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Afton Mines
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AFTON MINES LTD.
PROPERTY NEAR IRON MASK LAKE
KAMLOOPS MINING DIVISION, B. C.

CHAPMAN, WOOD & GRISWOLD LTD.



V. W. Shuttleworth



E. P. Chapman, Jr. President

March 9, 1967

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DRAWINGS (in pocket)	
Canadian Aero Mineral Surveys Ltd. Drwg. No. 7002 - Induced Polarization Survey	
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C. W. & G. Ltd. Drwg. No. 547 - Geochemical Survey	
C. W. & G. Ltd. Drwg. No. 548 - Geologic and Electromagnetic Surveys	

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

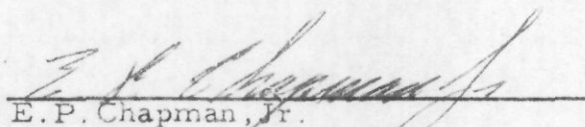
1. The Afton Mines Ltd. property near Iron Mask Lake, Kamloops Mining Division, British Columbia, includes an area of mineralized altered rocks of the Iron Mask Batholith.
2. The 1957 geochemical survey by Darling supports Ward's interpretation of the 1966 I.P. survey by Canadian Aero Mineral Surveys, Ltd. Dr. Ward suggests the I.P. results indicate a possible pyrite halo surrounding the copper mineralization. The interior of this halo contains the geochemical anomaly of Darling's survey.
3. Drilling to date has proven approximately 600,000 tons of material carrying 0.63% copper.
4. In our opinion there is a target potential of 50-to-150 million tons which with a tenor of 0.6% copper sufficiently close to surface could support an economic open pit mining operation.
5. We believe that a program of drilling can clearly demonstrate whether or not an orebody exists within the area of interest. Such a program would involve approximately 4,000 feet of diamond drilling plus up to 50,000 feet of diamond or percussion drilling contingent upon the results of the first 4,000 feet.
6. A program has been designed for this property.
It consists of two stages:
Stage 1 has an estimated cost of \$68,850.00
Stage 2, contingent upon favorable results from Stage 1, is estimated to cost between \$200,000.00 and \$700,000.00.

7. In our opinion, this is a speculative project involving the normal high risk factors encountered in mining exploration. However, we believe the value of the potential target more than justifies the expenditures recommended, provided speculative funds are available.

Respectfully submitted,

CHAPMAN, WOOD & GRISWOLD LTD.


V. W. Shuttleworth


E. P. Chapman, Jr.

March 9, 1967

CERTIFICATE

I, Edward P. Chapman Jr., of North Vancouver, B. C., do hereby certify:

1. That I am a Mining and Geological Engineer, residing at 2135 Argyle Avenue, West Vancouver, B. C.
2. That I am President of Chapman, Wood & Griswold Ltd., Consulting Mining Engineers and Geologists, with offices at 133 East 14th Street, North Vancouver, B. C.
3. That I am a registered Professional Engineer in the Province of British Columbia and a member of the Consulting Engineers' Division of the Association of Professional Engineers of British Columbia.
4. That I have practiced my profession for more than thirty years.
5. That neither I nor any employee of my company has any direct, indirect or contingent interest in Afton Mines Ltd., or any properties or subsidiaries which might be controlled by this company.
6. That our report dated March 9, 1967 is based upon an examination of Afton's property near Iron Mask Lake and an evaluation of data and information furnished to us by Afton Mines Ltd. by members of our engineering staff acting under my direct personal supervision.


E. P. Chapman Jr., P. Eng.

March 9, 1967

AFTON MINES LTD

Property near Iron Mask Lake

Kamloops Mining Division, B.C.

INTRODUCTION

Chapman, Wood & Griswold Ltd. has been requested to make an independent evaluation of the Afton Mines Ltd. property some seven and one quarter miles at approximately S75 °W from the City of Kamloops, B.C.

The property is in an area of mineralization known since the 1890's and considerable sporadic exploration has been carried out up to and including the present. The property concerned has enjoyed its share of attention but only a portion of the information developed over the years is currently available and much data pertinent for evaluation is unavailable. The more important reports and data that have been considered in writing this report are:

- 1) "Report of Geological and Geochemical Surveys covering DM Group of Mineral Claims of Graham Bousquet Gold Mines Limited and Afton Group of Mineral Claims of Axel Berglund", Harry W. Darling, B.Sc., November 30th, 1957.
- 2) "Report on Induced Polarization Survey of the Property near Iron Mask Lake, Kamloops, B.C., for Afton Mines Ltd.", by W. Schuur, Canadian Aero Mineral Surveys Ltd., Project No. 7002, September 22nd, 1966.
- 3) diamond drill records from Kennco Explorations (Canada) Limited for holes 1, 2, 5 - 14 inc., drilled between April 14, 1952 and

August 12, 1952.

- 4) Afton Claims, Percussion Drill Logs for holes Q1 to Q11 drilled during December 1964 and holes Q12 to Q49 drilled during June and July 1965, reportedly logged by C.F. Millar.

LOCATION AND ACCESS

The property borders on the south side of the Trans Canada Highway eight or nine miles by road west of Kamloops, B.C. It is easily accessible by car or truck and is served by a small network of roads. The terrain is moderate, rising to the south-east, and a suitable vehicle may be driven almost anywhere on the property through the sagebrush and grass.

Kamloops is served by two railroads, Canadian National and Canadian Pacific; the freight yards being about ten miles by road from the property. Kamloops also receives daily scheduled airline service.

TIMBER, WATER AND POWER

Timber appears sparse, but there is likely sufficient for exploration purposes on the southwestern portion of the property.

Several ponds and small lakes are on the property although some of them are expected to dry up during the summer. The Thompson River is about four miles north of and 1300 feet lower than the property.

Power lines and a gas pipe line parallel the Trans Canada Highway just north of the property.

LAND STATUS

The property consists of fifty full sized mineral claims, five fractions

and one mineral lease. The area considered in this report is covered by twelve to fourteen of these claims.

No investigation of title has been made by C.W. & G. Ltd. Since claim boundary location, validity of title and conflict of ownership are problems frequently encountered in areas of exploration activity such as this, we recommend that Afton Mines take any steps necessary to ensure their title position prior to undertaking any major exploration program.

GEOLOGY

The property is underlain by the Iron Mask Batholith in contact with sedimentary and volcanic rocks, including the Nicola Group. The composition of this intrusive is widely variable, ranging from ultrabasic to acidic.

The portion of interest mainly consists of syenites and diorites, with scattered later-stage intrusions such as magnetite dykes and basic rocks including pyroxenites and gabbros. Alteration is moderate, with chloritization, epidotization, albitization and carbonitization present. Fracture density is difficult to estimate due to lack of outcrop, but appears to be at least moderate. Core recovery in previous diamond drilling was often very poor, possibly as a result of highly fragmented rock.

Mineralization is not confined to a single rock type nor alteration type, but it does appear to favour the more acidic environments. Chalcopyrite is the predominant copper mineral. Native copper is common, probably occurring as primary replacement of mafic minerals. Other copper minerals appear to be of minor importance. Molybdenite has been noted in minor amounts in a few percussion drill assays. Pyrite, at present, appears to be relatively sparse which may explain the small amounts of secondary copper minerals such as malachite. The mineralization observed to date appears

as very thin fracture-fillings and fine-grained disseminations.

Regarding structure, as a result of the sparsity of outcrops, little is positively known. R.E. Jones, in a geologic appendix to Darling's 1957 report, suggests the main body of intrusive rocks occupies a north-westerly plunging anticline. Jones feels that there is evidence of either a wide-spread area of crushing or a complex history of faulting. If such is the case, favorable environments for mineral deposition may exist.

Jones's geologic appendix to Darling's report appears to be very well done, reliable and worthy of further detailed examination.

GEOCHEMICAL SURVEY

In 1957, Darling carried out a geochemical soil survey over the area. In his report, he states that he used a cold-attack dithizone method for total heavy metals. At the time, he considered 150 parts per million (p.p.m.) to be normal background, 300 p.p.m. to represent the threshold of anomaly and greater than 500 p.p.m. to be truly anomalous. These values and the values plotted on his map would appear to refer to total heavy metals. McPhar Geophysics Ltd., who supplied the equipment and reagents, independently tested numerous samples to obtain an average copper value of about 70% of the total heavy metal value. In other words, a value of 500 p.p.m. on the map probably represents only 350 p.p.m. copper. Never-the-less, within an area considerably larger than that presently under consideration, there is a definite soil geochemical anomaly as shown on the accompanying map, C.W. & G. Ltd. Drawing No. 547.

ELECTRO-MAGNETIC SURVEY

Virtually nothing is known about an E. M. survey except for the map showing the locations of conductors submitted by Darling in his report. With no information as to type of equipment used, or magnitude of the anomalies, no interpretation of them can be made. The best guess is that they delineate magnetite veins, of which there are known to be many in this area. Conversely, they may indicate richly mineralized shears of economic importance.

INDUCED POLARIZATION-RESISTIVITY SURVEY

Two I. P. surveys have been made on the property. The first, which due to lack of supporting information has not been considered in this report, was by McPhar Geophysics Ltd. for New Jersey Zinc Ltd. in 1959. The second survey was by Canadian Aero Mineral Surveys Ltd. for Afton Mines Ltd. in 1966. The results of this survey have been considered in some detail, including an independent appraisal by Stanley H. Ward, Ph.D. of Oakland, California. The results of the survey show one large polarizable zone, Zone I, trending south-easterly across a major portion of the property with three smaller zones to the north. Dr. Ward's hypothesis is that these four zones reflect a halo of pyrite (reinforced by magnetite in the north) surrounding an economically more interesting central zone of lower polarizability. Dr. Ward also notes that several areas of high polarizability are accompanied by high resistivities which might indicate silicified mineralized zones of possible ore grade material. This writer wishes to point out, however, that the main I. P. zone, Zone I, closely follows an occurrence of pyroxenite or gabbro as mapped by Jones, and may have little, if any, relation to economic mineralization. Zone III

could be caused by magnetite (reportedly, there are major amounts in the area), leaving only the relatively small and widely separated Zone II and Zone IV of economic interest.

DRILLING

Two drilling programs have been carried out on the property. The first, by Kennco Explorations (Canada) Ltd., was a diamond-drilling program consisting of 12 holes drilled to a total of 4260 feet. The second was a percussion-drilling program by Afton Mines Ltd. This second program drilled 54 percussion holes for a total of 9235 feet which includes five holes totalling 250 feet which were abandoned without reaching bedrock. The two programs were confined to a sub-rectangular area about 700 feet wide by 2100 feet long trending S70°E and centered near the old Pot Hook shaft. The combined programs have proven some 600,000 tons of 0.63% copper bearing material in the immediate vicinity of the Pot Hook shaft.

ECONOMIC CONSIDERATIONS

A considerable amount of work has been done on the property to date. Several copper occurrences are known and one shaft, the Pot Hook, extends to a depth of 330 feet with some 900 feet of drifts and cross-cuts, some portion of which intersects "low-grade ore". The geological, geochemical and induced polarization-resistivity surveys offer some degree of encouragement. The drilling programs were, in light of presently available data, not particularly well planned and tested a restricted portion of the area. However, the drilling did prove some 600,000 tons of mineralized material carrying 0.63% copper adjacent to the Pot Hook shaft and open to the north.

While the pyroxenite or gabbro in I.P. Zone I and magnetite in Zone III may detract from Dr. Ward's halo hypothesis, it is still the best explanation of the I.P. results. Also, while geochemistry in this part of British Columbia has often proved erratic and confusing, the soil geochemistry pattern on this property shows a marked correlation to the interior of the halo pattern of I.P. anomalies. Rock types also are more favourable within the I.P. halo. Furthermore, the limited amount of significant mineralization that has been proven is on the interior flank of I.P. Zone I and under a small but high geochemical anomaly. While the drilling did find some mineralization, three drill holes (two diamond and one percussion), drilled to depths between 200 and 300 vertical feet in an area to the east of the shaft and well within the I.P. halo and geochemical anomaly failed to return significant copper values. The surface area tested by these three holes is in the order of 75,000 square feet, only a minor portion of the total potential area.

Rock alteration, while only moderate, is present and is of types frequently associated with ore deposits.

In considering a potential target, if one takes the approximate area of the geochemical anomaly within the I.P. halo a tonnage potential of 50- to -150 million tons is reasonable. With this tonnage, combined with the excellent proximity of highway and railroad transportation, a tenor of 0.6% copper (which has been indicated) should prove economic, if situated sufficiently close to surface to permit exploitation by open pit mining methods.

RECOMMENDED PROGRAM

We believe that a large-scale drilling program should be approached with

caution. Before consideration of such a program, a small number of exploratory diamond drill holes are recommended in order to test various anomalies and hypotheses. A first stage diamond drilling program to test the geophysics, geochemistry and possible extension of known mineralization would involve nine holes for a total of 4000 feet of drilling. These recommended drill-sites are as follows:

- 1) At 117 + 00N on Line 156E, to be drilled 500 feet at -45° toward grid south to test a conductive polarizable zone interrupting an E.M. conductor. *117E*
- 2) At 100 + 00N on Line 132E, to be drilled 300 feet at -45° toward grid north to test a moderate I.P. anomaly with a sharp increase in resistivity near known copper and geochemical highs. *100E*
- 3) At 102 + 50N on Line 116E, to be drilled 420 feet at -45° toward grid north to test an I.P. high with a low embayment containing the extension of an E.M. conductor plus a sharp change in resistivity. *102E*
- 4) At 114 + 50N on Line 121E, to be drilled 300 feet at -90° to test the possible northerly extension of mineralization near the Pot Hook shaft. *114E*
- 5) At 119 + 00N on Line 114E, to be drilled 480 feet at -45° toward grid north to test an E.M. conductor and geochemical high on the south flank of I.P. Zone III. *119E*
- 6) At 114 + 00N on Line 110E, to be drilled 550 feet at -60° toward grid north to test a geochemical high on the northern side of an I.P. high in Zone I, a situation similar to that near the Pot Hook shaft. *114E*

- 7) At 116 + 00N on Line 100E, to be drilled 550 feet at -45° toward grid north to test an E. M. conductor in a very strong I. P. anomaly with known copper to the north.
- 8) At 119 + 00N on Line 92E, to be drilled 420 feet at -45° towards grid north to test a moderate I. P. anomaly on a fault intersection with one fault parallel to smaller nearby faults with apparently associated copper.
- 9) At 129 + 00N on Line 92E, to be drilled 500 feet at -45° toward grid north to test I. P. and geochemical anomalies near known copper occurrences.

In all cases, grid north is assumed to be 020° . Drill-sites have been picked without benefit of ground inspection and are therefore subject to revision as conditions might indicate.

Analysis of the results of this proposed program will indicate the nature of a second stage program. If copper mineralization appears associated with the linear I. P. Zone I, then a series of "fences" drilled across this zone would be in order. A similar pattern of drilling would be recommended if I. P. Zones II and III are of interest. To follow up indicated mineralization within the I. P. "halo" would require a grid program of drilling, possibly starting with 400 foot centers with plans to reduce to closer spacing of centers or to "fan" angled holes from selected sites as results might indicate. A successful first stage program could require up to 50,000 feet of second stage drilling. Costs for the second stage program would be sharply reduced if it is possible to use percussion

drills rather than diamond drills.

Estimates of the cost of these programs are shown on Table I.

TABLE I
ESTIMATED COST

A. STAGE I

DIAMOND DRILLING		\$40,200.00
4,020 feet		
ASSAYING		3,000.00
PERSONNEL		
Cost per month	2 mos.	6,670.00
1 Laborer-core splitter	\$450	
1 Geologist	700	
2 Samplers @ \$350	700	
1 Cook	600	
1 Expediter	450	
	<u>2900</u>	
Social Services 15%	435	
Total Monthly	<u>\$3335</u>	
SUBSISTENCE	2 mos.	3,000.00
Total monthly \$1500		
COMMUNICATION	2 mos.	1,000.00
Total monthly \$500		
VEHICLES	2 mos.	2,000.00
2 @ \$500		
Total monthly \$1000		
TRANSPORTATION & FREIGHT	2 mos.	1,000.00
Total monthly \$500		
CAPITAL EQUIPMENT		3,000.00
Tents, stove, refrigerator, bunks, core splitter, etc.		
CONTINGENCY		8,980.00
15%		
TOTAL STAGE I		<u>\$68,850.00</u>

B. STAGE 2

This stage is rather indefinite and contingent upon results of Stage I.
Costs for this stage could range between \$200,000.00 and \$700,000.00.

APPENDIX

Letter Report by Dr. Stanley H. Ward

STANLEY H. WARD
Consulting Geophysicist

8119 Phaeton Drive
Oakland, California
December 8, 1966

Mr. John F. Fairley
Chapman, Wood & Griswold
133 East 14th Street
North Vancouver, British Columbia
Canada

RE: Afton Mines Ltd. property
at Iron Mask Lake

Dear John:

I have reviewed the geological, geophysical, and drilling data for the above-named property and offer the following comments:

1. There is a distinct possibility that all of the I. P. anomalies reflect a pyrite halo surrounding the copper mineralization.
2. If this concept is correct, then magnetite veins must be adding to the halo I.P. anomaly on the northern part of the ring.
3. There is no I.P. anomaly of consequence in the center of the ring nor is there a strong I.P. anomaly with 200 foot dipoles over the drilled copper mineralization. Note, however, that the 100 foot dipole gave a small clear anomaly over the best grade copper near 112N on line 120E.
4. The I.P. data presently available is not encouraging in terms of serving to indicate the presence of copper mineralization, if this halo theory is correct.
5. I would certainly recommend drilling the holes spotted by Canadian Aero Mineral Surveys to learn whether or not the halo theory is correct. However, I would include Zone IV (as well as all other zones) in the halo and believe that Zone IV should be drilled early because it is a conductive polarizable knob interrupting an electromagnetic anomaly.
6. Note that in many places the high chargeabilities are accompanied by high resistivities and that this could indicate silicified mineralized zones which might be ore grade. (Study I.P. profiles for correlations.)
7. The magnetometer could be used to sort out magnetite veins from sulphide mineralization.

Mr. John F. Fairley

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December 8, 1966

8. Detailed I.P. survey with 50' and 100' dipoles should be done over the known copper mineralization to obtain an idea of how such a zone may respond. Perhaps there are similar zones elsewhere within the assumed pyrite halo.
9. This study has been made without the benefit of the geochemical and electromagnetic survey data.

S. H. Ward

S. H. Ward