81-#979-# 9755

GEOLOGY AND MOLYBDENITE OCCURRENCE
MT. SEATON CLAIM GROUP
SNOW, AVALANCHE, KAREN AND NOBLE-C CLAIMS
OMINECA MINING DIVISION
MAP 93 M/3
55°9.5'N 127°15.5'W
NTS 6114000N 611000E

Owner: North Staun Minerals Corp.

Consultant: Arctex Engineering Services

J. L. Nelson, Geologist

Locke B. Goldsmith, P.Eng.
Consulting Geologist

October 16, 1981

9755

TABLE OF CONTENTS

ABSTRACT..... 1

INTRODUCTION..... 2

LOCATION, ACCESS, PHYSIOGRAPHY AND ENVIRONMENT..... 2

LIST OF CLAIMS..... 2

PREVIOUS WORK..... 2

GEOLOGY..... 4

- Regional setting..... 4
- Geologic units and structures, Mt. Seaton..... 4
  - 1) Bowser Lake Group..... 4
  - 2) The Blunt Mt. Stock and its contact aureole..... 6
  - 3) Smaller intrusions..... 8
  - 4) Structure..... 8
- Alteration..... 9
- Mineralization.....12

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS.....14

COST ESTIMATE.....15

GEOLOGIST'S CERTIFICATE.....16

ENGINEER'S CERTIFICATE.....17

LIST OF REFERENCES.....18

COST STATEMENT.....19

APPENDIX 1 - GEOCHEMICAL ANALYSES

APPENDIX 2 - PETROGRAPHIC DESCRIPTIONS

APPENDIX 3 - STATION DESCRIPTIONS

LIST OF FIGURES

Figure 1. Index map..... 2

Figure 2. Geology of the Mt. Seaton Claim Group (in pocket)

Figure 3. The regional setting of the molybdenum mineralization at Mt. Seaton..... 5

Figure 4. A) Unaltered granodiorite, Blunt Mt. Stock..... 7
B) Strongly altered granodiorite from fracture zone..... 7

Figure 5. Potassic alteration textures..... 10

Figure 6. A) Finely brecciated vein quartz and sulfides in Fe-oxide-carbonate matrix.... 11
B) Carbonate veinlets, parallel to main quartz vein, cut secondary Kspar along the vein selvages..... 11

Figure 7. A) Uncommon porphyritic phase of Blunt Mt. Stock..... 13
B) Clumped molybdenite plates in quartz veinlet..... 13

ABSTRACT

The Mt. Seaton claim group, 40 km north of Smithers, B. C., partly overlies the southern part of the Cretaceous (?) Blunt Mt. Stock which intrudes and is in steep-sided contact with Bowser Lake Group sedimentary strata. The sediments are hornfelsed to a distance of 1.5 km from the granodiorite.

A pyrite halo is developed in the hornfelsed sediments, occupying most of the zone of contact metamorphism. Small sulfide veins with precious metal values, crackle breccias, and silicified breccias with tourmaline are present within the pyrite zone. The granodiorite contains narrow, fracture-controlled zones of potassic and sericite-carbonate-clay alteration with associated minor molybdenite and chalcopyrite. Vertical E-W fracture sets are especially important in controlling alteration and mineralization. They are parallel to a number of silicified breccias in the sediments, and to a major shear zone that marks the northern limit of granodiorite exposures in the Mt. Seaton massif.

INTRODUCTION

At the request of Winston Lodge, president of North Staun Minerals Corp., a geological mapping and prospecting programme was undertaken on the Mt. Seaton Claim Group in August-September 1981 by Arctex Engineering Services. The purpose of this study was to evaluate the porphyry molybdenum potential of the claims. A total of 15 km^2 was mapped at 1:12,500 scale. The most promising area, about 1 km^2, was prospected in detail. Eleven rock samples were submitted for geochemical analysis. A petrographic study of rock types and alteration was conducted on eleven prepared thin sections.

LOCATION, ACCESS, PHYSIOGRAPHY AND ENVIRONMENT

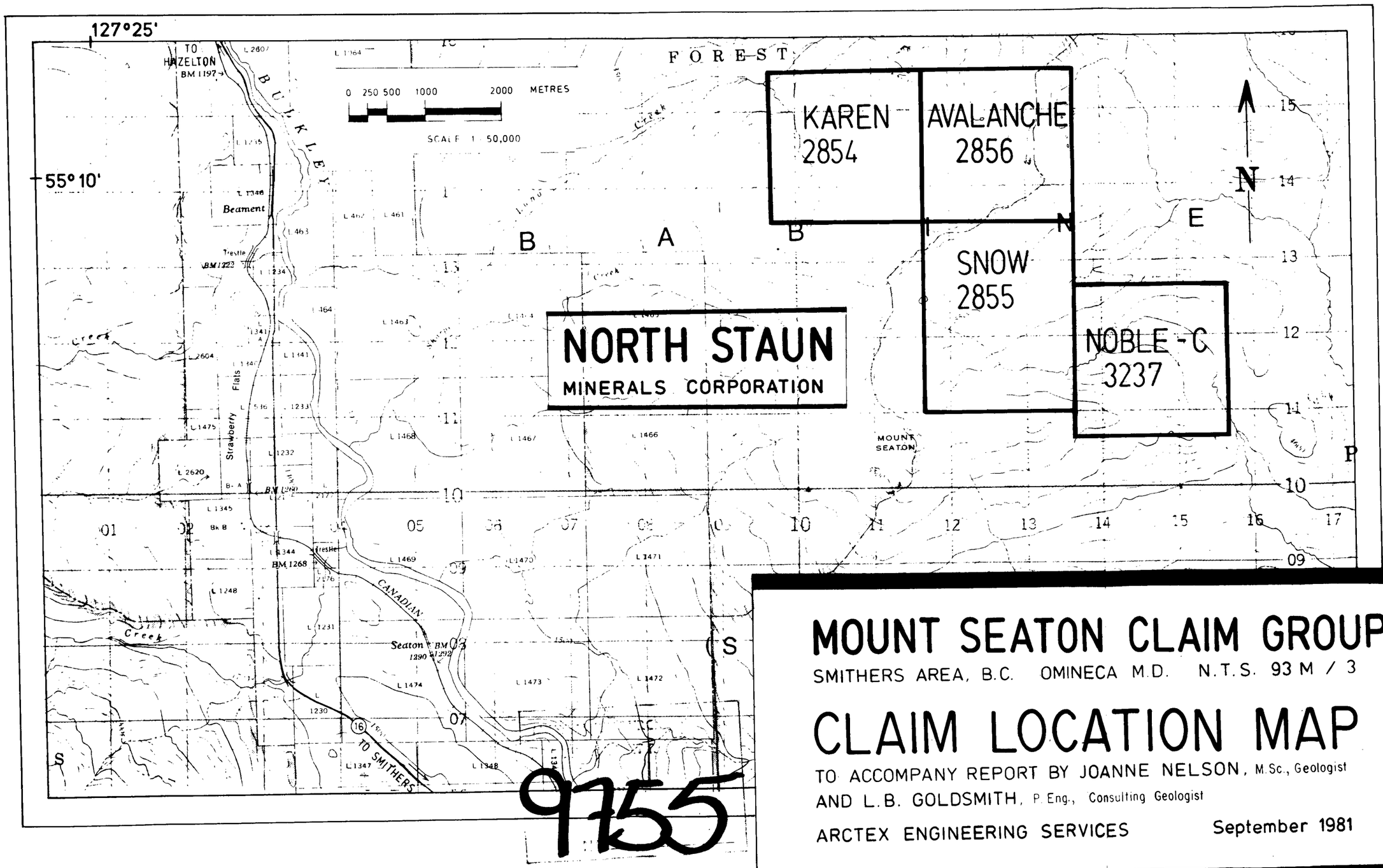
The claim group lies in the northern part of the Mt. Seaton massif, 40 km north of Smithers, B. C. (Figure 1). Access is via helicopter. A poorly maintained gravel road south of Mt. Seaton enters the southern part of the Noble-C claim. The northwest corner of the Karen claim is 7 km east of Highway 16. Most of the property is in the high cirques and ridges of the massif, with elevations ranging from 1300 to 2000 m. About three quarters of the area is in the alpine zone; the rest lies below tree line. Snow melts in May and June. In 1980, the first winter snowfall was in early September. Generally the winter season begins from mid-September to October.

LIST OF CLAIMS

		Record Date
Karen	2854	June 18, 1980
Snow	2855	" "
Avalanche	2856	" "
Noble-C	3237	September 22, 1980

PREVIOUS WORK

Parts of the northern Mt. Seaton claim block were staked previously by Noranda Mines in 1965-66 (Rob Claims). No reports on these claims are



MOUNT SEATON CLAIM GROUP

SMITHERS AREA, B.C. OMINECA M.D. N.T.S. 93 M / 3

CLAIM LOCATION MAP

TO ACCOMPANY REPORT BY JOANNE NELSON, M.Sc., Geologist
AND L.B. GOLDSMITH, P.Eng., Consulting Geologist

ARCTEX ENGINEERING SERVICES September 1981

9755

available. A claim post for the Gypsy-29 claim, dated 1972, is located on the ridge separating the eastern from the central north-facing cirque in the Avalanche claim. A magnetic survey was conducted on the Gypsy claims in 1973 (Jilson and Simpson 1973). The authors report a spherical magnetic low near the lake at the head of Luno Creek, west of the Mt. Seaton claims (Figure 1). Le bel (1976) conducted a combined IP and ground magnetic survey on the Wolf claims owned by Amax of Canada Ltd. These claims extended south to overlap the northern part of the Avalanche claim. Two mild IP anomalies, corresponding to 1/2% sulfides, were outlined in the study. One lies at the headwaters of Luno Creek; the other in the valley east of the Mt. Seaton massif, at the headwaters of Blunt Creek.

The present Mt. Seaton claim block was staked in 1980. James Logan of Arctex Engineering Services conducted a stream sediment geochemical reconnaissance of the claims for Mo and Cu. Two anomalous Mo values were found. They were accompanied by high Cu values. Both samples came from creeks draining the north side of the Mt. Seaton massif which is occupied by the Blunt Mt. Stock.

GEOLOGY

Regional setting

Mt. Seaton is underlain by sediments of the Jurassic-Cretaceous Bowser Lake Group (Richards 1977, 1978; Richards and Tipper 1975). They are intruded to the north by the Blunt Mt. Stock. Although the stock has not been radiometrically dated, it occurs within a cluster of Bulkley Intrusions, several of which give 60 to 74 ma K-Ar dates (unpublished regional compilation map, R. L. Armstrong, U.B.C.). A number of these intrusions, for instance Hudson Bay Mt., Rocher Deboule, Mt. Thomlinson, and Poplar Creek, contain significant Mo and/or Cu porphyry mineralization. They form part of a swarm of porphyry occurrences which spans the central Intermontane Belt south of the Bowser Basin and north of the area covered by Miocene basalts (Figure 3).

Geologic units and structures, Mt. Seaton

1) Bowser Lake Group

The Jurassic-Cretaceous strata in the Mt. Seaton area consist of interbedded greywacke, mudstone, siltstone, conglomerate, and minor andesite and

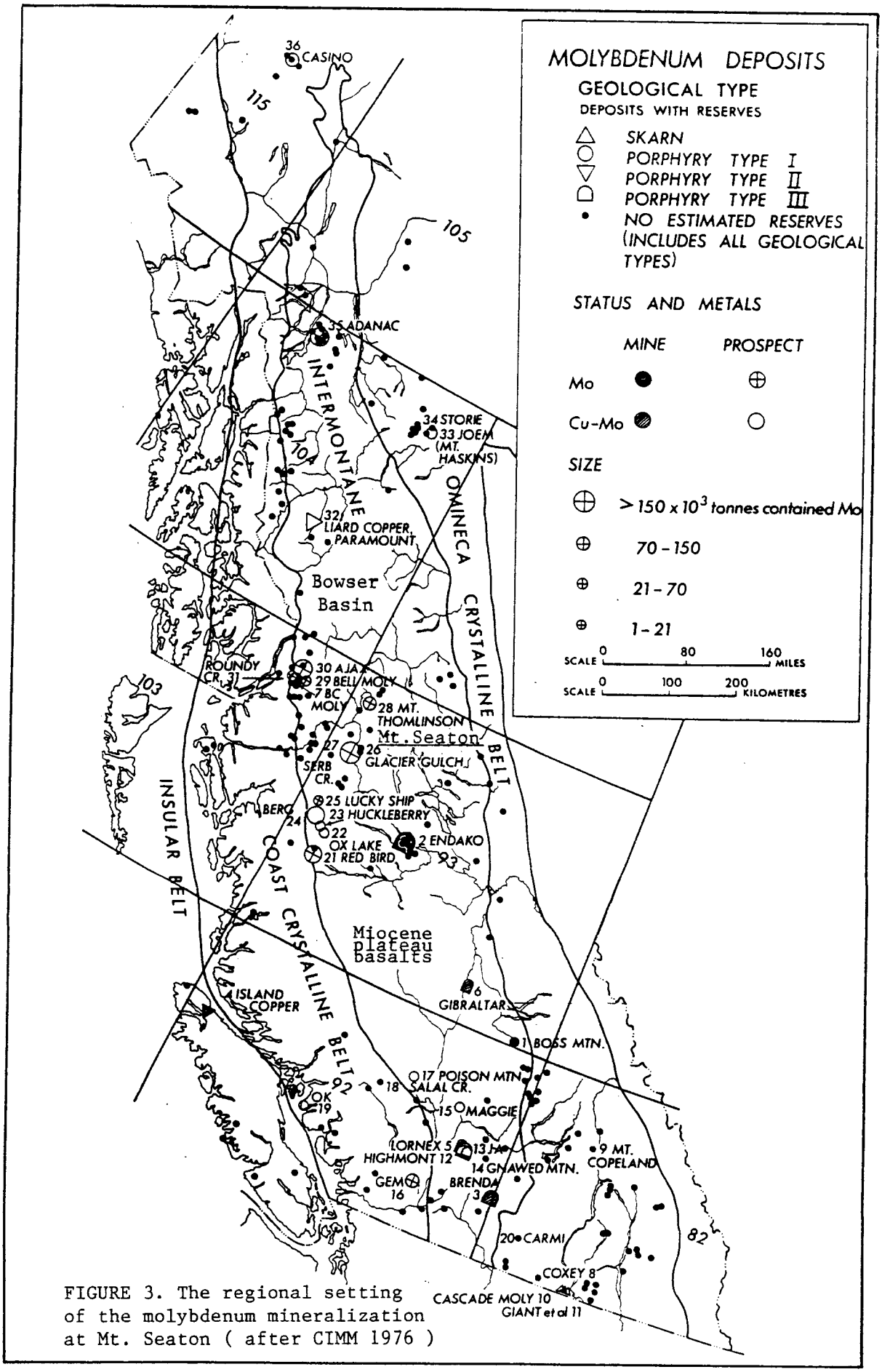


FIGURE 3. The regional setting of the molybdenum mineralization at Mt. Seaton (after CIMM 1976)

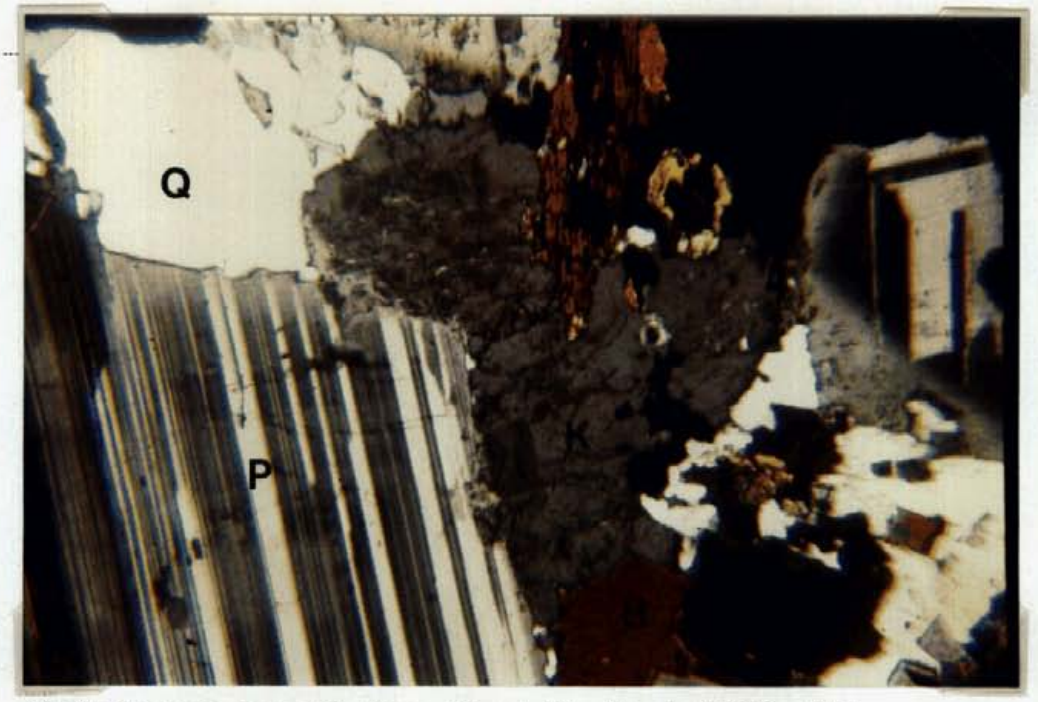
dacite flows and tuffs (Figure 2). Most of the greywackes are crossbedded on an average 1 to 10 cm scale. Fine black lines of carbonaceous material mark the cross laminae. Thin, wavy, very fine-grained green bands, which occur sporadically within the thick greywacke sequences, are interpreted as tuffs. The conglomerates contain well-rounded and highly spherical clasts. Pebbles are also scattered along bedding directions in some greywackes. Intermediate volcanic rocks predominate as clasts. Lesser chert and a few hypabyssal quartz diorite pebbles are also present.

Abundant plant debris - reeds, ferns and possibly palm stems - is seen along bedding planes in Bowser Lake Group siltstones and greywackes removed from the contact aureole. These fossils are not diagnostic of age (H. Tipper pers. comm.) but they do indicate a continental environment for the sediments. Further evidence is provided by a few raindrop casts that occur near the fossils (station N46).

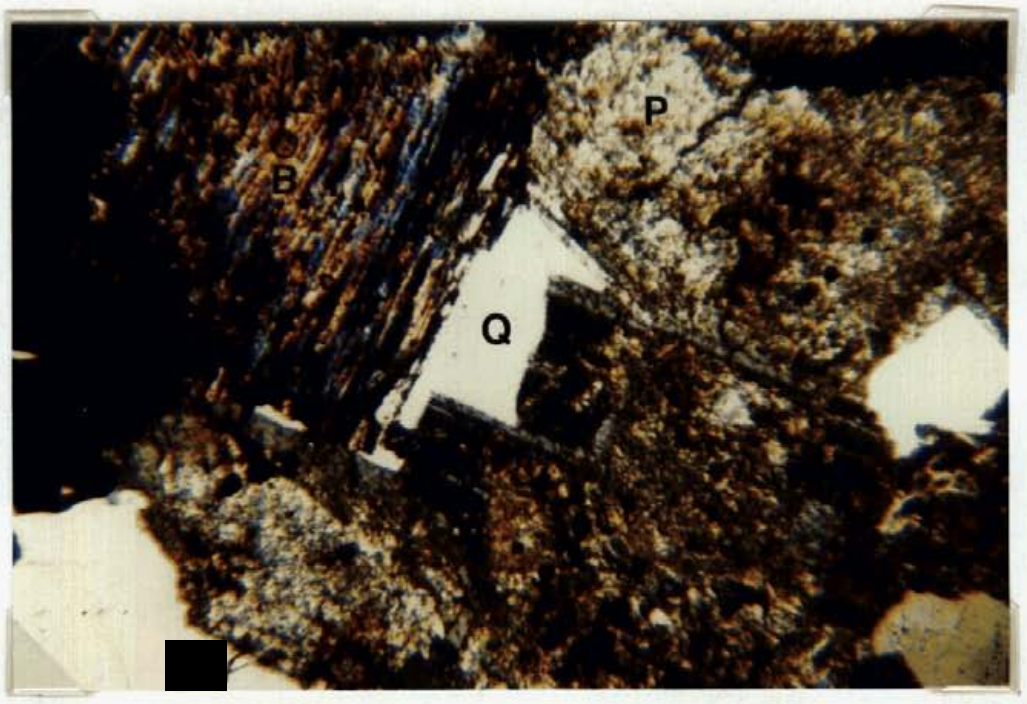
Volcanic rocks are rare in the sedimentary sequence. They are not mentioned in descriptions of the Bowser Lake Group in the regional literature (Richards 1977, 1978). An andesite overlain by a felsite flow occurs at the head of the norhteasterly cirque (station N14). White to pale green dacites appear in talus debris from the cirque walls on the Avalanche and Karen claims. A few dacites were observed in place. They are either flows or pre-plutonic dykes. They characteristically contain large red garnet porphyroblasts. In thin section one dacite (N34) consists of an even-grained mosaic matrix of small, equant plagioclases and scattered biotite trains with sparse, somewhat corroded relict plagioclase phenocrysts. These textures are consistent with its identification as a contact-metamorphosed porphyritic intermediate volcanic rock.

2) The Blunt Mt. Stock and its contact aureole

Two phases of the Blunt Mt. Stock - granodiorite and diorite - are exposed in the northern part of the claim block (Figure 2). Both are generally coarse-grained equigranular except for one small area in the granodiorite which is porphyritic, containing about 40% fine-grained quartz-Kspar matrix (N36). Where not altered, the granodiorite consists of euhedral to subhedral oscillatory-zoned plagioclase, slightly smaller euhedral biotite and hornblende, and anhedral to interstitial Kspar and quartz. A typical mode, taken from stations N27A and N25, is:



A) Unaltered granodiorite, Blunt Mt. Stock (N25). X17.
Q=quartz P=plagioclase B=biotite H=hornblende



B) Strongly altered granodiorite from fracture zone (N27B). X17.
Biotite(B) pseudomorphed by white mica; plagioclase(P) partly sericitized. Interstitial quartz(Q) unaffected.

FIGURE 4.

plagioclase	45%
quartz	25%
Kspar	15%
hornblende	5%
biotite	5%
chlorite, epidote, sphene	5%

The contacts of the Blunt Mt. Stock against the surrounding sediments are sharp. They have nearly vertical traces on steep cirque walls, and trend generally east-west across the claim group.

Rocks of the Bowser Lake Group have been transformed into dense, brittle hornfels to a distance of 1.5 km south of the Blunt Mt. Stock. Metamorphic biotite is especially abundant in the mudstones. Red garnet porphyroblasts stud the metadacites. Primary sedimentary features such as cross beds and pebbles show perfect preservation, but gross bedding features are somewhat obscured in the inner aureole.

3) Smaller intrusions

A number of small dacite outcrops occur in the north-central cirque on the Avalanche claim (Figure 2). They consist of fine-grained hypabyssal rock, pervasively and typically orange-stained from limonite. Plagioclase and biotite were the original phenocrysts. The biotite plates have been converted to white mica; plagioclases are soft and dull due to heavy sericite-clay alteration. The age of the porphyritic dacite with respect to the Blunt Mt. Stock could not be determined.

4) Structure

The Bowser Lake Group in the Mt. Seaton massif forms a homoclinal sequence dipping moderately to the northwest. Sedimentary tops face northwest. It is likely that this area is part of a single tilted fault block.

A prominent zone of strong shearing cuts the granodiorite at the north end of the northerly ridges of the Mt. Seaton massif. It involves close-spaced shears with bright red slickensides and strong chlorite-sericite alteration of the granodiorite. This fault zone trends easterly across the Blunt Mt. Stock (Figure 2).

Alteration

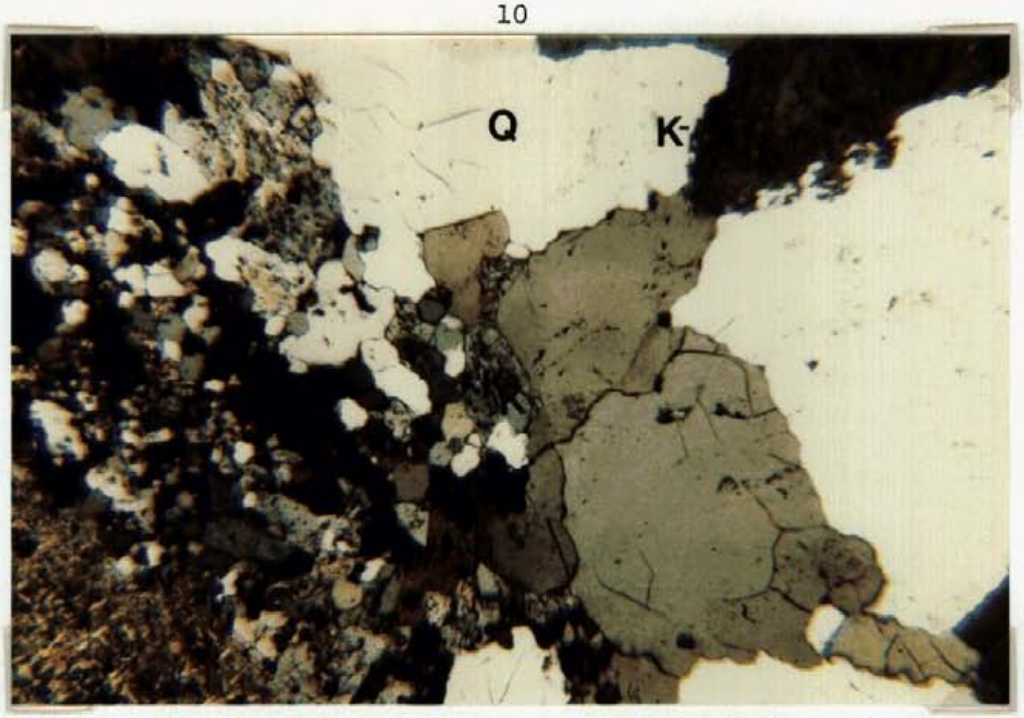
In general, alteration and mineralization on Mt. Seaton are rock-type specific. Strong pyrite development and sulfide and quartz veins, some with Ag and Au values, are confined to the Bowser Lake Group within the hornfels zone. Potassic alteration and later sericite-carbonate alteration and molybdenite occur within part of the granodiorite phase of the Blunt Mt. Stock. The diorite phase is unaltered and unmineralized. The porphyritic dacite plug(s) show very strong sericite alteration but no mineralization except pyrite clots.

The pyrite halo of the Blunt Mt. Stock is well developed. It appears as a zone of prominent red Fe-oxide staining in the sediments south of the stock on Blunt Mountain. This zone of strong iron staining continues west across the valley to Mt. Seaton. In it, pyrite occurs as disseminations and fine veinlets and in rare massive sulfide knots with minor chalcopyrite. Large areas of the pyrite halo, for instance the floor of the northeasterly cirque, have a very high fracture density (more than 25/metre). In places, these fractured rocks grade into crackle breccias.

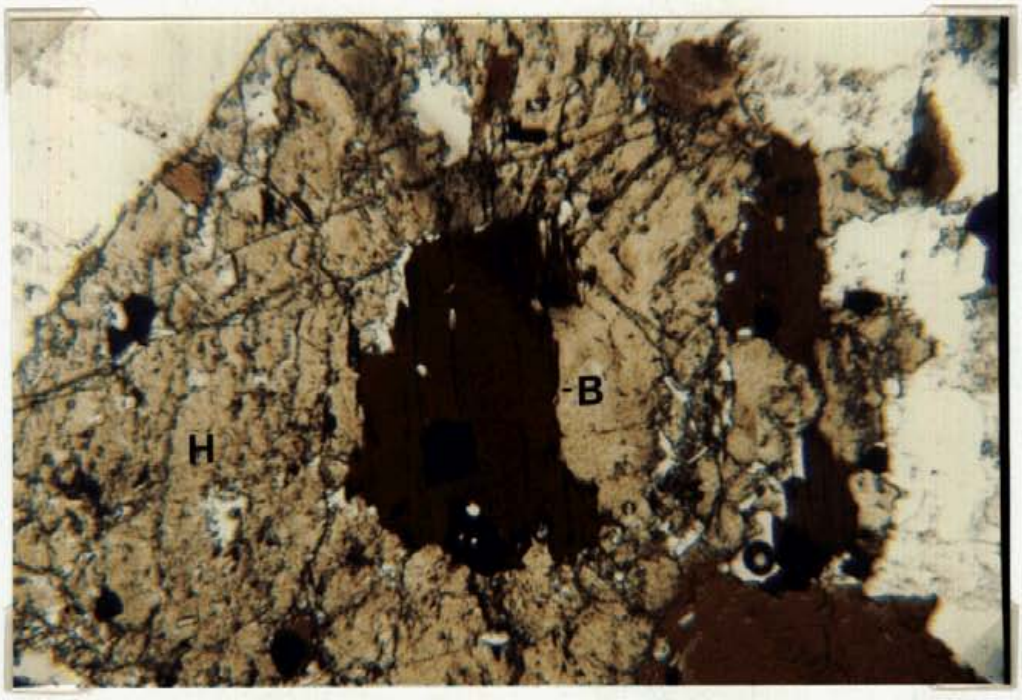
Several distinct, silicified breccia units are present in the northeasterly cirque (Figure 2). In them, angular, or less commonly rounded, clasts have been replaced by aggregates of very fine-grained quartz. The matrix is either quartz or, as in N7 or N23A, tourmaline. Tourmaline is seen throughout the pyrite halo as sprays and cursts on fracture surfaces as well.

Two overall morphologies were noted for the silicified breccias. Most are tabular bodies 1-2 m thick that were controlled by vertical E-W fractures. One breccia (N7) does not conform to this pattern. It forms a single oval-shaped outcrop, and may be pipe-like in morphology.

A number of small sulfide veins were noted either in float or outcrop in the pyrite halo. Phases in them include pyrite, pyrrhotite, chalcopyrite, stibnite, sphalerite, hematite, galena and quartz. Some contain minor amounts of gold and silver (Figure 2 and Appendix 1). One float sample contains more than 100 ppm (3 oz/ton) Ag. The veins are not of economic importance, but their occurrence is an integral part of the porphyry system on Mt. Seaton.

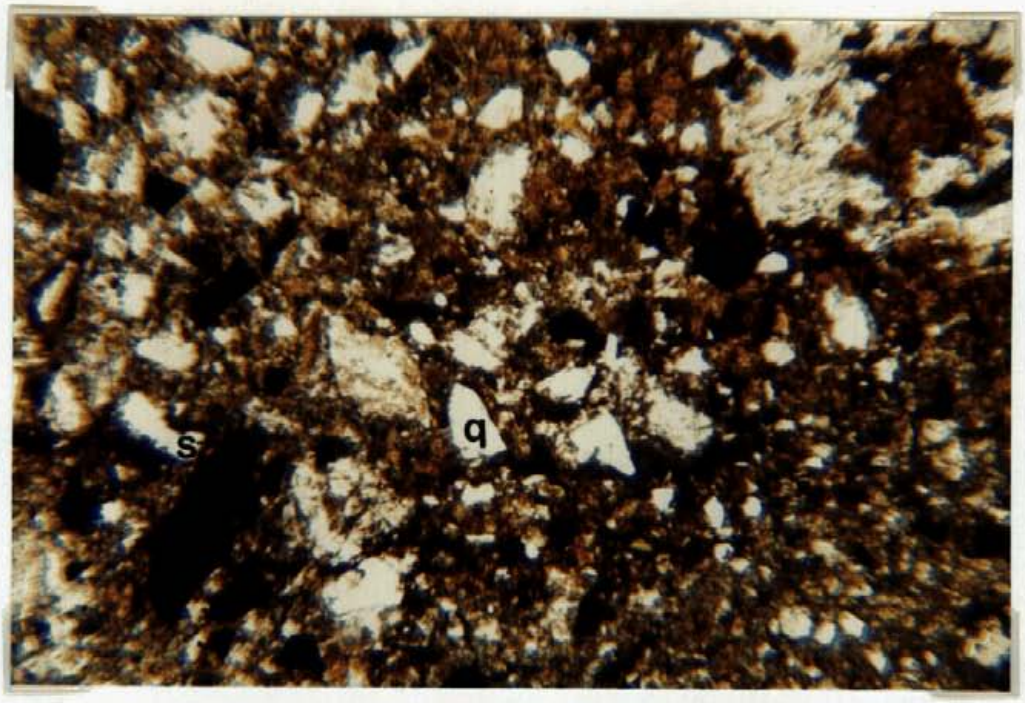


A) Secondary Kspar in and next to quartz vein (N36). X17
K=Kspar Q=quartz

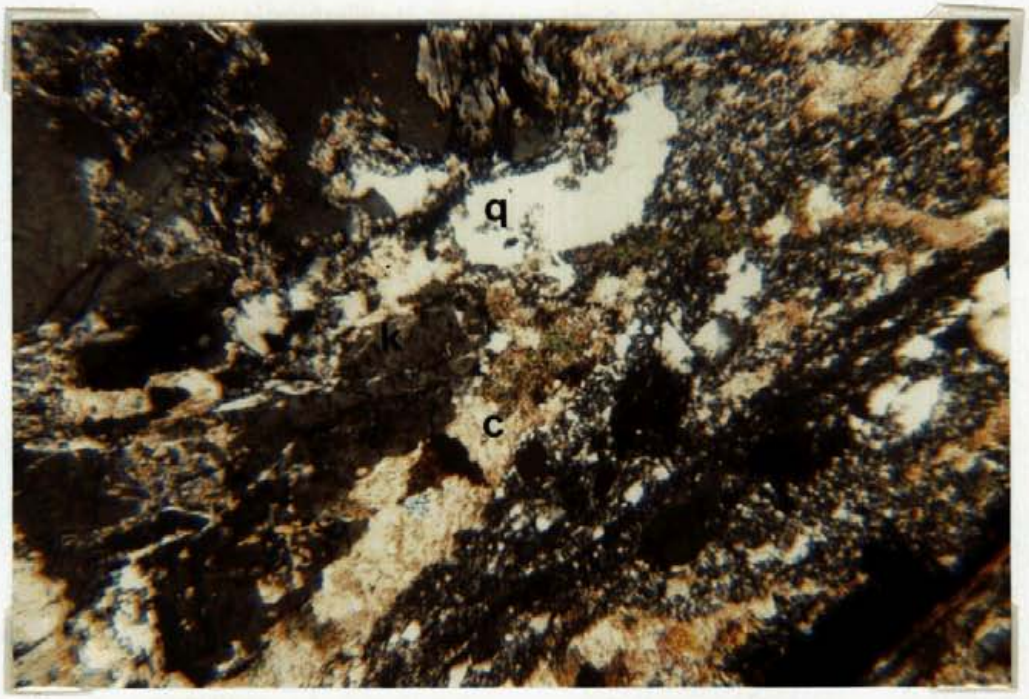


B) Hornblende(H) partly replaced by secondary biotite(B) (N25). X17

FIGURE 5. POTASSIC ALTERATION TEXTURES.



A) Finely brecciated vein quartz(Q) and sulfides(S) in Fe-oxide-carbonate matrix (N27D). X17



B) Carbonate veinlets, parallel to main quartz vein, cut secondary Kspar(K) along the vein selvages (N27C). X17
Q=quartz C=carbonate

FIGURE 6.

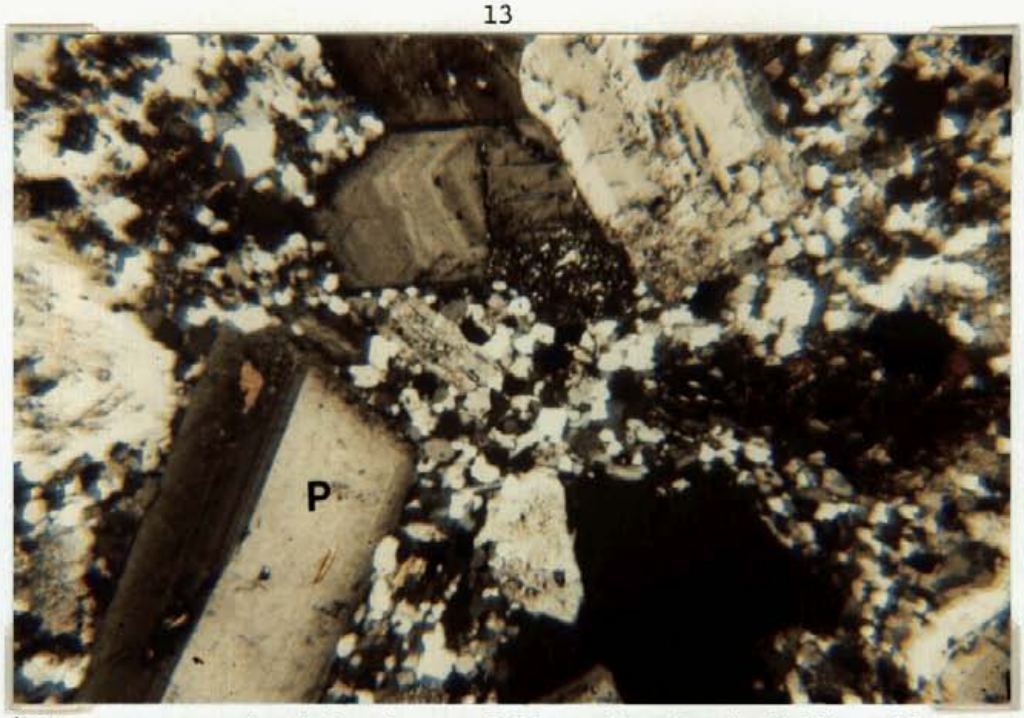
In general, the Blunt Mt. Stock in the northern Mt. Seaton massif is very weakly altered. It has wide-spaced, blocky joints. Feldspars appear fresh and vitreous in hand sample. Quartz veinlets with pink Kspar selvages, and fracture veinlets with Kspar/sericite altered margins, are uncommon. Sample N25 is typical of this minor potassic alteration. A veinlet cuts it, centered upon a fracture. Chalcopyrite blebs occur along the fracture. For a distance of 5 mm around it, plagioclase crystals have been replaced by Kspar, probably in crystallographic continuity. Hornblendes contain biotite cores and cross-cutting biotite plates. This effect is seen throughout the thin section but is especially strong near the veinlet.

A number of E-W fractures in the granodiorite in the north-central cirque, in addition to potassic alteration, host later sericite-clay-carbonate zones which are continuous over tens of metres and average 5-20 cm in width. They are greasy, green and punky. In thin section the outlines of plagioclase, converted to fine-grained sericite-clay-carbonate, and biotites, pseudomorphed by white mica-Fe-oxide, can be distinguished. In one thin section (N27D) this alteration has succeeded potassic alteration. Secondary Kspar grains are fractured and surrounded by sericite and carbonate.

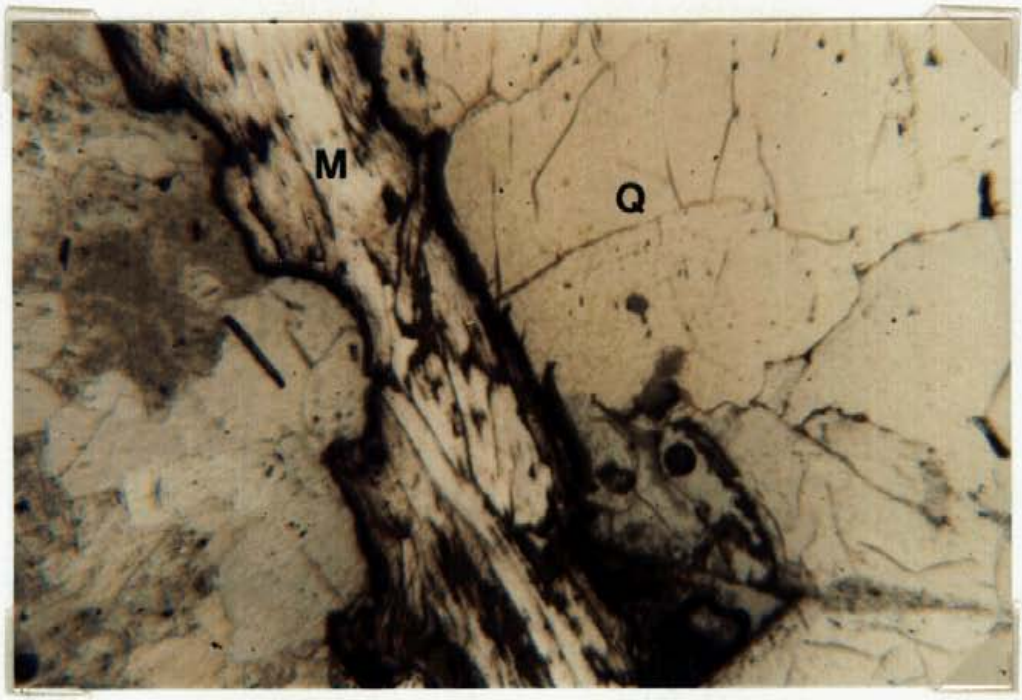
The E-W fractures must have localized potassic alteration during the main phase of mineralization, and later alteration/mineralization as well (see below).

Mineralization

Molybdenite mineralization in concentrated in the north central cirque on the Avalanche claim, within the Blunt Mt. Stock (locations of molybdenite showings on Figure 2). It occurs as traces on fractures, in quartz-Kspar veinlets, and in veins along the prominent steep E-W fractures. In the latter, molybdenite accompanies potassic alteration but also occurs in later, lower-temperature veins. At station N40, small molybdenite plates are scattered in a strongly Fe-stained coxcomb quartz vein; and also in a patchy gossan along with greasy green sericite-clay-carbonate alteration. At N27, molybdenite occurs along E-W fractures both in quartz veinlets with Kspar selvages and in later coxcomb quartz and carbonate veins with substantial chalcopyrite. In one thin section, a quartz-molybdenite-chalcopyrite vein is brecciated into sharp, angular fragments and incorporated into a carbonate-



A) Uncommon porphyritic phase of Blunt Mt. Stock (N36). X17
Oscillatory-zoned plagioclase(P) phenocrysts in fine grained matrix of quartz, plagioclase and Kspar.



B) Clumped molybdenite(M) plates in quartz veinlet (N36). X54

FIGURE 7.

limonite matrix. Clearly, veining along these fractures was multistage and outlasted potassic alteration.

Molybdenite is restricted to only a part of the exposed granodiorite. A single molybdenite-bearing quartz vein was seen in a metasedimentary talus boulder from next to the contact. As shown by the pattern of occurrences, the amount of molybdenite mineralization decreases sharply outside the north-central cirque. None appears in the sheared granodiorite to the north.

Molybdenite occurrences are small and sparse - approximately one per 200 m of traverse. No stockworks or thick quartz veins with abundant molybdenite are present. The degree of mineralization and alteration does not apparently increase from the sides of the ridges (5000-5600 ft elevation) to the valley bottom (4500-5000 ft elevation). These indications are somewhat discouraging in terms of the likelihood of Mt. Seaton hosting a major porphyry molybdenite system.

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

The 1980 programme of geological mapping and prospecting has confirmed the existence of porphyry-type molybdenum mineralization on the Mt. Seaton claim group. It is similar to a number of other systems in intrusions east of the Coast Mountains near Smithers and Hazelton. The host body is a granodiorite without, however, extensive development of porphyritic textures. A strong pyrite halo has formed around it in the hornfelsed sediments. Sulfide veins and solution (?) breccias occur within the pyrite zone. Alteration of the granodiorite itself, while not intense, is diagnostic. It consists of two phases, potassic followed by sericite-clay-carbonate. Small but persistent amounts of molybdenite are associated with the alteration.

In general, the molybdenite mineralization is weak and sporadic. It consists of scattered flakes in fractures or within narrow veins more than 100 m apart. It is unlikely, given this pattern, that an economic orebody exists in the near subsurface below the showings.

However, if further work is considered desirable, it should take the following lines:

1) Granodiorite samples should be taken at systematic intervals on traverses along ridge crests and in the bottom of the north central cirque. The samples should be thin sectioned and point counted for abundance of

alteration phases; statistical comparisons of alteration intensity as a function of elevation should be drawn. It is possible that alteration does increase downwards without being apparent in outcrop or hand sample. If this is the case, a further intensification of the molybdenum system could be expected in the subsurface. Drilling might be warranted.

2) Further prospecting could be done in the parts of the claims underlain by granodiorite. In particular, the ends of the ridges and the valley bottoms along river courses in the northern part of the Karen claims should receive attention.

The Noble-C claim should be relinquished.

COST ESTIMATE

Prospectors, 2 - 2 weeks, allow		$ 6,000
Travel, including helicopter		4,000
Camp, supplies, grub		1,500
Supervision, engineering		1,000
Assays		500
Petrographic studies, 150 samples @ $40/sample		6,000
Reporting		5,000
		$24,000
Contingencies @ 10%		2,400
	TOTAL	$26,400

All of which is respectfully submitted,

J. L. Nelson
Geologist

Locke B. Goldsmith, P.Eng.
Consulting Geologist

Vancouver, B. C.

October 16, 1981

GEOLOGIST'S CERTIFICATE

1. I, JoAnne Nelson, hold a B.Sc. in geology from the University of Washington, and an M.Sc. in geology from the University of British Columbia.

2. I have been engaged in mining exploration for 4 years.

3. I co-authored the report, "Geology and Molybdenite Occurrence, Mt. Seaton Claim Group, Snow, Avalanche, Karen and Noble-C Claims, Omineca Mining Division," based on field and laboratory work and research of relevant literature.

4. I have no direct or indirect ownership of the property, nor do I own shares in North Staun Minerals Corp.

5. I consent to the use of this report in a prospectus or in a statement of material facts related to the raising of funds.

Respectfully submitted,

J. Nelson

JoAnne Nelson
Geologist

Vancouver, B. C.
October 16, 1981

ENGINEER'S CERTIFICATE

LOCKE B. GOLDSMITH

1. I, Locke B. Goldsmith, am a Registered Professional Engineer in the Province of Ontario and a Registered Professional Geologist in the State of Oregon. My address is 301, 1855 Balsam Street, Vancouver, B.C.
2. I have a B.Sc. (Honours) degree from Michigan Technological University and have done postgraduate study in Geology at Michigan Tech, University of Nevada and the University of British Columbia. I am a graduate of the Haileybury School of Mines and am a Certified Mining Technician. I am a member of the Society of Economic Geologists, the AIME, and the Australasian Institute of Mining and Metallurgy, and a Fellow of the Geological Association of Canada.
3. I have been engaged in mining exploration for the past 22 years.
4. I have co-authored the report entitled, "Geology and Molybdenite Occurrence, Mt. Seaton Claim Group, Snow, Avalanche, Karen and Noble-C Claims, Omineca Mining Division," dated October 16, 1981. The report is based upon fieldwork and research supervised by the author.
5. I have no ownership in the property, nor in the stocks of North Staun Minerals Corp.
6. I consent to the use of this report in a prospectus or in a statement of material facts related to the raising of funds.

Respectfully submitted,

Locke B. Goldsmith, P.Eng.
Consulting Geologist

Vancouver, B. C.
October 16, 1981

LIST OF REFERENCES

Canadian Institute of Mining and Metallurgy, 1976. Porphyry Deposits of the Canadian Cordillera. Special Volume 15.

Jilson, G. and J. G. Simpson, 1973. A report on a magnetic survey on the Gypsy claims, Omineca Mining Division, B. C. Assessment Report #4429.

Le bel, J. L., 1976. 1976 Geophysical Assessment Report, Luno Creek Property. Assessment Report #5994.

Richards, T., 1977. Geology of Hazelton Map Area, B. C. in GSC Paper 77-1A, p. 247.

_____, 1978. Geology of Hazelton (West-Half) Map Area, B. C. in GSC Paper 78-1A, pp. 59-60.

_____ and O. L. Jeletzky, 1975. A preliminary study of the Upper Jurassic Bowser Assemblage in the Hazelton West Half Map Area, B. C. in GSC Paper 75-1A, pp. 31-36.

COST STATEMENT - 1981 PROGRAMME

WAGES		
L. B. Goldsmith, ¼ Aug. 28, ½ Sept. 24, ¼ Oct. 14, 3/4 16, ½ 17, 3/4 Nov. 3, Total = 3 days @ 320/day		$ 960.00
J. Nelson, Geologist, Aug. 28-Sept. 7, Sept. 26-29, ½ 30, Nov. 3, Total = 16½ days @ 280/day		4,620.00
M. Izard, Assistant, Aug. 28-Sept. 7, Total = 11 days @ 180/day		1,980.00
FOOD, ACCOMMODATION, CAMP SUPPLIES		
Aug. 28-Sept. 7 1,023.07 ÷ 11 days = 93.01/day		1,023.07
TRANSPORTATION		
Airfares, Vancouver-Smithers return, Aug. 28-Sept. 7	$ 462.00	
Helicopter, Aug. 29 & Sept. 7	1,303.60	
		1,765.60
ANALYSES		
Geochemistry, 11 samples, 8.25/sample	$ 90.75	
Petrographic thin sections, 11 @ 11.00/each	121.00	211.75
REPORT MATERIALS		
Prints, Xerox, photos, typing, report covers	$222.62	
Drafting	540.00	762.62
TOTAL		$11,323.04

A P P E N D I X

1

CHEMEX LABS LTD.

212 BROOKSBANK AVE.
NORTH VANCOUVER. B.C.
CANADA V7J 2C1

TELEPHONE: (604)984-0221
TELEX: 043-52597

• ANALYTICAL CHEMISTS • GEOCHEMISTS • REGISTERED ASSAYERS

CERTIFICATE OF ANALYSIS

TO : ARCTEX ENGINEERING
#301-1855 BALSAM STREET.
VANCOUVER.B.C.
V6K 3M3

CERT. # : A8113968-001-A
INVOICE # : I8113968
DATE : 25-SEP-81
P.O. # : NONE

ATTN: L. GOLDSMITH CC: J. NELSON

Sample description	Prep code	Ag ppm	Au -(AA) ppb				
N3	205	>100.0	240	--	--	--	--
N5	205	1.2	10	--	--	--	--
N6	205	0.6	20	--	--	--	--
N7	205	0.1	10	--	--	--	--
N9	205	0.1	<10	--	--	--	--
N18	205	7.8	1820	--	--	--	--
N24	205	0.7	100	--	--	--	--
N43	205	0.1	<10	--	--	--	--
N44	205	8.7	20	--	--	--	--
N45	205	10.6	20	--	--	--	--
N48	205	11.2	<10	--	--	--	--

Certified by .....

CTA MEMBER CANADIAN TESTING ASSOCIATION

A P P E N D I X

2

N7 Silicified breccia with tourmaline matrix

This breccia consists of clasts dominated by fine grained quartz aggregates. It was derived from hornfels of the Bowser Lake Group by silicification. At a later stage, the silicified hornfels was ruptured into angular clasts and long tourmaline prisms grew in the interstices.

Quartz.

Quartz makes up the breccia clasts, in very fine grained aggregates with scattered larger grains. Abundant coarser grained quartz veinlets cut across them. They are welded to the matrix and are not fracture-filling type veins. These veinlets terminate at the edges of the fragments. Probably they formed before the brecciation event.

Tourmaline.

In the quartz clasts, tourmaline occurs as minor, small skeletal to anhedral grains. Most tourmaline occurs in the breccia matrix. Here, it forms aggregates of radiating prisms, some of them several cm long. They are clear to light green, and rarely brown in color in thin section. In hand sample they appear black. They show prominent rings of color zoning.

Small grains of rutile, nearly opaque, occur interstitial to tourmaline and within the silicified clasts.

N15 Sericite-altered dacite

This rock was originally a porphyritic, hypabyssal dacite, consisting of plagioclase and biotite phenocrysts in a medium-fine grained matrix dominated by plagioclase and quartz. The matrix quartz is intact. Other phases are largely sericitized. Plagioclases are now aggregates of fine grained sericite and minor carbonate. Biotites have been pseudomorphed by white mica. Pyrite is the only sulfide.

Mode

53	plagioclase
20	white mica
15	quartz
10	pyrite
2	carbonate

Plagioclase phenocrysts are dense. In the matrix, plagioclase occurs as anhedral grains of the order of .1 mm in diameter.

Sericite in the matrix occurs as small, well-formed plates overprinting the plagioclase. They tend to form sprays and clumps. Biotite plates are now thick books of white mica with Fe-oxide after pyrite along the 001 cleavages.

Anhedral quartz grains form an interlocking aggregate with original plagioclase in the matrix.

Pyrite occurs as large, skeletal aggregates, some more than a cm across. They enclose white mica. Scattered small pyrite cubes have been either plucked or weathered out.

Carbonate patches are small and ragged.

N23A Silicified breccia with tourmaline matrix

This sample resembles N7. It has been completely silicfied to a fine grained aggregate of quartz. Tourmaline occurs in incipient fractures and in fracture sets which isolate parts of the silicified matrix as fragments. However, brecciation is not as strong as in N7.

Mode

35	tourmaline
57	quartz
5	white mica
3	hematite
tr	pyrite

Tourmaline appears black in hand sample. In thin section, it is blue green to brownish green; also greenish blue. It commonly is color zoned. It occurs in even-grained aggregates. Grains are euhedral to subhedral. The general pattern of tourmaline-filled fractures is parallel lamellar.

Quartz is generally very fine grained, but coarser segregations and veinlets are also seen. Where tourmaline is most abundant, quartz forms small angular fragments.

White mica forms radiating, well-formed, relatively coarse plates in a few open-space fillings. It occurs in the fragments as extremely small grains interstitial to quartz.

Scattered ragged hematite blobs in the matrix may be after pyrite.

A single pyrite blob is rimmed heavily by hematite.

N23B Quartz vein, veined by tourmaline-carbonate-chalcopyrite

The main part of this sample is a quartz vein of variable grain size. It has been cut by fracture-controlled veinlets which contain tourmaline, carbonate, and sulfides (predominantly chalcopyrite).

Quartz.

Quartz ranges from very fine grained and cherty to coarse (.5 mm) prisms and anhedra. This variability is typical of vein quartz. In some of the tourmaline veins, quartz has recrystallized along with the introduced phases. It is clearer than normal and may be coxcomb.

Tourmaline.

Tourmaline is seen in distinct veins with straight, parallel traces. Most of it is prismatic to acicular. It is green to brown in color, and commonly color-zoned.

Carbonate.

This occurs as large but uncommon blobs which have grown around collections of tourmaline prisms in the veins.

Chalcopyrite.

Like carbonate, chalcopyrite occurs as blobs in the veins. There is only one large one in the section. It is accompanied by pyrrhotite and pyrite. Pyrrnotite and pyrite also occur independantly. Small anhedral pyrite grains are seen in the quartz matrix. Euhedral pyrrhotites are seen with tourmaline in one case.

N25 Potassic-altered granodiorite

This sample of the Plunt Mt. Stock shows features typical of mild potassic alteration. Biotite plates grow inside and across hornblendes. A veinlet crosses the section. It has not involved the introduction of quartz. Its centre is a healed fracture. Around this, kspar has replaced plagioclase. Biotite is the only mafic mineral stable in the kspar-altered area.

Mode

48	plagioclase
22	quartz
15	kspar
8	biotite
5	hornblende
2	magnetite

At locations removed from the veinlet the plagioclase is fresh and oscillatory-zoned. It forms nearly euhedral, stubby tabular crystals.

Quartz occurs as large, anhedral interstitial grains, typical of coarse grained plutonic rocks.

About 8% of the rock itself is Kspar. The remainder occurs along the replacement veinlet. It is coarse grained and anhedral, and encroaches on surrounding plagioclase.

Original biotite plates are euhedral and much smaller than the plagioclases that they grew with. Secondary biotite mostly takes the form of single plates which either core or grow across hornblendes. A xenolith occupies part of the section removed from the veinlet. In it, biotite is more abundant than in the granodiorite. It and the other phases (plagioclase, hornblende, quartz) are finer grained than in the granodiorite.

Original hornblendes are light green, euhedral, and, like biotites, much smaller than the plagioclases.

Small round magnetite grains either grow with or are included in biotite and hornblende.

N27A Lightly altered granodiorite

This sample is somewhat more altered than the average from the Blunt Mt. Stock, but is otherwise typical. The pink veinlet which cuts it is due to sericite-Fe-oxide in the plagioclases, not to Kspar. The sample is of a coarse grained, equigranular intermediate plutonic rock.

Mode

45	plagioclase
25	quartz
15	kspar
5	biotite
4	chlorite
1	sphene
1	pyrite, chalcopyrite
4	sericite
tr	hornblende
tr	epidote, carbonate

Except near the veinlet, plagioclase is fresh. It shows oscillatory zoning superimposed on normal zoning, An 32-20. The veinlet is a fracture cored by discontinuous chalcopyrite. Around it, plagioclases are partly albitized and contain abundant sericite and pink Fe-oxide.

Anhedral kspar grows interstitial to the subhedral/euhedral plagioclase in a typical plutonic relationship.

Quartz occurs in intergrowths with Kspar and in anhedral blobby grains surrounding plagioclases.

Brown biotite plates are well-formed, even euhedral. They contain very small apatite grains.

Chlorite sprays are most abundant near the veinlet. Chlorite penetrates into biotite and, with sphene, replaces some of the hornblendes.

Large anhedral sphenes penetrate into some of the biotites.

Pyrite occurs with chlorite after hornblende. Elongate chalcopyrite blobs occur at the centre of the fracture-controlled veinlet.

About 15% of the plagioclase near the veinlet is sericitized. Elsewhere, sericite ranges from 0 to 10% of the plagioclase.

A few prismatic hornblendes are still intact, but they have been converted to pale green actinolite.

Epidote occurs as scattered grains and aggregates. Small carbonate patches are seen in the veinlet.

N27B Granodiorite cut by altered dacite dike

This thin section shows two compositional divisions with a sharp demarcation between them, probably an original igneous contact. The granodiorite resembles the other granodiorites in the Blunt Mt. Stock, except for its strong degree of alteration. The dacite consists of uniform medium-grained plagioclase, biotite and quartz. It is of hypabyssal origin. It has been highly altered to white mica and Fe-oxide, clay and carbonate.

Mode

1. Granodiorite

34	plagioclase, sericite, carbonate
30	kspar
30	quartz
5	biotite(white mica)
1	pyrite
tr	hematite, rutile

2. Dacite

30	carbonate
57	sericite, white mica, clay
8	Fe-oxide
5	quartz

Plagioclase in the granodiorite has been heaviliy altered to sericite and carbonate. In the dacite, no original plagioclase remains.

Kspar in the granodiorite is much less altered than coexisting plagioclase. It occurs as large, anhedral grains, interstitial to original plagioclase. It contains a little secondary clay.

Quartz is intact in both rock types. It forms anhedral grains and aggregates, coarser in the granodiorite than in the dacite.

Biotite has been converted to large white mica plates with Fe-oxide along the 001 cleavages.

Pyrite in the granodiorite is surrounded by hematite. It may have been the original opaque mineral in the dacite as well.

Carbonate forms abundant ragged patches after plagioclase in the dacite.

Dense, fine grained sericite and clay replace the remainder of the plagioclase in the dacite.

Fe-oxide in the dacite occurs as stains on sericite and in opaque patches, as both limonite and hematite.

N27C Complex quartz vein

This sample shows at least two stages of veining and alteration. The earlier was a quartz vein with kspar selvages. Intense sericitization of the surrounding country rock may have accompanied either this or a later stage. Obviously later veining involved carbonate, as well as cataclastic deformation of the quartz. Pyrite and chalcopyrite occur in the quartz vein. Chalcopyrite shows evidence of remobilization during the second stage of veining.

Mode

70	quartz
8	Kspar
7	white mica/sericite
7	carbonate
5	pyrite
3	chalcopyrite

Quartz in the main vein ranges from coarse grained to cherty. Fine lines of very fine grained quartz, which parallel the edges of the vein, are zones of shearing and cataclastic deformation which post-dated the initial crystallization of quartz in the vein. Quartz is also part of the remaining quartz diorite outside of the vein. It has preserved the original texture, while the plagioclase was converted to fine grained sericite aggregates.

Kspar concentrates along the vein selvages. It is definitely secondary, and represents the earliest alteration stage in evidence.

White mica replaces plagioclase and pseudomorphs biotite in the adjacent quartz diorite.

Fine carbonate stringers parallel the main vein trend. They concentrate along its margin, where they dismember earlier-formed aggregates of secondary kspar.

Pyrite forms large blobs in the main quartz vein.

Chalcopyrite forms uneven grains that tend to be elongate along the fractures which parallel the vein trend.

N27D Complex quartz-carbonate-sulfide vein breccia

This sample shows at least two stages of veining separated by a brecciation event. The earlier stage involved coxcomb quartz and a variety of sulfides - chalcopyrite, digenite, pyrite and molybdenite. These veins were then brecciated, in places to a fine scale, and incorporated in a matrix of fine to coarse grained carbonate and Fe-oxide. Later carbonate veins lack both Fe-oxide and sulfides. They must post-date the mineralization.

Mode

57	carbonate
25	quartz
8	Fe-oxide
3	chalcopyrite
3	digenite
3	molybdenite
1	pyrite
tr	white mica

The latest carbonate veins consist of large grains with commonly euhedral terminations and compositional banding near them. These nucleate on material of the brecciation phase - mainly anhedral carbonate aggregates with abundant Fe-oxide.

The quartz vein material is of variable grain size, tending to coarse. It has been extensively fragmented and is surrounded by the carbonate-Fe-oxide matrix.

Chalcopyrite occurs as large isolated blobs and angular fragments and in aggregates with quartz. Large digenite fragments are probably after original chalcopyrite.

Molybdenite occurs as plates, both in aggregates in the early quartz veins and isolated in the carbonate matrix. Those in the carbonate are bent and distorted and show uneven extinction.

Pyrite forms angular shards. Some of them contain fine seams of chalcopyrite.

A few large white mica plates occur with quartz and also in the later carbonate veins.

N34 Garnetiferous felsic hornfels (porphyritic dacite) with veins of pegmatite

No mode is given because of the intimate intermixture of hornfels and pegmatite on thin section scale. The hornfels consists mostly of plagioclase with minor biotite and scattered large garnet porphyroblasts. Its porphyritic character is shown by the few large plagioclases. These are pre-metamorphic, not porphyroblasts. Their edges have been corroded by the growth of the fine grained matrix. They were originally lath-shaped.

Plagioclase. In the hornfels, most of the plagioclase is very fine grained and shows albite twinning. Grain boundaries are even and grains anhedral, typical of hornfels texture. The relict phenorysts have irregular margins. In a few cases they are cut by metamorphic biotite trains.

Garnet. The largest porphyroblasts contain scattered biotite in their cores and are surrounded by biotite depletion haloes. Small amounts of chlorite occur around them. Smaller garnet grains are also seen.

Biotite. This occurs in clusters and trains of very small subhedral platelets. Its uneven distribution is notable.

Pegmatites. These consist of relatively coarse grained plagioclase, quartz, kspar and muscovite. Kspar tends to occur at their ends, where they finger into the hornfels. Muscovite forms sprays and aggregates of large plates with quartz.

N36 Porphyritic granodiorite

This sample is an example of an uncommon porphyritic phase of the Blunt Mt. Stock. Large plagioclases, hornblende, biotite and quartz are isolated in a fine grained matrix of equant feldspars which constitutes about 50% of the rock. Chlorite, sericite and white mica alteration have affected the rock. Secondary kspar occurs along the quartz veinlet which contains molybdenite.

Mode

39	plagioclase
25	quartz
10	Kspar
15	sericite, white mica
7	chlorite
3	biotite
1	Ti-oxide
tr	epidote
tr	carbonate
tr	apatite
tr	molybdenite

Some of the plagioclase phenocrysts are fresh; others are partly altered to sericite.

Quartz occurs as round phenocrysts, in the matrix, and in the veinlet.

In the vein, secondary Kspar forms columnar intergrowths with quartz and grows densely along the selvages. Primary Kspar is restricted to the fine grained matrix.

Sericite is densest in the plagioclase phenocrysts near the veinlet. It occurs to a lesser extent elsewhere. Coarse white mica forms intergrowths with chlorite after biotite phenocrysts near the veinlet.

Chlorite replaces biotite, initially as parallel intergrowths along 001. Chlorite sprays occur in the quartz veinlet. Patchy chlorite has replaced hornblende prisms.

Biotite plates removed from the vein are brown and fresh except for chlorite lamellae.

Acicular Ti-oxide grows in chlorite. It accomodates the Ti from the original biotite, which does not enter the chlorite structure.

Epidote, as small grains and larger skeletal crystals, replaces hornblende along with chlorite.

Abundant small ragged carbonate grains are seen in plagioclases near the veinlet.

Large apatite prisms are scattered in the matrix.

Fairly large molybdenite plates cluster in one area of the quartz veinlet.

N48 Quartz vein with hematite and sphalerite

This sample has a simple mineralogy. Quartz is the dominant phase. Lesser specular hematite and minor sphalerite accompany it. The assay results indicate minimal precious metals.

Mode

85	quartz
14	hematite
1	sphalerite

Quartz grains are anhedral and vary in grain size both locally and from place to place in the section, as is typical of quartz in veins. Some radiating growth was observed, both in the form of quartz aggregates and in the fine internal structure of individual quartz grains.

The original hematite in the sample was probably all of the specular variety. It is opaque and forms large blobs interstitial to quartz, with abundant acicular overgrowths radiating into the surrounding quartz. Reddish hematite has partly replaced it, probably due to near-surface oxidation.

Small, round, zoned sphalerite grains are scattered in the section. Their colors vary concentrically from orange to yellow.

A P P E N D I X

3

N1.rubble JKBL. fine grained purple, green mdstn-sts-gwk. One plag porphyry dike. Some seds abt py stringers, disseminated.

N2. JKBL. fine light green wavy tuffaceous bands bdg. 25/54NW. Small blob py-cpy with malachite stn.

N3. To west, orange carbonate breccia zone. Here, massive sulfide cobble in rubble pyrite with 3% stibnite. Sample for assay.

N4. Dike or plug of porphyritic dacite. Waxy yellow on broken surfaces. Plagioclase altered to clay, biotite to plates of white mica.

N5. JKBL, fine grained green. Wht bx zone 1 m 95/90, 1-2 cm rdd cherty qz clasts. bdg 30/40NW. py-rich blotchy zones. Sample of bx for assay.

N6. float. thick quartz vein, coxcomb-textured, with interstitial py. Sample for assay.

N7. bx, Angular frags wht silicified with py cubes in matrix of radiating blk tourmaline. Punky gossan float abt here. Sample of breccia for assay and thin section.

N8. highly fc JKBL. Fe-stnd.

N9. small zone qz veins with sericite alteration in seds trends 100°.

N11. 2 m thk white to pale gn crackle zone. Dominant fracture in seds 05/50W.

N12. JKBL dk gn to blk, lt gn weathering. sts-gwk-tuffaceous sts. To south, homoclinal bedding in seds dips NW.

N13. gwk-cg (rdd andesite clasts). cut by fine py zones at edge of pyritic area.

N14. white to pale green weathering felsite flow in JKBL - conformable. Just below this to east - andesite flow.

N15. porphyritic dacite as at N4. biotite to white mica.

N16. fine grained black hornfels.

N17. rubble - argillite-sts-gwk-cg-dacite?(hornblende pxts, bands of red garnet) a few tourmaline-quartz veinlets.

N18. JKBL. fine wht irregular tuffaceous bands in cross-bedding gwk-sts. Bdg. 12/25W dominant fc 114/75N cross beds show gwk is right side up. Sample of float massive sulfide pyrite-cpy-aspy-sl-gn, also stringers in siliceous matrix.
N19. wht-weathering gwk with claystone interclasts. Blk laminae 04/56W

N20. diorite sill. white plagioclase, 55% secondary? biotite in clumps. Along base- rusty zone py-aspy-cpy stringers.

N21. dk gy sts? prominent fc set 38/75 NW.Since last point abt gwk-sts some pyrite matrix also fine blk tour veinlets.

N22. cross bedding in JKBL here 46/36SE. Float here includes small lumps of massive sulfide pyrrhotite with 2% cpy. Quartz vein with pyrite.

N23. talus. breccia with blk tour. Quartz vein cut by bx zones - one contains tr cpy. Dissem py or aspy in gwk.

N24. very pyritic gwk-sts-arg. Sample for assay

N25. wide-jointed relatively unaltered granodiorite. Sample of rare pink Kspar veinlet.

N26. mb in float in qz vein in gd. not a stockwork. Gd almost fresh.

N27. float samples from gully above. 1) quartz vein with pyrite-cpy-kspar halo 2) mb-py-cpy in chloritized? bx with carb alteration. also samples showing progressive alteration of gd around veins.

N28. 45/82NW fc set in gd. Most fc py coated. fc in centre of gully contains mb-py-cpy also carbonate plue very fine grained sulfide. The maximum width of this vein is less than 10 cm as shown by the float below. Complex vein-multistage? In particular carbonate versus quartz. Clay-altered around vein-feldspars very white in dark matrix.

N29. assumed shear? contact between gd with persistent fc 38/85NW and extremely sheared gd. Hem-coated slicks, chlorite veinlets. In talus just below this abt dun-colored felsite but no oc. Suspect dike(s)

N30. purple hf bldr from gully that comes from top of ridge - qz vein with mb. Also bi veinlets. Abt hf bldrs no other mb.

N31. lt gn metatuff? or metadacite gn hb, lg round garnets. Banded. Tr cpy
N32. malachite stn with abt Fe-oxide on fc.
N33. dun felsite dike 3 m thick in gd. Tr mb in Fe-stned coxcomb qz in float.

N34. contact gd/JKBL- bn-purple hf, some laminated; lt gn felsic tuff(?) with garnet porphyroblasts.

N35. gd. with sparse pink aplie, pegmatite, white quartz veins with pyrite. In part medium grained with plagioclase phenocrysts.

N36. Unusually altered granodiorite-chl, feldspar weathered out(clay), Fe-oxide stns. Abt qz veinlets with py, about a quarter of them have molybdenite. Samples for thin section.

N37. since last point alteration persisted but tr py, two instances cpy, no mb. Here gullies cored by greenish clay-altered zones 100/90. Margot reports mb below here in gully.

N38. contact gd/hf (not pyritic here). brown to black porphyritic diorite locally at contact. No mb on this hillside. Tr malachite stn.

N39. contact gd-hf with porphyritic dacite between. Tr mb in skarny zone in hf next to contact.

N40. along creek. two fc zones in gd 33/87 NW. One contains crystalline quartz with pyrite, mb. The other - punky gossan, clay-altered feldspar around. Malachite-py-mb.

N41. At lake. Medium grained diorite - bi-hb-plag no qz or kspar. No mineralization

N42. gd with qz-carb, greasy gn clay alteration no sulfides.

N43. qz vein 5 cm thk with purplish sl. 18/55W. Sample for assay

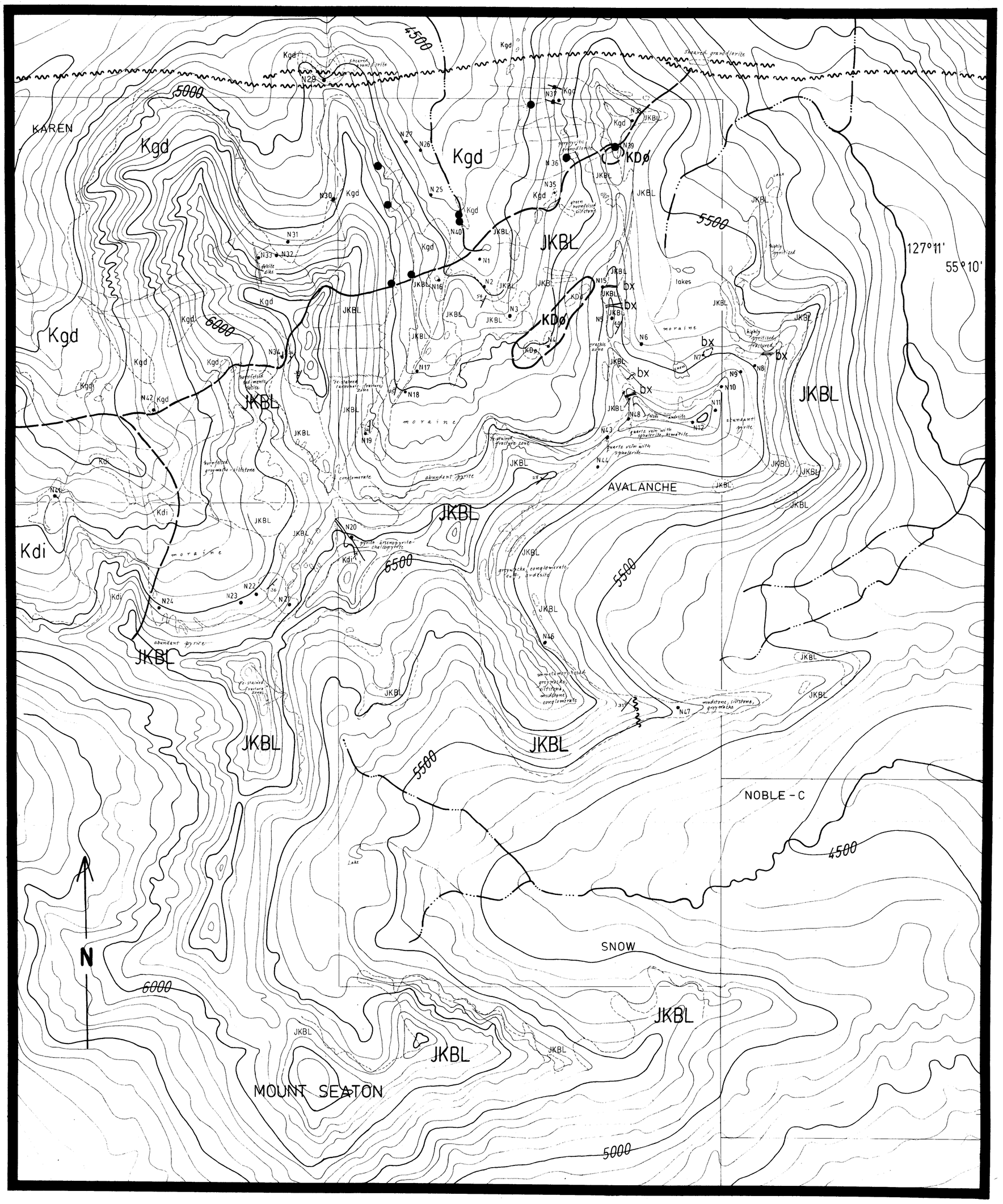
N44. abundant large blocks chalcedony with pyrite, stibnite. Vein-bx in talus. Sample of veins for assay. Cg here clast-supported bands in gwk. Finely laminated tuff/ tuffaceous seds. Not much mdstn.

N45. sample- selection of quartz+ pyrite veins from rubble at the head of the cirque.

N46. this face unmetamorphosed JKBL seds, fining downwards ie prominent cg near head of cirque, abt mdstn-sh near end of oc. Xbdd gwk, limy gwk. Abt plant debris - large to small lineated plant stems, ferns. Strange parallel grooves on some organic-coated surfaces in gwks. In one bn mdstn, small depressions probably rain-drop casts.

N47. interbdd sh-gwk. Gwk contains plant stems, mud balls.

N48. 8-10 cm qz vein with sphalerite, hematite. Sample for assay.



GEOLOGY and molybdenite occurrences

To accompany report by JoAnne Nelson, M.Sc., Geologist
and L.B. Goldsmith, P.Eng., Consulting Geologist

ARCTEX ENGINEERING SERVICES

September 1981

SCALE
1 : 12 500

0 100 m. 500 m. 1000 m.

Stratified rocks

Upper Jurassic Lower Cretaceous	[JKBL]	BOWSER LAKE GROUP GREYWACKE, SHALE, SILTSTONE, CONGLOMERATE, ANDESITE, TUFF.

Intrusive rocks

Cretaceous	[Kgd]	GRANODIORITE
	[Kdi]	DIORITE
	bx	BRECCIA
	[KDø]	PORPHYRITIC DACITE

GEOCHEMISTRY

SAMPLE No.	N3	N5	N6	N7	N9	N18	N24	N43
ppm. Ag	> 100	1.2	0.6	0.1	0.1	7.8	0.7	0.1
ppb. Au	240	10	20	10	∠10	1820	100	∠10

SAMPLE No.	N44	N45	N48
ppm. Ag	8.7	10.6	11.2
ppb. Au	20	20	∠10

MOUNT SEATON
CLAIM GROUP

SMITHERS AREA B. C. OMINECA MINING DIVISION

NORTH STAUN
MINERALS CORPORATION

REGISTERED PROFESSIONAL ENGINEER
L. B. GOLDSMITH
PROVINCE OF BRITISH COLUMBIA

9755

Key

CONTACT
Observed
Approximate
GULLY
FAULT
OUTCROP BOUNDARY
BEDDING with attitude
Tops known 31
unknown 36
MOLYBDENITE OCCURRENCE
SAMPLE LOCATION AND NUMBER N48
FORM LINES ON BEDDING
CLAIM BOUNDARIES, approx.
JOINTING, vertical