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AN INVESTIGATION OF THE COAL RESERVES IN THE OZARKS SECTION OF OKLAHOMA AND THEIR POTENTIAL USES

Final Report

To the Ozarks Regional Commission

July 10, 1974

by

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Principal Investigator

This technical assistance study was accomplished by professional consultants under contract with the Ozarks Regional Commission. The statements, findings, conclusions, recommendations, and other data in this report are solely those of the Contractor and do not necessarily reflect the views of the Ozarks Regional Commission.

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PREFACE

This is the seventh and final report to the Ozarks Regional Commission on the coal reserves of the Ozarks Section of Oklahoma and their potential uses. It includes and expands upon information previously presented to the Commission in six progress reports for the periods July 1, 1971-January 1, 1972; January 1, 1972 - May 1, 1972; July 1-December 31, 1972; January 1-May 1, 1973; the first annual report for the period July 1, 1971-June 30, 1972; and the second annual report for July 1, 1972-June 30, 1973. Extensions in time granted to March 1, 1974, and June 10, 1974, are gratefully acknowledged.

All data are updated to January 1, 1974, in this final report.

SUMMARY REPORT

This is a summary of the final report, "An Investigation of the Coal Reserves in the Ozarks Section of Oklahoma and Their Potential Uses."

The investigation was undertaken to reevaluate the knowledge of the State's coal resources and to show in a report the details of these resources, such as the quantity of the original, remaining, and recoverable reserves and their identification by coal bed, county, depth, thickness, amenability to surface mining, classification by rank, sulfur content, and potential uses.

The basic results of the investigation are that 24 bituminous coal beds covering 1.5 million acres in 19 counties in eastern Oklahoma once contained 7.7 billion short tons of original coal resources, of which 7.2 billion remains. Approximately 0.5 billion tons has been mined and lost in mining during the past 100 years of commercial coal development in Oklahoma.

Of the 7.2 billion tons of remaining coal resources, 3.8 billion is recoverable reserves, of which 2.3 billion is net recoverable reserves--that is, reserves that are recoverable within certain geologic, engineering, socio-economic, economic, and political limitations or regulations.

Of the 2.3 billion tons of net recoverable coal reserves, 1.3 billion is suitable for coke manufacture, 657 million is suitable for electric-power generation (without limits on sulfur content), and 240 million is suitable for gasification (within limits on sulfur, ash, and carbon content). Statistical details are in the section on coal resources and in the large Appendix containing 57 tables of data on coal reserves and mined coal.

Of the 7.2 billion short tons of remaining coal resources, 684 million is strippable, of which 496 million is net recoverable. Thus, 6.5 billion tons of remaining coal resources is amenable to underground mining only.

The principal uses of Oklahoma coal in 1973 were for electric-power generation, coke manufacture, and metallurgical purposes. Cement manufacturers have used Oklahoma coal in 1974, but the electric utilities and the iron and steel industry will continue to use most of the State's annual production in the next few years. Gasification, liquefaction, or chemical plants could become major consumers of Oklahoma's coal by 1984.

The most favorable of four possible sites for a proposed gasification plant that would produce 500 million cubic feet daily of pipeline-quality (975-Btu) methane gas is on Lake Eufaula in central Pittsburg County, which would be within 50 miles of the suitable reserves. An illustrated, detailed discussion is given in the section on gasification under Coal Resources in this report.

Based on individual company reports, the weighted average cost of mining a ton of coal in Oklahoma in 1973 was $6.91, the cost of cleaning most of the coal produced was $0.40 per ton, and the weighted average selling price was $9.05 a ton. The weighted average cost of reclaiming the strip-mined areas was $0.76 per ton or $1,457 per acre. Additional economic aspects are included in the Coal Economics section.

The following conclusions have been synthesized or deduced from the findings given in the text, tables, and illustrations of this report.

1. This investigation has demonstrated that the quantity of original and remaining coal resources in Oklahoma as of January 1, 1974, are twice those estimated in the previous Statewide study completed 22 years ago.

2. Of the 7.2 billion short tons of remaining coal resources in Oklahoma, 9 percent is strippable with present technology.

3.a. The average cost of underground coal production would be approximately 61 percent greater than that of surface coal production in Oklahoma at present.
b. This greater cost percentage is the main reason that 100 percent of the coal produced in Oklahoma in 1973 was at surface mines.

4.a. Of the remaining coal resources, 32 percent is considered net recoverable because of existing engineering, socio-economic, economic, and political limitations or regulations.
b. Therefore, the percentage of net recoverable reserves will change as these regulations change.

5. Of the remaining coal resources, only 7 percent is net recoverable by surface mining.

6. Of the net recoverable reserves, 22 percent is strippable.

7. Of the net recoverable reserves, 60 percent is suitable for coke manufacture, 29 percent for electric-power generation, and 11 percent for gasification.

8. Of the net recoverable reserves suitable for coke manufacture, 12 percent is strippable; of the net recoverable reserves suitable for electric-power generation, 43 percent is strippable; and of the net recoverable reserves suitable for gasification, 19 percent is strippable and 81 percent must be mined by underground methods.

9. If the limitations were changed on impurities covering the bituminous-coal reserves suitable for gasification in Oklahoma (to permit sulfur content to range from 2.5-4.5 percent and ash content from 9-15 percent), then additional reserves of coal would be suitable for gasification and could be mined by surface methods.

10.a. The weighted average sulfur content of the original and remaining coal resources of Oklahoma is 2.2 percent; that of the remaining strippable resources, 2.9 percent; and that of the 1973 coal produced and, in part, cleaned, 2.8 percent.

b. Thus the weighted average sulfur content of coal reserves and coal produced in Oklahoma is lower than that of bituminous coal in Illinois, Indiana, Iowa, Kansas, western Kentucky, Missouri, and Ohio.

11. The average cost of surface-mining a ton of coal in Oklahoma is higher than the average in other coal-producing states; costs of cleaning coal and reclaiming mined land probably are less, however, than the average costs in other states.

12. The quality of Oklahoma's bituminous coal is better than that of the average bituminous coal in most other states, which is reflected in a typically higher average selling price.

13. Oklahoma's abundant coal reserves could supply a large part of the fuel necessary to generate electricity in the State if well-designed preparation plants were to reduce the sulfur and ash content of the mined coals, if successful SO_2 and particulate-matter (flyash) removal systems were to be installed and function properly in some of the State's new and proposed electric-power-generating plants, or if the sulfur limits imposed by statute were raised to 2.8 percent for coal of 12,000-Btu content.

14.a. More than one future coke plant, iron smelter, or steel mill could be supplied with coking and metallurgical coal that could be produced at future surface and underground mines in Le Flore and Haskell Counties.

b. A feasible location for such plants would be the Arkansas River valley adjacent to the coal deposits.

15.a. In spite of the incentives of rapidly increasing coal-selling prices, new coal markets, and increasing demand for all qualities of coal that is abundant in Oklahoma, the capital investment and general business activity necessary to attract new companies, to construct new mines, and to expand present operations have not been forthcoming at a noticeable rate.

b. This is probably due to uncertain economic and political conditions, uncertain Federal mining and reclamation policies, and difficulties encountered by coal operators in readily obtaining additional equipment, replacement parts, railroad coal-hopper cars, and qualified, experienced coal miners and mining engineers.

INTRODUCTION

Purpose and Scope of Investigation

The purpose of the coal-investigation project was to obtain, evaluate, and provide basic information in a detailed report to the Ozarks Regional Commission on the bituminous-coal resources and recoverable reserves of Oklahoma and their potential uses. A subordinate but integral part of the investigation was the determination of the quantity, quality, and location of recoverable coal reserves suitable for gasification by a modified solvent-refined process that is part of a State- and federally-sponsored feasibility study by Gulf General Atomic Corporation, of San Diego, and Stone and Webster Engineering Corporation, of Boston.

Included in the basic coal-resources project is the separation of the strippable and nonstrippable resources, or that coal that can be mined by surface methods and that coal that can be mined by underground methods. Air- and water-pollution regulations make it desirable also to indicate the total sulfur content of the coal resources by county and by coal bed. Additional categories of coal resources are (1) thickness and depth of coal bed within the three fundamental categories of reliability of remaining coal resources and (2) recoverable reserves--namely, measured, indicated, and inferred.

Proximate analysis permits a coal to be classified by rank. Therefore, numerous proximate analyses were used to segregate the coal resources by rank. Rank is directly related to the volatile matter and fixed carbon in coal, and it is indirectly related in some cases to the sulfur content of coal. These factors and others determine the potential use of the coal.

The results of this investigation are directly related to local, State, and national energy, social, economic, mining, and environmental problems. The sulfur content of the reserves is stressed in this investigation as in no previous study on Oklahoma coal. An effort is also made to indicate those coal reserves that can be mined with present technology and engineering ability under present economic conditions and under present environmental regulations by adding an additional category, namely, net recoverable reserves (see section on definitions and coal-reserve tables in Appendix).

Coal resources were investigated in the major bituminous coal fields of eastern Oklahoma in 19 counties: Atoka, Coal, Craig, Creek, Haskell, Latimer, Le Flore, Mayes, McIntosh, Muskogee, Nowata, Okfuskee, Okmulgee, Pittsburg, Rogers, Sequoyah, Tulsa, Wagoner, and Washington.

Geologic Setting

The bituminous coal resources of eastern Oklahoma are in beds of Middle and Late Pennsylvanian age (270 to 300 million years old). They occur in

an area of some 8,000 square miles, which is in the southern part of the Western Region of the Interior Coal Province of the United States (Campbell, 1917) (figs. 1, 2, 3).

The Hartshorne coal is stratigraphically the lowest exploited coal bed for which resources have been determined. It is at the base of 5,500 feet of thick sequences of shales, sandstones, and thin but important coals in the Arkoma basin. This coal is present at the top of the Hartshorne Sandstone of the Krebs Group, Desmoinesian Series, Pennsylvanian System (fig. 4).

The Dawson coal is stratigraphically the highest exploited coal bed for which resources have been determined. It is in the Seminole Formation of the Skiatook Group, Missourian Series, approximately 1,000 feet or less above the basal Pennsylvanian strata in the Northeast Oklahoma shelf.

The coal-bearing rocks extend beyond the developed coal fields (figs. 2, 3) and include a total area of about 14,500 miles. The southern part of the coal region is in the Arkansas Valley section of the Interior Highland geomorphic (or physiographic) province (Fenneman, 1931), which has been divided into the Arkansas Hill and Valley belt and the McAlester Marginal Hills belt (Johnson and others, 1972, p. 3).

The Arkansas Hill and Valley belt contains broad, gently rolling plains and valleys with scattered hills 100 to 300 feet high capped by sandstones of Desmoinesian (Middle Pennsylvanian) age.

The McAlester Marginal Hills belt contains resistant sandstones, also of Desmoinesian age, that cap broad hills and mountains 300 to 2,000 feet above wide hilly plains. Structurally, this is the Arkoma basin part of the coal fields, and it is underlain by faulted and folded broad anticlines and synclines that plunge westward and southwestward. These structures have resulted in some vertical and steep dips of the coal beds in certain areas.

The Northeast Oklahoma shelf area of the coal region (fig. 5) extends into the Neosho Lowland, Claremore Cuesta Plains, and Eastern Sandstone Cuesta Plains subsections (Johnson and others, 1972, p. 3) of the Sandstone Hills section of part of the Osage Plains of the Central Lowlands (Fenneman, 1931).

The Neosho Lowland contains gently rolling shale lowlands with a few low escarpments and buttes capped by sandstones; only the western part is in the coal region.

The Claremore Cuesta Plains contains resistant sandstones and limestones of Desmoinesian and early Missourian ages, which dip gently westward, forming cuestas between broad shale plains.

The Eastern Sandstone Cuesta Plains is in the western part of the coal region. The Eastern Sandstone Cuesta Plains area differs from the northern, Claremore Cuesta Plains only in containing cuestas composed of sandstone and not limestone.

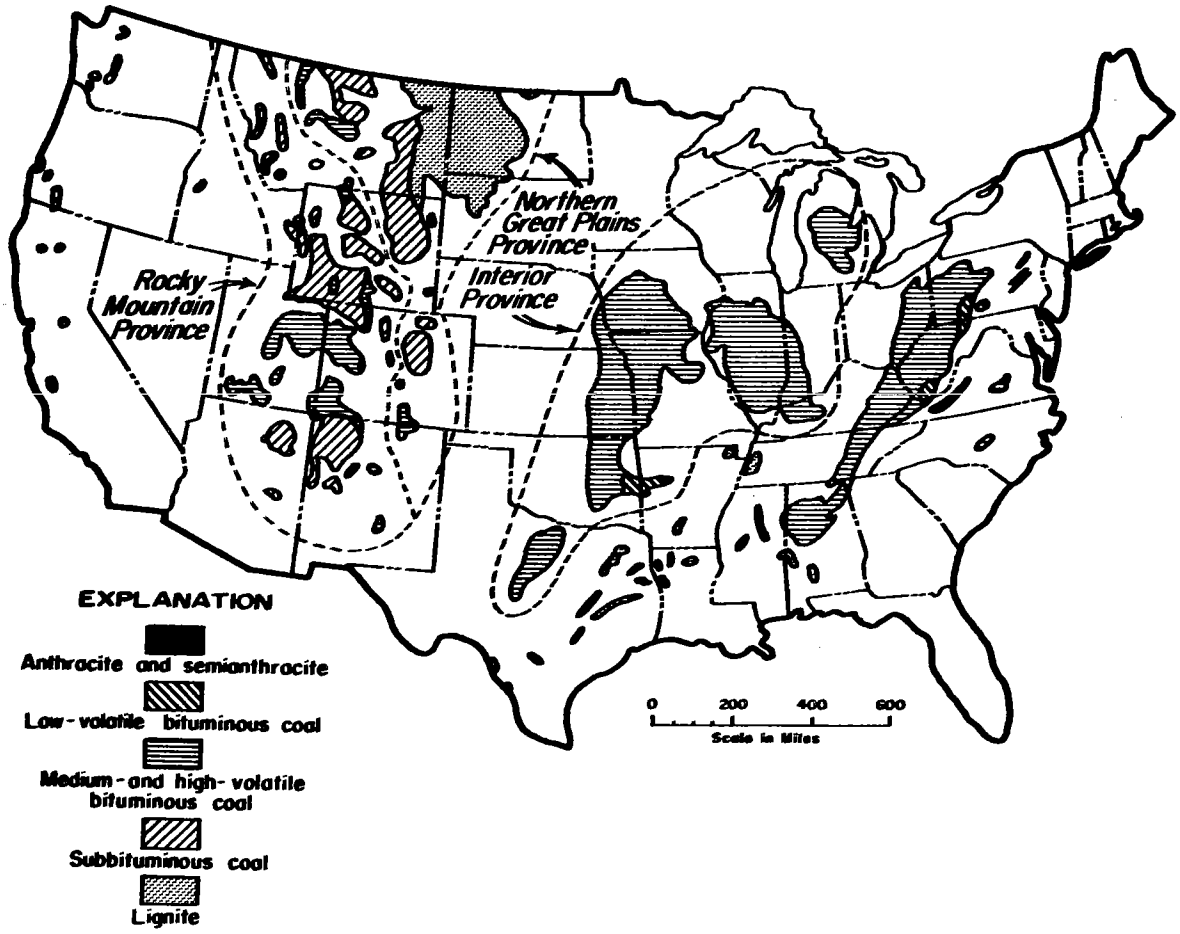

Figure 1. Map showing locations of coal fields of the contiguous United States, after Averitt (1969).

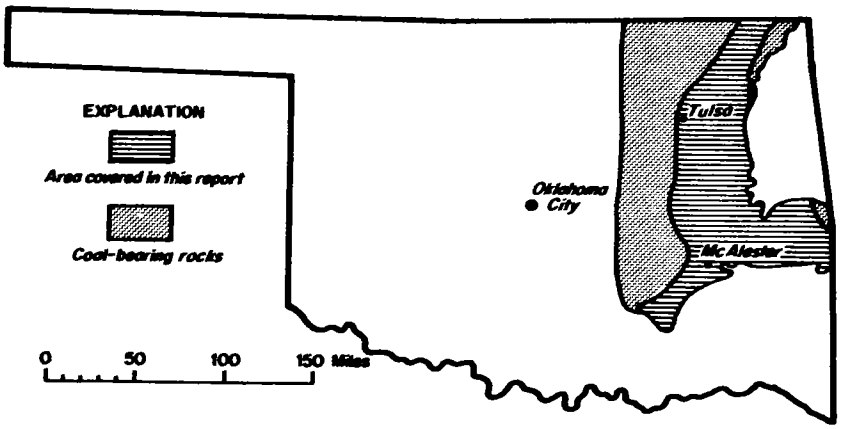

Figure 2. Index map showing the Oklahoma part of the Western Region of the Interior Coal Province.

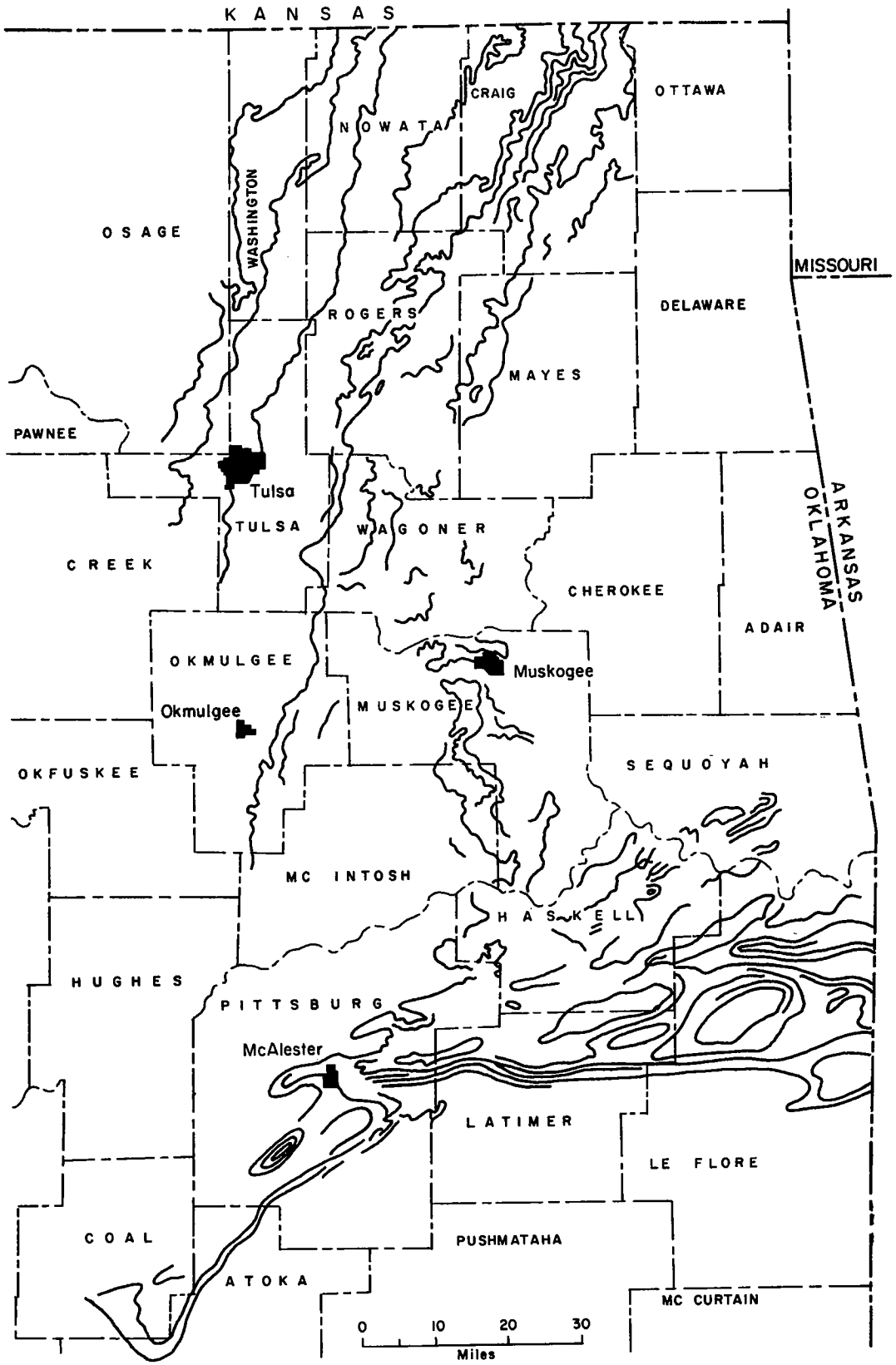

Figure 3. Index map showing approximate outcrop patterns of principal coal beds in eastern Oklahoma (modified from unpublished compilation by C. C. Branson).

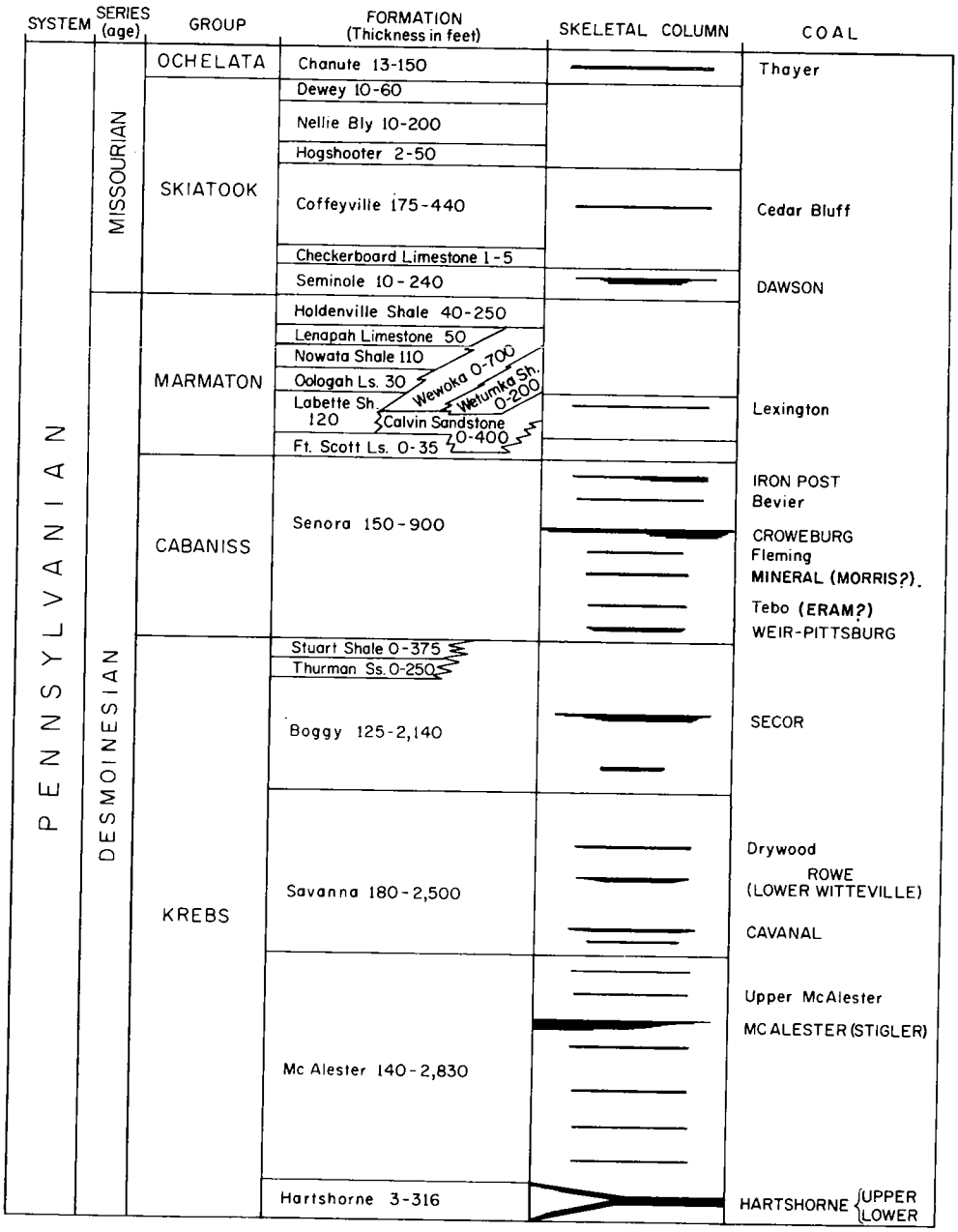

Figure 4. Generalized geologic column showing sequence of coal beds of Pennsylvanian age in Oklahoma (revised June 1974). Coal beds containing identified coal resources are shown in capitals.

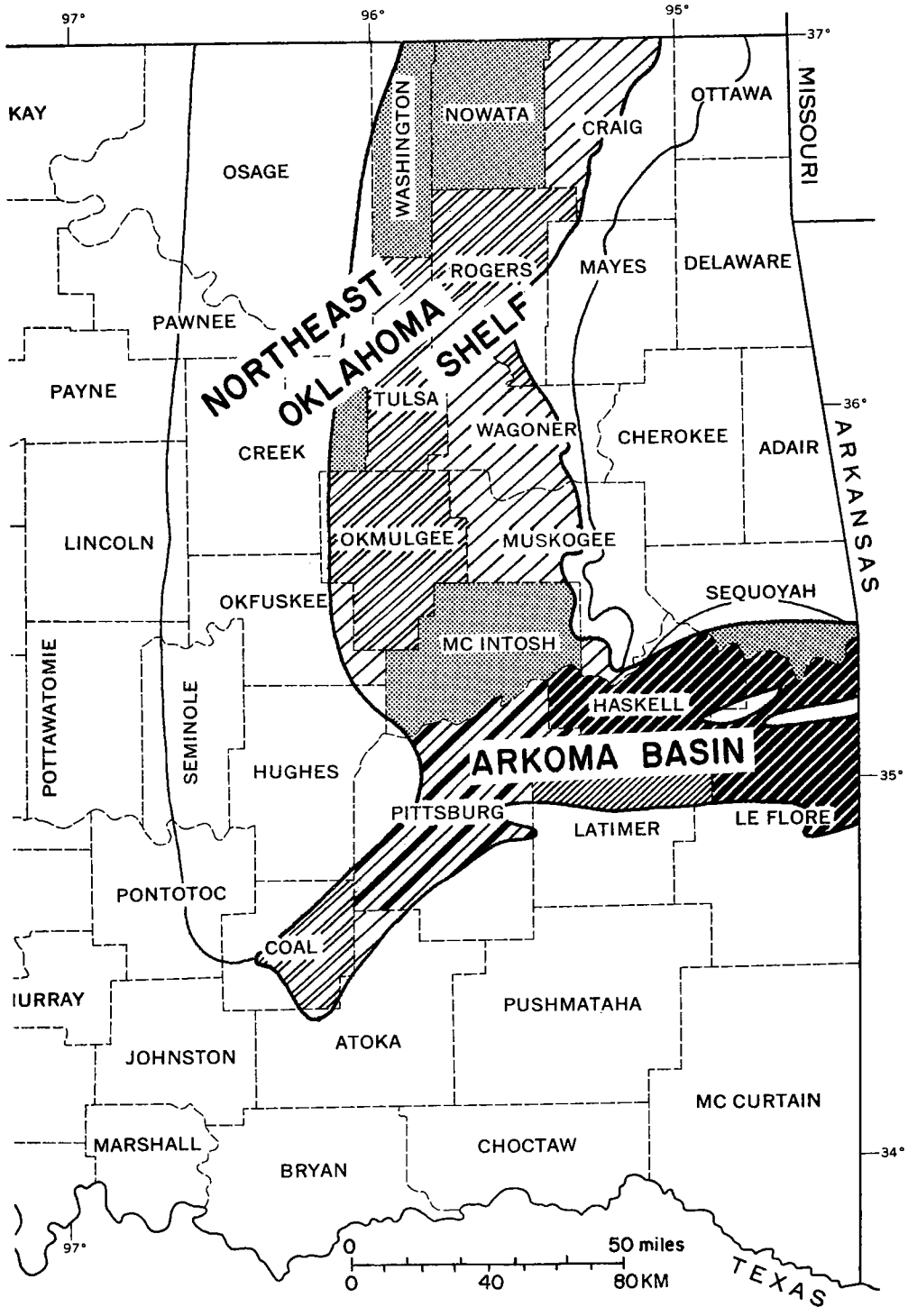

Figure 5. Map outlining boundary of the Oklahoma part of the Western Region of the Interior Coal Province and showing distribution by county of remaining resources of bituminous coal in Oklahoma (as of January 1, 1974).

The Choctaw fault forms essentially the southern boundary of the coal field and also separates the McAlester Marginal Hills belt from the Ouachita Mountains. The Ozark Plateau and the Boston Mountains lie north and east of the coal-field area. The Northeast Oklahoma shelf continues northward into Kansas.

The Arkansas, Canadian, and North Canadian Rivers flow southeastward and eastward through the coal fields and contain a few large lakes constructed by the U.S. Army Corps of Engineers.

Previous Investigations

The earliest estimate of the coal resources of Oklahoma was prepared by G. H. Ashley before 1910 from information submitted by J. A. Taff (see Senate Document 390, p. 91-115, 1910). This report showed that 3.57 billion tons of coal was present in the segregated Indian coal lands in what is now called the Arkoma basin (fig. 5). The coal resources of the unsegregated land in this basin were estimated at 11.24 billion tons for a total of approximately 15 billion short tons. This estimate omitted the coal resources north of the Canadian River.

The earliest comprehensive estimate of the coal resources of the entire eastern coal-bearing region of Oklahoma was made by a distinguished coal-resources geologist, M. R. Campbell, in 1917, who also named and defined the coal fields of the United States. Details of Campbell's apparently high estimate of approximately 55 billion short tons of bituminous coal resources in Oklahoma were reprinted by Averitt, Berryhill, and Taylor (1953, tables 1 and 2). Trumbull (1957, p. 325) explained Campbell's high estimate by indicating that it included large estimates of the Croweburg coal in eight counties excluded from the Trumbull report. These Croweburg coal estimates are largely excluded from the present report because no coal data are available to justify their inclusion. Nevertheless, geologic evaluation of the continuity and lithology of strata in these counties strongly suggests the probability of some Croweburg coal deposits.

The most recent comprehensive coal investigation in Oklahoma was completed in 1952 by Trumbull (1957). He had new exploratory-drilling records to use in his estimate in addition to data available when the earlier reports were made. Trumbull's was admittedly a "minimum rock-bottom estimate that excludes assumptions or tonnage figures for vast areas of coal-bearing land in the State for which information is still inadequate or entirely lacking" (1957, p. 325). He reported 3.25 billion short tons of remaining bituminous coal resources in Oklahoma from an estimated 3.67 billion short tons of original resources. He further reported that 65 percent of the estimated remaining reserves of coal in Oklahoma was of high-volatile-bituminous rank, 13 percent of medium-volatile-bituminous rank, 22 percent of low-volatile-bituminous rank, and that nearly all of the medium- and low-volatile coal was in Haskell and Le Flore Counties (p. 207). He also calculated (p. 308)

that 427.23 million short tons of coal had been mined and lost in mining. Trumbull made use of the various criteria and limiting factors for estimating coal resources that had been established in the earlier estimates. These limitations are used also in the present report, with few minor additions, in an effort to maintain a high degree of technical standardization, which is explained later.

Numerous other early and recent reports on parts of the Oklahoma coal fields explain the distribution, thickness, structure, lithology, depositional environments, and paleontology of the sedimentary strata associated with the coal beds and the palynology and composition of the coals. These are referenced in the Selected Bibliography. One notable study gives a detailed evaluation of the geology and coal resources of the Henryetta district (Dunham and Trumbull, 1955).

Ford, Bacon, and Davis, Inc., an engineering firm, completed an evaluation of Oklahoma's coal reserves suitable for liquefaction, on behalf of the U.S. Army Corps of Engineers, in a report to the U.S. Bureau of Mines in 1951.

Acknowledgments

The writer is grateful for the cooperation of the coal-mining industry of Oklahoma, which provided hundreds of useful recent drilling logs. A. M. Dinsmore, U.S. Geological Survey, provided information on the federally owned coal in areas of the Arkoma basin. Ward Padgett, Chief Mine Inspector, State of Oklahoma, provided information on coal mines and coal production.

The following persons worked part-time to assemble data and maps that were essential to the completion of this investigation: Richard P. Lockwood, 1971-72, Mike McQuillan 1972-73, Douglas Schultz, summer of 1973, all graduate students in geology at The University of Oklahoma; Raymond Trebbi, 1972-73, and Alan Cain, 1973-74, undergraduate geology majors at The University of Oklahoma. John Rommel, undergraduate geology major from Antioch College, Yellow Springs, Ohio, worked full-time on a cooperative agreement from January through March 1974.

David Foster, chemist with the Oklahoma Geological Survey, performed some 30 proximate analyses.

DEFINITIONS OF TECHNICAL TERMINOLOGY

The estimates of the coal resources and reserves determined in this investigation are based on standard techniques, limitations, and assumptions used by geologists of many State Geological Surveys and the U.S. Geological Survey (USGS Bulletin 1042-J, p. 316-322). The writer has modified these to

fit special regional situations in accordance with geological principles and judgment, taking into consideration present economic conditions, technological advancement, potential mining conditions and regulations, conflicting land-use policy, and regulations on mined-land reclamation. Definitions taken from a specific reference are followed by a reference citation.

Coal.--A readily combustible rock containing carbonaceous material of more than 50 percent by weight and more than 70 percent by volume, which has formed from compaction or induration of variously altered plant remains similar to those of peaty deposits (Schopf, 1956).

Coal bed.--A sedimentary rock composed of coal, commonly identified by stratigraphic terminology such as the "Stigler coal bed" or "Stigler coal." A coal bed commonly contains microscopic noncoal inclusions of pyrite (iron sulfide). Lenses and nodules of pyrite, siderite (iron carbonate), and calcite also are common in coal. Vertical cracks (cleats) may contain calcite and pyrite. A coal bed may contain thin layers or laminae of clay, shale, and siltstone and nodules of siderite and pyrite.

Bituminous coal.--That rank of coal which contains a moist calorific value of at least 10,500 Btu, and at least 14 percent volatile matter and at most 85 percent fixed carbon, on a dry-mineral-matter-free basis (ASTM Standard D388-66). Also known as soft coal.

Resources.--The broadest term applied to coal deposits that are identified or presumed to exist within a coal field, based on interpretation of geologic data and geologic judgment. Resources include maximum estimates of original and remaining coal resources and (maximum and net) recoverable reserves. No depth limits apply in this study for original or remaining resources, so that data on coal greater than 3,000 feet deep have been included. Resources have not been determined for coal beds less than 10 inches thick, however.

Original coal resources.--Coal resources determined from coal datum points, including all categories of reliability that are present in beds now and that were present before mining. New coal data can result in updating original-resources estimates.

Remaining coal resources.--Coal resources in all categories of reliability that are present in beds now but excluding coal that has been mined and lost in mining. These estimates require periodic updating because of coal production and new coal data. In areas of no mining, original resources equal remaining resources. Remaining resources are updated by subtracting coal production and coal lost in mining from the original-resources estimate.

Reserves.--Reserves are determined from estimates of maximum recoverable

resources, based on 50-percent recovery for underground mining and 80-percent recovery for surface mining. In this report, the term "reserves" is used only in the sense of recoverable reserves.

Measured, indicated, and inferred coal resources and reserves.--Coal resources and reserves are classified according to standard procedure as measured, indicated, and inferred. These terms are categories of reliability based on geologic evidence and judgment. Coal datum points provide evidence of thickness, composition, continuity, depth, and altitude of coal beds. These datum points may be at mine boundaries, in drill holes that penetrate coal, or at outcrops. In places where geologic evidence indicates impure or thin coal beds--or the absence of coal because of channel-sandstone erosional cutouts, post-Pennsylvanian erosion, or structural faults--coal resources are not computed in either measured, indicated, or inferred categories.

Measured resources are those for which datum points are not more than 1/2 mile apart. (An isolated datum point is considered to be the center of a circle whose radius is 1/4 mile, and this circle defines an area of measured resources.)

Indicated resources are those for which datum points are not more than 1 1/2 miles apart. (An isolated datum point is considered to be the center of a circle whose area of indicated resources is defined by a radius segment of 1/4 to 3/4 mile.)

Inferred resources are those for which datum points are not more than 4 miles apart. (An isolated datum point is considered to be the center of a circle whose area of inferred resources is defined by a radius segment of 3/4 to 2 miles.)

Recoverable reserves.--Recoverable reserves are determined by multiplying the remaining resources by the estimated recovery percentage, which is 50 percent for nonstrippable resources and 80 percent for strippable. Recoverable reserves are also the estimated maximum recoverable coal. Since remaining resources may change because of additional coal data or coal production, the recoverable reserves may change; thus both require periodic updating.

Net recoverable reserves.--Net recoverable reserves are the recoverable reserves less those reserves that probably will not be mined in the near future for various reasons. These reasons include adverse economic conditions, adverse governmental policy and regulation, land-use conflicts or disseminated land ownership, poor accessibility, and adverse geologic and engineering conditions.

Mined and lost in mining.--Mined coal is produced at mines, and coal lost in mining is that which cannot be recovered in the mined area. Examples of the latter include coal in pillars in underground mines, in areas between closely spaced mines, in the web area between auger holes in auger mines, and in areas of strip mines that are inaccessible or too close to the outcrop to be of good quality. Generally

a 300- to 500-foot coal barrier must be left beyond the perimeter of abandoned underground mines, as required by Federal or State law for safety purposes, and such a barrier is included in the lost-in-mining category.

Overburden.--All unconsolidated material, including soil, clay, and sand, and consolidated rock, such as sandstone, limestone, or other rock that overlies or covers a mineral deposit (in this case, coal). Commonly includes that material which might be removed by surface mining to expose a mineral deposit for the extractive process.

CRITERIA, LIMITATIONS, AND TECHNIQUES

In this report, coal resources and reserves are strippable (that is, minable by surface techniques) if the coal bed is not more than 100 feet deep and the ratio (in feet) of overburden to coal not more than 60:1. If both limitations are exceeded, the coal resources are nonstrippable--that is, they are recoverable only by underground mining. Coal in either category may be minable by auger. In the coal-resources tables (Appendix, tables 21-77), strippable coal is shown under the depth category of 0-100 feet for each coal in each county. This single depth category was selected because 100 feet is the greatest depth generally that has been reached in a coal strip mine in Oklahoma, and it is unlikely to be exceeded in mining any one coal bed. It is possible, however, that 150 feet of overburden can be removed in mining two coal beds at the same time in Oklahoma, if their combined thickness is 3 feet or greater and if the coal is either low in sulfur content or suitable for metallurgical use; this implies that a premium f.o.b. price will be paid for the coal produced.

Coal resources are further divided into depth categories of 101-1,000 feet, 1,001-2,000 feet, 2,001-3,000 feet, and more than 3,000 feet. Coal at all these depths is assumed to be too deep for surface mining, except under conditions previously noted, and amenable to mining only by standard underground techniques. The likelihood of developing underground mines in coal beds within these depth categories depends on various factors, especially the thickness of the coal bed and the quality of the coal or its suitability for a particular use or market. The success of coal-mine development depends on individual and corporate technological and managerial ability. Such success may be measured by the length of the life of the coal mine and the achievement of a planned production level.

At present, Oklahoma contains the deepest (vertical shaft) coal mine under development in the United States, at a depth of 1,418 feet. The success of this mine depends upon engineering ability to maintain the roof strata and to remove gas that is under great pressure from the face of the coal bed in advance of mining, the eventual mining technique, and the ability of labor and management to cooperate in mining coal efficiently. Potential investors

in coal, the present coal industry, and others await the outcome of this undertaking. If it is successful, then coal-mine development at this depth and even deeper (say, between 1,500 and 2,000 feet) is likely in the future in the United States.

Mine maps in the Oklahoma Chief Mine Inspector's records show that underground coal mining reached 1,600 feet in depth just east of McAlester about 10 years ago. It is noted that underground coal mining is active at a depth of 3,000 feet in Europe at present. Thus it is presumed that engineering technology is available to mine coal at similar depths in the United States, providing geological and economic conditions are favorable. Nevertheless, until additional mining takes place at depths between 1,500 and 2,000 feet, coal reserves that are deeper than 2,000 feet will not be included in the net-recoverable category.

For the first time in Oklahoma, coal resources and recoverable reserves that are greater than 3,000 feet deep have been included in the measured, indicated, and inferred categories of reliability (within 2 miles of a datum point), but, of course, they have not been included in the net recoverable reserves. Coal resources and recoverable reserves that are in coal beds less than 29 inches thick also are not included in the net recoverable reserves.

However, coal reserves have not been excluded from the net recoverable reserves because of their sulfur content. Instead, the sulfur content of the raw coal is one of the principal parameters in determining the end-use category suggested for the net recoverable coal reserves, as shown in the coal-resources tables with the heading "Suitability Categories for Net Recoverable Reserves." These categories are gasification, coke, and electric-power generation (Appendix). The suggested three major use categories for the coal also depend on the proximate analysis and free-swelling index of each coal bed in each county.

Thus, if the average analysis is 3.2 percent sulfur and the range in sulfur content is 2.7-3.7 percent, if the ash averages 9 percent and the range is 8-10 percent, and if the coal rank is high-volatile bituminous, then in most cases the tonnage was included under gasification. If the ash was lower or if the sulfur was lower, then in most cases the coal was included under coke. Any remaining net-recoverable coal reserves were then placed under electric-power manufacture. This is an arbitrary categorization that best suits Oklahoma coal at present. If the working-model analysis for gasification submitted to us by Stone and Webster Engineering Corporation is modified, then the net-recoverable reserves suitable for gasification could be increased. Some of the coal at present that is suitable for electric-power manufacture could be used for gasification or liquefaction. Good coking coal is fairly scarce in the United States, and in the interest of conservation it generally should not be used for other purposes.

Other uses have been and are being made of Oklahoma coal. On a small scale, some medium- and low-volatile coal and some low-sulfur, high-volatile coal is suitable for the manufacture of activated charcoal, electric power,

cement, lime, and paper products, and some of it has been used for local domestic heating.

In addition to being used for these purposes, some of the coal in the three major use categories can be interchanged. For example, a low-sulfur, low-ash coal that has a low free-swelling index might be better suited for the previously mentioned minor industrial uses or for electric-power generation than for coke manufacture.

Coal datum points have been plotted on base maps compiled from 7.5-minute topographic-quadrangle maps at a scale of 1:24,000, on county road maps and geologic maps at a scale of 1:63,360, and on published geologic maps at a scale of 1:31,680. These datum points are located by 1/4 1/4 section, township, and range, within a geographic accuracy of about 50-100 feet. The datum points have been obtained from previous work published in the geologic literature, coal-mine maps surveyed by engineers, recent coal-test boreholes, coal faces exposed in active mines, and coal outcrops, but they have not been determined from electric logs. Mine slopes, drifts, shafts, and mine boundaries also have been taken as datum points. Arcs or circles were drawn around all datum points, in the manner previously described, delineating the measured, indicated, and inferred, resources and reserves (see section on definitions). Although coal deposits were judged to exist in geologic continuity with adjacent resources, they have not been included in the tonnage figures of resources if they were more than 2 miles from a datum point. This has been done to adhere as closely as possible to the criteria established by the U.S. Geological Survey, which have been used conservatively by Trumbull (1957) in maintaining the standard method of determining coal resources and reserves.

In determining coal resources, it is assumed that bituminous coal weighs 1,800 tons per acre-foot. Thus, the number of acres multiplied by 1,800 tons and the product multiplied by coal-bed thickness in feet determines the number of tons of coal per acre. Acreage determination is vital in coal-resources calculations. Acreage has been measured two or three times by planimeter for each coal bed under investigation and has also been checked by inspection, using a special grid with 10-acre subdivisions.

SOURCES OF COAL INFORMATION

The basic sources of geologic, physical, and chemical information used in the present investigation consisted of more than 600 logs of boreholes drilled for coal during the past 20 years, 10 logs of boreholes drilled on a subcontract for this project, and earlier coal information published by the U.S. Geological Survey and the Oklahoma Geological Survey. Some 200 additional proximate, sulfur, Btu, and ash-fusion analyses were provided by private coal operators and persons exploring for coal. These analyses were integrated with those from publications to permit determinations of average and range of sulfur content and the breakdown by rank of the coal resources

that are shown in the main coal-resources tables (Appendix). They are also averaged with published data and shown on the main analytical table (table 1) by coal bed and county.

Most of the analyses from the literature were done by the U.S. Bureau of Mines, and some were done by The University of Oklahoma. Some 30 proximate analyses were done in the new laboratory of the Oklahoma Geological Survey. Most of the donated analyses were done at well-known commercial analytical coal laboratories.

The 10 boreholes that constituted the subcontracted drilling project were selected from 50 possible sites, based on the potential suitability of the coal for gasification. The boreholes were drilled at sites carefully selected to lie from 2 to 5 miles beyond a plotted coal datum point, to provide supplemental coal data. These boreholes ranged from 63 to 990 feet in depth and provided cored coal samples. The 10 drilling logs are available for public inspection at the offices of the Oklahoma Geological Survey.

Information on mining costs and prices was derived from publications of the U.S. Bureau of Mines, except for 1973, which was provided by mining companies in Oklahoma. Transportation-rate estimates were provided by the State of Oklahoma and by private transportation-rate consultants. They are credited in the appropriate tables. Idealized reclamation costs were estimated by Kenneth S. Johnson, Oklahoma Geological Survey. Actual reclamation costs for 1973 were provided by the mine operators of Oklahoma.

COAL RESOURCES OF OKLAHOMA

The bituminous coal deposits of eastern Oklahoma contain 7.2 billion short tons of coal in the remaining-resources category (table 2). Approximately 488 million tons of coal is in the mined and lost-in-mining category. Thus, 7.7 billion tons of coal resources is in the original-resources category. The remaining coal resources are present in 1,542,944 acres of land in 19 counties (table 2; fig. 5). These determinations were made as of January 1, 1974. Additional coal-resources data and the mining of coal will require updates in the future. The details and further categories and subcategories of the coal resources, such as depth of coal, reliability of data (measured, indicated, and inferred), thickness and sulfur content of the coal beds, the names of the coal beds in each category and in each county, and the major potential suitability categories of the net recoverable reserves, are listed in the Appendix as tables 21-77. These tables, it is hoped, will serve as a comprehensive reference on Oklahoma's coal resources and recoverable reserves. A primary purpose of this section of the report is to point out the highlights of these detailed tables and to summarize them.

Table 1.--Average Analyses of Coals in Eastern Oklahoma

County	Coal bed	Typical Proximate Analyses (as received, percent) Moisture	Volatile matter	Fixed carbon	Ash	Sulfur (percent)	Btu	Ash softening temp. (°F)	Number of analyses	Data source	Date
Coal	Lower Hartshorne	5.9	35.7	50.5	7.9	1.4	12,782	--	1	USGS	1915
Coal	McAlester	6.8	38.6	44.3	10.4	3.6	11,590	2,180	23	USGS Bull. 1042-J	Pre-1953
Craig	Iron Post	3.5	45.0	47.9	7.1	3.5	13,420	2,050	1	USBM R.I. 7712	1972
Craig	Mineral	3.6	39.4	49.6	11.0	3.6	12,730	1,990	2	USBM R.I. 7712	1972
Craig	(undifferentiated)	4.6	37.5	47.7	10.2	5.6	12,750	2,160	7	USGS Bull. 1042-J	Pre-1953
Haskell	Stigler	3.1	25.4	67.3	4.2	1.2	14,430	2,180	13	"	"
Haskell	Stigler	5.0	27.4	63.2	4.4	1.1	13,869	--	3	USBM	1972
Haskell	Hartshorne	3.1	22.0	68.2	6.7	0.9	13,960	2,200	23	USGS Bull. 1042-J	Pre-1953
Haskell	Hartshorne	DRY	22.3	69.1	8.6	1.8	14,346	--	64	Company	1958-1968
Haskell	Upper Hartshorne	0.04	21.0	71.9	7.0	1.3	13,969	--	1	USGS	1965
Haskell	Lower Hartshorne	0.2	21.3	72.1	6.4	0.8	14,233	--	1	USGS	1965
Latimer	McAlester	2.5	31.6	54.2	11.7	3.2	--	--	1	USGS Bull. 1042-J	Pre-1953
Latimer	Upper Hartshorne	3.4	37.1	55.0	5.3	1.0	13,590	2,190	11	"	"
Latimer	Lower Hartshorne	4.7	35.9	53.5	5.6	1.4	13,450	2,030	21	"	"
Le Flore	Secor	2.4	18.3	56.7	22.6	4.1	11,711	--	1	USBM	1972
Le Flore	Lower Witteville	1.7	22.1	63.0	13.3	4.3	13,180	--	5	USGS Bull. 1042-J	Pre-1953
Le Flore	Cavanal	2.3	22.0	66.3	9.4	3.4	13,840	2,410	4	"	"
Le Flore	Cavanal	2.0	20.9	66.2	10.9	4.7	13,580	--	1	USGS	1969
Le Flore	Hartshorne	2.4	20.6	71.4	5.6	1.0	14,190	2,250	5	USGS Bull. 1042-J	Pre-1953
Le Flore	Upper Hartshorne	2.5	21.3	66.3	10.1	4.1	13,702	2,340	2	"	"
Le Flore	Lower Hartshorne	2.9	17.8	72.3	7.1	0.8	14,000	2,100	23	"	"
Le Flore	Lower Hartshorne	DRY	17.3	73.5	9.1	0.8	--	--	47	Company	1957-1968
Muskogee	Stigler	2.3	30.5	60.6	6.6	3.7	14,110	2,340	1	USGS Bull. 1042-J	Pre-1953
Okmulgee	Croweburg	7.1	34.5	52.8	5.6	1.6	12,910	2,020	25	"	"
Okmulgee	Morris	4.2	37.5	49.0	9.4	3.7	12,505	--	1	OGS	1973
Okmulgee	Eram	3.2	38.1	45.5	13.3	5.1	12,188	--	1	OGS	1973
Pittsburg	Secor	2.5	37.2	48.4	11.8	5.4	12,880	2,240	3	USGS Bull. 1042-J	Pre-1953
Pittsburg	Secor	3.0	34.5	46.2	16.5	5.9	11,065	--	2	OGS	1973
Pittsburg	McAlester	3.3	36.1	55.1	5.6	0.9	13,640	2,210	59	USGS Bull. 1042-J	Pre-1953
Pittsburg	Upper McAlester	2.3	38.9	50.5	8.3	4.1	13,327	--	1	USGS	--
Pittsburg	Upper Hartshorne	4.5	35.4	53.7	6.5	1.5	13,230	2,000	6	USGS Bull. 1042-J	Pre-1953
Pittsburg	Lower Hartshorne	3.6	37.2	52.8	6.5	1.5	13,490	2,080	39	"	"
Rogers	Croweburg	7.1	34.7	51.9	6.3	2.0	12,780	2,280	17	"	"
Rogers	Croweburg	DRY	33.3	59.7	7.0	0.4	12,690	--	1	USBM R.I. 6792	1965
Rogers	Rowe	1.9	35.6	54.6	7.9	2.8	13,995	--	3	Company	1971
Rogers	Rowe	0.7	38.3	47.9	13.2	3.4	13,348	--	1	OGS	1973
Sequoyah	Hartshorne	5.3	16.8	72.4	5.5	1.7	13,980	2,170	1	USGS Bull. 1042-J	Pre-1953
Tulsa	Dawson	6.2	36.2	48.5	9.0	4.0	12,460	2,020	6	"	"

Table 2.-- Summary of Remaining Bituminous Coal Resources in Oklahoma
January 1, 1974

County	Coal bed	Acres	Short tons (in thousands)
Atoka	McAlester	1,078	8,380
	Lower Hartshorne	5,146	21,239
	Total	6,224	29,619
Coal	McAlester	35,193	264,560
	Lower Hartshorne	5,321	28,315
	Total	40,514	292,875
Craig	Iron Post	19,475	35,272
	Croweburg	34,348	60,279
	Mineral	12,391	25,501
	Total	66,214	121,052
Creek	Dawson	3,547	14,046
	Total	3,547	14,046
Haskell	Secor	4,552	17,160
	Stigler	121,411	370,733
	Hartshorne	178,973	1,089,176
	Upper Hartshorne	275	990
	Lower Hartshorne	5,890	35,622
	Total	311,101	1,513,681
Latimer	Upper McAlester	31,637	106,916
	Lower McAlester	56,184	201,495
	Upper Hartshorne	38,382	211,085
	Lower Hartshorne	41,670	322,472
	Total	167,873	841,968
Le Flore	Secor	26,860	148,259
	Lower Witteville	9,606	51,931
	Cavanal	28,343	112,540
	Unnamed coals above Cavanal & Lower Cavanal	10,438	39,861
	Unnamed coals above Stigler	9,568	21,616
	Stigler	25,068	67,315
	Upper McAlester	3,274	11,700
	Lower McAlester	4,546	17,417
	Hartshorne	81,101	482,774
	Upper Hartshorne	55,509	262,372
	Lower Hartshorne	107,540	757,577
	Total	361,853	1,973,362

Table 2.--Oklahoma Bituminous Coal Resources (cont.)

County	Coal bed	Acres	Short tons (in thousands)
Mayes	Weir-Pittsburg	2,132	4,004
	Total	2,132	4,004
McIntosh	Croweburg	564	1,726
	Secor	5,733	28,419
	Stigler	7,098	16,610
	Total	13,395	46,755
Muskogee	Secor	5,396	9,726
	Stigler	24,456	51,473
	Total	29,852	61,199
Nowata	Iron Post	3,428	6,043
	Total	3,428	6,043
Okfuskee	Croweburg	21,607	79,351
	Total	21,607	79,351
Okmulgee	Croweburg	63,619	324,303
	Morris	12,301	30,213
	Eram	2,996	16,179
	Total	78,916	370,695
Pittsburg	Coal above Secor	2,583	8,996
	Secor	60,083	241,955
	Coal below Secor	601	2,380
	Cavanal	12,870	46,331
	McAlester	86,883	519,826
	Upper Hartshorne	41,289	188,913
	Lower Hartshorne	55,713	375,432
	Total	260,022	1,383,833
Rogers	Dawson	14,388	51,797
	Iron Post	11,520	23,935
	Croweburg	60,149	148,854
	Mineral	500	1,017
	Weir-Pittsburg	4,455	9,169
	Rowe	3,525	9,134
	Total	94,535	243,906
Sequoyah	Stigler	11,437	27,146
	Total	11,437	27,146

Table 2.--Oklahoma Bituminous Coal Resources (cont.)

County	Coal bed	Acres	Short tons (in thousands)
Tulsa	Dawson	28,170	112,071
	Croweburg	8,475	26,326
	Total	36,645	138,397
Wagoner	Croweburg	13,973	38,610
	Minor Coals	9,951	24,931
	Total	23,924	63,541
Washington	Dawson	1,293	4,655
	Total	1,293	4,655
GRAND TOTAL		1,542,994	7,216,128

Le Flore County leads the 19 counties by containing 27 percent of the State's remaining coal resources. Haskell County ranks second, containing 20 percent, and Pittsburg County is third with 19 percent. Each of these counties contains more than 1 billion tons of remaining coal resources (fig. 5). Latimer County ranks fourth with 11 percent (842 million tons). Coal, Okmulgee, Rogers, and Tulsa Counties each contain 101-500 million tons of remaining coal resources. Atoka, Craig, Muskogee, Okfuskee, and Wagoner Counties each contain 51-100 million tons. Creek, Mayes, McIntosh, Nowata, Sequoyah, and Washington Counties are the least significant, each containing 1-50 million tons of remaining coal resources.

Sulfur Content

Next in importance to the quantity and location of the coal resources is their sulfur content, which has always been a valid factor for determining certain end uses of coal, such as cement and coke manufacture. Recently the sulfur content of fuels, including coal, has also become an important social, political, and economic factor.

The sulfur content of most of the coal resources in the Arkoma basin area is low in comparison to those resources of the Northeast Oklahoma shelf area. For example, the original and remaining coal resources of Haskell, Pittsburg, Latimer, Le Flore, and Sequoyah Counties in the Arkoma basin average less than 2 percent sulfur. However, exceptions are Atoka and Coal Counties, whose coal resources average 4.1 and 5.0 percent sulfur, respectively. Coal

resources of the counties in the shelf area average more than 3.0 percent. An exception to this is the Croweburg coal in Okmulgee, Okfuskee, and Rogers Counties. Here, the Croweburg averages 2.2, 2.3, and 0.8 percent sulfur, respectively. The distribution of Oklahoma coal production for 1973 by sulfur content, by county, is shown on maps in figures 6-9.

Some 20 percent of the sulfur in some of the high-sulfur coals (coals containing more than 3.0 percent sulfur) has been cleaned or removed by coal-washing plants in Oklahoma. This process is feasible because an inorganic brassy-yellow mineral, pyrite (iron sulfide), contains most of the sulfur in these coals. Pyrite is much denser than coal and tends to sink in the water and coal mixture used in the washing plants. However, most of the coal produced in Oklahoma is not washed. It is partly cleaned by being broken, crushed, and sized without the use of water.

The sulfur content of coal is influenced by the depositional origin of the coal as well as by the diagenetic and post-diagenetic changes affecting the coal beds. In addition, deep-lying bituminous coal beds tend to contain less sulfur than shallow-lying coal beds. Furthermore, the low- and medium-volatile coals of Le Flore and Haskell Counties tend to contain less sulfur than the high-volatile coals of the Northeast Oklahoma shelf area, with two exceptions: the Secor coal of the Arkoma basin is high in sulfur content, and the Croweburg coal of the shelf is low in sulfur content.

Strippable Resources

Only 9 percent of the remaining coal resources of Oklahoma are strippable or amenable to surface mining. Rogers County contains 24 percent of the remaining strippable coal resources, and these contain a weighted average sulfur content of 2.1 percent. Craig County contains 17 percent of the strippable coal resources, and they average 3.7 percent sulfur. Le Flore County ranks third with 11 percent of the strippable coal resources, which averages 1.9 percent sulfur. Haskell, Muskogee, Okmulgee, Pittsburg, and Tulsa Counties each contain 5-8 percent of the strippable resources, with average sulfur contents of 1.7 percent, 4.1 percent, 2.7 percent, 3.8 percent, and 4.0 percent, respectively. Of the remaining strippable coal resources, 72 percent are also net recoverable strippable coal reserves. The net recoverable strippable coal reserves show a similar percentage distribution by county and by sulfur content.

Stratigraphy and Potential Uses of Coals

At least 24 coals have been recognized as Desmoinesian and early Missourian (Pennsylvanian) in age in eastern Oklahoma (fig. 3). Fifteen named coals have been mined commercially at some time during the past 100 years. Coal resources have been determined for 14 named coals and 5 others less formally designated. As of January 1, 1974, the Rowe, Mineral, Croweburg, and Iron

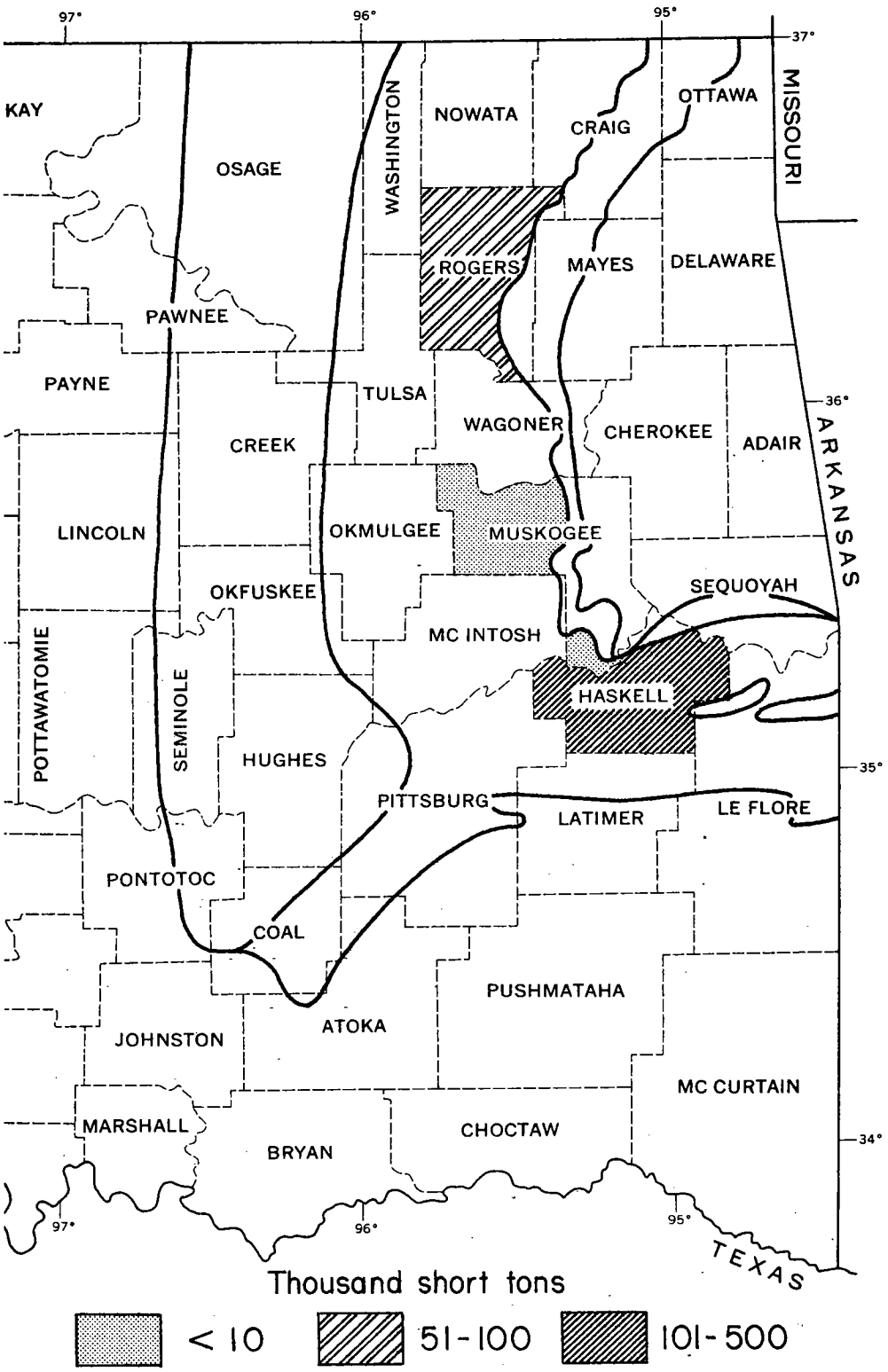

Figure 6. Index map showing distribution by county of 1973 Oklahoma production of bituminous coal containing 0.1 to 0.5 percent sulfur.

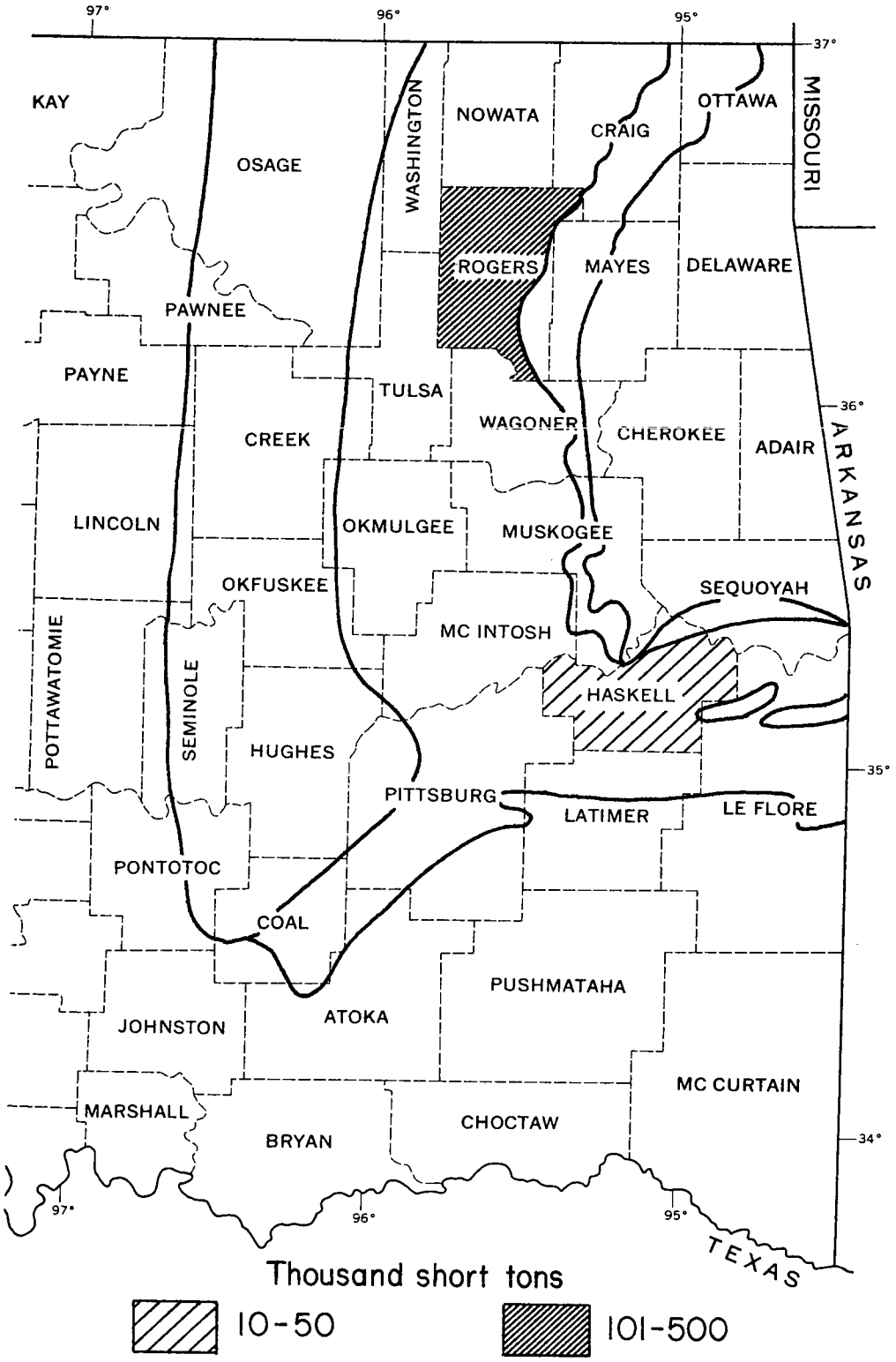

Figure 7. Index map showing distribution by county of 1973 Oklahoma production of bituminous coal containing 0.6 to 1.0 percent sulfur.

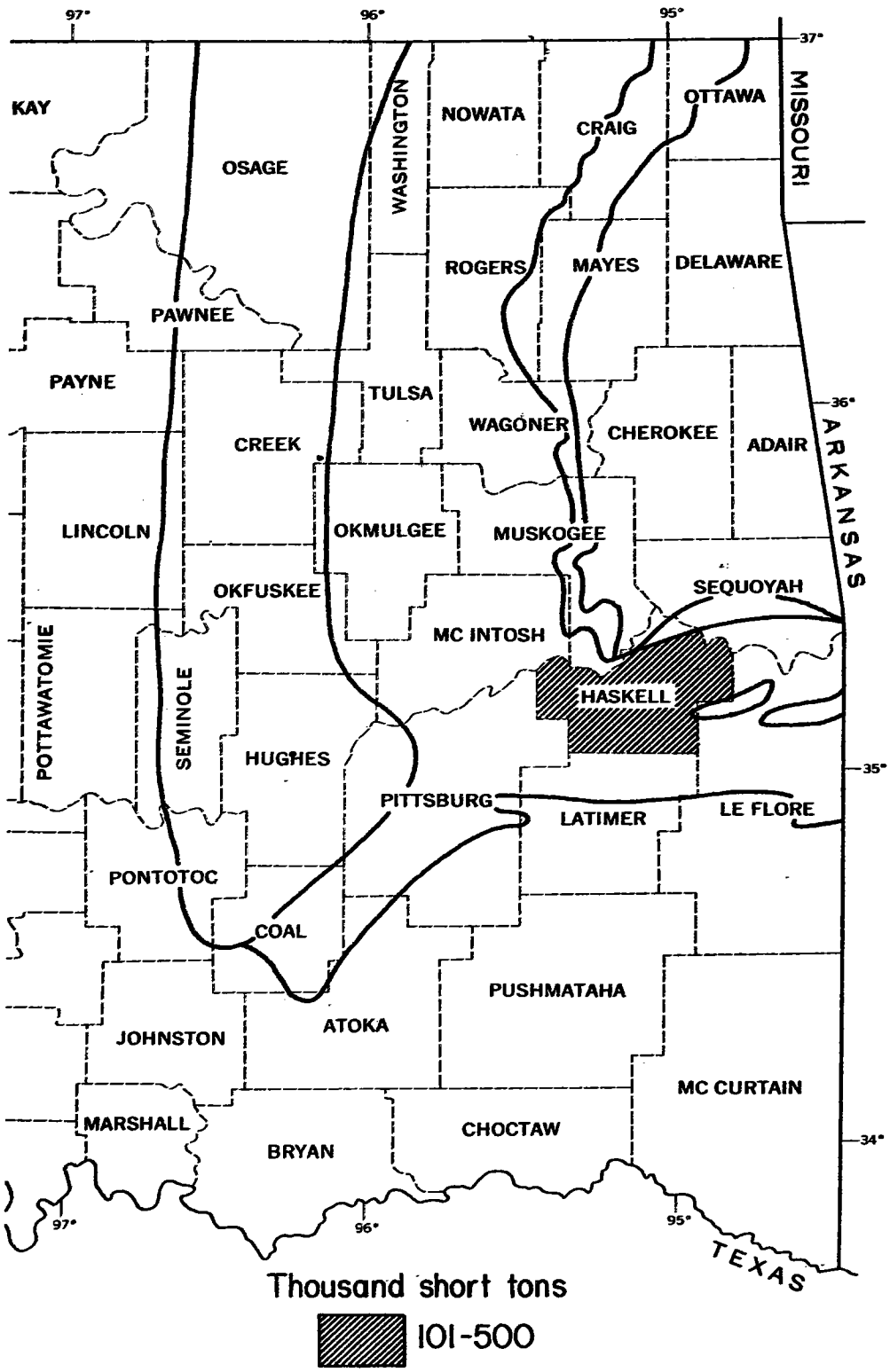

Figure 8. Index map showing distribution by county of 1973 Oklahoma production of bituminous coal containing 1.1 to 2.0 percent sulfur.

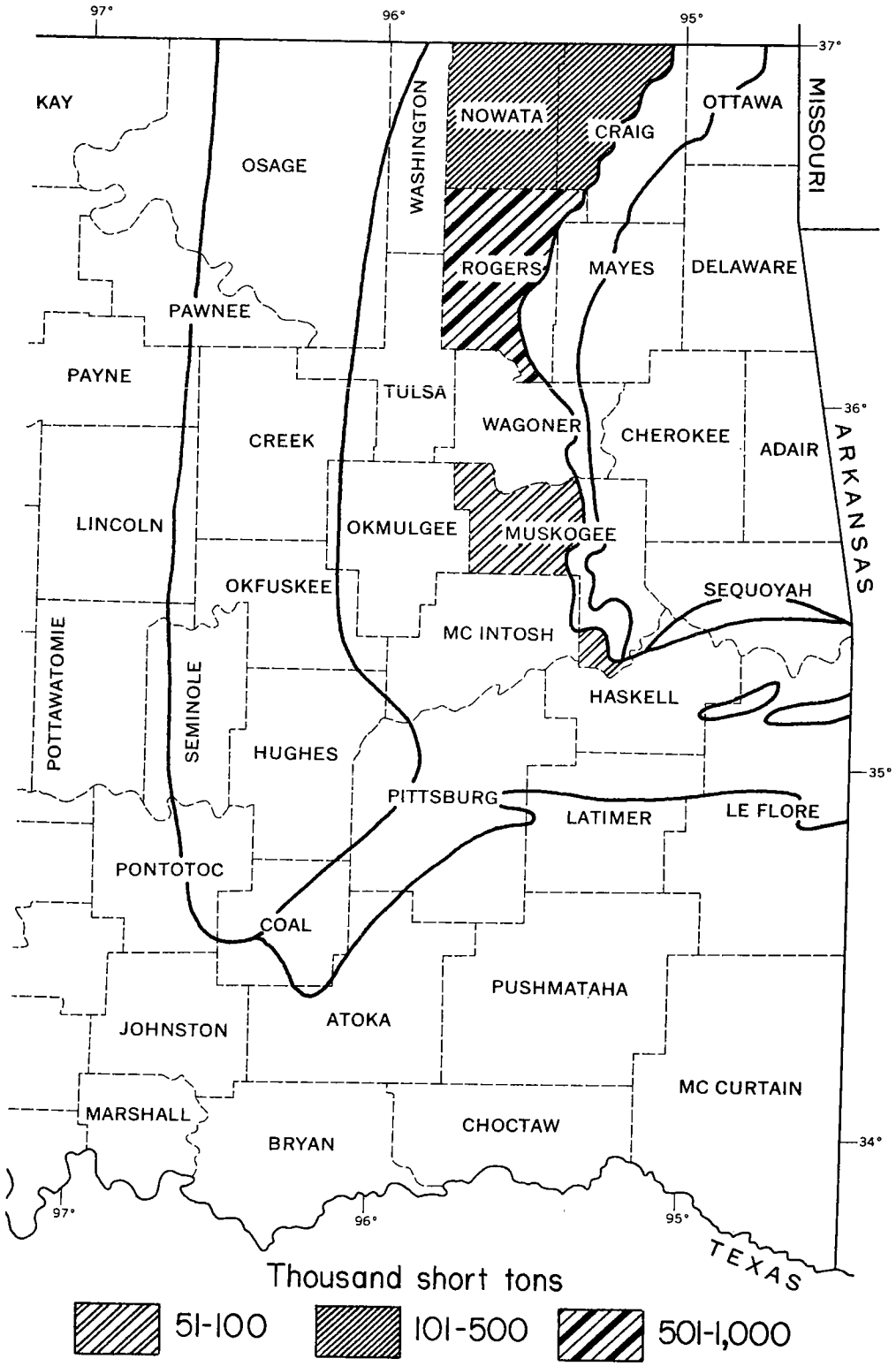

Figure 9. Index map showing distribution by county of 1973 Oklahoma production of bituminous coal containing greater than 3.0 percent sulfur.

Post coals were mined by surface methods in the Northeast Oklahoma shelf depositional area, and the Upper Hartshorne and Stigler coals were mined by surface methods in the Arkoma basin depositional area. The Hartshorne coal was undergoing degasification in a developing underground mine in the Arkoma basin.

Accurate coal-bed correlation is an essential prerequisite to the determination of coal resources and reserves. The bituminous coals of Oklahoma are shown in sequence in a generalized geologic column (fig. 4). Although some additional minor coals have been noted or described in the geologic literature, they are not shown in the geologic column, having been omitted from the present coal investigation because of insufficient information.

During the course of the coal-resources work, certain stratigraphic sequences and correlation uncertainties were observed. Four coals are present in the McAlester Formation above the Hartshorne coal and beneath the Stigler or McAlester coal. The McAlester coal appears to correlate with the Stigler coal. The Upper McAlester coal appears to correlate with a "rider" coal above the Stigler. At least one additional coal is present above this rider coal in the McAlester Formation in Le Flore County.

As many as four coals are present in the "Cavanal coal zone" in the lower part of the Savanna Formation in Le Flore County. A previously undetected coal occurs about midway between the Secor (Upper Witteville) coal and the Lower Witteville coal in Cavanal Mountain, Le Flore County. This coal may be the one that is present 30-45 feet below the Secor in Pittsburg County in places where the Lower Witteville cannot be identified.

An unnamed coal lies some 30-50 feet above the Secor coal in Pittsburg County, and it may or may not be equivalent to the Mayberry coal in Cavanal Mountain in Le Flore County.

Another unnamed coal lies at least 100 feet stratigraphically above this "rider" of the Secor coal, and if it is in the Boggy Formation it cannot be equivalent to the Weir-Pittsburg coal of the Northeast Oklahoma shelf area. Surely the last word has not been written on Desmoinesian coal-bed correlation of eastern Oklahoma; numerous stratigraphic problems remain unsolved. Coal beds are the most continuous lithotypes and can be used as key beds in lithostratigraphic correlation. Thus the first comprehensive generalized geologic column showing coal beds in the coal fields of Oklahoma (fig. 4) is preliminary and will be changed as additional facts come to light.

Hartshorne coal.--At the southern edge of the coal region in Oklahoma the Hartshorne coal commonly is split into two beds by shale and sandstone 5-100 feet thick. These beds are known as the Upper and Lower Hartshorne coals, and they have been mined extensively. Northward, in the middle of the Arkoma basin, the Hartshorne coal is a single bed containing a persistent black-shale parting about 1 inch thick. Recent core drilling has indicated significant underground coal resources in the Hartshorne coal in areas where it is 3-5 feet thick and of low- or medium-volatile rank. The Hartshorne has the qualities of a good coking coal with a high free-swelling index. However, in the vicinity of the Arkansas River in northern Le Flore County, it is

essentially noncaking. The Hartshorne coal bed contains 0.5-6.0 percent sulfur and averages 1.8 percent (raw). This coal requires cleaning for use in coke manufacture and metallurgical processes.

Lower Hartshorne coal.--The Lower Hartshorne coal is 0.7-7.0 feet thick. It has been mined recently in Le Flore County in underground mines, where it is 3.0-3.7 feet thick, and it has been mined by strip and auger methods in southeastern Haskell County. This coal recently has been shipped to Texas and overseas markets for coke manufacture. The Lower Hartshorne coal bed contains 0.4-5.1 percent sulfur and averages 1.0 percent (raw). Because of a thin shale parting and its sulfur content, this coal requires cleaning for use in coke manufacture and metallurgical processes.

Upper Hartshorne coal.--The Upper Hartshorne coal has been extensively mined from slopes and drifts in Haskell, Latimer, and Le Flore Counties. It is 2-4 feet thick and is low or medium volatile in rank on the east side of the Arkoma basin and high volatile on the west side. This coal is mined in a small strip mine at McCurtain, Haskell County (March 1974), and it is shipped mine-run for coke manufacture. It contains 0.8-2.6 percent sulfur and averages 1.6 percent.

McAlester coal.--The McAlester coal was extensively mined in the past by underground methods at McAlester in central Pittsburg County and in southeastern Coal County, where it had been called the Lower McAlester. Significant resources of this coal remain in these areas and are amenable to underground mining. The McAlester coal bed is 1.5-5.0 feet thick and mostly high volatile in rank. It is not mined at present but is suitable for use in electric-power generation, for blending with higher rank coal for coke manufacture, and for gasification and liquefaction. The McAlester coal bed contains 0.8-4.8 percent sulfur and averages 2.1 percent. In places where it is high volatile in rank and also high in sulfur content it requires cleaning.

Stigler coal.--A correlative of the McAlester coal, the Stigler coal has been mined by surface methods in Haskell, Le Flore, Muskogee, and Sequoyah Counties. Of low- and medium-volatile rank, the Stigler coal is used in coke manufacture in Texas and in overseas markets. At present, three companies operate surface mines in this coal where it is 1.0-2.7 feet thick. The overburden consists of 30 to 90 feet of medium- or dark-gray shale. Most of the coal from these mines is transported by truck to preparation plants at two loading docks, where it is crushed and loaded onto barges which leave the State on the McClellan-Kerr Arkansas River Navigation System (fig. 10). The Stigler coal contains 0.4-5.2 percent sulfur and averages 1.5 percent. At 1 of the 3 active mines, it requires cleaning to reduce the sulfur content before being shipped for coke manufacture and metallurgical use.

Cavanal coal.--Reserves for the Cavanal coal and Cavanal(?) coal have been determmined in Le Flore and Pittsburg Counties (see tables 46 and 53, Appendix). The Cavanal coal is strip-mined at Cavanal Mountain, Le Flore County (March 1974), adjacent to an area that had been mined previously by

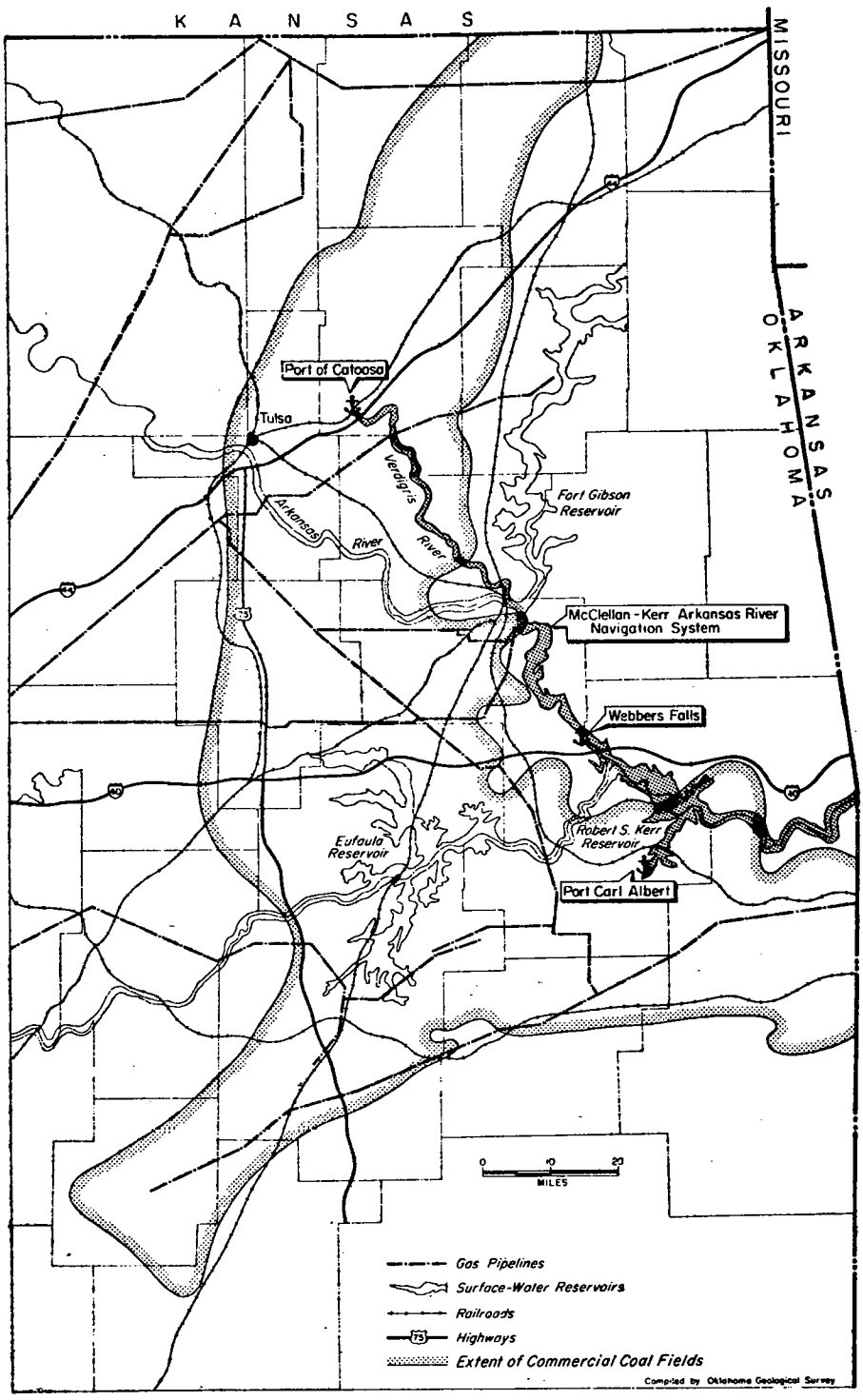

Figure 10. Index map showing distribution of principal gas pipelines, selected surface-water reservoirs, and transportation routes through the Oklahoma coal fields.

surface and underground methods. It is 1.2-2.2 feet thick, has a high (+100) Hardgrove grindability index, and is mostly medium volatile and in part high volatile in rank. The Cavanal coal is overlain by 20-50 feet of shale and sandstone, at the top of which another, thinner coal is present at some places. The Cavanal coal contains 2.1-4.8 percent sulfur and averages 3.3 percent. It requires cleaning to reduce sulfur and ash before being shipped for use in electric-power generation, cement manufacture, and paper manufacture.

Lower Witteville coal.--A high-ash, high-sulfur, medium-volatile coal, the Lower Witteville is present in Cavanal Mountain, Le Flore County, where it has been mined underground. It is 3-4 feet thick with one or more claystone partings, and the underlying shale contains numerous coal stringers. It has potential use in electric-power generation and cement manufacture. The Lower Witteville coal contains 4.4 percent sulfur.

Rowe coal.--A high-volatile coal of the Northeast Oklahoma shelf area, the Rowe is believed a correlative of the Lower Witteville. The Rowe coal bed is 1.0-2.5 feet thick in Craig, Mayes, Muskogee, Rogers, and Wagoner Counties. Recent exploration by drilling in Rogers County has indicated recoverable reserves beneath 15-60 feet of dark- or medium-gray shale overburden. It is expected that additional resources of this coal will be identified. The Rowe coal may be suitable for gasification and liquefaction. A surface mine has been producing coal from this bed in southeastern Rogers County for use in electric-power generation since 1973. Although it had been considered of only marginal value because of high sulfur and ash content and its dull appearance, it contains more than 13,000 Btu in mine-run condition; the washed product should have a still higher heating value (table 1). The sulfur content is 2.8-3.4 percent and averages 3.1 percent (mine run).

Secor coal.--In the Arkoma basin area (fig. 5), the Secor coal is 1.5-4.3 feet thick in places where it has been mined. It is a medium-volatile bituminous coal in Le Flore County and a high-volatile coal in Haskell, Pittsburg, Muskogee, and McIntosh Counties. This coal bed commonly contains one or two shale partings and is high in ash and sulfur content. Thus the coal would require cleaning for use in electric-power generation. In places where it is of high-volatile rank, the Secor coal probably is suitable for use in gasification and liquefaction processes.

Recent exploratory drilling indicates that in Pittsburg County the Secor, 3 feet thick, can be mined by surface and underground methods and that additional recoverable reserves in Le Flore County are amenable to underground mining. It contains 3.5-5.6 percent sulfur and averages 4.9 percent (raw).

Weir-Pittsburg coal.--The Weir-Pittsburg coal is present in Craig, Mayes, Rogers, and Wagoner Counties, where it has been produced at strip mines. Insufficient data permit determination of reserves in Mayes and Rogers Counties only (see tables 47 and 54, Appendix). Recent drilling information has not been released on this coal, but available data show that it contains

4.5-5.4 percent sulfur and averages 4.8 percent (raw). It is believed that additional reserves remain to be determined in this coal for use in electric-power generation.

Mineral coal.--The Mineral coal has been produced continually at small- to moderate-sized surface mines in Craig County for decades. In the past few years it has been mined on a moderate to large scale in Rogers County. The Mineral coal is high-volatile bituminous in rank, 1.0-2.0 feet thick, and contains 3.5-4.7 percent sulfur, averaging 4.5 percent. It is used exclusively for electric-power generation. Sulfur and moderate ash content of this coal have been reduced somewhat by washing and by dry, gravity separation.

The Mineral coal is overlain by a hard thin limestone and by gray shale in Craig County, but the limestone is absent in Rogers County. This coal may be the equivalent of the Morris coal of Okmulgee County, which contains about 3 percent sulfur.

Croweburg coal.--Most of the coal beds in the Northeast Oklahoma shelf area are high in sulfur content, with the exception of the Croweburg coal. This coal contains less than 1 percent sulfur in places where it has been mined by surface methods in Rogers and Wagoner Counties. It is a high-volatile bituminous coal, 1.0-3.4 feet thick. Figure 11 is a map showing the distribution and thickness of the Croweburg coal in Craig County. The Croweburg has been mined by both surface and underground methods extensively in the vicinity of Henryetta in Okmulgee County, where it is known as the Henryetta coal. One of the most useful coals in the State, the Croweburg has been blended with low- and medium-volatile coals in coke manufacture and utilized for other industrial purposes as well as for domestic heating. At present, it is produced at two surface mines in Rogers County. The overburden consists, in ascending order, of a thin black shale, a thick gray shale, and a thin limestone and shale unit, which total 40 to 75 feet thick.

The Croweburg coal has been called the Broken Arrow coal east of Tulsa in Wagoner County and the "Sequoyah" coal in central and northern Rogers County. The Croweburg contains 0.4-3.5 percent sulfur, averaging 1.9 percent.

The Croweburg coal is used at present almost exclusively for coke manufacture.

Iron Post coal.--Although only 1.0-1.4 feet thick and high in sulfur content (3.5-5.0 percent), the Iron Post coal, locally called the Fort Scott, is mined extensively by surface methods at three pits in Craig, Nowata, and Rogers Counties. Overburden, 20-45 feet thick, consists, in ascending order, of dark-gray or black shale containing pyrite and hard nodules, dense massive limestone, dark-gray shale, and one or two beds of dense limestone. Vertical shotholes are drilled into this tough overburden in preparation for blasting. The resultant limestone boulders are a problem in reclamation. The coal is cleaned in rotary breakers. A greater tonnage of this coal is mined at present than of any other coal in Oklahoma; the coal is used for

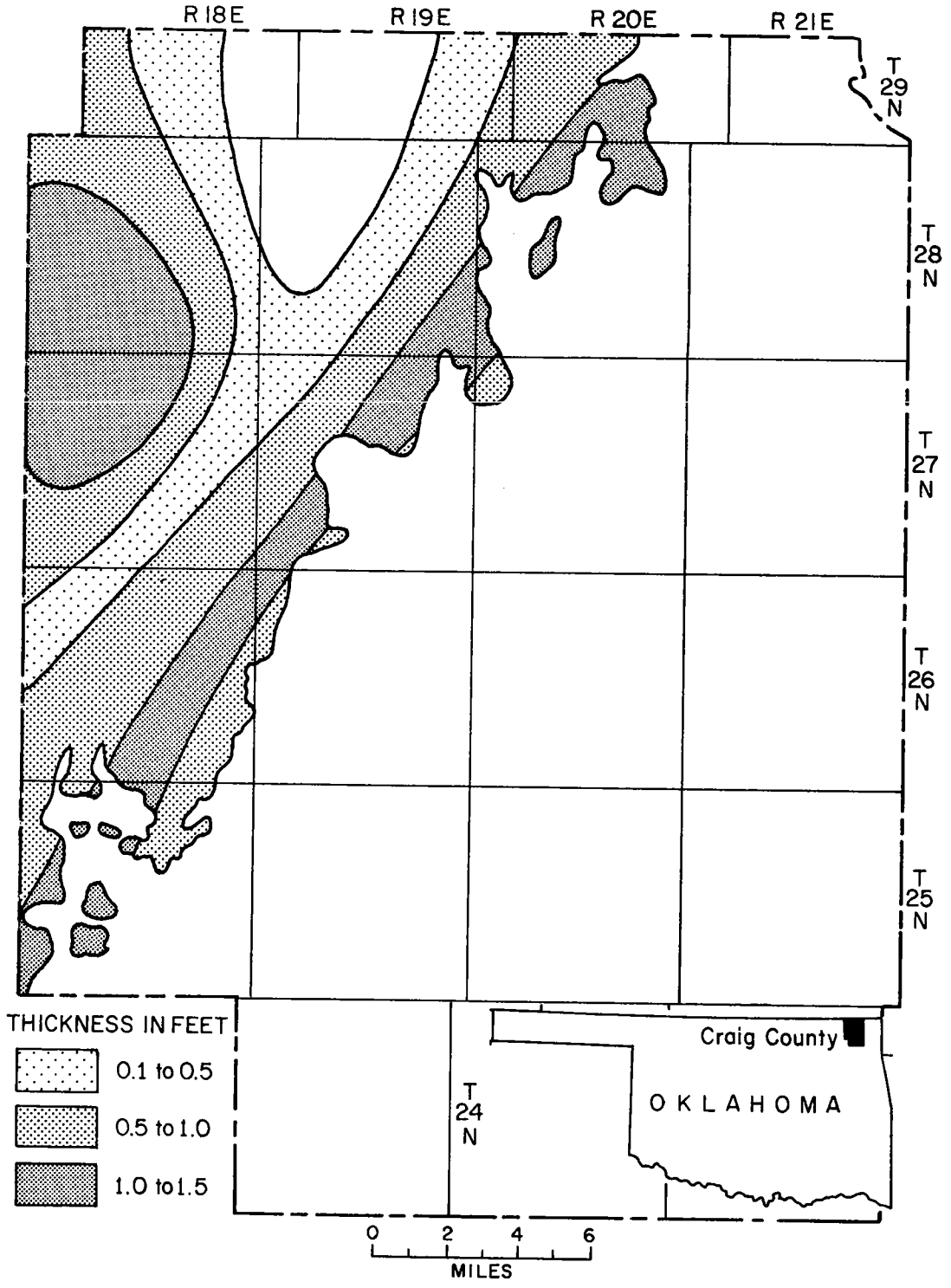

Figure 11. Map showing distribution and thickness of the Croweburg coal in Craig County, Oklahoma.

electric-power generation. The Iron Post coal also would be suitable for some gasification and liquefaction processes. It averages about 4.0 percent sulfur.

Dawson coal.--Of high-volatile-bituminous rank, the Dawson coal has been mined by underground and surface methods in Tulsa and Rogers Counties. It is 1.5-2.8 feet thick in these abandoned mines, and remaining reserves of the coal bed are 1.8-2.5 feet thick. The Dawson coal contains 3.4-4.8 percent sulfur and averages 4.6 percent. At present, it is not mined. Its proximate analysis appears to be most suitable for electric-power generation (table 1) and possibly for some processes of gasification and liquefaction.

POTENTIAL USES FOR NET RECOVERABLE COAL RESERVES

The principal uses of Oklahoma coal at present are, in order of decreasing importance, for electric-power generation, coke manufacture and metallurgical use, and, recently, cement manufacture. The coal will continue to be used for these purposes in the foreseeable future. Gasification and liquefaction of Oklahoma coals is feasible, but it may be 10 years before a commercial plant could be operative. Numerous by-product organic chemicals are derived from coking coal, and many also could be derived from coal conversion to gases and liquids. Minor potential uses of Oklahoma coal that have been considered lately are for drying crushed stone, lime manufacture, and activated charcoal manufacture and by-products.

The statistical data derived from the detailed coal-resources compilations (Appendix, tables 21-77) are grouped by only three major potential uses--namely, gasification, coke manufacture, and electric-power generation (tables 59-77).

Gasification

Most high-volatile bituminous coal can be gasified. The gasification process proposed by Stone and Webster Engineering Corporation and Gulf General Atomic Corporation was to have included the use of a typical high-volatile bituminous coal from Oklahoma. Thus a working model analysis was suggested as a basis for evaluating the State's coal resources suitable for this particular gasification process. The reserves amenable to gasification were determined, based on this analytical model, which requires a 3.2-percent sulfur content and a 9-percent ash content of raw coal. (For details see an earlier section on criteria and a later section on gasification-plant sites.) Approximately 240 million tons of net recoverable coal reserves that meet these requirements are present in 9 counties in Oklahoma (fig. 12). Coal County contains 43 percent of this coal, Okmulgee County contains 22 percent, and Haskell County contains 21 percent. The remaining 14 percent is present in Latimer, McIntosh, Muskogee, Okfuskee, Pittsburg, and Wagoner Counties. Of the total net recoverable reserves that are suitable for gasification, only 19 percent is strippable (Appendix).

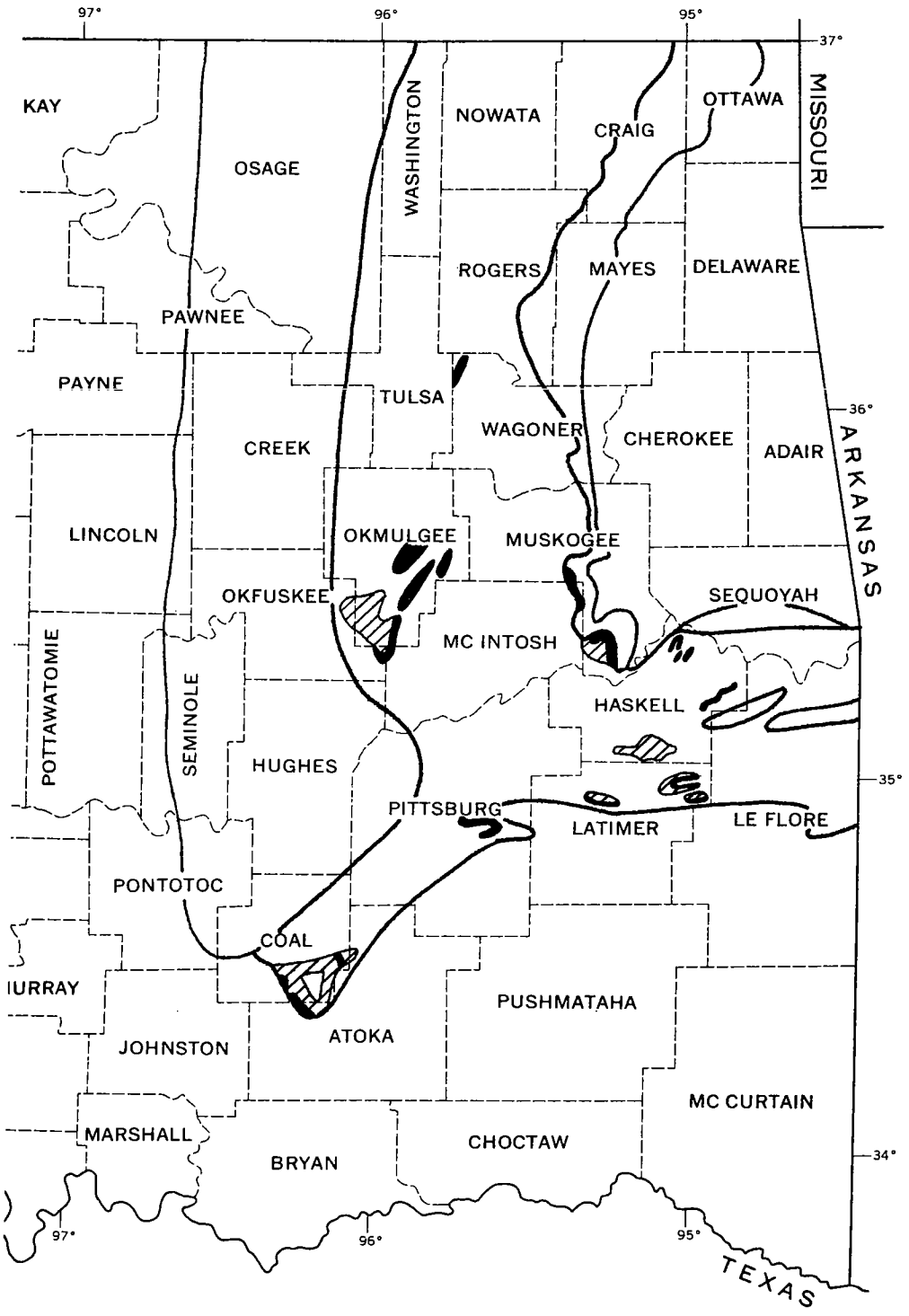

Figure 12. Index map showing distribution of selected net recoverable coal reserves suitable for gasification in Oklahoma. Black areas contain strippable reserves.

If wider ranges of sulfur and ash content of raw coal are permitted, then it is believed that approximately 3 times the total net recoverable quantity, or 720 million tons of coal, would be suitable for gasification in Oklahoma. This would include part of the reserves suitable for electric-power generation. Additional reserves of coal would be suitable for gasification if the coal were cleaned by conventional plants to reduce sulfur and ash content before it was fed to a gasification plant.

Principal and alternate sites for a gasification plant.--Although early plans by Stone and Webster Engineering Corporation to utilize bituminous coal from Oklahoma in an advanced but hypothetical gasification plant permitted a wide range in coal composition, short of anthracite and semi-anthracite, later plans required a restricted ideal-model coal analysis. The typical ultimate analysis of the raw-coal supply would be 5.5 percent hydrogen, 72.3 percent carbon, 1.4 percent nitrogen, and 8.6 percent oxygen. The sulfur would be 3.2 percent, and the ash, 9 percent. The carbon was the critical element, for in combination with hydrogen, which would be derived largely from water, it would form the desired methane gas (CH_4). The ideal ash and sulfur limits would be quite restrictive, such that only 240 million tons of net recoverable coal reserves were determined as suitable for gasification. As 81 percent of these reserves would require underground mining, the cost of production and the selling price of each ton of coal for gasification would be increased accordingly.

It is noted that the hypothetical, modified solvent-refined, high-temperature coal-gasification process has been determined feasible by the engineering company, so that, given the necessary water and coal, a plant could produce 500 million cubic feet a day of high-quality pipeline gas. The methane gas would contain approximately 975 Btu per cubic foot. This plant would consume 200 million tons of bituminous coal during a 20-year period.

The early concept of coal being supplied to the plant from a cluster of mines is still viable if it is expanded to a few clusters, spaced within two or three distance intervals from the plant. Ideally, 20 mines, each producing half a million short tons of coal annually, would be necessary to supply the plant with 10 million tons of coal annually. The number of mines could vary, depending on the developed and demonstrated production capacity of each mine.

The largest quantity of suitable net recoverable reserves, 103 million tons, is in the old Lehigh mining district of Coal County (fig. 12). Two percent of this can be mined by surface methods. However, part of the reserves is federally owned.

Approximately 54 million short tons of coal is suitable for gasification in Okmulgee County and is classed as net recoverable reserves (fig. 12). Fifty-seven percent of these reserves can be mined by surface methods. Coal ownership is private or non-government.

Approximately 52 million tons of net recoverable coal reserves suitable for gasification is in Haskell County (fig. 12). Part of these reserves is federally owned. Sixty-four percent can be mined by surface methods.

Approximately 10 million tons of suitable net recoverable reserves is in Latimer County; part is federally owned. Forty-three percent can be strip-mined. An additional 21 million tons of net recoverable coal reserves suitable for gasification is present in Mayes, McIntosh, Muskogee, Okfuskee, Pittsburg, and Wagoner Counties (fig. 12).

Four possible plant sites, selected on the basis of proximity to water supply, suitable coal supply, and transportation routes, have been determined: (1) along the southern reaches of Lake Eufaula in central Pittsburg County, (2) along the northern limits of this lake in McIntosh County, (3) south of Webbers Falls near the Canadian River and Arkansas River in northern Haskell County or in southern Muskogee County, and (4) at Fort Gibson Reservoir in eastern Wagoner County (figs. 13-16). Any of these sites would be on the shores of man-made lakes or a controlled major river, which could supply a plant requirement of 25,000 gallons a minute of process water and 200,000 gallons a minute of cooling water; most of this water would be recycled.

The Wagoner County site on Fort Gibson Reservoir (fig. 13) is the farthest from most of the net recoverable coal reserves determined as suitable for gasification under the limiting sulfur, ash, and carbon parameters. Therefore, this is believed to be the least desirable of the four possible plant sites.

The Muskogee County-Haskell County site (fig. 14) would be within 25 miles of 24 percent of the suitable reserves, from 25-50 miles of 8 percent of the suitable reserves, from 50-75 miles of 25 percent of the suitable reserves, and from 75-100 miles of 43 percent of the suitable reserves. This site would be within 50 miles of 32 percent of these reserves. Therefore, it is recommended as the second alternate plant site.

The northwestern McIntosh County area would be within 25 miles of 25 percent of the suitable coal reserves, from 25-50 miles of 30 percent of the reserves, and from 50-75 miles of 45 percent of the reserves. Therefore this area is recommended as the first alternate plant site (fig. 15).

The central Pittsburg County area would be within 25 miles of only 3 percent of the suitable reserves (but they are strippable); however, it is from 25-50 miles of 97 percent of the suitable reserves. Therefore, this area is recommended as the most favorable for a gasification plant site (fig. 16).

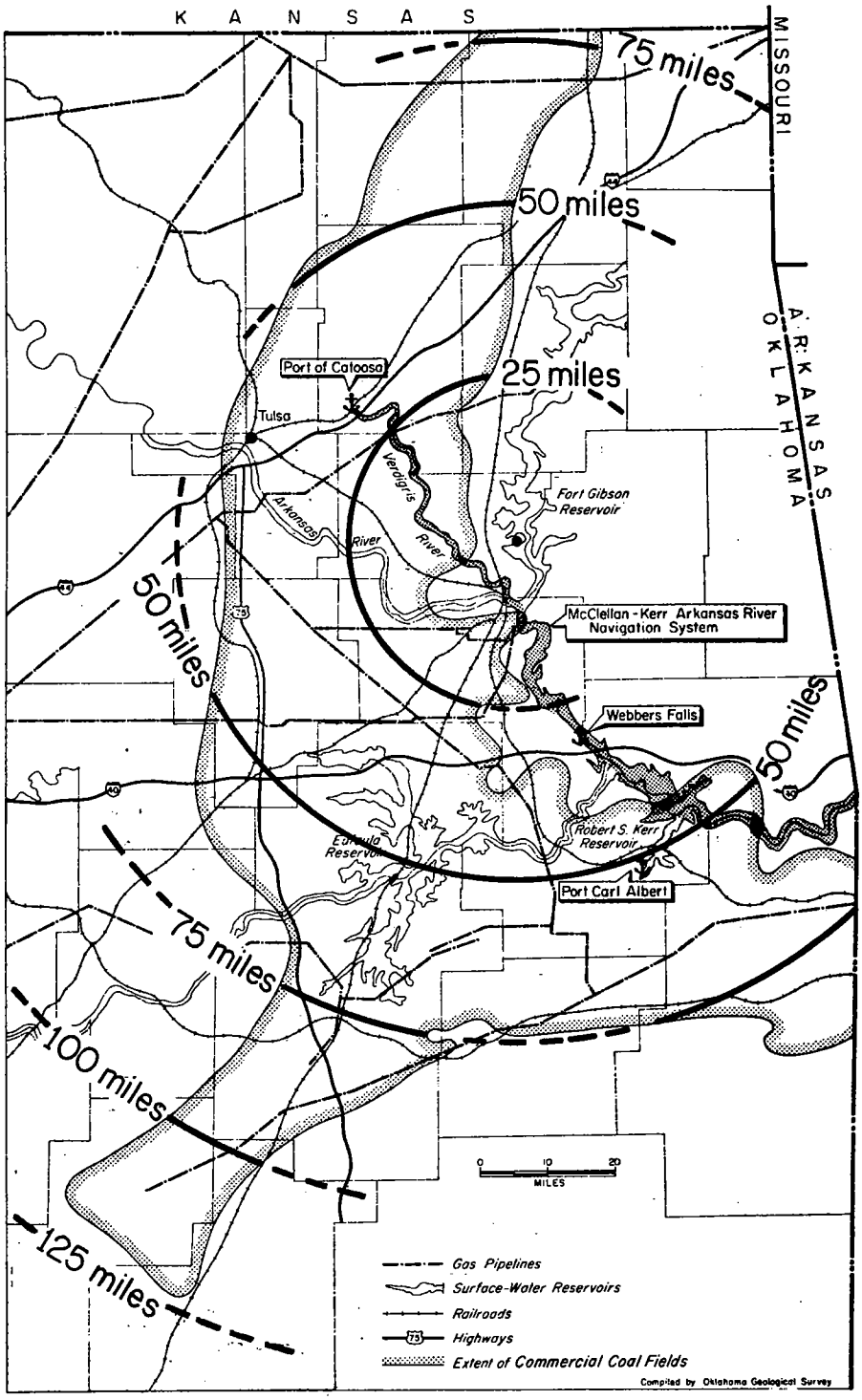

Figure 13. Index map shown in figure 10, marked to indicate least preferred of four possible sites for gasification plant and distance from such plant to coal reserves.

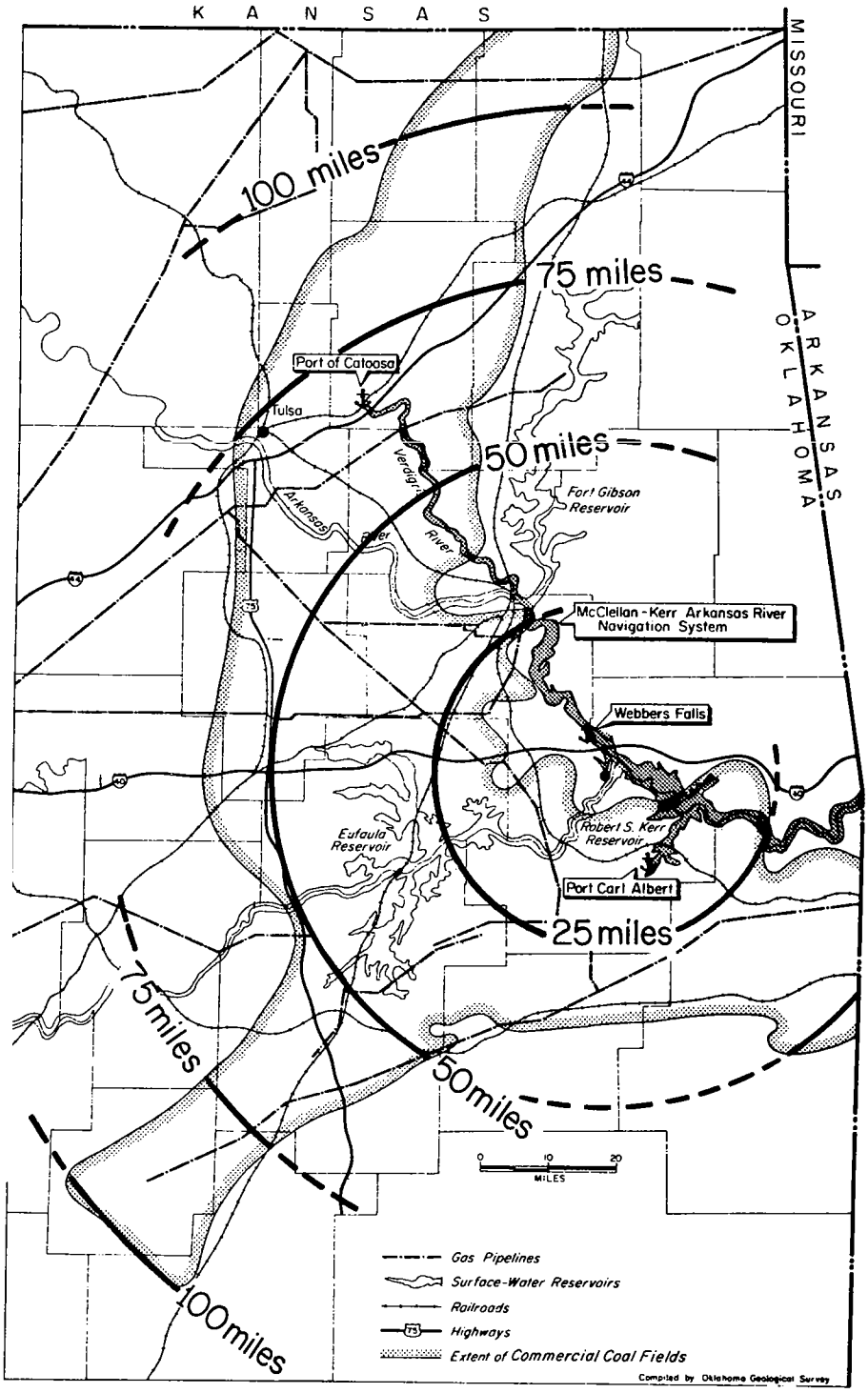

Figure 14. Index map shown in figure 13, modified to show location and distance from second alternate site for proposed gasification plant.

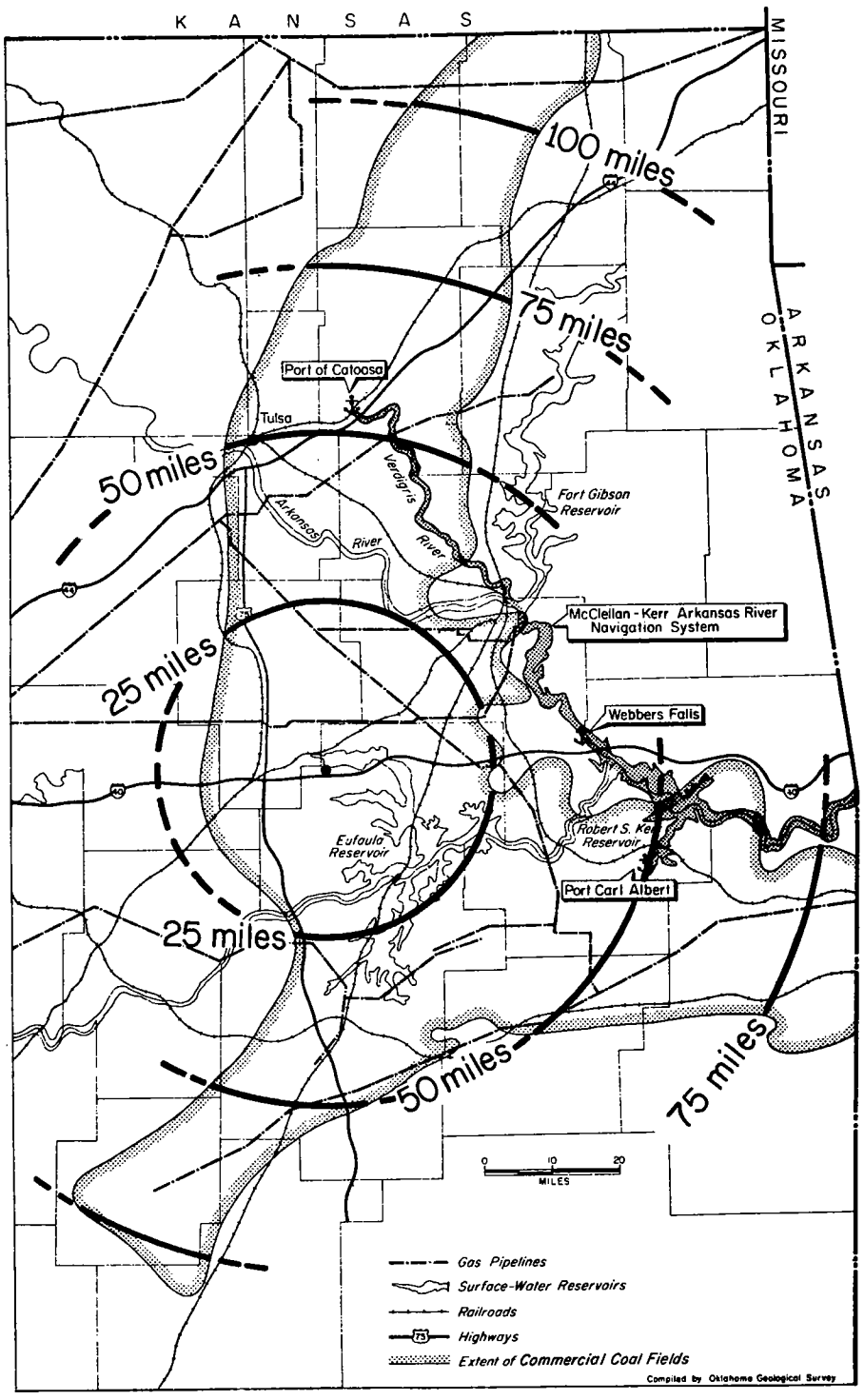

Figure 15. Index map shown in figure 13, modified to show location and distance from reserves for first alternate site for proposed gasification plant.

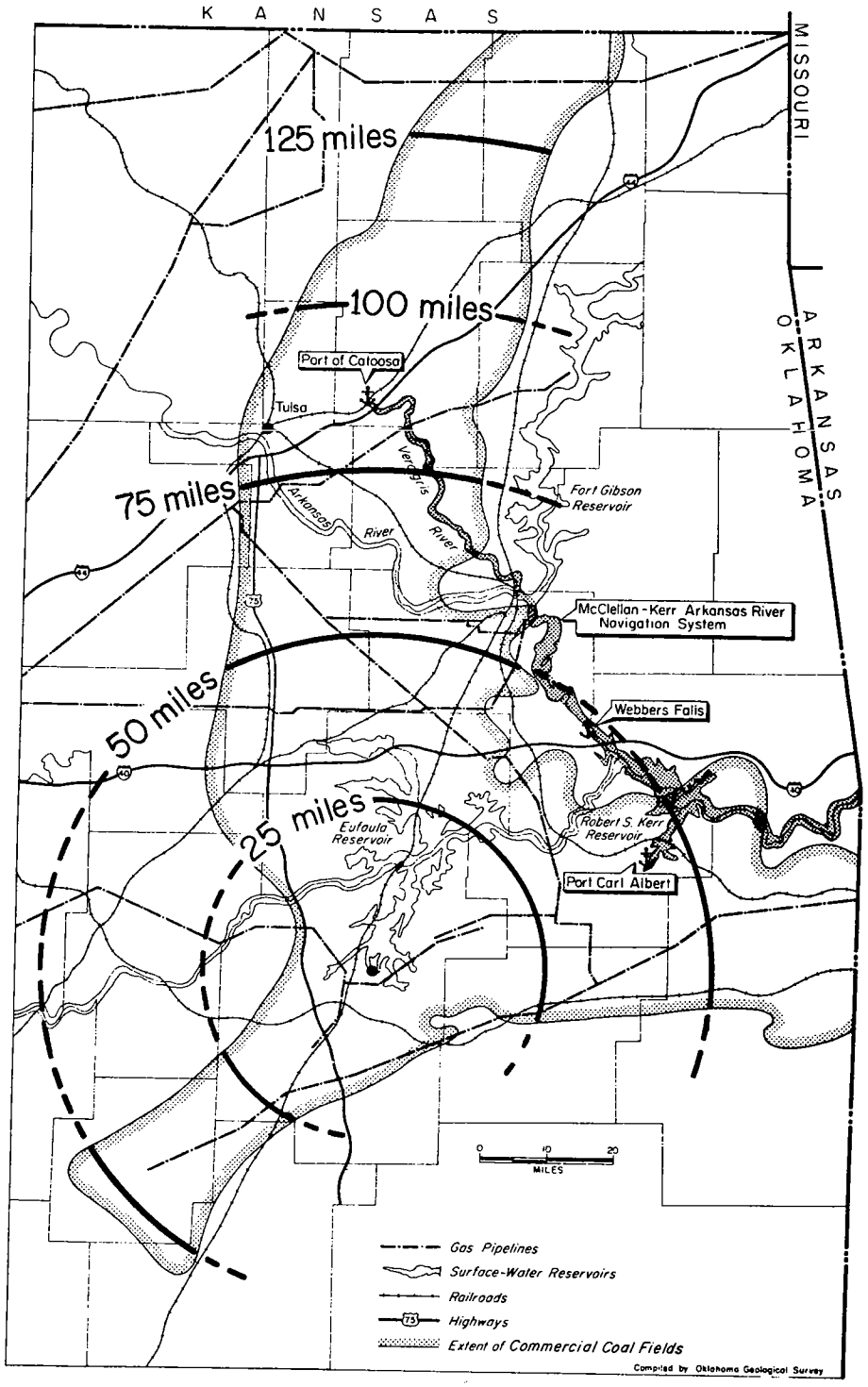

Figure 16. Index map shown in figure 13, modified to show location and distance from reserves for recommended site for proposed gasification plant.

Coke Manufacture

Commonly two or more bituminous coals are blended to obtain coke with certain preferred chemical and physical properties for use in iron-ore smelters and steel mills. Thus certain physical and chemical criteria were established in determining that part of Oklahoma's coal reserves that are best suited for coke manufacture. These criteria are, if known, a free-swelling index (FSI) of 7 or greater, an ash content of 8 percent or less, and a sulfur content of 2 percent or less (commonly about 1 percent).

Oklahoma contains 1.3 billion short tons of net recoverable coal reserves suitable for coke manufacture. These reserves are present in nine counties, but most are in Le Flore and Haskell Counties. Le Flore County contains 37 percent, and Haskell County, 33 percent, of the State's net recoverable coking-coal reserves. Pittsburg County contains 16 percent, Okmulgee County, 7 percent, and Rogers County, 6 percent. Latimer, Okfuskee, Tulsa, and Wagoner Counties contain small quantities of coking coal, consisting of 1 percent of the total (see tables 59-77, Appendix).

Approximately 165 million tons or 12 percent of the net recoverable coking-coal reserves is strippable. Rogers County contains 47 percent, Le Flore County, 22 percent, and Haskell County, 12 percent of such reserves.

Electric-Power Generation

About 72 percent of the coal production in Oklahoma in 1973 was used in electric-power generation. Thus at present and in the foreseeable future, the largest use of Oklahoma's coal is for electric-power production, although the net recoverable reserves suitable for this purpose are about one-half the quantity suitable for coke.

In establishing the criteria for use categories, all net recoverable coal that was determined unsuitable for gasification or coke manufacture was included in the electric-power category. Thus the ash content of the coal for electric-power generation tends to be 10 percent or greater and the sulfur content, 3 percent or greater. Even though other parameters are satisfactory, however, the FSI (free-swelling index) of some low-sulfur and low-ash coals may not be suitable for coke, the ash or sulfur content may be too high for gasification, or the fixed carbon may be high for gasification. Thus some low-sulfur, high-ash coals and some high-sulfur, low-ash coals as well as some coals high in fixed carbon are included in the net recoverable coal reserves suitable for electric-power generation (tables 59-77, Appendix).

Of the 657 million short tons of net recoverable coal reserves in Oklahoma suitable for electric-power generation (and unsuitable for the gasification process of Stone and Webster Engineering Corporation or for coke manufacture), 33 percent is in Le Flore County. Latimer County contains 16 percent of these reserves suitable for electric- power production, Craig County, 13 percent, Pittsburg County, 10 percent, and Rogers County, 8 percent. The remaining 20 percent is distributed in 14 other counties in the coal region of the State.

Approximately 285 million short tons, or 43 percent of the net recoverable coal reserves suitable for electric-power generation, is amenable to surface mining. Of this quantity, 31 percent is strippable in Craig County, 19 percent in Rogers County, 10 percent in Pittsburg County, and 9 percent in Le Flore County. The remaining 31 percent is strippable in the remaining 15 counties.

COAL MINING

History of Production

One of the finest concise summaries of the early history of coal production in Oklahoma was written by Trumbull (1957, p. 361-363) and is quoted as follows.

> The presence of coal in what is now Oklahoma has been known since at least 1821, when Thomas Nuttall's journal of several excursions across the coalfield was published (Nuttall, 1821, p. 146-177; Drake, 1898, p. 327), but mining on a commercial scale did not begin until the Missouri-Kansas-Texas Railroad was built through McAlester in 1872 (Taff, 1902, p. 386-7; 1905, p. 397-8). In the following year branch lines were built to haul coal from nearby mines to the main line at McAlester, and the beginning of commercial-scale mining in each succeeding part of the coalfield was similarly made possible by the arrival of railroad lines.
>
> The Choctaw, Oklahoma, and Gulf Railroad was built eastward from South McAlester along the southern limit of the coalfield soon after 1872, as a consequence of which mines were opened at Hartshorne, Wilburton, Howe, and other points; and the later extension of this line eastward to Memphis, Tenn., and westward across Oklahoma widely increased the market for the coal. The St. Louis-San Francisco Railway was built across the east side of Indian Territory about 1885, followed by the building there of the Kansas City Southern Railway, which gave transportation north to Kansas and Missouri and south to the Gulf of Mexico at Port Arthur, Tex. In 1891 the steadily rising production first reached a million tons a year. . . . These 4 railroad lines were the only ones operating in the coalfield in 1897, at which time 18 companies and individuals were mining coal on a commercial scale, but soon after the turn of the century many main and branch lines were built through much of the remainder of the coalfield, including the Henryetta mining district, in which production began in 1902. By 1903, production from the 117 mines throughout the coalfield exceeded 3 1/2 million tons.

From the first few years of the twentieth century through World War I, coal was a major fuel in Oklahoma and a major ingredient in steel production in adjacent states. Oklahoma was then an important coal producer.

Spurred on by the increased needs for coal during World War I, the coal industry set the all-time production record for the State, 4.85 million short tons in 1920. Coal was produced in 11 counties that year, led by Okmulgee and Pittsburg Counties, with 1.5 and 1.4 million tons, respectively. All but 5 percent of this coal was produced at underground mines. An extremely small part of this production came from Craig and Rogers Counties, the present leaders in coal production.

Coal production declined moderately through 1925 and then climbed sharply until the 1929 stock-market crash, following which it declined rapidly. Once more responding to increasing demands for fuel and for coke for steel manufacture brought on by World War II, Oklahoma's coal production climbed out of the depression of the 1930's, reaching 3.2 million short tons in 1946. Coal was produced in 11 counties in 1946, led by the Henryetta district, Okmulgee County, with almost 850,000 tons. Production has remained below the 1946 level to the present time (1973), because Oklahoma coal has been replaced by natural gas in this State for use in space heating and in electric-power generation and because diesel-fueled engines have replaced coal-burning locomotives in rail transportation. In fact, if it were not for the out-of-State coal-burning power plants, which consume more than 1.5 million tons annually of Oklahoma's coal, the State's present coal production would be all but terminated.

Figure 17 is a histogram indicating annual percentages of coal mined by surface and underground methods. Trumbull (1957) reported that by January 1, 1953, the cumulative commercial production of coal in Oklahoma was 166 million short tons, of which only 17 percent had been strip mined. In 1952, about 60 percent of Oklahoma's production of coal was strip mined. Most of the production, as in previous years, came from counties in or adjacent to the Arkoma basin. However, by 1960, underground coal production had declined, and surface mining had increased to the point where more production came from the Northeast Oklahoma shelf area than from the Arkoma basin; the shelf area has led in coal production since then. In 1967, only 827,000 tons was produced, the smallest annual production in Oklahoma in the twentieth century. Production climbed from that nadir and has leveled off at 2.2-2.5 million short tons annually from 1970-1973 (table 3).

By January 1, 1974, the cumulative reported coal production in Oklahoma was 200 million short tons, of which 28 percent had been strip mined. Figure 18 is a bar graph indicating percentages of coal mined by underground and surface methods in Oklahoma, by county.

Present Production

In 1973, for the first time in the State's 100-year-old coal-mining history, 100 percent of the coal produced was strip-mined (table 3; fig. 17).

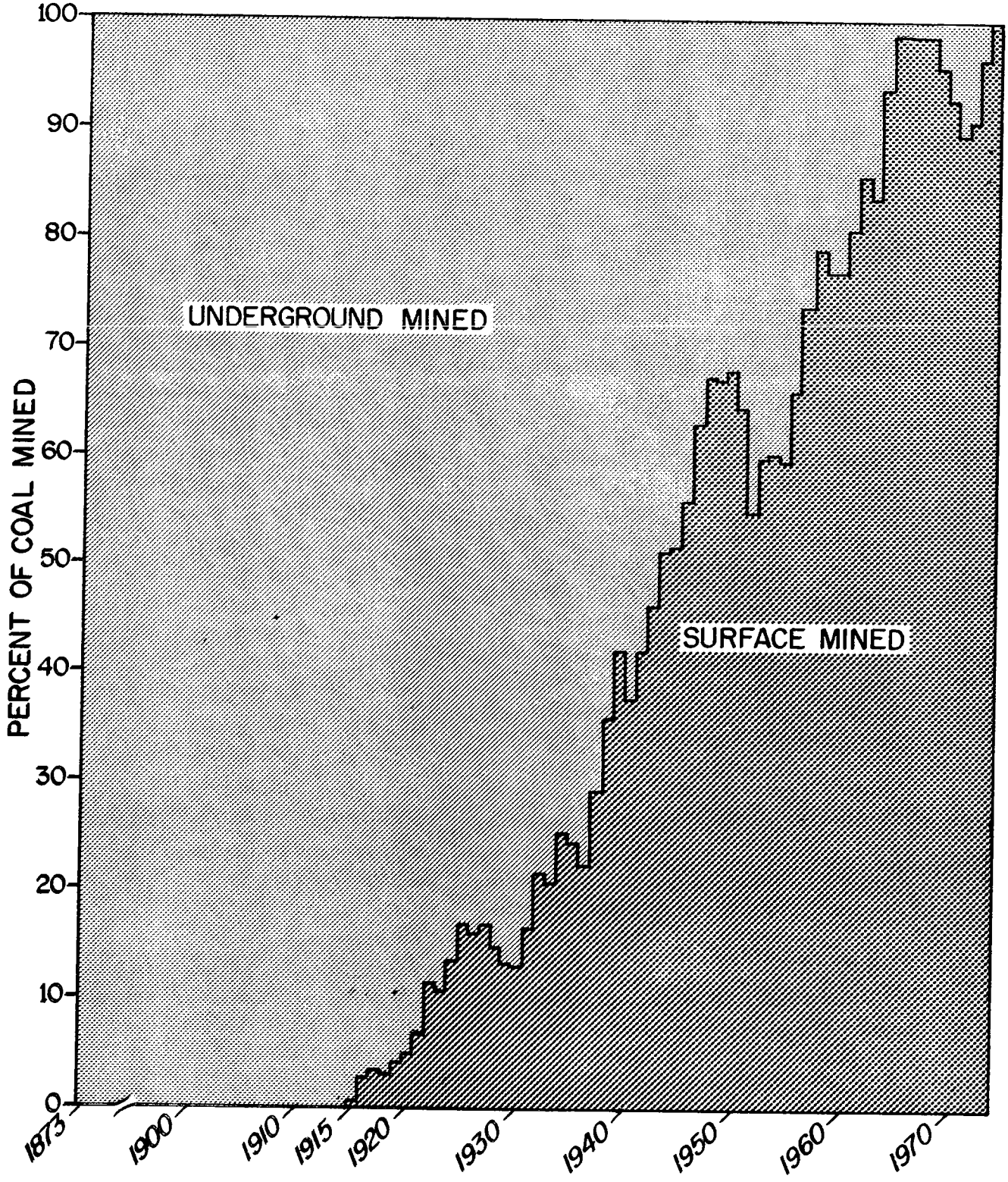

Figure 17. Histogram indicating annual percentages of coal mined by surface and underground methods in Oklahoma from 1873 to 1973.

Table 3A.--Reported Production of Coal in Oklahoma by County, 1873-1952

[Figures for 1873-79 from Eavenson (1942, p. 568); for 1880-1923 from USGS, Mineral Resources of the United States; for 1933-52 from USBM. All figures in short tons.]

Year	Tonnage	Year	Tonnage	Year	Tonnage	Year	Tonnage
1873	[1]50,000	1883	350,000	1893	1,252,110	1903	3,517,388
1874	[1]60,000	1884	448,000	1894	969,606	1904	3,046,539
1875	[1]70,000	1885	500,000	1895	1,211,185	1905	2,924,427
1876	[1]80,000	1886	534,580	1896	1,366,646	1906	2,860,200
1877	[1]90,000	1887	685,911	1897	1,336,380	1907	3,642,658
1878	[1]100,000	1888	761,986	1898	1,381,466		-
1879	[1]110,000	1889	752,832	1899	1,537,427	Total	40,428,015
1880	120,000	1890	869,229	1900	1,922,298		
1881	150,000	1891	1,091,032	1901	2,241,781		
1882	200,000	1892	1,192,721	1902	2,820,666		

Year	Coal	Craig	Haskell	Latimer	Le Flore	Muskogee	Okmulgee	Pittsburg	Rogers	Tulsa	Other[2]	Total Mined	Surface Mined[3] (percent)
1873-1907	--	--	--	--	--	--	--	--	--	--	--	40,428,015	0
1908	576,746	--	[3]674,636	([4])	187,624	--	172,934	1,294,936	--	39,848	1,392	2,948,116	0
1909	658,159	--	[3]738,806	([4])	128,376	--	262,310	1,271,109	[5]14,556	39,834	6,227	3,119,377	0
1910	498,658	--	[3]675,953	([4])	87,628	--	227,107	1,083,243	[5]27,618	40,007	6,012	2,646,226	0
1911	778,546	--	[3]701,374	([4])	122,468	--	408,202	1,018,742	[5]18,784	21,422	[6]4,704	3,074,242	0
1912	816,155	--	[3]766,798	([4])	150,511	--	629,989	1,234,334	[5]30,126	39,964	[7]7,541	3,675,418	0
1913	889,299	--	[3]738,679	([4])	201,853	--	820,659	1,420,350	[5]31,067	52,300	2,563	4,165,770	0
1914	676,292	--	--	666,274	264,023	--	905,128	1,373,771	([4])	[8]98,360	4,765	3,988,613	0
1915	556,479	0	0	740,869	256,642	0	869,244	1,132,272	[9]20,943	96,160	[7]20,971	3,693,580	0.8
1916	524,954	0	[7]82,752	810,504	266,162	0	852,206	977,043	[5]30,817	59,730	3,843	3,608,011	2.9
1917	581,770	([4])	[7]230,174	841,262	285,239	0	1,051,748	1,279,063	[5]35,930	73,137	[8]8,521	4,386,844	3.5
1918	542,254	0	[7]246,049	919,487	331,374	0	1,282,130	1,364,207	([4])	[8]121,636	6,301	4,813,447	3.3
1919	427,306	12,707	[7]129,306	697,177	274,597	[8]48,221	965,497	1,170,061	([4])	72,467	4,774	3,802,113	4.2
1920	461,394	12,700	[7]96,070	800,442	411,812	[8]35,323	1,477,677	1,404,170	([4])	130,700	19,000	4,849,288	5.0
1921	187,451	([4])	[7]83,010	344,659	296,814	[11]27,503	974,457	1,283,551	([4])	164,278	0	[10]3,362,623	6.8
1922	79,847	([4])	[12]226,744	191,098	211,401	([4])	829,554	1,022,179	([4])	222,242	19,446	2,802,511	11.5
1923	33,464	([4])	130,695	137,144	214,907	[11]66,253	818,050	1,241,943	([4])	197,894	44,688	2,885,038	10.9
1924	29,249	([4])	72,847	254,024	163,139	[8]96,903	818,683	717,794	([4])	176,976	0	[10]2,329,615	13.4
1925	52,862	([4])	129,132	269,023	250,965	[13]103,081	541,096	774,100	0	205,581	0	2,325,840	17.0
1926	83,452	5,052	[14]321,234	308,988	370,285	([4])	584,607	965,784	([4])	203,271	0	2,842,673	16.0
1927	124,015	8,284	[13]380,248	371,318	446,939	([4])	869,227	1,227,298	121,295	269,430	0	3,818,054	16.8
1928	131,110	2,187	148,736	247,690	568,878	[16]181,038	735,322	1,175,056	70,906	240,402	0	3,501,325	14.8
1929	134,328	3,619	161,412	210,780	672,749	[5]215,330	722,819	1,319,672	[17]45,785	237,586	0	3,774,080	13.1
1930	96,931	6,242	115,255	175,644	483,367	[5]161,969	541,284	976,424	[17]60,103	176,735	0	2,793,954	13.0
1931	53,396	13,932	103,239	62,209	415,917	[5]110,736	259,931	696,694	58,028	134,312	0	1,908,394	16.6
1932	42,886	4,426	88,263	83,959	323,067	[5]122,330	254,733	203,045	22,098	110,659	0	1,255,466	21.6
1933	46,671	3,444	90,476	93,466	340,062	[5]122,144	227,629	204,619	16,759	92,974	0	1,238,244	20.8
1934	38,913	([4])	103,535	69,082	347,416	11,172	185,846	177,979	[9]22,881	113,976	[18]137,489	1,208,289	25.2
1935	31,079	([4])	95,027	57,988	355,831	19,853	223,999	180,094	[13]204,225	61,302	0	1,229,398	24.4
1936	24,740	([4])	68,161	57,392	419,192	6,333	311,036	262,689	[13]314,527	76,233	0	1,540,303	22.3
1937	21,126	3,532	50,642	29,229	406,057	10,635	343,597	231,112	[5]437,595	66,770	0	1,600,295	29.1
1938	13,312	([4])	([4])	6,153	[19]341,530	9,586	224,315	198,969	[13]413,585	37,282	0	1,540,303	36.0
1939	17,941	8,288	[20]75,315	6,794	219,253	6,797	231,575	159,689	[5]423,900	38,010	0	1,600,295	42.1
1940	24,451	10,329	[20]85,811	27,409	354,544	[5]453,540	351,859	196,494	96,727	44,817	0	1,244,732	37.8
1941	21,918	13,643	[20]104,377	34,637	372,819	[5]552,123	368,089	161,927	106,187	35,388	0	1,187,562	42.1
1942	26,280	[5]667,388	[20]62,210	20,810	452,988	53,030	533,212	212,943	331,905	24,853	[21]1,573	1,645,981	46.1
1943	63,035	17,718	102,060	17,057	396,521	123,891	639,630	246,981	481,594	21,278	[18]727,582	1,771,108	51.1
1944	242,932	[5]652,213	153,567	33,566	421,451	181,994	623,211	372,159	492,039	35,402	0	2,387,192	51.5
1945	312,035	8,216	110,163	36,790	297,042	138,345	699,262	245,821	453,855	13,726	[5]593,721	2,837,347	56.0
1946	239,479	10,784	39,933	126,748	198,809	152,198	848,746	98,019	494,520	25,229	[5]412,825	3,208,534	63.2
1947	213,702	7,839	91,532	329,234	495,964	203,930	1,164,622	166,148	610,044	47,742	[5]80,806	2,908,976	67.4
1948	233,038	14,301	177,371	314,142	452,681	194,823	1,110,530	294,353	581,253	77,942	[5]11,750	2,647,380	67.3
1949	134,937	34,462	239,518	82,271	681,394	184,935	767,650	294,483	559,635	10,049	[22]32,025	3,420,563	68.1
1950	81,269	85,214	388,057	2,420	424,637	151,010	600,724	282,220	456,096	[5]10,296	[20]106,628	3,462,184	64.5
1951	72,267	58,704	392,099	0	361,327	2,268	457,596	299,302	334,654	[5]6,082	[23]238,930	3,021,859	55.0
1952	58,184	14,932	307,312	22,546	320,532	0	394,094	200,126	370,709	[5]8,142	[23]496,832	2,678,571	59.9
Total 1873-1952	10,954,312	1,680,156	9,779,478	9,500,285	15,047,377	3,747,294	28,321,825	32,121,968	7,790,746	4,072,424	3,009,909	166,453,789	16.8

[1] Estimated.
[2] Includes small mines.
[3] Includes Latimer County.
[4] Production included elsewhere.
[5] Includes Wagoner County.
[6] Includes Atoka and Johnston Counties.
[7] Includes Atoka County.
[8] Includes Wagoner and Rogers Counties.
[9] Includes Craig County.
[10] Exclusive of wagon mines in 1921 and from 1924-52.
[11] Includes Wagoner, Rogers, and Craig Counties.
[12] Includes Wagoner, Rogers, Muskogee, and Craig Counties.
[13] Includes Craig and Wagoner Counties
[14] Includes Muskogee, Rogers, Sequoyah, and Wagoner Counties.
[15] Includes Mayes, Muskogee, and Wagoner Counties.
[16] Includes Mayes and Wagoner Counties.
[17] Includes Mayes County.
[18] Includes McIntosh and Wagoner Counties
[19] Includes Haskell County.
[20] Includes Sequoyah County.
[21] Includes McIntosh County.
[22] Includes Sequoyah and Wagoner Counties.
[23] Includes McIntosh and Sequoyah Counties.

Table 3B.--Reported Production[1] of Coal in Oklahoma by County, 1953-73

(In thousands of short tons)

Year	Coal	Craig	Haskell	Latimer	Le Flore	Muskogee	Okmulgee	Pittsburg	Rogers	Tulsa	Other[2]	State Total	Total Surface Mined	Surface[3] Mined (percent)
1953	35	8	506	79	279	2	368	210	347	3	318	2,155	1,302	60
1954	26	8	346	70	253	3	326	200	305	1	244	1,782	1,042	58
1955	13	18	405	87	350	2	285	196	348	2	281	1,987	1,284	66
1956	2	39	241	86	356	(4)	124	261	341	0	471	1,921	1,423	74
1957	3	89	312	75	345	1	72	254	433	0	463	2,047	1,607	79
1958	(4)	73	236	11	304	(4)	60	183	391	0	371	1,629	1,257	77
1959	0	132	276	1	223	0	37	186	357	0	333	1,545	1,195	77
1960	0	99	244	1	215	0	15	125	297	0	366	1,362	1,105	81
1961	78	131	369	1	105	5	1	41	202	0	165	1,098	947	86
1962	0	264	374	1	50	1	2	110	237	0	18	1,057	893	84
1963	0	319	393	1	12	(4)	2	43	242	0	1	1,013	956	94
1964	0	330	427	1	11	1	1	(4)	266	0	1	1,038	1,025	99
1965	0	274	440	1	9	1	1	0	237	0	1	964	954	99
1966	0	202	403	1	6	2	2	0	226	0	1	843	837	99
1967	0	81	303	1	3	1	3	0	432	0	3	827	821	99
1968	0	51	336	1	46	2	1	0	668	0	0	1,105	1,059	96
1969	0	50	432	(4)	113	2	1	0	1,240	0	0	1,838	1,716	93
1970	0	993	424	(4)	222	1	2	4	798	0	0	2,444	2,205	90
1971	0	500	363(5)	0	174	2	0	0	780	0	415(6)	2,234	2,039	91
1972	0	453	418	0	80	157	0	18	928	0	476(6)	2,530	2,445	97
1973	0	436	334	0	0	65	0	0	1,027	0	331(6)	2,195	2,195	100
Total 1953-1973	157	4,550	7,582	418	3,156	248	1,303	1,831	10,102	6	4,259	33,617	28,307	84
Total 1873-1952 (7)	10,954	1,680	9,779	9,500	15,047	3,747	28,322	32,122	7,791	4,072	3,010	166,454	27,964	17
Grand Total 1873-1973	11,111	6,230	17,361	9,918	18,203	3,995	29,625	33,935	17,893	4,078	7,269	200,071	56,271	28

(1) Data from Annual Report of the Chief Mine Inspector, Oklahoma Department of Mines, 1953-1973 inclusive. From each mine, production between 500 and 999 tons was rounded to one thousand tons; production below 500 tons was not included.
(2) Most tonnage, from McIntosh and Sequoyah Counties, with some from Nowata and Wagoner.
(3) Includes one auger mine in Haskell County, the remainder is strip mined.
(4) Less than 500 tons.
(5) 1971 Haskell, part augered.
(6) Nowata County.
(7) See preceeding table by Trumbull.

Ten mines produced 2.2 million tons of coal that year. The weighted average sulfur content of this coal was 2.8 percent as shipped. Most of it was crushed and cleaned mechanically; some was mine-run and picked.

The 1952 production was also 2.2 million tons, when Oklahoma ranked 15th among coal-producing States. But in 1973 the same quantity probably will result in the State's ranking 21st, having been caught and passed in recent years by Arizona, Washington, Montana, North Dakota, Maryland, and Texas.

Figure 19 is an index map showing the distribution of the production of bituminous coal in Oklahoma, by county, in 1973. More than 1 million tons of coal was produced in Rogers County, top-ranked for 1973. Figure 20 shows 12 active and developing coal mines as of January 1, 1974, and areas of recent coal exploration in Oklahoma. Figure 21 shows shipping destinations of coal mined in Oklahoma in 1973. Essentially all production is shipped out of State.

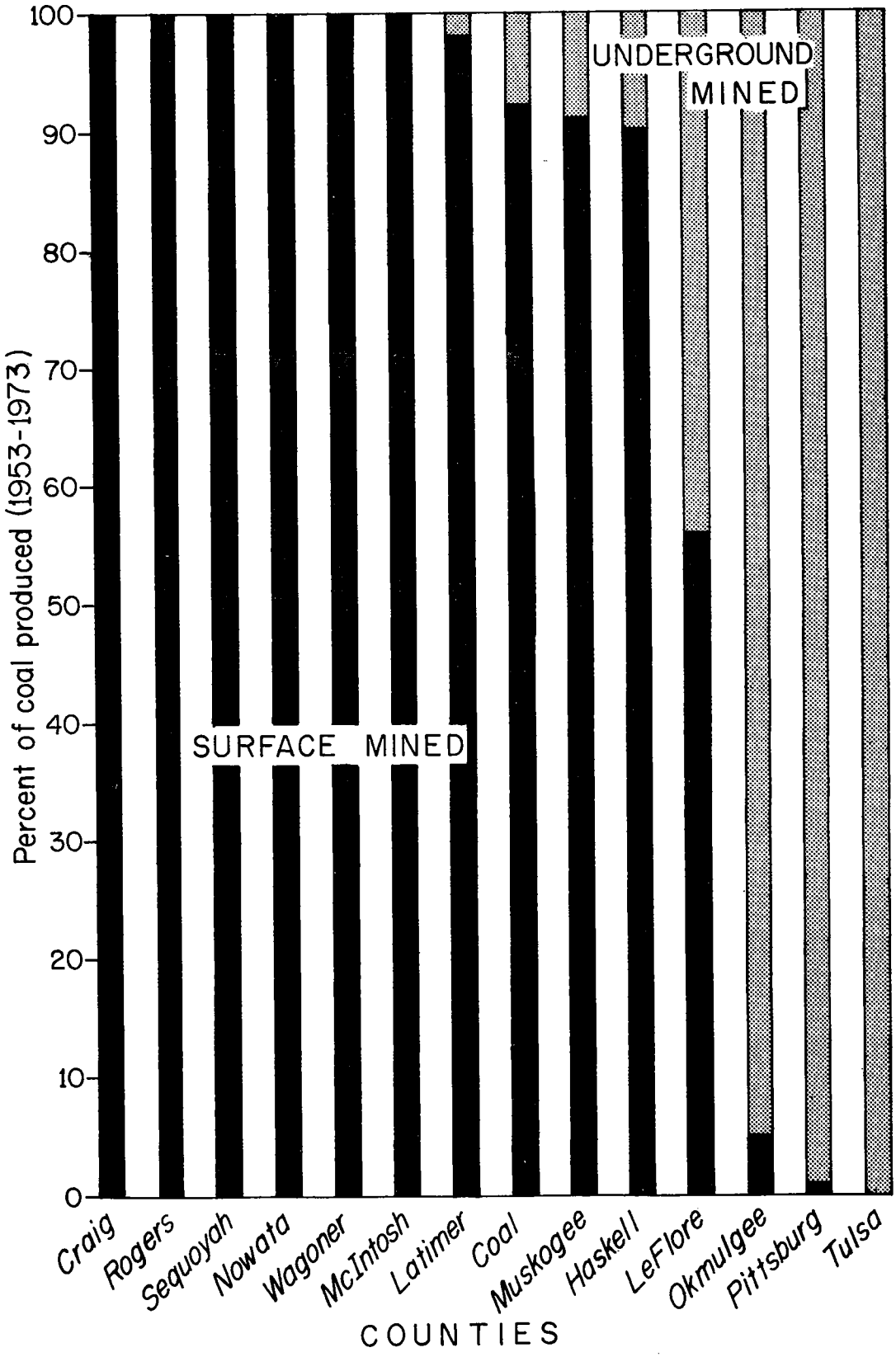

Figure 18. Bar graph illustrating county-by-county percentages of coal mined by surface and underground methods in Oklahoma, 1953-1973.

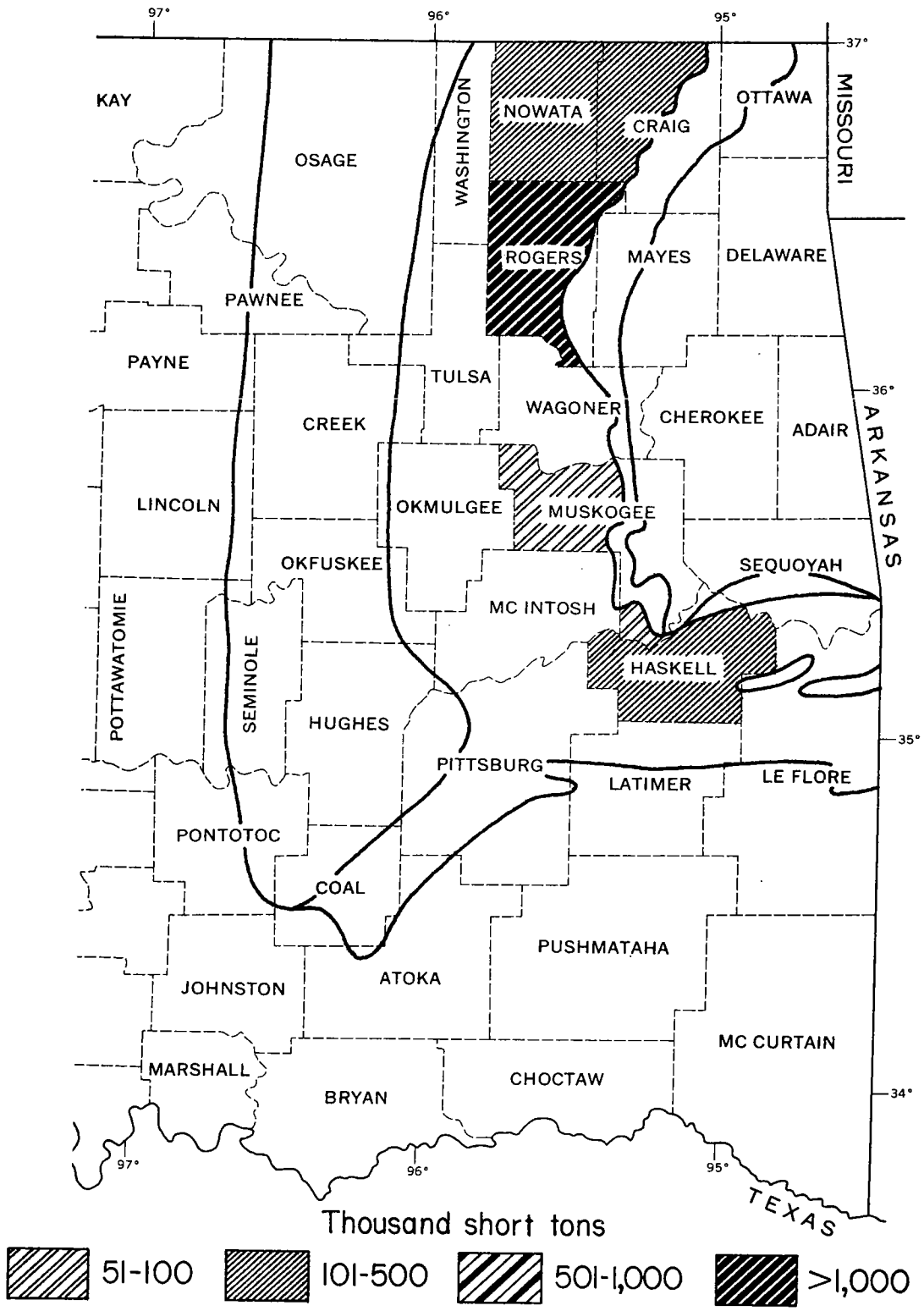

Figure 19. Index map showing bituminous coal production in Oklahoma--by county--in 1973.

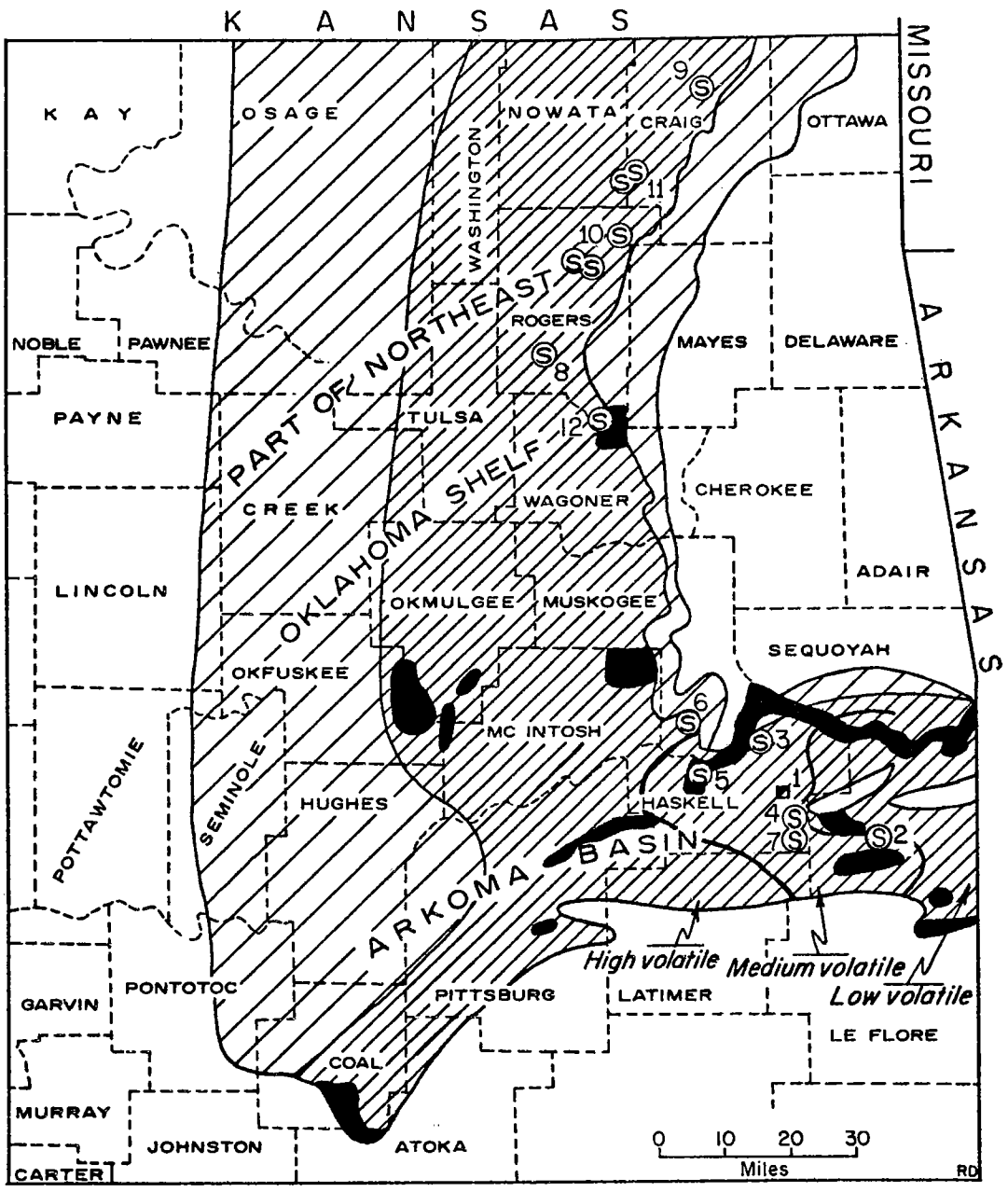

Figure 20. Index map showing active and developing coal mines in Oklahoma (as of January 1, 1974) and areas of recent coal exploration (in black). Numbers are keyed to table 4.

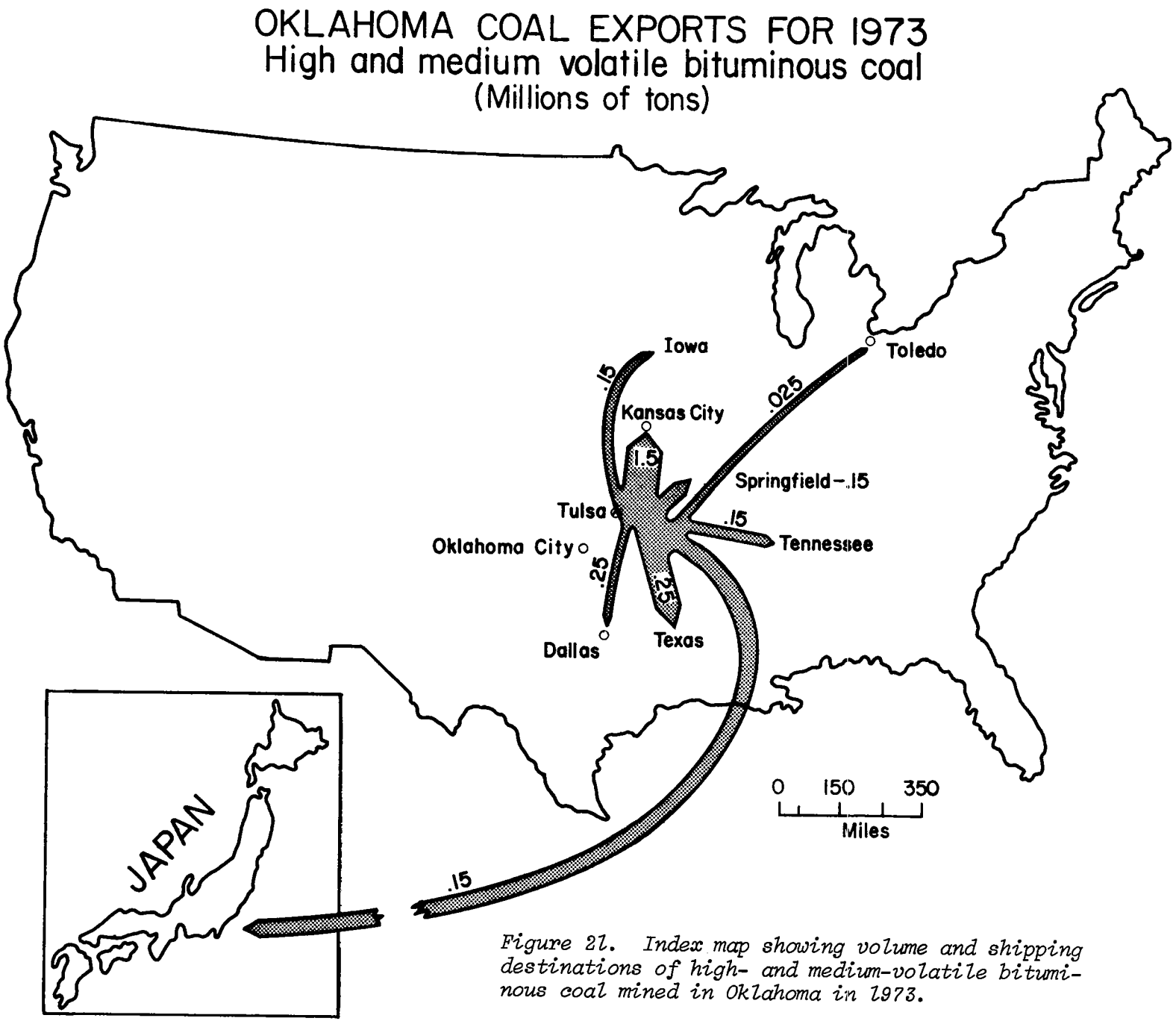

Figure 21. Index map showing volume and shipping destinations of high- and medium-volatile bituminous coal mined in Oklahoma in 1973.

Future Production

If the major utilities continue with plans to obtain coal from Wyoming for expanding and new electric-generating plants in Oklahoma, then nothing short of chemical conversion will cause Oklahoma coal to be used within the State on a moderate to large scale. As it looks now, future production of Oklahoma's large coal deposits will continue to depend mostly on markets in adjacent states. On the other hand, if a major chemical plant or a gasification plant is constructed in eastern Oklahoma, then more than 10 million tons of the State's coal will be required annually, and the mining and transportation industries will expand greatly in the next 10 years. This multiplier effect, furthermore, would create thousands of additional jobs.

To place the potential use of Oklahoma coal in perspective, a graph (fig. 22) shows predicted gas consumption (but in terms of equivalent short

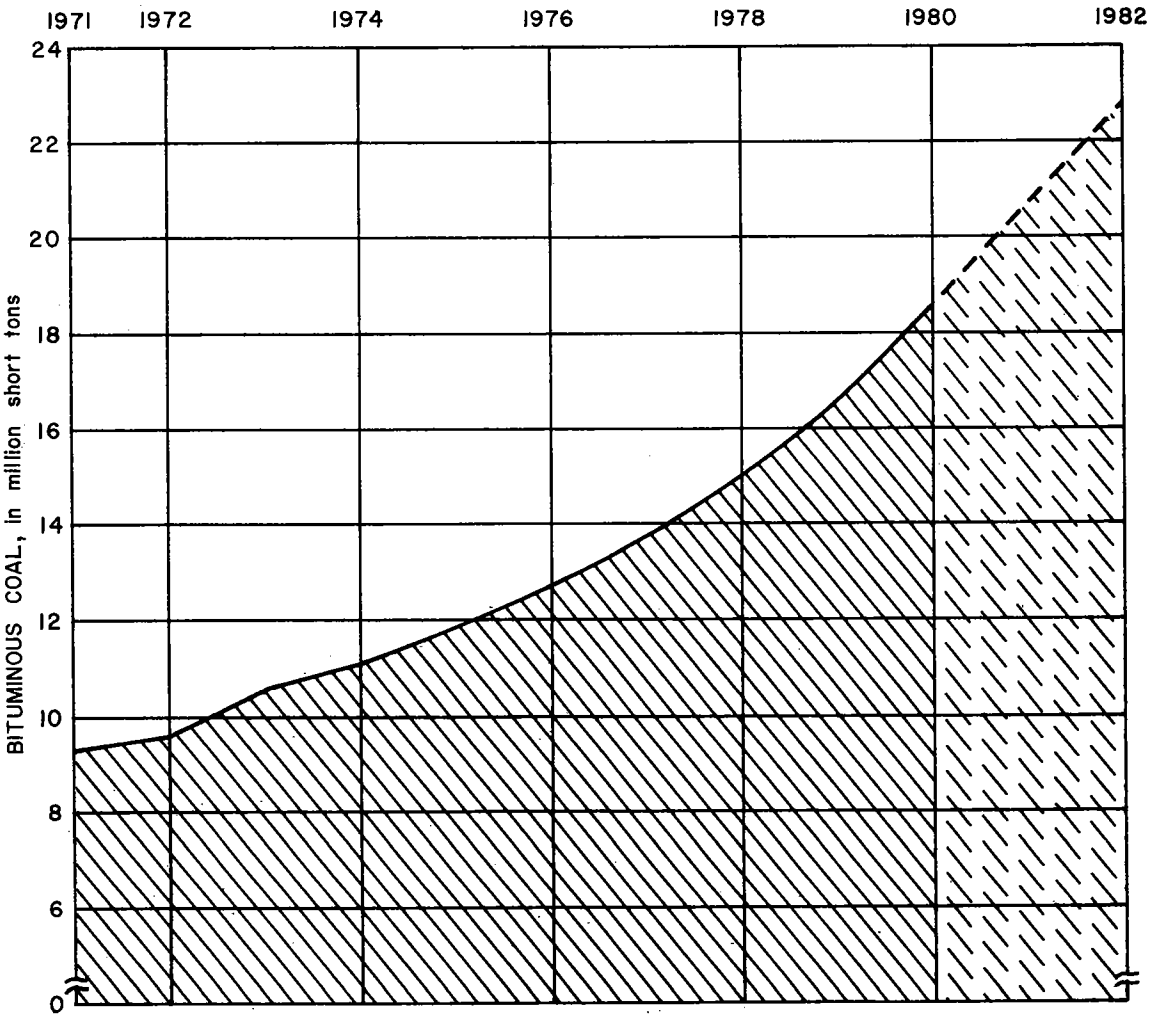

Figure 22. Graph showing potential gas consumption in terms of equivalent short tons of bituminous coal by selected electricity-generating plants in Oklahoma (modified from Keystone Coal Industry Manual, 1972).

tons of bituminous coal) by selected electric-generating plants in Oklahoma through 1982.

Mining Methods

By the end of December 1973, coal was being mined exclusively by surface methods in Oklahoma. At that time, 9 mines with 12 pits were mining coal, 2 mines were developing, and one was idle (table 4). An aerial view of an active strip mine in northern Rogers County is shown in figure 23. The five largest pits in the Northeast Oklahoma shelf area contained stripping shovels, which could remove overburden composed of siltstone, shale, sandstone, and limestone with better efficiency than comparably sized draglines. Six draglines were operating at six pits removing shale and mudstone overburden, mostly in the Arkoma basin. A dragline with a 30-cubic-yard bucket is shown in operation in Haskell County in figure 24.

Table 4.--Active Coal Mines in Oklahoma, January 1, 1974
(Numbers keyed to map, figure 20)

1.	Choctaw mine, Kerr-McGee Coal Corporation, underground, idle.
2.	Shady Point strip mine, Okar Energy Corporation.
3.	Stigler strip mine, Garland Coal and Mining Company.
4.	McCurtain strip mine, Lone Star Steel Company.
5.	Whitefield strip mine (inactive), Briartown Coal Company.
6.	Porum strip mine, Sierra Coal Corporation.
7.	McCurtain strip mine, Great National Coal Company
8.	Catoosa strip mine, McNabb Coal Company.
9.	No. 2 strip mine, Bill's Coal Company.
10.	Rogers County No. 1 strip mine, Peabody Coal Company
11.	Rogers County No. 2 strip mine, Peabody Coal Company.
12.	Rebecca strip mine, United Coal Company.

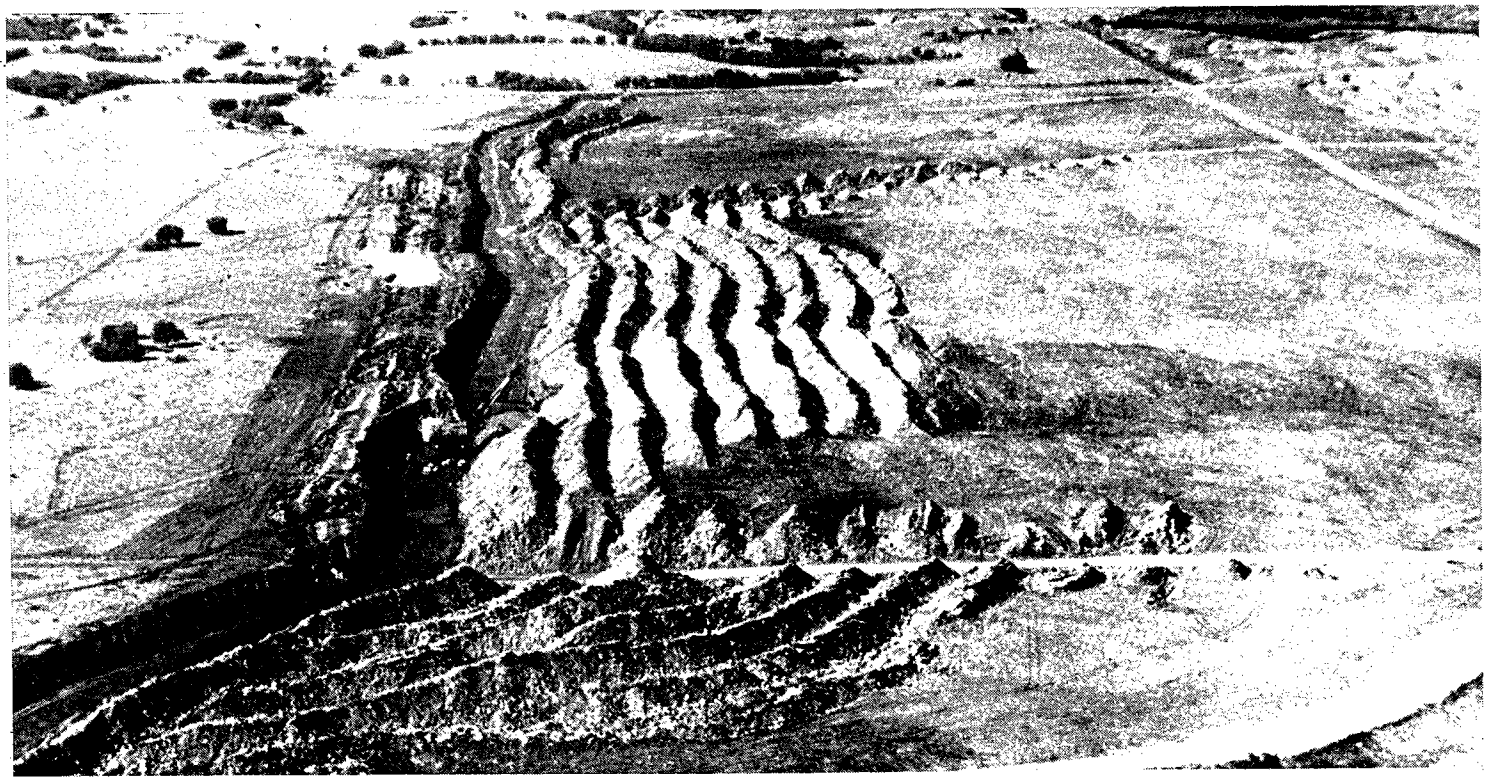

Figure 23. Photograph of strip mine in northeastern Rogers County, Oklahoma, 1971, showing, from left to right, undisturbed land underlain by measured reserves, a narrow belt drilled for shooting and overburden removal, mine pit with coal exposed, alternating furrows and ridges where coal has been mined and overburden piled, and reclaimed land that has been seeded (by helicopter) with grass. (Courtesy of K.S. Johnson.)

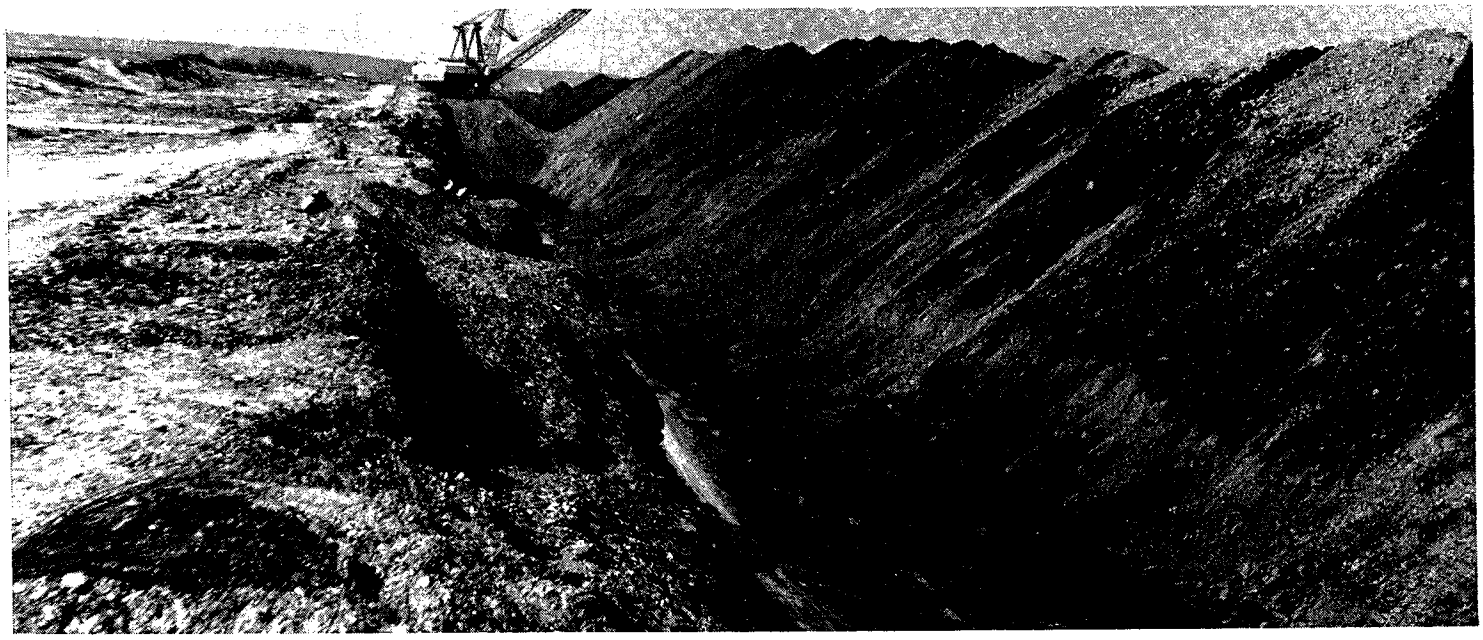

Figure 24. View, looking north, of dragline removing 70 feet of shale and mudstone overburden, exposing low-sulfur, coking, Stigler coal, 1.5 feet thick, in north-central Haskell County, Oklahoma, 1973.

Shotholes are drilled vertically into the overburden along the top of the highwall at all pits except one; there, horizontal shotholes are bored by an auger into interlaminated shale, siltstone, and sandstone. Ammonium nitrate alone or in combination with dynamite is used as the explosive to "shoot" the overburden.

The coal beds in these strip mines are 10-30 inches (0.8-2.5 feet) thick and average 18 inches (1.5 feet). After the overburden is removed, these thin coal beds are exposed and are ripped by a ripping device commonly mounted on a front-end loader. The loader then piles the coal and loads it onto 20-35-ton-capacity trucks, which haul it to preparation plants.

Historical documentation of past mining methods in Oklahoma is not easy to locate. An excellent summary was prepared by Trumbull (1957, p. 363-364) and is quoted as follows.

> Most of the underground operations have been slope mines, partly because in much of the large and intensively mined southern part of the coalfield the coal occurs on the flanks of folds, so that the coal beds at the outcrop have relatively high dips. In most of the slope mines the main entry is driven directly down the dip, generally paralleled by one or more air courses, and a number of horizontal cross entries are driven on each side, from which rooms or panels are driven up or down dip. Many shaft mines have also been operated, mainly where the coal is at depth in the more level central part of synclines, but also in areas such as the vicinity of Henryetta and in the Dawson bed near Tulsa, where a uniformly low dip has resulted in the coal being only a few hundred feet underground at a great distance from the outcrop. The far smaller number of drift mines have been located mainly where gently dipping coal beds are exposed in hillsides, such as in the hilly country in Le Flore County in the southeastern corner of the coalfield and in the Henryetta mining district. In the Henryetta district, of the 57 underground mines known to have been operated, 21 were opened by shafts, 21 by drifts, and 15 by slopes.
>
> The predominant plan of underground mining in the State has been the room-and-pillar system, but numerous mines are now being operated on the panel system. Longwall mining was experimented with in various parts of the field in the early years, and has long been used in mining the relatively thin Cavanal bed on Poteau Mountain near Poteau, Le Flore County. An interesting system has been used for extracting the coal from one longwall mine in the Cavanal bed in this area. After undercutting, the coal is hauled out of the mine in large blocks, some weighing as much as 3 tons, by scow-pan and low flat mine cars. These blocks are broken into lump size with air hammers at the tipple, resulting in nearly 100 percent production of lump coal.

The coal produced at the present strip mines is crushed in many operations to 1 1/2 by 1/4 size for use in electric-power generating plants, coke manufacture, or other industrial purposes. An undetermined but small quantity of low-sulfur coal from Oklahoma is bagged in larger sizes for individual use and is shipped throughout North America.

The longwall-mining method may be used eventually at the developing Choctaw Mine of Kerr-McGee Coal Company in Haskell County.

COAL ECONOMICS

General Statement

What is the cost of mining a ton of coal in Oklahoma? This simple question demands a simple answer, but a valid answer is difficult to determine. The question of the cost of producing coal directly ties the academic knowledge about coal resources to the practical knowledge of business and mining that is required to bring coal to the market. The best information available from previous cost-benefit studies has been reviewed, and personal interviews with coal-company executives, public and private transportation consultants, and tax experts have been conducted to permit the presentation in this report of cost estimates on mining, cleaning, and shipping coal; on reclaiming land at Oklahoma coal strip mines, and on f.o.b. (selling) prices of coal. In all cases, individual company data are not disclosed. Information from the U.S. Bureau of Mines is derived from hypothetical models.

Many variables make cost estimates highly tenuous at best and certainly justify use of the very word "estimate." Like coal-reserve estimates, cost estimates require frequent change because new information and economic conditions generate change in the variables. Cost and price estimates obtained from coal-mine operators in Oklahoma are based on 1973 dollar value. The strip-mine estimates of the U.S. Bureau of Mines are based on 1969 dollar value, and the estimates for underground mining are based on 1973 dollar value.

Costs of Production

Surface mining.--A report by the U.S. Bureau of Mines (1972, Information Circular 8535) on the cost analysis of model strip mines included a hypothetical surface coal mine in the Northeast Oklahoma shelf area. Of course, all costs have increased since 1969, for which year the report was applicable, and the 1969 dollar value has correspondingly decreased. However, taken as published, the information on capital investment, development, equipment, labor, and so on is deemed of great value and certainly worthy of presentation in the present report.

The following selected paragraphs from the Bureau's report are presented here as an explanation of their tables 39-45. The tables are given as originally published, except that they have been renumbered.

Basic costs are developed by geographic area, rank of coal, and output capacity. Seam thickness and depth and type of overburden are considered typical for the area in which the hypothetical mine would be located. The cost analyses are based on the use of new equipment, the prevailing union wage scales, and the payment of all miscellaneous costs including royalties, contributions to the miners' welfare fund, and license and permit fees. All model mines are considered to have a life span of 20 years.

Capital costs of bituminous strip mines with a capacity of 1 million tons per year range from $12.7 million in the Appalachian region to $16.0 million in the Interior province. The corresponding selling price, assuming a discounted cash flow return of 12 percent on investment, is $5.40 and $6.95 per ton, respectively. For bituminous coal strip mines producing 3 million tons annually, a capital investment of $24.9 million will render a selling price of $3.46 per ton in the Interior province, whereas a similar mine in the Appalachian region requires a capital investment of $28.0 million to produce coal selling for $4.01 per ton.

Subbituminous strip mines of 5 million tons of output per year range in capital costs from $28.7 million in the Southwest to $13.9 million in Wyoming and Montana. Coal produced in the Southwest would sell for $3.03 per ton, while coal from Wyoming and Montana would sell for $1.83 and $1.64 per ton, respectively.

The capital costs for the strip mining of lignite range from $6.4 million for an output capacity of 1 million tons annually to $20.7 million for an annual capacity of 5 million tons. The corresponding selling prices of $3.01 and $2.12 per ton, respectively, indicate the advantages of a large-capacity strip mine.

This study develops costs of producing coal for steam-electric generation by strip-mining methods from a 16-inch coal seam. The hypothetical mine is in eastern Oklahoma in the Iron Post (Fort Scott) coal. Data in this report substantiate Bureau of Mines estimates of economical strippable coal reserves in seams of comparable grade and thickness elsewhere in eastern Oklahoma and in southeast Kansas and southwest Missouri.

The Iron Post coal occurs in a belt that extends across Craig, Nowata, and Rogers Counties in northeastern Oklahoma. The seam averages 16 inches in thickness. The coal is classed as high sulfur (in excess of 2 percent) but is suitable for burning in steam-electric generating plants without benefication other than screening to remove rock and tramp material. Production costs, per ton of coal, from the Iron Post seam, will vary with changing thickness of overburden and mine location. Costs for the hypothetical mine are based on average overburden thickness and average proximity to railroad and electric-power facilities.

Costs for this analysis were established through an outlay of charges for services and prices of equipment and supplies. These data were obtained from mining companies, equipment manufacturers, individuals conducting cost-analyses studies, trade journals and mining publications, and unpublished material from Bureau of Mines files.

Tables [5-11] give a complete cost analysis; a summary of the estimated capital investment, operating cost, and selling price on a 12-percent discounted cash flow rate of return, after income taxes, follows.

Production, million tons per year	Estimated capital investment	Operating cost		Selling price, 12 percent DCF
		Dollars per year	Dollars per ton	
1	$15,998,000	5,267,000	5.27	$6.95

(Tables 5-11 refer to a hypothetical Oklahoma strip mine producing 1 million tons of bituminous coal annually.)

Table 5.--Total Estimated Capital Requirements
(Table 39, USBM Inf. Circ. 8535)

Exploration, buildings, road, and railroad	$1,269,800
Unit-train loading facility	752,000
Mining equipment	10,147,300
Total direct	12,169,100
Field indirect	243,400
Total construction	12,412,500
Engineering	248,300
Subtotal	12,660,800
Overhead and administration	633,000
Subtotal	13,293,800
Contingency	1,329,400
Subtotal	14,623,200
Fee	292,500
Total plant cost (insurance-tax base)	14,915,700
Interest during construction	372,900
Working capital	709,400
Total capital requirements	15,998,000

Table 6.--Equipment Cost Summary
(Table 40, USBM Inf. Circ. 8535)

Item	No.	Unit cost	Total cost
Drills (overburden)	2	$126,800	$253,600
Shovels (overburden), include freight, erection, bucket, and crawler spares	2	4,200,000	8,400,000
Bulldozers	3	117,400	352,200
Do	1	38,705	38,705
Motor grader	1	29,957	29,957
Trucks (coal haulers)	4	101,085	404,340
Supply truck	1	4,000	4,000
Pickup trucks	7	2,500	17,500
Mechanic truck	1	7,000	7,000
Crane truck	1	80,000	80,000
Welding truck	1	21,000	21,000
Explosives trucks	2	5,000	10,000
Water truck	1	20,000	20,000
Loaders, front-end (coal)	2	125,000	250,000
Air compressor	1	4,000	4,000
Pump	1	5,000	5,000
Electrical equipment (substation, cables, etc.)	-	250,000	250,000
Construction of railroad spur line	-	-	680,000
Preparation of building sites	-	-	5,000
Shop and storage buildings	-	-	13,400
Shop, tools, and equipment	-	-	300,000
Office and equipment	-	-	19,000
Unit-train loading facility	-	-	752,000
Road construction	-	-	120,000
Exploration	-	-	132,400
Total	-	-	12,169,100

Table 7.--Depreciation Schedule
(Table 41, USBM Inf. Circ. 8535)

Item	Straight line depreciation, years	Yearly charge
Exploration	20	$6,600
Building and site preparation[1]	20	35,400
Shop, tools, and equipment	10	30,000
Office furniture and equipment	10	1,900
Road	20	6,000
Drills (overburden)	20	12,700
Shovels (overburden), include bucket and crawler spares	20	420,000
Bulldozers	10	39,100
Motor grader	10	3,000
Trucks (coal haulers)	8	50,000
Supply truck	5	800
Pickup trucks	5	3,500
Mechanic truck	4	1,800
Crane truck	6	13,300
Welding truck	6	3,500
Explosives trucks	10	1,000
Water truck	6	3,300
Loaders (front-end)	10	25,000
Air compressor	10	400
Pump	10	500
Unit-train loading facility	20	37,600
Electrical equipment	10	25,000
Subtotal	-	720,400
Depreciation for field indirect, engineering, overhead and administration, contingency, fee, and interest during construction	20	156,000
Total yearly depreciation	-	876,400

[1] Includes construction of railroad spur line and shop and storage buildings.

Table 8.--Manning Table
(Table 42, USBM Inf. Circ. 8535)

Personnel	Total	Wages,[1] dollars per day (7-1/4 hours)	Annual cost (240 workdays)
Production:			
Driller (overburden)[2]	4	$33.20	$46,500
Driller helper (overburden)[2]	4	31.23	43,700
Shooter[2]	4	33.20	46,500
Shooter helper[2]	4	31.23	43,700
Shovel operator (overburden)[2]	6	38.53	80,900
Shovel oiler (overburden)[2]	6	33.87	71,100
Bulldozer operator (coal storage)[3]	2	34.68	17,300
Bulldozer operator (reclamation)[2]	8	34.68	97,100
Grader operator[3]	2	32.04	16,000
Loader operator (coal loading)[3]	4	34.68	34,700
Truck driver (coal hauler)[3]	8	31.94	63,900
Truck driver	2	31.23	15,000
Tipple man	1	31.87	7,600
Loader	1	31.23	7,500
Sampler	1	30.93	7,400
Subtotal	57	-	598,900
Maintenance:			
Mechanic	8	32.44	62,300
Welder	6	32.44	46,700
Electrician	4	32.44	31,100
Subtotal	18	-	140,100
Supervision:			
Superintendent	1	-	20,000
Pit foreman	6	-	66,000
Maintenance foreman	2	-	22,000
Electrical engineer	1	-	15,000
Mining engineer	2	-	30,000
Safety engineer	1	-	11,000
Draftsman	1	-	8,000
Warehouseman	2	-	14,000
Mine clerk	1	-	8,000
Stenographer	1	-	5,000
Subtotal	18	-	199,000
Grand total	93	-	938,000

[1] Union wages in Appalachian Agreement, National Bituminous Wage Agreement, effective Oct. 1, 1968 (Oct. 1, 1969, wage scale).
[2] Personnel work 350 days per year.
[3] Personnel work 250 days per year.

Table 9.--Estimated Working Capital
(Table 43, USBM Inf. Circ. 8535)

Direct labor, 3 months	$234,500
Payroll overhead, 3 months	82,100
Operating supplies, 3 months	188,600
Indirect cost, 4 months	84,600
Fixed cost, 0.5 percent of insurance base	74,600
Spare parts	32,000
Miscellaneous expense	13,000
Total	709,400

Table 10.--Estimated Annual Production Cost
(Table 44, USBM Inf. Circ. 8535)

	Total annual cost	Cost per ton
Direct cost:		
Production:		
Labor	$598,900	$0.60
Supervision	139,500	.14
Subtotal	738,400	.74
Maintenance:		
Labor	140,100	.14
Supervision	59,500	.06
Subtotal	199,600	.20
Total direct labor	938,000	.94
Operating supplies:		
Spare parts	176,000	.18
Explosives	268,400	.27
Fuel, oil, and lubricants	100,000	.10
Tires	150,000	.15
Miscellaneous (includes aggregate for road maintenance)	60,000	.06
Total operating supplies	754,400	.75
Power	710,500	.71
Payroll overhead (35 percent of payroll)	328,300	.33
Union welfare	400,000	.40
Royalty	280,000	.28
Operators permit and reclamation bond	27,900	.03
Subtotal	1,746,700	1.75
Total direct cost	3,439,100	3.44
Indirect cost: 15 percent of labor, maintenance, and supplies	253,900	.25
Fixed cost:		
Taxes and insurance (2 percent of plant cost)	298,300	.30
Depreciation	876,400	.87
Deferred expense	400,000	.40
Total fixed cost	1,574,700	1.57
Total annual production cost	5,267,700	5.27

Table 11.--Calculation of Coal-Selling Price
(Table 45, USBM Inf. Circ. 8535)

12 percent--20 years

R = $15,998,000/7.469 = $2,141,900

less depreciation -876,400

$1,265,500 = depletion + net profit

Depletion + net profit = 3/4 gross profit

Gross profit = 4/3 X $1,265,500 = $1,686,900

Sales = production cost + gross profit
= $5,267,700 + $1,686,900 = $6,954,600

Selling price/ton--$6,954,600/1,000,000 = $6.95

Depletion = 50 percent of gross profit

F.I.T. = 50 percent of taxable income

Gross profit	$1,686,900
Depletion	843,450
Taxable income	843,450
Federal income tax (F.I.T.)	421,700
Net profit	421,750

Annual cash flow = net profit + depreciation + depletion
= $421,800 + $876,400 + $843,500 = $2,141,700

The following equipment will be needed:

Drill (overburden)

Electric	volts	2,300/4,160
Motor	horsepower	200
Drill hole diameter	inches	7-1/2-9-3/4
Crawler chassis, diesel	horsepower	238

Shovel (overburden)

Electric, crawler	horsepower	4,000
Dipper capacity	cubic yards	40

Bulldozer (highwall, pit, and reclamation)

Diesel power	horsepower	385
Rear-mounted ripper		
Straight blade		

An estimated 7-percent increase occurred annually in mining and labor costs during 1970-73. Thus in 4 years these costs increased a total of 28 percent (Neil J. Dikeman, Jr., Bureau for Business and Economic Research, University of Oklahoma, 1974, personal communication). Applying this percentage increase would increase the mining cost from $5.27 to $6.95 per ton, and the price from $6.95 to $8.90 per ton of Oklahoma coal at the hypothetical model strip mine of the U.S. Bureau of Mines (1972).

By interviewing each Oklahoma coal operator for 1973 data, the writer concluded that the weighted average mining cost was $6.91 per ton, a figure remarkably similar to that of the amended hypothetical model. The information from the interviews revealed a weighted average f.o.b. selling price of $9.05 per ton. Costs will continue to increase in 1974 for mining and cleaning coal and for reclamation at surface mines. The trend of other costs is less certain. But the rising costs and increasing demand for Oklahoma coal each will result in increases in the weighted average selling price per ton in 1974.

Underground mining.--At present and during 1973, coal was not mined by underground methods in Oklahoma. Most of the State's coal resources (91 percent) are amenable to underground-mining methods, however. An effort has been under way for 5 years to develop coal reserves by underground mining in Haskell County. The potential is increasing for underground-mine development in Le Flore County in the near future. Thus a brief discussion follows of potential mining costs and selling price for coal produced at possible underground mines in Oklahoma.

Katell and Hemingway (1974, p. 1) estimated that the initial capital investment for a hypothetical underground coal mine in the United States would be $12.5 million (1973 dollar value). At this mine the coal bed would be 6 feet thick, and annual production would be 1 million short tons for 20 years. Annual operating costs per ton would be $7.35, and selling price would be $8.76. These U.S. Bureau of Mines researchers summarized their data in the following selected tables (tables 12-17).

As given, the cost and price per ton of coal in this report (Katell and Hemingway, 1974) probably would not apply fully to Oklahoma. But with reduction of coal thickness and annual production, most of the criteria could be applied in analyzing production costs for mining coal underground in Oklahoma. As it is, few areas are present in Oklahoma where a coal bed is 6 feet thick and amenable to underground mining. However, a few areas are present in Haskell and Le Flore Counties in which a coal averages 4.5 feet thick and could be produced at an underground mine for 20 years.

The U.S. Bureau of Mines (1972, p. 62) has indicated that the average cost per ton of annual production of Oklahoma coal at a typical strip mine in the Northeast Oklahoma shelf area was $5.27 in 1969; the writer has updated this cost to $6.95 for 1973, and coal operators have shown information resulting in a weighted average cost estimate of $6.91 for all active surface mines in 1973. Furthermore, the Bureau of Mines has substantiated

the general economic understanding that it costs more to produce a ton of coal at underground mines than at surface mines by indicating that the difference in cost of mining between these two methods was $4.22 per ton of coal produced in 1973 in the United States. Thus, if $4.22 is added to $6.91, the sum would be $11.13 per ton (1973 dollar value)--an estimated cost of producing a ton of coal in a hypothetical underground mine in Oklahoma, if the coal averages 6 feet in thickness. It is obvious that it would cost more to produce coal at a smaller underground mine--that is, at one whose annual production was less than 1 million tons--than in the model mine of Katell and Hemingway (1974).

Table 12.--Summary of Capital Investment, Operating Costs, and Selling Price by Annual Output Capacity (Table 2, USBM Inf. Circ. 8632)

MM tons per year..	1.06	2.04	3.18	4.99
Estimated initial capital investment.....	$12,540,700	$20,868,900	$29,711,100	$44,720,500
Estimated deferred capital investment.....	9,310,000	14,837,000	20,783,000	30,973,000
Total.....	21,850,700	35,705,900	50,494,100	75,693,500
Capital investment per ton of production.....	20.62	17.47	15.87	15.15
Operating cost per year.....	7,793,900	13,830,300	20,656,700	32,211,300
Operating cost per ton of production.....	7.35	6.77	6.50	6.45
Selling price per ton, 12 percent DCF[1]	8.76	7.99	7.63	7.53

[1] Discounted cash flow.

Table 13.--Estimated Annual Production Cost, 1.06 MM tpy Mine
(Table A-5, USBM Inf. Circ. 8632)

	Annual cost	Cost per ton
Direct cost		
Production:		
Labor	$1,755,500	$1.66
Supervision	480,400	0.45
	2,235,900	2.11
Maintenance:		
Labor	289,700	0.28
Supervision	75,000	.07
	364,700	.35
Operating supplies:		
Mining machine parts	529,500	.50
Lubrication and hydraulic oil	211,900	.20
Roof bolts and timber	264,900	.25
Rock dust	106,000	.10
Ventilation	158,900	.15
Bits	84,800	.08
Cables	53,900	.05
Miscellaneous	106,000	.10
	1,515,900	1.43
Power	202,600	0.19
Water	900	
Payroll overhead (35 percent of payroll)	910,200	.86
Union welfare[1]	794,600	.75
Indirect cost		
15 percent labor, supervision, and supplies	617,500	.58
Fixed cost		
Taxes and insurance, 2 percent of mine cost	206,200	.19
Depreciation	945,400	.89
	1,151,600	1.08
Total	7,793,900	7.35

[1]Effective Nov. 12, 1973, under the Bituminous Wage Agreement of 1971.

Table 14.--Estimated Development Cost[1], 1.06 MM tpy Mine
(Table A-6, USBM Inf. Circ. 8632)

Item	Total cost	Cost per ton
Total labor and supervision	$2,849,900	$2.53
Operating supplies	1,014,800	0.90
Power	169,100	.15
Payroll overhead	997,500	.89
Union welfare	845,600	.75
Indirect cost	579,700	.51
Fixed cost	667,200	.59
Total	7,123,800	6.32
Cost per ton = $6.32		
Tonnage = 1,127,500		
Credit for coal mined at $6.50 per ton = $7,328,800		

[1]Estimated development cost covers the period of time required to place all units in operation within the projected mining plan.

Table 15.--Estimated Working Capital and Total Capital Investment, 1.06 MM tpy Mine
(Table A-7, USBM Inf. Circ. 8632)

Estimated working capital		
Direct labor	3 months...	$650,200
Operating supplies	3 months...	379,000
Payroll overhead	3 months...	227,600
Indirect cost	4 months...	205,800
Fixed cost	0.5 percent of insurance base...	51,500
Spare parts		200,000
Miscellaneous		25,000
Total working capital		1,739,100
Total estimated capital investment		
Total mine cost (insurance, tax base)		10,308,600
Interest during development		493,000
Subtotal		10,801,600
Working capital		1,739,100
Estimated capital investment		12,540,700
Estimated deferred capital investment		9,310,000
Total capital investment and deferred investment		21,850,700[1]

[1] This is an average cost of $20.62 per ton of annual production.

Table 16.--Summary of Discounted Cash Flow, 1.06 MM tpy mine
(Table A-8, USBM Inf. Circ. 8632)

Year	Capital investment	Cash flow	Present worth factor at 12 percent	Present worth capital investment at 12 percent	Present worth cash flow value at 12 percent
0	$12,540,700	$-12,540,700	1.	$12,540,700	$-12,540,700
1	125,000	1,933,700	0.8929	111,600	1,726,600
2	125,000	1,933,700	.7972	99,700	1,541,500
3	125,000	1,933,700	.7118	89,000	1,376,400
4	125,000	1,933,700	.6355	79,400	1,228,900
5	260,500	1,798,200	.5674	147,800	1,020,300
6	125,000	1,933,700	.5066	63,600	979,600
7	125,000	1,933,700	.4523	56,500	874,600
8	125,000	1,933,700	.4039	50,500	781,000
9	125,000	1,933,700	.3606	45,100	697,300
10	6,664,000	-4,605,300	.3220	2,145,800	-1,432,900
11	125,000	1,933,700	.2875	35,900	555,900
12	125,000	1,933,700	.2567	32,100	496,400
13	125,000	1,933,700	.2292	28,700	443,200
14	125,000	1,933,700	.2046	25,600	395,600
15	260,500	1,798,200	.1827	47,600	328,500
16	125,000	1,933,700	.1631	20,400	315,400
17	125,000	1,933,700	.1456	18,200	281,500
18	125,000	1,933,700	.1300	16,300	251,400
19	125,000	1,933,700	.1161	14,500	224,500
20	-2,818,800	4,877,500	.1037	-292,300	505,800
				15,376,700	800

Coal Preparation (Cleaning)

In Oklahoma in 1973, the sulfur content of the high-sulfur coals was reduced as much as 20 percent by washing with water or by dry separation in a rotary breaker. Sulfur reduction is important in selling coal for electric-power generation, coke manufacture, and cement manufacture. The ash (inorganic mineral matter) content of the mined coal is reduced by only a few percent in these plants, a requirement so that the coal can meet the maximum ash-restriction standards that suit a particular power plant, coking plant, or iron-ore smelter.

Table 17.--Discounted Cash Flow, 1.06 MM tpy Mine
(Table A-9, USBM Inf. Circ. 8632)

12 percent - 20 years

R = 15,376,700 ÷ 7.469[1] = $2,058,700
less depreciation 945,400
Depletion + net profit = 1,113,300

Gross profit = Federal income tax (FIT) + depletion + net profit
Depletion = 1/2 gross profit
FIT = net profit
Depletion + net profit = 3/4 gross profit
Gross profit = 4/3 x 1,113,300 = $1,484,400

Sales.....	$9,278,300
Operating cost.....	7,793,900
Gross profit.....	1,484,400
Depletion.....	742,200
Taxable income.....	742,200
FIT.....	371,100
Net profit.....	371,100

Annual cash flow = net profit + depreciation + depletion
= 371,200 + 945,400 + 742,200 = **$2,058,700**

Selling price per ton = $9,278,300 ÷ 1,059,500 = $8.76

[1] Uniform series present worth factor.

Three coal-washing plants were in use in Oklahoma in 1973, in addition to three cleaning plants that did not use water. Reported coal recovery at the plants following washing was 80-85 percent, and at the other preparation plants reported coal recovery was 90-95 percent. Thus 87 percent of the coal production was cleaned at plants. At three mines the coal was crushed, and obvious non-coal or rock material was picked by hand from the coal in the absence of a cleaning plant. Company data indicate that total coal-cleaning cost was $0.30 to $1.50 per ton and that the weighted average coal-cleaning cost was $0.40 per ton in Oklahoma in 1973. There are no indications that coal-cleaning costs will rise in 1974. Additional mines are under development at which coal-washing plants also are under construction.

Reclamation

This section deals with the mined-land-reclamation law, the practice of reclamation, and the cost of reclamation in Oklahoma.

The Oklahoma law.--Oklahoma's first reclamation law, passed in 1970, was repealed the following year and replaced by the Mining Lands Reclamation Act, H.B. No. 1492, Oklahoma Session Laws, 1971, p. 855-862, Chapter 332, par. 721-738.

This act covers all underground and surface mines and includes recovery of all minerals or mineral commodities except oil and gas. It provides that the Chief Mine Inspector of Oklahoma be responsible for its administration.

Mining of Federal coal across private land surfaces comes under the reclamation regulations of the U.S. Department of the Interior, Bureau of Land Management. These regulations, similar to those of the State act, are enforced by the area mining supervisor of the U.S. Geological Survey.

The following are highlights of the State act.

All surface- and underground-mining companies must obtain a permit and pay an application fee of $350-$650 for each acre of land to be affected. The minimum bond is $5,000. In addition, each application for a permit must be accompanied by a reclamation plan that meets the requirements of the act, setting forth the proposed use to be made of the affected land following mining, the grading to be done, the type of vegetation to be planted, and the approximate time of grading and of the initial revegetation effort. An operator who mines without a valid permit is liable to a fine of $50-$1,000 for each day of operation.

The operator is permitted to determine the subsequent use of the land to be reclaimed and which parts of the land are to be reclaimed for forest, crop, pasture, homesite, recreational, or industrial use. He is required to grade all spoil ridges and peaks to a "rolling topography traversable by machines or equipment customarily used in connection with the use to be made of the land after reclamation." Where significant concentrations of acid-forming materials are present, the operator must cover the exposed face of mineral seams to a depth of not less than 3 feet with earth capable of supporting plant life or with a permanent water impoundment. Grading must be completed within 1 year following mining, except where prevented by weather conditions, and initial seeding or planting must be done at the first appropriate time following completion of grading.

No coal mine has as yet been closed by the Chief Mine Inspector, although one company that went bankrupt before completing land reclamation had its bond forfeited. If reclamation work should not proceed on schedule, operators are given an opportunity to comply following a warning by the inspectors. The mining industry has indicated it considers the reclamation act to be reasonable.

Some groups of people, however, have voiced the opinion that the operators alone should not decide the use to be made of the land and then rehabilitate it for that use, even pending the approval of the Chief Mine Inspector.

The principal use of land underlain by coal prior to strip mining has been for grazing of cattle, and some land was essentially unproductive except for supporting wildlife. Thus, most of the active-mine operators are reclaiming the land for grazing and wildlife by planting grasses and legumes. Figure 23 shows various stages of recent coal strip mining and land reclamation in Oklahoma.

Cost of reclamation.--Aside from the permit and bond costs, the major expense to the operator is for land reclamation itself, a cost that varies among companies because of differing conditions. Figured by the ton and by the acre, reclamation should cost less at the large coal mines. But other factors, such as stripping ratio, hardness of overburden, value of coal produced, labor and equipment costs, and seeding success, play roles in the reclamation cost. Even though it is not a requirement of the State reclamation act, two Oklahoma operators, for example, save the topsoil and return it following grading, a process involving separate handling of the soil, thus increasing their reclamation costs above those of other coal operators.

A table prepared by Kenneth S. Johnson of the Oklahoma Geological Survey shows calculated reclamation costs per ton of coal based on the thickness of the coal, estimated coal production per acre, and assumed reclamation costs per acre of $300-$1,000 (Johnson, 1971, table 1). In an effort to determine reclamation costs based on actual costs, the writer conducted interviews with executives of each coal-mining company active in Oklahoma in 1973. Reported individual costs of reclamation for that year ranged from $0.33 to $3.00 per ton of coal produced and from $380 to $5,616 per acre of land reclaimed. The weighted average cost for reclamation per ton of coal was $0.76, and the weighted average cost per acre of land reclaimed was $1,457.

Taxes

A potentially encouraging fact to those with capital to invest in coal mining is the absence of a gross production tax and a severance tax on coal in Oklahoma. Seeming almost as if designed to compensate for this advantage, a Federal tax is levied on Federal coal at 4-6 percent of the gross value of coal produced. Two of the 12 coal operators are mining on Federal leases at present.

State income tax, of course, applies also to corporate and individual income from coal mining. The State obtains coal leases by foreclosure on land property, later selling the land and half the coal lease; that is, it maintains one-half interest in the coal leases. The State charges $0.35 per ton royalty for the coal mined on its leases. One operator may be mining on or adjacent to a State lease at present.

The State law permits each county assessor to tax coal in the ground as real estate under the ad-valorem tax. This taxing procedure therefore

varies from county to county. Stockpiled coal also is subject to a county tax.

Although it may be overlooked as a tax by Federal and State agencies and by the average citizen, the miners' welfare fund of the coal-mining union collects a special tax from the operator per ton of coal mined.

Table 18.--Rail and Barge Shipping-Tariff Rates on Coal from Oklahoma Origins

Rail Rates on Coal from Oklahoma Origins to Harrah, Oklahoma

Miles	Rail Rates Col. A	Col. B	Miles	Rail Rates Col. A	Col. B
10	$1.26	$1.26	210	$2.88	$2.53
20	----	----	220	2.94	2.59
25	----	----	230	3.00	2.64
30	1.46	1.32	240	3.08	2.70
40	----	----	250	3.14	2.73
50	----	----	260	3.21	2.81
60	1.66	1.49	270	3.26	2.88
70	----	----	280	3.32	2.93
75	----	----	290	3.39	2.99
80	1.87	1.67	300	3.44	3.05
90	----	----	310	3.51	3.10
100	----	----	320	3.57	3.15
110	1.95	1.75	330	3.62	3.22
120	2.06	1.84	340	3.69	3.26
130	2.14	1.91	350	3.75	3.31
140	2.25	1.98	360	3.81	3.37
150	2.32	2.08	370	3.87	3.41
160	2.43	2.14	380	3.93	3.47
170	2.51	2.23	390	3.99	3.52
180	2.61	2.30	400	4.05	3.57
190	2.71	2.39			
200	2.80	2.47			

Column A--Rates apply on: (a) Coal of all kinds
(b) Coal briquettes

Column B--Rates apply on: (a) Slack coal (coal that can pass through a bar screen 1 5/8")

Transportation

Based on the transportation-rate information on coal shipping (tables 18-20), it is possible to produce coal from almost any good coal prospect in eastern Oklahoma and ship it to a large consumer such as an electric-power-generating station or a gasification or liquefaction plant in the central part of the Oklahoma coal fields and remain competitive with coal of the same quality that might be shipped here from other states.

Table 18 shows rail-shipping tariff rates for coal from any origin in Oklahoma. Table 19 shows truck-shipping rates from any origin in Oklahoma. These tables are useful for estimating coal transportation costs from one place to another. Table 20, however, was prepared by a transportation consultant at the writer's request, and it shows costs of shipping coal to the vicinity of possible gasification-plant sites from the vicinity of probable mine sites.

The coal-transportation-rate authorities indicated that these rates are negotiable downward, especially for contracts of 2 years' duration or longer.

Table 18.--Rail and Barge Rates (cont.)

Rail Rates on Coal by Volume

FROM Tulsa (Group 5[1]) TO Kansas City, Missouri, Kansas			
Minimum	6,000 tons	$1.51 Net ton (=short ton)	
(Applies only in shipper-owned equipment)			
FROM Tulsa (Group 5[1])	(Catoosa)	TO Kansas City, Missouri, Kansas	
Minimum	1,250 tons	$3.83 Net ton	230.6 miles
FROM Pittsburgh, Kansas TO Kansas City, Missouri, Kansas			
Minimum	1,500 tons	$2.09 Net ton	130.7 miles

[1]Group 5 points: Broken Arrow, Bushyhead, Catale, Catoosa, Chelsea, Claremore, Inola, Oologah, Porter, Sequoyah, Talala, Tulsa, Vinita, Wagoner, and Whiteoak.

Barge Rates on Coal

Coal, one-half mill per ton mile.

Handling charges:
$.85 to $2.25 net ton (short ton). (These charges depend on annual volume.)

Source: Oklahoma Department of Industrial Development (1973).

Table 19.--Truck Shipping-Tariff Rates on Coal From Oklahoma Origins (coal--lump, slack, or mine run; min. 20,000 pounds)

Miles	Cents per short ton	Miles	Cents per short ton
5	$1.43	205	----
10	1.56	210	4.10
15	1.69	215	----
20	1.82	220	4.10
25	1.95	225	4.16
30	1.95	230	4.16
35	2.08	235	----
40	2.08	240	4.16
45	2.21	245	----
50	2.21	250	4.29
55	2.34	255	----
60	2.34	260	4.29
65	2.47	265	----
70	2.47	270	4.29
75	2.60	275	4.36
80	2.60	280	----
85	2.73	285	----
90	2.73	290	----
95	2.86	295	----
100	2.86	300	4.42
105	2.99	305	4.42
110	3.12	310	----
115	3.25	315	----
120	3.38	320	----
125	3.51	325	4.49
130	3.64	330	----
135	3.77	335	----
140	3.90	340	----
145	3.97	345	----
150	3.97	350	4.55
155	----	355	----
160	3.97	360	4.62
165	----	365	----
170	4.03	370	4.68
175	----	375	4.75
180	$4.03	380	4.81
185	----	385	----
190	4.03	390	4.88
195	----	395	----
200	4.10	400	4.94

Source: Oklahoma Department of Industrial Development (1973).

Table 20.--Volume Coal-Shipping Rates from Possible Loading Points to Three Possible Unloading Points in the vicinity of Possible Gasification-Plant Sites

The railroad tariff authority is Southwestern Lines Freight Tariff 83 series; the minimum carload weight is 60,000 pounds. Shipper loads and consignee unloads rail cars.

The truck tariff authority is the Corporation Commission of Oklahoma Motor Freight Tariff 2. Minimum weight will be trailers loaded by shipper to full visible capacity, not exceeding a gross weight of 73,280 pounds. Carrier unloads.

Railroad rates and rates by dump trucks with four or more axles (over irregular routes) to Bugtussle, Hoffman, and Wagoner, Oklahoma, from selected prospective coal-producing mines are listed below. All rates quoted are in dollar and cents per net ton of 2,000 pounds. Current rates are quoted and are subject to change. The rates can be negotiable downward for large annual volumes that will move for 2 or more years.

To Bugtussle From:	Rail rate	Highway miles	Truck rate
Red Oak	$2.11	47	$1.28
Henryetta	2.11	52	1.37
Checotah	1.71	72	1.68
Morris	2.11	62	1.54
Porum	2.21	46	1.26
Atoka	-	63	1.55
Quinton	-	36	1.05

To: Hoffman From:	Rail rate	Highway miles	Truck rate
McAlester	$2.47	52	$1.37
Atoka	-	100	2.22
Krebs	2.47	53	1.39
Quinton	-	60	1.52
Porum	1.95	40	1.14
Okmulgee	1.64	15	.62
Inola	2.21	78	1.79
Catoosa	2.21	63	1.55

To: Wagoner From:	Rail rate	Highway miles	Truck rate
Inola	$2.11	24	$ .83
Catoosa	2.11	38	1.10
Whiteoak	2.11	50	1.34
Chelsea	2.11	50	1.34
Porum	1.88	40	1.14
Enterprise	-	55	1.43
Atoka	2.70	124	2.75
Quinton	-	64	1.57
Checotah	1.88	34	1.02
Okmulgee	2.11	56	1.44
Henryetta	2.11	65	1.59
Carbon	-	79	1.81
Talala	-	57	1.47

Source:

Bennett Traffic and Transportation Services

CONCLUSIONS

A Summary Report has been inserted at the beginning of this report in place of the standard abstract common to geologic reports, in compliance with the contract. Therefore, this section does not summarize the report but rather lists significant conclusions synthesized or deduced from the findings given in the text, tables, and illustrations.

1. This investigation has demonstrated that the quantity of original and remaining coal resources in Oklahoma as of January 1, 1974, are twice those estimated in the previous Statewide study completed 22 years ago.

2. Of the 7.2 billion short tons of remaining coal resources in Oklahoma, 9 percent is strippable with present technology.

3.a. The average cost of underground-coal production would be approximately 61 percent greater than that of surface-coal production in Oklahoma at present.

b. This greater cost percentage is the main reason that 100 percent of the coal produced in Oklahoma in 1973 was at surface mines.

4.a. Of the remaining coal resources, 32 percent is considered net recoverable because of existing engineering, socio-economic, economic, and political limitations or regulations.

b. Therefore, the percentage of net recoverable reserves will change as these regulations change.

5. Of the remaining coal resources, only 7 percent is net recoverable by surface mining.

6. Of the net recoverable reserves, 22 percent is strippable.

7. Of the net recoverable reserves, 60 percent is suitable for coke manufacture, 29 percent for electric-power generation, and 11 percent for gasification.

8. Of the net recoverable reserves suitable for coke manufacture, 12 percent is strippable; of the net recoverable reserves suitable for electric-power generation, 43 percent is strippable; and of the net recoverable reserves suitable for gasification, 19 percent is strippable and 81 percent must be mined by underground methods.

9. If the limitations were changed on impurities covering the bituminous-coal reserves suitable for gasification in Oklahoma (to permit sulfur content to range from 2.5-4.5 percent and ash content from 9-15 percent), then additional reserves of coal would be suitable for gasification and could be mined by surface methods.

10.a. The weighted average sulfur content of the original and remaining coal resources of Oklahoma is 2.2 percent; that of the remaining strippable resources, 2.9 percent; and that of the 1973 coal produced and, in part, cleaned, 2.8 percent.

b. Thus the weighted average sulfur content of coal reserves and coal produced in Oklahoma is lower than that of bituminous coal in Illinois, Indiana, Iowa, Kansas, western Kentucky, Missouri, and Ohio.

11. The average cost of surface-mining a ton of coal in Oklahoma is higher than the average in other coal-producing states; costs of cleaning coal and reclaiming mined land probably are less, however, than the average costs in other states.

12. The quality of Oklahoma's bituminous coal is better than that of the average bituminous coal in most other states, which is reflected in a typically higher average selling price.

13. Oklahoma's abundant coal reserves could supply a large part of the fuel necessary to generate electricity in the State if well-designed preparation plants were to reduce the sulfur and ash content of the mined coals, if successful SO_2 and particulate-matter (flyash) removal systems were to be installed and function properly in some of the State's new and proposed electric-power-generating plants, or if the sulfur limits imposed by statute were raised to 2.8 percent for coal of 12,000-Btu content.

14.a. More than one future coke plant, iron smelter, or steel mill could be supplied with coking and metallurgical coal that could be produced at future surface and underground mines in Le Flore and Haskell Counties.

b. A feasible location for such plants would be the Arkansas River valley adjacent to the coal deposits.

15.a. In spite of the incentives of rapidly increasing coal-selling prices, new coal markets, and increasing demand for all qualities of coal that is abundant in Oklahoma, the capital investment and general business activity necessary to attract new companies, to construct new mines, and to expand present operations have not been forthcoming at a noticeable rate.

b. This is probably due to uncertain economic and political conditions, uncertain Federal mining and reclamation policies, and difficulties encountered by coal operators in readily obtaining additional equipment, replacement parts, railroad coal-hopper cars, and qualified, experienced coal miners and mining engineers.

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APPENDIX

Coal-Resources Tables

(Tables 21-77)

Table 21.--Original and Mined Coal Resources, Atoka County, Oklahoma (in thousands of short tons)

COAL AND RANK[1]	COAL DEPTH (FEET)	SULFUR CONTENT[2] (PERCENT)	ORIGINAL RESOURCES 12-14 INCHES ACRES	12-14 INCHES TONS	15-28 INCHES ACRES	15-28 INCHES TONS	29-42 INCHES ACRES	29-42 INCHES TONS	42+ INCHES ACRES	42+ INCHES TONS	TOTAL ACRES	TOTAL TONS	MINED AND LOST IN MINING SURFACE ACRES	SURFACE TONS	UNDERGROUND ACRES	UNDERGROUND TONS	TOTAL ACRES	TOTAL TONS
MC ALESTER (hvb)	0-100	4.8 est.	--	--	--	--	--	--	249	1,837	249	1,837	--	--	--	--	--	--
	101-1,000	4.8 est.	--	--	--	--	--	--	829	6,543	829	6,543	--	--	--	--	--	--
	1,001-2,000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	2,001-3,000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	3,000+	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Total	4.8 est.	--	--	--	--	--	--	1,078	8,380	1,078	8,380	--	--	--	--	--	--
LOWER HARTSHORNE (hvb)	0-100	5.1 (5.1)	--	--	112	303	483	2,407	--	--	595	2,710	70	365	39	225	109	590
	101-1,000	5.1 (5.1)	--	--	2,674	9,001	1,592	7,045	432	3,292	4,698	19,338	--	--	38	219	38	219
	1,001-2,000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	2,001-3,000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	3,000+	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Total	5.1 (5.1)	--	--	2,786	9,304	2,075	9,452	432	3,292	5,293	22,048	70	365	77	444	147	809
ALL COALS TOTAL	0-100	5.0 (4.8-5.1)	--	--	112	303	483	2,407	249	1,837	844	4,547	70	365	39	225	109	590
	101-1,000	5.0 (4.8-5.1)	--	--	2,674	9,001	1,592	7,045	1,261	9,835	5,527	25,881	--	--	38	219	38	219
	Grand total	5.0 (4.8-5.0)	--	--	2,786	9,304	2,075	9,452	1,510	11,672	6,371	30,428	70	365	77	444	147	809

Table 22.--Original and Mined Coal Resources, Coal County, Oklahoma (in thousands of short tons)

COAL AND RANK[1]	COAL DEPTH (FEET)	SULFUR CONTENT[2] (PERCENT)	ORIGINAL RESOURCES 12-14 INCHES ACRES	12-14 INCHES TONS	15-28 INCHES ACRES	15-28 INCHES TONS	29-42 INCHES ACRES	29-42 INCHES TONS	42+ INCHES ACRES	42+ INCHES TONS	TOTAL ACRES	TOTAL TONS	MINED AND LOST IN MINING SURFACE ACRES	SURFACE TONS	UNDERGROUND ACRES	UNDERGROUND TONS	TOTAL ACRES	TOTAL TONS
MC ALESTER (hvb)	0-100	4.1 (0.8-4.8)	--	--	--	--	57	359	969	7,314	1,026	7,673	576	4,438	--	--	576	4,438
	100-1,000	4.1 (0.8-4.8)	--	--	--	--	--	--	20,338	159,134	20,338	159,134	--	--	8,225	63,952	8,225	63,952
	1,001-2,000	4.0 est.	--	--	--	--	--	--	16,853	121,322	16,853	121,322	--	--	--	--	--	--
	2,001-3,000	3.9 est.	--	--	--	--	--	--	5,635	43,671	5,635	43,671	--	--	--	--	--	--
	3,000+	3.8 est.	--	--	--	--	--	--	142	1,150	142	1,150	--	--	--	--	--	--
	Total	4.0 (0.8-4.8)	--	--	--	--	57	359	43,937	332,591	43,994	332,950	576	4,438	8,225	63,952	8,801	68,390
LOWER HARTSHORNE (hvb)	0-100	5.0 est.	--	--	208	749	245	1,279	--	--	453	2,028	--	--	--	--	--	--
	101-1,000	5.0 est.	--	--	562	3,034	3,806	20,553	--	--	4,368	23,587	--	--	--	--	--	--
	1,001-2,000	5.0 est.	--	--	30	97	470	2,603	--	--	500	2,700	--	--	--	--	--	--
	Total	5.0 est.	--	--	800	3,880	4,521	24,435	--	--	5,321	28,315	--	--	--	--	--	--
ALL COALS TOTAL (hvb)	0-100	4.3 (0.8-5.0)	--	--	208	749	302	1,638	969	7,314	1,479	9,701	576	4,438	--	--	576	4,438
	101-1,000	4.2 (0.8-5.0)	--	--	562	3,034	3,806	20,553	20,338	159,134	24,706	182,721	--	--	8,225	63,952	8,225	63,952
	1,001-2,000	4.0 (0.8-5.0)	--	--	30	97	470	2,603	16,853	121,322	17,353	124,022	--	--	--	--	--	--
	2,001-3,000	3.9 est.	--	--	--	--	--	--	5,635	43,671	5,635	43,671	--	--	--	--	--	--
	3,000+	3.8 est.	--	--	--	--	--	--	142	1,150	142	1,150	--	--	--	--	--	--
	Grand total	4.1 (0.8-5.0)	--	--	800	3,880	4,578	24,794	43,937	322,591	49,315	361,265	576	4,438	8,225	63,952	8,801	68,390

Table 23.--Original and Mined Coal Resources, Craig County, Oklahoma (in thousands of short tons)

COAL AND RANK[1]	COAL DEPTH (FEET)	SULFUR CONTENT[2] (PERCENT)	ORIGINAL RESOURCES 10-14 INCHES ACRES	10-14 INCHES TONS	15-28 INCHES ACRES	15-28 INCHES TONS	29-42 INCHES ACRES	29-42 INCHES TONS	42+ INCHES ACRES	42+ INCHES TONS	TOTAL ACRES	TOTAL TONS	MINED AND LOST IN MINING SURFACE ACRES	SURFACE TONS	UNDERGROUND ACRES	UNDERGROUND TONS	TOTAL ACRES	TOTAL TONS
IRON POST (hvb)	0-100	3.5 (-)	15,704	27,824	6,570	12,658	--	--	--	--	22,274	40,482	2,799	5,210	--	--	2,799	5,210
CROWEBURG (hvb)	0-100	3.5 (est.)	34,797	61,083	70	164	--	--	--	--	34,867	61,247	519	968	--	--	519	968
MINERAL (hvb)	0-100	4.5 (3.6-4.7)	10,930	21,674	845	2,039	--	--	--	--	11,775	23,713	543	1,258	--	--	543	1,258
	101-1,000	4.5 (3.6-4.7)	--	--	1,159	3,046	--	--	--	--	1,159	3,046	--	--	--	--	--	--
	Total	4.5 (3.6-4.7)	10,930	21,674	2,004	5,085	--	--	--	--	12,934	26,759	543	1,258	--	--	543	1,258
ALL COALS TOTAL	0-100	3.7 (3.5-4.7)	61,431	110,581	7,485	14,861	--	--	--	--	68,916	125,442	3,861	7,436	--	--	3,861	7,436
	101-1,000	4.5 (3.6-4.7)	--	--	1,159	3,046	--	--	--	--	1,159	3,046	--	--	--	--	--	--
	Grand total	3.7 (3.5-4.7)	61,431	110,581	8,644	17,907	--	--	--	--	70,075	128,488	3,861	7,436	--	--	3,861	7,436

[1]Rank, shown in parentheses, abbreviated as follows: high-volatile bituminous, hvb; medium-volatile bituminous, mvb; low-volatile bituminous, lvb.

[2]Figure given is average sulfur content; figures in parentheses represent range; est. = estimated.

Table 24.--Original and Mined Coal Resources, Creek County, Oklahoma (in thousands of short tons)

COAL AND RANK[1]		COAL DEPTH (FEET)	SULFUR CONTENT[2] (PERCENT)	ORIGINAL RESOURCES 12-14 INCHES ACRES	12-14 INCHES TONS	15-28 INCHES ACRES	15-28 INCHES TONS	29-42 INCHES ACRES	29-42 INCHES TONS	42+ INCHES ACRES	42+ INCHES TONS	TOTAL ACRES	TOTAL TONS	MINED AND LOST IN MINING SURFACE ACRES	SURFACE TONS	UNDERGROUND ACRES	UNDERGROUND TONS	TOTAL ACRES	TOTAL TONS
DAWSON	(hvb)	0-100	3.8 -	--	--	1,229	4,867	--	--	--	--	1,229	4,867	--	--	--	--	--	--
		101-1,000	3.8 -	--	--	2,318	9,179	--	--	--	--	2,318	9,179	--	--	--	--	--	--
		Total	3.8 -	--	--	3,547	14,046	--	--	--	--	3,547	14,046	--	--	--	--	--	--

Table 25.--Original and Mined Coal Resources, Haskell County, Oklahoma (in thousands of short tons)

COAL AND RANK[1]		COAL DEPTH (FEET)	SULFUR CONTENT[2] (PERCENT)	ORIGINAL RESOURCES 12-14 INCHES ACRES	12-14 INCHES TONS	15-28 INCHES ACRES	15-28 INCHES TONS	29-42 INCHES ACRES	29-42 INCHES TONS	42+ INCHES ACRES	42+ INCHES TONS	TOTAL ACRES	TOTAL TONS	MINED AND LOST IN MINING SURFACE ACRES	SURFACE TONS	UNDERGROUND ACRES	UNDERGROUND TONS	TOTAL ACRES	TOTAL TONS
SECOR	(hvb)	0-100	6.5 est.	--	--	714	2,680	--	--	--	--	714	2,680	9	32	--	--	9	32
		101-1,000	6.5 est.	--	--	3,847	14,512	--	--	--	--	3,847	14,512	--	--	--	--	--	--
		Total	6.5 est.	--	--	4,561	17,192	--	--	--	--	4,561	17,192	9	32	--	--	9	32
		0-100	1.3 (1.1-1.4)	655	1,254	4,571	12,689	--	--	--	--	5,226	13,943	1,507	4,252	--	--	1,507	4,252
		101-1,000	1.3 (0.4-1.7)	--	--	44,106	126,659	--	--	--	--	44,106	126,659	--	--	--	--	--	--
	(hvb)	1,001-2,000	1.3 (1.1-1.4)	--	--	10,119	35,057	126	544	--	--	10,245	35,601	--	--	--	--	--	--
		Total	1.3 (0.4-1.7)	655	1,254	58,796	174,405	126	544	--	--	59,577	176,203	1,507	4,252	--	--	1,507	4,252
STIGLER		0-100	1.8 (0.4-5.2)	269	490	8,920	27,673	1,795	7,890	--	--	10,984	36,053	3,169	10,563	--	--	3,169	10,563
		101-1,000	1.5 (0.4-5.2)	--	--	54,494	168,704	1,032	4,588	--	--	55,526	173,292	--	--	--	--	--	--
	(mvb)	1,001-2,000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
		Total	1.6 (0.4-5.2)	269	490	63,414	196,377	2,827	12,478	--	--	66,510	209,345	3,169	10,563	--	--	3,169	10,563
		All ranks total	1.5 (0.4-5.2)	924	1,744	122,210	370,782	2,953	13,022	--	--	126,087	385,548	4,676	14,815	--	--	4,676	14,815
		0-100	0.9 (0.7-1.7)	--	--	51	156	--	--	941	7,156	992	7,312	726	5,301	--	--	726	5,301
		101-1,000	2.2 (0.5-5.9)	6,990	15,080	20,584	70,156	12,909	67,499	25,955	205,386	66,438	358,121	--	--	918	6,279	918	6,279
		1,001-2,000	1.8 (0.5-5.0)	3,264	7,050	9,929	28,818	11,960	72,851	55,540	457,560	80,693	566,279	--	--	15	103	15	103
	(mvb)	2,001-3,000	1.2 (0.5-6.0)	--	--	224	927	350	2,205	2,944	26,679	3,518	29,811	--	--	--	--	--	--
		3,000+	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
		Total	1.9 (0.5-6.0)	10,254	22,130	30,788	100,057	25,219	142,555	85,380	696,781	151,641	961,523	726	5,301	933	6,382	1,659	11,683
HARTSHORNE		0-100	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
		101-1,000	1.8 (0.8-3.7)	870	1,866	11,081	40,257	9,160	50,988	365	2,693	21,476	95,804	--	--	--	--	--	--
		1,001-2,000	1.0 (0.6-2.1)	--	--	1,805	6,990	2,695	15,468	3,015	21,074	7,515	43,523	--	--	--	--	--	--
	(lvb)	2,001-3,000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
		3,000+	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
		Total	1.6 (0.6-2.1)	870	1,866	12,866	47,247	11,855	66,456	3,380	23,767	28,991	139,336	--	--	--	--	--	--
		All ranks total	1.9 (0.5-6.0)	11,124	23,996	43,674	147,304	37,074	209,011	88,760	720,548	180,632	1,100,859	726	5,301	993	6,382	1,659	11,683
UPPER HARTSHORNE		0-100	0.9 est.	--	--	102	367	--	--	--	--	102	367	--	--	--	--	--	--
	(mvb)	101-1,000	0.9 est.	--	--	173	623	--	--	--	--	173	623	--	--	--	--	--	--
		Total	0.9 est.	--	--	275	990	--	--	--	--	275	990	--	--	--	--	--	--
		0-100	0.8 (0.8)	--	--	--	--	304	1,821	168	1,199	472	3,020	158	1,130	20	130	178	1,260
		101-1,000	0.8 (0.8)	--	--	--	--	1,033	6,352	390	2,666	1,423	9,018	--	--	--	--	--	--
LOWER		1,001-2,000	0.8 (0.8)	--	--	--	--	1,888	11,462	64	415	1,952	11,877	--	--	--	--	--	--
HARTSHORNE	(mvb)	2,001-3,000	0.8 (0.8)	--	--	--	--	2,221	12,967	--	--	2,221	12,967	--	--	--	--	--	--
		3,000+	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
		Total	0.8 (0.8)	--	--	--	--	5,446	32,602	622	4,280	6,068	36,882	158	1,130	20	130	178	1,260
		0-100	2.1 (1.1-6.5)	655	1,254	5,285	15,369	--	--	--	--	5,940	16,623	1,516	4,284	--	--	1,516	4,284
		101-1,000	1.8 (0.4-6.5)	--	--	47,953	141,171	--	--	--	--	47,953	141,171	--	--	--	--	--	--
	(hvb)	1,001-2,000	1.3 (1.1-1.4)	--	--	10,119	35,057	126	544	--	--	10,245	35,601	--	--	--	--	--	--
		Total	1.7 (0.4-6.5)	655	1,254	63,357	191,597	126	544	--	--	64,138	193,395	1,516	4,284	--	--	1,516	4,284
		0-100	1.6 (0.4-5.2)	269	490	9,073	28,196	2,099	9,711	1,109	8,355	12,550	46,752	4,053	16,994	20	130	4,073	17,124
		101-1,000	2.0 (0.4-5.2)	6,990	15,080	75,251	239,483	14,974	78,439	26,345	208,052	123,560	541,054	--	--	918	6,279	918	6,279
ALL COALS		1,001-2,000	1.8 (0.5-5.0)	3,264	7,050	9,929	28,818	13,848	84,313	55,604	457,975	82,645	578,156	--	--	15	103	15	103
TOTAL	(mvb)	2,001-3,000	1.5 (0.5-6.0)	--	--	224	927	2,571	15,172	2,944	26,679	5,739	42,778	--	--	--	--	--	--
		Total	1.9 (0.4-6.0)	10,523	22,620	94,477	297,424	33,492	187,635	86,002	701,061	224,494	1,208,740	4,053	16,994	953	6,512	5,006	23,506
		0-100	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
		101-1,000	1.8 (0.8-3.7)	870	1,866	11,081	40,257	9,160	50,988	365	2,693	21,476	95,804	--	--	--	--	--	--
	(lvb)	1,001-2,000	1.0 (0.6-2.1)	--	--	1,805	6,990	2,695	15,468	3,015	21,074	7,515	43,523	--	--	--	--	--	--
		Total	1.6 (0.6-2.1)	870	1,866	12,886	47,247	11,855	66,456	3,380	23,767	28,991	139,336	--	--	--	--	--	--
		Grand total	1.8 (0.4-6.0)	12,048	25,740	170,720	536,268	45,473	254,635	89,382	724,828	317,623	1,541,471	5,569	21,278	953	6,512	6,522	27,790

Table 26.--Original and Mined Coal Resources, Latimer County, Oklahoma (in thousands of short tons)

COAL AND RANK[1]	COAL DEPTH (FEET)	SULFUR CONTENT[2] (PERCENT)	ORIGINAL RESOURCES 12-14 INCHES ACRES	12-14 INCHES TONS	15-28 INCHES ACRES	15-28 INCHES TONS	29-42 INCHES ACRES	29-42 INCHES TONS	42+ INCHES ACRES	42+ INCHES TONS	TOTAL ACRES	TOTAL TONS	MINED AND LOST IN MINING SURFACE ACRES	SURFACE TONS	UNDERGROUND ACRES	UNDERGROUND TONS	TOTAL ACRES	TOTAL TONS
UPPER MC ALESTER (hvb)	0-100	4.1 (4.1)	5	11	1,461	4,950	86	464	--	--	1,552	5,425	52	166	--	--	52	166
	101-1,000	4.1 (4.1)	27	58	22,574	74,893	1,856	9,025	--	--	24,457	83,976	--	--	--	--	--	--
	1,001-2,000	4.1 (4.1)	--	--	5,125	15,184	555	2,497	--	--	5,680	17,681	--	--	--	--	--	--
	Total	4.1 (4.1)	32	69	29,160	95,027	2,497	11,986	--	--	31,689	107,082	52	166	--	--	52	166
LOWER MC ALESTER (hvb)	0-100	2.3 (1.9-3.2)	8	17	3,379	10,195	556	2,676	--	--	3,943	12,888	342	1,129	--	--	342	1,129
	101-1,000	2.3 (1.9-3.2)	29	63	25,365	77,475	14,473	65,898	--	--	39,867	143,436	--	--	--	--	--	--
	1,001-2,000	2.3 (1.9-3.2)	--	--	7,928	25,536	3,030	13,169	--	--	10,958	38,705	--	--	--	--	--	--
	2,001-3,000	2.3 (1.9-3.2)	--	--	--	--	1,758	7,595	--	--	1,758	7,595	--	--	--	--	--	--
	3,000+	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Total	2.3 (1.9-3.2)	37	80	36,672	113,206	19,817	89,338	--	--	56,526	202,624	342	1,129	--	--	342	1,129
UPPER HARTSHORNE (hvb)	0-100	1.5 (0.9-1.8)	--	--	40	151	277	1,286	89	638	406	2,075	121	822	--	--	121	822
	101-1,000	1.5 (1.0-2.6)	--	--	2,178	7,739	2,235	11,039	4,437	31,166	8,850	49,944	--	--	250	1,800	250	1,800
	1,001-2,000	1.6 (1.0-2.6)	--	--	2,210	7,825	3,560	17,002	4,054	28,825	9,824	53,652	--	--	--	--	--	--
	2,001-3,000	1.5 (1.0-2.6)	--	--	1,349	3,679	9,685	44,161	8,639	60,196	19,673	108,036	--	--	--	--	--	--
	3,000+	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Total	1.5 (1.0-2.6)	--	--	5,777	19,394	15,757	73,488	17,219	120,825	38,753	213,707	121	822	250	1,800	371	2,622
LOWER HARTSHORNE (hvb)	0-100	1.6 (1.1-2.4)	--	--	--	--	185	1,133	189	1,476	374	2,609	25	226	--	--	25	226
	101-1,000	1.5 (1.1-3.4)	--	--	--	--	560	3,358	12,720	101,006	13,280	104,364	--	--	4,814	40,849	4,814	40,849
	1,001-2,000	1.6 (1.2-2.4)	--	--	--	--	1,405	7,734	8,696	70,504	10,101	78,238	--	--	26	243	26	243
	2,001-3,000	1.5 (1.2-2.4)	--	--	--	--	3,356	18,572	19,424	160,007	22,780	178,579	--	--	--	--	--	--
	3,000+	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Total	1.5 (1.1-3.4)	--	--	--	--	5,506	30,797	41,029	332,993	46,535	363,790	25	226	4,840	41,092	4,865	41,318
ALL COALS TOTAL	0-100	2.6 (0.9-4.1)	13	28	4,880	15,296	1,104	5,559	278	2,114	6,275	22,997	540	2,343	--	--	540	2,343
	101-1,000	2.4 (1.0-4.1)	56	121	50,117	160,107	19,124	89,320	17,157	132,172	86,454	381,720	--	--	5,064	42,649	5,064	42,649
	1,001-2,000	2.0 (1.0-4.1)	--	--	15,263	48,545	8,550	40,402	12,750	99,329	36,563	188,276	--	--	26	243	26	243
	2,001-3,000	1.5 (1.0-3.2)	--	--	1,349	3,679	14,799	70,328	28,063	220,203	44,211	294,210	--	--	--	--	--	--
	3,000+	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Grand total	2.0 (0.9-4.1)	69	149	71,609	227,637	43,577	205,609	58,248	453,818	173,503	887,203	540	2,343	5,090	42,892	5,630	45,235

Table 27.--Original and Mined Coal Resources, Le Flore County, Oklahoma (in thousands of short tons)

COAL AND RANK[1]	COAL DEPTH (FEET)	SULFUR CONTENT[2] (PERCENT)	ORIGINAL RESOURCES 12-14 INCHES ACRES	12-14 INCHES TONS	15-28 INCHES ACRES	15-28 INCHES TONS	29-42 INCHES ACRES	29-42 INCHES TONS	42+ INCHES ACRES	42+ INCHES TONS	TOTAL ACRES	TOTAL TONS	MINED AND LOST IN MINING SURFACE ACRES	SURFACE TONS	UNDERGROUND ACRES	UNDERGROUND TONS	TOTAL ACRES	TOTAL TONS
SECOR (mvb)	0-100	4.1 (4.1)	--	--	453	1,497	634	3,134	6	41	1,093	4,672	13	61	--	--	13	61
	101-1,000	4.1 (4.1)	--	--	2,143	7,367	6,118	32,653	3,950	27,049	12,211	67,069	--	--	1,007	6,919	1,007	6,919
	1,001-2,000	4.7 (4.7)	--	--	1,644	5,357	4,134	22,976	2,681	18,339	8,459	46,672	--	--	--	--	--	--
	2,001-3,000	4.7 (4.7)	--	--	89	264	3,641	20,234	2,387	16,328	6,117	36,826	--	--	--	--	--	--
	Total	4.4 (4.1-4.7)	--	--	4,329	14,485	14,527	78,997	9,024	61,757	27,880	155,239	13	61	1,007	6,919	1,020	6,980
LOWER WITTEVILLE (mvb)	101-1,000	4.4 (4.4)	--	--	915	3,294	4,970	28,607	60	410	5,945	32,311	--	--	83	522	83	522
	1,001-2,000	4.4 (4.4)	--	--	659	2,372	3,085	17,770	--	--	3,744	20,142	--	--	--	--	--	--
	Total	4.4 (4.4)	--	--	1,574	5,666	8,055	46,377	60	410	9,689	52,453	--	--	83	522	83	522
CAVANAL (mvb)	0-100	3.3 (4.8-2.1)	--	--	1,117	3,785	351	1,814	--	--	1,468	5,599	56	203	--	--	56	203
	101-1,000	3.3 (4.8-2.1)	--	--	9,622	33,060	5,056	28,021	--	--	14,678	61,081	--	--	61	253	61	253
	1,001-2,000	3.3 (4.8-2.1)	--	--	8,031	28,057	1,491	8,455	--	--	9,522	36,512	--	--	--	--	--	--
	2,001-3,000	3.3 (4.8-2.1)	--	--	2,792	9,804	--	--	--	--	2,792	9,804	--	--	--	--	--	--
	Total	3.3 (4.8-2.1)	--	--	21,562	74,706	6,898	38,290	--	--	28,460	112,996	56	203	61	253	117	456
UNNAMED COALS ABOVE CAVANAL; AND LOWER CAVANAL (mvb)	0-100	--	263	520	379	1,391	66	297	--	--	708	2,208	30	126	40	109	70	235
	101-1,000	--	--	--	4,745	18,039	37	166	--	--	4,782	18,205	--	--	--	--	--	--
	1,001-2,000	--	--	--	4,011	15,589	--	--	--	--	4,011	15,589	--	--	--	--	--	--
	2,001-3,000		--	--	1,007	4,094	--	--	--	--	1,007	4,094	--	--	--	--	--	--
	Total	--	263	520	10,142	39,113	103	463	--	--	10,508	40,096	30	126	40	109	70	235
UNNAMED COALS ABOVE STIGLER (mvb and lvb)	0-100	--	2,005	3,943	2,229	5,176	--	--	--	--	4,234	9,119	--	--	84	182	84	182
	101-1,000	--	--	--	4,580	10,718	--	--	--	--	4,580	10,718	--	--	--	--	--	--
	1,001-2,000	--	--	--	838	1,961	--	--	--	--	838	1,961	--	--	--	--	--	--
	Total	--	2,005	3,943	7,647	17,855	--	--	--	--	9,652	21,798	--	--	84	182	84	182
STIGLER (lvb)	0-100	1.7 (est.)	--	--	2,297	6,105	--	--	--	--	2,297	6,105	109	328	--	--	109	328
	101-1,000	1.4 (est.)	--	--	15,928	42,414	--	--	--	--	15,928	42,414	--	--	--	--	--	--
	1,001-2,000	1.3 (est.)	--	--	6,952	19,124	--	--	--	--	6,952	19,124	--	--	--	--	--	--
	Total	1.4 (est.)	--	--	25,177	67,643	--	--	--	--	25,177	67,643	109	328	--	--	109	328

Table 27.--Le Flore County (cont.)

COAL AND RANK[1]	COAL DEPTH (FEET)	SULFUR CONTENT[2] (PERCENT)	ORIGINAL RESOURCES 12-14 INCHES ACRES	12-14 INCHES TONS	15-28 INCHES ACRES	15-28 INCHES TONS	29-42 INCHES ACRES	29-42 INCHES TONS	42+ INCHES ACRES	42+ INCHES TONS	TOTAL ACRES	TOTAL TONS	MINED AND LOST IN MINING SURFACE ACRES	SURFACE TONS	UNDERGROUND ACRES	UNDERGROUND TONS	TOTAL ACRES	TOTAL TONS
UPPER MC ALESTER (mvb)	0-100	4.1 (est.)	--	--	26	89	--	--	--	--	26	89	--	--	--	--	--	--
	101-1,000	1.4 (est.)	--	--	1,701	6,268	--	--	--	--	1,701	6,268	--	--	--	--	--	--
	1,001-2,000	4.1 (est.)	--	--	1,336	4,621	--	--	--	--	1,336	4,621	--	--	--	--	--	--
	2,001-3,000	4.1 (est.)	--	--	211	722	--	--	--	--	211	722	--	--	--	--	--	--
	Total	4.1 (est.)	--	--	3,274	11,700	--	--	--	--	3,274	11,700	--	--	--	--	--	--
LOWER MC ALESTER (mvb)	0-100	3.2 (est.)	--	--	19	68	2	9	--	--	21	77	2	9	--	--	2	9
	101-1,000	3.2 (est.)	--	--	1,182	4,255	878	4,109	--	--	2,060	8,364	--	--	--	--	--	--
	1,001-2,000	3.2 (est.)	--	--	1,771	6,376	96	449	--	--	1,867	6,825	--	--	--	--	--	--
	2,001-3,000	3.2 (est.)	--	--	600	2,160	--	--	--	--	600	2,160	--	--	--	--	--	--
	Total	3.2 (est.)	--	--	3,572	12,859	976	4,567	--	--	4,548	17,426	2	9	--	--	2	9
HARTSHORNE (lvb)	0-100	1.3 (1.1-1.4)	--	--	1,120	4,288	577	3,026	3,053	22,583	4,750	29,897	1,395	7,632	--	--	1,395	7,632
	101-1,000	1.5 (0.9-2.7)	--	--	11,135	30,748	18,320	105,776	17,388	138,569	46,843	275,073	--	--	774	7,880	774	7,880
	1,001-2,000	1.5 (0.9-2.7)	--	--	7,411	23,581	12,418	75,211	10,523	80,196	30,352	178,988	--	--	--	--	--	--
	2,001-3,000	1.5 (0.9-2.7)	--	--	--	--	--	--	1,325	14,308	1,325	14,308	--	--	--	--	--	--
	Total	1.5 (0.9-2.7)	--	--	19,666	58,617	31,315	184,013	32,289	255,656	83,270	498,286	1,395	7,632	774	7,880	2,169	15,512
UPPER HARTSHORNE (mvb)	101-1,000	1.6 (1.2-1.9)	--	--	1,087	3,811	1,455	7,470	--	--	2,542	11,281	--	--	--	--	--	--
	1,001-2,000	1.6 (1.2-1.9)	--	--	667	4,993	1,031	5,290	--	--	1,698	10,283	--	--	--	--	--	--
	2,001-3,000	1.5 (1.1-1.9)	--	--	--	--	1,280	5,760	--	--	1,280	5,760	--	--	--	--	--	--
	Total	1.6 (1.2-1.9)	--	--	1,754	8,804	3,766	18,520	--	--	5,520	27,324	--	--	--	--	--	--
UPPER HARTSHORNE (lvb)	0-100	1.6 (0.8-2.6)	--	--	155	453	1,357	7,805	442	2,945	1,954	11,203	--	--	--	--	--	--
	101-1,000	1.6 (0.8-2.6)	--	--	4,950	16,601	17,625	101,299	1,488	10,566	24,063	128,466	--	--	954	12,116	954	12,116
	1,001-2,000	1.6 (0.8-2.6)	--	--	6,523	22,068	11,178	55,784	--	--	17,701	77,852	--	--	--	--	--	--
	2,001-3,000	1.6 (0.8-2.6)	--	--	2,956	10,410	2,346	10,579	--	--	5,302	20,989	--	--	--	--	--	--
	3,000+	1.6 (0.8-2.6)	--	--	--	--	1,923	8,654	--	--	1,923	8,654	--	--	--	--	--	--
	Total	1.6 (0.8-2.6)	--	--	14,584	49,532	34,429	184,121	1,930	13,511	50,943	247,164	--	--	954	12,116	954	12,116
	All ranks total	1.6 (0.8-2.6)	--	--	16,338	58,336	38,195	202,641	1,930	13,511	56,463	274,488	--	--	954	12,116	954	12,116
LOWER HARTSHORNE (mvb)	0-100	1.5 (1.2-1.9)	--	--	--	--	451	2,648	288	2,875	739	5,523	199	2,090	--	--	199	2,090
	101-1,000	1.5 (1.2-1.9)	--	--	--	--	3,308	19,455	2,373	20,455	5,681	39,910	--	--	343	2,792	343	2,792
	1,001-2,000	1.5 (1.2-1.9)	--	--	--	--	1,557	9,249	108	908	1,665	10,157	--	--	--	--	--	--
	2,001-3,000	1.5 (1.2-1.9)	--	--	--	--	903	5,364	--	--	903	5,364	--	--	--	--	--	--
	Total	1.5 (1.2-1.9)	--	--	--	--	6,219	36,716	2,769	24,238	8,988	60,954	199	2,090	343	2,792	542	4,882
LOWER HARTSHORNE (lvb)	0-100	1.0 (0.8-1.3)	--	--	--	--	1,574	8,942	1,008	7,363	2,582	16,305	399	2,814	--	--	399	2,814
	101-1,000	0.8 (0.4-1.3)	--	--	70	290	14,915	83,747	27,273	195,191	42,258	279,228	--	--	3,432	23,165	3,432	23,165
	1,001-3,000	0.8 (0.5-1.1)	--	--	--	--	5,575	31,834	33,686	253,088	39,261	284,922	--	--	--	--	--	--
	2,001-3,000	0.8 (0.5-1.3)	--	--	--	--	1,165	6,798	15,336	118,163	16,501	124,961	--	--	--	--	--	--
	3,000+	0.9 (0.8-1.3)	--	--	--	--	--	--	2,323	22,068	2,323	22,068	--	--	--	--	--	--
	Total	0.8 (0.4-1.3)	--	--	70	290	23,229	131,321	79,626	595,873	102,925	727,484	399	2,814	3,432	23,165	3,831	25,979
	All ranks Total	0.9 (0.4-1.9)	--	--	70	290	29,448	168,037	82,395	620,111	111,913	788,438	598	4,904	3,775	25,951	4,373	30,861
ALL RANKS	0-100	1.9 (0.8-4.8)	2,268	4,463	7,795	22,852	5,012	27,675	4,797	35,807	19,872	90,797	2,203	13,263	124	291	2,327	13,554
	101-1,000	1.8 (0.4-4.8)	--	--	58,058	176,865	72,682	411,303	52,532	392,240	183,272	980,408	--	--	6,654	53,647	6,654	53,647
	1,001-2,000	1.7 (0.5-4.8)	--	--	39,843	134,099	40,565	227,018	46,998	352,531	127,406	713,648	--	--	--	--	--	--
	2,001-3,000	1.8 (0.5-4.8)	--	--	7,655	27,454	9,335	48,735	19,048	148,799	36,038	224,988	--	--	--	--	--	--
	3,000+	1.1 (0.8-2.6)	--	--	--	--	1,923	8,654	2,323	22,068	4,246	30,722	--	--	--	--	--	--
	Grand total	1.8 (0.4-4.8)	2,268	4,463	113,351	361,270	129,517	723,385	125,698	951,445	370,834	2,040,563	2,203	13,263	6,778	53,938	8,981	67,201

Table 28.--Original and Mined Coal Resources, Mayes County, Oklahoma (in thousands of short tons)

COAL AND RANK[1]	COAL DEPTH (FEET)	SULFUR CONTENT[2] (PERCENT)	ORIGINAL RESOURCES 12-14 INCHES ACRES	12-14 INCHES TONS	15-28 INCHES ACRES	15-28 INCHES TONS	29-42 INCHES ACRES	29-42 INCHES TONS	42+ INCHES ACRES	42+ INCHES TONS	TOTAL ACRES	TOTAL TONS	MINED AND LOST IN MINING SURFACE ACRES	SURFACE TONS	UNDERGROUND ACRES	UNDERGROUND TONS	TOTAL ACRES	TOTAL TONS
WEIR-PITTSBURG (hvb)	0-100	4.8 (4.5-5.0)	2,132	4,004	186	510	--	--	--	--	2,318	4,514	186	510	--	--	186	510

Table 29.--Original and Mined Coal Resources, McIntosh County, Oklahoma (in thousands of short tons)

COAL AND RANK[1]	COAL DEPTH (FEET)	SULFUR CONTENT[2] (PERCENT)	ORIGINAL RESOURCES 12-14 INCHES ACRES	12-14 INCHES TONS	15-28 INCHES ACRES	15-28 INCHES TONS	29-42 INCHES ACRES	29-42 INCHES TONS	42+ INCHES ACRES	42+ INCHES TONS	TOTAL ACRES	TOTAL TONS	MINED AND LOST IN MINING SURFACE ACRES	SURFACE TONS	UNDERGROUND ACRES	UNDERGROUND TONS	TOTAL ACRES	TOTAL TONS
CROWEBURG (hvb)	0-100	3.0 (2.5-4.0)	--	--	250	765	--	--	--	--	250	765	--	--	--	--	--	--
	101-1,000	3.0 (2.5-4.0)	--	--	314	961	--	--	--	--	314	961	--	--	--	--	--	--
	Total	3.0 (2.5-4.0)	--	--	564	1,726	--	--	--	--	564	1,726	--	--	--	--	--	--
SECOR (hvb)	0-100	4.5 (est.)	--	--	2,457	10,172	1,925	10,395	--	--	4,382	20,567	646	2,674	--	--	646	2,674
	101-1,000	4.5 (est.)	--	--	205	849	1,792	9,677	--	--	1,997	10,526	--	--	--	--	--	--
	Total	4.5 (est.)	--	--	2,662	11,021	3,717	20,072	--	--	6,379	31,093	646	2,674	--	--	646	2,674
STIGLER (hvb)	0-100	1.0 (0.8-1.2)	--	--	672	1,573	--	--	--	--	672	1,573	--	--	--	--	--	--
	101-1,000	1.0 (0.8-1.2)	--	--	6,426	15,037	--	--	--	--	6,426	15,037	--	--	--	--	--	--
	Total	1.0 (0.8-1.2)	--	--	7,098	16,610	--	--	--	--	7,098	16,610	--	--	--	--	--	--
ALL COALS TOTAL	0-100	4.2 (0.8-4.5)	--	--	3,379	12,510	1,925	10,395	--	--	5,304	22,905	646	2,674	--	--	646	2,674
	101-1,000	1.2 (0.8-4.5)	--	--	6,945	16,847	1,792	9,677	--	--	8,737	26,524	--	--	--	--	--	--
	Grand total	4.2 (0.8-4.5)	--	--	10,324	29,357	3,717	20,072	--	--	14,041	49,429	646	2,674	--	--	646	2,674

Table 30.--Original and Mined Coal Resources, Muskogee County, Oklahoma (in thousands of short tons)

COAL AND RANK[1]	COAL DEPTH (FEET)	SULFUR CONTENT[2] (PERCENT)	ORIGINAL RESOURCES 12-14 INCHES ACRES	12-14 INCHES TONS	15-28 INCHES ACRES	15-28 INCHES TONS	29-42 INCHES ACRES	29-42 INCHES TONS	42+ INCHES ACRES	42+ INCHES TONS	TOTAL ACRES	TOTAL TONS	MINED AND LOST IN MINING SURFACE ACRES	SURFACE TONS	UNDERGROUND ACRES	UNDERGROUND TONS	TOTAL ACRES	TOTAL TONS
SECOR (hvb)	0-100	4.0 (est.)	2,930	5,287	--	--	--	--	--	--	2,930	5,287	19	34	--	--	19	34
	101-1,000	4.0 (est.)	2,485	4,473	--	--	--	--	--	--	2,485	4,473	--	--	--	--	--	--
	Total	4.0 (est.)	5,415	9,760	--	--	--	--	--	--	5,415	9,760	19	34	--	--	19	34
			10-14 INCHES ACRES	10-14 INCHES TONS	15-28 INCHES ACRES	15-28 INCHES TONS	29-42 INCHES ACRES	29-42 INCHES TONS	42+ INCHES ACRES	42+ INCHES TONS	TOTAL ACRES	TOTAL TONS	SURFACE ACRES	SURFACE TONS	UNDERGROUND ACRES	UNDERGROUND TONS	TOTAL ACRES	TOTAL TONS
STIGLER (hvb)	0-100	4.1 (0.4-4.9)	4,106	7,216	4,128	12,340	--	--	--	--	8,234	19,556	960	3,147	--	--	960	3,147
	101-1,000	4.1 (0.4-4.9)	11,763	19,961	5,644	14,878	--	--	--	--	17,407	34,839	--	--	--	--	--	--
	Total	4.1 (0.4-4.9)	15,869	27,177	9,772	27,218	--	--	--	--	25,641	54,395	960	3,147	--	--	960	3,147
	Grand total	4.1 (0.4-4.9)	21,284	36,937	9,772	27,218	--	--	--	--	31,056	64,155	979	3,181	--	--	979	3,181

Table 31.--Original and Mined Coal Resources, Nowata County, Oklahoma (in thousands of short tons)

COAL AND RANK[1]	COAL DEPTH (FEET)	SULFUR CONTENT[2] (PERCENT)	ORIGINAL RESOURCES 10-14 INCHES ACRES	10-14 INCHES TONS	15-28 INCHES ACRES	15-28 INCHES TONS	29-42 INCHES ACRES	29-42 INCHES TONS	42+ INCHES ACRES	42+ INCHES TONS	TOTAL ACRES	TOTAL TONS	MINED AND LOST IN MINING SURFACE ACRES	SURFACE TONS	UNDERGROUND ACRES	UNDERGROUND TONS	TOTAL ACRES	TOTAL TONS
IRON POST (hvb)	0-100	3.6 (est.)	3,534	6,129	386	903	--	--	--	--	3,920	7,032	492	989	--	--	492	989

Table 32.--Original and Mined Coal Resources, Okfuskee County, Oklahoma (in thousands of short tons)

COAL AND RANK[1]	COAL DEPTH (FEET)	SULFUR CONTENT[2] (PERCENT)	ORIGINAL RESOURCES 12-14 INCHES ACRES	12-14 INCHES TONS	15-28 INCHES ACRES	15-28 INCHES TONS	29-42 INCHES ACRES	29-42 INCHES TONS	42+ INCHES ACRES	42+ INCHES TONS	TOTAL ACRES	TOTAL TONS	MINED AND LOST IN MINING SURFACE ACRES	SURFACE TONS	UNDERGROUND ACRES	UNDERGROUND TONS	TOTAL ACRES	TOTAL TONS
CROWEBURG (hvb)	0-100	1.6 (est.)	825	1,634	1,619	4,080	--	--	--	--	2,444	5,714	--	--	--	--	--	--
	101-1,000	2.2 (1.4-5.0)	666	1,319	8,825	28,156	5,767	30,104	--	--	15,258	59,579	--	--	--	--	--	--
	1,001-2,000	2.9 (1.4-5.0)	--	--	3,905	14,058	--	--	--	--	3,905	14,058	--	--	--	--	--	--
	Total	2.3 (1.4-5.0)	1,491	2,953	14,349	46,294	5,767	30,104	--	--	21,607	79,351	--	--	--	--	--	--

Table 33.--Original and Mined Coal Resources, Okmulgee County, Oklahoma (in thousands of short tons)

COAL AND RANK[1]	COAL DEPTH (FEET)	SULFUR CONTENT[2] (PERCENT)	ORIGINAL RESOURCES 12-14 INCHES ACRES	12-14 INCHES TONS	15-28 INCHES ACRES	15-28 INCHES TONS	29-42 INCHES ACRES	29-42 INCHES TONS	42+ INCHES ACRES	42+ INCHES TONS	TOTAL ACRES	TOTAL TONS	MINED AND LOST IN MINING SURFACE ACRES	SURFACE TONS	UNDERGROUND ACRES	UNDERGROUND TONS	TOTAL ACRES	TOTAL TONS
CROWEBURG (hvb)	0-100	2.2 (0.9-4.2)	1,011	2,037	3,443	13,286	2,605	12,101	--	--	7,059	27,424	1,069	4,387	--	--	1,069	4,387
	101-1,000	2.2 (0.9-4.2)	975	1,972	6,515	25,153	60,199	322,135	3,149	20,972	70,838	370,232	--	--	13,209	68,966	13,209	68,966
	Total	2.2 (0.9-4.2)	1,986	4,009	9,958	38,439	62,804	334,236	3,149	20,972	77,897	397,656	1,069	4,387	13,209	68,966	14,278	73,353

Table 33.--Okmulgee County (cont.)

COAL AND RANK[1]	COAL DEPTH (FEET)	SULFUR CONTENT[2] (PERCENT)	ORIGINAL RESOURCES 12-14 INCHES ACRES	12-14 INCHES TONS	15-28 INCHES ACRES	15-28 INCHES TONS	29-42 INCHES ACRES	29-42 INCHES TONS	42+ INCHES ACRES	42+ INCHES TONS	TOTAL ACRES	TOTAL TONS	MINED AND LOST IN MINING SURFACE ACRES	SURFACE TONS	UNDERGROUND ACRES	UNDERGROUND TONS	TOTAL ACRES	TOTAL TONS
MORRIS (hvb)	0-100	3.1-	1,364	2,700	2,528	7,009	--	--	--	--	3,892	9,709	166	512	--	--	166	512
	101-1,000	3.1-	1,004	1,988	7,571	19,028	--	--	--	--	8,575	21,016	--	--	--	--	--	--
	Total	3.1-	2,368	4,688	10,099	26,037	--	--	--	--	12,467	30,725	166	512	--	--	166	512
ERAM (hvb)	0-100	4.0-	--	--	--	--	1,185	6,297	--	--	1,185	6,297	38	205	--	--	38	205
	101-1,000	4.0-	--	--	--	--	1,849	9,985	--	--	1,849	9,985	--	--	--	--	--	--
	Total	4.0-	--	--	--	--	3,034	16,282	--	--	3,034	16,282	38	205	--	--	38	205
ALL COALS (hvb)	0-100	2.7 (0.9-4.2)	2,375	4,737	5,971	20,295	3,790	18,398	--	--	12,136	43,430	1,273	5,104	--	--	1,273	5,104
	101-1,000	2.3 (0.9-4.2)	1,979	3,960	14,086	44,181	62,048	332,120	3,149	20,972	81,262	401,233	--	--	13,209	68,966	13,209	68,966
	Grand total	2.3 (0.9-4.2)	4,354	8,697	20,057	64,476	65,838	350,518	3,149	20,972	93,398	444,663	1,273	5,104	13,209	68,966	14,482	74,070

Table 34.--Original and Mined Coal Resources, Pittsburg County, Oklahoma (in thousands of short tons)

COAL AND RANK[1]	COAL DEPTH (FEET)	SULFUR CONTENT[2] (PERCENT)	ORIGINAL RESOURCES 12-14 INCHES ACRES	12-14 INCHES TONS	15-28 INCHES ACRES	15-28 INCHES TONS	29-42 INCHES ACRES	29-42 INCHES TONS	42+ INCHES ACRES	42+ INCHES TONS	TOTAL ACRES	TOTAL TONS	MINED AND LOST IN MINING SURFACE ACRES	SURFACE TONS	UNDERGROUND ACRES	UNDERGROUND TONS	TOTAL ACRES	TOTAL TONS
COAL ABOVE SECOR (hvb)	0-100	--	168	302	946	3,406	--	--	--	--	1,114	3,708	22	79	--	--	22	79
	101-1,000	--	--	--	1,491	5,367	--	--	--	--	1,491	5,367	--	--	--	--	--	--
	Total	--	168	302	2,437	8,773	--	--	--	--	2,605	9,075	22	79	--	--	22	79
SECOR (hvb)	0-100	5.3 (6.6-3.5)	--	--	3,176	11,762	3,671	18,479	--	--	6,847	30,241	127	569	--	--	127	569
	101-1,000	5.6 est.	762	1,646	31,049	114,760	15,688	74,813	--	--	47,499	191,219	--	--	--	--	--	--
	1,001-2,000	5.6 est.	673	1,454	3,035	9,908	2,156	9,702	--	--	5,864	21,064	--	--	--	--	--	--
	Total	5.4 (6.6-3.5)	1,435	3,100	37,260	136,430	21,515	102,994	--	--	60,210	242,524	127	569	--	--	127	569
COAL BELOW SECOR (hvb)	0-100	--	--	--	125	495	--	--	--	--	125	495	--	--	--	--	--	--
	101-1,000	--	--	--	476	1,885	--	--	--	--	476	1,885	--	--	--	--	--	--
	Total	--	--	--	601	2,380	--	--	--	--	601	2,380	--	--	--	--	--	--
CAVANAL(?) COAL OR COAL IN SAVANNA FORMATION (hvb)	0-100	--	--	--	626	2,253	--	--	--	--	626	2,253	--	--	--	--	--	--
	101-1,000	--	--	--	5,787	20,833	--	--	--	--	5,787	20,833	--	--	--	--	--	--
	1,001-2,000	--	--	--	6,457	23,245	--	--	--	--	6,457	23,245	--	--	--	--	--	--
	Total	--	--	--	12,870	46,331	--	--	--	--	12,870	46,331	--	--	--	--	--	--
MC ALESTER (hvb)	0-100	0.9 (2.4-0.4)	--	--	--	--	409	2,218	50	346	459	2,564	74	458	--	--	74	458
	101-1,000	1.0 (2.4-0.4)	--	--	510	2,111	18,422	93,460	14,295	100,909	33,227	196,480	--	--	12,553	66,441	12,553	66,441
	1,001-2,000	1.2 (2.4-0.4)	--	--	443	1,834	30,699	179,818	4,976	34,957	36,118	216,609	--	--	814	4,741	814	4,741
	2,001-3,000	0.8 est.	--	--	--	--	27,304	156,061	179	1,183	27,483	157,244	--	--	--	--	--	--
	3,000+	0.8 est.	--	--	--	--	3,037	18,568	--	--	3,037	18,568	--	--	--	--	--	--
	Total	1.0 (2.4-0.4)	--	--	953	3,945	79,871	450,125	19,500	137,395	100,324	591,465	--	458	13,367	71,182	13,441	71,640
UPPER HARTSHORNE (hvb)	0-100	1.5 (1.8-1.2)	--	--	320	1,152	121	562	--	--	441	1,714	5	25	--	--	5	25
	101-1,000	1.5 (1.8-1.2)	--	--	467	1,430	5,759	27,350	202	1,527	6,428	30,307	--	--	598	2,915	598	2,915
	1,001-2,000	1.2 (1.3-1.2)	--	--	689	2,108	16,228	74,469	330	2,792	17,247	79,369	--	--	--		--	--
	2,001-3,000	1.2 est.	--	--	6,366	19,480	10,284	55,916	--	--	16,650	75,396	--	--	--	--	--	--
	3,000+	1.2 est.	--	--	--	--	1,126	5,067	--	--	1,126	5,067	--	--	--	--	--	--
	Total	1.2 (1.8-1.2)	--	--	7,842	24,170	33,518	163,364	532	4,319	41,892	191,853	5	25	598	2,915	603	2,940
LOWER HARTSHORNE (hvb)	0-100	1.6 (3.4-0.5)	--	--	--	--	141	700	354	2,477	495	3,177	50	360	--	--	50	360
	101-1,000	1.6 (2.4-0.8)	--	--	--	--	2,760	17,042	14,040	101,221	16,800	118,263	--	--	7,485	54,025	7,485	54,025
	1,001-2,000	1.4 (1.7-1.1)	--	--	--	--	4,012	22,922	17,392	124,495	21,404	147,417	--	--	--	--	--	--
	2,001-3,000	1.4 est.	--	--	--	--	7,818	47,471	9,916	70,823	17,734	118,294	--	--	--	--	--	--
	3,000+	1.4 est.	--	--	--	--	5,260	32,030	1,555	10,636	6,815	42,666	--	--	--	--	--	--
	Total	1.5 (3.4-0.5)	--	--	--	--	19,991	120,165	43,257	309,652	63,248	429,817	50	360	7,485	54,025	7,535	54,385
ALL COALS TOTAL (hvb)	0-100	3.8 (6.6-0.4)	168	302	5,193	19,068	4,342	21,959	404	2,823	10,107	44,152	208	1,491	--	--	278	1,491
	101-1,000	2.7 (5.6-0.9)	762	1,646	39,780	146,386	42,629	212,665	28,537	203,657	111,708	564,354	--	--	20,636	123,381	20,636	123,381
	1,001-2,000	1.4 (5.6-0.4)	673	1,454	10,624	37,095	53,095	286,911	22,698	162,244	87,090	487,704	--	--	814	4,741	814	4,741
	2,001-3,000	1.1 (1.4-0.8)	--	--	6,366	19,480	45,406	259,448	10,095	72,006	61,867	350,934	--	--	--	--	--	--
	3,000+	1.2 (1.4-0.8)	--	--	--	--	9,423	55,665	1,555	10,636	10,978	66,301	--	--	--	--	--	--
	Grand total	1.9 (6.6-0.4)	1,603	3,402	61,963	222,029	154,895	836,648	63,289	451,366	281,750	1,513,445	278	1,491	21,450	128,121	21,728	129,613

Table 35.--Original and Mined Coal Resources, Rogers County, Oklahoma (in thousands of short tons)

COAL AND RANK[1]	COAL DEPTH (FEET)	SULFUR CONTENT[2] (PERCENT)	ORIGINAL RESOURCES 12-14 INCHES ACRES	12-14 INCHES TONS	15-28 INCHES ACRES	15-28 INCHES TONS	29-42 INCHES ACRES	29-42 INCHES TONS	42+ INCHES ACRES	42+ INCHES TONS	TOTAL ACRES	TOTAL TONS	MINED AND LOST IN MINING SURFACE ACRES	SURFACE TONS	UNDERGROUND ACRES	UNDERGROUND TONS	TOTAL ACRES	TOTAL TONS
DAWSON (hvb)	0-100	3.8 (est.)	--	--	8,751	31,504	--	--	--	--	8,751	31,504	1,248	4,493	--	--	1,248	4,493
	101-1,000	3.8 (est.)	--	--	6,885	24,786	--	--	--	--	6,885	24,786	--	--	--	--	--	--
	Total	3.8 (est.)	--	--	15,636	56,290	--	--	--	--	15,636	56,290	1,248	4,493	--	--	1,248	4,493
IRON POST (hvb)	0-100	4.0 (3.7-4.2)	8,013	15,657	4,543	10,630	--	--	--	--	12,556	26,287	1,465	3,182	--	--	1,465	3,182
	101-1,000	4.0 (4.0 est.)	352	650	77	180	--	--	--	--	429	830	--	--	--	--	--	--
	Total	4.0 (3.7-4.2)	8,365	16,307	4,620	10,810	--	--	--	--	12,985	27,117	1,465	3,182	--	--	1,465	3,182
CROWEBURG (hvb)	0-100	0.8 (0.4-1.1)	15,196	32,504	32,737	84,162	--	--	--	--	47,933	116,666	7,515	19,310	--	--	7,515	19,310
	101-1,000	0.8 (0.5-2.0)	3,801	8,472	15,930	43,026	--	--	--	--	19,731	51,498	--	--	--	--	--	--
	Total	0.8 (0.4-2.0)	18,997	40,976	48,667	127,188	--	--	--	--	67,664	168,164	7,515	19,310	--	--	7,515	19,310
MINERAL (hvb)	0-100	3.5 (est.)	781	1,615	50	117	--	--	--	--	831	1,732	331	715	--	--	331	715
WEIR-PITTSBURG (hvb)	0-100	4.8 (4.5-5.4)	4,455	9,169	243	6,561	--	--	--	--	4,698	15,730	243	6,561	--	--	243	6,561
ROWE (hvb)	0-100	3.1 (2.8-3.4)	2,063	4,141	1,358	4,439	200	900	--	--	3,621	9,480	96	346	--	--	96	346
ALL COALS TOTAL (hvb)	0-100	2.1 (0.4-5.4)	30,508	63,086	47,682	137,413	200	900	--	--	78,390	201,399	10,898	34,607	--	--	10,898	34,607
	101-1,000	1.8 (0.5-4.0)	4,153	9,122	22,892	67,992	--	--	--	--	27,045	77,114	--	--	--	--	--	--
	Grand total	2.0 (0.4-5.4)	34,661	72,208	70,574	205,405	200	900	--	--	105,435	278,513	10,898	34,607	--	--	10,898	34,607

Table 36.--Original and Mined Coal Resources, Sequoyah County, Oklahoma (in thousands of short tons)

COAL AND RANK[1]	COAL DEPTH (FEET)	SULFUR CONTENT[2] (PERCENT)	ORIGINAL RESOURCES 12-14 INCHES ACRES	12-14 INCHES TONS	15-28 INCHES ACRES	15-28 INCHES TONS	29-42 INCHES ACRES	29-42 INCHES TONS	42+ INCHES ACRES	42+ INCHES TONS	TOTAL ACRES	TOTAL TONS	MINED AND LOST IN MINING SURFACE ACRES	SURFACE TONS	UNDERGROUND ACRES	UNDERGROUND TONS	TOTAL ACRES	TOTAL TONS
STIGLER (mvb)	0-100	2.0 (est.)	2,671	5,926	--	--	--	--	--	--	2,671	5,926	1,459	3,224	--	--	1,459	3,224
	101-1,000	2.0 (est.)	8,369	18,765	1,856	5,679	--	--	--	--	10,225	24,444	--	--	--	--	--	--
	Total	2.0 (est.)	11,040	24,691	1,856	5,679	--	--	--	--	12,896	30,370	1,459	3,224	--	--	1,459	3,224

Table 37.--Original and Mined Coal Resources, Tulsa County, Oklahoma (in thousands of short tons)

COAL AND RANK[1]	COAL DEPTH (FEET)	SULFUR CONTENT[2] (PERCENT)	ORIGINAL RESOURCES 12-14 INCHES ACRES	12-14 INCHES TONS	15-28 INCHES ACRES	15-28 INCHES TONS	29-42 INCHES ACRES	29-42 INCHES TONS	42+ INCHES ACRES	42+ INCHES TONS	TOTAL ACRES	TOTAL TONS	MINED AND LOST IN MINING SURFACE ACRES	SURFACE TONS	UNDERGROUND ACRES	UNDERGROUND TONS	TOTAL ACRES	TOTAL TONS
DAWSON (hvb)	0-100	4.6 (3.4-4.8)	--	--	9,594	36,834	552	2,484	--	--	10,146	39,318	1,011	3,852	--	--	1,011	3,852
	101-1,000	4.6 (3.4-4.8)	--	--	17,806	70,825	3,149	14,959	--	--	20,955	85,784	--	--	1,920	9,179	1,920	9,179
	Total	4.6 (3.4-4.8)	--	--	27,400	107,659	3,701	17,443	--	--	31,101	125,102	1,011	3,852	1,920	9,179	2,931	13,031
CROWEBURG (hvb)	0-100	2.0 (est.)	--	--	3,700	11,988	--	--	--	--	3,700	11,988	320	1,037	--	--	320	1,037
	101-1,000	2.0 (est.)	--	--	5,095	15,375	--	--	--	--	5,095	15,375	--	--	--	--	--	--
	Total	2.0 (est.)	--	--	8,795	27,363	--	--	--	--	8,795	27,363	320	1,037	--	--	320	1,037
ALL COALS TOTAL (hvb)	0-100	4.0 (2.0-4.8)	--	--	13,294	48,822	552	2,484	--	--	13,846	51,306	1,331	4,889	--	--	1,331	4,889
	101-1,000	4.2 (2.0-4.8)	--	--	22,901	86,200	3,149	14,959	--	--	26,050	101,159	--	--	1,920	9,179	1,920	9,179
	Grand total	4.1 (2.0-4.8)	--	--	36,195	135,022	3,701	17,443	--	--	39,896	152,465	1,331	4,889	1,920	9,179	3,251	14,068

Table 38.--Original and Mined Coal Resources, Wagoner County, Oklahoma (in thousands of short tons)

COAL AND RANK[1]	COAL DEPTH (FEET)	SULFUR CONTENT[2] (PERCENT)	ORIGINAL RESOURCES 12-14 INCHES ACRES	12-14 INCHES TONS	15-28 INCHES ACRES	15-28 INCHES TONS	29-42 INCHES ACRES	29-42 INCHES TONS	42+ INCHES ACRES	42+ INCHES TONS	TOTAL ACRES	TOTAL TONS	MINED AND LOST IN MINING SURFACE ACRES	SURFACE TONS	UNDERGROUND ACRES	UNDERGROUND TONS	TOTAL ACRES	TOTAL TONS
CROWEBURG (hvb)	0-100	2.7 (0.5-3.4)	--	--	10,842	30,053	--	--	--	--	10,842	30,053	2,688	7,471	--	--	2,688	7,471
	101-1,000	2.7 (0.5-3.4)	320	634	4,742	15,394	--	--	--	--	5,062	16,028	--	--	--	--	--	--
	Total	2.7 (0.5-3.4)	320	634	15,584	45,447	--	--	--	--	15,904	46,081	2,688	7,471	--	--	2,688	7,471
MINOR COALS	0-100	6.1 -	1,339	2,875	977	2,612	--	--	--	--	2,316	5,487	142	380	--	--	142	380
	101-1,000	6.1 -	1,387	2,996	6,390	16,828	--	--	--	--	7,777	19,824	--	--	--	--	--	--
	Total	6.1 -	2,726	5,871	7,367	19,440	--	--	--	--	10,093	25,311	142	380	--	--	142	380

Table 38.--Wagoner County (cont.)

COAL AND RANK[1]	COAL DEPTH (FEET)	SULFUR CONTENT[2] (PERCENT)	ORIGINAL RESOURCES										MINED AND LOST IN MINING					
			12-14 INCHES		15-28 INCHES		29-42 INCHES		42+ INCHES		TOTAL		SURFACE		UNDERGROUND		TOTAL	
			ACRES	TONS	ACRES	TONS	ACRES	TONS	ACRES	TONS	ACRES	TONS	ACRES	TONS	ACRES	TONS	ACRES	TONS
ALL COALS	0-100	3.2 (0.5-6.1)	1,339	2,875	11,819	32,665	--	--	--	--	13,158	35,540	2,830	7,851	--	--	2,830	7,851
TOTAL	101-1,000	3.2 (0.5-6.1)	1,707	3,630	11,132	32,222	--	--	--	--	12,839	35,852	--	--	--	--	--	--
	Grand total	3.2 (0.5-6.1)	3,046	6,505	22,951	64,887	--	--	--	--	25,997	71,392	2,830	7,851	--	--	2,830	7,851

Table 39.--Original and Mined Coal Resources, Washington County, Oklahoma (in thousands of short tons)

COAL AND RANK[1]		COAL DEPTH (FEET)	SULFUR CONTENT[2] (PERCENT)	ORIGINAL RESOURCES										MINED AND LOST IN MINING					
				12-14 INCHES		15-28 INCHES		29-42 INCHES		42+ INCHES		TOTAL		SURFACE		UNDERGROUND		TOTAL	
				ACRES	TONS	ACRES	TONS	ACRES	TONS	ACRES	TONS	ACRES	TONS	ACRES	TONS	ACRES	TONS	ACRES	TONS
DAWSON	(hvb)	101-1,000	3.8 (est.)	--	--	1,293	4,655	--	--	--	--	1,293	4,655	--	--	--	--	--	--

Table 40.--Remaining Coal Resources, Atoka County, Oklahoma (in thousands of short tons)

COAL AND RANK[1]	COAL DEPTH (FEET)	SULFUR CONTENT[2] (PERCENT)	MEASURED 12-14 INCHES ACRES	MEASURED 12-14 INCHES TONS	MEASURED 15-28 INCHES ACRES	MEASURED 15-28 INCHES TONS	MEASURED 29-42 INCHES ACRES	MEASURED 29-42 INCHES TONS	MEASURED 42+ INCHES ACRES	MEASURED 42+ INCHES TONS	MEASURED TOTAL ACRES	MEASURED TOTAL TONS	INDICATED 12-14 INCHES ACRES	INDICATED 12-14 INCHES TONS	INDICATED 15-28 INCHES ACRES	INDICATED 15-28 INCHES TONS	INDICATED 29-42 INCHES ACRES	INDICATED 29-42 INCHES TONS
MC ALESTER (hvb)	0-100	4.8 est.	--	--	--	--	--	--	30	216	30	216	--	--	--	--	--	--
	101-1,000	4.8 est.	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	1,001-2,000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	2,001-3,000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	3,000+	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Total	4.8 est.	--	--	--	--	--	--	30	216	30	216	--	--	--	--	--	--
LOWER HARTSHORNE (hvb)	0-100	5.1 (5.1)	--	--	110	297	304	1,477	--	--	414	1,774	--	--	2	6	--	--
	101-1,000	5.1 (5.1)	--	--	50	189	144	648	432	3,292	626	4,129	--	--	179	709	1,013	5,106
	1,001-2,000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	2,001-3,000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	3,000+	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Total	5.1 (5.1)	--	--	160	486	448	2,125	432	3,292	1,040	5,903	--	--	181	715	1,013	5,106
ALL COALS TOTAL	0-100	5.0 (4.8-5.1)	--	--	110	297	304	1,477	30	216	444	1,990	--	--	2	6	--	--
	101-1,000	5.0 (4.8-5.1)	--	--	50	189	144	648	432	3,292	626	4,129	--	--	179	709	1,013	5,106
	Grand total	5.0 (4.8-5.0)	--	--	160	486	448	2,125	462	3,508	1,070	6,119	--	--	181	715	1,013	5,106

Table 41.--Remaining Coal Resources, Coal County, Oklahoma (in thousands of short tons)

COAL AND RANK[1]	COAL DEPTH (FEET)	SULFUR CONTENT[2] (PERCENT)	MEASURED 12-14 INCHES ACRES	MEASURED 12-14 INCHES TONS	MEASURED 15-28 INCHES ACRES	MEASURED 15-28 INCHES TONS	MEASURED 29-42 INCHES ACRES	MEASURED 29-42 INCHES TONS	MEASURED 42+ INCHES ACRES	MEASURED 42+ INCHES TONS	MEASURED TOTAL ACRES	MEASURED TOTAL TONS	INDICATED 12-14 INCHES ACRES	INDICATED 12-14 INCHES TONS	INDICATED 15-28 INCHES ACRES	INDICATED 15-28 INCHES TONS	INDICATED 29-42 INCHES ACRES	INDICATED 29-42 INCHES TONS
MC ALESTER (hvb)	0-100	4.1 (0.8-4.8)	--	--	--	--	57	359	382	2,795	439	3,154	--	--	--	--	--	--
	100-1,000	4.1 (0.8-4.8)	--	--	--	--	--	--	3,053	23,282	3,053	23,282	--	--	--	--	--	--
	1,001-2,000	4.0 est.	--	--	--	--	--	--	495	4,076	495	4,076	--	--	--	--	--	--
	2,001-3,000	3.9 est.	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	3,000+	3.8 est.	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Total	4.0 (0.8-4.8)	--	--	--	--	57	359	3,930	30,153	3,987	30,512	--	--	--	--	--	--
LOWER HARTSHORNE (hvb)	0-100	5.0 est.	--	--	208	749	--	--	--	--	208	749	--	--	--	--	107	520
	101-1,000	5.0 est.	--	--	--	--	246	1,328	--	--	246	1,328	--	--	113	609	1,015	5,482
	1,001-2,000	5.0 est.	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Total	5.0 est.	--	--	208	749	246	1,328	--	--	454	2,077	--	--	113	609	1,122	6,002
ALL COALS TOTAL (hvb)	0-100	4.3 (0.8-5.0)	--	--	208	749	57	359	382	2,795	647	3,903	--	--	--	--	107	520
	101-1,000	4.2 (0.8-5.0)	--	--	--	--	246	1,328	3,053	23,282	3,299	24,610	--	--	113	609	1,015	5,482
	1,001-2,000	4.0 (0.8-5.0)	--	--	--	--	--	--	495	4,076	495	4,076	--	--	--	--	--	--
	2,001-3,000	3.9 est.	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	3,000+	3.8 est.	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Grand total	4.1 (0.8-5.0)	--	--	208	749	303	1,687	3,930	30,153	4,441	32,589	--	--	113	609	1,122	6,002

Table 42.--Remaining Coal Resources, Craig County, Oklahoma (in thousands of short tons)

COAL AND RANK[1]	COAL DEPTH (FEET)	SULFUR CONTENT[2] (PERCENT)	MEASURED 10-14 INCHES ACRES	MEASURED 10-14 INCHES TONS	MEASURED 15-28 INCHES ACRES	MEASURED 15-28 INCHES TONS	MEASURED 29-42 INCHES ACRES	MEASURED 29-42 INCHES TONS	MEASURED 42+ INCHES ACRES	MEASURED 42+ INCHES TONS	MEASURED TOTAL ACRES	MEASURED TOTAL TONS	INDICATED 10-14 INCHES ACRES	INDICATED 10-14 INCHES TONS	INDICATED 15-28 INCHES ACRES	INDICATED 15-28 INCHES TONS	INDICATED 29-42 INCHES ACRES	INDICATED 29-42 INCHES TONS
IRON POST (hvb)	0-100	3.5 (-)	5,057	8,746	486	1,156	--	--	--	--	5,543	9,902	6,888	11,622	1,235	2,890	--	--
CROWEBURG (hvb)	0-100	3.5 (est.)	4,009	7,242	70	164	--	--	--	--	4,079	7,406	11,860	20,525	--	--	--	--
MINERAL (hvb)	0-100	4.5 (3.6-4.7)	2,181	4,415	500	1,170	--	--	--	--	2,681	5,585	3,737	7,473	--	--	--	--
	101-1,000	4.5 (3.6-4.7)	--	--	100	360	--	--	--	--	100	360	--	--	558	1,343	--	--
	Total	4.5 (3.6-4.7)	2,181	4,415	600	1,530	--	--	--	--	2,781	5,945	3,737	7,473	558	1,343	--	--
ALL COALS TOTAL	0-100	3.7 (3.5-4.7)	11,247	20,403	1,056	2,490	--	--	--	--	12,303	22,893	22,485	39,620	1,235	2,890	--	--
	101-1,000	4.5 (3.6-4.7)	--	--	100	360	--	--	--	--	100	360	--	--	558	1,343	--	--
	Grand total	3.7 (3.5-4.7)	11,247	20,403	1,156	2,850	--	--	--	--	12,403	23,253	22,485	39,620	1,793	4,233	--	--

[1]Rank, shown in parentheses, abbreviated as follows: high-volatile bituminous, hvb; medium-volatile bituminous, mvb; low-volatile bituminous, lvb.

[2]Figure given is average sulfur content; figures in parentheses represent range; est. = estimated.

42+ INCHES		TOTAL		INFERRED										GRAND TOTAL		RECOVERABLE	NET RECOVERABLE
				12-14 INCHES		15-28 INCHES		29-42 INCHES		42+ INCHES		TOTAL					
ACRES	TONS	ACRES	TONS	ACRES	TONS	ACRES	TONS	ACRES	TONS	ACRES	TONS	ACRES	TONS	ACRES	TONS	RESERVES (TONS)	RESERVES (TONS)
123	930	123	930	--	--	--	--	--	--	96	691	96	691	249	1,837	1,470	1,470
128	991	128	991	--	--	--	--	--	--	701	5,552	701	5,552	829	6,543	3,272	3,272
--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
251	1,921	251	1,921	--	--	--	--	--	--	797	6,243	797	6,243	1,078	8,380	4,742	4,742
--	--	2	6	--	--	--	--	70	340	--	--	70	340	486	2,120	1,696	1,696
--	--	1,192	5,815	--	--	2,445	8,103	397	1,072	--	--	2,842	9,175	4,660	19,119	9,560	5,059
--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
--	--	1,194	5,821	--	--	2,445	8,103	467	1,412	--	--	2,912	9,515	5,146	21,239	11,256	6,755
123	930	125	936	--	--	--	--	70	340	96	691	166	1,031	735	3,957	3,166	3,166
128	991	1,320	6,806	--	--	2,445	8,103	397	1,072	701	5,552	3,543	14,727	5,489	25,662	12,831	8,331
251	1,921	1,445	7,742	--	--	2,445	8,103	467	1,412	797	6,243	3,709	15,758	6,224	29,619	15,997	11,497

42+ INCHES		TOTAL		INFERRED										GRAND TOTAL		RECOVERABLE	NET RECOVERABLE
				12-14 INCHES		15-28 INCHES		29-42 INCHES		42+ INCHES		TOTAL					
ACRES	TONS	ACRES	TONS	ACRES	TONS	ACRES	TONS	ACRES	TONS	ACRES	TONS	ACRES	TONS	ACRES	TONS	RESERVES (TONS)	RESERVES (TONS)
11	81	11	81	--	--	--	--	--	--	--	--	--	--	450	3,235	2,588	1,836
4,132	31,853	4,132	31,853	--	--	--	--	--	--	4,928	40,047	4,928	40,047	12,113	95,182	47,591	46,660
4,191	32,329	4,191	32,329	--	--	--	--	--	--	12,167	84,917	12,167	84,917	16,853	121,322	60,661	54,832
152	1,231	152	1,231	--	--	--	--	--	--	5,485	42,440	5,483	42,440	5,635	43,671	21,836	0
--	--	--	--	--	--	--	--	--	--	142	1,150	142	1,150	142	1,150	575	0
8,486	65,494	8,486	65,494	--	--	--	--	--	--	22,720	168,554	22,720	168,554	35,193	264,560	133,251	103,328
--	--	107	520	--	--	--	--	138	759	--	--	138	759	453	2,028	1,622	1,023
--	--	1,128	6,091	--	--	449	2,425	2,545	13,743	--	--	2,994	16,168	4,368	23,587	11,794	10,276
--	--	--	--	--	--	30	97	470	2,603	--	--	500	2,700	500	2,700	1,350	1,302
--	--	1,235	6,611	--	--	479	2,522	3,153	17,105	--	--	3,632	19,627	5,321	28,315	14,766	12,601
11	81	118	601	--	--	--	--	138	759	--	--	138	759	903	5,263	4,211	2,859
4,132	31,853	5,260	37,944	--	--	449	2,425	2,545	13,743	4,928	40,047	7,922	56,215	16,481	118,769	59,384	56,936
4,191	32,329	4,191	32,329	--	--	30	97	470	2,603	12,167	84,917	12,667	87,617	17,353	124,022	62,011	56,134
152	1,231	152	1,231	--	--	--	--	--	--	5,483	42,440	5,483	42,440	5,635	43,671	21,836	0
--	--	--	--	--	--	--	--	--	--	142	1,150	142	1,150	142	1,150	575	0
8,486	65,494	9,721	72,105	--	--	479	2,522	3,153	17,105	22,720	168,554	26,352	188,181	40,514	292,875	148,017	115,929

42+ INCHES		TOTAL		INFERRED										GRAND TOTAL		RECOVERABLE	NET RECOVERABLE
				10-14 INCHES		15-28 INCHES		29-42 INCHES		42+ INCHES		TOTAL					
ACRES	TONS	ACRES	TONS	ACRES	TONS	ACRES	TONS	ACRES	TONS	ACRES	TONS	ACRES	TONS	ACRES	TONS	RESERVES (TONS)	RESERVES (TONS)
--	--	8,123	14,512	1,210	2,831	4,599	8,027	--	--	--	--	5,809	10,858	19,475	35,272	21,218	21,218
--	--	11,860	20,525	18,409	32,348	--	--	--	--	--	--	18,409	32,348	34,348	60,279	48,223	48,223
--	--	3,737	7,473	4,814	9,397	--	--	--	--	--	--	4,814	9,397	11,232	22,455	17,964	17,964
--	--	558	1,343	--	--	501	1,343	--	--	--	--	501	1,343	1,159	3,046	1,523	0
--	--	4,295	8,816	4,814	9,397	501	1,343	--	--	--	--	5,315	10,740	12,391	25,501	19,487	17,964
--	--	23,720	42,510	24,433	44,576	4,599	8,027	--	--	--	--	29,032	52,603	65,055	118,006	87,405	87,405
--	--	588	1,343	--	--	501	1,343	--	--	--	--	501	1,343	1,159	3,046	1,523	0
--	--	24,278	43,853	24,433	44,576	5,100	9,370	--	--	--	--	29,533	53,946	66,214	121,052	88,928	87,405

Table 43.--Remaining Coal Resources, Creek County, Oklahoma (in thousands of short tons)

COAL AND RANK[1]	COAL DEPTH (FEET)	SULFUR CONTENT[2] (PERCENT)	MEASURED 12-14 INCHES ACRES	MEASURED 12-14 INCHES TONS	MEASURED 15-28 INCHES ACRES	MEASURED 15-28 INCHES TONS	MEASURED 29-42 INCHES ACRES	MEASURED 29-42 INCHES TONS	MEASURED 42+ INCHES ACRES	MEASURED 42+ INCHES TONS	MEASURED TOTAL ACRES	MEASURED TOTAL TONS	INDICATED 12-14 INCHES ACRES	INDICATED 12-14 INCHES TONS	INDICATED 15-28 INCHES ACRES	INDICATED 15-28 INCHES TONS	INDICATED 29-42 INCHES ACRES	INDICATED 29-42 INCHES TONS
DAWSON (hvb)	0-100	3.8 -	--	--	6	24	--	--	--	--	6	24	--	--	275	1,089	--	--
	101-1,000	3.8 -	--	--	--	--	--	--	--	--	--	--	--	--	90	356	--	--
	Total	3.8 -	--	--	6	24	--	--	--	--	6	24	--	--	365	1,445	--	--

Table 44.--Remaining Coal Resources, Haskell County, Oklahoma (in thousands of short tons)

COAL AND RANK[1]	COAL DEPTH (FEET)	SULFUR CONTENT[2] (PERCENT)	MEASURED 12-14 INCHES ACRES	MEASURED 12-14 INCHES TONS	MEASURED 15-28 INCHES ACRES	MEASURED 15-28 INCHES TONS	MEASURED 29-42 INCHES ACRES	MEASURED 29-42 INCHES TONS	MEASURED 42+ INCHES ACRES	MEASURED 42+ INCHES TONS	MEASURED TOTAL ACRES	MEASURED TOTAL TONS	INDICATED 12-14 INCHES ACRES	INDICATED 12-14 INCHES TONS	INDICATED 15-28 INCHES ACRES	INDICATED 15-28 INCHES TONS	INDICATED 29-42 INCHES ACRES	INDICATED 29-42 INCHES TONS
SECOR (hvb)	0-100	6.5 est.	--	--	137	517	--	--	--	--	137	517	--	--	245	890	--	--
	101-1,000	6.5 est.	--	--	145	502	--	--	--	--	145	502	--	--	905	3,437	--	--
	Total	6.5 est.	--	--	282	1,019	--	--	--	--	282	1,019	--	--	1,150	4,327	--	--
STIGLER (hvb)	0-100	1.3 (1.1-1.4)	179	337	2,393	6,504	--	--	--	--	2,572	6,841	77	139	766	2,073	--	--
	101-1,000	1.3 (0.4-1.7)	--	--	3,316	9,055	--	--	--	--	3,316	9,055	--	--	17,501	48,620	--	--
	1,001-2,000	1.3 (1.1-1.4)	--	--	21	76	126	544	--	--	147	620	--	--	1,564	6,032	--	--
	Total	1.3 (0.4-1.7)	179	337	5,730	15,635	126	544	--	--	6,035	16,516	77	139	19,831	56,725	--	--
STIGLER (mvb)	0-100	1.8 (0.4-5.2)	102	184	3,839	11,272	989	4,365	--	--	4,930	15,821	45	81	1,699	5,705	396	1,711
	101-1,000	1.5 (0.4-5.2)	--	--	6,987	22,121	559	2,459	--	--	7,546	24,580	--	--	25,615	79,741	473	2,129
	1,001-2,000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Total	1.6 (0.4-5.2)	102	184	10,826	33,393	1,548	6,824	--	--	12,476	40,401	45	81	27,314	85,446	869	3,840
	All ranks total	1.5 (0.4-5.2)	281	521	16,556	49,028	1,674	7,368	--	--	18,511	56,917	122	220	47,145	142,171	869	3,840
HARTSHORNE (mvb)	0-100	0.9 (0.7-1.7)	--	--	--	--	--	--	266	2,011	266	2,011	--	--	--	--	--	--
	101-1,000	2.2 (0.5-5.9)	90	178	1,147	3,941	1,144	6,185	5,016	38,711	7,397	49,015	--	--	5,411	19,521	6,241	33,211
	1,001-2,000	1.8 (0.5-5.0)	--	--	222	715	481	2,925	3,110	24,407	3,813	28,047	--	--	1,764	5,654	3,105	19,003
	2,001-3,000	1.2 (0.5-6.0)	--	--	--	--	126	794	--	--	126	794	--	--	--	--	224	1,411
	3,000+	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Total	1.9 (0.5-6.0)	90	178	1,369	4,656	1,751	9,904	8,392	65,129	11,602	79,867	--	--	7,175	25,175	9,570	53,625
HARTSHORNE (lvb)	0-100	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	101-1,000	1.8 (0.8-3.7)	38	68	252	976	310	1,593	64	449	664	3,086	--	--	2,149	8,355	2,208	11,733
	1,001-2,000	1.0 (0.6-2.1)	--	--	126	522	406	2,350	1,083	7,629	1,615	10,501	--	--	719	2,977	1,225	6,823
	2,001-3,000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	3,000+	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Total	1.6 (0.6-2.1)	38	68	378	1,498	716	3,943	1,147	8,078	2,279	13,587	--	--	2,868	11,332	3,433	18,556
	All ranks total	1.9 (0.5-6.0)	128	246	1,747	6,154	2,467	13,847	9,539	73,207	13,881	93,454	--	--	10,043	36,507	13,003	72,181
UPPER HARTSHORNE (mvb)	0-100	0.9 est.	--	--	77	277	--	--	--	--	77	277	--	--	25	90	--	--
	101-1,000	0.9 est.	--	--	38	137	--	--	--	--	38	137	--	--	135	486	--	--
	Total	0.9 est.	--	--	115	414	--	--	--	--	115	414	--	--	160	576	--	--
LOWER HARTSHORNE (mvb)	0-100	0.8 (0.8)	--	--	--	--	269	1,625	--	--	269	1,625	--	--	--	--	25	135
	101-1,000	0.8 (0.8)	--	--	--	--	38	205	128	968	166	1,173	--	--	--	--	135	729
	1,001-2,000	0.8 (0.8)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	2,001-3,000	0.8 (0.8)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	3,000+	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Total	0.8 (0.8)	--	--	--	--	307	1,830	128	968	435	2,798	--	--	--	--	160	864
ALL COALS TOTAL (hvb)	0-100	2.1 (1.1-6.5)	179	337	2,530	7,021	--	--	--	--	2,709	7,358	77	139	1,011	2,963	--	--
	101-1,000	1.8 (0.4-6.5)	--	--	3,461	9,557	--	--	--	--	3,461	9,557	--	--	18,406	52,057	--	--
	1,001-2,000	1.3 (1.1-1.4)	--	--	21	76	126	544	--	--	147	620	--	--	1,564	6,032	--	--
	Total	1.7 (0.4-6.5)	179	337	6,012	16,654	126	544	--	--	6,317	17,535	77	139	20,981	61,052	--	--
ALL COALS TOTAL (mvb)	0-100	1.6 (0.4-5.2)	102	184	3,916	11,549	1,258	5,990	266	2,011	5,542	19,734	45	81	1,724	5,795	421	1,846
	101-1,000	2.0 (0.4-5.2)	90	178	8,172	26,199	1,741	8,849	5,144	39,679	15,147	74,905	--	--	31,161	99,748	6,849	36,069
	1,001-2,000	1.8 (0.5-5.0)	--	--	222	715	481	2,925	3,110	24,407	3,813	28,047	--	--	1,764	5,654	3,105	19,003
	2,001-3,000	1.5 (0.5-6.0)	--	--	--	--	126	794	--	--	126	794	--	--	--	--	224	1,411
	Total	1.9 (0.4-6.0)	192	362	12,310	38,463	3,606	18,558	8,520	66,097	24,628	123,480	45	81	34,649	111,197	10,599	58,329
ALL COALS TOTAL (lvb)	0-100	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	101-1,000	1.8 (0.8-3.7)	38	68	252	976	310	1,593	64	449	664	3,086	--	--	2,149	8,355	2,208	11,733
	1,001-2,000	1.0 (0.6-2.1)	--	--	126	522	406	2,350	1,083	7,629	1,615	10,501	--	--	719	2,977	1,225	6,823
	Total	1.6 (0.6-2.1)	38	68	378	1,498	716	3,943	1,147	8,078	2,279	13,587	--	--	2,868	11,332	3,433	18,556
	Grand total	1.8 (0.4-6.0)	409	767	18,700	56,615	4,448	23,045	9,667	74,175	33,224	154,602	122	220	58,498	183,581	14,032	76,885

42+ INCHES		TOTAL		INFERRED										GRAND TOTAL		RECOVERABLE	NET RECOVERABLE
				12-14 INCHES		15-28 INCHES		29-42 INCHES		42+ INCHES		TOTAL					
ACRES	TONS	ACRES	TONS	ACRES	TONS	ACRES	TONS	ACRES	TONS	ACRES	TONS	ACRES	TONS	ACRES	TONS	RESERVES (TONS)	RESERVES (TONS)
--	--	275	1,089	--	--	948	3,754	--	--	--	--	948	3,754	1,229	4,867	3,893	3,893
--	--	90	356	--	--	2,228	8,823	--	--	--	--	2,228	8,823	2,318	9,179	4,589	0
--	--	365	1,445	--	--	3,176	12,577	--	--	--	--	3,176	12,577	3,547	14,046	8,482	3,893

42+ INCHES		TOTAL		INFERRED										GRAND TOTAL		RECOVERABLE	NET RECOVERABLE
				12-14 INCHES		15-28 INCHES		29-42 INCHES		42+ INCHES		TOTAL					
ACRES	TONS	ACRES	TONS	ACRES	TONS	ACRES	TONS	ACRES	TONS	ACRES	TONS	ACRES	TONS	ACRES	TONS	RESERVES (TONS)	RESERVES (TONS)
--	--	245	890	--	--	323	1,241	--	--	--	--	323	1,241	705	2,648	2,118	2,118
--	--	905	3,437	--	--	2,797	10,573	--	--	--	--	2,797	10,573	3,847	14,512	7,256	0
--	--	1,150	4,327	--	--	3,120	11,814	--	--	--	--	3,120	11,814	4,552	17,160	9,374	2,118
--	--	843	2,212	262	519	42	119	--	--	--	--	304	638	3,719	9,691	7,753	7,753
--	--	17,501	48,620	--	--	23,289	68,984	--	--	--	--	23,289	68,984	44,106	126,659	63,330	0
--	--	1,564	6,032	--	--	8,534	28,949	--	--	--	--	8,534	28,949	10,245	35,601	17,800	272
--	--	19,908	56,864	262	519	31,865	98,052	--	--	--	--	32,127	98,571	58,070	171,951	88,883	8,025
--	--	2,140	7,497	90	162	655	2,010	--	--	--	--	745	2,172	7,815	25,490	20,392	19,664
--	--	26,088	81,870	--	--	21,892	66,842	--	--	--	--	21,892	66,842	55,526	173,292	86,646	2,294
--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
--	--	28,228	89,367	90	162	22,547	68,852	--	--	--	--	22,637	69,014	63,341	198,782	107,038	21,958
--	--	48,136	146,231	352	681	54,412	166,904	--	--	--	--	54,764	167,585	121,411	370,733	195,921	29,983
--	--	--	--	--	--	--	--	--	--	--	--	--	--	266	2,011	1,609	1,609
14,256	114,874	25,908	167,606	6,900	14,902	14,026	46,694	5,524	28,103	5,765	45,522	32,215	135,221	65,520	351,842	175,921	133,303
18,841	154,757	23,710	179,414	3,264	7,050	7,943	22,449	8,374	50,923	33,574	278,293	53,155	358,715	80,678	566,176	283,088	265,154
32	23	256	1,642	--	--	224	927	--	--	2,912	26,448	3,136	27,375	3,518	29,811	14,906	0
--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
33,129	269,862	49,874	348,662	10,164	21,952	22,193	70,070	13,898	79,026	42,251	350,263	88,506	521,311	149,982	949,840	475,524	400,066
--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
177	1,351	4,534	21,439	832	1,798	8,680	30,926	6,642	37,662	124	893	16,278	71,279	21,476	95,804	47,902	26,840
1,932	13,445	3,876	23,245	--	--	960	3,491	1,064	6,295	--	--	2,024	9,786	7,515	43,532	21,766	18,271
--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,109	14,796	8,410	44,684	832	1,798	9,640	34,417	7,706	43,957	124	893	18,302	81,065	28,991	139,336	69,668	45,111
35,238	284,658	58,284	393,346	10,996	23,750	31,833	104,487	21,604	122,983	42,375	351,156	106,808	602,376	178,973	1,089,176	545,192	445,177
--	--	25	90	--	--	--	--	--	--	--	--	--	--	102	367	184	184
--	--	135	486	--	--	--	--	--	--	--	--	--	--	173	623	312	0
--	--	160	576	--	--	--	--	--	--	--	--	--	--	275	990	496	184
--	--	25	135	--	--	--	--	--	--	--	--	--	--	294	1,760	1,408	1,408
262	1,698	397	2,427	--	--	--	--	860	5,418	--	--	860	5,418	1,423	9,018	4,509	4,509
64	415	64	415	--	--	--	--	1,888	11,462	--	--	1,888	11,462	1,952	11,877	5,938	5,938
--	--	--	--	--	--	--	--	2,221	12,967	--	--	2,221	12,967	2,221	12,967	6,484	0
--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
326	2,113	486	2,977	--	--	--	--	4,969	29,847	--	--	4,969	29,847	5,890	35,622	18,339	11,855
--	--	1,088	3,102	262	519	365	1,360	--	--	--	--	627	1,879	4,424	12,339	9,871	9,871
--	--	18,406	52,057	--	--	26,086	79,557	--	--	--	--	26,086	79,557	47,953	141,171	70,586	0
--	--	1,564	6,032	--	--	8,534	28,949	--	--	--	--	8,534	28,949	10,245	35,601	17,800	272
--	--	21,058	61,191	262	519	34,985	109,866	--	--	--	--	35,247	110,385	62,622	189,111	98,257	10,143
--	--	2,190	7,722	90	162	655	2,010	--	--	--	--	745	2,172	8,477	29,628	23,702	22,865
14,518	116,572	52,528	252,389	6,900	14,902	35,918	113,536	6,384	33,521	5,765	45,522	54,967	207,481	122,642	534,775	267,388	140,106
18,905	155,172	23,774	179,829	3,264	7,050	7,943	22,449	10,262	62,385	33,574	278,293	55,043	370,177	82,630	578,053	289,026	271,092
32	231	256	1,642	--	--	224	927	2,221	12,967	2,912	26,448	5,357	40,342	5,739	42,778	21,389	0
33,455	271,975	78,748	441,582	10,254	22,114	44,740	138,922	18,867	108,873	42,251	350,263	116,112	620,172	219,488	1,185,234	601,505	434,063
--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
177	1,351	4,534	21,439	832	1,798	8,680	30,926	6,642	37,662	124	893	16,278	71,279	21,476	95,804	47,902	26,840
1,932	13,445	3,876	23,245	--	--	960	3,491	1,064	6,295	--	--	2,024	9,786	7,515	43,532	21,766	18,271
2,109	14,796	8,410	44,684	832	1,798	9,640	34,417	7,706	43,957	124	893	18,302	81,065	28,991	139,336	69,668	45,111
35,564	286,771	108,216	547,457	11,348	24,431	89,365	283,205	26,573	152,830	42,375	351,156	169,661	811,622	311,101	1,513,681	769,430	489,317

Table 45.--Remaining Coal Resources, Latimer County, Oklahoma (in thousands of short tons)

COAL AND RANK[1]	COAL DEPTH (FEET)	SULFUR CONTENT[2] (PERCENT)	MEASURED 12-14 INCHES ACRES	MEASURED 12-14 INCHES TONS	MEASURED 15-28 INCHES ACRES	MEASURED 15-28 INCHES TONS	MEASURED 29-42 INCHES ACRES	MEASURED 29-42 INCHES TONS	MEASURED 42+ INCHES ACRES	MEASURED 42+ INCHES TONS	MEASURED TOTAL ACRES	MEASURED TOTAL TONS	INDICATED 12-14 INCHES ACRES	INDICATED 12-14 INCHES TONS	INDICATED 15-28 INCHES ACRES	INDICATED 15-28 INCHES TONS	INDICATED 29-42 INCHES ACRES	INDICATED 29-42 INCHES TONS
UPPER MC ALESTER (hvb)	0-100	4.1 (4.1)	--	--	513	1,734	5	27	--	--	518	1,761	2	4	362	1,266	63	340
	101-1,000	4.1 (4.1)	--	--	723	2,543	224	1,114	--	--	947	3,657	27	58	5,208	17,889	1,106	5,544
	1,001-2,000	4.1 (4.1)	--	--	--	--	--	--	--	--	--	--	--	--	38	89	--	--
	Total	4.1 (4.1)	--	--	1,236	4,277	229	1,141	--	--	1,465	5,418	29	62	5,608	19,244	1,169	5,884
LOWER MC ALESTER (hvb)	0-100	2.3 (1.9-3.2)	--	--	1,632	5,169	29	146	--	--	1,661	5,315	8	17	649	1,865	328	1,561
	101-1,000	2.3 (1.9-3.2)	--	--	1,495	4,932	1,242	5,677	--	--	2,737	10,609	29	63	7,702	24,416	4,535	21,016
	1,001-2,000	2.3 (1.9-3.2)	--	--	--	--	--	--	--	--	--	--	--	--	38	103	154	665
	2,001-3,000	2.3 (1.9-3.2)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	3,000+	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Total	2.3 (1.9-3.2)	--	--	3,127	10,101	1,271	5,823	--	--	4,398	15,924	37	80	8,389	26,384	5,017	23,242
UPPER HARTSHORNE (hvb)	0-100	1.5 (0.9-1.8)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	101-1,000	1.5 (1.0-2.6)	--	--	126	318	806	4,293	1,268	8,588	2,200	13,199	--	--	466	1,426	1,384	6,533
	1,001-2,000	1.6 (1.0-2.6)	--	--	--	--	907	4,771	29	209	936	4,980	--	--	298	751	1,727	7,986
	2,001-3,000	1.5 (1.0-2.6)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1,172	5,850
	3,000+	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Total	1.5 (1.0-2.6)	--	--	126	318	1,713	9,064	1,297	8,797	3,136	18,179	--	--	764	2,177	4,283	20,369
LOWER HARTSHORNE (hvb)	0-100	1.6 (1.1-2.4)	--	--	--	--	91	541	46	414	137	955	--	--	--	--	94	592
	101-1,000	1.5 (1.1-3.4)	--	--	--	--	100	594	2,746	21,509	2,846	22,103	--	--	--	--	134	790
	1,001-2,000	1.6 (1.2-2.4)	--	--	--	--	197	993	987	7,560	1,184	8,553	--	--	--	--	784	4,375
	2,001-3,000	1.5 (1.2-2.4)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	285	1,436
	3,000+	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Total	1.5 (1.1-3.4)	--	--	--	--	388	2,128	3,779	29,483	4,167	31,611	--	--	--	--	1,297	7,193
ALL COALS TOTAL	0-100	2.6 (0.9-4.1)	--	--	2,145	6,903	125	714	46	414	2,316	8,031	10	21	1,011	3,131	485	2,493
	101-1,000	2.4 (1.0-4.1)	--	--	2,344	7,793	2,372	11,678	4,014	30,097	8,730	49,568	56	121	13,376	43,731	7,159	33,883
	1,001-2,000	2.0 (1.0-4.1)	--	--	--	--	1,104	5,764	1,016	7,769	2,120	13,533	--	--	374	943	2,665	13,026
	2,001-3,000	1.5 (1.0-3.2)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1,457	7,286
	3,000+	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Grand total	2.0 (0.9-4.1)	--	--	4,489	14,696	3,601	18,156	5,076	38,280	13,166	71,132	66	142	14,761	47,805	11,766	56,688

Table 46.--Remaining Coal Resources, Le Flore County, Oklahoma (in thousands of short tons)

COAL AND RANK[1]	COAL DEPTH (FEET)	SULFUR CONTENT[2] (PERCENT)	MEASURED 12-14 INCHES ACRES	MEASURED 12-14 INCHES TONS	MEASURED 15-28 INCHES ACRES	MEASURED 15-28 INCHES TONS	MEASURED 29-42 INCHES ACRES	MEASURED 29-42 INCHES TONS	MEASURED 42+ INCHES ACRES	MEASURED 42+ INCHES TONS	MEASURED TOTAL ACRES	MEASURED TOTAL TONS	INDICATED 12-14 INCHES ACRES	INDICATED 12-14 INCHES TONS	INDICATED 15-28 INCHES ACRES	INDICATED 15-28 INCHES TONS	INDICATED 29-42 INCHES ACRES	INDICATED 29-42 INCHES TONS
SECOR (mvb)	0-100	4.1 (4.1)	--	--	332	1,106	154	794	--	--	486	1,900	--	--	121	391	237	1,161
	101-1,000	4.1 (4.1)	--	--	70	230	480	2,678	422	2,886	972	5,794	--	--	806	2,684	1,843	9,984
	1,001-2,000	4.7 (4.7)	--	--	--	--	83	463	51	349	134	812	--	--	6	24	755	4,213
	2,001-3,000	4.7 (4.7)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	51	285
	Total	4.4 (4.1-4.7)	--	--	402	1,336	717	3,935	473	3,235	1,592	8,506	--	--	933	3,099	2,886	15,643
LOWER WITTEVILLE (mvb)	101-1,000	4.4 (4.4)	--	--	--	--	384	2,212	--	--	384	2,212	--	--	13	47	2,534	14,596
	1,001-2,000	4.4 (4.4)	--	--	--	--	211	1,215	--	--	211	1,215	--	--	--	--	922	5,311
	Total	4.4 (4.4)	--	--	--	--	595	3,427	--	--	595	3,427	--	--	13	47	3,456	19,907
CAVANAL (mvb)	0-100	3.3 (4.8-2.1)	--	--	322	1,089	97	424	--	--	419	1,513	--	--	314	1,071	55	243
	101-1,000	3.3 (4.8-2.1)	--	--	484	1,790	260	1,311	--	--	744	3,101	--	--	3,216	11,240	1,581	8,311
	1,001-2,000	3.3 (4.8-2.1)	--	--	--	--	--	--	--	--	--	--	--	--	52	154	93	402
	2,001-3,000	3.3 (4.8-2.1)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Total	3.3 (4.8-2.1)	--	--	806	2,879	357	1,735	--	--	1,163	4,614	--	--	3,582	12,465	1,729	8,956
UNNAMED COALS ABOVE CAVANAL; AND LOWER CAVANAL (mvb)	0-100	--	51	101	51	202	27	122	--	--	129	425	90	178	186	709	26	117
	101-1,000	--	--	--	80	317	37	166	--	--	117	483	--	--	1,641	6,538	--	--
	1,001-2,000	--	--	--	--	--	--	--	--	--	--	--	--	--	27	107	--	--
	2,001-3,000		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Total	--	51	101	131	519	64	288	--	--	246	908	90	178	1,854	7,354	26	117
UNNAMED COALS ABOVE STIGLER (mvb and lvb)	0-100	--	166	323	169	396	--	--	--	--	335	719	822	1,613	1,043	2,440	--	--
	101-1,000	--	--	--	6	14	--	--	--	--	6	14	--	--	608	1,423	--	--
	1,001-2,000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Total	--	166	323	175	410	--	--	--	--	341	733	822	1,613	1,651	3,863	--	--
STIGLER (lvb)	0-100	1.7 (est.)	--	--	550	1,559	--	--	--	--	550	1,559	--	--	627	1,669	--	--
	101-1,000	1.4 (est.)	--	--	412	1,166	--	--	--	--	412	1,166	--	--	3,550	9,936	--	--
	1,001-2,000	1.3 (est.)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Total	1.4 (est.)	--	--	962	2,725	--	--	--	--	962	2,725	--	--	4,177	11,605	--	--

42+ INCHES		TOTAL		INFERRED										GRAND TOTAL		RECOVERABLE	NET RECOVERABLE
				12-14 INCHES		15-28 INCHES		29-42 INCHES		42+ INCHES		TOTAL					
ACRES	TONS	ACRES	TONS	ACRES	TONS	ACRES	TONS	ACRES	TONS	ACRES	TONS	ACRES	TONS	ACRES	TONS	RESERVES (TONS)	RESERVES (TONS)
--	--	427	1,610	3	7	534	1,784	18	97	--	--	555	1,888	1,500	5,259	4,207	4,207
--	--	6,341	23,491	--	--	16,643	54,461	526	2,367	--	--	17,169	56,828	24,457	83,976	41,988	4,190
--	--	38	89	--	--	5,087	15,095	555	2,497	--	--	5,642	17,592	5,680	17,681	8,840	1,248
--	--	6,806	25,190	3	7	22,264	71,340	1,099	4,961	--	--	23,366	76,308	31,637	106,916	55,035	9,645
--	--	985	3,443	--	--	761	2,055	194	946	--	--	955	3,001	3,601	11,759	9,407	9,407
--	--	12,266	45,495	--	--	16,168	48,127	8,696	39,205	--	--	24,864	87,332	39,867	143,436	71,718	24,725
--	--	192	768	--	--	7,890	25,433	2,876	12,504	--	--	10,766	37,937	10,958	38,705	19,352	1,688
--	--	--	--	--	--	--	--	1,758	7,595	--	--	1,758	7,595	1,758	7,595	3,798	0
--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
--	--	13,443	49,706	--	--	24,819	75,615	13,524	60,250	--	--	38,343	135,865	56,184	201,495	104,275	35,820
--	--	--	--	--	--	40	151	245	1,102	--	--	285	1,253	285	1,253	1,002	1,002
2,310	16,552	4,160	24,511	--	--	1,586	5,995	45	213	609	4,226	2,240	10,434	8,600	48,144	24,072	10,416
1,120	7,914	3,145	16,651	--	--	1,912	7,074	926	4,245	2,905	20,702	5,743	32,021	9,824	53,652	26,826	14,169
365	2,614	1,537	8,464	--	--	1,349	3,679	8,513	38,311	8,274	57,582	18,136	99,572	19,673	108,036	54,018	0
--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3,795	27,080	8,842	49,626	--	--	4,887	16,899	9,729	43,871	11,788	82,510	26,404	143,280	38,382	211,085	105,918	25,587
--	--	94	592	--	--	--	--	--	--	118	836	118	836	349	2,383	1,906	1,906
3,476	26,952	3,610	27,742	--	--	--	--	251	1,534	1,759	12,136	2,010	13,670	8,466	63,515	31,758	16,481
3,759	32,351	4,543	36,726	--	--	--	--	424	2,366	3,924	30,350	4,348	32,716	10,075	77,995	38,998	26,619
1,702	13,605	1,987	15,041	--	--	--	--	3,071	17,136	17,722	146,402	20,793	163,538	22,780	178,579	89,289	0
--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
8,937	72,908	10,234	80,101	--	--	--	--	3,746	21,036	23,523	189,724	27,269	210,760	41,670	322,472	161,951	45,006
--	--	1,506	5,645	3	7	1,335	3,990	457	2,145	118	836	1,913	6,978	5,735	20,654	16,522	16,522
5,786	43,504	26,377	121,239	--	--	34,397	108,583	9,518	43,319	2,368	16,362	46,283	168,264	81,390	339,071	169,536	55,812
4,879	40,265	7,918	54,234	--	--	14,889	47,602	4,781	21,612	6,829	51,052	26,499	120,266	36,537	188,033	94,016	43,724
2,067	16,219	3,524	23,505	--	--	1,349	3,679	13,342	63,042	25,996	203,984	40,687	270,705	44,211	294,210	147,105	0
--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
12,732	99,988	39,325	204,623	3	7	51,970	163,854	28,098	130,118	35,311	272,234	115,382	566,213	167,873	841,968	427,179	116,058

42+ INCHES		TOTAL		INFERRED										GRAND TOTAL		RECOVERABLE	NET RECOVERABLE
				12-14 INCHES		15-28 INCHES		29-42 INCHES		42+ INCHES		TOTAL					
ACRES	TONS	ACRES	TONS	ACRES	TONS	ACRES	TONS	ACRES	TONS	ACRES	TONS	ACRES	TONS	ACRES	TONS	RESERVES (TONS)	RESERVES (TONS)
6	41	364	1,593	--	--	--	--	230	1,118	--	--	230	1,118	1,080	4,611	3,689	3,689
1,382	9,453	4,031	22,121	--	--	1,267	4,453	3,795	19,991	1,139	7,791	6,201	32,235	11,204	60,150	30,075	26,392
883	6,040	1,644	10,277	--	--	1,638	5,333	3,296	18,300	1,747	11,950	6,681	35,583	8,459	46,672	23,336	20,658
6	41	57	326	--	--	89	264	3,590	19,949	2,381	16,287	6,060	36,500	6,117	36,826	18,413	0
2,277	15,575	6,096	34,317	--	--	2,994	10,050	10,911	59,358	5,267	36,028	19,172	105,436	26,860	148,259	75,513	50,739
--	--	2,547	14,643	--	--	902	3,247	2,029	11,687	--	--	2,931	14,934	5,862	31,789	15,894	14,248
--	--	922	5,311	--	--	659	2,372	1,952	11,244	--	--	2,611	13,616	3,744	20,142	10,071	8,885
--	--	3,469	19,954	--	--	1,561	5,619	3,981	22,931	--	--	5,542	28,550	9,606	51,931	25,965	23,133
--	--	369	1,314	--	--	425	1,422	199	1,147	--	--	624	2,569	1,412	5,396	4,317	4,317
--	--	4,797	19,551	--	--	5,861	19,777	3,215	18,399	--	--	9,076	38,176	14,617	60,828	30,414	14,010
--	--	145	556	--	--	7,979	27,903	1,398	8,053	--	--	9,377	35,956	9,522	36,512	18,256	4,227
--	--	--	--	--	--	2,792	9,804	--	--	--	--	2,792	9,804	2,792	9,804	4,902	0
--	--	5,311	21,421	--	--	17,057	58,906	4,812	27,599	--	--	21,869	86,505	28,343	112,540	57,889	22,554
--	--	302	1,004	109	215	96	320	2	9	--	--	207	544	638	1,973	1,578	1,578
--	--	1,641	6,538	--	--	3,024	11,184	--	--	--	--	3,024	11,184	4,782	18,205	9,102	83
--	--	27	107	--	--	3,984	15,482	--	--	--	--	3,984	15,482	4,011	15,589	7,794	0
--	--	--	-	--	--	1,007	4,094	--	--	--	--	1,007	4,094	1,007	4,094	2,047	0
--	--	1,970	7,649	109	215	8,111	31,080	2	9	--	--	8,222	31,304	10,438	39,861	20,521	1,661
--	--	1,865	4,053	959	1,886	991	2,279	--	--	--	--	1,950	4,165	4,150	8,937	7,150	7,150
--	--	608	1,423	--	--	3,966	9,281	--	--	--	--	3,966	9,281	4,580	10,718	5,359	0
--	--	--	--	--	--	838	1,961	--	--	--	--	838	1,961	838	1,961	980	0
--	--	2,473	5,476	959	1,886	5,795	13,521	--	--	--	--	6,754	15,407	9,568	21,616	13,489	7,150
--	--	627	1,669	--	--	1,011	2,549	--	--	--	--	1,011	2,549	2,188	5,777	4,622	4,622
--	--	3,550	9,936	--	--	11,966	31,312	--	--	--	--	11,966	31,312	15,928	42,414	21,207	0
--	--	--	--	--	--	6,952	19,124	--	--	--	--	6,952	19,124	6,952	19,124	9,562	0
--	--	4,177	11,605	--	--	19,929	52,985	--	--	--	--	19,929	52,985	25,068	67,315	35,391	4,622

Table 46.--Le Flore County (cont.)

COAL AND RANK[1]	COAL DEPTH (FEET)	SULFUR CONTENT[2] (PERCENT)	MEASURED 12-14 INCHES ACRES	MEASURED 12-14 INCHES TONS	MEASURED 15-28 INCHES ACRES	MEASURED 15-28 INCHES TONS	MEASURED 29-42 INCHES ACRES	MEASURED 29-42 INCHES TONS	MEASURED 42+ INCHES ACRES	MEASURED 42+ INCHES TONS	MEASURED TOTAL ACRES	MEASURED TOTAL TONS	INDICATED 12-14 INCHES ACRES	INDICATED 12-14 INCHES TONS	INDICATED 15-28 INCHES ACRES	INDICATED 15-28 INCHES TONS	INDICATED 29-42 INCHES ACRES	INDICATED 29-42 INCHES TONS
UPPER MC ALESTER (mvb)	0-100	4.1 (est.)	--	--	22	75	--	--	--	--	22	75	--	--	4	14	--	--
	101-1,000	1.4 (est.)	--	--	50	171	--	--	--	--	50	171	--	--	339	1,159	--	--
	1,001-2,000	4.1 (est.)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	2,001-3,000	4.1 (est.)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Total	4.1 (est.)	--	--	72	246	--	--	--	--	72	246	--	--	343	1,173	--	--
LOWER MC ALESTER (mvb)	0-100	3.2 (est.)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	101-1,000	3.2 (est.)	--	--	62	223	--	--	--	--	62	223	--	--	370	1,332	--	--
	1,001-2,000	3.2 (est.)	--	--	--	--	--	--	--	--	--	--	--	--	70	252	--	--
	2,001-3,000	3.2 (est.)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Total	3.2 (est.)	--	--	62	223	--	--	--	--	62	223	--	--	440	1,584	--	--
HARTSHORNE (lvb)	0-100	1.3 (1.1-1.4)	--	--	480	1,728	455	2,389	1,274	10,085	2,209	14,202	--	--	--	--	90	435
	101-1,000	1.5 (0.9-2.7)	--	--	26	69	1,505	8,010	4,589	32,444	6,120	40,523	--	--	3,244	10,302	8,936	53,085
	1,001-2,000	1.5 (0.9-2.7)	--	--	--	--	288	1,746	539	3,521	827	5,267	--	--	--	--	6,445	39,275
	2,001-3,000	1.5 (0.9-2.7)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Total	1.5 (0.9-2.7)	--	--	506	1,797	2,248	12,145	6,402	46,050	9,156	59,992	--	--	3,244	10,302	15,471	92,795
UPPER HARTSHORNE (mvb)	101-1,000	1.6 (1.2-1.9)	--	--	272	917	181	970	--	--	453	1,887	--	--	135	446	804	3,793
	1,001-2,000	1.6 (1.2-1.9)	--	--	17	61	--	--	--	--	17	61	--	--	--	--	105	491
	2,001-3,000	1.5 (1.1-1.9)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1,280	5,760
	Total	1.6 (1.2-1.9)	--	--	289	978	181	970	--	--	470	1,948	--	--	135	446	2,189	10,044
UPPER HARTSHORNE (lvb)	0-100	1.6 (0.8-2.6)	--	--	--	--	787	4,526	275	1,863	1,062	6,389	--	--	147	431	409	2,351
	101-1,000	1.6 (0.8-2.6)	--	--	887	3,082	3,703	19,664	337	2,439	4,927	25,185	--	--	2,271	7,340	7,235	38,928
	1,001-2,000	1.6 (0.8-2.6)	--	--	316	999	486	2,247	--	--	802	3,246	--	--	1,765	5,078	3,298	15,374
	2,001-3,000	1.6 (0.8-2.6)	--	--	--	--	24	130	--	--	24	130	--	--	38	136	490	2,205
	3,000+	1.6 (0.8-2.6)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Total	1.6 (0.8-2.6)	--	--	1,203	4,081	5,000	26,567	612	4,302	6,815	34,950	--	--	4,221	12,985	11,432	58,858
	All ranks total	1.6 (0.8-2.6)	--	--	1,492	5,059	5,181	27,537	612	4,302	7,285	36,898	--	--	4,356	13,431	13,621	68,902
LOWER HARTSHORNE (mvb)	0-100	1.5 (1.2-1.9)	--	--	--	--	180	1,069	43	380	223	1,449	--	--	--	--	87	517
	101-1,000	1.5 (1.2-1.9)	--	--	--	--	171	923	1,511	13,391	1,682	14,314	--	--	--	--	619	3,575
	1,001-2,000	1.5 (1.2-1.9)	--	--	--	--	--	--	104	882	104	882	--	--	--	--	38	226
	2,001-3,000	1.5 (1.2-1.9)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Total	1.5 (1.2-1.9)	--	--	--	--	351	1,992	1,658	14,653	2,009	16,645	--	--	--	--	744	4,318
LOWER HARTSHORNE (lvb)	0-100	1.0 (0.8-1.3)	--	--	--	--	678	3,914	551	3,832	1,229	7,746	--	--	--	--	423	2,451
	101-1,000	0.8 (0.4-1.3)	--	--	70	290	3,833	20,990	6,406	45,218	10,309	66,498	--	--	--	--	4,239	23,616
	1,001-2,000	0.8 (0.5-1.1)	--	--	--	--	322	1,748	1,296	10,079	1,618	11,827	--	--	--	--	1,112	6,266
	2,001-3,000	0.8 (0.5-1.3)	--	--	--	--	--	--	21	200	21	200	--	--	--	--	--	--
	3,000+	0.9-(0.8-1.3)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Total	0.8 (0.4-1.3)	--	--	70	290	4,833	26,652	8,274	59,329	13,177	86,271	--	--	--	--	5,774	32,333
	All ranks Total	0.9 (0.4-1.9)	--	--	70	290	5,184	28,644	9,932	73,982	15,186	102,916	--	--	--	--	6,518	36,651
ALL RANKS	0-100	1.9 (0.8-4.8)	217	424	1,926	6,155	2,378	13,238	2,143	16,160	6,664	35,977	912	1,791	2,442	6,725	1,327	7,275
	101-1,000	1.8 (0.4-4.8)	--	--	2,419	8,269	10,554	56,924	13,265	96,378	26,238	161,571	--	--	16,193	52,447	27,791	155,888
	1,001-2,000	1.7 (0.5-4.8)	--	--	333	1,060	1,390	7,419	1,990	14,831	3,713	23,310	--	--	1,920	5,615	12,768	71,558
	2,001-3,000	1.8 (0.5-4.8)	--	--	--	--	24	130	21	300	45	330	--	--	38	136	1,821	8,250
	3,000+	1.1 (0.8-2.6)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Grand total	1.8 (0.4-4.8)	217	424	4,678	15,484	14,346	77,711	17,419	127,569	36,660	221,188	912	1,791	20,593	64,923	43,707	242,971

Table 47.--Remaining Coal Resources, Mayes County, Oklahoma (in thousands of short tons)

COAL AND RANK[1]	COAL DEPTH (FEET)	SULFUR CONTENT[2] (PERCENT)	MEASURED 12-14 INCHES ACRES	MEASURED 12-14 INCHES TONS	MEASURED 15-28 INCHES ACRES	MEASURED 15-28 INCHES TONS	MEASURED 29-42 INCHES ACRES	MEASURED 29-42 INCHES TONS	MEASURED 42+ INCHES ACRES	MEASURED 42+ INCHES TONS	MEASURED TOTAL ACRES	MEASURED TOTAL TONS	INDICATED 12-14 INCHES ACRES	INDICATED 12-14 INCHES TONS	INDICATED 15-28 INCHES ACRES	INDICATED 15-28 INCHES TONS	INDICATED 29-42 INCHES ACRES	INDICATED 29-42 INCHES TONS
WEIR-PITTSBURG (hvb)	0-100	4.8 (4.5-5.0)	461	995	--	--	--	--	--	--	461	996	1,671	3,008	--	--	--	--

42+ INCHES		TOTAL		INFERRED										GRAND TOTAL		RECOVERABLE	NET RECOVERABLE
				12-14 INCHES		15-28 INCHES		29-42 INCHES		42+ INCHES		TOTAL					
ACRES	TONS	ACRES	TONS	ACRES	TONS	ACRES	TONS	ACRES	TONS	ACRES	TONS	ACRES	TONS	ACRES	TONS	RESERVES (TONS)	RESERVES (TONS)
--	--	4	14	--	--	--	--	--	--	--	--	--	--	26	89	71	71
--	--	339	1,159	--	--	1,312	4,938	--	--	--	--	1,312	4,938	1,701	6,268	3,134	0
--	--	--	--	--	--	1,336	4,621	--	--	--	--	1,336	4,621	1,336	4,621	2,310	0
--	--	--	--	--	--	211	722	--	--	--	--	211	722	211	722	361	0
--	--	343	1,173	--	--	2,859	10,281	--	--	--	--	2,859	10,281	3,274	11,700	5,876	71
--	--	--	--	--	--	19	68	--	--	--	--	19	68	19	68	54	54
--	--	370	1,332	--	--	750	2,700	878	4,109	--	--	1,628	6,809	2,060	8,364	4,182	1,746
--	--	70	252	--	--	1,701	6,124	96	449	--	--	1,797	6,573	1,867	6,825	3,412	224
--	--	--	--	--	--	600	2,160	--	--	--	--	600	2,160	600	2,160	1,080	0
--	--	440	1,584	--	--	3,070	11,052	974	4,558	--	--	4,044	15,610	4,546	17,417	8,728	3,024
698	4,929	788	5,364	--	--	--	--	--	--	358	2,699	358	2,699	3,355	22,265	17,812	17,812
9,951	81,001	22,131	144,388	--	--	7,865	20,377	7,879	44,681	2,074	17,244	17,818	82,302	46,069	267,213	133,606	118,232
954	9,052	7,399	48,327	--	--	7,411	23,581	5,685	34,190	9,030	67,623	22,126	125,394	30,352	178,988	89,494	77,704
32	346	32	346	--	--	--	--	--	--	1,293	13,962	1,293	13,962	1,325	14,308	7,154	0
11,635	95,328	30,350	198,425	--	--	15,276	43,958	13,564	78,871	12,755	101,528	41,595	224,357	81,101	482,774	248,066	213,748
--	--	939	4,239	--	--	680	2,448	470	2,707	--	--	1,150	5,155	2,542	11,281	5,640	0
--	--	105	491	--	--	650	4,932	926	4,799	--	--	1,576	9,731	1,698	10,283	5,141	4,799
--	--	1,280	5,760	--	--	--	--	--	--	--	--	--	--	1,280	5,760	2,880	0
--	--	2,324	10,490	--	--	1,330	7,380	1,396	7,506	--	--	2,726	14,886	5,520	27,324	13,661	4,799
103	667	659	3,449	--	--	8	22	161	928	64	415	233	1,365	1,954	11,203	8,962	8,962
951	6,723	10,457	52,991	--	--	1,792	6,179	5,733	30,591	200	1,404	7,725	38,174	23,109	116,350	58,175	49,874
--	--	5,063	20,452	--	--	4,442	15,991	7,394	38,163	--	--	11,836	54,154	17,701	77,852	38,926	27,892
--	--	528	2,341	--	--	2,918	10,274	1,832	8,244	--	--	4,750	18,518	5,302	20,989	10,494	0
--	--	--	--	--	--	--	--	1,923	8,654	--	--	1,923	8,654	1,923	8,654	4,327	0
1,054	7,390	16,707	79,233	--	--	9,160	32,466	17,043	86,580	264	1,819	26,467	120,865	49,989	235,048	120,884	86,728
1,054	7,390	19,031	89,723	--	--	10,490	39,846	18,439	94,086	264	1,819	29,193	135,751	55,509	262,372	134,545	91,527
20	144	107	661	--	--	--	--	150	891	60	432	210	1,323	540	3,433	2,746	2,746
211	1,722	830	5,297	--	--	--	--	2,518	14,957	308	2,550	2,826	17,507	5,339	37,118	18,559	11,229
4	26	42	252	--	--	--	--	1,519	9,023	--	--	1,519	9,023	1,665	10,157	5,078	4,012
--	--	--	--	--	--	--	--	903	5,364	--	--	903	5,364	903	5,364	2,682	0
235	1,892	979	6,210	--	--	--	--	5,090	30,235	368	2,982	5,458	33,217	8,446	56,072	29,065	17,987
178	1,357	601	3,808	--	--	--	--	333	1,793	20	144	353	1,937	2,183	13,491	10,793	10,793
12,679	91,110	16,918	114,726	--	--	--	--	5,174	29,218	6,425	45,621	11,599	74,839	38,826	256,063	128,031	120,176
8,131	64,586	9,243	70,852	--	--	--	--	4,141	23,820	24,259	178,423	28,400	202,243	39,261	284,922	142,461	141,037
703	6,343	703	6,343	--	--	--	--	1,165	6,798	14,612	111,620	15,777	118,418	16,501	124,961	62,480	0
--	--	--	--	--	--	--	--	--	--	2,323	22,068	2,323	22,068	2,323	22,068	11,034	0
21,691	163,396	27,465	195,729	--	--	--	--	10,813	61,629	47,639	357,876	58,452	419,505	99,094	701,505	354,799	272,006
21,926	165,288	28,444	201,939	--	--	--	--	15,903	91,864	48,007	360,858	63,910	452,722	107,540	757,577	383,864	289,993
1,005	7,138	5,686	22,929	1,068	2,101	2,550	6,660	1,075	5,886	502	3,690	5,195	18,337	17,545	77,243	61,794	61,794
25,174	190,009	69,158	398,344	--	--	39,385	115,896	31,691	176,340	10,146	74,610	81,222	366,846	176,618	926,761	463,378	355,990
9,972	79,704	24,660	156,877	--	--	37,590	127,424	26,407	148,041	35,036	257,996	99,033	533,461	127,406	713,648	356,821	289,438
741	6,730	2,600	15,116	--	--	7,617	27,318	7,490	40,355	18,286	141,869	33,393	209,542	36,038	224,988	112,493	0
--	--	--	--	--	--	--	--	1,923	8,654	2,323	22,068	4,246	30,722	4,246	30,722	15,361	0
36,892	283,581	102,104	593,266	1,068	2,101	87,142	277,298	68,586	379,276	66,293	500,233	223,089	1,158,908	361,853	1,973,362	1,009,847	707,222

42+ INCHES		TOTAL		INFERRED										GRAND TOTAL		RECOVERABLE	NET RECOVERABLE
				12-14 INCHES		15-28 INCHES		29-42 INCHES		42+ INCHES		TOTAL					
ACRES	TONS	ACRES	TONS	ACRES	TONS	ACRES	TONS	ACRES	TONS	ACRES	TONS	ACRES	TONS	ACRES	TONS	RESERVES (TONS)	RESERVES (TONS)
--	--	1,671	3,008	--	--	--	--	--	--	--	--	--	--	2,132	4,004	3,203	3,203

Table 48.--Remaining Coal Resources, McIntosh County, Oklahoma (in thousands of short tons)

COAL AND RANK[1]	COAL DEPTH (FEET)	SULFUR CONTENT[2] (PERCENT)	MEASURED 12-14 INCHES ACRES	MEASURED 12-14 INCHES TONS	MEASURED 15-28 INCHES ACRES	MEASURED 15-28 INCHES TONS	MEASURED 29-42 INCHES ACRES	MEASURED 29-42 INCHES TONS	MEASURED 42+ INCHES ACRES	MEASURED 42+ INCHES TONS	MEASURED TOTAL ACRES	MEASURED TOTAL TONS	INDICATED 12-14 INCHES ACRES	INDICATED 12-14 INCHES TONS	INDICATED 15-28 INCHES ACRES	INDICATED 15-28 INCHES TONS	INDICATED 29-42 INCHES ACRES	INDICATED 29-42 INCHES TONS
CROWEBURG (hvb)	0-100	3.0 (2.5-4.0)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	101-1,000	3.0 (2.5-4.0)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Total	3.0 (2.5-4.0)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SECOR (hvb)	0-100	4.5 (est.)	--	--	806	3,337	45	243	--	--	851	3,580	--	--	915	3,788	320	1,728
	101-1,000	4.5 (est.)	--	--	64	265	13	70	--	--	77	335	--	--	141	584	359	1,939
	Total	4.5 (est.)	--	--	870	3,602	58	313	--	--	928	3,915	--	--	1,056	4,372	679	3,667
STIGLER (hvb)	0-100	1.0 (0.8-1.2)	--	--	83	194	--	--	--	--	83	194	--	--	275	644	--	--
	101-1,000	1.0 (0.8-1.2)	--	--	--	--	--	--	--	--	--	--	--	--	429	1,004	--	--
	Total	1.0 (0.8-1.2)	--	--	83	194	--	--	--	--	83	194	--	--	704	1,648	--	--
ALL COALS TOTAL	0-100	4.2 (0.8-4.5)	--	--	889	3,531	45	243	--	--	934	3,774	--	--	1,190	4,432	320	1,728
	101-1,000	1.2 (0.8-4.5)	--	--	64	265	13	70	--	--	77	335	--	--	570	1,588	359	1,939
	Grand total	4.2 (0.8-4.5)	--	--	953	3,796	58	313	--	--	1,011	4,109	--	--	1,760	6,020	679	3,667

Table 49.--Remaining Coal Resources, Muskogee County, Oklahoma (in thousands of short tons)

COAL AND RANK[1]	COAL DEPTH (FEET)	SULFUR CONTENT[2] (PERCENT)	MEASURED 12-14 INCHES ACRES	MEASURED 12-14 INCHES TONS	MEASURED 15-28 INCHES ACRES	MEASURED 15-28 INCHES TONS	MEASURED 29-42 INCHES ACRES	MEASURED 29-42 INCHES TONS	MEASURED 42+ INCHES ACRES	MEASURED 42+ INCHES TONS	MEASURED TOTAL ACRES	MEASURED TOTAL TONS	INDICATED 12-14 INCHES ACRES	INDICATED 12-14 INCHES TONS	INDICATED 15-28 INCHES ACRES	INDICATED 15-28 INCHES TONS	INDICATED 29-42 INCHES ACRES	INDICATED 29-42 INCHES TONS
SECOR (hvb)	0-100	4.0 (est.)	203	379	--	--	--	--	--	--	203	379	629	1,132	--	--	--	--
	101-1,000	4.0 (est.)	--	--	--	--	--	--	--	--	--	--	283	509	--	--	--	--
	Total	4.0 (est.)	203	379	--	--	--	--	--	--	203	379	912	1,641	--	--	--	--
			10-14 INCHES ACRES	10-14 INCHES TONS	15-28 INCHES ACRES	15-28 INCHES TONS	29-42 INCHES ACRES	29-42 INCHES TONS	42+ INCHES ACRES	42+ INCHES TONS	TOTAL ACRES	TOTAL TONS	10-14 INCHES ACRES	10-14 INCHES TONS	15-28 INCHES ACRES	15-28 INCHES TONS	29-42 INCHES ACRES	29-42 INCHES TONS
STIGLER (hvb)	0-100	4.1 (0.4-4.9)	739	1,309	1,881	5,849	--	--	--	--	2,620	7,158	1,926	3,455	762	2,156	--	--
	101-1,000	4.1 (0.4-4.9)	83	134	230	707	--	--	--	--	313	841	2,406	4,254	1,931	5,585	--	--
	Total	4.1 (0.4-4.9)	822	1,443	2,111	6,556	--	--	--	--	2,933	7,999	4,332	7,709	2,693	7,741	--	--
	Grand total	4.1 (0.4-4.9)	1,025	1,822	2,111	6,556	--	--	--	--	3,136	8,378	5,244	9,350	2,693	7,741	--	--

Table 50.--Remaining Coal Resources, Nowata County, Oklahoma (in thousands of short tons)

COAL AND RANK[1]	COAL DEPTH (FEET)	SULFUR CONTENT[2] (PERCENT)	MEASURED 10-14 INCHES ACRES	MEASURED 10-14 INCHES TONS	MEASURED 15-28 INCHES ACRES	MEASURED 15-28 INCHES TONS	MEASURED 29-42 INCHES ACRES	MEASURED 29-42 INCHES TONS	MEASURED 42+ INCHES ACRES	MEASURED 42+ INCHES TONS	MEASURED TOTAL ACRES	MEASURED TOTAL TONS	INDICATED 10-14 INCHES ACRES	INDICATED 10-14 INCHES TONS	INDICATED 15-28 INCHES ACRES	INDICATED 15-28 INCHES TONS	INDICATED 29-42 INCHES ACRES	INDICATED 29-42 INCHES TONS
IRON POST (hvb)	0-100	3.6 (est.)	612	1,086	192	449	--	--	--	--	804	1,535	2,298	3,869	154	360	--	--

Table 51.--Remaining Coal Resources, Okfuskee County, Oklahoma (in thousands of short tons)

COAL AND RANK[1]	COAL DEPTH (FEET)	SULFUR CONTENT[2] (PERCENT)	MEASURED 12-14 INCHES ACRES	MEASURED 12-14 INCHES TONS	MEASURED 15-28 INCHES ACRES	MEASURED 15-28 INCHES TONS	MEASURED 29-42 INCHES ACRES	MEASURED 29-42 INCHES TONS	MEASURED 42+ INCHES ACRES	MEASURED 42+ INCHES TONS	MEASURED TOTAL ACRES	MEASURED TOTAL TONS	INDICATED 12-14 INCHES ACRES	INDICATED 12-14 INCHES TONS	INDICATED 15-28 INCHES ACRES	INDICATED 15-28 INCHES TONS	INDICATED 29-42 INCHES ACRES	INDICATED 29-42 INCHES TONS
CROWEBURG (hvb)	0-100	1.6 (est.)	83	165	141	355	--	--	--	--	224	520	544	1,077	646	1,628	--	--
	101-1,000	2.2 (1.4-5.0)	--	--	83	299	141	736	--	--	224	1,035	314	622	857	2,754	813	4,244
	1,001-2,000	2.9 (1.4-5.0)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Total	2.3 (1.4-5.0)	83	165	224	654	141	736	--	--	448	1,555	858	1,699	1,503	4,382	813	4,244

Table 52.--Remaining Coal Resources, Okmulgee County, Oklahoma (in thousands of short tons)

COAL AND RANK[1]	COAL DEPTH (FEET)	SULFUR CONTENT[2] (PERCENT)	MEASURED 12-14 INCHES ACRES	MEASURED 12-14 INCHES TONS	MEASURED 15-28 INCHES ACRES	MEASURED 15-28 INCHES TONS	MEASURED 29-42 INCHES ACRES	MEASURED 29-42 INCHES TONS	MEASURED 42+ INCHES ACRES	MEASURED 42+ INCHES TONS	MEASURED TOTAL ACRES	MEASURED TOTAL TONS	INDICATED 12-14 INCHES ACRES	INDICATED 12-14 INCHES TONS	INDICATED 15-28 INCHES ACRES	INDICATED 15-28 INCHES TONS	INDICATED 29-42 INCHES ACRES	INDICATED 29-42 INCHES TONS
CROWEBURG (hvb)	0-100	2.2 (0.9-4.2)	307	610	1,817	7,212	1,254	5,888	--	--	3,378	13,710	487	970	762	2,861	723	3,357
	101-1,000	2.2 (0.9-4.2)	45	94	269	1,007	7,220	38,460	--	--	7,534	39,561	142	286	1,721	6,555	18,387	99,969
	Total	2.2 (0.9-4.2)	352	704	2,086	8,219	8,474	44,348	--	--	10,912	53,271	629	1,256	2,483	9,416	19,110	103,326

42+ INCHES		TOTAL		INFERRED										GRAND TOTAL		RECOVERABLE	NET RECOVERABLE
				12-14 INCHES		15-28 INCHES		29-42 INCHES		42+ INCHES		TOTAL					
ACRES	TONS	ACRES	TONS	ACRES	TONS	ACRES	TONS	ACRES	TONS	ACRES	TONS	ACRES	TONS	ACRES	TONS	RESERVES (TONS)	RESERVES (TONS)
--	--	--	--	--	--	250	765	--	--	--	--	250	765	250	765	612	612
--	--	--	--	--	--	314	961	--	--	--	--	314	961	314	961	481	0
--	--	--	--	--	--	564	1,726	--	--	--	--	564	1,726	564	1,726	1,093	612
--	--	1,235	5,516	--	--	90	373	1,560	8,424	--	--	1,650	8,797	3,736	17,893	14,315	14,315
--	--	500	2,523	--	--	--	--	1,420	7,668	--	--	1,420	7,668	1,997	10,526	5,263	4,839
--	--	1,735	8,039	--	--	90	373	2,980	16,092	--	--	3,070	16,465	5,733	28,419	19,577	19,154
--	--	275	644	--	--	314	735	--	--	--	--	314	735	672	1,573	1,258	1,258
--	--	429	1,004	--	--	5,997	14,033	--	--	--	--	5,997	14,033	6,426	15,037	7,519	0
--	--	704	1,648	--	--	6,311	14,768	--	--	--	--	6,311	14,768	7,098	16,610	8,777	1,258
--	--	1,510	6,160	--	--	654	1,873	1,560	8,424	--	--	2,214	10,297	4,658	20,231	16,185	16,185
--	--	929	3,527	--	--	6,311	14,994	1,420	7,668	--	--	7,731	22,662	8,737	26,524	13,262	4,839
--	--	2,439	9,687	--	--	6,965	16,867	2,980	16,092	--	--	9,945	32,959	13,395	46,755	29,447	21,024

42+ INCHES		TOTAL		INFERRED										GRAND TOTAL		RECOVERABLE	NET RECOVERABLE
				12-14 INCHES		15-28 INCHES		29-42 INCHES		42+ INCHES		TOTAL					
ACRES	TONS	ACRES	TONS	ACRES	TONS	ACRES	TONS	ACRES	TONS	ACRES	TONS	ACRES	TONS	ACRES	TONS	RESERVES (TONS)	RESERVES (TONS)
--	--	629	1,132	2,079	3,742	--	--	--	--	--	--	2,079	3,742	2,911	5,253	4,202	4,202
--	--	283	509	2,202	3,964	--	--	--	--	--	--	2,202	3,964	2,485	4,473	2,237	0
--	--	912	1,641	4,281	7,706	--	--	--	--	--	--	4,281	7,706	5,396	9,726	6,439	4,202
42+ INCHES		TOTAL		10-14 INCHES		15-28 INCHES		29-42 INCHES		42+ INCHES		TOTAL		GRAND TOTAL		RECOVERABLE	NET RECOVERABLE
ACRES	TONS	ACRES	TONS	ACRES	TONS	ACRES	TONS	ACRES	TONS	ACRES	TONS	ACRES	TONS	ACRES	TONS	RESERVES (TONS)	RESERVES (TONS)
--	--	2,688	5,611	1,428	2,426	538	1,439	--	--	--	--	1,966	3,865	7,274	16,634	13,307	13,307
--	--	4,337	9,839	9,274	15,573	3,258	8,586	--	--	--	--	12,532	24,159	17,182	34,839	17,420	0
--	--	7,025	15,450	10,702	17,999	3,796	10,025	--	--	--	--	14,498	28,024	24,456	51,473	30,727	13,307
--	--	7,937	17,091	14,973	25,705	3,796	10,025	--	--	--	--	18,779	35,730	29,852	61,199	37,166	17,509

42+ INCHES		TOTAL		INFERRED										GRAND TOTAL		RECOVERABLE	NET RECOVERABLE
				10-14 INCHES		15-28 INCHES		29-42 INCHES		42+ INCHES		TOTAL					
ACRES	TONS	ACRES	TONS	ACRES	TONS	ACRES	TONS	ACRES	TONS	ACRES	TONS	ACRES	TONS	ACRES	TONS	RESERVES (TONS)	RESERVES (TONS)
--	--	2,452	4,229	172	279	--	--	--	--	--	--	172	279	3,428	6,043	4,834	4,834

42+ INCHES		TOTAL		INFERRED										GRAND TOTAL		RECOVERABLE	NET RECOVERABLE
				12-14 INCHES		15-28 INCHES		29-42 INCHES		42+ INCHES		TOTAL					
ACRES	TONS	ACRES	TONS	ACRES	TONS	ACRES	TONS	ACRES	TONS	ACRES	TONS	ACRES	TONS	ACRES	TONS	RESERVES (TONS)	RESERVES (TONS)
--	--	1,190	2,705	198	392	832	2,097	--	--	--	--	1,030	2,489	2,444	5,714	4,571	4,571
--	--	1,984	7,620	352	697	7,885	25,103	4,813	25,124	--	--	13,050	50,924	15,258	59,579	29,790	15,052
--	--	--	--	--	--	3,905	14,058	--	--	--	--	3,905	14,058	3,905	14,058	7,029	0
--	--	3,174	10,325	550	1,089	12,622	41,258	4,813	25,124	--	--	17,985	67,471	21,607	79,351	41,390	19,623

42+ INCHES		TOTAL		INFERRED										GRAND TOTAL		RECOVERABLE	NET RECOVERABLE
				12-14 INCHES		15-28 INCHES		29-42 INCHES		42+ INCHES		TOTAL					
ACRES	TONS	ACRES	TONS	ACRES	TONS	ACRES	TONS	ACRES	TONS	ACRES	TONS	ACRES	TONS	ACRES	TONS	RESERVES (TONS)	RESERVES (TONS)
--	--	1,972	7,188	217	457	141	406	282	1,276	--	--	640	2,139	5,990	23,037	18,430	18,430
179	1,192	20,429	108,002	788	1,592	4,525	17,591	21,383	114,740	2,970	19,780	29,666	153,703	57,629	301,266	150,633	137,071
179	1,192	22,401	115,190	1,005	2,049	4,666	17,997	21,665	116,016	2,970	19,780	30,306	155,842	63,619	324,303	169,063	155,501

Table 52.--Okmulgee County (cont.)

COAL AND RANK[1]	COAL DEPTH (FEET)	SULFUR CONTENT[2] (PERCENT)	MEASURED 12-14 INCHES ACRES	MEASURED 12-14 INCHES TONS	MEASURED 15-28 INCHES ACRES	MEASURED 15-28 INCHES TONS	MEASURED 29-42 INCHES ACRES	MEASURED 29-42 INCHES TONS	MEASURED 42+ INCHES ACRES	MEASURED 42+ INCHES TONS	MEASURED TOTAL ACRES	MEASURED TOTAL TONS	INDICATED 12-14 INCHES ACRES	INDICATED 12-14 INCHES TONS	INDICATED 15-28 INCHES ACRES	INDICATED 15-28 INCHES TONS	INDICATED 29-42 INCHES ACRES	INDICATED 29-42 INCHES TONS
MORRIS (hvb)	0-100	3.1-	275	544	973	2,844	--	--	--	--	1,248	3,388	794	1,572	954	2,512	--	--
	101-1,000	3.1-	--	--	6	18	--	--	--	--	6	18	140	277	877	2,351	--	--
	Total	3.1-	275	544	979	2,862	--	--	--	--	1,254	3,406	934	1,849	1,831	4,863	--	--
ERAM (hvb)	0-100	4.0-	--	--	--	--	225	1,215	--	--	225	1,215	--	--	--	--	403	2,176
	101-1,000	4.0-	--	--	--	--	19	103	--	--	19	103	--	--	--	--	441	2,381
	Total	4.0-	--	--	--	--	244	1,318	--	--	244	1,318	--	--	--	--	844	4,557
ALL COALS (hvb)	0-100	2.7 (0.9-4.2)	582	1,154	2,790	10,056	1,479	7,103	--	--	4,851	18,313	1,281	2,542	1,716	5,373	1,126	5,533
	101-1,000	2.3 (0.9-4.2)	45	94	275	1,025	7,239	38,563	--	--	7,559	39,682	282	563	2,598	8,906	18,828	102,350
	Grand total	2.3 (0.9-4.2)	627	1,248	3,065	11,081	8,718	45,666	--	--	12,410	57,995	1,563	3,105	4,314	14,279	19,954	107,883

Table 53.--Remaining Coal Resources, Pittsburg County, Oklahoma (in thousands of short tons)

COAL AND RANK[1]	COAL DEPTH (FEET)	SULFUR CONTENT[2] (PERCENT)	MEASURED 12-14 INCHES ACRES	MEASURED 12-14 INCHES TONS	MEASURED 15-28 INCHES ACRES	MEASURED 15-28 INCHES TONS	MEASURED 29-42 INCHES ACRES	MEASURED 29-42 INCHES TONS	MEASURED 42+ INCHES ACRES	MEASURED 42+ INCHES TONS	MEASURED TOTAL ACRES	MEASURED TOTAL TONS	INDICATED 12-14 INCHES ACRES	INDICATED 12-14 INCHES TONS	INDICATED 15-28 INCHES ACRES	INDICATED 15-28 INCHES TONS	INDICATED 29-42 INCHES ACRES	INDICATED 29-42 INCHES TONS
COAL ABOVE SECOR (hvb)	0-100	--	13	23	310	1,116	--	--	--	--	323	1,139	112	202	427	1,537	--	--
	101-1,000	--	--	--	123	443	--	--	--	--	123	443	--	--	1,368	4,924	--	--
	Total	--	13	23	433	1,559	--	--	--	--	446	1,582	112	202	1,795	6,461	--	--
SECOR (hvb)	0-100	5.3 (6.6-3.5)	--	--	693	2,462	1,376	6,831	--	--	2,069	9,293	--	--	1,175	4,318	1,449	7,339
	101-1,000	5.6 est.	--	--	882	2,905	979	4,975	--	--	1,861	7,880	--	--	7,008	25,785	6,267	30,675
	1,001-2,000	5.6 est.	--	--	126	340	--	--	--	--	126	340	--	--	1,004	2,711	--	--
	Total	5.4 (6.6-3.5)	--	--	1,701	5,707	2,355	11,806	--	--	4,056	17,513	--	--	9,187	32,814	7,716	38,014
COAL BELOW SECOR (hvb)	0-100	--	--	--	40	158	--	--	--	--	40	158	--	--	85	337	--	--
	101-1,000	--	--	--	32	127	--	--	--	--	32	127	--	--	444	1,758	--	--
	Total	--	--	--	72	285	--	--	--	--	72	285	--	--	529	2,095	--	--
CAVANAL(?) COAL OR COAL IN SAVANNA FORMATION (hvb)	0-100	--	--	--	99	356	--	--	--	--	99	356	--	--	178	641	--	--
	101-1,000	--	--	--	130	468	--	--	--	--	130	468	--	--	1,322	4,759	--	--
	1,001-2,000	--	--	--	--	--	--	--	--	--	--	--	--	--	248	893	--	--
	Total	--	--	--	229	824	--	--	--	--	229	824	--	--	1,748	6,293	--	--
MC ALESTER (hvb)	0-100	0.9 (2.4-0.4)	--	--	--	--	329	1,810	8	55	337	1,865	--	--	--	--	48	242
	101-1,000	1.0 (2.4-0.4)	--	--	106	439	3,081	18,061	2,036	14,051	5,223	32,551	--	--	123	509	5,555	31,698
	1,001-2,000	1.2 (2.4-0.4)	--	--	--	--	1,316	7,584	426	2,790	1,742	10,374	--	--	349	1,445	9,609	57,120
	2,001-3,000	0.8 est.	--	--	--	--	48	269	--	--	48	269	--	--	--	--	1,504	8,400
	3,000+	0.8 est.	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Total	1.0 (2.4-0.4)	--	--	106	439	4,774	27,724	2,470	16,896	7,350	45,059	--	--	472	1,954	16,716	97,460
UPPER HARTSHORNE (hvb)	0-100	1.5 (1.8-1.2)	--	--	--	--	57	271	--	--	57	271	--	--	--	--	59	266
	101-1,000	1.5 (1.8-1.2)	--	--	78	239	750	3,582	29	245	857	4,066	--	--	194	594	1,221	5,922
	1,001-2,000	1.2 (1.3-1.2)	--	--	56	171	637	2,939	34	288	727	3,398	--	--	403	1,233	2,558	11,064
	2,001-3,000	1.2 est.	--	--	--	--	29	172	--	--	29	172	--	--	355	1,086	795	4,550
	3,000+	1.2 est.	--	--	--	--	1,126	5,067	--	--	1,126	5,067	--	--	--	--	--	--
	Total	1.2 (1.8-1.2)	--	--	134	410	2,599	12,031	63	533	2,796	12,974	--	--	952	2,913	4,633	21,802
LOWER HARTSHORNE (hvb)	0-100	1.6 (3.4-0.5)	--	--	--	--	141	700	138	969	279	1,669	--	--	--	--	--	--
	101-1,000	1.6 (2.4-0.8)	--	--	--	--	557	3,448	3,253	23,393	3,810	26,841	--	--	--	--	447	2,738
	1,001-2,000	1.4 (1.7-1.1)	--	--	--	--	525	3,095	497	3,087	1,022	6,182	--	--	--	--	771	4,685
	2,001-3,000	1.4 est.	--	--	--	--	229	1,429	--	--	229	1,429	--	--	--	--	1,681	10,343
	3,000+	1.4 est.	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Total	1.5 (3.4-0.5)	--	--	--	--	1,452	8,672	3,888	27,449	5,340	36,121	--	--	--	--	2,899	17,766
ALL COALS TOTAL (hvb)	0-100	3.8 (6.6-0.4)	13	23	1,142	4,092	1,903	9,612	146	1,024	3,204	14,751	112	202	1,865	6,833	1,556	7,847
	101-1,000	2.7 (5.6-0.9)	--	--	1,351	4,621	5,367	30,066	5,318	37,689	12,036	72,376	--	--	10,459	38,329	13,490	71,033
	1,001-2,000	1.4 (5.6-0.4)	--	--	182	511	2,478	13,618	957	6,165	3,617	20,294	--	--	2,004	6,282	12,938	72,869
	2,001-3,000	1.1 (1.4-0.8)	--	--	--	--	306	1,870	--	--	306	1,870	--	--	355	1,086	3,980	23,293
	3,000+	1.2 (1.4-0.8)	--	--	--	--	1,126	5,067	--	--	1,126	5,067	--	--	--	--	--	--
	Grand total	1.9 (6.6-0.4)	13	23	2,675	9,224	11,180	60,233	6,421	44,878	20,289	114,358	112	202	14,683	52,530	31,964	175,042

42+ INCHES		TOTAL		INFERRED										GRAND TOTAL		RECOVERABLE	NET RECOVERABLE
				12-14 INCHES		15-28 INCHES		29-42 INCHES		42+ INCHES		TOTAL					
ACRES	TONS	ACRES	TONS	ACRES	TONS	ACRES	TONS	ACRES	TONS	ACRES	TONS	ACRES	TONS	ACRES	TONS	RESERVES (TONS)	RESERVES (TONS)
--	--	1,748	4,084	295	584	435	1,141	--	--	--	--	730	1,725	3,726	9,197	7,358	7,358
--	--	1,017	2,628	864	1,711	6,688	16,659	--	--	--	--	7,552	18,370	8,575	21,016	10,508	0
--	--	2,765	6,712	1,159	2,295	7,123	17,800	--	--	--	--	8,282	20,095	12,301	30,213	17,866	7,358
--	--	403	2,176	--	--	--	--	519	2,803	--	--	519	2,803	1,147	6,194	4,955	4,955
--	--	441	2,381	--	--	--	--	1,389	7,501	--	--	1,389	7,501	1,849	9,985	4,993	4,993
--	--	844	4,557	--	--	--	--	1,908	10,304	--	--	1,908	10,304	2,996	16,179	9,948	9,948
--	--	4,123	13,448	512	1,041	576	1,547	801	4,079	--	--	1,889	6,667	10,863	38,428	30,743	30,743
179	1,192	21,887	113,011	1,652	3,303	11,213	34,250	22,772	122,241	2,970	19,780	38,607	179,574	68,053	332,267	166,134	142,064
179	1,192	26,010	126,459	2,164	4,344	11,789	35,797	23,573	126,320	2,970	19,780	40,496	186,241	78,916	370,695	196,877	172,807

42+ INCHES		TOTAL		INFERRED										GRAND TOTAL		RECOVERABLE	NET RECOVERABLE
				12-14 INCHES		15-28 INCHES		29-42 INCHES		42+ INCHES		TOTAL					
ACRES	TONS	ACRES	TONS	ACRES	TONS	ACRES	TONS	ACRES	TONS	ACRES	TONS	ACRES	TONS	ACRES	TONS	RESERVES (TONS)	RESERVES (TONS)
--	--	539	1,739	43	77	187	674	--	--	--	--	230	751	1,092	3,629	2,903	2,903
--	--	1,368	4,924	--	--	--	--	--	--	--	--	--	--	1,491	5,367	2,684	0
--	--	1,907	6,663	43	77	187	674	--	--	--	--	230	751	2,583	8,996	5,587	2,903
--	--	2,624	11,657	--	--	1,278	4,885	749	3,837	--	--	2,027	8,722	6,720	29,672	23,738	23,586
--	--	13,275	56,460	762	1,646	23,159	86,070	8,442	39,163	--	--	32,363	126,879	47,499	191,219	95,610	34,540
--	--	1,004	2,711	673	1,454	1,905	6,857	2,156	9,702	--	--	4,734	18,013	5,864	21,064	10,532	4,851
--	--	16,903	70,828	1,435	3,100	26,342	97,812	11,347	52,702	--	--	39,124	153,614	60,083	241,955	129,880	62,977
--	--	85	337	--	--	--	--	--	--	--	--	--	--	125	495	396	396
--	--	444	1,758	--	--	--	--	--	--	--	--	--	--	476	1,885	942	0
--	--	529	2,095	--	--	--	--	--	--	--	--	--	--	601	2,380	1,338	396
--	--	178	641	--	--	349	1,256	--	--	--	--	349	1,256	626	2,253	1,802	1,802
--	--	1,322	4,759	--	--	4,335	15,606	--	--	--	--	4,335	15,606	5,787	20,833	10,416	0
--	--	248	893	--	--	6,209	22,352	--	--	--	--	6,209	22,352	6,457	23,245	11,622	0
--	--	1,748	6,293	--	--	10,893	39,214	--	--	--	--	10,893	39,214	12,870	46,331	23,840	1,802
--	--	48	242	--	--	--	--	--	--	--	--	--	--	385	2,107	1,686	1,177
3,626	26,741	9,304	58,948	--	--	230	952	2,418	13,166	3,499	24,423	6,147	38,541	20,674	130,040	65,020	39,315
707	4,901	10,665	63,466	--	--	94	389	19,039	110,899	3,769	26,740	22,897	138,028	35,304	211,868	105,934	72,345
179	1,183	1,683	9,583	--	--	--	--	25,752	147,391	--	--	25,752	147,391	27,483	157,243	78,622	0
--	--	--	--	--	--	--	--	3,037	18,568	--	--	3,037	18,568	3,037	18,568	9,284	0
4,512	32,825	21,700	132,239	--	--	324	1,341	50,246	290,024	7,268	51,163	57,833	342,528	86,883	519,826	260,546	112,837
--	--	59	266	--	--	320	1,152	--	--	--	--	320	1,152	436	1,689	1,351	1,351
128	922	1,543	7,438	--	--	195	597	3,219	15,176	16	115	3,430	15,888	5,830	27,392	13,696	6,826
296	2,504	3,257	14,801	--	--	230	704	13,033	60,466	--	--	13,263	61,170	17,247	79,369	39,684	24,905
--	--	1,150	5,636	--	--	6,011	18,394	9,460	41,194	--	--	15,471	69,588	16,650	75,396	37,698	0
--	--	--	--	--	--	--	--	--	--	--	--	--	--	1,126	5,067	2,534	0
424	3,426	6,009	28,141	--	--	6,756	20,847	25,712	126,836	16	115	32,484	147,798	41,289	188,913	94,963	33,082
86	597	86	597	--	--	--	--	--	--	80	551	80	551	445	2,817	2,252	2,252
2,269	16,063	2,716	18,801	--	--	--	--	1,172	7,280	1,617	11,316	2,789	18,596	9,315	64,238	32,142	19,071
5,421	39,262	6,192	43,947	--	--	--	--	2,716	15,142	11,474	82,146	14,190	97,288	21,404	147,417	73,708	48,328
355	2,428	2,036	12,771	--	--	--	--	5,908	35,699	9,561	68,395	15,469	104,094	17,734	118,294	59,147	0
--	--	--	--	--	--	--	--	5,260	32,030	1,555	10,636	6,815	42,666	6,815	42,666	21,333	0
8,131	58,350	11,030	76,116	--	--	--	--	15,056	90,151	24,287	173,044	39,343	263,195	55,713	375,432	188,582	69,651
86	597	3,619	15,479	43	77	2,134	7,967	749	3,837	80	551	3,006	12,432	9,829	42,662	34,130	33,467
6,023	43,726	29,972	153,088	762	1,646	27,919	103,225	15,251	74,785	5,132	35,854	49,064	215,510	91,072	440,974	220,487	99,752
6,424	46,667	21,366	125,818	673	1,454	8,438	30,302	36,944	196,209	15,238	108,886	61,293	336,851	86,276	482,963	241,482	150,429
534	3,611	4,869	27,990	--	--	6,011	18,394	41,120	234,284	9,561	68,395	56,692	321,073	61,867	350,933	175,466	0
--	--	--	--	--	--	--	--	8,297	50,598	1,555	10,636	9,852	61,234	10,978	66,301	33,150	0
13,067	94,601	59,826	322,375	1,478	3,177	44,502	159,888	102,361	559,713	31,566	224,322	179,907	947,100	260,022	1,383,833	704,715	283,648

Table 54.--Remaining Coal Resources, Rogers County, Oklahoma (in thousands of short tons)

COAL AND RANK[1]	COAL DEPTH (FEET)	SULFUR CONTENT[2] (PERCENT)	MEASURED 12-14 INCHES ACRES	MEASURED 12-14 INCHES TONS	MEASURED 15-28 INCHES ACRES	MEASURED 15-28 INCHES TONS	MEASURED 29-42 INCHES ACRES	MEASURED 29-42 INCHES TONS	MEASURED 42+ INCHES ACRES	MEASURED 42+ INCHES TONS	MEASURED TOTAL ACRES	MEASURED TOTAL TONS	INDICATED 12-14 INCHES ACRES	INDICATED 12-14 INCHES TONS	INDICATED 15-28 INCHES ACRES	INDICATED 15-28 INCHES TONS	INDICATED 29-42 INCHES ACRES	INDICATED 29-42 INCHES TONS
DAWSON (hvb)	0-100	3.8 (est.)	--	--	1,766	6,358	--	--	--	--	1,766	6,358	--	--	3,937	14,173	--	--
	101-1,000	3.8 (est.)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Total	3.8 (est.)	--	--	1,766	6,358	--	--	--	--	1,766	6,358	--	--	3,937	14,173	--	--
IRON POST (hvb)	0-100	4.0 (3.7-4.2)	896	1,724	672	1,572	--	--	--	--	1,568	3,296	2,023	3,985	1,427	3,339	--	--
	101-1,000	4.0 (4.0 est.)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Total	4.0 (3.7-4.2)	896	1,724	672	1,572	--	--	--	--	1,568	3,296	2,023	3,985	1,427	3,339	--	--
CROWEBURG (hvb)	0-100	0.8 (0.4-1.1)	2,386	5,012	8,416	21,192	--	--	--	--	10,802	26,204	4,349	9,217	6,618	16,620	--	--
	101-1,000	0.8 (0.5-2.0)	64	138	1,261	3,046	--	--	--	--	1,325	3,184	755	1,622	4,788	11,625	--	--
	Total	0.8 (0.4-2.0)	2,450	5,150	9,677	24,238	--	--	--	--	12,127	29,388	5,104	10,839	11,406	28,245	--	--
MINERAL (hvb)	0-100	3.5 (est.)	130	266	50	117	--	--	--	--	180	383	60	119	--	--	--	--
WEIR-PITTSBURG (hvb)	0-100	4.8 (4.5-5.4)	1,146	2,475	--	--	--	--	--	--	1,146	2,475	3,309	6,694	--	--	--	--
ROWE (hvb)	0-100	3.1 (2.8-3.4)	373	671	361	1,155	200	900	--	--	934	2,726	690	1,490	856	2,776	--	--
ALL COALS TOTAL (hvb)	0-100	2.1 (0.4-5.4)	4,931	10,148	11,265	30,394	200	900	--	--	16,396	41,442	10,431	21,505	12,838	36,908	--	--
	101-1,000	1.8 (0.5-4.0)	64	138	1,261	3,046	--	--	--	--	1,325	3,184	755	1,622	4,788	11,625	--	--
	Grand total	2.0 (0.4-5.4)	4,995	10,286	12,526	33,440	200	900	--	--	17,721	44,626	11,186	23,127	17,626	48,533	--	--

Table 55.--Remaining Coal Resources, Sequoyah County, Oklahoma (in thousands of short tons)

COAL AND RANK[1]	COAL DEPTH (FEET)	SULFUR CONTENT[2] (PERCENT)	MEASURED 12-14 INCHES ACRES	MEASURED 12-14 INCHES TONS	MEASURED 15-28 INCHES ACRES	MEASURED 15-28 INCHES TONS	MEASURED 29-42 INCHES ACRES	MEASURED 29-42 INCHES TONS	MEASURED 42+ INCHES ACRES	MEASURED 42+ INCHES TONS	MEASURED TOTAL ACRES	MEASURED TOTAL TONS	INDICATED 12-14 INCHES ACRES	INDICATED 12-14 INCHES TONS	INDICATED 15-28 INCHES ACRES	INDICATED 15-28 INCHES TONS	INDICATED 29-42 INCHES ACRES	INDICATED 29-42 INCHES TONS
STIGLER (mvb)	0-100	2.0 (est.)	975	2,184	--	--	--	--	--	--	975	2,184	231	505	--	--	--	--
	101-1,000	2.0 (est.)	800	1,792	32	98	--	--	--	--	832	1,890	3,016	6,759	422	1,291	--	--
	Total	2.0 (est.)	1,775	3,976	32	98	--	--	--	--	1,807	4,074	3,247	7,364	422	1,291	--	--

Table 56.--Remaining Coal Resources, Tulsa County, Oklahoma (in thousands of short tons)

COAL AND RANK[1]	COAL DEPTH (FEET)	SULFUR CONTENT[2] (PERCENT)	MEASURED 12-14 INCHES ACRES	MEASURED 12-14 INCHES TONS	MEASURED 15-28 INCHES ACRES	MEASURED 15-28 INCHES TONS	MEASURED 29-42 INCHES ACRES	MEASURED 29-42 INCHES TONS	MEASURED 42+ INCHES ACRES	MEASURED 42+ INCHES TONS	MEASURED TOTAL ACRES	MEASURED TOTAL TONS	INDICATED 12-14 INCHES ACRES	INDICATED 12-14 INCHES TONS	INDICATED 15-28 INCHES ACRES	INDICATED 15-28 INCHES TONS	INDICATED 29-42 INCHES ACRES	INDICATED 29-42 INCHES TONS
DAWSON (hvb)	0-100	4.6 (3.4-4.8)	--	--	2,088	8,212	64	288	--	--	2,152	8,500	--	--	2,726	10,166	386	1,737
	101-1,000	4.6 (3.4-4.8)	--	--	603	2,454	--	--	--	--	603	2,454	--	--	2,817	11,192	45	203
	Total	4.6 (3.4-4.8)	--	--	2,691	10,666	64	288	--	--	2,755	10,954	--	--	5,543	21,358	431	1,940
CROWEBURG (hvb)	0-100	2.0 (est.)	--	--	366	1,186	--	--	--	--	366	1,186	--	--	1,126	3,648	--	--
	101-1,000	2.0 (est.)	--	--	--	--	--	--	--	--	--	--	--	--	128	415	--	--
	Total	2.0 (est.)	--	--	366	1,186	--	--	--	--	366	1,186	--	--	1,254	4,063	--	--
ALL COALS TOTAL (hvb)	0-100	4.0 (2.0-4.8)	--	--	2,454	9,398	64	288	--	--	2,518	9,686	--	--	3,852	13,814	386	1,737
	101-1,000	4.2 (2.0-4.8)	--	--	603	2,454	--	--	--	--	603	2,454	--	--	2,945	11,607	45	203
	Grand total	4.1 (2.0-4.8)	--	--	3,057	11,852	64	288	--	--	3,121	12,140	--	--	6,797	25,421	431	1,940

Table 57.--Remaining Coal Resources, Wagoner County, Oklahoma (in thousands of short tons)

COAL AND RANK[1]	COAL DEPTH (FEET)	SULFUR CONTENT[2] (PERCENT)	MEASURED 12-14 INCHES ACRES	MEASURED 12-14 INCHES TONS	MEASURED 15-28 INCHES ACRES	MEASURED 15-28 INCHES TONS	MEASURED 29-42 INCHES ACRES	MEASURED 29-42 INCHES TONS	MEASURED 42+ INCHES ACRES	MEASURED 42+ INCHES TONS	MEASURED TOTAL ACRES	MEASURED TOTAL TONS	INDICATED 12-14 INCHES ACRES	INDICATED 12-14 INCHES TONS	INDICATED 15-28 INCHES ACRES	INDICATED 15-28 INCHES TONS	INDICATED 29-42 INCHES ACRES	INDICATED 29-42 INCHES TONS
CROWEBURG (hvb)	0-100	2.7 (0.5-3.4)	--	--	2,057	5,702	--	--	--	--	2,057	5,702	--	--	3,619	10,026	--	--
	101-1,000	2.7 (0.5-3.4)	--	--	32	91	--	--	--	--	32	91	--	--	725	2,085	--	--
	Total	2.7 (0.5-3.4)	--	--	2,089	5,793	--	--	--	--	2,089	5,793	--	--	4,344	12,111	--	--
MINOR COALS	0-100	6.1 -	486	1,050	523	1,392	--	--	--	--	1,009	2,442	733	1,583	148	399	--	--
	101-1,000	6.1 -	--	--	219	587	--	--	--	--	219	587	91	197	1,506	3,993	--	--
	Total	6.1 -	486	1,050	742	1,979	--	--	--	--	1,228	3,029	824	1,780	1,654	4,392	--	--

42+ INCHES		TOTAL		INFERRED										GRAND TOTAL		RECOVERABLE	NET RECOVERABLE
				12-14 INCHES		15-28 INCHES		29-42 INCHES		42+ INCHES		TOTAL					
ACRES	TONS	ACRES	TONS	ACRES	TONS	ACRES	TONS	ACRES	TONS	ACRES	TONS	ACRES	TONS	ACRES	TONS	RESERVES (TONS)	RESERVES (TONS)
--	--	3,937	14,173	--	--	1,800	6,480	--	--	--	--	1,800	6,480	7,503	27,011	21,608	21,608
--	--	--	--	--	--	6,885	24,786	--	--	--	--	6,885	24,786	6,885	24,786	12,393	0
--	--	3,937	14,173	--	--	8,685	31,266	--	--	--	--	8,685	31,266	14,388	51,797	34,001	21,608
--	--	3,450	7,324	4,096	7,859	1,977	4,626	--	--	--	--	6,073	12,485	11,091	23,105	18,484	18,484
--	--	--	--	352	650	77	180	--	--	--	--	429	830	429	830	415	0
--	--	3,450	7,324	4,448	8,509	2,054	4,806	--	--	--	--	6,502	13,315	11,520	23,935	18,899	18,484
--	--	10,967	25,837	7,455	16,102	11,194	29,213	--	--	--	--	18,649	45,315	40,418	97,356	77,884	77,884
--	--	5,543	13,247	2,982	6,712	9,881	28,355	--	--	--	--	12,863	35,067	19,731	51,498	25,749	0
--	--	16,510	39,084	10,437	22,814	21,075	57,568	--	--	--	--	31,512	80,382	60,149	148,854	103,633	77,884
--	--	60	119	260	515	--	--	--	--	--	--	260	515	500	1,017	813	813
--	--	3,309	6,694	--	--	--	--	--	--	--	--	--	--	4,455	9,169	7,335	7,335
--	--	1,546	4,266	1,000	1,980	45	162	--	--	--	--	1,045	2,142	3,525	9,134	7,307	7,307
--	--	23,269	58,413	12,900	26,456	15,016	40,481	--	--	--	--	27,827	66,937	67,492	166,792	133,431	133,431
--	--	5,543	13,247	3,334	7,362	16,843	53,321	--	--	--	--	20,177	60,683	27,045	77,114	38,557	0
--	--	28,812	71,660	16,234	33,818	31,859	93,802	--	--	--	--	48,004	127,620	94,537	243,906	171,988	133,431

42+ INCHES		TOTAL		INFERRED										GRAND TOTAL		RECOVERABLE	NET RECOVERABLE
				12-14 INCHES		15-28 INCHES		29-42 INCHES		42+ INCHES		TOTAL					
ACRES	TONS	ACRES	TONS	ACRES	TONS	ACRES	TONS	ACRES	TONS	ACRES	TONS	ACRES	TONS	ACRES	TONS	RESERVES (TONS)	RESERVES (TONS)
--	--	231	505	6	13	--	--	--	--	--	--	6	13	1,212	2,702	2,162	2,162
--	--	3,438	8,050	4,553	10,214	1,402	4,290	--	--	--	--	5,955	14,504	10,225	24,444	12,222	0
--	--	3,669	8,555	4,559	10,227	1,402	4,290	--	--	--	--	5,961	14,517	11,437	27,146	14,384	2,162

42+ INCHES		TOTAL		INFERRED										GRAND TOTAL		RECOVERABLE	NET RECOVERABLE
				12-14 INCHES		15-28 INCHES		29-42 INCHES		42+ INCHES		TOTAL					
ACRES	TONS	ACRES	TONS	ACRES	TONS	ACRES	TONS	ACRES	TONS	ACRES	TONS	ACRES	TONS	ACRES	TONS	RESERVES (TONS)	RESERVES (TONS)
--	--	3,112	11,903	--	--	3,769	14,604	102	459	--	--	3,871	15,063	9,135	35,466	28,373	14,725
--	--	2,862	11,395	--	--	13,925	55,353	1,645	7,403	--	--	15,570	62,756	19,035	76,605	38,303	3,577
--	--	5,974	23,298	--	--	17,694	69,957	1,747	7,862	--	--	19,441	77,819	28,170	112,071	66,676	18,302
--	--	1,126	3,648	--	--	1,888	6,117	--	--	--	--	1,888	6,117	3,380	10,951	8,761	8,761
--	--	128	415	--	--	4,967	14,960	--	--	--	--	4,967	14,960	5,095	15,375	7,687	0
--	--	1,254	4,063	--	--	6,855	21,077	--	--	--	--	6,855	21,077	8,475	26,326	16,448	8,761
--	--	4,238	15,551	--	--	5,657	20,721	102	459	--	--	5,759	21,180	12,515	46,417	37,134	23,486
--	--	2,990	11,810	--	--	18,892	70,313	1,645	7,403	--	--	20,537	77,716	24,130	91,980	45,990	3,577
--	--	7,228	27,361	--	--	24,549	91,034	1,747	7,862	--	--	26,296	98,896	36,645	138,397	83,124	27,063

42+ INCHES		TOTAL		INFERRED										GRAND TOTAL		RECOVERABLE	NET RECOVERABLE
				12-14 INCHES		15-28 INCHES		29-42 INCHES		42+ INCHES		TOTAL					
ACRES	TONS	ACRES	TONS	ACRES	TONS	ACRES	TONS	ACRES	TONS	ACRES	TONS	ACRES	TONS	ACRES	TONS	RESERVES (TONS)	RESERVES (TONS)
--	--	3,619	10,026	--	--	2,478	6,854	--	--	--	--	2,478	6,854	8,154	22,582	18,066	18,066
--	--	725	2,085	320	634	4,742	13,218	--	--	--	--	5,062	13,852	5,819	16,028	0	0
--	--	4,344	12,111	320	634	7,220	20,072	--	--	--	--	7,540	20,706	13,973	38,610	18,066	18,066
--	--	881	1,982	156	337	128	346	--	--	--	--	284	683	2,174	5,107	4,086	4,086
--	--	1,597	4,190	1,296	2,799	4,665	12,248	--	--	--	--	5,961	15,047	7,777	19,824	0	0
--	--	2,478	6,172	1,352	3,136	4,793	12,594	--	--	--	--	6,245	15,730	9,951	24,931	4,086	4,086

Table 57.--Wagoner County (cont.)

COAL AND RANK[1]	COAL DEPTH (FEET)	SULFUR CONTENT[2] (PERCENT)	MEASURED 12-14 INCHES ACRES	MEASURED 12-14 INCHES TONS	MEASURED 15-28 INCHES ACRES	MEASURED 15-28 INCHES TONS	MEASURED 29-42 INCHES ACRES	MEASURED 29-42 INCHES TONS	MEASURED 42+ INCHES ACRES	MEASURED 42+ INCHES TONS	MEASURED TOTAL ACRES	MEASURED TOTAL TONS	INDICATED 12-14 INCHES ACRES	INDICATED 12-14 INCHES TONS	INDICATED 15-28 INCHES ACRES	INDICATED 15-28 INCHES TONS	INDICATED 29-42 INCHES ACRES	INDICATED 29-42 INCHES TONS
ALL COALS TOTAL	0-100	3.2 (0.5-6.1)	486	1,050	2,580	7,094	--	--	--	--	3,066	8,144	733	1,583	3,767	10,425	--	--
	101-1,000	3.2 (0.5-6.1)	--	--	251	678	--	--	--	--	251	678	91	197	2,231	6,078	--	--
	Grand total	3.2 (0.5-6.1)	486	1,050	2,831	7,772	--	--	--	--	3,317	8,822	824	1,780	5,998	16,503	--	--

Table 58.--Remaining Coal Resources, Washington County, Oklahoma (in thousands of short tons)

COAL AND RANK[1]	COAL DEPTH (FEET)	SULFUR CONTENT[2] (PERCENT)	MEASURED 12-14 INCHES ACRES	MEASURED 12-14 INCHES TONS	MEASURED 15-28 INCHES ACRES	MEASURED 15-28 INCHES TONS	MEASURED 29-42 INCHES ACRES	MEASURED 29-42 INCHES TONS	MEASURED 42+ INCHES ACRES	MEASURED 42+ INCHES TONS	MEASURED TOTAL ACRES	MEASURED TOTAL TONS	INDICATED 12-14 INCHES ACRES	INDICATED 12-14 INCHES TONS	INDICATED 15-28 INCHES ACRES	INDICATED 15-28 INCHES TONS	INDICATED 29-42 INCHES ACRES	INDICATED 29-42 INCHES TONS
DAWSON (hvb)	101-1,000	3.8 (est.)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

42+ INCHES		TOTAL		INFERRED										GRAND TOTAL		RECOVERABLE RESERVES (TONS)	NET RECOVERABLE RESERVES (TONS)
				12-14 INCHES		15-28 INCHES		29-42 INCHES		42+ INCHES		TOTAL					
ACRES	TONS	ACRES	TONS	ACRES	TONS	ACRES	TONS	ACRES	TONS	ACRES	TONS	ACRES	TONS	ACRES	TONS		
--	--	4,500	12,008	156	337	2,606	7,200	--	--	--	--	2,762	7,537	10,328	27,689	22,152	22,152
--	--	2,322	6,275	1,616	3,433	9,407	25,466	--	--	--	--	11,023	28,899	13,596	35,852	0	0
--	--	6,822	18,283	1,772	3,770	12,013	32,666	--	--	--	--	13,785	36,436	23,924	63,541	22,152	22,152

42+ INCHES		TOTAL		INFERRED										GRAND TOTAL		RECOVERABLE RESERVES (TONS)	NET RECOVERABLE RESERVES (TONS)
				12-14 INCHES		15-28 INCHES		29-42 INCHES		42+ INCHES		TOTAL					
ACRES	TONS	ACRES	TONS	ACRES	TONS	ACRES	TONS	ACRES	TONS	ACRES	TONS	ACRES	TONS	ACRES	TONS		
--	--	--	--	--	--	1,293	4,655	--	--	--	--	1,293	4,655	1,293	4,655	2,327	0

Table 59.--Suitability Categories for Net Recoverable Coal Reserves, Atoka County, Oklahoma (in thousands of short tons)

COAL AND RANK[1]	COAL DEPTH (FEET)	SULFUR CONTENT[2] (PERCENT)	NET RECOVERABLE RESERVES SUITABLE FOR: GASIFICATION (TONS)	COKE (TONS)	ELECTRIC-POWER GENERATION (TONS)
MC ALESTER (hvb)	0-100	4.8 est.	0	0	1,470
	101-1,000	4.8 est.	0	0	3,272
	1,001-2,000	--	--	--	--
	2,001-3,000	--	--	--	--
	3,000+	--	--	--	--
	Total	4.8 est.	0	0	4,742
LOWER HARTSHORNE (hvb)	0-100	5.1 (5.1)	0	0	1,696
	101-1,000	5.1 (5.1)	0	0	5,059
	1,001-2,000	--	--	--	--
	2,001-3,000	--	--	--	--
	3,000+	--	--	--	--
	Total	5.1 (5.1)	0	0	6,755
ALL COALS TOTAL[3]	0-100	5.0 (4.8-5.1)	0	0	3,166
	101-1,000	5.0 (4.8-5.1)	0	0	8,331
	Grand total	5.0 (4.8-5.0)	0	0	11,497

Table 60.--Suitability Categories for Net Recoverable Coal Reserves, Coal County, Oklahoma (in thousands of short tons)

COAL AND RANK[1]	COAL DEPTH (FEET)	SULFUR CONTENT[2] (PERCENT)	NET RECOVERABLE RESERVES SUITABLE FOR: GASIFICATION (TONS)	COKE (TONS)	ELECTRIC-POWER GENERATION (TONS)
MC ALESTER (hvb)	0-100	4.1 (0.8-4.8)	1,836	0	0
	100-1,000	4.1 (0.8-4.8)	46,660	0	0
	1,001-2,000	4.0 est.	54,532	0	0
	2,001-3,000	3.9 est.	0	0	0
	3,000+	3.8 est.	0	0	0
	Total	4.0 (0.8-4.8)	103,328	0	0
LOWER HARTSHORNE (hvb)	0-100	5.0 est.	0	0	1,023
	101-1,000	5.0 est.	0	0	10,276
	1,001-2,000	5.0 est.	0	0	1,302
	Total	5.0 est.	0	0	12,601
ALL COALS TOTAL[3] (hvb)	0-100	4.3 (0.8-5.0)	1,836	0	1,023
	101-1,000	4.2 (0.8-5.0)	46,660	0	10,276
	1,001-2,000	4.0 (0.8-5.0)	54,832	0	1,302
	2,001-3,000	3.9 est.	0	0	--
	3,000+	3.8 est.	0	0	0
	Grand total	4.1 (0.8-5.0)	103,328	0	12,601

Table 61.--Suitability Categories for Net Recoverable Coal Reserves, Craig County, Oklahoma (in thousands of short tons)

COAL AND RANK[1]	COAL DEPTH (FEET)	SULFUR CONTENT[2] (PERCENT)	NET RECOVERABLE RESERVES SUITABLE FOR: GASIFICATION (TONS)	COKE (TONS)	ELECTRIC-POWER GENERATION (TONS)
IRON POST (hvb)	0-100	3.5 (-)	0	0	21,218
CROWEBURG (hvb)	0-100	3.5 (est.)	0	0	48,223
MINERAL (hvb)	0-100	4.5 (3.6-4.7)	0	0	17,964
	101-1,000	4.5 (3.6-4.7)	0	0	0
	Total	4.5 (3.6-4.7)	0	0	17,964
ALL COALS TOTAL[3]	0-100	3.7 (3.5-4.7)	0	0	87,405
	101-1,000	4.5 (3.6-4.7)	0	0	0
	Grand total	3.7 (3.5-4.7)	0	0	87,405

[1]Rank, shown in parentheses, abbreviated as follows: high-volatile bituminous, hvb; medium-volatile bituminous, mvb; low-volatile bituminous, lvb.

[2]Figure given is average sulfur content; figures in parentheses represent range; est. = estimated.

[3]Sulfur percentages given for all coals are not necessarily indicative of suitability categories for net recoverable reserves.

Table 62.--Suitability Categories for Net Recoverable Coal Reserves, Creek County, Oklahoma (in thousands of short tons)

COAL AND RANK[1]		COAL DEPTH (FEET)	SULFUR CONTENT[2] (PERCENT)	NET RECOVERABLE RESERVES SUITABLE FOR: GASIFICATION (TONS)	COKE (TONS)	ELECTRIC-POWER GENERATION (TONS)
DAWSON[3]	(hvb)	0-100	3.8 -	0	0	3,893
		101-1,000	3.8 -	0	0	0
		Total	3.8 -	0	0	3,893

Table 63.--Suitability Categories for Net Recoverable Coal Reserves, Haskell County, Oklahoma (in thousands of short tons)

COAL AND RANK[1]		COAL DEPTH (FEET)	SULFUR CONTENT[2] (PERCENT)	NET RECOVERABLE RESERVES SUITABLE FOR: GASIFICATION (TONS)	COKE (TONS)	ELECTRIC-POWER GENERATION (TONS)
SECOR	(hvb)	0-100	6.5 est.	0	0	2,118
		101-1,000	6.5 est.	0	0	0
		Total	6.5 est.	0	0	2,118
STIGLER	(hvb)	0-100	1.3 (1.1-1.4)	0	7,753	0
		101-1,000	1.3 (0.4-1.7)	0	0	0
		1,001-2,000	1.3 (1.1-1.4)	0	272	0
		Total	1.3 (0.4-1.7)	0	8,025	0
	(mvb)	0-100	1.8 (0.4-5.2)	2,439	17,225	0
		101-1,000	1.5 (0.4-5.2)	199	2,095	0
		1,001-2,000	--	--	--	--
		Total	1.6 (0.4-5.2)	2,638	19,320	0
		All ranks total	1.5 (0.4-5.2)	2,638	27,345	0
HARTSHORNE	(mvb)	0-100	0.9 (0.7-1.7)	0	1,609	0
		101-1,000	2.2 (0.5-5.9)	0	133,303	0
		1,001-2,000	1.8 (0.5-5.0)	40,847	224,307	0
		2,001-3,000	1.2 (0.5-6.0)	0	0	0
		3,000+	--	--	--	--
		Total	1.9 (0.5-6.0)	40,847	359,219	0
	(lvb)	0-100	--	--	--	--
		101-1,000	1.8 (0.8-3.7)	0	26,840	0
		1,001-2,000	1.0 (0.6-2.1)	0	18,271	0
		2,001-3,000	--	--	--	--
		3,000+	--	--	--	--
		Total	1.6 (0.6-2.1)	0	45,111	0
		All ranks total	1.9 (0.5-6.0)	40,847	404,330	0
UPPER HARTSHORNE	(mvb)	0-100	0.9 est.	0	184	0
		101-1,000	0.9 est.	0	0	0
		Total	0.9 est.	0	184	0
LOWER HARTSHORNE	(mvb)	0-100	0.8 (0.8)	0	1,408	0
		101-1,000	0.8 (0.8)	0	4,509	0
		1,001-2,000	0.8 (0.8)	0	5,938	0
		2,001-3,000	0.8 (0.8)	0	0	0
		3,000+	--	--	--	--
		Total	0.8 (0.8)	0	11,855	0
ALL COALS TOTAL[3]	(hvb)	0-100	2.1 (1.1-6.5)	7,753	0	2,118
		101-1,000	1.8 (0.4-6.5)	0	0	0
		1,001-2,000	1.3 (1.1-1.4)	272	0	0
		Total	1.7 (0.4-6.5)	8,025	0	2,118
	(mvb)	0-100	1.6 (0.4-5.2)	2,439	20,426	0
		101-1,000	2.0 (0.4-5.2)	199	139,907	0
		1,001-2,000	1.8 (0.5-5.0)	40,847	230,245	0
		2,001-3,000	1.5 (0.5-6.0)	0	0	0
		Total	1.9 (0.4-6.0)	43,485	390,578	
	(lvb)	0-100	--	--	--	--
		101-1,000	1.8 (0.8-3.7)	0	26,840	0
		1,001-2,000	1.0 (0.6-2.1)	0	18,271	0
		Total	1.6 (0.6-2.1)	0	45,111	0
		Grand total	1.8 (0.4-6.0)	51,510	435,689	2,118

Table 64.--Suitability Categories for Net Recoverable Coal Reserves, Latimer County, Oklahoma (in thousands of short tons)

COAL AND RANK[1]	COAL DEPTH (FEET)	SULFUR CONTENT[2] (PERCENT)	NET RECOVERABLE RESERVES SUITABLE FOR: GASIFICATION (TONS)	COKE (TONS)	ELECTRIC-POWER GENERATION (TONS)
UPPER MC ALESTER (hvb)	0-100	4.1 (4.1)	4,207	0	0
	101-1,000	4.1 (4.1)	4,190	0	0
	1,001-2,000	4.1 (4.1)	1,248	0	0
	Total	4.1 (4.1)	9,645	0	0
LOWER MC ALESTER (hvb)	0-100	2.3 (1.9-3.2)	0	655	8,752
	101-1,000	2.3 (1.9-3.2)	0	465	24,260
	1,001-2,000	2.3 (1.9-3.2)	0	1,085	603
	2,001-3,000	2.3 (1.9-3.2)	0	0	0
	3,000+	--	--	--	--
	Total	2.3 (1.9-3.2)	0	2,205	33,615
UPPER HARTSHORNE (hvb)	0-100	1.5 (0.9-1.8)	0	0	1,002
	101-1,000	1.5 (1.0-2.6)	0	0	10,416
	1,001-2,000	1.6 (1.0-2.6)	0	0	14,169
	2,001-3,000	1.5 (1.0-2.6)	0	0	0
	3,000+	--	--	--	--
	Total	1.5 (1.0-2.6)	0	0	25,587
LOWER HARTSHORNE (hvb)	0-100	1.6 (1.1-2.4)	0	0	1,906
	101-1,000	1.5 (1.1-3.4)	116	0	16,365
	1,001-2,000	1.6 (1.2-2.4)	0	0	26,619
	2,001-3,000	1.5 (1.2-2.4)	0	0	0
	3,000+	--	--	--	--
	Total	1.5 (1.1-3.4)	116	0	44,890
ALL COALS TOTAL[3]	0-100	2.6 (0.9-4.1)	4,207	655	11,660
	101-1,000	2.4 (1.0-4.1)	4,306	465	51,041
	1,001-2,000	2.0 (1.0-4.1)	1,248	1,085	41,391
	2,001-3,000	1.5 (1.0-3.2)	0	0	0
	3,000+	--	--	--	--
	Grand total	2.0 (0.9-4.1)	9,761	2,205	104,092

Table 65.--Suitability Categories for Net Recoverable Coal Reserves, Le Flore County, Oklahoma (in thousands of short tons)

COAL AND RANK[1]	COAL DEPTH (FEET)	SULFUR CONTENT[2] (PERCENT)	NET RECOVERABLE RESERVES SUITABLE FOR: GASIFICATION (TONS)	COKE (TONS)	ELECTRIC-POWER GENERATION (TONS)
SECOR (mvb)	0-100	4.1 (4.1)	0	0	3,689
	101-1,000	4.1 (4.1)	0	0	26,392
	1,001-2,000	4.7 (4.7)	0	0	20,658
	2,001-3,000	4.7 (4.7)	0	0	0
	Total	4.4 (4.1-4.7)	0	0	50,739
LOWER WITTEVILLE (mvb)	101-1,000	4.4 (4.4)	0	0	14,248
	1,001-2,000	4.4 (4.4)	0	0	8,885
	Total	4.4 (4.4)	0	0	23,133
CAVANAL (mvb)	0-100	3.3 (4.8-2.1)	0	0	4,317
	101-1,000	3.3 (4.8-2.1)	0	0	14,010
	1,001-2,000	3.3 (4.8-2.1)	0	0	4,227
	2,001-3,000	3.3 (4.8-2.1)	0	0	0
	Total	3.3 (4.8-2.1)	0	0	22,554
UNNAMED COALS ABOVE CAVANAL; AND LOWER CAVANAL (mvb)	0-100	--	--	--	1,578
	101-1,000	--	--	--	83
	1,001-2,000	--	--	--	0
	2,001-3,000		--	--	0
	Total	--	--	--	1,661
UNNAMED COALS ABOVE STIGLER (mvb and lvb)	0-100	--	--	--	7,150
	101-1,000	--	--	--	0
	1,001-2,000	--	--	--	--
	Total	--	--	--	7,150

Table 65.--Le Flore County (cont.)

COAL AND RANK[1]		COAL DEPTH (FEET)	SULFUR CONTENT[2] (PERCENT)	NET RECOVERABLE RESERVES SUITABLE FOR: GASIFICATION (TONS)	COKE (TONS)	ELECTRIC-POWER GENERATION (TONS)
STIGLER	(lvb)	0-100	1.7 (est.)	0	4,622	0
		101-1,000	1.4 (est.)	0	0	0
		1,001-2,000	1.3 (est.)	0	0	0
		Total	1.4 (est.)	0	4,622	0
UPPER MC ALESTER	(mvb)	0-100	4.1 (est.)	0	0	71
		101-1,000	1.4 (est.)	0	0	0
		1,001-2,000	4.1 (est.)	0	0	0
		2,001-3,000	4.1 (est.)	0	0	0
		Total	4.1 (est.)	0	0	71
LOWER MC ALESTER	(mvb)	0-100	3.2 (est.)	0	0	54
		101-1,000	3.2 (est.)	0	0	1,746
		1,001-2,000	3.2 (est.)	0	0	224
		2,001-3,000	3.2 (est.)	0	0	0
		Total	3.2 (est.)	0	0	2,024
HARTSHORNE	(lvb)	0-100	1.3 (1.1-1.4)	0	8,906	8,906
		101-1,000	1.5 (0.9-2.7)	0	59,116	59,116
		1,001-2,000	1.5 (0.9-2.7)	0	38,852	38,852
		2,001-3,000	1.5 (0.9-2.7)	0	0	0
		Total	1.5 (0.9-2.7)	0	106,874	106,874
UPPER HARTSHORNE	(mvb)	101-1,000	1.6 (1.2-1.9)	0	0	0
		1,001-2,000	1.6 (1.2-1.9)	0	4,799	0
		2,001-3,000	1.5 (1.1-1.9)	0	0	0
		Total	1.6 (1.2-1.9)	0	4,799	0
	(lvb)	0-100	1.6 (0.8-2.6)	0	8,962	0
		101-1,000	1.6 (0.8-2.6)	0	49,874	0
		1,001-2,000	1.6 (0.8-2.6)	0	27,892	0
		2,001-3,000	1.6 (0.8-2.6)	0	0	0
		3,000+	1.6 (0.8-2.6)	0	0	0
		Total	1.6 (0.8-2.6)	0	86,728	0
		All ranks total	1.6 (0.8-2.6)	0	91,527	0
LOWER HARTSHORNE	(mvb)	0-100	1.5 (1.2-1.9)	0	2,746	0
		101-1,000	1.5 (1.2-1.9)	0	11,229	0
		1,001-2,000	1.5 (1.2-1.9)	0	4,012	0
		2,001-3,000	1.5 (1.2-1.9)	0	0	0
		Total	1.5 (1.2-1.9)	0	17,987	0
	(lvb)	0-100	1.0 (0.8-1.3)	0	10,793	0
		101-1,000	0.8 (0.4-1.3)	0	120,176	0
		1,001-3,000	0.8 (0.5-1.1)	0	141,037	0
		2,001-3,000	0.8 (0.5-1.3)	0	0	0
		3,000+	0.9 (0.8-1.3)	0	0	0
		Total	0.8 (0.4-1.3)	0	272,006	0
		All ranks Total	0.9 (0.4-1.9)	0	289,993	0
ALL RANKS[3]		0-100	1.9 (0.8-4.8)	0	36,029	25,765
		101-1,000	1.8 (0.4-4.8)	0	240,395	115,595
		1,001-2,000	1.7 (0.5-4.8)	0	216,592	72,846
		2,001-3,000	1.8 (0.5-4.8)	0	0	0
		3,000+	1.1 (0.8-2.6)	0	0	0
		Grand total	1.8 (0.4-4.8)	0	493,016	214,206

Table 66.--Suitability Categories for Net Recoverable Coal Reserves, Mayes County, Oklahoma (in thousands of short tons)

COAL AND RANK[1]	COAL DEPTH (FEET)	SULFUR CONTENT[2] (PERCENT)	NET RECOVERABLE RESERVES SUITABLE FOR: GASIFICATION (TONS)	COKE (TONS)	ELECTRIC-POWER GENERATION (TONS)
WEIR-PITTSBURG[3](hvb)	0-100	4.8 (4.5-5.0)	0	0	3,203

Table 67.--Suitability Categories for Net Recoverable Coal Reserves, McIntosh County, Oklahoma (in thousands of short tons)

COAL AND RANK[1]	COAL DEPTH (FEET)	SULFUR CONTENT[2] (PERCENT)	NET RECOVERABLE RESERVES SUITABLE FOR: GASIFICATION (TONS)	COKE (TONS)	ELECTRIC-POWER GENERATION (TONS)
CROWEBURG (hvb)	0-100	3.0 (2.5-4.0)	612	0	0
	101-1,000	3.0 (2.5-4.0)	--	0	0
	Total	3.0 (2.5-4.0)	612	0	0
SECOR (hvb)	0-100	4.5 (est.)	0	0	14,315
	101-1,000	4.5 (est.)	0	0	4,839
	Total	4.5 (est.)	0	0	19,154
STIGLER (hvb)	0-100	1.0 (0.8-1.2)	0	0	1,258
	101-1,000	1.0 (0.8-1.2)	0	0	0
	Total	1.0 (0.8-1.2)	0	0	1,258
ALL COALS TOTAL[3]	0-100	4.2 (0.8-4.5)	612	0	15,573
	101-1,000	1.2 (0.8-4.5)	0	0	4,839
	Grand total	4.2 (0.8-4.5)	612	0	20,412

Table 68.--Suitability Categories for Net Recoverable Coal Reserves, Muskogee County, Oklahoma (in thousands of short tons)

COAL AND RANK[1]	COAL DEPTH (FEET)	SULFUR CONTENT[2] (PERCENT)	NET RECOVERABLE RESERVES SUITABLE FOR: GASIFICATION (TONS)	COKE (TONS)	ELECTRIC-POWER GENERATION (TONS)
SECOR[3] (hvb)	0-100	4.0 (est.)	0	0	4,202
	101-1,000	4.0 (est.)	0	0	0
	Total	4.0 (est.)	0	0	4,202
STIGLER[3] (hvb)	0-100	4.1 (0.4-4.9)	6,654	0	6,653
	101-1,000	4.1 (0.4-4.9)	0	0	0
	Total	4.1 (0.4-4.9)	6,654	0	6,653
	Grand total	4.1 (0.4-4.9)	6,654	0	10,855

Table 69.--Suitability Categories for Net Recoverable Coal Reserves, Nowata County, Oklahoma (in thousands of short tons)

COAL AND RANK[1]	COAL DEPTH (FEET)	SULFUR CONTENT[2] (PERCENT)	NET RECOVERABLE RESERVES SUITABLE FOR: GASIFICATION (TONS)	COKE (TONS)	ELECTRIC-POWER GENERATION (TONS)
IRON POST[3] (hvb)	0-100	3.6 (est.)	0	0	4,834

Table 70.--Suitability Categories for Net Recoverable Coal Reserves, Okfuskee County, Oklahoma (in thousands of short tons)

COAL AND RANK[1]	COAL DEPTH (FEET)	SULFUR CONTENT[2] (PERCENT)	NET RECOVERABLE RESERVES SUITABLE FOR: GASIFICATION (TONS)	COKE (TONS)	ELECTRIC-POWER GENERATION (TONS)
CROWEBURG[3] (hvb)	0-100	1.6 (est.)	1,525	1,525	1,526
	101-1,000	2.2 (1.4-5.0)	5,017	5,017	5,018
	1,001-2,000	2.9 (1.4-5.0)	0	0	0
	Total	2.3 (1.4-5.0)	6,542	6,542	6,544

Table 73.--Suitability Categories for Net Recoverable Coal Reserves, Rogers County, Oklahoma (in thousands of short tons)

COAL AND RANK[1]	COAL DEPTH (FEET)	SULFUR CONTENT[2] (PERCENT)	NET RECOVERABLE RESERVES SUITABLE FOR: GASIFICATION (TONS)	COKE (TONS)	ELECTRIC-POWER GENERATION (TONS)
DAWSON (hvb)	0-100	3.8 (est.)	0	0	21,608
	101-1,000	3.8 (est.)	0	0	0
	Total	3.8 (est.)	0	0	21,608
IRON POST (hvb)	0-100	4.0 (3.7-4.2)	0	0	18,484
	101-1,000	4.0 (4.0 est.)	0	0	0
	Total	4.0 (3.7-4.2)	0	0	18,484
CROWEBURG (hvb)	0-100	0.8 (0.4-1.1)	0	77,884	0
	101-1,000	0.8 (0.5-2.0)	0	0	0
	Total	0.8 (0.4-2.0)	0	77,884	0
MINERAL (hvb)	0-100	3.5 (est.)	0	0	813
WEIR-PITTSBURG (hvb)	0-100	4.8 (4.5-5.4)	0	0	7,335
ROWE (hvb)	0-100	3.1 (2.8-3.4)	0	0	7,307
ALL COALS TOTAL[3] (hvb)	0-100	2.1 (0.4-5.4)	0	77,884	55,547
	101-1,000	1.8 (0.5-4.0)	0	0	0
	Grand total	2.0 (0.4-5.4)	0	77,884	55,547

Table 74.--Suitability Categories for Net Recoverable Coal Reserves, Sequoyah County, Oklahoma (in thousands of short tons)

COAL AND RANK[1]	COAL DEPTH (FEET)	SULFUR CONTENT[2] (PERCENT)	NET RECOVERABLE RESERVES SUITABLE FOR: GASIFICATION (TONS)	COKE (TONS)	ELECTRIC-POWER GENERATION (TONS)
STIGLER[3] (mvb)	0-100	2.0 (est.)	0	0	2,162
	101-1,000	2.0 (est.)	0	0	0
	Total	2.0 (est.)	0	0	2,162

Table 75.--Suitability Categories for Net Recoverable Coal Reserves, Tulsa County, Oklahoma (in thousands of short tons)

COAL AND RANK[1]	COAL DEPTH (FEET)	SULFUR CONTENT[2] (PERCENT)	NET RECOVERABLE RESERVES SUITABLE FOR: GASIFICATION (TONS)	COKE (TONS)	ELECTRIC-POWER GENERATION (TONS)
DAWSON (hvb)	0-100	4.6 (3.4-4.8)	0	0	14,725
	101-1,000	4.6 (3.4-4.8)	0	0	3,577
	Total	4.6 (3.4-4.8)	0	0	18,302
CROWEBURG (hvb)	0-100	2.0 (est.)	0	2,917	5,844
	101-1,000	2.0 (est.)	0	0	0
	Total	2.0 (est.)	0	2,917	5,844
ALL COALS TOTAL[3] (hvb)	0-100	4.0 (2.0-4.8)	0	2,917	20,569
	101-1,000	4.2 (2.0-4.8)	0	0	3,577
	Grand total	4.1 (2.0-4.8)	0	2,917	24,146

Table 76.--Suitability Categories for Net Recoverable Coal Reserves, Wagoner County, Oklahoma (in thousands of short tons)

COAL AND RANK[1]	COAL DEPTH (FEET)	SULFUR CONTENT[2] (PERCENT)	NET RECOVERABLE RESERVES SUITABLE FOR: GASIFICATION (TONS)	COKE (TONS)	ELECTRIC-POWER GENERATION (TONS)
CROWEBURG (hvb)	0-100	2.7 (0.5-3.4)	6,022	12,044	0
	101-1,000	2.7 (0.5-3.4)	0	0	0
	Total	2.7 (0.5-3.4)	6,022	12,044	0
MINOR COALS	0-100	6.1 -	0	0	4,086
	101-1,000	6.1 -	0	0	0
	Total	6.1 -	0	0	4,086
ALL COALS TOTAL[3]	0-100	3.2 (0.5-6.1)	6,022	12,044	4,086
	101-1,000	3.2 (0.5-6.1)	0	0	0
	Grand total	3.2 (0.5-6.1)	6,022	12,044	4,086

Table 77.--Suitability Categories for Net Recoverable Coal Reserves, Washington County, Oklahoma (in thousands of short tons)

COAL AND RANK[1]	COAL DEPTH (FEET)	SULFUR CONTENT[2] (PERCENT)	NET RECOVERABLE RESERVES SUITABLE FOR: GASIFICATION (TONS)	COKE (TONS)	ELECTRIC-POWER GENERATION (TONS)
DAWSON[3] (hvb)	101-1,000	3.8 (est.)	0	0	0