GEOLOGY OF THE KAMLOOPS GROUP
(92I/9, 10, 15, 16)

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INTRODUCTION

An area of approximately 250 square kilometres lying west and northwest of Kamloops has been mapped for a final scale of 1:30 000 (Fig. 31). This area extends northward from the Afton mine to include the type area of the Middle Eocene Kamloops Group.

G. M. Dawson (1896) first described the Eocene volcanic and sedimentary sequence at Kamloops. Later mapping by Cockfield (1948) at 1:250 000 redefined the Kamloops Group and outlined the main outcrop area. The internal stratigraphy of the group, apart from the informally named 'Tranquille beds,' was not considered.

This study was undertaken to work out the stratigraphy and structure of the Eocene Kamloops Group. One of the aims of the project is to aid in the search for uranium, coal, and copper in the surrounding region, by increasing the understanding of Eocene tectonic and depositional environments. The study has been sponsored, in part, by the British Columbia Ministry of Mines and Petroleum Resources.

STRATIGRAPHY

The Eocene volcanic and sedimentary sequence, approximately 2 000 metres thick, is intensely faulted and changes lithologies over short distances. Correlations are thus tentative, especially across major fractures. Those following are products of field observation and inference; petrologic and geochemical information will almost certainly modify them.

The Kamloops Group can be subdivided into two extensive units, called here the 'Tranquille beds' and the 'Dewdrop Flats' formations.* The Tranquille beds, 500 metres thick, are chiefly sedimentary and underlie the Dewdrop Flats formation, some 1 300 metres thick, which is chiefly made up of volcanic flows and breccias and corresponds with Dawson's 'Upper Volcanic Series.' Although the boundary between the two is irregular and interfingering in detail, it is generally conformable, as seem to be most contacts between their various members.

*All formation and member names in this report are provisional, and are not yet proposed as formal rock-stratigraphic names under the *Stratigraphic Code*. No type sections are described, and names used herein are for convenience in describing the various units.

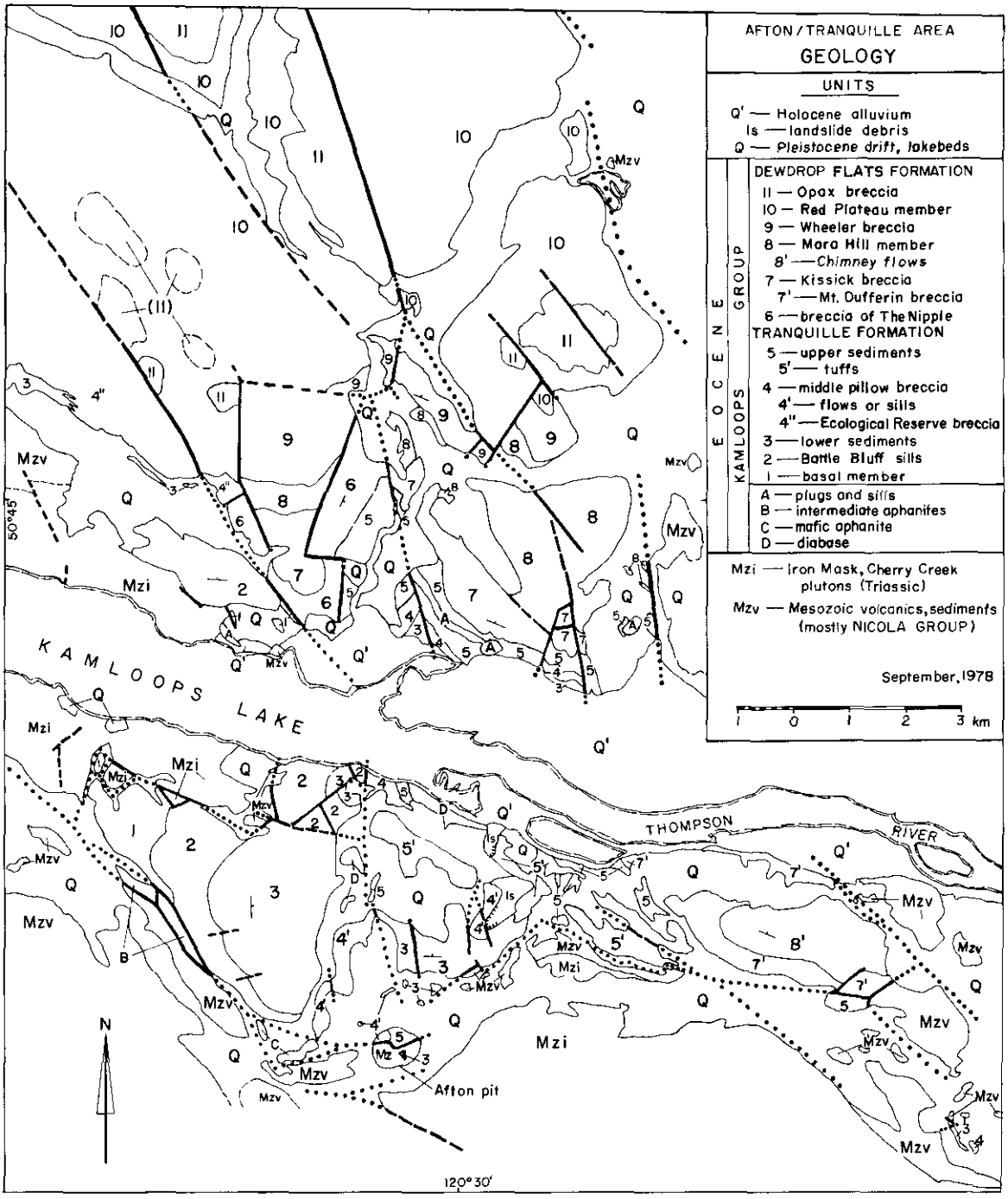

Figure 31. Geological map of the Kamloops Group, Afton-Tranquille area.

MESOZOIC ROCKS

The older rocks in the area are Mesozoic volcanic and plutonic rocks of the Nicola Group and the Iron Mask batholith. These are andesitic flows and tuffs (Nicola Group) and their intrusive equivalents (Iron Mask pluton), which are altered to epidote and hematite-bearing assemblages. These rocks were not mapped in detail.

TRANQUILLE BEDS

The *basal member* (unit 1) consists of a poorly exposed series of fossiliferous lakebeds north of Kamloops Lake. To the south, porphyritic trachytes (?) form the base of the succession and may be sill-like intrusive bodies. Some lakebeds are also found in this section. The basal member was originally gradational to the *lower member* (unit 3), which consists of tuffaceous fine-grained sediments with low organic contents. The lower Tranquille is intruded by the *Battle Bluff diabase sills* (unit 2) (the dolerites of Dawson, 1896), which are medium-grained, biotite-bearing diabases totalling about 120 metres in thickness. These sills are probably related to other diabase intrusions in the area (unit D), and may be from a source near the east end of Kamloops Lake. The total thickness of the basal and lower members of the Tranquille beds is greater than 250 metres.

The *middle member* (unit 4) is a pillow breccia of andesitic material, about 120 metres thick. South of the Thompson River, the same stratigraphic position is occupied by intermediate flows or sills (unit 4'). This unit may be correlated with the volcanic rocks exposed in the Afton open pit.

The *upper member* (unit 5) varies in lithology. North of the Thompson River valley, the unit is dominated by altered andesitic ash-rich mudflows. South of the Thompson River, the sequence is largely tuffaceous (unit 5'), with indistinct large-scale structure much obscured by faulting; some true lacustrine beds are also included. Total thickness of this member is about 100 to 150 metres.

UPPER VOLCANIC SERIES (DEWDROP FLATS FORMATION)

The lowermost member of the Dewdrop Flats formation is the *breccia of 'The Nipple'* (unit 6). This is a basaltic mudflow breccia, containing large (5 millimetre) pyroxene and occasional olivine phenocrysts. The unit is thicker than 100 metres west of Tranquille River, but rapidly interfingers eastward with the upper member of the Tranquille formation.

The overlying *Kissick breccia* (unit 7) consists mainly of flow breccias and derived mudflows of aphanitic andesite. Unbrecciated flow cores have also been observed. The unit is entirely subaerial at Mara Hill and to the west, but becomes subaqueous to the north. South of the Thompson River, the correlative *Mount Dufferin breccia* (unit 7') shows occasional pillows in a subaqueous breccia. Primary dips indicate a volcanic centre near the present Mara Hill. Total thickness is about 160 to 190 metres.

The *Mara Hill member* (unit 8) is primarily red-brown trachytic to andesitic flows and breccias, with tuffaceous sediments present toward its base. At Mara Hill summit, this lithology interfingers with a pile of

andesite flow breccia similar to the Kissick, indicating an andesitic source to the southeast. Thickness of the unit is 100 to 150 metres. South of the Thompson River, the correlative *'Chimney' flows* (unit 8') are trachytic flows similar to those of the Mara Hill member.

The *Wheeler breccia* (unit 9) overlies the Mara Hill sequence. Cliff-forming grey andesitic flow breccias and mudflows similar to the Kissick are characteristic. Subaqueous breccias are common in some strata, as are unbrecciated flow. One source to the southwest is indicated by primary dips west of Tranquille River; others may also have been important. The breccia is 250 metres thick in typical exposures.

The *'Ecological Reserve' breccia* [incorrectly shown under the Tranquille formation (unit 4") on Fig. 31] is composed of flow breccias and mudflows of phenocrystic trachyte, similar in composition to the overlying Red Plateau member. Primary dips indicate a volcanic centre to the west and southwest. The total thickness of the complex is about 600 metres. The unit contains some tuffaceous sediments near its base; its relations to the main mass of the breccia and the Tranquille formation is not clear.

The *Red Plateau member* (unit 10) consists of red-brown trachytic flows, moderately to highly vesicular, interlayered with derived flow-top breccias and mudflows. Irregular couplets of flow rock and flow-top breccia average about 15 metres thick, as seen in the Tranquille gorge. Centres for this sequence are not evident; the eruptions may have been of fissure or shield type. Thickness of this member is 300 to 400 metres.

The highest exposed unit, the *Opax breccia* (unit 11), consists of flow breccias and mudflows of aphanitic andesite similar to the Kissick and Wheeler breccias. There are no indications of local volcanic centres. Thickness of this breccia is greater than 300 metres.

INTRUSIVE BODIES

Besides the Battle Bluff sills, noted previously, several varieties of hypabyssal intrusive bodies cut the Eocene succession. A set of andesite plugs with associated dykes and sills is located north of the Thompson River, as are other dyke systems of andesitic and trachytic composition (unit A). Small areas of nondescript aphanites occur along the fault zone in the southwest part of the map-area (units B and C).

STRUCTURE

Primary volcanic structures are described above. The dominant secondary structures are normal faults, which break up the area into small blocks or panels of varying orientation. Three northwest/southeast faults were possibly active in the Eocene: the Cherry Creek fault to the southwest, the 'Road Creek' fault through the centre, and the Tranquille Canyon fault in the northern part of the area. The zone of complex structure presently followed by the Trans-Canada Highway (the Afton zone) may also have been active.

Present structure is complex. An east/west horst of Mesozoic rock extends west from Tranquille. A northwest/southeast graben is irregularly developed along Tranquille Canyon and at Dufferin in the southeast. Significant structures also lie under the Thompson River/Kamloops Lake trough.

ECONOMIC GEOLOGY

During the field season, no areas of promising mineralization were encountered. A Geiger counter survey of the area gave a few readings above background, mostly in sedimentary units; further tests will be carried out.

Veins of quartz, calcite, and various zeolites with stains of bright green celadonite, were found in many areas, especially in the Tranquille formation and along dykes. Analcite crystals were found in diabase along the tracks south of Kamloops Lake, while an unnamed blue-green mineral is fairly abundant in the Red Plateau member.

Coal is rare in the Kamloops Group. Traces of organic-rich sediment occur at various places in the succession, but true coal has only been found on the southern fringe of the mapped area, in the Afton open pit and along Guerrin Creek in the southeast. The areas involved in both are minute; most of the Tranquille formation is very low in organic matter. The depositional basin appears to have been choked with ash and volcanic debris throughout most of its history.

There is much interest in identifying the depth to basement, as the Tirassic volcanic and plutonic rocks are known hosts for mineralization. It appears at this time that in most parts of the area, the basement is more than 250 metres deep and hence inaccessible. In the southwestern part of the area, it might be reached at lesser depths.

TECTONIC RECONSTRUCTION

The Kamloops Group appears to represent one sedimentary/tectonic episode, beginning with lacustrine sedimentation. Ash contribution, always considerable, increased with time, and was followed by subaqueous flows and debris flows of volcanic material. Northwest/southeast faults and east/west structures may have controlled the basin geometry, following pre-existing lines of weakness. Later, lacustrine sedimentation virtually ceased, as the basin was filled by volcanic debris. Several small stratovolcanoes were built, surrounded by fissure or shield-volcano eruptions of more trachytic material. The Battle Bluff sills were probably intruded contemporaneously with this (Dewdrop Flats) volcanism. Later faulting, probably still Eocene in age, disrupted the sequence into panels of varying dip.

ACKNOWLEDGMENTS

The help of Gordon White, District Geologist in Kamloops, along with the staff of the Kamloops office of the British Columbia Ministry of Mines and Petroleum Resources, was essential in carrying out this fieldwork. Thanks also go to Alan Reed of Afton Mines Ltd. for maps and access to the Afton open pit, and to John Harrop, field assistant, for the summer.

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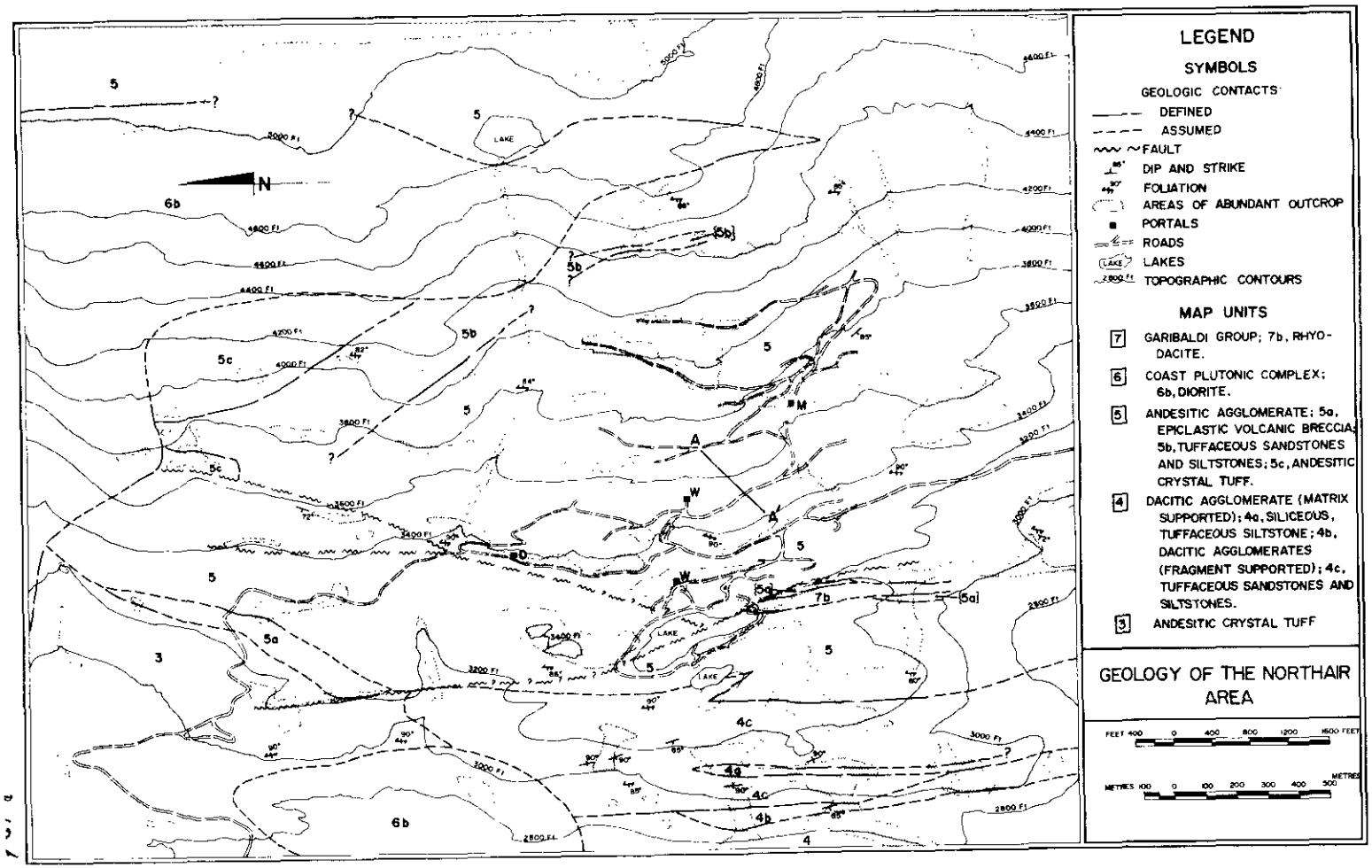

Figure 32. Detailed geological map of a part of Callaghan Creek pendant including mineral deposits of Northair Mines Ltd. Portals to the main deposits are labelled: M — Manifold zone, W — Warman zone, and D — Discovery zone. A—A^1 is the location of a cross-section through the Warman zone, shown in Figure 35.