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Analyses of Coal Samples Collected in Virginia 1978-1980

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This report is preliminary and has not been edited or reviewed for conformity with U.S. Geological Survey standards and nomenclature.

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# Analyses of Coal Samples Collected in Virginia 1978-1980

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## Abstract

Since 1975 the Virginia Division of Mineral Resources has been collecting coal samples from fresh coal exposures in Virginia. Results from the analyses of 83 samples are included in this report. The analyses of these samples are performed in cooperation with the U. S. Geological Survey and the results are entered into the National Coal Resources Data System (NCRDS). Channel samples were collected at all but one of the sampling sites. In addition, supplemental samples of the roof- and floor-rock and major partings were collected at many sample sites, but were not analyzed. The samples are from many of the major coal beds in southwest Virginia, and are from fresh exposures in active surface and underground mines.

Chemical analyses were made by the U. S. Geological Survey, the U. S. Department of Energy, and Geochemical Testing, Inc. and include proximate and ultimate analyses, forms of sulfur, calorific values, fusibility of ash, free-swelling index, and major-, minor-, and trace-element concentrations. A statistical summary is included for the samples described in this report and a comparison is made with samples of Henderson, Oman, and Coleman (1981).

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## INTRODUCTION

Coal has been mined in Virginia since colonial times. Initial production in the State was in the Richmond basin (fig. 1) and production of Triassic-age coal was reported there into the early part of the 20th century. Coal of Mississippian age was mined in the Valley coal fields (fig. 1) beginning in the middle 1800's and continued until 1971. Coal mining in the Pennsylvanian-age coals of the southwest Virginia coal field began in the 1890's. The southwest Virginia coal field (fig. 1) covers part or all of Buchanan, Dickenson, Lee, Russell, Scott, Tazewell, and Wise counties.

Proximate and ultimate analyses, heat values, and forms of sulfur for some Virginia coals are available in reports published by the U. S. Bureau of Mines (U.S. Bureau of Mines, 1926; Eby and Campbell, 1944; and others). Preparation characteristics for Virginia coals have also been published by the U.S. Bureau of Mines (Gray and Boley, 1958a, 1958b; Deurbrouck, 1963a, 1963b; and others). Several reports are available on the chemical composition of coal ash (Abernathy, Peterson, and Gibson, 1969a, 1969b). Proximate and ultimate analyses, forms of sulfur, calorific values, major, minor, and trace element concentrations are presented in U. S. Geological Survey open-file reports (Swanson and others, 1976; Zubovic and others, 1979, 1980; Simon and Englund, 1983a, 1983b) and Henderson, Oman, and Coleman (1981).

Since 1975 the Division of Mineral Resources has been collecting coal samples for analyses in cooperation with the U. S. Geological Survey. This report contains the analytical results for 83 coal samples collected by the authors and other Division of Mineral Resources personnel in 1978, 1979 and 1980. A generalized stratigraphic section

is shown in figure 2. These samples are from many of the major coal beds in the southwest Virginia coal field that were being mined during the time of the study. Data presented in this report and those by Swanson and others (1976), Zubovic and others (1979 and 1980) and Henderson, Oman and Coleman (1981) are the latest and most detailed available for Virginia coals.

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#### SAMPLED AREA

The southwest Virginia coal field is in the Appalachian Plateaus physiographic province. Most of the coal occurs in the rocks of the Cumberland thrust sheet. The coal and associated rocks in the southwest Virginia coal field are generally flat-lying to gently dipping except along the southeastern boundary of the Appalachian Plateaus province (which is an area of imbricated thrust sheets) and the northwestern edge of the Cumberland thrust sheet (which is bounded by the Pine Mountain fault). Other major structural features include the Russell Fork fault



(a northwest-trending strike-slip fault), the Powell Valley anticline, and the Middlesboro syncline (Miller 1974, figure 11). Geologic maps and reports on the coal-bearing counties in southwest Virginia are listed in the bibliography. The coal beds occur in sequences composed of sandstone and shale and, rarely, in thin clastic and calcareous beds that are of marine origin.

Samples were collected from three of the seven counties in the southwest field (table 1; fig. 3-5). Numbers of the samples from the counties are: Buchanan (2); Dickenson (44); and Wise (37). Forty-eight of the samples are from the Wise Formation and 35 are from the Norton Formation. The oldest coal sampled for this report is the Tiller coal bed from the Norton Formation in Dickenson County. The youngest coal sampled is the Morris coal bed from the Wise Formation in Wise County.

#### SAMPLING PROCEDURES

All but one of the samples presented in this report are face-channel samples and were collected using procedures similar to those described by Schopf (1960) and Swanson and Huffman (1976). One run of mine sample was taken from an underground mine in the Lower Banner coal bed in Dickenson County. These sampling procedures are also similar to techniques used by Glass (1975) and Boreck and others (1977). Sampling sites were selected to give wide geographic and stratigraphic distribution. Coal freshness, geographic proximity to other samples, and the safety of the sampling area were used in deciding whether to accept or reject a sampling site. Each channel sample represents the entire thickness of coal and interbedded material being mined at each locality. Partings (shale laminae) that are mined with the coal were included in the sample. In places where partings were excluded from

mining, a separate supplemental sample of the partings was taken; these samples were not analyzed, but are stored at the Division of Mineral Resources. Where the coal was being mined in benches, separate samples were taken from each coal interval. At sites where the coal thickness was greater than about 6 feet (2m), two samples were taken. In such cases, samples were collected on either side of major partings or textural breaks in the coal.

A complete description of the coal and associated roof- and floor-rocks was made at each sampling site. Coal descriptions based on field observations included thickness of the coal, thicknesses of subunits, accessory minerals, amount and type of observable macerals and primary and secondary structures. Sampling site descriptions included site location, altitude of the coal bed, lithologies of rocks above and below the coal bed, and strike and dip of the coal-bearing units. In many cases, supplemental samples were taken of the roof- and floor-rock.

Samples were taken using chisels and a hammer. Width and depth of the sample channels were adjusted to the thickness of the coal, but were sufficient to give a sample weight of approximately 20-25 lbs. (9-11 kg.). Samples were collected on a canvas tarpaulin covered by polyethylene sheeting. The freshly cut sample was then crushed by hammers into pieces generally less than 3/4 inch (2 cm) in size, thoroughly mixed, and divided into quarters. One quarter was placed in a U. S. Department of Energy coal can to be sent to the U. S. Geological Survey for forwarding to the U. S. Department of Energy or Geochemical Testing laboratory; the other three quarters were bagged and sealed separately in double plastic bags. One of the quarters was retained by

the Division as a contingency sample; the other two were sent to the U. S. Geological Survey for analyses.

#### CHEMICAL AND PHYSICAL TESTS

Analytical procedures used by the U. S. Department of Energy and Geochemical Testing, Inc. are described in U. S. Bureau of Mines Bulletin 638 (1967) and ASTM (1982). Determinations (fig. 6) included proximate and ultimate analyses forms of sulfur, ash fusibility temperatures, calorific values, and free swelling indexes.

The U. S. Geological Survey analyzed each sample for major, minor and trace elements. Procedures for these analyses as performed by the U. S. Geological Survey laboratory in Denver are described by Swanson and Huffman (1975). Analytical methods used at the U. S. Geological Survey in Reston are similar to those used in Denver and are outlined in figure 5.

#### RESULTS

Analytical results from the U. S. Department of Energy and Geochemical Testing, Inc. are shown in table 2; results from analyses performed by the U. S. Geological Survey are shown in tables 3, 4 and 5; statistical summaries for the 83 samples from Virginia are shown in table 6, and are compared to analyses reported by Henderson, Oman, and Coleman (1981).

Table 7a compares 217 Virginia samples with 548 Appalachian bituminous coals reported by Zubovic and others (1980). The table shows the differences between the two sets of data to be very small. The ultimate and proximate data are nearly identical. The Btu values are slightly higher for the Virginia data, and the forms of sulfur are lower especially the pyritic sulfur. The ash deformation and softening

temperatures are higher for the Virginia coals but the fluid temperature is about the same as the Appalachian coals. The free-swelling index is much higher for Virginia coals, 7.4 compared to the Appalachian value of 4.5.

Table 7b is a comparison of the major and minor oxides and ash content of the 217 Virginia coals with 644 Appalachian coals reported by Zubovic and others (1980). The concentrations of the oxides and ash are similar with the exception of P2O5 which is 5 times higher in the Virginia samples.

Table 7c is a comparison of the trace element content of the 217 Virginia samples with 644 Appalachian samples reported by Zubovic and others (1980). The antimony content in the Virginia samples is four times higher than in the Appalachian samples. All of the other trace elements are very similar in their concentration.

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Table 1a. Sample and location information for samples collected in 1978, 1979, and 1980.

Sample Number	Coal Field Type of Exposure	Formation Age	Coal Bed Measured Interval Thickness Sample thickness
Buchanan County			
R-7383	Southwest Virginia Surface Mine	Norton Pennsylvanian	Banner (lower split) 4.1 ft. (1.2 m) 3.2 ft. or 38.4 in. (0.97 m)
R-7494	Southwest Virginia Surface Mine	Wise Pennsylvanian	Elkhorn 24.4 + ft. (7.4 + m) 2.4 ft. or 28.8 in. (0.73 m)
Dickenson County			
R-7348	Southwest Virginia Surface Mine	Norton Pennsylvanian	Upper Banner 64.1 + ft. (19.5 + m) 2.5 ft. or 30.0 in. (0.76 m)
R-7351	Southwest Virginia Surface Mine	Wise Pennsylvanian	Clintwood (upper bench) 33.2 + ft. (10.1 + m) 7.12 ft. or 85.4 in. (2.17 m)
R-7356	Southwest Virginia Surface Mine	Norton Pennsylvanian	Jawbone 42.29 + ft. (12.9 + m) 4.99 ft. or 59.9 in. (1.52 m)
R-7357	Southwest Virginia Surface Mine	Norton Pennsylvanian	Upper Banner (lower bench) 48.0 + ft. (14.6 + m) 2.9 ft. or 34.8 in. (0.88 m)
R-7358	Southwest Virginia Surface Mine	Norton Pennsylvanian	Upper Banner (upper bench) 48.0 + ft. (14.6 + m) 2.19 ft. or 26.3 in. (0.7 m)
R-7359	Southwest Virginia Surface Mine	Wise Pennsylvanian	Clintwood (lower bench) 33.2 + ft. (10.1 + m) 2.35 ft. or 28.2 in. (0.72 m)
R-7380	Southwest Virginia Surface Mine	Wise Pennsylvanian	Clintwood Marker 33.2 + ft. (10.1 + m) 1.28 ft. or 15.4 in. (0.39 m)
R-7381	Southwest Virginia Surface Mine	Wise Pennsylvanian	Lower Clintwood (upper bench) 53.2 + ft. (16.2 + m) 0.97 ft. or 11.6 in. (0.30 m)

Table 1a. Sample and location information for samples collected in 1978, 1979, and 1980. (continued)

Sample Number	Coal Field Type of Exposure	Formation Age	Coal Bed Measured Interval Thickness Sample Thickness
Dickenson County (cont.)			
R-7382	Southwest Virginia Surface Mine	Wise Pennsylvanian	Lower Clintwood (lower bench) 53.2 + ft. (16.2 + m) 1.0 ft. or 12 in. (0.30 m)
R-7465	Southwest Virginia Surface Mine	Wise Pennsylvanian	Clintwood Split 45.8 + ft. (14.0 + m) 1.48 ft. or 17.8 in. (0.45 m)
R-7491	Southwest Virginia Surface Mine	Wise Pennsylvanian	Clintwood Split 95.0 + ft. (28.9 + m) 2.65 ft. or 31.8 in. (0.81 m)
R-7492	Southwest Virginia Surface Mine	Wise Pennsylvanian	Clintwood Rider 91.6 + ft. (27.9 + m) 1.8 ft. or 21.6 in. (0.55 m)
R-7493	Southwest Virginia Surface Mine	Norton Pennsylvanian	Norton 48.0 + ft. (14.6 + m) 2.05 ft. or 24.6 in. (0.62 m)
R-7545	Southwest Virginia Underground Mine	Norton Pennsylvanian	Upper Banner 5.6 + ft. (1.7 + m) 3.25 ft. or 39 in. (1.00 m)
R-7546	Southwest Virginia Surface Mine	Norton Pennsylvanian	Norton 47.2 + ft. (14.4 + m) 3.15 ft. or 37.8 in. (0.96 m)
R-7547	Southwest Virginia Surface Mine	Wise Pennsylvanian	Clintwood 29.2 + ft. (8.9 + m) 1.1 ft. or 13.2 in. (0.33 m)
R-7548	Southwest Virginia Underground Mine	Norton Pennsylvanian	Lower Banner 4.8 + ft. (1.5 + m) 3.3 ft. or 39.6 in. (1.01 m)
R-7549	Southwest Virginia Underground Mine	Norton Pennsylvanian	Upper Banner (lower bench) 9.2 + ft. (2.8 + m) 2.45 ft. or 29.4 in. (0.75 m)

Table 1a. Sample and location information for samples collected in 1978, 1979, and 1980. (continued)

Sample Number	Coal Field Type of Exposure	Formation Age	Coal Bed Measured Interval Thickness Sample Thickness
Dickenson County (cont.)			
R-7550	Southwest Virginia Underground Mine	Norton Pennsylvanian	Lower Banner (upper bench) 4.8 + ft. (1.5 + m) 2.85 ft. or 34.2 in. (0.87 m)
R-7551	Southwest Virginia Underground Mine	Norton Pennsylvanian	Lower Banner (lower bench) 4.8 + ft. (1.5 + m) 0.85 ft. or 10.2 in. (0.26 m)
R-7552	Southwest Virginia Underground Mine	Norton Pennsylvanian	Splashdam 4.6 + ft. (1.4 + m) 3.95 ft. or 47.4 in. (1.20 m)
R-7553	Southwest Virginia Underground Mine	Norton Pennsylvanian	Splashdam 2.7 + ft. (0.8 + m) 2.4 ft. or 28.8 in. (0.73 m)
R-7554	Southwest Virginia Underground Mine	Norton Pennsylvanian	Splashdam 3.4 + ft. (1.0 + m) 3.15 ft. or 37.8 in. (0.96 m)
R-7555	Southwest Virginia Underground Mine	Norton Pennsylvanian	Lower Banner 3.5 ft. (1.1 m) 2.88 ft. or 34.6 in. (0.88 m)
R-7556	Southwest Virginia Grab from Underground Mine	Norton Pennsylvanian	Lower Banner Not Applicable Not Applicable
R-7557	Southwest Virginia Surface Mine	Wise Pennsylvanian	Eagle 32.3 + ft. (9.8 + m) 2.1 ft. or 25.2 in. (0.64 m)
R-7593	Southwest Virginia Underground Mine	Norton Pennsylvanian	Lower Banner 5.3 + ft. (1.6 + m) 4.7 ft. or 56.4 in. (1.43 m)
R-7594	Southwest Virginia Underground Mine	Norton Pennsylvanian	Splashdam 4.2 + ft. (1.3 + m) 3.98 ft. or 47.8 in. (1.21 m)

Table 1a. Sample and location information for samples collected in 1978, 1979, and 1980. (continued)

Sample Number	Coal Field Type of Exposure	Formation Age	Coal Bed Measured Interval Thickness Sample Thickness
Dickenson County (cont.)			
R-7595	Southwest Virginia Underground Mine	Norton Pennsylvanian	Lower Banner 6.6 + ft. (2.0 + m) 3.2 ft. or 38.4 in. (0.98 m)
R-7596	Southwest Virginia Underground Mine	Norton Pennsylvanian	Upper Banner 3.4 + ft. (1.0 + m) 2.45 ft. or 29.4 in. (0.75 m)
R-7597	Southwest Virginia Underground Mine	Norton Pennsylvanian	Lower Banner 5.9 + ft. (1.8 + m) 3.6 ft. or 43.2 in. (1.1 m)
R-7860	Southwest Virginia Surface Mine	Wise Pennsylvanian	Blair 102.3 + ft. (31.2 + m) 3.9 ft. or 46.8 in. (1.19 m)
R-7861	Southwest Virginia Underground Mine	Norton Pennsylvanian	Tiller 6.5 + ft. (2.0 + m) 1.3 ft. or 15.6 in. (0.4 m)
R-7862	Southwest Virginia Underground Mine	Norton Pennsylvanian	Kennedy 3.8 + ft. (1.2 + m) 3.45 ft. or 41.4 in. (1.05 m)
R-7863	Southwest Virginia Underground Mine	Norton Pennsylvanian	Raven 5.2 + ft. (1.6 + m) 5.05 ft. or 60.6 in. (1.54 m)
R-7864	Southwest Virginia Underground Mine	Norton Pennsylvanian	Jawbone 7.2 + ft. (2.2 + m) 2.75 ft. or 33 in. (0.84 m)
R-7865	Southwest Virginia Underground Mine	Norton Pennsylvanian	Kennedy 5.1 + ft. (1.6 + m) 2.0 ft. or 24 in. (0.61 m)

Table 1a. Sample and location information for samples collected in 1978, 1979, and 1980. (continued)

Sample Number	Coal Field Type of Exposure	Formation Age	Coal Bed Measured Interval Thickness Sample Thickness
Dickenson County (cont.)			
R-7866	Southwest Virginia Surface Mine	Wise Pennsylvanian	Dorchester 26.1 ft. (8.0 + m) 5.5 ft. or 66 in. (1.68 m)
R-8167	Southwest Virginia Surface Mine	Wise Pennsylvanian	Eagle 43.8 + ft. (13.3 + m) 3.1 ft. or 37.2 in. (0.94 m)
R-8168	Southwest Virginia Surface Mine	Wise Pennsylvanian	Biair 55.2 + ft. (16.8 + m) 0.85 ft. or 10.2 in. (0.26 m)
R-8169	Southwest Virginia Underground Mine	Norton Pennsylvanian	Splashdam 6.7 + ft. (2.0 + m) 4.4 ft. or 52.8 in. (1.34 m)
R-8170	Southwest Virginia Underground Mine	Norton Pennsylvanian	Splashdam 4.8 + ft. (1.5 + m) 4.3 ft. or 51.6 in. (1.31 m)
R-8206	Southwest Virginia Surface Mine	Wise Pennsylvanian	Clintwood (middle split) 40.0 + ft. (12.2 + m) 3.45 ft. or 41.4 in. (1.05 m)
R-8242	Southwest Virginia Surface Mine	Wise Pennsylvanian	Clintwood (middle split) 91.6 + ft. (27.9 + m) 6.9 ft. or 82.8 in. (2.10 m)
Wise County			
R-7324	Southwest Virginia Surface Mine	Wise Pennsylvanian	Lyons 53.1 + ft. (16.2 + m) 2.7 ft. or 32.4 in. (0.82 m)
R-7325	Southwest Virginia Surface Mine	Norton Pennsylvanian	Norton 13.9 + ft. (4.2 + m) 1.7 ft. or 20.4 in. (0.52 m)
R-7341	Southwest Virginia Surface Mine	Wise Pennsylvanian	Lyons 26.7 + ft. (8.1 + m) 1.33 ft. or 16.0 in. (0.40 m)

Table 1a. Sample and location information for samples collected in 1978, 1979, and 1980. (continued)

Sample Number	Coal Field Type of Exposure	Formation Age	Coal Bed Measured Interval Thickness Sample Thickness
Wise County (cont.)			
R-7342	Southwest Virginia Surface Mine	Wise Pennsylvanian	Lyons 26.4 + ft. (8.0 + m) 1.16 ft. or 13.9 in. (0.35 m)
R-7343	Southwest Virginia Surface Mine	Wise Pennsylvanian	Imboden 52.1 + ft. (15.9 + m) 3.4 ft. or 40.8 in. (1.046 m)
R-7344	Southwest Virginia Surface Mine	Wise Pennsylvanian	Imboden (upper bench) 62.8 + ft. (19.2 + m) 2.55 ft. or 30.6 in. (0.78 m)
R-7345	Southwest Virginia Surface Mine	Wise Pennsylvanian	Imboden (lower bench) 62.8 + ft. (19.2 + m) 3.0 ft. or 36 in. (0.91 m)
R-7346	Southwest Virginia Surface Mine	Norton Pennsylvanian	Jawbone 39.6 + ft. (12.0 + m) 3.5 ft. or 42.0 in. (1.07 m)
R-7347	Southwest Virginia Surface Mine	Wise Pennsylvanian	Upper Standiford 26.3 + ft. (8.0 + m) 2.07 ft. or 24.8 in. (0.63 m)
R-7349	Southwest Virginia Surface Mine	Norton Pennsylvanian	Norton (upper bench) 26.2 + ft. (8.0 + m) 1.6 ft. or 19.2 in. (0.49 m)
R-7350	Southwest Virginia Surface Mine	Norton Pennsylvanian	Norton (lower bench) 26.2 + ft. (8.0 + m) 0.45 ft. or 5.4 in. (0.14 m)
R-7354	Southwest Virginia Surface Mine	Norton Pennsylvanian	Norton 61.0 + ft. (18.6 + m) 1.95 ft. or 23.4 in. (0.59 m)
R-7355	Southwest Virginia Surface Mine	Norton Pennsylvanian	Norton 61.0 + ft. (18.6 + m) 1.95 ft. or 23.4 in. (0.59 m)

Table 1a. Sample and location information for samples collected in 1978, 1979, and 1980. (continued)

Sample Number	Coal Field Type of Exposure	Formation Age	Coal Bed Measured Interval Thickness Sample Thickness
Wise County (cont.)			
R-7366	Southwest Virginia Underground Mine	Wise Pennsylvanian	Morris 4.9 + ft. (1.5 + m) 4.53 ft. or 54.4 in. (1.38 m)
R-7367	Southwest Virginia Surface Mine	Wise Pennsylvanian	Morris 30.0 + ft. (9.2 + m) 3.83 ft. or 46.0 in. (1.17 m)
R-7406	Southwest Virginia Underground Mine	Wise Pennsylvanian	Dorchester 5.0 + ft. (1.5 + m) 4.32 ft. or 51.8 in. (1.32 m)
R-7407	Southwest Virginia Underground Mine	Wise Pennsylvanian	Dorchester 5.0 + ft. (1.5 + m) 4.16 ft. or 49.9 in. (1.27 m)
R-7408	Southwest Virginia Underground Mine	Wise Pennsylvanian	Taggart 6.4 + ft. (2.0 + m) 4.50 ft. or 55.1 in. (2.4 m)
R-7409	Southwest Virginia Underground Mine	Wise Pennsylvanian	Low Splint (lower bench) 6.4 + ft. (2.0 + m) 3.24 ft. or 38.9 in. (0.99 m)
R-7410	Southwest Virginia Underground Mine	Wise Pennsylvanian	Low Splint (upper bench) 6.4 + ft. (2.0 + m) 2.02 ft. or 24.2 in. (0.62 m)
R-7411	Southwest Virginia Underground Mine	Wise Pennsylvanian	Pardee 6.0 + ft. (1.8 + m) 5.21 ft. or 62.5 in. (1.59 m)
R-7412	Southwest Virginia Underground Mine	Wise Pennsylvanian	Morris 6.8 + ft. (2.1 + m) 6.1 ft. or 73.2 in. (1.86 m)
R-7515	Southwest Virginia Surface Mine	Wise Pennsylvanian	Imboden(lower bench, bottom split) 73.6 + ft. (22.4 + m) 0.5 ft. or 6 in. (0.15 m)

Table 1a. Sample and location information for samples collected in 1978, 1979, and 1980. (continued)

Sample Number	Coal Field Type of Exposure	Formation Age	Coal Bed Measured Interval Thickness Sample Thickness
Wise County (cont.)			
R-7516	Southwest Virginia Surface Mine	Wise Pennsylvanian	Imboden(lower bench, middle split) 73.6 + ft. (22.4 + m) 2.2 ft. or 26.4 in. (0.67 m)
R-7517	Southwest Virginia Surface Mine	Wise Pennsylvanian	Imboden(lower bench, upper split) 73.6 + ft. (22.4 + m) 1.85 ft. or 22.2 in. (0.56 m)
R-7518	Southwest Virginia Surface Mine	Wise Pennsylvanian	Imboden (upper bench) 73.6 + ft. (22.4 + m) 2.85 ft. or 34.2 in. (0.87 m)
R-7519	Southwest Virginia Surface Mine	Wise Pennsylvanian	Kelly 73.6 + ft. (22.4 + m) 4.7 ft. or 56.4 in. (1.43 m)
R-7520	Southwest Virginia Surface Mine	Wise Pennsylvanian	Pinhook 73.6 + ft. (22.4 + m) 1.65 ft. or 19.8 in. (0.50 m)
R-8165	Southwest Virginia Underground Mine	Wise Pennsylvanian	Pardee (upper bench) 7.7 + ft. (2.4 + m) 3.3 ft. or 39.6 in. (1.0 m)
R-8166	Southwest Virginia Underground Mine	Wise Pennsylvanian	Pardee (lower bench) 7.7 + ft. (2.4 + m) 3.8 ft. or 45.6 in. (1.16 m)
R-8207	Southwest Virginia Surface Mine	Wise Pennsylvanian	Upper Standiford 24.4 + ft. (7.4 + m) 3.0 ft. or 36.0 in. (0.91 m)
R-8208	Southwest Virginia Underground Mine	Wise Pennsylvanian	Kelly 3.3 + ft. (1.0 + m) 3.1 ft. or 37.2 in. (0.94 m)
R-8209	Southwest Virginia Surface Mine	Wise Pennsylvanian	Imboden 73.0 + ft. (22.2 + m) 3.0 ft. or 36 in. (0.91 m)



Table 1a. Sample and location information for samples collected in 1978, 1979, and 1980. (continued)

Sample Number	Coal Field Type of Exposure	Formation Age	Coal Bed Measured Interval Thickness Sample Thickness
Wise County (cont.)			
R-8210	Southwest Virginia Surface Mine	Wise Pennsylvanian	Clintwood split 45.6 + ft. (13.9 + m) 3.75 ft. or 45 in. (1.14 m)
R-8241	Southwest Virginia Underground Mine	Wise Pennsylvanian	Dorchester 3.6 + ft. (1.1 + m) 2.2 ft. or 26.4 in. (0.67 m)
R-8243	Southwest Virginia Surface Mine	Wise Pennsylvanian	Lyons 100.3 + ft. (30.6 + m) 2.55 ft. or 30.6 in. (0.78 m)
R-8244	Southwest Virginia Surface Mine	Wise Pennsylvanian	Dorchester 100.3 + ft. (30.6 + m) 2.85 ft. or 34.2 in. (0.87 m)

Table 1b. Descriptions for 2 samples from Buchanan County, Virginia.

U.S.G.S. Analysis No.	V.D.M.R. Sample No.	County	Latitude	Longitude	Formation	Coal Bed	Rank	Sample type	Sampled thickness (inches)
w204620	R-7383	Buchanan	371519n	821011w	Norton	Banner	Bituminous	Channel	38.4
w206890	R-7494	Buchanan	372523n	815758w	Wise	Elkhorn	Bituminous	Channel	28.8

Table 1c. Descriptions for 44 samples from Dickenson County, Virginia.

U. S. G. S. Analysis No.	V. D. M. R. Sample No.	County	Latitude	Longitude	Formation	Coal Bed	Rank	Sample type	Sampled thickness (inches)
w203390	R-7348	Dickenson	370246n	822858w	Norton	Upper Banner	Bituminous	Channel	30.0
w203392	R-7351	Dickenson	370749n	822804w	Wise	Upper Clintwood	Bituminous	Channel	85.4
w204159	R-7356	Dickenson	370303n	820922w	Norton	Jawbone	Bituminous	Channel	59.9
w204160	R-7357	Dickenson	370108n	821814w	Norton	Upper Banner	Bituminous	Channel	34.8
w204161	R-7358	Dickenson	370108n	821814w	Norton	Upper Banner	Bituminous	Channel	26.3
w204162	R-7359	Dickenson	370749n	822804w	Wise	Lower Clintwood	Bituminous	Channel	28.2
w204617	R-7380	Dickenson	371003n	822840w	Wise	Clintwood Marker	Bituminous	Channel	15.4
w204618	R-7381	Dickenson	371036n	822537w	Wise	Clintwood	Bituminous	Channel	11.6
w204619	R-7382	Dickenson	371036n	822537w	Wise	Clintwood	Bituminous	Channel	12.0
w206886	R-7465	Dickenson	371003n	822903w	Wise	Clintwood	Bituminous	Channel	17.8
w206887	R-7491	Dickenson	371040n	822548w	Wise	Clintwood	Bituminous	Channel	31.8
w206888	R-7492	Dickenson	371042n	822549w	Wise	Clintwood Rider	Bituminous	Channel	21.6
w206889	R-7493	Dickenson	370506n	822536w	Norton	Norton	Bituminous	Channel	24.6
w209959	R-7545	Dickenson	370050n	822556w	Norton	Upper Banner	Bituminous	Channel	39.0
w209960	R-7546	Dickenson	370104n	822724w	Norton	Norton	Bituminous	Channel	37.8
w209961	R-7547	Dickenson	370904n	823238w	Norton	Clintwood Split	Bituminous	Channel	13.2
w209962	R-7548	Dickenson	370220n	821834w	Norton	Lower Banner	Bituminous	Channel	39.6
w209963	R-7549	Dickenson	370028n	821848w	Norton	Upper Banner	Bituminous	Channel	29.4
w210391	R-7550	Dickenson	370045n	821844w	Norton	Lower Banner	Bituminous	Channel	34.2
w210392	R-7551	Dickenson	370045n	821844w	Norton	Lower Banner	Bituminous	Channel	10.2
w210393	R-7552	Dickenson	370149n	822008w	Norton	Splash Dam	Bituminous	Channel	47.4
w210394	R-7553	Dickenson	370005n	821937w	Norton	Splash Dam	Bituminous	Channel	28.8
w210395	R-7554	Dickenson	370018n	822003w	Norton	Splash Dam	Bituminous	Channel	37.8
w210396	R-7555	Dickenson	370218n	821723w	Norton	Lower Banner	Bituminous	Channel	34.6
w210403	R-7556	Dickenson	370218n	821723w	Norton	Lower Banner	Bituminous	Run of Mine	
w210397	R-7557	Dickenson	370819n	822952w	Wise	Eagle	Bituminous	Channel	25.2
w210398	R-7593	Dickenson	370022n	822017w	Norton	Lower Banner	Bituminous	Channel	56.4
w210399	R-7594	Dickenson	370140n	822031w	Norton	Splash Dam	Bituminous	Channel	47.8
w210400	R-7595	Dickenson	370143n	821611w	Norton	Lower Banner	Bituminous	Channel	38.4
w210401	R-7596	Dickenson	370133n	821252w	Norton	Upper Banner	Bituminous	Channel	29.4

Table 1c. Descriptions for 44 samples from Dickenson County, Virginia.--continued

U.S.G.S. Analysis No.	V.D.M.R. Sample No.	County	Latitude	Longitude	Formation	Coal Bed	Rank	Sample type	Sampled thickness (inches)
w210402	R-7597	Dickenson	370135n	821239w	Norton	Lower Banner	Bituminous	Channel	43.2
w211174	R-7860	Dickenson	371151n	821555w	Wise	Blair	Bituminous	Channel	46.8
w211169	R-7861	Dickenson	370424n	820945w	Norton	Tiller	Bituminous	Channel	15.6
w211168	R-7862	Dickenson	370748n	821449w	Norton	Kennedy	Bituminous	Channel	41.4
w211170	R-7863	Dickenson	370337n	821317w	Norton	Raven	Bituminous	Channel	60.6
w211171	R-7864	Dickenson	370452n	821331w	Norton	Jawbone	Bituminous	Channel	33.0
w211172	R-7865	Dickenson	370719n	821346w	Norton	Kennedy	Bituminous	Channel	24.0
w211173	R-7866	Dickenson	370259n	821436w	Wise	Dorchester	Bituminous	Channel	66.0
w211674	R-8167	Dickenson	370221n	821431w	Wise	Eagle	Bituminous	Channel	37.2
w211675	R-8168	Dickenson	371150n	821554w	Wise	Blair	Bituminous	Channel	10.2
w211676	R-8169	Dickenson	371427n	822038w	Norton	Splash Dam	Bituminous	Channel	52.8
w211677	R-8170	Dickenson	371429n	822027w	Norton	Splash Dam	Bituminous	Channel	51.6
w212486	R-8206	Dickenson	370836n	822953w	Wise	Clintwood	Bituminous	Channel	41.4
w212487	R-8242	Dickenson	370726n	822757w	Wise	Clintwood	Bituminous	Channel	82.8

Table 1d. Descriptions for 37 samples from Wise County, Virginia.

U.S.G.S. Analysis No.	V.D.M.R. Sample No.	County	Latitude	Longitude	Formation	Coal Bed	Rank	Sample type	Sampled thickness (inches)
w202130	R-7324	Wise	365652n	824007w	Wise	Lyons	Bituminous	Channel	32.4
w202129	R-7325	Wise	365815n	824242w	Norton	Norton	Bituminous	Channel	20.4
w203394	R-7341	Wise	370149n	823740w	Wise	Lyons	Bituminous	Channel	16.0
w203393	R-7342	Wise	370149n	823740w	Wise	Lyons	Bituminous	Channel	13.9
w203387	R-7343	Wise	365722n	824147w	Wise	Imboden	Bituminous	Channel	40.8
w203386	R-7344	Wise	365555n	824238w	Wise	Upper Imboden	Bituminous	Channel	30.6
w203385	R-7345	Wise	365555n	824238w	Wise	Lower Imboden	Bituminous	Channel	36.0
w203384	R-7346	Wise	365506n	822054w	Norton	Jawbone	Bituminous	Channel	42.0
w203389	R-7347	Wise	370327n	823829w	Wise	Upper Standiford	Bituminous	Channel	24.8
w203388	R-7349	Wise	365851n	822541w	Wise	Upper Norton	Bituminous	Channel	19.2
w203391	R-7350	Wise	365851n	822541w	Norton	Lower Norton	Bituminous	Channel	5.4
w204157	R-7354	Wise	365957n	822952w	Norton	Norton	Bituminous	Channel	23.4
w204158	R-7355	Wise	365957n	822952w	Norton	Norton	Bituminous	Channel	23.4
w204163	R-7366	Wise	365946n	824930w	Wise	Morris	Bituminous	Channel	54.4
w204164	R-7367	Wise	370021n	824719w	Wise	Morris	Bituminous	Channel	46.0
w205190	R-7406	Wise	365400n	824739w	Wise	Dorchester	Bituminous	Channel	51.8
w205191	R-7407	Wise	365458n	824949w	Wise	Dorchester	Bituminous	Channel	49.9
w205192	R-7408	Wise	365305n	825203w	Wise	Taggart	Bituminous	Channel	55.1
w205193	R-7409	Wise	365331n	825212w	Wise	Low Splint	Bituminous	Channel	38.9
w205194	R-7410	Wise	365331n	825212w	Wise	Low Splint	Bituminous	Channel	24.2
w205195	R-7411	Wise	365734n	825121w	Wise	Pardee	Bituminous	Channel	62.5
w205196	R-7412	Wise	365910n	825003w	Wise	Morris	Bituminous	Channel	73.2
w208044	R-7515	Wise	365719n	824217w	Wise	Imboden	Bituminous	Channel	6.0
w208045	R-7516	Wise	365717n	824217w	Wise	Imboden	Bituminous	Channel	26.4
w208046	R-7517	Wise	365719n	824217w	Wise	Imboden	Bituminous	Channel	22.2
w208047	R-7518	Wise	365719n	824217w	Wise	Imboden	Bituminous	Channel	34.2
w208048	R-7519	Wise	365719n	824217w	Wise	Kelly	Bituminous	Channel	56.4
w208049	R-7520	Wise	365719n	824217w	Wise	Pinhook	Bituminous	Channel	19.8
w211679	R-8165	Wise	370154n	824358w	Wise	Pardee	Bituminous	Channel	39.6
w211678	R-8166	Wise	370154n	824358w	Wise	Pardee	Bituminous	Channel	45.6

Table 1d. Descriptions for 37 samples from Wise County, Virginia.--continued

U.S.G.S. Analysis No.	V.D.M.R. Sample No.	County	Latitude	Longitude	Formation	Coal Bed	Rank	Sample type	Sampled thickness (inches)
w212488	R-8207	Wise	370313n	823855w	Wise	Upper Standiford	Bituminous	Channel	36.0
w212491	R-8208	Wise	370308n	823711w	Wise	Imboden	Bituminous	Channel	37.2
w212489	R-8209	Wise	370842n	823336w	Wise	Imboden	Bituminous	Channel	36.0
w212490	R-8210	Wise	370918n	823259w	Wise	Clintwood	Bituminous	Channel	45.0
w212492	R-8241	Wise	370332n	823303w	Wise	Dorchester	Bituminous	Channel	26.4
w212493	R-8243	Wise	370503n	823519w	Wise	Lyons	Bituminous	Channel	30.6
w212494	R-8244	Wise	370510n	823519w	Wise	Dorchester	Bituminous	Channel	34.2

Table 2a.--Proximate and ultimate analyses, heat content, forms of sulfur, free-swelling index and ash-fusion temperature determinations for 2 bituminous coal samples from Buchanan County, Virginia.

[All analyses except Kcal/kg, Btu, free-swelling index and ash-fusion temperatures in percent. For each sample number, the analyses are reported three ways: first, as-received, second, moisture-free, and third, moisture- and ash-free. Analyses by Coal Analysis Section, Department of Energy, Pittsburgh, Pa. and a commercial testing laboratory following ASTM standards. G for ash-fusion temperatures means greater than.]

Sample number	Proximate Analysis					Ultimate Analysis					Heat of Combustion	
	Moisture	Volatile matter	Fixed carbon	Ash	Hydrogen	Carbon	Nitrogen	Oxygen	Sulfur	Kcal/kg	Btu/lb	
R-7383	3.6	23.3	44.9	28.2	4.1	58.5	1.1	7.4	0.6	5,720	10,300	
	---	24.2	46.6	29.3	3.8	60.7	1.1	4.4	.6	5,940	10,690	
	---	34.2	65.8	---	5.4	85.8	1.6	6.2	.9	8,390	15,110	
R-7494	3.3	33.2	57.1	6.4	5.6	78.5	1.6	7.2	.8	7,740	13,940	
	---	34.3	59.0	6.6	5.4	81.2	1.7	4.4	.8	8,010	14,410	
	---	36.8	63.2	---	5.8	86.9	1.8	4.7	.9	8,570	15,430	

Sample number	Forms of sulfur			Ash-fusion temperature, C				
	Air-dried loss	Sulfate	Pyritic	Organic	Free-swelling index	Initial deformation	Softening	Fluid
R-7383	2.7	0.01	0.19	0.44	4.5	1,540G	1,540G	1,540G
	---	.01	.20	.46				
	---	.01	.28	.65				
R-7494	2.1	.01	.23	.53	9.0	1,540G	1,540G	1,540G
	---	.01	.24	.55				
	---	.01	.25	.59				

Table 2b.--Proximate and ultimate analyses, heat content, forms of sulfur, free-swelling index and ash-fusion temperature determinations for 44 bituminous coal samples from Dickenson County, Virginia.

[All analyses except Kcal/kg, Btu, free-swelling index and ash-fusion temperatures in percent. For each sample number, the analyses are reported three ways: first, as-received, second, moisture-free, and third, moisture- and ash-free. Analyses by Coal Analysis Section, Department of Energy, Pittsburgh, Pa. and a commercial testing laboratory following ASTM standards. G for ash-fusion temperatures means greater than.]

Sample number	Proximate Analysis					Ultimate Analysis					Heat of Combustion	
	Moisture	Volatile matter	Fixed carbon	Ash	Hydrogen	Carbon	Nitrogen	Oxygen	Sulfur	Kcal/kg	Btu/lb	
R-7348	2.8	28.8	58.1	10.3	5.1	76.1	1.3	6.3	0.9	7,520	13,530	
	---	29.6	59.8	10.6	4.9	78.3	1.3	3.9	.9	7,740	13,920	
	---	33.1	66.9	---	5.5	87.6	1.5	4.4	1.0	8,650	15,580	
R-7351	3.9	33.7	57.7	4.7	5.5	79.0	1.8	8.2	.8	7,850	14,140	
	---	35.1	60.0	4.9	5.3	82.2	1.9	4.9	.8	8,170	14,710	
	---	36.9	63.1	---	5.5	86.4	2.0	5.2	.9	8,590	15,470	
R-7356	4.0	25.6	57.0	13.4	4.8	72.1	1.4	7.7	.6	7,080	12,740	
	---	26.7	59.4	14.0	4.5	75.1	1.5	4.3	.6	7,370	13,270	
	---	31.0	69.0	---	5.3	87.3	1.7	5.0	.7	8,570	15,420	
R-7357	3.3	32.6	60.5	3.6	5.4	81.8	1.5	7.1	.6	8,040	14,470	
	---	33.7	62.6	3.7	5.2	84.6	1.6	4.3	.6	8,310	14,960	
	---	35.0	65.0	---	5.4	87.9	1.6	4.5	.6	8,630	15,540	
R-7358	3.4	28.8	52.0	15.8	4.9	69.2	1.4	8.0	.6	6,880	12,380	
	---	29.8	53.8	16.4	4.7	71.6	1.4	5.2	.6	7,120	12,820	
	---	35.6	64.4	---	5.6	85.6	1.7	6.2	.7	8,510	15,330	
R-7359	2.2	30.8	55.9	11.1	5.0	74.4	1.5	7.1	.9	7,440	13,400	
	---	31.5	57.2	11.3	4.9	76.1	1.5	5.3	.9	7,610	13,700	
	---	35.5	64.5	---	5.5	85.8	1.7	5.9	1.0	8,580	15,450	
R-7380	4.0	34.6	57.8	3.6	5.8	79.7	1.7	8.3	.9	7,920	14,260	
	---	36.0	60.2	3.7	5.6	83.0	1.8	4.9	.9	8,250	14,860	
	---	37.4	62.6	---	5.8	86.3	1.8	5.1	1.0	8,580	15,440	
R-7381	3.9	31.6	57.5	7.0	5.3	76.3	1.5	9.0	.8	7,550	13,590	
	---	32.9	59.8	7.3	5.1	79.4	1.6	5.8	.8	7,860	14,150	
	---	35.5	64.5	---	5.5	85.6	1.7	6.2	.9	8,480	15,260	
R-7382	3.4	30.8	54.2	11.6	4.9	72.6	1.4	8.5	.9	7,180	12,930	
	---	31.9	56.1	12.0	4.7	75.2	1.4	5.7	.9	7,430	13,380	
	---	36.2	63.8	---	5.3	85.4	1.6	6.4	1.1	8,450	15,210	
R-7465	3.7	34.5	55.4	6.4	5.9	76.5	1.7	7.9	1.6	7,630	13,740	
	---	35.8	57.5	6.6	5.7	79.4	1.8	4.8	1.7	7,930	14,270	
	---	38.4	61.6	---	6.1	85.1	1.9	5.1	1.8	8,490	15,280	
R-7491	4.0	33.2	56.5	6.3	5.6	77.0	1.8	8.1	1.3	7,670	13,800	
	---	34.6	58.9	6.6	5.4	80.2	1.9	4.7	1.4	7,990	14,370	
	---	37.0	63.0	---	5.7	85.8	2.0	5.1	1.4	8,550	15,380	



Table 2b.--Proximate and ultimate analyses, heat content, forms of sulfur, free-swelling index and ash-fusion temperature determinations for 44 bituminous coal samples from Dickenson County, Virginia--continued

Sample number	Forms of sulfur					Ash-fusion temperature, C			
	Air-dried loss	Sulfate	Pyritic	Organic	Free-swelling index	Initial deformation	Softening	Fluid	
R-7348	2.0	0.01	0.29	0.59	8.0	1,600G	1,600G	1,600G	
	---	.01	.30	.61					
	---	.01	.33	.68					
R-7351	2.7	.02	.19	.62	8.0	1,390	1,445	1,505	
	---	.02	.20	.65					
	---	.02	.21	.68					
R-7356	3.4	.01	.12	.46	8.0	1,540G	1,540G	1,540G	
	---	.01	.12	.48					
	---	.01	.15	.56					
R-7357	2.5	.01	.13	.45	8.0	1,180	1,230	1,295	
	---	.01	.13	.47					
	---	.01	.14	.48					
R-7358	2.7	.01	.16	.40	7.5	1,540G	1,540G	1,540G	
	---	.01	.17	.41					
	---	.01	.20	.50					
R-7359	1.3	.01	.36	.52	7.5	1,540G	1,540G	1,540G	
	---	.01	.37	.53					
	---	.01	.42	.60					
R-7380	2.8	.01	.24	.62	7.0	1,245	1,295	1,365	
	---	.01	.25	.65					
	---	.01	.26	.67					
R-7381	2.9	.01	.17	.65	9.0	1,540G	1,540G	1,540G	
	---	.01	.18	.68					
	---	.01	.19	.73					
R-7382	2.3	.01	.19	.72	9.0	1,540G	1,540G	1,540G	
	---	.01	.20	.75					
	---	.01	.22	.85					
R-7465	2.3	.01	1.20	.38	8.0	1,330	1,395	1,440	
	---	.01	1.25	.39					
	---	.01	1.33	.42					
R-7491	2.8	.02	.84	.46	9.0	1,395	1,440	1,490	
	---	.02	.87	.48					
	---	.02	.94	.51					

Table 2b.--Proximate and ultimate analyses, heat content, forms of sulfur, free-swelling index and ash-fusion temperature determinations for 44 bituminous coal samples from Dickenson County, Virginia--continued

Sample number	Proximate Analysis					Ultimate Analysis					Heat of Combustion		
	Moisture	Volatile matter	Fixed carbon	Ash	Hydrogen	Carbon	Nitrogen	Oxygen	Sulfur	Kcal/kg	Btu/lb		
R-7492	3.4	33.7	59.0	3.9	5.8	79.5	1.8	7.4	1.6	7,960	14,330		
	---	34.9	61.1	4.0	5.6	82.3	1.9	4.5	1.7	8,240	14,830		
	---	36.4	63.6	---	5.8	85.8	1.9	4.7	1.7	8,590	15,460		
R-7493	3.9	29.9	61.6	4.6	5.5	80.2	1.6	7.1	.9	7,890	14,200		
	---	31.1	64.1	4.8	5.3	83.5	1.7	3.8	.9	8,210	14,780		
	---	32.7	67.3	---	5.5	87.7	1.7	4.0	1.0	8,620	15,520		
R-7545	2.0	31.7	60.0	6.3	5.1	79.7	1.5	6.7	.6	7,910	14,240		
	---	32.3	61.2	6.4	5.0	81.3	1.5	5.0	.6	8,070	14,530		
	---	34.6	65.4	---	5.3	86.9	1.6	5.4	.7	8,620	15,520		
R-7546	3.7	30.9	57.0	8.4	5.7	75.0	1.5	8.4	1.0	7,480	13,470		
	---	32.1	59.2	8.7	5.5	77.9	1.6	5.3	1.0	7,770	13,990		
	---	35.2	64.8	---	6.0	85.3	1.7	5.8	1.1	8,510	15,320		
R-7547	8.9	34.1	49.2	7.8	5.9	69.8	1.5	12.3	2.6	7,050	12,690		
	---	37.4	54.0	8.6	5.4	76.6	1.6	4.8	2.9	7,740	13,930		
	---	40.9	59.1	---	5.9	83.8	1.8	5.3	3.1	8,460	15,230		
R-7548	2.5	28.2	56.4	12.9	4.9	72.8	1.4	7.0	1.1	7,220	12,990		
	---	28.9	57.8	13.2	4.7	74.7	1.4	4.9	1.1	7,400	13,330		
	---	33.3	66.7	---	5.5	86.1	1.7	5.6	1.3	8,530	15,360		
R-7549	2.0	31.8	57.2	9.0	5.4	77.0	1.4	6.4	.7	7,570	13,620		
	---	32.4	58.4	9.2	5.3	78.6	1.4	4.7	.7	7,720	13,900		
	---	35.7	64.3	---	5.8	86.5	1.6	5.2	.8	8,500	15,300		
R-7550	1.3	44.5	47.3	6.9	5.2	80.0	1.6	5.5	.8	7,930	14,270		
	---	45.1	47.9	7.0	5.1	81.1	1.6	4.4	.8	8,030	14,460		
	---	48.5	51.5	---	5.5	87.1	1.7	4.7	.9	8,640	15,550		
R-7551	1.5	19.7	28.5	50.3	3.0	39.2	.8	5.6	1.0	3,860	6,950		
	---	20.0	28.9	51.1	2.9	39.8	.8	4.3	1.0	3,920	7,050		
	---	40.9	59.1	---	5.9	81.3	1.7	8.9	2.1	8,010	14,410		
R-7552	2.0	29.6	59.3	9.1	5.2	77.0	1.5	6.3	1.0	7,680	13,820		
	---	30.2	60.5	9.3	5.1	78.6	1.5	4.6	1.0	7,840	14,100		
	---	33.3	66.7	---	5.6	86.6	1.7	5.1	1.1	8,640	15,550		
R-7553	1.9	33.5	55.0	9.6	5.3	75.4	1.4	6.5	1.8	7,560	13,600		
	---	34.1	56.1	9.8	5.2	76.9	1.4	4.9	1.8	7,700	13,860		
	---	37.9	62.1	---	5.8	85.2	1.6	5.4	2.0	8,540	15,370		
R-7554	3.0	34.8	55.1	7.1	5.4	74.8	1.4	7.1	4.1	7,640	13,750		
	---	35.9	56.8	7.3	5.2	77.1	1.4	4.6	4.2	7,880	14,180		
	---	38.7	61.3	---	5.6	83.2	1.6	4.9	4.6	8,500	15,300		

Table 2b.--Proximate and ultimate analyses, heat content, forms of sulfur, free-swelling index and ash-fusion temperature determinations for 44 bituminous coal samples from Dickenson County, Virginia--continued

Forms of sulfur  
Ash-fusion temperature, C

Sample number	Air-dried loss	Sulfate	Pyritic	Organic	Free-swelling index	Initial deformation	Softening	Fluid
R-7492	1.9	0.02	1.18	0.39	9.0	1,215	1,265	1,320
	---	.02	1.22	.40				
	---	.02	1.27	.42				
R-7493	2.8	.01	.43	.46	9.0	1,355	1,425	1,475
	---	.01	.45	.48				
	---	.01	.47	.50				
R-7545	1.2	.01	.10	.51	8.0	1,365	1,415	1,490
	---	.01	.10	.52				
	---	.01	.11	.56				
R-7546	2.2	.01	.15	.80	8.5	1,190	1,255	1,325
	---	.01	.16	.83				
	---	.01	.17	.91				
R-7547	7.5	.01	2.20	.43	8.0	1,095	1,160	1,220
	---	.01	2.41	.47				
	---	.01	2.64	.52				
R-7548	1.8	.01	.65	.45	7.0	1,400	1,470	1,520
	---	.01	.67	.46				
	---	.01	.77	.53				
R-7549	.9	.01	.06	.58	8.0	1,210	1,290	1,350
	---	.01	.06	.59				
	---	.01	.07	.65				
R-7550	.4	.01	.10	.65	8.0	1,165	1,215	1,300
	---	.01	.10	.66				
	---	.01	.11	.71				
R-7551	.6	.02	.54	.49	1.5	1,330	1,380	1,445
	---	.02	.55	.50				
	---	.04	1.12	1.02				
R-7552	1.1	.01	.28	.73	8.5	1,280	1,355	1,420
	---	.01	.29	.74				
	---	.01	.31	.82				
R-7553	.7	.14	1.03	.66	8.5	1,040	1,145	1,225
	---	.14	1.05	.67				
	---	.16	1.16	.75				
R-7554	1.7	.23	2.77	1.15	8.5	1,070	1,120	1,170
	---	.24	2.86	1.19				
	---	.26	3.08	1.28				

Table 2b.--Proximate and ultimate analyses, heat content, forms of sulfur, free-swelling index and ash-fusion temperature determinations for 44 bituminous coal samples from Dickenson County, Virginia--continued

Sample number	Proximate Analysis					Ultimate Analysis					Heat of Combustion		
	Moisture	Volatile matter	Fixed carbon	Ash	Hydrogen	Carbon	Nitrogen	Oxygen	Sulfur	Kcal/kg	Btu/lb		
R-7555	2.2	28.4	58.2	11.2	5.0	74.1	1.4	7.0	1.1	7,380	13,280		
	---	29.0	59.5	11.5	4.9	75.8	1.4	5.2	1.1	7,550	13,580		
	---	32.8	67.2	---	5.5	85.6	1.6	5.8	1.3	8,520	15,340		
R-7556	3.1	22.8	40.7	33.4	4.0	54.3	1.1	6.2	.9	5,380	9,690		
	---	23.5	42.0	34.5	3.8	56.0	1.1	3.6	.9	5,560	10,000		
	---	35.9	64.1	---	5.8	85.5	1.7	5.4	1.4	8,480	15,260		
R-7557	3.9	30.8	52.1	13.2	5.3	71.0	1.4	8.0	1.1	7,090	12,760		
	---	32.0	54.2	13.7	5.1	73.9	1.5	4.7	1.1	7,370	13,270		
	---	37.2	62.8	---	5.9	85.6	1.7	5.5	1.3	8,550	15,390		
R-7593	1.6	30.0	53.1	15.3	4.8	72.0	1.4	5.6	.8	7,140	12,850		
	---	30.5	54.0	15.5	4.7	73.2	1.4	4.2	.8	7,260	13,060		
	---	36.1	63.9	---	5.6	86.6	1.7	5.0	1.0	8,590	15,470		
R-7594	3.3	42.9	32.1	21.7	4.5	64.6	1.2	7.3	.7	6,240	11,240		
	---	44.4	33.2	22.4	4.3	66.8	1.2	4.5	.7	6,460	11,620		
	---	57.2	42.8	---	5.5	86.1	1.6	5.8	.9	8,320	14,980		
R-7595	2.4	30.5	60.0	7.1	5.4	78.8	1.5	6.3	.8	7,820	14,080		
	---	31.2	61.5	7.3	5.3	80.7	1.5	4.3	.8	8,010	14,420		
	---	33.7	66.3	---	5.7	87.1	1.7	4.6	.9	8,640	15,550		
R-7596	1.5	33.1	50.5	14.9	5.0	70.5	1.3	6.1	2.2	7,130	12,830		
	---	33.6	51.3	15.1	4.9	71.6	1.3	4.8	2.2	7,240	13,030		
	---	39.6	60.4	---	5.8	84.3	1.6	5.7	2.6	8,530	15,350		
R-7597	3.8	32.2	57.5	6.5	5.9	77.8	1.5	7.6	.8	7,740	13,920		
	---	33.5	59.8	6.8	5.7	80.9	1.6	4.4	.8	8,040	14,470		
	---	35.9	64.1	---	6.1	86.7	1.7	4.7	.9	8,620	15,520		
R-7860	2.7	30.4	55.9	11.0	5.0	73.3	1.4	6.5	2.8	7,290	13,120		
	---	31.2	57.5	11.3	4.8	75.3	1.4	4.2	2.9	7,490	13,490		
	---	35.2	64.8	---	5.4	84.9	1.6	4.7	3.3	8,450	15,210		
R-7861	1.8	23.4	56.5	18.3	4.4	70.0	1.2	5.5	.6	6,790	12,220		
	---	23.8	57.6	18.6	4.3	71.2	1.2	4.0	.6	6,910	12,440		
	---	29.3	70.7	---	5.3	87.5	1.5	5.0	.8	8,490	15,280		
R-7862	1.4	20.8	55.3	22.6	4.1	64.6	1.2	6.8	.7	6,500	11,700		
	---	21.1	56.1	22.9	4.0	65.5	1.2	5.7	.8	6,590	11,860		
	---	27.3	72.7	---	5.2	84.9	1.6	7.4	1.0	8,550	15,380		
R-7863	2.0	22.9	50.5	24.6	4.1	63.6	1.2	6.0	.5	6,260	11,260		
	---	23.4	51.5	25.1	4.0	65.0	1.2	4.3	.5	6,390	11,490		
	---	31.2	68.8	---	5.3	86.7	1.6	5.7	.7	8,520	15,340		

Table 2b.--Proximate and ultimate analyses, heat content, forms of sulfur, free-swelling index and ash-fusion temperature determinations for 44 bituminous coal samples from Dickenson County, Virginia--Continued

Sample number	Forms of sulfur					Ash-fusion temperature, C			
	Air-dried loss	Sulfate	Pyritic	Organic	Free-swelling index	Initial deformation	Softening	Fluid	
R-7555	1.0	0.10	0.23	0.81	7.5	1,300	1,360	1,410	
	---	.10	.24	.83					
	---	.12	.27	.94					
R-7556	2.3	.01	.37	.55	6.5	1,295	1,365	1,410	
	---	.01	.38	.57					
	---	.02	.58	.87					
R-7557	2.8	.19	.32	.62	8.5	1,170	1,240	1,330	
	---	.20	.33	.65					
	---	.23	.39	.75					
R-7593	.7	.01	.22	.61	7.5	1,245	1,305	1,355	
	---	.01	.22	.62					
	---	.01	.26	.73					
R-7594	2.2	.01	.13	.57	7.0	1,410	1,480	1,530	
	---	.01	.13	.59					
	---	.01	.17	.76					
R-7595	1.3	.01	.07	.72	8.0	1,150	1,210	1,260	
	---	.01	.07	.74					
	---	.01	.08	.80					
R-7596	.5	.01	1.91	.25	7.5	1,310	1,365	1,425	
	---	.01	1.94	.25					
	---	.01	2.28	.30					
R-7597	2.6	.01	.09	.66	6.0	1,330	1,375	1,425	
	---	.01	.09	.69					
	---	.01	.10	.74					
R-7860	1.5	.42	1.29	1.14	9.0	1,225	1,295	1,405	
	---	.43	1.33	1.17					
	---	.49	1.49	1.32					
R-7861	.9	.03	.04	.53	9.0	1,425	1,470	1,510	
	---	.03	.04	.54					
	---	.04	.05	.66					
R-7862	.6	.05	.24	.45	8.0	1,405	1,500	1,540G	
	---	.05	.24	.46					
	---	.07	.32	.59					
R-7863	1.0	.02	.03	.45	8.0	1,375	1,465	1,540G	
	---	.02	.03	.46					
	---	.03	.04	.61					

Table 2b.--Proximate and ultimate analyses, heat content, forms of sulfur, free-swelling index and ash-fusion temperature determinations for 44 bituminous coal samples from Dickenson County, Virginia--continued

Sample number	Proximate Analysis					Ultimate Analysis					Heat of Combustion	
	Moisture	Volatile matter	Fixed carbon	Ash	Hydrogen	Carbon	Nitrogen	Oxygen	Sulfur	Kcal/kg	Btu/lb	
R-7864	1.5	19.8	53.6	25.1	4.0	64.2	1.1	5.2	0.5	6,220	11,200	
	---	20.1	54.5	25.5	3.9	65.2	1.1	3.8	.6	6,320	11,370	
	---	26.9	73.1	---	5.2	87.4	1.4	5.2	.7	8,480	15,260	
R-7865	2.5	19.1	48.8	29.5	3.9	58.3	1.1	5.7	1.5	5,780	10,400	
	---	19.6	50.1	30.3	3.7	59.8	1.1	3.6	1.5	5,930	10,670	
	---	28.1	71.9	---	5.3	85.8	1.6	5.1	2.1	8,510	15,310	
R-7866	2.2	28.9	53.2	15.7	4.8	70.8	1.4	6.7	.6	6,980	12,560	
	---	29.6	54.4	16.0	4.7	72.4	1.4	4.8	.6	7,140	12,840	
	---	35.2	64.8	---	5.6	86.2	1.7	5.8	.7	8,500	15,290	
R-8167	2.1	33.3	61.2	3.4	5.4	81.4	1.5	7.5	.8	8,020	14,430	
	---	34.0	62.5	3.5	5.3	83.2	1.6	5.7	.8	8,190	14,730	
	---	35.2	64.8	---	5.5	86.2	1.6	5.9	.8	8,480	15,260	
R-8168	2.7	29.5	55.8	12.0	4.9	72.9	1.5	6.5	2.2	7,240	13,030	
	---	30.3	57.4	12.3	4.7	74.9	1.5	4.2	2.3	7,440	13,390	
	---	34.5	65.5	---	5.4	85.5	1.7	4.8	2.6	8,490	15,280	
R-8169	2.8	31.1	56.0	10.1	5.1	74.8	1.5	7.8	.6	7,340	13,210	
	---	32.0	57.6	10.4	4.9	77.0	1.5	5.5	.6	7,550	13,590	
	---	35.7	64.3	---	5.5	86.0	1.7	6.1	.7	8,430	15,180	
R-8170	2.3	28.9	52.8	16.0	4.9	70.0	1.5	6.8	.8	7,020	12,630	
	---	29.6	54.0	16.4	4.7	71.6	1.6	4.9	.8	7,180	12,930	
	---	35.4	64.6	---	5.6	85.7	1.9	5.9	.9	8,590	15,460	
R-8206	2.1	30.9	61.8	5.2	5.1	79.9	1.6	7.5	.7	7,820	14,080	
	---	31.6	63.2	5.3	4.9	81.7	1.7	5.7	.7	7,990	14,380	
	---	33.3	66.7	---	5.2	86.2	1.8	6.0	.8	9,440	15,190	
R-8242	4.0	31.7	59.6	4.7	5.2	77.3	1.8	10.1	.8	7,540	13,580	
	---	33.0	62.1	4.9	4.9	80.6	1.9	6.8	.9	7,860	14,150	
	---	34.7	65.3	---	5.2	84.7	2.0	7.2	.9	8,270	14,880	

Table 2b.--Proximate and ultimate analyses, heat content, forms of sulfur, free-swelling index and ash-fusion temperature determinations for 44 bituminous coal samples from Dickenson County, Virginia--continued

Sample number	Forms of sulfur				Ash-fusion temperature, C			
	Air-dried loss	Sulfate	Pyritic	Organic	Free-swelling index	Initial deformation	Softening	Fluid
R-7864	0.7	0.05	0.10	0.40	7.5	1,515	1,540G	1,540G
	---	.05	.10	.41				
	---	.07	.14	.55				
R-7865	1.5	.24	.73	.48	8.0	1,305	1,415	1,540G
	---	.25	.75	.49				
	---	.35	1.07	.71				
R-7866	.9	.03	.04	.54	7.5	1,475	1,540G	1,540G
	---	.03	.04	.55				
	---	.04	.05	.66				
R-8167	.6	.07	.17	.55	8.5	1,275	1,330	1,470
	---	.07	.17	.56				
	---	.07	.18	.58				
R-8168	1.5	.26	1.16	.78	9.0	1,190	1,280	1,370
	---	.27	1.19	.80				
	---	.30	1.36	.91				
R-8169	1.6	.04	.03	.56	7.5	1,400	1,540G	1,540G
	---	.04	.03	.58				
	---	.05	.03	.64				
R-8170	1.1	.11	.16	.48	7.5	1,370	1,455	1,500
	---	.11	.16	.49				
	---	.13	.20	.59				
R-8206	.6	.01	.10	.61	3.5	1,540	1,540G	1,540G
	---	.01	.10	.62				
	---	.01	.11	.66				
R-8242	1.9	.09	.15	.60	7.5	1,225	1,375	1,445
	---	.09	.16	.63				
	---	.10	.16	.66				

Table 2c.--Proximate and ultimate analyses, heat content, forms of sulfur, free-swelling index and ash-fusion temperature determinations for 37 bituminous coal samples from Wise County, Virginia.

[All analyses except Kcal/kg, Btu, free-swelling index and ash-fusion temperatures in percent. For each sample number, the analyses are reported three ways: first, as-received, second, moisture-free, and third, moisture- and ash-free. Analyses by Coal Analysis Section, Department of Energy, Pittsburgh, Pa. and a commercial testing laboratory following ASTM standards. G for ash-fusion temperatures means greater than.]

Sample number	Proximate Analysis					Ultimate Analysis					Heat of Combustion	
	Moisture	Volatile matter	Fixed carbon	Ash	Hydrogen	Carbon	Nitrogen	Oxygen	Sulfur	Kcal/kg	Btu/lb	
R-7324	3.0	34.2	53.9	8.9	5.2	73.8	1.3	8.0	2.8	7,440	13,390	
	---	35.3	55.6	9.2	5.0	76.1	1.3	5.5	2.9	7,670	13,800	
	---	38.8	61.2	---	5.5	83.8	1.5	6.1	3.2	8,440	15,200	
R-7325	3.9	34.4	55.4	6.3	5.4	77.2	1.4	8.8	.9	7,630	13,730	
	---	35.8	57.6	6.6	5.2	80.3	1.5	5.5	.9	7,940	14,290	
	---	38.3	61.7	---	5.5	86.0	1.6	5.9	1.0	8,500	15,290	
R-7341	2.5	33.1	53.8	10.6	5.2	73.3	1.5	5.3	4.2	7,410	13,330	
	---	33.9	55.2	10.9	5.0	75.2	1.5	3.2	4.3	7,600	13,670	
	---	38.1	61.9	---	5.7	84.3	1.7	3.5	4.8	8,520	15,340	
R-7342	2.2	32.8	52.3	12.7	5.0	71.5	1.4	4.8	4.5	7,240	13,040	
	---	33.5	53.5	13.0	4.9	73.1	1.4	2.9	4.6	7,410	13,330	
	---	38.5	61.5	---	5.6	84.0	1.6	3.3	5.3	8,510	15,320	
R-7343	3.8	33.4	51.8	11.0	5.4	72.5	1.4	8.8	.8	7,210	12,990	
	---	34.7	53.8	11.4	5.2	75.4	1.5	5.6	.8	7,500	13,500	
	---	39.2	60.8	---	5.8	85.1	1.6	6.4	.9	8,470	15,240	
R-7344	2.7	36.9	57.4	3.0	5.7	80.1	1.5	8.7	1.0	7,990	14,390	
	---	37.9	59.0	3.1	5.5	82.3	1.5	6.5	1.0	8,220	14,790	
	---	39.1	60.9	---	5.7	84.9	1.6	6.7	1.1	8,480	15,260	
R-7345	3.3	31.8	48.9	16.0	4.9	68.2	1.3	8.8	.8	6,740	12,130	
	---	32.9	50.6	16.5	4.7	70.5	1.3	6.1	.8	6,970	12,540	
	---	39.4	60.6	---	5.6	84.5	1.6	7.3	1.0	8,350	15,030	
R-7346	3.6	21.4	64.2	10.8	5.1	73.7	1.4	8.0	.9	7,200	12,970	
	---	22.2	66.6	11.2	4.9	76.5	1.5	5.0	.9	7,470	13,450	
	---	25.0	75.0	---	5.5	86.1	1.6	5.6	1.1	8,420	15,150	
R-7347	3.1	32.6	53.6	10.7	5.3	73.5	.4	8.2	2.0	7,330	13,200	
	---	33.6	55.3	11.0	5.1	75.9	.4	5.6	2.1	7,570	13,620	
	---	37.8	62.2	---	5.7	85.3	.5	6.3	2.3	8,510	15,310	
R-7349	3.5	31.4	50.1	15.0	5.2	69.6	1.5	7.8	1.1	6,880	12,390	
	---	32.5	51.9	15.5	5.0	72.1	1.6	4.9	1.1	7,130	12,840	
	---	38.5	61.5	---	5.9	85.4	1.8	5.8	1.3	8,450	15,210	
R-7350	2.6	33.0	51.8	12.6	5.1	73.0	1.4	7.0	.8	7,240	13,030	
	---	33.9	53.2	12.9	4.9	74.9	1.4	4.8	.8	7,430	13,380	
	---	38.9	61.1	---	5.7	86.1	1.7	5.5	.9	8,540	15,370	



Table 2c.--Proximate and ultimate analyses, heat content, forms of sulfur, free-swelling index and ash-fusion temperature determinations for 37 bituminous coal samples from Wise County, Virginia--continued

Sample number	Forms of sulfur				Ash-fusion temperature, C			
	Air-dried loss	Sulfate	Pyritic	Organic	Free-swelling index	Initial deformation	Softening	Fluid
R-7324	1.5	0.02	1.65	1.15	8.5	1,140	1,260	1,305
	---	.02	1.70	1.19				
	---	.02	1.87	1.31				
R-7325	2.3	.01	.31	.62	8.5	1,165	1,195	1,305
	---	.01	.32	.65				
	---	.01	.35	.69				
R-7341	1.6	.01	2.54	1.62	8.5	1,075	1,145	1,180
	---	.01	2.61	1.66				
	---	.01	2.92	1.86				
R-7342	1.2	.01	3.02	1.50	8.0	1,110	1,175	1,270
	---	.01	3.09	1.53				
	---	.01	3.55	1.76				
R-7343	2.2	.01	.16	.64	8.0	1,600G	1,600G	1,600G
	---	.01	.17	.67				
	---	.01	.19	.75				
R-7344	.9	.01	.21	.79	8.0	1,320	1,380	1,430
	---	.01	.22	.81				
	---	.01	.22	.84				
R-7345	1.5	.01	.23	.61	6.5	1,600G	1,600G	1,600G
	---	.01	.24	.63				
	---	.01	.29	.76				
R-7346	2.2	.05	.19	.70	6.5	1,325	1,375	1,425
	---	.05	.20	.73				
	---	.06	.22	.82				
R-7347	1.9	.01	1.09	.90	8.5	1,350	1,400	1,450
	---	.01	1.12	.93				
	---	.01	1.26	1.04				
R-7349	2.0	.01	.35	.71	8.5	1,320	1,380	1,440
	---	.01	.36	.74				
	---	.01	.43	.87				
R-7350	1.1	.01	.20	.63	8.5	1,405	1,455	1,515
	---	.01	.21	.65				
	---	.01	.24	.74				

Table 2c.--Proximate and ultimate analyses, heat content, forms of sulfur, free-swelling index and ash-fusion temperature determinations for 37 bituminous coal samples from Wise County, Virginia--continued

Sample number	Proximate Analysis					Ultimate Analysis					Heat of Combustion	
	Moisture	Volatile matter	Fixed carbon	Ash	Hydrogen	Carbon	Nitrogen	Oxygen	Sulfur	Kcal/kg	Btu/lb	
R-7354	2.7	31.3	61.3	4.7	5.3	80.2	1.6	7.4	0.8	7,940	14,280	
	---	32.2	63.0	4.8	5.1	82.4	1.6	5.1	.8	8,160	14,680	
	---	33.8	66.2	---	5.4	86.6	1.7	5.4	.9	8,570	15,430	
R-7355	2.2	31.8	60.3	5.7	5.6	79.6	1.6	6.7	.9	7,890	14,200	
	---	32.5	61.7	5.8	5.5	81.4	1.6	4.9	.9	8,070	14,520	
	---	34.5	65.5	---	5.8	86.4	1.7	5.2	1.0	8,560	15,420	
R-7366	3.5	33.5	56.2	6.8	5.2	76.3	1.6	9.5	.6	7,460	13,420	
	---	34.7	58.2	7.0	5.0	79.1	1.7	6.6	.6	7,730	13,910	
	---	37.3	62.7	---	5.4	85.1	1.8	7.1	.7	8,310	14,970	
R-7367	2.2	34.5	56.5	6.8	5.3	77.6	1.6	8.0	.7	7,600	13,690	
	---	35.3	57.8	7.0	5.2	79.3	1.6	6.2	.7	7,770	13,990	
	---	37.9	62.1	---	5.6	85.3	1.8	6.6	.8	8,360	15,040	
R-7406	2.0	32.3	49.6	16.1	4.9	69.3	1.5	7.4	.8	6,850	12,330	
	---	33.0	50.6	16.4	4.8	70.7	1.5	5.7	.8	6,990	12,580	
	---	39.4	60.6	---	5.7	84.6	1.8	6.9	1.0	8,360	15,050	
R-7407	1.5	33.1	53.0	12.4	5.0	73.3	1.6	6.5	1.2	7,290	13,130	
	---	33.6	53.8	12.6	4.9	74.4	1.6	5.2	1.2	7,400	13,330	
	---	38.4	61.6	---	5.6	85.1	1.9	6.0	1.4	8,470	15,250	
R-7408	3.4	34.3	53.1	9.2	5.4	74.1	1.4	9.3	.7	7,340	13,210	
	---	35.5	55.0	9.5	5.2	76.7	1.4	6.5	.7	7,600	13,680	
	---	39.2	60.8	---	5.7	84.8	1.6	7.2	.8	8,400	15,120	
R-7409	2.3	37.9	55.3	4.5	5.1	79.2	1.6	9.1	.6	7,880	14,190	
	---	38.8	56.6	4.6	5.0	81.1	1.6	7.2	.6	8,070	14,530	
	---	40.7	59.3	---	5.2	85.0	1.7	7.6	.6	8,460	15,230	
R-7410	2.3	36.3	51.4	10.0	5.0	73.6	1.5	9.1	.8	7,320	13,180	
	---	37.2	52.6	10.2	4.9	75.3	1.5	7.2	.8	7,500	13,490	
	---	41.4	58.6	---	5.4	83.9	1.7	8.0	.9	8,350	15,030	
R-7411	2.2	35.9	53.2	8.7	5.4	75.0	1.7	8.3	.9	7,520	13,530	
	---	36.7	54.4	8.9	5.3	76.7	1.7	6.5	.9	7,690	13,830	
	---	40.3	59.7	---	5.8	84.2	1.9	7.1	1.0	8,440	15,180	
R-7412	2.9	34.6	57.5	5.0	5.4	78.9	1.6	8.5	.6	7,760	13,970	
	---	35.6	59.2	5.1	5.2	81.3	1.6	6.1	.6	7,990	14,390	
	---	37.6	62.4	---	5.5	85.7	1.7	6.4	.7	8,430	15,170	
R-7515	3.9	34.8	55.8	5.5	5.5	77.0	1.5	9.5	1.1	7,640	13,760	
	---	36.2	58.1	5.7	5.3	80.1	1.6	6.3	1.1	7,950	14,320	
	---	38.4	61.6	---	5.6	85.7	1.7	6.7	1.2	8,440	15,190	

Table 2c.--Proximate and ultimate analyses, heat content, forms of sulfur, free-swelling index and ash-fusion temperature determinations for 37 bituminous coal samples from Wise County, Virginia--continued

Sample number	Forms of sulfur					Ash-fusion temperature, C			
	Air-dried loss	Sulfate	Pyritic	Organic	Free-swelling index	Initial deformation	Softening	Fluid	
R-7354	1.6	0.01	0.22	0.57	9.0	1,455	1,515	1,540G	
	---	.01	.23	.59					
	---	.01	.24	.62					
R-7355	1.2	.01	.33	.55	9.0	1,290	1,350	1,405	
	---	.01	.34	.56					
	---	.01	.36	.60					
R-7366	1.8	.01	.13	.43	4.5	1,430	1,495	1,540G	
	---	.01	.13	.45					
	---	.01	.14	.48					
R-7367	.7	.01	.16	.50	5.0	1,540G	1,540G	1,540G	
	---	.01	.16	.51					
	---	.01	.18	.55					
R-7406	.8	.01	.20	.58	6.0	1,495	1,540G	1,540G	
	---	.01	.20	.59					
	---	.01	.24	.71					
R-7407	.4	.02	.48	.74	6.0	1,455	1,515	1,540G	
	---	.02	.49	.75					
	---	.02	.56	.86					
R-7408	1.8	.01	.10	.57	5.5	1,505	1,540G	1,540G	
	---	.01	.10	.59					
	---	.01	.11	.65					
R-7409	.6	.05	.06	.50	6.0	1,490	1,540G	1,540G	
	---	.05	.06	.51					
	---	.05	.06	.54					
R-7410	.7	.02	.08	.66	4.5	1,510	1,540G	1,540G	
	---	.02	.08	.68					
	---	.02	.09	.75					
R-7411	.6	.01	.14	.76	5.5	1,540G	1,540G	1,540G	
	---	.01	.14	.78					
	---	.01	.16	.85					
R-7412	.9	.01	.12	.52	5.0	1,540G	1,540G	1,540G	
	---	.01	.12	.54					
	---	.01	.13	.56					
R-7515	2.3	.02	.61	.48	9.0	1,405	1,455	1,515	
	---	.02	.63	.5					
	---	.02	.67	.53					

Table 2c.--Proximate and ultimate analyses, heat content, forms of sulfur, free-swelling index and ash-fusion temperature determinations for 37 bituminous coal samples from Wise County, Virginia--continued

Sample number	Proximate Analysis					Ultimate Analysis					Heat of Combustion	
	Moisture	Volatile matter	Fixed carbon	Ash	Hydrogen	Carbon	Nitrogen	Oxygen	Sulfur	Kcal/kg	Btu/lb	
R-7516	3.0	33.8	57.3	5.9	5.3	75.5	1.5	11.2	0.6	7,740	13,940	
	---	34.8	59.1	6.1	5.1	77.8	1.5	8.8	.6	7,980	14,370	
	---	37.1	62.9	---	5.5	82.9	1.6	9.4	.7	8,500	15,300	
R-7517	4.2	28.0	47.9	19.9	4.7	64.0	1.2	9.4	.8	6,300	11,350	
	---	29.2	50.0	20.8	4.4	66.8	1.3	5.9	.8	6,580	11,840	
	---	36.9	63.1	---	5.6	84.3	1.6	7.5	1.1	8,300	14,950	
R-7518	2.5	35.2	55.0	7.3	5.4	76.9	1.5	8.2	.7	7,670	13,800	
	---	36.1	56.4	7.5	5.3	78.9	1.5	6.1	.7	7,860	14,150	
	---	39.0	61.0	---	5.7	85.3	1.7	6.6	.8	8,500	15,300	
R-7519	2.4	33.4	58.1	6.1	6.3	78.7	1.6	7.7	.6	7,750	13,960	
	---	34.2	59.5	6.2	6.2	80.6	1.6	5.7	.6	7,940	14,300	
	---	36.5	63.5	---	6.6	86.0	1.7	6.1	.7	8,470	15,250	
R-7520	3.3	35.0	57.2	4.5	5.5	78.3	1.5	9.2	1.0	7,850	14,130	
	---	36.2	59.2	4.7	5.3	81.0	1.6	6.5	1.0	8,120	14,610	
	---	38.0	62.0	---	5.6	84.9	1.6	6.8	1.1	8,510	15,320	
R-8165	1.9	31.5	54.5	12.1	4.9	73.1	1.6	7.3	.9	7,200	12,970	
	---	32.1	55.6	12.3	4.8	74.5	1.7	5.7	.9	7,340	13,220	
	---	36.6	63.4	---	5.5	85.0	1.9	6.5	1.0	8,370	15,070	
R-8166	2.1	34.2	51.8	11.9	5.2	72.7	1.7	7.3	1.3	7,200	12,970	
	---	35.0	52.9	12.1	5.0	74.3	1.7	5.6	1.3	7,360	13,240	
	---	39.8	60.2	---	5.7	84.5	2.0	6.3	1.5	8,370	15,070	
R-8207	1.7	33.8	55.4	9.2	5.1	76.4	1.4	6.8	1.1	7,570	13,620	
	---	34.3	56.3	9.3	5.0	77.7	1.4	5.4	1.1	7,700	13,860	
	---	37.9	62.1	---	5.6	85.7	1.5	5.9	1.3	8,490	15,280	
R-8208	2.2	28.5	53.5	15.7	4.6	70.1	1.2	7.7	.7	6,910	12,430	
	---	29.2	54.8	16.1	4.4	71.7	1.2	5.9	.7	7,060	12,710	
	---	34.7	65.3	---	5.3	85.4	1.5	7.0	.8	8,420	15,150	
R-8209	2.5	36.2	56.2	5.1	5.3	77.7	1.7	8.2	2.0	7,780	14,000	
	---	37.2	57.6	5.2	5.2	79.7	1.8	6.2	2.0	7,980	14,360	
	---	39.2	60.8	---	5.4	84.1	1.9	6.5	2.1	8,410	15,140	
R-8210	1.9	31.6	52.6	13.9	4.7	71.8	1.6	7.3	.7	7,090	12,770	
	---	32.2	53.6	14.2	4.6	73.2	1.6	5.8	.7	7,230	13,010	
	---	37.6	62.4	---	5.3	85.2	1.9	6.7	.8	8,420	15,150	
R-8241	2.4	30.3	63.1	4.3	5.2	80.8	1.6	7.4	.7	7,990	14,390	
	---	31.0	64.6	4.4	5.0	82.7	1.7	5.4	.7	8,190	14,740	
	---	32.4	67.6	---	5.3	86.5	1.7	5.7	.8	8,570	15,420	

Table 2c.--Proximate and ultimate analyses, heat content, forms of sulfur, free-swelling index and ash-fusion temperature determinations for 37 bituminous coal samples from Wise County, Virginia--continued

Sample number	Forms of sulfur					Ash-fusion temperature, C		
	Air-dried loss	Sulfate	Pyritic	Organic	Free-swelling index	Initial deformation	Softening	Fluid
R-7516	1.5	0.01	0.20	0.40	9.0	1,510	1,540G	1,540G
	---	.01	.21	.41				
	---	.01	.22	.44				
R-7517	2.8	.01	.33	.48	5.5	1,540G	1,540G	1,540G
	---	.01	.34	.50				
	---	.01	.43	.63				
R-7518	1.1	.01	.31	.40	8.0	1,540G	1,540G	1,540G
	---	.01	.32	.41				
	---	.01	.34	.44				
R-7519	.8	.01	.23	.35	7.5	1,525	1,540G	1,540G
	---	.01	.24	.36				
	---	.01	.25	.38				
R-7520	1.8	.01	.62	.42	8.5	1,225	1,325	1,370
	---	.01	.64	.43				
	---	.01	.67	.46				
R-8165	.5	.04	.14	.72	5.0	1,480	1,540G	1,540G
	---	.04	.14	.73				
	---	.05	.16	.84				
R-8166	.8	.11	.00	.60	7.0	1,425	1,480	1,520
	---	.11	.00	.61				
	---	.13	.00	.70				
R-8207	.5	.05	.26	.81	8.0	1,540G	1,540G	1,540G
	---	.05	.26	.82				
	---	.06	.29	.91				
R-8208	.8	.07	.12	.47	8.0	1,500	1,540G	1,540G
	---	.07	.12	.48				
	---	.09	.15	.57				
R-8209	1.0	.10	1.11	.75	5.5	1,105	1,155	1,225
	---	.10	1.14	.77				
	---	.11	1.20	.81				
R-8210	.4	.04	.14	.53	6.5	1,510	1,540G	1,540G
	---	.04	.14	.54				
	---	.05	.17	.63				
R-8241	1.2	.03	.12	.57	8.5	1,450	1,540G	1,540G
	---	.03	.12	.58				
	---	.03	.13	.61				

Table 2c.--Proximate and ultimate analyses, heat content, forms of sulfur, free-swelling index and ash-fusion temperature determinations for 37 bituminous coal samples from Wise County, Virginia--continued

Sample number	Proximate Analysis					Ultimate Analysis					Heat of Combustion	
	Moisture	Volatile matter	Fixed carbon	Ash	Hydrogen	Carbon	Nitrogen	Oxygen	Sulfur	Kcal/kg	Btu/lb	
R-8243	2.6	31.4	53.5	12.5	4.9	72.2	1.7	6.1	2.5	7,160	12,890	
	---	32.2	54.9	12.9	4.8	74.1	1.8	3.9	2.5	7,350	13,230	
	---	37.0	63.0	---	5.5	85.1	2.0	4.5	2.9	8,430	15,180	
R-8244	1.8	30.2	53.5	14.4	4.8	70.4	1.7	5.3	3.4	7,060	12,710	
	---	30.8	54.5	14.7	4.7	71.7	1.7	3.8	3.4	7,190	12,940	
	---	36.1	63.9	---	5.5	84.1	2.0	4.5	4.0	8,430	15,170	

Sample number	Forms of sulfur				Ash-fusion temperature, C			
	Air-dried loss	Sulfate	Pyritic	Organic	Free-swelling index	Initial deformation	Softening	Fluid
R-8243	1.3	0.20	1.35	0.92	8.0	1,220	1,300	1,425
	---	.21	1.39	.94				
	---	.24	1.59	1.08				
R-8244	.8	.25	2.12	1.01	6.5	1,140	1,215	1,295
	---	.25	2.16	1.03				
	---	.30	2.53	1.21				

Table 3a.--Major and minor oxide and trace element composition of the laboratory ash of 2 bituminous coal samples from Buchanan County, Virginia.

[Values in percent or parts-per-million. Coal ashed at 525 C. L means less than the value shown;

B, not determined; S after element title indicates determinations by automatic plate reading computer assisted, emission spectrographic analyses. The standard deviation of any single answer should be taken as plus 50% and minus 35%. Methods of analyses for other elements as shown in figure 6.]

Sample number	Ash (percent)	S102 (percent)	Al2O3 (percent)	CaO (percent)	MgO (percent)	Na2O (percent)	K2O (percent)	Fe2O3 (percent)	TiO2 (percent)	P2O5 (percent)	Sample number
R-7383	26.4	59	26	0.74	0.78	0.20	1.8	3.1	2.0	0.38	R-7383
R-7494	6.9	51	36	.98	.68	.85	2.2	3.8	2.0	.07L	R-7494

Sample number	SO3 (percent)	Ag-S (ppm)	B-S (ppm)	Ba-S (ppm)	Be-S (ppm)	Cd (ppm)	Ce (ppm)	Co (ppm)	Cr (ppm)	Cs (ppm)	Sample number
R-7383	0.25	0.10L	84	790	6.0	0.28	160	37	160	8.7	R-7383
R-7494	.02L	.30	140	880	51	.58	260	77	200	14	R-7494

Sample number	Cu (ppm)	Er-S (ppm)	Eu (ppm)	Ga-S (ppm)	Ge-S (ppm)	Hf (ppm)	La (ppm)	Li (ppm)	Lu (ppm)	Mn (ppm)	Sample number
R-7383	74	10L	2.1	44	3.0	9.1	95	670	1.1	48	R-7383
R-7494	280	10	4.5	52	21	10	72	230	1.4	56	R-7494

Sample number	Mo-S (ppm)	Nb-S (ppm)	Nd-S (ppm)	Ni-S (ppm)	Pb (ppm)	Rb (ppm)	Sc (ppm)	Sm (ppm)	Sn-S (ppm)	Sr-S (ppm)	Sample number
R-7383	4.0	33	49	71	61	110	32	11	13	1,300	R-7383
R-7494	4.0	36	140	130	89	230L	41	22	11	1,600	R-7494

Sample number	Ta (ppm)	Tb (ppm)	Th (ppm)	U (ppm)	V-S (ppm)	W-S (ppm)	Y-S (ppm)	Yb (ppm)	Zn (ppm)	Zr-S (ppm)	Sample number
R-7383	0.20L	1.9	34	11	150	0.4	29	6.1	34	160	R-7383
R-7494	.20	2.9	39	10	220	.6	64	8.7	27	230	R-7494

Table 3b.--Major and minor oxide and trace element composition of the laboratory ash of 44 bituminous coal samples from Dickenson County, Virginia.

[Values in percent or parts-per-million. Coal ashed at 525 C. L means less than the value shown; H, not enough sample; B, not determined; S after element title indicates determinations by automatic plate reading computer assisted. emission spectrographic analyses. The standard deviation of any single answer should be taken as plus 50% and minus 35%. Methods of analyses for other elements as shown in figure 6.]

Sample Number	Ash (percent)	S102 (percent)	Al2O3 (percent)	CaO (percent)	MgO (percent)	Na2O (percent)	K2O (percent)	Fe2O3 (percent)	TiO2 (percent)	P2O5 (percent)	Sample number
R-7348	11.8	54	31	0.78	0.88	0.23	2.7	6.4	1.2	0.05L	R-7348
R-7351	4.7	47	30	2.3	.51	1.3	.94	11	2.6	.13	R-7351
R-7356	14.1	58	26	.89	.73	.81	1.8	3.2	2.1	.23	R-7356
R-7357	4.5	39	25	3.9	1.5	.96	2.6	11	1.4	.49	R-7357
R-7358	12.0	50	28	1.8	.99	.43	2.5	6.0	1.1	.13	R-7358
R-7359	8.7	54	26	.85	.98	.54	1.4	8.5	1.9	.17	R-7359
R-7380	3.3	43	29	2.7	.83	.81	1.9	9.9	1.6	1.0	R-7380
R-7381	7.4	54	34	.83	.50	.16	1.8	2.8	1.1	.07L	R-7381
R-7382	12.1	51	35	.53	.95	.32	4.1	3.0	1.0	.04L	R-7382
R-7465	6.8	45	27	1.0	.50	.19	1.1	20	1.7	.07L	R-7465
R-7491	8.8	62	22	.88	.33	.27	.78	10	3.5	.22	R-7491
R-7492	3.7	36	24	1.8	.60	.93	1.3	27	1.2	.54	R-7492
R-7493	5.8	52	29	1.2	.93	.69	2.8	8.3	1.6	.09L	R-7493
R-7545	6.4	46	29	2.3	1.6	.89	1.8	8.1	1.1	.16L	R-7545
R-7546	7.4	42	25	1.6	.98	.47	2.6	18	1.1	.20	R-7546
R-7547	7.6	29	20	1.4	.38	.13	1.2	40	1.1	1.1	R-7547
R-7548	14.0	48	30	1.3	1.4	.34	4.2	7.1	1.3	.08	R-7548
R-7549	9.2	47	27	2.1	2.0	.63	3.9	9.2	1.3	.11L	R-7549
R-7550	7.1	50	25	4.3	.99	.89	5.0	6.6	1.9	.10	R-7550
R-7551	54.4	56	25	.32	2.0	.20	5.0	6.6	1.1	.01L	R-7551
R-7552	12.3	49	26	2.0	1.2	.46	3.4	9.5	1.5	.01L	R-7552
R-7553	11.9	44	20	2.8	1.4	.53	3.2	18	1.3	.01L	R-7553
R-7554	14.5	46	26	2.7	1.5	.38	3.1	10	1.2	.02	R-7554
R-7555	13.3	49	27	1.3	1.6	.42	3.7	9.8	1.4	.01L	R-7555
R-7556	36.2	54	25	2.0	1.8	.35	4.4	6.6	1.0	.02	R-7556
R-7557	6.7	22	14	1.5	.40	.08	1.0	51	.89	.01L	R-7557
R-7593	18.5	51	26	2.1	1.6	.27	4.2	8.0	1.3	.01L	R-7593
R-7594	26.1	56	24	.80	1.6	.28	4.1	7.0	1.1	.04	R-7594
R-7595	7.5	46	25	5.2	1.7	.90	1.5	8.4	1.8	.04	R-7595
R-7596	11.1	32	22	2.2	.75	.12	.62	34	.68	.01L	R-7596
R-7597	6.4	48	23	4.8	1.7	.81	.68	9.3	1.9	.09	R-7597
R-7860	15.3	41	23	.67	1.1	.44	4.2	23	.95	.07L	R-7860
R-7861	21.5	52	28	5.5	.86	.16	2.2	2.5	1.9	.26	R-7861
R-7862	24.5	70	19	.39	.88	.18	2.4	3.5	2.6	.04L	R-7862
R-7863	27.5	53	28	1.6	1.8	.44	4.1	5.2	1.2	.04L	R-7863
R-7864	28.7	58	28	.55	.93	.22	3.4	3.4	2.3	.09	R-7864
R-7865	32.2	52	25	.34	1.8	.22	5.2	10	1.0	1.2	R-7865
R-7866	17.1	60	26	.87	1.0	.44	2.7	3.3	1.7	.06L	R-7866
R-8167	3.1	40	29	3.5	1.1	.75	2.5	14	1.4	.32L	R-8167
R-8168	12.5	53	19	.49	1.2	.30	3.1	19	.63	.08L	R-8168



Table 3b.--Major and minor oxide and trace element composition of the laboratory ash of 44 bituminous coal samples from Dickenson County, Virginia--continued

Sample number	Ash (percent)	S102 (percent)	Al2O3 (percent)	CaO (percent)	MgO (percent)	Na2O (percent)	K2O (percent)	Fe2O3 (percent)	T102 (percent)	P2O5 (percent)	Sample number
R-8169	12.9	57	29	0.70	0.81	0.57	3.4	3.2	1.5	0.21	R-8169
R-8170	16.5	58	27	.56	1.0	.43	4.2	4.7	1.4	.07	R-8170
R-8206	4.5	49	31	2.3	.56	.44	1.0	6.2	2.6	4.0	R-8206
R-8242	4.8	44	26	1.9	.83	1.1	1.5	15	2.2	3.3	R-8242

Table 3b.--Major and minor oxide and trace element composition of the laboratory ash of 44 bituminous coal samples from Dickenson County, Virginia--continued

Sample number	S03 (percent)	Ag-S (ppm)	B-S (ppm)	Ba-S (ppm)	Be-S (ppm)	Br (ppm)	Cd (ppm)	Ce (ppm)	Co (ppm)	Cr (ppm)	Sample number
R-7348	1.2	0.10	80	620	19	B	0.77	200	40	91	R-7348
R-7351	2.4	.60	500	1,100	15	B	1.1	340	57	190	R-7351
R-7356	1.0	.20	120	1,100	10	B	.50	230	33	170	R-7356
R-7357	7.0	.30	140	2,100	21	B	.98	240	140	160	R-7357
R-7358	2.8	.30	85	1,100	29	B	.66	180	93	94	R-7358
R-7359	1.0	.60	140	1,100	38	B	1.1	340	160	200	R-7359
R-7380	3.5	1.2	290	1,200	51	B	3.1	360	180	210	R-7380
R-7381	.75	.70	180	570	34	B	.78	190	210	170	R-7381
R-7382	.50	.40	150	700	45	B	1.2	190	78	180	R-7382
R-7465	.27	.50	130	1,400	33	B	.84	280	250	170	R-7465
R-7491	.02L	.40	150	590	33	B	.78	260	91	170	R-7491
R-7492	1.3	.70	200	1,000	57	B	1.6	300	340	160	R-7492
R-7493	.32	.50	110	770	63	B	1.1	190	81	160	R-7493
R-7545	2.1	.20	220	1,700	23	B	.25	230	64	97	R-7545
R-7546	1.7	.20	150	970	25	B	.92	190	78	140	R-7546
R-7547	1.6	.90	130	910	46	B	2.3	290	190	180	R-7547
R-7548	1.7	6.5	130	1,200	7.0	B	.55	160	36	140	R-7548
R-7549	2.1	.20	190	1,500	12	B	.56	200	78	140	R-7549
R-7550	2.9	.30	130	780	14	B	.77	250	63	160	R-7550
R-7551	1.2	.10	150	850	7.0	B	.35	130	24	100	R-7551
R-7552	2.7	.30	140	1,200	12	B	.80	140	55	120	R-7552
R-7553	4.2	.40	160	1,100	6.0	B	.50	130	18	120	R-7553
R-7554	3.8	.40	180	1,100	8.0	B	.69	120	36	130	R-7554
R-7555	2.4	.40	150	1,200	9.0	B	.89	140	25	100	R-7555
R-7556	1.9	.10L	140	900	8.0	B	.57	130	30	110	R-7556
R-7557	2.4	.80	200	790	34	B	.81	75	33	75	R-7557
R-7593	2.2	.10	140	830	10	B	.62	140	28	110	R-7593
R-7594	1.3	.10L	140	1,300	7.0	B	.44	140	35	110	R-7594
R-7595	3.1	.30	250	1,400	9.0	B	1.1	160	39	130	R-7595
R-7596	3.1	.40	22	660	42	B	.25	130	87	41	R-7596
R-7597	3.3	.20	230	1,800	14	B	.65	170	23	110	R-7597
R-7860	2.0	.20	110	1,000	10	B	.58	100	21	92	R-7860
R-7861	1.7	.19	70	600	8.2	B	.14	230	77	220	R-7861
R-7862	.82	.18	93	550	6.5	B	.10L	190	22	130	R-7862
R-7863	1.7	.14	120	930	7.9	B	.24	110	21	93	R-7863
R-7864	.93	.14	86	640	8.5	B	.30	160	24	150	R-7864
R-7865	1.3	.14	93	650	8.6	B	.10L	130	27	100	R-7865
R-7866	1.3	.11	120	900	10	B	.14	160	28	130	R-7866
R-8167	3.8	.61	240	1,900	24	B	1.0	230	150	170	R-8167
R-8168	1.1	.16	69	1,900	20	B	.71	110	62	92	R-8168

Table 3b.--Major and minor oxide and trace element composition of the laboratory ash of 44 bituminous coal samples from Dickenson County, Virginia--continued

Sample number	S03 (percent)	Ag-S (ppm)	B-S (ppm)	Ba-S (ppm)	Be-S (ppm)	Br (ppm)	Cd (ppm)	Ce (ppm)	Co (ppm)	Cr (ppm)	Sample number
R-8169	0.50	0.17	180	930	10	B	0.30	160	33	110	R-8169
R-8170	.60	.15	160	850	8.6	B	.35	160	28	110	R-8170
R-8206	2.5	.52	210	1,600	52	170	.51	330	180	230	R-8206
R-8242	2.2	.46	220	1,500	20	63	1.6	250	100	240	R-8242

Table 3b. --Major and minor oxide and trace element composition of the laboratory ash of 44 bituminous coal samples from Dickenson County, Virginia--continued

Sample number	Cs (ppm)	Cu (ppm)	Dy-S (ppm)	Er-S (ppm)	Eu (ppm)	Ga-S (ppm)	Gd-S (ppm)	Ge-S (ppm)	Hf (ppm)	La (ppm)	Sample number
R-7348	11	180	22L	10L	2.9	59	15L	5.0	8.5	110	R-7348
R-7351	4.3	310	22L	15	5.5	53	17	3.0	15	190	R-7351
R-7356	7.1	140	22L	10L	3.3	44	15L	2.0L	11	130	R-7356
R-7357	8.9	300	22L	10L	4.9	48	15L	6.0	8.9	130	R-7357
R-7358	8.3	140	22L	10L	2.8	55	15L	3.0	14	92	R-7358
R-7359	3.4	360	22L	10L	6.1	48	15L	23	13	200	R-7359
R-7380	9.1	520	22L	15	6.7	59	20	66	9.1	180	R-7380
R-7381	6.8	310	33	14	4.2	67	15L	48	6.8	95	R-7381
R-7382	15	220	22L	16	3.6	58	15L	78	5.0	91	R-7382
R-7465	8.8	350	22L	12	4.3	39	39	22	10	160	R-7465
R-7491	3.4	270	22L	17	5.2	34	29	14	17	140	R-7491
R-7492	11	420	22L	29	6.8	47	33	49	8.1	160	R-7492
R-7493	14	270	22L	21	3.4	33	15L	15	8.6	52	R-7493
R-7545	4.7	150	22L	20	4.4	50	21	4.0	11	130	R-7545
R-7546	14	230	22L	15	4.9	44	16	3.0	5.4	95	R-7546
R-7547	3.9	220	22L	10L	5.7	79	15L	130	5.3	140	R-7547
R-7548	14	140	24	16	3.2	44	21	2.0L	5.7	93	R-7548
R-7549	9.8	200	22L	10L	4.0	45	15L	3.0	5.4	110	R-7549
R-7550	2.8	200	22L	10L	5.2	31	16	5.0	8.5	150	R-7550
R-7551	13	65	22L	10L	2.3	38	15L	2.0L	5.1	74	R-7551
R-7552	9.8	140	22L	10L	3.4	51	15L	4.0	6.5	89	R-7552
R-7553	17	78	22L	10L	2.2	41	15L	4.0	7.6	76	R-7553
R-7554	10	150	22L	10L	2.3	38	26	2.0L	5.5	69	R-7554
R-7555	13	150	22L	10L	2.7	43	15L	2.0	5.3	83	R-7555
R-7556	15	76	22L	10L	2.3	38	21	3.0	5.8	72	R-7556
R-7557	3.0	130	22L	10L	1.9	59	16	190	4.5	45	R-7557
R-7593	16	120	22L	10L	2.8	37	20	3.0	5.4	92	R-7593
R-7594	11	74	22L	10L	2.5	41	18	2.0	6.5	88	R-7594
R-7595	5.3	160	22L	10L	3.1	42	15L	2.0	8.0	110	R-7595
R-7596	1.8	82	22L	10L	2.2	61	15L	8.0	9.9	72	R-7596
R-7597	4.7	180	22L	10L	3.1	40	49	4.0	9.4	130	R-7597
R-7860	17	72	22L	10L	1.8	28	15L	1.5L	3.3	59	R-7860
R-7861	6.5	120	22L	10L	4.0	40	15L	3.5	7.9	120	R-7861
R-7862	9.0	110	22L	10L	2.9	33	15L	1.5L	13	110	R-7862
R-7863	16	80	22L	10L	2.1	34	15L	1.5L	3.6	62	R-7863
R-7864	10	100	22L	10L	2.1	39	15L	3.5L	7.7	94	R-7864
R-7865	14	80	22L	10L	2.3	35	15L	5.6	3.7	75	R-7865
R-7866	15	79	22L	10L	2.4	29	15L	2.5	7.0	94	R-7866
R-8167	19	240	22L	10L	5.8	31	15L	12	6.5	130	R-8167
R-8168	16	160	22L	10L	2.8	30	15L	23	3.2	64	R-8168

Table 3b.--Major and minor oxide and trace element composition of the laboratory ash of 44 bituminous coal samples from Dickenson County, Virginia--continued

Sample number	Cs (ppm)	Cu (ppm)	Dy-S (ppm)	Er-S (ppm)	Eu (ppm)	Ga-S (ppm)	Gd-S (ppm)	Ge-S (ppm)	Hf (ppm)	La (ppm)	Sample number
R-8169	11	150	22L	10L	3.3	34	15L	12	7.0	100	R-8169
R-8170	11	110	22L	10L	2.9	34	15L	8.7	6.7	97	R-8170
R-8206	4.4	300	22L	10L	5.8	50	15L	59	13	200	R-8206
R-8242	6.3	230	22L	10L	5.6	58	15L	10	15L	150	R-8242

Table 3b. Major and minor oxide and trace element composition of the laboratory ash of 44 bituminous coal samples from Dickenson County, Virginia--continued

Sample number	Li (ppm)	Lu (ppm)	Mn (ppm)	Mo-S (ppm)	Nb-S (ppm)	Nd-S (ppm)	Ni-S (ppm)	Pb (ppm)	Pd-S (ppm)	Pr-S (ppm)	Sample number
R-7348	270	1.7	260	15	33	98	94	160	2.0L	68L	R-7348
R-7351	200	2.1	80	27	48	170	140	87	2.0L	68L	R-7351
R-7356	200	1.4	64	9.0	30	120	85	74	2.0L	68L	R-7356
R-7357	140	2.2	220	19	10	74	140	63	2.0L	68L	R-7357
R-7358	180	1.7	120	9.0	23	54	120	140	2.0L	68L	R-7358
R-7359	210	2.3	30	11	22	100	230	120	2.0L	68L	R-7359
R-7380	170	3.0	82	67	33	150	300	120	1.0L	68L	R-7380
R-7381	230	1.4	51	23	36	140	230	160	1.0L	68L	R-7381
R-7382	290	1.7	75	10	21	110	140	97	1.0L	68L	R-7382
R-7465	190	1.5	64	33	45	170	330	67	1.0L	120	R-7465
R-7491	140	3.4	39	28	73	200	160	72	1.0L	77	R-7491
R-7492	93	2.7	180	36	19	210	370	63	1.0	120	R-7492
R-7493	150	1.7L	98	22	24	110	140	52	1.0L	68L	R-7493
R-7545	200	1.6	340	14	38	140	150	160	1.0L	68L	R-7545
R-7546	95	1.4	1,600	36	21	160	140	37	1.0L	78	R-7546
R-7547	71	2.6	92	41	19	180	280	60	1.0L	68L	R-7547
R-7548	210	1.4	160	13	14	110	88	60	1.0L	68L	R-7548
R-7549	130	2.2	200	11	9	32L	88	57	1.0L	68L	R-7549
R-7550	230	1.4	310	21	36	120	150	62	1.0L	68L	R-7550
R-7551	220	.7	220	1.0L	15	41	70	30	1.0L	68L	R-7551
R-7552	190	1.6	390	21	16	32L	110	60	1.0L	68L	R-7552
R-7553	150	.8	180	5.0	21	32L	56	26	1.0L	68L	R-7553
R-7554	280	.7	200	9.0	19	32L	42	65	1.0L	68L	R-7554
R-7555	220	.8	180	15	23	70	82	58	1.0L	68L	R-7555
R-7556	140	.8	340	3.0	22	33	86	37	1.0L	68L	R-7556
R-7557	71	1.5	170	21	21	41	100	90	1.0L	68L	R-7557
R-7593	220	1.1	270	6.0	17	32L	76	44	1.0L	68L	R-7593
R-7594	150	.8	320	6.0	20	60	92	37	1.0L	68L	R-7594
R-7595	210	1.3	700	16	17	36	120	58	1.0L	68L	R-7595
R-7596	290	.9	320	23	47	32	160	150	1.0L	89	R-7596
R-7597	150	1.6	900	13	18	32L	73	46	1.0L	68L	R-7597
R-7860	62	.7	120	6.9	7	36	47	55	1.0L	68L	R-7860
R-7861	120	1.3	110	10	34	54	130	58	1.0L	68L	R-7861
R-7862	100	1.5	68	1.5	25	90	50	73	1.0L	68L	R-7862
R-7863	100	.7	130	1.0L	15	57	59	80	1.0L	68L	R-7863
R-7864	130	1.0	54	2.0	32	66	47	53	1.0L	68L	R-7864
R-7865	88	.8	130	4.0	15	68	69	59	1.0L	68L	R-7865
R-7866	94	.9	46	2.8	33	73	67	50	1.0L	68L	R-7866
R-8167	140	1.6	170	43	35	110	160	43	1.0L	150L	R-8167
R-8168	91	1.4	170	16	5	32L	130	26	1.0L	68L	R-8168

Table 3b.--Major and minor oxide and trace element composition of the laboratory ash of 44 bituminous coal samples from  
Dickenson County, Virginia--continued

Sample number	Li (ppm)	Lu (ppm)	Mn (ppm)	Mo-S (ppm)	Nb-S (ppm)	Nd-S (ppm)	Ni-S (ppm)	Pb (ppm)	Pq-S (ppm)	Pr-S (ppm)	Sample number
R-8169	410	0.9	60	6.7	23	76	76	53	1.0L	68L	R-8169
R-8170	290	1.3	94	2.5	14	50	56	46	1.0L	68L	R-8170
R-8206	210	2.0	160	11	51	76	440	89	1.0L	79	R-8206
R-8242	150	1.7	1,000	38	55	130	340	76	1.0L	68L	R-8242

Table 3b.--Major and minor oxide and trace element composition of the laboratory ash of 44 bituminous coal samples from Dickenson County, Virginia--continued

Sample number	Rb (ppm)	Sc (ppm)	Sm (ppm)	Sn-S (ppm)	Sr-S (ppm)	Ta (ppm)	Tb (ppm)	Th (ppm)	Tl-S (ppm)	U (ppm)	Sample number
R-7348	140	30	18	15	580	0.54	2.5	67	3.0L	35	R-7348
R-7351	430L	43	30	4.0	3,200L	.19	4.3	49	3.0L	21	R-7351
R-7356	160	34	18	8.0	1,100	.38	2.8	35	3.0L	11	R-7356
R-7357	440L	42	20	2.0L	3,900	.08	4.4	33	3.0L	11	R-7357
R-7358	140	27	19	6.0	1,900	.45	3.3	59	3.0L	30	R-7358
R-7359	340L	63	31	2.0L	1,500	.28	4.6	47	3.0L	21	R-7359
R-7380	300L	58	30	7.0	3,400	.16	6.1	36	5.0L	18	R-7380
R-7381	81	45	19	10	790	.72	4.1	31	5.0L	23	R-7381
R-7382	190	46	18	10	430	.18	3.3	33	5.0L	26	R-7382
R-7465	290L	34	22	2.0L	1,400	.22	2.9	37	5.0L	12	R-7465
R-7491	280L	41	26	14	1,500	.48	4.5	41	11	16	R-7491
R-7492	680L	43	35	2.0	2,800	.30L	5.4	27	5.0L	14	R-7492
R-7493	34L	34	1.7L	2.0	1,200	.17	3.4	28	5.0L	8.6	R-7493
R-7545	780L	30	23	12	3,000	.27	6.3	83	5.0L	61	R-7545
R-7546	680L	32	16	2.0L	2,000	.14	4.1	23	5.0L	12	R-7546
R-7547	530L	49	25	H	2,900	.05	7.9	22	5.0L	9.2	R-7547
R-7548	320L	30	15	4.0	1,400	.29	2.9	26	5.0L	14	R-7548
R-7549	490L	32	20	3.0	1,700	.20	4.3	26	5.0L	12	R-7549
R-7550	280L	38	20	2.0	3,000	.27	1.4	39	5.0L	8.5	R-7550
R-7551	210	24	10	2.0	340	.10	1.8	19	5.0L	7.4	R-7551
R-7552	160	33	13	5.0	1,600	.28	3.3	25	5.0L	11	R-7552
R-7553	260	26	9.2	2.0L	1,600	.28	1.7	20	5.0L	7.6	R-7553
R-7554	190	25	10	3.0	1,400	.37	1.4	20	5.0L	10	R-7554
R-7555	140	26	11	2.0	1,400	.26	2.3	22	5.0L	14	R-7555
R-7556	220	26	10	3.0	630	.69	2.2	21	5.0L	8.8	R-7556
R-7557	300L	33	7.5	H	900	.12	1.5	12	5.0L	4.5	R-7557
R-7593	190	26	12	6.0	930	.33	2.2	23	5.0L	10	R-7593
R-7594	280	26	11	4.0	1,200	.50	2.3	21	5.0L	7.7	R-7594
R-7595	400L	28	15	7.0	2,400	.25	2.7	31	5.0L	13	R-7595
R-7596	180L	14	14	H	1,400	.75	.90L	68	5.0L	39	R-7596
R-7597	310L	31	16	2.0L	2,200	.19	3.1	31	5.0L	14	R-7597
R-7860	130	21	7.8	1.5L	850	.20	.26	15	4.6L	5.8	R-7860
R-7861	230L	32	16	12	1,200	.59	4.2	34	4.6L	14	R-7861
R-7862	90	26	14	10	330	.90	4.0	36	4.6L	12	R-7862
R-7863	110	21	9.1	4.7	770	.37	2.7	18	4.6L	10	R-7863
R-7864	130	32	10	8.8	630	.87	2.5	32	4.6L	11	R-7864
R-7865	200	25	11	1.5L	320	.44	3.1	19	8.5	14	R-7865
R-7866	150	28	11	6.5	1,200	.41	3.2	25	4.6L	9.4	R-7866
R-8167	1,100L	45	19	1.5L	3,800	.07	4.2	29	4.6L	15	R-8167
R-8168	280L	31	9.6	1.5L	560	.16	2.2	18	4.6L	18	R-8168



Table 3b.--Major and minor oxide and trace element composition of the laboratory ash of 44 bituminous coal samples from Dickenson County, Virginia--continued

Sample number	Rb (ppm)	Sc (ppm)	Sm (ppm)	Sn-S (ppm)	Sr-S (ppm)	Ta (ppm)	Tb (ppm)	Th (ppm)	Tl-S (ppm)	U (ppm)	Sample number
R-8169	390L	30	13	7.2	1,100	0.26	1.9	26	4.6L	11	R-8169
R-8170	360L	31	9.7	1.9	800	.50	1.9	27	4.6L	9.6	R-8170
R-8206	560L	56	24	9.8	1,900	.20	4.2	51	4.6L	27	R-8206
R-8242	830L	49	21	1.5L	2,200	.19	4.8	38	4.6L	18	R-8242

Table 3b.---Major and minor oxide and trace element composition of the laboratory ash of 44 bituminous coal samples from Dickenson County, Virginia--continued

Sample number	V-S (ppm)	W-S (ppm)	Y-S (ppm)	Yb (ppm)	Zn (ppm)	Zr-S (ppm)	Sample number
R-7348	180	1.1	83	7.6	80	230	R-7348
R-7351	230	.4	130	13	69	310	R-7351
R-7356	180	.7	64	8.5	45	180	R-7356
R-7357	180	.8L	93	13	63	90	R-7357
R-7358	130	.9	74	10	110	110	R-7358
R-7359	240	.4	86	14	110	150	R-7359
R-7380	310	.4	140	18	160	260	R-7380
R-7381	330	.9	110	11	120	290	R-7381
R-7382	340	.4	74	9.1	170	170	R-7382
R-7465	180	.4	86	10	170	370	R-7465
R-7491	210	.8	120	18	68	520	R-7491
R-7492	200	.4	160	19	220	230	R-7492
R-7493	200	.6	64	1.7L	77	150	R-7493
R-7545	140	.5	84	11	48	230	R-7545
R-7546	200	.4	86	9.5	140	170	R-7546
R-7547	170	.3	90	16	190	190	R-7547
R-7548	210	.4	45	7.1	120	110	R-7548
R-7549	150	.4	32	11	57	100	R-7549
R-7550	190	.4	77	11	110	310	R-7550
R-7551	160	1.3	31	5.7	170	91	R-7551
R-7552	170	.7	34	9.8	120	110	R-7552
R-7553	98	.5	27	6.7	82	120	R-7553
R-7554	140	.8	21	5.5	80	94	R-7554
R-7555	210	.6	43	6.0	160	180	R-7555
R-7556	190	1.1	40	5.8	170	180	R-7556
R-7557	110	.3	43	7.5	65	120	R-7557
R-7593	160	.7	31	7.0	110	97	R-7593
R-7594	140	.8	29	6.5	99	99	R-7594
R-7595	140	.4	39	8.0	100	210	R-7595
R-7596	69	1.2	58	7.2	53	220	R-7596
R-7597	140	.6	37	9.4	33	180	R-7597
R-7860	120	.3	25	3.9	86	96	R-7860
R-7861	180	.8	69	7.9	81	330	R-7861
R-7862	140	1.2	47	9.0	44	230	R-7862
R-7863	180	.6	38	4.7	28	100	R-7863
R-7864	170	1.0	47	5.9	110	280	R-7864
R-7865	200	1.1	42	5.6	53	150	R-7865
R-7866	170	.5	52	5.8	100	260	R-7866
R-8167	200	.3	100	16	53	330	R-8167
R-8168	170	.7	41	8.0	340	78	R-8168

Table 3b.--Major and minor oxide and trace element composition of the laboratory ash of 44 bituminous coal samples from Dickenson County, Virginia--continued

Sample number	V-S (ppm)	W-S (ppm)	V-S (ppm)	Yb (ppm)	Zn (ppm)	Zr-S (ppm)	Sample number
R-8169	160	0.6	45	7.0	35	160	R-8169
R-8170	140	.5	33	6.1	45	100	R-8170
R-8206	280	.4	83	13	53	380	R-8206
R-8242	260	.2	120	13	180	400	R-8242

Table 3c. --Major and minor oxide and trace element composition of the laboratory ash of 37 bituminous coal samples from Wise County, Virginia.

[Values in percent or parts-per-million. Coal ashed at 525 C. L means less than the value shown; B, not determined; S after element title indicates determinations by automatic plate reading computer assisted. Emission spectrographic analyses. The standard deviation of any single answer should be taken as plus 50% and minus 35%. Methods of analyses for other elements as shown in figure 6.]

Sample number	Ash (percent)	SiO <sub>2</sub> (percent)	Al <sub>2</sub> O <sub>3</sub> (percent)	CaO (percent)	MgO (percent)	Na <sub>2</sub> O (percent)	K <sub>2</sub> O (percent)	Fe <sub>2</sub> O <sub>3</sub> (percent)	TiO <sub>2</sub> (percent)	P <sub>2</sub> O <sub>5</sub> (percent)	Sample number
R-7324	8.4	32	22	1.7	0.90	0.40	2.7	31	0.89	0.10	R-7324
R-7325	7.0	43	24	3.6	1.7	.38	2.1	14	1.3	.07	R-7325
R-7341	9.9	31	18	1.0	.38	.10	1.4	49	1.0	.66	R-7341
R-7342	12.9	29	18	.59	.58	.11	1.9	42	.94	.52	R-7342
R-7343	16.0	57	29	.45	1.3	.19	3.9	4.8	1.4	.05	R-7343
R-7344	3.0	33	32	3.9	1.2	.35	1.8	20	1.3	.03L	R-7344
R-7345	9.3	52	29	.86	1.2	.15	3.3	6.8	1.2	.05L	R-7345
R-7346	10.3	50	26	3.3	1.0	.13	.82	9.3	1.8	.66	R-7346
R-7347	11.7	50	27	.50	.78	.23	2.8	15	1.5	.05	R-7347
R-7349	14.4	56	25	1.0	1.4	.23	3.1	9.0	1.1	.13	R-7349
R-7350	11.7	55	26	1.6	1.2	.35	4.1	7.8	1.2	.05L	R-7350
R-7354	4.8	49	27	1.9	.83	.35	2.4	8.2	1.4	1.3	R-7354
R-7355	5.5	52	26	1.6	.71	.39	2.5	6.6	1.7	.84	R-7355
R-7366	8.3	50	33	2.7	.66	.19	1.4	2.7	1.4	.08	R-7366
R-7367	7.5	52	32	1.3	1.1	.28	1.6	4.8	1.6	.15	R-7367
R-7406	15.3	56	26	1.9	.88	.31	1.9	4.4	1.8	.54	R-7406
R-7407	13.7	53	24	2.2	.80	.38	1.9	9.6	1.7	.67	R-7407
R-7408	11.9	51	30	.97	1.4	.39	4.4	5.3	1.1	.04L	R-7408
R-7409	4.5	52	27	2.3	.90	.66	.82	5.8	2.6	.11L	R-7409
R-7410	10.1	55	26	2.8	.91	.27	2.2	3.9	1.7	.32	R-7410
R-7411	9.2	51	33	1.4	.76	.32	2.1	4.1	2.0	.49	R-7411
R-7412	5.1	48	31	2.7	.78	.19	1.4	6.7	1.5	1.4	R-7412
R-7515	5.4	44	32	1.0	1.1	.43	4.1	13	1.0	.19L	R-7515
R-7516	5.3	49	32	1.3	1.5	.65	3.9	6.9	1.2	.19L	R-7516
R-7517	22.6	55	28	.60	1.5	.19	3.1	8.1	1.4	.04L	R-7517
R-7518	7.8	47	36	.84	.78	.58	3.5 <sup>r</sup>	4.8	1.6	.13L	R-7518
R-7519	11.0	67	21	.95	.53	.84	1.0	3.4	2.0	.09L	R-7519
R-7520	4.2	47	29	2.0	.90	.94	2.2	9.4	1.5	.24L	R-7520
R-8165	12.2	53	32	2.9	.40	.26	.89	3.5	2.1	1.9	R-8165
R-8166	12.3	52	31	.49	.83	.43	3.3	7.9	1.6	.08L	R-8166
R-8207	13.8	55	29	.45	.95	.46	3.8	6.1	1.3	1.5	R-8207
R-8208	11.1	56	28	1.1	.91	.36	3.5	5.0	1.4	.14	R-8208
R-8209	5.6	40	21	3.0	.43	.49	.85	26	1.5	1.8	R-8209
R-8210	17.6	56	30	.34	1.2	.43	4.2	4.1	1.2	.06	R-8210
R-8241	5.2	54	29	.94	.60	.81	2.0	8.5	1.7	.19L	R-8241
R-8243	10.3	39	25	.63	1.0	.53	4.0	26	.92	.10L	R-8243
R-8244	14.2	45	22	.60	.75	.36	2.6	26	.99	.32	R-8244

Table 3c.--Major and minor oxide and trace element composition of the laboratory ash of 37 bituminous coal samples from Wise County, Virginia--continued

Sample number	SO <sub>3</sub> (percent)	Ag-S (ppm)	B-S (ppm)	Ba-S (ppm)	Be-S (ppm)	Br (ppm)	Cd (ppm)	Ce (ppm)	Co (ppm)	Cr (ppm)	Sample number
R-7324	3.4	0.40	110	1,000	11	B	0.88	120	64	120	R-7324
R-7325	5.6	.60	150	1,200	24	B	1.2	170	190	130	R-7325
R-7341	1.7	.50	44	480	19	B	1.3	150	95	110	R-7341
R-7342	1.1	.40	37	420	19	B	1.3	160	96	110	R-7342
R-7343	.90	.20	98	670	7.0	B	.36	140	21	130	R-7343
R-7344	7.0	.80	500	2,100	46	B	2.1	370	130	210	R-7344
R-7345	1.5	.20	190	720	11	B	.54	170	48	130	R-7345
R-7346	5.0	.20	160	580	13	B	.62	200	40	130	R-7346
R-7347	.90	.20	58	610	29	B	.78	140	29	130	R-7347
R-7349	1.9	.20	110	700	15	B	.62	150	45	110	R-7349
R-7350	2.8	.40	110	940	30	B	1.3	160	160	130	R-7350
R-7354	2.5	.50	150	750	31	B	1.5	190	150	180	R-7354
R-7355	2.3	.40	140	760	23	B	1.4	200	140	160	R-7355
R-7366	1.3	.30	140	580	21	B	.90	240	55	120	R-7366
R-7367	1.3	.30	120	460	17	B	1.3	270	140	140	R-7367
R-7406	2.0	.20	140	790	9.0	B	.43	180	33	150	R-7406
R-7407	2.3	.20	110	630	9.0	B	.49	180	27	130	R-7407
R-7408	1.5	.30	160	1,200	7.0	B	.59	180	48	130	R-7408
R-7409	3.0	.40	340	1,300	24	B	1.1	360	80	180	R-7409
R-7410	2.3	.40	180	820	16	B	.75	240	56	180	R-7410
R-7411	1.0	.40	140	660	18	B	.89	210	43	180	R-7411
R-7412	2.0	.30	150	540	21	B	.90	290	35	140	R-7412
R-7515	1.4	.30	220	710	87	B	2.4	200	280	180	R-7515
R-7516	2.1	.30	290	1,100	9.0	B	.85	210	83	120	R-7516
R-7517	1.3	.10L	110	700	6.0	B	.25	140	16	130	R-7517
R-7518	1.0	.30	270	1,200	5.0	B	.71	240	29	190	R-7518
R-7519	.88	.10	280	1,100	7.0	B	.58	180	15	120	R-7519
R-7520	2.5	.40	330	1,600	21	B	.59	310	100	180	R-7520
R-8165	.60	.16	140	630	13	B	.64	300	17	160	R-8165
R-8166	.47	.37	180	770	18	B	.46	160	67	130	R-8166
R-8207	.88	.26	170	920	19	B	.74	140	41	140	R-8207
R-8208	1.7	.10L	170	1,000	30	B	.31	180	37	150	R-8208
R-8209	1.9	.83	300	1,200	11	B	1.1	200	45	120	R-8209
R-8210	.82	.15	240	850	8.0	B	.92	170	16	140	R-8210
R-8241	1.3	.57	170	820	24	B	3.2	170	63	140	R-8241
R-8243	1.4	.36	140	1,100	12	B	.66	130	27	120	R-8243
R-8244	1.3	.37	100	590	9.6	B	.38	110	23	97	R-8244

Table 3c.--Major and minor oxide and trace element composition of the laboratory ash of 37 bituminous coal samples from Wise County, Virginia--continued

Sample number	Cs (ppm)	Cu (ppm)	Er-S (ppm)	Eu (ppm)	Ga-S (ppm)	Gd-S (ppm)	Ge-S (ppm)	Hf (ppm)	La (ppm)	Li (ppm)	Sample number
R-7324	15	170	10L	2.6	46	15L	30	4.8	71	150	R-7324
R-7325	16	310	10L	3.6	46	20	5.0	7.1	86	130	R-7325
R-7341	7.1	230	10L	2.9	46	22	35	5.1	81	130	R-7341
R-7342	7.8	210	10L	3.0	42	21	47	4.7	85	130	R-7342
R-7343	16	84	10L	2.4	39	15L	2.0L	6.3	75	160	R-7343
R-7344	3.3	510	22	7.3	92	33	24	13	200	250	R-7344
R-7345	14	110	10L	3.0	41	15	2.0	6.5	86	190	R-7345
R-7346	4.9	190	15	3.0	48	15L	4.0	9.7	140	480	R-7346
R-7347	15	120	10L	2.6	50	15L	8.0	6.8	77	190	R-7347
R-7349	13	170	10L	2.7	43	15	13	5.6	83	160	R-7349
R-7350	17	340	14	4.0	52	18	12	6.8	85	140	R-7350
R-7354	13	370	10L	3.8	54	15L	27	8.3	100	60	R-7354
R-7355	15	270	10L	3.6	43	15L	14	9.1	110	120	R-7355
R-7366	3.6	190	10L	3.3	64	15L	12	11	130	280	R-7366
R-7367	4.0	210	10L	4.0	53	15L	26	9.3	160	220	R-7367
R-7406	8.5	140	10L	2.7	52	15L	6.0	7.8	110	390	R-7406
R-7407	8.0	130	10L	2.8	50	15L	5.0	7.3	100	380	R-7407
R-7408	16	210	10L	3.2	53	15L	2.0	5.0	92	130	R-7408
R-7409	2.2	280	17	4.9	42	15L	5.0	13	200	190	R-7409
R-7410	15	160	16	4.2	53	15L	51	8.9	130	180	R-7410
R-7411	14	210	10L	3.7	62	15L	6.0	8.7	130	400	R-7411
R-7412	3.9	310	16	4.5	45	15L	8.0	9.8	160	290	R-7412
R-7515	22	340	13	5.2	67	15L	23	5.6	93	100	R-7515
R-7516	17	190	10L	3.8	32	15L	2.0L	3.8	94	99	R-7516
R-7517	17	60	10L	2.1	30	15L	2.0L	6.2	71	99	R-7517
R-7518	7.7	250	10L	3.7	44	15L	2.0L	6.4	130	200	R-7518
R-7519	3.6	140	10L	2.7	26	25	2.0L	10	110	140	R-7519
R-7520	12	240	10L	5.5	42	15L	9.0	7.1	170	140	R-7520
R-8165	3.3	160	10L	3.9	32	15L	8.2	9.0	130	450	R-8165
R-8166	11	200	10L	3.0	34	15L	6.5	6.5	98	190	R-8166
R-8207	14	140	10L	3.3	47	15L	11	4.3	80	150	R-8207
R-8208	19	88	10L	3.9	50	15L	4.0	6.3	90	120	R-8208
R-8209	3.6	200	10L	3.4	50	15L	5.8	7.1	110	130	R-8209
R-8210	13	80	11	3.0	49	15L	4.2	5.1	100	200	R-8210
R-8241	9.6	170	10	4.2	40	15L	2.7	9.6	96	140	R-8241
R-8243	15	130	10L	2.5	49	18	57	6.8L	68	130	R-8243
R-8244	7.7	92	10L	2.0	44	15L	23	3.5	63	210	R-8244

Table 3c.--Major and minor oxide and trace element composition of the laboratory ash of 37 bituminous coal samples from Wise County, Virginia--continued

Sample number	Lu (ppm)	Mn (ppm)	Mo-S (ppm)	Nb-S (ppm)	Nd-S (ppm)	Ni-S (ppm)	Pb (ppm)	Pd-S (ppm)	Pr-S (ppm)	Rb (ppm)	Sample number
R-7324	1.2	180	21	12	66	90	29	2.0L	87	190	R-7324
R-7325	1.4	160	46	26	110	250	43	2.0L	7.4	430L	R-7325
R-7341	1.0	120	44	19	81	170	31	2.0L	68L	150	R-7341
R-7342	1.6	95	33	18	81	160	39	2.0L	68L	100	R-7342
R-7343	.6	120	7.0	21	97	58	41	2.0L	68L	240	R-7343
R-7344	3.3	220	63	20	170	330	86	2.0L	68L	670L	R-7344
R-7345	1.1	150	13	20	110	94	35	2.0L	68L	240	R-7345
R-7346	1.0	280	20	34	76	110	70	2.0L	68L	190L	R-7346
R-7347	.9	100	4.0	23	82	59	49	2.0L	68L	200	R-7347
R-7349	1.4	160	9.0	15	100	110	55	2.0L	68L	200	R-7349
R-7350	2.6	150	17	16	120	150	76	2.0L	68L	210	R-7350
R-7354	2.1	80	27	13	110	190	71	2.0L	68L	190	R-7354
R-7355	1.8	53	20	15	79	140	50	2.0L	68L	160	R-7355
R-7366	1.2	36	5.0	22	68	150	100	2.0L	68L	96	R-7366
R-7367	1.3	76	3.0	16	96	220	93	2.0L	68L	270L	R-7367
R-7406	1.3	82	4.0	26	53	92	73	1.0L	68L	140	R-7406
R-7407	1.5	130	11	22	32L	68	66	1.0L	68L	140	R-7407
R-7408	.8	170	16	15	94	100	91	1.0L	68L	290	R-7408
R-7409	2.2	71	20	71	180	200	94	1.0L	68L	440L	R-7409
R-7410	2.0	190	10	39	120	110	80	1.0L	68L	170	R-7410
R-7411	1.1	100	5.0	34	110	98	99	1.0L	68L	110	R-7411
R-7412	2.0	70	13	45	170	96	110	1.0L	68L	390L	R-7412
R-7515	3.7	110	30	9	65	210	89	1.0L	68L	370	R-7515
R-7516	1.9	230	18	6	68	97	47	1.0L	68L	750L	R-7516
R-7517	.9	2,000	5.0	19	55	46	28	1.0L	68L	270	R-7517
R-7518	1.3	37	20	10	67	80	75	1.0L	68L	260	R-7518
R-7519	.9	32	6.0	28	110	62	53	1.0L	68L	450L	R-7519
R-7520	2.4	59	27	19	86	130	48	1.0L	68L	950L	R-7520
R-8165	1.1	68	10	54	76	63	83	1.0L	68L	330L	R-8165
R-8166	1.1	61	4.4	26	110	97	63	1.0L	68L	330L	R-8166
R-8207	.9	78	3.5	27	80	89	58	1.0L	68L	200	R-8207
R-8208	1.0	390	9.1	22	100	79	34	1.0L	68L	170	R-8208
R-8209	1.1	120	6.8L	20	75	140	53	1.0L	94	540L	R-8209
R-8210	.9	97	2.5	12	95	64	33	1.0L	68L	180	R-8210
R-8241	1.3	39	42	48	130	150	43	1.0L	68L	580L	R-8241
R-8243	.9	110	4.1	8	32	62	38	1.0L	68L	150	R-8243
R-8244	.8	170	11	42	73	22L	30	80	5L	92	R-8244

Table 3c.--Major and minor oxide and trace element composition of the laboratory ash of 37 bituminous coal samples from Wise County, Virginia--continued

Sample number	Sc (ppm)	Sm (ppm)	Sn-S (ppm)	Sr-S (ppm)	Ta (ppm)	Tb (ppm)	Th (ppm)	Tl-S (ppm)	U (ppm)	V-S (ppm)	Sample number
R-7324	36	12	4.0	990	0.10	1.2	18	3.0L	7.1	110	R-7324
R-7325	31	17	2.0L	3,900	.09	2.9	21	3.0L	11	260	R-7325
R-7341	28	15	3.0	1,400	.14	2.0	17	3.0L	13	150	R-7341
R-7342	26	16	2.0L	960	.17	2.3	16	3.0L	15	150	R-7342
R-7343	26	11	8.0	460	.26	1.9	18	3.0L	6.9	180	R-7343
R-7344	47	33	4.0	7,000	.06	6.7	43	3.0L	27	490	R-7344
R-7345	27	14	2.0	840	.16	2.2	19	3.0L	5.4	220	R-7345
R-7346	32	13	3.0	3,700	.25	1.9	34	3.0L	13	230	R-7346
R-7347	30	12	2.0L	570	.21	1.7	20	3.0L	8.5	160	R-7347
R-7349	27	14	2.0L	960	.20	2.1	19	3.0L	13	230	R-7349
R-7350	50	18	4.0	1,300	.20	3.4	23	3.0L	15	270	R-7350
R-7354	46	21	2.0L	1,700	.20L	2.1	21	3.0L	29	260	R-7354
R-7355	36	16	2.0L	1,500	.14	3.6	24	3.0L	9.1	170	R-7355
R-7366	36	20	9.0	1,100	.21	3.6	41	3.0L	16	170	R-7366
R-7367	32	23	3.0	920	.20	4.0	33	3.0L	15	160	R-7367
R-7406	30	14	4.0	1,600	.39	2.0	30	5.0L	11	170	R-7406
R-7407	30	14	4.0	1,600	.36	2.2	28	5.0L	11	160	R-7407
R-7408	31	16	4.0	1,300	.18	2.5	29	5.0L	18	210	R-7408
R-7409	40	29	6.0	3,100	.17	4.4	51	5.0L	22	180	R-7409
R-7410	40	21	6.0	1,500	.22	3.0	36	5.0	12	250	R-7410
R-7411	41	18	8.0	940	.25	3.3	39	5.0L	18	240	R-7411
R-7412	31	27	7.0	1,000	.14	3.9	41	5.0L	18	180	R-7412
R-7515	69	24	3.0	740	.07	3.7	30	51	26	200	R-7515
R-7516	28	19	2.0	1,500	.06	1.9	19	5.0L	11	150	R-7516
R-7517	25	10	3.0	430	.37	1.3	19	5.0L	5.3	130	R-7517
R-7518	36	21	5.0	1,300	.15	2.6	36	5.0L	18	200	R-7518
R-7519	25	15	11	1,500	.31	1.8	31	5.0L	4.5	120	R-7519
R-7520	50	29	5.0	3,500	.11	4.8	36	5.0L	12	190	R-7520
R-8165	41	18	11	1,600	.41	2.8	32	4.6L	18	170	R-8165
R-8166	32	13	3.8	800	.23	2.0	26	4.6L	13	210	R-8166
R-8207	34	12	1.6	1,100	.22	2.0	22	4.6L	8.3	250	R-8207
R-8208	31	14	3.8	1,000	.23	2.9	23	4.6L	7.9	210	R-8208
R-8209	33	13	1.5L	2,700	.12	2.5	27	4.6L	16	180	R-8209
R-8210	27	13	3.3	670	.33	2.2	25	6.1	9.7	220	R-8210
R-8241	30	15	4.2	1,300	.12	4.4	21	34	6.2	220	R-8241
R-8243	32	9.7	1.5L	460	.15	1.8	20	4.6L	13	140	R-8243
R-8244	21	8.5	1.5L	970	.18	1.5	18	4.6L	12	150	R-8244



Table 3c.--Major and minor oxide and trace element composition of the laboratory ash of 37 bituminous coal samples from Wise County, Virginia--continued

Sample number	W-S (ppm)	Y-S (ppm)	Yb (ppm)	Zn (ppm)	Zr-S (ppm)
R-7324	0.5	45	7.1	100	80
R-7325	.4	110	8.6	400	250
R-7341	.4	83	8.1	170	190
R-7342	.6	69	7.8	190	140
R-7343	.5	52	5.6	91	190
R-7344	.3	180	17	130	190
R-7345	.4	76	6.5	85	190
R-7346	.7	98	7.8	55	340
R-7347	.7	60	6.0	46	220
R-7349	.6	72	6.3	100	140
R-7350	1.3	140	15	220	120
R-7354	.5	82	10	200	94
R-7355	1.3	69	9.1	90	100
R-7366	.9L	85	9.6	55	190
R-7367	.9L	75	9.3	110	140
R-7406	B	37	5.2	49	170
R-7407	B	29	6.6	47	110
R-7408	B	51	6.7	90	110
R-7409	B	140	16	76	560
R-7410	B	110	9.9	200	350
R-7411	B	65	9.8	91	210
R-7412	B	140	12	51	550
R-7515	1.4	70	24	73	49
R-7516	.3	25	7.5	63	48
R-7517	.6	28	5.3	100	170
R-7518	.4	25	7.7	60	73
R-7519	.8L	49	7.3	30	220
R-7520	.7L	73	14	69	160
R-8165	.6	75	8.2	30	410
R-8166	.4	67	8.1	93	240
R-8207	.9	47	7.2	78	180
R-8208	.5	50	7.2	66	210
R-8209	.3	59	7.1	96	190
R-8210	.4	42	6.3	90	110
R-8241	.7	100	9.6	45	420
R-8243	.5	24	6.8	65	74
R-8244	.7	19	4.2	89	82

Table 4a.--Content of 23 trace elements in 2 bituminous coal samples from Buchanan County, Virginia.

[Analysis performed on whole-coal. Values in parts-per-million (ppm). L, less than the value shown; B, not determined.]

Sample number	As (ppm)	Ce (ppm)	Cl (ppm)	Co (ppm)	Cr (ppm)	Cs (ppm)	Eu (ppm)	F (ppm)	Hf (ppm)	Hg (ppm)	Sample number
R-7383	4.0	43	150	9.8	42	2.3	0.55	120	2.4	0.020	R-7383
R-7494	1.0	18	1,100	5.3	14	1.0	.31	70	.7	.19	R-7494

Sample number	La (ppm)	Lu (ppm)	Na (ppm)	P (ppm)	Rb (ppm)	Sb (ppm)	Sc (ppm)	Se (ppm)	Sm (ppm)	Tb (ppm)	Sample number
R-7383	25	0.3	400	440	28	0.70	8.5	B	3.0	0.5	R-7383
R-7494	5	.1	430	22L	16L	.80	2.8	3.1	1.5	.2	R-7494

Sample number	Th (ppm)	U (ppm)	Yb (ppm)
R-7383	9.0	2.8	1.6
R-7494	2.7	.70	.6

Table 4b.--Content of 23 trace elements in 44 bituminous coal samples from Dickenson County, Virginia.

[Analysis performed on whole-coal. Values in parts-per-million (ppm). L, less than the value shown; B, not determined.]

Sample number	As (ppm)	Ce (ppm)	Cl (ppm)	Co (ppm)	Cr (ppm)	Cs (ppm)	Eu (ppm)	F (ppm)	Hf (ppm)	Hg (ppm)	Sample number
R-7348	7.0	24	240	4.7	11	1.3	0.34	56	1.0	0.070	R-7348
R-7351	3.0	16	280	2.7	8.8	.2	.26	48	.7	.030	R-7351
R-7356	2.0	32	420	4.7	24	1.0	.46	260	1.6	.030	R-7356
R-7357	2.0	11	50L	6.5	7.4	.4	.22	510	.4	.010L	R-7357
R-7358	6.0	22	60	11	11	1.0	.34	210	1.7	.030	R-7358
R-7359	4.0	30	350	14	18	.3	.53	560	1.1	.12	R-7359
R-7380	6.0	12	430	6.0	7.0	.3	.22	57	.3	.010L	R-7380
R-7381	1.0	14	230	16	12	.5	.31	35	.5	.010L	R-7381
R-7382	2.0	23	200	9.4	22	1.8	.43	95	.6	.020	R-7382
R-7465	17.0	19.	200	17	12	.6	.29	60	.7	.17	R-7465
R-7491	6.0	23	350	8.0	15	.3	.46	90	1.5	.20	R-7491
R-7492	13.0	11	650	13	6.0	.4	.25	50	.3	.11	R-7492
R-7493	.1L	11	360	4.7	9.1	.8	.20	70	.5	.10	R-7493
R-7545	2.0	15	130	4.1	6.2	.3	.28	60	.7	.080	R-7545
R-7546	29.0	14	190	5.8	10	1.0	.36	60	.4	.13	R-7546
R-7547	68.0	22	520	15	14	.3	.43	70	.4	.25	R-7547
R-7548	4.0	22	260	5.1	20	2.0	.45	180	.8	.35	R-7548
R-7549	3.5	18	100L	7.2	13	.9	.37	70	.5	.16	R-7549
R-7550	8.0	18	720	4.5	12	.2	.40	40	.6	.070	R-7550
R-7551	36.0	70	100L	13	57	7.0	1.3	120	2.8	.14	R-7551
R-7552	6.0	17	100L	6.8	15	1.2	.42	40	.8	.050	R-7552
R-7553	12.0	15	100L	2.2	14	2.0	.26	30	.9	.060	R-7553
R-7554	6.0	17	100L	5.2	19	1.5	.34	10	.8	.050	R-7554
R-7555	16.0	18	200	3.3	14	1.7	.36	60	.7	.050	R-7555
R-7556	19.0	46	100L	11	40	5.4	.85	80	2.1	.050	R-7556
R-7557	106	5.0	100L	2.2	5.0	.2	.13	10L	.3	.15	R-7557
R-7593	23.0	26	300	5.2	21	3.0	.51	60	1.0	.070	R-7593
R-7594	5.0	37	100L	9.2	28	2.9	.65	70	1.7	.090	R-7594
R-7595	5.0	12	210	2.9	9.8	.4	.23	40	.6	.050	R-7595
R-7596	59.0	14	210	9.7	4.6	.2	.24	10	1.1	.18	R-7596
R-7597	4.0	11	240	1.5	7.3	.3	.20	10	.6	.070	R-7597
R-7860	123	16	290	3.2	14	2.6	.27	260	.5	.37	R-7860
R-7861	1.5	49	490	17	47	1.4	.86	170	1.7	.12	R-7861
R-7862	7.2	47	480	5.5	31	2.2	.71	150	3.1	.50	R-7862
R-7863	2.7	31	230	5.8	26	4.4	.59	260	1.0	.37	R-7863
R-7864	11.2	45	530	6.9	43	3.0	.61	210	2.2	.41	R-7864
R-7865	64.1	43	350	8.7	33	4.5	.73	230	1.2	.37	R-7865
R-7866	1.5	27	100L	4.8	22	2.6	.41	150	1.2	.18	R-7866
R-8167	5.6	7.0	510	4.6	5.3	.6	.18	100	.2	.058	R-8167
R-8168	40.0	14	550	7.8	12	2.0	.35	90	.4	.068	R-8168

Table 4b.---Content of 23 trace elements in 44 bituminous coal samples from Dickenson County, Virginia--continued

Sample number	As (ppm)	Ce (ppm)	Cl (ppm)	Co (ppm)	Cr (ppm)	Cs (ppm)	Eu (ppm)	F (ppm)	Hf (ppm)	Hg (ppm)	Sample number
R-8169	2.8	21	1,400	4.2	15	1.4	0.42	100	0.9	0.14	R-8169
R-8170	2.8	27	1,200	4.7	19	1.8	.48	90	1.1	.058	R-8170
R-8206	1.5	15	520	8.3	10	.2	.26	30	.6	.10	R-8206
R-8242	9.1	12	170	4.9	11	.3	.27	30	.7L	.17	R-8242

Table 4b.--Content of 23 trace elements in 44 bituminous coal samples from Dickenson County, Virginia--continued

Sample number	La (ppm)	Lu (ppm)	Na (ppm)	P (ppm)	Rb (ppm)	Sb (ppm)	Sc (ppm)	Se (ppm)	Sm (ppm)	Tb (ppm)	Sample number
R-7348	13	0.2	200	26L	17	1.2	3.5	4.2	2.1	0.3	R-7348
R-7351	9	.1	460	26	20L	.30	2.0	2.1	1.4	.2	R-7351
R-7356	19	.2	850	140	22	.40	4.8	2.0L	2.6	.4	R-7356
R-7357	6	.1	320	96	20L	.40	1.9	5.2	.90	.2	R-7357
R-7358	11	.2	380	70	17	.60	3.2	2.6	2.3	.4	R-7358
R-7359	17	.2	350	66	30L	.80	5.5	7.4	2.7	.4	R-7359
R-7380	6	.1	200	150	10L	.70	1.9	1.5	1.0	.2	R-7380
R-7381	7	.1	89	22L	6	.90	3.3	5.2	1.4	.3	R-7381
R-7382	11	.2	290	22L	23	1.7	5.6	4.2	2.2	.4	R-7382
R-7465	11	.1	95	22L	20L	1.1	2.3	5.3	1.5	.2	R-7465
R-7491	12	.3	180	83	25L	.90	3.6	2.5	2.3	.4	R-7491
R-7492	6	.1	260	87	25L	.70	1.6	1.3	1.3	.2	R-7492
R-7493	3	.1L	300	22L	2L	.90	2.0	1.3	.10L	.2	R-7493
R-7545	8	.1	420	44L	50L	.40	1.9	3.4	1.5	.4	R-7545
R-7546	7	.1	260	66	50L	.70	2.4	1.8	1.2	.3	R-7546
R-7547	11	.2	76	370	40L	1.8	3.7	1.9	1.9	.6	R-7547
R-7548	13	.2	350	48	45L	.60	4.2	3.0	2.1	.4	R-7548
R-7549	10	.2	430	44L	45L	.60	2.9	5.6	1.8	.4	R-7549
R-7550	11	.1	64	31	20L	.60	2.7	2.4	1.4	.1	R-7550
R-7551	40	.4	820	22L	120	1.7	13	1.7	5.5	1	R-7551
R-7552	11	.2	420	4L	20	1.2	4.1	3.5	1.6	.4	R-7552
R-7553	9	.1	460	4L	31	1.2	3.1	4.4	1.1	.2	R-7553
R-7554	10	.1	410	13	27	2.9	3.6	2.8	1.5	.2	R-7554
R-7555	11	.1	410	4L	19	1.5	3.4	2.7	1.5	.3	R-7555
R-7556	26	.3	940	31	80	1.9	9.3	3.2	3.8	.8	R-7556
R-7557	3	.1	40	4L	20L	5.9	2.2	7.0	.50	.1	R-7557
R-7593	17	.2	370	9L	35	2.4	4.9	2.8	2.2	.4	R-7593
R-7594	23	.2	550	44	74	.60	6.7	3.2	2.8	.6	R-7594
R-7595	8	.1	500	13	30L	.80	2.1	2.1	1.1	.2	R-7595
R-7596	8	.1	100	4L	20L	.60	1.6	3.5	1.5	.1L	R-7596
R-7597	8	.1	380	26	20L	1.1	2.0	1.7	1.0	.2	R-7597
R-7860	9	.1	500	48L	20	.50L	3.2	7.1	1.2	.0	R-7860
R-7861	26	.3	260	240	50L	1.0L	7.0	5.1	3.4	.9	R-7861
R-7862	27	.4	320	44L	22	3.2	6.3	4.5	3.5	1	R-7862
R-7863	17	.2	910	48L	30	1.0L	5.8	2.7	2.5	.7	R-7863
R-7864	27	.3	460	110	38	1.0	9.1	4.8	2.9	.7	R-7864
R-7865	24	.3	510	1,700	66	2.0	8.0	2.6	3.5	1	R-7865
R-7866	16	.2	560	44L	26	1.0	4.7	2.0	1.9	.5	R-7866
R-8167	4	.1	170	44L	35L	.80	1.4	3.1	.60	.1	R-8167
R-8168	8	.2	270	44L	35L	1.8	3.9	1.8	1.2	.3	R-8168

Table 4b.--Content of 23 trace elements in 44 bituminous coal samples from Dickenson County, Virginia--continued

Sample number	La (ppm)	Lu (ppm)	Na (ppm)	P (ppm)	Rb (ppm)	Sb (ppm)	Sc (ppm)	Se (ppm)	Sm (ppm)	Tb (ppm)	Sample number
R-8169	13	0.1	540	120	50L	0.90	3.9	2.6	1.7	0.3	R-8169
R-8170	16	.2	530	52	60L	.80	5.1	2.5	1.6	.3	R-8170
R-8206	9	.1	150	790	25L	1.0L	2.5	3.0	1.1	.2	R-8206
R-8242	7	.1	370	700	40L	1.0L	2.4	3.1	1.0	.2	R-8242

Table 4b.--Content of 23 trace elements in 44 bituminous coal samples from Dickenson County, Virginia--continued

Sample number	Th (ppm)	U (ppm)	Yb (ppm)
R-7348	7.9	4.1	0.9
R-7351	2.3	1.0	.6
R-7356	5.0	1.6	1.2
R-7357	1.5	.50	.6
R-7358	7.1	3.6	1.2
R-7359	4.1	1.8	1.2
R-7380	1.2	.60	.6
R-7381	2.3	1.7	.8
R-7382	4.0	3.1	1.1
R-7465	2.5	.80	.7
R-7491	3.6	1.4	1.6
R-7492	1.0	.50	.7
R-7493	1.6	.50	.1L
R-7545	5.3	3.9	.7
R-7546	1.7	.90	.7
R-7547	1.7	.70	1.2
R-7548	3.7	1.9	1.0
R-7549	2.4	1.1	1.0
R-7550	2.8	.60	.8
R-7551	10	4.0	3.1
R-7552	3.1	1.3	1.2
R-7553	2.4	.90	.8
R-7554	2.9	1.5	.8
R-7555	2.9	1.9	.8
R-7556	7.6	3.2	2.1
R-7557	.8	.30	.5
R-7593	4.3	1.9	1.3
R-7594	5.6	2.0	1.7
R-7595	2.3	1.0	.6
R-7596	7.5	4.3	.8
R-7597	2.0	.90	.6
R-7860	2.3	.89	.6
R-7861	7.4	3.0	1.7
R-7862	8.7	2.9	2.2
R-7863	5.0	2.8	1.3
R-7864	9.2	3.0	1.7
R-7865	6.2	4.4	1.8
R-7866	4.3	1.6	1.0
R-8167	.9	.46	.5
R-8168	2.2	2.3	1.0

Table 4b.--Content of 23 trace elements in 44 bituminous coal samples from Dickenson County, Virginia--continued

Sample number	Th (ppm)	U (ppm)	Yb (ppm)
R-8169	3.3	1.4	0.9
R-8170	4.4	1.6	1.0
R-8206	2.3	1.2	.6
R-8242	1.8	.84	.6



Table 4c.--Content of 23 trace elements in 37 bituminous coal samples from Wise County, Virginia.

[Analysis performed on whole-coal. Values in parts-per-million (ppm). L. less than the value shown; B. not determined.]

Sample number	As (ppm)	Ce (ppm)	Cl (ppm)	Co (ppm)	Cr (ppm)	Cs (ppm)	Eu (ppm)	F (ppm)	Hf (ppm)	Hg (ppm)	Sample number
R-7324	55.0	10	140	5.4	9.8	1.3	0.22	76	0.4	0.17	R-7324
R-7325	8.0	12	480	13	9.3	1.1	.25	45	.5	.030	R-7325
R-7341	62.0	15	260	9.4	11	.7	.29	24	.5	.39	R-7341
R-7342	95.0	20	240	12	14	1.0	.39	43	.6	.39	R-7342
R-7343	3.0	22	50L	3.4	20	2.6	.38	120	1.0	.020	R-7343
R-7344	8.0	11	150	4.0	6.2	.1	.22	20L	.4	.10	R-7344
R-7345	4.0	16	110	4.5	12	1.3	.28	88	.6	.030	R-7345
R-7346	8.0	21	1,700	4.1	14	.5	.31	48	1.0	.13	R-7346
R-7347	32.0	16	510	3.4	15	1.8	.31	80	.8	.12	R-7347
R-7349	9.0	22	290	6.5	16	1.9	.39	46	.8	.030	R-7349
R-7350	18.0	19	450	18	15	2.0	.47	84	.8	.080	R-7350
R-7354	4.0	9.0	180	7.0	8.7	.6	.18	220	.4	.080	R-7354
R-7355	8.0	11	80	7.7	8.7	.8	.20	350	.5	.020	R-7355
R-7366	2.0	20	1,700	4.6	9.6	.3	.27	140	.9	.070	R-7366
R-7367	2.0	20	370	10	10	.3	.30	48	.7	.030	R-7367
R-7406	3.0	27	70	5.1	23	1.3	.41	77	1.2	.060	R-7406
R-7407	24.1	24	100	3.7	18	1.1	.39	72	1.0	.21	R-7407
R-7408	2.0	21	50	5.7	15	1.9	.38	80	.6	.040	R-7408
R-7409	1.0	16	50	3.6	7.9	.1	.22	37	.6	.010	R-7409
R-7410	1.0	24	70	5.7	18	1.5	.42	70	.9	.030	R-7410
R-7411	3.0	19	70	4.0	16	1.3	.34	47	.8	.040	R-7411
R-7412	3.0	15	110	1.8	6.9	.2	.23	84	.5	.040	R-7412
R-7515	33.0	11	170	15	9.5	1.2	.28	10	.3	.33	R-7515
R-7516	1.0	11	180	4.4	6.1	.9	.20	10	.2	.10	R-7516
R-7517	4.0	32	100	3.7	30	3.8	.47	130	1.4	.23	R-7517
R-7518	4.0	19	200	2.3	15	.6	.29	20	.5	.48	R-7518
R-7519	2.0	20	120	1.6	13	.4	.30	10	1.1	.27	R-7519
R-7520	37.0	13	190	4.2	7.4	.5	.23	40	.3	.20	R-7520
R-8165	2.5	37	270	2.1	19	.4	.47	160	1.1	.16	R-8165
R-8166	12.3	20	290	8.2	15	1.3	.37	120	.8	.19	R-8166
R-8207	9.9	20	340	5.6	20	2.0	.45	120	.6	.11	R-8207
R-8208	5.4	20	570	4.1	17	2.1	.43	100	.7	.045	R-8208
R-8209	7.2	11	630	2.5	6.8	.2	.19	60	.4	.073	R-8209
R-8210	4.2	30	360	2.8	24	2.3	.53	140	.9	.20	R-8210
R-8241	17.3	9.0	340	3.3	7.5	.5	.22	70	.5	.16	R-8241
R-8243	63.2	13	160	2.8	13	1.5	.26	60	.7L	.15	R-8243
R-8244	34.1	16	280	3.2	14	1.1	.28	80	.5	.26	R-8244

Table 4c.--Content of 23 trace elements in 37 bituminous coal samples from Wise County, Virginia--continued

Sample number	La (ppm)	Lu (ppm)	Na (ppm)	P (ppm)	Rb (ppm)	Sb (ppm)	Sc (ppm)	Se (ppm)	Sm (ppm)	Tb (ppm)	Sample number
R-7324	6	0.1	250	35	16	0.80	3.0	6.0	1.0	0.1	R-7324
R-7325	6	.1	200	22	30L	.70	2.2	1.6	1.2	.2	R-7325
R-7341	8	.1	75	280	15	1.6	2.8	2.3	1.5	.2	R-7341
R-7342	11	.2	100	290	13	2.1	3.4	2.7	2.0	.3	R-7342
R-7343	12	.1	220	35	39	.40	4.2	3.3	1.8	.3	R-7343
R-7344	6	.1	78	4L	20L	.50	1.4	3.6	1.0	.2	R-7344
R-7345	8	.1	100	22L	22	.30	2.5	2.6	1.3	.2	R-7345
R-7346	14	.1	97	300	20L	.60	3.3	2.8	1.3	.2	R-7346
R-7347	9	.1	200	26	23	.50	3.5	7.5	1.4	.2	R-7347
R-7349	12	.2	240	83	29	1.3	3.9	1.7	2.0	.3	R-7349
R-7350	10	.3	300	26L	24	2.0	5.8	1.3	2.1	.4	R-7350
R-7354	5	.1	120	270	9	1.0	2.2	1.7	1.0	.1	R-7354
R-7355	6	.1	160	200	9	.60	2.0	1.0	.90	.2	R-7355
R-7366	11	.1	120	31	8	.50	3.0	3.0	1.7	.3	R-7366
R-7367	12	.1	160	48	20L	.50	2.4	3.5	1.7	.3	R-7367
R-7406	17	.2	350	360	21	.50	4.6	1.4	2.1	.3	R-7406
R-7407	14	.2	380	400	19	.70	4.1	1.5	1.9	.3	R-7407
R-7408	11	.1	340	22L	34	.60	3.7	4.8	1.9	.3	R-7408
R-7409	9	.1	220	22L	20L	.20	1.8	1.8	1.3	.2	R-7409
R-7410	13	.2	200	140	17	.50	4.0	1.0	2.1	.3	R-7410
R-7411	12	.1	220	200	10	.60	3.8	.7	1.7	.3	R-7411
R-7412	8	.1	71	310	20L	.30	1.6	3.1	1.4	.2	R-7412
R-7515	5	.2	170	44L	20	1.5	3.7	5.6	1.3	.2	R-7515
R-7516	5	.1	250	44L	40L	.40	1.5	2.9	1.0	.1	R-7516
R-7517	16	.2	320	39L	61	.80	5.7	4.8	2.3	.3	R-7517
R-7518	10	.1	330	44L	20	.50	2.8	4.7	1.6	.2	R-7518
R-7519	12	.1	680	44L	50L	.20	2.8	3.1	1.7	.2	R-7519
R-7520	7	.1	290	44L	40L	.50	2.1	1.7	1.2	.2	R-7520
R-8165	16	.1	230	1,000	40L	.80	5.0	2.9	2.2	.3	R-8165
R-8166	12	.1	390	44L	40L	.70	4.0	3.9	1.6	.3	R-8166
R-8207	11	.1	470	920	27	1.0L	4.6	5.7	1.7	.3	R-8207
R-8208	10	.1	300	70	19	1.0L	3.4	4.6	1.6	.3	R-8208
R-8209	6	.1	200	440	30L	.50L	1.8	3.1	.70	.1	R-8209
R-8210	18	.2	560	48	31	1.5L	4.8	2.1	2.2	.4	R-8210
R-8241	5	.1	310	44L	30L	1.0L	1.6	2.2	.80	.2	R-8241
R-8243	7	.1	400	44L	15	2.0L	3.3	6.0	1.0	.2	R-8243
R-8244	9	.1	380	200	13	1.0L	3.0	2.9	1.2	.2	R-8244

Table 4c.--Content of 23 trace elements in 37 bituminous coal samples from Wise County, Virginia--continued

Sample number	Th (ppm)	U (ppm)	Yb (ppm)
R-7324	1.5	0.60	0.6
R-7325	1.5	.80	.6
R-7341	1.7	1.3	.8
R-7342	2.1	1.9	1.0
R-7343	2.9	1.1	.9
R-7344	1.3	.80	.5
R-7345	1.8	.50	.6
R-7346	3.5	1.3	.8
R-7347	2.3	1.0	.7
R-7349	2.7	1.9	.9
R-7350	2.7	1.8	1.7
R-7354	1.0	1.4	.5
R-7355	1.3	.50	.5
R-7366	3.4	1.3	.8
R-7367	2.5	1.1	.7
R-7406	4.6	1.7	.8
R-7407	3.9	1.5	.9
R-7408	3.4	2.2	.8
R-7409	2.3	1.0	.7
R-7410	3.6	1.2	1.0
R-7411	3.6	1.7	.9
R-7412	2.1	.90	.6
R-7515	1.6	1.4	1.3
R-7516	1.0	.60	.4
R-7517	4.4	1.2	1.2
R-7518	2.8	1.4	.6
R-7519	3.4	.50	.8
R-7520	1.5	.50	.6
R-8165	3.9	2.2	1.0
R-8166	3.2	1.6	1.0
R-8207	3.0	1.1	1.0
R-8208	2.5	.87	.8
R-8209	1.5	.89	.4
R-8210	4.4	1.7	1.1
R-8241	1.1	.32	.5
R-8243	2.1	1.4	.7
R-8244	2.5	1.8	.6

Table 5a.--Major, minor, and trace element composition of 2 bituminous coal samples from Buchanan County, Virginia reported on whole-coal basis.

[Values in percent or parts-per-million. 23 values are from direct determinations on whole-coal; all other values calculated from analyses of ash. S means analysis by emission spectrography; L, less than the value shown; N, not detected; B, not determined.]

Sample number	Si (percent)	Al (percent)	Ca (percent)	Mg (percent)	Na (percent)	K (percent)	Fe (percent)	Tl (percent)	Ag-S (ppm)	As (ppm)	Sample number
R-7383	7.3	3.6	0.14	0.12	0.040	0.40	0.57	0.32	0.026L	4.0	R-7383
R-7494	1.6	1.3	.048	.028	.043	.12	.18	.083	.021	1.0	R-7494
Sample number	B-S (ppm)	Ba-S (ppm)	Be-S (ppm)	Cd (ppm)	Ce (ppm)	Cl (ppm)	Co (ppm)	Cr (ppm)	Cs (ppm)	Cu (ppm)	Sample number
R-7383	22	210	2	0.07	43	150	9.8	42	2.3	20	R-7383
R-7494	9.7	61	4	.04	18	1,100	5.3	14	1.0	19	R-7494
Sample number	Er-S (ppm)	Eu (ppm)	F (ppm)	Ga-S (ppm)	Ge-S (ppm)	Hf (ppm)	Hg (ppm)	La (ppm)	Li (ppm)	Lu (ppm)	Sample number
R-7383	2.6L	0.55	120	12	0.79	2.4	0.020	25	180	0.3	R-7383
R-7494	.7	.31	70	3.6	1.4	.7	.19	5	16	.1	R-7494
Sample number	Mn (ppm)	Mo-S (ppm)	Nb-S (ppm)	Nd-S (ppm)	Ni-S (ppm)	P (ppm)	Pb (ppm)	Rb (ppm)	Sb (ppm)	Sc (ppm)	Sample number
R-7383	13	1.1	8.7	13	19	440	16	28	0.70	8.5	R-7383
R-7494	3.9	.28	2.5	9.7	9.0	22L	6.1	16L	.80	2.8	R-7494
Sample number	Se (ppm)	Sm (ppm)	Sn-S (ppm)	Sr-S (ppm)	Ta-S (ppm)	Tb (ppm)	Th (ppm)	U (ppm)	V-S (ppm)	W-S (ppm)	Sample number
R-7383	B	3.0	3.4	340	0.05L	0.50	9.0	2.8	40	0.11	R-7383
R-7494	3.1	1.5	.76	110	.01	.20	2.7	.70	15	.04	R-7494
Sample number	Y-S (ppm)	Yb (ppm)	Zn (ppm)	Zr-S (ppm)							
R-7383	7.7	1.6	9.0	42							
R-7494	4.4	.6	1.9	16							

Table 5b.--Major, minor, and trace element composition of 44 bituminous coal samples from Dickenson County, Virginia reported on whole-coal basis.

[Values in percent or parts-per-million. 23 values are from direct determinations on whole-coal; all other values calculated from analyses of ash. S means analysis by emission spectrography; L, less than the value shown; N, not detected; B, not determined.]

Sample number	Si (percent)	Al (percent)	Ca (percent)	Mg (percent)	Na (percent)	K (percent)	Fe (percent)	Ti (percent)	Ag-S (ppm)	As (ppm)	Sample number
R-7348	3.0	1.9	0.066	0.062	0.020	0.27	0.53	0.085	0.012	7.0	R-7348
R-7351	1.0	.75	.077	.015	.046	.037	.36	.073	.028	3.0	R-7351
R-7356	3.8	1.9	.090	.062	.085	.21	.32	.18	.028	2.0	R-7356
R-7357	.82	.60	.13	.041	.032	.097	.35	.038	.014	2.0	R-7357
R-7358	2.8	1.8	.15	.072	.038	.25	.50	.079	.036	6.0	R-7358
R-7359	2.2	1.2	.053	.051	.035	.10	.52	.099	.052	4.0	R-7359
R-7380	.66	.51	.063	.016	.020	.051	.23	.032	.040	6.0	R-7380
R-7381	1.9	1.3	.044	.022	.009	.11	.14	.050	.052	1.0	R-7381
R-7382	2.9	2.2	.046	.069	.029	.42	.26	.075	.048	2.0	R-7382
R-7465	1.4	.97	.049	.020	.010	.065	.95	.070	.034	17	R-7465
R-7491	2.5	1.0	.055	.018	.018	.057	.63	.18	.035	6.0	R-7491
R-7492	.62	.47	.048	.013	.026	.039	.70	.027	.026	13	R-7492
R-7493	1.4	.90	.049	.032	.030	.14	.34	.056	.029	.10L	R-7493
R-7545	1.4	.99	.11	.061	.042	.098	.36	.042	.013	2.0	R-7545
R-7546	1.4	.98	.087	.044	.026	.16	.91	.048	.015	29	R-7546
R-7547	1.0	.82	.074	.017	.008	.073	2.1	.048	.068	68	R-7547
R-7548	3.1	2.2	.13	.12	.035	.49	.70	.11	.91	4.0	R-7548
R-7549	2.0	1.3	.14	.11	.043	.30	.50	.074	.018	3.5	R-7549
R-7550	1.7	.94	.22	.043	.006	.053	.46	.080	.021	8.0	R-7550
R-7551	14	7.1	.12	.65	.082	2.3	2.5	.36	.054	36	R-7551
R-7552	2.8	1.7	.17	.090	.042	.35	.82	.11	.037	6.0	R-7552
R-7553	2.5	1.3	.24	.099	.046	.31	1.5	.093	.048	12	R-7553
R-7554	3.1	2.0	.27	.13	.041	.37	1.1	.11	.058	6.0	R-7554
R-7555	3.0	1.9	.12	.12	.041	.41	.91	.11	.053	16	R-7555
R-7556	9.0	4.7	.52	.40	.094	1.3	1.7	.23	.036L	19	R-7556
R-7557	.68	.50	.070	.016	.004	.057	2.4	.036	.054	110	R-7557
R-7593	4.4	2.6	.28	.18	.037	.64	1.0	.14	.019	23	R-7593
R-7594	6.8	3.4	.15	.26	.055	.89	1.3	.17	.026L	5.0	R-7594
R-7595	1.6	.99	.28	.075	.050	.096	.44	.079	.023	5.0	R-7595
R-7596	1.7	1.3	.17	.050	.010	.057	2.7	.045	.044	59	R-7596
R-7597	1.4	.77	.22	.064	.038	.036	.42	.072	.013	4.0	R-7597
R-7860	2.9	1.8	.073	.099	.050	.53	2.5	.087	.031	120	R-7860
R-7861	5.2	3.2	.85	.14	.026	.40	.37	.24	.041	1.5	R-7861
R-7862	8.0	2.5	.068	.13	.032	.49	.60	.38	.044	7.2	R-7862
R-7863	6.8	4.1	.31	.30	.091	.95	1.0	.19	.039	2.7	R-7863
R-7864	7.8	4.3	.11	.16	.046	.80	.67	.39	.040	11	R-7864
R-7865	7.8	4.3	.078	.35	.051	1.4	2.3	.20	.045	64	R-7865
R-7866	4.8	2.4	.11	.11	.056	.38	.39	.18	.019	1.5	R-7866
R-8167	.59	.47	.077	.021	.017	.063	.29	.025	.019	5.6	R-8167
R-8168	3.1	1.2	.044	.089	.027	.32	1.7	.047	.020	40	R-8168

Table 5b.--Major, minor, and trace element composition of 44 bituminous coal samples from Dickenson County, Virginia reported on whole-coal basis--continued

Sample number	Si (percent)	Al (percent)	Ca (percent)	Mg (percent)	Na (percent)	K (percent)	Fe (percent)	Ti (percent)	Ag-S (ppm)	As (ppm)	Sample number
R-8169	3.4	2.0	0.064	0.063	0.054	0.36	0.28	0.12	0.022	2.8	R-8169
R-8170	4.4	2.4	.066	.10	.053	.58	.54	.14	.025	2.8	R-8170
R-8206	1.0	.73	.073	.015	.015	.037	.19	.069	.023	1.5	R-8206
R-8242	.98	.66	.065	.024	.037	.059	.50	.062	.022	9.1	R-8242

Table 5b.--Major, minor, and trace element composition of 44 bituminous coal samples from Dickenson County, Virginia reported on whole-coal basis--continued

Sample number	B-S (ppm)	Ba-S (ppm)	Be-S (ppm)	Br (ppm)	Cd (ppm)	Ce (ppm)	Cl (ppm)	Co (ppm)	Cr (ppm)	Cs (ppm)	Sample number
R-7348	9.4	73	2	B	0.09	24	240	4.7	11	1.3	R-7348
R-7351	24	52	1	B	.05	16	280	2.7	8.8	.2	R-7351
R-7356	17	160	1	B	.07	32	420	4.7	24	1.0	R-7356
R-7357	6.3	94	1	B	.04	11	50L	6.5	7.4	.4	R-7357
R-7358	10	130	3	B	.08	22	60	11	11	1.0	R-7358
R-7359	12	96	3	B	.10	30	350	14	18	.3	R-7359
R-7380	9.6	40	2	B	.10	12	430	6.0	7.0	.3	R-7380
R-7381	13	42	3	B	.06	14	230	16	12	.5	R-7381
R-7382	18	85	5	B	.15	23	200	9.4	22	1.8	R-7382
R-7465	8.8	95	2	B	.06	19	200	17	12	.6	R-7465
R-7491	13	52	3	B	.07	23	350	8.0	15	.3	R-7491
R-7492	7.4	37	2	B	.06	11	650	13	6.0	.4	R-7492
R-7493	6.4	45	4	B	.06	11	360	4.7	9.1	.8	R-7493
R-7545	14	110	1	B	.02	15	130	4.1	6.2	.3	R-7545
R-7546	11	72	2	B	.07	14	190	5.8	10	1.0	R-7546
R-7547	9.9	69	3	B	.17	22	520	15	14	.3	R-7547
R-7548	18	170	1	B	.08	22	260	5.1	20	2.0	R-7548
R-7549	17	140	1	B	.05	18	100L	7.2	13	.9	R-7549
R-7550	9.2	55	1	B	.05	18	720	4.5	12	.2	R-7550
R-7551	82	460	4	B	.19	70	100L	13	57	7.0	R-7551
R-7552	17	150	1	B	.10	17	100L	6.8	15	1.2	R-7552
R-7553	19	130	1	B	.06	15	100L	2.2	14	2.0	R-7553
R-7554	26	160	1	B	.10	17	100L	5.2	19	1.5	R-7554
R-7555	20	160	1	B	.12	18	200	3.3	14	1.7	R-7555
R-7556	51	330	3	B	.21	46	100L	11	40	5.4	R-7556
R-7557	13	53	2	B	.05	5.0	100L	2.2	5.0	.2	R-7557
R-7593	26	150	2	B	.11	26	300	5.2	21	3.0	R-7593
R-7594	37	340	2	B	.11	37	100L	9.2	28	2.9	R-7594
R-7595	19	110	1	B	.08	12	210	2.9	9.8	.4	R-7595
R-7596	2.4	73	5	B	.03	14	210	9.7	4.6	.2	R-7596
R-7597	15	120	1	B	.04	11	240	1.5	7.3	.3	R-7597
R-7860	17	150	2	B	.09	16	290	3.2	14	2.6	R-7860
R-7861	15	130	2	B	.03	49	490	17	47	1.4	R-7861
R-7862	23	130	2	B	.02L	47	480	5.5	31	2.2	R-7862
R-7863	33	260	2	B	.07	31	230	5.8	26	4.4	R-7863
R-7864	25	180	2	B	.09	45	530	6.9	43	3.0	R-7864
R-7865	30	210	3	B	.03L	43	350	8.7	33	4.5	R-7865
R-7866	21	150	2	B	.02	27	100L	4.8	22	2.6	R-7866
R-8167	7.4	59	1	B	.03	7.0	510	4.6	5.3	.6	R-8167
R-8168	8.6	240	3	B	.09	14	550	7.8	12	2.0	R-8168

Table 5b.--Major, minor, and trace element composition of 44 bituminous coal samples from Dickenson County, Virginia reported on whole-coal basis--continued

Sample number	B-S (ppm)	Ba-S (ppm)	Be-S (ppm)	Br (ppm)	Cd (ppm)	Ce (ppm)	Cl (ppm)	Co (ppm)	Cr (ppm)	Cs (ppm)	Sample number
R-8169	23	120	1	B	0.04	21	1,400	4.2	15	1.4	R-8169
R-8170	26	140	1	B	.06	27	1,200	4.7	19	1.8	R-8170
R-8206	9.5	72	2	7.6	.02	15	520	8.3	10	.2	R-8206
R-8242	11	72	1	3.0	.08	12	170	4.9	11	.3	R-8242



Table 5b.--Major, minor, and trace element composition of 44 bituminous coal samples from Dickenson County, Virginia reported on whole-coal basis--continued

Sample number	Cu (ppm)	Dy-S (ppm)	Er-S (ppm)	Eu (ppm)	F (ppm)	Ga-S (ppm)	Gd-S (ppm)	Ge-S (ppm)	Hf (ppm)	Hg (ppm)	Sample number
R-7348	21	2.6L	1.2L	0.34	56	7.0	1.8L	0.59	1.0	0.070	R-7348
R-7351	15	1.0L	.7	.26	48	2.5	.80	.14	.7	.030	R-7351
R-7356	20	3.1L	1.4L	.46	260	6.2	2.1L	.28L	1.6	.030	R-7356
R-7357	14	1.0L	.5L	.22	510	2.2	.68L	.27	.4	.010L	R-7357
R-7358	17	2.6L	1.2L	.34	210	6.6	1.8L	.36	1.7	.030	R-7358
R-7359	31	1.9L	.9L	.53	560	4.2	1.3L	2.0	1.1	.12	R-7359
R-7380	17	.7L	.5	.22	57	1.9	.66	2.2	.3	.010L	R-7380
R-7381	23	2.4	1.0	.31	35	5.0	1.1L	3.6	.5	.010L	R-7381
R-7382	27	2.7L	1.9	.43	95	7.0	1.8L	9.4	.6	.020	R-7382
R-7465	24	1.5L	.8	.29	60	2.7	2.7	1.5	.7	.17	R-7465
R-7491	24	1.9L	1.5	.46	90	3.0	2.6	1.2	1.5	.20	R-7491
R-7492	16	.8L	1.1	.25	50	1.7	1.2	1.8	.3	.11	R-7492
R-7493	16	1.3L	1.2	.20	70	1.9	.87L	.87	.5	.10	R-7493
R-7545	9.6	1.4L	1.3	.28	60	3.2	1.3	.26	.7	.080	R-7545
R-7546	17	1.6L	1.1	.36	60	3.3	1.2	.22	.4	.13	R-7546
R-7547	17	1.7L	.8L	.43	70	6.0	1.1L	9.9	.4	.25	R-7547
R-7548	20	3.4	2.2	.45	180	6.2	2.9	.28L	.8	.35	R-7548
R-7549	18	2.0L	.9L	.37	70	4.1	1.4L	.28	.5	.16	R-7549
R-7550	14	1.6L	.7L	.37	40	2.2	1.1	.36	.6	.070	R-7550
R-7551	35	12L	5.4L	1.3	120	21	8.2L	1.1L	2.8	.14	R-7551
R-7552	17	2.7L	1.2L	.42	40	6.3	1.8L	.49	.8	.050	R-7552
R-7553	9.3	2.6L	1.2L	.26	30	4.9	1.8L	.48	.9	.060	R-7553
R-7554	22	3.2L	1.5L	.34	10	5.5	3.8	.29L	.8	.050	R-7554
R-7555	20	2.9L	1.3L	.36	60	5.7	2.0L	.27	.7	.050	R-7555
R-7556	28	8.0L	3.6L	.85	80	14	7.6	1.1	2.1	.050	R-7556
R-7557	8.7	1.5L	.7L	.13	10L	4.0	1.1	13	.3	.15	R-7557
R-7593	22	4.1L	1.9L	.51	60	6.8	3.7	.56	1.0	.070	R-7593
R-7594	19	5.7L	2.6L	.65	70	11	4.7	.52	1.7	.090	R-7594
R-7595	12	1.7L	.8L	.23	40	3.2	1.1L	.15	.6	.050	R-7595
R-7596	9.1	2.4L	1.1L	.24	10	6.8	1.7L	.89	1.1	.18	R-7596
R-7597	12	1.4L	.6L	.20	10	2.6	3.1	.26	.6	.070	R-7597
R-7860	11	3.4L	1.5L	.27	260	4.3	2.3L	.23L	.5	.37	R-7860
R-7861	26	4.7L	2.2L	.86	170	8.6	3.2L	.75	1.7	.12	R-7861
R-7862	27	5.4L	2.5L	.71	150	8.1	3.7L	.37L	3.1	.50	R-7862
R-7863	22	6.1L	2.8L	.59	260	9.4	4.1L	.41L	1.0	.37	R-7863
R-7864	29	6.3L	2.9L	.61	210	11	4.3L	1.0L	2.2	.41	R-7864
R-7865	26	7.1L	3.2L	.73	230	11	4.8L	1.8	1.2	.37	R-7865
R-7866	14	3.8L	1.7L	.41	150	5.0	2.6L	.43	1.2	.18	R-7866
R-8167	7.4	.7L	.3L	.18	100	1.0	.47L	.37	.2	.058	R-8167
R-8168	20	2.8L	1.3L	.35	90	3.8	1.9L	2.9	.4	.068	R-8168

Table 5b.--Major, minor, and trace element composition of 44 bituminous coal samples from Dickenson County, Virginia reported on whole-coal basis--continued

Sample number	Cu (ppm)	Dy-S (ppm)	Er-S (ppm)	Eu (ppm)	F (ppm)	Ga-S (ppm)	Gd-S (ppm)	Ge-S (ppm)	Hf (ppm)	Hg (ppm)	Sample number
R-8169	19	2.8L	1.3L	0.42	100	4.4	1.9L	1.5	0.9	0.14	R-8169
R-8170	18	3.6L	1.7L	.48	90	5.6	2.5L	1.4	1.1	.058	R-8170
R-8206	14	1.0L	.5L	.26	30	2.3	.68L	2.7	.6	.10	R-8206
R-8242	11	1.1L	.5L	.27	30	2.8	.72L	.48	.7L	.17	R-8242

Table 5b.--Major, minor, and trace element composition of 44 bituminous coal samples from Dickenson County, Virginia reported on whole-coal basis--continued

Sample number	La (ppm)	Li (ppm)	Lu (ppm)	Mn (ppm)	Mo-S (ppm)	Nb-S (ppm)	Nd-S (ppm)	Ni-S (ppm)	P (ppm)	Pb (ppm)	Sample number
R-7348	13	32	0.2	31	1.8	3.9	12	11	26L	19	R-7348
R-7351	9	9.4	.1	3.8	1.3	2.3	8.0	6.6	26	4.1	R-7351
R-7356	19	28	.2	9.0	1.3	4.2	17	12	140	10	R-7356
R-7357	6	6.3	.1	9.9	.86	.45	3.3	6.3	96	2.8	R-7357
R-7358	11	22	.2	14	1.1	2.8	6.5	14	70	17	R-7358
R-7359	17	18	.2	2.6	.96	1.9	8.7	20	66	10	R-7359
R-7380	6	5.6	.1	2.7	2.2	1.1	5.0	9.9	150	4.0	R-7380
R-7381	7	17	.1	3.8	1.7	2.7	10	17	22L	12	R-7381
R-7382	11	35	.2	9.1	1.2	2.5	13	17	22L	12	R-7382
R-7465	11	13	.1	4.4	2.2	3.1	12	22	22L	4.6	R-7465
R-7491	12	12	.3	3.4	2.5	6.4	18	14	83	6.3	R-7491
R-7492	6	3.4	.1	6.7	1.3	.70	7.8	14	87	2.3	R-7492
R-7493	3	8.7	.1L	5.7	1.3	1.4	6.4	8.1	22L	3.0	R-7493
R-7545	8	13	.1	22	.90	2.4	9.0	9.6	44L	10	R-7545
R-7546	7	7.0	.1	120	2.7	1.5	12	10	66	2.7	R-7546
R-7547	11	5.4	.2	7.0	3.1	1.4	14	21	370	4.6	R-7547
R-7548	13	29	.2	22	1.8	2.0	15	12	48	8.4	R-7548
R-7549	10	12	.2	18	1.0	.83	2.9L	8.1	44L	5.2	R-7549
R-7550	11	16	.1	22	1.5	2.6	8.5	11	31	4.4	R-7550
R-7551	40	120	.4	120	.54L	8.2	22	38	22L	16	R-7551
R-7552	11	23	.2	48	2.6	2.0	3.9L	14	4L	7.4	R-7552
R-7553	9	18	.1	21	.60	2.5	3.8L	6.7	4L	3.1	R-7553
R-7554	10	41	.1	29	1.3	2.8	4.6L	6.1	13	9.4	R-7554
R-7555	11	29	.1	24	2.0	3.1	9.3	11	4L	7.7	R-7555
R-7556	26	51	.3	120	1.1	8.0	12	31	31	13	R-7556
R-7557	3	4.8	.1	11	1.4	1.4	2.7	6.7	4L	6.0	R-7557
R-7593	17	41	.2	50	1.1	3.1	5.9L	14	9L	8.1	R-7593
R-7594	23	39	.2	84	1.6	5.2	16	24	44	9.7	R-7594
R-7595	8	16	.1	53	1.2	1.3	2.7	9.0	13	4.4	R-7595
R-7596	8	32	.1	36	2.6	5.2	3.6	18	4L	17	R-7596
R-7597	8	9.6	.1	58	.83	1.2	2.0L	4.7	26	2.9	R-7597
R-7860	9	9.5	.1	18	1.1	1.0	5.5	7.2	48L	8.4	R-7860
R-7861	26	26	.3	24	2.2	7.3	12	28	240	12	R-7861
R-7862	27	25	.4	17	.37	6.1	22	12	44L	18	R-7862
R-7863	17	28	.2	36	.28L	4.1	16	16	48L	22	R-7863
R-7864	27	37	.3	15	.57	9.2	19	13	110	15	R-7864
R-7865	24	28	.3	42	1.3	4.8	22	22	1,700	19	R-7865
R-7866	16	16	.2	7.9	.48	5.6	12	11	44L	8.6	R-7866
R-8167	4	4.3	.1	5.3	1.3	1.1	3.4	5.0	44L	1.3	R-8167
R-8168	8	11	.2	21	2.0	.66	4.0L	16	44L	3.3	R-8168

Table 5b.--Major, minor, and trace element composition of 44 bituminous coal samples from Dickenson County, Virginia reported on whole-coal basis--continued

Sample number	La (ppm)	Li (ppm)	Lu (ppm)	Mn (ppm)	Mo-S (ppm)	Nb-S (ppm)	Nd-S (ppm)	Ni-S (ppm)	P (ppm)	Pb (ppm)	Sample number
R-8169	13	53	0.1	7.7	0.86	3.0	9.8	9.8	120	6.8	R-8169
R-8170	16	48	.2	16	.41	2.3	8.3	9.2	52	7.6	R-8170
R-8206	9	9.5	.1	7.2	.50	2.3	3.4	20	790	4.0	R-8206
R-8242	7	7.2	.1	48	1.8	2.6	6.2	16	700	3.6	R-8242

Table 5b.--Major, minor, and trace element composition of 44 bituminous coal samples from Dickenson County, Virginia reported on whole-coal basis--continued

Sample number	Pd-S (ppm)	Pr-S (ppm)	Rb (ppm)	Sb (ppm)	Sc (ppm)	Se (ppm)	Sm (ppm)	Sn-S (ppm)	Sr-S (ppm)	Ta-S (ppm)	Sample number
R-7348	0.24L	8.0L	17	1.2	3.5	4.2	2.1	1.8	68	0.06	R-7348
R-7351	.09L	3.2L	20L	.30	2.0	2.1	1.4	1.19	150L	.01	R-7351
R-7356	.28L	9.6L	22	.40	4.8	2.0L	2.6	1.1	160	.05	R-7356
R-7357	.09L	3.1L	20L	.40	1.9	5.2	.90	.09L	180	.00	R-7357
R-7358	.24L	8.2L	17	.60	3.2	2.6	2.3	.72	230	.05	R-7358
R-7359	.17L	5.9L	30L	.80	5.5	7.4	2.7	.17L	130	.02	R-7359
R-7380	.03L	2.2L	10L	.70	1.9	1.5	1.0	.23	110	.01	R-7380
R-7381	.07L	5.0L	6	.90	3.3	5.2	1.4	.74	58	.05	R-7381
R-7382	.12L	8.2L	23	1.7	5.6	4.2	2.2	1.2	52	.02	R-7382
R-7465	.07L	8.2	20L	1.1	2.3	5.3	1.5	.14L	95	.01	R-7465
R-7491	.09L	6.8	25L	.90	3.6	2.5	2.3	1.2	130	.04	R-7491
R-7492	.04	4.4	25L	.70	1.6	1.3	1.3	.07	100	.01L	R-7492
R-7493	.06L	3.9L	2L	.90	2.0	1.3	.10L	.12	70	.01	R-7493
R-7545	.06L	4.4L	50L	.40	1.9	3.4	1.5	.77	190	.02	R-7545
R-7546	.07L	5.8	50L	.70	2.4	1.8	1.2	.15L	150	.01	R-7546
R-7547	.08L	5.2L	40L	1.8	3.7	1.9	1.9	H	220	.00	R-7547
R-7548	.14L	9.5L	45L	.60	4.2	3.0	2.1	.56	200	.04	R-7548
R-7549	.09L	6.3L	45L	.60	2.9	5.6	1.8	.28	160	.02	R-7549
R-7550	.07L	4.8L	20L	.60	2.7	2.4	1.4	.14	210	.02	R-7550
R-7551	.54L	37L	120	1.7	13	1.7	5.5	1.1	180	.55	R-7551
R-7552	.12L	8.4L	20	1.2	4.1	3.5	1.6	.62	200	.03	R-7552
R-7553	.12L	8.1L	31	1.2	3.1	4.4	1.1	.24L	190	.03	R-7553
R-7554	.15L	9.9L	27	2.9	3.6	2.8	1.5	.44	200	.05	R-7554
R-7555	.13L	9.0L	19	1.5	3.4	2.7	1.5	.27	190	.03	R-7555
R-7556	.36L	25L	80	1.9	9.3	3.2	3.8	1.1	230	.25	R-7556
R-7557	.07L	4.6L	20L	5.9	2.2	7.0	.50	H	60	.01	R-7557
R-7593	.19L	13L	35	2.4	4.9	2.8	2.2	1.1	170	.06	R-7593
R-7594	.26L	18L	74	.60	6.7	3.2	2.8	1.0	310	.13	R-7594
R-7595	.08L	5.1L	30L	.80	2.1	2.1	1.1	.53	180	.02	R-7595
R-7596	.11L	9.9	20L	.60	1.6	3.5	1.5	H	160	.08	R-7596
R-7597	.06L	4.4L	20L	1.1	2.0	1.7	1.0	.13L	140	.01	R-7597
R-7860	.15L	10L	20	.50L	3.2	7.1	1.2	.23L	130	.03	R-7860
R-7861	.22L	15L	50L	1.0L	7.0	5.1	3.4	2.6	260	.13	R-7861
R-7862	.25L	17L	22	3.2	6.3	4.5	3.5	2.5	81	.22	R-7862
R-7863	.28L	19L	30	1.0L	5.8	2.7	2.5	1.3	210	.10	R-7863
R-7864	.29L	20L	38	1.0	9.1	4.8	2.9	2.5	180	.25	R-7864
R-7865	.32L	22L	66	2.0	8.0	2.6	3.5	.48L	100	.14	R-7865
R-7866	.17L	12L	26	1.0	4.7	2.0	1.9	1.1	210	.08	R-7866
R-8167	.03L	4.7L	35L	.80	1.4	3.1	.60	.05L	120	.00	R-8167
R-8168	.13L	8.5L	35L	1.8	3.9	1.8	1.2	.19L	70	.02	R-8168

Table 5b.--Major, minor, and trace element composition of 44 bituminous coal samples from Dickenson County, Virginia reported on whole-coal basis--continued

Sample number	Pd-S (ppm)	Pr-S (ppm)	Rb (ppm)	Sb (ppm)	Sc (ppm)	Se (ppm)	Sm (ppm)	Sn-S (ppm)	Sr-S (ppm)	Ta-S (ppm)	Sample number
R-8169	0.13L	8.8L	50L	0.90	3.9	2.6	1.7	0.93	140	0.03	R-8169
R-8170	.17L	11L	60L	.80	5.1	2.5	1.6	.31	130	.08	R-8170
R-8206	.05L	3.6	25L	1.0L	2.5	3.0	1.1	.44	86	.01	R-8206
R-8242	.05L	3.3L	40L	1.0L	2.4	3.1	1.0	.07L	110	.01	R-8242

Table 5b.--Major, minor, and trace element composition of 44 bituminous coal samples from Dickenson County, Virginia reported on whole-coal basis--continued

Sample number	Tb (ppm)	Th (ppm)	Tl-S (ppm)	U (ppm)	V-S (ppm)	W-S (ppm)	Y-S (ppm)	Yb (ppm)	Zn (ppm)	Zr-S (ppm)	Sample number
R-7348	0.30	7.9	0.35L	4.1	21	0.12	9.8	0.9	9.4	27	R-7348
R-7351	.20	2.3	.14L	1.0	11	.02	6.1	.6	3.2	15	R-7351
R-7356	.40	5.0	.42L	1.6	25	.09	9.0	1.2	6.3	25	R-7356
R-7357	.20	1.5	.14L	.50	8.1	.04L	4.2	.6	2.8	4.1	R-7357
R-7358	.40	7.1	.36L	3.6	16	.11	8.9	1.2	13	13	R-7358
R-7359	.40	4.1	.26L	1.8	21	.03	7.5	1.2	9.6	13	R-7359
R-7380	.20	1.2	.17L	.60	10	.01	4.6	.6	5.3	8.6	R-7380
R-7381	.30	2.3	.37L	1.7	24	.07	8.1	.8	8.9	21	R-7381
R-7382	.40	4.0	.61L	3.1	41	.05	9.0	1.1	21	21	R-7382
R-7465	.20	2.5	.34L	.80	12	.03	5.8	.7	12	25	R-7465
R-7491	.40	3.6	.97	1.4	18	.07	11	1.6	6.0	46	R-7491
R-7492	.20	1.0	.19L	.50	7.4	.01	5.9	.7	8.1	8.5	R-7492
R-7493	.20	1.6	.29L	.50	12	.03	3.7	.1L	4.5	8.7	R-7493
R-7545	.40	5.3	.32L	3.9	9.0	.03	5.4	.7	3.1	15	R-7545
R-7546	.30	1.7	.37L	.90	15	.03	6.4	.7	10	13	R-7546
R-7547	.60	1.7	.38L	.70	13	.02	6.8	1.2	14	14	R-7547
R-7548	.40	3.7	.70L	1.9	29	.06	6.3	1.0	17	15	R-7548
R-7549	.40	2.4	.46L	1.1	14	.04	2.9	1.0	5.2	9.2	R-7549
R-7550	.10	2.8	.36L	.60	13	.03	5.5	.8	7.8	22	R-7550
R-7551	1.0	10	2.7L	4.0	87	.68	17	3.1	92	50	R-7551
R-7552	.40	3.1	.62L	1.3	21	.09	4.2	1.2	15	14	R-7552
R-7553	.20	2.4	.60L	.90	12	.06	3.2	.8	9.8	14	R-7553
R-7554	.20	2.9	.73L	1.5	20	.12	3.0	.8	12	14	R-7554
R-7555	.30	2.9	.67L	1.9	28	.08	5.7	.8	21	24	R-7555
R-7556	.80	7.6	1.8L	3.2	69	.40	14	2.1	62	65	R-7556
R-7557	.10	.80	.34L	.30	7.4	.02	2.9	.5	4.4	8.0	R-7557
R-7593	.40	4.3	.93L	1.9	30	.13	5.7	1.3	20	18	R-7593
R-7594	.60	5.6	1.3L	2.0	37	.21	7.6	1.7	26	26	R-7594
R-7595	.20	2.3	.38L	1.0	11	.03	2.9	.6	7.5	16	R-7595
R-7596	.10L	7.5	.56L	4.3	7.7	.13	6.4	.8	5.9	24	R-7596
R-7597	.20	2.0	.32L	.90	9.0	.04	2.4	.6	2.1	12	R-7597
R-7860	.04	2.3	.70L	.89	18	.05	3.8	.6	13	15	R-7860
R-7861	.90	7.4	.99L	3.0	39	.17	15	1.7	17	71	R-7861
R-7862	.97	8.7	1.1L	2.9	34	.29	12	2.2	11	56	R-7862
R-7863	.73	5.0	1.3L	2.8	50	.17	10	1.3	7.7	28	R-7863
R-7864	.72	9.2	1.3L	3.0	49	.29	13	1.7	32	80	R-7864
R-7865	.99	6.2	2.7	4.4	64	.35	14	1.8	17	48	R-7865
R-7866	.54	4.3	.79L	1.6	29	.09	8.9	1.0	17	44	R-7866
R-8167	.13	.90	.14L	.46	6.2	.01	3.1	.5	1.6	10	R-8167
R-8168	.28	2.2	.58L	2.3	21	.09	5.1	1.0	43	9.8	R-8168

Table 5b.--Major, minor, and trace element composition of 44 bituminous coal samples from Dickenson County, Virginia reported on whole-coal basis--continued

Sample number	Tb (ppm)	Th (ppm)	Tl-S (ppm)	U (ppm)	V-S (ppm)	W-S (ppm)	Y-S (ppm)	Yb (ppm)	Zn (ppm)	Zr-S (ppm)	Sample number
R-8169	0.25	3.3	0.59L	1.4	21	0.08	5.8	0.9	4.5	21	R-8169
R-8170	.31	4.4	.76L	1.6	23	.08	5.4	1.0	7.4	17	R-8170
R-8206	.19	2.3	.21L	1.2	13	.02	3.7	.6	2.4	17	R-8206
R-8242	.23	1.8	.22L	.84	12	.01	5.8	.6	8.6	19	R-8242



Table 5c.--Major, minor, and trace element composition of 37 bituminous coal samples from Wise County, Virginia reported on whole-coal basis.

[Values in percent or parts-per-million. 23 values are from direct determinations on whole-coal; all other values calculated from analyses of ash. S means analysis by emission spectrography; L, less than the value shown; N, not detected; B, not determined.]

Sample number	Si (percent)	Al (percent)	Ca (percent)	Mg (percent)	Na (percent)	K (percent)	Fe (percent)	Ti (percent)	Ag-S (ppm)	As (ppm)	Sample number
R-7324	1.3	0.98	0.10	0.045	0.025	0.19	1.8	0.045	0.034	55	R-7324
R-7325	1.4	.89	.18	.070	.020	.12	.69	.055	.042	8.0	R-7325
R-7341	1.4	.94	.071	.023	.008	.12	3.4	.059	.050	62	R-7341
R-7342	1.7	1.2	.054	.045	.010	.20	3.8	.073	.052	95	R-7342
R-7343	4.3	2.5	.051	.13	.022	.52	.54	.13	.032	3.0	R-7343
R-7344	.46	.51	.084	.022	.008	.045	.42	.023	.024	8.0	R-7344
R-7345	2.3	1.4	.057	.065	.010	.26	.44	.067	.019	4.0	R-7345
R-7346	2.4	1.4	.24	.063	.010	.070	.67	.11	.021	8.0	R-7346
R-7347	2.7	1.7	.042	.055	.020	.27	1.2	.11	.023	32	R-7347
R-7349	3.8	1.9	.10	.12	.024	.37	.91	.095	.029	9.0	R-7349
R-7350	3.0	1.6	.13	.082	.030	.40	.64	.084	.047	18	R-7350
R-7354	1.1	.69	.065	.024	.012	.096	.28	.040	.024	4.0	R-7354
R-7355	1.3	.76	.063	.024	.016	.11	.25	.056	.022	8.0	R-7355
R-7366	1.9	1.4	.16	.033	.012	.097	.16	.070	.025	2.0	R-7366
R-7367	1.8	1.3	.070	.048	.016	.10	.25	.072	.023	2.0	R-7367
R-7406	4.0	2.1	.20	.081	.035	.25	.47	.16	.031	3.0	R-7406
R-7407	3.4	1.7	.21	.066	.038	.21	.91	.14	.027	24	R-7407
R-7408	2.8	1.9	.082	.10	.034	.44	.44	.078	.036	2.0	R-7408
R-7409	1.1	.64	.073	.024	.022	.031	.18	.071	.018	1.0	R-7409
R-7410	2.6	1.4	.20	.055	.020	.19	.27	.10	.040	1.0	R-7410
R-7411	2.2	1.6	.090	.042	.022	.16	.27	.11	.037	3.0	R-7411
R-7412	1.1	.85	.10	.024	.007	.058	.24	.047	.015	3.0	R-7412
R-7515	1.1	.91	.039	.036	.017	.18	.48	.034	.016	33	R-7515
R-7516	1.2	.88	.048	.048	.025	.17	.26	.037	.016	1.0	R-7516
R-7517	5.8	3.4	.097	.20	.032	.59	1.3	.19	.023L	4.0	R-7517
R-7518	1.7	1.5	.047	.037	.034	.23	.26	.072	.023	4.0	R-7518
R-7519	3.4	1.2	.075	.035	.068	.093	.26	.13	.011	2.0	R-7519
R-7520	.93	.64	.061	.023	.029	.076	.28	.039	.017	37	R-7520
R-8165	3.0	2.1	.25	.029	.023	.090	.30	.15	.020	2.5	R-8165
R-8166	3.0	2.0	.043	.061	.039	.34	.68	.12	.046	12	R-8166
R-8207	3.6	2.1	.044	.079	.047	.44	.58	.10	.036	9.9	R-8207
R-8208	2.9	1.7	.086	.061	.030	.32	.39	.091	.011L	5.4	R-8208
R-8209	1.0	.63	.12	.015	.020	.040	1.0	.051	.046	7.2	R-8209
R-8210	4.6	2.8	.043	.12	.056	.62	.50	.13	.026	4.2	R-8210
R-8241	1.3	.80	.035	.019	.031	.088	.31	.053	.030	17	R-8241
R-8243	1.9	1.4	.046	.063	.040	.34	1.9	.057	.037	63	R-8243
R-8244	3.0	1.7	.061	.064	.038	.30	2.6	.084	.053	34	R-8244

Table 5c.--Major, minor, and trace element composition of 37 bituminous coal samples from Wise County, Virginia reported on whole-coal basis--continued

Sample number	B-S (ppm)	Ba-S (ppm)	Be-S (ppm)	Br (ppm)	Cd (ppm)	Ce (ppm)	Cl (ppm)	Co (ppm)	Cr (ppm)	Cs (ppm)	Sample number
R-7324	9.2	84	1	B	0.07	10	140	5.4	9.8	1.3	R-7324
R-7325	11	84	2	B	.08	12	480	13	9.3	1.1	R-7325
R-7341	4.4	48	2	B	.13	15	250	9.4	11	.7	R-7341
R-7342	4.8	54	2	B	.17	20	240	12	14	1.0	R-7342
R-7343	16	110	1	B	.06	22	50L	3.4	20	2.6	R-7343
R-7344	15	63	1	B	.06	11	150	4.0	6.2	.1	R-7344
R-7345	18	67	1	B	.05	16	110	4.5	12	1.3	R-7345
R-7346	16	60	1	B	.06	21	1,700	4.1	14	.5	R-7346
R-7347	6.8	71	3	B	.09	16	510	3.4	15	1.8	R-7347
R-7349	16	100	2	B	.09	22	290	6.5	16	1.9	R-7349
R-7350	13	110	4	B	.15	19	450	18	15	2.0	R-7350
R-7354	7.2	36	1	B	.07	9.0	180	7.0	8.7	.6	R-7354
R-7355	7.7	42	1	B	.08	11	80	7.7	8.7	.8	R-7355
R-7366	12	48	2	B	.07	20	1,700	4.6	9.6	.3	R-7366
R-7367	9.0	35	1	B	.10	20	370	10	10	.3	R-7367
R-7406	21	120	1	B	.07	27	70	5.1	23	1.3	R-7406
R-7407	15	86	1	B	.07	24	100	3.7	18	1.1	R-7407
R-7408	19	140	1	B	.07	21	50	5.7	15	1.9	R-7408
R-7409	15	58	1	B	.05	16	50	3.6	7.9	.1	R-7409
R-7410	18	83	2	B	.08	24	70	5.7	18	1.5	R-7410
R-7411	13	61	2	B	.08	19	70	4.0	16	1.3	R-7411
R-7412	7.7	28	1	B	.05	15	110	1.8	6.9	.2	R-7412
R-7515	12	38	5	B	.13	41	170	15	9.5	1.2	R-7515
R-7516	15	58	1	B	.05	11	180	4.4	6.1	.9	R-7516
R-7517	25	160	1	B	.06	32	100	3.7	30	3.8	R-7517
R-7518	21	94	1	B	.06	19	200	2.3	15	.6	R-7518
R-7519	31	120	1	B	.06	20	120	1.6	13	.4	R-7519
R-7520	14	67	1	B	.02	13	190	4.2	7.4	.5	R-7520
R-8165	17	77	2	B	.08	37	270	2.1	19	.4	R-8165
R-8166	22	95	2	B	.06	20	290	8.2	15	1.3	R-8166
R-8207	23	130	3	9.0	.10	20	340	5.6	20	2.0	R-8207
R-8208	19	110	3	9.1	.03	20	570	4.1	17	2.1	R-8208
R-8209	17	67	1	4.2	.06	11	530	2.5	6.8	.2	R-8209
R-8210	42	150	1	6.3	.06	30	360	2.8	24	2.3	R-8210
R-8241	8.8	43	1	3.0	.17	9.0	340	3.3	7.5	.5	R-8241
R-8243	14	110	1	4.0L	.07	13	160	2.8	13	1.5	R-8243
R-8244	14	84	1	4.5	.05	16	280	3.2	14	1.1	R-8244

Table 5c.--Major, minor, and trace element composition of 37 bituminous coal samples from Wise County, Virginia reported on whole-coal basis--continued

Sample number	Cu (ppm)	Er-S (ppm)	Eu (ppm)	F (ppm)	Ga-S (ppm)	Gd-S (ppm)	Ge-S (ppm)	Hf (ppm)	Hg (ppm)	La (ppm)	Sample number
R-7324	14	0.8L	0.22	76	3.9	1.3L	2.5	0.4	0.17	6	R-7324
R-7325	22	.7L	.25	45	3.2	1.4	.35	.5	.030	6	R-7325
R-7341	23	1.0L	.29	24	4.6	2.2	3.5	.5	.39	8	R-7341
R-7342	27	1.3L	.39	43	5.4	2.7	6.1	.6	.39	11	R-7342
R-7343	13	1.6L	.38	120	6.2	2.4L	.32L	1.0	.020	12	R-7343
R-7344	15	.7	.22	20L	2.8	.99	.72	.4	.10	6	R-7344
R-7345	10	.9L	.28	98	3.8	1.4	.19	.6	.030	8	R-7345
R-7346	20	1.5	.31	48	4.9	1.5L	.41	1.0	.13	14	R-7346
R-7347	14	1.2L	.31	80	5.9	1.8L	.94	.8	.12	9	R-7347
R-7349	24	1.4L	.39	46	6.2	2.2	1.9	.8	.030	12	R-7349
R-7350	40	1.6	.47	84	6.1	2.1	1.4	.8	.080	10	R-7350
R-7354	18	.5L	.18	220	2.6	.72L	1.3	.4	.080	5	R-7354
R-7355	15	.6L	.20	350	2.4	.83L	.77	.5	.020	6	R-7355
R-7366	16	.8L	.27	140	5.3	1.2L	1.0	.9	.070	11	R-7366
R-7367	16	.8L	.30	48	4.0	1.1L	2.0	.7	.030	12	R-7367
R-7406	21	1.5L	.41	77	8.0	2.3L	.92	1.2	.060	17	R-7406
R-7407	18	1.4L	.39	72	6.9	2.1L	.69	1.0	.21	14	R-7407
R-7408	25	1.2L	.38	80	6.3	1.8L	.24	.6	.040	11	R-7408
R-7409	13	.8	.22	37	1.9	.68L	.23	.6	.010	9	R-7409
R-7410	16	1.6	.42	70	5.4	1.5L	5.2	.9	.030	13	R-7410
R-7411	19	.9L	.34	47	5.7	1.4L	.55	.8	.040	12	R-7411
R-7412	16	.8	.23	84	2.3	.77L	.41	.5	.040	8	R-7412
R-7515	18	.7	.28	10	3.6	.81L	1.2	.3	.33	5	R-7515
R-7516	10	.5L	.20	10	1.7	.80L	.11L	.2	.10	5	R-7516
R-7517	14	2.3L	.47	130	6.8	3.4L	.45L	1.4	.23	16	R-7517
R-7518	20	.8L	.29	20	3.4	1.2L	.16L	.5	.48	10	R-7518
R-7519	15	1.1L	.30	10	2.9	2.8	.22L	1.1	.27	12	R-7519
R-7520	10	.4L	.23	40	1.8	.63L	.38	.3	.20	7	R-7520
R-8165	20	1.2L	.47	160	3.9	1.8L	1.0	1.1	.16	16	R-8165
R-8166	25	1.2L	.37	120	4.2	1.8L	.80	.8	.19	12	R-8166
R-8207	19	1.4L	.45	120	6.5	2.1L	1.5	.6	.11	11	R-8207
R-8208	9.8	1.1L	.43	100	5.6	1.7L	.44	.7	.045	10	R-8208
R-8209	11	.6L	.19	60	2.8	.84L	.32	.4	.073	6	R-8209
R-8210	14	1.9	.53	140	8.6	2.6L	.74	.9	.20	18	R-8210
R-8241	8.8	.5	.22	70	2.1	.78L	.14	.5	.16	5	R-8241
R-8243	13	1.0L	.26	60	5.0	1.9	5.9	.7L	.15	7	R-8243
R-8244	13	1.4L	.28	80	6.2	2.1L	3.3	.5	.26	9	R-8244

Table 5c.--Major, minor, and trace element composition of 37 bituminous coal samples from Wise County, Virginia reported on whole-coal basis--continued

Sample number	Li (ppm)	Lu (ppm)	Mn (ppm)	Mo-S (ppm)	Nb-S (ppm)	Nd-S (μpm)	Ni-S (ppm)	P (ppm)	Pb (ppm)	Pd-S (ppm)	Sample number
R-7324	13	0.1	15	1.8	1.0	5.5	7.6	35	2.4	0.17L	R-7324
R-7325	9.1	.1	11	3.2	1.8	7.7	18	22	3.0	.14L	R-7325
R-7341	13	.1	12	4.4	1.9	8.0	17	280	3.1	.20L	R-7341
R-7342	17	.2	12	4.3	2.3	10	21	290	5.0	.26L	R-7342
R-7343	26	.1	19	1.1	3.4	16	9.3	35	6.6	.32L	R-7343
R-7344	7.5	.1	6.6	1.9	.60	5.1	9.9	4L	2.6	.06L	R-7344
R-7345	18	.1	14	1.2	1.9	10	8.7	22L	3.3	.19L	R-7345
R-7346	49	.1	29	2.1	3.5	7.8	11	300	7.2	.21L	R-7346
R-7347	22	.1	12	.47	2.7	9.6	6.9	26	5.7	.23L	R-7347
R-7349	23	.2	23	1.3	2.2	14	16	83	7.9	.29L	R-7349
R-7350	16	.3	18	2.0	1.9	14	18	26L	8.9	.23L	R-7350
R-7354	2.9	.1	3.8	1.3	.62	5.3	9.1	270	3.4	.10L	R-7354
R-7355	6.6	.1	2.9	1.1	.83	4.3	7.7	200	2.8	.11L	R-7355
R-7366	23	.1	3.0	.42	1.8	5.6	12	31	8.3	.17L	R-7366
R-7367	17	.1	5.7	.23	1.2	7.2	17	48	7.0	.15L	R-7367
R-7406	60	.2	13	.61	4.0	8.1	14	360	11	.15L	R-7406
R-7407	52	.2	18	1.5	3.0	4.4L	9.3	400	9.0	.14L	R-7407
R-7408	15	.1	20	1.9	1.8	11	12	22L	11	.12L	R-7408
R-7409	8.6	.1	3.2	.90	3.2	8.1	9.0	22L	4.2	.05L	R-7409
R-7410	18	.2	19	1.0	3.9	12	11	140	8.1	.10L	R-7410
R-7411	37	.1	9.2	.46	3.1	10	9.0	200	9.1	.09L	R-7411
R-7412	15	.1	3.6	.66	2.3	8.7	4.9	310	5.6	.05L	R-7412
R-7515	5.4	.2	5.9	1.6	.49	3.5	11	44L	4.8	.05L	R-7515
R-7516	5.2	.1	12	.95	.32	3.6	5.1	44L	2.5	.05L	R-7516
R-7517	22	.2	440	1.1	4.3	12	10	39L	6.3	.23L	R-7517
R-7518	16	.1	2.9	1.6	.78	5.2	6.2	44L	5.9	.08L	R-7518
R-7519	15	.1	3.5	.66	3.1	12	6.8	44L	5.8	.11L	R-7519
R-7520	5.9	.1	2.5	1.1	.80	3.6	5.5	44L	2.0	.04L	R-7520
R-8165	55	.1	8.3	1.2	6.6	9.3	7.7	1,000	10	.12L	R-8165
R-8166	23	.1	7.5	.54	3.2	14	12	44L	7.7	.12L	R-8166
R-8207	21	.1	11	.48	3.7	11	12	920	8.0	.14L	R-8207
R-8208	13	.1	43	1.0	2.4	11	8.8	70	3.8	.11L	R-8208
R-8209	7.3	.1	6.7	.38L	1.1	4.2	7.8	440	3.0	.06L	R-8209
R-8210	35	.2	17	.44	2.1	17	11	48	5.8	.18L	R-8210
R-8241	7.3	.1	2.0	2.2	2.5	6.8	7.8	44L	2.2	.05L	R-8241
R-8243	13	.1	11	.42	.84	3.3	6.4	44L	3.9	.10L	R-8243
R-8244	30	.1	24	1.6	6.0	10	3.1L	200	4.3	11	R-8244

Table 5c.--Major, minor, and trace element composition of 37 bituminous coal samples from Wise County, Virginia reported on whole-coal basis--continued

Sample number	Pr-S (ppm)	Rb (ppm)	Sb (ppm)	Sc (ppm)	Se (ppm)	Sm (ppm)	Sn-S (ppm)	Sr-S (ppm)	Ta-S (ppm)	Tb (ppm)	Sample number
R-7324	7.3	16	0.80	3.0	6.0	1.0	0.34	83	0.01	0.10	R-7324
R-7325	5.2	30L	.70	2.2	1.6	.12	.14L	270	.01	.20	R-7325
R-7341	6.7L	15	1.6	2.8	2.3	1.5	.30	140	.01	.20	R-7341
R-7342	8.8L	13	2.1	3.4	2.7	2.0	.26L	120	.02	.30	R-7342
R-7343	11L	39	.40	4.2	3.3	1.8	1.3	74	.04	.30	R-7343
R-7344	2.0L	20L	.50	1.4	3.6	1.0	.12	210	.00	.20	R-7344
R-7345	6.3L	22	.30	2.5	2.6	1.3	.19	78	.01	.20	R-7345
R-7346	7.0L	20L	.60	3.3	2.8	1.3	.31	380	.03	.20	R-7346
R-7347	8.0L	23	.50	3.5	7.5	1.4	.23L	67	.02	.20	R-7347
R-7349	9.8L	29	1.3	3.9	1.7	2.0	.29L	140	.03	.30	R-7349
R-7350	8.0L	24	2.0	5.8	1.3	2.1	.47	150	.02	.40	R-7350
R-7354	3.3L	9	1.0	2.2	1.7	1.0	.10L	82	.01L	.10	R-7354
R-7355	3.7L	9	.60	2.0	1.0	.90	.11L	82	.01	.20	R-7355
R-7366	5.6L	8	.50	3.0	3.0	1.7	.75	91	.02	.30	R-7366
R-7367	5.1L	20L	.50	2.4	3.5	1.7	.23	69	.02	.30	R-7367
R-7406	10L	21	.50	4.6	1.4	2.1	.61	240	.06	.30	R-7406
R-7407	9.3L	19	.70	4.1	1.5	1.9	.55	220	.05	.30	R-7407
R-7408	8.1L	34	.60	3.7	4.8	1.9	.48	150	.02	.30	R-7408
R-7409	3.1L	20L	.20	1.8	1.8	1.3	.27	140	.01	.20	R-7409
R-7410	6.9L	17	.50	4.0	1.0	2.1	.61	150	.02	.30	R-7410
R-7411	6.3L	10	.60	3.8	.7	1.7	.74	86	.02	.30	R-7411
R-7412	3.5L	20L	.30	1.6	3.1	1.4	.36	51	.01	.20	R-7412
R-7515	3.7L	20	1.5	3.7	5.6	1.3	.16	40	.00	.20	R-7515
R-7516	3.6L	40L	.40	1.5	2.9	1.0	.11	80	.00	.10	R-7516
R-7517	15L	61	.80	5.7	4.5	2.3	.68	57	.08	.30	R-7517
R-7518	5.3L	20	.50	2.8	4.7	1.6	.39	100	.01	.20	R-7518
R-7519	7.5L	50L	.20	2.8	3.1	1.7	1.2	170	.03	.20	R-7519
R-7520	2.9L	40L	.50	2.1	1.7	1.2	.21	150	.00	.20	R-7520
R-8165	8.3L	40L	.80	5.0	2.9	2.2	1.3	200	.05	.34	R-8165
R-8166	8.4L	40L	.70	4.0	3.9	1.6	.47	98	.03	.25	R-8166
R-8207	9.4L	27	1.0L	4.6	5.7	1.7	.22	150	.03	.28	R-8207
R-8208	7.5L	19	1.0L	3.4	4.6	1.6	.42	110	.03	.32	R-8208
R-8209	5.3	30L	.50L	1.8	3.1	.70	.08L	150	.01	.14	R-8209
R-8210	12L	31	1.5L	4.8	2.1	2.2	.58	120	.06	.39	R-8210
R-8241	3.5L	30L	1.0L	1.6	2.2	.80	.22	68	.01	.23	R-8241
R-8243	7.0L	15	2.0L	3.3	6.0	1.0	.15L	47	.02	.19	R-8243
R-8244	.7L	13	1.0L	3.0	2.9	1.2	.21L	140	.03	.22	R-8244

Table 5c.--Major, minor, and trace element composition of 37 bituminous coal samples from Wise County, Virginia reported on whole-coal basis--continued

Sample number	Th (ppm)	Tl-S (ppm)	U (ppm)	V-S (ppm)	W-S (ppm)	Y-S (ppm)	Yb (ppm)	Zn (ppm)	Zr-S (ppm)	Sample number
R-7324	1.5	0.25L	0.60	9.2	0.04	3.8	0.6	8.4	6.7	R-7324
R-7325	1.5	.21L	.80	18	.03	7.7	.6	28	18	R-7325
R-7341	1.7	.30L	1.3	15	.04	8.2	.8	17	19	R-7341
R-7342	2.1	.39L	1.9	19	.07	8.9	1.0	25	18	R-7342
R-7343	2.9	.48L	1.1	29	.07	8.3	.9	15	30	R-7343
R-7344	1.9	.09L	.80	15	.01	5.4	.5	3.9	5.7	R-7344
R-7345	1.8	.28L	.50	20	.04	7.1	.6	7.9	18	R-7345
R-7346	3.5	.31L	1.3	24	.07	10	.8	5.7	35	R-7346
R-7347	2.3	.35L	1.0	19	.08	7.0	.7	5.4	26	R-7347
R-7349	2.7	.43L	1.9	33	.09	10	.9	14	20	R-7349
R-7350	2.7	.35L	1.8	32	.15	16	1.7	26	14	R-7350
R-7354	1.0	.14L	1.4	12	.02	3.9	.5	9.6	4.5	R-7354
R-7355	1.3	.17L	.50	9.4	.07	3.8	.5	5.0	5.5	R-7355
R-7366	3.4	.25L	1.3	14	.07L	7.1	.8	4.6	16	R-7366
R-7367	2.5	.23L	1.1	12	.07L	5.6	.7	8.3	11	R-7367
R-7406	4.6	.77L	1.7	26	B	5.7	.8	7.5	26	R-7406
R-7407	3.9	.69L	1.5	22	B	4.0	.9	6.4	15	R-7407
R-7408	3.4	.60L	2.2	25	B	6.1	.8	11	13	R-7408
R-7409	2.3	.23L	1.0	8.1	B	6.3	.7	3.4	25	R-7409
R-7410	3.6	.51	1.2	25	B	11	1.0	20	35	R-7410
R-7411	3.6	.46L	1.7	22	B	6.0	.9	8.4	19	R-7411
R-7412	2.1	.26L	.90	9.2	B	7.1	.6	2.6	28	R-7412
R-7515	1.6	2.8	1.4	11	.07	3.8	1.3	3.9	2.6	R-7515
R-7516	1.0	.27L	.60	8.0	.02	1.3	.4	3.3	2.5	R-7516
R-7517	4.4	1.1L	1.2	29	.14	6.3	1.2	23	38	R-7517
R-7518	2.8	.39L	1.4	16	.03	2.0	.6	4.7	5.7	R-7518
R-7519	3.4	.55L	.50	13	.09L	5.4	.8	3.3	24	R-7519
R-7520	1.5	.21L	.50	8.0	.03L	3.1	.6	2.9	6.7	R-7520
R-8165	3.3	.56L	2.2	21	.07	9.2	1.0	3.7	50	R-8165
R-8166	3.2	.57L	1.6	26	.05	8.2	1.0	11	30	R-8166
R-8207	3.0	.63L	1.1	35	.12	6.5	1.0	11	25	R-8207
R-8208	2.5	.51L	.87	23	.06	5.6	.8	7.3	23	R-8208
R-8209	1.5	.26L	.89	10	.02	3.3	.4	5.4	11	R-8209
R-8210	4.4	1.1	1.7	39	.07	7.4	1.1	16	19	R-8210
R-8241	1.1	1.8	.32	11	.04	5.2	.5	2.3	22	R-8241
R-8243	2.1	.47L	1.4	14	.05	2.5	.7	6.7	7.6	R-8243
R-8244	2.5	.65L	1.8	21	.10	2.7	.6	13	12	R-8244

Table 6a.--Arithmetic mean, observed range, geometric mean, and geometric deviation, of proximate and ultimate analyses, heat of combustion, forms of sulfur, and ash-fusion temperature of 83 coal samples from Virginia.

[All values are in percent except Btu/lb, ash-fusion temperatures, and free-swelling index and are reported on the as-received basis.  
°F= 9/5°C + 32; Kcal/kg = 0.556 (Btu/lb).]

	Arithmetic mean	Observed range		Geometric mean	Geometric deviation	Geometric mean 134 samples (from Henderson Omah and Coleman 1981)
		Minimum	Maximum			

Proximate and ultimate analyses

Moisture	2.81	1.30	8.90	2.66	1.39	2.70
Volatile matter	31.37	19.10	44.50	31.01	1.17	29.93
Fixed carbon	54.48	28.50	64.20	54.14	1.13	56.49
Ash	11.34	3.00	50.30	9.55	1.77	7.80
Hydrogen	5.10	3.00	6.30	5.08	1.11	5.08
Carbon	73.44	39.20	81.80	73.09	1.11	74.62
Nitrogen	1.45	.40	1.80	1.43	1.22	1.39
Oxygen	7.50	4.80	12.30	7.39	1.19	7.20
Sulfur	1.16	.50	4.50	0.99	1.66	1.01

Heat of combustion (Btu/lb)

Calorific value	13115.	6948.	14470.	13051.	1.11	13305.
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Forms of sulfur

Sulfate	0.04	.01	0.42	0.02	2.90	0.02
Pyritic	0.50	.03	3.02	0.27	2.93	0.28
Organic	0.62	.25	1.62	0.59	1.37	0.59

Ash-fusion temperature ° C

Initial deformation	2418.	1900.	2910.	2405.	1.11	2335.
Softening temperature	2470.	2050.	2910.	2461.	1.09	2417.28
Fluid temperature	2551.	2140.	2910.	2544.	1.08	2494.48
Free-Swelling index	7.5	1.5	9.0	7.3	1.3	7.5

Table 6b.--Arithmetic mean, observed range, geometric mean, and geometric deviation of ash content and contents of 11 major and minor oxides in the laboratory ash of 83 coal samples from Virginia.

[All samples were ashed at 515° C; all data except geometric deviation are in percent.]

Oxide	Arithmetic mean	Observed range		Geometric mean	Geometric deviation	Geometric mean 134 samples (from Henderson, Oman and Coleman 1981)
		Minimum	Maximum			
(Ash)	12.	3.0	54.	10.	1.8	7.8
SiO2	49.	22.	70.	48.	1.2	43.
Al2O3	27.	14.	36.	26.	1.2	23.
CaO	1.7	.32	5.5	1.3	2.0	2.0
MgO	1.0	.33	2.0	.94	1.5	.90
Na2O	.43	.08	1.3	.36	1.9	.55
K2O	2.6	.62	5.2	2.3	1.7	1.9
Fe2O3	11.	2.5	51.	8.5	2.1	10.
MnO	.03	.004	.25	.02	2.1	.03
TiO2	1.5	.63	3.5	1.4	1.4	1.2
P2O5	.58	.02	4.0	.26	3.7	.14
SO3	2.0	.25	7.0	1.6	2.0	2.7



Table 6c.--Arithmetic mean, observed range, geometric mean, and geometric deviation of concentrations of 51 trace elements in 83 coal samples.  
 [All data are in parts-per-million and are reported on a whole-coal basis;

Element	Arithmetic mean	Observed range		Geometric mean	Geometric deviation	Geometric mean 134 samples (from Henderson, Oman and Coleman 1981)
		Minimum	Maximum			
Ag	.04	.01	.91	.03	1.8	.03
As	16.	1.0	123.	7.3	3.5	8.1
B	17.	2.4	82.	15.	1.7	11.
Ba	109.	28.	462.	92.	1.8	71.
Be	1.9	.39	5.4	1.6	1.7	1.8
Br	2.1	.14	8.0	1.1	3.5	---
Cd	.08	.02	.21	.07	1.6	.06
Ce	21.	5.0	70.	19.	1.6	14.
Cl	362.	50.	1700.	264.	2.2	300.
Co	6.5	1.5	18.	5.5	1.8	6.0
Cr	16.	4.6	57.	14.	1.7	11.
Cs	1.4	.10	7.0	.90	2.6	.61
Cu	18.	7.4	40.	17.	1.4	16.
Dy	2.9	2.4	3.4	2.9	1.2	1.5
Er	1.2	.50	2.2	1.1	1.6	.85
Eu	.37	.13	1.3	.34	1.5	.27
F	101.	10.	560.	71.	2.4	83.
Ga	5.2	.96	21.	4.5	1.7	3.5
Gd	2.3	.66	7.6	2.0	1.8	1.1
Ge	1.6	.14	13.	.88	2.9	1.2
Hf	.86	.20	3.1	.73	1.8	.58
Hg	.14	.01	.50	.10	2.4	.07
La	12.	3.0	40.	10.	1.7	7.5
Li	24.	2.9	177.	17.	2.2	11.
Lu	.15	.05	.40	.13	1.5	.13
Mn	26.	2.0	443.	13.	2.8	14.
Mo	1.4	.23	4.4	1.2	1.9	1.4
Nb	2.9	.32	9.2	2.2	2.1	1.3
Nd	9.8	2.7	22.	8.6	1.7	7.0
Ni	12.	4.7	38.	11.	1.6	9.2
Pb	7.4	1.3	22.	6.1	1.9	4.2
Pd	5.7	.04	11.	.65	18.	---
Pr	6.3	3.6	9.9	6.0	1.4	---
Rb	28.	6.0	115.	23.	1.8	22.
Sb	1.0	.20	5.9	.81	1.9	.74
Sc	3.7	1.4	13.	3.3	1.6	2.7
Se	3.2	.70	7.5	2.9	1.7	2.6
Sm	1.7	.50	5.5	1.6	1.5	1.4
Sn	.75	.07	3.4	.52	2.4	.76
Sr	144.	40.	381.	129.	1.6	82.
Ta	.05	.002	.55	.02	3.1	.02
Tb	.32	.04	1.0	.27	1.8	.24
Th	3.3	.80	10.	2.8	1.8	1.9
Tl	1.6	.51	2.8	1.4	1.8	1.0
U	1.6	.30	4.4	1.3	1.9	1.3
V	22.	6.2	87.	18.	1.8	13.
W	.09	.009	.68	.06	2.5	.04
Y	6.7	1.3	17.	5.9	1.7	5.7
Yb	.94	.40	3.1	.86	1.5	.72
Zn	12.	1.6	92.	8.5	2.2	8.8
Zr	22.	2.5	80.	17.	2.0	11.

Table 7a.--Arithmetic mean, observed range, geometric mean, and geometric deviation, of proximate and ultimate analyses, heat of combustion, forms of sulfur, and ash-fusion temperature of 217 coal samples from Virginia.

[All values are in percent except Btu/lb, ash-fusion temperatures, and free-swelling index and are reported on the as-received basis.

$F = 9/5 C + 32$ ;  $Kcal/kg = 0.556 (Btu/lb.)$ ]

	Arithmetic mean	Observed range		Geometric mean	Geometric deviation	Geometric mean 548 samples (Zubovic and others, 1980)
		Minimum	Maximum			
Proximate and ultimate analyses						
Moisture	2.9	.8	11.0	2.7	1.5	2.5
Volatile matter	30.7	15.3	44.5	30.3	1.2	28.1
Fixed carbon	55.9	28.5	76.0	55.6	1.1	54.7
Ash	10.5	1.9	50.8	8.3	1.9	9.7
Hydrogen	5.1	2.3	6.3	5.1	1.1	4.9
Carbon	74.4	39.2	83.8	74.0	1.1	71.8
Nitrogen	1.4	.4	1.8	1.4	1.2	1.3
Oxygen	7.4	2.9	16.6	7.3	1.2	7.1
Sulfur	1.2	.4	5.2	1.0	1.7	1.4
Heat of combustion (Btu/lb)						
Calorific value	13278.	6948.	15038.	13207.	1.1	12730.
Forms of sulfur						
Sulfate	0.04	.01	0.42	0.02	2.6	0.04
Pyritic	0.54	.02	4.20	0.28	3.2	0.62
Organic	0.63	.03	2.05	0.59	1.5	0.76
Ash-fusion temperature o C						
Initial deformation	2375.	1900.	2910.	2361.	1.1	1260.
Softening temperature	2443.	2015.	2910.	2432.	1.1	1300.
Fluid temperature	2520.	2125.	2910.	2511.	1.1	1360.
Free-Swelling dex	7.7	1.0	9.0	7.4	1.4	5.6

Table 7b.--Arithmetic mean, observed range, geometric mean, and geometric deviation of ash content and contents of 11 major and minor oxides in the laboratory ash 217 coal samples from Virginia.

[All samples were ashed at 515 C; all data except geometric deviation are in percent; L means less than the value shown.]

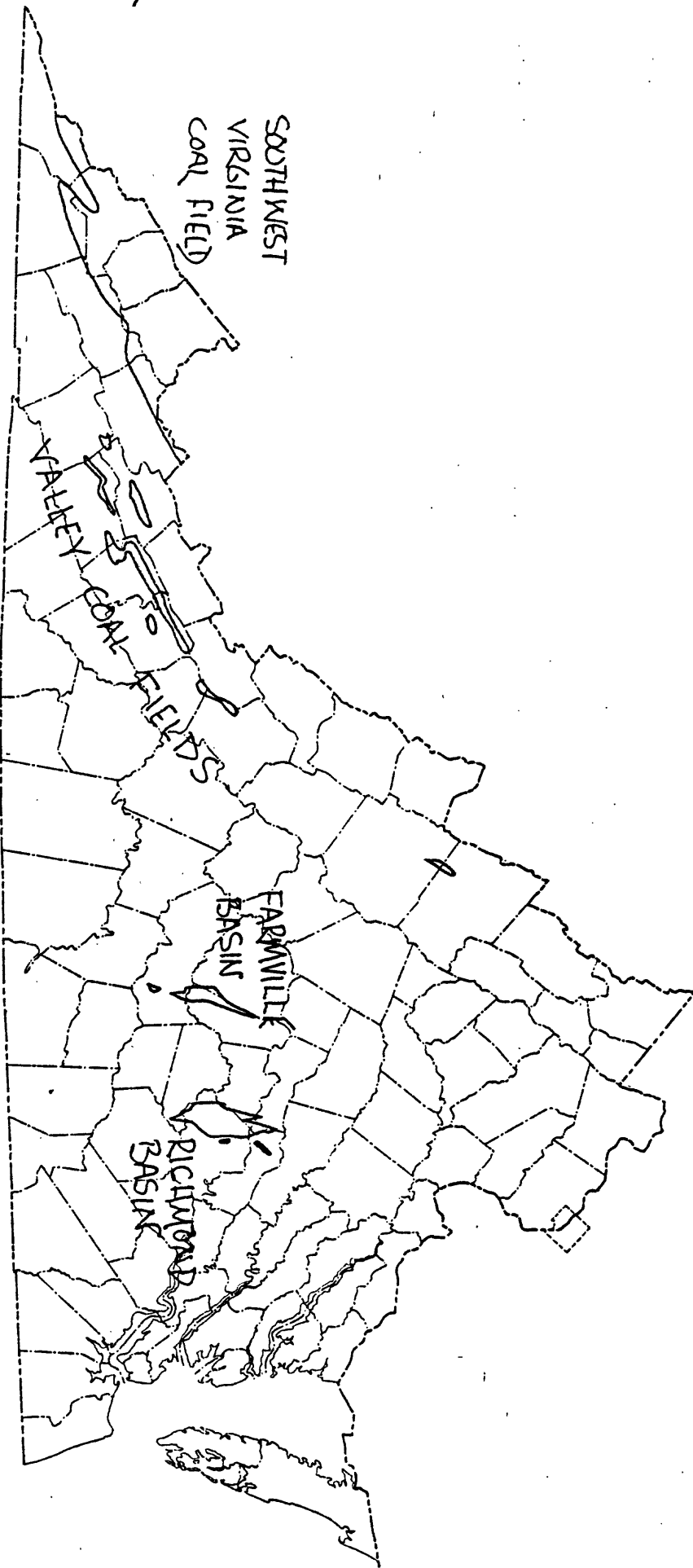
Oxide	Arithmetic mean	Observed range		Geometric mean	Geometric deviation	Geometric Mean 644 samples (Zubovic and others, 1980)
		Minimum	Maximum			
(A.h)	11.	1.9	54.	8.6	1.9	9.76
SiO <sub>2</sub>	46.	13.	71.	45.	1.3	43.
Al <sub>2</sub> O <sub>3</sub>	25.	8.0	36.	24.	1.3	24.
CaO	2.6	.21	20.	1.7	2.3	1.4
MgO	1.0	.23	3.0	.92	1.6	.68
Na <sub>2</sub> O	.59	.08	3.1	.47	2.0	.34
K <sub>2</sub> O	2.3	.38	5.4	2.0	1.8	1.6
Fe <sub>2</sub> O <sub>3</sub>	13.	2.3	57.	9.6	2.2	11.
MnO	.03	.004	.25	.02	2.2	.02
TiO <sub>2</sub>	1.4	.30	3.5	1.3	1.5	1.1
P <sub>2</sub> O <sub>5</sub>	.37	.02	4.0	.16	3.3	.13
SO <sub>3</sub>	3.1	.25	16.	2.2	2.3	1.7

Table 7c.--Arithmetic mean, observed range, geometric mean, and geometric deviation of concentrations of 38 trace elements in 217 coal samples.

[All data are in parts-per-million and are reported on a whole-coal basis; L means less than value shown.]

Element	Arithmetic mean	Observed range		Geometric mean	Geometric deviation	Geometric Mean 644 samples (Zubovic and others, 1980)
		Minimum	Maximum			
Ag	.04	.006	.91	.03	1.8	.03
As	18.	1.0	166.	7.8	3.6	8.4
B	15.	1.7	82.	13.	1.8	14.
Ba	96.	15.	462.	78.	1.9	48.
Be	2.0	.38	11.	1.7	1.8	1.9
Cd	.10	.004	4.1	.06	2.1	.07
Ce	19.	2.0	88.	16.	1.9	16.
Co	6.8	1.2	21.	5.8	1.8	6.2
Cr	14.	2.8	67.	12.	1.9	14.
Cs	1.1	.02	7.0	.71	2.7	.66
Cu	18	5.9	70.	16.	1.5	15.
Eu	.34	.08	1.3	.30	1.7	.33
F	129.	10.	2100.	78.	2.4	51.
Ga	4.7	.62	21.	3.9	1.8	4.8
Ge	1.8	.12	13.	1.1	2.8	1.1
Hf	.80	.10	5.0	.63	2.0	.61
Hg	.12	.01	.80	.08	2.6	.12
La	10.	1.0	47.	8.4	1.9	8.8
Li	20.	.89	181.	13.	2.6	15.
Lu	.15	.05	.60	.13	1.5	.15
Mn	24.	.75	443.	14.	2.7	14.
Mo	1.6	.23	12.	1.3	1.9	1.5
Nb	2.3	.17	12.	1.6	2.4	1.4
Nd	9.4	1.0	44.	7.7	1.9	4.2
Ni	11.	2.5	39.	9.9	1.7	12.
Pb	6.5	.09	61.	4.9	2.2	7.0
Sb	1.0	.15	19.	.76	2.0	.73
Sc	3.4	.80	14.	2.9	1.7	3.3
Se	3.0	.70	7.6	2.7	1.7	2.8
Sm	1.7	.30	6.9	1.4	1.7	1.6
Sr	119.	21.	580.	97.	1.9	65.
Tb	.30	.04	1.1	.26	1.7	.26
U	1.6	.20	5.6	1.3	1.9	1.3
V	19.	2.8	87.	15.	2.0	16.
Y	6.8	1.3	31.	5.8	1.7	6.2
Yb	.87	.20	3.6	.77	1.6	.84
Zn	13.	1.5	94.	9.7	2.4	14.
Zr	19.	1.4	132.	13.	2.4	13.

Figure 1. Locations of the coal fields and basins of Virginia.





Legend

- ◇ Low Splint coal bed
- Upper Standiford coal bed
- △ Eagle coal bed
- Blair coal bed
- ⊠ Little Blair coal bed
- ▲ Norton coal bed
- ⊙ Jawbone coal bed
- ⊕ Jawbone/Tiller coal bed

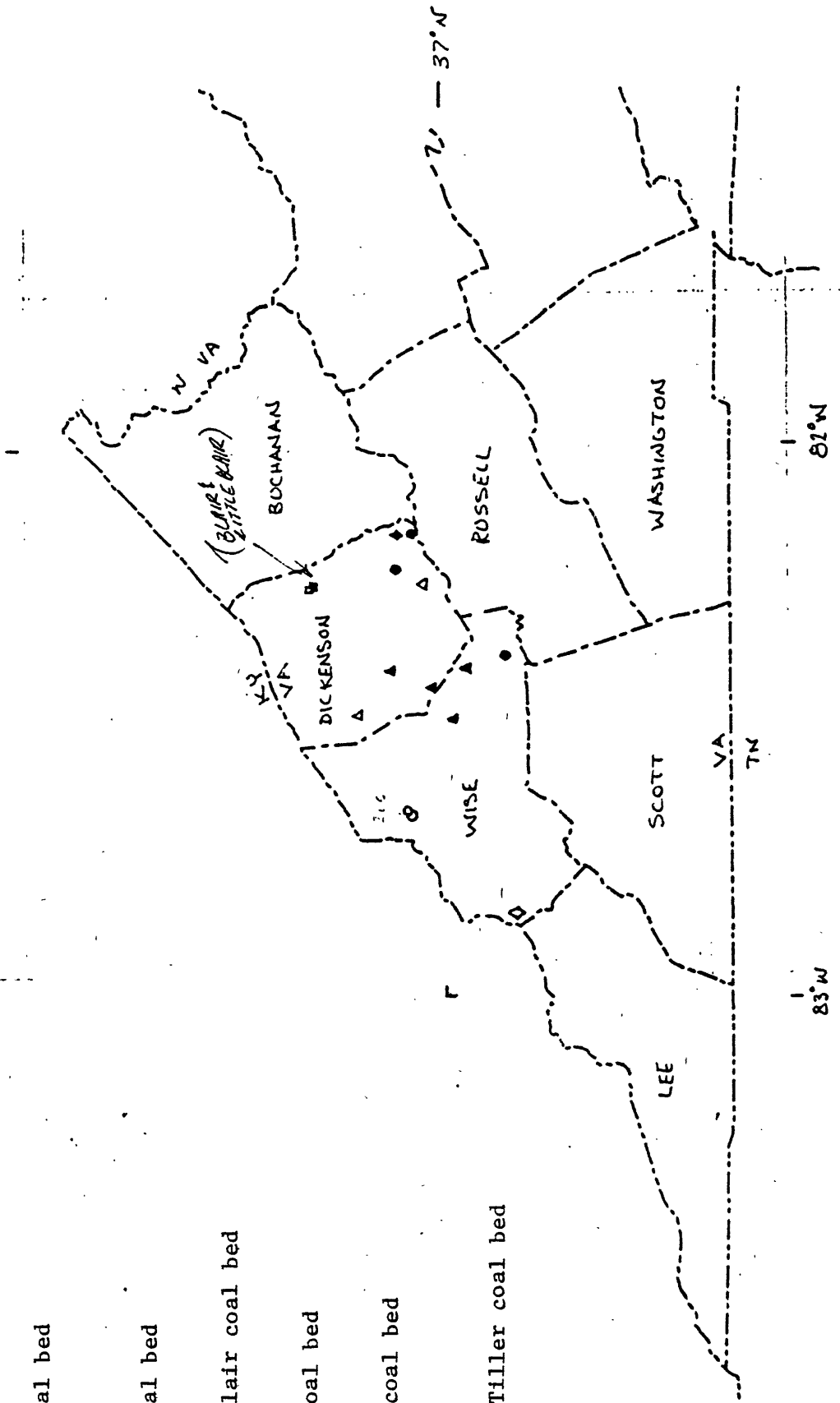


Figure 3, Location of coal samples by bed in Virginia

Legend

- ◇ Morris coal bed
- Taggart coal bed
- △ Pinhook coal bed
- Clintwood coal bed
- ▨ Clintwood Split coal bed
- ▲ Lyons coal bed
- ⊙ Splashdam coal bed
- ◆ Widow Kennedy coal bed

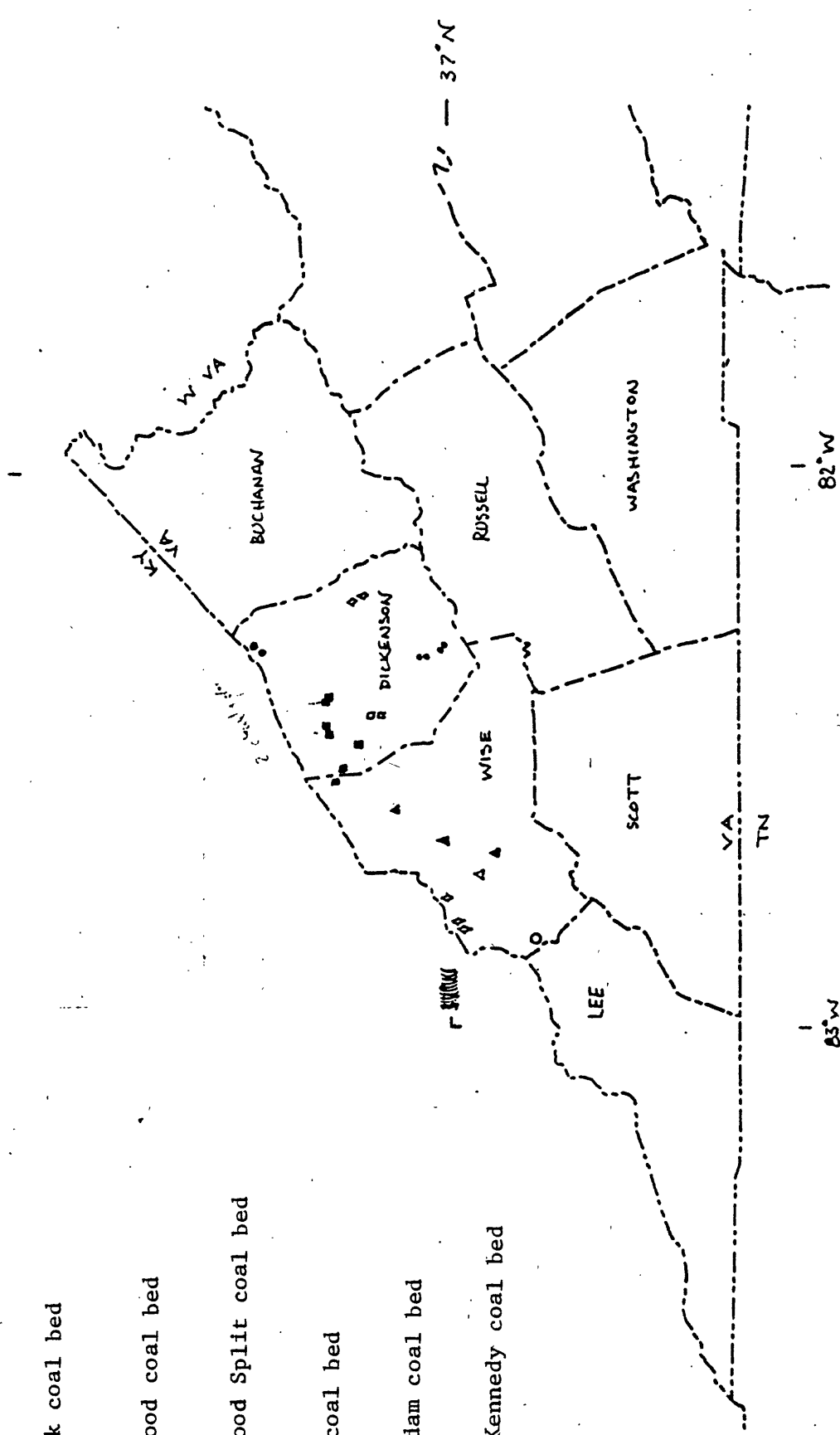


Figure 4. Location of coal samples by bed in Virginia--continued



Legend

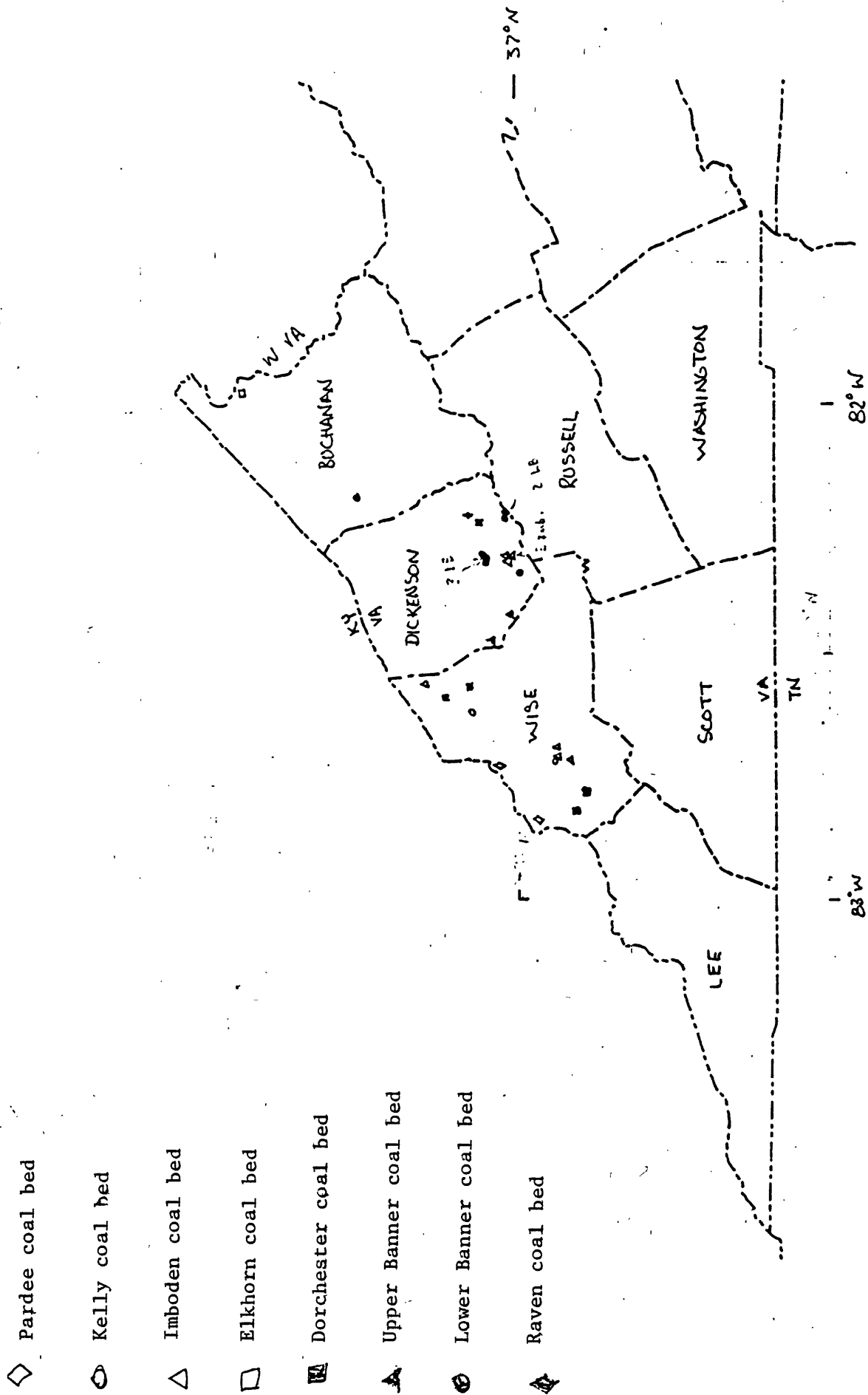


Figure 5. Location of coal samples by bed in Virginia--continued

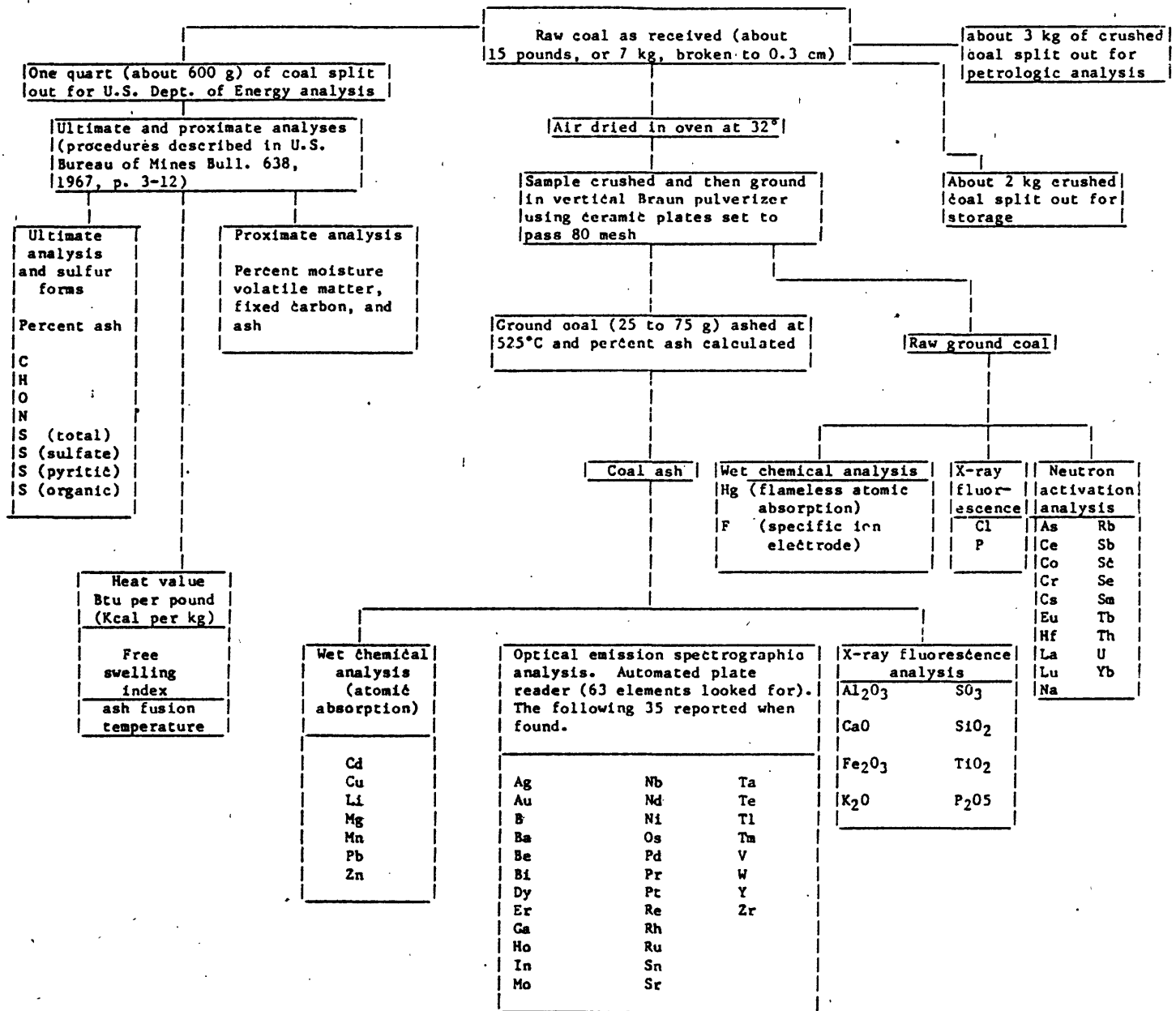


Figure 6. Flow chart of analyses performed on coal samples.



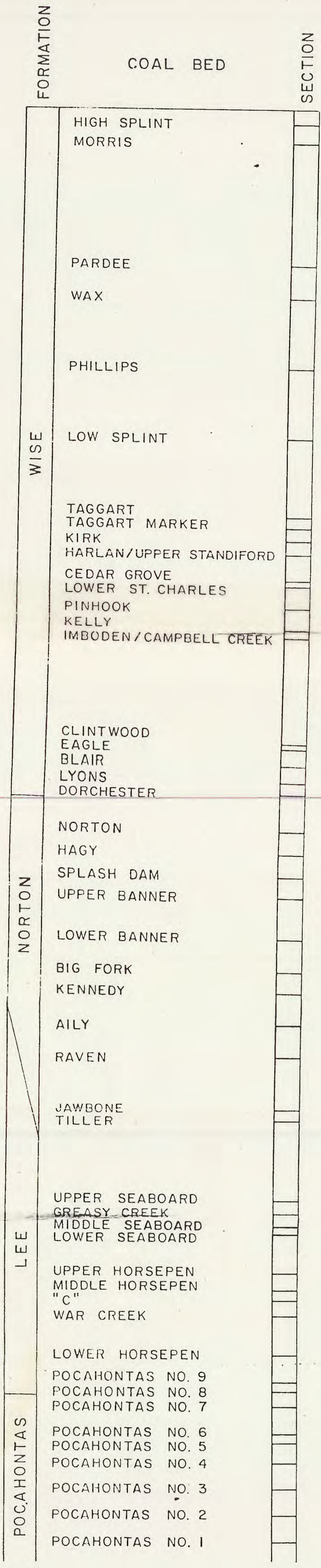


Figure 2. Generalized stratigraphic section of the coals in Southwest Virginia.