



GEOLOGY AND MINERAL POTENTIAL OF THE CHILKO LAKE AREA* (92N/1,8; 92O/4)

By G. P. McLaren

INTRODUCTION

During the 1985 field season the author initiated a mineral potential evaluation of the mountainous terrain in the Chilko-Taseko Lakes area, 230 kilometres north of Vancouver (McLaren, 1986a). In 1986 this study was extended to the west of Chilko Lake to continue 1:50 000-scale mapping and prospecting, together with litho-geochemical and stream sediment sampling. In addition, mapping was completed in the area between the Tchaikazan and Falls Rivers that was stream sediment sampled in 1985. Follow-up of anomalous geochemical results from the 1985 survey in this area resulted in the location of a new arsenic-bearing mineral showing.

Approximately 600 square kilometres were covered by the 1986 stream sediment sampling survey west of Chilko Lake. Mapping and litho-geochemistry within this area varied in detail depending on accessibility, complexity of geology and indications of mineralization. As in the previous year, all geological and geochemical data are being compiled for release as open file publications.

REGIONAL GEOLOGY AND PREVIOUS WORK

The geology of the area was first mapped in 1924 by Dolmage (1925), who broadly divided the stratified rocks into Triassic and Cretaceous formations. The Mesozoic volcanic and sedimentary stratigraphy of the Mount Waddington (92N) and Taseko Lakes (92O) map sheets has been mapped by Tipper (1969, 1978). Upper Jurassic and Lower Cretaceous rocks of this area accumulated in the northwest-trending Tyaughton trough, a sedimentary basin bounded by intermittent land masses on the northeast and southwest. The area has been cut by numerous right-lateral transcurrent faults and the stratified rocks now lie along the northeastern flank of the Coast Plutonic Complex.

Jeletzky and Tipper (1968) described a faunal stratigraphy for the Taseko Lakes map sheet and discussed the role of the Tyaughton trough in the geological history of southwestern British Columbia. The rocks in the current study area record a volcanic island arc environment on the southwest flank of the Tyaughton trough, as opposed to the dominantly clastic sedimentary environments in the axial regions of the trough (McLaren, 1986a).

Work completed between Chilko and Taseko Lakes in the 1985 season identified a section of Lower and Upper Cretaceous sediments and volcanics similar to that previously mapped by Tipper (1978). A number of fossil collections obtained in this work have since been identified and dated by J.A. Jeletzky of the Geological Survey of Canada. Correlations and ages previously proposed (McLaren, 1986a, Table 41-1) appear valid; the following comments on fossil ages apply to rock units described in the 1985 work. Correlations between unit numbers given to rocks mapped in 1985 and 1986 are discussed elsewhere in this paper and are shown in Table 3-10-1.

An *Inoceramus* fauna collected from Unit 1 was dated as a general Hauterivian age and was suggested to be younger than, or contemporaneous with, two collections made from Unit 4. Of the three collections taken from Unit 4, two indicated an early Hauterivian

age while the third indicated a Hauterivian to Barremian age and is likely of the same early Hauterivian age as the others. Unit 4 was previously correlated with fossiliferous rocks of the Relay Mountain Group (Jeletzky and Tipper, 1968; McLaren, 1986a). Unit 5 yielded an ammonite and pelecypod collection representing a late Early Albian age and a gastropod collection with a general Albian age; these rocks have been correlated with the Taylor Creek Group.

All of the above ages conform with the previously proposed stratigraphy and correlations and suggest that Units 1 through 4 represent a partially contemporaneous succession of volcanic rocks and sediments that accumulated as overlapping lateral facies equivalents. This supports the suggestion that both Units 2 and 4 conformably underlie the mixed volcanics and sediments of Unit 5 (McLaren, 1986a).

A collection of pelecypods was taken from limy and argillaceous sediments, immediately north of the Tchaikazan fault, that were mapped as Unit 6 and correlated with Kingsvale Group sediments of Albian to Cenomanian age. These pelecypods have been tentatively dated as a general Hauterivian to Aptian age. This age suggests either that fault wedges of Lower Cretaceous sediments occur with similar younger lithologies along the Tchaikazan fault zone, or that the sedimentary sequence north of the fault represents a conformable Lower to Upper Cretaceous section. A conformable sedimentary facies of this age is more likely to represent rocks deposited closer to the axis of the Tyaughton trough and which must therefore have been transported along transcurrent faults to their present position adjacent to the Hauterivian to Albian island arc environment. These sediments pass into an overlying succession of volcanic rocks regionally correlated with the Kingsvale Group of Late Cretaceous age (Tipper, 1978).

LOCAL GEOLOGY

Figure 3-10-1 outlines the general geology of the area west of Chilko Lake mapped in 1986 and Figure 3-10-2 displays geological cross sections of the area. Previous regional mapping by Tipper (1969) again provided an invaluable guide to following contacts of rock units. A number of stratigraphic interpretations, different from those of Tipper, are presented here and are based on lithologic relationships observed in the 1986 fieldwork. A limited amount of data from assessment reports in the Franklyn Arm area has been incorporated into the mapping. Stratigraphic and structural relationships in the extreme northwestern corner of the map area are somewhat speculative as only a few reconnaissance traverses were completed. The interpretations may be subject to revision pending dating of fossil collections obtained in this work.

STRATIFIED ROCKS

UNIT 1

The oldest rocks exposed in the map area consist of an interbedded sequence of intermediate to basic volcanic flows and pyroclastic rocks, fine clastic sediments and limestones, that outcrops in fault-bounded wedges within Descharps Creek valley and

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British Columbia Ministry of Energy, Mines and Petroleum Resources, Geological Fieldwork, 1986, Paper 1987-1.

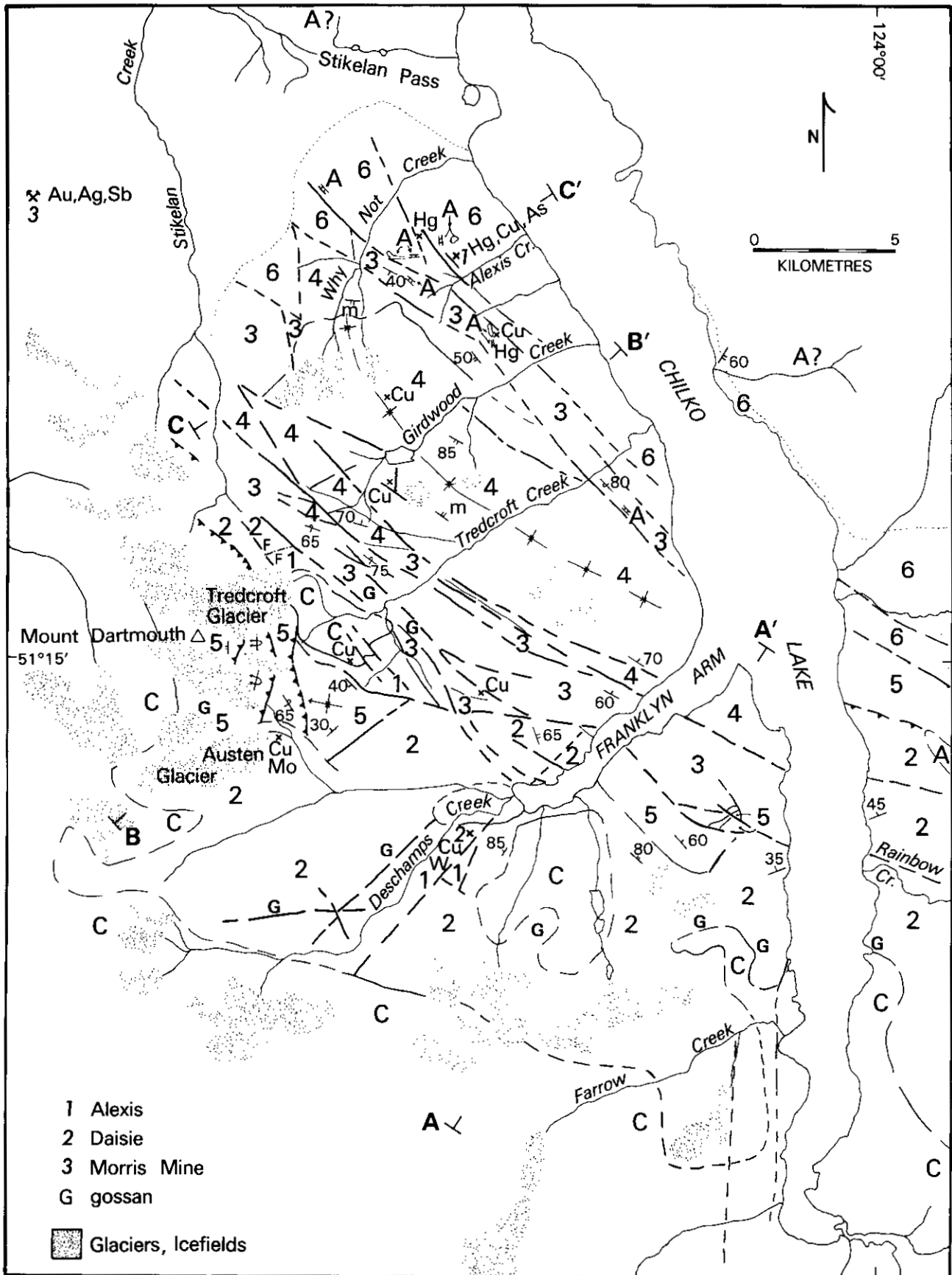


Figure 3-10-1. Geology west of Chilko Lake.

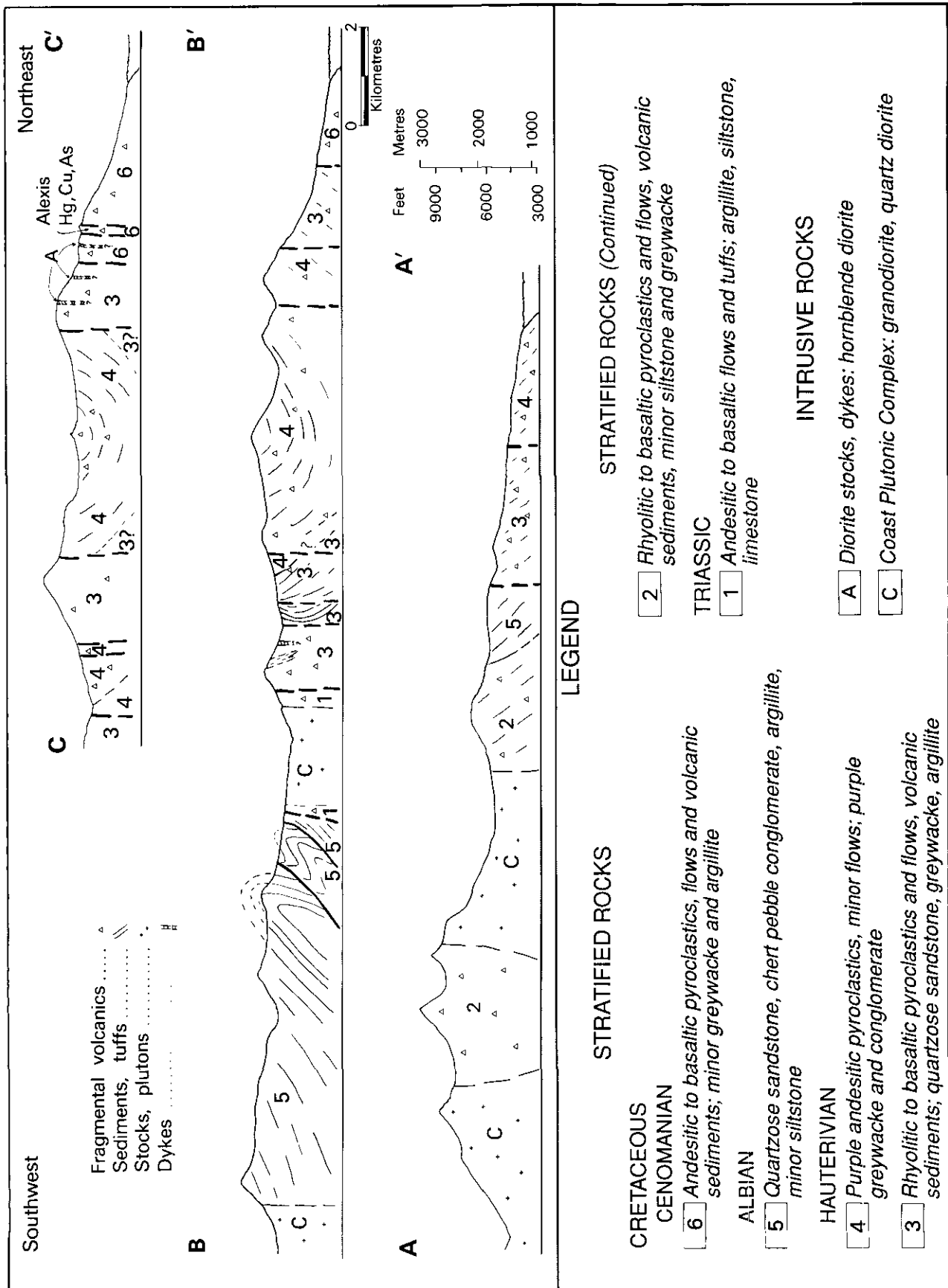


Figure 3-10-2. Geological cross-sections to accompany Figure 3-10-1.



Plate 3-10-1. Pillow basalts of Unit 1.

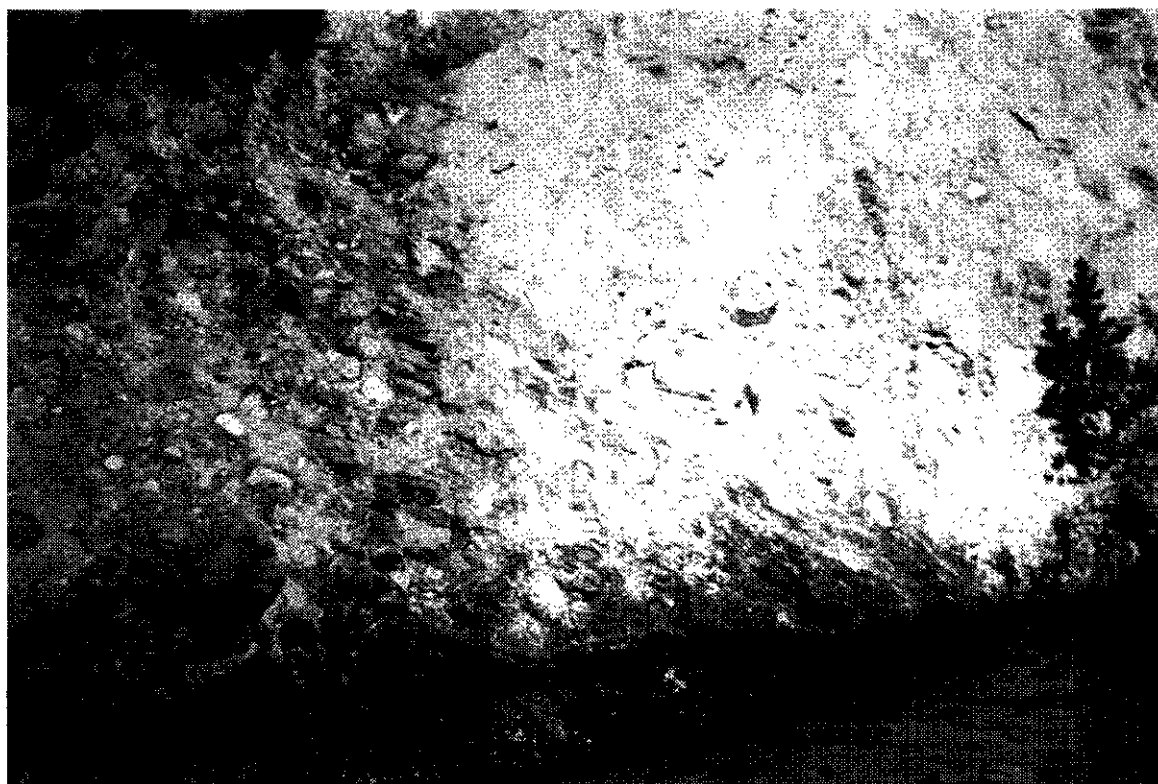


Plate 3-10-2. Chaotic debris flows of Unit 2, east shore of Chilko Lake.

TABLE 3-10-1. CRETACEOUS STRATIGRAPHIC CORRELATIONS

	Age	Lithologies	This Paper 92N	McLaren 1986 92O	Tipper 1978 92O	Tipper 1969 92N
Late Cretaceous	Cenomanian	volcanics	6	7		19
		sediments		6	Kingsvale Group	18
Early Cretaceous	Albian	volcanics and sediments	5	5a 5b	Taylor Creek Group	16
	Aptian	sediments		4	Relay Mountain Group	9
	Hauterivian	volcanics	4 3 2	3 2	lkv	15 ↑ ↓ 12
		sediments		1		
Late Triassic		volcanics and sediments	1			1

at the headwaters of Tredcroft Creek. Intrusive stocks cut these rocks in both locations and have developed extensive hornfels zones in the Deschamps Creek area.

Volcanic lithologies predominate and consist of intermediate to basic flows, interflow breccia and associated lithic fragmental tuffs. Pillowed basalt flows are well exposed on the ridge dividing the southern headwaters of Tredcroft Creek (Plate 3-10-1). The pillows are up to 1 metre across and are composed of aphanitic dark grey material with numerous siliceous, calcareous or chloritic amygdules. Radial cooling fractures filled with quartz are common. Interpillow material consists of chloritized pillow fragments set in a siliceous or pale grey clay-rich matrix. Massive nonpillowed flows are present, as are horizons of interflow breccia. Feldspar-augite crystal to lithic fragmental tuffs and breccias, reworked volcanic epiclastic rocks and some argillaceous sediments displaying flame structures, scours and volcanic bombs, are interbedded with the flow units.

Elsewhere purple or green, coarse lithic fragmentals predominate. These rocks have been thoroughly fractured and infilled by an anastomosing network of quartz-carbonate veins. North of Tredcroft Glacier grey crystalline limestone containing pelecypod shell fragments is interbedded with limy argillaceous sediments and fine lithic to crystal tuffs.

In Deschamps Valley similar volcanics and sediments have been cut by a diorite to quartz diorite stock of the Coast Plutonic Complex. Here the limestones have been recrystallized to a grey, massive, sugary marble with local development of copper-bearing garnet diopside skarn zones. The marbles occur within a broader section of hornfelsed clastic sediments and tuffaceous volcanic rocks.

These rocks have previously been dated as Late Triassic by Tipper (1969) on the basis of fossils located north of Tredcroft Glacier. The contact with overlying sediments at this locality appears to be unconformable with only a small angular discordance, as reported

by Tipper. In all other areas these Triassic rocks are in fault contact with adjacent units. The limy and hornfelsed rocks in Deschamps Valley are attributed to this Triassic section on the basis of lithologic similarities. The occurrence of intrusives and faults in both locations indicates that these rocks have been structurally uplifted and exposed through erosion.

UNIT 2

A thick succession of volcanic rocks with lesser gritty sediments is in contact with intrusives of the Coast Plutonic Complex in the southern portion of the study area. The volcanics comprise a varicoloured and well-differentiated suite ranging from rhyolite to basalt in composition. Crystal and fragmental tuffs dominate but rhyolite and columnar basalt flows are also present.

The finer tuffs generally display feldspar or mafic crystals and crystal fragments distributed through an ash-like grey, maroon or green matrix. They grade through lapilli tuffs into coarser lithic fragmentals with subrounded to angular clasts of locally derived volcanics. Carbonates are often present in the matrix or as discrete pods. Tuffs may be subaerial or waterlain and are regularly interbedded with reworked epiclastic material. These rocks are dominantly andesitic to dacitic in composition.

Basic flows are interlayered with the tuffs, generally forming more massive, resistant horizons. A prominent bluff on the west shore of Chilko Lake exposes well-developed columnar jointing in a fine-grained grey basalt. This flow overlies a layered volcanic breccia to laharic mudflow section. The lahars contain coarse volcanic boulders irregularly dispersed through a white-weathering ash-like matrix. Similar lithologies form distinctive white cliffs along strike on the east shore of Chilko Lake. Here, in excess of 1 kilometre of shoreline provides excellent exposure of a chaotic volcanic conglomerate with a layered ash flow or muddy matrix (Plate 3-10-2). Fine-grained portions of this section are thinly laminated and display some crossbedding features. Similar lithologies

were mapped within this unit near Mount Goddard during the 1985 season (McLaren, 1986a, page 265).

Rhyolitic volcanics occur throughout this unit. Layered quartz-eye tuffs pass into massive quartz-feldspar porphyry north of Franklyn Arm. To the south, along strike, similar tuffs are interbedded with lithic fragmentals of a more typical intermediate composition. Rhyolitic fragmentals carrying considerable pyrite and pyrrhotite occur along the contact of the Coast Plutonic Complex on the east side of Chilko Lake.

Sedimentary strata of Unit 2 consist primarily of siltstones and greywackes that are associated with volcanically derived epiclastic material. Prismatic shell fragments, likely from the pelecypod *Inoceramus*, were found in a layered hornfelsed limy siltstone on the western slopes of Deschamps Valley. Similar volcanics and sediments containing *Inoceramus* shells and other pelecypods were noted north of Tredcroft Glacier; these fossiliferous sediments were previously dated as Hauterivian by Jeletzky (1968).

These rocks unconformably overlie Triassic rocks as described for Unit 1; elsewhere the base of this unit is not exposed as it is in contact with rocks of the Coast Plutonic Complex in the south. The upper contacts are generally not exposed except on the ridge between Franklyn Arm and Chilko Lake where these volcanics are conformably overlain by clastic sedimentary rocks of Unit 5. On the ridge crest the volcanic rocks grade into the sediments with no major breaks, while in a creek valley to the east the sediments and volcanics clearly interfinger. The creek valley lies along a fault zone containing numerous slivers of mixed volcanic and sedimentary lithologies, however the faults do not separate lithologies. Unit 2 is in fault contact with the mixed volcanics and sediments of Unit 3, however similar lithologies on either side of the fault mask the true nature of the stratigraphic relationship between these units.

UNIT 3

Interbedded sediments and volcanics of Unit 3 can be subdivided into a lower dominantly volcanic section and an upper dominantly sedimentary section. These rocks are lithologically similar to rocks of Unit 2 and may be a lateral facies equivalent.

The lower volcanic assemblage comprises green, purple or brown pyroclastics and flows of intermediate to felsic composition. They are characterized by feldspar-hornblende crystal tuffs that grade into coarser lapilli and lithic fragmental tuffs with locally derived volcanic clasts. Laharic deposits with a fine white ash-like matrix resemble those described in Unit 2. Flow-banded rhyolite and quartz-eye tuffs are present in two localities north of Franklyn Arm, and again resemble Unit 2 rocks in this area. This is the lowest unit in which cherty pebbles are noted in volcanic conglomerates and may be indicative of developing tectonic uplift in adjacent areas and deposition of externally derived clastic material; such material becomes common in the overlying sediments.

Minor argillaceous beds are present within these volcanics. A pyrite-pyrrhotite-rich gossanous zone has developed on one such horizon, on ridges north and south of Tredcroft Creek.

North of Tredcroft Creek clastic sediments increase in the section and become predominant. They consist of interbedded quartz-rich sandstones, immature greywacke, dark grey to green silty to argillaceous beds, and minor conglomerates. Thin limy horizons are also present. Argillaceous beds are either extremely friable and sheared or tightly contorted. Gritty sediments display bedding features facing northeast. Numerous volcanic tuffs and possibly some flows are interbedded with the sediments.

The contact with overlying purple sediments and volcanic rocks is gradational and reflects a change from neritic to subaerial conditions. Mixed sediments and volcanics in the headwaters of Alexis Creek, and south and west of the head of Why Not Creek, were

mapped with this unit based on lithological similarities, a conformable contact with the overlying purple rocks and on their position around the broad synclinal structure cored by the purple volcanics of Unit 4.

Strong faulting and shearing are evident in the sedimentary sections of this unit in both the eastern and western portions of the map area. North of Tredcroft Creek the sediments are overturned and are shattered at one location and tightly contorted at another. These rocks are particularly susceptible to deformation and appear to have deformed in a more ductile fashion than the surrounding volcanics.

UNIT 4

A thick succession of distinctive purple volcanics and sediments forms the core of a broad syncline in the centre of the area mapped. The base of the unit is dominantly sedimentary, but it passes quickly into a volcanic sequence dominated by pyroclastic rocks. These rocks are lithologically similar to, and conformably overlie, sediments and volcanics of Unit 3, however due to their distinctive colour and probable subaerial deposition they are mapped separately.

The sediments of Unit 4 comprise a well-bedded sequence of greywackes and conglomerates that often grade into epiclastic volcanic material. The base is clearly transitional with the white quartzose sediments and argillites of Unit 3, but tuffaceous and argillaceous clasts, set in a matrix containing detrital hematite, become more common as these rocks pass upwards into the overlying volcanics. Single beds may change colour along strike, probably reflecting variations in hematite content. The only fossils located in these sediments were gastropods; no clearly marine fossils were found.

Pyroclastic rocks dominate the volcanic lithologies; feldspar or feldspar-hornblende crystal tuffs grade into lithic fragmental tuffs and breccias. Fragments are angular to subrounded, purple or green and are locally derived. The matrix is often calcareous and may be magnetic; chlorite and epidote alteration is common. More massive flows or irregular subvolcanic intrusive bodies of augite-feldspar porphyry occur within the pyroclastics. Layered epiclastic horizons are occasionally present, but bedding is not well developed in the tuffs.

This unit forms prominent rugged peaks in the centre of the map area. Quartz-carbonate veins with epidote selvages are common where the rocks are fractured. The strongest development of veining occurs north and south of Girdwood Lake where epidote alteration is noted in zones up to 2 metres wide and minor copper mineralization is present in the veins (*see* section on mineralization).

No contact was observed between Unit 4 rocks and younger units. The basal contact is shown as a fault in many locations, but this is uncertain due to the similarities of lithologies in Units 3 and 4.

UNIT 5

Well-bedded quartz and chert-rich clastic sedimentary lithologies occur in a series of stacked thrust sheets near Tredcroft Glacier and as a distinct layered section between Franklyn Arm and Chilko Lake. Argillaceous rocks are interbedded with the coarser clastics and tuffaceous horizons are also present. Fossilized logs, leaf and stem impressions, and pockets of organic debris are characteristic of this unit.

Conglomeratic horizons, most common lower in the section, are usually discontinuous channel or floodplain deposits. Chert and quartz generally account for 80 to 85 per cent of the clasts; argillite and some volcanics make up the remainder. Clasts are set in a gritty quartzose matrix. Sandstones are grey to white, clast-supported quartz-rich rocks with sparse, weakly calcareous cement; argillite grains are locally present. Dark grey argillites and some siltstone are interbedded with the coarser rocks. Occasionally these become



Plate 3-10-3. Imbricate thrust sheets in Unit 5 sediments, east of Mount Dartmouth.



Plate 3-10-4. Recumbent dragfolds associated with thrusting, at the toe of Hamilton Glacier (Mount Dartmouth in background).

greenish and appear glauconitic. Brown calcareous concretions weather out of the finer sediments as large round balls. Tuffaceous or volcanic epiclastic material, represented by feldspar crystals or broken crystal pieces, was noted in a number of horizons.

A variety of bedding features, including crossbedding, graded bedding, channel scours and flame structures, indicate a north-easterly facing sequence with a westerly source. Individual beds often lens out laterally or are cut off by channels. All the above features strongly suggest a relatively active deltaic environment. Furthermore pockets of carbonized organic debris are common. Fossilized logs can be found in several localities including high above the west shore of Chilko Lake (Fry, 1959) and in the headwaters of Tredcroft Creek. A number of samples were taken from these rocks for possible microfossil identification. Similar quartz and chert-rich clastic rocks carrying fossilized log fragments were mapped in the Tchaikazan Valley in 1985 and were thought to conformably overlie a volcanic succession equivalent to Unit 2 rocks.

The base of this unit was only observed on the ridge west of Chilko Lake, where these sediments are interbedded with volcanics of Unit 2. Elsewhere all contacts appear fault-related or are covered. Numerous thrust faults cut the unit at the head of Tredcroft and Torch Creeks where spectacular recumbent dragfolds are exposed (Plates 3-10-3 and 3-10-4).

UNIT 6

Intermediate to basic volcanic pyroclastics, flows and conglomerates of Unit 6 outcrop on the slopes along both shores of Chilko Lake. Purple and green feldspar crystal tuffs, lapilli tuffs and lithic fragmentals predominate. Angular lithic fragments are up to 15 centimetres across and are generally composed of locally derived feldspar crystal tuffs. These occasionally grade into horizons of volcanic conglomerate with well-rounded volcanic boulders up to 20 centimetres across resting in a tuffaceous or epiclastic matrix. Pyroclastics are often calcareous and may be magnetic. Finer grained, more massive grey flows, with fine mafic needles, are locally intercalated in the tuffs. All of these lithologies are distinctly similar to rocks correlated with Kingsvale volcanics and mapped along strike just east of Chilko Lake in 1985 (McLaren, 1986 a and b, Unit 7).

Minor clastic sedimentary rocks are present within Unit 6 volcanics in the vicinity of Alexis Creek. They are generally greywackes and argillites. On the east shore of Chilko Lake, a limited collection of gastropods and pelecypods was taken from similar sediments that were previously mapped as Kingsvale Group by Tipper (1969).

Unit 6 rocks appear to be fault-bounded in all parts of the map area, however, the similar lithologies across the faults and the reconnaissance nature of mapping in the northwest makes this uncertain.

INTRUSIVE ROCKS

UNIT A — DIORITE STOCKS, DYKES

A number of irregularly shaped diorite to quartz diorite intrusions occur within a broad zone of faulting on the slopes to the west of Chilko Lake. These rocks display medium to fine feldspar and hornblende phenocrysts crowded in a fine crystalline matrix. Partially chloritized biotite is a common constituent; quartz and magnetite are generally minor accessories. They are well fractured, discontinuous and clay or carbonate alteration is common. Diorite stocks mapped east of Chilko Lake during 1985 also appear spatially related to fault zones.

UNIT C — COAST PLUTONIC COMPLEX

Massive granodiorite and quartz diorite intrusions of the Coast Plutonic Complex outcrop in the southern and southwestern portions of the area. No attempt was made to map these in detail. Satellite stocks of similar rocks were seen at the head of Franklyn Arm and Tredcroft Creek. Extensive hornfelsing, accompanied by disseminated or veinlet pyrite-pyrrhotite mineralization, is common throughout the volcanic and sedimentary rocks of Unit 2 adjacent to the stocks. The irregular shape of the intrusive contacts, and the extensive hornfelsing between Franklyn Arm and Chilko Lake, suggest that intrusive rocks underlie much of the area at a relatively shallow depth. These intrusions are presumably responsible for the skarn development in Deschamps Valley.

STRATIGRAPHIC CORRELATIONS

Work completed east of Chilko Lake in 1985 outlined a Hauterivian to Cenomanian succession of volcanics and sediments correlative in part with the Relay Mountain Group, Taylor Creek Group and Kingsvale Group (McLaren, 1986a, Table 41-1). It was further suggested that these Lower Cretaceous units could be correlated with the Gambier Group of the southern Coast Mountains.

The mapping completed in 1986 extended the previously documented stratigraphy and similar correlations can be drawn. However, as the sections mapped in 1985 and 1986 differ in character, the rock unit numbers used each year are not directly correlative. Table 3-10-1 shows the rock unit correlations from the two seasons of this project and compares them with those of Tipper (1969, 1978).

Triassic rocks mapped this year were not seen east of Chilko Lake in 1985. Volcanics and sediments of Unit 2 (1986) are equivalent to those of Unit 2 (1985), and the purple volcanic unit mapped as Unit 4 (1986) is equivalent to Unit 3 (1985). The intervening sediments and volcanics mapped as Unit 3 (1986) appear to be a facies change from the purple volcanics and are likely correlative with parts of the Units 2 and 3 mapped in 1985. All of these rocks, on both sides of Chilko Lake, record a Hauterivian volcanic island arc environment with both marine and subaerial deposition and localized sedimentary basins. These rocks are correlative as a package, but the relative locations of sediments and volcanics in a stratigraphic column may vary.

The fossiliferous rocks attributed to Unit 4 (1985) were not located in 1986. They are probably contemporaneous with the Hauterivian island arc and may record a final stage of the previously more widespread sedimentary deposition of the Relay Mountain Group.

An incursion of westerly derived clastic sediments carrying organic debris is recorded by Unit 5 (1986). Similar rocks are located within Unit 5b (1985) on the east side of Chilko Lake; these sediments interfinger with the broader volcanic and sedimentary assemblage of Unit 5, given an Albian age and correlated with the Taylor Creek Group in 1985.

Volcanic rocks mapped in Unit 6 (1986) are correlative with those of Unit 7 (1985). They are temporally equivalent with the Kingsvale Group.

STRUCTURE

Northwesterly trending transcurrent faults dominate the structural geology of the area. Tipper (1969) has previously indicated that two major structures, the Tchaikazan and Stikelan faults, cut through the map area. Two broad zones of multiple faulting with complex deformation are present in the current study area. A zone along the west side of Chilko Lake, and probably extending beneath it, marks the trace of the Tchaikazan fault. Tipper has suggested that

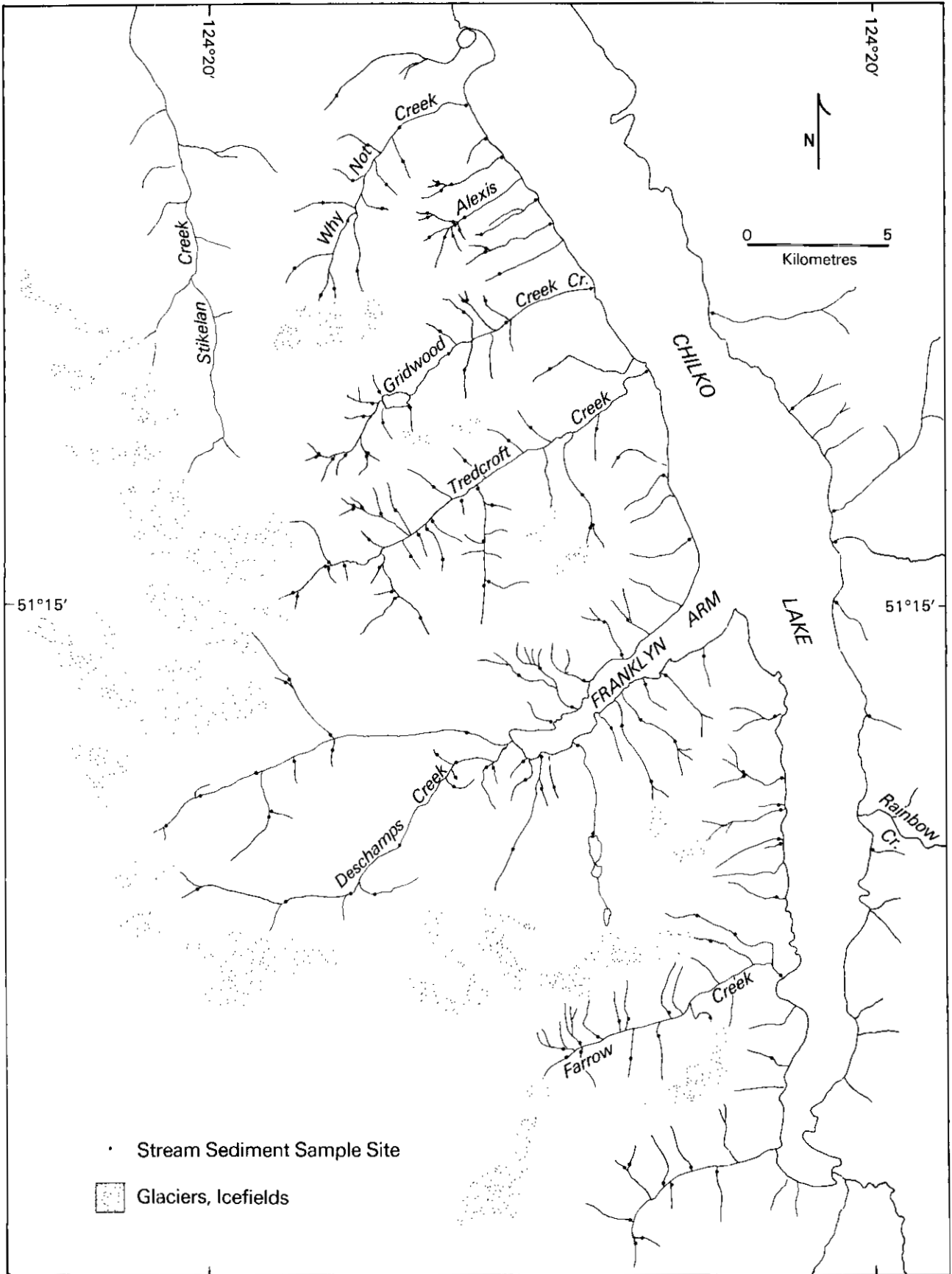


Figure 3-10-3. Stream sediment sample site locations.

this fault may have in excess of 30 kilometres of right lateral displacement. Intense shearing of carbonaceous argillites, slickensiding, and juxtaposition of volcanics and sediments were noted in canyons in lower Tredcroft Creek. Prominent zones of pervasive, orange-weathering carbonate alteration containing strongly silicified fractures are seen further north at Alexis Creek. Multi-directional slickensides are characteristic of this zone. Numerous dioritic intrusions have invaded the zone and epithermal copper-mercury mineralization occurs within the alteration zones at Alexis Creek. Extensions of these faults were mapped to the southwest in 1985 and were found to be associated with dioritic intrusions and to contain copper mineralization and anomalous mercury concentrations at various locations.

A second zone of faulting trends across Franklyn Arm to the headwaters of Stikelan Creek. Here argillaceous rocks have been intensely sheared and locally contorted into tight irregular minor folds. A large section of rocks north of Tredcroft Creek has been steeply overturned along the fault zone, possibly in conjunction with thrusting from the southwest. The Stikelan fault lies within this zone.

Multiple northeasterly facing thrust faulting is clearly evident in the well-bedded sediments of Unit 5 to the south of Tredcroft Glacier. Stacked thrust sheets with spectacular recumbent dragfolds (Plates 3-10-3 and 3-10-4) attest to considerable stratigraphic shortening in this area. West of these thrusts the sediments on Mount Dartmouth are gently dipping and appear to have been transported eastward above the thrust planes, with minimal deformation.

Northeasterly trending faults are evident in the Deschamps Creek-Franklyn Arm area and in Nine Mile Creek. Similar structures were mapped east of Chilko Lake in 1985 and were determined to be relatively young features with little or no lateral movement. These faults are responsible for the uplift and exposure of Triassic rocks in Deschamps Valley. The parallelism of Franklyn Arm, Tredcroft Creek and Girdwood Creek, together with the occurrence of airphoto linears and the orientation of joints in these areas, suggest that these valleys may be underlain by northeasterly faults.

A broad southwesterly plunging synclinal fold, cored by the purple volcanic rocks of Unit 4, dominates the centre of the map area between the two major fault zones. The fold axis trends across Chilko Lake and is seen again to the southeast in younger rocks equivalent to the Taylor Creek Group.

MINERALIZATION

Copper-bearing skarn mineralization has been known on the Daisy property (MI 092N-026) near the head of Franklyn Arm since the early 1920s. A 3-kilometre trail leads to the showings from a cabin at the head of Franklyn Arm. Limestones within the Triassic sediments have been intruded and recrystallized to sugary marbles by quartz diorite stocks of the Coast Plutonic Complex. A fine-grained and moderately altered diorite to quartz-diorite stock truncates the Triassic rocks in Deschamps Creek and a larger stock of coarse-grained, relatively fresh quartz-diorite to granodiorite intrudes Unit 2 volcanics immediately to the east. A dyke of the coarser intrusive cuts the finer grained diorite. Bluffs of banded grey and white marble with moderate skarn development occur within a few hundred metres of the younger intrusive.

Trenches expose pockets of garnet-diopside-calcite-quartz skarn carrying localized concentrations of veinlet to near massive pyrrhotite-chalcocopyrite and disseminated scheelite mineralization. Malachite and azurite are common. The strongest mineralization is controlled by fracture zones in the marble up to 1.5 metres wide. Away from these zones the marbles are clean, white and unmineralized. No significant precious metal values have been reported from these skarns.

The Alexis property, overlooking Chilko Lake, covers copper-mercury-arsenic-antimony mineralization in the silicified fractures

and pervasive carbonate alteration of the Tchaikazan fault zone. The faults cut the volcanic and sedimentary rocks of Unit 6 and in this area, the fault zone contains numerous discontinuous dioritic dykes and stocks. Silicified veinlets or quartz-calcite vein breccia with a brown ankeritic matrix carry most of the mineralization. Minerals identified include tennantite, azurite, malachite, cinnabar, realgar, stibnite, hematite, aragonite and dickite; these occur sporadically around the property with the copper-mercury mineralization being concentrated at the "Knob showing". Prospecting along the strike of the fault zone led to the discovery of a new zone of similar copper-mercury mineralization 3 kilometres to the southeast and traces of mercury mineralization 1 kilometre to the northwest, extending the length of the mineralized system well beyond that previously reported. In both cases mineralization was located adjacent to intrusive rocks. Preliminary lithogeochemical analyses of samples from the Alexis area indicate widespread anomalous mercury and antimony values whereas arsenic and copper anomalies are more sporadic. Gold values are low, with a single high value of 445 parts per billion in a sample from the new southernmost showing.

The Tchaikazan fault, and parallel faults, were mapped east of Chilko Lake in 1985 and shown to contain anomalous mercury and copper values (McLaren, 1986 a and b). Mineralization at Alexis is probably epithermal, with the mineralizing fluids moving through a structurally prepared conduit system in the volcanic rocks. Heat to drive convecting hydrothermal fluids may have been supplied by the nearby intrusive bodies. Assessment work, including limited shallow drilling, has not yielded significant precious metal assays. Further encouragement from this area may be gained by probing the fault systems to greater depths or by searching along strike for areas of greater intrusive activity with related hydrothermal alteration and mineralization. A white intrusive stock and enclosing gossanous zone is visible 10 kilometres to the north on the north side of Stikelan Pass (Tipper, 1969). Projections of the Tchaikazan fault zone extending through Stikelan Pass immediately adjacent to this stock may represent a worthwhile prospecting target.

No similar mineralization has yet been found along the Stikelan fault zone. However, a portion of the fault zone cuts rhyolitic volcanics of Units 2 and 3 containing disseminations and massive pods of pyrite-pyrrhotite mineralization, with minor amounts of malachite.

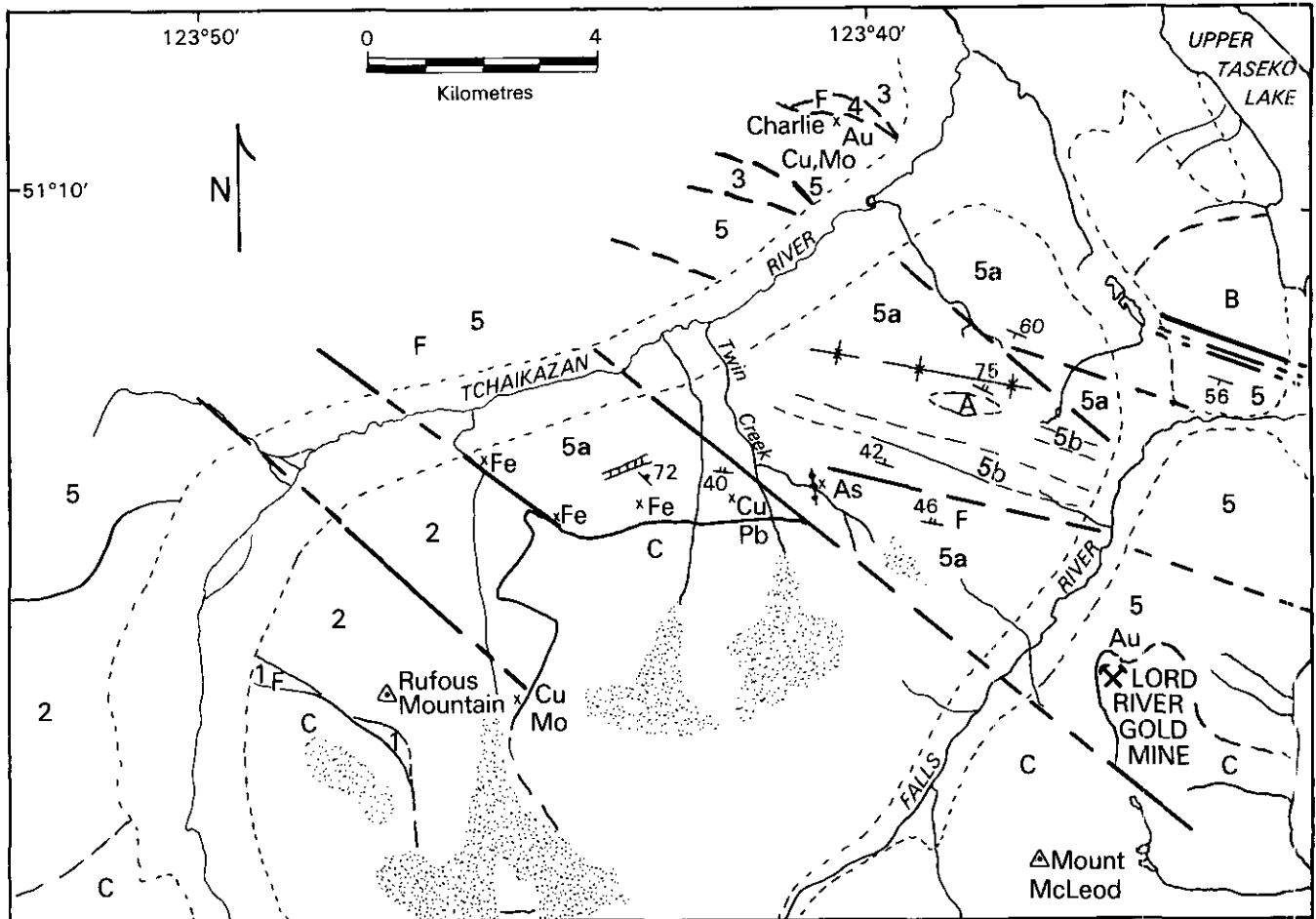
Pyrite and pyrrhotite mineralization in rhyolitic horizons is common in the Hauterivian volcanics observed on both sides of Chilko Lake (McLaren, 1986a). If the suggested correlation with Gambier Group rocks that host the Britannia mine in the southern Coast Mountains is valid, then the potential for volcanogenic massive sulphide deposits in these volcanic units must be considered.

Traces of chalcocopyrite and malachite occur on the western periphery of the intrusion at the head of Tredcroft Creek. Pyrite, chalcocopyrite and molybdenum mineralization was noted in quartz veins hosted by hornfelsed volcanics just southeast of the toe of Austen Glacier. A broad zone of gossanous hornfelsed volcanics and sediments is present between Austen and Hamilton Glaciers. The entire area between Tredcroft and Austen Glaciers was once covered by a single claim group and a number of other minor copper-molybdenum occurrences have been found.

Unit 4 purple volcanics have undergone brittle fracturing and development of quartz epidote veins over a broad area. North and south of Girdwood Lake copper mineralization was noted in talus. Prospecting upslope revealed epidote alteration zones up to 2 metres wide that contain quartz-carbonate veins and vein breccias carrying native copper and malachite. Prehnite was also identified in vuggy cavities in the veins.

GEOCHEMISTRY

A total of 182 stream sediment samples were collected from an area of approximately 600 square kilometres to the west of Chilko



LEGEND

STRATIFIED ROCKS

LOWER CRETACEOUS

ALBIAN

- 5a** Dacitic to basaltic pyroclastics, flows, breccias, and volcanic sediments
- 5b** Argillite, siltstone, sandstone, conglomerate
- 5** Undifferentiated 5a, 5b

HAUTERIVIAN

- 4** Black argillite, siltstone, sandstone, minor tuffs and flows
- 3** Purple andesitic pyroclastics and breccias; minor flows
- 2** Dacitic to basaltic pyroclastics and flows; minor rhyolite tuffs
- 1** Argillite, greywacke, conglomerate, minor tuffs

INTRUSIVE ROCKS

- A** Diorite stocks: hornblende diorite
- B** Felsites: feldspar and biotite feldspar porphyry
- C** Coast plutonic complex: granodiorite, quartz diorite

Figure 3-10-4. Geology between Tchaikazan and Falls Rivers.

Lake. The density of sampling within the volcanic and sedimentary units is approximately 1 site per 2.5 square kilometres (Figure 3-10-3). All samples will be analysed for 30 elements using an inductively coupled plasma (ICP) technique; for gold by a fire assay and neutron activation analysis; and for mercury using a flameless atomic absorption method.

Rock chip samples were collected from all locations containing mineralization or alteration assemblages potentially related to mineralization. A total of 144 rock samples will be analysed for 14 elements, including base and precious metals and precious metal indicators.

TCHAIKAZAN TO FALLS RIVERS AREA (920/4)

The area between the Tchaikazan and Falls Rivers was silt sampled but not mapped or prospected during the 1985 season; a short period was spent completing this work in 1986. Figure 3-10-4 outlines the geology mapped and mineral occurrences discovered.

Hauterivian volcanics and sediments, partially mapped in 1985, occur between the upper Tchaikazan River and Discord Creek. This section is entirely volcanic in Discord Valley where it is composed primarily of andesitic lapilli and lithic fragmental tuffs. Hornfelsing by the adjacent Coast Plutonic intrusive is widespread. A fault zone controls a gorge in lower Discord Creek and is marked by a gossanous alteration zone extending high up the slope to the southeast.

Volcanic rocks mapped further to the east are interbedded with fossiliferous sediments and are clearly correlative with the Albian Taylor Creek Group equivalents (Unit 5) mapped in 1985. Similarities between the Hauterivian and Albian volcanics make the contact between these rocks difficult to define. The basal conglomerate of the Albian rocks, seen to the west in 1985, was not located in 1986 and the contact is interpreted to lie along the gossanous fault zone.

The sediments and volcanics of Unit 5 consist of dark grey argillites and siltstones with limy horizons intercalated with andesitic feldspar crystal to lithic fragmental tuffs. Green vesicular flows, with quartz or epidote amygdules that locally carry traces of copper, occur within the tuffs. Beds of reworked epiclastic volcanic material are also common.

These rocks are intruded by a quartz-diorite to granodiorite stock with extensive hornfelsing in adjacent units and a fault truncated eastern contact. Tipper (1978) attributed an Eocene age to this intrusive. Another stock of crowded feldspar porphyry cuts sediments and volcanics 10 kilometres to the east. It is abruptly truncated on the south side by a strong fault zone. This intrusive is related to the Eocene felsites mapped in 1985 (McLaren, 1986 a and b) and by Tipper (1978).

A series of intensely silicified fracture zones, one of which carries considerable realgar mineralization, was found in a broad, drift-covered valley referred to here as Twin Creek valley (Plate 3-10-5). Distinct orange-weathering zones of rubble and outcrop occur 35 metres apart on either side of the creek, while a third isolated zone was noted 150 metres further upstream. Quartz-carbonate veining and vein breccias occur within areas of ankerite-siderite-kaolinite alteration. Realgar, orpiment and traces of cinnabar occur as fine disseminations, in veinlets and as crusts on fracture planes in one zone approximately 4.5 metres in true width. Assays of two channel samples across this zone returned an average of 0.2 per cent arsenic while selected grab samples contain up to 0.4 per cent arsenic; mercury geochemistry ranges from 6 to 18 parts per million. Gold values are low in the mineralized zone, but 100 to 200 parts per billion gold are present in samples taken from the other alteration zones. An anomalous arsenic stream sediment value was determined in this valley in 1985 (McLaren, 1986c) and the valley follows the trace of a major fault, possibly related to mineralization at the Lord River gold mine (MI 920-045) 6 kilometres to the

southeast. Gold mineralization is also known 6 kilometres to the northeast in the Charlie veins (MI 920-043). The proximity of the Twin Creek arsenic showing to known gold mineralization, a major fault and an intrusive contact suggests this area is highly prospective for precious metal veins.

The periphery of the quartz diorite to granodiorite stock in this area is fractured, quartz veined and mineralized in at least two locations. Copper-lead mineralization occurs on the ridge crest west of Twin Creek while a vein carrying copper-molybdenum mineralization was found in Discord Valley. Stream sediment samples anomalous in gold, arsenic and lead have previously been obtained in this area.

SUMMARY: MINERAL POTENTIAL

The Hauterivian strata west of Chilko Lake accumulated in a marine to subaerial volcanic island arc bounding the Tyaughton trough on the southwest. Uplift of a larger landmass to the west is indicated by siliciclastic deltaic sedimentation during Albian time. Tectonic adjustments and intrusion of the Coast Plutonic Complex led to broad folding, localized areas of imbricate thrust faulting and at least two broad zones of transcurrent faulting. This varied geology offers potential for a diversity of mineral occurrences in the area.

The greatest potential for making new mineral discoveries lies in searching for precious metal epithermal veins in the major structural zones. Brittle fracturing of subaerial volcanic rocks cut by the fault zones has provided the conduit system necessary for fluid migration. Sufficient heat to drive a hydrothermal system may have been provided by intrusive bodies. This is suggested by the close association of the Alexis epithermal mercury-copper-arsenic mineralization with intrusive activity along the Tchaikazan fault zone. Similar relationships between anomalous mercury values and intrusive activity in fault zones were noted in 1985. Prospecting has now documented mercury mineralization over a strike length of 4 kilometres near the Alexis property. Gold-silver-antimony-arsenic mineralization is known 14 kilometres to the northwest of Alexis at the Morris mine (MI 92N-002) where mineralized quartz veins cut Triassic volcanics and quartz diorite intrusions occur adjacent to the veins. Further mapping and prospecting of structural zones and related intrusives are warranted in the Chilko Lake region. A more detailed evaluation of the newly discovered realgar-bearing siliceous fault zones overlooking the Tchaikazan Valley is also required.

Gossanous felsic volcanic horizons in Units 2 and 3 suggest a volcanogenic massive sulphide environment in the Hauterivian island arc setting. To date only iron sulphides and traces of copper have been found in these rocks but the proposed correlation with the Gambier Group raises the potential for mineralization analogous to that at Britannia mine. Similar environments and correlations were noted east of Chilko Lake in 1985 (McLaren, 1986a).

Porphyry and skarn mineralization is also known to occur in the Chilko Lake region. The Fish Lake porphyry copper deposit (MI 920-042) occurs in a similar geologic setting north of Taseko Lakes and porphyry related copper-bearing stockworks are known east of Chilko Lake (McLaren 1986a). Copper-molybdenite veining occurs in the area of Hamilton and Austen Glaciers, but no extensive alteration zones or stockworks have been found. Exploration of the skarn deposits in Deschamps Valley has outlined only limited mineralization to date, however additional altered limestone horizons may exist in the Triassic rocks beneath the broad valley floor.

Prospecting, mapping and geochemical surveys conducted during the past two seasons in the Chilko-Taseko Lakes area continue to define new mineral occurrences, extend known mineralization and highlight zones of higher potential. The discovery of arsenic-bearing veins, adjacent to an arsenic stream sediment anomaly located in the 1985 survey and in an environment favourable for epithermal precious metal mineralization, illustrates the value of following up the geochemical surveys and the potential for making further mineral discoveries.

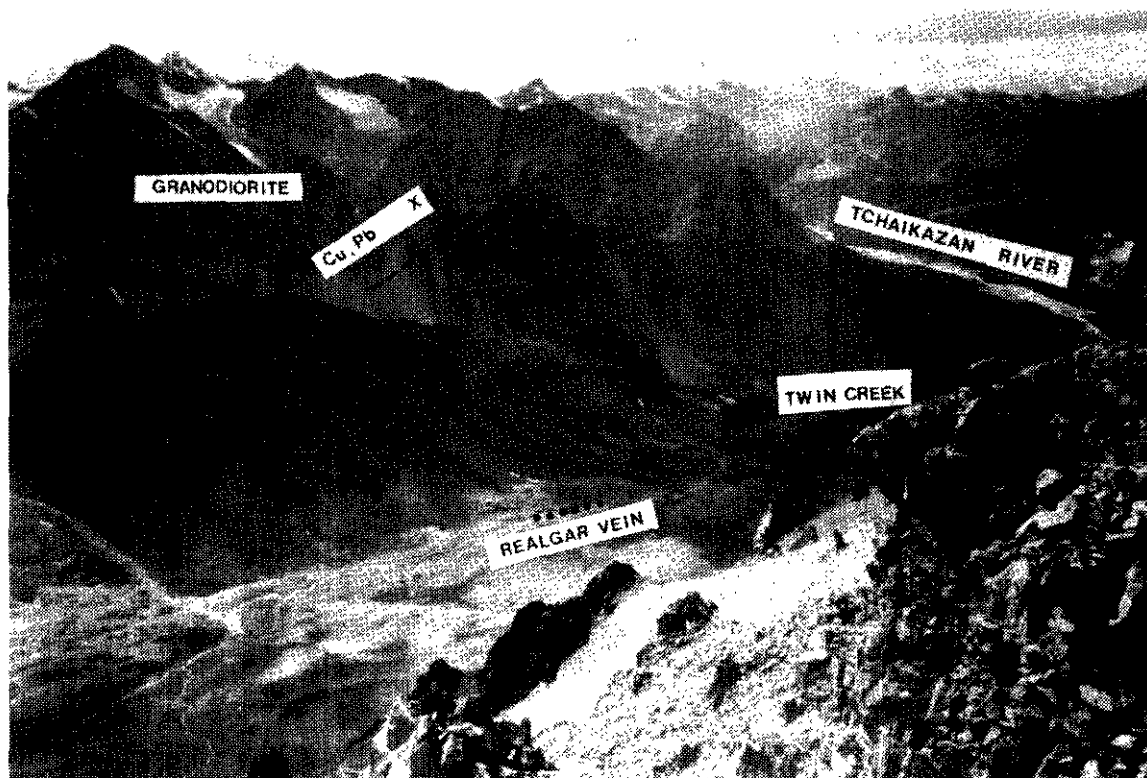


Plate 3-10-5. View of Twin Creek and location of realgar vein. Coast Plutonic Complex lies to the upper left; remaining area comprises Unit 5 sediments and volcanics.

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