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NICOLA PROJECT

March 1981

compiled by

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Introduction

The Iron Mountain property, located 6 km southeast of Merritt, British Columbia (figure 1) was acquired by Chevron Standard Ltd. in July, 1978. Upper Triassic to Lower Jurassic volcanic rocks and associated sediments of the Nicola Group of south-central British Columbia underlie the area. The Nicola Group strata are thought to represent part of a collage of Early Mesozoic magmatic arcs and associated subduction complexes (Monger and Price, 1979). Certain sequences of the Nicola Group volcanic rocks were formed during submarine volcanic activity (Shau, 1968). The available literature has been examined to determine the potential of the Nicola Group volcanic rocks of the poperty and its surrounding area for hosting strata-bound polymetallic mineral deposits genetically related to the submarine volcanic activity. An area of 1,936 square km, bounded by 50°25' north latitude, 120°00' west longitude, 49°55' north latitude, and 121°00' west latitude, was examined.

Exploration criteria*

Volcanogenic massive sulphide deposits form at the completion of a submarine felsic to intermediate volcanic cycle. Felsic lava domes and/or their plutonic equivalents are formed during the volcanism. The effusive rocks accompanying the emplacement of a lava dome often show brecciated structure due to rapid cooling and/or steam explosions on the side of the dome during or after its formation. The mineralization originates in the exhalative action that follows

*taken from Matsukuma and Horikoshi, 1970 steam explosions. Tuffs emplaced by turbidity currents may accompany the submarine eruptions. The commonly observed sequence starts with massive tuff breccias rich in lithic fragments which change to stratified tuffs intercalating mudstone and sometimes also limestone. Strongly-altered dacitic to rhyolitic lavas often underlie the sequence. The rhyolites are generally poor in phenocrysts, brecciated, and altered to quartz-sericite rock.

Regional alteration of intermediate volcanic rocks leads to the assemblage epidote-chlorite-albite-sericite-quartz-(calcite), while the alteration of felsic volcanic rocks is shown by a zeolite-montmorillonite assemblage. Alteration directly related to mineralization can be difficult to distinguish from regional alteration, diagenetic alteration and post-magmatic hydrothermal alteration. The alteration products associated with volcanogenic deposits are zoned both vertically and laterally around the deposit, with alteration zones crossing stratigraphic boundaries. Strongly-silicified zones with some sericite and chlorite are generally found near to the concentration of metallic minerals. Within the mineralized zone sericite, chlorite and quartz alteration is common. Sericite, chlorite and pyrite alteration prevails in the area surrounding the mineralization while a montmorillonite-zeolite assemblages is found farthest from the mineralized zone. The alteration adjacent to the mineralization is formed metasomatically by solutions discharged during and after the main episode of metallic mineralization.

The following stratigraphic succession of ore zones, from the outermost to the innermost zones characterizes volcanogenic massive sulphide deposits. One or more of the zones may be lacking.

hanging wall: intermediate to mafic volcanic and/or marine sedimentary sedimentary rocks.

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ferruginous quartz zone: composed of aggregates of cryptocrystalline quartz with disseminated hematite and often associated with barite and pyrite.

↓

barite ore zone

↓

barite-zinc-lead-copper-silver-bearing polymetallic sulphide ore zone: the most common mineral constituents are sphalerite, galena, barite, chalcopyrite, pyrite and tetrahedrite with minor bornite, gold and silver. Calcite has been known to occur as an important gangue mineral instead of barite but is usually of limited occurrence.

↓

cupiferous pyritic ore zone: ore poor in barite and quartz with variable amounts of sphalerite, galena and tetrahedrite.

↓

copper-bearing siliceous ore zone: disseminated or stockwork

↓

anhydrite-gypsum-pyrite ore zone

↓

footwall: silicified rhyolite and pyroclastics with disseminated and veined sulphides.

The copper-bearing siliceous ore zone appears to be a useful prospecting guide in the Nicola Group volcanic rocks as it has been found in close association with probable felsic volcanic centers. It generally takes the form of highly-silicified rocks replacing rhyolite and pyroclastic rock. The original breccia structure is often detectable, with openings between silicified rock fragments filled with quartz. The whole mass is also cut by vein quartz. Pyrite is found disseminated in the rock fragments or is associated with chalcopyrite in quartz veins. The silicified zone may gradually change to a vein-type deposit. Quartz veins may be mineralized with sphalerite-galena or chalcopyrite-pyrite assemblages. Variable amounts of sericite and chlorite are present.

Gypsum deposits are commonly associated with mineralization. Gypsum ores usually correspond spatially to the highly-siliceous sulphide-bearing zone. The host rocks are strongly silicified pyroclastic rocks, which are characterized by sericite-chlorite alteration. The gypsum ore may be weakly mineralized with pyrite.

On the larger scale, submarine down-slope transportation of ore may occur, giving rise to redeposited, brecciated ore and this phenomenon should be considered when prospecting.

Lastly, magnetite can be formed by thermal metamorphism of the ores while hematite occurs in weakly metamorphosed ore instead of magnetite.

Geology of the project area

Fault zones separate a portion of the Nicola Group volcanic rocks and associated sediments into three belts; the Western Belt, Central Belt and Eastern Belt (Preto, 1975) (figure 1).

Andesite to dacite flows predominate in the Western Belt. Plagioclase-rich andesite to dacite breccias and tuffs are common and are usually found in close association with massive to cherty limestone and calcareous volcanic conglomerate, sandstone and siltstone. South of Nicola Lake, Shau (1968) has shown that the volcanic assemblage of the Western Belt was deposited in a submarine to subaerial environment. Although most of the basin was submarine, subaerial volcanoes appeared intermittently along with carbonate fringing reefs which formed during quiescent periods. The lateral variation in grain size in a widespread dacite tuff horizon of the submarine volcanic assemblage suggests that the source of dacite tuff lay to the east of Nestor Creek and south of Nicola Lake. Shau (1968) has mapped a coarse agglomerate unit containing bombs of volcanic breccia and blocks of mixed submarine and subaerial volcanic rocks. The agglomerate unit probably represents debris associated with steam explosions. The unit occurs west of Nestor Creek and also near the summit of Iron Mountain. Laterally removed from these probable volcanic centers, the same assemblage is composed of much finer tuffaceous sediments and volcanic wackes. Shau believes that the volcanic centers were in part subject to subaerial oxidation. Reefoid limestone lenses which represent carbonate fringing reefs occur west of Nestor Creek and near the summit of Iron Mountain. Reefoid limestone lenses also occur near Swakum Mountain and in the Promontory Hills area, two areas where the observed volcanic assemblages would suggest volcanic centers.

The Central Belt of Nicola Group volcanic rocks has been displaced relative to the Western Belt by the Allison Fault. The assemblage of volcanic rocks is similar to that of the Western Belt. The Central Belt is typified by an extensive sequence of massive pyroxene-rich andesite to basalt flows, coarse volcanic breccia and fine-grained pyroclastic tuffs (Preto, 1973). As in the Western Belt, siltstone, sandstone, argillite, calcareous sedimentary rocks and reefoid lenses are commonly associated with and appear to fringe areas of volcanic breccia. Near Aspen Grove a sequence of augite-porphyry andesite flows, coarse volcanic breccia and dioritized volcanic rocks and associated reefoid limestone lenses may indicate a volcanic center (Christopher, 1973).

Only volcanic centers in the Western Belt are examined in detail, largely due to their higher concentration in the Western Belt and due to the greater felsic character of the volcanic tuffs and breccias associated with these centers as compared to the Central Belt. Rhyolite and dacite tuffs and breccias are commonly associated with volcanic centers of the Western Belt and represent periods of explosive activity (McMillan, 1978).

The volcanic rocks and associated sediments of the Western Belt show northeasterly-trending structures. The volcanic centers are also aligned along two northeasterly trends (figure 1). The exploration implications of this alignment will be discussed in more detail in the concluding section.

Western Belt volcanic rocks have been metamorphosed, strongly-fractured and weakly-folded, inhibiting the use of alteration facies as a prospecting guide. Alteration to chlorite and calcite is widespread.

Mineral deposits

The Western Belt of Nicola Group volcanic rocks is divided into four geographic areas to facilitate more concise descriptions of mineral deposits in the project area. Assessment reports examined are listed in Appendix 1.

Area 1

Area 1 is bounded by Nicola Lake and Nicola River to the north, a major fault to the east, the Coldwater River to the west and the limit of mineralized occurrences to the south (figures 1 and 2). Extensive geological mapping of the area by Shau (1968) and McMillan (1978) indicates the existence of two volcanic centers.

One volcanic center lies to the west of Nestor Creek and to the south of Nicola Lake. A detailed geological map of the area accompanies Assessment Report (A.R.) 1798 (Mouse Group I & II Mineral Claims, 1969). The volcanic rocks in this area are predominantly andesite and dacite porphyries and breccias, which show calcite, sericite and chlorite alteration. The andesite breccias contain disseminated pyrite, specularite, hematite and some magnetite and have abundant mariposite. A dioritized andesite plug on the property shows alteration to chlorite, calcite, epidote and secondary albite, and contains disseminated pyrite and specularite.

The most intense mineralization in the area is generally found in proximity to fracture/vein systems with disseminations decreasing in intensity away from these mineralized fracture systems. An extensive area of silicification and quartz veining occurs at the crest of a topographic high northeast of Sugarloaf Mountain and south of Nicola Lake (figure 1). A silicified andesite breccia which occurs here has selenite (gypsum) and/or chalcedony as the matrix of the breccia and is sheared and veined by quartz-selenite veins, quartz veins, chalcedony veins, epidote veins and epidote-quartz veins. Malachite, chalcopyrite, bornite, covellite, pyrite and galena occur in the veins and tetrahedrite and chrysocolla are disseminated in the host.

South of the area of most intense veining is a silicified, aphanitic dacite with disseminated pyrite. Again veining occurs, the veins having sideritic walls with quartz infillings and mineralized with bornite and chalcocite. In the same general area siderite fragments with disseminated sulphides of copper are found in an andesite matrix which is itself brecciated and held together with a cement of quartz.

Farther south yet is an extremely-silicified andesite that has a sugary texture and almost looks like a metaquartzite (rhyolite?). A horizon of chert occurs in the area.

All of the geochemical anomalies related to the intense silicification and quartz, quartz-calcite veining are oriented along a northeasterly trend.

A siliceous limestone occurs to the west of the areas of silicification and veining.

The writer of A.R. 1798 suggest that the widespread occurrence of finely-disseminated chalcocite present in calcite in amygdules in andesite breccia could be due to leakage from more massive deposits of sulphides.

West of the volcanic center is a massive limonite deposit (figure 1).

South of the volcanic center, on the southwest slopes of Sugarloaf Mountain, showings of chalcopyrite and magnetite are found (A.R. 336, 1960; A.R. 396, 1961, Soo Mineral Claims) in predominantly andesitic volcanics. A massive north-trending magnetite lens is found. Trenching has apparently uncovered some rhyolite tuffs, which could be associated with the volcanic sequence observed to the north.

Trenching on the south slope of Sugarloaf Mountain has uncovered ore grade copper and iron mineralization just to the east of the magnetite lens. Bornite, malachite and pyrite is found associated with altered volcanoclastics (A.R. 356, Ralph Mineral Claims, 1961). Again stripping has exposed rhyolite near a zone of magnetite and malachite with abundant epidote in an andesite porphyry. Farther south, bornite, chalcopyrite, malachite and chalcocite along with calcite and abundant epidote are found in fractured limy volcanoclastics. Nearby, an outcrop of "iron capping", chiefly pyrite with minor chalcopyrite, malachite and calcite and abundant epidote is found in siliceous volcanoclastics.

A southerly extension of what is observed on the Soo Mineral Claims on the southwest flank of Sugarloaf Mountain is described in A.R. 401 (AL Group Mineral Claims, 1961). Excavations uncovered pyrite, malachite, bornite, and chalcopyrite with epidote and calcite developed in an altered limestone unit.

North of Iron Mountain, the Go and Far Mineral Claims, currently shown on claim map 92I/2E (A.R. 6919, 1978) incorporate the western part of the AL Group Mineral Claims described above. Northeast-trending andesite pyroclastics with minor rhyolite pyroclastics and andesite flows underlie the property. The associated sediments consist of limestone, chert and a minor magnetite-hematite iron formation. The small mineralized lens of massive magnetite and minor hematite and chalcopyrite is hosted by a limestone-calc-silicate sequence just to the south of the property. The writer of A.R. 6919 believes this lens to represent a cupiferous stratiform iron formation which developed in conjunction with fumarolic activity that was active during the waning stages of the rhyolitic volcanic activity. The calc-silicate unit is thought to have originally been a calcareous mud composed of andesite and rhyolite tuff.

The andesite pyroclastics contain disseminated magnetite and hematite and show chlorite alteration. Rhyolite pyroclastics include minor dacite pyroclastics and contain disseminated pyrite and minor disseminated magnetite. Diorite dikes and plugs cut the volcanic sequence and contain disseminated magnetite.

The second probable volcanic center of area 1 occurs on Iron Mountain, south of the Go and Far Mineral Claims. The Iron Mountain property of Chevron Standard Ltd. covers the summit and slopes of Iron Mountain. In the vicinity of the volcanic center, copper-lead-zinc-iron-sulphide, iron oxide and barium and calcium sulphate mineralization exist, with minor silver mineralization. A bedded barite, galena and sphalerite showing has been found.

Iron Mountain is on the easterly-dipping, west limb of a north-striking syncline. The area has the largest known accumulation of rhyolites and dacites within the project area. The lowest and most westerly unit is composed of pyroclastic andesite tuffs and breccias. This unit is overlain by rhyolite and dacite tuffs and breccias which thicken from south to north and disappear after tapering off under cover to the north (A.R. 6248, One-sixty-one #1 and #2 Mineral Claims, 1977). The unit is sericitized and pyritized. A finer-grained volcanoclastic unit overlies the rhyolite and dacite tuffs and breccias and thins to the north. The uppermost and most easterly unit is composed of reefoid limestone, shale and volcanoclastics. A map of the area is included in Assessment Report 6248. Specularite and minor chalcopyrite are found in the lower volcanoclastic unit and barite, galena and sphalerite are found in the felsic volcanic rocks. A ferruginous chert horizon occurs on the property, as well as gypsum. A detailed geologic map of the Iron Mountain area and accompanying discussion may be found in a recent report by McMillan (1978), and a detailed map of the Iron Mountain property prepared for Chevron Standard Ltd. is available (Howell, 1981).

Geological exploration in the Iron Mountain area should include investigation of down-dip areas given the possibility of submarine down-slope transportation of ore.

East of Iron Mountain the rocks consist predominantly of andesite flow breccia and limestone with some interbeds of argillite and volcanoclastics. A pyrite, chalcopyrite and sphalerite showing in limestone occurs along a northeast-striking shear zone (A.R. 6041, 1976).

Southeast of Iron Mountain, andesitic tuffs and minor breccia are common and show chlorite-epidote alteration. Limestone lenses occur erratically in this area. A small chalcopyrite with minor bornite showing occurs in the area and has the associated minerals magnetite, specularite, pyrite and minor sphalerite (A.R. 4107, 1973).

South of Iron Mountain on the northeast slope of Selish Mountain, andesite pyroclastics and porphyries dominate and are interbedded with limestone and argillite. Minor amounts of limy pillow lavas also occur. The andesitic volcanics contain minor disseminated pyrite and chalcopyrite,and silica and jasper alteration occurs with minor chalcopyrite and galena. A diorite stock outcrops on Selish Mountain and shows chlorite and epidote alteration. A fairly-thick mantle of overburden covers much of the Selish Mountain area making prospecting more difficult.

On the southeast slope of Iron Mountain, east of the main west branch of Howarth Creek the most common rock type is a massive andesite porphyry which contains abundant epidote and magnetite and rare pyrite. Andesite tuff, argillaceous tuff, andesite flow breccia and dacite tuff and breccia also occur in the area.

West of the main west branch of Howarth Creek, a chert horizon occurs near an altered limestone that contains calcite, epidote and narrow seams of massive magnetite with some specular hematite and some disseminated pyrite. This mineralized zone occurs near a highly-fractured dacite tuff,and aplite dikes and chert bands occur nearby (A.R. 4677, Where Group of Mineral Claims, 1973). Chloritic alteration of andesite is pervasive in the area.

East of Selish Mountain chalcocite has been found in amygdules in andesite (A.R. 4172, 1972 and A.R. 7457, 1979). Near Harmon Lake minor disseminated pyrite occurs in andesitic volcanics (A.R. 4086, 1972) with minor hematite, epidote and calcite alteration. Some pyrite also occurs in an altered impure limestone lens.

Despite the favourable volcanic terrain near the main west branch of Howarth Creek, geochemical and geophysical surveys of the Selish Mountain area have found negligible evidence of massive sulphide mineralization. The thick overburden in the area could be partly responsible.

Area 2

Area 2 lies immediately west of area 1 and to the west of the Coldwater River. It incorporates the area of Nicola Group volcanic rocks mapped to the south of the Nicola River and also the area of Nicola Group volcanic rocks north of the Nicola River and bounded to the west by Guichon Creek, to the north by Hector Creek and to the east by the Kingsvale Group volcanic assemblage (figures 1 and 2).

South of the Nicola River, no geochemical or geophysical anomalies have been found in the volcanic rocks of the area. Small pockets of disseminated specularite, chalcopyrite, copper carbonate and calcite occur with quartz in minor fracture zones in the area.

North of the Nicola River, a cover of overburden obscures some of the volcanic rocks. Andesite tuffs and breccias occur in the area. Rhyolite and aplite dikes occur near zones of explosion breccia (A.R. 1799, 1968). Calcareous volcanoclastics in the area are mineralized with pyrite, hematite, chalcopyrite and sphalerite. The andesite tuff is locally heavily-fractured and pyritized and contains calcite veins and some quartz veins. More extensive quartz veining has been found in drill holes (A.R. 7218, Cinderella Mineral Claims, 1979), along with calcite-epidote veining with albitization which carries some pyrite, chalcopyrite and hematite.

Just to the east of the Cinderella Group Mineral Claims, andesitic rocks ranging from fine-grained to porphyritic and agglomerate are heavily-fractured and in some cases weakly-brecciated. Rhyolite and aplite dikes occur. The weakly-brecciated andesites contain disseminated copper and iron sulphides (A.R. 2466, 1970).

North of the Cinderella Group Mineral Claims, disseminated hematite and specularite are found in the andesite, which is weakly-brecciated and cut with quartz stringers. Lenses of limestone and associated hematite and magnetite occur.

Significantly, a gypsum ore deposit exists north of Merritt in area 2 (Cockfield, 1948). The gypsum occurs in irregular patches but Cockfield believes that the deposit was once quite extensive prior to erosion.

Area 3

Area 3 occurs to the west of area 2, and is bounded to the east by Guichon Creek, to the north by the Guichon batholith, to the south by the Kingsvale Group volcanic assemblage and to the west by the western edge of the project area, 121°00' W (figures 1 and 2).

Area 3 or the Promontory Hills area is underlain by sequences of andesites, dacites and volcanoclastics with interbedded limestone lenses. The overall sequence is intruded by the multistage Guichon batholith and several small complex intrusions. One of the limestone lenses which occurs within the contact aureole of the Guichon batholith is the host rock for the Craigmont mineral deposit. The Craigmont orebody lies within a limestone/limy horizon between a southern dacite tuff and a northern volcanoclastic unit. The orebody contains specularite, magnetite, and chalcopyrite with minor bornite, and the limestone shows alteration to chlorite, calcite and epidote.

Nearly 20% of the Promontory Hills area is covered by a veneer of Kingsvale Group agglomerate and flow rocks up to 200 meters thick. These volcanic rocks cover the eastern portion of the area and masked portions of the Craigmont orebody.

South of the Nicola River a mantle of overburden obscures the underlying geology and no significant mineralization has been found.

North of the Nicola River on the southwest slopes of the Promontory Hills, an andesite porphyry and agglomerate occur which show silicification and pyritization. Faulting is pervasive and rhyolite containing disseminated pyrite occurs (A.R. 441, Wade Group Mineral Claims, 1961). Calcite veins carrying siderite and chalcopyrite also occur. The andesites are interbedded with limy tuff, silicified tuff, volcanoclastics, limy argillite and lapilli tuff. Anomalous geochemical copper values have been found in an area of limy tuff, limestone, feldspathic tuff and agglomerate (A.R. 330, Hank, Domino, Freda, P.C.M. and Cap Mineral Slaims, 1960). A chert horizon is found in the same area. Disseminated chalcopyrite and specularite is found in limy tuff of the former Hank and Domino Mineral Claims (A.R. 450, 1962) and chloritic alteration is common.

To the east, on the southern slopes of the Promontory Hills, in the vicinity of Baldie Creek, specularite, chalcopyrite, bornite, malachite and minor pyrite mineralization occurs (A.R. 5771, Chalco Group A & B Mineral Claims, 1975). The andesites in the area are altered to epidote, chlorite and contain disseminated specularite and hematite. Coincident copper and mercury geochemical anomalies have been found in the overburden in two depressions in the area and are coincident with projected faults.

Farther east, near the contact with the overlying Kingsvale Group volcanics, granodiorite and diorite intimately mixed with andesite tuffs and porphyries and sheared dacite, occur. The andesitic volcanics contain disseminated chalcopyrite, hematite and magnetite (A.R. 237, P.S.M. and Cap Mineral Claims, 1958). Locally andesites are veined with calcite. The intrusive rocks are often silicified and contain disseminated chalcopyrite, hematite and magnetite and calcite veins. Specularite, chalcopyrite and pyrite are disseminated in a fragmental andesite (A.R. 2128, 1969).

North of the southeast slopes of the Promontory Hills, highly fractured, sheared and chloritized andesite breccia outcrops. Siliceous and aplite dikes cut the andesite breccia and limestone lenses are found. The dikes are mineralized with disseminated pyrite (A.R. 531, H.A.R. Mineral Claims, 1963). Andesite agglomerate with a siliceous matrix and andesite amygdaloidal flow rocks are found. The amygdules contain calcite and epidote. Diorite with disseminated pyrite also occurs.

In the northernmost part of area 3, a diorite breccia containing volcanic fragments occurs. Disseminated pyrite and pyrrhotite are found in the volcanic fragments in the breccia. Pyrite, pyrrhotite and chalcopyrite occur in shear zones in the unit.

Drilling on the western slopes of the Promontory Hills has intersected a rhyolite unit overlain by a crystal-poor dacite pyroclastic unit, volcanoclastics and a limestone lens (A.R. 6934, Beth Mineral Claims, 1978). The same rhyolite unit outcrops to the south on the southwest slopes of the Promontory Hills. The evidence suggests that one or more volcanic centers occur along the west to southwest slopes of Promontory Hills. The rhyolite unit may be more extensive laterally at depth. Where observed in outcrop or in drill core, the rhyolite is highly sericitized, fractured and quartz-veined, contains disseminated pyrite and shows epidote and chlorite alteration. Two proposed volcanic centers have been indicated on the map (figure 1) based on the available evidence.

It should be noted that the geological, geochemical and geophysical surveys in the Promontory Hills area have failed to indicate any mineral occurrence of economic significance, at least to shallow depth, other than the Craigmont deposit.

Area 4

Area 4 is centered around Swakum Mountain and lies to the north of areas 1 and 3. Area 4 is bounded to the south by Nicola Lake and Nicola River, to the west by Guichon Creek, to the east by the Nicola batholith and to the north by Mt. Guichon (figures 1 and 2).

The most southerly part of area 4 is covered with a mantle of overburden.

Near Hersel Lake, minor zones of coincident copper, lead and zinc geochemical anomalies have been discovered. The sulphide mineralization observed here includes chalcopyrite, pyrrhotite and pyrite.

North of Hersel Lake on Swakum Mountain pyritized, porphyritic andesites occur (A.R. 4223, WAK 11 & 12 Mineral Claims, 1973). Shear zones contain quartz, chalcopyrite and pyrite, and a quartz-chalcopyrite-galena vein occurs. Many geochemical anomalies have been found, particularly in the vicinity of old workings.

Lead and zinc anomalies dominate on the southern part of the mountain, copper, lead and zinc anomalies occur farther north, while copper and tungsten anomalies occur most northerly. Cockfield (1948) has shown the principal ore minerals to be sphalerite, galena and tetrahedrite in the south, with showings of chalcopyrite, galena and sphalerite, and pyrite, chalcopyrite, galena, silver and minor gold farther north. On Swakum Mountain the mineralization occurs in veins, as disseminations and in replacement deposits in limestone, andesitic porphyries and agglomerate and siliceous tuff. The most northerly deposit in the immediate vicinity of Swakum Mountain occurs on the north slope and consists of pyrite, chalcopyrite, pyrrhotite and scheelite in altered calcareous volcanoclastics showing calcite and epidote alteration. Disseminated hematite is common along fracture zones in the andesitic volcanic rocks.

North of Swakum Mountain, near Helmer Lake, copper, lead and zinc geochemical anomalies are found in altered, silicified and sheared andesite porphyries, agglomerates, breccias and tuffs and rhyolite, which show epidote alteration and contain lenses of limestone (A.R. 2175, Smokie, ACA and CON Mineral Claims, 1970). Quartz-calcite veining is common and the minerals present include pyrite, limonite, chalcopyrite, malachite, galena and traces of scheelite and silver.

Northwest of Swakum Mountain a pyritized sequence of andesite porphyry and agglomerate, argillite and limestone occurs. The associated mineralization includes sphalerite, galena and chalcopyrite (A.R. 7031, Sophia Mineral Claims, 1978). Two km to the west of the Sophia Mineral Claims is the Tolman Lake property. Geological, geochemical and geophysical surveys have uncovered mineralization occurring as sphalerite, chalcopyrite, pyrite and minor silver in a zone of brecciated and bleached andesite with quartz and calcite forming the matrix. Quartz veining of the andesite breccia is common. The geochemical anomalies have a northeasterly trend and appear to be related to shear zones.

Minor tungsten anomalies also occur.

North of the Sophia Mineral Claims, rhyolitic volcanic rocks have been described in addition to andesitic tuffs.

The volcanic assemblages and associated mineralization observed in the vicinity of Helmer Lake and Tolman Lake would suggest that volcanic centers exist in the area, likely along the northeasterly trend indicated on figure 1, which also includes Swakum Mountain. Geophysical surveys show that Swakum Mountain may be underlain by a dioritic plug that is contemporaneous with the volcanic assemblages overlying it. Further geological prospecting is necessary in order to determine the exact localities of volcanic centers in the area.

Exploration proposal

Two major trends of felsic volcanic centers have been identified (figure 1). Regional geological prospecting along these trends is recommended but emphasis should be placed on prospecting in areas where known mineralization occurs in volcanic assemblages suitable for hosting a strata-bound massive sulphide deposit. These areas would include, in rough order of priority;

1. the Iron Mountain area,
2. the felsic volcanic center which occurs to the northeast of Iron Mountain and lies to the west of Nestor Creek and to the south of Nicola Lake,
3. the proposed volcanic center(s?) which occur on the west and southwest slopes of the Promontory Hills area, and
4. the area north and northwest of Swakum Mountain.

The volcanic assemblage and associated mineralization which occur in area 2, just south of Jesse Creek would also warrant investigation, particularly in the vicinity of the Cinderella Mineral Claims. Although assessment reports indicate that geological, geochemical and geophysical surveys in this area have shown the mineralization to be of limited extent, it should be considered that the extensive overburden in the area can act as a barrier to the production of strong geochemical anomalies. The limy horizions in this and other areas of the project area may be restricting copper ion mobility as regards to secondary dispersion.

When prospecting in area 3 on the west and southwest slopes of the Promontory Hills it is also suggested that the area just to the north of the copper and mercury geochemical anomalies which occur in depressions near Baldie Creek, be examined. The geochemical anomalies could reflect down-slope migration of copper and mercury ions from a mineralized area to the north.

Lastly, when prospecting in the Nicola Group volcanic rocks it must also be remembered that the high threshold values of copper concentrations in the Nicola Group rocks can mask otherwise anomalous zones.

References

Assessment Reports from Tulameen 92H/NE and Merritt 92I/SE, Ministry of Mines and Pet. Res. (see Appendix 1)

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Topographic Maps for Aspen Grove 92H/15, Merritt 92I/2 and Mamit Lake 92I/7. Department of Mines, Energy and Resources.

Appendix 1. Assessment reports examined

Assessment reports examined are listed below by area. Xeroxed excerpts from the starred* reports may be found in the appropriate files which accompany this report.

Area 1

(reports in brackets were not examined)

279	269
336*	840*
356*	3284, 4086*
396*	3558
401*	4088, 4338
582* (519)	4172*
802*	4228
1045*	4428
1052	4677*
1053	7457*
1789* (890)	
3018*	
4107* (1108)	
4161*	
6041*	
6248*	
6919* (6356, 2112)	
7568	

Appendix 1 continued.

Area 2	Area 3	Area 4
(reports in brackets were not examined)		
229	227	136*
248	235	1074
398	237*	1911
401 (357)	274	2105
415 (420)	275	2635
461	330*	2715*
736	399	2811
1598*	405	3634
1799*	450*, 330, 240	3143
2101	452, 441*	4163
2466*	531*	4223*
3285*, 2466	735*	4404, 3936, 1795
3896	1684	4503
4640	1767	4765
6132	2128*	4936*
7218*	3889	5658, 5320, 4846
	4767, 4106	6040, 5678*
	5771*, 3889	6264
	6795*, 6707, 397	7016, 6119
	6934*, 6486, 5660, 516*, 359, 280	7488, 7031*, 6441

Appendix 2. Claim status

The current claim status in most of the target areas is such that most of the areas have portions of open ground. Iron Mountain is currently covered by a claim group which was optioned by Chevron Standard Ltd. in 1978. The area west of Nestor Creek and south of Nicola Lake is not currently covered by claims except for one small claim block centered on the dioritized andesite to the east of the area of silicification, veining and mineralization. The south and southwest slopes of the Promontory Hills area are not currently covered by claims but the western slopes are staked as is part of the area where the anomalous geochemical values described previously, occur. Northwest of Swakum Mountain, claims cover the most interesting area but north of Swakum Nountain near Helmer Lake only part of the area is covered by claims. North of the Nicola River in area 2, claims currently exist which cover the most promising area.

Currently-revised claim maps for the project area may be found in the appropriate file which accompanies this report and include M92H/15E&W, M92I/2E&W and M92I/7E&W.