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GEOLOGICAL REPORT  
ON THE  
GOOSLY LAKE PROPERTY  
Omineca Mining Division  
British Columbia

for  
NORMINE REOURCES LTD.  
and  
AMIR MINES LTD.

by  
N.C. CARTER, Ph.D. P.Eng.

Victoria, B.C.

February 12, 1985

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## SUMMARY

Normine Resources Ltd. holds an option to purchase 12 mineral claims comprising 142 units at Goosly Lake south of Houston in west-central British Columbia. Normine plans to enter into a joint venture agreement with Amir Mines Ltd. to conduct an exploration program on the property.

The Goosly Lake mineral claims adjoin the Equity Silver mine property on the west. Much of the claims area is accessible by old logging roads. The property features relatively gentle relief and overburden is extensive over much of the claims area.

The Equity silver-copper-antimony-gold deposit (current reserves - 21.6 million tonnes grading 109 g/t silver, 0.85 g/t gold, 0.35% copper and 0.08% antimony) is a tabular zone conformable with host felsic pyroclastic rocks of late Mesozoic age. These are exposed in an erosional window within an extensive area of Tertiary volcanic rocks and are intruded by a quartz monzonite stock and a gabbroic plug which bracket the mineral deposit. The Equity deposit has a distinctive mineralogy and alteration mineral assemblage and a marked litho-geochemical signature for most elements.

The Goosly Lake mineral claims have geological and geochemical features similar to those at the Equity property. Mesozoic volcanic rocks are exposed in several

areas of the property and were noted in percussion drill holes on an adjacent claim. This limited drilling indicated an intensely altered zone with abundant pyrite mineralization trending onto the eastern part of the Goosly Lake property. A broad area in the central claims is anomalous in arsenic and mercury and values are similar to those found adjacent to the Equity deposit.

These features render the Goosly Lake property an attractive prospect which warrants a thorough exploration program.

A staged program is recommended with the first phase to include geophysical surveys and overburden drilling estimated to cost \$42,400. Pending encouraging results, a percussion drilling program with estimated costs of \$95,000 is recommended.

## INTRODUCTION

Normine Resources Ltd. has an option on 142 mineral claim units adjacent to the Equity Silver mine in west-central British Columbia. Normine plans to enter into a joint venture agreement with Amir Mines Ltd. to carry out exploratory work on the property.

This report, prepared at the request of Normine Resources Ltd. and Amir Mines Ltd., is based on a brief visit to the claims area by the writer on September 19, 1984, and on the writer's background knowledge of the area which includes numerous examinations of the Equity (Sam Goosly) property between 1969 and 1983.

Extensive published and unpublished information pertaining to the Equity deposit and the general area is available. References to much of this information are listed at the end of this report. Mr. G.D. Nordin, of Bema Industries Ltd., has prepared a report on the claims area for Amir Mines Ltd. and the writer has benefitted from access to this report and discussions with Mr. Nordin.

## LOCATION AND ACCESS

The Goosly Lake property is situated 30 km southeast of the municipality of Houston in west-central British Columbia (Figure 1). The geographic centre of the claims is at latitude 54 12' North and longitude 126 23' West.

Houston is on Provincial highway 16 and the northern CN

rail line. The town of Smithers, 64 km northwest of Houston, has daily scheduled airline service from Vancouver.

Access to the property is by 38 km of good surface gravel road linking Houston with Equity mine. Old logging roads, some of which require 4 wheel drive vehicles, provide access to the north and east parts of the property (Figure 2) and the southern claims are off the Buck Creek road which also affords access to Houston.

#### MINERAL PROPERTY

The Goosly Lake property consists of 8 modified grid and 4 2-post mineral claims comprising the equivalent of 142 units (Figure 2) in the Omineca Mining Division.

These claims are believed to have been located in accordance with procedures specified in the Mineral Act Regulations for the Province of British Columbia. The writer did not examine claim posts or lines during the visit to the property.

Details of mineral claims are as follows:

Name of Claim	Units	Record Number	Expiry Date
Tet 1	1	6073	March 6, 1985
Tet 2	1	6074	" "
Tet 3	1	6075	" "
Tet 4	1	6076	" "
Colin	18	6635	September 19, 1985
Dave	18	6636	" "
Bob	15	6637	" "
Ken	15	6638	" "
Gold	18	6639	" "
Morning	18	6640	" "
Sept 1	18	6662	" "
Sept	18	6663	" "

## PHYSICAL FEATURES

The Goosly Lake claims are situated in an upland plateau of relatively moderate relief. Elevations range from about 900 metres at Goosly Lake to 1400 metres in the northeast corner of the claim block (Figure 2).

Most prominent relief is along the northern boundary of the claims where rocky ridges display poorly developed columnar jointing at higher elevations. The former logging road into this part of the claims area (Figure 2) is along the break in slope below which the topographic gradient decreases and overburden is extensive.

Much of the original forest cover of jackpine and spruce has been removed by forest fire and recent logging. Small second growth jackpine is extensive in old burn areas.

## HISTORY

The discovery of the Sam Goosly silver-copper deposit (now Equity mine) in 1968 was the result of a persistent exploration effort in the area by Kennco Explorations (Western) Ltd. A window of Mesozoic rocks within an extensive area of Tertiary volcanic rocks, originally mapped by Lang (1942) in the Goosly Lake area, was selected by Kennco in the early 1960's for a regional geochemical survey.

Stream sediments in drainages northeast of Goosly Lake were found to be slightly anomalous in copper, zinc and fluorine (Ney et al, 1972). More detailed work in 1967

disclosed the presence of a small quartz monzonite stock containing weak copper-molybdenum mineralization, with an enveloping pyrite shell developed in volcanic rocks marginal to the intrusion. Soil sampling showed areas anomalous in silver, partly coincident with copper and molybdenum anomalies, but best developed over an area east of the quartz monzonite stock where tetrahedrite had been noted in volcanic rocks. Subsequent drilling outlined the mineralized zone which was later to become the Sam Goosly or Equity ore body.

Equity Mining Capital, a private company, acquired an option on the property in 1972 and carried out an underground bulk testing program on the Main Zone and drilling which delineated the Southern Tail Zone. Further drilling was done in participation with Placer Development, and later with Granby Mining in 1977. In late 1978, Placer Development undertook a joint venture with Equity and a production decision was announced in early 1979. Mining of the Southern Tail Zone began in late 1980 at a milling rate of 5000 tonnes per day.

News of the Sam Goosly discovery in late 1968 - early 1969 resulted in the staking of claims by companies and individuals throughout the general area. The area of the present Goosly Lake claims was held in 1969 by several companies and various surveys and physical work were performed over the subsequent five years.

The south part of the present claims area, south and east



of Goosly Lake, was held by Mark V Mines who undertook geochemical surveys. Dorita Silver Mines, a subsidiary of Silver Standard, collected stream sediment and soil samples in the southern and eastern parts of the present claims. Orequest Exploration Syndicate conducted soil geochemical surveys, bulldozer trenching and limited percussion drilling in the northern part of the present property.

The Sam claim, shown as Faraway Gold on Figure 2, and between the Goosly Lake claims and the Equity property, is part of ground first held by Dorita Silver Mines and subsequently by Payette River Mines Ltd. This company carried out an IP survey in 1971 and a four hole percussion drilling program in 1974. The present Sam claim was staked by a local prospector in 1980 and optioned to Carpenter Lake Resources Ltd. who conducted a limited amount of soil geochemistry. In 1983, J.P. Elwell, P.Eng., recommended a vertical diamond drill hole to test the IP anomaly defined by Payette River Mines, but this was not done and the option lapsed. Faraway Gold, a private company, acquired an option on the claim and drilled 15 percussion holes in early 1984. Drill cuttings from some of these holes were made available to Normine Resources Ltd. for examination and analysis.

#### REGIONAL GEOLOGICAL SETTING AND MINERAL DEPOSITS

The Goosly Lake area is within the Intermontane tectonic belt, comprised principally of Mesozoic volcanic and sedimentary rocks cut by intrusive rocks ranging in age from early Jurassic

to mid-Tertiary. More specifically, the area is in the northern part of the Nechako Trough, a subdivision of the Intermontane belt, in which the Mesozoic sequences are overlain by extensive areas of Tertiary volcanic rocks.

This is particularly evident in the region south of Houston where much of the area is underlain by a gently dipping sequence of Tertiary volcanic rocks and related intrusive centres. According to Church (1973, 1985) these are contained within the Buck Creek basin or caldera structure and are comprised of two major Eocene sequences, the Goosly Lake trachytic andesite flows and pyroclastic rocks and the slightly younger Buck Creek basaltic andesite flows and breccias.

Feeders for the Goosly Lake volcanics are gabbroic plugs and stocks aligned in an east-northeast direction with the central feeder or intrusive complex marginal to the Equity deposit (Church, 1971, 1973, 1985). Buck Creek volcanic centres occupy the outer edge of the Tertiary basin postulated by Church (1985).

Mesozoic layered rocks are exposed within and adjacent to the broad area of Tertiary rocks. These range in age from mid-Jurassic to late Cretaceous and are intruded by late Jurassic to early Tertiary granitic and gabbroic stocks and plugs. Jurassic to early Cretaceous volcanic and lesser sedimentary rocks (Hazelton and Skeena Groups) are found south of Houston, in the Burns Lake area and in erosional windows within the Tertiary cover rocks. One of these erosional

windows northeast of Goosly Lake exposes rocks which host the Equity deposit. Late Cretaceous rocks, referred to as the Tip Top Hill Volcanic Rocks (Church, 1971, 1973), and occurring in the Owen Lake area and north of Goosly Lake, are porphyritic andesites and pyroclastic rocks with some rhyolites.

The area south of Houston is noted for a variety of mineral deposit types including porphyry copper and molybdenum associated with small granitic intrusions and polymetallic precious and base metal vein and replacement deposits developed in Jurassic and Cretaceous volcanic rocks.

To date, the most significant mineral deposit in this area is that currently being mined by Equity Silver. This silver-copper deposit is hosted by a Mesozoic homoclinal north-striking, west-dipping sequence comprised of four principal divisions (Cyr et al, 1984). From oldest to youngest these are a basal clastic division of conglomerate, sandstone and siltstone, a felsic pyroclastic division of lapilli tuffs, breccia and dust tuff, a sedimentary-volcanic division of epiclastic volcanic rocks and chert pebble conglomerates and a volcanic flow division of andesite and dacite flows. This sequence is from 2400 to 4300 metres thick (Cyr et al, 1984) and is believed to be of early Cretaceous (Skeena Group) age, based on fossil evidence from lithologically similar sequences elsewhere in the region.

Intruding this sequence are an Eocene (57 m.y.) quartz

monzonite stock with weak copper-molybdenum mineralization on the west, a slightly younger (49 m.y.) gabbro-monzonite intrusive complex on the east and a series of dykes between the two.

The Equity deposit is a tabular zone conformable with host rocks of the pyroclastic division. Iron-copper-silver-antimony sulfides (pyrite, pyrrhotite, chalcopyrite, tetrahedrite) and lesser galena and sphalerite occur as disseminations, fracture and breccia fillings and veins over a strike length of 1500 metres. Three principal zones have been defined of which one, the Southern Tail Zone, is mined out. Current reserves of the Main Zone are 21.6 million tonnes of 109 g/t silver, 0.85 g/t gold, 0.35% copper and 0.08% antimony. A distinctive clay alteration zone surrounds the deposit and includes quartz, sericite, andalusite, tourmaline, scorzalite, corundum and some dumortierite (Wojdak and Sinclair, 1984).

The deposits are spatially between the quartz monzonite and gabbroic intrusions and the sulfide zones are cut by three types of post-mineral dykes and sills (Cyr et al, 1984) which are apparently related to the gabbro intrusive complex.

Three hypotheses have been advanced for the origin of the Equity deposit. Church (1971, 1985) believes the ore minerals were deposited by hydrothermal solutions related to the gabbro-monzonite intrusive complex, while Ney et al (1972) propose a volcanogenic origin associated with processes involved in the evolution of the felsic volcanic division

with subsequent remobilization of sulfides by the two later intrusive events. Current thought (Cyr et al,1984;Wojdak and Sinclair,1984) is that the deposits are related to the intrusion of the quartz monzonite, based partly on similar radiometric ages for alteration minerals associated with mineralization.

An appreciation of all three proposals for the origin of the Equity deposits is necessary for planning a program to search for similar deposits.

#### PROPERTY GEOLOGY AND MINERALIZATION

Much of the Goosly Lake property area is drift covered, with bedrock exposures restricted to higher elevations in the northern claims area and to isolated areas around Goosly Lake.

Oldest rocks exposed are andesitic lavas and breccias, believed to be part of the Tip Top Hill volcanic rocks (Church,1971). These occur north and south of Goosly Lake and in the northwest part of the present claims adjacent to Klo Creek. Recent percussion drilling on the adjacent Faraway Gold claim intersected rocks of apparent andesite-dacite composition which may be equivalent to the host rocks at the Equity deposit.

Tertiary volcanic rocks, part of the Goosly Lake and Buck Creek sequences (Church,1971) are exposed in road cuts and ridges in the northern part of the property. Exposures

seen by the writer were uniform grey trachytic textured flows with prominent aligned 4 mm feldspar phenocrysts. These are overlain by crudely columnar jointed Buck Creek volcanics at higher elevations. Goosly Lake rocks were intersected in previous trenching and percussion drilling programs on the property (Cochran,1970).

There is no record of economic mineralization on the present claims. However, two percussion drilling programs have been carried out on ground adjacent to the present property. The first of these was a four hole program (MacDonald,1974) which intersected sericite and clay altered dacites with 5-10% pyrite below barren Goosly Lake volcanic rocks. Geochemical analysis of samples showed anomalous copper, zinc, silver, antimony, arsenic and gold values which increased with depth. Faraway Gold's 1984 program covered a broader area and intersected generally higher pyrite (15-40%) content associated with intense quartz-sericite alteration. Limited geochemical analysis of samples yielded zinc values of up to 1000 ppm, arsenic to 400 ppm, antimony to 6 ppm, gold to 100 ppb and silver to 4,8 ppm.

Limited percussion drilling on this adjacent claim indicates the quartz-sericite-pyrite zone may be up to 700 metres in extent and it trends into the eastern part of the Goosly Lake property (Figure 3).

## GEOPHYSICAL AND GEOCHEMICAL SIGNATURES

Aeromagnetic maps for the Goosly Lake area (Figure 3) show higher magnetic susceptibilities over areas underlain by Tertiary volcanic rocks and the gabbro intrusive complex, a volcanic centre for the lower part of the Tertiary sequence.

Areas of lower magnetic response are underlain by Mesozoic rocks and these include rocks in the vicinity of the Equity deposit and those areas north and south of Goosly Lake (Figures 3 and 4).

Induced polarization surveys over the Equity property outlined a broad anomalous area due principally to disseminated sulfides but did not indicate the principal mineralized zone (Ney et al, 1972). Ground and airborne electromagnetic surveys were similarly unsuccessful in pin-pointing the zone.

An IP survey on what is now the Faraway Gold claim outlined a chargeability anomaly that was later shown to be due to abundant pyrite in Mesozoic rocks (Cochran, 1971, MacDonald, 1974).

Original soil geochemical surveys over the Equity property defined areas anomalous in silver (+5 ppm) which were found to be transported west of the ore zone (Ney et al, 1972). Overburden depths were in the order of 4 to 8 metres.

Previous soil geochemical surveys in the area of the present claims (Cochran, 1970, 1971) have been generally unsuccessful, except it was noted that copper values increased with depth in bulldozer trenches while zinc values remained the same.

Heavy mineral sampling of stream sediments in the drainage

emanating from the Equity deposit yielded strong arsenic, gold and silver anomalies (Barakso and Tegart, 1982).

Lithogeochemistry has been the most useful geochemical tool in the Goosly Lake area. Published results of these data (Church and Barakso, 1973; Church et al, 1976; Kowalchuk et al, 1984) show concentric high values for most base metals and silver and gold over the Equity deposit. Pathfinder elements, including arsenic and mercury, were also found to be good indicators and dispersal of arsenic may be used to delineate areas underlain by Mesozoic rocks (Church, et al, 1976).

Figures 5 and 6 show contoured values for arsenic and mercury for rock samples collected from the Equity property, the present Goosly Lake claims and the Faraway Gold claim and are based on published results referred to above and geochemical analyses of drill cuttings from some of the recent percussion drill holes on the Faraway Gold property.

Arsenic shows a good dispersal pattern outward from the Equity ore body with highest values above 23 ppm. (Figure 5). A zone with similar values is present in the central part of the Goosly Lake property with a slightly weaker zone, based on partial results, indicated on the Faraway Gold claim which appears to trend into the Goosly Lake property.

Higher mercury values (Figure 6) are not centred on the Equity deposit and may have been dispersed outward from it by later intrusive activity. Anomalous zones, coincident with those for arsenic, are centred on the Faraway Gold claim



and in the central part of the Goosly Lake property.

#### CONCLUSIONS

The Goosly Lake claims area is known to include areas of Mesozoic rocks believed to be similar to the host rocks at the nearby Equity silver-copper mine.

Limited percussion drill programs on an adjacent claim have intersected Mesozoic volcanic rocks which display intense quartz-sericite alteration with pyrite contents ranging from 10 to 40%. Analysis of some drill cuttings has yielded anomalous values for zinc, arsenic and mercury, and to a lesser degree, gold and silver. This zone, which extends over 700 metres, apparently trends into the eastern part of the Goosly Lake property.

Lithogeochemical studies in the area show distinctive dispersion haloes for many elements over the Equity ore body. Arsenic and mercury anomalies of similar magnitude to those at the Equity deposit are present in the central part of the Goosly Lake property and are coincident with areas underlain by Mesozoic volcanic rocks.

The genesis of the Equity deposit is imperfectly known. In this writer's opinion, it was probably formed by volcanic processes related to the evolution of the Mesozoic host rocks, with modification by later intrusive events.

Regardless of origin, the style, nature and setting of this type of deposit has apparently been due to specific sequences

of geological events which may be difficult to duplicate elsewhere than in the general Goosly Lake area.

For this and other reasons as outlined above, the Goosly Lake property is an attractive prospect which warrants a thorough exploration program to assess its potential for hosting Equity type mineralization.

#### RECOMMENDED PROGRAM

A staged exploration program is recommended to evaluate the two target areas defined to date on the property.

The first phase would involve the establishment of control grids over the coincident arsenic - mercury anomalous area and the altered zone trending into the eastern part of the property from the adjacent claim. Widely spaced Induced Polarization, VLF electromagnetic and magnetometer should assist in better definition of bedrock geology and potential sulfide mineralization. Because of the inherent problems in this area with conventional soil geochemistry, due to largely unknown depths of overburden consisting mainly of boulder clay, it is recommended that overburden drilling be utilized in selected areas to facilitate collection of proper samples. Samples collected should be analyzed for copper, zinc, silver and arsenic. Rock samples should be collected from available outcrop areas and analyzed for the above elements plus mercury.

Areas of interest defined by phase one work should be further tested by a percussion drilling program.

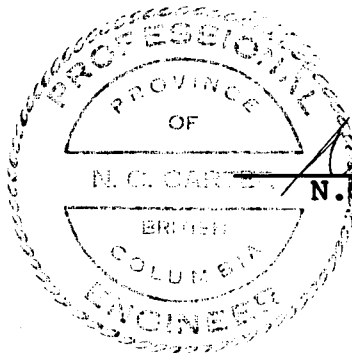
COST ESTIMATE

Phase I

Line cutting - 15 km @ \$275/km	\$4125
IP survey - 15 km @ \$750/km	\$11250
VLF-EM and Magnetometer survey- 15 km @ \$200/km	\$3000
Overburden drilling	\$5000
Sample analysis	\$2000
Support costs - travel, accomodation	\$7500
Engineering, supervision	\$4000
Contingencies	<u>\$5525</u>
Total, Phase I	\$42400

Phase II

Percussion drilling - 1200 metres @ \$50/metre	\$60000
Analytical costs	\$10000
Support costs	\$7500
Engineering, supervision	\$5000
Contingencies	<u>\$12500</u>
Total, Phase II	\$95000



*N.C. Carter Ph.D. P. Eng.*  
N.C. Carter, Ph.D. P. Eng.

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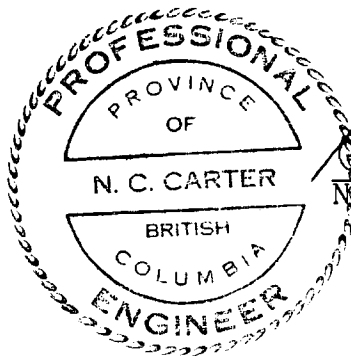
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CERTIFICATE

I, NICHOLAS C. CARTER, do hereby certify that:

1. I am a Consulting Geologist resident at 1410 Wende Road, Victoria, British Columbia.
2. I am a graduate of the University of New Brunswick with B.Sc.(1960), Michigan Technological University with M.S. (1962), and the University of British Columbia with Ph.D. (1974).
3. I am a registered Professional Engineer in the Association of Professional Engineers of British Columbia.
4. I have practised my profession in eastern and western Canada and in parts of the United States over the past 24 years.
5. This report is based on a personal examination of the Goosly Lake property on September 19, 1984, on published and unpublished reports and maps, and on my background knowledge of the general area.
6. I have no direct or indirect interest in the Goosly Lake mineral claims described in this report, or in either of Amir Mines Ltd. or Normine Resources Ltd.
7. permission is hereby granted to Amir Mines Ltd. and Normine Resources Ltd. to use this report in support of any Statement of Material Fact, Filing Statement or any other document to be submitted to the Superintendent of Brokers and the Vancouver Stock Exchange.



*N. C. Carter*  
N. C. Carter, Ph.D., P.Eng.

Victoria, B.C.  
February 12, 1985

**N.C. CARTER, Ph.D., P.Eng.**

Consulting Geologist

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June 14, 1985

The Directors  
Normine Resources Ltd.  
320 - 475 Howe Street  
Vancouver, B.C. V6C 2B3

Dear Sirs:

Re: Geological Report on the  
Goosly Lake Property  
Omenica Mining Division  
British Columbia

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With reference to the above report, prepared by the undersigned and dated February 12, 1985, a Phase II program of percussion drilling, estimated to cost \$95,000 was recommended.

Since the preparation of this report, the writer has been made aware of a report by J.P. Elwell, P. Eng. dealing with recent exploratory work on the Sam mineral claim, which adjoins the Normine claims on the east. Some forty percussion drill holes have been drilled in the central part of the Sam claim, many of which contain significant sulfide mineral content. Several of these holes are reported to have yielded anomalous values in zinc and silver. These latter holes suggest a northeast-southwest structure which may extend onto the Normine claims.

Limited results, as discussed in the Elwell report, indicate that percussion drilling, while of great value in outlining zones, may not yield definitive samples. For this reason, the percussion drilling program, as recommended by the writer for Normine claims, should be complemented by diamond drilling.

Accordingly, the writer recommends a revised Phase II program for the Normine Goosly Lake Property to consist of both percussion and diamond drilling at an estimated cost of \$200,000.00.

Permission is hereby granted to Normine Resources Ltd. to use this letter in support of any Statement of Material Facts, Filing Statement or other document to be submitted to the Office of the Superintendent of Brokers and the Vancouver Stock Exchange.

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N. C. Carter, Ph.D., P.Eng.

Victoria, B. C.  
June 14, 1985