MASSIVE SULPHIDE DEPOSITS OF THE EAGLE BAY ASSEMBLAGE, ADAMS PLATEAU, SOUTH CENTRAL BRITISH COLUMBIA (082M3,4)

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INTRODUCTION

The Eagle Bay assemblage in south central British Columbia contains numerous polymetallic massive sulphide deposits, mainly within highly deformed and metamorphosed Devonian felsic volcanic rocks. A number of these, including Rea and Homestake, have had limited past production, and others have undergone extensive exploration and development. Less known and understood are the sediment-hosted massive sulphide deposits that occur on Adams Plateau near the southern extent of exposures of the Eagle Bay assemblage. These deposits are thin sheets of dominantly lead and zinc sulphides within carbonaceous and calcareous phyllites. Their age is unknown, but based on regional correlations and geochemistry of underlying mafic volcanic rocks, host successions may be equivalent to phyllites and quartzites of the EoCambrian Hamill Group exposed farther east. This paper describes these deposits, their structural and stratigraphic setting, and compares them to other deposits in the Kootenay Terrane. The paper is part of a regional study of massive sulphide deposits and mineral potential of the Kootenay Terrane of southern British Columbia and the correlative Yukon-Tanana Terrane in the northern part of the province and Yukon Territory (see Lett *et al*., 1999; Paulen *et al*., 1999). It summarizes six weeks of regional mapping and deposit studies in July and August, 1998.

The Kootenay Terrane, and correlative rocks of the Barkerville subterrane farther north, comprise dominantly Paleozoic metasedimentary and metavolcanic rocks that are inferred to have been deposited on the distal western edge of ancestral North America. Major rock packages of the Kootenay Terrane include the Lardeau Group, the Eagle Bay assemblage, eastern assemblages of the Late Paleozoic Milford Group, and equivalent rocks within the Shuswap metamorphic complex.

Massive sulphide deposits in the Kootenay Terrane include Besshi style volcanogenic massive sulphide deposits (VMS) of the Goldstream camp, formed during episodic extension along the western North American margin in Early Paleozoic time, and the Devonian polymetallic VMS deposits of the Eagle Bay assemblage, deposited in arc volcanic rocks in response to eastward subduction of a paleopacific ocean. Other important deposits or mineral camps within the Kootenay Terrane include numerous vein deposits in Lardeau Group rocks, such as the lead-zinc-silver veins of the Beaton-Camborne camp (Church, 1999), and within the Barkerville subterrane, the gold veins in the Wells-Barkerville area.

The Adams Plateau is a moderately high, low-relief plateau located southeast of Adams Lake in southern British Columbia (Figure 1). It is accessible by a well maintained gravel logging road that leaves the Scotch Creek road at Shuswap Lake park. The plateau is heavily treed, but with extensive logged areas. Numerous logging roads provide access to most of the area. Outcrops are relatively rare, and are largely restricted to roads and, less commonly, creeks.

Mineral exploration on the plateau has focused on the sediment-hosted massive sulphide deposits, and two of these, the Mosquito King and Lucky Coon have had limited past production. Published reserves of these, and others on the plateau, are listed in Table 1. These deposits have locally high gold and copper content and exhibit close spatial association with

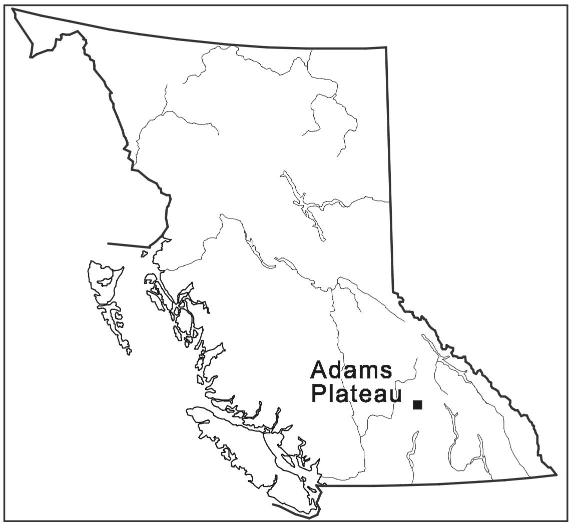


Figure 1. Location map

mafic volcanic rocks. Other occurrences on the plateau, mainly small massive sulphide copper deposits within mafic volcanic rocks, have had little exploration.

REGIONAL GEOLOGY

The Adams Plateau is underlain by rocks of the Eagle Bay assemblage, Late (?) Devonian orthogneiss, Late Cretaceous granites and numerous Tertiary dykes (Schiarizza and Preto, 1987). The Eagle Bay assemblage comprises Lower Cambrian to Mississippian metasedimentary and metavolcanic rocks that have been correlated with the Hamill and Lardeau Groups of the Kootenay arc (Schiarizza and Preto, 1987; Okulitch, 1977) and with rocks of the Barkerville subterrane in the Cariboo Mountains (Struik, 1986).

Paleozoic rocks of the Eagle Bay assemblage (Figure 2) are contained within four west directed thrust slices that collectively contain a succession of Cambrian (and possibly Late Proterozoic) quartzites, grits and quartz mica schists (Units EBH and EBQ), mafic metavolcanic rocks and limestone (EBG), and overlying schistose sandstones and grits (EBS) with minor calcareous and mafic volcanic units (Schiarizza and Preto, 1987). These are overlain by a "...Devono-Mississippian succession of mafic to intermediate metavolcanic rocks (Units EBA and EBF) intercalated with and overlain by dark grey phyllite, sandstone and grit (EBP)" (Schiarizza and Preto, op. cit.). Many of the polymetallic VMS deposits in the Eagle Bay assemblage, including Rea and Homestake (Höy and Goutier, 1986; Höy , 1991), are within units EBA and EBF whereas the massive sulphide deposits of the Adams Plateau are within a sedimentary succession in Unit EBG.

The structure of the area underlain by Eagle Bay assemblage rocks and Fennel Formation has been described by Schiarizza and Preto (op. cit.). The earliest recognized structures are east-directed, essentially layer-parallel thrust faults that imbricated and emplaced Fennel Formation rocks, part of Slide Mountain Terrane, over Eagle Bay assemblage. Synmetamorphic southwest verging folds and thrust faults followed tectonic emplacement of the Fennel Formation. These folds are the most conspicuous macroscopic folds in the Eagle Bay assemblage, and the associated northeast dipping thrust faults separate the assemblage into the major structural-stratigraphic panels. Late folds are post-metamorphic, generally upright, northwest to west plunging structures with associated crenulation cleavage. In general, they are small structures that do not effect the regional distribution of lithologies (Schiarizza and Preto, op. cit.).

Table 1. Published reserves of lead-zinc massive sulphide deposits, Eagle Bay assemblage, Adams Plateau.

Deposit	Drill indicated tonnage	Zn %	Pb %	Cu %	Ag g/tonne
Spar adit	11,160	4.83	10.56		206
Mosquito King	33,740	2.09	0.83		13
Bowler Creek	171,500	2.43	0.53	0.19	50
Lucky Coon	68,033	"high	grade"		

Source of data: B.C. Minfile

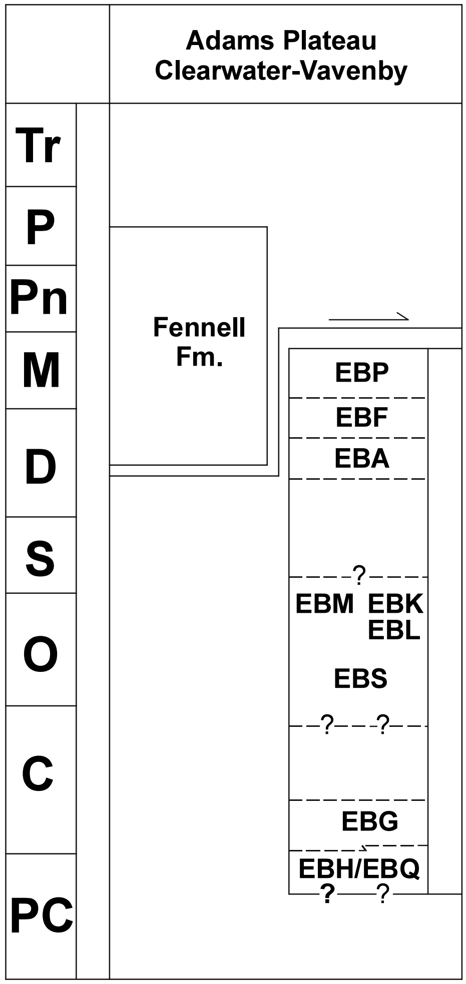


Figure 2. Stratigraphic column of the Eagle Bay assemblage (from Schiarizza and Preto, 1987).

These structures are cut by Jurassic-Cretaceous batholiths and stocks, including the Baldy and Raft batholiths and, on Adams Plateau, by granitic rocks exposed in Scotch and Nikwikwaia Creeks. Late quartz-feldpar porphyry dykes are locally conspicuous, and dark, commonly aphanitic dykes are less common. These are interpreted to be Tertiary in age (Schiarizza and Preto, 1987).

STRUCTURE

The earliest structures recognized on Adams Plateau are small, rootless isoclinal folds. Their vergence is unknown, but if correlative with the Phase 1 structures identified by Schiarizza and Preto (1987) west of Adams Lake, they may have an overall easterly vergence, related to the east-directed thrust faults that are prominent in the Fennel Formation.

The Nikwikwaia synform, a Phase 2 structure, is the earliest map-scale structure identified on Adams Plateau (Figure 3). It is inferred to be a syncline because "the metasediments in its core are enclosed by chlorite schist which underlie them regionally" (Schiarizza and Preto, 1987, p. 56). It is outlined by a prominent sericitic quartzite, exposed in its limbs and hinge zone, and by repetition of the greenstones and metasediments of Unit EBG in its limbs. It closes to the southwest of Nikwikwaia Lake, and opens to the east towards Scotch Creek (Figure 3). The prominent foliation throughout the area parallels the axial plane of the syncline, and mineral lineations and bedding-cleavage intersections define its fold axis. In western exposures, the Nikwikwaia syncline has a northwest plunge, with a northeast trending axial plane that dips northwest at 30 to 40 degrees (Domain 1, Figure 4). Variable attitudes to the east reflect the effects of later north trending folds (Domain 2). Farther east, on the plateau northwest of Mosquito King, phase 2 axial planar foliations indicate that the syncline is essentially a recumbent fold that plunges variably to the north (Domain 3).

Units in the limbs of the Nikwikwaia synform are locally attenuated, but do not appear to be appreciably thickened in the hinge zone. Both the quartzite and an overlying thin chlorite schist retain a relatively constant thickness in its southern limb and in its closure to the southwest (Figure 3). Hence, it is assumed that the dramatic thickening of some units in the north limb north of Nikwikwaia Lake are due to original stratigraphic changes, particularly as they are accompanied by lithological changes.

A west-verging thrust fault, the Haggard Creek fault, that emplaced Unit EBG on Unit EBA, has been projected south to the Adams Plateau by Schiarizza and Preto (op. cit.). However, as there is little direct evidence for the existence of the fault on Adams Plateau, based on this mapping, it is not shown on Figure 3. Rather, this contact may be intrusive, with highly foliated metaplutonic rocks intruding greenstone of Unit EBG (see below).

The latest folds recognized in the area are broad, open, upright folds. These fold the limbs and axial plane of the Nikwikwaia synform, producing synform-antiform pairs that verge to the

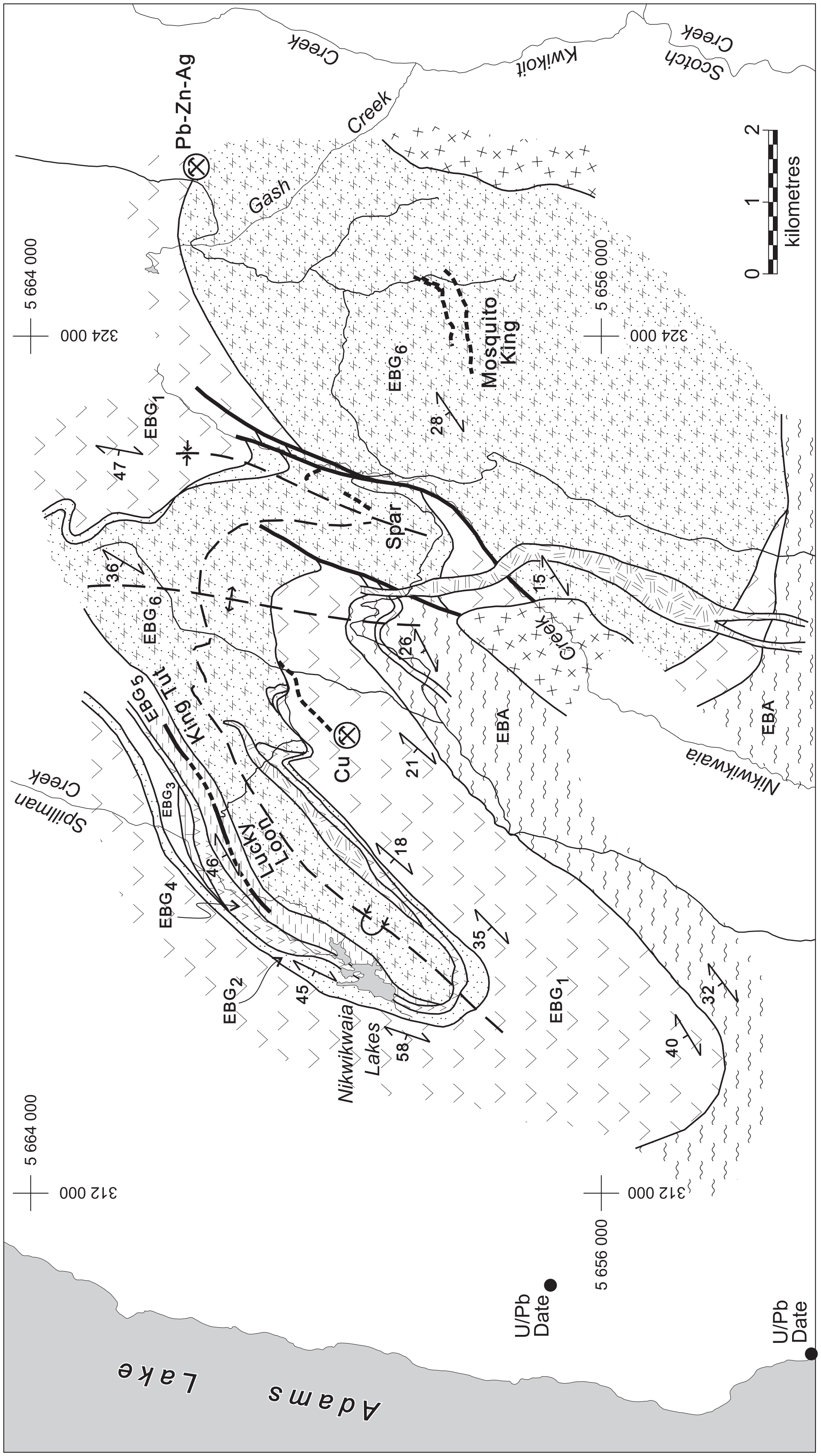
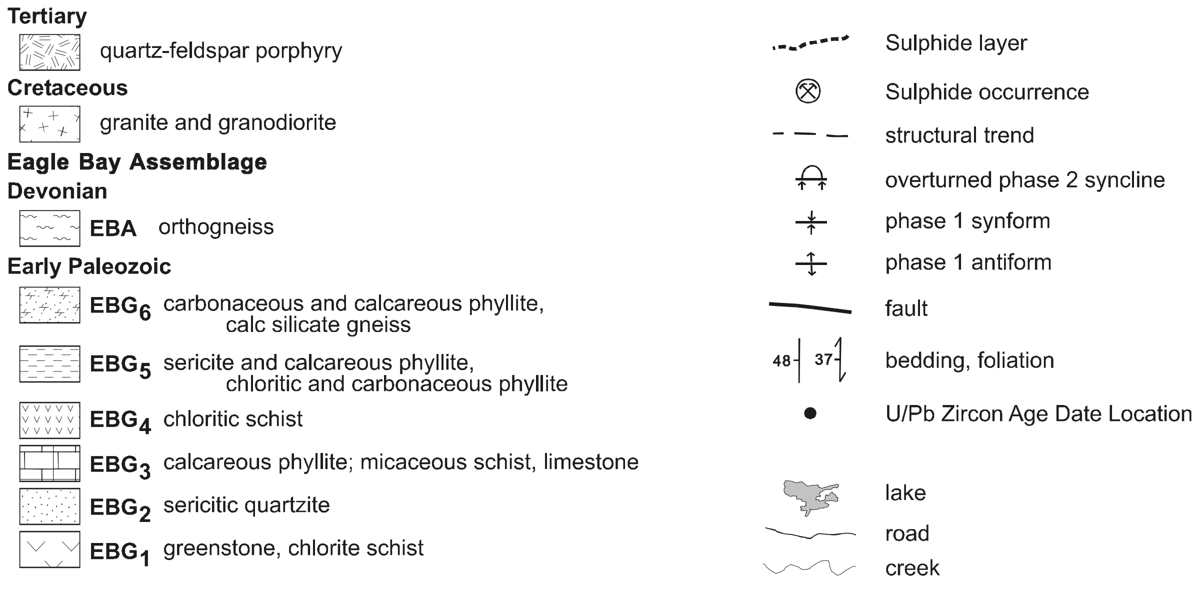


Figure 3. Geology of the Adams Plateau area (after Schiarizza and Preto, 1987 and this paper).



Legend for Figures 3, 8, 12.

east (Figure 3). The most western fold is a large, north-trending antiform, just west of the Spar deposit, with a northeast trending western limb and a northwest trending eastern limb. Steeply dipping, north to northeast trending faults appear to parallel the axial planes of these folds. These faults and related folds are cut by the Late Cretaceous intrusion in Nikwikwaia creek valley and by north-trending Tertiary dykes exposed to the east and north. Locally, minor lead-zinc or copper vein mineralization occurs along the faults.

A late, prominent crenulation cleavage and lineation trends to the west throughout the area (Figure 5). There are no macroscopic folds on Adams plateau associated with these structures. Their age is not known, but Schiarizza and Preto (1987) suggest they are the same age as mid-Cretaceous kink folds associated with emplacement of the Baldy and Raft batholiths.

STRATIGRAPHY

Units EBA and EBG of the Eagle Bay assemblage are exposed on Adams Plateau. Unit EBG comprises dominantly mafic volcanic rocks with interlayered metasedimentary units of Late Proterozoic to Early Cambrian age. EBA is dominated by plutonic orthogneiss that to the west, has a Late Devonian age.

Unit EBG

The basal part of Unit EBG comprises massive to foliated greenstone and chloritic phyllite exposed in the limb of the Nikwikwaia synform. The succession comprises dominantly mafic flows and pillow lavas, with a minor interbedded mafic tuffs and occasional calcareous phyllite and limestone layers. Some massive sulphide layers, comprising mainly chalcopyrite and pyrrhotite, occur within chlorite schists near

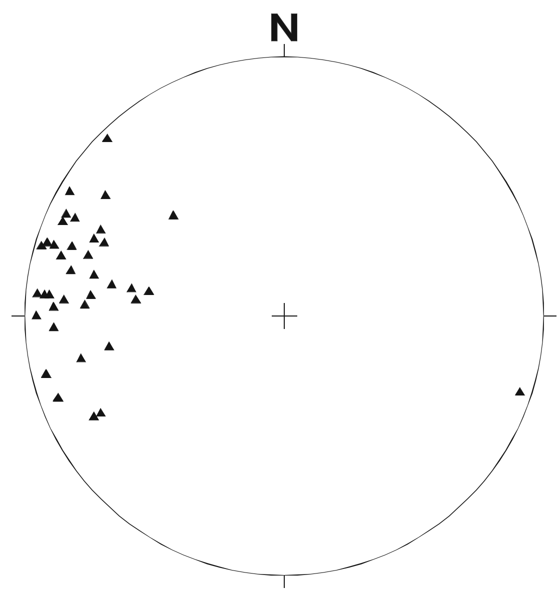


Figure 5. Stereoplot of “late” crenulation lineations, Adams Plateau.

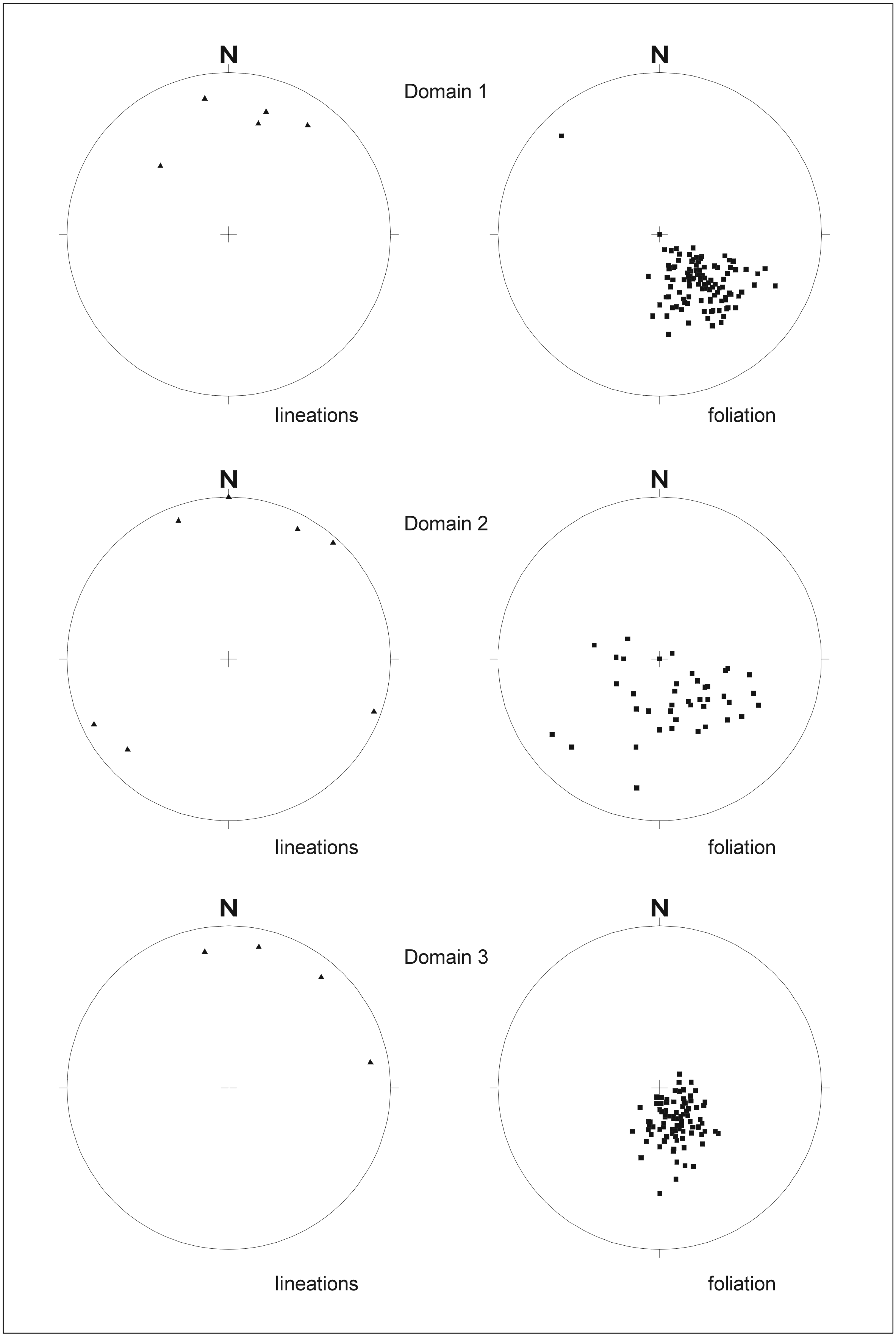


Figure 4a. Structural domains on the Adams Plateau, and stereoplots of Phase 2 foliation planes and mineral lineations (see next page).

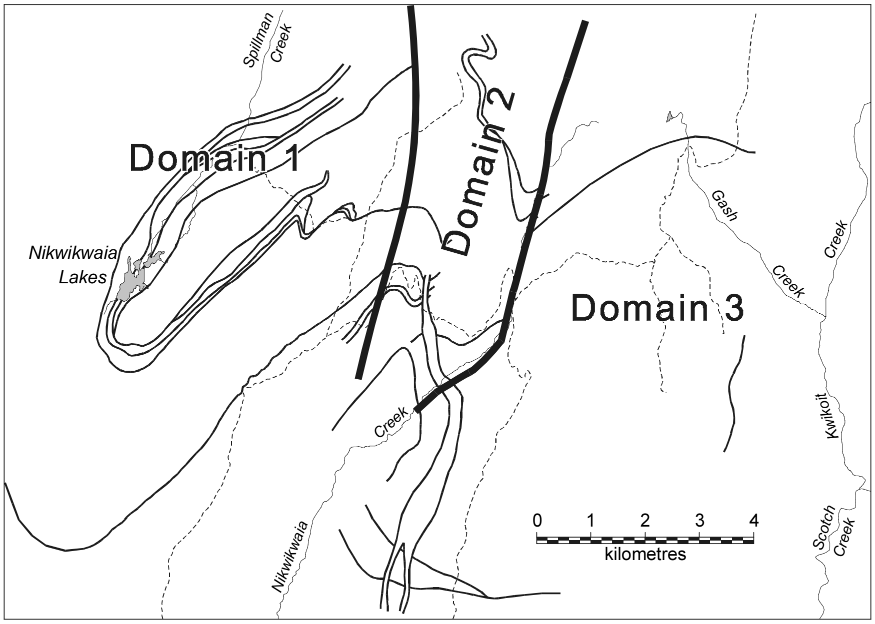


Figure 4. Structural domains on the Adams Plateau, and stereoplots of Phase 2 foliation planes and mineral lineations (see previous page).

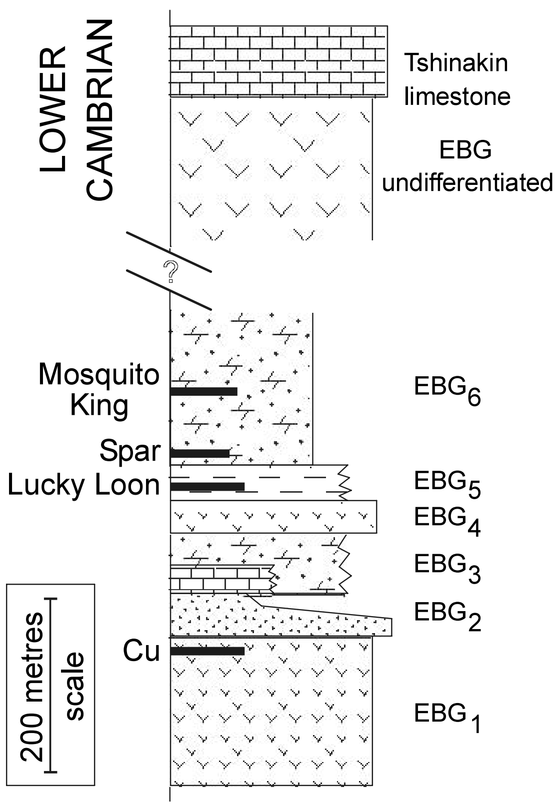


Figure 6. Stratigraphic succession of the Eagle Bay assemblage, Unit EBG, Adams Plateau.

the top of EBG1 (Figure 6).

North of these exposures of EBG1 is a thick limestone unit that has been correlated with the Lower Cambrian Tshinakin limestone exposed in the Vavenby area farther north (Schiarizza and Preto, 1987). An overturned antiform has been postulated to occur within Unit EBG1 (see Figure 4 and 5 of Schiarizza and Preto, op. cit.) thereby placing the Tshinakin limestone stratigraphically above the Adams Plateau succession. However, it is possible that the succession north of the Nikwikwaia synform is homoclinal and rocks hosting the stratabound mineralization on Adams Plateau is younger than the Tshinakin.

Major and trace element analyses of Unit EBG1 are given in Table 2 and plotted in Figure 7. Although these trace element data are assumed to be relatively immobile, the scatter in data may indicate some mobility during either regional metamorphism or hydrothermal activity related to mineralizing events. On a Zr/TiO2 vs Nb/Y plot (Figure 7A), EBG1 metavolcanics plot mainly as subalkaline to alkaline basalts. Low vanadium/titanium ratios (Figure 7B) suggest ocean floor affinities, rather than arc basalts. Similarly, on a Ti-Zr-Y and Nb-Zr-Y plots (Figure 7C,D), these samples plot mainly as within plate, alkaline to tholeiitic basalts,

Table 2. Analyses of metavolcanic rocks of Unit EBG1, Eagle Bay assemblage, Adams Plateau.

	Element	SiO2	TiO2	Al2O3	Fe2O3	MnO	MgO	CaO	Na2O	K2O	P2O5	Ba*	LOI	TOTAL	Zr	Nb	Sr	Y	V	Cr2O3
	Units	%	%	%	%	%	%	%	%	%	%	%	%	%	ppm	ppm	ppm	ppm	ppm	%
	Method	XRF1	XRF1	XRF1	XRF1	XRF1	XRF1	XRF1	XRF1	XRF1	XRF1	XRF1	FUS	SUM	XRF2	XRF2	XRF2	XRF2	XRF2	XRF2
	Lab.	COM	COM	COM	COM	COM	COM	COM	COM	COM	COM	COM	COM	COM	COM	COM	COM	COM	COM	COM
Lab No.	Field No.																			
53769	AP98-26	45.97	1.85	16.47	13.6	0.2	7.96	8.56	3.05	0.4	0.21	0.01	1.64	99.92	120	18	470	25	287	0
53770	AP98-31	79.94	0.6	9.06	3.7	0.05	1.11	0.41	1.85	1.23	0.05	0.03	1.87	99.9	199	12	58	17	74	0.02
53771	Std. SY4	50.09	0.28	20.14	6.17	0.09	0.51	7.96	7.03	1.55	0.1	0.03	5.15	99.1	446	19	1135	113	8	0
53772	AP98-32	46	0.56	10.85	4.9	0.31	1.79	14.31	0.51	7.26	0.07	0.07	12.36	98.99	172	9	447	14	86	0
53773	AP98-36	36.77	0.18	3.54	26.71	0.85	1.84	25.87	0.03	0.25	0.15	0	2.53	98.72	38	5	35	9	118	0.01
53774	AP98-62	46.16	1.25	13.02	12.67	0.31	9.77	10.9	1.83	0.6	0.18	0.02	3.04	99.75	107	6	578	18	206	0.05
53775	AP98-90A	42.81	0.8	11.75	8.31	0.14	3.99	13.64	0.99	1.9	0.15	0.03	13.03	97.54	146	19	441	20	152	0.02
53776	AP98-95	45.68	2.44	16.53	12.52	0.14	7.5	3.51	4.28	0	0.25	0	6.86	99.71	123	16	152	20	243	0.03
53777	AP98-133B	48.86	2.65	14.82	13.21	0.12	4.65	8.43	3.75	0.81	0.56	0.01	2	99.87	146	33	841	25	201	0
53778	AP98-190	43	1.76	16.64	14.14	0.11	10.43	2.8	2.53	0.58	0.21	0.03	7.61	99.84	117	10	100	25	348	0.05
53779	AP98-250	49.84	1.03	15.52	14.14	0.43	4.25	6.76	2.35	0.07	0.25	0	5.09	99.73	91	5	512	26	324	0
53780	AP98-269	43.38	3.33	16.92	15.67	0.21	5.13	4.59	4.78	0.61	0.5	0.01	4.42	99.55	281	24	97	39	171	0

NOTES

Steel mill grinding @ Cominco

XRF1 = Fused Disc - X-ray fluorescence

Ba* = Fused disc analysis for XRF calibration. Values should be used w ith CAUTION.

XRF2 = Pressed pellet -XRF

COM = Cominco

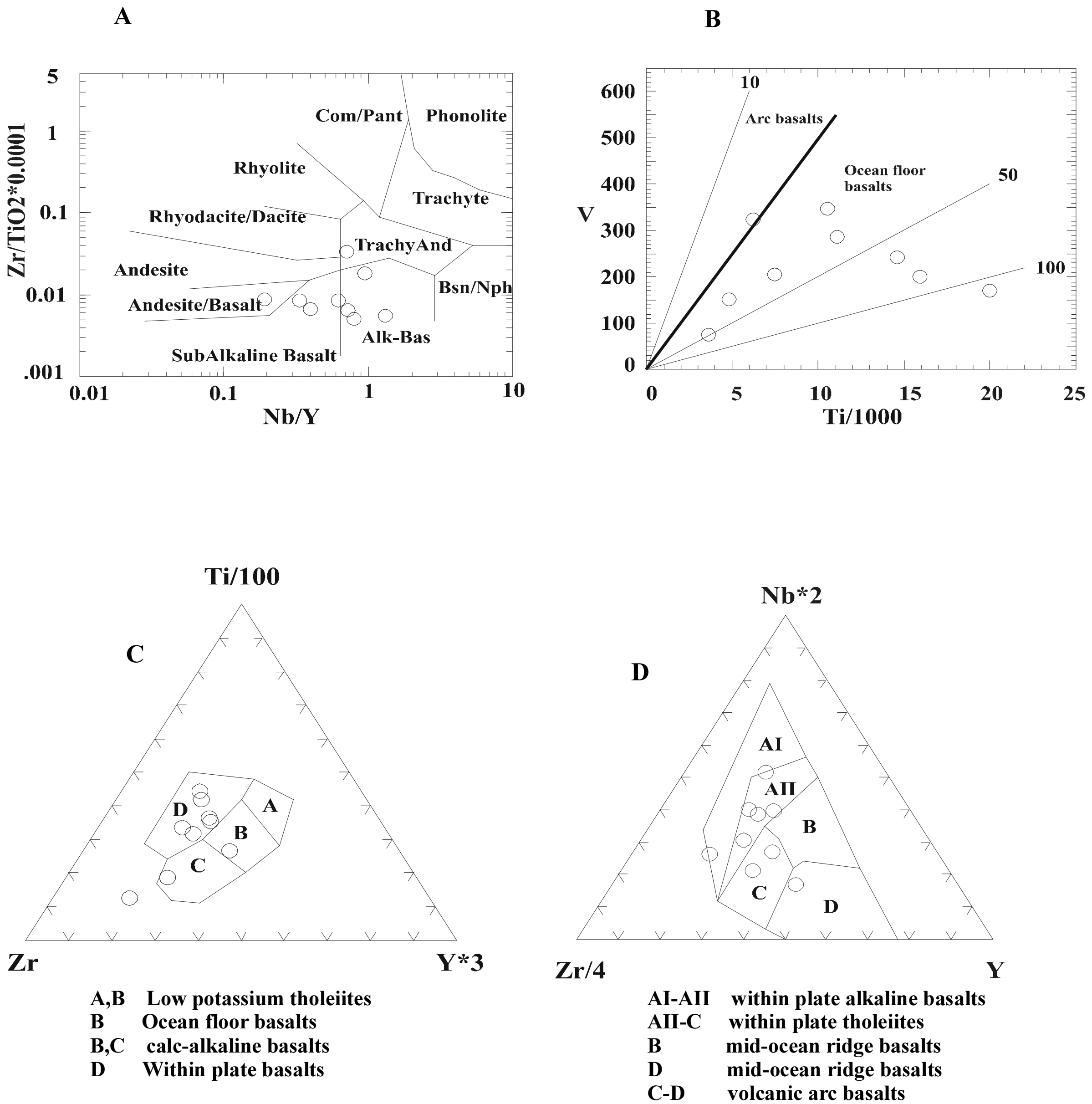


Figure 7. Plots of trace element data from metavolcanic rocks of Unit EBG1, Adams Plateau. A: after Winchester and Floyd (1977). B: after Shervais (1982). C: after Pearce and Cann (1973). D: after Meschede (1986).

recording extensional tectonics within the Kootenay Terrane in latest Proterozoic to Early Cambrian time.

A prominent white to pale grey quartzite marker unit, EBG2, overlies the greenstones of EBG1. It is a marker unit that outlines the limbs and closure of the Nikwikwaia synform. It has a variable thickness, from a maximum of 250-300 metres immediately northwest of Nikwikwaia Lake, to several tens of metres farther northeast on the north limb of the synform and a similar thickness on the south limb. Farther east, on both limbs, the quartzite apparently pinches out, and carbonaceous and calcareous metasediments of EBG6 appear to directly overlie greenstones. This rapid thinning of the quartzite may be in part structural, but as it is associated with clearly defined facies changes in overlying units north of the Lucky Coon showing, and as the thickest succession does not occur in the hinge zone of the Nikwikwaia synform, it is inferred to be mainly a stratigraphic thinning.

Unit EBG2 comprises white, pure to muscovite-rich quartzite, minor quartz-rich muscovite schist, and rare thin interlaminae of dark carbonaceous phyllite. It is typically foliated or has schistose textures due to variable muscovite

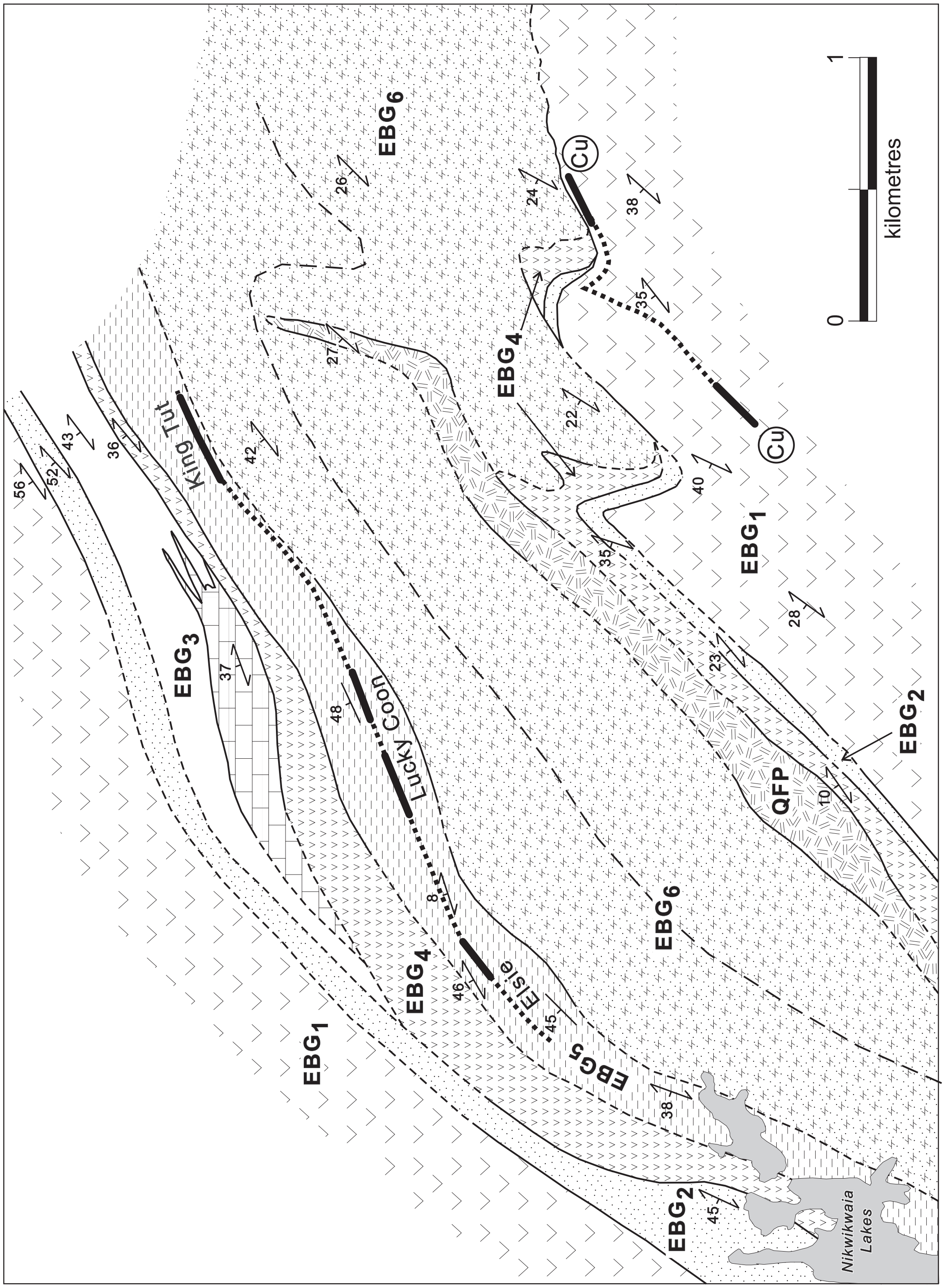


Figure 8. Geological map of the Lucky Coon, King Tut and Elsie deposit area, (legend; see Figure 3)

content. Intrafolial folds are common throughout, as are thin cross-cutting quartz-muscovite veins. The quartzite commonly forms small resistant white to grey outcrops. It has a sharp contact with underlying greenstone; in the south limb of the Nikwikwaia synform it appears to be in sharp contact with overlying chlorite phyllite, whereas in the north limb, the quartzite grades up into sericite schists of Unit EBG3.

EBG3, exposed only north of the King Tut showing, is characterized by rapid thickness and facies changes. Southwestern exposures comprise carbonaceous and sericite phyllite, overlain by several tens of metres of relatively pure grey limestone (Figure 8). To the northeast, EBG3 comprises a heterogeneous assemblage of carbonaceous, sericitic and chloritic phyllite, thin impure quartzite layers, "granular" quartz-feldpar phyllites and impure carbonates. The overlying limestone grades to the northeast into a succession of phyllites with thin interbeds of limestone and dolomite. These rapid facies changes, schematically illustrated in Figure 12, are suggestive of growth faults with deeper water, more basinal facies exposed in the northeast. Chloritic and feldspathic sericite-chlorite schists may record mafic to intermediate tuffaceous volcanism that followed deposition of the mafic volcanics of EBG1.

Chloritic schists of Unit EBG4 directly overlie either EBG3 or EBG2 in the core of the Nikwikwaia synform. The schists are thickest immediately north of Lucky Coon, thinning from several tens of metres to a few metres to the northeast (Figure 8). Only a few thin exposures were found south of Nikwikwaia Lake and to the east on the south limb of the synform where they occur immediately above the quartzite of EBG2. The chloritic schist was not recognized east of the north-trending faults, due either to lack of exposure or stratigraphic thinning. Unit EBG4 is similar to the greenstones of EBG1, comprising mainly chlorite schist or phyllite. Contorted layering is common within the schists. A few thin grey limestone layers occur within the thick section north of Lucky Coon. Unit EBG4 is interpreted to be a mafic tuff unit.

The succession hosting mineralization at the Lucky Coon, King Tut and Elsie deposits overlies EBG4. It comprises mainly sericitic or calcareous phyllite with common interlayers of chlorite or carbonaceous phyllite, and minor limestone and granular quartz-feldspar phyllite interbeds. It contrasts with the immediately overlying units which are dominated by dark, carbonaceous phyllite and limestone. Sulphide host rocks are potassic and silica-altered producing sericite schists and thin bedded "quartzitic" units. Disseminated sulphides are locally common in Unit EBG5, resulting in rusty-weathering exposures; some of these have been extensively trenched in the vicinity of the folds in the south limb of the synform. Farther east, in areas of higher metamorphic grade, calcareous units within EBG5 have become a relatively massive diopsidic skarn.

A large part of the area underlying Adams Plateau comprises a mixture of carbonaceous and calcareous phyllite of Unit EBG6. It forms the core of the Nikwikwaia synform and appears to be the host to mineralization at the Mosquito King and Spar deposits. It has a variable lithology, but appears to comprise mainly carbonaceous phyllite with numerous thin interbeds of grey limestone at its base, the dominant lithology of western exposures, and grades up in more eastern exposures, to mixed carbonaceous and calcareous phyllites with occasional limestone, calcsilicate or chlorite phyllite layers. At higher metamorphic grades, grey to pale green diopsidic skarn layers and impure calcite marbles are common. Disseminated sulphides associated with silicification are common throughout the unit, but particularly in the dark carbonaceous layers, producing very rusty-weathering interbeds. The internal stratigraphy of EBG6 is not known, and it is possible that there is considerable infolding and repetition of layers within it. The sulphide layers occur at a number of structural levels, but their exact stratigraphic positions are not known due to the internal complexity of this unit. EBG6 appears to record deposition of dark calcareous muds and thin limestones with only very minor mafic tuffaceous volcanism.

Unit EBA

Unit EBA, a succession of mainly chlorite and sericite phyllites and schists derived mainly from felsic to intermediate volcanic rocks, hosts the VMS deposits northwest of Adams Lake. On Adams Plateau, rocks correlated with EBA occur in the south part of the map area (Figure

3). Only the basal part of the succession has been examined and it comprises mainly well foliated, locally rusty-weathering, orthogneiss.

Exposures of EBA are common along the logging access road southwest of the Spar deposit. They are dominated by grey to tan weathering, foliated quartz-feldspar porphyry, and quartz-feldspar schists and granitic orthogneisses. Aphanitic phases are less common. Hornblende and biotite are common throughout, and epidote alteration occurs near a few pyrite and chalcopyrite veins.

The contact with Unit EBG1 appears to be intrusive, rather than structural, as a number of layers of chloritic phyllite, similar to EBG1, occur in the basal part of EBA. As well, angular to subrounded xenoliths of chloritic phyllite of EBG1 occur in more massive phases of the orthogneiss, and occasionally foliated dykes, similar to EBA, cut EBG1 along its contact with the orthogneiss. U-Pb dates of metavolcanics of EBA, from exposures on the southwest slopes of the plateau (plotted on Figure 3), indicate a Middle Devonian age (Preto, 1981; Preto and Schiarizza, 1985).

Discussion and regional correlations

The exposed Eagle Bay stratigraphy on Adams Plateau comprises a succession of mafic volcanic rocks overlain by a relatively thin succession of metasedimentary rocks. These are intruded by granites that have been correlated with the Late (?) Devonian orthogneisses of Unit EBA.

The metasedimentary rocks of EBG include a basal quartzite overlain by dominantly carbonaceous and calcareous phyllites. Thickness and facies changes within the basal part of this metasedimentary succession are concentrated in the vicinity of stratabound lead-zinc mineralization in the Lucky Coon deposit area. These changes include rapid thinning of the quartzite (EBG2) and overlying mafic metavolcanics (EBG4), and associated thickening of the intervening metasedimentary schists of EBG3, as has been schematically shown in Figure 12. A change from grey limestone to interlayered phyllite and limestone within EBG3 accompanies these changes in stratigraphic thickness. These abrupt stratigraphic changes are characteristic of growth faulting that may have provided mineralizing conduits for overlying mineralization.

The age of the metasedimentary succession is not known. However, on the north slopes of Adams Plateau it is within a greenstone package that contains a thick limestone unit that has been correlated with the Early Cambrian Tshinakin limestone (Schiarizza and Preto, 1987). These authors suggested that an antiform occurs within the greenstones north of the map-area, thereby repeating the succession and placing EBG beneath the limestone.

The stratigraphic succession of the Eagle Bay assemblage and correlations with the Hamill, Lardeau and Milford Groups in the Kootenay arc, and with the Snowshoe succession in the Barkerville subterrane are shown in Figure 9. EBH and EBQ, comprising mainly quartzitic units, are correlated with the Late Proterozoic to Early Cambrian Hamill and Gog North American miogeoclinal rocks. Mafic volcanic rocks of EBG contain the Lower Cambrian Tshinakin limestone, as well as the metasedimentary succession that hosts massive sulphides on Adams Plateau (Schiarizza and Preto, op. cit.). As these are interpreted to be stratigraphically lower than the Tshinakin, they may correlate with the Mohican Formation, a succession of interbedded calcareous schists, pelites, limestones and quartzites at the top of the Hamill Group. Metavolcanic rocks of EBG are within plate, ocean floor basalts, similar to those that occur within the upper part of the Hamill Group (J. Logan, personal communication, 1998). Correlation of the Mosquito King - Lucky Coon succession with the Mohican Formation (or top of Hamill Group) indicates that these deposits are older than the massive sulphide deposits in the Goldstream camp (Höy , 1979; Höy *et al*., 1984), hosted by Lower Paleozoic metavolcanics of the Index Formation (Logan and Colpron, 1995), or the stratabound sulphide deposits such as Ace (Höy and Ferri, 1998) in the basal part of the Snowshoe Group in the Barkerville subterrane (Struik, 1988).

EBS, EBL and EBK are mainly metasedimentary rocks that are inferred to stratigraphically overlie EBG and underlie Late Devonian rocks of EBA (Schiarizza and Preto, 1987). Their stratigraphic position and similar lithologies allow correlation with the Lardeau Group (Figure 9). A mafic volcanic unit within EBS may correlate with Index Formation volcanics. EBL, comprising limestone and calcareous phyllite, "is identical to the Sicamous Formation in the Vernon map area" (Schiarizza and Preto, op. cit., p.23), and is apparently continuous with these exposures (Jones, 1959).

EBM, dominated by mafic metavolcanic rocks (Schiarizza and Preto, op.cit.), may correlate with similar basaltic rocks of the Jowett Formation in the Lardeau Group. It is inferred to be in stratigraphic contact with EBS and may be overlain unconformably by Devono-Mississippian rocks of EBA, EBF and EBP (Figure 9).

Unit EBA, host to many of the volcanogenic massive sulphide deposits, is a succession of dominantly felsic to intermediate volcanic rocks that have been dated as Middle Devonian (Schiarizza and Preto, 1987). Gritty and fragmental rocks of EBF, derived in large part from intermediate tuffs and volcanic breccias, overlie EBA. Rea is a polymetallic volcanogenic massive sulphide deposit within dominantly mafic and minor felsic tuffs of EBF. Unit EBP, a succession of slates, phyllites and siltstone, with lesser sandstone, conglomerate and carbonates with Early and Middle Mississippian conodonts, is the youngest unit of the Eagle Bay assemblage. The contact of these Devonian to Mississippian rocks with underlying Lardeau correlative rocks may be unconformable, as a variety of different units of the Eagle Bay assemblage, including locally EBQ, underlie EBA (Schiarizza and Preto, 1987).

Unit EBP at the top of the Devono-Mississippian package may correlate, in part, with rocks of the Milford Group that unconformably overlies the Lardeau Group in the Kootenay arc (Figure 9). Similarities include their age and stratigraphic position, as well as some lithologic and metallogenic similarities; most notable of these are the occurrences of conglomeratic units in both, including quartz pebble conglomerates, and the recognition of felsic volcanics in both. Thin felsic tuffaceous units occur in Milford Group (?) rocks at Kootenay Lake, and some of these contain small polymetallic massive sulphide deposits such as True Blue and Copper Cliff (BC Minfile numbers 82F/SW002 and 82K/SW079). This correlation suggests that an unconformity may separate EBP from underlying units of the Eagle Bay.

MINERAL DEPOSITS

Three main deposit types are recognized on Adams Plateau: stratabound lead-zinc-silver deposits in metasedimentary rocks, stratabound copper occurrences in mafic volcanics and a variety of small vein occurrences. The lead-zinc deposits, including Mosquito King, Spar, King Tut, Lucky Coon and Elsie, have received considerable exploration activity while only limited work has been done on other occurrences. The following descriptions of these deposits are based on company reports, BC MINFILE descriptions as well as field visits and mapping

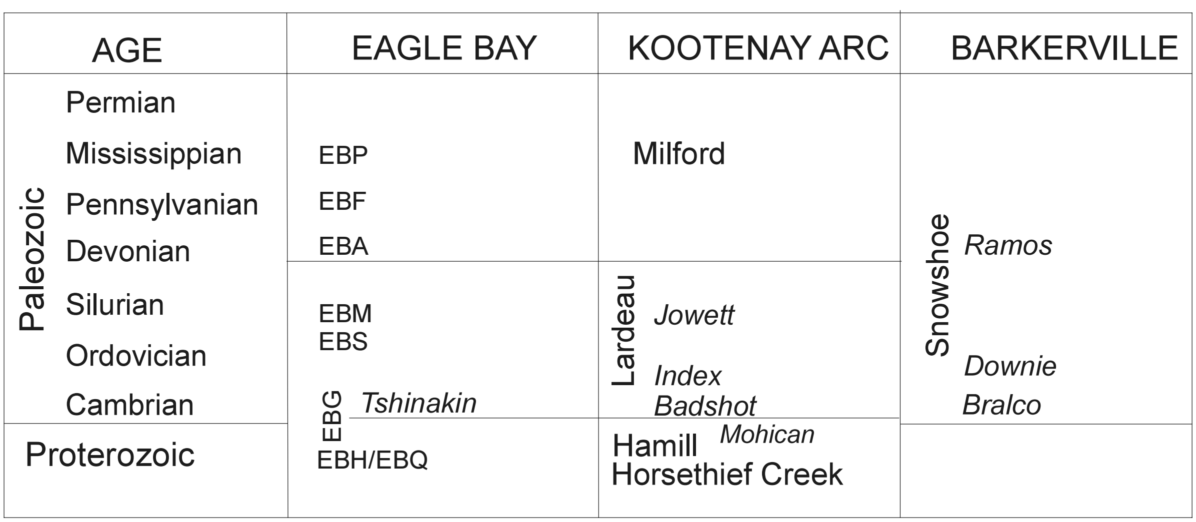


Figure 9. Regional correlation of rocks of the Eagle Bay assemblage with those in Kootenay Terrane rocks to the east, and Barkerville subterrane rocks to the north (after Schiarizza and Preto, 1987 with data from Struik, 1988; Höy and Ferri, 1998, and J. Logan, personal communication, 1998).

this past summer. Vein deposits, mainly lead-zinc-silver or copper-rich occurrences, are not described.

Mosquito King (082M 016)

Introduction

Mosquito King comprises a number of layers of stratabound Pb-Zn mineralization in a calcsilicate succession of Unit EBG6 of the Eagle Bay assemblage (Figures 3, 6). It is readily accessible via approximately 30 kilometres of logging access roads that leave the Scotch Creek road at Shuswap Lake park. The area is relatively flat and, as elsewhere on the plateau, exposures are largely limited to roads and trenches.

Recorded exploration on Adams Plateau dates back to 1927 with the discovery of the Spar deposit. Although records are scarce, considerable past work has been done in the Mosquito King area, including trenching, sampling, geological mapping, geophysical surveys and limited drilling. Orell Copper Mines Ltd., now Killick Gold Company Ltd., has held the ground since the mid 1970's; in 1976 and 1977 it was optioned to Craigmont Mines Ltd. who drilled a series of short drill holes to test down dip extensions of known sulphide occurrences and geophysical anomalies (Vollo, 1977; 1978). Test ore shipments were sent to the Trail smelter in 1972 and 1980, with recovery of 22,721 kg lead, 18,328 kg zinc, 232 kg of silver and 281 grams of gold from 212 tonnes of ore (1972).

Noranda Exploration Company Ltd. optioned the claims in 1984, and conducted an airborne geophysical survey by Dighem Ltd., followed by considerable mapping, trenching and soil sampling. More recently, Minnova Ltd. drilled a northeast extension of the Mineral King, the Gash prospect. Reserves at the Mosquito King, based on drilling by Killick Gold Company in 1981, are summarized in Table 1.

Geology

Mosquito King is within a succession of calcareous and phyllitic rocks that trend approximately east-west and dip variably to the north. This succession includes mainly dark carbona-

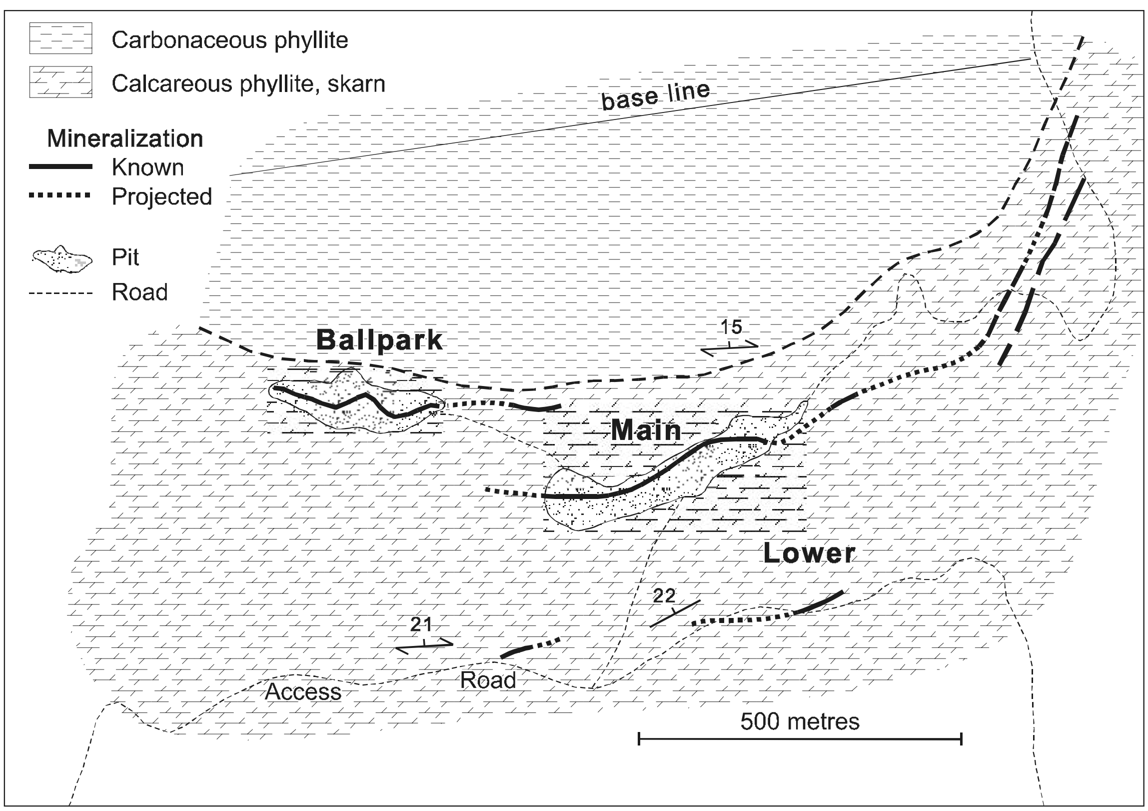


Figure 10. Geological map of the Mosquito King deposit area.

ceous phyllite, calcareous phyllite, thin impure grey limestone layers, and calcsilicate gneiss layers. It is not known if there are structural repetitions in the deposit area; where noted, bedding is essentially parallel with schistosity, and minor folds are generally late, affecting both bedding and the earlier foliation. However, the sulphide layers are interpreted to be separate and discrete layers, rather than fold repetitions, as associated thin limestone layers are not repeated.

At least three sulphide layers are recognized (Figure 10). A Lower zone is exposed in two trenched areas approximately 500 metres apart. It comprises banded, fine-grained galena and sphalerite with minor pyrrhotite in layers up to 30 centimetres in thickness hosted in interlayered diopside-rich calcsilicate gneiss, diopside-amphibole gneisses and thin marble layers. The total thickness of the mineralized calcsilicate layers is less than two metres. They are underlain by a grey calcite marble and overlain by calcsilicate gneisses and thin marble. Assays of two samples of the Lower zone, AP98-139 and AP98-385, are given in Table 3.

The Main showing consists of two thin sulphide layers, separated by calcsilicate gneiss and a prominent grey marble layer. The showings have been trenched along a strike length of approximately 300 metres, and are projected northeastward towards the Gap showings. The Ballpark showing occurs 400 metres west of the Main Mosquito King showing. The Mosquito King layers are separated from the structurally underlying Lower zone by several tens of metres of calcsilicate gneiss, dark carbonaceous and calcareous phyllite and thin limestone layers. They are overlain by less calcareous, dark carbonaceous phyllites. Immediate host rocks contain considerable disseminated pyrrhotite, producing very rusted outcrops.

A detailed section through the upper mineralized layer of the Main showing is illustrated in Figure 11. Layers vary from essentially massive, fine grained sphalerite, galena, pyrrhotite and minor chalcopyrite and magnetite (unit E), to semi-massive sulphides with variable diopside and quartz gangue (units A,B and C), to calcsilicate layers with dispersed to irregularly laminated sulphides (Unit D). Lead content in these layers varies from less than one to 4.5 per cent, zinc, to greater than 10 per cent, and silver to 34 grams/tonne

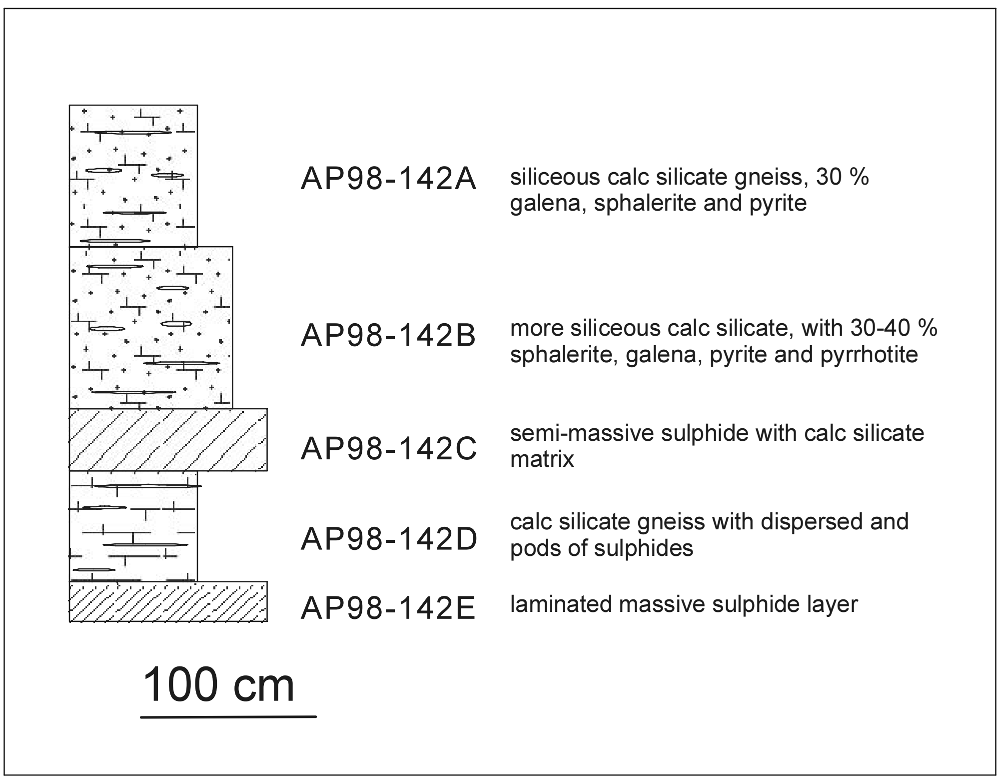


Figure 11. A detailed section through the Main sulphide layer, Mosquito King deposit; assays of sample numbers are given in Table 3.

Table 3. Analyses of selected hand samples of deposits and mineral occurrences on Adams Plateau. See next page.

Field No.	UTM E	UTM N	Mo ppm	Cu ppm	Pb ppm	Zn ppm	Ag ppm	Ni ppm	Co ppm	Mn ppm	Fe %	As ppm	Sr ppm	Cd ppm	Sb ppm	Bi ppm	V ppm	P %	La ppm	Cr ppm	Ba ppm	Ti %	W ppm	Zr ppm	Sn ppm	Y ppm	Sc ppm	Au** ppb
King Tut																												
AP98-333	318274	5661860	< 2	179	34013	99999	497.1	30	15	23600	17.48	634	22	563.8	560	49	15	0.01	9	223	31	0.01	6	13	8	4	2	316
AP98-334A	318432	5662119	< 2	172	41102	78667	593.6	17	7	53116	18.75	284	27	290.9	581	37	4	< .002	4	86	6	< .01	< 4	13	12	6	< 1	521
AP98-334B	318493	5662023	< 2	248	31887	31868	101.8	30	< 2	79798	27.42	24	10	101.8	86	28	7	< .002	6	29	7	0.01	< 4	18	< 2	9	1	152
AP98-334C	318493	5662023	2	180	44448	67011	127.9	14	14	332	6.38	2091	15	212.9	151	< 5	14	0.008	3	21	134	0.01	< 4	8	2	< 2	1	195
Lucky Coon																												
AP98-88A	317377	5661379	< 2	1897	1722	9427	21.1	48	6	54392	27.74	< 5	52	31.4	< 5	< 5	20	0.039	10	30	26	0.04	< 4	24	2	8	5	62
AP98-88B	317377	5661379	4	238	4320	50054	23.1	18	6	2065	17.87	4074	11	172.4	676	< 5	15	0.008	10	76	59	0.04	< 4	8	4	3	2	1692
AP98-88C	317377	5661379	4	143	48121	68904	600.7	27	16	13232	13.13	1103	16	316.2	842	< 5	38	0.021	6	120	40	0.13	< 4	11	15	3	3	1387
AP98-88E	317377	5661379	3	81	44107	99999	477.9	19	8	30180	11.96	710	101	494.4	381	29	18	0.011	4	210	9	0.03	4	9	11	4	3	1007
AP98-150	322319	5658944	4	626	283	270	1	187	161	1054	12.93	15	481	1.2	< 5	< 5	63	0.047	15	49	46	0.3	< 4	19	2	24	10	6
AP98-160	324658	5659526	< 2	398	4113	683	7.8	87	61	16492	23.93	9069	328	5.1	122	< 5	59	0.036	28	35	53	0.28	6	52	< 2	33	8	217
AP98-198	322373	5658317	4	1467	35930	99999	28.6	26	39	17465	22.8	214	38	495.9	32	53	16	0.018	7	267	5	0.05	5	10	< 2	4	2	188
AP98-200A	322441	5658512	< 2	137	608	588	2.3	20	69	42631	21.18	491	431	0.6	< 5	< 5	36	0.017	19	19	9	0.11	< 4	15	< 2	32	4	1132
AP98-200C	322441	5658512	< 2	127	4638	23870	5.7	30	18	35367	13.54	22	202	87	< 5	< 5	48	0.025	17	52	154	0.23	9	16	3	19	5	73
AP98-200E	322441	5658512	< 2	52	9833	31802	12.6	16	5	87411	20.69	13	243	130.4	7	< 5	24	0.024	18	54	17	0.13	6	28	2	16	3	186
AP98-202	322617	5658950	3	269	8726	99999	26.8	13	29	25990	5.97	520	423	416.4	45	10	3	0.002	13	164	14	0.01	< 4	4	3	35	3	974
AP98-203	322401	5658138	3	2194	25526	93772	440.5	112	49	1225	28.02	1761	4	351.5	482	303	< 2	< .002	< 2	173	4	< .01	< 4	< 2	< 2	< 2	< 1	772
AP98-220	315917	5660773	3	228	26187	99999	60.5	23	13	38199	17.73	114	12	1295.9	48	< 5	30	0.01	5	900	97	0.05	< 4	9	< 2	3	2	39
Mosquito King																												
AP98-139	323929	5657833	2	514	35060	99999	34.1	15	21	5655	14.45	370	117	1174.2	41	15	14	0.012	3	720	71	0.05	< 4	3	4	9	3	198
AP98-142A	324167	5658078	3	196	41186	1313	24	24	6	1558	4.72	107	121	7.2	50	< 5	37	0.018	30	32	176	0.11	< 4	5	2	11	5	81
AP98-142B	324167	5658078	3	580	9649	12175	11	49	24	1522	16.59	20	93	42.8	14	< 5	57	0.029	11	45	60	0.1	8	7	3	8	7	126
AP98-142C	324167	5658078	3	749	16611	19286	19	30	9	2376	7.33	35	524	71.8	21	< 5	81	0.044	42	61	160	0.25	< 4	12	2	19	11	108
AP98-142D	324167	5658078	3	177	3203	4418	10.5	28	8	5144	7.23	279	256	16.3	26	< 5	84	0.04	29	63	71	0.34	6	37	3	22	10	231
AP98-142E	324167	5658078	3	2089	44659	44835	54.6	97	31	3433	24.92	97	158	193.5	49	26	23	0.015	13	81	156	0.07	9	3	4	12	3	80
AP98-146A	322608	5657880	4	74	43305	99999	397.1	7	13	934	4.54	129	70	1128.7	436	12	29	0.022	8	768	109	0.06	4	12	5	5	2	1205
AP98-166	324798	5658596	4	387	41385	43503	109.4	60	114	2418	13.1	303	135	177.2	53	117	40	0.027	15	99	175	0.17	< 4	8	11	8	4	425
AP98-167	324741	5658522	3	1793	320	7337	2.9	36	67	8703	20.75	93	31	26.9	5	< 5	15	0.005	3	25	4	0.06	6	5	3	4	2	54
AP98-167A	324741	5658522	3	1408	45105	57156	104.5	80	172	11969	24.04	968	111	257.7	77	96	15	0.006	9	117	76	0.06	< 4	4	10	8	2	879
AP98-168	324741	5658522	4	297	9285	99999	18.5	99	167	1688	16.14	1082	196	492.2	18	44	60	0.027	28	211	83	0.13	4	13	4	7	5	717
AP98-169	324656	5658343	4	1334	2475	15795	20.7	81	113	1925	17.58	211	79	75.4	14	45	27	0.013	3	35	98	0.08	< 4	3	2	2	3	83
AP98-208A	323745	5658188	< 2	3702	26747	855	140	95	53	5575	44.67	263	47	5.3	40	204	9	0.002	2	14	27	0.03	< 4	3	< 2	5	1	424
AP98-208B	323745	5658188	< 2	840	802	494	4.2	73	38	3565	28.75	947	45	< .4	10	< 5	22	0.004	6	19	82	0.05	< 4	4	< 2	2	2	429
AP98-209	323745	5658188	< 2	1985	6378	9734	28	162	61	6752	23.8	15	35	42.1	< 5	31	56	0.023	27	34	39	0.12	< 4	11	6	5	5	54
AP98-211	323745	5658188	2	695	23649	2414	84.2	66	24	1804	16.02	98	55	11.8	49	99	65	0.027	19	30	190	0.07	< 4	14	13	4	6	414
AP98-212	323745	5658188	3	448	5284	99999	< .5	9	< 2	2107	34.32	64	3	357.7	11	< 5	2	< .002	11	193	8	< .01	< 4	< 2	< 2	6	< 1	550
AP98-385	324384	5657903	< 2	91	38138	84745	164.6	23	6	16666	13.14	< 5	435	405.3	154	11	54	0.032	20	102	8	0.23	52	16	2	18	7	197
Spar																												
AP98-235	321731	5659417	2	1731	24699	26866	42.5	41	53	2287	20.23	70	71	122	43	20	48	0.023	9	51	107	0.16	19	14	5	6	4	111
AP98-235A	321731	5659417	2	1708	25555	38338	155.6	47	16	2170	25.07	95	46	156.1	55	239	36	0.014	14	71	102	0.06	6	8	6	6	4	84
AP98-235B	321731	5659417	2	1790	25420	99999	283.2	26	28	4926	17.7	182	26	533	261	45	6	0.002	4	461	22	0.02	< 4	2	5	3	< 1	177
AP98-236	321725	5659420	2	853	22814	39894	485.2	57	29	502	12.04	1075	7	151.9	572	< 5	10	0.004	6	36	30	0.04	< 4	2	10	< 2	1	856
AP98-237	321660	5659610	3	261	356	683	2	76	41	10692	14.29	12	438	3.2	< 5	< 5	76	0.065	28	35	123	0.22	< 4	27	< 2	25	7	8

All elements but Au by TICP = HCLO4-HNO3-HCl-HF digestion - inductively coupled plasma emission spectroscopy; Au by flameless AAS; ACME Analytical

Table 3. Analyses of selected hand samples of deposits and mineral occurrences on Adams Plateau.

Field No.	UTM E	UTM N	Mo ppm	Cu ppm	Pb ppm	Zn ppm	Ag ppm	Ni ppm	Co ppm	Mn ppm	Fe %	As ppm	Sr ppm	Cd ppm	Sb ppm	Bi ppm	V ppm	P %	La ppm	Cr ppm	Ba ppm	Ti %	W ppm	Zr ppm	Sn ppm	Y ppm	Sc ppm	Au** ppb
Miscellaneous occurrences																												
AP98-8	321703	5656281	2	45	26	60	< .5	40	15	1634	3.54	< 5	385	0.4	< 5	< 5	102	0.055	41	70	592	0.31	< 4	31	2	23	13	3
AP98-14A	322058	5658377	< 2	150	43	127	0.5	87	45	2801	8.77	6	806	0.7	< 5	< 5	112	0.113	31	81	127	0.53	12	43	3	32	14	3
AP98-37	321113	5660434	2	41	66	69	1.6	30	12	871	3.43	12	492	< .4	< 5	< 5	64	0.022	26	33	489	0.19	11	12	< 2	18	7	2
AP98-38	321113	5660434	< 2	91	55	204	1.6	24	14	2583	5.34	12	996	1.2	6	< 5	63	0.037	20	41	260	0.19	9	14	< 2	18	7	3
AP98-46	320327	5660228	< 2	7277	13	65	3.1	104	181	3067	30.36	< 5	134	0.5	< 5	< 5	26	0.027	10	20	7	0.18	42	11	30	14	3	22
AP98-46A	320327	5660228	< 2	4831	19	59	2	123	276	2564	33.55	< 5	141	1.5	< 5	< 5	27	0.037	12	22	7	0.19	44	11	26	15	3	13
AP98-63	619184	5659606	4	377	16	17974	1.2	17	51	4188	12.78	< 5	457	137.8	< 5	8	210	0.074	10	114	52	0.92	< 4	27	< 2	24	20	5
AP98-67	319620	5661177	5	199	6	79	1.6	27	19	982	6.38	8	329	0.7	7	< 5	186	0.313	36	17	439	2.01	8	21	11	39	17	< 2
AP98-133A	323184	5658037	4	76	713	417	3.6	26	31	1155	9.13	37	948	1.6	12	< 5	205	0.26	30	21	92	1.61	< 4	19	< 2	32	15	3
AP98-307	320082	5655156	5	604	165	175	3.2	54	232	2757	17.5	32	33	< .4	7	16	45	0.098	150	49	75	0.12	< 4	12	4	11	3	81
AP98-365A	318433	5659803	2	9878	547	4893	10	30	79	3012	14.27	6	266	19.4	< 5	28	94	0.062	20	108	81	0.61	< 4	14	9	17	10	111
AP98-365B	318433	5659803	< 2	12336	689	2486	10.4	91	239	2257	22.91	< 5	237	8.6	< 5	40	49	0.041	14	30	28	0.3	< 4	12	5	14	6	96
AP98-408	326137	5661783	2	2111	20272	11015	30.1	139	125	766	32.71	< 5	39	40.6	< 5	65	10	< .002	3	15	28	0.02	< 4	2	< 2	2	< 1	152

(samples AP98-142a,b,c,d,e; Table 3). Gold content varies from approximately 80 to 230 ppb. AP98-212, a more pyritic sample in a small trench farther west and on strike with the Main showing contains 550 ppb gold. The sulphide succession of the Main showing is within a pale greyish-green sericitic and siliceous rich calcsilicate unit, that may reflect both potassic and siliceous alteration. Footwall rocks comprise dark green, diopside-rich calcsilicate gneiss with approximately 10 per cent disseminated pyrrhotite.

The Ballpark showing is a very heavily rusted and extensively trenched area west of the Main showing. It is structurally higher, and may represent a separate sulphide layer. However, mineralization is similar to the Main showing, comprising massive to poorly banded pyrrhotite with sphalerite and galena, and minor pyrite and chalcopyrite, within a siliceous calcsilicate host. The footwall consists of fine-grained granular quartz with minor dispersed pyrrhotite, and the hangingwall, a thin silicified zone overlain by siliceous sericite phyllite. Analyses of samples from the Ballpark sulphide layer (samples AP98-208a,b) are given in Table 3, and indicate locally high silver (140 ppm) and gold (>400 ppb) contents. Copper (0.37 per cent) is also high in one of the samples. Samples AP98-209 and 211 (Table 3) are just east, on strike with the Ballpark sulphide layer.

In summary, Mosquito King comprises a number of thin, laterally extensive massive pyrrhotite-sphalerite layers, with locally high precious metal content, in a highly deformed and metamorphosed calcsilicate gneiss succession. Potassic and siliceous alteration are reflected in silicified sericitic zones in the immediate hangingwall and footwall.

Spar (082M 017)

Introduction

The Spar massive sulphide deposit is located near the headwaters of the east branch of Nikwikwaia Creek (Figure 3). Access is via 29 kilometres of logging roads that leave Shuswap Lake at Shuswap Lake park.

Spar, discovered in 1927, was the first deposit located on the plateau. Due to lack of exposure in the area, as well as elsewhere on the plateau, most subsequent exploration has involved geochemical and geophysical surveys, followed by trenching and limited drilling. In the 1960's, Giant Metallics mapped the area and undertook some trenching and drilling. The property was acquired in 1974 by the present owners, Killick Gold Company Ltd. (formerly Orell Copper Mines Ltd.). It was optioned to Craigmont Mines Ltd. in 1977 and 1978, Brinex Limited in 1980, and Noranda Exploration in 1984 and 1985. The Noranda exploration program consisted primarily of following-up airborne geophysical anomalies through geological mapping, soil geochemistry, geophysical ground surveys, trenching, considerable sampling, and some drilling (Shevchenko and Bradish, 1986). Minnova optioned the property in 1991, conducted an IP and magnetometer survey and drilled three holes, totaling 350 metres. Drill indicated reserves at the Main showing are 12,300 tonnes containing 4.83 per cent zinc, 10.56 per cent lead, and 206 grams/tonne silver.

Geology

The Spar deposit is a massive lead-zinc-silver layer near the base of Unit EBG6 of the Eagle Bay assemblage. Unit EBG6 in the vicinity of the deposit comprises dominantly calcsilicate schists, calcsilicate gneiss and thin marble layers in the footwall and dark carbonaceous phyllites, with interlayered calcareous schists in the hangingwall. This succession is believed to be stratigraphically lower than rocks that host Mosquito King.

The Spar massive sulphide layer trends northeast and dips 30 to 40 degrees to the northwest. The layer can be traced and extrapolated from the Main adit showing approximately 600 metres to the north where it is folded into an open, north plunging antiform whose east limb is truncated by a north-trending fault (Figure 3). Late, open minor folds, common in the immediate deposit area, verge to the east, supporting this antiformal closure. An exposure of a massive sulphide layer, 300 metres west of the Main showing, may be a fold repetition or a second sulphide layer.

The thickness of the sulphide layer is highly variable, due mainly to structural attenuation or thickening. In 1976 Hesca Resources Ltd. drilled 8 short vertical holes within a radius of 35 metres of the Main adit to determine the extent and thickness of the mineralized zones (Gutrath, 1978). DDH76-1 intersected 5 metres of massive sulphides that assayed 18.9 per cent lead, 8.5 per cent zinc, 0.23 per cent copper, 380 g/tonne silver and 0.79 g/tonne gold. A hole drilled to the south, to intersect the "southwest plunge" of the mineralization, intersected a considerably thinner intercept, and holes to the north, along strike, did not intersect "mineralization of economic interest". It is critical to recognize the controlling structures in these deposits; the west-plunging Phase 3 structures do not appreciably thicken mineralized layers, whereas the less obvious Phase 2 structures typically control the distribution and plunge of massive sulphide zones.

Spar comprises crudely banded sulphides with siliceous and calcareous interbeds. Exposed mineralization at the Main showing comprises approximately 2 metres of coarse grained galena, with finer grained sphalerite and pyrrhotite in a granular quartzitic matrix, overlain by a variable but generally thin pyritic layer, and 2 metres of sphalerite with galena, pyrite and pyrrhotite. Chalcopyrite and trace arsenopyrite are also observed in the massive sulphide layers.

Assays of samples of the Spar sulphide layers are given in Table 3. A sample of the lower layer (AP98-235A) contains 2.5 per cent Pb, 3.8 per cent Zn and 155 ppm Ag whereas the more zinc-rich upper sulphide layer contained 2.5 per cent Pb, greater than 10 per cent Zn, 283 ppm Ag and 177 ppb Au. Copper content, 0.17 per cent, is similar in all samples. AP98-236, a sample from a thin sulphide layer in the immediate hangingwall, contained lead and zinc values similar to the main sulphide layers, but higher arsenic (1075 ppm), gold (856 ppb) and silver (485 ppm) content.

The hangingwall of the sulphide layers includes very rusty-weathering, hornfelsed argillite, dark limestone, minor granular, siliceous or chloritic phyllite and crudely layered calcsilicate gneiss. Pyrrhotite occurs throughout these units, either finely disseminated or forming discontinuous lamellae. The main alteration minerals are quartz, pyrrhotite and minor sericite.

Lucky Coon (082M 012), Elsie (082M 213) and King Tut (082M 013)

A layer of massive sulphides has been traced discontinuously for approximately 2.5 kilometres along the north limb of the Nikwikwaia synform. The southwest end of the sulphide layer is referred to as the Elsie deposit, the central part where most exploration has been focused, the Lucky Coon, and its northeastern extension, King Tut. The Elsie and Lucky Coon deposits are accessible by a four-wheel drive road that crosses the ridge southeast of the deposit or by a logging road northwest of Gilfrid Lake that was opened this past September. The access road to the King Tut is largely overgrown. Sulphide exposures are restricted to numerous trenches and open cuts; however, cliffs on the slopes of Spillman Creek just to the north expose considerable outcrops of structural hangingwall rocks.

Recorded exploration on these properties was first described in 1927, and considerable trenching and minor drilling by the Granby Consolidated Mining, Smelting and Power Company undertaken in 1928 and 1930. In 1977, two pits were mined and 1360 tons of mineralization shipped to the Trail smelter (Spencer, 1985). In 1981, Adams Silver Resources undertook a program of mapping, soil geochemistry and diamond drilling to test the near-surface extension of the Lucky Coon mineralization, and in 1987, Esso Minerals Ltd. mapped approximately 1125 hectares at a 1:5,000 scale, relogged drill core and did some additional soil geochemistry (Holbek and Thiersch, 1987).

Geology

The Lucky Coon, King Tut and Elsie deposits are parts of a massive sulphide layer that has been traced or extrapolated more than 2500 metres along the north limb of the Nikwikwaia synform (Figure 8). The sulphide layer is generally thin, with typical widths ranging up 30 centimetres; a maximum thickness of 2.8 metres is reported in a 1981 drill hole just below the main pit of the Lucky Coon (Tough, 1981; reported in Holbek and Thiersch, 1987). In detail, the sulphides can occur at several intervals, separated by thin phyllitic or calcareous units; these probably represent separate layers, similar to the Mosquito King and Spar occurrences, rather than structural repetitions. The sulphide layer is within a heterogeneous succession of thin bedded carbonaceous, calcareous and sericitic phyllites, chloritic schist, grey limestone and granular phyllite of Unit EBG5. It occurs stratigraphically lower than the sulphide layers of Mosquito King and Spar.

Lucky Coon is the central and largest sulphide zone in the area. A number of open pits and extensive trenching have exposed the mineralized layer for a strike distance of several hundred metres.

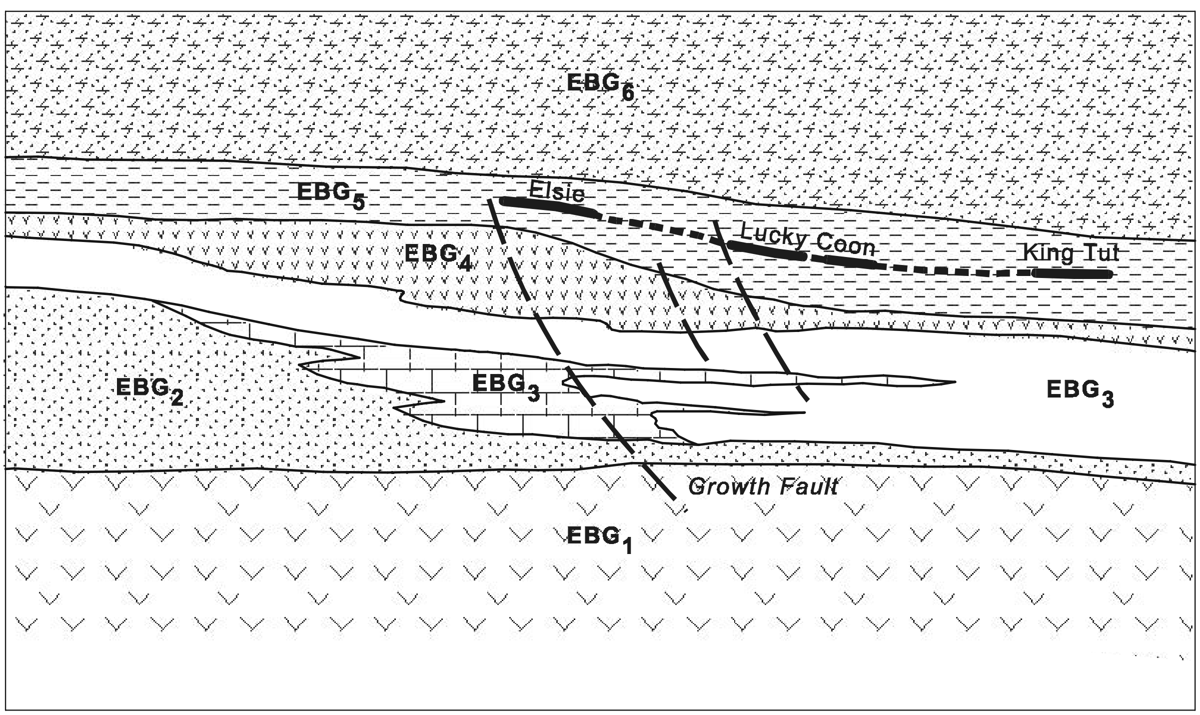


Figure 12. Schematic diagram showing facies and thickness variations in Eagle Bay rocks in the vicinity of the Lucky Coon, King Tut and Elsie occurrences; (legend, see Figure 3)

The massive sulphide layer comprises banded pyrite, sphalerite, galena, minor arsenopyrite, and trace argentite, tetrahedrite and chalcopyrite in a quartz ± carbonate gangue. Its mineralogy is described in some detail by Hedley (1936). Pyrite and arsenopyrite are commonly euhedral, suggesting post-strain recrystallization, sphalerite and galena are typically closely intergrown, and argentite occurs only within galena. The high precious metal content of Lucky Coon is shown in analyses of selected hand samples in Table 3, with one sample containing greater than 600 ppm Ag and another, approximately 1.7 ppm Au.

Sulphides are usually enclosed in an alteration envelope of sericite, silica, minor carbonate and disseminated pyrite. The most common, persistent and widespread alteration is a tan to pale grey sericite in phyllite in both the hangingwall and footwall of the Lucky Coon. Silicification is closely associated with the sulphides, occurring as gangue, fine laminae and thin quartz veinlets within the sulphides and in both the hangingwall and footwall. Carbonate alteration, recognized by the typical brown weathering of iron-rich dolomite, is also closely associated with sulphides. It forms small spots or foliation parallel laminae, best developed in more chloritic units, and thin dolomitic beds in the immediate footwall. These beds may be dolomitized limestone units, as limestones are recognized along strike.

Elsie has been explored by a short underground adit. Although it is difficult to trace sulphides between these two deposits, they are at approximately similar stratigraphic levels. Samples in the dump comprise mainly pyrite with minor dispersed galena and sphalerite in a granular sericite-quartz matrix.

Exposures at King Tut are within a trench that trends 075 degrees, parallel to the strike of the sulphide layer. Sulphides comprise massive to banded galena, sphalerite and pyrite, with minor pyrrhotite in a granular to gneissic quartz, siderite, sericite and minor chlorite gangue. Analyses of selected hand samples (Table 3) returned approximately 10 per cent combined Pb+Zn and high silver content. Footwall rocks are commonly siliceous and sericitic schists with minor disseminated pyrite, whereas hangingwall rocks are dark carbonaceous phyllites.

The sulphide layer and Unit EBG5 are underlain by units that are characterized by prominent facies and thickness changes as are schematically illustrated in Figure 12. EBG2, an impure quartzite succession, thickens considerably immediately south of the Elsie occurrence. EBG3 is characterized by rapid facies and thickness changes that are concentrated immediately below Lucky Coon mineralization. The most prominent of these is a change from thick-bedded, grey limestone near the base of the unit to thinly interbedded limestones and phyllites to the northeast (Figure 8). As well, chloritic schists of the overlying Unit EBG4 are also thicker in the immediate deposit area. These changes are indicative of growth faulting that may have controlled the discharge of basinal fluids leading to deposition of massive sulphide mineralization.

AP98-408 (082M 268 - new)

A small trench at the northeast end of the map area has exposed a massive pyrrhotite layer with minor chalcopyrite, sphalerite and galena. The sulphide layer has an exposed thickness of 80 centimetres and a length of a few metres. It is within a very rusted, siliceous calcsilicate gneiss. Based on its base and precious metal content, and location relative to the projected eastern extension of EBG1, it may be at approximately the same stratigraphic level as the Lucky Coon sulphide layer. A high pyrrhotite content, relative to pyrite, may reflect higher metamorphic grade.

STRATABOUND COPPER OCCURRENCES

A number of small showings of copper mineralization, including veins and massive sulphides, occur in metavolcanic rocks of EBG1 (Figure 8). The massive sulphide occurrences typically comprise pyrrhotite and chalcopyrite, with variable silver and gold content.

AXL 1 (082M 068)

This occurrence is within a trenched and cleared area several tens of metres in diameter. Bedrock is not exposed, but numerous large rusted boulders indicate a bedrock source. Host rocks are chloritic phyllites of Unit EBG1.

Boulders comprise very rusted, pyrrhotite rich chloritic phyllite as well as semi-massive sulphides. The sulphides are dominated by pyrrhotite rich layers with variable but generally minor chalcopyrite and sphalerite. Sulphides are highly foliated, with a chlorite, quartz and minor sericite gangue.

Analyses of the two samples of the massive sulphides (AD98-365A,B; Table 3) yielded 0.1 and 1.2 per cent Cu, 0.5 and 0.2 per cent Zn, and low lead content.

AP98-46 (082M 269 - new)

A small pod of very rusty-weathering massive sulphides is exposed within amphibolite of Unit EBG1 several kilometres northeast of AXL 1. The sulphide exposure is several metres in length and up to a metre in thickness. It comprises mainly pyrrhotite and chalcopyrite, with subrounded granular quartz eyes, in a dark green chlorite-amphibole-quartz matrix. Sulphides are typically banded, commonly swirled and cut by late, thin chalcopyrite veinlets. Small euhedral pyrite grains may overgrow the massive sulphides.

Assays of two samples of the massive sulphide layer returned 0.48 and 0.23 per cent copper, with low lead and zinc content and only trace silver and gold (Table 3)

SUMMARY AND DISCUSSION

The Adams plateau is underlain mainly by highly deformed metasedimentary and metavolcanic rocks of Unit EBG of the Eagle Bay assemblage. The age of these are not known, but based mainly on the lithogeochemistry of the mafic volcanic rocks, and their stratigraphic position relative to the Tshinakin limestone, as established elsewhere in the Adams Lake-Vavenby area (Schiarizza and Preto, 1987), they are correlated with the Late Proterozoic to Early Cambrian Hamill Group or Mohican Formation.

EBG comprises massive to foliated greenstones and chloritic phyllites, derived from mafic volcanic rocks, overlain by a metasedimentary succession of phyllites, thin limestone layers, chloritic, calcareous and carbonaceous schists, and, at the base, a prominent marker quartzite unit. These are intruded by a variety of felsic plutonic rocks, including a Late (?) Devonian orthogneiss, Late Cretaceous granitic rocks, and a number of Tertiary quartz porphyry dykes.

The structure of Adams Plateau is dominated by a tight, north plunging syncline, the Nikwikwaia synform that closes in the western part of the area. Its axial plane, defined by synmetamorphic fabrics, trends approximately east-west and dips north, shallowing to almost horizontal in the east. The limbs and axial plane of the synform are folded into a number of broad, upright north-trending folds. These folds and associated north-trending faults postdate the metamorphic fabric but are cut by the Late Cretaceous intrusions.

Three main deposit types were examined on the plateau: stratiform massive lead-zinc sulphide layers, stratabound massive copper-pyrrhotite lenses, and a variety of veins. The copper occurrences are generally small, comprising massive pyrrhotite and chalcopyrite in mafic metavolcanic rocks of Unit EBG. Most veins appear to be located near the north trending faults; they include a number of small lead-zinc-copper-silver occurrences and a small massive fluorite occurrence.

Most exploration and development has been directed towards the massive lead-zinc layers, including the Mosquito King, Spar, Lucky Coon, Elsie and King Tut. These comprise mainly layered galena, sphalerite, and pyrrhotite or pyrite within a calcsilicate gneiss or schist host. They occur at a number of horizons, within a stratigraphic interval of probably less than a few hundred metres. In all deposits, immediate host rocks are silicified and sericitized, reflecting potassic and silica alteration; locally (Lucky Coon) dolomitization of host limestone layers is important. More western deposits are characterized by higher lead/zinc ratios and higher silver contents. More eastern deposits are in rocks of higher metamorphic grade, and contain mainly pyrrhotite rather than pyrite.

Prominent facies and thickness changes in rocks stratigraphically underlying the Lucky Coon, King Tut and Elsie deposits indicate that growth faulting may have controlled the location of these deposits. These faults may have been the conduit for the discharge of hydrothermal fluids that led to the formation of massive sulphide deposits in overlying rocks. These deposits may be related to a period of regional extension, marked by rifting, volcanism and submergence, along the North American continental margin in EoCambrian time. Other deposits associated with this extension include sedex deposits such as Cottonbelt and Big Ledge in high grade metamorphic rocks of the

Monashee Complex farther east.

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