

1972

AIRBORNE MAG.

018201

1. Federal survey seems to have been flown at high enough altitude to not be affected by presence of small volumes of greenstones. Lockwood Surveys Amag flown at 400 feet (cf. 1000' for federal survey) shows MAG anomalies many of which can be related to greenstone.
2. In the Anvil Range 5 of 11 isolated airborne anomalies are associated with known sulfides (not necessarily economic). The remaining 6 anomalies may not have been tested sufficiently, if at all.
 - A. Known sulfide masses identified by these anomalies include:
 - 1) Swim orebody
 - 2) Vangorda orebody
 - 3) Sulfides in Swim Lake on Kerr-Addison's BS claims
 - 4) SEA sulfides - originally worked on by Dynasty
 - 5) Faro
 - B. The size of the anomalies is probably a function of 1) size of the deposit, and 2) pyrrhotite $\frac{1}{2}$ magnetite content, and 3) depth of sulfides. For example, the two 500,000 ton sulfide bodies, Champ and Firth, do not have coinciding magnetic anomalies. The Faro orebodies have weak magnetic anomalies, while Swim (10,000,000 tons sulfides) and especially Vangorda (22,000,000 tons of sulfides) have strong magnetic anomalies. The differences in the strength and character of these anomalies may be due to different pyrrhotite volumes and percentages in the ore.

Bob -

Information on location ore-sulfide bodies - is shown on my original memo on above subject.

Uldis Jansons

ANVIL MINING CORPORATION LIMITED

MEMORANDUM

TO: R. L. Haffner FROM: U. Jansons
SUBJECT: YOUR COMMENTS ON MY APRIL 10, 1972 DATE: April 19, 1972
REGIONAL EXPLORATION MEMO

The following are answers to questions in your memo:

- 1) The proposed regional exploration is for areas outside the present Anvil claim holdings. My understanding is that Anvil is limited to exploration within the claim group only.
- 2) Our time advantage is:
 - a) We have started to compile a regional geology map for the Yukon. We can extrapolate Anvil Range rocks past the present Anvil claim holdings. A similar but smaller scale map is in the preliminary compilation stage and will be available to the public through the Geological Survey of Canada.
 - b) Within the Anvil Range rocks and the Anvil claim area, 5 out of 11 anomalies are known to contain sulfides. All of the six remaining anomalies have not been tested adequately, if at all.
 - c) Having above information (a and b) in hand, I feel, gives us an edge for exploration inside as well as outside the present claim group.

Also:

- 3) We have used the above airborne magnetic information to stake two groups of claims in the Swim Lake area. This was approved verbally by Bob Thurmond and you on March 23, 1972. At the next exploration meeting we will have to give an explanation for acquiring this ground.

I am hesitant about divulging the relationship between air-
borne mag and sulfides to Dynasty. I feel that they have not
been fully open about divulging all they know about the
Anvil area.

If Anvil were to go to a regional exploration program, I do
not feel that we should go out of our way to help a competitor.

Uldis Jansons
U. Jansons
Chief Exploration Geologist

UJ/mm

Attach.

ANVIL MINING CORPORATION LIMITED

MEMORANDUM

TO: Uldis Jansons FROM: R. L. Haffner
SUBJECT: Your proposal re Regional Exploration DATE: April 17, 1972

I have read your very interesting memorandum of April 10 and have a few questions and comments to make.

In the fourth paragraph on your first page you indicate that you intend to carry out a regional examination of the airborne magnetic anomalies in addition to the previously proposed and approved 1972 exploration program. Do you plan on extending the magnetic anomaly review beyond that area presently under Anvil's jurisdiction for exploration?

In your closing paragraphs numbered 1 and 2, is the time advantage you are referring to the fact that you are compiling a map of regional geology at the present time or are you referring to the fact that Anvil has an edge on the local geology in this region.

Your proposal is extremely interesting and one that I would like to follow up in further detail with an eye toward discussions with Bob Thurmond in Vancouver early in May. He will be at Faro later in May and if enough interest is generated we can go into the matter more fully at that time.

In any of the foregoing we will of course have to be very careful about exceeding the scope of the responsibilities that Anvil is assigned to with regard to exploration and I realize that we are all very sensitive to this point.



Robert L. Haffner
General Manager

RLH/cmd

Typed

MEMORANDUM

TO: R. L. Haffner

FROM: U. Jansons

DATE: April 10, 1972

SUBJECT: POTENTIAL REGIONAL EXPLORATION METHODS

During the compilation of airborne magnetometer results published by the Federal Government and the general geological information for the Anvil Range, a strong coincidence was found between known sulfides and isolated magnetic anomalies within the phyllite-schist rock units. The results of this compilation for the Anvil area are shown on the attached map. This memorandum is a request for approval to follow-up on this to develop a regional exploration program.

Preliminary compilations of geologic maps show that the Anvil Range metamorphic rock units can be projected on strike to the southeast towards Watson Lake. Several lead-zinc sulfide deposits have been prospected along this trend. These include the Matt Berry property (600,000 + tons), the Norquist Joint Venture (500,000 + tons), Asarco's Quartz Creek property (size unknown), plus lead-zinc shows to the southwest of the Tintina Trench controlled by Conwest and a lead-zinc property controlled by Tintina Silver Mines.

The lead-zinc showings listed above do not represent an exhaustive compilation of deposits in the trend. A major deposit located in the same area, but not on strike with the Anvil Range rocks, is the Tom property of Hudson Bay Mining & Smelting Company (7,000,000 + tons of 16.5% Pb-Zn combined).

Basically then the airborne magnetic surveys can be used to pick out areas of sulfide mineralization in the uniformly, weakly magnetic rocks. This method is proposed as a regional exploration tool. The areas to be investigated are in the Yukon for which airborne magnetic and general geologic maps are available. This work will be done in addition to the previously proposed 1972 exploration program which will be carried out as originally proposed.

*For what regions?
need OR outside area*

This memorandum is presented to determine if Anvil is interested in carrying on regional exploration at this time or in the near future. If there is interest to go into a regional program, much of the preliminary ground work can be carried out at the present time. From the results in the Anvil Range, the above method appears to represent a step in the direction that has not been used by Dynasty Exploration Ltd. or by Cyprus Explorations Ltd.

It is proposed that airborne magnetic anomalies be investigated to see if sufficient areas of magnetic anomalies can be outlined which warrant follow-up. This will be done by eliminating magnetic anomalies that can be ascribed to specific rock types. A compilation will be made of these anomalies. Follow-up of the anomalies will be reconnaissance soil geochemistry across these areas. Any areas of anomalous soil geochemistry will be staked and followed by appropriate detailed ground work.

A decision regarding the extension into regional exploration would be made in the near future for the following reasons:

1) A compilation map of the regional geology is in the preparation state - this will allow easy information to other workers on the regional geology. Regional maps of a larger scale can be prepared from available maps, but the compilation of these is hindered by the "map edge faults - or discontinuities." This can in large part be overcome by our knowledge of rocks in the field and the interpretation of rock descriptions on that basis. ?

2) We may have some time advantage over other companies in results, as outlined above.

Uldis Jansons

Uldis Jansons
Chief Exploration Geologist

UJ/mm

GLENNYON
TAY RIVER

PHYLITE
SCHIST
BELT

HILL RUST (HECLA'S GROUND)

ANVIL
BATHOLITH

FARO ORE BODIES

VANGORDA ORE BODY

LAKE CLAIMS ANOMALY

SWIM ORE BODY

DEADLY ANOMALY

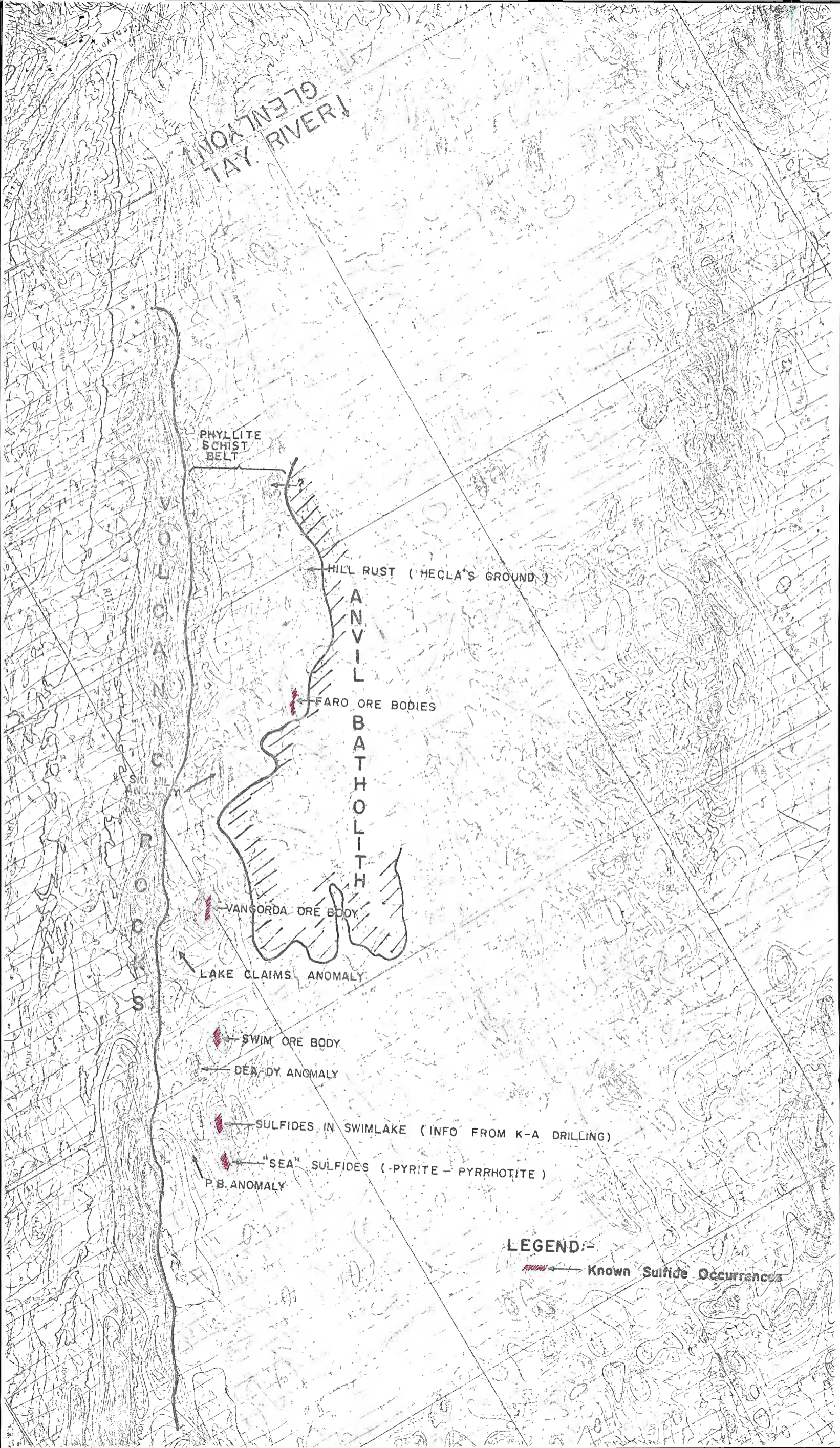
SULFIDES IN SWIMLAKE (INFO FROM K-A DRILLING)

"SEA" SULFIDES (PYRITE - PYRRHOTITE)

P.B. ANOMALY

LEGEND:-

 Known Sulfide Occurrences



INTRODUCTION

A strong correlation exists between aeromagnetic (AMAG) anomalies and known sulfide deposits in phyllites and schists of the Anvil Range. A regional exploration program can be developed using selected AMAG anomalies as targets for ground follow-up. A one year regional exploration program, including ground follow-up and exploration drilling, would cost about \$300,000.

ANVIL RANGE CASE HISTORY

Aeromagnetic maps, published by the Federal Government, show specific anomalies that can be related to known sulfide deposits in phyllite-schist belt of the Anvil Range. Figure I shows the relation of known sulfides and their associated airborne magnetic anomalies.

In the Anvil Range five of eleven isolated airborne anomalies are associated with known sulfides (not necessarily economic). The remaining six anomalies may not have been tested sufficiently, if at all. The known sulfide masses identified by these anomalies include:

- 1) Swim orebody
- 2) Vangorda orebody
- 3) Sulfides in Swim Lake on Kerr-Addison's BS claims
- 4) SEA sulfides - originally worked on by Dynasty
- 5) Faro orebody.

The size of the anomalies is probably a function of 1) size of the deposit, 2) pyrrhotite-magnetite content, and 3) depth of sulfides below surface. For example, the two 500,000 ton sulfide bodies, Champ and Firth, do not have coinciding magnetic anomalies, while Swim (10,000,000 tons sulfides) and especially Vangorda (22,000,000 tons of sulfides) have strong magnetic anomalies. The differences in the strength and character of these anomalies may be due to different pyrrhotite volumes and percentages in the ore.

REGIONAL EXPLORATION APPROACH

A regional exploration program based on investigating isolated AMAG anomalies in rocks of low magnetic susceptibility is proposed. Sulfide masses in Anvil Range phyllites and schists, and time-rock equivalents, present significant exploration targets of this type. A regional geologic map of part of the Yukon has been prepared by Anvil at a scale of 1:250,000 to show the distribution of Anvil Range and equivalent Eocambrian pelitic rock units. A northwest-southeast trend, from Mayo-Elsa to Watson Lake is apparent. Known lead-zinc sulfide mineralization is found within this trend. These lead-zinc deposits in addition to those in the Anvil Range include the Matt Berry Norquist Joint Venture, Quartz Creek, Tom property and others.

Aeromagnetic maps at a scale of 1:250,000 are available for the area of interest. These maps can be used in conjunction with the geologic map to select specific AMAG anomalies as exploration targets.

The possibility of using this approach for regional prospecting has been investigated on the Tay River, Watson Lake, and Wolf Lake map sheets. The geology of these areas has been sketched on to the equivalent AMAG sheets. Several unexplained isolated AMAG anomalies have been located which should have some follow-up ground work to determine their cause.

The suggested ground follow-up should include geological, geochemical and geophysical investigation.

The plan for regional investigation is to select all AMAG anomalies that can not be readily attributed to rock type variations. The anomalies are to be investigated initially by reconnaissance ground methods. The first approach is to investigate for rock-type

variations as possible cause of anomalies. If significant rock variations do not exist, soil and stream geochemical surveys will be done on these areas. The ground location of the magnetic anomaly would be fixed with a magnetometer.

A one year program for regional exploration would be adequate to test this method of regional exploration. This program can be subdivided into:

- 1) Office and library research - to be done in winter
- 2) Field programs - spring-summer-fall
- 3) Evaluation of field results - late fall program.

The office - library work would include selecting AMAG anomalies for investigation. All selected areas would be located on claim maps to determine any previous exploration activity in these areas. All work filed for assessment purposes with the Mining Recorder's office regarding these areas will be evaluated.

The spring-summer-fall program will consist of field work. This work will include exploration drilling. The costs for the various phases of work are outlined below.

BUDGETING OF REGIONAL PROGRAM

Costs for this work were estimated and the figures represent only highly generalized values.

Winter-Early Spring Program

1. Office Work

2 mo., 2 people @ \$1500/mo./ea.	\$ 6,000.00	
Office supplies, typing, drafting, etc.	<u>1,000.00</u>	
Sub-Total	\$ 7,000.00	\$ 7,000.00

Summer-Fall Program

2. Field Work

4 mo. helicopter mobilization		
4 hr./day - 60 days @ \$235/hr.	\$ 56,400.00	
Personnel - 2 @ \$1500/mo./person	12,000.00	
2 soil samplers \$750/mo./person	6,000.00	
Geophysics (ground mag operator) \$850/mo.	3,400.00	
4 mo., 2 vehicles @ \$650/mo./ea.	5,200.00	
Sample analysis - 100 per anomaly @ \$3.50 ea. - assume 50 anomalies	17,500.00	
Follow-Up - Contingency:		
Diamond drilling 7500' @ \$15	112,500.00	
Land acquisition 1000 claims @ \$50	50,000.00	
Geophysical Surveys:		
E-M, Linecutting, Gravity	<u>30,000.00</u>	
Sub-Total	\$293,000.00	\$293,000.00

Winter Program

3. Data Interpretation & Evaluation

2 people @ \$1,500/mo./person	\$ 6,000.00	
2 soil samplers, draftsman, technician @ \$750/mo./person	3,000.00	
Final reports and recommendations	<u>2,500.00</u>	
Sub-Total	\$ 11,500.00	\$ 11,500.00
TOTAL		<u><u>\$311,500.00</u></u>

The above regional exploration program is estimated to cost approximately \$311,500.00. This amount should cover any proposed drilling through the exploration stage only. No development drilling of significant proportion, if required, could be done on the above budget. To do development drilling a contingency fund of approximately \$200,000 should be budgeted.

OBJECTIVES TO BE SET FOR EXPLORATION PROGRAM

In the above section no reference has been made to property acquisition of staked claims or prospects. Whether this should be done or not will depend on company policies that will have to be established for any exploration outside the Anvil claim group. Other policies regarding exploration goals that will have to be established are:

- 1) Nature and type of primary exploration targets
- it was assumed that lead-zinc deposits of the Anvil Range type of 5,000,000 + tons were sought,
- 2) Areas of exploration
- will exploration be limited to the Yukon,
- 3) Personnel, office, etc.
- will work be carried out from Anvil mine site, staff requirements, etc.
- 4) Chain of command and job descriptions to identify areas and limits of responsibilities.

NOTES ON AMAG SURVEY

The speedy inception of the regional AMAG and subsequent follow-up exploration is recommended for two reasons. First is the available geology map, and second is the accumulated expertise on the Yukon geology and mineral deposits at Anvil. A 1:250,000 geology compilation map has been prepared for the Yukon at Anvil. A similar map on a 1:1,000,000 scale is being prepared by the Geological Survey of Canada. The availability of this map to the general public will put most competing exploration groups at the same level. Some companies working in the Yukon may also have 1:250,000 compilation maps of the general geology, others may not. To the best of our knowledge, Dynasty Explorations Ltd., one of the most active exploration teams working the Yukon the past ten years, do not have such a map. Cyprus Explorations also has shown no hint that such a map exists in their files.

At present the only available map of the Yukon which shows regional geology is a 1957 1:1267,200 scale map. The geology on this map is sketchy with large unmapped areas. No recent work, most of it in the area of interest for the proposed Anvil exploration program, had been mapped at that time, but this is available now. With the incorporation of recent geologic data and the help of the compiled aeromag map, the distribution of rock units in this area was possible and many of the rock contacts were defined. With a knowledge of the rock distribution in this area, specific time rock units or rock types can be selected for exploration.

The significance of mineralized time-rock units is well established in many parts of the world, and from regional work it appears that this approach to exploration can be used in the Yukon.

The following are time-rock units and their related mineralization that have been recognized in Western Canada in general, and in the Selwyn Basin of the Yukon in particular:

Cretaceous	W	Interediate Igneous Rocks
examples: Cantung, Mactung		
Mesozoic	Pb, Zn, Ag, Au	Siliceous Clastics
examples: United Keno Hill Mines		
Devonian-Mississippian	Pb, Zn, Ag	Black Shales, Cherts Quartzites, Conglomerates
example: Tom		
Cambrian Ordovician	Pb, Cu, Ag	Pelitic Rocks
examples: Faro, Vangorda, Swim, etc.		
Proterozoic	Pb, Zn, Ag, Au	Siliceous Clastic Rocks

The age assigned to the various rock units are not well established and therefore the "time" part of the time-rock units has to be evaluated carefully for the specific cases mentioned above.

On basis of gross metal value of Pb-Zn ore that has been found there the rocks of the Selwyn Basin present the most likely discovery of additional base metal sulfides if the "elephant country" theory of regional exploration is adhered to.

The second advantage of an imminent start-up of a regional exploration program is to take advantage of the available expertise of the regional exploration that has been accumulated at Anvil, to take advantage of the projected postulated increases in the lead-zinc prices, advantage of bringing in additional reserves for a potential smelter in the area, or any other reason.

Suggestion

~~Plan for Regional Exploration~~

The plan for regional investigation ~~would be to select~~ is to select ~~anomalous~~ all AMAG anomalies that can not be readily attributed to rock type variations. ~~These~~ ^{the anomalies} ~~would~~ ^{initially} ~~be~~ ^{reconnaissance} investigated by ground methods. The first ~~method~~ ^{approach} ~~would be~~ ^{is} investigation for rock-type variations as possible cause of anomalies. ~~Where no cause is readily~~ ^{IF significant} ~~variations exist,~~ ^{rock} soil and stream ^{surveys} geochemical will be done on these areas. The ground ^{location} of the magnetic anomaly would ^{be located} with a magnetometer.

A one year program for regional exploration ~~is~~ ^{would} be adequate to ~~test~~ test this method of regional exploration. ~~For~~ This program can be subdivided into:

- 1) office & library research - to be done in winter
- 2) field programs - ~~from~~ Spring - Summer - Fall
- 3) evaluation of field results - late fall program.

~~The Office - Library Work~~

The office - library work would include selecting AMAG anomalies for investigation. All selected areas would ~~be~~ be located on claim maps to determine any previous exploration activity ^{in these areas} ~~at~~ ^{with} ~~the~~ ^{with} ~~these~~ ^{with} areas. All work filed for assessment purposes ^{of the} ~~on~~ ^{mining} ~~these~~ ^{records office} ~~areas~~ ^{regarding} will be evaluated.

The spring - summer - fall program will consist of field work. ~~required to evaluate the selected anomalies.~~ This work will include ~~the~~ ^{up to} ~~the~~ exploration drilling ~~stages.~~ The costs for the various phases of work are outlined below.

REGIONAL EXPLORATION APPROACH

A regional exploration program based on investigating isolated AMAG anomalies in rocks of low magnetic susceptibility is ~~presented~~ ^{proposed}. Sulfide masses in Anvil Range phyllites and schists, and time-rock equivalents, present significant exploration targets of this type. A regional geologic map of part of the Yukon has been prepared ^{by Anvil} at a scale of 1:250,000 to show the distribution of Anvil Range and equivalent rock units. A northwest-southeast trend, from Mayo-Elsa to Watson Lake, is revealed ^(by the rock units). ~~Anvil Range time-rock equivalents and areas of~~ ^{known} lead-zinc sulfide mineralization ^{is} ~~can be traced~~ ^{are also found} within this trend. These lead-zinc deposits, in addition to those in the Anvil Range, include the Matt Barry ~~and~~ Norquist Joint Venture, ~~and~~ Quartz Creek, ~~and~~ Tom properties and others. Aeromagnetic maps at a scale of 1:250,000 are available for the ~~Mayo-Elsa to Watson Lake~~ ^{area of interest} ~~area of interest~~. These maps can be used in conjunction with the geologic map to select specific AMAG anomalies as exploration targets.

The possibility of using this approach for regional prospecting has been investigated on the Tay River, Watson Lake, and Wolf Lake map sheets. The geology of these ~~map~~ areas has been sketched on to the ~~so~~ ~~equivalent~~ equivalent AMAG sheets. Several unexplained isolated AMAG anomalies have been located which should have some follow-up ground work to determine their ~~cause~~ ^{cause} ~~for~~ ~~them~~.

The suggested ground follow-up ^{sh}ould include geological, geochemical, and geophysical investigation.

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2 mo., 2 people @ \$1500/mo./each	\$ 6,000.00
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	<hr/>
	7,000.00

Summer-Fall Program

2. Field Work

4 mo. helicopter mobilization	
4 hr./day - 60 days @ \$235/hr.	\$ 56,400.00
Personnel - 2 @ \$1500/mo./person	12,000.00
2 soil samplers \$750/mo./person	6,000.00
Geophysics (ground mag operation) ²⁵ \$850/mo	1,700.00 ^{\$3,400.00}
4 mo., 2 vehicles @ \$650/mo. ea	5,200.00
Sample analysis - 100 per anomaly @ \$3.50 ea. - assume 50 anomalies	<hr/> 17,500.00
Follow-up - Contingency	
Diamond drilling 7500' @ \$15	112,500.00
Land acquisition 1000 claims @ \$50	50,000.00
Geophysical Surveys	
E-M	}
Linecutting	
Gravity	
	30,000.00

Winter Program

Data Interpretation & Evaluation

2 people @ \$1,500/mo./person	\$ 6,000.00
2 soil samplers, draftsman, technician @ \$750/mo./person	3,000.00
Final reports and recommendations	2,500.00
	<hr/>
	\$299,200.00
	311,500.00

The above regional exploration program is estimated to cost approximately ~~\$300,000.00~~^{311,500.00}. This amount should cover any proposed drilling through the exploration stage only. No development drilling of significant proportion, if required, could be done on the above budget. To do development drilling a contingency fund of approximately \$200,000 should be budgeted.

OBJECTIVES TO BE SET FOR EXPLORATION PROGRAM

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 - it was assumed that lead-zinc deposits of the Anvil Range type of 5,000,000 + tons were sought,
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At present ^{shows} The only available map of the Yukon ~~on~~ which the regional geology is a 1957 1:267,200 ^{scale} map. The geology on this map is sketchy with large unmapped areas. No recent work, most of it in the area of interest for the proposed Anvil exploration program, had been mapped at that time but ^{this} is available now. With the incorporation of ~~this~~ ^{recent} geologic data and the help of the compiled aeromag map, the distribution of rock units in this area was possible and many of the rock contacts were defined. With a knowledge of the rock distribution in this area, specific time rock units or rock types can be selected for exploration.

1:1267

The second advantage of an imminent start-up of a regional exploration program is to take advantage of the available expertise of the regional exploration that has been accumulated at Anvil, to take advantage of the projected postulated increases in the lead-zinc prices, advantage of bringing in additional reserves for a potential smelter in the area, or any other reasons.