MAGNETIC AND ELECTROMAGNETIC
GEOPHYSICAL SURVEYS

LIARD MINERAL CLAIM GROUP
Old Gold Area
Watson Lake Mining Division
Yukon Territory

Lat. 61°00' North
Long. 130°38' West

by

John S. Brock
Atlas Explorations Limited

Respectfully Submitted

John S. Brock

GEOLOGICAL SURVEY

APR 27 1957
Resident Geologist
Whitehorse, Yukon
# MAGNETIC AND ELECTROMAGNETIC GEOPHYSICAL SURVEYS

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INTRODUCTION

Under an agreement with G.E. "Bud" Stephens, prospector, and Atlas Copper Ltd., the Liard Claims 1 to 4 were acquired for the purposes of carrying out further exploration in order to determine the extent of known copper mineralization in the area. It was understood that Liard Claims 5 to 20 would be staked by Stephens in order that further protection of ground around the original Liard claims may be had. During March of 1966 Atlas Explorations flew airborne electromagnetic and magnetic surveys over the Old Gold area which included coverage of the Liard Mineral Claim Group. Due to results obtained through this survey, additional claims were staked, bringing the total claims in number to 92.

From May 25, 1966 to July 12, 1966, a ground follow-up crew consisting of a geologist, party chief, soil sampler, geophysical operators, linecutters and cook, were moved to the Liard Claim Group to commence operations within the area. It was proposed that the crew would detail airborne geophysical anomalies and examine areas of known mineralization for possible extensions. It was hoped that the ground surveys would also assist in correlation of airborne geophysical results to target zones within the claim group.
Three grids, the 'D', 'L' and 'O' (see key map), were laid out over areas of interest. Geophysical work was done only on the 'L' and 'O' grids in order to delineate airborne anomalies and reported float occurrences. Electromagnetic, magnetic, geochemical and geologic survey information were correlated from these areas to aid in interpretations that would aid in leading to further mineral discoveries.

The geophysical program in conjunction with the geochemical and geologic work revealed no targets of immediate significance, although further work is recommended.

LOCATION AND ACCESS

The Old Gold area is located approximately 100 miles south of Ross River on the eastern limits of the upper Liard River, five miles west of the Tintina Trench. The Liard mineral claims are located on the west limit of Rainbow Creek (map sheet 105 B15) at 61°00' North latitude and 130°38' West longitude.

Access to the property was most conveniently made by helicopter from Ross River. The camp move into the area was originally made by Beaver aircraft on floats from Ross River. The Liard River, at the junction of Rainbow Creek, is only suitable during 'high water'
season for float-equipped aircraft. Aircraft may land on Wasson Lake, some ten miles to the southeast. A trail connects Wasson Lake to the Liard property. Normal supply runs to the property were made by helicopter for supervisory and support purposes.

A total of three camps were established for work on each grid area. Each camp was set up in close proximity to the grid so that crew travel time was kept to a minimum.

Constant communication was kept with Ross River by single sideband radio; all field administration and expediting were carried out from company offices at this location.

PREVIOUS WORK

The Old Gold copper showings include some areas of mineralization that were originally explored by Newmont Mining in 1957. These did not constitute features of primary interest to Atlas Explorations. Some previous work in the form of prospecting, geochemistry and dip needle surveys was done by prospector Bud Stephens during 1965.

METHOD OF SURVEY

Instruments Used: For the magnetometer survey, a Jalander 46-65 magnetometer was used, the instrument is hand held and measures the vertical magnetic component by use of an oil-dampened fluxgate which automatically levels itself in the vertical direction. The range of this instrument is 10 to 250,000 gammas over five sensitivity ranges, the
lowest being 10 gammas per scale division. The instrument is of light weight and readings can be obtained quickly, a conversion factor is necessary before gamma values can be determined.

For the electromagnetic survey, a Crone JEM dual frequency unit was employed. The Crone unit is of the inductive type and may be either used as a horizontal or vertical loop apparatus. Measurements are made of the resultant dip angle of the field and the width of null or out of phase component. It is designed to be operated with a maximum coil spread of 300 feet on frequencies of 480 and 1800 cycles per second with no inter-connecting cables. The effective depth penetration is 300 feet for a horizontal conductor with maximum coil spread (no skin effect allowance) and 100 feet for a vertical conductor. The effective lateral coverage is a direct function of the spread under ideal conditions. The equipment was chosen in order to give reliable information on the attitude and configuration of a conductor, the physical properties of the host rock, dimensions of the conductor and results free from error due to topographic relief.

Survey Method:

Linecutting: All grids designed for ground geophysical and geochemical surveys were laid out using eight hundred foot line spacing with one hundred foot station intervals. Over
areas of interest four hundred foot spacing was used and two hundred foot line spacing was used over areas requiring detailed information. Central base lines were used for control, all cross lines were surveyed by picket and chain methods. Linecutters were hired from the native settlement of Ross River, survey control was checked by the party chief. Magnetometer Survey: Prior to the actual magnetometer survey, readings were taken along the central base line at cross line intersection points. These stations were looped and re-read every hour as a means of controlling drift and diurnal variations. With base stations of an established value serving as reference points for each cross line portion of the survey, a rapid and precise check was kept on magnetic variations and the entire survey was thus kept on a relative basis during day to day operation. Each cross line was read with re-checks at the base station within every hour, this method provided an internal control for detecting diurnal and drift variations. The survey was done by one operator using the same instrument. Electromagnetic Survey: All surveys were run with horizontal loop configuration and 300 foot coil spacing in order that highest response could be obtained from flat-lying sulphide bodies. Both 1800 and 480 cycles per second readings were taken at each station. The coil configuration was not
adaptable to conditions of conductive overburden and maximum response from such was expected. All traverses were by the "in line method" and done on the same grid as the magnetometer and geochemical surveys. In some cases shorter spacing was adopted for better resolution of shallow conductors, for the same reason line spacing was reduced to 200 feet over areas of interest. The two man EM crew did all their ground work in coincidence with the magnetometer and soil sampling crew.

**Treatment of Data:**

**Magnetic Results:** Magnetic results were corrected for diurnal and drift each night by the field operator. The final gamma values were then plotted on a grid plan using scale of 400 feet to 1 inch. This data was presented to the party chief who profiled and contoured the data on overlay material in order that he could remain familiar with day to day results and progress of the survey, direct its course and have results available for comparison with electromagnetic and geological-geochemical data. Field plots of this information were forwarded to the base office at Ross River at the end of the survey for final plotting and examination on a scale of 1 inch to 200 feet. Magnetic data is presented in this report on such maps showing gamma values - profiles and contoured results (see Appendix). All maps show major topographic features and locations of mineral claim posts.
Electromagnetic Results: All results as derived in the field were plotted each night by the EM operators on a grid plan using a scale of 1 inch to 400 feet. High and low frequency results were presented to the party chief for inspection and profiling in order that this data be compared with the other surveys and the course of the electromagnetic survey be directed on a daily basis. Plots of readings and profiles were sent to Ross River base at the end of the survey for final plotting and compilation on grid plans similar to those used for the magnetic maps. Electromagnetic data is presented in this report showing values-profiles (1800 and 480 cps), and a contour map of high and low frequency dip angles.

GEOLOGY

Introduction

The Old Gold Area is located in the southeastern corner of the Yukon Territory. The mapped area lies to the north of the Liard River between Old Gold and Rainbow creeks. The southern portion of the area is heavily forested and has a gentle topography which affords few rock exposures. The Old Gold and Rainbow creeks are deeply entrenched in the southern portion of the area, however, and do provide very good exposures along their courses and those of their tributaries. To the north the topography is
one of extremely steep relief, much of which is above timberline. The rock exposure in the northern portion of the area is consequently far better than in the southern portion.

**Rock Units**

The rocks of the Old Gold Area are predominantly grey thin-bedded phyllites which are locally graphitic. These rocks form a thick section which underlies most of the mapped area. These phyllites are interbedded with greywakes, argillites, slates, and very rarely with argillaceous limestones. To the north of these rocks is a thinner section of interbedded rhyolite and argillaceous tuff. These extrusive rocks are in contact with granodiorite to the north. The granodiorite is part of a major batholith which forms the core of the very rugged mountains in the northern portion of the Old Gold Area.

**Structural Geology**

The rocks of the Old Gold Area strike to the northwest and are predominantly south dipping. Regional folding has produced some local north dipping strata. Faulting in the area would seem to be considerably less than indicated by the air photo interpretation done previously. According to air photo geologic interpretation nearly every stream was mapped as a fault. Evidence for
this correlation is lacking and in fact much of the structural control on the course of streams in the area is due to the strike of the bedding.

**Economic Geology**

Because the predominant structural dip is away from the plutonic intrusion to the north, and because very little faulting is indicated in the area, the Old Gold property would appear to be unfavourable for extensive mineralization. The rock types encountered are not those typically thought of as favourable to economic mineralization. The steeply dipping nearly homoclinal strata of the area offers little in the way of ore traps.

On grid 'D' an area of several hundred square feet has been intruded by quartz and calcite veins. The quartz appears to be predominantly barren, but it does contain scattered chalcopyrite. An EM anomaly located on lines 56 West and 60 West of grid 'D' is apparently associated with this quartz and calcite. Within the quartz, blocks of float containing high grade calcopyrite mineralization were found which seemed to indicate a vein two or three in width. It would seem that the mineralization indicated here is quite limited. A second smaller anomaly was located to the north on line 56 West. Some very sparse mineralization was found here also. A small showing of
chalcopyrite mineralization is located on the north bank of the Liard River in the southern portion of the area. It would also appear to be of very limited extent.

Conclusion

It is believed that any mineralization in the Old Gold area would be limited to narrow veins and fracture fillings, as indicated by the known showings in the area. The geology of the area would seem to make it very improbable that a major replacement ore body would be found.

Most of the EM anomalies within the area appear to be due to graphitic phyllites. The magnetic anomalies are apparently due to pyrrhotite which is found in many of the argillaceous rocks.

GEOPHYSICAL OBSERVATIONS

'D' Grid

The 'D' grid was laid out to delineate two airborne electromagnetic anomalies and its possible associations to reported mineralized float in the same area. No aero-magnetics of any coincidence were obtained, except for a closure over the most western portion of the electromagnetic anomaly.

The magnetic contour map, when examined (see Appendix), shows four areas of closure of moderate intensity. The most isolated and obvious, reaches a peak intensity of
300 gammas above background on line 16W at station 7+00N. This anomaly is one of three on strike from the base line to the northeast from 1600 feet to 16W - 7+00N. The other two anomalies on this trend reach peak values of 150 gammas each. The fourth anomaly is located at Line 32W - 5+00S and reaches a peak of 150 gammas above background; this anomaly is also on strike with the others and if all were considered, the total strike length of the trend would be in the order of 2,500 feet.

A profile study of the magnetics on the 'D' grid is more suitable, considering the low intensity features. The northeast trend as mentioned above is inconsistent in altitude but generally appears to dip steeply to the south. Lower intensity and less complex profiles to the northern half of the survey area reflect a marked change in susceptibility of formations there.

Electromagnetic profiles show a marked conductive trend with probable southerly dip between lines 48W and 60W, north of the baseline and striking northwest. Between lines 44W and 60W and south of the baseline, stronger electromagnetic response is significant of a well defined conductor. In the area of the Rainbow Creek tributary junction, electromagnetic values reflect an irregular conductor on line 16W.
Both 1800 cps and 480 cps resultant dip angle results were contoured. No other major anomalies were noted other than results mentioned above. The 1800 cps contours outline conductive areas represented by negative dip angles as mentioned above.

'L' Grid

The 'L' grid was designed to cover a large electromagnetic anomaly on the west limit of Rainbow Creek. The southern part of the anomaly was of high conducting ratio and, therefore, work was concentrated on this region. The second electromagnetic anomaly to be investigated on the same grid was at the western end; it is of lower intensity and apparent conductivity. No aeromagnetic response of higher intensity was noted.

Electromagnetic response is strong on high and low frequencies at the northeast and northwest extremities of the 'L' grid, thus reflecting the airborne results with well defined negative resultant dip angles. No defined magnetic anomalies or trends are evident in coincidence with the electromagnetics; however, there is some weak response of irregular nature of 50 gamma variance between line 52W and 60W at 20+00N.

A stronger magnetic trend runs between line 52W and 50W at about 4+00S; no EM coincidence is apparent.
GEOPHYSICAL INTERPRETATION

'D' Grid:

Analysis of aeromagnetic and electromagnetic results show that the major electromagnetic anomaly at the southeast end of the grid is probably due to graphitic and phyllitic horizons as mapped geologically and followed up with ground EM. The airborne EM anomaly at the northwest end of the grid was delineated by ground EM and is located over known copper mineralization. Graphitic schists in this area probably complicate conductive measurements of apparent mineralization. The aeromagnetic response is weak and anomalies as shown in relation to 'D' grid do not appear to be of value.

High grade copper float of chalcopyrite mineralization may have a local source reflected by a weak (50 gamma) magnetic trend south of the baseline between lines 52W to 60W. The major northeast magnetic trend as shown from line 39W to 32W, south of the baseline and 24W to 16W north of the baseline, appears to be due to an andesitic dyke carrying pyrrhotite mineralization. No electromagnetic evidence of sulphide mineralization occurs over these zones.

Good negative dip angles were recorded over a zone of chalcopyrite mineralization found in place, north of the baseline between lines 52W and 60W. Conductivity
measurements of mineralization could be masked by phyllitic horizons noted in this area.

The major electromagnetic anomaly on the 'D' grid as reflected by airborne and ground surveys is coincident with graphitic schists and a drainage confluence that causes much wet ground which may also act as a minor conductor.

'L' Grid

The northeastern electromagnetic anomaly over the 'L' grid is of large negative angle response. The conductor appears to have a gentle southerly dip and is thought to be a graphitic horizon. The absence of magnetics of any sort would tend to confirm this assumption.

The northwestern electromagnetic anomaly is also of negative dip angle values and is interpreted as a northerly dipping conductor. There is some magnetic irregularity over this zone, but geophysical results are typical of carbonaceous horizons carrying disseminated pyrrhotite.

The magnetic trend between line 52W and 50W, south of the baseline, has no electromagnetic coincidence. No geologic information in this area assists in the explanation of the anomaly; however, the magnetics are similar in size and intensity to those obtained over dyke structures on the 'D' grid.
Other irregular and local EM responses obtained throughout the grid are typical of severe topographic and ground water conditions.

CONCLUSIONS AND RECOMMENDATIONS

Grid 'D' has the most favourable geophysical results, as the anomaly at the northwest end of the grid occurs over known mineralization. This anomaly is still open at the west end and should have surveys completed over it as indicated by the airborne results.

An aeromagnetic anomaly of high intensity and isolated characteristics is situated to the northeast of the 'D' grid. This anomaly is in an area of reported mineralogical float and should definitely be delineated on the ground.

If further work is planned over the Liard claims in general, the 'L' grid should be extended to the west to cover an aeromagnetic and electromagnetic anomaly of low intensity and partial coincidence.
APPENDIX I

WEEKLY LOGS

GEOLOGIC SURVEYS
GEOPHYSICAL SURVEYS
GEOCHEMICAL SURVEYS
LINECUTTING
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**TOTALS:**
- 41,000
- 44 acres
- 2,000
- 6,200

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**Grass Lakes: July 13 to July 17**

**Party Chief:** Bob Harvey

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<td>Bernard Spanier</td>
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**Soil Sampler**

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**6 Linecutters**

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**Geophysics**

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**General**

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<td>Wed.</td>
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SUMMARY OF COSTS

MAGNETIC AND ELECTROMAGNETIC GEOPHYSICAL SURVEYS

LIARD CLAIM GROUP
SUMMARY OF COSTS
GEOPHYSICAL SURVEYS
LIARD MINERAL CLAIMS

A. 'D' GRID COVERING

1) Linecutting

54,000 feet = 10.2 line miles
@ $70/line mile
$ 714.00

Cost includes camp costs, supervision, administration, wages.

2) Magnetometer Survey

10.11 line miles
@ $50/line mile
505.50

Cost includes camp costs, supervision, administration, equipment rental, wages.

3) Electromagnetic Survey

10.11 line miles
@ $110/line mile
1,112.10

Cost includes camp costs, supervision, administration, equipment rental, wages.

Sub-total $2,331.60
B. 'L' GRID COVERING  

Liard Claims 30, 32, 34, 36  
39 - 45 inclusive  
65 - 70 inclusive

1) Linecutting

60,000 feet = 11.10 line miles
@ $70/line mile  
Cost includes camp costs, administration, supervision, wages.  
$ 780.00

2) Magnetometer Survey

11.10 line miles
@ $50/line mile  
Cost includes camp costs, supervision, administration, equipment rental, wages.  
550.00

3) Electromagnetic Survey

11.10 line miles
@ $110/line mile  
Cost includes camp costs, supervision, administration, equipment rental, wages.  
1,221.00

Sub-total  
$2,551.00

C. GENERAL COSTS - LIAIRD GROUP

1) Aircraft Support

a) Fixed wing charters for camp mobilization and demobilization, plus support:

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<th>Great Northern Airways</th>
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<tr>
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538.00
b) Helicopter support for camp mobilization and demobilization, plus support:

Klondike Helicopters Ltd.

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27:55 hours

@ $111.00/hour $3,098.75

2. Presentation of Data and Report 500.00

Sub-total $4,136.75

TOTAL $9,019.35
AFFIDAVIT SUPPORTING

SUMMARY OF COSTS
AFFIDAVIT SUPPORTING SUMMARY OF COSTS:

I, John S. Brock, Assistant Exploration Manager of Atlas Explorations Limited, of Ross River, Yukon Territory, do hereby state that to the best of my knowledge and belief the statement of costs as presented in this report "Magnetic and Electromagnetic Geophysical Surveys - Liard Mineral Claim Groups" (Appendix II) is both correct and true.

John S. Brock

Date

A Commissioner of Oaths in and for the Yukon Territory
PERSONNEL

LINECUTTERS
1) Herman Asp  
2) Ike Johnston  
3) Michael Shorty  
4) Jack Ladue

Watson Lake, Yukon  
Whitehorse, Yukon  
Ross River, Yukon  
Ross River, Yukon

MAGNETOMETER OPERATOR
1) Bill Markiw

EM OPERATORS
1) Paul Cartwright  
2) Vic Wright

PARTY CHIEF
1) Robert Harvey

FIELD SUPERVISOR
1) John S. Brock  

Ross River, Yukon
AIRBORNE ELECTROMAGNETIC-MAGNETIC
GEOPHYSICAL SURVEY

OLD GOLD AREA, YUKON TERRITORY
March 12 - April 3, 1966

LOCATION: LIARD RIVER AREA
130° - 30'W. Long.
61° - 00'N. Lat.
Claim Sheet 105B & 105G-2
Val-Rabo M.C. Group

Submitted by: John S. Brock
June 3, 1966
Instruments:

A Gulf Thyratron Magnetometer Mark III and a Mark III electromagnetic unit consisting of a vertical coaxial transmitter and receiver coils mounted on a thirty foot boom were used for the entire survey. The instruments and operator were provided under a contract agreement with Lockheed Survey Corporation. The survey was conducted with a Bell 206 helicopter as fixed wing aircraft were judged to be unsuitable for some of the regions of more rugged terrain.

For the electromagnetic apparatus amplitudes of in-phase and out of phase response of the resultant field are measured in parts per billion of the primary field, the frequency of the primary current is 4000 cycles per second. The magnetometer has a sensitivity of 1200 gammas and measures total magnetic field.

Survey Methods:

The geophysical instruments were towed at a mean terrain clearance of 200 feet over flight lines of 1000 feet spacing which was narrowed to 500 feet spacing over areas of known mineralization in order that more survey detail might be obtained. Effective ground control was maintained by the use of aerial photographs with predetermined flight lines for navigational purposes. The helicopter was equipped with ARS-1 radio altimeter and stop motion 35 mm camera for further ground control and recording of fiduciary points. All flight lines were orientated perpendicular to geologic strike.
FLIGHT DATA

Flight records were processed in the field by the staff of
Adlers Explorations as no fielding of results is done by the contractor
during the actual survey. All airborne information was plotted on
plastic overlays showing drainage, existing claim group locations and
photo-geologic interpretation to a scale of one inch to one-quarter
mile. Flight lines and fiducial points are shown on the compilation.
Magnetic data was contoured for all results above regional background.

Electromagnetic data was shown by contoured in-phase and quadrature
response. As a later date Adlers Explorations will receive a final plot
of all geophysical results prepared by Lockwood Survey Corporation.

LIAARD MINERAL CLAIM AREA

All magnetic anomalies obtained in this area are of isolated
nature and have apparent relation to fault control. The magnetics are
of low magnitude but may be significant in mineralization as reported
on the original Liaard Claims. At the northern end of the claim group
two electromagnetic anomalies occur in areas of recently discovered
galena veins. Some spot electromagnetic response is recorded in coincide-
cence with the magnetics. No geophysical anomalies were obtained
over the Liaard mineral showing.

GENERAL SURVEY AREA

To the northwest of the Liaard Claims, continuous and well
defined electromagnetic results were obtained, no magnetic coincidence
is apparent. The anomalies appear to be of formational nature and
in coincidence with what has been described as an area of graphitic
schists. The area, however, warrants geochemical prospecting and
further mapping in the event that major fault structures in the gra-
phitic formations may provide ore bearing zones. A high in-phase
electromagnetic anomaly centered in a parallel fault system on Old
Cold Creek requires further ground investigation.
At a later date the boundaries of the Old Gold survey should be extended west to the Doe Creek area in order that sedimentary formations in which mineralization has been reported may be surveyed.

To the south of the survey area a coincident magnetic-electromagnetic anomaly was recorded over Quartz Creek while the airborne equipment was being ferried to base camp. This area also requires ground follow-up as it may be in the vicinity of reported sulphides.

Summary and Conclusions

The Old Gold area warrants a ground follow-up program based on airborne geophysical results obtained to date. Electromagnetic and magnetic anomalies obtained in the vicinity of the Liaci and VC-NBC mineral claims should be protected by additional staking of mineral claims. Coincident mag-EM anomalies centered within northwest-northeast cross faults and magnetic and electromagnetic anomalies in the vicinity of known mineralization are of immediate interest.

Further treatment and interpretation of airborne data will be carried out upon receipt of final data reductions from Technic Survey Corporation.
GEOCHEMICAL SOIL SAMPLING SURVEY

LIARD MINERAL CLAIMS

OLD GOLD AREA
Watson Lake Mining Division
Yukon Territory

Long. 130° 40' West
Lat. 56° 50' North

by

John S. Brock
Atlas Explorations Limited

May 25 - July 12; 1966
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**GEOCHEMICAL SOIL SAMPLING SURVEY**  
**LIARD MINERAL CLAIM GROUP**  

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   3) Lead Values
   4) Lead Contour
   5) Zinc Values
   6) Zinc Contour

Maps - 'L' Grid

A) Geochemical
   1) Copper Values
   2) Copper Contour
   3) Lead Values
   4) Lead Contour
   5) Zinc Values
   6) Zinc Contour

Maps - 'D' Grid

A) Geochemical
   1) Copper Value
   2) Copper Contour
   3) Lead Values
   4) Lead Contour
   5) Zinc Values
   6) Zinc Contour

B) Geologic

Maps

A) Development
   1) 'L' Grid
   2) 'O' Grid
   3) 'D' Grid
KEY MAP
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<td>Y7265 - Y7336</td>
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INTRODUCTION

Under an agreement with G.E. "Bud" Stephens, prospector, and Atlas Copper Ltd., the Liard Claims 1 to 4 were acquired for the purposes of carrying out further exploration in order to determine the extent of known copper mineralization in the area. It was understood that Liard Claims 5 to 20 would be staked by Stephens in order that further protection of ground around the original Liard claims may be had. During March of 1966, Atlas Explorations flew airborne electromagnetic and magnetic surveys over the Old Gold Area which included coverage of the Liard Mineral Claim Group. Due to results obtained through this survey, additional claims were staked, bringing the total claims in number to 92.

From May 25, 1966 to July 12, 1966, a ground follow-up crew consisting of a geologist, party chief, soil sampler, geophysical operators, linecutters and cook, were moved to the Liard Claim Group to commence operations within the area. It was proposed that the crew would detail airborne geophysical anomalies and examine areas of known mineralization for possible extensions. It was hoped that the ground surveys would also assist in correlation of airborne geophysical results to target zones within the claim group.
Three grids, the 'D', 'L' and 'O' (see key map), were laid out over areas of interest. Geochemical soil sampling surveys were done on all grids in order to delineate airborne anomalies and reported float occurrences. Geochemical, geophysical and geologic survey information were correlated from these areas to aid in interpretations that would aid in leading to further mineral discoveries.

The geochemical program, in conjunction with the geophysical and geologic work, revealed no targets of immediate significance, although further work is recommended.

LOCATION AND ACCESS

The Old Gold Area is located approximately 100 miles south of Ross River on the eastern limits of the upper Liard River, five miles west of the Tintina Trench. The Liard mineral claims are located on the west limit of Rainbow Creek (map sheet 105 Bl5) at 61°00' North latitude and 130°38' West longitude.

Access to the property was most conveniently made by helicopter from Ross River. The camp move into the area was originally made by Beaver aircraft on floats from Ross River. The Liard River, at the junction of Rainbow Creek, is only suitable during 'high water' season for float-equipped aircraft. Aircraft may land on
Wasson Lake, some ten miles to the southeast. A trail connects Wasson Lake to the Liard property. Normal supply runs to the property were made by helicopter for supervisory and support purposes.

A total of three camps were established for work on each grid area. Each camp was set up in close proximity to the grid so that crew travel time was kept to a minimum.

Constant communication was kept with Ross River by single sideband radio; all field administration and expediting were carried out from company offices at this location.

PREVIOUS WORK

The Old Gold copper showings include some areas of mineralization that were originally explored by Newmont Mining in 1957. These did not constitute features of primary interest to Atlas Explorations. Some previous work in the form of prospecting, geochemistry and dip needle surveys was done by prospector Bud Stephens during 1965.

GEOLOGY

Introduction

The Old Gold Area is located in the southeastern corner of the Yukon Territory. The mapped area lies to the north of the Liard River between Old Gold and Rainbow
creeks. The southern portion of the area is heavily forested and has a gentle topography which affords few rock exposures. The Old Gold and Rainbow creeks are deeply entrenched in the southern portion of the area, however, and do provide very good exposures along their courses and those of their tributaries. To the north the topography is one of extremely steep relief, much of which is above timberline. The rock exposure in the northern portion of the area is consequently far better than in the southern portion.

**Rock Units**

The rocks of the Old Gold Area are predominantly gray thin-bedded phyllites which are locally graphitic. These rocks form a thick section which underlies most of the mapped area. These phyllites are interbedded with greywakes, argillites, slates, and very rarely with argillaceous limestones. To the north of these rocks is a thinner section of interbedded rhyolite and argillaceous tuff. These extrusive rocks are in contact with granodiorite to the north. The granodiorite is part of a major batholith which forms the core of the very rugged mountains in the northern portion of the Old Gold Area.

**Structural Geology**

The rocks of the Old Gold Area strike to the
northwest and are predominantly south dipping. Regional folding has produced some local north dipping strata. Faulting in the area would seem to be considerably less than indicated by the air photo interpretation done previously. According to air photo geologic interpretation, nearly every stream was mapped as a fault. Evidence for this correlation is lacking and, in fact, much of the structural control on the course of streams in the area is due to the strike of the bedding.

Economic Geology

Because the predominant structural dip is away from the plutonic intrusion to the north and because very little faulting is indicated in the area, the Old Gold property would appear to be unfavourable for extensive mineralization. The rock types encountered are not those typically thought of as favourable to economic mineralization. The steeply dipping, nearly homoclinal, strata of the area offers little in the way of ore traps.

On grid 'D', an area of several hundred square feet has been intruded by quartz and calcite veins. The quartz appears to be predominantly barren, but it does contain scattered chalcopyrite. An EM anomaly located on lines 56 West and 60 West of grid 'D' is apparently associated with this quartz and calcite. Within the quartz,
blocks of float containing high grade chalcopyrite mineralization were found which seemed to indicate a vein two or three in width. It would seem that the mineralization indicated here is quite limited. A second smaller anomaly was located to the north on line 56 West. Some very sparse mineralization was found here also. A small showing of chalcopyrite mineralization is located on the north bank of the Liard River in the southern portion of the area. It would also appear to be of very limited extent.

Conclusion

It is believed that any mineralization in the Old Gold Area would be limited to narrow veins and fracture fillings, as indicated by the known showings in the area. The geology of the area would seem to make it very improbable that a major replacement ore body would be found.

Most of the EM anomalies within the area appear to be due to graphitic phyllites. The magnetic anomalies are apparently due to pyrrhotite which is found in many of the argillaceous rocks.

TOPOGRAPHY AND GROUND CONDITIONS

The Liard Mineral Claims lie on the eastern slopes running into the Liard River. Elevations are from 3,000 feet at the Liard River to approximately 4,500 feet above sea level at the eastern extremity of the claim group. The
southwestern portion of the claim group is of gentle relief as reflected from the Liard River Valley. Local accumulations of glacial deposition provide some topographic irregularities in the form of eskers and moraines. Glaciation is apparently from the northwest to southeast. There is no estimate of overburden thickness throughout the area, although it obviously varies over the claim group. Well defined drainage, such as Rainbow Creek and Old Gold Creek to the northwest, are deeply entrenched and provide good exposure of rock units throughout their length.

Other local and tributary drainage is, in most cases, not well defined and commonly consists of swampy depressions and channels formed by seasonal run-off conditions. Most drainage patterns are to the southwest or down slope.

Some development of soil horizons is apparent, even though the major part of the overburden is not remnant. The 'B' horizon is partially developed and the 'C' horizon, comprised of parental material, is usually well developed, although the source of parental material in some cases is unknown due to glaciation. A thick layer of muskeg over some areas provides generation for a well-defined 'A' horizon or organic zone which, at times, makes sampling of lower soil profiles difficult. Due to irregularities in
local topography, vegetational cover, drainage systems and some permafrost, soil types are not well defined, thus preventing proper sampling.

Vegetation consisted of heavy spruce cover over most of the survey area, with dense patches of dwarf birch predominating in more open regions. Ground in the vicinity of topographic depressions and swamp regions usually has thick muskeg cover.

SURVEY TECHNIQUES

Linecutting

The soil sampling survey was conducted over the same grids as used for the geophysical surveys, no extra linecutting was required other than that done for the magnetic and electromagnetic work, except for grid '0'.

Soil Sampling

The soil sampling survey was carried out in conjunction with the electromagnetic and magnetic survey. One soil sampler was employed for the entire survey.

The samples were obtained by use of a prospector's grub hoe, which was found adequate as a tool for cutting through heavy layers of organic material overlying the soil. Samples were taken at 100 foot stations over the same grid area as geophysical data was obtained from.

Due to the inconsistency of specific soil horizons

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1 See Report, "Magnetic and Electromagnetic Geophysical Surveys, Liard Mineral Claim Group".
as well as variable depths to favourable horizons, samples were taken from an average depth of approximately one and one-half feet. Soils of the upper 'B' horizon were usually encountered, except in areas of much glacial till and overburden. Soils of large organic content were not sampled; in areas of immature soils, the 'C' horizon was sampled. Approximately 100 grams of soil from each sample site were placed in Kraft bags which were then periodically shipped to the soil testing laboratory at Ross River.

Method of Analysis

All samples were analysed at a complete testing laboratory at Ross River. When the samples were received, each was dried while in its Kraft bag, then screened to 80 mesh, weighed out to 0.5 grams and digested in hot aqua regia. Samples were then diluted, clarified for 20 hours and then tested for copper, lead and zinc content on an atomic absorption spectrophotometer. The 'AA' unit used was a Perkins Elmer Model 290 and accuracy of the instrument ideally is 1% of the amount of metal present. Individual cathode lamps were used for each element being tested and two determinations per minute can be made with ease.

Treatment of Data

All results of geochemical tests were returned to the field as soon as possible. Results in parts per
million (ppm) were plotted on field data sheets kept by the field soil sampler. The field data sheets were kept as a record of each sample taken, noting particulars concerning drainage, topography, physiography, soil type and depth of sample. This information was compiled for use in further detailed geochemical studies.

Separate maps were prepared\(^1\) using a scale of 1":400', as was used for geophysical data, showing values obtained for copper, lead and zinc, profiles of values and contoured values. Contour intervals varied according to results obtained in parts per million. Maps for each element were compiled separately in order to aid in comparative study of geophysical, geologic and geochemical results.

**GEOCHEMICAL OBSERVATIONS**

'D' Grid

There are no major anomalous geochemical coincidences between copper, lead and zinc values obtained over the 'D' grid. As copper mineralization was being searched for, emphasis has been given to the copper content of soils sampled.

Due to varying depths of overburden and drainage, all copper values above 80 ppm were considered as above 'threshold'. One anomaly of major dimension was outlined

\(^1\) See Appendix: Map File
between line 32W and 60W, south of the baseline (see Development map). This zone is still 'open' at its western extremity. The anomaly flanks an electromagnetic conductive zone and is partially coincident at its eastern end with a magnetic anomaly. There is also partial coincidence with a zone of lead 'highs' above 40 ppm between lines 32W and 44W, south of the baseline. The copper anomaly is probably directly associated with massive chalcopyrite float found in the area of lines 52W and 56W, at 9+00S. This float discovery is situated on the western flanks of a small hill that trends northwest-southeast through the anomalous copper area. As the copper values are also on the eastern flanks of this hill, it is assumed that the mineralization is fairly widespread.

There are other scattered copper 'highs' throughout the grid area at the following coordinates:

- 60W, 1N
- 56W-52W, 2S
- 44W-48W, 9N
- 40W, 15S
- 24W, 8N
- 20W, B.L.

All are of lesser areal dimensions than thought to be significant of widely mineralized areas. One is coincident with a lead high at 20W and the baseline.

Lead anomalies at 32W to 44W at 9S and 8W to 24W at approximately 12S, are coincident with quartz vein
structures noted within the same area. As galena float of a vein-type origin was found in Rainbow Creek, it has been assumed that the lead (above 40 ppm) anomalies may be direct reflections of the float source.

Zinc (above 100 ppm) occurs in coincidence with the best defined lead anomaly (values above 40 ppm) at 20W - 28W and 12N. No explanation is offered geologically and no geophysical response was mapped over this area.

'L' Grid

A development map of 'L' grid was prepared in order to assess geophysical and geochemical results as a whole. Geophysical results have been examined and commented upon in report, "Electromagnetic and Magnetic Geophysical Surveys, Liard Mineral Claims", by J.S. Brock. No copper geochemical 'highs' of any significance or areal extent were noted.

'O' Grid

No geophysical surveys were done over the 'O' grid, other than an electromagnetic test over a known copper showing. Lead results are not conclusive; however, copper and zinc results are widespread.

Over the known showing in the vicinity of lines 80E to 92E at 13N and at line 72E and 13N, results above 80 ppm zinc were also outlined. As overburden depths appear
to vary considerably, a lower threshold for each element was chosen. There is generally good copper-zinc coincidence in this area, assuming that zinc is more easily mobilized and, therefore, more widely dispersed. From line 0 to 60E, a series of copper 'highs' strikes in a northwesterly direction. This could be a reflection of copper mineralization controlled by recognized northwest striking cross faults and/or the glaciation trend. A well-defined copper-zinc coincidence at line 108E on the baseline could possibly represent extension of known mineralization.

CONCLUSIONS AND RECOMMENDATIONS

'D' Grid

The main geochemical anomaly of interest is the extensive zone of copper 'highs' between lines 32W and 60W, south of the baseline. As further follow-up work is recommended for geophysical surveys to the west of the present grid, it is also recommended that more soil sampling be also done at this time in order to trace the western extension of the above-mentioned copper anomaly. This anomaly has been attributed to copper float found within its limits, but due to the topographic conditions and direction of glaciation, it is felt that its boundaries are in excess of those as could be due to known mineralization.
The lead anomalies should be investigated only if assays of galena float found in the area prove to be of economic value.

'L' Grid

No further geochemical work should be considered in this area, unless it is used as an integrated part of a geophysical follow-up program or on a regional coverage basis of the Old Gold Area.

'O' Grid

The geochemical copper and zinc values appear to represent the known mineralization well. Further work should be done to the east where there is reported to be more mineralized copper float and also to cover possible eastern extension of the anomaly already outlined.

Although some geophysical tests were conducted over the known showing, the other areas of geochemical interest should be examined with electromagnetic and magnetic surveys. This would assist in determining if faulting does control possible mineralization, as assumed by the northwesterly alignment of copper anomalies between lines 0 and 60E.

Respectfully submitted,

John S. Brock
Assistant Exploration Manager
Atlas Explorations Limited

January, 1967
APPENDIX I

WEEKLY LOGS

GEOLOGIC SURVEYS
GEOPHYSICAL SURVEYS
GEOCHEMICAL SURVEYS
LINECUTTING
**PROJECT:** (Land Old Gold)  
**ATLAS EXPLORATON LIMITED**  
**PERIOD:** From May 25 To May 29

**CLAIM GROUP:** Land  
**PARTY CHIEF:** Bob Harvey

**PERSONNEL**  
- Ted Skrange
- Vic Weight
- Paul Gartwright
- Bill Martin
- The Johnston
- Pat Johnny
- Herman Asg
- Jack Hade
- Bob Harvey

**POSITION**  
- Prospectors (EM)
- Linecutters

**TIME**  

**WAGE**  
- 400
- 315
- 375
- 2,500/1,000 km
- 400

<table>
<thead>
<tr>
<th>Day</th>
<th>HELICOPTER</th>
<th>FIXED WING</th>
<th>LINECUTTING</th>
<th>GEOCHEM.</th>
<th>GEOPHYSICS</th>
<th>GENERAL</th>
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<td>Mon.</td>
<td>24</td>
<td>9.5</td>
<td></td>
<td></td>
<td>5</td>
<td></td>
</tr>
<tr>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thurs.</td>
<td>25</td>
<td>8.5</td>
<td></td>
<td></td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Fri.</td>
<td>26</td>
<td>7</td>
<td></td>
<td></td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>Sat.</td>
<td>27</td>
<td>9</td>
<td></td>
<td></td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>Sun.</td>
<td>28</td>
<td>8</td>
<td></td>
<td></td>
<td>35</td>
<td></td>
</tr>
<tr>
<td>Tues.</td>
<td>29</td>
<td>11</td>
<td></td>
<td></td>
<td>12</td>
<td></td>
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</tbody>
</table>

**TODAY CAMP:** Setting up camp & setting gear down over.  
**TUESDAY:** Setting up camp.  
**THURSDAY:** Snow in morning.
Note: Until the line-cutting crews get down to two men per crew, each line-cutter should get $20/day (from May 25 to May 31st inclusive).

The three students (Markin, Wright, Cartwright) should be paid their agreed-upon wages until May 31st. After which, they should receive line-cutting wages.
<table>
<thead>
<tr>
<th>PERSONNEL</th>
<th>POSITION</th>
<th>TIME</th>
<th>WAGE</th>
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<tr>
<td>Ted Skene</td>
<td>Prop.</td>
<td></td>
<td>400</td>
</tr>
<tr>
<td>Vic Wright</td>
<td>EM</td>
<td></td>
<td>325</td>
</tr>
<tr>
<td>Pat Cartwright</td>
<td>EM</td>
<td></td>
<td>375</td>
</tr>
<tr>
<td>Bill Malcom</td>
<td>Line Cutters</td>
<td></td>
<td>2 x $15/day + 5/800 St.</td>
</tr>
<tr>
<td>Tom Johnston</td>
<td>Line Cutters</td>
<td></td>
<td>2 x $15/day + 5/800 St.</td>
</tr>
<tr>
<td>Don Johnston</td>
<td>Line Cutters</td>
<td></td>
<td>2 x $15/day + 5/800 St.</td>
</tr>
<tr>
<td>Herman</td>
<td>Line Cutters</td>
<td></td>
<td>2 x $15/day + 5/800 St.</td>
</tr>
<tr>
<td>Jack</td>
<td>Line Cutters</td>
<td></td>
<td>2 x $15/day + 5/800 St.</td>
</tr>
<tr>
<td>Rod Harvey</td>
<td>Party Chief</td>
<td></td>
<td>2 x $15/day + 5/800 St.</td>
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<th>DAY</th>
<th>HELICOPTER</th>
<th>FIXED WING</th>
<th>LINECUTTING</th>
<th>GROCHER</th>
<th>GEOPHYSICS</th>
<th>GENERAL</th>
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<td>May 30</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>June 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>11,400</td>
<td>15,700'</td>
</tr>
<tr>
<td>June 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>18,900</td>
<td>18,500</td>
</tr>
<tr>
<td>June 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>June 4</td>
<td>Mining</td>
<td>40min</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td>June 5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>18,400</td>
<td>14,700</td>
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The visit to company by Roden Davis on 4/5 for linecutting.
<table>
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<tr>
<th>Date</th>
<th>Herman Aze</th>
<th>Ike Johnston</th>
<th>Jack Ladue</th>
<th>Pat Johnny</th>
<th>Bill McLean</th>
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<tbody>
<tr>
<td>May 31</td>
<td>4700'</td>
<td>3000'</td>
<td>4900'</td>
<td>4700'</td>
<td>8200'</td>
</tr>
<tr>
<td></td>
<td>2000'</td>
<td>3000'</td>
<td>5000'</td>
<td>4500'</td>
<td>7400'</td>
</tr>
</tbody>
</table>

Herman Aze $320/day

June 1  
Herman Aze 3500'  
Ike Johnston 3500'  
Pat Johnny 36500'  
Bill McLean 72700'  
Paul Cartwright 7400'  
Vic Wright  

June 2  
3800'  
3800'  

June 3  
7500'  
7500'  
3500'  

June 4  
7500'  
5400'  

June 5  
9800'  
5000'  
32800'  
30400'  

Bill McLean 716,200  
Pay Markina-Cartwright line-cutting wages.  
And give Wright same pay for this period.  

Line-Cutting Wages: $5 per man per 1000' feet cut by a crew of two.
<table>
<thead>
<tr>
<th>Day of Work</th>
<th>HELICOPTER</th>
<th>FIXED WING</th>
<th>LINE CUTTING</th>
<th>GEOCHEM.</th>
<th>GEOPHYSICS</th>
<th>GENERAL</th>
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<tr>
<td></td>
<td>Job</td>
<td>Hrs.</td>
<td>Job</td>
<td>Hrs.</td>
<td>Lines</td>
<td>Foot</td>
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<td>June 6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>13,400</td>
<td></td>
</tr>
<tr>
<td>June 7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>10,600</td>
<td></td>
</tr>
<tr>
<td>June 8</td>
<td></td>
<td></td>
<td>Moving Camp</td>
<td></td>
<td>Thro</td>
<td></td>
</tr>
<tr>
<td>June 9</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>8,200'</td>
<td></td>
</tr>
<tr>
<td>June 10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>9,400'</td>
<td></td>
</tr>
<tr>
<td>June 11</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>8,100'</td>
<td></td>
</tr>
<tr>
<td>June 12</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>4,100'</td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>54,000</td>
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**WAGE**
- 520
- 375
- 325
- 715 per day plus
- $45/1000 lines
- $0.06/line per 1000 ft for each
- $400 for 1000 ft
<table>
<thead>
<tr>
<th>Date</th>
<th>Hours</th>
<th>Rate</th>
<th>Pay</th>
<th>Comment</th>
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<tr>
<td>Mon. June 6</td>
<td></td>
<td></td>
<td>5400'</td>
<td></td>
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<tr>
<td>Tue. June 7</td>
<td></td>
<td></td>
<td>5260'</td>
<td></td>
</tr>
<tr>
<td>Wed. June 8</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thurs. June 9</td>
<td></td>
<td></td>
<td>3200'</td>
<td></td>
</tr>
<tr>
<td>Fri. June 10</td>
<td></td>
<td></td>
<td>2800'</td>
<td></td>
</tr>
<tr>
<td>Sat. June 11</td>
<td></td>
<td></td>
<td>3000'</td>
<td></td>
</tr>
<tr>
<td>Sun. June 12</td>
<td></td>
<td></td>
<td>1200'</td>
<td></td>
</tr>
</tbody>
</table>

**Herman Papp**  3 4000' line
**Ike Johnston** 3 4000' line

**Jack Landre**  3 4800' line
**Pat Johnson**  3 4200' line

**Bill Hahei**  3 300' line
**Paul Carter**  3 200' line

**Vic Wright**  3 3000' line

---

_**Bonus on 9400'**_

_Bonus on 3000'_

_**Bonus on 3000'**_
## Project: A7
### ATLAS EXPLORATION LIMITED

**Period:** From June 13 to June 19

### Claim Group: Mica, Searra, Grid "L"
### Party Chief: R.H. Harriing

### Personnel
- Ted Shanshaw
- Ray Hursting
- Dick Currie
- Vic Wright
- Bill Martin
- Pete Johnston
- Pat Johnson
- Jack Lane
- Harvey Fig
- Mrs. Gillis
- Jim
- Russell Special

### Position
- Proprietor
- Party Chief
- E.M. op.
- E.M. Sec.
- Meter op.
- Linecutter
- Cook
- Social assist
- Seven Days

### Time & Wage

<table>
<thead>
<tr>
<th>Day</th>
<th>Helicopter</th>
<th>Fixed Wing</th>
<th>Linecutting</th>
<th>Geochem.</th>
<th>Geophysics</th>
<th>General</th>
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<tr>
<td>June 13</td>
<td></td>
<td>6,600</td>
<td>45</td>
<td></td>
<td></td>
<td>Put Johnny sick.</td>
</tr>
<tr>
<td>June 14</td>
<td>3 1/2 hrs</td>
<td>5,400</td>
<td>5.4</td>
<td></td>
<td></td>
<td>Helicopter in well 1. Brack flies cut to E and with Pat.</td>
</tr>
<tr>
<td>June 15</td>
<td>No injury</td>
<td>3,000</td>
<td>4.5</td>
<td></td>
<td></td>
<td>Jack Lodge hurt back flown out by chopper.</td>
</tr>
<tr>
<td>June 16</td>
<td></td>
<td>5,000</td>
<td>88.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>June 17</td>
<td></td>
<td>5,600</td>
<td>4.8</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>June 18</td>
<td></td>
<td>1,000</td>
<td>10,000</td>
<td>12,000</td>
<td>56,000</td>
<td>Grid &quot;L&quot;: linecuttings Meter finished.</td>
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<td>LINECUTTING</td>
<td>GEOCHEM.</td>
<td>GEOPHYSICS</td>
<td>GENERAL</td>
</tr>
<tr>
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<td>No. Samples</td>
<td>E.M.</td>
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<td></td>
<td>Job</td>
<td>Hrs.</td>
<td>Job</td>
<td>Hrs.</td>
<td>Lines</td>
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<td>20</td>
<td></td>
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</tr>
<tr>
<td>Tues</td>
<td>21</td>
<td></td>
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<tr>
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<td>22</td>
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<td>Thurs</td>
<td>23</td>
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<td>Fri</td>
<td>24</td>
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<td>25</td>
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<tr>
<td>Sun</td>
<td>26</td>
<td></td>
<td></td>
<td></td>
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Notable entries include:
- **Projected Time:** 7:40 a.m. - June 22
- **Wages:**
  - 200
  - 375
  - 315
  - 300
  - 200
- Total personnel listed:
  - Ted Stouven
  - Vic. White
  - Bill Mullen
  - Paul Coles
  -缝信
  - Tig Stanford
  - Herman Aco
  - Ral Kington
  - Bela Wayne

Other details include:
- **Project and Period:**
  - Project:
**Project**: Lead

**Claim Group**: Lead Grid D

**Party Chief**: Bob Handy

**Personnel**
- Bernie Spencer
- Herman Pep
- Joe Fettich
- Bob Harkins
- Paul P. Krzyzly
- Mary A. Pep
- Mike A. Pep

**Sampling**
- 20 Soil Samples
- 3 Linecuts

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<th>Day of Week</th>
<th>Helicopter</th>
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<th>Linecutting</th>
<th>Geochem</th>
<th>Geophysics</th>
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<td></td>
<td></td>
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- Magnetometer broken down
- Linecutting on grid D completed
- Soil sampling ended
- Dr. 1/3

**From June 27 to July 3**
<table>
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<th>PERSONNEL</th>
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<tr>
<td>Herman A.</td>
<td>Line-Cutting</td>
<td></td>
<td></td>
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<td>Oakley &amp; Ed.</td>
<td>Line-Cutter</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Paul published</td>
<td>Air</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bill Burb</td>
<td>Ground</td>
<td></td>
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</tr>
<tr>
<td>Fred Dingle</td>
<td>Party Chief</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ken Wright (Coming from Eye L.)</td>
<td>Party Chief</td>
<td></td>
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<thead>
<tr>
<th>Day</th>
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<th>LINESCutting</th>
<th>GEOCHEM</th>
<th>GEOPHysics</th>
<th>GENERAL</th>
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<tbody>
<tr>
<td>Mon 1</td>
<td>6</td>
<td>6½</td>
<td>1</td>
<td>E-F 1756</td>
<td>56</td>
<td>Chased out of line of W. E. and J. E. E. 200 lbs. 207 lbs.</td>
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<tr>
<td>Tues 2</td>
<td>6½</td>
<td>6½</td>
<td>1</td>
<td>262</td>
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<td>Took aerial line 110 to 100 and 40 lbs.</td>
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<tr>
<td>Wed 3</td>
<td>6</td>
<td>6½</td>
<td>1</td>
<td>356</td>
<td></td>
<td>Main camp moved from D's to E's</td>
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<tr>
<td>Thurs 4</td>
<td>6½</td>
<td>6½</td>
<td>1</td>
<td>389</td>
<td></td>
<td>FL. Camp set up 4.40 and 2.40 Magnetic Steel</td>
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<tr>
<td>Fri 5</td>
<td>6½</td>
<td>6½</td>
<td>1</td>
<td>346</td>
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<td>Magnetic Steel</td>
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<td>Sat 6</td>
<td>6½</td>
<td>6½</td>
<td>1</td>
<td>50</td>
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<td>Magnetic Steel</td>
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<tr>
<td>Sun 7</td>
<td>6½</td>
<td>6½</td>
<td>1</td>
<td>1459</td>
<td></td>
<td>Magnetic Steel</td>
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<td>TOTAL</td>
<td></td>
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<td>50</td>
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<td>Fly camp moved from 4.40 and 2.40 Magnetic Steel</td>
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<tr>
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<td>GEOCHEM</td>
<td>GEOPHYSICS</td>
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<tr>
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<td>------------</td>
<td>-------------</td>
<td>---------</td>
<td>------------</td>
<td>---------</td>
</tr>
<tr>
<td>Mon. July 11</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Move camp</td>
<td>120W</td>
<td>7500'</td>
<td>120W</td>
<td>75</td>
<td>120W</td>
</tr>
<tr>
<td>13</td>
<td>to Wason 16</td>
<td>120W</td>
<td>7500'</td>
<td>120W</td>
<td>75</td>
<td>120W</td>
</tr>
<tr>
<td>14</td>
<td>B.L.</td>
<td>8500'</td>
<td>120W</td>
<td>75</td>
<td>120W</td>
<td>1500'</td>
</tr>
<tr>
<td>15</td>
<td>B.L.</td>
<td>112W</td>
<td>7500'</td>
<td>120W</td>
<td>75</td>
<td>120W</td>
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<tr>
<td>16</td>
<td>B.L.</td>
<td>112W</td>
<td>11,000'</td>
<td>B.L.</td>
<td>40</td>
<td>B.L.</td>
</tr>
<tr>
<td>Sun. July 17</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>7</td>
<td>13</td>
<td>34,500'</td>
<td>195</td>
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**PERSONNEL**
- Bernard Spanier
- Henry Playn
- Ike Johnston
- Michael Shorty
- Bill Martin
- Paul Cantwell
- Mrs. Clara Tiery
- Bob Harvey
- Vic Wright

**Soil Sampler**
- 3 Linescutters

**Magnetometer**
- E.M.
- Cook
- Party Chief
- E.M.

**PAYMENTS**
- $300
- $400
- $375
- $500
- $550
- $400

**Liards: July 11 to July 12**
- Grass Lakes: July 13 to July 17
- Camp: July 13 to July 17
- Party Chief: Bob Harvey

From July 11
To July 17
PERSONNEL

B. Spanier
Soil Sampler,
Vancouver, B.C.

R.W. Harvey
Party Chief,
Vancouver, B.C.

J.S. Brock
Assistant Exploration Manager,
Ross River, Y.T.

E. Clegg
Chief Soils Analyst,
Ottawa, Ontario

All above-mentioned employees were under the employ of Atlas Explorations Limited as field exploration personnel for the year of 1966.
BIBLIOGRAPHY

1) GEOLOGIC SURVEY, THE OLD GOLD AREA AND LIARD MINERAL CLAIMS, J.W. STANIFORD

2) MAGNETIC AND ELECTROMAGNETIC GEOPHYSICAL SURVEYS, LIARD MINERAL CLAIM GROUP J.S. BROCK

3) GEOCHEMICAL SURVEYS, DUB AND ZOT GROUPS, J.S. BROCK

A private report to Atlas Explorations
SUMMARY OF COSTS

1) Wages and Salary
   May 25 - July 12, 1966
   48 days @ $20/day
   $ 960.00

2) Subsistence, Room and
   Board in the Field
   @ $12/man/day
   576.00

3) Overall Supervision
   of Sampling Survey
   @ pro-rated cost
   of $10/man/day
   480.00

4) Aircraft Support Charges,
   included in Report
   "Magnetic and Electro-
   magnetic Geophysical
   Surveys, Liard Claim Group"
   --

5) Total Cost Analysis of
   Samples for Trace Element
   Content by Atomic Absorption
   Photospectrometer Method:
   a) 'D' Grid  534 samples @ $2.50  1,335.00
   b) 'L' Grid  590 samples @ $2.50  1,475.00
   c) 'O' Grid  1,355 samples @ $2.50 3,388.00

6) Preparation of Report and
   Presentation of Data
   500.00

TOTAL $8,714.00
ATLAS EXPLORATIONS LIMITED
(N.P.L.)
330 MARINE BUILDING
355 BURRARD STREET
VANCOUVER, B.C.

AFFIDAVIT SUPPORTING SUMMARY OF COSTS:

I, John S. Brock, Assistant Exploration Manager
of Atlas Explorations Limited, of Ross River, Yukon
Territory, do hereby state that to the best of my know-
ledge and belief the statement of costs as presented in
this report, "Geochemical Soil Sampling Survey - Liard
Mineral Claim Group", Appendix IV, is both correct and
true.

John S. Brock

A Commissioner of Oaths
in and for the Yukon
Territory
GEOLOGIC SURVEY
OF
THE OLD GOLD AREA
AND LIARD MINERAL CLAIMS

WATSON LAKE MINING DIVISION
Yukon Territory

Long.  130° 40' West
Lat.   59° 50' North

by
Joseph W. Staniford, Geologist
Atlas Explorations Limited

June 22 - July 10, 1966
# GEOLOGIC SURVEY
THE OLD GOLD AREA
AND LIARD MINERAL CLAIMS

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<td>ECONOMIC GEOLOGY</td>
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<td>CONCLUSION</td>
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<td>APPENDICES</td>
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<td>Summary of Costs</td>
<td>I</td>
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<tr>
<td>Affidavit Supporting Summary of Costs</td>
<td>II</td>
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<td>Personnel</td>
<td>III</td>
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<td>Photo Geologic Study</td>
<td>IV</td>
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<td>Maps - A) Geologic Map</td>
<td>V</td>
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<td>B) Aero Magnetic Map</td>
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<td>C) Aero Electromagnetic Map</td>
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<td>D) Geologic Map - 'D' Grid</td>
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<td>Map - A) Geologic Map</td>
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KEY MAP
**LIST OF CLAIMS**

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<td>89244 - 89247</td>
<td>Assessment work filed to August 9, 1966</td>
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<td>Liard 5 - 20</td>
<td>89908 - 89923</td>
<td>Recorded January 31, 1966</td>
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<td>Liard 23 - 94</td>
<td>Y7265 - Y7336</td>
<td>Recorded April 27, 1966</td>
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INTRODUCTION

The Old Gold Area is located in the southeastern corner of the Yukon Territory. The mapped area lies to the north of the Liard River between Old Gold and Rainbow creeks. The southern portion of the area is heavily forested and has a gentle topography which affords few rock exposures. The Old Gold and Rainbow creeks are deeply entrenched in the southern portion of the area, however, and do provide very good exposures along their courses and those of their tributaries. To the north, the topography is one of extremely steep relief, much of which is above timberline. The rock exposure in the northern portion of the area is consequently far better than in the southern portion.

ROCK UNITS

The rocks of the Old Gold Area are predominantly grey thin-bedded phyllites which are locally graphitic. These rocks form a thick section which underlies most of the mapped area. These phyllites are interbedded with greywakes, argillites, slates, and very rarely with argillaceous limestones. To the north of these rocks is a
thinner section of interbedded rhyolite and argillaceous tuff. These extrusive rocks are in contact with granodiorite to the north. The granodiorite is part of a major batholith which forms the core of the very rugged mountains in the northern portion of the Old Gold Area.

**STRUCTURAL GEOLOGY**

The rocks of the Old Gold Area strike to the northwest and are predominantly south dipping. Regional folding has produced some local north dipping strata. Faulting in the area would seem to be considerably less than indicated by the air photo interpretation done previously. According to air photo geologic interpretation, nearly every stream was mapped as a fault. Evidence for this correlation is lacking and, in fact, much of the structural control on the course of streams in the area is due to the strike of the bedding.

**ECONOMIC GEOLOGY**

Because the predominant structural dip is away from the plutonic intrusion to the north and because very little faulting is indicated in the area, the Old Gold property would appear to be unfavourable for extensive mineralization. The rock types encountered are not those typically thought of as favourable to economic mineralization. The steeply dipping, nearly homoclinal, strata of
the area offers little in the way of ore traps.

On grid 'D', an area of several hundred square feet has been intruded by quartz and calcite veins. The quartz appears to be predominantly barren, but it does contain scattered chalcopyrite. An EM anomaly, located on lines 56 West and 60 West of grid 'D', is apparently associated with this quartz and calcite. Within the quartz blocks of float containing high grade chalcopyrite mineralization was found which seemed to indicate a vein two or three in width. It would seem that the mineralization indicated here is quite limited. A second smaller anomaly was located to the north on line 56 West. Some very sparse mineralization was found here also. A small showing of chalcopyrite mineralization is located on the north bank of the Liard River in the southern portion of the area. It would also appear to be of very limited extent.

The largest showing of the Old Gold Area, and by far the most interesting, is the showing drilled by Newmont Mines in 1956. This showing is located in the northern portion of the area in the rhyolitic and tuffaceous rocks. The showing is indicated for a considerable distance by surface gossans. It would seem to be quite narrow on the bases of the Newmont drilling, and it is believed that the mineralization is limited to a narrow favourable rock
unit, probably in limestone, and to a few north trending fractures.

CONCLUSION

It is believed that any mineralization in the Old Gold Area would be limited to narrow veins and fracture fillings, as indicated by the known showings in the area. The geology of the area would seem to make it very improbable that a major replacement ore body would be found.

Most of the EM anomalies within the area appear to be due to graphitic phyllites. The magnetic anomalies are apparently due to phyrrotite which is found in many of the argillaceous rocks.

Respectfully submitted,

[Signature]

Joseph W. Staniford
Geologist
Atlas Explorations Ltd.
### SUMMARY OF COSTS

1) Salary, 1 Geologist, 19 days @ $30/diem  $ 570.00

2) Camp costs and subsistence @ $12/diem  228.00

3) Compilation and presentation of report  325.00

4) Helicopter costs - included in geophysical costs, Liard Group

5) Fixed wing support costs - included in geophysical costs, Liard Group

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<th>Description</th>
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<td>Say</td>
<td>$1,100.00</td>
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AFFIDAVIT SUPPORTING SUMMARY OF COSTS:

GEOLOGIC SURVEY
THE OLD GOLD AREA
AND LIARD MINERAL CLAIMS

I, John S. Brock, Assistant Exploration
Manager of Atlas Explorations Limited, of Vancouver,
do hereby state that to the best of my knowledge
and belief, the statement of costs as presented in
Appendix I of this Report, "Geologic Survey, Old
Gold Area and Liard Claims", by J.W. Staniford, is
both correct and true.

\[Signature\]
John S. Brock

\[Date\]
Jan 25/67

A Commissioner of Oaths
in and for the
Yukon Territory
GEOLOGIST

J.W. Staniford,
Whitehorse, Yukon Territory

A geologist under the employ
of Atlas Explorations Limited
for the 1966 field season.
Staniford is a graduate geologist
with a B.Sc. degree obtained
in 1966 from the University
of California.
PHOTO GEOLOGIC STUDY

OLD GOLD AREA
GEOLOGY

OLD GOLD AREA

YUKON TERRITORY

ATLAS EXPLORATION LIMITED

-by-

W. WALKER, P.G.A.C.

Chev-Walker Associates
161 Milpolygon Avenue,
Willemdale, Ontario

24th, February, 1966
GEOLOGY

OLD GOLD AREA, LUKCH TERRITORY

-By-

W. WALKER, P.G.A.C.

SUMMARY

The Old Gold area is crossed by the Liard River which follows the north end of the Rocky Mountain Trench. Southwest of the break is a sequence of Lower Cambrian quartzites and limestones, dipping uniformly 20 to 30 degrees S.E.W. and crossed by many minor faults. Northeast of the break is a uniform series of Middle Cambrian to Middle Silurian beds, now largely phyllites and argillites with thin interbeds. A normal pattern of wrench faulting was imposed on these beds, N.W. faults are anomalous and may indicate a change in direction of pressures.

Mineralization is principally replacement type. The intersections of major N.W. and left hand (E.N.E.) faults appear to be the favoured structure, and investigation of these at stratigraphic traps, e.g. argillite over limestone, is recommended.
INTRODUCTION

The Old Gold area is one of several selected for exploration by Atlas. The present photogeologic study is based on published data.

The area, location and access

Two mineral deposits are known in the area, a chalcocite deposit at the head of Old Gold Creek, and a deposit on the north bank of the Liard, between the mouths of Old Gold and Rainbow Creeks. The Liard River divides the Simpson Range of the Polly Mountains from the north end of the Cassiar Mountains. The area straddles the 61°N line at 130° 45' W. Aerial photographs have been studied for the area between the Black River (E), hills on the west bank of the Liard (W), Wasen Lake (S) and the main N.E. to S.E. trend in the Liard.

The Alaska Highway at Pino Lake airstrip is about 60 air miles to the south, the Wassen Lake to Ross River road is about 50 miles to the east, and the road from Ross River to Carcross and the railway is about 75 miles to the west.

Previous work

Newmont Corporation explored the property at the head of Old Gold Creek from 1955 to 1957, but no records are available to the writer.

Work in preparation for the 4 mile series of
maps of the southern Yukon, begun by Bostock in the 1930's, was started in the Wolf Lake area by Fee in 1951 and completed by Roddick and Green in 1959 (C.S.G. Map 15-1960). The 1959 workers also helped complete work in the Finlayson Lake area to the north, started by Wheeler in 1950. The data were not available therefore for the 1957 map of the Yukon Territory (1050A), but are incorporated on the 1963 compilation of the Yukon and Northwest Territories (Map 10-1963) and Gabrielsco and Wheeler's Tectonic Framework of Southern Yukon and N.W. British Columbia (Paper 60-24).

Aeromagnetic sheets 13400 to 13510 and 13600 to 13620, at the one mile scale, and the 4 mile compilations, 70010 and 70020, cover the area.

The history of the prospect on the north bank of the Liard is not known.


**GENERAL GEOLOGY** (after Gabrielsco and Wheeler)

That part of the Cordilleran region which includes the southern Yukon Territory, may be divided into three northwesterly trending belts of relatively unmetamorphosed stratified rocks separated by two
zones of crystalline metamorphic and granitic rocks.

Lithology

The Old Gold area falls within the eastern belt of stratified rocks which embodies the Polly, Cassiar, and northern Rocky Mountains. This belt is underlain mainly by Mississippian and older rocks in regularly banded formations traceable for many miles.

The eastern belt was mainly miogeosynclinal during the late Proterozoic and early Paleozoic. Non-volcanic marine sediments deposited in late Proterozoic time are probably more than 7,500 feet thick and those deposited between early Cambrian and pre-late Devonian time probably total no more than 9,000 feet in thickness.

A relatively thick and widespread quartzite member was deposited as the basal member of the Cambrian succession. Perhaps the quartzite represents the basal beds of an eastern transgressing sea. A relatively thin unit of shale commonly overlies the quartzite sequence and is in turn overlain by fossiliferous limestone of early Cambrian age. The limestone was apparently deposited in shallow, well-aerated seas.

Minor green volcanic breccia and tuff interbedded with Middle and Upper Cambrian phyllites indicate some volcanism at this time.

Granitic rocks probably represent intrusions accompanying successive disturbances throughout much
of late Palaeozoic and Mesozoic time.

Structure

The middle Cambrian to middle Silurian rocks are generally highly folded and commonly form the loci of major faults. Within the map area, the Liard River follows the north end of the Rocky Mountain Trench, and the south end of the Tintina Fault lies just northeast of the area.

The Palaeozoic sediments form a flanking syncline to the Cassiar batholith antclinal area. A short distance northwest of the Old Gold area thrusting parallels the Tintina Fault. The Porcupine thrust is mapped in the Finlayson Lake area and Moorhouse has described thrusting at the Tintina Silver property. Southwest of the Porcupine thrust the structure is characterized by moderate dips and extensive low-angle thrusts, some apparently folded. Northeast of the Porcupine thrust the structures are featured by steep dips, tight upright folds, and fault slices, bounded by steep faults.

LOCAL GEOLOGY

Lithology

The oldest known relatively unmetamorphosed rocks in the Old Gold area are to the southwest of the Liard River (Rocky Mountain Trench). Thick-beded, reddish, grey, and white-weathering quartzites (1a) contain interbeds of phyllite and slate. The sequence appears to be several thousand feet thick. The unit is acc-
ompanied by thick-bedded, light gray limestone (lc), and it is not clear whether it is above or below unit 1a.

The sediments to the northeast of the Liard are probably Middle and Upper Cambrian, thin-bedded buff and gray phyllite and limestone (Unit 2) in part hornfels, limestone and skarn. They have been intruded, at the north boundary of the Old Gold area, by one of the granitic bosses which lie on the south flank of the Tintina Trench.

This much is evident from published data: to it one may add evidence from aerial photographs.

The hills within the right-angled bend of the Liard in the N.W. corner of the area give good exposures of the lower Cambrian formations. These appear to dip more or less uniformly S.S.W. at 20 to 30 degrees, with much minor faulting. One may envisage a series of limestone-quartzite cyclethems, and anticipate that some of the lower ground is occupied by shale.

The western outcrops of the phyllites of unit 2 are on the west bank of the Liard, i.e., west of the main break, and one has the impression that they were deposited against a fault-scarp shoreline. The implication is that the Rocky Mountain Trench was already in existence in Cambrian times.

In the Liard plain, although outcrop is scarce,
the effect of bedrock control on the terrain is clearly evident in the southeast trending ridges, which follow the bedding, broken up by cross-faulting. Glacial scouring and deposition, along this readily travelled southeast valley, has obscured much detail. The few recognisable bedding surfaces dip S.E., and there is probably repetition of beds by bedding-plane faulting.

To the northeast, where the granite has hornfelsed the sediments, and the terrain is mountainous, there is no perceptible change in the structural pattern.

One may nevertheless consider that the sediments in the lower ground were principally faulted by horizontal pressures, and that the sediments in the hills, while also subjected to those movements, were also jingled by the more or less vertical intrusion of the granitic stock: the form of the stock, both as mapped and as outlined by the aeromagnetic data, suggests forceful emplacement.

Most of the faults can be readily reconciled with a system of wrench fault tectonics acting under N.E.-S.W. pressures. Bedding and strike faults trend N.W. right hand faults trend N-3 (and are followed by the lower parts of Old Gold and Rainbow crooks, for example) and left hand faults trend E.N.E. (see Dome Crook). N.E. faults are presumably tensional.
A strong N.W. set of faults is anomalous to this strike and primary wrench fault pattern, and may well reflect a later changed direction of pressure. Several reaches of the Liard, Quartz Creek and depressions between Rainbow and Old Gold creeks provide examples.

ECONOMIC GEOLOGY

The main impression one gets of the geology of the area is of regularity. In such an environment one would expect that mineral deposits would be of the replacement type, where faults provide channelways and shales provide traps so that underlying limestones and sandstones can be replaced.

At the Tintina Silver deposit Moorhouse (p.74 op. cit.) noted "The silver-bearing lead zinc mineralization occurs in the limestone units as lenses, streaks and disseminations immediately below an argillite contact, in highly sheared zones in the argillaceous unit close to the thrust planes, in faults in the argillaceous limestone, and in shears in the two lower limestones".

And: "Chalcopyrite has replaced hornfels at the head of Old Gold Creek on a property explored by Newmont Corp., from 1955 to 1957 (J.O. Wheeler et al, Map 8-1960).

The Old Gold deposit appears to be associated with one of the many left hand (E.N.E.) wrenches; the deposit on the north bank of the Liard between Old Gold and Rainbow creeks is associated with a N.W.
fault and minor tension faults. These structures are far from unique, and appears that in utilizing geology in the search for deposits we must next look for stratigraphic traps, either by mapping on the ground or by using geophysics to differentiate rock types.

As much of the drainage is structure-controlled, the writer would wish to utilise stream sediment sampling to direct attention to the more important areas. Testing directly for copper and zinc is recommended, bearing in mind that because of mechanical weathering, the dispersion pattern of zinc is likely to be smaller than in warmer, chemically weathered areas.

On the evidence of the Keno Hill and Anvil Mountains areas, E.N.E. faults control ore deposition. Rose Creek at the foot of the Anvil Mountains follows a N.W. parallel subsidiary of the Tintina fault, and has several deposits along it at the junction with E.N.E. faults. Several of the principal creeks of the area, Little Scurvy, Quartz, Dome, etc., have lower reaches on E.N.E. faults which intersect the N.W. Rocky Mountain tronca (and its subsidiaries) followed by the Liard.

It is therefore recommended that the airborne geophysical program about to commence be studied not only for direct guidance to sulphide deposits,
but also to map potential stratigraphic traps, e.g.,
shale and argillite over limostone, and the stream
sediments be sampled for analysis initially for zinc
and copper.

Respectfully submitted,
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