



## Well History

Piceance Creek Unit PCU 297-12A6  
API: 051031116400  
Rio Blanco County, Colorado

Canrig Drilling Technology LTD  
New Iberia, Louisiana

**ExxonMobil**  
*Development*

**CANRIG**

**ExxonMobil**

**ExxonMobil Production Company**

**Piceance Creek Unit PCU 297-12A6**

**Rio Blanco County, Colorado**

  
**CANRIG**  
Canrig Drilling Technology LTD

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## **Introduction and Geology**

**Piceance Creek Unit PCU 297-12A6  
Rio Blanco County, Colorado**



## Introduction

Canrig Drilling Technology LTD (Canrig) 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, Canrig was requested to provide mud logging and geologic services for the Piceance Creek Unit (PCU) 297-12A6 production well. The well was drilled as the second production hole in a series of nine directional wells for production on the Piceance Creek Unit 297 pad. The well is located in the Piceance Basin at the following coordinates:

- Latitude 39.889045 N
- Longitude 108.237271 W

The well was spudded on June 1, 2009 by a separate rig which drilled to 4133' and set surface casing at 4118'. Drilling operations were then continued from surface casing to a total depth of 13445' (MD) on 11/12/2009. Drilling operations were conducted by Helmerich & Payne using a Flex 4 rig (#326). Canrig personnel logged and collected samples starting at 4133' through to 13445' MD. Drilling fluid engineering services were provided by Halliburton. The well was drilled with conventional water-based mud and spud mud to 4133', LSND (Low Solids Non-Dispersed) from 4134' through 5811', DSF (Drilling Stress Fluid) from 5812' to 6184', and LSND from 6185' to TD at 13445' MD.

The well was cased and cemented according to the following:

- 16-inch casing from surface to 130 feet.
- 10.75-inch casing at 4133 feet.
- 7.00-inch casing at 9375 feet.
- 4.5-inch casing at 13421 feet.

Canrig provided the following services for this drilling operation:

- General mud logging 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;
- Personnel - Two Senior Mud logging Geologists were onboard the rig at all times during the well with two Sample Catchers being assigned during actual drilling phases to ensure timely and accurate sample collection, processing and presentation as the Geology of the well dictated. Interaction with ExxonMobil on-site and Houston-based personnel to determine formation tops and provide support as required through drilling.

Canrig Drilling Technology LTD. wishes to thank you for the opportunity to provide services on this well and look forward to being of service to you again in the future.

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## 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 297-12A6 well incorporates terminology as developed by ExxonMobil and provided to Canrig.

Geologically, Canrig 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 Segó 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 mud log 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.

Formation/Member Name	Stratigraphic Unit Top	Depth (MD/TVD)
<b>Wasatch Formation</b>		
Lower Wasatch		5935' / 5454'
<b>Ohio Creek Formation</b>		
	950 Abandonment Surface (AS)	7868' / 7354'
<b>Williams Fork Formation</b>		
WF 800	850 Abandonment Surface (AS)	8720' / 8206'
WF 700	800 Sequence Boundary (SB)	8970' / 8456'
WF 500	600 Sequence Boundary (SB)	9156' / 8642'
WF 400	490 Abandonment Surface (AS)	9843' / 9368'
WF 200	290 Abandonment Surface (AS)	11550' / 11075'
Cameo	210 Sequence Boundary (SB)	11820' / 11345'
<b>Iles Formation</b>		
Rollins Member	200 Sequence Boundary (SB)	12130' / 11655'
Cozette Member	180 Flooding Surface (FS)	12320' / 11845'
Corcoran Coastal Plain	140 Flooding Surface (FS)	12625' / 12150'
Corcoran Marine	140 Sequence Boundary (SB)	13244' / 12769'

**ExxonMobil**

**Correlation and Gas Character**

**Piceance Creek Unit PCU 297-12A6**

**Rio Blanco County, CO.**

**CANRIG**  Canrig Drilling Technology LTD

**ExxonMobil**  
**PCU 297-12A6**  
**Correlation and Gas Character**

Correlation of formation tops from the Wasatch G to the Corcoran Marine for the PCU 297-12A6 has been confirmed by ExxonMobil geologists using correlating logs from nearby well pads, as well as the other wells drilled on this pad. LWD was conducted in the surface hole only. Directional drilling reached a max inclination of 24.40° at 5671' MD and was brought to 2.00° at 8490'. Overall the well was stratigraphically similar to that of wells drilled in the nearby area.

**Wasatch Formation**

The upper Wasatch was encountered when drilling out of the surface casing at 4133'. It consisted of interbedded sandstone, siltstone and shale. Background gas was in the 4 to 16 unit range. There were four gas shows of 265 to 506 units in 10 to 20 foot sandstones at 5010', 5090', 5215', and 5485'. This section was drilled with 9.10 ppg mud with minimal mud loss.

The Wasatch "G" at 5935' marked the top of the lower Wasatch, and was followed by the Wasatch "I". The Wasatch "G" consisted of interbedded sandstone, siltstone and shale. The Wasatch "G" and "I" sections respectively consisted of 20% to 70% sandstone with a balance of siltstone, shale, and thinly interbedded carbonaceous shales. There were four gas spikes above 200 units in the Wasatch "G" and "I" between 6560' and 7060'. These were in sandstones with thin coal seams. The interval was drilled with 9.20-9.25 ppg mud.

**Ohio Creek Formation**

The Ohio Creek formation was drilled at 7868' in lithology consisting of 40% sandstone, 30% siltstone, 30% shale. Sandstone percentages ranged from 200% to 80% in this section. There were three max gas shows above 200 units. The significant max gas spikes of 359u to 415u came in at a depth range of 8530' to 8600' in 80% sandstone. Connection gases ranged from 40 units to 190 units. Mud weights ranged from 9.25 to 9.30 ppg.

**Williams Fork 800 Member**

The top of the Williams Fork 800 was drilled at 8720'. This formation came in with a 60% sandstone, 20% carbonaceous shale, and 10% shale and siltstone producing gas readings around 43u. Sandstone increased throughout this section to 70%. There was one gas show of 107 units. The remainder of the formation consisted of primarily thick shales and fluctuation thicknesses of siltstones and carbonaceous shales interbedded in high volume sandstones. Mud weight of 9.20 ppg was used in this section.

### **Williams Fork 700 Member**

The top of the Williams Fork 700 was encountered at 8970'. The lithology was 70% sandstone with 10% shales and siltstones. A 10% carbonaceous shale seam ran through the middle to lower zones of this section. A max gas of 72 units was observed at 9030'. Mud weight of 9.20 ppg was used in this section.

### **Williams Fork 500 Member**

The top of the Williams Fork 500 was drilled at 9156'. The lithology was 20% to 80% sandstone with alternating layers of shales, carbonaceous shales, and kaolinitic sands. There were six major gas shows above 300 units with a max gas of 2465 unit at 9780'. This particular gas spike was caused from kaolinitic sands in an 80% thick sandstone interval. There were also two connection gas spikes of 1543 units and 1411 units. Mud weight of 9.30 ppg was used in this section. Mud losses were over 600 BBLs.

### **Williams Fork 400 Member**

The top of the Williams Fork 400 member was placed at 9842' MD. Sandstone intervals fluctuated from 30%-70% throughout the formation. There were a total of twelve gas spikes above 400 units of gas. In respect, the major gas spikes of 1708u, 1267, and 2542u were from major sandstone beds with kaolinitic sands, calcite fracturing in sandstones, and coal seams. High connection gases were common with a maximum value of 2960 units. The average connection gas was around 2860 units. Mud weight was maintained at 9.15 to 9.20 ppg. Approximately 666 barrels of mud were lost in the interval.

### **Williams Fork 200 Member**

The Williams Fork 200 came in at a depth of 11550' with a formation gas of 308u. An increase in depth correlated to an increase in carbonaceous shales and thicker coal seams resulting in higher gas shows. Several max gas and connection gases exceeded 450u throughout the Williams Fork 200 section with mud weight average of 9.25 ppg and mud losses of 116 bbls. The maximum gas of 1508u was observed at 11573' and was attributed to a thick sandstone interval. Background gases were averaging 100 units.

### **Cameo Member**

The Cameo was encountered at a depth of 11820' with a 30% coal seams and carbonaceous shales, and 20% sandstone and siltstones. Eight gas spikes, primarily in the middle section of the formation, from 11900' to 12050' produced multiple gas shows above 1000 units. The final max gas spike came in at 12120' with 2871u out of a sandstone and thick coal interval. The average mud weight of 9.3 was maintained throughout the Cameo Section. Approximately 125 barrels of mud were lost to formation while drilling this formation. Background gas was relatively high with most areas over 150u.

## **Rollins Member**

The Rollins member came in at 12130' with approximately 20% sandstone in the samples. The percentage of sandstone increased to 60% at 12150' then rose to 70% by 12180' where it again gradually decreased to 40% by the bottom of the member. The sandstone was variably inter-bedded with siltstone, shale and carbonaceous shale. A minor amount of coal was observed near the top and bottom of the interval before the TransCozzette. There was one significant gas show in sandstones of the TransCozzette. The gas reading of 914 units was related to a thin coal seam and close to a 40% sandstone layer. There were two high connection gases of over 2000 units throughout the interval. Mud weight was held between 9.25 and 9.30 ppg. An estimated 58 barrels of mud was lost to formation in this member.

## **Cozzette Member**

The Cozzette member top was drilled at 12320' MD. The samples contained 30% carbonaceous shales and siltstones, and 20% sandstone and shale. The percentage of sandstone fluctuated from 20% to 50% towards the bottom of the formation. There were coal seams observed throughout the formation that led to higher gas shows. There were five significant gas shows in the formation with the highest reading of 2926 units at 12560'. This gas show was due to the highest percentage of sandstone in the formation. The overall balance of the Lithology was variable amounts of siltstone, shale and carbonaceous shales with varying coal seam thicknesses. A mud weight of 9.3 ppg was maintained throughout. A total of 67 barrels of mud was lost to formation while drilling the member.

## **Corcoran Coastal Plain Member**

The top of the Corcoran Coastal Plain was drilled at 12625' MD. The sample at the top consisted of 40% sandstone, 30% coal, 20% siltstone, and 10% kaolinitic sands which produced a gas reading of 2690 units. The sandstone percentage increased to 70% and varied from 10 to 70% throughout the interval. Coal seams were visible throughout most of the section and produced high gas values. The balance of the lithology consisted of interbedded siltstone, shale, carbonaceous shale, coal seams, and sandstones. There were seven gas spikes that exceeded 300 units. The two highest gas shows were located at depths of 12900'-12920' with respective values of 2177u-2813u. Connections gases were high throughout. The maximum connection gas was 2894 units at 12963'. Mud weight was maintained at 9.35 ppg throughout. Approximately 225 barrels of mud were lost to formation while drilling the interval.

## **Corcoran Marine Member**

The top of the Corcoran Marine was drilled at 13244'. It consisted of 30% sandstone, 60% siltstone, and 10% carbonaceous shale. The proportion of lithology remained roughly constant throughout the section to a final depth of 13445'. There were no significant gas shows in the interval. Connection gases remained high with a maximum value of 2553 units. The interval was drilled with 9.50 to 9.65 ppg mud. Approximately 82 barrels of mud were lost to formation while drilling this interval.



## **Lithology Descriptions**

**Piceance Creek Unit PCU 297-12A6**

**Rio Blanco County, CO.**



## Upper Wasatch (4133' – 5934')

Interval		ROP			CO2			TLGAS		
From	To	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg
4133	5934	141.60	18.90	76.63	22038.14	330.00	1534.99	506.35	.44	19.39

**4150' Shale** = moderate yellowish brown; crumbly, tenacity; subblocky fracture; wedgelike, tabular cuttings habit; dull earthy luster, silty, clayey texture; massive to thick structure.

**4210' Siltstone** = purplish brown, light to medium gray; firm to moderately hard; crumbly to occasionally tough; irregular and subblocky or wedgelike cuttings habit; matte luster with scattered sparkles; moderately calcareous; scattered carbonaceous specks; locally common very fine sand, occasionally sandy, grades in part to very fine sandstone.

**4320' Siltstone** = light yellowish brown, moderate pale yellowish brown; pulverulent, crunchy tenacity; earthy subblocky fracture; wedgelike cuttings habit; dull semi earthy luster; gritty to granular texture; thin structure; grading to sandstone.

**4400' Shale** = medium gray, light bluish gray, brownish yellow orange, some slight grayish red; crumbly to pulverulent tenacity; irregular earthy fracture; tabular to wedgelike cuttings habit; dull earthy luster; clayey to silty texture; thin structure.

**4480' Sandstone** = white, translucent, pale brown with dark lithics; very fine to fine grains; well sorted; easily friable subangular to angular; low sphericity; quartz framework; calcite cement; strong reaction to dilute hcl.

**4550' Siltstone** = yellowish brown, light gray, some with purplish hues, light olive gray; firm to friable; brittle crunchy tenacity; earthy luster some sparkling; thin structure, some grading to sandstone.

**4620' Shale** = medium gray, dark yellowish orange, hues of dark reddish gray; dense crunchy tenacity; earthy, hackly fracture; tabular wedgelike cuttings habit; waxy, earthy luster; silty texture; thin structure.

**4690' Sandstone** = white to light gray with salt pepper appearance; very fine to lower fine grains; well sorted; subround to subangular; moderate sphericity; easily friable; quartz framework, light calcite cement.

**4760' Shale** = medium gray, yellowish orange, pale brown, grayish red; crumbly, pulverulent tenacity; earthy fracture; wedgelike, tabular some elongated cuttings habit; waxy, earthy luster; smooth to slightly silty texture; some grading to siltstone.

**4840' Siltstone** = light gray to gray with hues of brown; firm to crumbly tenacity; blocky fracture; massive cuttings habit; earthy, sparkling luster; silty texture; massive structure; calcite cement.

**4900' Shale** = light to medium gray, some with purplish hues, dark yellowish orange; dense, crumbly tenacity; irregular, earthy fracture; platy, wedgelike cuttings habit; waxy, dull luster; smooth with slight silty texture; thin structure.

**4980' Sandstone** = light brownish gray, white, translucent and clear grains; upper very fine to lower medium grain size; fair sorting; firm to easily friable; subround to subangular; moderate sphericity; quartz framework, grain support.

**5050' Shale** = light to medium gray, yellowish orange, reddish gray; crumbly to pulverulent tenacity; irregular, earthy fracture; platy, wedgelike cuttings habit; earthy, some sparkling luster; smooth to silty texture.

**5120' Sandstone** = light pale brown, very light gray, off white with slight translucent grains; predominately quartz framework; lower fine to some upper fine grain; poor sorting; subangular to subround; traces frosted surface features; easily friable to some friable; clay matrix cement, trace calcareous cement; some grain supported; trace siltstone interbedded.

**5230' Siltstone** = light yellowish brown, moderate pale yellowish brown; pulverulent, crunchy tenacity; earthy subblocky fracture; wedgelike cuttings habit; dull semi earthy luster; gritty to granular texture; thin structure; grading to sandstone.

**5310' Shale** = dark yellowish brown, medium to dark olive gray; firm to moderately hard; crumbly to moderately tough; irregular, planer and wedgelike cuttings habit; matte to occasionally slightly resinous luster dominantly smooth texture; slightly to very calcareous; locally silty, grading in part and interbedded with siltstone; poor to moderate fissility.

**5420' Sandstone** = very light gray to white; occasionally with slight brownish hues; firm clasts range from very fine lower to fine lower; subangular to subround; moderately sorted; quartz rich, scattered to common dark gray to black lithics; clay matrix; light calc cement; locally silty, grades to and interbedded with siltstone.

**5520' Siltstone** = moderate yellowish brown, light grayish brown; slightly firm to moderately hard, semi crumbly tenacity; subblocky to slight irregular fracture; wedgelike massive cuttings habit; dull earthy resinous luster; gritty to clayey texture; massive structure, no hcl reaction.

**5610' Shale** = grayish orange, moderate yellowish brown; pale grayish brown; crunchy to semi crumbly tenacity; subblocky, blocky to slightly irregular fracture; irregular wedgelike cuttings habits; dull waxy luster; silty, clayey texture; thick structure.

**5690' Siltstone** = moderate to dark yellowish brown, light gray, occasional slightly olive hues; firm to moderately hard; crumbly to occasionally moderately tough; earthy luster with scattered sparkles; abrasive, gritty texture; moderately calcareous; interbedded with and interogational with shales.

**5790' Sandstone** = white to light gray, some with pale yellow brown hues , some slight purple hues; firm to friable; subangular to subround; very fine to lower fine grains; well sorted; quartz framework, dark lithics; clay matrix, light calcite cement.

**5870' Shale** = light to medium dark gray, pale yellowish orange, reddish gray, some olive black; crumbly to pulverulent tenacity; irregular , earthy fracture; tabular to wedgelike cuttings habit; waxy, earthy, slight sparkling luster; smooth to silty texture; thin structure.

## Lower Wasatch (5935' – 7867')

Interval		ROP			CO2			TLGAS		
From	To	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg
5935	7867	126.80	3.70	57.93	17425.16	330.00	1695.78	1145.36	3.53	50.71

**5950' Sandstone** = white to light gray some with greenish hues; hard to friable; very fine to lower medium grain size; moderately sorted; subangular to subround; quartz framework with dark lithics; dominantly grain supported with light calcite cement; some interbedding with siltstone.

**6040' Sandstone** = pale to tan stain off white; light yellowish pale brown; some clear translucent quartz framework; upper very fine, predominately fine grain; poor sorting; traces subround, subangular in angularity; low sphericity; slight semi frosted surface features; friable to semi firm friable; clay matrix cement, very minor calcareous cement; dark gray to grayish black lithics and some dark brownish silts interbedded.

**6170' Shale** = light to medium gray, brownish black, yellowish orange, reddish gray; crumbly to pulverulent tenacity; irregular, earthy fracture; wedgelike, tabular with some equant cuttings habit; dull earthy luster; smooth to slightly silty texture; thin structure.

**6250' Siltstone** = moderate to dark yellowish brown, light gray, occasional slightly olive hues; firm to moderately hard; crumbly to occasionally moderately tough; earthy luster with scattered sparkles; abrasive, gritty texture; moderately calcareous; interbedded with and inter-gradational with shales.

**6350' Shale** = grayish orange, moderate yellowish brown; pale grayish brown; crunchy to semi crumbly tenacity; subblocky, blocky to slightly irregular fracture; irregular wedgelike cuttings habits; dull waxy luster; silty, clayey texture; thin coal beds.

**6430' Siltstone** = light brownish orange, light grayish brown; slightly firm, crumbly tenacity; subblocky, irregular, fracture; blocky wedgelike cuttings habit; dull waxy resinous luster; gritty, clayey texture; thick massive structure.

**6510' Shale** = dark yellowish brown, com reddish hues, occasionally light greenish gray; moderately hard; crumbly to moderately tough; irregular, planer and wedgelike cuttings habit; matte to occasionally slightly resinous luster dominantly smooth texture; slightly to non calcareous; poor to moderately fissile.

**6600' Coal** = black to dusky yellowish brown; firm; brittle; irregular cuttings with sharp edges; resinous luster; smooth surface texture; occasional thin streaks carbonaceous shale; thinly interbedded with shale and siltstone

**6670' Carbonaceous Shale** = dusky reddish brown, dark grayish brown; firm to crumbly tenacity; earthy, subblocky blocky slight irregular fracture; subblocky, wedgelike, semi massive cuttings habit; dull, earthy luster; semi massive structure.

**6750' Sandstone** = white to light gray with black lithic, some clasts with greenish hues; firm to easily friable; very fine to fine grains; well sorted; subround to subangular; moderate sphericity; dominate quartz, light calcite cement.

**6820' Siltstone** = light gray to bluish gray, grayish red, pale brown; hard to friable silty to gritty texture; earthy with sparkling luster; some banded structure with carbonaceous material; intergrading with very fine sandstone.

**6890' Shale** = light to medium gray, brownish gray; dense, brittle, crunchy tenacity; earthy to blocky fracture; wedgelike tabular some elongated cuttings habit; waxy, earthy luster with some sparkles; clayey to silty texture; thin, with some slight fissile structure.

**6970' Sandstone** = white to light gray, pale brown, olive hues, dark lithics throughout, easily friable; very fine to fine grain size; well sorted; subround to subangular; moderate sphericity; quartz dominated, light calcite cement.

**7040' Carbonaceous Shale** = dark gray, olive black, grayish black; tough, dense brittle tenacity; irregular, blocky fracture; massive wedgelike, equant cuttings habit; waxy, earthy luster; smooth to silty texture; massive structure; trace coal in sample.

**7170' Sandstone** = white to light gray with dark lithics; quartz framework; very fine to fine grain size; well sorted; subangular to sub round; moderate sphericity; carbonaceous material throughout; light calcite cement.

**7240' Shale** = moderate to dark yellowish brown, brownish yellow orange, occasionally medium gray with slight greenish hues; firm; crumbly to occasionally moderately tough; irregular, subblocky, rarely wedgelike cuttings habit; matte to rarely slightly resinous luster; dominantly smooth texture; moderately calcareous; locally silty, grading in part to and interbedded with siltstone.

**7360' Shale** = brownish yellow orange, pale yellowish brown; pulverulent brittle tenacity; subblocky massive cuttings habit; dull earthy luster; gritty clayey texture; massive thick structure.

**7430' Siltstone** = light to dark yellowish brown, lithic gray yellowish brown; pulverulent to crunchy tenacity; subblocky, irregular fracture; blocky, wedgelike cuttings habit; dull waxy luster; gritty, silty texture; thick structure.

**7510' Sandstone** = white to very light gray, occasionally with slight brownish hues; firm clasts range from very fine lower to fine lower; subangular to subround; moderately sorted; quartz rich, scattered to common dark gray to black lithics; clay matrix; light calc cement; locally silty, grades to and is interbedded with siltstone.

**7610' Shale** = light to medium light gray, light brownish black, light bluish gray; crumbly to pulverulent tenacity; blocky, hackly some slightly earthy fracture; tabular, wedgelike cuttings habit; dull, earthy luster; clayey to silty texture; fissile structure.

**7690' Siltstone** = medium to dark, light gray, olive black; hard to friable; crunchy, some crumbly; earthy luster with occasional sparkles; silty to gritty texture; moderately calcareous; scattered carbonaceous material; interbedded with sandstone and shale.

**7770' Sandstone** = white, light gray, pale brown, light greenish gray, occasional grayish red hues; firm to friable; very fine to fine grains; well sorted; subangular to sub round; moderate sphericity; quartz framework with dark lithics throughout; clay matrix, light calcite cement.

**7860' Sandstone** = white, very light gray, very light grayish green, dominate quartz abundant unconsolidated grains; clasts easily friable; fine to medium grain size; moderately well sorted; subround to sub angular, moderate sphericity; carbonaceous material throughout sample; grain support.

## Ohio Creek (7868' – 8919')

Interval		ROP			CO2			TLGAS		
From	To	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg
7868	8919	115.00	11.40	58.35	1415.40	330.00	337.09	418.99	11.06	58.74

**7950' Shale** = medium light gray, pale brown, grayish red; crunchy to crumbly tenacity earthy to hackly fracture; wedgelike to equant cuttings habit; dull earthy luster; clayey to slightly silty texture fissile structure.

**8020' Sandstone** = white, light gray, pale greenish hues, dark lithics through out; fine to upper medium grain size; subangular to subround; moderate sorting quartz framework, light calcite cement.

**8080' Shale** = light bluish gray, medium light gray, pale brown, grayish red; crunchy to crumbly tenacity; irregular, earthy to hackly fracture; tabular, wedgelike some blocky cuttings habit; waxy earthy with occasional sparkling luster; smooth to silty texture; thin, fissile structure.

**8170' Siltstone** = medium to dark gray, dark brown, light gray, occasionally with slightly olive hues; firm to moderately hard; crumbly to occasionally moderately tough; dull luster with scattered sparkles; gritty, abrasive texture; moderately calcareous; scattered black pinpoint carbonaceous material; interbedded with sandstone and shale.

**8280' Sandstone** = white, light gray, light grayish brown with dark lithics, some clast white with pale green hues, abundant translucent unconsolidated calcite; easily friable to friable; upper fine to upper very fine grains; subround to subangular; low sphericity; quartz framework; grain support with some calcite cement.

**8380' Sandstone** = light gray, light greenish gray; common "peppered" appearance; easily friable to occasionally hard; clasts range from very fine lower to fine lower, rare medium lower grains; angular to subround; moderately sorted; dominantly quartz; scattered dark gray lithics and carbonaceous matter; white clay matrix; variable grain/matrix supported; lightly calcite cemented; interbedded with siltstone and shale.

**8510' Shale** = light - medium gray, dark brown, light bluish gray, occasional light greenish hues; crumbly to brittle tenacity; irregular to earthy fracture; wedgelike to tabular, occasional platy cuttings habit; waxy earthy luster some slightly sparkly; silty texture; thinly interbedded with siltstone and sandstone.

**8600' Carbonaceous Shale** = dusky reddish brown, dark grayish brown; firm to crumbly tenacity; earthy, subblocky blocky slight irregular fracture; subblocky, wedgelike, semi massive cuttings habit; dull, earthy luster.

**8670' Sandstone** = white with black lithics, transparent and translucent grains; abundant unconsolidated grains; clasts easily friable; fine to medium in size; moderately well sorted; subangular to subround; low sphericity; quartz dominate; carbonaceous material scattered throughout sample; light calcite cement.

## WF 800 (8720' – 8969')

Interval		ROP			CO2			TLGAS		
From	To	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg
8720	8969	93.90	8.40	45.69	330.00	330.00	330.00	213.13	22.13	53.51

**8770' Shale** = medium light gray, light bluish gray, pale brown, brownish black, grayish red; brittle to pulverulent and crumbly; irregular to blocky fracture; tabular to wedgelike with occasional elongated cuttings habit; waxy, earthy luster with some sparkles; smooth to silty texture; thick with some slight fissile structure.

**8870' Sandstone** = white, light gray, pale greenish hues, salt and pepper appearance; carbonaceous material abundant, trace coal in sample; very fine to medium grain size, fair sorting; subround to subangular; moderate sphericity quartz dominated, calcite cement; mild reaction to dilute hcl.

**8960' Shale** = medium gray, light bluish gray, pale brown; dark yellowish orange; dense, brittle tenacity; sub blocky, hackly fracture; tabular, wedgelike, some equant cuttings habit; waxy, earthy luster with slight sparkles; clayey, silty texture.

## WF 700 (8970' – 9155')

Interval		ROP			CO2			TLGAS		
From	To	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg
8970	9155	73.60	9.60	36.52	330.00	330.00	330.00	164.59	19.37	38.12

**9040' Siltstone** = medium to dark gray, light gray, dark brown, firm to moderately hard; crumbly to commonly moderately tough; dull luster with scattered sparkles; gritty, abrasive texture; moderately calcareous; scattered black pinpoint carbonaceous material; interbedded with sandstone and shale.

**9140' Sandstone** = white to very light gray, occasionally light greenish gray; common "peppered" appearance; friable to hard; clasts range from very fine lower to fine upper, rarely medium lower; moderately sorted; subangular to subround; dominantly quartz with minor lithics; a few pieces with common carbonaceous matter; mostly grain supported; clay matrix; light to moderate calcite cement; grades in part to and is interbedded with siltstone.

## WF 500 (9156' – 9842')

Interval		ROP			CO2			TLGAS		
From	To	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg
9156	9842	99.50	11.40	47.69	901.26	330.00	331.62	2438.60	1.96	122.18

**9156' Sandstone** = white to very light gray, and occasionally light greenish gray; common peppered appearance; friable to hard; clasts range from very fine to fine grained; moderately sorted; subangular to subrounded; dominantly quartz with minor lithics; few pieces with carbonaceous matter; mostly grain supported with a clay matrix; light to moderate calcite cement; grades in part to siltstone and is interbedded in siltstone.

**9300' Shale** = dark to dusky yellowish brown; light to medium gray with occasional greenish gray hues; firm to hard and crumbly to tough; tabular and blocky to platy cuttings; matte to slightly shiny luster; smooth to silty texture; non to slightly calcareous; rarely with some carbonaceous content.

**Note:** Drill to 9390'. Circulate out. POOH for casing run. Bit # 4 made 2267' in 48.09 hrs.

**9470' Sandstone** = light to medium gray with occasional black lithics; medium grains with fair sorting; subangular to subrounded; moderate sphericity; friable; calcite and silica cement; quartz grains present; moderate gas in sandstones.

**9570' Siltstone** = light grayish white to brownish gray; hard to firm; blocky irregular fractures; massive to platy cuttings; dull to waxy luster; very gritty texture grading to very fine white moderately hard to friable sandstone; high gas in sandstones.

**9670' Shale** = light to dark gray; moderately hard to firm; irregular to blocky fractures; massive platy cuttings; dull waxy to earthy luster; clayey smooth silty texture; interbedded in some sandstones and carbonaceous shales.

## WF 400 (9843' – 11549')

Interval		ROP			CO2			TLGAS		
From	To	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg
9843	11549	99.60	15.10	44.66	330.00	330.00	330.00	2963.33	9.10	168.99

**9843' Sandstone** = clear white poorly cemented with loose clear unconsolidated quartz in sample; very fine grained; well sorted; subangular to subrounded; moderate to high sphericity; silica with some calcite cement in matrix; reaction to hcl; grain supported with trace of black lithics; kaolinitic sands present in high gas.

**9950' Siltstone** = light to medium gray with brownish gray hues; brittle to crumbly irregular fractures; platy to wedgelike cuttings; dull to slightly polished luster; abrasive to silty texture; sandstones appear grading to abrasive siltstone; thinly interbedded shales observed in high net sands; moderate to low gas values in siltstones.

**10050' Sandstone** = light gray to white with unconsolidated brownish white kaolinitic sands; medium to fine grains with fair sorting; subangular to subrounded; moderate sphericity with individual quartz grains; traces of pyrite and coal; thinly interbedded layers of siltstones and shales; appears grading to siltstone; moderate gas.

**10140' Coal** = black with a slight glossy appearance; brittle to pulverulent; irregular to conchoidal fractures; massive to tabular cuttings; waxy to slight polished luster; smooth texture; moderately thick coal seam observed; higher gas values with coal seam.

**10270' Sandstone** = light grayish white to light brownish white; medium to fine grains; fair to well sorting; subangular to subrounded; moderate sphericity; friable to moderately hard; low percent of calcite cement with silica grains; appears grading to abrasive siltstone; unconsolidated kaolinitic sands observed with higher gas values.

**10350' Carbonaceous Shale** = light grayish brown with occasional light grayish black hues; brittle crumbly tenacity; irregular blocky fractures; massive to platy cuttings; dull to earthy luster; smooth to gritty texture; occasionally embedded in shales; lower gas values.

**10500' Sandstone** = white, predominately unconsolidated medium quartz crystals; easily friable with silica cement with traces of calcite cement present; grain supported; subrounded to subangular; well sorted; moderate sphericity; traces of black lithic fragments; traces of calcite fill fracture in sample.

**10610' Coal** = black semi-glassy; brittle to crumbly; blocky irregular fractures; massive wedgelike cuttings; metallic luster with smooth texture; embedded in sandstones and interbedded in shales and carbonaceous shales; higher gas values.

**10700' Carbonaceous Shale** = grayish black to black; brittle to crumbly; irregular to planar fractures; platy to tabular cuttings; dull to slight sparkly luster ; clayey to silty texture; appears interbedded in sandstones; moderate to lower gas values.

**10850' Sandstone** = light grayish white to white with brownish white hues; <5% kaolinitic sands present with grayish white to brown hues; coarse to medium fine grains; fair sorting; subangular to subrounded; moderate sphericity; friable; calcite cement with silica grains; traces of carbonaceous shales; increase in kaolinitic sands with gas values.

**11000' Siltstone** = light to medium gray with occasional bluish gray hues; brittle to crumbly; irregular to planar fractures; platy to tabular cuttings; waxy to dull earthy luster; silty to slight abrasive texture; appears grading from sandstone into abrasive sandy siltstone; traces of kaolinitic sands and moderate gas values.

**11100' Shale** = light to medium gray; tough to brittle; irregular to planar fractures; occasional massive to tabular cuttings; slight waxy to dull luster; smooth to silty texture when grading from siltstone; traces of kaolinitic sands and pyrite; low to moderate gas.

**11220' Coal** = dark gray to black; crumbly to pulverulent; irregular to hackly fractures; platy to wedgelike cuttings; waxy luster and smooth texture; thinly interbedded in sandstone and siltstone; moderate to higher gas values with coals.

**11350' Sandstone** = very pale orange to yellowish gray; frequently salt and peppered appearance due to larger black lithic clasts; 70% quartz clasts with 30% black lithic fragments; most common being black to dark gray shales with minor organics; very fine to medium grained with fine grained the most common; fair to well sorted; rounded to subangular larger sand grains; frosted grains; easily friable to friable; minor soft predominately calcite cement; grain supported; occasionally grading into siltstone or very rarely into siltstone and organic sandstones; interbedded with light to medium gray shales, and occasional carbonaceous shale; gas shows seen in porous and organic sandstone; no luminescence or oil staining.

### WF 200 (11550' – 11819')

Interval		ROP			CO2			TLGAS		
From	To	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg
11550	11819	105.20	28.60	50.89	330.00	330.00	330.00	3046.03	40.64	271.39

**11550' Sandstone** = yellowish gray to brownish gray; salt and pepper appearances; medium to fine grains; fair to well sorted; subangular to subrounded; 100 to 80% quartz grains with up to 20% lithic fragments including dark shale; grains frosted with occasionally minor occurrences of organic staining; interbedded shales and carbonaceous shales and appears grading into siltstone; gas observed in sandstone with moderate visible porosity.

**11650' Carbonaceous Shale** = grayish black to black; tough to crumbly tenacity; planar fracture; wedgelike to tabular cuttings; earthy to dull with occasionally waxy luster; interbedded organic siltstone and coal seams; gas seen in coal seams.

**11750' Sandstone** = light grayish white to white; medium to fine grains; fair sorting; subangular to subrounded; moderate sphericity; friable to hard; slight silica cement and grain supported; <5% black lithic clasts; moderate gas shows.

### Cameo (11820' – 12129')

Interval		ROP			CO2			TLGAS		
From	To	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg
11820	12129	115.00	22.4	56.13	330.00	330.00	330.00	3022.81	47.39	457.82

**11820' Coal** = black; brittle to pulverulent; irregular to conchoidal fractures; massive to wedgelike cuttings; vitreous to waxy luster with a smooth texture; thinly interbedded becoming more prominent; sandstone becoming darker gray and a higher percent of carbonaceous shales observed; higher gas values with coals.

**11920' Siltstone** = dark to medium gray with occasional grayish black hues; slightly dense to brittle; irregular fractures; platy to wedgelike cuttings; slight polished to dull luster; silty to abrasive texture; sandstones appear grading to abrasive siltstones; black organic siltstones appear grading to shales; abundant coal observed; traces of pyrite in sandstone layers; high gas in coals.

**12020' Carbonaceous Shale** = medium to dark grayish black; brittle to crunchy; irregular to splintery fractures; platy to elongated cuttings; slight greasy dull luster; slightly silty to smooth texture; traces of kaolinitic sands; thicknesses; moderate to higher gas values.

### Rollins Member (12130' – 12319')

Interval		ROP			CO2			TLGAS		
From	To	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg
12130	12319	115.00	22.40	56.13	330.00	330.00	330.00	3022.80	47.39	457.80

**12130' Sandstone** = brownish gray to light gray; often appears as mottled or as salt and peppered; 80-60% quartz crystals with 20-40% lithic clasts of reddish brown and black hues; medium upper to very fine upper grain size; fair to poor sorting; subangular to subrounded; low to moderate sphericity; quartz are often frosted; moderate translucent grains; grades into siltstones and often siltstones and sandstones are stained with brown organics; interbedded with shale and minor carbonaceous shale; low background gas observed throughout formation.

**12300' Carbonaceous Shale** = grayish black to black with a brittle to crunchy tenacity; planar fractures; tabular to wedgelike cuttings; gritty to clayey texture; dull to earthy waxy luster; very minor sparkling; interbedded organic rich siltstone and minor sandstones.

### Cozzette Member (12320' – 12624')

Interval		ROP			CO2			TLGAS		
From	To	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg
12320	12624	102.20	18.20	38.25	1144.05	330.00	339.78	2855.03	20.09	309.42

**12350' Carbonaceous Shale** = grayish black to black and occasionally brownish black; crumbly to brittle tenacity; wedgelike to nodular cuttings; dull to earthy luster with rare sparkling; granular to clayey; grades into organic siltstone; interbedded coal seams; high gas in coals.

**12460' Siltstone** = brownish gray with mottled brownish black to light gray; brittle to crunchy; nodular to elongated cuttings; frosted to dull luster; granular to silty with some sucrosic texturing; organic staining; interbedded coal and carbonaceous shale; gas seen in coal seams.

**12560' Sandstone** = light grayish white to white with unconsolidated white to light grayish white kaolinitic sands; fine grains and well sorted; subrounded to rounded; moderate to high sphericity; friable to hard; silica cement with quartz grains observed; siltstone appears grading from sandstone; silicic dominated siltstones; coal seams interbedded in siltstones and sandstones along with thin layers of carbonaceous shale; moderate to high gas in sandstones and coal seams.

### Corcoran Coastal Plain (12625' – 13243')

Interval		ROP			CO2			TLGAS		
From	To	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg
12625	13243	91.70	7.80	33.40	17696.	330.00	468.98	3005.15	13.60	262.90

**12670' Siltstone** = medium to dark gray; dense to crumbly; irregular to mottled fractures; platy to nodular cuttings; slight waxy to polished luster; silty to abrasive texture; thin coal seams and carbonaceous shales interbedded; lower gas values observed.

**12810' Sandstone** = light to medium gray with grayish white hues; fine grains and well sorted; subrounded to rounded; high sphericity; <5% unconsolidated kaolinitic sands; firmly friable to hard; silica cement with quartz grains observed; traces of coal observed; sandstones appear grading to silicic very abrasive siltstones; higher gas values in sandstones and coals.

**12890' Coal** = black; crumbly to pulverulent; irregular to mottled fractures; platy to nodular cuttings; resinous to waxy luster; smooth texture; appears as thinly interbedded seams in siltstones and sandstones; <5% kaolinitic sands.

**13000' Siltstone** = medium to dark gray and light gray to dark brown; firm to moderately hard; crumbly to commonly moderately tough; dull luster with scattered sparkles; gritty and abrasive texture; moderately calcareous; scattered black pinpoint carbonaceous material; interbedded with sandstone and shale.

**13130' Sandstone** = light grayish white to light brownish gray; medium to very fine grained; fair to well sorting; subrounded to subangular; moderate to low sphericity; friable to moderately hard; silica cement and grain supported; frosted grains and interbedded with and grading into an abrasive and sucrosic siltstone; interbedded carbonaceous shale and minor coal seams; lower background gas and higher connection gas observed.

### Corcoran Marine (13244 – 13445' TD)

Interval		ROP			CO2			TLGAS		
From	To	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg
13244	13445	44.30	9.10	27.42	330.00	330.00	330.00	1981.32	24.60	92.50

**13244' Siltstone** = medium to dark gray with grayish black hues; slightly dense to brittle; irregular to conchoidal fractures; slightly earthy polished to sparkly luster; abrasive to silty texture; sandstone is very fine grained and appears grading to sandy abrasive siltstone; carbonaceous shales and dark grayish black shades of shales are observed; grayish black hues in siltstones are more abundant; lower gas values observed.

**13380' Siltstone** = medium to dark gray; brittle to crunchy; blocky fractures; flaky to tabular cuttings; dull to earthy luster; and fissile.

**PCU297-12A6 completed drilling on 11/12/2009 to a total depth of 13445' MD.**

**ExxonMobil**

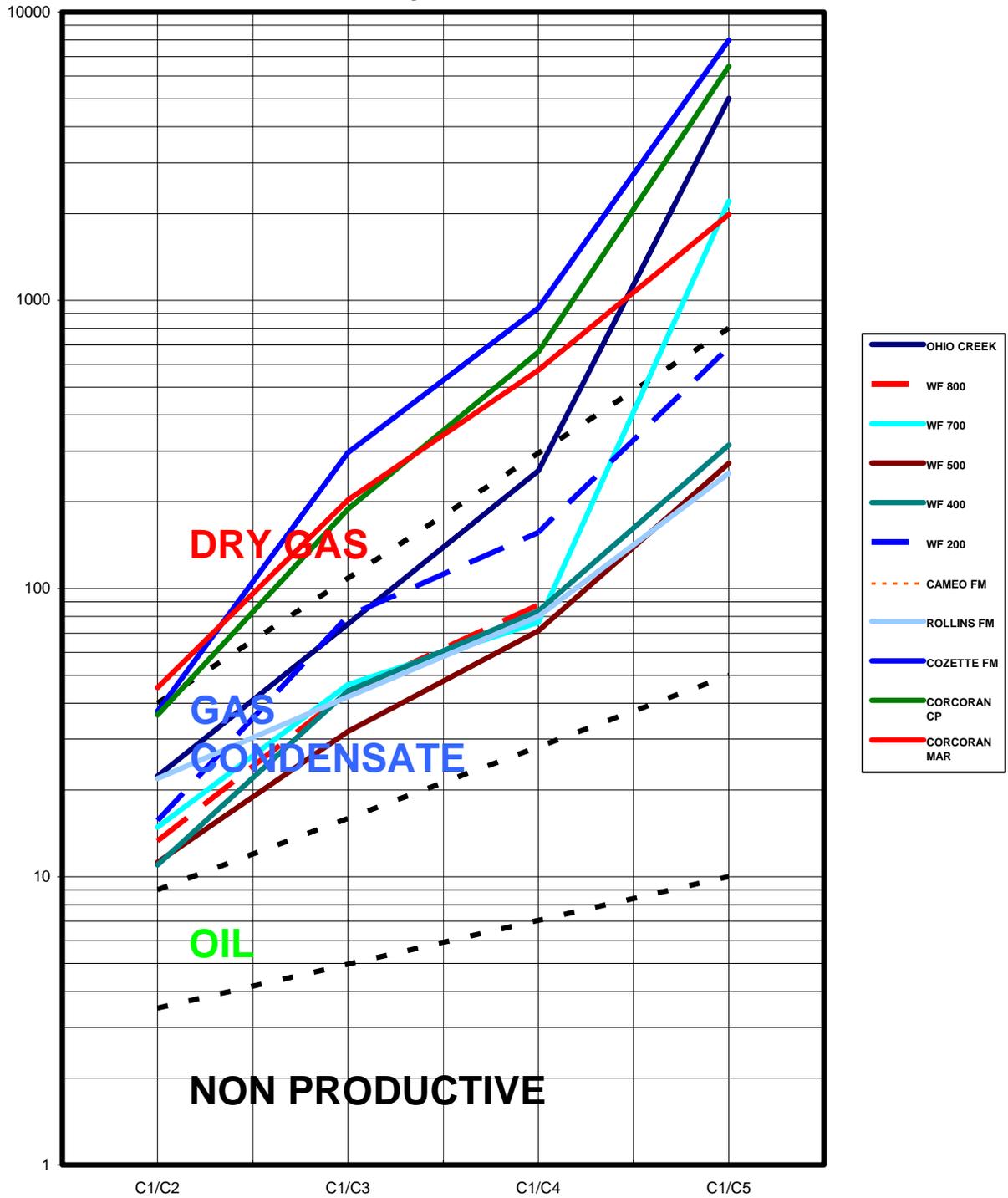
**Pixler Plot**

**Piceance Creek Unit PCU 297-12A6**

**Rio Blanco County, CO.**

**CANRIG**  Canrig Drilling Technology LTD

PCU 297-12 A6  
Pixler Plot Of Average Chromatography  
Data By Formation



**ExxonMobil**

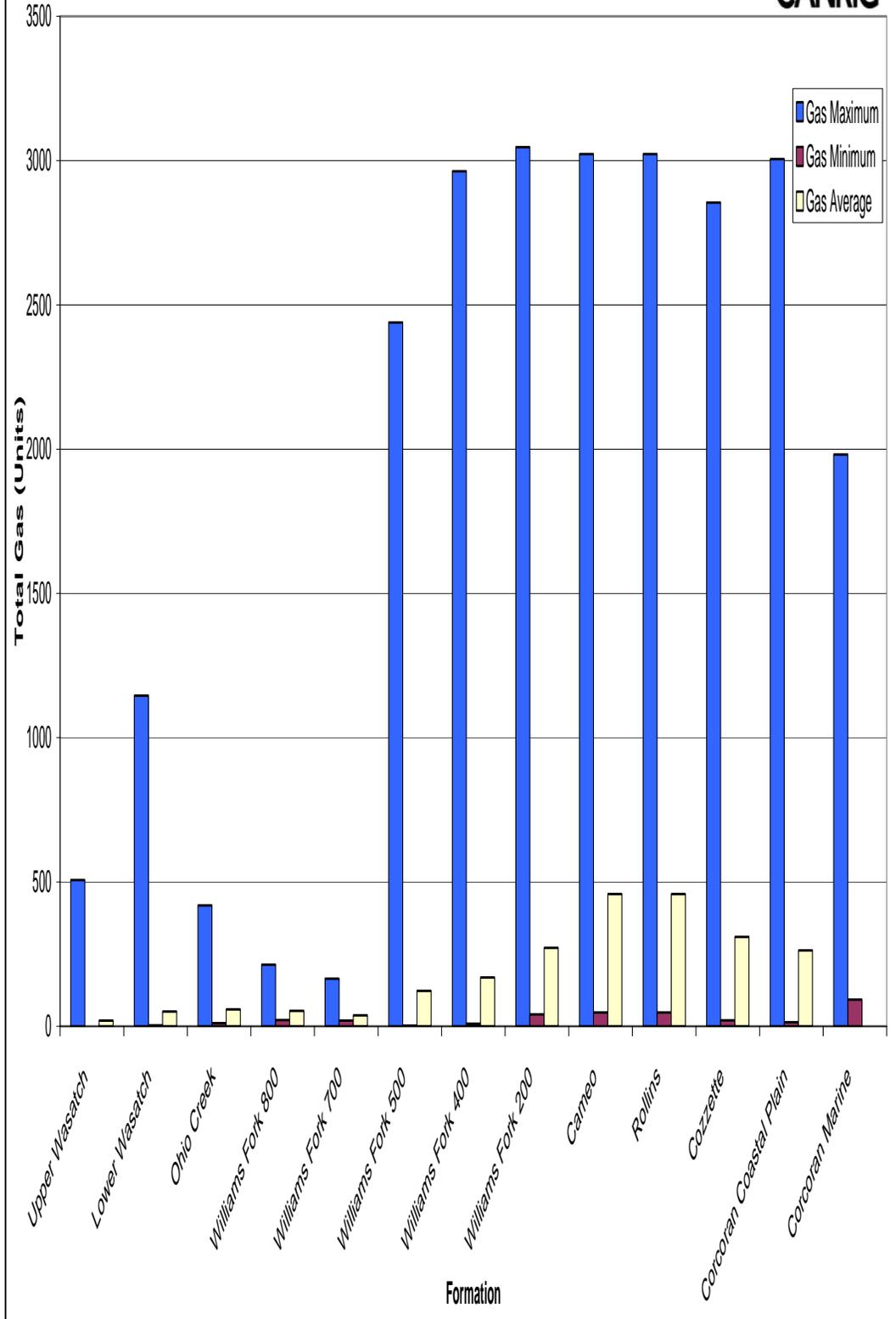
**Other Data Plots**

**Piceance Creek Unit PCU 297-12A6  
Rio Blanco County, CO.**

**CANRIG**  Canrig Drilling Technology LTD

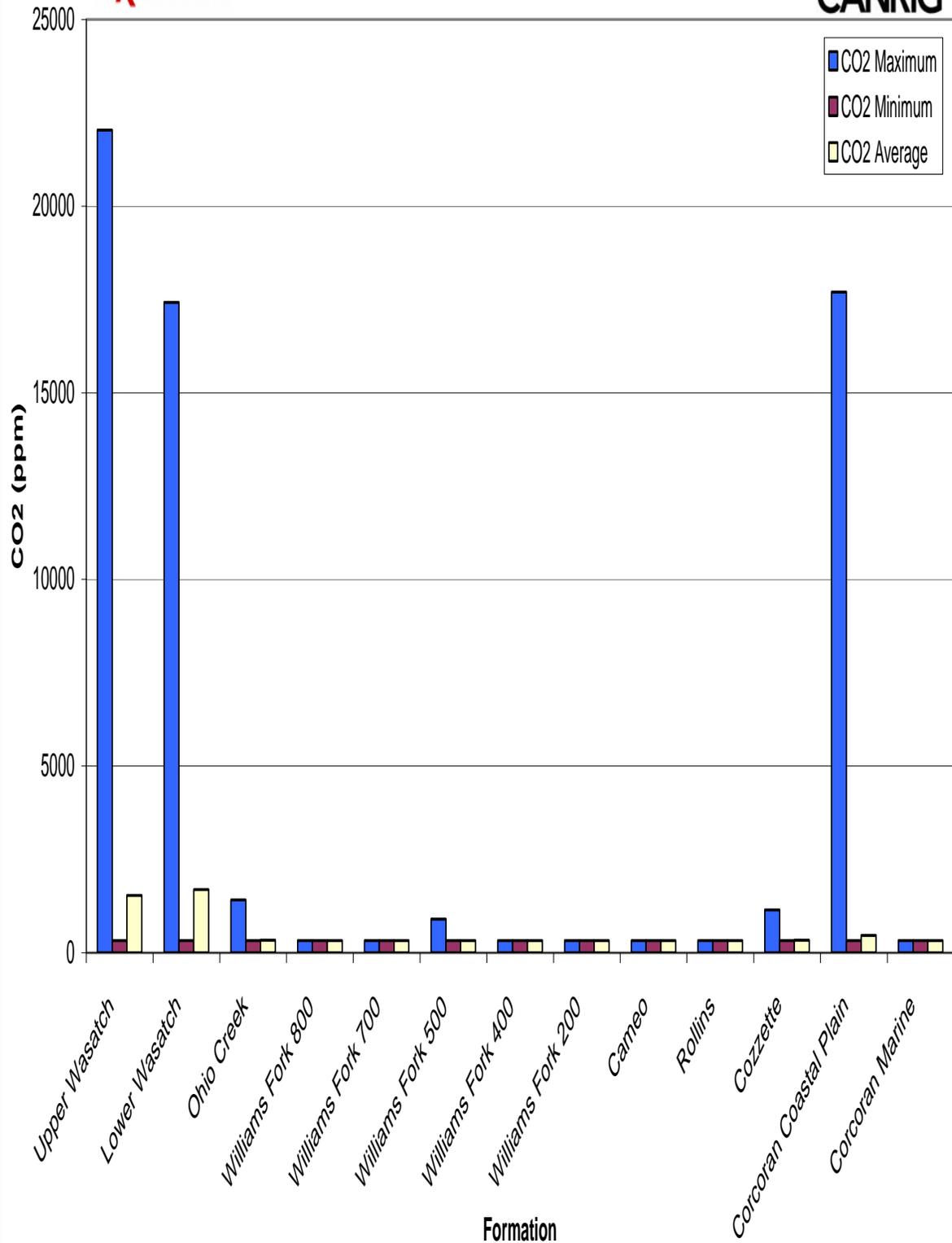


PCU 297-12A6  
Total Gas Statistics By Formation



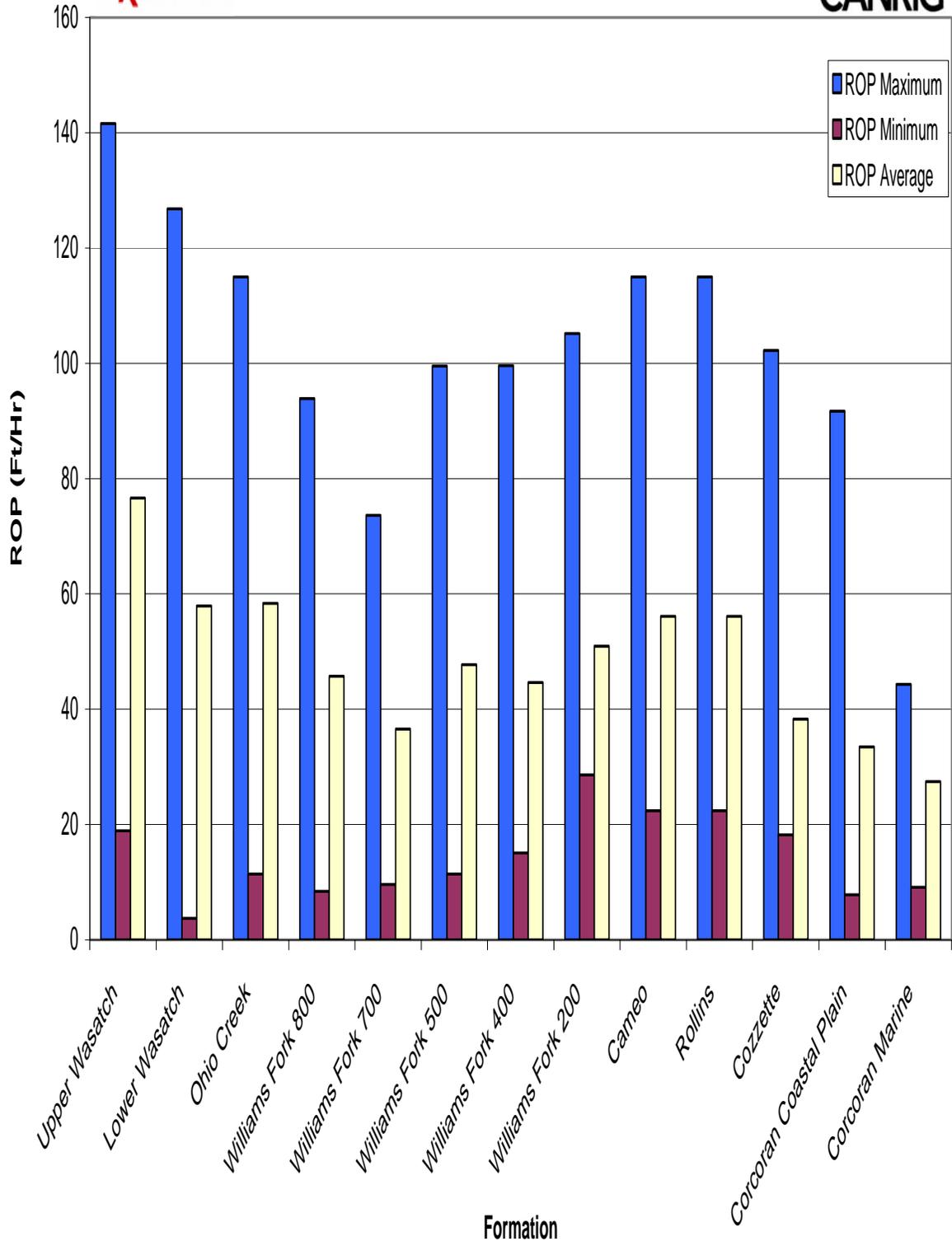


PCU 297-12A6  
CO2 Statistics





PCU 297-12A6  
Rate of Penetration Statistics



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**Ballooning Surveillance Charts**

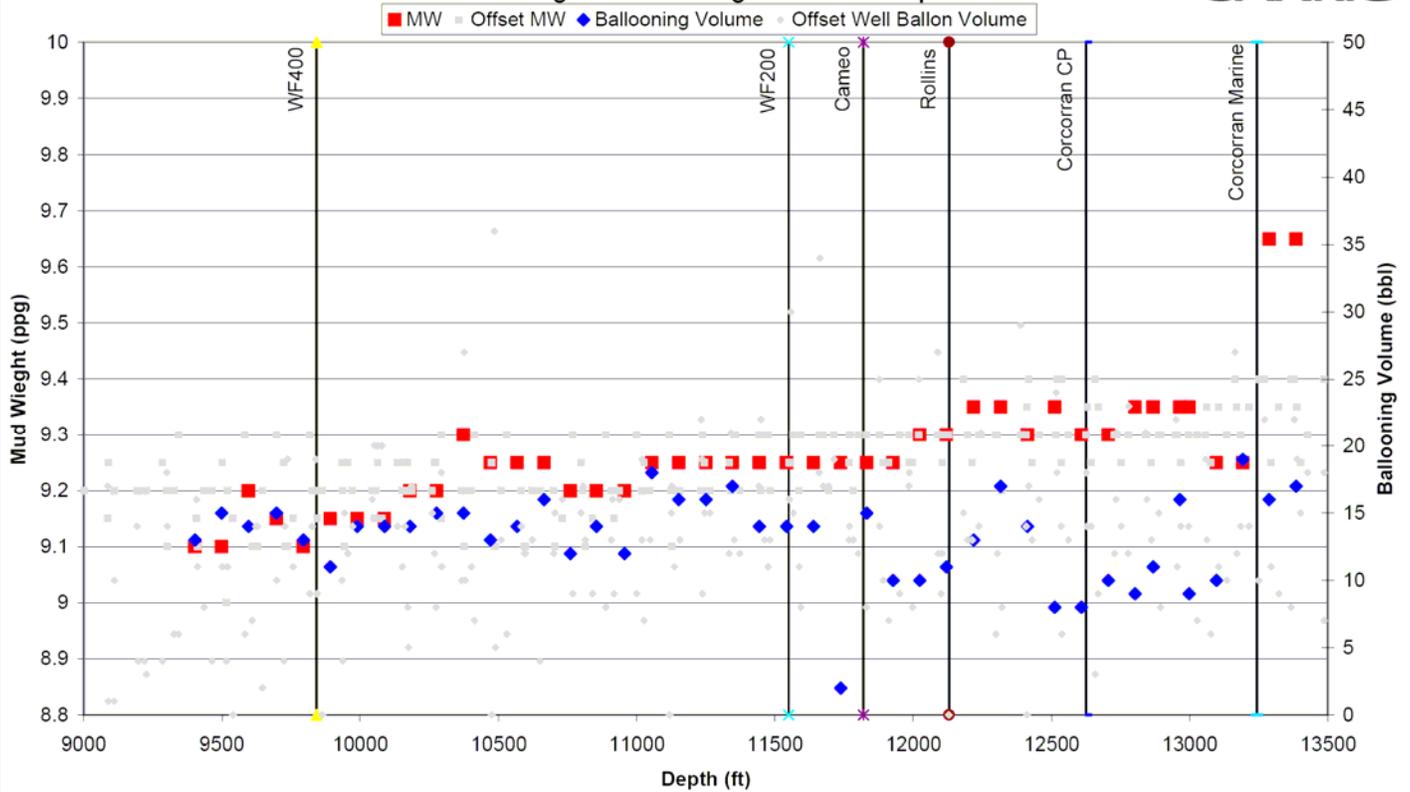
**Piceance Creek Unit PCU 297-12A6  
Rio Blanco County, CO.**

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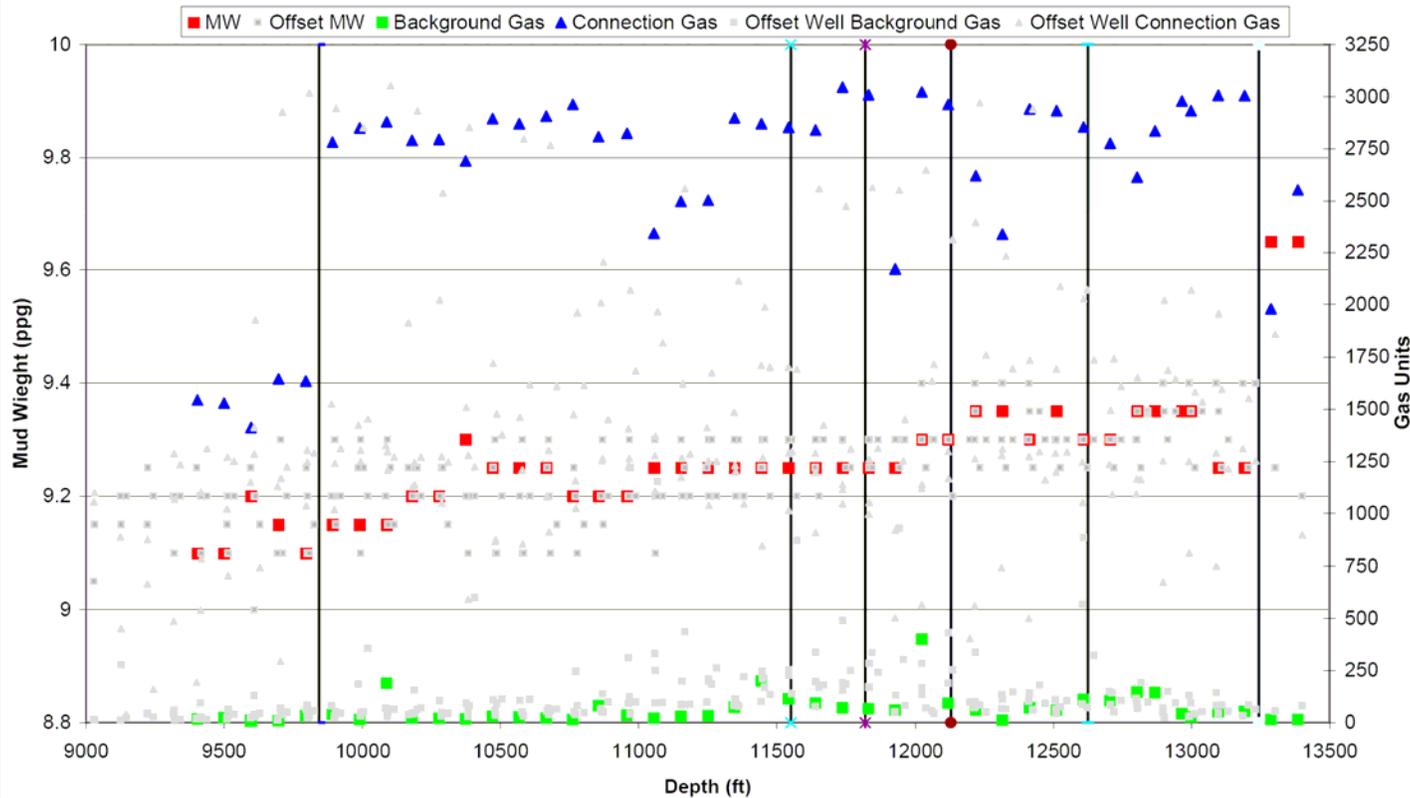
PCU 297-12A6



Mud Wieght & Ballooning Volume vs. Depth



Mud Wieght & Gas Unis vs. Dpeth



**ExxonMobil**

**Mud Losses Summary**

**Piceance Creek Unit PCU 297-12A6**

**Rio Blanco County, CO.**

 **CANRIG** Canrig Drilling Technology LTD



**ExxonMobil**

**Daily Activity Summary  
From H&P Daily Tour Sheet**

**Piceance Creek Unit PCU 297-12A6  
Rio Blanco County, CO.**

**CANRIG**  Canrig Drilling Technology LTD

# Daily Activity Summary

## 06/01/09

Skid rig from A-7 to A-6; nipple up stack and flow line.

## 06/02/09

Rig up and prepare to test BOP. Test BOP and trip in hole with 30 stands. Lay down 30 stands and inspect same. Trip in hole with inspected pipe; racked back 30 stands; picked up BHA and began tripping in hole.

## 06/03/09

Trip in to 4063', test directional equipment. Cut drill line. Circulate bottoms up. Test casing to 1600 psi for 30 minutes. Drill out float, shoe and new formation to 4143'. Circulate and run FIT test. Drill to 4750'

## 06/04/09

Drilling ahead from 4750' to 5810'; directional drilling off-set section of well; drilled to 5810'; switched mud system to DSF mud.

## 06/05/09

Continue to drill to 6055'; lost returns; worked with lost returns; returns present; drilled ahead to 6186'; back reamed out of hole to shoe; washed and reamed from shoe back into hole.

## 06/06/09

Continue to wash and ream to bottom. Displace DSF mud out of hole. Drill ahead to 6430'. Begin dropping angle back to vertical. Drill ahead to 6975'

## 06/07/09

Drill ahead to 7123'. Circulate out. Back ream out of hole for new BHA. Pump sweeps for loss returns. Lay out BHA.

## 06/08/09

Cut and slip drill line. Pick up bit and BHA. Trip in hole.

## 06/09/09

Continue to wash and ream to bottom. Drill ahead to 8020'.

## 06/10/09

Drill ahead to 8905'.

## 06/11/09

Drill ahead to 9390'. TD intermediate A6 well. Circulate out. Back ream and pull out of hole.

## 06/12/09

Continue to pull out of hole. Lay out BHA. Rig up and start running 7" casing.

## 06/13/09

Continue running casing washing down when needed. Continue to run casing.

## 06/14/09

Continue to wash down casing. Rig up Halliburton cementing units and perform cement job. Rig down cementing equipment and nipple down and cut casing.

## 11/04/2009

Skid rig over to 12A6 well; Nipple up BOP stack; Tested BOP; Picked up new drilling assembly tripping in hole.

## 11/05/2009

TIH to 7863 high gas alarm pulled trip nipple and set rotating head rubber; TIH to 9114' washed down to 9250 cir B/U; Tested casing at 2000psi for 30 min; pulled rotating head level out derrick; drilled out float collar cement and shoe and 10'new formation to 9380'; Performed FIT; Drilling ahead max co2 2100ppm Max gas 1534U.

**11/06/2009**

Drilling ahead controlling loses with LCM sweeps with Baracarb and Nut plug; Max gas 2465u max CO@ 330ppm.

**11/07/2009**

Drilled to 10860'; Circulated and condition mud to 9.8ppg; POOH using Positive displacement method to 9275; Monitor well; Pumped slug then POOH; Changed out bit and BHA and tripped into hole Max gas 2963u max CO2 330ppm

**11/08/2009**

A new bit was made up at 10860'; began to trip into the hole to bottom; encountered tight zones to bottom and was forced to ream; began drilling ahead from 10860'.

**11/09/2009**

Cut the drill line; pulled the trip nipple; washed and reamed down to bottom at a depth of 10860'; drilled ahead.

**11/10/2009**

Continued to drill ahead from a depth of 11051'; a washout occurred during connection; circulated out gas from washout at a 12024'; drilled ahead.

**11/11/2009**

Continued drilling ahead from 12019'; experienced another washout after connection near a depth of 12800'; drilled ahead.

**11/12/2009**

Completed drilling to a total depth of 13445'MD; circulated bottoms up with a max gas of 2975 units; spotted a 14.2ppg slug on bottom; began tripping out of the hole.

**11/13/2009**

Pulled wear bushing; rig down pipe elevators and bails; hold JSA on rigging up casing equipment; make up casing shoe track and test floats; run in the hole with casing.

**11/14/2009**

Completed running in 4.5" casing; circulated at bottom with a max gas of 469 units; rigging up Halliburton cementing equipment.

**ExxonMobil**

**Survey Data**

**Piceance Creek Unit PCU 297-12A6**

**Rio Blanco County, CO.**

**CANRIG** Canrig Drilling Technology LTD



**RIO BLANCO, COLORADO**  
**Piceance Creek Unit 297-12A3**



**SURVEY DATA**  
**Provided by Schlumberger**

	MD Depth (ftKB)	Inc Angle (°)	Azimuth (°)	TVD Depth (ft)	Vertical Section (ft)	DLS (°/100ft)	Vertical		
							+N/S- (ft)	+E/W- (ft)	
	4143	22.88	21.85	3857.95	1371.33	0.54	1244.13	576.99	
	4237	22.96	23.00	3944.53	1407.88	0.48	1277.97	590.96	
	4332	22.93	24.91	4032.01	144.90	0.78	1311.81	605.99	
	4428	22.70	26.32	4120.50	1482.12	0.62	1345.37	622.08	
	4524	22.90	25.19	4209.00	1519.32	0.50	1378.88	638.25	
	4619	23.39	24.59	4296.36	1556.66	0.57	1412.75	653.96	
	4715	23.71	25.13	4384.36	1595.01	0.40	1447.55	670.09	
	4810	23.64	27.58	4471.37	1633.15	1.04	1481.73	687.02	
	4906	23.51	28.54	4559.35	1671.50	0.42	1515.61	705.08	
	5003	23.61	26.06	4648.27	1710.25	1.03	1550.06	722.85	
	5098	23.53	24.26	4735.35	1748.23	0.76	1584.44	739.00	
	5193	23.50	23.77	4822.46	1786.12	0.21	1619.06	754.43	
	5289	23.55	23.17	4910.48	1824.42	0.25	1654.21	769.69	
	5385	23.41	24.30	4998.53	1862.65	0.49	1689.22	785.08	
	5481	23.69	24.10	5086.53	1900.99	0.30	1724.21	800.81	
	5575	23.58	24.06	5172.65	1938.67	0.12	1758.61	816.18	
	5671	24.40	25.69	5260.36	1977.69	1.10	1794.01	832.61	
	5767	24.10	24.89	5347.89	2017.12	0.46	1829.66	849.45	
	5862	24.33	24.67	5434.53	2056.08	0.26	1865.78	865.78	
	5958	23.86	23.70	5522.18	2095.26	0.64	1900.79	881.84	
	6053	23.44	23.29	5609.18	2133.35	0.47	1935.74	897.04	
	6149	21.99	24.95	5697.74	2170.40	1.65	1969.58	912.17	
	6244	19.83	25.77	5786.48	2204.30	2.29	2000.22	926.68	
	6341	17.53	26.12	5878.48	2235.37	2.37	2028.15	940.26	
	6436	14.51	26.00	5969.66	2261.58	3.18	2051.70	951.78	
	6532	13.17	25.38	6062.87	2284.54	1.40	2072.39	961.74	
	6625	10.35	23.28	6153.91	2303.49	30.7	2089.64	969.59	
	6723	9.03	23.10	6250.51	2319.97	1.35	2104.80	976.08	
	6817	6.91	23.64	6343.60	2332.99	2.26	2116.77	981.25	
	6914	4.89	18.74	6440.08	2342.93	2.14	2126.03	984.91	
	7010	1.99	355.23	6535.90	2348.44	3.30	2131.57	986.09	
	7086	0.09	267.79	6611.88	2349.55	2.62	2132.88	985.92	
	7123	0.09	267.79	6648.88	2349.52	0.00	2132.88	985.86	
	8490	2.00	Tele	Drift	Survey				

**ExxonMobil**

**Drilling Fluid Reports**

**Piceance Creek Unit PCU 297-12A6**

**Rio Blanco County, CO.**

 **CANRIG** Canrig Drilling Technology LTD



**PICEANCE CREEK UNIT PCU 297-12A6**  
**WATER BASED MUD REPORT**  
 Mud Engineering Services Provided By Baroid

Property	6/03/2009	6/04/2009	6/05/2009	6/06/2009	6/07/2009	6/08/2009	6/09/2009
Sample Temperature (deg F)	88	132		136	122		119
Sample Depth	4460	5803	6185	6795	7123	7123	7780
Mud Weight (lb/gal)	9.05	9.25	9.4	9.3	9.00	9.25	9.2
FV (sec/quart)	50	51	50	45	45	45	45
PV(cP)	14	13	16	14	14	11	11
YP (lb/100 ft2)	18	18	18	16	17	16	19
Gels (10 sec lb/100ft2)	9	8	8	9	9	8	8
Gels (10 min lb/100ft2)	29	28	19	29	26	15	21
Gels (30 min lb/100ft2)	44	50	30	47	44	25	29
API FL (cc/30 min)	12.0	12.0	12.0	12.4	10.0	10.0	11.2
Cake (API)	2/-	2/-	2/-	2/-	2/-	2/-	2/-
pH	10.9	9.9	8.9	10.0	10.0	8.8	9.4
Pm	0.85	0.60	0.70	0.65	0.70	0.62	0.71
Hardness (mg/l)	20	10	10	20	20	10	10
Chlorides (mg/l)	1700	1700	1700	2000	2000	1800	1800
MBT (lb/bbl)	17.5	15.0	17.5	20.0	20.0	20.0	17.5
Sand (%)	0.10	0.15	0.25	0.30	0.30	0.15	0.25
Corrected Solids (%)	4.0	5.2	5.7	5.2	3.7	4.7	4.7
CO2							



**PICEANCE CREEK UNIT PCU 297-12A6**  
**WATER BASED MUD REPORT**  
Mud Engineering Services Provided By Baroid

Property	06/10/2009	06/11/2009	06/12/2009	06/13/2009	06/14/2009	11/04/2009	11/05/2009
Sample Temperature (deg F)	128	136	125	105	---	-	102
Sample Depth	8720	9390	9390	9390	9390	9390	9500
Mud Weight (lb/gal)	9.3	9.30	9.3	9.25	9.10	9.55	9.15
FV (sec/quart)	55	54	60	52	43	42	38
PV(cP)	16	16	17	16	15	14	9
YP (lb/100 ft <sup>2</sup> )	17	22	22	19	15	16	12
Gels (10 sec lb/100ft <sup>2</sup> )	9	10	11	10	7	5	4
Gels (10 min lb/100ft <sup>2</sup> )	18	28	31	21	18	10	8
Gels (30 min lb/100ft <sup>2</sup> )	38	41	49	37	24	12	12
API FL (cc/30 min)	10.8	10.8	10.0	9.0	11.1	8.2	9.8
Cake (API)	2/-	3/-	3/-	2/-	2/-	2/-	2/-
pH	9.8	9.80	9.6	10.5	8.10	10.1	9.60
Pm	0.80	0.65	0.65	0.85	0.20	0.75	0.55
Hardness (mg/l)	20	20	20	40	---	40	30
Chlorides (mg/l)	1800	1900	1900	1900	2400	1500	1700
MBT (lb/bbl)	20.0	20.0	20.0	17.5	---	15.0	15.0
Sand (%)	0.25	-	-	-	---	0.30	0.20
Corrected Solids (%)	5.7	5.7	5.7	5.2	4.1	6.0	3.9
CO <sub>2</sub>						330	330



**PICEANCE CREEK UNIT PCU 297-12A6**  
**WATER BASED MUD REPORT**  
 Mud Engineering Services Provided By Baroid

Property	11/06/2009	11/07/2009	11/08/2009	11/09/2009	11/10/2009	11/11/2009	11/12/2009
Sample Temperature (deg F)	92	107	95	105	109	114	100
Sample Depth	10175	10860	10860	11640	12462	13193	13445
Mud Weight (lb/gal)	9.20	9.70	9.25	9.25	9.35	9.25	10.00
FV (sec/quart)	45	45	44	44	43	40	44
PV(cP)	12	13	13	14	14	11	14
YP (lb/100 ft2)	16	17	16	16	15	17	17
Gels (10 sec lb/100ft2)	5	6	5	5	4	4	5
Gels (10 min lb/100ft2)	8	10	10	10	12	9	8
Gels (30 min lb/100ft2)	15	16	16	16	17	13	13
API FL (cc/30 min)	7.0	7.4	7.0	7.2	7.0	7.3	7.4
Cake (API)	2/-	2/-	2/-	2/-	2/-	2/-	2/-
pH	10.50	10.50	10.20	11.00	10.20	10.40	10.40
Pm	0.80	0.80	.83	.90	.82	.95	1.15
Hardness (mg/l)	40	40	40	40	40	60	60
Chlorides (mg/l)	1900	1900	2000	2200	1800	2000	2100
MBT (lb/bbl)	15.0	15.0	15.0	15.0	15.0	12.5	15.0
Sand (%)	0.35	0.30	.33	.42	.50	.50	.30
Corrected Solids (%)	4.0	5.9	4.1	4.3	4.7	4.7	7.4
CO2	330	330	330	330	330	330	330



**PICEANCE CREEK UNIT PCU 297-12A6**  
**WATER BASED MUD REPORT**  
Mud Engineering Services Provided By Baroid

Property	11/13/2009	11/14/2009					
Sample Temperature (deg F)	----	70					
Sample Depth	13445	13445					
Mud Weight (lb/gal)	10.00	10.00					
FV (sec/quart)	43	42					
PV(cP)	11	12					
YP (lb/100 ft <sup>2</sup> )	15	13					
Gels (10 sec lb/100ft <sup>2</sup> )	5	4					
Gels (10 min lb/100ft <sup>2</sup> )	11	8					
Gels (30 min lb/100ft <sup>2</sup> )	13	11					
API FL (cc/30 min)	7.6	8.0					
Cake (API)	2/-	2/-					
pH	10.00	10.10					
Pm	.90	.85					
Hardness (mg/l)	40	40					
Chlorides (mg/l)	2100	2100					
MBT (lb/bbl)	12.5	12.5					
Sand (%)	.10	.10					
Corrected Solids (%)	7.4	7.2					
CO <sub>2</sub>	330	330					

**ExxonMobil**

**Bit History**

**Piceance Creek Unit PCU 297-12A6**

**Rio Blanco County, CO.**

**CANRIG** Canrig Drilling Technology LTD



### Bit History PCU 297-12A6

Bit #	Ser #	Mfr.	Size	Type	Jet Sizes	Depth In	Depth Out	Footage	Avg ROP	Hours
1	SURFACE									
2	SURFACE									
3	7014224	Hughes	9 7/8"	HCM504ZX	4X13 2X12	4133'	7123'	2990'	57.22	52.25
4	JY9468	Geodiamond	9 7/8"	M1616	4X13 2X12	7123'	9390'	2267'	47.14	48.09
5	7126068	Hughes	6.125"	QD406	3X13	9390'	10860'	1470'	39.16	37.53
6	7126158	Hughes	6.125"	QD406	3X13	10860'	13445'	2586'	36.36	71.12

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**Pressure Test Graphs**

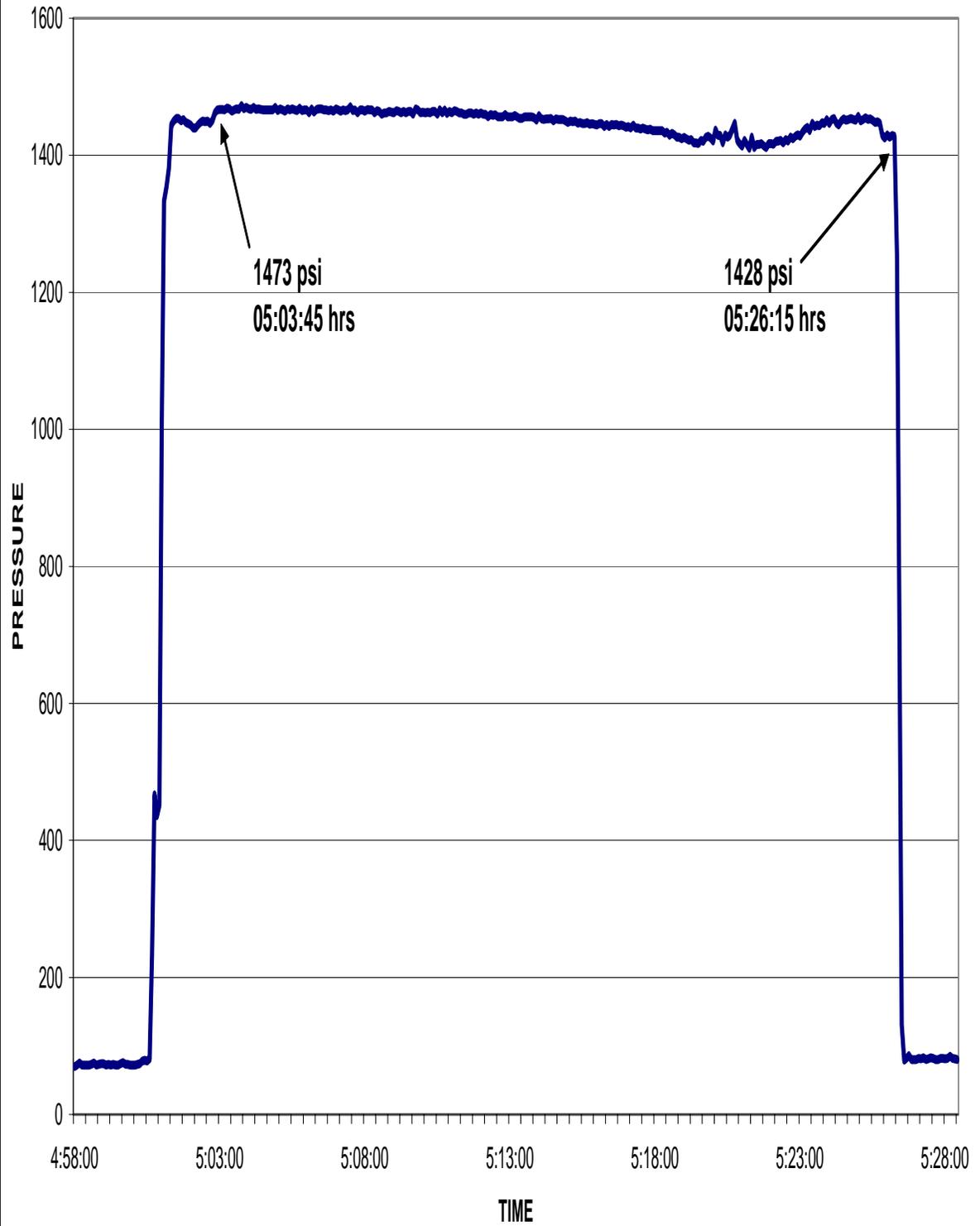
**Piceance Creek Unit PCU 297-12A6**

**Rio Blanco County, CO.**

**CANRIG**  Canrig Drilling Technology LTD

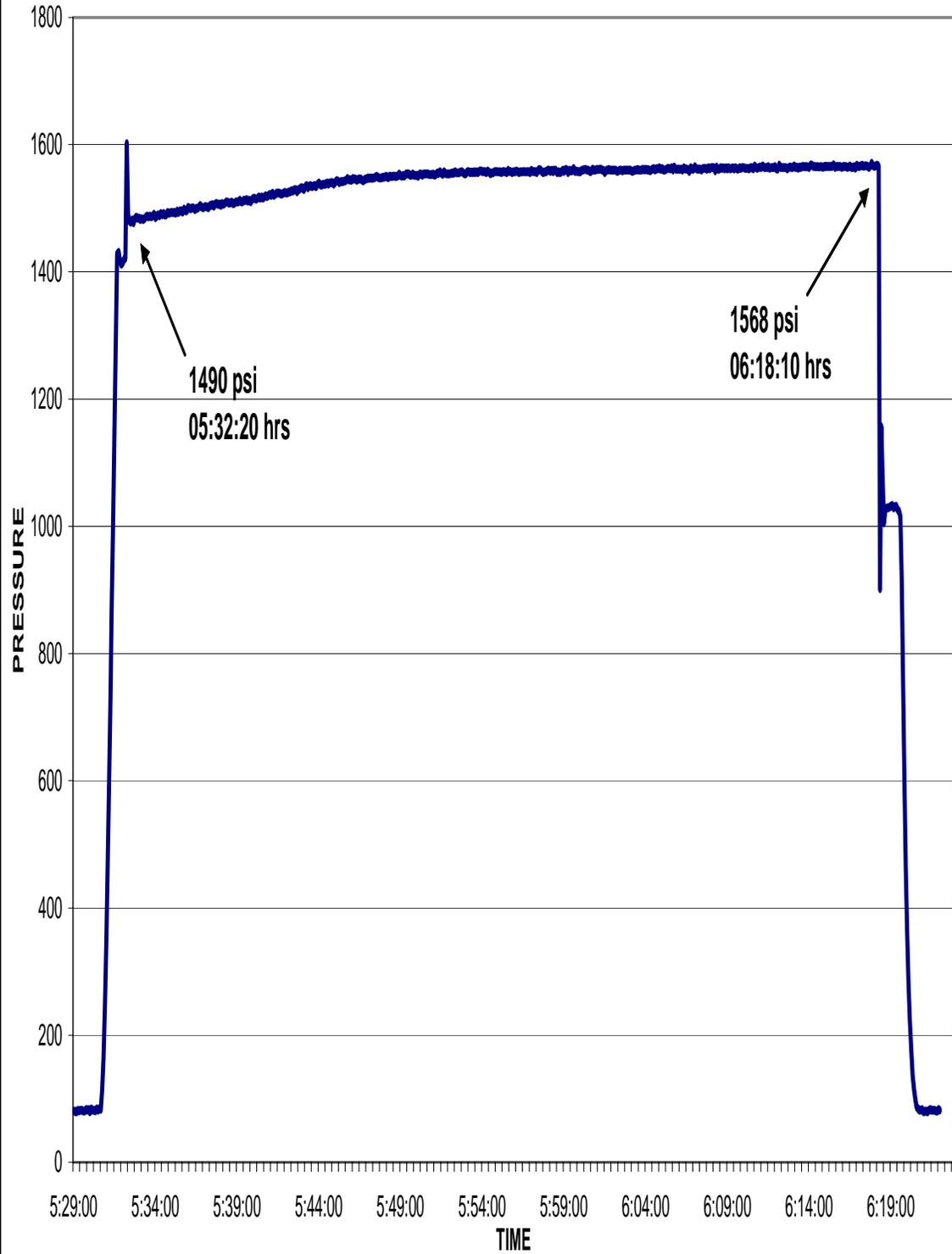
ExxonMobil PCU 297-12A6  
Surface Casing Pressure Test 1

06/03/2009



ExxonMobil PCU 297-12A6  
Surface Casing Pressure Test 2

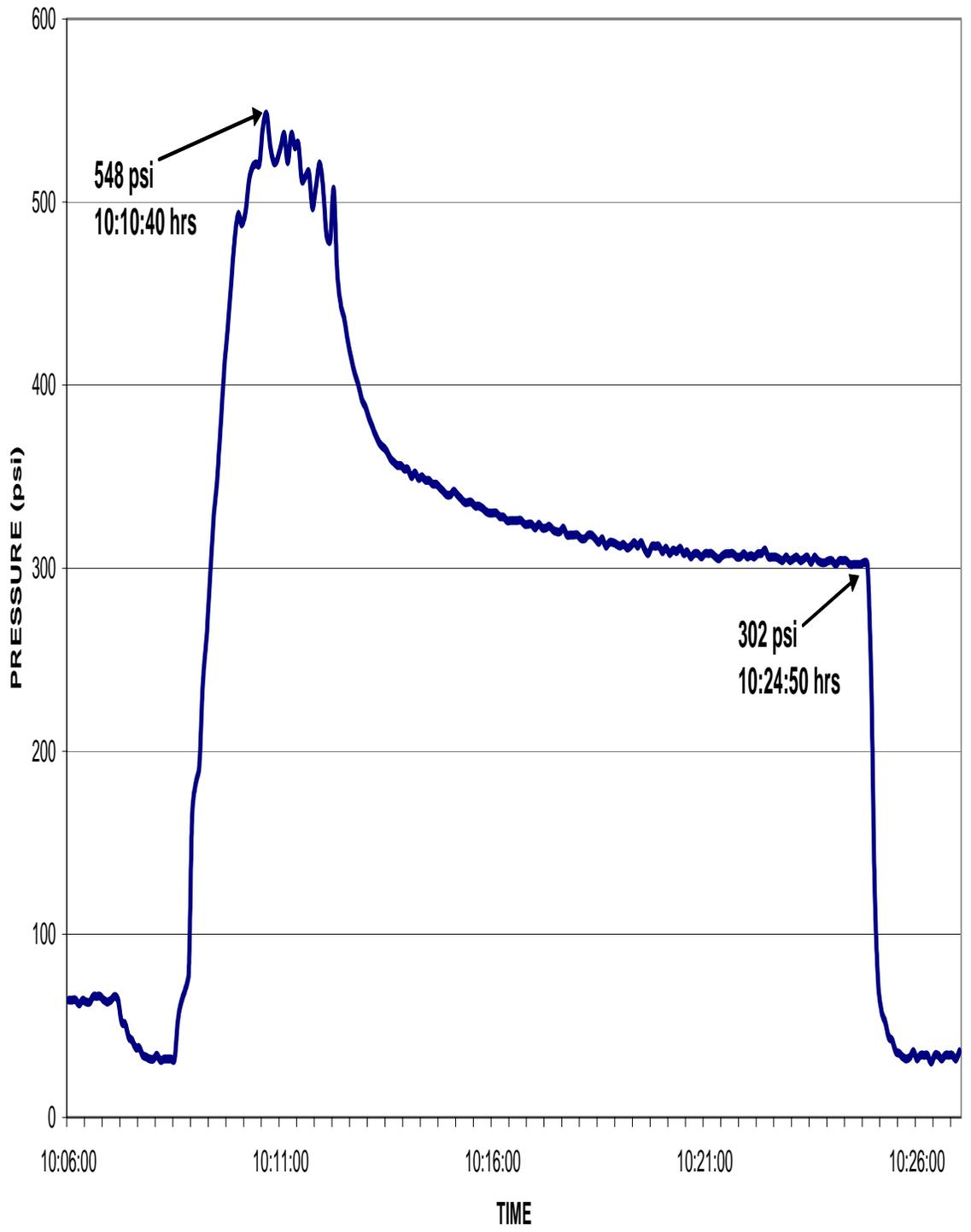
06/03/2009



ExxonMobil PCU 297-12A6

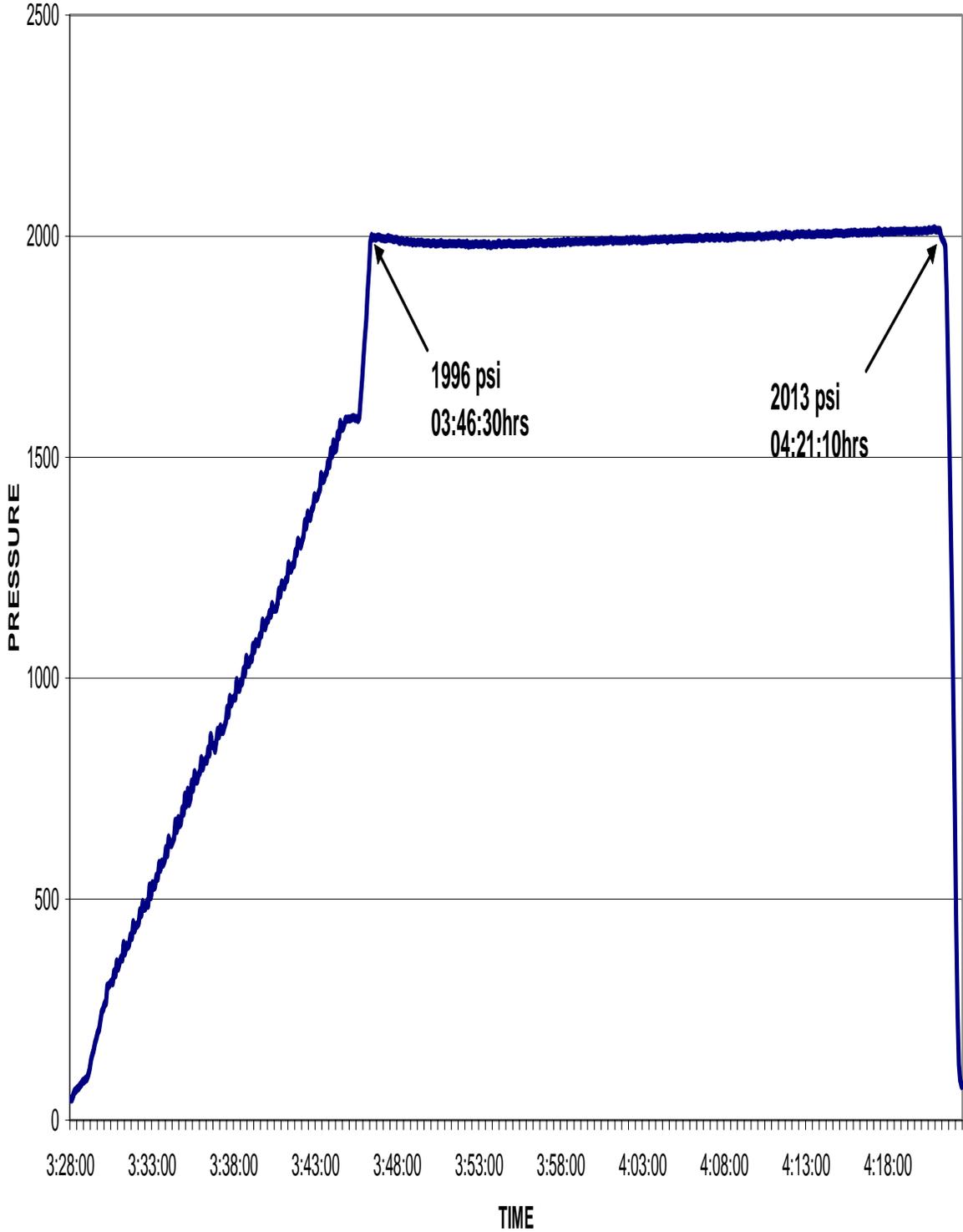
06/03/2009

Surface Casing FIT



ExxonMobil PCU 297-12A6  
Intermediate Casing Pressure Test

11/05/2009



ExxonMobil PCU 297-12A6  
Intermediate Casing FIT

11/05/2009

