STOP 3: Springbrook Formation. The Springbrook Formation is well displayed on bluffs east of Keremeos Creek above Highway 3A. The unit is about 230 m thick in this channel and consists of dark chert breccia in the lower part, overlain by well-layered polymictic pebble and boulder conglomerates. The clasts were derived from pre-Tertiary beds of feldspathic andesite, grey and black chert, argillite, chlorite schist, and quartzofeldspathic gneiss. These rocks are slightly downfaulted and tilted to the east.

STOP 4: Shackanite Lava. The basal part of the Marron Formation, known as the Yellow Lake member, is well exposed on the bluffs north of Yellow Lake and along the west side of the Penticton Tertiary outlier. The phonolitic volcanic rocks that characterize this member are normally zeolite bearing, containing minerals such as natrolite, laumontite-leonhardite, mordenite, and thomsonite.

A peculiar variety of mafic phonolite with both primary and secondary analcite, similar to Daly's (1912) 'shackanite' of the Boundary region, forms a distinctive horizon within the Yellow Lake member (Church, 1978). The primary analcite occurs as small pink polygonal phenocrysts in the lava accompanied by anorthoclase, sanidine, augite, olivine, accessory biotite, magnetite, apatite, and some glass. Secondary analcite is found with calcite, natrolite, and other zeolites in amygdales.

STOP 5: Panorama of the White Lake Basin (Fig. 8). A resistant band of conglomerate, 50 m south of the main road, forms an excellent vantage point overlooking the eroded core of the White Lake syncline. A view to the southeast shows the south limb of the syncline, composed mainly of soft sedimentary rocks, warped downward to meet a line of high bluffs of lahar beds just beyond White Lake (Fig. 9). To the south, sedimentary rocks of the White Lake Formation onlap the Park Rill andesite lavas which form the uppermost member of the Marron Formation. The ridges and tiered benches to the west are underlain by trachyte and trachyandesite lava forming the middle members of the Marron Formation.

The east-west orientation of the White Lake syncline is judged to be the effect of north-south compression. subsequent downfaulting in the Okanagan Valley has caused a pronounced general easterly rotation of the beds of the Tertiary outlier forming a trapdoor-like half-graben structure.

STOP 6: Skaha Formation. Indian Head is a conspicuous erosional remnant of the Skaha Formation 1 km east of White Lake. The Skaha breccias consist of highly comminuted chert and greenstone forming a cap on little disturbed White Lake tuff breccia and agglomerate. Here the breccia is near the projected western edge of a massive slide breccia complex that underlies the ridges east of Indian Head, including Mount Hawthorne located 3 km distant. The emplacement of this slide complex may have been triggered by culminating volcanic and seismic events in the White lake depositional cycle.

The youngest facies of the Skaha Formation exposed on Mount Hawthorne is a channel deposit of granite slide breccia reworked in part to boulder conglomerate and arkose. This can be traced from a point beyond Indian Head near 'The Hole' for a distance of about 3 km to the east and southeast to the vicinity of Green Lake. Source of the granite clasts is thought to be the Oliver granite stock exposed several kilometres further south.

THE DUSTY MAC AREA

Detailed mapping shows that the rocks in the Dusty Mac area belong to the upper part of the Tertiary section exposed in the White Lake basin, namely the White Lake Formation and the older Marama Formation (Fig. 10).

The Marama Formation crops out in the south and west parts of the map area where it forms the high bluff, known locally as Peach Cliff, overlooking the village of Okanagan falls. These rocks are resistant rhyolite and rhyodacite lavas.

The White Lake Formation underlies most of the area and consists of several facies. The lowermost facies rests on Marama rocks and is composed of blocky andesitic lahar beds carrying exotic blocks of Marama lava. This unit is overlain in turn by greenish, feldspathic andesite lahars and minor lavas of the same composition. The uppermost unit is exposed in the northeast part of the map area. This consists of soft, cream-coloured pyroclastic trachyte. Lenses of carbonaceous shales and sandstones are intercalated locally with the volcanic beds.

The units described previously are on the south limb of a southeasterly trending syncline. The beds have variable dips ranging from about 30 to 55° northeast.

These rocks are cut by an important system of reverse faults. The system trends generally southeasterly, with interwoven easterly and southerly striking segments and splays. The direction and magnitude of movement on these faults are indicated at a number of points where large slices of Marama lava have been thrust outward and upward from the core of the syncline through a few hundred metres of White Lake strata. As witnessed in the White Lake basin,

GEOLOGY OF THE PENTICTON TERTIARY OUTLIER

BY B. N. CHURCH

LEGEND

MIOCENE

(OLALLA RHYOLITE)

11 MOSTLY RHYOLITE BRECCIA, SOME MASSIVE OBSIDIAN, AND ASSOCIATED DYKES

EOCENE

PENTICTON GROUP

SKAHA FORMATION

10a MOSTLY CHERT AND GREENSTONE SLIDE BRECCIA AND SOME TEPHRITE LAVA OVERLAIN BY POLYMICTIC FANGLOMERATE

10b CHANNEL DEPOSIT OF GRANITE BOULDER CONGLOMERATE AND BRECCIA AND ARKOSIC SANDSTONES

WHITE LAKE FORMATION

9 MOSTLY VOLCANIC BRECCIAS INCLUDING PYROCLASTIC ROCKS AND LAHARS, MINOR TRACHYTIC AND ANDESITIC LAVAS

8 VOLCANIC CONGLOMERATE, SANDSTONES, AND SHALES

MARAMA FORMATION

7a AENEAS BUTTE FELDSPATHIC DACITE

7b MASSIVE APHANITIC DACITE LAVA AND SOME BRECCIA FORMING MOSTLY REMNANTS OF VOLCANIC DOMES

7c VOLCANIC CONGLOMERATE WITH CLASTS FROM THE MARRON FORMATION

MARRON FORMATION

6 PARK RILL MEMBER: MEROCRYSTALLINE ANDESITE LAVA AND MINOR BRECCIA

5 *NIMPIT LAKE MEMBER*: TAN TRACHYTE AND TRACHYANDESITE LAVA AND MINOR BRECCIA

4 KEARNS CREEK MEMBER: VESICULAR PYROXENE RICH BASALTIC ANDESITE LAVA

EOCENE *(CONTINUED)*

MARRON FORMATION *(CONTINUED)*

3 KITLEY LAKE MEMBER: TRACHYANDESITE LAVA WITH CONSPICUOUS GLOMEROPHENOCRYSTIC CLOTS OF FELDSPAR

2 SHATFORD CREEK MEMBER: LOCAL DEPOSIT OF BROWN ANDESITE LAVA AND BRECCIA WITH SOME QUARTZ-FILLED AMYGDALES

YELLOW LAKE MEMBER:

1a MOSTLY PYROXENE-RICH MAFIC PHONOLITE LAVA WITH *LOCAL WELL-DEVELOPED PHENOCRYSTS OF RHOMB*-ANORTHOCLASE AND SOME PRIMARY ANALCITE, ABUNDANT ZEOLITE FILLINGS IN CRACKS AND AMYGDALES

1b PURPLE AND GREY VOLCANIC WACKE FROM EROSION OF 1a AND PINK RADIOACTIVE FELDSPATHIC TRACHYTIC ASH FLOW, SANDSTONE, AND CONGLOMERATE

1c CLARK CREEK PORPHYRY: A SILL-LIKE BODY RELATED TO 1a WITH LARGE FELDSPAR PHENOCRYSTS

SPRINGBROOK FORMATION

Oa POLYMICTIC CONGLOMERATE AND BRECCIA WITH CLASTS DERIVED MAINLY FROM PRE-TERTIARY BEDDED ROCKS

KETTLE RIVER FORMATION

Ob MAINLY GRANITE BOULDER CONGLOMERATES, ARKOSE, VOLCANIC WACKE, AND RHYOLITE BRECCIA

Oc SHINGLE CREEK PORPHYRY: A COARSE SANIDINE QUARTZ PORPHYRY INTRUSION FEEDER TO THE RHYOLITE VOLCANIC ROCKS OF Ob

PRE-TERTIARY ROCKS

Y MAINLY GRANITIC INTRUSIONS

Z MAINLY CHERTS, GREENSTONES, SCHISTOSE ROCKS, AND MINOR INTRUSIONS

CROSS-SECTION

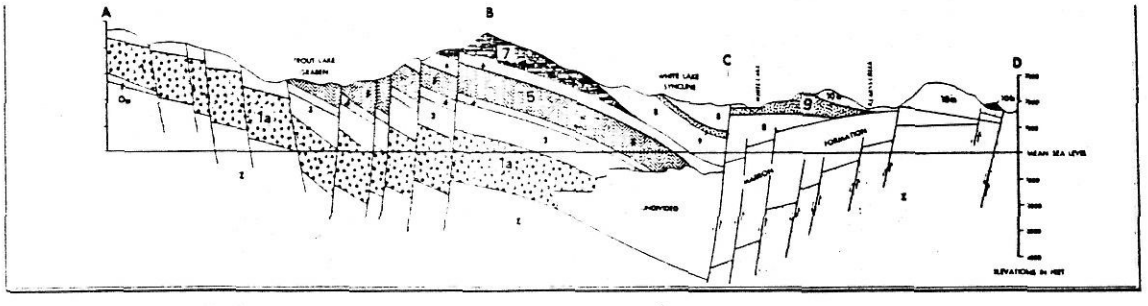

Figure 7b. Geology of the Penticton Tertiary outlier.

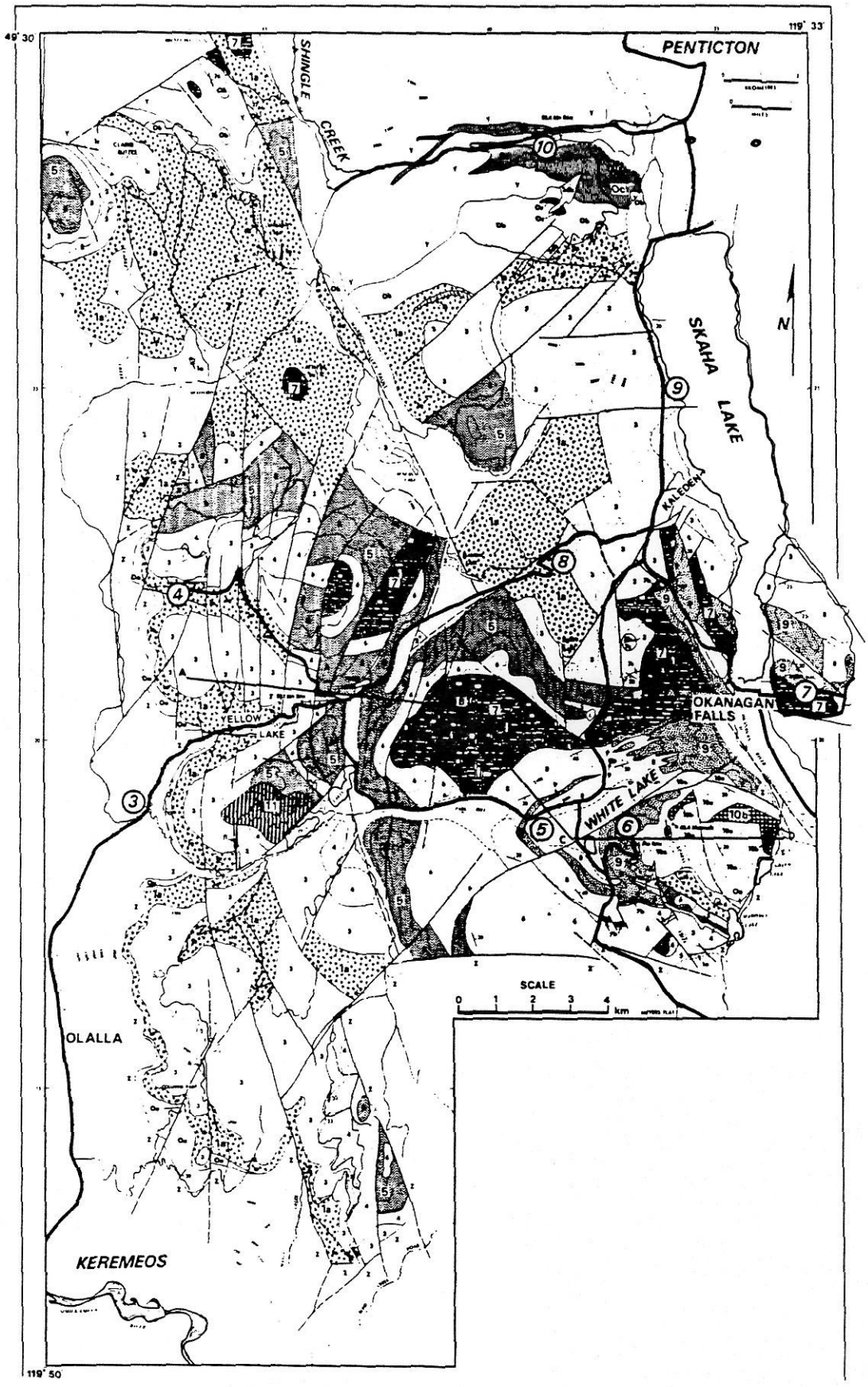
49° 30
119° 33
PENTICTON
SHINGLE CREEK
SKAHA LAKE
N
KALEDEN
OKANAGAN FALLS
YELLOW LAKE
WHITE LAKE
SCALE
0 1 2 3 4 km
OLALLA
KEREMEOS
119° 50

Figure 7a.

reverse faulting is thought to be the result of concentric folding and accommodation of the stratigraphic pile to bedding plane slip.

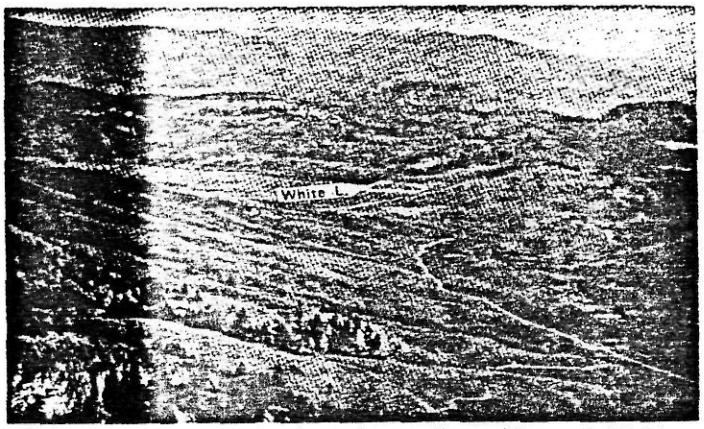

Figure 8. Panoramic view of units of White Lake syncline looking southeast.

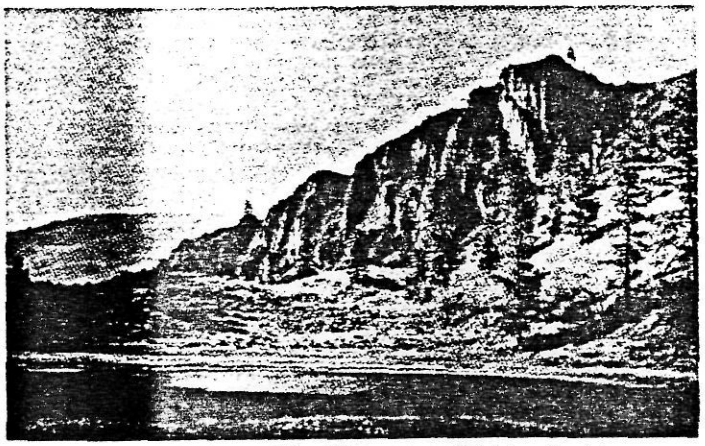

Figure 9. Lahar bluffs near White Lake.

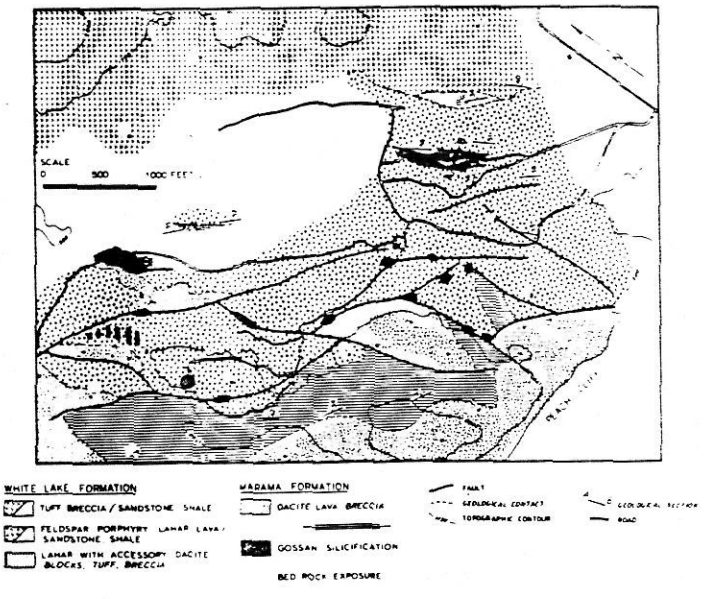

Figure 10. Geology of the Okanagan Falls syncline and Dusty Mac mine area.

STOP 7: The Dusty Mac Mine. The abandoned mine pit, dating from the 1975-1976 operation, is 1.5 km east of Okanagan Falls. Mineralization consists of free gold and silver and minor sulphides in a 180-m-long zone of quartz breccia. The deposit is a shallow-dipping lens in a zone of reverse faulting on the south limb of the Okanagan Falls syncline. The host rocks, consisting mainly of White Lake volcaniclastic beds, have been thrust outward and upward from the axis of the syncline in response to concentric folding. Fissures and dilations resulting from this movement provided passageways for ore-bearing solutions (Fig. 11). Repeated movement in the zone caused brecciation of the quartz and local diminishing of metal values by the admixture of barren wallrock breccia.

Production from the open pit over a ten-month period of mine operation was 198,572 tonnes of which 93,437 tonnes was ore yielding 581,533 grams of gold, 10,181,367 grams of silver, 2365 kilograms of copper, and 1523 kilograms of lead. Net smelter return from the operation was $3,433,792.

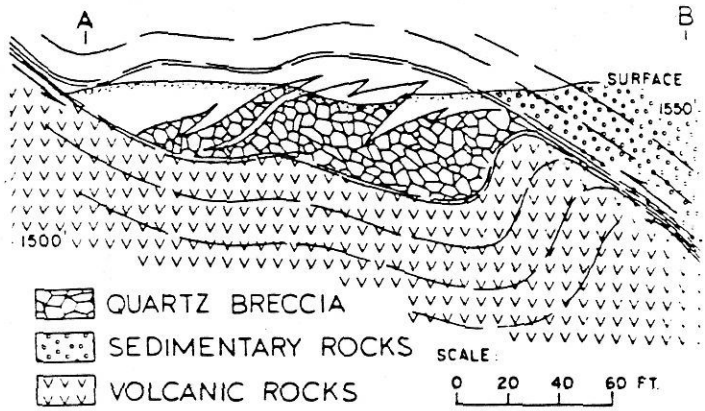

Figure 11. Cross-section of the Dusty Mac quartz breccia zone.

STOP 8: Lava Tube. Deep erosion over an anticlinal axis exposed the basal units of the Marron Formation east of the switchback on Highway 3A. What appears to be a frozen lava tube of mafic phonolite is viewed in Yellow Lake volcaniclastic beds near the easterly extremity of a long rock cut. The tube is circular in cross-section, about 8 m in diameter, and cut by concentric and radial cooling joints. Some of the joints are filled with calcite and pink laumontite.

STOP 9: Rhomb Porphyry (Fig. 12). Lavas bearing distinctive rhomb-shaped anorthoclase phenocrysts are a common phase of the Yellow Lake member of the Marron Formation. The uppermost lavas in the succession are usually microporphyritic and composed of small subhedral crystals (less than 2mm in diameter) consisting of grid twinned anortho-clase (15 to 20%) and diopsidic augite (5%)