AREAL GEOLOGY OF THE THUNDER HAWK QUADRANGLE

by

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INTRODUCTION

This quadrangle was mapped in the summer of 1953 as a part of the State Geological Survey's coal resources program. Exploratory drilling for subsurface coal was also done in 1953.

LOCATION

The quadrangle lies in the northwestern corner of Clark County and along the north Dakota line. It is in the Standing Rock Indian Reservation, the area is approximately 127 miles north-west of Fiebo and 137 miles northeast of Rapid City.

GEOGRAPHY

This area is a lightly inhabited region of rolling prairie lands intersected by small patches of bad lands. Most of the quadrangle is, on the Cannonball River-Grand River divide. All the major streams are intermittent. Only the permanent water body in the quadrangle is the artificial Markostown Lake. The approximate relief is 400 feet.

The climate is semi-arid with an average rainfall of 14-17 inches. Dryland farming and stock grazing are the principal agricultural pursuits.

The only towns in the area, Thunder Hawk, with a population of 20 and Kehlmo, with 30-40 inhabitants, are both on the main line of the Chicago, Milwaukee, St. Paul and Pacific Railroad and US Highway 12. Many county and township roads make the area fairly accessible.

STRATIGRAPHY

Surface rocks of this quadrangle consist of Cretaceous, Tertiary, and Quaternary sediments.

TONGUE RIVER FORMATION

This formation occurs in the southern part of the map area. The member is a heterogeneous series of interbedded and lensing lithologies, grey to buff bentonitic clay and grey to buff, slightly bentonitic clay and sandy clay, with occasional brown peat clays. There are numerous horizons of manganese-iron concretions.

LUDLOW FORMATION LLOYD AND HAKES, 1914: Outcrops of this formation are found along Hay Creek, on the eastern edge of the area, and in an irregular strip across the center of the map. Like the Hay Creek, the Ludlow consists of a variety of interbedded and lensing lithologies; grey to buff, cross-bedded medium and fine-grained arkose and graywacke sands, silt and clay, and sandy clays. Numerous slaty lenses of carbonaceous sandstone "cementations," and grey to brown silt and clay, locally at the base of the formation, there is the Shadhill coal facies consisting of 15 to 20 feet of grey to brown clays, brown peat clays, and buff to rusticy silt and clay, with one or more thin interbedded lignite seams (3 to 12 feet).

The Ludlow facies, stratigraphically about 60 to 90 feet above the Shadhill, consists of a series of interbedded and lensing lithologies; grey to buff, cross-bedded medium and fine-grained arkose and graywacke sands, silt and clay, and sandy clays. There are numerous carbonaceous graywacke lenses and ledges; and in the northeast corner of the map area, the facies consists of one or more lignitic coal seams (3 to 10 feet) interbedded with grey to dark grey clay, brown peat-clay, and grey to buff clayey graywacke sands. Fossilized thickness in this area is 10 feet plus.

The Ludlow is approximately 125-200 feet in this area. The upper portion interfingers laterally with the lower Cannonball formation.

CANNONBALL FORMATION LLOYD, 1914: Good outcrops of this formation are not abundant, but fragments of the characteristic concretions are scattered over the uplands in the north-central and northwest portions of the quadrangle. The formation consists of interbedded and lensing grey to buff clay and grey, clayey fine graywacke sands, with abundant small concretions of dense grey limestone. There are numerous carbonaceous graywacke lenses and ledges; and in the northeast corner of the map area, there is a 30 to 40 feet of irregular and continuous, interbedded with grey to dark grey clay and brown peat clays. The lower part of the Cannonball interfingers laterally with the upper part of the Ludlow.

TONGUE RIVER FORMATION (TAFM, 1909): Exposures of this formation are restricted to the area of the Cannonball River, Batte, and the surrounding area south of the area.

TERRACE GRAVELS: These are the gravel deposits, generally near a major stream, consist of coarse angular gravel and medium and fine sand derived principally from the Ludlow, Cannonball, and Tongue River formations. These terraces are best developed on the northeast corner of the mapped area.

There is a slight regional dip to the northwest and center of Dakota (Williston) Basin. Superimposed upon this regional structure are small minor faults and folds, with displacements less than 20 feet.

ECONOMIC GEOLOGY

Coal is the only currently exploited mineral resource in this area.

In addition to gravel, clay has potential value. Small quantities of lignite and coal have been mined in the past, but according to present day standards, there are no commercial coal deposits in this area.

Gravel: Angular gravel deposits occur along both banks of Hay Creek, Willow Creek, and other smaller unnamed creeks. The deposits characteristic by broken concretions and sandstone fragments from local formations, contain a high percentage of sand and clay, but are still adequate for road metal.

The high terraces deposits of clean gravel gravel in the SR and SE parts of the map area may be used as aggregate for concrete as well as road metal. Estimated volumes for the larger gravel deposits are given in the following table.

<table>
<thead>
<tr>
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<th></th>
<th></th>
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<tbody>
<tr>
<td>27,18,19,30</td>
<td>23</td>
<td>19</td>
<td>130</td>
<td>5</td>
<td>1,032,133</td>
</tr>
<tr>
<td>27,23,30</td>
<td>23</td>
<td>19</td>
<td>92</td>
<td>5</td>
<td>782,133</td>
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<tr>
<td>29,30</td>
<td>23</td>
<td>19</td>
<td>89</td>
<td>4</td>
<td>574,347</td>
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<td>19</td>
<td>76</td>
<td>4</td>
<td>494,453</td>
</tr>
<tr>
<td>19,24,30</td>
<td>23</td>
<td>19</td>
<td>19</td>
<td>3</td>
<td>362,963</td>
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</tbody>
</table>

Some of the clay horizons in the hill creek formation contain a high percentage of bentonite and may be used as a sealer in earthen dams. Coal: The Ludlow formation has an area contains two discontinuous coal horizons, the Hillel and Shadhill facies. Neither has present day commercial potentialities. A brief description of each facies follows.

Hill Creek: Black silt and barely clays, green bed, lignite coal seams varying in thickness from 3 to 12 feet. The thin seams contain a large amount of clay.

Shadhill: Black silt and barely clays, lignite coal seams in beds from 3 to 20 feet thick. Thickness of over 10 feet are restricted to a very small area, under an acre.

The following are coal analyses from this general area:

<table>
<thead>
<tr>
<th>Location</th>
<th>Moisture</th>
<th>Volatile Matter</th>
<th>Fixed Carbon</th>
<th>Ash</th>
<th>Sulfur B.T.U.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hill Creek 19, 24, 30</td>
<td>37,524</td>
<td>27,456</td>
<td>7,456</td>
<td>27,182</td>
<td>0,246</td>
</tr>
<tr>
<td>Shadhill 24, 21, 30</td>
<td>45,404</td>
<td>29,373</td>
<td>9,689</td>
<td>15,546</td>
<td>0,665</td>
</tr>
</tbody>
</table>

Measurements in nearby quadrangles give the complete thickness as 60 to 70 feet. Measurements in the adjacent Cannonball quadrangle to west give an estimated thickness of at least 100 feet.