ANALYSIS OF CHEROKEE GROUP CUTTINGS SAMPLES FOR GAS CONTENT -- DART CHEROKEE BASIN OPERATING COMPANY #D2-9 J.V. GORDON TRUSTS, E2 SE SW 9-T.33S.-R.14E., MONTGOMERY COUNTY, KANSAS

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SUMMARY

Cuttings samples from the Pennsylvanian Cherokee Group were collected from the Dart Cherokee Basin #D2-9 J.V. Gordon Trusts, E2 SE SW 9-T.33S.-R.14E., Montgomery County, KS. The samples calculate as having the following gas contents:

- Excello Shale at 1071' depth[1] (30 scf/ton)
- Iron Post coal at 1097' depth[1, 2] (---- scf/ton)
- Croweburg coal at 1121' depth[3, 4] (496 scf/ton)
- Mineral coal at 1161' depth[3] (107 scf/ton)
- Tebo coal at 1208' depth[3] (200 scf/ton)
- Weir-Pittsburg coal at 1231' depth[3] (93 scf/ton)
- Rowe coal at 1424' depth[3] (218 scf/ton)
- "Lower Riverton" coal at 1470' depth[1] (--- scf/ton)

[1]no significant coal in sample
[2]no significant gas desorbed
[3]assuming accompanying dark shales in sample desorb 3 scf/ton
[4]difficult to assign value for coal gas content; accompanying shales likely desorbing approximately 10 to 15 scf/ton, coal possibly 175 to 325 scf/ton

BACKGROUND

The Dart Cherokee Basin #D2-9 J.V. Gordon Trusts, E2 SE SW 9-T.33S.-R.14E., Montgomery County, KS, was selected for cuttings desorption tests in association with an on-going coalbed gas research project at the Kansas Geological Survey. The samples were gathered April 28 and 29, 2005 by personnel from Dart Cherokee Basin L.L.C., and soon turned over to LeaAnn Davidson of the Kansas Geological Survey. Samples were obtained during normal drilling of the well, with no cessation of drilling before zones of interest (i.e., coals and dark shales in the Cherokee Group) were penetrated.

The samples were canistered, with surface time and canistering times noted. These samples were collected in canisters that were supplied by Dart Cherokee Basin L.L.C. and the Kansas Geological Survey. Lag times for samples to reach the surface (important were determined by the wellsite geologist and driller.

The cuttings samples from the Pennsylvanian Cherokee Group were:

- Excello Shale at 1071' depth (960 grams)
- Iron Post coal at 1097' depth[1] (---- grams)
- Croweburg coal at 1121' depth (517 grams)
- Mineral coal at 1161' depth (317 grams)
- Tebo coal at 1208' depth (525 grams)
- Weir-Pittsburg coal at 1231' depth (1028 grams)
- Rowe coal at 1424' depth (1041 grams)
- "Lower Riverton" coal at 1470' depth (333 grams)

[1]sample not weighed due to no coal in sample and no gas evolved from sample

If correct wellsite procedures were followed, the cuttings were caught in kitchen strainers as they exited the air-stream pipe emptying to the mud pit. The samples were then washed in water while in the kitchen strainers to rid them of as much drilling mud as possible before the cuttings were placed in desorption canisters. Water with zephyrn chloride biocide was then added to the canisters, with a headspace of 1 to 2 inches being preserved at the top of the canister.

Desorption measurements at the Kansas Geological Survey in Lawrence, KS were continued at approximately 70 °F. Desorption measurements were periodically made until the canisters produced negligible gas with daily testing for at least two successive days.

DESORPTION MEASUREMENTS

The equipment and method for measuring desorption gas is that prescribed by McLennan and others (1995). The volumetric displacement apparatus is a set of connected dispensing burettes, one of which measures the gas evolved from the desorption canister. The other burette compensates for the compression that occurs when the desorbed gas displaces the water in the measuring burette. This compensation is performed by adjusting the cylinders so that their water levels are identical, then figuring the amount of gas that evolved by reading the difference in water level using the volumetric scale on the side of the burette.

The desorption canisters were obtained from SSD, Inc. in Grand Junction, CO. These canisters are 12.5 inches high (32 cm), 3 1/2 inches (9 cm) in diameter, and enclose a volume of approximately 150 cubic inches (2450 cm^3). The desorbed gas that collected in the desorption canisters was periodically released into the volumetric displacement apparatus and measured as a function of time, temperature and atmospheric pressure.

The time and atmospheric pressure were measured in the field using a portable weather station (model BA928) marketed by Oregon Scientific (Tualatin, OR). The atmospheric pressure was displayed in millibars on this instrument, however, this measurement was not the actual barometric pressure, but rather an altitude-compensated barometric pressure automatically converted to a sea-level-equivalent pressure. In order to translate this measurement to actual atmospheric pressure, a regression correlation was determined over several weeks by comparing readings from the Oregon Scientific instrument to that from a pressure transducer in the Petrophysics Laboratory in the Kansas Geological Survey in Lawrence, Kansas (Figure 1). The regression equation shown graphically in Figure 1 was entered into a spreadsheet and was used to automatically convert the millibar measurement to barometric pressure in pounds per square inch (psi).

A spreadsheet program written by K.D. Newell (Kansas Geological Survey) was used to convert all gas volumes at standard temperature and pressure. Conversion of gas

volumes to standard temperature and pressure was by application of the perfect-gas equation, obtainable from basic college chemistry texts:

$n = PV/RT$

where n is moles of gas, T is degrees Kelvin (i.e., absolute temperature), V is in liters, and R is the universal gas constant, which has a numerical value depending on the units in which it is measured (for example, in the metric system R = 0.0820 liter atmosphere per degree mole). The number of moles of gas (i.e., the value n) is constant in a volumetric conversion, therefore the conversion equation, derived from the ideal gas equation, is:

$(P_{stp}V_{stp})/(RT_{stp}) = (P_{rig}V_{rig})/(RT_{rig})$

Customarily, standard temperature and pressure for gas volumetric measurements in the oil industry are 60 °F and 14.7 psi (see Dake, 1978, p. 13), therefore P_{stp}, V_{stp}, and T_{stp}, respectively, are pressure, volume and temperature at standard temperature and pressure, where standard temperature is degrees Rankine (°R = 460 + °F). P_{rig}, V_{rig}, and T_{rig}, respectively, are ambient pressure, volume and temperature measurements taken at the rig site or in the desorption laboratory.

The universal gas constant R drops out as this equation is simplified and the determination of Vstp becomes:

$V_{stp} = (T_{stp}/T_{rig})\ (P_{rig}/P_{stp})\ V_{rig}$

The conversion calculations in the spreadsheet were carried out in the English metric system, as this is the customary measure system used in American coal and oil industry. V is therefore converted to cubic feet; P is psia; T is °R.

The desorbed gas was summed over the time period for which the coal samples evolved all of their gas.

Lost gas for samples (i.e., the gas lost from the sample from the time it was drilled, brought to the surface, to the time it was canistered) are normally determined using the direct method (Kissel and others, 1975; also see McLennan and others, 1995, p. 6.1-6.14) in which the cumulative gas evolved is plotted against the square root of elapsed time. Time zero is assumed to be the moment that the rock is cut and its cuttings circulated off bottom. Lost gas, however, had to be inferred for the samples collected from this well because no desorption apparatus was on site when those samples were collected. The procedure used to infer lost gas for these samples is outlined in the section below on Lost Gas.

LITHOLOGIC ANALYSIS

Upon removal from the canisters, the cuttings were washed of drilling mud, and dried in air for at least a week. After drying, the cuttings were weighed and then dry sieved into 5 size fractions: >0.0930", >0.0661", >0.0460", >0.0331", and <0.0331". For large sample sizes, the cuttings were ran through a sample splitter and a lesser portion (approximately 75 grams) were sieved and weighed, and the derived size-fraction ratios were applied to the entire sample.

The size fractions were then inspected and sorted by hand under a dissecting microscope. Three major lithologic categories were differentiated: coal, dark shales (generally Munsell rock colors N3 (dark gray), N2 (grayish black), and N1 (black) on dry surface), and lighter-colored lithologies and/or dark and light-colored carbonates. The lighter-colored lithologies are considered to be incapable of generating significant amounts of gas. After sorting, and for every size class, each of these three lithologic categories was weighed and the proportion of coal dark shale and light-colored lithologies were determined for the entire cuttings sample based on the weight percentages.

DATA PRESENTATION

Data and analyses accompanying this report are presented in the following order: 1) data tables for the desorption analyses, 2) lost-gas graphs, 3) "lithologic component sensitivity analyses" showing the interdependence of gas evolved from dark shale versus coal in each sample, 4) a summary component analysis for all samples showing relative reliability of the data from all the samples.

Data Tables of the Desorption Analyses (Table 1)
These are the basic data used for lost-gas analysis and determination of total gas desorbed from the cuttings samples. Basic temperature, volume, and barometric measurements are listed at left. Farther to the right, these are converted to standard temperature, pressure and volumes. The volumes are cumulatively summed, and converted to scf/ton based on the total weight of coal and dark shale in the sample. At the right of the table, the time of the measurements are listed and converted to hours (and square root of hours) since the sample was drilled.

Lost-Gas Graphs (Figure 2, 3)
Surface and canistering times for each sample were noted by the wellsite geologist. Bottom hole time was inferred by subtracting lag time from surface time, with lag time determined from a depth-lag-time plot for a nearby well (Figure 2). To infer an approximate lost-gas value for each sample, a correlation of the total gas desorbed from a sample after it had been canistered to its rate of lost gas was developed using desorption data accumulated for 42 cuttings samples obtained from air-drilled wells in the Cherokee basin in southeastern Kansas (Figure 3). The rate of lost gas used in this correlation was that amount of gas lost by the square root of 0.6 hours (the square root of 0.36 hours). By knowing the total gas given up by the sample after canistering (i.e., the total gas desorbed) a hypothetical rate of lost-gas could be calculated using the a regression line:

lost gas rate per square root of 0.36 hours = 0.1241 X (total gas desorbed in ccs) + 48.14

Once the hypothetical lost-gas rate was calculated, the lost gas could be calculated by taking the square root of the bottom-hole to canister time (derived from subtracting the lag time from the surface time), and multiplying it times the hypothetical lost-gas rate. Analysis of the lithology of the cuttings used in this correlation revealed no consistent relationship (see Figure 2), therefore further refinement of the relationship of the rate of lost gas to the total gas desorbed after canistering is not possible at this point in time.

"Lithologic Component Sensitivity Analyses" (Figures 4-10)
The rapidity of penetration of an air-drilled well makes collection of pure lithologies from relatively thin-bedded strata rather difficult. Mixed lithologies are more the norm rather than the exception. Some of this mixing is due to cavings from strata farther up hole. The mixing may also be due to collection of two or more successively drilled lithologies in the kitchen sieve at the exit line, or differential lifting of relatively less-dense coal compared to other lithologies, all of which are more dense than coal.

The total gas evolved from the sample is due to gas being desorbed from both the coal and dark shale. Both lithologies are capable of generating gas, albeit the coal will be richer in gas than the dark-colored shale. Even though dark-colored shale is less rich in sorbed gas than coal, if a sample has a large proportion of dark, organic-rich shale and only a minor amount of coal, the total volume of gas evolved from the dark-shale component may be considerable. The lighter-colored lithologies are considered to be incapable of generating significant amounts of gas.

The total amount of gas evolved from a cuttings sample can be expressed by the following equation:

$$\text{Total gas } (cm^3) = [\text{weight}_{coal} \text{ (grams) X gas content}_{coal} (cm^3/\text{gram})] + [\text{weight}_{\text{dark shale}} \text{ (grams) X gas content}_{\text{dark shale}} (cm^3/\text{gram})]$$

A unique solution for gas content_{coal} in this equation is not possible because gas $\text{content}_{\text{dark shale}}$ is not known exactly. An answer can only be expressed as a linear solution to the above equation. The richer in gas the dark shales are, the poorer in gas the admixed coal has to be, and visa versa. If there is little dark shale in a sample, a relatively well constrained answer for gas content_{coal} can be obtained. Conversely, if considerable dark shale is in a sample, the gas content of a coal will be hard to precisely determine.

The lithologic-component-sensitivity-analysis diagram therefore expresses the bivariant nature inherent in the determination of gas content in mixed cuttings. The gas content of dark shales in Kansas can vary greatly. Proprietary desorption analyses of dark shales in cores from southeastern Kansas have registered as much as 50 scf/ton, but can be as low as 2-4 scf/ton.

A value of 3 scf/ton for average dark shale is based on the assay of the gas content of cores of dark shales in nearby wells. However, high-gamma-ray shales (such as the Excello Shale), also colloquially known as "hot shales", typically have more organic matter and associated gas content than dark shales with no excessive gamma-ray level. Determination of gas content for a coal associated with a "hot" shale therefore carries more uncertainty than if the coal were associated with a shale without a high gamma-ray value.

In general, shale gas content does not have to be very much greater that 10 scf/ton before the associated coal starts to have a gas content less than that of the dark shale. In all the lithologic-component-sensitivity-analysis diagrams, a "break-even" point is therefore noted where the gas content of the coal is equal to that of the dark shale. This "break-even" point corresponds to the minimum gas content assignable to the coal and maximum gas content assignable to the dark shale. It can also be thought of the scf/ton gas content of the cuttings sample minus the weight of any of the lighter-colored lithologies, which are assumed to have no inherent gas content. Conversely though, to assume that all the gas evolved from a cuttings sample is derived solely from the coal would result in an erroneously high gas content for the coal.

Summary Component Analysis for all Samples (Figure 11)
This diagram is a summary of the individual "lithologic component sensitivity analyses" for each sample, all set at a common scale. The steeper the angle of the line for a sample, the more uncertainty is attached to the results (i.e., $gas\ content_{coal}$) for that sample. If the coal content is miniscule (i.e., < approximately 5%), the results are a better reflection of the $gas\ content_{dark\ shale}$.

RESULTS and DISCUSSION

The best constrained data is that associated with the Rowe coal at 1424'. The Weir-Pittsburg coal at 1231' and Mineral coals at 1161' have virtually identical reliabilities, according to Figure 11. The "lower Riverton" coal has poorly constrained reliability, and the results are considered unclear due to the small amount (<1%) of coal in the sample. A nearly similar lack of confidence is associated with the Croweburg coal at 1121', except that the Croweburg sample has 3% coal. It is difficult to assign value for coal gas content to the Croweburg coal, but accompanying shales likely contain 10 to 15 scf/ton, so the coal possibly contains 175 to 325 scf/ton.

REFERENCES

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McLennan, J.D., Schafer, P.S., and Pratt, T.J., 1995, A guide to determining coalbed gas content: Gas Research Institute, Chicago, IL, Reference No. GRI-94/0396, 180 p.

FIGURES and TABLES

Correlation of Field Barometer to KGS Petrophysics Lab Barometer

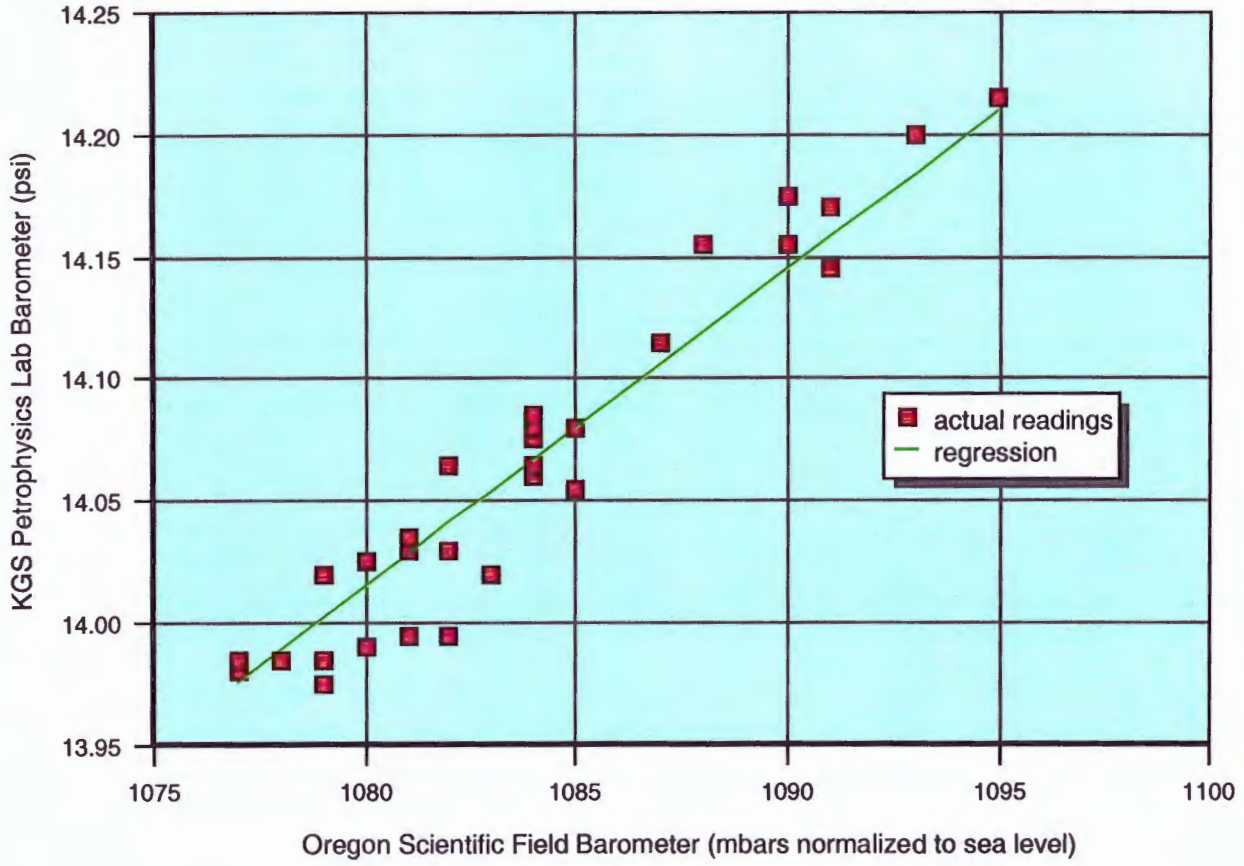


FIGURE 1.

TABLE 1 -- Desorption data for DART CHEROKEE BASIN J.V. Gordon Trusts #D2-9; E2 SE SW 9-T.33S.-R.14E.

SAMPLE: 1071' to 1077' (Excello Shale) cuttings in Dart SSD canister

	lbs.	grams
dry sample weight:	1.9669	892.15

NOTE: lost gas is estimated by time interval between at surface and canister times, and total gas evolved

RIG/LAB MEASUREMENTS			CONVERSION OF RIG/LAB MEASUREMENTS TO STP (@60 deg F; 14.7 psi)					CUMULATIVE VOLUMES		SCF/TON	SCF/TON												
measured cc	measured T (F)	measured P	cubic ft	absolute T (R)	psia	cubic ft (@STP)	cc (@STP)	cubic ft (@STP)	cc (@STP)	without lost gas	with lost gas												
547	63	1086	0.0193	523	14.096	0.018416991	521.51	0.018416991	521.51	18.73	20.16												
116	68	1089	0.0041	528	14.135	0.003879316	109.85	0.022296307	631.36	22.67	24.11												
64	70	1089	0.0023	530	14.135	0.002132236	60.38	0.024428542	691.74	24.84	26.28												
37	66	1093	0.0013	526	14.187	0.001246635	35.30	0.025675177	727.04	26.11	27.54												
21	66	1081	0.0007	526	14.031	0.000699781	19.82	0.026374959	746.85	26.82	28.26												
9	68	1078	0.0003	528	13.992	0.000297941	8.44	0.0266729	755.29	27.12	28.56												
10	67	1074	0.0004	527	13.940	0.000330443	9.36	0.027003343	764.65	27.46	28.89												
4	68	1077	0.0001	528	13.979	0.000132295	3.75	0.027135639	768.39	27.59	29.03												
9	67	1075	0.0003	527	13.953	0.000297676	8.43	0.027433315	776.82	27.90	29.33												
3	73	1078	0.0001	533	13.992	9.83821E-05	2.79	0.027531697	779.61	28.00	29.43												
2	71	1081	7E-05	531	14.031	6.60183E-05	1.87	0.027597715	781.48	28.06	29.50												
-1	68	1085	-4E-05	528	14.083	-3.33195E-05	-0.94	0.027564395	780.53	28.03	29.47												

est. lost gas (cc) = 40

TIME OF:					
	off bottom		at surface		in canister
	4/28/05	15:13	4/28/05	15:15	4/28/05	15:17

elapsed time (off bottom to canistering)
4.5 minutes
0.075 hours
0.273353658 SQRT (hrs)

TIME OF MEASURE	TIME SINCE off bottom	TIME SINCE in canister	SQRT hrs. (since off bottom)
4/30/05 19:10	51:56:50	51:52:21	7.207442141
5/1/05 18:51	75:37:50	75:33:21	8.696582982
5/2/05 20:37	101:23:50	101:19:21	10.06961877
5/5/05 6:54	159:40:50	159:36:21	12.63647718
5/6/05 18:41	195:27:50	195:23:21	13.98084006
5/7/05 16:59	217:45:50	217:41:21	14.75682516
5/8/05 18:14	243:00:50	242:56:21	15.58890275
5/9/05 15:02	263:48:50	263:44:21	16.24234863
5/10/05 20:17	293:03:50	292:59:21	17.11910888
5/11/05 17:20	314:06:50	314:02:21	17.72325842
5/12/05 20:55	341:41:50	341:37:21	18.48505402
5/14/05 13:12	381:58:50	381:54:21	19.54432285

DESORPTION TERMINATED 5/15/2005 DUE TO NO GAS BEING EVOLVED; sample air dried for 15 days

SAMPLE: 1097' to 1099' (Iron Post coal) cuttings in Dart SSD canister 6

	lbs.	grams
dry sample weight:	1.0858	492.49

NOTE: lost gas is estimated by time interval between at surface and canister times, and total gas evolved

RIG/LAB MEASUREMENTS			CONVERSION OF RIG/LAB MEASUREMENTS TO STP (@60 deg F; 14.7 psi)					CUMULATIVE VOLUMES		SCF/TON	SCF/TON												
measured cc	measured T (F)	measured P	cubic ft	absolute T (R)	psia	cubic ft (@STP)	cc (@STP)	cubic ft (@STP)	cc (@STP)	without lost gas	with lost gas												
-1	63	1086	-4E-05	523	14.096	-3.36691E-05	-0.95	-3.36691E-05	-0.95	-0.06	-0.06												
5	68	1089	0.0002	528	14.135	0.000167212	4.73	0.000133543	3.78	0.25	0.25												
5	70	1089	0.0002	530	14.135	0.000166581	4.72	0.000300124	8.50	0.55	0.55												
-4	66	1093	-0.0001	526	14.187	-0.000134771	-3.82	0.000165352	4.68	0.30	0.30												
0.5	66	1081	2E-05	526	14.031	1.66615E-05	0.47	0.000182014	5.15	0.34	0.34												

est. lost gas (cc) = 0

TIME OF:					
	off bottom		at surface		in canister
	4/28/05	15:31	4/28/05	15:33	4/28/05	15:34

elapsed time (off bottom to canistering)
3.8 minutes
0.064 hours
0.252762515 SQRT (hrs)

TIME OF MEASURE	TIME SINCE off bottom	TIME SINCE in canister	SQRT hrs. (since off bottom)
4/30/05 19:18	51:46:53	51:43:03	7.195928633
5/1/05 18:53	75:21:53	75:18:03	8.681285747
5/2/05 20:38	101:06:53	101:03:03	10.05558165
5/5/05 6:55	159:23:53	159:20:03	12.62529428
5/6/05 18:42	195:10:53	195:07:03	13.9707333

DESORPTION TERMINATED 5/07/2005 DUE TO NO MORE GAS BEING EVOLVED; no coal in sample

SAMPLE: 1121' to 1123' (Croweburg coal) cuttings in Dart SSD canister

	lbs.	grams
dry sample weight:	0.8029	364.2

NOTE: lost gas is estimated by time interval between at surface and canister times, and total gas evolved

RIG/LAB MEASUREMENTS			CONVERSION OF RIG/LAB MEASUREMENTS TO STP (@60 deg F; 14.7 psi)					CUMULATIVE VOLUMES		SCF/TON	SCF/TON												
measured cc	measured T (F)	measured P	cubic ft	absolute T (R)	psia	cubic ft (@STP)	cc (@STP)	cubic ft (@STP)	cc (@STP)	without lost gas	with lost gas												
161	63	1086	0.0057	523	14.096	0.005420723	153.50	0.005420723	153.50	13.50	15.17												
30	68	1089	0.0011	528	14.135	0.001003271	28.41	0.006423994	181.91	16.00	17.67												
21	70	1089	0.0007	530	14.135	0.00069964	19.81	0.007123634	201.72	17.74	19.42												
7	66	1093	0.0002	526	14.187	0.00023585	6.68	0.007359484	208.40	18.33	20.00												
9	66	1081	0.0003	526	14.031	0.000299906	8.49	0.00765939	216.89	19.08	20.75												
3	68	1078	0.0001	528	13.992	9.93137E-05	2.81	0.007758704	219.70	19.33	21.00												
3	67	1074	0.0001	527	13.940	9.9133E-05	2.81	0.007857837	222.51	19.57	21.24												
1	68	1077	4E-05	528	13.979	3.30739E-05	0.94	0.007890911	223.44	19.66	21.33												
4	67	1075	0.0001	527	13.953	0.0001323	3.75	0.008023211	227.19	19.98	21.66												
0.5	73	1078	2E-05	533	13.992	1.6397E-05	0.46	0.008039608	227.66	20.03	21.70												
0	71	1081	0	531	14.031	0	0.00	0.008039608	227.66	20.03	21.70												
-3	68	1085	-0.0001	528	14.083	-9.99586E-05	-2.83	0.00793965	224.82	19.78	21.45												

est. lost gas (cc) = 19

TIME OF:					
	off bottom		at surface		in canister
	4/28/05	15:46	4/28/05	15:48	4/28/05	15:49

elapsed time (off bottom to canistering)
3.7 minutes
0.061 hours
0.246644143 SQRT (hrs)

TIME OF MEASURE	TIME SINCE off bottom	TIME SINCE in canister	SQRT hrs. (since off bottom)
4/30/05 19:20	51:33:59	51:30:20	7.180974091
5/1/05 18:53	75:06:59	75:03:20	8.666971149
5/2/05 20:38	100:51:59	100:48:20	10.04322602
5/5/05 6:56	159:09:59	159:06:20	12.61611624
5/6/05 18:43	194:56:59	194:53:20	13.96243969
5/7/05 17:00	217:13:59	217:10:20	14.73862816
5/8/05 18:15	242:28:59	242:25:20	15.57186744
5/9/05 15:03	263:16:59	263:13:20	16.22599937
5/10/05 20:17	292:30:59	292:27:20	17.1031105
5/11/05 17:20	313:33:59	313:30:20	17.70760587
5/12/05 20:55	341:08:59	341:05:20	18.47023882
5/14/05 13:13	381:26:59	381:23:20	19.53073788

DESORPTION TERMINATED 5/15/2005 DUE TO NO GAS BEING EVOLVED; sample air dried for 15 days

SAMPLE: 1161' to 1163' (Mineral coal) cuttings in Dart SSD canister

	lbs.	grams
dry sample weight:	0.5858	265.7

NOTE: lost gas is estimated by time interval between at surface and canister times, and total gas evolved

RIG/LAB MEASUREMENTS			CONVERSION OF RIG/LAB MEASUREMENTS TO STP (@60 deg F; 14.7 psi)					CUMULATIVE VOLUMES		SCF/TON	SCF/TON												
measured cc	measured T (F)	measured P	cubic ft	absolute T (R)	psia	cubic ft (@STP)	cc (@STP)	cubic ft (@STP)	cc (@STP)	without lost gas	with lost gas												

est. lost gas (cc) = 17

TIME OF:					
	off bottom		at surface		in canister
	4/28/05	16:06	4/28/05	16:08	4/28/05	16:10

elapsed time (off bottom to canistering)
4.1 minutes
0.068 hours
0.260874597 SQRT (hrs)

TIME OF MEASURE	TIME SINCE off bottom	TIME SINCE in canister	SQRT hrs. (since off bottom)

87	63	1086	0.0031	523	14.096	0.002929211	82.95	0.002929211	82.95	10.00	12.05	4/30/05	19:27	51:20:47	51:16:42	7.165639461
20	68	1089	0.0007	528	14.135	0.000668848	18.94	0.003598058	101.89	12.28	14.33	5/1/05	18:54	74:47:47	74:43:42	8.648490556
16	70	1089	0.0006	530	14.135	0.000533059	15.09	0.004131117	116.98	14.10	16.15	5/2/05	20:39	100:32:47	100:28:42	10.02728223
6	66	1093	0.0002	526	14.187	0.000202157	5.72	0.004333274	122.70	14.80	16.84	5/5/05	6:57	158:50:47	158:46:42	12.60342766
8	66	1081	0.0003	526	14.031	0.000266583	7.55	0.004599858	130.25	15.71	17.76	5/6/05	18:44	194:37:47	194:33:42	13.95097567
3	68	1078	0.0001	528	13.992	9.93137E-05	2.81	0.004699171	133.07	16.04	18.09	5/7/05	17:01	216:54:47	216:50:42	14.72796848
3	67	1074	0.0001	527	13.940	9.9133E-05	2.81	0.004798304	135.87	16.38	18.43	5/8/05	18:15	242:08:47	242:04:42	15.56105359
1	68	1077	4E-05	528	13.979	3.30739E-05	0.94	0.004831378	136.81	16.50	18.55	5/9/05	15:03	262:56:47	262:52:42	16.21562175
4	67	1075	0.0001	527	13.953	0.0001323	3.75	0.004963678	140.56	16.95	19.00	5/10/05	20:18	292:11:47	292:07:42	17.09375292
0.5	73	1078	2E-05	533	13.992	1.6397E-05	0.46	0.004980075	141.02	17.00	19.05	5/11/05	17:21	313:14:47	313:10:42	17.698768
0.5	71	1081	2E-05	531	14.031	1.65046E-05	0.47	0.00499658	141.49	17.06	19.11	5/12/05	20:56	340:49:47	340:45:42	18.46157421
-2	68	1085	-7E-05	528	14.083	-6.66391E-05	-1.89	0.004929941	139.60	16.83	18.88	5/14/05	13:14	381:07:47	381:03:42	19.52254395

DESORPTION TERMINATED 5/15/2005 DUE TO NO GAS BEING EVOLVED; sample air dried for 15 days

SAMPLE: 1208' to 1210' (Tebo coal) cuttings in Dart SSD canister

	lbs.	grams
dry sample weight:	0.1768	80.19

NOTE: lost gas is estimated by time interval between at surface and canister times, and total gas evolved

est. lost gas (cc) =	TIME OF:					elapsed time (off bottom to canistering)
14	off bottom		at surface		in canister	4.3 minutes
	4/28/05	16:32	4/28/05	16:34	4/28/05 16:37	0.071 hours

RIG/LAB MEASUREMENTS			CONVERSION OF RIG/LAB MEASUREMENTS TO STP (@60 deg F; 14.7 psi)					CUMULATIVE VOLUMES		SCF/TON	SCF/TON	TIME SINCE			0.267186992 SQRT (hrs)
measured cc	measured T (F)	measured P	cubic ft	absolute T (R)	psia	cubic ft (@STP)	cc (@STP)	cubic ft (@STP)	cc (@STP)	without lost gas	with lost gas	TIME OF MEASURE		off bottom	in canister	SQRT hrs. (since off bottom)
20	63	1086	0.0007	523	14.096	0.000673382	19.07	0.000673382	19.07	7.62	13.21	4/30/05	19:30	50:57:13	50:52:56	7.138179818
10	68	1089	0.0004	528	14.135	0.000334424	9.47	0.001007806	28.54	11.40	16.99	5/1/05	18:55	74:22:13	74:17:56	8.62382037
10	70	1089	0.0004	530	14.135	0.000333162	9.43	0.001340967	37.97	15.17	20.76	5/2/05	20:40	100:07:13	100:02:56	10.00601208
-7	66	1093	-0.0002	526	14.187	-0.00023585	-6.68	0.001105117	31.29	12.50	18.10	5/5/05	6:57	158:24:13	158:19:56	12.58584964
0	66	1081	0	526	14.031	0	0.00	0.001105117	31.29	12.50	18.10	5/6/05	18:44	194:11:13	194:06:56	13.93509758
1	68	1078	4E-05	528	13.992	3.31046E-05	0.94	0.001138222	32.23	12.88	18.47	5/7/05	17:01	216:28:13	216:23:56	14.71292893

DESORPTION TERMINATED 5/8/2005 DUE TO NO MORE GAS BEING EVOLVED; sample air dried for 14 days

SAMPLE: 1231' to 1233' (Weir-Pittsburg coal) cuttings in Dart SSD canister

	lbs.	grams
dry sample weight:	0.4639	210.44

NOTE: lost gas is estimated by time interval between at surface and canister times, and total gas evolved

est. lost gas (cc) =	TIME OF:					elapsed time (off bottom to canistering)
20	off bottom		at surface		in canister	6.7 minutes
	4/28/05	16:46	4/28/05	16:48	4/28/05 16:52	0.112 hours

RIG/LAB MEASUREMENTS			CONVERSION OF RIG/LAB MEASUREMENTS TO STP (@60 deg F; 14.7 psi)					CUMULATIVE VOLUMES		SCF/TON	SCF/TON	TIME SINCE			0.334995854 SQRT (hrs)
measured cc	measured T (F)	measured P	cubic ft	absolute T (R)	psia	cubic ft (@STP)	cc (@STP)	cubic ft (@STP)	cc (@STP)	without lost gas	with lost gas	TIME OF MEASURE		off bottom	in canister	SQRT hrs. (since off bottom)
65	63	1086	0.0023	523	14.096	0.002188491	61.97	0.002188491	61.97	9.43	12.48	4/30/05	19:51	51:04:55	50:58:11	7.147163384
19	68	1089	0.0007	528	14.135	0.000635405	17.99	0.002823896	79.96	12.17	15.22	5/1/05	18:56	74:09:55	74:03:11	8.611926485
18	70	1089	0.0006	530	14.135	0.000599691	16.98	0.003423587	96.94	14.76	17.80	5/2/05	20:40	99:53:55	99:47:11	9.99492927
-6	66	1093	-0.0002	526	14.187	-0.000202157	-5.72	0.00322143	91.22	13.89	16.93	5/5/05	6:58	158:11:55	158:05:11	12.57770293
0	66	1081	0	526	14.031	0	0.00	0.00322143	91.22	13.89	16.93	5/6/05	18:45	193:58:55	193:52:11	13.92774011
1	68	1078	4E-05	528	13.992	3.31046E-05	0.94	0.003254535	92.16	14.03	17.07	5/7/05	17:02	216:15:55	216:09:11	14.70596062

SAMPLE DECANISTERED 3/30/2004 DUE TO NO MORE GAS BEING EVOLVED; sample air dried for 18 days

SAMPLE: 1424' to 1426' (Rowe coal) cuttings in Dart SSD canister

	lbs.	grams
dry sample weight:	0.6635	300.94

NOTE: lost gas is estimated by time interval between at surface and canister times, and total gas evolved

est. lost gas (cc) =	TIME OF:					elapsed time (off bottom to canistering)
43	off bottom		at surface		in canister	6.8 minutes
	4/29/05	8:57	4/29/05	9:00	4/29/05 9:04	0.114 hours

RIG/LAB MEASUREMENTS			CONVERSION OF RIG/LAB MEASUREMENTS TO STP (@60 deg F; 14.7 psi)					CUMULATIVE VOLUMES		SCF/TON	SCF/TON	TIME SINCE			0.337474279 SQRT (hrs)
measured cc	measured T (F)	measured P	cubic ft	absolute T (R)	psia	cubic ft (@STP)	cc (@STP)	cubic ft (@STP)	cc (@STP)	without lost gas	with lost gas	TIME OF MEASURE		off bottom	in canister	SQRT hrs. (since off bottom)
273	63	1086	0.0096	523	14.096	0.009191661	260.28	0.009191661	260.28	27.71	32.29	4/30/05	19:34	34:36:50	34:30:00	5.88335694
115	68	1089	0.0041	528	14.135	0.003845874	108.90	0.013037534	369.18	39.30	43.88	5/1/05	18:57	57:59:50	57:53:00	7.615590734
84	70	1089	0.003	530	14.135	0.002798559	79.25	0.015836094	448.43	47.74	52.32	5/2/05	20:41	83:43:50	83:37:00	9.150440184
41	66	1093	0.0014	526	14.187	0.001381406	39.12	0.0172175	487.54	51.90	56.48	5/5/05	6:58	142:00:50	141:54:00	11.91695804
24	66	1081	0.0008	526	14.031	0.00079975	22.65	0.01801725	510.19	54.31	58.89	5/6/05	18:46	177:48:50	177:42:00	13.33468743
12	68	1078	0.0004	528	13.992	0.000397255	11.25	0.018414505	521.44	55.51	60.09	5/7/05	17:03	200:05:50	199:59:00	14.14557253
14	67	1074	0.0005	527	13.940	0.000462621	13.10	0.018877126	534.54	56.91	61.48	5/8/05	18:16	225:18:50	225:12:00	15.01045932
11	68	1077	0.0004	528	13.979	0.000363813	10.30	0.019240938	544.84	58.00	62.58	5/9/05	15:03	246:05:50	245:59:00	15.68748617
13	69	1075	0.0005	529	13.953	0.000428351	12.13	0.019669289	556.97	59.29	63.87	5/10/05	20:19	275:21:50	275:15:00	16.59409199
6	72	1078	0.0002	532	13.992	0.000197134	5.58	0.019866423	562.55	59.89	64.47	5/11/05	17:22	296:24:50	296:18:00	17.21667473
8	71	1081	0.0003	531	14.031	0.000264073	7.48	0.020130496	570.03	60.68	65.26	5/12/05	20:56	323:58:50	323:52:00	17.99945987
5	68	1085	0.0002	528	14.083	0.000166598	4.72	0.020297094	574.75	61.19	65.76	5/14/05	13:14	364:16:50	364:10:00	19.08613517
-1.5	66	1090	-5E-05	526	14.148	-5.04005E-05	-1.43	0.020246693	573.32	61.03	65.61	5/15/05	11:04	386:06:50	386:00:00	19.64978089

8	66	1080	0.0003	526	14.018	0.000266337	7.54	0.02051303	580.86	61.84	66.41	5/16/05	16:09	415:11:50	415:05:00	20.37638884
14	68	1072	0.0005	528	13.914	0.000460885	13.05	0.020973915	593.91	63.23	67.80	5/18/05	18:33	465:35:50	465:29:00	21.57770197
5	68	1075	0.0002	528	13.953	0.000165062	4.67	0.021138977	598.59	63.72	68.30	5/19/05	20:08	491:10:50	491:04:00	22.16259361
0	71	1081	0	531	14.031	0	0.00	0.021138977	598.59	63.72	68.30	5/20/05	12:10	507:12:50	507:06:00	22.52140957
6	71	1076	0.0002	531	13.966	0.000197139	5.58	0.021336116	604.17	64.32	68.90	5/21/05	16:02	535:04:50	534:58:00	23.13180831
1	72	1081	4E-05	532	14.031	3.29471E-05	0.93	0.021369063	605.10	64.42	68.99	5/22/05	10:10	553:12:50	553:06:00	23.52049933
7	71	1085	0.0002	531	14.083	0.000231919	6.57	0.021600982	611.67	65.12	69.69	5/26/05	4:10	643:12:50	643:06:00	25.36166179
0.5	70	1084	2E-05	530	14.070	1.65816E-05	0.47	0.021617564	612.14	65.17	69.74	5/27/05	14:28	677:30:50	677:24:00	26.02909697
3	70	1080	0.0001	530	14.018	9.91225E-05	2.81	0.021716686	614.95	65.47	70.04	5/28/05	15:14	702:16:50	702:10:00	26.50057651
3	70	1078	0.0001	530	13.992	9.8939E-05	2.80	0.021815625	617.75	65.76	70.34	5/29/05	16:24	727:26:50	727:20:00	26.97122953
-1	70	1082	-4E-05	530	14.044	-3.3102E-05	-0.94	0.021782523	616.81	65.66	70.24	5/30/05	14:22	749:24:50	749:18:00	27.37542491
4	70	1080	0.0001	530	14.018	0.000132163	3.74	0.021914686	620.55	66.06	70.64	6/1/05	11:15	794:17:50	794:11:00	28.18327912
4	70	1077	0.0001	530	13.979	0.000131796	3.73	0.022046483	624.28	66.46	71.04	6/2/05	14:19	821:21:50	821:15:00	28.65944677
6	71	1075	0.0002	531	13.953	0.000196956	5.58	0.022243438	629.86	67.05	71.63	6/3/05	17:07	848:09:50	848:03:00	29.1232534
1	71	1071	4E-05	531	13.901	3.27038E-05	0.93	0.022276142	630.79	67.15	71.73	6/4/05	12:52	867:54:50	867:48:00	29.46037829
-3	72	1079	-0.0001	532	14.005	-9.86584E-05	-2.79	0.022177484	627.99	66.85	71.43	6/6/05	11:41	914:43:50	914:37:00	30.24451282
6	73	1074	0.0002	533	13.940	0.000196034	5.55	0.022373518	633.55	67.45	72.02	6/7/05	23:26	950:28:50	950:22:00	30.82986467
4	73	1072	0.0001	533	13.914	0.000130446	3.69	0.022503964	637.24	67.84	72.42	6/8/05	17:07	968:09:50	968:03:00	31.11533205
-1	73	1077	-4E-05	533	13.979	-3.27636E-05	-0.93	0.0224712	636.31	67.74	72.32	6/10/05	12:02	1011:04:50	1010:58:00	31.79749291
0	73	1079	0	533	14.005	0	0.00	0.0224712	636.31	67.74	72.32	6/14/05	18:12	1113:14:50	1113:08:00	33.36535961

SAMPLE DECANISTERED 6/14/2005 DUE TO NO MORE GAS BEING EVOLVED; sample air dried for 21 days

SAMPLE: 1470' to 1472' (lower Riverton) cuttings in Dart SSD canister

	lbs.	grams
dry sample weight:	0.2127	96.484

NOTE: lost gas is estimated by time interval between at surface and canister times, and total gas evolved

est. lost gas (cc) =	TIME OF:						elapsed time (off bottom to canistering)
18	off bottom		at surface		in canister		6.7 minutes
	4/29/05	9:30	4/29/05	9:33	4/29/05	9:36	0.111 hours

RIG/LAB MEASUREMENTS			CONVERSION OF RIG/LAB MEASUREMENTS TO STP (@60 deg F; 14.7 psi)					CUMULATIVE VOLUMES		SCF/TON	SCF/TON	TIME SINCE			0.333333333 SQRT (hrs)
measured cc	measured T (F)	measured P	cubic ft	absolute T (R)	psia	cubic ft (@STP)	cc (@STP)	cubic ft (@STP)	cc (@STP)	without lost gas	with lost gas	TIME OF MEASURE	off bottom	in canister	SQRT hrs. (since off bottom)
37	63	1086	0.0013	523	14.096	0.001245756	35.28	0.001245756	35.28	11.71	17.69	4/30/05 19:48	34:17:55	34:11:15	5.85650161
13	68	1089	0.0005	528	14.135	0.000434751	12.31	0.001680507	47.59	15.80	21.78	5/1/05 19:00	57:29:55	57:23:15	7.582783863
12	70	1089	0.0004	530	14.135	0.000399794	11.32	0.002080301	58.91	19.56	25.54	5/2/05 20:42	83:11:55	83:05:15	9.121327267
-6	66	1093	-0.0002	526	14.187	-0.000202157	-5.72	0.001878144	53.18	17.66	23.64	5/5/05 6:59	141:28:55	141:22:15	11.8946183
0	66	1081	0	526	14.031	0	0.00	0.001878144	53.18	17.66	23.64	5/6/05 18:47	177:16:55	177:10:15	13.3147266

SAMPLE DECANISTERED 5/07/2005 DUE TO NO MORE GAS BEING EVOLVED; sample air dried for 14 days

Dart Cherokee Basin #D2-9 J.V. Gordon Trusts, E2 SE SW 9-T.33S.-R.14E., Montgomery County, KS

(based on lag times from Dart Cherokee Basin #CH-1 Holder; sec. 1-T.30S.-R.14E., Wilson County, KS

lag-time to surface for well cuttings

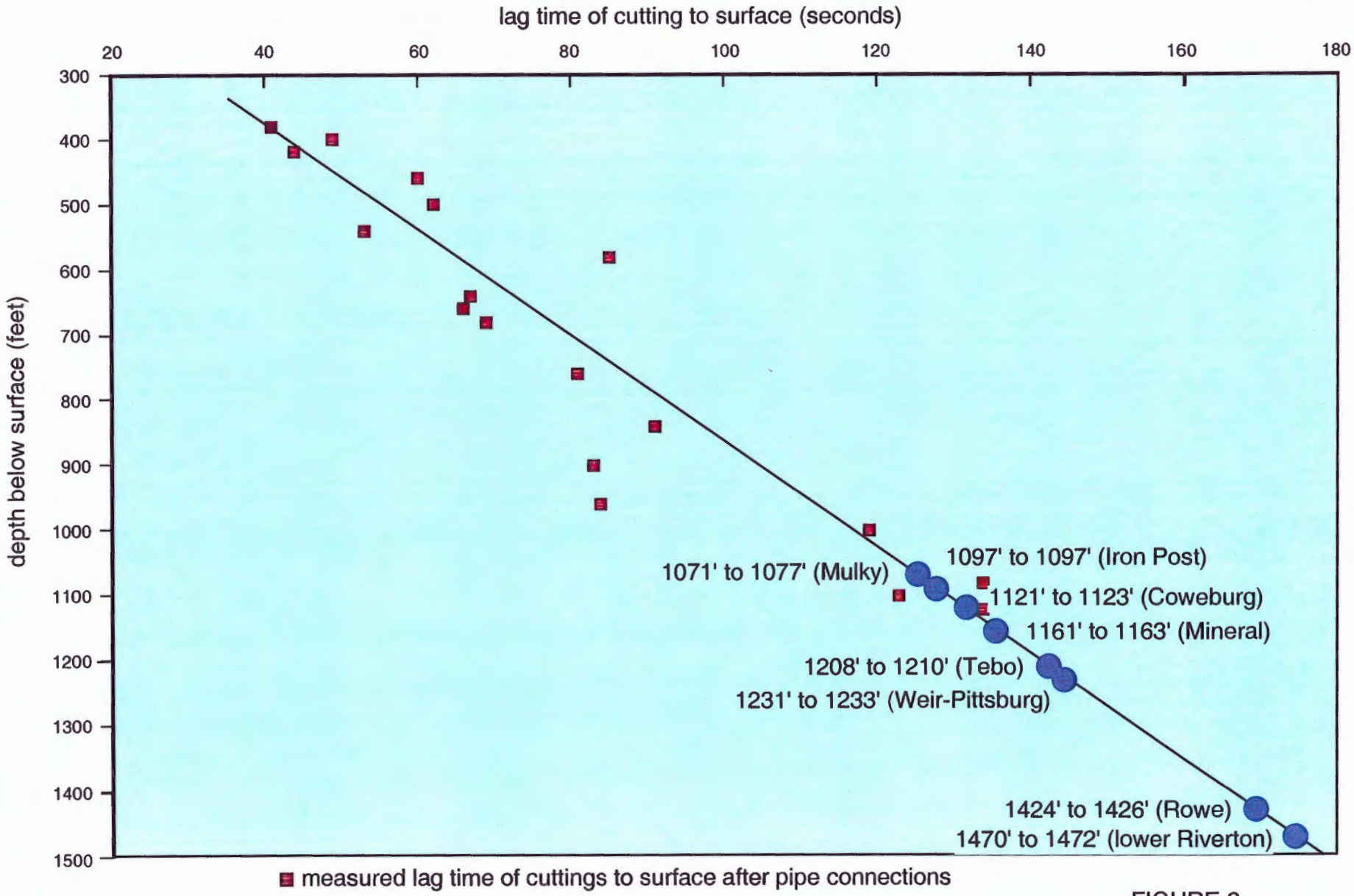
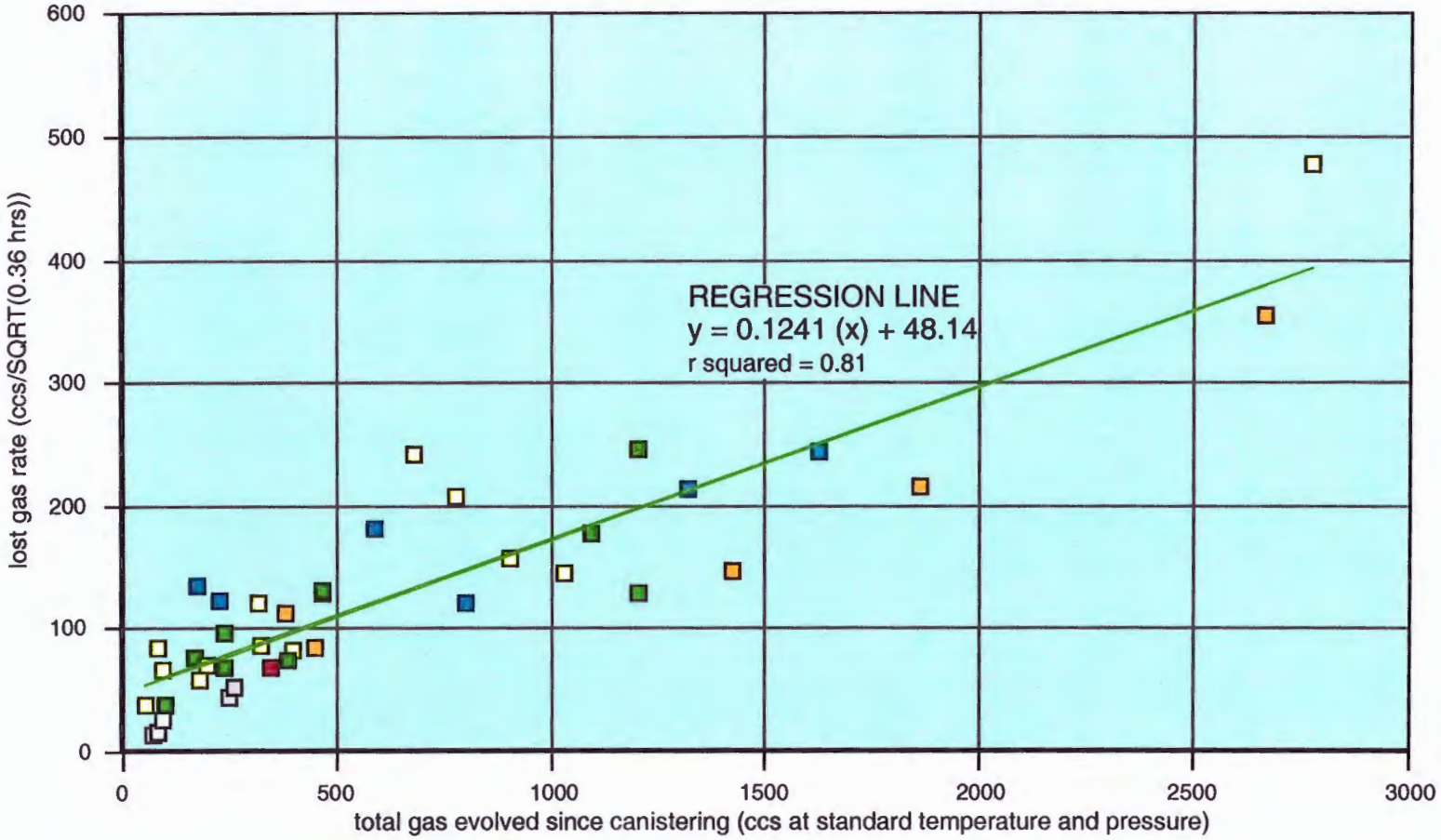
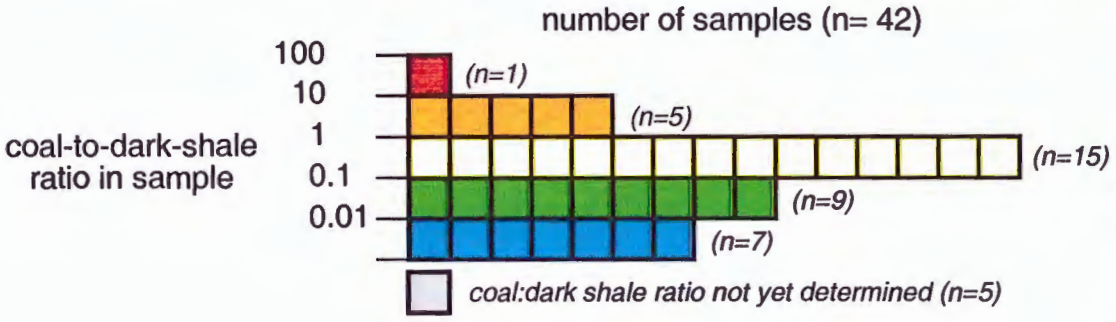


FIGURE 2.

RELATIONSHIP of TOTAL GAS EVOLVED FROM a CUTTINGS SAMPLE to RATE of LOST-GAS
(from 42 cuttings samples from air-drilled wells, Cherokee basin, southeastern Kansas)





LOST-GAS ALGORITHM

ccs lost gas = $\sqrt{X}$ (Y)

where X = bottom-hole to canister time (in hours)
where Y = ccs lost gas at 0.36 hours
(i.e., value Y from regression equation)

FIGURE 3.

Desorption Characteristics of Cuttings Samples

Dart Cherokee Basin #D2-9 J.V. Gordon Trusts, E2 SE SW 9-T.33S.-R.14E., Montgomery County, KS

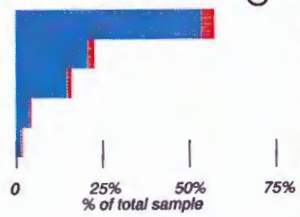
LITHOLOGIC COMPONENT SENSITIVITY ANALYSIS for calculation of Excello Shale at 1071'

$$\text{GAS CONTENT}_{coal} = \frac{\text{total gas desorbed} - ((\text{gas content}_{dark\ shale}) * (\text{weight}_{dark\ shale}))}{\text{weight}_{coal}}$$

total gas desorbed
(including estimated lost gas) = 821.5 ccs

TOTAL DRY WEIGHT OF SAMPLE = 959.87 grams
$\text{weight}_{light\text{-}colored\ lithologies}$ = 67.72 grams (7.6%)
$\text{weight}_{dark\ shale}$ = 892.15 grams (92.9%)
weight_{coal} = 0.00 grams (0.0%)

sieve size	*grams*	*% coal / % dark shale / % light-colored liths*
>0.0930"	543.57	0.00% / 93.61% / 6.39%
>0.0661"	212.68	0.00% / 92.04% / 7.96%
>0.0460"	150.25	0.00% / 92.43% / 7.57%
>0.0331"	38.24	0.00% / 91.67% / 8.33%
<0.0331"	15.12	0.00% / 90.00% / 10.00%
	959.87 TOTAL	



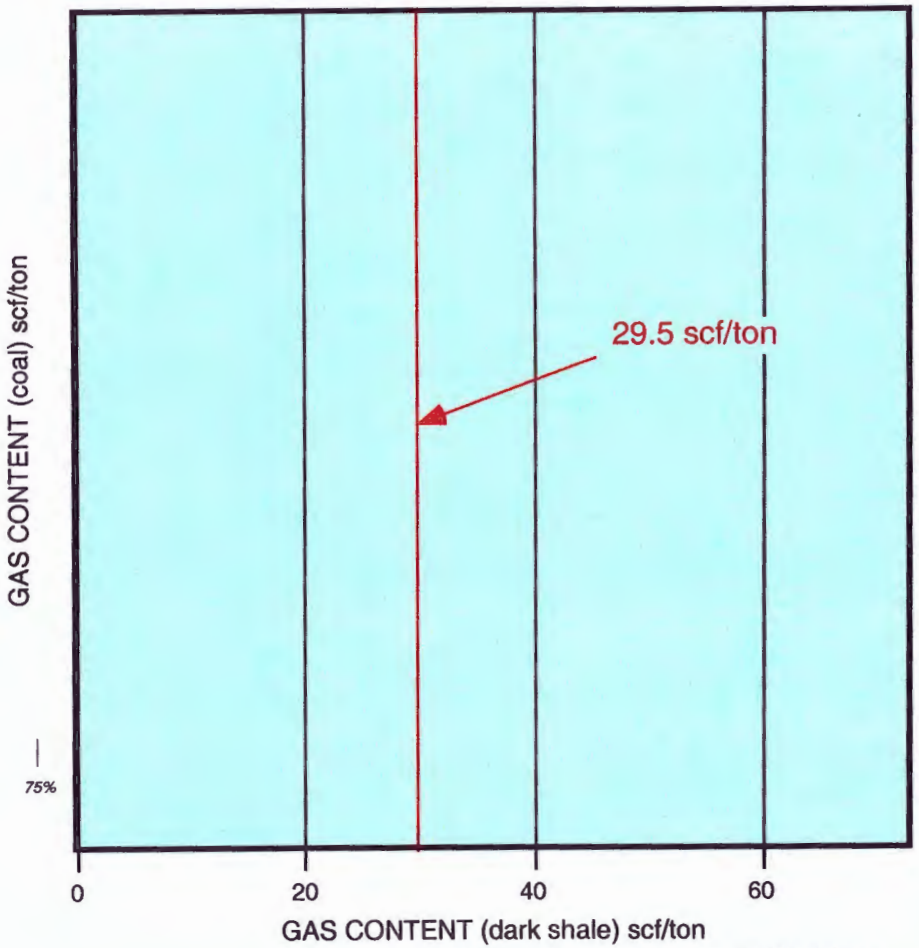


FIGURE 4.

Desorption Characteristics of Cuttings Samples

Dart Cherokee Basin #D2-9 J.V. Gordon Trusts, E2 SE SW 9-T.33S.-R.14E., Montgomery County, KS

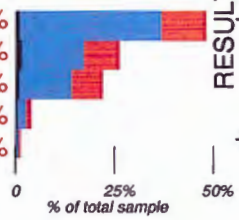
LITHOLOGIC COMPONENT SENSITIVITY ANALYSIS for calculation of gas content of Croweburg coal from 1121'

$$\text{GAS CONTENT}_{coal} = \frac{\text{total gas desorbed} - ((\text{gas content}_{dark\ shale}) * (\text{weight}_{dark\ shale}))}{\text{weight}_{coal}}$$

total gas desorbed
(including estimated lost gas) = 246.7 ccs

TOTAL DRY WEIGHT OF SAMPLE = 517.02 grams
$\text{weight}_{light\text{-}colored\ lithologies}$ = 152.82 grams (29.6%)
$\text{weight}_{dark\ shale}$ = 350.37 grams (67.8%)
weight_{coal} = 13.82 grams (2.7%)

sieve size	*grams*	*% coal / % dark shale / % light-colored liths*
>0.0930"	246.02	1.44% / 75.19% / 23.37%
>0.0661"	133.80	4.74% / 60.46% / 34.80%
>0.0460"	111.91	2.69% / 61.43% / 35.87%
>0.0331"	19.58	3.23% / 62.90% / 35.87%
<0.0331"	5.70	5.00% / 60.00% / 35.00%
	364.20 TOTAL	



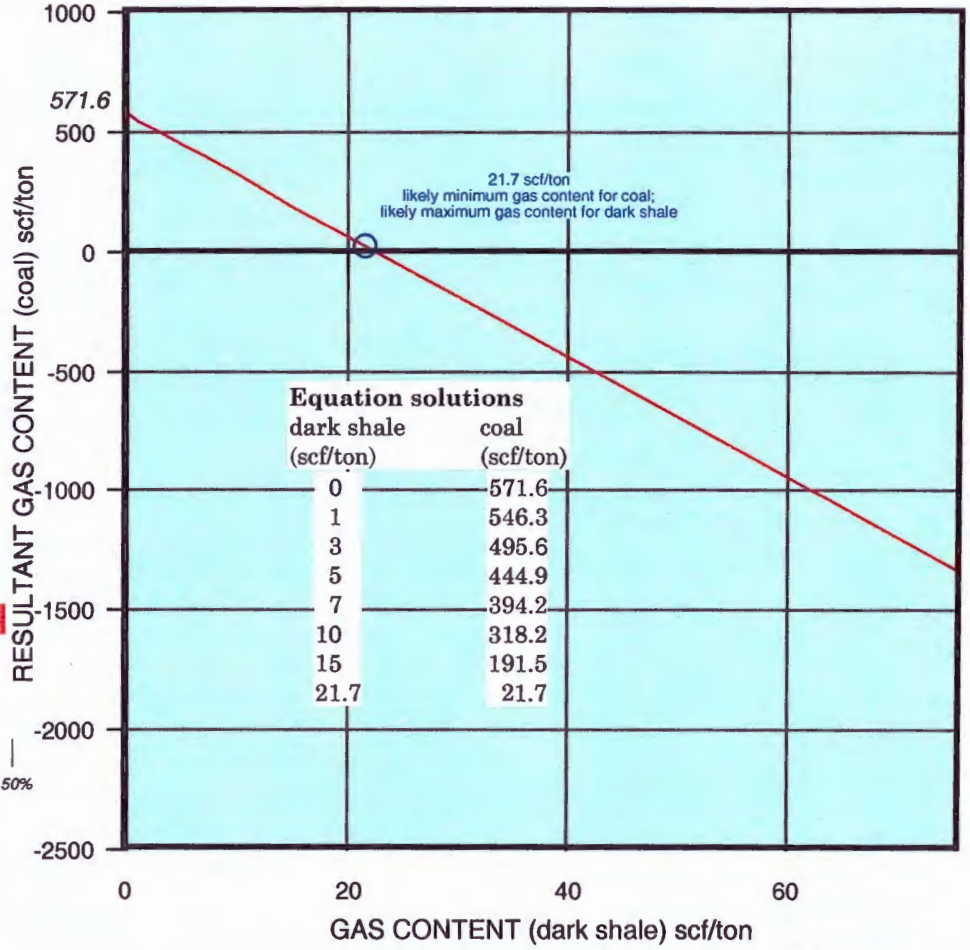


FIGURE 5.

Desorption Characteristics of Cuttings Samples

Dart Cherokee Basin #D2-9 J.V. Gordon Trusts, E2 SE SW 9-T.33S.-R.14E., Montgomery County, KS

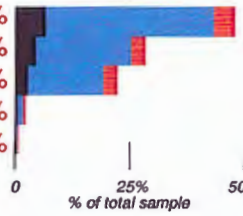
LITHOLOGIC COMPONENT SENSITIVITY ANALYSIS for calculation of gas content of Mineral coal from 1161'

$$\text{GAS CONTENT}_{coal} = \frac{\text{total gas desorbed} - ((\text{gas content}_{dark\ shale}) * (\text{weight}_{dark\ shale}))}{\text{weight}_{coal}}$$

total gas desorbed
(including estimated lost gas) = 158.5 ccs

TOTAL DRY WEIGHT OF SAMPLE = 298.43 grams
$\text{weight}_{light\text{-}colored\ lithologies}$ = 32.93 grams (11.0%)
$\text{weight}_{dark\ shale}$ = 224.50 grams (75.2%)
weight_{coal} = 41.20 grams (13.8%)

sieve size	*grams*	*% coal / % dark shale / % light-colored liths*
>0.0930"	141.10	13.63% / 76.86% / 9.51%
>0.0661"	83.39	15.48% / 73.99% / 10.53%
>0.0460"	65.73	11.74% / 74.65% / 13.62%
>0.0331"	6.40	16.25% / 63.75% / 20.00%
<0.0331"	2.01	15.00% / 60.00% / 25.00%
	298.63 TOTAL	



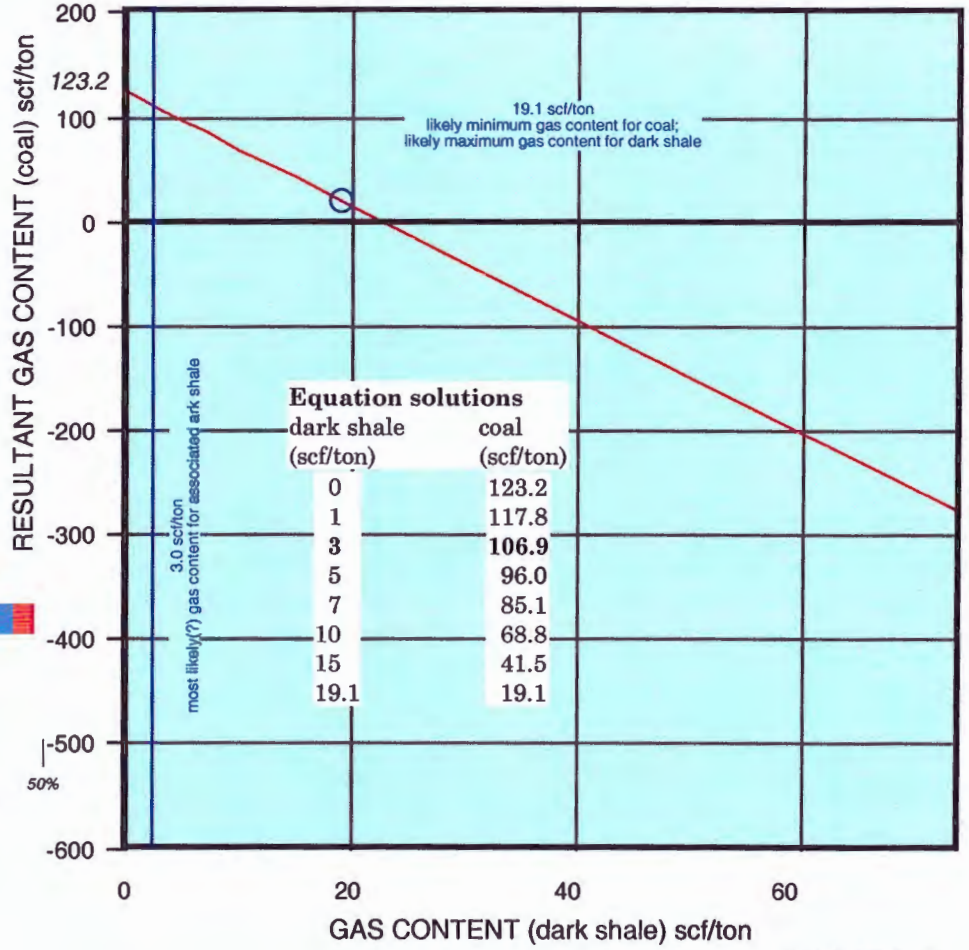


FIGURE 6.

Desorption Characteristics of Cuttings Samples

Dart Cherokee Basin #D2-9 J.V. Gordon Trusts, E2 SE SW 9-T.33S.-R.14E., Montgomery County, KS

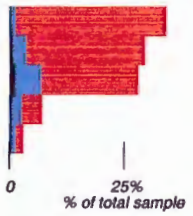
LITHOLOGIC COMPONENT SENSITIVITY ANALYSIS for calculation of gas content of Tebo coal from 1208'

$$\text{GAS CONTENT}_{coal} = \frac{\text{total gas desorbed} - ((\text{gas content}_{dark\ shale}) * (\text{weight}_{dark\ shale}))}{\text{weight}_{coal}}$$

total gas desorbed
(including estimated lost gas) = 52.0 ccs

TOTAL DRY WEIGHT OF SAMPLE = 524.99 grams
$\text{weight}_{light\text{-}colored\ lithologies}$ = 444.80 grams (84.7%)
$\text{weight}_{dark\ shale}$ = 72.96 grams (13.9%)
weight_{coal} = 41.20 grams (1.4%)

sieve size	*grams*	*% coal / % dark shale / % light-colored liths*
>0.0930"	176.25	0.17% / 3.48% / 96.35%
>0.0661"	152.73	1.21% / 10.91% / 87.88%
>0.0460"	145.19	2.92% / 21.57% / 75.51%
>0.0331"	35.96	1.52% / 35.86% / 62.63%
<0.0331"	14.85	2.00% / 40.00% / 58.00%
	524.99 TOTAL	



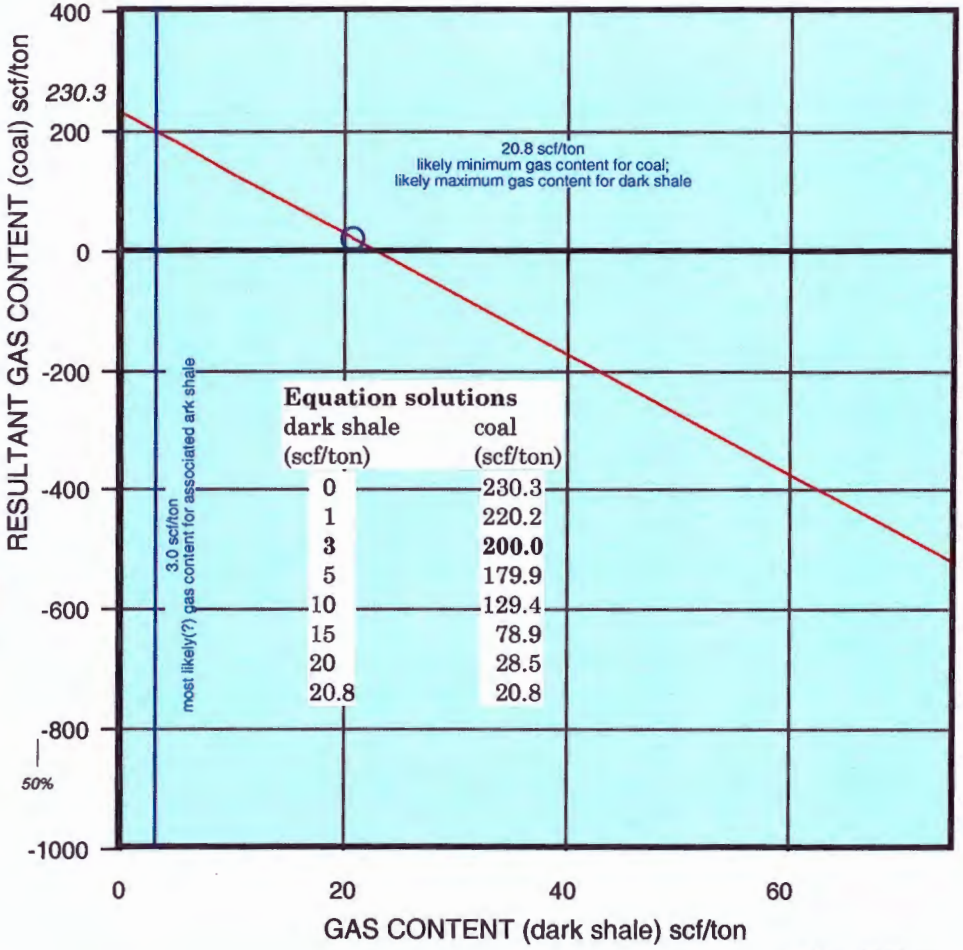


FIGURE 7.

Desorption Characteristics of Cuttings Samples

Dart Cherokee Basin #D2-9 J.V. Gordon Trusts, E2 SE SW 9-T.33S.-R.14E., Montgomery County, KS

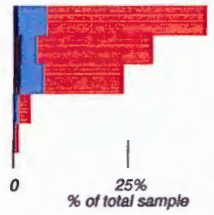
LITHOLOGIC COMPONENT SENSITIVITY ANALYSIS for calculation of gas content of Weir-Pittsburg coal from 1231'

$$\text{GAS CONTENT}_{coal} = \frac{\text{total gas desorbed} - ((\text{gas content}_{dark\ shale}) * (\text{weight}_{dark\ shale}))}{\text{weight}_{coal}}$$

total gas desorbed
(including estimated lost gas) = 116.9 ccs

TOTAL DRY WEIGHT OF SAMPLE = 1027.93 grams
$\text{weight}_{light\text{-}colored\ lithologies}$ = 817.49 grams (79.5%)
$\text{weight}_{dark\ shale}$ = 175.63 grams (17.1%)
weight_{coal} = 34.81 grams (3.4%)

sieve size	*grams*	*% coal / % dark shale / % light-colored liths*
>0.0930"	427.00	1.81% / 15.68% / 82.51%
>0.0661"	309.15	4.66% / 12.48% / 82.85%
>0.0460"	243.71	4.70% / 23.15% / 72.15%
>0.0331"	37.39	1.80% / 27.93% / 70.27%
<0.0331"	10.68	5.00% / 30.00% / 65.00%
	1027.93 TOTAL	



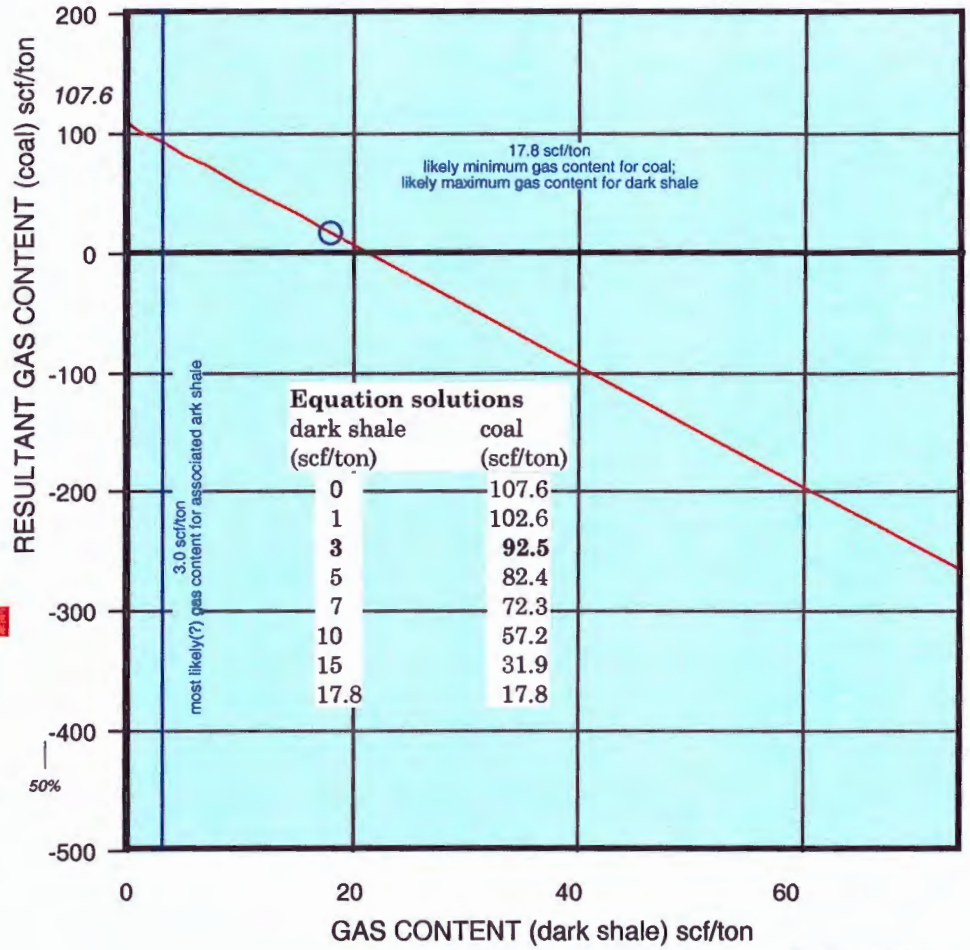


FIGURE 8.

Desorption Characteristics of Cuttings Samples

Dart Cherokee Basin #D2-9 J.V. Gordon Trusts, E2 SE SW 9-T.33S.-R.14E., Montgomery County, KS

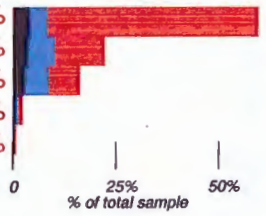
LITHOLOGIC COMPONENT SENSITIVITY ANALYSIS for calculation of gas content of Rowe coal from 1424'

$$\text{GAS CONTENT}_{coal} = \frac{\text{total gas desorbed} - ((\text{gas content}_{\text{dark shale}}) * (\text{weight}_{\text{dark shale}}))}{\text{weight}_{coal}}$$

total gas desorbed
(including estimated lost gas) = 680.2 ccs

TOTAL DRY WEIGHT OF SAMPLE = 1041.07 grams
$\text{weight}_{\text{light-colored lithologies}}$ = 740.13 grams (79.5%)
$\text{weight}_{\text{dark shale}}$ = 203.71 grams (19.6%)
weight_{coal} = 97.22 grams (9.3%)

sieve size	*grams*	*% coal / % dark shale / % light-colored liths*
>0.0930"	614.05	6.20% / 8.06% / 85.74%
>0.0661"	229.06	14.02% / 32.29% / 53.69%
>0.0460"	167.28	14.46% / 39.67% / 45.87%
>0.0331"	23.96	9.09% / 45.45% / 45.45%
<0.0331"	6.72	10.00% / 45.00% / 45.00%
	1041.07 TOTAL	



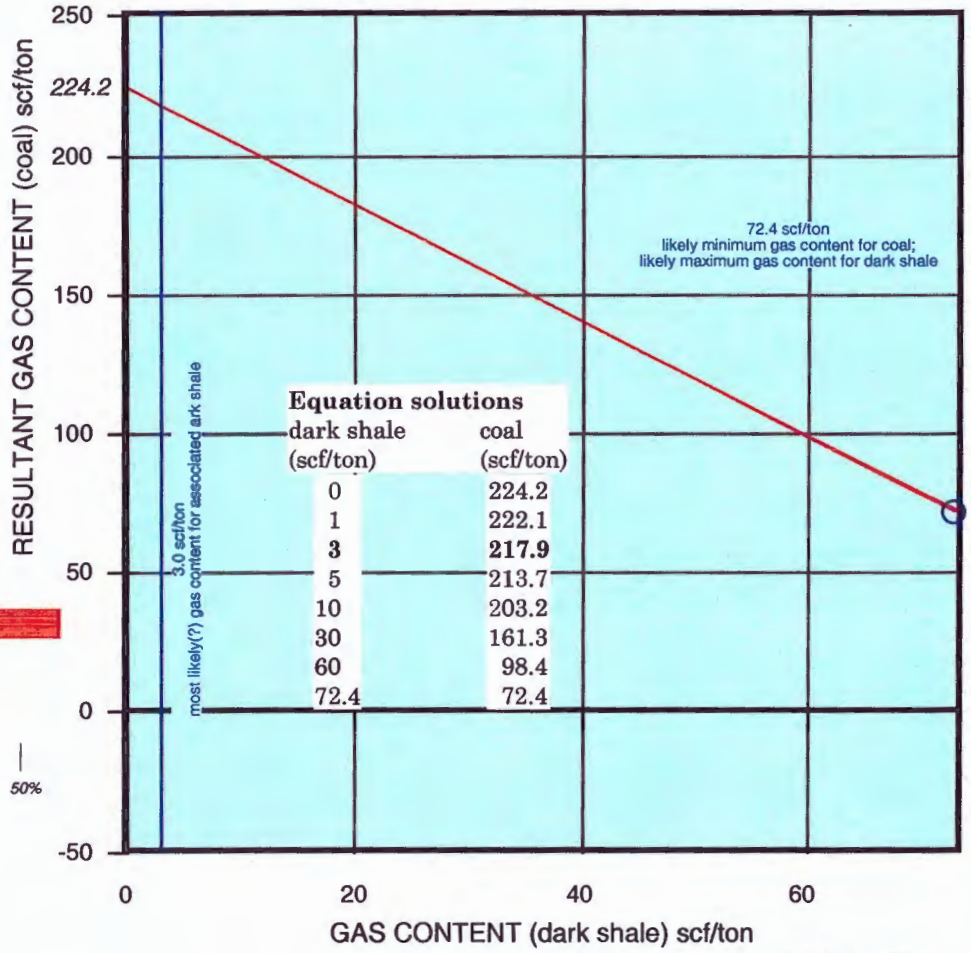


FIGURE 9.

Desorption Characteristics of Cuttings Samples

Dart Cherokee Basin #D2-9 J.V. Gordon Trusts, E2 SE SW 9-T.33S.-R.14E., Montgomery County, KS

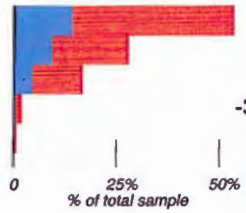
LITHOLOGIC COMPONENT SENSITIVITY ANALYSIS for calculation of gas content of lower Riverton coal from 1470'

$$\text{GAS CONTENT}_{coal} = \frac{\text{total gas desorbed} - ((\text{gas content}_{dark\ shale}) * (\text{weight}_{dark\ shale}))}{\text{weight}_{coal}}$$

total gas desorbed
(including estimated lost gas) = 76.9 ccs

TOTAL DRY WEIGHT OF SAMPLE = 333.20 grams
$\text{weight}_{light\text{-}colored\ lithologies}$ = 236.72 grams (71.0%)
$\text{weight}_{dark\ shale}$ = 93.78 grams (28.2%)
weight_{coal} = 2.70 grams (0.8%)

sieve size	*grams*	*% coal / % dark shale / % light-colored liths*
>0.0930"	176.89	0.85% / 25.98% / 73.17%
>0.0661"	92.24	1.03% / 32.56% / 66.41%
>0.0460"	55.22	0.27% / 27.93% / 71.81%
>0.0331"	6.54	1.16% / 24.42% / 74.42%
<0.0331"	2.30	1.00% / 34.00% / 65.00%
	333.20 TOTAL	



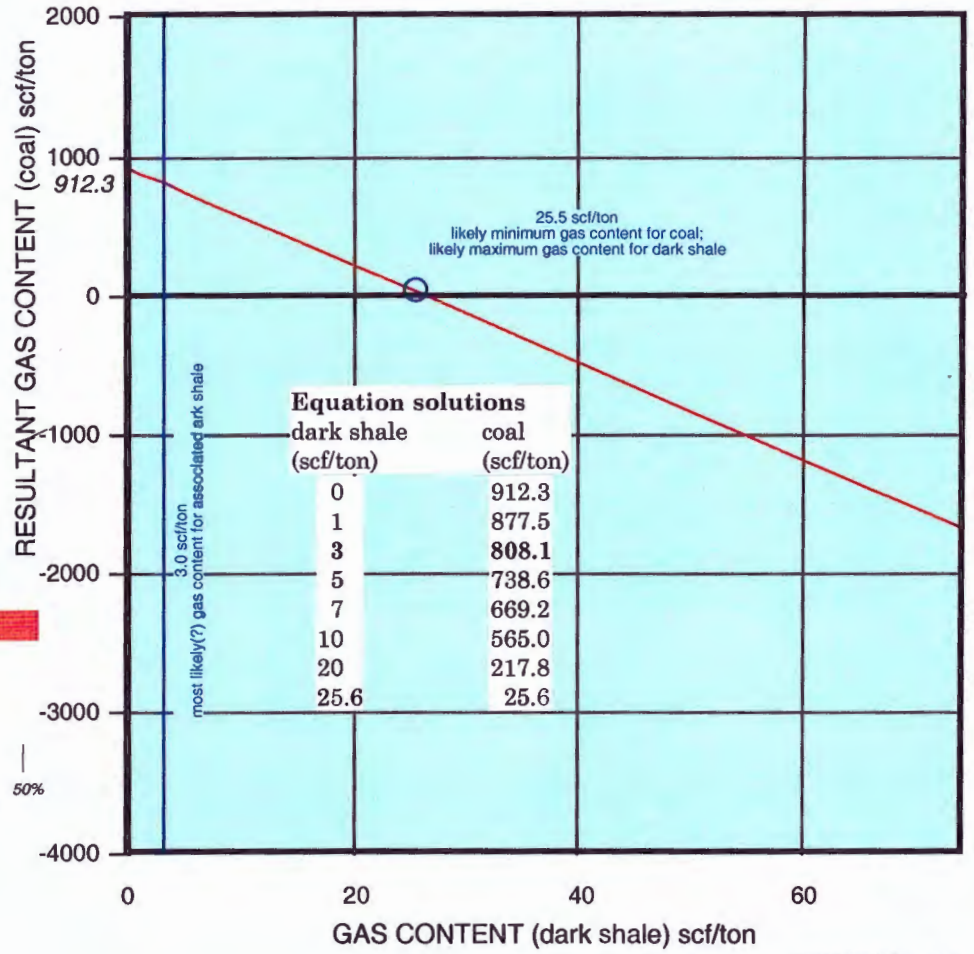


FIGURE 10.

Desorption Characteristics of Cuttings Samples

Dart Cherokee Basin #D2-9 J.V. Gordon Trusts, E2 SE SW 9-T.33S.-R.14E., Montgomery County, KS

300'

400'

500'

600'

700'

800'

900'

1000'

1200'

1300'

1400'

LITHOLOGIC COMPONENT SENSITIVITY ANALYSIS for all samples

UNIT	coal in sample	dk sh in sample	scf/ton w/ shale @ 3 scf/ton	maximum scf/ton	minimum scf/ton
1071' Excello Sh.	0%	93%	----	----	29.5
1097' Iron Post			no valid data		
1121' Croweburg	3%	68%	495.6	571.6	21.7
1161' Mineral	14%	75%	106.9	123.2	19.1
1208' Tebo	1%	14%	200.0	230.3	20.8
1231' Weir-Pitt	3%	17%	92.5	107.6	17.8
1424' Rowe	9%	20%	217.9	224.2	72.4
1470' l. Riverton	<1%	28%	808.1	912.3	25.6

scf/ton w/ shale @ 20 scf/ton

- 1071' Excello Sh.
- 1097' Iron Post
- 1121' Croweburg
- 1161' Mineral
- 1208' Tebo
- 1231' Weir-Pitt
- 1424' Rowe
- 1470' lower Riverton

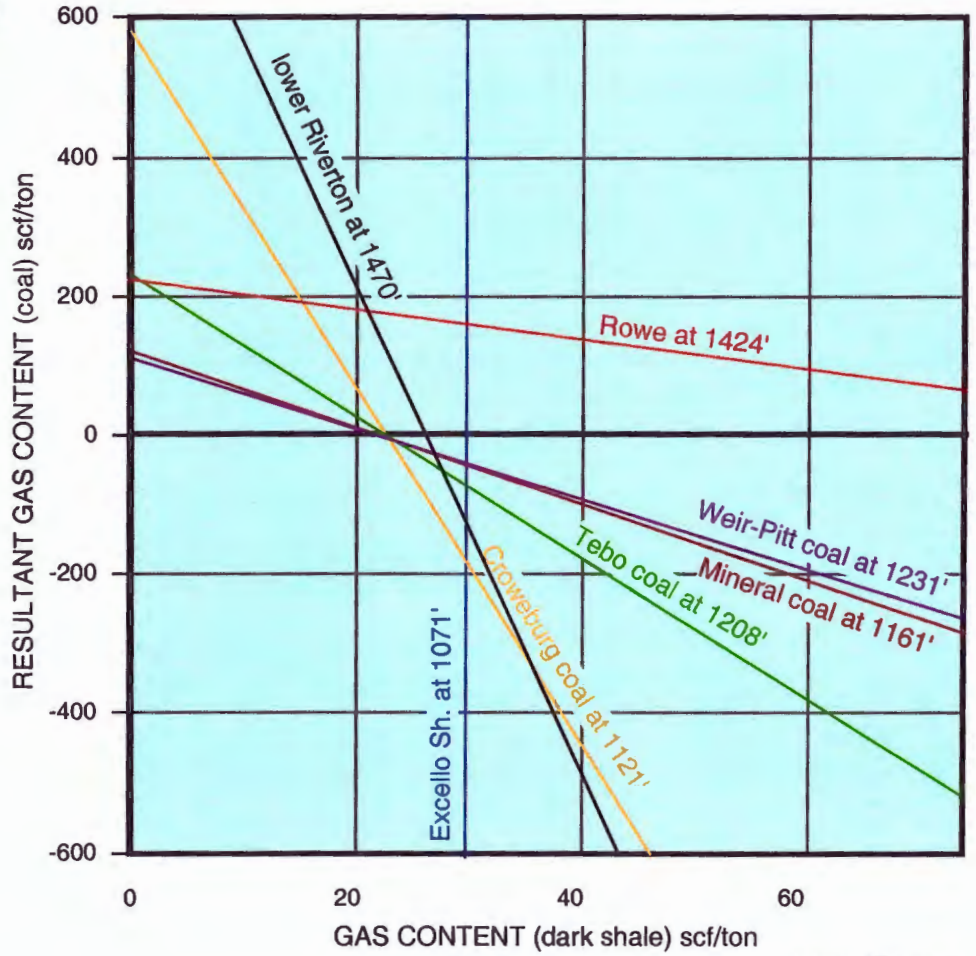


FIGURE 11.