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Methane Emission
From U.S. Coal Mines in 1973,
A Survey

A Supplement to IC 8558



UNITED STATES DEPARTMENT OF THE INTERIOR

Information Circular 8659

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**By M. C. Irani, P. W. Jeran, and Maurice Deul
Pittsburgh Mining and Safety Research Center, Pittsburgh, Pa.**



**UNITED STATES DEPARTMENT OF THE INTERIOR
Rogers C. B. Morton, Secretary**

Jack W. Carlson, Assistant Secretary—Energy and Minerals

**BUREAU OF MINES
Thomas V. Falkie, Director**

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METHANE EMISSION FROM U.S. COAL MINES IN 1973, A SURVEY

A Supplement to IC 8558

by

M. C. Irani,¹ P. W. Jeran,² and Maurice Deul³

ABSTRACT

This Bureau of Mines survey of methane emissions indicates that total daily emissions have declined from 227 MM ft³ in 1971 to 214.7 MM ft³ in 1973. The highest average daily emissions in million cubic feet per day observed in U.S. bituminous coal mines were, in decreasing order, Monongalia County, W. Va., 40.7; Marion County, W. Va., 23.1; Buchanan County, Va., 22.1; Washington County, Pa., 12.4; Greene County, Pa., 11.7; McDowell County, W. Va., 11.4; Cambria County, Pa., 9.8; Jefferson County, Ala., 9.5; Wyoming County, W. Va., 6.0; Marshall County, W. Va., 4.8; and Indiana County, Pa., 4.8.

INTRODUCTION

The presence of methane in the air of coal mines constitutes an explosion hazard with which the Bureau of Mines has been concerned since its establishment in 1910. Darton (1)⁴ reported on the occurrence of explosive gases in coal mines, based on a study begun in 1907 under the supervision of J. A. Holmes, who subsequently became the first director of the Bureau of Mines. His data were obtained from the anthracite fields in Pennsylvania and the southern bituminous fields in Illinois. His specific objective was "to obtain information on the origin of the inflammable gases in coal and the conditions under which they occur."

In recent years the Bureau has been conducting a vigorous and increasingly comprehensive methane control research program. The need for this program is evidenced by the fact that while coal mine fatalities were decreasing in the years from 1965 to 1970, the number of fatalities due to ignitions and explosions in underground coal mines was increasing (9). This is attributed largely to the fact that deeper coalbeds were being mined at faster rates and that more methane was emitted under these conditions.

¹Mining engineer.

²Geologist.

³Supervisory geologist.

⁴Underlined numbers in parentheses refers to the list of references preceding the appendixes.

The extent to which methane gas emission will be a problem in the future, especially in the underground mining of subbituminous coals and lignites, has not yet been established. However, the data presented in this report, which supplements a previous Bureau survey of methane emissions (4), should assist in planning new mine development in the vicinity of operating mines for which methane emission rates are known, and in planning effective methane control procedures.

ACKNOWLEDGMENTS

The authors express their appreciation to the district and subdistrict managers, supervisors, and inspectors of the Mining Enforcement and Safety Administration (MESA), who willingly contributed their time and experience. The successful completion of this study would not have been possible without their cooperation. Further, special credit is due G. L. Hassett and E. M. Burse, who collected and tabulated information from Federal mine inspection reports; M. A. Trevits, who checked the tabulated data included here; and P. J. Scott, who collected and summarized information from other sources.

DATA SOURCES

The data presented in this report were obtained from Federal coal mine inspection reports for 1973, interviews with mine officials, and interviews with Federal mine inspectors. Although the Bureau has 22 continuous-recording methanometers installed at the exhaust fans of 14 mines, the data from these instruments have not been included because they are not available from all mines.

METHANE IN COALBEDS

All coalbeds contain methane. It is formed from plant material by biochemical and bacterial transformations that occur during the peat stage of coal deposition and by subsequent metamorphic processes as buried peat increases in rank to become coal. The fine pore structure of coal and degraded peat makes their sorptive capacities very large, so that much of the methane evolved during coalification is retained in the peat and in the coal. Kim (5) has reported that methane constitutes about 98 percent of the hydrocarbon gases formed in the genesis of coalbeds. Concentrations of other hydrocarbon gases range from 1 to 20 parts per million. These gases include ethylene, propane, propylene, butanes, pentanes, hydrogen, helium, oxygen, and nitrogen. The actual amount of methane retained in the coal depends also on the depth of overburden, the hydrostatic head, and the location of faults and free surfaces.

When a coalbed is mined, the equilibrium conditions change and methane and other gases migrate from the coalbed into the active mine workings. The flow of methane from coal into the mine workings is a two-step process consisting of diffusion and flow through fractures. The importance of diffusion in controlling the emission of methane in mines was examined by defining and calculating an in situ diffusion parameter for a hypothetical unfractured lump of coal in the Pittsburgh and Pocahontas No. 3 coalbeds. The values obtained

are similar to those obtained with lump coal in laboratory experiments. Methane flow and pressure data taken from a mine in the Pocahontas No. 3 coalbed were compared with flow rates from lump coal obtained in laboratory experiments. The results indicated that the main source of gas from the Pocahontas No. 3 coalbed was the coalbed itself (6).

McCulloch (8) has reported that a geologic study of the Lower Kittanning coalbed in central Pennsylvania showed a high methane content in the strata overlying the coalbed. In a methane emission study (7) conducted in 1969 on a longwall section, the average methane emission rate from the coalbed during mining at the face and development of the headings at the tailend of the face was 34 ft³/m over 22 consecutive shifts (7-1/2 days). Subsequent caving of the gassy overlying strata increased the emission to rates ranging from 702 to 1,049 ft³/min. This mine later utilized vertical holes drilled into developing gob to drain methane. These boreholes have removed up to 1 MM ft³/d of methane and reduced the methane content in the immediate returns to less than 1 percent (3).

Methane can be removed from a coalbed before it is mined by drilling vertical holes into the coalbed with subsequent stimulation by hydrofracturing or by horizontal holes drilled into virgin coalbed from large ventilation shafts or specially designed boreholes sunk to the coalbed in advance of mining. The gas from such holes is of pipeline quality, and commercially significant quantities have been produced. Deul estimates the quantity of methane contained in minable coalbeds less than 3,000 feet deep in the conterminous United States at 260 trillion ft³ (2). This is a potential resource, and the production of this gas prior to mining will significantly reduce the daily emissions from coal mines as well as provide additional energy for the Nation.

PRESENTATION OF THE DATA

The data obtained in this study have been summarized in tabular form. The most complete set of data, given in appendix A, comprises a list of 59 bituminous coal mines that produced at least 1 MM ft³/d of methane. This table also includes the identification and thickness of the coalbed, methane emission and coal production rates, ventilation rate, number of mine openings used for ventilation purposes, average shaft depth, and age of mine. The ratio of methane emission to coal production has been taken as a measure of gasiness.

Appendix B lists 178 mines in order of daily gas emission rates from 12.1 to 0.1 MM ft³/d. These mines emitted a total of 214.7 MM ft³/d.

Appendix C presents data by counties for mines with methane emission rates in excess of 100,000 ft³/d. Appendix D is a similar compilation by coalbed, listing the coalbeds with a daily emission rate of 1 MM ft³ or more.

DISCUSSION

In 1973, 276 underground bituminous coal mines in the United States had measurable methane emissions, totaling 216.7 MM ft³/d. Two million cubic feet per day came from 84 mines with emission rates of less than 100,000 ft³/d. The remaining 192 mines are listed in Appendix B in order of daily emission rate. Of these, 59 mines with emission rates of 1 MM ft³/d or more (appendix A) emitted 169.0 MM ft³/d, or 78 percent of the total.

Geographically, the Appalachian area accounted for almost 88 percent of the total emissions. West Virginia had the highest emissions (100.7 MM ft³/d), followed by Pennsylvania (42.0 MM ft³/d), Virginia (27.0 MM ft³/d), Alabama (11.1 MM ft³/d), Ohio (5.7 MM ft³/d), eastern Tennessee (2.6 MM ft³/d), and eastern Kentucky (0.9 MM ft³/d). The only State with significant gas emissions outside the Appalachian area was Illinois with 11.8 MM ft³ (5.4 percent of total).

The Pittsburgh coalbed underlies southwestern Pennsylvania, eastern Ohio, and northern West Virginia. More gas was emitted from mines in this coalbed than any other (99.9 MM ft³/d). The next highest producer was the Pocahontas No. 3 coalbed (34.9 MM ft³/d) which underlies southern West Virginia and northwestern Virginia. Following these two were the Illinois Nos. 5 and 6 coalbeds (11.8 MM ft³/d), the Freeport coalbeds (10.9 MM ft³/d), and the Kittanning coalbeds (10.5 MM ft³/d). All of these accounted for 77.4 percent of the methane emissions.

Comparing data for 1971 and 1973, we find a decline in the number of mines with measurable methane emissions from 430 in 1971 to 276 in 1973. The greatest reduction was in mines producing less than 100,000 ft³/d, which dropped from 231 to 84. The total of the average daily emissions from this group dropped from 4.7 to 2.0 MM ft³/d. Mines producing in excess of 100,000 ft³/d declined both in number and in total emissions, from 199 mines producing 227 MM ft³/d in 1971 to 192 mines producing 214.7 MM ft³/d in 1973.

In recent years several mining companies have begun using vertical boreholes to drain methane from developing gob areas. Methane removed in this way does not enter the ventilation air and cannot be measured at the exhaust fans. There are at present no systematic data available on the amount of methane produced by these boreholes. Based on discussions with mine officials and Federal inspectors, this production is estimated to average 15 MM ft³/d. This would bring the total methane emission from mines producing in excess of 100,000 ft³/d to 229.7 MM ft³/d, or slightly above that reported in 1971.

The present energy situation in the United States makes the daily wasting of large quantities of methane seem tragic. However, since this methane is contained in ventilating air at usually less than 1 percent concentration, its recovery would expend more energy than could be gained. The methane contents of gob degasification boreholes and vertical boreholes drilled into virgin coal are much higher, almost 100 percent in some cases. Methane removed in this way reduces ventilation requirements for mining and becomes a recoverable resource. Based on the emission data for 1973, the Appalachian area, with 88 percent of the total emissions, is the most promising for endeavors of this type.

REFERENCES

1. Darton, N. H. Occurrence of Explosive Gases in Coal Mines. BuMines Bull. 72, 1915, 248 pp.
2. Deul, M. Degasification of Coalbeds - A Commercial Source of Pipeline Gas. American Gas Association (AGA) Monthly, January 1974, 3 pp.
3. Elder, C. H. Use of Vertical Boreholes for Assisting Ventilation of Longwall Gob Areas. BuMines TPR 13, 1969, 6 pp.
4. Irani, M. C., E. D. Thimons, T. G. Bobick, M. Deul, and M. G. Zabetakis. Methane Emissions From U.S. Coal Mines, A Survey. BuMines IC 8558, 1972, 58 pp.
5. Kim, A. G., and L. J. Douglas. Hydrocarbon Gases Produced in a Simulated Swamp Environment. BuMines RI 7690, 1972, 15 pp.
6. Kissell, R. N., and R. J. Bielicki. An In Situ Diffusion Parameter for the Pittsburgh and Pocahontas No. 3 Coalbeds. BuMines RI 7668, 1972, 13 pp.
7. Krickovic, S. and C. Findlay. Methane Emission Rate Studies in a Central Pennsylvania Mine. BuMines RI 7591, 1971, 9 pp.
8. McCulloch, C. M., and M. Deul. Geologic Factors Causing Roof Instability and Methane Emission Problems. The Lower Kittanning Coalbed, Cambria County, Pa. BuMines RI 7769, 1973, 25 pp.
9. Zabetakis, M. G., M. Deul, and M. L. Skow. Methane Control In United States Coal Mines - 1972. BuMines IC 8600, 1973, 22 pp.

APPENDIX A.--CHARACTERISTICS OF U.S. COAL MINES PRODUCING OVER 1 MM FT³/D OF METHANE

Owner, name of mine, and location	Coalbed	Thick-ness of coal-bed, inches	Average methane emis-sion in 24 hr ¹ , MM ft ³	Daily coal produc-tion, tons	Gas per ton of coal mined, cu ft	Air circulated in 24 hr, MM ft ³	Number of drifts, shafts, and slopes	Average depth of shaft ² and slope, feet	Age of mine, years
Allied Chemical Corp.: Shannon Branch mine McDowell County, W. Va.	Pocahontas Nos. 3 and 4.	38-52	1.9	3,500	543	1,328	1 slope 7 shafts	- 700	66
Barnes and Tucker Co.: Lancashire No. 20 mine Cambria County, Pa.	Lower Kittanning	60	1.7	3,600	472	660	2 drifts 1 slope 2 shafts	- - 110	67
Bethlehem Mines Corp.: Bethlehem No. 32 mine Cambria County, Pa.	.....do.....	60	4.2	3,000	1,400	1,008	6 shafts	656 (358-955)	57
Marianna No. 58 mine Cambria County, Pa.	Pittsburgh.....	60	2.3	5,500	418	1,701	9 shafts	399 (385-413)	62
Cambria slope No. 33 Cambria County, Pa.	Lower Kittanning	42	3.0	4,400	682	778	1 slope 4 shafts	- 753 (650-857)	10
Somerset No. 60 mine Washington County, Pa.	Pittsburgh.....	48	1.7	5,200	327	1,423	1 slope 6 shafts	- 605 (450-760)	69
Bishop Coal Co.: Bishop mine McDowell County, W. Va.	Pocahontas Nos. 3, 4, and 5.	48-60	1.5	6,000	250	1,473	10 drifts 3 shafts	- 700	44
Clinchfield Coal Co.: Moss No. 2 mine Russell County, Va.	Tiller	60	2.4	4,000	600	1,000	3 shafts 1 slope	- 650 (100-1,200)	59
Moss No. 3 mine (portal A) Dickenson County, Va.	.....do.....	84-180	1.3	2,100	619	875	3 drifts 1 shaft	- 722 (626-817)	15

Consolidation Coal Co., Blacksville Division:									
Blacksville No. 1 mine Monongalia County, W. Va.	Pittsburgh.....	78	5.2	2,600	2,000	1,120	4 shafts	725 (650-800)	6
Blacksville No. 2 mine Monongalia County, W. Va.	.....do.....	78	5.4	5,000	1,080	1,358	2 shafts	713 (711-716)	4
Consolidation Coal Co., Christopher Coal Co.:									
Humphrey No. 7 mine Monongalia County, W. Va.	.....do.....	90	9.6	12,000	800	2,153	1 drift 6 shafts	- 446 (225-568)	18
Osage No. 3 mine Monongalia County, W. Va.	.....do.....	96	5.1	9,500	537	1,421	1 drift 4 shafts	- 441 (260-623)	57
Arkright mine Monongalia County, Va.	.....do.....	84	7.3	9,000	811	1,695	5 shafts	332	51
Pursglove mine Monongalia County, Va.	.....do.....	96	1.4	4,800	292	938	2 slopes 5 shafts	- 394 (292-496)	55
Consolidation Coal Co., Mountaineer Coal Co.:									
Loveridge mine Marion County, W. Va.	.....do.....	96	12.1	10,000	1,210	2,690	1 slope 5 shafts	- 721	22
Consol No. 20 mine Marion County, W. Va.	.....do.....	84	2.1	4,498	467	935	7 shafts	398 (267-530)	63
Robinson Run No. 95 mine Harrison County, W. Va.	.....do.....	72-92	2.4	12,000	200	1,239	10 drifts 2 shafts	- 300	7
Consolidation Coal Co., Ohio Valley Division:									
Ireland mine Marshall County, W. Va.	Pittsburgh No. 8	62	2.1	10,000	210	1,570	2 slopes 6 shafts	- 370	18
McElroy mine Marshall County, W. Va.	.....do.....	62	1.0	7,400	135	592	2 slopes 1 shaft	- -	3

See footnotes at end of table.

Owner, name of mine, and location	Coalbed	Thick- ness of coal- bed, inches	Average methane emis- sion in 24 hr ¹ , MM ft ³	Daily coal produc- tion, tons	Gas per ton of coal mined, cu ft	Air circulated in 24 hr, MM ft ³	Number of drifts, shafts, and slopes	Average depth of shaft ² and slope, feet	Age of mine, years
Shoemaker mine Marshall County, W. Va.	Pittsburgh No. 8	62	1.0	6,660	150	1,252	1 drift 1 slope 2 shafts	- - 290	7
Consolidation Coal Co., Pittsburgh Coal Co.:									
Montour No. 4 Washington County, Pa.	Pittsburgh.....	52	1.0	8,400	119	1,344	2 slopes 6 shafts	- 145 (92-198)	60
Consolidation Coal Co., Pocahontas Fuel Co. Division:									
Maitland mine McDowell County, W. Va.	Pocahontas Nos. 3 and 4	60	1.1	2,500	440	759	2 shafts	185	5
Eastern Associated Coal Corp.:									
Federal No. 2 Monongalia County, W. Va.	.....do.....	90	6.7	4,700	1,426	1,380	3 shafts	788 (734-842)	6
Federal No. 1 Marion County, W. Va.	.....do.....	82	5.7	7,000	814	1,926	8 shafts	448 (260-637)	31
Joanne mine Marion County, W. Va.	.....do.....	84	1.9	3,760	505	1,114	4 shafts	404 (354-455)	57
Keystone No. 1 mine McDowell County, W. Va.	Pocahontas No. 3	60	1.2	4,200	286	1,857	1 slope 1 drift 7 shafts	- - 700	73
Freeman Coal Mining Corp.:									
Orient No. 3 mine Jefferson County, Ill.	Illinois No. 6	108	1.8	9,670	186	651	2 slopes 3 shafts	- 800	27
Gateway Coal Co.:									
Gateway mine Greene County, Pa.	Pittsburgh.....	84	2.9	6,910	420	1,925	2 slopes 3 shafts	- 375 (50-700)	55

Helvetia Coal Co., Rochester and Pittsburgh Coal Co.:									
Lucerne No. 6 mine Indiana County, Pa.	Upper Freeport	60	1.8	5,600	321	806	1 slope 1 shaft	636 -	6
Inland Steel Co.:									
Inland mine Jefferson County, Ill.	Illinois No. 6	108	1.3	9,994	130	606	2 shafts	750	8
Island Creek Coal Co.:									
Virginia Pocahontas No. 1 mine Buchanan County, Va.	Pocahontas No. 3	54	5.5	4,670	1,178	1,320	3 shafts	1,162 (1,151-1,167)	7
Virginia Pocahontas No. 3 mine Buchanan County, Va.	.....do.....	66	2.5	3,000	833	1,136	3 shafts	1,925 (1,350-2,500)	5
Virginia Pocahontas No. 4 mine Buchanan County, Va.	.....do.....	48	1.4	960	1,458	696	3 shafts	1,316	2
Island Creek Coal Co., Beatrice Pocahontas Co.:									
Beatrice mine Buchanan County, Va.	.....do.....	54	8.5	4,643	1,831	1,425	4 shafts	1,925 (1,350-2,500)	10
Island Creek Coal Co.:									
Virginia Pocahontas No. 2 mine Buchanan County, Va.	.....do.....	48	3.2	1,567	2,042	891	3 shafts	1,925 (1,350-2,500)	6
Island Creek Coal Co., West Kentucky Division:									
Fies mine Hopkins County, Ky.	Kentucky 11....	66	1.2	4,200	286	515	1 slope 3 shafts	- 200	24

See footnoes at end of table.

Owner, name of mine, and location	Coalbed	Thick- ness of coal- bed, inches	Average methane emis- sion in 24 hr ¹ , MM ft ³	Daily coal produc- tion, tons	Gas per ton of coal mined, cu ft	Air circulated in 24 hr, MM ft ³	Number of drifts, shafts, and slopes	Average depth of shaft ² and slope, feet	Age of mine, years
Itmann Coal Co.:									
Itmann No. 3 mine Wyoming County, W. Va.	Pocahontas No. 3.	48	2.2	12,000	183	1,021	2 drifts 2 shafts	- 600	14
Itmann No. 4 mine Wyoming County, W. Va.	Pocahontas No. 4	66	1.4	870	1,599	419	1 shaft	500	8
Jones and Laughlin Steel Corp., Vesta Shannopin Coal Division:									
Shannopin mine Greene County, Pa.	Pittsburgh.....	56	2.5	4,000	625	1,779	10 drifts 5 shafts	- 225 (0-450)	47
Vesta No. 5 mine Washington County, Pa.	.....do.....	84	1.6	2,400	667	1,575	1 slope 7 drifts 6 shafts	- 250 (0-500)	31
Mathies Coal Co.:									
Mathies mine Washington County, Pa.	.....do.....	42	2.1	9,250	227	1,844	1 drift 7 shafts	- 175 (0-350)	30
Mid-Continent Coal and Coke Co.:									
L. S. Wood mine Pitkin County, Colo.	Basin B.....	81	1.4	1,200	1,167	549	6 slopes	0-2,500	9
Dutch Creek mine Pitkin County, Colo.	.....do.....	81	2.1	1,200	1,750	585	6 slopes	0-2,500	18
North American Coal Co., Helen Mining Co.:									
Homer City mine Indiana County, Pa.	Upper Freeport	50	2.0	3,000	667	721	1 slope 1 shaft	- 608	5

Old Ben Coal Co.:										
No. 21 mine Franklin County, Ill.	Illinois No. 6	105	1.2	8,000	150	660	3 shafts	600	13	
Old Ben No. 24 Franklin County, Ill.	.....do.....	100	1.2	9,000	133	572	2 shafts	660	9
Old Ben No. 26 Franklin County, Ill.	.....do.....	102	1.7	8,660	196	706	2 shafts	660	6
Olga Coal Co.:										
Olga mine McDowell County, W. Va.	Pocahontas No. 4.	72	3.0	6,000	500	1,978	13 shafts	800	50	
Peabody Coal Co.:										
Peabody No. 10 mine Christian County, Ill.	Illinois No. 6	104	1.1	20,000	55	1,019	1 slope 3 shafts	- 350	21	
Republic Steel Corp.:										
Clyde mine Washington County, Pa.	Pittsburgh.....	50	1.7	2,843	598	1,123	2 drifts 5 shafts	- 487 (450-525)	35	
United States Steel Corp.:										
Concord No. 1 mine Jefferson County, Ala.	Pratt.....	66-144	5.3	7,000	757	3,475	2 slopes 8 shafts	- 600 (400-800)	27	
Robena mine Greene County, Pa.	Pittsburgh.....	84	4.9	14,295	343	4,565	1 slope 12 shafts	- 556 (445-667)	35	
Sunnyside No. 1 mine Carbon County, Utah	Upper Sunnyside Lower Sunnyside	54-66 } 66-127 }	1.9	4,500	422	217	2 slopes 1 drift 2 shafts	- - 1,250 (500-2,000)	76	
Valley Camp Coal Co.:										
Valley Camp No. 3 mine Ohio County, W. Va.	Pittsburgh No. 8.	63	1.4	4,533	309	643	1 slope 4 shafts	- 471 (350-463-600)	56	

See footnotes at end of table.

Owner, name of mine, and location	Coalbed	Thick- ness of coal- bed, inches	Average methane emis- sion in 24 hr ¹ , MM ft ³	Daily coal produc- tion, tons	Gas per ton of coal mined, cu ft	Air circulated in 24 hr, MM ft ³	Number of drifts, shafts, and slopes	Average depth of shaft ² and slope, feet	Age of mine, years
Volunteer Mining Corp.:									
Volunteer No. 1 mine Anderson County, Tenn.	Deal.....	72	2.5	1,000	2,500	156	4 drifts	-	5
Westmoreland Coal Co.:									
Hampton No. 3 mine Boone County, W. Va.	Cedar Grove....	42-90	1.4	2,200	636	553	1 drift 3 slopes 3 shafts	- - 450	19
Woodward Co., Division of Mead Corp.:									
Mulga mine Jefferson County, Ala.	Pratt.....	70	2.0	6,300	317	1,892	5 slopes 8 shafts	- 425 (300-550)	73
Youghiogeny and Ohio Coal Co.:									
Nelms No. 1 mine Harrison County, Ohio	6 A.....	36-120	2.0	4,500	444	641	4 shafts	450	43

¹Emissions from exhaust shafts only.

²Items in parentheses indicate range of depth of shaft(s) given in preceding column.

APPENDIX B.--MEASURED METHANE EMISSION FROM COAL MINES OF THE UNITED
STATES WITH AN EMISSION RATE OF AT LEAST 100,000 FT³/D.

<u>Mine, owner, and location of mine</u>	<u>Average methane emission</u> <u>MM ft³/d</u>
Loveridge mine Consolidation Coal Co. Marion County, W. Va.	12.1
Humphrey No. 7 mine Consolidation Coal Co. Monongalia County, W. Va.	9.6
Beatrice mine Island Creek Coal Co. Buchanan County, Va.	8.5
Arkrighr mine Consolidation Coal Co. Monongalia County, W. Va.	7.3
Federal No. 2 mine Eastern Associated Coal Corp. Monongalia County, W. Va.	6.7
Federal No. 1 mine Eastern Associated Coal Corp. Marion County, W. Va.	5.7
Virginia Pocahontas No. 1 mine Island Creek Coal Co. Buchanan County, Va.	5.5
Blacksville No. 2 mine Consolidation Coal Co. Monongalia County, W. Va.	5.4
Concord No. 1 mine United States Steel Corp. Jefferson County, Ala.	5.3
Blacksville No. 1 mine Consolidation Coal Co. Monongalia County, W. Va.	5.2
Osage No. 3 mine Consolidation Coal Co. Monongalia County, W. Va.	5.1

<u>Mine, owner, and location of mine</u>	<u>Average methane emission</u> <u>MM ft³/d</u>
Robena mine United States Steel Corp. Green County, Pa.	4.9
Bethlehem No. 32 mine Bethlehem Mines Corp. Cambria County, Pa.	4.2
Virginia Pocahontas No. 2 mine Island Creek Coal Co. Buchanan County, Va.	3.2
Cambria Slope No. 33 mine Bethlehem Mines Corp. Cambria County, Pa.	3.0
Olga mine Olga Coal Co. McDowell County, W. Va.	3.0
Gateway mine Gateway Coal Corp. Greene County, Pa.	2.9
Shannopin mine Jones & Laughlin Steel Corp. Green County, Pa.	2.5
Virginia Pocahontas No. 3 mine Island Creek Coal Co. Buchanan County, Va.	2.5
Volunteer No. 1 mine Volunteer Mining Co. Rosedale, Tenn.	2.5
Moss No. 2 mine Clinchfield Coal Co. Russell County, Va.	2.4
Robinson Run No. 95 mine Consolidation Coal Co. Harrison County, W. Va.	2.4
Marianna No. 58 mine Bethlehem Mines Corp. Washington County, Pa.	2.3

<u>Mine, owner, and location of mine</u>	<u>Average methane emission</u> <u>MM ft³/d</u>
Itmann No. 3 mine Itmann Coal Co. Wyoming County, W. Va.	2.2
Consol No. 20 mine Consolidation Coal Corp. Marion County, W. Va.	2.1
Dutch Creek mine Mid-Continent Coal & Coke Co. Pitkin County, Colo.	2.1
Ireland mine Consolidation Coal Co. Marshall County, W. Va.	2.1
Mathies mine Mathies Coal Corp. Washington County, Pa.	2.1
Homer City mine Helen Mining Co. Indiana County, Pa.	2.0
Mulga mine Woodward Co. (Division of Mead Corp.) Jefferson County, Ala.	2.0
Nelms No. 1 mine Youghiogheny & Ohio Coal Co. Harrison County, Ohio	2.0
Joanne mine Eastern Associated Coal Co. Marion County, W. Va.	1.9
Shannon Branch mine Allied Chemical Corp. McDowell County, W. Va.	1.9
Sunnyside No. 1 mine Kaiser Steel Corp. Carbon County, Utah	1.9
Lucerne No. 6 mine Helvetia Coal Co. Indiana County, Pa.	1.8

<u>Mine, owner, and location of mine</u>	<u>Average methane emission</u> <u>MM ft³/d</u>
Orient No. 3 mine Freeman Coal Mining Corp. Jefferson County, Ill.	1.8
Clyde mine Republic Steel Corp. Washington County, Pa.	1.7
Old Ben No. 26 mine Old Ben Coal Co. Franklin County, Ill.	1.7
Lancashire No. 20 mine Barnes & Tucker Co. Cambria County, Pa.	1.7
Somerset mine No. 60 Bethlehem Mines Corp. Washington County, Pa.	1.7
Vesta No. 5 mine Jones & Laughlin Steel Corp. Washington County, Pa.	1.6
Bishop mine Bishop Coal Co. McDowell County, W. Va.	1.5
Hampton No. 3 mine Westmoreland Coal Co. Boone County, W. Va.	1.4
Itmann No. 4 mine Itmann Coal Co. Wyoming County, W. Va.	1.4
Virginia Pocahontas No. 4 mine Island Creek Coal Co. Buchanan County, Va.	1.4
Valley Camp No. 3 mine Valley Camp Coal Corp. Ohio County, W. Va.	1.4
L. S. Wood mine Mid-Continent Coal Co. Pitkin County, Colo.	1.4

<u>Mine, owner, and location of mine</u>	<u>Average methane emission</u> <u>MM ft³/d</u>
Pursglove mine Consolidation Coal Co. Monongalia County, W. Va.	1.4
Inland mine Inland Steel Co. Jefferson County, Ill.	1.3
Moss No. 3 portal A Clinchfield Coal Co. Dickenson County, Va.	1.3
Fies mine Island Creek Coal Co. Hopkins County, Ky.	1.2
Keystone No. 1 mine Eastern Associated Coal Co. McDowell County, W. Va.	1.2
Old Ben No. 24 mine Old Ben Coal Co. Franklin County, Ill.	1.2
Old Ben No. 21 mine Old Ben Coal Co. Franklin County, Ill.	1.2
Peabody No. 10 mine Peabody Coal Co. Christian County, Ill.	1.1
Maitland mine Pocahontas Fuel Co. (Division of Consolidation Coal Corp.) McDowell County, W. Va.	1.1
McElroy mine Consolidation Coal Co. Marshall County, W. Va.	1.0
Montour No. 4 mine Consolidation Coal Co. Washington County, Pa.	1.0
Shoemaker mine Consolidation Coal Corp. Marshall County, W. Va.	1.0

<u>Mine, owner, and location of mine</u>	<u>Average methane emission</u> <u>MM ft³/d</u>
Bessie mine United States Pipe and Foundry Co. Jefferson County, Ala.	0.9
Maple Creek mine United States Steel Corp. Washington County, Pa.	.9
United States Steel No. 2 mine United States Steel Corp. McDowell County, W. Va.	.9
United States Steel No. 14 mine United States Steel Corp. Mc Dowell County, W. Va.	.9
Kepler mine Consolidation Coal Corp. Wyoming County, W. Va.	.8
Consol No. 93 mine Consolidation Coal Corp. Marion County, W. Va.	.8
Orient No. 6 mine Freeman Coal Corp. Jefferson County, Ill.	.8
Segco No. 1 mine Southern Electric Generating Co. Walker County, Ala.	.8
Alexander mine Valley Camp Coal Co. Marshall County, W. Va.	.7
Flat Top mine United States Pipe and Foundry Co. Jefferson County, Ala.	.7
Kennilworth mine North American Coal Corp. Carbon County, Utah	.7
Keystone No. 2 mine Eastern Associated Coal Corp. Wyoming County, W. Va.	.7

<u>Mine, owner, and location of mine</u>	<u>Average methane emission</u> <u>MM ft³/d</u>
Lady Dunn No. 105 mine Cannellton Coal Co. Kanawha County, W. Va.	0.7
Nelms No. 2 mine Youghiogheny & Ohio Coal Co. Harrison County, Ohio	.7
No. 1 Cedar Grove mine Boone County Coal Corp. Logan County, W. Va.	.7
Renton mine Consolidation Coal Corp. Allegheny County, Pa.	.7
Slab Fork No. 10 mine Slab Fork Coal Co. Raleigh County, W. Va.	.7
Cedar Grove No. 1 mine Zapata Coal Co. Boone County, W. Va.	.6
Lambert Fork mine Clinchfield Coal Co. Buchanan County, Va.	.6
Mary Lee No. 1 mine Alabama By Products Corp. Walker County, Ala.	.6
Newfield mine Republic Steel Corp. Allegheny County, Pa.	.6
Warwick portal 3 Duquesne Light Co. Greene County, Pa.	.6
Bethlehem No. 41 mine Bethlehem Mines Corp. Marion County, W. Va.	.5
Bethlehem No. 51 mines Bethlehem Mines Corp. Washington County, Pa.	.5

<u>Mine, owner, and location of mine</u>	<u>Average methane emission</u> <u>MM ft³/d</u>
Crescent mine Island Creek Coal Co. Muhlenberg County, Ky.	0.5
Macalpin mine Westmoreland Coal Co. Raleigh County, W. Va.	.5
Marion mine Tunnellton Mining Co. Indiana County, Pa.	.5
Mars No. 2 mine Clinchfield Coal Co. Harrison County, W. Va.	.5
Monterey No. 1 mine Monterey Coal Corp. Macoupin County, Ill.	.5
Morton mine Carbon Fuel Co. Kanawha County, W. Va.	.5
Murdock mine Ziegler Coal Co. Douglas County, Ill.	.5
Nemacolin mine Buckeye Coal Co. Greene County, Pa.	.5
Newhall No. 6 mine Consolidation Coal Co. McDowell County, W. Va.	.5
Powhatan No. 1 mine North American Coal Corp. Belmont County, Ohio	.5
Powhatan No. 4 mine North American Coal Corp. Belmont County, Ohio	.5
Ross Valley No. 6 mine Consolidation Coal Co. Harrison County, Ohio	.5

<u>Mine, owner, and location of mine</u>	<u>Average methane emission MM ft³/d</u>
Westland mine Pittsburgh Coal Co. Washington County, Pa.	0.5
Wolf Creek mine Wolf Creek Collieries Martin County, Ky.	.5
Banning No. 4 mine Republic Steel Corp. Westmoreland County, Pa.	.4
Beckley mine Beckley Coal Mining Co. Raleigh County, W. Va.	.4
Chetopa mine Alabama By Products Corp. Jefferson County, Ala.	.4
Choctaw coal facility Kerr-McGee Corp. Haskell County, Okla.	.4
Compass No. 2 mine Clinchfield Coal Corp. Harrison County, W. Va.	.4
Hampton No. 4 mine Westmoreland Coal Co. Boone County, W. Va.	.4
Jane 1 and 2 mine Rochester & Pittsburgh Coal Co. Armstrong County, Pa.	.4
Lancashire No. 24 mine Barnes and Tucker Coal Co. Indiana County, Pa.	.4
Powhatan No. 3 mine North American Coal Corp. Belmont County, Ohio	.4
Scotia mine Scotia Coal Co. Letcher County, Ky.	.4

<u>Mine, owner, and location of mine</u>	<u>Average methane emission</u> <u>MM ft³/d</u>
Seaboard No. 1 mine Jewell Ridge Coal Co. Buchanan County, Va.	0.4
Slab Fork No. 8 mine Slab Fork Coal Co. Raleigh County, W. Va.	.4
Somerset mine United States Steel Corp. Gunnison County, Colo.	.4
United States Steel No. 50 mine United States Steel Corp. Wyoming County, W. Va.	.4
Ziegler No. 4 mine Bell & Zoller Co. Williamson County, Ill.	.4
Ziegler No. 9 mine Ziegler Coal Co. Hopkins County, Ky.	.4
Allen mine C. F. & L. Steel Corp. Las Animas County, Colo.	.3
Badger No. 14 mine Badger Coal Corp. Barbour County, W. Va.	.3
Bethlehem No. 77 mine Bethlehem Mines Corp. Cambria County, Pa.	.3
Bird No. 2 mine Island Creek Coal Co. Somerset County, Pa.	.3
Bird No. 3 mine Island Creek Coal Co. Cambria County, Pa.	.3
Dehue mine Youngstown Mines Corp. Logan County, W. Va.	.3

<u>Mine, owner, and location of mine</u>	<u>Average methane emission</u> <u>MM ft³/d</u>
Dotiki mine Webster Coal Corp. Webster County, Ky.	0.3
Eagle No. 1 mine Peabody Coal Co. Gallatin County, Ill.	.3
Eccles No. 5 mine Westmoreland Coal Co. Raleigh County, W. Va.	.3
Guyan No. 5 mine Island Creek Coal Co. Logan County, W. Va.	.3
Hamilton No. 1 mine Island Creek Coal Co. Union County, Ky.	.3
Jensie mine North American Coal Corp. Jefferson County, Ohio	.3
Keystone No. 4 mine Eastern Associated Coal Corp. Raleigh County, W. Va.	.3
Keystone No. 4 A mine Eastern Associated Coal Corp. Raleigh County, W. Va.	.3
Kings mine Kings Station Coal Corp. Gibson County, Ind.	.3
Moss No. 3 mine, portal C Clinchfield Coal Corp. Dickenson County, Va.	.3
Orient No. 4 mine Freeman Coal Co. Williamson County, Ill.	.3
Peabody Camp No. 2 mine Peabody Coal Co. Union County, Ky.	.3

<u>Mine, owner, and location of mine</u>	<u>Average methane emission</u> <u>MM ft³/d</u>
Prescott No. 2 mine Freeman Coal Mining Corp. Wise County, Va.	0.3
Pyro No. 2 mine Pyro Mining Co. Union County, Ky.	.3
Retiki mine Henderson County Coal Corp. Henderson County, Ky.	.3
Sunnyside No. 3 mine Kaiser Steel Corp. Carbon County, Utah	.3
Warwick No. 2 mine Duquesne Light Co. Greene County, Pa.	.3
Ken No. 4 mine Peabody Coal Co. Ohio County, Ky.	.2
Madison No. 1 mine Kanawha Coal Co. Kanawha County, W. Va.	.2
Maxine mine Alabama By Products, Jefferson County, Ala.	.2
Moss No. 3 mine, portal D Clinchfield Coal Co. Dickenson County, Va.	.2
National No. 25 mine National Coal Mining Co. Mingo County, W. Va.	.2
Oak Park No. 7 mine Hanna Coal Co. Harrison County, Ohio	.2
Powhattan No. 5 mine North American Coal Corp. Belmont County, Ohio	.2

<u>Mine, owner, and location of mine</u>	<u>Average methane emission</u> <u>MM ft³/d</u>
Providence No. 1 mine Island Creek Coal Co. Hopkins County, Ky.	0.2
Sahara No. 21 mine Sahara Coal Co. Saline County, Ill.	.2
Siltix mine The New River Co. Fayette County, W. Va.	.2
Soldier Canyon mine Premium Coal Co. Carbon County, Utah	.2
Valley Camp No. 1 mine Valley Camp Coal Co. Ohio County, W. Va.	.2
Williams mine Mountaineer Coal Co. Harrison County, W. Va.	.2
Allison mine Youghigheny & Ohio Coal Co. Belmont County, Ohio	.2
Bethlehem No. 31 mine Bethlehem Mines Corp. Cambria County, Pa.	.2
Cannellton No. 3 and 4 mine Cannellton Coal Corp. McDowell County, W. Va.	.2
Cannellton No. 8 mine Cannellton Coal Corp. Kanawha County, W. Va.	.2
Chaney Creek No. 2 mine Clinchfield Coal Co. Russell County, Va.	.2
David mine Canterbury Coal Co. Armstrong County, Pa.	.2

<u>Mine, owner, and location of mine</u>	<u>Average methane emission</u> <u>MM ft³/d</u>
Eagle No. 2 mine Peabody Coal Co. Gallatin County, Ill.	0.2
East Gulf mine Winding Gulf Coal, Inc. Raleigh County, W. Va.	.2
Gorgas No. 7 mine Alabama Power Co. Walker County, Ala.	.2
Harmar mine Harmar Coal Co. Allegheny County, Pa.	.2
Hurricane Creek mine Clinchfield Coal Co. Russell County, Va.	.2
Isabella mine National Mines Corp. Fayette County, Pa.	.2
Island Creek No. 9 mine Island Creek Coal Co. Hopkins County, Ky.	.2
Itmann No. 1 mine Itmann Coal Co. Wyoming County, W. Va.	.2
Harris No. 1 mine Eastern Associated Coal Corp. Boone County, W. Va.	.1
Hillsboro mine Traux-Traer Coal Co. Montgomery County, Ill.	.1
Lancashire No. 25 mine Barnes & Tucker Co. Cambria County, Pa.	.1
Matthews mine Consolidation coal Co. Clearborne County, Tenn.	.1

<u>Mine, owner, and location of mine</u>	<u>Average methane emission</u> <u>MM ft³/d</u>
Oakmont mine Harmar Coal Co. Allegheny County, Pa.	0.1
Otsego mine Westmoreland Coal Co. Wyoming County, W. Va.	.1
Paragon mine Amherst Coal Co. Logan County, W. Va.	.1
Peabody Camp No. 1 mine Peabody Coal Co. Union County, Ky.	.1
Pocahontas No. 7 mine Pocahontas Fuel Co. McDowell County, W. Va.	.1
Powhatan No. 6 mine (Quarto) North American Coal Corp. Belmont County, Ohio	.1
River King underground mine Peabody Mining Co. St. Clair County, Ill.	.1
River Queen underground mine Peabody Mining Co. Muhlenberg County, Ky.	.1
Saginaw No. 1 mine Oglebay Norton Co. Belmont County, Ohio	.1
Adrian mine Upshur Coal Co., Ltd. Upshur County, W. Va.	.1
Bear mine Bear Coal Co. Gunnison County, Colo.	.1
Beech Bottom mine Windsor Power House Coal Co. Brooke County, W. Va.	.1

<u>Mine, owner, and location of mine</u>	<u>Average methane emission</u> <u>MM ft³/d</u>
Bishop 33 and 37 mine Bishop Coal Co. McDowell County, W. Va.	0.3
Buckeye colliery Pocahontas Fuel Co. Wyoming County, W. Va.	.1
Carbon No. 2 mine Carbon Fuel Co. Carbon County, Utah	.1
Delmont mine Eastern Associated Coal Corp. Westmoreland County, Pa.	.1
Florence No. 2 mine Florence Mining Co. Indiana County, Pa.	.1
Gaston No. 2 mine Slab Fork Coal Co. Wyoming County, W. Va.	.1
Hamilton No. 2 mine Island Creek Coal Co. Union County, Ky.	.1
Harold No. 1 mine Allegheny River Mining Co. Armstrong County, Pa.	.1
Sahara No. 20 mine Sahara Coal., Inc. Saline County, Ill.	.1
Star underground mine Peabody Coal Co. Muhlenberg County, Ky.	.1
Vesta No. 4 mine Jones & Laughlin Steel Corp. Washington County, Pa.	.1
Winding Gulf No. 4 mine Westmoreland Coal Co. Raleigh County, W. Va.	.1

<u>Mine, owner, and location of mine</u>	<u>Average methane emission</u> <u>MM ft³/d</u>
York Canyon mine Kaiser Steel Corp. Colfax County, N. Mex.	0.1

APPENDIX C.--METHANE EMISSION IN RELATION TO COUNTIES FROM MINES
EMITTING AT LEAST 100,000 FT³/D FROM EACH BED

State and mine	County	Average methane emission, MM ft ³ /d
Alabama:		
Concord No. 1.....	Jefferson.....	5.3
Mulga.....	.....do.....	2.0
Bessie.....	.....do.....	.9
Flat Top.....	.....do.....	.7
Chetopa.....	.....do.....	.4
Maxine.....	.....do.....	.2
Total.....	-	9.5
Segco No. 1.....	Walker.....	.8
Mary Lee No. 1.....	.....do.....	.6
Gorgas No. 7.....	.....do.....	.2
Total.....	-	1.6
Total Alabama.....	-	11.1
Colorado:		
Somerset.....	Gunnison.....	.4
Bear.....	.....do.....	.1
Total.....	-	.5
Allen.....	Las Animas.....	.3
Dutch Creek.....	Pitkin.....	2.1
L. S. Wood.....	.....do.....	1.4
Total.....	-	3.5
Total Colorado.....	-	4.3
Illinois:		
Peabody No. 10.....	Christian.....	1.1
Murdock.....	Douglas.....	.5
Old Ben No. 26.....	Franklin.....	1.7
Old Ben No. 21.....	.....do.....	1.2
Old Ben no. 24.....	.....do.....	1.2
Total.....	-	4.1
Eagle No. 1.....	Gallatin.....	.3
Eagle No. 2.....	.....do.....	.2
Total.....	-	.5
Orient No. 3.....	Jefferson.....	1.8
Inland.....	.....do.....	1.3
Orient No. 6.....	.....do.....	.8
Total.....	-	3.9
Monterey No. 1.....	Macoupin.....	.5
Hillsboro.....	Montgomery.....	.1
Sahara No. 21.....	Saline.....	.2
Sahara No. 20.....	.....do.....	.1
Total.....	-	.3
River King underground.....	St. Clair.....	.1
Ziegler No. 4.....	Williamson.....	.4
Orient No. 4.....	.....do.....	.3
Total.....	-	.7
Total Illinois.....	-	11.8

State and mine	County	Average methane emission, MM ft ³ /d
Indiana: Kings.....	Gibson.....	0.3
Kentucky:		
Retiki.....	Henderson.....	.3
Fies.....	Hopkins.....	1.2
Ziegler No. 9.....	.....do.....	.4
Island Creek No. 9.....	.....do.....	.2
Providence No. 1.....	.....do.....	.2
Total.....	-	2.0
Scotia.....	Letcher.....	.4
Wolf Creek.....	Martin.....	.5
Crescent.....	Muhlenberg.....	.5
River Queen Underground No. 1.....	.....do.....	.1
Star Underground.....	.....do.....	.1
Total.....	-	.7
Ken No. 4.....	Ohio.....	.2
Hamilton No. 1.....	Union.....	.3
Peabody Camp No. 2.....	.....do.....	.3
Pyrd No. 2.....	.....do.....	.3
Peabody Camp No. 1.....	.....do.....	.1
Hamilton No. 2.....	.....do.....	.1
Total.....	-	1.1
Dotiki.....	Webster.....	.3
Total Kentucky.....	-	5.5
New Mexico: York Canyon.....	Colfax.....	.1
Ohio:		
Powhatan No. 1.....	Belmont.....	.5
Powhatan No. 4.....	.....do.....	.5
Powhatan No. 3.....	.....do.....	.4
Powhatan No. 5.....	.....do.....	.2
Allison.....	.....do.....	.2
Saginaw No. 1.....	.....do.....	.1
Powhatan No. 6 (Quarto).....	.....do.....	.1
Total.....	-	2.0
Nelms No. 1.....	Harrison.....	2.0
Nelms No. 2.....	.....do.....	.7
Rose Valley No. 6.....	.....do.....	.5
Oak Park No. 7.....	.....do.....	.2
Total.....	-	3.4
Jensi.....	Jefferson.....	.3
Total Ohio.....	-	5.7
Oklahoma: Choctaw coal facility.....	Haskell.....	.4
Pennsylvania:		
Renton.....	Allegheny.....	.7
Newfield.....	.....do.....	.6
Hamar.....	.....do.....	.2
Oakmont.....	.....do.....	.1
Total.....	-	1.6

State and mine	County	Average methane emission, MM ft ³ /d
Pennsylvania--Continued:		
Jane Nos. 1 and 2.....	Armstrong.....	0.4
David.....	.....do.....	.2
Harold No. 1.....	.....do.....	.1
Total.....	-	.7
Bethlehem No. 32.....	Cambria.....	4.2
Cambria Slope No. 33.....	.....do.....	3.0
Lancashire No. 20.....	.....do.....	1.7
Bird No. 3.....	.....do.....	.3
Bethlehem No. 77.....	.....do.....	.3
Bethlehem No. 31.....	.....do.....	.2
Lancashire No. 25.....	.....do.....	.1
Total.....	-	9.8
Isabella.....	Fayette.....	.2
Robena.....	Greene.....	4.9
Gateway.....	.....do.....	2.9
Shannopin.....	.....do.....	2.5
Warwick Portal No. 3.....	.....do.....	.6
Nemacolin.....	.....do.....	.5
Warwick No. 2.....	.....do.....	.3
Total.....	-	11.7
Homer City.....	Indiana.....	2.0
Lucerne No. 6.....	.....do.....	1.8
Marion.....	.....do.....	.5
Lancashire No. 24.....	.....do.....	.4
Florence No. 2.....	.....do.....	.1
Total.....	-	4.8
Bird No. 2.....	Somerset.....	.3
Marianna No. 58.....	Washington.....	2.3
Mathies.....	.....do.....	2.1
Somerset No. 60.....	.....do.....	1.7
Clyde.....	.....do.....	1.7
Vesta No. 5.....	.....do.....	1.6
Montour No. 4.....	.....do.....	1.0
Maple Creek.....	.....do.....	.9
Bethlehem No. 51.....	.....do.....	.5
Westland.....	.....do.....	.5
Vesta No. 4.....	.....do.....	.1
Total.....	-	12.4
Banning No. 4.....	Westmoreland.....	.4
Delmont.....	.....do.....	.1
Total.....	-	.5
Total Pennsylvania.....	-	42.0
Tennessee:		
Volunteer No. 1.....	Anderson.....	2.5
Mathews.....	Clearbone.....	.1
Total Tennessee.....	-	2.6

State and mine	County	Average methane emission, MM ft ³ /d
Utah:		
Sunnyside No. 1.....	Carbon.....	1.9
Kennilworth.....	.....do.....	.7
Sunnyside No. 3.....	.....do.....	.3
Soldier Canyon.....	.....do.....	.2
Carbon No. 2.....	.....do.....	.2
Total Utah.....	-	3.2
Virginia:		
Beatrice.....	Buchanan.....	8.5
Virginia Pocahontas No. 1.....	.....do.....	5.5
Virginia Pocahontas No. 2.....	.....do.....	3.2
Virginia Pocahontas No. 3.....	.....do.....	2.5
Virginia Pocahontas No. 4.....	.....do.....	1.4
Lambert Fork.....	.....do.....	.6
Seaboard No. 1.....	.....do.....	.4
Total.....	-	22.1
Moss No. 3 portal A.....	Dickenson.....	1.3
Moss No. 3 portal C.....	.....do.....	.3
Moss No. 3 portal D.....	.....do.....	.2
Total.....	-	1.8
Moss No. 2.....	Russell.....	2.4
Chaney Creek No. 2.....	.....do.....	.2
Hurricane Creek.....	.....do.....	.2
Total.....	-	2.8
Prescott No. 2.....	Wise.....	.3
Total Virginia.....	-	27.0
West Virginia:		
Badger No. 4.....	Barbour.....	.3
Hampton No. 3.....	Boone.....	1.4
Cedar Grove No. 3.....	.....do.....	.6
Hampton No. 4.....	.....do.....	.4
Harpis No. 1.....	.....do.....	.1
Total.....	-	2.5
Beech Bottom.....	Brooke.....	.1
Siltix.....	Fayette.....	.2
Robinson Run No. 95.....	Harrison.....	2.4
Mars No. 2.....	.....do.....	.5
Compass No. 2.....	.....do.....	.4
Williams.....	.....do.....	.2
Total.....	-	3.5
Lady Dunn No. 105.....	Kanawha.....	.7
Morton.....	.....do.....	.5
Madison No. 1.....	.....do.....	.2
Cannellton No. 8.....	.....do.....	.2
Total.....	-	1.6

State and mine	County	Average methane emission, MM ft ³ /d
West Virginia--Continued:		
No. 1 Cedar Grove.....	Logan.....	0.7
Dehue.....	.....do.....	.3
Guyan No. 5.....	.....do.....	.3
Paragon.....	.....do.....	.1
Total.....	-	1.4
Loveridge.....	Marion.....	12.1
Federal No. 1.....	.....do.....	5.7
Consol No. 20.....	.....do.....	2.1
Joanne.....	.....do.....	1.9
Consol No. 93.....	.....do.....	.8
Bethlehem No. 41.....	.....do.....	.5
Total.....	-	23.1
Ireland.....	Marshall.....	2.1
McElroy.....	.....do.....	1.0
Shoemaker.....	.....do.....	1.0
Alexander.....	.....do.....	.7
Total.....	-	4.8
Olga.....	McDowell.....	3.0
Shannon Branch.....	.....do.....	1.9
Bishop.....	.....do.....	1.5
Keystone No. 1.....	.....do.....	1.2
Maitland.....	.....do.....	1.1
U.S. Steel No. 2.....	.....do.....	.9
U.S. Steel No. 14.....	.....do.....	.9
Newhall No. 6.....	.....do.....	.5
Cannellton Nos. 3 and 4.....	.....do.....	.2
Bishop Nos. 33 and 37.....	.....do.....	.1
Pocahontas No. 7.....	.....do.....	.1
Total.....	-	11.4
National No. 25.....	Mingo.....	.2
Arkright.....	Monongalia.....	9.6
Humphrey No. 7.....	.....do.....	6.7
Federal No. 2.....	.....do.....	5.4
Blacksville No. 2.....	.....do.....	5.2
Blacksville No. 1.....	.....do.....	5.1
Osage No. 3.....	.....do.....	7.3
Pursglove.....	.....do.....	1.4
Total.....	-	40.7
Valley Camp No. 3.....	Ohio.....	1.4
Valley Camp No. 1.....	.....do.....	.2
Total.....	-	1.6
Slab Fork No. 10.....	Raleigh.....	.7
Macalpin.....	.....do.....	.5
Beckley.....	.....do.....	.4
Slab Fork No. 8.....	.....do.....	.4
Eccles No. 5.....	.....do.....	.3
Keystone No. 4.....	.....do.....	.3

State and mine	County	Average methane emission, MM ft ³ /d
West Virginia--Continued:		
East Gulf.....	Raleigh.....	0.2
Winding Gulf No. 4.....	.....do.....	.1
Total.....	-	<u>3.2</u>
Adrian.....	Upshur.....	<u>.1</u>
Itmann No. 3.....	Wyoming.....	2.2
Itmann No. 4.....	.....do.....	1.4
Kepler.....	.....do.....	.8
Keystone No. 2.....	.....do.....	.7
U.S.Steel No. 50 (Pinnacle Creek)....	.....do.....	.4
Itmann No. 1.....	.....do.....	.2
Buckeye Colliery.....	.....do.....	.1
Gaston No. 2.....	.....do.....	.1
Otsego.....	.....do.....	.1
Total.....	-	<u>6.0</u>
Total West Virginia.....	-	<u>100.7</u>
Grand total.....	-	<u>214.7</u>

APPENDIX D.--METHANE EMISSION FROM MINES IN COALBEDS WITH TOTAL
MINE EMISSIONS IN EXCESS OF 1 MM FT³/D

Coalbed	Name and location of mine	Methane emission, MM ft ³ /d
Pittsburgh.....	Loveridge mine Marion County, W. Va.	12.1
	Humphrye No. 7 mine Monongalia County, W. Va.	9.6
	Arkright mine Monongalia County, W. Va.	7.3
	Federal No. 2 mine Monongalia County, W. Va.	6.7
	Federal No. 1 mine Marion County, W. Va.	5.7
	Blacksville No. 2 mine Monongalia County, W. Va.	5.4
	Blacksville No. 1 mine Monongalia County, W. Va.	5.2
	Osage No. 3 mine Monongalia County, W. Va.	5.1
	Robena mine Greene County, Pa.	4.9
	Gateway mine Greene County, Pa.	2.9
	Shannopin mine Greene County, Pa.	2.5
	Robinson Run No. 95 mine Harrison County, W. Va.	2.4
	Marianna mine No. 58 Washington County, Pa.	2.3
	Consol No. 20 mine Marion County, W. Va.	2.1
Ireland mine Marshall County, W. Va.	2.1	

Coalbed	Name and location of mine	Methane emission, MM ft ³ /d
Pittsburgh--Continued.....	Mathies mine Washington County, Pa.	2.1
	Joanne mine Marion County, W. Va.	1.9
	Clyde mine Washington County, Pa.	1.7
	Somerset mine Washington County, Pa.	1.7
	Vesta No. 5 mine Washington County, Pa.	1.6
	Pursglove mine Monongalia County, W. Va.	1.4
	Valley Camp No. 3 mine Ohio County, W. Va.	1.4
	McElroy mine Marshall County, W. Va.	1.0
	Montour No. 4 mine Washington County, Pa.	1.0
	Shoemaker mine Marshall County, W. Va.	1.0
	Maple Creek mine Washington County, Pa.	.9
	Consol No. 93 mine Marion County, W. Va.	.8
	Alexander mine Marshall County, W. Va.	.7
	Bethlehem No. 51 mine Washington County, Pa.	.5
	Bethlehem No. 41 mine Marion County, W. Va.	.5
	Mars No. 2 mine Harrison County, W. Va.	.5

Coalbed	Name and location of mine	Methane emission, MM ft ³ /d
Pittsburgh--Continued.....	Nemacolin mine Greene County, Pa.	0.5
	Powhatan No. 1 mine Belmont County, Ohio	.5
	Powhatan No. 4 mine Belmont County, Ohio	.5
	Westland mine Washington County, Pa.	.5
	Banning No. 4 mine Westmoreland County, Pa.	.4
	Compass No. 2 mine Harrison County, W. Va.	.4
	Powhatan No. 3 mine Belmont County, Ohio	.4
	Warwick No. 2 mine Green County, Pa.	.3
	Allison mine Belmont County, Ohio	.2
	Isabella mine Fayette County, Pa.	.2
	Powhatan No. 5 mine Belmont County, Ohio	.2
	Williams mine Harrison County, W. Va.	.2
	Valley Camp No. 1 mine Ohio County, W. Va.	.2
	Beech Bottom mine Brooke County, W. Va.	.1
	Saginaw No. 1 mine Belmont County, Ohio	.1
	Vesta No. 4 mine Washington County, Pa.	.1

Coalbed	Name and location of mine	Methane emission, MM ft ³ /d
Pittsburgh--Continued.....	Powhatan No. 6 mine (Quarto) Belmont County, Ohio	.1
	Total.....	99.9
Pocahontas No. 3.....	Beatrice mine Buchanan County, Va.	8.5
	Virginia Pocahontas No. 1 Buchanan County, Va.	5.5
	Virginia Pocahontas No. 2 Buchanan County, Va.	3.2
	Virginia Pocahontas No. 3 Buchanan County, Va.	2.5
	Itmann No. 3 mine Wyoming County, W. Va.	2.2
	Shannon Branch mine McDowell County, W. Va.	1.9
	Bishop mine McDowell County, W. Va.	1.5
	Virginia Pocahontas No. 4 Buchanan County, Va.	1.4
	Keystone No. 1 mine McDowell County, W. Va.	1.2
	Maitland mine McDowell County, W. Va.	1.1
	United States Steel No. 14 Mine McDowell County, W. Va.	.9
	Kepler mine Wyoming County, W. Va.	.8
	Keystone No. 2 mine Wyoming County, W. Va.	.7
	Slab Fork No. 10 mine Raleigh County, W. Va.	.7
Newhall No. 6 mine McDowell County, W. Va.	.5	

Coalbed	Name and location of mine	Methane emission, MM ft ³ /d
Pocahontas No. 3--Continued.	Macalpin No. 3 mine Raleigh County, W. Va.	0.5
	U.S. Steel No. 50 mine Wyoming County, W. Va.	.4
	Keystone No. 4 mine Raleigh County, W. Va.	.3
	Cannelton 3 and 4 McDowell County, W. Va.	.2
	East Gulf mine Raleigh County, W. Va.	.2
	Itmann No. 1 mine Wyoming County, W. Va.	.2
	Bishop 33 and 37 mine McDowell County, W. Va.	.1
	Buckeye colliery Wyoming County, W. Va.	.1
	Gaston No. 2 mine Wyoming County, W. Va.	.1
	Otsego mine Wyoming County, W. Va.	.1
	Pocahontas No. 7 mine McDowell County, W. Va.	.1
	Total.....	<u>34.9</u>
Pocahontas No. 4.....	Olga mine McDowell County, W. Va.	3.0
	Itmann No. 4 mine Wyoming County, W. Va.	1.4
	U.S. Steel No. 2 mine McDowell County, W. Va.	.9
	Slab Fork No. 8 mine Raleigh County, W. Va.	.4
	Winding Gulf No. 4 mine Raleigh County, W. Va.	.1
	Total.....	<u>6.1</u>

Coalbed	Name and location of mine	Methane emission MM ft ³ /d
Illinois Nos. 5 and 6.....	Orient No. 3 mine Jefferson County, Ill.	1.8
	Old Ben No. 26 mine Franklin County, Ill.	1.7
	Inland mine Jefferson County, Ill.	1.3
	Old Ben No. 21 mine Frankling County, Ill.	1.2
	Old Ben No. 24 mine Franklin County, Ill.	1.2
	Peabody No. 10 mine Christian County, Ill.	1.1
	Orient No. 6 mine Jefferson County, Ill.	.8
	Monteray No. 1 mine Macoupin County, Ill.	.5
	Murdock mine Douglas County, Ill.	.5
	Zeigler No. 4 mine Williamson County, Ill.	.4
	Eagle No. 1 mine Gallatin County, Ill.	.3
	Orient No. 4 mine Williamson County, Ill.	.3
	Eagle No. 2 mine Gallatin County, Ill.	.2
	Sahara No. 21 mine Saline County, Ill.	.2
	Hillsboro mine Montgomery County, Ill	.1
	River King underground St. Clair County, Ill.	.1

Coalbed	Name and location of mine	Methane emission MM ft ³ /d
Illinois Nos. 5 and 6-- Continued.	Sahara No. 20 mine Saline County, Ill.	0.1
	Total.....	11.8
Kentucky Nos. 9 and 11.....	Fies mine Hopkins County, Ky.	1.2
	Crescent mine Muhlenberg County, Ky.	.5
	Zeigler No. 9 mine Hopkins County, Ky.	.4
	Dotiki mine Webster County, Ky.	.3
	Hamilton No. 1 mine Union County, Ky.	.3
	Peabody Camp No. 2 mine Union County, Ky.	.3
	Pyro No. 2 mine Union County, Ky.	.3
	Retiki mine Henderson County, Ky.	.3
	Ken mine No. 4 Ohio County, Ky.	.2
	Island Creek No. 9 mine Hopkins County, Ky.	.2
	Providence No. 1 mine Hopkins County, Ky.	.2
	Hamilton No. 2 mine Union County, Ky.	.1
	Peabody Camp No. 1 Union County, Ky.	.1
	River Queen underground No. 1 Muhlenberg County, Ky.	.1
Star underground Muhlenberg County, Ky.	.1	
Total.....	4.6	

Coalbed	Name and location of mine	Methane emission, MM ft ³ /d
Freeport and Lower Freeport.	Homer City mine Indiana County, Pa.	2.0
	Nelms No. 1 mine Harrison County, Ohio	2.0
	Lucerne No. 6 mine Indiana County, Pa.	1.8
	Nelms No. 2 mine Harrison County, Ohio	.7
	Renton mine Allegheny County, Pa.	.7
	Newfield mine Allegheny County, Pa.	.6
	Marion mine Indiana County, Pa.	.5
	Rose Valley No. 6 mine Harrison County, Ohio	.5
	Jane Nos. 1 and 2 mine Armstrong County, Pa.	.4
	Lancashire No. 24 mine Indiana County, Pa.	.4
	Jensie mine Jefferson County, Ohio	.3
	David mine Armstrong County, Pa.	.2
	Harmar mine Allegheny County, Pa.	.2
	Oak Park No. 7 mine Harrison County, Ohio	.2
Adrian mine Upshur County, W. Va.	.1	
Delmont mine Westmoreland County, Pa.	.1	

Coalbed	Name and location of mine	Methane emission, MM ft ³ /d
Freeport and Lower Freeport-- Continued.	Florence No. 2 mine Indiana County, Pa.	0.1
	Oakmont mine Allegheny County, Pa.	.1
	Total.....	10.9
Upper and Lower Kittanning..	Bethlehem No. 32 mine Cambria County, Pa.	4.2
	Cambria Slope No. 33 mine Cambria County, Pa.	3.0
	Lancashire No. 20 mine Cambria County, Pa.	1.7
	Badger No. 14 mine Barbour County, W. Va.	.3
	Bethlehem No. 77 mine Cambria County, Pa.	.3
	Bird No. 2 mine Somerset County, Pa.	.3
	Bird No. 3 mine Cambria County, Pa.	.3
	Bethlehem No. 31 mine Cambria County, Pa.	.2
	Harold mine Armstrong County, Pa.	.1
	Lancashire No. 25 mine Cambria County, Pa.	.1
	Total.....	10.5
	Deal.....	Volunteer No. 1 mine Anderson County, Tenn.	2.5
Cedar Grove.....	Hampton No. 3 mine Boone County, W. Va.	1.4
	No. 1 Cedar Grove Logan County, W. Va.	.7
	Cedar Grove No. 1 mine Boone County, W. Va.	.6

Coalbed	Name and location of mine	Methane emission, MM ft ³ /d
Cedar Grove--Continued.....	Hampton No. 4 mine Boone County, W. Va.	0.4
	Guyan No. 5 mine Logan County, W. Va.	.3
	National No. 25 mine Mingo County, W. Va.	.2
	Paragon mine Logan County, W. Va.	.1
	Total.....	3.7
No. 2 Gas (Imboden).....	Lady Dunn No. 105 Kanawha County, W. Va.	.7
	Scotia mine Letcher County, Ky.	.4
	Prescott No. 2 mine Wise County, Va.	.3
	Total.....	1.4
No. 2 Eagle.....	Morton mine Kanawha County, W. Va.	.5
	Dehue mine Logan County, W. Va.	.3
	Madison No. 1 mine Kanawha County, W. Va.	.2
	Cannellton No. 8 mine Kanawha County, W. Va.	.2
	Harris No. 1 mine Boone County, W. Va.	.1
Total.....	1.3	
Upper and Lower Sunnyside..	Sunnyside No. 1 mine Carbon County, Utah	1.9
	Kennilworth mine Carbon County, Utah	.7
	Sunnyside No. 3 mine Carbon County, Utah	.3

Coalbed	Name and location of mine	Methane emission, MM ft ³ /d
Upper and Lower Sunnyside-- Continued	Soldier Canyon mine Carbon County, Utah	0.2
	Carbon No. 2 mine Carbon County, Utah	.1
	Total.....	3.2
Pratt.....	Concord No. 1 mine Jefferson County, Ala.	5.3
	Mulga mine Jefferson County, Ala.	2.0
	Total.....	7.3
Basin B.....	Dutch Creek mine Pitkin County, Colo.	2.1
	L. S. Wood mine Pitkin County, Colo.	1.4
	Somerset mine Gunnison County, Colo.	.4
	Bear mine Gunnison County, Colo.	.1
	Total.....	4.0
Tiller.....	Moss No. 2 mine Russell County, Va.	2.4
	Moss No. 3 mine portal A Dickenson County, Va.	1.3
	Lambert Fork mine Buchanan County, Va.	.6
	Moss No. 3 mine, portal C Dickenson County, Va.	.3
	Moss No. 3 mine, portal D Dickenson County, Va.	.2
Total.....	4.8	

Coalbed	Name and location of mine	Methane emission, MM ft ³ /d
Mary Lee.....	Segco No. 1 mine Walker County, Ala.	0.8
	Flat Top mine Jefferson County, Ala.	.7
	Mary Lee mine Walker County, Ala.	.6
	Chetopa mine Jefferson County, Ala.	.4
	Total.....	3.4