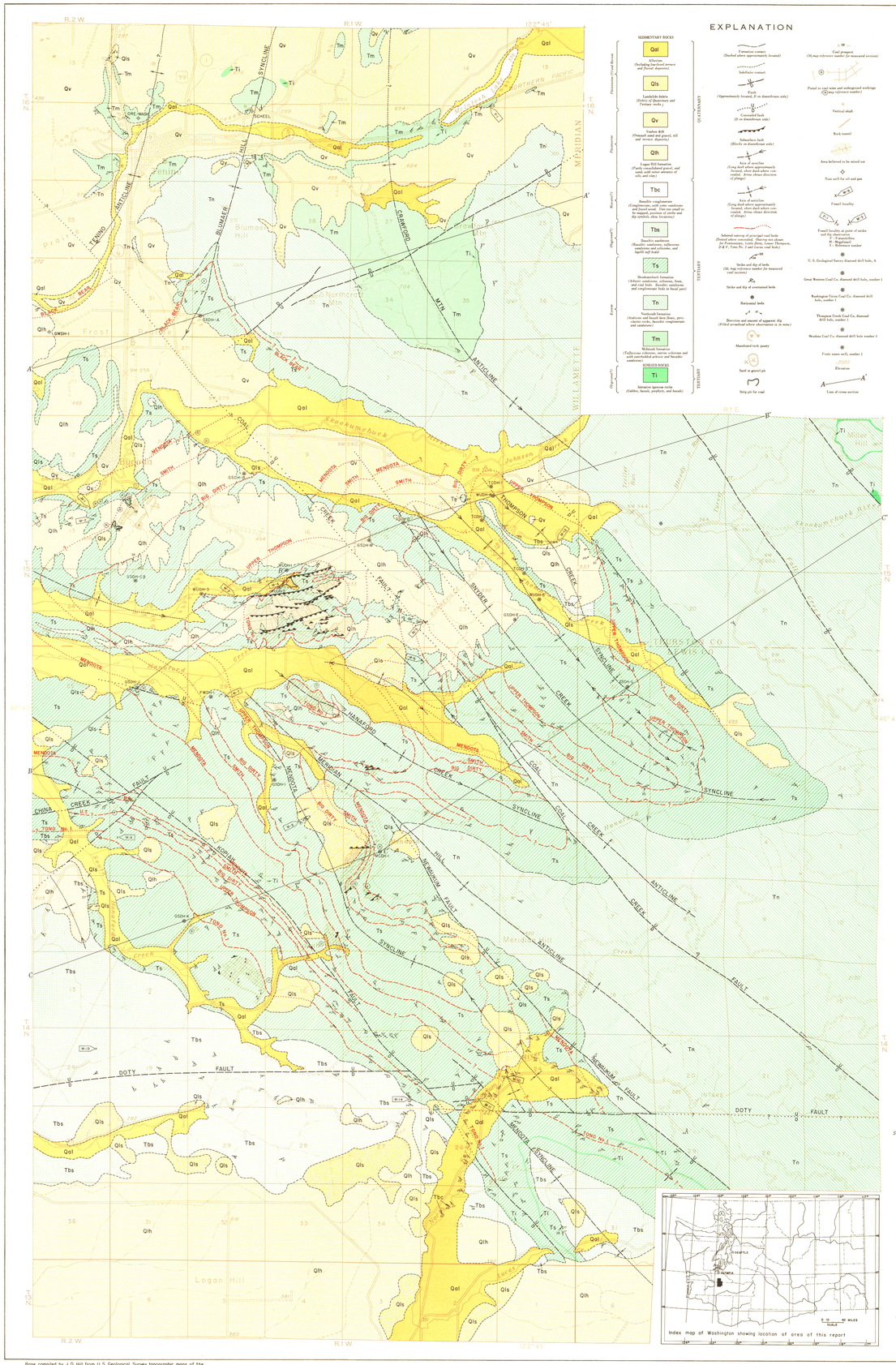
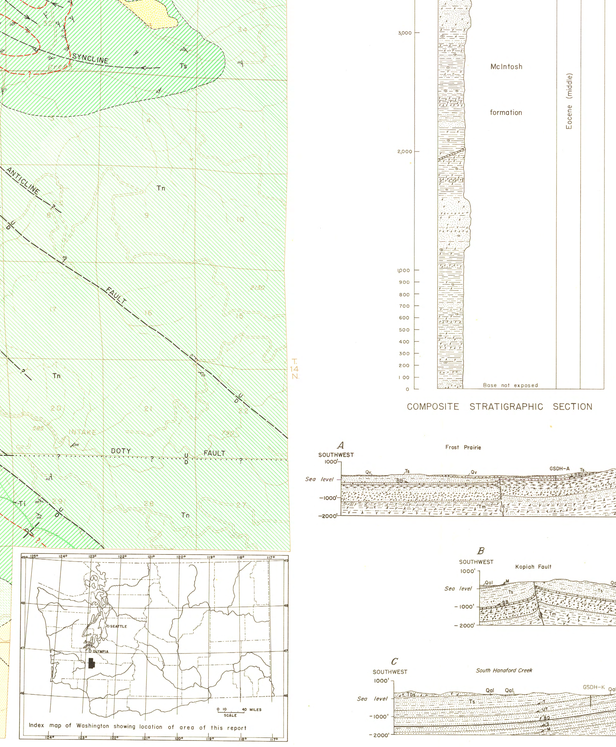
UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

COAL INVESTIGATIONS
MAP C 8 (IN 2 SHEETS) SHEET 1





Base compiled by J.D Hill from U.S. Geological Survey topographic maps of the Chehalis, Tenino, and Yelm quadrangles, and from aerial photographs.

GEOLOGY OF THE EASTERN PART OF THE CENTRALIA - CHEHALIS COAL DISTRICT LEWIS AND THURSTON COUNTIES, WASHINGTON

By
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INTRODUCTION

This report gives the results of geologic investigations made in the eastern part of the Centralia-Chehalis coal district of southwest Washington. Detailed geologic mapping and stratigraphic studies were supplemented by a few drill holes. The purpose was to obtain the structural and physical character of the individual coal beds and also to determine the continuity of the beds. It is hoped that the information on coal resources thus obtained will provide data useful in the development and utilization of the coal, and that knowledge of the geology will be helpful to mineral industries growth of this region. Exploratory drilling for oil and gas has been thus far unsuccessful and geologic conditions are not favorable for the accumulation of petroleum; the geologic information obtained during this investigation may, however, be helpful in the location of water wells and in the search for underground water that may be favorably developed.

The Centralia-Chehalis coal district lies in the southern part of Thurston County and northern part of Lewis County, near the Willamette Principal Meridian. The part of the district described in this report is bounded by parallels of latitude 46°30' and 46°45' and by meridians 122°45' and 123°00' W. The coal fields are bordered on the north and east by the Skookumchuck River and on the south by the Chehalis River. The district is crossed and dissected by the Skookumchuck River and its principal tributaries, Johnson Creek and Coal Creek, and by the Chehalis River and its principal tributaries, Salmon Creek and Newaukum River. The area is mostly hilly and mountainous, and the coal-bearing rocks are broad and flat. With the exception of the Chehalis River west of the area mapped. The region is largely covered by glacial drift, which in most places overlies Pre-Pleistocene geologic formations and underlying bedrock in most places. Landslides and soil slumps, common throughout the region, are widespread and in many places obscure the strata near the surface.

This investigation was started by the senior author in the summer of 1946. Assistance in 1947 was given by A. E. Wolf, and J. D. Hill. Geologic field studies were completed in the summer of 1948. In 1949 and 1950 Linn Hoover, Jr., and M. H. Pease, Jr., were employed. The senior author and writers are indebted to H. E. Yokes, H. D. Gillson, and W. W. Rubey for geologic information and to Ira S. Allison for help in the paleontologic determinations. The cooperation of Messrs. Ralph Hoffstetter, Chief Engineer, and Ralph Bowman, Geologist, State Department of Conservation was helpful. It is gratefully acknowledged as are also the information and assistance given by many residents of the district, especially W. E. Culver, whose field notes yielded valuable information, particularly on abandoned mines and prospects.

STRATIGRAPHY

The rocks that crop out in the eastern part of the Centralia-Chehalis district have a thickness of more than 10,000 feet. They consist of sedimentary rocks and a few intrusive igneous rocks with Intermediate to basic composition. Their range is age from middle Eocene to Miocene(?). They are unconformably overlain by Pleistocene and Recent deposits of unconsolidated sand, silt, and gravel. The oldest rocks exposed in the eastern part of the Centralia-Chehalis district are of marine tuffaceous siltstone and claystone with interbedded sandstone and conglomerate. They are the oldest rocks exposed in the coal area along State Highway 6 in the south side of Lake McIntosh have been named the McIntosh formation.

The McIntosh formation is overlain by the Skookumchuck formation, which consists in the area of Coal Mountain anticline, where the soft siltstone and claystone form a low valley, and the Skookumchuck is the lowest coal bed. It is exposed within the valley of this stream and was mined in 1947 by the Ohlo Oil Co., on Sec. 35, T. 16 N., R. 1 W., Indicates that the Skookumchuck underlies the valley floor. The upper part of the formation consists of 200 feet of massive erosion resistant sandstone, which has been extensively quarried near Tenino.

In fresh exposures the McIntosh formation consists of well-indurated dark-gray siltstone and claystone that weathers with some thin beds of tuff and sandstone. The siltstone and claystone are commonly massive and in most places are exposed in vertical cuts along State Highway 6. In some beds are preserved megafossils, are present in some exposures. The rocks are commonly jointed and break with a blocky fracture. In some localities, as in the vicinity of Coal Mountain anticline, there are interbedded with thin beds of tuff and sandstone. The tuff beds are commonly yellow and weather into small rounded fragments. The sandstone beds are commonly thin and rarely more than a few feet thick. Sandstone concretions are common in the vicinity of Coal Mountain anticline, where the soft siltstone and claystone form a low valley. Concretions are rare in the upper part of the formation. The thickness of this member was measured by the writers and by the Ohlo Oil Co., on Sec. 35, T. 16 N., R. 1 W., indicates that the McIntosh formation is at least 2,000 feet thick. The lower part of the formation consists of 200 feet of massive siltstone and claystone, which has been extensively quarried near Tenino.

The arkosic sandstone in the McIntosh formation is massive and is commonly cross-bedded and contains tuffaceous material. Most of the sediments, some of which have been derived from metamorphic and igneous rocks with the addition of pyroclastic material, are fine grained. The sandstone is commonly gray, but locally is yellowish-brown. It is massive-bedded and a few megafossils, and locally is conglomeratic. This sandstone is well exposed in the vicinity of Northcraft Mountain, where the thickness was obtained for building stone.

Microscopically the arkosic sandstone is composed of about 75 to 90 percent clastic grains and 10 to 25 percent matrix. The clastic grains are mostly angular to subangular. From the matrix, plagioclase (labradorite and andesine), euhedral and distinctly zoned, makes up 25 to 40 percent of the rock. Quartz, which is commonly strained, is present in small amounts. Orthoclase and microcline are commonly present to 30 percent of the rock. The plagioclase grains are angular to subrounded and the orthoclase and microcline are rounded and monocrystalline fragments, which generally are crenulated, mass of the rock. Rock fragments, which are commonly present, but they generally constitute less than 10 percent of the sandstone. Glass, which at many places is altered to chlorite, is present in small amounts. Accessory minerals are hornblende, augite, and hornblende.

Pyroclastic material interbedded in the McIntosh formation ranges from fine tuff to lapilli-tuff. The tuffs consist of fragments of volcanic glass, which is altered to chlorite, and euhedral crystals of zoned plagioclase (labradorite), calcite, zeolites, and altered glass. Welded tuffs were observed in the vicinity of Coal Mountain anticline, where the tuffs are commonly cross-bedded.

The megafossils collected throughout the McIntosh formation were poorly preserved. Some of the fossils collected from the upper part of the formation can be correlated with the Keasey formation of Oregon. (See table 1).

East of the Centralia-Chehalis district the McIntosh formation crops out along the Skookumchuck River a mile east of the district boundary in the vicinity of Bunker Creek in Sec. 8, T. 15 N., R. 2 W. This area is partly in the Packwood quadrangle and contains richest coarse grained clastic deposits in the district. The rocks consist of tuffaceous siltstone, tuffaceous sandstone, and tuff breccia and conglomerate. Some of the sandstone beds are conglomeratic. Pebbles and cobbles of andesite, basalt, and porphyry are common in the conglomerate. The tuffaceous siltstone is commonly massive and contains many thin beds of tuff. Some of the tuff beds are lapilli-tuff. The tuffaceous sandstone is commonly cross-bedded and is composed of fragments of volcanic glass, plagioclase, and hornblende. The tuff breccia and conglomerate are composed of angular to subrounded fragments of andesite, basalt, and porphyry. The matrix consists of tuffaceous material and is commonly altered to chlorite. The rocks are commonly jointed and break with a blocky fracture. They are commonly massive and are exposed in vertical cuts along the Skookumchuck River. The thickness of the McIntosh formation in this area is more than 2,000 feet.

The Centralia-Chehalis coal district lies in the southern part of the Puget Sound basin, which is a structural trough that extends from the Strait of Juan de Fuca southward to the Columbia River. The trough is bounded on the east by the Cascade Mountains and on the west by the Olympic Mountains. The Puget Sound basin is filled with a thick sequence of Tertiary sedimentary rocks, which are folded into a series of northward-trending anticlines and synclines. The Centralia-Chehalis district is on the southern plunging end of the Puget Sound basin. The structure of the district is complex and is dominated by the Skookumchuck anticline, which is a major fold that trends northward through the district. The Skookumchuck anticline is a broad, asymmetrical fold that is overturned on the west side. The axial trace of the anticline is offset by a number of faults that trend northeastward. The Skookumchuck anticline is cut by the Skookumchuck River in the vicinity of Centralia, where the river has cut a deep gorge through the anticline. The Skookumchuck anticline plunges to the north and to the south. The anticline plunges to the northeast into the Toto Basin before the axial trace is offset by the Skookumchuck fault. The anticline in this field is steep, with dips as high as 80°, whereas the dips along the northeast limb range from 25° to 50°. South of the Skookumchuck River the axial trace of the anticline has not been mapped north of Bill Creek.

The Newaukum Creek syncline, a northward-trending fold, parallels the east side of Newaukum Creek from a point near the junction of Dogden and Newaukum Creeks southward to the Coal Creek fault, where the fold terminates. A second parallel fold divides the syncline into two subsidiary basins.

The Toto Basin, which is the major downward in the area mapped, is broad and shallow. Its dips are generally less than 10°, but locally they are as much as 20°. The axial trace of the Toto Basin syncline trends northward from the Coal Creek fault and then curves northeastward. The Toto Basin is asymmetrical and the axial trace is closer to the west limb than to the east limb. The eastern limb is overturned in the vicinity of Coal Creek fault. The Toto Basin is bounded on the west by the Skookumchuck anticline and on the east by the Coal Creek syncline. The Toto Basin is terminated on the north by the Skookumchuck fault, which has a displacement of 1,000 feet. The Toto Basin is terminated on the south by the Coal Creek fault, which has a displacement of 1,000 feet.

The Coal Creek anticline is a narrow northwest-plunging fold that is overturned on the southwest side. The axial trace of this structure and the trace of the axis of the anticline trends northward from the Coal Creek fault to the north of Snyder Creek.

The Snyder Creek and Thompson Creek synclines are shallow northwest-trending canoe-shaped folds, separated by a narrow, west-plunging anticlinal fold. The northeast end