SURFICIAL GEOLOGY, STRUCTURE, AND THICKNESS OF SELECTED GEOHYDROLOGIC UNITS IN THE COLUMBIA PLATEAU, WASHINGTON

By B.W. Drost and K.J. Whiteman
1986

INTRODUCTION

The Columbia Plateau is a vast upland region characterized by a uniform surface of basaltic rock. The surface of this plateau is composed of the Columbia River Basalt Group, which formed as a result of the eruption of large volumes of basaltic lava during the Pleistocene Epoch. The Columbia Plateau is a feature of great significance to the hydrogeology of the region, as it provides a significant source of groundwater recharge and storage.

The Columbia Plateau is divided into three major basalt units: the Grande Ronde, Wanapum, and Saddle Mountains Basalts. These units are separated by thin sedimentary interbeds and are characterized by distinct petrography and internal structure.

The Grande Ronde Basalt is the oldest of the three units and is characterized by its fine-grained texture and low porosity. The Wanapum Basalt is younger than the Grande Ronde and is characterized by its coarse-grained texture and higher porosity. The Saddle Mountains Basalt is the youngest of the three units and is characterized by its intermediate porosity and texture.

The Columbia Plateau is underlain by Precambrian to lower Tertiary sedimentary, metamorphic, and granitic basement rocks. These rocks form the subsurface geology of the region and are important in determining the hydrologic behavior of the groundwater system.

The surficial geology of the Columbia Plateau is simplified from published maps to provide maps with this information at the 1:500,000 scale. The surficial geology shown on sheet 2 is simplified from Swanson and others (1982), Gardner and others (1982), and other sources.

The accuracy of identification of geologic units is dependent primarily on the method of preparation of the maps from drill chips, geophysical or geologist's logs, or driller's logs, in decreasing order of reliability.

ACKNOWLEDGMENTS

The preparation of maps and reports, literature, and well data is supplemented by information from Water-Resources Investigations Report 86-195. Map materials were acquired from the Geological Survey, Washington, and were mapped by the Washington State Geological Survey. Map materials were also acquired from the U.S. Geological Survey.

The Columbia Plateau is intended to serve as a base for evaluating the distribution of dissolved sodium in basalt aquifers and to relate these variations to the ground-water flow system and its relationships and nomenclature for the Columbia River Basalt Group; Swanson and others (1982). Studies that contributed directly to the preparation of these maps include:

- Identification of geologic units;
- Drilling and sampling of wells;
- Geophysical logging of wells;
- Analysis of water samples;
- Compilation of data points;
- Preparation of maps.

These contributions are gratefully acknowledged. Geophysical logs and analyses of water samples from wells contributed by the Washington State Department of Health, the U.S. Geological Survey, the Washington State Geological Survey, and the State of Washington are included in the study area.

REFERENCES


FIGURE 1-Map of the Columbia Plateau (Other Sources and others, 1982).
Surficial Geology

SURFICIAL GEOLOGY, STRUCTURE, AND THICKNESS OF SELECTED GEOHYDROLOGIC UNITS IN THE COLUMBIA PLATEAU, WASHINGTON
By
B.W. Drost and K.J. Whiteman
1986
SURFICIAL GEOLOGY, STRUCTURE, AND THICKNESS OF SELECTED GEOHYDROLOGIC UNITS IN THE COLUMBIA PLATEAU, WASHINGTON

By
B.W. Drost and K.J. Whiteman

1986
Altitude of the top the Grande Ronde Basalt and combined thickness of Grande Ronde and older basalts

SURFICIAL GEOLOGY, STRUCTURE, AND THICKNESS OF SELECTED GEOHYDROLOGIC UNITS IN THE COLUMBIA PLATEAU, WASHINGTON

By

B.W. Drost and K.J. Whitman

1986
The stratigraphic nomenclature of interbeds between basalts of the Columbia River Basalt Group has not been formally defined. Thicknesses shown on this sheet are for interbed materials identified as lying between the Grande Ronde and Wanapum Basalts. These materials are probably equivalent to the Vantage Member of the Ellensburg Formation in the western part of the study area and the Latulip Formation in the northeastern part (Swanson and others, 1979c).

Identification of the interbed between the Grande Ronde Basalt and Wanapum Basalt from geophysical logs, geologists' logs, and drillers' logs is generally very difficult. The interbed is commonly at great depth, thin, and composed of materials with properties similar to flow top materials. Materials identified as interbeds probably include some flow-top clinker material, highly weathered zones in the basalts, and soil zones, in addition to fluvial, lacustrine, and eolian sediments. In most wells (about 80 percent) in which interbed materials are identified, the materials are fine-grained (clay, silt, claystone, or siltstone). Those wells with coarse-grained interbed materials (about 20 percent) generally have sand, sand and gravel, or sandstone. There is no apparent pattern of distribution of fine-grained versus coarse-grained materials.

Thickness of the interbed between the Grande Ronde Basalt and Wanapum Basalt
EXPLANATION

1. Zoning between Quaternary Basalt at land surface and rocks older than Grande Ronde (primarily sedimentary and granitic rocks).
2. Lines of equal thickness of Wanapum Basalt in feet. Contour interval varies.
3. Interpretation based on:
   - Chemical analysis of core or drill chips, field-checked well.
   - Chemical analysis of core or drill chips, non-field-checked well.
   - Geophysical or geologist's log, field-checked well.
   - Geophysical or geologist's log, non-field-checked well.
   - Driller's log, field-checked well.
   - Driller's log, non-field-checked well.
   - Well does not fully penetrate Wanapum Basalt.

THICKNESS OF THE WANAPUM BASALT

Contours are based primarily on data at points shown, supplemented by the structural features map. In areas of sparse data or complex geology, structure contour maps of Swanson and others (1979b) and Myers and Price (1979 and 1981) were used to supplement the data points.

SURFICIAL GEOLOGY, STRUCTURE, AND THICKNESS OF SELECTED GEOhYDROLOGIC UNITS IN THE COLUMBIA PLATEAU, WASHINGTON

By B.W. Drost and K.J. Whiteman
1986
Altitude of the top of the Wanapum Basalt

SURFICIAL GEOLOGY, STRUCTURE, AND THICKNESS OF SELECTED GEOLITHROLOGIC UNITS IN THE COLUMBIA PLATEAU, WASHINGTON

By

R.W. Drost and K.J. Whitman

1986
EXPLANATION

INTERBED BETWEEN THE WANAPUM BASALT AND SADDLE MOUNTAINS BASALT

Stratigraphic nomenclature of interbeds between basalts of the Columbia River Basalt Group has not been formally defined. Thicknesses shown on this sheet are for interbed materials between the Wanapum and Saddle Mountains Basalts. These materials are probably equivalent to the Mabton Member (informal usage) of the Ellensburg Formation. In at least a few locations the interbed materials between the Wanapum and Saddle Mountains Basalts are known to include other members of the Ellensburg Formation, which are younger than the Mabton Member.

The interbed between the Wanapum Basalt and Saddle Mountains Basalt was identified from geophysical logs, geologists' logs, and driller's logs. Identification is difficult in places because the interbed is composed of materials with physical properties similar to flow top materials. Materials identified as interbeds probably include some flow-top clinker material, highly weathered zones in the basalts, and soil zones, in addition to fluvial, lacustrine, and eolian sediments. In most wells (about 70 percent) in which interbed materials are identified, the materials are fine-grained (clay, silt, claystone, or siltstone). Those wells with coarse-grained interbed materials (about 30 percent) generally have sand, sand and gravel, or sandstone. The only apparent pattern of distribution of fine-grained versus coarse-grained materials is regional in scope. In the southeast part of the study area fine-grained interbed materials were penetrated by 90 percent of the wells; in the Walla Walla area by about 86 percent of the wells; and in the Pasco Basin and surrounding area by about 68 percent of the wells.
EXPLANATION

THICKNESS OF THE SADDLE MOUNTAINS BASALT

The thickness of the Saddle Mountains Basalt is shown on this map. The contours are based primarily on data points as shown, supplemented by the structural features map and the top and thickness maps of the Wanapum Basalt.

SURFICIAL GEOLOGY, STRUCTURE, AND THICKNESS OF SELECTED GEOHYDROLOGIC UNITS IN THE COLUMBIA PLATEAU, WASHINGTON

By

R.W. Drost and K.J. Whiteman

1986
SURFICIAL GEOLOGY, STRUCTURE, AND THICKNESS OF SELECTED GEOHYDROLOGIC UNITS IN THE COLUMBIA PLATEAU, WASHINGTON

B.W. Drost and K.J. Whiteman
1986
OVERBURDEN

The term overburden as used here refers to all materials overlying the Columbia River Basalt Group. Included are all post-Columbia River Basalt Group Pliocene to Holocene sediments (fluvial, glaciofluvial, eolian, and volcaniclastic), Quaternary basalts and andesites, and that part of the Miocene sediments (Ellensburg and Latah Formations) that overlies the Columbia River Basalt Group. The surficial distribution of overburden shown is simplified from Swanson and others (1979a) who included only those areas "where important bedrock relations are obscured" by overburden. This includes most areas where overburden thicknesses are 50 feet or more. Where well data indicate that overburden is in excess of 50 feet thick but no overburden is shown, thickness is shown next to each data point. Conversely, where well data indicate overburden thicknesses of less than 50 feet and overburden is shown on the map, data points indicating thicknesses of less than 50 feet are shown. Where Quaternary basalts or andesites are included in the overburden, their thickness is indicated on the map next to each data point.