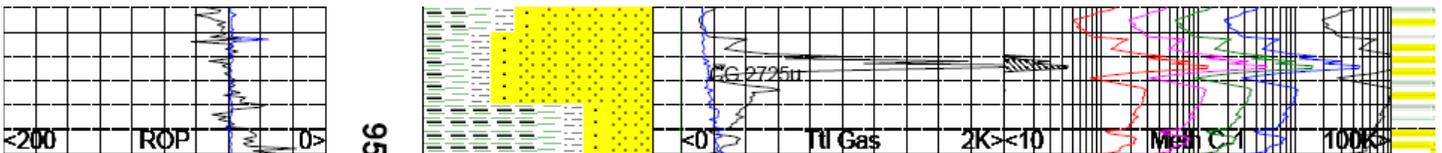
Data concerning the WF 400 are summarized as follows:

**Williams Fork 400 Formation Statistics**

	ROP (Ft/Hr)	CO2 (ppm)	Total Gas (Units)
Maximum	83.328	1383.001	2725.435
Minimum	15.786	330.000	11.363
Mean	42.121	709.574	132.688
Standard Deviation	12.847	287.927	221.996



The first gas of the section was a connection gas at 9160' and measured 870 units while producing a 10' flare.



Another significant connection gas of the section recorded 2725 units at 9464'.

The chromatography of this section was C-1 through C-5.

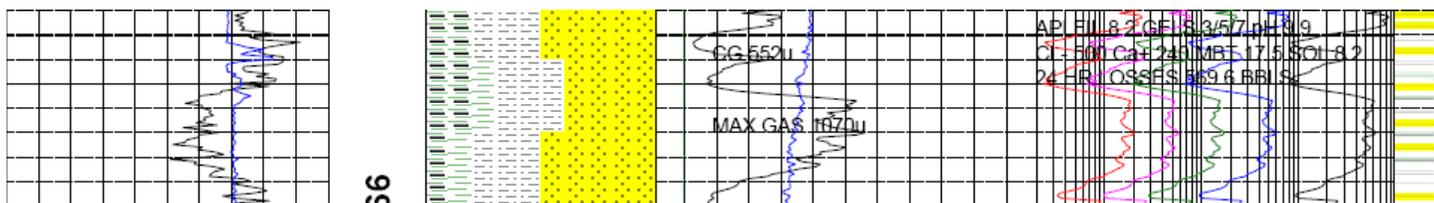
## 400 Sequence Boundary/ Williams Fork 300

The Williams Fork 300 member has an upper boundary of 9592' MD and is determined by the 400 SB. The WF 300 generally features interbedded sandstone, shale, and siltstone are common through the WF300 with 20%-50% of carbonaceous shale appearing near the upper and lower portions of the section with a few bands of coal present around 10500'. The gas buster was used frequently throughout the WF 300 due to very high gas concentrations and generally produced 5' flares.

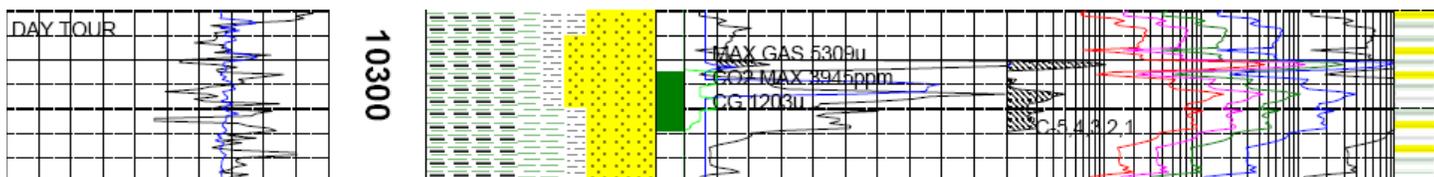
Data concerning the WF 300 are presented as follows:

### Williams Fork 300 Formation Statistics

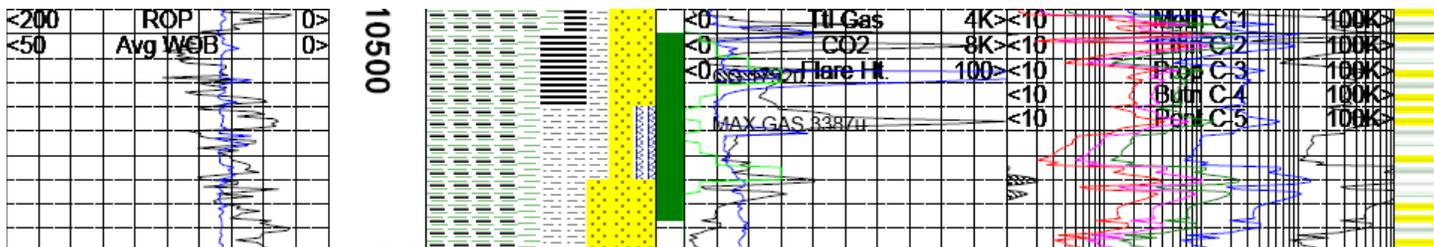
	ROP (Ft/Hr)	CO2 (ppm)	Total Gas (Units)
Maximum	115.005	23790.656	5309.046
Minimum	8.028	330.000	13.781
Mean	51.713	1195.946	425.085
Standard Deviation	17.814	1358.939	629.555



The first notable gas was a connection gas followed by a drilling gas observed at 9839' and 9857' recording 552 and 1070 units respectively.



The highest formation gas of 5309 units occurred at 10302' followed by a CO2 spike of 3945 ppm which produced a 10' flare after being sent through the gas buster.



A significant gas show occurred between 10495' and 10542' with a maximum drilling gas of 4050 units producing the largest flare of the section measuring 30' in height twice in the coal and kaolinitic sandstone layer.

The chromatography of this section was C-1 through C-5 gas.

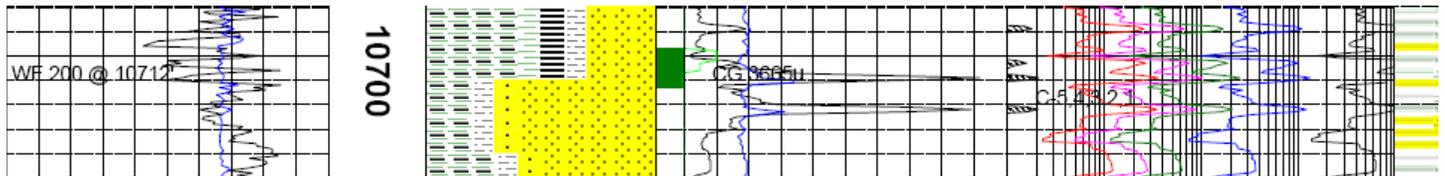
**290 Abandonment Surface/ Williams Fork 200**

The Williams Fork 200 member, whose top is marked by the 290 AS, was encountered at 10712' MD and encompasses interbedded sandstone, shale, carbonaceous shale, siltstone and coal.

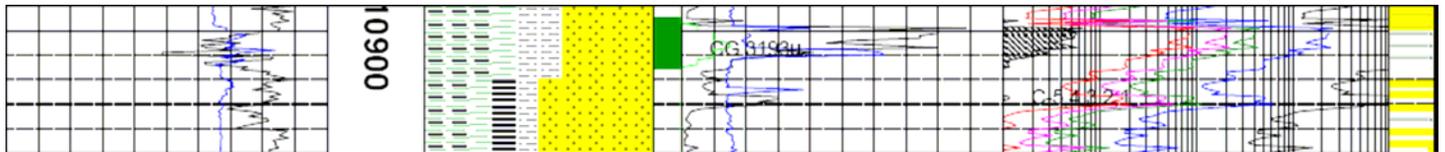
Data for the WF 200 are summarized as follows:

**Williams Fork 200 Formation Statistics**

	ROP (Ft/Hr)	CO2 (ppm)	Total Gas (Units)
Maximum	104.490	5502.771	3563.730
Minimum	13.434	1085.804	36.393
Mean	43.448	1484.436	447.766
Standard Deviation	18.027	641.564	634.726



Upon entering the Williams Fork 200 there was a maximum connection gas of 3665 units at 10709' producing a 10' flare.



The highest flare of the section was 15' at 10907' and was preceded by 3193 units of connection gas and followed by 5036 ppm of CO2.

The chromatography of the section was C-1 through C-5 gas.

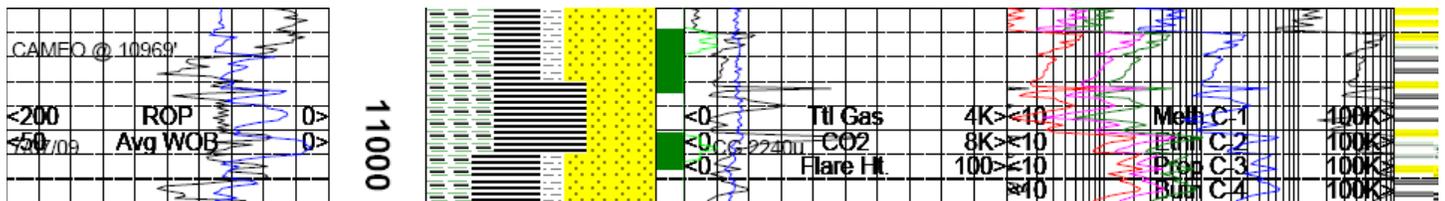
## 210 Sequence Boundary/Cameo Formation

The 210 SB, marking the top of the Cameo Formation, occurred at a depth of 10969' MD. The rocks of the Cameo Formation include sandstone, carbonaceous shale, and siltstone along with a significant number of coal units. ROP began to increase in short bursts as the brittle coal crumbled very easily and sandstone percentage was variable.

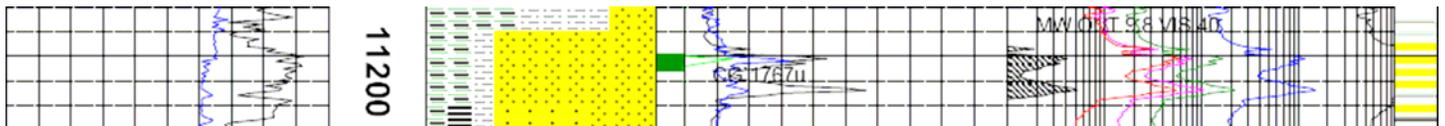
Data for the Cameo Formation are summarized as follows:

### Cameo Formation Statistics

	ROP (Ft/Hr)	CO2 (ppm)	Total Gas (Units)
Maximum	106.223	2748.572	2256.806
Minimum	11.139	330.000	45.437
Mean	46.051	1059.466	484.601
Standard Deviation	21.563	330.612	382.364



Upon entering the Cameo there was a formation gas of 883 units at 10961' which produced a 10' flare followed by a connection gas at 11003' measuring 2240 units and also produced a 10' flare.



The largest flare of the section was 15' and came during a connection gas reading 1767 units at 11201' near the bottom of the section.

Chromatography through the Cameo Formation included C-1 through C-5 for the entire drilled interval.

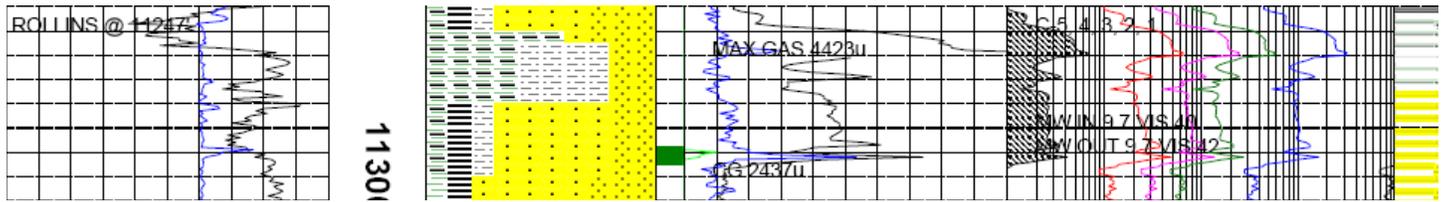
## 200 Sequence Boundary/Rollins Formation

The 200 SB occurred at 11247' MD and marks the top of the Rollins Formation. The top of the Rollins is dominated by thick, relatively clean looking quartz sandstone and sand grains followed by siltstone layers in the middle of the section and lesser amounts of carbonaceous shale, coal, and shale.

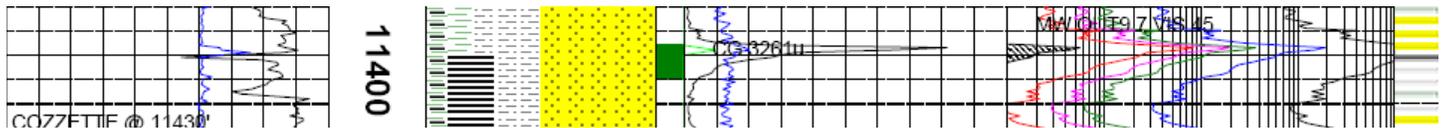
Data for the Rollins Formation are summarized as follows:

### Rollins Formation Statistics

	ROP (Ft/Hr)	CO2 (ppm)	Total Gas (Units)
Maximum	124.206	4272.989	4422.795
Minimum	12.101	330.000	24.403
Mean	39.498	938.927	823.041
Standard Deviation	18.370	441.785	981.139



The highest recorded gas was 4423 units at 11259' and produced a 5' flare at the very top of the Rollins followed by a connection gas of 2437 units at 11297' which produced a 10' flare.



The highest connection gas of the section measured 3261 units and was observed at 11397' followed by a 10' flare.

Chromatography for the section exhibited C-1 to C-5.

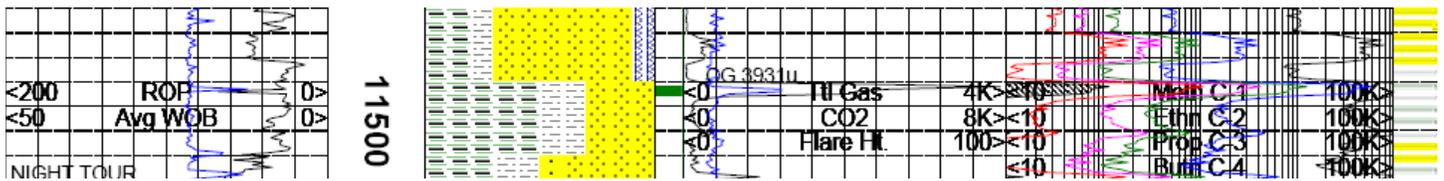
## 180 Flooding Surface/Cozzette Formation

The top of the Cozzette Formation, at 11430' MD is marked by the 180 FS. The Cozzette is predominately composed of poorly consolidated sandstone, carbonaceous shale, and siltstone with a 10%-20% coal zone found within the middle of the section.

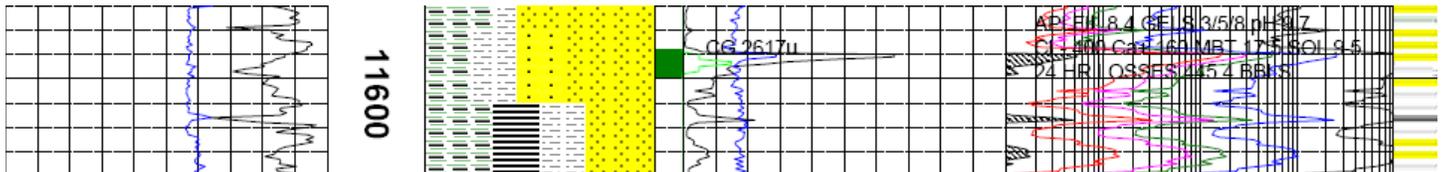
Drilling and gas data for the Cozzette Formation are summarized as follows:

### Cozzette Formation Statistics

	ROP (Ft/Hr)	CO2 (ppm)	Total Gas (Units)
Maximum	80.278	3143.127	3931.450
Minimum	7.148	330.000	13.781
Mean	29.193	1098.948	223.792
Standard Deviation	14.171	405.655	431.231



The first and largest connection gas of the section measured 3931 units at 11492' accompanied by a CO2 spike reading 2436 ppm.



The high flare of the section was 10' and it occurred just after a connection gas at 11590' which measured 2617 units.

Chromatography for the Cozzette Formation returned C-1 through C-5 for most of the drilled interval with C-5 dropping out near the very bottom of the section.

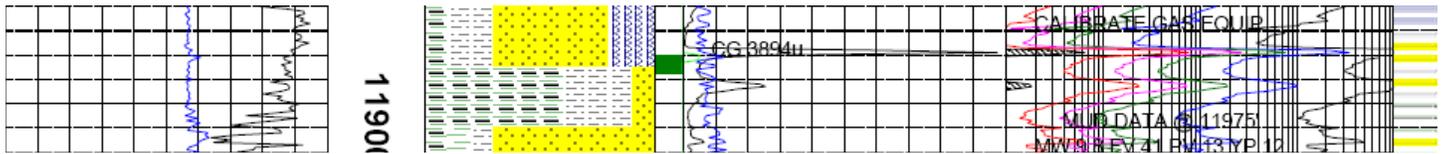
### 140 Flooding Surface/Corcoran Coastal Plain

The top of the Corcoran Coastal Plain, marked by the 140 Flooding Surface, was encountered at 11752' MD. This section encompasses a thick sequence of sandstone, shale, siltstone, and carbonaceous shale with common occurrences of kaolinitic sand in the middle to lower portion of the formation.

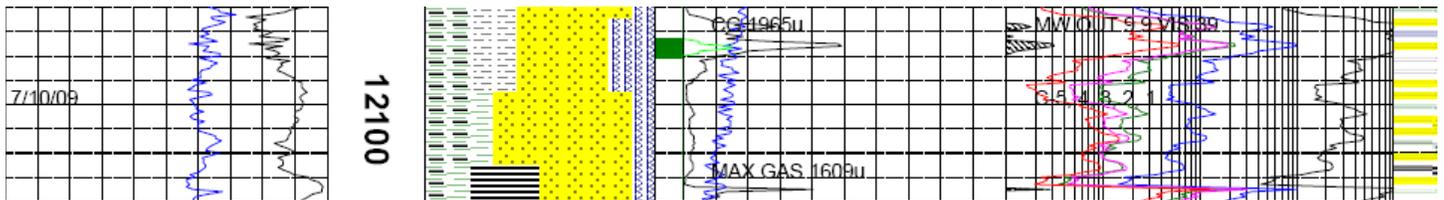
Drilling data for this section are summarized as follows:

#### Corcoran Coastal Plain Formation Statistics

	ROP (Ft/Hr)	CO2 (ppm)	Total Gas (Units)
Maximum	80.375	3468.507	5116.747
Minimum	2.979	330.000	16.043
Mean	21.832	976.587	229.977
Standard Deviation	12.245	452.318	430.367



The highest connection gas of the section recorded 3894 units of gas at 11879' producing a 5' flare.



The high flare of the section was 15' and associate with a connection gas reading 1965 units at 12076' followed by the high formation gas of 1609 units at 12135' in a kaolinitic sandstone layer.

Chromatography for this section was C-1 to C-5 for most of the interval.

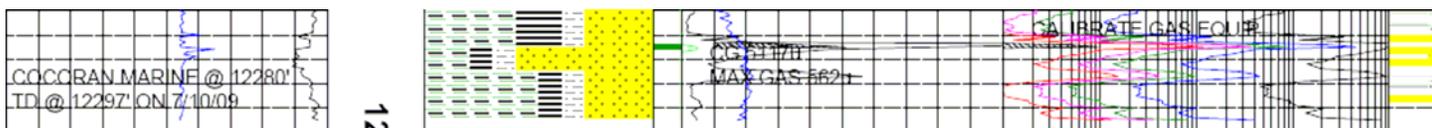
## 140 Sequence Boundary/Corcoran Marine Formation

The Corcoran Marine top was drilled at 12280' MD. This unit was composed dominantly of siltstone and sandstone with interbedded areas of shale and carbonaceous shale present. The well was completed within the Corcoran Marine at a depth of 12297' MD at the request of the drilling engineer due to very slow ROP rates.

Data for the Corcoran Marine are summarized as follows:

### Corcoran Marine Formation Statistics

	ROP (Ft/Hr)	CO <sub>2</sub> (ppm)	Total Gas (Units)
Maximum	11.350	1759.622	65.787
Minimum	5.037	1359.943	27.348
Mean	8.311	1581.032	41.855
Standard Deviation	2.020	113.335	10.893



The only recorded gas within the Corcoran Marine was a connection gas of 5116 units at 12265' associated with a 5' flare followed by a formation gas of 562 units at 12277'.

Chromatography for this section exhibited C-1 to C-5.

### Other Data Plots

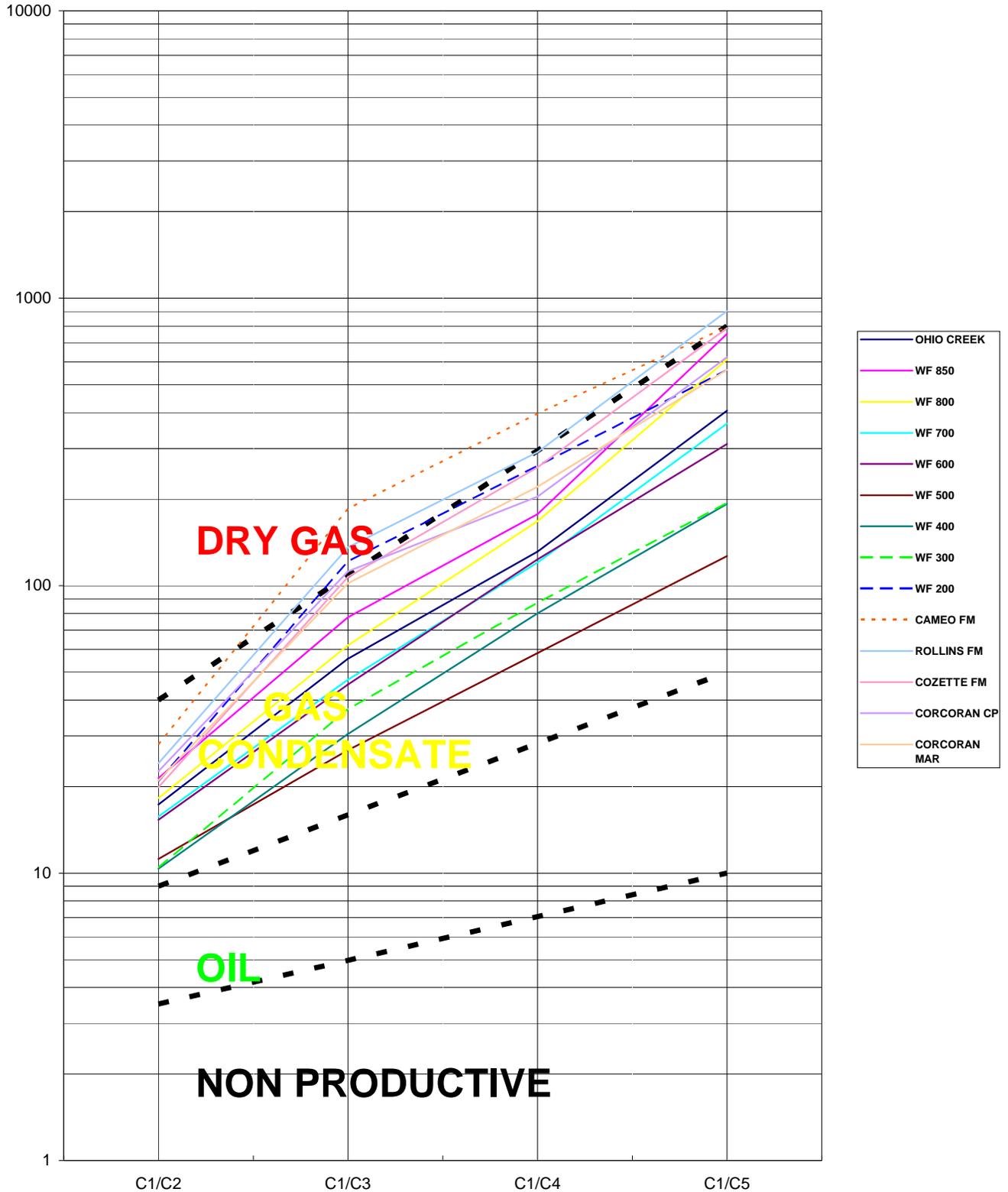
The following series of data plots summarize data concerning rate of penetration, total gas, and CO<sub>2</sub> as discussed in the above sections. Data are referenced to the formation top for each of the formations described above. The data are intended to illustrate general trends for each of these parameters relative to depth.

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**Pixler Plot**

**FRU 197-33 A2**

**Pixler Plot Of Average Chromatography Data By Formation**

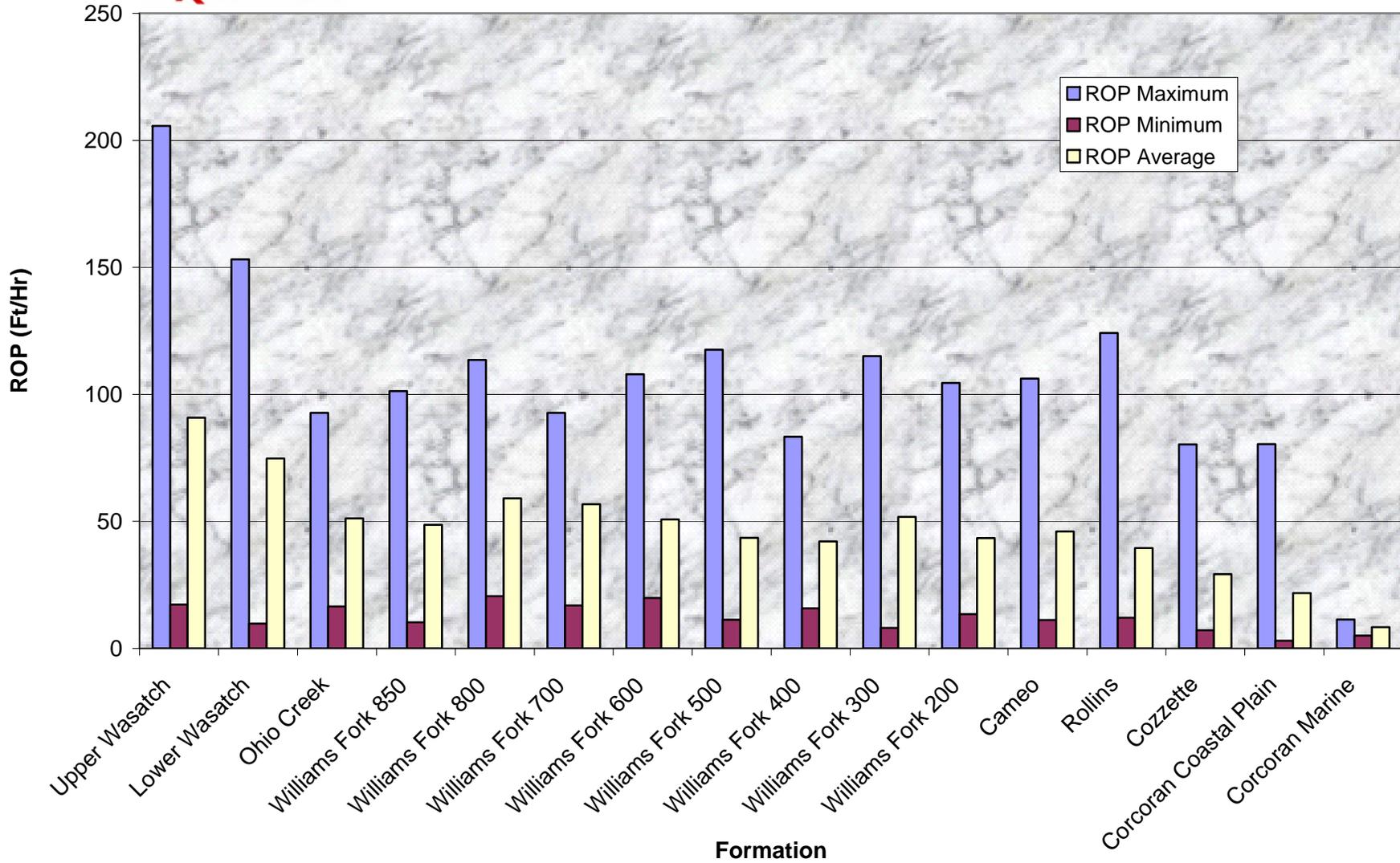


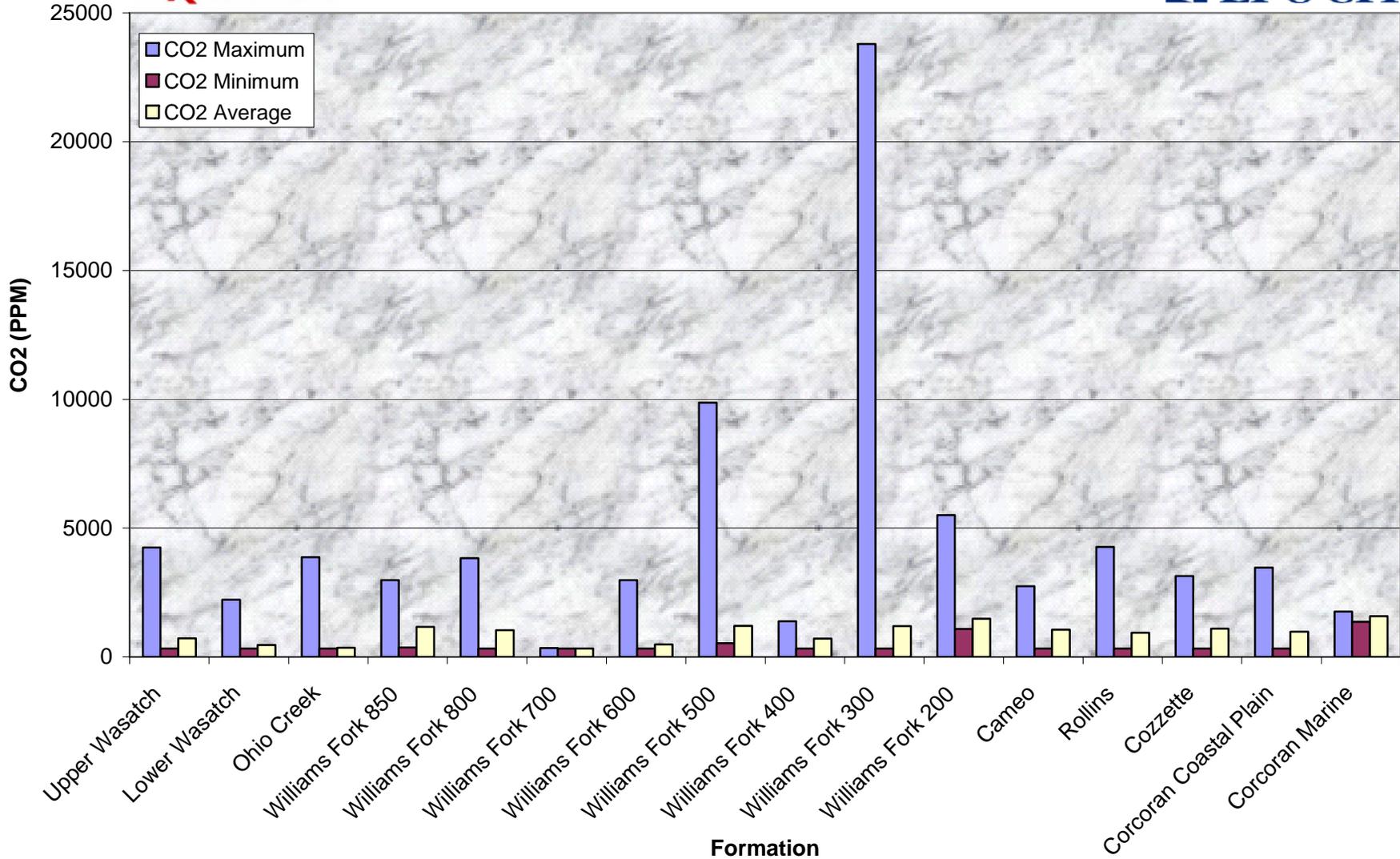
# **ExxonMobil FRU 197-33A2**

**Other Data Plots**



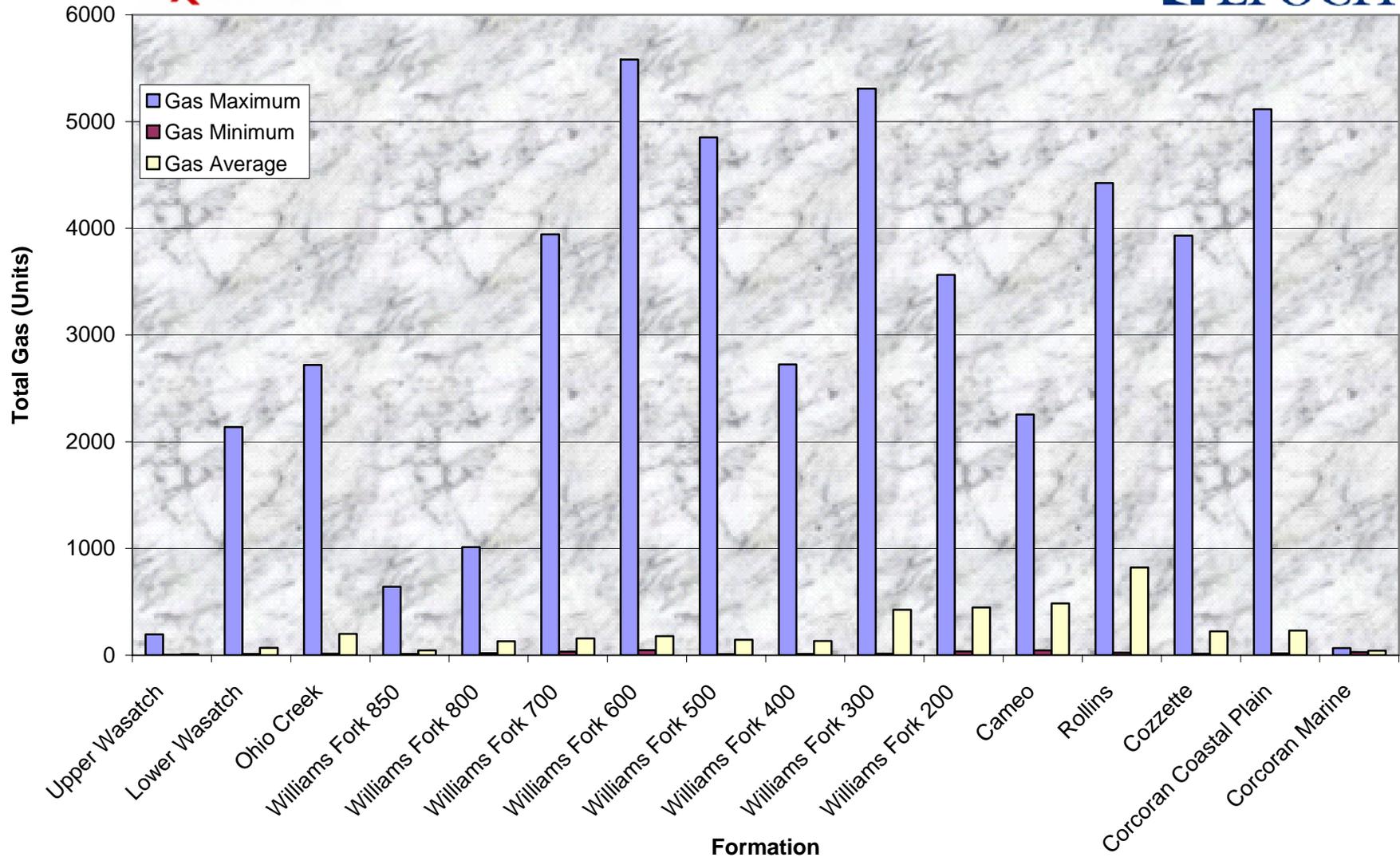
FRU 197-33A2  
Rate of Penetration Statistics







### FRU 197-33A2 Total Gas Statistics By Formation



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FRU 197-33A2**

**Formation Descriptions**

**3910' Shale** = light bluish gray to light yellow brown to gray; brittle to crumbly tenacity; irregular to blocky to occasionally planar fracture; tabular to wedgelike to occasionally nodular cuttings habit; dull to earthy to occasionally waxy luster; smooth to clayey texture; thick to massively bedded; traces of pyrite nodules found in sample tray; common claylike mud properties; overall non calcareous.

**4030' Shale** = color varies from gray to yellowish brown to brown; crumbly to crunchy to brittle tenacity; irregular to planar fracture; massive to flaky to wedge like cuttings habit; dull to earthy to waxy luster; smooth to slightly clayey texture; massive structure.

**4120' Sandstone** = color ranges from gray to white to tan to translucent; fine to medium grain; fair to well sorted grains; sub-angular to sub-round to round grains with low to moderate sphericity; easily friable to friable; calcite cementation; sample is highly reactive to Hydrochloric acid solution; approx. two to five percent of sample consists of dark brown and black lithic fragments; no fluorescence under uv light.

**4240' Siltstone** = light gray to gray to bluish gray; brittle to crumbly to crunchy tenacity; generally irregular fracture; massive cuttings habit; waxy to dull to earthy luster; silty to gritty texture; massive structure.

**4320' Shale** = yellowish brown to brown to light gray; sample has brittle to crunchy to crumbly tenacity; planar to irregular fracture; cuttings are generally massive to platy to flaky to wedge like; overall dull to earthy luster; smooth to clayey texture; massive structure.

**4410' Shale** = color varies from light gray to gray to black to tan; slightly dense to brittle to crunchy tenacity; planar to blocky to irregular fracture; platy to flaky to scaly to wedge like to massive cuttings habit; earthy to dull to waxy to occasionally frosted luster; smooth to clayey to slightly gritty texture; generally massive structure.

**4520' Sandstone** = white to light gray to dark gray to tan to translucent; quartz framework; very fine to fine to medium grain size; generally fair to well sorted grains with low to moderate sphericity; friable to firm friable hardness; calcite cementation; sample is readily active to Hydrochloric acid solution; sample contains dark brown and black lithic fragments.

**4630' Shale** = light bluish gray to light yellow brown to gray; brittle to crumbly tenacity; irregular to blocky to occasionally planar fracture; tabular to wedgelike to occasionally nodular cuttings habit; dull to earthy to occasionally waxy luster; smooth to clayey texture; thick to massively bedded.

**4720' Sandstone** = color ranges from gray to white to tan to translucent; fine to medium grain; fair to well sorted grains; sub-angular to sub-round to round grains with low to moderate sphericity; easily friable to friable; calcite cementation; sample is highly reactive to Hydrochloric acid solution; approx. two to five percent of sample consists of brown and black lithic fragments; no fluorescence under uv light.

**4840' Shale** = light bluish gray to light gray to occasionally hues of dark yellowish brown; crumbly to crunchy tenacity; irregular to blocky to occasionally planar fracture; tabular to wedgelike to occasionally nodular and elongated habit; very earthy to dull luster; smooth to silty texture when clean with clayey feel before mud is washed out of sample; thick to occasionally thin and banded structure; overall well consolidated shale matrix with grains of quartz sand and kaolinite present <10%.

**4970' Sandstone** = white to opaque with traces of light pinkish hues common, dark brown to black lithics appear throughout sand grain matrix; fine to medium lower to occasionally coarse upper grained; moderately well sorted; subrounded to subangular; moderate sphericity with some rounded grains present <5%; firm to brittle to occasionally hard; moderate to very calcareous; kaolinite alteration common throughout sample tray; no visible hydrocarbon indicators present.

**5170' Shale** = color varies from light gray to gray to black to tan; slightly dense to brittle to crunchy tenacity; planar to blocky to irregular fracture; platy to flaky to scaly to wedge like to massive cuttings habit; earthy to dull to waxy to occasionally frosted luster; smooth to clayey texture.

**5260' Siltstone** = dark gray to light brown; crumbly to crunchy to occasionally brittle tenacity; blocky to planar fracture to irregular fracture; scaly to tabular to occasionally wedgelike habit; dull to earthy with rare sparkly luster; smooth to silty texture; thin to thick structure; breaks apart into planar fractures with gritty properties; very few bubbles occur in Hydrochloric acid solution.

**5370' Sandstone** = off white to translucent to white to occasionally light green hues and dark lithics common; fine to medium grained with some loose coarse grains; fair to well sorted; angular to subangular to occasionally subrounded; low to moderate sphericity; very clean quartz grained sand very common in sample tray; non to very slightly calcareous overall; pyrite clusters abundant at Wasatch G contact; no fluorescence under uv light.

**5490' Shale** = color varies from light bluish gray to light gray to reddish brown and occasionally light purple gray; brittle to crumbly to occasionally crunchy tenacity; blocky to irregular to occasionally hackly fracture; very earthy to dull luster; mainly smooth to silty to occasionally gritty texture; thin to thick to becoming massively bedded outside of sandstone bedding planes; traces of aggregated pyrite found throughout sample tray; overall non calcareous.

**5620' Sandstone** = off white to white to light gray with black and brown lithics found within grain matrix; fine to medium lower to medium and coarse upper grained; well to fairly sorted; subangular to subrounded with few rounded grains present; low to moderate sphericity; brittle to firm to moderately hard; disseminated pyrite common on outside of quartz grains; very slightly reactive in Hydrochloric acid solution; no apparent oil indicators present.

**5750' Shale** = color varies from light bluish gray to light gray to reddish brown and occasionally dark gray to black; brittle to crumbly to occasionally crunchy tenacity; blocky to irregular to occasionally hackly fracture; very earthy to dull luster; mainly smooth to silty to occasionally gritty texture; thin to thick to becoming massively structured with coarse grains common throughout sample tray; overall non calcareous.

**5870' Carbonaceous Shale** = very dark gray to black; crumbly to crunchy to pulverulent tenacity; blocky to irregular fracture; wedgelike to tabular to occasionally flaky cuttings habit; resinous to greasy to occasionally earthy luster; gritty to granular texture and easily smudges black onto skin when dry; thin to laminae to occasionally thick structure; nodules of visibly degassing coal found in sample tray very common <10%.

**5990' Coal** = black to very dark brown; dense to brittle tenacity; conchoidal to blocky fracture; tabular to wedgelike cuttings habit; vitreous luster on bit cut face; smooth to silty texture; degasses regularly when wet under sample microscope.

**6070' Sandstone** = color ranges from gray to white to tan to translucent; fine to medium grain; fair to well sorted grains; sub-angular to sub-round to round grains with low to moderate sphericity; easily friable to friable; calcite cementation; sample is highly reactive to Hydrochloric acid solution; approx. two to five percent of sample consists of dark brown and black lithic fragments; no fluorescence under uv light.

**6190' Carbonaceous Shale** = dark gray to reddish black to black; brittle to crunchy tenacity; irregular to blocky to planar fracture; massive to platy to tabular to wedge like cutting habit; earthy to dull to greasy to resinous luster with smooth to clayey to slightly silty texture; occasional bands of pyrite are visible in sample; also slight degassing is visible.

**6300' Sandstone** = white to light gray to dark gray to tan to translucent; quartz framework; very fine to fine to medium grain size; generally fair to well sorted grains with low to moderate sphericity; friable to firm friable hardness; calcite cementation; sample is readily active to Hydrochloric acid solution; sample contains dark brown and black lithic fragments.

**6410' Shale** = color varies from light gray to gray to dark gray; sample is crunchy to crumbly to brittle tenacity; generally planar to irregular fracture; cuttings habit tends to be massive to platy to flaky to wedge like to bladed; earthy to dull to occasionally waxy luster; overall massive structure with occasional stringers of dark brown and black carbonaceous material.

**6520' Carbonaceous Shale** = dark gray to reddish black to black; brittle to crunchy tenacity; irregular to blocky to planar fracture; massive to platy to tabular to wedge like cutting habit; earthy to dull to greasy to resinous luster with smooth to silty texture.

**6600' Sandstone** = white to light gray to opaque and occasionally translucent with greenish blue hues common; fine to medium lower and coarse to very coarse upper grained; well sorted; subangular to angular to subrounded; low to moderate to trace high sphericity; firm to hard to very hard calcite cementation; rare frosted mechanical abrasion found on bit cut face; moderately to very reactive in Hydrochloric acid solution; traces of clustered and pinpoint pyrite very common throughout sample tray; no visible hydrocarbon indicators present.

**6750' Shale** = color varies from light gray to gray to bluish gray and occasionally red brown; crunchy to crumbly to brittle tenacity; overall planar to irregular fracture; cuttings habit tends to be massive to platy to flaky to wedgelike to bladed with coarse nodular shale pieces very common; some occasionally pinpoint pyrite found when sample is broken into pieces; earthy to dull to occasionally sparkly luster; overall massive structure with occasional stringers of dark brown and black carbonaceous material that slightly degasses under microscope.

**6900' Sandstone** = white to light gray to opaque and occasionally translucent with greenish blue hues common; very fine to fine low and coarse to very coarse upper grained; well sorted; subangular to angular to subrounded; low to moderate to trace high

sphericity; firm to hard to very hard silica cementation; rare frosted mechanical abrasion found on bit cut face; moderate to very reactive in Hydrochloric acid; pinpoint pyrite common throughout sample tray; kaolinitic sandstone also notable <10% of sand matrix; no apparent oil indicators present under uv light.

**7050' Shale** = color varies from light gray to gray to bluish gray and occasionally dark brown; crunchy to crumbly to brittle tenacity; overall planar to irregular fracture; platy to flaky to wedgelike to bladed with coarse nodular shale pieces; very earthy to dull to occasionally sparkly luster; overall massive structure that slightly degasses under microscope; overall non calcareous.

**7160' Siltstone** = light gray to gray to bluish gray to tan; slightly dense to brittle with irregular to blocky fracture; sample exhibits massive to nodular cuttings habit; generally earthy to dull to waxy luster; silty to gritty texture.

**7240' Sandstone** = color ranges from gray to white to tan to translucent; fine to medium grain; fair to well sorted grains; sub-angular to sub-round to round grains with low to moderate sphericity; easily friable to friable; calcite cementation; sample is slightly reactive to Hydrochloric acid solution; approx. two to five percent of sample consists of dark brown and black lithic fragments; no visible signs of hydrocarbons with use of uv light.

**7370' Carbonaceous Shale** = dark gray to reddish black to black; brittle to crunchy tenacity; irregular to blocky to planar fracture; massive to platy to tabular to wedge like cutting habit; earthy to dull to greasy to resinous luster with smooth to clayey to slightly silty texture; occasional bands of pyrite are visible in sample; also slight degassing is visible.

**7480' Shale** = dark gray to gray to light gray; brittle to crunchy tenacity; planar to occasionally irregular fracture; bladed to wedge like to scaly to platy cuttings habit; waxy to earthy to dull luster; massive structure with occasional pyrite and carbonaceous stringers.

**7570' Sandstone** = color varies from white to light gray to translucent with a salt and pepper appearance; very fine to fine lower to medium and rare coarse grained upper; well to very well sorted; angular to subangular to occasionally subrounded; low to moderate sphericity; hard to brittle to occasionally friable; mixture of calcite and silica cementation; kaolinitic sand very common in planar and flaky structure <10% in sample tray; moderately calcareous; very clean beach looking sand; no visible fluorescence under uv light.

**7720' Shale** = light gray to light bluish gray with traces of reddish brown; brittle to crumbly tenacity; irregular to blocky to occasionally planar fracture; massive cuttings habit with large tabular and elongated pieces common; dull to earthy to occasionally waxy luster; silty to gritty to rare clayey texture; overall thick to massive structure; planar embedded features found on bit cut face; traces of pinpoint pyrite common found within the shale grains; overall non calcareous.

**7850' Sand** = white to clear and translucent with light pink and light green hues; angular to cubic, very hard quartz grains; fine to medium grained; very well sorted and consolidated clean looking sand; overall slightly calcareous; no visible hydrocarbon indicators under uv light.

**7940' Siltstone** = dark gray to light tan with light brownish hues; dense to brittle tenacity; overall blocky fracture; massive to wedgelike to rarely nodular cuttings habit; earthy to dull to occasionally resinous luster; very silty to clayey texture; thick to massive structure; breaks into planar pieces against bit cut face; very small inclusions of pinpoint pyrite and siliceous sand particles when scraped with metal tool; overall non to very slightly calcareous.

**8070' Carbonaceous Shale** = dark gray to reddish black to black; brittle to crunchy tenacity; irregular to blocky to planar fracture; massive to platy to tabular to wedge like cutting habit; earthy to dull to greasy to resinous luster with smooth to clayey to slightly silty texture; occasional bands of pyrite and carbonaceous material visible in sample.

**8180' Sandstone** = color varies from gray to white to tan to translucent; fine to medium grain; fair to well sorted grains; sub-angular to sub-round to round grains with low to moderate sphericity; friable to firm friable; calcite cementation; sample is slightly reactive to Hydrochloric acid solution; approx. five to ten percent of sample consists of brown and black lithic fragments; no visible signs of fluorescence under uv light.

**8300' Shale** = dark gray to gray to light gray; brittle to crunchy tenacity; planar to occasionally irregular fracture; bladed to wedge like to scaly to platy cuttings habit; waxy to earthy to dull luster; massive structure with occasional pyrite and carbonaceous stringers.

**8390' Siltstone** = dark gray to light tan with light brownish hues; dense to brittle tenacity; overall blocky fracture; massive to wedgelike to rarely nodular cuttings habit; earthy to dull to occasionally resinous luster; very silty to clayey texture; thick to massive structure.

**8470' Sandstone** = white to gray to clear with dark lithics common; fine to medium grained; fair to well sorted; subangular grains with low to moderate sphericity; mainly calcitic matrix; slightly calcareous; no visible fluorescence.

**8600' Siltstone** = dark gray to light brown; crumbly to crunchy to occasionally brittle tenacity; blocky to planar fracture to irregular fracture; scaly to tabular to occasionally wedgelike habit; dull to earthy with rare sparkly luster; smooth to silty texture; thin to thick structure.

**8680' Sandstone** = color varies from gray white to occasionally translucent to transparent; quartz framework; grain size tends to be fine to medium to occasionally coarse; grains are fair to well sorted with generally round to sub-round angularity and low to moderate sphericity; surface features include occasionally polished and frosted grains; sample is friable to firm friable to moderately hard; overall silica cementation although slight reaction to Hydrochloric acid solution; approx. five percent of sample consists of brown and black lithic fragments; no fluorescence under uv light.

**8850' Carbonaceous Shale** = dark gray to reddish black to black; brittle to crunchy tenacity; irregular to blocky to planar fracture; massive to platy to tabular to wedge like cutting habit; earthy to dull to greasy to resinous luster with smooth to clayey to slightly silty texture; occasional bands of pyrite are visible in sample; also slight degassing is visible.

**8960' Siltstone** = light to dark gray to occasionally dark brown with traces of black; dense to brittle to occasionally tough tenacity; blocky to irregular fracture; massive to tabular and occasionally wedgelike cuttings habit; earthy to dull to rare greasy luster; very silty to gritty texture; overall thick to massively bedded; slightly reacts with Hydrochloric acid 10% solution.

**9060' Sandstone** = color varies from light gray to white to occasionally translucent with a salt and pepper appearance; medium to coarse to occasionally fine grained; fair to well sorted; round to subrounded with few angular grains present; brittle to hard; low to moderate sphericity; mainly silica cementation with loose quartz crystals common; moderately to very calcareous in Hydrochloric acid solution; no apparent hydrocarbon indicators present.

**9180' Carbonaceous Shale** = dark gray to brownish black to black; brittle to crunchy tenacity; irregular to blocky to occasionally planar fracture; massive to platy to tabular to wedgelike cuttings habit; earthy to dull to greasy to resinous luster; smooth to clayey to silty to slightly abrasive texture; occasional pinpoint pyrite common on sample bit cut face; degasses very slightly under normal white light.

**9300' Siltstone** = dark gray to light tan with light brownish hues; dense to brittle tenacity; overall blocky fracture; massive to wedgelike to rarely nodular cuttings habit; earthy to dull to occasionally resinous luster; very silty to clayey texture; thick to massive structure.

**9380' Shale** = generally gray to dark gray in color; brittle to crunchy tenacity; planar to irregular fracture; platy to flaky to scaly to wedgelike to bladed to cuttings habit; dull to earthy luster; smooth to clayey texture; occasional stringers of pyrite are visible.

**9470' Sandstone** = color varies from gray to white to tan to translucent; fine to medium grain; fair to well sorted grains; sub-angular to sub-round to round grains with low to moderate sphericity; friable to firm friable; calcite cementation; sample is slightly reactive to Hydrochloric acid solution; approx. five to ten percent of sample consists of brown and black lithic fragments; no visible signs of fluorescence under uv light.

**9590' Carbonaceous Shale** = dark gray to reddish black to black; brittle to crunchy tenacity; irregular to blocky to planar fracture; massive to platy to tabular to wedge like cutting habit; earthy to dull to greasy to resinous luster with smooth to clayey to slightly silty texture; occasional bands of pyrite are visible in sample; also slight degassing is visible.

**9700' Sandstone** = color ranges from off white to light brown to translucent with a salt and pepper appearance and traces of dark greenish hues; fine to medium lower to coarse and occasionally very coarse upper grained; poorly to fairly sorted with some well sorted silica cementation; overall subangular to subrounded; moderate to low to occasionally high sphericity; firm friable to moderately hard and occasionally hard; dark brown and black lithics found embedded within sand matrix; stringers of carbonaceous shale common; kaolinitic sand also visible within sample tray <10%; moderately calcareous; no visible fluorescence under uv light.

**9870' Siltstone** = dark gray to light gray with light brownish blue hues; dense to occasionally brittle tenacity; blocky to irregular fracture; wedgelike to tabular to massive cuttings habit; earthy to greasy luster; very silty to claylike texture; thick to massive structure overall; less than 2% of visible degassing coal fragments found within sample tray.

**9970' Shale** = overall gray to dark gray with light bluish hues; crunchy to occasionally brittle tenacity; irregular to platy to occasionally splintery and planar fracture; platy to flaky to scaly to wedgelike to trace bladed cuttings habit; dull to waxy to earthy luster; smooth to clayey texture; occasional stringers of pinpoint pyrite are common along with slightly degassing carbonaceous shale found within sample matrix.

**10090' Sandstone** = color ranges from off white to light brown to translucent with a salt and pepper appearance and traces of dark greenish hues; fine to medium lower to coarse and occasionally very coarse upper grained; poorly to fairly sorted with some well sorted silica cementation; overall subangular to subrounded; moderate to low sphericity; firm friable to moderately hard and occasionally hard; dark brown and black lithics found within sand matrix; stringers of shale and carbonaceous shale common; kaolinitic sand also visible within sample tray <10%; moderately calcareous; no visible hydrocarbon indicators present.

**10260' Carbonaceous shale** = dark gray to reddish black to black; brittle to crunchy tenacity; irregular to blocky to planar fracture; massive to platy to tabular to wedge like cutting habit; earthy to dull to greasy to resinous luster with smooth to clayey to slightly silty texture; occasional stringers of carbonaceous material and pyrite are visible in sample.

**10370' Sandstone** = color varies from gray white to occasionally translucent to transparent; quartz framework; grain size tends to be fine to medium to occasionally coarse; grains are fair to well sorted with generally round to sub-round angularity and low to moderate sphericity; surface features include occasionally polished and frosted grains; sample is friable to firm friable to moderately hard; overall silica cementation although slight reaction to hydrochloric acid solution; sample consists of approx. two to five percent dark colored lithic fragments; under uv light no visible signs of hydrocarbons.

**10550' Shale** = color varies from gray to dark gray to occasionally black; crunchy to brittle to slightly dense tenacity; irregular to planar to hackly fracture; platy to flaky to wedge-like to bladed cuttings habit; slightly waxy to dull to earthy luster; texture is generally smooth to slightly clayey; thin laminae to massive structure; occasional carbonaceous material present in sample.

**10670' Carbonaceous shale** = dark gray to gray to reddish black to black; brittle to crunchy tenacity; irregular to blocky to planar fracture; massive to platy to tabular to wedgelike cuttings habit; earthy to dull to greasy to resinous to slightly sparkly luster; overall has a smooth to clayey to ashy and slightly silty texture; very common occurrence of carbonaceous material and pyrite clusters are visible in sample; non calcareous overall.

**10800' Shale** = generally gray to dark gray in color; brittle to crunchy tenacity; planar to irregular to blocky fracture; massive to tabular with occasionally flaky to scaly to wedgelike to bladed cuttings habit; dull to somewhat waxy and earthy luster; smooth to clayey texture; occasional stringers of pyrite and large carbonaceous shale nodules are very common.

**10910' Coal** = black to very dark gray; crunchy to brittle to occasionally dense tenacity; blocky to conchoidal fractured; overall massive to tabular cuttings habit; metallic to vitreous luster on bit cut face; very smooth texture; well laminated to thick structure; distinct planar features embedded within grain matrix with visible degassing common.

**11010' Sandstone** = color ranges from off white to tanish brown to translucent with a salt and pepper appearance and traces of dark greenish hues; fine to medium lower to coarse and occasionally very coarse upper grained; poorly to fairly sorted with some well sorted silica cementation; overall subangular to subrounded; moderate to low sphericity; firm friable to moderately hard and occasionally hard; dark overall silica cementation throughout; very reactive in hydrochloric acid solution; sample tray consists of approximately five to ten percent dark colored lithic fragments; under uv light no visible signs of hydrocarbons.

**11180' Carbonaceous shale** = grayish brown to brownish black color; tough to dense tenacity; blocky fracture; wedgelike to nodular cuttings habit; earthy to greasy luster; silty texture; trace of carbonaceous laminae; no reaction with 10% hydrochloric acid.

**11260' Siltstone** = dark yellowish brown to brownish gray color; dense tenacity; blocky fracture; nodular cuttings habit; earthy luster; massive structure; no reaction with hydrochloric acid.

**11320' Sandstone** = light gray to very light gray color; quartz grains; fine to very fine grain size; fair sorting; subangular grains with moderate sphericity; grain supported, predominantly unconsolidated in tray due to pdc bit; no reaction with hydrochloric acid; trace of fracture fill; no fluorescence under uv light.

**11410' Shale** = medium bluish to light brownish color; dense tenacity; irregular to hackly fracture; platy to wedgelike cuttings habit; dull to waxy luster; clayey to silty texture; massive structure; no reaction with hydrochloric acid.

**11480' Sandstone** = color ranges from off white to tanish brown to translucent with a salt and pepper appearance and traces of dark bluish hues; fine to medium lower to coarse and occasionally very coarse upper grained; poorly to fairly sorted with some well sorted quartz cementation; overall subangular to subrounded; moderate to low sphericity; firm friable to moderately hard to very hard; dark fragments of dense coal common <10%; kaolinitic sand grains occur <5%; very slightly reactive in hydrochloric acid solution; tray consists of approximately five to ten percent dark colored platy shale fragments; no visible signs of fluorescence under uv light.

**11660' Siltstone** = light gray to dark bluish gray; very blocky fracture; massive to wedgelike habit; dull to earthy to occasionally waxy luster; smooth to silty to somewhat clayey texture; overall thick to massive structure; moderately hard to hard; clusters of pyrite and coal <5% in sample tray.

**11750' Carbonaceous shale** = brownish gray to brownish black color; dense to brittle tenacity; blocky to splintery fracture; wedgelike to tabular cuttings habit; dull to greasy luster; silty texture; trace of carbonaceous and pyrite laminae; no reaction with hydrochloric acid.

**11830' Coal** = brownish black to black color; dense to brittle tenacity; conchoidal to blocky fracture; nodular to tabular cuttings habit; greasy luster; visible degassing; smooth texture.

**11890' Sandstone** = color ranges from off white to tanish brown to translucent with a salt and pepper appearance and traces of dark brown hues; fine to medium lower to coarse and occasionally very coarse upper grained; fairly to well sorted with some quartz cementation; overall subangular to subrounded to angular; moderate to low sphericity; moderately hard to very hard; dark brown to black fragments of dense coal common <5%; kaolinitic sand grains very common; very slightly reactive in hydrochloric acid solution; tray consists of approximately ten to twenty percent dark colored platy carbonaceous shale nodules; no visible signs of fluorescence under uv light.

**12070' Carbonaceous shale** = brownish gray to brownish black color; dense to brittle tenacity; blocky to irregular fracture; wedgelike to tabular cuttings habit; dull to greasy luster; silty texture; overall massive to lenticular structure; traces of carbonaceous and pyrite laminae; no reaction with hydrochloric acid.

**12160' Coal** = brownish black to grayish black to black color; crunchy to brittle tenacity; blocky to conchoidal fracture; tabular to nodular to wedgelike cuttings habit; greasy to dull luster; smooth to gritty texture; massive structure; degassing is visible.

**12240' Siltstone** = brownish gray color; brittle tenacity; irregular fracture; nodular cuttings habit; earthy luster; silty texture; massive structure.

**Note** = td production @ 12297' 07/10/09

**Exxon Mobil  
FRU 197-33A2**

**Daily Activity Summary**

**NOTE – Data For This Section Provided By ExxonMobil**

- 6/25/2009 Skidded rig from FRU 197-33A3 to FRU 197-33A2; remove dry hole cap on well FRU197-33A2; set BOP on well head and rig up; change out saver sub; rig up and testing equipment and test BOPs; Rig down testing equipment.
- 6/26/2009 Finnish rigging down testing equipment; install new o-rings on wear bushing, make up wear bushing and set in well head; connect flow line to flow line manifold, gook up fill up line, bud bucket line and 2" circulation line, rig up drip pan and hoses, put cap on flow line manifold from last well, rebuild fill up (nipple broke); lay down all 4" tools, pull up mouse hole and install; pull up drilling tools and BHA; install rotating rubber, test Schlumberger tools; trip in hole from 739' to 3485'; continue running in hole from 3485' to 3860', tagged up; displaced water in hole with 9.4 ppg mud; perform casing test 1500 psi for 30 minutes; drill out float collar, shoe track, and shoe, drill 10 ft of new hole tagged bottom at 3982' circulate bottoms up; perform PIT test 9.3 ppg test weight, 300 psi applied, equivalent mud weight 10.8 ppg; drill from 3993' to 4147'.
- 6/27/2009 Drill from 4147' to 4810'; rig service; drill from 4810' to 4978'; drill from 4978' to 5186'; pump two 45 bbl high viscosity sweeps and circulate out; pull out of hole from 5186' to 3958'; slip and cut drill line; pull out of hole from 3958' to 739' pull rotating rubber and install trip nipple; continue to pull out of hole with BHA.
- 6/28/2009 Finnish laying down Schlumberger's drilling tools; clean rig floor; pull up and make up new BHA; trip in hole to 703'; change out trip nipple to rotating rubber; trip in hole from 703' to 4964'; wash from 4964' to 5186'; drill from 5186' to 5420'; drill from 5420' to 5625'; take teledrift survey 1 degree, and slow pump rates; drill from 5625' to 6098'; rig service; drill from 6098' to 6131'.
- 6/29/2009 Drill from 6131' to 6194' teledrift survey less than 1 degree; drill from 6194' to 6573'; rig service; teledrift survey less than 1 degree; drill from 6573' to 6668'; Drill from 6668' to 6854'; take teledrift survey 1 degree; drill from 6854' to 7235'.
- 6/30/2009 Drill from 7235' to 7329'; teledrift survey less than 1 degree; drill from 7329' to 7517'; rig service; drill from 7517' to 7654'; drill from 7654' to 7890' take teledrift survey 1 degree; drill from 7890' to 8168'.
- 7/01/2009 Drill from 8168' to 8555' circulate and condition hole clean, pumped 50 bbls of high viscosity sweep and circulate out of hole; pump 50 bbls high viscosity sweep and circulate out; trip out of hole from 8555' to 3922'; lay down drill pipe from 3922' to 703'; trip in hole to 3543' lay down drill pipe from 3543' to 703'.
- 7/02/2009 Trip in hole from 703' to 2596' lay down 5" drill pipe from 2596' to 703'; pull rotating head and install trip nipple; lay down BHA; clear rig floor and lay down 5" tools; pull wear bushing; JSA with Tesco over rigging up casing equipment and running casing; rig up casing equipment; make up shoe track testing float independently and run casing to 899'; run casing from 899' to 3643' fill casing and circulate bottoms up; run casing from 3643' to 5849'; fill casing and circulate bottoms up; run casing from 5849' to 7878'.
- 7/03/2009 Run casing from 7878' to 8546' circulate bottoms up and condition mud; JSA with Tesco over rig down of casing equipment; no returns, washed and reamed back to bottom from 8416' to 8550', after getting to bottom got full returns back; rig down casing equipment and rig up casing bales and elevators; JSA with Halliburton over rigging up cementing equipment; rig up cementing equipment, attempted to circulate, no returns; JSA with Halliburton over cementing; begin cement job with Halliburton, pressure tested line, pumped 5 bbls of water, 40 bbls of 10 ppg tuned spacer, shut down and dropped bottom plug, orange, mix and pumped 150 bbls of lead cement at 10.5 ppg; finish pumping lead cement, pump 167 bbls tail cement at 12.0 ppg, drop top plug, displace with 323 bbls of 9.5 ppg mud, pump plug with 500 psi over and hold 5 minutes; rig down cement equipment; pull mouse hole hook up BOP traveler and lift BOP to set emergency slips, cut off joint of casing, set BOP back down and torque bolts, set pack off and install mouse hole; rig up BOP testing equipment.
- 7/04/2009 Test BOPs; rig down test plug; install wear bushing; pull up and make up BHA and run in hole to 821'; rig service; install rotating head rubber; trip in hole from 821' to 4889'; trip in hole from 4889' to 6057'; motors went down, back lashed drill line, docked top drive and un-spoiled drill line, put drill line back on drum, inspect drill line and crown sheaves and undocked the blocks, test run top drive and continue tripping; trip in hole from 6057' to 8286' wash from 8286' to 8433'; casing pressure test to 1850 psi for 30 minutes; drill top float collar at 8433', bottom float collar at 8525', shoe at 8535'; drill 10' of new hole from 8560' to 8570' circulate bottoms up; formation integrity test to 700 psi, equivalent mud weight 11.0 ppg; drill from 8570' to 8615'.
- 7/05/2009 Drill from 8615' to 8676'; rig service; drill from 8676' to 9020'; drill from 9090' to 9066'; lost power, reset PLC and computer system; drill from 9066' to 9409'.

7/06/2009 Drill from 9409' to 9744'; rig service; drill from 9744' to 9840'; drill from 9840' to 10327'.

7/07/2009 Drill from 10327' to 10620'; rig service, drill from 10620' to 10815'; drill from 10815' to 11203'.

7/08/2009 Drill from 11203' to 11494', pumping sweeps to reduce losses and clean hole, losses 30 bbls per hour; perform rig service; drill from 11494' to 11546', pumping 20 bbl sweeps to reduce losses and clean hole, losses 20 bbls per hour; drill from 11546' to 11774' pump 40 bbl high viscosity sweep.

7/09/2009 Drill from 11774' to 11883'; rig service; drill from 11883' to 11980', weighted up active from 9.7 ppg to 9.9 ppg, reduced pump rate from 60 strokes per minute to 40 strokes per minute; drill from 11980' to 1269'.

7/10/2009 Drill from 12169' to 12269'; rig service; drill from 12269' to 12295' circulate and condition hole at 35 strokes per minute; circulate, finish weighting up from a 9.9 to a 10.2; pump and spot 200 bbl 12.0 ppg, chase with 60 bbl mud pump at 50 strokes per minute; trip out hole from 12297' to 8382'; monitor well; trip out hole from 8382' to 2373'.

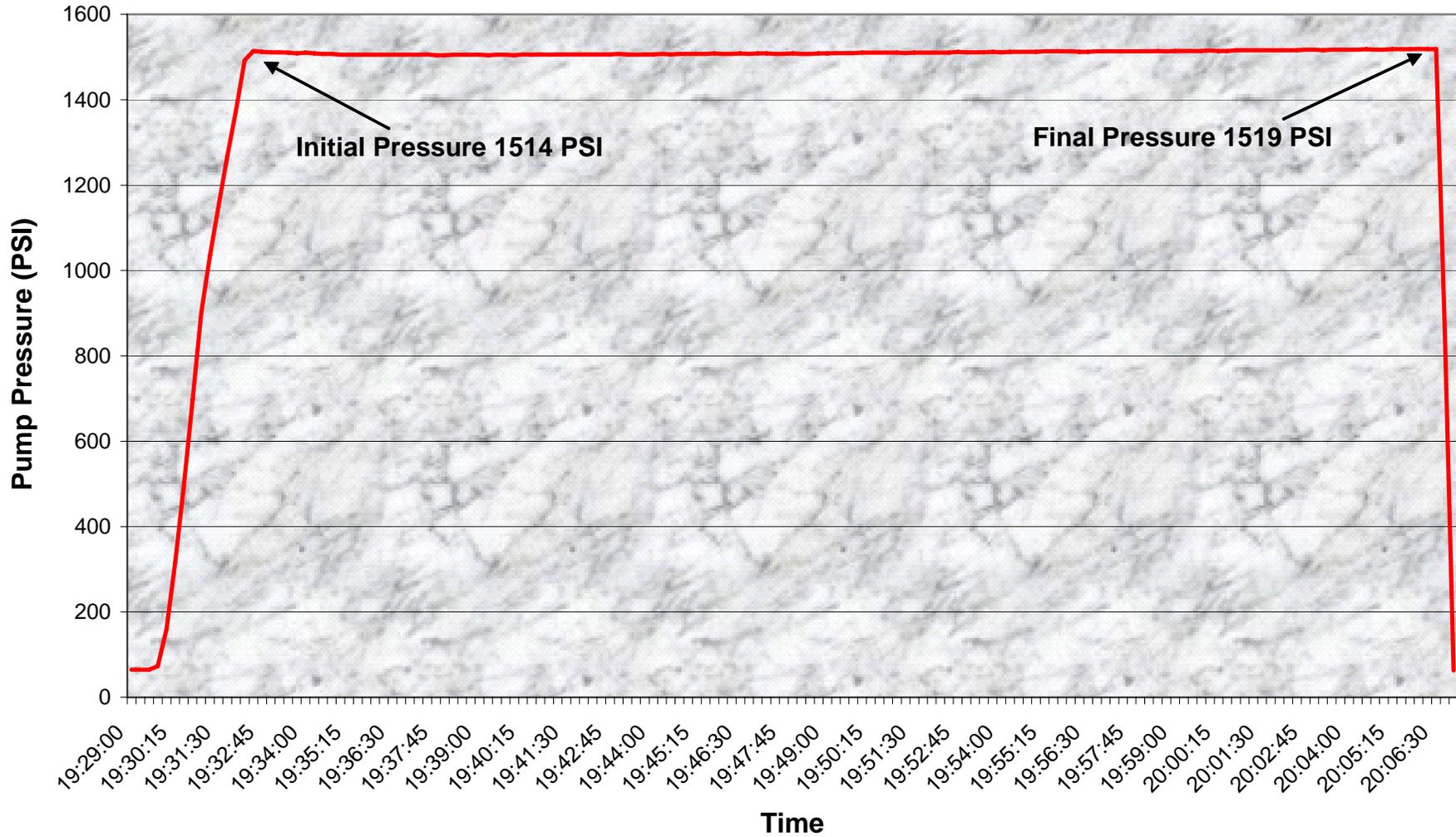
7/11/2009 Pull out of hole from 2373' to 821'; pull rotating head and install trip nipple; pull out of hole with BHA to surface; JSA with Schlumberger over rig up of wire line equipment; run usit log with schlumberger; rig down Schlumberger wire line equipment; trip in hole to 821' pull rotating head and install rotating head; trip in hole from 821' to 4685'; Trip in hole from 4695' to 7020' monitor well on trip tanks, build and pump slug; lost power on rig due to motors; lay down drill pipe from 7020 to 4531' with pipe wrangler; trouble shoot pipe wrangler, stopped at rig floor and lost all power; trip in hole from 4531' to 6989'; review JSA and rig up lay down line, hoist lines and boards over pipe wrangler to lay down drill pipe; lay down drill pipe from 6989' to 5927' using lay down line and hoist.

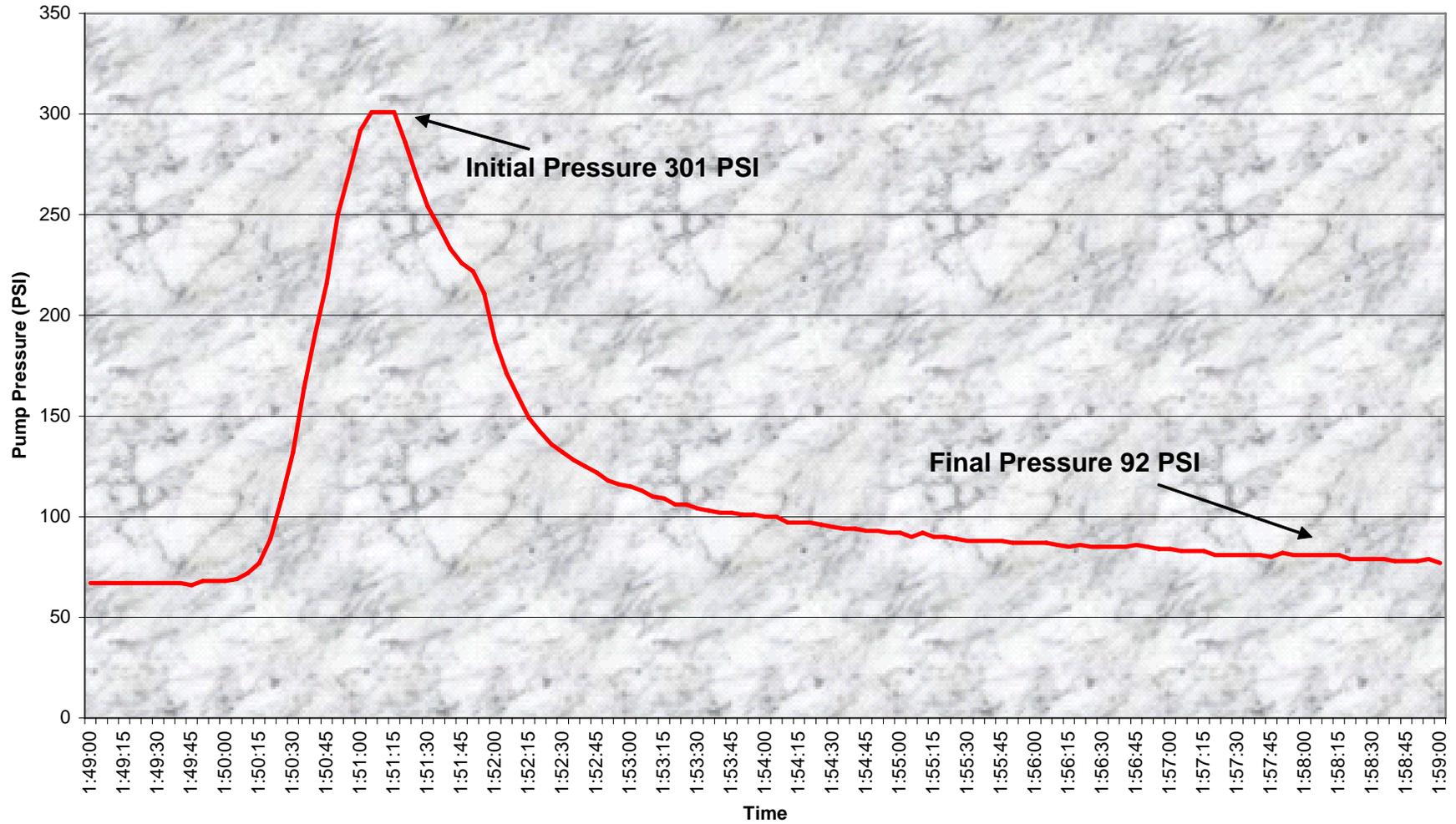
7/12/2009 Lay down drill pipe from 5927' to 5473' with hoist line; trip in hole from 5473' to 8286'; lay down drill pipe from 8286' to 821' with pipe wrangler; pull rotating head and install trip nipple; lay down BHA; Rig up to run casing; make up shoe track and run casing to 6692' fill casing and break circulation every 20 joints.

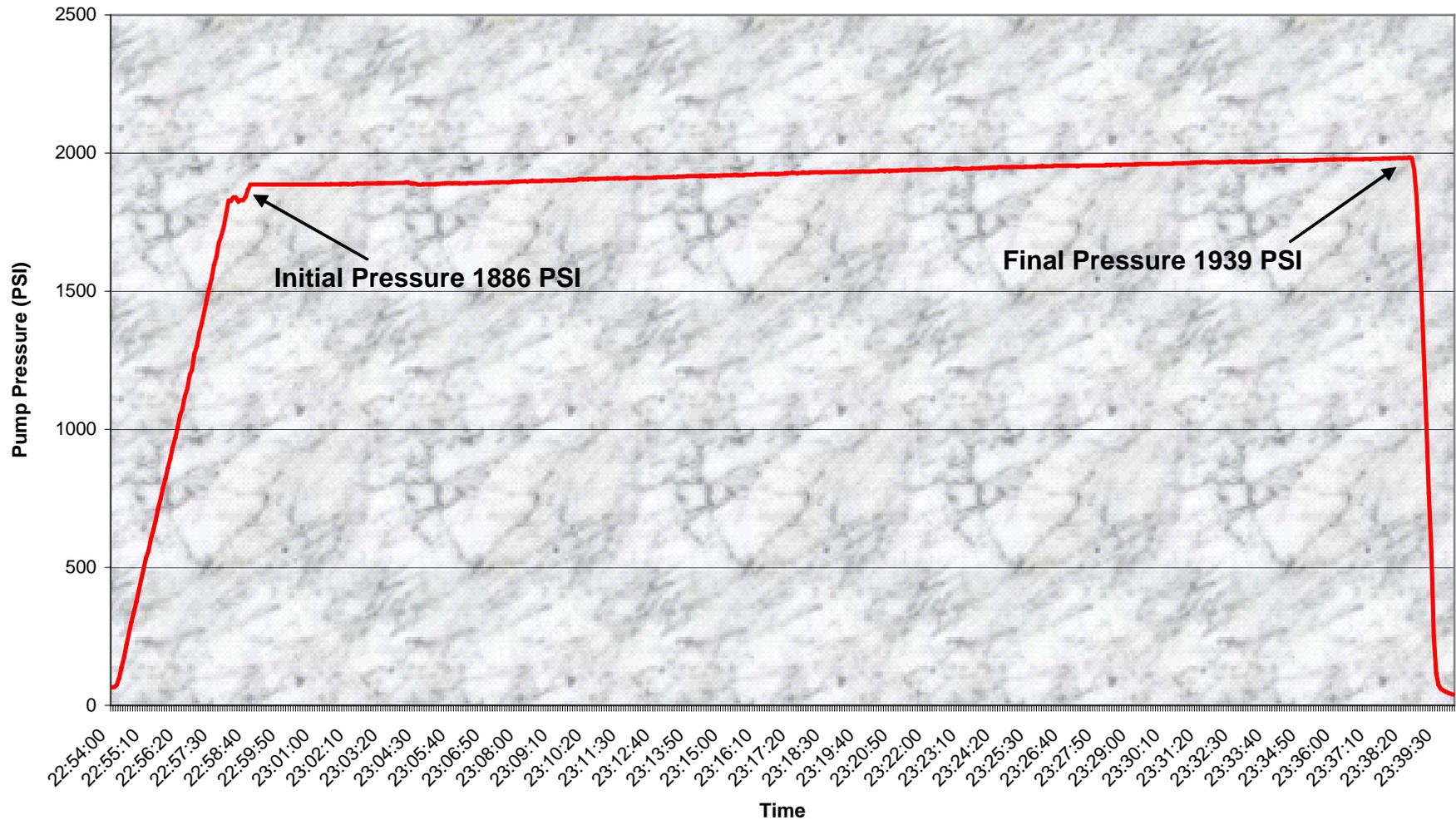
7/13/2009 Run casing from 6692' to 6984'; change our casing elevators; run casing from 6984' to 12127', wash casing from 12127' to 12290'; JSA and rig down casing equipment; while circulating; circulate and condition mud, bringing mud weight down from 10.2 ppg to 9.8 ppg; cement; nipple down BOP.

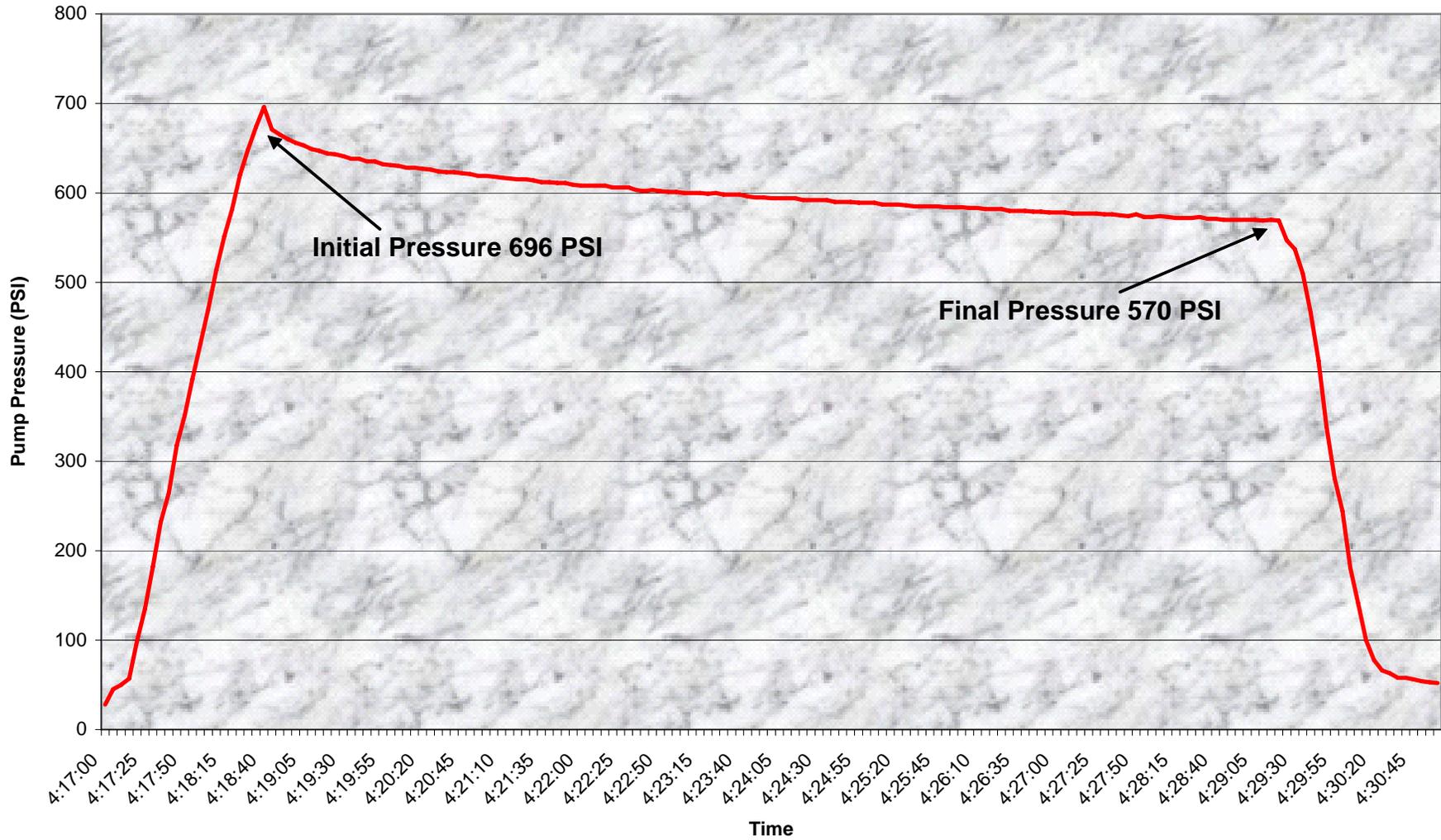
7/14/2009 Epoch rig down mudlogging unit.

**ExxonMobil**  
**FRU 197-33A2**  
Pressure Tests









**Exxon Mobil**  
**FRU 197-33A2**  
**Drilling Fluid Reports**

**FRU 197-33A2**  
**WATER BASED MUD REPORT**  
Mud Engineering Services Provided By Halliburton

Property	06/26/09	06/27/09	06/28/09	06/29/09	06/30/09	07/01/09	07/02/09
Sample Temperature (deg F)	100	100	100	110	120	135	135
Sample Depth (feet MD)	3971	4978	5430	6660	7650	8555	8555
Mud Weight (lb/gal)	9.3	9.3	9.5	9.3	9.3	9.4	9.5
FV (sec/quart)	37	47	48	41	38	39	39
PV(cP)	9	14	15	14	15	12	11
YP (lb/100 ft2)	13	17	19	12	17	12	11
Gels (10 sec lb/100ft2)	3	12	12	8	7	3	3
Gels (10 min lb/100ft2)	5	16	19	11	9	5	5
Gels (10 30 min lb/100ft2)	6	27	25	19	12	7	8
API FL (cc/30 min)	12	10.4	11	8	8	8.6	8.4
Cake (API)	2	2	2	2	2	2	2
pH	9.9	10.2	10.2	10	10.2	9.8	9.3
PM	0.5	0.95	0.95	0.95	0.95	0.2	0.1
Pf	0.1	0.05	0.1		0.05	0.05	0.05
MF	0.35	0.85	0.6	0.65	0.6	0.5	0.4
Excess Lime (lb/bbl)	0.11	0.23	0.22	0.25	0.23	0.03	0.09
Hardness (mg/l)		80	40	20		60	40
Chlorides (mg/l)	1200	1200	1200	1200	1200	250	300
NaCl (mg/l)							
MBT (lb/bbl)	15	20	20	20	17.5	17.5	17.5
Retort Water (%)	94.5	94	93	94	94	92.6	92.5
Sand (%)	0.25	0.25	0.25	0.25	0.5	0.5	0.25
Retort Solids (%)							
Corrected Solids (%)	5.2	5.7	6.7	5.7	5.7	7.2	7.3
CO2							

**FRU 197-33A2**  
**WATER BASED MUD REPORT**  
Mud Engineering Services Provided By Halliburton

Property	07/03/09	07/04/09	07/05/09	07/06/09	07/07/09	07/08/09	07/09/09
Sample Temperature (deg F)	125	120	115	115	122	125	120
Depth (feet MD)	8555	8555	8997	9791	10850	11519	11975
Mud Weight (lb/gal)	9.4	9.3	9.5	9.5	9.7	9.7	9.8
FV (sec/quart)	40	37	39	40	39	40	41
PV(cP)	11	6	12	12	13	15	13
YP (lb/100 ft2)	9	8	13	13	13	12	12
Gels (10 sec lb/100ft2)	2	2	3	3	3	3	3
Gels (10 min lb/100ft2)	5	4	5	5	5	6	5
Gels (10 30 min lb/100ft2)	7	6	8	7	8	8	7
API FL (cc/30 min)	8.6	9.8	8	8.2	8.4	8.8	9.2
Cake (API)	2	2	2	2	2	2	2
pH	10.3	9.8	10.3	9.9	9.7	10.2	9.4
Pm	0.7	0.6	0.8	0.65	0.45	0.6	0.5
Pf	0.1	0.05	0.05	0.5	0.05	0.5	0.05
MF	0.8	0.6	1.1	1.1	1.2	1	0.6
Excess Lime (lb/bbl)	0.15	0.14	0.19	0.15	0.1	0.14	0.11
Hardness (mg/l)	80	80	200	240	240	160	120
Chlorides (mg/l)	400	450	700	500	600	400	450
NaCl (mg/l)							
MBT (lb/bbl)	17.5	17.5	17.5	17.5	17.5	17.5	17.5
Retort Water (%)	92.5	93.6	92	91.6	91	90.3	89.8
Sand (%)	0.2		0.5	0.2	0.2	0.2	0.2
Retort Solids (%)							
Corrected Solids (%)	7.3	6.2	7.8	8.2	8.8	9.5	10
CO2							

**FRU 197-33A2**  
**WATER BASED MUD REPORT**  
 Mud Engineering Services Provided By Halliburton

Property	07/10/09	07/11/09	07/12/09	07/13/09	07/14/09	07/15/09	07/16/09
Sample Temperature (deg F)	120	90	80				
Depth (feet MD)	12297	12297	12297				
Mud Weight (lb/gal)	10.1	10.30	10.3				
FV (sec/quart)	40	38	39				
PV(cP)	15	12	10				
YP (lb/100 ft2)	10	9	9				
Gels (10 sec lb/100ft2)	3	2	2				
Gels (10 min lb/100ft2)	4	4	3				
Gels (10 30 min lb/100ft2)	6	6	5				
API FL (cc/30 min)	9.8	9.8	10				
Cake (API)	2	2	2				
pH	10	9.7	9.7				
Pm	0.6	0.60	0.5				
Pf	0.05	0.05	0.05				
MF	0.7	0.70	0.6				
Excess Lime (lb/bbl)	0.14	0.14	0.11				
Hardness (mg/l)	120	120	120				
Chlorides (mg/l)	400	450	400				
NaCl (mg/l)							
MBT (lb/bbl)	17.5	17.5	17.5				
Retort Water (%)	89	89.0	89				
Sand (%)	0.2	0.20	0.1				
Retort Solids (%)							
Corrected Solids (%)	10.8	10.8	10.8				
CO2							

**Exxon Mobil  
FRU 197-33A2**

**Bit History**

