

Shallow Coal Exploration Drill-Hole Data, Western Kentucky

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Chapter D of

**Shallow Coal Exploration Drill-Hole Data—Alabama, Georgia,
Kentucky, Louisiana, Mississippi, Missouri, North Carolina,
South Carolina, Tennessee, and Texas**

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Introduction

Coal exploration drill-hole data from 657 wells in western Kentucky drilled between 1962 and 1981 by Phillips Coal Company, a division of Phillips Petroleum Company (Phillips), are discussed in this chapter, and the data are provided in an accompanying spreadsheet. The data are part of a larger dataset donated to the U.S. Geological Survey (USGS) by the North American Coal Corporation, which purchased Phillips assets in 2001 (see chapter A, this volume). The data in 10 State reports have been digitized from field maps to create unified and spatially consistent coal exploration drill-hole datasets for each of the States (chapters B–K, this volume). Data for western Kentucky include a geologic map of the State with drill-hole coverage (fig. D1), a list of data attributes and explanations of the data format (table D1), a list of comments found in the data and their explanations (table D2), a list of counties and the number of drill holes for each county (table D3), and tabulated data in spreadsheet format (see appendix D1).

Methods

Hardcopy Phillips exploration maps, in Kentucky South 1927 State coordinate plane projection, were digitized into a geographic information system using ArcMap™ software from the Environmental Systems Research Institute Inc. (ESRI). Roads and county boundaries served as reference points to georeference scanned maps. Shapefile attribute values were populated with data from drill-hole locations in eight counties in western Kentucky. Comments were added to the attribute table (table D1) to indicate notations made by the coal company as well as general observations made when digitizing the drill-hole points (table D2). The dataset was projected into a North American Datum of 1983 geographic coordinate system to facilitate combining this dataset with similar Phillips datasets published by the USGS for other States. The shapefile was exported to a spreadsheet (see appendix D1).

Generalized Coal Geology of Western Kentucky

Western Kentucky is a part of the Jackson Purchase area, which is comprised of the northernmost part of the Mississippi Embayment region of the Gulf Coastal Plain and contains sediments of Cretaceous through Quaternary ages (figs. D1, D2) (Cushing and others, 1964; Hackley and others, 2006). Lignite deposits are found in the Gulf Coastal Plain Coal Province that extends into western Kentucky (Cushing and others, 1964; Hackley and others, 2006). The lignite-bearing counties within the Jackson Purchase area of western Kentucky are Ballard, Carlisle, Calloway, Fulton, Graves, Hickman, Marshall and McCracken Counties (table D3) (Hackley and others, 2006). The Upper Cretaceous and Lower Tertiary strata of the Jackson Purchase area contain thin, discontinuous lignite beds (Olive and McDowell, 1986; Hackley and others, 2006). The majority of the lignite lenses in western Kentucky are found in the Wilcox, Claiborne, and Jackson Formations and, to a lesser extent, in the McNairy Formation (fig. D2) (Hackley and others, 2006).

The McNairy Formation is Upper Cretaceous in age containing marine and freshwater deltaic deposition that produced the lignite beds in this formation (Stephenson, 1914; Hackley and others, 2006). Sediments in the McNairy Formation were deposited in an environment with a subtropical climate, shown through pollen studies (Tschurdy, 1970; Hackley and others, 2006). The lignite in the McNairy Formation is found in northeastern Calloway County in a bed that is one and one-half feet thick (Olive, 1980; Hackley and others, 2006). Lignite from the McNairy Formation can also be found in the subsurface in McCracken County (Hower and others, 1990; Hackley and others, 2006). McNairy Formation lignite originated from allochthonous organic material (Hower and others, 1990; Hackley and others, 2006).

The Tertiary Age formations in the Jackson Purchase area are the Wilcox, Claiborne, and Jackson Groups. The Wilcox Group sediments are from the Paleocene/Eocene and were deposited in a freshwater environment (Olive, 1980; Hackley and others, 2006). Lignite lenses as thick as 3 feet can be found in northeastern Calloway County (Olive, 1980; Hackley and others, 2006), although they are relatively rare (Hower

and others, 1990). The Wilcox Group also contains sands and clays that include lignitized plant material and leaf imprints (Olive, 1980; Hackley and others, 2006). In the Claiborne Group overlying the Wilcox Group, lignite can be found in beds generally less than 5 feet thick (Olive, 1980; Hackley and others, 2006). This lignite is locally composed of woody fragments of tree trunks and stumps (Olive, 1980; Hackley and others, 2006). Lignite of the Claiborne Group most likely formed from sediment that was deposited in an oxbow lake environment (Potter and Dilcher, 1980; Hower and others, 1990). The Jackson Formation overlies the Claiborne Group and is comprised of similar lithologies (Hackley and others, 2006). Underlying modern stream floodplains are Pliocene, Pleistocene, and Holocene aged sediments that include loess and alluvium. (Olive and Finch, 1969; Olive and McDowell, 1986; Hackley and others, 2006).

Data

The drill-hole dataset from western Kentucky is part of the data for lignite deposits in the Gulf Coast region (see fig. A1 in chapter A, this volume). A total of 657 drill-hole locations were in western Kentucky, with 31 drill holes that had recorded probe depths. Out of the 657 drill holes, 196 contained coal with an average thickness of 3.72 feet for the coal bed and partings. The minimum depth at which coal was found was 28 feet and the maximum coal depth was 292 feet. The majority of the drill holes with coal were found in Fulton County (244 drill holes containing coal) and to a lesser extent in Hickman County (146 drill holes containing coal) (table D3). There is a ± 0.25 mile error in location due to the generalized nature of the drill-hole locations on the original highway maps and georeferencing those maps to a new base layer.

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Appendix D1

The western Kentucky coal exploration drill-hole dataset in spreadsheet format is available at pubs.usgs.gov/of/2011/1261/Appendices/D1-KY.xls.

Table D1. Attribute titles and data descriptions and formats for the western Kentucky drill-hole dataset.

Attribute title	Data description and format
DRILL-HOLE NAME	Two-letter county code followed by drill-hole number.
COUNTY	The county where the drill hole was located.
ELEVATION	Elevation above sea level in feet.
DEPTH_TOTAL	Depth of drill hole in feet.
DEPTH_PROBED	Depth of geophysical probe measurement in feet.
LATITUDE	Decimal degree location values given to 4 decimal places.
LONGITUDE	Decimal degree location values given to 4 decimal places.
COMMENT	Additional information regarding the entire drill hole.
X_C	Thickness of coal for bed number X in decimal feet.
X_CP	Thickness of coal and partings combined for bed number X in decimal feet.
X_DEPTH	Top depth of bed number X in feet.
X_BED	A number or letter assigned to different coal beds of the same drill hole, which are not correlated throughout the dataset.
X_COMMENT	Additional information regarding coal bed X.

Table D2. Explanation of comments used to describe the western Kentucky drill-hole dataset (modified from J.A. Luppens, U.S. Geological Survey, written commun., 2009).

SYMBOL/COMMENT	DESCRIPTION
?	Questionable data/information.
CORED	Indicating that the drill hole was cored.
I	Abbreviation for “inferior.” Subjective term used to describe poor coal quality.
LOCATION FROM LOG	Locations were not digitized from coal exploration maps. The locations were acquired from sample description sheets completed by the geologist onsite. The coordinates originally were in a State plane coordinate system.
NC	Abbreviation for “no coal.” No coal was found during exploration for this drill hole.
NO DATA	No data were recorded on the original coal exploration maps for this drill hole.
NP	Abbreviation for “not probed.” Geophysical logging never occurred at this location.
NSL	Abbreviation for “no significant lignite.” Coal may have been found during exploration but because the coal beds were thin (usually less than 2 feet thick) no coal data was recorded.
PI	Abbreviation for “partially inferior.” Used to describe that a portion of the coal bed is of a low quality.

D4 Shallow Coal Exploration Drill-Hole Data—AL, GA, KY, LA, MS, MO, NC, SC, TN, TX

Table D3. Western Kentucky counties and the number of drill holes by county.

County	Number of drill holes
Ballard	52
Carlisle	81
Calloway	36
Fulton	244
Graves	75
Hickman	146
Marshall	6
McCracken	17
Total	657

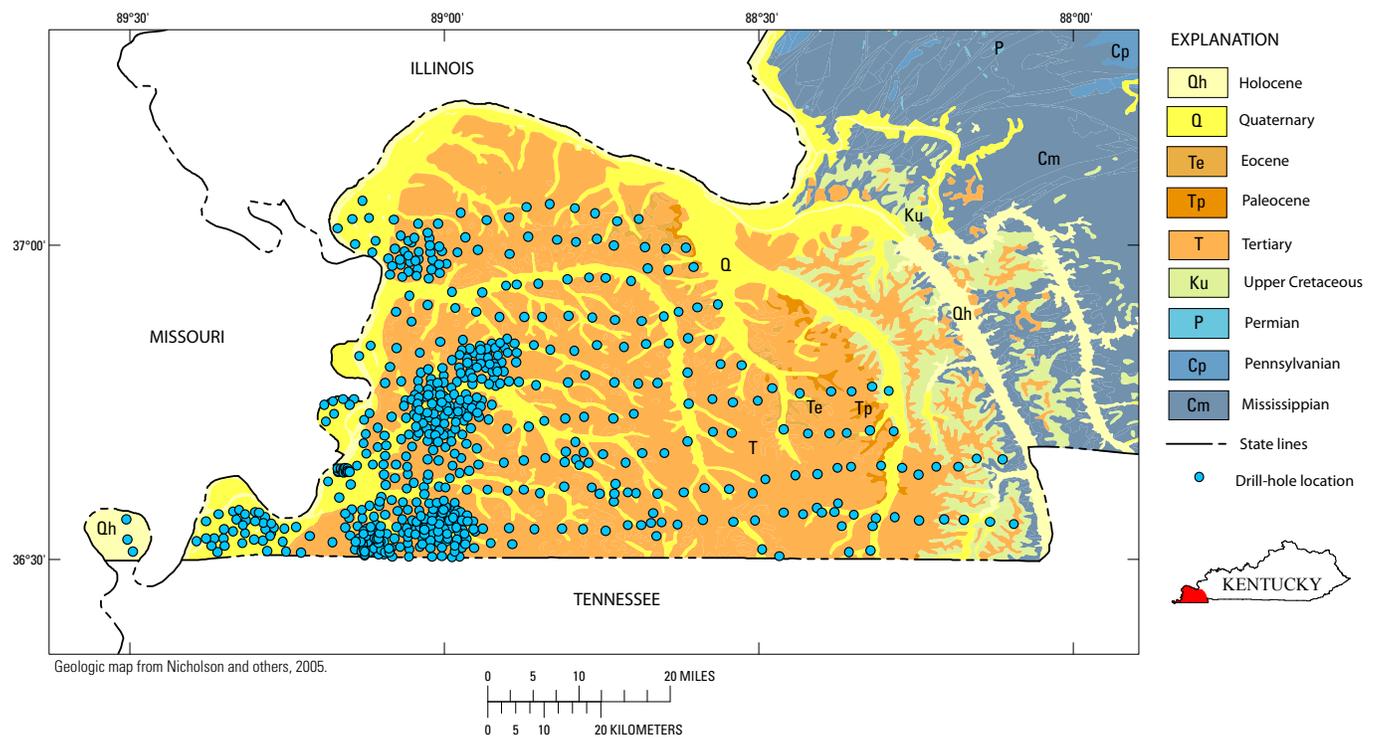


Figure D1. Regional map of western Kentucky with generalized geology overlaid with drill-hole locations.

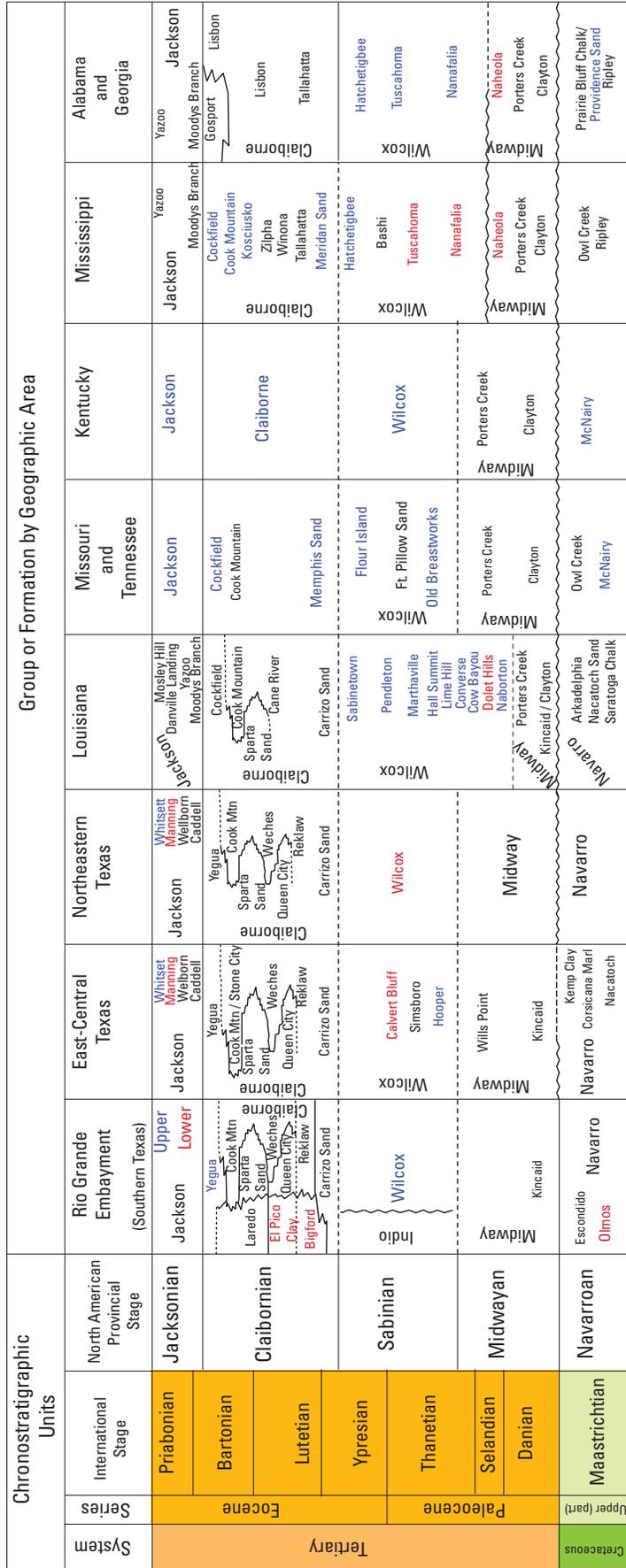


Figure D2. Generalized stratigraphic chart showing major and minor coal-bearing formations in the Mississippi Embayment and Gulf Coastal Plain (modified from Warwick and others, 1997; Ogg and others, 2008).