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GEOLOGY OF THE SITLIKA ASSEMBLAGE IN THE KENNY CREEK - MOUNT OLSON AREA (93N/12, 13), CENTRAL BRITISH COLUMBIA

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KEYWORDS: Sitlika assemblage, Cache Creek Group, Hazelton Group, Sustut Group, Takla fault, Vital fault, Mount Bodine, Mount Olson, volcanogenic massive sulphides, gold-quartz veins, listwanite, nephrite.

INTRODUCTION

The Sitlika assemblage was named by Paterson (1974) for greenschist facies metavolcanic and metasedimentary rocks that outcrop east of Takla Lake, between the Takla fault and the Stuart Lake belt of the Cache Creek Group (Figure 1). Monger *et al.* (1978) recognized a strong lithologic and structural similarity between the Sitlika assemblage and the Kutcho Formation, which occurs in the eastern part of the King Salmon allochthon in northern British Columbia. They suggested that the King Salmon allochthon and structurally overlying Atlin belt of Cache Creek Terrane had been displaced northward from the Sitlika assemblage and adjacent Stuart Lake belt, on Late Cretaceous or early Tertiary dextral strike-slip faults. Gabrielse (1985) accepted this correlation, and suggested that restoration of about 300 kilometres of dextral offset, distributed on the Kutcho, Finlay, Ingenika and Takla faults, would match the Atlin belt and King Salmon allochthon with the Stuart Lake belt and Sitlika assemblage (Figure 2).

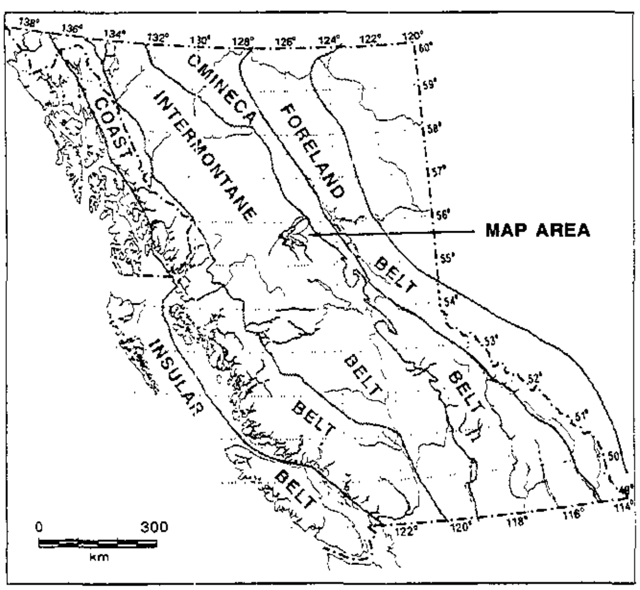

Figure 1. Location of the Sitlika project area.

The Kutcho Formation is host to the Kutcho Creek volcanogenic massive sulphide deposit, with reserves of 17 Mt grading 1.62% Cu, 2.32% Zn, 29.2 g/t Ag and 0.3 g/t Au in the main sulphide lens, and an additional 11 Mt of variable grade in two smaller lenses (Bridge *et al.*, 1986). Correlation of the Sitlika assemblage with the Kutcho Formation suggests that the Sitlika assemblage has potential to host similar volcanogenic massive sulphide mineralization. The Sitlika bedrock mapping project, part of the Nechako Natmap program, was therefore designed to update the geologic database for the western Manson River map area and, in particular, to determine the stratigraphy and structure of the Sitlika assemblage, the validity of its correlation with the Kutcho Formation, and its potential to host volcanogenic massive sulphide mineralization. Recent work on the Kutcho Creek deposit, by the Mineral Deposit Research Unit of the University of British Columbia, has established a Permo-Triassic age for volcanic and intrusive rocks of the Kutcho Formation, and documented their geochemical characteristics (Childe and Thompson, 1995; Thompson *et al.*, 1995). This new database provides some quantitative constraints with which to test the Kutcho - Sitlika correlation.

This report summarizes the findings from the first year of regional mapping within and adjacent to the Sitlika belt, carried out from late June to the end of August, 1996. It also incorporates data from 9 days of reconnaissance mapping and sampling by the senior author in August 1995. The map area covers the northern part of the Sitlika assemblage where it was originally studied and defined by Paterson (1974). It is planned to continue mapping southward along the Sitlika belt in the 1997 field season (*see* Figure 3).

The Kenny Creek - Mount Olson map area is situated mainly within the Hogem Ranges (including parts of the Sitlika and Vital ranges) of the western Omineca Mountains. The lowlands bordering Takla Lake in the southwestern corner of the area comprise part of the northern end of the adjacent Nechako Plateau. Access to the southwestern part of the area is provided by a network of logging and Forest Service roads that originates at Fort St. James, 160 kilometres to the southeast. A major logging road also extends eastward through the map area along the Fall River, and a seasonal four-wheel-drive road follows Kenny Creek along the area's southeastern boundary. Access to other parts of the area was by helicopter, facilitated by a seasonal base established by Pacific Western Helicopters at Rustad Limited's Lovell Cove logging camp, 5 kilometres west of the map area.

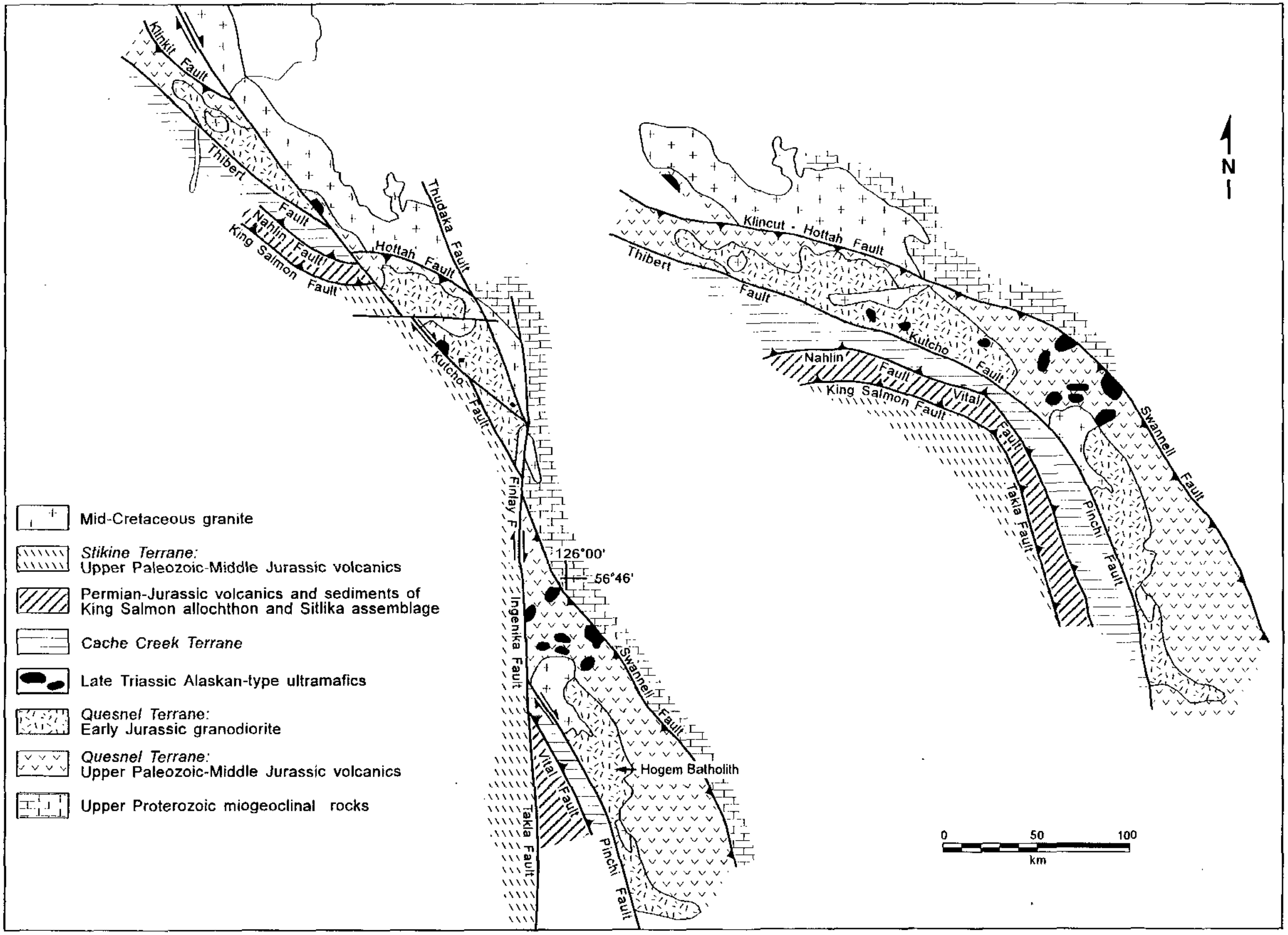

Figure 2. Major fault systems in the Intermontane Belt of central & northern British Columbia; right-hand diagram shows restoration matching Sitlika assemblage & King Salmon allochthon after removing about 300 kilometres of dextral displacement distributed on the Kutcho, Findlay, Ingenika and Takla faults. After Figures 9A and 9D of Gabrielse (1985).

The only permanent settlement in the area is the village of Takla Landing, located just beyond the southwest corner of the map area.

REGIONAL GEOLOGIC SETTING

The Kenny Creek - Mount Olson map area is situated within the eastern to central part of the Intermontane Belt. At this latitude the eastern Intermontane Belt includes early to mid-Mesozoic arc volcanic and plutonic rocks of the Quesnel Terrane flanked to the west by late Paleozoic and early Mesozoic oceanic rocks of the Cache Creek Terrane (Figure 3). The two terranes are separated by the Pinchi fault, which has had a long history, possibly beginning as an early Mesozoic subduction zone and/or transform plate boundary between the Cache Creek accretionary wedge and the Quesnel Terrane magmatic arc (Paterson, 1977; Ghent *et al.*, 1996). Latest movement is inferred to be dextral strike-slip of Tertiary age, based on occurrences of deformed and altered sedimentary rocks resembling the Late Cretaceous and Paleocene Sifton Formation within strands of the fault (Paterson, 1977; Struik, 1993).

The Cache Creek Group within and adjacent to the Kenny Creek - Mount Olson map area was referred to as the Stuart Lake Belt by Armstrong (1949) in order to distinguish it from a separate belt of rocks that he also included in the Cache Creek Group farther to the east. The latter, which he referred to as the Manson Creek belt, includes rocks that are presently assigned to Cassiar, Slide Mountain and Quesnel terranes (Ferri and Melville, 1994). The Stuart Lake belt can be traced southward for 400 kilometres into the type area of the Cache Creek Group in southern British Columbia (Wheeler and McFeely, 1991). It includes polydeformed chert, siliceous argillite, limestone, phyllite, slate, siltstone, sandstone, and mafic metavolcanic and meta-intrusive rocks. Thick limestone units contain fusulinids, corals, brachiopods, bryozoans, gastropods and conodonts that are Pennsylvanian and Permian in age (Armstrong, 1949; Thompson, 1965; Orchard and Struik, 1996); radiolarian chert and cherty mudstone range from Early Permian to earliest Jurassic in age (Cordey and Struik, 1996a,b). Ultramafic rocks within the Stuart Lake belt were referred to as the Trembleur intrusions by Armstrong, who interpreted them to be intrusive bodies cutting the Cache Creek sedimentary and volcanic rocks. These rocks are now included within the Cache Creek Group, and interpreted to be tectonically emplaced upper mantle and lower crustal portions of dismembered ophiolite sequences (Paterson, 1977; Ross, 1977; Whittaker, 1983; Ash and Macdonald, 1993; Struik *et al.*, 1996).

The Sitlika assemblage consists of greenschist facies metavolcanic and metasedimentary rocks that outcrop west of the Cache Creek Group (Figure 3). Rocks assigned to this assemblage in the Manson River map sheet were included in the Cache Creek Group by Armstrong (1949). They were named the Sitlika assemblage by Paterson (1974), who noted that they were structurally and lithologically distinct from the Cache Creek Group, and separated from the main belt of Cache Creek rocks to the east by a zone of serpentinite melange. Rocks correlated with the Sitlika assemblage were subsequently mapped as a narrow belt that extends northwestward through the northeastern corner of the Hazelton map area and into the southern McConnel Creek map area (Figure 3; Richards, 1990; Monger, 1977). The southern extent of the Sitlika assemblage is not well defined, as the area around central and southern Takla Lake has not been remapped since the unit was defined by Paterson. On Figure 3 it is shown to occur west of a discontinuous belt of ultramafic rocks that may correlate with those that mark the Sitlika - Cache Creek contact to the north (Bellefontaine *et al.*, 1995). It is possible, however, that the areas shown to be underlain by Stuhini and Cache Creek groups in the vicinity of southern Takla Lake include rocks of the Sitlika assemblage.

The Sitlika assemblage and Cache Creek Group are faulted to the west against the Stikine Terrane, which includes three successive assemblages of arc-derived volcanic, sedimentary and plutonic rocks that are assigned to the Lower Permian Asitka Group, the Upper Triassic Stuhini (formerly Takla) Group and the Lower to Middle Jurassic Hazelton Group (Tipper and Richards, 1976; Monger, 1977; MacIntyre *et al.*, 1996). These arc successions are overlain by predominantly marine clastic sedimentary rocks of the upper Middle Jurassic to Lower Cretaceous Bowser Lake and Skeena Groups, which in turn are overlapped by Upper Cretaceous to Eocene nonmarine clastic sedimentary rocks of the Sustut Group or age-equivalent continental arc volcanic rocks of the Kasalka and Ootsa Lake groups. Stikine Terrane and overlying clastic basin and continental arc assemblages cover the western two-thirds of the Intermontane Belt at the latitude of the study area, extending westward to the Coast Mountains.

The earliest deformation documented within Cache Creek Terrane in central British Columbia is related to subduction, probably beneath adjacent magmatic arc rocks of Quesnel Terrane, as indicated by blueschist facies rocks that yield Late Triassic K-Ar and Ar-Ar cooling dates (Paterson and Harakal, 1974; Paterson, 1977; Ghent *et al.*, 1996). Subsequent uplift of Cache Creek Terrane is recorded by chert-rich clastic detritus that was shed westward into the basal part of the Bowser Lake Group in late Middle Jurassic to Late Jurassic time. This uplift may relate to the early stages of a deformational episode that generated greenschist facies metamorphism and penetrative deformation within the Cache Creek Terrane and the Sitlika assemblage, and ultimately resulted in Cache Creek Terrane being thrust westward over Stikine Terrane (Monger *et al.*, 1978). Monger *et al.* suggest that the final stages of this contractional episode occurred in latest Jurassic to earliest Cretaceous time, based on the involvement of Oxfordian strata in west-directed thrusting to the northwest of the present study area, and a 110±4 Ma K-Ar date on synkinematic metamorphic biotite from a sample of the Sitlika assemblage collected in Ominicetla Creek. Younger deformation in the region involved dextral strike-slip and related extension, and occurred in Late

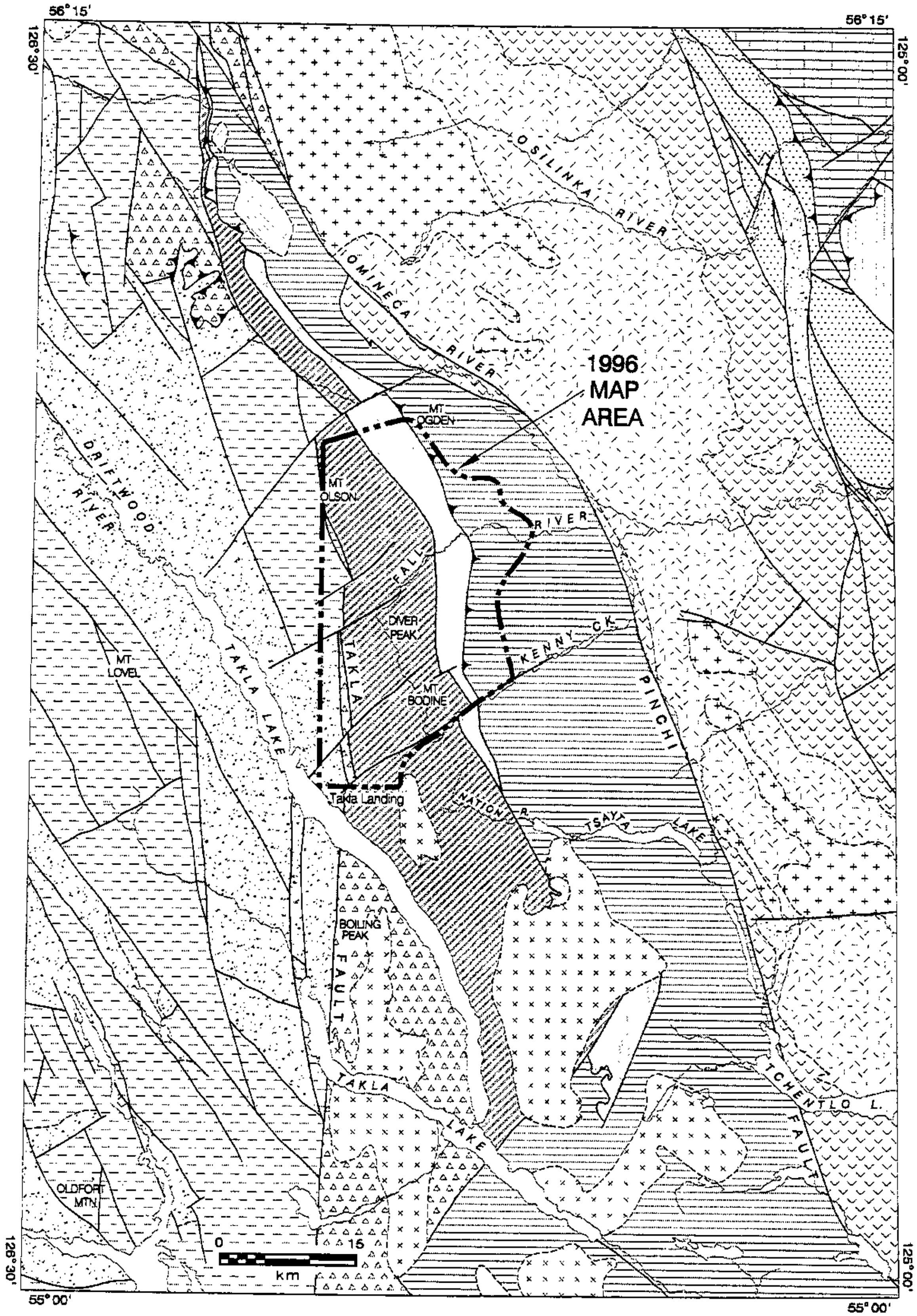

Figure 3. Geologic Setting of the Kenny Creek - Mount Olson map area. Modified from compilations by MacIntyre *et al.* (1994, 1995) and Bellefontaine *et al.* (1995).

Cretaceous to Eocene

Marine to nonmarine conglomerate, sandstone, shale; dacite, rhyolite; includes Skeena, Sustut and Ootsa Lake groups west of Takla fault; Sifton and Uslika formations east of Pinchi fault.

Cretaceous

Granite; local quartz syenite and alaskite.

Axelgold intrusions: layered gabbro.

Jurassic to Cretaceous

Granodiorite, quartz diorite, diorite.

STIKINE TERRANE

Lower to Upper Jurassic

Hazelton and Bowser Lake groups: mafic to felsic flows, tuffs and breccias; sandstone, siltstone, shale, conglomerate.

Permian and Upper Triassic

Mainly mafic to intermediate flows, tuffs, breccias & associated sedimentary rocks of the Upper Triassic Stuhini Group; locally includes basalt, rhyolite, tuff, chert, argillite and limestone of the Lower Permian Asitka Group, or granite of the Topley intrusions.

SITLIKA ASSEMBLAGE

Permian to Jurassic

Basalt, dacite, rhyolite, sandstone, slate, conglomerate; locally includes limestone, diorite, tonalite.

CACHE CREEK TERRANE

Pennsylvanian to Triassic

Quartz phyllite, chert, argillite, limestone, sandstone, greenstone, gabbro

Variably serpentinized harzburgite, dunite and ultramafic cumulates; serpentinite melange; greenstone, gabbro, amphibolite; local chert and limestone.

QUESNEL TERRANE

Late Triassic to Early Jurassic

Hogem batholith: monzonite, quartz monzonite, granodiorite, monzodiorite, diorite; locally includes gabbro, pyroxenite, syenite, quartz syenite.

Middle Triassic to Lower Jurassic

Takla Group: mafic volcanic flows, tuffs and breccias; conglomerate, sandstone, siltstone, limestone.

Mississippian to Permian

Lay Range assemblage: siltstone, argillite, slate, sandstone, chert, conglomerate; basalt, tuff, agglomerate; locally includes gabbro and serpentinite.

SLIDE MOUNTAIN TERRANE

Nina Creek Group: chert, argillite, basalt, breccia, gabbro.

CASSIAR TERRANE

Hadrynian to Permian

Sandstone, siltstone, shale, conglomerate, limestone, dolostone; local tuff

Legend to accompany Figure 3.

Cretaceous(?) to early Tertiary time (Monger *et al.*, 1978; Gabrielse, 1985; Struik, 1993; Wetherup and Struik, 1996).

LITHOLOGIC UNITS

Sitlika Assemblage

In the Kenny Creek - Mount Olson area (Figure 4), the Sitlika assemblage is subdivided into 3 units, corresponding to the 3 divisions originally defined by Paterson (1974). These are informally referred to as the volcanic unit (equivalent to Paterson's volcanic division), the eastern clastic unit (equivalent to Paterson's greywacke division) and the western clastic unit (equivalent to Paterson's argillite division). Volcanic and plutonic rocks within the volcanic unit are, at least in part, of Permian and Early Triassic age, and are readily correlated with the Kutcho Formation. The eastern clastic unit rests depositionally above the volcanic unit and contains detritus that was probably derived from it. It can also be correlated with rocks in the King Salmon allochthon, including the conglomerate unit of the upper Kutcho Formation and correlative or younger limestone, conglomerate and sandstone of the Sinwa and Inklin formations. The western clastic unit occurs as a narrow belt adjacent to the Takla fault. It is inferred to be in fault contact with the volcanic unit, and is of unknown stratigraphic relationship to the other two units of the assemblage. It includes chert pebble conglomerates which, together with its other lithologic components, suggest that it may correlate with Middle to Upper Jurassic rocks in the lower part of the Bowser Lake Group.

VOLCANIC UNIT

The volcanic unit of the Sitlika assemblage comprises mafic to felsic flow and fragmental rocks, along with co-magmatic intrusions. Mafic rocks are dominant, and include thoroughly recrystallized actinolite-epidote-chlorite schists as well as more massive greenstones with variable preservation of vesicles, plagioclase phenocrysts and pillow structures. Felsic volcanic rocks are distinctly subordinate, and typically occur as narrow intervals, from a few metres to several tens of metres thick, overlain and underlain by mafic rocks. They include quartz-sericite schists, with or without relict quartz and feldspar phenocrysts, as well as massive to flow-banded feldspar porphyry and quartz-feldspar porphyry. Although the internal stratigraphy of the volcanic unit is not well understood, felsic rocks seem to be thickest and most abundant in the upper part of the unit.

Schistose fragmental volcanics are a common and widespread component of the volcanic unit. Mafic fragmental rocks, in part derived from pillow breccias, occur locally. Most fragmental units, however, consist of light grey to green, variably flattened felsic volcanic clasts within a sericite-chlorite schist matrix. In places the schists with felsic fragments grade into non-fragmental felsic volcanics. More commonly, however, they form thick units that interfinger with pillowed mafic volcanics.

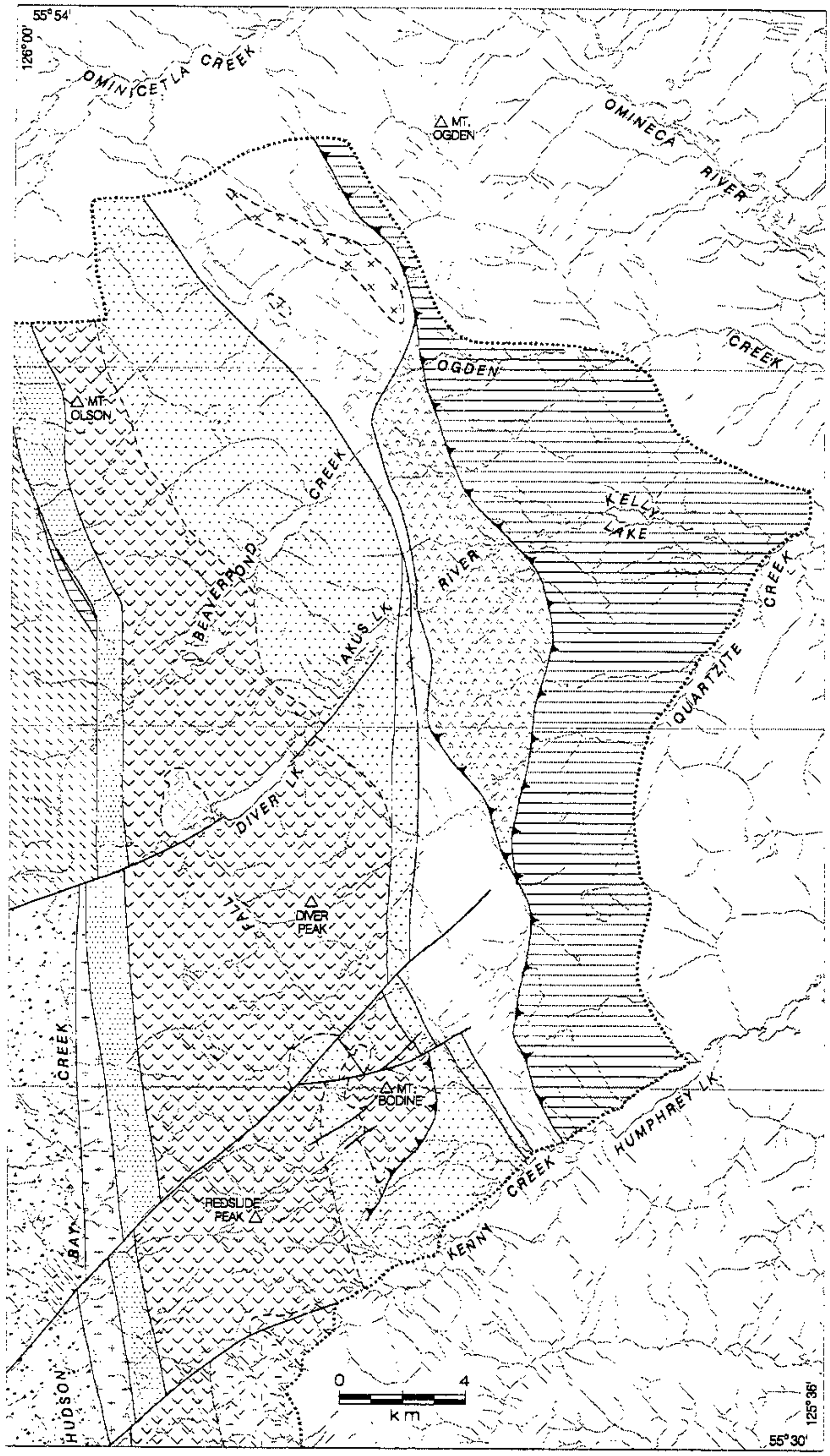

Figure 4. Generalized geology of the Kenny Creek - Mount Olson map area.

Upper Cretaceous
Sustut Group

Tango Creek Formation: polymictic conglomerate; sandstone, shale

Jurassic or Cretaceous (?)

Medium to coarse grained biotite granodiorite

STIKINE TERRANE
Lower to Middle Jurassic
Hazelton Group

Medium to dark green, brownish-weathered andesite, basalt and associated breccias and tuffs; commonly feldspar or feldspar-pyroxene-phyric; lesser amounts of volcanic conglomerate, sandstone and siltstone

Late Triassic to Early Jurassic (?)

Topley Intrusions(?): Red to pink, fine to medium-grained granite; lesser amounts of feldspar porphyry

SITLIKA ASSEMBLAGE
Middle to Upper Jurassic (?)

Western clastic unit: dark grey phyllite and slate; foliated chert-pebble conglomerate and chert-grain sandstone; lesser amounts of foliated limestone and grey phyllite containing flattened sedimentary and volcanic-lithic granules

Triassic to Jurassic (?)

Eastern clastic unit: variably foliated siltstone, sandstone and conglomerate containing felsic volcanic and plutonic clasts; medium to dark grey slate and phyllite; locally includes foliated limestone limestone conglomerate and green chloritic phyllite

Early Triassic

Light grey, medium to coarse-grained tonalite; medium green, medium-grained tonalite to quartz diorite

Late Permian or Early Triassic

Medium grained epidote-chlorite-feldspar schist to semischist; sericite-chlorite-feldspar schist; weakly foliated chloritized hornblende diorite

Permian to Early Triassic

Volcanic unit: medium to dark green chlorite schist, fragmental chlorite schist and pillowed metabasalt; chlorite-sericite schist containing felsic metavolcanic fragments; lesser amounts of quartz-sericite schist, quartz-feldspar porphyry, metasandstone and metachert

CACHE CREEK TERRANE
Pennsylvanian to Triassic
Cache Creek Group

Sedimentary unit: light to medium grey quartz phyllite, platy quartzite and metachert; lesser amounts of recrystallized limestone, dark grey phyllite, massive to pillowed greenstone, fragmental greenstone and chlorite schist; minor amounts of metasandstone

Mafic unit: Medium to dark green, massive to pillowed greenstone, fragmental greenstone and chlorite schist; minor amounts of metagabbro, amphibolite, serpentinite, listwanite, slate, ribbon chert and metasandstone

Ultramafic unit: serpentinite, serpentinized ultramafite and serpentine-magnesite-talc schist; serpentinite melange containing knockers of greenstone, diabase, amphibolite, chert and limestone; locally includes mariposite-quartz-magnesite-altered rock and nephrite

Legend to accompany Figure 4.

These may represent mass flow deposits derived from adjacent felsic volcanic buildups.

Sedimentary rocks occur rarely, but are a very minor component of the volcanic unit. Dark grey phyllite is most common, and is locally intercalated with thin beds of feldspathic tuffaceous(?) sandstone. Narrow intervals of light grey to green thin-bedded chert and siliceous phyllite also occur, as do intervals of light grey, thin-bedded, laminated to crosslaminated siltstone and fine-grained sandstone.

Mafic to intermediate intrusive rocks within the volcanic unit include fine to medium-grained feldspar-chlorite schist and semischist, derived from sills, dikes and small plugs of diabase, gabbro and diorite. Felsic intrusive rocks include widespread dikes and sills of variably foliated quartz-feldspar porphyry, as well as a small multiphase tonalite stock west of Diver Lake that intrudes pillowed volcanics and fragmental schists (Figure 4). The dominant phase within this stock has abundant glassy quartz phenocrysts, 3 to 6 millimetres in size, within a fine to medium grained, massive to weakly foliated groundmass of intergrown quartz, plagioclase and chloritized mafic grains. An older phase has sparse, small phenocrysts of quartz and plagioclase within a fine-grained groundmass that includes these same minerals, as well as abundant metamorphic chlorite and epidote.

Zircons from a weakly foliated quartz-plagioclase-phyric rhyolite north of Mount Bodine have yielded a U-Pb date of 258 +10/-1 Ma, and the tonalite plug that intrudes metabasalts and fragmental schists east of Diver Lake has been dated at 241 ±1 Ma by the same method (Childe and Schiarizza, 1997). These dates indicate that magmatism within the Sitlika volcanic unit occurred in Permian to Early Triassic time. Childe and Schiarizza also present geochemical and Nd isotopic data indicating that the Sitlika volcanic and intrusive rocks have a low-K tholeiitic magmatic affinity, and were derived from primitive magmas uncontaminated by old, evolved crust.

EASTERN CLASTIC UNIT

The eastern clastic unit of the Sitlika assemblage is best exposed in a wide outcrop belt north of the Fall River (Figure 4). Its contact with the adjacent volcanic rocks is well defined, although not quite exposed, on two adjacent ridges southeast of Mount Olson. There, it appears to be a stratigraphic contact, marked by a basal conglomerate, across which the eastern clastic unit overlies the volcanic unit. South of the Fall River, this stratigraphic contact is truncated by the northerly-striking fault bounding the Cache Creek ultramafic unit, although the eastern clastic unit apparently continues southward as a narrow fault-bounded lens along this fault system. The eastern clastic unit is repeated across a faulted anticline and adjacent syncline south and west of Mount Bodine. The stratigraphic contact is locally exposed on the east limb of the syncline, west of Mount Bodine, where it is marked by a basal conglomerate similar to the one north of the Fall River.

The basal part of the eastern clastic unit comprises several tens of metres of moderately to strongly schistose pebble to cobble conglomerate, in shades of green, grey or maroon. The conglomerates contain mainly felsic volcanic clasts, but also include clasts of limestone, mafic volcanic rocks, felsic plutonic rocks and phyllitic rocks of possible sedimentary origin. The volcanic and plutonic clasts are lithologically similar to rocks found within the Sitlika volcanic unit, from which they were presumably derived. In the sections north of the Fall River, conglomerates in the upper part of the basal conglomerate unit are intercalated with lenses of gritty sandstone and purple or green phyllite. These rocks pass up-section into green chloritic phyllite containing layers and lenses of buff to rusty dolomitic marble, which in turn pass up-section into grey phyllite containing lenses and layers of grey marble and silty calcarenite. This calcareous interval is several tens of metres thick and is overlain by predominantly thin-bedded sandstone and dark-grey slate, typical of much of the eastern clastic unit. Similar calcareous rocks are present locally west of Mount Bodine, but seem to be absent in some sections in the southern part of the area.

Most of the eastern clastic unit, above the basal conglomerate and overlying calcareous rocks, consists of dark grey slate intercalated with thin to thick, massive to graded beds of volcanic-lithic sandstone, siltstone and calcarenite. The internal stratigraphy and thickness of this part of the unit is not known, as the top is not exposed and it is repeated by numerous folds where it is best exposed north of the Fall River. Conglomerate, similar in composition to the basal conglomerate unit, occurs locally, as do beds and lenses of grey marble and calcarenite. Calcareous rocks are particularly abundant in highly folded and faulted sections exposed on the ridge 3.5 kilometres northeast of Mount Olson. In one section on this ridge, limestone beds up to 5 metres thick are intercalated with schisty sandstone, calcarenite and slate over a stratigraphic interval of about 40 metres. Some of the carbonate units are conglomeratic, containing flattened clasts of felsic volcanic rock and grey phyllite. The stratigraphic position of this interval is not known, and it is possible that it might be a structural repeat of the basal part of the unit.

The eastern clastic unit is not dated. It appears to be structurally concordant with the underlying volcanic unit, but the contact is abrupt, and the clastic rocks contain volcanic and plutonic detritus that was probably derived from the underlying unit. This suggests that the contact might be a disconformity or an unconformity. In any case, the eastern clastic unit apparently postdates the Permian to Early Triassic magmatism recorded in the underlying volcanic unit, and is therefore Early Triassic or younger. The possibility that the contact is disconformable or unconformable, coupled with a lithologic similarity to the Lower Jurassic Inklin Formation which overlies the Kutcho Formation, suggests that parts of the unit may be as young as Jurassic.

WESTERN CLASTIC UNIT

The western clastic unit of the Sitlika assemblage consists of dark grey slate, chert-pebble conglomerate, sandstone and limestone. It is nowhere well exposed, but apparently forms a continuous belt, from less than a kilometre to 1.5 kilometres wide, that occurs east of the Takla fault over the full length of the map area (Figure 4). Foliated chert-pebble conglomerate is the dominant and most characteristic lithology within the belt. It consists of moderately to strongly flattened clasts within a foliated sandy matrix of flattened chert and quartz grains with or without metamorphic sericite and chlorite. Pebbles are typically a few centimetres or less in longest dimension, but range up to 10 centimetres. They are almost entirely chert, but clasts of limestone, quartz, white felsite and chert-quartz sandstone, the latter of probable intraformational origin, also occur. Stratification within the conglomerates is locally defined by discontinuous narrow lenses of chert-quartz sandstone. Locally, similar sandstone dominates intervals up to 10 metres thick, where it occurs as thin planar beds separated by thinner interbeds or partings of grey slate.

Dark grey slate or phyllite is also a common component of the western clastic unit, but typically forms poor rubbly outcrops. The slate is commonly pyritic, and locally displays thin beds or laminae of slaty siltstone or fine-grained sandstone. In exposures south of Mount Olson, strongly fissile dark grey phyllite contains abundant light grey patches, from 1 to 10 millimetres across, that may be completely flattened lithic grains.

Carbonate was observed within the western clastic unit at one locality, about 3 kilometres west of Diver Lake. It forms an isolated outcrop about 30 metres wide, consisting of foliated, dark grey, finely recrystallized limestone containing patches and lenses of light grey marble. This outcrop is about 400 metres east of exposures of chert pebble conglomerate typical of the unit, and several hundred metres west of the inferred contact with the Sitlika volcanic unit.

None of the rocks within the western clastic unit are dated. Furthermore, it is apparently bounded by faults, so its stratigraphic relationship, if any, to the other units of the Sitlika assemblage is unknown. The most likely correlation, based solely on lithology, is with the Middle to Upper Jurassic Ashman Formation of the Bowser Lake Group, which includes dark grey shale, feldspathic to quartzose sandstone, chert-pebble conglomerate and local lenses of limestone (Tipper and Richards, 1976).

REGIONAL CORRELATION OF THE SITLIKA ASSEMBLAGE

The volcanic unit of the Sitlika assemblage resembles the Kutcho Formation in its bimodal character, the presence of comagmatic intrusions, and the Permo-Triassic age of magmatism. This correlation is fully supported by the geochemical and Nd isotopic characteristics reported by Childe and Schiarizza (1997). It is also supported by the strong lithologic similarity between the eastern clastic unit of the Sitlika assemblage and clastic rocks overlying the Kutcho volcanics. The latter include conglomerates that are included in the upper part of the Kutcho Formation, as well as rocks that have been included in the Sinwa and Inklin formations

(Pearson and Panteleyev, 1975; Panteleyev and Pearson, 1977a,b; Thorstad and Gabrielse, 1986). Similar features include the presence of a basal conglomerate unit containing clasts derived from the underlying volcanic rocks; an overlying limestone unit gradational with the conglomerates (Sinwa Formation) and an upper interval of slate, siltstone and calcareous greywacke with local conglomerate intervals (Inklin Formation).The Kutcho Formation and Sitlika assemblage also share a similar structural relationship to the Cache Creek Group, leaving little reason to doubt that the two units are correlative.

The age of the western clastic unit is unknown, as is the stratigraphic relationship to the volcanic and eastern clastic units. As discussed above, its lithologic attributes, and in particular the presence of chert-pebble conglomerates, suggest that it may correlate with the Middle to Upper Jurassic Ashman Formation of the Bowser Lake Group. The Bowser Lake Group was deposited on Middle Jurassic and older rocks of the Stikine Terrane, but contains detritus eroded from Cache Creek Terrane. Monger *et al.* (1978) suggest that the Cache Creek Terrane, the Sitlika assemblage and the Stikine Terrane, including overlying Bowser Lake Group, were imbricated by westerly-directed thrust faults in Late Jurassic or Early Cretaceous time. Correlation of the western clastic unit with the Bowser Lake Group is consistent with this interpretation, and suggests that the Sitlika assemblage is essentially a structural - metamorphic entity that formed during this major episode of contractional deformation.

The volcanic unit and overlying eastern clastic unit of the Sitlika assemblage may also correlate with an assemblage of rocks that is in thrust contact beneath the Cache Creek Group in the northeastern part of the Taseko Lakes map area, 450 kilometres to the south. There, Read (1992, 1993) documented a succession of Upper Permian metadacite flows and tuffs, overlain by meta-andesite and metabasalt flows and intruded by a Late Permian leucoquartz monzonite pluton. The dacitic volcanics have yielded a U-Pb date of 259±2 Ma (Read, 1993), almost identical to the date from the Sitlika rhyolite north of Mount Bodine (Childe and Schiarizza, 1997), and the associated leucoquartz monzonite pluton has been dated at 254±1.2 Ma. Correlation of this succession with the Sitlika volcanic unit is based on similarities in age, general lithologic character (mafic and felsic metavolcanic rocks plus comagmatic intrusions) and structural position along the western margin of the Cache Creek Group. Furthermore, the Upper Permian volcanic succession in the northeastern Taseko Lakes map area is depositionally(?) overlain by Lower Jurassic siltstone and sandstone containing felsic volcanic detritus that is inferred to have been derived from the underlying volcanics. These clastic rocks (Unit lJs of Read, 1993) may correlate, at least in part, with the eastern clastic unit of the Sitlika assemblage, as well as with the Inklin Formation of the King Salmon allochthon.

Childe *et al.* (1996, 1997) suggest that the Kutcho and Sitlika successions may also correlate with one or more fault-bounded panels of felsic and mafic volcanic rocks that are juxtaposed against the Cache Creek Group in the Ashcroft map area, south of the town of Cache Creek. They report that a tonalitic body that intrudes volcanic rocks in one of these panels has yielded a preliminary U-Pb zircon age of 242±2 Ma, which correlates with the age of magmatism in the Kutcho Formation, and with the dated tonalite body in the Sitlika assemblage.

Cache Creek Group

ULTRAMAFIC UNIT

The westernmost element of the Cache Creek Group in the Kenny Creek - Mount Olson map area is a belt of ultramafic rocks and serpentinite melange, up to 5 kilometres wide, that was first described by Paterson (1974), and is here referred to as the ultramafic unit. This unit is dominated by serpentinite and talc-magnesite schists, but also includes lenses and knockers of greenstone, amphibolite and metasedimentary rocks. It rests structurally beneath other units of the Cache Creek Group across east-dipping thrust faults; its contact with the Sitlika assemblage to the west is, at least in part, a younger dextral strike-slip fault.

The ultramafic unit is dominated by sheared and foliated serpentinite, locally containing metre-scale lenses of relatively massive ultramafite. Although grains of relict pyroxene could be discerned locally, even the relatively massive lenses are sufficiently serpentinized that protolith compositions are generally not apparent. Rusty-weathered talc-magnesite schist is also a common component of the ultramafic unit. In places it is restricted to narrow, linear zones in sharp contact with enclosing serpentinite, but elsewhere it occurs over broad areas and is gradational with the associated serpentinite. Orange-weathered zones of quartz-carbonate-mariposite-altered serpentinite (listwanite) are also fairly common, but are restricted to relatively narrow, linear zones that are, at least in part, fault-controlled. Rodingite and nephrite are likewise restricted to narrow alteration zones, typically along contacts between serpentinite and other rock types.

Greenstone forms discontinuous lenses and knockers within the ultramafic unit, ranging from a few metres to more than a kilometre in size. Although some of the greenstone was derived from mafic volcanic rocks, as indicated by relict pillows and pillow breccia, a larger proportion appears to have been derived from fine to finely-medium grained diabasic rock. In some large knockers, fine to medium-grained diabasic to gabbroic greenstone with an isotropic igneous(?) texture grades into foliated amphibolite. Similar moderately to strongly foliated, fine to medium grained amphibolite occurs as discrete knockers, ranging up to several tens of metres in size. The amphibolite facies metamorphism of these rocks is presumed to predate the mid-Mesozoic(?) greenschist facies metamorphism that characterizes the Cache Creek and Sitlika rocks within the map area. It might be related to Late Paleozoic construction of oceanic crust, or to early Mesozoic subduction or obduction tectonics.

Sedimentary rocks are not common within the ultramafic unit, but bedded chert, quartz phyllite and limestone occur locally, either as discrete knockers within serpentinite or as components of larger composite lenses comprising both metasedimentary rock and greenstone. At one locality, bedded chert within a mafic knocker occurs as an isolated raft enclosed by diabasic greenstone.

MAFIC UNIT

Rocks assigned to the mafic unit of the Cache Creek Group form a lens, 15 kilometres long by 4 kilometres wide, that outcrops between the ultramafic and sedimentary units north and south of the Fall River (Figure 4). Exposures within this lens are predominantly massive and pillowed greenstones, locally associated with fragmental greenstones probably derived from pillow breccias. Although most of the greenstones are of volcanic origin, relict textures suggest that some were derived from diabasic intrusive phases. Also included in the mafic unit are rare occurrences of amphibolitic metagabbro, serpentinite, listwanite-altered ultramafic rock and metasedimentary rock. The metasedimentary rocks are mainly interbedded chert and slate, but include rare exposures of quartz-feldspar-lithic sandstone that occurs as thin beds, with graded bases and laminated tops, intercalated with slate.

The western contact of the mafic unit was observed at one place, east of Diver Lake, where it is an east-dipping thrust(?) fault that separates it from the underlying ultramafic unit. The eastern contact was not observed. The mafic unit is dominated by greenstones of both extrusive and intrusive origin, similar to those that form knockers and lenses within the ultramafic unit. It is therefore thought to be more closely related to the ultramafic unit than the sedimentary unit, and may essentially be a very large lens within the former, as the map pattern suggests (Figure 4). In detail, however, greenstones within the mafic unit are dominantly of volcanic origin, whereas those that form knockers within the ultramafic unit are dominantly intrusive. This suggests that the mafic unit represents a slightly higher stratigraphic level within the crustal section of an original ophiolite stratigraphy, from which the ultramafic and mafic units were presumably derived.

SEDIMENTARY UNIT

Easternmost exposures in the Kenny Creek - Mount Olson map area are assigned to the sedimentary unit of the Cache Creek Group. This unit is dominated by grey platy quartz phyllites, but also includes metachert, cherty argillite, slate, limestone, greenstone, chlorite schist and metasandstone. Reconnaissance mapping to the east indicates that similar rocks dominate the Cache Creek Group all the way to the Pinchi fault (*see* Figure 3).

The sedimentary unit is dominated by light to dark grey platy quartz phyllites, comprising plates and lenses of fine-grained recrystallized granular quartz, typically a centimetre or less thick, separated by phyllitic mica-rich partings. Locally these platy rocks grade into less siliceous and more homogeneous medium to dark grey phyllites. Less commonly, they include intervals of light to medium grey bedded chert, comprising beds and lenses of cryptocrystalline cherty quartz, from 1 to 5 centimetres thick, separated by phyllitic partings. Also present are fragmental phyllites consisting of siliceous rock fragments within a green to grey phyllite matrix. The fragments typically range from a few millimetres to a few centimetres in size, but locally include narrow lenses up to 50 centimetres long that resemble broken beds. The fragmental intervals may have been derived from thin-bedded siliceous sedimentary units that were fragmented during soft-sediment slumping.

Light to dark grey recrystallized limestone occurs as intervals ranging from a few metres to a few tens of metres thick. These are in apparent depositional contact with bedded chert and platy quartz phyllite, or in fault contact with quartz phyllite or greenstone. Much thicker, light-grey weathered limestone units are visible in the mountains northeast of the study area, north of Ogden Creek (Armstrong, 1949). Paterson (1974) reports that fusulinids from these thick limestone exposures are of early Late Permian age. Macrofossils were not seen in limestones in the Kenny Creek - Mount Olson area; samples are being processed for microfossils, but the results are not yet available.

Mafic metavolcanic rocks, including chlorite schist, pillowed greenstone and fragmental greenstone, occur as intervals ranging up to many tens of metres thick within the sedimentary unit. These are widespread, but comprise less than 10 per cent of the unit. The mafic metavolcanic rocks typically form lenses parallel to the synmetamorphic foliation and transposed compositional layering in surrounding metasedimentary intervals. Locally they are associated with weakly foliated, fine-grained chlorite-feldspar semischists that were probably derived from mafic dikes or sills.

Clastic rocks are a very minor component of the sedimentary unit in the Kenny Creek - Mount Olson area, although narrow intervals of thin-bedded sandstone or siltstone occur locally within sections of grey phyllite. The unit also includes rare exposures comprising contorted thin beds and fragments of green tuffaceous(?) siltstone within dark grey slaty argillite.

The sedimentary unit is juxtaposed above the ultramafic unit across an east-dipping thrust fault in the northern and southern parts of the map area. A similar structure may separate it from the mafic unit in the intervening area, but the contact is not exposed. The thrust fault at the base of the unit may have formed in the Late Jurassic, as one component of a protracted event that resulted in greenschist facies metamorphism of the Cache Creek Group and its westward translation above the Sitlika assemblage and the Stikine Terrane (Monger *et al.*, 1978). This deformation apparently postdated its early to mid-Mesozoic (and older?) accumulation as an accretion-subduction complex. It is not clear from what part of the Cache Creek complex the adjacent ophiolitic rocks of the mafic and ultramafic units were derived, or when they attained their present structural position along the western margin of the Cache Creek belt.

INTRUSIVE ROCKS CUTTING THE CACHE CREEK GROUP

Felsic plutonic rocks of probable Jura-Cretaceous age are common only in the eastern part of the map area, where they cut the Cache Creek Group. The largest of these intrusive bodies is an elongate stock of coarse grained, biotite±muscovite granodiorite that occurs within the Cache Creek ultramafic unit in the northern part of the area, southwest of Mount Ogden (Figure 4). Similar granodiorite forms a small plug 2 kilometres southwest of the main stock, and occurs as dikes and pods elsewhere in this part of the ultramafic unit.

Dikes of light grey felsite and aplite occur locally within all three units of the Cache Creek Group, but are most common in the sedimentary unit in the southern part of the area. They range from less than a metre to about 10 metres in thickness. Most are massive, but some display a foliation parallel to the schistosity in the enclosing schists. A swarm of gently-dipping dikes within the western part of the sedimentary unit on the ridge above Kenny Creek is truncated by the east-dipping thrust fault that separates the metasedimentary rocks from the underlying ultramafic unit. This relationship, combined with the foliated to massive nature of the dikes, suggests that they were intruded during the late stages of synmetamorphic contractional deformation in this part of the Cache Creek Group.

CACHE CREEK ROCKS SOUTH OF MOUNT OLSON

Rocks tentatively included in the Cache Creek Group also occur west of the Sitlika assemblage, in a fault-bounded lens of limited extent that crops out about 5 kilometres south of Mount Olson. The eastern part of this lens comprises several tens of metres of serpentinite and quartz-carbonate-mariposite-altered serpentinite that are juxtaposed against dark grey phyllites of the Sitlika western clastic unit. To the west, these ultramafic rocks are in contact with a metasedimentary interval consisting mainly of dark grey slate with discontinuous, contorted lenses of greenish slaty siltstone to fine grained sandstone, and local lenses of contorted chert to cherty argillite. The metasedimentary rocks are in turn bounded to the west by an interval of strongly foliated chlorite-sericite-feldspar schist, which grades westward into weakly foliated, medium grained chloritized metagabbro.

The serpentinite, metasedimentary rocks and metagabbro described above, which are lithologically similar to parts of the extensive belt of Cache Creek rocks exposed east of the Sitlika assemblage, were observed over an area less than 150 metres wide. Their contact with the adjacent Sitlika assemblage is fairly well constrained, although not exposed, but they are separated from rocks of the Hazelton Group to the west (Richards, 1990) by more than a kilometre of Quaternary cover. This poorly-defined western boundary is inferred to be the main strand of the Takla fault, which is well defined about 8 kilometres to the south. The contact with the Sitlika assemblage to the east is also inferred to be a fault. It may be an older structure, related to structural imbrication of the Sitlika assemblage and Cache Creek Terrane in early to late Mesozoic time, and analogous to structures that separate the Kutcho Formation from structurally underlying lenses of Cache Creek Group that occur locally along the base of the King Salmon allochthon (Thorstad and Gabrielse, 1986). Alternatively, it may be a splay from the Takla fault. In this interpretation, the Cache Creek lens might have been derived from the vicinity of southern Takla Lake, where a major splay of the Takla fault system apparently marks the western boundary of Cache Creek Terrane (Figure 3).

Stikine Terrane

GRANITE ALONG THE TAKLA FAULT

Sparse exposures of red to pink-weathering granite in the southwestern part of the map area define a narrow, linear belt that separates the Sitlika assemblage from the Sustut Group to the west. The granite is a fine to medium grained equigranular rock consisting of pink K-feldspar, lesser amounts of grey-green saussuritic plagioclase, 10 to 20 per cent quartz, and 5 to 10 per cent chloritized mafics. Pink to brown-weathering feldspar porphyry locally occurs as narrow dikes cutting the granite, or as larger, isolated exposures of massive to flow-banded rock within the same belt.

The granite is highly fractured, and rarely displays a weak foliation. It apparently forms a narrow fault-bounded lens along the Takla fault. It is tentatively correlated with the lithologically similar Late Triassic to Early Jurassic Topley intrusions, which outcrop on either side of Babine Lake, 25 to 50 kilometres to the south (Carter, 1981; MacIntyre *et al.*, 1996).

HAZELTON GROUP

The Hazelton Group comprises Lower to Middle Jurassic submarine to subaerial arc volcanic rocks and related sedimentary rocks that are a widespread component of Stikine Terrane in central and northern British Columbia (Tipper and Richards, 1976; Marsden and Thorkelson, 1992). Following Paterson (1974), volcanic and sedimentary rocks that occur east of the Takla fault in the northwest corner of the map area are included in the group. These rocks are poorly exposed and are not dated within the present map area, but are continuous with better exposed rocks to the west, which Richards (1990) assigns to the Lower Jurassic Telkwa Formation of the Hazelton Group.

Rocks assigned to the Hazelton Group in the Kenny Creek - Mount Olson map area lack the penetrative foliation that characterizes the adjacent Sitlika assemblage. Most exposures consist of chlorite-epidote-altered, medium to dark green or mottled green/maroon andesitic or basaltic volcanics. Feldspar phenocrysts are commonly present, and chloritized pyroxene phenocrysts are evident locally. Most of the volcanics were apparently derived from massive flows, although monolithic flow(?) breccias also occur. Sedimentary rocks of uncertain relationship to the volcanics are also present, and include well indurated, thin to medium-bedded feldspar-lithic sandstone intercalated with siltstone and cherty argillite, purple concretionary siltstone, and red to purple, vaguely stratified volcanic breccia or conglomerate. The latter rock type consists of angular to amoeboid-shaped clasts of mainly felsic to intermediate volcanic rock, up to 6 centimetres across, within a gritty sandstone to siltstone matrix of similar composition.

SUSTUT GROUP

The Sustut Group (Lord, 1948; Eisbacher, 1974) consists of Upper Cretaceous to Eocene nonmarine clastic sedimentary rocks and intercalated tuffs that were deposited above Stikine Terrane and overlying Bowser Lake Group in central and northern British Columbia. Exposures of Upper Cretaceous conglomerate west of the Takla fault in the southwestern corner of the map area were assigned to the group by Armstrong (1949). These rocks occur near the south end of a belt that extends northwestward through the Hazelton map area (Richards, 1990) to the type area of the group along the Sustut River in the McConnell Creek map area (Lord, 1948).

Exposures of Sustut Group rocks in the Kenny Creek - Mount Olson map area are entirely sedimentary, and parts of the succession along Takla Lake just to the south have yielded collections of Cenomanian plant fossils (Armstrong, 1949). These rocks are therefore assigned to basal unit of the group, the Tango Creek Formation, as defined by Eisbacher (1974). The dominant lithology is light brownish-weathering, well-indurated conglomerate containing clasts of mafic to felsic volcanic rock, chert, cherty argillite and a wide variety of plutonic clasts, including granite, granodiorite and monzonite. White vein quartz is a conspicuous clast component in most exposures, and clasts of strongly foliated quartz-rich tectonite occur locally. The conglomerates are generally poorly to moderately sorted, comprising rounded to subrounded cobbles and pebbles within a gritty sandstone matrix of similar composition. There is no stratification apparent in many exposures, whereas in others the conglomerate forms medium to thick beds that locally display cross stratification and channeling. Medium to coarse-grained sandstone and gritty sandstone commonly forms thin to medium lenticular beds within these stratified intervals. Green concretionary siltstone to fine grained sandstone, commonly with fossil plant remains, occurs locally as intervals that are up to several metres or more thick. No basal contacts of this distinctive lithofacies were observed; upper contacts are sharply defined by overlying conglomerates.

STRUCTURE

Structure of the Sitlika Assemblage

All three units of the Sitlika assemblage are characterized by a single penetrative cleavage or schistosity defined by the preferred orientation of metamorphic minerals and variably flattened clastic grains or volcanic fragments. Metamorphic mineral assemblages reported by Paterson (1974) indicate lower to mid greenschist facies metamorphic grade; his observations are supported by the present study, although this report was written prior to a thorough petrographic examination of thin sections. The metamorphic foliation dips steeply to the east-northeast or west-southwest throughout the Sitlika belt. It is axial planar to upright folds of bedding, most commonly observed in the well-bedded eastern clastic unit, with axes that plunge north-northwest or south-southeast. Bedding was only rarely observed in the volcanic and western clastic units, where it typically dips more gently than, and in the same direction as, the associated schistosity.

The contact between the western clastic unit and volcanic unit is tightly constrained on the west flank of Mount Olson and on the ridge 1.5 kilometres to the south. There, it appears to be an east-dipping ductile fault contemporaneous with the steeply-east-dipping schistosity in both units. Bedding in both units dips at moderate angles eastward. This relationship, steeply east-dipping schistosity cutting more gently east-dipping bedding, apparently persists eastward across the entire width of the volcanic belt, and across the stratigraphic contact into the basal part of the overlying eastern clastic unit. The wide expanse of eastern clastic unit farther east, however, is repeated across numerous upright, north-northwest trending folds.

The outcrop width of the volcanic unit is considerably greater in the south than it is in the Mount Olson area. This is in part due to internal folding, as indicated by a faulted anticline and adjacent syncline that repeat the contact between the volcanic unit and overlying eastern clastic unit south and west of Mount Bodine (Figure 4). The contact between the volcanic unit and western clastic unit is not exposed anywhere south of the Mount Olson area, but is constrained to be essentially parallel to the adjacent Takla fault. Structural trends within the southern and central parts of the volcanic unit strike northwesterly, at a shallow angle to this contact (Schiarizza *et al.*, 1997). This suggests that the northward narrowing of the volcanic unit is due to a gradual truncation along this contact. It is suspected, therefore, that the southern and central parts of the volcanic/western clastic contact is a relatively young fault, related to the adjacent Takla fault, that has been superimposed on the east-dipping ductile fault that marks the contact at Mount Olson. In a similar fashion, the wide expanse of folded eastern clastic unit exposed north of the Fall River thins dramatically southward due to its truncation along the relatively young dextral strike-slip fault system that defines the contact between the Sitlika assemblage and the adjacent Cache Creek Group (Figure 4).

Structure of the Cache Creek Group

The Cache Creek Group comprises greenschist facies rocks that are of comparable metamorphic grade to the Sitlika assemblage, but contrast markedly in structural style (Paterson, 1974). Mesoscopic structures are best displayed in the sedimentary unit, where compositional layering has been transposed into parallelism with a prominent metamorphic foliation. This schistosity is deformed by a pervasive set of second-generation structures characterized by east-verging folds with moderately west-dipping axial surfaces, commonly marked by a crenulation or fracture cleavage. The axes of these folds, along with associated crenulation lineations, plunge gently north to north-northwest. Metamorphic minerals that define the first generation schistosity are, at least in part, bent and kinked by these younger structures, indicating that the second phase of deformation postdates most of the metamorphism.

Although their orientation is locally highly variable due to later folding, the schistosity and compositional layering within the Cache Creek Group most commonly dip to the east. This east dipping foliation is parallel to east-dipping faults that were observed to mark the contact between the sedimentary unit and underlying ultramafic unit in the northern and southern parts of the area. A similar east-dipping fault separates the mafic unit from the ultramafic unit where the contact was observed east of Diver Lake. Asymmetric fabrics within east-dipping shear zones in the immediate footwall of the fault that separates the sedimentary unit from the ultramafic unit in the southern part of the area indicate thrust movement. The synmetamorphic deformation within the Cache Creek Terrane may therefore by related to an episode of west-directed thrusting. Although structures within the Sitlika assemblage are not easy to relate to those within the Cache Creek Group, the east-dipping synmetamorphic fault that separates the volcanic unit from the western clastic unit at Mount Olson may be a correlative structure.

Contact Between the Cache Creek Group and the Sitlika Assemblage

Monger *et al.* (1978) referred to the contact between the Cache Creek Group and Sitlika assemblage as the Vital fault, which they described as "a zone of imbricated alpine-type peridotite and basalt up to 3 kilometres wide with fault planes dipping easterly at about 50 degrees". This fault zone corresponds to the Cache Creek ultramafic unit of this report. As described above, east-dipping faults, one with documented thrust movement, mark the contacts between the ultramafic unit and the overlying mafic and sedimentary units, and east-dipping outcrop-scale faults were also observed internally within the ultramafic unit. However, the contact between the Cache Creek ultramafic unit and the adjacent Sitlika assemblage is well defined only on the north face of an east-trending ridge 3.8 kilometres east of Diver Lake. There, the fault contact strikes northerly and dips steeply. For about 200 metres east of the fault contact, most mesoscopic faults within serpentinite of the ultramafic unit are vertical or dip steeply west, and most display gently plunging mineral fibres or slickensides. One such fault zone contains several discrete faults which enclose domains of sigmoidally disposed foliation that indicate dextral strike-slip movement. Farther east, steeply-dipping, north-striking faults and zones of listwanite alteration appear to cut across east-northeast-dipping foliation and related fault zones along and beneath the contact with the overlying mafic unit.

Shear bands indicating dextral strike slip were also observed within the western part of the ultramafic unit about 5 kilometres north-northeast of Mount Bodine, although there, the actual contact with the adjacent Sitlika assemblage is not well defined. Nevertheless, these relationships suggest that within all or parts of the Kenny Creek - Mount Olson map area, the eastern boundary of the Sitlika assemblage is a system of dextral strike-slip faults that postdates the east to northeast-dipping contractional structures within the adjacent Cache Creek Group. This dextral fault system is inferred to be Tertiary in age, and broadly contemporaneous with the Takla fault to the west, and latest movement on the Pinchi fault to the east. It may be a relatively local feature that here crosscuts a regional west-directed thrust system that places Cache Creek Group above the Sitlika assemblage and its correlatives. This thrust system is mapped in the western Axelgold Range at the north end of the Stuart Lake belt (Monger, 1977; Monger *et al.*, 1978), in northern British Columbia where it separates the Cache Creek Group from the Sitlika-correlative King Salmon allochthon (Nahlin fault: Monger *et al.*, 1978; Thorstad and Gabrielse, 1986), and in southern British Columbia where it separates the Cache Creek Group from Sitlika-correlative rocks in the northeastern Taseko Lakes map area (Read, 1992, 1993).

Takla Fault

The Takla fault (Armstrong, 1949; Paterson, 1974) marks the western boundary of the Sitlika assemblage, and juxtaposes it against volcanic, sedimentary and plutonic rocks of Stikine Terrane. It is not exposed, but its north-striking trace is fairly well defined in the southern part of the map area, where it separates the Sitlika assemblage from an elongate lens of pink granite that is correlated with the Topley intrusions of Stikine Terrane. This granite is in contact with the Sustut Group to the west, across an inferred fault that may also be part of the Takla system. The trace of the Takla fault is also well constrained for a few kilometres north of the northeast striking Diver Lake fault, where it juxtaposes the Sitlika assemblage against unmetamorphosed volcanic and sedimentary rocks of the Hazelton Group (Figure 4). It is not well defined farther to the north, where the main strand of the fault is inferred to mark the western boundary of Cache Creek Group rocks exposed south of

Mount Olson. As discussed previously, this lens of Cache Creek Group may have been emplaced along the Takla fault, or it might be part of an older fault slice imbricated with the Sitlika assemblage and then truncated by the Takla fault.

Monger *et al.* (1978) and Gabrielse (1985) suggest that the Takla fault is part of a Late Cretaceous to early Tertiary dextral strike-slip fault system that may have a cumulative displacement of about 300 kilometres (Figure 2). In this interpretation, the Takla fault would correlate with the Glenlyd - Ingeneka fault of the McConnell Creek map area, with which it can be matched after restoring 15 to 20 kilometres of dextral offset on the Pinchi - Two Lake Creek fault system as mapped by Monger (1977) which is equivalent to the Omineca fault of Lord (1948). Relationships within the Kenny Creek - Mount Olson map area provide little direct evidence bearing on the nature of movement on the Takla fault, although a northwest plunging anticline that is documented in the Sustut Group directly west of the fault (Schiarizza *et al.*, 1997) is of an appropriate orientation (Wilcox *et al.*, 1973) to be related to Late Cretaceous or Tertiary dextral movement on the fault. This study does, however, support correlation of the Sitlika assemblage with the King Salmon allochthon, and this correlation forms the main basis for the dextral strike-slip interpretation.

Northeast Striking Faults

Prominent topographic lineaments along Diver Lake, the creek north of Redslide Peak, and Kenny Creek coincide with northeast striking faults that mark apparent dextral offsets of the Takla fault system. The Diver Lake fault also truncates the Hazelton Group and juxtaposes it against the Sustut Group to the south. Northeast striking faults that coincide with minor dextral offsets of the contact between the Sitlika volcanic unit and overlying eastern clastic unit were also mapped southeast of Mount Bodine, and an east-northeast striking fault north of the mountain marks a one kilometre sinistral offset of the fault separating the Sitlika assemblage from the adjacent serpentinite melange unit. These northeast striking faults are relatively young features, as they offset the Takla fault and related structures which are probably of Tertiary age. They might be broadly related to strike-slip faulting on the Takla system, or might reflect a discrete younger event.

MINERAL OCCURRENCES

Eureka (MINFILE 93N 179)

The Eureka showing occurs within the Sitlika assemblage about 1.5 kilometres north-northeast of Mount Bodine. It comprises a pod of mineralized quartz, measuring about 60 centimetres high by 40 centimetres wide, within a vertical, northwest-striking shear zone. The quartz contains patches and disseminations of pyrite and chalcopyrite, as well as malachite and manganese oxide staining. The shear zone cuts variably quartz-pyrite-altered schists, apparently derived from a dominantly felsic succession within the volcanic unit a short distance west of the fault(?) contact with the eastern clastic unit. Watkins (1980, sample 430) reports that a channel sample across the mineralized pod returned 1.3% Cu, 106 ppm Pb, 6450 ppm Zn, 22 ppm Ag and 70 ppb Au. A 127.5 metre drill hole was collared to the northeast of the Eureka showing in 1989, and inclined to the southwest in order to test the mineralization and an associated IP anomaly at depth (Campbell, 1990). The hole encountered variably pyritic felsic flows and fragmental rocks, locally cut by veinlets and stringers of quartz±pyrite. Traces of chalcopyrite and sphalerite were recorded from the upper part of the hole, where one 3.8 metre section contained 0.44% Zn, and a separate 1.7 metre section contained 0.40% Cu (Campbell, 1990).

The Eureka showing appears to represent epigenetic mineralization, possibly related to the system of northwest-striking faults that separate the Sitlika volcanic unit, eastern clastic unit, and Cache Creek ultramafic unit in this area. However, evidence for syngenetic sulphide deposition within the Sitlika volcanic unit comes from 500 metres to the west, at a locality referred to as the Crystal showing (Figure 5). There, several centimetres of laminated pyrite and chert, of probable exhalative origin, occur within a zone of rubbly subcrop dominated by massive jasperoidal quartz containing patches of specular hematite and stringers of magnetite. These rocks occur at the contact between a succession of west-dipping sericite-chlorite schists and fragmental schists, and an overlying unit of relatively massive silicified rhyolite. The footwall schists contain chlorite-rich stringers and patches that have been interpreted as zones of pre-metamorphic chlorite alteration, related to the hydrothermal activity that deposited the overlying banded sulphide and chert (Watkins, 1980; D. Bohme, personal communication 1995). A sample of the laminated pyrite/chert submitted for assay by Watkins (1980, sample 445) did not yield anomalous base or precious metal concentrations.

Don Showing (New)

The Don showing comprises a system of mineralized quartz veins that occur within the Sitlika volcanic unit about a kilometre southwest of Mount Bodine (Figure 5). The veins are exposed, although not easily accessible, over a distance of about 200 metres in the south wall of the cirque basin west of the mountain. Veins just below the ridge crest at the east end of the system occur on either side of a northeast-striking fault that defines a 300 metre apparent dextral offset of the contact between the volcanic and eastern clastic units. They range from a few centimetres to about a metre in width, and most dip at moderate to shallow angles to the southeast. Most of the thicker veins contain patches, up to several centimetres across, of limonite-altered pyrite, locally with chalcopyrite, malachite and azurite. A sample of mineralized material from one of these thick veins contained 2.17% Cu, 380 ppb Au and 1.8 ppm Ag (Table 1, Sample 96PSC-28-12-2). Veins farther west within the system are in part marked by gossanous zones, but were not examined.

Silica-Pyrite Alteration Zones within the Sitlika Assemblage

Gossanous areas of pyritized and silicified rock are scattered throughout the Sitlika volcanic unit, mainly as narrow zones associated with felsic volcanic rocks. The most visible gossans occur on the southeast shoulder of Mount Olson and the two ridges to the south, and on the low slopes north-northeast of Mount Bodine (Figure 5). These alteration zones comprise intervals of variably pyritic sericite-quartz schist, platy pyrite-quartz semischist and, locally, talc-quartz schist. The intensely altered rocks are interleaved with layers and lenses of variably pyritic metadacite to metarhyolite, as well as chloritic schists that were probably derived from basalts. However, the relative proportion of mafic to felsic volcanics is generally obscure due to the pervasive nature of much of the alteration. Samples from these alteration zones commonly show elevated concentrations of zinc, but are not appreciably anomalous with respect to other base or precious metals (Table 1).

A significant new discovery of a hydrothermal breccia and associated alteration zone was made by L.B. Warren in the summer of 1995, and staked as the Vent claims. The discovery outcrop occurs in a narrow canyon in the lower portion of an unnamed Creek, about 500 metres east of Diver Lake (Figure 5). It includes a vertical outcrop face, about 6 metres long, made up of a hydrothermal breccia consisting of angular, white, silicified rock fragments held together by a matrix of granular fine-grained pyrite and grey quartz. This breccia grades northward into highly fractured pyritic and silicified rock that can be traced for about 200 metres downstream. It is abruptly truncated to the southeast by a moderately northwest-dipping brittle fault that juxtaposes the breccia against a medium green, rusty-weathered rock with ghosts of small feldspar phenocrysts. This green feldspar-phyric unit is about one metre thick; it is structurally underlain, across an abrupt but apparently unfaulted west-northwest-dipping contact, by a pale grey silicified rock containing disseminated pyrite. This rock passes southeastward into variably silicified chlorite-sericite schists that were derived from a felsic volcanic protolith. These felsic schists were traced for 2 kilometres along the creek to the southeast. They apparently form a relatively narrow unit, perhaps as much as 100 metres wide, enclosed by metabasalt. What may be the same felsic unit is also exposed on Fall River logging road to the north, but is offset from the Vent unit by about 500 metres of apparent dextral displacement across the inferred trace of the northeast trending Diver Lake fault. Grab samples from the Vent hydrothermal breccia and associated pyritic rocks just to the south did not yield anomalous base or precious metal values, and a sample from quartz-pyrite-altered rock to the north contained only a slightly elevated concentration of zinc (Table 1). Nevertheless, this occurrence clearly warrants further exploration.

Source (MINFILE 93N 110)

The Source occurrence is a narrow, gold-bearing quartz vein within the Cache Creek ultramafic unit, 3.7 kilometres east-northeast of Mount Bodine (Figure 5). It was discovered in June 1989 and subsequently staked as the Source claims by L.B. Warren of Smithers. Grexton (1990) reports that the vein is 25 centimetres wide and was traced as subcrop for more than 100 metres in an east-west direction. It locally contains very fine visible gold which occupies minute, discontinuous fractures within the quartz. The best assay result reported by Grexton had 7.27 grams per tonne gold and 89.8 grams per tonne silver.

The Source vein is within an east-trending zone of mariposite-quartz-magnesite (listwanite) alteration, 10 to 20 metres wide, that cuts across the north-northwest-striking foliation of talc-magnesite schists containing knockers of greenstone and amphibolite. Where best exposed, just to the west of the Source vein, individual listwanite zones are 2 to 3 metres wide and separated by similar widths of schist. A sample of listwanite collected from this exposure in 1996 contained 12 ppb Au (Table 1, Sample 96PSC-23-9-2); Culbert (1985) reports that a sample of silicified rock from the same listwanite-altered zone contained 45 ppb Au and 2.6 ppm Ag.

A prominent zone of listwanite alteration also occurs along the contact between the ultramafic unit and the Cache Creek sedimentary unit, where it appears to postdate fabrics related to west-directed thrusting within serpentine-magnesite-talc schist. A sample of listwanite from this contact, collected on the ridge crest 600 metres north-northeast of the Source vein, contained 94 ppb Au (Table 1, Sample 96PSC-23-17). Macfarlane (1984b) reports soil anomalies of 780, 550 and 35 ppb Au from adjacent sample sites along strike approximately 1 kilometre to the north, and a nearby stream sediment silt sample collected by Culbert (1985) yielded 315 ppb Au. More recent work has yielded a soil anomaly of 135 000 ppb Au from the same area (L.B. Warren, personal communication, 1996).

The eastern contact of the Cache Creek ultramafic unit is not well exposed for a considerable distance to the north, but the entire outcrop width of the unit is exposed 9 kilometres north of the Source showing, east of Diver Lake. There, the serpentinite melange unit is only about 600 metres wide, and northerly-striking zones of listwanite alteration, locally associated with extensive quartz veining, occur within its central and eastern parts. One sample of listwanite from the central part of this belt yielded 36 ppb Au (Table 1, Sample 96PSC-11-9).

Shane Showing (New)

The Shane showing is a mineralized quartz vein that was discovered within the Cache Creek ultramafic unit

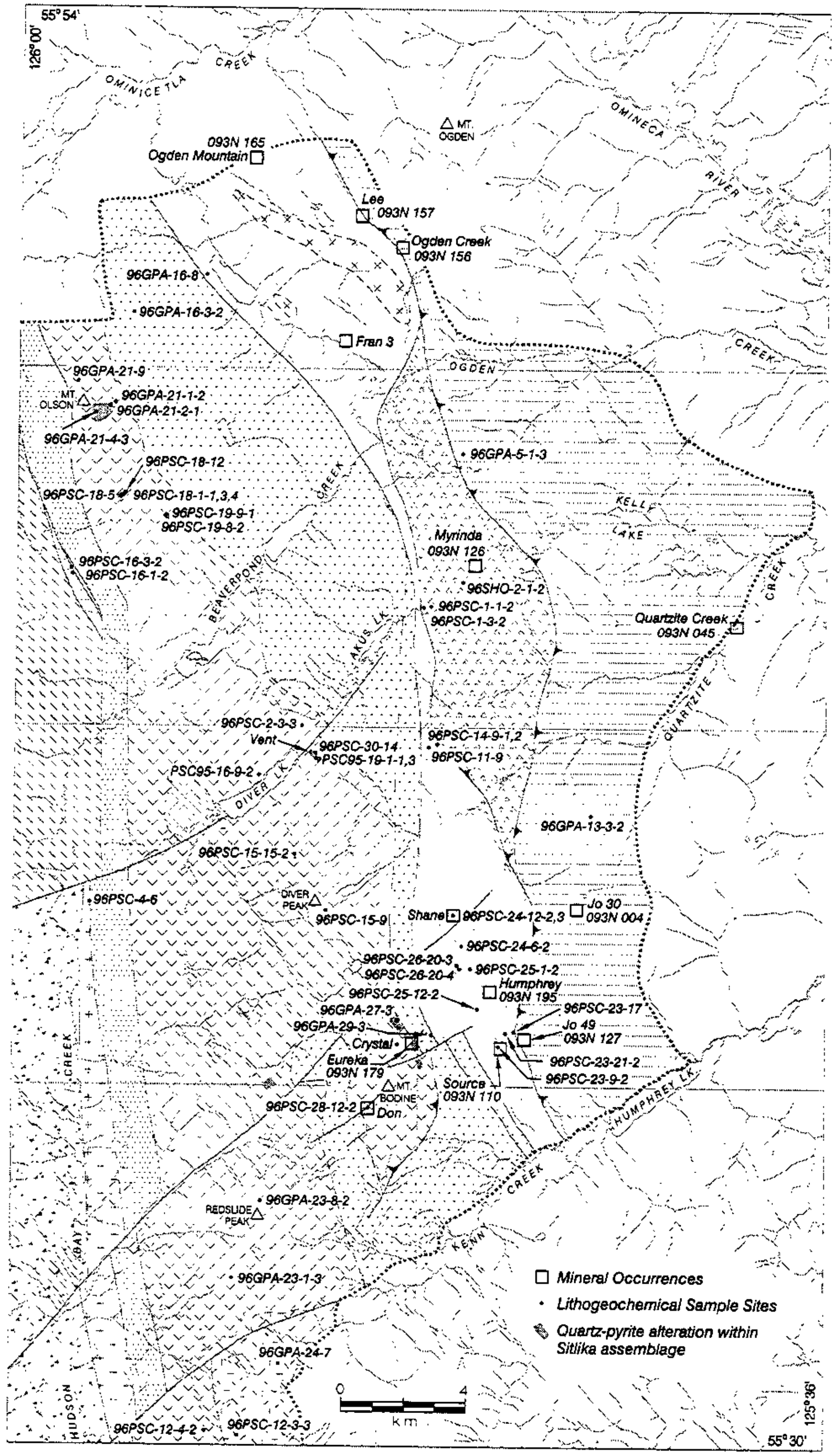

Figure 5. Locations of mineral occurrences and lithogeochemical sample sites in the Kenny Creek - Mount Olson map area.

TABLE 1. ANALYTICAL RESULTS FOR ROCK SAMPLES COLLECTED IN THE KENNY CREEK-MOUNT OLSON MAP AREA

	Element	Au	Mo	Cu	Pb	Zn	Ag	Ni	Co	Mn	Fe	As	U	Th	Sr	Cd	Sb	Bi	V	Cr	Mg	Ba	Ti	B	Al	W
	Units	ppb	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	%	ppm	%	ppm	%	ppm
	Method	INA	AICP	AICP	AICP	AICP	AICP	AICP	AICP	AICP	AICP	AICP	AICP	AICP	AICP	AICP	AICP	AICP	AICP	AICP	AICP	AICP	AICP	AICP	AICP	AICP
	Detection limit	2	1	1	3	1	0.3	1	1	2	0.01	2	5	2	1	0.2	2	2	1	1	0.01	1	0.01	3	0.01	2
Field No.	**Description**																									
PSC95-16-9-2	pyritic schist	3*	7	178	20	398	0.5	52	13	323	20.97	< 2	< 5	2	13	4.2	< 2	< 2	89	74	0.6	6	0.07	< 3	0.8	< 2
PSC95-19-1-1	qtz-py altd	2*	1	6	< 3	< 1	< .3	4	1	27	2.18	4	< 5	2	14	< .2	< 2	< 2	5	146	0.03	2	0.1	< 3	0.47	< 2
PSC95-19-1-3	silic py breccia	3*	3	1	5	< 1	< .3	4	2	14	17.14	29	< 5	< 2	2	0.8	< 2	< 2	1	90	< .01	3	< .01	< 3	0.08	< 2
96PSC 1-1-2	limonite altd	-2	3	67	< 3	84	< .3	67	33	1012	6.03	29	5	3	148	0.5	2	< 2	67	58	2.36	63	< .01	14	0.73	< 2
96PSC 1-3-2	rusty carb alt	-2	2	20	3	88	< .3	18	21	1358	5.74	12	6	< 2	252	0.7	< 2	< 2	47	12	3.3	58	< .01	8	0.34	< 2
96PSC 2-3-3	qtz-lim altd	2	9	16	10	43	0.3	12	1	86	2.22	33	< 5	< 2	8	0.4	3	< 2	22	22	0.05	31	0.01	< 3	0.23	6
96PSC 4-6	qtz-carb alt	9	6	71	4	94	0.3	32	24	3739	6.22	15	< 5	4	71	0.2	< 2	< 2	87	27	0.67	143	< .01	16	1.05	< 2
96PSC 11-9	listwanite	36	2	13	< 3	14	< .3	1509	78	619	3.71	5	< 5	< 2	9	< .2	4	< 2	22	469	17.36	398	< .01	7	0.08	3
96PSC 12-3-3	qtz float with cpy	-2	4	71	< 3	10	< .3	10	1	619	1.12	< 2	< 5	< 2	58	0.2	2	< 2	7	21	0.26	50	0.01	< 3	0.18	8
96PSC 12-4-2	pyritic schists	-2	4	53	3	173	< .3	24	11	1349	7.85	< 2	< 5	< 2	15	0.4	2	< 2	127	21	2.37	31	0.53	< 3	2.87	< 2
96PSC 14-9-1	list. with qtz+py	-2	8	6	5	62	< .3	822	54	892	5.27	456	< 5	< 2	229	0.3	4	< 2	18	193	15.29	40	< .01	3	0.16	2
96PSC 14-9-2	magnesite + qtz	-2	4	6	< 3	19	< .3	245	12	206	1.73	56	< 5	< 2	15	< .2	4	< 2	8	73	3.33	10	< .01	3	0.09	10
96PSC 15-9	pyritic schist	7	2	14	< 3	138	< 3	26	4	281	6.36	10	< 5	< 2	9	0.2	4	< 2	138	154	1.59	18	0.57	< 3	2.53	< 2
96PSC 15-15-2	pyritic gossan	-2	3	47	< 3	84	< .3	38	11	972	6.23	< 2	< 5	< 2	4	0.2	< 2	< 2	147	174	3.38	13	0.66	< 3	2.78	< 2
96PSC 16-1-2	rusty qtz-carb vn	-2	3	26	< 3	48	< .3	22	16	1501	5.54	20	< 5	< 2	74	0.2	2	< 2	98	25	2.22	12	0.01	< 3	1.42	2
96PSC 16-3-2	list with qtz veins	-2	2	21	< 3	23	< .3	1392	64	1158	5.68	379	< 5	< 2	42	0.4	4	< 2	14	419	15.53	13	0.01	< 3	0.13	3
96PSC 18-1-1	pyritic schist	-2	2	22	< 3	235	< .3	17	3	1751	4.4	< 2	< 5	< 2	5	< .2	< 2	< 2	157	68	5.59	7	< .01	< 3	4.41	< 2
96PSC 18-1-3	lim. stringers (py)	3	3	38	< 3	141	< .3	6	8	1699	7.58	2	< 5	< 2	6	< .2	5	< 2	155	10	3	5	0.37	< 3	3.12	< 2
96PSC 18-4	pyritic qtz schist	-2	3	6	< 3	24	< .3	10	< 1	140	1.67	8	< 5	< 2	2	< .2	3	< 2	2	20	0.39	8	< .01	< 3	0.48	8
96PSC 18-5	pyritic schist	-2	3	14	7	149	< .3	11	16	2752	6.71	7	< 5	< 2	4	0.3	4	< 2	304	40	3.45	6	0.14	< 3	3.69	< 2
96PSC 18-12	pyritic qtz schist	2	2	32	< 3	156	< .3	11	17	2472	7.01	< 2	10	2	2	< .2	< 2	< 2	234	16	4.32	1	0.01	< 3	3.27	< 2
96PSC 19-8-2	py-qtz alt. rock	-2	5	5	< 3	3	< .3	8	1	71	1.84	< 2	< 5	< 2	1	< .2	< 2	< 2	5	15	0.05	1	< .01	< 3	0.18	4
96PSC 19-9-1	pyritic schist	-2	4	6	< 3	1	< .3	9	2	38	2.27	< 2	< 5	< 2	4	< .2	3	< 2	2	15	0.02	26	< .01	< 3	0.1	4
96PSC 23-9-2	listwanite zone	12	3	14	< 3	31	< .3	781	40	725	3.74	60	< 5	< 2	69	0.3	5	< 2	10	289	15.53	6	< .01	3	0.09	3
96PSC23-17	listwanite zone	94	2	17	< 3	19	< .3	739	52	554	3.61	75	< 5	< 2	138	< .2	2	< 2	14	448	15.2	7	< .01	< 3	0.12	4
96PSC 23-21-2	rusty alt +qtz vn	-2	2	4	< 3	14	< .3	30	5	327	1.38	< 2	< 5	< 2	11	< .2	3	< 2	28	39	0.36	7	< .01	< 3	0.22	7
96PSC 24-6-2	pyritic gossan	-2	3	71	< 3	87	< .3	73	38	690	5.74	< 2	5	< 2	11	0.5	< 2	< 2	167	156	1.88	30	0.46	10	3.32	< 2
96PSC 24-12-2	qtz vns with cpy	-2	3	878	24	43	< .3	19	2	93	0.81	6	< 5	< 2	3	0.2	2	< 2	8	30	0.07	2	< .01	3	0.09	9
96PSC 24-12-3	pyritic carb altd	-2	1	68	< 3	105	< .3	52	32	1568	6.93	14	8	< 2	111	0.7	< 2	< 2	56	42	4.38	6	< .01	3	0.28	< 2
96PSC 25-1-2	goss rock w. po	-2	1	75	< 3	143	< .3	92	40	934	7.3	< 2	7	< 2	13	0.8	2	< 2	92	90	1.92	8	0.78	< 3	2.01	< 2
96PSC 25-12-2	list. and qtz veins	-2	3	5	< 3	7	< .3	456	27	363	1.77	3	< 5	< 2	20	< .2	3	< 2	8	510	6.87	1	< .01	< 3	0.15	6
96PSC 26-20-3	qtz vein	-2	2	353	< 3	48	< 3	21	5	300	1.65	10	< 5	< 2	4	< .2	6	< 2	17	28	0.18	2	0.01	3	0.18	6
96PSC 26-20-4	rusty qtz-carb vn	-2	2	5	< 3	23	< .3	26	2	466	1.46	4	< 5	< 2	14	< .2	2	< 2	12	24	0.75	2	< .01	3	0.12	7
96PSC 28-12-2	qtz vein w. py/cpy	380	5	21714	< 3	107	1.8	17	86	347	7.01	121	< 5	< 2	3	1.7	383	< 2	7	33	0.02	7	< .01	< 3	0.09	14
96PSC 30-14	silic. schist w, py	-2	4	28	5	166	< .3	37	27	361	4.31	36	7	< 2	7	1.3	3	< 2	80	47	0.67	50	0.4	< 3	1.06	< 2
96SHO 2-1-2	qtz/carb alt (list)	9	1	50	5	110	< 3	170	42	1403	6.99	170	16	2	236	0.8	14	< 2	45	92	3.97	45	< .01	14	0.54	< 2
96GPA 1-9-3	py ritic chert layer	20	45	36	4	10	0.6	7	1	49	11.44	9	< 5	4	1	< .2	4	4	2	9	0.02	25	< .01	5	0.07	3
96GPA 5-1-3	limonitic qtz vein	8	3	38	< 3	29	0.3	20	5	213	2.59	7	5	3	4	< .2	< 2	2	25	18	0.09	43	< .01	3	0.26	7
96GPA 13-3-2	limonitic qtz vein	-2	3	27	10	10	0.5	14	2	126	0.95	2	11	3	4	0.3	2	< 2	5	21	0.14	13	< .01	< 3	0.35	5
96GPA 16-3-2	limonitic qtz vein	10	3	29	22	11	0.7	16	4	116	0.93	3	< 5	3	3	< .2	3	2	4	20	0.07	22	0.01	4	0.13	7
96GPA 16-8	pyritic listwanite	-2	1	23	< 3	19	< .3	2301	147	551	6.9	14	< 5	3	10	< .2	< 2	< 2	25	1304	17.85	6	< .01	4	0.45	< 2
96GPA 21-1-2	silic pyritic rock	-2	4	41	6	538	0.7	6	2	1482	3.29	< 2	< 5	3	1	< .2	< 2	2	68	26	3.42	2	0.24	< 3	2.49	< 2
96GPA 21-2-1	silic. pyritic rock	-2	3	9	< 3	38	0.4	19	1	190	2.09	< 2	11	3	3	< .2	< 2	2	5	23	0.43	5	0.06	< 3	0.45	3
96GPA 21-4-3	silic. pyritic rock	-2	[illegible]	8	< 3	43	< .3	9	2	198	3.18	< 2	< 5	2	3	< .2	< 2	< 2	40	23	0.88	7	0.06	< 3	0.94	7
96GPA 21-9	altd pyritic rock	-2	21	59	< 3	22	< .3	111	18	165	14.15	53	< 5	5	13	0.2	< 2	< 2	62	174	1.17	11	0.33	< 3	1.27	< 2
96GPA 23-1-3	lim-py-qtz altd	-2	3	51	3	17	0.4	13	9	224	3.08	77	< 5	< 2	23	< .2	2	3	84	31	0.37	25	0.68	< 3	0.92	< 2
96GPA 23-8-2	lim-py-qtz altd	-3	1	15	< 3	31	< .3	26	7	314	4.3	< 2	< 5	2	7	0.2	< 2	8	76	156	1.3	11	0.52	3	1.61	2
96GPA 24-7	pyritic intrusive	-2	< 1	41	< 3	22	< .3	4	4	442	4.17	< 2	< 5	2	33	< .2	< 2	< 2	128	11	1.82	20	0.33	< 3	2.24	< 2
96GPA 27-3	lim-qtz-py volc	-2	1	16	11	413	< .3	4	< 1	1285	2.43	< 2	< 5	2	7	0.2	< 2	< 2	5	7	1.42	76	0.01	< 3	1.28	< 2
96GPA 29-3	talc,magnesite,py	-2	< 1	10	< 3	20	< .3	1174	92	957	3.92	5	5	2	30	0.3	< 2	< 2	9	521	11.61	8	< .01	< 3	0.12	< 2

Abbreviations: AICP = Aqua regia digestion-ICPES; INA = Instrumental Neutron Activation; alt = alteration; altd = altered; carb = carbonate; cpy = chalcopyrite; lim = limonite; list = listwanite; goss = gossan; qtz = quartz; po = pyrrhotite; silc = silicified; volc = volcanic rock; vn(s) = vein(s); w = with; * = fire assay about 6 kilometres north-northeast of Mount Bodine (Figure 5). It occurs within a large lens of greenstone to amphibolite that measures about one kilometre in its longest, north-northwest dimension. The vein is about a metre wide, dips steeply to the south, and was traced for several tens of metres along its east-west strike. The white quartz contains local cavities lined with small quartz crystals, and is separated into discontinuous sheets by partings of chlorite and rusty carbonate. The partings are oriented approximately parallel to the vein walls, and some contain slickensides or mineral fibres that pitch at moderate angles to the east. Wallrocks are variably altered with rusty carbonate and pyrite for one to two metres beyond the vein. Mineralization within the vein consists of scattered blebs of chalcopyrite and pyrite. A single grab sample of vein material yielded 878 ppm Cu and 24 ppm Pb, but did not contain anomalous concentrations of Au or Ag. (Table 1, Sample 96PSC-24-12-2). A sample of altered wallrock did not contain significantly anomalous base or precious metal concentrations (Sample 96PSC-24-12-3).

East to northeast-striking quartz and quartz-carbonate veins occur throughout the Cache Creek ultramafic unit between the Shane and Source occurrences, but are not particularly abundant. Most of the veins occur in relatively large greenstone or amphibolite knockers, although some are within serpentinite or magnesite-talc schist. Some of the veins contain pyrite, although base metal sulphides were observed only at the Shane occurrence. However, one 80-centimetre-wide quartz vein on the ridge crest 1.5 kilometres south of the Shane showing contained abundant limonitic vugs and selvages, and yielded 353 ppm Cu (Table 1, Sample 96PSC-26-20-3). None of the quartz veins sampled in this area contained anomalous precious metal values.

Jo 49 (MINFILE 93N 127)

The Jo 49 MINFILE occurrence is 800 metres east-northeast if the Source vein, within the Cache Creek sedimentary unit about 200 metres east of its contact with the ultramafic unit. It was discovered on the Jo 49 claim during a regional exploration program for gold in the Vital Range, carried out in 1983 and 1984, but is presently within the Source claim group, staked by L.B. Warren in 1989. The area is underlain by phyllites and platy quartz phyllites cut by abundant aplite dikes and sills. The occurrence comprises a number of gold anomalies, including values of 4000 and 2500 ppb Au, reported by Macfarlane (1984b) from rock chip samples collected over a linear zone about 200 metres long, parallel to and 200 metres east of the Vital fault. Re-sampling of the area by Culbert (1985) confirmed the presence of anomalous gold, but failed to repeat the highest values reported by Macfarlane; he reports 5 different samples with gold values ranging from 340 to 695 ppb Au.

The anomalous gold concentrations at the Jo 49 occurrence are within narrow, discontinuous, north-striking quartz veinlets that occur within a relatively large, irregular aplitic body (Culbert, 1985). Although similar aplite is abundant within the Cache Creek metasedimentary rocks for a considerable distance to the east, the gold-bearing veinlets are apparently restricted to the area adjacent to the fault contact with the ultramafic unit. The veinlets are therefore inferred to have formed during some stage of movement on the fault, which originated as a west-directed Jurassic(?) thrust, but may have been overprinted by dextral strike-slip in the early Tertiary. Their presence predominantly within a large aplite body may reflect the contrast in competency and ability to develop open fractures between this body and the host Cache Creek phyllites.

Jo 30 (MINFILE 93N 004)

The Jo 30 occurrence is within the Cache Creek sedimentary unit near the headwaters of Quartzite Creek, 8 kilometres northeast of Mount Bodine. The mineralization is reported as "skarn with chalcopyrite, pyrite, manganese and quartz veining" (Macfarlane, 1984a), apparently within Cache Creek metasedimentary rocks adjacent to a felsic dike. Macfarlane reports that one rock chip sample of this mineralization contained 2850 ppb Au, while two other samples did not yield anomalous gold values. The Jo 30 mineralization was discovered during a regional exploration program carried out in 1983 and 1984, aimed at locating the source rock for the placer gold deposits found along Quartzite Creek and other creeks draining the Vital Range to the south and southeast. No subsequent work has been reported in the area, and the Jo claim group has lapsed.

Quartzite Creek (MINFILE 93N 045)

The Quartzite Creek occurrence is a past-producing placer mine on the lower reaches of Quartzite Creek (Figure 5), which at this point flows over Cache Creek phyllites and schists containing numerous, apparently barren, quartz veins (Lay, 1934). This creek has been worked intermittently from the late 1800s to the present, but the only recorded production was between 1931 and 1945, when 13 530 grams of gold were extracted (Holland, 1950). Lay (1934) reports that mining efforts were directed at both post-glacial gravels above rock benches and an older buried channel. The placer working have also yielded boulders of rhodonite and jade (Leaming, 1973).

Nephrite Occurrences (MINFILE 93N 126, 156, 157, 165)

Nephrite jade was produced from boulders and *in situ* occurrences on the southwest slopes of Mount Ogden from 1967 to 1992. As reported by Price (1973, 1988), good quality jade was first discovered by W.L. Owen and S.E. Porayko in the upper reaches of Ogden Creek and two of its tributaries in the summer of 1967 (Ogden Creek occurrence; MINFILE 93N 156). Jade was produced from these placer leases in 1967, 1968 and 1969, at which time

Owen and Porayko discovered and staked a high grade *in situ* showing at the head of Lee Creek, one of the nephrite-bearing tributaries of Ogden Creek. This lens, along with several other *in situ* nephrite lenses subsequently discovered nearby (Price, 1988), are collectively referred to as the Lee occurrence (MINFILE 93N 157). New World Jade Ltd. was formed in 1970 to explore and produce nephrite from this property, and operated until 1974 when the assets were acquired by B.C. Gem (H.K.) Ltd. The claims were acquired by The Continental Jade Ltd in 1976, and production continued until at least 1992, in part under the direction of operator Jade West Resources Ltd.

Nephrite occurrences contiguous with the Lee occurrences to the north-northwest are collectively referred to as the Mount Ogden occurrence (MINFILE 93N 165). These include a number of *in situ* nephrite lenses of various sizes and quality, associated colluvial blocks, and alluvial boulders in Squawkbird Creek and the unnamed creek to the east (Price, 1973). Placer leases were first located along Squawkbird Creek by L.D. Barr in 1968, and *in situ* nephrite was discovered the following year. Mineral claims and additional placer leases covering these occurrences were staked by Barr for Far North Jade Ltd. which began producing nephrite from the property in 1970.

According to MINFILE, the nephrite production from the three occurrences southwest of Mount Ogden totaled about 1700 tonnes between 1967 and 1992. It is uncertain how much production there has been since that time, but there was no mining or exploration activity apparent during our mapping program in 1996. The claims covering both the Lee and Mount Ogden occurrences are currently held by The Continental Jade Ltd.

The nephrite occurrences southwest of Mount Ogden are within the eastern part of the Cache Creek ultramafic unit. The initial *in situ* nephrite discovery at the head of Lee Creek is along the fault contact with structurally overlying platy quartz phyllites of the Cache Creek sedimentary unit. The contact zone is up to 30 metres wide (Leaming, 1978), and includes a narrow zone of talc schist which passes downward into rodingite containing lenses of nephrite. The other significant area of production on the Lee occurrence is about 700 metres to the south-southwest. There, narrow bands of high quality nephrite occur along the contact between serpentinite and the large granodiorite body that intrudes it (Price, 1988); additional nephrite lenses occur within altered serpentinite a short distance northeast of the contact (Leaming, 1978). At the Mount Ogden occurrence to the northwest, nephrite typically occurs along contacts between serpentinite (or talc-magnesite schist) and enclosed lenses of altered greenstone or siliceous metasedimentary rock (Price, 1973).

The Fran 3 claim covers a nephrite lens within the Cache Creek ultramafic unit about 3.5 kilometres south of the Lee occurrence. The nephrite there occurs along the contact between serpentinite and structurally overlying metachert and greenstone. N. Scafe, owner of the claim, and L. Warren extracted about 90 tonnes of low quality nephrite from this locality in the mid 1980s (L. Warren, personal communication, 1996).

The Myrinda nephrite occurrence (MINFILE 93N 126) is within the Cache Creek mafic unit, about 10 kilometres south-southeast of the Mount Ogden occurrences. The nephrite occurs as a narrow lens along a northeast-striking fault a few hundred metres north of the Fall River. It was tested by three short drill holes in 1985, which showed the jade to be of low quality and unsuitable for any commercial purpose (Makepeace, 1986). Other jade occurrences were reportedly uncovered a short distance away during the drill program, but these were not drill-tested and the Myrinda claim has subsequently lapsed.

Humphrey (MINFILE 93N 195)

The Humphrey MINFILE occurrence refers to talc and chrysotile veinlets mentioned by Macfarlane (1984b), and talc-ankerite alteration described by Culbert (1985), in their descriptions of the Cache Creek ultramafic unit northeast of Mount Bodine. However, although talc is a common metamorphic constituent of the ultramafic rocks, and asbestiform serpentine occurs locally, the unit has not apparently been explored for either commodity.

SUMMARY OF MAIN CONCLUSIONS

The 1996 mapping program covered most of the Sitlika assemblage where it was originally defined by Paterson (1974). This has resulted in an improved understanding of the composition, distribution and mutual relationships of Paterson's three divisions of the assemblage, and an improved understanding of the structural relationships between the Sitlika assemblage and terranes to the east and west. Following are some of the main conclusions derived from this mapping and supporting radiometric dating and geochemical analyses reported by Childe and Schiarizza (1997).

- The volcanic unit of the Sitlika assemblage is readily correlated with metavolcanic rocks of the Kutcho Formation on the basis of lithology (mafic and felsic volcanics with associated intrusions), Permo-Triassic age, and primitive tholeiitic geochemistry. Clastic metasedimentary rocks of the eastern clastic unit (greywacke division of Paterson, 1974) rest stratigraphically above the volcanic unit and contain felsic volcanic and plutonic clasts that were probably derived from the underlying unit. These clastic rocks are likely correlative with metasedimentary rocks that comprise the upper part of the Kutcho Formation and/or the overlying Sinwa and Inklin formations.
- Rocks correlative with volcanic and plutonic rocks of the Kutcho Formation and Sitlika assemblage also occur in southern British Columbia, where they are likewise in structural contact with the Cache Creek Group. These assemblages are distinct from volcanic arc rocks in adjacent Stikine

Terrane in both the age of magmatism and their primitive geochemical and isotopic signatures (Childe *et al.*, 1996). They may comprise remnants of primitive arc sequences that developed on oceanic crust in western Cache Creek Terrane or as part of a previously unrecognized terrane to the west.

- The western clastic unit of the Sitlika assemblage (argillite division of Paterson, 1974) consists of dark grey phyllite and chert-pebble conglomerate, with lesser chert-quartz sandstone and minor limestone. It is faulted against the volcanic unit along the western margin of the Sitlika belt, and is of unknown stratigraphic relationship to the other two units of the assemblage. The western clastic unit is included in the Sitlika assemblage on the basis of similar metamorphic grade and structural style, but is tentatively correlated, on the basis of lithology, with the upper Middle Jurassic to Upper Jurassic Ashman Formation of the Bowser Lake Group, which was deposited above Stikine Terrane to the west. Therefore, although the Sitlika assemblage consists largely of a distinctive stratigraphic succession correlative with the Kutcho Formation, it is primarily a structural - metamorphic entity, possibly analogous with the King Salmon allochthon of northern British Columbia.
- The Sitlika assemblage is bounded to the west by the northerly-trending Takla fault system, which juxtaposes the western clastic unit against volcanic rocks of the Lower to Middle Jurassic Hazelton Group in the north, and against undated granite and adjacent Upper Cretaceous clastic rocks of the Sustut Group in the south. The Takla fault system is not well exposed, but the presence of a northwest-trending fold in the adjacent Sustut Group is consistent with previous interpretations that it is a Late Cretaceous to early Tertiary dextral fault system.
- The eastern boundary of the Sitlika assemblage is, at least in part, a steeply-dipping, north to northwest-striking dextral fault system that is probably of early Tertiary age. It juxtaposes the eastern clastic unit against serpentinite melange that outcrops along the western limit of Cache Creek Terrane. The dextral strike-slip fault apparently postdates east-dipping thrust faults that occur within the serpentinite melange and define its eastern contacts with structurally overlying sedimentary and mafic units of the Cache Creek Group. Regionally, similar east-dipping thrust faults separate the Cache Creek Terrane from underlying Sitlika assemblage and its correlatives, and separate the latter assemblages from structurally underlying Stikine Terrane. Tentative correlation of the Sitlika western clastic unit with Middle to Upper Jurassic rocks of the Bowser Lake Group supports the Late Jurassic to Early Cretaceous timing proposed by Monger *et al.* (1978) for this west-directed contractional deformation and related metamorphism in central British Columbia.
- The Sitlika volcanic unit is a bimodal assemblage of mafic and felsic rocks that has potential to host volcanogenic massive sulphide mineralization. The upper part of the unit may be most prospective as it contains a relatively high proportion of felsic volcanic rocks and has prominent gossanous pyrite-silica alteration zones in several areas. This part of the assemblage includes the newly discovered Vent hydrothermal breccia and alteration zone east of Diver Lake, as well as a narrow interval of laminated pyrite-chert of probable exhalative origin (Crystal showing) north of Mount Bodine.
- Previously known and newly discovered metallic mineral occurrences within the map area are mainly vein systems that occur within the Sitlika assemblage and adjacent Cache Creek Terrane in a band that trends northeasterly from the vicinity of Mount Bodine. These veins occur where the fault separating the Sitlika assemblage from the Cache Creek Group changes from its regional north-northwest trending orientation to a northerly trend. As latest movement on this fault system appears to be dextral strike-slip, the northerly trending segment of the fault system, which persists from the Mount Bodine area to the Fall River, marks an extensional jog in the system (*see* Figure 3), and is therefore a favourable site for syn-faulting mineral deposition (Sibson, 1987). It is suspected, therefore, that the vein systems in the Mount Bodine area are relatively young occurrences related to movement along this dextral fault system. Alternatively, some of the occurrences in the Cache Creek Group, such as the Jo 49, may have formed during the late stages of the earlier episode of synmetamorphic west-directed Jurassic(?) thrusting.
- Nephrite occurrences within the Cache Creek ultramafic unit are restricted to the area north of Beaverpond Creek, where the unit is intruded by stocks and dikes of granodiorite. In detail, the intrusive rocks are not spatially associated with most of the *in situ* nephrite lenses, and were not considered by Leaming (1978) to be an important factor in their genesis. However, the general spatial relationship suggests that the intrusive rocks may have been a source of heat and/or fluids that helped drive the metasomatic processes that produced nephrite.

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