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ANALYSES OF PAKISTAN COALS

by

E. R. Landis, J. A. Reinemund  
and G. C. Cone  
U. S. Geological Survey

and

D. P. Schlick and W. Kebblish  
U. S. Bureau of Mines

OPEN FILE REPORT

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

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# CONTENTS

ABSTRACT.....	Page 1
INTRODUCTION.....	1
THE COAL FIELDS OF PAKISTAN.....	3
Location.....	3
Surface features.....	3
Geologic setting.....	4
Coal-bearing formations.....	4
Geologic structure.....	5
Coal beds.....	5
Coal fields.....	11
Makarwal.....	11
Salt Range.....	11
Sor Range-Daghari.....	12
Khost-Sharig-Harnai.....	12
Lakhra.....	13
Meting-Jhimpir.....	13
Coal reserves.....	14
ANALYSES OF SAMPLES.....	15
DESCRIPTION OF SAMPLES.....	18
Makarwal coal field.....	18
Salt Range coal field.....	20
Sor Range-Daghari coal field.....	20
Khost-Sharig-Harnai coal field.....	44
Lakhra coal field.....	61
Meting-Jhimpir coal field.....	66

REFERENCES.....	71
ILLUSTRATIONS	
Figure	
Figure 1.--Index map of Pakistan showing coal fields.....	3a
Tables	
Table 1.--Range analyses and apparent ranks of coals by rank.....	6
2.--Range analyses and apparent ranks of coals from major Pakistan coal fields.....	8
3.--Analyses of samples.....	16
4.--Fusibility of ash.....	17



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### ABSTRACT

Between 1952 and 1969, a total of 71 samples of Pakistan coals were collected, described, and analyzed by standardized methods and procedures. Descriptions of all the samples as reported by the collectors and complete coal analyses as reported by the U. S. Bureau of Mines are presented in this report.

## INTRODUCTION

As part of a cooperative program between the Geological Survey of Pakistan(GSP) and the U. S. Geological Survey(USGS), sponsored by the Government of Pakistan and the International Cooperation Administration (ICA) and its successor, the Agency for International Development(AID), U. S. Department of State, coal beds in mines in major coal fields of West Pakistan were measured and sampled. The samples collected by geologists of the U. S. Geological Survey the Geological Survey of Pakistan, and engineers of the U. S. Bureau of Mines(USBM), were later analyzed in the laboratories of the U. S. Bureau of Mines at Pittsburgh, Pennsylvania, by internationally recognized methods and procedures. Thus, the analytical results possess comparability with the hundreds of thousands of analyses of coals from the United States and other parts of the world that have been performed in the Pittsburgh laboratories. The complete analyses of Pakistan coals, with full descriptions of samples, are presented in this report because the information is both valuable and timely, and is not available in any other single publication.

Responsibility for the work is as follows: Landis is responsible for the text and general organization; Cone prepared the tabular material; Reinemund and Harbour measured and sampled many of the coal sections; and Schlick and Kebblish sampled some of the sections and supplied the analyses. Additional samples were collected by S. Tayyab Ali, M. Yar Khan, and S. Qamar Raza, GSP; L. F. Trenczak, United Nations; F. D. Spencer, USGS; and P. R. Eyrich, USBM. R. L. Harbour, USGS, measured and sampled some of the coal sections.

## The coal fields of Pakistan

### Location

Most of the known coal fields of Pakistan are in the western part of the nation, though large amounts of coal are present in undeveloped fields in East Pakistan also. The major developed or potential coal fields of the nation are indicated on figure 1. Many other undeveloped fields and coal beds are known but are not shown on figure 1 because of lack of comparable coal analytical and sample collection data. One of the seven major fields in West Pakistan--the Mach field--is not discussed in this report because no U. S. Bureau of Mines coal analyses are available for the field.

### Surface features

Most of the coal fields of West Pakistan are in mountainous areas in which the local relief ranges from several hundreds to several thousands of feet. The Lakhra and Meting-Jhimpir fields of West Pakistan and the Jamalganj field of East Pakistan are in areas in which local relief ranges from tens of feet to a few hundreds of feet.

In most of the coal fields the soil is too thin to conceal the coal-bearing rocks but weathering depths are great--in excess of 100 feet in some areas--and the coal beds have been destroyed to considerable depths. Consequently, exploration and development are slow and difficult.

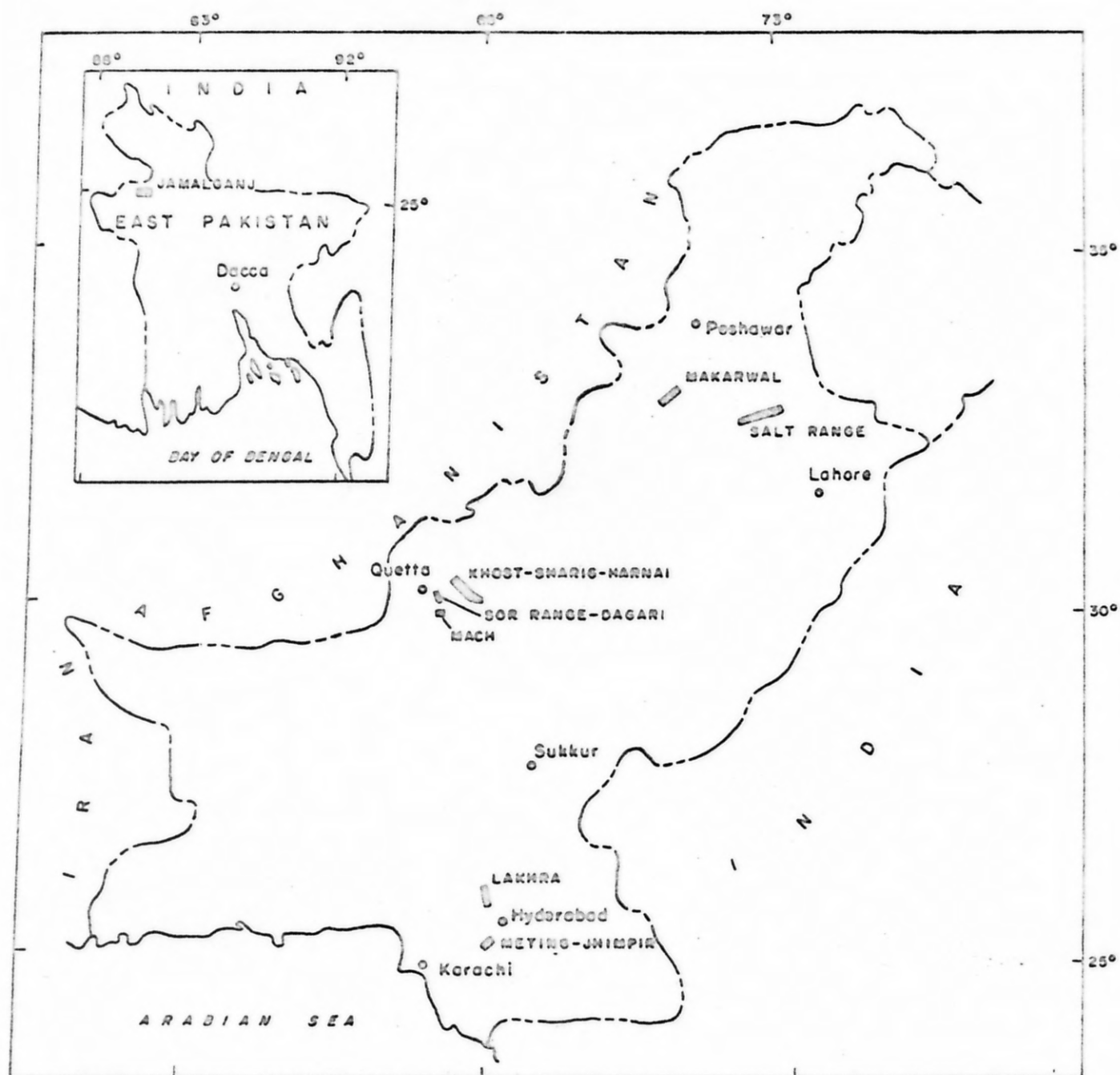


Figure 1. INDEX MAP OF PAKISTAN SHOWING COAL FIELDS

## Geologic setting

### Coal-bearing formations

The coal-bearing rocks of Pakistan range from Late Permian to Miocene. The Permian Paharpur Formation--the coal bearing unit in the Jamalganj field of East Pakistan--is the oldest known coal-bearing unit and contains much of the estimated reserves of the nation. Some coaly material is present in rocks of Jurassic age but the next younger rock units that contain significant quantities of coal are the Dhak Pass Formation and Ranikot formation of Paleocene age. Rock units of Eocene age--the Ghazij Shale, Patala Formation, and Laki Limestone of West Pakistan, and the Tura Formation of East Pakistan--contain slightly more than half of the reserves estimated to be present in rocks of Tertiary age. Rocks assigned to the Turbat and Multana Groups of Oligocene and Miocene age contain coaly material in a few places in West Pakistan.

In common with most coals of the world, the coal beds of Pakistan are associated with rocks of terrestrial or brackish-water origin or else a mixture of rocks of terrestrial, brackish, and nearshore marine origin. The rocks are composed dominantly of shale with lesser quantities of sandstone. Limestone is a very minor constituent in some areas.

## Geologic structure

The coal-bearing rocks in all of the coal fields of Pakistan have been structurally deformed to some extent but the amount of disturbance ranges from relatively gentle folding with associated simple tensional faulting to complex folding with associated large-scale reverse faulting and duplication of beds. The coal beds being mined range in attitude from nearly flat-lying to inclinations in excess of 45 degrees.

### Coal beds

Coal has been defined as "a readily combustible rock containing more than 50 percent by weight and more than 70 percent by volume of carbonaceous material, formed from compaction or induration of variously altered plant remains similar to those of peaty deposits. Differences in the kinds of plant materials (type), in degree of metamorphism (rank), and range of impurity (grade), are characteristics of the varieties of coal." (Schopf, 1956.) These characteristics can be used to classify coals, but of the three--type, rank, grade--classification by rank, that is, by degree of metamorphism, is the most commonly used system. One of the most commonly employed systems for rank classification is the "Standard specifications for classification of coals by rank," D388-66, adopted by the American Society for Testing and Materials (1969, p. 66-71; and table 1).

Table 1.--Standard specifications for classification of coals by rank.<sup>a</sup>

Class	Group	Fixed Carbon Limits, per cent (Dry, Mineral-Matter- Free Basis)		Volatile Matter Limits, per cent (Dry, Mineral-Matter- Free Basis)		Calorific Value Limits, Btu per pound (Moist, <sup>b</sup> Mineral-Matter- Free Basis)		Agglomerating Character
		Equal or Greater Than	Less Than	Greater Than	Equal or Less Than	Equal or Greater Than	Less Than	
I. Anthracitic	1. Meta-anthracite.....	98	...	...	2	...	...	Nonagglomerating
	2. Anthracite.....	92	98	2	8	...	...	
	3. Semianthracite <sup>c</sup> .....	86	92	8	14	...	...	
II. Bituminous	1. Low volatile bituminous coal.....	78	86	14	22	...	...	Commonly agglom- erating <sup>d</sup> Agglomerating
	2. Medium volatile bituminous coal.....	69	78	22	31	...	...	
	3. High volatile A bituminous coal.....	...	69	31	...	14 000 <sup>d</sup>	...	
	4. High volatile B bituminous coal.....	...	...	...	...	13 000 <sup>d</sup>	14 000	
	5. High volatile C bituminous coal.....	...	...	...	...	11 500	13 000	
III. Subbituminous	1. Subbituminous A coal.....	...	...	...	...	10 500	11 500	Nonagglomerating
	2. Subbituminous B coal.....	...	...	...	...	9 500	10 500	
	3. Subbituminous C coal.....	...	...	...	...	8 300	9 500	
IV. Lignite	1. Lignite A.....	...	...	...	...	6 300	8 300	Nonagglomerating
	2. Lignite B.....	...	...	...	...	...	6 300	

<sup>a</sup> This classification does not include a few coals, principally nonbanded varieties, which have unusual physical and chemical properties and which come within the limits of fixed carbon or calorific value of the high-volatile bituminous and subbituminous ranks. All of these coals either contain less than 48 per cent dry, mineral-matter-free fixed carbon or have more than 15,500 moist, mineral-matter-free British thermal units per pound.

<sup>b</sup> Moist refers to coal containing its natural inherent moisture but not including visible water on the surface of the coal.

<sup>c</sup> If agglomerating, classify in low-volatile group of the bituminous class.

<sup>d</sup> Coals having 69 per cent or more fixed carbon on the dry, mineral-matter-free basis shall be classified according to fixed carbon, regardless of calorific value.

<sup>e</sup> It is recognized that there may be nonagglomerating varieties in these groups of the bituminous class, and there are notable exceptions in high-volatile C bituminous group.

The comparable range of analyses and apparent ranks of coals from major Pakistan coal fields are given in table 2. The ASTM classification system does not include coals that contain less than 48 percent dry, mineral-matter-free fixed carbon but samples of less than this minimum have been included in the apparent rank determinations shown in table 2 because they do not indicate any significant difference in classification from other samples. In comparison with many coals of similar rank from other parts of the world, the Pakistan coals tend to be low in fixed carbon content, and high in ash, hydrogen, and sulfur.

The apparent ranks of coals from the fields listed in table 2 range from lignite B to high-volatile A bituminous. The apparent rank assignments for the Makarwal and Sor Range-Daghari fields are probably valid indications of the true rank of coal in those fields but the apparent rank assignments for the Salt Range, Lakhra, and Meting-Jhimpir fields must be considered only provisional because of the relatively small number of analyses available. It seems probable that coals of each of the indicated apparent ranks for the Khost-Sharig-Harnai field are present within this large relatively undeveloped field.



Table 2. Range analyses 1/ and apparent ranks of coals from major coal fields in West Pakistan

Coal field	Proximate analysis (percent)				Ultimate analysis (percent)					Heat value Btu	Apparent ranks <u>2/</u> and numbers of samples
	Moisture	Volatile matter	Fixed carbon	Ash	Hydrogen	Carbon	Nitrogen	Oxygen	Sulfur		
Makarwal	4.2-	37.1-	36.3-	6.9-	4.6-	52.6-	0.2-	14.1-	4.1-	9,550-	hvCb(5) and HvBb(4) <u>4/</u>
	6.0	45.3	43.4	20.4	5.5	64.9	1.0	17.5	5.6	11,850	
Salt Range	10.8	31.6	36.0	21.6	4.8	47.7	0.8	16.6	8.5	8,900	hvCb(1) <u>3/</u>
Sor Range-Daghari	5.1-	31.0-	36.0-	2.7-	5.0-	51.2-	0.9-	16.6-	0.4-	8,690-	sub A(22), sub B (4) and hvCb(2) <u>6/</u>
	21.2	43.1	43.0	14.1	6.5	64.1	1.4	29.6	5.6	11,490	
Khost-Sharig-Harnai	2.2-	29.7-	28.4-	13.0-	3.9-	45.1-	1.0-	7.0-	1.9-	8,260-	hvBb(9) <u>5/</u> , hvCb(5) <u>6/</u> , and hvAb(3) <u>6/</u>
	11.2	45.7	45.2	32.7	5.9	67.3	1.5	16.2	9.5	12,560	
Lakhra	24.3-	25.3-	20.7-	7.4-	5.6-	28.8-	0.6-	29.4-	1.8-	4,630-	sub C(3), lig A (4), and lig B (1)
	39.4	30.8	30.0	23.4	7.0	43.0	0.8	47.8	6.5	7,660	
Meting-Jhimpir	25.6-	28.2-	24.1-	8.3-	6.2-	37.5-	0.7-	33.1-	2.9-	6,740-	sub C(2) <u>6/</u> , and lig A (5)
	36.6	32.3	28.0	16.8	7.1	41.8	0.8	42.3	5.1	7,460	

1/ As received, includes mine-run.

2/ High-volatile A bituminous (hvAb), high-volatile B bituminous (hvBb), high-volatile C bituminous (hvCb), subbituminous A (sub A), subbituminous (sub B), subbituminous C (sub C), lignite A (lig A), and lignite (lig B).

3/ Only one sample; may not be completely representative.

4/ Includes 2 samples with less than 48% dry, mineral-matter-free fixed carbon.

5/ Includes 3 samples with less than 48% dry, mineral-matter-free fixed carbon.

6/ Includes 1 sample with less than 48% dry, mineral-matter-free fixed carbon.

Classification of coals by type, such as the "type" classification used commercially in some coal fields of the Eastern United States (U.S. Bur. Mines, 1965, p. 123), are not in widespread use. The systems are mostly based upon the same or similar gross distinctions in plant material used by Tomkeieff (1954, table II, and p. 9), who divided the coals into three series--humic coals, humic-sapropelic coals, and sapropelic coals, based upon the nature of the original plant materials. The humic coals are largely composed of the remains of the woody parts of plants, and the sapropelic coals are largely composed of the more resistant waxy, fatty, and resinous parts of plants, such as cell walls, spore-coatings, pollen, resin particles, and algae. Most coals fall into the humic series, with some coals being mixtures of humic and sapropelic elements and, therefore, falling into the humic-sapropelic series. The sapropelic series is quantitatively insignificant and when found is commonly regarded as an organic curiosity.

Grade, or quality, classifications of coals are generally based upon the quantity of ash, sulfur, and other deleterious constituents that are important in determining the utilization potential. According to M.Y. Khan and others (written commun., 1969), a comparison of 97 Pakistan coals from seven major fields with 642 United States coals (Fieldner, Rice, and Moran, 1942) shows that the Pakistan coals average 15.1 percent ash and 4.8 percent sulfur compared to 8.9 percent ash and 1.9 percent sulfur for the U.S. coals. Obviously, most Pakistan coals, as mined, are relatively high in ash and sulfur.

The following list, compiled by M. Y. Khan, E. R. Landis, and J. A. Reinemund, shows that the average thickness of coal mined in seven major coal fields of Pakistan is 3.2 feet and in four of the seven fields beds as thin as 1 foot are mined. In most other coal-mining areas of the world, beds less than 2 feet thick are seldom considered minable but thin beds will probably continue to be mined in Pakistan because of the lack of widespread thick beds. The following tabulation includes the six fields discussed in this report:

Coal field	Thickness of minable coal beds		
	Maximum	Average	Minimum
Makarwal	10	5	2
Salt Range	5	2.5	1
Sor Range-Daghari	10	4	1
Khost-Sharig-Harnai	5	2	1
Lakhra	8	4	2
Meting-Jhimpir	3	1.5	1
Average for Pakistan coals	6.8	3.2	1.3

The coal beds of Pakistan are commonly lenticular as a result of deposition in unconnected basins of limited areal extent. In addition, structural deformation in many areas has broken and distorted the beds so complexly as to create major mining problems. However, in most of the major coal fields the beds being mined have a lateral extent measured in miles.

The discussion in this section is largely derived from data compiled by M. Y. Khan, E. R. Landis and J. A. Reinemund.

#### Coal fields

##### Makarwal

The Makarwal field covers an area of about 30 square miles on the eastern side of the Shinghar Range, which is part of the Trans-Indus Mountains. The coal occurs in a single bed that ranges from 2 to 10 feet thick and averages about 5 feet thick. The coal is of high-volatile B and C bituminous ranks and is in the lowest part of the Dhak Pass Formation of Paleocene age.

The as-mined coal from the field has a higher proportion of lump coal than the coal produced in most other Pakistan coal fields. The ash content ranges from 6.9 to 20.4 percent and the sulfur content from 4.1 to 5.6 percent. Much of the sulfur is in the form of very finely divided pyrite and is difficult to remove by washing. Resin content is high but not sufficiently so as to justify extraction.

##### Salt Range

The Salt Range field covers an area of about 100 square miles in the Salt Range of north-central West Pakistan. The Patala Formation of early Eocene age contains what apparently is a single coal bed throughout the field. The bed ranges in thickness from 1 to 5 feet and is characterized by rapid lateral variations in thickness and composition. The coal is high-volatile C and B bituminous in rank, is high in ash and sulfur content, and variable in composition.

### Sor Range-Daghari

The Sor Range-Daghari field, which is about 16 square miles in area, comprises a topographically elevated synclinal basin. The coal-bearing Ghazij Shale of Eocene age crops out around all but the west side of the syncline, where it abutts older beds along a large fault. The Ghazij is about 6,000 feet thick but the coal-bearing sequence in the upper third of the formation is only about 200 feet thick. Several different lenticular coal beds reach minable thickness in different parts of the field and the average thickness of mined beds is about 4 feet.

Most of the coal in the field is of subbituminous A rank, with an ash content of 2.7 to 14.1 percent and a sulfur content of 0.4 to 5.6 percent. With improved mining and haulage the percentage of lump coal could be fairly large.

### Khost-Sharig-Harnai

This large geologically complex field has been known since before 1880, has been studied in part by many investigators, and is still enigmatic in detail. The coal field covers an area of about 80 square miles along a northwest-trending folded and faulted structure along which coal crops out for at least 35 miles. The coal-bearing Ghazij Shale of Eocene age contains as many as seven coal beds that are mined at some place in the field. Much of the coal is of high-volatile B bituminous rank, but some high-volatile A and C bituminous coals are present also. Nearly all the coals in the field possess caking properties to some degree but cannot be classed as coking coals.

## Lakhra

The Lakhra coal field in the southern part of West Pakistan lies along the crest of a north-trending anticline that is about 40 miles long and about 10 miles wide. The Lakhra field comprises an area of about 80 square miles in which the Ranikot Formation of Paleocene age contains at least one persistent coal bed and two or more nonpersistent beds. The bed that is mined ranges in thickness from 2 to 8 feet and averages about 4 feet. In most of the field the rocks dip at less than 6 degrees and the major structural problems are caused by north-trending normal faults that dislocate the coal beds.

Most of the coal in the field has an apparent rank of either lignite A or subbituminous C. The coal as mined contains about 30 percent moisture and can be extracted in large lumps. However, the coal soon dries to a moisture content of about 8 percent, tends to crumble, and is subject to spontaneous combustion.

## Meting-Jhimpir

The Meting-Jhimpir coal field covers a known area of about 35 square miles in the southern part of West Pakistan. The coal-bearing Sonhari beds which comprise the basal part of the Laki Limestone of Eocene age dip very gently westward and have been largely undisturbed by faulting.

Only one workable coal bed is present in the field and most of the analyzed samples indicate a rank of lignite A, though some subbituminous C coal is present also. The coal tends to slack upon exposure to the air and is subject to spontaneous combustion.



## Coal reserves

The estimated original coal reserves of Pakistan total about 2,012 million long tons. Of this total, about 549 million long tons were originally present in West Pakistan. All of the coal mined in the past, about 23.5 million long tons, came from West Pakistan and if a 50-percent recoverability factor is applied the estimated remaining coal reserves in West Pakistan are about 502 million long tons as of Jan. 1, 1969.

The estimated original reserves (M. Y. Khan, E. R. Landis, and J. A. Reinemund, written commun., 1969) for the six fields discussed in this report are as follows:

Makarwal	26 million long tons
Salt Range	91.5 million long tons
Sor Range-Daghari	53 million long tons
Khost-Sharig-Harnai	60 million long tons
Lakhra	239.7 million long tons
Meting-Jhimpir	40 million long tons
Other	39.8 million long tons

### Analyses of samples

The analyses in table 3 are arranged geographically by coal field and are grouped as follows: The proximate analysis, moisture, volatile matter, fixed carbon, and ash; the ultimate analysis, ash, hydrogen, carbon, nitrogen, oxygen, and sulfur; the calorific value or heat of combustion expressed in British thermal units; other analytical data such as free-swelling index, specific gravity, and Hardgrove grindability index. The results of ash fusibility tests are given separately in table 4, arranged by laboratory number similar to table 3.

The analytical procedures used for the proximate and ultimate analyses, the calorific determination, and the ash fusibility tests are given in detail in ASTM Standard D271-58 (ASTM, 1964, p. 14-45). The free-swelling index tests are described in detail in ASTM Standard D720-57 (ASTM, 1964, p. 110-114), and the Hardgrove grindability tests are explained in ASTM Standard D409-51 (ASTM, 1964, p. 78-81).



Table 3.--Analyses of samples.

1, sample as received; 2, moisture free; 3, moisture and ash free

Mine	Bed	Sample			Proximate			Ultimate					Calorific value		Other	
		Collector's/ Condition	Laboratory number		Moisture	Volatile matter	Fixed carbon	Ash	Hydrogen	Carbon	Nitrogen	Oxygen	Sulfur	Btu		
		Makarwal coal field														
Godarmal		8	1 2 3	D-91602	5.0	44.9 47.2 52.1	41.1 43.4 47.9	9.0 9.4 --	5.5 5.2 5.8	64.9 68.3 75.4	0.2 0.2 0.2	16.0 12.2 13.5	4.4 4.7 5.1	11,850 12,470 13,770	Hardgrove grindability index 61 Free-swelling index No. 1½	
Charles	Top bench	8	1 2 3	D-91603	6.0	43.7 46.5 50.2	43.2 46.2 49.8	6.9 7.3 --	5.4 5.1 5.5	64.8 68.9 74.4	1.0 1.0 1.1	16.3 11.8 12.6	5.6 5.9 6.4	11,800 12,560 13,550	Hardgrove grindability index No. 55 Free-swelling index No. 2½	
Charles	Bottom bench	8	1 2 3	D-91604	4.5	42.9 44.9 54.2	36.3 38.0 45.8	16.3 17.1 --	5.2 4.9 5.9	58.1 60.8 73.3	0.9 0.9 1.1	14.1 10.7 12.9	5.4 5.6 6.8	10,700 11,200 13,500	Hardgrove grindability index No. 50 Free-swelling index No. 1½	
Omparkash	Top bench	8	1 2 3	D-91605	4.2	43.6 45.5 51.8	40.6 42.4 48.2	11.6 12.1 --	5.1 4.8 5.4	60.2 62.9 71.5	0.7 0.8 0.9	17.5 14.3 16.4	4.9 5.1 5.8	10,900 11,380 12,940	Hardgrove grindability index No. 51 Free-swelling index No. 1	
Omparkash	Bottom bench	8	1 2 3	D-91606	4.3	37.1 38.8 49.4	38.2 39.9 50.6	20.4 21.3 --	4.6 4.3 5.5	52.6 55.0 70.0	0.6 0.7 0.8	16.9 13.6 17.2	4.9 5.1 6.5	9,550 9,980 12,690	Hardgrove grindability index No. 48 Free-swelling index No. 1½	
Omparkash		8	1 2 3	D-91607	5.5	44.7 47.3 53.6	38.7 41.0 46.4	11.1 11.7 --	5.5 5.2 5.9	62.3 65.9 74.7	0.8 0.8 0.9	16.2 12.0 13.6	4.1 4.4 4.9	11,400 12,060 13,660	Hardgrove grindability index No. 49 Free-swelling index No. 1½	
Mine Run Composite		8	1 2 3	D-91611	4.2	42.1 44.0 51.8	39.2 40.9 48.2	14.5 15.1 --	5.0 4.8 5.6	60.2 62.8 74.0	0.5 0.6 0.7	14.6 11.3 13.3	5.2 5.4 6.4	11,010 11,490 13,530	Hardgrove grindability index No. 59 Free-swelling index No. 1½	
Lando	Top bench	8	1 2 3	D-91608	5.8	45.3 48.1 53.1	40.1 42.5 46.9	8.8 9.4 --	5.5 5.1 5.6	63.3 67.3 74.2	0.9 0.9 1.0	16.4 11.9 13.2	5.1 5.4 6.0	11,570 12,290 13,560	Hardgrove grindability index No. 58 Free-swelling index No. 1½	
Lando	Bottom bench	8	1 2 3	D-91609	5.9	45.1 48.0 53.2	39.8 42.2 46.8	9.2 9.8 --	5.5 5.1 5.7	63.1 67.1 74.4	1.0 1.0 1.1	15.8 11.3 12.5	5.4 5.7 6.3	11,510 12,230 13,560	Hardgrove grindability index No. 57 Free-swelling index no. 1½	

Mine	Bed	Sample			Proximate			Ultimate					Calorific value		Other
		Collector/	Condition	Laboratory number	Moisture	Volatile matter	Fixed carbon	Ash	Hydrogen	Carbon	Nitrogen	Oxygen	Sulfur	Btu	
Salt Range coal field															
No. 4, East Chabhal	Top and bottom bench	8	1	D-91610	10.8	31.6	36.0	21.6	4.8	47.7	0.8	16.6	8.5	8,900	Hardgrave grindability index No. 52 Free-swelling index no. noncaking
			2			35.4	40.4	24.2	4.0	53.5	0.9	7.9	9.5	9,970	
			3			46.7	53.3	--	5.3	70.6	1.1	10.5	12.5	13,150	
Sor Range-Daghari coal field															
Lease No. 9 Gilani Coal Co.	Unknown	2	1	H-58383	15.2	34.0	39.4	11.4	5.8	55.3	1.2	24.5	1.8	9,740	Free-swelling index no. noncaking Real specific gravity 1.47
			2			40.1	46.5	13.4	4.9	65.1	1.4	13.1	2.1	11,480	
			3			46.3	53.7	--	5.6	75.2	1.6	15.2	2.4	13,250	
Lease No. 58, H.M. Habibullah Co.	Unknown	2	1	H-58829	6.9	37.1	41.9	14.1	5.0	57.7	1.3	18.5	3.4	10,130	Real specific gravity 1.52
			2			39.9	44.9	15.2	4.5	62.0	1.4	13.3	3.6	10,880	
			3			47.0	53.0	--	5.3	73.0	1.6	15.8	4.3	12,830	
Kalat Coal Co.	Unknown	2	1	H-60172	5.1	43.1	43.0	8.8	5.4	64.1	1.2	16.6	3.9	11,490	Real specific gravity 1.45
			2			45.4	45.3	9.3	5.0	67.5	1.2	12.9	4.1	12,110	
			3			50.1	49.9	--	5.6	74.4	1.3	14.2	4.5	13,350	
Kalat Coal Co.	Unknown	2	1	H-60171	15.8	36.5	37.6	10.1	5.9	55.5	1.1	25.1	2.3	9,820	Real specific gravity 1.47
			2			43.3	44.7	12.0	5.0	66.0	1.3	13.0	2.7	11,670	
			3			49.2	50.8	--	5.6	74.9	1.5	14.9	3.1	13,250	
Lease No. 9, Gilani Coal Co.	Unknown	2	1	H-58382	17.6	33.9	39.2	9.3	6.0	55.0	1.3	26.4	2.0	9,730	Free-swelling index no. noncaking Real specific gravity 1.46
			2			41.1	47.7	11.2	4.9	66.7	1.5	13.3	2.4	11,810	
			3			46.4	53.6	--	5.6	75.2	1.7	14.8	2.7	13,300	
Lease No. 58, H.M. Habibullah Co.	Unknown	2	1	H-58830	18.4	35.5	37.9	10.2	5.8	51.7	1.1	27.3	3.9	9,180	Real specific gravity 1.49
			2			41.0	46.5	12.5	4.6	63.4	1.4	13.4	4.7	11,260	
			3			46.9	53.1	--	5.3	72.4	1.6	15.3	5.4	12,860	
Lease No. 8, Mir Quadir Bahksh	Top seam	2	1	H-35651	21.2	31.0	38.3	9.5	5.6	51.2	1.2	29.6	2.9	8,620	
			2			39.3	48.7	12.0	4.1	64.9	1.5	13.8	3.7	11,030	
			3			44.7	55.3	--	4.7	73.8	1.8	15.5	4.2	12,540	
Lease No. 8, Mir Quadir Bahksh	Bottom seam	2	1	H-35650	17.1	36.2	40.4	6.3	6.2	57.4	1.2	26.1	2.8	10,240	
			2			43.7	48.7	7.6	5.1	69.3	1.4	13.3	3.3	12,360	
			3			47.2	52.8	--	5.6	75.0	1.5	14.3	3.6	13,370	
W.P.I.D.C. Lease No. 143, Tunnel 3, Pakistan Industrial Development Corp.	Top bed	1	1	F-55410	18.1	36.7	41.4	3.8	6.4	60.2	1.4	27.6	.6	10,490	
			2			44.9	50.5	4.6	5.4	73.5	1.7	14.1	.7	12,810	
			3			47.0	53.0	--	5.6	77.1	1.8	14.8	.7	13,430	
W.P.I.D.C. Lease 98, Tunnel 7, Pakistan Industrial Development Corp.	Top bed	1	1	F-55411	16.8	37.8	40.9	4.5	6.2	60.3	.9	27.6	.5	10,560	
			2			45.3	49.4	5.3	5.2	72.4	1.0	15.5	.6	12,690	
			3			47.9	52.1	--	5.5	76.5	1.1	16.2	.7	13,400	

Mine	Bed	Sample			Proximate			Ultimate				Calorific value			Other
		Collector/	Condition	Laboratory number	Moisture	Volatile matter	Fixed carbon	Ash	Hydrogen	Carbon	Nitrogen	Oxygen	Sulfur	Btu	
Sor Range-Daghari coal field															
Daghari, State Mine, Incline A	Unknown	1	1	F-55412	17.5	35.5	40.0	7.0	6.1	56.7	1.2	26.9	2.1	10,080	
		7	2			43.1	48.4	8.5	5.0	68.7	1.5	13.8	2.5	12,220	
			3			47.1	52.9	--	5.5	75.1	1.6	15.1	2.7	13,360	
Daghari, State Mine, Incline A	Unknown	1	1	F-55413	16.3	35.6	36.5	11.6	5.8	53.0	1.1	22.9	5.6	9,600	
		7	2			42.5	43.7	13.8	4.8	63.3	1.3	10.1	6.7	11,480	
			3			49.4	50.6	--	5.6	73.5	1.5	11.7	7.7	13,310	
Daghari, State Mine, Adit No. 1	Unknown	1	1	F-55414	17.6	36.7	42.4	3.3	6.4	60.1	1.4	27.8	1.0	10,660	
		7	2			44.6	51.4	4.0	5.4	72.9	1.7	14.8	1.2	12,940	
			3			46.5	53.5	--	5.6	76.0	1.7	15.4	1.3	13,490	
P.I.D.C. lease No. 143, Tunnel No. 4, Pakistan Industrial Development Corp.	Top bed	1	1	F-57437	16.3	39.8	40.7	3.2	6.5	61.5	1.4	27.0	.4	10,900	
			2			47.6	48.5	3.9	5.6	73.5	1.7	14.8	.5	13,030	
			3			49.5	50.5	--	5.8	76.4	1.7	15.6	.5	13,550	
P.I.D.C. lease No. 92, Tunnel No. 4, Pakistan Industrial Development Corp.	Top bed	1	1	F-57438	17.9	36.8	41.6	3.7	6.4	60.0	1.4	28.0	.5	10,600	
			2			44.8	50.7	4.5	5.4	73.0	1.7	14.7	.7	12,910	
			3			46.9	53.1	--	5.6	76.5	1.8	15.4	.7	13,520	
Hameed, Lease No. 58, H.M. Habibullah Co.	Middle bed	1	1	F-58291	15.9	34.9	38.4	10.8	5.6	53.2	1.1	24.4	4.9	9,580	
			2			41.5	45.6	12.9	4.6	63.2	1.4	12.1	5.8	11,400	
			3			47.6	52.4	--	5.2	72.6	1.6	13.9	6.7	13,080	
Adit No. 2, Lease 113, H.M. Habibullah Co.	Middle bed	1	1	F-58292	17.1	36.4	41.6	4.9	6.3	59.9	1.4	26.5	1.0	10,590	
		7	2			43.9	50.2	5.9	5.3	72.3	1.6	13.7	1.2	12,770	
			3			46.7	53.3	--	5.6	76.8	1.7	14.6	1.3	13,560	
New Area, Adit 12, Eastern Baluchistan Coal Trading Co.	Top bed	1	1	F-61502	17.2	33.5	36.0	13.3	5.8	51.7	1.2	25.0	3.0	9,210	Hardgrove grindability index No. 59
		7	2			40.4	43.5	16.1	4.6	62.4	1.5	11.8	3.6	11,110	
			3			48.1	51.9	--	5.5	74.4	1.7	14.1	4.3	13,240	
Lease 18, Adit 2, Eastern Baluchistan Coal Trading Co.	Top bed	1	1	F-61503	16.8	37.0	38.8	7.4	6.2	57.2	1.3	25.7	2.2	10,240	Hardgrove grindability index No. 51
		7	2			44.5	46.6	8.9	5.2	68.7	1.6	12.9	2.7	12,310	
			3			48.8	51.2	--	5.7	75.5	1.7	14.1	3.0	13,520	
Ahmadyar Adit Lease No. 9 Gilani Coal Co.	Middle bed	1	1	F-61504	18.7	35.0	39.9	6.4	6.0	56.0	1.1	28.1	2.4	9,870	Hardgrove grindability index No. 72
		7	2			43.1	49.1	7.8	4.9	68.9	1.3	14.1	3.0	12,150	
			3			46.8	53.2	--	5.3	74.8	1.4	15.3	3.2	13,180	
-DO-	Middle bed	1	1	F-61505	18.0	35.4	40.6	6.0	6.1	57.2	1.1	27.3	2.3	10,050	Hardgrove grindability index no. 56
		7	2			43.2	49.5	7.3	5.0	69.7	1.4	13.8	2.8	12,260	
			3			46.6	53.4	--	5.4	75.2	1.5	14.9	3.0	13,230	

Mine	Bed	Sample			Proximate			Ultimate			Calorific value			Other	
		Collector's	Condition	Laboratory number	Moisture	Volatile matter	Fixed carbon	Ash	Hydrogen	Carbon	Nitrogen	Oxygen	Sulfur		Btu
		Sor Range-Daghari coal field													
Longwell, Lease No. 9, Gilani Coal Co.	Top bed	1	1	F-61506	14.7	37.1	39.6	8.6	6.0	57.3	1.2	23.1	3.8	10,290	Hardgrove grindability index no. 56
			2			43.5	46.4	10.1	5.1	67.2	1.5	11.7	4.4	12,070	
			3			48.4	51.6	--	5.7	74.7	1.6	13.1	4.9	13,430	
Pak Khazina Lease No. 58B H.M. Habibullah Co.	Lower bed	1	1	G-39307	16.2	37.8	41.6	4.4	6.1	59.2	1.3	26.1	2.9	10,490	Hardgrove grindability index no. 56 Free-swelling index no. noncaking
			2			45.1	49.7	5.2	5.1	70.7	1.6	13.9	3.5	12,520	
			3			47.6	52.4	--	5.4	74.5	1.7	14.7	3.7	13,210	
Muen-Lease 126 H.M. Habibullah Co.	Lower bed	1	1	G-39308	16.5	37.8	43.0	2.7	6.1	58.6	1.2	28.6	2.8	10,350	Hardgrove grindability index no. 59 Free-swelling index no. noncaking
			2			45.3	51.5	3.2	5.1	70.1	1.5	16.7	3.4	12,400	
			3			46.8	53.2	--	5.3	72.4	1.5	17.3	3.5	12,810	
Kaka, Lease No. 7, United Minerals Co.	Middle bed	1	1	G-41355	14.0	39.2	41.3	5.5	6.0	60.0	1.3	23.2	4.0	10,700	Hardgrove grindability index no. 82 Free-swelling index no. noncaking
			2			45.6	48.0	6.4	5.2	69.7	1.5	12.5	4.7	12,440	
			3			48.8	51.2	--	5.5	74.5	1.6	13.4	5.0	13,290	
Saeed, Lease No. 59, H.M. Habibullah Co.	Lower bed	1	1	G-41356	18.7	34.6	40.9	5.8	6.1	56.4	1.3	27.5	2.9	9,900	Hardgrove grindability index no. 71 Free-swelling index no. noncaking
			2			42.5	50.3	7.2	4.9	69.3	1.6	13.4	3.6	12,170	
			3			45.8	54.2	--	5.3	74.7	1.7	14.4	3.9	13,110	
Sorabjee Lease No. 128 Sorabjee Mining Co.	Lower bed	1	1	G-41357	19.4	35.1	38.8	6.7	6.1	54.9	1.2	27.7	3.4	9,610	Hardgrove grindability index no. 69 Free-swelling index no. noncaking
			2			43.5	48.1	8.4	4.9	68.2	1.5	12.7	4.3	11,920	
			3			47.5	52.5	--	5.3	74.4	1.6	14.1	4.6	13,010	
Enfir, Lease No. 6, H.M. Habibullah Co.	Bottom bed	1	1	H-10248	12.8	37.0	38.3	11.9	5.5	55.1	1.1	21.3	5.1	9,960	
			2			42.4	44.0	13.6	4.7	63.2	1.2	11.4	5.9	11,430	
			3			49.1	50.9	--	5.4	73.1	1.4	13.3	6.8	13,230	

## Khosh-Sharig Harnai coal field

Unknown	None	3	1	H-78952	4.8	34.1	28.4	32.7	3.9	45.1	1.0	10.3	7.0	8,260	Free-swelling index no. 1
			2			35.8	29.9	34.3	3.6	47.4	1.0	6.4	7.3	8,680	
			3			54.5	45.5	--	5.4	72.2	1.6	9.6	11.2	13,210	
Ihsan and Sons	None	3	1	H-78951	4.1	39.3	35.2	21.4	4.8	56.4	1.2	9.0	7.2	10,470	Free-swelling index no. 2½
			2			40.9	36.8	22.3	4.5	58.8	1.2	5.7	7.5	10,910	
			3			52.7	47.3	--	5.8	75.6	1.6	7.3	9.7	14,050	
Roghani Pakistan Industries	Unnamed	3	1	H-78949	7.7	35.8	39.2	17.3	5.2	58.9	1.3	13.3	4.0	10,740	Free-swelling index no. 3½
			2			38.8	42.5	18.7	4.7	63.9	1.4	6.9	4.4	11,640	
			3			47.8	52.2	--	5.8	78.6	1.8	8.4	5.4	14,320	
Nakus No. 1 Pakistan Industries	Mangals seam	3	1	H-78948	5.1	41.8	34.5	18.6	5.0	57.4	1.3	11.0	6.7	10,680	Free-swelling index no. 3½
			2			44.1	36.3	19.6	4.7	60.5	1.4	6.7	7.1	11,250	
			3			54.8	45.2	--	5.8	75.2	1.7	8.5	8.8	14,000	
Nakus No. 4 Pakistan Industries	Unnamed	3	1	H-78947	8.5	40.2	37.0	14.3	5.2	56.6	1.2	16.2	6.5	10,310	Free-swelling index no. 1
			2			44.0	40.3	15.7	4.6	51.9	1.3	9.4	7.1	11,270	
			3			52.1	47.9	--	5.5	73.4	1.5	11.1	8.5	13,360	
Nukersheh Pakistan Industries	Unnamed	3	1	H-78953	8.6	36.1	40.5	14.8	5.2	59.0	1.5	12.2	7.3	10,900	Free-swelling index no. 3½
			2			39.5	44.3	16.2	4.7	64.5	1.6	5.0	8.0	11,920	
			3			47.1	52.9	--	5.6	76.9	1.9	6.1	9.5	14,220	



Mine	Bed	Sample			Proximate			Ultimate				Calorific value		Other	
		Collector	Condition	Laboratory number	Moisture	Volatile matter	Fixed carbon	Ash	Hydrogen	Carbon	Nitrogen	Oxygen	Sulfur		Btu
Khosh-Sharig Harnai coal field															
Old Zardalu Progressive Mining Co.	Zardalu	3	1 2 3	H-78955	2.2	45.7 46.7 54.2	38.5 39.4 45.8	13.6 13.9 --	5.9 5.8 6.7	67.3 68.8 79.9	1.4 1.4 1.6	9.9 8.1 9.5	1.9 2.0 2.3	12,560 12,840 14,920	Free-swelling index no. 2½
Tor Char Pakistan Industries	Top(?) seam	3	1 2 3	H-78954	9.8	42.3 46.9 57.7	31.1 34.5 42.3	16.8 18.6 --	5.1 4.5 5.5	53.9 59.8 73.5	1.0 1.1 1.4	15.6 7.6 9.2	7.6 8.4 10.4	9,790 10,860 13,340	Free-swelling index no. 2½
Nakus No. 2 Pakistan Industries	Middle(?) seam	3	1 2 3	H-78946	4.7	44.0 46.1 56.2	34.1 35.9 43.8	17.2 18.0 --	5.0 4.7 5.8	57.3 60.1 73.3	1.2 1.3 1.6	10.3 6.4 7.7	9.0 9.5 11.6	10,940 11,470 13,990	Free-swelling index no. 3
Lease No. 105 Mining Industry of Pakistan	Unnamed	2	1 2 3	H-67080	5.0	38.4 40.4 48.5	40.8 43.0 51.5	15.8 16.6 --	5.1 4.8 5.8	62.2 65.5 78.5	1.4 1.5 1.8	9.8 5.6 6.7	5.7 6.0 7.2	11,480 12,080 14,480	Real specific gravity 1.46
Lease No. 104A Mining Industry of Pakistan	Unknown	2	1 2 3	H-67081	4.0	38.3 39.9 48.7	40.3 42.0 41.3	17.4 18.1 --	4.7 4.4 5.4	60.7 63.2 77.1	1.4 1.5 1.8	9.1 5.8 7.2	6.7 7.0 8.5	11,030 11,490 14,020	Real specific gravity 1.52
Ali Corp.	Unknown	2	1 2 3	H-67079	7.6	29.7 32.1 46.4	34.3 37.2 53.6	28.4 30.7 --	4.2 3.7 5.3	45.9 49.7 71.7	1.0 1.1 1.6	11.0 4.5 6.6	9.5 10.3 14.8	8,640 9,350 13,480	Real specific gravity 1.74
Adina Commercial Coal Corp.	Northern (bottom?)	3	1 2 3	H-38240	5.7	33.9 36.0 42.9	45.2 47.8 57.1	15.2 16.2 --	5.3 5.0 6.0	63.5 67.3 80.3	1.5 1.6 1.9	7.0 2.0 2.3	7.5 7.9 9.5	11,980 12,710 15,160	Free-swelling index no. 9
W.P.I.D.C. Lease 61, W.Pak. Indus. Development Corp.	Unknown	9	1 2 3	G-79324	11.2	37.2 41.9 49.7	37.7 42.5 50.3	13.9 15.6 --	5.5 4.8 5.7	58.5 65.8 78.0	1.4 1.6 1.8	15.4 6.3 7.5	5.3 5.9 7.0	10,580 11,920 14,120	Free-swelling index no. 4
Lease No. 56A Commercial Mining Co.	Below bottom seam	9	1 2 3	G-93335	8.3	36.6 39.9 47.8	40.1 43.7 52.2	15.0 16.4 --	5.0 4.4 5.3	57.3 62.4 74.6	1.2 1.3 1.6	12.0 5.2 6.2	9.5 10.3 12.3	10,590 11,540 13,800	Hardgrove grindability index no. 72 Free-swelling index no. 3½
W.P.I.D.C. Lease 151, Adit No. 6 W.Pak. Indus. Development Corp.	Middle seam	9	1 2 3	G-93336	4.0	45.1 46.9 55.4	36.1 37.7 44.6	14.8 15.4 --	5.0 4.7 5.6	61.6 64.1 75.7	1.3 1.4 1.6	10.1 6.9 8.2	7.2 7.5 8.9	11,320 11,790 13,930	Hardgrove grindability index no. 57 Free-swelling index no. 3½
W.P.I.D.C. Lease 151, W.Pak. Indus. Develop. Corp.	Bottom seam	9	1 2 3	G-93337	5.5	42.9 45.4 52.6	38.6 40.9 47.4	13.0 13.7 --	5.2 4.8 5.6	61.3 64.8 75.1	1.2 1.3 1.5	10.1 5.7 6.5	9.2 9.7 11.3	11,410 12,070 13,990	Hardgrove grindability index no. 61 Free-swelling index no. 4
Lakhra coal field															
H.M. Habibullah Co.	Lailian	2	1 2 3	H-51788	31.8	30.0 43.9 50.6	29.2 42.9 49.4	9.0 13.2 --	6.8 4.8 5.5	42.1 61.7 71.1	0.8 1.1 1.3	38.0 14.3 16.4	3.3 4.9 5.7	7,530 11,050 12,730	Real specific gravity 1.51 Free-swelling index no. noncaking
GSP Boring L-16	Lailian	3	1 2 3	H-51789	35.7	28.0 43.5 52.0	25.8 40.1 48.0	10.5 16.4 --	7.0 4.7 5.7	38.7 60.3 72.1	.7 1.1 1.3	39.3 11.5 13.8	3.8 6.0 7.1	7,010 10,910 13,040	Real specific gravity 1.57 Free-swelling index no. noncaking

Mine	Bed	Sample			Proximate			Ultimate					Calorific value		Other
		Collector/ Condition	Laboratory number		Moisture	Volatile matter	Fixed carbon	Ash	Hydrogen	Carbon	Nitrogen	Oxygen	Sulfur	Btu	
Lakira coal field															
Lailian Colliery, H.M. Habibullah Mining Co.	Lailian	3	1 2 3	H-45314	31.8	30.8 45.1 50.6	30.0 44.1 49.4	7.4 10.8 --	6.8 4.9 5.4	43.0 63.1 70.7	.8 1.2 1.3	38.4 14.7 16.6	3.6 5.3 6.0	7,660 11,230 12,590	Free-swelling index no. noncaking
-Do-	Lailian	3	1 2 3	H-33049	39.4	25.3 41.8 55.1	20.7 34.0 44.9	14.6 24.2 --	6.4 3.4 4.4	28.8 47.4 62.5	.6 1.0 1.3	47.8 21.1 28.0	1.8 2.9 3.8	4,630 7,640 10,080	
Baluchistan Coal Co.	Lailian	4	1 2 3	J-37990	30.0	27.7 39.6 50.8	26.8 38.3 49.2	15.5 22.1 --	6.2 4.1 5.3	38.4 54.8 70.3	.8 1.1 1.4	35.9 13.4 17.2	3.2 4.5 5.8	6,770 9,670 12,410	
Indus Coal Co.	Lailian	4	1 2 3	J-37989	24.3	29.5 38.9 52.9	26.3 34.8 47.1	19.9 26.3 --	5.7 3.9 5.3	38.7 51.1 69.4	.7 1.0 1.3	29.4 10.3 13.9	5.6 7.4 10.1	7,020 9,280 12,600	
H.M. Habibullah Co.	Lailian	4	1 2 3	J-37987	31.0	29.2 42.4 52.6	26.4 38.1 47.4	13.4 19.5 --	6.3 4.2 5.2	38.8 56.2 69.8	.8 1.1 1.4	36.3 12.6 15.6	4.4 6.4 8.0	6,900 10,000 12,410	
Khan Coal Co.	Lailian	4	1 2 3	J-37993	27.7	26.2 36.3 53.6	22.7 31.4 46.4	23.4 32.3 --	5.6 3.6 5.3	33.3 46.1 68.1	.6 .8 1.2	30.6 8.2 12.1	6.5 9.0 13.3	6,040 8,360 12,350	
Meting-Jalpir coal field															
SCH-1 Amin Agencies	Sonhari	2	1 2 3	H-51787	25.6	32.3 43.5 53.7	28.0 37.5 46.3	14.1 19.0 --	6.3 4.6 5.7	41.8 56.2 69.4	0.8 1.1 1.3	33.3 14.1 17.4	3.7 5.0 6.2	7,460 10,030 12,380	Real specific gravity 1.60 Free-swelling index no. noncaking
Dawood, Dawood Co. Ltd.	Sonhari	2	1 2 3	H-51786	27.8	29.1 40.3 52.5	26.3 36.4 47.5	16.8 23.3 --	6.2 4.3 5.6	38.5 53.3 69.5	.8 1.0 1.4	33.1 11.7 15.1	4.6 6.4 8.4	6,970 9,650 12,580	Real specific gravity 1.66 Free-swelling index no. noncaking
14-14A, Amin Agencies	Sonhari	2	1 2 3	H-33721	34.1	29.1 44.1 53.0	25.8 39.2 47.0	11.0 16.7 --	7.0 4.8 5.8	39.6 60.0 72.1	.8 1.2 1.4	38.1 11.9 14.2	3.5 5.4 6.5	7,100 10,780 12,950	
Mine 1E, Amin Coal Co.	Sonhari	4	1 2 3	J-37992	34.1	29.9 45.5 55.0	24.6 37.2 45.0	11.4 17.3 --	6.8 4.6 5.5	38.8 59.0 71.3	.7 1.1 1.3	37.2 10.3 12.5	5.1 7.7 9.4	7,150 10,850 13,120	
Dawood, Mine 11, Dawood Co. Ltd.	Sonhari	4	1 2 3	J-37991	36.6	28.2 44.5 51.2	26.9 42.4 48.8	8.3 13.1 --	6.9 4.5 5.2	38.3 60.4 69.6	.7 1.1 1.3	42.3 15.4 17.6	3.5 5.5 6.3	6,740 10,620 12,220	
Mine 14C (Amin Coal Co.)	Sonhari	4	1 2 3	J-37988	35.4	29.6 45.8 52.5	26.7 41.3 47.5	8.3 12.9 --	7.1 5.0 5.7	40.9 63.3 72.7	.8 1.2 1.4	40.0 13.0 15.0	2.9 4.6 5.2	7,370 11,400 13,090	
Dawood, Mine 8, Dawood Co. Ltd.	Sonhari	4	1 2 3	J-37986	36.0	29.1 45.5 54.7	24.1 37.6 45.3	10.8 16.9 --	7.1 4.9 5.9	37.5 58.5 70.5	.7 1.1 1.3	40.1 12.7 15.2	3.8 5.9 7.1	7,120 11,130 13,460	

1. John A. Reinemund, U.S.G.S; 2. D. P. Schlick, U.S.B.M.; 3. R. L. Harbour, U.S.G.S; 4. W. Koblisch, U.S.B.M.; 5. M. V. Chatterjee, I.P.; 6. S. Tayyab Ali, G.S.P.; 7. L. F. Trenchak, U.N.; 8. P. R. Eyrich, U.S.B.M.; 9. F. D. Spencer, U.S.G.S; 10. S. Q. Rana, U.S.G.S.

Table 4.--Fusibility of ash.

Laboratory number	Collector 1/	Initial deformation temperature	Softening temperature	Fluid temperature
H-58383	2	2020	2080	2190
H-58829	2	2020	2080	2130
H-60172	2	2010	2060	2110
H-6071	2	1980	2010	2050
H-58382	2	2000	2050	2100
H-58830	2	2020	2080	2180
H-35651	2	2090	2190	2270
H-35650	2	2010	2050	2090
F-55410	1	2020	2080	2150
F-55411	1	1920	2050	2160
F-55412	1 and 7	1940	2110	2220
F-55413	1 and 7	1930	1990	2180
F-55414	1 and 7	1970	2180	2280
F-57437	1	2110	2180	2370
F-57438	1	2030	2080	2310
F-48291	1	1940	2030	2210
F-58292	1	1940	2040	2200
F-61502	1 and 7	1930	2010	2100
F-61503	1 and 7	1970	2010	2090
F-61504	1 and 7	1970	2140	2220
F-61505	1 and 7	2040	2270	2420
F-61506	1	1960	2050	2160
G-39307	1 and 6	2100	2150	2260
G-39308	5 and 1	2050	2180	2300
G-41355	1	2060	2150	2320
G-41356	1 and 5	1980	2030	2080
G-41357	1 and 5	2150	2260	2340
H-10248	1	1960	2000	2050
H-78952	3	1900	1920	1960
H-78951	3	1920	1960	2020
H-78949	3	2010	2070	2120
H-78948	3	1900	1920	1940
H-78947	3	1900	1920	1960
H-78953	3	1910	1940	1970
H-78955	3	2590	2650	2700
H-78954	3	2220	2260	2300
H-78946	3	1880	1900	1920
H-67080	2	1940	1970	2020
H-67081	2	1900	1940	1970
H-67079	2	1940	1970	2020
H-38240	3	2000	2050	2120
G-79324	9	2060	2100	2310
G-39303	9	2360	2570	2680
H-51788	2	2520	2570	2680
H-51789	3	2000	2110	2260
H-33049	3	2910+		
J-37990	4	2080	2130	2180
J-37989	4	2060	2110	2160
J-37987	4	1940	1980	2030
J-37993	4	2100	2150	2200
H-51787	2	2020	2100	2190
H-51786	2	2010	2130	2260
H-33721	2	2080	2130	2180
J-37992	4	2610	2670	2720
J-37991	4	2090	2140	2190
J-37988	4	2250	2350	2460
J-37986	4	2130	2180	2240
D-91602	8	2440	2540	2680
D-91603	8	2090	2210	2380
D-91604	8	2100	2190	2440
D-91605	8	2390	2510	2600
D-91606	8	2250	2650	2800
D-91607	8	2510	2570	2700
D-91611	8	2050	2260	2500
D-91603	8	2070	2140	2450
D-91609	8	2000	2090	2210
D-91610	8	1930	2020	2230
G-39306	1 and 9	2360	2570	2680

1/Collectors: 1. John A. Reinemund, USGS; 2. D. P. Schlick, USEM; 3. R. L. Harbor, USGS; 4. W. Kebblish, USEM; 5. M. Yar Khan, GSP; 6. S. Tayyab Ali, GSP; 7. L. F. Trenczak, UN; 8. P. R. Eyrich, USEM; 9. F. D. Spencer, USGS.

## DESCRIPTION OF SAMPLES

The brief descriptions in this section supplement the information presented in tables 3 and 4 and have been compiled from notes made by the geologists and engineers who collected the samples.

### Makarwal coal field

Godarmal Mine, West Pakistan Industrial Development Corp.  
(Pakistan Government)

Analysis D-91602. High-volatile B bituminous coal from the Godarmal Mine, Simpson Section, Pakistan Government. Sample from Entry no. 6 East, pillar between no. 4 and no. 5 crosscut heading, about 2,000 feet from mine mouth. Coal bed  $48\frac{1}{2}$  inches thick. Sampled by P. R. Eyrich, U.S.B.M., July 30, 1952.

Charles Mine, West Pakistan Industrial Development Corp.  
(Pakistan Government)

Analysis D-91603. High-volatile C bituminous coal from Charles Mines, Simpson Section, Pakistan Government. Sample from 27 Left Level, 800 feet south of haulage incline. Top bench of bed only, 42 inches thick. Sampled by P. R. Eyrich, U.S.B.M., July 30, 1952.

Charles Mine, West Pakistan Industrial Development Corp.  
(Pakistan Government)

Analysis D-91604. High-volatile B bituminous coal from Charles Mine, Simpson Section, Pakistan Government. Sample from 27 Left Level, 800 feet south of haulage incline. Bottom bench of bed only,  $33\frac{1}{2}$  inches thick. Sampled by P. R. Eyrich, U.S.B.M., July 30, 1952.



Omparkash Mine, West Pakistan Industrial Development Corp.  
(Pakistan Government)

Analysis D-91605. High-volatile C bituminous coal from Omparkash Mine, Lumshiwal Section, Pakistan Government. Sample from crosscut off main haulage incline, about 2,300 feet in from mine mouth. Top bench of bed only, 55 inches thick. Sampled by P. R. Eyrich, July 31, 1952.

Omparkash Mine, West Pakistan Industrial Development Corp.  
(Pakistan Government)

Analysis D-91606. High-volatile C bituminous coal from Omparkash Mine, Lumshiwal Section, Pakistan Government. Sample from crosscut off main haulage incline, about 2,300 feet in from mine mouth. Bottom bench of bed only, 14 inches thick. Sampled by P. R. Eyrich, July 31, 1952.

Omparkash Mine, West Pakistan Industrial Development Corp.  
(Pakistan Government)

Analysis D-91607. High-volatile B bituminous coal from Omparkash Mine, Lumshiwal Section, Pakistan Government. Sample from District No. 9, south-east of main haulage incline, about 900 feet in from mine mouth. Coal bed 72 inches thick. Sampled by P. R. Eyrich, July 31, 1952.

Mine run composite sample

Analysis D-91611. High-volatile B bituminous coal from accumulated sample from previous listed mines of about 150 tons used for screen tests. Sampled by P. R. Eyrich, August 4, 1952.

Landoo Mine, West Pakistan Industrial Development Corp.  
(Pakistan Government)

Analysis D-91608. High-volatile C bituminous coal from Landoo Mine, Gullakhel area, Pakistan Government. Sample from face of lower level gangway at No. 5 cross heading, 400 feet in from mine mouth. Cover at sample point 400 feet. Top bench of bed only, 14 inches thick. Sampled by P. R. Eyrich, August 1, 1952.

Landoo Mine, West Pakistan Industrial Development Corp.  
(Pakistan Government)

Analysis D-91609. High-volatile C bituminous coal from Landoo Mine, Gullakhel area, Pakistan Government. Sample from face of lower level gangway at No. 5 cross heading, 400 feet in from mine mouth. Cover at sample point 400 feet. Bottom bench of bed only, 8 inches thick. Sampled by P. R. Eyrich, August 1, 1952.

Salt Range coal field

No. 4 East Chambol Mine, Katha Collieries

Analysis D-91610. High-volatile C bituminous coal from No. 4 East Chambol Mine, Katha Group No. 8, Katha Collieries. Sample from face at lower level gangway, 800 feet in from mine mouth. Cover at sample point 300 feet. Top and bottom benches of bed, 26 inches thick in total. Sampled by P. R. Eyrich, August 2, 1952.

Sor Range-Daghari coal field

Lease No. 9, Gilani Coal Co.

Analysis H-58383. Subbituminous A coal, from Lease No. 9, Gilani Coal Co., a slope mine, 6,000 feet above sea level. Dip 50°; grab sample of weathered coal outside of mine. Sampled by D. P. Schlick, U.S.B.M., July 24, 1963.

Lease No. 58, H. M. Habibullah Co.

Analysis H-58829. High-volatile C bituminous coal, from Lease No. 58, K. B. H. M. Habibullah Co., a drift, 6,000 feet above sea level. Dip 60°; a grab sample of weathered coal outside of mine. Sampled by D. P. Schlick, U.S.B.M., August 2, 1963.

Lease No. 3, Kalat Coal Co.

Analysis H-60172. High-volatile C bituminous coal, from Kalat Coal Co. Mine, 6,000 feet above sea level, 15 miles from Quetta. A grab sample of weathered coal from dump. Sampled by D. P. Schlick, U.S.B.M., August 19, 1963.

Lease No. 3, Kalat Coal Co.

Analysis H-60171. Subbituminous A coal, from Kalat Coal Co. Mine, a drift, 6,000 feet above sea level, 15 miles from Quetta. A grab sample of fresh coal outside of mine. Sampled by D. P. Schlick, U.S.B.M., August 22, 1963.

Lease No. 9, Gilani Coal Co.

Analysis H-58382. Subbituminous A coal, from Lease No. 9, Gilani Coal Co., a slope mine, 6,000 feet above sea level, 15 miles south of Quetta. A grab sample of fresh outside of pithead. Sampled by D. P. Schlick, U.S.B.M., August 1, 1963.

Lease No. 58, H. M. Habibullah Co.

Analyses H-58830. Subbituminous B coal, from Lease No. 58, H. M. Habibullah Co., a drift, 7,000 feet above sea level. A grab sample of fresh coal outside of pithead. Sampled by D. P. Schlick, U. S. B. M., August 1, 1963.

Lease No. 8, Mir Quadir Bahksh

Analysis H-35651. Subbituminous B coal, from Lease No. 8, Mir Quadir Bahksh, a drift, 6,120 feet above sea level, 15 miles northeast of Quetta. Coal bed, top bed; dip 42°, strike N 20° E; cover at point sampled 150 feet. A channel sample of fresh coal. The bed was measured and sampled by D. P. Schlick, U.S.B.M., June 30, 1962, as described below:

Section in bed in Lease No. 8, Mir Quadir Bahksh

Laboratory No-----	H-35651	
Roof, claystone.	<u>Ft.</u>	<u>in.</u>
Claystone-----		$\frac{1}{6}$
Coal, dull-----		5
Coal-----		7.
Claystone-----		1 1/2
Coal-----	1	1
Claystone-----		$\frac{1}{7}$
Coal-----	3	0
Claystone-----		$\frac{1}{6}$
Floor, soft, smooth.		
Total thickness of bed-----	6	8 1/2
Thickness of sample-----	5	1 1/2

$\frac{1}{7}$  Not included in sample.

Lease No. 8, Mir Quadir Bahksh

Analysis H-35650. Subbituminous A coal, from Lease No. 8,  
Mir Quadir Bahksh, a drift mine. Coal bed, bottom bed. A channel  
sample. The bed was sampled by D. P. Schlick, U.S.B.M., June 30, 1962.

Lease No. 143, Tunnel 3, West Pakistan Industrial Development Corp.

Analysis F-55410. Subbituminous A coal, from Lease No. 143, Tunnel 3, W.P.I.D.C., a slope mine, 7,500 feet above sea level, lat.  $30^{\circ}10'N$ , long.  $67^{\circ}12'E$ , 12 miles east of Quetta. Coal bed, top bed; dip  $50^{\circ}$  SW, strike  $N 43^{\circ}W$ ; cover at point sampled 400 feet. A channel sample of fresh coal. About 550 feet from portal. The bed was measured and sampled by John A. Reinemund, U.S.G.S., June 29, 1957, as described below:

Section in bed in Lease No. 143, Tunnel 3, W.P.I.D.C.

Laboratory No-----	F-55410	
Roof, claystone.	<u>Ft</u>	<u>in.</u>
Claystone-----		$\frac{1}{4}+$
Coal-----	7	0
Claystone-----		$\frac{1}{6}+$
Floor, claystone.		
Total thickness of bed-----	7	10+
Thickness of sample-----	7	0

$\frac{1}{4}$  Not included in sample.

Lease No. 98, Tunnel 7, West Pakistan Industrial Development Corp.

Analysis F-55411. Subbituminous A coal, from Lease No. 98, Tunnel 7, P.I.D.C. A channel sample of fresh coal in the face of first right drift. The bed was measured and sampled by John A. Reinemund, U.S.G.S., June 29, 1957, as described below:

Section in bed in Lease No. 98, Tunnel 7, W.P.I.D.C.

Laboratory No-----	F-55411	
Roof, claystone.	<u>Ft</u>	<u>in.</u>
Claystone-----		<u>1/4+</u>
Coal (top 3 in. clayey)-----	5	9 1/2
Claystone-----		<u>1/4+</u>
Floor, claystone, smooth.		
Total thickness of bed-----	6	5 1/2+
Thickness of sample-----	5	9 1/2

1/ Not included in sample.

Daghari Mine, West Pakistan Industrial Development Corp.

(formerly State Mine, West Pakistan Province)

Analysis F-55412. Subbituminous A coal from State Mine, West Pakistan Province, a slope mine, 6,800 feet above sea level, 35 miles southeast of Quetta. Coal bed, bottom bed; dip 90°, strike N 40°E; cover at point sampled 600 feet. A channel sample of fresh coal located in incline A, face of lower level, 60 feet below incline. The bed was measured and sampled by John A. Reinemund, U.S.G.S., and L. F. Trenczak, United Nations, August 27, 1957, as described below:

Section in bed in State Mine, West Pakistan Province

Laboratory No-----		F-55412	
Roof, claystone.		<u>Ft.</u>	<u>in.</u>
Claystone, carbonaceous-----			$\frac{1}{2}$ 9+
Coal, fusainous-----			$\frac{1}{2}$ 2
Claystone, carbonaceous-----			$\frac{1}{2}$ 2
Coal, not banded, tough-----	1	7	
Coal, bright, banded-----			2
Coal, bright, clay layers-----			6
Coal, bright, banded-----			8
Coal, bright, fusain layers-----	2	3	
Claystone, carbonaceous-----			$\frac{1}{2}$ 6+
Floor, claystone, soft.			
Total thickness of bed-----	6	9+	
Thickness of sample-----	5	2	

$\frac{1}{2}$  Not included in sample.



Daghari Mine, West Pakistan Industrial Development Corp.

Lease No. 2

(formerly State Mine, West Pakistan Province)

Analysis F-55413. Subbituminous A coal, from State Mine, West Pakistan Province, a slope mine, 6,800 feet above sea level, 35 miles southeast of Quetta. Coal bed, bottom bed; dip 90°, strike N 40° E; cover at point sampled 700 feet. A channel sample of fresh coal located in incline A, right entry, coal face in pit below entry level. The bed was measured and sampled by John A. Reinemund, U.S.G.S, and L. F. Tenczak, United Nations, August 27, 1957, as described below:

Section in bed in State Mine, West Pakistan Province

Laboratory No-----		F-55413	
		<u>Ft</u>	<u>in.</u>
Roof, claystone.			
Claystone, light gray, soft-----			$\frac{1}{2}+$
Coal, fusain bands in upper part-----	2		0
Clay-----			1/2
Coal, bright, friable-----	1		0
Clay-----			1/2
Coal, bright, friable-----			7
Claystone, carbonaceous-----			$\frac{1}{2}$
Floor, claystone, soft.			
Total thickness of bed-----	4		0+
Thickness of sample-----	3		8

1 Not included in sample.

Daghari Mine, West Pakistan Industrial Development Corp.  
 Lease No. 2  
 (formerly State Mine, Adit No. 1, West Pakistan Province)

Analysis F-55414. Subbituminous A coal, from State Mine, West Pakistan Province, a slope mine, 6,800 feet above sea level, 35 miles southeast of Quetta. Coal bed, bottom bed; dip 90°, strike N 40°E; cover at point sampled 700 feet. A channel sample of fresh coal located in Adit No. 1, coal face in right entry from bottom of slope at end of adit. The bed was measured and sampled by John A. Reinemund, U.S.G.S., and L. F. Trenczak, United Nations, August 27, 1957, as described below:

Section in bed in State Mine Adit No. 1, West Pakistan Province

Laboratory No---		F-55414	
Roof, siltstone.		<u>Ft</u>	<u>in.</u>
Siltstone, carbonaceous, laminated-----			$\frac{1}{6}+$
Coal, banded, with fusain layers-----	2		3
Coal, mottled with fusain masses-----	1		3
Claystone, carbonaceous-----			$\frac{1}{3}+$
Floor, claystone, soft.			
Total thickness of bed-----	4		3+
Thickness of sample-----	3		6

1/ Not included in sample.

Lease No. 143, Tunnel 4, West Pakistan Industrial Development Corp.

Analysis F-57437. Subbituminous A coal, from Lease No. 143, Tunnel 4, W.P.I.D.C., a slope mine, 7,300 feet above sea level, 20 miles east of Quetta. Coal bed, top bed; dip 45° SW; cover at point sampled, 550 feet. A channel sample of fresh coal in face of right entry about 600 feet from portal. The bed was measured and sampled by John A. Reinemund, U.S.G.S., August 14, 1957, as described below:

Section in bed in Lease No. 143, Tunnel 4, W.P.I.D.C.

Laboratory No-----	F-57437	
Roof, claystone.	<u>Ft</u>	<u>in.</u>
Claystone, medium gray-----		<u>1</u> / <u>4</u> +
Coal, banded-----	1	8
Coal, contorted bands-----	2	10
Coal, bony-----		<u>1</u> / <u>3</u>
Claystone, carbonaceous, ferruginous-----		<u>1</u> / <u>4</u> +
Floor, claystone, soft, smooth.		
Total thickness of bed-----	5	5
Thickness of sample-----	4	6

1 Not included in sample.

Lease No. 98, Tunnel 4, West Pakistan Industrial Development Corp.

Analysis F-57438. Subbituminous A coal, from Lease No. 98, Tunnel 4, W.P.I.D.C., a slope mine, 7,300 feet above sea level, 20 miles east of Quetta. Coal bed, top bed; dip 45° SW; cover at point sampled 350 feet. A channel sample of fresh coal in face of tunnel slope about 400 feet from portal. The bed was measured and sampled by John A. Reinemund, U.S.G.S., August 14, 1957, as described below:

Section in bed in Lease No. 98, Tunnel 4, W.P.I.D.C.

Laboratory No-----	F-57438	
Roof, claystone.	<u>Ft</u>	<u>in.</u>
Claystone, carbonaceous, dark gray-----		$\frac{1}{4}+$
Coal, banded-----	1	10
Coal, imperfect, banded-----	4	4
Claystone, carbonaceous, ferruginous-----		$\frac{1}{4}+$
Floor, claystone, soft, smooth.		
Total thickness of bed-----	6	10+
Thickness of sample-----	6	2

1 Not included in sample.

Lease No. 58, Hameed Adit, H. M. Habibullah Co.

Analysis F-58291. Subbituminous A coal, from Hameed Adit Lease No. 58, H. M. Habibullah Co., 7,350 feet above sea level, 8 miles east of Quetta. Coal bed, middle; dip 50°, strike N 80° W; cover at point sampled 400 feet. A channel sample of fresh coal in face in slope from end of adit. The bed was measured and sampled by John A. Reinemund, U.S.G.S., September 25, 1957, as described below:

Section in bed in Hameed Adit, Lease No. 58, H. M. Habibullah Co.

Laboratory No-----		F-58291	
		<u>Ft</u>	<u>in.</u>
Roof, claystone.			
Claystone, brownish gray, carbonaceous-----			$\frac{1}{3}$
Coal, bright, not banded, blocky-----			3
Coal, dull, fusainous-----			1
Coal, banded, bright and dull-----			1 1/2
Coal, bright, not banded, blocky-----			1 1/2
Coal, dull, fusainous-----			2
Coal, bright, not banded, blocky-----			6
Coal, banded, bright and dull-----			6
Coal, bright, banded, blocky-----			9
Coal, bright, blocky-----			5
Claystone, brownish gray, carbonaceous-----			$\frac{1}{2}$
Floor, claystone, soft, smooth.			
Total thickness of bed-----	3		4
Thickness of sample-----	2		11

$\frac{1}{2}$  Not included in sample.

Lease No. 113, Adit No. 2, H. M. Habibullah Co.

Analysis F-58292. Subbituminous A coal, from Lease No. 113, Adit No. 2, H. M. Habibullah Co., 7,500 feet above sea level, 12 miles east of Quetta. Coal bed, middle bed; dip 50°, strike N 50° W; cover at point sampled 300 feet. A channel sample of fresh coal from slope No. 5, level No. 2, end of level. The bed was measured and sampled by John A. Reinemund, U.S.G.S., September 25, 1957, as described below:

Section in bed in Lease No. 113, Adit No. 2, H. M. Habibullah Co.

Laboratory No-----	F-58292	
Roof, claystone.	<u>Ft</u>	<u>in.</u>
Claystone, brownish gray, carbonaceous-----		$\frac{1}{4}+$
Coal, bright, attrital, sheared-----		5 1/2
Coal, mottled, attrital, friable-----	3	9 1/2
Claystone, medium gray, soft-----		$\frac{1}{2}+$
Floor, claystone, soft, smooth.		
Total thickness of bed-----	4	9+
Thickness of bed-----	4	3

1/ Not included in sample.

Lease No. 102, New area Adit No. 12, Eastern Baluchistan Coal Trading Co.

Analysis F-61502. Subbituminous A coal, from New area Adit No. 12. Eastern Baluchistan Coal Trading Co., a slope mine, 7,400 feet above sea level, 20 miles southeast of Quetta. Coal bed, top bed; dip 45° SW, strike N 20° W; cover at point sampled 300 feet. A channel sample of fresh coal in face of slope from adit, about 400 feet from portal. The bed was measured and sampled by John A. Reinemund, U.S.G.S, and L. F. Trenczak, United Nations, October 15, 1957, as described below:

Section in bed in New area Adit No. 12, Eastern Baluchistan Coal Trading Co.

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Laboratory No----- F-61502

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Roof, claystone.	<u>Ft</u>	<u>in.</u>
Claystone, carbonaceous-----	$\frac{1}{2}+$	
Coal, banded, fusainous, and clayey-----		10
Coal, bright, friable-----	1	
Coal and clay, interbedded-----		$\frac{1}{4}$
Claystone, carbonaceous-----	$\frac{1}{2}$	3
Coal, dull, fusainous-----	1	4
Claystone, carbonaceous-----		$\frac{1}{2}+10+$
Floor, claystone, soft.		
Total thickness of bed-----	6	7+
Thickness of sample-----	3	2

---

1/2 Not included in sample.



Lease No. 18, Adit No. 2, Eastern Baluchistan Coal Trading Co.

Analysis F-61503. Subbituminous A coal, from Lease No. 18, Adit No. 2, Eastern Baluchistan Coal Trading Co., 7,400 feet above sea level, 20 miles southeast of Quetta. Coal bed, top bed; dip 43° SW, strike N 24° W; cover at point sampled 300 feet. A channel sample of fresh coal in face of slope from left drift off adit, 200 feet from portal. The bed was measured and sampled by John A. Reinemund, U.S.G.S, and L. F. Trenczak, United Nations, October 15, 1957, as described below:

Section in bed in Lease No. 18, Adit No. 2, Eastern Baluchistan  
Coal Trading Co.

Laboratory No-----	F-61503	
Roof, claystone, sheared.	<u>Ft</u>	<u>in.</u>
Claystone, soft, with coal lenses-----	$\frac{1}{2}$ 1	3+
Coal, bright, attrital-----	2	0
Clay, soft-----		$\frac{1}{2}$ 1/4
Coal, bright, attrital-----	1	2
Claystone, carbonaceous-----		$\frac{1}{2}$ 2+
Floor, claystone, smooth.		
Total thickness of sample-----	4	7 1/4+
Thickness of bed-----	3	2

$\frac{1}{2}$  Not included in sample.

Lease No. 9, Ahmadyar Adit, Gilani Coal Co.

Analysis F-61504. Subbituminous A coal, from Ahmadyar Adit, Lease No. 9, Gilani Coal Co., 6,600 feet above sea level, 25 miles southeast of Quetta. Coal bed, lower part of middle bed; dip irregular SW, strike N 40° W; cover at point sampled 300 feet. A channel sample of fresh coal from face of slope from first left entry. The bed was measured and sampled by John A. Reinemund, U.S.G.S., and L. F. Trenczak, United Nations, October 17, 1957, as described below:

Section in bed in Ahmadyar Adit, Lease No. 9, Gilani Coal Co.

Laboratory No-----	F-61504	
Roof, claystone.	<u>Ft</u>	<u>in.</u>
Claystone, carbonaceous-----		1/1
Claystone, soft, plastic-----		1/9
Coal, faintly banded, attrital, blocky-----		9
Coal, not banded, friable, mottled-----	1	8
Coal, faintly banded, attrital, blocky-----		6
Claystone, carbonaceous-----		1 1/2
Floor, claystone, soft.		
Total thickness of bed-----	3	10 1/2
Thickness of sample-----	2	11

1/ Not included in sample.

Lease No. 9, Ahmadyar Adit, Gilani Coal Co.

Analysis F-61505. Subbituminous A coal, from Ahmadyar Adit, Lease No. 9, Gilani Coal Co., 6,600 feet above sea level, 25 miles southeast of Quetta. Coal bed, upper part of middle bed; dip irregular SW, strike N 40° W; cover at point sampled 300 feet. A channel sample of fresh coal from face of slope from first left entry. The bed was measured and sampled by John A. Reinemund, U.S.G.S., and L. F. Trenczak, United Nations, November 20, 1957, as described below:

Section in bed in Ahmadyar Adit, Lease No. 9, Gilani Coal Co.

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Laboratory No----- F-61505

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Roof, claystone, soft.	<u>Ft</u>	<u>in.</u>
Claystone, soft, plastic-----		$\frac{1}{2}$ 2+
Coal, not banded, fusainous-----		4
Coal, faintly banded, attrital-----	1	8
Coal, not banded, fusainous-----	1	3
Claystone, carbonaceous-----		$\frac{1}{2}$ 1
Floor, claystone, soft.		
Total thickness of bed-----	3	6
Thickness of sample-----	3	3

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1/2 Not included in sample.

Lease No. 9, Longwall Mine, Gilani Coal Co.

Analysis F-61506. Subbituminous A coal, from Longwall Mine, Lease No. 9, Gilani Coal Co., 6,400 feet above sea level, 25 miles southeast of Quetta. Coal bed, top bed ; dip 35° SW, strike N 18° W; cover at point sampled 300 feet. A channel sample of fresh coal in face of left entry, 30 feet from Slope No. 1, about 400 feet from portal of Adit No. 3. The bed was measured and sampled by John A. Reinemund, U.S.G.S., October 17, 1957, as described below:

Section in bed in Longwall Mine, Lease No. 9, Gilani Coal Co.

Laboratory No-----	F-61506	
Roof, claystone, soft.	<u>Ft</u>	<u>in.</u>
Claystone, soft, plastic-----		1/2+
Coal, not banded, fusainous-----	2	6
Claystone, carbonaceous-----		1/2+
Floor, claystone, soft.		
Total thickness of sample-----	2	10+
Thickness of bed-----	2	6

1/ Not included in sample.

Lease No. 58B, Pak Khazina Mine, H. M. Habibullah Co.

Analysis C-39307. Subbituminous A coal, from Pak Khazina Mine, Lease No. 58B, H. M. Habibullah Co., an adit and slope mine, 7,500 feet above sea level, 10 miles east of Quetta. Coal bed, lower bed; dip 50°, strike N 38° W; cover at point sampled 450 feet. A channel sample of fresh coal in No. 2 slope from right entry; left entry, 50 feet off slope, about 400 feet from portal. The bed was measured and sampled by John A. Reinemund, U.S.G.S., and S. Tayyab Ali, G.S.P., July 1, 1959, as described below:

Section in bed in Pak Khazina Mine, Lease No. 58B, H. M. Habibullah Co.

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Laboratory No-----	G-39307
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Roof, claystone, soft.	Ft.	in.
Claystone, carbonaceous-----		$\frac{1}{3}$ 1/2
Coal, with 1/16"-1/8" shale layers-----		$\frac{1}{1}$
Coal, blocky, bright-----	2	3 1/2
Coal, clayey with shale layers-----		$\frac{1}{3}$
Siltstone, carbonaceous-----		$\frac{1}{3}$
Sandstone, fine-grained-----	$\frac{1}{15}$	0
Floor, sandstone, smooth.		
Total thickness of bed-----	3	2
Thickness of sample-----	2	3 1/2

---

1/ Not included in sample.

Lease No. 126, Muen Mine, H. M. Habibullah Co.

Analysis G-39308. Subbituminous A coal, from Muen Mine, Lease No. 126, H. M. Habibullah Co., a slope mine, 7,500 feet above sea level, 10 miles east of Quetta. Coal bed, lower bed; dip 49°, strike N 49° W; cover at point sampled 450 feet. A channel sample of fresh coal from foot of slope, 425 feet from portal. The bed was measured and sampled by M. Yar Khan, G.S.P., and John A. Reinemund, U.S.G.S., July 1, 1959, as described below:

Section in bed in Muen Mine, Lease No. 126, H. M. Habibullah Co.

Laboratory No-----	G-39308	
Roof, claystone, soft.	Ft.	in.
Claystone, soft-----	$\frac{1}{2}$	1+
Coal, bright, friable-----		1
Coal, bright, blocky-----		4
Claystone, carbonaceous-----	$\frac{1}{2}$	1
Coal, bright, blocky-----	1	0
Claystone, carbonaceous-----	$\frac{1}{2}$	6
Coal, mottled, blocky-----		3 1/2
Claystone, tough-----	$\frac{1}{2}$	1
Coal, bright, friable-----	2	10
Sandstone, very fine-grained-----	$\frac{1}{2}$	1+
Floor, sandstone, smooth.		
Total thickness of bed-----	5	2 1/2
Thickness of sample-----	4	6 1/2

$\frac{1}{2}$  Not included in sample.

Lease No. 7, Kaka Mine, Adit No. 1, United Minerals Co.

Analysis G-41355. Subbituminous A coal, from Kaka Mine, Adit No. 1, Lease No. 7, United Minerals Co., 6,400 feet above sea level, 20 miles east of Quetta. Coal bed, middle bed; dip 48° NW, strike N 25° E; cover at point sampled 300 feet. A channel sample of fresh coal from face of left entry from main adit, about 300 feet from adit. The bed was measured and sampled by John A. Reinemund, U.S.G.S., July 7, 1959, as described below:

Section in bed in Kaka Mine, Adit No. 1, Lease No. 7, United Minerals Co.

Laboratory No-----	G-41355	
<hr/>		
Roof, sandstone, wavy.	Ft.	in.
Sandstone, very fine-grained-----	$\frac{1}{2}$	2+
Coal, bright banded-----		11
Coal, clayey, powdery-----		11
Coal, bright, sheared-----	6	0
Claystone, silty-----	$\frac{1}{3}$	3+
Floor, claystone, soft.		
Total thickness of bed-----	7	10
Thickness of sample-----	7	10
<hr/>		
$\frac{1}{2}$ Not included in sample.		



Lease No. 59, Saeed Mine, H. M. Habibullah Co.

Analysis G-41356. Subbituminous B coal, from Saeed Mine, Lease No. 59, H. M. Habibullah Co., an adit, 7,500 feet above sea level, 10 miles east of Quetta. Coal bed, lower bed; dip 10°; cover at point sampled 200 feet. A channel sample of fresh coal from face of first left from first right entry off main tunnel about 1,000 feet from portal. The bed was measured and sampled by John A. Reinemund, U.S.G.S., and M. Y. Khan, G.S.P., July 21, 1959, as described below:

Section in bed in Saeed Mine, Lease No. 59, H. M. Habibullah Co.

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Laboratory No----- G-41356

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	Ft.	in.
Roof, claystone, soft.		
Claystone, soft, calcareous-----	$\frac{1}{1}$	3+
Coal, bright, faintly banded-----	2	1
Coal, dull, not banded-----	1	10
Siltstone, carbonaceous-----		$\frac{1}{1+}$
Floor, siltstone, hard, rough.		
Total thickness of bed-----	4	0
Thickness of sample-----	3	11

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$\frac{1}{1}$  Not included in sample.

Lease No. 128, Sorabjee Mine, Adit 96, Sorabjee Mining Co.

Analysis G-41357. Subbituminous B coal, from Sorabjee Mine, Adit 96, Lease No. 128, Sorabjee Mining Co., 7,500 feet above sea level, 10 miles east of Quetta. Coal bed, lower bed; dip 30° NW, strike N 35° E; cover at point sampled 200 feet. A channel sample of fresh coal from face of first right entry from slope, about 250 feet from portal. The bed was measured and sampled by John A. Reinemund, U.S.G.S., and M. Y. Khan, G.S.P., July 21, 1959, as described below:

Section in bed in Sorabjee Mine, Adit 96, Lease 128, Sorabjee Mining Co.

Laboratory No-----	G-41357
Roof, claystone, soft.	Ft. in.
Claystone, coaly, soft-----	$\frac{1}{1+}$
Clay, light gray, plastic-----	$\frac{1}{1/4}$
Coal, mottled, sheared-----	3 10
Siltstone, light gray, hard-----	$\frac{1}{6}$
Floor, siltstone, hard, rough.	
Total thickness of bed-----	3 10 $\frac{1}{4}$
Thickness of sample-----	3 10

$\frac{1}{-}$  Not included in sample.

Lease No. 6, Hafiz Mine, H. M. Habibullah Co.

Analysis H-10248. Subbituminous A coal, from Hafiz Mine, Lease No. 6, H. M. Habibullah Co., an adit, 6,365 feet above sea level; 32 miles southeast of Quetta. Coal bed, bottom; dip 45° W, strike, north; cover at point sampled 200 feet. A channel sample of fresh coal, from adit level, 775 feet north of adit in entry along bottom bed. The bed was measured and sampled by John A. Reinemund, U.S.G.S., March 27, 1961, as described below:

Section in bed in Hafiz Mine, H. M. Habibullah Co.

Laboratory No-----	H-10248
Roof, claystone, soft.	Ft. in.
Coal, faintly banded-----	8 1/2
Claystone, carbonaceous-----	1/3
Coal, attrital-----	1 2
Sandstone, fine-grained-----	1/3+
Floor, sandstone, smooth, hard.	
Total thickness of bed-----	2 1 1/2
Thickness of sample-----	1 10 1/2

<sup>1/</sup> Not included in sample.

# Khost-Sharig-Harnai coal field

Mine name, unknown; Operator, unknown

Analysis H-78952. High-volatile B bituminous coal from a mine (name unknown), a shaft mine, 4,000 feet above sea level, in SOP sheet 34 N/12; 720, 100 yards N; 2,970, 800 yards E, 0.8 miles east of Sharig rail station. Coal bed unnamed; dip 20° S., strike E-W; cover at point sample 50 feet. The bed was measured and sampled by R. L. Harbour, U.S.G.S., April 10, 1964, as described below:

## Section in bed in unnamed mine

Laboratory No-----	H-78952	
Roof, claystone.	<u>Ft.</u>	<u>in.</u>
Coal-----	1	6
Floor, claystone.		
Thickness of bed-----	1	6
Thickness of sample-----	1	6

# Ihsan and Sons Mine

Analysis H-78951. High-volatile bituminous B coal, from Ihsan and Sons Mine, a meandering drift, 3,710 feet above sea level, in Survey of Pakistan topographic sheet 34 N/12; 720, 50 yards N; 2,964, 350 yards E, 3 miles from Sharig rail station. Dip 56° N (overturned), strike E-W; cover at point sampled 80 feet. The bed was measured and sampled by R. L. Harbour, U.S.G.S., April 10, 1964, as described below.

## Section in bed in Ihsan and Sons Mine

Laboratory No-----	H-78951	
Roof, hard claystone*.	<u>Ft.</u>	<u>in.</u>
Coal (0.4 to 1.5 feet)-----	1	0
Claystone-----	$\frac{1}{2}$	0
Coal-----	1	0
Shale-----	$\frac{1}{1}$	
Coal-----		5
Claystone-----	$\frac{1}{4}$	
Coal-----		2
Floor, claystone.		
Total thickness of bed-----	5	0
Total thickness of sample-----	2	7

$\frac{1}{1}$  Not included in sample.

\* Beds are stratigraphically inverted.

Roghani Mine, Pakistan Industries

Analysis H-78949. High-volatile B bituminous coal from Roghani Mine, Pakistan Industries, an incline along bed, 3,700 feet above sea level, in Survey of Pakistan topographic sheet 34 N/16 717, 100 yards N; 2,980, 300 yards E, 2.2 miles northwest of Nakus. Unnamed coal bed; dip 30°, strike N 55° W; cover at point sampled 75 feet. The bed was measured and sampled by R. L. Harbour, U.S.G.S., April 11, 1964, as described below:

Section in bed in Roghani Mine, Pakistan Industries

Laboratory No-----	H-78949	
Roof, claystone.	<u>Ft.</u>	<u>in.</u>
Coal-----	2	7
Floor, claystone.		
Total thickness of bed-----	2	7
Total thickness of sample-----	2	7

# Nakus No. 1, Pakistan Industries

Analysis H-78948. High-volatile B bituminous coal (<48% F. C.), Nakus district, from Nakus No. 1 Mine, Pakistan Industries, a horizontal drift, 3,400 feet above sea level in Survey of Pakistan topographic sheet 34 N/16; 710, 980 yards N; 2,979, 730 yards E, 3 miles southwest of Nakus. Coal bed, Mangals; dip 50° S, strike N 70° W; cover at point samples 150 feet. The bed was measured and sampled by R. L. Harbour, U.S.G.S., April 11, 1964, as described below:

## Section in bed in Nakus No. 1 Mine, Pakistan Industries

Laboratory No-----		H-78948	
Roof, claystone, hard.		<u>Ft.</u>	<u>in.</u>
Coal-----	1		1
Claystone-----	0		$\frac{1}{8}$
Coal-----			2
Limestone-----			$\frac{1}{1}$
Coal-----			10
Claystone-----			$\frac{1}{3}$
Coal-----			1
Floor, claystone.			
Total thickness of bed-----	3		2
Total thickness of sample-----	2		2

$\frac{1}{8}$  Not included in sample.



# Nakus No. 4, Pakistan Industries

Analysis H-78947. High-volatile C bituminous coal, from Nakus No. 4 mine, Pakistan Industries, an adit normal to strike, 3,300 feet above sea level, in Survey of Pakistan topographic sheet 34 N/16; 711, 370 yards N; 2,979, 770 yards E, 3 miles southwest of Nakus. Coal bed, unnamed; dip 60° N, strike N 70° W; cover at point sampled 100 feet. The bed was measured and sampled by R. L. Harbour, U.S.G.S., April 11, 1964, as described below:

## Section in bed in Nakus No. 4 Mine, Pakistan Industries

Laboratory No-----	H-78947	
Roof, claystone.	<u>Ft.</u>	<u>in.</u>
Coal-----	0	6
Claystone-----		$\frac{1}{2}$
Coal-----		5
Claystone-----		$\frac{1}{2}$
Coal-----		6
Floor, claystone.		
Total thickness of bed-----	1	9
Total thickness of sample-----	1	5

$\frac{1}{2}$  Not included in sample.

Nukershela Mine, Pakistan Industries

Analysis H-78953. High-volatile B bituminous coal, from Nukershela Mine, Pakistan Industries, drift along bed, 3,500 feet above sea level, in Survey of Pakistan Topographic sheet 34 N/16; 716, 230 yards N; 2,981, 600 yards E, 1.3 miles northwest of Nakus. Coal bed unnamed; dip  $26^{\circ}$  S, strike  $N 55^{\circ} W$ ; cover at point sampled 75 feet. The bed was measured and sampled by R. L. Harbour, U.S.G.S., April 11, 1964, as described below:

Section in bed in Nukershela Mine, Pakistan Industries

Laboratory No.-----	H-78953	
Roof, claystone.	<u>Ft.</u>	<u>in.</u>
Coal-----	1	10
Floor, claystone.		
Total thickness of bed-----	1	10
Total thickness of sample-----	1	10

Old Zardalu Mine, Progressive Mining Co.

Analysis H-78955. High-volatile bituminous A coal (< 48% F. C.), from Old Zardalu Mine, Progressive Mining Co., an incline, 4,550 feet above sea level, in Survey of Pakistan topographic sheet 34 N-11; 730, 200 yards N; 2,949, 300 yards E, 0.7 mile west of Zardalu. Coal bed, Zardalu; dip 40°, strike N 45° W; cover at point sampled 100 feet. The bed was measured and sampled by R. L. Harbour, U.S.G.S., April 9, 1964, as described below:

Section in bed in Old Zardalu Mine, Progressive Mining Co.

Laboratory No-----	H-78955	
Roof, claystone.	<u>Ft.</u>	<u>in.</u>
Coal-----	1	5
Claystone-----		$\frac{1}{10}$
Coal-----	1	0
Claystone-----		$\frac{1}{5}$
Coal-----		2
Floor, sandy claystone.		
Total thickness of bed-----	3	10
Thickness of sample-----	2	7

$\frac{1}{10}$  Not included in sample.

# Tor Ghar Mine, Pakistan Industries

Analysis H-78954. High-volatile C bituminous coal (<48% F. C.), from Tor Ghar Mine, Pakistan Industries, a winding incline along bed in Survey of Pakistan Topographic sheet 34 N/16; 780 yards N; 2,987, 200 yards E, 4 miles southeast of Nakus. Coal bed, top(?); dip 83° N, strike N 80° W; cover at point sampled 40 feet. The bed was measured and sampled by R. L. Harbour, U.S.G.S., April 12, 1964, as described below:

## Section in bed in Tor Ghar Mine, Pakistan Industries

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Laboratory No-----	H-78954
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Roof, sandstone.	<u>Ft.</u>	<u>in.</u>
Shale-----	0	$\frac{1}{7}$
Coal-----	1	0
Claystone-----		$\frac{1}{1}$
Coal-----		3
Claystone-----		$\frac{1}{2}$
Coal-----		$\frac{1}{2}$
Claystone-----		$\frac{1}{3}$
Dirty coal-----		$\frac{1}{1}$
Floor, claystone.		
Total thickness of bed-----	2	7
Thickness of sample-----	1	3

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$\frac{1}{7}$   
Not included in sample.

Nakus No. 2 Mine, Pakistan Industries

Analysis H-78946. High-volatile B bituminous coal (<48% F. C.), from Nakus No. 2 Mine, Pakistan Industries, level drift along bed, 3,700 feet above sea level, in Survey of Pakistan topographic sheet 34 N/16; 710, 700 yards N; 2,979, 400 yards N; 3 miles southwest of Nakus rail station. Coal bed, middle bed(?); dip 50° S, strike N 70° W; cover at point sampled 100 feet. The bed was measured and sampled by R. L. Harbour, U.S.G.S., April 11, 1964, as described below:

Section in bed in Nakus No. 2 Mine, Pakistan Industries

Laboratory No-----	H-78946
Roof, claystone.	<u>Ft.</u> <u>in.</u>
Coal-----	0      8
Claystone-----	1/10
Coal-----	1/1
Claystone-----	1/1
Coal-----	1/2
Claystone-----	1/1
Coal-----	1/3
Floor, claystone.	
Total thickness of bed-----	2      2
Thickness of sample-----	0      8

1/ Not included in sample.

Lease 105, Mining Industry of Pakistan

Analysis H-67080. High-volatile A bituminous coal, from Lease 105, Mining Industry of Pakistan, 4,000 feet above sea level. Coal bed, unnamed; dip 30°; cover at point sampled 100 feet. The bed was measured and sampled by D. P. Schlick, U.S.B.M., November 15, 1963 as described below:

Section in bed in Lease 105, Mining Industry of Pakistan

Laboratory No-----	H-67080	
Roof, shale (?).	<u>Ft.</u>	<u>in.</u>
Shale-----	0	$\frac{1}{1}$
Coal-----	1	6
Floor (?).		
Total thickness of bed-----	1	7
Thickness of sample-----	1	6
<u>1/</u> Not included in sample.		

Lease 104A, Mining Industry of Pakistan

Analysis H-67081. High-volatile B bituminous coal from Lease 104A, Mining Industry of Pakistan, a drift, 4,000(?) feet above sea level, 5 miles from Khost. Dip 30°; cover at point sampled 150 feet. The bed was measured and sampled by D. P. Schlick, U.S.B.M., November 15, 1963, as described below:

Section in bed in Lease 104A, Mining Industry of Pakistan

Laboratory No-----	H-67081
Roof, shale.	<u>Ft.</u> <u>in.</u>
Shale-----	0 $\frac{1}{2}$
Coal-----	1   7
Floor, soft.	
Total thickness of bed-----	1   9
Thickness of sample-----	1   7

$\frac{1}{2}$  Not included in sample.



# Ali Corporation Mine

Analysis H-67079. High-volatile C bituminous coal, from Ali Corporation Mine 3,500 feet above sea level, 2 miles from Sharig. Cover at point sampled is 20 feet. The bed was measured and sampled by D. P. Schlick, U.S.B.M., November 15, 1963, as described below:

## Section in bed in Ali Corporation Mine

Laboratory No-----	H-67079	
Roof, shale.	<u>Ft.</u>	<u>in.</u>
Shale-----	0	$\frac{1}{5}$
Coal-----	1	8
Floor, soft.		
Total thickness of bed-----	2	1
Thickness of sample-----	1	8

1/ Not included in sample.

Adina Mine, Commercial Coal Corp.

Analysis H-38240. High-volatile A bituminous coal, from Adina Mine, Commercial Coal Corp., 150-foot incline, 5,824 feet above sea level, in Survey of Pakistan topographic sheet 34 N/7, coordinates 738, 900 yards N; 2,942, 500 yards E, 9 miles from Zardalu. Coal bed, northern (bottom?); dip 40° SW, strike N 68° W; cover at point sampled 80(?) feet. The bed was measured and sampled by R. L. Harbour, U.S.G.S., September 7, 1962, as described below:

Section in bed in Adina Mine, Commercial Coal Corp.

Laboratory No-----		H-38240	
Roof, claystone.		<u>Ft.</u>	<u>in.</u>
Coal-----		0	8
Claystone-----			$\frac{1}{3}$
Coal-----			8
Floor, soft.			
Total thickness of bed-----		1	7
Thickness of sample-----		1	4

$\frac{1}{3}$  Not included in sample.

Lease No. 61, Pakistan Industrial Development Corp.

Analysis G-79324. High-volatile C bituminous coal, from Lease No. 61, Pakistan Industrial Development Corp.; a slope mine, 3,835 feet above sea level, 2 1/2 miles northeast of Sharig. Coal bed unknown; dip 85°, strike N 30° E, cover at point of sample 75 feet.

The bed was measured and sampled by S. Qamar Raza, G.S.P., and Frank D. Spencer, U.S.G.S., April 24, 1960, as described below:

Section in bed in Lease No. 61, Pakistan Industrial Development Corp.

Laboratory No-----	G-79324	
Roof, clay, hard, rough.	<u>Ft.</u>	<u>in.</u>
Coal-----	1	2
Clay-----		$\frac{1}{2}$
Coal-----		5
Clay-----		$\frac{1}{2}$
Coal-----		5
Floor, clay, hard, rough.		
Total thickness of bed-----	2	4
Thickness of sample-----	2	0

1/  
Not included in sample.

Lease No. 56-A, Commercial Mining Co.

Analysis G-93335. High-volatile C bituminous coal, from Lease No. 56-A, Commercial Mining Co., a slope mine, 3,800 feet above sea level, 4 miles southeast of Sharig. Coal bed, unnamed; below bottom seam, dip 85° SW, strike N 55° W; cover at point sampled 45 feet. The bed was measured and sampled by Frank D. Spencer, U.S.G.S., September 26, 1960, as described below:

Section in bed in Lease No. 56-A, Commercial Mining Co.

Laboratory No-----	G-93335	
Roof, shale, hard.	<u>Ft.</u>	<u>in.</u>
Coal-----	1	2 1/2
Clay-----		1/2
Coal-----		3
Floor, shale, hard.		
Total thickness of bed-----	1	7 1/2
Thickness of sample-----	1	5 1/2

<sup>1/</sup> Not included in sample.

Lease 151, Adit No. 6, West Pakistan Industrial Development Corp.

Analysis G-93336. High-volatile B bituminous coal (48% F. C.), from Lease 151, Adit No. 6, W. P. I. D. C., a level mine, 3,900 feet above sea level, 3 miles southwest of Sharig. Coal bed, middle bed; dip 60° SW, strike N 55° W; cover at point sampled 150 feet. The bed was measured and sampled by Frank D. Spencer, U.S.G.S., September 26, 1960, as described below:

Section in bed in Lease 151, Adit No. 6, W.P.I.D.C.

Laboratory No-----	G-93336	
Roof, shale, hard.	<u>Ft.</u>	<u>in.</u>
Shale, carbonaceous-----	0	$\frac{1}{2}$ 1 1/2
Coal-----	1	8
Coal, brown, dirty-----		2 1/2
Floor, shale, hard.		
Total thickness of bed-----	2	0
Thickness of sample-----	1	10 1/2

1/  
Not included in sample.

Lease No. 151, West Pakistan Industrial Development Corp.

Analysis G-93337. High-volatile B bituminous coal, from Lease No. 151, W.P.I.D.C., a slope mine, approximately 4,000 feet above sea level, 3 miles southeast of Sharig. Coal bed, bottom bed; dip  $61^{\circ}$  SW, strike N  $47^{\circ}$  W; cover at point sampled 22 feet. The bed was measured and sampled by Frank D. Spencer, U.S.G.S., September 26, 1960, as described below:

Section in bed in bed in Lease No. 151, W.P.I.D.C.

Laboratory No-----		G-93337	
Roof, shale, hard.		<u>Ft.</u>	<u>in.</u>
Coal-----		0	2
Coal, dirty-----			1
Coal-----			6
Clay-----		$\frac{1}{1}$	$3\frac{3}{8}$
Coal-----			$1\frac{3}{4}$
Shale-----		$\frac{1}{1}$	$3\frac{3}{4}$
Coal-----			8
Shale-----		$\frac{1}{1}$	$1\frac{1}{4}$
Coal-----			2
Floor, shale, hard.			
Total thickness of bed-----		2	$1\frac{1}{8}$
Thickness of sample-----		1	$8\frac{3}{4}$

$\frac{1}{1}$  Not included in sample.

Lakhra coal field

H. M. Habibullah

Analysis H-51788. Subbituminous C coal, from H. M. Habibullah mine, a slope mine 400 feet above sea level, 5 miles from Khanot. Lailian bed. The bed was measured and sampled by D. P. Schlick, March 7, 1963, as described below:

Section in bed in H. M. Habibullah Mine

Laboratory No-----	H-51788	
Roof, shale.	<u>Ft.</u>	<u>in.</u>
Drawer slate-----	-	-
Coal-----	2	8
Claystone-----	-	-
Floor, claystone.		
Thickness of bed-----	2	8
Thickness of sample-----	2	8



# Geological Survey of Pakistan Boring L-16

Analysis H-51789. Lignite A coal, from Geological Survey of Pakistan Boring L-16, 420 feet above sea level, in Survey of Pakistan grid reference 982, 350 yards N; 2,359, 100 yards E, 16 miles to Khanot rail station. Lailian bed; horizontal; cover at point sampled 195 feet. The bed was measured and sampled by R. L. Harbour, U.S.G.S., March 9, 1963, as described below: Section in bed in GSP Boring L-16

Laboratory No-----		H-51789	
Roof, claystone.		<u>Ft.</u>	<u>in.</u>
Claystone, light gray-----		<u>2</u> /2	4
Shale, black-----		<u>2</u> /0	6
Coal-----		<u>1</u> /0	5
Claystone, dark gray-----		0	5
Coal-----		3	7
Claystone, dark gray-----		0	2
Coal-----		1	11
Floor, claystone.			
Thickness of bed-----		6	6
Thickness of sample-----		5	6

1/ Not included in sample.

2/ Not included in bed thickness.

Lailian Colliery New Incline Mine, Habibullah Mining Co.

Analysis H-45314. Subbituminous C coal, from Lailian Colliery New Incline Mine, 321 feet above sea level, in SOP grid reference 975, 600 yards N; 2,538, 700 yards E (68°08'58" E; 25°40'45" N), 12 miles from Khanot rail station. Lailian bed; horizontal; cover at point sampled 85 feet. The bed was measured and sampled by R. L. Harbour, U.S.G.S., November 30, 1962, as described below:

Section in bed in Lailian Colliery New Incline Mine, Habibullah Mining Co.

Laboratory No-----	H-45314	
Roof, claystone.	<u>Ft.</u>	<u>in.</u>
Claystone-----	-	-
Coal-----	2	1
Claystone-----	-	-
Floor, claystone.		
Thickness of bed-----	2	1
Thickness of sample-----	2	1

Lailian Colliery Mine, Habibullah Mining Co.

Analysis H-33049. Lignite B coal from Lailian Colliery Mine, a shaft mine, 316 feet above sea level, (68°09'10" E, 25°40'40"N), 24 miles northwest of Hyderabad; 11 miles from Khanot rail station. Lailian bed, horizontal; cover at point sampled 83 feet. The bed was measured and sampled by R. L. Harbour, U.S.G.S., May 3, 1962, as described below:

Section in bed in Lailian Colliery Mine, Habibullah Mining Co.

Laboratory No-----	H-33049	
Roof, claystone.	<u>Ft.</u>	<u>in.</u>
Coal-----	0	4
Claystone, gray-----	0	4
Coal-----	2	7
Floor, claystone.		
Thickness of bed-----	3	3
Thickness of sample-----	2	7

#### Baluchistan Coal Co. Mine

Analysis J-37990. Lignite A coal, from Baluchistan Coal Co. Mine, located east of Habibullah Coal Co. Mine; Lailian bed, 3 feet thick, The bed was measured and sampled by William Kebblish, U.S.B.M., November 21, 1969.

#### Indus Coal Co. Mine

Analysis J-37989. Subbituminous C coal, from Indus Coal Co. Mine, located approximately 2 miles south of Khan Coal Mine. Lailian bed, 7 feet thick. The bed was measured and sampled by William Kebblish, U.S.B.M., November 21, 1969.

#### Habibullah Coal Co. Mine

Analysis J-37987. Lignite A coal, from Habibullah Coal Co. Mine in central part of Lakhra area. Lailian bed, 5 feet thick. The bed was measured and sampled by William Kebblish, U.S.B.M., November 21, 1969.

#### Khan Coal Co.

Analysis J-37993. Lignite A coal, from Khan Coal Co. in the northern part of Lakhra field. Lailian bed, 9 feet thick. The bed was measured and sampled by William Kebblish, U.S.B.M., November 21, 1969.

Meting-Jhimpir coal field

SCM-1 Mine, Amin Agencies

Analysis H-51787. Subbituminous C (<48% F. C.) coal, from SCM-1 Mine, Amin Agencies, a slope mine, 300 feet above sea level, 5 miles from Meting. Sonhari coal bed; dip 2°; cover at point sampled, 120 feet. The bed was measured and sampled by D. P. Schlick, U.S.B.M., March 7, 1963, as described below:

Section in bed in SCM-1 Mine

Laboratory No-----	H-51787	
Roof, claystone.	<u>Ft.</u>	<u>in.</u>
Claystone-----	-	-
Coal-----	2	6
Claystone-----	-	-
Floor, soft.		
Thickness of bed-----	2	6
Thickness of sample-----	2	6

Dawood Mine, Dawood Co., Ltd.

Analysis H-51786. Subbituminous C coal, from Dawood Mine, Dawood Co., Ltd., a slope mine, 120 feet above sea level, 10 miles from Jhampir. Sonhari coal bed; horizontal; cover at point sampled, 120 feet. The bed was measured and sampled by D. P. Schlick, U.S.B.M., March 7, 1963, as described below:

Section in bed in Dawood Mine

Laboratory No-----	H-51786	
Roof, claystone.	<u>Ft.</u>	<u>in.</u>
Claystone-----	-	-
Coal-----	2	4
Floor, soft.		
Thickness of bed-----	2	4
Thickness of sample-----	2	4

Mine 14-14A, Amin Agencies

Analysis H-33721. Lignite A coal, from Mine 14-14A, Amin Agencies, a slope mine, 130 feet above sea level, 4 miles south of Meting. Sonhari coal bed; horizontal; cover at point sampled 150 feet; in galleries 1 and 2. The bed was sampled by D. P. Schlick, U.S.B.M., May 24, 1962.



Mine 1E, Amin Coal Co.

Analysis J-37992. Lignite A coal, from Mine 1E, Amin Coal Co. in northern part of Lease S.C.M. 6. Sonhari coal bed, 3 1/2 feet thick. The bed was measured and sampled by William Kebblish, U.S.B.M., November 21, 1969.

Dawood Mine 11, Dawood Co., Ltd.

Analysis J-37991. Lignite A coal, from Dawood Mine 11, Dawood Co., Ltd., in northern part of lease, sampled 200 feet from bottom. Sonhari coal bed, 2 1/2 feet thick. The bed was measured and sampled by William Kebblish, U.S.B.M., November 21, 1969.

Mine 14 C, Amin Coal Co.

Analysis J-37988. Lignite A coal, from mine 14 C, Amin Coal Co., a shaft mine. Sonhari coal bed, 20 inches thick. The bed was measured and sampled by William Kebblish, U.S.B.M., November 21, 1969.

Dawood Mine 8, Dawood Co., Ltd.

Analysis J-37986. Lignite A coal, from Dawood Mine 8, Dawood Co., Ltd., 1,000 feet in by shaft bottom. Sonhari coal bed, 2 1/2 feet thick. The bed was measured and sampled by William Kebblish, U.S.B.M., November 21, 1969.

Muzaffarabad (Azad Kashmir) occurrence

Unnamed mine, Medina Trading Co.

Analysis G-39306. Anthracite, from an unnamed mine, Medina Trading Co. a drift mine, approximately 4,000 feet above sea level, 2 miles east of Muzaffarabad. Unnamed coal bed of Eocene age; average dip  $30^{\circ}$  N, strike E-W; cover at point sampled, 60 feet; from face, 50 feet from portal. The bed was measured and sampled by John A. Reinemund and F. D. Spencer, U.S.G.S., July 16, 1959, as described below:

Section in bed in unnamed mine

Laboratory No-----	G-39306	
Roof, limestone.	<u>Ft</u>	<u>in.</u>
Coal-----	7	5
Floor, claystone.		
Thickness of bed-----	7	5
Thickness of sample-----	7	5

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