

OPEN-FILE REPORT 81-04

COAL BED METHANE DESORPTION DATA

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Colorado Geological Survey
Department of Natural Resources
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Finally, we must thank the U.S. Geological Survey and the oil and coal companies who allowed us to sample their cores and gave us permission to publish this data.

DISCLAIMER

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"However, any opinions, findings, conclusions, or recommendations expressed herein are those of the authors and do not necessarily reflect the views of DOE."

INTRODUCTION

This report contains only Colorado Geological Survey desorption data for Colorado as determined by the U.S. Bureau of Mines direct method (see Appendix 1). (Other data may be available.) This data was collected under grants from the U.S. Bureau of Mines, the Colorado Oil and Gas Conservation Commission, and especially the U.S. Department of Energy during the years 1975 through 1982 in order to determine the extent of the potential methane hazard and/or resource.

Most of the samples tested are coal; a few are sandstone, siltstone, shale, or oil shale. The data are arranged by CGS numbers (roughly chronological order of sample collection). A Colorado coal region map (Figure 1), a stratigraphic chart (Figure 2), and sample locations maps for each sample coal region (Figures 3-8) are provided to aid in data searches. Table 1 indicates which tests were run on each sample. Appendix 2 lists abbreviations frequently used in the text.

Gas results are presented in cubic feet per ton, not standard cubic feet per ton. These cubic feet per ton results are approximately 20% higher than standard cubic feet results, due to the elevation of the sample locations and our Denver office. Furthermore, the U.S. Bureau of Mines admits to a $\pm 30\%$ error in their direct method. Therefore, total gas content figures are best considered to be relative numbers indicating high, medium, or low gas contents.

Only raw data is presented. We hope there is enough data on most individual samples for interested parties to conduct their own analyses. For example, a low gas content for a particular sample may be explained by shallow sample depths listed in the desorption data section, or high ash contents or low rank listed in the coal analyses section.

Finally, this report and our other individual basin reports on the Green River, Raton, San Juan, and Piceance Basins, are designed to give an indication of where high gas contents (based on the desorption data herein and other geological factors) are likely to be found. We cannot quantify the relationship between gas contents and reservoir production potential. We assume that successful production is more likely in an area of high gas content; however, other factors such as water saturation, permeability, and structural position might also be significant. Furthermore, even in areas where gas content and other geologic factors appear favorable, proper production procedures are still in dispute and await further testing.

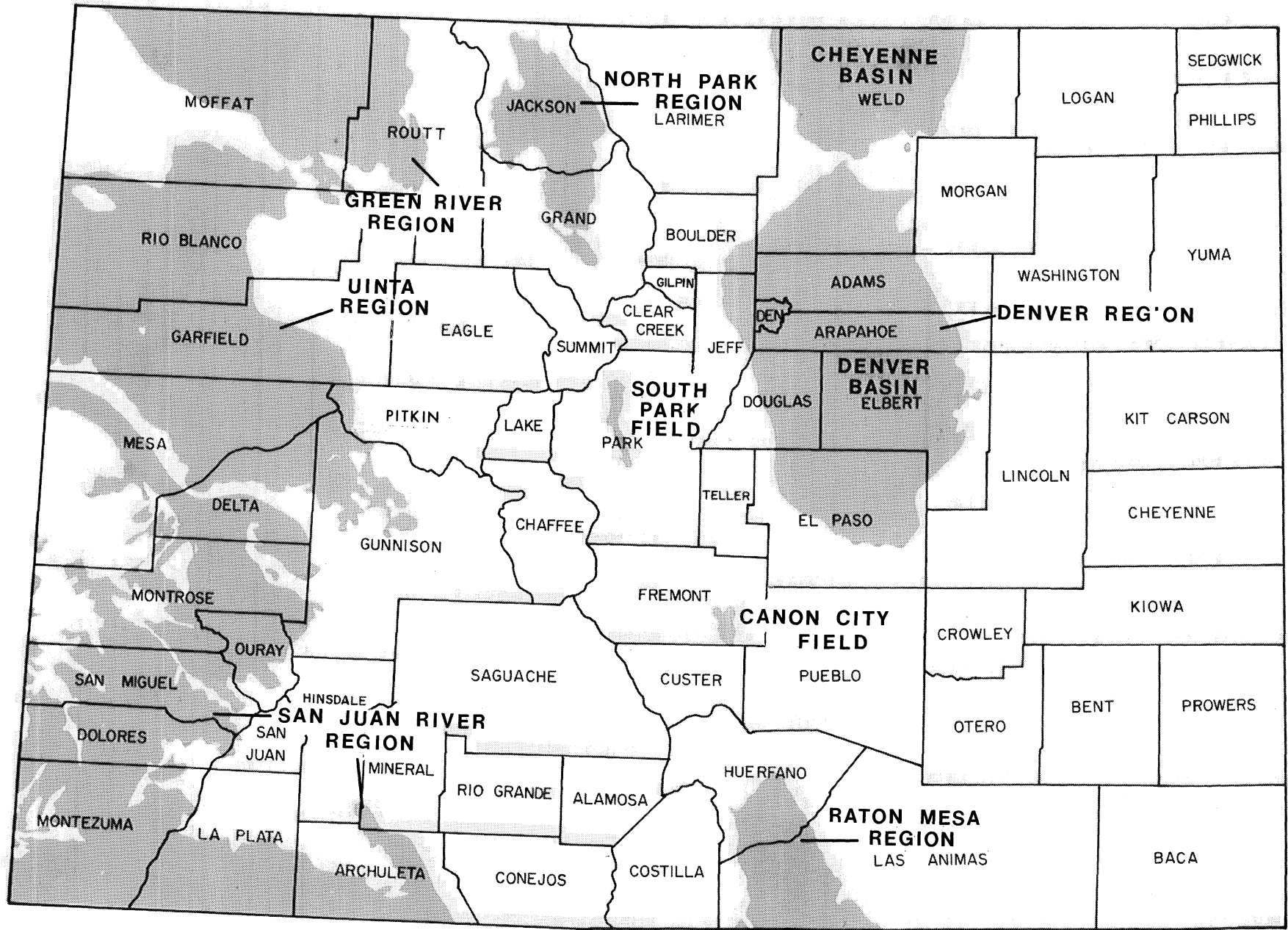
TABLE 1

CGS #	METHANE CONTENT	PROXIMATE ANALYSIS	ULTIMATE ANALYSES	GAS ANALYSIS	ADSORPTION ISOTHERM	PETROGRAPHY
1	X	X	X			X
2	X	X	X			X
3	X	X	X			X
4	X	X	X			X
5		X	X			
6	X	X	X			
7		X	X			
8	X	X	X			
9		X	X			
10		composited with #9				
11	X					
12	X					
13	X					
14	X					
15	X	X	X			
16	X	X	X			
17	X	X	X			
18	X	X	X			
19	X	composited with #18				
20	X	X	X			
21	X	X	X			
22	X	X	X			
23	X	X	X			
24	X	X	X			
25	X	X	X			
26	X	X	X			
27	X	X	X	X		
28	X	X	X			
29	X	X	X	X		
30	X	X	X	X		
31	X	X	X	X		X
32	X	X	X	X		
33	X	X	X			
34	X	X	X			
35	X	X	X			
36	X	X	X			X
37	X	X	X	X		
38	X	X	X			X
39	X	X	X			
40	X	X	X			X
41	X	X	X			X
42	X	X	X			X
43	X	X	X	X	X	
44	X	X	X	X	X	
45	X	X	X			
46	X	X	X			
47	X	X	X			
48	X	X	X			
49	X	X	X			

CGS #	METHANE CONTENT	PROXIMATE ANALYSIS	ULTIMATE ANALYSES	GAS ANALYSIS	ADSORPTION ISOTHERM	PETROGRAPHY
50	X	X	X			X
51	X	X	X		X	
52	X	X	X		X	
53	X	X	X		X	
54	X	X	X			
55	X	X	X			
56	X	X	X			
57	X	X	X			
58	X	X	X			
59	X	X	X			
60	X	X	X			
61	X	X	X			
62	X	X	X			
63	X	X	X			
64	X	X	X			
65	X	X	X			
66	X	X	X			
67	X	X	X			
68	X	X	X			
69	X	X	X			
70	X	X	X			
71	X	X	X			
72	X	X	X			
73	X	X	X			
74	X	X	X			
75	X	X	X			
76	X	X	X			
77	X	X	X			
78	X	X	X			
79	X	X	X			
80	X	X	X			
81	X	X	X			
82	X	X	X	X	X	
83	X	shale	X	X		
84	X	X	X			X
85	X	X	X		X	
86	X	X	X			X
87	X	X	X			X
88	X	X	X			
89	X	X	X		X	
90	X	X	X			
91	X	X	X		X	
92	X	X	X	X		
93	X	X	X			
94	X	X	X	X		
95	X	X	X		X	
96	X	X	X			
97	X	X	X			
98	X	X	X			X
99	X	X	X		X	X
100	X	X	X			
101	X	X	X	X		X
102	X	X	X		X	X

CGS #	METHANE CONTENT	PROXIMATE ANALYSIS	ULTIMATE ANALYSES	GAS ANALYSIS	ADSORPTION ISOTHERM	PETROGRAPHY
103	X	X	X			X
104	X	X	X			X
105	X	X	X			
106	X	X	X			
107	X	X	X			X
108	X	X	X			X
109	X	X	X			X
110	X	X	X		X	X
111	X	X	X			X
112	X	X	X			X
113	X	X	X			X
114	X	X	X			X
115	X	X	X			X
116	X	X	X			
117	X	X	X	X	X	X
118	X	X	X			X
119	X	X	X	X		X
120	X	X	X			X
121	X	X	X			
122	X	X	X			
123	X	X	X			
124	X	X	X	X		
125	X	X	X	X		
126	X	X	X			
127	X	X	X	X		
128	X	X	X			
129	X	X	X			
130	X	X	X			
131	X	X	X	X		
132	X	X	X	X		
133	X	X	X	X		
134	X	X	X	X		
135	X	X	X			
136	X	X	X	X		X
137		confidential				
138	X	X	X			
139	X	X	X	X		X
140	X	X	X	X		X
141	X	X	X	X		X
142	X	X	X			
143	X	X	X			
144	X	X	X			
145	X	X	X			
146	X	X	X			
147	X	shale				
148	X	X	X			
149	X	siltstone				
150	X	siltstone				
151	X	X	X			
152	X	X	X			
153	X	siltstone				
154	X	siltstone				
155	X	shale				

CGS #	METHANE CONTENT	PROXIMATE ANALYSIS	ULTIMATE ANALYSES	GAS ANALYSIS	ADSORPTION ISOTHERM	PETROGRAPHY
156	X	siltstone				
157	X	X	X			
158	X	X	X			
159	X	siltstone				
160	X	X	X			
161	X	X	X			X
162	X	X	X			
163	X	X	X			
164	X	X	X			X
165	X	X	X			X
166	X	X	X			X
167	X	X	X			X
168						
169	X	X	X	X		X
170	X	X	X	X		
171	X	X	X	X		
172	X	X	X	X		
173	X	X	X	X		
174	X	shale				
175	X	X	X			
176	X	X	X			
177	X	X	X	X		
178	X	X	X			
179	X	X	X	X		
180	X	X	X	X		
181	X	X	X	X		
182	X	X	X			
183	X	X	X	X		X
184	X	oil shale				
185	X	oil shale		X		
186	X	X	X			
187	X	X	X	X		
188	X	X	X			
189	X	X	X			
190	X	X	X			
191	X	X	X			
192	X	X	X			
193	X	X	X			
194	X	oil shale				
195	X	oil shale				
196	X					
197	X					X
198	X					X
199	X	oil shale				
200	X	oil shale				
201	X	oil shale		X		
202	X	X	X	X		
203	X	X	X			
204	X	X	X	X		X
205	X	X	X	X		X
206	X	X	X	X		X
207	X	X	X	X		X
208	X	X	X	X		X
209	X	X	X	X		X



GEOLOGIC AGE	DENVER REGION	CAÑON CITY FIELD	RATON MESA REGION	NORTH PARK REGION	GREEN RIVER REGION	WESTERN UINTA REGION	NORTHERN UINTA REGION	UINTA REGION PICEANCE BASIN	SAN JUAN RIVER REGION				
PLIOCENE				UNNAMED									
				GROUSE MTN BASALT									
MIOCENE				TROUBLESOME FM	BROWNS PARK FM								
				NORTH PARK FM									
OLIGOCENE	CASTLE ROCK FM			TRUMP CGL									
	WALL MOUNTAIN TUFF												
EOCENE	DAWSON ARKOSE			UNNAMED	UINTA FM	UINTA FM	UINTA FM	UINTA FM	UINTA FM				
				HUERFANO CUCHARA FM	GREEN RIVER FM	GREEN RIVER FM	GREEN RIVER FM	UINTA FM					
PALEOCENE	DENVER FM	POISON CANYON FM	POISON CANYON FM	COALMONT FM	WASATCH FM	WASATCH FM	WASATCH FM	GREEN RIVER FM	SAN JOSE FM				
		RATON FM	RATON FM		FORT UNION FM	WASATCH FM	WASATCH FM	WASATCH FM	WASATCH FM				
UPPER CRETACEOUS	ARAPAHOE FM	VERMEJO FM	TRINIDAD SS		LANCE FM			UNNAMED SS	OJO ALAMO SS				
	LARAMIE FM												
	FOX HILLS SS	TRINIDAD SS	PIERRE SH		LEWIS SH	WILLIAMS FORK FM	WILLIAMS FORK FM	UNNAMED SH					
	PIERRE SH	PIERRE SH							PIERRE SH	PIERRE SH	PIERRE SH	PIERRE SH	PIERRE SH
	NIOBRARA FM	NIOBRARA FM	NIOBRARA FM	NIOBRARA FM	SMOKY HILL MBR	MANSOS SH				FRUITLAND FM			
				FT HAYS LS	NIOBRARA FM						NIOBRARA FM	NIOBRARA FM	NIOBRARA FM
	BENTON GRP	CARLILE SH	GREENHORN SH	GREENHORN LS	BENTON GRP	SANDY MBR				LOWER MANCOS SH			
				GRANEROS SH							GRANEROS SH	GRANEROS SH	GRANEROS SH
				DAKOTA FM							DAKOTA FM	DAKOTA FM	DAKOTA FM
	LOWER CRETACEOUS	DAKOTA FM	DAKOTA FM	DAKOTA FM	DAKOTA FM	DAKOTA FM	DAKOTA FM	DAKOTA FM	DAKOTA FM	DAKOTA FM			
PURGATOIRE FM		PURGATOIRE FM	PURGATOIRE FM	PURGATOIRE FM	PURGATOIRE FM	PURGATOIRE FM	PURGATOIRE FM	PURGATOIRE FM	PURGATOIRE FM				

FIGURE BY CHARLES R CAMPBELL

Figure 2. Stratigraphic correlation chart for the Lower Cretaceous through Pliocene. Gray shading indicates coal-bearing formations or zones (after Collins, 1976; Fisher and others, 1960; Henkes, 1959; Landis, 1959; Pearl and Murray, 1974).

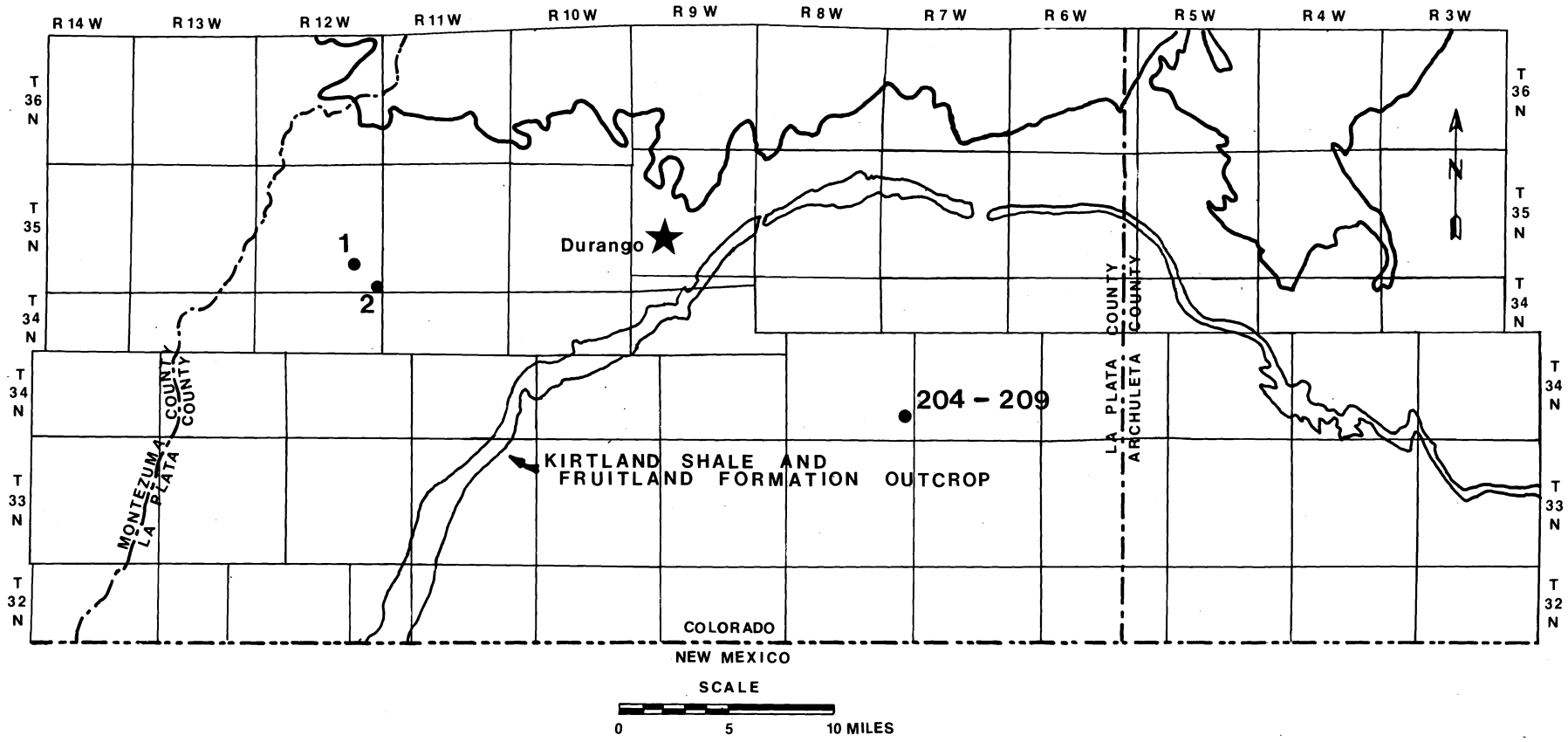


Figure 3. Colorado Geological Survey desorption samples in the San Juan Basin area.

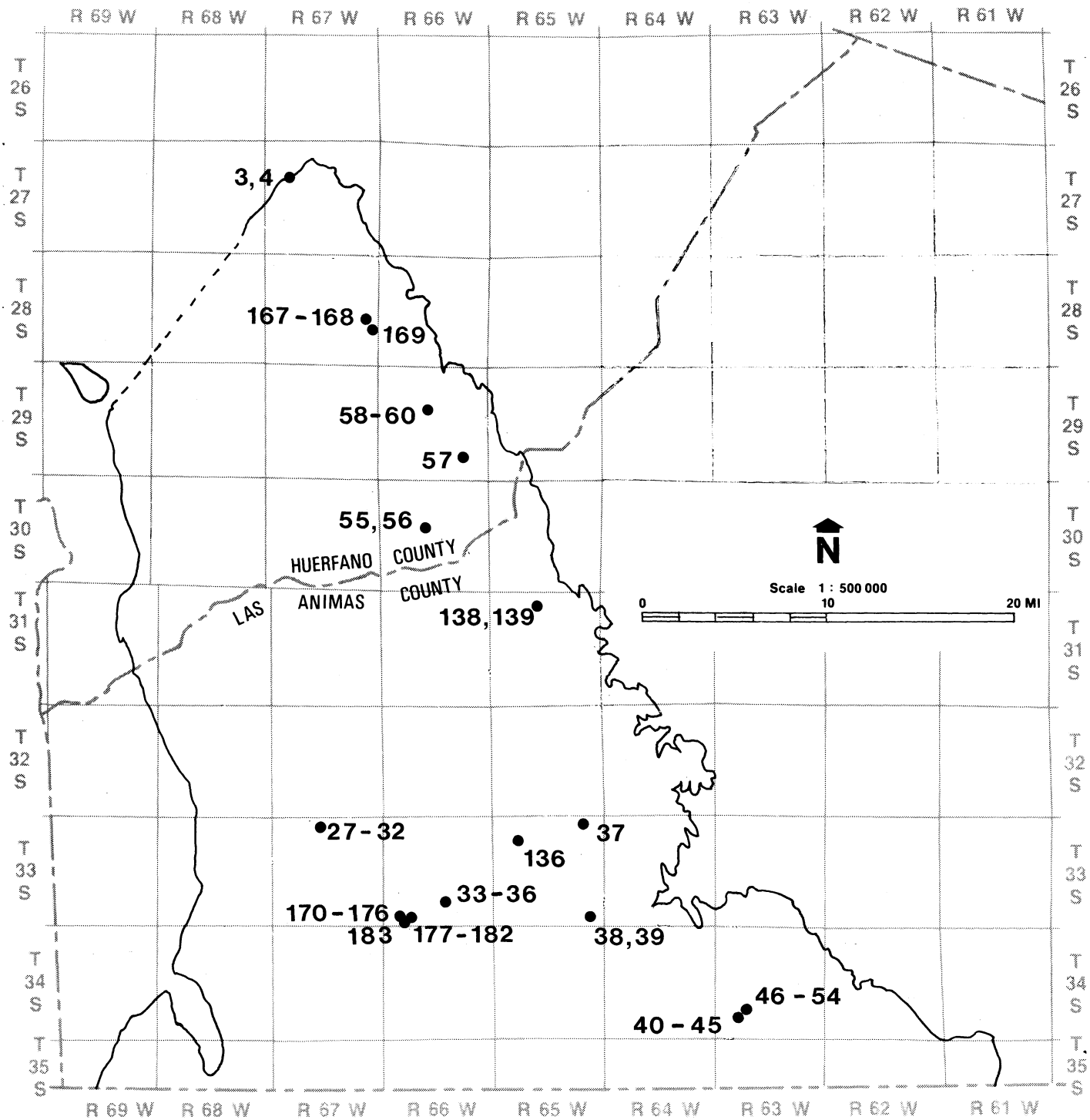


Figure 4. Colorado Geological Survey desorption samples in the Raton Mesa coal region.

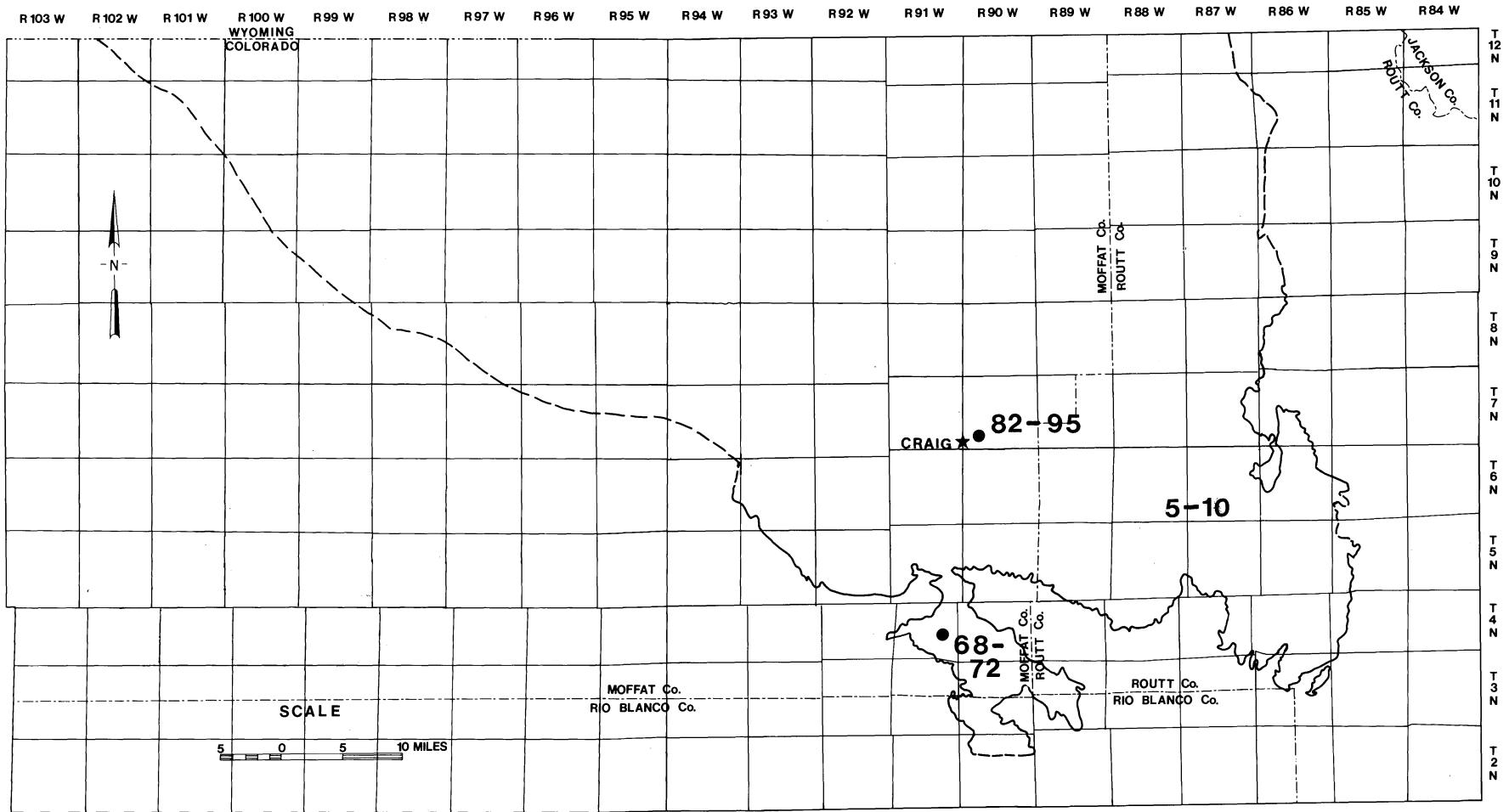


Figure 5. Colorado Geological Survey desorption samples in the Green River coal region.

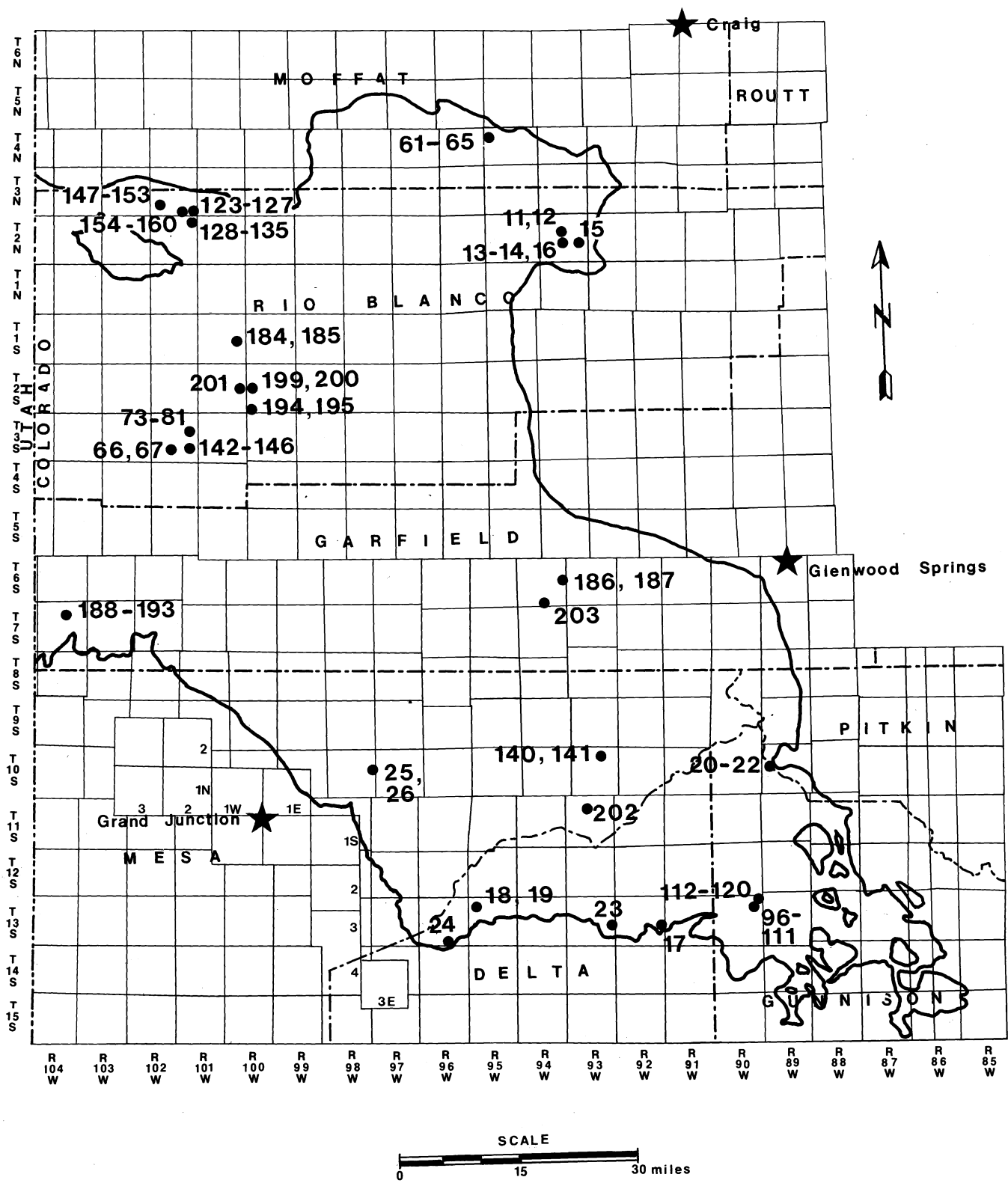


Figure 6. Colorado Geological Survey description samples in the Uinta coal region.

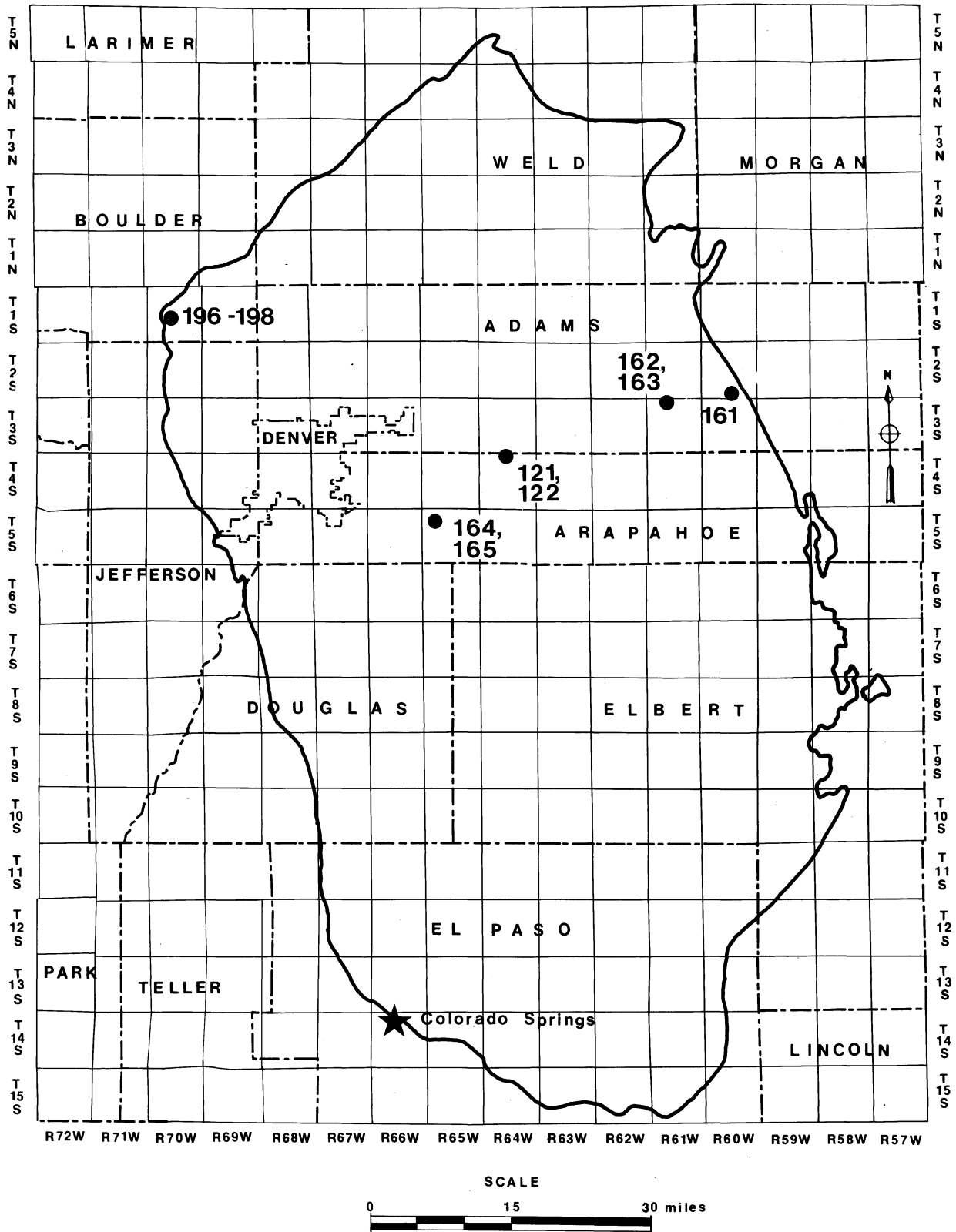


Figure 7. Colorado Geological Survey desorption samples in the Denver coal region.

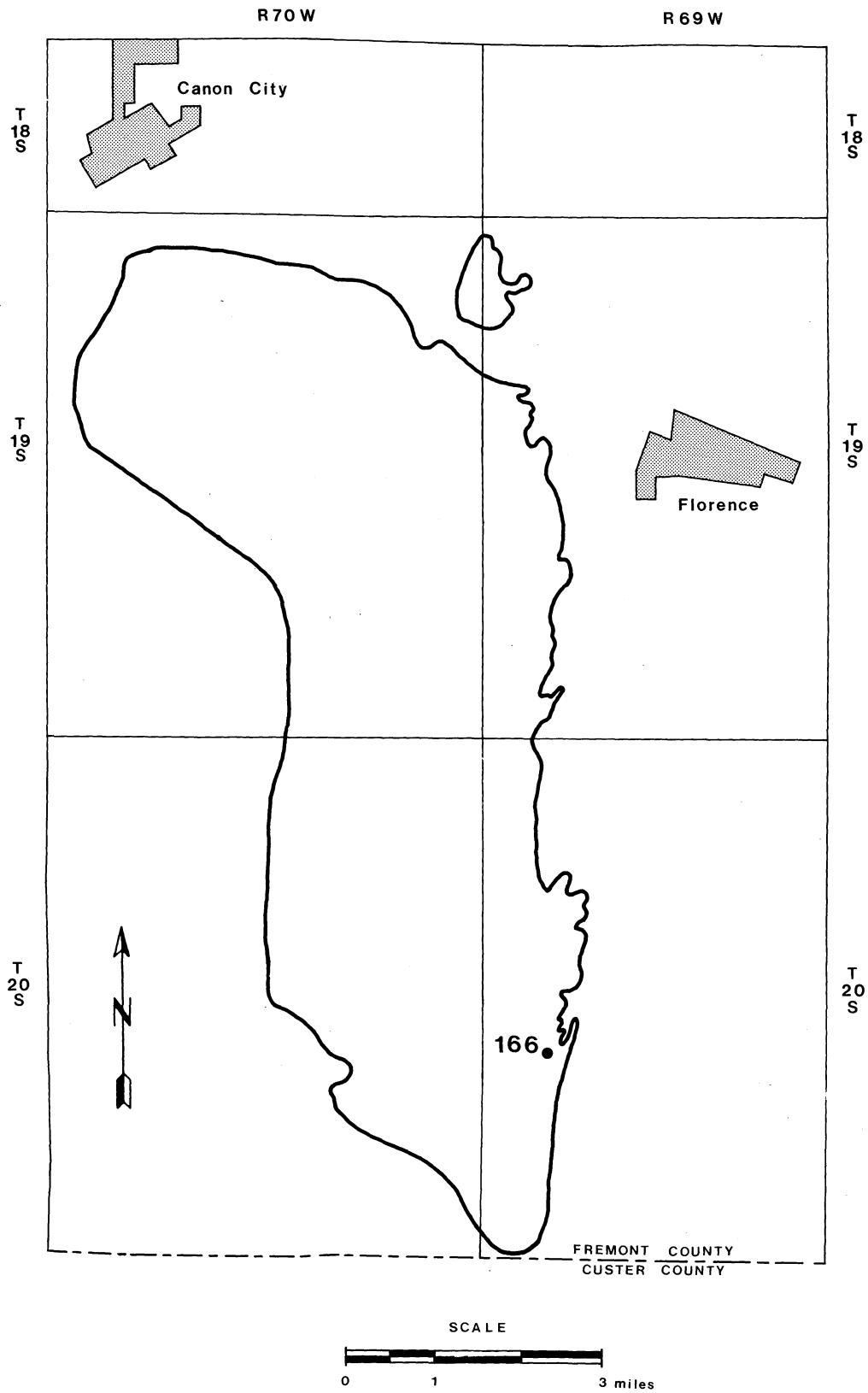


Figure 8. Colorado Geological Survey desorption samples in the Canon City field.

DESORPTION DATA

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 1

LOCATION

County: La Plata
Location: Sec 26 Twp 35N Rge 12W

Surface Elev (ft) 7520
Coordinates C SE NE

GENERAL

CGS Sample No. 1
Sampled By H. Fender & D. C. Jones
Operator Calder & Co.
Hole No. C 26-1

Date 2-3-76
Sample Type core

DRILLING DATA

Drilling Co. ? Address ?
Core Size 3" Barrel Length 20'?
Type of core retrieval ?
Drilling media mud and water Air Temperature ?
TD Hole ? Logs ?

GEOLOGY

Geologic Unit Menefee Age Cretaceous
Coal zone/bed A, B, or C Bed Thickness 9±
Depth to top of coal 295.3' (Driller) ? (Log)
Depth to bottom of coal 304.3' (Driller) ? (Log)
Cored interval 289'-307' (Driller)
Roof description mostly fine grain ss with some slt stringers
Coal description bituminous, hrd, blocky

Floor description shale - m. hd. to hd., medium-dark gray with slickensides

DESORPTION DATA

Sampled interval (ft) throughout coal (Driller) ? (Log)
Condition of sample top 2.5' very broken
Sample Weight (g) 1336 g
Lost gas time (min) 55 Lost gas cc 40
Desorbed gas cc 105 Residual gas cc/g .06
Total gas content cc/g .17 Total gas content cf/t 5

Miscellaneous This sample, from the north side of Hay Gulch (Durango area), is supposed to be less gassy than the next sample from the south side of the gulch. The core is from the same vicinity as the Peacock and King coal mines. The Peacock Mine is on the north side of the gulch and the King Mine is on the south side.

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
-----------------	--------------------	----------------------	------------------------------

Proximate Analyses (%)

Moisture	3.4	N/A	N/A
Volatile Matter	34.7	36.0	40.0
Fixed Carbon	52.2	54.0	60.0
Ash	9.7	10.0	N/A

Ultimate Analyses (%)

Hydrogen	5.3	5.1	5.7
Carbon	71.0	73.5	81.7
Nitrogen	1.5	1.6	1.7
Sulfur	.7	.7	.8
Oxygen	11.8	9.1	10.1
Ash	9.7	10.0	N/A

Heating value
(BTU/lb)

12701	13152	14616
-------	-------	-------

Sulfur Forms (%)

Sulfate	.02	.02	.02
Pyritic	.07	.07	.08
Organic	.56	.58	.65

Ash

Initial deformation (°F)	2800+
Softening temperature (°F)	2800+
Fluid temperature (°F)	2800+

Free Swelling Index 1.5Fixed CarbonDMMF 60.76Heating ValueBTU/lb MMMF 14,209.3Apparent Rank HvA bituminousDate of Analysis: 12-22-76Laboratory: Bureau of MinesLab No. K68967Comments: have trace element dataGAS ANALYSES - not doneADSORPTION ISOTHERM DATA - not done

PETROGRAPHIC ANALYSES

Lab. SIU Coal Characterization Lab Petrographer John C. Crelling
 Lab No. SIU #841 Date of Analysis ?

Maceral Analyses

Vitrinite	<u>63.9</u>
Pseudovitrinite	<u>17.0</u>
Semifusinite	<u>10.9</u>
Semimacrinite	<u>0.6</u>
Fusinite	<u>3.4</u>
Macrinite	<u>0.1</u>
Micrinite	<u>1.3</u>
Exinite	<u>2.0</u>
Resinite	<u>0.8</u>
Total	<u>100%</u>

Reflectance Analysis

Vitrinite Ro	<u>0.66</u>
pVit Ro	<u>0.71</u>
Combined Ro	<u>0.67</u>
pVit Ro - Vit Ro	<u>0.05</u>

Combined V-Type Table

V-Type	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>	<u>9</u>	<u>10</u>	<u>11</u>
%				<u>3.0</u>	<u>55.0</u>	<u>41.0</u>	<u>1.0</u>			

V-Type	<u>12</u>	<u>13</u>	<u>14</u>	<u>15</u>	<u>16</u>	<u>17</u>	<u>18</u>	<u>19</u>	<u>21</u>	<u>21</u>
%										

Comments: Apparent rank HvA bituminous

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 2

LOCATION

County: La Plata
Location: Sec 36 Twp 35N Rge 12W

Surface Elev (ft) 7520
Coordinates SE SE SE

GENERAL

CGS Sample No. 2
Sampled By D. C. Jones & H. Fender
Operator Calder & Co.
Hole No. C 36-1

Date 2-4-76
Sample Type core

DRILLING DATA

Drilling Co. ? Address ?
Core Size 3" Barrel Length 20'
Type of core retrieval ?
Drilling media mud and water Air Temperature ?
TD Hole 514? Logs ?

GEOLOGY

Geologic Unit Menefee Age Cretaceous
Coal zone/bed ? Bed Thickness 7.5' (1.8' parting)
Depth to top of coal 310.7' (Driller) ? (Log)
Depth to bottom of coal 318.2' (Driller) ? (Log)
Cored interval 303-320' (Driller)
Roof description sand stringers becoming shale
Coal description bituminous, hd, fairly broken
Floor description shale

DESORPTION DATA

Sampled interval (ft) throughout coal (Driller) ? (Log)
Condition of sample fairly broken
Sample Weight (g) 1318
Lost gas time (min) 38 Lost gas cc 145
Desorbed gas cc 91 Residual gas cc/g .14
Total gas content cc/g .32 Total gas content cf/t 10

Miscellaneous This sample, from the south side of Hay Gulch (Durango area), is supposed to be more gassy than the first sample from the north side of the gulch. This sample is also from the vicinity of the Peacock and King coal mines.

COAL ANALYSES

Analyses	As Received	Moisture Free	Moisture and Ash Free
----------	-------------	---------------	-----------------------

Proximate Analyses (%)

Moisture	3.1	N/A	N/A
Volatile Matter	32.0	33.0	40.1
Fixed Carbon	47.7	49.3	59.9
Ash	17.2	17.7	N/A

Ultimate Analyses (%)

Hydrogen	4.9	4.7	5.7
Carbon	65.2	67.2	81.7
Nitrogen	1.4	1.5	1.8
Sulfur	.7	.7	.8
Oxygen	10.6	8.1	9.9
Ash	17.2	17.7	N/A

Heating value
(BTU/lb)

11657	12028	14623
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Sulfur Forms (%)

Sulfate	.02	.02	.02
Pyritic	.07	.07	.09
Organic	.56	.58	.71

Ash

Initial deformation (°F)	2800+
Softening temperature (°F)	2800+
Fluid temperature (°F)	2800+

Free Swelling Index 1.0Fixed Carbon
DMMF 61.07Heating Value
BTU/lb MMMF 14341.2Apparent Rank HvA bituminousDate of Analysis: 12-22-76Laboratory: Bureau of MinesLab No. K68968

Comments: _____

GAS ANALYSES - not runADSORPTION ISOTHERM DATA - not run

PETROGRAPHIC ANALYSES

Lab. SIU Coal Characterization Lab Petrographer John C. Crelling
 Lab No. SIU #842 Date of Analysis ?

Maceral Analyses

Vitrinite	<u>66.2</u>
Pseudovitrinite	<u>13.9</u>
Semifusinite	<u>10.7</u>
Semimacrinite	<u>0.9</u>
Fusinite	<u>3.5</u>
Macrinite	<u>0.2</u>
Micrinite	<u>1.7</u>
Exinite	<u>0.8</u>
Resinite	<u>2.1</u>
Total	<u>100%</u>

Reflectance Analysis

Vitrinite Ro	<u>0.71</u>
pVit Ro	<u>0.77</u>
Combined Ro	<u>0.72</u>
pVit Ro - Vit Ro	<u>0.06</u>

Combined V-Type Table

V-Type	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>	<u>9</u>	<u>10</u>	<u>11</u>
%				<u>1.0</u>	<u>4.0</u>	<u>56.0</u>	<u>38.0</u>	<u>1.0</u>		

V-Type	<u>12</u>	<u>13</u>	<u>14</u>	<u>15</u>	<u>16</u>	<u>17</u>	<u>18</u>	<u>19</u>	<u>21</u>	<u>21</u>
%										

Comments: Apparent rank HvA bituminous

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 3

LOCATION

County: Huerfano
Location: Sec 8 Twp 27S Rge 67W

Surface Elev (ft) 6440
Coordinates SW SE

GENERAL

CGS Sample No. 3
Sampled By Dave Jones
Operator Groves/Calder
Hole No. 8-6

Date 6-9-76
Sample Type core

DRILLING DATA

Drilling Co. Welco Exploration Address ?
Core Size 2 1/8" Barrel Length 10'?
Type of core retrieval ?
Drilling media Air & Foam Air Temperature 80°F
TD Hole ? Logs

GEOLOGY

Geologic Unit Vermejo Formation Age Cretaceous
Coal zone/bed Prior Bed Bed Thickness 4.0
Depth to top of coal 111' (Driller) ? (Log)
Depth to bottom of coal 115' (Driller) ? (Log)
Cored interval 111'-115' (Driller)
Roof description ss
Coal description attrital with lenticular fusain and vitrain in lower
0.9', good cleat
Floor description carb ss

DESORPTION DATA

Sampled interval (ft) 111-115' (Driller) ? (Log)
Condition of sample blocky, clean
Sample Weight (g) 1049
Lost gas time (min) 48 Lost gas cc 75 + 478 estimated gas
Desorbed gas cc 51 Residual gas cc/g .36
Total gas content cc/g .93 Total gas content cf/t 30

Miscellaneous There are many old underground mines in the area, notably the
Calumet No. 1 & 2, Gorden, and Maitland No. 1 mines. The dip of the formation
appears to be about 13°(?) to the SE toward the center of the Raton Basin.
According to the contractor's geologist, the major seams on the
western flank of the basin do not correlate stratigraphically with the
major seams on the eastern flank.

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
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Proximate Analyses (%)

Moisture	7.5	N/A	N/A
Volatile Matter	37.0	40.0	45.4
Fixed Carbon	44.4	48.0	54.6
Ash	11.1	12.0	N/A

Ultimate Analyses (%)

Hydrogen	5.5	5.0	5.7
Carbon	64.4	69.5	79.0
Nitrogen	1.2	1.3	1.5
Sulfur	.7	.7	.8
Oxygen	17.2	11.4	13.0
Ash	11.1	12.0	N/A

Heating value
(BTU/lb)

11378	12295	13974
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Sulfur Forms (%)

Sulfate	.02	.02	.02
Pyritic	.07	.07	.08
Organic	.56	.61	.69

Ash

Initial deformation (°F)	2605
Softening temperature (°F)	2715
Fluid temperature (°F)	2800

Free Swelling Index	0.0
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Fixed Carbon	
DMMF	55.28

Heating Value	
BTU/lb MMMF	12,944.6

Apparent Rank	hVc bituminous
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Date of Analysis:	1-21-77
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Laboratory:	Bureau of Mines
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Lab No.	K69857
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Comments:	
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GAS ANALYSES - not runADSORPTION ISOTHERM DATA - not run

PETROGRAPHIC ANALYSES

Lab. SIU Coal Characterization Lab Petrographer John C. Crelling
 Lab No. SIU #839 Date of Analysis ?

Maceral Analyses

Vitrinite	<u>71.2</u>
Pseudovitrinite	<u>7.5</u>
Semifusinite	<u>9.4</u>
Semimacrinite	<u>3.5</u>
Fusinite	<u>2.4</u>
Macrinite	<u>0.2</u>
Micrinite	<u>2.6</u>
Exinite	<u>1.6</u>
Resinite	<u>1.6</u>
Total	<u>100%</u>

Reflectance Analysis

Vitrinite Ro	<u>0.56</u>
pVit Ro	<u>0.60</u>
Combined Ro	<u>0.56</u>
pVit Ro - Vit Ro	<u>0.04</u>

Combined V-Type Table

V-Type	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>	<u>9</u>	<u>10</u>	<u>11</u>
%			<u>2.0</u>	<u>66.0</u>	<u>31.0</u>	<u>1.0</u>				

V-Type	<u>12</u>	<u>13</u>	<u>14</u>	<u>15</u>	<u>16</u>	<u>17</u>	<u>18</u>	<u>19</u>	<u>21</u>	<u>21</u>
%										

Comments: Apparent BTU rank (12971) HvC bituminous

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 4

LOCATION

County: Huerfano
Location: Sec 8 Twp 27S Rge 67W

Surface Elev (ft) 6440
Coordinates SW SE

GENERAL

CGS Sample No. 4
Sampled By Dave Jones
Operator Groves/Calder
Hole No. 8-6

Date 6-10-76
Sample Type core

DRILLING DATA

Drilling Co. Welco Exploration Address ?
Core Size 2 1/8" Barrel Length 20'
Type of core retrieval ?
Drilling media air & foam Air Temperature 85°F
TD Hole ? Logs

GEOLOGY

Geologic Unit Vermejo Formation Age Cretaceous
Coal zone/bed Walsen Bed Thickness 6.0'
Depth to top of coal 155' (Driller) ? (Log)
Depth to bottom of coal 161' (Driller) ? (Log)
Cored interval 157-161' (Driller)
Roof description shale
Coal description dull - bright attrital .3' fusain parting 2.0' above bottom of seam (cored only lower 4' of 6' seam), abundant pyrite & some gypsum
Floor description interbedded coal and fine-grained slty ss

DESORPTION DATA

Sampled interval (ft) 157-161' (Driller) ? (Log)
Condition of sample blocky
Sample Weight (g) 1211
Lost gas time (min) 170 Lost gas cc 241 + 490 estimated gas
Desorbed gas cc 82 Residual gas cc/g .41
Total gas content cc/g 1.08 Total gas content cf/t 35

Miscellaneous There are many old underground mines in the area, notably the Calumet No. 1 & 2, Gordon, and Maitland No. 1 mines. The dip of the formation appears to be about 13°(?) to the SE toward the synclinal axis of the Raton Basin.

According to the contractor's geologist, the major seams of the western flank of the basin do not correlate stratigraphically with the major seams of the eastern flank.

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
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Proximate Analyses (%)

Moisture	6.8	N/A	N/A
Volatile Matter	36.4	39.0	45.4
Fixed Carbon	43.8	47.1	54.6
Ash	13.0	13.9	N/A

Ultimate Analyses (%)

Hydrogen	5.3	4.8	5.6
Carbon	63.2	67.9	78.8
Nitrogen	1.2	1.3	1.5
Sulfur	.6	.6	.7
Oxygen	16.7	11.5	13.3
Ash	13.0	13.9	N/A

Heating value
(BTU/lb)

11084	11893	13817
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Sulfur Forms (%)

Sulfate	.01	.01	.01
Pyritic	.09	.09	.11
Organic	.48	.52	.60

Ash

Initial deformation (°F)	2495
Softening temperature (°F)	2585
Fluid temperature (°F)	2680

Free Swelling Index .0Fixed Carbon
DMMF 55.45Heating Value
BTU/lb MMMF 12,909.0Apparent Rank h_vC bituminousDate of Analysis: 1-21-77Laboratory: Bureau of MinesLab No. K69858

Comments: _____

GAS ANALYSES - not runADSORPTION ISOTHERM DATA - not run

PETROGRAPHIC ANALYSES

Lab. S.I.U. Coal Characterization Lab Petrographer John C. Crelling
 Lab No. S.I.U. #840 Date of Analysis ?

Maceral Analysis (white light)

Vitrinite	<u>71.1</u>
Pseudovitrinite	<u>10.6</u>
Semifusinite	<u>10.7</u>
Semimacrinite	<u>0.4</u>
Fusinite	<u>3.7</u>
Macrinite	<u>0.1</u>
Micrinite	<u>1.5</u>
Exinite	<u>0.9</u>
Resinite	<u>1.0</u>
Total	<u>100%</u>

Reflectance Analysis

Vitrinite Ro	<u>0.58</u>
pVit Ro	<u>0.62</u>
Combined Ro	<u>0.58</u>
pVit Ro - Vit Ro	<u>0.04</u>

Combined V-Type Table

V-Type	2	3	4	5	6	7	8	9	10	11
%				42.0	58.0					

V-Type	12	13	14	15	16	17	18	19	20	21
%										

Comments: _____

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 5

LOCATION

County: Routt
Location: Sec Twp Rge

Surface Elev (ft) 7000 ?
Coordinates

GENERAL

CGS Sample No. 5
Sampled By D. C. Jones
Operator
Hole No.

Date 8-23-76
Sample Type core

DRILLING DATA

Drilling Co. Sanders Assoc. Address --
Core Size 1 7/8" Barrel Length 20'
Type of core retrieval ?
Drilling media mud and water Air Temperature 75°F
TD Hole 1516' Log Logs ?
1510 Drtr.

GEOLOGY

Geologic Unit Mesaverde Age Cretaceous
Coal zone/bed Bed Thickness
Depth to top of coal (Driller) (Log)
Depth to bottom of coal ? (Driller) (Log)
Cored interval (Driller)
Roof description shaly ss
Coal description bituminous-blocky, dull to bright attrital, good conchoidal fracture, sporadic vitrain bands less than 50 mm thick, good face cleat
Floor description sandy sh.

DESORPTION DATA

Sampled interval (ft) 1280-1289' (Driller) 1287-1296' (Log)
Condition of sample excellent, caught core and bagged immediately
Sample Weight (g) 1560
Lost gas time (min) 69 Lost gas cc 0
Desorbed gas cc 0 Residual gas cc/g 0
Total gas content cc/g 0 Total gas content cf/t 0

Miscellaneous sample is split of full recovered core

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
-----------------	--------------------	----------------------	------------------------------

Proximate Analyses (%)

Moisture	8.2	N/A	N/A
Volatile Matter	34.2	37.2	40.5
Fixed Carbon	50.1	54.6	59.5
Ash	7.5	8.2	N/A

Ultimate Analyses (%)

Hydrogen	5.4	4.8	5.3
Carbon	66.9	72.9	79.3
Nitrogen	1.7	1.9	2.0
Sulfur	.5	.5	.5
Oxygen	18.1	11.8	12.8
Ash	7.5	8.2	N/A

Heating value
(BTU/lb)

11845	12902	14050
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Sulfur Forms (%)

Sulfate	.01	.01	.01
Pyritic	.02	.02	.02
Organic	.43	.47	.51

Ash

Initial deformation (°F)	2345
Softening temperature (°F)	2460
Fluid temperature (°F)	2560

Free Swelling Index 0.0Fixed Carbon
DMMF 59.96Heating Value
BTU/lb MMMF 12,900.4Apparent Rank hVc bituminousDate of Analysis: 1-21-77Laboratory: Bureau of MinesLab No. K69864

Comments: _____

GAS ANALYSES - not runADSORPTION ISOTHERM DATA - not runPETROGRAPHIC ANALYSES - not run

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 6

LOCATION

County: Routt
Location: Sec _____ Twp _____ Rge _____

Surface Elev (ft) 6860
Coordinates _____

GENERAL

CGS Sample No. 6
Sampled By D. C. Jones
Operator _____
Hole No. _____

Date 8-26-76
Sample Type core?

DRILLING DATA

Drilling Co. Superior Address ?
Core Size 1 7/8" Barrel Length 20'
Type of core retrieval ?
Drilling media mud and water Air Temperature 55°F
TD Hole 1630' Logs ?

GEOLOGY

Geologic Unit Williams Fork Formation Age Upper Cretaceous
Coal zone/bed _____ Bed Thickness 11' with 1 1/2' parting
Depth to top of coal _____ (Driller) _____ (Log)
Depth to bottom of coal ? (Driller) _____ (Log)
Cored interval bottom 6.0' (Driller) _____
Roof description interbedded shales and ss
Coal description dull to bright attrital throughout, very hard, no
good cleat
Floor description interbedded shales and ss

DESORPTION DATA

Sampled interval (ft) -- (Driller) _____ (Log)
Condition of sample excellent
Sample Weight (g) 1126
Lost gas time (min) 45 Lost gas cc 45 + 267 estimated gas
Desorbed gas cc 49 Residual gas cc/g .16
Total gas content cc/g .48 Total gas content cf/t 15

Miscellaneous Whole sections of core removed at intervals throughout core.
Bed was middle bed of 3 major coal beds in this area.

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
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Proximate Analyses (%)

Moisture	8.2	N/A	N/A
Volatile Matter	35.6	38.7	41.6
Fixed Carbon	49.8	54.3	58.4
Ash	6.4	7.0	N/A

Ultimate Analyses (%)

Hydrogen	5.6	5.1	5.5
Carbon	67.4	73.4	78.9
Nitrogen	1.7	1.9	2.0
Sulfur	.4	.5	.5
Oxygen	18.4	12.1	13.1
Ash	6.4	7.0	N/A

Heating value
(BTU/lb)

12007	13080	14057
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Sulfur Forms (%)

Sulfate	.02	.02	.02
Pyritic	.08	.09	.09
Organic	.35	.38	.41

Ash

Initial deformation (°F)	2800
Softening temperature (°F)	2800
Fluid temperature (°F)	2800

Free Swelling Index .0Fixed Carbon
DMMF 58.75Heating Value
BTU/lb MMMF 12,907.6Apparent Rank hVc bituminousDate of Analysis: 1-21-77Laboratory: Bureau of MinesLab No. K69865

Comments: _____

GAS ANALYSES - not runADSORPTION ISOTHERM DATA - not runPETROGRAPHIC ANALYSES - not run

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 7

LOCATION

County: Routt
Location: Sec _____ Twp _____ Rge _____

Surface Elev (ft) 6810
Coordinates _____

GENERAL

CGS Sample No. 7
Sampled By Donna Boreck
Operator _____
Hole No. _____

Date 9/18/76
Sample Type core

DRILLING DATA

Drilling Co. Sweetwater Address ?
Core Size 2.1" Barrel Length 20'
Type of core retrieval ?
Drilling media mud and water Air Temperature 83°
TD Hole 540 Logs ?

GEOLOGY

Geologic Unit Williams Fork Formation Age Upper Cretaceous
Coal zone/bed _____ Bed Thickness _____
Depth to top of coal _____ (Driller) ? (Log) _____
Depth to bottom of coal _____ (Driller) ? (Log) _____
Cored interval 470-490' (Driller) _____
Roof description mostly muddy shales with ss lenses
Coal description Bituminous - blocky
Floor description carbonaceous sandy shale and mudstone with ss lenses

DESORPTION DATA

Sampled interval (ft) throughout coal (Driller) _____ (Log) _____
Condition of sample good
Sample Weight (g) 852.7
Lost gas time (min) 33 Lost gas cc 0
Desorbed gas cc ? Residual gas cc/g 0
Total gas content cc/g ? Total gas content cf/t ?

Miscellaneous Bed sampled was the uppermost of 4 beds totalling 10': Gas was emitted from hole after core was pulled. Depth of hole when emitting was 490.0'.

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
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Proximate Analyses (%)

Moisture	9.6	N/A	N/A
Volatile Matter	35.2	38.9	41.2
Fixed Carbon	50.1	55.5	58.8
Ash	5.1	5.6	N/A

Ultimate Analyses (%)

Hydrogen	5.8	5.3	5.6
Carbon	66.6	73.7	78.0
Nitrogen	1.6	1.7	1.8
Sulfur	.6	.7	.7
Oxygen	20.3	13.1	13.8
Ash			

Heating value
(BTU/lb)

11758	13003	13775
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Sulfur Forms (%)

Sulfate	.01	.01	.01
Pyritic	.19	.22	.23
Organic	.40	.44	.47

Ash

Initial deformation (°F)	2415
Softening temperature (°F)	2520
Fluid temperature (°F)	2610

Free Swelling Index .0Fixed CarbonDMMF 59.14Heating ValueBTU/lb MMMF 12,455.1Apparent Rank HvC bituminousDate of Analysis: 4-22-77Laboratory: Bureau of MinesLab No. K72355

Comments: _____

GAS ANALYSES - not runADSORPTION ISOTHERM DATA - not runPETROGRAPHIC ANALYSES - not run

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 8

LOCATION

County: Routt
Location: Sec Twp Rge

Surface Elev (ft) 6810
Coordinates

GENERAL

CGS Sample No. 8
Sampled By Donna Boreck
Operator
Hole No.

Date 9/19/76
Sample Type core

DRILLING DATA

Drilling Co. Sweetwater Address --
Core Size 2.1" Barrel Length 20'
Type of core retrieval ?
Drilling media mud and water Air Temperature 55°F
TD Hole 340+ Logs ?

GEOLOGY

Geologic Unit Williams Fork Formation Age Upper Cretaceous
Coal zone/bed Bed Thickness 8.5'
Depth to top of coal (Driller) ? (Log)
Depth to bottom of coal (Driller) (Log)
Cored interval (Driller)
Roof description shaly sandstone
Coal description Bituminous-blocky

Floor description black carbonaceous shale, interlayered shale & mudstone
predominate

DESORPTION DATA

throughout core
Sampled interval (ft) 335.5-340' (Driller) (Log)
Condition of sample blocky
Sample Weight (g) 1233
Lost gas time (min) 30 Lost gas cc 62
Desorbed gas cc 165 Residual gas cc cc/g .06
Total gas content cc/g .24 Total gas content cf/t 7

Miscellaneous Coal consists mainly of vitrinite Wpods of fusinite
(pod measurement approx. 1/2 inch). Description taken by Energy
Fuels geologist. 50% vitrain
40% fusain
10% attrital
T sulfides
Gas emitted from hole after each coring

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
-----------------	--------------------	----------------------	------------------------------

Proximate Analyses (%)

Moisture	8.8	N/A	N/A
Volatile Matter	33.9	37.1	40.6
Fixed Carbon	49.5	54.4	59.4
Ash	7.8	8.5	N/A

Ultimate Analyses (%)

Hydrogen	5.6	5.1	5.6
Carbon	65.1	71.3	77.9
Nitrogen	1.6	1.8	1.9
Sulfur	.6	.6	.7
Oxygen	19.4	12.7	13.9
Ash	7.8	8.5	N/A

Heating value
(BTU/lb)

11502	12607	13780
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Sulfur Forms (%)

Sulfate	.01	.01	.01
Pyritic	.21	.23	.25
Organic	.34	.38	.41

Ash

Initial deformation (°F)	2800 +
Softening temperature (°F)	2800 +
Fluid temperature (°F)	2800 +

Free Swelling Index 0.0Fixed Carbon
DMMF 59.93Heating Value
BTU/lb MMMF 12572.6Apparent Rank hVc bituminousDate of Analysis: 4-22-77Laboratory: Bureau of MinesLab No. K72356

Comments: _____

GAS ANALYSES - not runADSORPTION ISOTHERM DATA - not runPETROGRAPHIC ANALYSES - not run

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 9

LOCATION

County: Routt
Location: Sec Twp Rge

Surface Elev (ft) ?
Coordinates

GENERAL

CGS Sample No. 9
Sampled By D. C. Jones
Operator
Hole No.

Date 10-5-76
Sample Type core

DRILLING DATA

Drilling Co. Sweetwater Address --
Core Size 2 1/8 Barrel Length 20'
Type of core retrieval ?
Drilling media mud and water Air Temperature 47°F
TD Hole ? Logs ?

GEOLOGY

Geologic Unit Williams Fork Formation Age Upper Cretaceous
Coal zone/bed Bed Thickness
Depth to top of coal (Driller) ? (Log)
Depth to bottom of coal (Driller) ? (Log)
Cored interval (Driller)
Roof description interbedded ss and siltstone
Coal description Bituminous, blocky, fair cleat
Floor description ss with some siltstone

DESORPTION DATA

Sampled interval (ft) 1107.8'-1108.8' (Driller) ? (Log)
Condition of sample good, caught and bagged immediately
Sampled Weight (g) 1038
Lost gas time (min) 38 Lost gas cc 0
Desorbed gas cc 112 Residual gas cc/g .1
Total gas content cc/g .20 Total gas content cf/t 6

Miscellaneous

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
-----------------	--------------------	----------------------	------------------------------

Proximate Analyses (%)

Moisture	7.3	N/A	N/A
Volatile Matter	33.8	36.5	46.6
Fixed Carbon	38.7	41.8	53.4
Ash	20.2	21.7	N/A

Ultimate Analyses (%)

Hydrogen	5.1	4.6	5.9
Carbon	55.8	60.2	76.9
Nitrogen	1.2	1.3	1.7
Sulfur	.9	1.0	1.2
Oxygen	16.8	11.1	14.2
Ash	20.2	21.7	N/A

Heating value
(BTU/lb)

9871	10645	13601
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Sulfur Forms (%)

Sulfate	.01	.01	.01
Pyritic	.27	.29	.37
Organic	.62	.67	.85

Ash

Initial deformation (°F)	2800 +
Softening temperature (°F)	2800 +
Fluid temperature (°F)	2800 +

Free Swelling Index 0Fixed Carbon
DMMF 54.79Heating Value
BTU/lb MMMF 12647.9Apparent Rank hVc bituminousDate of Analysis: 4-22-77Laboratory: Bureau of MinesLab No. K72353

Comments: _____

GAS ANALYSES - not runADSORPTION ISOTHERM DATA - not runPETROGRAPHIC ANALYSES - not run

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 10

LOCATION

County: Routt
Location: Sec _____ Twp _____ Rge _____

Surface Elev (ft) ?
Coordinates _____

GENERAL

CGS Sample No. 10
Sampled By D. C. Jones
Operator _____
Hole No. _____

Date 10-6-76
Sample Type core

DRILLING DATA

Drilling Co. Sweetwater Address ?
Core Size 2 1/8" Barrel Length 20'
Type of core retrieval ?
Drilling media mud and water Air Temperature 42°F
TD Hole ? Logs ?

GEOLOGY

Geologic Unit Williams Fork Formation Age Upper Cretaceous
Coal zone/bed _____ Bed Thickness _____
Depth to top of coal _____ (Driller) ? (Log) _____
Depth to bottom of coal _____ (Driller) ? (Log) _____
Cored interval _____ (Driller) _____
Roof description unknown
Coal description Bituminous, blocky, good cleat
Floor description unknown

DESORPTION DATA

Sampled interval (ft) 1123.3-1133' (Driller) ? (Log) _____
Condition of sample good
Sample Weight (g) 1442.5
Lost gas time (min) 43 Lost gas cc 0
Desorbed gas cc 118 Residual gas cc/g .1
Total gas content cc/g .18 Total gas content cf/t 6

Miscellaneous _____

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
<u>Proximate Analyses (%)</u>			
Moisture	8.7	N/A	N/A
Volatile Matter	36.5	40.0	45.2
Fixed Carbon	44.2	48.4	54.8
Ash	10.6	11.6	N/A
<u>Ultimate Analyses (%)</u>			
Hydrogen	5.6	5.0	5.7
Carbon	63.1	69.1	78.1
Nitrogen	1.5	1.6	1.8
Sulfur	.4	.5	.5
Oxygen	18.9	12.2	13.8
Ash	10.6	11.6	N/A
<u>Heating value</u> (BTU/lb)	11132	12195	13790
<u>Sulfur Forms (%)</u>			
Sulfate	.01	.01	.01
Pyritic	.17	.18	.21
Organic	.24	.27	.30
<u>Ash</u>			
Initial deformation (°F)	2800 +		
Softening temperature (°F)	2800 +		
Fluid temperature (°F)	2800 +		
<u>Free Swelling Index</u>	0		
<u>Fixed Carbon</u>			
<u>DMMF</u>	55.43		
<u>Heating Value</u>			
<u>BTU/lb MMMF</u>	12579.8		
<u>Apparent Rank</u>	hvC bituminous		
<u>Date of Analysis:</u>	4-22-77		
<u>Laboratory:</u>	Bureau of Mines		Lab No. <u>K72354</u>
<u>Comments:</u>			

GAS ANALYSES - not runADSORPTION ISOTHERM DATA - not runPETROGRAPHIC ANALYSES - not run

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 11

LOCATION

County: Rio Blanco
Location: Sec 16 Twp 2N Rge 93W

Surface Elev (ft) 7049 BM
Coordinates NE/4 SW/4 SW/4
SW/4

GENERAL

CGS Sample No. 11
Sampled By Schultz and Fender
Operator Northern Natural Gas
Hole No. 22C

Date 7-9-77
Sample Type core

DRILLING DATA

Drilling Co. Comanche Address ?
Core Size 2 7/8" Barrel Length 30'
Type of core retrieval Drill pipe
Drilling media mud Air Temperature 50°F
TD Hole ? Logs ?

GEOLOGY

Geologic Unit Williams Fork Formation Age Upper Cretaceous
Coal zone/bed ? Bed Thickness 7'
Depth to top of coal 2224.1' (Driller) ? (Log)
Depth to bottom of coal 2231.1' (Driller) ? (Log)
Cored interval 2224.1-2241' (Driller)
Roof description mostly shale
Coal description 7.0' coal - some vitrain - mostly attrital with calcite, conchoidal fractures in pure coal; 2.0' parting of dark brown carb. sh.
Floor description unknown

DESORPTION DATA

Sampled interval (ft) 2224.1-2231.1' (Driller) ? (Log)
Condition of sample fair
Sample Weight (g) 329.1
Lost gas time (min) 105 Lost gas cc 0
Desorbed gas cc 177 Residual gas cc/g 0
Total gas content cc/g .54 Total gas content cf/t 17

Miscellaneous _____

COAL ANALYSES - not run

GAS ANALYSES - not run

ADSORPTION ISOTHERM DATA - not run

PETROGRAPHIC ANALYSES - not run

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 12

LOCATION

County: Rio Blanco
Location: Sec 16 Twp 2N Rge 93W

Surface Elev (ft) 7049 BM
Coordinates NE/4 SW/4 SW/4

GENERAL

CGS Sample No. 12
Sampled By Schultz and Fender
Operator Northern Natural Gas
Hole No. 22C

Date 7-9-77
Sample Type core

DRILLING DATA

Drilling Co. Comanche Drilling Address ?
Core Size 2 7/8" Barrel Length 30'
Type of core retrieval Drill pipe
Drilling media mud Air Temperature 70°F
TD Hole ? Logs ?

GEOLOGY

Geologic Unit Williams Fork Formation Age Upper Cretaceous
Coal zone/bed unnamed Bed Thickness approx. 15-20' ?
Depth to top of coal 2243.35' (Driller) ? (Log)
Depth to bottom of coal ? (Driller) ? (Log)
Cored interval 2241-2265' (Driller)
Roof description sandy sh -? if to be called roof
Coal description bituminous, blocky, clean, brittle, brite, parts with some difficulty
Floor description unknown (Trout Creek ss is a marker)

DESORPTION DATA

Sampled interval (ft) 2243.35-2246.35' (Driller) ? (Log)
Condition of sample fair - poor
Sample Weight (g) 486
Lost gas time (min) 107 Lost gas cc 460
Desorbed gas cc 153 Residual gas cc/g 0
Total gas content cc/g 1.26 Total gas content cf/t 40

Miscellaneous core description - 2241 - 2265' - 1.7 crossbedded sandy shale - .65' dark shale with coal streaks - 3' coal - 2.95' shale with coal streaks - 1.3' coal, bright, hard, blocky, becomes finely broken with bottom part bony - 14.4' lost, recovered 9.6'

COAL ANALYSES - not run

GAS ANALYSES - not run

ADSORPTION ISOTHERM DATA - not run

PETROGRAPHIC ANALYSES - not run

LOCATION

County: Rio Blanco
Location: Sec 21 Twp 2N Rge 93W

Surface Elev (ft) 7140' MSL
Coordinates SE/4 NW/4

GENERAL

CGS Sample No. 13
Sampled By Fender and Schultz
Operator Northern Natural Gas
Hole No. 26-C

Date 1-9-77
Sample Type core

DRILLING DATA

Drilling Co. XL Drilling Co. Address ?
Core Size 3" Barrel Length 15'
Type of core retrieval drill pipe
Drilling media mud Air Temperature 85°F
TD Hole ? Logs ?

GEOLOGY

Geologic Unit Williams Fork Formation Age Upper Cretaceous
Coal zone/bed unknown Bed Thickness approximately 12'
Depth to top of coal 2123.6' (Driller) ? (Log)
Depth to bottom of coal 2134.2' (Driller) ? (Log)
Cored interval 2123.6-2138.6 (Driller)
Roof description shale
Coal description bituminous - solid - hard, bright, blocky
Floor description unknown

DESORPTION DATA

Sampled interval (ft) 2123.6-2134.2 (Driller) (Log)
Condition of sample good split
Sample Weight (g) 679
Lost gas time (min) 72 Lost gas cc 284
Desorbed gas cc 234 Residual gas cc/g .2
Total gas content cc/g 1.0 Total gas content cf/t 32

Miscellaneous core description - 2123.6 - 2138.6' - 10.6' coal, hard, bright, conchoidal fracture - 3.4' dark shale with bands of coal - 1.0' lost

COAL ANALYSES - not run

GAS ANALYSES - not run

ADSORPTION ISOTHERM DATA - not run

PETROGRAPHIC ANALYSES - not run

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 14

LOCATION

County: Rio Blanco
Location: Sec 21 Twp 2N Rge 93W

Surface Elev (ft) 7029 GL
Coordinates C NE/4 ?

GENERAL

CGS Sample No. 14
Sampled By H. Fender
Operator Northern Natural Gas Co.
Hole No. 77-21C-NN #15

Date 8-4-77
Sample Type core

DRILLING DATA

Drilling Co. Comanche Address ?
Core Size 2 7/8" Barrel Length 30'
Type of core retrieval drill pipe
Drilling media mud and water Air Temperature 78°F
TD Hole ? Logs ?

GEOLOGY

Geologic Unit Williams Fork Formation Age Upper Cretaceous
Coal zone/bed _____ Bed Thickness 12'+
Depth to top of coal 2106 (Driller) _____ (Log)
Depth to bottom of coal 2118.8' (Driller) _____ ? (Log)
Cored interval 2106-2119.6' (Driller)
Roof description sandstone
Coal description bituminous, hard, brittle, a lot vitrain, conchoidal fracture, some vertical cleats with calcite
Floor description shale

DESORPTION DATA

Sampled interval (ft) 2112.3-2114.5, 2106-2112.1 (Driller) _____ ? (Log)
Condition of sample fair
Sample Weight (g) 725
Lost gas time (min) 85 Lost gas cc not calculated
Desorbed gas cc 74 Residual gas cc/g 0
Total gas content cc/g .10 Total gas content cf/t 3

Miscellaneous core description - 2106 - 2119.6' - 6.1' coal; .2' sandstone, gray-brown, very fine grained, silty; 2.2' coal, very broken and ground up; 4.3' lost; .8' shale, brown, hard with coal streaks

COAL ANALYSES - not run

GAS ANALYSES - not run

ADSORPTION ISOTHERM DATA - not run

PETROGRAPHIC ANALYSES - not run

LOCATION

County: Rio Blanco
Location: Sec _____ Twp 2N Rge 93W

Surface Elev (ft) 7640
Coordinates _____

GENERAL

CGS Sample No. 15
Sampled By _____
Operator _____
Hole No. _____

Date 9-24-77
Sample Type core

DRILLING DATA

Drilling Co. Kope Address Denver, CO
Core Size 2 1/4" Barrel Length 10'
Type of core retrieval conventional
Drilling media air Air Temperature 60°
TD Hole 66' Logs ?

GEOLOGY

Geologic Unit Williams Fork Formation Age Upper Cretaceous
Coal zone/bed F-F Bed Thickness 10.83'
Depth to top of coal 48.67 (Driller) ? (Log)
Depth to bottom of coal 59.5' (Driller) ? (Log)
Cored interval 35'-65' (Driller)
Roof description mudstone brown gray
Coal description clarain (slightly bright to bright bands, with alternating dull bands, brittle bright bands, very weak conchoidal fracture, parts along band plane.
Floor description mudstone, med gray-brown

DESORPTION DATA

Sample interval (ft) 48.67-55.0 (Driller) _____ (Log)
Condition of sample good
Sampled Weight (g) 863
Lost gas time (min) 25 Lost gas cc vaccum
Desorbed gas cc 0 Residual gas cc/g 0
Total gas content cc/g 0 Total gas content cf/t 0

Miscellaneous core description - 35 - 41.65' - sandstone, light-medium gray, medium-fine grained, interbedded siltstone layers, also clay bands approx. .1', fractures parallel to bedding as well as some horizontal and diagonal, bedding weak to medium, moderately well cemented, locally well sorted, minor arg. content, moderate carb. content in bedding locally. 41.65 - 42.85 sandstone, medium gray, medium grained, well sorted, faint bedding, minor carb. & arg. content, 1 diagonal fracture. 42.85 - 45' siltstone, medium gray, unbedded, nondescript clay band at approx. 44' (approx. 2"). 45 - 45.66 - siltstone, medium gray, minor bedding, bioturbated 45.66 - 47.42 - mudstone, brown gray, soft, unbedded, high clay content (sticky); 47.42 - 47.83 - lost; 47.83 - 48.67 - mudstone, brown gray, as above; 48.67 - 59.5 - coal, clarain, waxy luster; 59.5 - 65 - mudstone, medium gray, brown fractures parallel to bedding and at greater angles than bedding, high clay content (very sticky)

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
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Proximate Analyses (%)

Moisture	16.1	N/A	N/A
Volatile Matter	33.2	39.5	41.2
Fixed Carbon	47.4	56.5	58.8
Ash	3.3	4.0	N/A

Ultimate Analyses (%)

Hydrogen	5.9	4.9	5.1
Carbon	61.8	73.6	76.7
Nitrogen	1.4	1.7	1.8
Sulfur	.4	.4	.5
Oxygen	27.1	15.3	15.9
Ash	3.3	4.0	N/A

Heating value
(BTU/lb)

As Received	10593	12618	13142
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Sulfur Forms (%)

Sulfate	.01	.01	.01
Pyritic	.09	.11	.11
Organic	.27	.32	.33

Ash

Initial deformation (°F)	not run
Softening temperature (°F)	not run
Fluid temperature (°F)	not run

Free Swelling Index	not run
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Fixed Carbon	
DMMF	59.10

Heating Value	
BTU/lb MMMF	10988.8

Apparent Rank	hvc bituminous
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Date of Analysis:	2-5-78
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Laboratory:	U.S. Dept. of Energy
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Lab No.	K79131
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Comments:	
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GAS ANALYSES - not runADSORPTION ISOTHERM DATA - not runPETROGRAPHIC ANALYSES - not run

LOCATION

County: Rio Blanco
Location: Sec _____ Twp 2N Rge 93W

Surface Elev (ft) 7200
Coordinates _____

GENERAL

CGS Sample No. 16
Sampled By _____
Operator _____
Hole No. _____

Date 9-28-77
Sample Type core

DRILLING DATA

Drilling Co. Kope Drilling Co. Address Denver, CO
Core Size 2 1/4 Barrel Length 10'
Type of core retrieval conventional
Drilling media mud Air Temperature 70°F
TD Hole 522.55' Logs ?

GEOLOGY

Geologic Unit Williams Fork Fm. Age Upper Cretaceous
Coal zone/bed F-F Bed Thickness 12.65 w/1.8' parting
Depth to top of coal 502.6' (Driller) ? (Log)
Depth to bottom of coal 515.25' (Driller) ? (Log)
Cored interval 490 - 522.55' (Driller)
Roof description sandstone
Coal description Clarain coal (slightly bright to bright bands with alternating dull bands, brittle bright bands, very weak conchoidal fracture, parts along band plans.
Floor description carbonaceous shale and siltstone

DESORPTION DATA

Sampled interval (ft) 506.3-516.0' (Driller) _____ (Log)
Condition of sample below
Sample Weight (g) 797
Lost gas time (min) 22 Lost gas cc 0
Desorbed gas cc 0 Residual gas cc/g 0
Total gas content cc/g 0 Total gas content cf/t 0

Miscellaneous core description - 490-494.35'-sandstone, medium gray w/black carb. bands, massive bedding, 5 horizontal fractures, medium grained, friable, poorly cemented, black carb. bands (some coaly) parallel to bedding locally, moderate argill. content throughout, gravelly at 491.15'.
494.35-500'-siltstone and silty sandstone, alternating bands of white & light gray color, 4 fractures parallel to bedding, high carb. & argill. content locally, crossbedded & burrowed locally. 500.0-502.6'-light gray sandstone w/fine grained band of silty sandstone from 500.35-500.55', minor carb. & argill. content parallel to bedding & medium gray siltstone. 502.60-510.65'-clarain coal, waxy lustre, 6 horizontal fractures, some vertical fractures, badly fractured 503.2-503.4' & 504-504.13' & 504.5-504.6' & 505.25-506.0'.
510.65-512.00'-interbedded mudstone & clay, dark gray, very high carb. content. 512.00-512.45'-lost. 512.45-515.25'-clarain coal, waxy lustre. 512.58 - 512.77'-carb. shale, core recovered in good sticks. 515.25-515.75'-carb. shale & siltstone, dark to light gray, coal stringers & filled in fracture. 515.75 - 516.90'-siltstone, gray, burrowed, coal in fractures. 516.90-518.75'-mudstone, dark gray, broken at 516.9', 517.3', 517.6', clay band 517.5-517.8'.
518.75-520.0'-siltstone as above.

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
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Proximate Analyses (%)

Moisture	14.4	N/A	N/A
Volatile Matter	32.4	37.8	39.7
Fixed Carbon	49.1	57.4	60.3
Ash	4.1	4.8	N/A

Ultimate Analyses (%)

Hydrogen	5.9	5.0	5.3
Carbon	63.8	74.6	78.3
Nitrogen	1.5	1.7	1.8
Sulfur	.3	.3	.3
Oxygen	24.4	13.6	14.2
Ash	4.1	4.8	N/A

Heating value
(BTU/lb)

10852	12677	13314
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Sulfur Forms (%)

Sulfate	.00	.00	.01
Pyritic	.02	.03	.03
Organic	.25	.30	.31

Ash

Initial deformation (°F)	not run
Softening temperature (°F)	not run
Fluid temperature (°F)	not run

Free Swelling Index	not run
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Fixed Carbon

DMMF	60.56
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Heating Value

BTU/lb MMMF	11,358.7
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Apparent Rank	hVc bituminous
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Date of Analysis:	2-6-78
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Laboratory:	U.S. Dept. of Energy
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Lab No.	K79132
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Comments:	
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GAS ANALYSES - not run

ADSORPTION ISOTHERM DATA - not run

PETROGRAPHIC ANALYSES - not run

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 17

LOCATION

County: Delta
Location: Sec 24 Twp 13S Rge 92W

Surface Elev (ft) 7720' topo maps
Coordinates C NW/4

GENERAL

CGS Sample No. 17
Sampled By Schultz and Fender
Operator Colorado Westmoreland
Hole No. 24

Date 6-30-77
Sample Type core

DRILLING DATA

Drilling Co. Materi Address Upton, Wyoming
Core Size 2 1/8" Barrel Length 15'
Type of core retrieval drill pipe
Drilling media air and foam Air Temperature 76°F
TD Hole ? Logs ?

GEOLOGY

Geologic Unit Mesaverde Fm. Age Upper Cretaceous
Coal zone/bed _____ Bed Thickness _____
Depth to top of coal 504.2' (Driller) ? (Log)
Depth to bottom of coal _____ (Driller) _____ (Log)
Cored interval _____ (Driller)
Roof description _____
Coal description _____
Floor description _____

DESORPTION DATA

Sampled interval (ft) _____ ? (Log)
Condition of sample small pieces
Sampled Weight (g) 773.5
Lost gas time (min) 100 Lost gas cc not calculated
Desorbed gas cc 35 Residual gas cc/ 0
Total gas content cc/g .19 Total gas content cft 6

Miscellaneous core description - 495-504.2' - sandstone & shale roof rock
504.2-516.0' - bituminous coal, fairly solid, good sample
516-522.5' - coal, bituminous, shaly, hard, fairly solid, some pyrite specs
& some calcite in cleats
522.5-525.5' - shale parting
525.5-530.5' - coal, same as 516-522.5'
530.5-531 - lost

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
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Proximate Analyses (%)

Moisture	10.8	N/A	N/A
Vol tile Matter	37.8	42.4	44.2
Fixed Carbon	47.7	53.5	55.8
Ash	3.7	4.1	N/A

Ultimate Analyses (%)

Hydrogen	5.9	5.2	5.4
Carbon	67.9	76.2	79.4
Nitrogen	1.5	1.7	1.7
Sulfur	.4	.5	.5
Oxygen	20.6	12.3	12.8
Ash	3.7	4.1	N/A

Heating value

(BTU/lb)

11840

13276

13844

Sulfur Forms (%)

Sulfate	not run
Pyritic	not run
Organic	not run

Ash

Initial deformation (°F)	not run
Softening temperature (°F)	not run
Fluid temperature (°F)	not run

Free Swelling Index not runFixed Carbon

DMMF 56.06

Heating Value

BTU/lb MMMF 12,340.3

Apparent Rank HvC bituminousDate of Analysis: 9-19-77Laboratory: Bureau of MinesLab No. K76535

Comments: _____

GAS ANALYSES - not runADSORPTION ISOTHERM DATA - not runPETROGRAPHIC ANALYSES - not run

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 18

LOCATION

County: Delta
Location: Sec 8 Twp 13S Rge 95W

Surface Elev (ft) 6970'
Coordinates SW/4, NE/4, NE/4

GENERAL

CGS Sample No. 18
Sampled By J. Schultz
Operator USGS Conservation Division
Hole No. HK-77-4

Date 9-20-77
Sample Type core

DRILLING DATA

Drilling Co. Hines Drilling Co. Address Grand Junction, CO
Core Size 1 7/8" Barrel Length 10'
Type of core retrieval wire line
Drilling media mud Air Temperature 70°F
TD Hole 804' Logs Gamma, Density, Caliper, Resistivity

GEOLOGY

Geologic Unit Mesaverde Group Age Upper Cretaceous
Coal zone/bed unknown Bed Thickness 7.6'(core), 7.5'(log)
Depth to top of coal 706.7' (Driller) 712' (Log)
Depth to bottom of coal 714.3' (Driller) 719.5' (Log)
Cored interval 703-713' (Driller)
Roof description carb. shale to 4.2' bone coal
Coal description bone coal in upper part of core to mostly hard attrital with stringers of vitrain - obvious pyrite
Floor description 1' carb shale, 2' ss, approx. 1' shale

DESORPTION DATA

Sampled interval (ft) 713-714' (Driller) 718.5-719.5' (Log)
Condition of sample broken at lithologic contact points - coal mostly ground up in coring process
Sampled Weight (g) 238
Lost gas time (min) 12.5 Lost gas cc 320
Desorbed gas cc 1018 Residual gas cc/g 0
Total gas content cc/g 5.62 Total gas content cf/t 180

Miscellaneous Seam above Rollins sandstone core description: 703 - 706' sandstone, 706 - 706.7' lost and shale, 706.7 - 708.7'; 2' bony coal, 708.7 - 713' coal with obvious pyrite - attrital with vitrain stringers, 713 - 714.3' coal with obvious pyrite, 714.3 - 715.3 carbonaceous shale, 715.3 - 717' sandstone, 717 - 717.6' shale, 717.6 - 721.9' sandstone and silty shale, 721.9 - 723 shale and lost, below - shale mixed with increasing sandstone (Rollins SS.). N.B. description not adjusted to log depths.

reference: U.S.G.S. Open File 78-540 by Philip Eager, 1978

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
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Proximate Analyses (%)

Moisture	11.8	N/A	N/A
Volatile Matter	30.9	35.0	40.3
Fixed Carbon	45.6	51.7	59.7
Ash	11.7	13.3	N/A

Ultimate Analyses (%)

Hydrogen	5.5	4.7	5.4
Carbon	59.3	67.2	77.5
Nitrogen	1.3	1.5	1.8
Sulfur	.7	.8	.9
Oxygen	21.5	12.5	14.4
Ash	11.7	13.3	N/A

Heating value
(BTU/lb)

	10453	11849	13662
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Sulfur Forms (%)

Sulfate	.00	.00	.01
Pyritic	.04	.04	.05
Organic	.63	.71	.82

Ash

Initial deformation (°F)	not run
Softening temperature (°F)	not run
Fluid temperature (°F)	not run

<u>Free Swelling Index</u>	not run
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<u>Fixed Carbon</u>	
DMMF	60.52

<u>Heating Value</u>	
BTU/lb MMMF	11,977.6

<u>Apparent Rank</u>	HvC bituminous
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Date of Analysis: 2-5-78

Laboratory: U.S. Dept. of Energy

Lab No. K79133

Comments: CGS #18 & CGS #19 (from same bed) were combined for the coal analyses.

GAS ANALYSES - not run

ADSORPTION ISOTHERM DATA - not run

PETROGRAPHIC ANALYSES - not run

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 19

LOCATION

County: Delta
Location: Sec 8 Twp 13S Rge 95W

Surface Elev (ft) 6970
Coordinates SW/4 NE/4 NE/4

GENERAL

CGS Sample No. 19
Sampled By J. Schultz
Operator USGS
Hole No. HK-77-4

Date 9-20-77
Sample Type core

DRILLING DATA

Drilling Co. Hines Drilling Co. Address Grand Junction, CO
Core Size 1 7/8" Barrel Length 10'
Type of core retrieval wire line
Drilling media mud Air Temperature 70°F
TD Hole 804' Logs Gamma, Density, Caliper, Resistivity

GEOLOGY

Geologic Unit Mesaverde Group Age Upper Cretaceous
Coal zone/bed unknown Bed Thickness 7.6' (core), 7.5' (log)
Depth to top of coal 706.7' (Driller) 712' (Log)
Depth to bottom of coal 714.3' (Driller) 719.5' (Log)
Cored interval 703-713' (Driller)
Roof description carb shale to 4.2' bone coal
Coal description bone coal in upper part of core to mostly hard attrital with stringers of vitrain - obvious pyrite
Floor description 1' carb shale, 2' ss approx. 1' shale

DESORPTION DATA

Sampled interval (ft) 707-713' (Driller) 712-719.5' (Log)
Condition of sample broken at lithologic contact points-coal mostly ground up in the coring process
Sampled Weight (g) 396
Lost gas time (min) 7.5 Lost gas cc 100
Desorbed gas cc 225 Residual gas cc/g 0
Total gas content cc/g .8 Total gas content cf/t 26

Miscellaneous seam above Rollins
core description: 703-706' sandstone, 706-706.7' lost and shale, 706.7-708.7' - 2' bony coal, 708.7-713' - coal with obvious pyrite-attrital with vitrain stringers, 713-714.3' - coal with obvious pyrite, 714.3-715.3' - carbonaceous shale, 715.3-717' - sandstone, 717-717.6' - shale, 717.6-721.9' - sandstone and silty shale, 721.9-723' - shale and lost, below - shale mixed with increasing sandstone (Rollins ss.). N.B. description not adjusted to log depths.

reference: USGS Open File Report 78-540 by Philip Eager, 1978.

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
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Proximate Analyses (%)

Moisture	11.8	N/A	N/A
Volatile Matter	30.9	35.0	40.3
Fixed Carbon	45.6	51.7	59.7
Ash	11.7	13.3	N/A

Ultimate Analyses (%)

Hydrogen	5.5	4.7	5.4
Carbon	59.3	67.2	77.5
Nitrogen	1.3	1.5	1.8
Sulfur	.7	.8	.9
Oxygen	21.5	12.5	14.4
Ash	11.7	13.3	N/A

Heating value
(BTU/lb)

10453	11849	13662
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Sulfur Forms (%)

Sulfate	.00	.00	.01
Pyritic	.04	.04	.05
Organic	.63	.71	.82

Ash

Initial deformation (°F)	not run
Softening temperature (°F)	not run
Fluid temperature (°F)	not run

Free Swelling Index	not run
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Fixed Carbon	
DMMF	60.52

Heating Value	
BTU/lb MMMF	11,977.6

Apparent Rank	hVc bituminous
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Date of Analysis: 2-5-78
 Laboratory: U.S. Dept. of Energy Lab No. K79133
 Comments: CGS #18 & CGS #19 (from same bed) were combined for the coal analyses.

GAS ANALYSES - not runADSORPTION ISOTHERM DATA - not runPETROGRAPHIC ANALYSES - not run

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 20

LOCATION

County: Pitkin Surface Elev (ft) approx. 10,000'
Location: Sec 17 Twp 10S Rge 89W Coordinates NE - SE

GENERAL

CGS Sample No. 20 Date 9/8/77
Sampled By D. C. Jones and J. E. Schultz Sample Type mine
Operator Mid-Continental Coal & Coke Co.
Dutch Creek No. 2 Mine

DRILLING DATA

Drilling Co. NA Address NA
Core Size NA Barrel Length NA
Type of core retrieval NA
Drilling media NA Air Temperature ?
TD Hole NA Logs NA

GEOLOGY

Geologic Unit Williams Fork Formation Age Upper Cretaceous
Coal zone/bed Dutch Creek Bed Thickness 8.7'
Depth to top of coal about 1500'(Driller) ? (Log)
Depth to bottom of coal about 1508.7'(Driller) (Log)
Cored interval NA (Driller)
Roof description dark grey shale, somewhat fissile with exposure of 1 day
Coal description bright attrital coal; semi-soft & somewhat sheared. Vitrain layers to 1/2" thick, 1-day exposure to 2 wk. exposure, includes .5' of bone, minor amount of calcite
Floor description _____

DESORPTION DATA

Sampled interval (ft) -- (Driller) NA (Log)
Condition of sample --
Sampled Weight (g) 1477
Lost gas time (min) NA Lost gas cc NA
Desorbed gas cc 2501 Residual gas cc/g 0
Total gas content cc/g 1.69 * Total gas content cf/t 54 *

Miscellaneous 18 inch parting, 29 inches from top of bed, very hard grey, silty sandstone with coal stringers. The parting described and sampled disappears approximately 300 ft to the north of the sampled area. Samples taken approximately 2/3 mile from nearest outcrop at surface.
Face description: 2.4' bright attrital coal, semi-soft & somewhat sheared, vitrain layers to 1/2" thick; 1.5' very hard, grey, silty sandstone with coal stringers; 2.75' bright attrital coal, somewhat softer than upper half, 2 week old exposure; includes .5' of bone & minor amounts of calcite; 1.5' coal left in floor.

* gas contents low since most of the gas was lost from this mine sample

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
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Proximate Analyses (%)

Moisture	.6	N/A	N/A
Volatile Matter	24.9	25.0	28.8
Fixed Carbon	61.3	61.7	71.2
Ash	13.2	13.3	N/A

Ultimate Analyses (%)

Hydrogen	4.7	4.7	5.4
Carbon	76.3	76.8	88.5
Nitrogen	1.6	1.6	1.9
Sulfur	.6	.6	.7
Oxygen	3.5	3.0	3.5
Ash	13.2	13.3	N/A

Heating value
(BTU/lb)

As Received	13522	Moisture Free	13597	Moisture and Ash Free	15679
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Sulfur Forms (%)

Sulfate	.01	.01	.01
Pyritic	.08	.08	.09
Organic	.54	.54	.62

Ash

Initial deformation (°F)	not run
Softening temperature (°F)	not run
Fluid temperature (°F)	not run

Free Swelling Index	not run
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Fixed Carbon	
DMMF	72.17

Heating Value	
BTU/lb MMMF	15796.00

Apparent Rank	MV bituminous
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Date of Analysis: 4-25-78Laboratory: U.S. Dept. of EnergyLab No. K81333

Comments: _____

GAS ANALYSES - not runADSORPTION ISOTHERM DATA - not runPETROGRAPHIC ANALYSES - not run

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 21

LOCATION

County: Pitkin
Location: Sec 17 Twp 10S Rge 89W

Surface Elev (ft) 9,900
Coordinates NE - SE

GENERAL

CGS Sample No. 21
Sampled By J. Schultz
Operator Mid Continent Coal & Coke Co.
L.S. Wood Mine

Date 9/9/77
Sample Type mine

DRILLING DATA

Drilling Co. NA Address _____
Core Size NA Barrel Length NA
Type of core retrieval NA
Drilling media NA Air Temperature ?
TD Hole NA Logs NA

GEOLOGY

Geologic Unit Williams Fork Formation Age Upper Cretaceous
Coal zone/bed Coal Basin "B" Bed Thickness 25'
Depth to top of coal 13-1500' (Driller) NA (Log)
Depth to bottom of coal NA (Driller) NA (Log)
Cored interval NA (Driller)
Roof description hard, dark grey shale
Coal description dull to bright attrital coal; very sheared; no cleat
observed; vitrain bands up to 1" thick
Floor description ?

DESORPTION DATA

Sampled interval (ft) ? (Driller) NA (Log)
Condition of sample good, exposed 1 day or more
Sampled Weight (g) 1515
Lost gas time (min) NA Lost gas cc NA
Desorbed gas cc 235 Residual gas cc/g .06
Total gas content cc/g .22 * Total gas content cf/t 7 *

Miscellaneous They are mining the top 6.8 ft (1.8-2.4 m) of 25 ft
(7.6 m) of coal. The bed seems somewhat sheared throughout.
face description: roof - hard, dark grey shale; 7.92' dull to bright
attrital coal, very sheared, no cleat or minerals observed, vitrain bands
up to 1" thick; 18.75' coal not sampled

*gas contents low since most of the gas was lost from this mine sample

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
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Proximate Analyses (%)

Moisture	1.0	N/A	N/A
Volatile Matter	22.8	23.0	24.8
Fixed Carbon	69.3	70.0	75.2
Ash	6.9	7.0	N/A

Ultimate Analyses (%)

Hydrogen	4.9	4.8	5.2
Carbon	82.8	83.7	90.0
Nitrogen	1.9	1.9	2.0
Sulfur	.5	.5	.6
Oxygen	2.9	2.1	2.2
Ash	6.9	7.0	N/A

Heating value
(BTU/lb)

14491	14634	15735
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Sulfur Forms (%)

Sulfate	.00	.00	.00
Pyritic	.01	.01	.01
Organic	.52	.53	.57

Ash

Initial deformation (°F)	not run
Softening temperature (°F)	not run
Fluid temperature (°F)	not run

Free Swelling Index	not run
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Fixed Carbon	
DMMF	75.84

Heating Value	
BTU/lb MMMF	15677.4

Apparent Rank	MV bituminous
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Date of Analysis:	4-25-78	Lab No.	K81335
Laboratory:	U.S. Dept. of Energy		
Comments:			

GAS ANALYSES - not runADSORPTION ISOTHERM DATA - not runPETROGRAPHIC ANALYSES - not run

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 22

LOCATION

County: Pitkin
Location: Sec 17 Twp 10S Rge 89W

Surface Elev (ft) 10,000
Coordinates SE-NE

GENERAL

CGS Sample No. 22
Sampled By D. C. Jones
Operator Mid Continent Coal & Coke Co.
Coal Basin Mine

Date 9/13/78
Sample Type mine

DRILLING DATA

Drilling Co. NA Address _____
Core Size NA Barrel Length NA
Type of core retrieval NA
Drilling media NA Air Temperature ?
TD Hole NA Logs NA

GEOLOGY

Geologic Unit Williams Fork Formation Age Upper Cretaceous
Coal zone/bed Coal Basin "B" Bed Thickness 20 ft
Depth to top of coal about 2000' (Driller) NA (Log)
Depth to bottom of coal ? (Driller) NA (Log)
Cored interval NA (Driller)
Roof description dark, greyish-black shale
Coal description Bright attrital coal. Appears very sheared with little
apparent cleat. No minerals observed.
Floor description ?

DESORPTION DATA

Sampled interval (ft) ? (Driller) NA (Log)
Condition of sample excellent-exposure 1 day old
Sample Weight (g) 945.5
Lost gas time (min) NA Lost gas cc NA
Desorbed gas cc 211 Residual gas cc/g 0
Total gas content cc/g .22 * Total gas content cf/t 7 *

Miscellaneous face description: roof-dark, greyish-black shale;
.5' reddish-brown bone coal, geologist said it runs 50% ash; 2.8' bright
attrital coal, appears very sheared with little apparent cleat, no minerals
observed; 5.5' bright attrital coal, very sheared, breaks easily, no
minerals observed, very little cleat; coal - approximately 11" left in
floor.

*gas contents low since most of the gas was lost from this mine sample

COAL ANALYSES

Analyses	As Received	Moisture Free	Moisture and Ash Free
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Proximate Analyses (%)

Moisture	.6	N/A	N/A
Volatile Matter	26.2	26.3	27.5
Fixed Carbon	68.9	69.4	72.5
Ash	4.3	4.3	N/A

Ultimate Analyses (%)

Hydrogen	5.1	5.1	5.3
Carbon	85.0	85.5	89.3
Nitrogen	1.9	1.9	2.0
Sulfur	.6	.6	.6
Oxygen	3.2	2.7	2.8
Ash	4.3	4.3	N/A

Heating value
(BTU/lb)

15098	15186	15867
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Sulfur Forms (%)

Sulfate	.01	.01	.01
Pyritic	.02	.02	.02
Organic	.57	.57	.60

Ash

Initial deformation (°F)	not run
Softening temperature (°F)	not run
Fluid temperature (°F)	not run

Free Swelling Index	not run
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Fixed Carbon	
DMMF	72.87

Heating Value	
BTU/lb MMMF	15856.7

Apparent Rank	MV bituminous
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Date of Analysis: 4-25-78

Laboratory: U.S. Dept. of Energy

Lab No. K81334

Comments:

GAS ANALYSES - not runADSORPTION ISOTHERM DATA - not runPETROGRAPHIC ANALYSES - not run

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 23

LOCATION

County: Delta
Location: Sec 24 Twp 13S Rge 93W

Surface Elev (ft) 8310
Coordinates NE/4 NW/4 SW/4

GENERAL

CGS Sample No. 23
Sampled By P. Eager
Operator USGS
Hole No. GR-77-1

Date 10/27/77
Sample Type core

DRILLING DATA

Drilling Co. Himes Drilling Co. Address Grand Junction, CO
Core Size 1 7/8" Barrel Length 10'
Type of core retrieval NX wireline
Drilling media water Air Temperature 15-20°F
TD Hole 1044' Logs Gamma Ray, Density, Resistivity, Caliper

GEOLOGY

Geologic Unit Mesaverde Group Age Upper Cretaceous
Coal zone/bed unknown Bed Thickness 14
Depth to top of coal 986' (Driller) 992.5' (Log)
Depth to bottom of coal 1000' (Driller) 1007' (Log)
Cored interval 553-1038' (Driller)
Roof description S.S., carb & shale alternate
Coal description coal, slightly bony
Floor description ss. and shale mixed

DESORPTION DATA

Sampled interval (ft) 987-992' (Driller) ? (Log)
Condition of sample _____
Sampled Weight (g) 422
Lost gas time (min) 11 Lost gas cc not calculated
Desorbed gas cc 24 Residual gas cc/g .4
Total gas content cc/g .46 Total gas content cft 15

Miscellaneous core description: 992.5-993' impure coal, 993-996' coal,
996-998' impure coal, 998-1003.5' coal, 1003.5-1004.5' impure coal,
1004.5-1007' coal
reference: U.S.G.S. Open File Report 78-540 by Philip Eager, 1978

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
<u>Proximate Analyses (%)</u>			
Moisture	12.8	N/A	N/A
Volatile Matter	29.7	34.1	40.0
Fixed Carbon	44.6	51.1	60.0
Ash	12.9	14.8	N/A
<u>Ultimate Analyses (%)</u>			
Hydrogen	5.3	4.4	5.2
Carbon	57.2	65.6	77.0
Nitrogen	1.2	1.4	1.7
Sulfur	.4	.5	.5
Oxygen	22.9	13.2	15.5
Ash	12.9	14.8	N/A
<u>Heating value</u> (BTU/lb)	9977	11443	13436
<u>Sulfur Forms (%)</u>			
Sulfate	.02	.02	.02
Pyritic	.02	.02	.03
Organic	.36	.42	.49
<u>Ash</u>			
Initial deformation (°F)	not run		
Softening temperature (°F)	not run		
Fluid temperature (°F)	not run		
<u>Free Swelling Index</u>	not run		
<u>Fixed Carbon</u>			
<u>DMMF</u>	60.97		
<u>Heating Value</u>			
<u>BTU/lb DMMF</u>	11598.4		
<u>Apparent Rank</u>	HvC bituminous		
Date of Analysis:	4-28-78		
Laboratory:	U.S. Dept. of Energy		Lab No. K81338
Comments:			

GAS ANALYSES - not runADSORPTION ISOTHERM DATA - not runPETROGRAPHIC ANALYSES - not run

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 24

LOCATION

County: Delta
Location: Sec 34 Twp 13S Rge 96W

Surface Elev (ft) 8030
Coordinates NE/4 SE/4 NW/4

GENERAL

CGS Sample No. 24
Sampled By P. Eager
Operator USGS
Hole No. HK 77-1

Date 12-7-77
Sample Type core

DRILLING DATA

Drilling Co. Himes Drilling Co. Address Grand Junction, CO
Core Size 1 7/8" Barrel Length 10'
Type of core retrieval wireline
Drilling media water Air Temperature 15-20°F
TD Hole 597 Logs Gamma Ray, Density, Resistivity, Caliper

GEOLOGY

Geologic Unit Mesaverde Group Age Upper Cretaceous
Coal zone/bed Mt. Garfield Fm./Cameo B bed Thickness _____
Depth to top of coal 581' (Driller) 579' (Log) _____
Depth to bottom of coal 585.5' (Driller) 583.5' (Log) _____
Cored interval 583-584.3' (Driller) _____
Roof description shale
Coal description coal
Floor description sandstone - Rollins

DESORPTION DATA

Sampled interval (ft) 583-583.4', 583.7-584.3' (Driller) ? (Log) _____
Condition of sample ?
Sampled Weight (g) 601
Lost gas time (min) 8.5 Lost gas cc 0
Desorbed gas cc 0 Residual gas cc/g 0
Total gas content cc/g 0 Total gas content cft 0

Miscellaneous 579-583.5' coal with sandstone dike
reference: U.S.G.S. Open-File Report 78-540

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
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Proximate Analyses (%)

Moisture	18.3	N/A	N/A
Volatile Matter	33.4	40.8	44.2
Fixed Carbon	42.0	51.4	55.8
Ash	6.3	7.8	N/A

Ultimate Analyses (%)

Hydrogen	6.0	4.9	5.3
Carbon	59.2	72.4	78.5
Nitrogen	1.2	1.5	1.6
Sulfur	.7	.9	1.0
Oxygen	26.5	12.6	13.6
Ash	6.3	7.8	N/A

Heating value
(BTU/lb)

10187	12462	13511
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Sulfur Forms (%)

Sulfate	.01	.01	.01
Pyritic	.04	.04	.05
Organic	.68	.84	.91

Ash

Initial deformation (°F)	not run
Softening temperature (°F)	not run
Fluid temperature (°F)	not run

Free Swelling Index	not run
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Fixed Carbon	
DMMF	56.23

Heating Value	
BTU/lb MMMF	10938.4

Apparent Rank	Sub bit A. or HvC bituminous
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Date of Analysis:	4-25-78
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Laboratory:	U.S. Dept. of Energy
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Lab No.	K81337
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Comments:	
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GAS ANALYSES - not runADSORPTION ISOTHERM DATA - not runPETROGRAPHIC ANALYSES - not run

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 25

LOCATION

County: Mesa
Location: Sec 13 Twp 10S Rge 98W

Surface Elev (ft) about 4840'
Coordinates SE/4 SW/4 SE/4

GENERAL

CGS Sample No. 25
Sampled By Eager
Operator USGS
Hole No. CA-77-2

Date 12/14/77
Sample Type core

DRILLING DATA

Drilling Co. Himes Drilling Co. Address Grand Junction, CO
Core Size 1 7/8" Barrel Length 10'
Type of core retrieval wireline
Drilling media water Air Temperature 15-20°F
TD Hole 1341 Logs Gamma Ray, Density, Resistivity, Caliper

GEOLOGY

Geologic Unit Mesaverde Group Age Cretaceous
Coal zone/bed uncorr. Cameo zone Bed Thickness 11'
Depth to top of coal 805.6' (Driller) 803.5' (Log)
Depth to bottom of coal 816.8' (Driller) 814.5' (Log)
Cored interval 683-1341' (Driller)
Roof description tan clay
Coal description coal with some impure coal and 2 tan clay partings
Floor description shaley coal

DESORPTION DATA

Sampled interval (ft) 811-813' (Driller) 809-811' (Log)
Condition of sample ?
Sampled Weight (g) 782 ?
Lost gas time (min) 7.5 Lost gas cc not calculated
Desorbed gas cc 1085 Residual gas cc/g 1.1
Total gas content cc/g 2.49 Total gas content cf/t 80

Miscellaneous core description: 803.5-805.5' impure coal,
805.5-806.5' tan clay, 806.5-808.5' coal, 808.5-809' tan clay,
809-811' coal, 811-813' impure coal, 813.5-814.5' impure coal

reference: U.S.G.S. Open File Report 78-540 by Philip Eager, 1978

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
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Proximate Analyses (%)

Moisture	3.5	N/A	N/A
Volatile Matter	35.4	36.7	43.3
Fixed Carbon	46.4	48.1	56.7
Ash	14.7	15.2	N/A

Ultimate Analyses (%)

Hydrogen	5.4	5.2	6.1
Carbon	66.6	69.1	81.5
Nitrogen	1.5	1.5	1.8
Sulfur	.8	.8	.9
Oxygen	11.1	8.2	9.7
Ash	14.7	15.2	N/A

Heating value
(BTU/lb)

11931	12370	14591
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Sulfur Forms (%)

Sulfate	.01	.01	.01
Pyritic	.15	.15	.18
Organic	.60	.63	.74

Ash

Initial deformation (°F)	2695
Softening temperature (°F)	2805
Fluid temperature (°F)	2905

Free Swelling Index	3.0
Fixed Carbon	
DMMF	57.72
Heating Value	
BTU/lb MMMF	14209.4
Apparent Rank	HvA bituminous

Date of Analysis: 9-12-78
 Laboratory: U.S. Dept. of Energy Lab No. ?
 Comments: _____

GAS ANALYSES - not runADSORPTION ISOTHERM DATA - not runPETROGRAPHIC ANALYSES - not run

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 26

LOCATION

County: Mesa
Location: Sec 13 Twp 10S Rge 98W

Surface Elev (ft) about 4840
Coordinates SE/4 SW/4 SE/4

GENERAL

CGS Sample No. 26
Sampled By P. Eager
Operator USGS
Hole No. CA-77-2

Date 12-18-77
Sample Type core

DRILLING DATA

Drilling Co. Himes Drilling Co. Address Grand Junction, CO
Core Size 1 7/8" Barrel Length 10'
Type of core retrieval wireline
Drilling media water Air Temperature 15-20°F
TD Hole 1341 Logs Gamma Ray, Density, Resistivity

GEOLOGY

Geologic Unit Mesaverde Group Age Upper Cretaceous
Coal zone/bed Palisade zone/uncorrelated Bed Thickness 3.5'
Depth to top of coal 1287.25' (Driller) 1284.5' (Log)
Depth to bottom of coal 1290.9' (Driller) 1288' (Log)
Cored interval 683-1341' (Driller)
Roof description shale
Coal description hard, bright

Floor description carb. shale, coaly at top

DESORPTION DATA

Sampled interval (ft) 1288.6-1289.8' (Driller) _____ (Log)
Condition of sample ?
Sampled Weight (g) 800
Lost gas time (min) 11.5 Lost gas cc 70
Desorbed gas cc 5113 Residual gas cc/g .5
Total gas content cc/g 6.98 Total gas content cf/t 223

Miscellaneous reference: U.S.G.S. Open File Report 78-540 by Philip Eager (1978)

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
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Proximate Analyses (%)

Moisture	1.9	N/A	N/A
Volatile Matter	39.4	40.2	42.4
Fixed Carbon	53.5	54.5	57.6
Ash	5.2	5.3	N/A

Ultimate Analyses (%)

Hydrogen	5.6	5.5	5.8
Carbon	76.7	78.2	82.5
Nitrogen	1.9	1.9	2.0
Sulfur	1.5	1.5	1.6
Oxygen	9.1	7.6	8.0
Ash	5.2	5.3	N/A

Heating value
(BTU/lb)

13931	14194	14987
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Sulfur Forms (%)

Sulfate	.03	.03	.03
Pyritic	.67	.68	.72
Organic	.77	.79	.83

Ash

Initial deformation (°F)	not run
Softening temperature (°F)	not run
Fluid temperature (°F)	not run

Free Swelling Index	not run
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Fixed Carbon

DMMF	58.12
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Heating Value

BTU/lb MMMF	14809.9
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Apparent Rank	HvA bituminous
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Date of Analysis:	4-25-78
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Laboratory:	U.S. Dept. of Energy
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Lab No.	K81336
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Comments:	
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GAS ANALYSES - not run

ADSORPTION ISOTHERM DATA - not run

PETROGRAPHIC ANALYSES - not run

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 27

LOCATION

County: Las Animas
Location: Sec 4 Twp 33S Rge 67W

Surface Elev (ft) 7240
Coordinates SE/4 SE/4

GENERAL

CGS Sample No. 27
Sampled By J. Schultz
Operator USGS
Hole No. DH 78-1A

Date 6-6-78
Sample Type core

DRILLING DATA

Drilling Co. Himes Drilling Co. Address Grand Junction, CO
Core Size 3 1/8" Barrel Length 20'
Type of core retrieval conventional
Drilling media mud Air Temperature 55°
TD Hole 1799' Logs focused density, natural gamma, caliper

GEOLOGY

Geologic Unit Raton Fm. Age Upper Cretaceous - Paleocene
Coal zone/bed unnamed Bed Thickness 2' (log)
Depth to top of coal 810' (Driller) ? (Log)
Depth to bottom of coal 811.3 (Driller) ? (Log)
Cored interval 810-832' (Driller)
Roof description shale on log
Coal description Hard-solid-bed intruded by sill. Laminated (bone) 1" below sample was blocky. Coal contains pyrite flakes.
Floor description sill, medium- to light-gray, very hard; contains irregular inclusions of bone coal, white mineral (zeolite? smectite?) filling fractures

DESORPTION DATA

Sampled interval (ft) 810-811' (Driller) (Log)
Condition of sample fractured across lamination
Sampled Weight (g) 2319
Lost gas time (min) 91.5 Lost gas cc 370
Desorbed gas cc 3086 Residual gas cc/g .10
Total gas content cc/g 1.59 Total gas content cf/t 51

Miscellaneous see U.S.G.S. Open File Reports 78-1101, 79-762 (CGS 79-3)

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
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Proximate Analyses (%)

Moisture	2.0	N/A	N/A
Volatile Matter	7.3	7.5	30.7
Fixed Carbon	16.5	16.8	69.3
Ash	74.2	75.7	N/A

Ultimate Analyses (%)

Hydrogen	1.5	1.3	5.2
Carbon	17.3	17.7	72.7
Nitrogen	.5	.5	2.0
Sulfur	1.4	1.4	5.9
Oxygen	5.2	3.5	14.2
Ash	74.2	75.7	N/A

Heating value
(BTU/lb)

2444	2495	10265
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Sulfur Forms (%)

Sulfate	.01	.01	.04
Pyritic	1.08	1.10	4.54
Organic	.32	.33	1.34

Ash

Initial deformation (°F)	not run
Softening temperature (°F)	not run
Fluid temperature (°F)	not run

Free Swelling Index	0
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Fixed Carbon	
DMMF	95.29

Heating Value	
BTU/lb MMMF	12433.2

Apparent Rank	coke-bed intruded by sill
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Date of Analysis:	1-30-79
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Laboratory:	U.S. Dept. of Energy
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Lab No.	K88877
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Comments:	
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GAS ANALYSES

	<u>With air</u>	<u>Air free</u>
<u>(MSI percent)</u>		
Hydrogen	5.99	7.76
Oxygen	5.02	nil
Hydrogen sulfide	nil	nil
Carbon dioxide	trace	trace
Nitrogen	37.48	25.45
Methane	51.50	66.78
Ethane	0.01	0.01
Other hydrocarbons	nil	nil
<u>Calculated gas gravity</u>	<u>0.707</u>	<u>0.621</u>

Calculated gross heating value (BTU/cf, air free) 698

Company: USGS Sampler: Steve Goolsby
 Date sample taken: 6-13-78 Date sample analyzed: 6-30-78
 Laboratory: Core Laboratories Lab No.: RFL 78407

Carbon Isotope Ratio (relative to Chicago standard) - not run

ADSORPTION ISOTHERM DATA - not run

PETROGRAPHIC ANALYSES - not run

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 28

LOCATION

County: Las Animas
Location: Sec 4 Twp 33S Rge 67W

Surface Elev (ft) 7240'
Coordinates SE/4, SE/4

GENERAL

CGS Sample No. 28
Sampled By J. Schultz
Operator USGS
Hole No. USGS DH78-1A

Date 6-6-78
Sample Type Core

DRILLING DATA

Drilling Co. Himes Drilling Co. Address Grand Junction, CO
Core Size 3 1/8" Barrel Length 20'
Type of core retrieval conventional
Drilling media mud Air Temperature 64°F
TD Hole 1799' Logs focused density, natural gamma, caliper

GEOLOGY

Geologic Unit Raton Formation Age Upper Cretaceous - Paleocene
Coal zone/bed unknown Bed Thickness 0.45'
Depth to top of coal 828.2' (Driller) ? (Log)
Depth to bottom of coal 828.65' (Driller) ? (Log)
Cored interval 810-832' (Driller)
Roof description dark medium gray claystone, see Miscellaneous
Coal description coaly shale, very dark gray
Floor description claystone, see Miscellaneous

DESORPTION DATA

Sampled interval (ft) 828.2-828.65' (Driller) ? (Log)
Condition of sample ?
Sampled Weight (g) 1098
Lost gas time (min) 60 Lost gas cc 130
Desorbed gas cc 755 Residual gas cc/g 0
Total gas content cc/g .81 Total gas content cf/t 26

Miscellaneous core description: 827-827.3' - claystone, laminated, slightly silty, alternations of medium and dark gray with the medium gray being more silty; 827.3-828.2' - claystone, dark medium gray, massive, very thin stringers of coal and carb. leaf material disseminated throughout, very thin calcareous layers, slickensided, 828.2-828.65' coaly shale; 828.65-831.25' - claystone as above, upper .5' more carbonaceous and coaly becoming more massive with coaly stringers. Fracture zone lower .5', slickensided depth; 831' - fault zone

see U.S.G.S. Open File Report 78-1101, 79-762 (CGS 79-3)

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
<u>Proximate Analyses (%)</u>			
Moisture	3.4	N/A	N/A
Volatile Matter	10.6	11.0	60.2
Fixed Carbon	7.1	7.3	39.8
Ash	78.9	81.7	N/A
<u>Ultimate Analyses (%)</u>			
Hydrogen	1.6	1.3	7.1
Carbon	9.1	9.5	51.8
Nitrogen	1.1	1.2	6.3
Sulfur	1.6	1.7	9.1
Oxygen	7.6	4.7	25.7
Ash	78.9	81.7	N/A
<u>Heating value</u> (BTU/lb)	1708	1768	9667
<u>Sulfur Forms (%)</u>			
Sulfate	not run		
Pyritic	not run		
Organic	not run		
<u>Ash</u>			
Initial deformation (°F)	not run		
Softening temperature (°F)	not run		
Fluid temperature (°F)	not run		
<u>Free Swelling Index</u>	0		
<u>Fixed Carbon</u>			
DMMF	65.28		
<u>Heating Value</u>			
BTU/lb MMMF	11705		
<u>Apparent Rank</u>	carb. shale		
Date of Analysis:	11-16-78		
Laboratory:	U.S. Dept. of Energy		Lab No. K86615
Comments:			

GAS ANALYSES - not runADSORPTION ISOTHERM DATA - not runPETROGRAPHIC ANALYSES - not run

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 29

LOCATION

County: Las Animas
Location: Sec 4 Twp 33S Rge 67W

Surface Elev (ft) 7240
Coordinates SE/4 SE/4

GENERAL

CGS Sample No. 29
Sampled By Schultz
Operator USGS
Hole No. USGS DH78-1A

Date 6-7-78
Sample Type core

DRILLING DATA

Drilling Co. Himes Drilling Co. Address Grand Junction, CO
Core Size 3 1/8" Barrel Length 20'
Type of core retrieval conventional
Drilling media mud Air Temperature ?
TD Hole 1799' Logs Natural Gamma, Focused Density, Caliper

GEOLOGY

Geologic Unit Raton Formation Age Upper Cretaceous - Paleocene
Coal zone/bed Frederick-Martinez coal zone Bed Thickness 0.4'
Depth to top of coal 1053.5' (Driller) ? (Log)
Depth to bottom of coal 1053.9' (Driller) ? (Log)
Cored interval 1026-1066' (Driller)
Roof description black Shale
Coal description coal, thin banded
Floor description coaly Shale

DESORPTION DATA

Sampled interval (ft) 1053.5-1053.9' (Driller) ? (Log)
Condition of sample mud not washed off
Sampled Weight (g) 2308
Lost gas time (min) 48 Lost gas cc 480
Desorbed gas cc 4731 Residual gas cc/g 0.0
Total gas content cc/g 2.26 Total gas content cf/t 72

Miscellaneous see USGS Open-File Report 78-1101,
Open-File Report 79-762 (CGS 79-3)

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
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Proximate Analyses (%)

Moisture	3.5	N/A	N/A
Volatile Matter	14.5	15.0	47.8
Fixed Carbon	15.7	16.3	52.2
Ash	66.3	68.7	N/A

Ultimate Analyses (%)

Hydrogen	2.5	2.2	7.1
Carbon	23.2	24.1	76.9
Nitrogen	.5	.5	1.7
Sulfur	.4	.4	1.2
Oxygen	7.1	4.1	13.2
Ash	66.3	68.7	N/A

<u>Heating value</u> (BTU/lb)	3888	4029	12861
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Sulfur Forms (%)

Sulfate	.01	.01	.03
Pyritic	.26	.27	.86
Organic	.10	.10	.33

Ash

Initial deformation (°F)	not run
Softening temperature (°F)	not run
Fluid temperature (°F)	not run

Free Swelling Index	1.0
Fixed Carbon	
DMMF	63.4
Heating Value	
BTU/lb MMMF	13728
Apparent Rank	carb. shale

Date of Analysis:	1-29-79
Laboratory:	U.S. Dept. of Energy
Comments:	

Lab No. K88873

GAS ANALYSES

	<u>With air</u>	<u>Air free</u>
<u>(MSI percent)</u>		
Hydrogen	0.11	0.13
Oxygen	3.16	nil
Hydrogen sulfide	nil	nil
Carbon dioxide	0.12	0.14
Nitrogen	18.07	7.97
Methane	78.53	91.75
Ethane	0.01	0.01
Other hydrocarbons	nil	nil
	100.00	100.00
<u>Calculated gas gravity</u>	0.647	0.587

Calculated gross heating value (BTU/cf, air free) 925

Company: USGS Sampler: S. Goolsby
 Date sample taken: 6-13-78 Date sample analyzed: 6-30-78
 Laboratory: Core Laboratories, Inc. Lab No.: RFL 78407

CARBON ISOTOPE RATIO (relative to Chicago standard) - not run

ADSORPTION ISOTHERM DATA - not run

PETROGRAPHIC ANALYSES - not run

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 30

LOCATION

County: Las Animas
Location: Sec 4 Twp 33S Rge 67W

Surface Elev (ft) 7240
Coordinates SE/4 SE/4

GENERAL

CGS Sample No. 30
Sampled By J. Schultz
Operator USGS
Hole No. USGS DH78-1A

Date 6-7-78
Sample Type core

DRILLING DATA

Drilling Co. Himes Drilling Co. Address Grand Junction, CO
Core Size 3 1/8" Barrel Length 20'
Type of core retrieval conventional
Drilling media mud Air Temperature ?
TD Hole 1799' Logs Natural Gamma, Focused Density, Caliper

GEOLOGY

Geologic Unit Raton Formation Age Upper Cretaceous - Paleocene
Coal zone/bed Frederick-Martinez Bed Thickness 2.1'
Depth to top of coal 1062.9' (Driller) _____ (Log) _____
Depth to bottom of coal 1065' (Driller) _____ (Log) _____
Cored interval 1026-1066 (Driller) _____
Roof description claystone, very dark gray; irregular laminations exhibit bedding compaction
Coal description broken

Floor description claystone, medium-gray, silty, irregularly laminated

DESORPTION DATA

Sampled interval (ft) 1063.1-1064.1 (Driller) ? (Log) _____
Condition of sample mud not washed off, broken
Sampled Weight (g) 1710
Lost gas time (min) 45 Lost gas cc 850
Desorbed gas cc 9441 Residual gas cc/g .01
Total gas content cc/g 6.03 Total gas content cf/t 193

Miscellaneous .8' of coal lost
see USGS Open File Report 78-1101, Open File Report 79-762 (CGS 79-3)

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
-----------------	--------------------	----------------------	------------------------------

Proximate Analyses (%)

Moisture	2.1	N/A	N/A
Volatile Matter	16.0	16.3	38.5
Fixed Carbon	25.5	26.1	61.5
Ash	56.4	57.6	N/A

Ultimate Analyses (%)

Hydrogen	2.7	2.6	6.0
Carbon	33.0	33.7	79.6
Nitrogen	.7	.7	1.6
Sulfur	.5	.5	1.2
Oxygen	6.6	4.9	11.5
Ash	56.4	57.6	N/A

Heating value
(BTU/lb)

5733	5854	13811
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Sulfur Forms (%)

Sulfate	.01	.01	.02
Pyritic	.33	.34	.79
Organic	.16	.16	.39

Ash

Initial deformation (°F)	not run
Softening temperature (°F)	not run
Fluid temperature (°F)	not run

Free Swelling Index 1.0

Fixed Carbon

DMMF 69.3

Heating Value

BTU/lb MMMF 14706.4Apparent Rank carb. shaleDate of Analysis: 1-30-79Laboratory: U.S. Dept. of EnergyLab No. K88874

Comments: _____

GAS ANALYSES

	<u>With air</u>	<u>Air free</u>
<u>(MSI percent)</u>		
Hydrogen	0.45	0.46
Oxygen	0.24	nil
Hydrogen sulfide	nil	nil
Carbon dioxide	0.48	0.48
Nitrogen	16.39	15.71
Methane	82.43	83.34
Ethane	0.01	0.01
Other hydrocarbons	nil	nil
	100.00	100.00
Calculated gas gravity	.625	.621

Calculated gross heating value (BTU/cf, air free) 841

Company: USGS Sampler: S. Goolsby
 Date sample taken: 6-13-78 Date sample analyzed: 6-30-78
 Laboratory: Core Laboratories, Inc. Lab No.: RFL 78407

	<u>With air</u>	<u>Air free</u>
<u>(MSI percent)</u>		
Hydrogen	61.75	61.99
Oxygen	0.09	nil
Hydrogen sulfide	nil	nil
Carbon dioxide	0.01	0.01
Nitrogen	4.03	3.75
Methane	34.11	34.24
Ethane	0.01	0.01
Other hydrocarbons	nil	nil
	100.00	100.00
Calculated gas gravity	0.272	0.269

Calculated gross heating value (BTU/cf, air free) 546

Company: USGS Sampler: S. Goolsby
 Date sample taken: Date sample analyzed: 7-12-78
 Laboratory: Core Laboratories, Inc. Lab No.: RFL 78438

CARBON ISOTOPE RATIO (relative to Chicago standard) - not run

ADSORPTION ISOTHERM DATA - not run

PETROGRAPHIC ANALYSES - not run

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 31

LOCATION

County: Las Animas
Location: Sec 4 Twp 33S Rge 67W

Surface Elev (ft) 7240
Coordinates SE/4 SE/4

GENERAL

CGS Sample No. 31
Sampled By J. Schultz
Operator USGS
Hole No. USGS DH 78-1A

Date 6-9-78
Sample Type core

DRILLING DATA

Drilling Co. Himes Address Grand Junction, Colo.
Core Size 3 1/8" Barrel Length 20'
Type of core retrieval conventional
Drilling media mud Air Temperature 55°F
TD Hole 1799' Logs Focused density, Natural Gamma, Caliper

GEOLOGY

Geologic Unit Vermejo Formation Age Upper Cretaceous
Coal zone/bed unknown Bed Thickness 4.2'
Depth to top of coal 1691.2' (Driller) ? (Log)
Depth to bottom of coal 1695.4' (Driller) ? (Log)
Cored interval 1676-1705' (Driller)
Roof description .2' medium gray, siltstone
Coal description bright, closely cleated

Floor description 10' medium dark gray siltstone ?

DESORPTION DATA

Sampled interval (ft) 1691.2-1692.2' (Driller) ? (Log)
Condition of sample mostly crumbled, bottom solid
Sampled Weight (g) 1600
Lost gas time (min) 115 Lost gas cc 3400
Desorbed gas cc 14255 Residual gas cc/g 0.04
Total gas content cc/g 11.07 Total gas content cf/t 354

Miscellaneous see USGS Open File Report 78-1101,
Open File Report 79-762 (CGS 79-3)

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
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Proximate Analyses (%)

Moisture	.6	N/A	N/A
Volatile Matter	25.2	25.4	28.8
Fixed Carbon	62.4	62.8	71.2
Ash	11.7	11.8	N/A

Ultimate Analyses (%)

Hydrogen	4.7	4.6	5.3
Carbon	77.3	77.8	88.2
Nitrogen	1.2	1.3	1.4
Sulfur	.7	.7	.8
Oxygen	4.3	3.7	4.2
Ash	11.7	11.8	N/A

Heating value
(BTU/lb)

13517	13605	15418
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Sulfur Forms (%)

Sulfate	.00	.00	.00
Pyritic	.09	.09	.10
Organic	.62	.62	.71

Ash

Initial deformation (°F)	not run
Softening temperature (°F)	not run
Fluid temperature (°F)	not run

Free Swelling Index 9.0Fixed Carbon
DMMF 72.1Heating Value
BTU/lb MMMF 15500.3Apparent Rank Mv bituminousDate of Analysis: 1-30-79Laboratory: U.S. Dept. of EnergyLab No. K88875

Comments: _____

GAS ANALYSES

	<u>With air</u>	<u>Air free</u>
(MSI percent)		
Hydrogen	0.04	0.04
Oxygen	1.41	nil
Hydrogen sulfide	nil	nil
Carbon dioxide	nil	nil
Nitrogen	55.37	53.80
Methane	43.16	46.14
Ethane	0.02	0.02
Other hydrocarbons	nil	nil
	100.00	100.00
Calculated gas gravity	0.790	0.776

Calculated gross heating value (BTU/cf, air free) 465

Company: USGS Sampler: C. M. Tremain
 Date sample taken: 7-3-78 Date sample analyzed: 7-20-78
 Laboratory: Core Laboratories Inc. Lab No.: RFL 78456

Carbon Isotope Ratio (relative to Chicago standard) - not run

ADSORPTION ISOTHERM DATA - not run

PETROGRAPHIC ANALYSES

Lab. SIU Coal Characterization Lab Petrographer John C. Crelling
 Lab No. SIU #663 Date of Analysis ?

Maceral Analyses

Vitrinite	<u>71.9</u>
Pseudovitrinite	<u>7.9</u>
Semifusinite	<u>14.8</u>
Semimacrinite	<u>1.6</u>
Fusinite	<u>2.3</u>
Macrinite	<u>0.6</u>
Micrinite	<u>0.9</u>
Exinite	<u>--</u>
Resinite	<u>--</u>
Total	<u>100%</u>

Reflectance Analysis

Vitrinite Ro	<u>1.18</u>
pVit Ro	<u>1.29</u>
Combined Ro	<u>1.19</u>
pVit Ro - Vit Ro	<u>0.11</u>

Combined V-Type Table

V-Type	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>	<u>9</u>	<u>10</u>	<u>11</u>
%									<u>2.0</u>	<u>25.0</u>

V-Type	<u>12</u>	<u>13</u>	<u>14</u>	<u>15</u>	<u>16</u>	<u>17</u>	<u>18</u>	<u>19</u>	<u>21</u>	<u>21</u>
%	<u>55.0</u>	<u>18.0</u>								

Comments: This petrographic sample is from the same seam and same core hole as CGS #31 although the petrographic sample was not desorbed.

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 32

LOCATION

County: Las Animas
Location: Sec 4 Twp 33S Rge 67W

Surface Elev (ft) 7240'
Coordinates SE/4 SE/4

GENERAL

CGS Sample No. 32
Sampled By J. Schultz
Operator USGS
Hole No. USGS DH 78-1A

Date 6-10-78
Sample Type core

DRILLING DATA

Drilling Co. Himes Address Grand Junction, Colo.
Core Size 3 1/8" Barrel Length 20'
Type of core retrieval conventional
Drilling media mud Air Temperature 82°F
TD Hole 1799' Logs Focused Density, Natural Gamma, Caliper

GEOLOGY

Geologic Unit Vermejo Formation Age Upper Cretaceous
Coal zone/bed unnamed Bed Thickness 3'
Depth to top of coal 1792' (Driller) ? (Log)
Depth to bottom of coal 1795' (Driller) ? (Log)
Cored interval 1785-1799' (Driller)
Roof description shale, coally, dark gray, burrowed or rooted, fissile
Coal description black, broken, pyritic, blocky, irregularly fractured, 1.2' core lost
Floor description shale, coally, dark gray to black fissile

DESORPTION DATA

Sampled interval (ft) 1792-1793' (Driller) ? (Log)
Condition of sample broken
Sampled Weight (g) 1724
Lost gas time (min) 114 Lost gas cc 8300
Desorbed gas cc 18,098 Residual gas cc/g .06
Total gas content cc/g 15.37 Total gas content cf/t 492

Miscellaneous see USGS Open File Report 78-1101, Open File Report 79-762 (CGS Open File Report 79-3)

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
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Proximate Analyses (%)

Moisture	.3	N/A	N/A
Volatile Matter	20.9	21.0	24.9
Fixed Carbon	63.1	63.3	75.1
Ash	15.7	15.7	N/A

Ultimate Analyses (%)

Hydrogen	4.5	4.5	5.3
Carbon	74.0	74.3	88.1
Nitrogen	1.0	1.0	1.2
Sulfur	.6	.6	.7
Oxygen	4.2	3.9	4.7
Ash	15.7	15.7	N/A

Heating value
(BTU/lb)

12955	12995	15421
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Sulfur Forms (%)

Sulfate	.01	.01	.01
Pyritic	.11	.11	.13
Organic	.45	.45	.54

Ash

Initial deformation (°F)	not run
Softening temperature (°F)	not run
Fluid temperature (°F)	not run

Free Swelling Index 4.5

Fixed Carbon

DMMF 76.5

Heating Value

BTU/lb DMMF 15626.1Apparent Rank Mv bituminousDate of Analysis: 1-30-79Laboratory: U.S. Dept. of EnergyLab No. K89030

Comments: _____

GAS ANALYSES

	<u>With air</u>	<u>Air free</u>
<u>(MSI percent)</u>		
Hydrogen	0.07	0.13
Oxygen	9.71	nil
Hydrogen sulfide	nil	nil
Carbon dioxide	0.69	1.24
Nitrogen	36.13	2.85
Methane	53.37	95.73
Ethane	0.03	0.05
Other hydrocarbons	nil	nil
	100.00	100.00
<u>Calculated gas gravity</u>	.763	.577

Calculated gross heating value (BTU/cf, air free) 965

Company: U.S. Geological Survey Sampler: J. Schultz
 Date sample taken: 6-17-78 Date sample analyzed: 7-20-78
 Laboratory: Core Laboratories, Inc. Lab No.: RFL 78456

GAS ANALYSES

	<u>With air</u>	<u>Air free</u>
<u>(MSI percent)</u>		
Hydrogen	0.09	0.14
Oxygen	8.04	nil
Hydrogen sulfide	nil	nil
Carbon dioxide	0.70	1.11
Nitrogen	28.67	0.10
Methane	62.46	98.59
Ethane	0.04	0.06
Other hydrocarbons	nil	nil
	100.00	100.00
<u>Calculated gas gravity</u>	0.723	0.564

Calculated gross heating value (BTU/cf, air free) 994

Company: U.S. Geological Survey Sampler: C. M. Tremain
 Date sample taken: 7-3-78 Date sample analyzed: 7-20-78
 Laboratory: Core Laboratories Lab No.: RFL 78456

Carbon Isotope Ratio (relative to Chicago standard) - not run

ADSORPTION ISOTHERM DATA - not run

PETROGRAPHIC ANALYSES - not run

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 33

LOCATION

County: Las Animas
Location: Sec 27 Twp 33S Rge 66W

Surface Elev (ft) 6870'
Coordinates NE/4, SW/4, SE/4

GENERAL

CGS Sample No. 33
Sampled By Carol Tremain
Operator USGS
Hole No. USGS DH 78-2A

Date 6-12-78
Sample Type core

DRILLING DATA

Drilling Co. Himes Address Grand Junction, Colo.
Core Size 2 7/8" Barrel Length 10'
Type of core retrieval conventional
Drilling media air, foam Air Temperature 74°
TD Hole 1115' Logs Focused Density, Natural Gamma, Apparent Resistivity, Caliper

GEOLOGY

Geologic Unit Raton Formation Age Upper Cretaceous-Paleocene
Coal zone/bed unknown Bed Thickness 2.2'
Depth to top of coal 308.3' (Driller) ? (Log)
Depth to bottom of coal 310.5' Driller) ? (Log)
Cored interval 302-312.2' (Driller)
Roof description shale*
Coal description dull, black, banded fusain and attrital
Floor description black, very carbonaceous

DESORPTION DATA

Sampled interval (ft) 308.3-308.65', 310-310.5', 309.2-309.65' (Driller) ? (Log)
Condition of sample ?
Sampled Weight (g) 1461
Lost gas time (min) 40 Lost gas cc 170
Desorbed gas cc 3390 Residual gas cc/g 0.16
Total gas content cc/g 2.60 Total gas content cf/t 83

Miscellaneous *black, very carbonaceous, pyritic; contains two 1 1/2 inch beds of light-brown siltstone on an irregular, undulatory contact

see USGS Open File Report 78-1101, Open File Report 79-762 (CGS 79-3)

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
<u>Proximate Analyses (%)</u>			
Moisture	.9	N/A	N/A
Volatile Matter	14.3	14.4	22.7
Fixed Carbon	48.6	49.1	77.3
Ash	36.2	36.5	N/A
<u>Ultimate Analyses (%)</u>			
Hydrogen	3.3	3.3	5.2
Carbon	54.9	55.4	87.1
Nitrogen	1.2	1.3	2.0
Sulfur	.5	.5	.8
Oxygen	3.9	3.2	5.0
Ash	36.2	36.5	N/A
<u>Heating value</u> (BTU/lb)	9305	9386	14772
<u>Sulfur Forms (%)</u>			
Sulfate	.01	.01	.02
Pyritic	.23	.23	.37
Organic	.24	.24	.38
<u>Ash</u>			
Initial deformation (°F)	not run		
Softening temperature (°F)	not run		
Fluid temperature (°F)	not run		
Free Swelling Index	0		
Fixed Carbon			
DMMF	81.2		
Heating Value			
BTU/lb MMMF	15306		
Apparent Rank	Lv bituminous		
Date of Analysis:	1-30-79		
Laboratory:	Bureau of Mines		Lab No. K89029
Comments:			

GAS ANALYSES - not runADSORPTION ISOTHERM DATA - not runPETROGRAPHIC ANALYSES - not run

LOCATION

County: Las Animas
Location: Sec 27 Twp 33S Rge 66W

Surface Elev (ft) 6870'
Coordinates NE/4, SW/4, SE/4

GENERAL

CGS Sample No. 34
Sampled By J. Schultz
Operator USGS
Hole No. USGS DH 78-2A

Date 6-12-78
Sample Type core

DRILLING DATA

Drilling Co. Himes Address Grand Junction, Colo.
Core Size 2 7/8" Barrel Length 10'
Type of core retrieval conventional
Drilling media foam Air Temperature 45°F
TD Hole 1115' Logs Focused Density, Natural Gamma, Apparent Resistivity, Caliper

GEOLOGY

Geologic Unit Raton Formation Age Upper Cretaceous-Paleocene
Coal zone/bed Frederick/Martinez zone Bed Thickness 2.5'
Depth to top of coal 482.2' (Driller) ? (Log)
Depth to bottom of coal 484.7' Driller) ? (Log)
Cored interval 478-485' (Driller)
Roof description coaly shale, dark-medium gray
Coal description blocky, gassy, friable
Floor description coaly shale, dark-medium gray

DESORPTION DATA

Sampled interval (ft) 482.65-483.6 (Driller) _____ (Log)
Condition of sample blocky, very friable and gassy
Sampled Weight (g) 1057
Lost gas time (min) 50 Lost gas cc 890
Desorbed gas cc 2031 Residual gas cc/g 0.0
Total gas content cc/g 2.76 Total gas content cf/t 88

Miscellaneous see USGS Open File Report 78-1101 and Open File Report 79-762 (CGS Open File Report 79-3)

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
-----------------	--------------------	----------------------	------------------------------

Proximate Analyses (%)

Moisture	1.1	N/A	N/A
Volatile Matter	21.6	21.9	33.9
Fixed Carbon	42.1	42.5	66.1
Ash	35.2	35.6	N/A

Ultimate Analyses (%)

Hydrogen	3.8	3.7	5.8
Carbon	53.4	54.0	83.9
Nitrogen	1.1	1.1	1.7
Sulfur	.5	.5	.7
Oxygen	6.0	5.1	7.9
Ash	35.2	35.6	N/A

Heating value
(BTU/lb)

9595	9704	15065
------	------	-------

Sulfur Forms (%)

Sulfate	not run
Pyritic	not run
Organic	not run

Ash

Initial deformation (°F)	not run
Softening temperature (°F)	not run
Fluid temperature (°F)	not run

Free Swelling Index 5.0Fixed CarbonDMMF 69.3Heating ValueBTU/lb MMMF 15508.3Apparent RankMv bituminousDate of Analysis: 11-9-78Laboratory: U.S. Dept. of EnergyLab No. K86616

Comments: _____

GAS ANALYSES - not runADSORPTION ISOTHERM DATA - not runPETROGRAPHIC ANALYSES - not run

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 35

LOCATION

County: Las Animas
Location: Sec 27 Twp 33S Rge 66W

Surface Elev (ft) 6870'
Coordinates NE/4, SW/4, SE/4

GENERAL

CGS Sample No. 35
Sampled By J. Schultz
Operator USGS
Hole No. USGS DH 78-2A

Date 6-13-78
Sample Type core

DRILLING DATA

Drilling Co. Himes Address Grand Junction, Colo.
Core Size 2 7/8" Barrel Length 10'
Type of core retrieval conventional
Drilling media foam Air Temperature ?
TD Hole 1115' Logs Focused Density, Natural Gamma, Apparent Resistivity, Caliper

GEOLOGY

Geologic Unit Raton Formation Age Upper Cretaceous-Paleocene
Coal zone/bed Frederick/Martinez zone Bed Thickness 2'
Depth to top of coal 499' (Driller) ? (Log)
Depth to bottom of coal 501' (Driller) (Log)
Cored interval 495-503' (Driller)
Roof description coaly shale, dark gray, friable where coaly
Coal description blocky, shiny, very friable coal, dominant thin-medium vitrain bands
Floor desc. coaly, shale, dark gray, becoming more coaly & friable near base

DESORPTION DATA

Sampled interval (ft) 499.7-501' (Driller) ? (Log)
Condition of sample crumbled
Sampled Weight (g) 767
Lost gas time (min) 50 Lost gas cc 1110
Desorbed gas cc 2719 Residual gas cc/g 0.0
Total gas content cc/g 4.99 Total gas content cf/t 160

Miscellaneous see USGS Open File Report 78-1101 & USGS Open File Report 79-762 (CGS Open File Report 79-3)

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
-----------------	--------------------	----------------------	------------------------------

Proximate Analyses (%)

Moisture	.5	N/A	N/A
Volatile Matter	24.9	25.0	30.9
Fixed Carbon	55.6	55.9	69.1
Ash	19.0	19.1	N/A

Ultimate Analyses (%)

Hydrogen	4.6	4.6	5.7
Carbon	69.4	69.7	86.1
Nitrogen	1.3	1.3	1.6
Sulfur	.5	.5	.7
Oxygen	5.2	4.8	5.9
Ash	19.0	19.1	N/A

Heating value
(BTU/lb)

12267	12326	15227
-------	-------	-------

Sulfur Forms (%)

Sulfate	.01	.01	.01
Pyritic	.14	.14	.17
Organic	.39	.39	.48

Ash

Initial deformation (°F)	not run
Softening temperature (°F)	not run
Fluid temperature (°F)	not run

Free Swelling Index 8.0Fixed Carbon
DMMF 70.5Heating Value
BTU/lb MMMF 15456.1Apparent Rank Mv bituminousDate of Analysis: 1-30-79Laboratory: U.S. Dept. of EnergyLab No. K89031

Comments: _____

GAS ANALYSES - not runADSORPTION ISOTHERM DATA - not runPETROGRAPHIC ANALYSES - not run

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 36

LOCATION

County: Las Animas
Location: Sec 27 Twp 33S Rge 66W

Surface Elev (ft) 6870
Coordinates NE/4 SW/4 SE/4

GENERAL

CGS Sample No. 36
Sampled By J. Schultz
Operator USGS
Hole No. USGS DH 78-2A

Date 6-13-78
Sample Type core

DRILLING DATA

Drilling Co. Himes Address Grand Junction, CO
Core Size 2 7/8" Barrel Length 10'
Type of core retrieval conventional
Drilling media foam Air Temperature ?
TD Hole 1115' Logs focused density, natural gamma, apparent resistivity, caliper

GEOLOGY

Geologic Unit Raton Formation Age Upper Cretaceous - Paleocene
Coal zone/bed Frederick-Martinez Bed Thickness 2.3'
Depth to top of coal 535.9' (Driller) ? (Log)
Depth to bottom of coal 538.2' (Driller) ? (Log)
Cored interval 532-540' (Driller)
Roof description shale, dark gray, very carbonaceous
Coal description .57' bright blocky coal .35' carbonaceous shale, 1.2', bright blocky coal
Floor description siltstone, medium gray, grading down to very fine grained sandstone

DESORPTION DATA

Sampled interval (ft) 535.9-536.45, 537-537.6' (Driller) ? (Log)
Condition of sample 100% recovery
Sampled Weight (g) 1024
Lost gas time (min) 58 Lost gas cc not calculated
Desorbed gas cc not calculated Residual gas cc/g 0.0
Total gas content cc/g not calculated Total gas content cf/t not calculated

Miscellaneous see USGS Open File Report 78-1101, Open File Report 79-762 (CGS Open File Report 79-3)

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
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Proximate Analyses (%)

Moisture	.8	N/A	N/A
Volatile Matter	22.7	22.9	35.9
Fixed Carbon	40.6	41.0	64.1
Ash	35.9	36.1	N/A

Ultimate Analyses (%)

Hydrogen	3.8	3.8	5.9
Carbon	53.2	53.6	83.9
Nitrogen	1.1	1.1	1.8
Sulfur	.4	.4	.6
Oxygen	5.6	5.0	7.8
Ash	35.9	36.1	N/A

Heating value
(BTU/lb)

	9416	9489	14857
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Sulfur Forms (%)

Sulfate	not run
Pyritic	not run
Organic	not run

Ash

Initial deformation (°F)	not run
Softening temperature (°F)	not run
Fluid temperature (°F)	not run

Free Swelling Index 4.5

Fixed Carbon

DMMF 67.3

Heating Value

BTU/lb MMMF 15401.3Apparent Rank HvA bituminousDate of Analysis: 11-4-78Laboratory: U.S. Dept. of EnergyLab No. K86617

Comments: _____

GAS ANALYSES - not runADSORPTION ISOTHERM DATA - not runPETROGRAPHIC ANALYSESLab. S.I.U. Coal Characterization Lab Petrographer John C. CrellingLab No. S.I.U. #665 Date of Analysis ?

Maceral Analysis (white light)

Vitrinite	<u>79.0</u>
Pseudovitrinite	<u>13.2</u>
Semifusinite	<u>6.1</u>
Semimacrinite	<u>0.2</u>
Fusinite	<u>0.9</u>
Macrinite	<u>0.0</u>
Micrinite	<u>0.6</u>
Exinite	<u>0.0</u>
Resinite	<u>0.0</u>
Total	<u>100%</u>

Reflectance Analysis

Vitrinite Ro	<u>1.07</u>
pVit Ro	<u>1.08</u>
Combined Ro	<u>1.07</u>
pVit Ro - Vit Ro	<u>0.01</u>

Combined V-Type Table

V-Type	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>	<u>9</u>	<u>10</u>	<u>11</u>
%									<u>76.0</u>	<u>24.0</u>

V-Type	<u>12</u>	<u>13</u>	<u>14</u>	<u>15</u>	<u>16</u>	<u>17</u>	<u>18</u>	<u>19</u>	<u>21</u>	<u>22</u>
%										

Comments _____

LOCATION

County: Las Animas
Location: Sec 2 Twp 33S Rge 65W

Surface Elev (ft) 6740'
Coordinates NW/4 NW/4 SW/4

GENERAL

CGS Sample No. 37
Sampled By Carol Tremain
Operator USGS
Hole No. USGS 78-3A

Date 6-15-78
Sample Type core

DRILLING DATA

Drilling Co. Himes Drilling Co. Address Grand Junction, CO
Core Size 2 7/8" Barrel Length 10'
Type of core retrieval conventional
Drilling media foam Air Temperature 100°F
TD Hole 910' Logs focused density, natural gamma, resistivity, caliper

GEOLOGY

Geologic Unit Vermejo Age Upper Cretaceous
Coal zone/bed unnamed Bed Thickness 3.2'
Depth to top of coal 729.4' (Driller) ? (Log)
Depth to bottom of coal 732.6' (Driller) ? (Log)
Cored interval 725-735.3' (Driller)
Roof description siltstone grading into carbonaceous shale, dark gray
Coal description coal, blocky, good cleavage, bright, bone in places

Floor description siltstone, dark gray, carbonaceous, locally coally,
grades into sandstone below

DESORPTION DATA

Sampled interval (ft) 729.4-732.5' (Driller) ? (Log)
Condition of sample ?
Sampled Weight (g) 1768
Lost gas time (min) 100 Lost gas cc 3300
Desorbed gas cc 10,176 Residual gas cc/g 0.33
Total gas content cc/g 7.95 Total gas content cf/t 254

Miscellaneous see USGS Open File Report 78-1101, Open File Report 79-762
(CGS Open File Report 79-3)

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
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Proximate Analyses (%)

Moisture	.9	N/A	N/A
Volatile Matter	23.4	23.6	33.3
Fixed Carbon	46.8	47.2	66.7
Ash	28.9	29.2	N/A

Ultimate Analyses (%)

Hydrogen	4.2	4.2	5.9
Carbon	60.5	61.0	86.1
Nitrogen	1.1	1.1	1.6
Sulfur	.6	.6	.8
Oxygen	4.7	4.0	5.6
Ash	28.9	29.2	N/A

Heating value
(BTU/lb)

10757	10853	15321
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Sulfur Forms (%)

Sulfate	.01	.01	.01
Pyritic	.11	.11	.16
Organic	.44	.44	.63

Ash

Initial deformation (°F)	not run
Softening temperature (°F)	not run
Fluid temperature (°F)	not run

Free Swelling Index 5.0Fixed Carbon
DMMF 69.1Heating Value
BTU/lb DMMF 15669.5Apparent Rank Mv bituminousDate of Analysis: 1-29-79Laboratory: U.S. Dept. of EnergyLab No. K88876

Comments: _____

GAS ANALYSES

	<u>With air</u>	<u>Air free</u>
<u>(MSI percent)</u>		
Hydrogen	nil	nil
Oxygen	7.80	nil
Hydrogen sulfide	nil	nil
Carbon dioxide	0.40	0.62
Nitrogen	27.99	0.37
Methane	63.79	98.98
Ethane	0.02	0.03
Other hydrocarbons	nil	nil
Total	100.00	100.00
<u>Calculated gas gravity</u>	0.716	0.561

Calculated gross heating value (BTU/cf, air free) 997

Company: USGS Sampler: Carol Tremain
 Date sample taken: 6/17/78 Date sample analyzed: 7/12/68
 Laboratory: Core Laboratories Lab No.: RFL 78447

Carbon Isotope Ratio (relative to Chicago standard) - not run

ADSORPTION ISOTHERM DATA - not run

PETROGRAPHIC ANALYSES - not run

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 38

LOCATION

County: Las Animas
Location: Sec 36 Twp 33S Rge 65W

Surface Elev (ft) 6250'
Coordinates C

GENERAL

CGS Sample No. 38
Sampled By Carol Tremain
Operator USGS
Hole No. USGS DH 78-4A

Date 6-16-78
Sample Type core

DRILLING DATA

Drilling Co. Himes Address Grand Junction, CO
Core Size 2 7/8" Barrel Length 10'
Type of core retrieval conventional
Drilling media air Air Temperature 90°F
TD Hole 310' Logs focused density, natural gamma, resistivity, caliper

GEOLOGY

Geologic Unit Vermejo Formation Age Upper Cretaceous
Coal zone/bed unnamed Bed Thickness 2.15'
Depth to top of coal 100.5' (Driller) ? (Log)
Depth to bottom of coal 102.65' (Driller) ? (Log)
Cored interval 100-107' (Driller)
Roof description shale, coaly, dark brown to black, hard with slickensides
Coal description bright to dull, blocky, good cleats, bone coal in lower part
Floor description coaly shale, dark brown-black, coaly

DESORPTION DATA

Sampled interval (ft) 100.5-101.5' (Driller) ? (Log)
Condition of sample 100% recovery
Sampled Weight (g) 808
Lost gas time (min) 51 Lost gas cc 170
Desorbed gas cc 158 Residual gas cc/g 0.3
Total gas content cc/g .71 Total gas content cf/t 23

Miscellaneous see USGS Open File Report 78-1101, USGS Open File Report 79-762 (CGS Open File Report 79-3)

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
-----------------	--------------------	----------------------	------------------------------

Proximate Analyses (%)

Moisture	.8	N/A	N/A
Volatile Matter	18.7	18.9	31.1
Fixed Carbon	41.5	41.8	68.9
Ash	39.0	39.3	N/A

Ultimate Analyses (%)

Hydrogen	3.3	3.3	5.4
Carbon	52.0	52.4	86.4
Nitrogen	.8	.8	1.4
Sulfur	.3	.3	.5
Oxygen	4.6	3.9	6.4
Ash	39.0	39.3	N/A

Heating value
(BTU/lb)

9056	9133	15057
------	------	-------

Sulfur Forms (%)

Sulfate	not run
Pyritic	not run
Organic	not run

Ash

Initial deformation (°F)	not run
Softening temperature (°F)	not run
Fluid temperature (°F)	not run

Free Swelling Index 1.0Fixed Carbon
DMMF 72.8Heating Value
BTU/lb MMMF 15664.9Apparent Rank Mv bituminousDate of Analysis: 11-4-78Laboratory: U.S. Dept. of EnergyLab No. K86618

Comments: _____

GAS ANALYSES - not runADSORPTION ISOTHERM DATA - not runPETROGRAPHIC ANALYSES

Lab. S.I.U. Coal Characterization Lab Petrographer John C. Crelling
 Lab No. S.I.U. #666 Date of Analysis ?

Maceral Analysis (white light)

Vitrinite	<u>68.5</u>
Pseudovitrinite	<u>9.3</u>
Semifusinite	<u>16.0</u>
Semimacrinite	<u>0.5</u>
Fusinite	<u>5.3</u>
Macrinite	<u>0.0</u>
Micrinite	<u>0.4</u>
Exinite	<u>0.0</u>
Resinite	<u>0.0</u>
Total	<u>100%</u>

Reflectance Analysis

Vitrinite Ro	<u>0.95</u>
pVit Ro	<u>1.02</u>
Combined Ro	<u>0.96</u>
pVit Ro - Vit Ro	<u>0.07</u>

Combined V-Type Table

V-Type	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>	<u>9</u>	<u>10</u>	<u>11</u>
%									<u>53.8</u>	<u>46.2</u>

V-Type	<u>12</u>	<u>13</u>	<u>14</u>	<u>15</u>	<u>16</u>	<u>17</u>	<u>18</u>	<u>19</u>	<u>21</u>	<u>22</u>
%										

Comments _____

LOCATION

County: Las Animas Surface Elev (ft) 6250'
Location: Sec 36 Twp 33S Rge 65W Coordinates C

GENERAL

CGS Sample No. 39 Date 6-16-78
Sampled By Carol Tremain Sample Type core
Operator USGS
Hole No. USGS DH 78-4A

DRILLING DATA

Drilling Co. Himes Address Grand Junction, CO
Core Size 2 7/8" Barrel Length 10'
Type of core retrieval conventional
Drilling media foam Air Temperature 90°F
TD Hole 310' Logs focused density, natural gamma, resistivity, caliper

GEOLOGY

Geologic Unit Vermejo Formation Age Upper Cretaceous
Coal zone/bed unnamed Bed Thickness 1.95
Depth to top of coal 167.9' (Driller) _____ (Log)
Depth to bottom of coal 169.85' (Driller) _____ (Log)
Cored interval 166-176' (Driller)
Roof description dark gray carbonaceous siltstone, coaly near base
Coal description dull attrital, poorly defined cleat directions, hard
Floor description dark gray carbonaceous siltstone, grades downward to light gray, fine-grained sandstone

DESORPTION DATA

Sampled interval (ft) 167.9-168.45' (Driller) ? (Log)
Condition of sample ?
Sampled Weight (g) 553
Lost gas time (min) 45 Lost gas cc 800
Desorbed gas cc 1057 Residual gas cc/g 0.2
Total gas content cc/g 3.56 Total gas content cf/t 114

Miscellaneous see USGS Open File Report 78-1101, USGS Open File Report 79-762 (CGS Open File Report 79-3)

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
-----------------	--------------------	----------------------	------------------------------

Proximate Analyses (%)

Moisture	.9	N/A	N/A
Volatile Matter	21.9	22.1	31.5
Fixed Carbon	47.6	48.0	68.5
Ash	29.6	29.9	N/A

Ultimate Analyses (%)

Hydrogen	3.8	3.7	5.3
Carbon	58.7	59.2	84.5
Nitrogen	1.0	1.0	1.5
Sulfur	2.5	2.5	3.5
Oxygen	4.4	3.6	5.2
Ash	29.6	29.9	N/A

Heating value
(BTU/lb)

10507	10601	15120
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Sulfur Forms (%)

Sulfate	not run
Pyritic	not run
Organic	not run

Ash

Initial deformation (°F)	not run
Softening temperature (°F)	not run
Fluid temperature (°F)	not run

Free Swelling Index 1.0

Fixed Carbon

DMMF 71.8

Heating Value

BTU/lb MMMF 15575.3Apparent Rank Mv bituminousDate of Analysis: 11-9-78Laboratory: U.S. Dept. of EnergyLab No. K86619

Comments: _____

GAS ANALYSES - not runADSORPTION ISOTHERM DATA - not runPETROGRAPHIC ANALYSES - not run

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 40

LOCATION

County: Las Animas
Location: Sec 29 Twp 34S Rge 63W

Surface Elev (ft) 7475.5
Coordinates 7941.38' @
263°33' 59.7" from USGS
"Berg" marker

GENERAL

CGS Sample No. 40
Sampled By Carol Tremain
Operator C.I.G./B.O.M.*
Hole No. C.F.&I. 29-1

Date 7-14-78
Sample Type core

DRILLING DATA

Drilling Co. Finley Drilling Address Raton, N.M.
Core Size 3" Barrel Length 15'
Type of core retrieval conventional, split barrel
Drilling media mud Air Temperature 75'
TD Hole 923' Logs Dual Induction-SFL, BHC Sonic, Compensated Neutron-
Formation Density, Lithology Log

GEOLOGY

Geologic Unit Vermejo Formation Age Upper Cretaceous
Coal zone/bed Cokedale coal Bed Thickness 2'
Depth to top of coal 715.6' (Driller) 718.5' (Log)
Depth to bottom of coal 717.6' Driller) 720.5' (Log)
Cored interval 715 - 730' (Driller)
Roof description carbonaceous shale grades to claystone into coaly shale,
abundant plant material
Coal description bright, hard, contains pyrite, abundant thin-medium
vitrain bands
Floor description siltstone, upper 5' carb. with pyrite, vitrain bands -
grades to sandy shale

DESORPTION DATA

Sampled interval (ft) 715.6-717.6' (Driller) (Log)
Condition of sample split
Sampled Weight (g) 876
Lost gas time (min) 23.5 Lost gas cc not calculated
Desorbed gas cc 88 Residual gas cc/g 1.35
Total gas content cc/g 1.45 Total gas content cf/t 46

Miscellaneous *U.S. Bureau of Mines, Colorado Interstate Gas, and Colorado
Fuel & Iron cooperative hole

Reference: "Drilling for Methane Gas in the Fishers Peak area, Las Animas
County, Colorado," unpublished U.S. Bureau of Mines Information Circular,
1979, by Bernard M. Bench

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
-----------------	--------------------	----------------------	------------------------------

Proximate Analyses (%)

Moisture	.9	N/A	N/A
Volatile Matter	35.0	35.3	39.9
Fixed Carbon	52.8	53.3	60.1
Ash	11.3	11.4	N/A

Ultimate Analyses (%)

Hydrogen	5.4	5.4	6.0
Carbon	74.2	74.9	84.5
Nitrogen	1.5	1.6	1.8
Sulfur	.7	.7	.8
Oxygen	6.9	6.1	6.9
Ash	11.3	11.4	N/A

Heating value
(BTU/lb)

13332	13456	15186
-------	-------	-------

Sulfur Forms (%)

Sulfate	.01	.01	.01
Pyritic	.12	.12	.14
Organic	.53	.53	.60

Ash

Initial deformation (°F)	not run
Softening temperature (°F)	not run
Fluid temperature (°F)	not run

Free Swelling Index 5.5Fixed Carbon
DMMF 60.9Heating Value
BTU/lb MMMF 15212Apparent Rank HvA bituminousDate of Analysis: 1-30-79Laboratory: U.S. Dept. of EnergyLab No. K89037

Comments: _____

GAS ANALYSES - not runADSORPTION ISOTHERM DATA - not run

PETROGRAPHIC ANALYSESLab. SIU Coal Characterization Lab
Lab No. SIU #1211Petrographer John C. Crelling
Date of Analysis ?

Maceral Analyses

Vitrinite	<u>70.1</u>
Pseudovitrinite	<u>13.4</u>
Semifusinite	<u>9.3</u>
Semimacrinite	<u>0.7</u>
Fusinite	<u>1.8</u>
Macrinite	<u>0.4</u>
Micrinite	<u>1.4</u>
Exinite	<u>2.0</u>
Resinite	<u>0.9</u>
Total	<u>100%</u>

Reflectance Analysis

Vitrinite Ro	<u>0.81</u>
pVit Ro	<u>0.88</u>
Combined Ro	<u>0.82</u>
pVit Ro - Vit Ro	<u>0.07</u>

Combined V-Type Table

V-Type	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>	<u>9</u>	<u>10</u>	<u>11</u>
%						<u>13.7</u>	<u>72.6</u>	<u>13.7</u>		

V-Type	<u>12</u>	<u>13</u>	<u>14</u>	<u>15</u>	<u>16</u>	<u>17</u>	<u>18</u>	<u>19</u>	<u>21</u>	<u>21</u>
%										

Comments: _____

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 41

LOCATION

County: Las Animas
Location: Sec 29 Twp 34S Rge 63W

Surface Elev (ft) 7470.5
Coordinates 7941.38' @
263° 33' 59.7"
from USGS "Berg"

GENERAL

CGS Sample No. 41
Sampled By Janet Schultz
Operator C.I.G./B.O.M.*
Hole No. C.F. & I. 29-1

Date 7-17-78
Sample Type core

DRILLING DATA

Drilling Co. Finley Drilling Address Raton, N.M.
Core Size 3" Barrel Length 15'
Type of core retrieval split barrel conventional
Drilling media mud Air Temperature 95°F
TD Hole 922' Logs Dual Induction-SFL, BHC Sonic, Compensated Neutron-
Formation Density

GEOLOGY

Geologic Unit Vermejo Formation Age Upper Cretaceous
Coal zone/bed Piedmont coal Bed Thickness 5.5'
Depth to top of coal 810' (Driller) 802' (Log)
Depth to bottom of coal 815' (Driller) 807.5' (Log)
Cored interval 795-845' (Driller)
Roof description sandstone, white to light gray, fine grained, laminated
with carbonaceous silt, disturbed bedding
Coal description coal, black dull, attrital with abundant thin to medium
vitrain bands, pyrite in cleats
Floor description shale, carbonaceous to bituminous, grades to claystone,
pyritic

DESORPTION DATA

Sampled interval (ft) 810-812.5' (Driller) _____ (Log)
Condition of sample 1/3 split
Sampled Weight (g) 1051
Lost gas time (min) 30.5 Lost gas cc 115
Desorbed gas cc 74 Residual gas cc/g 0.0
Total gas content cc/g .18 Total gas content cf/t 6

Miscellaneous *U.S. Bureau of Mines, Colorado Interstate Gas, and Colorado
Fuel & Iron cooperative hole

Reference: "Drilling for Methane Gas in the Fishers Peak area, Las Animas
County, Colorado," unpublished U.S. Bureau of Mines Information Circular,
1979 by Bernard M. Bench

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
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Proximate Analyses (%)

Moisture	.9	N/A	N/A
Volatile Matter	28.2	28.5	36.0
Fixed Carbon	50.2	50.6	64.0
Ash	20.7	20.9	N/A

Ultimate Analyses (%)

Hydrogen	4.8	4.8	6.0
Carbon	65.1	65.7	83.1
Nitrogen	1.1	1.2	1.5
Sulfur	.7	.7	.9
Oxygen	7.5	6.7	8.5
Ash	20.7	20.9	N/A

Heating value
(BTU/lb)

11598	11707	14803
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Sulfur Forms (%)

Sulfate	.01	.01	.01
Pyritic	.12	.12	.15
Organic	.59	.60	.75

Ash

Initial deformation (°F)	not run
Softening temperature (°F)	not run
Fluid temperature (°F)	not run

Free Swelling Index 2.0Fixed Carbon
DMMF 65.6Heating Value
BTU/lb MMMF 14966.5Apparent Rank HvA bituminousDate of Analysis: 1-30-79Laboratory: U.S. Dept. of EnergyLab No. K89038

Comments: _____

GAS ANALYSES - not runADSORPTION ISOTHERM DATA - not run

PETROGRAPHIC ANALYSES

Lab. SIU Coal Characterization Lab Petrographer John C. Crelling
 Lab No. SIU #1212 Date of Analysis ?

Maceral Analyses

Vitrinite	<u>33.2</u>
Pseudovitrinite	<u>4.7</u>
Semifusinite	<u>51.7</u>
Semimacrinite	<u>0.9</u>
Fusinite	<u>4.2</u>
Macrinite	<u>0.3</u>
Micrinite	<u>2.4</u>
Exinite	<u>1.8</u>
Resinite	<u>0.8</u>
Total	<u>100%</u>

Reflectance Analysis

Vitrinite Ro	<u>0.81</u>
pVit Ro	<u>0.87</u>
Combined Ro	<u>0.82</u>
pVit Ro - Vit Ro	<u>0.06</u>

Combined V-Type Table

V-Type	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>	<u>9</u>	<u>10</u>	<u>11</u>
%						<u>11.8</u>	<u>76.4</u>	<u>11.8</u>		

V-Type	<u>12</u>	<u>13</u>	<u>14</u>	<u>15</u>	<u>16</u>	<u>17</u>	<u>18</u>	<u>19</u>	<u>21</u>	<u>21</u>
%										

Comments: _____

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 42

LOCATION

County: Las Animas
Location: Sec 29 Twp 34S Rge 63W

Surface Elev (ft) 7475.5
Coordinates 7941.38' @
263°33'59.7" from
USGS "Berg"

GENERAL

CGS Sample No. 42
Sampled By Janet Schultz
Operator C.I.G./B.O.M.*
Hole No. C.F.&I. 29-1

Date 7-17-78
Sample Type core

DRILLING DATA

Drilling Co. Finley Drilling Address Raton, N.M.
Core Size 3" Barrel Length 15'
Type of core retrieval conventional, split barrel
Drilling media mud Air Temperature 95°F
TD Hole 922' Logs Dual Induction-SFL, BHC Sonic, Compensated Neutron-
Formation Density, Lithology Log

GEOLOGY

Geologic Unit Vermejo Formation Age Upper Cretaceous
Coal zone/bed Piedmont coal Bed Thickness 5.5'
Depth to top of coal 810' (Driller) 802' (Log)
Depth to bottom of coal 815' (Driller) 807.5' (Log)
Cored interval 795-845' (Driller)
Roof description sandstone, white to light gray, fine grained, laminated w/
carbonaceous silt, disturbed bedding
Coal description semi-bright pyrite along cleats, hard, vitrain banded in
attrital, calcite
Floor description shale, carbonaceous to bituminous, grades to claystone,
pyritic

DESORPTION DATA

Sampled interval (ft) 812.5-815' (Driller) _____ (Log)
Condition of sample 1/3 split
Sampled Weight (g) 1657
Lost gas time (min) 30.5 Lost gas cc 65
Desorbed gas cc 56 Residual gas cc/g 0.0
Total gas content cc/g .07 Total gas content cf/t 2

Miscellaneous *U.S. Bureau of Mines, Colorado Interstate Gas, and Colorado
Fuel and Iron cooperative hole

Reference: "Drilling for Methane Gas in the Fishers Peak area, Las Animas
County, Colorado," unpublished U.S. Bureau of Mines Information Circular,
1979 by Bernard M. Bench

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
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Proximate Analyses (%)

Moisture	.9	N/A	N/A
Volatile Matter	30.5	30.8	36.5
Fixed Carbon	53.0	53.5	63.5
Ash	15.6	15.7	N/A

Ultimate Analyses (%)

Hydrogen	5.0	4.9	5.9
Carbon	70.5	71.1	84.4
Nitrogen	1.3	1.3	1.6
Sulfur	.7	.7	.8
Oxygen	6.9	6.2	7.3
Ash	15.6	15.7	N/A

Heating value
(BTU/lb)

12623	12738	15112
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Sulfur Forms (%)

Sulfate	.01	.01	.01
Pyritic	.10	.10	.12
Organic	.58	.59	.69

Ash

Initial deformation (°F)	not run
Softening temperature (°F)	not run
Fluid temperature (°F)	not run

Free Swelling Index 5.5Fixed CarbonDMMF 64.6Heating ValueBTU/lb DMMF 15209Apparent Rank HvA bituminousDate of Analysis: 1-30-79Laboratory: U.S. Dept. of EnergyLab No. K89039

Comments: _____

GAS ANALYSES - not runADSORPTION ISOTHERM DATA - not run

PETROGRAPHIC ANALYSES

Lab. SIU Coal Characterization Lab Petrographer John C. Crelling
 Lab No. SIU #1213 Date of Analysis ?

Maceral Analyses

Vitrinite	<u>61.3</u>
Pseudovitrinite	<u>9.7</u>
Semifusinite	<u>22.4</u>
Semimacrinite	<u>1.3</u>
Fusinite	<u>2.2</u>
Macrinite	<u>0.0</u>
Micrinite	<u>1.3</u>
Exinite	<u>0.7</u>
Resinite	<u>1.1</u>
Total	<u>100%</u>

Reflectance Analysis

Vitrinite Ro	<u>0.77</u>
pVit Ro	<u>0.84</u>
Combined Ro	<u>0.79</u>
pVit Ro - Vit Ro	<u>0.07</u>

Combined V-Type Table

V-Type	2	3	4	5	6	7	8	9	10	11
%					2.9	38.8	55.4	2.9		

V-Type	12	13	14	15	16	17	18	19	21	21
%										

Comments: _____

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 43

LOCATION

County: Las Animas
Location: Sec 29 Twp 34S Rge 63W

Surface Elev (ft) 7475.5
Coordinates 7941.38' @
263°33'59.7" from
USGS "Berg"

GENERAL

CGS Sample No. 43
Sampled By Janet Schultz
Operator C.I.G./B.O.M.*
Hole No. C.F. & I. 29-1

Date 7-18-78
Sample Type core

DRILLING DATA

Drilling Co. Finley Drilling Address Raton, N.M.
Core Size 3" Barrel Length 15'
Type of core retrieval conventional, split barrel
Drilling media mud Air Temperature 75°F
TD Hole 922' Logs Dual Induction-SFL, BHC Sonic, Compensated Neutron-
Formation Density, Lithology Log

GEOLOGY

Geologic Unit Vermejo Formation Age Upper Cretaceous
Coal zone/bed unnamed Bed Thickness 1.2'
Depth to top of coal 857.5' (Driller) 860.5' (Log)
Depth to bottom of coal 858.7' (Driller) 861.7' (Log)
Cored interval 853-861.35' (Driller)
Roof description shale, carbonaceous to bituminous, grades to claystone
Coal description bright, CaCO₃ along fractures, blk, pyrite abundant
brittle
Floor description shale, black, carbonaceous to bituminous

DESORPTION DATA

Sampled interval (ft) 857.5-858.7' (Driller) 860.5-861.7' (Log)
Condition of sample brittle
Sampled Weight (g) 1107
Lost gas time (min) 28.5 Lost gas cc 280
Desorbed gas cc 4409 Residual gas cc/g 0.6
Total gas content cc/g 4.84 Total gas content cf/t 155

Miscellaneous *U.S. Bureau of Mines, Colorado Interstate Gas, and Colorado
Fuel and Iron cooperative hole

Reference: "Drilling for Methane Gas in the Fishers Peak area, Las Animas
County, Colorado," unpublished U.S. Bureau of Mines Information Circular,
1979 by Bernard M. Bench

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
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Proximate Analyses (%)

Moisture	1.0	N/A	N/A
Volatile Matter	34.3	34.7	39.5
Fixed Carbon	52.5	53.0	60.5
Ash	12.2	12.3	N/A

Ultimate Analyses (%)

Hydrogen	5.1	5.0	5.7
Carbon	72.8	73.5	83.9
Nitrogen	1.3	1.3	1.5
Sulfur	.7	.7	.8
Oxygen	7.9	7.1	8.1
Ash	12.2	12.3	N/A

<u>Heating value</u> (BTU/lb)	13259	13392	15277
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Sulfur Forms (%)

Sulfate	.01	.01	.01
Pyritic	.16	.16	.18
Organic	.53	.54	.61

Ash

Initial deformation (°F)	2650
Softening temperature (°F)	2760
Fluid temperature (°F)	2800+

<u>Free Swelling Index</u>	not run
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<u>Fixed Carbon</u>	
<u>DMMF</u>	61.3

<u>Heating Value</u>	
<u>BTU/lb DMMF</u>	15299

<u>Apparent Rank</u>	HvA bituminous
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<u>Date of Analysis:</u>	3-9-79
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<u>Laboratory:</u>	U.S. Dept. of Energy
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<u>Lab No.</u>	K90194
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<u>Comments:</u>	
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GAS ANALYSES

	<u>With air</u>	<u>Air free</u>
<u>(MSI percent)</u>		
Hydrogen	nil	nil
Oxygen	9.51	nil
Hydrogen sulfide	nil	nil
Carbon dioxide	0.12	0.22
Nitrogen	44.10	18.15
Methane	46.26	81.62
Ethane	0.01	0.01
Other hydrocarbons	nil	nil
	100.00	100.00
<u>Calculated gas gravity</u>	0.790	0.631

Calculated gross heating value (BTU/cf, air free) 822

Company: Colo. Interstate Gas Co. Sampler: Carol Tremain
 Date sample taken: 7-21-78 Date sample analyzed: 8-22-78
 Laboratory: Core Laboratories Lab No.: RFL 78511

Carbon Isotope Ratio (relative to Chicago standard) - not run

ADSORPTION ISOTHERM DATA

Sample:

Langmuir Constants

a = 17.159
 b = 2.5949 x 10⁻³

<u>P, psia</u>	<u>V, cc STP/g (Exptl.)</u>	<u>V, cc STP/g (Smoothed)</u>
204.0	6.153	5.939
405.5	8.720	8.798
600.5	10.194	10.451
787.5	11.369	11.521
957.0	12.485	12.233

Standard deviation 0.226 cc/g
 V calc. @ 400 psia = 8.739 cc/g

Laboratory P-V-T, Inc. Lab No. CF& I 29-1 Run #3
 Technician James M. Berryman Analysis Date 9-18-78
 Comments _____

PETROGRAPHIC ANALYSES - not run

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 44

LOCATION

County: Las Animas
Location: Sec 29 Twp 34S Rge 63W

Surface Elev (ft) 7475.5
Coordinates 7941.38' @
263°33'59.7" from
USGS "Berg"

GENERAL

CGS Sample No. 44
Sampled By Janet Schultz
Operator C.I.G./B.O.M.*
Hole No. C.F. & I. 29-1

Date 7-18-78
Sample Type core

DRILLING DATA

Drilling Co. Finley Drilling Address Raton, N.M.
Core Size 3" Barrel Length 15'
Type of core retrieval conventional, split barrel
Drilling media mud Air Temperature 80°F
TD Hole 922' Logs Dual Induction-SFL, BHC Sonic, Compensated Neutron-
Formation Density, Lithology Log

GEOLOGY

Geologic Unit Vermejo Formation Age Upper Cretaceous
Coal zone/bed Morley coal Bed Thickness 2.4'
Depth to top of coal 869.5' (Driller) 873' (Log)
Depth to bottom of coal 871.9' (Driller) 875.4' (Log)
Cored interval 861-874.4' (Driller)
Roof description shale, dark grey to black, carbonaceous pyritic
Coal description moderately bright, occasionally dull, good cleats,
pyrite & calcite on cleats, blocky, abundant thin vitrain bands
Floor description shale, dark grey to black, carb. w/bituminous stringers

DESORPTION DATA

Sampled interval (ft) 869.5-871.9' (Driller) (Log)
Condition of sample blocky
Sampled Weight (g) 1661
Lost gas time (min) 31 Lost gas cc 360
Desorbed gas cc 6589 Residual gas cc/g .4
Total gas content cc/g 4.58 Total gas content cf/t 147

Miscellaneous *U.S. Bureau of Mines, Colorado Interstate Gas, and
Colorado Fuel and Iron cooperative hole

Reference: "Drilling for Methane Gas in the Fishers Peak area, Las Animas
County, Colorado," unpublished U.S. Bureau of Mines Information Circular,
1979 by Bernard M. Bench

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
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Proximate Analyses (%)

Moisture	1.0	N/A	N/A
Volatile Matter	31.1	31.4	37.9
Fixed Carbon	51.0	51.5	62.1
Ash	16.9	17.1	N/A

Ultimate Analyses (%)

Hydrogen	4.9	4.9	5.9
Carbon	69.1	69.8	84.2
Nitrogen	1.2	1.2	1.4
Sulfur	1.0	1.0	1.2
Oxygen	6.9	6.1	7.3
Ash	16.9	17.1	N/A

Heating value
(BTU/lb)

12344	12471	15039
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Sulfur Forms (%)

Sulfate	.01	.01	.01
Pyritic	.40	.40	.49
Organic	.58	.59	.71

Ash

Initial deformation (°F)	2800+
Softening temperature (°F)	2800+
Fluid temperature (°F)	2800+

Free Swelling Index not run

Fixed Carbon

DMMF 63.41

Heating Value

BTU/lb DMMF 15,140

Apparent Rank HvA bituminous

Date of Analysis: 3-9-79

Laboratory: U.S. Dept. of Energy

Lab No. K90195

Comments:

GAS ANALYSES

	<u>With air</u>	<u>Air free</u>
<u>(MSI percent)</u>		
Hydrogen	nil	nil
Oxygen	5.36	nil
Hydrogen sulfide	nil	nil
Carbon dioxide	0.01	0.01
Nitrogen	33.49	19.08
Methane	61.13	80.90
Ethane	0.01	0.01
Other hydrocarbons	nil	nil
	100.00	100.00
<u>Calculated gas gravity</u>	0.722	0.633

Calculated gross heating value (BTU/cf, air free) 815

Company: Colorado Interstate Gas Sampler: S. Goolsby

Date sample taken: 7/25/78 Date sample analyzed: 8-22-78

Laboratory: Core Laboratories Lab No.: RFL 78511

Carbon Isotope Ratio (relative to Chicago standard) - not run

GAS ANALYSES

	<u>With air</u>	<u>Air free</u>
<u>(MSI percent)</u>		
Hydrogen	nil	nil
Oxygen	2.71	nil
Hydrogen sulfide	nil	nil
Carbon dioxide	0.07	0.08
Nitrogen	25.28	17.84
Methane	71.93	82.07
Ethane	0.01	0.01
Other hydrocarbons	nil	nil
	100.00	100.00
<u>Calculated gas gravity</u>	0.674	0.628

Calculated gross heating value (BTU/cf, air free) 827

Company: Colorado Interstate Gas Sampler: S. Goolsby

Date sample taken: 7-25-78 Date sample analyzed: 8-22-78

Laboratory: Core Laboratories Lab No.: RFL 78511

Carbon Isotope Ratio (relative to Chicago standard) - not run

ADSORPTION ISOTHERM DATA

Sample:

Langmuir Constantsa = 16.403b = 2.6890 x 10⁻³

<u>P, psia</u>	<u>V, cc STP/g (Exptl.)</u>	<u>V, cc STP/g (Smoothed)</u>
136.5	4.465	4.404
299.0	7.226	7.311
491.0	9.379	9.334
745.0	10.836	10.941
978.0	11.952	11.884

Standard deviation 0.085 cc/g

V calc @ 400psia = 8.500 cc/g

Laboratory	<u>D-V-T Inc.</u>	Lab No.	<u>CF&I 29-1 869.5'-871.9'</u>
Technician	<u>James Berryman</u>	Analysis Date	<u>10/18/78</u>
Comments	<u></u>		

PETROGRAPHIC ANALYSES - not run

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 45

LOCATION

County: Las Animas
Location: Sec 29 Twp 34S Rge 63W

Surface Elev (ft) 7470
Coordinates 7941.38' @
263°33'59.7" from
USGS "Berg"

GENERAL

CGS Sample No. 45
Sampled By B. Bench
Operator C.I.G./B.O.M.*
Hole No. C.F. & I. 29-1

Date 7-18-78
Sample Type core

DRILLING DATA

Drilling Co. Finley Drilling Address Raton, N.M.
Core Size 3" Barrel Length 15'
Type of core retrieval conventional, split barrel
Drilling media mud Air Temperature 80°F
TD Hole 923' Logs Dual Induction-SFL, BHC Sonic, Compensated Neutron-
Formation Density, Lithology Log

GEOLOGY

Geologic Unit Vermejo Formation Age Upper Cretaceous
Coal zone/bed Morley Bed Thickness 2' and .45'
Depth to top of coal 875', 878.7' (Driller) 878', 882.5' (Log)
Depth to bottom of coal 875.5' & 879.1' (Driller) 879', 883' (Log)
Cored interval 874.4'-? (Driller)
Roof description grey shale
Coal description hard, brittle bituminous
Floor description grey shale

DESORPTION DATA

Sampled interval) 875-875.5' & 878.7-879.1' (Driller) 878-879', 882.5-883' (Log)
Condition of sample thin, solid coal beds
Sampled Weight (g) 1223
Lost gas time (min) 35 Lost gas cc 100
Desorbed gas cc 3183 Residual gas cc/g 0.5
Total gas content cc/g 3.18 Total gas content cf/t 102

Miscellaneous *U.S. Bureau of Mines, Colorado Interstate Gas, and Colorado
Fuel and Iron cooperative hole

Reference: "Drilling for Methane Gas in the Fishers Peak area, Las Animas
County, Colorado," unpublished U.S. Bureau of Mines Information Circular,
1979 by Bernard M. Bench

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
<u>Proximate Analyses (%)</u>			
Moisture	2.0	N/A	N/A
Volatile Matter	28.5	29.1	42.6
Fixed Carbon	38.5	39.2	57.4
Ash	31.0	31.7	N/A
<u>Ultimate Analyses (%)</u>			
Hydrogen	4.4	4.3	6.3
Carbon	56.5	57.6	84.3
Nitrogen	1.1	1.1	1.6
Sulfur	.9	.9	1.3
Oxygen	6.1	4.4	6.4
Ash	31.0	31.7	N/A
<u>Heating value</u> (BTU/lb)	10108	10317	15096
<u>Sulfur Forms (%)</u>			
Sulfate	.01	.01	.01
Pyritic	.50	.51	.75
Organic	.35	.36	.52
<u>Ash</u>			
Initial deformation (°F)	2620		
Softening temperature (°F)	2710		
Fluid temperature (°F)	2800		
<u>Free Swelling Index</u>	4.0		
<u>Fixed Carbon</u>			
<u>DMMF</u>	59.9		
<u>Heating Value</u>			
<u>BTU/lb MMMF</u>	15241.2		
<u>Apparent Rank</u>	HvA bituminous		
Date of Analysis:	2-5-79		
Laboratory:	U.S. Dept. of Energy	Lab No.	K89074
Comments:			

GAS ANALYSES - not runADSORPTION ISOTHERM DATA - not runPETROGRAPHIC ANALYSES - not run

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 46

LOCATION

County: Las Animas
Location: Sec 29 Twp 34S Rge 63W

Surface Elev (ft) 7640.8
Coordinates 62°14'42",
1665.91' from #1
or 142,866.02,
2298312.77

GENERAL

CGS Sample No. 46
Sampled By C. Tremain
Operator C.I.G./B.O.M.*
Hole No. C.F. & I. 29-2

Date 8-2-78
Sample Type core

DRILLING DATA

Drilling Co. Finley Drilling Address Raton, N.M.
Core Size 3" Barrel Length 15'
Type of core retrieval conventional
Drilling media mud Air Temperature 58°F
TD Hole 1082' Logs Dual Induction-SFL, BHC-Sonic, Compensated Neutron-
Formation Density, Lithology Log

GEOLOGY

Geologic Unit Vermejo Formation Age Upper Cretaceous
Coal zone/bed Cokedale Coal Bed Thickness 2.1'
Depth to top of coal 868' (Driller) 869' (Log)
Depth to bottom of coal 870.1' (Driller) 871.1' (Log)
Cored interval 868-875.25' (Driller)
Roof description Ss, light gray to white, vfg, friable, interbedded with
thin gray, soft shale
Coal description coal, dull, sparse vitrain stringers
Floor description shale, black, carb-bitum, silty, pyrite near base

DESORPTION DATA

Sampled interval (ft) 868-870.1' (Driller) 869-871.1' (Log)
Condition of sample part solid, part crumbly
Sampled Weight (g) 1035
Lost gas time (min) 58.5 Lost gas cc 70
Desorbed gas cc 505 Residual gas cc/g 0.60
Total gas content cc/g 1.16 Total gas content cf/t 37

Miscellaneous *U.S. Bureau of Mines, Colorado Interstate Gas, and Colorado
Fuel and Iron cooperative hole

Reference: "Drilling for Methane Gas in the Fishers Peak area, Las Animas
County, Colorado," unpublished U.S. Bureau of Mines Information Circular,
1979 by Bernard M. Bench

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
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Proximate Analyses (%)

Moisture	1.7	N/A	N/A
Volatile Matter	18.6	18.9	43.6
Fixed Carbon	24.1	24.5	56.4
Ash	55.6	56.6	N/A

Ultimate Analyses (%)

Hydrogen	3.1	2.9	6.7
Carbon	33.9	34.5	79.5
Nitrogen	.7	.7	1.5
Sulfur	.4	.4	1.0
Oxygen	6.3	4.8	11.2
Ash	55.6	56.6	N/A

Heating value
(BTU/lb)

6177	6286	14480
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Sulfur Forms (%)

Sulfate	.01	.01	.02
Pyritic	.17	.17	.40
Organic	.24	.24	.56

Ash

Initial deformation (°F)	not run
Softening temperature (°F)	not run
Fluid temperature (°F)	not run

Free Swelling Index	1.0
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Fixed Carbon	
DMMF	63.2

Heating Value	
BTU/lb DMMF	15496.3

Apparent Rank	carb. shale
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Date of Analysis:	1-30-79
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Laboratory:	U.S. Dept. of Energy
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Lab No.	K88878
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Comments:	
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GAS ANALYSES - not runADSORPTION ISOTHERM DATA - not runPETROGRAPHIC ANALYSES - not run

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 47

LOCATION

County: Las Animas
Location: Sec 29 Twp 34S Rge 63W

Surface Elev (ft) 7640.8
Coordinates 62°14'42",
1665.91' from #1
or 142,866.02,
2298312.77

GENERAL

CGS Sample No. 47
Sampled By Barney Bench
Operator C.I.G./B.O.M.*
Hole No. C.F. & I. 29-2

Date 8-2-78
Sample Type core

DRILLING DATA

Drilling Co. Finley Drilling Address Raton, N.M.
Core Size 3" Barrel Length 15'
Type of core retrieval conventional
Drilling media mud Air Temperature 58°F
TD Hole 1082' Logs Dual Induction-SFL, BHC-Sonic, Compensated Neutron-
Formation Density, Lithology Log

GEOLOGY

Geologic Unit Vermejo Formation Age Upper Cretaceous
Coal zone/bed below Cokedale, rider Bed Thickness .5'
Depth to top of coal 872.5' (Driller) 873.5' (Log)
Depth to bottom of coal 873' (Driller) 874' (Log)
Cored interval 868-875.25' (Driller)
Roof description shale, black, carb-bitum, silty, pyrite near base
Coal description dull, shaley coal

Floor description shale, dark gray, hard, occasionally carbonaceous, silty
toward base, upper 1' dark gray claystone

DESORPTION DATA

Sampled interval (ft) 872.5-873' (Driller) 873.5-874' (Log)
Condition of sample ?
Sampled Weight (g) 1122
Lost gas time (min) 58.5 Lost gas cc 10
Desorbed gas cc 280 Residual gas cc/g .13
Total gas content cc/g .40 Total gas content cf/t 13

Miscellaneous *U.S. Bureau of Mines, Colorado Interstate Gas, and Colorado
Fuel and Iron cooperative hole

Reference: "Drilling for Methane Gas in the Fishers Peak area, Las Animas
County, Colorado," unpublished U.S. Bureau of Mines Information Circular,
1979 by Bernard M. Bench

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
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Proximate Analyses (%)

Moisture	1.0	N/A	N/A
Volatile Matter	26.0	26.5	46.1
Fixed Carbon	30.5	30.8	53.9
Ash	42.5	42.9	N/A

Ultimate Analyses (%)

Hydrogen	3.9	3.8	6.7
Carbon	45.9	46.4	81.3
Nitrogen	.9	1.0	1.7
Sulfur	.5	.5	.9
Oxygen	6.2	5.4	9.4
Ash	42.5	42.9	N/A

Heating value
(BTU/lb)

8352	8435	14780
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Sulfur Forms (%)

Sulfate	not run
Pyritic	not run
Organic	not run

Ash

Initial deformation (°F)	2740
Softening temperature (°F)	2800+
Fluid temperature (°F)	2800+

Free Swelling Index	not run
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Fixed Carbon	
DMMF	57.6

Heating Value	
BTU/lb MMMF	15470.5

Apparent Rank	HvA bituminous
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Date of Analysis:	2-23-79
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Laboratory:	U.S. Dept. of Energy
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Lab No.	K89372
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Comments:	
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GAS ANALYSES - not runADSORPTION ISOTHERM DATA - not runPETROGRAPHIC ANALYSES - not run

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 48

LOCATION

County: Las Animas
Location: Sec 29 Twp 34S Rge 63W

Surface Elev (ft) 7640.8'
Coordinates 62°14'42",
1665.91' from #1,
142,866.02,
2298312.77

GENERAL

CGS Sample No. 48
Sampled By C. Tremain
Operator C.I.G./B.O.M.*
Hole No. C.F. & I. 29-2

Date 8-4-78
Sample Type core

DRILLING DATA

Drilling Co. Finley Drilling Address Raton, N.M.
Core Size 3" Barrel Length 15'
Type of core retrieval conventional
Drilling media mud Air Temperature ?
TD Hole 1082' Logs Dual Induction-SFL, BHC-Sonic, Compensated Neutron-
Formation Density, Lithology Log

GEOLOGY

Geologic Unit Vermejo Formation Age Upper Cretaceous
Coal zone/bed Piedmont Coal Bed Thickness 4.65'
Depth to top of coal 961.7' (Driller) 963' (Log)
Depth to bottom of coal 966.5' (Driller) 967.65' (Log)
Cored interval 955-968.5' (Driller)
Roof description ss brown-gray, fg-med gr, calc, bottom .2' pyrite
Coal description dull to mod. bright, pyritic, well dev. cleats, .65' boney
split, with abundant pyrite 964.5-965.15'
Floor description claystone, dark gray, pyritic, grades to shale, greasy luster

DESORPTION DATA

Sampled interval (ft) 961.7-963.2'** (Driller) 963-964.5' (Log)
Condition of sample ?
Sampled Weight (g) 753
Lost gas time (min) 39.5 Lost gas cc 130
Desorbed gas cc 260 Residual gas cc/g .61
Total gas content cc/g 1.13 Total gas content cf/t 36

Miscellaneous *U.S. Bureau of Mines, Colorado Interstate Gas, Colorado Fuel
and Iron cooperative hole

**Top part of seam is CGS #48, bottom part of seam (below parting) is CGS #49
Reference: "Drilling for Methane Gas in the Fishers Peak area, Las Animas
County, Colorado," unpublished U.S. Bureau of Mines Information Circular,
1979 by Bernard M. Bench

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
<u>Proximate Analyses (%)</u>			
Moisture	1.0	N/A	N/A
Volatile Matter	29.5	29.8	36.5
Fixed Carbon	51.2	51.7	63.5
Ash	18.3	18.5	N/A
<u>Ultimate Analyses (%)</u>			
Hydrogen	4.7	4.7	5.8
Carbon	67.4	68.1	83.5
Nitrogen	1.2	1.2	1.5
Sulfur	.7	.7	.9
Oxygen	7.6	6.8	8.4
Ash	18.3	18.5	N/A
<u>Heating value</u> (BTU/lb)	12076	12193	14960
<u>Sulfur Forms (%)</u>			
Sulfate	.01	.01	.01
Pyritic	.11	.11	.14
Organic	.61	.62	.76
<u>Ash</u>			
Initial deformation (°F)	not run		
Softening temperature (°F)	not run		
Fluid temperature (°F)	not run		
<u>Free Swelling Index</u>	5.0		
<u>Fixed Carbon</u>			
<u>DMMF</u>	64.8		
<u>Heating Value</u>			
<u>BTU/lb MMMF</u>	15079.3		
<u>Apparent Rank</u>	HvA bituminous		
Date of Analysis:	1-30-79		
Laboratory:	U.S. Depet. of Energy		Lab No. <u>K88879</u>
Comments:			

GAS ANALYSES - not runADSORPTION ISOTHERM DATA - not runPETROGRAPHIC ANALYSES - not run

LOCATION

County: Las Animas
Location: Sec 29 Twp 34S Rge 63W

Surface Elev (ft) 7640.8
Coordinates 62°14'42",
1665.91' from #1
142,866.02,
2298312.77

GENERAL

CGS Sample No. 49
Sampled By C. Tremain
Operator C.I.G./B.O.M.*
Hole No. C.F. & I. 29-2

Date 8-4-78
Sample Type core

DRILLING DATA

Drilling Co. Finley Drilling Address Raton, N.M.
Core Size 3" Barrel Length 15'
Type of core retrieval conventional
Drilling media mud Air Temperature 69°F
TD Hole 1082' Logs Dual Induction-SFL, BHC-Sonic, Compensated Neutron-
Formation Density, Lithology Log

GEOLOGY

Geologic Unit Vermejo Formation Age Upper Cretaceous
Coal zone/bed Piedmont Coal Bed Thickness 4.65'
Depth to top of coal 961.7' (Driller) 963' (Log)
Depth to bottom of coal 966.35' (Driller) 967.65' (Log)
Cored interval 955-968.5' (Driller)
Roof description Ss, brown-gray, fg-med. gr., calc, bottom .2' pyrite
Coal description black, crumbled, no cleat direction, dull to med. bright,
pyrite, occ. boney
Floor description claystone, dark gray, pyritic, grades to shale, greasy luster

DESORPTION DATA

Sampled interval (ft) 963.85-966.35>** (Driller) 965.15-967.65' (Log)
Condition of sample crumbled
Sampled Weight (g) 1014
Lost gas time (min) 34.5 Lost gas cc 70
Desorbed gas cc 270 Residual gas cc/g 0.69
Total gas content cc/g 1.03 Total gas content cf/t 33

Miscellaneous *U.S. Bureau of Mines, Colorado Interstate Gas, and Colorado
Fuel and Iron cooperative hole

**bottom part of seam is CGS #49, top part of seam (above parting at
964.5-965.15') is CGS #48

Reference: "Drilling for Methane Gas in the Fishers Peak area, Las Animas
County, Colorado," unpublished U.S. Bureau of Mines Information Circular,
1979 by Bernard M. Bench

COAL ANALYSES no info.

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
<u>Proximate Analyses (%)</u>			
Moisture	.8	N/A	N/A
Volatile Matter	29.3	29.6	37.5
Fixed Carbon	49.0	49.4	62.5
Ash	20.8	21.0	N/A
<u>Ultimate Analyses (%)</u>			
Hydrogen	4.6	4.6	5.8
Carbon	65.2	65.8	83.3
Nitrogen	1.2	1.2	1.5
Sulfur	.7	.7	.9
Oxygen	7.4	6.7	8.5
Ash	20.8	21.0	N/A
<u>Heating value</u> (BTU/lb)	11710	11809	14942
<u>Sulfur Forms (%)</u>			
Sulfate	.01	.01	.01
Pyritic	.14	.14	.18
Organic	.58	.58	.74
<u>Ash</u>			
Initial deformation (°F)	not run		
Softening temperature (°F)	not run		
Fluid temperature (°F)	not run		
<u>Free Swelling Index</u>	2.5		
<u>Fixed Carbon</u>			
<u>DMMF</u>	64.04		
<u>Heating Value</u>			
<u>BTU/lb DMMF</u>	15132.66		
<u>Apparent Rank</u>	HvA bituminous		
Date of Analysis:	1-29-79		
Laboratory:	U.S. Dept. of Energy		Lab No. K89024
Comments:			

GAS ANALYSES - not runADSORPTION ISOTHERM DATA - not runPETROGRAPHIC ANALYSES - not run

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 50

LOCATION

County: Las Animas
Location: Sec 29 Twp 34S Rge 63W

Surface Elev (ft) 7640.8
Coordinates 62°14'42"
1665.91 from #1,
142,866.02,
2298312.77

GENERAL

CGS Sample No. 50
Sampled By C. Tremain
Operator C.I.G./B.O.M.*
Hole No. C.F. & I. 29-2

Date 8-7-78
Sample Type core

DRILLING DATA

Drilling Co. Finley Drilling Address Raton, N.M.
Core Size 3" Barrel Length 15'
Type of core retrieval conventional
Drilling media mud Air Temperature 78°F
TD Hole 1082' Logs Dual Induction-SFL, BHC-Sonic, Compensated Neutron-
Formation Density, Lithology Log

GEOLOGY

Geologic Unit Vermejo Formation Age Upper Cretaceous
Coal zone/bed unnamed Bed Thickness .45'
Depth to top of coal 1005.5' (Driller) 1005.5' (Log)
Depth to bottom of coal 1005.95' (Driller) 1005.95' (Log)
Cored interval 1002-1016.45' (Driller)
Roof description shale, bit., coal seamlets up to 1/16"
Coal description coal, black, pyritic
Floor description bit shale

DESORPTION DATA

Sampled interval (ft) 1005.5-1005.95' (Driller) 1005.5-1005.95' (Log)
Condition of sample 1/3 split desorbed
Sampled Weight (g) 1152
Lost gas time (min) 44 Lost gas cc 130
Desorbed gas cc 745 Residual gas cc/g 0.44
Total gas content cc/g 1.20 Total gas content cf/t 38

Miscellaneous *U.S. Bureau of Mines, Colorado Interstate Gas, and Colorado
Fuel and Iron cooperative hole

Reference: "Drilling for Methane Gas in the Fishers Peak area, Las Animas
County, Colorado," unpublished U.S. Bureau of Mines Information Circular,
1979 by Bernard M. Bench

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
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Proximate Analyses (%)

Moisture	.7	N/A	N/A
Volatile Matter	35.8	36.0	41.4
Fixed Carbon	50.6	51.0	58.6
Ash	12.9	13.0	N/A

Ultimate Analyses (%)

Hydrogen	5.2	5.2	6.0
Carbon	72.0	72.6	83.4
Nitrogen	1.5	1.5	1.7
Sulfur	.6	.6	.7
Oxygen	7.7	7.1	8.2
Ash	12.9	13.0	N/A

Heating value
(BTU/lb)

13118	13212	15190
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Sulfur Forms (%)

Sulfate	.01	.01	.01
Pyritic	.10	.10	.12
Organic	.47	.47	.54

Ash

Initial deformation (°F)	not run
Softening temperature (°F)	not run
Fluid temperature (°F)	not run

Free Swelling Index 6.5Fixed Carbon
DMMF 59.4Heating Value
BTU/lb MMMF 15265Apparent Rank HvA bituminousDate of Analysis: 1-29-79Laboratory: U.S. Dept. of EnergyLab No. K89025

Comments: _____

GAS ANALYSES - not runADSORPTION ISOTHERM DATA - not run

PETROGRAPHIC ANALYSES

Lab. SIU Coal Characterization Lab Petrographer John C. Crelling
 Lab No. SIU #1214 Date of Analysis ?

Maceral Analyses

Reflectance Analysis

Vitrinite	<u>67.0</u>	Vitrinite Ro	<u>0.78</u>
Pseudovitrinite	<u>15.2</u>	pVit Ro	<u>0.82</u>
Semifusinite	<u>10.3</u>	Combined Ro	<u>0.79</u>
Semimacrinite	<u>0.5</u>	pVit Ro - Vit Ro	<u>0.04</u>
Fusinite	<u>2.8</u>		
Macrinite	<u>0.1</u>		
Micrinite	<u>1.3</u>		
Exinite	<u>2.0</u>		
Resinite	<u>0.8</u>		
Total	<u>100%</u>		

Combined V-Type Table

V-Type	2	3	4	5	6	7	8	9	10	11
%					2.0	52.5	45.5			

V-Type	12	13	14	15	16	17	18	19	21	21
%										

Comments: _____

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 51

LOCATION

County: Las Animas
Location: Sec 29 Twp 34S Rge 63W

Surface Elev (ft) 7640.8'
Coordinates 62°14'42",
1665.91' from #1
142,866.02,
2298312.77

GENERAL

CGS Sample No. 51
Sampled By C. Tremain
Operator C.I.G./B.O.M.*
Hole No. C.F. & I. 29-2

Date 8-7-78
Sample Type core

DRILLING DATA

Drilling Co. Finley Drilling Address Raton, N.M.
Core Size 3" Barrel Length 15'
Type of core retrieval conventional
Drilling media mud Air Temperature 78°F
TD Hole 1082' Logs Dual Induction-SFL, BHC-Sonic, Compensated Neutron-
Formation Density, Lithology Log

GEOLOGY

Geologic Unit Vermejo Formation Age Upper Cretaceous
Coal zone/bed unknown Bed Thickness 1.6'
Depth to top of coal 1012.75' (Driller) 1012.8' (Log)
Depth to bottom of coal 1014.35' (Driller) 1014.4' (Log)
Cored interval 1002-1016.45' (Driller)
Roof description shale carb to bit
Coal description coal, black, poor cleat, mod abundant, thin to medium
vitrain bands
Floor description shale, carbonaceous

DESORPTION DATA

Sampled interval (ft) 1012.75-1014.35' (Driller) 1012.8-1014.4' (Log)
Condition of sample ?
Sampled Weight (g) 796
Lost gas time (min) 42 Lost gas cc 170
Desorbed gas cc 445 Residual gas cc/g 1.9
Total gas content cc/g 2.7 Total gas content cf/t 86

Miscellaneous *U.S. Bureau of Mines, Colorado Interstate Gas, and Colorado
Fuel and Iron cooperative hole

Reference: "Drilling for Methane Gas in the Fishers Peak area, Las Animas
County, Colorado," unpublished U.S. Bureau of Mines Information Circular,
1979 by Bernard M. Bench

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
<u>Proximate Analyses (%)</u>			
Moisture	1.2	N/A	N/A
Volatile Matter	29.8	30.2	34.5
Fixed Carbon	56.7	57.3	65.5
Ash	12.3	12.5	N/A

Ultimate Analyses (%)

Hydrogen	5.2	5.2	5.9
Carbon	73.2	74.1	84.6
Nitrogen	1.4	1.4	1.6
Sulfur	.7	.7	.8
Oxygen	7.2	6.2	7.1
Ash	12.3	12.5	N/A

Heating value
(BTU/lb)

13067	13220	15108
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Sulfur Forms (%)

Sulfate	.01	.01	.01
Pyritic	.10	.10	.12
Organic	.57	.58	.66

Ash

Initial deformation (°F)	not run
Softening temperature (°F)	not run
Fluid temperature (°F)	not run

Free Swelling Index not run

Fixed Carbon

DMMF 66.5

Heating Value

BTU/lb DMMF 15095.4

Apparent Rank HvA bituminous

Date of Analysis: 1-30-79

Laboratory: U.S. Dept. of Energy

Lab No. K89042

Comments:

GAS ANALYSES - not runADSORPTION ISOTHERM DATA

Sample:

Langmuir Constants

a = 13.851

b = 3.6738 x 10⁻³

<u>P, psia</u>	<u>V, cc STP/g (Exptl.)</u>	<u>V, cc STP/g (Smoothed)</u>
170.0	5.360	5.325
339.5	7.538	7.688
511.5	9.176	9.040
725.0	10.075	10.070
941.0	10.719	10.744

Standard deviation 0.104 cc/g

V_{calc} @ 400 psia = 8.242 cc/gPETROGRAPHIC ANALYSES - not run

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 52

LOCATION

County: Las Animas Surface Elev (ft) 7640.8
Location: Sec 29 Twp 34S Rge 63W Coordinates 1665.91 @ 62°14'
42" from #1, 142866.02
2298312.77

GENERAL

CGS Sample No. 52 Date 8-7-78
Sampled By C. Tremain Sample Type core
Operator C.I.G./B.O.M.*
Hole No. C.F. & I. 29-2

DRILLING DATA

Drilling Co. Finley Drilling Address Raton, New Mexico
Core Size 3" Barrel Length 15'
Type of core retrieval conventional
Drilling media mud Air Temperature 62°
TD Hole 1082' Logs Dual Induction-SFL, BHC-Sonic, Compensated Neutron
- Formation Density, Lithology Log

GEOLOGY

Geologic Unit Vermejo Formation Age Upper Cretaceous
Coal zone/bed Morley Coal Bed Thickness 3.2'
Depth to top of coal 1029.1' (Driller) 1030' (Log)
Depth to bottom of coal 1032.3' (Driller) 1033.2' (Log)
Cored interval 1016.5-1030' (Driller)
Roof description claystone, dark gray
Coal description coal, 1/3 split desorbed, black, moderately abundant
thin vitrain bands
Floor description shale, black, bituminous

DESORPTION DATA

Sampled interval (ft) 1029.1-1030' ** (Driller) 1030-1030.9' (Log)
Condition of sample 1/3 split desorbed
Sampled Weight (g) 809
Lost gas time (min) 34.5 Lost gas cc 90
Desorbed gas cc 320 Residual gas cc/g 1.20
Total gas content cc/g 1.71 Total gas content cf/t 55

Miscellaneous * U.S. Bureau of Mines, Colorado Interstate Gas, and Colorado Fuel and Iron cooperative hole.

** Upper portion of Morley seam, CGS #53 & 54 from lower portion of same seam.

Reference- "Drilling for Methane Gas in the Fishers Peak Area, Las Animas County Colorado" unpublished U.S. Bureau of Mines Information Circular/1979 by Bernard M. Bench

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
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Proximate Analyses (%)

Moisture	.7	N/A	N/A
Volatile Matter	29.0	29.2	35.4
Fixed Carbon	53.0	53.4	64.6
Ash	17.3	17.4	N/A

Ultimate Analyses (%)

Hydrogen	4.8	4.7	5.7
Carbon	69.6	70.1	84.9
Nitrogen	1.2	1.2	1.5
Sulfur	.9	.9	1.0
Oxygen	6.2	5.6	6.8
Ash	17.3	17.4	N/A

Heating value
(BTU/lb)

12338	12421	15043
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Sulfur Forms (%)

Sulfate	.01	.01	.01
Pyritic	.17	.17	.21
Organic	.68	.68	.83

Ash

Initial deformation (°F)	Not run
Softening temperature (°F)	Not run
Fluid temperature (°F)	Not run

Free Swelling Index 1.5Fixed CarbonDMMF 66Heating ValueBTU/lb MMMF 15210.2Apparent Rank HvA bituminousDate of Analysis: 1-30-79Laboratory: U.S. Dept. of EnergyLab No. K89026

Comments: _____

GAS ANALYSES - Not run

ADSORPTION ISOTHERM DATA

Sample:

Langmuir Constantsa = 12.302b = 3.2255 x 10⁻³

<u>P, psia</u>	<u>V, cc STP/g (Exptl.)</u>	<u>V, cc STP/g (Smoothed)</u>
156.5	4.298	4.127
308.0	6.000	6.131
498.0	7.496	7.582
723.5	8.541	8.612
947.5	9.364	9.269
V calc @ 400 psia = 6.930 cc/g	Standard deviation 0.130 cc/g	

Laboratory P-V-T Inc.
 Technician James Berryman
 Comments _____

CF&I 29.2 Run 6
 Lab No. 1029.1-1032.3
 Analysis Date 10-13-78

PETROGRAPHIC ANALYSES - not run

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 53

LOCATION

County: Las Animas Surface Elev (ft) 7640.8
Location: Sec 29 Twp 34S Rge 63W Coordinates 1665.91' @ 62°14'
42" from #1, 142,866.02,
2298312.77

GENERAL

CGS Sample No. 53 Date 8-8-78
Sampled By C. Tremain Sample Type core
Operator C.I.G./B.O.M.*
Hole No. C.F. & I. 29-2

DRILLING DATA

Drilling Co. Finley Drilling Address Raton, New Mexico
Core Size 3" Barrel Length 15'
Type of core retrieval conventional
Drilling media mud Air Temperature 78°
TD Hole 1082' Logs Duel Induction - SFL, BHC-Sonic, Compensated Neutron
Formation Density, Lithology Log

GEOLOGY

Geologic Unit Vermejo Formation Age Upper Cretaceous
Coal zone/bed Morley Coal Bed Thickness 3.2'
Depth to top of coal 1029.1' (Driller) 1030' (Log)
Depth to bottom of coal 1032.3' (Driller) 1033.2' (Log)
Cored interval 1030-1042' (Driller)
Roof description dark gray claystone
Coal description coal, blk; 1/3 split desorbed, bottom of Morley seam
Floor description shale, black, bituminous

DESORPTION DATA

Sampled interval (ft) 1030-1032.3' ** (Driller) 1030.9-1033.2' (Log)
Condition of sample 1/3 split desorbed
Sampled Weight (g) 938
Lost gas time (min) 33.5 Lost gas cc 160
Desorbed gas cc 335 Residual gas cc/g 1.11
Total gas content cc/g 1.64 Total gas content cf/t 52

Miscellaneous *U.S. Bureau of Mines, Colorado Interstate Gas, and Colorado Fuel and Iron cooperative hole

**Same interval as CGS sample #54, same seam as #52.

Reference - "Drilling for Methane Gas in the Fishers Peak area, Las Animas County, Colorado" unpublished U.S. Bureau of Mines Information Circular/1979 by Bernard M. Bench

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
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Proximate Analyses (%)

Moisture	.7	N/A	N/A
Volatile Matter	30.7	30.9	39.4
Fixed Carbon	47.3	47.7	60.6
Ash	21.3	21.4	N/A

Ultimate Analyses (%)

Hydrogen	4.8	4.8	6.1
Carbon	65.0	65.5	83.4
Nitrogen	1.2	1.2	1.6
Sulfur	.8	.8	1.0
Oxygen	6.9	6.3	8.0
Ash	21.3	21.4	N/A

Heating value
(BTU/lb)

11737	11824	15049
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Sulfur Forms (%)

Sulfate	.01	.01	.01
Pyritic	.21	.21	.27
Org nic	.57	.57	.73

Ash

Initial deformation (°F)	not run
Softening temperature (°F)	not run
Fluid temperature (°F)	not run

Free Swelling Index 5.0Fixed CarbonDMMF 62.2Heating ValueBTU/lb MMMF 15279Apparent Rank HvA bituminousDate of Analysis: 1-30-79Laboratory: U.S. Dept. of EnergyLab No. K89027

Comments: _____

GAS ANALYSES - not run

ADSORPTION ISOTHERM DATA

Sample:

Langmuir Constantsa = 12.302b = 3.2255 x 10⁻³

<u>P, psia</u>	<u>V, cc STP/g (Exptl.)</u>	<u>V, cc STP/g (Smoothed)</u>
156.5	4.298	4.127
308.0	6.000	6.131
498.0	7.496	7.582
723.5	8.541	8.612
947.5	9.364	9.269
V calc @ 400 psia = 6.930 cc/g	Standard deviation 0.130 cc/g	

Laboratory	<u>P-V-T Inc.</u>	CF&I 29.2 Run 6
Technician	<u>James Berryman</u>	Lab No. <u>1029.1-1032.3</u>
Comments		Analysis Date <u>10/13/78</u>

PETROGRAPHIC ANALYSES - not run

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 54

LOCATION

County: Las Animas Surface Elev (ft) 7640.8
Location: Sec 29 Twp 34S Rge 63W Coordinates 1665.91' @ 62°14'42"
from #1, 142866.02, 2298312.77

GENERAL

CGS Sample No. 54 Date 8-8-78
Sampled By Barney Bench Sample Type core
Operator C.I.G./B.O.M.*
Hole No. C.F. & I. 29-2

DRILLING DATA

Drilling Co. Finley Drilling Address Raton, New Mexico
Core Size 3" Barrel Length 15'
Type of core retrieval conventional
Drilling media mud Air Temperature 78°
TD Hole 1082' Logs Dual Induction-SFL, BHC-Sonic, Compensated Neutron -
Formation Density, Lithology Log

GEOLOGY

Geologic Unit Vermejo Formation Age Upper Cretaceous
Coal zone/bed Morley Coal Bed Thickness 3.2'
Depth to top of coal 1029.1' (Driller) 1030' (Log)
Depth to bottom of coal 1032.3' (Driller) 1033.2' (Log)
Cored interval 1030-1042' (Driller)
Roof description dark gray claystone
Coal description coal blk., 1/4 split desorbed, bottom of Run 5 seam
Floor description black, bituminous shale

DESORPTION DATA

Sampled interval (ft) 1030-1032.3'** (Driller) 1030.9-1033.2' (Log)
Condition of sample 1/4 split
Sampled Weight (g) 478
Lost gas time (min) 33.5 Lost gas cc 200
Desorbed gas cc 847 Residual gas cc/g 0.6
Total gas content cc/g 2.79 Total gas content cft 89

Miscellaneous *U.S. Bureau of Mines, Colorado Interstate Gas, and Colorado Fuel and Iron cooperative hole

**1/4 split desorbed, same interval as in sample CGS #53

Reference - "Drilling for Methane Gas in the Fishers Peak area, Las Animas County, Colorado," unpublished U.S. Bureau of Mines Information Circular/1979 by Bernard M. Bench

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
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Proximate Analyses (%)

Moisture	1.2	N/A	N/A
Volatile Matter	27.9	28.3	38.3
Fixed Carbon	45.0	45.5	61.7
Ash	25.9	26.2	N/A

Ultimate Analyses (%)

Hydrogen	4.8	4.7	6.4
Carbon	61.2	62.0	83.9
Nitrogen	1.1	1.1	1.5
Sulfur	.7	.7	.9
Oxygen	6.3	5.3	7.2
Ash	25.9	26.2	N/A

Heating value
(BTU/lb)

10914	11044	14961
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Sulfur Forms (%)

Sulfate	not run
Pyritic	not run
Organic	not run

Ash

Initial deformation (°F)	2800+
Softening temperature (°F)	2800+
Fluid temperature (°F)	2800+

Free Swelling Index not run

Fixed Carbon	
DMMF	63.7

Heating Value	
BTU/lb MMMF	15185

Apparent Rank	HvA bituminous
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Date of Analysis: 2-23-79Laboratory: U.S. Dept. of EnergyLab No. K89373

Comments: _____

GAS ANALYSES - not runADSORPTION ISOTHERM DATA - not runPETROGRAPHIC ANALYSES - not run

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 55

LOCATION

County: Huerfano
Location: Sec 16 Twp 30S Rge 66W

Surface Elev (ft) 7035
Coordinates 2500 fnl, 1050 fet

GENERAL

CGS Sample No. 55
Sampled By C. Tremain
Operator Mobil
Hole No. CT-78-16-1C

Date 7-8-78
Sample Type core

DRILLING DATA

Drilling Co. Teton Exploration Address Casper, Wyoming
Core Size 1 7/8" Barrel Length 10'
Type of core retrieval conventional
Drilling media foam Air Temperature 85°
TD Hole 920' Logs Resistivity, Gamma, Density

GEOLOGY

Geologic Unit Raton Formation Age Upper Cretaceous-Paleocene
Coal zone/bed Boncarbo equiv. coal Bed Thickness 2.7'
Depth to top of coal 674.7' (Driller) 674.7' (Log)
Depth to bottom of coal 677.4' (Driller) 677.4' (Log)
Cored interval 671-681' (Driller)
Roof description shale, carb. dk. gray, frm & mod indurated, uniform, mod. broken, coal lens at 684.15-.25'
Coal description blk, shiny-vitreous with good app, mod to highly broken, mod competent, 75% vitrain occurring as thin (1/16") bands, small cleating giving 1/2" fragments
Floor description *

DESORPTION DATA

Sampled interval (ft) 674.7-677.4' (Driller) 674.7-677.4' (Log)
Condition of sample 1/4 split, hard small blocky fragments
Sampled Weight (g) 315
Lost gas time (min) 36 Lost gas cc 300
Desorbed gas cc 185 Residual gas cc/g 0.1
Total gas content cc/g 1.64 Total gas content cf/t 52

Miscellaneous * floor - carb. shale, dark gray to brown, uniform except for coal lens at 677.75' (1/16"), 678.0' (3/4"), and 678.1' (1/4")

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
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Proximate Analyses (%)

Moisture	1.1	N/A	N/A
Volatile Matter	34.4	34.8	40.5
Fixed Carbon	50.5	51.1	59.5
Ash	14.0	14.1	N/A

Ultimate Analyses (%)

Hydrogen	5.1	5.1	5.9
Carbon	70.4	71.2	82.9
Nitrogen	1.3	1.3	1.5
Sulfur	.5	.6	.6
Oxygen	8.7	7.8	9.1
Ash	14.0	14.1	N/A

Heating value
(BTU/lb)

12524	12665	14746
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Sulfur Forms (%)

Sulfate	.01	.01	.01
Pyritic	.14	.14	.16
Organic	.40	.40	.47

Ash

Initial deformation (°F)	not run
Softening temperature (°F)	not run
Fluid temperature (°F)	not run

Free Swelling Index 3.0Fixed Carbon
DMMF 60.4Heating Value
BTU/lb MMMF 14773.4Apparent Rank HvA bituminousDate of Analysis: 1-30-79Laboratory: U.S. Dept. of EnergyLab No. K89033

Comments: _____

GAS ANALYSES - not runADSORPTION ISOTHERM DATA - not runPETROGRAPHIC ANALYSES - not run

LOCATION

County: Huerfano
Location: Sec 16 Twp 30S Rge 66W

Surface Elev (ft) 7035
Coordinates 2500 fnl, 1050 fel

GENERAL

CGS Sample No. 56
Sampled By C. Tremain
Operator Mobil
Hole No. CT-78-16-1C

Date 7-8-78
Sample Type core

DRILLING DATA

Drilling Co. Teton Exploration Address Casper, Wyoming
Core Size 1 7/8" Barrel Length 10'
Type of core retrieval conventional
Drilling media foam Air Temperature 80°
TD Hole 920' Logs Resistivity, Gamma, Density

GEOLOGY

Geologic Unit Raton Formation Age Upper Cretaceous-Paleocene
Coal zone/bed Delagua Coal Bed Thickness 3.3' (core), 4' (Log)
Depth to top of coal 895.1' (Driller) 896' (Log)
Depth to bottom of coal 898.4' (Driller) 900' (Log)
Cored interval 891-901' (Driller)
Roof description shale, carb, firm, mod. uniform, coaly from 894.7' (3/4")*
Coal description 75% vitrain, good app, mod broken, mod hard, small blocky frags, shale @ 896.8' (1/2"), and 897' (1/2"), otherwise good coal
Floor description shale, carb, firm, med-dkgy, coalaceous & mod. broken at top .25, grades to siltstone

DESORPTION DATA

Sampled interval (ft) 895.1-898.4' (Driller) 896-899.3' (Log)
Condition of sample 1/4 split,
Sampled Weight (g) 352
Lost gas time (min) 46 Lost gas cc 370
Desorbed gas cc 157 Residual gas cc/g 0
Total gas content cc/g 1.50 Total gas content cft 48

Miscellaneous *and 894.8' (3/4") w/coalaceous fragments throughout

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
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Proximate Analyses (%)

Moisture	1.1	N/A	N/A
Volatile Matter	35.8	36.2	39.3
Fixed Carbon	55.3	55.9	60.7
Ash	7.8	7.9	N/A

Ultimate Analyses (%)

Hydrogen	5.2	5.2	5.6
Carbon	76.1	77.0	83.6
Nitrogen	1.5	1.5	1.6
Sulfur	.6	.6	.6
Oxygen	8.8	7.9	8.5
Ash	7.8	7.9	N/A

Heating value
(BTU/lb)

13676	13835	15025
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Sulfur Forms (%)

Sulfate	.01	.01	.01
Pyritic	.13	.13	.14
Organic	.45	.46	.49

Ash

Initial deformation (°F)	not run
Softening temperature (°F)	not run
Fluid temperature (°F)	not run

Free Swelling Index 4.5Fixed Carbon
DMMF 61.2Heating Value
BTU/lb MMMF 14955Apparent Rank HvA bituminousDate of Analysis: 2-14-79Laboratory: U.S. Dept. of EnergyLab No. K89035

Comments: _____

GAS ANALYSES - not runADSORPTION ISOTHERM DATA - not runPETROGRAPHIC ANALYSES - not run

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 57

LOCATION

County: Huerfano Surface Elev (ft) 6860
Location: Sec 26 Twp 29S Rge 66W Coordinates 2125 FSL, 2550 FEL

GENERAL

CGS Sample No. 57 Date 7-12-78
Sampled By C. Tremain Sample Type core
Operator Mobil
Hole No. CT-78-26-1C

DRILLING DATA

Drilling Co. Teton Exploration Address Casper, Wyoming
Core Size 1 7/8" Barrel Length 10'
Type of core retrieval conventional
Drilling media mud Air Temperature 80°
TD Hole 1300' Logs Resistivity, Gamma, Density

GEOLOGY

Geologic Unit Vermejo Formation Age Upper Cretaceous
Coal zone/bed unnamed Bed Thickness 5.05'(core), 5.6'(Log)
Depth to top of coal 1136.7' (Driller) 1136.7'(Log)
Depth to bottom of coal 1141.75'(Driller) 1142.3' (Log)
Cored interval 1134-1144' (Driller)
Roof description shale, carb, dk gray-blk, firm-mod hd, uniform
Coal description blk shiny, vitreous, 90% vitrain, very good appearance
1/2" cleats, mod competent, mod broken, calcite minor, some cleats and
fracture joints, slightly shaley at 1136.8'(2")
Floor description shale, carb, blk-dk gray, firm-mod hd, uniform

DESORPTION DATA

Sampled interval (ft) 1136.7-1141.75' (Driller) 1136.7-1142.3' (Log)
Condition of sample 1/4 split
Sampled Weight (g) 549
Lost gas time (min) 300 Lost gas cc 550
Desorbed gas cc 134 Residual gas cc/g .8
Total gas content cc/g 2.05 Total gas content cf/t 65.5

Miscellaneous _____

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
<u>Proximate Analyses (%)</u>			
Moisture	1.1	N/A	N/A
Volatile Matter	32.8	33.2	39.6
Fixed Carbon	50.1	50.6	60.4
Ash	16.0	16.2	N/A
<u>Ultimate Analyses (%)</u>			
Hydrogen	5.1	5.1	6.0
Carbon	68.5	69.2	82.6
Nitrogen	1.1	1.1	1.4
Sulfur	.6	.6	.7
Oxygen	8.6	7.7	9.2
Ash	16.0	16.2	N/A
<u>Heating value</u> (BTU/lb)	12228	12363	14756
<u>Sulfur Forms (%)</u>			
Sulfate	.01	.01	.01
Pyritic	.06	.06	.07
Organic	.52	.53	.63
<u>Ash</u>			
Initial deformation (°F)	not run		
Softening temperature (°F)	not run		
Fluid temperature (°F)	not run		
<u>Free Swelling Index</u>	1.5		
<u>Fixed Carbon</u>			
<u>DMMF</u>	61.5		
<u>Heating Value</u>			
<u>BTU/lb MMMF</u>	14805.2		
<u>Apparent Rank</u>	HvA bituminous		
Date of Analysis:	2-14-79		
Laboratory:	U.S. Dept. of Energy		Lab No. K89034
Comments:			

GAS ANALYSES - not runADSORPTION ISOTHERM DATA - not runPETROGRAPHIC ANALYSES - not run

LOCATION

County: Huerfano Surface Elev (ft) 6560
Location: Sec 16 Twp 29S Rge 66W Coordinates 440'FNL, 300'FEL

GENERAL

CGS Sample No. 58 Date 7-18-78
Sampled By C. Tremain Sample Type core
Operator Mobil
Hole No. CT-78-16-2C

DRILLING DATA

Drilling Co. Teton Exploration Address Casper, Wyoming
Core Size 1 7/8" Barrel Length 10'
Type of core retrieval conventional
Drilling media mud Air Temperature 70°
TD Hole 1077 Logs Resistivity, Gamma, Density

GEOLOGY

Geologic Unit Vermejo Formation Age Upper Cretaceous
Coal zone/bed unnamed Bed Thickness 4.3'(core), 3.9'(Log)
Depth to top of coal 1006.4' (Driller) 1006.6'(Log)
Depth to bottom of coal 1010.7 (Driller) 1010.5' (Log)
Cored interval 1003-1013.5' (Driller)
Roof description *
Coal description bright, black, dominant vitrain bands of med. thickness, occ calcite mineral along frags., 1/2" cleats
Floor description shale, drk gry, carb w/interbedded ss. (Hgy) @ 1011.1-1012.0', otherwise uniform, firm-soft

DESORPTION DATA

Sampled interval (ft) 1006.4-1008.6' (Driller) 1006.6-1008.8' (Log)
Condition of sample 1/4 split desorbed
Sampled Weight (g) 369
Lost gas time (min) 209 Lost gas cc 300
Desorbed gas cc 32 Residual gas cc/g 0.0
Total gas content cc/g .90 Total gas content cf/t 29

Miscellaneous * shale, mod. hd., dk. gy. firm, carb, pyrite and calcite mineralization along vertical fractures from 1003.4'-.9', 1004.65-.85', and feathered at 1004.9'(1")

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
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Proximate Analyses (%)

Moisture	1.4	N/A	N/A
Volatile Matter	36.2	36.7	40.0
Fixed Carbon	54.2	55.0	60.0
Ash	8.2	8.3	N/A

Ultimate Analyses (%)

Hydrogen	5.2	5.1	5.6
Carbon	75.2	76.3	83.2
Nitrogen	1.3	1.3	1.5
Sulfur	.6	.6	.6
Oxygen	9.5	8.4	9.1
Ash	8.2	8.3	N/A

Heating value
(BTU/lb)

13328	13515	14737
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Sulfur Forms (%)

Sulfate	.01	.01	.01
Pyritic	.08	.08	.09
Organic	.48	.49	.53

Ash

Initial deformation (°F)	not run
Softening temperature (°F)	not run
Fluid temperature (°F)	not run

Free Swelling Index 3.0

Fixed Carbon

DMMF 60.5

Heating Value

BTU/lb MMMF 14643.1Apparent Rank HvA bituminousDate of Analysis: 1-30-79Laboratory: U.S. Dept. of EnergyLab No. K89032

Comments: _____

GAS ANALYSES - not runADSORPTION ISOTHERM DATA - not runPETROGRAPHIC ANALYSES - not run

LOCATION

County: Huerfano
Location: Sec 16 Twp 29S Rge 66W

Surface Elev (ft) 6560
Coordinates 400 fnl, 300 fel

GENERAL

CGS Sample No. 59
Sampled By C. Tremain
Operator Mobil Oil
Hole No. CT-78-16-2C

Date 7-18-78
Sample Type core

DRILLING DATA

Drilling Co. Teton Drilling Address Casper, Wyoming
Core Size 1 7/8" Barrel Length 10'
Type of core retrieval conventional
Drilling media mud Air Temperature 90°F
TD Hole 1077 Logs Resistivity, Gamma, Density

GEOLOGY

Geologic Unit Vermejo Formation Age Upper Cretaceous
Coal zone/bed unnamed Bed Thickness 3.95' (core), 4.5' (Log)
Depth to top of coal 1012.9' (Driller) 1012.6' (Log)
Depth to bottom of coal 1016.85' (Driller) 1017.4' (Log)
Cored interval 1013.5-1020' (Driller)
Roof description sh, dk/gy, carb, w interlaced h/gy/ss, @ 1011.0-1012.0, otherwise uniform, firm-soft
Coal description calcite in cleats, black, shiny, dominant thin-med vitrain bands, one good cleat direction
Floor description sh, carb, dk/gy, firm-mov. hard, coalaceous lens @ 1016.9 (1/4")

DESORPTION DATA

Sampled interval (ft) 1013.5-1016.85' (Driller) 1013.05-1017.4' (Log)
Condition of sample ?
Sampled Weight (g) 584
Lost gas time (min) 23 Lost gas cc 30
Desorbed gas cc 54 Residual gas cc/g 0.0
Total gas content cc/g .14 Total gas content cf/t 5

Miscellaneous _____

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
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Proximate Analyses (%)

Moisture	1.4	N/A	N/A
Volatile Matter	34.6	35.1	40.8
Fixed Carbon	50.1	50.8	59.2
Ash	13.9	14.1	N/A

Ultimate Analyses (%)

Hydrogen	5.1	5.0	5.8
Carbon	70.4	71.4	83.1
Nitrogen	1.3	1.3	1.5
Sulfur	.6	.6	.7
Oxygen	8.7	7.6	8.8
Ash	13.9	14.1	N/A

Heating value
(BTU/lb)

12484	12663	14743
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Sulfur Forms (%)

Sulfate	.01	.01	.01
Pyritic	.07	.07	.08
Organic	.54	.55	.64

Ash

Initial deformation (°F)	not run
Softening temperature (°F)	not run
Fluid temperature (°F)	not run

<u>Free Swelling Index</u>	<u>1.5</u>
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<u>Fixed Carbon</u>	
<u>DMMF</u>	<u>60.1</u>

<u>Heating Value</u>	
<u>BTU/lb DMMF</u>	<u>14711</u>

<u>Apparent Rank</u>	<u>HvA bituminous</u>
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<u>Date of Analysis:</u>	<u>1-30-79</u>
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<u>Laboratory:</u>	<u>U.S. Dept. of Energy</u>
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<u>Lab No.</u>	<u>K89036</u>
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<u>Comments:</u>	
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GAS ANALYSES - not runADSORPTION ISOTHERM DATA - not runPETROGRAPHIC ANALYSES - not run

LOCATION

County: Huerfano
Location: Sec 16 Twp 29S Rge 66W

Surface Elev (ft) 6560'
Coordinates 400'FNL, 300'FEL

GENERAL

CGS Sample No. 60
Sampled By C. Tremain
Operator Mobil
Hole No. CT-78-16-2C

Date 7-18-78
Sample Type core

DRILLING DATA

Drilling Co. Teton Exploration Address Casper, Wyoming
Core Size 1 7/8" Barrel Length 10'
Type of core retrieval conventional
Drilling media mud Air Temperature 80°F
TD Hole 1077' Logs Resistivity, Gamma, Density

GEOLOGY

Geologic Unit Vermejo Formation Age Upper Cretaceous
Coal zone/bed unnamed Bed Thickness 1.6'
Depth to top of coal 1074.0' (Driller) 1073.5' (Log)
Depth to bottom of coal 1075.6' (Driller) 1075.1' (Log)
Cored interval 1068-1077' (Driller)
Roof description missing core (shale?)
Coal description black, shiny, abundant thin-med vitrain bands
Floor description shale top .7' carb. otherwise med gray, sl silty, firm, uniform

DESORPTION DATA

Sampled interval (ft) 1074-1075.6 (Driller) (Log)
Condition of sample 1/4 split
Sampled Weight (g) 257
Lost gas time (min) 20.5 Lost gas cc 90
Desorbed gas cc 48 Residual gas cc/g 0.0
Total gas content cc/g .54 Total gas content cft 17

Miscellaneous _____

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
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Proximate Analyses (%)

Moisture	1.2	N/A	N/A
Volatile Matter	38.0	38.5	42.4
Fixed Carbon	51.8	52.4	57.6
Ash	9.0	9.1	N/A

Ultimate Analyses (%)

Hydrogen	5.3	5.2	5.8
Carbon	73.3	74.1	81.6
Nitrogen	1.4	1.4	1.5
Sulfur	1.4	1.5	1.6
Oxygen	9.6	8.6	9.5
Ash	9.0	9.1	N/A

Heating value
(BTU/lb)

13253	13413	14760
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Sulfur Forms (%)

Sulfate	.01	.01	.01
Pyritic	.66	.67	.74
Organic	.77	.78	.86

Ash

Initial deformation (°F)	not run
Softening temperature (°F)	not run
Fluid temperature (°F)	not run

Free Swelling Index	3.5
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Fixed Carbon	
DMMF	58.4

Heating Value	
BTU/lb MFM	14728

Apparent Rank	HvA bituminous
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Date of Analysis:	1-30-79
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Laboratory:	U.S. Dept. of Energy
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Lab No.	K89028
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Comments:	
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GAS ANALYSES - not run

ADSORPTION ISOTHERM DATA - not run

PETROGRAPHIC ANALYSES - not run

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 61

LOCATION

County: Moffat
Location: Sec 18 Twp 4N Rge 94W

Surface Elev (ft) 7895
Coordinates C, E 1/2, SW 1/4

GENERAL

CGS Sample No. 61
Sampled By NirBhao Singh Khalsa
Operator USGS
Hole No. D-38-EG

Date 8/21/78
Sample Type core

DRILLING DATA

Drilling Co. McCabe Bros. Address Idaho Falls, Idaho
Core Size 2.5" Barrel Length 18'
Type of core retrieval wireline
Drilling media water Air Temperature 85°F
TD Hole 1080' Logs Gamma, Density, SP, RES, Caliper

GEOLOGY

Geologic Unit Williams Fork Formation Age Upper Cretaceous
Coal zone/bed unnamed Bed Thickness 10.6' (Core), 13' (Log)
Depth to top of coal 146.5' (Driller) 144' (Log)
Depth to bottom of coal 157.1' (Driller) 157' (Log)
Cored interval 144.2-150.2' (Driller)
Roof description shaley coal (1.5'), overlain by carb. sh.
Coal description bright attrital dominant with vitrain bands up to .02', black, small amount of pyrite
Floor description interbedded carb sh and siltstone, sh.

DESORPTION DATA

Sampled interval (ft) 146.5-150.2' (Driller) 144-147.7' (Log)
Condition of sample representative
Sampled Weight (g) 680
Lost gas time (min) 7 Lost gas cc 20
Desorbed gas cc 226 Residual gas cc/g 0.0
Total gas content cc/g .36 Total gas content cf/t 12

Miscellaneous Reference - U.S.G.S. Open File 78-1031, 1978, by Marith J. Reheis

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
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Proximate Analyses (%)

Moisture	16.3	N/A	N/A
Volatile Matter	32.7	39.0	40.7
Fixed Carbon	47.6	57.0	59.3
Ash	3.4	4.0	N/A

Ultimate Analyses (%)

Hydrogen	5.2	4.1	4.2
Carbon	62.9	75.1	78.3
Nitrogen	1.3	1.6	1.7
Sulfur	.4	.5	.5
Oxygen	26.8	14.7	15.4
Ash	3.4	4.0	N/A

Heating value
(BTU/lb)

10581	12636	13165
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Sulfur Forms (%)

Sulfate	.01	.01	.01
Pyritic	.06	.07	.07
Organic	.37	.44	.46

Ash

Initial deformation (°F)	not run
Softening temperature (°F)	not run
Fluid temperature (°F)	not run

Free Swelling Index	not run
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Fixed Carbon	
DMMF	59.6

Heating Value	
BTU/lb MMTF	10988.7

Apparent Rank	Sub A - HvC bituminous
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Date of Analysis:	1-30-79
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Laboratory:	U.S. Dept. of Energy
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Lab No.	K89044
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Comments:	
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GAS ANALYSES - not runADSORPTION ISOTHERM DATA - not runPETROGRAPHIC ANALYSES - not run

LOCATION

County: Moffat
Location: Sec 18 Twp 4N Rge 94W

Surface Elev (ft) 7895
Coordinates C, E 1/2, SW 1/4

GENERAL

CGS Sample No. 62
Sampled By NirBhao Singh Khalsa
Operator USGS
Hole No. D-38-EG

Date 8/21/78
Sample Type core

DRILLING DATA

Drilling Co. McCabe Bros. Address Idaho Falls, Idaho
Core Size 2.5" Barrel Length 18'
Type of core retrieval wireline
Drilling media water Air Temperature 85°F
TD Hole 1080' Logs SP, RES, Gamma, Density, Caliper

GEOLOGY

Geologic Unit Williams Fork Formation Age Upper Cretaceous
Coal zone/bed unnamed Bed Thickness 10.6' (Core), 13' (Log)
Depth to top of coal 146.5 (Driller) 144' (Log)
Depth to bottom of coal 157.1 (Driller) 157' (Log)
Cored interval 150.2-166.9 (Driller)
Roof description shaley coal (1.5'), overlain by carb sh
Coal description bright attrital dominant, vitrain bands less than .02' black conchoidal fracture
Floor description interbedded carbonaceous shale and siltstone, shale

DESORPTION DATA

Sampled interval (ft) 150.2-157.1' (Driller) 150.1-157' (Log)
Condition of sample representative sample
Sampled Weight (g) 668
Lost gas time (min) 12.5 Lost gas cc 35
Desorbed gas cc 226 Residual gas cc/g 0.0
Total gas content cc/g .39 Total gas content cf/t 13

Miscellaneous Reference - U.S.G.S. Open File 78-1031, 1978, by Marith J. Reheis

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
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Proximate Analyses (%)

Moisture	15.0	N/A	N/A
Volatile Matter	33.7	39.7	40.6
Fixed Carbon	49.4	58.0	59.4
Ash	1.9	2.3	N/A

Ultimate Analyses (%)

Hydrogen	5.1	4.1	4.2
Carbon	63.9	75.1	76.9
Nitrogen	1.3	1.6	1.6
Sulfur	.4	.4	.4
Oxygen	27.4	16.6	17.0
Ash	1.9	2.3	N/A

Heating value
(BTU/lb)

10986	12920	13220
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Sulfur Forms (%)

Sulfate	.01	.01	.01
Pyritic	.10	.12	.12
Organic	.24	.28	.29

Ash

Initial deformation (°F)	not run
Softening temperature (°F)	not run
Fluid temperature (°F)	not run

Free Swelling Index	not run
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Fixed Carbon	
DMMF	59.6

Heating Value	
BTU/lb MFMF	11220.9

Apparent Rank	subbituminous A - HvC bituminous
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Date of Analysis:	2-12-79	Lab No.	K89045
Laboratory:	U.S. Dept. of Energy		
Comments:			

GAS ANALYSES - not runADSORPTION ISOTHERM DATA - not runPETROGRAPHIC ANALYSES - not run

LOCATION

County: Moffat
Location: Sec 18 Twp 4N Rge 94W

Surface Elev (ft) 7895
Coordinates C, E/2, SW/4

GENERAL

CGS Sample No. 63
Sampled By Nir Bhao Singh Khalsa
Operator USGS
Hole No. D-38-EG

Date 8/21/78
Sample Type core

DRILLING DATA

Drilling Co. McCabe Bros. Address Idaho Falls, Idaho
Core Size 2.5" Barrel Length 18'
Type of core retrieval wireline
Drilling media water Air Temperature 85°F
TD Hole 1080' Logs SP, Restivity, Gamma, Density, Caliper

GEOLOGY

Geologic Unit Williams Fork Formation Age Upper Cretaceous
Coal zone/bed unnamed Bed Thickness 16' (core), 19.5' (log)
Depth to top of coal 166.9' (Driller) 163.5' (Log)
Depth to bottom of coal 182.9' (Driller) 183' (Log)
Cored interval 166.9' - 182.9' (Driller)
Roof description shale and siltstone, carbonaceous
Coal description black, pyrite, moderate thin-med. vitrain
banded, mod. shiny, bony 177-178.5' and 182-183'
Floor description interbedded shale, silty sandstone & siltstone, carbonaceous

DESORPTION DATA

Sampled interval (ft) 166.9-182.9' (Driller) 166.9-183' (Log)
Condition of sample representative
Sampled Weight (g) 638
Lost gas time (min) 13 Lost gas cc 70
Desorbed gas cc 85 Residual gas cc/g 0.0
Total gas content cc/g .24 Total gas content cf/t 8

Miscellaneous reference: U.S.G.S. Open File 78-1031, 1978, by Marith
J. Reheis

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
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Proximate Analyses (%)

Moisture	15.8	N/A	N/A
Volatile Matter	33.3	39.5	41.1
Fixed Carbon	47.6	56.6	58.9
Ash	3.3	3.9	N/A

Ultimate Analyses (%)

Hydrogen	5.1	4.0	4.2
Carbon	63.1	75.0	78.0
Nitrogen	1.2	1.5	1.5
Sulfur	.4	.5	.5
Oxygen	26.8	15.1	15.8
Ash	3.3	3.9	N/A

Heating value
(BTU/lb)

10753	12772	13295
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Sulfur Forms (%)

Sulfate	.01	.01	.01
Pyritic	.10	.12	.12
Organic	.32	.38	.40

Ash

Initial deformation (°F)	not run
Softening temperature (°F)	not run
Fluid temperature (°F)	not run

Free Swelling Index not run

<u>Fixed Carbon</u>	
DMMF	59.1

<u>Heating Value</u>	
BTU/lb MMTF	11155.1

<u>Apparent Rank</u>	subbituminous A-HvC bituminous
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Date of Analysis: 1-30-79Laboratory: U.S. Dept. of EnergyLab No. K89041

Comments: _____

GAS ANALYSES - not runADSORPTION ISOTHERM DATA - not runPETROGRAPHIC ANALYSES - not run

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 64

LOCATION

County: Moffat
Location: Sec 18 Twp 4N Rge 94W

Surface Elev (ft) 7895'
Coordinates C, E/2, SW/4

GENERAL

CGS Sample No. 64
Sampled By Nir Bhao Singh Khalsa
Operator USGS
Hole No. D-38-EG

Date 8/22/78
Sample Type core

DRILLING DATA

Drilling Co. McCabe Bros. Address Idaho Falls, Idaho
Core Size 2.5" Barrel Length 18'
Type of core retrieval wireline
Drilling media water Air Temperature 85°F
TD Hole 1080' Logs SP, Resistivity, Gamma, Density, Caliper

GEOLOGY

Geologic Unit Williams Fork Formation Age Upper Cretaceous
Coal zone/bed unnamed Bed Thickness 4.3'
Depth to top of coal 287.5' (Driller) 287.5' (Log)
Depth to bottom of coal 291.8' (Driller) 291.8' (Log)
Cored interval 287.5-291.8' (Driller)
Roof description sandstone, silty, part carbonaceous
Coal description coal, black good cleat in 1 direction, moderate thin - thick vitrain bands
Floor description carbonaceous shale

DESORPTION DATA

Sampled interval (ft) 287.5-288.5' (Driller) 287.5-291.8' (Log)
Condition of sample ?
Sampled Weight (g) 904
Lost gas time (min) 21 Lost gas cc 30
Desorbed gas cc 103 Residual gas cc/g 0.0
Total gas content cc/g .15 Total gas content cf/t 5

Miscellaneous reference: U.S.G.S. Open File 78-1031, 1978, by Marith J. Reheis

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
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Proximate Analyses (%)

Moisture	14.3	N/A	N/A
Volatile Matter	34.8	40.6	43.3
Fixed Carbon	45.5	53.3	56.7
Ash	5.3	6.1	N/A

Ultimate Analyses (%)

Hydrogen	5.3	4.3	4.6
Carbon	62.9	73.4	78.2
Nitrogen	1.1	1.3	1.4
Sulfur	1.2	1.4	1.4
Oxygen	24.3	13.5	14.4
Ash	5.3	6.1	N/A

Heating value
(BTU/lb)

10730	12528	13347
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Sulfur Forms (%)

Sulfate	.01	.01	.01
Pyritic	.14	.16	.17
Organic	1.01	1.18	1.26

Ash

Initial deformation (°F)	not run
Softening temperature (°F)	not run
Fluid temperature (°F)	not run

Free Swelling Index not runFixed Carbon
DMMF 57.1Heating Value
BTU/lb MMMF 11397.6Apparent Rank subbituminous A - HvC bituminousDate of Analysis: 1-30-79Laboratory: U.S. Dept. of EnergyLab No. K89043

Comments: _____

GAS ANALYSES - not runADSORPTION ISOTHERM DATA - not runPETROGRAPHIC ANALYSES - not run

LOCATION

County: Moffat
Location: Sec 18 Twp 4N Rge 94W

Surface Elev (ft) 7895
Coordinates C, E 1/2, SW 1/4

GENERAL

CGS Sample No. 65
Sampled By Nir Bhao Singh Khalsa
Operator USGS
Hole No. D-38-EG

Date 8/22/78
Sample Type core

DRILLING DATA

Drilling Co. McCabe Bros. Address Idaho Falls, ID
Core Size 2.5" Barrel Length 18'
Type of core retrieval wireline
Drilling media mud Air Temperature 85°F
TD Hole 1080' Logs SP, Resistivity, Gamma, Density, Caliper

GEOLOGY

Geologic Unit Williams Fork Formation Age Upper Cretaceous
Coal zone/bed unnamed Bed Thickness 16.6' (core), 20.7' (log)
Depth to top of coal 296.9' (Driller) 294.8' (Log)
Depth to bottom of coal 313.5' (Driller) 315.5' (Log)
Cored interval 296.9-313.5' (Driller)
Roof description carbonaceous shale
Coal description black, hard, conchoidal fracture, shiny, dominant vitrain
Floor description shale and siltstone, carbonaceous

DESORPTION DATA

Sampled interval (ft) 296.9-298.0' (Driller) 296.9-298.0' (Log)
Condition of sample ?
Sampled Weight (g) 862
Lost gas time (min) 9 Lost gas cc 20
Desorbed gas cc 80 Residual gas cc/g 0.0
Total gas content cc/g .12 Total gas content cf/t 4

Miscellaneous reference: U.S.G.S. Open File 78-1031, 1978, by Marith J. Reheis

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
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Proximate Analyses (%)

Moisture	14.6	N/A	N/A
Volatile Matter	33.7	39.5	40.9
Fixed Carbon	48.7	57.0	59.1
Ash	3.0	3.5	N/A

Ultimate Analyses (%)

Hydrogen	5.2	4.1	4.3
Carbon	64.7	75.7	78.4
Nitrogen	1.2	1.4	1.5
Sulfur	.4	.4	.4
Oxygen	25.6	14.8	15.3
Ash	3.0	3.5	N/A

Heating value
(BTU/lb)

11013	12897	13362
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Sulfur Forms (%)

Sulfate	.00	.00	.00
Pyritic	.04	.05	.05
Organic	.32	.37	.39

Ash

Initial deformation (°F)	not run
Softening temperature (°F)	not run
Fluid temperature (°F)	not run

<u>Free Swelling Index</u>	not run
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<u>Fixed Carbon</u>	
DMMF	59.4

<u>Heating Value</u>	
BTU/lb MMMF	11387

<u>Apparent Rank</u>	sub A - HvC bituminous
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Date of Analysis:	1-30-79
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Laboratory:	U.S. Dept. of Energy
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Lab No.	K89046
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Comments:	
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GAS ANALYSES - not runADSORPTION ISOTHERM DATA - not runPETROGRAPHIC ANALYSES - not run

LOCATION

County: Rio Blanco
Location: Sec 28 Twp 3S Rge 101W

Surface Elev (ft) 7894
Coordinates NE, SW, SE,
965' NSL, 1712' WEL

GENERAL

CGS Sample No. 66
Sampled By Nir Bhao Singh Khalsa
Operator Fuelco
Hole No. 0-28-3-101-S

Date 9/9/78
Sample Type core

DRILLING DATA

Drilling Co. Willard Pease Co. Address ?
Core Size 3" Barrel Length 30'
Type of core retrieval conventional
Drilling media mist Air Temperature ?
TD Hole 4347' Logs Dual Induction - Laterolog, Compensated Neutron -
Formation Density

GEOLOGY

Geologic Unit Mesaverde Group Age Upper Cretaceous
Coal zone/bed unnamed Bed Thickness 2 (core), 3 (log)
Depth to top of coal 1582' (Driller) 1588' (Log)
Depth to bottom of coal 1584' (Driller) 1591' (Log)
Cored interval 1564-1595' (Driller)
Roof description shale, dark, gray, carbonaceous, bioturbated
Coal description black, blocky, crumbly, semi-conchoidal fracture, some
boney abundant thin-thick vitrain bands, occasional pyrite
Floor description sandstone, light gray, fine to very fine grained, massive*

DESORPTION DATA

Sampled interval (ft) 1582-1584' (Driller) 1588-1590' (Log)
Condition of sample crumbly
Sampled Weight (g) 1584
Lost gas time (min) 118 Lost gas cc 130
Desorbed gas cc 768 Residual gas cc/g 0.1
Total gas content cc/g .67 Total gas content cf/t 21

Miscellaneous *subparallel laminations of dark gray shaley material,
few shale lenses

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
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Proximate Analyses (%)

Moisture	6.1	N/A	N/A
Volatile Matter	39.8	42.3	46.6
Fixed Carbon	45.5	48.6	53.4
Ash	8.6	9.1	N/A

Ultimate Analyses (%)

Hydrogen	5.6	5.2	5.7
Carbon	68.2	72.7	80.0
Nitrogen	1.7	1.8	2.0
Sulfur	1.4	1.4	1.6
Oxygen	14.5	9.7	10.6
Ash	8.6	9.1	N/A

Heating value
(BTU/lb)

12215	13009	14313
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Sulfur Forms (%)

Sulfate	.01	.01	.01
Pyritic	.69	.73	.81
Organic	.66	.70	.77

Ash

Initial deformation (°F)	2455
Softening temperature (°F)	2565
Fluid temperature (°F)	2655

Free Swelling Index	1.5
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Fixed Carbon	
DMMF	54.0

Heating Value	
BTU/lb MMMF	13500

Apparent Rank	HvB bituminous
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Date of Analysis:	3-9-79
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Laboratory:	U.S. Dept. of Energy
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Lab No.	K90197
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Comments:	
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GAS ANALYSES - not run

ADSORPTION ISOTHERM DATA - not run

PETROGRAPHIC ANALYSES - not run

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 67

LOCATION

County: Rio Blanco Surface Elev (ft) 7894
Location: Sec 28 Twp 3S Rge 101W Coordinates NE, SW, SE, 965' NSL,
1712' WEL

GENERAL

CGS Sample No. 67 Date 9/10/78
Sampled By Nir Bhao Singh Khalsa Sample Type core
Operator Fuelco
Hole No. 0-28-3-101-S

DRILLING DATA

Drilling Co. Willard Pease Drilling Address ?
Core Size 3" Barrel Length 30'
Type of core retrieval conventional
Drilling media mist Air Temperature 65°F
TD Hole 4347' Logs Duel Induction - Laterolog, Compensated Nuetron
Formation Density

GEOLOGY

Geologic Unit Mesaverde Group Age Upper Cretaceous
Coal zone/bed unnamed Bed Thickness 1' (core), 3' (log)
Depth to top of coal 1603' (Driller) 1607' (Log)
Depth to bottom of coal 1604' (Driller) 1610' (Log)
Cored interval 1595-1625' (Driller)
Roof description shale, dark gray, silty, interbedded sandstone stringers*
Coal description blocky, crumbly, conchoidal fracture, thin to thick
vitrain bands are abundant
Floor description sandstone, massive, light gray, fine grain

DESORPTION DATA

Sampled interval (ft) 1603-1604' (Driller) 1607-1608' (Log)
Condition of sample crumbly
Sampled Weight (g) 744
Lost gas time (min) 271 Lost gas cc 200
Desorbed gas cc 164 Residual gas cc/g 0.0
Total gas content cc/g .49 Total gas content cf/t 16

Miscellaneous *in middle, vitrain bands in lower 2'

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
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Proximate Analyses (%)

Moisture	7.2	N/A	N/A
Volatile Matter	38.6	41.6	43.7
Fixed Carbon	49.7	53.6	56.3
Ash	4.5	4.8	N/A

Ultimate Analyses (%)

Hydrogen	5.6	5.2	5.4
Carbon	71.7	77.2	81.2
Nitrogen	1.8	1.9	2.0
Sulfur	.7	.7	.8
Oxygen	15.7	10.0	10.6
Ash	4.5	4.8	N/A

Heating value
(BTU/lb)

12762	13748	14448
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Sulfur Forms (%)

Sulfate	.01	.01	.01
Pyritic	.07	.08	.08
Organic	.61	.66	.69

Ash

Initial deformation (°F)	2500
Softening temperature (°F)	2610
Fluid temperature (°F)	2700

Free Swelling Index not runFixed Carbon
DMMF 56.6Heating Value
BTU/lb MMTF 13430Apparent Rank HvB bituminousDate of Analysis: 3/9/79Laboratory: U.S. Dept. of EnergyLab No. K90196

Comments: _____

GAS ANALYSES - not runADSORPTION ISOTHERM DATA - not runPETROGRAPHIC ANALYSES - not run

LOCATION

County: Moffat
Location: Sec 23 Twp 4N Rge 91W

Surface Elev (ft) 7615'
Coordinates SW/4 SW/4

GENERAL

CGS Sample No. 68
Sampled By C. Tremain
Operator USGS
Hole No. C-1C-H

Date 9/9/78
Sample Type core

DRILLING DATA

Drilling Co. McCabe Bros., Inc. Address Idaho Falls, Idaho
Core Size 2 3/8" Barrel Length 17'
Type of core retrieval wireline
Drilling media mud Air Temperature 80°F
TD Hole 876' Logs Gamma, SP, Density, Resistance, Caliper, High Resolution Density

GEOLOGY

Geologic Unit Williams Fork Formation Age Upper Cretaceous
Coal zone/bed unknown Bed Thickness 20.6'
Depth to top of coal 176.5' (Driller) same (Log)
Depth to bottom of coal 197.1' (Driller) same (Log)
Cored interval 173.7-207.7' (Driller)
Roof description med-dk gray laminated shale, carb stringers at base
Coal description pyrite in cleats, mod. shiny, dominant thick vitrain stringers, poor cleavage directions, top 2', 1/4 split desorbed
Floor description dark gray, laminated siltstone with bituminous stringers

DESORPTION DATA

Sampled interval (ft) 176.5-178.5' (Driller) same (Log)
Condition of sample 1/4 split desorbed
Sampled Weight (g) 703
Lost gas time (min) 10 Lost gas cc 50
Desorbed gas cc 30 Residual gas cc/g 0.0
Total gas content cc/g .11 Total gas content cf/t 4

Miscellaneous _____

Reference: Geophysical Logs of 9 Holes Drilled in 1978 in the Yampa Coal Field, Hamilton and Pagoda Quadrangles, Moffat County, Colorado, 1982, by Richard F. Meyer and Robert R. Brown, USGS Open File Report 82-475.

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
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Proximate Analyses (%)

Moisture	14.7	N/A	N/A
Volatile Matter	34.5	40.4	42.1
Fixed Carbon	47.5	55.8	57.9
Ash	3.3	3.8	N/A

Ultimate Analyses (%)

Hydrogen	5.6	4.6	4.8
Carbon	63.3	74.2	77.2
Nitrogen	1.5	1.7	1.8
Sulfur	.7	.8	.8
Oxygen	25.7	14.8	15.4
Ash	3.3	3.8	N/A

Heating value
(BTU/lb)

10876	12755	13263
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Sulfur Forms (%)

Sulfate	.01	.01	.01
Pyritic	.20	.23	.24
Organic	.47	.55	.57

Ash

Initial deformation (°F)	not run
Softening temperature (°F)	not run
Fluid temperature (°F)	not run

Free Swelling Index	not run
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Fixed Carbon

DMMF	58.3
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Heating Value

BTU/lb MMEF	11286.7
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Apparent Rank	sub A-HvC Bituminous
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Date of Analysis: 1-30-79Laboratory: U.S. Dept. of EnergyLab No. K89040

Comments: _____

GAS ANALYSES - not runADSORPTION ISOTHERM DATA - not runPETROGRAPHIC ANALYSES - not run

LOCATION

County: Moffat
Location: Sec 23 Twp 4N Rge 91W

Surface Elev (ft) 7615'
Coordinates SW/4 SW/4

GENERAL

CGS Sample No. 69
Sampled By Nir Bhao Singh Khalsa
Operator USGS
Hole No. C-1C-H

Date 9/21/78
Sample Type core

DRILLING DATA

Drilling Co. McCabe Bros. Address Idaho Falls
Core Size 2.5" Barrel Length 18'
Type of core retrieval wireline
Drilling media mud Air Temperature 65°F
TD Hole 876' Logs Gamma, SP, Density, Resistance, Caliper, High Resolution Density

GEOLOGY

Geologic Unit Williams Fork Formation Age Upper Cretaceous
Coal zone/bed unknown Bed Thickness 20'
Depth to top of coal 644' (Driller) same (Log)
Depth to bottom of coal ? (Driller) 664' (Log)
Cored interval 635-647.6' (Driller)
Roof description interbedded gray siltstone and shale
Coal description coal--black and friable, occ boney, moderately bright attrital dominant with few very fine vitrain bands, minor pyrite or cleats
Floor description not cored, appears shaley on logs

DESORPTION DATA

Sampled interval (ft) 644-647.6' (Driller) same (Log)
Condition of sample mostly 1/2" to 2" pieces
Sampled Weight (g) 782
Lost gas time (min) 5.5 Lost gas cc 20
Desorbed gas cc 51 Residual gas cc/g 0.0
Total gas content cc/g 0.9 Total gas content cf/t 3

Miscellaneous _____

Reference: Geophysical logs of 9 holes drilled in 1978 in the Yampa Coal Field, Hamilton and Pagoda Quadrangles, Moffat County, Colorado, 1982, by Richard F. Meyers and Robert R. Brown, USGS Open File Report 82-475.

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
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Proximate Analyses (%)

Moisture	10.4	N/A	N/A
Volatile Matter	33.1	36.9	40.6
Fixed Carbon	48.5	54.2	59.4
Ash	8.0	8.9	N/A

Ultimate Analyses (%)

Hydrogen	5.2	4.5	4.9
Carbon	62.5	69.7	76.6
Nitrogen	1.1	1.2	1.3
Sulfur	.8	.9	.9
Oxygen	22.5	14.8	16.3
Ash	8.0	8.9	N/A

Heating value
(BTU/lb)

10934	12200	13398
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Sulfur Forms (%)

Sulfate	not run
Pyritic	not run
Organic	not run

Ash

Initial deformation (°F)	2610
Softening temperature (°F)	2720
Fluid temperature (°F)	2800+

Free Swelling Index	.0
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Fixed Carbon	
DMMF	60.1

Heating Value	
BTU/lb MMMF	11982

Apparent Rank	hVc Bituminous
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Date of Analysis:	2-5-79
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Laboratory:	U.S. Dept. of Energy
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Lab No.	K89077
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Comments:	
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GAS ANALYSES - not runADSORPTION ISOTHERM DATA - not runPETROGRAPHIC ANALYSES - not run

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 70

LOCATION

County: Moffat
Location: Sec 23 Twp 4N Rge 91W

Surface Elev (ft) 7615
Coordinates SW/4 SW/4

GENERAL

CGS Sample No. 70
Sampled By Nir Bhao Singh Khalsa
Operator USGS
Hole No. C-1C-H

Date 9/23/78
Sample Type core

DRILLING DATA

Drilling Co. McCabe Bros. Address Idaho Falls, Idaho
Core Size 2.5" Barrel Length 18'
Type of core retrieval wireline
Drilling media mud Air Temperature 78°F
TD Hole 876' Logs Gamma, SP, Density, Resistance, Caliper, High
Resolution Density

GEOLOGY

Geologic Unit Williams Fork Formation Age Upper Cretaceous
Coal zone/bed unknown Bed Thickness 32'
Depth to top of coal 720.9' (Driller) same (Log)
Depth to bottom of coal ? (Driller) 753' (Log)
Cored interval 718.9-723.9' (Driller)
Roof description carbonaceous shale, dark gray, fissile, few vitrain bands
Coal description black, predominantly attrital, moderately bright, 20% fine
1-3 mm vitrain bands, minor pyrite & amber, strong vertical fractures with
trace slickensides
Floor description not cored, appears shaley on logs

DESORPTION DATA

Sampled interval (ft) 720.9-723.9' (Driller) same (Log)
Condition of sample core badly broken, 1/2 sample very small fragments, rest
up to 2"
Sampled Weight (g) 758
Lost gas time (min) 11.5 Lost gas cc 0
Desorbed gas cc 0 Residual gas cc/g 0.0
Total gas content cc/g 0 Total gas content cf/t 0

Miscellaneous Reference: Geophysical Logs of 9 Holes Drilled in 1978 in
the Yampa Coal Field, Hamilton and Pagoda Quadrangles, Moffat County,
Colorado, 1982, by Richard F. Meyers and Robert R. Brown, USGS Open File
Report 82-475.

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
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Proximate Analyses (%)

Moisture	11.4	N/A	N/A
Volatile Matter	35.3	39.9	42.7
Fixed Carbon	47.3	53.5	57.3
Ash	5.9	6.6	N/A

Ultimate Analyses (%)

Hydrogen	5.2	4.4	4.7
Carbon	63.5	71.7	76.8
Nitrogen	1.2	1.3	1.4
Sulfur	.6	.7	.8
Oxygen	23.6	15.2	16.3
Ash	5.9	6.6	N/A

Heating value
(BTU/lb)

11052	12477	13361
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Sulfur Forms (%)

Sulfate	not run
Pyritic	not run
Organic	not run

Ash

Initial deformation (°F)	2510
Softening temperature (°F)	2620
Fluid temperature (°F)	2710

Free Swelling Index	.0
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Fixed Carbon	
DMMF	57.6

Heating Value	
BTU/lb MMMF	11814

Apparent Rank	hVc Bituminous
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Date of Analysis:	2-6-79
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Laboratory:	U.S. Dept. of Energy
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Lab No.	K89078
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Comments:	
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GAS ANALYSES - not runADSORPTION ISOTHERM DATA - not runPETROGRAPHIC ANALYSES - not run

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 71

LOCATION

County: Moffat
Location: Sec 23 Twp 4N Rge 91W

Surface Elev (ft) 7615'
Coordinates SW/4, SW/4

GENERAL

CGS Sample No. 71
Sampled By Nir Bhao Singh Khalsa
Operator USGS
Hole No. C-1C-H

Date 9/25/78
Sample Type core

DRILLING DATA

Drilling Co. McCabe Bros. Address Idaho Springs, Colo.
Core Size 2.5" Barrel Length 18'
Type of core retrieval wireline
Drilling media thin mud Air Temperature 85°F
TD Hole 876' Logs Gamma, SP, Density, Resistance, Caliper, High Resolution Density

GEOLOGY

Geologic Unit Williams Fork Formation Age Upper Cretaceous
Coal zone/bed unknown Bed Thickness 9'
Depth to top of coal 766.3' (Driller) same (Log)
Depth to bottom of coal 775.3' (Driller) (Log)
Cored interval 766.3-775.3' (Driller)
Roof description gray siltstone with fine carb. stringers just above coal
Coal description black, v. hard, moderate to bright attrital predominates, vitrain bands up to 1 cm. Vertical fractures with 5% pyrite
Floor description gray siltstone

DESORPTION DATA

Sampled interval (ft) 766.3-775.3' (Driller) same (Log)
Condition of sample mostly large 2" fragments
Sampled Weight (g) 765
Lost gas time (min) 7.5 Lost gas cc 50
Desorbed gas cc 334 Residual gas cc/g 0.0
Total gas content cc/g .50 Total gas content cf/t 16

Miscellaneous Reference: Geophysical Logs of 9 Holes Drilled in 1978 in the Yampa Coal Field, Hamilton and Pagoda Quadrangles, Moffat County, Colorado, 1982, by Richard F. Meyers and Robert R. Brown, USGS Open File Report 82-475.

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
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Proximate Analyses (%)

Moisture	12.0	N/A	N/A
Volatile Matter	34.8	39.6	41.5
Fixed Carbon	49.1	55.9	58.5
Ash	4.0	4.5	N/A

Ultimate Analyses (%)

Hydrogen	5.2	4.4	4.6
Carbon	64.3	73.1	76.5
Nitrogen	1.5	1.6	1.7
Sulfur	.6	.6	.7
Oxygen	24.5	15.7	16.4
Ash	4.0	4.5	N/A

Heating value
(BTU/lb)

11126	12645	13239
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Sulfur Forms (%)

Sulfate	not run
Pyritic	not run
Organic	not run

Ash

Initial deformation (°F)	2210
Softening temperature (°F)	2320
Fluid temperature (°F)	2410

Free Swelling Index .0

Fixed Carbon
DMMF 58.8

Heating Value
BTU/lb MMMF 11637.1

Apparent Rank hvC Bituminous

Date of Analysis: 2-6-79

Laboratory: U.S. Dept. of Energy

Lab No. K89079

Comments:

GAS ANALYSES - not run

ADSORPTION ISOTHERM DATA - not run

PETROGRAPHIC ANALYSES - not run

LOCATION

County: Moffat
Location: Sec 23 Twp 4N Rge 91W

Surface Elev (ft) 7615'
Coordinates SW/4, SW/4

GENERAL

CGS Sample No. 72
Sampled By Nir Bhao Singh Khalsa
Operator USGS
Hole No. C-1C-H

Date 9/26/78
Sample Type core

DRILLING DATA

Drilling Co. McCabe Bros. Address Idaho Falls, Idaho
Core Size 2.5" Barrel Length 18'
Type of core retrieval wireline
Drilling media mud Air Temperature 83°F
TD Hole 876' Logs Gamma, SP, Density, Resistance, Caliper, High Resolution Density

GEOLOGY

Geologic Unit Williams Fork Formation Age Upper Cretaceous
Coal zone/bed unknown Bed Thickness ?
Depth to top of coal 799.8' (Driller) not logged (Log)
Depth to bottom of coal ? (Driller) not logged (Log)
Cored interval 799.8-807.1' (Driller)
Roof description very silty - gray - soft clay
Coal description black, solid, mod. bright attrital with few vitrain bands, few fractures filled with calcite and pyrite
Floor description not cored or logged

DESORPTION DATA

Sampled interval (ft) 799.8-807.1' (Driller) not logged (Log)
Condition of sample 3" dominant with some smaller pieces
Sampled Weight (g) 706
Lost gas time (min) 8.5 Lost gas cc 70
Desorbed gas cc 56 Residual gas cc/g 0.0
Total gas content cc/g .18 Total gas content cf/t 6

Miscellaneous Reference: Geophysical Logs of 9 Holes Drilled in 1978 in the Yampa Coal Field, Hamilton and Pagoda Quadrangles, Moffat County, Colorado, 1982, by Richard F. Meyers and Robert R. Brown, USGS Open File Report 82-475

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
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Proximate Analyses (%)

Moisture	9.2	N/A	N/A
Volatile Matter	42.0	46.2	49.0
Fixed Carbon	43.6	48.1	51.0
Ash	5.2	5.7	N/A

Ultimate Analyses (%)

Hydrogen	5.5	4.9	5.2
Carbon	66.2	72.9	77.3
Nitrogen	1.3	1.4	1.5
Sulfur	.7	.8	.8
Oxygen	21.2	14.4	15.2
Ash	5.2	5.7	N/A

Heating value
(BTU/lb)

11443	12599	13360
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Sulfur Forms (%)

Sulfate	not run
Pyritic	not run
Organic	not run

Ash

Initial deformation (°F)	2460
Softening temperature (°F)	2570
Fluid temperature (°F)	2650

Free Swelling Index	.0
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Fixed Carbon	
DMMF	51.3

Heating Value	
BTU/lb MMMF	12136.3

Apparent Rank	HvC bituminous
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Date of Analysis:	2-6-79
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Laboratory:	U.S. Dept. of Energy
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Lab No.	K89080
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Comments:	
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GAS ANALYSES - not runADSORPTION ISOTHERM DATA - not runPETROGRAPHIC ANALYSES - not run

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 73

LOCATION

County: Rio Blanco
Location: Sec 14 Twp 3S Rge 101W

Surface Elev (ft) 6931
Coordinates 1720'FSL, 1259'FEL,
NE 1/4, SE 1/4

GENERAL

CGS Sample No. 73
Sampled By Choate & McCord
Operator Twin Arrow, Inc.
Hole No. C & K 4-14

Date 11-30-78
Sample Type core

DRILLING DATA

Drilling Co. Twin Arrow Address Rangely, Colorado
Core Size 2" Barrel Length 60'
Type of core retrieval conventional
Drilling media air Air Temperature ?
TD Hole 2500' Logs Duel Induction, Micro Laterolog, Dual Laterolog,
Acoustilog, Densilog, Densilog-Neutron, Diplog,
Spectralog

GEOLOGY

Geologic Unit Mesaverde Group Age Upper Cretaceous
Coal zone/bed unknown Bed Thickness .4'
Depth to top of coal 685.2' (Driller) ? (Log)
Depth to bottom of coal 685.6' (Driller) ? (Log)
Cored interval 631-685.8' (Driller)
Roof description dark gray-black carbonaceous shale
Coal description well fractured black vitreous coal, conchoidal
fractures, plant fragments
Floor description dark gray carbonaceous shale w/ thin laminations,
gradually grading into massive bedded dk. gray sh.

DESORPTION DATA

Sampled interval (ft) 685.2-685.6' (Driller) ? (Log)
Condition of sample 5 pieces - 1/2" thick, cylindrical
Sampled Weight (g) 355
Lost gas time (min) 186 Lost gas cc 890
Desorbed gas cc 345 Residual gas cc/g 0.1
Total gas content cc/g 3.58 Total gas content cf/t 115

Miscellaneous Sample is 53.5% ash

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
<u>Proximate Analyses (%)</u>			
Moisture	4.6	N/A	N/A
Volatile Matter	21.4	22.4	51.1
Fixed Carbon	20.5	21.5	48.9
Ash	53.5	56.1	N/A
<u>Ultimate Analyses (%)</u>			
Hydrogen	3.2	2.8	6.4
Carbon	31.4	32.9	75.0
Nitrogen	1.1	1.2	2.7
Sulfur	.9	1.0	2.2
Oxygen	9.8	6.0	13.6
Ash	53.5	56.1	N/A
<u>Heating value</u> (BTU/lb)	5527	5794	13200
<u>Sulfur Forms (%)</u>			
Sulfate	not run		
Pyritic	not run		
Organic	not run		
<u>Ash</u>			
Initial deformation (°F)	2690+		
Softening temperature (°F)	2800+		
Fluid temperature (°F)	2800+		
<u>Free Swelling Index</u>	not run		
<u>Fixed Carbon</u>			
DMMF	54.86		
<u>Heating Value</u>			
BTU/lb MMMF	13138.4		
<u>Apparent Rank</u>	coaly shale		
Date of Analysis:	5-4-79		
Laboratory:	U.S. Dept. of Energy		Lab No. K92135
Comments:	"is not coal"		

GAS ANALYSES - not runADSORPTION ISOTHERM DATA - not runPETROGRAPHIC ANALYSES - not run

LOCATION

County: Rio Blanco Surface Elev (ft) 6931
Location: Sec 14 Twp 3S Rge 101W Coordinates 1720' FSL, 1259' FEL,
NE 1/4, SE 1/4,

GENERAL

CGS Sample No. 74 Date 12/01/78
Sampled By Choate/McCord Sample Type core
Operator Twin Arrow
Hole No. C & K 4-14

DRILLING DATA

Drilling Co. Twin Arrow Address Rangely, Colorado
Core Size 2" Barrel Length 60'
Type of core retrieval conventional
Drilling media air Air Temperature ?
TD Hole 2500' Logs Duel Induction, Micro-Laterolog, Duel Laterolog,
Acoustilog, Densilog, Densilog-Neutron, Diplog,
Spectralog

GEOLOGY

Geologic Unit Mesaverde Group Age Upper Cretaceous
Coal zone/bed unnamed Bed Thickness .35'
Depth to top of shale 698.1' (Driller) ? (Log)
Depth to bottom of shale 698.45' (Driller) ? (Log)
Cored interval 691.8-748.3' (Driller)
Roof description massive bedded - medium grain, sandstone, dk/gy w/ carb
stringers
Sample description gray-black carb. sh. w/ vitreous coal stingers and a
siltstone lens
Floor description dark gray carbonaceous shale

DESORPTION DATA

Sampled interval (ft) 698.1-698.45' (Driller) ? (Log)
Condition of sample ?
Sampled Weight (g) 353
Lost gas time (min) 505 Lost gas cc 1825
Desorbed gas cc 250 Residual gas cc/g 0.8
Total gas content cc/g 6.68 Total gas content cf/t 214

Miscellaneous sample is carb. shale

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
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Proximate Analyses (%)

Moisture	2.6	N/A	N/A
Volatile Matter	15.7	16.1	54.0
Fixed Carbon	13.3	13.7	46.0
Ash	68.4	70.2	N/A

Ultimate Analyses (%)

Hydrogen	2.6	2.4	8.1
Carbon	21.5	22.0	73.9
Nitrogen	.8	.8	2.8
Sulfur	.5	.6	1.9
Oxygen	6.2	4.0	13.5
Ash	68.4	70.2	N/A

Heating value
(BTU/lb)

3728	3826	12842
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Sulfur Forms (%)

Sulfate	.03	.03	.10
Pyritic	.40	.41	1.38
Organic	.12	.12	.41

Ash

Initial deformation (°F)	2710
Softening temperature (°F)	2800+
Fluid temperature (°F)	2800+

<u>Free Swelling Index</u>	.0
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<u>Fixed Carbon</u>	
<u>DMMF</u>	56.87

<u>Heating Value</u>	
<u>BTU/lb MMMF</u>	14323

<u>Apparent Rank</u>	not coal - carb. sh
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<u>Date of Analysis:</u>	5-2-79
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<u>Laboratory:</u>	U.S. Dept. of Energy
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<u>Lab No.</u>	K92136
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<u>Comments:</u>	
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GAS ANALYSES - not run

ADSORPTION ISOTHERM DATA - not run

PETROGRAPHIC ANALYSES - not run

LOCATION

County: Rio Blanco Surface Elev (ft) 6931
Location: Sec 14 Twp 3S Rge 101W Coordinates 1720 FSL, 1259 FEL,
NE 1/4, SE 1/4

GENERAL

CGS Sample No. 75 Date 12-1-78
Sampled By R. Choate Sample Type core
Operator Twin Arrow
Hole No. C & K 4-14

DRILLING DATA

Drilling Co. Twin Arrow Address Rangely, Colorado
Core Size 2" Barrel Length 60'
Type of core retrieval conventional
Drilling media Air Air Temperature _____
TD Hole 2500' Logs Dual Induction, Micro-Laterilog, Dual Laterolog,
Acoustilog, Densilog, Densilog-Neutron, Diplog,
Spectralog

GEOLOGY

Geologic Unit Mesaverde Group Age Upper Cretaceous
Coal zone/bed unnamed Bed Thickness 2.8'
Depth to top of coal 771' (Driller) ? _____ (Log)
Depth to bottom of coal 773.8' (Driller) ? _____ (Log)
Cored interval 748.3-773.8' (Driller)
Roof description carbonaceous shale with coal
Sample description pieces of carbonaceous siltstone with a few coal
stringers
Floor description carbonaceous shale - highly fractured

DESORPTION DATA

772.35-772.65
Sampled interval (ft) 773.35-773.65 (Driller) ? _____ (Log)
Condition of sample several small pieces
Sampled Weight (g) 393
Lost gas time (min) 141 Lost gas cc 240
Desorbed gas cc 329 Residual gas cc/g 0.0
Total gas content cc/g 1.45 Total gas content cf/t 46

Miscellaneous sample is carbonaceous siltstone

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
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Proximate Analyses (%)

Moisture	3.3	N/A	N/A
Volatile Matter	9.9	10.3	96.9
Fixed Carbon	.3	.3	3.1
Ash	86.4	89.4	N/A

Ultimate Analyses (%)

Hydrogen	.9	.5	5.0
Carbon	4.7	4.9	46.0
Nitrogen	.4	.4	3.4
Sulfur	.3	.3	2.4
Oxygen	7.4	4.6	43.5
Ash	86.4	89.4	N/A

Heating value
(BTU/lb)

404	418	3945
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Sulfur Forms (%)

Sulfate	.01	.01	.10
Pyritic	.12	.12	1.17
Organic	.12	.12	1.17

Ash

Initial deformation (°F) not run

Softening temperature (°F) not run

Fluid temperature (°F) not run

Free Swelling Index not run

Fixed Carbon

DMMF 7.9

Heating Value

BTU/lb DMMF 5963.5

Apparent Rank not coal - carb siltstone

Date of Analysis: 5-9-79

Laboratory: U.S. Dept. of Energy

Lab No. K92137

Comments: is not coal

GAS ANALYSES - not run

ADSORPTION ISOTHERM DATA - not run

PETROGRAPHIC ANALYSES - not run

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 76

LOCATION

County: Rio Blanco Surface Elev (ft) 6931
Location: Sec 14 Twp 3S Rge 101W Coordinates NE 1/4, SE 1/4,
1720 FSL, 1259 FEL

GENERAL

CGS Sample No. 76 Date 12-1-78
Sampled By R. Choate Sample Type core
Operator Twin Arrow
Hole No. C & K 4-14

DRILLING DATA

Drilling Co. Twin Arrow Address Rangely, Colorado
Core Size 2" Barrel Length 60'
Type of core retrieval conventional
Drilling media air Air Temperature ?
TD Hole 2500' Logs Duel Induction, Micro-Laterolog, Duel Laterolog,
Acoustilog, Densilog, Densilog-Neutron, Diplog,
Spectralog

GEOLOGY

Geologic Unit Mesaverde Group Age Upper Cretaceous
Coal zone/bed unnamed Bed Thickness ?
Depth to top of coal 770.88'(Driller) ? (Log)
Depth to bottom of coal 771.45'(Driller) ? (Log)
Cored interval 748.3-773.8' (Driller)
Roof description carbonaceous shale, fractured, dk/gy-blk, some thin coal
seams with tan inclusions and stringers
Coal description dark gray, carbonaceous shale, rich in coal lenses
Floor description carbonaceous shale with coal lenses

DESORPTION DATA

Sampled interval (ft) 770.88-771.45 (Driller) ? (Log)
Condition of sample 4 peices, 1/4-2" in size
Sampled Weight (g) 593
Lost gas time (min) 147 Lost gas cc 180
Desorbed gas cc 270 Residual gas cc/g 0.0
Total gas content cc/g .76 Total gas content cf/t 24

Miscellaneous sample is carbonaceous shale

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
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Proximate Analyses (%)

Moisture	3.0	N/A	N/A
Volatile Matter	9.0	9.3	71.6
Fixed Carbon	3.6	3.7	28.4
Ash	84.4	87.0	N/A

Ultimate Analyses (%)

Hydrogen	1.3	1.0	7.8
Carbon	7.4	7.6	58.7
Nitrogen	.5	.5	3.8
Sulfur	.3	.3	2.5
Oxygen	6.1	3.5	27.2
Ash	84.4	87.0	N/A

Heating value
(BTU/lb)

1190	1227	9467
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Sulfur Forms (%)

Sulfate	.03	.03	.24
Pyritic	.22	.23	1.75
Organic	.07	.07	.56

Ash

Initial deformation (°F)	2800+
Softening temperature (°F)	2800+
Fluid temperature (°F)	2800+

Free Swelling Index	0.0
Fixed Carbon	
DMMF	62.55
Heating Value	
BTU/lb MMTF	13,532
Apparent Rank	not coal - carb. shale

Date of Analysis:	5-4-79	Lab No.	K92138
Laboratory:	U.S. Dept. of Energy		
Comments:	is not coal		

GAS ANALYSES - not runADSORPTION ISOTHERM DATA - not runPETROGRAPHIC ANALYSES - not run

LOCATION

County: Rio Blanco Surface Elev (ft) 6931
Location: Sec 14 Twp 3S Rge 101W Coordinates NE 1/4, SE 1/4,
1720 FSL, 1259 FEL

GENERAL

CGS Sample No. 77 Date 12-1-78
Sampled By R. Choate Sample Type core
Operator Twin Arrow
Hole No. C & K 4-14

DRILLING DATA

Drilling Co. Twin Arrow Address Rangely, Colorado
Core Size 2" Barrel Length 60'
Type of core retrieval conventional
Drilling media air Air Temperature ?
TD Hole 2500' Logs Duel Induction, Micro-Laterolog, Duel Laterolog,
Acoustilog, Densilog, Densilog-Nuetron, Diplog,
Spectralog

GEOLOGY

Geologic Unit Mesaverde Group Age Upper Cretaceous
Coal zone/bed unnamed Bed Thickness .8'
Depth to top of coal 759.2' (Driller) ? (Log)
Depth to bottom of coal 760' (Driller) ? (Log)
Cored interval 748.3-773.8' (Driller)
Roof description massive fine grained ss, some inclusion of carb. material
Coal description cleavage fractures in 1 direction and conchoidal
fractures in vitrain bands
Floor description coaly carbonaceous shale, fractured

DESORPTION DATA

Sampled interval (ft) 759.2-760 (Driller) ? (Log)
Condition of sample approx. 8 pieces, largest 2" x .2"
Sampled Weight (g) 397
Lost gas time (min) 250 Lost gas cc 400
Desorbed gas cc 351 Residual gas cc/g 0.8
Total gas content cc/g 2.69 Total gas content cf/t 86

Miscellaneous _____

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
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Proximate Analyses (%)

Moisture	5.1	N/A	N/A
Volatile Matter	33.8	35.7	46.9
Fixed Carbon	38.3	40.3	53.1
Ash	22.8	24.0	N/A

Ultimate Analyses (%)

Hydrogen	4.8	4.4	5.8
Carbon	57.1	60.2	79.2
Nitrogen	1.7	1.8	2.4
Sulfur	.9	1.0	1.3
Oxygen	12.7	8.6	11.3
Ash	22.8	24.0	N/A

Heating value
(BTU/lb)

10137	10686	14060
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Sulfur Forms (%)

Sulfate	.01	.01	.01
Pyritic	.10	.11	.14
Organic	.82	.86	1.14

Ash

Initial deformation (°F)	2800+
Softening temperature (°F)	2800+
Fluid temperature (°F)	2800+

Free Swelling Index 1.0Fixed Carbon

DMMF 54.7

Heating Value

BTU/lb MMMF 13477

Apparent Rank HvB bituminousDate of Analysis: 5/2/79Laboratory: U.S. Dept. of EnergyLab No. K92139

Comments: _____

GAS ANALYSES - not runADSORPTION ISOTHERM DATA - not runPETROGRAPHIC ANALYSES - not run

LOCATION

County: Rio Blanco Surface Elev (ft) 6931
Location: Sec 14 Twp 3S Rge 101W Coordinates NE 1/4, SE 1/4
1720' FSL, 1259' FEL

GENERAL

CGS Sample No. 78 Date 12-2-78
Sampled By R. Choate Sample Type core
Operator Twin Arrow
Hole No. C & K 4-14

DRILLING DATA

Drilling Co. Twin Arrow Address Rangely, Colorado
Core Size 2" Barrel Length 60'
Type of core retrieval conventional
Drilling media air mist Air Temperature ?
TD Hole 2500' Logs Duel Induction, Micro-Laterolog, Duel Laterolog,
Acoustilog, Densilog, Densilog-Neutron, Diplog,
Spectralog

GEOLOGY

Geologic Unit Mesaverde Group Age Upper Cretaceous
Coal zone/bed unnamed Bed Thickness 1.6'
Depth to top of coal 808.1' (Driller) ? (Log)
Depth to bottom of coal 809.7' (Driller) ? (Log)
Cored interval 773.8-827.7' (Driller)
Roof description carbonaceous shale
Coal description black, slickensides, amber, calcite, pyrite, banded
vitrain and attrital, conchoidal fracture in thick vitrain band
Floor description carb. sh. w/irregular stringers of coal

DESORPTION DATA

Sampled interval (ft) 809.3-809.7 (Driller) ? (Log)
Condition of sample 4 pieces, 3 are 1 x 2" size
Sampled Weight (g) 132
Lost gas time (min) 243 Lost gas cc 340
Desorbed gas cc 334 Residual gas cc/g 2.5
Total gas content cc/g 7.61 Total gas content cf/t 243

Miscellaneous _____

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
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Proximate Analyses (%)

Moisture	5.8	N/A	N/A
Volatile Matter	35.3	37.5	45.2
Fixed Carbon	42.8	45.4	54.8
Ash	16.1	17.1	N/A

Ultimate Analyses (%)

Hydrogen	5.1	4.7	5.7
Carbon	62.2	66.1	79.7
Nitrogen	1.7	1.8	2.2
Sulfur	1.0	1.0	1.2
Oxygen	13.9	9.3	11.2
Ash	16.1	17.1	N/A

Heating value
(BTU/lb)

10921	11593	13982
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Sulfur Forms (%)

Sulfate	.01	.01	.01
Pyritic	.24	.25	.31
Organic	.72	.76	.92

Ash

Initial deformation (°F)	2800+
Softening temperature (°F)	2800+
Fluid temperature (°F)	2800+

Free Swelling Index 1.0Fixed CarbonDMMF 55.9Heating ValueBTU/lb MMMF 13247Apparent Rank HvB bituminousDate of Analysis: 5/2/79Laboratory: U.S. Dept. of EnergyLab No. K92140

Comments: _____

GAS ANALYSIS - not runADSORPTION ISOTHERM DATA - not runPETROGRAPHIC ANALYSES - not run

LOCATION

County: Rio Blanco Surface Elev (ft) 6931
Location: Sec 14 Twp 3S Rge 101W Coordinates NE 1/4, SE 1/4,
1720' FSL, 1259' FEL

GENERAL

CGS Sample No. 79 Date 12/2/78
Sampled By R. Choate Sample Type core
Operator Twin Arrow
Hole No. C & K 4-14

DRILLING DATA

Drilling Co. Twin Arrow Address Rangely, Colorado
Core Size 2" Barrel Length 60'
Type of core retrieval conventional
Drilling media air mist Air Temperature _____
TD Hole 2500' Logs Dual Induction, Micro-Laterolog, Dual Laterolog,
Acoustilog, Densilog, Densilog-Neutron, Diplog, Spectralog

GEOLOGY

Geologic Unit Mesaverde Group Age Upper Cretaceous
Coal zone/bed Unnamed Bed Thickness 4.8'
Depth to top of coal 800.6' (Driller) ? (Log)
Depth to bottom of coal 805.4' (Driller) ? (Log)
Cored interval 773.8 - 827.7' (Driller)
Roof description carbonaceous shale with many thin coal stringers
Coal description clean black, good cleavage in one direction, dominant thin to thick vitrain lenses, some pyrite
Floor description carbonaceous shale

DESORPTION DATA

Sampled interval (ft) 801.9-802.6 (Driller) ? (Log)
Condition of sample 2" and 1" size pieces
Sampled Weight (g) 306
Lost gas time (min) 319 Lost gas cc 400
Desorbed gas cc 262 Residual gas cc/g 0.6
Total gas content cc/g 2.76 Total gas content cf/t 88

Miscellaneous _____

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
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Proximate Analyses (%)

Moisture	6.2	N/A	N/A
Volatile Matter	37.7	40.2	45.6
Fixed Carbon	45.0	48.0	54.4
Ash	11.1	11.8	N/A

Ultimate Analyses (%)

Hydrogen	5.3	4.9	5.6
Carbon	65.6	69.9	79.3
Nitrogen	1.7	1.9	2.1
Sulfur	.9	1.0	1.1
Oxygen	15.3	10.4	11.8
Ash	11.1	11.8	N/A

Heating value
(BTU/lb)

11496	12255	13899
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Sulfur Forms (%)

Sulfate	.01	.01	.01
Pyritic	.14	.15	.17
Organic	.77	.82	.93

Ash

Initial deformation (°F)	2800+
Softening temperature (°F)	2800+
Fluid temperature (°F)	2800+

Free Swelling Index	1.0
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Fixed Carbon	
DMMF	55.2

Heating Value	
BTU/lb MMMF	13084

Apparent Rank	HvB bituminous
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Date of Analysis:	5/2/79
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Laboratory:	U.S. Dept. of Energy
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Lab No.	K92141
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Comments:	
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GAS ANALYSES - not runADSORPTION ISOTHERM DATA - not runPETROGRAPHIC ANALYSES - not run

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 80

LOCATION

County: Rio Blanco
Location: Sec 14 Twp 3S Rge 101W

Surface Elev (ft) 6931
Coordinates NE/4 SE/4,
1720' FSL, 1259' FEL

GENERAL

CGS Sample No. 80
Sampled By R. Choate
Operator Twin Arrow
Hole No. C & K 4-14

Date 12/2/78
Sample Type core

DRILLING DATA

Drilling Co. Twin Arrow Address Rangely, Colorado
Core Size 2" Barrel Length 60'
Type of core retrieval conventional
Drilling media air mist Air Temperature ?
TD Hole 2500' Logs Dual Induction, Micro-Laterolog, Dual Laterolog,
Acoustilog, Densilog, Densilog-Neutron, Diplog, Spectralog

GEOLOGY

Geologic Unit Mesaverde Group Age Upper Cretaceous
Coal zone/bed unnamed Bed Thickness 4.8'
Depth to top of coal 800.6' (Driller) ? (Log)
Depth to bottom of coal 805.4' (Driller) ? (Log)
Cored interval 773.8 - 827.7' (Driller)
Roof description carbonaceous shale with many thin coal stringers
Coal description dull, dark gray - brown carb. shale with numerous coal stringers
Floor description carbonaceous shale

DESORPTION DATA

Sampled interval (ft) 804.5-805 (Driller) (Log)
Condition of sample a single piece .55' long
Sampled Weight (g) 643
Lost gas time (min) 327 Lost gas cc 440
Desorbed gas cc 353 Residual gas cc/g 0.2
Total gas content cc/g 1.43 Total gas content cf/t 46

Miscellaneous _____

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
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Proximate Analyses (%)

Moisture	5.3	N/A	N/A
Volatile Matter	22.1	23.4	45.7
Fixed Carbon	26.4	27.8	54.3
Ash	46.2	48.8	N/A

Ultimate Analyses (%)

Hydrogen	3.2	2.7	5.3
Carbon	37.0	39.0	76.3
Nitrogen	1.1	1.2	2.3
Sulfur	.5	.6	1.1
Oxygen	12.0	7.7	15.0
Ash	46.2	48.8	N/A

Heating value
(BTU/lb)

6530	6895	13467
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Sulfur Forms (%)

Sulfate	.01	.01	.02
Pyritic	.12	.13	.25
Organic	.40	.42	.82

Ash

Initial deformation (°F)	2800+
Softening temperature (°F)	2800+
Fluid temperature (°F)	2800+

<u>Free Swelling Index</u>	0.0
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<u>Fixed Carbon</u>	
DMMF	59.1

<u>Heating Value</u>	
BTU/lb MMMF	13054

<u>Apparent Rank</u>	HvB bituminous
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Date of Analysis:	5/4/79
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Laboratory:	U.S. Dept. of Energy
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Lab No.	K92142
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Comments:	
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GAS ANALYSES - not runADSORPTION ISOTHERM DATA - not runPETROGRAPHIC ANALYSES - not run

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 81

LOCATION

County: Rio Blanco
Location: Sec 14 Twp 3S Rge 101W

Surface Elev (ft) 6931
Coordinates NE/4 SE/4,
1720' FSL, 1259' FEL

GENERAL

CGS Sample No. 81
Sampled By Bleakly & Hodges (CER)
Operator Twin Arrow
Hole No. C & K 4-14

Date 12/2/78
Sample Type core

DRILLING DATA

Drilling Co. Twin Arrow Address Rangely, Colorado
Core Size 2" Barrel Length 60'
Type of core retrieval conventional
Drilling media air mist Air Temperature _____
TD Hole 2500' Logs Dual Induction, Micro-Laterolog, Dual Laterolog,
Acoustilog, Densilog, Densilog-Neutron, Diplog, Spectralog

GEOLOGY

Geologic Unit Mesaverde Age Upper Cretaceous
Coal zone/bed _____ Bed Thickness 7.8' (cored), 11' (log)
Depth to top of coal ? (Driller) 963' ? (Log)
Depth to bottom of coal 990.5' (Driller) 974' (Log)
Cored interval 982.7 - 997.6' (Driller)
Roof description ? *
Coal description black, banded, vitrain dominant, some pyrite

Floor description lt gray, fine grained sandstone with numerous black carbonaceous sandstone laminae

DESORPTION DATA

Sampled interval (ft) 986.5-987.3 (Driller) ? (Log)
Condition of sample two pieces of core
Sampled Weight (g) 653
Lost gas time (min) 244 Lost gas cc 865
Desorbed gas cc 617 Residual gas cc/g 1.2
Total gas content cc/g 3.47 Total gas content cf/t 111

Miscellaneous *core started in coal, therefore top of coal bed and roof rock are missing, looks like roof is shale on log

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
<u>Proximate Analyses (%)</u>			
Moisture	6.3	N/A	N/A
Volatile Matter	39.1	41.7	43.8
Fixed Carbon	50.2	53.6	56.2
Ash	4.4	4.7	N/A

Ultimate Analyses (%)

Hydrogen	5.6	5.2	5.4
Carbon	71.5	76.3	80.0
Nitrogen	1.8	1.9	2.0
Sulfur	.4	.5	.5
Oxygen	16.3	11.4	12.0
Ash	4.4	4.7	N/A

Heating value
(BTU/lb)

12793	13655	14324
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Sulfur Forms (%)

Sulfate	.01	.01	.01
Pyritic	.10	.11	.11
Organic	.33	.35	.37

Ash

Initial deformation (°F)	2420
Softening temperature (°F)	2510
Fluid temperature (°F)	2620

Free Swelling Index 1.0Fixed Carbon
DMMF 56.5Heating Value
BTU/lb MMMF 13441Apparent Rank HvB bituminousDate of Analysis: 5/4/79Laboratory: U.S. Dept. of EnergyLab No. K92143

Comments: _____

GAS ANALYSES - not runADSORPTION ISOTHERM DATA - not runPETROGRAPHIC ANALYSES - not run

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 82

LOCATION

County: Moffat
Location: Sec 29 Twp 7N Rge 90W

Surface Elev (ft) 6540
Coordinates SW SW 814' NSL,
981' EWL

GENERAL

CGS Sample No. 82
Sampled By R. Jenkins
Operator Energy Reserves Group, Inc.
Hole No. Van Doren #1

Date 11-17-78
Sample Type core

DRILLING DATA

Drilling Co. Uranium Exploration Inc. Address Casper, Wyoming
Core Size 3" Barrel Length 30'
Type of core retrieval conventional
Drilling media mud Air Temperature 19°F
TD Hole 5017' Logs Dual Induction; BHC Sonic; Comp. Neutron-Density

GEOLOGY

Geologic Unit Williams Fork Formation Age Upper Cretaceous
Coal zone/bed unnamed Bed Thickness .6' (core), 3' (log)
Depth to top of coal 3652' (Driller) 3660' (Log)
Depth to bottom of coal 3652.6' (Driller) 3663' (Log)
Cored interval 3642-3672' (Driller)
Roof description shale, carbonaceous
Coal description well developed cleat, shaley in places, black, hard
Floor description shale, w/ few ss partings

DESORPTION DATA

Sampled interval (ft) 3652-3652.6' (Driller) ? (Log)
Condition of sample muddy, medium sized pieces, 80% of bed desorbed
Sampled Weight (g) 749
Lost gas time (min) 185 Lost gas cc 500
Desorbed gas cc 4995 Residual gas cc/g .5
Total gas content cc/g 7.84 Total gas content cf/t 251

Miscellaneous _____

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
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Proximate Analyses (%)

Moisture	5.6	N/A	N/A
Volatile Matter	35.1	37.2	46.4
Fixed Carbon	40.6	43.0	53.6
Ash	18.7	19.8	N/A

Ultimate Analyses (%)

Hydrogen	5.0	4.6	5.7
Carbon	59.3	62.9	78.4
Nitrogen	1.7	1.8	2.3
Sulfur	1.7	1.8	2.3
Oxygen	13.6	9.1	11.4
Ash	18.7	19.8	N/A

Heating value
(BTU/lb)

10700	11339	14145
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Sulfur Forms (%)

Sulfate	not run
Pyritic	not run
Organic	not run

Ash not run

Initial deformation (°F)	not run
Softening temperature (°F)	not run
Fluid temperature (°F)	not run

Free Swelling Index not run

<u>Fixed Carbon</u>	
DMMF	55.1

<u>Heating Value</u>	
BTU/lb MMTF	13,460

<u>Apparent Rank</u>	HvB bituminous
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Date of Analysis: 10/25/79

Laboratory: U.S. Dept. of Energy

Lab No. K96359

Comments: _____

GAS ANALYSES

	<u>With air</u>	<u>Air free</u>
<u>(MSI percent)</u>		
Hydrogen	0.03	0.05
Oxygen	9.20	nil
Hydrogen sulfide	nil	nil
Carbon dioxide	0.59	1.02
Nitrogen	42.63	17.07
Methane	47.51	81.78
Ethane	0.04	0.06
Other hydrocarbons	trace	trace
	100.00	100.00
<u>Calculated gas gravity</u>	<u>.787</u>	<u>.634</u>

Calculated gross heating value (BTU/cf, air free) 825

Company: Energy Reserves Group Sampler: Carol Tremain
 Date sample taken: 11-28-78 Date sample analyzed: 12-21-78
 Laboratory: Core Laboratories, Inc. Lab No.: RFL 78868

CARBON ISOTOPE RATIO (relative to Chicago standard) - not run

ADSORPTION ISOTHERM DATA

<u>Absolute Pressure (atm)</u>	<u>V, cc STP/g</u>
1.0	0.04
5.7	4.7
11.5	8.0
19.8	12.6
40.0	18.7
51.7	20.4

Laboratory U.S. Dept. of Energy Lab No. 94
 Technician ? Analysis Date ?
 Comments Isotherm Temperature 20°C; Particle Size: 35 X 60 Mesh (ASTM)

PETROGRAPHIC ANALYSES - not run

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 83

LOCATION

County: Moffat
Location: Sec 29 Twp 7N Rge 90W

Surface Elev (ft) 6540
Coordinates 814'NSL,981'EWL

GENERAL

CGS Sample No. 83
Sampled By Rod Jenkins
Operator Energy Reserves Group, Inc.
Hole No. Van Doren #1

Date 11/17/78
Sample Type conv. core

DRILLING DATA

Drilling Co. Uranium Exploration Address Casper, Wyoming
Core Size 3" Barrel Length 30'
Type of core retrieval conventional
Drilling media mud Air Temperature 15°F
TD Hole 5017' Logs Sonic BHC, FDC-CNL, DIL, GR

GEOLOGY

Geologic Unit Williams Fork Formation Age Upper Cretaceous
Coal zone/bed unnamed Bed Thickness 6'
Depth to top of sample 3652.6'(Driller) ? (Log)
Depth to bottom of sample 3658.6' (Driller) ? (Log)
Cored interval 3642-3672' (Driller)
Roof description coal
Sample description brownish gray shale

Floor description sandstone with a few thin, irregular carbonaceous partings

DESORPTION DATA

Sampled interval (ft) 1 ft from 3652.6-58.6'(Driller) ? (Log)
Condition of sample *
Sampled Weight (g) 2915
Lost gas time (min) 200 Lost gas cc 710
Desorbed gas cc 618 Residual gas cc/g 0.12
Total gas content cc/g .58 Total gas content cf/t 18

Miscellaneous *core mixed up, footages may be wrong
sample is shale

COAL ANALYSES - not runGAS ANALYSES

	<u>With air</u>	<u>Air free</u>
<u>(MSI percent)</u>		
Hydrogen	0.19	0.48
Oxygen	13.26	nil
Hydrogen sulfide	nil	nil
Carbon dioxide	0.66	1.66
Nitrogen	64.81	44.60
Methane	21.06	53.21
Ethane	0.02	0.05
Other hydrocarbons	nil	nil
<u>Calculated gas gravity</u>	<u>.900</u>	<u>.752</u>

Calculated gross heating value (BTU/cf, air free) 538

Company: Energy Reserves Sampler: C. M. Tremain
 Date sample taken: 11-29-78 Date sample analyzed: 12-21-78
 Laboratory: Core Laboratories Lab No.: RFL 78868

CARBON-ISOTOPE RATIO (relative to Chicago standard) - not run

ADSORPTION ISOTHERM DATA - not run

PETROGRAPHIC ANALYSES - not run

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 84

LOCATION

County: Moffat
Location: Sec 29 Twp 7N Rge 90W

Surface Elev (ft) 6540'
Coordinates SW SW 814' NSL,
981' EWL

GENERAL

CGS Sample No. 84
Sampled By C. Rightmire
Operator Energy Reserves Group, Inc.
Hole No. Van Doren #1

Date 11/17/79
Sample Type core

DRILLING DATA

Drilling Co. Uranium Exploration, Inc. Address Casper, Wyoming
Core Size 3.5" Barrel Length 30'
Type of core retrieval conventional
Drilling media mud Air Temperature ?
TD Hole 5017' Logs Sonic BHC, FDC-CNL, DIL, GR

GEOLOGY

Geologic Unit Williams Fork Formation Age Upper Cretaceous
Coal zone/bed unnamed Bed Thickness 1.4'(core), 4'(log)
Depth to top of coal 3674.7' (Driller) 3684'? (Log)
Depth to bottom of coal 3676.1'(Driller) 3688'? (Log)
Cored interval 3672-3702' (Driller)
Roof description shale, med. dark gray to locally dark gray
Coal description locally fractured and blocky, trace gas bleeding slowly from fractures, mostly attrital w/a few vitrain bands up to 1/8", 1 good cleat direction
Floor description shale, predominantly med. dark gray, locally slightly calcareous

DESORPTION DATA

Sampled interval (ft) 3675-3675.8' (Driller) ? (Log)
Condition of sample 4 large chunks, muddy
Sampled Weight (g) 1628
Lost gas time (min) 210 Lost gas cc 1130
Desorbed gas cc 11395 Residual gas cc/g 0.3
Total gas content cc/g 7.99 Total gas content cf/t 256

Miscellaneous _____

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
<u>Proximate Analyses (%)</u>			
Moisture	6.7	N/A	N/A
Volatile Matter	35.7	38.2	43.7
Fixed Carbon	45.9	49.3	56.3
Ash	11.7	12.5	N/A

Ultimate Analyses (%)

Hydrogen	5.1	4.6	5.3
Carbon	65.5	70.2	80.2
Nitrogen	1.8	2.0	2.2
Sulfur	.5	.6	.7
Oxygen	15.4	10.2	11.6
Ash	11.7	12.5	N/A

Heating value
(BTU/lb)

11455	12272	14022
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Sulfur Forms (%)

Sulfate	not run
Pyritic	not run
Organic	not run

Ash

Initial deformation (°F)	not run
Softening temperature (°F)	not run
Fluid temperature (°F)	not run

Free Swelling Index not runFixed Carbon
DMMF 57.0Heating Value
BTU/lb MMMF 13,124Apparent Rank HvB bituminousDate of Analysis: 10-2-79Laboratory: U.S. Dept. of EnergyLab No. K95622

Comments: _____

GAS ANALYSES - not runADSORPTION ISOTHERM DATA - not run

PETROGRAPHIC ANALYSES

Lab. SIU Coal Characterization Lab Petrographer John C. Crelling
 Lab No. SIU #847 Date of Analysis ?

Maceral Analyses

Vitrinite	<u>73.7</u>
Pseudovitrinite	<u>12.9</u>
Semifusinite	<u>6.2</u>
Semimacrinite	<u>2.1</u>
Fusinite	<u>2.3</u>
Macrinite	<u>0.3</u>
Micrinite	<u>0.8</u>
Exinite	<u>1.6</u>
Resinite	<u>0.1</u>
Total	<u>100%</u>

Reflectance Analysis

Vitrinite Ro	<u>0.70</u>
pVit Ro	<u>0.74</u>
Combined Ro	<u>0.71</u>
pVit Ro - Vit Ro	<u></u>

Combined V-Type Table

V-Type	2	3	4	5	6	7	8	9	10	11
%					1.0	76.0	22.0	1.0		

V-Type	12	13	14	15	16	17	18	19	21	21
%										

Comments: Apparent rank HvB bituminous

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 85

LOCATION

County: Moffat
Location: Sec 29 Twp 7N Rge 90W

Surface Elev (ft) 6540
Coordinates SW SW 814' NSL,
981' EWL

GENERAL

CGS Sample No. 85
Sampled By R. Jenkins
Operator Energy Reserves Group, Inc.
Hole No. Van Doren #1

Date 11/21/78
Sample Type core

DRILLING DATA

Drilling Co. Uranium Exploration, Inc. Address Casper, Wyoming
Core Size 3.5" Barrel Length 30'
Type of core retrieval conventional
Drilling media mud Air Temperature ?
TD Hole 5017 Logs BHC Sonic; FDC-CNL, DIL, GR

GEOLOGY

Geologic Unit Williams Fork Formation Age Upper Cretaceous
Coal zone/bed unnamed Bed Thickness 1.1'(core), 6'(log)
Depth to top of coal 3921' (Driller) 3929'? (Log)
Depth to bottom of coal 3922.1' (Driller) 3935'? (Log)
Cored interval 3921-3951' (Driller)
Roof description shale on log
Coal description poor cleat, black, muddy, slickenslides
Floor description shale, dark gray to black, locally carbonaceous

DESORPTION DATA

Sampled interval (ft) 3921-3922.1' (Driller) ? (Log)
Condition of sample muddy
Sampled Weight (g) 1161
Lost gas time (min) 160.5 Lost gas cc 1035
Desorbed gas cc 2990 Residual gas cc/g 0.3
Total gas content cc/g 3.77 Total gas content cf/t 121

Miscellaneous _____

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
<u>Proximate Analyses (%)</u>			
Moisture	6.8	N/A	N/A
Volatile Matter	38.1	40.9	42.0
Fixed Carbon	52.6	56.4	58.0
Ash	2.5	2.7	N/A
<u>Ultimate Analyses (%)</u>			
Hydrogen	5.5	5.1	5.3
Carbon	74.3	79.8	82.0
Nitrogen	1.9	2.0	2.1
Sulfur	.5	.5	.5
Oxygen	15.3	9.9	10.2
Ash	2.5	2.7	N/A
<u>Heating value</u> (BTU/lb)	12917	13862	14240
<u>Sulfur Forms (%)</u>			
Sulfate	not run		
Pyritic	not run		
Organic	not run		
<u>Ash</u>			
Initial deformation (°F)	not run		
Softening temperature (°F)	not run		
Fluid temperature (°F)	not run		
<u>Free Swelling Index</u>	not run		
<u>Fixed Carbon</u>			
<u>DMMF</u>	58.2		
<u>Heating Value</u>			
<u>BTU/lb DMMF</u>	13,287		
<u>Apparent Rank</u>	HvB bituminous		
Date of Analysis:	<u>10/25/79</u>		
Laboratory:	<u>U.S. Dept. of Energy</u>	Lab No.	<u>K96360</u>
Comments:	<u></u>		

GAS ANALYSES - not runADSORPTION ISOTHERM DATA

Absolute Pressure (atm)	<u>V, cc STP/g (Exptl.)</u>	<u>V, cc STP/g (Smoothed)</u>
1.0	0.12	
5.0	5.8	
9.9	10.1	
19.0	15.4	
40.0	20.1	
50.9	22.4	

Laboratory U.S. Dept. of Energy Lab No. 95
Technician ? Analysis Date ?
Comments Isotherm Temperature 20°C, Particle Size 35 x 60 mesh (ASTM)

PETROGRAPHIC ANALYSES - not run

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 86

LOCATION

County: Moffat
Location: Sec 29 Twp 7N Rge 90W

Surface Elev (ft) 6540
Coordinates SW SW 814' NSL,
981' EWL

GENERAL

CGS Sample No. 86
Sampled By R. Jenkins
Operator Energy Reserves Group, Inc.
Hole No. Van Doren #1

Date 11/21/78
Sample Type core

DRILLING DATA

Drilling Co. Uranium Exploration, Inc. Address Casper, Wyoming
Core Size 3.5" Barrel Length 30'
Type of core retrieval conventional
Drilling media mud Air Temperature ?
TD Hole 5017 Logs BHC Sonic, FDC-CNL, DIL, GR

GEOLOGY

Geologic Unit Williams Fork Formation Age Upper Cretaceous
Coal zone/bed unnamed Bed Thickness .3'
Depth to top of coal 3930.0'*(Driller) ? (Log)
Depth to bottom of coal 3930.3'*(Driller) ? (Log)
Cored interval 3921-3951' (Driller)
Roof description siltstone, rare isolated coal veinlets
Coal description attrital, vitrain, fusain
Floor description shale w/siltstone partings

DESORPTION DATA

Sampled interval (ft) 3930-3930.3' (Driller) ? (Log)
Condition of sample 3 large muddy chunks
Sampled Weight (g) 495
Lost gas time (min) 157.5 Lost gas cc 395
Desorbed gas cc 972.5 Residual gas cc/g 1.1
Total gas content cc/g 3.86 Total gas content cf/t 124

Miscellaneous *Lithology Log says 3937-3937'2"

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
<u>Proximate Analyses (%)</u>			
Moisture	5.1	N/A	N/A
Volatile Matter	39.0	41.1	46.6
Fixed Carbon	44.7	47.1	53.4
Ash	11.2	11.8	N/A
<u>Ultimate Analyses (%)</u>			
Hydrogen	5.3	5.0	5.6
Carbon	67.4	71.0	80.5
Nitrogen	1.8	1.9	2.1
Sulfur	.9	.9	1.1
Oxygen	13.5	9.4	10.7
Ash	11.2	11.8	N/A
<u>Heating value</u> (BTU/lb)	11973	12617	14298
<u>Sulfur Forms (%)</u>			
Sulfate	not run		
Pyritic	not run		
Organic	not run		
<u>Ash</u>			
Initial deformation (°F)	not run		
Softening temperature (°F)	not run		
Fluid temperature (°F)	not run		
<u>Free Swelling Index</u>	not run		
<u>Fixed Carbon</u>			
DMMF	54.14		
<u>Heating Value</u>			
BTU/lb MMMF	13646		
<u>Apparent Rank</u>	HvB bituminous		
Date of Analysis:	10/2/79		
Laboratory:	U.S. Dept. of Energy	Lab No.	K95623
Comments:			

GAS ANALYSES - not runADSORPTION ISOTHERM DATA - not run

PETROGRAPHIC ANALYSES

Lab. SIU Coal Characterization Lab Petrographer John C. Crelling
 Lab No. SIU #845 Date of Analysis ?

Maceral Analyses

Vitrinite	<u>74.4</u>
Pseudovitrinite	<u>16.6</u>
Semifusinite	<u>1.4</u>
Semimacrinite	<u>1.9</u>
Fusinite	<u>1.8</u>
Macrinite	<u>0.1</u>
Micrinite	<u>1.4</u>
Exinite	<u>2.0</u>
Resinite	<u>0.4</u>
Total	<u>100%</u>

Reflectance Analysis

Vitrinite Ro	<u>0.63</u>
pVit Ro	<u>0.66</u>
Combined Ro	<u>0.64</u>
pVit Ro - Vit Ro	<u>0.03</u>

Combined V-Type Table

V-Type	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>	<u>9</u>	<u>10</u>	<u>11</u>
%					<u>52.0</u>	<u>46.0</u>	<u>2.0</u>			

V-Type	<u>12</u>	<u>13</u>	<u>14</u>	<u>15</u>	<u>16</u>	<u>17</u>	<u>18</u>	<u>19</u>	<u>21</u>	<u>21</u>
%										

Comments: Apparent rank HvB bituminous

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 87

LOCATION

County: Moffat
Location: Sec 29 Twp 7N Rge 90W

Surface Elev (ft) 6540'
Coordinates SW SW 814'NSL,
981'EWL

GENERAL

CGS Sample No. 87
Sampled By R. Jenkins
Operator Energy Reserves Group, Inc.
Hole No. Van Doren #1

Date 11/21/78
Sample Type core

DRILLING DATA

Drilling Co. Uranium Exploration, Inc. Address Casper, Wyoming
Core Size 3.5" Barrel Length 30'
Type of core retrieval conventional
Drilling media mud Air Temperature ?
TD Hole 5017 Logs BHC Sonic, FDC-CNL, DIL, GR

GEOLOGY

Geologic Unit Williams Fork Formation Age Upper Cretaceous
Coal zone/bed unnamed Bed Thickness .5' (core), 1' (log)
Depth to top of coal 3947.5' (Driller) 3958' (Log)
Depth to bottom of coal 3948' (Driller) 3959' (Log)
Cored interval 3921-3951' (Driller)
Roof description shale, non-calcareous
Coal description attrital & vitrain, bands to 1/2", 1 good cleat direction
Floor description siltstone occ. grading to a silty, very fine hard sandstone

DESORPTION DATA

Sampled interval (ft) 3947.5-3948 (Driller) (Log)
Condition of sample 2 large chunks, muddy
Sampled Weight (g) 988
Lost gas time (min) 152.5 Lost gas cc 965
Desorbed gas cc 1225 Residual gas cc/g .5
Total gas content cc/g 2.72 Total gas content cf/t 87

Miscellaneous _____

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
<u>Proximate Analyses (%)</u>			
Moisture	5.5	N/A	N/A
Volatile Matter	39.3	41.6	44.1
Fixed Carbon	50.0	52.9	55.9
Ash	5.2	5.5	N/A
<u>Ultimate Analyses (%)</u>			
Hydrogen	5.6	5.3	5.6
Carbon	72.2	76.4	80.9
Nitrogen	1.8	1.9	2.0
Sulfur	.8	.9	.9
Oxygen	14.4	10.0	10.6
Ash	5.2	5.5	N/A
<u>Heating value</u> (BTU/lb)	12861	13614	14408
<u>Sulfur Forms (%)</u>			
Sulfate	not run		
Pyritic	not run		
Organic	not run		
<u>Ash</u>			
Initial deformation (°F)	not run		
Softening temperature (°F)	not run		
Fluid temperature (°F)	not run		
<u>Free Swelling Index</u>	not run		
<u>Fixed Carbon</u>			
DMMF	56.40		
<u>Heating Value</u>			
BTU/lb MMMF	13647		
<u>Apparent Rank</u>	HvB bituminous		
Date of Analysis:	<u>9/27/78</u>		
Laboratory:	<u>U.S. Dept. of Energy</u>		Lab No. <u>K95624</u>
Comments:			

GAS ANALYSES - not runADSORPTION ISOTHERM DATA - not run

PETROGRAPHIC ANALYSES

Lab. SIU Coal Characterization Lab Petrographer John C. Crelling
 Lab No. SIU #846 Date of Analysis ?

Maceral Analyses

Vitrinite	<u>74.3</u>
Pseudovitrinite	<u>20.2</u>
Semifusinite	<u>1.0</u>
Semimacrinite	<u>0.6</u>
Fusinite	<u>0.5</u>
Macrinite	<u>0.1</u>
Micrinite	<u>0.7</u>
Exinite	<u>2.4</u>
Resinite	<u>0.2</u>
Total	<u>100%</u>

Reflectance Analysis

Vitrinite Ro	<u>0.70</u>
pVit Ro	<u>0.76</u>
Combined Ro	<u>0.71</u>
pVit Ro - Vit Ro	<u>0.06</u>

Combined V-Type Table

V-Type	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>	<u>9</u>	<u>10</u>	<u>11</u>
%					<u>3.0</u>	<u>64.0</u>	<u>33.0</u>			

V-Type	<u>12</u>	<u>13</u>	<u>14</u>	<u>15</u>	<u>16</u>	<u>17</u>	<u>18</u>	<u>19</u>	<u>21</u>	<u>21</u>
%										

Comments: Apparent rank HvB bituminous

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 88

LOCATION

County: Moffat
Location: Sec 29 Twp 7N Rge 90W

Surface Elev (ft) 6540'
Coordinates SW SW 814' NSL,
981' EWL

GENERAL

CGS Sample No. 88
Sampled By R. Jenkins
Operator Energy Reserves Group, Inc.
Hole No. Van Doren #1

Date 11/27/78
Sample Type core

DRILLING DATA

Drilling Co. Uranium Exploration, Inc. Address Casper, Wyoming
Core Size 3.5" Barrel Length 30'
Type of core retrieval conventional
Drilling media mud Air Temperature ?
TD Hole 5017' Logs BHC Sonic, FDC-CNL, DIL, GR

GEOLOGY

Geologic Unit Williams Fork Formation Age Upper Cretaceous
Coal zone/bed unnamed Bed Thickness 10.8' (cored), 16' (log)
Depth to top of coal 4649.0' (Driller) 4658' (Log)
Depth to bottom of coal 4659.8' (Driller) 4674' (Log)
Cored interval 4649-4679' (Driller)
Roof description shale on log
Coal description highly broken and fractured
Floor description shale, dark gray, carb. blocky, med. hard

DESORPTION DATA

Sampled interval (ft) 4654-4655' (Driller) ? (Log)
Condition of sample broken
Sampled Weight (g) 1421
Lost gas time (min) 185 Lost gas cc 685
Desorbed gas cc 10,842 Residual gas cc/g 0.9
Total gas content cc/g 9.01 Total gas content cf/t 288

Miscellaneous CGS 88-93 are from same seam

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
<u>Proximate Analyses (%)</u>			
Moisture	3.8	N/A	N/A
Volatile Matter	38.7	40.2	43.8
Fixed Carbon	49.7	51.7	56.2
Ash	7.8	8.1	N/A
<u>Ultimate Analyses (%)</u>			
Hydrogen	5.6	5.4	5.8
Carbon	71.2	74.1	80.6
Nitrogen	1.7	1.7	1.9
Sulfur	.5	.5	.6
Oxygen	13.2	10.2	11.1
Ash	7.8	8.1	N/A
<u>Heating value</u> (BTU/lb)	12705	13211	14380
<u>Sulfur Forms (%)</u>			
Sulfate	not run		
Pyritic	not run		
Organic	not run		
<u>Ash</u>			
Initial deformation (°F)	not run		
Softening temperature (°F)	not run		
Fluid temperature (°F)	not run		
<u>Free Swelling Index</u>	not run		
<u>Fixed Carbon</u> DMMF	56.7		
<u>Heating Value</u> BTU/lb MMMF	13888		
<u>Apparent Rank</u>	HvB bituminous		
Date of Analysis:	10/25/79		
Laboratory:	U.S. Dept. of Energy		Lab No. <u>K96361</u>
Comments:			

GAS ANALYSES - not runADSORPTION ISOTHERM DATA - not runPETROGRAPHIC ANALYSES - not run

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 89

LOCATION

County: Moffat
Location: Sec 29 Twp 7N Rge 90W

Surface Elev (ft) 6540
Coordinates SW SW 814' NSL,
981' EWL

GENERAL

CGS Sample No. 89
Sampled By R. Jenkins
Operator Energy Reserves Group, Inc.
Hole No. Van Doren #1

Date 11/29/79
Sample Type core

DRILLING DATA

Drilling Co. Uranium Exploration, Inc. address Casper, Wyoming
Core Size 3.5" Barrel Length 30'
Type of core retrieval conventional
Drilling media mud Air Temperature ?
TD Hole 5017' Logs BHC Sonic, FDC-CNL, DIL, GR

GEOLOGY

Geologic Unit Williams Fork Formation Age Upper Cretaceous
Coal zone/bed unnamed Bed Thickness 10.8' (cored), 16' (log)
Depth to top of coal 4649.0' (Driller) 4658' (Log)
Depth to bottom of coal 4659.8' (Driller) 4674' (Log)
Cored interval 4649-4679' (Driller)
Roof description shale on log
Coal description black, muddy, competent, poor cleat, highly broken and fractured
Floor description shale, dark gray, carbonaceous, blocky, medium hard

DESORPTION DATA

Sampled interval (ft) 4655-4656' (Driller) ? (Log)
Condition of sample muddy
Sampled Weight (g) 1783
Lost gas time (min) 201 Lost gas cc 750
Desorbed gas cc 12470 Residual gas cc/g 1.0
Total gas content cc/g 8.41 Total gas content cf/t 269

Miscellaneous CGS 88-93 are from same seam

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
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Proximate Analyses (%)

Moisture	3.7	N/A	N/A
Volatile Matter	38.5	39.9	44.3
Fixed Carbon	48.4	50.3	55.7
Ash	9.4	9.8	N/A

Ultimate Analyses (%)

Hydrogen	5.4	5.1	5.7
Carbon	70.2	72.8	80.7
Nitrogen	1.5	1.6	1.8
Sulfur	.5	.5	.6
Oxygen	13.0	10.1	11.2
Ash	9.4	9.8	N/A

Heating value
(BTU/lb)

12489	12964	14373
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Sulfur Forms (%)

Sulfate	not run
Pyritic	not run
Organic	not run

Ash

Initial deformation (°F)	not run
Softening temperature (°F)	not run
Fluid temperature (°F)	not run

Free Swelling Index	not run
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Fixed Carbon

DMMF	56.3
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Heating Value

BTU/lb MMMF	13915
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Apparent Rank	HvB bituminous
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Date of Analysis: 10/25/79Laboratory: U.S. Dept. of EnergyLab No. K96362

Comments: _____

GAS ANALYSES - not runADSORPTION ISOTHERM DATA

Absolute Pressure (atm)	<u>V, cc STP/g (Exptl.)</u>
1.0	0.03
4.7	6.8
9.6	11.5
20.1	15.1
41.8	17.0
51.1	17.5

Laboratory U.S. Dept. of Energy Lab No. 96
Technician ? Analysis Date ?
Comments Isotherm Temperature: 20°C, Particle Size 35 x 60 mesh (ASTM)

PETROGRAPHIC ANALYSES - not run

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 90

LOCATION

County: Moffat
Location: Sec 29 Twp 7N Rge 90W

Surface Elev (ft) 6540
Coordinates SW SW 814'NSL,
981'EWL

GENERAL

CGS Sample No. 90
Sampled By R. Jenkins
Operator Energy Reserves Group, Inc.
Hole No. Van Doren #1

Date 11/27/79
Sample Type core

DRILLING DATA

Drilling Co. Uranium Exploration, Inc. Address Casper, Wyoming
Core Size 3.5" Barrel Length 30'
Type of core retrieval conventional
Drilling media mud Air Temperature ?
TD Hole 5017' Logs BHC Sonic, FDC-CNL, DIL, GR

GEOLOGY

Geologic Unit Williams Fork Formation Age Upper Cretaceous
Coal zone/bed unnamed Bed Thickness 10.8'(cored), 16'(log)
Depth to top of coal 4649.0' (Driller) 4658' (Log)
Depth to bottom of coal 4659.8' (Driller) 4674' (Log)
Cored interval 4649-4679' (Driller)
Roof description shale on log
Coal description muddy, black, pyrite, hard, highly broken and fractured

Floor description shale, dark gray, carbonaceous, blocky, medium hard

DESORPTION DATA

Sampled interval (ft) 4656-4657' (Driller) ? (Log)
Condition of sample 4 large chunks, muddy
Sampled Weight (g) 1731
Lost gas time (min) 202 Lost gas cc 1050
Desorbed gas cc 14,117 Residual gas cc/g 0.5
Total gas content cc/g 9.26 Total gas content cf/t 296

Miscellaneous CGS 88-93 are from same seam

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
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Proximate Analyses (%)

Moisture	4.1	N/A	N/A
Volatile Matter	39.4	41.0	42.3
Fixed Carbon	53.6	56.0	57.7
Ash	2.9	3.0	N/A

Ultimate Analyses (%)

Hydrogen	5.8	5.5	5.7
Carbon	75.9	79.1	81.6
Nitrogen	1.7	1.7	1.8
Sulfur	.5	.5	.5
Oxygen	13.3	10.1	10.4
Ash	2.9	3.0	N/A

<u>Heating value</u> (BTU/lb)	13510	14088	14530
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Sulfur Forms (%)

Sulfate	not run
Pyritic	not run
Organic	not run

Ash

Initial deformation (°F)	not run
Softening temperature (°F)	not run
Fluid temperature (°F)	not run

Free Swelling Index	not run
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Fixed Carbon	
DMMF	57.9

Heating Value	
BTU/lb DMMF	13961

Apparent Rank	HvB bituminous
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Date of Analysis:	<u>10/29/79</u>	Lab No.	<u>K96363</u>
Laboratory:	<u>U.S. Dept. of Energy</u>		
Comments:	<u></u>		

GAS ANALYSES - not runADSORPTION ISOTHERM DATA - not runPETROGRAPHIC ANALYSES - not run

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 91

LOCATION

County: Moffat
Location: Sec 29 Twp 7N Rge 90W

Surface Elev (ft) 6540
Coordinates SW SW 814'NSL,
981'EWL

GENERAL

CGS Sample No. 91
Sampled By R. Jenkins
Operator Energy Reserves Group, Inc.
Hole No. Van Doren #1

Date 11/27/79
Sample Type core

DRILLING DATA

Drilling Co. Uranium Exploration, Inc. Address Casper, Wyoming
Core Size 3.5" Barrel Length 30'
Type of core retrieval conventional
Drilling media mud Air Temperature ?
TD Hole 5017' Logs BHC Sonic, FDC-CNL, DIL, GR

GEOLOGY

Geologic Unit Williams Fork Formation Age Upper Cretaceous
Coal zone/bed unnamed Bed Thickness 10.8'(cored), 16'(log)
Depth to top of coal 4649.0' (Driller) 4658' (Log)
Depth to bottom of coal 4659.8' (Driller) 4674' (Log)
Cored interval 4649-4679' (Driller)
Roof description shale on log
Coal description muddy, black, pyrite, hard, slickensides, resin, highly broken and fractured
Floor description shale, dark gray, carbonaceous, blocky, medium hard

DESORPTION DATA

Sampled interval (ft) 4657-4658' (Driller) ? (Log)
Condition of sample muddy, large pieces
Sampled Weight (g) 1370
Lost gas time (min) 205 Lost gas cc 800
Desorbed gas cc 11,395 Residual gas cc/g 0.5
Total gas content cc/g 9.40 Total gas content cf/t 301

Miscellaneous CGS 88-93 are from same seam

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
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Proximate Analyses (%)

Moisture	4.0	N/A	N/A
Volatile Matter	40.9	42.6	44.6
Fixed Carbon	50.8	52.9	55.4
Ash	4.3	4.5	N/A

Ultimate Analyses (%)

Hydrogen	5.9	5.6	5.9
Carbon	74.4	77.4	81.1
Nitrogen	1.7	1.7	1.8
Sulfur	.6	.6	.6
Oxygen	13.3	10.2	10.7
Ash	4.3	4.5	N/A

<u>Heating value</u> (BTU/lb)	13283	13830	14478
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Sulfur Forms (%)

Sulfate	not run
Pyritic	not run
Organic	not run

Ash

Initial deformation (°F)	not run
Softening temperature (°F)	not run
Fluid temperature (°F)	not run

<u>Free Swelling Index</u>	not run
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<u>Fixed Carbon</u>	
DMMF	55.7

<u>Heating Value</u>	
BTU/lb MMMF	13946

<u>Apparent Rank</u>	HvB bituminous
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Date of Analysis: 10/25/79Laboratory: U.S. Dept. of EnergyLab No. K96364

Comments: _____

GAS ANALYSES - not runADSORPTION ISOTHERM DATA

<u>Absolute Pressure (atm)</u>	<u>V, cc STP/g (Exptl.)</u>
1.0	0.05
4.7	6.9
9.5	12.4
20.9	17.1
40.1	19.0
51.7	20.5

Laboratory U.S. Dept. of Energy Lab No. 97
Technician ? Analysis Date ?
Comments Isotherm Temperature: 20°C, Particle Size: 35 x 60 mesh (ASTM)

PETROGRAPHIC ANALYSES - not run

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 92

LOCATION

County: Moffat
Location: Sec 29 Twp 7N Rge 90W

Surface Elev (ft) 6540'
Coordinates SW SW 814'NSL,
981'EWL

GENERAL

CGS Sample No. 92
Sampled By R. Jenkins
Operator Energy Reserves Group, Inc.
Hole No. Van Doren #1

Date 11/27/79
Sample Type core

DRILLING DATA

Drilling Co. Uranium Exploration, Inc. Address Casper, Wyoming
Core Size 3.5" Barrel Length 30'
Type of core retrieval conventional
Drilling media mud Air Temperature ?
TD Hole 5017' Logs BHC Sonic, FDC-CNL, DIL, GR

GEOLOGY

Geologic Unit Williams Fork Formation Age Upper Cretaceous
Coal zone/bed unnamed Bed Thickness 10.8'(cored), 16'(log)
Depth to top of coal 4649' (Driller) 4658' (Log)
Depth to bottom of coal 4659.8' (Driller) 4674' (Log)
Cored interval 4649-4679' (Driller)
Roof description shale on log
Coal description muddy, black, pyrite, hard, highly broken and fractured
Floor description shale, dark gray, carbonaceous, blocky, medium hard

DESORPTION DATA

Sampled interval (ft) 4658-4659' (Driller) ? (Log)
Condition of sample large and medium pieces, muddy
Sampled Weight (g) 1704
Lost gas time (min) 216 Lost gas cc 850
Desorbed gas cc 12,040 es dual gas cc/g 1.0
Total gas content cc/g 8.56 Total gas content cf/t 274

Miscellaneous CGS 88-93 are from same seam

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
<u>Proximate Analyses (%)</u>			
Moisture	3.9	N/A	N/A
Volatile Matter	41.3	42.9	44.4
Fixed Carbon	51.5	53.7	55.6
Ash	3.3	3.4	N/A
<u>Ultimate Analyses (%)</u>			
Hydrogen	5.8	5.6	5.8
Carbon	75.9	78.9	81.7
Nitrogen	1.7	1.7	1.8
Sulfur	.6	.6	.6
Oxygen	12.8	9.7	10.1
Ash	3.3	3.4	N/A
<u>Heating value</u> (BTU/lb)	13530	14074	14568
<u>Sulfur Forms (%)</u>			
Sulfate	not run		
Pyritic	not run		
Organic	not run		
<u>Ash</u>			
Initial deformation (°F)	not run		
Softening temperature (°F)	not run		
Fluid temperature (°F)	not run		
<u>Free Swelling Index</u>	not run		
<u>Fixed Carbon</u>			
DMMF	55.8		
<u>Heating Value</u>			
BTU/lb MMMF	14047		
<u>Apparent Rank</u>	HvA bituminous		
Date of Analysis:	10/29/79		
Laboratory:	U.S. Dept. of Energy		Lab No. <u>K96365</u>
Comments:			

GAS ANALYSES

	<u>With air</u>	<u>Air free</u>
<u>(MSI percent)</u>		
Hydrogen	trace	trace
Oxygen	6.52	nil
Hydrogen sulfide	nil	nil
Carbon dioxide	16.61	23.63
Nitrogen	23.79	0.86
Methane	52.31	74.41
Ethane	0.75	1.07
Other hydrocarbons	0.02	0.03
	100.00	100.00
<u>Calculated gas gravity</u>	0.852	0.791

Calculated gross heating value (BTU/cf, air free) 769

Company: Energy Reserves Group, Inc. Sampler: C. Tremain

Date sample taken: 1-9-79 Date sample analyzed: 1-16-79

Laboratory: Core Laboratories Lab No.: RFL 79022

ADSORPTION ISOTHERM DATA - not run

PETROGRAPHIC ANALYSES - not run

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 93

LOCATION

County: Moffat
Location: Sec 29 Twp 7N Rge 90W

Surface Elev (ft) 6540
Coordinates SW SW 814'NSL,
981'EWL

GENERAL

CGS Sample No. 93
Sampled By R. Jenkins
Operator Energy Reserves Group, Inc.
Hole No. Van Doren #1

Date 11/27/79
Sample Type core

DRILLING DATA

Drilling Co. Uranium Exploration, Inc. Address Casper, Wyoming
Core Size 3.5" Barrel Length 30'
Type of core retrieval conventional
Drilling media mud Air Temperature _____
TD Hole 5017' Logs BHC Sonic, FDC-CNL, DIL, GR

GEOLOGY

Geologic Unit Williams Fork Formation Age Upper Cretaceous
Coal zone/bed unnamed Bed Thickness 10.8'(cored), 16'(log)
Depth to top of coal 4649' (Driller) 4658' (Log)
Depth to bottom of coal 4659.8' (Driller) 4674' (Log)
Cored interval 4649-4679' (Driller)
Roof description shale on log
Coal description muddy, black, pyrite, hard, highly broken and fractured
Floor description shale, dark gray, carbonaceous, blocky, medium hard

DESORPTION DATA

Sampled interval (ft) 4659-4660' (Driller) ? (Log)
Condition of sample large pieces
Sampled Weight (g) 1407
Lost gas time (min) 218 Lost gas cc 730
Desorbed gas cc 12605 Residual gas cc/g 0.6
Total gas content cc/g 10.08 Total gas content cf/t 322

Miscellaneous CGS 88-93 are from same seam

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
<u>Proximate Analyses (%)</u>			
Moisture	4.0	N/A	N/A
Volatile Matter	38.5	40.1	43.5
Fixed Carbon	50.2	52.3	56.5
Ash	7.3	7.6	N/A
<u>Ultimate Analyses (%)</u>			
Hydrogen	5.5	5.3	5.7
Carbon	71.6	74.6	80.7
Nitrogen	1.6	1.7	1.8
Sulfur	.6	.6	.7
Oxygen	13.4	10.3	11.1
Ash	7.3	7.6	N/A
<u>Heating value</u> (BTU/lb)	12788	13320	14421
<u>Sulfur Forms (%)</u>			
Sulfate	not run		
Pyritic	not run		
Organic	not run		
<u>Ash</u>			
Initial deformation (°F)	not run		
Softening temperature (°F)	not run		
Fluid temperature (°F)	not run		
<u>Free Swelling Index</u>	not run		
<u>Fixed Carbon</u>			
DMMF	57.1		
<u>Heating Value</u>			
BTU/lb MMMF	13899		
<u>Apparent Rank</u>	HvB bituminous		
Date of Analysis:	10/25/79		
Laboratory:	U.S. Dept. of Energy		Lab No. K96366
Comments:			

GAS ANALYSES - not runADSORPTION ISOTHERM DATA - not runPETROGRAPHIC ANALYSES - not run

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 94

LOCATION

County: Moffat
Location: Sec 29 Twp 7N Rge 90W

Surface Elev (ft) 6540
Coordinates SW SW 814'NSL,
981'EWL

GENERAL

CGS Sample No. 94
Sampled By R. Jenkins
Operator Energy Reserves Group, Inc.
Hole No. Van Doren #1

Date 11/28/79
Sample Type core

DRILLING DATA

Drilling Co. Uranium Exploration, Inc. Address Casper, Wyoming
Core Size 3.5" Barrel Length 30'
Type of core retrieval conventional
Drilling media mud Air Temperature ?
TD Hole 5017' Logs BHC Sonic, FDC-CNL, DIL, GR

GEOLOGY

Geologic Unit Williams Fork Formation Age Upper Cretaceous
Coal zone/bed unnamed Bed Thickness 1.6' (cored), 10' (log)
Depth to top of coal 4704.4' (Driller) 4716' (Log)
Depth to bottom of coal 4706' (Driller) 4726' (Log)
Cored interval 4649-4679' (Driller)
Roof description shale, gray black, locally slight calcareous and silty
Coal description severely fractured and broken, black, well developed cleat
Floor description shale on log

DESORPTION DATA

Sampled interval (ft) 4707.6-4708.4' (Driller) ? (Log)
Condition of sample muddy, broken
Sampled Weight (g) 1703
Lost gas time (min) 147.5 Lost gas cc 1760
Desorbed gas cc 15,100 Residual gas cc/g 0.6
Total gas content cc/g 10.50 Total gas content cf/t 336

Miscellaneous _____

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
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Proximate Analyses (%)

Moisture	3.6	N/A	N/A
Volatile Matter	39.3	40.7	43.0
Fixed Carbon	51.9	54.0	57.0
Ash	5.2	5.3	N/A

Ultimate Analyses (%)

Hydrogen	5.7	5.5	5.8
Carbon	74.4	77.2	81.6
Nitrogen	1.5	1.5	1.6
Sulfur	.6	.6	.6
Oxygen	12.7	9.8	10.4
Ash	5.2	5.3	N/A

Heating value
(BTU/lb)

13281	13780	14558
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Sulfur Forms (%)

Sulfate	not run
Pyritic	not run
Organic	not run

Ash

Initial deformation (°F)	not run
Softening temperature (°F)	not run
Fluid temperature (°F)	not run

Free Swelling Index	not run
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Fixed Carbon

DMMF	57.3
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Heating Value

BTU/lb MMMF	14089
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Apparent Rank	HvA bituminous
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Date of Analysis: 10/25/79Laboratory: U.S. Dept. of EnergyLab No. K96367

Comments: _____

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
<u>Proximate Analyses (%)</u>			
Moisture	3.5	N/A	N/A
Volatile Matter	38.2	39.5	42.6
Fixed Carbon	51.4	53.3	57.4
Ash	6.9	7.2	N/A
<u>Ultimate Analyses (%)</u>			
Hydrogen	5.4	5.1	5.5
Carbon	73.1	75.7	81.5
Nitrogen	1.8	1.9	2.1
Sulfur	1.4	1.4	1.5
Oxygen	11.5	8.7	9.4
Ash	6.9	7.2	N/A
<u>Heating value</u> (BTU/lb)	13177	13649	14702
<u>Sulfur Forms (%)</u>			
Sulfate	.01	.01	.01
Pyritic	.90	.93	1.00
Organic	.45	.47	.50
<u>Ash</u>			
Initial deformation (°F)	2315		
Softening temperature (°F)	2415		
Fluid temperature (°F)	2515		
Free Swelling Index	3.0		
Fixed Carbon			
DMMF	58.0		
Heating Value			
BTU/lb MMMF	14281		
Apparent Rank	HvA bituminous		
Date of Analysis:	5/4/79		
Laboratory:	U.S. Dept. of Energy	Lab No.	K92145
Comments:			

GAS ANALYSES - not runADSORPTION ISOTHERM DATA - not runPETROGRAPHIC ANALYSES - not run

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 100

LOCATION

County: Gunnison Surface Elev (ft) 6840' (surface G.L.)
6840.5' (in mine G.L.)
Location: Sec 11 Twp 13S Rge 90W Coordinates NE 1/4 NE 1/4
Hawk's Nest East Mine
670' FNL, 1285' FEL

GENERAL

CGS Sample No. 99 Date 12/4/78
Sampled By K. C. Bowman Sample Type core-in mine
Operator Western Slope Carbon
Hole No. WSC #5

DRILLING DATA

Drilling Co. Boyles Bros. Address Salt Lake City
Core Size 2 3/8" NC Barrel Length 5'
Type of core retrieval wireline
Drilling media water Air Temperature 40°F
TD Hole 440' Logs Sample Log

GEOLOGY

Geologic Unit Mesaverde Group Age Upper Cretaceous
Coal zone/bed Bowie Member-"C" seam Bed Thickness 6.65'
Depth to top of coal 341.25' (Driller) same (Log)
Depth to bottom of coal 347.9' (Driller) same (Log)
Cored interval ? (Driller)
Roof description bone
Coal description black, some resin and pyrite in fractures, 1 well formed cleat, banded vitrain dominant with shiny attrital
Floor description shale, carb. sooty with fine vitrain streaks

DESORPTION DATA

Sampled interval (ft) 341.25-344.6' (Driller) same (Log)
Condition of sample large and small pieces, 1/2 core desorbed
Sampled Weight (g) 604
Lost gas time (min) 3.5 Lost gas cc 10
Desorbed gas cc 159 Residual gas cc/g 1.4
Total gas content cc/g 1.6 Total gas content cf/t 54

Miscellaneous CGS 100 is top 1/2 of C seam, CGS 101 is bottom 1/2 of C seam

PETROGRAPHIC ANALYSES

Lab. S.I.U. Coal Characterization Lab Petrographer John C. Crelling
 Lab No. SIU #858 Date of Analysis ?

Maceral Analysis (white light)

Vitrinite	<u>78.6</u>
Pseudovitrinite	<u>12.4</u>
Semifusinite	<u>3.4</u>
Semimacrinite	<u>1.6</u>
Fusinite	<u>1.6</u>
Macrinite	<u>0.3</u>
Micrinite	<u>0.4</u>
Exinite	<u>1.4</u>
Resinite	<u>0.3</u>
Total	<u>100%</u>

Reflectance Analysis

Vitrinite Ro	<u>0.72</u>
pVit Ro	<u>0.74</u>
Combined Ro	<u>0.72</u>
pVit Ro - Vit Ro	<u>0.02</u>

Combined V-Type Table

V-Type	2	3	4	5	6	7	8	9	10	11
%				1.0	28.0	59.0	12.0			

V-Type	12	13	14	15	16	17	18	19	21	21
%										

Comments: Apparent Rank HvA bituminous

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
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Proximate Analyses (%)

Moisture	2.9	N/A	N/A
Volatile Matter	43.9	45.2	47.5
Fixed Carbon	48.5	50.0	52.5
Ash	4.7	4.8	N/A

Ultimate Analyses (%)

Hydrogen	5.9	5.7	6.0
Carbon	74.9	77.1	81.0
Nitrogen	1.5	1.6	1.7
Sulfur	2.5	2.6	2.7
Oxygen	10.5	8.2	8.6
Ash	4.7	4.8	N/A

Heating value
(BTU/lb)

As Received	13567	Moisture Free	13968	Moisture and Ash Free	14673
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Sulfur Forms (%)

Sulfate	not run
Pyritic	not run
Organic	not run

Ash

Initial deformation (°F)	2000
Softening temperature (°F)	2090
Fluid temperature (°F)	2180

Free Swelling Index 4.0Fixed Carbon
DMMF 53.1Heating Value
BTU/lb MMMF 14368Apparent Rank HvA bituminousDate of Analysis: 10/2/79Laboratory: U.S. Dept. of EnergyLab No. K95630

Comments: _____

GAS ANALYSES - not run

ADSORPTION ISOTHERM DATA - not run
 (78-SMC-106) 158.8-163.8' had adsorption isotherm run

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 99

LOCATION

County: Gunnison Surface Elev (ft) 6840' (surface G.L.)
6048.5' (in mine G.L.)
Location: Sec 11 Twp 13S Rge 90W Coordinates NE 1/4 NE 1/4
Hawk's Nest East Mine
670' FNL, 1285' FEL

GENERAL

CGS Sample No. 99 Date 11/29/78
Sampled By S. Goolsby Sample Type core-in mine
Operator Western Slope Carbon
Hole No. WSC #5

DRILLING DATA

Drilling Co. Boyles Bros. Address Salt Lake City
Core Size 2 3/8" NC Barrel Length 5'
Type of core retrieval wireline
Drilling media water Air Temperature 40°F
TD Hole 440' Logs sample log

GEOLOGY

Geologic Unit Mesaverde Group Age Upper Cretaceous
Coal zone/bed Bowie Member-"D" Seam Bed Thickness 2.9'
Depth to top of coal 155.5' (Driller) same (Log)
Depth to bottom of coal 158.4' (Driller) same (Log)
Cored interval ? (Driller)
Roof description shale, black, carb. abundt vit., grad. lower contact
Coal description black, attrital, fine-med. vit. streaks, calcite in cleats, little resin, grad. lower contact
~~Floor description shale, black, carb., abundt. vit., grad. lower contact~~

DESORPTION DATA

Sampled interval (ft) 155.5-158.4' (Driller) same (Log)
Condition of sample large chunks, 1/2 core
Sample weight (g) 780
Lost gas time (min) 19.5 Lost gas cc 140
Desorbed gas cc 2261 Residual gas cc/g 0.8
Total gas content cc/g 3.88 Total gas content cf/t 124

Miscellaneous core hole drilled in mine

PETROGRAPHIC ANALYSES

Lab. S.I.U. Coal Characterization Lab Petrographer John C. Crelling
 Lab No. SIU #857 Date of Analysis ?

Maceral Analysis (white light)

Vitrinite	<u>67.0</u>
Pseudovitrinite	<u>28.1</u>
Semifusinite	<u>0.4</u>
Semimacrinite	<u>0.5</u>
Fusinite	<u>0.1</u>
Macrinite	<u>0.0</u>
Micrinite	<u>1.2</u>
Exinite	<u>2.2</u>
Resinite	<u>0.5</u>
Total	<u>100%</u>

Reflectance Analysis

Vitrinite Ro	<u>0.74</u>
pVit Ro	<u>0.80</u>
Combined Ro	<u>0.76</u>
pVit Ro - Vit Ro	<u>0.06</u>

Combined V-Type Table

V-Type	2	3	4	5	6	7	8	9	10	11
%					5.9	57.8	34.3	2.0		

V-Type	12	13	14	15	16	17	18	19	21	21
%										

Comments: Apparent Rank HvA bituminous

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
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Proximate Analyses (%)

Moisture	4.2	N/A	N/A
Volatile Matter	38.6	40.3	44.3
Fixed Carbon	48.4	50.5	55.7
Ash	8.8	9.2	N/A

Ultimate Analyses (%)

Hydrogen	5.4	5.2	5.7
Carbon	71.2	74.3	81.8
Nitrogen	1.6	1.6	1.8
Sulfur	.7	.7	.8
Oxygen	12.3	9.0	9.9
Ash	8.8	9.2	N/A

Heating value
(BTU/lb)

12656	13205	14537
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Sulfur Forms (%)

Sulfate	not run
Pyritic	not run
Organic	not run

Ash

Initial deformation (°F)	2470
Softening temperature (°F)	2600
Fluid temperature (°F)	2690

Free Swelling Index	1.5
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Fixed Carbon

DMMF	56.2
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Heating Value

BTU/lb MMMF	14006
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Apparent Rank	HvA bituminous
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Date of Analysis: 9/27/79

Laboratory: U.S. Dept. of Energy

Lab No. K95626

Comments: _____

GAS ANALYSES - not run

ADSORPTION ISOTHERM DATA - not run

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 98

LOCATION

County: Gunnison Surface Elev (ft) 6048.5 in mine
6840 G.L.
Location: Sec 11 Twp 13S Rge 90W Coordinates NE 1/4 NE 1/4
Hawk's Nest East Mine
670' FNL, 1285' FEL

GENERAL

CGS Sample No. 98 Date 11/29/78
Sampled By S. Goolsby Sample Type core-in mine
Operator Western Slope Carbon
Hole No. WSC #5

DRILLING DATA

Drilling Co. Boyles Bros. Address Salt Lake City
Core Size 2 3/8" NC Barrel Length 5'
Type of core retrieval wireline
Drilling media water Air Temperature 40°F
TD Hole 440' Logs Sample Log

GEOLOGY

Geologic Unit Mesaverde Group Age Upper Cretaceous
Coal zone/bed Bowie Member, Wild Seam Bed Thickness 3.6'
Depth to top of coal 110.5' (Driller) same (Log)
Depth to bottom of coal 114.1' (Driller) same (Log)
Cored interval ? (Driller)
Roof description shale, dark gray-black, vit. streaks, slickensides
Coal description black, attrital, fine-med. vit., calcite on cleats, resin & minor pyrite, 1 good cleat direction
Floor description shale dark gray-black, carb. coaly in places

DESORPTION DATA

Sampled interval (ft) 112.5-114.1' (Driller) same (Log)
Condition of sample _____
Sampled Weight (g) 646
Lost gas time (min) 11 Lost gas cc 35
Desorbed gas cc 1800 Residual gas cc/g .9
Total gas content cc/g 3.74 Total gas content cft 120

Miscellaneous core hole drilled in mine

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
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Proximate Analyses (%)

Moisture	4.0	N/A	N/A
Volatile Matter	36.4	37.9	42.6
Fixed Carbon	49.0	51.1	57.4
Ash	10.6	11.0	N/A

Ultimate Analyses (%)

Hydrogen	5.6	5.4	6.0
Carbon	70.0	72.9	81.9
Nitrogen	1.5	1.6	1.8
Sulfur	.5	.5	.6
Oxygen	11.9	8.7	9.8
Ash	10.6	11.0	N/A

Heating value
(BTU/lb)

12418	12936	14539
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Sulfur Forms (%)

Sulfate	not run
Pyritic	not run
Organic	not run

Ash

Initial deformation (°F)	not run
Softening temperature (°F)	not run
Fluid temperature (°F)	not run

Free Swelling Index	not run
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Fixed Carbon	
DMMF	58.0

Heating Value	
BTU/lb DMMF	14039

Apparent Rank	HvA bituminous
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Date of Analysis:	7/12/79
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Laboratory:	U.S. Dept. of Energy
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Lab No.	K94209
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Comments:	
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GAS ANALYSES - not runADSORPTION ISOTHERM DATA - not runPETROGRAPHIC ANALYSES - not run

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 97

LOCATION

County: Gunnison Surface Elev (ft) 6840 (surface G.L.)
6048.5 (in mine G.L.)
Location: Sec 11 Twp 13S Rge 90W Coordinates NE 1/4 NE 1/4
Hawk's Nest East Mine
670' FNL, 1285' FEL

GENERAL

CGS Sample No. 97 Date 11/29/78
Sampled By S. Goolsby Sample Type core-in mine
Operator Western Slope Carbon
Hole No. WSC #5

DRILLING DATA

Drilling Co. Boyles Bros. Address Salt Lake City
Core Size 2 3/8" NC Barrel Length 5'
Type of core retrieval wireline
Drilling media water Air Temperature about 40°F
TD Hole 440' Logs sample log

GEOLOGY

Geologic Unit Mesaverde Group Age Upper Cretaceous
Coal zone/bed Bowie Member-Wild Seam Bed Thickness 6.1'
Depth to top of coal 104.3' (Driller) same (Log)
Depth to bottom of coal 110.4' (Driller) same (Log)
Cored interval ? (Driller)
Roof description shale, dark gray, carb, interbedded siltstone in shale
Coal description black, attrital, grad. upper boundary, vitrain & attrital
Floor description shale, dark gray-black, vit streaks, slickensides,
grad. contacts, carb. plant material

DESORPTION DATA

Sampled interval (ft) 108.66-110.4' (Driller) same (Log)
Condition of sample large pieces, 1/2 core
Sample weight (g) 708
Lost gas time (min) 17.5 Lost gas cc 45
Desorbed gas cc 2220 Residual gas cc/g .4
Total gas content cc/g 3.59 Total gas content cf/t 115

Miscellaneous core hole drilled in mine

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
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Proximate Analyses (%)

Moisture	4.4	N/A	N/A
Volatile Matter	39.5	41.4	45.0
Fixed Carbon	48.2	50.5	55.0
Ash	7.8	8.1	N/A

Ultimate Analyses (%)

Hydrogen	5.4	5.1	5.5
Carbon	71.7	75.0	81.6
Nitrogen	1.8	1.9	2.1
Sulfur	.8	.8	.9
Oxygen	12.6	9.0	9.8
Ash	7.8	8.1	N/A

Heating value
(BTU/lb)

12690	13281	14453
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Sulfur Forms (%)

Sulfate	.01	.01	.01
Pyritic	.26	.27	.30
Organic	.50	.52	.57

Ash

Initial deformation (°F)	2410
Softening temperature (°F)	2510
Fluid temperature (°F)	2620

Free Swelling Index 1.5

Fixed Carbon
DMMF 55.4

Heating Value
BTU/lb MMMF 13,880

Apparent Rank HvB bituminous

Date of Analysis: 5/4/79

Laboratory: U.S. Dept. of Energy

Lab No. K92144

Comments: _____

GAS ANALYSES - not run

ADSORPTION ISOTHERM DATA - not run

PETROGRAPHIC ANALYSES - not run

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 96

LOCATION

County: Gunnison Surface Elev (ft) 6840 (surface G.L.)
6048.5 (in mine G.L.)

Location: Sec 11 Twp 13S Rge 90W Coordinates NE 1/4 NE 1/4
Hawk's Nest East Mine
670' FNL, 1285' FEL

GENERAL

CGS Sample No. 96 Date 11/27/78
Sampled By S. Goolsby Sample Type core-in mine
Operator Western Slope Carbon
Hole No. WSC #5

DRILLING DATA

Drilling Co. Boyles Bros. Address Salt Lake City, Utah
Core Size 2 3/8" NC Barrel Length 5'
Type of core retrieval wireline
Drilling media water Air Temperature 40°F
TD Hole 440' Logs sample log

GEOLOGY

Geologic Unit Mesaverde Group Age Upper Cretaceous
Coal zone/bed Bowie Member, Wild Seam Bed Thickness 4.8'
Depth to top of coal 81.4 (Driller) same (Log)
Depth to bottom of coal 86.2' (Driller) same (Log)
Cored interval ? (Driller)
Roof description shale, dark gray, slickenslides, carb plant material
Coal description black, attrital, fn. vit. streaks dominant, pyrite, amber
Floor description shale, carb, black, fn. to med. vit. streaks,
grad. contact

DESORPTION DATA

Sampled interval (ft) 81.63-82.75 (Driller) same (Log)
Condition of sample large pieces
Sample weight (g) 533
Lost gas time (min) 3.5 Lost gas cc 15
Desorbed gas cc 458 Residual gas cc/g 1.6
Total gas content cc/g 2.49 Total gas content cf/t 80

Miscellaneous core hole drilled in mine

ADSORPTION ISOTHERM DATA

<u>Absolute Pressure (Atm)</u>	<u>V, cc STP/g (Exptl.)</u>
1.0	0.13
4.4	7.3
9.4	12.0
20.1	17.2
40.0	21.5
50.7	24.1

Laboratory U.S. Dept. of Energy Lab No. 98
Technician ? Analysis Date ?
Comments Isotherm Temperature: 20°C, Particle Size: 35 x 60 mesh (ASTM)

PETROGRAPHIC ANALYSES - not run

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
<u>Proximate Analyses (%)</u>			
Moisture	4.0	N/A	N/A
Volatile Matter	39.8	41.5	42.8
Fixed Carbon	53.3	55.4	57.2
Ash	2.9	3.1	N/A
<u>Ultimate Analyses (%)</u>			
Hydrogen	5.7	5.5	5.6
Carbon	76.4	79.6	82.1
Nitrogen	1.5	1.5	1.6
Sulfur	.6	.6	.6
Oxygen	12.9	9.7	10.0
Ash	2.9	3.1	N/A
<u>Heating value</u> (BTU/lb)	13479	14043	14487
<u>Sulfur Forms (%)</u>			
Sulfate	not run		
Pyritic	not run		
Organic	not run		
<u>Ash</u>			
Initial deformation (°F)	not run		
Softening temperature (°F)	not run		
Fluid temperature (°F)	not run		
<u>Free Swelling Index</u>	not run		
<u>Fixed Carbon</u>			
DMMF	57.5		
<u>Heating Value</u>			
BTU/lb MMMF	13931		
<u>Apparent Rank</u>	HvB bituminous		
Date of Analysis:	10/24/79		
Laboratory:	U.S. Dept. of Energy		Lab No. <u>K96368</u>
Comments:			

GAS ANALYSES - not run

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 95

LOCATION

County: Moffat
Location: Sec 29 Twp 7N Rge 90W

Surface Elev (ft) 6540'
Coordinates SW SW 814' NSL,
981' EWL

GENERAL

CGS Sample No. 95
Sampled By R. Jenkins
Operator Energy Reserves Group, Inc.
Hole No. Van Doren #1

Date 11/28/78
Sample Type core

DRILLING DATA

Drilling Co. Uranium Exploration, Inc. Address Casper, Wyoming
Core Size 3.5" Barrel Length 30'
Type of core retrieval conventional
Drilling media mud Air Temperature ?
TD Hole 5017' Logs BHC Sonic, FDC-CNL, DIL, GR

GEOLOGY

Geologic Unit Williams Fork Formation Age Upper Cretaceous
Coal zone/bed unnamed Bed Thickness 1.6(cored), 10'(log)
Depth to top of coal 4704.4' (Driller) 4716' (Log)
Depth to bottom of coal 4706' (Driller) 4726' (Log)
Cored interval 4649-4679' (Driller)
Roof description shale; gray black, slightly calcareous and silty
Coal description black; muddy, pyrite, vitrain, fusain
Floor description shale on log

DESORPTION DATA

Sampled interval (ft) 4708.4-4709' (Driller) ? (Log)
Condition of sample muddy
Sampled weight (g) 1253
Lost gas time (min) 151.5 Lost gas cc 1510
Desorbed gas cc 12,350 Residual gas cc/g 0.7
Total gas content cc/g 11.76 Total gas content cf/t 376

Miscellaneous _____

GAS ANALYSES

	<u>With air</u>	<u>Air free</u>
<u>(MSI percent)</u>		
Hydrogen	0.95	1.28
Oxygen	5.58	nil
Hydrogen sulfide	nil	nil
Carbon dioxide	19.74	26.47
Nitrogen	20.52	0.88
Methane	51.79	69.45
Ethane	1.14	1.53
Other hydrocarbons	0.28	0.39
	100.00	100.00
Calculated gas gravity	0.864	0.818

Calculated gross heating value (BTU/cf, air free) 741

Company: Energy Reserves Group, Inc. Sampler: C. Tremain

Date sample taken: 12-13-78 Date sample analyzed: 1-12-79

Laboratory: Core Laboratories Lab No.: RFL 78908

ADSORPTION ISOTHERM DATA - not run

PETROGRAPHIC ANALYSES - not run

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 101

LOCATION

County: Gunnison Surface Elev (ft) 6840' (surface G.L.)
6048.5' (in mine G.L.)
Location: Sec 11 Twp 13S Rge 90W Coordinates NE/4 NE/4 670' FNL,
1285' FEL, Hawk's Nest East Mine

GENERAL

CGS Sample No. 101 Date 12/4/78
Sampled By K. C. Bowman Sample Type core-in mine
Operator Western Slope Carbon
Hole No. WSC #5

DRILLING DATA

Drilling Co. Boyle Bros. Address Salt Lake City
Core Size 2 3/8" NC Barrel Length 5'
Type of core retrieval wireline
Drilling media water Air Temperature 50°F
TD Hole 440' Logs Sample Log

GEOLOGY

Geologic Unit Mesaverde Group Age Upper Cretaceous
Coal zone/bed Bowie-"C" Seam Bed Thickness 5.8'
Depth to top of coal 341.25' (Driller) same (Log)
Depth to bottom of coal 347.9' (Driller) same (Log)
Cored interval ? (Driller)
Roof description bone
Coal description black, bright attrital with about 30% vitrain stringers
gypsum, resin, trace calcite, mod-well developed cleat
Floor description shale, carb, sooty with fine vitrain streaks

DESORPTION DATA

Sampled interval (ft) 344.6-347.9' (Driller) same (Log)
Condition of sample All sizes, mostly large pieces
Sampled Weight (g) 632
Lost gas time (min) 4.5 Lost gas cc 25
Desorbed gas cc 3775 Residual gas cc/g 0.8
Total gas content cc/g 6.81 Total gas content cf/t 218

Miscellaneous Core hole drilled in mine, CGS #101 is bottom 1/2 of "C"
seam, CGS 100 is top half of "C" seam

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
<u>Proximate Analyses (%)</u>			
Moisture	3.8	N/A	N/A
Volatile Matter	38.2	39.7	40.8
Fixed Carbon	55.4	57.6	59.2
Ash	2.6	2.7	N/A
<u>Ultimate Analyses (%)</u>			
Hydrogen	5.9	5.7	5.8
Carbon	77.2	80.3	82.5
Nitrogen	1.8	1.9	2.0
Sulfur	.6	.6	.6
Oxygen	11.9	8.8	9.1
Ash	2.6	2.7	N/A
<u>Heating value</u> (BTU/lb)	13823	14375	14770
<u>Sulfur Forms (%)</u>			
Sulfate	not run		
Pyritic	not run		
Organic	not run		
<u>Ash</u>			
Initial deformation (°F)	1990		
Softening temperature (°F)	2080		
Fluid temperature (°F)	2200		
<u>Free Swelling Index</u>	5.0		
<u>Fixed Carbon</u>			
DMMF	59.4		
<u>Heating Value</u>			
BTU/lb MMMF	14240		
<u>Apparent Rank</u>	HvA bituminous		
Date of Analysis:	10/19/79		
Laboratory:	U.S. Dept. of Energy		Lab No. K95971
Comments:			

GAS ANALYSES

	<u>With air</u>	<u>Air free</u>
(MSI percent)		
Hydrogen	Trace	Trace
Oxygen	7.59	Nil
Hydrogen sulfide	Nil	Nil
Carbon dioxide	7.10	10.86
Nitrogen	37.40	15.89
Methane	47.80	73.09
Ethane	0.11	0.16
Other hydrocarbons	Nil	Nil
	100.00	100.00
Calculated gas gravity	0.819	0.725

Calculated gross heating value (BTU/cf, air free) 739

Company: Western Slope Carbon Sampler: C. Tremain
 Date sample taken: 12/13/78 Date sample analyzed: 1/12/79
 Laboratory: Core Labs. Lab No.: RFL 78908

Carbon Isotope Ratio (relative to Chicago standard) - not run

ADSORPTION ISOTHERM DATA - not run

PETROGRAPHIC ANALYSES

Lab. S.I.U. Coal Characterization Lab Petrographer John C. Crelling
 Lab No. SIU #859 Date of Analysis ?

Maceral Analysis (white light)

Vitrinite	<u>70.8</u>
Pseudovitrinite	<u>23.7</u>
Semifusinite	<u>1.0</u>
Semimacrinite	<u>0.5</u>
Fusinite	<u>0.5</u>
Macrinite	<u>0.0</u>
Micrinite	<u>1.1</u>
Exinite	<u>2.2</u>
Resinite	<u>0.2</u>
Total	<u>100%</u>

Reflectance Analysis

Vitrinite Ro	<u>0.75</u>
pVit Ro	<u>0.81</u>
Combined Ro	<u>0.76</u>
pVit Ro - Vit Ro	<u>0.06</u>

Combined V-Type Table

V-Type	2	3	4	5	6	7	8	9	10	11
%					6.0	60.0	34.0			

V-Type	12	13	14	15	16	17	18	19	21	21
%										

Comments: Apparent rank HvA bituminous

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 102

LOCATION

County: Gunnison Surface Elev (ft) 6840'(surface G.L.)
6048.5'(in mine G.L.)

Location: Sec 11 Twp 13S Rge 90W Coordinates NE/4 NE/4, 670'FNL,
1285' FEL

GENERAL

CGS Sample No. 102 Date 12/6/78
Sampled By C. Tremain Sample Type core-in mine
Operator Western Slope Carbon
Hole No. WSC #5

DRILLING DATA

Drilling Co. Boyles Bros. Address Salt Lake City
Core Size 2 3/8" NC Barrel Length 5'
Type of core retrieval wireline
Drilling media water Air Temperature 51°F
TD Hole 440' Logs Sample Log

GEOLOGY

Geologic Unit Mesaverde Group Age Upper Cretaceous
Coal zone/bed Bowie Member-"B" Seam Bed Thickness 14'
Depth to top of coal 395' (Driller) same (Log)
Depth to bottom of coal 409' (Driller) same (Log)
Cored interval 392.5-409.9' (Driller)
Roof description dark gray carb. shale, hard, v. thin vitrain streaks
Coal description black attrital with thin-med vitrain streaks, rare thick streaks, rare resin spots, vitrain mod-abundant, rare pyrite & calcite, good cleats @ 1/8"*
Floor description dark gray carb. shale, thin vitrain streaks near coal

DESORPTION DATA

Sampled interval (ft) 395-400' (Driller) same (Log)
Condition of sample 1/4 split desorbed, mostly large chunks
Sampled Weight (g) 1413
Lost gas time (min) 10 Lost gas cc 150
Desorbed gas cc 5955 Residual gas cc/g 1.5
Total gas content cc/g 5.82 Total gas content cf/t 186

Miscellaneous Core hole was drilled in mine, CGS #102 is from top 5' of "B" seam
*fine-grained, carbonaceous sandstone split @ 398.4-398.5'

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
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Proximate Analyses (%)

Moisture	3.0	N/A	N/A
Volatile Matter	40.1	41.3	43.6
Fixed Carbon	51.9	53.5	56.4
Ash	5.0	5.2	N/A

Ultimate Analyses (%)

Hydrogen	5.9	5.7	6.1
Carbon	75.2	77.5	81.7
Nitrogen	1.8	1.8	1.9
Sulfur	.7	.8	.8
Oxygen	11.4	9.0	9.5
Ash	5.0	5.2	N/A

Heating value
(BTU/lb)

13637	14058	14823
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Sulfur Forms (%)

Sulfate	not run
Pyritic	not run
Organic	not run

Ash

Initial deformation (°F)	2000
Softening temperature (°F)	2110
Fluid temperature (°F)	2220

Free Swelling Index	5.0
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Fixed Carbon	
DMMF	56.8

Heating Value	
BTU/lb MMMF	14437

Apparent Rank	HvA bituminous
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Date of Analysis:	10/19/79
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Laboratory:	U.S. Dept. of Energy
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Lab No.	K95972
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Comments:	
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GAS ANALYSES - not runADSORPTION ISOTHERM DATA

Absolute Pressure (atm)	Volume Methane Adsorbed (STP cc/g coal)
1.0	0.04
5.2	6.7
10.6	10.9
19.2	16.2
39.7	22.4
49.3	27.3

Laboratory U.S. Dept. of Energy Lab No. Sample No. 91
 Technician ? Analysis Date ?
 Comments Isotherm Temperature: 20°C, Particle Size 35 x 60 mesh (ASTM)

PETROGRAPHIC ANALYSES

Lab. S.I.U. Coal Characterization Lab Petrographer John C. Crelling
 Lab No. SIU #860 Date of Analysis ?

Maceral Analysis (white light)

Vitrinite	<u>75.6</u>
Pseudovitrinite	<u>14.8</u>
Semifusinite	<u>3.4</u>
Semimacrinite	<u>1.7</u>
Fusinite	<u>1.1</u>
Macrinite	<u>0.3</u>
Micrinite	<u>1.1</u>
Exinite	<u>1.7</u>
Resinite	<u>0.3</u>
Total	<u>100%</u>

Reflectance Analysis

Vitrinite Ro	<u>0.72</u>
pVit Ro	<u>0.78</u>
Combined Ro	<u>0.73</u>
pVit Ro - Vit Ro	<u>0.06</u>

Combined V-Type Table

V-Type	2	3	4	5	6	7	8	9	10	11
%					14.0	68.0	18.0			

V-Type	12	13	14	15	16	17	18	19	21	21
%										

Comments: Apparent rank HvA bituminous

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 103

LOCATION

County: Gunnison Surface Elev (ft) 6840' (surface G.L.)
6048.5' (in mine G.L.)

Location: Sec 11 Twp 13S Rge 90W Coordinates NE/4 NE/4, 670' FNL,
1285' FEL,
Hawk's Nest East Mine

GENERAL

CGS Sample No. 103 Date 12/6/78
Sampled By C. Tremain Sample Type core-in mine
Operator Western Slope Carbon
Hole No. WSC #5

DRILLING DATA

Drilling Co. Boyles Bros. Address Salt Lake City
Core Size 2 3/8" Barrel Length 5'
Type of core retrieval wireline
Drilling media water Air Temperature 51°F
TD Hole 440' Logs Sample Log

GEOLOGY

Geologic Unit Mesaverde Group Age Upper Cretaceous
Coal zone/bed Bowie Member-"B" Seam Bed Thickness 14'
Depth to top of coal 395' (Driller) same (Log)
Depth to bottom of coal 409' (Driller) same (Log)
Cored interval 392.5-409.9' (Driller)
Roof description dark gray, carbonaceous shale, very thin vitrain streaks in basal 1/2"
Coal description vitrinite 15%, rest attrital, well developed cleats, resin, trace gypsum
Floor description dark gray carb. shale, thin vitrain streaks near coal

DESORPTION DATA

Sampled interval (ft) 405-409' (Driller) same (Log)
Condition of sample mostly large chunks, 1/4 split
Sampled Weight (g) 1201
Lost gas time (min) 12 Lost gas cc 190
Desorbed gas cc 5147 Residual gas cc/g 1.5
Total gas content cc/g 5.94 Total gas content cf/t 190

Miscellaneous basal 4' of "B" seam is sample CGS #103, upper 5' of seam sampled for CGS #102
Core hole drilled in mine

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
<u>Proximate Analyses (%)</u>			
Moisture	3.2	N/A	N/A
Volatile Matter	37.7	39.0	42.6
Fixed Carbon	50.9	52.6	57.4
Ash	8.2	8.4	N/A
<u>Ultimate Analyses (%)</u>			
Hydrogen	5.6	5.5	6.0
Carbon	72.5	74.9	81.8
Nitrogen	1.7	1.8	2.0
Sulfur	.7	.7	.8
Oxygen	11.3	8.7	9.6
Ash	8.2	8.4	N/A
<u>Heating value</u> (BTU/lb)	13054	13484	14726
<u>Sulfur Forms (%)</u>			
Sulfate	not run		
Pyritic	not run		
Organic	not run		
<u>Ash</u>			
Initial deformation (°F)	2600		
Softening temperature (°F)	2710		
Fluid temperature (°F)	2790		
<u>Free Swelling Index</u>	3.5		
<u>Fixed Carbon</u>			
<u>DMMF</u>	58.0		
<u>Heating Value</u>			
<u>BTU/lb MMMF</u>	14345		
<u>Apparent Rank</u>	HvA bituminous		
Date of Analysis:	10/12/79		
Laboratory:	U.S. Dept. of Energy		Lab No. <u>K95973</u>
Comments:			

GAS ANALYSES - not runADSORPTION ISOTHERM DATA - not run

PETROGRAPHIC ANALYSES

Lab. S.I.U. Coal Characterization Lab Petrographer John C. Crelling
 Lab No. SIU #861 Date of Analysis ?

Maceral Analysis

Vitrinite	<u>76.9</u>
Pseudovitrinite	<u>15.8</u>
Semifusinite	<u>1.6</u>
Semimacrinite	<u>0.7</u>
Fusinite	<u>0.5</u>
Macrinite	<u>0.0</u>
Micrinite	<u>1.7</u>
Exinite	<u>2.6</u>
Resinite	<u>0.2</u>
Total	<u>100%</u>

Reflectance Analysis

Vitrinite Ro	<u>0.73</u>
pVit Ro	<u>0.75</u>
Combined Ro	<u>0.73</u>
pVit Ro - Vit Ro	<u>0.02</u>

Combined V-Type Table

V-Type	2	3	4	5	6	7	8	9	10	11
%					24.0	63.0	13.0			

V-Type	12	13	14	15	16	17	18	19	21	21
%										

Comments: Apparent rank HvA bituminous

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 104

LOCATION

County: Gunnison Surface Elev (ft) 6840' (surface G.L.)
6048.5' (in mine G.L.)

Location: Sec 11 Twp 13S Rge 90W Coordinates NE/4 NE/4,
670' FNL, 1285' FEL,
Hawk's Nest East Mine

GENERAL

CGS Sample No. 104 Date 12/6/78
Sampled By C. Tremain Sample Type core in mine
Operator Western Slope Carbon
Hole No. WSC #5

DRILLING DATA

Drilling Co. Boyle Bros. Address Salt Lake City
Core Size 2 3/8" NC Barrel Length 5'
Type of core retrieval wireline
Drilling media water Air Temperature 51°F
TD Hole 440' Logs Sample Log

GEOLOGY

Geologic Unit Mesaverde Group Age Upper Cretaceous
Coal zone/bed Bowie Member-lower "B" Seam Bed Thickness 6.8'
Depth to top of coal 415.4' (Driller) same (Log)
Depth to bottom of coal 422.25' (Driller) same (Log)
Cored interval 413.6-428.25' (Driller)
Roof description saponitic, lt. brown shale
Coal description black, thin, medium and thick vitrain bands dominant at top and base, middle dominantly attrital with thin to thick vitrain bands*
Floor description dark gray, boney shale w/thin vitrain streaks in basal 6"

DESORPTION DATA

Sampled interval (ft) 415.4-420' (Driller) same (Log)
Condition of sample all sizes, 1/4 split desorbed
Sampled Weight (g) 815
Lost gas time (min) 6.5 Lost gas cc 35
Desorbed gas cc 3345 Residual gas cc/g 2.0
Total gas content cc/g 6.15 Total gas content cf/t 197

Miscellaneous core hole drilled in mine
*1/4 - 1/2" cleats, well developed, trace resin and gypsum

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
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Proximate Analyses (%)

Moisture	3.4	N/A	N/A
Volatile Matter	36.5	37.8	42.6
Fixed Carbon	49.2	50.9	57.4
Ash	10.9	11.3	N/A

Ultimate Analyses (%)

Hydrogen	5.5	5.3	6.0
Carbon	70.5	73.0	82.2
Nitrogen	1.7	1.7	1.9
Sulfur	.8	.8	.9
Oxygen	10.6	7.8	8.8
Ash	10.9	11.3	N/A

Heating value
(BTU/lb)

12621	13071	14732
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Sulfur Forms (%)

Sulfate	not run
Pyritic	not run
Organic	not run

Ash

Initial deformation (°F)	2800
Softening temperature (°F)	2800
Fluid temperature (°F)	2800

Free Swelling Index	4.0
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Fixed Carbon	
DMMF	58.2

Heating Value	
BTU/lb MMMF	14331

Apparent Rank	HvA bituminous
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Date of Analysis:	10-19-79
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Laboratory:	U.S. Dept. of Energy
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Lab No.	K95974
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Comments:	
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GAS ANALYSES - not runADSORPTION ISOTHERM DATA - not run

PETROGRAPHIC ANALYSES

Lab. S.I.U. Coal Characterization Lab Petrographer John C. Crelling
 Lab No. SIU #862 Date of Analysis ?

Maceral Analysis

Vitrinite	<u>68.0</u>
Pseudovitrinite	<u>21.2</u>
Semifusinite	<u>2.2</u>
Semimacrinite	<u>2.0</u>
Fusinite	<u>0.9</u>
Macrinite	<u>0.1</u>
Micrinite	<u>2.5</u>
Exinite	<u>2.8</u>
Resinite	<u>0.3</u>
Total	<u>100%</u>

Reflectance Analysis

pVit Ro - Vit Ro	<u>0.72</u>
pVit Ro	<u>0.80</u>
Combined Ro	<u>0.73</u>
pVit Ro - Vit Ro	<u>0.08</u>

Combined V-Type Table

V-Type	2	3	4	5	6	7	8	9	10	11
%				1.0	16.0	53.0	30.0			
V-Type	12	13	14	15	16	17	18	19	21	21
%										

Comments: Apparent rank HvA bituminous

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 105

LOCATION

County: Gunnison Surface Elev (ft) 6840' (surface G.L.)
6048.5' (in mine G.L.)
Location: Sec 11 Twp 13S Rge 90W Coordinates NE/4 NE/4,
670'FNL, 1285'FEL
Hawk's Nest East Mine

GENERAL

CGS Sample No. 105 Date 12/7/78
Sampled By C. Tremain Sample Type core in mine
Operator Western Slope Carbon
Hole No. WSC #5

DRILLING DATA

Drilling Co. Boyles Bros. Address Salt Lake City
Core Size 2 3/8" NC Barrel Length 5'
Type of core retrieval wireline
Drilling media water Air Temperature 49°F
TD Hole 440' Logs Sample Log

GEOLOGY

Geologic Unit Mesaverde Group Age Upper Cretaceous
Coal zone/bed Bowie Member, "A" Seam Bed Thickness 1.1'
Depth to top of coal 434.5' (Driller) same (Log)
Depth to bottom of coal 435.66' (Driller) same (Log)
Cored interval 434.5-440' (Driller)
Roof description sandstone
Coal description good cleat in one direction, dominant attrital with
fine-thick vitrain lenses (<.6")
Floor description Rollins sandstone, fn grain, very light gray, salt &
pepper appearance, glauconitic, uniform, non-calcareous

DESORPTION DATA

Sampled interval (ft) 435-435.66' (Driller) same (Log)
Condition of sample 5 large pieces, wet, 1/2 split desorbed
Sampled Weight (g) 484
Lost gas time (min) 14.5 Lost gas cc 75
Desorbed gas cc 1256 Residual gas cc/g 0.97
Total gas content cc/g 3.72 Total gas content cf/t 119

Miscellaneous core hole drilled in mine

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
<u>Proximate Analyses (%)</u>			
Moisture	1.5	N/A	N/A
Volatile Matter	24.9	25.3	48.6
Fixed Carbon	26.4	26.8	51.4
Ash	47.2	47.9	N/A
<u>Ultimate Analyses (%)</u>			
Hydrogen	3.7	3.6	6.8
Carbon	41.8	42.5	81.4
Nitrogen	.9	.9	1.7
Sulfur	.4	.4	.8
Oxygen	6.1	4.8	9.3
Ash	47.2	47.9	N/A
<u>Heating value</u> (BTU/lb)	7653	7769	14904
<u>Sulfur Forms (%)</u>			
Sulfate	not run		
Pyritic	not run		
Organic	not run		
<u>Ash</u>			
Initial deformation (°F)	not run		
Softening temperature (°F)	not run		
Fluid temperature (°F)	not run		
<u>Free Swelling Index</u>			
Fixed Carbon			
DMMF	55.7		
Heating Value			
BTU/lb MMMF	15640		
Apparent Rank	HvA bituminous		
Date of Analysis:	<u>7-17-79</u>		
Laboratory:	<u>U.S. Dept. of Energy</u>		Lab No. <u>K94210</u>
Comments:			

GAS ANALYSES - not runADSORPTION ISOTHERM DATA - not runPETROGRAPHIC ANALYSES - not run

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 106

LOCATION

County: Gunnison Surface Elev (ft) 6520' (surface G.L.)
6149' (in mine G.L.)
Location: Sec 11 Twp 13S Rge 90W Coordinates SW/4 NE/4
1400'FEL, 2370'FNL,
Hawk's Nest East Mine

GENERAL

CGS Sample No. 106 Date 1/12/79
Sampled By K. C. Bowman Sample Type core-in mine
Operator Western Slope Carbon
Hole No. WSC #6

DRILLING DATA

Drilling Co. Boyles Bros. Address Salt Lake City
Core Size 2 3/8" NC Barrel Length 5'
Type of core retrieval wire line
Drilling media water Air Temperature about 30°
TD Hole 424' Logs Sample Log

GEOLOGY

Geologic Unit Mesaverde Group Age Upper Cretaceous
Coal zone/bed Bowie Member-Upper "B" Seam Bed Thickness 13.2'
Depth to top of coal 399.6' (Driller) same (Log)
Depth to bottom of coal 412.8' (Driller) same (Log)
Cored interval ? (Driller)
Roof description 3" carb. shale up to interbedded carb sh ss & sltst
Coal description black large to small chunks, fine stringers of vitrain
with a few thick lenses (< 1/4") about 35% vitrain, rest dull attrital, one
good cleat direction
Floor description 10" bone down to interb carb sh, ss & sltst

DESORPTION DATA

Sampled interval (ft) 399.6-402.0' (Driller) same (Log)
Condition of sample large & small chunks
Sampled Weight (g) 698
Lost gas time (min) 7 Lost gas cc 110
Desorbed gas cc 2581 Residual gas cc/g 2.2
Total gas content cc/g 6.06 Total gas content cf/t 194

Miscellaneous core hole drilled in mine

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
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Proximate Analyses (%)

Moisture	3.4	N/A	N/A
Volatile Matter	38.6	40.0	42.2
Fixed Carbon	52.9	54.7	57.8
Ash	5.1	5.3	N/A

Ultimate Analyses (%)

Hydrogen	5.9	5.7	6.0
Carbon	75.5	78.1	82.4
Nitrogen	1.7	1.8	1.9
Sulfur	.8	.8	.8
Oxygen	11.1	8.4	8.9
Ash	5.1	5.3	N/A

Heating value
(BTU/lb)

13516	13986	14764
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Sulfur Forms (%)

Sulfate	not run
Pyritic	not run
Organic	not run

Ash

Initial deformation (°F)	not run
Softening temperature (°F)	not run
Fluid temperature (°F)	not run

Free Swelling Index	not run
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Fixed Carbon	
DMMF	58.2

Heating Value	
BTU/lb MMTF	14328

Apparent Rank	HvA bituminous
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Date of Analysis:	<u>7/20/79</u>
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Laboratory:	<u>U.S. Dept. of Energy</u>
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Lab No.	<u>K94211</u>
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Comments:	<u></u>
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GAS ANALYSES - not runADSORPTION ISOTHERM DATA - not runPETROGRAPHIC ANALYSES - not run

LOCATION

County: Gunnison Surface Elev (ft) 6520' (surface G.L.)
6149' (in mine G.L.)

Location: Sec 11 Twp 13S Rge 90W Coordinates Hawk's Nest East Mine
1400'FEL, 2370'FNL

GENERAL

CGS Sample No. 107 Date 1/12/79
Sampled By K. C. Bowman Sample Type core-in mine
Operator Western Slope Carbon
Hole No. WSC #6

DRILLING DATA

Drilling Co. Boyles Bros. Address Salt Lake City
Core Size 2 3/8" NC Barrel Length 5'
Type of core retrieval wireline
Drilling media water Air Temperature about 30°/mine
TD Hole 424' Logs Sample Log

GEOLOGY

Geologic Unit Mesaverde Group Age Upper Cretaceous
Coal zone/bed Bowie Member-Upper "B" Seam Bed Thickness 13.2'
Depth to top of coal 399.6' (Driller) same (Log)
Depth to bottom of coal 412.8' (Driller) same (Log)
Cored interval ? (Driller)
Roof description 3" carb. sh. up to interbed carb sh, ss, and sltst
Coal description black, about 25% vitrain, remainder bright to dull
attrital, well dvpt face cleat about 1/4" spacing, med-well dvpt butt cleat,
tr. flake pyrite on cleats
Floor description 10" bone down to interb carb sh, ss, and sltst

DESORPTION DATA

Sampled interval (ft) 402.0-407.0' (Driller) same (Log)
Condition of sample all sizes, 1/2 seam split desorbed
Sampled Weight (g) 934
Lost gas time (min) 12.5 Lost gas cc 300
Desorbed gas cc 4250 Residual gas cc/g 1.9
Total gas content cc/g 6.77 Total gas content cf/t 217

Miscellaneous core hole was drilled in mine
Upper part of seam sampled in CGS 106, lower part in CGS 107

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
<u>Proximate Analyses (%)</u>			
Moisture	3.7	N/A	N/A
Volatile Matter	39.4	40.9	42.8
Fixed Carbon	52.7	54.8	57.2
Ash	4.2	4.3	N/A
<u>Ultimate Analyses (%)</u>			
Hydrogen	5.8	5.5	5.8
Carbon	76.3	79.3	82.8
Nitrogen	1.8	1.9	2.0
Sulfur	.5	.5	.6
Oxygen	11.4	8.4	8.8
Ash	4.2	4.3	N/A
<u>Heating value</u> (BTU/lb)	13637	14161	14802
<u>Sulfur Forms (%)</u>			
Sulfate	not run		
Pyritic	not run		
Organic	not run		
<u>Ash</u>			
Initial deformation (°F)	2140		
Softening temperature (°F)	2250		
Fluid temperature (°F)	2370		
<u>Free Swelling Index</u>	2.0		
<u>Fixed Carbon</u> DMMF	57.5		
<u>Heating Value</u> BTU/lb MMMF	14300		
<u>Apparent Rank</u>	HvA bituminous		
Date of Analysis:	10/2/79		
Laboratory:	U.S. Dept. of Energy		Lab No. K95632
Comments:			

GAS ANALYSES - not runADSORPTION ISOTHERM DATA - not run

PETROGRAPHIC ANALYSES

Lab. S.I.U. Coal Characterization Lab Petrographer John C. Crelling
 Lab No. SIU #863 Date of Analysis ?

Maceral Analysis

Vitrinite	<u>75.6</u>
Pseudovitrinite	<u>10.5</u>
Semifusinite	<u>6.0</u>
Semimacrinite	<u>1.4</u>
Fusinite	<u>1.8</u>
Macrinite	<u>0.0</u>
Micrinite	<u>1.6</u>
Exinite	<u>2.4</u>
Resinite	<u>0.7</u>
Total	<u>100%</u>

Reflectance Analysis

pVit Ro - Vit Ro	<u>0.78</u>
pVit Ro	<u>0.82</u>
Combined Ro	<u>0.79</u>
pVit Ro - Vit Ro	<u>0.04</u>

Combined V-Type Table

V-Type	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>	<u>9</u>	<u>10</u>	<u>11</u>
%						<u>48.8</u>	<u>49.6</u>	<u>1.6</u>		
V-Type	<u>12</u>	<u>13</u>	<u>14</u>	<u>15</u>	<u>16</u>	<u>17</u>	<u>18</u>	<u>19</u>	<u>21</u>	<u>21</u>
%										

Comments: Apparent rank HvA bituminous

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 108

LOCATION

County: Gunnison Surface Elev (ft) 6520' (surface G.L.)
6149' (in mine G.L.)

Location: Sec 11 Twp 13S Rge 90W Coordinates SW NE
Main slope portal hole - Hawk's Nest East Mine
1400' FEL, 2370' FNL

GENERAL

CGS Sample No. 108 Date 1/10/79
Sampled By K. C. Bowman Sample Type core-in mine
Operator Western Slope Carbon
Hole No. WSC #6

DRILLING DATA

Drilling Co. Boyles Bros. Address Salt Lake City
Core Size 2 3/8" NC Barrel Length 5'
Type of core retrieval wireline
Drilling media water Air Temperature 50°
TD Hole 424' Logs Sample Log

GEOLOGY

Geologic Unit Mesaverde Group Age Upper Cretaceous
Coal zone/bed Bowie Member-"C" Seam Bed Thickness 6'
Depth to top of coal 337.4' (Driller) same (Log)
Depth to bottom of coal 343.4' (Driller) same (Log)
Cored interval ? (Driller)
Roof description carbaceous shale & siltstone up to carbonaceous shale
Coal description black, 1 good cleat direction, calcite in cleats and resin, vitrain bands up to 1/4" and attrital most large (3") chunks
Floor description 9" bone down to interb carb sh & ss

DESORPTION DATA

Sampled interval (ft) 337.4-342.0' (Driller) same (Log)
Condition of sample most large chunks (about 3")
Sampled Weight (g) 830
Lost gas time (min) 12 Lost gas cc ?
Desorbed gas cc 4495 Residual gas cc/g 1.2
Total gas content cc/g 6.62 Total gas content cf/t 212

Miscellaneous core hole drilled in mine

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
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Proximate Analyses (%)

Moisture	4.4	N/A	N/A
Volatile Matter	36.6	38.3	42.1
Fixed Carbon	50.4	52.7	57.9
Ash	8.6	9.0	N/A

Ultimate Analyses (%)

Hydrogen	5.4	5.2	5.7
Carbon	71.5	74.8	82.2
Nitrogen	1.7	1.7	1.9
Sulfur	.5	.6	.6
Oxygen	12.2	8.7	9.6
Ash	8.6	9.0	N/A

Heating value
(BTU/lb)

12774	13358	14683
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Sulfur Forms (%)

Sulfate	not run
Pyritic	not run
Organic	not run

Ash

Initial deformation (°F)	2410
Softening temperature (°F)	2490
Fluid temperature (°F)	2580

Free Swelling Index	1.5
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Fixed Carbon	
DMMF	58.5

Heating Value	
BTU/lb MMTF	14098

Apparent Rank	HvA bituminous
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Date of Analysis:	9/27/79
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Laboratory:	U.S. Dept. of Energy
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Lab No.	K95627
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Comments:	
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GAS ANALYSES - not run

ADSORPTION ISOTHERM DATA - not run

PETROGRAPHIC ANALYSES

Lab. S.I.U. Coal Characterization Lab Petrographer John C. Crelling
 Lab No. SIU #864 Date of Analysis ?

Maceral Analysis

Vitrinite	<u>64.2</u>
Pseudovitrinite	<u>18.5</u>
Semifusinite	<u>6.3</u>
Semimacrinite	<u>0.5</u>
Fusinite	<u>3.9</u>
Macrinite	<u>0.4</u>
Micrinite	<u>4.1</u>
Exinite	<u>1.4</u>
Resinite	<u>0.7</u>
Total	<u>100%</u>

Reflectance Analysis

pVit Ro - Vit Ro	<u>0.77</u>
pVit Ro	<u>0.82</u>
Combined Ro	<u>0.78</u>
pVit Ro - Vit Ro	<u>0.05</u>

Combined V-Type Table

V-Type	2	3	4	5	6	7	8	9	10	11
%						49.6	50.4			
V-Type	12	13	14	15	16	17	18	19	21	21
%										

Comments: Apparent rank HvA bituminous

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 109

LOCATION

County: Gunnison Surface Elev (ft) 6880' (surface G.L.)
6040' (in mine G.L.)
Location: Sec 11 Twp 13S Rge 90W Coordinates 150' FEL, 710' FNL
Hawk's Nest East Mine

GENERAL

CGS Sample No. 109 Date 2/7/79
Sampled By K. C. Bowman Sample Type core-in mine
Operator Western Slope Carbon
Hole No. WSC #7

DRILLING DATA

Drilling Co. Boyles Bros. Address Salt Lake City
Core Size 2 3/8" NC Barrel Length 5'
Type of core retrieval wireline
Drilling media water Air Temperature 41°F
TD Hole 434.5' Logs Sample Log

GEOLOGY

Geologic Unit Mesaverde Group Age Upper Cretaceous
Coal zone/bed Bowie Member "C" Seam Bed Thickness 6.9'
Depth to top of coal 339.1' (Driller) same (Log)
Depth to bottom of coal 346.0' (Driller) same (Log)
Cored interval ? (Driller)
Roof description 1' shale, black, carb w/vitrain partings - fine (bone)
Coal description attrital, thin to med vitrain, resinous, well developed
1/8" to 1/2" cleat, rare gypsum on cleats
Floor description bone and shale

DESORPTION DATA

Sampled interval (ft) 339.1-342.0' (Driller) same (Log)
Condition of sample all sizes
Sampled Weight (g) 1281
Lost gas time (min) 14 Lost gas cc 120
Desorbed gas cc 5510 Residual gas cc/g 1.3
Total gas content cc/g 5.70 Total gas content cf/t 182

Miscellaneous core hole drilled in mine

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
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Proximate Analyses (%)

Moisture	3.6	N/A	N/A
Volatile Matter	38.1	39.5	42.1
Fixed Carbon	52.3	54.2	57.9
Ash	6.0	6.3	N/A

Ultimate Analyses (%)

Hydrogen	5.7	5.5	5.8
Carbon	74.2	77.0	82.1
Nitrogen	1.7	1.8	1.9
Sulfur	.7	.8	.8
Oxygen	11.6	8.7	9.3
Ash	6.0	6.3	N/A

Heating value
(BTU/lb)

13383	13880	14807
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Sulfur Forms (%)

Sulfate	not run
Pyritic	not run
Organic	not run

Ash

Initial deformation (°F)	2440
Softening temperature (°F)	2530
Fluid temperature (°F)	2650

Free Swelling Index	3.5
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Fixed Carbon	
DMMF	58.3

Heating Value	
BTU/lb MMTF	14332

Apparent Rank	HvA bituminous
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Date of Analysis: 10/12/79Laboratory: U.S. Dept. of EnergyLab No. K95977

Comments: _____

GAS ANALYSES - not runADSORPTION ISOTHERM DATA - not run

PETROGRAPHIC ANALYSES

Lab. S.I.U. Coal Characterization Lab Petrographer John C. Crelling
 Lab No. SIU #865 Date of Analysis ?

Maceral Analysis

Vitrinite	<u>75.5</u>
Pseudovitrinite	<u>10.4</u>
Semifusinite	<u>4.8</u>
Semimacrinite	<u>0.7</u>
Fusinite	<u>2.3</u>
Macrinite	<u>0.2</u>
Micrinite	<u>1.7</u>
Exinite	<u>3.6</u>
Resinite	<u>0.8</u>
Total	<u>100%</u>

Reflectance Analysis

pVit Ro - Vit Ro	<u>0.73</u>
pVit Ro	<u>0.82</u>
Combined Ro	<u>0.74</u>
pVit Ro - Vit Ro	<u>0.09</u>

Combined V-Type Table

V-Type	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>	<u>9</u>	<u>10</u>	<u>11</u>
%					<u>10.0</u>	<u>56.0</u>	<u>34.0</u>			
V-Type	<u>12</u>	<u>13</u>	<u>14</u>	<u>15</u>	<u>16</u>	<u>17</u>	<u>18</u>	<u>19</u>	<u>21</u>	<u>21</u>
%										

Comments: Apparent rank HvA bituminous

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 110

LOCATION

County: Gunnison Surface Elev (ft) 6880' (surface G.L.)
6040' (in mine G.L.)
Location: Sec 11 Twp 13S Rge 90W Coordinates 150' FEL, 710' FNL

GENERAL

CGS Sample No. 110 Date 2/12/79
Sampled By K. C. Bowman Sample Type core-in mine
Operator Western Slope Carbon
Hole No. WSC #7

DRILLING DATA

Drilling Co. Boyles Bros. Address Salt Lake City
Core Size 2 3/8" NC Barrel Length 5'
Type of core retrieval wireline
Drilling media water Air Temperature 48°F
TD Hole 434.5' Logs Sample Log

GEOLOGY

Geologic Unit Mesaverde Group Age Upper Cretaceous
Coal zone/bed Bowie Member-Upper B Seam Bed Thickness 12.67'
Depth to top of coal 392.66' (Driller) same (Log)
Depth to bottom of coal 405.33' (Driller) same (Log)
Cored interval 392.8-397.0' (Driller)
Roof description dark gray carb silty shale
Coal description black attrital, fine-medium vitrain, some resin
well developed 1/4" to 1" cleat, calcite on cleats, some gypsum
Floor description bone-shale

DESORPTION DATA

Sampled interval (ft) 392.66-397.0' (Driller) same (Log)
Condition of sample all size pieces
Sampled Weight (g) 1397
Lost gas time (min) 9 Lost gas cc 75
Desorbed gas cc 5701 Residual gas cc/g 1.8
Total gas content cc/g 5.93 Total gas content cf/t 190

Miscellaneous core hole drilled in mine

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
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Proximate Analyses (%)

Moisture	2.9	N/A	N/A
Volatile Matter	37.2	38.3	43.2
Fixed Carbon	48.9	50.4	56.8
Ash	11.0	11.3	N/A

Ultimate Analyses (%)

Hydrogen	5.6	5.5	6.1
Carbon	70.0	72.1	81.3
Nitrogen	1.6	1.6	1.8
Sulfur	1.1	1.1	1.2
Oxygen	10.7	8.4	9.4
Ash	11.0	11.3	N/A

Heating value
(BTU/lb)

12646	13024	14687
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Sulfur Forms (%)

Sulfate	not run
Pyritic	not run
Organic	not run

Ash

Initial deformation (°F)	2800
Softening temperature (°F)	2800
Fluid temperature (°F)	2800

Free Swelling Index 3.0Fixed CarbonDMMF 57.6Heating ValueBTU/lb MMMF 14387Apparent Rank HvA bituminousDate of Analysis: 10/12/79Laboratory: U.S. Dept. of EnergyLab No. K95975

Comments: _____

GAS ANALYSES - not runADSORPTION ISOTHERM DATA

Absolute Pressure (atm)	Volume Methane Adsorbed (STP cc/g coal)
1.0	0.07
5.1	5.7
10.4	9.7
20.4	14.1
40.2	23.7
50.7	25.6

Laboratory U.S. Dept. of Energy Lab No. Sample No. 92
 Technician ? Analysis Date 11-5-79
 Comments Isotherm Temperature: 20°C, Particle Size 35 x 60 mesh (ASTM)

PETROGRAPHIC ANALYSES

Lab. S.I.U. Coal Characterization Lab Petrographer John C. Crelling
 Lab No. SIU #866 Date of Analysis ?

Maceral Analysis

Vitrinite	<u>73.7</u>
Pseudovitrinite	<u>13.6</u>
Semifusinite	<u>4.9</u>
Semimacrinite	<u>1.0</u>
Fusinite	<u>1.5</u>
Macrinite	<u>0.2</u>
Micrinite	<u>1.2</u>
Exinite	<u>2.9</u>
Resinite	<u>1.0</u>
Total	<u>100%</u>

Reflectance Analysis

pVit Ro - Vit Ro	<u>0.72</u>
pVit Ro	<u>0.81</u>
Combined Ro	<u>0.73</u>
pVit Ro - Vit Ro	<u>0.09</u>

Combined V-Type Table

V-Type	2	3	4	5	6	7	8	9	10	11
%					10.0	58.0	31.0	1.0		
V-Type	12	13	14	15	16	17	18	19	21	21
%										

Comments: Apparent rank HvA bituminous

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 111

LOCATION

County: Gunnison Surface Elev (ft) 6880' (surface G.L.)
6040' (in mine G.L.)
Location: Sec 11 Twp 13S Rge 90W Coordinates 150' FEL, 710' FNL
Sta. 212 Subslope
Hawks Nest East Mine

GENERAL

CGS Sample No. 111 Date 2/12/79
Sampled By K. C. Bowman Sample Type core in mine
Operator Western Slope Carbon
Hole No. WSC #7

DRILLING DATA

Drilling Co. Boyles Bros. Address Salt Lake City
Core Size 2 3/8" NC Barrel Length 5'
Type of core retrieval wireline
Drilling media water Air Temperature 48°C
T Hole 434.5' Logs Sample Log

GEOLOGY

Geologic Unit Mesaverde Group Age Upper Cretaceous
Coal zone/bed Bowie Member-Lower B Seam Bed Thickness 6.33'
Depth to top of coal 416.0' (Driller) same (Log)
Depth to bottom of coal 422.33' (Driller) same (Log)
Cored interval ? (Driller)
Roof description 1" dark gray carbonaceous shale, up to 1" fire clay, up to black carbonaceous shale
Coal description black attrital, fine-thick vitrain, good 1/4" cleat
Floor description bone, fireclay, shale

DESORPTION DATA

Sampled interval (ft) 417-422' (Driller) same (Log)
Condition of sample ?
Sampled Weight (g) 938
Lost gas time (min) 14.5 Lost gas cc 40
Desorbed gas cc 4131 Residual gas cc/g 2.1
Total gas content cc/g 6.55 Total gas content cf/t 209

Miscellaneous core hole drilled in mine

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
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Proximate Analyses (%)

Moisture	3.1	N/A	N/A
Volatile Matter	37.8	39.0	42.5
Fixed Carbon	51.1	52.7	57.5
Ash	8.0	8.3	N/A

Ultimate Analyses (%)

Hydrogen	5.8	5.6	6.1
Carbon	73.2	75.5	82.4
Nitrogen	1.7	1.8	1.9
Sulfur	.6	.6	.6
Oxygen	10.7	8.2	8.9
Ash	8.0	8.3	N/A

Heating value
(BTU/lb)

13041	13459	14674
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Sulfur Forms (%)

Sulfate	not run
Pyritic	not run
Organic	not run

Ash

Initial deformation (°F)	2740
Softening temperature (°F)	2800
Fluid temperature (°F)	2800

Free Swelling Index	3.0
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Fixed Carbon	
DMMF	58.0

Heating Value	
BTU/lb MMMF	14,293

Apparent Rank	HvA bituminous
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Date of Analysis:	10-12-79
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Laboratory:	U.S. Dept. of Energy
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Lab No.	K95976
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Comments:	
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GAS ANALYSES - not runADSORPTION ISOTHERM DATA - not run

PETROGRAPHIC ANALYSES

Lab. S.I.U. Coal Characterization Lab Petrographer John C. Crelling
 Lab No. SIU #867 Date of Analysis ?

Macaral Analysis

Vitrinite	<u>70.5</u>
Pseudovitrinite	<u>15.7</u>
Semifusinite	<u>3.7</u>
Semimacrinite	<u>1.0</u>
Fusinite	<u>0.9</u>
Macrinite	<u>0.1</u>
Micrinite	<u>2.6</u>
Exinite	<u>4.0</u>
Resinite	<u>1.5</u>
Total	<u>100%</u>

Reflectance Analysis

pVit Ro - Vit Ro	<u>0.71</u>
pVit Ro	<u>0.82</u>
Combined Ro	<u>0.73</u>
pVit Ro - Vit Ro	<u>0.11</u>

Combined V-Type Table

V-Type	2	3	4	5	6	7	8	9	10	11
%					4.0	60.3	31.7	4.0		
V-Type	12	13	14	15	16	17	18	19	21	21
%										

Comments: Apparent rank HvA bituminous

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 112

LOCATION

County: Gunnison Surface Elev (ft) 7420' (surface G.L.)
5994' (in mine G.L.)

Location: Sec 1 Twp 13S Rge 90W Coordinates SE SW
Hawk's Nest East Mine
2180' FWL, 1005' FSL

GENERAL

CGS Sample No. 112 Date 2/21/79
Sampled By Donna Boreck, K. C. Bowman Sample Type core-in mine
Operator Western Slope Carbon
Hole No. WSC #8

DRILLING DATA

Drilling Co. Boyles Bros. Address Salt Lake City
Core Size 2 3/8" NC Barrel Length 5'
Type of core retrieval wireline
Drilling media water Air Temperature 60°F
TD Hole 452' Logs Sample Log

GEOLOGY

Geologic Unit Mesaverde Group Age Upper Cretaceous
Coal zone/bed Paonia Member-Wild Seam Bed Thickness 12'
Depth to top of coal 80.33' (Driller) same (Log)
Depth to bottom of coal 92.33' (Driller) same (Log)
Cored interval ? (Driller)
Roof description Sandstone, scoured contact
Coal description black, attrital and vitrinite bands up to 1/4" wide, resin and translucent mineral on cleats (not CaCO3), good cleat in one direction, some pyrite on cleat faces
Floor description bone

DESORPTION DATA

Sampled interval (ft) 80.33-84.33' (Driller) same (Log)
Condition of sample 1"-2" chunks
Sampled Weight (g) 673
Lost gas time (min) ? Lost gas cc ?
Desorbed gas cc 1390 Residual gas cc/g 1.1
Total gas content cc/g 3.16 Total gas content cf/t 101

Miscellaneous core hole drilled in mine

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
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Proximate Analyses (%)

Moisture	3.5	N/A	N/A
Volatile Matter	38.7	40.1	42.4
Fixed Carbon	52.5	54.4	57.6
Ash	5.3	5.5	N/A

Ultimate Analyses (%)

Hydrogen	5.6	5.4	5.7
Carbon	75.3	78.1	82.6
Nitrogen	1.6	1.6	1.7
Sulfur	.6	.6	.7
Oxygen	11.6	8.8	9.3
Ash	5.3	5.5	N/A

Heating value
(BTU/lb)

13436	13922	14727
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Sulfur Forms (%)

Sulfate	not run
Pyritic	not run
Organic	not run

Ash

Initial deformation (°F)	2400
Softening temperature (°F)	2500
Fluid temperature (°F)	2610

Free Swelling Index	2.0
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Fixed Carbon	
DMMF	57.9

Heating Value	
BTU/lb MMMF	14270

Apparent Rank	HvA bituminous
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Date of Analysis:	10/2/79
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Laboratory:	U.S. Dept. of Energy
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Lab No.	K95625
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Comments:	
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GAS ANALYSES - not runADSORPTION ISOTHERM DATA - not run

PETROGRAPHIC ANALYSES

Lab. S.I.U. Coal Characterization Lab Petrographer John C. Crelling
 Lab No. SIU #868 Date of Analysis ?

Macaral Analysis

Vitrinite	<u>69.1</u>
Pseudovitrinite	<u>17.1</u>
Semifusinite	<u>3.6</u>
Semimacrinite	<u>1.3</u>
Fusinite	<u>3.2</u>
Macrinite	<u>0.4</u>
Micrinite	<u>2.0</u>
Exinite	<u>2.4</u>
Resinite	<u>0.9</u>
Total	<u>100%</u>

Reflectance Analysis

pVit Ro - Vit Ro	<u>0.71</u>
pVit Ro	<u>0.78</u>
Combined Ro	<u>0.72</u>
pVit Ro - Vit Ro	<u>0.07</u>

Combined V-Type Table

V-Type	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>	<u>9</u>	<u>10</u>	<u>11</u>
%					<u>17.0</u>	<u>72.0</u>	<u>11.0</u>			
V-Type	<u>12</u>	<u>13</u>	<u>14</u>	<u>15</u>	<u>16</u>	<u>17</u>	<u>18</u>	<u>19</u>	<u>21</u>	<u>21</u>
%										

Comments: Apparent rank HvA bituminous

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 113

LOCATION

County: Gunnison Surface Elev (ft) 7420' (surface G.L.)
5994' (in mine G.L.)

Location: Sec 1 Twp 13S Rge 90W Coordinates SE SW
2180' FWL, 1005' FSL
Hawk's Nest East Mine

GENERAL

CGS Sample No. 113 Date 2/21/79
Sampled By Donna Boreck, K. C. Bowman Sample Type core-in mine
Operator Western Slope Carbon
Hole No. WSC #8

DRILLING DATA

Drilling Co. Boyles Bros. Address Salt Lake City
Core Size 2 3/8" NC Barrel Length 5'
Type of core retrieval wireline
Drilling media water Air Temperature 60°F
TD Hole 452' Logs Sample Log

GEOLOGY

Geologic Unit Mesaverde Group Age Upper Cretaceous
Coal zone/bed Paonia Member-"D" Seam Bed Thickness 7.9'
Depth to top of coal 147.4' (Driller) same (Log)
Depth to bottom of coal 155.33' (Driller) same (Log)
Cored interval ? (Driller)
Roof description gray medium grained sandstone w/ black carb. shale at base
Coal description black, mainly attrital, up to 50% vitrain, rare resin
and gypsum on cleats, 1/8"-1/2" well developed cleats
Floor description carb. shale (bone)

DESORPTION DATA

Sampled interval (ft) 147.4-152.0' (Driller) same (Log)
Condition of sample 2" chunks, 1/2 split of upper 4' of seam
Sampled Weight (g) 1077
Lost gas time (min) 9.5 Lost gas cc 35
Desorbed gas cc 2510 Residual gas cc/g 1.0
Total gas content cc/g 3.36 Total gas content cf/t 108

Miscellaneous core hole drilled in mine

CGS 113 is sample of upper part of "D" Seam, CGS 114 is sample of lower
half of "D" Seam

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
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Proximate Analyses (%)

Moisture	3.6	N/A	N/A
Volatile Matter	40.0	41.5	45.1
Fixed Carbon	48.8	50.6	54.9
Ash	7.6	7.9	N/A

Ultimate Analyses (%)

Hydrogen	5.6	5.4	5.9
Carbon	73.1	75.9	82.3
Nitrogen	1.6	1.6	1.8
Sulfur	.8	.8	.9
Oxygen	11.4	8.5	9.2
Ash	7.6	7.9	N/A

Heating value
(BTU/lb)

13197	13694	14861
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Sulfur Forms (%)

Sulfate	not run
Pyritic	not run
Organic	not run

Ash

Initial deformation (°F)	2760
Softening temperature (°F)	2800+
Fluid temperature (°F)	2800+

Free Swelling Index 2.0

Fixed Carbon	
DMMF	55.5

Heating Value	
BTU/lb MMMF	14403

Apparent Rank	HvA bituminous
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Date of Analysis: 9/27/79

Laboratory: U.S. Dept. of Energy

Lab No. K95628

Comments:

GAS ANALYSES - not runADSORPTION ISOTHERM DATA - not run

PETROGRAPHIC ANALYSES

Lab. S.I.U. Coal Characterization Lab Petrographer John C. Crelling
 Lab No. SIU #869 Date of Analysis ?

Maceral Analysis

Vitrinite	<u>71.4</u>
Pseudovitrinite	<u>16.1</u>
Semifusinite	<u>3.4</u>
Semimacrinite	<u>1.2</u>
Fusinite	<u>2.4</u>
Macrinite	<u>0.6</u>
Micrinite	<u>2.0</u>
Exinite	<u>1.8</u>
Resinite	<u>1.1</u>
Total	<u>100%</u>

Reflectance Analysis

pVit Ro - Vit Ro	<u>0.71</u>
pVit Ro	<u>0.79</u>
Combined Ro	<u>0.73</u>
pVit Ro - Vit Ro	<u>0.08</u>

Combined V-Type Table

V-Type	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>	<u>9</u>	<u>10</u>	<u>11</u>
%					<u>11.8</u>	<u>71.5</u>	<u>15.7</u>	<u>1.0</u>		
V-Type	<u>12</u>	<u>13</u>	<u>14</u>	<u>15</u>	<u>16</u>	<u>17</u>	<u>18</u>	<u>19</u>	<u>21</u>	<u>21</u>
%										

Comments: Apparent rank HvA bituminous

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 114

LOCATION

County: Gunnison Surface Elev (ft) 7420' (surface G.L.)
5994' (in mine G.L.)
Location: Sec 1 Twp 13S Rge 90W Coordinates 2180' FWL, 1005' FSL
Hawk's Nest East Mine

GENERAL

CGS Sample No. 114 Date 2/21/79
Sampled By Donna Boreck, K. C. Bowman Sample Type core-in mine
Operator Western Slope Carbon
Hole No. WSC #8

DRILLING DATA

Drilling Co. Boyles Bros. Address Salt Lake City
Core Size 2 3/8" NC Barrel Length 5'
Type of core retrieval wireline
Drilling media water Air Temperature 60°F
TD Hole 452' Logs Sample Log

GEOLOGY

Geologic Unit Mesaverde Group Age Upper Cretaceous
Coal zone/bed Paonia Member-"D" Seam Bed Thickness 7.9'
Depth to top of coal 147.4' (Driller) same (Log)
Depth to bottom of coal 155.33' (Driller) same (Log)
Cored interval ? (Driller)
Roof description gray med grained sandstone with black carb. shale at base
Coal description 10-20% vitrain, rest dull attrital, traces of resin and gypsum, 1/8-1/2" well developed cleat
Floor description carb. shale

DESORPTION DATA

Sampled interval (ft) 152.0-155.33' (Driller) same (Log)
Condition of sample wet, large chunks
Sampled Weight (g) 901
Lost gas time (min) ? Lost gas cc not calculated
Desorbed gas cc 2364 Residual gas cc/g 1.5
Total gas content cc/g 4.12 Total gas content cf/t 132

Miscellaneous core hole drilled in mine
CGS 114 is sample of lower part of "D" Seam, CGS 113 is sample of upper part of seam

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
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Proximate Analyses (%)

Moisture	3.7	N/A	N/A
Volatile Matter	37.5	39.0	44.8
Fixed Carbon	46.3	48.0	55.2
Ash	12.5	13.0	N/A

Ultimate Analyses (%)

Hydrogen	5.5	5.3	6.1
Carbon	68.5	71.1	81.7
Nitrogen	1.5	1.5	1.8
Sulfur	.7	.7	.8
Oxygen	11.3	8.4	9.6
Ash	12.5	13.0	N/A

Heating value
(BTU/lb)

12253	12718	14616
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Sulfur Forms (%)

Sulfate	not run
Pyritic	not run
Organic	not run

Ash

Initial deformation (°F)	2800+
Softening temperature (°F)	2800+
Fluid temperature (°F)	2800+

Free Swelling Index	3.5
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Fixed Carbon	
DMMF	56.0

Heating Value	
BTU/lb MMMF	14188

Apparent Rank	HvA bituminous
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Date of Analysis:	9/27/79
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Laboratory:	U.S. Dept. of Energy
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Lab No.	K95629
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Comments:	
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GAS ANALYSES - not runADSORPTION ISOTHERM DATA - not run

PETROGRAPHIC ANALYSESLab. S.I.U. Coal Characterization Lab Petrographer John C. CrellingLab No. SIU #870 Date of Analysis ?

Maceral Analysis

Vitrinite	<u>74.8</u>
Pseudovitrinite	<u>14.7</u>
Semifusinite	<u>3.5</u>
Semimacrinite	<u>0.2</u>
Fusinite	<u>2.2</u>
Macrinite	<u>0.0</u>
Micrinite	<u>1.7</u>
Exinite	<u>1.9</u>
Resinite	<u>1.0</u>
Total	<u>100%</u>

Reflectance Analysis

pVit Ro - Vit Ro	<u>0.73</u>
pVit Ro	<u>0.80</u>
Combined Ro	<u>0.74</u>
pVit Ro - Vit Ro	<u>0.07</u>

Combined V-Type Table

V-Type	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>	<u>9</u>	<u>10</u>	<u>11</u>
%					<u>15.2</u>	<u>57.5</u>	<u>26.3</u>	<u>1.0</u>		
V-Type	<u>12</u>	<u>13</u>	<u>14</u>	<u>15</u>	<u>16</u>	<u>17</u>	<u>18</u>	<u>19</u>	<u>21</u>	<u>21</u>
%										

Comments: Apparent rank HvA bituminous

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 115

LOCATION

County: Gunnison Surface Elev (ft) 7420' (surface G.L.)
5994' (in mine G.L.)
Location: Sec 1 Twp 13S Rge 90W Coordinates 2180' FWL, 1005' FSL
Hawk's Nest East Mine

GENERAL

CGS Sample No. 115 Date 2/23/79
Sampled By Donna Boreck, K. C. Bowman Sample Type core-in mine
Operator Western Slope Carbon
Hole No. WSC #8

DRILLING DATA

Drilling Co. Boyles Bros. Address Salt Lake City
Core Size 2 3/8" NC Barrel Length 5'
Type of core retrieval wireline
Drilling media water Air Temperature 58°F
TD Hole 452' Logs Sample Log

GEOLOGY

Geologic Unit Mesaverde Group Age Upper Cretaceous
Coal zone/bed Bowie Member-"C" Seam Bed Thickness 12'
Depth to top of coal 346.6' (Driller) same (Log)
Depth to bottom of coal 358.6' (Driller) same (Log)
Cored interval ? (Driller)
Roof description interbedded sandstone, siltstone, shale
Coal description black attrital w/fine vitrain (about 30%) resin, rare
flake pyrite in cleat, mod. well developed cleat
Floor description 4" shale down to 4" sandy shale down to interbedded
sandstone, siltstone, and shale

DESORPTION DATA

Sampled interval (ft) 346.6-352.0' (Driller) same (Log)
Condition of sample all sizes of pieces
Sampled Weight (g) 949
Lost gas time (min) 8 Lost gas cc 55
Desorbed gas cc 3936 Residual gas cc/g 1.2
Total gas content cc/g 5.41 Total gas content cf/t 173

Miscellaneous core hole drilled in mine
CGS 115 is sample of upper part of "C" Seam, CGS 116 is sample of lower
part of "C" Seam

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
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Proximate Analyses (%)

Moisture	2.6	N/A	N/A
Volatile Matter	41.0	42.1	45.0
Fixed Carbon	50.2	51.5	55.0
Ash	6.2	6.4	N/A

Ultimate Analyses (%)

Hydrogen	5.8	5.6	6.0
Carbon	74.9	76.8	82.1
Nitrogen	1.6	1.6	1.7
Sulfur	1.7	1.8	1.9
Oxygen	9.9	7.8	8.3
Ash	6.2	6.4	N/A

Heating value
(BTU/lb)

13689	14050	15005
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Sulfur Forms (%)

Sulfate	not run
Pyritic	not run
Organic	not run

Ash

Initial deformation (°F)	2030
Softening temperature (°F)	2140
Fluid temperature (°F)	2250

Free Swelling Index	3.0
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Fixed Carbon	
DMMF	55.6

Heating Value	
BTU/lb MMMF	14728

Apparent Rank	HvA bituminous
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Date of Analysis: 10/19/79Laboratory: U.S. Dept. of EnergyLab No. K95983

Comments: _____

GAS ANALYSES - not runADSORPTION ISOTHERM DATA - not run

PETROGRAPHIC ANALYSES

Lab. S.I.U. Coal Characterization Lab Petrographer John C. Crelling
 Lab No. SIU #871 Date of Analysis ?

Maceral Analysis

Vitrinite	<u>70.5</u>
Pseudovitrinite	<u>15.4</u>
Semifusinite	<u>6.0</u>
Semimacrinite	<u>0.5</u>
Fusinite	<u>2.4</u>
Macrinite	<u>0.4</u>
Micrinite	<u>2.7</u>
Exinite	<u>1.3</u>
Resinite	<u>0.8</u>
Total	<u>100%</u>

Reflectance Analysis

pVit Ro - Vit Ro	<u>0.66</u>
pVit Ro	<u>0.75</u>
Combined Ro	<u>0.67</u>
pVit Ro - Vit Ro	<u>0.09</u>

Combined V-Type Table

V-Type	2	3	4	5	6	7	8	9	10	11
%				4.0	43.4	50.6	2.0			
V-Type	12	13	14	15	16	17	18	19	21	21
%										

Comments: Apparent rank HvA bituminous

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 116

LOCATION

County: Gunnison Surface Elev (ft) 7420' (surface G.L.)
5994' (in mine G.L.)
Location: Sec 1 Twp 13S Rge 90W Coordinates SE SW
2180' FWL, 1005' FSL
Hawk's Nest East Mine

GENERAL

CGS Sample No. 116 Date 2/23/79
Sampled By Donna Boreck, K. C. Bowman Sample Type core-in mine
Operator Western Slope Carbon
Hole No. WSC #8

DRILLING DATA

Drilling Co. Boyles Bros. Address Salt Lake City
Core Size 2 3/8" NC Barrel Length 5'
Type of core retrieval wireline
Drilling media water Air Temperature 58°F
TD Hole 452' Logs Sample Log

GEOLOGY

Geologic Unit Mesaverde Group Age Upper Cretaceous
Coal zone/bed Bowie Member-"C" Seam Bed Thickness 12'
Depth to top of coal 346.6' (Driller) same (Log)
Depth to bottom of coal 358.6' (Driller) same (Log)
Cored interval ? (Driller)
Roof description interbedded sandstone, siltstone and shale
Coal description black attrital with fine vitrain (about 30%) resinous,
rare flake pyrite in cleats, mod. well dev. cleats at 1/16"-1/2" *
Floor description shale, brownish-black, very carb. with abundant fine vitrain

DESORPTION DATA

Sampled interval (ft) 352.0-357.0' (Driller) same (Log)
Condition of sample 2"-fine sizes
Sampled Weight (g) 798
Lost gas time (min) 9.5 Lost gas cc 70
Desorbed gas cc 480 Residual gas cc/g 2.3
Total gas content cc/g 2.99 Total gas content cf/t 96

Miscellaneous core hole drilled in mine
*carbonaceous shale split in coal from 348.33-350.6'
CGS #116 is sample of lower part of "C" Seam, CGS #115 is sample of
upper "C" Seam

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
<u>Proximate Analyses (%)</u>			
Moisture	3.3	N/A	N/A
Volatile Matter	40.2	41.5	44.7
Fixed Carbon	49.7	51.4	55.3
Ash	6.8	7.1	N/A
<u>Ultimate Analyses (%)</u>			
Hydrogen	5.7	5.5	5.9
Carbon	73.7	76.2	82.0
Nitrogen	1.7	1.7	1.9
Sulfur	.4	.4	.5
Oxygen	11.7	9.0	9.7
Ash	6.8	7.1	N/A
<u>Heating value</u> (BTU/lb)	13272	13729	14774
<u>Sulfur Forms (%)</u>			
Sulfate	not run		
Pyritic	not run		
Organic	not run		
<u>Ash</u>			
Initial deformation (°F)	not run		
Softening temperature (°F)	not run		
Fluid temperature (°F)	not run		
<u>Free Swelling Index</u>	not run		
<u>Fixed Carbon</u> DMMF	55.7		
<u>Heating Value</u> BTU/lb MMMF	14336		
<u>Apparent Rank</u>	HvA bituminous		
Date of Analysis:	7/12/79		
Laboratory:	U.S. Dept. of Energy		Lab No. K94212
Comments:			

GAS ANALYSES - not runADSORPTION ISOTHERM DATA - not runPETROGRAPHIC ANALYSES - not run

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 117

LOCATION

County: Gunnison Surface Elev (ft) 7420' (surface G.L.)
5994' (in mine G.L.)
Location: Sec 1 Twp 13S Rge 90W Coordinates 2180' FWL, 1005' FSL

GENERAL

CGS Sample No. 117 Date 2/23/79
Sampled By Donna Boreck & K. C. Bowman Sample Type core-in mine
Operator Western Slope Carbon
Hole No. WSC #8

DRILLING DATA

Drilling Co. Boyles Bros. Address Salt Lake City
Core Size 2 3/8" NC Barrel Length 5'
Type of core retrieval wireline
Drilling media water Air Temperature 62°F
TD Hole 452' Logs Sample Log

GEOLOGY

Geologic Unit Mesaverde Group Age Upper Cretaceous
Coal zone/bed Bowie Member-Upper "B" Seam Bed Thickness 14.7'
Depth to top of coal 393.75' (Driller) same (Log)
Depth to bottom of coal 408.4' (Driller) same (Log)
Cored interval 393.9-397.0' (Driller)
Roof description 6" shale up to 10' thin interbedded sh, slst, & ss.
Coal description black, attrital with fine, medium, and some thick vitrain stringers (about 25% of sample) excellent cleat - some calcite on cleats, flake pyrite and resin
Floor description 2' shale down to interbedded shale and ss

DESORPTION DATA

Sampled interval (ft) 393.75-397' (Driller) same (Log)
Condition of sample 2" to powder in size
Sampled Weight (g) 938
Lost gas time (min) 7 Lost gas cc 80
Desorbed gas cc 3973 Residual gas cc/g 1.8
Total gas content cc/g 6.12 Total gas content cf/t 196

Miscellaneous core hole drilled in mine
CGS #117 is sample of upper part of Upper "B" Seam, CGS #118 is sample of lower part of Upper "B" Seam

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
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Proximate Analyses (%)

Moisture	2.6	N/A	N/A
Volatile Matter	40.8	41.9	43.7
Fixed Carbon	52.6	54.0	56.3
Ash	4.0	4.1	N/A

Ultimate Analyses (%)

Hydrogen	5.9	5.8	6.0
Carbon	77.5	79.6	83.0
Nitrogen	1.7	1.8	1.8
Sulfur	.9	.9	1.0
Oxygen	9.9	7.8	8.2
Ash	4.0	4.1	N/A

Heating value
(BTU/lb)

13868	14234	14844
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Sulfur Forms (%)

Sulfate	not run
Pyritic	not run
Organic	not run

Ash

Initial deformation (°F)	2030
Softening temperature (°F)	2120
Fluid temperature (°F)	2250

Free Swelling Index	5.0
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Fixed Carbon	
MMMF	56.7

Heating Value	
BTU/lb MMMF	14522

Apparent Rank	HvA bituminous
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Date of Analysis: 10/12/79
 Laboratory: U.S. Dept. of Energy
 Comments: _____

Lab No. K95978

GAS ANALYSES

	<u>With air</u>	<u>Air free</u>
<u>(MSI percent)</u>		
Hydrogen	--	--
Oxygen	4.64	Nil
Hydrogen sulfide	Nil	Nil
Carbon dioxide	9.16	11.62
Nitrogen	41.34	31.50
Methane	44.61	56.57
Ethane	0.25	0.31
Other hydrocarbons	Nil	Nil
	100.00	100.00
<u>Calculated gas gravity</u>	0.840	0.798

Calculated gross heating value (BTU/cf, air free) 575

Company: Western Slope Carbon Sampler: Donna Boreck
 Date sample taken: 3/6/79 Date sample analyzed: 3/19/79
 Laboratory: Core Labs Lab No.: RFL 79159

Carbon Isotope Ratio (relative to Chicago standard) - not run

ADSORPTION ISOTHERM DATA

<u>Absolute Pressure</u> (atm)	<u>Volume Methane Adsorbed</u> (STP cc/g coal)
1.0	0.0
3.9	7.8
9.8	12.3
19.3	16.9
39.4	20.8
50.1	22.6

Laboratory U.S. Dept. of Energy Lab No. Sample No. 93
 Technician ? Analysis Date ?
 Comments Isotherm Temperature 20°C, Particle Size 35 x 60 mesh (ASTM)

PETROGRAPHIC ANALYSES

Lab. S.I.U. Coal Characterization Lab Petrographer John C. Crelling
 Lab No. SIU #872 Date of Analysis ?

Macaral Analysis

Vitrinite	<u>71.1</u>
Pseudovitrinite	<u>14.6</u>
Semifusinite	<u>6.0</u>
Semimacrinite	<u>0.6</u>
Fusinite	<u>2.8</u>
Macrinite	<u>0.0</u>
Micrinite	<u>0.9</u>
Exinite	<u>3.0</u>
Resinite	<u>1.0</u>
Total	<u>100%</u>

Reflectance Analysis

pVit Ro - Vit Ro	<u>0.68</u>
pVit Ro	<u>0.78</u>
Combined Ro	<u>0.69</u>
pVit Ro - Vit Ro	<u>0.10</u>

Combined V-Type Table

V-Type	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>	<u>9</u>	<u>10</u>	<u>11</u>
%					<u>33.7</u>	<u>54.4</u>	<u>11.9</u>			
V-Type	<u>12</u>	<u>13</u>	<u>14</u>	<u>15</u>	<u>16</u>	<u>17</u>	<u>18</u>	<u>19</u>	<u>21</u>	<u>21</u>
%										

Comments: Apparent rank HvA bituminous

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 118

LOCATION

County: Gunnison Surface Elev (ft) 7420' (surface G.L.)
5994' (in mine G.L.)
Location: Sec 1 Twp 13S Rge 90W Coordinates 2180'FWL, 1005' FSL
Hawk's Nest East Mine

GENERAL

CGS Sample No. 118 Date 2/23/79
Sampled By Donna Boreck, K. C. Bowman Sample Type core-in mine
Operator Western Slope Carbon
Hole No. WSC #8

DRILLING DATA

Drilling Co. Boyles Bros. Address Salt Lake City
Core Size 2 3/8" NC Barrel Length 5'
Type of core retrieval wireline
Drilling media water Air Temperature 62°F
TD Hole 452' Logs Sample Log

GEOLOGY

Geologic Unit Mesaverde Group Age Upper Cretaceous
Coal zone/bed Bowie Member Upper "B" Seam Bed Thickness 14.7'
Depth to top of coal 393.75' (Driller) same (Log)
Depth to bottom of coal 408.4' (Driller) same (Log)
Cored interval ? (Driller)
Roof description carb., brown-black shale grading upward to light, very fine-grained sandstone, dark shale and siltstone
Coal description black attrital w/fine, medium, and rare thick vitrain bands (about 25%) resin caclite on cleat, flake pyrite
Floor description brown-black carb. shale, grading into interbedded sandstone and shale

DESORPTION DATA

Sampled interval (ft) 397.0-402.0' (Driller) same (Log)
Condition of sample 1/2 seam split desorbed
Sampled Weight (g) 969
Lost gas time (min) 8.5 Lost gas cc 50
Desorbed gas cc 3274 Residual gas cc/g 2.1
Total gas content cc/g 5.53 Total gas content cf/t 177

Miscellaneous core hole drilled in mine
CGS #118 is sample of lower part of Upper "B" Seam, CGS #117 is sample of upper part of Upper "B" Seam

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
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Proximate Analyses (%)

Moisture	2.7	N/A	N/A
Volatile Matter	39.3	40.4	42.3
Fixed Carbon	53.6	55.1	57.7
Ash	4.4	4.5	N/A

Ultimate Analyses (%)

Hydrogen	5.8	5.7	6.0
Carbon	76.8	78.9	82.6
Nitrogen	1.7	1.8	1.9
Sulfur	.5	.6	.6
Oxygen	10.7	8.5	8.9
Ash	4.4	4.5	N/A

Heating value
(BTU/lb)

13827	14214	14883
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Sulfur Forms (%)

Sulfate	not run
Pyritic	not run
Organic	not run

Ash

Initial deformation (°F)	2550
Softening temperature (°F)	2640
Fluid temperature (°F)	2720

Free Swelling Index	5.0
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Fixed Carbon	
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DMMF	58.0
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Heating Value	
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BTU/lb MMMF	14533
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Apparent Rank	HvA bituminous
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Date of Analysis:	10/2/79
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Laboratory:	U.S. Dept. of Energy
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Lab No.	K95631
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Comments:	
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GAS ANALYSES - not runADSORPTION ISOTHERM DATA - not run

PETROGRAPHIC ANALYSES

Lab. S.I.U. Coal Characterization Lab Petrographer John C. Crelling
 Lab No. SIU #873 Date of Analysis ?

Macaral Analysis

Vitrinite	<u>70.2</u>
Pseudovitrinite	<u>14.3</u>
Semifusinite	<u>5.9</u>
Semimacrinite	<u>0.9</u>
Fusinite	<u>3.4</u>
Macrinite	<u>0.3</u>
Micrinite	<u>1.9</u>
Exinite	<u>1.6</u>
Resinite	<u>1.5</u>
Total	<u>100%</u>

Reflectance Analysis

pVit Ro - Vit Ro	<u>0.70</u>
pVit Ro	<u>0.81</u>
Combined Ro	<u>0.72</u>
pVit Ro - Vit Ro	<u>0.11</u>

Combined V-Type Table

V-Type	2	3	4	5	6	7	8	9	10	11
%					23.3	44.7	32.0			
V-Type	12	13	14	15	16	17	18	19	21	21
%										

Comments: Apparent rank HvA bituminous

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 119

LOCATION

County: Gunnison Surface Elev (ft) 7420' (surface G.L.)
5994' (in mine G.L.)

Location: Sec 1 Twp 13S Rge 90W Coordinates 2180' FWL, 1005' FSL

GENERAL

CGS Sample No. 119 Date 2/23/79
Sampled By Donna Boreck, K. C. Bowman Sample Type core-in mine
Operator Western Slope Carbon
Hole No. WSC #8

DRILLING DATA

Drilling Co. Boyle Bros. Address Salt Lake City
Core Size 2 3/8" NC Barrel Length 5'
Type of core retrieval wireline
Drilling media water Air Temperature 60°C
TD Hole 452' Logs Sample Log

GEOLOGY

Geologic Unit Mesaverde Group Age Upper Cretaceous
Coal zone/bed Bowie Member-Lower "B" Seam Bed Thickness 6.7'
Depth to top of coal 418.1' (Driller) same (Log)
Depth to bottom of coal 424.8' (Driller) same (Log)
Cored interval ? (Driller)
Roof description 2.25' shale up to to interbedded shale and sandstone
Coal description black, attrital w/fine to medium vitrain (about 20%)
scarce mineralization, some calcite in cleats at base of coal seam,
excellent cleat
Floor description 2.2' shale down to sandstone

DESORPTION DATA

Sampled interval (ft) 418.1-422.0' (Driller) same (Log)
Condition of sample assorted sizes
Sampled Weight (g) 1077
Lost gas time (min) 6 Lost gas cc 90
Desorbed gas cc 4840 Residual gas cc/g 1.4
Total gas content cc/g 5.98 Total gas content cf/t 191

Miscellaneous core hole drilled in mine

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
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Proximate Analyses (%)

Moisture	3.3	N/A	N/A
Volatile Matter	34.6	35.7	42.4
Fixed Carbon	46.9	48.6	57.6
Ash	15.2	15.7	N/A

Ultimate Analyses (%)

Hydrogen	5.2	5.1	6.0
Carbon	67.1	69.4	82.3
Nitrogen	1.6	1.6	1.9
Sulfur	.5	.5	.6
Oxygen	10.3	7.7	9.1
Ash	15.2	15.7	N/A

Heating value
(BTU/lb)

11975	12379	14690
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Sulfur Forms (%)

Sulfate	not run
Pyritic	not run
Organic	not run

Ash

Initial deformation (°F)	2800
Softening temperature (°F)	2800
Fluid temperature (°F)	2800

Free Swelling Index	3.0
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Fixed Carbon	
DMMF	58.5

Heating Value	
BTU/lb MMMF	14344

Apparent Rank	HvA bituminous
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Date of Analysis: 10/19/79
 Laboratory: U.S. Dept. of Energy
 Comments: _____

Lab No. K95982

GAS ANALYSES

	<u>With air</u>	<u>Air free</u>
(MSI percent)		
Hydrogen	--	--
Oxygen	6.02	Nil
Hydrogen sulfide	Nil	Nil
Carbon dioxide	11.73	16.16
Nitrogen	35.09	18.83
Methane	43.77	60.34
Ethane	0.71	0.98
Other hydrocarbons	2.68	3.69
	100.00	100.00
Calculated gas gravity	0.913	0.881
Calculated gross heating value (BTU/cf, air free)		<u>799</u>

Company: Western Slope Carbon Sampler: Donna Boreck
Date sample taken: 3-6-79 Date sample analyzed: 3/14/79
Laboratory: Core Labs Lab No.: RFL 79159

Carbon Isotope Ratio (relative to Chicago standard) - not run

ADSORPTION ISOTHERM DATA - not run

PETROGRAPHIC ANALYSES

Lab. S.I.U. Coal Characterization Lab Petrographer John C. Crelling
Lab No. SIU #874 Date of Analysis ?

Maceral Analysis

Vitrinite	<u>60.2</u>
Pseudovitrinite	<u>24.7</u>
Semifusinite	<u>2.9</u>
Semimacrinite	<u>0.2</u>
Fusinite	<u>1.8</u>
Macrinite	<u>0.3</u>
Micrinite	<u>7.4</u>
Exinite	<u>0.5</u>
Resinite	<u>2.0</u>
Total	<u>100%</u>

Reflectance Analysis

pVit Ro - Vit Ro	<u>0.73</u>
pVit Ro	<u>0.80</u>
Combined Ro	<u>0.75</u>
pVit Ro - Vit Ro	<u>0.07</u>

Combined V-Type Table

V-Type	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>	<u>9</u>	<u>10</u>	<u>11</u>
%				<u>9.9</u>	<u>57.4</u>	<u>32.7</u>				
V-Type	<u>12</u>	<u>13</u>	<u>14</u>	<u>15</u>	<u>16</u>	<u>17</u>	<u>18</u>	<u>19</u>	<u>21</u>	<u>21</u>
%										

Comments: Apparent rank HvA bituminous

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 120

LOCATION

County: Gunnison Surface Elev (ft) 7420' (surface G.L.)
5994' (in mine G.L.)
Location: Sec 1 Twp 13S Rge 90W Coordinates SE SW
2180' FWL, 1005' FSL
Hawk's Nest East Mine

GENERAL

CGS Sample No. 120 Date 2/23/79
Sampled By Donna Boreck, K. C. Bowman Sample Type core-in mine
Operator Western Slope Carbon
Hole No. WSC #8

DRILLING DATA

Drilling Co. Boyles Bros. Address Salt Lake City
Core Size 2 3/8" NC Barrel Length 5'
Type of core retrieval wireline
Drilling media water Air Temperature 65°F
TD Hole 452' Logs Sample Log

GEOLOGY

Geologic Unit Mesaverde Group Age Upper Cretaceous
Coal zone/bed Bowie Member - Lower "B" Seam Bed Thickness 6.7'
Depth to top of coal 418.1' (Driller) same (Log)
Depth to bottom of coal 424.8' (Driller) same (Log)
Cored interval ? (Driller)
Roof description 2" very carbonaceous black shale, up to 1" saponitic dark gray shale, up to 2.33' shale, dark gray, very carb, up to interb sh & sltst.
Coal description black, attrital with fine to med vitrain (about 20%) very little mineralization at top, some calcite on cleat near base, good cleat 1/8"-1/2"
Floor description 26" shale brownish-black, very carb, w/ fn-med vitrain at top

DESORPTION DATA

Sampled interval (ft) 422.0-424.8' (Driller) same (Log)
Condition of sample 1"-2" chunks, 1/2 split desorbed
Sampled Weight (g) 410
Lost gas time (min) ? Lost gas cc not calculated
Desorbed gas cc 2237 Residual gas cc/g 2.2
Total gas content cc/g 7.66 Total gas content cf/t 245

Miscellaneous core hole drilled in mine

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
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Proximate Analyses (%)

Moisture	2.7	N/A	N/A
Volatile Matter	36.3	37.3	42.8
Fixed Carbon	48.5	49.8	57.2
Ash	12.5	12.9	N/A

Ultimate Analyses (%)

Hydrogen	5.3	5.1	5.9
Carbon	69.7	71.7	82.2
Nitrogen	1.7	1.7	1.9
Sulfur	.6	.7	.8
Oxygen	10.2	8.0	9.2
Ash	12.5	12.9	N/A

Heating value
(BTU/lb)

12600	12950	14862
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Sulfur Forms (%)

Sulfate	not run
Pyritic	not run
Organic	not run

Ash

Initial deformation (°F)	2420
Softening temperature (°F)	2500
Fluid temperature (°F)	2610

Free Swelling Index	2.5
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Fixed Carbon	
DMMF	58.00

Heating Value	
BTU/lb MMMF	14587

Apparent Rank	HvA bituminous
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Date of Analysis:	9/27/79
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Laboratory:	U.S. Dept. of Energy
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Lab No.	K95633
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Comments:	
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GAS ANALYSES - not runADSORPTION ISOTHERM DATA - not run

PETROGRAPHIC ANALYSES

Lab. S.I.U. Coal Characterization Lab Petrographer John C. Crelling
 Lab No. SIU #875 Date of Analysis ?

Maceral Analysis

Vitrinite	<u>61.3</u>
Pseudovitrinite	<u>29.4</u>
Semifusinite	<u>1.9</u>
Semimacrinite	<u>0.0</u>
Fusinite	<u>1.1</u>
Macrinite	<u>0.1</u>
Micrinite	<u>2.5</u>
Exinite	<u>1.7</u>
Resinite	<u>2.0</u>
Total	<u>100%</u>

Reflectance Analysis

pVit Ro - Vit Ro	<u>0.71</u>
pVit Ro	<u>0.80</u>
Combined Ro	<u>0.74</u>
pVit Ro - Vit Ro	<u>0.09</u>

Combined V-Type Table

V-Type	2	3	4	5	6	7	8	9	10	11
%					20.0	54.0	26.0			
V-Type	12	13	14	15	16	17	18	19	21	21
%										

Comments: Apparent rank HvA bituminous

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 121

LOCATION

County: Arapahoe
Location: Sec 4 Twp 4S Rge 64W

Surface Elev (ft) 5595
Coordinates NW/4 SW/4

GENERAL

CGS Sample No. 121
Sampled By Carol Tremain
Operator Mynet Inc.
Hole No. Biosphere #1

Date 5/7/79
Sample Type core

DRILLING DATA

Drilling Co. Look-N-Good Drilling Address Strasburg, Colorado
Core Size 2" NX Barrel Length 15'
Type of core retrieval Split barrel, conventional
Drilling media water with bentonite Air Temperature 55°
TD Hole 960' Logs SP-Resistivity, Caliper, Natural Gamma,
Gamma-Gamma Density, High Resolution Density

GEOLOGY

Geologic Unit Denver Formation Age Paleocene
Coal zone/bed Watkins or "E" Seam Bed Thickness 29' (log)
Depth to top of coal 122' (Driller) 117.5' (Log)
Depth to bottom of coal 146.6' (Driller) 146.5' (Log)
Cored interval 124-135' (Driller)
Roof description gray claystone
Coal description Lignite, brown-black, conchoidal fracture, hard, lots of thin, brown, sandy claystone partings
Floor description claystone, dark brown-chocolate color

DESORPTION DATA

Sampled interval (ft) 127-135' (Driller) same (Log)
Condition of sample wet, fine-2" size pieces, top 3" of each foot in 1/2 split
Sampled Weight (g) 961
Lost gas time (min) 25 Lost gas cc 100
Desorbed gas cc 25 Residual gas cc/g 0.0
Total gas content cc/g .13 Total gas content cf/t 4

Miscellaneous CGS 121 is sample from top portion of Watkins Seam; CGS 122 is a sample from lower part of seam.

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
<u>Proximate Analyses (%)</u>			
Moisture	21.0	N/A	N//A
Volatile Matter	41.4	52.4	85.3
Fixed Carbon	7.1	9.0	14.7
Ash	30.5	38.6	N/A
<u>Ultimate Analyses (%)</u>			
Hydrogen	4.9	3.2	5.2
Carbon	34.2	43.3	70.5
Nitrogen	.7	.8	1.4
Sulfur	.3	.4	.6
Oxygen	29.5	13.7	22.3
Ash	30.5	38.6	N/A
<u>Heating value</u> (BTU/lb)	5636	7136	11627
<u>Sulfur Forms (%)</u>			
Sulfate	not run		
Pyritic	not run		
Organic	not run		
<u>Ash</u>			
Initial deformation (°F)	not run		
Softening temperature (°F)	not run		
Fluid temperature (°F)	not run		
<u>Free Swelling Index</u>	not run		
<u>Fixed Carbon</u>			
DMMF	15.4		
<u>Heating Value</u>			
BTU/lb DMMF	8402		
<u>Apparent Rank</u>	subbituminous C		
Date of Analysis:	7-12-79		
Laboratory:	U.S. Dept. of Energy		Lab No. <u>K94207</u>
Comments:			

GAS ANALYSES - not runADSORPTION ISOTHERM DATA - not runPETROGRAPHIC ANALYSES - not run

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 122

LOCATION

County: Arpahoe
Location: Sec 4 Twp 4S Rge 64W

Surface Elev (ft) 5595
Coordinates NW/4 SW/4

GENERAL

CGS Sample No. 122
Sampled By C. Tremain
Operator Mynet Inc.
Hole No. Biosphere #1

Date 5-7-79
Sample Type core

DRILLING DATA

Drilling Co. Look-N-Good Drilling Address Strasburg, Colorado
Core Size 2" NX Barrel Length 15'
Type of core retrieval split barrel, conventional
Drilling media water w/bentonite Air Temperature 64°
TD Hole 960 Logs SP-Resistivity, High Resolution Density, Caliper, Gamma Gamma Density, Natural Gamma

GEOLOGY

Geologic Unit Denver Formation Age Paleocene
Coal zone/bed Watkins or "E" seam Bed Thickness 29' (log)
Depth to top of coal 122' (Driller) 117.5' (Log)
Depth to bottom of coal 146.6' (Driller) 146.5' (Log)
Cored interval 124-135' (Driller)
Roof description gray claystone
Coal description lignite, brown-black, conchoidal fracture, hard, lots of thin, brown, sandy claystone partings
Floor description claystone, dark brown-chocolate color

DESORPTION DATA

Sampled interval (ft) 140.25-144.60 (Driller) ? (Log)
Condition of sample wet, 2" size pieces, top 3" of each foot of 1/2 split
Sampled Weight (g) 529
Lost gas time (min) 26.5 Lost gas cc 140
Desorbed gas cc 35 Residual gas cc/g 0.0
Total gas content cc/g .33 Total gas content cf/t 11

Miscellaneous CGS 122 is sample of lower part of Watkins Seam; CGS 121 is sample of upper part of seam.

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
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Proximate Analyses (%)

Moisture	27.4	N/A	N/A
Volatile Matter	26.4	36.4	61.6
Fixed Carbon	16.6	22.8	38.4
Ash	29.6	40.8	N/A

Ultimate Analyses (%)

Hydrogen	5.0	2.8	4.7
Carbon	30.3	41.8	70.6
Nitrogen	.6	.9	1.4
Sulfur	.4	.6	1.0
Oxygen	34.0	13.3	22.4
Ash	29.6	40.8	N/A

Heating value
(BTU/lb)

5102	7029	11877
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Sulfur Forms (%)

Sulfate	not run
Pyritic	not run
Organic	not run

Ash

Initial deformation (°F)	not run
Softening temperature (°F)	not run
Fluid temperature (°F)	not run

Free Swelling Index	not run
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Fixed Carbon	
DMMF	40.9

Heating Value	
BTU/lb MMTF	7494

Apparent Rank	Lignite A
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Date of Analysis: 7-12-79
 Laboratory: U.S. Dept. of Energy Lab No. K94208
 Comments: _____

GAS ANALYSES - not runADSORPTION ISOTHERM DATA - not runPETROGRAPHIC ANALYSES - not run

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 123

LOCATION

County: Rio Blanco
Location: Sec 36 Twp 3N Rge 101W

Surface Elev (ft) 5459
Coordinates SE/4 SW/4

GENERAL

CGS Sample No. 123
Sampled By McCord and Schepcoff
Operator Western Fuels Assn.
Hole No. Moon Lake 310136-2

Date 6/19/79
Sample Type core

DRILLING DATA

Drilling Co. Teton Exploration Address Casper, Wyoming
Core Size 3" Barrel Length 15'
Type of core retrieval split inner tube
Drilling media water w/stafoam 202 Air Temperature ?
TD Hole 1378' Logs Resistivity, Gamma, Caliper, High Resolution Density

GEOLOGY

Geologic Unit Mesaverde Group Age Upper Cretaceous
Coal zone/bed "E" Seam Bed Thickness 2.3' (3' log)
Depth to top of coal 1324.7' (Driller) 1320' (Log)
Depth to bottom of coal 1327.1' (Driller) 1323' (Log)
Cored interval 1311-1325.9' * (Driller)
Roof description carbonaceous shale, black with interbedded coal stringers
Coal description black, good cleat in one direction, trace resin
Floor description gray shale w/intermittent coal partings

DESORPTION DATA

Sampled interval (ft) 1324.8-1326.0' (Driller) 1320-1321.2' (Log)
Condition of sample four large pieces, wet
Sampled Weight (g) 1588
Lost gas time (min) 27.5 Lost gas cc 130
Desorbed gas cc 2795 Residual gas cc/g 0.2
Total gas content cc/g 2.04 Total gas content cf/t 65

Miscellaneous *coal bed continued in next core

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
<u>Proximate Analyses (%)</u>			
Moisture	8.0	N/A	N/A
Volatile Matter	36.5	39.7	44.8
Fixed Carbon	45.0	48.9	55.2
Ash	10.5	11.4	N/A
<u>Ultimate Analyses (%)</u>			
Hydrogen	5.2	4.7	5.3
Carbon	62.6	68.1	76.9
Nitrogen	1.2	1.3	1.5
Sulfur	.5	.6	.6
Oxygen	19.9	13.9	15.6
Ash	10.5	11.4	N/A
<u>Heating value</u> (BTU/lb)	10675	11610	13104
<u>Sulfur Forms (%)</u>			
Sulfate	not run		
Pyritic	not run		
Organic	not run		
<u>Ash</u>			
Initial deformation (°F)	2000		
Softening temperature (°F)	2080		
Fluid temperature (°F)	2200		
<u>Free Swelling Index</u>	0.0		
<u>Fixed Carbon</u>			
DMMF	55.88		
<u>Heating Value</u>			
BTU/lb MMTF	12049.55		
<u>Apparent Rank</u>	HvC bituminous		
Date of Analysis:	9-11-80		
Laboratory:	U.S. Dept. of Energy		Lab No. <u>L03658</u>
Comments:			

GAS ANALYSES - not runADSORPTION ISOTHERM DATA - not runPETROGRAPHIC ANALYSES - not run

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 124

LOCATION

County: Rio Blanco
Location: Sec 36 Twp 3N Rge 101W

Surface Elev (ft) 5459
Coordinates SE/4, SW/4

GENERAL

CGS Sample No. 124
Sampled By Schepcoff & McCord
Operator Western Fuels Assn.
Hole No. Moon Lake 310136-2

Date 6-20-79
Sample Type core

DRILLING DATA

Drilling Co. Teton Exploration Address Casper, Wyoming
Core Size 3" Barrel Length 15'
Type of core retrieval split inner tube, conventional
Drilling media air mist w/sta foam Air Temperature ?
TD Hole 1378' Logs Resistivity, Gamma, Caliper, High Resolution Density

GEOLOGY

Geologic Unit Mesaverde Group Age Upper Cretaceous
Coal zone/bed "D" Seam Bed Thickness 8.2'
Depth to top of coal 1330.6' (Driller) 1327' (Log)
Depth to bottom of coal 1338.8' (Driller) 1335' (Log)
Cored interval 1325.9-1340.9' (Driller)
Roof description carbonaceous shale
Coal description top 1' 2 3/4" hard, bright blocky coal - friable coal, bottom 6' 11.8", good cleat in one direction, vitrinite in thin lenses
Floor description Gray shale w/intermittent coal partings

DESORPTION DATA

Sampled interval (ft) 1330.65-1331.65 (Driller) ? (Log)
Condition of sample ?
Sampled Weight (g) 1626
Lost gas time (min) 95 Lost gas cc 510
Desorbed gas cc 2978 Residual gas cc/g 0.1
Total gas content cc/g 2.25 Total gas content cf/t 72

Miscellaneous CGS 124 and CGS 125 and CGS 126 are all samples of "D" seam

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
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Proximate Analyses (%)

Moisture	7.6	N/A	N/A
Volatile Matter	34.4	37.2	41.3
Fixed Carbon	49.0	53.0	58.7
Ash	9.0	9.8	N/A

Ultimate Analyses (%)

Hydrogen	5.9	5.5	6.0
Carbon	65.1	70.5	78.1
Nitrogen	1.3	1.4	1.6
Sulfur	.6	.6	.7
Oxygen	18.1	12.3	13.6
Ash	9.0	9.8	N/A

Heating value
(BTU/lb)

11318	12245	13571
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Sulfur Forms (%)

Sulfate	not run
Pyritic	not run
Organic	not run

Ash

Initial deformation (°F)	2190
Softening temperature (°F)	2330
Fluid temperature (°F)	2420

Free Swelling Index 0.0Fixed Carbon
DMMF 59.39Heating Value
BTU/lb MMMF 12549.19Apparent Rank HvC bituminousDate of Analysis: 7-21-80Laboratory: U.S. Dept. of EnergyLab No. L02663

Comments: _____

GAS ANALYSES

	<u>With air</u>	<u>Air free</u>
<u>(MSI percent)</u>		
Hydrogen	-	
Oxygen	-	
Hydrogen sulfide	-	
Carbon dioxide	2.16	
Nitrogen	49.72	
Methane	47.63	
Ethane	0.38	
Other hydrocarbons	0.039	
<u>Calculated gas gravity</u>	--	

Calculated gross heating value (BTU/cf, air free) _____

Company: Western Fuels Sampler: Colorado Geological Survey
 Date sample taken: 7-3-79 Date sample analyzed: ?
 Laboratory: USGS Denver Lab No.: Moon Lake Can #63

Carbon Isotope Ratio (relative to Chicago standard)

C13 (ppm) -54.22
 Comments C1/C 1-5 = .9898
 Laboratory USGS Lab No.: Moon Lake Can #63
 Contact Dudley Rice Analysis date: ?

ADSORPTION ISOTHERM DATA - not run

PETROGRAPHIC ANALYSES - not run

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 125

LOCATION

County: Rio Blanco
Location: Sec 36 Twp 3N Rge 101W

Surface Elev (ft) 5459
Coordinates SE/4, SW/4

GENERAL

CGS Sample No. 125
Sampled By Schepcoff & McCord
Operator Western Fuels
Hole No. Moon Lake 310136-2

Date 6/20/79
Sample Type core

DRILLING DATA

Drilling Co. Teton Exploration Address Casper, Wyoming
Core Size 3" Barrel Length 15'
Type of core retrieval split-inner-tube
Drilling media air mist w/stafoam Air Temperature ?
TD Hole 1378' Logs Resistivity, Gamma, Caliper, High Resolution Density

GEOLOGY

Geologic Unit Mesaverde Group Age Upper Cretaceous
Coal zone/bed "D" seam Bed Thickness 8.2'
Depth to top of coal 1330.6' (Driller) 1327' (Log)
Depth to bottom of coal 1338.8' (Driller) 1335' (Log)
Cored interval 1325.9-1340.9' (Driller)
Roof description carbonaceous shale
Coal description bright, friable coal, mostly thin banded, vitrinite, fair cleat - one direction, some resin
Floor description gray shale w/intermittent coal partings

DESORPTION DATA

Sampled interval (ft) 1333.3-1334.3 (Driller) ? (Log)
Condition of sample several large pieces
Sampled Weight (g) 1643
Lost gas time (min) 96 Lost gas cc 365
Desorbed gas cc 2740 Residual gas cc/g 0.3
Total gas content cc/g 2.19 Total gas content cf/t 70

Miscellaneous CGS 124 and CGS 125 and CGS 126 are all samples of "D" Seam

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
<u>Proximate Analyses (%)</u>			
Moisture	9.0	N/A	N/A
Volatile Matter	34.1	37.5	39.0
Fixed Carbon	53.3	58.6	61.0
Ash	3.6	3.9	N/A
<u>Ultimate Analyses (%)</u>			
Hydrogen	6.1	5.6	5.8
Carbon	67.9	74.6	77.6
Nitrogen	1.3	1.5	1.5
Sulfur	.4	.4	.4
Oxygen	20.8	14.1	14.7
Ash	3.6	3.9	N/A
<u>Heating value</u> (BTU/lb)	11883	13055	13587
<u>Sulfur Forms (%)</u>			
Sulfate	not run		
Pyritic	not run		
Organic	not run		
<u>Ash</u>			
Initial deformation (°F)	2060		
Softening temperature (°F)	2180		
Fluid temperature (°F)	2300		
Free Swelling Index	0.0		
Fixed Carbon			
DMMF	61.27		
Heating Value			
BTU/lb MMMF	12371.20		
Apparent Rank	HvC bituminous		
Date of Analysis:	7-21-80		
Laboratory:	U.S. Dept. of Energy	Lab No.	L02664
Comments:			

GAS ANALYSES

	<u>With air</u>	<u>Air free</u>
<u>(MSI percent)</u>		
Hydrogen	--	
Oxygen	--	
Hydrogen sulfide	--	
Carbon dioxide	1.99	
Nitrogen (+ air)	64.63	
Methane	33.11	
Ethane	0.24	
Other hydrocarbons	0.025	
<u>Calculated gas gravity</u>	--	

Calculated gross heating value (BTU/cf, air free) _____

Company: Western Fuels Assn. Sampler: Colorado Geological Survey
 Date sample taken: 7-3-79 Date sample analyzed: ?
 Laboratory: USGS Denver Lab No.: Moon Lake Can 64

Carbon Isotope Ratio (relative to Chicago standard)

C13 (ppm) -53.48
 Comments C1/C1-5 = .9919
 Laboratory USGS Denver Lab No.: Moon Lake Can 64
 Contact Dudley Rice Analysis date: ?

ADSORPTION ISOTHERM DATA - not run

PETROGRAPHIC ANALYSES - not run

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 126

LOCATION

County: Rio Blanco
Location: Sec 36 Twp 3N Rge 101W

Surface Elev (ft) 5459
Coordinates SE/4, SW/4

GENERAL

CGS Sample No. 126
Sampled By Schepcoff & McCord
Operator Western Fuels
Hole No. Moon Lake 310136-2

Date 6/20/79
Sample Type core

DRILLING DATA

Drilling Co. Teton Exploration Address Casper, Wyoming
Core Size 3" Barrel Length 15'
Type of core retrieval split inner-tube conventional
Drilling media air mist w/foam Air Temperature ?
TD Hole 1378' Logs Resistivity, Gamma, Caliper High Resolution Density

GEOLOGY

Geologic Unit Mesaverde Group Age Upper Cretaceous
Coal zone/bed "D" seam Bed Thickness 8.2'
Depth to top of coal 1330.6' (Driller) 1327' (Log)
Depth to bottom of coal 1338.8' (Driller) 1335' (Log)
Cored interval 1325.9-1340.9' (Driller)
Roof description carbonaceous shale
Coal description hard, bright, blocky, trace of resin, good cleat in one direction
Floor description gray shale w/intermittent coal partings

DESORPTION DATA

Sampled interval (ft) 1335.8-1336.8 (Driller) ? (Log)
Condition of sample mostly large pieces
Sampled Weight (g) 1681
Lost gas time (min) 97 Lost gas cc 415
Desorbed gas cc 2552 Residual gas cc/g 0.3
Total gas content cc/g 2.06 Total gas content cf/t 66

Miscellaneous CGS 126 is sample of "D" seam as is CGS 125 and CGS 124

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
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Proximate Analyses (%)

Moisture	8.7	N/A	N/A
Volatile Matter	37.0	40.6	42.4
Fixed Carbon	50.3	55.0	57.6
Ash	4.0	4.4	N/A

Ultimate Analyses (%)

Hydrogen	5.6	5.1	5.3
Carbon	67.3	73.7	77.1
Nitrogen	1.4	1.6	1.7
Sulfur	.5	.5	.5
Oxygen	21.1	14.7	15.3
Ash	4.0	4.4	N/A

Heating value
(BTU/lb)

11885	13013	13610
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Sulfur Forms (%)

Sulfate	not run
Pyritic	not run
Organic	not run

Ash

Initial deformation (°F)	2100
Softening temperature (°F)	2240
Fluid temperature (°F)	2330

Free Swelling Index	0.0
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Fixed Carbon	
DMMF	57.92

Heating Value	
BTU/lb MMMF	12431.21

Apparent Rank	HvC bituminous
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Date of Analysis:	9-11-80
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Laboratory:	U.S. Dept. of Energy
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Lab No.	L03659
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Comments:	
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GAS ANALYSES - not runADSORPTION ISOTHERM DATA - not runPETROGRAPHIC ANALYSES - not run

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 127

LOCATION

County: Rio Blanco
Location: Sec 36 Twp 3N Rge 101W

Surface Elev (ft) 5459
Coordinates SE/4, SW/4

GENERAL

CGS Sample No. 127
Sampled By Schepocoff & McCord
Operator Western Fuels
Hole No. Moon Lake 310136-2

Date 6-20-79
Sample Type core

DRILLING DATA

Drilling Co. Teton Exploration Address Casper, Wyoming
Core Size 3" Barrel Length 15'
Type of core retrieval split barrel-tube conventional
Drilling media air mist w/foam Air Temperature ?
TD Hole 1378' Logs Resistivity, Gamma, Caliper, High Resolution Density

GEOLOGY

Geologic Unit Mesaverde Group Age Upper Cretaceous
Coal zone/bed "C" Seam Bed Thickness .9'
Depth to top of coal 1351.2 (Driller) 1346' (Log)
Depth to bottom of coal 1352.1 (Driller) ? (Log)
Cored interval 1340.9-1353.9' (Driller)
Roof description shale-black, carbonaceous w/coal lenses interbedded thruout
Coal description black fractured extensively
Floor description shaley coal

DESORPTION DATA

Sampled interval (ft) 1351.1-1352.1' (Driller) ? (Log)
Condition of sample wet, muddy
Sampled Weight (g) 1482
Lost gas time (min) 116 Lost gas cc 530
Desorbed gas cc 2148 Residual gas cc/g 0.0
Total gas content cc/g 1.81 Total gas content cf/t 58

Miscellaneous _____

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
<u>Proximate Analyses (%)</u>			
Moisture	6.4	N/A	N/A
Volatile Matter	27.3	29.2	41.9
Fixed Carbon	37.9	40.4	58.1
Ash	28.4	30.4	N/A
<u>Ultimate Analyses (%)</u>			
Hydrogen	4.4	3.9	5.6
Carbon	49.4	52.7	75.8
Nitrogen	1.2	1.2	1.8
Sulfur	.7	.8	1.1
Oxygen	15.9	10.9	15.6
Ash	28.4	30.4	N/A
<u>Heating value</u> (BTU/lb)	8686	9282	13336
<u>Sulfur Forms (%)</u>			
Sulfate	not run		
Pyritic	not run		
Organic	not run		
<u>Ash</u>			
Initial deformation (°F)	2800		
Softening temperature (°F)	2800		
Fluid temperature (°F)	2800		
Free Swelling Index	0.0		
Fixed Carbon			
DMMF	60.43		
Heating Value			
BTU/lb MMMF	12548.04		
Apparent Rank	HvC bituminous		
Date of Analysis:	2-28-80		
Laboratory:	U.S. Dept. of Energy	Lab No.	K99778
Comments:			

GAS ANALYSES

	<u>With air</u>	<u>Air free</u>
<u>(MSI percent)</u>		
Hydrogen	--	
Oxygen	--	
Hydrogen sulfide	--	
Carbon dioxide	2.25	
Nitrogen (or air)	49.78	
Methane	49.51	
Ethane	0.36	
Other hydrocarbons	0.04	
<u>Calculated gas gravity</u>	--	

Calculated gross heating value (BTU/cf, air free) --

Company: Western Fuels Sampler: Colorado Geological Survey
 Date sample taken: 7-3-79 Date sample analyzed: ?
 Laboratory: USGS Denver Lab No.: Moon Lake Can 66

Carbon Isotope Ratio (relative to Chicago standard)

C13 (ppm) -58.99
 Comments C1/C1-5 = .9905
 Laboratory USGS Denver Lab No.: Moon Lake Can 66
 Contact Dudley Rice Analysis date: ?

ADSORPTION ISOTHERM DATA - not run

PETROGRAPHIC ANALYSES - not run

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 128

LOCATION

County: Rio Blanco
Location: Sec 1 Twp 2N Rge 101W

Surface Elev (ft) 5344
Coordinates NE/4, SW/4

GENERAL

CGS Sample No. 128
Sampled By McCord - Wimer
Operator Western Fuels
Hole No. Moon Lake 21011-5

Date 6/30/79
Sample Type core

DRILLING DATA

Drilling Co. Teton Expl. Address Casper, Wyoming
Core Size 3" Barrel Length 15'
Type of core retrieval split inner-tube, conventional
Drilling media airmist w/stafoam Air Temperature ?
TD Hole 820' Logs Resistivity, Gamma, Caliper, High Resolution Density

GEOLOGY

Geologic Unit Mesaverde Group Age Upper Cretaceous
Coal zone/bed "F" Seam Bed Thickness 6.43'
Depth to top of coal 741.75 (Driller) 742' (Log)
Depth to bottom of coal 748.18(Driller) 749' (Log)
Cored interval 740-749.5' (Driller)
Roof description brown gray to dark gray silty shale, hard, massive
Coal description interbedded w/highly carbonaceous shale scattered patches of yellow resin, many slickenslides
Floor description shale black, highly carbonaceous, scattered resin, frequent coal partings

DESORPTION DATA

Sampled interval (ft) 741.25-742.25 (Driller) -- (Log)
Condition of sample fractured - several large pieces
Sampled Weight (g) 1703
Lost gas time (min) 133 Lost gas cc 600
Desorbed gas cc 318 Residual gas cc/g 0.1
Total gas content cc/g .64 Total gas content cf/t 20

Miscellaneous _____

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
<u>Proximate Analyses (%)</u>			
Moisture	8.6	N/A	N/A
Volatile Matter	38.4	42.0	45.4
Fixed Carbon	46.2	50.5	54.6
Ash	6.8	7.5	N/A
<u>Ultimate Analyses (%)</u>			
Hydrogen	5.2	4.6	5.0
Carbon	65.7	71.9	77.7
Nitrogen	1.3	1.4	1.6
Sulfur	.7	.7	.8
Oxygen	20.3	13.9	15.0
Ash	6.8	7.5	N/A
<u>Heating value</u> (BTU/lb)	11522	12603	13623
<u>Sulfur Forms (%)</u>			
Sulfate	not run		
Pyritic	not run		
Organic	not run		
<u>Ash</u>			
Initial deformation (°F)	2350		
Softening temperature (°F)	2440		
Fluid temperature (°F)	2570		
<u>Free Swelling Index</u>	not run		
<u>Fixed Carbon</u>			
DMMF	55.09		
<u>Heating Value</u>			
BTU/lb MMMF	12449.19		
<u>Apparent Rank</u>	HvC bituminous		
Date of Analysis:	<u>1/18/80</u>		
Laboratory:	<u>U.S. Dept. of Energy</u>		Lab No. <u>K98805</u>
Comments:	<u></u>		

GAS ANALYSES - not runADSORPTION ISOTHERM DATA - not runPETROGRAPHIC ANALYSES - not run

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 129

LOCATION

County: Rio Blanco
Location: Sec 1 Twp 2N Rge 101W

Surface Elev (ft) 5344
Coordinates NE/4, SW/4

GENERAL

CGS Sample No. 129
Sampled By McCord - Wimer
Operator Western Fuels
Hole No. Moon Lake 21011-5

Date 6/30/79
Sample Type core

DRILLING DATA

Drilling Co. Teton Expl. Address Casper, Wyoming
Core Size 3" Barrel Length 15'
Type of core retrieval split inner-tube conventional
Drilling media air-airmist w/stafoam Air Temperature ?
TD Hole 820' Logs Resistivity, Caliper, Gamma, High Resolution Density

GEOLOGY

Geologic Unit Mesaverde Group Age Upper Cretaceous
Coal zone/bed "F" Seam Bed Thickness 6.43'
Depth to top of coal 741.75' (Driller) 742' (Log)
Depth to bottom of coal 748.18' (Driller) 749' (Log)
Cored interval 740-749.5' (Driller)
Roof description brown gray - dark gray silty shale, very hard, massive
Coal description black interbedded w/highly carbonaceous shale. Friable, good cleat in one direction, thin vitrain bands, scattered resin.
Floor description shale, black, highly carbonaceous, frequent coal partings and scattered resin

DESORPTION DATA

Sampled interval (ft) 744.25-745.25 (Driller) ? (Log)
Condition of sample small to large pieces
Sampled Weight (g) 1852
Lost gas time (min) 134 Lost gas cc 860
Desorbed gas cc 3772 Residual gas cc/g 0.0
Total gas content cc/g 2.50 Total gas content cf/t 80

Miscellaneous _____

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
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Proximate Analyses (%)

Moisture	8.2	N/A	N/A
Volatile Matter	32.5	35.4	44.4
Fixed Carbon	40.8	44.4	55.6
Ash	18.5	20.2	N/A

Ultimate Analyses (%)

Hydrogen	5.1	4.6	5.8
Carbon	55.7	60.7	76.0
Nitrogen	1.2	1.3	1.6
Sulfur	.6	.7	.8
Oxygen	18.9	12.6	15.8
Ash	18.5	20.2	N/A

<u>Heating value</u> (BTU/lb)	9707	10579	13251
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Sulfur Forms (%)

Sulfate	not run
Pyritic	not run
Organic	not run

Ash

Initial deformation (°F)	2120
Softening temperature (°F)	2270
Fluid temperature (°F)	2360

<u>Free Swelling Index</u>	0.0
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<u>Fixed Carbon</u>	
DMMF	56.94

<u>Heating Value</u>	
BTU/lb MMMF	12143.30

<u>Apparent Rank</u>	HvB bituminous
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Date of Analysis:	9/11/80
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Laboratory:	U.S. Dept. of Energy
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Lab No.	L03660
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Comments:	
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GAS ANALYSES - not run

ADSORPTION ISOTHERM DATA - not run

PETROGRAPHIC ANALYSES - not run

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 130

LOCATION

County: Rio Blanco
Location: Sec 1 Twp 2N Rge 101W

Surface Elev (ft) 5344
Coordinates NE/4, SW/4

GENERAL

CGS Sample No. 130
Sampled By McCord - Wimer
Operator Western Fuels
Hole No. Moon Lake 21011-5

Date 6/30/79
Sample Type core

DRILLING DATA

Drilling Co. Teton Expl. Address Casper, Wyoming
Core Size 3" Barrel Length 15'
Type of core retrieval split inner-tube
Drilling media air-airmist w/stafoam Air Temperature ?
TD Hole 820' Logs Resistivity, Gamma, Caliper, High Resolution Density

GEOLOGY

Geologic Unit Mesaverde Group Age Upper Cretaceous
Coal zone/bed "E" Seam Bed Thickness 2.3
Depth to top of coal 758.71 (Driller) 760' (Log)
Depth to bottom of coal 761.01(Driller) 762' (Log)
Cored interval 755-770' (Driller)
Roof description dark gray to black carb. shale w/coal stringers in bottom .35"
Coal description black, good cleat in 1 direction, mostly vitrain, shale parting, trace resin
Floor description shale, brown-black w/coal stringers

DESORPTION DATA

Sampled interval (ft) 758.72-759.72 (Driller) -- (Log)
Condition of sample large pieces
Sampled Weight (g) 1627
Lost gas time (min) 70 Lost gas cc 285
Desorbed gas cc 3223 Residual gas cc/g 0.1
Total gas content cc/g 2.25 Total gas content cf/t 72

Miscellaneous _____

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
<u>Proximate Analyses (%)</u>			
Moisture	7.1	N/A	N/A
Volatile Matter	35.3	38.0	42.4
Fixed Carbon	48.1	51.8	57.6
Ash	9.5	10.2	N/A
<u>Ultimate Analyses (%)</u>			
Hydrogen	5.4	5.0	5.6
Carbon	64.6	69.5	77.4
Nitrogen	1.4	1.5	1.7
Sulfur	.6	.6	.7
Oxygen	18.5	13.1	14.6
Ash	9.5	10.2	N/A
<u>Heating value</u> (BTU/lb)	11364	12234	13627
<u>Sulfur Forms (%)</u>			
Sulfate	not run		
Pyritic	not run		
Organic	not run		
<u>Ash</u>			
Initial deformation (°F)	2500		
Softening temperature (°F)	2620		
Fluid temperature (°F)	2730		
<u>Free Swelling Index</u>	0.0		
<u>Fixed Carbon</u>			
DMMF	58.32		
<u>Heating Value</u>			
BTU/lb MMMF	12676.4		
<u>Apparent Rank</u>	HvC bituminous		
Date of Analysis:	9/11/80		
Laboratory:	U.S. Dept. of Energy		Lab No. <u>L03661</u>
Comments:			

GAS ANALYSES - not runADSORPTION ISOTHERM DATA - not runPETROGRAPHIC ANALYSES - not run

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 131

LOCATION

County: Rio Blanco
Location: Sec 1 Twp 2N Rge 101W

Surface Elev (ft) 5344
Coordinates NE/4, SW/4

GENERAL

CGS Sample No. 131
Sampled By McCord - Wimer
Operator Western Fuels
Hole No. Moon Lake 21011-5

Date 6/30/79
Sample Type core

DRILLING DATA

Drilling Co. Teton Expl. Address Rio Blanco, Colorado
Core Size 3" Barrel Length 15'
Type of core retrieval split inner tube conventional
Drilling media air-air mist w/stafoam Air Temperature ?
TD Hole 820' Logs High Resolution Density, Restivity, Caliper, Gamma

GEOLOGY

Geologic Unit Mesaverde Group Age Upper Cretaceous
Coal zone/bed "D" Seam Bed Thickness 7.58'
Depth to top of coal 764.92' (Driller) 766' (Log)
Depth to bottom of coal 772.5' (Driller) 774.5' (Log)
Cored interval 755-770' (Driller)
Roof description carbonaceous shale, gray-black
Coal description black, mostly thin banded vitrinite, good cleat in 1 direction, trace resin, conchoidal fracture
Floor description gray to black carb. shale with interbedded coal stringers

DESORPTION DATA

Sampled interval (ft) 764.87-765.87 (Driller) ? (Log)
Condition of sample mostly large pieces
Sampled Weight (g) 1744
Lost gas time (min) 72 Lost gas cc 310
Desorbed gas cc 3880 Residual gas cc/g 0.1
Total gas content cc/g 2.50 Total gas content cf/t 80

Miscellaneous CGS 131 and CGS 132 are both samples of the "D" Seam

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
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Proximate Analyses (%)

Moisture	8.3	N/A	N/A
Volatile Matter	35.4	38.7	41.4
Fixed Carbon	50.1	54.6	58.6
Ash	6.2	6.7	N/A

Ultimate Analyses (%)

Hydrogen	5.6	5.1	5.5
Carbon	66.5	72.5	77.8
Nitrogen	1.2	1.4	1.4
Sulfur	.4	.4	.5
Oxygen	20.1	13.9	14.9
Ash	6.2	6.7	N/A

Heating value
(BTU/lb)

As Received	11722	Moisture Free	12786	Moisture and Ash Free	13708
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Sulfur Forms (%)

Sulfate	not run
Pyritic	not run
Organic	not run

Ash

Initial deformation (°F)	2190
Softening temperature (°F)	2300
Fluid temperature (°F)	2440

Free Swelling Index 0.0Fixed Carbon
DMMF 59.02Heating Value
BTU/lb MMMF 12571.44Apparent Rank HvC bituminousDate of Analysis: 7/21/80Laboratory: U.S. Dept. of EnergyLab No. L02665

Comments: _____

GAS ANALYSES

	<u>With air</u>	<u>Air free</u>
<u>(MSI percent)</u>		
Hydrogen	--	--
Oxygen	--	
Hydrogen sulfide	--	
Carbon dioxide	3.35	
Nitrogen (or air)	38.33	
Methane	57.66	
Ethane	0.47	
Other hydrocarbons	0.07	
Argon	--	
<u>Calculated gas gravity</u>	--	
<u>Calculated gross heating value</u>	(BTU/cf, air free)	--
Company: <u>Western Fuels</u>	Sampler: <u>Carol Tremain</u>	
Date sample taken: <u>7/5/79</u>	Date sample analyzed: <u>?</u>	
Laboratory: <u>U.S.G.S.</u>	Lab No.: <u>Moon Lake Can 70</u>	

GAS ANALYSES

	<u>With air</u>	<u>Air free</u>
<u>(MSI percent)</u>		
Helium	trace	
Hydrogen	0.0	
Oxygen	0.0	
Hydrogen sulfide	0.0	
Carbon dioxide	2.4	
Nitrogen (or air)	37.8	
Methane	58.6	
Ethane	0.5	
Other hydrocarbons	.2	
Argon	0.5	
<u>Calculated gas gravity</u>	0.744	
<u>Calculated gross heating value</u>	(BTU/cf, air free)	610
Company: <u>Western Fuels</u>	Sampler: <u>Carol Tremain</u>	
Date sample taken: <u>7/5/79</u>	Date sample analyzed: <u>?</u>	
Laboratory: <u>U.S. Bur. of Mines</u>	Lab No.: <u>Can No. 70</u>	

Carbon Isotope Ratio (relative to Chicago standard)

C13 (ppm) -56.24
 Comments C1/C1-5 - .9887
 Laboratory USGS Denver Lab No.: _____
 Contact Dudley Rice Analysis date: ?

ADSORPTION ISOTHERM DATA - not run

PETROGRAPHIC ANALYSES - not run

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 132

LOCATION

County: Rio Blanco
Location: Sec 1 Twp 2N Rge 101W

Surface Elev (ft) 5344
Coordinates NE/4, SW/4

GENERAL

CGS Sample No. 132
Sampled By McCord - Wimer
Operator Western Fuels
Hole No. Moon Lake 21011-5

Date 7/1/79
Sample Type core

DRILLING DATA

Drilling Co. Teton Exploration Address Casper, Wyoming
Core Size 3" Barrel Length 15'
Type of core retrieval split inner tube conventional
Drilling media air mist w/stafoam Air Temperature ?
TD Hole 820' Logs Resistivity, Caliper, Gamma, High Resolution Density

GEOLOGY

Geologic Unit Mesaverde Group Age Upper Cretaceous
Coal zone/bed "D" Seam Bed Thickness 7.58
Depth to top of coal 764.92' (Driller) 766' (Log)
Depth to bottom of coal 772.5' (Driller) 774.5' (Log)
Cored interval 770-774.7' (Driller)
Roof description carbonaceous shale, gray to black
Coal description black, mostly banded vitrinite, good cleat in one direction, conchoidal fracture, shiny, trace resin
Floor description black carb. shale w/coal stringers interbedded

DESORPTION DATA

Sampled interval (ft) 771.5-772.5 (Driller) _____ (Log)
Condition of sample large core pieces
Sampled Weight (g) 1651
Lost gas time (min) 194 Lost gas cc 670
Desorbed gas cc 3775 Residual gas cc/g 0.1
Total gas content cc/g 2.79 Total gas content cf/t 89

Miscellaneous CGS 132 and CGS 131 are both samples of "D" Seam

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
<u>Proximate Analyses (%)</u>			
Moisture	9.4	N/A	N/A
Volatile Matter	32.4	35.7	38.1
Fixed Carbon	52.6	58.1	61.9
Ash	5.6	6.2	N/A
<u>Ultimate Analyses (%)</u>			
Hydrogen	5.5	4.9	5.2
Carbon	65.4	72.2	76.9
Nitrogen	1.4	1.5	1.6
Sulfur	.6	.6	.7
Oxygen	21.6	14.6	15.6
Ash	5.6	6.2	N/A
<u>Heating value</u> (BTU/lb)	11447	12632	13465
<u>Sulfur Forms (%)</u>			
Sulfate	not run		
Pyritic	not run		
Organic	not run		
<u>Ash</u>			
Initial deformation (°F)	2800		
Softening temperature (°F)	2800		
Fluid temperature (°F)	2800		
<u>Free Swelling Index</u>	0.0		
<u>Fixed Carbon</u>			
DMMF	62.34		
<u>Heating Value</u>			
BTU/lb MMMF	12,194.78		
<u>Apparent Rank</u>	HvC bituminous		
Date of Analysis:	7/21/80		
Laboratory:	U.S. Dept. of Energy		
Comments:			
		Lab No.	L02666

GAS ANALYSESWith air(MSI percent)

Argon	__
Helium	__
Hydrogen	__
Oxygen	__
Hydrogen sulfide	__
Carbon dioxide	3.13
Nitrogen	50.37
Methane	46.10
Ethane	0.05
Other hydrocarbons	0.008

Calculated gas gravity __Calculated gross heating value (BTU/cf, air free) __

Company: Western Fuels Sampler: Carol Tremain
 Date sample taken: 7/1/79 Date sample analyzed: 7/5/79
 Laboratory: USGS Lab No.: Moon Lake Can No. 71

GAS ANALYSESWith air(MSI percent)

Argon	0.6
Helium	trace
Hydrogen	0.0
Oxygen	1.2
Hydrogen sulfide	0.0
Carbon dioxide	3.5
Nitrogen	45.1
Methane	49.2
Ethane	0.4
Other hydrocarbons	trace

Calculated gas gravity 0.788Calculated gross heating value (BTU/cf, air free) 506

Company: Western Fuels Sampler: Carol Tremain
 Date sample taken: 7/1/79 Date sample analyzed: ?
 Laboratory: U.S. Bureau of Mines Lab No.: Can No. 71

Carbon Isotope Ratio (relative to Chicago standard)C13 (ppm) -57.08Comments C1/C1-5 = .9914Laboratory USGS Denver Lab No.: Moon Lake Can No. 71Contact Dudley Rice Analysis date: ?ADSORPTION ISOTHERM DATA - not runPETROGRAPHIC ANALYSES - not run

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 133

LOCATION

County: Rio Blanco
Location: Sec 1 Twp 2N Rge 101W

Surface Elev (ft) 5344
Coordinates NE/4, SW/4

GENERAL

CGS Sample No. 133
Sampled By McCord - Wimer
Operator Western Fuels
Hole No. Moon Lake 21011-5

Date 7/1/79
Sample Type core

DRILLING DATA

Drilling Co. Teton Expl. Address Casper, Wyoming
Core Size 3" Barrel Length 15'
Type of core retrieval split inner-tube conventional
Drilling media air-air mist w/stafoam Air Temperature ?
TD Hole 820' Logs Resistivity, Caliper, Gamma, High Resolution Density

GEOLOGY

Geologic Unit Mesaverde Group Age Upper Cretaceous
Coal zone/bed "C" Seam Bed Thickness 2.15'
Depth to top of coal 794.65' (Driller) 796.5' (Log)
Depth to bottom of coal 796.8' (Driller) 798.5' (Log)
Cored interval 789.5-804.2' (Driller)
Roof description carb. shale, dark gray to black
Coal description black, good cleat in one direction, mostly banded vitrain, trace resin and fusain
Floor description carb. shale, black

DESORPTION DATA

Sampled interval (ft) 795.4-796.4 (Driller) _____ (Log)
Condition of sample mostly large pieces
Sampled Weight (g) 1675
Lost gas time (min) 64 Lost gas cc 350
Desorbed gas cc 3408 Residual gas cc/g 0.1
Total gas content cc/g 2.34 Total gas content cf/t 75

Miscellaneous _____

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
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Proximate Analyses (%)

Moisture	10.2	N/A	N/A
Volatile Matter	35.2	39.2	40.7
Fixed Carbon	51.2	57.0	59.3
Ash	3.4	3.8	N/A

Ultimate Analyses (%)

Hydrogen	6.2	5.6	5.9
Carbon	66.4	73.9	76.8
Nitrogen	1.4	1.5	1.6
Sulfur	.6	.7	.7
Oxygen	22.0	14.4	15.0
Ash	3.4	3.8	N/A

Heating value
(BTU/lb)

As Received	11710	13034	13553
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Sulfur Forms (%)

Sulfate	not run
Pyritic	not run
Organic	not run

Ash

Initial deformation (°F)	2420
Softening temperature (°F)	2500
Fluid temperature (°F)	2590

Free Swelling Index 0.0Fixed Carbon
DMMF 59.57Heating Value
BTU/lb MMMF 12166.92Apparent Rank HvC bituminousDate of Analysis: 9/11/80Laboratory: U.S. Dept. of Energy

Comments: _____

Lab No. L03662

GAS ANALYSESWith air(MSI percent)

Argon	0.6
Hydrogen	0.0
Oxygen	5.7
Hydrogen sulfide	0.0
Carbon dioxide	2.4
Nitrogen (or air)	51.6
Methane	39.3
Ethane	0.3
Other hydrocarbons	trace
Helium	trace

Calculated gas gravity 0.828

Calculated gross heating value (BTU/cf, air free) 403

Company: Western Fuels Sampler: Carol Tremain
 Date sample taken: 7/05/79 Date sample analyzed: ?
 Laboratory: U.S. Bureau of Mines Lab No.: Can No. 72

GAS ANALYSESWith air Air Free(MSI percent)

Hydrogen	--
Oxygen	--
Hydrogen sulfide	--
Carbon dioxide	2.67
Nitrogen and/or air	59.63
Methane	40.03
Ethane	0.35
Other hydrocarbons	0.01

Calculated gas gravity --

Calculated gross heating value (BTU/cf, air free) --

Company: Western Fuels Sampler: Carol Tremain
 Date sample taken: 7/05/79 Date sample analyzed: ?
 Laboratory: USGS Lab No.: Moon Lake Can #72

Carbon Isotope Ratio (relative to Chicago standard)

C13 (ppm) -59.63

Comments C1/C1-5 = .9895

Laboratory USGS Denver Lab No.: Moon Lake Can 72
 Contact Dudley Rice Analysis date: ?

ADSORPTION ISOTHERM DATA - not run

PETROGRAPHIC ANALYSES - not run

LOCATION

County: Rio Blanco Surface Elev (ft) 5344
Location: Sec 1 Twp 2N Rge 101W Coordinates NE/4, SW/4

GENERAL

CGS Sample No. 134 Date 7/1/79
Sampled By McCord-Wimer Sample Type core
Operator Western Fuels
Hole No. Moon Lake 21011-5

DRILLING DATA

Drilling Co. Teton Exploration Address Casper, Wyoming
Core Size 3" Barrel Length 15'
Type of core retrieval Split Inner Tube Conventional
Drilling media air-air mist w/stafoam Air Temperature ?
TD Hole 820' Logs Resistivity, Caliper, Gamma, High Resolution Density

GEOLOGY

Geologic Unit Mesaverde Group Age Upper Cretaceous
Coal zone/bed "B" Seam Bed Thickness 4.0'
Depth to top of coal 797.5 (Driller) _____ (Log)
Depth to bottom of coal 801.5 (Driller) _____ (Log)
Cored interval 789.5-804.2 (Driller)
Roof description carb. shale black
Coal description coal-black, vitrinite in thick to thin lenses, some resin,
good cleat in one direction, one large shale inclusion
Floor description highly carb shale w/coal stringers

DESORPTION DATA

Sampled interval (ft) 797.45-798.45 (Driller) ? (Log)
Condition of sample wet, large core sections
Sampled Weight (g) 1650
Lost gas time (min) 66 Lost gas cc 470
Desorbed gas cc 3060 Residual gas cc/g 0.1
Total gas content cc/g 2.23 Total gas content cf/t 72

Miscellaneous _____

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
-----------------	--------------------	----------------------	------------------------------

Proximate Analyses (%)

Moisture	7.8	N/A	N/A
Volatile Matter	35.4	38.3	41.3
Fixed Carbon	50.3	54.6	58.7
Ash	6.5	7.1	N/A

Ultimate Analyses (%)

Hydrogen	6.1	5.7	6.1
Carbon	66.2	71.8	77.3
Nitrogen	1.3	1.4	1.5
Sulfur	.5	.6	.6
Oxygen	19.3	13.4	14.5
Ash	6.5	7.1	N/A

Heating value
(BTU/lb)

11740	12730	13702
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Sulfur Forms (%)

Sulfate	not run
Pyritic	not run
Organic	not run

Ash

Initial deformation (°F)	2910+
Softening temperature (°F)	2910+
Fluid temperature (°F)	2910+

Free Swelling Index	0.0
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Fixed Carbon	
DMMF	59.15

Heating Value	
BTU/lb MMMF	12636.85

Apparent Rank	HvC bituminous
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Date of Analysis:	9-11-80
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Laboratory:	U.S. Dept. of Energy
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Lab No.	L03663
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Comments:	
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GAS ANALYSESWith air(MSI percent)

Helium	trace
Hydrogen	0.0
Oxygen	2.6
Hydrogen sulfide	0.0
Carbon dioxide	3.4
Nitrogen	55.2
Methane	37.8
Ethane	0.3
Other hydrocarbons	trace
Argon	0.7

Calculated gas gravity	0.837
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Calculated gross heating value (BTU/cf, air free)	388
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Company: <u>Western Fuels Assn.</u>	Sampler: <u>Carol Tremain</u>
Date sample taken: <u>7/05/79</u>	Date sample analyzed: <u>?</u>
Laboratory: <u>U.S. Bur. of Mines</u>	Lab No.: <u>Moon Lake Can #73</u>

GAS ANALYSESWith air Air free(MSI percent)

Hydrogen	--	
Oxygen	--	
Hydrogen sulfide	--	
Carbon dioxide	2.03	
Nitrogen and/or air	60.29	
Methane	38.27	
Ethane	0.27	
Other hydrocarbons	0.036	

Calculated gas gravity	--
------------------------	----

Calculated gross heating value (BTU/cf, air free)	--
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Company: <u>Western Fuels Assn.</u>	Sampler: <u>Carol Tremain</u>
Date sample taken: <u>7/05/79</u>	Date sample analyzed: <u>?</u>
Laboratory: <u>U.S. Geol. Survey</u>	Lab No.: <u>Moon Lake Can #73</u>

Carbon Isotope Ratio (relative to Chicago standard)

C13 (ppm)	<u>-60.29</u>		
Comments	<u>C1/C 1-5= .9904</u>		
Laboratory	<u>USGS Denver</u>	Lab No.:	<u>Moon Lake Can #73</u>
Contact	<u>Dudley Rice</u>	Analysis date:	<u>?</u>

ADSORPTION ISOTHERM DATA - not runPETROGRAPHIC ANALYSES - not run

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 135

LOCATION

County: Rio Blanco
Location: Sec 1 Twp 2N Rge 101W

Surface Elev (ft) 5344
Coordinates NE/4, SW/4

GENERAL

CGS Sample No. 135
Sampled By McCord-Wimer
Operator Western Fuels
Hole No. Moon Lake 21011-5

Date 7/1/79
Sample Type core

DRILLING DATA

Drilling Co. Teton Exploration Address Casper, Wyoming
Core Size 3" Barrel Length 15'
Type of core retrieval Split Inner-Tube
Drilling media air-air mist w/stafoam Air Temperature _____
TD Hole 820' Logs Resistivity, Caliper, Gamma, High Resolution Density

GEOLOGY

Geologic Unit Mesaverde Group Age Upper Cretaceous
Coal zone/bed "A" Seam Bed Thickness 5.37
Depth to top of coal 805.6 (Driller) 807' (Log)
Depth to bottom of coal 810.97 (Driller) 812.5' (Log)
Cored interval 804.2-819.25' (Driller)
Roof description carb. shale, black with interbedded coal stringers
Coal description black, dull, good cleat in one direction
Floor description shaley coal, black

DESORPTION DATA

Sampled interval (ft) 808.6-809.3 (Driller) _____ (Log)
Condition of sample 3 large pieces
Sampled Weight (g) 1695
Lost gas time (min) 60 Lost gas cc 55
Desorbed gas cc 1900 Residual gas cc/g 0.2
Total gas content cc/g 1.35 Total gas content cf/t 43

Miscellaneous _____

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
<u>Proximate Analyses (%)</u>			
Moisture	7.6	N/A	N/A
Volatile Matter	33.1	35.9	39.3
Fixed Carbon	51.3	55.4	60.7
Ash	8.0	8.7	N/A
<u>Ultimate Analyses (%)</u>			
Hydrogen	5.4	4.9	5.4
Carbon	66.7	72.2	79.1
Nitrogen	1.3	1.4	1.5
Sulfur	.4	.4	.5
Oxygen	18.2	12.4	13.6
Ash	8.0	8.7	N/A
<u>Heating value</u> (BTU/lb)	11656	12616	13815
<u>Sulfur Forms (%)</u>			
Sulfate	not run		
Pyritic	not run		
Organic	not run		
<u>Ash</u>			
Initial deformation (°F)	2340		
Softening temperature (°F)	2450		
Fluid temperature (°F)	2540		
<u>Free Swelling Index</u>	0.0		
<u>Fixed Carbon</u>			
<u>DMMF</u>	61.33		
<u>Heating Value</u>			
<u>BTU/lb MMMF</u>	12767.17		
<u>Apparent Rank</u>	HvC bituminous		
Date of Analysis:	7-21-80		
Laboratory:	U.S. Dept. of Energy	Lab No.	L02667
Comments:			

GAS ANALYSES - not runADSORPTION ISOTHERM DATA - not runPETROGRAPHIC ANALYSES - not run

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 136

LOCATION

County: Las Animas
Location: Sec 8 Twp 33S Rge 65W

Surface Elev (ft) 6970
Coordinates 600'FNL,1525'FWL

GENERAL

CGS Sample No. 136
Sampled By S. M. Goolsby
Operator Mobil
Hole No. CT-79-8-9c

Date 7-23-79
Sample Type core

DRILLING DATA

Drilling Co. Teton Exploration Address Casper, Wyoming
Core Size 3" Barrel Length 10'
Type of core retrieval conventional split tube
Drilling media mud Air Temperature 104°
TD Hole Logs

GEOLOGY

Geologic Unit Vermejo Formation Age Upper Cretaceous
Coal zone/bed unnamed Bed Thickness 2.6'
Depth to top of coal 1192.1' (Driller) (Log)
Depth to bottom of coal 1194.7' (Driller) (Log)
Cored interval 1185-1198' (Driller)
Roof description sandstone and sandy shale layers
Coal description black, vitreous, 85% vitrain, 15% durain, blocky, 70% competent, banding, thin sparse, good cleat in 2 directions
Floor description dk gray, carbonaceous shale

DESORPTION DATA

Sampled interval (ft) 1192.1 - 1194.7' (Driller) (Log)
Condition of sample 1/4 - 3" pieces
Sampled Weight (g) 1286
Lost gas time (min) 45 Lost gas cc 7100
Desorbed gas cc 13,430 Residual gas cc/g 0.1
Total gas content cc/g 16.06 Total gas content cf/t 514

Miscellaneous _____

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
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Proximate Analyses (%)

Moisture	.8	N/A	N/A
Volatile Matter	19.7	19.9	24.6
Fixed Carbon	60.2	60.6	75.4
Ash	19.3	19.5	N/A

Ultimate Analyses (%)

Hydrogen	4.5	4.5	5.6
Carbon	70.1	70.7	87.7
Nitrogen	1.1	1.1	1.4
Sulfur	.5	.5	.7
Oxygen	4.4	3.7	4.6
Ash	19.3	19.5	N/A

Heating value
(BTU/lb)

12417	12513	15537
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Sulfur Forms (%)

Sulfate	not run
Pyritic	not run
Organic	not run

Ash

Initial deformation (°F)	not run
Softening temperature (°F)	not run
Fluid temperature (°F)	not run

Free Swelling Index not run

<u>Fixed Carbon</u>	
DMMF	77.00

<u>Heating Value</u>	
BTU/lb MMMF	15709.7

<u>Apparent Rank</u>	Mv bituminous
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Date of Analysis: 9-10-80

Laboratory: U.S. Dept. of Energy

Lab No. L03664

Comments:

GAS ANALYSES

	<u>With air</u>	<u>Air free</u>
<u>(MSI percent)</u>		
Aron	0.1	
Helium	trace	
Hydrogen	0.0	
Oxygen	0.4	
Hydrogen sulfide	0.0	
Carbon dioxide	1.1	
Nitrogen	4.6	
Methane	93.7	
Ethane	trace	
Other hydrocarbons	trace	
<u>Calculated gas gravity</u>	<u>0.587</u>	
<u>Calculated gross heating value</u>	<u>(BTU/cf, air free)</u>	<u>949</u>

Company: Mobil Oil Corporation Sampler: Carol Tremain
Date sample taken: 8-7-79 Date sample analyzed: ?
Laboratory: U.S. Bureau of Mines Lab No.: Mobil CT-79-9C

GAS ANALYSES

	<u>With air</u>	<u>Air free</u>
<u>(MSI percent)</u>		
Hydrogen	--	
Oxygen	--	
Hydrogen sulfide	--	
Carbon dioxide	1.18	
Nitrogen and/or air	27.95	
Methane	70.73	
Ethane	0.04	
Other hydrocarbons	--	
<u>Calculated gas gravity</u>	<u>--</u>	
<u>Calculated gross heating value</u>	<u>(BTU/cf, air free)</u>	<u>--</u>

Company: Mobil Oil Corporation Sampler: Carol Tremain
Date sample taken: 8-7-79 Date sample analyzed: ?
Laboratory: U.S.G.S. Lab No.: Mobil CT-79-9C

Carbon Isotope Ratio (relative to Chicago standard)

C13 (ppm) -42.51
Comments C1/C 1-5 = .998
Laboratory USGS Denver Lab No.: Mobil CT-79-8-9C
Contact Dudley Rice Analysis date: ?

ADSORPTION ISOTHERM DATA - not run

PETROGRAPHIC ANALYSES

Company S.I.U. Coal Characterization Lab Petrographer John C. Crelling
 Lab No. S.I.U. #896 Date of Analysis April/May of 1982

Maceral Analysis (white light)

Vitrinite	<u>62.3</u>
Pseudovitrinite	<u>6.6</u>
Semifusinite	<u>17.3</u>
Semimacrinite	<u>0.8</u>
Fusinite	<u>12.0</u>
Macrinite	<u>0.4</u>
Micrinite	<u>0.6</u>
Exinite	<u>0.0</u>
Resinite	<u>0.0</u>
Total	<u>100%</u>

Reflectance Analysis

Vitrinite Ro	<u>1.06</u>
pVit Ro	<u>1.15</u>
Combined Ro	<u>1.07</u>
pVit Ro - Vit Ro	<u>0.09</u>

Combined V-Type Table

V-Type	2	3	4	5	6	7	8	9	10	11
%									43.4	48.5

V-Type	12	13	14	15	16	17	18	19	20	21
%	8.1									

Comments: _____

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 138

LOCATION

County: Las Animas Surface Elev (ft) 6690'
Location: Sec 4 Twp 31S Rge 65W Coordinates 1075'FSL, 2255'FWL

GENERAL

CGS Sample No. 138 Date 7-26-79
Sampled By Mark Strever Sample Type core
Operator Mobil
Hole No. CT-79-4-1

DRILLING DATA

Drilling Co. Teton Exploration Address Casper, Wyoming
Core Size 2 1/8" Barrel Length 10'
Type of core retrieval conventional
Drilling media water Air Temperature 92°
TD Hole Logs

GEOLOGY

Geologic Unit Raton Formation Age Upper Cretaceous
Coal zone/bed unnamed Bed Thickness 2.8'
Depth to top of coal 223.8' (Driller) ? (Log)
Depth to bottom of coal 226.6' (Driller) ? (Log)
Cored interval 221-231' (Driller)
Roof description shale
Coal description black
Floor description carbonaceous shale

DESORPTION DATA

Sampled interval (ft) 223.8-226.6' ? (Driller) ? (Log)
Condition of sample small pieces, wet
Sampled Weight (g) 485
Lost gas time (min) 20 Lost gas cc 470
Desorbed gas cc 195 Residual gas cc/g 0.0
Total gas content cc/g 1.58 Total gas content cf/t 51

Miscellaneous _____

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
-----------------	--------------------	----------------------	------------------------------

Proximate Analyses (%)

Moisture	1.5	N/A	N/A
Volatile Matter	41.2	41.8	46.8
Fixed Carbon	46.8	47.5	53.2
Ash	10.5	10.7	N/A

Ultimate Analyses (%)

Hydrogen	5.7	5.6	6.3
Carbon	72.1	73.2	82.0
Nitrogen	1.6	1.6	1.8
Sulfur	.7	.7	.8
Oxygen	9.3	8.1	9.1
Ash	10.5	10.7	N/A

Heating value
(BTU/lb)

13223	13421	15024
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Sulfur Forms (%)

Sulfate	not run
Pyritic	not run
Organic	not run

Ash

Initial deformation (°F)	2800
Softening temperature (°F)	2800
Fluid temperature (°F)	2800

Free Swelling Index	3.5
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Fixed Carbon	
DMMF	53.81

Heating Value	
BTU/lb MMMF	14939.67

Apparent Rank	HvA bituminous
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Date of Analysis:	1-18-80
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Laboratory:	U.S. Dept. of Energy
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Lab No.	K98806
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Comments:	
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GAS ANALYSES - not runADSORPTION ISOTHERM DATA - not runPETROGRAPHIC ANALYSES - not run

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 139

LOCATION

County: Las Animas
Location: Sec 4 Twp 31S Rge 65W

Surface Elev (ft) 6690
Coordinates 1075'FSL, 2255'FWL

GENERAL

CGS Sample No. 139
Sampled By Mark Strever
Operator Mobil
Hole No. CT-79-4-1

Date 7-26-79
Sample Type core

DRILLING DATA

Drilling Co. Teton Exploration Address Casper, Wyoming
Core Size 2 1/8" Barrel Length 10'
Type of core retrieval conventional
Drilling media water Air Temperature 84°F
TD Hole ? Logs ?

GEOLOGY

Geologic Unit Raton Formation Age Upper Cretaceous
Coal zone/bed unnamed Bed Thickness 3'
Depth to top of coal 343' (Driller) ? (Log)
Depth to bottom of coal 346' (Driller) ? (Log)
Cored interval 339-349' (Driller)
Roof description shale
Coal description coal w/ss. partings, black, mostly banded vitrain, trace calcite
Floor description ss. w/occasional sh. streaks

DESORPTION DATA

Sampled interval (ft) 343-346 (Driller) ? (Log)
Condition of sample a few big pieces, most small
Sampled Weight (g) 702
Lost gas time (min) 15 Lost gas cc 120
Desorbed gas cc 1640 Residual gas cc/g 0.3
Total gas content cc/g 2.80 Total gas content cf/t 90

Miscellaneous _____

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
-----------------	--------------------	----------------------	------------------------------

Proximate Analyses (%)

Moisture	1.9	N/A	N/A
Volatile Matter	33.2	33.9	39.0
Fixed Carbon	52.0	52.9	61.0
Ash	12.9	13.2	N/A

Ultimate Analyses (%)

Hydrogen	5.4	5.3	6.1
Carbon	70.4	71.8	82.7
Nitrogen	1.5	1.5	1.7
Sulfur	.6	.6	.7
Oxygen	9.3	7.7	8.9
Ash	12.9	13.2	N/A

Heating value
(BTU/lb)

12665	12916	14879
-------	-------	-------

Sulfur Forms (%)

Sulfate	not run
Pyritic	not run
Organic	not run

Ash

Initial deformation (°F)	2800
Softening temperature (°F)	2800
Fluid temperature (°F)	2800

Free Swelling Index

Fixed Carbon

DMMF 61.91

Heating Value

BTU/lb MMMF 14736.75

Apparent Rank HvA bituminous

Date of Analysis: 9-10-80

Laboratory: U.S. Dept. of Energy

Lab No. L03665

Comments: _____

GAS ANALYSES

	<u>With air</u>	<u>Air free</u>
<u>(MSI percent)</u>		
Hydrogen	--	
Oxygen	--	
Hydrogen sulfide	--	
Carbon dioxide	0.75	
Nitrogen (or air)	45.85	
Methane	53.34	
Ethane	0.01	
Other hydrocarbons	--	
<u>Calculated gas gravity</u>	--	

Calculated gross heating value (BTU/cf, air free) --

Company: Mobil Sampler: Colo. Geol. Survey
 Date sample taken: 8-7-79 Date sample analyzed: ?
 Laboratory: USGS, Denver Lab No.: Mobil CT-79-4-1

Carbon Isotope Ratio (relative to Chicago standard)

C13 (ppm) -54.91
 Comments C1/C1-5 = .9989
 Laboratory USGS, Denver Lab No.: Mobil CT-79-4-1
 Contact Dudley Rice Analysis date: ?

ADSORPTION ISOTHERM DATA - not run

PETROGRAPHIC ANALYSES

Lab. S.I.U. Coal Characterization Lab Petrographer John C. Crelling
 Lab No. S.I.U. #897 Date of Analysis 5/82

Maceral Analysis (white light)

Vitrinite	<u>69.6</u>
Pseudovitrinite	<u>14.4</u>
Semifusinite	<u>7.5</u>
Semimacrinite	<u>0.1</u>
Fusinite	<u>5.2</u>
Macrinite	<u>0.1</u>
Micrinite	<u>0.7</u>
Exinite	<u>1.8</u>
Resinite	<u>0.6</u>
Total	<u>100%</u>

Reflectance Analysis

Vitrinite Ro	<u>0.64</u>
pVit Ro	<u>0.72</u>
Combined Ro	<u>0.65</u>
pVit Ro - Vit Ro	<u>0.08</u>

Combined V-Type Table

V-Type	2	3	4	5	6	7	8	9	10	11
%				2.9	50.0	46.1	1.0			

V-Type	12	13	14	15	16	17	18	19	20	21
%										

Comments: _____

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 140

LOCATION

County: Mesa
Location: Sec 10 Twp 10S Rge 93W

Surface Elev (ft) 8132
Coordinates 2504 FWL,
2368 FNL

GENERAL

CGS Sample No. 140
Sampled By Carol Tremain
Operator Exxon
Hole No. Vega 3

Date 7-31-79
Sample Type Conv. Core

DRILLING DATA

Drilling Co. Loffland Bros. Address Denver, CO
Core Size 4 1/4" Barrel Length 60'
Type of core retrieval conventional
Drilling media mud Air Temperature 92°
TD Hole 8570' Logs Dual Induction-SFL, FDC-CNL-GR, Cyberlook, Microlog,
Repeat Formation Tester, Sonic, Spectralog

GEOLOGY

Geologic Unit Mesaverde Group Age Upper Cretaceous
Coal zone/bed unknown Bed Thickness 14'
Depth to top of coal 7587' (Driller) 7598' (Log)
Depth to bottom of coal 7598' (Driller) 7612' (Log)
Cored interval 7570-7592 (Driller)
Roof description shale, gray, hard thin carb partings and boney coal zones
Coal description top of bed, broken chunks, rinsed off mud
Floor description silty shale (from log)

DESORPTION DATA

Sampled interval (ft) 7587-7592' (Driller) ? (Log)
Condition of sample broken chunks
Sampled Weight (g) 1338
Lost gas time (min) 204.5 Lost gas cc 10,000
Desorbed gas cc 8315 Residual gas cc/g 0.1
Total gas content cc/g 13.69 Total gas content cf/t 438

Miscellaneous _____

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
<u>Proximate Analyses (%)</u>			
Moisture	.7	N/A	N/A
Volatile Matter	20.6	20.7	24.9
Fixed Carbon	61.9	62.4	75.1
Ash	16.8	16.9	N/A
<u>Ultimate Analyses (%)</u>			
Hydrogen	4.4	4.3	5.2
Carbon	73.2	73.7	88.7
Nitrogen	1.7	1.7	2.0
Sulfur	.7	.7	.8
Oxygen	3.4	2.8	3.4
Ash	16.8	16.9	N/A
<u>Heating value</u> (BTU/lb)	12912	13003	15642
<u>Sulfur Forms (%)</u>			
Sulfate	not run		
Pyritic	not run		
Organic	not run		
<u>Ash</u>			
Initial deformation (°F)	2800		
Softening temperature (°F)	2800		
Fluid temperature (°F)	2800		
<u>Free Swelling Index</u>	8.5		
<u>Fixed Carbon</u>			
DMMF	76.50		
<u>Heating Value</u>			
BTU/lb MMMF	15805.62		
<u>Apparent Rank</u>	Mv bituminous		
Date of Analysis:	2-28-80		
Laboratory:	U.S. Dept. of Energy	Lab No.	K99779
Comments:			

GAS ANALYSESWith air(MSI percent)

Hydrogen	__
Oxygen	__
Hydrogen sulfide	__
Carbon dioxide	6.82
Nitrogen and/or air	4.22
Methane	82.99
Ethane	5.55
Other hydrocarbons	0.4
Calculated gas gravity	__

Calculated gross heating value (BTU/cf, air free) 942

Company: Exxon-USA Sampler: Carol Tremain
 Date sample taken: 8-2-79 Date sample analyzed: ?
 Laboratory: U.S.G.S. Lab No.: Core No. 2

GAS ANALYSESWith air(MSI percent)

Argon	0.1
Helium	trace
Hydrogen	0.0
Oxygen	0.2
Hydrogen sulfide	0.0
Carbon dioxide	7.3
Nitrogen and/or air	4.6
Methane	82.1
Ethane	5.3
Other hydrocarbons	0.5
Calculated gas gravity	0.680

Calculated gross heating value (BTU/cf) 942

Company: Exxon Sampler: Carol Tremain
 Date sample taken: 8-2-79 Date sample analyzed: 8-79
 Laboratory: U.S. Bureau of Mines Lab No.: Vega Unit #3

Carbon Isotope Ratio (relative to Chicago standard)

C13 (ppm) -40.34
 Comments C1/C1-5 = .9329
 Laboratory USGS, Denver Lab No.: Exxon Vega Core #2
 Contact Dudley Rice Analysis date: ?

ADSORPTION ISOTHERM DATA - not run

PETROGRAPHIC ANALYSES

Lab. S.I.U. Coal Characterization Lab Petrographer John C. Crelling
 Lab No. S.I.U. #848 Date of Analysis 10/80

Maceral Analysis (white light)

Vitrinite	<u>72.1</u>
Pseudovitrinite	<u>14.3</u>
Semifusinite	<u>6.1</u>
Semimacrinite	<u>2.4</u>
Fusinite	<u>3.0</u>
Macrinite	<u>0.2</u>
Micrinite	<u>0.3</u>
Exinite	<u>0.0</u>
Resinite	<u>1.6 *</u>
Total	<u>100%</u>

Reflectance Analysis

Vitrinite Ro	<u>1.51</u>
pVit Ro	<u>1.52</u>
Combined Ro	<u>1.51</u>
pVit Ro - Vit Ro	<u>0.01</u>

Combined V-Type Table

V-Type	2	3	4	5	6	7	8	9	10	11
%										

V-Type	12	13	14	15	16	17	18	19	20	21
%			34.0	64.0		1.0		1.0		

Comments: *Note--the Ultraviolet light was used to verify this percentage;
therefore, the resinite count may be slightly higher than a normal white
light maceral analysis.

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 141

LOCATION

County: Mesa Surface Elev (ft) 8132'
Location: Sec 10 Twp 10S Rge 93W Coordinates 2504' FWL, 2368' FNL

GENERAL

CGS Sample No. 141 Date 8-1-79
Sampled By Carol Tremain Sample Type core
Operator Exxon
Hole No. Vega 3

DRILLING DATA

Drilling Co. Loffland Bros. Address Denver, CO
Core Size 4 1/4" Barrel Length 60'
Type of core retrieval conventional
Drilling media mud Air Temperature 47°
TD Hole 8570' Logs Dual Induction-SFL, FDC-CNL-GR, Cyberlook, Microlog, Repeat Formation Tester, Sonic, Spectralog

GEOLOGY

Geologic Unit Mesaverde Group Age Upper Cretaceous
Coal zone/bed unknown Bed Thickness from log 18' & 31'
Depth to top of coal 7587' (Driller) 7598' (Log)
Depth to bottom of coal 7598' (Driller) 7612' (Log)
Cored interval 7532-7598' (Driller)
Roof description shale, gray, hard, thin carb. partings & boney coal zones
Coal description black
Floor description silty shale (from log)

DESORPTION DATA

Sampled interval (ft) 7592-7598' (Driller) ? (Log)
Condition of sample med - small chunks
Sampled Weight (g) 1388
Lost gas time (min) 242.5 Lost gas cc 4800
Desorbed gas cc 11,445 Residual gas cc/g 0.2
Total gas content cc/g 11.90 Total gas content cf/t 381
Miscellaneous Depth of coal from logs: 7598-7612 = 14'
7625-7653 = 23'

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
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Proximate Analyses (%)

Moisture	1.8	N/A	N/A
Volatile Matter	18.8	19.1	23.5
Fixed Carbon	61.0	62.2	76.5
Ash	18.4	18.7	N/A

Ultimate Analyses (%)

Hydrogen	4.2	4.1	5.1
Carbon	71.1	72.4	89.1
Nitrogen	1.7	1.7	2.1
Sulfur	.6	.6	.7
Oxygen	4.0	2.4	3.0
Ash	18.4	18.7	N/A

Heating value
(BTU/lb)

12576	12808	15757
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Sulfur Forms (%)

Sulfate	not run
Pyritic	not run
Organic	not run

Ash

Initial deformation (°F)	2800+
Softening temperature (°F)	2800+
Fluid temperature (°F)	2800+

Free Swelling Index	7.5
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Fixed Carbon	
DMMF	78.09

Heating Value	
BTU/lb DMMF	15722.19

Apparent Rank	Lv bituminous
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Date of Analysis: 3-3-80

Laboratory: U.S. Dept. of Energy

Lab No. K99780

Comments: _____

GAS ANALYSESWith air(MSI percent)

Argon	0.1
Helium	trace
Hydrogen	0.0
Oxygen	1.8
Hydrogen sulfide	0.0
Carbon dioxide	6.6
Nitrogen	9.9
Methane	78.3
Ethane	3.1
Other hydrocarbons	0.2
Calculated gas gravity	0.688

Calculated gross heating value (BTU/cf, air free) 854

Company: Exxon Sampler: Carol Tremain
 Date sample taken: 8-2-74 Date sample analyzed: ?
 Laboratory: U.S. Bureau of Mines Lab No.: Core No. 3

GAS ANALYSESWith air(MSI percent)

Argon	trace
Helium	trace
Hydrogen	0.0
Oxygen	0.0
Hydrogen sulfide	0.0
Carbon dioxide	6.8
Nitrogen	2.3
Methane	85.9
Ethane	4.6
Other hydrocarbons	0.3
Calculated gas gravity	0.655

Calculated gross heating value (BTU/cf, air free) 960

Company: Exxon Sampler: Carol Tremain
 Date sample taken: 8-2-74 Date sample analyzed: ?
 Laboratory: U.S. Bureau of Mines Lab No.: Core No. 3

GAS ANALYSESWith air(MSI percent)

Hydrogen	<u> --</u>
Oxygen	<u> --</u>
Hydrogen sulfide	<u> --</u>
Carbon dioxide	<u> 6.20</u>
Nitrogen and/or air	<u> 10.56</u>
Methane	<u> 79.63</u>
Ethane	<u> 3.41</u>
Other hydrocarbons	<u> 0.185</u>
Calculated gas gravity	<u> --</u>

Calculated gross heating value	(BTU/cf, air free)	<u> --</u>
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Company:	<u>Exxon</u>	Sampler:	<u>Carol Tremain</u>
Date sample taken:	<u>8-2-74</u>	Date sample analyzed:	<u>?</u>
Laboratory:	<u>U.S.G.S.</u>	Lab No.:	<u>Core No. 3</u>

Carbon Isotope Ratio (relative to Chicago standard)

C13 (ppm)	<u>-48.8</u>		
Comments	<u>C1/C1-5 = .9566</u>		
Laboratory	<u>USGS, Denver</u>	Lab No.:	<u>Exxon Vega Core ?</u>
Contact	<u>Dudley Rice</u>	Analysis date:	<u>?</u>

ADSORPTION ISOTHERM DATA - not runPETROGRAPHIC ANALYSES

Lab.	<u>S.I.U. Coal Characterization Lab</u>	Petrographer	<u>John C. Crelling</u>
Lab No.	<u>SIU #849</u>	Date of Analysis	<u>?</u>

Maceral Analysis

Vitrinite	<u> 75.7</u>
Pseudovitrinite	<u> 15.6</u>
Semifusinite	<u> 3.4</u>
Semimacrinite	<u> 1.1</u>
Fusinite	<u> 1.3</u>
Macrinite	<u> 0.1</u>
Micrinite	<u> 0.2</u>
Exinite	<u> 0.0</u>
Resinite	<u> 2.6</u>
Total	<u> 100%</u>

Reflectance Analysis

pVit Ro - Vit Ro	<u> 1.52</u>
pVit Ro	<u> 1.53</u>
Combined Ro	<u> 1.52</u>
pVit Ro - Vit Ro	<u> 0.01</u>

Combined V-Type Table

V-Type	2	3	4	5	6	7	8	9	10	11
%										
V-Type	12	13	14	15	16	17	18	19	20	21
%		1.0	19.0	78.0	2.0					

Comments: _____

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 142

LOCATION

County: Rio Blanco
Location: Sec 26 Twp 3S Rge 101W

Surface Elev (ft) 7391
Coordinates 945 fnl 935 fwl

GENERAL

CGS Sample No. 142
Sampled By Archer-Wimer
Operator Fuelco
Hole No. D-26-3-101-S

Date 8/14/79
Sample Type core

DRILLING DATA

Drilling Co. Veco Address Grand Junction, CO
Core Size 3" Barrel Length 30'
Type of core retrieval conventional
Drilling media air mist Air Temperature ?
TD Hole 4110' Logs Comp. Neutron-Density; Dual Induction-Laterlog
Micro-Seismogram

GEOLOGY

Geologic Unit Mesaverde Group Age Upper Cretaceous
Coal zone/bed "C" Seam Bed Thickness 3'
Depth to top of coal 1148.9' (Driller) 1144' (Log)
Depth to bottom of coal 1151.9' (Driller) 1147' (Log)
Cored interval 1140 - 1170' (Driller)
Roof description sandstone, gray fine-med. grain subangular, med. sorted *
Coal description black coal, shiny, mostly banded vitrinite, good cleat in one direction, gypsum on cleat faces
Floor description shale, dk. gray, fissile, v. carb., well developed, slickensided fracture surfaces

DESORPTION DATA

Sampled interval (ft) 1148.9 - 1149.9' (Driller) ? (Log)
Condition of sample mostly large pieces
Sampled Weight (g) 989
Lost gas time (min) 145 Lost gas cc 310
Desorbed gas cc 594 Residual gas cc/g 0.2
Total gas content cc/g 1.11 Total gas content cf/t 36

Miscellaneous *abundant shale laminae, carb.

CGS 142 & 143 are both from "C" seam

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
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Proximate Analyses (%)

Moisture	9.4	N/A	N/A
Volatile Matter	30.2	33.4	35.4
Fixed Carbon	55.2	60.8	64.6
Ash	5.2	5.8	N/A

Ultimate Analyses (%)

Hydrogen	5.4	4.8	5.1
Carbon	68.1	75.2	79.8
Nitrogen	1.6	1.7	1.8
Sulfur	.8	.9	.9
Oxygen	18.9	11.6	12.3
Ash	5.2	5.8	N/A

Heating value
(BTU/lb)

12159	13424	14243
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Sulfur Forms (%)

Sulfate	not run
Pyritic	not run
Organic	not run

Ash

Initial deformation (°F)	2800
Softening temperature (°F)	2800
Fluid temperature (°F)	2800

Free Swelling Index	1.0
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Fixed Carbon	
DMMF	65.14

Heating Value	
BTU/lb MMMF	12900.23

Apparent Rank	HvC bituminous
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Date of Analysis:	7-21-80
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Laboratory:	U.S. Dept. of Energy
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Lab No.	L02668
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Comments:	
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GAS ANALYSES - not run

ADSORPTION ISOTHERM DATA - not run

PETROGRAPHIC ANALYSES - not run

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 143

LOCATION

County: Rio Blanco
Location: Sec 26 Twp 3S Rge 101W

Surface Elev (ft) 7391
Coordinates 945 fnl, 935 fwl

GENERAL

CGS Sample No. 143
Sampled By Archer-Wimer
Operator Fuelco
Hole No. D-26-3-101-S

Date 8/14/79
Sample Type core

DRILLING DATA

Drilling Co. Veco Address Grand Junction, CO
Core Size 3" Barrel Length 30'
Type of core retrieval conventional
Drilling media air mist Air Temperature ?
TD Hole 4110' Logs Comp. Neutron-Density; Dual Induction-Laterolog, Micro-Seismology

GEOLOGY

Geologic Unit Mesaverde Group Age Upper Cretaceous
Coal zone/bed "C" Seam Bed Thickness *
Depth to top of coal 1148.9'*(Driller) 1144' (Log)
Depth to bottom of coal 1159.0'*(Driller) 1154' (Log)
Cored interval 1140-1170' (Driller)
Roof description see Misc.
Coal description large pieces, black, gypsum in slickensides and calcite in cleats, vitrinite in thin lenses
Floor description see Misc.

DESORPTION DATA

1149.9-1150.4*
Sampled interval (ft) 1154.5-1155.1* (Driller) ? (Log)
Condition of sample large pieces
Sampled Weight (g) 1543
Lost gas time (min) 150 Lost gas cc 120 ?
Desorbed gas cc 750 Residual gas cc/g 0.2
Total gas content cc/g .76 Total gas content cf/t 24

Miscellaneous

*Bed C consists of 1148.9-1151.9 = 3 feet = Bed C,
and 1154.0-1159 = 5 feet = Bed C₂

C₁ Roof = sandstone, gray, fine-med. grain subangular, med. sorted,
abundant shale laminae, carb.

Floor = shale, dk. gray, fissile, V. carbonaceous, well developed
slickensided fracture surfaces

C₂ Roof = Shale, dk. gray, fissile, V. carbonaceous, well developed
slickensided fracture surfaces

Floor = shale

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
<u>Proximate Analyses (%)</u>			
Moisture	7.4	N/A	N/A
Volatile Matter	32.4	35.0	43.4
Fixed Carbon	42.2	45.6	56.6
Ash	18.0	19.4	N/A
<u>Ultimate Analyses (%)</u>			
Hydrogen	4.8	4.3	5.4
Carbon	59.5	64.2	79.7
Nitrogen	1.4	1.5	1.9
Sulfur	.7	.7	.9
Oxygen	15.7	9.8	12.2
Ash	18.0	19.4	N/A
<u>Heating value</u> (BTU/lb)	10538	11386	14132
<u>Sulfur Forms (%)</u>			
Sulfate	not run		
Pyritic	not run		
Organic	not run		
<u>Ash</u>			
Initial deformation (°F)	2800		
Softening temperature (°F)	2800		
Fluid temperature (°F)	2800		
<u>Free Swelling Index</u>	1.0		
<u>Fixed Carbon</u>			
<u>DMMF</u>	57.84		
<u>Heating Value</u>			
<u>BTU/lb MMMF</u>	13100.09		
<u>Apparent Rank</u>	HvB bituminous		
Date of Analysis:	7-21-80		
Laboratory:	U.S. Dept. of Energy		Lab No. <u>L02669</u>
Comments:			

GAS ANALYSES - not run

ADSORPTION ISOTHERM DATA - not run

PETROGRAPHIC ANALYSES - not run

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 144

LOCATION

County: Rio Blanco
Location: Sec 26 Twp 3S Rge 101W

Surface Elev (ft) 7391
Coordinates 945 fnl 935 fwl

GENERAL

CGS Sample No. 144
Sampled By Archer-Wimer
Operator Fuelco
Hole No. D-26-3-101-S

Date 8-14-79
Sample Type core

DRILLING DATA

Drilling Co. Veco Address Grand Junction, CO
Core Size 3" Barrel Length 30'
Type of core retrieval conventional (PVC)
Drilling media air mist Air Temperature ?
TD Hole 4110' Logs Comp. Neutron-Density; Dual Induction-Laterolog, Micro-Seismogram

GEOLOGY

Geologic Unit Mesaverde Group Age Upper Thickness _____
Coal zone/bed "A" Seam Bed Thickness 8.7'
Depth to top of coal 1209.1' (Driller) 1207' (Log)
Depth to bottom of coal 1217.8' (Driller) 1215' (Log)
Cored interval 1186.0 - 1214.5' (Driller)
Roof description SS, fine grain, silty in parts, carb. shale laminae
Coal description black coal, good cleat in one direction, shiny to dull, vitrinite mostly in thin bands, slickensides with gypsum
Floor description shale, increasingly sandy, coal & sand stringers

DESORPTION DATA

Sampled interval (ft) 1211.6-1212.4 (Driller) ? (Log)
Condition of sample mostly small pieces, wet
Sampled Weight (g) 1317
Lost gas time (min) 109 Lost gas cc 125 ?
Desorbed gas cc 1089 Residual gas cc/g 0.0
Total gas content cc/g .92 Total gas content cf/t 29

Miscellaneous CGS 144 & 145 are both samples of "A" seam

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
<u>Proximate Analyses (%)</u>			
Moisture	8.1	N/A	N/A
Volatile Matter	27.3	29.7	32.1
Fixed Carbon	57.8	62.9	67.9
Ash	6.8	7.4	N/A
<u>Ultimate Analyses (%)</u>			
Hyd ogen	5.3	4.8	5.2
Carbon	69.0	75.1	81.1
Nitrogen	1.5	1.6	1.7
Sulfur	.5	.5	.5
Oxygen	16.9	10.6	11.4
Ash	6.8	7.4	N/A
<u>Heating value</u> (BTU/lb)	12103	13165	14219
<u>Sulfur Forms (%)</u>			
Sulfate	not run		
Pyritic	not run		
Organic	not run		
<u>Ash</u>			
Initial deformation (°F)	2800		
Softening temperature (°F)	2800		
Fluid temperature (°F)	2800		
<u>Free Swelling Index</u>	1.0		
<u>Fixed Carbon</u>			
DMMF	68.49		
<u>Heating Value</u>			
BTU/lb MMMF	13074.11		
<u>Apparent Rank</u>	HvB bituminous		
Date of Analysis:	7-21-80		
Laboratory:	U.S. Dept. of Energy	Lab No.	L02670
Comments:			

GAS ANALYSES - not runADSORPTION ISOTHERM DATA - not runPETROGRAPHIC ANALYSES - not run

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 145

LOCATION

County: Rio Blanco
Location: Sec 26 Twp 3S Rge 101W

Surface Elev (ft) 7391
Coordinates 945 fml, 935 fwl

GENERAL

CGS Sample No. 145
Sampled By Archer-Wimer
Operator Fuelco
Hole No. D-26-3-101-S

Date 8/14/79
Sample Type core

DRILLING DATA

Drilling Co. Veco Address Grand Junction, CO
Core Size 3" Barrel Length 30'
Type of core retrieval conventional (PVC)
Drilling media air mist Air Temperature ?
TD Hole 4110' Logs Comp. Neutron-Density; Dual Induction-Laterolog;
Micro-Seismogram

GEOLOGY

Geologic Unit Mesaverde Group Age Upper Cretaceous
Coal zone/bed "A" Bed Thickness 8.7'
Depth to top of coal 1209.1' (Driller) 1207' (Log)
Depth to bottom of coal 1217.8' (Driller) 1215' (Log)
Cored interval 1186.0 - 1214.5' (Driller)
Roof description SS, fine grain, silty in parts, carb. shale laminae
Coal description mostly one large piece, black, shiny, good cleat in
one direction, trace resin, vitrinite in very thin lenses.
Floor description shale, increasingly sandy, coal and sand stringers

DESORPTION DATA

Sampled interval (ft) 1209.5-1210.5 (Driller) ? (Log)
Condition of sample mostly one large piece
Sampled Weight (g) 1503
Lost gas time (min) 111 Lost gas cc 30 ?
Desorbed gas cc 782 Residual gas cc/g 0.1
Total gas content cc/g .64 Total gas content cf/t 20

Miscellaneous CGS 144 & 145 are both samples of "A" seam

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
<u>Proximate Analyses (%)</u>			
Moisture	7.6	N/A	N/A
Volatile Matter	27.8	30.1	31.7
Fixed Carbon	60.0	65.0	68.3
Ash	4.6	4.9	N/A
<u>Ultimate Analyses (%)</u>			
Hydrogen	5.8	5.4	5.7
Carbon	71.3	77.2	81.2
Nitrogen	1.5	1.6	1.7
Sulfur	.6	.6	.7
Oxygen	16.2	10.2	10.7
Ash	4.6	4.9	N/A
<u>Heating value</u> (BTU/lb)	12456	13488	14189
<u>Sulfur Forms (%)</u>			
Sulfate	not run		
Pyritic	not run		
Organic	not run		
<u>Ash</u>			
Initial deformation (°F)	2800		
Softening temperature (°F)	2800		
Fluid temperature (°F)	2800		
<u>Free Swelling Index</u>	1.0		
<u>Fixed Carbon</u>			
DMMF	68.78		
<u>Heating Value</u>			
BTU/lb MMMF	13121.15		
<u>Apparent Rank</u>	HvB bituminous		
Date of Analysis:	7-21-80		
Laboratory:	U.S. Dept. of Energy	Lab No.	L02671
Comments:			

GAS ANALYSES - not runADSORPTION ISOTHERM DATA - not runPETROGRAPHIC ANALYSES - not run

LOCATION

County: Rio Blanco
Location: Sec 26 Twp 3S Rge 101W

Surface Elev (ft) 7391
Coordinates 945 fnl, 935 fwl

GENERAL

CGS Sample No. 146
Sampled By Archer-Wimer
Operator Fuelco
Hole No. D-26-3-101-S

Date 8-15-79
Sample Type core

DRILLING DATA

Drilling Co. Veco Address Grand Junction, CO
Core Size 3" Barrel Length 30"
Type of core retrieval conventional
Drilling media air-mist Air Temperature ?
TD Hole 4110' Logs Comp. Neutron-Density; Dual Induction-Laterolog; Micro-Seismogram

GEOLOGY

Geologic Unit Mesaverde Group Age Upper Cretaceous
Coal zone/bed no name Bed Thickness 1-2'
Depth to top of coal 1223.0'*(Driller) 1217'?(Log)
Depth to bottom of coal 1225.0' (Driller) 1221' ? (Log)
Cored interval 1214.5 - 1236.5' (Driller)
Roof description shale, increasingly sandy, coal & sand stringers
Coal description Black, shiny, mostly banded vitrinite, some resin, slickensides, good cleat in two directions
Floor description SS, fine-med. grained, carb. streaks, increasingly cleaner

DESORPTION DATA

Sampled interval (ft) 1223.0-1224.0' (Driller) ? (Log)
Condition of sample large pieces
Sampled Weight (g) 1252
Lost gas time (min) 180 Lost gas cc 360 ?
Desorbed gas cc 705 Residual gas cc/g 0.1
Total gas content cc/g .95 Total gas content cf/t 30

Miscellaneous *Rider below bed A (CGS #145)

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
<u>Proximate Analyses (%)</u>			
Moisture	6.2	N/A	N/A
Volatile Matter	33.7	35.9	38.2
Fixed Carbon	54.4	58.0	61.8
Ash	5.7	6.1	N/A
<u>Ultimate Analyses (%)</u>			
Hydrogen	5.9	5.5	5.9
Carbon	71.1	75.8	80.6
Nitrogen	1.6	1.7	1.8
Sulfur	.7	.7	.8
Oxygen	15.1	10.2	10.9
Ash	5.7	6.1	N/A
<u>Heating value</u> (BTU/lb)	12633	13464	14332
<u>Sulfur Forms (%)</u>			
Sulfate	not run		
Pyritic	not run		
Organic	not run		
<u>Ash</u>			
Initial deformation (°F)	2800		
Softening temperature (°F)	2800		
Fluid temperature (°F)	2800		
<u>Free Swelling Index</u>	1.5		
<u>Fixed Carbon</u>			
DMMF	62.22		
<u>Heating Value</u>			
BTU/lb MMMF	13479.70		
<u>Apparent Rank</u>	HvB bituminous		
Date of Analysis:	<u>7-21-80</u>		
Laboratory:	<u>U.S. Dept. of Energy</u>		Lab No. <u>L02672</u>
Comments:			

GAS ANALYSES - not runADSORPTION ISOTHERM DATA - not runPETROGRAPHIC ANALYSES - not run

LOCATION

County: Rio Blanco
Location: Sec 29 Twp 3N Rge 101W

Surface Elev (ft) 5877
Coordinates NW/4, NW/4

GENERAL

CGS Sample No. 147
Sampled By Wimer/Johnson
Operator Western Fuels
Hole No. Moon Lake 310129-4

Date 8-28-79
Sample Type core

DRILLING DATA

Drilling Co. Teton Exploration Address Casper, Wyoming
Core Size 3" Barrel Length 15'
Type of core retrieval split barrel (inner), conventional
Drilling media air mist Air Temperature ?
TD Hole 918' Logs Gamma, Caliper, Single Point Resistance,
High Resolution Density

GEOLOGY

Geologic Unit Mesaverde Group Age Upper Cretaceous
Coal zone/bed "C" Bed Thickness 3.33'
Depth to top of coal 879.15' (Driller) same (Log)
Depth to bottom of coal 882.48' (Driller) same (Log)
Cored interval 870.0-885.1' (Driller)
Roof description shale, dark gray
Coal description black, good luster, extensive fractures

Floor description brown shale to black shale, abundant coal layers & lenses

DESORPTION DATA

Sampled interval (ft) 878.75-879.15 (Driller) same (Log)
Condition of sample several large pieces
Sampled Weight (g) 2117
Lost gas time (min) 53 Lost gas cc not calculated-shale
Desorbed gas cc 63 Residual gas cc/g 0.0
Total gas content cc/g .03 Total gas content cf/t 1

Miscellaneous sample - shale roof of "C" beam

COAL ANALYSES - not run - shale

GAS ANALYSES - not run

ADSORPTION ISOTHERM DATA - not run

PETROGRAPHIC ANALYSES - not run

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 148

LOCATION

County: Rio Blanco
Location: Sec 29 Twp 3N Rge 101W

Surface Elev (ft) 5877
Coordinates NW/4, NW/4

GENERAL

CGS Sample No. 148
Sampled By Wimer Johnson
Operator Western Fuels
Hole No. Moon Lake 310129-4

Date 8-28-79
Sample Type core

DRILLING DATA

Drilling Co. Teton Exploration Address Casper, Wyoming
Core Size 3" Barrel Length 15'
Type of core retrieval split-barrel (inner), conventional
Drilling media air mist Air Temperature ?
TD Hole 918' Logs Gamma, Caliper, Single Point Resistance,
High Resolution Density

GEOLOGY

Geologic Unit Mesaverde Group Age Upper Cretaceous
Coal zone/bed "C" Seam Bed Thickness 3.33'
Depth to top of coal 879.15' (Driller) same (Log)
Depth to bottom of coal 882.48' (Driller) same (Log)
Cored interval 870.0 - 885.1' (Driller)
Roof description dark gray shale
Coal description black, good luster, extensive fractures, trace of resin
Floor description brown to black shale, abundant layers & lenses of coal

DESORPTION DATA

Sampled interval (ft) 879.15-882.48 (Driller) same (Log)
Condition of sample all sizes
Sampled Weight (g) 1512
Lost gas time (min) 53 Lost gas cc 190
Desorbed gas cc 248 Residual gas cc/g 0.0
Total gas content cc/g .29 Total gas content cf/t 9

Miscellaneous _____

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
<u>Proximate Analyses (%)</u>			
Moisture	8.3	N/A	N/A
Volatile Matter	36.0	39.2	43.2
Fixed Carbon	47.2	51.5	56.8
Ash	8.5	9.3	N/A
<u>Ultimate Analyses (%)</u>			
Hydrogen	5.2	4.6	5.1
Carbon	63.6	69.3	76.4
Nitrogen	1.3	1.4	1.6
Sulfur	.5	.6	.6
Oxygen	20.9	14.7	16.2
Ash	8.5	9.3	N/A
<u>Heating value</u> (BTU/lb)	11135	12144	13386
<u>Sulfur Forms (%)</u>			
Sulfate	not run		
Pyritic	not run		
Organic	not run		
<u>Ash</u>			
Initial deformation (°F)	2670		
Softening temperature (°F)	2800		
Fluid temperature (°F)	2800		
Free Swelling Index	0.0		
Fixed Carbon			
DMMF	57.29		
Heating Value			
BTU/lb MMMF	12270.14		
Apparent Rank	HvC bituminous		
Date of Analysis:	2-28-80		
Laboratory:	U.S. Dept. of Energy		Lab No. <u>K99781</u>
Comments:			

GAS ANALYSES - not runADSORPTION ISOTHERM DATA - not runPETROGRAPHIC ANALYSES - not run

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 149

LOCATION

County: Rio Blanco
Location: Sec 29 Twp 3N Rge 101W

Surface Elev (ft) 5877
Coordinates NW 1/4, NW 1/4

GENERAL

CGS Sample No. 149
Sampled By Wimer/Johnson
Operator Western Fuels
Hole No. Moon Lake 310129-4

Date 8/28/79
Sample Type core

DRILLING DATA

Drilling Co. Teton Expl. Address Casper, Wyoming
Core Size 3" Barrel Length 15'
Type of core retrieval split inner barrel, conventional
Drilling media air mist Air Temperature ?
TD Hole 918' Logs Gamma, Caliper, Single Point Resistance, High Resolution Density

GEOLOGY

Geologic Unit Mesaverde Group Age Upper Cretaceous
Sample zone between "B" & "C" seams Thickness 8.8'
Depth to top of zone 891.3' (Driller) same (Log)
Depth to bottom of zone 900.1' (Driller) same (Log)
Cored interval 885.1-900.1' (Driller)
Roof description _____
Sample description siltstone, gray to black, hard and massive, abundant carb fragments
Floor description _____

DESORPTION DATA

Sampled interval (ft) 892.72 - 893.72' (Driller) same (Log)
Condition of sample 1 large piece
Sampled Weight (g) 3287
Lost gas time (min) 109 Lost gas cc not calc.-siltstone
Desorbed gas cc 55 Residual gas cc/g 0.0
Total gas content cc/g .02 Total gas content cf/t 1

Miscellaneous Sample is of interburden between "B" & "C" coal seams

COAL ANALYSES - not run - siltstone

GAS ANALYSES - not run

ADSORPTION ISOTHERM DATA - not run

PETROGRAPHIC ANALYSES - not run

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 150

LOCATION

County: Rio Blanco
Location: Sec 29 Twp 3N Rge 101W

Surface Elev (ft) 5877
Coordinates NW 1/4, NW 1/4

GENERAL

CGS Sample No. 150
Sampled By Wimer/Johnson
Operator Western Fuels
Hole No. Moon Lake 310129-4

Date 8/28/79
Sample Type core

DRILLING DATA

Drilling Co. Teton Expl. Address Casper, Wyoming
Core Size 3" Barrel Length 15'
Type of core retrieval split inner barrel, conventional core
Drilling media air mist Air Temperature ?
TD Hole 918' Logs Gamma, Caliper, Single Point Resistance, High Resolution Density

GEOLOGY

Geologic Unit Mesaverde Group Age Upper Cretaceous
Coal zone/bed Between 'B' & 'C' Bed Thickness 8.8'
Depth to top of zone 891.3' (Driller) same (Log)
Depth to bottom of zone 900.1' (Driller) same (Log)
Cored interval 885.1-900.1 (Driller)
Roof description _____
Sample description sample taken above the 'B' seam, siltstone, gray to black, hard, massive, abundant carbonate fragments
Floor description _____

DESORPTION DATA

Sampled interval (ft) 898.45-900.0 (Driller) same (Log)
Condition of sample ? _____
Sampled Weight (g) 3324
Lost gas time (min) 109 Lost gas cc not calculated - siltstone
Desorbed gas cc 56 Residual gas cc/g 0.0
Total gas content cc/g .02 Total gas content cf/t 1

Miscellaneous Sample is of interburden between "B" & "C" coal seams

COAL ANALYSES - not run - siltstone

GAS ANALYSES - not run

ADSORPTION ISOTHERM DATA - not run

PETROGRAPHIC ANALYSES - not run

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 151

LOCATION

County: Rio Blanco
Location: Sec 29 Twp 3N Rge 101W

Surface Elev (ft) 5877
Coordinates NW 1/4, NW 1/4

GENERAL

CGS Sample No. 151
Sampled By Wimer/Johnson
Operator Western Fuels
Hole No. Moon Lake 310129-4

Date 8/28/79
Sample Type core

DRILLING DATA

Drilling Co. Teton Expl. Address Casper, Wyoming
Core Size 3" Barrel Length 15'
Type of core retrieval split inner barrel, conventional core
Drilling media air mist Air Temperature ?
TD Hole 918' Logs Gamma, Caliper, Single Point Resistance, High Resolution Density

GEOLOGY

Geologic Unit Mesaverde Group Age Upper Cretaceous
Coal zone/bed 'B' seam Bed Thickness 7.7'
Depth to top of coal 904.3' (Driller) same (Log)
Depth to bottom of coal 912' (Driller) same (Log)
Cored interval 900.1-915.1' (Driller)
Roof description shale, black, carbonaceous, thin coal layers & lenses, tuffaceous, ss layer (volcanic ash layer) at 903.5-903.6'
Coal description black, blocky, good luster, good cleat, resin and pyrite
Floor description shale, black, carbonaceous

DESORPTION DATA

Sampled interval (ft) 904.3-905.3 (Driller) same (Log)
Condition of sample ?
Sampled Weight (g) 1785
Lost gas time (min) 80 Lost gas cc 140
Desorbed gas cc 105 Residual gas cc/g 0.0
Total gas content cc/g .13 Total gas content cf/t 4

Miscellaneous The "B" seam has a black, carbonaceous shale parting from 907.3-908.25. CGS #151 is a seam sample above the parting; CGS #152 is a seam sample below the parting.

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
<u>Proximate Analyses (%)</u>			
Moisture	12.2	N/A	N/A
Volatile Matter	32.4	36.9	41.5
Fixed Carbon	45.7	52.0	58.5
Ash	9.7	11.1	N/A
<u>Ultimate Analyses (%)</u>			
Hydrogen	5.1	4.3	4.8
Carbon	59.4	67.7	76.1
Nitrogen	1.2	1.4	1.5
Sulfur	.6	.6	.7
Oxygen	24.0	15.0	16.8
Ash	9.7	11.1	N/A
<u>Heating value</u> (BTU/lb)	10337	11770	13235
<u>Sulfur Forms (%)</u>			
Sulfate	not run		
Pyritic	not run		
Organic	not run		
<u>Ash</u>			
Initial deformation (°F)	2390		
Softening temperature (°F)	2470		
Fluid temperature (°F)	2580		
<u>Free Swelling Index</u>	0.0		
<u>Fixed Carbon</u> DMMF	59.23		
<u>Heating Value</u> BTU/lb MMMF	11555.71		
<u>Apparent Rank</u>	HvC bituminous		
Date of Analysis:	9/11/80		
Laboratory:	U.S. Dept. of Energy		Lab No. <u>L03666</u>
Comments:			

GAS ANALYSES - not runADSORPTION ISOTHERM DATA - not runPETROGRAPHIC ANALYSES - not run

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 152

LOCATION

County: Rio Blanco
Location: Sec 29 Twp 3N Rge 101 W

Surface Elev (ft) 5877
Coordinates NW 1/4, NW 1/4

GENERAL

CGS Sample No. 152
Sampled By Wimer/Johnson
Operator Western Fuels
Hole No. Moon Lake 310129-4

Date 8/28/79
Sample Type core

DRILLING DATA

Drilling Co. Teton Expl. Address Casper, Wyoming
Core Size 3" Barrel Length 15'
Type of core retrieval split barrel (inner), conventional
Drilling media air mist Air Temperature ?
TD Hole 918' Logs Gamma, Caliper, Single Point Resistance, High Resolution Density

GEOLOGY

Geologic Unit Mesaverde Group Age Upper Cretaceous
Coal zone/bed "B" Seam Bed Thickness 7.7'
Depth to top of coal 904.3' (Driller) same (Log)
Depth to bottom of coal 912.0' (Driller) same (Log)
Cored interval 900.1-915.1' (Driller)
Roof description shale, black, carbonaceous, thin coal layers and lenses, tuff ss @ 903.5-903.6'
Coal description black, good luster, resin fragments, rare pyrite, good cleat in one direction
Floor description shale, black, carbonaceous

DESORPTION DATA

Sampled interval (ft) 911.0-911.8 (Driller) same (Log)
Condition of sample wet, all sizes
Sampled Weight (g) 1527
Lost gas time (min) 80 Lost gas cc 275
Desorbed gas cc 27 Residual gas cc/g 0.0
Total gas content cc/g .20 Total gas content cft 6

Miscellaneous The "B" Seam has a black carbonaceous shale parting from 907.3-908.25'. CGS #152 is a sample of the seam below the parting; CGS #151 was a seam sample above the parting.

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
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Proximate Analyses (%)

Moisture	12.8	N/A	N/A
Volatile Matter	33.6	38.6	42.1
Fixed Carbon	46.3	53.0	57.9
Ash	7.3	8.4	N/A

Ultimate Analyses (%)

Hydrogen	5.0	4.1	4.5
Carbon	61.9	71.0	77.4
Nitrogen	1.1	1.3	1.4
Sulfur	1.6	1.8	2.0
Oxygen	23.1	13.4	14.7
Ash	7.3	8.4	N/A

Heating value
(BTU/lb)

10697	12270	13390
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Sulfur Forms (%)

Sulfate	not run
Pyritic	not run
Organic	not run

Ash

Initial deformation (°F)	2380
Softening temperature (°F)	2500
Fluid temperature (°F)	2620

Free Swelling Index	not run
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Fixed Carbon	
DMMF	58.72

Heating Value	
BTU/lb MMMF	11636.85

Apparent Rank	HvC bituminous
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Date of Analysis: 1/18/80
 Laboratory: Dept. of Energy Lab No. K98807
 Comments: _____

GAS ANALYSES - not runADSORPTION ISOTHERM DATA - not runPETROGRAPHIC ANALYSES - not run

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 153

LOCATION

County: Rio Blanco
Location: Sec 29 Twp 3N Rge 101 W

Surface Elev (ft) 5877
Coordinates NW 1/4, NW 1/4

GENERAL

CGS Sample No. 153
Sampled By Wimer/Johnson
Operator Western Fuels
Hole No. Moon Lake 310129-4

Date 8/28/79
Sample Type core

DRILLING DATA

Drilling Co. Teton Expl. Address Casper, Wyoming
Core Size 3" Barrel Length 15'
Type of core retrieval split inner barrel, conventional
Drilling media air mist Air Temperature ?
TD Hole 918' Logs Gamma, Caliper, High Resolution Density, Single Point
Reesistance

GEOLOGY

Geologic Unit Mesaverde Group Age Upper Cretaceous
Sample zone underburden below "B" Bed Thickness 0.95'
Depth to top of zone 912.4' (Driller) same (Log)
Depth to bottom of zone 913.35' Driller) same (Log)
Cored interval 900.1-915.1' (Driller)
Roof description _____
Sample description carb. shale, gray to black, abundant carb. fragments and
lenses fine horizontal bedding, slightly bioturbated; fine, lt. gray sltst.
beds (thin)
Floor description _____

DESORPTION DATA

Sampled interval (ft) 912.4-913.35 (Driller) same (Log)
Condition of sample ?
Sampled Weight (g) 2244
Lost gas time (min) 80 Lost gas cc not calculated - siltstone
Desorbed gas cc 28 Residual gas cc/g 0.0
Total gas content cc/g .01 Total gas content cf/t 0

Miscellaneous _____

COAL ANALYSES - not run - shale

GAS ANALYSES - not run

ADSORPTION ISOTHERM DATA - not run

PETROGRAPHIC ANALYSES - not run

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 154

LOCATION

County: Rio Blanco
Location: Sec 35 Twp 3N Rge 101W

Surface Elev (ft) 5562.8
Coordinates SW 1/4, SW 1/4

GENERAL

CGS Sample No. 154
Sampled By Wimer/Johnson
Operator Western Fuels
Hole No. Moon Lake 310135-4

Date 8/29/79
Sample Type core

DRILLING DATA

Drilling Co. Teton Expl. Address Casper, Wyoming
Core Size 3" Barrel Length 15'
Type of core retrieval split inner barrel, conventional
Drilling media air mist Air Temperature ?
TD Hole 1330' Logs Gamma, Caliper, Single Point Resistance, High Resolution Density

GEOLOGY

Geologic Unit Mesaverde Group Age Upper Cretaceous
Sample zone overburden of "E" Zone Thickness .86'
Depth to top of zone 1186.5' (Driller) same (Log)
Depth to bottom of zone 1187.36' (Driller) same (Log)
Cored interval 1180.0-1194.6' (Driller)
Roof description _____
Sample Description interbedded silty ss and shale, hard, carb, gray mottled bedding
Floor description _____

DESORPTION DATA

Sampled interval (ft) 1186.5-1187.36 (Driller) same (Log)
Condition of sample 2 large pieces
Sampled Weight (g) 3409
Lost gas time (min) 63 Lost gas cc not calculated -silty sandstone
Desorbed gas cc 65 Residual gas cc/g 0.0
Total gas content cc/g .02 Total gas content cf/t 1

Miscellaneous _____

COAL ANALYSES - not run

GAS ANALYSES - not run

ADSORPTION ISOTHERM DATA - not run

PETROGRAPHIC ANALYSES - not run

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 155

LOCATION

County: Rio Blanco
Location: Sec 35 Twp 3N Rge 101W

Surface Elev (ft) 5562.8
Coordinates SW 1/4, SW 1/4

GENERAL

CGS Sample No. 155
Sampled By Wimer/Johnson
Operator Western Fuels
Hole No. Moon Lake 310135-4

Date 8/29/79
Sample Type core

DRILLING DATA

Drilling Co. Teton Expl. Address Casper, Wyoming
Core Size 3" Barrel Length 15'
Type of core retrieval split inner barrel, conventional
Drilling media Air Mist Air Temperature ?
TD Hole 1330' Logs Gamma, Caliper, Single Point Resistance, High Resolution Density

GEOLOGY

Geologic Unit Mesa Verde Group Age Upper Cretaceous
Coal zone/bed Underburden of "E" Zone Thickness 2.7'
Depth to top of zone 1190.96' (Driller) same (Log)
Depth to bottom of zone 1193.7' (Driller) same (Log)
Cored interval 1180.0-1194.6' (Driller)
Roof description _____
Sample description shale, hard gray massive, several coal lenses, slickensides
Floor description _____

DESORPTION DATA

Sampled interval (ft) 1190.6-1191.82 (Driller) same (Log)
Condition of sample ?
Sampled Weight (g) 2784
Lost gas time (min) 67 Lost gas cc Not Calculated-Shale
Desorbed gas cc 75 Residual gas cc/g 0.0
Total gas content cc/g .03 Total gas content cf/t 1

Miscellaneous _____

COAL ANALYSES - not run - shale

GAS ANALYSES - not run

ADSORPTION ISOTHERM DATA - not run

PETROGRAPHIC ANALYSES - not run

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 156

LOCATION

County: Rio Blanco
Location: Sec 35 Twp 3N Rge 101W

Surface Elev (ft) 5562.8
Coordinates SW 1/4, SW 1/4

GENERAL

CGS Sample No. 156
Sampled By Wimer/Johnson
Operator Western Fuels
Hole No. Moon Lake 310135-4

Date 8/30/79
Sample Type core

DRILLING DATA

Drilling Co. Teton Expl. Address Casper, Wyoming
Core Size 3" Barrel Length 15'
Type of core retrieval split inner barrel, conventional
Drilling media Air Mist Air Temperature ?
TD Hole 1330' Logs Gamma, Caliper, Single Point Resistance, High Resolution Density

GEOLOGY

Geologic Unit Mesa Verde Group Age Upper Cretaceous
Coal zone/bed overburden of "D" Bed Thickness 3.05
Depth to top of zone 1194.9' (Driller) same (Log)
Depth to bottom of zone 1197.95' (Driller) same (Log)
Cored interval 1194.9-1209.29' (Driller)
Sample description Fine Siltstone, dr. gray hard, massive, slightly carbonaceous, mottled bedding (white/sandstone burrow fillings)
Coal description _____
Floor description _____

DESORPTION DATA

Sampled interval (ft) 1197.15-1197.95 (Driller) same (Log)
Condition of sample 2 large pieces
Sampled Weight (g) 2689
Lost gas time (min) 85 Lost gas cc Not calculated-Siltstone
Desorbed gas cc 74 Residual gas cc/g 0.0
Total gas content cc/g 0.3 Total gas content cf/t 1

Miscellaneous _____

COAL ANALYSES - not run - siltstone

GAS ANALYSES - not run

ADSORPTION ISOTHERM DATA - not run

PETROGRAPHIC ANALYSES - not run

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 157

LOCATION

County: Rio Blanco
Location: Sec 35 Twp 3N Rge 101W

Surface Elev (ft) 5562.8
Coordinates SW 1/4, SW 1/4

GENERAL

CGS Sample No. 157
Sampled By Wimer/Johnson
Operator Western Fuels
Hole No. Moon Lake 310135-4

Date 8/30/79
Sample Type core

DRILLING DATA

Drilling Co. Teton Expl. Address Casper, Wyoming
Core Size 3" Barrel Length 15'
Type of core retrieval Split Inner Barrel, conventional
Drilling media Air Mist Air Temperature ?
TD Hole 1330' Logs Gamma, Caliper, Single Point Resistance, High Resolution Density

GEOLOGY

Geologic Unit Mesa Verde Group Age Upper Cretaceous
Coal zone/bed "D" seam Bed Thickness 8.4
Depth to top of coal 1198.35' (Driller) same (Log)
Depth to bottom of coal 1206.75' (Driller) same (Log)
Cored interval 1194.9-1209.29' (Driller)
Roof description Siltstone to Sandstone, Gray, Hard, Massive, Carb Lenses
Coal description Bright & Blocky, good cleats in 2 directions, vitrinite in thin lenses, numerous resin fragments top .3' and bottom .15' of coal is shl
Floor description Shale, Carbonaceous, Black, Numerous Coal lenses and amber fragments.

DESORPTION DATA

Sampled interval (ft) 1199.30-1200.15 (Driller) same (Log)
Condition of sample _____
Sampled Weight (g) 1662
Lost gas time (min) 87 Lost gas cc 240
Desorbed gas cc 1961 Residual gas cc/g 0.0
Total gas content cc/g 1.32 Total gas content cf/t 42

Miscellaneous _____

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
<u>Proximate Analyses (%)</u>			
Moisture	7.9	N/A	N/A
Volatile Matter	34.5	37.4	40.8
Fixed Carbon	49.9	54.3	59.2
Ash	7.7	8.3	N/A
<u>Ultimate Analyses (%)</u>			
Hydrogen	5.7	5.2	5.7
Carbon	65.5	71.2	77.6
Nitrogen	1.3	1.4	1.6
Sulfur	.5	.5	.6
Oxygen	19.3	13.3	14.5
Ash	7.7	8.3	N/A
<u>Heating value</u> (BTU/lb)	11442	12430	13558
<u>Sulfur Forms (%)</u>			
Sulfate	not run		
Pyritic	not run		
Organic	not run		
<u>Ash</u>			
Initial deformation (°F)	2800		
Softening temperature (°F)	2800		
Fluid temperature (°F)	2800		
<u>Free Swelling Index</u>	0.0		
<u>Fixed Carbon</u>			
DMMF	59.66		
<u>Heating Value</u>			
BTU/lb MMMF	12490.01		
<u>Apparent Rank</u>	HvC Bituminous		
Date of Analysis:	<u>7-21-80</u>		
Laboratory:	<u>U.S. Dept. of Energy</u>		Lab No. <u>L02673</u>
Comments:			

GAS ANALYSES - not runADSORPTION ISOTHERM DATA - not runPETROGRAPHIC ANALYSES - not run

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 158

LOCATION

County: Rio Blanco
Location: Sec 35 Twp 3N Rge 101W

Surface Elev (ft) 5562.8
Coordinates SW/4, SW/4

GENERAL

CGS Sample No. 158
Sampled By Wimer/Johnson
Operator Western Fuels
Hole No. 310135-4

Date 8/30/79
Sample Type core

DRILLING DATA

Drilling Co. Teton Exploration Address Casper, Wyoming
Core Size 3" Barrel Length 15'
Type of core retrieval split inner barrel, conventional
Drilling media Air Mist Air Temperature ?
TD Hole 1330' Logs Gamma, Caliper, Single Point Resistance,
High Resolution Density

GEOLOGY

Geologic Unit Mesaverde Group Age Upper Cretaceous
Coal zone/bed "D" seam Bed Thickness 8.40'
Depth to top of coal 1198.35' (Driller) same (Log)
Depth to bottom of coal 1206.75' (Driller) same (Log)
Cored interval 1194.9-1209.29' (Driller)
Roof description siltstone, SS, gray, hard, massive, carb. lenses & fragments
Coal description coal, shaley, dull, blocky, numerous resin fragments, good cleat in both directions, resin, calcite, slickensides *
Floor description shale, carb., black, numerous coal lenses & resin fragments

DESORPTION DATA

Sampled interval (ft) 1205.05-1206.05' (Driller) same (Log)
Condition of sample large pieces
Sampled Weight (g) 1966
Lost gas time (min) 89 Lost gas cc 490
Desorbed gas cc 1858 Residual gas cc/g 0.0
Total gas content cc/g 1.19 Total gas content cf/t 38

Miscellaneous *top .3' and bottom .15' of coal seam is shaley

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
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Proximate Analyses (%)

Moisture	8.6	N/A	N/A
Volatile Matter	28.6	31.3	46.0
Fixed Carbon	33.6	36.7	54.0
Ash	29.2	32.0	N/A

Ultimate Analyses (%)

Hydrogen	4.4	3.8	5.6
Carbon	45.8	50.1	73.7
Nitrogen	1.0	1.1	1.6
Sulfur	.5	.5	.8
Oxygen	19.1	12.5	18.4
Ash	29.2	32.0	N/A

Heating value
(BTU/lb)

8065	8821	12970
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Sulfur Forms (%)

Sulfate	not run
Pyritic	not run
Organic	not run

Ash

Initial deformation (°F)	2910+
Softening temperature (°F)	2910+
Fluid temperature (°F)	2910+

Free Swelling Index	0.0
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Fixed Carbon	
DMMF	56.26

Heating Value	
BTU/lb MMMF	11790.75

Apparent Rank	HvC bituminous
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Date of Analysis:	9-11-80
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Laboratory:	U.S. Dept. of Energy
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Lab No.	L03667
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Comments:	
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GAS ANALYSES - not run

ADSORPTION ISOTHERM DATA - not run

PETROGRAPHIC ANALYSES - not run

LOCATION

County: Rio Blanco
Location: Sec 35 Twp 3N Rge 101W

Surface Elev (ft) 5562.8
Coordinates SW/4, SW/4

GENERAL

CGS Sample No. 159
Sampled By Wimer/Johnson
Operator Western Fuels
Hole No. Moon Lake 310135-4

Date 8/30/79
Sample Type core

DRILLING DATA

Drilling Co. Teton Exploration Address Casper, Wyoming
Core Size 3" Barrel Length 15'
Type of core retrieval split inner barrel, conventional
Drilling media Air Mist Air Temperature ?
TD Hole 1330' Logs Gamma, Caliper, Single Point Resistance, High Resolution Density

GEOLOGY

Geologic Unit Mesaverde Group Age Upper Cretaceous
Sample Zone underburden of "D" Zone Thickness 1.32'
Depth to top of coal 1207.97' (Driller) same (Log)
Depth to bottom of coal 1209.29' (Driller) same (Log)
Cored interval 1194.9-1209.29' (Driller)
Roof description _____
Sample description shaley siltstone, gray, hard, massive, carbonaceous, plant debris on bedding planes
Floor description _____

DESORPTION DATA

Sampled interval (ft) 1208.34-1209.29 (Driller) same (Log)
Condition of sample 5 pieces
Sampled Weight (g) 3061
Lost gas time (min) 90 Lost gas cc not calculated-siltstone
Desorbed gas cc 35 Residual gas cc/g 0.0
Total gas content cc/g .01 Total gas content cf/t 0

Miscellaneous _____

COAL ANALYSES - not run - siltstone

GAS ANALYSES - not run

ADSORPTION ISOTHERM DATA - not run

PETROGRAPHIC ANALYSES - not run

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 160

LOCATION

County: Rio Blanco
Location: Sec 35 Twp 3N Rge 101W

Surface Elev (ft) 5562.8
Coordinates SW/4, SW/4

GENERAL

CGS Sample No. 160
Sampled By Wimer/Johnson
Operator Western Fuels
Hole No. Moon Lake 310135-4

Date 8/29/79
Sample Type core

DRILLING DATA

Drilling Co. Teton Exploration Address Casper, Wyoming
Core Size 3" Barrel Length 15'
Type of core retrieval split inner barrel, conventional
Drilling media Air Mist Air Temperature ?
TD Hole 1330' Logs Gamma, Caliper, Single Point Resistance,
High Resolution Density

GEOLOGY

Geologic Unit Mesaverde Group Age Upper Cretaceous
Coal zone/bed "E" Bed Thickness 3.5'
Depth to top of coal 1187.46' (Driller) same (Log)
Depth to bottom of coal 1190.96' (Driller) same (Log)
Cored interval 1180.0-1194.6' (Driller)
Roof description shale, massive, hard, few carb. lenses, dark gray
Coal description black, shaley, resin fragments, luster from silky to
bright, good cleat
Floor description siltstone, hard, gray, massive, small coal lenses

DESORPTION DATA

Sampled interval (ft) 1187.7-1188.7 (Driller) same (Log)
Condition of sample large fragments
Sampled Weight (g) 1691
Lost gas time (min) 61 Lost gas cc 280
Desorbed gas cc 1358 Residual gas cc/g 0.0
Total gas content cc/g .97 Total gas content cf/t 31

Miscellaneous _____

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
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Proximate Analyses (%)

Moisture	7.3	N/A	N/A
Volatile Matter	35.2	37.9	41.8
Fixed Carbon	48.9	52.8	58.2
Ash	8.6	9.3	N/A

Ultimate Analyses (%)

Hydrogen	5.2	4.7	5.2
Carbon	64.7	69.8	77.0
Nitrogen	1.5	1.6	1.8
Sulfur	.6	.7	.7
Oxygen	19.4	13.9	15.3
Ash	8.6	9.3	N/A

<u>Heating value</u> (BTU/lb)	11480	12387	13655
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Sulfur Forms (%)

Sulfate	not run
Pyritic	not run
Organic	not run

Ash

Initial deformation (°F)	2800
Softening temperature (°F)	2800
Fluid temperature (°F)	2800

<u>Free Swelling Index</u>	0
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<u>Fixed Carbon</u>	
<u>DMMF</u>	58.74

<u>Heating Value</u>	
<u>BTU/lb MMMF</u>	12668.45

<u>Apparent Rank</u>	HvC bituminous
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<u>Date of Analysis:</u>	2-28-80
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<u>Laboratory:</u>	U.S. Dept. of Energy
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<u>Lab No.</u>	K99782
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<u>Comments:</u>	
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GAS ANALYSES - not runADSORPTION ISOTHERM DATA - not runPETROGRAPHIC ANALYSES - not run

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 161

LOCATION

County: Adams
Location: Sec 34 Twp 2S Rge 60W

Surface Elev (ft) 4975
Coordinates SW corner

GENERAL

CGS Sample No. 161
Sampled By C. Tremain
Operator Colorado Geological Survey
Hole No. 4C

Date 11-15-79
Sample Type core

DRILLING DATA

Drilling Co. Teton Exploration Address Casper, Wyoming
Core Size 2 7/8" Barrel Length 10'
Type of core retrieval conventional split barrel
Drilling media mud Air Temperature 50°
TD Hole 130' * Logs gamma, density, caliper, resistance

GEOLOGY

Geologic Unit Laramie Fm Age Upper Cretaceous
Coal zone/bed unnamed Bed Thickness 5'
Depth to top of coal 109' (Driller) same (Log)
Depth to bottom of coal 114' (Driller) same (Log)
Cored interval 108-117' (Driller)
Roof description carb. clay, brown-dark brown
Coal description black, conchoidal fractures, woody texture, resin in cleats
Floor description silty claystone, dark gray

DESORPTION DATA

Sampled interval (ft) 109-114 (Driller) same (Log)
Condition of sample slightly muddy, wet, medium chunks, 1/2 split
Sampled Weight (g) 1147
Lost gas time (min) 13 Lost gas cc 60
Desorbed gas cc 75 Residual gas cc/g 0.0
Total gas content cc/g .12 Total gas content cf/t 4

Miscellaneous Reference: CGS Open File Report No. 80-1, 1980 by Karl E. Brand - Geophysical and Lithological Logs from the 1979 Coal Drilling and Coring Program, Denver East 1/2° x 1° Quadrangle.

* T.D. for Pilot Hole is 200'

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
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Proximate Analyses (%)

Moisture	25.0	N/A	N/A
Volatile Matter	29.4	39.2	48.9
Fixed Carbon	30.8	41.0	51.1
Ash	14.8	19.8	N/A

Ultimate Analyses (%)

Hydrogen	4.8	2.7	3.4
Carbon	44.2	59.0	73.6
Nitrogen	1.1	1.5	1.9
Sulfur	.4	.5	.7
Oxygen	34.6	16.5	20.5
Ash	14.8	19.8	N/A

Heating value
(BTU/lb)

7417	9893	12334
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Sulfur Forms (%)

Sulfate	not run
Pyritic	not run
Organic	not run

Ash

Initial deformation (°F)	2320
Softening temperature (°F)	2440
Fluid temperature (°F)	2530

Free Swelling Index	not run
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Fixed Carbon

DMMF	52.28
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Heating Value

BTU/lb MMMF	8827
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Apparent Rank	subbituminous C
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Date of Analysis: 3-3-80Laboratory: U.S. Dept. of EnergyLab No. K99783

Comments: _____

GAS ANALYSES - not runADSORPTION ISOTHERM DATA - not run

PETROGRAPHIC ANALYSESLab. Commercial Testing & Engineering CompanyLab No. CGS #161 (Denver Basin)

MACERAL ANALYSIS *
(Volume Percent)
(Mineral-Matter Free Basis)

<u>MACERAL</u>		<u>MACERAL GROUP</u>	
Vitrinite	77.6	Vitrinite	78.3
Pseudovitrinite	0.7		
Sporinite	1.7		
Cutinite	0.2		
Resinite	3.2		
Alginite	---	Exinite	
Bituminite	1.3	(Liptinite)	6.5
Fluorinite	---		
Exudatinite	0.1		
Semi-Fusinite	2.5		
Semi-Macrinite	0.3		
Fusinite	6.6	Inertinite	15.2
Macrinite	0.6		
Micrinite	5.2		
Sclerotinite	---		
TOTAL	100 %		100 %

* COMBINED RESULTS OF ANALYSES IN WHITE AND BLUE LIGHT

REFLECTANCE ANALYSIS

Mean-Maximum Vitrinite Ro- 0.37

V-Type Table for Vitrinites (=100%)

<u>V-2</u>	<u>V-3</u>	<u>V-4</u>	<u>V-</u>
2	77	21	

PETROGRAPHIC ANALYSES

Lab. S.I.U. Coal Characterization Lab Petrographer John C. Crelling
 Lab No. S.I.U. #853 Date of Analysis 10/80

Maceral Analysis (white light)

Vitrinite	<u>78.7</u>
Pseudovitrinite	<u>1.9</u>
Semifusinite	<u>3.9</u>
Semimacrinite	<u>2.7</u>
Fusinite	<u>1.0</u>
Macrinite	<u>0.5</u>
Micrinite	<u>3.1</u>
Exinite	<u>6.9</u>
Resinite	<u>1.3</u>
Total	<u>100%</u>

Reflectance Analysis*

Vitrinite Ro	<u> </u>
pVit Ro	<u> </u>
Combined Ro	<u> </u>
pVit Ro - Vit Ro	<u> </u>

Combined V-Type Table

V-Type	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>	<u>9</u>	<u>10</u>	<u>11</u>
%		<u>12.9</u>	<u>84.1</u>	<u>3.0</u>						

V-Type	<u>12</u>	<u>13</u>	<u>14</u>	<u>15</u>	<u>16</u>	<u>17</u>	<u>18</u>	<u>19</u>	<u>20</u>	<u>21</u>
%										

Comments: Apparent rank - Subbituminous C

*The reflectance analysis was undifferentiated due to the low amount of pVit. 0.43 = mean max. reflectance.

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 162

LOCATION

County: Adams
Location: Sec 4 Twp 3S Rge 61W

Surface Elev (ft) 5027'
Coordinates NE corner of
NE/4 NE/4

GENERAL

CGS Sample No. 162
Sampled By C. Tremain
Operator Colorado Geological Survey
Hole No. 5C

Date 11-16-79
Sample Type Core

DRILLING DATA

Drilling Co. Teton Exploration Address Casper, Wyoming
Core Size 2 7/8" Barrel Length 10'
Type of core retrieval conventional split barrel
Drilling media mud Air Temperature 60°F
TD Hole 390' Logs Gamma, Density, Caliper, Resistance

GEOLOGY

Geologic Unit Laramie Formation Age Upper Cretaceous
Coal zone/bed unnamed Bed Thickness 6.7'
Depth to top of coal 306.3' (Driller) same (Log)
Depth to bottom of coal 313' (Driller) same (Log)
Cored interval 304-314' (Driller)
Roof description carbonaceous shale, fissile, brown-black
Coal description black, hard, resin particles in cleats, woody structure,
parting at 311-312'
Floor description dark gray claystone, occassionally thin sandstone lenses

DESORPTION DATA

Sampled interval (ft) 306.3 - 308' (Driller) same (Log)
Condition of sample wet, small pieces
Sampled Weight (g) 459
Lost gas time (min) 18.5 Lost gas cc 230
Desorbed gas cc 112 Residual gas cc/g 0.0
Total gas content cc/g .75 Total gas content cf/t 24

Miscellaneous Reference: CGS Open File Report No. 80-1, 1980, by Karl E.
Brand, Geophysical and Lithological Logs from the 1979 Coal Drilling and
Coring Program, Denver East 1/2° x 1° Quadrangle

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
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Proximate Analyses (%)

Moisture	19.0	N/A	N/A
Volatile Matter	30.4	37.5	47.2
Fixed Carbon	34.0	42.0	52.8
Ash	16.6	20.5	N/A

Ultimate Analyses (%)

Hydrogen	4.8	3.3	4.2
Carbon	46.6	57.6	72.4
Nitrogen	1.2	1.5	1.9
Sulfur	.5	.6	.7
Oxygen	30.3	16.6	20.8
Ash	16.6	20.5	N/A

Heating value
(BTU/lb)

7971	9841	12382
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Sulfur Forms (%)

Sulfate	not run
Pyritic	not run
Organic	not run

Ash

Initial deformation (°F)	2310
Softening temperature (°F)	2400
Fluid temperature (°F)	2480

Free Swelling Index	not run
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Fixed Carbon	
DMMF	54.02

Heating Value	
BTU/lb MMMF	9714.29

Apparent Rank	subbituminous B
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Date of Analysis:	3-3-80
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Laboratory:	U.S. Dept. of Energy
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Lab No.	K99784
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Comments:	
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GAS ANALYSES - not runADSORPTION ISOTHERM DATA - not runPETROGRAPHIC ANALYSES - not run

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 163

LOCATION

County: Adams
Location: Sec 4 Twp 3S Rge 61W

Surface Elev (ft) 5027
Coordinates NE corner of
NE/4 NE/4

GENERAL

CGS Sample No. 163
Sampled By C. Tremain
Operator Colorado Geological Survey
Hole No. 5C

Date 11-16-79
Sample Type conv. core

DRILLING DATA

Drilling Co. Teton Exploration Address Casper, Wyoming
Core Size 2 7/8" Barrel Length 10'
Type of core retrieval conventional split barrel
Drilling media mud Air Temperature 30°
TD Hole 390 Logs gamma, density, caliper, resistance

GEOLOGY

Geologic Unit Laramie Fm Age Upper Cretaceous
Coal zone/bed unnamed Bed Thickness 8.0'
Depth to top of coal 362.5' (Driller) same (Log)
Depth to bottom of coal 370.5' (Driller) same (Log)
Cored interval 362.2 - 371.0 (Driller)
Roof description gray siltstone
Coal description black, fractured slightly, with pyrite, woody texture, resin in cleats
Floor description claystone, gray

DESORPTION DATA

Sampled interval (ft) 362.5 - 371.0 (Driller) same (Log)
Condition of sample wet, medium fragments
Sampled Weight (g) 910
Lost gas time (min) -- Lost gas cc 0
Desorbed gas cc 0 Residual gas cc/g 0
Total gas content cc/g 0 Total gas content cf/t 0

Miscellaneous Reference: CGS Open File Report No. 80-1, 1980, by Karl E. Brand - Geophysical and Lithological Logs from the 1979 Coal Drilling and Coring Program, Denver East 1/2° x 1° Quadrangle.

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
-----------------	--------------------	----------------------	------------------------------

Proximate Analyses (%)

Moisture	24.7	N/A	N/A
Volatile Matter	31.6	42.0	47.1
Fixed Carbon	35.5	47.2	52.9
Ash	8.2	10.8	N/A

Ultimate Analyses (%)

Hydrogen	5.0	3.0	3.4
Carbon	49.2	65.4	73.3
Nitrogen	1.3	1.7	1.9
Sulfur	.3	.4	.5
Oxygen	36.0	18.6	20.9
Ash	8.2	10.8	N/A

Heating value
(BTU/lb)

8377	11131	12484
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Sulfur Forms (%)

Sulfate	not run
Pyritic	not run
Organic	not run

Ash

Initial deformation (°F)	1980
Softening temperature (°F)	2060
Fluid temperature (°F)	2150

Free Swelling Index	not run
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Fixed Carbon	
DMMF	53.49

Heating Value	
BTU/lb MMMF	9191.13

Apparent Rank	Subbituminous C
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Date of Analysis:	3-3-80
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Laboratory:	U.S. Dept. of Energy
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Lab No.	K99785
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Comments:	
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GAS ANALYSES - not run

ADSORPTION ISOTHERM DATA - not run

PETROGRAPHIC ANALYSES - not run

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 164

LOCATION

County: Arapahoe
Location: Sec 8 Twp 5S Rge 65W

Surface Elev (ft) 5857'
Coordinates 1150'FNL,
1600'FEL, NW, NE

GENERAL

CGS Sample No. 164
Sampled By Brand/Boreck
Operator Colorado Geological Survey
Hole No. 10C

Date 12-2-79
Sample Type Core

DRILLING DATA

Drilling Co. Teton Exploration Address Casper, Wyoming
Core Size 2 7/8" Barrel Length 10'
Type of core retrieval split rod, conventional
Drilling media foam Air Temperature 40°F
TD Hole 620' Logs Gamma, Density, Caliper, Resistance

GEOLOGY

Geologic Unit Denver Formation Age Upper Cretaceous
Coal zone/bed unnamed Bed Thickness 19.4'
Depth to top of coal 434.3' (Driller) same (Log)
Depth to bottom of coal 453.7' (Driller) same (Log)
Cored interval 425-435' (part of cored interval from 384-511.3') (Driller)
Roof description claystone, gray, blocky
Coal description lignite with sandstone partings, some pyrite or marcasite nodules, also kaolinite splits
Floor description very fine grained-silty, gray sandstone

DESORPTION DATA

Sampled interval (ft) 434.3-434.9 (Driller) same (Log)
Condition of sample ?
Sampled Weight (g) 1217
Lost gas time (min) -- Lost gas cc 0
Desorbed gas cc 0 Residual gas cc/g 0
Total gas content cc/g 0 Total gas content cf/t 0

Miscellaneous Reference: CGS Open File Report No. 80-1, 1980, by Karl E. Brand, Geophysical and Lithologic Logs from the 1979 Coal Drilling and Coring Program, Denver East 1/2° x 1° Quadrangle

COAL ANALYSES

Analyses	As Received	Moisture Free	Moisture and Ash Free
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Proximate Analyses (%)

Moisture	29.3	N/A	N/A
Volatile Matter	29.1	41.2	49.5
Fixed Carbon	29.8	42.1	50.5
Ash	11.8	16.7	N/A

Ultimate Analyses (%)

Hydrogen	5.2	2.7	3.3
Carbon	42.7	60.4	72.5
Nitrogen	1.0	1.5	1.7
Sulfur	0.4	.5	.6
Oxygen	39.0	18.3	21.9
Ash	11.8	16.7	N/A

Heating value
(BTU/lb)

7316	10356	12429
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Sulfur Forms (%)

Sulfate	not run
Pyritic	not run
Organic	not run

Ash

Initial deformation (°F)	not run
Softening temperature (°F)	not run
Fluid temperature (°F)	not run

Free Swelling Index	0
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Fixed Carbon	
DMMF	51.51

Heating Value	
BTU/lb MMMF	8382.73

Apparent Rank	subbituminous C
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Date of Analysis: 3-3-80

Laboratory: U.S. Dept. of Energy

Lab No. K99786

Comments: _____

GAS ANALYSES - not run

ADSORPTION ISOTHERM DATA - not run

PETROGRAPHIC ANALYSES

Lab. S.I.U. Coal Characterization Lab Petrographer John C. Crelling
 Lab No. SIU #855 Date of Analysis ?

Macaral Analysis

Vitrinite	<u>88.1</u>
Pseudovitrinite	<u>0.6</u>
Semifusinite	<u>0.7</u>
Semimacrinite	<u>1.1</u>
Fusinite	<u>0.0</u>
Macrinite	<u>0.1</u>
Micrinite	<u>3.8</u>
Exinite	<u>5.0</u>
Resinite	<u>0.6</u>
Total	<u>100%</u>

Reflectance Analysis

Vitrinite Ro	<u>The reflectance</u>
pVit Ro	<u>analysis was un-</u>
Combined Ro	<u>differentiated due</u>
pVit Ro - Vit Ro	<u>to the low amount</u>
	<u>of Pvit.</u>
	<u>*0.35 = mean-</u>
	<u>maximum</u>
	<u>reflectance</u>

Combined V-Type Table

V-Type	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>	<u>9</u>	<u>10</u>	<u>11</u>
%	<u>3.0</u>	<u>88.0</u>	<u>9.0</u>							
V-Type	<u>12</u>	<u>13</u>	<u>14</u>	<u>15</u>	<u>16</u>	<u>17</u>	<u>18</u>	<u>19</u>	<u>20</u>	<u>21</u>
%										

Comments: Apparent rank = Subbituminous C (abundant lumps of cutinite)

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 165

LOCATION

County: Arapahoe
Location: Sec 8 Twp 5S Rge 65W

Surface Elev (ft) 5857'
Coordinates 1150' FNL,
1600' FEL, NW/4, NE/4

GENERAL

CGS Sample No. 165
Sampled By D. Boreck
Operator Colorado Geological Survey
Hole No. 10C

Date 12-2-79
Sample Type Core

DRILLING DATA

Drilling Co. Teton Exploration Address Casper, Wyoming
Core Size 2 7/8" Barrel Length 10'
Type of core retrieval conventional split barrel
Drilling media foam Air Temperature 40°
TD Hole 620' Logs Gamma, Density, Caliper, Resistance

GEOLOGY

Geologic Unit Denver Formation Age Upper Cretaceous
Coal zone/bed unnamed Bed Thickness 19.4'
Depth to top of coal 434.3' (Driller) same (Log)
Depth to bottom of coal 453.7' (Driller) same (Log)
Cored interval 435-445' (part of cored interval 384-511.3') (Driller)
Roof description claystone, gray, blocky
Coal description lignite, brown/black, w/carb. clay, some attrital, vitrain
Floor description very fine grained-silty, gray sandstone

DESORPTION DATA

Sampled interval (ft) 435-445' (Driller) same (Log)
Condition of sample wet, pieces all sizes, representative sample
Sampled Weight (g) 839
Lost gas time (min) -- Lost gas cc 0
Desorbed gas cc 0 Residual gas cc/g 0
Total gas content cc/g 0 Total gas content cf/t 0

Miscellaneous Reference: CGS Open File Report No. 80-1, 1980,
Geophysical and Lithological Logs from 1979 Coal Drilling and Coring
Program, Denver East 1/2° x 1° Quadrangle

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
-----------------	--------------------	----------------------	------------------------------

Proximate Analyses (%)

Moisture	22.3	N/A	N/A
Volatile Matter	31.6	40.7	53.1
Fixed Carbon	28.0	36.0	46.9
Ash	18.1	23.3	N/A

Ultimate Analyses (%)

Hydrogen	4.5	2.6	3.4
Carbon	43.0	55.4	72.2
Nitrogen	1.0	1.3	1.6
Sulfur	.4	.5	.7
Oxygen	33.0	16.9	22.1
Ash	18.1	23.3	N/A

Heating value
(BTU/lb)

7441	9581	12495
------	------	-------

Sulfur Forms (%)

Sulfate	not run
Pyritic	not run
Organic	not run

Ash

Initial deformation (°F)	2580
Softening temperature (°F)	2650
Fluid temperature (°F)	2730

Free Swelling Index	not run
---------------------	---------

Fixed Carbon	
DMMF	48.22

Heating Value	
BTU/lb MMMF	9249.42

Apparent Rank	subbituminous C
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Date of Analysis:	3-3-80
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Laboratory:	U.S. Dept. of Energy
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Lab No.	K99787
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Comments:	
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GAS ANALYSES - not run

ADSORPTION ISOTHERM DATA - not run

PETROGRAPHIC ANALYSES

Lab. S.I.U. Coal Characterization Lab Petrographer John C. Crelling
 Lab No. SIU #856 Date of Analysis ?

Macaral Analysis

Vitrinite	88.3
Pseudovitrinite	2.2
Semifusinite	1.0
Semimacrinite	1.1
Fusinite	0.2
Macrinite	0.2
Micrinite	3.4
Exinite	3.2
Resinite	0.4
Total	100%

Reflectance Analysis

Vitrinite Ro	The reflectance analysis was un-differentiated due to the low amount of Pvit. *0.42 = mean-maximum reflectance
pVit Ro	
Combined Ro	
pVit Ro - Vit Ro	

Combined V-Type Table

V-Type	2	3	4	5	6	7	8	9	10	11
%		18.0	82.0							
V-Type	12	13	14	15	16	17	18	19	20	21
%										

Comments: Apparent rank = Subbituminous C

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 166

LOCATION

County: Fremont
Location: Sec 19 Twp 20S Rge 69W

Surface Elev (ft) 6220'
Coordinates 950'N, 1350'E
from SE/4 of mine area

GENERAL

CGS Sample No. 166
Sampled By Stuart Cohen
Operator Kings Point Corporation
Hole No. Hastings Mine #4

Date 10-18-79
Sample Type core

DRILLING DATA

Drilling Co. Johns Drilling Address _____
Core Size _____ Barrel Length _____
Type of core retrieval _____
Drilling media _____ Air Temperature 40°
TD Hole 260' Logs GR, Density, Resist

GEOLOGY

Geologic Unit Vermejo Formation Age Upper Cretaceous
Coal zone/bed "C" or Zenith Seam Bed Thickness 3.5'
Depth to top of coal 198' (Driller) same (Log)
Depth to bottom of coal 201.5' (Driller) same (Log)
Cored interval 196-219' (Driller)
Roof description shale
Coal description black, very friable, good cleat in 2 directions; calcite
Floor description shale

DESORPTION DATA

Sampled interval (ft) 198-201.5' ? (Driller) same (Log)
Condition of sample small pieces
Sampled Weight (g) 1107
Lost gas time (min) -- Lost gas cc 0
Desorbed gas cc 0 Residual gas cc/g 0
Total gas content cc/g 0 Total gas content cf/t 0

Miscellaneous _____

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
-----------------	--------------------	----------------------	------------------------------

Proximate Analyses (%)

Moisture	9.1	N/A	N/A
Volatile Matter	32.5	35.8	48.3
Fixed Carbon	34.9	38.4	51.7
Ash	23.5	25.8	N/A

Ultimate Analyses (%)

Hydrogen	4.9	4.3	5.8
Carbon	51.8	57.0	76.8
Nitrogen	.9	.9	1.3
Sulfur	1.3	1.5	2.0
Oxygen	17.7	10.5	14.2
Ash	23.5	25.8	N/A

Heating value
(BTU/lb)

9057	9969	13442
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Sulfur Forms (%)

Sulfate	not run
Pyritic	not run
Organic	not run

Ash

Initial deformation (°F)	2140
Softening temperature (°F)	2270
Fluid temperature (°F)	2400

Free Swelling Index	0
---------------------	---

Fixed Carbon	
DMMF	53.55

Heating Value	
BTU/lb MMMF	12166.97

Apparent Rank	HvC bituminous
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Date of Analysis:	7-21-80
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Laboratory:	U.S. Dept. of Energy
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Lab No.	L02674
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Comments:	
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GAS ANALYSES - not run

ADSORPTION ISOTHERM DATA - not run

PETROGRAPHIC ANALYSES

Lab. S.I.U. Coal Characterization Lab Petrographer John C. Crelling
 Lab No. SIU #850 Date of Analysis ?

Macaral Analysis

Vitrinite	<u>72.9</u>
Roedovitrinite	<u>11.3</u>
Semifusinite	<u>5.2</u>
Semimacrinite	<u>3.0</u>
Fusinite	<u>2.5</u>
Macrinite	<u>0.2</u>
Micrinite	<u>1.7</u>
Exinite	<u>2.5</u>
Resinite	<u>0.7</u>
Total	<u>100%</u>

Reflectance Analysis

Vitrinite Ro	<u>0.50</u>
pVit Ro	<u>0.54</u>
Combined Ro	<u>0.51</u>
pVit Ro - Vit Ro	<u>0.04</u>

Combined V-Type Table

V-Type	2	3	4	5	6	7	8	9	10	11
%			28.0	71.0	1.0					
V-Type	12	13	14	15	16	17	18	19	20	21
%										

Comments: _____

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 167

LOCATION

County: Huerfano
Location: Sec 24 Twp 28S Rge 67W

Surface Elev (ft) _____
Coordinates _____

GENERAL

CGS Sample No. 167
Sampled By D. Boreck
Operator Amax
Hole No. Amax 006

Date 3/7/80
Sample Type Core

DRILLING DATA

Drilling Co. Teton Drilling Address Casper, Wyoming
Core Size 2 7/8" Barrel Length 15'
Type of core retrieval split barrel
Drilling media mud Air Temperature 37°F
TD Hole 1000' Logs SP, Gamma Ray, Density, Resistance

GEOLOGY

Geologic Unit Vermejo Formation Age Upper Cretaceous
Coal zone/bed Walsen Seam Bed Thickness _____
Depth to top of coal _____ (Driller) _____ (Log)
Depth to bottom of coal _____ (Driller) _____ (Log)
Cored interval _____ (Driller)
Roof description dark gray shale, coaly, plant fossils, slickensided, breaks along bedding
Coal description resin, vitrinite in thin bands, fair cleat in one direction
Floor description underclay, rooted, silty carbonaceous

DESORPTION DATA

Sampled interval (ft) _____ (Driller) _____ (Log)
Condition of sample wet, small pieces
Sampled Weight (g) 572
Lost gas time (min) 25.5 Lost gas cc 80 ?
Desorbed gas cc 291 Residual gas cc/g 0.7
Total gas content cc/g 1.35 Total gas content cf/t 43

Miscellaneous _____

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
-----------------	--------------------	----------------------	------------------------------

Proximate Analyses (%)

Moisture	2.0	N/A	N/A
Volatile Matter	33.4	34.1	45.5
Fixed Carbon	40.0	40.8	54.5
Ash	24.6	25.1	N/A

Ultimate Analyses (%)

Hydrogen	4.9	4.7	6.3
Carbon	59.6	60.9	81.2
Nitrogen	1.1	1.1	1.5
Sulfur	.5	.5	.7
Oxygen	9.3	7.6	10.2
Ash	24.6	25.1	N/A

Heating value
(BTU/lb)

10732	10955	14625
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Sulfur Forms (%)

Sulfate	not run
Pyritic	not run
Organic	not run

Ash

Initial deformation (°F)	2800
Softening temperature (°F)	2800
Fluid temperature (°F)	2800

Free Swelling Index	1.0
---------------------	-----

Fixed Carbon	
DMMF	56.10

Heating Value	
BTU/lb MMMF	14635.64

Apparent Rank	HvA bituminous
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Date of Analysis: 7-21-80

Laboratory: U.S. Dept. of Energy

Lab No. L02675

Comments: _____

GAS ANALYSES - not run

ADSORPTION ISOTHERM DATA - not run

PETROGRAPHIC ANALYSES

Lab. Commercial Testing & Engineering Co. Petrographer ?
 Lab No. CGS #167 (Walsenberg) Date of Analysis ?

MACERAL ANALYSIS *
 (Volume Percent)
 (Mineral-Matter Free Basis)

MACARAL		MACERAL GROUP	
Vitrinite	<u>52.3</u>	Vitrinite	<u>53.9</u>
Pseudovitrinite	<u>1.6</u>		
Sporinite	<u>1.1</u>		
Cutinite	<u>0.2</u>		
Resinite	<u>5.9</u>		
Alginite	<u>0.1</u>	Exinite	
Bituminite	<u>1.3</u>	(Liptinite)	<u>8.7</u>
Fluorinite	<u>--</u>		
Exudatinite	<u>0.1</u>		
Semi-Fusinite	<u>7.3</u>		
Semi-Macrinite	<u>0.9</u>		
Fusinite	<u>11.2</u>	Inertinite	<u>37.4</u>
Macrinite	<u>1.8</u>		
Micrinite	<u>16.2</u>		
Schlerotinite	<u>--</u>		
TOTAL	100%		100%

*COMBINED RESULTS OF ANALYSES IN WHITE AND BLUE LIGHT.

REFLECTANCE ANALYSIS

Mean-Maximum Vitrinite Ro- 0.64

V-Type Table for Vitrinite (1=100%)

<u>V-5</u>	<u>V-6</u>	<u>V-7</u>	<u>V-</u>
11	86	3	

Number
of
Counts
(Total=
100)

PETROGRAPHIC ANALYSES

Lab. S.I.U. Coal Characterization Lab Petrographer John C. Crelling
 Lab No. SIU #851 Date of Analysis ?

Macaral Analysis

Vitrinite	<u>69.8</u>
Pseudovitrinite	<u>6.9</u>
Semifusinite	<u>7.0</u>
Semimacrinite	<u>7.7</u>
Fusinite	<u>1.4</u>
Macrinite	<u>0.0</u>
Micrinite	<u>4.2</u>
Exinite	<u>1.9</u>
Resinite	<u>1.1</u>
Total	<u>100%</u>

Reflectance Analysis

pVit Ro - Vit Ro	<u>0.63</u>
pVit Ro	<u>0.67</u>
Combined Ro	<u>0.63</u>
pVit Ro - Vit Ro	<u>0.04</u>

Combined V-Type Table

V-Type	2	3	4	5	6	7	8	9	10	11
%				11.0	74.0	15.0				
V-Type	12	13	14	15	16	17	18	19	20	21
%										

Comments: _____

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 168

LOCATION

County: Huerfano
Location: Sec 24 Twp 28S Rge 67W

Surface Elev (ft) _____
Coordinates _____

GENERAL

CGS Sample No. 168
Sampled By D. Boreck
Operator Amax
Hole No. Amax 006

Date 3/7/80
Sample Type Core

DRILLING DATA

Drilling Co. Teton Exploration Address Casper, Wyoming
Core Size 2 1/8" Barrel Length 15'
Type of core retrieval split barrel
Drilling media mud Air Temperature 37°F
TD Hole 1000' Logs SP, Gamma Ray, Density, Resistance

GEOLOGY

Geologic Unit Vermejo Formation Age Upper Cretaceous
Coal zone/bed Walsen Seam Bed Thickness _____
Depth to top of coal _____ (Driller) _____ (Log)
Depth to bottom of coal _____ (Driller) _____ (Log)
Cored interval _____ (Driller)
Roof description see #167
Coal description see #167
Floor description see #167

DESORPTION DATA

Sampled interval (ft) ? (Driller) _____ (Log)
Condition of sample ?
Sampled Weight (g) not recorded
Lost gas time (min) NC Lost gas cc NC
Desorbed gas cc 284 Residual gas cc/g NC
Total gas content cc/g not calculated Total gas content cf/t not calculated

Miscellaneous sample returned to company, same bed as CGS #167

COAL ANALYSES - not run

GAS ANALYSES - not run

ADSORPTION ISOTHERM DATA - not run

PETROGRAPHIC ANALYSES - not run

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 169

LOCATION

County: Huerfano
Location: Sec 24 Twp 28S Rge 67W

Surface Elev (ft) _____
Coordinates _____

GENERAL

CGS Sample No. 169
Sampled By D. Boreck
Operator Amax
Hole No. 004

Date 3/11/80
Sample Type core

DRILLING DATA

Drilling Co. Teton Exploration Address Casper, Wyoming
Core Size 2 1/8" Barrel Length 15'
Type of core retrieval split core barrel
Drilling media foam Air Temperature 60°-65°
TD Hole 1239' Logs SP, gamma ray, density, resistance

GEOLOGY

Geologic Unit Vermejo Fm Age Upper Cretaceous
Coal zone/bed uncorrelated Bed Thickness 2.75'
Depth to top of coal ? (Driller) _____ (Log) _____
Depth to bottom of coal ? (Driller) _____ (Log) _____
Cored interval _____ (Driller) _____
Roof description blk shale, thin coaly streaks
Coal description dull, black, much resin, some calcite, slickensides
Floor description blk coaly shale, hard & brittle

DESORPTION DATA

Sampled interval (ft) _____ (Driller) ? (Log) _____
Condition of sample fresh core
Sampled Weight (g) 859
Lost gas time (min) not calculated Lost gas cc 0
Desorbed gas cc 850 Residual gas cc/g 0.9
Total gas content cc/g 1.88 Total gas content cf/t 60

Miscellaneous _____

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
-----------------	--------------------	----------------------	------------------------------

Proximate Analyses (%)

Moisture	2.8	N/A	N/A
Volatile Matter	34.4	35.4	42.9
Fixed Carbon	45.8	47.1	57.1
Ash	17.0	17.5	N/A

Ultimate Analyses (%)

Hydrogen	5.7	5.5	6.7
Carbon	64.7	66.6	80.7
Nitrogen	1.2	1.3	1.5
Sulfur	.6	.6	.7
Oxygen	10.8	8.5	10.4
Ash	17.0	17.5	N/A

Heating value
(BTU/lb)

As Received	11750	12090	14651
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Sulfur Forms (%)

Sulfate	not run
Pyritic	not run
Organic	not run

Ash

Initial deformation (°F)	2800 +
Softening temperature (°F)	2800 +
Fluid temperature (°F)	2800 +

Free Swelling Index	1.0
---------------------	-----

Fixed Carbon	
DMMF	58.22

Heating Value	
BTU/lb MMTF	14,413.97

Apparent Rank	HvA bituminous
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Date of Analysis:	9-11-80
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Laboratory:	U.S. Dept. of Energy
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Lab No.	L03668
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Comments:	
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GAS ANALYSES

	<u>With air</u>	<u>Air free</u>
(MSI percent)		
Hydrogen	--	
Oxygen	--	
Hydrogen sulfide	--	
Carbon dioxide	1.40	
Nitrogen + air	80.80	
Methane	17.55	
Ethane	.007	
Other hydrocarbons	.004	
Calculated gas gravity	not run	

Calculated gross heating value (BTU/cf) 177.8

Company: Amax Sampler: D. Boreck
 Date sample taken: 3-28-80 Date sample analyzed: ?
 Laboratory: USGS Denver Lab No.: CGS 169

Carbon Isotope Ratio (relative to Chicago standard)

C13 (ppm) -51.27

Comments

Laboratory USGS Denver Lab No.: CGS 169
 Contact Dudley Rice Analysis date: ?

ADSORPTION ISOTHERM DATA - not run

PETROGRAPHIC ANALYSES

Lab. S.I.U. Coal Characterization Lab Petrographer John C. Crelling
 Lab No. SIU #898 Date of Analysis May/June 1982

Maceral Analysis

Vitrinite	<u>62.8</u>
Pseudovitrinite	<u>14.7</u>
Semifusinite	<u>14.5</u>
Semimacrinite	<u>0.4</u>
Fusinite	<u>3.2</u>
Macrinite	<u>0.1</u>
Micrinite	<u>1.0</u>
Exinite	<u>3.0</u>
Resinite	<u>0.3</u>
Total	<u>100%</u>

Reflectance Analysis

Vitrinite Ro	<u>0.60</u>
pVit Ro	<u>0.65</u>
Combined Ro	<u>0.61</u>
pVit Ro - Vit Ro	<u>0.05</u>

Combined V-Type Table

V-Type	2	3	4	5	6	7	8	9	10	11
%				20.6	74.5	4.9				
V-Type	12	13	14	15	16	17	18	19	20	21
%										

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 170

LOCATION

County: Las Animas
Location: Sec 32 Twp 33S Rge 66W

Surface Elev (ft) 6770
Coordinates 965'FWL; 502'FNL

GENERAL

CGS Sample No. 170
Sampled By Rebecca Owen
Operator APGA, Inc.
Hole No. City of Trinidad #2

Date 6/22/80
Sample Type Core

DRILLING DATA

Drilling Co. Ormsbee Drilling Co. Address Lafayette, Colo.
Core Size 3" Barrel Length 20'
Type of core retrieval conventional
Drilling media mud Air Temperature 103°F
TD Hole 1448.6' Logs Gamma, Caliper, Resistivity, Density, Temperature,
Coal Quality

GEOLOGY

Geologic Unit Vermejo Formation Age Upper Cretaceous
Coal zone/bed uncorrelated Bed Thickness 1'
Depth to top of coal 1184' (Driller) ? (Log)
Depth to bottom of coal 1185' (Driller) ? (Log)
Cored interval 1184-1190' (Driller)
Roof description shale
Sample description carbonaceous shale w/trace sandstone & coal
Floor description shale

DESORPTION DATA

Sampled interval (ft) 1184-1185 (Driller) ? (Log)
Condition of sample dirty, fractured, wet
Sampled Weight (g) 1933
Lost gas time (min) 47.5 Lost gas cc 1200
Desorbed gas cc 6531 Residual gas cc/g 0.1
Total gas content cc/g 4.10 Total gas content cf/t 131

Miscellaneous _____

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
-----------------	--------------------	----------------------	------------------------------

Proximate Analyses (%)

Moisture	1.06	N/A	N/A
Volatile Matter	12.32	12.45	29.71
Fixed Carbon	29.15	29.46	70.29
Ash	57.47	58.09	N/A

Ultimate Analyses (%)

Hydrogen	2.54	2.44	5.83
Carbon	35.83	36.22	86.41
Nitrogen	.62	.62	1.49
Sulfur	.28	.28	.68
Oxygen	3.27	2.35	5.60
Ash	57.47	58.09	N/A

Heating value
(BTU/lb)

6184	6251	14914
------	------	-------

Sulfur Forms (%)

Sulfate	not run
Pyritic	not run
Organic	not run

Ash

Initial deformation (°F)	2640
Softening temperature (°F)	2730
Fluid temperature (°F)	2840

Free Swelling Index	1.0
---------------------	-----

Fixed Carbon	
DMMF	79.27

Heating Value	
BTU/lb MMTF	16,332.08

Apparent Rank	carbonaceous shale
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Date of Analysis:	2-21-82
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Laboratory:	U.S. Dept. of Energy
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Lab No.	L11684
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Comments:	
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GAS ANALYSES

	<u>With air</u>	<u>Air free</u>
<u>(MSI percent)</u>		
Propane	0.46	
Isobutane	0.027	
n-Butane	0.024	
Carbon dioxide	0.78	
Nitrogen (or air)	6.09	
Methane	91.29	
Ethane	1.02	
Pentanes	.000	
<u>Calculated gas gravity</u>	--	

Calculated gross heating value (BTU/cf) 955.6

Company: A.P.G.A. Sampler: Colorado Geological Survey
 Date sample taken: 7-8-80 Date sample analyzed: ?
 Laboratory: U.S. Geol. Survey Lab No.: CGS 170

Carbon Isotope Ratio (relative to Chicago standard)

C13 (ppm) -43.24

Comments _____
 Laboratory U.S. Geol. Survey Lab No.: CGS #170
 Contact Dudley Rice Analysis date: ?

ADSORPTION ISOTHERM DATA - not run

PETROGRAPHIC ANALYSES - not run

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 171

LOCATION

County: Las Animas
Location: Sec 32 Twp 33S Rge 66W

Surface Elev (ft) 6770
Coordinates 965'FWL; 502'FNL

GENERAL

CGS Sample No. 171
Sampled By Rebecca Owen
Operator APGA, Inc.
Hole No. City of Trinidad #2

Date 6/27/80
Sample Type Core

DRILLING DATA

Drilling Co. Ormsbee Drilling Co. Address Lafayette, Colo.
Core Size 3" Barrel Length 20'
Type of core retrieval conventional
Drilling media mud Air Temperature 90°F

Coal Quality

GEOLOGY

Geologic Unit Vermejo Formation Age Upper Cretaceous
Coal zone/bed uncorrelated Bed Thickness .75'
Depth to top of coal 1190' (Driller) ? (Log)
Depth to bottom of coal 1190.75' (Driller) ? (Log)
Cored interval 1188-1199' (Driller)
Roof description shale
Coal description black, dull coal, carb. shale?, desceminated pyrite
Floor description shale

DESORPTION DATA

Sampled interval (ft) 1190-1190.75' (Driller) ? (Log)
Condition of sample very fractured, bubbly
Sampled Weight (g) 1653
Lost gas time (min) 45 Lost gas cc 5600
Desorbed gas cc 8247 Residual gas cc/g 0.1
Total gas content cc/g 8.48 Total gas content cf/t 271

Miscellaneous _____

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
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Proximate Analyses (%)

Moisture	1.50	N/A	N/A
Volatile Matter	11.79	11.97	30.20
Fixed Carbon	27.26	27.68	69.80
Ash	59.45	60.35	N/A

Ultimate Analyses (%)

Hydrogen	2.29	2.16	5.44
Carbon	33.72	34.24	86.36
Nitrogen	.58	.59	1.49
Sulfur	.27	.27	.69
Oxygen	3.69	2.39	6.02
Ash	59.45	60.35	N/A

Heating value
(BTU/lb)

5666	5752	14509
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Sulfur Forms (%)

Sulfate	not run
Pyritic	not run
Organic	not run

Ash

Initial deformation (°F)	2630
Softening temperature (°F)	2740
Fluid temperature (°F)	2830

Free Swelling Index	1.0
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Fixed Carbon	
DMMF	79.72

Heating Value	
BTU/lb MMMF	15,857.54

Apparent Rank	carbonaceous shale
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Date of Analysis:	2-21-82
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Laboratory:	U.S. Dept. of Energy
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Lab No.	L11641
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Comments:	
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GAS ANALYSES

	<u>With air</u>	<u>Air free</u>
<u>(MSI percent)</u>		
Propane	.055	
Isobutane	.006	
n-Butane	.002	
Carbon dioxide	1.12	
Nitrogen (or air)	4.82	
Methane	93.89	
Ethane	.075	
Pentanes	.000	
<u>Calculated gas gravity</u>	--	

Calculated gross heating value (BTU/cf) 953.2

Company: A.P.G.A. Sampler: Colorado Geological Survey
 Date sample taken: 7-8-80 Date sample analyzed: ?
 Laboratory: U.S. Geol. Survey Lab No.: CGS 171

Carbon Isotope Ratio (relative to Chicago standard)

C13 (ppm) -45.22

Comments

Laboratory U.S. Geological Survey Lab No.: CGS 171
 Contact Dudley Rice Analysis date: ?

ADSORPTION ISOTHERM DATA - not run

PETROGRAPHIC ANALYSES - not run

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 172

LOCATION

County: Las Animas
Location: Sec 32 Twp 33S Rge 66W

Surface Elev (ft) 6770'
Coordinates 965'FWL; 502'FNL

GENERAL

CGS Sample No. 172
Sampled By Rebecca Owen
Operator APGA, Inc.
Hole No. City of Trinidad #2

Date 6-27-80
Sample Type Core

DRILLING DATA

Drilling Co. Ormsbee Drilling Co. Address Lafayette, Colorado
Core Size 3" Barrel Length 20'
Type of core retrieval conventional
Drilling media mud Air Temperature 90°F
TD Hole 1448.6' Logs Gamma, Caliper, Resistivity, Density, Temp., Coal Quality

GEOLOGY

Geologic Unit Vermejo Formation Age Upper Cretaceous
Coal zone/bed unnamed Bed Thickness 1.5'
Depth to top of coal 1190' (Driller) ? (Log)
Depth to bottom of coal 1191.5' (Driller) ? (Log)
Cored interval 1188-1199' (Driller)
Roof description shale
Coal description carbonaceous shale, waxy luster, pyrite, calcite in fractures
Floor description shale

DESORPTION DATA

Sampled interval (ft) 1190.75-1191.5' (Driller) ? (Log)
Condition of sample fractured, crumbly, bubbly
Sampled Weight (g) 2161
Lost gas time (min) 45 Lost gas cc 2300
Desorbed gas cc 8147 Residual gas cc/g 0.1
Total gas content cc/g 4.93 Total gas content cf/t 158

Miscellaneous _____

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
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Proximate Analyses (%)

Moisture	1.21	N/A	N/A
Volatile Matter	11.14	11.38	36.89
Fixed Carbon	19.06	19.29	63.11
Ash	68.59	69.43	N/A

Ultimate Analyses (%)

Hydrogen	1.87	1.75	5.74
Carbon	24.45	24.75	80.98
Nitrogen	.43	.44	1.43
Sulfur	.24	.24	.80
Oxygen	4.42	3.38	11.07
Ash	68.59	69.43	N/A

Heating value
(BTU/lb)

4111	4161	13613
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Sulfur Forms (%)

Sulfate	not run
Pyritic	not run
Organic	not run

Ash

Initial deformation (°F)	not run
Softening temperature (°F)	not run
Fluid temperature (°F)	not run

Free Swelling Index	not run
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Fixed Carbon	
DMMF	77.4

Heating Value	
BTU/lb MMMF	15893

Apparent Rank	carb. shale
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Date of Analysis:	3-11-82
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Laboratory:	U.S. Dept. of Energy
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Lab No.	L11974
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Comments:	
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GAS ANALYSES

	<u>With air</u>	<u>Air free</u>
<u>(MSI percent)</u>		
Propane	.010	
Isobutane	.000	
n-Butane	.000	
Carbon dioxide	1.14	
Nitrogen (or air)	5.03	
Methane	93.78	
Ethane	.025	
Pentanes	.000	
<u>Calculated gas gravity</u>	--	

Calculated gross heating value (BTU/cf) 949.8

Company: A.P.G.A. Sampler: Colorado Geological Survey
 Date sample taken: 7-8-80 Date sample analyzed: ?
 Laboratory: U.S.G.S. Lab No.: CGS 172

Carbon Isotope Ratio (relative to Chicago standard)

C13 (ppm) -45.17

Comments _____

Laboratory U.S.G.S. Lab No.: CGS 172
 Contact Dudley Rice Analysis date: ?

ADSORPTION ISOTHERM DATA - not run

PETROGRAPHIC ANALYSES - not run

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 173

LOCATION

County: Las Animas
Location: Sec 32 Twp 33S Rge 66W

Surface Elev (ft) 6770
Coordinates 965'FWL; 502'FNL

GENERAL

CGS Sample No. 173
Sampled By Rebecca Owen
Operator APGA, Inc.
Hole No. City of Trinidad #2

Date 6-27-80
Sample Type core

DRILLING DATA

Drilling Co. Ormsbee Drilling Co. Address Lafayette, Colorado
Core Size 3" Barrel Length 20'
Type of core retrieval conventional
Drilling media mud Air Temperature 74°F
TD Hole 1448.6' Logs gamma, caliper, resistivity, density, temp.,
coal quality

GEOLOGY

Geologic Unit Vermejo Formation Age Upper Cretaceous
Coal zone/bed unnamed Bed Thickness 4'
Depth to top of coal 1205' (Driller) ? (Log)
Depth to bottom of coal 1209' (Driller) ? (Log)
Cored interval 1199-1209' (Driller)
Roof description shale w/ ss stringers
Coal description dull, carb. shale?
Floor description intermixed ss & shale

DESORPTION DATA

Sampled interval (ft) 1205-1209 (Driller) ? (Log)
Condition of sample crumbly, wet, random sample
Sampled Weight (g) 1048
Lost gas time (min) 21.5 Lost gas cc 1500
Desorbed gas cc 9887 Residual gas cc/g 0.5
Total gas content cc/g 11.37 Total gas content cf/t 364

Miscellaneous _____

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
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Proximate Analyses (%)

Moisture	.99	N/A	N/A
Volatile Matter	13.92	14.06	25.80
Fixed Carbon	40.05	40.45	74.20
Ash	45.04	45.49	N/A

Ultimate Analyses (%)

Hydrogen	2.95	2.87	5.26
Carbon	47.32	47.80	87.60
Nitrogen	.77	.78	1.43
Sulfur	.32	.32	.59
Oxygen	3.60	2.75	5.04
Ash	45.04	45.49	N/A

Heating value
(BTU/lb)

81.92	82.74	15179
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Sulfur Forms (%)

Sulfate	not run
Pyritic	not run
Organic	not run

Ash

Initial deformation (°F)	not run
Softening temperature (°F)	not run
Fluid temperature (°F)	not run

Free Swelling Index	not run
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Fixed Carbon	
DMMF	79.7

Heating Value	
BTU/lb MMMF	15974.7

Apparent Rank	low volatile bituminous
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Date of Analysis:	3-11-82
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Laboratory:	U.S. Dept. of Energy
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Lab No.	L11975
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Comments:	
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GAS ANALYSES

	<u>With air</u>	<u>Air free</u>
<u>(MSI percent)</u>		
Propane	<u>.000</u>	
Isobutane	<u>.000</u>	
n-butane	<u>.000</u>	
Carbon dioxide	<u>1.71</u>	
Nitrogen	<u>6.23</u>	
Methane	<u>92.04</u>	
Ethane	<u>.15</u>	
Pentanes	<u>.000</u>	
<u>Calculated gas gravity</u>	<u>--</u>	

Calculated gross heating value (BTU/cf, air free) 934.1

Company: A.P.G.A. Sampler: Colorado Geol. Survey
 Date sample taken: 7-8-80 Date sample analyzed: ?
 Laboratory: U.S.G.S. Lab No.: CGS #173

Carbon Isotope Ratio (relative to Chicago standard)

C13 (ppm) -45.60

Comments _____

Laboratory U.S.G.S. Lab No.: CGS 173
 Contact Dudley Rice Analysis date: ?

ADSORPTION ISOTHERM DATA - not run

PETROGRAPHIC ANALYSES - not run

LOCATION

County: Las Animas
Location: Sec 32 Twp 33S Rge 66W

Surface Elev (ft) 6770
Coordinates 965'FWL; 502'FNL

GENERAL

CGS Sample No. 174
Sampled By Rebecca Owen
Operator APGA, Inc.
Hole No. City of Trinidad #2

Date 6-28-80
Sample Type core

DRILLING DATA

Drilling Co. Ormsbee Drilling Co. Address Lafayette, Colo.
Core Size 3" Barrel Length 20'
Type of core retrieval conventional
Drilling media mud Air Temperature 84°F
TD Hole 1448.6' Logs gamma, caliper, resistivity, density, temp.,
coal quality

GEOLOGY

Geologic Unit Vermejo Formation Age Upper Cretaceous
Coal zone/bed uncorrelated Bed Thickness ?
Depth to top of zone ? (Driller) ? (Log)
Depth to bottom of zone ? (Driller) ? (Log)
Cored interval 1208-1228' (Driller)
Roof description shale
Sample description shale, carbonaceous, fissile, fine vitrinite bands,
CaCO3 veins
Floor description shale

DESORPTION DATA

Sampled interval (ft) 1218-1219 (Driller) ? (Log)
Condition of sample hard, slightly fractured
Sampled Weight (g) 2398
Lost gas time (min) 25 Lost gas cc 400
Desorbed gas cc 1226 Residual gas cc/g 0.1
Total gas content cc/g .78 Total gas content cf/t 25

Miscellaneous carbonaceous shale

COAL ANALYSES - not run

GAS ANALYSES - not run

ADSORPTION ISOTHERM DATA - not run

PETROGRAPHIC ANALYSES - not run

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 175

LOCATION

County: Las Animas
Location: Sec 32 Twp 33S Rge 66W

Surface Elev (ft) 6770
Coordinates 965'FWL; 502'FNL

GENERAL

CGS Sample No. 175
Sampled By Rebecca Owen
Operator APGA, Inc.
Hole No. City of Trinidad #2

Date 6-28-80
Sample Type core

DRILLING DATA

Drilling Co. Ormsbee Drilling Co. Address Lafayette, Colorado
Core Size 3" Barrel Length 20'
Type of core retrieval conventional
Drilling media mud Air Temperature 54°
TD Hole 1448.6' Logs Gamma, Caliper, Resistivity, Density, Temperature, Coal Quality

GEOLOGY

Geologic Unit Vermejo Formation Age Upper Cretaceous
Coal zone/bed uncorrelated Bed Thickness _____
Depth to top of zone ? (Driller) ? (Log)
Depth to bottom of zone ? (Driller) ? (Log)
Cored interval 1208-1228' (Driller)
Roof description shale
Sample description carbonaceous shale, fissile, fine vitrinite bands, CaCO3 veins
Floor description shale

DESORPTION DATA

Sampled interval (ft) 1219-1219.5 (Driller) ? (Log)
Condition of sample hard, slightly fractured
Sampled Weight (g) 1812
Lost gas time (min) 28 Lost gas cc 300
Desorbed gas cc 1188 Residual gas cc/g 0.0
Total gas content cc/g .82 Total gas content cf/t 26

Miscellaneous carbonaceous shale

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
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Proximate Analyses (%)

Moisture	3.36	N/A	N/A
Volatile Matter	6.71	6.95	73.46
Fixed Carbon	2.42	2.51	26.54
Ash	87.51	90.54	N/A

Ultimate Analyses (%)

Hydrogen	1.17	.82	8.71
Carbon	5.02	5.19	54.88
Nitrogen	.17	.17	1.83
Sulfur	.21	.22	2.31
Oxygen	5.93	3.05	32.35
Ash	87.51	90.54	N/A

Heating value
(BTU/lb)

622	643	6804
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Sulfur Forms (%)

Sulfate	not run
Pyritic	not run
Organic	not run

Ash

Initial deformation (°F)	2630
Softening temperature (°F)	2720
Fluid temperature (°F)	2810

Free Swelling Index	0.0
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Fixed Carbon	
DMMF	118.61

Heating Value	
BTU/lb MMMF	11379

Apparent Rank	carbonaceous shale
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Date of Analysis:	2-21-82
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Laboratory:	U.S. Dept. of Energy
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Lab No.	L11699
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Comments:	
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GAS ANALYSES - not run

ADSORPTION ISOTHERM DATA - not run

PETROGRAPHIC ANALYSES - not run

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 176

LOCATION

County: Las Animas
Location: Sec 32 Twp 33S Rge 66W

Surface Elev (ft) 6770
Coordinates 502'FNL; 965'FWL

GENERAL

CGS Sample No. 176
Sampled By Rebecca Owen
Operator APGA, Inc.
Hole No. City of Trinidad #2

Date 6/28/80
Sample Type Core

DRILLING DATA

Drilling Co. Ormsbee Drilling Co. Address Lafayette, Colorado
Core Size 3" Barrel Length 20'
Type of core retrieval Conventional
Drilling media Mud Air Temperature ?
TD Hole 1448.6' Logs Gamma, Caliper, Resistivity, Density, Temperature,
Coal Quality

GEOLOGY

Geologic Unit Vermejo Formation Age Upper Cretaceous
Sample zone unnamed Bed Thickness ?
Depth to top of zone ? (Driller) ? (Log)
Depth to bottom of zone ? (Driller) ? (Log)
Cored interval 1235-1241.5' (Driller)
Roof description ?
Sample description Carbonaceous shale with slickensides and a fine grained, gray sandstone lens
Floor description ?

DESORPTION DATA

Sampled interval (ft) 1234-1235 (Driller) ? (Log)
Condition of sample several large pieces
Sampled Weight (g) 2748
Lost gas time (min) 31.5 Lost gas cc 300
Desorbed gas cc 429 Residual gas cc/g 0.1
Total gas content cc/g .37 Total gas content cf/t 12

Miscellaneous _____

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
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Proximate Analyses (%)

Moisture	2.54	N/A	N/A
Volatile Matter	4.94	5.07	91.63
Fixed Carbon	.45	.47	8.37
Ash	92.07	94.46	N/A

Ultimate Analyses (%)

Hydrogen	.95	.68	12.33
Carbon	2.51	2.58	46.53
Nitrogen	.13	.13	2.42
Sulfur	.06	.06	1.09
Oxygen	4.28	2.08	37.55
Ash	92.07	94.46	N/A

Heating value
(BTU/lb)

238	245	4418
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Sulfur Forms (%)

Sulfate	not run
Pyritic	not run
Organic	not run

Ash

Initial deformation (°F)	not run
Softening temperature (°F)	not run
Fluid temperature (°F)	not run

<u>Free Swelling Index</u>	not run
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<u>Fixed Carbon</u>	
<u>DMMF</u>	--

<u>Heating Value</u>	
<u>BTU/lb MMMF</u>	--

<u>Apparent Rank</u>	carbonaceous shale
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<u>Date of Analysis:</u>	2-21-82
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<u>Laboratory:</u>	U.S. Dept. of Energy
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<u>Lab No.</u>	L11685
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<u>Comments:</u>	
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GAS ANALYSES - not run

ADSORPTION ISOTHERM DATA - not run

PETROGRAPHIC ANALYSES - not run

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 177

LOCATION

County: Las Animas
Location: Sec 32 Twp 33S Rge 66W

Surface Elev (ft) 6750'
Coordinates 1614'FWL,862'FNL

GENERAL

CGS Sample No. 177
Sampled By D. Boreck
Operator APGA, Inc.
Hole No. City of Trinidad #3

Date 7/23/80
Sample Type Core

DRILLING DATA

Drilling Co. Ormsbee Drilling Co. Address Lafayette, Colorado
Core Size 3" Barrel Length 20'
Type of core retrieval conventional
Drilling media mud Air Temperature 101°
TD Hole 1449' Logs Resistivity, Gamma, L.S. Density, Caliper

GEOLOGY

Geologic Unit Vermejo Formation Age Upper Cretaceous
Coal zone/bed uncorrelated Bed Thickness 2'
Depth to top of coal 1092.6' (Driller) 1098' (Log)
Depth to bottom of coal 1094.6' (Driller) 1100' (Log)
Cored interval 1090.5-1102.5' (Driller)
Roof description White, med.-gr. ss, w/CaCo3 cement, erosional contact w/coal
Coal description good cleat in one direction, black
Floor description gradational contact between coal & black massive carbonaceous shale

DESORPTION DATA

Sampled interval (ft) 1092.6-1093.6' (Driller) 1098-1099' (Log)
Condition of sample fractured
Sampled Weight (g) 1475
Lost gas time (min) 27.5 Lost gas cc 3300
Desorbed gas cc 10,697 Residual gas cc/g 0.4
Total gas content cc/g 9.89 Total gas content cf/t 316

Miscellaneous _____

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
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Proximate Analyses (%)

Moisture	.60	N/A	N/A
Volatile Matter	16.73	16.83	25.58
Fixed Carbon	48.69	48.99	74.42
Ash	33.92	34.18	N/A

Ultimate Analyses (%)

Hydrogen	3.47	3.42	5.20
Carbon	57.62	57.97	88.07
Nitrogen	.93	.93	1.42
Sulfur	.43	.43	.65
Oxygen	3.58	3.07	4.66
Ash	33.98	34.18	N/A

Heating value
(BTU/lb)

10005	10066	15293
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Sulfur Forms (%)

Sulfate	not run
Pyritic	not run
Organic	not run

Ash

Initial deformation (°F)	not run
Softening temperature (°F)	not run
Fluid temperature (°F)	not run

Free Swelling Index	not run
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Fixed Carbon	
DMMF	77.8

Heating Value	
BTU/lb MMMF	15830.5

Apparent Rank	medium volatile bituminous
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Date of Analysis:	3-11-82
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Laboratory:	U.S. Dept. of Energy
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Lab No.	L11971
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Comments:	
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GAS ANALYSES

	<u>With air</u>	<u>Air free</u>
<u>(MSI percent)</u>		
Propane	.000	
Isobutane	.000	
n-Butane	.000	
Carbon dioxide	.64	
Nitrogen (plus air)	6.96	
Methane	92.69	
Ethane	.03	
Pentanes	.000	
<u>Calculated gas gravity</u>	--	

Calculated gross heating value (BTU/cf) 938.6

Company: A.P.G.A. Sampler: C. M. Tremain
 Date sample taken: 8-1-80 Date sample analyzed: ?
 Laboratory: U.S.G.S. Lab No.: CGS 177

Carbon Isotope Ratio (relative to Chicago standard)

C13 (ppm) -44.66

Comments _____
 Laboratory U.S.G.S. Lab No.: CGS 177
 Contact Dudley Rice Analysis date: ?

ADSORPTION ISOTHERM DATA - not run

PETROGRAPHIC ANALYSES - not run

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 178

LOCATION

County: Las Animas
Location: Sec 32 Twp 33S Rge 66W

Surface Elev (ft) 6750'
Coordinates 1614'FWL,862'FNL

GENERAL

CGS Sample No. 178
Sampled By D. Boreck
Operator APGA, Inc.
Hole No. City of Trinidad #3

Date 7/23/80
Sample Type Core

DRILLING DATA

Drilling Co. Ormsbee Drilling Co. Address Lafayette, Colorado
Core Size 3" Barrel Length 20'
Type of core retrieval conventional
Drilling media mud Air Temperature 101°
TD Hole 1449' Logs Resistivity, Gamma, L.S. Density, Caliper

GEOLOGY

Geologic Unit Vermejo Formation Age Upper Cretaceous
Coal zone/bed uncorrelated Bed Thickness 2'
Depth to top of coal 1092.6' (Driller) 1098' (Log)
Depth to bottom of coal 1094.6' (Driller) 1100' (Log)
Cored interval 1090.5-1102.5' (Driller)
Roof description white, med.-gr. ss w/CaCO3 cement, erosional contact w/coal
Coal description black, fractured, carbonaceous shale ?
Floor description gradational contact between coal & black massive carbonaceous shale

DESORPTION DATA

Sampled interval (ft) 1093.6-1094.6' (Driller) 1099-1100' (Log)
Condition of sample fractured
Sampled Weight (g) 1655
Lost gas time (min) 27.5 Lost gas cc 2950
Desorbed gas cc 13,404 Residual gas cc/g 0.7
Total gas content cc/g 10.58 Total gas content cf/t 339

Miscellaneous _____

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
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Proximate Analyses (%)

Moisture	.56	N/A	N/A
Volatile Matter	16.19	16.28	23.69
Fixed Carbon	52.14	52.44	76.31
Ash	31.11	31.28	N/A

Ultimate Analyses (%)

Hydrogen	3.53	3.49	5.07
Carbon	60.01	60.35	87.82
Nitrogen	.88	.89	1.29
Sulfur	.39	.39	.57
Oxygen	4.09	3.61	5.25
Ash	31.11	31.28	N/A

Heating value
(BTU/lb)

10450	10509	15293
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Sulfur Forms (%)

Sulfate	not run
Pyritic	not run
Organic	not run

Ash

Initial deformation (°F)	not run
Softening temperature (°F)	not run
Fluid temperature (°F)	not run

Free Swelling Index	not run
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Fixed Carbon	
DMMF	79.4

Heating Value	
BTU/lb MMMF	15759.2

Apparent Rank	low volatile bituminous
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Date of Analysis:	3-11-82
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Laboratory:	U.S. Dept. of Energy
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Lab No.	L11972
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Comments:	
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GAS ANALYSES - not runADSORPTION ISOTHERM DATA - not runPETROGRAPHIC ANALYSES - not run

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 179

LOCATION

County: Las Animas
Location: Sec 32 Twp 33S Rge 66W

Surface Elev (ft) 6750'
Coordinates 1614'FWL,862'FNL

GENERAL

CGS Sample No. 179
Sampled By D. Boreck
Operator APGA, Inc.
Hole No. City of Trinidad #3

Date 7/24/80
Sample Type Core

DRILLING DATA

Drilling Co. Ormsbee Drilling Co. Address Lafayette, Colorado
Core Size 3" Barrel Length 20'
Type of core retrieval conventional
Drilling media mud Air Temperature 101°
TD Hole 1449' Logs Resistivity, Gamma, L.S. Density, Caliper

GEOLOGY

Geologic Unit Vermejo Formation Age Upper Cretaceous
Coal zone/bed uncorrelated Bed Thickness 1'
Depth to top of coal 1099.3' (Driller) 1104.5' (Log)
Depth to bottom of coal 1100.3' (Driller) 1105.5' (Log)
Cored interval 1090.5-1102.5' (Driller)
Roof description interbedded medium-grained sandstone and shale
Coal description black, highly fractured, pyrite & calcite in fractures
Floor description gray shale, massive, highly fractured

DESORPTION DATA

Sampled interval (ft) 1099.3-1103.3' (Driller) 1104.5-1105.5' (Log)
Condition of sample highly fractured
Sampled Weight (g) 1620
Lost gas time (min) 22.5 Lost gas cc 3500
Desorbed gas cc 13617 Residual gas cc/g 0.2
Total gas content cc/g 10.77 Total gas content cf/t 345

Miscellaneous _____

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
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Proximate Analyses (%)

Moisture	.93	N/A	N/A
Volatile Matter	14.08	14.21	29.09
Fixed Carbon	32.32	34.64	70.91
Ash	50.67	51.15	N/A

Ultimate Analyses (%)

Hydrogen	2.87	2.80	5.73
Carbon	42.37	42.77	87.56
Nitrogen	.78	.79	1.61
Sulfur	.34	.35	.71
Oxygen	2.96	2.15	4.41
Ash	50.67	51.15	N/A

Heating value
(BTU/lb)

7281	7349	15044
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Sulfur Forms (%)

Sulfate	not run
Pyritic	not run
Organic	not run

Ash

Initial deformation (°F)	not run
Softening temperature (°F)	not run
Fluid temperature (°F)	not run

Free Swelling Index	not run
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Fixed Carbon	
DMMF	77.6

Heating Value	
BTU/lb MMMF	16110.2

Apparent Rank	carb. shale
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Date of Analysis:	3-11-82
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Laboratory:	U.S. Dept. of Energy
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Lab No.	L11973
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Comments:	
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GAS ANALYSES (see CGS No. 179)

	<u>With air</u>	<u>Air free</u>
<u>(MSI percent)</u>		
Propane	.000	
Isobutane	.000	
n-Butane	.000	
Carbon dioxide	.36	
Nitrogen (+ air)	5.90	
Methane	93.68	
Ethane	.02	
Pentanes	.000	

Calculated gross heating value (BTU/cf, air free) 948.4

Company: A.P.G.A. Sampler: C. M. Tremain
 Date sample taken: 8-1-80 Date sample analyzed: ?
 Laboratory: U.S.G.S. Lab No.: CGS 179

Carbon Isotope Ratio (relative to Chicago standard)

C13 (ppm) -44.50

Comments _____
 Laboratory U.S.G.S. Lab No.: CGS 179
 Contact Dudley Rice Analysis date: ?

ADSORPTION ISOTHERM DATA - not run

PETROGRAPHIC ANALYSES - not run

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 180

LOCATION

County: Las Animas
Location: Sec 32 Twp 33S Rge 66W

Surface Elev (ft) 6750
Coordinates 1614'FWL,862'FNL

GENERAL

CGS Sample No. 180
Sampled By D. Boreck
Operator APGA, Inc.
Hole No. City of Trinidad #3

Date 7/23/80
Sample Type Core

DRILLING DATA

Drilling Co. Ormsbee Drilling Co. Address Lafayette, Colorado
Core Size 3" Barrel Length 20'
Type of core retrieval conventional
Drilling media mud Air Temperature 68°F
TD Hole 1449' Logs Resistivity, Gamma, L.S. Density, Caliper

GEOLOGY

Geologic Unit Vermejo Formation Age Upper Cretaceous
Coal zone/bed uncorrelated Bed Thickness 1'
Depth to top of coal 1108' (Driller) 1113.5' (Log)
Depth to bottom of coal 1109' (Driller) 1114.5' (Log)
Cored interval 1102.5-1122' (Driller)
Roof description black carbonaceous shale with vitrain stringers
Coal description black, highly fractured, CaCO3 in cleats
Floor description gray, sandy mudstone, poorly sorted, flat bedding, CaCO3 along fractures and bedding planes

DESORPTION DATA

Sampled interval (ft) 1108-1109 (Driller) 1113.5-1114.5' (Log)
Condition of sample highly fractured, foaming
Sampled Weight (g) 1724
Lost gas time (min) 25 Lost gas cc 4200
Desorbed gas cc 17226 Residual gas cc/g .5
Total gas content cc/g 12.93 Total gas content cf/t 414

Miscellaneous _____

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
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Proximate Analyses (%)

Moisture	.73	N/A	N/A
Volatile Matter	17.36	17.49	23.02
Fixed Carbon	58.05	58.48	76.98
Ash	23.86	24.03	N/A

Ultimate Analyses (%)

Hydrogen	3.91	3.86	5.08
Carbon	66.63	67.12	88.35
Nitrogen	1.01	1.02	1.34
Sulfur	.44	.44	.58
Oxygen	4.15	3.52	4.64
Ash	23.86	24.03	N/A

Heating value
(BTU/lb)

11610	11695	15395
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Sulfur Forms (%)

Sulfate	not run
Pyritic	not run
Organic	not run

Ash

Initial deformation (°F)	2830
Softening temperature (°F)	2910
Fluid temperature (°F)	2910

Free Swelling Index	4.0
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Fixed Carbon	
DMMF	79.15

Heating Value	
BTU/lb MMMF	15,661.74

Apparent Rank	lv bituminous
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Date of Analysis:	2-21-82
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Laboratory:	U.S. Dept. of Energy
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Lab No.	L11663
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Comments:	
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GAS ANALYSES

	<u>With air</u>	<u>Air free</u>
<u>(MSI percent)</u>		
Propane	.000	
Isobutane	.000	
n-Butane	.000	
Carbon dioxide	.40	
Nitrogen	4.51	
Methane	95.06	
Ethane	.02	
Pentanes	.000	
<u>Calculated gas gravity</u>	--	
<u>Calculated gross heating value</u>	(BTU/cf)	962.4

Company: APGA Sampler: C. M. Tremain
 Date sample taken: 8-1-80 Date sample analyzed: ?
 Laboratory: USGS Lab No.: CGS 180

Carbon Isotope Ratio (relative to Chicago standard)

C13 (ppm) -44.80

Comments

Laboratory U.S. Geol. Survey Lab No.: CGS 180
 Contact Dudley Rice Analysis date: ?

ADSORPTION ISOTHERM DATA - not run

PETROGRAPHIC ANALYSES - not run

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 181

LOCATION

County: Las Animas
Location: Sec 32 Twp 33S Rge 66W

Surface Elev (ft) 6750
Coordinates 862'FNL;1614'FWL

GENERAL

CGS Sample No. 181
Sampled By D. Boreck
Operator APGA
Hole No. City of Trinidad #3

Date 7/25/80
Sample Type core

DRILLING DATA

Drilling Co. Ormsbee Exploration Address Lafayette, Colo.
Core Size 3" Barrel Length 20'
Type of core retrieval conventional
Drilling media mud Air Temperature 86°F
TD Hole 1449' Logs Gamma Ray-Density, Resistivity

GEOLOGY

Geologic Unit Vermejo Formation Age Cretaceous
Coal zone/bed uncorrelated Bed Thickness 1'
Depth to top of coal 1157' (Driller) 1166' (Log)
Depth to bottom of coal 1158' (Driller) 1167.5' (Log)
Cored interval 1154-1160' (Driller)
Roof description blk mudstone, even bedded, massive, fossiliferous, highly fractured, CaCO3 veins
Coal description blk, hd, bright, highly fractured, predominantly bright attrital with about 25% vitrinite. Well developed cleats in all directions.
Floor description fine gr. gray ss interbedded w/mudstone, ss coarsen toward base, vertical fractures

DESORPTION DATA

Sampled interval (ft) 1157-1158' (Driller) 1166.5-1167.5' (Log)
Condition of sample --
Sampled Weight (g) 1722
Lost gas time (min) 26 Lost gas (cc) 3050
Desorbed gas (cc) 24,472 Residual gas cc/g 0.1
Total gas content cc/g 16.08 Total gas content cf/t 515

Miscellaneous _____

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
-----------------	--------------------	----------------------	------------------------------

Proximate Analyses (%)

Moisture	.57	N/A	N/A
Volatile Matter	15.59	15.68	23.38
Fixed Carbon	51.08	51.37	76.62
Ash	32.76	32.95	N/A

Ultimate Analyses (%)

Hydrogen	3.43	3.38	5.05
Carbon	59.62	59.97	89.43
Nitrogen	1.00	1.00	1.50
Sulfur	.42	.42	.63
Oxygen	2.77	2.27	3.39
Ash	32.76	32.95	N/A

Heating value
(BTU/lb)

10441	10501	15661
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Sulfur Forms (%)

Sulfate	not run
Pyritic	not run
Organic	not run

Ash

Initial deformation (°F)	2570°F
Softening temperature (°F)	2680°F
Fluid temperature (°F)	2770°F

Free Swelling Index	6.5
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Fixed Carbon	
DMMF	79.9

Heating Value	
BTU/lb MMMF	16,183

Apparent Rank	low volatile bituminous
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Date of Analysis:	5-4-82
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Laboratory:	U.S. Dept. of Energy
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Lab No.	L13719
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Comments:	
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GAS ANALYSES

	<u>With air</u>	<u>Air free</u>
<u>(MSI percent)</u>		
Hydrogen	--	
Oxygen	--	
Hydrogen sulfide	--	
Carbon dioxide	.38	
Nitrogen	2.92	
Methane	96.68	
Ethane	.02	
Other hydrocarbons	--	
<u>Calculated gas gravity</u>	--	

Calculated gross heating value (BTU/cf) 978.8

Company: _____ Sampler: Carol Tremain
 Date sample taken: 8-1-80 Date sample analyzed: 8-6-80
 Laboratory: U.S.G.S. Lab No.: CGS 181

Carbon Isotope Ratio (relative to Chicago standard)

C13 (ppm) -44.01

Comments _____

Laboratory U.S.G.S. Lab No.: CGS 181
 Contact Dudley Rice Analysis date: --

ADSORPTION ISOTHERM DATA - not run

PETROGRAPHIC ANALYSES

Company _____ Laboratory No. _____
 Date of Analysis _____ Petrographer _____
 Maceral Analyses _____
 of total seam _____

Vitrinite _____ Pseudo Vitrinite _____
 Semi Fusinite _____ Semi Macrinite _____
 Fusinite _____ Macrinite _____
 Micrinite _____ Exinite _____
 Resinite _____ % Mean Variation _____

Comments: _____

Reflectance Analyses

% of total seam _____
 Mean Max Reflectance 1 _____ + 0.02
 Variation _____
 Mean Max Refl. 2 V _____ + .02
 Variation _____
 Mean Max Refl. 2 PV _____ + 0.02
 Variation _____
 Difference RoPV-RoV _____

Comments _____

LOCATION

County: Las Animas
Location: Sec 32 Twp 33S Rge 66W

Surface Elev (ft) 6750
Coordinates 1614'FWL,862'FNL

GENERAL

CGS Sample No. 182
Sampled By D. Boreck
Operator APGA, Inc.
Hole No. City of Trinidad #3

Date 7/27/80
Sample Type Core

DRILLING DATA

Drilling Co. Ormsbee Drilling Co. Address Lafayette, Colorado
Core Size 3" Barrel Length 20'
Type of core retrieval Conventional
Drilling media Mud Air Temperature 85°F
TD Hole 1449' Logs Resistivity, Gamma, L.S. Density, Caliper

GEOLOGY

Geologic Unit Vermejo Formation Age Upper Cretaceous
Coal zone/bed unnamed Bed Thickness ?
Depth to top of zone ? (Driller) ? (Log)
Depth to bottom of zone ? (Driller) ? (Log)
Cored interval 1179-1186' (Driller)
Roof description same as sample
Sample description highly fractured black carbonaceous mudstone-shale, aa.
Floor description same

DESORPTION DATA

Sampled interval (ft) 1179-1180 (Driller) ? (Log)
Condition of sample 6", partially fractured, fizzing
Sampled Weight (g) 989
Lost gas time (min) not calculated Lost gas cc not calculated
Desorbed gas cc 1800 Residual gas cc/g 0.1
Total gas content cc/g 1.92 Total gas content cf/t 61

Miscellaneous _____

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
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Proximate Analyses (%)

Moisture	2.65	N/A	N/A
Volatile Matter	8.40	8.63	45.64
Fixed Carbon	10.01	10.29	54.36
Ash	78.94	81.08	N/A

Ultimate Analyses (%)

Hydrogen	1.59	1.33	7.02
Carbon	13.80	14.18	74.94
Nitrogen	.30	.31	1.65
Sulfur	.18	.18	.97
Oxygen	5.19	2.91	15.40
Ash	78.94	81.08	N/A

Heating value
(TU/lb)

1873	1924	10171
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Sulfur Forms (%)

Sulfate	not run
Pyritic	not run
Organic	not run

Ash

Initial deformation (°F)	not run
Softening temperature (°F)	not run
Fluid temperature (°F)	not run

Free Swelling Index	not run
---------------------	---------

Fixed Carbon	
DMMF	83.22

Heating Value	
BTU/lb MMMF	12,727

Apparent Rank	carbonaceous shale
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Date of Analysis: 2-21-82

Laboratory: U.S. Dept. of Energy

Lab No. L11686

Comments: _____

GAS ANALYSES - not run

ADSORPTION ISOTHERM DATA - not run

PETROGRAPHIC ANALYSES - not run

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 183

LOCATION

County: Las Animas
Location: Sec 32 Twp 33S Rge 66W

Surface Elev (ft) 6771
Coordinates 1100'FWL,946'FNL

GENERAL

CGS Sample No. 183
Sampled By C. Tremain
Operator APGA, Inc.
Hole No. City of Trinidad #1

Date 9-23-80
Sample Type slotting sample

DRILLING DATA

Drilling Co. Pride Oil Well Serv. Co. Address Brighton, Colo.
Core Size --- Barrel Length ---
Type of core retrieval chips from mud
Drilling media water Air Temperature 80°
TD Hole 1606 Logs Gamma, L.S. Density, B.R. Density, Caliper,
Temperature, SP-Resistivity

GEOLOGY

Geologic Unit Vermejo Formation Age Upper Cretaceous
Coal zone/bed uncorrelated Bed Thickness 4.5'
Depth to top of coal 1360' (Driller) 1356.5' (Log)
Depth to bottom of coal 1363' (Driller) 1360' (Log)
Cored interval --- (Driller)
Roof description Sandstone
Coal description black, small pieces from slotting
Floor description siltstone or silty shale

DESORPTION DATA

Sampled interval (ft) 1360-1363 (Driller) 1356.5-1360 (Log)
Condition of sample small pieces
Sampled Weight (g) 721
Lost gas time (min) not calculated Lost gas cc not calculated
Desorbed gas cc 8874 Residual gas cc/g .4
Total gas content cc/g 12.71 Total gas content cf/t 407

Miscellaneous _____

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
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Proximate Analyses (%)

Moisture	.39	N/A	N/A
Volatile Matter	18.87	18.94	22.36
Fixed Carbon	65.52	65.78	77.64
Ash	15.22	15.28	N/A

Ultimate Analyses (%)

Hydrogen	4.40	4.37	5.16
Carbon	75.76	76.06	69.79
Nitrogen	1.25	1.25	1.48
Sulfur	.57	.57	.67
Oxygen	2.80	2.46	2.90
Ash	15.22	15.28	N/A

Heating value
(BTU/lb)

13244	13296	15695
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Sulfur Forms (%)

Sulfate	not run
Pyritic	not run
Organic	not run

Ash

Initial deformation (°F)	2740
Softening temperature (°F)	2860
Fluid temperature (°F)	2910

Free Swelling Index	8.5
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Fixed Carbon	
DMMF	78.97

Heating Value	
BTU/lb MMTF	15,874

Apparent Rank	lv bituminous
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Date of Analysis:	8-21-82
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Laboratory:	U.S. Dept. of Energy
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Lab No.	L11694
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Comments:	
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GAS ANALYSES

	<u>With air</u>	<u>Air free</u>
(MSI percent)		
Propane	0.01	
Isobutane	--	
n Butane	--	
Carbon dioxide	0.12	
Nitrogen + air	2.04	
Methane	97.82	
Ethane	0.02	
Pentanes	--	
Calculated gas gravity		

Calculated gross heating value (BTU/cf) 990.6

Company: A.P.G.A. Sampler: Colorado Geol. Survey
 Date sample taken: 9-30-80 Date sample analyzed: _____
 Laboratory: U.S. Geol. Survey Lab No.: J-2 (Raton Basin)

Carbon Isotope Ratio (relative to Chicago standard)

C13 (ppm) -43.52

Comments _____

Laboratory U.S. Geol. Survey Lab No.: J-2 (Raton Basin)
 Contact Dudley Rice Analysis date: ?

ADSORPTION ISOTHERM DATA - not run

PETROGRAPHIC ANALYSES

Company C.T. & E. Laboratory No. Trinidad #1

MACERAL ANALYSIS
 (Volume Percent)

(Mineral-Matter Free Basis)

<u>MACERAL</u>		<u>MACERAL GROUP</u>	
Vitrinite	79.5	Vitrinite	81.2
Pseudovitrinite	1.8		
Exinite	0.0	Exinite	0.0
Resinite	0.0	(Liptinite)	
Semi-Fusinite	12.6		
Semi-Macrinite	0.4		
Fusinite	3.1	Inertinite	18.7
Macrinite	0.3		
Micrinite	2.3		
TOTAL:	100		100%

Based on 1000 point counts

REFLECTANCE ANALYSIS

Mean-MNaximum Vitrinite Ro- 1.39

V-Type Table for Vitrinites (=100%)

<u>V-12</u>	<u>V-13</u>	<u>V-14</u>	<u>V-</u>
1	56	43	

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 184

LOCATION

County: Rio Blanco
Location: Sec 23 Twp 1S Rge 100W

Surface Elev (ft) 8023
Coordinates 662'FNL, 2594'FEL

GENERAL

CGS Sample No. 184
Sampled By ?
Operator Phillips Petroleum
Hole No. Hole P-2

Date 7/29/80
Sample Type Core

DRILLING DATA

Drilling Co. Connors Address Denver, Colo.
Core Size 2 3/8" Barrel Length 10'
Type of core retrieval wireline
Drilling media foam Air Temperature _____
TD Hole 1564' Logs _____

GEOLOGY

Geologic Unit Green River Formation Age Eocene
Zone/bed Parachute Creek Member Bed Thickness ?
Depth to top ? (Driller) ? (Log)
Depth to bottom ? (Driller) ? (Log)
Cored interval 792.3-802.1' (Driller)
Roof description brn oil shale w/even to contorted bedding, calcite stringers
Sample description oil shale, collapse breccia, tuffaceous, granular
Floor description oil shale, marlstone, buff-lt brown, massive, porous & fractures

DESORPTION DATA

Sampled interval (ft) 795.3-795.95 (Driller) ? (Log)
Condition of sample Good
Sampled Weight (g) 1044
Lost gas time (min) 105 Lost gas cc 100
Desorbed gas cc 78 Residual gas cc/g 0.0
Total gas content cc/g .17 Total gas content cf/t 5

Miscellaneous _____

COAL ANALYSES - not run - oil shaleGAS ANALYSES - not runADSORPTION ISOTHERM DATA - not runPETROGRAPHIC ANALYSES - not runOIL SHALE ASSAY

<u>SAMPLE NO.</u>	<u>DEPTH</u>	<u>OIL GAL/TON</u>	<u>OIL WT.%</u>	<u>WATER GAL/TON</u>	<u>WATER WT.%</u>	<u>OIL GRAV.</u>	<u>SHALE WT.%</u>	<u>GAS PLUS LOSS WT.%</u>	<u>TENDENCY TO COKE</u>
1515	795.3- 96.0	41.5	16.5	8.1	3.4	0.952	76.1	4.0	NIL (NONE)

Date of Analysis: 6-16-81Analysts: BL, MJ, EC, GLLaboratory: Core Labs, Inc.Comments: ASTM D 3940-80 PROCEDURE

LOCATION

County: Rio Blanco
Location: Sec 23 Twp 1S Rge 100W

Surface Elev (ft) 8023
Coordinates 662'FNL;2594'FEL

GENERAL

CGS Sample No. 185
Sampled By ?
Operator Phillips Petroleum
Hole No. P-2

Date 8/9/80
Sample Type Core

DRILLING DATA

Drilling Co. Connors Drilling Co. Address Denver, Colo.
Core Size 2 3/8" Barrel Length 10'
Type of core retrieval wireline
Drilling media foam Air Temperature ?
TD Hole 1564' Logs ?

GEOLOGY

Geologic Unit Green River Formation Age Eocene
Coal zone/bed Parchute Creek Member Bed Thickness ?
Depth to top ? (Driller) ? (Log)
Depth to bottom ? (Driller) ? (Log)
Cored interval 1180.5-1190.6' (Driller)
Roof description oil shale
Sample description interbed tuff, bubbling with gas
Floor description oil shale & marlstone, calcite filled fractures

DESORPTION DATA

Sampled interval (ft) 1189.7-1190.1 (Driller) ? (Log)
Condition of sample good
Sampled Weight (g) 1144
Lost gas time (min) 100 Lost gas cc 500
Desorbed gas cc 126 Residual gas cc/g 0.1
Total gas content cc/g .65 Total gas content cf/t 21

Miscellaneous _____

COAL ANALYSES - not run - oil shaleGAS ANALYSES

	<u>With air</u>	<u>Air free</u>
(MSI percent)		
Hydrogen		
Oxygen		
Hydrogen sulfide		
Carbon dioxide	0.08	
Nitrogen or air	99.92	
Methane	--	
Ethane	--	
Other hydrocarbons	--	
<u>Calculated gas gravity</u>		

Calculated gross heating value (BTU/cf, air free) _____

Company: Berge Exploration Sampler: ?
 Date sample taken: ? Date sample analyzed: ?
 Laboratory: U.S.G.S. Denver Lab No.: P-2 #2

Carbon Isotope Ratio (relative to Chicago standard)

C13 (ppm) --
 Comments _____
 Laboratory U.S.G.S. Denver Lab No.: P-2 #2
 Contact Dudley Rice Analysis date: ?

ADSORPTION ISOTHERM DATA - not runPETROGRAPHIC ANALYSES - not runOIL SHALE ASSAY

SAMPLE NO.	DEPTH	OIL		WATER		OIL GRAV.	SHALE WT. %	GAS PLUS LOSS WT. %	TENDENCY TO COKE
		GAL/TON	OIL WT. %	GAL/TON	WT. %				
1516	1180.5- 90.6	3.4	1.4	4.5	1.9	0.956	92.8	3.9	NIL (NONE)

Date of Analysis: 6-16-81 Analysts: BL, MJ, EC, GL
 Laboratory: Core Labs, Inc.
 Comments: ASTM D 3940-80 PROCEDURE

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 186

LOCATION

County: Garfield
Location: Sec 13 Twp 6S Rge 94W

Surface Elev (ft) 5307
Coordinates 1800'FNL,700'FEL

GENERAL

CGS Sample No. 186
Sampled By Craig Martinez
Operator Northwest Exploration
Hole No. Clough #13

Date 9-14-80
Sample Type Core

DRILLING DATA

Drilling Co. Loffland Address ?
Core Size 2 7/8" Barrel Length 60'
Type of core retrieval split barrel conventional
Drilling media mud Air Temperature 50°
TD Hole 7700' Logs Dual Induction-SFL, Compensated Neutron-Formation
Density, Gamma, Caliper

GEOLOGY

Geologic Unit Mesaverde Group Age Upper Cretaceous
Coal zone/bed uncorrelated Bed Thickness 1'
Depth to top of coal 7445' (Driller) ? (Log)
Depth to bottom of coal 7446' (Driller) ? (Log)
Cored interval 7442-7488' (Driller)
Roof description carbonaceous shale, abundant coal veinlets, coal partings
Coal description shaley to dull coal with fine bright stringers

Floor description carbonaceous shale, occassional coal partings

DESORPTION DATA

Sampled interval (ft) 7445-7446 (Driller) ? (Log)
Condition of sample one piece
Sampled Weight (g) 341
Lost gas time (min) 172 Lost gas cc 250
Desorbed gas cc 1140 Residual gas cc/g 0.2
Total gas content cc/g 4.28 Total gas content cf/t 137

Miscellaneous _____

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
<u>Proximate Analyses (%)</u>			
Moisture	.92	N/A	N/A
Volatile Matter	10.19	10.29	29.98
Fixed Carbon	23.81	24.03	70.02
Ash	65.08	65.68	N/A
<u>Ultimate Analyses (%)</u>			
Hydrogen	2.03	1.95	5.67
Carbon	27.87	28.13	81.97
Nitrogen	.71	.71	2.08
Sulfur	.73	.74	2.15
Oxygen	3.58	2.79	8.13
Ash	65.08	65.68	N/A
<u>Heating value</u> (BTU/lb)	47.29	4773	13908
<u>Sulfur Forms (%)</u>			
Sulfate	not run		
Pyritic	not run		
Organic	not run		
<u>Ash</u>			
Initial deformation (°F)	2770		
Softening temperature (°F)	2850		
Fluid temperature (°F)	2910		
<u>Free Swelling Index</u>	1.0		
<u>Fixed Carbon</u>			
DMMF	83.48		
<u>Heating Value</u>			
BTU/lb MMMF	16,008.75		
<u>Apparent Rank</u>	carbonaceous shale		
Date of Analysis:	2-21-82		
Laboratory:	U.S. Dept. of Energy		Lab No. L11687
Comments:			

GAS ANALYSES - not runADSORPTION ISOTHERM DATA - not runPETROGRAPHIC ANALYSES - not run

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 187

LOCATION

County: Garfield
Location: Sec 13 Twp 6S Rge 94W

Surface Elev (ft) 5307
Coordinates 1800'FNL;700'FEL

GENERAL

CGS Sample No. 187
Sampled By Craig Martinez
Operator Northwest Exploration
Hole No. Clough #13

Date 9/14/80
Sample Type core

DRILLING DATA

Drilling Co. Loffland Address ?
Core Size 2 7/8" Barrel Length 60'
Type of core retrieval split barrel conventional
Drilling media mud Air Temperature 50°
TD Hole 7700' Logs Dual Induction SFL; Compensated Neutron-Formation
Density; Gamma; Caliper

GEOLOGY

Geologic Unit Mesaverde Group Age Upper Cretaceous
Coal zone/bed uncorrelated Bed Thickness 1'
Depth to top of coal 7476.5' (Driller) ? (Log)
Depth to bottom of coal 7477.5' (Driller) ? (Log)
Cored interval 7442-7488' (Driller)
Roof description black carb. sh., slightly silicious
Coal description shale with coal, black, vitreous, lustrous
Floor description black carb. sh., v. slightly silicious, occ. coal partings

DESORPTION DATA

Sampled interval (ft) 7476.5-7477.5 (Driller) ? (Log)
Condition of sample ?
Sampled Weight (g) 1199
Lost gas time (min) not calculated Lost gas cc not calculated
Desorbed gas cc 1814 Residual gas cc/g 0.3
Total gas content cc/g 1.81 Total gas content cf/t 58

Miscellaneous _____

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
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Proximate Analyses (%)

Moisture	.96	N/A	N/A
Volatile Matter	5.90	5.95	45.56
Fixed Carbon	7.04	7.12	54.44
Ash	86.10	86.93	N/A

Ultimate Analyses (%)

Hydrogen	1.08	.98	7.49
Carbon	9.12	9.21	70.45
Nitrogen	.29	.29	2.23
Sulfur	.12	.12	.90
Oxygen	3.30	2.47	18.92
Ash	86.10	86.93	N/A

Heating value
(BTU/lb)

1390	1403	10738
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Sulfur Forms (%)

Sulfate	not run
Pyritic	not run
Organic	not run

Ash

Initial deformation (°F)	2770
Softening temperature (°F)	2860
Fluid temperature (°F)	2910

Free Swelling Index	0.0
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Fixed Carbon	
--------------	--

DMMF	--
------	----

Heating Value	
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BTU/lb MMMF	--
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Apparent Rank	carb. shale
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Date of Analysis:	5-4-82
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Laboratory:	U.S. Dept. of Energy
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Lab No.	L13693
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Comments:	
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GAS ANALYSES

	<u>With air</u>	<u>Air free</u>
<u>(MSI percent)</u>		
propane	0.12	
isobutane	0.4	
n-Butane	0.04	
Carbon dioxide	3.17	
Nitrogen + air	65.7	
Methane	28.8	
Ethane	2.0	
Isopentane	0.05	
<u>Calculated gas gravity</u>	--	

Calculated gross heating value (BTU/cf, air free) 346.97

Company: Northwest Exploration Sampler: C. M. Tremain
 Date sample taken: 9-17-80 Date sample analyzed: ?
 Laboratory: U.S.G.S. Denver Lab No.: Cyl. 309 (Piceance Basin)

Carbon Isotope Ratio (relative to Chicago standard)

C13 (ppm) -39.21

Comments

Laboratory U.S.G.S. Denver Lab No.: Cyl. 309 (Piceance Basin)
 Contact Dudley Rice Analysis date: ?

ADSORPTION ISOTHERM DATA - not run

PETROGRAPHIC ANALYSES - not run

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 188

LOCATION

County: Garfield
Location: Sec 10 Twp 7S Rge 104W

Surface Elev (ft) 5800
Coordinates NE NE, 420'FEL;
2625'FNL

GENERAL

CGS Sample No. 188
Sampled By Bruce Kelso, Rich Babcock
Operator USGS
Hole No. Carbonera 80-1-C

Date 10/15/80
Sample Type Core

DRILLING DATA

Drilling Co. USGS, Coal Branch Address Denver, Colo.
Core Size 3" Barrel Length 15'
Type of core retrieval split barrel
Drilling media Water Air Temperature 45°F
TD Hole 945' Logs Gamma Ray; Density; Resistivity; Caliper

GEOLOGY

Geologic Unit Mesaverde Group Age Upper Cretaceous
Coal zone/bed Cameo Bed Thickness 2.5' (core) 2' (log)
Depth to top of coal 292' (Driller) 293' (Log)
Depth to bottom of coal 294.5' (Driller) 295' (Log)
Cored interval 15.8 - 842.2' (Driller)
Roof description shale, silty, gray/black, highly carbonaceous
Coal description black, resin, gypsum, pyrite, vitrain lenses with attrital, 120° cleat angle, uppermost .2 ft shaly & impure
Floor description shale, gray/black and brown/black, abundant vitrain lenses

DESORPTION DATA

Sampled interval (ft) 292-293 (Driller) 293-294' (Log)
Condition of sample excellent
Sampled Weight (g) 1423
Lost gas time (min) 21.5 Lost gas cc 45
Desorbed gas cc 36 Residual gas cc/g 0.1
Total gas content cc/g .16 Total gas content cf/t 5

Miscellaneous Reference: USGS Open File 82-827, "Carbonera Coal Geophysical Logging Research Hole, Core Descriptions and Coal Analysis" by R. G. Hobbs, J. L. Gualtieri, and R. N. Babcock.

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
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Proximate Analyses (%)

Moisture	5.11	N/A	N/A
Volatile Matter	37.57	39.59	42.23
Fixed Carbon	51.39	54.16	57.77
Ash	5.93	6.25	N/A

Ultimate Analyses (%)

Hydrogen	5.12	4.80	5.12
Carbon	70.01	73.78	78.69
Nitrogen	1.64	1.73	1.84
Sulfur	.55	.58	.61
Oxygen	16.76	12.87	13.73
Ash	5.93	6.25	N/A

Heating value
(BTU/lb)

12267	12927	13789
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Sulfur Forms (%)

Sulfate	not run
Pyritic	not run
Organic	not run

Ash

Initial deformation (°F)	2830
Softening temperature (°F)	2910
Fluid temperature (°F)	2910

Free Swelling Index	0.0
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Fixed Carbon	
DMMF	58.18

Heating Value	
BTU/lb MMMF	13,119

Apparent Rank	HvB bituminous
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Date of Analysis: 2-21-82

Laboratory: U.S. Dept. of Energy

Lab No. L11688

Comments: _____

GAS ANALYSES - not run

ADSORPTION ISOTHERM DATA - not run

PETROGRAPHIC ANALYSES - not run

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 189

LOCATION

County: Garfield
Location: Sec 10 Twp 7S Rge 104W

Surface Elev (ft) 5800
Coordinates NE NE, 420'FEL,
2625'FNL

GENERAL

CGS Sample No. 189
Sampled By Bruce Kelso, Rich Babcock
Operator USGS
Hole No. Carbonera 80-1-C

Date 10/15/80
Sample Type Core

DRILLING DATA

Drilling Co. USGS, Coal Branch Address Denver, CO
Core Size 3" Barrel Length 15'
Type of core retrieval Split Barrel
Drilling media water Air Temperature 40°F
TD Hole 945' Logs Gamma Ray; Density; Resistivity; Caliper

GEOLOGY

Geologic Unit Mesaverde Group Age Upper Cretaceous
Coal zone/bed Cameo Bed Thickness 2.5' (core) 2' (log)
Depth to top of coal 292' (Driller) 293' (Log)
Depth to bottom of coal 294.5' (Driller) 295' (Log)
Cored interval 15.8 - 842.2' (Driller)
Roof description shale, silty, highly carbonaceous
Coal description black, pyrite, gypsum, resin, 2 cleat directions at 120°, vitrain lenses in attrital coal, uppermost .2' shaly & impure
Floor description shale, gray/black & brown/black, vitrain lenses

DESORPTION DATA

Sampled interval (ft) 293.5-294.5' (Driller) -- (Log)
Condition of sample excellent
Sampled Weight (g) 1814
Lost gas time (min) 27.5 Lost gas cc 100
Desorbed gas cc 49 Residual gas cc/g 0.0
Total gas content cc/g .08 Total gas content cf/t 3

Miscellaneous Reference: USGS Open File Report 82-827, "Carbonera Coal Geophysical Logging Research Hole, Core Descriptions and Coal Analysis" by R. G. Hobbs, J. L. Gualtieri, and R. N. Babcock.

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
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Proximate Analyses (%)

Moisture	4.05	N/A	N/A
Volatile Matter	36.58	38.12	44.24
Fixed Carbon	46.10	48.05	55.76
Ash	13.27	13.83	N/A

Ultimate Analyses (%)

Hydrogen	4.93	4.67	5.42
Carbon	64.35	67.06	77.83
Nitrogen	1.48	1.55	1.79
Sulfur	.56	.59	.68
Oxygen	15.40	12.30	14.28
Ash	13.27	13.83	N/A

Heating value
(BTU/lb)

11372	11851	13753
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Sulfur Forms (%)

Sulfate	not run
Pyritic	not run
Organic	not run

Ash

Initial deformation (°F)	2910
Softening temperature (°F)	2910
Fluid temperature (°F)	2910

Free Swelling Index 0.0

Fixed Carbon
DMMF 56.59

Heating Value
BTU/lb MMMF 13289

Apparent Rank HvB bituminous

Date of Analysis: 2-21-82

Laboratory: U.S. Dept. of Energy

Lab No. L11689

Comments:

GAS ANALYSES - not run

ADSORPTION ISOTHERM DATA - not run

PETROGRAPHIC ANALYSES - not run

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 190

LOCATION

County: Garfield
Location: Sec 10 Twp 7S Rge 104W

Surface Elev (ft) 5800
Coordinates NE NE, 420'FEL,
2625'FNL

GENERAL

CGS Sample No. 190
Sampled By B. Kelso and R. Babcock
Operator USGS
Hole No. Carbonera 80-1-C

Date 10/15/80
Sample Type Core

DRILLING DATA

Drilling Co. USGS, Coal Branch Address Denver, CO
Core Size 3" Barrel Length 15'
Type of core retrieval split barrel
Drilling media water Air Temperature 40°
TD Hole 945' Logs Gamma Ray; Density; Resistivity; Caliper

GEOLOGY

Geologic Unit Mesaverde Group Age Upper Cretaceous
Coal zone/bed Cameo Bed Thickness 3.4'? (core) 4.6' (log)
Depth to top of coal (Driller) 299.9' (Log)
Depth to bottom of coal (Driller) 304.5' (Log)
Cored interval 15.8 - 842.2' (Driller)
Roof description shale and siltstone intermixed
Coal description black, calcite & resin, one good cleat direction,
vitrain lenses and attrital
Floor description gray/black shale, highly carbonaceous

DESORPTION DATA

Sampled interval (ft) 298.0-299.2' (Driller) 299.9-301.1' (Log)
Condition of sample excellent
Sampled Weight (g) 1976
Lost gas time (min) 36.5 Lost gas cc 110
Desorbed gas cc 20 Residual gas cc/g 0.0
Total gas content cc/g .07 Total gas content cf/t 2

Miscellaneous Reference: USGS Open File Report 82-827, "Carbonera Coal
Geophysical Logging Research Hole, Core Descriptions and Coal Analysis" by
R. G. Hobbs, J. L. Guattieri, and R. N. Babcock.

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
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Proximate Analyses (%)

Moisture	3.82	N/A	N/A
Volatile Matter	31.66	32.92	43.28
Fixed Carbon	41.49	43.14	56.72
Ash	23.02	23.94	N/A

Ultimate Analyses (%)

Hydrogen	4.40	4.14	5.44
Carbon	56.88	59.15	77.77
Nitrogen	1.26	1.31	1.73
Sulfur	.43	.45	.59
Oxygen	13.99	11.01	14.48
Ash	23.03	23.94	N/A

Heating value
(BTU/lb)

9938	10333	13586
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Sulfur Forms (%)

Sulfate	not run
Pyritic	not run
Organic	not run

Ash

Initial deformation (°F)	2910
Softening temperature (°F)	2910
Fluid temperature (°F)	2910

Free Swelling Index	0.0
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Fixed Carbon	
DMMF	58.29

Heating Value	
BTU/lb MMMF	13,241

Apparent Rank	HvB bituminous
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Date of Analysis:	2-21-82
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Laboratory:	U.S. Dept. of Energy
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Lab No.	L11690
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Comments:	
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GAS ANALYSES - not runADSORPTION ISOTHERM DATA - not runPETROGRAPHIC ANALYSES - not run

LOCATION

County: Garfield
Location: Sec 10 Twp 7S Rge 104W

Surface Elev (ft) 5800
Coordinates NE NE, 420' FEL,
2625' FNL

GENERAL

CGS Sample No. 191
Sampled By B. Kelso, R. Babcock
Operator USGS
Hole No. Carbonera 80-1-C

Date 10/15/80
Sample Type Core

DRILLING DATA

Drilling Co. USGS, Coal Branch Address Denver, CO
Core Size 3" Barrel Length 15'
Type of core retrieval split barrel
Drilling media water Air Temperature 40°F
TD Hole 945' Logs Gamma Ray; Density; Resistivity; Caliper

GEOLOGY

Geologic Unit Mesaverde Group Age Upper Cretaceous
Coal zone/bed Cameo Bed Thickness 6.8' (core) 5.2' (log)
Depth to top of coal 303.9' (Driller) 305.5' (Log)
Depth to bottom of coal 310.7' (Driller) 310.7' (Log)
Cored interval 15.8-842.2' (Driller)
Roof description gray/black shale, highly carbonaceous
Coal description black, some resin, 2 cleat directions, gypsum & pyrite in cleats, bright
Floor description siltstone, brown/black, highly carbonaceous

DESORPTION DATA

Sampled interval (ft) 305.1-306.1 (Driller) -- (Log)
Condition of sample large pieces
Sampled Weight (g) 1769
Lost gas time (min) 24.5 Lost gas cc can't calculate
Desorbed gas cc 0 Residual gas cc/g 0
Total gas content cc/g 0 Total gas content cf/t 0

Miscellaneous Reference: USGS Open File Report 82-827, "Carbonera Coal Geophysical Logging Research Hole, Core Descriptions and Coal Analysis" by R. G. Hobbs, J. L. Gualtieri, and R. N. Babcock.

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
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Proximate Analyses (%)

Moisture	3.62	N/A	N/A
Volatile Matter	38.29	39.73	44.60
Fixed Carbon	47.55	49.33	55.40
Ash	10.54	10.94	N/A

Ultimate Analyses (%)

Hydrogen	5.15	4.93	5.53
Carbon	67.33	69.86	78.43
Nitrogen	1.60	1.66	1.86
Sulfur	.47	.48	.54
Oxygen	14.92	12.14	13.63
Ash	10.54	10.94	N/A

Heating value
(BTU/lb)

11907	12355	13871
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Sulfur Forms (%)

Sulfate	not run
Pyritic	not run
Organic	not run

Ash

Initial deformation (°F)	2910
Softening temperature (°F)	2910
Fluid temperature (°F)	2910

Free Swelling Index	0.0
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Fixed Carbon	
DMMF	56.03

Heating Value	
BTU/lb MMMF	13,449

Apparent Rank	HvB bituminous
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Date of Analysis:	2-21-82
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Laboratory:	U.S. Dept. of Energy
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Lab No.	L11691
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Comments:	
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GAS ANALYSES - not runADSORPTION ISOTHERM DATA - not runPETROGRAPIC ANALYSES - not run

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 192

LOCATION

County: Garfield
Location: Sec 10 Twp 7S Rge 104W

Surface Elev (ft) 5800
Coordinates NE NE, 420' FEL,
2625' FNL

GENERAL

CGS Sample No. 192
Sampled By B. Kelso, R. Babcock
Operator USGS
Hole No. Carbonera 80-1-C

Date 10/15/80
Sample Type Core

DRILLING DATA

Drilling Co. USGS, Coal Branch Address Denver, CO
Core Size 3" Barrel Length 15'
Type of core retrieval Split Barrel
Drilling media water Air Temperature 40°F
TD Hole 945' Logs Gamma Ray; Density; Resistivity; Caliper

GEOLOGY

Geologic Unit Mesaverde Group Age Upper Cretaceous
Coal zone/bed Cameo Bed Thickness 6.8' (core) 5.2' (log)
Depth to top of coal 303.9' (Driller) 305.5' (Log)
Depth to bottom of coal 310.7' (Driller) 310.7' (Log)
Cored interval 15.8 - 842.2' (Driller)
Roof description gray/black shale, highly carbonaceous
Coal description black, gypsum, resin, good cleat direction
Floor description brown/black siltstone, highly carbonaceous, gradational contact with underlying unit

DESORPTION DATA

Sampled interval (ft) 307.5-308.5 (Driller) -- (Log)
Condition of sample two large pieces
Sampled Weight (g) 1872
Lost gas time (min) 30.5 Lost gas cc 5.52
Desorbed gas cc 20 Residual gas cc/g 0
Total gas content cc/g .02 Total gas content cf/t 1

Miscellaneous Reference: USGS Open File Report 82-827, "Carbonera Coal Geophysical Logging Research Hole, Core Descriptions and Coal Analysis" by R. G. Hobbs, J. L. Gualtieri, and R. N. Babcock.

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
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Proximate Analyses (%)

Moisture	2.96	N/A	N/A
Volatile Matter	28.10	28.96	42.76
Fixed Carbon	37.63	38.77	57.24
Ash	31.31	32.27	N/A

Ultimate Analyses (%)

Hydrogen	3.98	3.76	5.55
Carbon	51.27	52.84	78.01
Nitrogen	1.26	1.30	1.92
Sulfur	.48	.49	.73
Oxygen	11.70	9.34	13.79
Ash	31.31	32.27	N/A

Heating value
(BTU/lb)

8983	9258	13668
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Sulfur Forms (%)

Sulfate	not run
Pyritic	not run
Organic	not run

Ash

Initial deformation (°F)	2910
Softening temperature (°F)	2910
Fluid temperature (°F)	2910

Free Swelling Index	0.0
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Fixed Carbon	
DMMF	59.65

Heating Value	
BTU/lb MMMF	13590

Apparent Rank	HvB bituminous
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Date of Analysis:	2-21-82
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Laboratory:	U.S. Dept. of Energy
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Lab No.	L11692
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Comments:	
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GAS ANALYSES - not runADSORPTION ISOTHERM DATA - not runPETROGRAPHIC ANALYSES - not run

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 193

LOCATION

County: Garfield
Location: Sec 10 Twp 7S Rge 104W

Surface Elev (ft) 5800
Coordinates NE NE, 420' FEL,
2625' FNL

GENERAL

CGS Sample No. 193
Sampled By B. Kelso, R. Babcock
Operator USGS
Hole No. Carbonera 80-1-C

Date 10-15-80
Sample Type Core

DRILLING DATA

Drilling Co. USGS, Coal Branch Address Denver, CO
Core Size 3" Barrel Length 15'
Type of core retrieval split barrel
Drilling media water Air Temperature 40°F
TD Hole 945' Logs Gamma Ray; Density; Resistivity; Caliper

GEOLOGY

Geologic Unit Mesaverde Group Age Upper Cretaceous
Coal zone/bed Cameo Bed Thickness 6.8' (core) 5.2' (log)
Depth to top of coal 303.1' (Driller) 305.5' (Log)
Depth to bottom of coal 310.7' (Driller) 310.7' (Log)
Cored interval 15.8 - 842.2' (Driller)
Roof description shale, gray/black, highly carbonaceous
Coal description black, some resin, one poor cleat direction
Floor description siltstone, brown/black, highly carbonaceous

DESORPTION DATA

Sampled interval (ft) 310.1-310.7 (Driller) -- (Log)
Condition of sample one large and smaller pieces
Sampled Weight (g) 1057
Lost gas time (min) 43.5 Lost gas cc 20
Desorbed gas cc 3 Residual gas cc/g 0.1
Total gas content cc/g .12 Total gas content cf/t 4

Miscellaneous Reference: USGS Open File Report 82-827, "Carbonera Coal Geophysical Logging Research Hole, Core Descriptions and Coal Analysis" by R. G. Hobbs, J. L. Gualtieri, and R. N. Babcock.

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
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Proximate Analyses (%)

Moisture	3.45	N/A	N/A
Volatile Matter	36.05	37.33	44.92
Fixed Carbon	44.20	45.79	55.08
Ash	16.30	16.88	N/A

Ultimate Analyses (%)

Hydrogen	4.84	4.62	5.55
Carbon	62.97	65.22	78.47
Nitrogen	1.48	1.53	1.85
Sulfur	.72	.75	.90
Oxygen	13.68	10.99	13.23
Ash	16.30	16.88	N/A

Heating value
(BTU/lb)

11149	11548	13893
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Sulfur Forms (%)

Sulfate	not run
Pyritic	not run
Organic	not run

Ash

Initial deformation (°F)	2910
Softening temperature (°F)	2910
Fluid temperature (°F)	2910

Free Swelling Index	0.0
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Fixed Carbon	
DMMF	56.13

Heating Value	
BTU/lb MMTF	13,552

Apparent Rank	HvB bituminous
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Date of Analysis:	<u>2-21-82</u>	Lab No.	<u>L11693</u>
Laboratory:	<u>U.S. Dept. of Energy</u>		
Comments:	<u></u>		

GAS ANALYSES - not runADSORPTION ISOTHERM DATA - not runPETROGRAPHIC ANALYSES - not run

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 194

LOCATION

County: Rio Blanco
Location: Sec 31 Twp 2S Rge 99W

Surface Elev (ft) 7901
Coordinates 147 FSL 1931 FEL

GENERAL

CGS Sample No. 194
Sampled By D. Marion
Operator Phillips Petroleum
Hole No. P-10

Date 11/8/80
Sample Type Core

DRILLING DATA

Drilling Co. Connors Drilling Inc. Address Denver, Colo.
Core Size 2 3/8" Barrel Length 10'
Type of core retrieval wireline
Drilling media foam Air Temperature 50°F
TD Hole 1605' Logs ?

GEOLOGY

Geologic Unit Green River Formation Age Eocene
Zone/bed Parachute Creek Member Bed Thickness ?
Depth to top ? (Driller) ? (Log)
Depth to bottom ? (Driller) ? (Log)
Cored interval 1146.1-1156.1' (Driller)
Roof description oil shale
Sample description interbed tuff, light gray/brown, medium grain, gas bubbles
Floor description oil shale

DESORPTION DATA

Sampled interval (ft) 1147.8-1148.4 (Driller) ? (Log)
Condition of sample good
Sampled Weight (g) 1519
Lost gas time (min) 60 Lost gas cc 220
Desorbed gas cc 365 Residual gas cc/g 0.3
Total gas content cc/g .69 Total gas content cf/t 22

Miscellaneous _____

COAL ANALYSES - not run - oil shaleGAS ANALYSES - not runADSORPTION ISOTHERM DATA - not runPETROGRAPHIC ANALYSES - not runOIL SHALE ASSAY

<u>SAMPLE NO.</u>	<u>DEPTH</u>	<u>OIL GAL/TON</u>	<u>OIL WT.%</u>	<u>WATER GAL/TON</u>	<u>WATER WT.%</u>	<u>OIL GRAV.</u>	<u>SHALE WT.%</u>	<u>GAS PLUS LOSS WT.%</u>	<u>TENDENCY TO COKE</u>
1518	1146.1- 56.1	15.2	6.0	3.0	1.2	0.941	90.6	2.2	NIL (NONE)

Date of Analysis: 6-16-81Analysts: BL, MJ, EC, GLLaboratory: Core Labs, Inc.Comments: ASTM D 3940-80 PROCEDURE

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 195

LOCATION

County: Rio Blanco
Location: Sec 31 Twp 2S Rge 99W

Surface Elev (ft) 7901
Coordinates 147 FSL 1931 FEL

GENERAL

CGS Sample No. 195
Sampled By Doug Marion
Operator Berge Exploration
Hole No. P-10

Date 11-17-80
Sample Type Core

DRILLING DATA

Drilling Co. Connors Drilling Address Denver, Colo.
Core Size 2 3/8" Barrel Length 10'
Type of core retrieval wireline
Drilling media foam Air Temperature 50°F
TD Hole 1605' Logs ?

GEOLOGY

Geologic Unit Green River Formation Age Eocene
Zone/bed ? Bed Thickness ?
Depth to top ? (Driller) ? (Log)
Depth to bottom ? (Driller) ? (Log)
Cored interval ? (Driller)
Roof description ?
Sample description oil shale, brown/gray, stringers ls, clyst, gas bleeding from interbedded tuff
Floor description ?

DESORPTION DATA

Sampled interval (ft) 1546.7-1547.3 (Driller) ? (Log)
Condition of sample good
Sampled Weight (g) 1233
Lost gas time (min) ? Lost gas cc not calculated
Desorbed gas cc 120 Residual gas cc/g 0.3
Total gas content cc/g .40 Total gas content cf/t 13

Miscellaneous _____

COAL ANALYSES - not run - oil shaleGAS ANALYSES - not runADSORPTION ISOTHERM DATA - not runPETROGRAPHIC ANALYSES - not runOIL SHALE ASSAY

<u>SAMPLE NO.</u>	<u>DEPTH</u>	<u>OIL GAL/TON</u>	<u>OIL WT.%</u>	<u>WATER GAL/TON</u>	<u>WATER WT.%</u>	<u>OIL GRAV.</u>	<u>SHALE WT.%</u>	<u>GAS PLUS LOSS WT.%</u>	<u>TENDENCY TO COKE</u>
1519	1546.7- 47.3	17.4	6.9	7.9	3.3	0.947	87.6	2.2	NIL (NONE)

Date of Analysis: 6-16-81 Analysts: BL, MJ, EC, GL
 Laboratory: Core Labs, Inc.
 Comments: ASTM D 3940-80 PROCEDURE

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 196

LOCATION

County: Boulder
Location: Sec 21 Twp 1S Rge 70W

Surface Elev (ft) 5540
Coordinates 800'E, 600'N, C

GENERAL

CGS Sample No. 196
Sampled By N. Khalsa, D. Boreck
Operator U.S.G.S.
Hole No. Marshal #2

Date 3-18-81
Sample Type core

DRILLING DATA

Drilling Co. U.S.G.S. Address Denver, CO
Core Size 3" Barrel Length 15'
Type of core retrieval split barrel
Drilling media water Air Temperature 50°F
TD Hole 156' Logs Gamma; H.R.D. Density; Gamma-Resistance; Caliper

GEOLOGY

Geologic Unit Laramie Formation Age Upper Cretaceous
Coal zone/bed uncorrelated Bed Thickness 2.5'
Depth to top of coal 37.5' (Driller) 40' (Log)
Depth to bottom of coal 40' (Driller) 42' (Log)
Cored interval 33-48' (Driller)
Roof description high energy erosional contact w/coal; ss & mudstone
Coal description 80% bright attrital, 20% vitrain in thick bands. Highly mineralized, resin & gypsum present in thin veinlets.
Floor description coarse grained ss

DESORPTION DATA

Sampled interval (ft) 37.5-40 ? (Driller) 40-42 (Log)
Condition of sample good, fairly solid
Sampled Weight (g) 995
Lost gas time (min) 16.5 Lost gas cc 0
Desorbed gas cc 5 Residual gas cc/g 0
Total gas content cc/g .01 Total gas content cf/t 0

Miscellaneous _____

COAL ANALYSES - no good

GAS ANALYSES - not run

ADSORPTION ISOTHERM DATA - not run

PETROGRAPHIC ANALYSES - not run

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 197

LOCATION

County: Boulder
Location: Sec 21 Twp 1S Rge 70W

Surface Elev (ft) 5540
Coordinates 800'E, 600'N, C

GENERAL

CGS Sample No. 197
Sampled By N. Khalsa, D. Boreck
Operator U.S.G.S.
Hole No. Marshall #2

Date 3-18-81
Sample Type core

DRILLING DATA

Drilling Co. U.S.G.S. Address Denver, CO
Core Size 3" Barrel Length 15'
Type of core retrieval split barrel
Drilling media water Air Temperature 55°F
TD Hole 156' Logs Gamma; H.R.D. Density; Gamma Resistance; Caliper

GEOLOGY

Geologic Unit Laramie Formation Age Upper Cretaceous
Coal zone/bed Gorham or No. 3 coal Bed Thickness 9.75'
Depth to top of coal 81.4' (Driller) 81' (Log)
Depth to bottom of coal 91' (Driller) 90' (Log)
Cored interval 76.75 - 91.7' (Driller)
Roof description interbedded gray mudstone & ss
Coal description 10-80% vitrain, bright to dull attrital, gypsum, resin & calcite; flake and framboidal pyrite
Floor description gray mudstone

DESORPTION DATA

Sampled interval (ft) 81.4-84.4 (Driller) 81-84 (Log)
Condition of sample excellent - large wet pieces
Sampled Weight (g) 1288
Lost gas time (min) 12 Lost gas cc 20
Desorbed gas cc 20 Residual gas cc/g 0
Total gas content cc/g .03 Total gas content cf/t 1

Miscellaneous _____

COAL ANALYSES - no goodGAS ANALYSES - not runADSORPTION ISOTHERM DATA - not runPETROGRAPHIC ANALYSESLab. Commercial Testing & Engineering Co. Lab No. Marsh 3MACERAL ANALYSIS
(VOLUME PERCENT)

(Mineral-Matter Free Basis)

<u>MACERAL</u>		<u>MACERAL GROUP</u>	
Vitrinite	88.8	Vitrinite	88.8
Pseudovitrinite	0.0		
Exinite	0.5	Exinite	0.5
Resinite	0.0	(Liptinite)	
Semi-Fusinite	5.4		
Semi-Macrinite	0.0		
Fusinite	5.3	Inertinite	10.7
Macrinite	0.0		
Micrinite	0.0		
TOTAL:	100.0		100.0

Based on 1000 point counts.

REFLECTANCE ANALYSIS

Maximum Vitrinite Ro: 0.42

V-Type Table for Vitrinites (=100%)

<u>V-3</u>	<u>V-4</u>	<u>V-5</u>	<u>V-</u>
20.0	76.4	3.6	

Comments: Petrography for entire 9.75' Gorham Bed

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 198

LOCATION

County: Boulder
Location: Sec 21 Twp 1S Rge 70W

Surface Elev (ft) 5540
Coordinates 800'E, 600'N, C

GENERAL

CGS Sample No. 198
Sampled By N. Khalsa, D. Boreck
Operator U.S.G.S.
Hole No. Marshall #2

Date 3-18-81
Sample Type core

DRILLING DATA

Drilling Co. U.S.G.S. Address Denver, CO
Core Size 3" Barrel Length 15'
Type of core retrieval split barrel
Drilling media water Air Temperature 55°F
TD Hole 156 Logs Gamma; H.R.D. Density; Gamma-Resistance; Caliper

GEOLOGY

Geologic Unit Laramie Formation Age Upper Cretaceous
Coal zone/bed Gorham or No. 3 coal Bed Thickness 9.75
Depth to top of coal 81.4' (Driller) same (Log)
Depth to bottom of coal 91' (Driller) same (Log)
Cored interval 76.75-91.7' (Driller)
Roof description interbedded gray mudstone & ss
Coal description 10-80% vitrain, high fusain content, remaining bright to dull attrital, pyrite, gypsum, calcite & amber
Floor description gray mudstone

DESORPTION DATA

Sampled interval (ft) 88-91 (Driller) same (Log)
Condition of sample excellent large wet pieces
Sampled Weight (g) 1436
Lost gas time (min) 18 Lost gas cc 20
Desorbed gas cc 12 Residual gas cc/g 0
Total gas content cc/g .02 Total gas content cf/t 1

Miscellaneous _____

COAL ANALYSES - no goodGAS ANALYSES - not runADSORPTION ISOTHERM DATA - not runPETROGRAPHIC ANALYSESLab. Commercial Testing & Engineering Co. Lab No. Marsh 3MACERAL ANALYSIS
(VOLUME PERCENT)

(Mineral-Matter Free Basis)

<u>MACERAL</u>		<u>MACERAL GROUP</u>	
Vitrinite	88.8	Vitrinite	88.8
Pseudovitrinite	0.0		
Exinite	0.5	Exinite	0.5
Resinite	0.0	(Liptinite)	
Semi-Fusinite	5.4		
Semi-Macrinite	0.0		
Fusinite	5.3	Inertinite	10.7
Macrinite	0.0		
Micrinite	0.0		
TOTAL:	100.0		100.0

Based on 1000 point counts.

REFLECTANCE ANALYSIS

Mean-Maximum Vitrinite Ro: 0.42

V-Type Table for Vitrinites (=100%)

<u>V-3</u>	<u>V-4</u>	<u>V-5</u>	<u>V-</u>
20.0	76.4	3.6	

Comments: Petrography for entire 9.75' Gorham Bed

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 199

LOCATION

County: Rio Blanco
Location: Sec 19 Twp 2S Rge 99W

Surface Elev (ft) 7770
Coordinates 1100 FSL,
1500 FWL

GENERAL

CGS Sample No. 199
Sampled By Scot Babbitt
Operator Berge Exploration
Hole No. P-13

Date 6-30-81
Sample Type Core

DRILLING DATA

Drilling Co. Romines Drilling Address _____
Core Size 2 3/8" Barrel Length 20'
Type of core retrieval wireline
Drilling media foam Air Temperature 85°F
TD Hole 1926' Logs ?

GEOLOGY

Geologic Unit Green River Formation Age Eocene
Coal zone/bed Parachute Creek Member Bed Thickness ?
Depth to top ? (Driller) ? (Log)
Depth to bottom ? (Driller) ? (Log)
Cored interval 1546-1926' (Driller)
Roof description oil shale
Sample description oil shale, medium gray/brown, even to streaked bedding, high competence, medium grade, sample from interbedded sandy siltstone
Floor description oil shale

DESORPTION DATA

Sampled interval (ft) 1276.2-1276.5 (Driller) ? (Log)
Condition of sample solid core broken in one place
Sampled Weight (g) 435
Lost gas time (min) -- Lost gas cc 0
Desorbed gas cc 0 Residual gas cc/g 0
Total gas content cc/g 0 Total gas content cf/t 0

Miscellaneous _____

COAL ANALYSES - not run - oil shaleGAS ANALYSES - not runADSORPTION ISOTHERM DATA - not runPETROGRAPHIC ANALYSES - not runOIL SHALE ASSAY

<u>SAMPLE NO.</u>	<u>DEPTH</u>	<u>OIL GAL/TON</u>	<u>OIL WT.%</u>	<u>WATER GAL/TON</u>	<u>WATER WT.%</u>	<u>OIL GRAV.</u>	<u>SHALE WT.%</u>	<u>GAS PLUS LOSS WT.%</u>	<u>TENDENCY TO COKE</u>
1	1276.2- 1276.5	24.0	9.0	1.3	0.6	0.894	88.9	1.6	NIL (NONE)

Date of Analysis: 2-8-82
 Laboratory: Core Labs, Inc.

Analysts: MJ

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 200

LOCATION

County: Rio Blanco
Location: Sec 19 Twp 2S Rge 99W

Surface Elev (ft) 7770
Coordinates 1100' FSL;
1500' FWL

GENERAL

CGS Sample No. 200
Sampled By Scot Babbitt
Operator Berge Exploration
Hole No. P-13

Date 7-1-81
Sample Type core

DRILLING DATA

Drilling Co. Romines Drilling Address ?
Core Size 2 3/8" Barrel Length 20'
Type of core retrieval wireline
Drilling media foam Air Temperature 60°F
TD Hole 1926' Logs ?

GEOLOGY

Geologic Unit Green River Formation Age Eocene
Zone/bed Parachute Creek Mbr (L-2) Bed Thickness _____
Depth to top ? (Driller) ? (Log) _____
Depth to bottom ? (Driller) ? (Log) _____
Cored interval ? (Driller) _____
Roof description ?
Sample description marlstone; light to medium gray brown, even bedded,
highly competent
Floor description _____

DESORPTION DATA

Sampled interval (ft) 1485.6-1486.3' (Driller) ? (Log) _____
Condition of sample solid core
Sampled Weight (g) 1484
Lost gas time (min) not calculated Lost gas cc not calculated
Desorbed gas cc 250 Residual gas cc/g not calculated
Total gas content cc/g .17 Total gas content cf/t 5

Miscellaneous _____

COAL ANALYSES - not run - oil shale

GAS ANALYSES - not run

ADSORPTION ISOTHERM DATA - not run

PETROGRAPHIC ANALYSES - not run

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 201

LOCATION

County: Rio Blanco
Location: Sec 24 Twp 2S Rge 100W

Surface Elev (ft) 7840
Coordinates 175'FNL;1000'FWL

GENERAL

CGS Sample No. 201
Sampled By D. Jackson
Operator Berge Exploration

Date 7-8-81
Sample Type core

DRILLING DATA

Drilling Co. Romines Drilling Address ?
Core Size 2 3/8" Barrel Length 20'
Type of core retrieval ?
Drilling media foam Air Temperature 72°F
TD Hole 1620' Logs ?

GEOLOGY

Geologic Unit Green River Fm Age Eocene
Oil shale zone Parachute Creek Mbr Bed Thickness --
Depth to top -- (Driller) -- (Log)
Depth to bottom -- (Driller) -- (Log)
Cored interval 925.2 - 945.2' (Driller)
Roof description --
Oil shale description light to dark gray brown, even to streaked bedding, medium to high competency, high grade, sample from interbedded tuff bed, light to medium brown, vuggy
Floor description --

DESORPTION DATA

Sampled interval (ft) 936.3-937.2 (Driller) -- (Log)
Condition of sample solid core, broken in one place
Sampled Weight (g) 1519
Lost gas time (min) -- Lost gas cc --
Desorbed gas cc 480 Residual gas cc/g --
Total gas content cc/g .32 Total gas content cf/t 10

Miscellaneous _____

COAL ANALYSES - not run, oil shaleGAS ANALYSES

	<u>Uncorrected</u>	<u>Corrected for air contamination</u>
--	--------------------	--

C2		
-- x 103	1.5	--
C1		
C1		
-----	.9985	--
2C _{1-C5}		
fc13	-47.51	-52.00
N2	60.68	
C1	33.78	85.91
CO2	5.49	13.96
C2	0.05	0.05
C3	--	--
iC4	--	--
nC4	--	--
iC5	--	--
m1	6.73	--
%R	153	--

Company: Berge Exploration Lab No.: P-14, CGS #201
 Date sample taken: 9-14-81
 Laboratory: USGS, Denver

ADSORPTION ISOTHERM DATA - not runPETROGRAPHIC ANALYSES - not run

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 202

LOCATION

County: Mesa
Location: Sec 9 Twp 11S Rge 93W

Surface Elev (ft) 9558'
Coordinates 2078' FEL;
892' FNL

GENERAL

CGS Sample No. 202
Sampled By Carol Tremain
Operator Exxon
Hole No. Kenny Creek

Date 10-26-81
Sample Type core

DRILLING DATA

Drilling Co. T.N.T. Exploration Address _____
Core Size 4" Barrel Length 30"
Type of core retrieval conventional
Drilling media mud Air Temperature 71°inside; 12°outside
TD Hole 8004' Logs ?

GEOLOGY

Geologic Unit Mesaverde Group Age Upper Cretaceous
Coal zone/bed unnamed Bed Thickness 1'
Depth to top 6945' (Driller) ? (Log) _____
Depth to bottom 6946' (Driller) ? (Log) _____
Cored interval 6930-6953 (Driller) _____
Sample description 6930-6936,dk gray shale, hd, thin coal laminations and
plant fragments, vertical fractures; 6936-6942,dk gray silty shale with
sandy laminations at top and base; 6942-6945,dk gray-blk shale; 6945-6946,
1' coal & carb shale, very broken and muddy, half foot lost; 6946-6953, dk
gray shale with coal laminations and conchoidal fractures

DESORPTION DATA

Sampled interval (ft) 6945-46 (Driller) ? (Log) _____
Condition of sample muddy, broken, shaley, 2/3 full
Sampled Weight (g) 2186
Lost gas time (min) 14.32 min Lost gas cc 3150
Desorbed gas cc 4710 Residual gas cc/g 0.2
Total gas content cc/g 3.55 Total gas content cf/t 114*

Miscellaneous * carb. shale

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
-----------------	--------------------	----------------------	------------------------------

Proximate Analyses (%)

Moisture	1.38	N/A	N/A
Volatile Matter	20.24	20.52	48.00
Fixed Carbon	21.93	22.24	52.00
Ash	56.45	57.24	N/A

Ultimate Analyses (%)

Hydrogen	2.77	2.66	6.22
Carbon	32.95	33.41	78.14
Nitrogen	.97	.98	2.29
Sulfur	1.65	1.67	3.91
Oxygen	5.21	4.04	9.45
Ash	56.45	57.24	N/A

Heating value
(BTU/lb)

5881	5963	15947
------	------	-------

Sulfur Forms (%)

Sulfate	not run
Pyritic	not run
Organic	not run

Ash

Initial deformation (°F)	2420
Softening temperature (°F)	2530
Fluid temperature (°F)	2660

Free Swelling Index	1.0
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Fixed Carbon	
DMMF	59

Heating Value	
BTU/lb MMMF	15209

Apparent Rank	carb. shale
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Date of Analysis:	5-4-82
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Laboratory:	U.S. Dept. of Energy
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Lab No.	L13720
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Comments:	
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GAS ANALYSES

	<u>With air</u>	<u>Air free</u>
--	-----------------	-----------------

(MSI percent)

C3	0.81	
iC4	0.12	
nC4	0.06	
Carbon dioxide	3.36	
Nitrogen + air	14.88	
Methane	77.38	
Ethane	3.37	
C5	--	

<u>Calculated gas gravity</u>	--
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<u>Calculated gross heating value</u>	(BTU/cf, air free) --
---------------------------------------	-----------------------

Company: <u>Exxon</u>	Sampler: <u>Carol Tremain</u>
Date sample taken: <u>11-10-81</u>	Date sample analyzed: <u>12-10-81</u>
Laboratory: <u>U.S.G.S.</u>	Lab No.: <u>E1 CGS 202</u>

Carbon Isotope Ratio (relative to Chicago standard)C13 (ppm) 39.48

Comments _____

Laboratory <u>U.S.G.S.</u>	Lab No.: <u>E1 CGS 202</u>
Contact <u>Chuck Threlkeld</u>	Analysis date: <u>12-10-81</u>

GAS ANALYSES

	<u>With air</u>	<u>Air free</u>
--	-----------------	-----------------

(MSI percent)

C3	0.88	
iC4	0.10	
nC4	0.05	
Carbon dioxide	3.36	
Nitrogen + air	12.27	
Methane	79.94	
Ethane	3.56	
C5	--	

<u>Calculated gas gravity</u>	--
-------------------------------	----

<u>Calculated gross heating value</u>	(BTU/cf, air free) --
---------------------------------------	-----------------------

Company: <u>Exxon</u>	Sampler: <u>Carol Tremain</u>
Date sample taken: <u>11-10-81</u>	Date sample analyzed: <u>12-10-81</u>
Laboratory: <u>U.S.G.S.</u>	Lab No.: <u>E1 CGS 202</u>

Carbon Isotope Ratio (relative to Chicago standard)C13 (ppm) -39.90

Comments _____

Laboratory U.S.G.S.Lab No.: E1 CGS 202Contact Chuck ThrelkeldAnalysis date: 12-10-81ADSORPTION ISOTHERM DATA - not runPETROGRAPHIC ANALYSES - being run

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 203

LOCATION

County: Garfield
Location: Sec 34 Twp 6S Rge 94W

Surface Elev (ft) 5356
Coordinates 824 FWL;2048 FNL

GENERAL

CGS Sample No. 203
Sampled By Sandia Lab
Operator Sandia
Hole No. MWX-1

Date 11-25-81
Sample Type core

DRILLING DATA

Drilling Co. _____ Address _____
Core Size 4" Barrel Length _____
Type of core retrieval conventional
Drilling media oil base mud Air Temperature _____
TD Hole 8350' Logs D.I.L.; IEL; BHC-GR; FDC-CNL-GR; Cyberlook;
Spectralog; Litho-Density; Long Spacing Sonic

GEOLOGY

Geologic Unit Mesaverde Group Age Upper Cretaceous
Coal zone/bed unknown Bed Thickness 1'
Depth to top of coal ? (Driller) 6826' (Log)
Depth to bottom of coal ? (Driller) 6827' (Log)
Cored interval _____ (Driller)
Sample description good cleat in one direction, bright, shiny coal

DESORPTION DATA

Sampled interval (ft) 6826.9-6827.2 (Driller) ? (Log)
Condition of sample mostly one large chunk
Sampled Weight (g) 694
Lost gas time (min) ? Lost gas cc not calculated
Desorbed gas cc 330 Residual gas cc/g 0.1
Total gas content cc/g 0.58 * Total gas content cf/t 18 *

Miscellaneous *most of original gas lost, coal desorbed after a month in seal peel

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
-----------------	--------------------	----------------------	------------------------------

Proximate Analyses (%)

Moisture	.74	N/A	N/A
Volatile Matter	19.16	19.30	21.13
Fixed Carbon	71.50	72.04	78.87
Ash	8.60	8.66	N/A

Ultimate Analyses (%)

Hydrogen	4.45	4.40	4.82
Carbon	81.19	81.80	89.55
Nitrogen	1.73	1.74	1.91
Sulfur	1.06	1.07	1.17
Oxygen	2.97	2.33	2.55
Ash	8.60	8.66	N/A

Heating value
(BTU/lb)

14305	14412	15779
-------	-------	-------

Sulfur Forms (%)

Sulfate	not run
Pyritic	not run
Organic	not run

Ash

Initial deformation (°F)	2345°F
Softening temperature (°F)	2435°F
Fluid temperature (°F)	2555°F

Free Swelling Index 9.0Fixed Carbon

DMMF 79.8

Heating Value

BTU/lb MMMF 15813

Apparent Rank low volatile bituminous

Date of Analysis: 5-11-82

Laboratory: Dept. of Energy

Lab No. L13721

Comments:

GAS ANALYSES - not runADSORPTION ISOTHERM DATA - not runPETROGRAPHIC ANALYSES - not run

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 204

LOCATION

County: La Plata
Location: Sec 25 Twp 34N Rge 8W

Surface Elev (ft) 6680
Coordinates NE/4 SE/4
660'FEL, 2040'FSL

GENERAL

CGS Sample No. 204
Sampled By B. Kelso
Operator SUTEC
Hole No. Oxford #1

Date 3/28/82
Sample Type core

DRILLING DATA

Drilling Co. Arapahoe Address Farmington, N.M.
Core Size 3" Barrel Length 20'
Type of core retrieval rubber sleeve conventional
Drilling media Gel/chem mud Air Temperature 65°F
TD Hole 2852 Logs Gamma-Density-Caliper

GEOLOGY

Geologic Unit Fruitland Age Cretaceous
Coal zone/bed Basal Fruitland Bed Thickness 9.0'
Depth to top of coal ? (Driller) 2769' (Log)
Depth to bottom of coal ? (Driller) 2778' (Log)
Cored interval 2769-2789' (Driller)
Roof description shale
Coal description dull black, thin vitrinite bands, good cleat one direction
Floor description siltstone

DESORPTION DATA

Sampled interval (ft) 2769.8-2770.7 (Driller) ? (Log)
Condition of sample good, large pieces
Sampled Weight (g) 1085
Lost gas time (min) 83 Lost gas cc 2860
Desorbed gas cc 9375 Residual gas cc/g 0.2
Total gas content cc/g 11.48 Total gas content cf/t 367

Miscellaneous _____

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
-----------------	--------------------	----------------------	------------------------------

Proximate Analyses (%)

Moisture	1.1	--	--
Volatile Matter	16.4	16.6	22.6
Fixed Carbon	56.1	56.7	77.4
Ash	26.4	26.7	--

Ultimate Analyses (%)

Hydrogen	4.03	3.95	5.39
Carbon	64.45	65.17	88.90
Nitrogen	0.78	0.79	1.06
Sulfur	0.45	0.46	0.62
Oxygen	3.90	2.94	4.03
Ash	26.39	26.69	--

Heating value
(BTU/lb)

As Received	11,280	Moisture Free	11,410	Moisture and Ash Free	15,560
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Sulfur Forms (%)

Sulfate	not run
Pyritic	not run
Organic	not run

Ash

Initial deformation (°F)	not run
Softening temperature (°F)	not run
Fluid temperature (°F)	not run

Free Swelling Index	not run
---------------------	---------

Fixed Carbon	
DMMF	79.89

Heating Value	
BTU/lb MMMF	15,802

Apparent Rank	Lv Bit
---------------	--------

Date of Analysis: 10-31-82Laboratory: Wyoming Analytical LaboratoriesLab No. 9774

Comments: _____

GAS ANALYSES

	<u>With air</u>	<u>Air free</u>
<u>(MSI percent)</u>		
Hydrogen	--	
Oxygen	--	
Hydrogen sulfide	--	
Carbon dioxide	1.97	
Nitrogen (+ air)	4.17	
Methane	93.65	
Ethane	0.21	
Other hydrocarbons	none	
<u>Calculated gas gravity</u>	<u>not run</u>	

Calculated gross heating value (BTU/cf) 951

Company: SUTEC Oxford #1 Sampler: B. Kelso
 Date sample taken: 4-1-82 Date sample analyzed: 6-15-82
 Laboratory: U.S.G.S. Lab No.: 3629

Carbon Isotope Ratio (relative to Chicago standard)

C13 (ppm) -34.32

Comments _____

Laboratory U.S.G.S. Lab No.: 3629
 Contact Dudley Rice Analysis date: 6-15-82

ADSORPTION ISOTHERM DATA - not run

PETROGRAPHIC ANALYSES - being run

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 205

LOCATION

County: La Plata
Location: Sec 25 Twp 34N Rge 8W

Surface Elev (ft) 6680
Coordinates NE/4 SE/4
660'FEL, 2040'FSL

GENERAL

CGS Sample No. 205
Sampled By B. Kelso
Operator SUTEC
Hole No. Oxford #1

Date 3/28/82
Sample Type core

DRILLING DATA

Drilling Co. Arapahoe Address Farmington, N.M.
Core Size 3" Barrel Length 20'
Type of core retrieval rubber sleeve conventional
Drilling media gel/chem. mud Air Temperature 65°F
TD Hole 2852' Logs Gamma-Density-Caliper

GEOLOGY

Geologic Unit Fruitland Age Cretaceous
Coal zone/bed Basal Fruitland Bed Thickness 15'
Depth to top of coal ? (Driller) 2806' (Log)
Depth to bottom of coal ? (Driller) 2821' (Log)
Cored interval 2804-2823' (Driller)
Roof description black carbonaceous shale
Coal description black, shaley coal, very dense, thin, bright vitrinite
lenses, good cleat one direction
Floor description gray carbonaceous shale

DESORPTION DATA

Sampled interval (ft) 2806.1 - 2806.8 (Driller) ? (Log)
Condition of sample 50% large pieces, 50% small pieces
Sampled Weight (g) 1603
Lost gas time (min) 62 Lost gas cc 1851
Desorbed gas cc 5990 Residual gas cc/g .1
Total gas content cc/g 4.99 Total gas content cf/t 160

Miscellaneous partings: 2' @ 2808' and 1' @ 2812'

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
<u>Proximate Analyses (%)</u>			
Moisture	1.4	--	--
Volatile Matter	7.7	7.8	26.4
Fixed Carbon	21.6	21.9	73.6
Ash	69.3	70.3	--
<u>Ultimate Analyses (%)</u>			
Hydrogen	1.83	1.70	5.72
Carbon	25.11	25.46	85.76
Nitrogen	0.32	0.32	1.09
Sulfur	0.29	0.29	0.99
Oxygen	3.12	1.92	6.44
Ash	69.33	70.31	--
<u>Heating value</u> (BTU/lb)	3380	3430	11550
<u>Sulfur Forms (%)</u>			
Sulfate	not run		
Pyritic	not run		
Organic	not run		
<u>Ash</u>			
Initial deformation (°F)	not run		
Softening temperature (°F)	not run		
Fluid temperature (°F)	not run		
<u>Free Swelling Index</u>	not run		
<u>Fixed Carbon</u>			
DMMF	91.35		
<u>Heating Value</u>			
BTU/lb MMMF	13,463		
<u>Apparent Rank</u>	carbonaceous shale		
Date of Analysis:	<u>10-31-82</u>		
Laboratory:	<u>Wyoming Analytical Laboratories</u>		Lab No. <u>9775</u>
Comments:			

GAS ANALYSES

	<u>With air</u>	<u>Air free</u>
<u>(MSI percent)</u>		
Hydrogen	--	
Oxygen	--	
Hydrogen sulfide	--	
Carbon dioxide	2.34	
Nitrogen (+ air)	5.34	
Methane	92.15	
Ethane	0.17	
Other hydrocarbons	none	
<u>Calculated gas gravity</u>	<u>not run</u>	

Calculated gross heating value (BTU/cf) 936

Company: SUTEC Oxford #1 Sampler: B. S. Kelso
 Date sample taken: 4-1-82 Date sample analyzed: 6-15-82
 Laboratory: U.S.G.S. Lab No.: 3630

Carbon Isotope Ratio (relative to Chicago standard)

C13 (ppm) -36.28

Comments _____

Laboratory U.S.G.S. Lab No.: 3630
 Contact Dudley Rice Analysis date: 6-15-82

ADSORPTION ISOTHERM DATA - not run

PETROGRAPHIC ANALYSES - being run

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 206

LOCATION

County: La Plata
Location: Sec 25 Twp 34N Rge 8W

Surface Elev (ft) 6680'
Coordinates NE/4 SE/4
660'FEL, 2040'FSL

GENERAL

CGS Sample No. 206
Sampled By B. Kelso
Operator SUTEC
Hole No. Oxford #1

Date 3-28-82
Sample Type core

DRILLING DATA

Drilling Co. Arapahoe Address Farmington, N.M.
Core Size 3" Barrel Length 20'
Type of core retrieval rubber sleeve conventional
Drilling media gel/chem mud Air Temperature 65°F
TD Hole 2852' Logs Gamma-Density-Caliper

GEOLOGY

Geologic Unit Fruitland Age Cretaceous
Coal zone/bed Basal Fruitland Bed Thickness 15'
Depth to top of coal ? (Driller) 2806' (Log)
Depth to bottom of coal ? (Driller) 2821' (Log)
Cored interval 2804-2823' (Driller)
Roof description black carbonaceous shale
Coal description dull black coal, thin bright vitrinite bands, tr. pyrite, good cleat 2 directions
Floor description gray carbonaceous shale

DESORPTION DATA

Sampled interval (ft) 2814.2-2815.1 (Driller) ? (Log)
Condition of sample Large pieces
Sampled Weight (g) 1744
Lost gas time (min) 57 Lost gas cc 6582
Desorbed gas cc 17,390 Residual gas cc/g 0.2
Total gas content cc/g 13.95 Total gas content cf/t 446

Miscellaneous _____

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
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Proximate Analyses (%)

Moisture	1.7	--	--
Volatile Matter	15.6	15.8	22.1
Fixed Carbon	54.7	55.7	77.9
Ash	28.0	28.5	--

Ultimate Analyses (%)

Hydrogen	3.84	3.71	5.19
Carbon	62.23	63.29	88.52
Nitrogen	0.78	0.79	1.11
Sulfur	0.52	0.53	0.74
Oxygen	4.61	3.18	4.44
Ash	28.02	28.50	--

Heating value
(BTU/lb)

As Received	10,850	11,040	15,440
-------------	--------	--------	--------

Sulfur Forms (%)

Sulfate	not run
Pyritic	not run
Organic	not run

Ash

Initial deformation (°F)	not run
Softening temperature (°F)	not run
Fluid temperature (°F)	not run

Free Swelling Index not run

<u>Fixed Carbon</u>	
DMMF	80.59

<u>Heating Value</u>	
BTU/lb MMMF	15,580

<u>Apparent Rank</u>	Lv bituminous
----------------------	---------------

Date of Analysis: 10-31-82Laboratory: Wyoming Analytical LaboratoriesLab No. 9776

Comments: _____

GAS ANALYSES

	<u>With air</u>	<u>Air free</u>
<u>(MSI percent)</u>		
Hydrogen	--	
Oxygen	--	
Hydrogen sulfide	--	
Carbon dioxide	2.33	
Nitrogen (+ air)	10.38	
Methane	87.10	
Ethane	0.19	
Other hydrocarbons	none	
<u>Calculated gas gravity</u>	<u>not calculated</u>	

Calculated gross heating value (BTU/cf) 885

Company: SUTEC Sampler: B. Kelso
 Date sample taken: 4-1-82 Date sample analyzed: 6-15-82
 Laboratory: U.S.G.S. Lab No.: 3631

Carbon Isotope Ratio (relative to Chicago standard)

C13 (ppm) -38.57

Comments _____

Laboratory U.S.G.S. Lab No.: 3631
 Contact Dudley Rice Analysis date: 6-15-82

ADSORPTION ISOTHERM DATA - not run

PETROGRAPHIC ANALYSES - being run

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 207

LOCATION

County: La Plata
Location: Sec 25 Twp 34N Rge 8W

Surface Elev (ft) 6703'
Coordinates SE/4 SW/4
1120'FSL, 2450'FWL

GENERAL

CGS Sample No. 207
Sampled By B. Kelso
Operator SUTEC
Hole No. Oxford #2

Date 4-14-82
Sample Type core

DRILLING DATA

Drilling Co. Arapahoe Address Farmington, N.M.
Core Size 3" Barrel Length 20'
Type of core retrieval rubber sleeve conventional
Drilling media gel/chem mud Air Temperature 75°F
TD Hole 2888' Logs Gamma-Density-Caliper

GEOLOGY

Geologic Unit Fruitland Age Cretaceous
Coal zone/bed Basal-Fruitland Bed Thickness 10'
Depth to top of coal ? (Driller) 2837' (Log)
Depth to bottom of coal ? (Driller) 2847' (Log)
Cored interval 2832-2852' (Driller)
Roof description shale
Coal description dull black, thin vitrinite bands, shaly, good cleat in 2 directions
Floor description siltstone

DESORPTION DATA

Sampled interval (ft) 2840.1-2841.0' (Driller) ? (Log)
Condition of sample mostly large pieces
Sampled Weight (g) 1676
Lost gas time (min) 72 Lost gas cc 5687
Desorbed gas cc 12,250 Residual gas cc/g 0.1
Total gas content cc/g 10.80 Total gas content cf/t 346

Miscellaneous _____

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
<u>Proximate Analyses (%)</u>			
Moisture	0.7	--	--
Volatile Matter	15.4	15.5	21.5
Fixed Carbon	56.1	56.5	78.5
Ash	27.8	28.0	--
<u>Ultimate Analyses (%)</u>			
Hydrogen	3.94	3.89	5.40
Carbon	63.89	64.36	89.37
Nitrogen	0.82	0.83	1.15
Sulfur	0.56	0.56	0.78
Oxygen	3.01	2.38	3.30
Ash	27.78	27.98	--
<u>Heating value</u> (BTU/lb)	11,200	11,280	15,660
<u>Sulfur Forms (%)</u>			
Sulfate	not run		
Pyritic	not run		
Organic	not run		
<u>Ash</u>			
Initial deformation (°F)	not run		
Softening temperature (°F)	not run		
Fluid temperature (°F)	not run		
Free Swelling Index	not run		
<u>Fixed Carbon</u>			
DMMF	81.22		
<u>Heating Value</u>			
BTU/lb MMMF	16,036		
<u>Apparent Rank</u>	Lv bituminous		
Date of Analysis:	10-31-82		
Laboratory:	Wyoming Analytical Laboratories		Lab No. 9777
Comments:			

GAS ANALYSES

	<u>With air</u>	<u>Air free</u>
<u>(MSI percent)</u>		
Hydrogen	--	
Oxygen	--	
Hydrogen sulfide	--	
Carbon dioxide	2.98	
Nitrogen (+ air)	3.36	
Methane	93.41	
Ethane	--	
Other hydrocarbons	none	
<u>Calculated gas gravity</u>	<u>not run</u>	

Calculated gross heating value (BTU/cf) 945

Company: SUTEC Sampler: B. Kelso
 Date sample taken: 4-19-82 Date sample analyzed: 6-15-82
 Laboratory: U.S.G.S. Lab No.: 3632

Carbon Isotope Ratio (relative to Chicago standard)

C13 (ppm) -33.23

Comments _____

Laboratory U.S.G.S. Lab No.: 3632
 Contact Dudley Rice Analysis date: 6-15-82

ADSORPTION ISOTHERM DATA - not run

PETROGRAPHIC ANALYSES - being run

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 208

LOCATION

County: La Plata
Location: Sec 25 Twp 34N Rge 8W

Surface Elev (ft) 6703
Coordinates SE/4 SW/4
1120'FSL, 2450'FWL

GENERAL

CGS Sample No. 207
Sampled By B. Kelso
Operator SUTEC
Hole No. Oxford #2

Date 4-14-82
Sample Type core

DRILLING DATA

Drilling Co. Arapahoe Address Farmington, N.M.
Core Size 3" Barrel Length 20'
Type of core retrieval rubber sleeve conventional
Drilling media gel/chem mud Air Temperature 75°F
TD Hole 2888' Logs Gamma-Density-Caliper

GEOLOGY

Geologic Unit Fruitland Age Cretaceous
Coal zone/bed Basal-Fruitland Bed Thickness 10'
Depth to top of coal ? (Driller) 2837' (Log)
Depth to bottom of coal ? (Driller) 2847' (Log)
Cored interval 2832-2852' (Driller)
Roof description shale
Coal description dull black, shaly, thin vitrinite bands, good cleat one direction, trace of gypsum
Floor description siltstone

DESORPTION DATA

Sampled interval (ft) 2842.0-2842.8 (Driller) ? (Log)
Condition of sample mostly large pieces
Sampled Weight (g) 1756
Lost gas time (min) 84 Lost gas cc 6647
Desorbed gas cc 12,090 Residual gas cc/g 0.2
Total gas content cc/g 10.87 Total gas content cf/t 348

Miscellaneous _____

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
-----------------	--------------------	----------------------	------------------------------

Proximate Analyses (%)

Moisture	1.7	--	--
Volatile Matter	14.3	14.6	22.3
Fixed Carbon	50.0	50.8	77.7
Ash	34.0	34.6	--

Ultimate Analyses (%)

Hydrogen	3.99	3.87	5.91
Carbon	56.07	57.03	87.15
Nitrogen	0.70	0.71	1.09
Sulfur	0.45	0.46	0.70
Oxygen	4.82	3.38	5.15
Ash	33.97	34.55	--

Heating value
(BTU/lb)

9960	10130	15480
------	-------	-------

Sulfur Forms (%)

Sulfate	not run
Pyritic	not run
Organic	not run

Ash

Initial deformation (°F)	not run
Softening temperature (°F)	not run
Fluid temperature (°F)	not run

Free Swelling Index not run

Fixed Carbon	
DMMF	81.41

Heating Value	
BTU/lb MMMF	15,766

Apparent Rank	Lv bituminous
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Date of Analysis: 10-31-82Laboratory: Wyoming Analytical LaboratoriesLab No. 9778

Comments: _____

GAS ANALYSES

	<u>With air</u>	<u>Air free</u>
<u>(MSI percent)</u>		
Hydrogen	--	
Oxygen	--	
Hydrogen sulfide	--	
Carbon dioxide	3.41	
Nitrogen (+ air)	3.56	
Methane	92.74	
Ethane	0.29	
Other hydrocarbons	none	
<u>Calculated gas gravity</u>	<u>not run</u>	

Calculated gross heating value (BTU/cf) 944

Company: SUTEC Sampler: B. Kelso
 Date sample taken: 4-19-82 Date sample analyzed: 6-15-82
 Laboratory: U.S.G.S. Lab No.: 3633

Carbon Isotope Ratio (relative to Chicago standard)

C13 (ppm) -32.87

Comments _____

Laboratory U.S.G.S. Lab No.: 3633
 Contact Dudley Rice Analysis date: 6-15-82

ADSORPTION ISOTHERM DATA - not run

PETROGRAPHIC ANALYSES - being run

COAL BED METHANE DESORPTION DATA
OPEN FILE REPORT 81-4

CGS No. 209

LOCATION

County: La Plata
Location: Sec 25 Twp 34N Rge 8W

Surface Elev (ft) 6703
Coordinates SE/4 SW/4
1120' FSL, 2450' FWL

GENERAL

CGS Sample No. 207
Sampled By B. Kelso
Operator SUTEC
Hole No. Oxford #2

Date 4-14-82
Sample Type core

DRILLING DATA

Drilling Co. Arapahoe Address Farmington, N.M.
Core Size 3" Barrel Length 20'
Type of core retrieval rubber sleeve conventional
Drilling media gel/chem mud Air Temperature 75°F
TD Hole 2888' Logs Gamma-Density-Caliper

GEOLOGY

Geologic Unit Fruitland Age Cretaceous
Coal zone/bed Basal-Fruitland Bed Thickness 10'
Depth to top of coal ? (Driller) 2837' (Log)
Depth to bottom of coal ? (Driller) 2847' (Log)
Cored interval 2832-2852' (Driller)
Roof description shale
Coal description dull black, shaly, thin vitrinite bands, good cleat in one direction, trace of pyrite, trace resin
Floor description siltstone

DESORPTION DATA

Sampled interval (ft) 2843.5-2844.6 (Driller) ? (Log)
Condition of sample mostly large pieces, wet
Sampled Weight (g) 1849
Lost gas time (min) 77 Lost gas cc 8959
Desorbed gas cc 18,550 Residual gas cc/g 0.1
Total gas content cc/g 14.98 Total gas content cf/t 479

Miscellaneous _____

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
<u>Proximate Analyses (%)</u>			
Moisture	0.9	--	--
Volatile Matter	15.1	15.3	20.4
Fixed Carbon	59.1	59.6	79.6
Ash	24.9	25.1	--
<u>Ultimate Analyses (%)</u>			
Hydrogen	4.01	3.95	5.27
Carbon	66.71	67.30	89.85
Nitrogen	0.83	0.84	1.12
Sulfur	0.62	0.63	0.84
Oxygen	2.95	2.18	2.92
Ash	24.88	25.10	--
<u>Heating value</u> (BTU/lb)	11580	11680	15590
<u>Sulfur Forms (%)</u>			
Sulfate	not run		
Pyritic	not run		
Organic	not run		
<u>Ash</u>			
Initial deformation (°F)	not run		
Softening temperature (°F)	not run		
Fluid temperature (°F)	not run		
<u>Free Swelling Index</u>	not run		
<u>Fixed Carbon</u>			
DMMF	82.10		
<u>Heating Value</u>			
BTU/lb MMMF	15871		
<u>Apparent Rank</u>	Lv bituminous		
Date of Analysis:	10-31-82		
Laboratory:	Wyoming Analytical Laboratories	Lab No.	9779
Comments:			

GAS ANALYSES

	<u>With air</u>	<u>Air free</u>
<u>(MSI percent)</u>		
Hydrogen	--	
Oxygen	--	
Hydrogen sulfide	--	
Carbon dioxide	2.98	
Nitrogen (+ air)	2.50	
Methane	94.29	
Ethane	0.22	
Other hydrocarbons	none	
<u>Calculated gas gravity</u>	<u>not run</u>	

Calculated gross heating value (BTU/cf) 958

Company: SUTEC Sampler: B. Kelso
 Date sample taken: 4-19-82 Date sample analyzed: 6-15-82
 Laboratory: U.S.G.S. Lab No.: 3634

Carbon Isotope Ratio (relative to Chicago standard)

C13 (ppm) -33.27
 Comments _____
 Laboratory U.S.G.S. Lab No.: 3634
 Contact Dudley Rice Analysis date: 6-15-82

ADSORPTION ISOTHERM DATA - not run

PETROGRAPHIC ANALYSES - being run

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- Meyer, R. F., and Brown, R. R., 1982, Geophysical logs of nine holes drilled in 1978 in the Yampa coal field, Hamilton and Pagoda Quadrangles, Moffat County, Colorado: U.S. Geol. Survey Open-File Rept. 82-475, 34 p.
- Reheis, M. J., 1978, Drilling during 1978 in the Danforth Hills coal field, Easton Gulch, Devils Hole Gulch, Axial and Ninemile Gap Quadrangles, Moffat and Rio Blanco Counties, Colorado: U.S. Geol. Survey Open-File Rept. 78-1031, 38 p.

APPENDIX 1
THE U.S. BUREAU OF MINES DIRECT METHOD

In this method, a coal core sample (approximately 2 lbs in weight) is sealed in an airtight plastic or aluminum cannister and the gas it emits (desorbs) is measured by water displacement in an inverted graduated cylinder (see Figure 9). The coal sample is weighed so its gas content can be stated in cc/g (cubic centimeters/gram) or cf/t. Gas lost by the sample before it is sealed in the cannister can be estimated using a back calculation method. Gas remaining in the structure of the coal sample after natural desorption ceases is measured by crushing the sample in a sealed ball mill and again using water displacement. The desorbed, lost, and remaining gas are all added to give the total gas content. Diamond and Levine (1981) describe the direct method in greater detail.

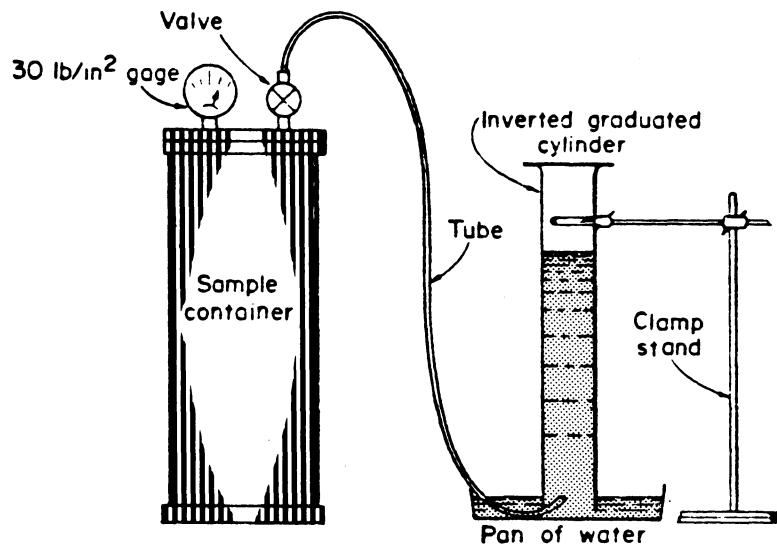


Figure 9. U.S. Bureau of Mines equipment for direct method desorption of coal samples (after Diamond and Levine, 1981, p. 6).

APPENDIX 2. ABBREVIATIONS

abundt	abundant
atm	atmosphere
BHC Sonic	Borehole Compensated Sonic Log
bit	bituminous
blk	black
brn	brown
BTU/cf	British Thermal Units per cubic foot of gas
BTU/lb	British Thermal Units per pound of coal
C ₁	methane
C ₂	ethane
C ₃	propane
C ₄	butane
C ₅	pentane
C ₁₃	carbon 13
carb	carbonaceous
cc	cubic centimeter
cc/g	cubic centimeters of gas per gram of coal
cf/t	cubic feet of gas per ton of coal
DIL	Dual Induction Log
dk	dark
DMMF	dry, mineral matter free
dvpt	developed
elev	elevation
FDC-CNL	Formation Density Compensated-Compensated Neutron Log
FEL	from east line
FNL	from north line
FSL	from south line
FWL	from west line
g	gram
gal	gallon
G.L.	ground level
GR	Gamma Ray Log
grad	gradational
grav	gravity
hd	hard
HvA	high volatile A bituminous coal
HvB	high volatile B bituminous coal
HvC	high volatile C bituminous coal
iC ₄	iso-butane
IEL	Induction Electrical Log
L.S. Density	Long Spaced Density Log
lt	light
Lv	low volatile
m	medium
min	minutes
MMMF	moist mineral matter free
Mv	medium volatile bituminous coal
nC ₄	n-butane
occ	occasional
ppm	parts per million
pVit	pseudovitrinite
Ro	vitrinite reflectance
sh	shale

S.I.U.	Southern Illinois University
slt	siltstone
slty	silty
ss	sandstone
STP	standard temperature and pressure
Subbit A	subbituminous A coal
TD	total depth
tr	trace
v	very
vit	vitritinite
wt	weight