DAWSON M.D.

MAP No. 116 A 3 115 P 14	ASSESSMENT REPORT ☐ N. M. E. A. P. ☐ CONFIDENTIAL ☐ OPEN FILE ☐	**TYPE OF WORK:**	GEOLOGICAL
REPORT FILED UNDER	NORANDA EXPLORATION CO. LTD. (N.P.L.)	DOCUMENT NO.	091782
DATE PERFORMED	JULY 1985	DATE FILED:	5 February 1986
LOCATION - LAT.	63°59'N	AREA:	CLEAR CREEK
LONG.	137°17'W		
CLAIM NO.			
	ZETA 1-32 YA79015-YA79046		
	ZETA 33-40 YA79190-YA79197		
VALUE $ 2,800.00	ZETA 41-84 YA85089-YA85132		
WORK DONE BY	S.M. ABERCROMBIE		
WORK DONE FOR	NORANDA EXPLORATION CO. LTD. (N.P.L.)		

REMARKS

42-ZETA

In 1985, exploration on the ZETA claims included detailed geologic mapping and sampling. A total of 150 samples were collected for age dating and petrographic analyses. Significant silver and tin mineralization has been discovered on this property and is described in D.I.A.N.D. (1986, p.220-221).

A detailed sulphide mineralogy study is contained in this report. Pyrite, arsenopyrite, cassiterite, sphalerite, jamesonite, covellite, chalcocite and stannite have been identified. Formational temperatures are believed to be between 360 and 490°C.

091782

YG 85 p.247

BEE	1-12	Y91728-Y91739
BEE	21-24	Y91748-Y91751
BEE	25-27	YA3106-YA3108
BEE	28-35	YA18302-YA18309
BEE	36-59	YA86575-YA86598
BEE	60-63	YA92340-YA92343
CEE	1-8	YA82524-YA82531
CEE	10-13	YA82532-YA82535
CEE	14-19	YA82576-YA82581
CEE	20-27	YA85579-YA85586
CEE	24(N)-26(N)	YA86010-YA86012

Two bulldozer trenches were completed to bedrock over gold-in-soil anomalies located earlier in 1985.

One trench gave negative results. The other encountered a siliceous porphyritic rhyolite overlain by hornfelsed argillite. A shear zone of 37 cm assayed 1,300 ppb Au. Minor quartz veins are contained within this shear zones.

GEOLOGY OF THE ZETA 1-84 CLAIMS

N.T.S. 115/P/14, 116/A/3

LATITUDE 63°59'N
LONGITUDE 137°17'W

DAWSON MINING DISTRICT

AUTHOR: Shirley M Abercrombie, B.Sc.
Owner: Noranda Exploration Company, Limited (NPL)
Date: January 1986
Work Period: July 11 to July 21, 1985

This report has been examined by the Geological Evaluation Unit under Section 53 (4) Yukon Quartz Mining Act and is allowed as representation work in the amount of $ 2,800.00 .

17 March 1986

Regional Manager, Exploration and Geological Services for Commissioner of Yukon Territory.

TABLE OF CONTENTS

1.0 SUMMARY

The Zeta 1-84 claims, owned by Noranda Exploration Company Limited, are approximately 105 km east of Dawson City, Yukon Territory (NTS: 115/P/14 and 116/A/03); 63°59' N, 137°20'W. The claims lie along the northern contact between the Cretaceous Lost Horses batholith and the Ordovician-Silurian fine to coarse grained clastic and chemical metasediments of the Road River Group. Work commenced on the claims on July 11, 1985 and was terminated on July 21, 1985 with the completion of detailed geological mapping, geochemical sampling, core relogging and sampling. About $6,200 was spent on the property during the dates specified (Appendix 2).

Significant tin-silver mineralization, associated with greisenized cassiterite-bearing veins and veinlets, has been found on the property.

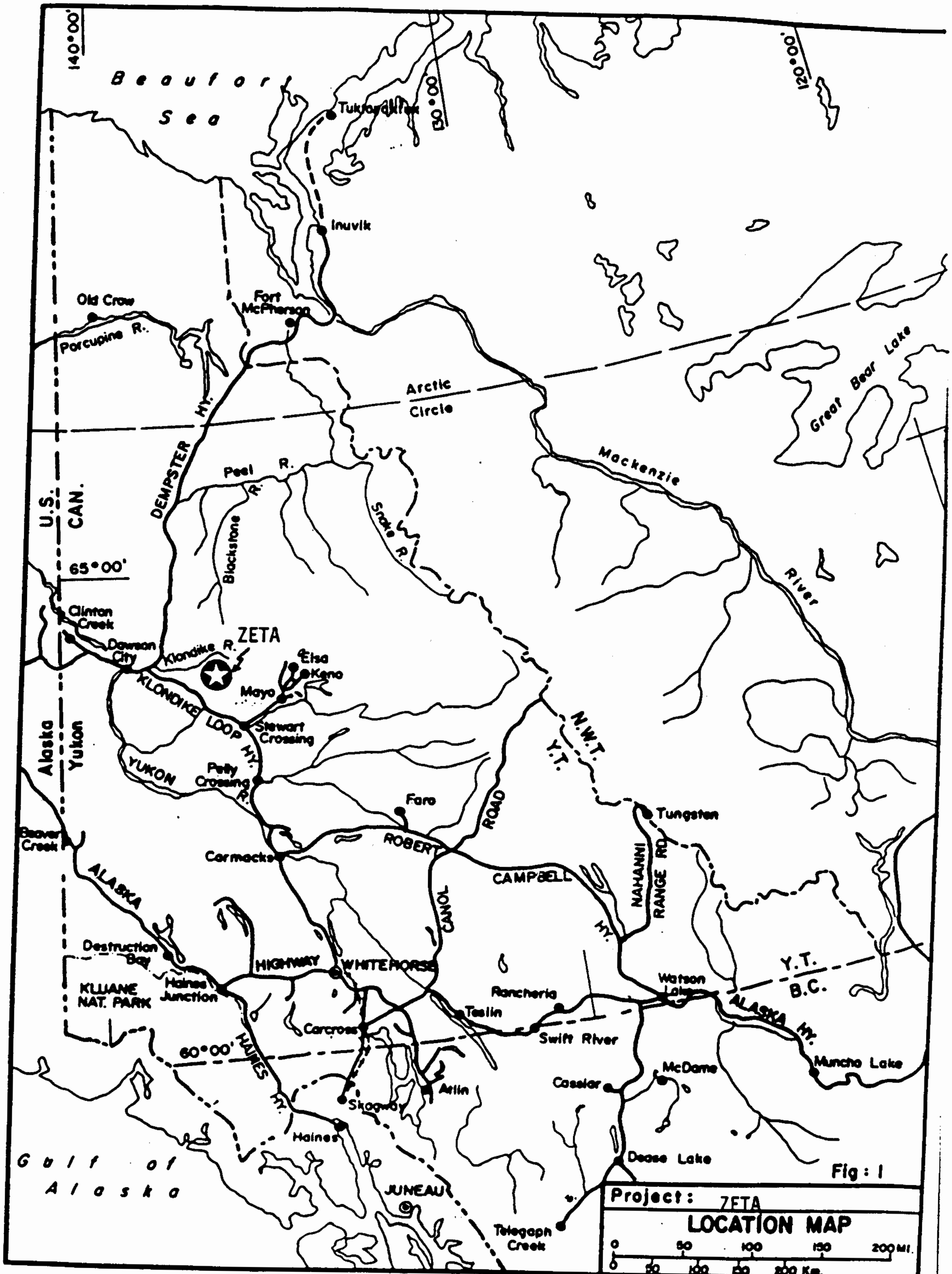
2.0 LOCATION AND ACCESS

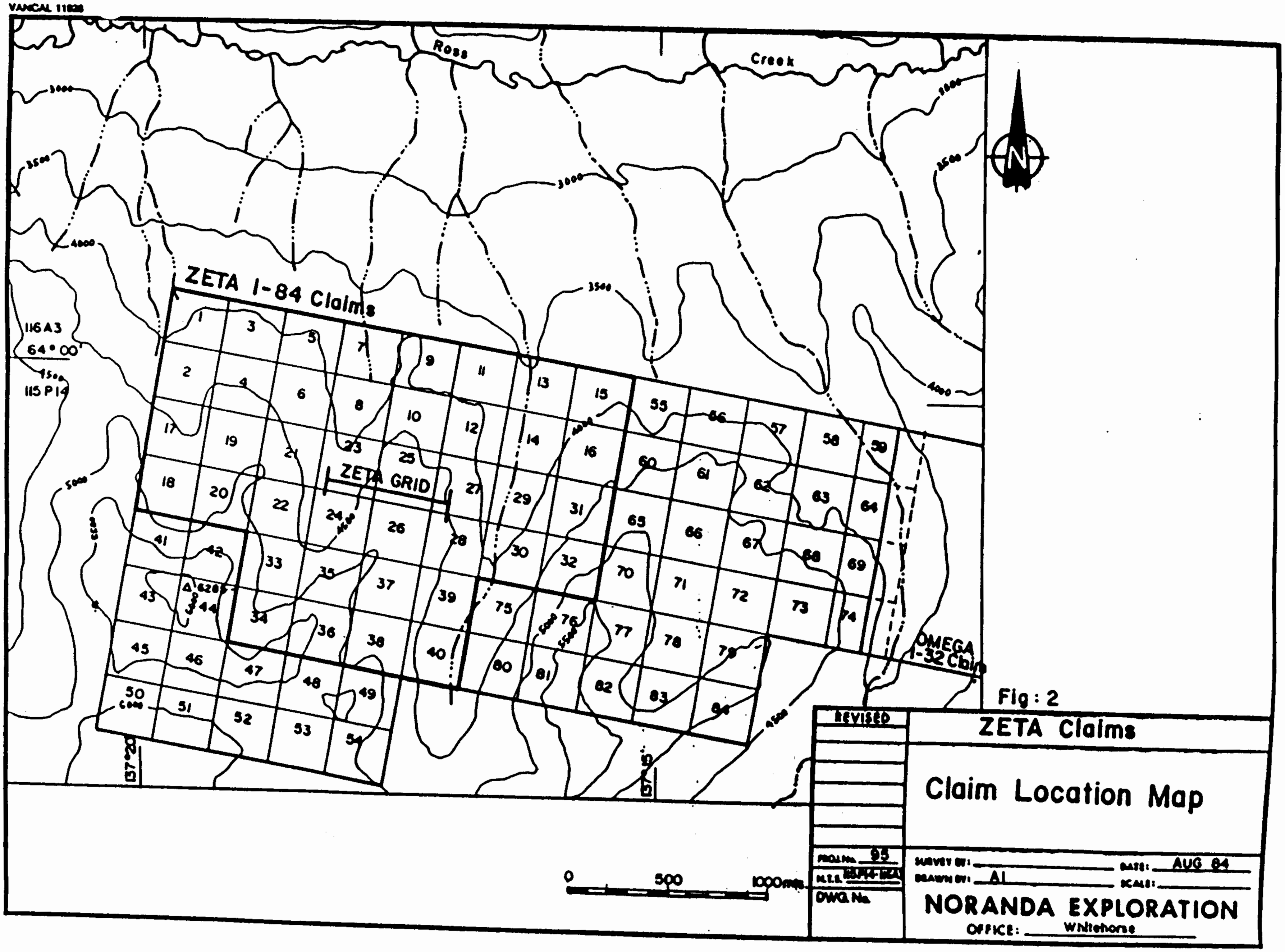
The Zeta 1-84 claims lie along the northern boundary of the Lost Horses batholith, within the Syenite Range Mountains, 105 km east of Dawson City, Yukon Territory (NTS: 115/P/14 and 116/A/03); 63°59'N, 137°20'W; (Fig. 1). The Clear Creek road and the Klondyke Highway lie 20 and 35 km to the southwest of the property, respectively. A winter cat trail within the Ross Creek valley passes 4 km north of the claims but is largely impassable during the summer. Access to the property has been by helicopter from Barlow Dome on the Clear Creek Road.

2.1 HISTORY OF THE CLAIMS

The Zeta 1-32 claims (Grant Numbers YA79015-46) were staked by Noranda Exploration on June 24th, 1983; the Zeta 33-40 (YA79190-97) were added on August 4th, 1983 to cover a second area of interest. The recording dates of these contiguous claims were June 27, 1983 and August 31, 1983, respectively. The Zeta 41-84 claims (YA85089-132) were staked November 25, 1984 and recorded November 26, 1984. All claims are on Figure 2.

Mattagami Lake Exploration initiated silt sampling in the area in 1980 (Biczok, 1980). A significant arsenic-in-silt value (200 ppm As *versus* background of 2 ppm) was obtained in a single stream draining the northern margin of the intrusion. This anomaly resulted in follow-up work in 1981. Silt sampling and limited detailed prospecting in June, 1982 located additional anomalous As values in silt in the same stream and identified at least one possible source for the anomaly (Jago, 1982). Additional detailed mapping and limited hand-pitting of this discovery located greisen style mineralization, as defined by Shcherba (1970), in highly altered syenite subcrop and quartzite float. This prompted a detailed follow-up in 1983, at which time, several hand trenches and pits located 5 m of subcropping, greisen style tourmaline- quartz-clay-sulphide vein mineralization. Significant rock geochemical results (13 opt Ag), and the discovery of a second, lower grade vein occurrence 500 m to the south, prompted a detailed program of exploration in 1984. Grid layout, detailed and


Beaufort Sea
Tuktoyaktuk
Inuvik
Old Crow
Porcupine R.
Fort McPherson
Arctic Circle
Great Bear Lake
Mackenzie River
DEMPSTER HY.
Peel R.
Blackstone R.
Snake R.
U.S. CAN.
65°00'
140°00'
130°00'
120°00'
Clinton Creek
Dawson City
Klondike R.
ZETA
Elsa
Keno
Mayo
KLONDIKE LOOP HY.
Stewart Crossing
Pelly Crossing
YUKON R.
Alaska
Yukon
N.W.T.
Y.T.
Tungsten
Faro
ROAD
ROBERT
CANOL
CAMPBELL HY.
NAHANNI RANGE RD.
Beaver Creek
ALASKA
Carmacks
Destruction Bay
KLUANE NAT. PARK
Haines Junction
HIGHWAY
WHITEHORSE
Rancheria
Teslin
Swift River
Watson Lake
Y.T.
B.C.
ALASKA HY.
Muncho Lake
60°00'
HAINES HY.
Carcross
Atlin
Skagway
Haines
Cassiar
McDame
Dease Lake
Gulf of Alaska
JUNEAU
Telegraph Creek
Fig: 1
Project: ZETA
LOCATION MAP
0 50 100 150 200 MI.
0 50 100 150 200 Km.
VANCAL 11626


VANCAL 11828
Ross
Creek
ZETA 1-84 Claims
ZETA GRID
OMEGA 1-32 Claims
116 A 3
64° 00
115 P 14
Fig: 2
ZETA Claims
Claim Location Map
REVISED
PROJ. No. 95
DWG. No.
SURVEY BY:
DRAWN BY: AI
DATE: AUG 84
SCALE:
NORANDA EXPLORATION
OFFICE: Whitehorse
0
500
1000 mts.

reconnaissance geological, geochemical, and geophysical surveys, trenching, and 10 NQ diamond drill holes totalling 883 m were completed on the Zeta 1-40 claims and surrounding Lost Horses batholith from June 16 to August 22, 1984.

2.2 WORK PROGRAM

Work commenced on the Zeta 1-40 claims on July 11, 1985 and was terminated on July 21, 1985. A crew of two geological staff completed detailed geological mapping, geochemical sampling, and core relogging and sampling. A total of 150 samples (Fig. 3) were collected: three 40 kg samples for K-Ar dating; 26 equally spaced (50 m) samples of granitic rock from the syenite-sediment contact to the granite core for wholerock and trace geochemistry; 100 samples from relogged diamond drill core; and 21 miscellaneous samples, basically of representative mineralization. In addition to samples for K-Ar dating and whole rock geochemistry, approximately 25 samples will be used for polished and thin section study. A total of 883 m of diamond drill core was relogged, resampled and photographed. The Zeta camp was serviced by a Bell 206 helicopter on casual charter from Trans North Turbo Air in Dawson City, Yukon.

3.0 REGIONAL GEOLOGY

The Zeta claims lie along the northern boundary of the Cretaceous Lost Horses batholith within the Syenite Range. The Lost Horses batholith is a roughly circular (8 km diameter) composite batholith with a core of granite grading outward to a rim of coarse, porphyritic syenite. Christopher (1973) has dated the syenite as late Cretaceous (85.3 $\pm$ 2.7 Ma). The syenite consists of large tabular Carlsbad-twinned K-feldspar megacrysts (80%) within a groundmass of hornblende, biotite, K-feldspar, plagioclase, and minor quartz and tourmaline. Towards the centre of the batholith the proportion of groundmass to phenocrysts increases, and in the granitic core the feldspar phenocrysts are stubby and scarce. The Cretaceous batholiths intrude Ordovicican to Silurian quartzites, coarse clastics, black and gray cherts, siltstones and greywackes of the Road River Group (Bostock, 1964). Previous work by the author and other Noranda personel (Biczok, 1983) suggests that these sediments may be part of the Devonian "Black Clastic Unit" (Thompson and Roots, 1982), however, no firm fossil evidence has been found. These Paleozoic sediments were deposited in an elongate, fault-bounded(?) basin which trends north-northeast and was broadly folded about an easterly trending axis. Local second or third order basins, bounded by graben-like fault systems, are suggested by the occurrence of stratiform barite and thick units of coarse chert-pebble conglomerate.

4.0 LOCAL GEOLOGY

The Zeta claims lie on the contact between the Cretaceous Lost Horses batholith and Ordovician-Silurian metasediments. Below, the sedimentary formations are described first, followed by the intrusive units.

Fine to coarse grained clastic and chemical metasediments generally strike at approximately 100^{o} and dip 80^{o} to the north. Away from the intrusion the dip shallows to 25^{o} north. The Ordovician-Silurian host metasediments, from the contact outwards are: quartzite and coarse clastics (Fig. 3: unit 1a), gray chert (1b), black chert and black chert with shale (1c), laminated barite (1d), and sandy siltstone to siliceous siltstone (1e).

Unit 1a is compact, locally rusty, pale to dark colored, fine to coarse grained quartzite that grades into greywacke. Bedding thicknesses are generally less than 20 cm. The unit is 100 m in width, is hornfelsed, and can be traced for several km along strike to the east and west. Reddish brown cassiterite is found locally along fractures and jointing planes. The quartzite unit is typically interbedded with coarse clastics and laminated graywacke and sandy siltstone. The coarse clastics are medium to coarse-grained pebbly quartzite to pebbly graywacke, and locally chert pebble matrix supported conglomerate. Clasts up to 2 cm in diameter, are white to black, angular, and occupy 10% of the rock. In alteration zones, the coarse clastic unit is bleached and gritty, the chert clasts are recognizable only by pale colored spots. Unit 1b, the light gray fractured chert unit, occurs in subcrop. Its composition and color is similar to clasts found in the chert pebble conglomerate. It is overlain by a black chert of unit 1c.

Unit 1c, black chert, is carbonaceous, and beds are approximately 1 m in thickness. The black chert beds are interbedded with black laminated carbonaceous shale. The close proximity of light and dark coloured cherts suggest that deep basin, euxinic sediments developed rapidly. Grey to black carbonaceous chert, cherty shale, and shale are thinly interbedded in beds up to 5 cm thick. Unit 1c is approximately 10 m thick whereas the gray chert and the black chert units are only 4 m thick.

Unit 1d, pale orange-weathering, finely interlaminated white siliceous barite, and white chert(?) is 3 m thick. The barite grades abruptly into the laminated medium grained, sandy siltsone to siliceous graywacke of unit 1e.

Unit 1e is finely bedded (up to 20 cm thick) and often fissile. Pyrite is not abundant but exposed surfaces generally are weathered rusty. The sandy siltstone to siliceous graywacke is tightly folded close to the intrusive contact.

The Lost Horses batholith, approximately 8 km in diameter, is zoned with a granite core and a syenite border. Unit 2a, the syenite, occurs at the margin of the batholith. It is a K-feldspar-phyric, hornblende plus biotite syenite (Fig. 3: unit 2a). Potassium feldspar megacrysts generally average 3 cm in length and comprise 65% of the rock, but zoned crystals 7 cm in length have been found up to 2.5 km from the contact. Hornblende, up to 20% ofthe rock and 8 mm in maximum length, generally is more abundant than biotite (maximum 10% of rock with books up to 8 mm in diameter), and is always less abundant than feldspar. Plagioclase is probably present in minor amounts (<10%). K-feldspar megacrysts near the contact are typically aligned, striking at approximately 140^{o} and dipping 70^{o} south; they are not aligned parallel to the contact. Feldspar megacrysts at the contact are randomly oriented and decrease in size to 2 cm in length. Rusty weathering quartz-chlorite xenoliths, up to 10 cm in diameter, are common only close to the contact.

Within drill core (DDH-5 and 9) a fine to coarse-grained biotite syenite has the form of a dyke; it is variably altered (Jago, 1984). Within the intrusions the dyke is coarse-grained with biotite crystals up to 1 cm in diameter. K-feldspar is scarce. Within the metasediments this unit is very fine-grained, often very biotite rich (up to 30%), and typically highly kaolinized and weakly to moderately hematized. Dyke splays are common (DDH-9), and the adjacent metasediments are always highly altered to clay.

A central zoned core, approximately 2.5 km in diameter, is composed of quartz syenite (units 2b and 2c) and tourmaline bearing granites (Fig. 3: unit 2d). Contacts between units depicted on Figure 3 are gradational. Quartz syenite contains up to 25% smoky brown quartz (2 mm diameter), 60% K-feldspar (2 cm diameter), 10-15% hornblende (2 mm diameter) and 5% biotite (1 mm diameter). Quartz content gradually increases inwards over several hundred meters. Hornblende predominates over biotite but locally greater concentrations of biotite are present. Oriented K-feldspar phenocrysts are up to 5 cm in length, are zoned, and locally have albitic rims. Tourmaline in the quartz syenite is prevalent adjacent to the tourmaline patch granite (unit 2c, below). Up to 8% tourmaline, occurs interstitially, and as 3 mm wide veins. Feldspar megacrysts from 3 cm to 8 cm long are strongly zoned and commonly aligned suggesting that large scale fractionation, crystal-mush movements and crystal settling occurred prior to complete crystallization of the groundmass. The tourmaline patch granite (Fig. 3: unit 2d) is medium grained and contains 60% feldspar (1 cm diameter), 30% brown quartz (3 mm diameter), 5% tourmaline, and 5% opaques and muscovite. Tourmaline is locally concentrated (up to 25%) in large (up to 25 cm in diameter) oval zoned orbicules (see Vernon, 1985) which also contain brown sericitized plagioclase (30%), quartz (40%) and traces of green fluorite, pyrite and chalcopyrite. Closely related to the tourmaline patch granite is a fine grained brown spotted granite of similar composition composed of 4% tourmaline, 40% quartz and 55% feldspar thought to be related to a chilled contact phase.

A fine to medium grained quartz feldspar porphyry dike (Fig. 3: unit 3a), 30 m in width, has been found on Arsenic Ridge (Fig. 3) and traced parallel to the sediment/intrusive contact for a distance of 2 km. The dike is extremely weathered and ranges in color from white to pale red. Phenocrysts of anhedral clear to brown quartz (15%), up to 8 mm in diameter, and feldspar up to 4 mm in diameter, are found in a fine grained quartz and feldspar matrix. Tourmaline aggregates up to 3 mm in diameter, and pyrite cubes (<1%) up to 1.5 cm in diameter, are locally present.

Fine to medium grained granite dikes (Fig. 3: unit 3b), 1 m in width are present along Arsenic Ridge. The dike contains 30% brown quartz (1 mm diameter), 3% biotite, 55% feldspar (1 mm diameter), 2% pyrrhotite, and 5% tourmaline as rosettes, needles and splays up to 2 cm across.

A porphyritic biotite dyke (Fig. 3: unit 3c) (lamprophyre?) contains 10% biotite phenocrysts up to 1.5 cm in diameter in a gray to dark gray fine grained matrix. Traces of disseminated chalcopyrite are found within the dyke.

5.0 MINERALIZATION AND ALTERATON

Mineralization on the Zeta Property occurs in two forms: 1) cassiterite in hornfelsed quartzite, and 2) greisen veins.

Alteration of the host metasediments is very intense, being characterized by moderate to strong bleaching and potasssium metasomatism. This has formed a light coloured, porous, and permeable rock in which atoll structures have developed around remnant quartz clasts.

The alteration halo associated with the greisen veins (quartz ± tourmaline ± sulphide) is 5 to 10 times wider than the vein and consists of parallel zones of moderately to completely kaolinized and strongly limonitized (± hematite) intrusive. Alteration beside vein material is complete, forming a massive, locally banded and porous zone of kaolinite. Gradationally outwards from the vein, kaolinization decreases in intensity and igneous textures are sometimes preserved. Biotite, followed by hornblende, progressively becomes more common as relatively unaltered intrusive is approached. Highly kaolinized intrusive is in sharp contact with relatively unaltered intrusive. Limonitization and chloritization are the most distal alteration features of these veins. Within the veins, two massive tourmaline vein sections are often sharply separated by a narrow clay-rich section. The latter is either a distinct lithology or, when containing disseminated tourmaline, is interpreted as a highly altered tourmaline vein.

A comparison between preliminary geochemical results, vein mineralogies, and morphologies suggests that several periods of mineralization are required to economically mineralize the tourmaline-greisen veins at the Zeta property.

5.0.1 Greisen in Hornfels

Reddish brown cassiterite, locally up to 0.5% of the rock and 3 mm in diameter, is found on fracture surfaces and as veinlettes within the quartzite. Fracture surfaces trend at approximately 120 degrees with a steep northerly dip. Sericite (5-10%) is closely associated with the cassiterite. It occurs as 1-2 mm wide veinletes and fracture coatings near the contact. Hornfelsed quartzite, containing 3% pyrite, extends for about 100 m outwards from the contact. Cassiterite blebs have been found in quartz vein float within the quartzite.

5.0.2 Greisen Veins

The greisen veins are of two types: 1) dominantly quartz-sulphide assemblages with very minor tourmaline, and 2) dominantly tourmaline with lesser quartz and minor sulphides.

5.0.2.1 Quartz-sulphide, low tourmaline veins

Sulphide rich veins are represented by the Low Fog Showing and the Cirque Showing (Fig. 3). They occupy small scale structures such as joints and trend 60^o to 90^o with a steep dip. Several sub-parallel, narrow (15 m), but laterally extensive (>500 m long) shear zones, contain several sub-parallel discontinuously mineralized quartz-sulphide-kaolinite-limonite veins. Individual veins are narrow (<30 cm wide), and are typically splayed and separated from the parallel veins by less than two to three metres of barren host rock. The sulpides are typically concentrated in the centre of the vein and are often well zoned with arsenopyrite rich margins and quartz-stibnite rich cores. Lateral zonation is untested. The alteration envelopes around these veins may be up to 80% of total vein/structure width.

Hand samples from the Cirque and the Low Fog showings (Fig. 3) contain: sulphide minerals (10-65%) including pyrite, arsenopyrite and jamesonite; gangue minerals including quartz (50-74%), tourmaline (1-30%) and altered feldspar (1-7%). A detailed polished section description is in Appendix 1. The Cirque and the Low Fog showing contain unique sulphide and gangue mineralogies. The Cirque showing, 1.4 m in width, is characterized by abundant pyrite and tourmaline with minor arsenopyrite and altered feldspars. The Low Fog showing is, by comparison, arsenopyrite and quartz rich with minor tourmaline and pyrite. Both showings contain textures indicative of open space filling environments of deposition (Appendix 1).

Hand samples from the Cirque showing are from a zoned pyrite vein containing about 65% pyrite, 5% arsenopyrite, 25% tourmaline and 5% altered feldspars. Five zones within this pyrite rich vein can be defined as (from margin to core): 1) coarse grained pyrite; 2) massive pyrite; 3) medium grained pyrite; 4) fine grained pyrite; and 5) tourmaline (Abercrombie, 1984).
Samples from zones 1, 2 and 3, above, contain tourmaline that apparently fills open spaces within the syenite host. Altered feldspars are all that remain to identify the original syenite host rock.

Mineralized veins from the Low Fog showing are characteristically quartz rich (50-75%) with arsenopyrite (25%), jamesonite (5%), tourmaline (1-15%) and traces of pyrite. Arsenopyrite veins are up to 0.5 cm in width and jamesonite occurs in aggregates of acicular crystals up to 0.3 cm in diameter. Tourmaline is a minor component when compared with quartz, and crystal aggregates vary from 0.2-0.45 cm in diameter. Pyrite is usually fine grained and disseminated throughout the rock. The host rock and arsenopyrite veins are fractured and disrupted. Quartz crystals up to 1.2 cm in diameter grow from the vein wall with comb texture suggesting an open space filling environment for deposition. Sample LF-4 from the Low Fog showing is quartz rich but the dominant sulphide is pyrite. Anhedral pyrite, the most abundant visible sulphide, comprises up to 10% of the rock. Tourmaline (22%), quartz (62%), and altered feldspar make up the groundmass.

5.0.2.2 Quartz-tourmaline, low sulphide veins

Quartz-tourmaline-low sulphide veins include the Main Zone and the Gash showing (Fig. 3). Mineralization occurs within small joint fillings as well as large regional foliation or fracture zones. The trend of the joints and foliation zones are similar to those of the sulphide rich veins (60^{o} to 80^{o}). Mineralized structures along Arsenic Ridge are less than 80 m long although tourmaline as joint fillings define several zones with widths of up to 175 m. Veins are up to 3 m in width but typically are less than 50cm. Tourmaline, the most important gangue mineral, consists of three generations: 1) coarse, radial aggregates of black tourmaline replaced by 2) blue-green tourmaline followed by 3) light brown tourmaline. Fine grained arsenopyrite (<5%), pyrite (<1%), jamesonite and boulangerite (<0.5%) are found at the vein margins. Drilling has suggested that the sulphide content may increase with depth (Jago, 1984). The symmetrical alteration envelope is up to 10 times the total vein width.

The Main Zone vein (0.9-3.0 m wide), exposed on surface in the 1983 Trench, has been intersected over a lateral distance of 150 m, a vertical distance of 100 m and is open at depth. The vein intersects the contact at 60^{o} and contains between one and three parallel tourmaline, and tourmaline-quartz $\pm$ clay $\pm$ sulphide greisen veins. These silver-antimony-tin veins are mineralogically complex and erratically mineralized. Veins range in width from 1.5 m to several centimetres, forming, in drill core, semi-continuous veins up to 3 m wide. Examination of assay data and core samples suggests that the vein has been heavily leached within 40 metres of surface, thus lowering the average silver grade to 4 opt. Deeper levels of the vein, which presumably have not been leached, contain 20 to 36 opt silver with significant Pb and Sb values. Tin mineralization averages 0.1% throughout the vein, but values as high as 0.6% Sn have been received from float samples.

The Gash vein is a curvilinear shear zone with tourmaline and intermittent sulphide veins along its length. Sulphides are typically rare (<5%). The zone varies from 1-2 m in width and contains thinly spaced, very narrow sub-parallel tourmaline joint fillings. Where the vein is 1 m wide it consists of quartz and clay with subordinate (5%)

arsenopyrite and pyrite. The vein is enclosed in a 1.0 m wide symmetrical alteration envelope. Near the vein, kaolinization and limonitization are very intense although porphyritic textures are still preserved. This alteration diminishes toward the unaltered host where biotitization predominates. Poorly terminated quartz crystals in the vein core, the colloform nature of tourmaline mineralization and the symmetry of vein mineralogies suggests that multiple episodes of mineralization occurred, and that dilation continued after the last fluid movement.

6.0 CONCLUSIONS

The Zeta 1-84 claims, owned by Noranda Exploration Company Limited, are approximately 105 km east of Dawson City, Yukon Territory (NTS: 115/P/14 and 116/A/03); 63°59' N, 137°20'W. The claims lie along the northern contact between the Cretaceous Lost Horses batholith and the Ordovician-Silurian fine to coarse grained clastic and chemical metasediments of the Road River Group. Work comenced on the claims on July 11, 1985 and was terminated on July 21, 1985 with the completion of detailed geological mapping, geochemical sampling, core relogging and sampling. A total of $ 6,148.93 was spent on the property during the dates specified (Appendix 2).

Significant tin-silver mineralization, associated with cassiterite bearing greisenized veins and veinlets, has been found on the property.

7.0 REFERENCES

Abercrombie, S.M., 1985. Ore Mineralogy of the Zeta Prospect, Central Yukon Territory. Confidential Research Report, University of British Columbia.

Barton, P.B., 1969.Thermochemical Study of the System Fe-As-S. Geochim. Cosmochim. Acta., 33, 841-857.

Biczok, J.L., 1983. Omega 1-32 Claims, Exploration Report No. 1, Geology, Geochemistry and Geophysics, 1983. Noranda Exploration Company Ltd. Assessment Report.

Bostock, H.S., 1964. Geology McQueston, Yukon Territory. GSC Map 1143A.

Clarke, L.A., 1960. The Fe-As-S System; Phase Relations and Applications. Economic Geology, Volume 55, pp. 1345-1381.

Christopher, P.A., 1973. Application of K-Ar and Fission-Track Dating to the Metallogeny of Porphyry and Related Mineral Deposits in the Canadian Cordillera. Unpublished Ph.D. Thesis, UBC.

Edwards, A.B., 1954. Textures of the Ore Minerals and Their Significance. Melbourne; The Australian Institute of Mining and Metallurgy.

Jago, B., 1982. Yukon Uranium Project on Exloration. Mattagami Lake Exploration Ltd./Noranda Exploration Co., Ltd. Internal Company Report.

Jago, B., 1984. The Zeta 1984 Exploration Report. Geology, Geochemistry, Geophysics, Trenching and Diamond Drilling. Zeta 1-84 Claims. Noranda Exploration Co., Ltd. Internal Company Report.

Lee, J.T., 1972. Experimental Investigation on Stannite-Sphalerite Solid Solution Series. Neues Jahrb. Mineral. Monatsh. pp. 556-559.

Ribbe, P.H., 1974 (Editor). Sulphide Mineralogy. Mineralogical Society of America Short Course Notes. Volume 1, Southern Printing Company, Blacksburg, Virginia. November 1974.

Shcherba, G.N., 1970. Greisens. International Geology Review, Volume 12, No. 2, pp. 114-150.

Thompson, R.I. and Roots, C.F., 1982. Ogilvie Mountains; Part A: A New Regional Mapping Program, Part B: Volcanic rocks in north-central Dawson map area. In Current Research, Part A. Geological Survey of Canada, Paper 82-1A, p. 403-414.

Vernon, R.H., 1985. Possible Role of Superheated Magma in the Formation of Orbicular Granitoids. Geology, Volume 13, No. 12, pp. 843-845.

APPENDIX I

MINERALOGY OF THE ZETA PROPERTY

MINERALOGY OF THE ZETA PROPERTY

Eight hypogene and supergene sulphide minerals were observed in the polished sections examined from the Cirque and Low Fog Showing and the 1983 Trench. These include arsenopyrite, pyrite, jamesonite, sphalerite, stannite, chalcopyrite, cassiterite and covellite. Table 1 and Table 2 show the modal percentages, grain sizes, and occurrences of the sulphide minerals.

Arsenopyrite, the most abundant sulphide, is present in all of the polished sections. It occurs as fractured veins (0.6 mm in width), euhedral crystals (average 0.6 mm diameter). Arsenopyrite varies from trace amounts to 30% within the sections. The veins have been fractured; these fractures have been filled by quartz. Anhedral arsenopyrite crystals (LF-3) have been shattered resulting in grains that retain the original euhedral outline but have a matrix of very fine grained euhedral to anhedral arsenopyrite crystals.~~(LF-3) have been shattered resulting~~ in ~~grains that retain~~ the original ~~euhedral to anhedral arsenopyrite~~. Small euhedral arsenopyrite often coats quartz crystals that have been formed in open spaces (LF-3). Arsenopyrite is in contact with pyrite, jamesonite, stannite and sphalerite. Arsenopyrite is commonly intergrown with pyrite containing inclusions of pyrite, and pyrite containing inclusions of arsenopyrite. Sphalerite, quartz and tourmaline, in addition to pyrite, occur as inclusions within arsenoyrite. Arsenopyrite is replaced by quartz and tourmaline; replacement varies from minor (<5%) to almost complete (90%) and is greatest when in close proximity to tourmaline grains. Both open space filling (if matrix removed fractures fit perfectly together), and replacement textures are apparent. Euhedral arsenoyrite, dodecahedron shape, appears to be late stage, perhaps recrystallization or crystallization within an open space. Sample LF-2 contained one minute arsenopyrite grain at the contact between stannite and sphalerite. but the paragenetic implications are not clear.

Pyrite is present in all of the polished sections from the Cirque showing and the Low Fog showing. Diameters of grains have a mode of 0.63 mm and a range from 0.05 mm to 1.4 cm. Percentage varies from 1 to 75% with the larger percentage being relted to the sections from the Cirque showing. Pyrite occurs as massive veins (C-3B) and as minute (0.05 mm) crystals (LF-3) disseminated throughout the rock. Pyrite is in contact with jamesonite, arsenopyrit, stannite, chalcopyrite, cassiterite and sphalerite. Sphalerite, chalcopyrite, cassiterite, jamesonite, quartz, tourmaline, and altered feldspar appear as inclusions within pyrite. Pyrite in C-3A and C-3B appears to have been deposited in three stages. The first stage makes up the majority of the section and is anhedral in shape. ~~The final stage is euhedral~~ The first stage makes up the majority ~~of the section and~~ is anhedral in shape. The final stage is euhedral pyrite formed in open spaces usually in contact with gangue. The second stage consists of subhedral pyrite formed between the original and the final stage. This subhedral pyrite is replaced by stannite and is rimmed by euhedral pyrite of the final stage. Cassiterite is included within pyrite in C-3A and C-3B. Pyrite in LF-3, like arsenopyrite, is commonly fractured. Small euhedral crystals,

Table 1. Grain size (mm) of minerals in polished sections.

AVERAGE SIZE (LARGEST SIZE)

SAMPLE	ASPY	PY	JAM	SL	ST	CP	CAS	CV	FELD	QZ	TO
C-3A	0.45 (0.9)	3.5 (13)	1.5 (2)	0.15 (0.4)	-	-	0.15 (0.5)	-	2.0 (5)	0.17 (1.4)	2.4 (8.0)
C-3B	0.6 (1.5)	3.0 (14)	0.1 (0.3)	0.2 (0.8)	-	<0.01 (0.05)	0.3 (0.4)	-	2.0 (13)	0.6 (1.6)	0.4 (1.0)
LF-1	0.9 (7.0)	0.15 (0.3)	1.3 (3.4)	-	-	-	-	-	-	3 (8)	1 (4)
LF-2	4 (10)	0.3 (0.65)	1.1 (2.3)	1.1 (2.0)	1.2 (2.0)	<0.01 (0.01)	-	-	-	2 (7)	0.35 (0.8)
LF-3	0.3 (6.0)	0.05 (1.0)	0.3 (1.5)	0.15 (1.1)	0.15 (0.23)	<0.01 (0.01)	-	-	-	1.4 (9.5)	1.2 (2.8)
LF-4	0.3 (0.6)	0.9 (6)	-	0.1 (0.4)	0.05 (0.15)	<0.01 (0.3)	-	-	3 (5)	<0.01	1.1 (1.6)
R35226A	0.4 (0.7)	-	-	0.07 (0.15)	-	<0.01 (0.05)	0.03 (0.1)	0.01 (0.05)	-	0.4 (1.2)	0.2 (2.0)
R35226B	0.1 (1.2)	-	0.15 (0.6)	0.2 (0.8)	0.05 (0.15)	<0.01 (0.01)	-	<0.01	-	0.25 (1.5)	0.3 (2.0)
AVERAGES	0.8 (1.0)	0.6 (1.4)	0.5 (3.4)	0.3 (2.0)	0.4 (2.0)	<0.01 (0.3)	0.25 (0.5)	<0.01 (0.05)	8 (13)	0.5 (9.5)	2.0 (8.0)

Table 2. Abundance(%) of minerals in polished sections.

SAMPLE	ASPY	PY	JAM	SL	ST	CP	CAS	CV	FELD	QZ	TO
C-3A	5	75	tr	1	-	-	tr	-	5	4	10
C-3B	5	60	1	2	-	tr	tr	-	25	3	4
LF-1	30	1	8	-	-	-	-	-	-	50	11
LF-2	17	3	8	1	1	tr	-	-	-	65	5
LF-3	18	3	6	2	1	tr	-	-	-	65	5
LF-4	tr	10	-	1	tr	tr	-	-	5	62	22
R35226A	1	-	-	tr	-	tr	1	tr	-	40	59
R35226B	2	-	8	1	tr	tr	-	<1	-	55	33
Average when present	10	35	6	1	1	tr	tr	tr	12	43	19

Abbreviations used: ASPY=arsenopyrite; PY=pyrite; JAM=jamesonite; SL=sphalerite ST=stannite; CP=chalcopyrite; CAS=cassiterite; CV=covellite; FELD=altered feldspar; QZ=quartz; TO=tourmaline; tr=trace; "-" =not present also like arsenoyrite, coat quartz crystals that developed in an open space environment. The interior of some pyrite grains are composed of a mosaic of anhedral and euhedral crystals while retaining the original outline.

Pyrite poikiloblasts are common in LF-3 and are usually in contact with arsenopyrite. Pyrite has recrystallized to incorporate quartz gangue and jamesonite. Quartz crystals probably filled open spaces.

Jamesonite is found in all of the samples from the Cirque showing. It is present in sections LF-1 to LF-3, which are from the Low Fog showing, and section R35226B from the 1983 Trench. The needle shaped aggregates are 0.52 mm in diameter and from 0.1 to 3.4 mm in length. Percentage of jamesonite in the sections ranges from 1 to 8%. Jamesonite is in contact with stannite, pyrite, arsenopyrite, chalcopyrite, arsenopyrite, quartz and tourmaline, and also is included within pyrite. In sections LF-3 and LF-2 it fills fractures and forms veinlets within sphalerite. Chalcopyrite blebs are found in jamesonite in section R35226B. Jamesonite occurs as blebs within sphalerite and arsenopyrite in section R35226B. The latter is unusual because jamesonite in the other sections appears to represent late stage deposition (it fills fractures in samples LF-2 and LF-3). Two stages of jamesonite deposition are possible but cannot be defined with certainty. Jamesonite replaces arsenopyrite, stannite and sphalerite and is being replaced by quartz. Intersecting fractures within jamesonite aggregates indicate replacement.

Sphalerite is present in all sections except LF-1. Average modal grain size is 0.28 mm and ranges from 0.15 to 2.0 mm. Subhedral sphalerite comprises up to 2% of the rock. It is in contact with jamesonite, arsenopyrite, stannite, chalcopyrite, covellite and pyrite. Samples C-3B, LF-2 to LF-4 and R3226B contain minute chalcopyrite blebs. Samples LF-2 to LF-4 and R35226B contain blebs of stannite. Chalcopyrite and stannite blebs occur with emulsion texture in sphalerite suggesting that they were exsolved from sphalerite. Sphalerite is found included within arsenopyrite in Sample LF-2 and within pyrite in LF-4. Stannite, jamesonite, quartz and tourmaline replace sphalerite. Jamesonite in LF-3 fills fractures within sphalerite. Sphalerite contains inclusions of quartz and tourmaline gangue. Sphalerite and stannite are intergrown in Sample LF-3.

Stannite (confirmed by SEM-EDS) is found within samples LF-2 to LF-4 and R35226B. Stannite is commonly twinned and comprises trace to 1% of the rock. Average modal grain size is 0.36 mm but can vary from 0.15 to 2.0 mm in diameter. Samples LF-3 and R35226B contain the majority of the stannite. Stannite is in contact with sphalerite, jamesonite and pyrite. It is included within sphalerite in all of the above sections as exsolution blebs. Stannite contains inclusions of sphalerite, pyrite, jamesonite and quartz. Jamesonite in LF-3 and sphalerite in R35226B are replacing stannite. Pyrite and stannite are intergrown in Sample C-3B. Stannite in this sample is localized along pyrite edges, and fills fractures and cleavage where pyrite is surrounded by quartz. Stannite in this sample is always in small fragments of second stage pyrite (discussed under pyrite). Stannite and sphalerite are commonly found together in Sample LF-3.

Chalcopyrite , in all of the sections except for C-3A and LF-1, forms anhedral blebs ranging from <0.01 to 0.05 mm in diameter with the average mode <0.01mm. It is usually found in trace amounts as exsolution blebs within sphalerite. In section R35226B chalcopyrite is replaced by stannite and covellite. It is rarely found in jamesonite and pyrite. Chalcopyrite is always associated with sphalerite.

Cassiterite , in trace amounts in C-3A and C-3B, forms acicular masses or clusters that range in size from 0.03 to 0.5 mm. Average modal diameter is 0.25 mm. Cassiterite is either within pyrite or quartz gangue. It apparently replaces tourmaline.

Covellite, a secondary sulphide mineral within samples R35226B and R35226A, occurs as fine grained aggregates in patches up to 0.05 mm in diameter. The average modal size is <0.01 mm. Covellite is replacing chalcopyrite, sphalerite and tourmaline. It is abundant in an isotropic, gray brown mineral (probably an arsenate) in sample R35226B.

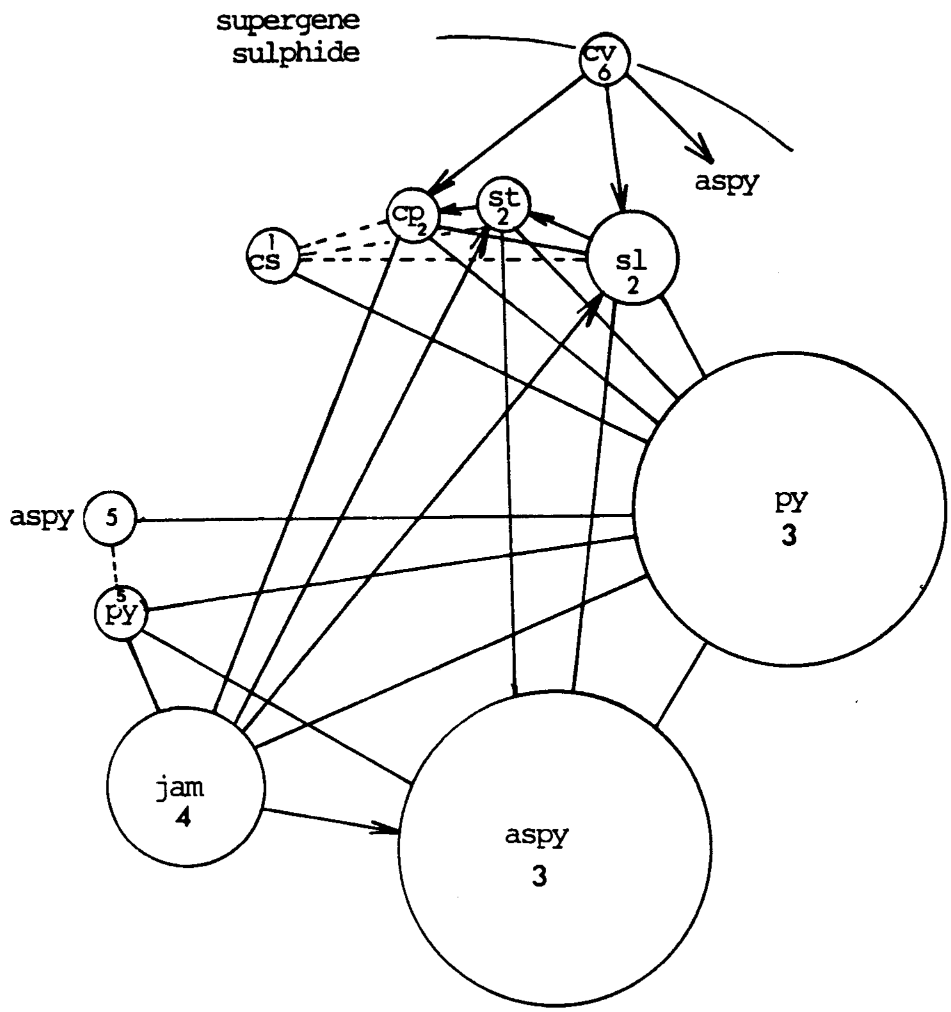
Quartz and tourmaline are the dominant gangue minerals. Tourmaline and quartz from polished thin sections R35226A and R35226B were examined under transmitted light. Tourmaline was deposited in three stages in both sections. The first stage (tourmaline-1), not found in Section R35226A, is a pale to light yellowish green tourmaline. It forms patches of extremely fine grained aggregates of equant to prismatic grains, averaging 0.02-0.03 mm in size, with coarser prismatic grains towards the borders of the patches. Later patches (tourmaline-2) consist of radiating aggregates of elongate prismatic grains up to 2 mm in length. Colors vary widely within and between grains. The darkest pleochroic colors are shades of medium green, brown, and blue. This stage and the next stage are present in both samples. Some blue tourmaline (tourmaline-3) forms late-stage veinlets cutting tourmaline patches of green and brown colors. Patches commonly grade at their ends into acicular tourmaline clusters surrounded by medium grained quartz. The next stage (tourmaline-4?) was found only in Sample R35226B. Later-formed, pale bluish green tourmaline consists of patches ranging from dense aggregates of unoriented, very fine to fine grains, to subparallel slightly radiating clusters of elongate prismatic grains up to 2.0 mm long. Some finer grained patches are strongly altered to a dense, somewhat fibrous mass of light brown color.

Quartz occurs mainly as fine to medium grained (0.02-0.05 mm) aggregates of a submosaic texture. A few patches consist of irregular aggregates of finer grained quartz, and may represent replaced mafic grains in the hostrock. Some grains (quartz-1) contain very abundant tiny acicular tourmaline needles whereas others, which possibly formed later (quartz-2) , contain none. Tourmaline replaces quartz.

Relations between sulphide and silicate minerals are tentative. One arsenopyrite grain in section R35226A was in contact with both the light yellow green tourmaline (tourmaline-1) and the deeply pleochroic tourmaline (tourmaline-2). It appears that arsenopyrite is later than the pale yellow tourmaline and is in contact with the pleochroic variety. This suggests that sulphide mineralization is post first-stage tourmaline.

A Vandeveer diagram (Fig. 4) shows the paragenesis of minerals for the Zeta Sn-Ag prospect. The following is a brief explanation of the paragenesis and an outline of the problems. Cassiterite is never in contact with chalcopyrite, stannite and sphalerite. Cassiterite occurs as inclusions within pyrite which is contemporaneous with arsenopyrite; it therefore is older than pyrite and arsenopyrite. Chalcopyrite and sphalerite are present as inclusions within pyrite and arsenopyrite. This indicates that pyrite and arsenopyrite are younger than chalcopyrite and sphalerite; however, in section LF-3, pyrite is found within sphalerite. It is possible that sphalerite, chalcopyrite, pyrite and arsenopyrite are approximately contemporaneous. Chalcopyrite and stannite appear as emulsion-textured blebs within sphalerite, and sphalerite occurs as blebs within stannite. Therefore, deposition of these latter minerals was contemporaneous. Pyrite and arsenopyrite are the major sulphide minerals present on the property. Pyrite inclusions are found within arsenopyrite, and arsenopyrite is found in pyrite; a contemporaneous period of deposition consequently is likely. Jamesonite is in contact with chalcopyrite, stannite, sphalerite, pyrite and arsenopyrite and replaces arsenopyrite, sphalerite and stannite. In one section jamesonite is included within arsenopyrite and sphalerite. This suggests that jamesonite is older than arsenopyrite and sphalerite, and that two periods of jamesonite deposition occurred. A period of fracturing resulted in discontinuous arsenopyrite veins, and recrystallized pyrite and arsenopyrite. Open spaces were filled by euhedral quartz crystals (coated by pyrite and arsenopyrite crystals), pyrite and arsenopyrite. Covellite is a supergene sulphide mineral replacing chalcopyrite, sphalerite and arsenopyrite. Tourmaline and quartz replace all of the sulphides.

Samples C-3A and C-3B contain arsenopyrite and pyrite in apparent equilibrium. Clarke (1960) demonstrated that this consequently is likely. Jamesonite is in contact with chalcopyrite, stannite, sphalerite, pyrite and arsenopyrite and replaces arsenopyrite, sphalerite and stannite. In one section jamesonite is included within arsenopyrite and sphalerite. This suggests that jamesonite is older than arsenopyrite and sphalerite, and that two periods of jamesonite deposition



LEGEND

——— line joins minerals in contact with each other

(b) → (a) replacement of "a" by "b"

Numerals indicate oldest(1) to youngest(6) minerals.
Size of circle indicates relative abundance of mineral.

Abbreviations

aspy - arsenopyrite
cs - cassiterite
cv - covellite
cp - chalcopyrite
jam - jamesonite
py - pyrite
sl - sphalerite
st - stannite

Figure 4. Vandeveer diagram showing paragenesis of sulphide minerals from Zeta prospect, Yukon.

occurred. A period of fracturing resulted in discontinuous arsenopyrite veins, and recrystallized pyrite and arsenopyrite. Open spaces were filled by euhedral quartz crystals (coated by pyrite and arsenopyrite crystals), pyrite and arsenopyrite. Covellite is a supergene sulphide mineral replacing chalcopyrite, sphalerite and arsenopyrite. Tourmaline and quartz replace all of the sulphides.

Samples C-3A and C-3B contain arsenopyrite and pyrite in apparent equilibrium. Clarke (1960) demonstrated that this assemblage was stable, at low pressures (0.02 Kbars), at 491±12°C; higher pressures (1.035 Kbars) raises this to 509±10°C). The maximum temperature at which arsenopyrite can exist is given as 702±3°C. Barton (1969) gives the minimum stability temperature for pyrite and arsenopyrite as 363±50°C. Edwards (1954) assumed that chalcopyrite exsolved from sphalerite and gave 350 to 400°C as the temperature of exsolution; this has not been supported by experimental evidence.

Stannite, chalcopyrite and sphalerite occur in apparent equilibrium together. For example, stannite and chalcopyrite has

been exsolved from sphalerite. Lee (1972) suggests that there is complete solid solution of Cu_2FeSnS and ZnS above approximately 860°C. Below 860°C stannite will exsolve from sphalerite. There is considerable solid solution of stannite in chalcopyrite above 462°C (Ribbe, 1974). At temperatures below 462°C stannite will exsolve out of chalcopyrite.

Assuming mineralogy is similar throughout the Zeta property, estimates of the temperature of emplacement for the sulphides can be estimated. A lower limit of 363±50°C is defined by the Fe-As-S system, while 860°C is the upper limit given by the Cu-Fe-Sn-S system. This upper limit is probably high because it is higher than the temperature of most granitic melts. Furthermore, Shcherba (1970) suggested that greisenization occurs between 470 to 360°C with the crystallization of ore-bearing vein quartz as follows: initial stages from 460 to 300°C, intermediate stages from 540 to 310°C, and late stages from 420 to 330°C; crystallization of quartz, after deposition of ore, is 430 to 290°C.

APPENDIX II

STATEMENT OF COSTS

STATEMENT OF COSTS

WAGES: S. Abercrombie- July 10-21, Aug. 2-4, 15 days @ $118/Day	$1,770
J. Nash- July 11-21, 10 Days @ $77/Day	770
HELICOPTER CHARTER	2,653.93
HOTEL ACCOMODATION	110
GROCERIES: 25 mandays @ $15/Day	375
VEHICLE RENTAL: 10 Days @ $17/Day	170
GASOLINE	100
REPORT WRITING	800
	TOTAL: $6,748.93

APPENDIX III

STATEMENT OF QUALIFICATIONS

STATEMENT OF QUALIFICATIONS OF SHIRLEY M. ABERCROMBIE

1) I, Shirley M. Abercrombie, of 2-6386 East Boulevard, Vancouver, British Columbia, Canada, testify that I supervised the exploration work summarized in this report and performed on the Zeta 1-84 claims, in the Dawson Mining District, Yukon Territory, Canada, in the summer of 1985.

2) I graduated with an H.B.Sc. (First Class Standing) degree in Geology from the University of Western Ontario in 1981.

3) I have worked as an explorationist is Ontario for two field seasons, in British Columbia, Northwest Territories for one field season and in Yukon for four field seasons.

4) I am currently a M.Sc. candidate in geology at The University of British Columbia.

5) I was employed with Noranda Exploration Co. Ltd. as a geologist while the work contained in this report was completed.

6) I am a Member in good standing of the Geological Association of Canada.

7) The material contained herein this report is correct to the best of my knowledge.

Shirley M Abercrombie

Shirley M. Abercrombie, H.B.Sc.
M.Sc. Geology Candidate, U.B.C.
January 1986

Ross Creek
Awesome Creek
Cyanide Creek
Arsenic Creek
Stonehedge Creek
Telephone Ridge
Cyanide Ridge
Arsenic Ridge
Stonehedge Ridge
Pinacle Ridge
Mt. Zeta
6285
Low Fog Showing
Canyon Showing
Cirque Showing
The Gosh
Noranda ZETA 1-84 Claims
Noranda OMEGA 1-56 Claims
116 A 3
64°00'
115 P 14
137°20'
137°15'
Legend
CRETACEOUS DYKES
3c Lamprophyre dyke.
3b Fine to medium grained granite dyke.
3a Quartz - feldspar porphyry dyke.
CRETACEOUS INTRUSIONS
2d Tourmaline patch granite and fine grained brown spotted granite.
2c Quartz syenite with tourmaline.
2b Quartz syenite - quartz, K-feldspar-phyric, hornblende ± biotite.
2a Syenite - K-feldspar-phyric, hornblende ± biotite.
ORDOVICIAN - SILURIAN METASEDIMENTS
Ie Sandy siltstone to siliceous greywacke.
Id Interlaminated white siliceous barite.
Ic Black chert, local interbeds of carbonaceous black shale.
Ib Light gray chert.
Ia Quartzite, hornfelsed, rusty, interbeds of coarse clastics laminated sandy siltstone and greywacke, minor limestone.
Symbols
Outcrop
Geological contact (defined, interpreted)
Trench (date, no.)
Bedding (vertical, inclined)
Joints (vertical, inclined)
Lineation w/ plunge
Flow alignment
Vein (dip unknown)
Tourmaline
Rock sample location and number
0 200 400 600 800 1000 metres
091782
Fig.: 3
REVISED
ZETA Claims
Geology
PROJ. No. 95
N.T.S. 115P14/116A3
DWG. No.
SURVEY BY: SA
DRAWN BY: AI
DATE: JAN 86
SCALE: 1:10,000 (approx.)
NORANDA EXPLORATION
OFFICE: Whitehorse