AREAL GEOLOGY OF THE BLACK HORSE BUTTE QUADRANGLE

By Robert E. Curtiss

The quadrangle is located in western Custer County, about 100 miles northwest of Pierre and 125 miles southwest of Rapid City. It is bounded on the north by parallels 45°30' and 46°45', north latitude and meridians 105°51' and 107°01' west longitude, enclosing an area of approximately 210 square miles.

TOPOGRAPHY AND GEOMORPHIC

The Grand River valley is a distinctive topographic feature. The Grand River meanders across the northern part of the area from west to east. The valley, which varies in width from 1 to 3 miles, is characterized by flat terraces and meander scarps. The valley is about 3 miles wide, and its floodplain is about 1 mile wide. The valleys of the Clear Creek and the Black Horse Butte Creek are similar to the Grand River valley.

GENERALIZED COLUMNAR SECTION

The columnar section is illustrated in the figure below. The bedrock consists of a sequence of interbedded sandstones and shales. The sandstones are mainly fine-grained, and the shales are mainly medium-grained. The sequence is approximately 400 feet thick.

STRIATIGRAPHY

The exposed stratigraphic sequence, ranging from the base upward, consists of: (1) the Lower Cretaceous Hell Creek Formation; (2) the Upper Cretaceous Bell Creek and Black Horse Butte Creek Formations; (3) the Paleocene Epoch; and (4) the Eocene Epoch. The sequence is about 1,000 feet thick.

DEPOSITIONAL ENVIRONMENTS

The Lower Cretaceous Hell Creek Formation is a sandstone primarily due to the deposition of sand in a fluvial environment. The Bell Creek and Black Horse Butte Creek Formations are also primarily sandstones, but they are composed of a mixture of sandstone and shale. The Paleocene Epoch is characterized by the deposition of sandstone and shale in a continental environment. The Eocene Epoch is characterized by the deposition of sandstone and shale in a marine environment.

PHYSICAL CHARACTER

The area is characterized by a generally flat topography with a few small hills and valleys. The climate is continental, with hot summers and cold winters. The area is subject to occasional snowstorms and flooding.

Sample analyses and petrographic studies indicate that the sandstones are composed of quartz, feldspar, and mica. The shales are composed of clay minerals and organic matter. The rocks are generally hard and durable, and they are well suited for construction and infrastructure projects.

The estimated volume of sand and gravel for large-scale operations totals in excess of 110,000,000 cubic yards. The largest terrace estimates follow:

<table>
<thead>
<tr>
<th>Terrace</th>
<th>Volume (cubic yards)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>25,000,000</td>
</tr>
<tr>
<td>2</td>
<td>30,000,000</td>
</tr>
<tr>
<td>3</td>
<td>40,000,000</td>
</tr>
</tbody>
</table>

The area is suitable for various uses, including road construction, housing developments, and industrial projects. The area is also suitable for recreational activities, such as hiking, fishing, and bird watching.