



GEOLOGY OF THE HAT CREEK BASIN

By B. N. Church

INTRODUCTION

Coal deposits in the Hat Creek basin, located about 22 kilometres west of the village of Cache Creek, are currently being investigated by the British Columbia Hydro and Power Authority. A reserve of several hundreds of millions of tonnes of sub-bituminous coal is indicated by recent drilling (Fig. 20).

This report is intended as a brief outline of the Hat Creek area preliminary to a more detailed report to be published in *Geology, Exploration and Mining in British Columbia, 1975*. The descriptions and interpretations offered are based mainly on direct field observations by the writer during June and July, 1975.

PHYSIOGRAPHY AND GLACIAL HISTORY

The valley formed by the upper reaches of Hat Creek, site of the coal deposits, is a northerly trending topographic and structural depression 22 kilometres long and 3 to 5 kilometres wide. It is an open basin bounded by the rugged Clear Range on the west and Cornwall Hills on the east. Relative relief is marked by slopes rising from Hat Creek, near Marble Canyon at the north end of the valley, at elevation approximately 810 metres, to the encircling ridges and peaks with elevations in excess of 1 950 metres.

It is evident that the valley was overridden by at least two and possibly several Pleistocene ice sheets. The most recent advance originated in the Coast Mountains and moved easterly at 117 degrees, according to striae measurements, and deposited much gravel and clay. Except for the coal beds now exposed at the north end of the valley, bedrock is rarely seen on the valley floor. Reconnaissance drilling shows that the average till cover is 51 metres thick.

The soils of Hat Creek valley are characteristically clay-rich. In many areas the clays have unusual swelling properties when water saturated suggesting the presence of bentonite — a type of clay formed by the decomposition of volcanic ash. In several places bands of volcanic ash are clearly visible intercalated in the glacial deposits.

The consequence of this clay-rich mantle is evident in the area immediately north of the proposed No. 1 pit, where two large active landslides have been identified. A second active landslide area is located farther south in the vicinity of White Rock Creek.

GEOLOGY
OF
THE HAT CREEK AREA

LEGEND

COVER FORMATIONS

- VOLCANIC ROCKS (MIOCENE ?)
- SEDIMENTARY ROCKS (Eocene ?)
- COAL BEDS (Eocene ?)
- VOLCANIC ROCKS (CRETACEOUS AND EARLY TERTIARY ?)

BASEMENT COMPLEX

- GRANITIC STOCK (MESOZOIC)
- PALEOZOIC LIMESTONE AND GREENSTONE

SYMBOLS

- LAKE
- STREAM
- ROAD
- GLACIAL STRIAE
- BEDDING
- DRILL HOLE
- GEOLOGICAL STATION
- PIT AREA
- GRAVITY ANOMALY STRONG NEGATIVE
- MEDIUM NEGATIVE
- FAULT LINEAMENT
- POSSIBLE FAULT

SCALE

0 1 2 3 MILES

0 1 2 3 4 5 KILOMETRES

B. N. CHURCH

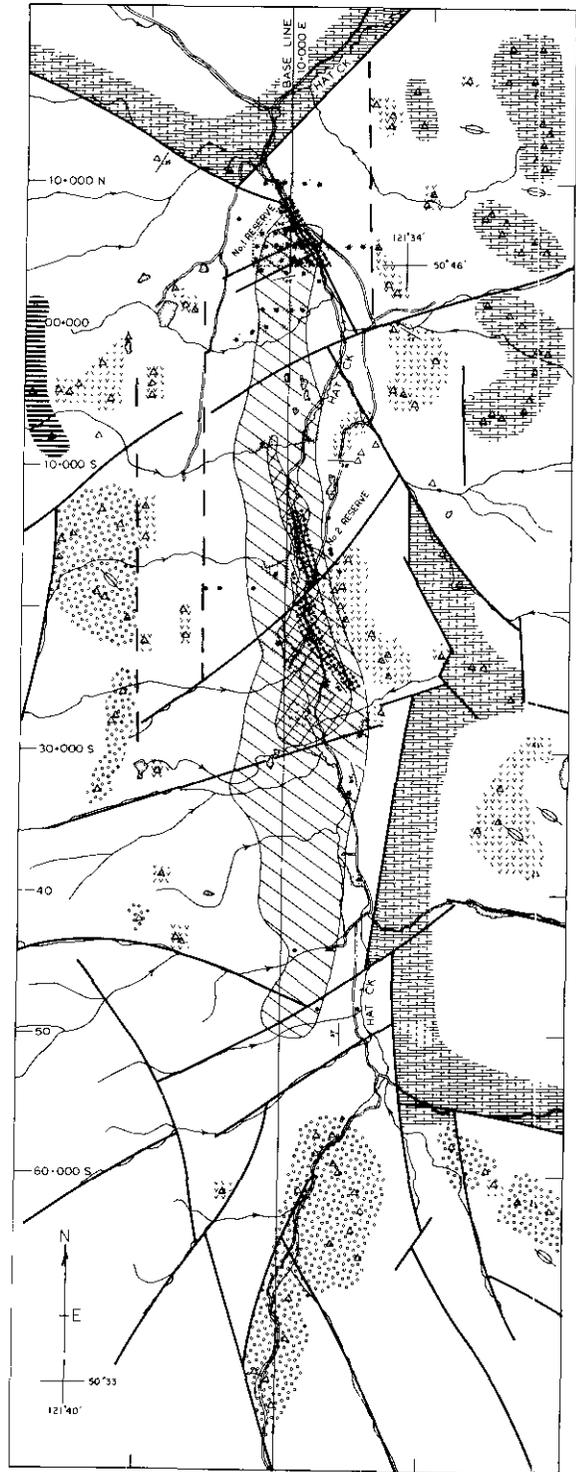


Figure 20. Geology of the Hat Creek area.

The bright yellow and reddish soils, conspicuous at several points in the valley, are residual and not glacial in origin. These are often found near coal seams and appear to be the cindery residue of burnt coal. There is evidence that much, if not all, of the exposed coal in the Hat Creek valley has been superficially burnt in prehistoric times.

GENERAL GEOLOGY AND STRUCTURE

The general geology of the Hat Creek area is shown on Figure 20.

Cover rocks of Tertiary and Cretaceous age, consisting of coal and sedimentary and volcanic formations, rest with marked unconformity on a Paleozoic basement of metamorphosed carbonate rocks and greenstones.

The soft, easily eroded coal and shaly formations occur mainly on the floor of the valley whereas the resistant volcanic rocks and basement formations are found on the valley slopes and ridge crests.

Although extensive glacial deposits have hampered geological investigation to date, much stratigraphic information has been obtained from drilling the 'cover rocks.' The most important relations revealed by this work show that the coal is almost everywhere overlain by a thick claystone sequence which in turn is overlain unconformably by a variety of volcanic rocks including lahars and dacite, basalt, rhyolite, and trachyte lavas.

Owing to the great thickness of the claystone and coal, often in excess of 750 metres, few drill holes have penetrated below the main coal horizon. A thick succession of intermixed sandstones, conglomerate, and shales found lateral to the coal formation are thought to underlie the coal. Andesitic volcanic rocks of the Kamloops Group (Eocene) and Spences Bridge Group (Cretaceous), exposed peripherally in the valley, appear to form the base of the 'cover rock' succession.

The general structure of the Hat Creek basin is simple. The central zone of the valley, underlain mainly by coal and sedimentary formations, has been down-dropped forming a graben. This has been achieved principally by downward movement on a series of north-south tension faults trending subparallel to the direction of regional maximum stress. Locally the walls of the graben have been offset somewhat by a series of northwest and northeast-striking conjugate shear faults. An important system of easterly trending gravity faults cutting across the basin appears to be of recent origin, and superimposed on the main graben structures.

COAL RESERVES

No. 1 Reserve

The proposed No. 1 open pit is adjacent to the original discovery on Hat Creek near the north end of the valley. Here the main near surface coal reserve covers approximately 117 hectares. The area has been thoroughly drilled yielding intersections of coal formation ranging from 150 to nearly 500 metres. Calculations based on data obtained from 21 holes indicates slightly more than 220 million tonnes determined to base elevation of 760 metres. Additional calculations, on fewer drill penetrations, suggest that about twice this tonnage can be realized by extending mining downward to base elevation of 600 metres.

Further investigation of the coal formation in this area is made difficult by the displacement of beds by major faults and the down dip burial of coal under the claystone formations.

No. 2 Reserve

A second major near surface coal occurrence was recently discovered south of the No. 1 reserve near the mid-point in the valley. This is a sinuous 3 600-metre long band of coal paralleling the axis of a large negative gravity anomaly. Initial drilling has indicated a thickness of about 510 metres of coal, the beds dipping 20 to 30 degrees westerly under the claystone formation. The band has been cut and displaced near the centre point by a fault.

The calculation of tonnage in this deposit awaits further drill results to establish the extent of the zone. There seems to be general consensus, however, that the volume of coal here well surpasses the No. 1 deposit. The quality also appears to be superior with only 15 to 25 per cent clay admixture.

OTHER POTENTIAL

The ultimate coal potential of Hat Creek basin is well delineated by the negative gravity contours. However much of the coal is deeply buried.

Figure 20 shows the position of diamond-drill holes to July 20. The positions of more recently completed holes have not been recorded and the core not yet examined. Much of this new drilling has been in the vicinity of No. 2 deposit.

Many additional holes are required to complete the testing of the gravity anomaly zone.

REFERENCES

- Dolmage, Campbell and Associates* (1975): Thermal Coal Resources of British Columbia, Hat Creek No. 1 Open Pit Deposit, summary report to British Columbia Hydro and Power Authority.
- Dolmage, Campbell and Associates* (1975): Coal Resources of British Columbia, report to British Columbia Hydro and Power Authority, pp. 5-2 to 5-27.
- Dowling, D. B. (1915): Coalfields of British Columbia, *Geol. Surv., Canada*, Mem. 69, pp. 289-294.
- Duffell, S. and McTaggart, K. C. (1952): Ashcroft Map-Area, British Columbia, *Geol. Surv., Canada*, Mem. 262, pp. 108-110.
- MacKay, B. R. (1926): Hat Creek Coal Deposit, Kamloops District, British Columbia, *Geol. Surv., Canada*, Sum. Rept., 1925, Pt. A, pp. 164-181.