Appendix III

The following reports on high-pressure methane adsorption, consisting of figures and tables of data, are taken verbatim from R.M.B. Earth Science Consultants Ltd., Delta, British Columbia, Canada, and have not been edited or reviewed for conformity with U.S. Geological Survey standards or nomenclature. The analyzed samples were supplied by the authors. Not all core holes were sampled for high-pressure methane adsorption.

High Pressure Methane Adsorption Analyses

Pilot State16-14, Pilot State 16-32, Schlautmann 9-10-45-74WY (Ocean 43-10C), Sorenson 2-33-54-74W, Haas 32-31, West 6-19W, Leroy Gregory 1, Laramore 11-6C, Kennecott CBM-1, Kennecott CBM-2 CARU State 22-16-5075W, Schoonover Road Unit (SRU) State 12-16-4876, CBM H 11-04, CBM C 33-1, PNG 33-1 (PNG 2), PNG 34-1 (PNG 1), PNG 31-1 (PNG 3), PNG 35-1 (PNG 4), All Night Creek Unit (ANCU) Iberlin 21-33-4374, PNG 16-2 (PNG 5), Coteau MC00250C, Coteau MC00251, Thomas Jefferson State 36-3, BCX-9, PNG Duvall 13J-D (PNG 6), KU Harriett 41-34-4777, PNG Carter-Federal 18F-D (PNG 7), Remington 587930 07A, Remington 57-79-18-03R, Remington 587930 01C, Bullwacker Creek Unit (BCU) 32-9-4277, Whiskey Draw Unit 12-12-4778, McBeth 12-30-4673-BG, State 23-16-4171, Groves 12-19-4574, PNG 24-1 (PNG 8), and PNG 26-1

Analyses carried out by R.M.B. Earth Science Consultants Ltd.
327 Rosehill Wynd, Delta British Columbia, V4M 3L8

INTRODUCTION

Seventy five sample coal samples from forty one core holes were submitted for methane isotherm analyses by Dr. Romeo Flores. This report describes the methods and provides the analytical results.

METHODS

The samples were received wet/damp. They were ground to -60 mesh and placed in an equilibrium moisture bath for a period of 20 days to confirm equilibrium moisture. A two gram split of each sample was used for duplicate moisture and ash analyses. A detailed description and overview of the adsorption measurement procedures are provided at the end of the Appendix.

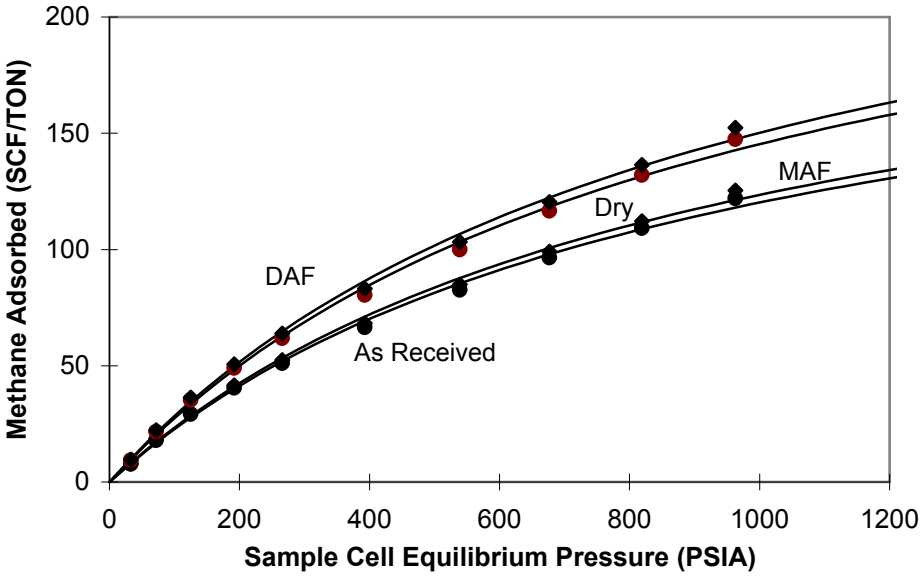
Results

Adsorption Analysis

The adsorption analysis of the sample is summarized on the attached pages in both SI (International System of measurement; e.g. gram and centimeter) and Imperial (Imp.) (British Imperial System; e.g. pound and foot) units.

Note that Standard Temperature and Pressure (STP) in SI units is at 0°C. In Imperial units standard (oil industry convention) STP is at a temperature of 60°F. Reported pressures are absolute.

MichiWest Energy, Inc
Pilot 16-14 1221.0'-1223.0'



Pressure (PSIA)	Adsorbed Methane (ft^3/ton)			
	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
33	7.90	9.55	8.11	9.87
72	17.97	21.73	18.47	22.46
125	29.14	35.23	29.94	36.41
192	40.58	49.06	41.69	50.70
266	50.93	61.58	52.33	63.63
393	66.45	80.34	68.28	83.02
539	82.52	99.77	84.79	103.10
677	96.41	116.57	99.06	120.45
819	109.21	132.04	112.21	136.45
963	122.01	147.52	125.36	152.44

Langmuir Parameters

	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
Vol. (ft^3/ton)	230	278	236	287
Pressure (PSIA)	911	911	911	911

Isotherm Temperature: 80 ºF

Goodness of fit of Langmuir regression: 0.98

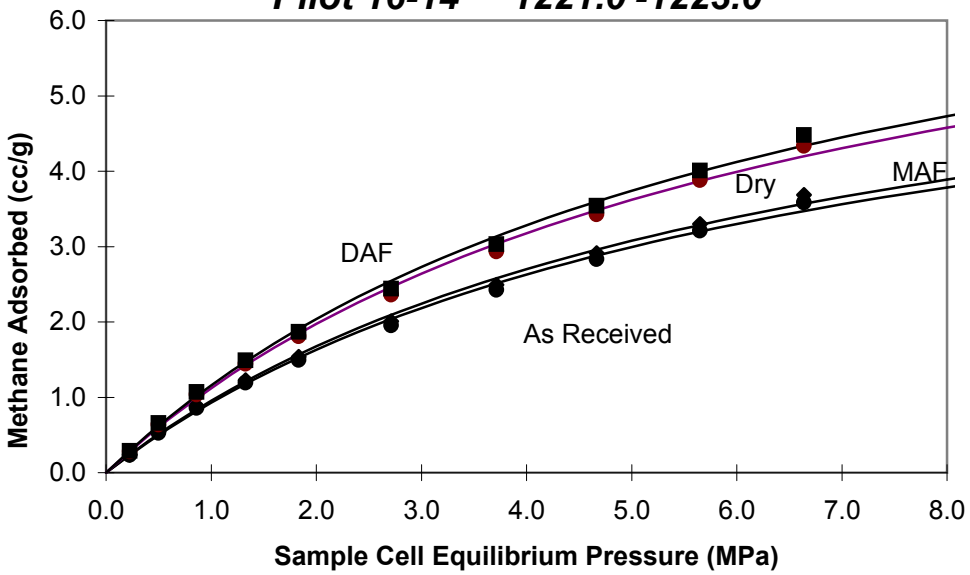
% Ash= 2.67 % Moisture= 17.29

SUMMARY OF ADSORPTION ANALYSES
IMPERIAL UNITS

Core Hole 1

MichiWest Energy, Inc

Pilot 16-14 1221.0'-1223.0'



Pressure	Adsorbed Methane (cc/g)			
(MPa)	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
0.23	0.23	0.28	0.24	0.29
0.50	0.53	0.64	0.54	0.66
0.86	0.86	1.04	0.88	1.07
1.33	1.19	1.44	1.23	1.49
1.83	1.50	1.81	1.54	1.87
2.71	1.95	2.36	2.01	2.44
3.71	2.43	2.93	2.49	3.03
4.67	2.83	3.43	2.91	3.54
5.65	3.21	3.88	3.30	4.01
6.64	3.59	4.34	3.68	4.48

Langmuir Parameters

	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
Vol. (cc/g)	6.76	8.17	6.94	8.44
Pressure (MPa)	6.28	6.28	6.28	6.28

Isotherm Temperature: **26.5 ºC**

Goodness of fit of Langmuir regression: **0.98**

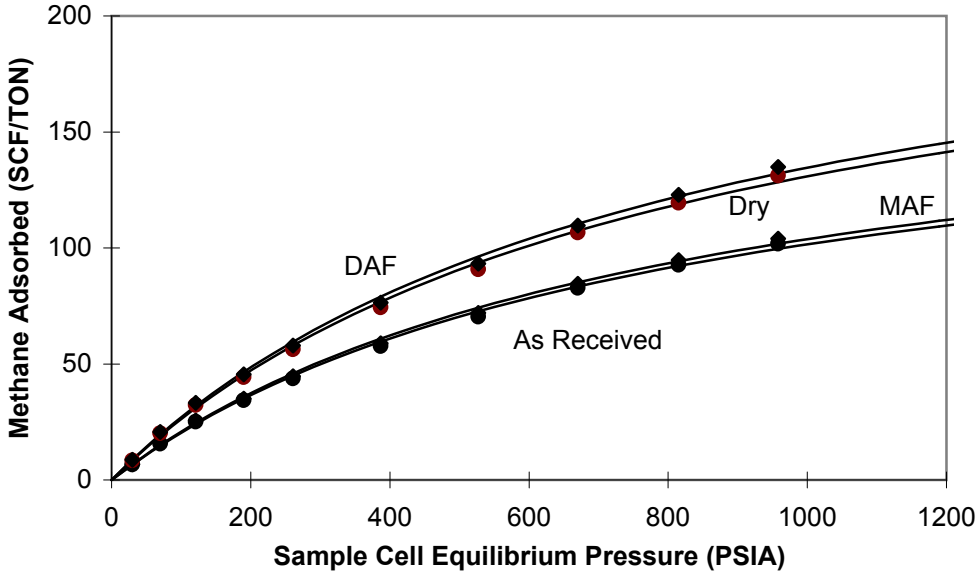
% Ash= 2.67 **% Moisture = 17.29**

SUMMARY OF ADSORPTION ANALYSES
INTERNATIONAL SYSTEM UNITS

Core Hole 1

MichiWest Energy, Inc

Pilot 16-14 Canister 10 1231.0'-1233.0'



Pressure (PSIA)	Adsorbed Methane (ft^3/ton)			
	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
30	6.67	8.60	6.82	8.85
70	15.66	20.18	16.00	20.76
121	25.16	32.42	25.71	33.35
190	34.40	44.33	35.15	45.60
261	43.64	56.24	44.60	57.85
387	57.50	74.11	58.76	76.22
527	70.33	90.65	71.88	93.23
670	82.66	106.53	84.47	109.57
815	92.67	119.43	94.70	122.84
958	101.65	131.01	103.89	134.75

Langmuir Parameters

	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
Vol. (ft^3/ton)	182	235	186	242
Pressure (PSIA)	798	798	798	798

Isotherm Temperature: 80 ºF

Goodness of fit of Langmuir regression: 0.99

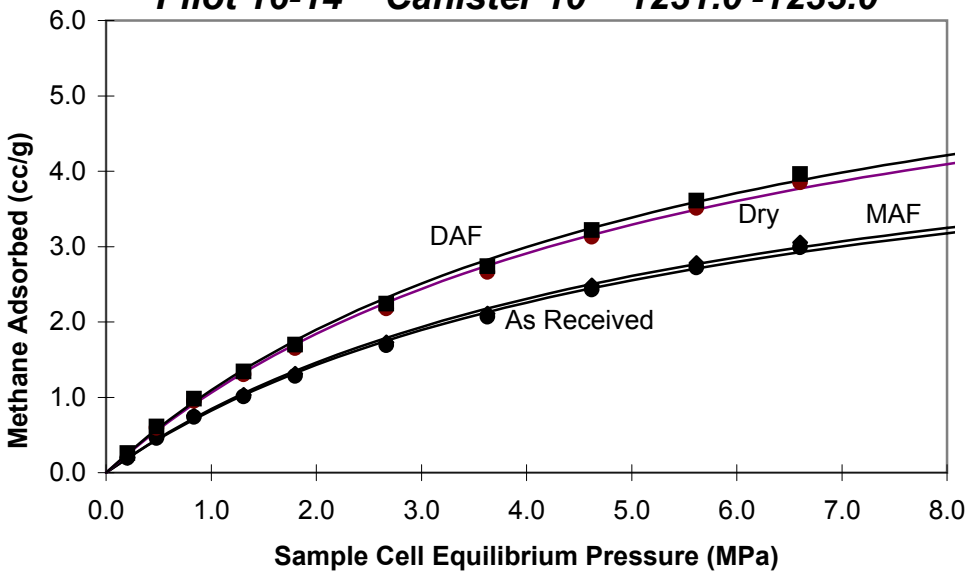
% Ash= 2.15 % Moisture= 22.41

SUMMARY OF ADSORPTION ANALYSES
IMPERIAL UNITS

Core Hole 1

MichiWest Energy, Inc

Pilot 16-14 Canister 10 1231.0'-1233.0'



Pressure	Adsorbed Methane (cc/g)			
(MPa)	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
0.21	0.20	0.25	0.20	0.26
0.48	0.46	0.59	0.47	0.61
0.84	0.74	0.95	0.76	0.98
1.31	1.01	1.30	1.03	1.34
1.80	1.28	1.65	1.31	1.70
2.67	1.69	2.18	1.73	2.24
3.63	2.07	2.66	2.11	2.74
4.62	2.43	3.13	2.48	3.22
5.62	2.72	3.51	2.78	3.61
6.60	2.99	3.85	3.05	3.96

Langmuir Parameters

	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
Vol. (cc/g)	5.36	6.91	5.48	7.11
Pressure (MPa)	5.50	5.50	5.50	5.50

Isotherm Temperature: **26.5 ºC**

Goodness of fit of Langmuir regression: **0.99**

% Ash= 2.15 **% Moisture =** **22.41**

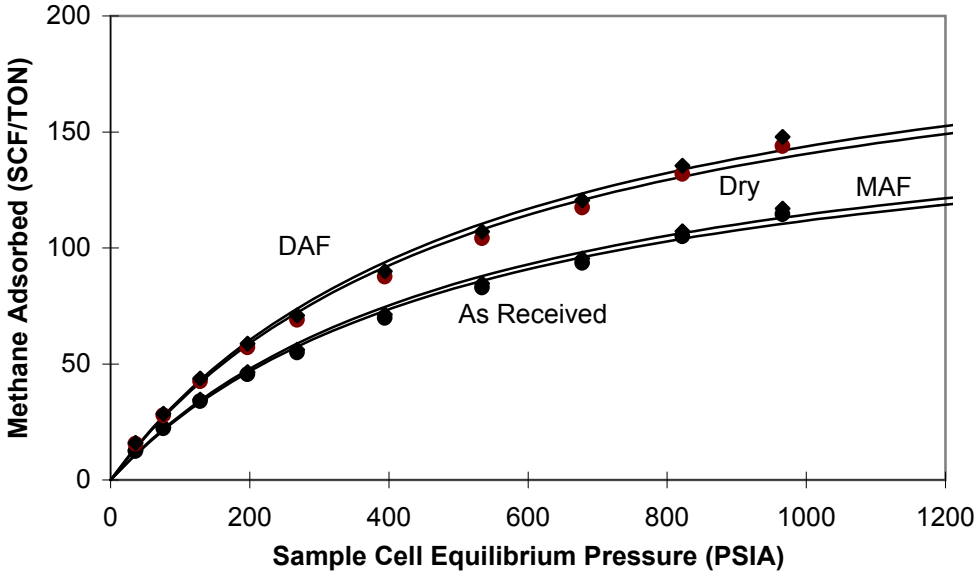
SUMMARY OF ADSORPTION ANALYSES

INTERNATIONAL SYSTEM UNITS

Core Hole 1

MichiWest Energy, Inc

Pilot 16-14 Canister 31 1284.0'-1286.0'



Pressure (PSIA)	Adsorbed Methane (ft^3/ton)			
	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
36	12.39	15.57	12.66	15.99
76	22.15	27.82	22.63	28.58
129	33.75	42.40	34.48	43.55
197	45.36	56.97	46.34	58.53
268	54.85	68.90	56.03	70.78
394	69.62	87.45	71.12	89.83
534	83.07	104.34	84.86	107.18
678	93.35	117.26	95.36	120.45
822	104.95	131.84	107.22	135.43
966	114.45	143.76	116.92	147.68

Langmuir Parameters

	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
Vol. (ft^3/ton)	171	215	175	220
Pressure (PSIA)	529	529	529	529

Isotherm Temperature: **80 ºF**

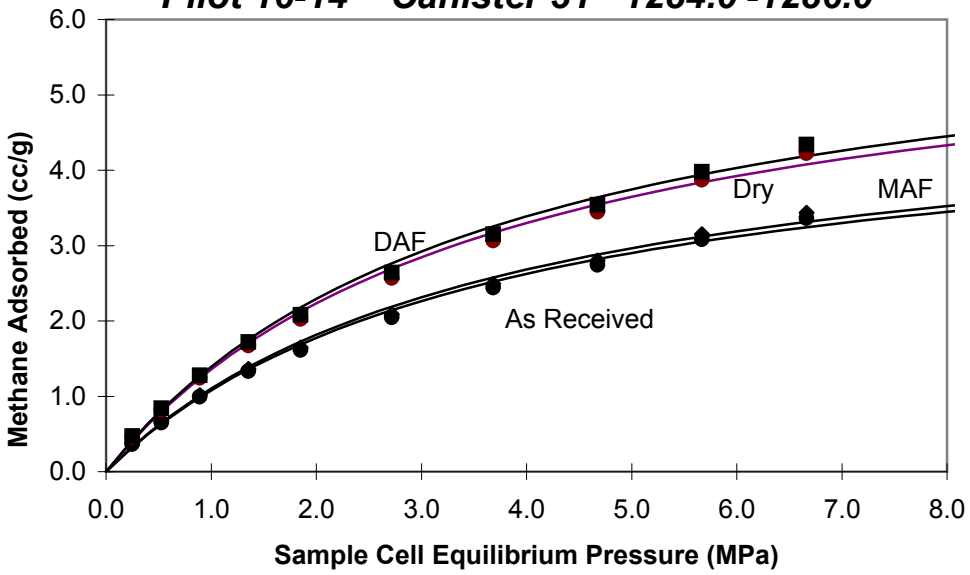
Goodness of fit of Langmuir regression: **0.99**

% Ash= **2.11** **% Moisture=** **20.39**

SUMMARY OF ADSORPTION ANALYSES
IMPERIAL UNITS

MichiWest Energy, Inc

Pilot 16-14 Canister 31 1284.0'-1286.0'



Pressure	Adsorbed Methane (cc/g)			
(MPa)	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
0.25	0.36	0.46	0.37	0.47
0.53	0.65	0.82	0.67	0.84
0.89	0.99	1.25	1.01	1.28
1.36	1.33	1.67	1.36	1.72
1.85	1.61	2.02	1.65	2.08
2.72	2.05	2.57	2.09	2.64
3.68	2.44	3.07	2.49	3.15
4.68	2.74	3.45	2.80	3.54
5.67	3.08	3.87	3.15	3.98
6.66	3.36	4.22	3.44	4.34

Langmuir Parameters

	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
Vol. (cc/g)	5.02	6.31	5.13	6.48
Pressure (MPa)	3.65	3.65	3.65	3.65

Isotherm Temperature: **26.5 ºC**

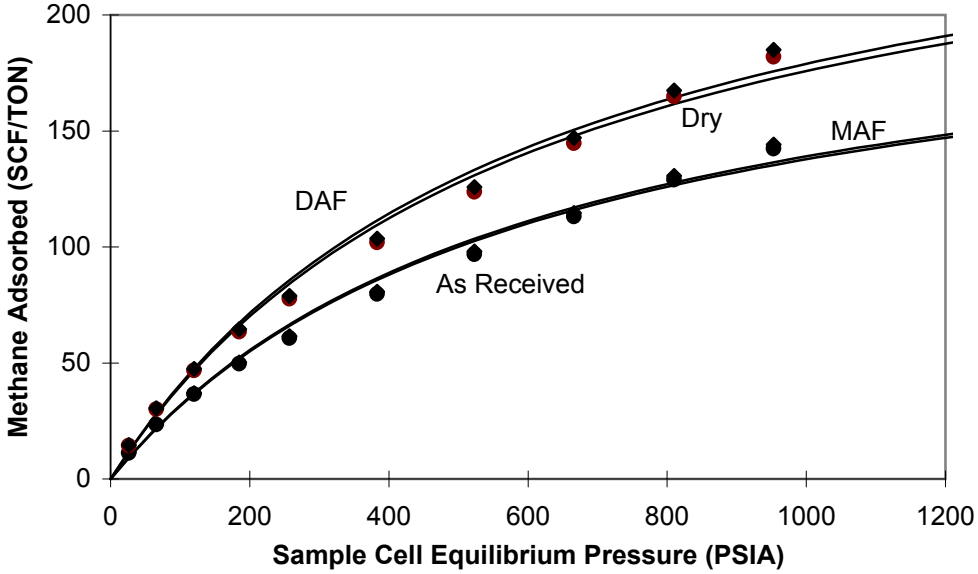
Goodness of fit of Langmuir regression: **0.99**

% Ash= **2.11** **% Moisture =** **20.39**

SUMMARY OF ADSORPTION ANALYSES
INTERNATIONAL SYSTEM UNITS

MichiWest Energy, Inc

Pilot 16-14 Canister 48 1332.0'-1334.0'



Pressure (PSIA)	Adsorbed Methane (ft^3/ton)			
	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
26	11.26	14.40	11.40	14.63
66	23.57	30.13	23.87	30.62
120	36.66	46.87	37.13	47.64
186	49.75	63.61	50.39	64.65
257	60.75	77.67	61.53	78.94
383	79.61	101.77	80.62	103.44
480	96.89	123.87	98.13	125.90
666	113.13	144.63	114.57	146.99
810	128.84	164.71	130.48	167.41
953	142.46	182.12	144.27	185.10

Langmuir Parameters

	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
Vol. (ft^3/ton)	220	282	223	287
Pressure (PSIA)	605	605	605	605

Isotherm Temperature: **80 ºF**

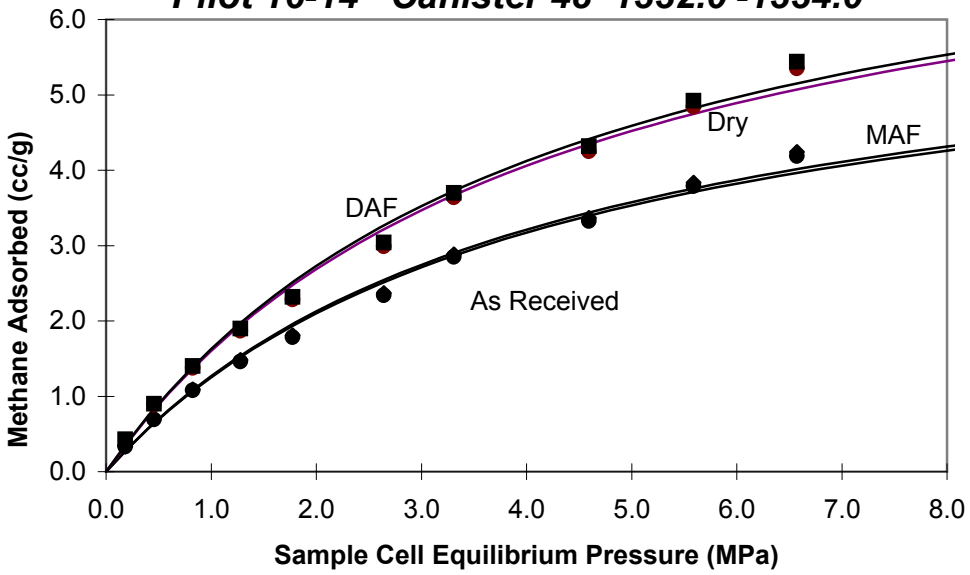
Goodness of fit of Langmuir regression: **0.96**

% Ash= 1.26 **% Moisture= 21.78**

SUMMARY OF ADSORPTION ANALYSES
IMPERIAL UNITS

MichiWest Energy, Inc

Pilot 16-14 Canister 48 1332.0'-1334.0'



Pressure	Adsorbed Methane (cc/g)			
(MPa)	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
0.18	0.33	0.42	0.34	0.43
0.46	0.69	0.89	0.70	0.90
0.83	1.08	1.38	1.09	1.40
1.28	1.46	1.87	1.48	1.90
1.78	1.79	2.28	1.81	2.32
2.64	2.34	2.99	2.37	3.04
3.31	2.85	3.64	2.88	3.70
4.60	3.32	4.25	3.37	4.32
5.59	3.79	4.84	3.83	4.92
6.57	4.19	5.35	4.24	5.44

Langmuir Parameters

	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
Vol. (cc/g)	6.48	8.29	6.56	8.42
Pressure (MPa)	4.17	4.17	4.17	4.17

Isotherm Temperature: **26.5 ºC**

Goodness of fit of Langmuir regression: **0.96**

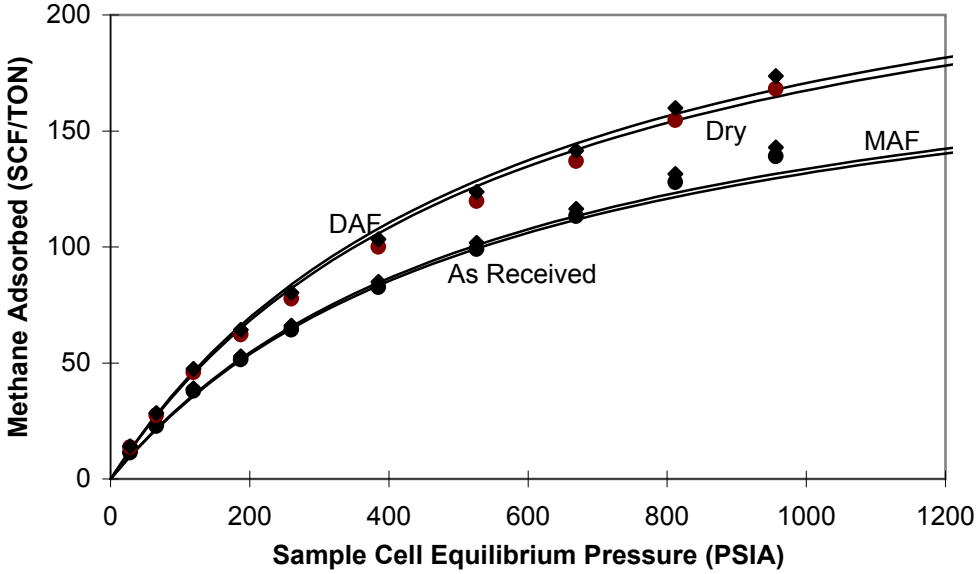
% Ash= 1.26 **% Moisture = 21.78**

SUMMARY OF ADSORPTION ANALYSES

INTERNATIONAL SYSTEM UNITS

MichiWest Energy, Inc

Pilot 16-14 Canister 57 1351.0'-1353.0'



Pressure (PSIA)	Adsorbed Methane (ft^3/ton)			
	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
28	11.17	13.50	11.47	13.95
66	22.88	27.66	23.50	28.58
119	37.86	45.77	38.89	47.30
187	51.47	62.23	52.89	64.31
260	64.27	77.71	66.04	80.30
385	82.79	100.10	85.07	103.44
526	98.86	119.53	101.57	123.52
669	113.30	136.98	116.40	141.55
812	128.00	154.76	131.52	159.92
956	139.17	168.26	142.99	173.88

Langmuir Parameters

	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
Vol. (ft^3/ton)	207	263	210	268
Pressure (PSIA)	571	571	571	571

Isotherm Temperature: **80 ºF**

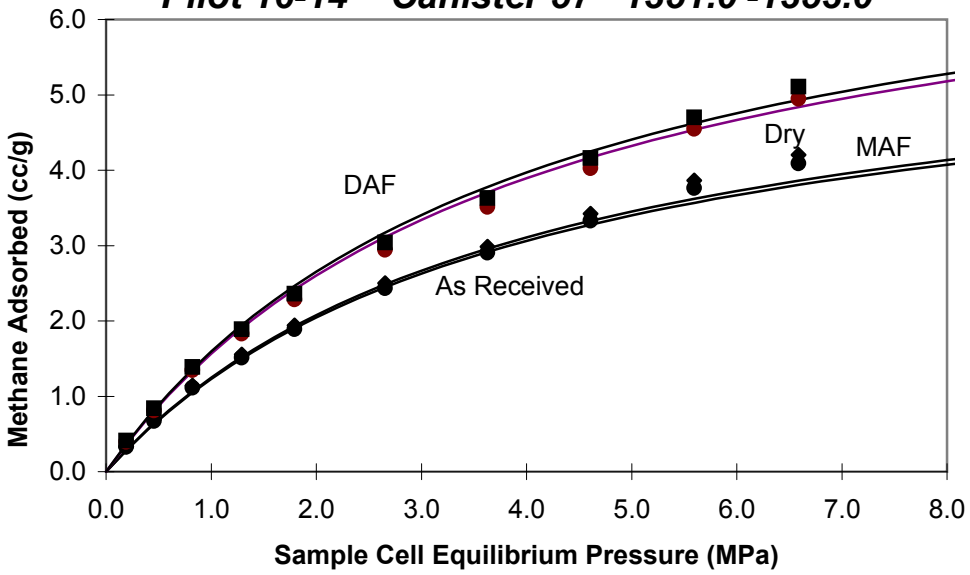
Goodness of fit of Langmuir regression: **0.98**

% Ash= **2.67** **% Moisture=** **17.29**

SUMMARY OF ADSORPTION ANALYSES
IMPERIAL UNITS

MichiWest Energy, Inc

Pilot 16-14 Canister 57 1351.0'-1353.0'



Pressure	Adsorbed Methane (cc/g)			
(MPa)	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
0.19	0.33	0.40	0.34	0.41
0.46	0.67	0.81	0.69	0.84
0.82	1.11	1.35	1.14	1.39
1.29	1.51	1.83	1.55	1.89
1.79	1.89	2.28	1.94	2.36
2.65	2.43	2.94	2.50	3.04
3.63	2.91	3.51	2.99	3.63
4.61	3.33	4.03	3.42	4.16
5.60	3.76	4.55	3.87	4.70
6.59	4.09	4.95	4.20	5.11

Langmuir Parameters

	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
Vol. (cc/g)	6.08	7.73	6.17	7.88
Pressure (MPa)	3.94	3.94	3.94	3.94

Isotherm Temperature: 26.5 ºC

Goodness of fit of Langmuir regression: 0.98

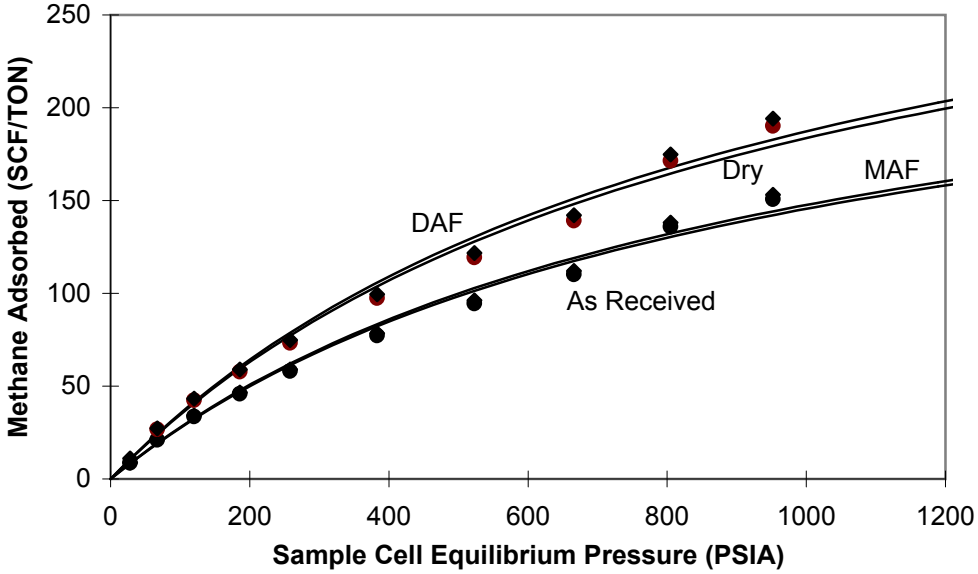
% Ash= 2.67 % Moisture = 17.29

SUMMARY OF ADSORPTION ANALYSES
INTERNATIONAL SYSTEM UNITS

Core Hole 1

MichiWest Energy, Inc

Pilot 16-14 Canister 64 1359.0'-1361.0'



Pressure (PSIA)	Adsorbed Methane (ft^3/ton)			
	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
28	8.72	11.00	8.86	11.23
67	21.13	26.66	21.48	27.22
120	33.55	42.33	34.10	43.21
187	45.70	57.66	46.46	58.87
258	58.12	73.33	59.08	74.86
383	77.14	97.33	78.41	99.36
523	94.58	119.33	96.13	121.81
666	110.16	138.99	111.98	141.89
805	135.79	171.32	138.03	174.90
952	150.58	189.99	153.06	193.95

Langmuir Parameters

	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
Vol. (ft^3/ton)	279	351	283	359
Pressure (PSIA)	918	918	918	918

Isotherm Temperature: **80 ºF**

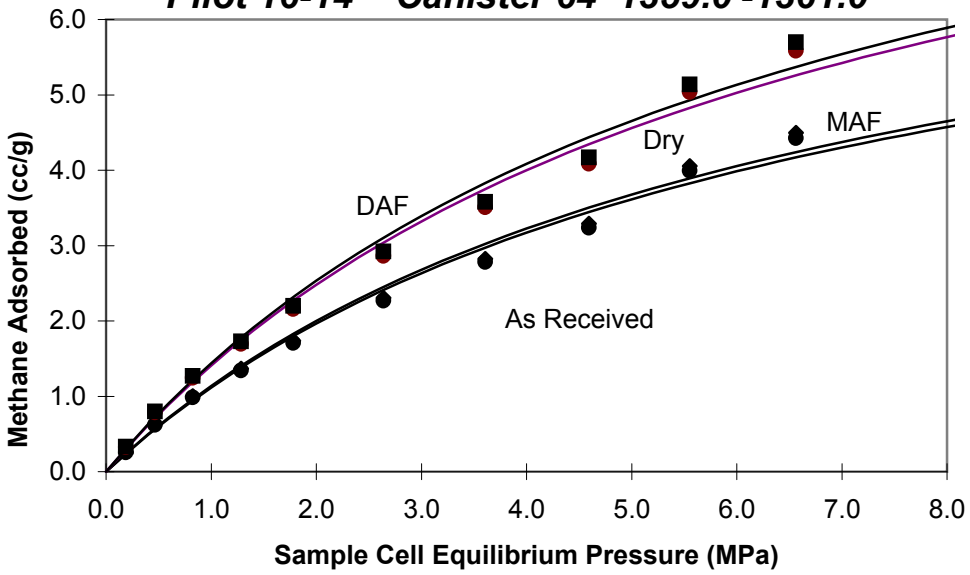
Goodness of fit of Langmuir regression: **0.94**

% Ash= **1.62** **% Moisture=** **20.74**

SUMMARY OF ADSORPTION ANALYSES
IMPERIAL UNITS

MichiWest Energy, Inc

Pilot 16-14 Canister 64 1359.0'-1361.0'



Pressure	Adsorbed Methane (cc/g)			
(MPa)	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
0.19	0.26	0.32	0.26	0.33
0.47	0.62	0.78	0.63	0.80
0.82	0.99	1.24	1.00	1.27
1.29	1.34	1.69	1.37	1.73
1.78	1.71	2.16	1.74	2.20
2.64	2.27	2.86	2.30	2.92
3.61	2.78	3.51	2.83	3.58
4.60	3.24	4.08	3.29	4.17
5.55	3.99	5.03	4.06	5.14
6.56	4.43	5.58	4.50	5.70

Langmuir Parameters

	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
Vol. (cc/g)	8.19	10.33	8.33	10.55
Pressure (MPa)	6.33	6.33	6.33	6.33

Isotherm Temperature: **26.5 ºC**

Goodness of fit of Langmuir regression: **0.94**

% Ash= **1.62** **% Moisture =** **20.74**

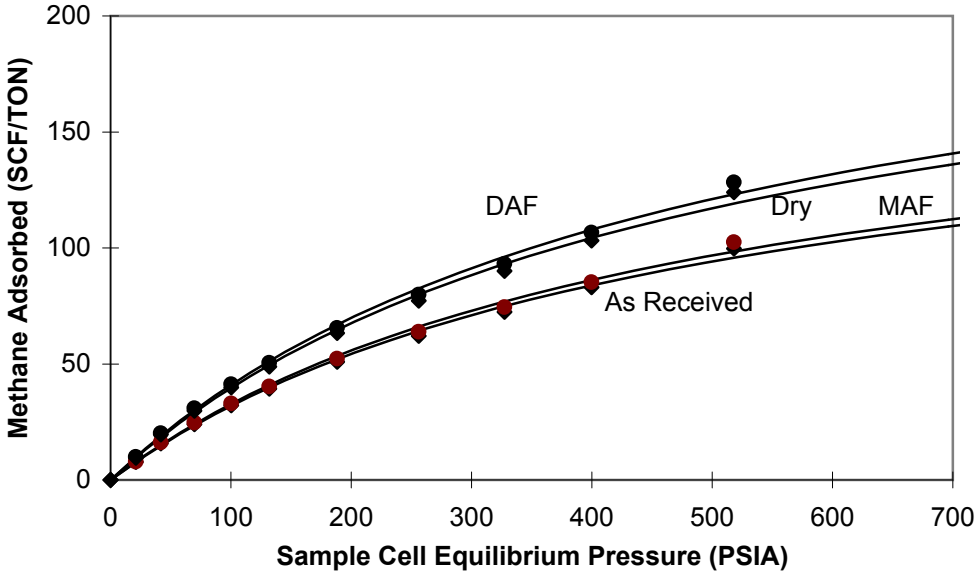
SUMMARY OF ADSORPTION ANALYSES

INTERNATIONAL SYSTEM UNITS

Core Hole 1

MichiWest Energy Inc.

Pilot 16-32 1119.0'-1119.6'



Pressure (PSIA)	Adsorbed Methane (ft^3/ton)			
	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
21	8	10	8	10
42	16	20	16	20
70	24	30	25	31
100	32	40	33	41
132	39	49	40	50
188	51	63	52	65
256	62	77	64	80
328	72	90	74	93
400	83	103	85	107
518	100	124	102	128

Langmuir Parameters

	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
Vol. (ft^3/ton)	184	229	189	237
Pressure (PSIA)	478	478	478	478

Isotherm Temperature: 77 ºF

Goodness of fit of Langmuir regression: 0.98

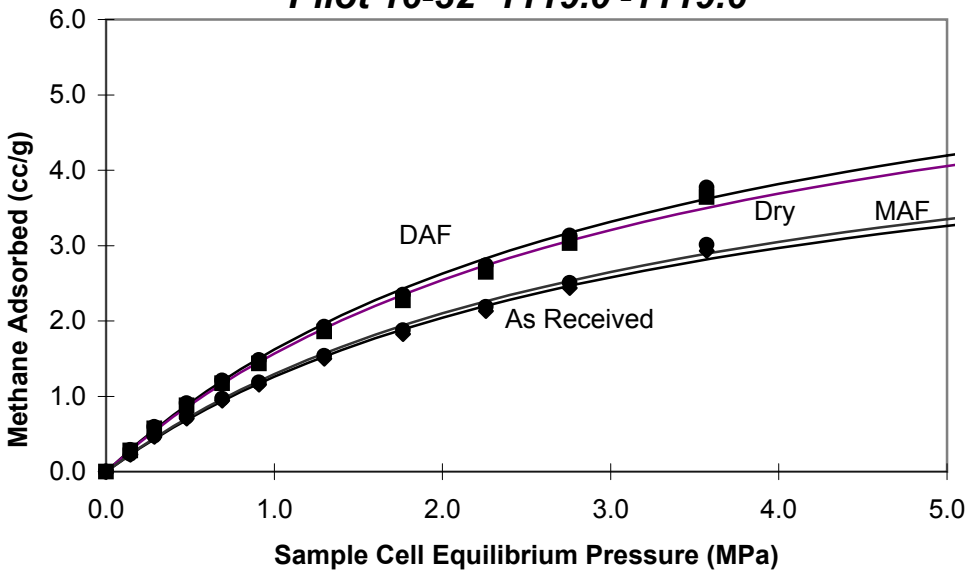
% Ash = 2.64 % Moisture = 19.57

SUMMARY OF ADSORPTION ANALYSES

IMPERIAL UNITS

MichiWest Energy Inc.

Pilot 16-32 1119.0'-1119.6'



Pressure	Adsorbed Methane (cc/g)			
(MPa)	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
0.14	0.23	0.28	0.23	0.29
0.29	0.46	0.57	0.47	0.59
0.48	0.71	0.88	0.72	0.91
0.69	0.94	1.17	0.97	1.21
0.91	1.15	1.43	1.18	1.48
1.30	1.50	1.86	1.54	1.92
1.76	1.83	2.27	1.88	2.35
2.26	2.13	2.65	2.19	2.74
2.76	2.44	3.03	2.51	3.14
3.57	2.93	3.65	3.01	3.77

Langmuir Parameters

	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
Vol. (cc/g)	5.41	6.73	5.56	6.96
Pressure (MPa)	3.30	3.30	3.30	3.30

Isotherm Temperature: 25.0 ºC

Goodness of fit of Langmuir regression: 0.98

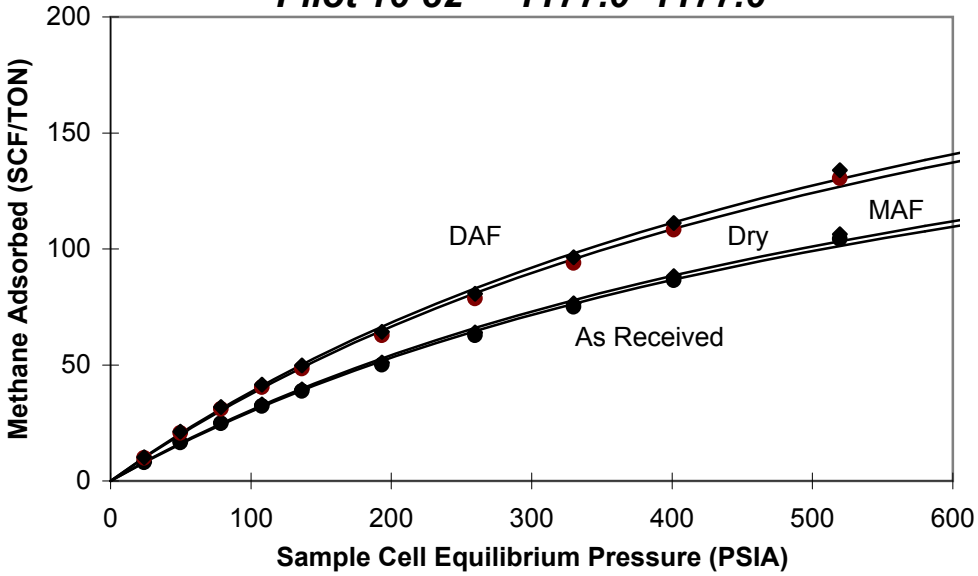
% Ash= 2.64 % Moisture = 19.57

SUMMARY OF ADSORPTION ANALYSES
INTERNATIONAL SYSTEM UNITS

Core Hole 2

MichiWest Energy, Inc.

Pilot 16-32 1177.0'-1177.6'



Pressure (PSIA)	Adsorbed Methane (ft^3/ton)			
	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
24	7.93	9.94	8.10	10.20
50	16.50	20.67	16.84	21.21
79	24.78	31.04	25.29	31.85
108	32.29	40.45	32.95	41.50
136	38.70	48.47	39.50	49.73
193	50.05	62.70	51.08	64.33
260	62.74	78.59	64.03	80.63
330	74.99	93.93	76.53	96.37
401	86.48	108.33	88.26	111.14
519	104.21	130.54	106.36	133.93

Langmuir Parameters

	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
Vol. (ft^3/ton)	234	293	239	301
Pressure (PSIA)	681	681	681	681

Isotherm Temperature: 77 ºF

Goodness of fit of Langmuir regression: 0.98

% Ash= 2.02 % Moisture= 20.17

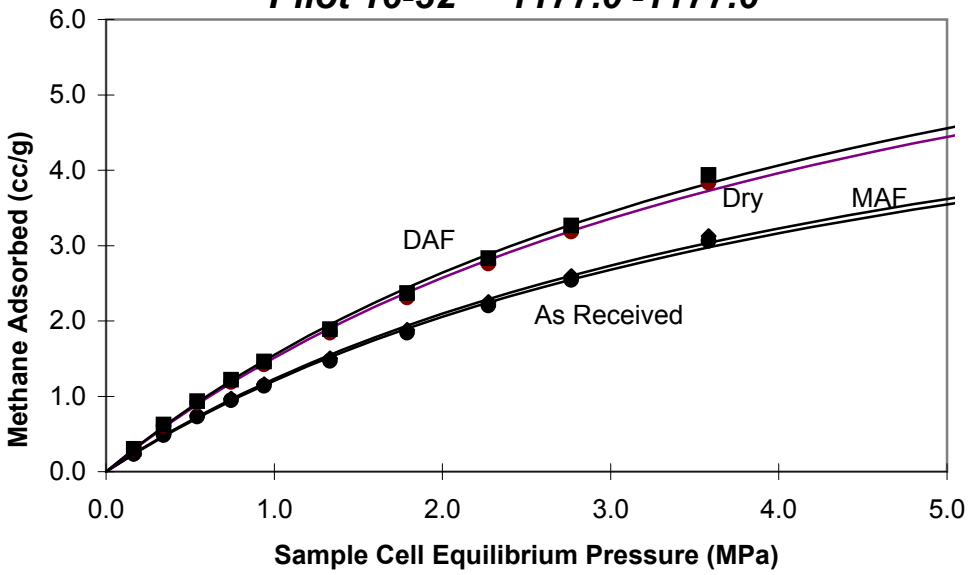
SUMMARY OF ADSORPTION ANALYSES

IMPERIAL UNITS

Core Hole 2

MichiWest Energy, Inc.

Pilot 16-32 1177.0'-1177.6'



Pressure	Adsorbed Methane (cc/g)			
(MPa)	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
0.16	0.23	0.29	0.24	0.30
0.34	0.49	0.61	0.50	0.62
0.54	0.73	0.91	0.74	0.94
0.74	0.95	1.19	0.97	1.22
0.94	1.14	1.42	1.16	1.46
1.33	1.47	1.84	1.50	1.89
1.79	1.84	2.31	1.88	2.37
2.27	2.20	2.76	2.25	2.83
2.77	2.54	3.18	2.59	3.27
3.58	3.06	3.84	3.13	3.94

Langmuir Parameters

	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
Vol. (cc/g)	6.88	8.62	7.02	8.84
Pressure (MPa)	4.70	4.70	4.70	4.70

Isotherm Temperature: 25.0 ºC

Goodness of fit of Langmuir regression: 0.98

% Ash= 2.02 % Moisture = 20.17

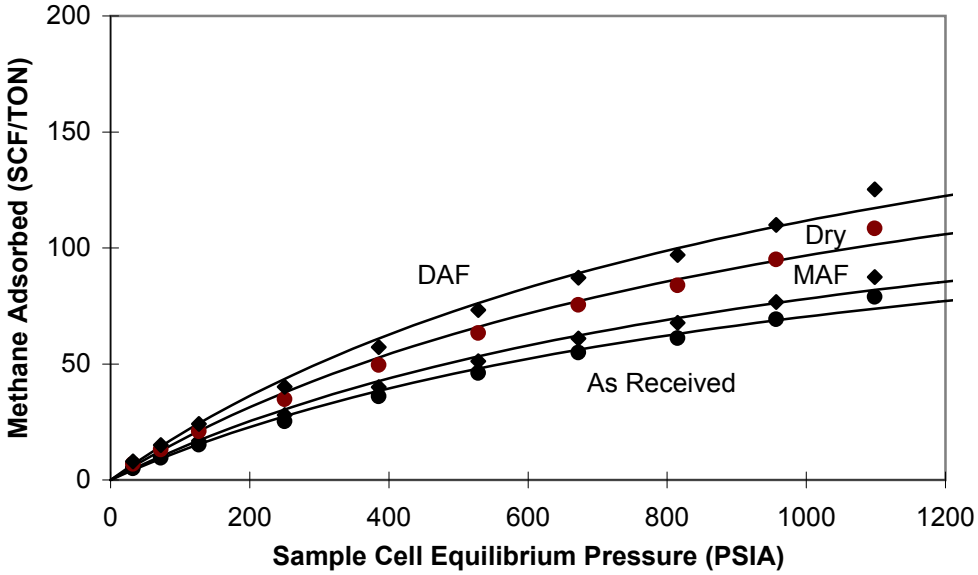
SUMMARY OF ADSORPTION ANALYSES

INTERNATIONAL SYSTEM UNITS

Core Hole 2

Ocean Energy Inc.

Schlautmann 9-10-45-74W 1194.0'



Pressure (PSIA)	Adsorbed Methane (ft^3/ton)			
	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
32	5	7	6	8
72	10	13	11	15
127	15	21	17	24
250	25	35	28	40
385	36	49	40	57
528	46	63	51	73
673	55	75	61	87
815	61	84	68	97
957	69	95	77	110
1098	79	108	87	125

Langmuir Parameters

	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
Vol. (ft^3/ton)	147	202	163	234
Pressure (PSIA)	1092	1092	1092	1092

Isotherm Temperature: 80 ºF

Goodness of fit of Langmuir regression: 0.94

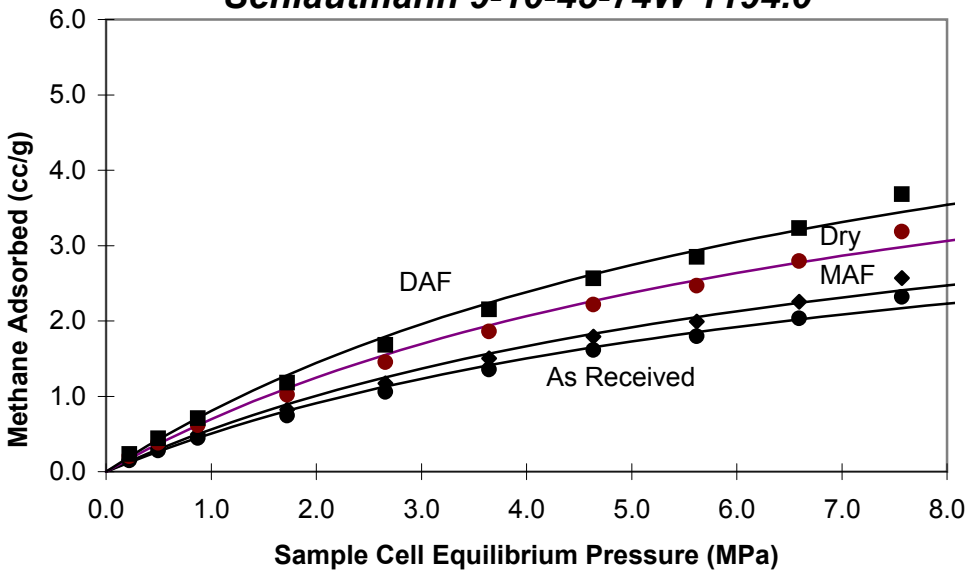
% Ash= 9.80 % Moisture= 27.20

SUMMARY OF ADSORPTION ANALYSES

IMPERIAL UNITS

Ocean Energy Inc.

Schlautmann 9-10-45-74W 1194.0'



Pressure (MPa)	Adsorbed Methane (cc/g) As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
0.22	0.15	0.20	0.16	0.23
0.50	0.28	0.38	0.31	0.44
0.87	0.45	0.62	0.50	0.71
1.72	0.74	1.02	0.82	1.18
2.66	1.06	1.45	1.17	1.68
3.64	1.36	1.86	1.50	2.15
4.64	1.61	2.22	1.79	2.56
5.62	1.79	2.46	1.99	2.85
6.59	2.03	2.79	2.26	3.23
7.57	2.32	3.19	2.57	3.68

Langmuir Parameters

	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
Vol. (cc/g)	4.33	5.95	4.80	6.87
Pressure (MPa)	7.53	7.53	7.53	7.53

Isotherm Temperature: **26.5 ºC**

Goodness of fit of Langmuir regression: **0.94**

% Ash= 9.80 **% Moisture = 27.20**

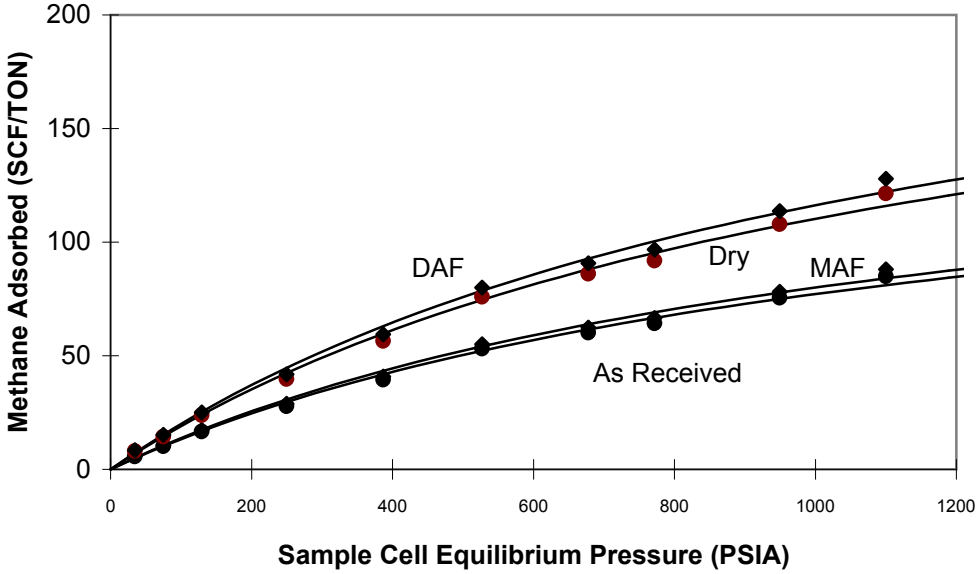
SUMMARY OF ADSORPTION ANALYSES

INTERNATIONAL SYSTEM UNITS

Core Hole 3

Pennaco Energy, Inc.

Sorenson 2-33-54-74W 829.0'



Pressure (PSIA)	Adsorbed Methane (ft^3/ton)			
	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
34	5.66	8.09	5.86	8.52
75	10.09	14.42	10.46	15.20
129	16.66	23.82	17.28	25.10
250	27.81	39.76	28.83	41.89
387	39.46	56.42	40.91	59.44
527	53.11	75.94	55.07	80.01
678	60.19	86.06	62.41	90.68
772	64.21	91.81	66.58	96.73
949	75.43	107.85	78.21	113.63
1100	84.93	121.43	88.07	127.95

Langmuir Parameters

	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
Vol. (ft^3/ton)	165	236	171	249
Pressure (PSIA)	1142	1142	1142	1142

Isotherm Temperature: 76 ºF

Goodness of fit of Langmuir regression: 0.95

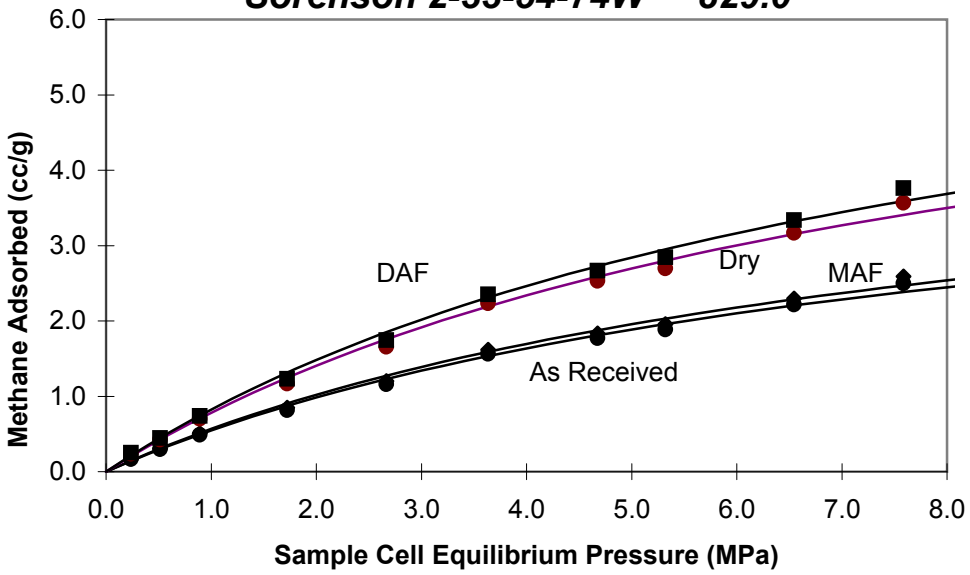
% Ash= 3.56 % Moisture= 30.06

SUMMARY OF ADSORPTION ANALYSES

IMPERIAL UNITS

Pennaco Energy, Inc.

Sorenson 2-33-54-74W 829.0'



Pressure	Adsorbed Methane (cc/g)			
(MPa)	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
0.24	0.17	0.24	0.17	0.25
0.52	0.30	0.42	0.31	0.45
0.89	0.49	0.70	0.51	0.74
1.72	0.82	1.17	0.85	1.23
2.67	1.16	1.66	1.20	1.75
3.64	1.56	2.23	1.62	2.35
4.68	1.77	2.53	1.83	2.66
5.32	1.89	2.70	1.96	2.84
6.55	2.22	3.17	2.30	3.34
7.58	2.50	3.57	2.59	3.76

Langmuir Parameters

	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
Vol. (cc/g)	4.86	6.95	5.04	7.32
Pressure (MPa)	7.88	7.88	7.88	7.88

Isotherm Temperature: **24.4 ºC**

Goodness of fit of Langmuir regression: **0.95**

% Ash= 3.56 **% Moisture = 30.06**

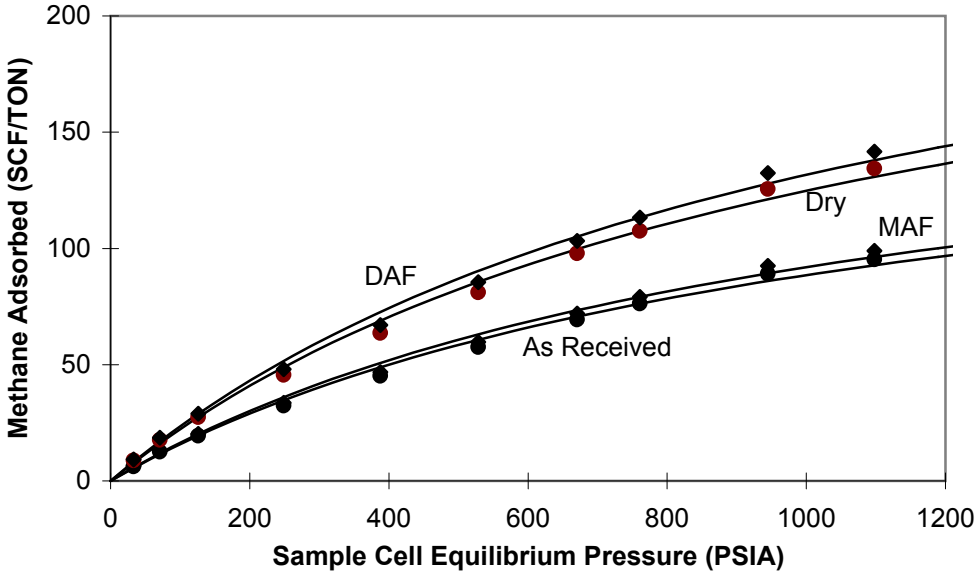
SUMMARY OF ADSORPTION ANALYSES

INTERNATIONAL SYSTEM UNITS

Core Hole 4

Pennaco Energy, Inc.

Sorenson 2-33-54-74W 1155.0'



Pressure (PSIA)	Adsorbed Methane (ft^3/ton)			
	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
33	6.22	8.76	6.45	9.24
71	12.47	17.58	12.95	18.54
126	19.42	27.39	20.17	28.89
249	32.33	45.59	33.57	48.09
388	45.09	63.57	46.82	67.06
528	57.50	81.07	59.71	85.52
670	69.39	97.83	72.05	103.20
761	76.21	107.45	79.13	113.34
945	89.03	125.52	92.44	132.40
1098	95.27	134.32	98.92	141.69

Langmuir Parameters

	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
Vol. (ft^3/ton)	182	257	189	271
Pressure (PSIA)	1056	1056	1056	1056

Isotherm Temperature: 82 ºF

Goodness of fit of Langmuir regression: 0.95

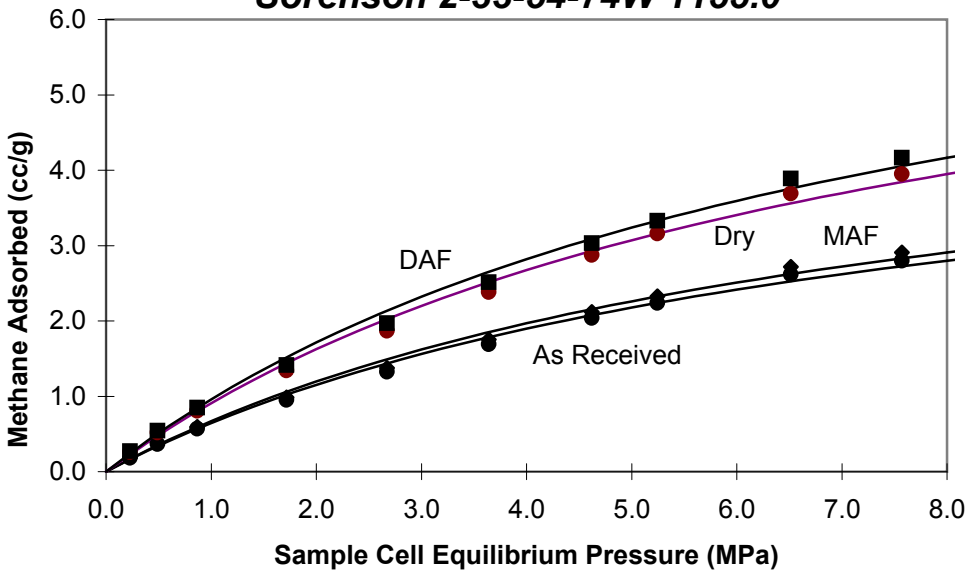
% Ash= 3.69 % Moisture= 29.07

SUMMARY OF ADSORPTION ANALYSES

IMPERIAL UNITS

Pennaco Energy, Inc.

Sorenson 2-33-54-74W 1155.0'



Pressure	Adsorbed Methane (cc/g)			
(MPa)	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
0.23	0.18	0.26	0.19	0.27
0.49	0.37	0.52	0.38	0.55
0.87	0.57	0.80	0.59	0.85
1.72	0.95	1.34	0.99	1.41
2.67	1.33	1.87	1.38	1.97
3.64	1.69	2.38	1.75	2.51
4.62	2.04	2.88	2.12	3.03
5.25	2.24	3.16	2.33	3.33
6.51	2.62	3.69	2.72	3.89
7.57	2.80	3.95	2.91	4.16

Langmuir Parameters

	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
Vol. (cc/g)	5.35	7.54	5.55	7.95
Pressure (MPa)	7.28	7.28	7.28	7.28

Isotherm Temperature: **28.0 ºC**

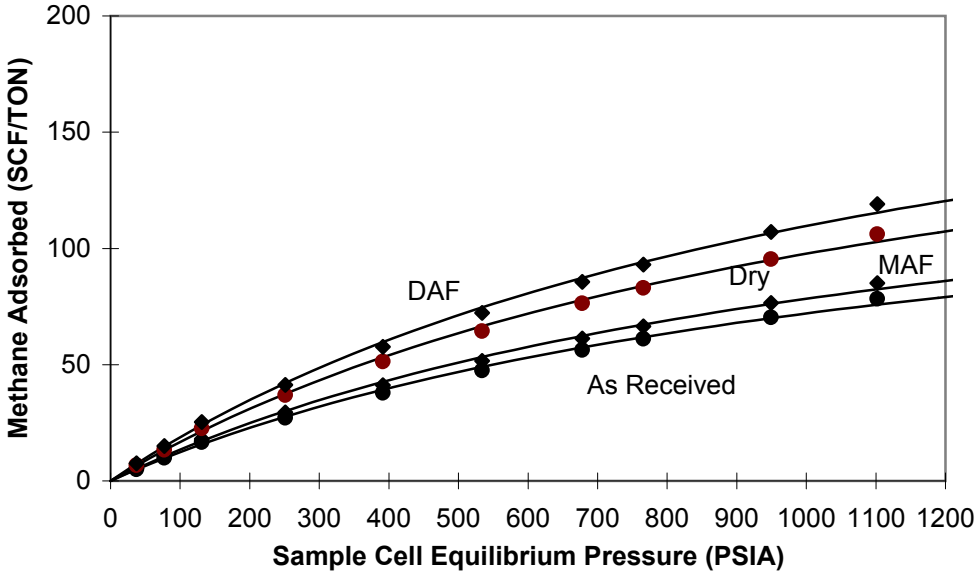
Goodness of fit of Langmuir regression: **0.95**

% Ash= 3.69 **% Moisture = 29.07**

SUMMARY OF ADSORPTION ANALYSES
INTERNATIONAL SYSTEM UNITS

Pennaco Energy, Inc.

Sorenson 2-33-54-74W 1166.8'



Pressure (PSIA)	Adsorbed Methane (ft^3/ton)			
	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
37	4.97	6.74	5.40	7.56
77	9.86	13.37	10.72	15.00
131	16.63	22.56	18.08	25.31
251	27.14	36.82	29.51	41.31
391	37.88	51.39	41.18	57.65
534	47.45	64.36	51.58	72.20
678	56.29	76.36	61.20	85.67
766	61.15	82.95	66.47	93.06
949	70.36	95.45	76.49	107.08
1102	78.27	106.17	85.09	119.12

Langmuir Parameters

	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
Vol. (ft^3/ton)	156	212	170	237
Pressure (PSIA)	1056	1056	1056	1056

Isotherm Temperature: **82 ºF**

Goodness of fit of Langmuir regression: **0.98**

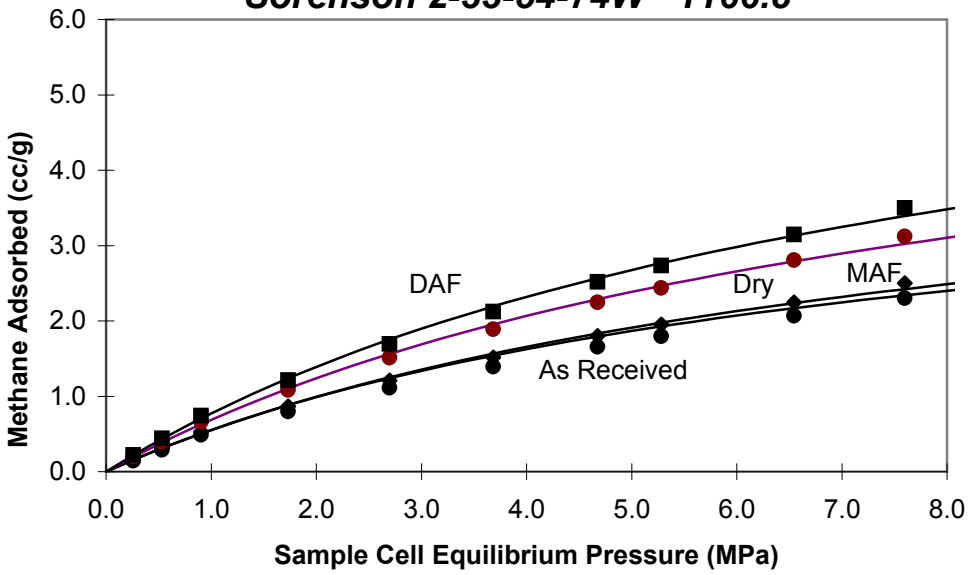
% Ash= 8.01 **% Moisture= 26.28**

SUMMARY OF ADSORPTION ANALYSES

IMPERIAL UNITS

Pennaco Energy, Inc.

Sorenson 2-33-54-74W 1166.8'



Pressure	Adsorbed Methane (cc/g)			
(MPa)	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
0.26	0.15	0.20	0.16	0.22
0.53	0.29	0.39	0.31	0.44
0.90	0.49	0.66	0.53	0.74
1.73	0.80	1.08	0.87	1.21
2.70	1.11	1.51	1.21	1.69
3.68	1.39	1.89	1.52	2.12
4.67	1.65	2.24	1.80	2.52
5.28	1.80	2.44	1.95	2.73
6.55	2.07	2.81	2.25	3.15
7.60	2.30	3.12	2.50	3.50

Langmuir Parameters

	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
Vol. (cc/g)	4.58	6.22	4.98	6.98
Pressure (MPa)	7.28	7.28	7.28	7.28

Isotherm Temperature: **28.0 ºC**

Goodness of fit of Langmuir regression: **0.98**

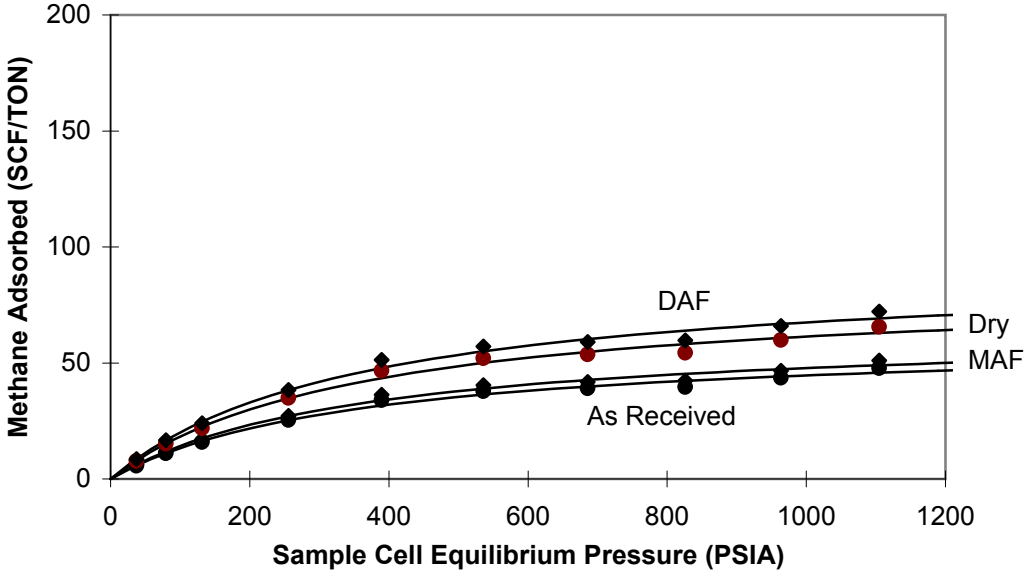
% Ash= 8.01 **% Moisture = 26.28**

SUMMARY OF ADSORPTION ANALYSES

INTERNATIONAL SYSTEM UNITS

Barrett Resources Corporation

Haas 32-31 1079.0'-1080.0'



Pressure (PSIA)	Adsorbed Methane (ft^3/ton)			
	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
37	5.66	7.77	6.06	8.55
80	11.07	15.22	11.85	16.74
131	15.88	21.83	17.01	24.02
256	25.36	34.86	27.16	38.35
389	33.91	46.62	36.31	51.28
536	37.79	51.96	40.47	57.15
686	39.08	53.72	41.84	59.09
826	39.52	54.33	42.32	59.76
964	43.59	59.93	46.68	65.92
1105	47.66	65.52	51.03	72.07

Langmuir Parameters

	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
Vol. (ft^3/ton)	60	83	65	91
Pressure (PSIA)	356	356	356	356

Isotherm Temperature: 62 ºF

Goodness of fit of Langmuir regression: 0.99

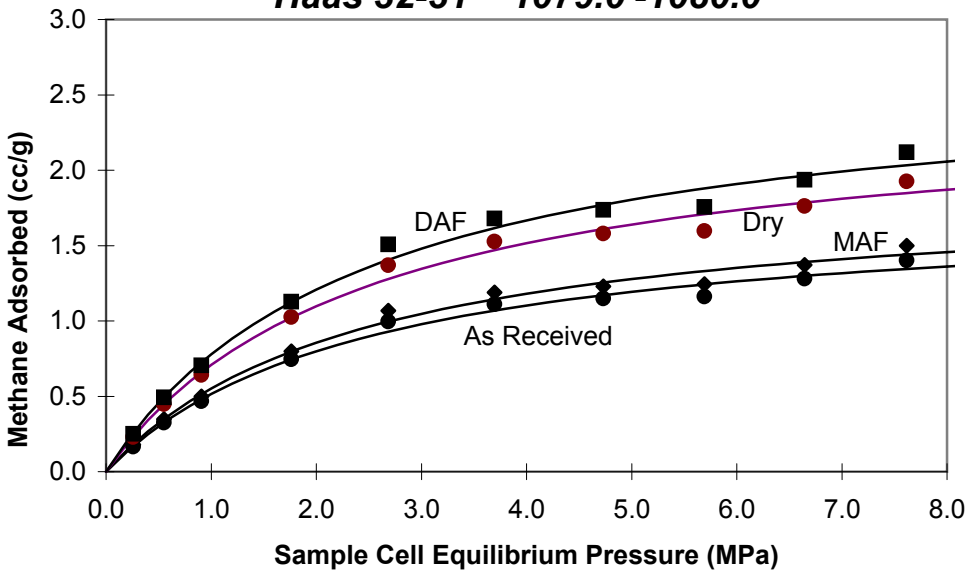
% Ash= 6.61 % Moisture= 27.26

SUMMARY OF ADSORPTION ANALYSES

IMPERIAL UNITS

Barrett Resources Corporation

Haas 32-31 1079.0'-1080.0'



Pressure	Adsorbed Methane (cc/g)			
(MPa)	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
0.26	0.17	0.23	0.18	0.25
0.55	0.33	0.45	0.35	0.49
0.91	0.47	0.64	0.50	0.71
1.76	0.75	1.02	0.80	1.13
2.69	1.00	1.37	1.07	1.51
3.69	1.11	1.53	1.19	1.68
4.73	1.15	1.58	1.23	1.74
5.69	1.16	1.60	1.24	1.76
6.64	1.28	1.76	1.37	1.94
7.62	1.40	1.93	1.50	2.12

Langmuir Parameters

	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
Vol. (cc/g)	1.78	2.44	1.90	2.69
Pressure (MPa)	2.45	2.45	2.45	2.45

Isotherm Temperature: **16.5 ºC**

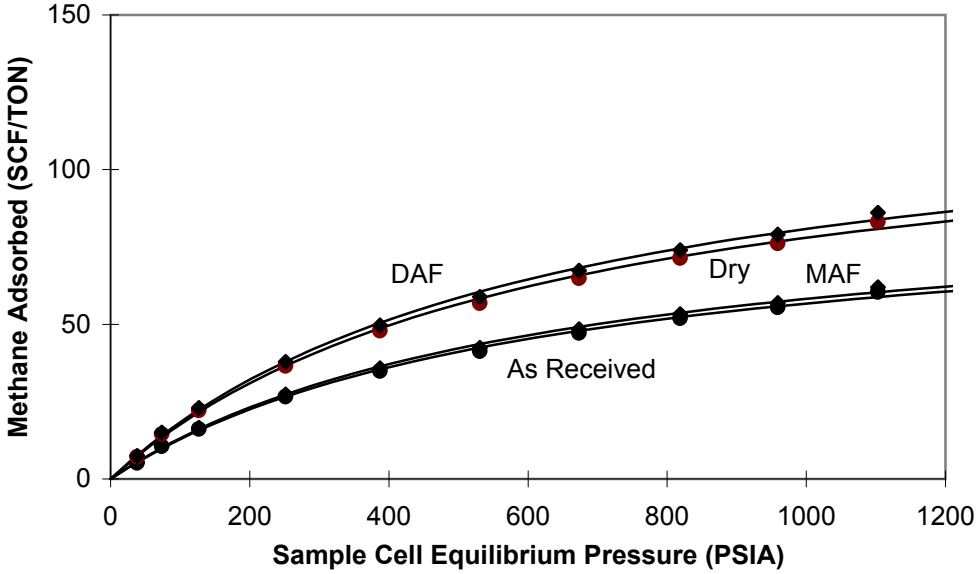
Goodness of fit of Langmuir regression: **0.99**

% Ash= 6.61 **% Moisture = 27.26**

SUMMARY OF ADSORPTION ANALYSES
INTERNATIONAL SYSTEM UNITS

Barrett Resources Corporation

Haas 32-31 1401.0'-1402.0'



Pressure (PSIA)	Adsorbed Methane (ft^3/ton)			
	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
38	5.19	7.14	5.33	7.40
74	10.55	14.50	10.83	15.04
127	16.10	22.13	16.52	22.94
252	26.57	36.53	27.28	37.88
387	34.85	47.91	35.78	49.68
531	41.31	56.79	42.41	58.88
673	47.21	64.90	48.46	67.30
819	51.92	71.37	53.30	74.01
959	55.41	76.18	56.88	78.99
1103	60.40	83.03	62.00	86.10

Langmuir Parameters

	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
Vol. (ft^3/ton)	92	126	94	130
Pressure (PSIA)	613	613	613	613

Isotherm Temperature: 77 ºF

Goodness of fit of Langmuir regression: 0.99

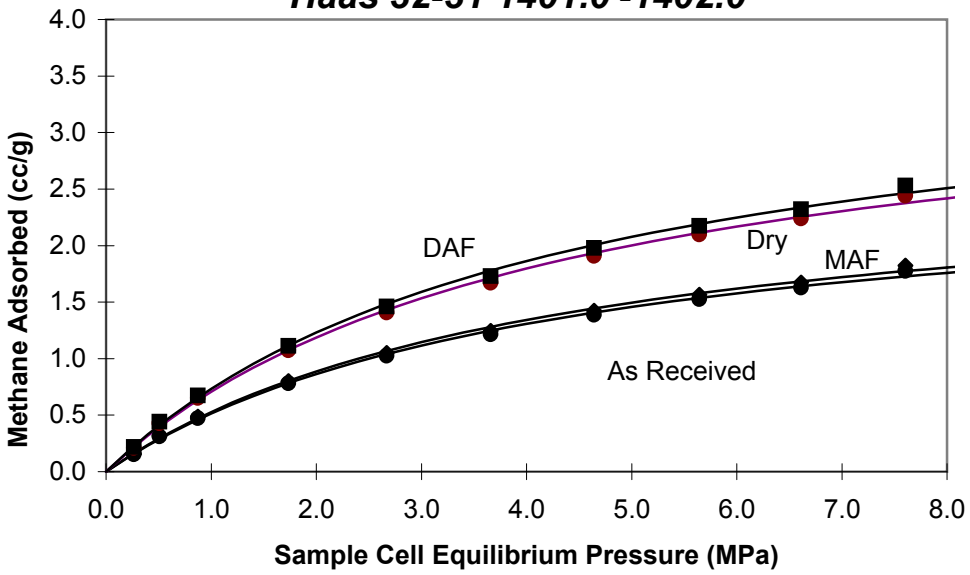
% Ash= 2.59 % Moisture= 27.26

SUMMARY OF ADSORPTION ANALYSES

IMPERIAL UNITS

Barrett Resources Corporation

Haas 32-31 1401.0'-1402.0'



Pressure	Adsorbed Methane (cc/g)			
(MPa)	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
0.26	0.15	0.21	0.16	0.22
0.51	0.31	0.43	0.32	0.44
0.87	0.47	0.65	0.49	0.67
1.74	0.78	1.07	0.80	1.11
2.67	1.02	1.41	1.05	1.46
3.66	1.21	1.67	1.25	1.73
4.64	1.39	1.91	1.42	1.98
5.64	1.53	2.10	1.57	2.17
6.61	1.63	2.24	1.67	2.32
7.60	1.78	2.44	1.82	2.53

Langmuir Parameters

	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
Vol. (cc/g)	2.68911	3.70	2.76	3.83
Pressure (MPa)	4.23	4.23	4.23	4.23

Isotherm Temperature: **16.5 ºC**

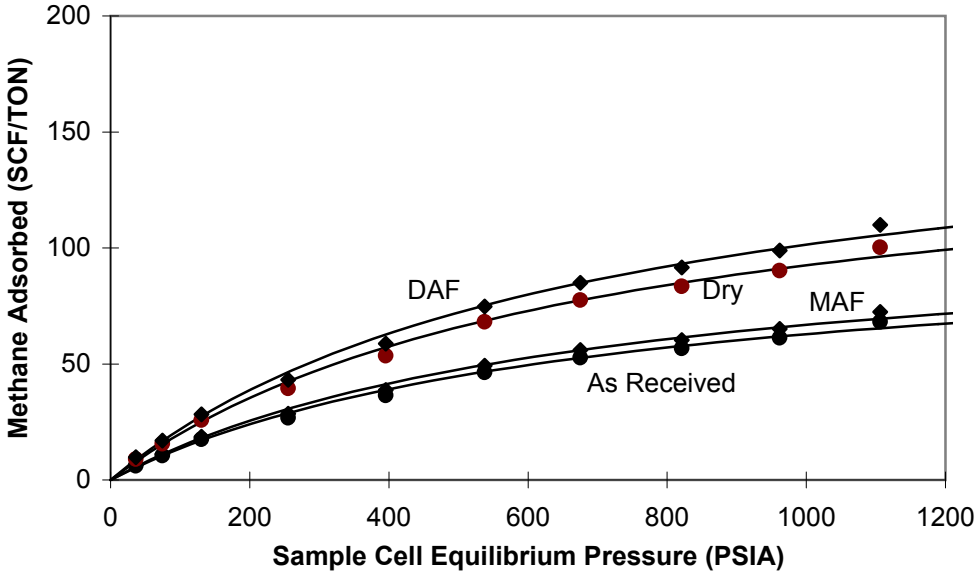
Goodness of fit of Langmuir regression: **0.99**

% Ash= 2.59 **% Moisture = 27.26**

SUMMARY OF ADSORPTION ANALYSES

INTERNATIONAL SYSTEM UNITS

CMS Oil and Gas Company
West 16-19W 662.0'-663.0'



Pressure (PSIA)	Adsorbed Methane (ft^3/ton)			
	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
36	6.11	8.99	6.50	9.86
74	10.55	15.53	11.22	17.02
131	17.49	25.74	18.60	28.22
255	26.79	39.43	28.49	43.22
395	36.40	53.56	38.70	58.71
537	46.30	68.14	49.24	74.69
675	52.69	77.54	56.03	85.00
821	56.74	83.50	60.34	91.53
962	61.28	90.19	65.17	98.86
1106	68.16	100.31	72.48	109.95

Langmuir Parameters

	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
Vol. (ft^3/ton)	106	155	112	170
Pressure (PSIA)	679	679	679	679

Isotherm Temperature: **61 ºF**

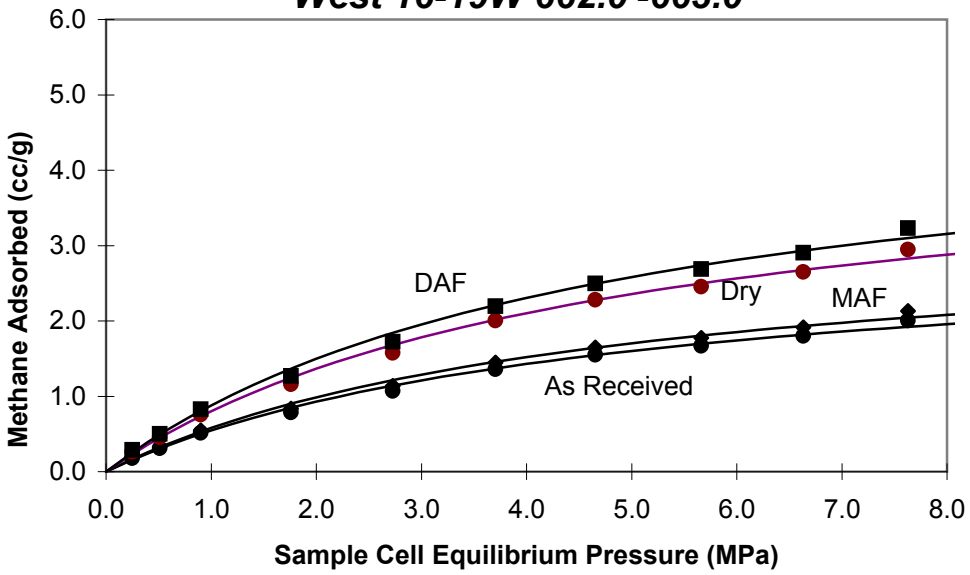
Goodness of fit of Langmuir regression: **0.98**

% Ash= 5.96 **% Moisture= 32.05**

SUMMARY OF ADSORPTION ANALYSES
IMPERIAL UNITS

CMS Oil and Gas Company

West 16-19W 662.0'-663.0'



Pressure	Adsorbed Methane (cc/g)			
(MPa)	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
0.25	0.18	0.26	0.19	0.29
0.51	0.31	0.46	0.33	0.50
0.90	0.51	0.76	0.55	0.83
1.76	0.79	1.16	0.84	1.27
2.73	1.07	1.57	1.14	1.73
3.71	1.36	2.00	1.45	2.20
4.66	1.55	2.28	1.65	2.50
5.66	1.67	2.45	1.77	2.69
6.63	1.80	2.65	1.92	2.91
7.63	2.00	2.95	2.13	3.23

Langmuir Parameters

	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
Vol. (cc/g)	3.10	4.57	3.30	5.00
Pressure (MPa)	4.68	4.68	4.68	4.68

Isotherm Temperature: **16.0 ºC**

Goodness of fit of Langmuir regression: **0.98**

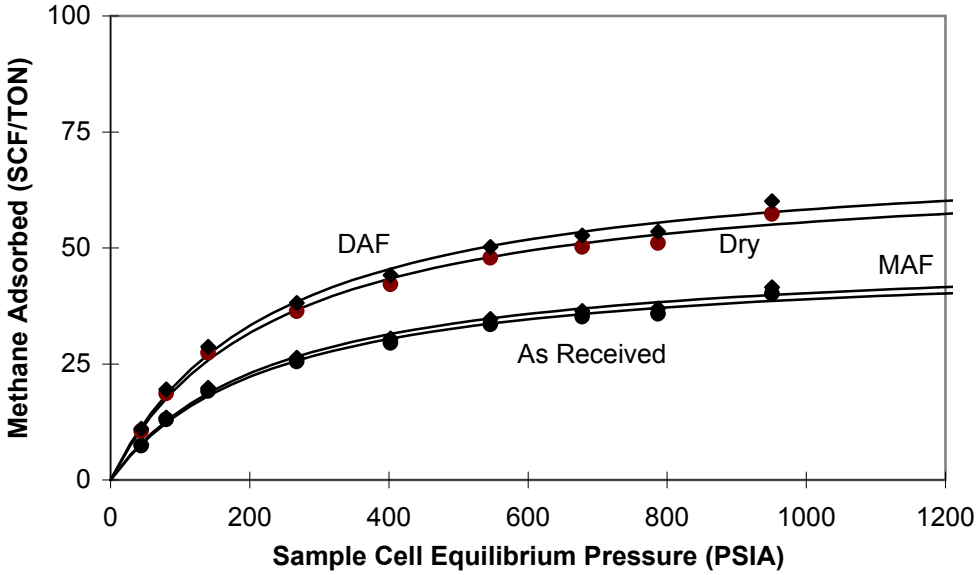
% Ash= 5.96 **% Moisture = 32.05**

SUMMARY OF ADSORPTION ANALYSES
INTERNATIONAL SYSTEM UNITS

Core Hole 6

CMS Oil and Gas Company

West 6-19W 950.0'-952.0'



Pressure (PSIA)	Adsorbed Methane (ft^3/ton)			
	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
44	7.39	10.55	7.64	11.06
80	13.03	18.59	13.47	19.50
140	19.19	27.38	19.84	28.72
268	25.49	36.36	26.35	38.14
402	29.52	42.11	30.51	44.17
546	33.54	47.85	34.67	50.18
678	35.20	50.22	36.38	52.67
787	35.78	51.04	36.98	53.53
951	40.16	57.29	41.51	60.09

Langmuir Parameters

	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
Vol. (ft^3/ton)	48	68	50	72
Pressure (PSIA)	232	232	232	232

Isotherm Temperature: **65 ºF**

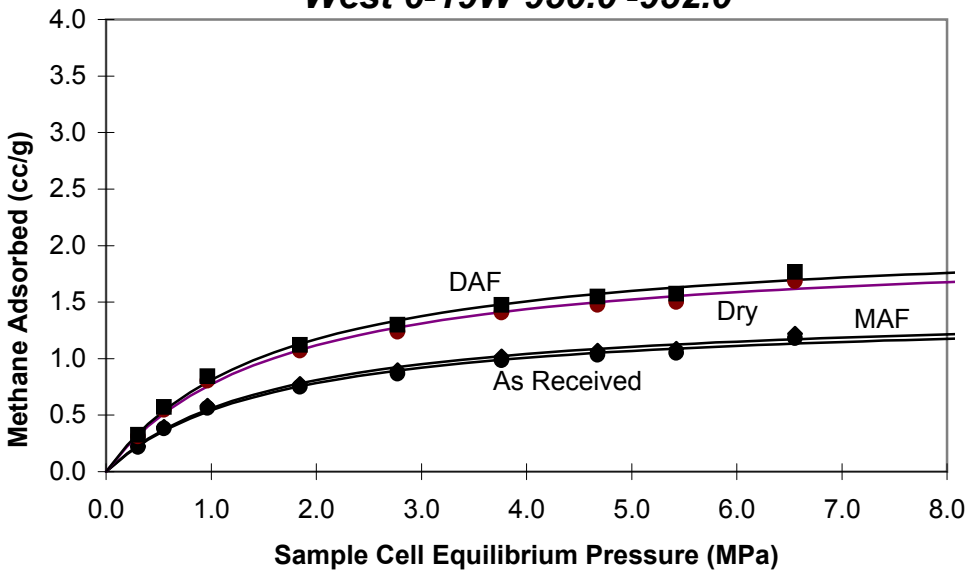
Goodness of fit of Langmuir regression: **0.99**

% Ash= 3.26 **% Moisture= 29.91**

SUMMARY OF ADSORPTION ANALYSES
IMPERIAL UNITS

CMS Oil and Gas Company

West 6-19W 950.0'-952.0'



Pressure	Adsorbed Methane (cc/g)			
(MPa)	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
0.30	0.22	0.31	0.22	0.33
0.55	0.38	0.55	0.40	0.57
0.97	0.56	0.80	0.58	0.84
1.85	0.75	1.07	0.77	1.12
2.77	0.87	1.24	0.90	1.30
3.76	0.99	1.41	1.02	1.47
4.67	1.03	1.48	1.07	1.55
5.42	1.05	1.50	1.09	1.57
6.55	1.18	1.68	1.22	1.77

Langmuir Parameters

	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
Vol. (cc/g)	1.41	2.01	1.46	2.11
Pressure (MPa)	1.60	1.60	1.60	1.60

Isotherm Temperature: **18.5 ºC**

Goodness of fit of Langmuir regression: **0.99**

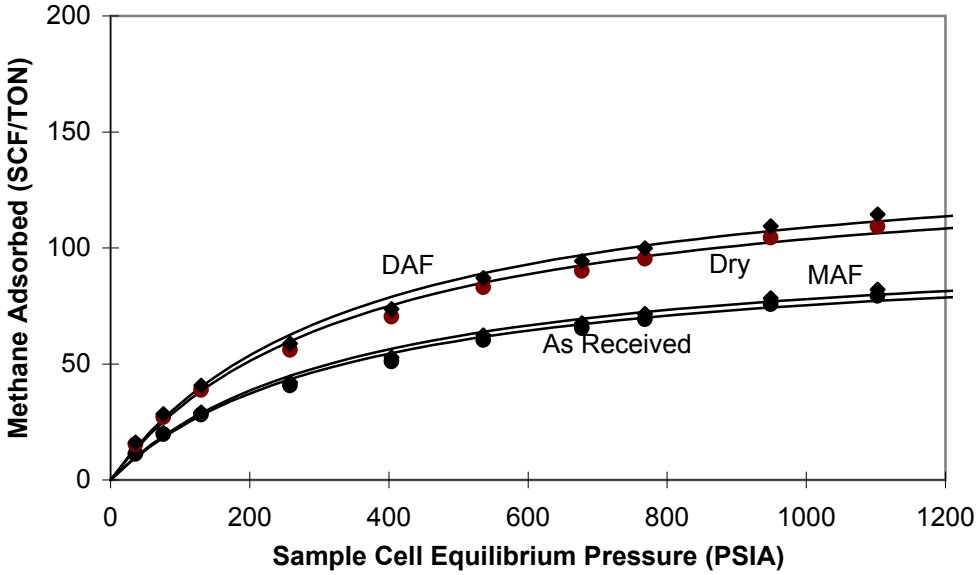
% Ash= 3.26 **% Moisture = 29.91**

SUMMARY OF ADSORPTION ANALYSES
INTERNATIONAL SYSTEM UNITS

Core Hole 6

CMS Oil and Gas Company

West 16-19W 1069.0'-1070.0'



Pressure (PSIA)	Adsorbed Methane (ft^3/ton)			
	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
36	11.17	15.38	11.55	16.12
76	19.66	27.08	20.34	28.39
130	28.14	38.75	29.11	40.63
258	40.69	56.04	42.10	58.75
404	51.05	70.32	52.82	73.72
536	60.28	83.03	62.37	87.05
677	65.38	90.05	67.64	94.41
768	69.20	95.32	71.60	99.93
949	75.76	104.35	78.38	109.39
1103	79.28	109.20	82.02	114.48

Langmuir Parameters

	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
Vol. (ft^3/ton)	101	139	105	146
Pressure (PSIA)	344	344	344	344

Isotherm Temperature: 68 ºF

Goodness of fit of Langmuir regression: 0.99

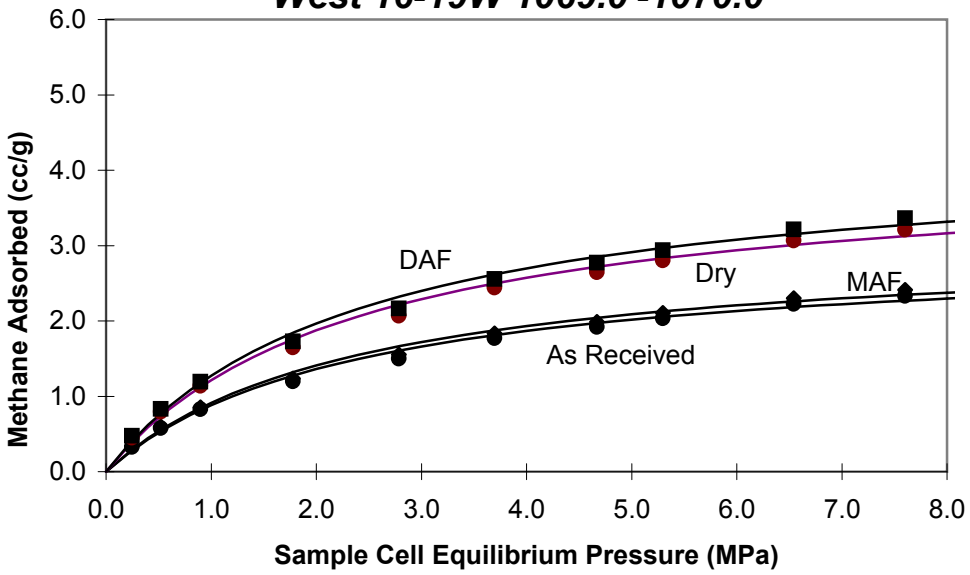
% Ash= 3.35 % Moisture= 27.40

SUMMARY OF ADSORPTION ANALYSES

IMPERIAL UNITS

CMS Oil and Gas Company

West 16-19W 1069.0'-1070.0'



Pressure	Adsorbed Methane (cc/g)			
(MPa)	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
0.25	0.33	0.45	0.34	0.47
0.52	0.58	0.80	0.60	0.83
0.90	0.83	1.14	0.86	1.19
1.78	1.20	1.65	1.24	1.73
2.79	1.50	2.07	1.55	2.17
3.70	1.77	2.44	1.83	2.56
4.67	1.92	2.65	1.99	2.77
5.30	2.03	2.80	2.10	2.94
6.54	2.23	3.07	2.30	3.21
7.60	2.33	3.21	2.41	3.36

Langmuir Parameters

	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
Vol. (cc/g)	2.98	4.10	3.08	4.30
Pressure (MPa)	2.37	2.37	2.37	2.37

Isotherm Temperature: **20.0 ºC**

Goodness of fit of Langmuir regression: **0.99**

% Ash= 3.35 **% Moisture = 27.40**

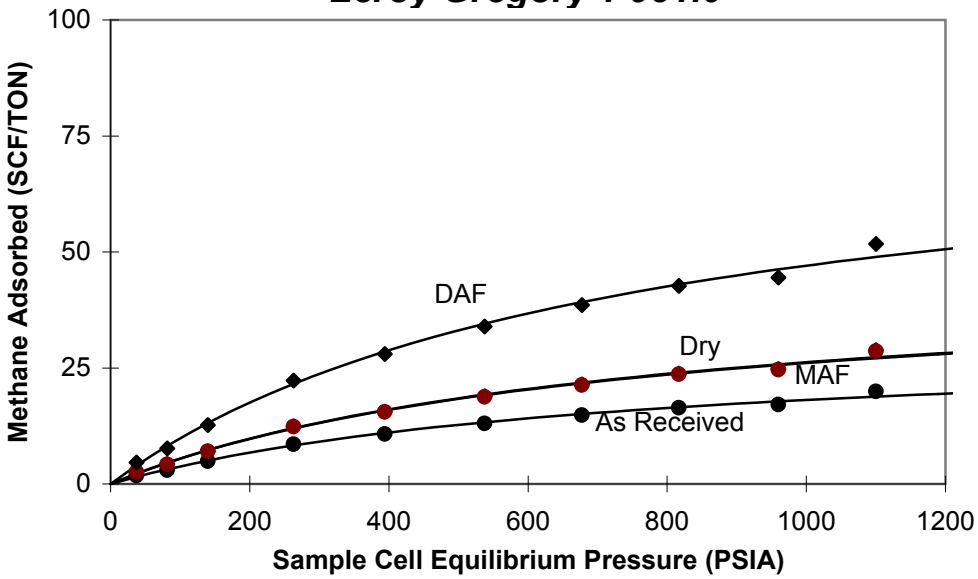
SUMMARY OF ADSORPTION ANALYSES

INTERNATIONAL SYSTEM UNITS

Core Hole 6

Gregory Water and Energy, Inc.

Leroy Gregory 1 951.0'



Pressure (PSIA)	Adsorbed Methane (ft^3/ton)			
	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
37	1.78	2.56	2.58	4.63
81	2.94	4.23	4.26	7.64
140	4.88	7.02	7.07	12.67
263	8.58	12.35	12.43	22.30
394	10.78	15.52	15.62	28.01
538	13.05	18.79	18.91	33.92
677	14.82	21.34	21.48	38.52
817	16.41	23.63	23.79	42.66
960	17.11	24.62	24.79	44.46
1100	19.90	28.65	28.84	51.72

Langmuir Parameters

	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
Vol. (ft^3/ton)	31	45	45	81
Pressure (PSIA)	727	727	727	727

Isotherm Temperature: 63 ºF

Goodness of fit of Langmuir regression: 0.98

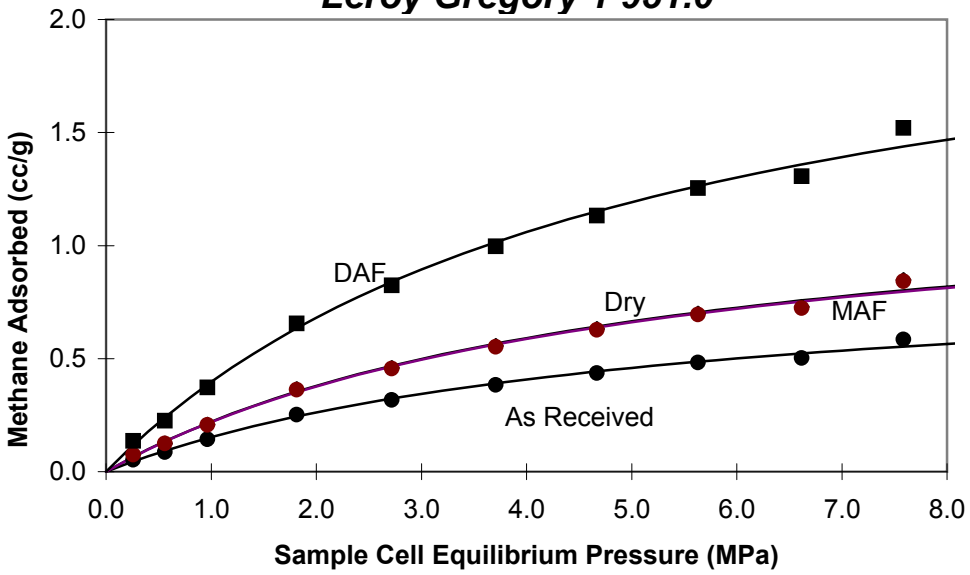
% Ash= 30.99 % Moisture= 30.53

SUMMARY OF ADSORPTION ANALYSES

IMPERIAL UNITS

Gregory Water and Energy, Inc.

Leroy Gregory 1 951.0'



Pressure	Adsorbed Methane (cc/g)			
(MPa)	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
0.26	0.05	0.08	0.08	0.14
0.56	0.09	0.12	0.13	0.22
0.97	0.14	0.21	0.21	0.37
1.81	0.25	0.36	0.37	0.66
2.72	0.32	0.46	0.46	0.82
3.71	0.38	0.55	0.56	1.00
4.67	0.44	0.63	0.63	1.13
5.63	0.48	0.69	0.70	1.25
6.62	0.50	0.72	0.73	1.31
7.59	0.58	0.84	0.85	1.52

Langmuir Parameters

	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
Vol. (cc/g)	0.92	1.32	1.33	2.39
Pressure (MPa)	5.01	5.01	5.01	5.01

Isotherm Temperature: **17.3 ºC**

Goodness of fit of Langmuir regression: **0.98**

% Ash= 30.99 **% Moisture = 30.53**

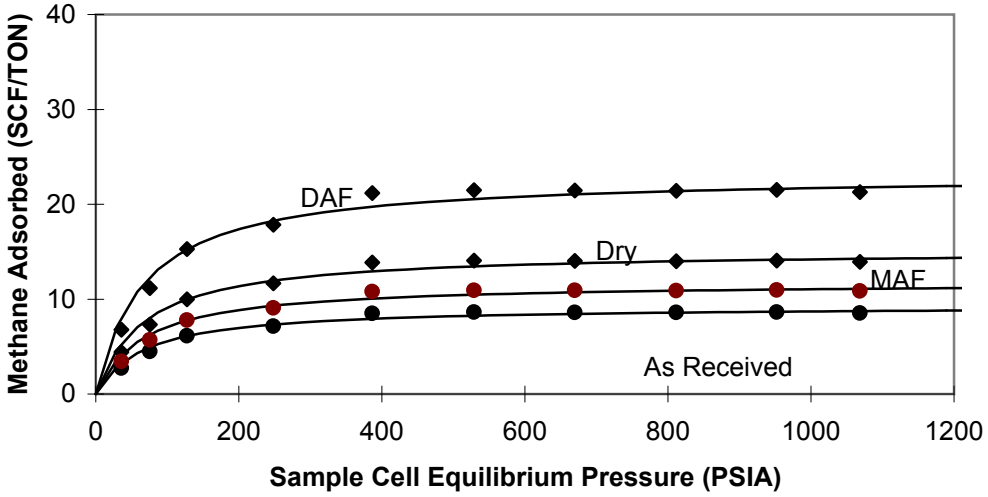
SUMMARY OF ADSORPTION ANALYSES

INTERNATIONAL SYSTEM UNITS

Core Hole 7

CMS Oil and Gas Company

Laramore 11-6C 362.5'-363.3'



Pressure	Adsorbed Methane (ft^3/ton)			
(PSIA)	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
36	2.72	3.45	4.43	6.77
75	4.48	5.69	7.31	11.17
127	6.13	7.78	9.99	15.27
248	7.16	9.08	11.67	17.83
387	8.50	10.79	13.86	21.18
529	8.62	10.94	14.06	21.48
670	8.61	10.93	14.04	21.45
812	8.59	10.90	14.01	21.41
952	8.63	10.96	14.08	21.52

Langmuir Parameters

	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
Vol. (ft^3/ton)	9	12	15	23
Pressure (PSIA)	66	66	66	66

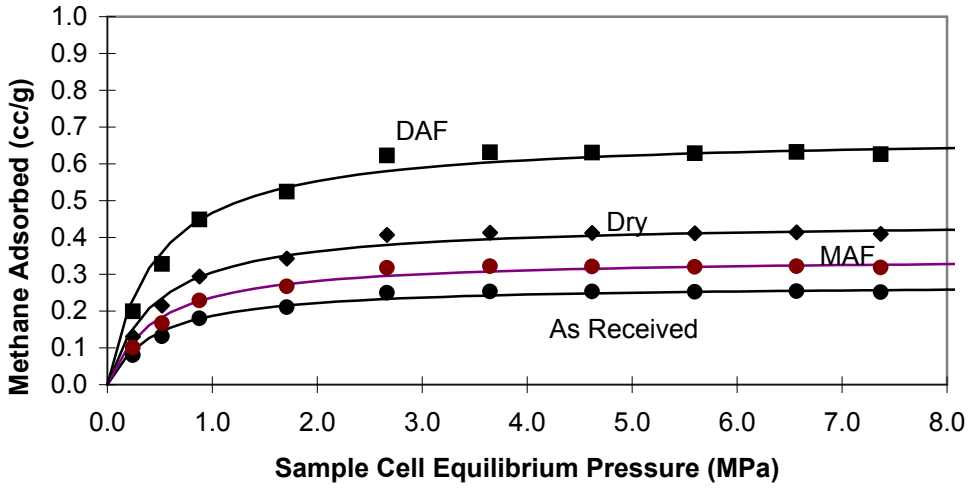
Isotherm Temperature: 65 ºF

Goodness of fit of Langmuir regression: 1.00

% Ash= 38.67 % Moisture= 21.20

SUMMARY OF ADSORPTION ANALYSES IMPERIAL UNITS

CMS Oil and Gas Company
Laramore 11-6C 362.5'-363.3'



Pressure	Adsorbed Methane (cc/g)			
(MPa)	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
0.25	0.08	0.10	0.13	0.20
0.52	0.13	0.17	0.21	0.33
0.88	0.18	0.23	0.29	0.45
1.71	0.21	0.27	0.34	0.52
2.67	0.25	0.32	0.41	0.62
3.65	0.25	0.32	0.41	0.63
4.62	0.25	0.32	0.41	0.63
5.60	0.25	0.32	0.41	0.63
6.57	0.25	0.32	0.41	0.63
7.37	0.25	0.32	0.41	0.63

Langmuir Parameters

	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
Vol. (cc/g)	0.27	0.35	0.44	0.68
Pressure (MPa)	0.46	0.46	0.46	0.46

Isotherm Temperature: **18.3 ºC**

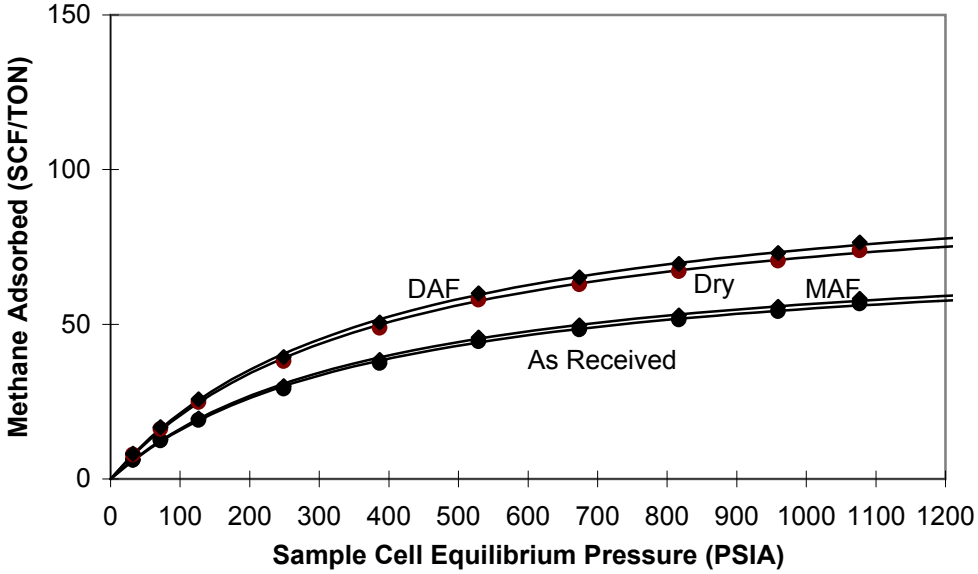
Goodness of fit of Langmuir regression: **1.00**

% Ash= 38.67 **% Moisture = 21.20**

SUMMARY OF ADSORPTION ANALYSES INTERNATIONAL SYSTEM UNITS

CMS Oil and Gas Company

Laramore 11-6C 791.2'-792.0'



Pressure (PSIA)	Adsorbed Methane (ft^3/ton)			
	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
32	6.05	7.89	6.22	8.17
72	12.40	16.16	12.73	16.73
127	19.06	24.84	19.57	25.71
249	29.20	38.04	29.98	39.39
387	37.49	48.85	38.49	50.57
529	44.48	57.95	45.67	60.00
674	48.31	62.95	49.61	65.17
817	51.52	67.12	52.90	69.49
960	54.17	70.58	55.63	73.07
1077	56.70	73.88	58.22	76.48

Langmuir Parameters

	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
Vol. (ft^3/ton)	76	99	78	102
Pressure (PSIA)	380	380	380	380

Isotherm Temperature: 72 ºF

Goodness of fit of Langmuir regression: 1.00

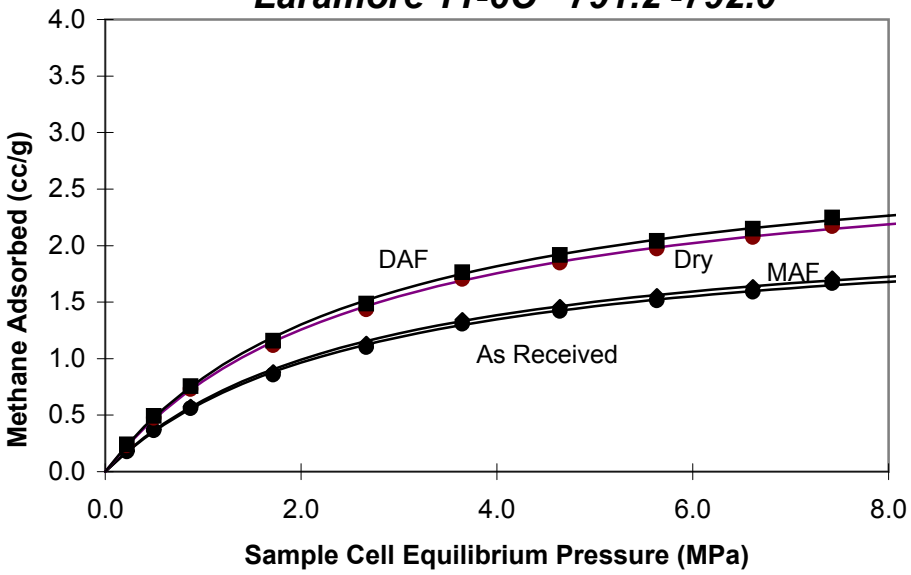
% Ash= 2.61 % Moisture= 23.25

SUMMARY OF ADSORPTION ANALYSES

IMPERIAL UNITS

CMS Oil and Gas Company

Laramore 11-6C 791.2'-792.0'



Pressure	Adsorbed Methane (cc/g)			
(MPa)	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
0.22	0.18	0.23	0.18	0.24
0.50	0.36	0.47	0.37	0.49
0.87	0.56	0.73	0.58	0.76
1.71	0.86	1.12	0.88	1.16
2.67	1.10	1.44	1.13	1.49
3.65	1.31	1.70	1.34	1.76
4.65	1.42	1.85	1.46	1.92
5.63	1.51	1.97	1.55	2.04
6.62	1.59	2.07	1.63	2.15
7.42	1.67	2.17	1.71	2.25

Langmuir Parameters

	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
Vol. (cc/g)	2.23057	2.91	2.29	3.01
Pressure (MPa)	2.62	2.62	2.62	2.62

Isotherm Temperature: **22.0 ºC**

Goodness of fit of Langmuir regression: **1.00**

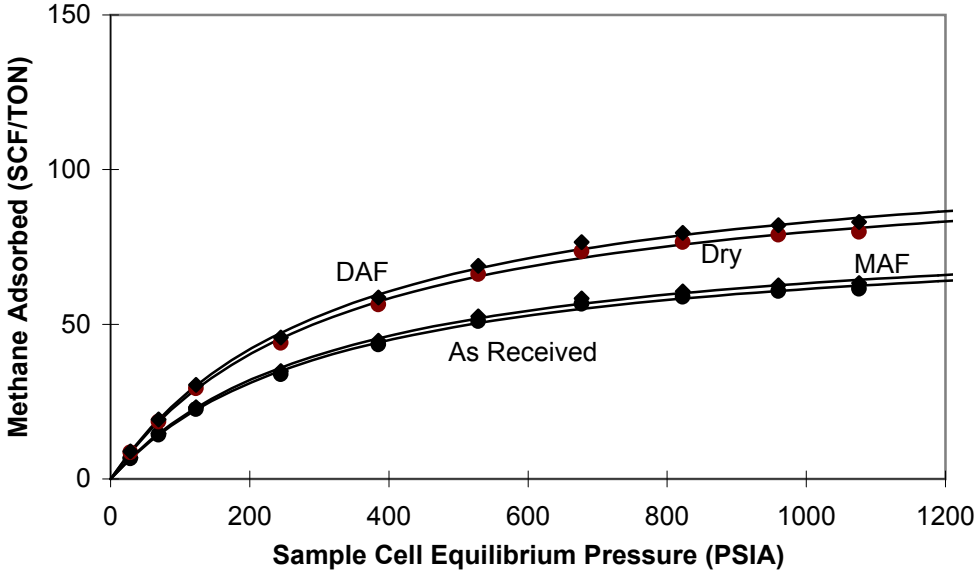
% Ash= 2.61 **% Moisture = 23.25**

SUMMARY OF ADSORPTION ANALYSES
INTERNATIONAL SYSTEM UNITS

Core Hole 8

CMS Oil and Gas Company

Laramore 11-6C 993.0'-994.2'



Pressure (PSIA)	Adsorbed Methane (ft^3/ton)			
	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
29	6.58	8.55	6.78	8.89
69	14.27	18.55	14.71	19.29
123	22.51	29.25	23.19	30.42
244	33.86	44.00	34.88	45.76
385	43.41	56.42	44.73	58.67
529	50.96	66.23	52.51	68.87
677	56.63	73.60	58.35	76.53
822	58.86	76.51	60.65	79.56
960	60.70	78.89	62.54	82.04
1076	61.47	79.90	63.34	83.08

Langmuir Parameters

	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
Vol. (ft^3/ton)	81	106	84	110
Pressure (PSIA)	325	325	325	325

Isotherm Temperature: 74 ºF

Goodness of fit of Langmuir regression: 1.00

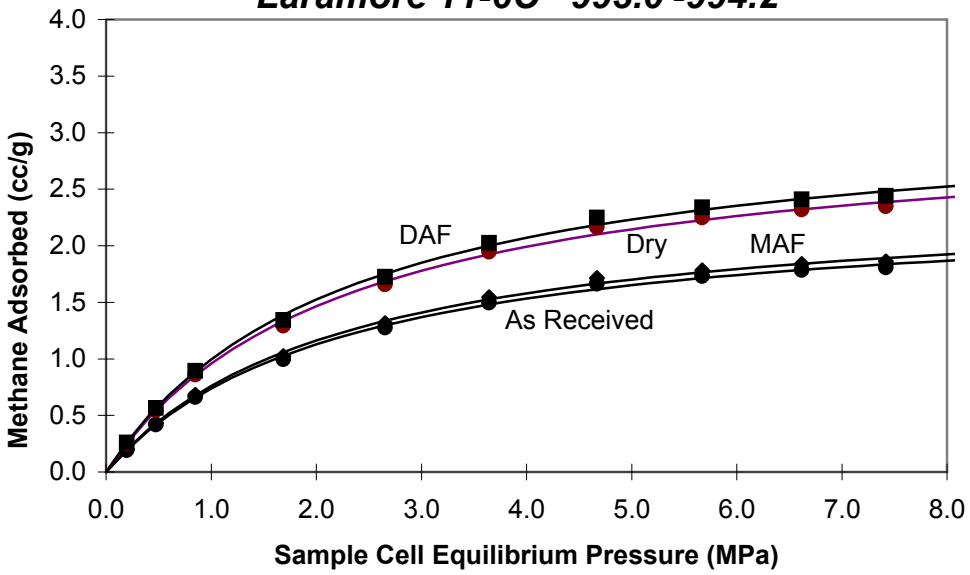
% Ash= 2.95 % Moisture= 23.06

SUMMARY OF ADSORPTION ANALYSES

IMPERIAL UNITS

CMS Oil and Gas Company

Laramore 11-6C 993.0'-994.2'



Pressure	Adsorbed Methane (cc/g)			
(MPa)	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
0.20	0.19	0.25	0.20	0.26
0.48	0.42	0.55	0.43	0.57
0.85	0.66	0.86	0.68	0.89
1.69	0.99	1.29	1.03	1.34
2.65	1.28	1.66	1.31	1.72
3.64	1.50	1.95	1.54	2.02
4.67	1.66	2.16	1.71	2.25
5.67	1.73	2.25	1.78	2.34
6.62	1.78	2.32	1.84	2.41
7.42	1.81	2.35	1.86	2.44

Langmuir Parameters

	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
Vol. (cc/g)	2.39069	3.11	2.46	3.23
Pressure (MPa)	2.24	2.24	2.24	2.24

Isotherm Temperature: **23.3 ºC**

Goodness of fit of Langmuir regression: **1.00**

% Ash= 2.95 **% Moisture = 23.06**

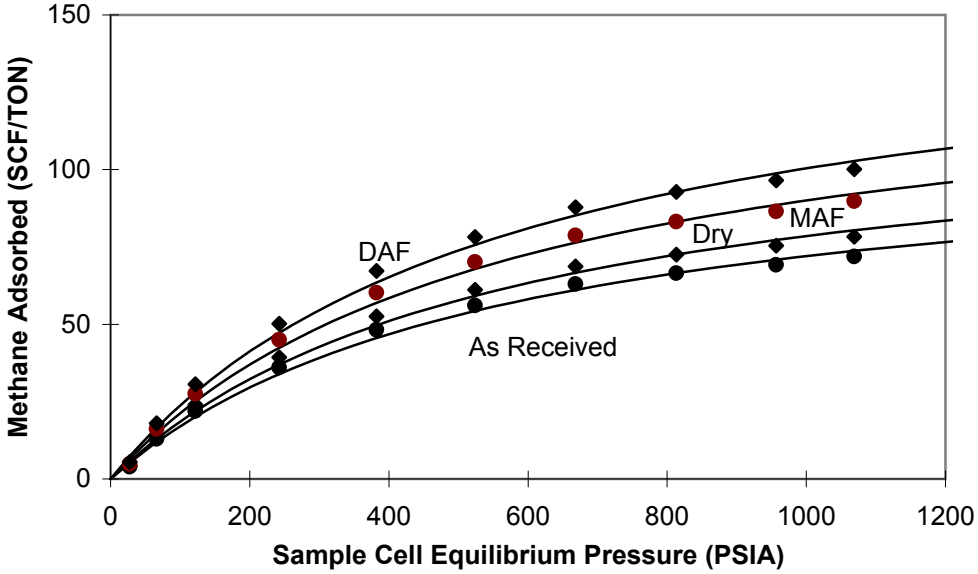
SUMMARY OF ADSORPTION ANALYSES

INTERNATIONAL SYSTEM UNITS

Core Hole 8

CMS Oil and Gas Company

Laramore 11-6C 1350.0'-1350.7'



Pressure (PSIA)	Adsorbed Methane (ft^3/ton)			
	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
28	3.93	4.91	4.28	5.48
66	12.89	16.11	14.05	17.97
122	21.97	27.47	23.95	30.63
242	36.02	45.03	39.27	50.22
382	48.20	60.25	52.55	67.20
524	56.11	70.14	61.17	78.23
668	63.02	78.77	68.70	87.86
813	66.53	83.16	72.53	92.75
957	69.22	86.52	75.46	96.50
1069	71.86	89.82	78.33	100.18

Langmuir Parameters

	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
Vol. (ft^3/ton)	112	140	122	157
Pressure (PSIA)	560	560	560	560

Isotherm Temperature: 79 ºF

Goodness of fit of Langmuir regression: 0.96

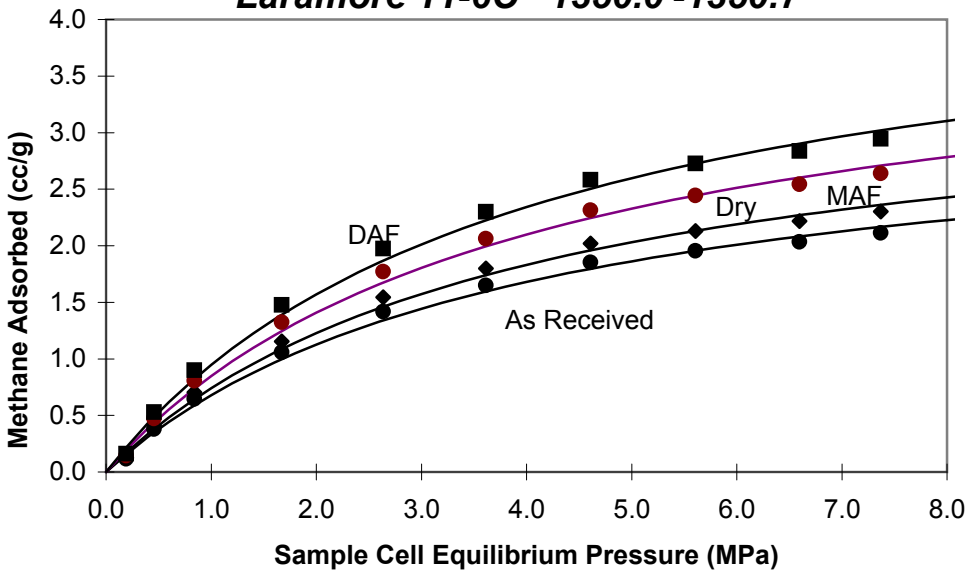
% Ash= 8.27 % Moisture= 20.00

SUMMARY OF ADSORPTION ANALYSES

IMPERIAL UNITS

CMS Oil and Gas Company

Laramore 11-6C 1350.0'-1350.7'



Pressure	Adsorbed Methane (cc/g)			
(MPa)	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
0.19	0.12	0.14	0.13	0.16
0.46	0.38	0.47	0.41	0.53
0.84	0.65	0.81	0.70	0.90
1.67	1.06	1.32	1.15	1.48
2.63	1.42	1.77	1.54	1.97
3.61	1.65	2.06	1.80	2.30
4.61	1.85	2.32	2.02	2.58
5.61	1.96	2.44	2.13	2.73
6.60	2.03	2.54	2.22	2.84
7.37	2.11	2.64	2.30	2.94

Langmuir Parameters

	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
Vol. (cc/g)	3.30195	4.13	3.60	4.60
Pressure (MPa)	3.86	3.86	3.86	3.86

Isotherm Temperature: **26.1 ºC**

Goodness of fit of Langmuir regression: **0.96**

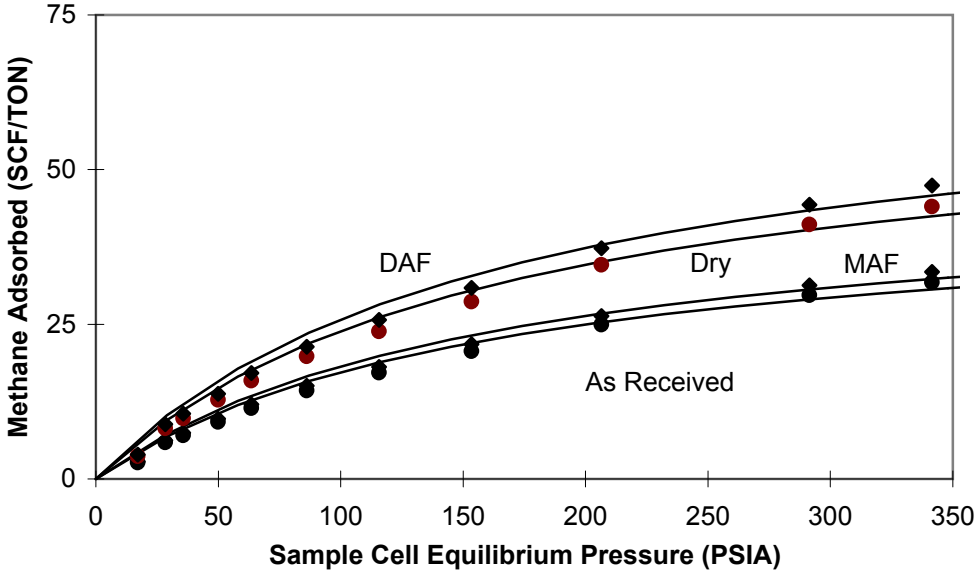
% Ash= 8.27 **% Moisture = 20.00**

SUMMARY OF ADSORPTION ANALYSES
INTERNATIONAL SYSTEM UNITS

Core Hole 8

Kennecott Energy

Kennecott CBM 1 Canister A21 148.5'-150.5'



Pressure (PSIA)	Adsorbed Methane (ft^3/ton)			
	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
17	2.64	3.67	2.79	3.95
28	5.90	8.19	6.23	8.82
36	7.04	9.77	7.43	10.53
50	9.22	12.78	9.72	13.78
64	11.44	15.86	12.07	17.10
86	14.29	19.81	15.07	21.35
116	17.18	23.83	18.13	25.69
153	20.65	28.64	21.79	30.87
206	24.96	34.61	26.33	37.30
291	29.66	41.14	31.29	44.34
341	31.74	44.02	33.49	47.45

Langmuir Parameters

	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
Vol. (ft^3/ton)	45	63	48	67
Pressure (PSIA)	161	161	161	161

Isotherm Temperature: 65 ºF

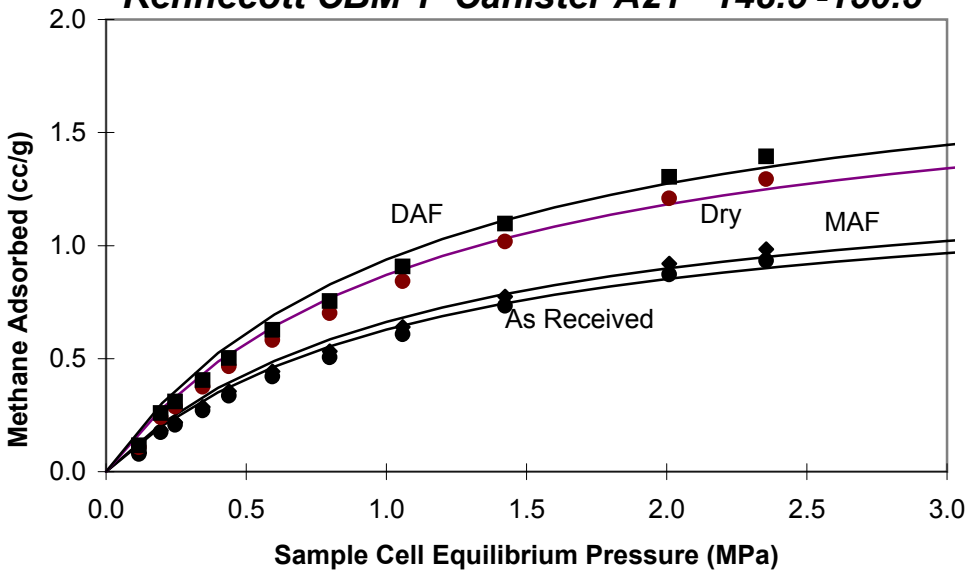
Goodness of fit of Langmuir regression: 0.98

% Ash= 5.21 % Moisture= 27.89

SUMMARY OF ADSORPTION ANALYSES
IMPERIAL UNITS

Kennecott Energy

Kennecott CBM 1 Canister A21 148.5'-150.5'



Pressure	Adsorbed Methane (cc/g)			
(MPa)	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
0.12	0.08	0.11	0.08	0.12
0.20	0.17	0.24	0.18	0.26
0.25	0.21	0.29	0.22	0.31
0.34	0.27	0.38	0.29	0.40
0.44	0.34	0.47	0.35	0.50
0.59	0.42	0.58	0.44	0.63
0.80	0.51	0.70	0.53	0.75
1.06	0.61	0.84	0.64	0.91
1.42	0.73	1.02	0.77	1.10
2.01	0.87	1.21	0.92	1.30
2.35	0.93	1.29	0.98	1.39

Langmuir Parameters

	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
Vol. (cc/g)	1.33	1.84	1.40	1.98
Pressure (MPa)	1.11	1.11	1.11	1.11

Isotherm Temperature: 18.3 ºC

Goodness of fit of Langmuir regression: 0.98

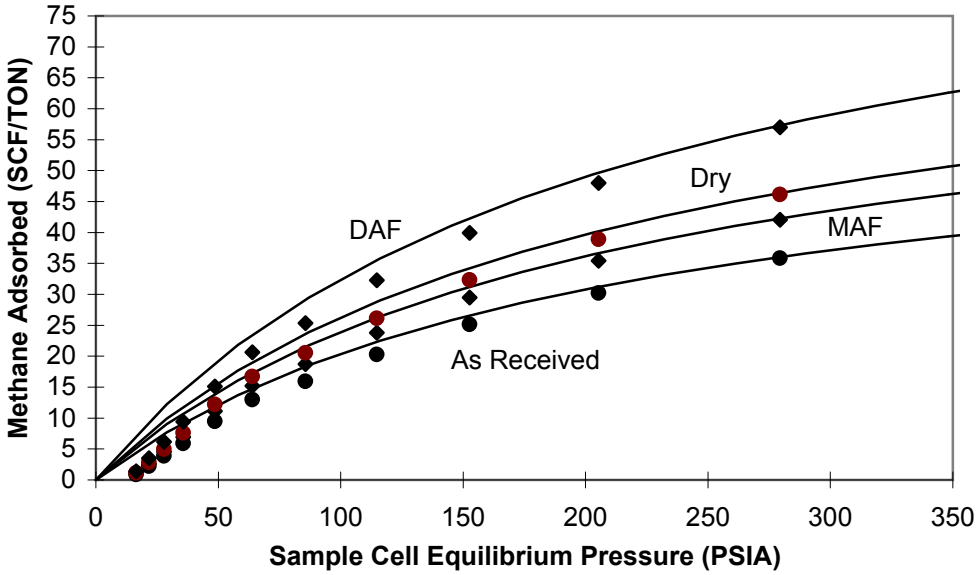
% Ash= 5.21 % Moisture = 27.89

SUMMARY OF ADSORPTION ANALYSES
INTERNATIONAL SYSTEM UNITS

Core Hole 9

Kennecott Energy

Kennecott CBM 1 Canister B19 173.5'-175.5'



Pressure (PSIA)	Adsorbed Methane (ft^3/ton)			
	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
16	0.89	1.15	1.05	1.42
22	2.20	2.84	2.58	3.50
28	3.87	4.98	4.54	6.15
36	5.90	7.60	6.93	9.39
49	9.49	12.22	11.13	15.09
64	12.98	16.71	15.23	20.64
86	15.95	20.53	18.71	25.36
115	20.29	26.12	23.80	32.26
153	25.12	32.35	29.48	39.95
205	30.19	38.87	35.42	48.01
279	35.84	46.16	42.06	57.00

Langmuir Parameters

	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
Vol. (ft^3/ton)	63	81	74	100
Pressure (PSIA)	208	208	208	208

Isotherm Temperature: 62 ºF

Goodness of fit of Langmuir regression: 0.98

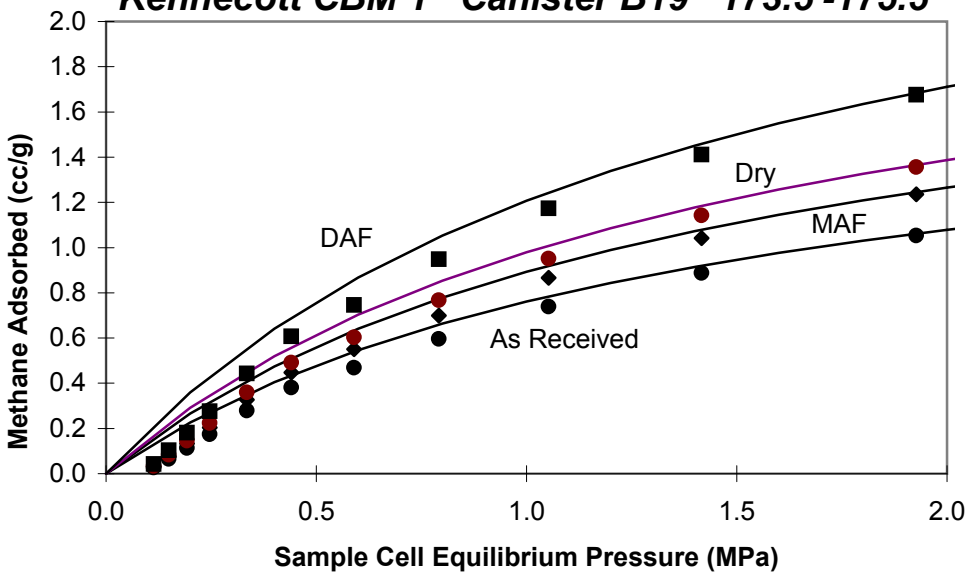
% Ash= 14.78 % Moisture= 22.34

SUMMARY OF ADSORPTION ANALYSES

IMPERIAL UNITS

Kennecott Energy

Kennecott CBM 1 Canister B19 173.5'-175.5'



Pressure	Adsorbed Methane (cc/g)			
(MPa)	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
0.11	0.03	0.03	0.03	0.04
0.15	0.06	0.08	0.08	0.10
0.19	0.11	0.15	0.13	0.18
0.25	0.17	0.22	0.20	0.28
0.34	0.28	0.36	0.33	0.44
0.44	0.38	0.49	0.45	0.61
0.59	0.47	0.60	0.55	0.75
0.79	0.60	0.77	0.70	0.95
1.05	0.74	0.95	0.87	1.17
1.42	0.89	1.14	1.04	1.41
1.93	1.05	1.36	1.24	1.68

Langmuir Parameters

	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
Vol. (cc/g)	1.85	2.38	2.17	2.93
Pressure (MPa)	1.43	1.43	1.43	1.43

Isotherm Temperature: **16.7 ºC**

Goodness of fit of Langmuir regression: **0.98**

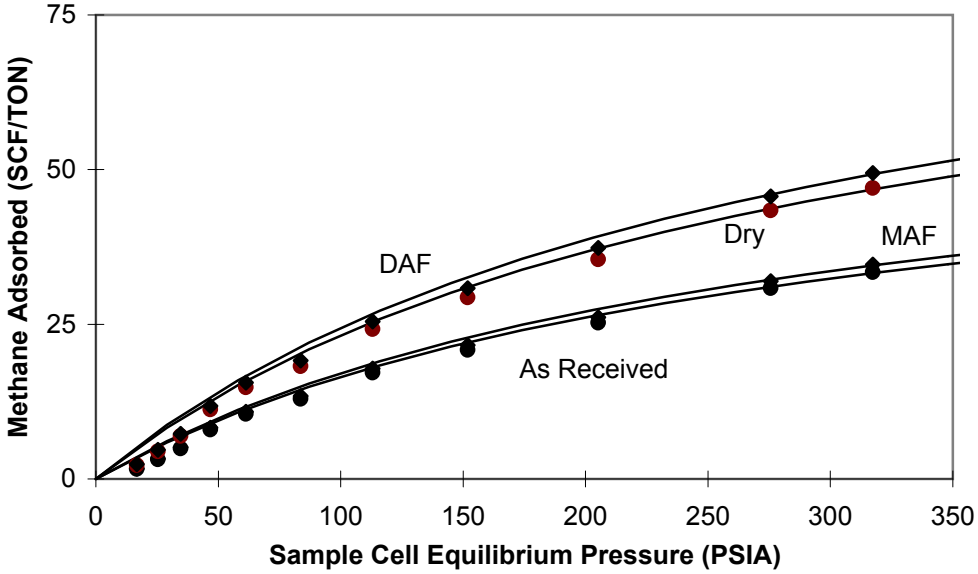
% Ash= **14.78** **% Moisture =** **22.34**

SUMMARY OF ADSORPTION ANALYSES

INTERNATIONAL SYSTEM UNITS

Kennecott Energy

Kennecott CBM 1 Canister B22 187.5'-188.5'



Pressure (PSIA)	Adsorbed Methane (ft^3/ton)			
	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
17	1.60	2.25	1.66	2.37
25	3.16	4.45	3.28	4.68
35	4.92	6.92	5.10	7.29
47	7.98	11.23	8.27	11.82
61	10.50	14.77	10.88	15.55
84	12.92	18.18	13.40	19.14
113	17.20	24.19	17.83	25.46
152	20.83	29.31	21.60	30.85
205	25.22	35.48	26.15	37.34
276	30.85	43.40	31.98	45.68
317	33.41	47.00	34.63	49.46

Langmuir Parameters

	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
Vol. (ft^3/ton)	62	88	65	93
Pressure (PSIA)	279	279	279	279

Isotherm Temperature: 65 ºF

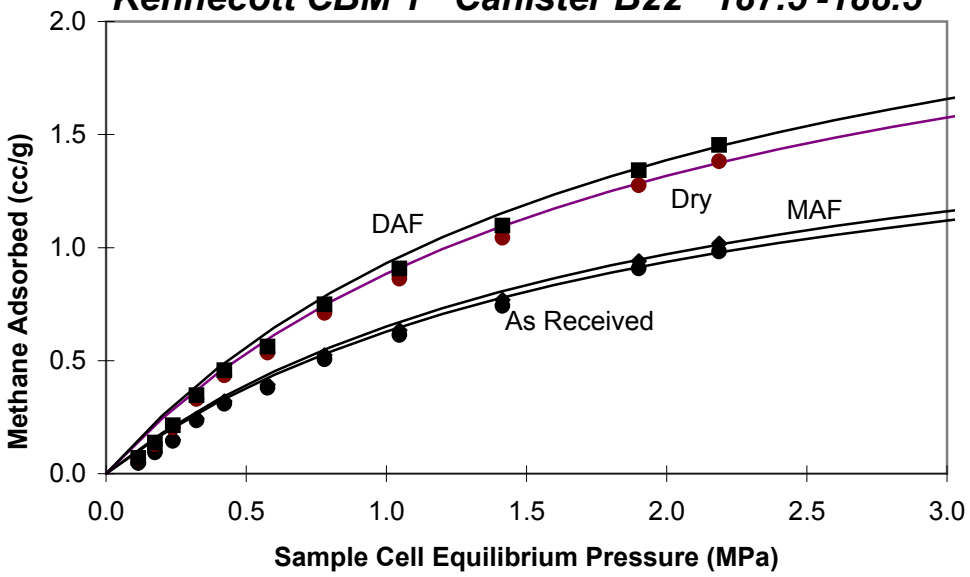
Goodness of fit of Langmuir regression: 0.89

% Ash= 3.54 % Moisture= 28.92

SUMMARY OF ADSORPTION ANALYSES
IMPERIAL UNITS

Kennecott Energy

Kennecott CBM 1 Canister B22 187.5'-188.5'



Pressure	Adsorbed Methane (cc/g)			
(MPa)	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
0.12	0.05	0.07	0.05	0.07
0.17	0.09	0.13	0.10	0.14
0.24	0.14	0.20	0.15	0.21
0.32	0.23	0.33	0.24	0.35
0.42	0.31	0.43	0.32	0.46
0.58	0.38	0.53	0.39	0.56
0.78	0.51	0.71	0.52	0.75
1.05	0.61	0.86	0.63	0.91
1.41	0.74	1.04	0.77	1.10
1.90	0.91	1.28	0.94	1.34
2.19	0.98	1.38	1.02	1.45

Langmuir Parameters

	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
Vol. (cc/g)	1.84	2.58	1.90	2.72
Pressure (MPa)	1.92	1.92	1.92	1.92

Isotherm Temperature: 18.3 ºC

Goodness of fit of Langmuir regression: 0.89

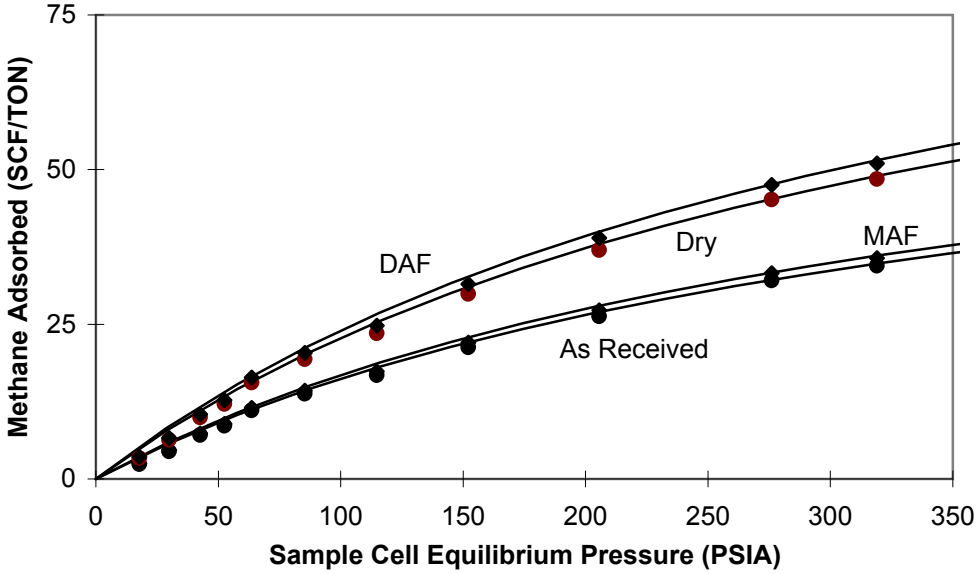
% Ash= 3.54 % Moisture = 28.92

SUMMARY OF ADSORPTION ANALYSES
INTERNATIONAL SYSTEM UNITS

Core Hole 9

Kennecott Energy

Kennecott CBM 2 190.5'-191.5'



Pressure (PSIA)	Adsorbed Methane (ft^3/ton)			
	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
18	2.40	3.38	2.49	3.56
30	4.47	6.29	4.63	6.62
43	7.06	9.94	7.32	10.46
53	8.60	12.10	8.91	12.73
64	11.07	15.58	11.48	16.40
85	13.75	19.35	14.26	20.36
115	16.74	23.56	17.36	24.79
152	21.26	29.91	22.04	31.48
206	26.29	36.99	27.26	38.93
276	32.09	45.15	33.27	47.52
319	34.45	48.47	35.72	51.01

Langmuir Parameters

	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
Vol. (ft^3/ton)	73	103	76	108
Pressure (PSIA)	351	351	351	351

Isotherm Temperature: 65 ºF

Goodness of fit of Langmuir regression: 0.98

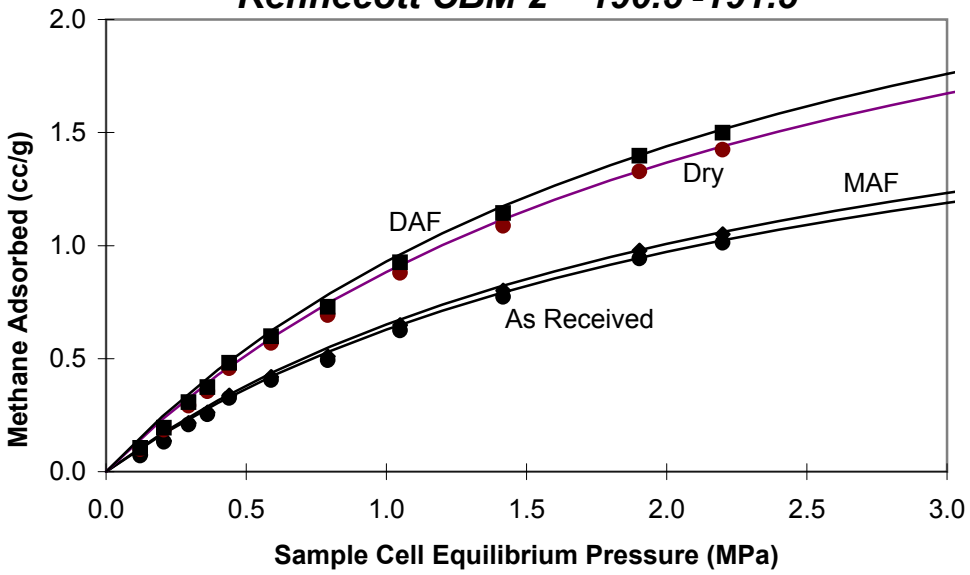
% Ash= 3.54 % Moisture= 28.92

SUMMARY OF ADSORPTION ANALYSES

IMPERIAL UNITS

Kennecott Energy

Kennecott CBM 2 190.5'-191.5'



Pressure	Adsorbed Methane (cc/g)			
(MPa)	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
0.12	0.07	0.10	0.07	0.10
0.21	0.13	0.18	0.14	0.19
0.29	0.21	0.29	0.22	0.31
0.36	0.25	0.36	0.26	0.37
0.44	0.33	0.46	0.34	0.48
0.59	0.40	0.57	0.42	0.60
0.79	0.49	0.69	0.51	0.73
1.05	0.62	0.88	0.65	0.93
1.42	0.77	1.09	0.80	1.14
1.90	0.94	1.33	0.98	1.40
2.20	1.01	1.42	1.05	1.50

Langmuir Parameters

	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
Vol. (cc/g)	2.15	3.02	2.23	3.18
Pressure (MPa)	2.42	2.42	2.42	2.42

Isotherm Temperature: 18.3 ºC

Goodness of fit of Langmuir regression: 0.98

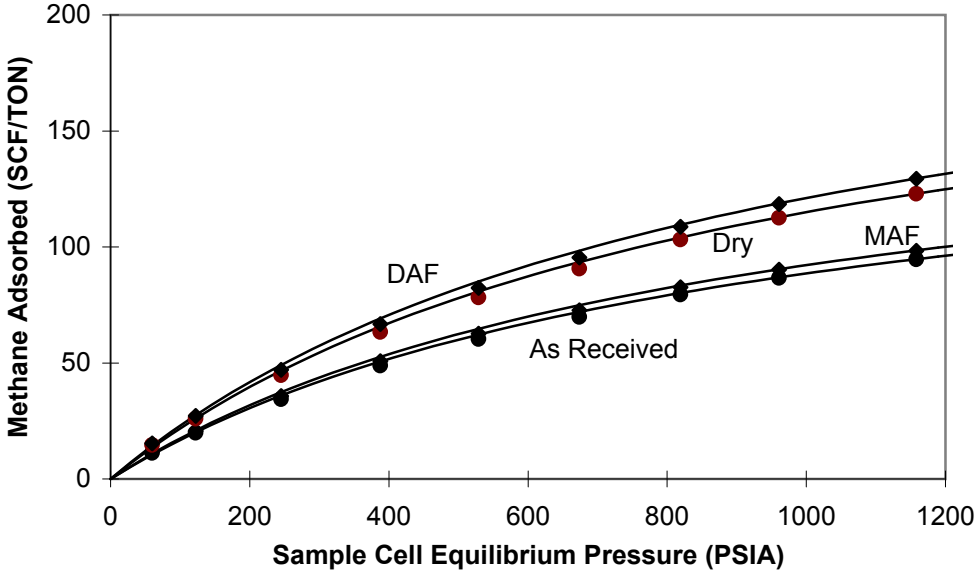
% Ash= 3.54 % Moisture = 28.92

SUMMARY OF ADSORPTION ANALYSES
INTERNATIONAL SYSTEM UNITS

Core Hole 10

Barrett Resources Corporation

CARU State 22-16-5075W 1364.8'



Pressure (PSIA)	Adsorbed Methane (ft^3/ton)			
	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
60	11.22	14.57	11.67	15.34
122	19.93	25.87	20.73	27.24
245	34.37	44.63	35.75	46.98
388	48.80	63.36	50.76	66.70
529	60.24	78.22	62.66	82.35
674	69.83	90.66	72.63	95.45
819	79.47	103.18	82.66	108.62
961	86.67	112.53	90.15	118.47
1158	94.61	122.83	98.40	129.31

Langmuir Parameters

	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
Vol. (ft^3/ton)	169	219	176	231
Pressure (PSIA)	907	907	907	907

Isotherm Temperature: 76 ºF

Goodness of fit of Langmuir regression: 0.99

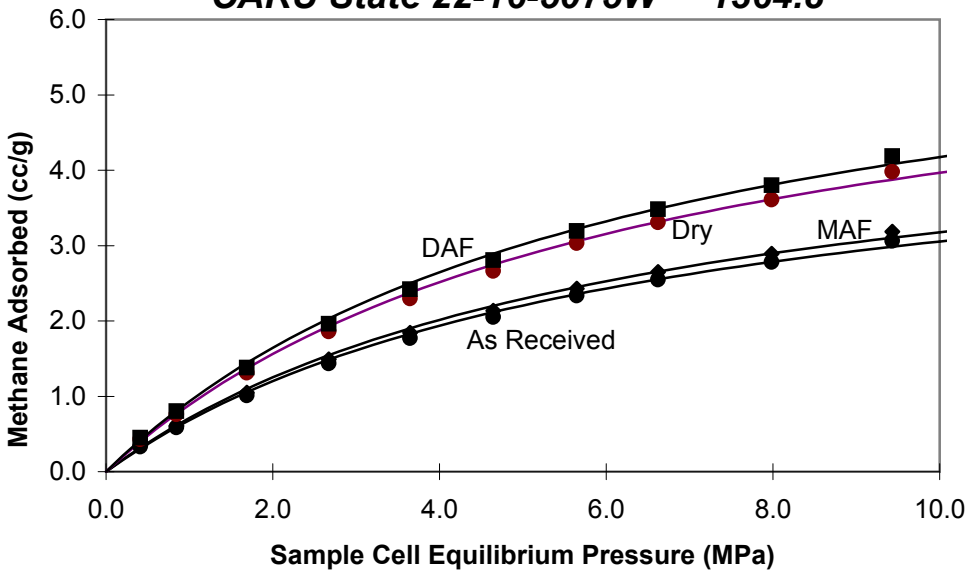
% Ash= 3.86 % Moisture= 22.98

SUMMARY OF ADSORPTION ANALYSES

IMPERIAL UNITS

Barrett Resources Corporation

CARU State 22-16-5075W 1364.8'



Pressure	Adsorbed Methane (cc/g)			
(MPa)	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
0.41	0.33	0.43	0.34	0.45
0.84	0.59	0.76	0.61	0.80
1.69	1.01	1.31	1.05	1.38
2.67	1.43	1.86	1.49	1.96
3.65	1.77	2.30	1.84	2.42
4.65	2.05	2.66	2.13	2.81
5.65	2.34	3.03	2.43	3.19
6.62	2.55	3.31	2.65	3.48
7.98	2.78	3.61	2.89	3.80
9.43	3.06	3.98	3.19	4.19

Langmuir Parameters

	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
Vol. (cc/g)	4.96358	6.44	5.16	6.78
Pressure (MPa)	6.25	6.25	6.25	6.25

Isotherm Temperature: 24.4 ºC

Goodness of fit of Langmuir regression: 0.99

% Ash= 3.86 % Moisture = 22.98

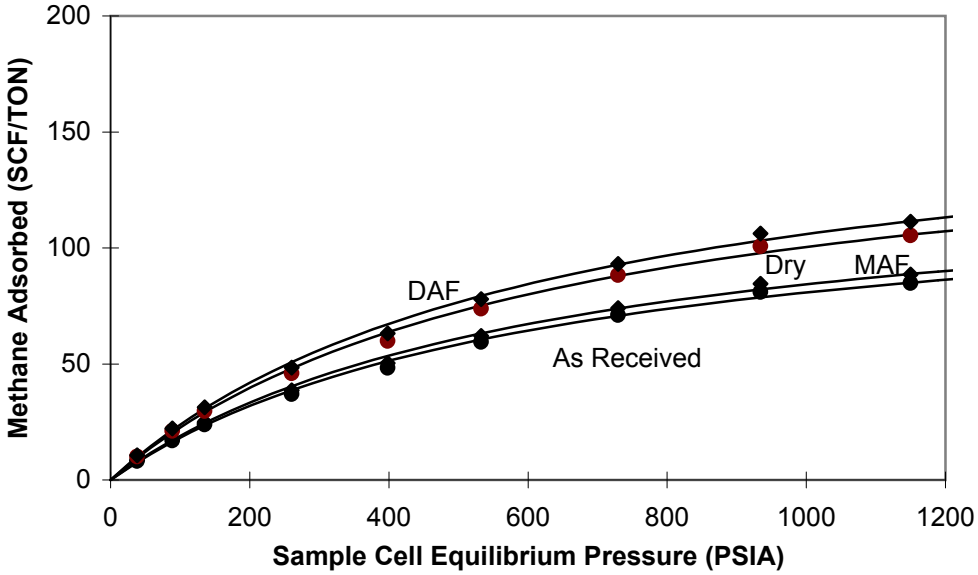
SUMMARY OF ADSORPTION ANALYSES

INTERNATIONAL SYSTEM UNITS

Core Hole 11

Barrett Resources Corporation

CARU State 22-16-5075W 1759.0'



Pressure (PSIA)	Adsorbed Methane (ft^3/ton)			
	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
38	8.09	10.06	8.45	10.61
89	16.97	21.09	17.72	22.26
135	23.87	29.67	24.92	31.31
260	36.95	45.92	38.57	48.46
398	48.22	59.93	50.34	63.24
533	59.40	73.83	62.01	77.90
729	71.01	88.26	74.13	93.13
934	81.00	100.67	84.56	106.23
1150	84.84	105.44	88.57	111.27

Langmuir Parameters

	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
Vol. (ft^3/ton)	131	163	137	172
Pressure (PSIA)	620	620	620	620

Isotherm Temperature: 83 ºF

Goodness of fit of Langmuir regression: 0.99

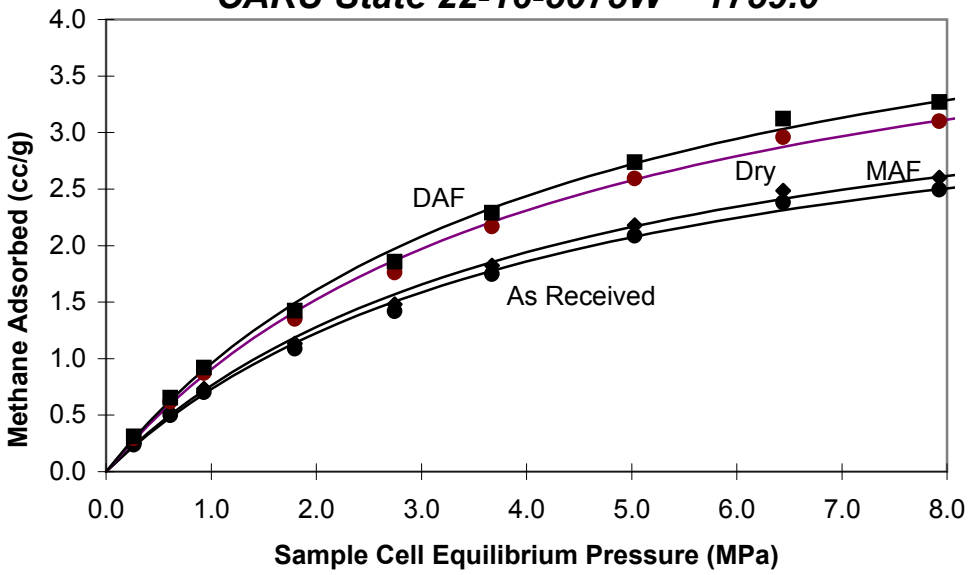
% Ash= 4.21 % Moisture= 19.54

SUMMARY OF ADSORPTION ANALYSES

IMPERIAL UNITS

Barrett Resources Corporation

CARU State 22-16-5075W 1759.0'



Pressure (MPa)	Adsorbed Methane (cc/g) As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
0.26	0.24	0.30	0.25	0.31
0.61	0.50	0.62	0.52	0.65
0.93	0.70	0.87	0.73	0.92
1.80	1.09	1.35	1.13	1.42
2.75	1.42	1.76	1.48	1.86
3.67	1.75	2.17	1.82	2.29
5.03	2.09	2.59	2.18	2.74
6.44	2.38	2.96	2.49	3.12
7.93	2.49	3.10	2.60	3.27

Langmuir Parameters

	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
Vol. (cc/g)	3.85	4.78	4.01	5.04
Pressure (MPa)	4.27	4.27	4.27	4.27

Isotherm Temperature: **24.4 ºC**

Goodness of fit of Langmuir regression: **0.99**

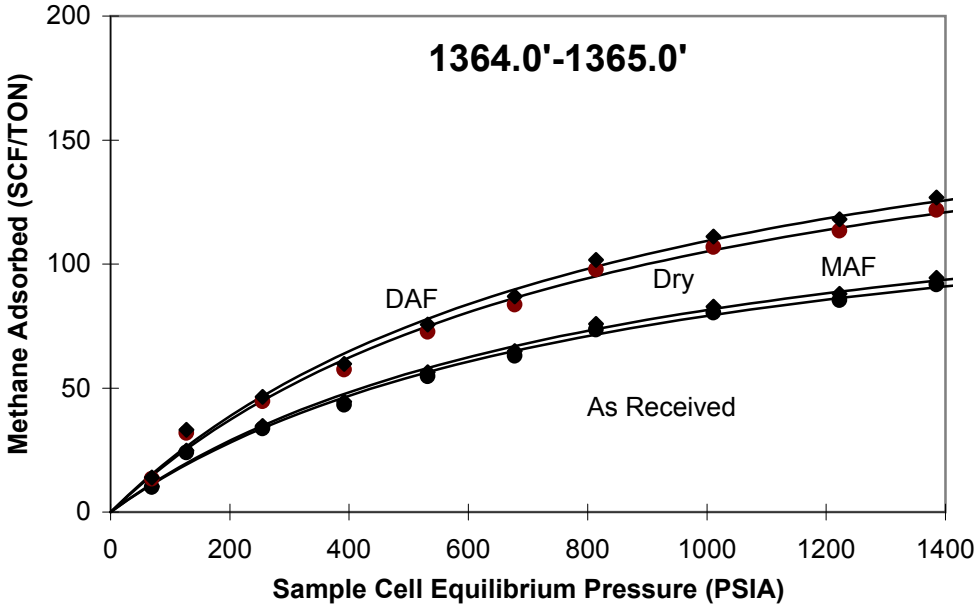
% Ash= 4.21 **% Moisture = 19.54**

SUMMARY OF ADSORPTION ANALYSES

INTERNATIONAL SYSTEM UNITS

Barrett Resources Corporation

Schoonover Road Unit State 12-16-4876



Pressure (PSIA)	Adsorbed Methane (ft^3/ton)			
	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
69	10.07	13.38	10.38	13.92
127	24.01	31.89	24.73	33.17
255	33.66	44.71	34.67	46.51
392	43.24	57.43	44.54	59.75
532	54.69	72.65	56.33	75.58
678	62.95	83.63	64.85	87.00
814	73.60	97.77	75.82	101.72
1011	80.43	106.84	82.85	111.15
1223	85.42	113.47	87.99	118.05

Langmuir Parameters

	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
Vol. (ft^3/ton)	146	194	150	201
Pressure (PSIA)	842	842	842	842

Isotherm Temperature: **76 ºF**

Goodness of fit of Langmuir regression: **0.97**

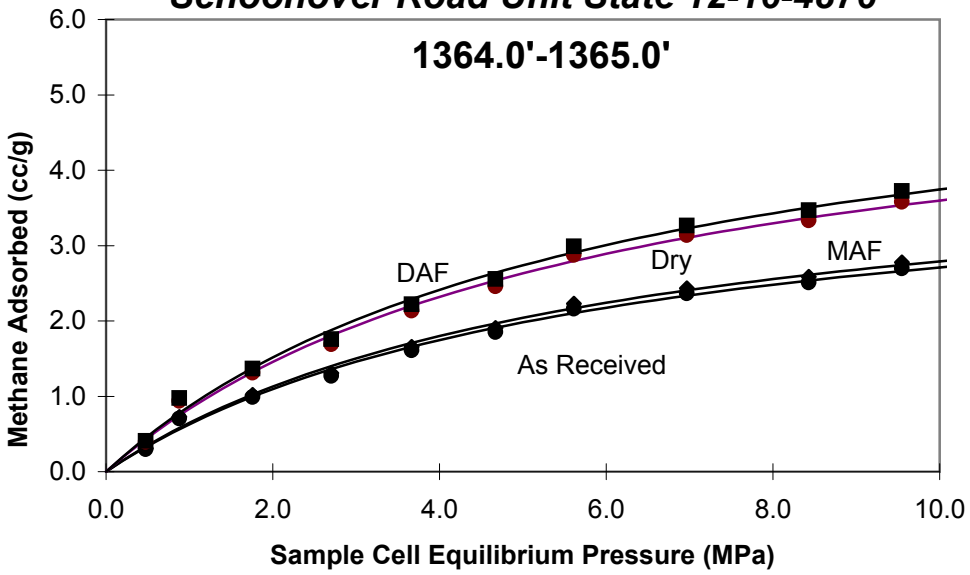
% Ash= 2.92 **% Moisture= 24.72**

SUMMARY OF ADSORPTION ANALYSES

IMPERIAL UNITS

Barrett Resources Corporation

Schoonover Road Unit State 12-16-4876



Pressure	Adsorbed Methane (cc/g)			
(MPa)	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
0.48	0.30	0.39	0.30	0.41
0.88	0.71	0.94	0.73	0.97
1.76	0.99	1.31	1.02	1.37
2.70	1.27	1.69	1.31	1.76
3.66	1.61	2.13	1.66	2.22
4.67	1.85	2.46	1.91	2.56
5.61	2.16	2.87	2.23	2.99
6.97	2.36	3.14	2.43	3.27
8.43	2.51	3.33	2.59	3.47
9.55	2.70	3.58	2.78	3.73

Langmuir Parameters

	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
Vol. (cc/g)	4.28	5.69	4.41	5.92
Pressure (MPa)	5.81	5.81	5.81	5.81

Isotherm Temperature: **24.5 ºC**

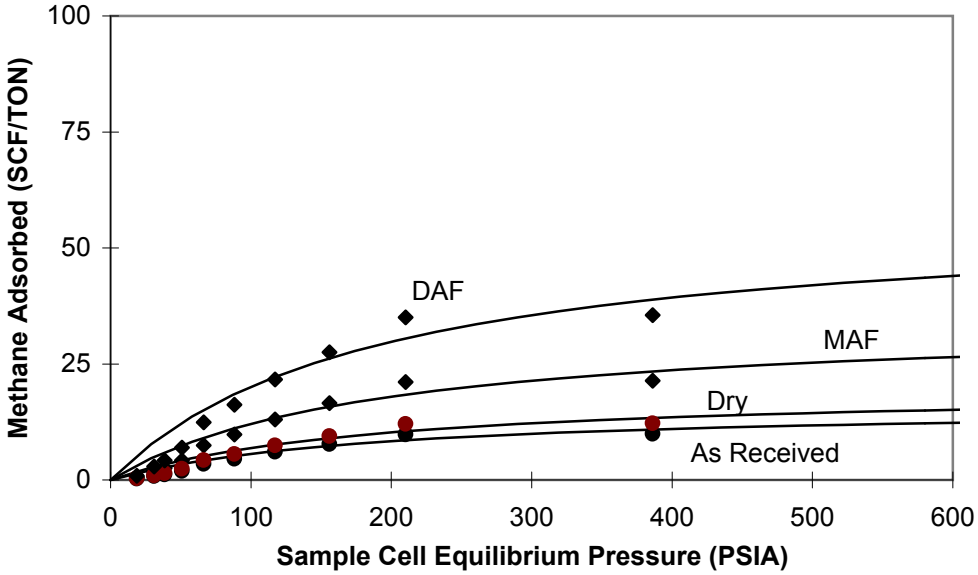
Goodness of fit of Langmuir regression: **0.97**

% Ash= 2.92 **% Moisture = 24.72**

SUMMARY OF ADSORPTION ANALYSES
INTERNATIONAL SYSTEM UNITS

Rim Operating, Inc.

CBM H 11-04 220.0'-221.0'



Pressure (PSIA)	Adsorbed Methane (ft^3/ton)			
	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
19	0.26	0.32	0.55	0.92
31	0.81	1.00	1.74	2.90
39	1.18	1.45	2.55	4.23
51	1.95	2.39	4.19	6.96
66	3.47	4.26	7.47	12.41
88	4.54	5.57	9.76	16.22
117	6.06	7.44	13.04	21.66
156	7.71	9.46	16.58	27.55
210	9.81	12.05	21.10	35.06
386	9.95	12.21	21.39	35.54

Langmuir Parameters

	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
Vol. (ft^3/ton)	16	20	35	58
Pressure (PSIA)	187	187	187	187

Isotherm Temperature: 65 ºF

Goodness of fit of Langmuir regression: 0.77

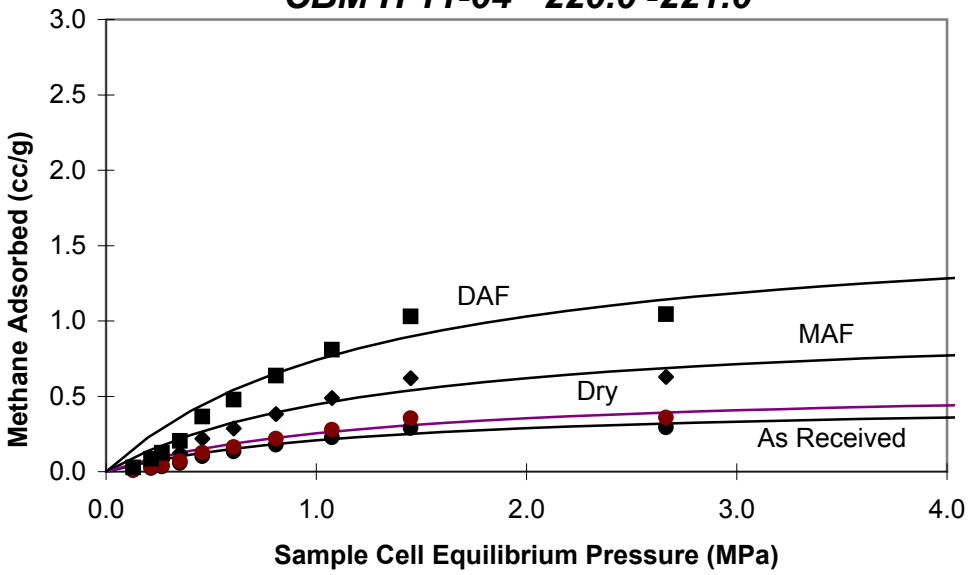
% Ash= 53.49 % Moisture= 18.52

SUMMARY OF ADSORPTION ANALYSES

IMPERIAL UNITS

Rim Operating, Inc.

CBM H 11-04 220.0'-221.0'



Pressure	Adsorbed Methane (cc/g)			
(MPa)	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
0.13	0.01	0.01	0.02	0.03
0.21	0.02	0.03	0.05	0.09
0.27	0.03	0.04	0.07	0.12
0.35	0.06	0.07	0.12	0.20
0.46	0.10	0.13	0.22	0.36
0.61	0.13	0.16	0.29	0.48
0.81	0.18	0.22	0.38	0.64
1.07	0.23	0.28	0.49	0.81
1.45	0.29	0.35	0.62	1.03
2.66	0.29	0.36	0.63	1.04

Langmuir Parameters

	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
Vol. (cc/g)	0.47	0.58	1.02	1.70
Pressure (MPa)	1.29	1.29	1.29	1.29

Isotherm Temperature: **18.3 ºC**

Goodness of fit of Langmuir regression: **0.77**

% Ash= **53.49** **% Moisture =** **18.52**

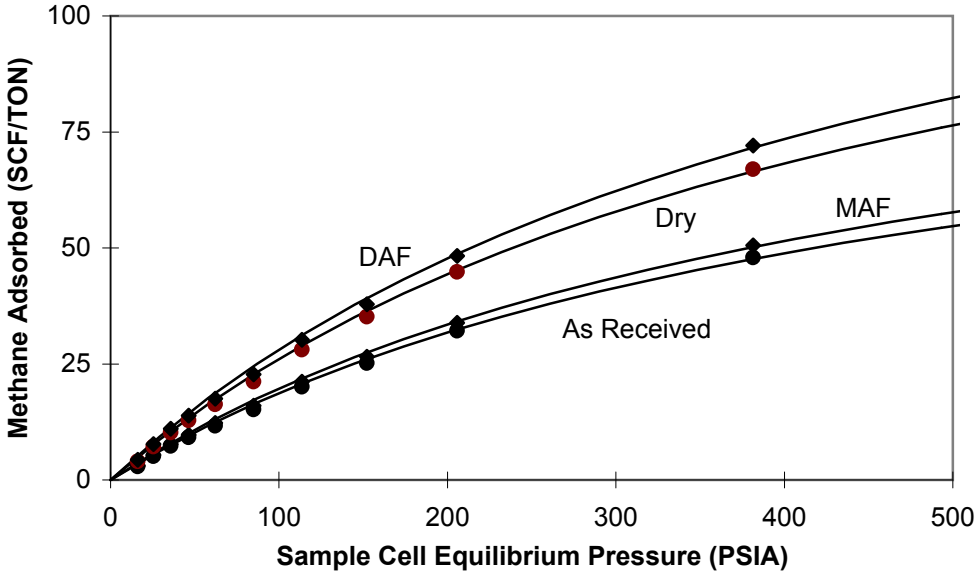
SUMMARY OF ADSORPTION ANALYSES

INTERNATIONAL SYSTEM UNITS

Core Hole 13

Rim Operating, Inc.

CBM H 11-04 278.0'-280.0'



Pressure (PSIA)	Adsorbed Methane (ft^3/ton)			
	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
16	2.88	4.02	3.03	4.33
25	5.12	7.15	5.40	7.70
36	7.32	10.21	7.71	11.00
46	9.20	12.85	9.70	13.84
62	11.63	16.24	12.26	17.49
85	15.15	21.16	15.97	22.79
114	20.10	28.07	21.19	30.23
152	25.19	35.18	26.55	37.88
206	32.12	44.85	33.85	48.30
381	47.94	66.93	50.52	72.08

Langmuir Parameters

	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
Vol. (ft^3/ton)	106	147	111	159
Pressure (PSIA)	465	465	465	465

Isotherm Temperature: 65 ºF

Goodness of fit of Langmuir regression: 0.98

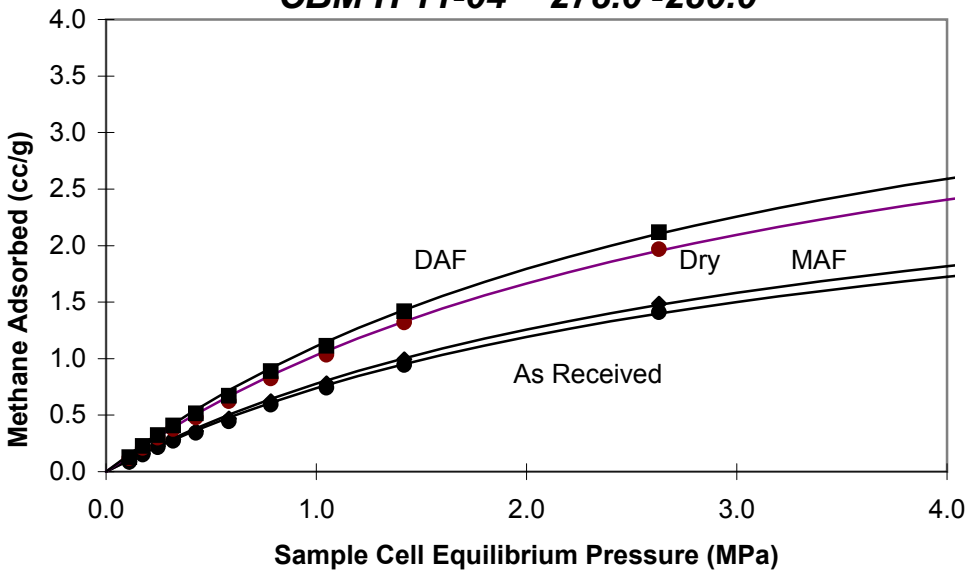
% Ash= 5.12 % Moisture= 28.38

SUMMARY OF ADSORPTION ANALYSES

IMPERIAL UNITS

Rim Operating, Inc.

CBM H 11-04 278.0'-280.0'



Pressure	Adsorbed Methane (cc/g)			
(MPa)	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
0.11	0.08	0.12	0.09	0.13
0.18	0.15	0.21	0.16	0.23
0.25	0.21	0.30	0.23	0.32
0.32	0.27	0.38	0.29	0.41
0.43	0.34	0.48	0.36	0.51
0.58	0.45	0.62	0.47	0.67
0.78	0.59	0.82	0.62	0.89
1.05	0.74	1.03	0.78	1.11
1.42	0.94	1.32	0.99	1.42
2.63	1.41	1.97	1.48	2.12

Langmuir Parameters

	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
Vol. (cc/g)	3.10	4.33	3.27	4.67
Pressure (MPa)	3.21	3.21	3.21	3.21

Isotherm Temperature: **18.3 ºC**

Goodness of fit of Langmuir regression: **0.98**

% Ash= **5.12** **% Moisture =** **28.38**

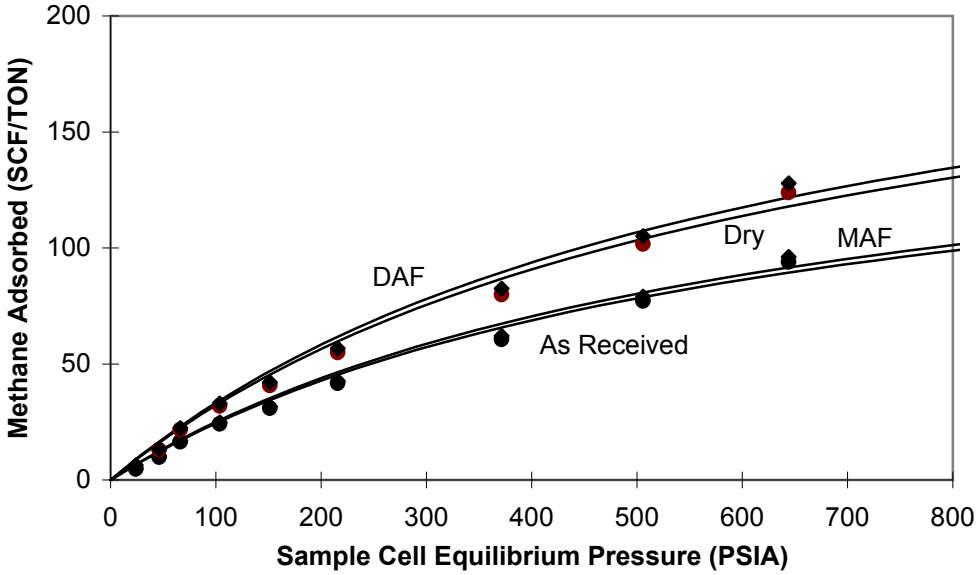
SUMMARY OF ADSORPTION ANALYSES

INTERNATIONAL SYSTEM UNITS

Core Hole 13

Rim Operating, Inc.

CBM C 33-1R Canister 36 311.0'-313.0'



Pressure (PSIA)	Adsorbed Methane (ft^3/ton)			
	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
24	4.66	6.15	4.77	6.35
46	9.81	12.94	10.06	13.37
66	16.43	21.67	16.83	22.38
103	24.19	31.91	24.79	32.95
151	30.86	40.71	31.63	42.04
216	41.65	54.93	42.68	56.74
372	60.57	79.89	62.07	82.51
506	77.12	101.71	79.02	105.05
644	93.86	123.80	96.18	127.86

Langmuir Parameters

	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
Vol. (ft^3/ton)	175	231	179	238
Pressure (PSIA)	617	617	617	617

Isotherm Temperature: **65 ºF**

Goodness of fit of Langmuir regression: **0.95**

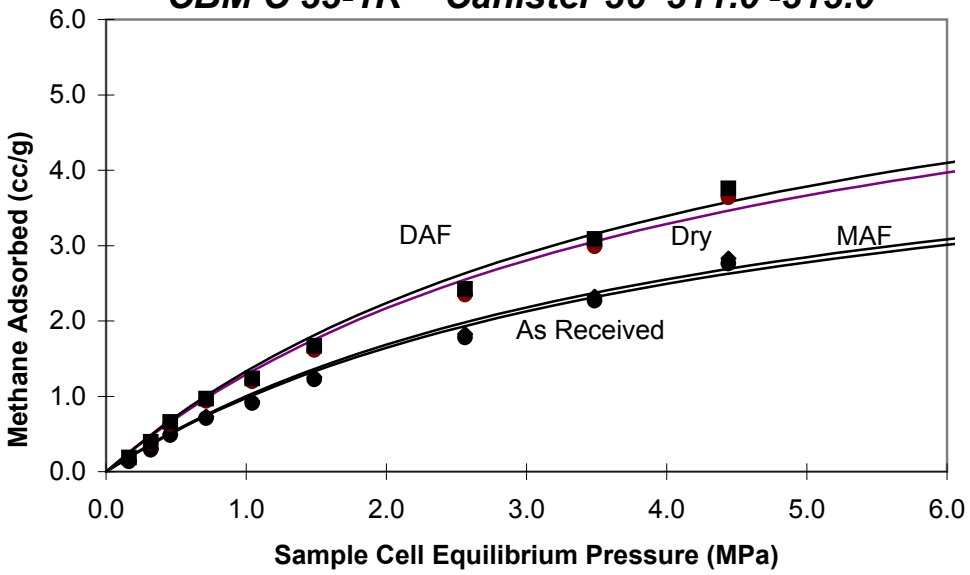
% Ash= **2.41** **% Moisture=** **24.18**

SUMMARY OF ADSORPTION ANALYSES

IMPERIAL UNITS

Rim Operating, Inc.

CBM C 33-1R Canister 36 311.0'-313.0'



Pressure	Adsorbed Methane (cc/g)			
(MPa)	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
0.17	0.14	0.18	0.14	0.19
0.32	0.29	0.38	0.30	0.39
0.46	0.48	0.64	0.49	0.66
0.71	0.71	0.94	0.73	0.97
1.04	0.91	1.20	0.93	1.24
1.49	1.22	1.61	1.25	1.67
2.56	1.78	2.35	1.82	2.42
3.49	2.27	2.99	2.32	3.09
4.44	2.76	3.64	2.83	3.76

Langmuir Parameters

	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
Vol. (cc/g)	5.14	6.78	5.27	7.01
Pressure (MPa)	4.26	4.26	4.26	4.26

Isotherm Temperature: **18.3 ºC**

Goodness of fit of Langmuir regression: **0.95**

% Ash= **2.41** **% Moisture =** **24.18**

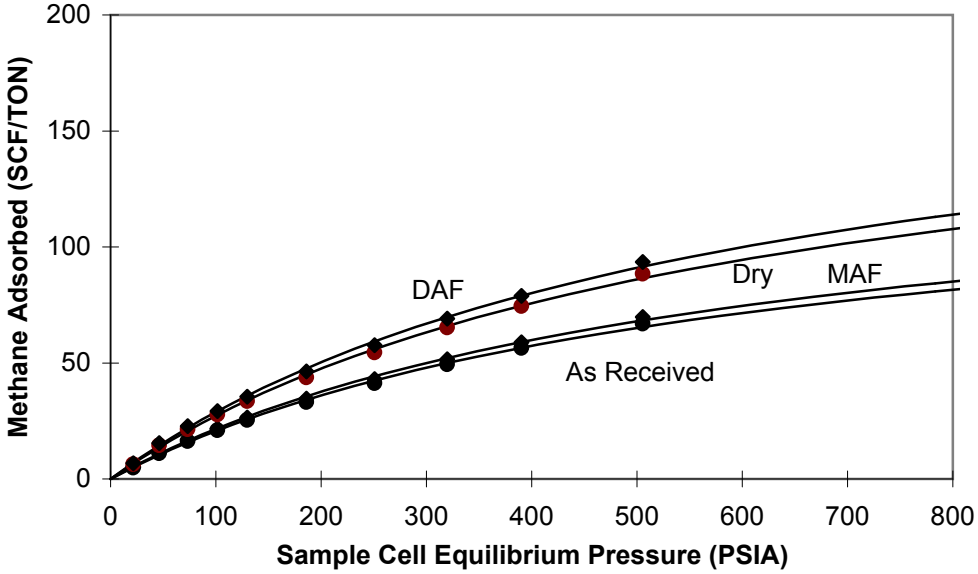
SUMMARY OF ADSORPTION ANALYSES

INTERNATIONAL SYSTEM UNITS

Core Hole 14

Peabody Natural Gas, LLC.

PNG 34-1 Canister B14 286.0'-288.0'



Pressure (PSIA)	Adsorbed Methane (ft^3/ton)			
	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
21	4.85	6.41	5.06	6.78
46	11.02	14.55	11.50	15.40
73	16.24	21.44	16.95	22.69
101	20.95	27.66	21.86	29.27
130	25.41	33.56	26.52	35.52
186	33.16	43.78	34.60	46.33
251	41.23	54.45	43.03	57.62
320	49.41	65.24	51.56	69.04
390	56.46	74.55	58.91	78.89

Langmuir Parameters

	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
Vol. (ft^3/ton)	141	186	147	197
Pressure (PSIA)	583	583	583	583

Isotherm Temperature: 60 ºF

Goodness of fit of Langmuir regression: 0.98

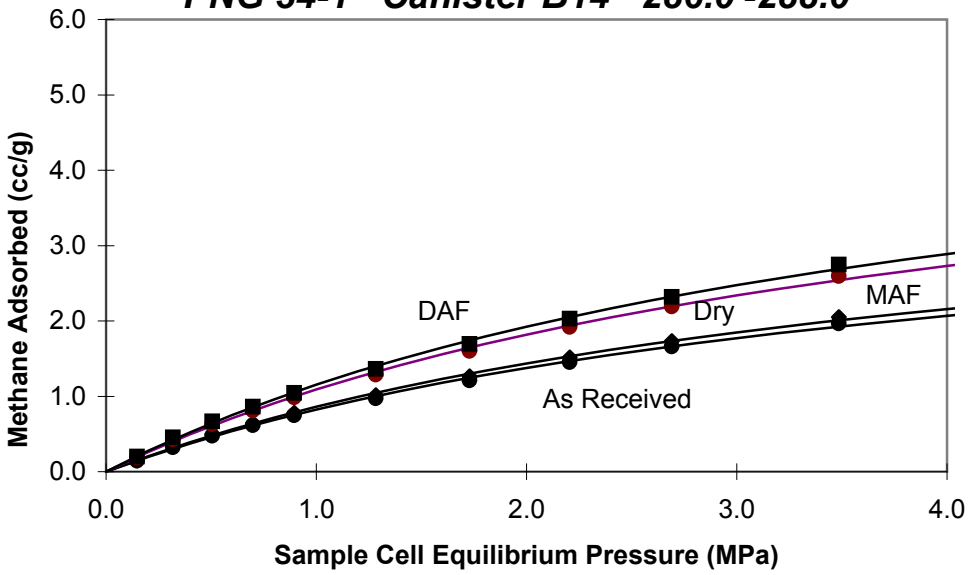
% Ash= 4.17 % Moisture= 24.27

SUMMARY OF ADSORPTION ANALYSES

IMPERIAL UNITS

Peabody Natural Gas, LLC.

PNG 34-1 Canister B14 286.0'-288.0'



Pressure	Adsorbed Methane (cc/g)			
(MPa)	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
0.15	0.14	0.19	0.15	0.20
0.32	0.32	0.43	0.34	0.45
0.51	0.48	0.63	0.50	0.67
0.70	0.62	0.81	0.64	0.86
0.90	0.75	0.99	0.78	1.04
1.28	0.97	1.29	1.02	1.36
1.73	1.21	1.60	1.26	1.69
2.21	1.45	1.92	1.52	2.03
2.69	1.66	2.19	1.73	2.32
3.49	1.97	2.60	2.05	2.75

Langmuir Parameters

	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
Vol. (cc/g)	4.14	5.47	4.32	5.79
Pressure (MPa)	4.02	4.02	4.02	4.02

Isotherm Temperature: **15.6 ºC**

Goodness of fit of Langmuir regression: **0.98**

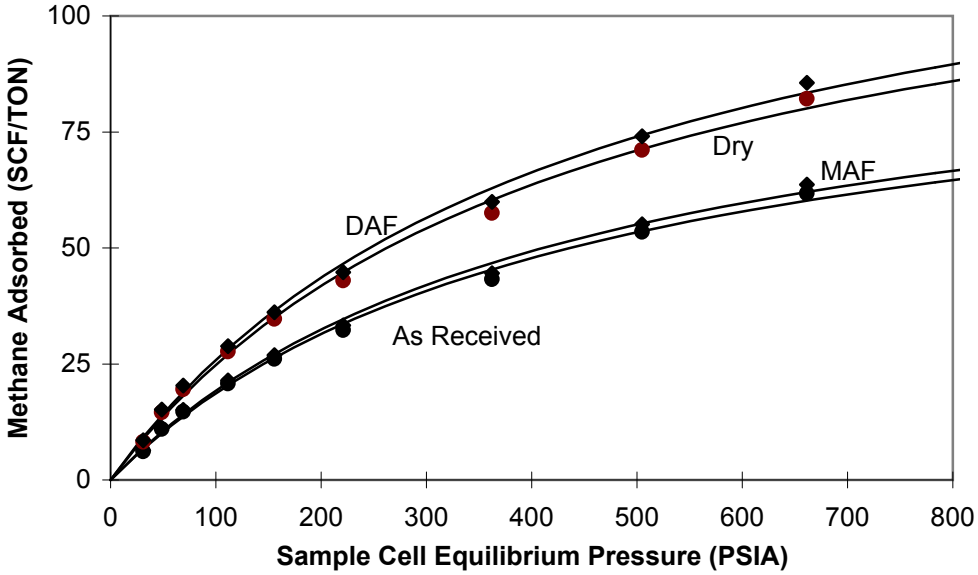
% Ash= 4.17 **% Moisture = 24.27**

SUMMARY OF ADSORPTION ANALYSES
INTERNATIONAL SYSTEM UNITS

Core Hole 15

Peabody Natural Gas, LLC.

PNG 34-1 Canister B22 303.0'-305.0'



Pressure (PSIA)	Adsorbed Methane (ft^3/ton)			
	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
31	6.16	8.20	6.36	8.55
49	10.93	14.55	11.27	15.16
69	14.68	19.53	15.13	20.35
111	20.78	27.65	21.43	28.81
156	26.06	34.68	26.88	36.13
221	32.30	42.98	33.31	44.78
362	43.23	57.52	44.57	59.93
505	53.44	71.11	55.10	74.08
661	61.75	82.16	63.67	85.60

Langmuir Parameters

	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
Vol. (ft^3/ton)	100	133	103	138
Pressure (PSIA)	433	433	433	433

Isotherm Temperature: 65 ºF

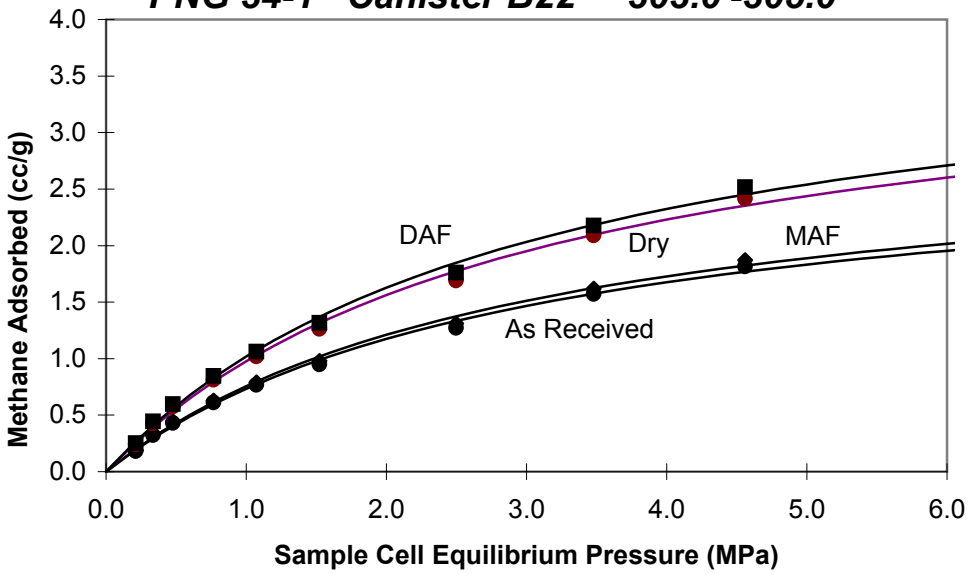
Goodness of fit of Langmuir regression: 0.98

% Ash= 3.02 % Moisture= 24.85

SUMMARY OF ADSORPTION ANALYSES
IMPERIAL UNITS

Peabody Natural Gas, LLC.

PNG 34-1 Canister B22 303.0'-305.0'



Pressure	Adsorbed Methane (cc/g)			
(MPa)	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
0.21	0.18	0.24	0.19	0.25
0.33	0.32	0.43	0.33	0.45
0.48	0.43	0.57	0.44	0.60
0.77	0.61	0.81	0.63	0.85
1.07	0.77	1.02	0.79	1.06
1.52	0.95	1.26	0.98	1.32
2.50	1.27	1.69	1.31	1.76
3.48	1.57	2.09	1.62	2.18
4.56	1.81	2.41	1.87	2.52

Langmuir Parameters

	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
Vol. (cc/g)	2.93	3.90	3.02	4.06
Pressure (MPa)	2.99	2.99	2.99	2.99

Isotherm Temperature: 18.3 ºC

Goodness of fit of Langmuir regression: 0.98

% Ash= 3.02 % Moisture = 24.85

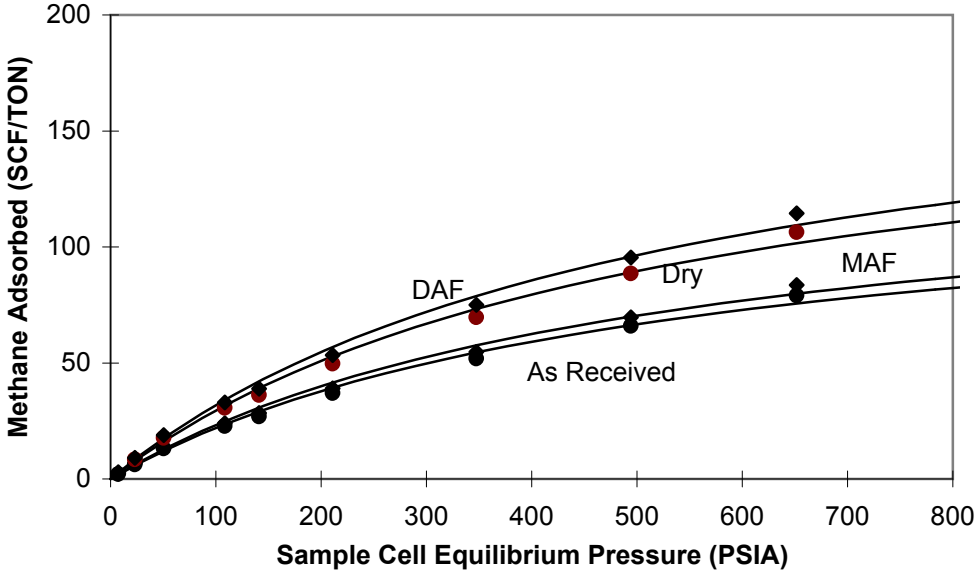
SUMMARY OF ADSORPTION ANALYSES

INTERNATIONAL SYSTEM UNITS

Core Hole 15

Peabody Natural Gas, LLC.

PNG 33-1 Canister C17 328.0'-330.0'



Pressure (PSIA)	Adsorbed Methane (ft^3/ton)			
	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
7	2.04	2.74	2.15	2.95
23	6.26	8.41	6.61	9.06
50	13.10	17.61	13.84	18.96
108	22.76	30.59	24.04	32.94
141	26.91	36.17	28.42	38.95
211	36.92	49.62	38.99	53.44
347	51.86	69.69	54.77	75.05
494	65.94	88.62	69.64	95.43
652	79.09	106.28	83.52	114.45

Langmuir Parameters

	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
Vol. (ft^3/ton)	135	182	143	196
Pressure (PSIA)	516	516	516	516

Isotherm Temperature: 65 ºF

Goodness of fit of Langmuir regression: 0.96

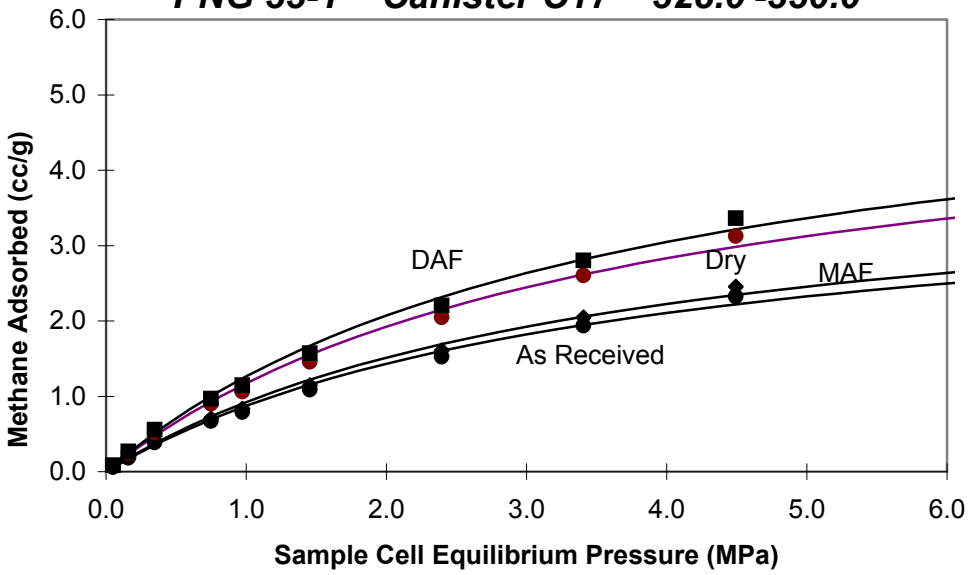
% Ash= 5.31 % Moisture= 25.59

SUMMARY OF ADSORPTION ANALYSES

IMPERIAL UNITS

Peabody Natural Gas, LLC.

PNG 33-1 Canister C17 328.0'-330.0'



Pressure	Adsorbed Methane (cc/g)			
(MPa)	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
0.05	0.06	0.08	0.06	0.09
0.16	0.18	0.25	0.19	0.27
0.35	0.39	0.52	0.41	0.56
0.75	0.67	0.90	0.71	0.97
0.97	0.79	1.06	0.84	1.14
1.46	1.09	1.46	1.15	1.57
2.39	1.52	2.05	1.61	2.21
3.41	1.94	2.60	2.05	2.80
4.49	2.32	3.12	2.45	3.36

Langmuir Parameters

	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
Vol. (cc/g)	3.98	5.35	4.20	5.76
Pressure (MPa)	3.55	3.55	3.55	3.55

Isotherm Temperature: **18.3 ºC**

Goodness of fit of Langmuir regression: **0.96**

% Ash= 5.31 **% Moisture = 25.59**

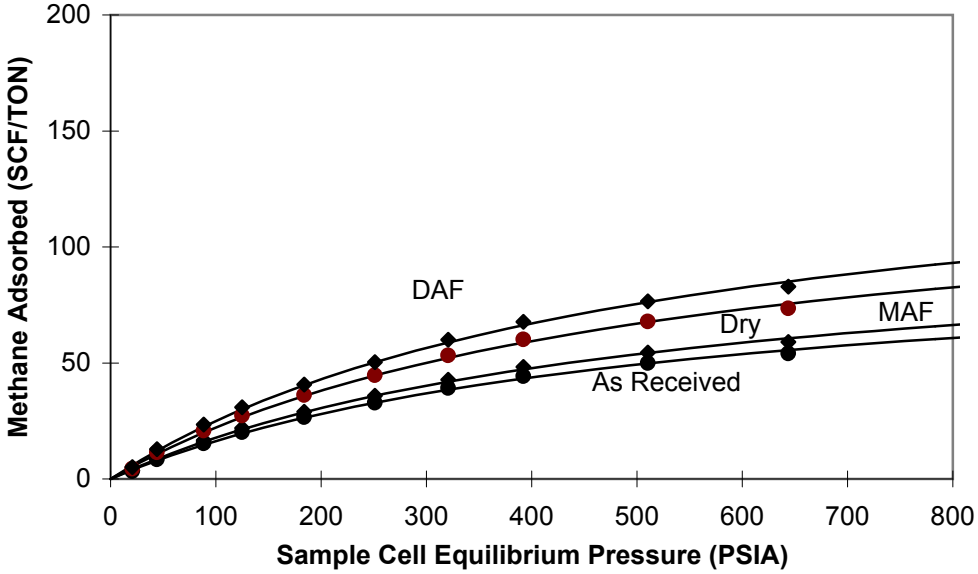
SUMMARY OF ADSORPTION ANALYSES

INTERNATIONAL SYSTEM UNITS

Core Hole 16

Peabody Natural Gas, LLC.

PNG 35-1 Canister 71 397.0'-399.0'



Pressure (PSIA)	Adsorbed Methane (ft^3/ton)			
	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
21	3.30	4.48	3.60	5.05
44	8.41	11.41	9.17	12.87
88	15.34	20.83	16.73	23.49
125	20.15	27.36	21.98	30.85
184	26.60	36.12	29.02	40.73
251	32.89	44.67	35.89	50.37
321	39.21	53.24	42.77	60.04
392	44.24	60.07	48.26	67.74
510	49.95	67.83	54.49	76.49

Langmuir Parameters

	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
Vol. (ft^3/ton)	100	135	109	153
Pressure (PSIA)	511	511	511	511

Isotherm Temperature: 60 ºF

Goodness of fit of Langmuir regression: 0.97

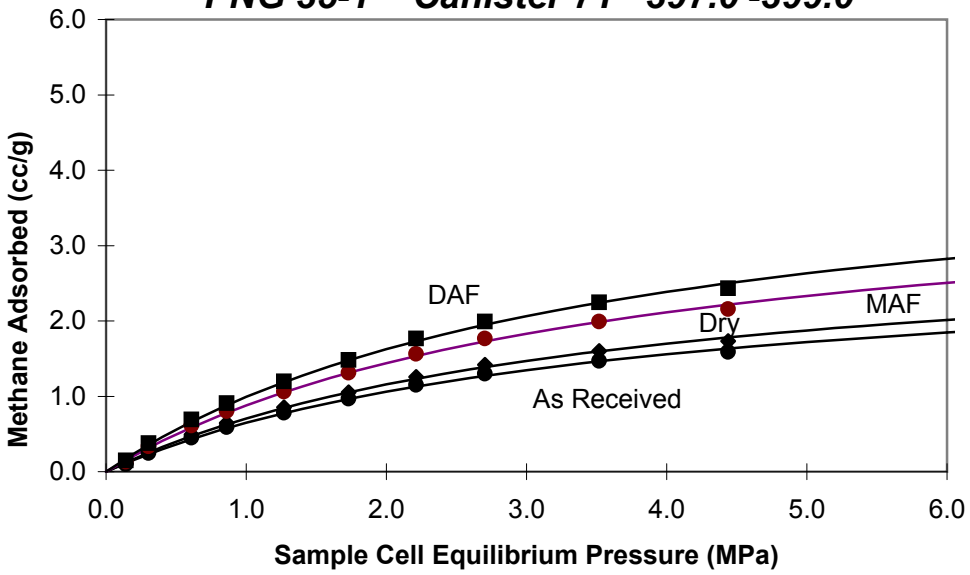
% Ash= 8.34 % Moisture= 26.36

SUMMARY OF ADSORPTION ANALYSES

IMPERIAL UNITS

Peabody Natural Gas, LLC.

PNG 35-1 Canister 71 397.0'-399.0'



Pressure	Adsorbed Methane (cc/g)			
(MPa)	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
0.14	0.10	0.13	0.11	0.15
0.30	0.25	0.34	0.27	0.38
0.61	0.45	0.61	0.49	0.69
0.86	0.59	0.80	0.65	0.91
1.27	0.78	1.06	0.85	1.20
1.73	0.97	1.31	1.05	1.48
2.21	1.15	1.56	1.26	1.76
2.70	1.30	1.77	1.42	1.99
3.52	1.47	1.99	1.60	2.25
4.44	1.59	2.16	1.73	2.43

Langmuir Parameters

	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
Vol. (cc/g)	2.93	3.98	3.19	4.48
Pressure (MPa)	3.52	3.52	3.52	3.52

Isotherm Temperature: **15.5 ºC**

Goodness of fit of Langmuir regression: **0.97**

% Ash= 8.34 **% Moisture = 26.36**

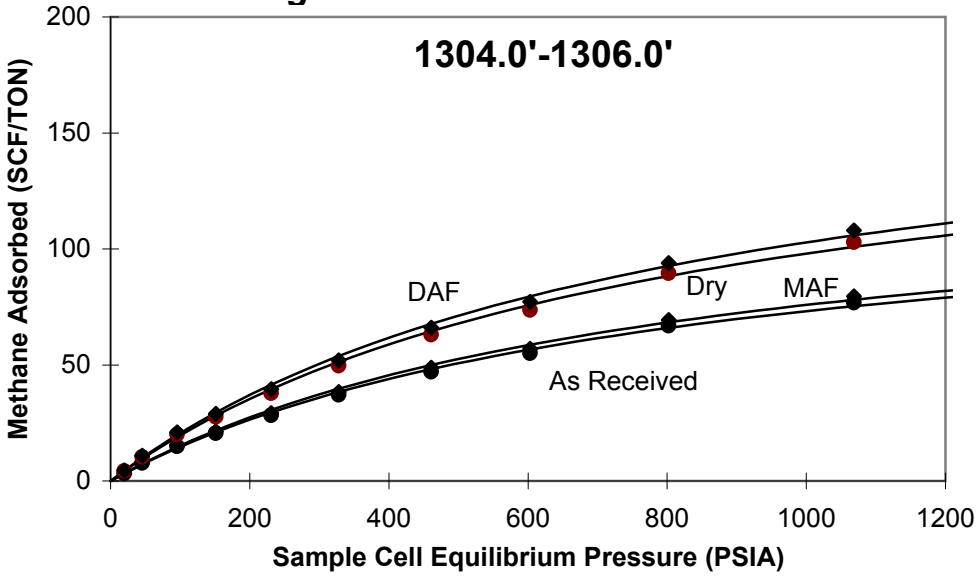
SUMMARY OF ADSORPTION ANALYSES

INTERNATIONAL SYSTEM UNITS

Core Hole 18

Barrett Resources Corporation

All Night Creek Unit Iberlin 21-33-4374



Pressure (PSIA)	Adsorbed Methane (ft^3/ton)			
	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
20	3.22	4.31	3.33	4.52
46	7.76	10.39	8.04	10.90
96	14.90	19.94	15.44	20.92
151	20.58	27.55	21.33	28.90
231	28.22	37.78	29.24	39.63
328	37.04	49.59	38.39	52.03
461	47.08	63.03	48.79	66.13
603	55.03	73.67	57.03	77.29
802	66.92	89.58	69.34	93.99
1068	76.86	102.89	79.65	107.95

Langmuir Parameters

	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
Vol. (ft3/ton)	132	176	136	185
Pressure (PSIA)	797	797	797	797

Isotherm Temperature: **75 ºF**

Goodness of fit of Langmuir regression: **0.99**

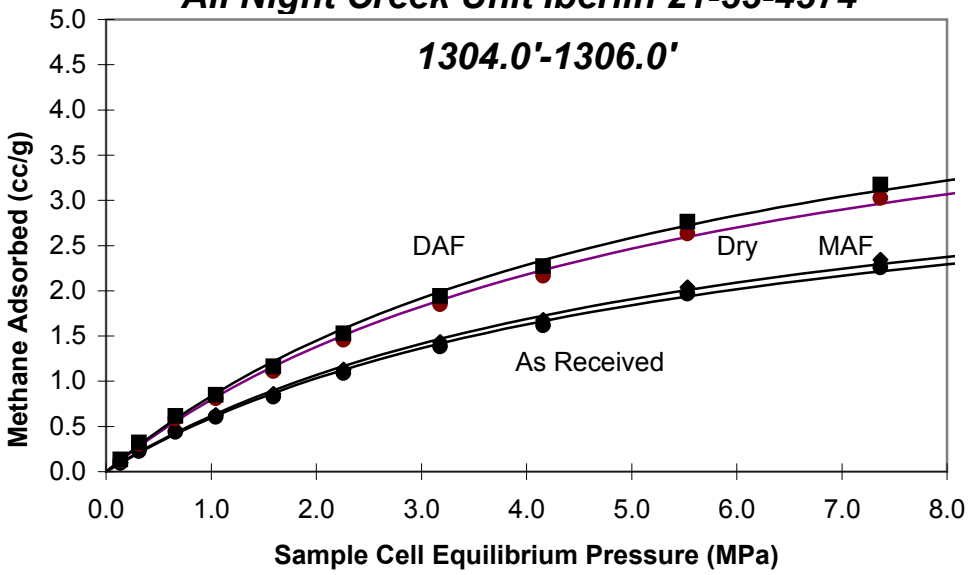
% Ash= **3.50** **% Moisture=** **25.30**

SUMMARY OF ADSORPTION ANALYSES

IMPERIAL UNITS

Barrett Resources Corporation

All Night Creek Unit Iberlin 21-33-4374



Pressure	Adsorbed Methane (cc/g)			
(MPa)	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
0.14	0.09	0.13	0.10	0.13
0.31	0.23	0.31	0.24	0.32
0.66	0.44	0.59	0.45	0.61
1.04	0.60	0.81	0.63	0.85
1.59	0.83	1.11	0.86	1.16
2.26	1.09	1.46	1.13	1.53
3.18	1.38	1.85	1.43	1.94
4.16	1.62	2.17	1.68	2.27
5.53	1.97	2.63	2.04	2.76
7.37	2.26	3.02	2.34	3.17

Langmuir Parameters

	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
Vol. (cc/g)	3.87	5.17	4.01	5.43
Pressure (MPa)	5.50	5.50	5.50	5.50

Isotherm Temperature: **23.9 ºC**

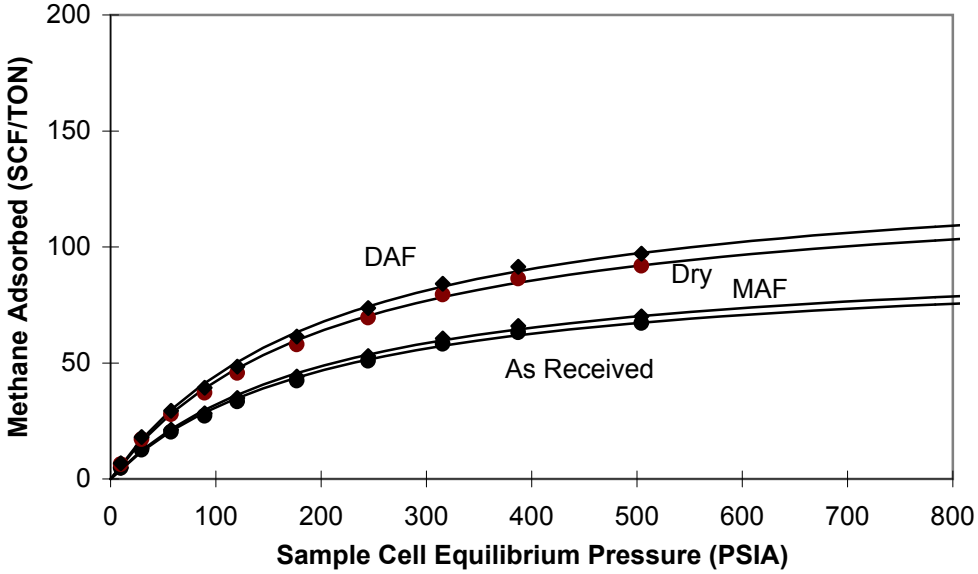
Goodness of fit of Langmuir regression: **0.99**

% Ash= 3.50 **% Moisture = 25.30**

SUMMARY OF ADSORPTION ANALYSES
INTERNATIONAL SYSTEM UNITS

Peabody Natural Gas, LLC.

PNG 16-2 Canister C26 251.0'-253.0'



Pressure (PSIA)	Adsorbed Methane (ft^3/ton)			
	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
10	4.64	6.35	4.84	6.72
30	12.52	17.11	13.05	18.11
57	20.34	27.79	21.19	29.41
89	27.17	37.13	28.31	39.30
120	33.43	45.68	34.84	48.35
177	42.40	57.94	44.18	61.32
245	50.89	69.54	53.03	73.60
316	58.17	79.49	60.62	84.13
387	63.22	86.39	65.88	91.43
504	67.18	91.80	70.00	97.16

Langmuir Parameters

	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
Vol. (ft^3/ton)	95	130	99	138
Pressure (PSIA)	208	208	208	208

Isotherm Temperature: 60 ºF

Goodness of fit of Langmuir regression: 0.99

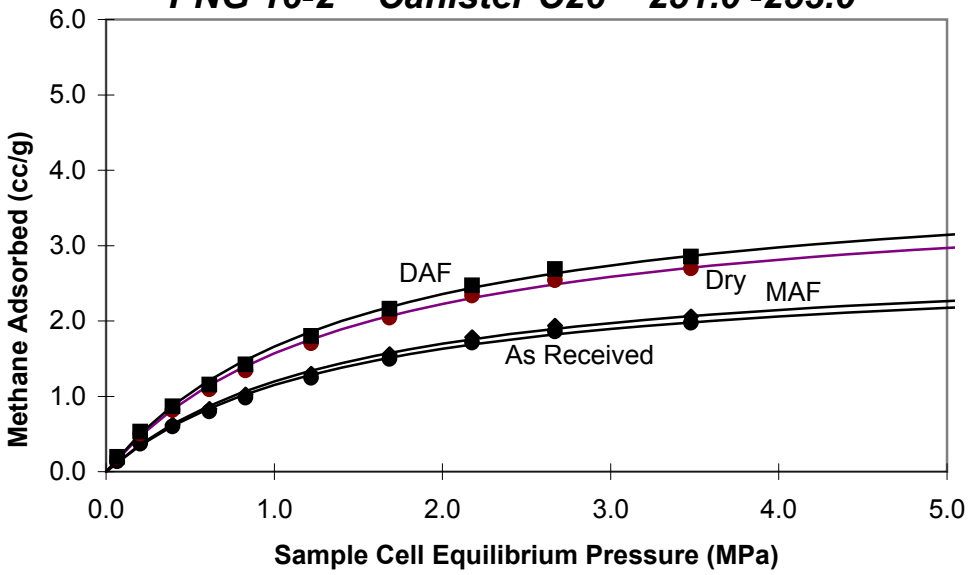
% Ash= 4.03 % Moisture= 26.82

SUMMARY OF ADSORPTION ANALYSES

IMPERIAL UNITS

Peabody Natural Gas, LLC.

PNG 16-2 Canister C26 251.0'-253.0'



Pressure	Adsorbed Methane (cc/g)			
(MPa)	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
0.07	0.14	0.19	0.14	0.20
0.20	0.37	0.50	0.38	0.53
0.40	0.60	0.82	0.62	0.86
0.62	0.80	1.09	0.83	1.15
0.83	0.98	1.34	1.02	1.42
1.22	1.25	1.70	1.30	1.80
1.69	1.50	2.04	1.56	2.16
2.18	1.71	2.34	1.78	2.47
2.67	1.86	2.54	1.94	2.69
3.48	1.97	2.70	2.06	2.86

Langmuir Parameters

	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
Vol. (cc/g)	2.80	3.82	2.91	4.04
Pressure (MPa)	1.43	1.43	1.43	1.43

Isotherm Temperature: 15.5 ºC

Goodness of fit of Langmuir regression: 0.99

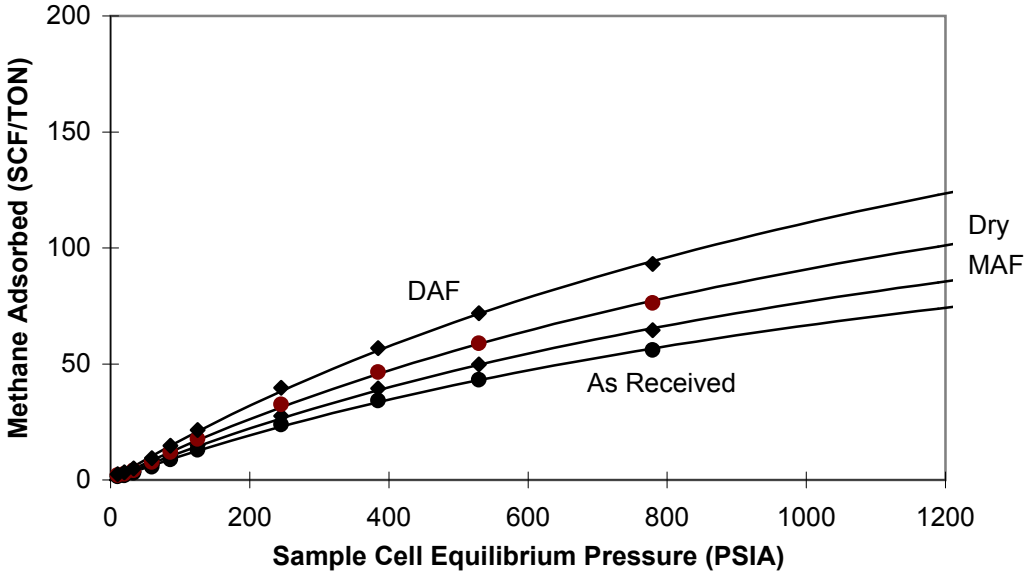
% Ash= 4.03 % Moisture = 26.82

SUMMARY OF ADSORPTION ANALYSES
INTERNATIONAL SYSTEM UNITS

Core Hole 20

The Coteau Properties Company

MC00250C Canister D21 173.0'-175.0'



Pressure (PSIA)	Adsorbed Methane (ft^3/ton)			
	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
10	1.48	2.02	1.71	2.46
20	1.95	2.66	2.25	3.24
33	3.02	4.11	3.48	5.02
59	5.66	7.71	6.53	9.42
86	8.83	12.03	10.18	14.69
125	12.91	17.60	14.89	21.48
245	23.91	32.59	27.58	39.79
385	34.15	46.54	39.38	56.82
530	43.17	58.83	49.78	71.83
779	55.94	76.23	64.50	93.07

Langmuir Parameters

	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
Vol. (ft^3/ton)	173	236	200	289
Pressure (PSIA)	1605	1605	1605	1605

Isotherm Temperature: **65 ºF**

Goodness of fit of Langmuir regression: **0.66**

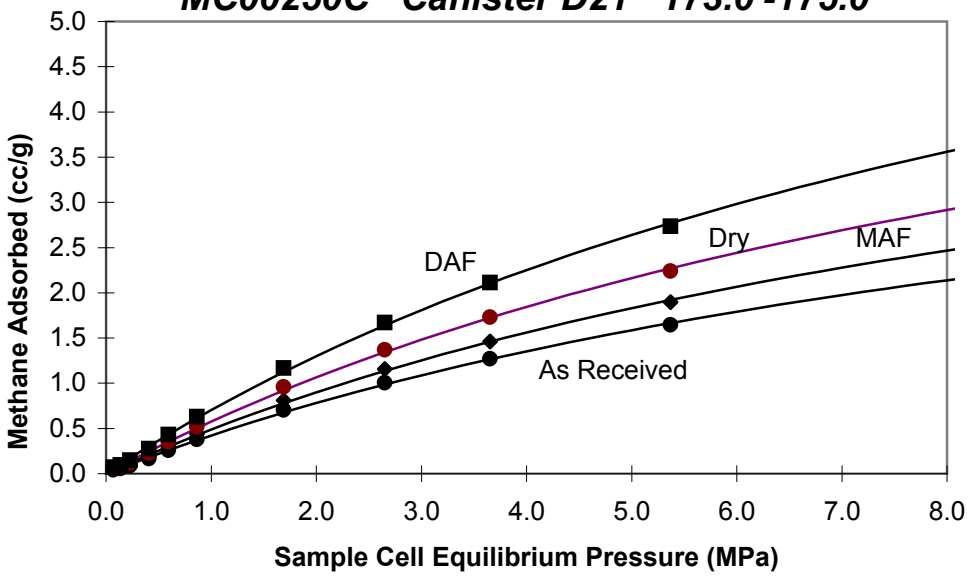
% Ash= 13.28 **% Moisture= 26.62**

SUMMARY OF ADSORPTION ANALYSES

IMPERIAL UNITS

The Coteau Properties Company

MC00250C Canister D21 173.0'-175.0'



Pressure	Adsorbed Methane (cc/g)			
(MPa)	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
0.07	0.04	0.06	0.05	0.07
0.14	0.06	0.08	0.07	0.10
0.23	0.09	0.12	0.10	0.15
0.41	0.17	0.23	0.19	0.28
0.59	0.26	0.35	0.30	0.43
0.86	0.38	0.52	0.44	0.63
1.69	0.70	0.96	0.81	1.17
2.65	1.00	1.37	1.16	1.67
3.65	1.27	1.73	1.46	2.11
5.37	1.64	2.24	1.90	2.74

Langmuir Parameters

	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
Vol. (cc/g)	5.10	6.95	5.88	8.48
Pressure (MPa)	11.07	11.07	11.07	11.07

Isotherm Temperature: 18.2 ºC

Goodness of fit of Langmuir regression: 0.66

% Ash= 13.28 % Moisture = 26.62

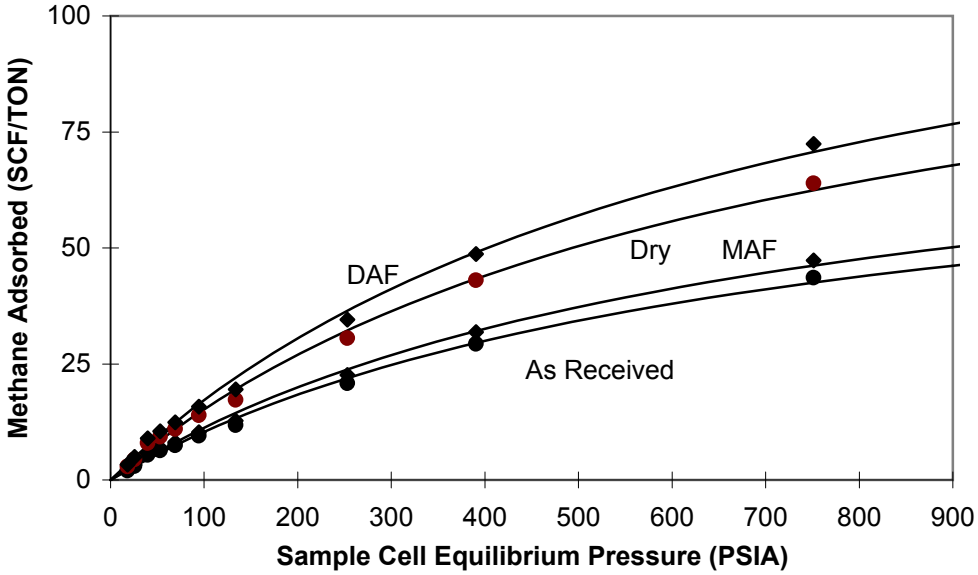
SUMMARY OF ADSORPTION ANALYSES

INTERNATIONAL SYSTEM UNITS

Core Hole 21

The Coteau Properties Company

MC00251 Canister D28 794.0'-796.0'



Pressure (PSIA)	Adsorbed Methane (ft^3/ton)			
	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
18	1.98	2.90	2.15	3.29
26	2.99	4.38	3.24	4.96
40	5.38	7.90	5.85	8.94
53	6.33	9.29	6.87	10.52
69	7.48	10.98	8.12	12.42
94	9.49	13.93	10.30	15.76
134	11.76	17.27	12.78	19.54
253	20.80	30.53	22.59	34.56
391	29.30	43.02	31.83	48.69
751	43.56	63.95	47.32	72.39

Langmuir Parameters

	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
Vol. (ft^3/ton)	81	119	88	135
Pressure (PSIA)	685	685	685	685

Isotherm Temperature: 65 ºF

Goodness of fit of Langmuir regression: 0.93

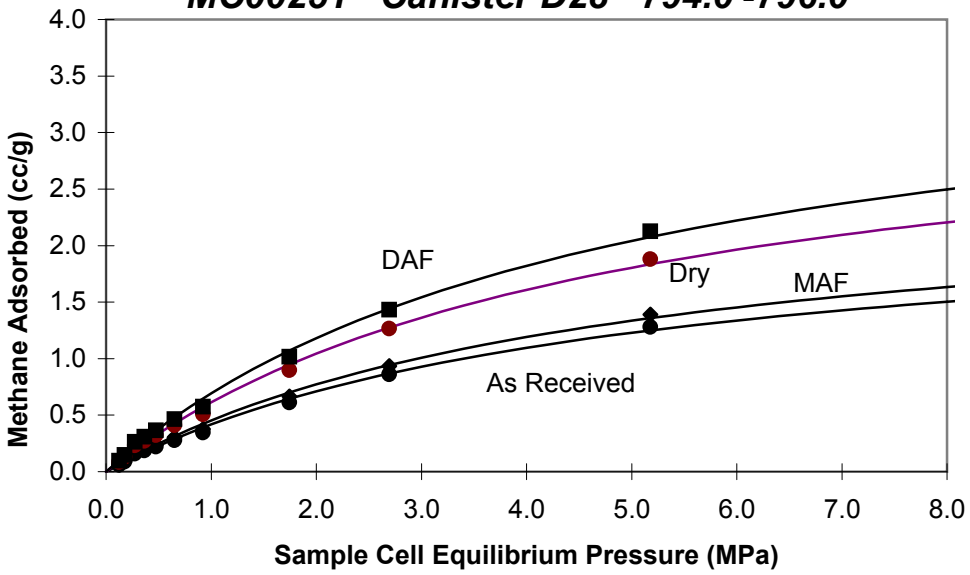
% Ash= 7.94 % Moisture= 31.88

SUMMARY OF ADSORPTION ANALYSES

IMPERIAL UNITS

The Coteau Properties Company

MC00251 Canister D28 794.0'-796.0'



Pressure	Adsorbed Methane (cc/g)			
(MPa)	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
0.12	0.06	0.09	0.06	0.10
0.18	0.09	0.13	0.10	0.15
0.27	0.16	0.23	0.17	0.26
0.37	0.19	0.27	0.20	0.31
0.48	0.22	0.32	0.24	0.37
0.65	0.28	0.41	0.30	0.46
0.92	0.35	0.51	0.38	0.57
1.74	0.61	0.90	0.66	1.02
2.69	0.86	1.26	0.94	1.43
5.18	1.28	1.88	1.39	2.13

Langmuir Parameters

	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
Vol. (cc/g)	2.39	3.51	2.60	3.97
Pressure (MPa)	4.72	4.72	4.72	4.72

Isotherm Temperature: **18.2 ºC**

Goodness of fit of Langmuir regression: **0.93**

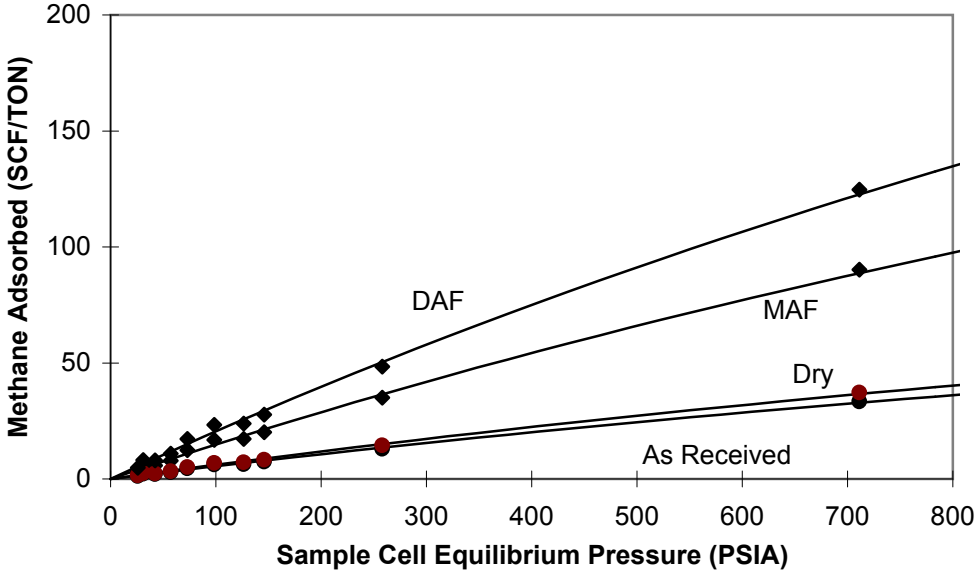
% Ash= 7.94 **% Moisture = 31.88**

SUMMARY OF ADSORPTION ANALYSES

INTERNATIONAL SYSTEM UNITS

Ammonite Energy Texas, Inc.

Thomas Jefferson State 36-3 355.5'-356.25'



Pressure (PSIA)	Adsorbed Methane (ft^3/ton)			
	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
26	1.31	1.46	3.53	4.88
31	2.19	2.44	5.92	8.18
42	2.13	2.37	5.75	7.95
57	2.92	3.26	7.89	10.91
73	4.62	5.15	12.47	17.24
98	6.25	6.96	16.87	23.31
126	6.40	7.13	17.28	23.89
146	7.44	8.29	20.10	27.79
258	12.97	14.45	35.02	48.41
711	33.39	37.20	90.17	124.63

Langmuir Parameters

	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
Vol. (ft^3/ton)	178	198	481	665
Pressure (PSIA)	3144	3144	3144	3144

Isotherm Temperature: **65 ºF**

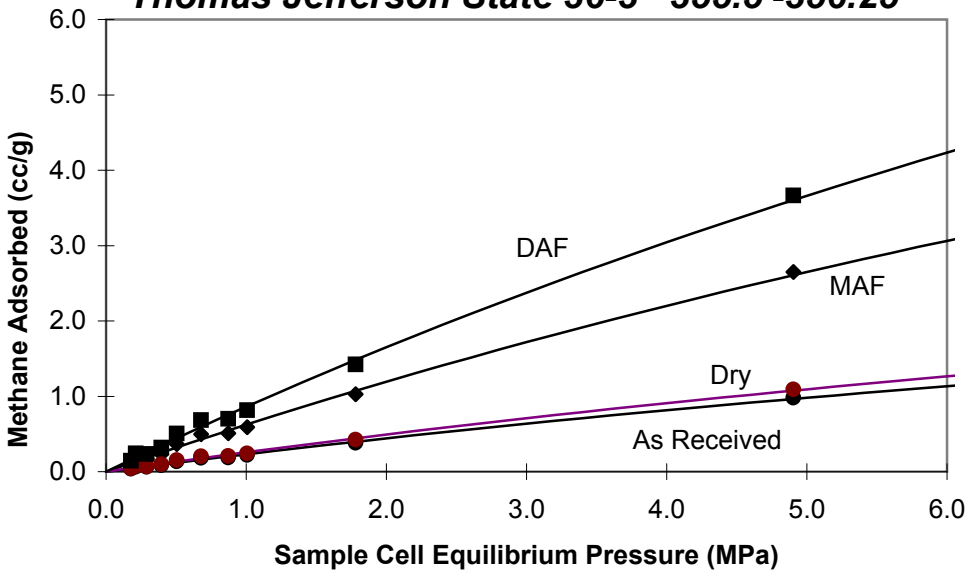
Goodness of fit of Langmuir regression: **0.24**

% Ash= 62.97 **% Moisture= 10.24**

SUMMARY OF ADSORPTION ANALYSES
IMPERIAL UNITS

Ammonite Energy Texas, Inc.

Thomas Jefferson State 36-3 355.5'-356.25'



Pressure	Adsorbed Methane (cc/g)			
(MPa)	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
0.18	0.04	0.04	0.10	0.14
0.21	0.06	0.07	0.17	0.24
0.29	0.06	0.07	0.17	0.23
0.39	0.09	0.10	0.23	0.32
0.50	0.14	0.15	0.37	0.51
0.68	0.18	0.20	0.50	0.69
0.87	0.19	0.21	0.51	0.70
1.01	0.22	0.24	0.59	0.82
1.78	0.38	0.42	1.03	1.42
4.90	0.98	1.09	2.65	3.66

Langmuir Parameters

	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
Vol. (cc/g)	5.23	5.83	14.13	19.53
Pressure (MPa)	21.68	21.68	21.68	21.68

Isotherm Temperature: **18.2 ºC**

Goodness of fit of Langmuir regression: **0.24**

% Ash= **62.97** **% Moisture =** **10.24**

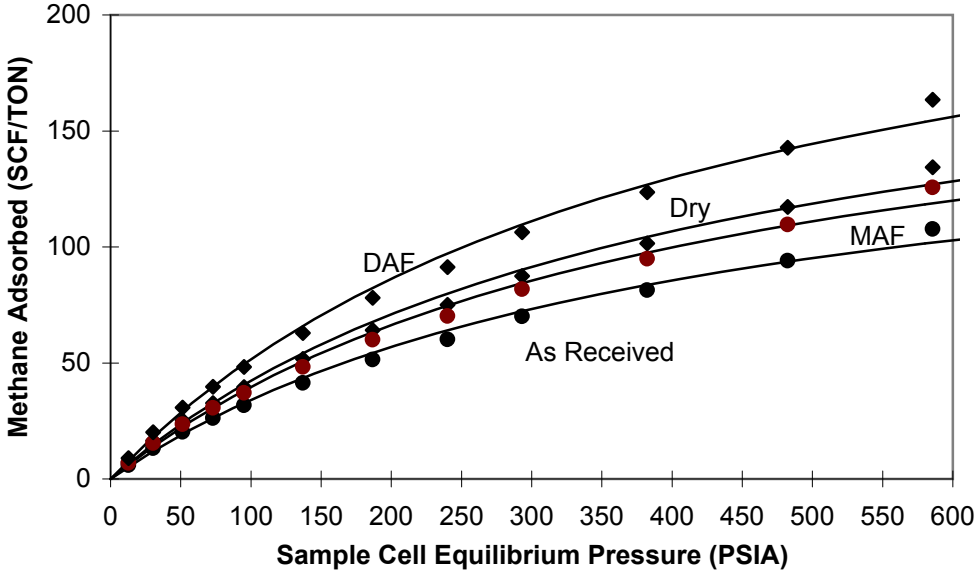
SUMMARY OF ADSORPTION ANALYSES

INTERNATIONAL SYSTEM UNITS

Core Hole 23

Bridger Coal Company

BCX-9 D13 949.0'-951.0'



Pressure (PSIA)	Adsorbed Methane (ft^3/ton)			
	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
13	5.88	6.86	7.34	8.93
30	13.27	15.48	16.55	20.14
51	20.23	23.60	25.23	30.69
73	26.21	30.58	32.69	39.78
95	31.78	37.07	39.63	48.22
137	41.42	48.32	51.66	62.85
187	51.40	59.97	64.11	78.00
240	60.17	70.19	75.04	91.30
293	70.08	81.76	87.41	106.35
382	81.40	94.97	101.53	123.53
482	94.04	109.71	117.29	142.70
586	107.67	125.61	134.29	163.39

Langmuir Parameters

	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
Vol. (ft^3/ton)	173	201	215	262
Pressure (PSIA)	407	407	407	407

Isotherm Temperature: 65 ºF

Goodness of fit of Langmuir regression: 0.97

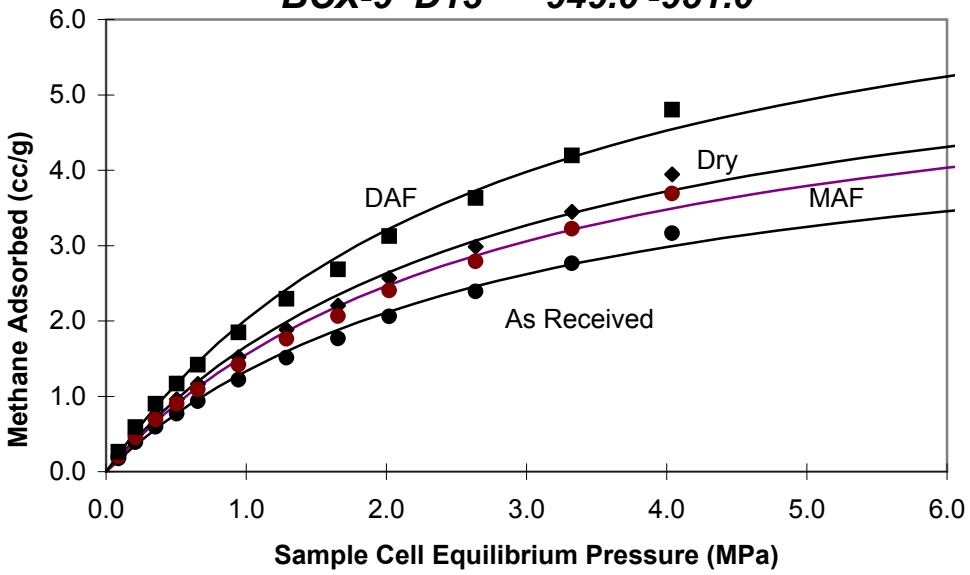
% Ash= 19.82 % Moisture= 14.28

SUMMARY OF ADSORPTION ANALYSES

IMPERIAL UNITS

Bridger Coal Company

BCX-9 D13 949.0'-951.0'



Pressure	Adsorbed Methane (cc/g)			
(MPa)	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
0.09	0.17	0.20	0.22	0.26
0.21	0.39	0.45	0.49	0.59
0.35	0.59	0.69	0.74	0.90
0.50	0.77	0.90	0.96	1.17
0.66	0.93	1.09	1.16	1.42
0.94	1.22	1.42	1.52	1.85
1.29	1.51	1.76	1.88	2.29
1.65	1.77	2.06	2.21	2.68
2.02	2.06	2.40	2.57	3.13
2.64	2.39	2.79	2.98	3.63
3.33	2.76	3.22	3.45	4.19
4.04	3.16	3.69	3.95	4.80

Langmuir Parameters

	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
Vol. (cc/g)	5.07	5.92	6.33	7.70
Pressure (MPa)	2.80	2.80	2.80	2.80

Isotherm Temperature: 18.3 ºC

Goodness of fit of Langmuir regression: 0.97

% Ash= 19.82 % Moisture = 14.28

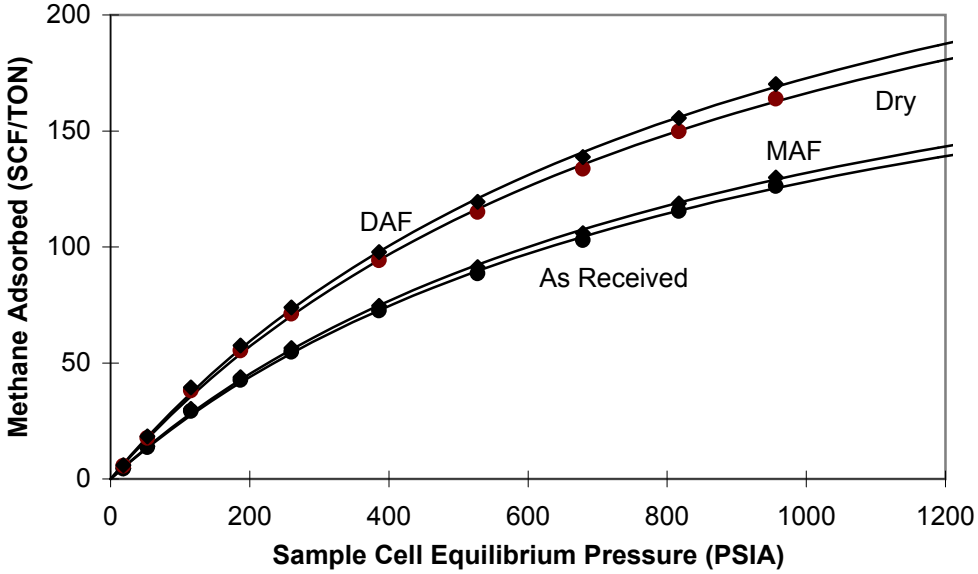
SUMMARY OF ADSORPTION ANALYSES

INTERNATIONAL SYSTEM UNITS

Core Hole 24

Barrett Resources Corporation

Harriett 41-34-4777 Canister D39 1221.0'-1223.0'



Pressure (PSIA)	Adsorbed Methane (ft^3/ton)			
	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
18	4.37	5.67	4.50	5.89
53	13.62	17.68	14.03	18.37
115	29.27	38.00	30.14	39.48
187	42.66	55.38	43.92	57.53
260	54.77	71.11	56.40	73.87
386	72.53	94.16	74.69	97.82
527	88.62	115.04	91.24	119.51
679	102.94	133.63	105.99	138.82
817	115.38	149.79	118.80	155.60
956	126.24	163.89	129.99	170.25

Langmuir Parameters

	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
Vol. (ft^3/ton)	246	319	253	331
Pressure (PSIA)	918	918	918	918

Isotherm Temperature: **77 ºF**

Goodness of fit of Langmuir regression: **0.99**

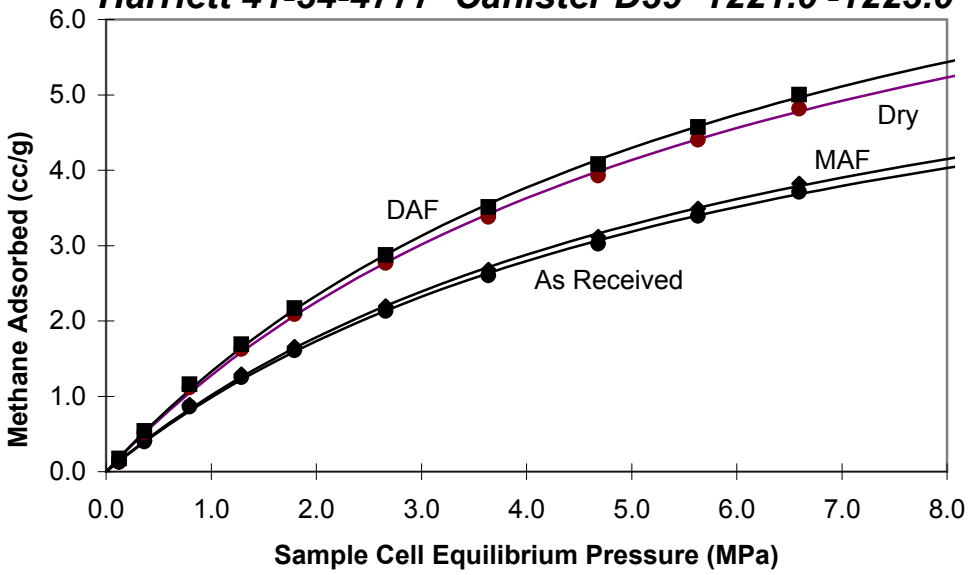
% Ash= 2.88 **% Moisture= 22.97**

SUMMARY OF ADSORPTION ANALYSES

IMPERIAL UNITS

Barrett Resources Corporation

Harriett 41-34-4777 Canister D39 1221.0'-1223.0'



Pressure	Adsorbed Methane (cc/g)			
(MPa)	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
0.13	0.13	0.17	0.13	0.17
0.37	0.40	0.52	0.41	0.54
0.80	0.86	1.12	0.89	1.16
1.29	1.25	1.63	1.29	1.69
1.79	1.61	2.09	1.66	2.17
2.66	2.13	2.77	2.19	2.87
3.64	2.60	3.38	2.68	3.51
4.68	3.03	3.93	3.11	4.08
5.63	3.39	4.40	3.49	4.57
6.59	3.71	4.82	3.82	5.00

Langmuir Parameters

	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
Vol. (cc/g)	7.22	9.37	7.43	9.74
Pressure (MPa)	6.33	6.33	6.33	6.33

Isotherm Temperature: **25.0 ºC**

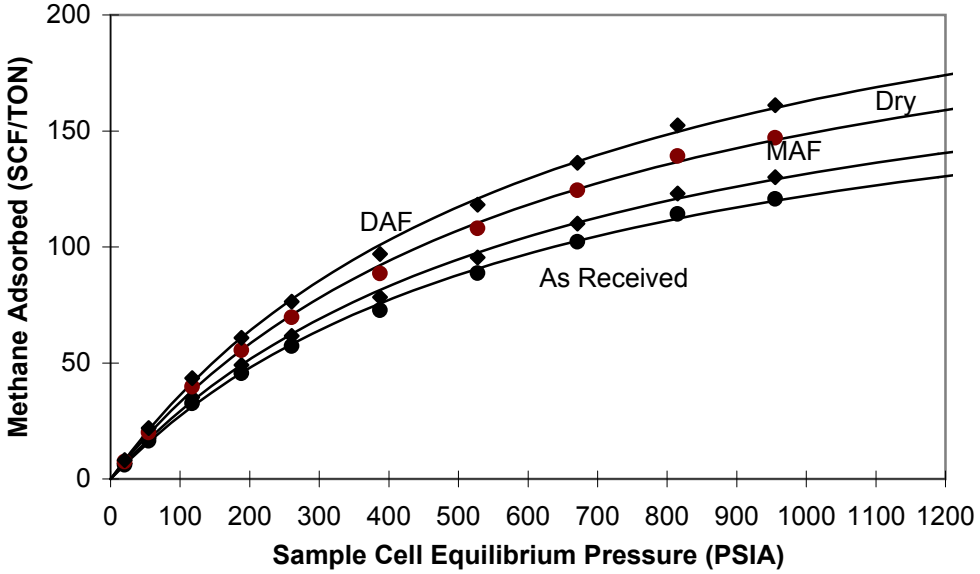
Goodness of fit of Langmuir regression: **0.99**

% Ash= 2.88 **% Moisture = 22.97**

SUMMARY OF ADSORPTION ANALYSES
INTERNATIONAL SYSTEM UNITS

Barrett Resources Corporation

Harriett 41-34-4777 Canister D44 1332.5'-1333.0'



Pressure (PSIA)	Adsorbed Methane (ft^3/ton)			
	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
20	6.11	7.44	6.58	8.15
55	16.45	20.04	17.71	21.94
117	32.60	39.71	35.11	43.48
188	45.56	55.49	49.06	60.76
260	57.24	69.72	61.64	76.35
387	72.72	88.57	78.31	96.99
528	88.63	107.94	95.43	118.20
671	102.20	124.47	110.05	136.31
815	114.25	139.15	123.03	152.38
955	120.74	147.05	130.01	161.03

Langmuir Parameters

	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
Vol. (ft^3/ton)	199	243	215	266
Pressure (PSIA)	634	634	634	634

Isotherm Temperature: 77 ºF

Goodness of fit of Langmuir regression: 0.99

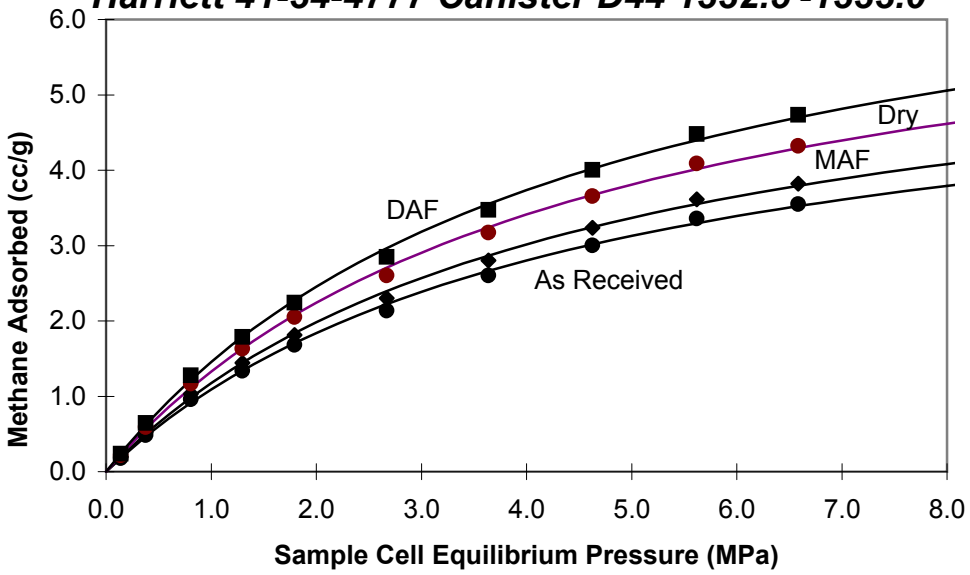
% Ash= 7.13 % Moisture= 17.89

SUMMARY OF ADSORPTION ANALYSES

IMPERIAL UNITS

Barrett Resources Corporation

Harriett 41-34-4777 Canister D44 1332.5'-1333.0'



Pressure	Adsorbed Methane (cc/g)			
(MPa)	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
0.14	0.18	0.22	0.19	0.24
0.38	0.48	0.59	0.52	0.64
0.81	0.96	1.17	1.03	1.28
1.30	1.34	1.63	1.44	1.79
1.79	1.68	2.05	1.81	2.24
2.67	2.14	2.60	2.30	2.85
3.64	2.60	3.17	2.80	3.47
4.63	3.00	3.66	3.23	4.01
5.62	3.36	4.09	3.62	4.48
6.59	3.55	4.32	3.82	4.73

Langmuir Parameters

	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
Vol. (cc/g)	5.86	7.14	6.31	7.82
Pressure (MPa)	4.37	4.37	4.37	4.37

Isotherm Temperature: **25.0 ºC**

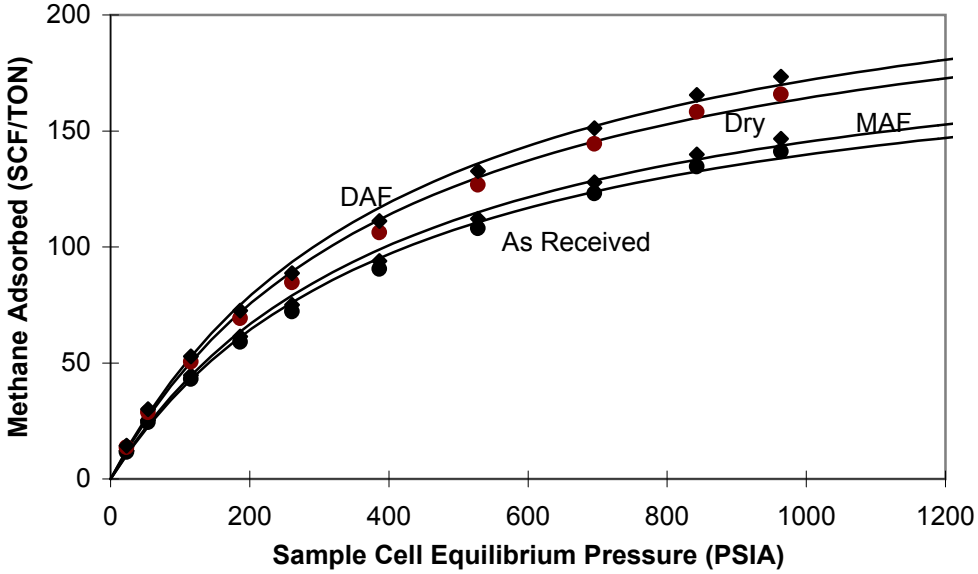
Goodness of fit of Langmuir regression: **0.99**

% Ash= 7.13 **% Moisture = 17.89**

SUMMARY OF ADSORPTION ANALYSES
INTERNATIONAL SYSTEM UNITS

Barrett Resources Corporation

Harriett 41-34-4777 Canister D5 1358.8'-1359.6'



Pressure (PSIA)	Adsorbed Methane (ft^3/ton)			
	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
23	11.62	13.65	12.08	14.28
54	24.47	28.74	25.43	30.07
116	43.04	50.55	44.72	52.88
186	59.01	69.31	61.31	72.51
261	72.15	84.74	74.97	88.66
386	90.46	106.24	93.99	111.15
528	107.93	126.77	112.15	132.63
695	123.00	144.47	127.81	151.15
843	134.66	158.17	139.92	165.47
964	141.12	165.75	146.63	173.41

Langmuir Parameters

	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
Vol. (ft^3/ton)	198	233	206	244
Pressure (PSIA)	419	419	419	419

Isotherm Temperature: **77 ºF**

Goodness of fit of Langmuir regression: **0.99**

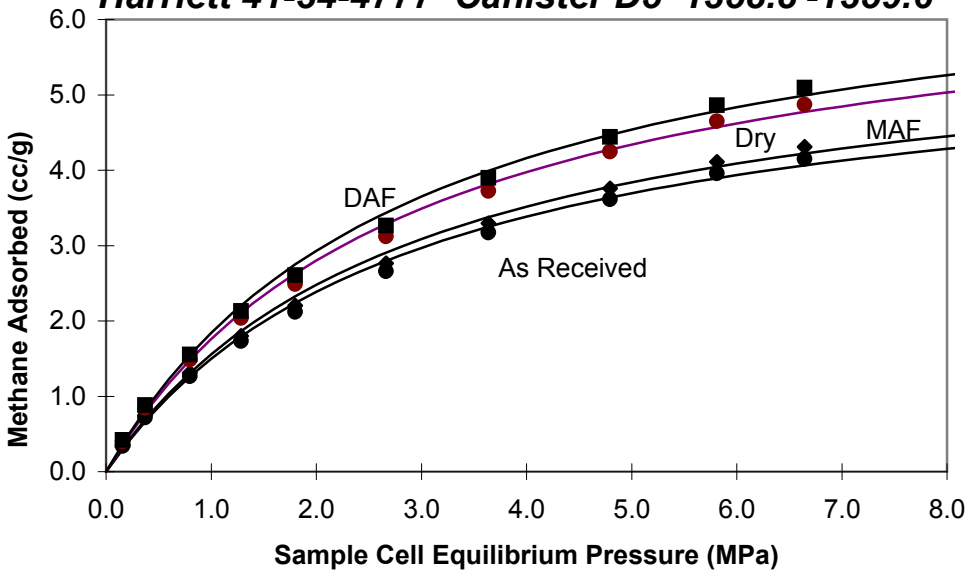
% Ash= 3.76 **% Moisture= 14.86**

SUMMARY OF ADSORPTION ANALYSES

IMPERIAL UNITS

Barrett Resources Corporation

Harriett 41-34-4777 Canister D5 1358.8'-1359.6'



Pressure (MPa)	Adsorbed Methane (cc/g) As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
0.16	0.34	0.40	0.35	0.42
0.37	0.72	0.84	0.75	0.88
0.80	1.26	1.49	1.31	1.55
1.28	1.73	2.04	1.80	2.13
1.80	2.12	2.49	2.20	2.61
2.66	2.66	3.12	2.76	3.27
3.64	3.17	3.73	3.30	3.90
4.80	3.61	4.25	3.76	4.44
5.81	3.96	4.65	4.11	4.86
6.64	4.15	4.87	4.31	5.10

Langmuir Parameters

	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
Vol. (cc/g)	5.83	6.85	6.06	7.16
Pressure (MPa)	2.89	2.89	2.89	2.89

Isotherm Temperature: **25.0 ºC**

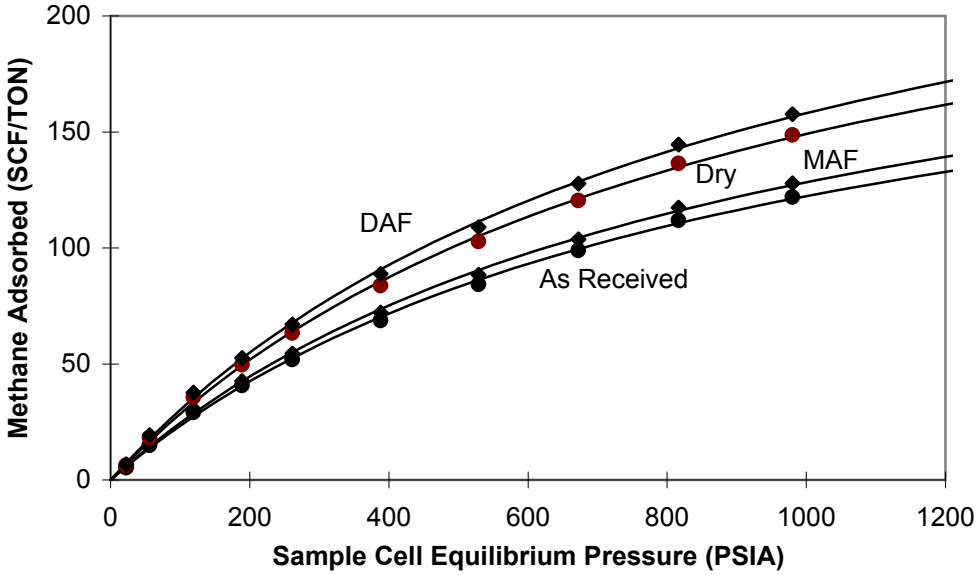
Goodness of fit of Langmuir regression: **0.99**

% Ash= 3.76 **% Moisture = 14.86**

SUMMARY OF ADSORPTION ANALYSES
INTERNATIONAL SYSTEM UNITS

Barrett Resources Corporation

Harriett 41-34-4777 Canister D26 1384.5'-1385.6'



Pressure (PSIA)	Adsorbed Methane (ft^3/ton)			
	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
23	5.20	6.34	5.45	6.72
56	14.91	18.17	15.64	19.26
119	29.16	35.54	30.59	37.68
189	40.69	49.59	42.68	52.58
261	51.90	63.26	54.44	67.07
388	68.72	83.75	72.08	88.80
529	84.29	102.73	88.41	108.91
672	98.83	120.45	103.66	127.71
816	111.90	136.38	117.37	144.59
980	121.96	148.65	127.93	157.60

Langmuir Parameters

	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
Vol. (ft^3/ton)	231	282	242	299
Pressure (PSIA)	889	889	889	889

Isotherm Temperature: 77 ºF

Goodness of fit of Langmuir regression: 0.98

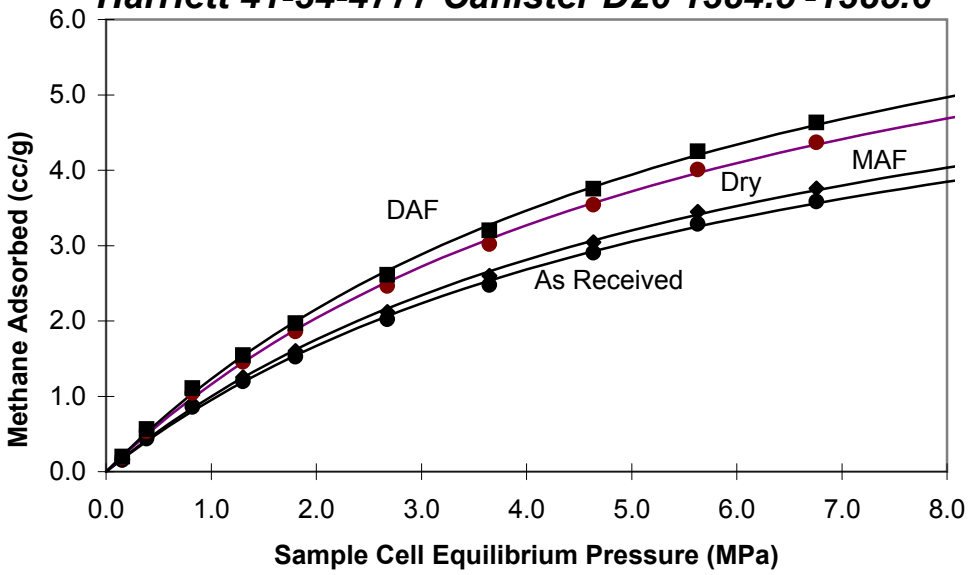
% Ash= 4.66 % Moisture= 17.95

SUMMARY OF ADSORPTION ANALYSES

IMPERIAL UNITS

Barrett Resources Corporation

Harriett 41-34-4777 Canister D26 1384.5'-1385.6'



Pressure	Adsorbed Methane (cc/g)			
(MPa)	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
0.16	0.15	0.19	0.16	0.20
0.39	0.44	0.53	0.46	0.57
0.82	0.86	1.04	0.90	1.11
1.30	1.20	1.46	1.25	1.55
1.80	1.53	1.86	1.60	1.97
2.68	2.02	2.46	2.12	2.61
3.65	2.48	3.02	2.60	3.20
4.64	2.90	3.54	3.05	3.75
5.63	3.29	4.01	3.45	4.25
6.76	3.58	4.37	3.76	4.63

Langmuir Parameters

	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
Vol. (cc/g)	6.79	8.28	7.12	8.77
Pressure (MPa)	6.13	6.13	6.13	6.13

Isotherm Temperature: **25.0 ºC**

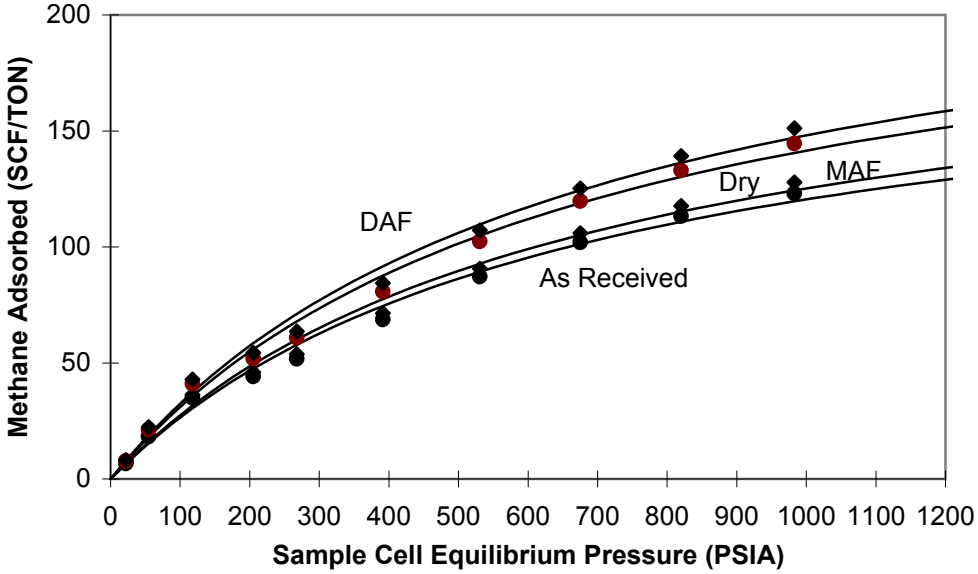
Goodness of fit of Langmuir regression: **0.98**

% Ash= 4.66 **% Moisture = 17.95**

SUMMARY OF ADSORPTION ANALYSES
INTERNATIONAL SYSTEM UNITS

Barrett Resources Corporation

Harriett 41-34-4777 Canister 38 1414.1'-1414.9'



Pressure (PSIA)	Adsorbed Methane (ft^3/ton)			
	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
22	6.59	7.74	6.85	8.10
55	18.14	21.31	18.85	22.29
118	34.91	41.00	36.28	42.90
205	44.17	51.88	45.90	54.28
267	51.78	60.82	53.81	63.63
392	68.71	80.71	71.40	84.44
531	87.17	102.39	90.58	107.12
675	101.92	119.71	105.90	125.24
820	113.22	132.98	117.64	139.13
983	123.06	144.54	127.87	151.22

Langmuir Parameters

	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
Vol. (ft^3/ton)	199	234	207	245
Pressure (PSIA)	654	654	654	654

Isotherm Temperature: **77 ºF**

Goodness of fit of Langmuir regression: **0.95**

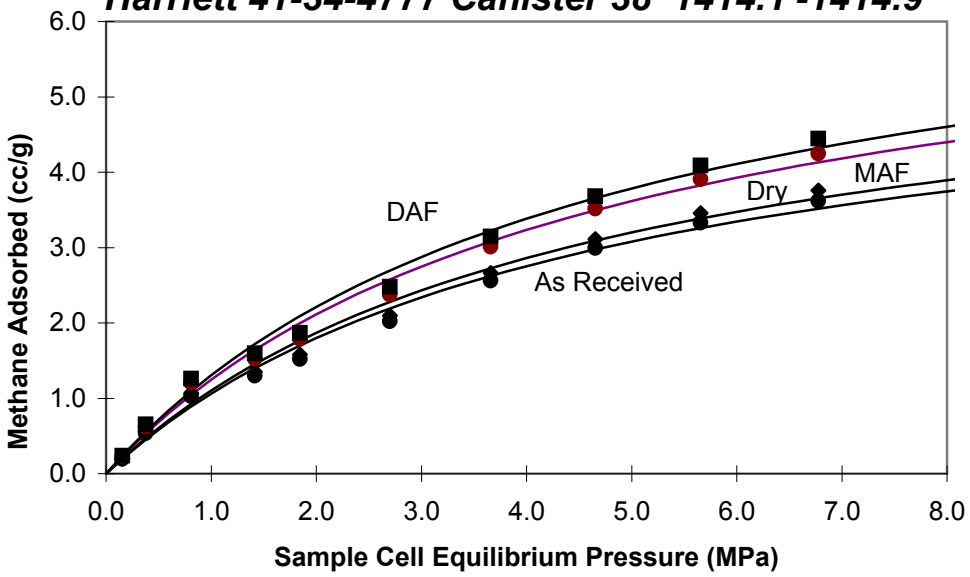
% Ash= 3.76 **% Moisture= 14.86**

SUMMARY OF ADSORPTION ANALYSES

IMPERIAL UNITS

Barrett Resources Corporation

Harriett 41-34-4777 Canister 38 1414.1'-1414.9'



Pressure	Adsorbed Methane (cc/g)			
(MPa)	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
0.15	0.19	0.23	0.20	0.24
0.38	0.53	0.63	0.55	0.66
0.81	1.03	1.21	1.07	1.26
1.41	1.30	1.52	1.35	1.60
1.84	1.52	1.79	1.58	1.87
2.70	2.02	2.37	2.10	2.48
3.66	2.56	3.01	2.66	3.15
4.66	3.00	3.52	3.11	3.68
5.66	3.33	3.91	3.46	4.09
6.78	3.62	4.25	3.76	4.44

Langmuir Parameters

	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
Vol. (cc/g)	5.86	6.88	6.09	7.20
Pressure (MPa)	4.51	4.51	4.51	4.51

Isotherm Temperature: **25.0 ºC**

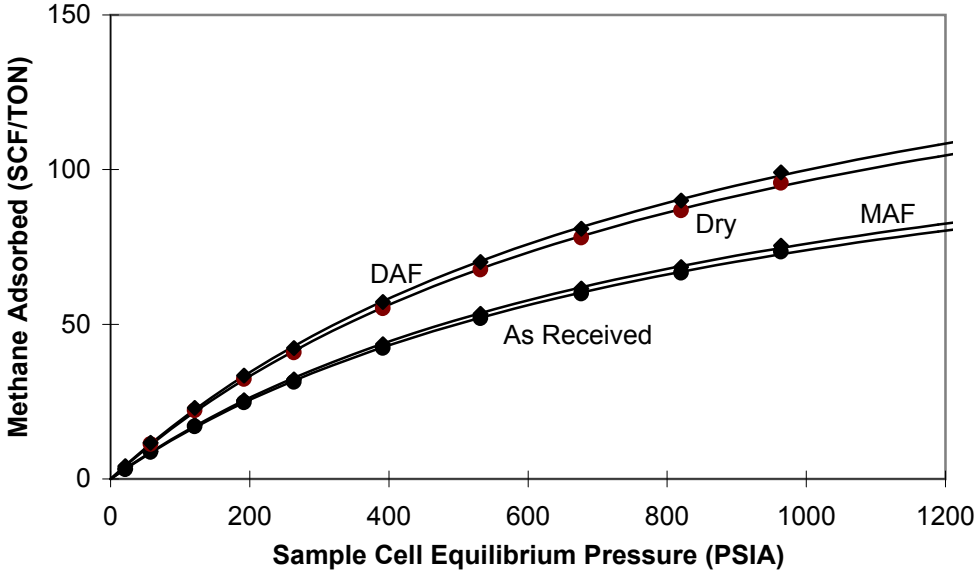
Goodness of fit of Langmuir regression: **0.95**

% Ash= 3.76 **% Moisture = 14.86**

SUMMARY OF ADSORPTION ANALYSES
INTERNATIONAL SYSTEM UNITS

Core Hole 26

Peabody Natural Gas, LLC.
Carter-Federal 18F-D Canister 1 1535.5'-1536.5'



Pressure (PSIA)	Adsorbed Methane (ft^3/ton)			
	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
21	4.07	5.31	4.19	5.50
57	11.42	14.87	11.73	15.42
121	22.31	29.07	22.93	30.13
192	32.51	42.36	33.42	43.91
264	41.19	53.67	42.34	55.63
391	55.64	72.49	57.19	75.14
532	68.24	88.91	70.14	92.17
676	78.68	102.51	80.87	106.26
820	87.57	114.09	90.01	118.27
963	96.46	125.68	99.15	130.29

Langmuir Parameters

	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
Vol. (ft^3/ton)	185	241	190	250
Pressure (PSIA)	904	904	904	904

Isotherm Temperature: 79 ºF

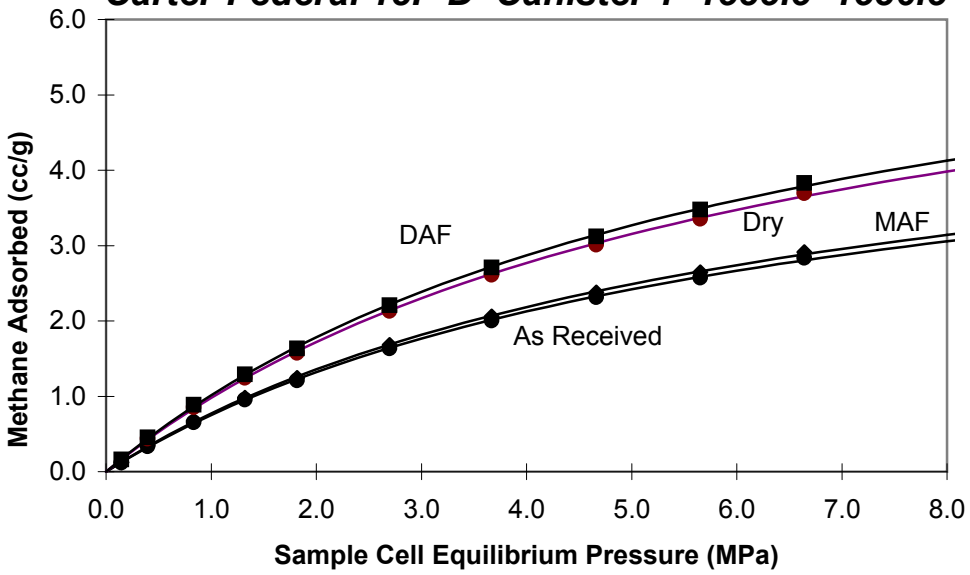
Goodness of fit of Langmuir regression: 1.00

% Ash= 2.71 % Moisture= 23.25

SUMMARY OF ADSORPTION ANALYSES
IMPERIAL UNITS

Peabody Natural Gas, LLC.

Carter-Federal 18F-D Canister 1 1535.5'-1536.5'



Pressure	Adsorbed Methane (cc/g)			
(MPa)	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
0.14	0.12	0.16	0.12	0.16
0.40	0.34	0.44	0.34	0.45
0.84	0.66	0.85	0.67	0.89
1.32	0.96	1.24	0.98	1.29
1.82	1.21	1.58	1.24	1.63
2.70	1.64	2.13	1.68	2.21
3.67	2.01	2.61	2.06	2.71
4.66	2.31	3.01	2.38	3.12
5.65	2.57	3.35	2.65	3.48
6.64	2.83	3.69	2.91	3.83

Langmuir Parameters

	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
Vol. (cc/g)	5.44	7.08	5.59	7.34
Pressure (MPa)	6.23	6.23	6.23	6.23

Isotherm Temperature: **26.1 ºC**

Goodness of fit of Langmuir regression: **1.00**

% Ash= 2.71 **% Moisture = 23.25**

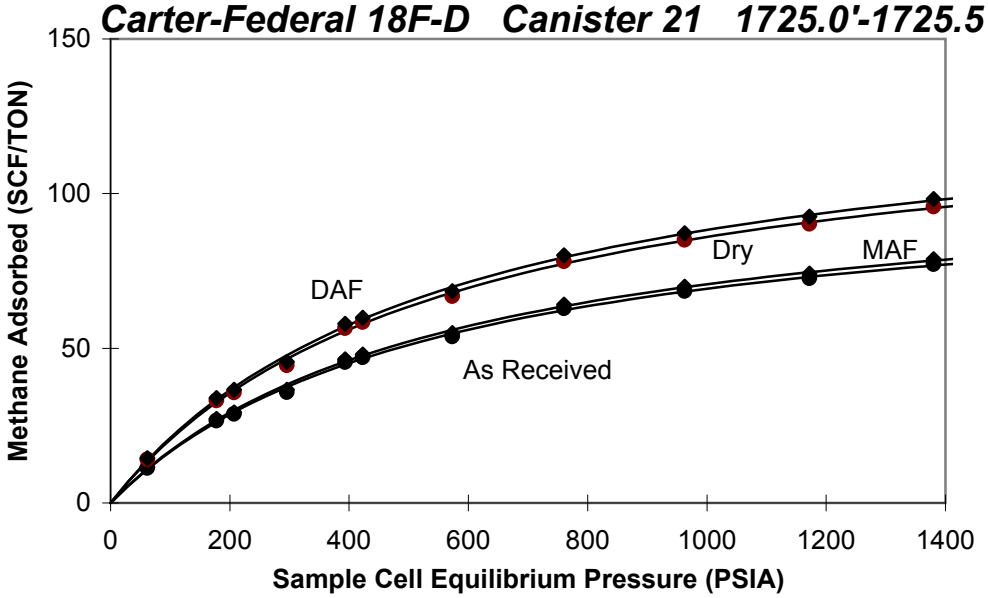
SUMMARY OF ADSORPTION ANALYSES

INTERNATIONAL SYSTEM UNITS

Core Hole 27

Peabody Natural Gas, LLC.

Carter-Federal 18F-D Canister 21 1725.0'-1725.5'



Pressure (PSIA)	Adsorbed Methane (ft^3/ton)			
	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
62	11.33	14.06	11.56	14.43
178	26.63	33.07	27.19	33.94
207	28.71	35.65	29.31	36.58
295	35.83	44.49	36.58	45.65
393	45.49	56.48	46.44	57.96
423	47.04	58.41	48.02	59.94
573	53.78	66.79	54.91	68.53
761	62.87	78.07	64.18	80.10
963	68.45	85.00	69.89	87.22
1172	72.64	90.20	74.16	92.56
1380	77.17	95.82	78.78	98.32

Langmuir Parameters

	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
Vol. (ft^3/ton)	107	133	110	137
Pressure (PSIA)	550	550	550	550

Isotherm Temperature: 82 ºF

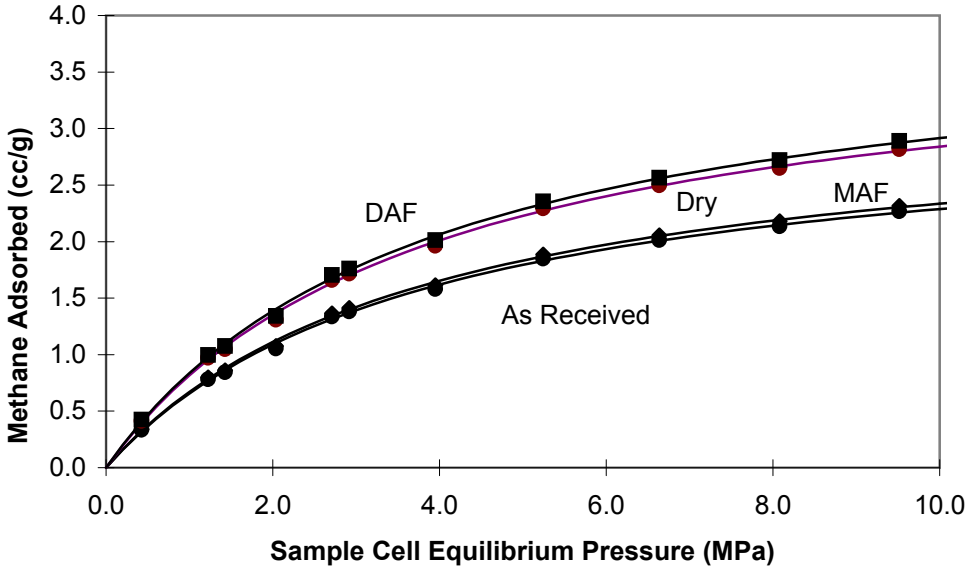
Goodness of fit of Langmuir regression: 1.00

% Ash= 2.05 % Moisture= 19.47

SUMMARY OF ADSORPTION ANALYSES

IMPERIAL UNITS

Peabody Natural Gas, LLC.
Carter-Federal 18F-D Canister 21 1725.0'-1725.5'



Pressure	Adsorbed Methane (cc/g)			
(MPa)	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
0.42	0.33	0.41	0.34	0.42
1.23	0.78	0.97	0.80	1.00
1.43	0.84	1.05	0.86	1.08
2.04	1.05	1.31	1.07	1.34
2.71	1.34	1.66	1.36	1.70
2.92	1.38	1.72	1.41	1.76
3.95	1.58	1.96	1.61	2.01
5.24	1.85	2.29	1.89	2.35
6.64	2.01	2.50	2.05	2.56
8.08	2.13	2.65	2.18	2.72
9.51	2.27	2.82	2.32	2.89

Langmuir Parameters

	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
Vol. (cc/g)	3.16	3.92	3.22	4.02
Pressure (MPa)	3.80	3.80	3.80	3.80

Isotherm Temperature: **28.0 ºC**

Goodness of fit of Langmuir regression: **1.00**

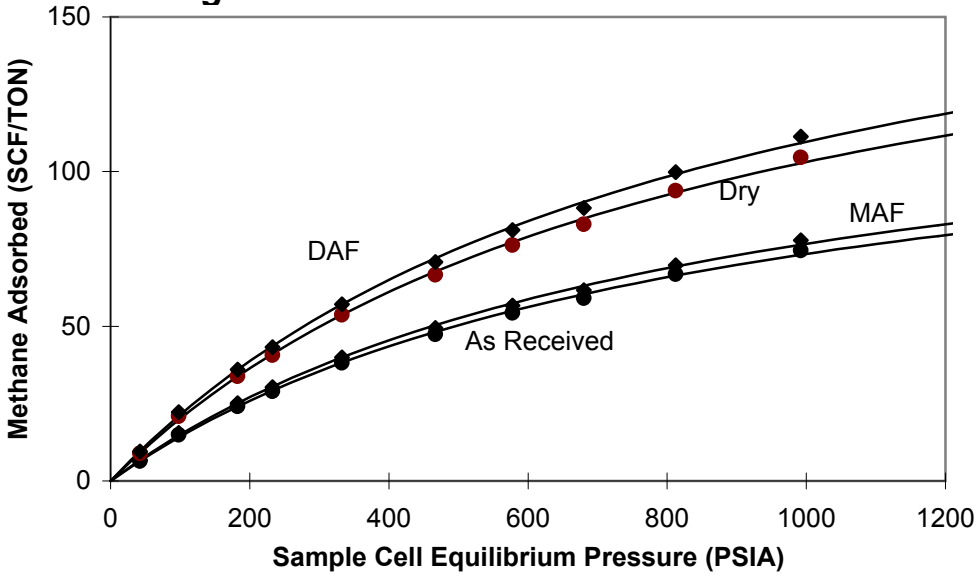
% Ash= **2.05** **% Moisture =** **19.47**

SUMMARY OF ADSORPTION ANALYSES
INTERNATIONAL SYSTEM UNITS

Core Hole 27

Nance Petroleum Corporation

Remington 587930 07A Canister B5 321.0'-321.2'



Pressure (PSIA)	Adsorbed Methane (ft^3/ton)			
	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
42	6.37	8.94	6.65	9.51
98	14.89	20.92	15.56	22.25
183	24.12	33.88	25.19	36.03
233	28.97	40.70	30.26	43.28
333	38.20	53.66	39.90	57.07
467	47.40	66.58	49.50	70.80
578	54.28	76.25	56.69	81.09
680	59.04	82.94	61.66	88.20
812	66.80	93.84	69.77	99.79
992	74.49	104.64	77.80	111.28

Langmuir Parameters

	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
Vol. (ft^3/ton)	136	190	142	202
Pressure (PSIA)	846	846	846	846

Isotherm Temperature: **65 ºF**

Goodness of fit of Langmuir regression: **0.99**

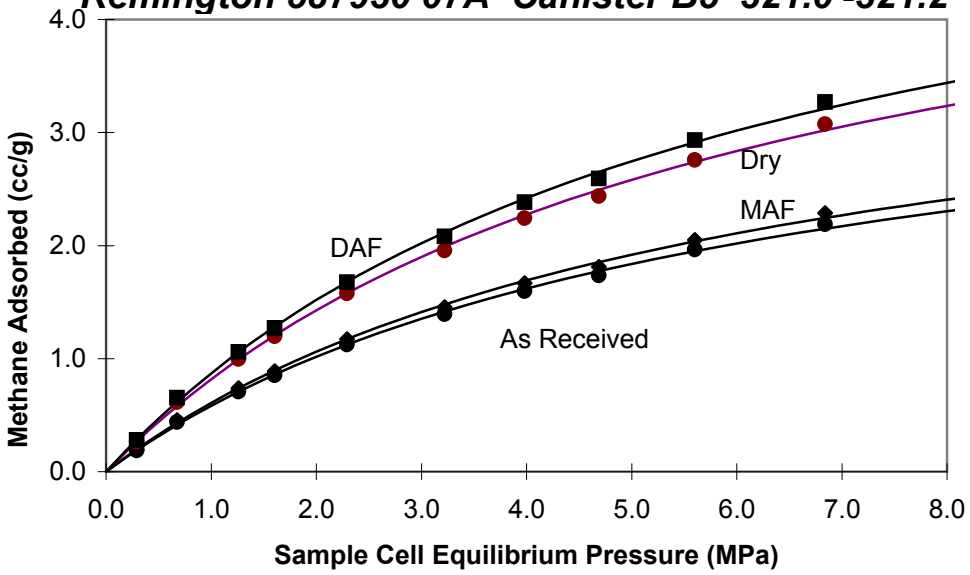
% Ash= **4.25** **% Moisture=** **28.81**

SUMMARY OF ADSORPTION ANALYSES

IMPERIAL UNITS

Nance Petroleum Corporation

Remington 587930 07A Canister B5 321.0'-321.2'



Pressure	Adsorbed Methane (cc/g)			
(MPa)	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
0.29	0.19	0.26	0.20	0.28
0.68	0.44	0.61	0.46	0.65
1.26	0.71	1.00	0.74	1.06
1.61	0.85	1.20	0.89	1.27
2.29	1.12	1.58	1.17	1.68
3.22	1.39	1.96	1.45	2.08
3.98	1.60	2.24	1.67	2.38
4.69	1.74	2.44	1.81	2.59
5.60	1.96	2.76	2.05	2.93
6.84	2.19	3.08	2.29	3.27

Langmuir Parameters

	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
Vol. (cc/g)	3.98	5.59	4.16	5.95
Pressure (MPa)	5.84	5.84	5.84	5.84

Isotherm Temperature: 18.3 ºC

Goodness of fit of Langmuir regression: 0.99

% Ash= 4.25 % Moisture = 28.81

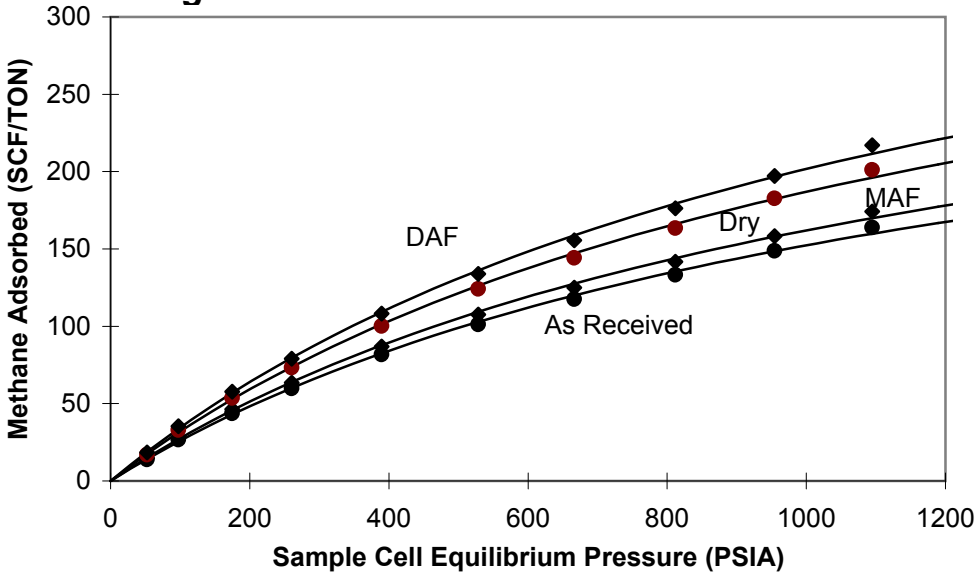
SUMMARY OF ADSORPTION ANALYSES

INTERNATIONAL SYSTEM UNITS

Core Hole 28

Nance Petroleum Corporation

Remington 587918 03R Canister C1 2190.5'-2191.0'



Pressure (PSIA)	Adsorbed Methane (ft^3/ton)			
	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
52	13.87	17.03	14.75	18.37
98	26.75	32.83	28.44	35.42
175	43.64	53.56	46.40	57.78
260	59.76	73.34	63.54	79.12
389	81.65	100.21	86.82	108.11
528	101.10	124.08	107.50	133.86
666	117.57	144.29	125.01	155.66
812	133.20	163.48	141.63	176.36
954	148.86	182.70	158.28	197.09
1095	163.92	201.17	174.29	217.02

Langmuir Parameters

	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
Vol. (ft^3/ton)	331	407	352	439
Pressure (PSIA)	1174	1174	1174	1174

Isotherm Temperature: 90 ºF

Goodness of fit of Langmuir regression: 0.99

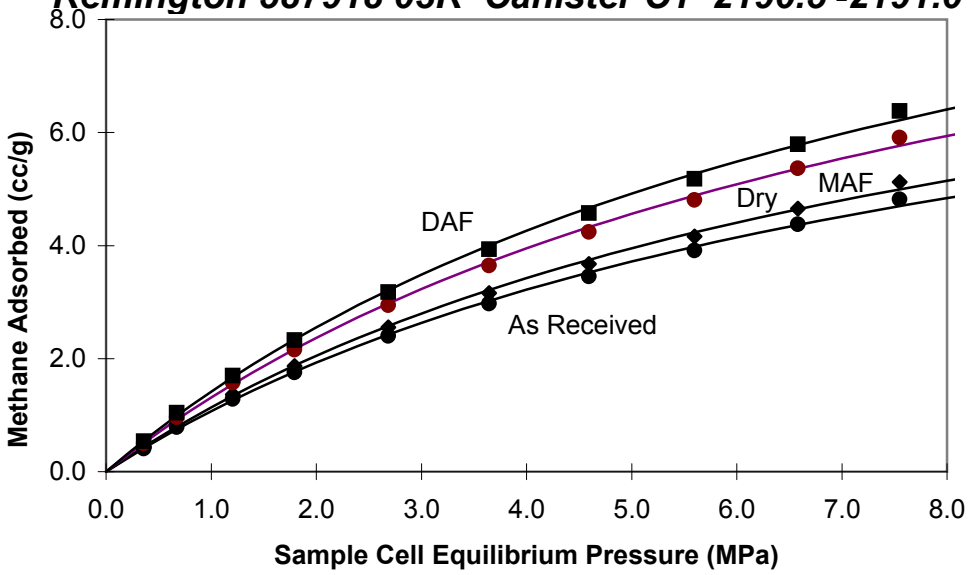
% Ash= 5.95 % Moisture= 18.52

SUMMARY OF ADSORPTION ANALYSES

IMPERIAL UNITS

Nance Petroleum Corporation

Remington 587918 03R Canister C1 2190.5'-2191.0'



Pressure	Adsorbed Methane (cc/g)			
(MPa)	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
0.36	0.41	0.50	0.43	0.54
0.67	0.79	0.96	0.84	1.04
1.21	1.28	1.57	1.36	1.70
1.79	1.76	2.16	1.87	2.33
2.69	2.40	2.95	2.55	3.18
3.64	2.97	3.65	3.16	3.93
4.59	3.46	4.24	3.67	4.57
5.60	3.91	4.80	4.16	5.18
6.58	4.37	5.37	4.65	5.79
7.55	4.82	5.91	5.12	6.38

Langmuir Parameters

	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
Vol. (cc/g)	9.73	11.95	10.35	12.89
Pressure (MPa)	8.10	8.10	8.10	8.10

Isotherm Temperature: **32.0 ºC**

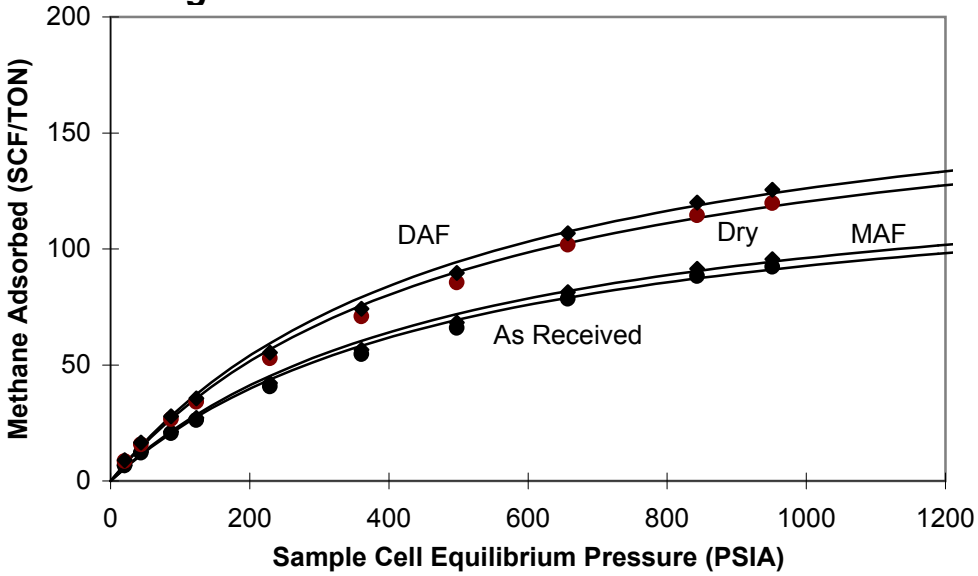
Goodness of fit of Langmuir regression: **0.99**

% Ash= 5.95 **% Moisture = 18.52**

SUMMARY OF ADSORPTION ANALYSES
INTERNATIONAL SYSTEM UNITS

Nance Petroleum Corporation

Remington 587918 01C Canister B17 635.0'-637.0'.0'



Pressure (PSIA)	Adsorbed Methane (ft^3/ton)			
	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
20	6.56	8.51	6.80	8.92
44	12.16	15.78	12.60	16.53
87	20.49	26.60	21.24	27.86
123	26.22	34.03	27.17	35.65
229	40.72	52.84	42.19	55.36
361	54.60	70.87	56.58	74.24
498	65.94	85.58	68.33	89.66
657	78.48	101.86	81.33	106.70
843	88.25	114.54	91.46	119.99
951	92.29	119.79	95.64	125.49
1136	98.48	127.81	102.05	133.90

Langmuir Parameters

	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
Vol. (ft^3/ton)	139	181	144	189
Pressure (PSIA)	501	501	501	501

Isotherm Temperature: 68 ºF

Goodness of fit of Langmuir regression: 0.99

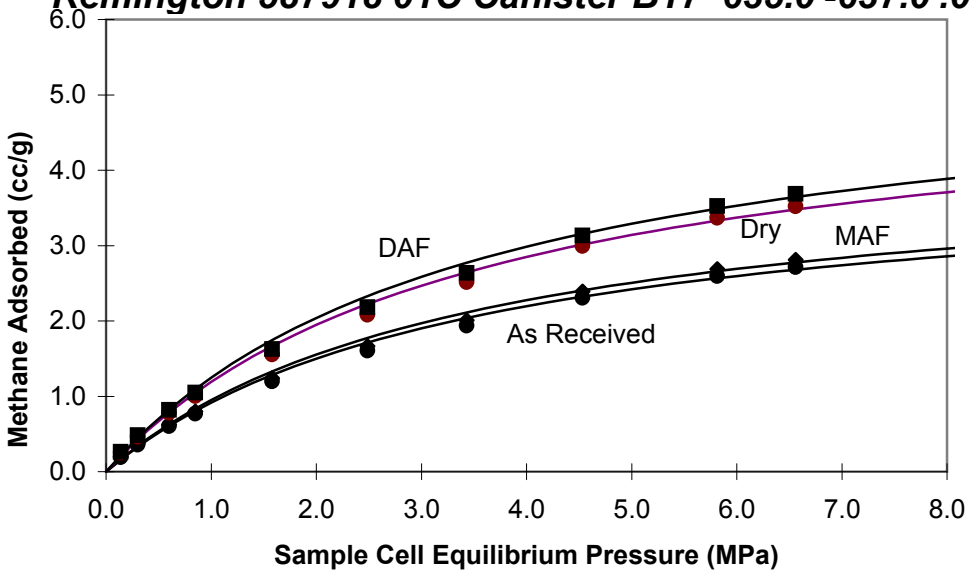
% Ash= 3.50 % Moisture= 22.95

SUMMARY OF ADSORPTION ANALYSES

IMPERIAL UNITS

Nance Petroleum Corporation

Remington 587918 01C Canister B17 635.0'-637.0'.0'



Pressure	Adsorbed Methane (cc/g)			
(MPa)	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
0.14	0.19	0.25	0.20	0.26
0.30	0.36	0.46	0.37	0.49
0.60	0.60	0.78	0.62	0.82
0.85	0.77	1.00	0.80	1.05
1.58	1.20	1.55	1.24	1.63
2.49	1.60	2.08	1.66	2.18
3.43	1.94	2.52	2.01	2.63
4.53	2.31	2.99	2.39	3.14
5.81	2.59	3.37	2.69	3.53
6.56	2.71	3.52	2.81	3.69
7.84	2.89	3.76	3.00	3.94

Langmuir Parameters

	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
Vol. (cc/g)	4.09	5.31	4.24	5.56
Pressure (MPa)	3.45	3.45	3.45	3.45

Isotherm Temperature: **20.0 ºC**

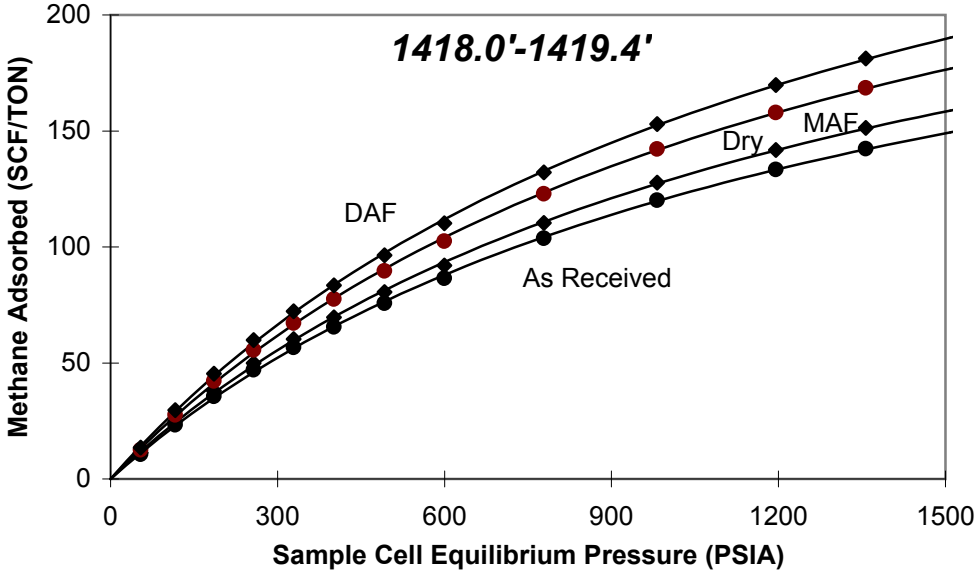
Goodness of fit of Langmuir regression: **0.99**

% Ash= 3.50 **% Moisture = 22.95**

SUMMARY OF ADSORPTION ANALYSES
INTERNATIONAL SYSTEM UNITS

Williams Production RMT Company

Bullwacker Creek Unit 32-9-4277 Canister D12



Pressure (PSIA)	Adsorbed Methane (ft^3/ton)			
	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
54	10.60	12.55	11.27	13.50
116	23.29	27.58	24.76	29.65
186	35.65	42.20	37.89	45.38
257	46.97	55.61	49.93	59.80
329	56.75	67.18	60.32	72.24
401	65.50	77.54	69.62	83.38
492	75.79	89.72	80.55	96.48
600	86.54	102.46	91.99	110.18
779	103.78	122.86	110.31	132.12
982	120.10	142.18	127.66	152.90
1195	133.40	157.92	141.79	169.82
1357	142.35	168.52	151.30	181.22

Langmuir Parameters

	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
Vol. (ft^3/ton)	277	328	295	353
Pressure (PSIA)	1293	1293	1293	1293

Isotherm Temperature: 78 ºF

Goodness of fit of Langmuir regression: 1.00

% Ash= 5.92 % Moisture= 15.53

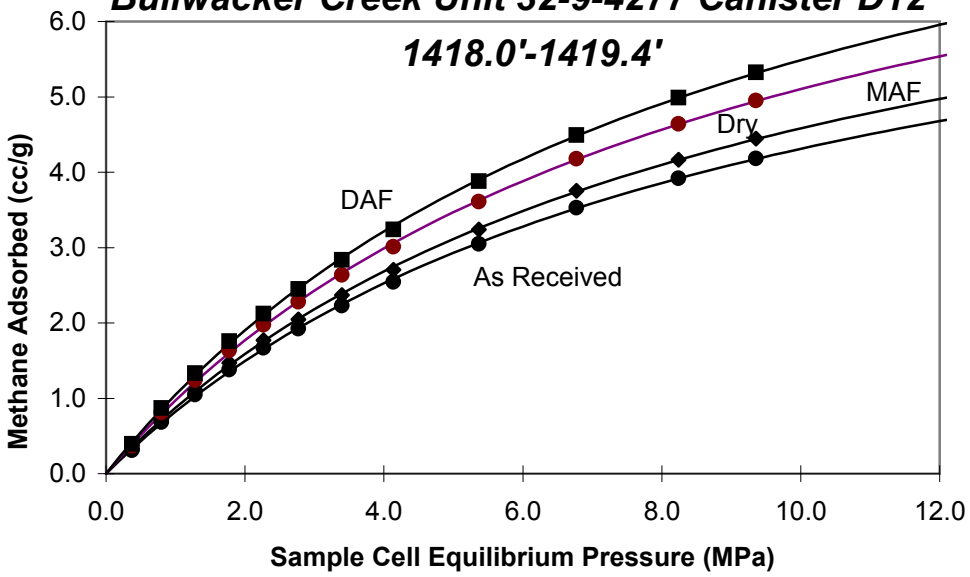
SUMMARY OF ADSORPTION ANALYSES

IMPERIAL UNITS

Core Hole 31

Williams Production RMT Company

Bullwacker Creek Unit 32-9-4277 Canister D12



Pressure (MPa)	Adsorbed Methane (cc/g) As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
0.37	0.31	0.37	0.33	0.40
0.80	0.68	0.81	0.73	0.87
1.28	1.05	1.24	1.11	1.33
1.77	1.38	1.63	1.47	1.76
2.27	1.67	1.97	1.77	2.12
2.77	1.92	2.28	2.05	2.45
3.39	2.23	2.64	2.37	2.84
4.13	2.54	3.01	2.70	3.24
5.37	3.05	3.61	3.24	3.88
6.77	3.53	4.18	3.75	4.49
8.24	3.92	4.64	4.17	4.99
9.35	4.18	4.95	4.45	5.33

Langmuir Parameters

	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
Vol. (cc/g)	8.15	9.65	8.67	10.38
Pressure (MPa)	8.92	8.92	8.92	8.92

Isotherm Temperature: **25.5 ºC**

Goodness of fit of Langmuir regression: **1.00**

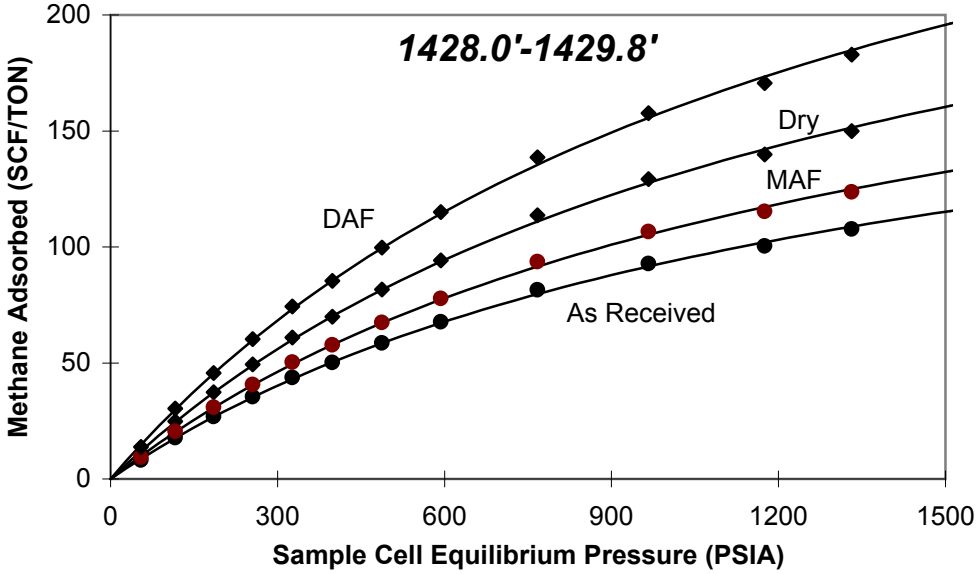
% Ash= 5.92 **% Moisture = 15.53**

SUMMARY OF ADSORPTION ANALYSES

INTERNATIONAL SYSTEM UNITS

Williams Production RMT Company

Bullwacker Creek Unit 32-9-4277 Canister D26



Pressure (PSIA)	Adsorbed Methane (ft^3/ton)			
	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
55	8.12	9.32	11.30	13.79
116	17.84	20.49	24.84	30.32
185	26.83	30.83	37.37	45.60
255	35.46	40.74	49.38	60.26
327	43.77	50.29	60.97	74.40
398	50.24	57.73	69.98	85.39
488	58.65	67.39	81.69	99.68
593	67.66	77.74	94.24	114.99
767	81.57	93.71	113.60	138.62
966	92.80	106.61	129.24	157.71
1175	100.40	115.35	139.84	170.63
1332	107.66	123.69	149.94	182.97

Langmuir Parameters

	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
Vol. (ft^3/ton)	216	248	300	366
Pressure (PSIA)	1309	1309	1309	1309

Isotherm Temperature: 78 ºF

Goodness of fit of Langmuir regression: 0.99

% Ash= 28.20 % Moisture= 12.96

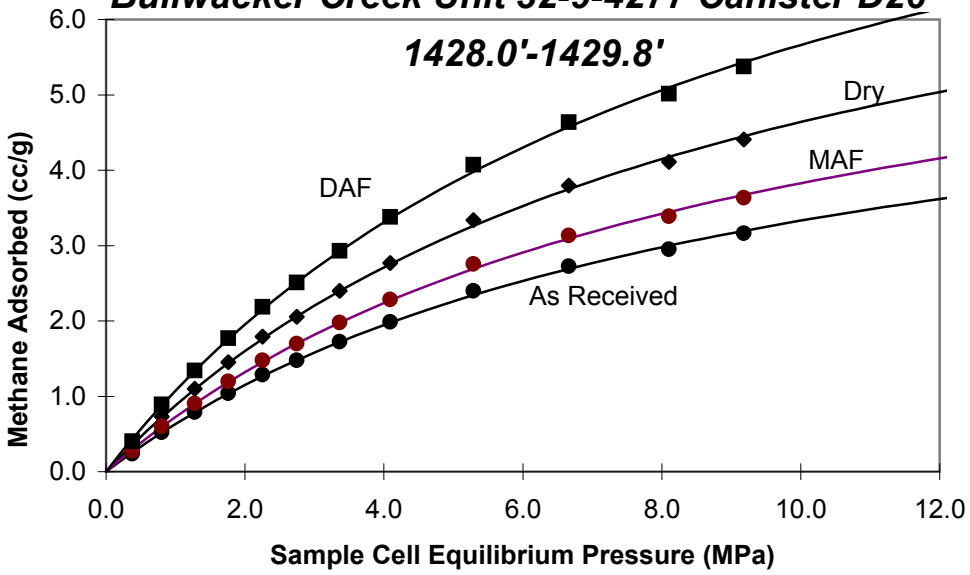
SUMMARY OF ADSORPTION ANALYSES

IMPERIAL UNITS

Core Hole 31

Williams Production RMT Company

Bullwacker Creek Unit 32-9-4277 Canister D26



Pressure	Adsorbed Methane (cc/g)			
(MPa)	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
0.38	0.24	0.27	0.33	0.41
0.80	0.52	0.60	0.73	0.89
1.27	0.79	0.91	1.10	1.34
1.76	1.04	1.20	1.45	1.77
2.25	1.29	1.48	1.79	2.19
2.75	1.48	1.70	2.06	2.51
3.36	1.72	1.98	2.40	2.93
4.09	1.99	2.28	2.77	3.38
5.29	2.40	2.75	3.34	4.07
6.66	2.73	3.13	3.80	4.63
8.10	2.95	3.39	4.11	5.01
9.18	3.16	3.64	4.41	5.38

Langmuir Parameters

	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
Vol. (cc/g)	6.34	7.28	8.83	10.77
Pressure (MPa)	9.02	9.02	9.02	9.02

Isotherm Temperature: **25.5 ºC**

Goodness of fit of Langmuir regression: **0.99**

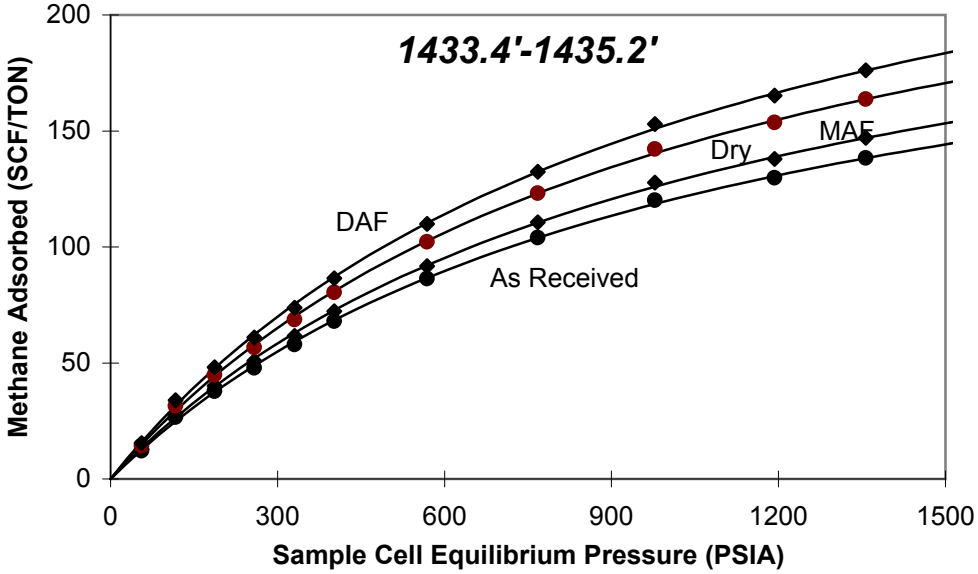
% Ash= 28.20 **% Moisture = 12.96**

SUMMARY OF ADSORPTION ANALYSES
INTERNATIONAL SYSTEM UNITS

Core Hole 31

Williams Production RMT Company

Bullwacker Creek Unit 32-9-4277 Canister D19



Pressure (PSIA)	Adsorbed Methane (ft^3/ton)			
	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
55	12.10	14.32	12.86	15.40
117	26.62	31.51	28.30	33.89
187	37.82	44.78	40.20	48.15
258	47.87	56.67	50.88	60.94
330	58.00	68.66	61.65	73.84
402	67.95	80.45	72.23	86.51
569	86.34	102.21	91.77	109.91
768	104.03	123.15	110.57	132.43
978	120.17	142.26	127.73	152.98
1193	129.82	153.69	137.99	165.27
1357	138.34	163.78	147.05	176.12

Langmuir Parameters

	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
Vol. (ft^3/ton)	243	287	258	309
Pressure (PSIA)	1023	1023	1023	1023

Isotherm Temperature: 78 ºF

Goodness of fit of Langmuir regression: 1.00

% Ash= 5.92 % Moisture= 15.53

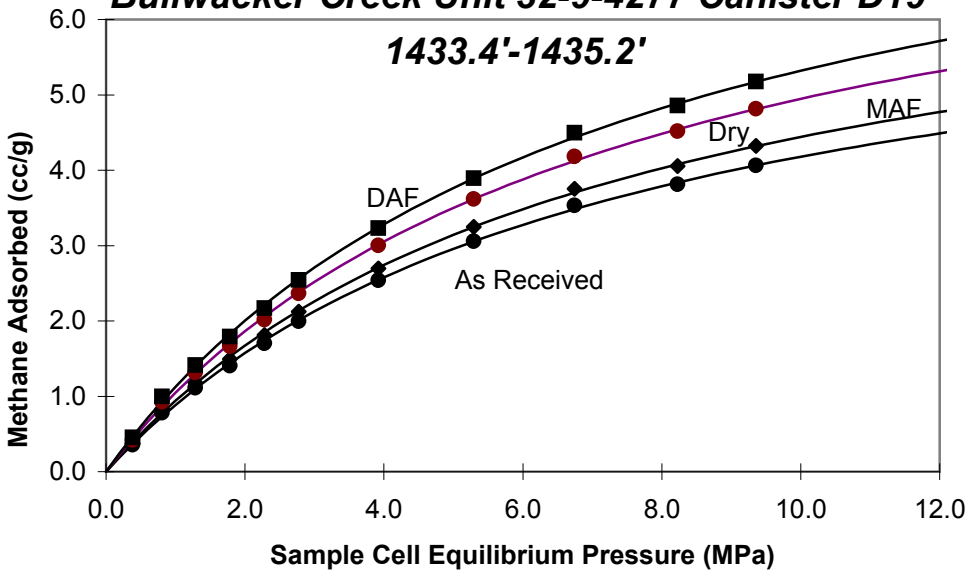
SUMMARY OF ADSORPTION ANALYSES

IMPERIAL UNITS

Williams Production RMT Company

Bullwacker Creek Unit 32-9-4277 Canister D19

1433.4'-1435.2'



Pressure (MPa)	Adsorbed Methane (cc/g)			
	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
0.38	0.36	0.42	0.38	0.45
0.81	0.78	0.93	0.83	1.00
1.29	1.11	1.32	1.18	1.42
1.78	1.41	1.67	1.50	1.79
2.28	1.70	2.02	1.81	2.17
2.77	2.00	2.36	2.12	2.54
3.92	2.54	3.00	2.70	3.23
5.29	3.06	3.62	3.25	3.89
6.74	3.53	4.18	3.75	4.50
8.23	3.82	4.52	4.06	4.86
9.36	4.07	4.81	4.32	5.18

Langmuir Parameters

	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
Vol. (cc/g)	7.13	8.44	7.58	9.07
Pressure (MPa)	7.05	7.05	7.05	7.05

Isotherm Temperature: **25.5 ºC**

Goodness of fit of Langmuir regression: **1.00**

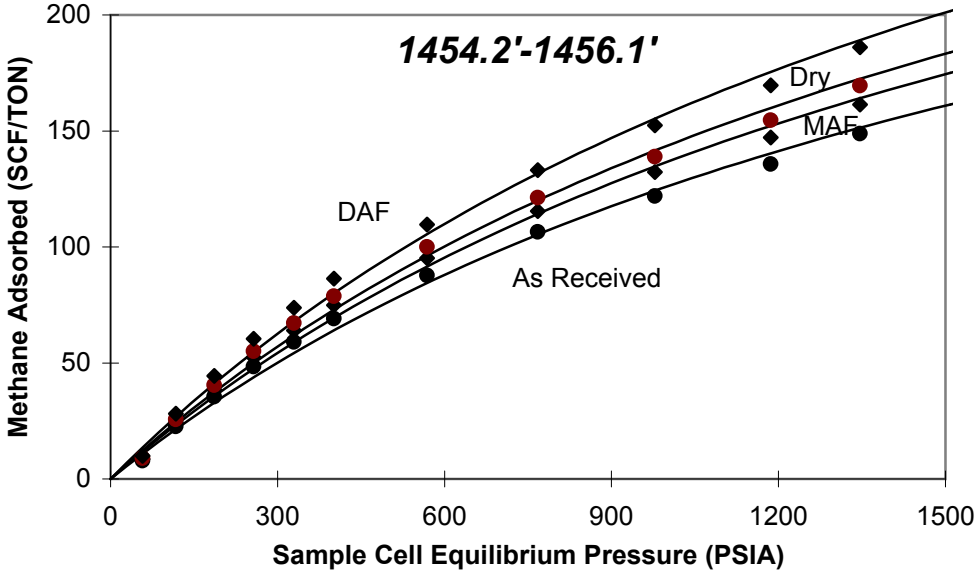
% Ash= 5.92 **% Moisture = 15.53**

SUMMARY OF ADSORPTION ANALYSES

INTERNATIONAL SYSTEM UNITS

Williams Production RMT Company

Bullwacker Creek Unit 32-9-4277 Canister D35



Pressure (PSIA)	Adsorbed Methane (ft^3/ton)			
	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
57	7.90	9.00	8.56	9.87
117	22.56	25.70	24.46	28.20
186	35.51	40.45	38.50	44.38
257	48.35	55.08	52.42	60.43
329	59.01	67.23	63.98	73.76
402	69.12	78.75	74.95	86.39
568	87.74	99.96	95.13	109.66
768	106.48	121.30	115.45	133.08
978	121.96	138.94	132.23	152.43
1186	135.73	154.63	147.17	169.65
1347	148.84	169.56	161.38	186.03

Langmuir Parameters

	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
Vol. (ft^3/ton)	360	410	390	449
Pressure (PSIA)	1852	1852	1852	1852

Isotherm Temperature: 78 ºF

Goodness of fit of Langmuir regression: 0.76

% Ash= 7.77 **% Moisture=** 12.22

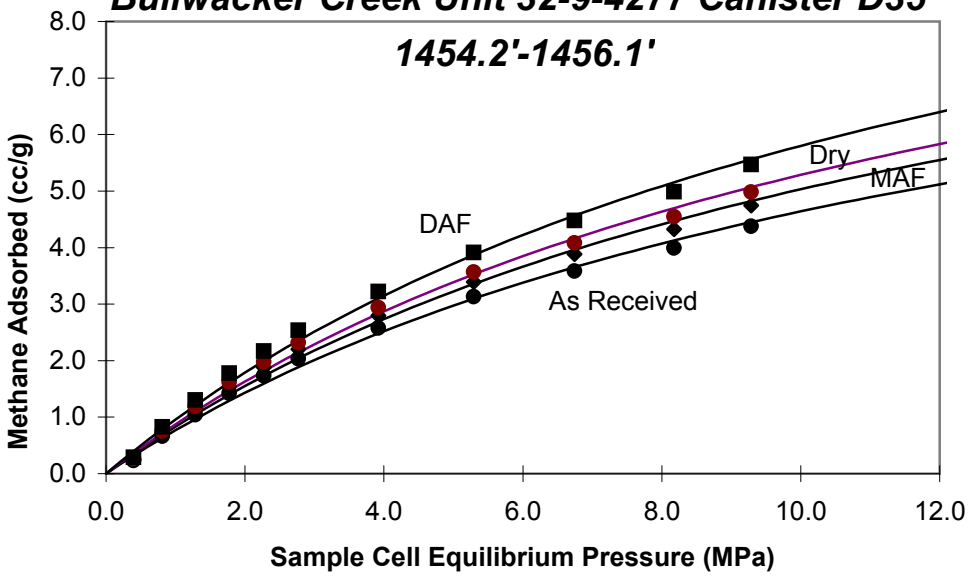
SUMMARY OF ADSORPTION ANALYSES

IMPERIAL UNITS

Williams Production RMT Company

Bullwacker Creek Unit 32-9-4277 Canister D35

1454.2'-1456.1'



Pressure	Adsorbed Methane (cc/g)			
(MPa)	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
0.39	0.23	0.26	0.25	0.29
0.81	0.66	0.76	0.72	0.83
1.28	1.04	1.19	1.13	1.30
1.77	1.42	1.62	1.54	1.78
2.27	1.73	1.98	1.88	2.17
2.77	2.03	2.31	2.20	2.54
3.92	2.58	2.94	2.80	3.22
5.29	3.13	3.56	3.39	3.91
6.74	3.58	4.08	3.89	4.48
8.18	3.99	4.54	4.33	4.99
9.28	4.37	4.98	4.74	5.47

Langmuir Parameters

	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
Vol. (cc/g)	10.57	12.04	11.46	13.21
Pressure (MPa)	12.77	12.77	12.77	12.77

Isotherm Temperature: 25.5 ºC

Goodness of fit of Langmuir regression: 0.76

% Ash= 7.77 % Moisture = 12.22

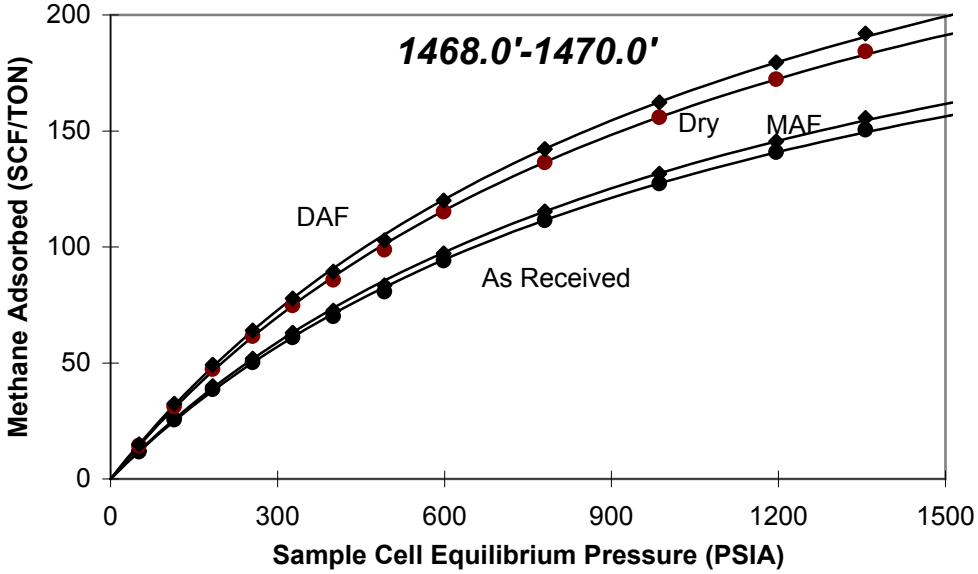
SUMMARY OF ADSORPTION ANALYSES

INTERNATIONAL SYSTEM UNITS

Core Hole 31

Williams Production RMT Company

Bullwacker Creek Unit 32-9-4277 Canister D42



Pressure (PSIA)	Adsorbed Methane (ft^3/ton)			
	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
51	11.71	14.34	12.11	14.94
114	25.46	31.16	26.32	32.47
184	38.63	47.28	39.94	49.27
255	50.21	61.46	51.92	64.04
327	61.02	74.69	63.10	77.83
400	70.11	85.81	72.49	89.41
492	80.69	98.77	83.44	102.91
598	94.10	115.18	97.30	120.01
780	111.50	136.48	115.30	142.21
986	127.30	155.82	131.63	162.35
1196	140.80	172.33	145.59	179.56
1356	150.53	184.24	155.65	191.98

Langmuir Parameters

	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
Vol. (ft^3/ton)	277	339	286	353
Pressure (PSIA)	1155	1155	1155	1155

Isotherm Temperature: 78 ºF

Goodness of fit of Langmuir regression: 0.76

% Ash= 3.29 % Moisture= 18.30

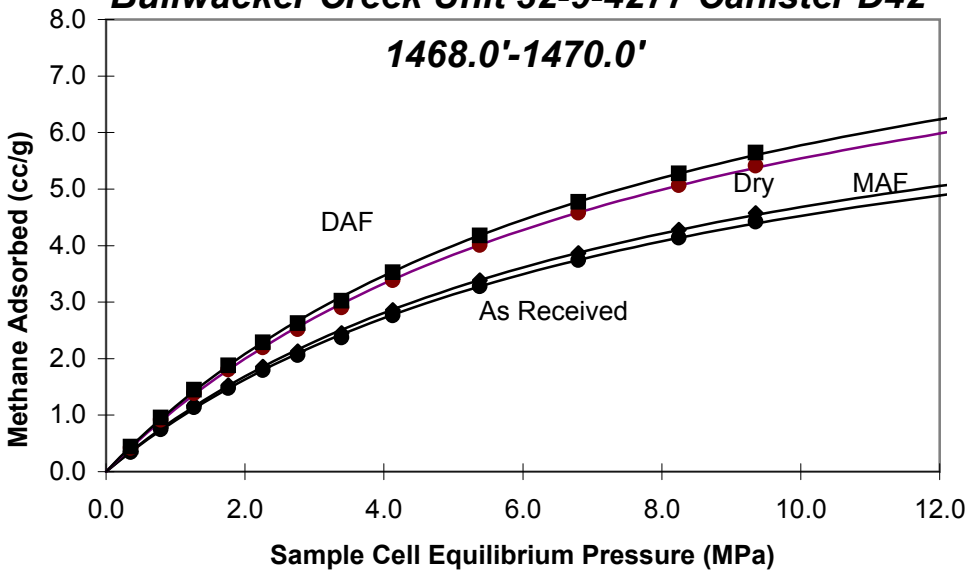
SUMMARY OF ADSORPTION ANALYSES

IMPERIAL UNITS

Williams Production RMT Company

Bullwacker Creek Unit 32-9-4277 Canister D42

1468.0'-1470.0'



Pressure	Adsorbed Methane (cc/g)			
(MPa)	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
0.35	0.34	0.42	0.36	0.44
0.79	0.75	0.92	0.77	0.95
1.27	1.14	1.39	1.17	1.45
1.76	1.48	1.81	1.53	1.88
2.26	1.79	2.20	1.85	2.29
2.76	2.06	2.52	2.13	2.63
3.39	2.37	2.90	2.45	3.02
4.13	2.77	3.38	2.86	3.53
5.38	3.28	4.01	3.39	4.18
6.80	3.74	4.58	3.87	4.77
8.25	4.14	5.06	4.28	5.28
9.35	4.42	5.41	4.57	5.64

Langmuir Parameters

	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
Vol. (cc/g)	8.13	9.95	8.41	10.37
Pressure (MPa)	7.96	7.96	7.96	7.96

Isotherm Temperature: **25.5 ºC**

Goodness of fit of Langmuir regression: **0.76**

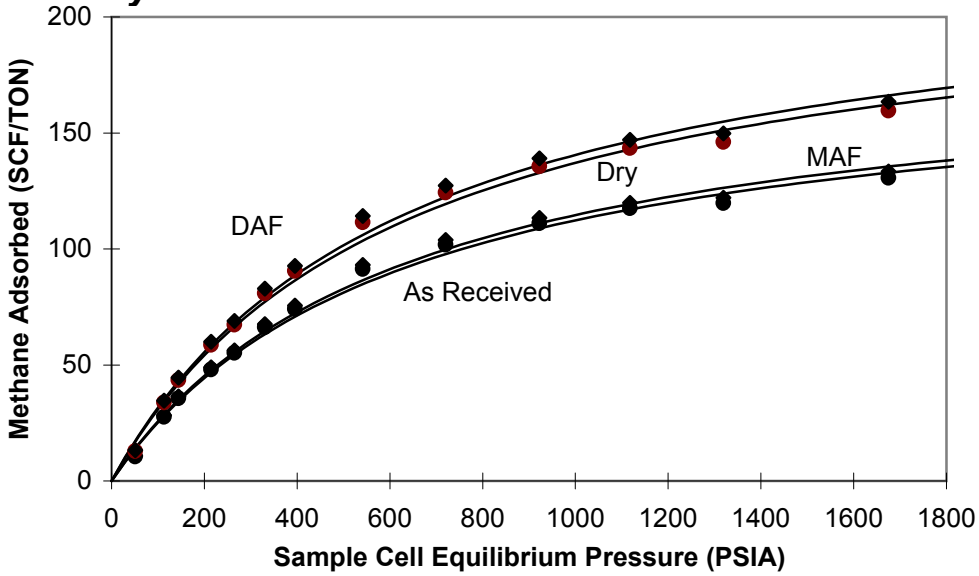
% Ash= 3.29 **% Moisture = 18.30**

SUMMARY OF ADSORPTION ANALYSES

INTERNATIONAL SYSTEM UNITS

Lance Oil and Gas Company, Inc.

Whiskey Draw Unit 12-12-4778 Canister 32 1521.0'-1521.5'



Pressure (PSIA)	Adsorbed Methane (ft^3/ton)			
	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
51	10.53	12.86	10.75	13.18
113	27.65	33.75	28.21	34.59
144	35.64	43.51	36.37	44.60
215	47.98	58.57	48.95	60.03
265	55.14	67.32	56.26	68.99
331	66.21	80.83	67.55	82.84
395	74.09	90.45	75.59	92.70
542	91.24	111.40	93.10	114.17
720	101.79	124.27	103.86	127.37
922	111.10	135.63	113.35	139.01
1118	117.51	143.46	119.89	147.03
1319	119.66	146.09	122.09	149.73
1675	130.68	159.54	133.34	163.52

Langmuir Parameters

	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
Vol. (ft^3/ton)	182	222	186	228
Pressure (PSIA)	622	622	622	622

Isotherm Temperature: **70 ºF**

Goodness of fit of Langmuir regression: **0.98**

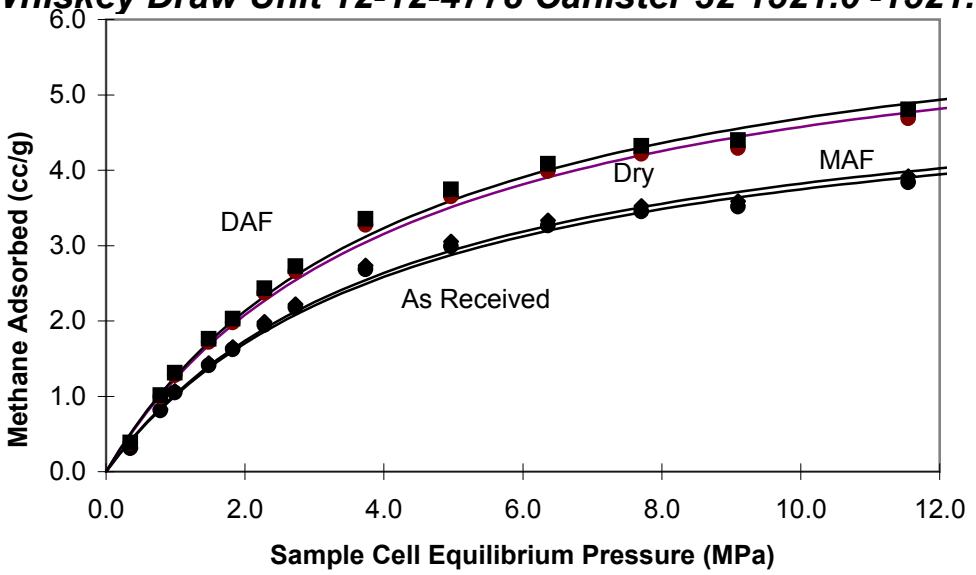
% Ash= 1.99 **% Moisture= 18.09**

SUMMARY OF ADSORPTION ANALYSES

IMPERIAL UNITS

Lance Oil and Gas Company, Inc.

Whiskey Draw Unit 12-12-4778 Canister 32 1521.0'-1521.5'



Pressure	Adsorbed Methane (cc/g)			
(MPa)	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
0.35	0.31	0.38	0.32	0.39
0.78	0.81	0.99	0.83	1.02
0.99	1.05	1.28	1.07	1.31
1.48	1.41	1.72	1.44	1.76
1.83	1.62	1.98	1.65	2.03
2.28	1.95	2.38	1.99	2.43
2.73	2.18	2.66	2.22	2.72
3.74	2.68	3.27	2.74	3.36
4.97	2.99	3.65	3.05	3.74
6.36	3.26	3.99	3.33	4.09
7.71	3.45	4.22	3.52	4.32
9.10	3.52	4.29	3.59	4.40
11.55	3.84	4.69	3.92	4.81

Langmuir Parameters

	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
Vol. (cc/g)	5.35	6.53	5.46	6.70
Pressure (MPa)	4.29	4.29	4.29	4.29

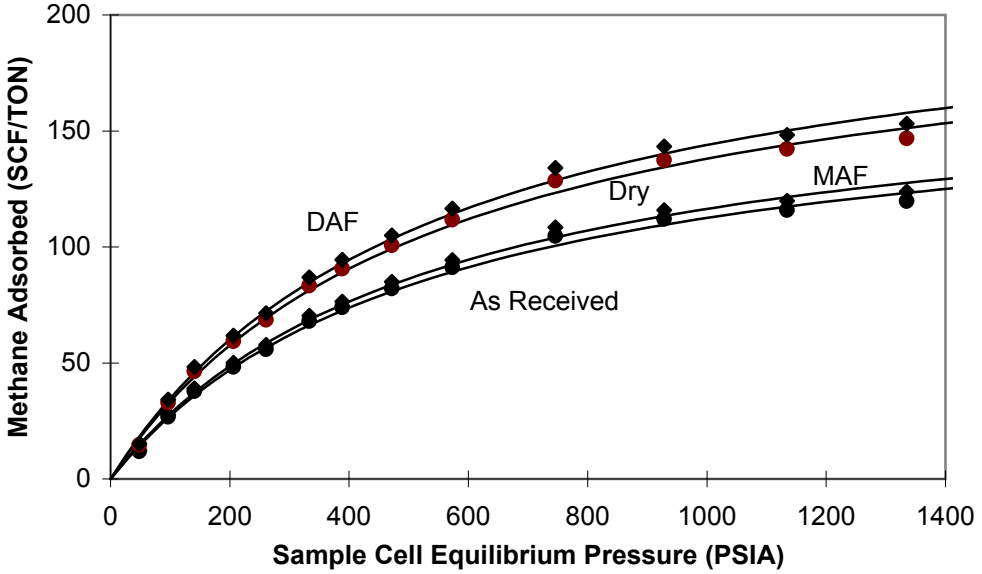
Isotherm Temperature: **21.0 ºC**

Goodness of fit of Langmuir regression: **0.98**

% Ash= 1.99 **% Moisture = 18.09**

SUMMARY OF ADSORPTION ANALYSES
INTERNATIONAL SYSTEM UNITS

Lance Oil and Gas Company, Inc.
Whiskey Draw Unit 12-12-4778 Canister 41 1547.0'-1547.5'



Pressure (PSIA)	Adsorbed Methane (ft^3/ton)			
	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
48	11.91	14.61	12.32	15.24
97	26.79	32.86	27.72	34.27
141	37.73	46.29	39.04	48.28
206	48.33	59.29	50.01	61.83
261	55.85	68.51	57.79	71.45
333	67.97	83.38	70.33	86.96
388	73.90	90.65	76.47	94.55
472	82.09	100.70	84.95	105.03
573	91.13	111.79	94.30	116.59
746	104.74	128.49	108.39	134.01
928	112.02	137.42	115.92	143.32
1134	115.88	142.15	119.91	148.26
1335	119.68	146.81	123.84	153.12

Langmuir Parameters

	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
Vol. (ft^3/ton)	173	212	179	221
Pressure (PSIA)	536	536	536	536

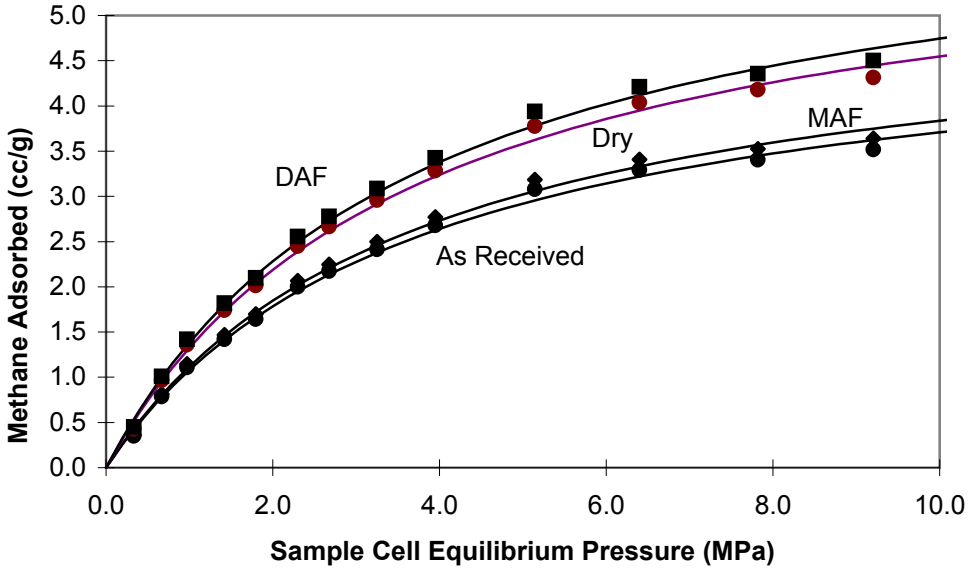
Isotherm Temperature: **70 ºF**

Goodness of fit of Langmuir regression: **0.99**

% Ash= 3.36 **% Moisture= 18.48**

SUMMARY OF ADSORPTION ANALYSES
IMPERIAL UNITS

Lance Oil and Gas Company, Inc.
Whiskey Draw Unit 12-12-4778 Canister 41 1547.0'-1547.5'



Pressure	Adsorbed Methane (cc/g)			
(MPa)	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
0.33	0.35	0.43	0.36	0.45
0.67	0.79	0.97	0.81	1.01
0.97	1.11	1.36	1.15	1.42
1.42	1.42	1.74	1.47	1.82
1.80	1.64	2.01	1.70	2.10
2.30	2.00	2.45	2.07	2.56
2.68	2.17	2.66	2.25	2.78
3.25	2.41	2.96	2.50	3.09
3.95	2.68	3.29	2.77	3.43
5.14	3.08	3.78	3.19	3.94
6.40	3.29	4.04	3.41	4.21
7.82	3.41	4.18	3.52	4.36
9.20	3.52	4.31	3.64	4.50

Langmuir Parameters

	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
Vol. (cc/g)	5.08	6.23	5.25	6.50
Pressure (MPa)	3.69	3.69	3.69	3.69

Isotherm Temperature: **21.0 ºC**

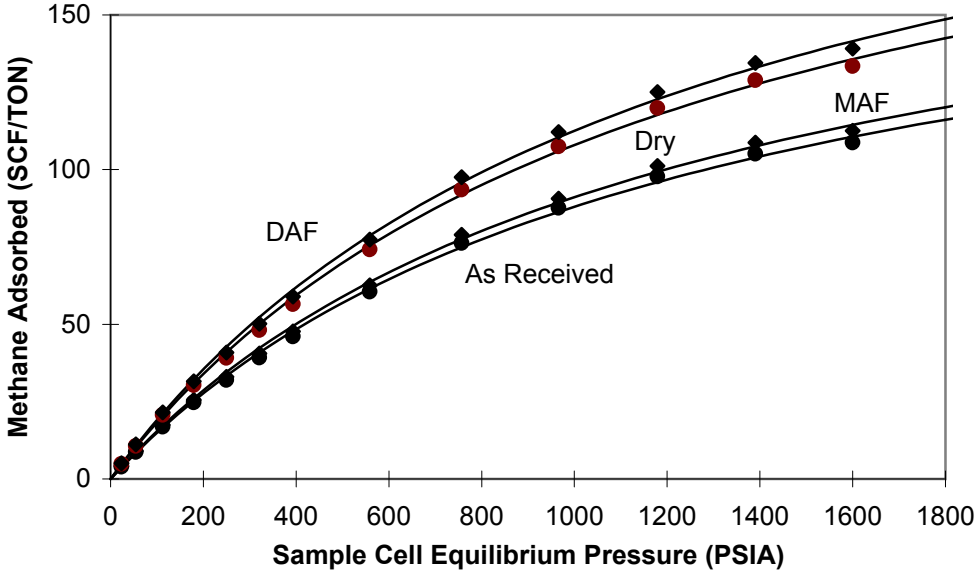
Goodness of fit of Langmuir regression: **0.99**

% Ash= 3.36 **% Moisture = 18.48**

SUMMARY OF ADSORPTION ANALYSES
INTERNATIONAL SYSTEM UNITS

Lance Oil and Gas Company, Inc.

McBeth 12-30-4673-BG Canister D3 952.0'-954.0'



Pressure (PSIA)	Adsorbed Methane (ft^3/ton)			
	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
23	3.97	4.87	4.11	5.08
55	8.70	10.68	9.01	11.14
113	16.85	20.67	17.43	21.56
179	24.68	30.27	25.54	31.57
250	31.92	39.15	33.03	40.83
321	39.23	48.12	40.60	50.19
393	46.08	56.53	47.68	58.96
559	60.48	74.18	62.58	77.37
757	76.27	93.55	78.92	97.58
966	87.61	107.47	90.66	112.09
1179	97.76	119.92	101.16	125.07
1390	105.07	128.89	108.73	134.44
1600	108.77	133.43	112.55	139.16

Langmuir Parameters

	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
Vol. (ft^3/ton)	193	237	200	248
Pressure (PSIA)	1199	1199	1199	1199

Isotherm Temperature: **70 ºF**

Goodness of fit of Langmuir regression: **0.99**

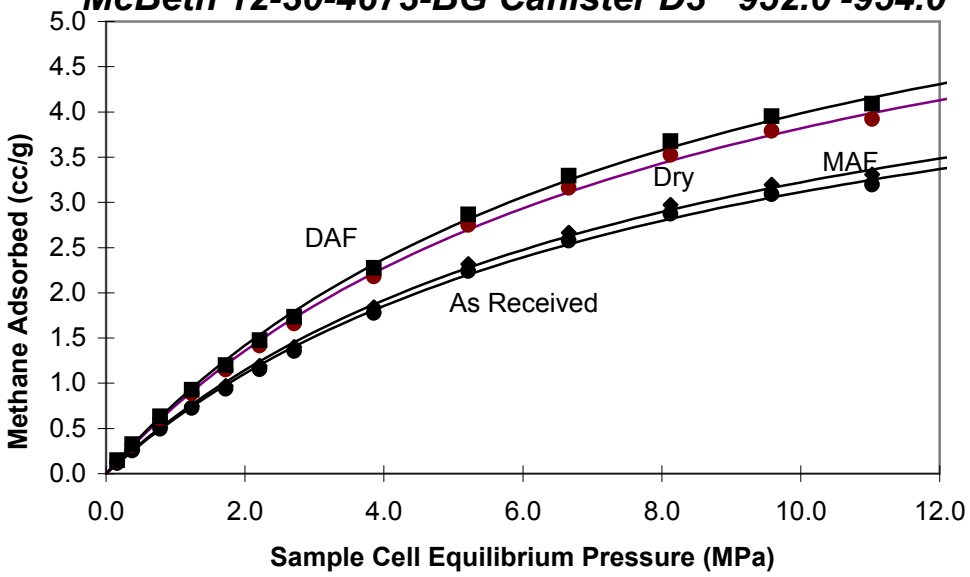
% Ash= 3.36 **% Moisture= 18.48**

SUMMARY OF ADSORPTION ANALYSES

IMPERIAL UNITS

Lance Oil and Gas Company, Inc.

McBeth 12-30-4673-BG Canister D3 952.0'-954.0'



Pressure (MPa)	Adsorbed Methane (cc/g) As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
0.16	0.12	0.14	0.12	0.15
0.38	0.26	0.31	0.26	0.33
0.78	0.50	0.61	0.51	0.63
1.23	0.73	0.89	0.75	0.93
1.72	0.94	1.15	0.97	1.20
2.21	1.15	1.41	1.19	1.48
2.71	1.35	1.66	1.40	1.73
3.85	1.78	2.18	1.84	2.27
5.22	2.24	2.75	2.32	2.87
6.66	2.57	3.16	2.66	3.29
8.13	2.87	3.52	2.97	3.68
9.58	3.09	3.79	3.20	3.95
11.03	3.20	3.92	3.31	4.09

Langmuir Parameters

	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
Vol. (cc/g)	5.69	6.97	5.88	7.27
Pressure (MPa)	8.26	8.26	8.26	8.26

Isotherm Temperature: **21.0 ºC**

Goodness of fit of Langmuir regression: **0.99**

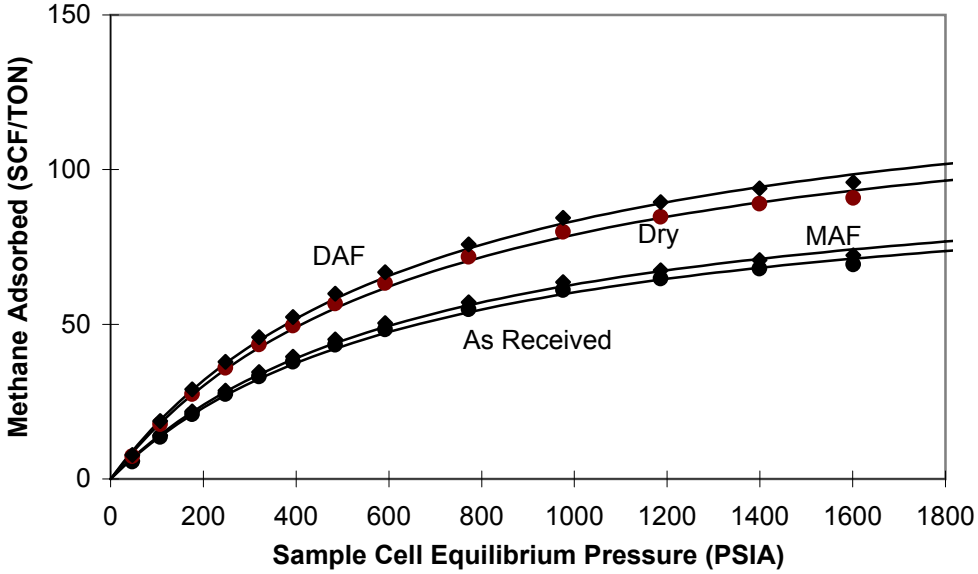
% Ash= 3.36 **% Moisture = 18.48**

SUMMARY OF ADSORPTION ANALYSES

INTERNATIONAL SYSTEM UNITS

Lance Oil and Gas Company, Inc.

McBeth 12-30-4673-BG Canister D27 968.0'-968.6'



Pressure (PSIA)	Adsorbed Methane (ft^3/ton)			
	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
47	5.57	7.30	5.81	7.71
107	13.54	17.73	14.11	18.72
176	20.95	27.43	21.83	28.96
248	27.38	35.86	28.54	37.86
320	33.15	43.41	34.55	45.84
393	37.88	49.59	39.47	52.37
484	43.32	56.72	45.14	59.89
592	48.33	63.29	50.37	66.82
772	54.82	71.78	57.13	75.79
975	61.03	79.91	63.60	84.38
1186	64.72	84.75	67.45	89.48
1399	67.92	88.93	70.78	93.90
1602	69.34	90.80	72.26	95.87

Langmuir Parameters

	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
Vol. (ft^3/ton)	102	133	106	141
Pressure (PSIA)	685	685	685	685

Isotherm Temperature: **70 ºF**

Goodness of fit of Langmuir regression: **0.99**

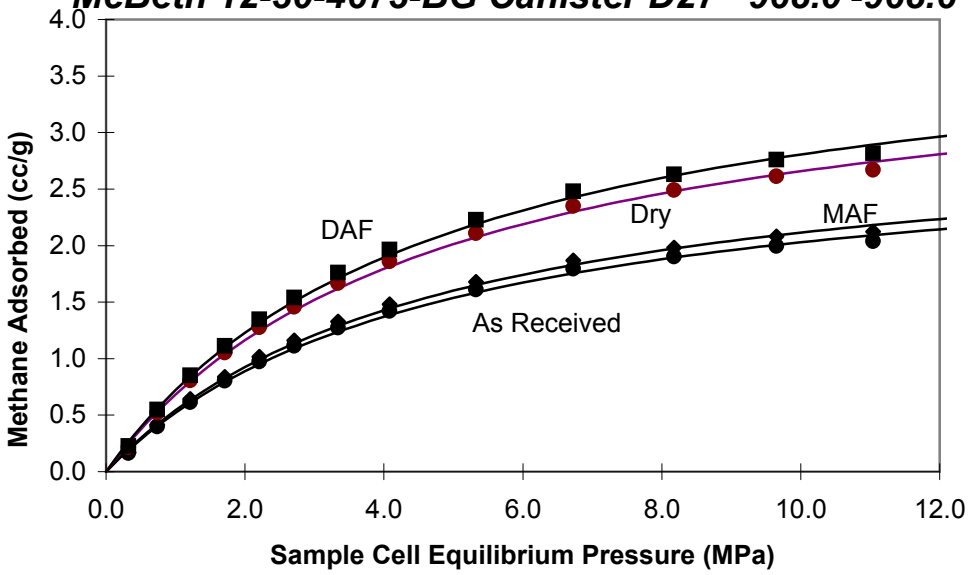
% Ash= 4.04 **% Moisture= 23.63**

SUMMARY OF ADSORPTION ANALYSES

IMPERIAL UNITS

Lance Oil and Gas Company, Inc.

McBeth 12-30-4673-BG Canister D27 968.0'-968.6'



Pressure	Adsorbed Methane (cc/g)			
(MPa)	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
0.32	0.16	0.21	0.17	0.23
0.74	0.40	0.52	0.41	0.55
1.21	0.62	0.81	0.64	0.85
1.71	0.80	1.05	0.84	1.11
2.21	0.97	1.28	1.02	1.35
2.71	1.11	1.46	1.16	1.54
3.34	1.27	1.67	1.33	1.76
4.08	1.42	1.86	1.48	1.96
5.32	1.61	2.11	1.68	2.23
6.73	1.79	2.35	1.87	2.48
8.18	1.90	2.49	1.98	2.63
9.65	2.00	2.61	2.08	2.76
11.04	2.04	2.67	2.12	2.82

Langmuir Parameters

	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
Vol. (cc/g)	2.99	3.91	3.11	4.13
Pressure (MPa)	4.72	4.72	4.72	4.72

Isotherm Temperature: **21.0 ºC**

Goodness of fit of Langmuir regression: **0.99**

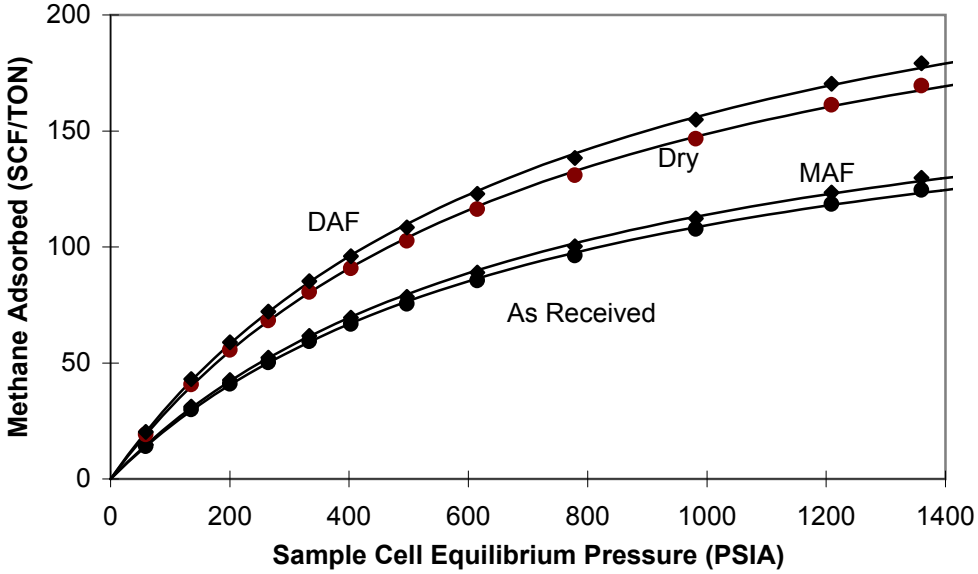
% Ash= 4.04 **% Moisture = 23.63**

SUMMARY OF ADSORPTION ANALYSES

INTERNATIONAL SYSTEM UNITS

Williams Production RMT Company

State 23-16-4171 Canister 51 334.0'-336.0'



Pressure (PSIA)	Adsorbed Methane (ft^3/ton)			
	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
59	14.12	19.20	14.71	20.30
135	29.93	40.70	31.17	43.03
200	40.93	55.65	42.62	58.84
265	50.22	68.29	52.30	72.19
333	59.25	80.56	61.70	85.17
403	66.79	90.83	69.56	96.02
497	75.42	102.56	78.55	108.42
615	85.49	116.24	89.03	122.89
779	96.28	130.92	100.27	138.41
981	107.78	146.56	112.25	154.94
1209	118.54	161.19	123.45	170.41
1360	124.61	169.45	129.78	179.15

Langmuir Parameters

	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
Vol. (ft^3/ton)	191	259	198	274
Pressure (PSIA)	742	742	742	742

Isotherm Temperature: **68 ºF**

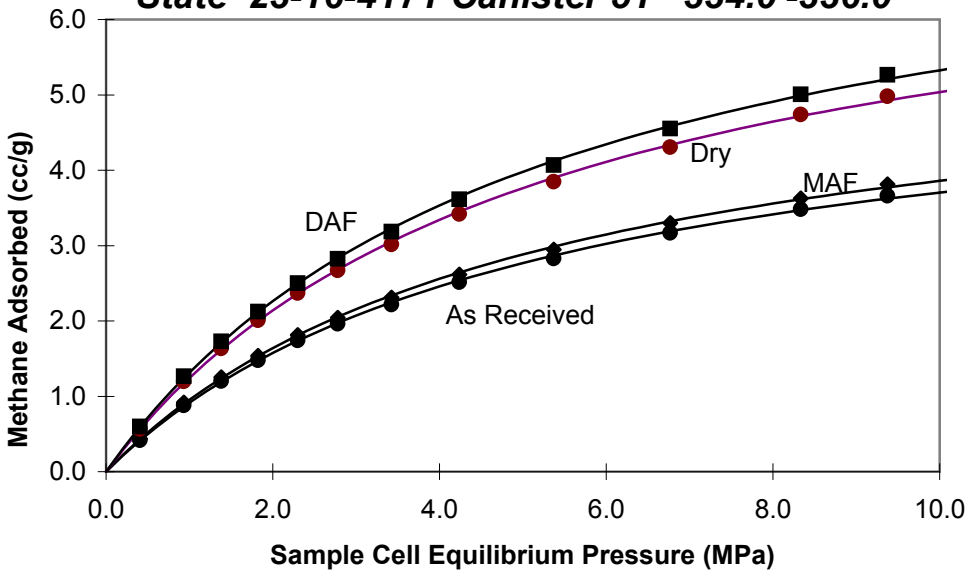
Goodness of fit of Langmuir regression: **1.00**

% Ash= 3.98 **% Moisture= 26.46**

SUMMARY OF ADSORPTION ANALYSES
IMPERIAL UNITS

Williams Production RMT Company

State 23-16-4171 Canister 51 334.0'-336.0'



Pressure (MPa)	Adsorbed Methane (cc/g) As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
0.41	0.42	0.56	0.43	0.60
0.93	0.88	1.20	0.92	1.26
1.38	1.20	1.64	1.25	1.73
1.82	1.48	2.01	1.54	2.12
2.30	1.74	2.37	1.81	2.50
2.78	1.96	2.67	2.04	2.82
3.43	2.22	3.01	2.31	3.19
4.24	2.51	3.42	2.62	3.61
5.37	2.83	3.85	2.95	4.07
6.77	3.17	4.31	3.30	4.55
8.33	3.48	4.74	3.63	5.01
9.37	3.66	4.98	3.81	5.26

Langmuir Parameters

	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
Vol. (cc/g)	5.60	7.61	5.83	8.05
Pressure (MPa)	5.11	5.11	5.11	5.11

Isotherm Temperature: **20.0 ºC**

Goodness of fit of Langmuir regression: **1.00**

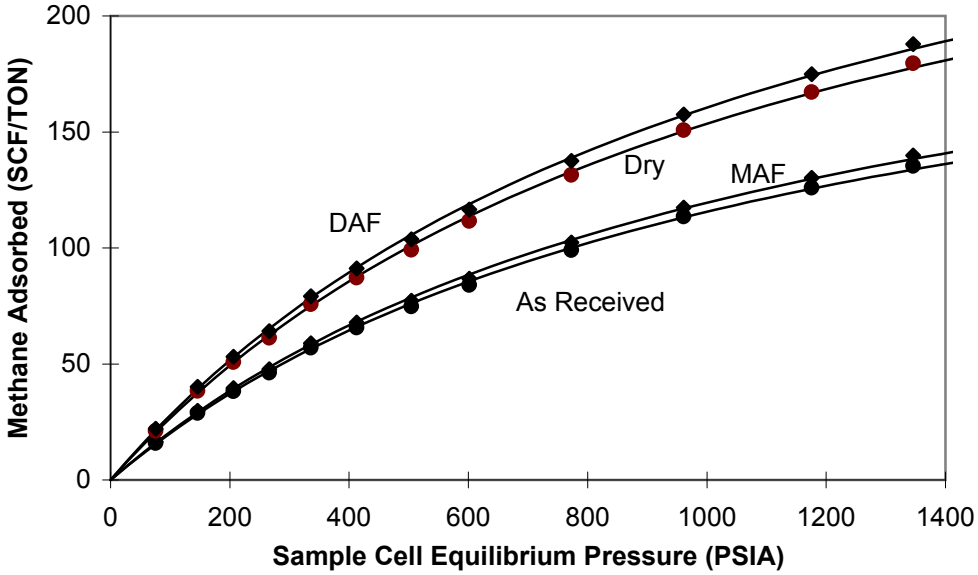
% Ash= 3.98 **% Moisture = 26.46**

SUMMARY OF ADSORPTION ANALYSES
INTERNATIONAL SYSTEM UNITS

Core Hole 34

Williams Production RMT Company

State 23-16-4171 Canister 5 508.5'-510.5'



Pressure (PSIA)	Adsorbed Methane (ft^3/ton)			
	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
76	15.92	21.14	16.46	22.10
146	28.88	38.35	29.85	40.10
206	38.24	50.79	39.54	53.10
266	46.14	61.29	47.71	64.08
336	56.99	75.69	58.92	79.14
413	65.62	87.16	67.85	91.13
504	74.70	99.22	77.24	103.74
602	83.98	111.54	86.82	116.62
773	98.98	131.46	102.34	137.45
961	113.48	150.72	117.32	157.58
1176	125.91	167.23	130.18	174.85
1346	135.24	179.63	139.83	187.81

Langmuir Parameters

	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
Vol. (ft^3/ton)	245	326	254	341
Pressure (PSIA)	1123	1123	1123	1123

Isotherm Temperature: **70 ºF**

Goodness of fit of Langmuir regression: **1.00**

% Ash= 3.28 **% Moisture= 24.71**

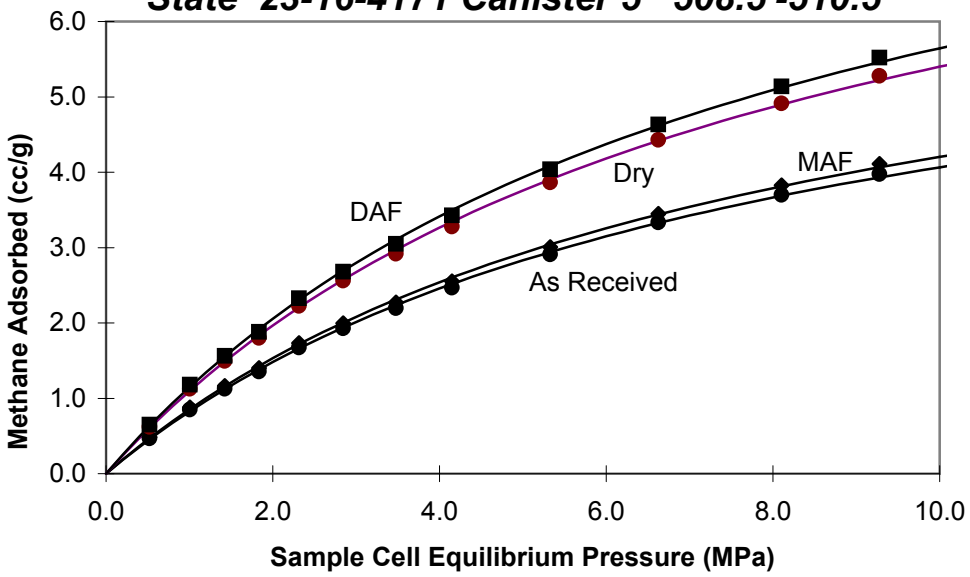
SUMMARY OF ADSORPTION ANALYSES

IMPERIAL UNITS

Core Hole 34

Williams Production RMT Company

State 23-16-4171 Canister 5 508.5'-510.5'



Pressure	Adsorbed Methane (cc/g)			
(MPa)	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
0.52	0.47	0.62	0.48	0.65
1.00	0.85	1.13	0.88	1.18
1.42	1.12	1.49	1.16	1.56
1.84	1.36	1.80	1.40	1.88
2.32	1.67	2.22	1.73	2.33
2.84	1.93	2.56	1.99	2.68
3.48	2.20	2.92	2.27	3.05
4.15	2.47	3.28	2.55	3.43
5.33	2.91	3.86	3.01	4.04
6.63	3.33	4.43	3.45	4.63
8.10	3.70	4.91	3.83	5.14
9.28	3.97	5.28	4.11	5.52

Langmuir Parameters

	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
Vol. (cc/g)	7.21	9.58	7.46	10.01
Pressure (MPa)	7.74	7.74	7.74	7.74

Isotherm Temperature: **21.0 ºC**

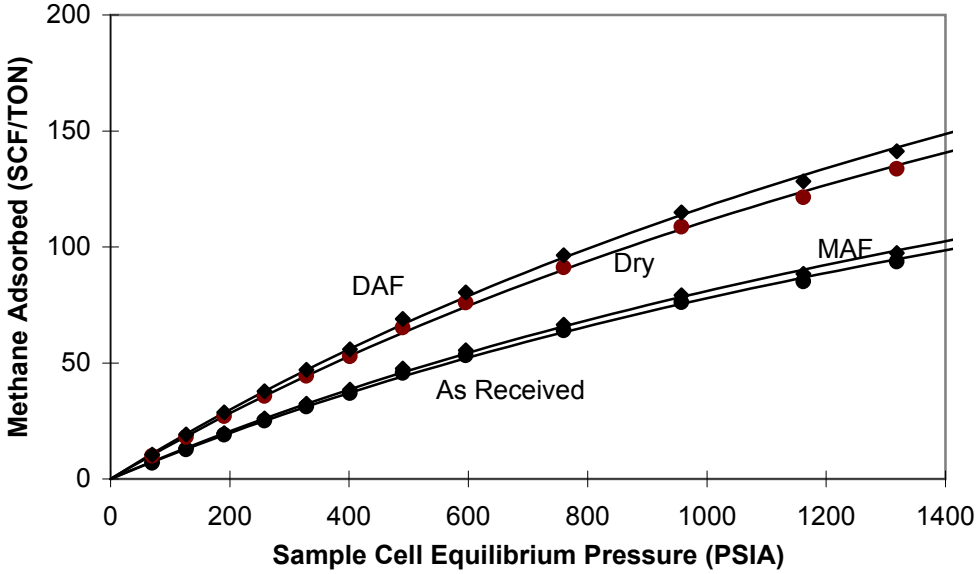
Goodness of fit of Langmuir regression: **1.00**

% Ash= 3.28 **% Moisture = 24.71**

SUMMARY OF ADSORPTION ANALYSES
INTERNATIONAL SYSTEM UNITS

Williams Production RMT Company

Groves 12-19-4574 Canister D3 1201.0'-1203.0'



Pressure (PSIA)	Adsorbed Methane (ft^3/ton)			
	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
70	6.94	9.90	7.22	10.47
127	12.68	18.10	13.19	19.14
190	18.98	27.08	19.73	28.63
258	25.04	35.73	26.03	37.77
328	31.15	44.44	32.38	46.99
401	37.03	52.83	38.49	55.86
490	45.72	65.22	47.52	68.96
596	53.31	76.06	55.42	80.42
760	63.94	91.23	66.47	96.46
957	76.18	108.69	79.19	114.92
1162	85.05	121.34	88.41	128.29
1318	93.64	133.60	97.34	141.25

Langmuir Parameters

	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
Vol. (ft^3/ton)	293	419	305	443
Pressure (PSIA)	2765	2765	2765	2765

Isotherm Temperature: **73 ºF**

Goodness of fit of Langmuir regression: **0.98**

% Ash= 3.80 **% Moisture= 29.91**

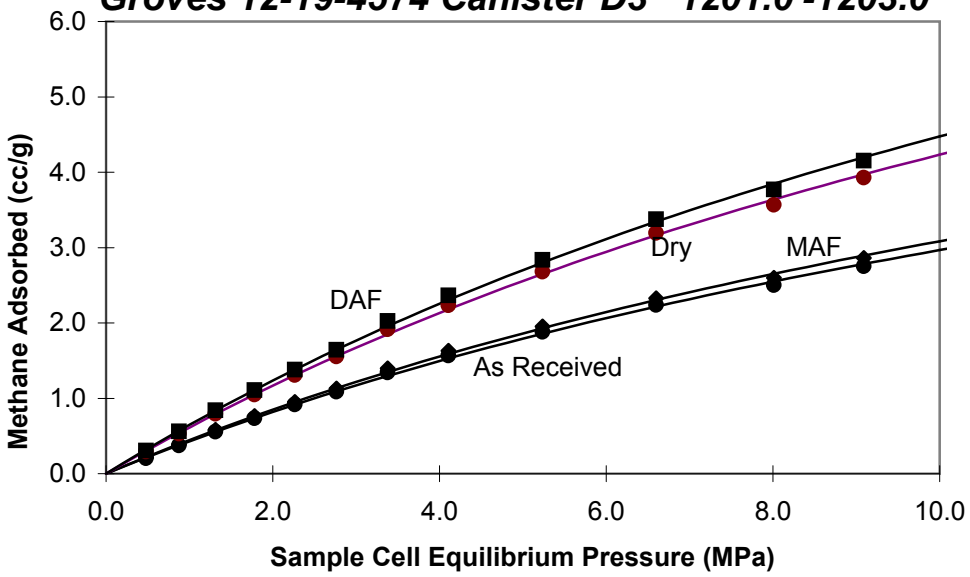
SUMMARY OF ADSORPTION ANALYSES

IMPERIAL UNITS

Core Hole 35

Williams Production RMT Company

Groves 12-19-4574 Canister D3 1201.0'-1203.0'



Pressure	Adsorbed Methane (cc/g)			
(MPa)	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
0.48	0.20	0.29	0.21	0.31
0.87	0.37	0.53	0.39	0.56
1.31	0.56	0.80	0.58	0.84
1.78	0.74	1.05	0.76	1.11
2.26	0.92	1.31	0.95	1.38
2.77	1.09	1.55	1.13	1.64
3.38	1.34	1.92	1.40	2.03
4.11	1.57	2.24	1.63	2.36
5.24	1.88	2.68	1.95	2.83
6.60	2.24	3.19	2.33	3.38
8.01	2.50	3.57	2.60	3.77
9.09	2.75	3.93	2.86	4.15

Langmuir Parameters

	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
Vol. (cc/g)	8.62	12.30	8.96	13.00
Pressure (MPa)	19.06	19.06	19.06	19.06

Isotherm Temperature: **23.0 ºC**

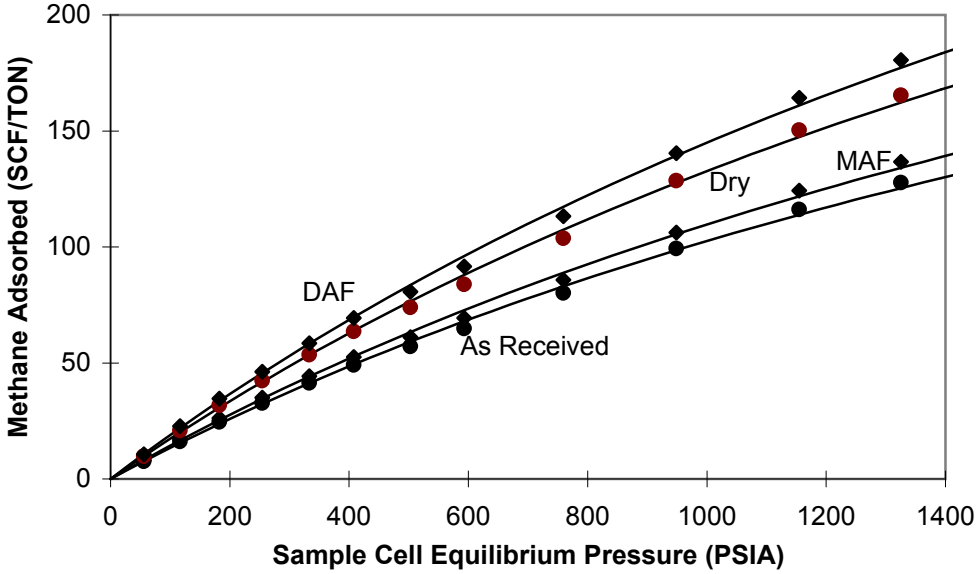
Goodness of fit of Langmuir regression: **0.98**

% Ash= **3.80** **% Moisture =** **29.91**

SUMMARY OF ADSORPTION ANALYSES
INTERNATIONAL SYSTEM UNITS

Williams Production RMT Company

Groves 12-19-4574 Canister D17 1243.0'-1245.0'



Pressure (PSIA)	Adsorbed Methane (ft^3/ton)			
	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
56	7.53	9.74	8.05	10.64
116	16.12	20.86	17.24	22.78
183	24.49	31.70	26.20	34.62
254	32.72	42.35	35.00	46.25
333	41.38	53.56	44.27	58.51
408	49.08	63.52	52.51	69.39
503	57.10	73.90	61.08	80.72
593	64.82	83.89	69.34	91.64
759	80.14	103.73	85.74	113.30
949	99.31	128.54	106.25	140.41
1155	116.20	150.40	124.31	164.28
1325	127.73	165.33	136.66	180.59

Langmuir Parameters

	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
Vol. (ft^3/ton)	397	514	425	561
Pressure (PSIA)	2872	2872	2872	2872

Isotherm Temperature: 73 ºF

Goodness of fit of Langmuir regression: 0.95

% Ash= 6.53 % Moisture= 22.74

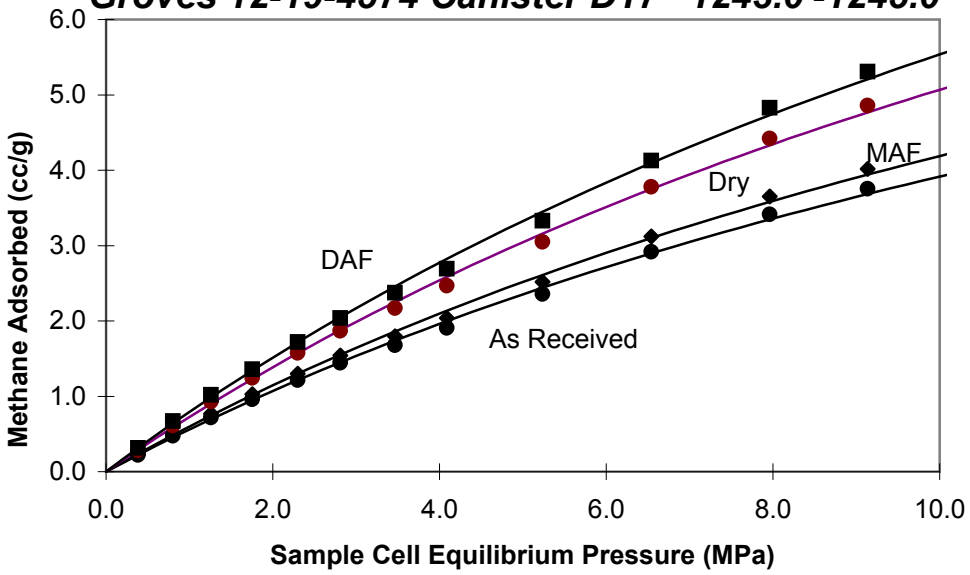
SUMMARY OF ADSORPTION ANALYSES

IMPERIAL UNITS

Core Hole 35

Williams Production RMT Company

Groves 12-19-4574 Canister D17 1243.0'-1245.0'



Pressure	Adsorbed Methane (cc/g)			
(MPa)	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
0.38	0.22	0.29	0.24	0.31
0.80	0.47	0.61	0.51	0.67
1.26	0.72	0.93	0.77	1.02
1.75	0.96	1.24	1.03	1.36
2.30	1.22	1.57	1.30	1.72
2.81	1.44	1.87	1.54	2.04
3.47	1.68	2.17	1.80	2.37
4.09	1.90	2.47	2.04	2.69
5.24	2.36	3.05	2.52	3.33
6.54	2.92	3.78	3.12	4.13
7.96	3.41	4.42	3.65	4.83
9.14	3.75	4.86	4.02	5.31

Langmuir Parameters

	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
Vol. (cc/g)	11.67	15.10	12.49	16.50
Pressure (MPa)	19.80	19.80	19.80	19.80

Isotherm Temperature: 23.0 ºC

Goodness of fit of Langmuir regression: 0.95

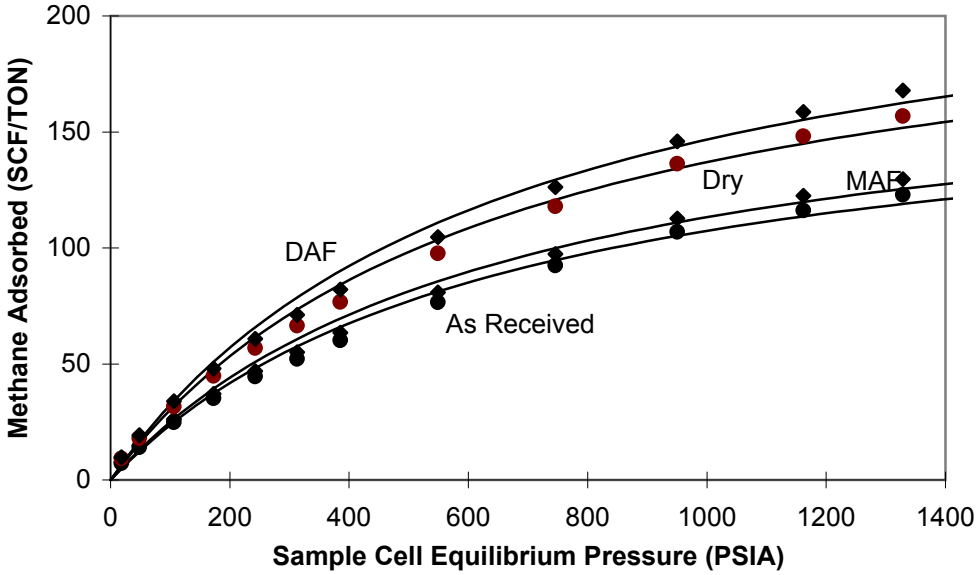
% Ash= 6.53 % Moisture = 22.74

SUMMARY OF ADSORPTION ANALYSES
INTERNATIONAL SYSTEM UNITS

Core Hole 35

Peabody Natural Gas, LLC.

PNG 24-1 Canister D24 1258.2'-1259.2'



Pressure (PSIA)	Adsorbed Methane (ft^3/ton)			
	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
18	7.20	9.18	7.59	9.83
48	14.09	17.98	14.86	19.25
106	24.81	31.65	26.17	33.89
173	35.13	44.81	37.05	47.98
242	44.52	56.79	46.95	60.81
313	52.14	66.52	54.99	71.23
385	60.11	76.68	63.39	82.10
549	76.60	97.72	80.78	104.63
746	92.39	117.86	97.44	126.20
950	106.88	136.34	112.72	145.99
1162	116.15	148.18	122.50	158.66
1328	122.92	156.81	129.64	167.90

Langmuir Parameters

	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
Vol. (ft^3/ton)	177	226	187	242
Pressure (PSIA)	648	648	648	648

Isotherm Temperature: **75 ºF**

Goodness of fit of Langmuir regression: **0.96**

% Ash= 5.18 **% Moisture= 21.61**

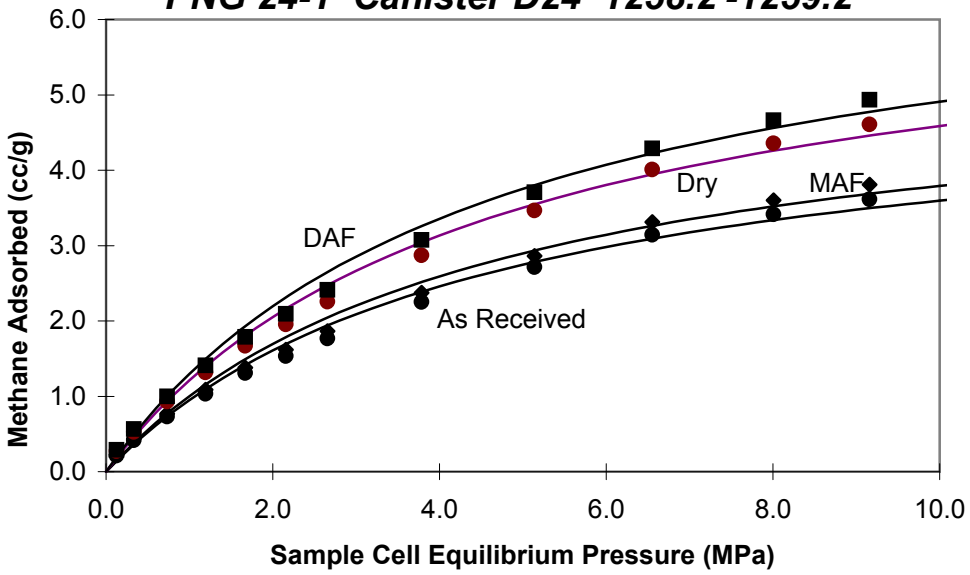
SUMMARY OF ADSORPTION ANALYSES

IMPERIAL UNITS

Core Hole 36

Peabody Natural Gas, LLC.

PNG 24-1 Canister D24 1258.2'-1259.2'



Pressure	Adsorbed Methane (cc/g)			
(MPa)	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
0.13	0.21	0.27	0.22	0.29
0.33	0.41	0.53	0.44	0.57
0.73	0.73	0.93	0.77	1.00
1.19	1.03	1.32	1.09	1.41
1.67	1.31	1.67	1.38	1.79
2.16	1.53	1.95	1.62	2.09
2.65	1.77	2.25	1.86	2.41
3.79	2.25	2.87	2.37	3.07
5.14	2.72	3.46	2.86	3.71
6.55	3.14	4.01	3.31	4.29
8.01	3.41	4.35	3.60	4.66
9.16	3.61	4.61	3.81	4.93

Langmuir Parameters

	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
Vol. (cc/g)	5.20	6.64	5.49	7.10
Pressure (MPa)	4.47	4.47	4.47	4.47

Isotherm Temperature: **24.0 ºC**

Goodness of fit of Langmuir regression: **0.96**

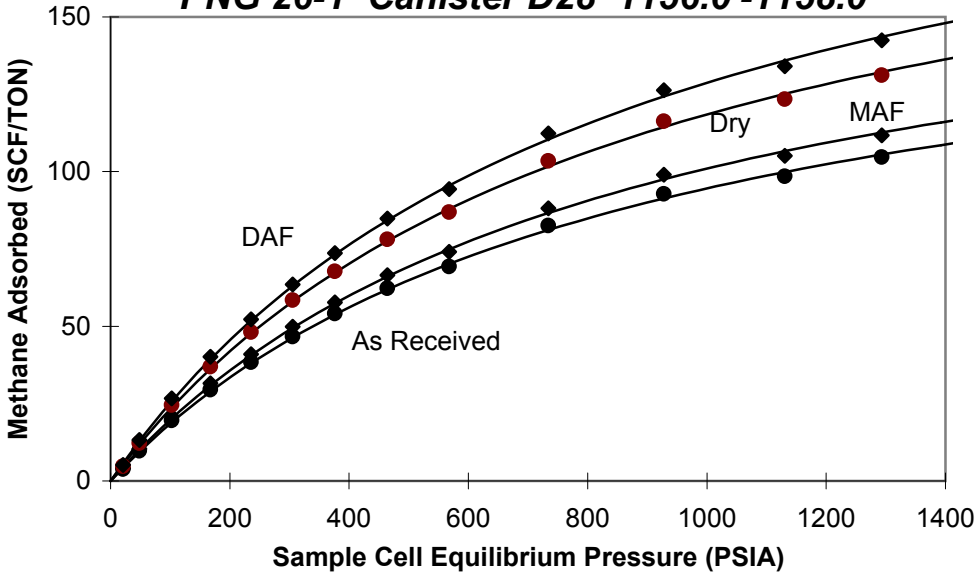
% Ash= 5.18 **% Moisture = 21.61**

SUMMARY OF ADSORPTION ANALYSES
INTERNATIONAL SYSTEM UNITS

Core Hole 36

Peabody Natural Gas, LLC.

PNG 26-1 Canister D28 1156.0'-1158.0'



Pressure (PSIA)	Adsorbed Methane (ft^3/ton)			
	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
21	3.79	4.74	4.04	5.15
48	9.71	12.16	10.37	13.21
103	19.60	24.56	20.93	26.68
167	29.51	36.98	31.51	40.17
236	38.35	48.05	40.95	52.20
305	46.66	58.47	49.82	63.51
376	54.10	67.78	57.76	73.63
464	62.29	78.05	66.51	84.79
568	69.35	86.90	74.05	94.40
734	82.57	103.45	88.16	112.38
928	92.76	116.23	99.04	126.26
1131	98.46	123.37	105.13	134.02
1293	104.67	131.15	111.76	142.47

Langmuir Parameters

	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
Vol. (ft^3/ton)	174	218	186	237
Pressure (PSIA)	843	843	843	843

Isotherm Temperature: **73 ºF**

Goodness of fit of Langmuir regression: **0.99**

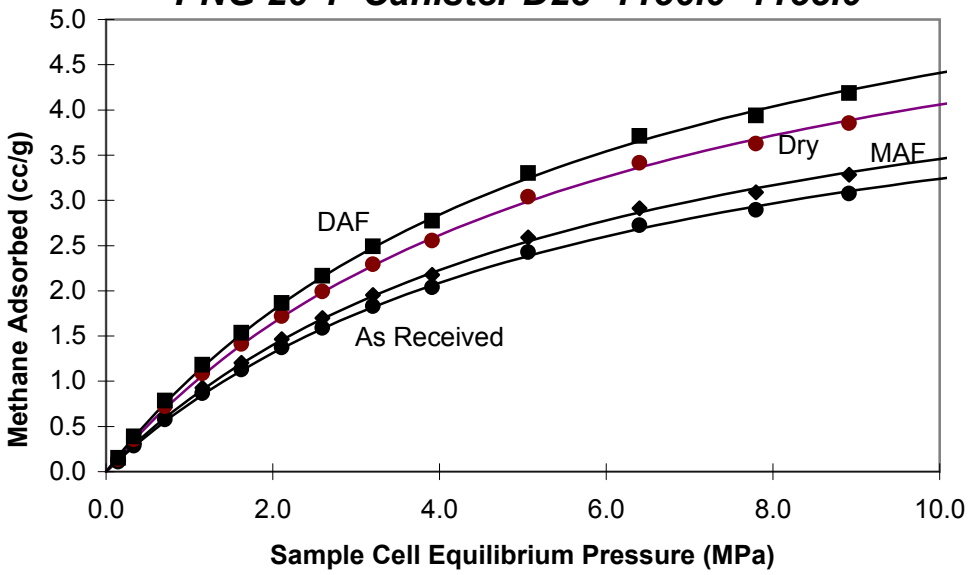
% Ash= 6.34 **% Moisture= 20.19**

SUMMARY OF ADSORPTION ANALYSES

IMPERIAL UNITS

Peabody Natural Gas, LLC.

PNG 26-1 Canister D28 1156.0'-1158.0'



Pressure	Adsorbed Methane (cc/g)			
(MPa)	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
0.15	0.11	0.14	0.12	0.15
0.33	0.29	0.36	0.30	0.39
0.71	0.58	0.72	0.62	0.78
1.15	0.87	1.09	0.93	1.18
1.62	1.13	1.41	1.20	1.53
2.11	1.37	1.72	1.46	1.87
2.59	1.59	1.99	1.70	2.16
3.20	1.83	2.29	1.95	2.49
3.91	2.04	2.55	2.18	2.77
5.06	2.43	3.04	2.59	3.30
6.40	2.73	3.42	2.91	3.71
7.80	2.89	3.63	3.09	3.94
8.92	3.08	3.85	3.28	4.19

Langmuir Parameters

	As Received	Dry with Ash	Moist Ash Free	Dry Ash Free
Vol. (cc/g)	5.12	6.42	5.47	6.97
Pressure (MPa)	5.81	5.81	5.81	5.81

Isotherm Temperature: **23.0 ºC**

Goodness of fit of Langmuir regression: **0.99**

% Ash= 6.34 **% Moisture = 20.19**

SUMMARY OF ADSORPTION ANALYSES

INTERNATIONAL SYSTEM UNITS

Your Isotherms

To help you interpret you data I have prepared a few short paragraphs to tell you how your data was obtained. If you have any questions please do not hesitate to contact us.

Obtaining and interpreting isotherm data and Langmuir Isotherms

Your high-pressure methane, carbon dioxide or mixed gas adsorption analyses were performed using a high-pressure volumetric adsorption technique. Your isotherms were measured on a custom made apparatus modeled after an apparatus designed and built at CSIRO in Lucus Heights, Australia. The apparatus is based on Boyle's Law. Simply, a known volume of gas within in a reference cell is used to dose a sample cell containing your sample. The amount of gas adsorbed, using the real gas law, in the sample cell is then determined based on change in pressure in the sample cell. Normally 100 g of sample is utilized in such analyses. Tests show that reproducible results can be obtained on samples as small as 25 g but the larger samples yield better quality data. Our instrument has four sample cells.

The pressures in the reference and four samples cells are measured using pressure transducers that are interfaced to a computer equipped with specialized boards and software for this purpose. The computer monitors the transducers and determines when equilibrium is reached as well as controls valves and switches for dosing and purging the references and sample cells. Following dosing of the sample cell with a known volume of gas, the pressure in the sample cell is monitored. As gas is adsorbed by the sample the pressure drops until equilibrium is reached; that is no more gas can be adsorbed by the samples at that particular specified pressure. Critical to obtaining quality isotherms is deciding when the equilibrium is reached. In our instrument we set a stringent test- equilibrium is reached only when the pressure in the cell does not change over a designated period of time. When equilibrium is reached the sample is dosed at the next highest pressure. We normally collect 12 separate pressure points selected such that the best Langmuir regression can be obtained. We can of course collect data at points selected by the client before hand. The temperature of the references and sample cells is maintained at the exact temperature requested by the client. The temperature is maintained within a tolerance less than 1/10 of one degree centigrade.

For a routine adsorption analyses about five to six days are required once equilibrium moisture has been determined.

How we assure the quality of the isotherms- potential sources of error and recognition of problems

With an apparatus such as ours the only potential error is a change in the characteristics of the pressure transducers, a leak in the system or non-isothermal conditions.

Our pressure transducers were selected for optimum performance within the range of pressures that isotherms are collected. They are not only factory guaranteed we cross-calibrate our transducers periodically to test for drift. The accuracy of our transducers is better than 0.001 MPa.

Prior to running your experiment the reference and sample cells and plumbing are pressure tested for leaks using helium. We do our leak tests at 9 MPa. Because the He molecule is smaller than either methane or carbon dioxide (the gases we normally do adsorption work with) using He assures us of a leak free system. If a leak were to develop during analyses (one never has) it would be readily apparent because the cells would never come to equilibrium at a given pressure (the leak would appear as an infinitely adsorbing material).

Non-isothermal conditions are not a potential problem utilizing our instrument unless a prolonged power failure occurs. Our bath temperature is maintained by a submerged electric heater and a circulating power. The heater is controlled by a temperature controller to a tolerance less than 1/10 of a degree centigrade.

We periodically run a standard sample in our apparatus to confirm that all is well.

Understanding Your Isotherms

The classic theory used to describe the Type I isotherm for microporous materials with small external surface area is based on the Langmuir equation (1916). The Type I isotherm displays a steep increase in adsorption at low relative pressures due to enhanced adsorption caused by the overlapping adsorption potentials between walls of pores whose diameters are commensurate in size with the adsorbate molecule. The Type I isotherm then flattens out into a plateau region at higher relative pressure, which is believed to be due to the completion of a monolayer of adsorbed gas. The micropore volume is then thought to be filled by only a few molecular layers of adsorbate, and further uptake is limited by the dimensions of the micropores.

The Langmuir model assumes that a state of dynamic equilibrium is established between the adsorbate vapor and the adsorbent surface and that adsorption is restricted to a single monolayer (Gregg and Sing, 1982). The adsorbent surface is thought to be composed of a regular array of energetically homogeneous adsorption sites upon which an adsorbed monolayer is assumed to form. The rate of condensation is assumed to be equal to the rate of evaporation from the adsorbed monolayer at a given relative pressure and constant temperature. The Langmuir equation was developed with these assumptions and takes the following form:

$$\frac{P}{V} = \frac{1}{BV_m} + \frac{P}{V_m}$$

where P is the equilibrium pressure, V is the volume of gas adsorbed at equilibrium, V_m is the volume of adsorbate occupying a monolayer, and B is an empirical constant. A plot of P/V Vs relative pressure should yield a straight line whose slope will yield V_m

from which the surface area may be obtained. As shown on your figures a best fit Langmuir isotherm and the data points have been plotted for each sample.

The Langmuir Isotherm can be written:

$$V(P) = \frac{V_L P}{P_L + P}$$

P = gas pressure
V(P) = predicated amount of gas adsorbed at P
V_L = Langmuir volume parameter
P_L = Langmuir pressure parameter

The difference between the measured amount of gas adsorbed (V(P)) and that predicted using the Langmuir Equation (Vi(P)) is a measure of error and is given as:

Err(P) = Vi(P) - V(P)

This error may be positive or negative. The square of the error is always positive and is a measure of the how well the calculated isotherm matches the data. This error can be calculate for each point and summed giving a measure of the overall error:

$$SSE = \sum_{i=1}^{N} Err_i^2$$

N= number of measured points.

We express the goodness of fit of the isotherm by calculation the correlation coefficient between the measured points and the calculate points. Our results generally yield correlation's that are better than $r^2 = 0.99$. and standard errors of Langmuir volumes of
$\pm$ 2%. The errors for your samples can be found on the bottom of the data sheets that are included with each sample.

In examining your data you should note that adsorption values are provided for the raw data and corrected for ash content. The ash content will also be corrected for equilibrium moisture content.

References for Appendix

ICCP (International Committee for Coal and Organic Petrology), 1998, The new vitrinite classification (ICCP System, 1994), Fuel, vol. 77, p. 349-358.

Langmuir, I., 1916. The constitution and fundamental properties of solids and liquids. Journal of the American Chemical Society, 38: 2221-2295.