British Columbia Geological Survey
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GEOLOGY OF A TERTIARY SEDIMENTARY BASIN NORTHEAST OF HAT CREEK (92I/NW)

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INTRODUCTION

This report summarizes the results of three weeks of fieldwork in a Tertiary sedimentary basin northeast of the Hat Creek area. The study was initiated in July 1974 and continued in June 1975. The area investigated includes approximately 100 square kilometres of hilly terrain, 10 to 20 kilometres west and northwest of Cache Creek. The area is underlain by a north-south-trending belt of dominantly coarse clastic rocks (conglomerate and sandstone, with minor siltstone and shale) of the Coldwater Group. These rocks appear to be bounded on all sides by greenstone, argillite, chert, and marble of the Cache Creek Group.

STRUCTURE

Exposed near the centre of the area are a number of outcroppings of Cache Creek rocks (argillite, slate, and 'greenstone') which define three aligned north-northwest - south-southeast-trending areas of outcrops (Fig. 21). Immediately to the west of these belts, the overlying Coldwater sedimentary rocks dip west at approximately 20 to 40 degrees; to the east, they dip east at 30 to 40 degrees. These exposures of Cache Creek rocks are interpreted to be within the core of an open, upright south-southeast-trending anticline (Fig. 22) with a horizontal to south-plunging fold axis (based on an equal area stereoplot of poles to layering within the central part of the basin). Coldwater beds in the eastern part of the area define the east limb of the anticline, and those in the west, the west limb.

Within the core of the anticline (the area mapped as 'Cache Creek' in Fig. 21), there are a number of small exposures of conglomerate and sandstone which appear to be members of the Coldwater Group. These may represent down-dropped fault slices suggesting the axial region of the anticline is more complex than illustrated on Figure 22.

The eastern contact of the Coldwater Group with the Cache Creek is fault controlled; the western contact is also partially fault controlled but may also be depositional since in the very western part of the basin Coldwater beds dip east (J. Irvine, *Geological Survey of Canada,* personal communication) suggesting the presence of a syncline immediately to the east of the Cache Creek contact (Fig. 22). The basin therefore probably represents a 'half-graben,' down-dropped along its eastern margin.

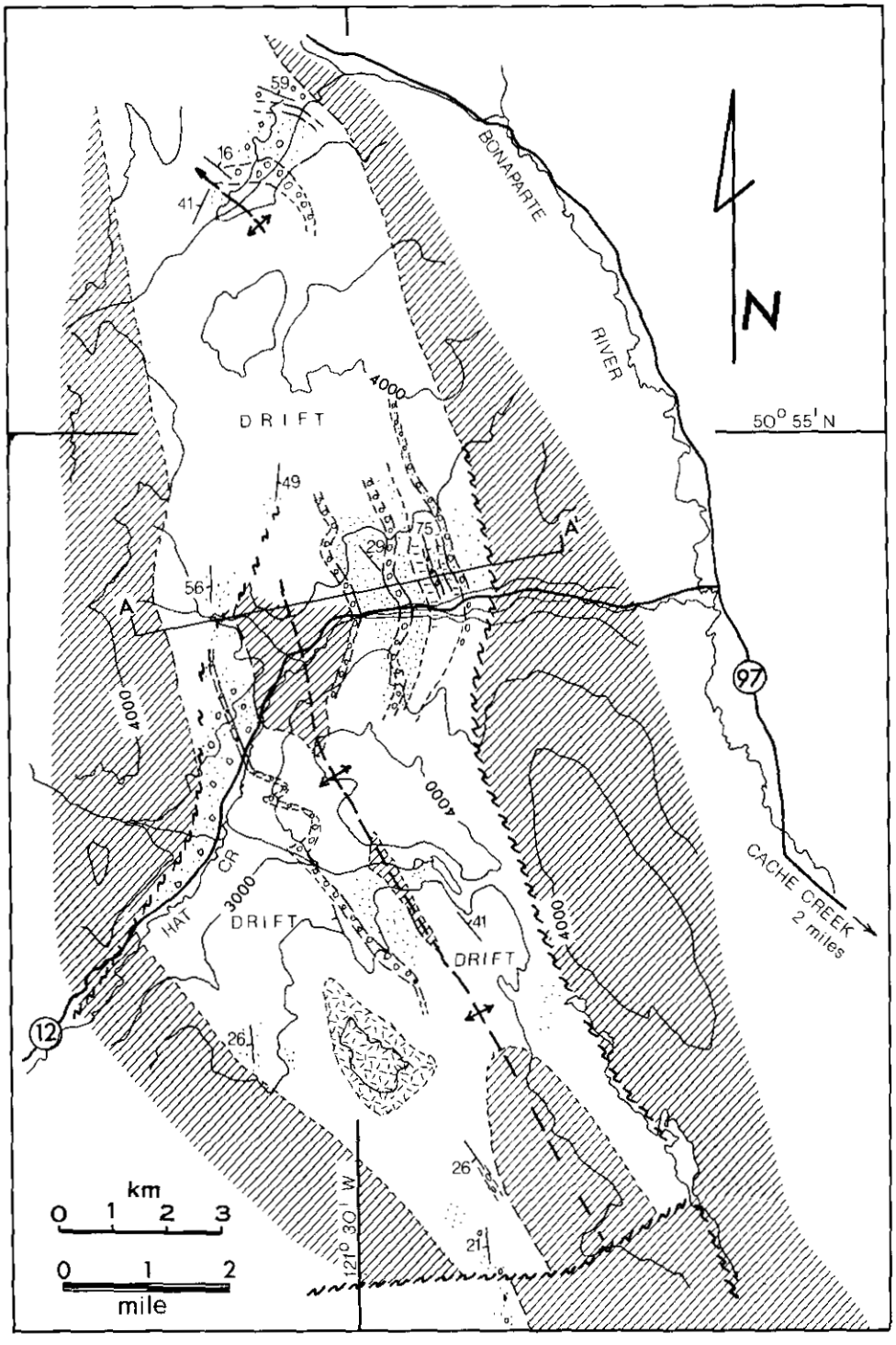

Figure 21. Geology of a Tertiary sedimentary basin northeast of Hat Creek.

LEGEND

TERTIARY

KAMLOOPS GROUP

BASALT, ANDESITE, RHYOLITE (DEFINED BY DUFFEL AND McTAGGART, 1952)

COLDWATER GROUP

SILTSTONE–SHALE; MINOR SANDSTONE AND CONGLOMERATE

SANDSTONE; RARE CONGLOMERATE

SANDSTONE; INTERLAYERED CONGLOMERATE

CONGLOMERATE; MINOR SANDSTONE

PRE–TERTIARY

CACHE CREEK GROUP – ARGILLITE, SHALE, LIMESTONE, 'GREENSTONE', ULTRAMAFICS

SYMBOLS

GEOLOGICAL CONTACT: DEFINED, APPROXIMATE, ASSUMED

BEDDING

AXIAL SURFACE TRACE OF ANTICLINE

FAULT

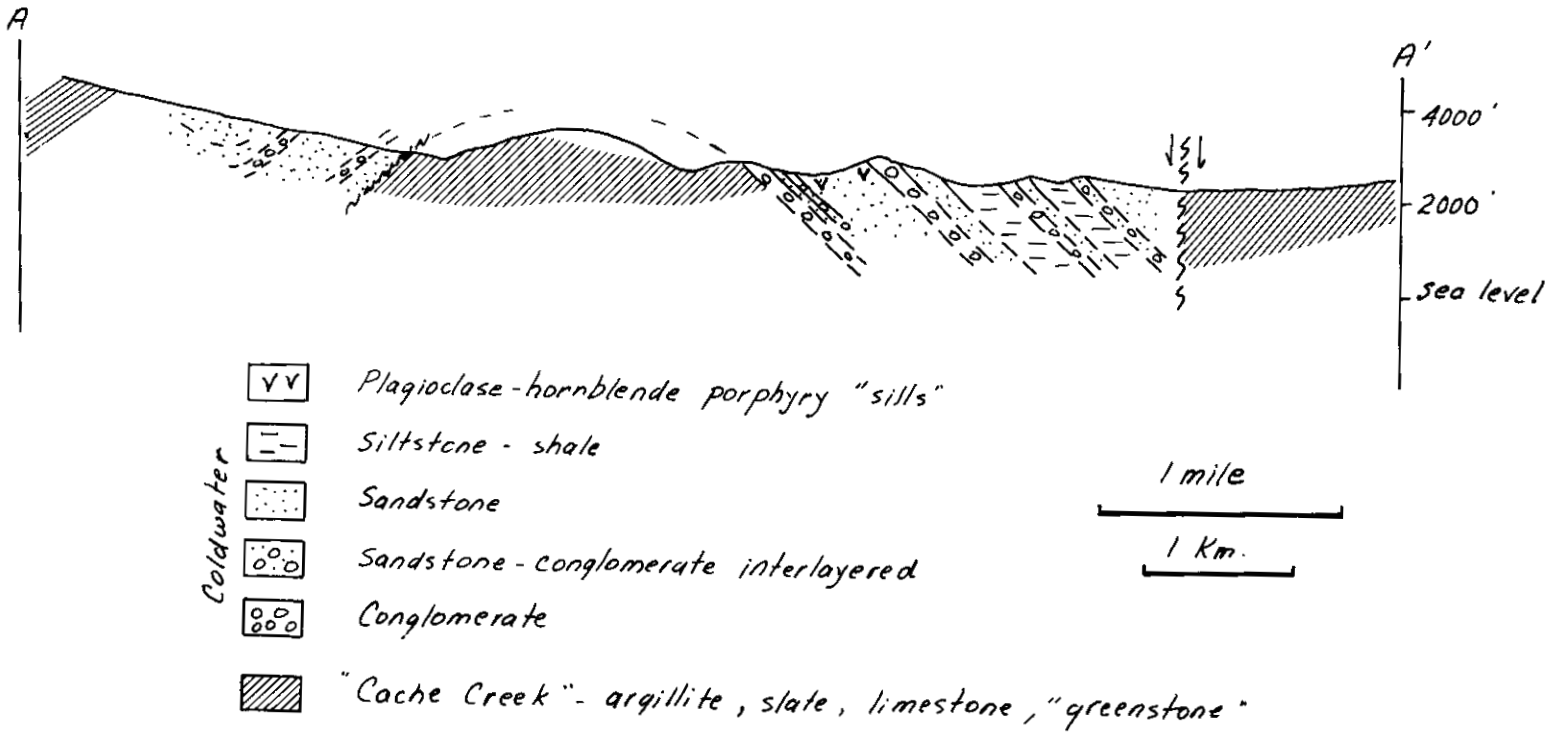

Figure 22. Vertical cross-section, Hat Creek area.

STRATIGRAPHY

Coldwater beds within the basin are composed dominantly of coarse clastic members, pebble conglomerate, and coarse to medium-grained sandstone with lesser amounts of siltstone and shale.

Conglomerates generally display a wide range of particle size, ranging from fine sand to large pebbles within a single sample. The matrix commonly forms the bulk of a sample with separated rounded to subrounded pebbles suspended in a coarse sand to granule-sized matrix. The pebbles are composed of rock fragments, similar to rocks of the underlying Cache Creek Group and hence are assumed to be derived from the Cache Creek rocks.

Sandstone members are generally better sorted, though coarse-grained layers and layers containing widely spaced pebbles are common. Sedimentary structures, such as crossbeds and less commonly, graded beds, provide sufficient data to determine stratigraphic tops throughout the area. Sandstones commonly have a green tinge, though in the western part of the area they are reddish brown. They are fairly compact, usually cemented by silica rather than carbonate.

The coarse-grained members, particularly the conglomerates, form prominent ridge exposures. The siltstones and shales are recessive weathering and are therefore poorly exposed. Hence the greater portion of the area mapped as 'siltstone-shale' on Figure 21 is interpreted from a few exposures, soil profiles, and low topographic relief.

DETAILED DESCRIPTION OF THE COLDWATER SECTION EXPOSED ALONG HIGHWAY 12

Coldwater beds exposed along Highway 12 eastward from the Cache Creek exposures (Fig. 21) are believed to represent a normal stratigraphic sequence. Numerous crossbeds within the sandstone members and some graded beds indicate that these beds become progressively younger toward the east. Structural repetitions or omissions, due to faulting, were not recognized in this sequence of rocks, although they may have been missed as a large part of the section is not well exposed. The section, illustrated on Figure 23, may therefore represent the lower 1 360 metres of the Coldwater sequence within this basin.

In general, the lower half of the exposed section is coarser grained than the upper half. The lowermost 600 metres include a thick basal conglomerate overlain by medium-grained sandstone with occasional conglomeratic lenses and two volcanic (amphibole-plagioclase porphyry) sills. Overlying the sandstone are two conglomerate-sandstone-shale sequences, each with an aggregate thickness of 300 to 450 metres.

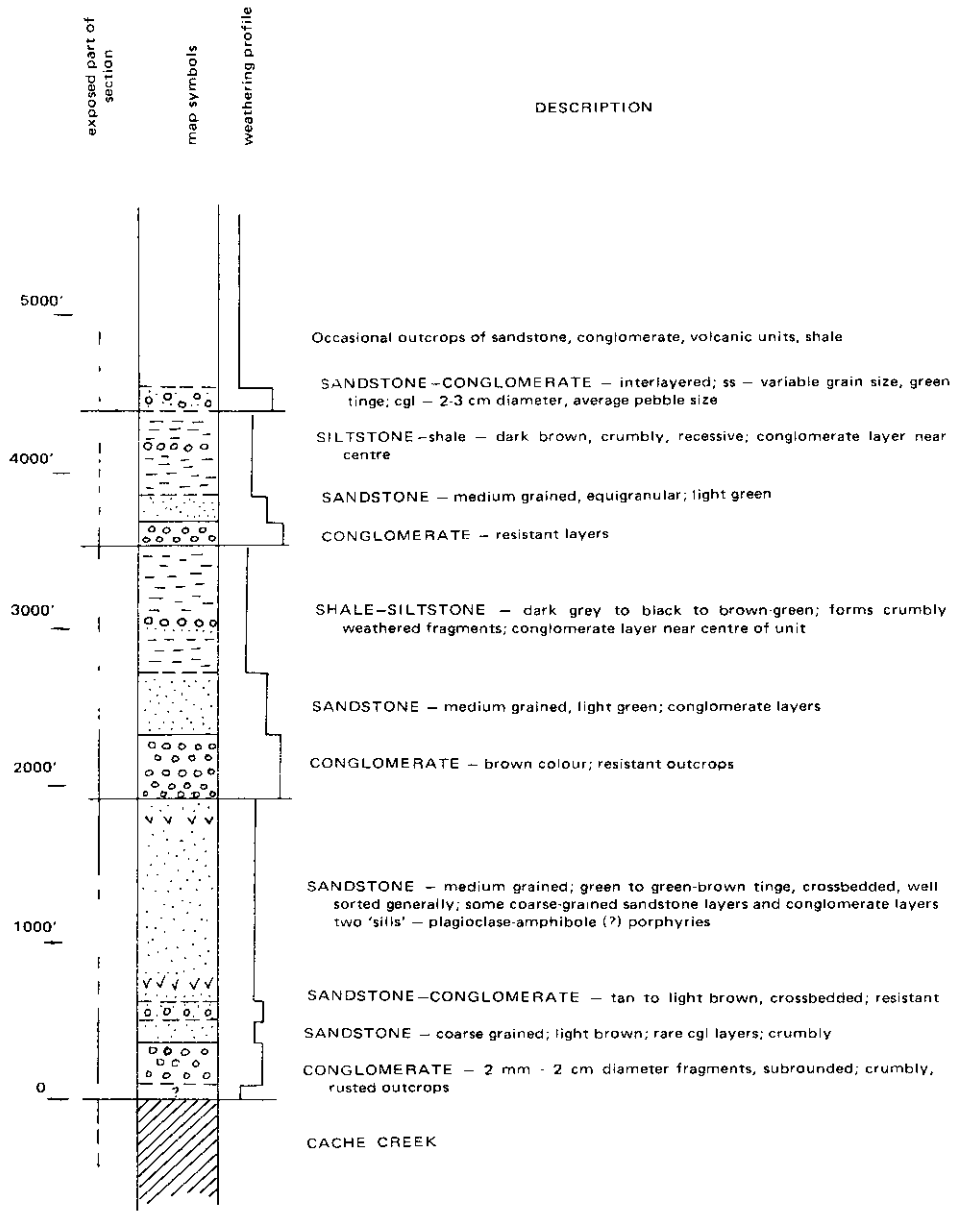

Figure 23. Sequence of rocks exposed along Highway 12, eastward (up-section) from Cache Creek exposures.

The section is thus a cyclical repetition of upward fining clastic sedimentary rocks. Three of these cyclical sequences and perhaps a part of a fourth (the lowermost, coarser grained part of it) are exposed along Highway 12. In each cycle, poorly sorted conglomerate is conformably overlain by medium to coarse-grained sandstone which, in the upper two, is overlain by dark, massive shale containing interbeds of conglomerate, grit, and sandstone. A similar sequence, conglomerate overlain by sandstone and then shale, is exposed in the northern part of the area (Fig. 21). However, it is difficult to correlate this sequence with one of the specific cycles exposed along Highway 12, even though they are roughly on strike. The various members within a cycle do not appear to be megascopically distinctive to that cycle. Hence, it has also not been possible to correlate individual units in the western part of the area, west of the anticline, with those on the east.

The pebbles and cobbles of the conglomerates are predominantly rock fragments; in decreasing order of abundance they include dark grey to black chert, quartzite, argillite, limestone, and rare volcanic fragments. The volcanic roundstones, pale grey to tan feldspar porphyries, are more abundant in the southern part of the area. The sandstones are composed primarily of quartz, dark chert, and argillite (?) grains. Altered feldspar (?) grains are less common.

SUMMARY

Coldwater beds northwest of the town of Cache Creek were deposited in an eastward-tilted non-marine basin. Sedimentation was cyclical and rapid with detritus derived from Cache Creek chert, argillite, and volcanic units.

Open flexure folding subsequent to sediment deposition produced the north-south-trending anticline and syncline. Faulting (?) in the core zone of the anticline may be related to the development of the anticline. Marginal faults cut the Coldwater beds and were hence active after sediment deposition.