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TINTINA PROJECT

PROPOSAL FOR EXPLORATION

1969

by:

J. S. BROCK,

Operations Manager

ATLAS EXPLORATIONS LIMITED.

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It has been proposed by A. E. Aho that the Tintina fault zone be explored for orebodies subsidiary to the fault trench system such as Anvil and Sullivan in British Columbia. The program would consist of a regional search for other base metal districts.

In his proposal (see Appendix I) a three year program is recommended involving a total expenditure of about $3 million.

The 1969 program would consist of a $500,000 expenditure involving a field crew of:

2	project geologists
4	party chief geologists
8	prospectors
8	prospector's assistants
16	geochem samplers
38	men

The project geologists would each be responsible for 2 crews, one in Yukon and one in Alaska, each crew would be divided into two camps.

On the basis of this proposal offered, the following facts have been noted:

1. Dependent on geologic environment, a belt of some 60 miles in width (30 miles on each side of the Tintina) and 580 miles in length (from Fyre Lake, Y.T. (105-G-2) to Loper Fork Creek (Circle-C3) in Alaska. This would involve a total examination of approximately 34,800 square miles. In reality, approximately 10,000 square miles would likely be examined through actual field work.

2. The Tintina project would operate in four areas:

   (a) Fyre Lake to Ross River
   (b) Ross River to Stewart
   (c) Stewart to Alaska Boundary
   (d) Boundary to Circle Area.

   These regions have been chosen on the basis of:

   (i) Known geologic boundaries.
   (ii) Present locations of road and ground access routes.
   (iii) Proximity to settlements and supply points.

TINTINA PROJECT

FIELD CREW REQUIREMENTS - 27 MEN

Chief Project Geologist _____ Rate _____

Project Geologist N.W. Tintina _____ Rate/Mo. _____

Project Geologist S.E. Tintina _____ Rate/Mo. _____

Geologist-Party Chief (Camp #1)	Rate/Mo.	Geologist-Party Chief (Camp #2)	Rate/Mo.	Geologist-Party Chief (Camp #3)	Rate/Mo.	Geologist-Party Chief (Camp #4)	Rate/Mo.
Prospector	Rate/Mo.	Prospector	Rate/Mo.	Prospector	Rate/Mo.	Prospector	Rate/Mo.
Prospector's Assistant	Rate/Mo.	Prospector's Assistant	Rate/Mo.	Prospector's Assistant	Rate/Mo.	Prospector's Assistant	Rate/Mo.
Geochem Sampler	Rate/Mo.	Geochem Sampler	Rate/Mo.	Geochem Sampler	Rate/Mo.	Geochem Sampler	Rate/Mo.
Geochem Sampler	Rate/Mo.	Geochem Sampler	Rate/Mo.	Geochem Sampler	Rate/Mo.	Geochem Sampler	Rate/Mo.
Cook	Rate/Mo.	Cook	Rate/Mo.	Cook	Rate/Mo.	Cook	Rate/Mo.
6 man crew		6 man crew		6 man crew		6 man crew	

N.W. Tintina Project - 13 men

S.E. Tintina Project - 13 men

(Six)

3. Personnel required for the 1969 phase of operations have been revised slightly and are described in Fig. (i).

An alternate proposal for exploration of the Tintina has been drawn for the following reasons:

1. To provide more scientific and thorough exploration of the Tintina fault trench.

2. To alleviate initial administration load and subsequent problems.

3. To prepare and familiarize a reconnaissance crew with all features of known geology and mineralization before a full scale program is attempted. The members of the reconnaissance crew would be project geologists and party chiefs the next year.

4. To carry out orientation survey and experiment with up to date exploration techniques involving photogrammetry, geochemistry, geophysics, etc. before choosing exploration methods.

5. To become familiar with known mineral occurrences.

6. To create a working base for personnel involved so that they may efficiently contribute their talents to a major program.

The program would still involve the same expenditure and period of time, however, by this alternative method it is felt that expenditures would be less wasted and subsequent operations more efficient, by allowing time for regional study of the area in whole.

TINTINA PROJECT

PROPOSED EXPLORATION PROGRAM

	Proposal A	Proposal B (Alternate)
PHASE I		
January-April 1969	A. Preliminary Studies	A. Same

1. Aerial Photo Interpretation

   (a) Government low level
   (b) Satellite shots - if available
   (c) False colour - feasability

2. Geologic (Regional)

   (a) Study of G.S.C. 4 mile sheets
   (b) G.S.C. personal interviews
   (c) Aho - personal communications
   (d) Alaska State Publications
   (e) Available reports on known mineral occurrences

3. Prospecting

   (a) Study of areas of known mineral occurrences for geologic control.

4. Geochemical

   (a) Study of sampling techniques used in past and recommendations for improving regional surveys.

5. Administration

   (a) Hiring - 27 field men
   (b) Equipment and supply order
   (c) Transportation logistics
   (d) Budget and proposed expenditures
   (e) Study of Alaska work regulations
   (f) Program planning

PHASE II

May-September/69

Proposal A

A. Establishment of Camps

South Region

(a) Area I south - Stewart Crossing
- Ross River

(b) Area II south - Ross River
- Fyre Lake

North Region

(a) Area I north - Alaska Boundary
Stewart Crossing

(b) Area II north - Alaska Boundary
- Circle

B. Exploration (all regions)

(Exploration of areas pre-determined by preliminary studies)

(a) Geologic mapping
(b) Geochemical silt sampling
(c) Prospecting

C. Follow-up, pending exploration

(a) Detailed geochem- mapping
(b) Property acquisition.

October-December/69

D. Evaluation of Data and planning of continued program

Proposal B (Alternate)

A. Reconnaissance

(a) Examination of areas of known showings.
(b) Familiarization with regional geology.
(c) Reconnaissance of all regions:

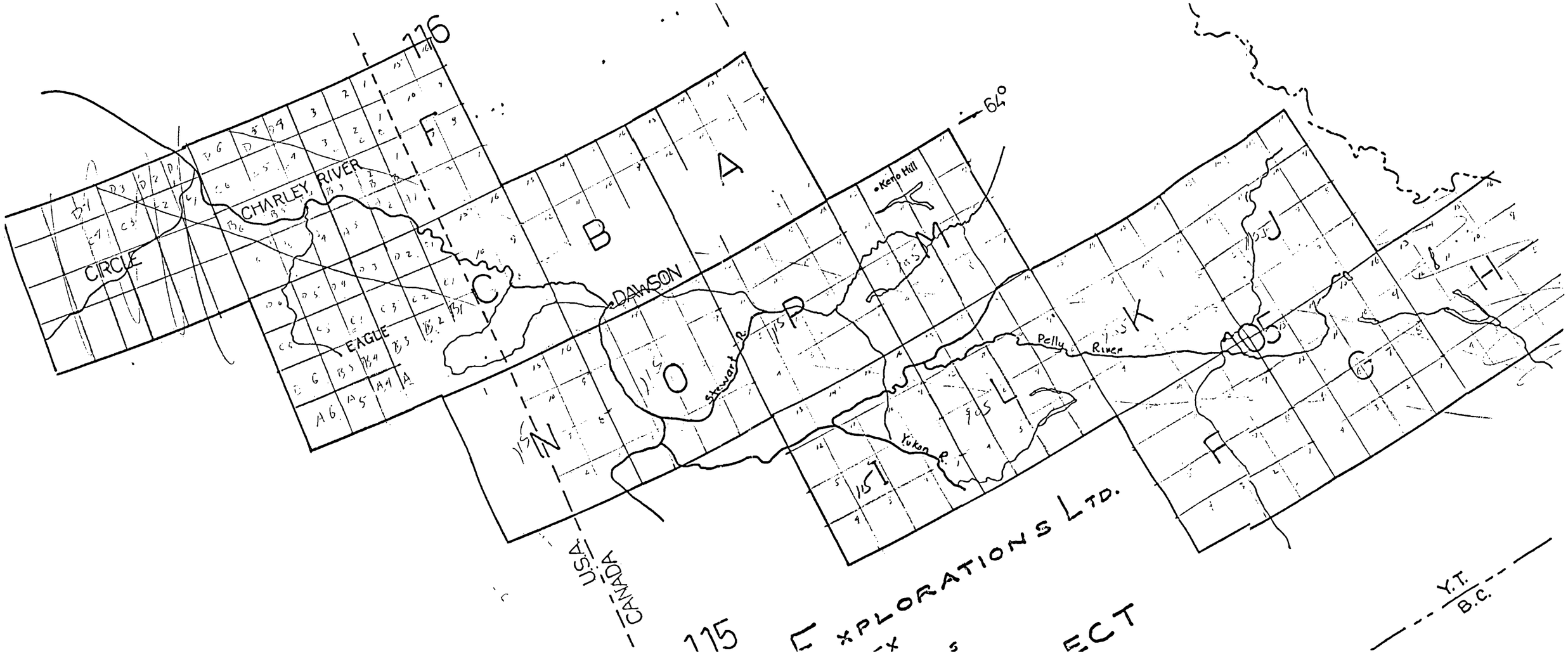
(i) Ross River-Stewart Crossing
(ii) Stewart Crossing-Boundary
(iii) Boundary-Circle
(iv) Ross River-Fyre Lake

to include:

- Super Cub recce
- False colour techniques
- Gossan spotting
- Geochem orientation such as silting of all drainages into Tintina Valley

B. Evaluation of data and planning of major program

PHASE III	Proposal A	Proposal B (Alternate)
1970	A. Property Evaluation to prepare targets for development. B. Continued regional exploration and follow-up.	A. Detailed follow-up on defined zones for intensified exploration. B. Property acquisition C. Limited property development
1971	A. Testing of prime targets B. Continued exploration.	A. Property development and testing of prime targets B. Continued exploration


116
115
64°
CIRCLE
CHARLEY RIVER
EAGLE
DAWSON
Stewart R.
Kerlo Hill
Pelly River
Yukon R.
USA
CANADA
EXPLORATIONS LTD.
PROJECT
Y.T.
B.C.
A
B
C
D
E
F
G
H
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K
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M
N
O
P

TINTINA PROJECT

BIBLIOGRAPHY

Yukon - N.T.S.

105 - H - 4, 5
105 - G - 1, 2, 3, 6, 7, 8, 9, 10, 11, 12, 13, 14.
105 - F - 9, 10, 15, 16.
105 - J - 4
105 - K - 1, 2, 3, 4, 5, 6, 7, 8, 11, 12.
105 - L - 1, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16.
115 - I - 16
105 - M - 3, 4, 5.
115 - P - 1, 2, 3, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14.
115 - O - 9, 10, 11, 13, 14, 15, 16.
116 - B - 1, 2, 3, 4, 5, 6, 7.
116 - C - 1, 2, 7, 8, 9, 10, 15, 16.
116 - F - 2

Alaska - Eagle - B1
C1, C2
D1, D2, D3, D4

Charlie River - B1, B2, B3, B4, B5, B6
C3, C4, C5, C6
D4, D5, D6

Circle - C1, C2, C3
D1, D2, D3

APPENDIX I

CONFIDENTIAL

Draft Proposal - Tintina Project (To be expanded)

A. BASIC PREMISE

The Anvil and Sullivan orebodies, which are remarkably similar, both occur subsidiary to the Rocky Mountain-Tintina fault trench system, their localization probably being favoured by dilational localities of uplift, anomalous structure, or divergence in the main deep-seated fault system. The program is based on regional geology and mineral deposits of North America, and is thus a regional search for another Anvil-type lead-zinc or /copper district rather than individual orebodies.

Using my paper on Zn-Pb province of Yukon as a general background reference, among other clues which may be developed, regional search should include:

(a) subsidiary structures at oblique angles to, or parallel to Tintina trench;

(b) areas of uplift or vertical tectonics which may also be accompanied by intrusives;

(c) intrusives of Cretaceous age;

(d) areas of Lower Cambrian or Proterozoic rocks, particularly if gently dipping; graphitic or pelitic sections with some limy members being favoured;

(e) zones of ultrabasic rocks indicating deep transgressive structures;

(f) areas in which replacement-type Pb, Zn or Cu mineralization occurs or is reported, or in which stratiform alteration zones occur;

(g) areas of rust cemented overburden or rust seepages;

(h) aeromagnetic anomaly zones that may tie in with above;

(i) possibly N-S linears that may result from tensional fault directions.

B. REGIONAL TARGETS

Yukon

Localities (among others possible) to investigate in Yukon by detailed compilation of data and preliminary reconnaissance silt sampling:

Field Check 1) Fortymile-Clinton Creek linear including Yukon River below Fifteenmile Creek (Dawson Sheet). Find old reference to silver-lead showing in bluff on Fortymile River.

Field Check 2) Vancouver and Reverse Creek-Rusty Creek areas on Mayo Sheet (check on Ag-Pb discovery trenched a few years ago by Dualco); also Zinc Creek near Barlow where zinc reported and staked ca. 1931. Check on reported Ag-Pb and Au occurrences in vicinity of Crooked Creek SE of Stewart Crossing.

Major structural intersections occur in the Mayo district at Clear Creek and at McArthur range; this intersection with the trench is late Cretaceous, same as most of the mineralization in Pb-Zn province (penecontemporaneous). The age of metallogenesis is therefore important.

3) Detour Lakes vicinity on Pelly River. Check reported mineral showings (copper) and extent of recent work done in this region. No field check until more background data is available on recent work by others. Also check on Glenlyon Lake.

* 4) In Anvil district check lower Anvil Creek. East Cub and Beta, Vangorda and other areas - have good chances for additional orebodies. Contingent on agreement with Anvil.

Field Check 5) Ross River area both up Pelly and Hoole Rivers and around first bend of Ross River. Check on previous work done, also on all published aeromagnetic sheets.

6) Review all data on Fyre Lake section of Pelly Mts. - copper

province. This area has promising type copper replacement deposits regionally associated with serpentine and major faults (as in Finland).

Compile detailed data on all mineral occurrences within 20 miles of Tintina trench, and also all reported rust areas.

* Further exploration in the Anvil district should be included somehow since it is apparent that additonal similar orebodies must exist in this district, even though their ease of discovery may be secondary to that in the overall Tintina project.

Alaska

Information on Alaska portion of Tintina trench to be compiled confidentially by one or two competent geologists who are good at scouting and public relations, to gather information.

1) Interview all geologists who have worked in the region to find out all possible on mineral occurrences, rust seepages, or rust-cemented overburden, alteration zones intrusive types, etc.
2) Interview (carefully) prospectors or other company representatives who have worked in the region.
3) Visit Eagle, Circle and Taylor areas to fill in further data.

Until data defines other localities of interest, see if anything develops in the areas of uplift and Lower Cambrian or Proterozoic rocks in (a) Tatonduk River-Hardluck Creek area (Charley River sheet), including area around Eagle (ultrabasics and favourable structure), (b) Snowy Peak area (Charley River sheet), and (c) the Crazy Mountains area (Circle sheet) (similar to the Sullivan mine area near the end of Rocky Mountain trench).

GENERAL PROPOSAL

Initial work should consist of compilation of all data - physiographic, geologic, mineralogic. Some airborne reconnaissance should be done to check for gossans, alteration zones, etc. not hitherto mapped.

Initial ground reconnaissance should be aimed at gathering further supporting data, especially geology, signs of mineral occurrences, and geochemical samples at half-mile spacing or closer from both soils and silts, mainly silts but with intervening soils where silts are not obtainable to give coverage of slopes; emphasis on small drainages, not the larger streams. All samples to be run for zinc, copper and lead. The possibilities of other minerals such as asbestos, gold, nickel, etc. should also be considered and prospecting and geochemistry should thus be done for other minerals or indicative trace elements.

Geochemistry in unglaciated areas differs from that in glaciated areas due to weathering and leaching, resulting in lower backgrounds in stream sediments and soils (cf. Thistle Creek silts and Clear Creek soils).

Personnel in 1969 should probably consist of approximately the following:

2 top-notch exploration geologists - one in Yukon section and one in Alaska, with 2 exploration teams under each. Exploration teams to each consist of a geologist in charge, 2 senior prospectors with assistants (the latter do geochem also) and 4 geochem samplers.

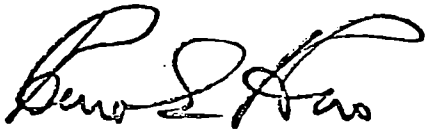
Follow-up should consist of more detailed work and aeromagnetic surveys of likely areas, on the assumption that the deposits are apt to be magnetic.

Initial budget to consist of about $500,000 for 1969 and about $2.5 million for followup and drill testing of varous targets in 1970 and 1971. Thus a total of about $3 million should be planned for the

project. This expenditure is relatively small in relation to the potential value of the expected discovery. Such a program should have a high probability of discovering another major mineral district. Proposed name for the operating company should be Tintina Mining Corporation Limited.

If several areas of combined favourable factors including mineralization are explored, probabilities of success are greatly heightened even on an empirical basis.

Development of the anticipated discovery could tie in with overall development of hydroelectric, mineral and petroleum-natural gas resources of Yukon or Alaska.



A. E. Aho
September 1968

APPENDIX II

OTHER RELATED EXPLORATION PROPOSALS AND REPORTS

1. Ross River Syndicate - Chaplin (January, 1966)
2. Proposed Areas for Further Reconnaissance - Aho (Feb. 1967).
3. Tectonic Research - Aho - Brock (January, 1967).
4. Suggestions for Prospecting Area - Aho (1965).
5. Tectonic Research - Chisholm - Smith (February, 1967).
6. Development of Yukon's Major Resources - A. E. Aho and Associates (file not completed)

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Descaul

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MEMO TO: Dr. A. E. Aho
A. Kulan
R. E. Chaplin

January 25, 1966.

MEMO RE: ROSS RIVER SYNDICATE PROPOSAL
by ROBERT E. CHAPLIN, P. Eng.

The attached report outlines a proposal to use geochemistry as a primary tool for indicating base metal targets in the area between Anvil and Watson lake along the TITINA fault. I am impressed with the geological thinking and compilation that has gone into the proposal and also the work carried out by Chaplin in the Terrace, B.C. area last year. He appears to have outlined some worthwhile targets there for further detailed investigation which were overlooked by other larger companies with more resources at their disposal.

The area proposed this year encompasses part of the area planned for investigation by us, ie, the Norque Syndicate area; the FYER LAKE CONWEST SHOWING AREA; and the Old Gold creek-Newmont Showing area. The geochemical survey could provide valuable background data for our future exploration in these areas.

His area was selected because of its geological similarity to the Dynasty area whose late MESOZOIC granitic stocks intrude earlier schists, along the north side of the regional TINTINA fault zone. He further localized this area by proximity to a theoretical flexure in the schist horizons outlined by a warp in the TINTINA fault itself near FYER LAKE, accompanied by a bend in more basic horizons to the north of the FYER LAKE intrusive mass, as shown by the aero magnetic trend lines. He plans to narrow down this area further by doing reconnaissance silt sampling along the stream at half mile intervals and subsequent detailed geochemical work in larger base metal localities. He also proposes to scan the area for gossans by helicopter during the early part of the season. This suggestion could be incorporated into our own program as well.

The Ross River Syndicate proposal could be criticized in being too ambitious for this type of syndicate, in that Chaplin proposes to raise $175,000 and employ 20 men in the field.

A smaller, more closely supervised operation might be more effective. The geological flexure he selected as being the important control in base metal deposition, may not be as important as he believes. My own thinking in the case of the DYNASTY area, is that three essential factors are necessary for base metal deposition there: (1) A highly positive base metal horizon provided by the black graphitic slates of the Dynasty-Vangorda area. (2) An acid intrusive stock to mobilize the base metals of the base metal positive horizon. (3) Channel-ways such as faults to provide the locus for base metal deposits. The loci of the deposits here appear to be the intersections of northeasterly trending subsidiary faults as outlined by the parallel creek pattern, and a northwesterly-south easterly trending fault parallel to the TINTINA fault on its north side. This north easterly trending fault system appears to be developed at other locations along the major TINTINA transcurrent fault, and should be investigated carefully in the vicinity of other granitic stocks along its length. The presence of the base metal positive source bed may be indicated by the airborne EM survey as was the case in the Vangorda area or it may show up in the geochemical work. Dr. Hugh S. Bostock drew my attention to the widespread base metal values in graphitic shales in this area and believes the base metals may be syngenetic in nature. He agreed that concentrations of these, under suitable structural conditions in the vicinity of intrusive stocks, was a distinct possibility. We thus combine the best features of the syngenetic and hydrothermal hypotheses.

Be this as it may, I think the most efficient method of locating these concentrations is by the airborne program we are embarking on this season. Despite its merits the geochemical program offered by Chaplin appears to put the cart before the horse in proposing to do airborne survey after the geochemical anomalies are located.

With the above reservations, however, I think his syndicate proposal is worthwhile and should provide valuable data which may provide secondary targets of interest. I would, therefore, recommend that we participate in the Ross River syndicate as a minority partner to the extent of, say, $15,000.00.

I discussed with Chaplin the possibility of running his samples in our laboratory in Ross River and he was agreeable.

He had a similar arrangement last year with Kennecott in the Terrace area of B. C. Kenco charged him $2.50 for a copper, lead, zinc, molybdenum determination. This would be compatible with our proposal to charge 50¢ per determination. We would require an additional shift at our laboratory to handle the work.

E. O. Chisholm.

ROSS RIVER SYNDICATE

Recent spectacular large low-grade base metal discoveries in the southeastern Yukon Territory will undoubtedly provide the ore for a vast industrial-metallurgical complex in the Yukon within the next few years.

Consequently your participation is invited for a joint venture to examine known properties and to conduct primary exploration using all available finances, personnel, and latest exploration ideas and techniques.

The availability of known mining properties is quickly diminishing as a direct result of the Dynasty-Cyprus success. The present proposal is largely concerned therefore with primary exploration using the method of successive technical approximations in the following stages:

1. Regional tectonic and lineament analysis in mineralized areas to provide a framework for an intelligent choice of area.

2. Rapid and highly mobile traverses and reconnaissance fixed wing gossan hunts within the chosen area. Representative silt samples are collected from every primary and secondary drainage basin to delimit metallogenic zones within the exploration area.

3. Saturation type prospecting starting in those areas, within the overall area, that appears most obviously promising on the basis of stage 2. Approximately 5 per cent of all the geochemical samples collected will be taken during stage 2. All known showings will be examined on a 3-G basis to serve as models for interpretation of other anomalies.

4. Airborne surveys if applicable based on data from first three stages (starting early in 2nd year).

5. Systematic ground surveys and diamond drilling of any targets outlined in all stages.

The area of primary interest is a wedge-shaped district of 4000 sq. miles located northeasterly from the Tintina Trench, between Findlayson Lake and Frances Lake, to the Tyers River area. The entire area is within a NE zone of flexure marking a change of trend in the cordillera from northerly to northwesterly. In the Tyers River area, the Norquest Joint Venture has discovered a large low grade base metal replacement zone, and more recently, similar zones have been located by the Mt. Billings syndicate. Conwest has located higher grade silver-bearing sulphides in the North Lakes and Grass Lakes areas. Newmont worked on a copper replacement zone in a silicified hornfelsic zone close to intrusive rocks located in the Old Gold River drainage near the Tintina fault zone.

The method of operation:

In mid May the field crew will begin a brief training program to insure that each member is capable of understanding basic exploration operations as applied to this operation. A mobile base camp will be set up on the Watson Lake - Ross River road and will include a mobile geochemical laboratory capable of determining hot extraction analyses for copper, lead, zinc and silver.

The work will begin with strip flights with a super cub for spotting gossans and simultaneously 6 - 2 man crews will be set out on rapid reconnaissance traverses to silt sample primary and secondary drainage areas. Results of the above work will determine priorities for areas of interest and will require approximately three weeks of maximum aircraft support plus road and waterway

mobility. The target of special interest is of the large low grade base metal replacement type and about 500 preliminary silt sites will be tested in this stage.to pick out metal positive rock units. Air photos and 1/2 mile base maps will be used for traverse control.

All traverse maps will be adequately prepared in advance and crews briefed to watch for special features that may materially affect the interpretation of data obtained. Geological, geochemical and geophysical data (3-G) will be interpreted on an integrated basis.

Note that the area is served by a central road along which the base camp will travel. Two other base camps may be necessary at the extreme NE and SW corners of the area of interest which may be supplied by fixed wing service.

Most of the saturation stage of prospecting will be done by foot traverses supported by aircraft, auto and boat transport. Radio communications will be necessary for efficient use of mobility factors.

Data will be collected on prepared traverse sheets designed to assist the field man in noting all data in a systematic manner. Data collected will contain geological descriptions of stream bottom contents at 1/2 mile intervals (the silt sample interval). Consideration should be given to a computer program to analyse geochemical results using equations developed by the G.S.C. The Perkins-Elmer double beam atomic adsorption photo spectrometer is well suited to such a program and will detect the metal contents of stream sediments to the nearest P.P.M.

A total of twenty men will be required to complete the preliminary survey and will include 6 - 2 men reconnaissance geochemical crews, 2 analysts, a geologist, a geophysicist (to determine geophysical characteristics of rock types and mineral occurrences), a cook, expediter, and manager and assistant.

ESTIMATED COST FOR 1966 SEASON (4 MONTHS)

Capital Costs

Prospecting equipment	$ 10,000	
Geochemical lab.	15,000	
Vehicles	7,000	
Maps, photos	1,500	
Subtotal		$ 33,500
Fixed wing	8,000	
Helicopter	35,000	
Claim staking	8,000	
Radio communications	4,000	
Food	15,000	
Salaries	52,000	
Transportation to and from Yukon	4,000	
Assays	1,000	
WCB, UIC, CPP, Insurance	5,000	
Reserve	9,500	
Subtotal		143,500
TOTAL:		$ 175,000

The figure of $175,000 for the first year would earn a 90 percent interest in the syndicate. The remaining 10 percent would be divided amongst the active field crews (6%) and management (4%).

Respectfully submitted

Robert E. Chaplin

Robert E. Chaplin, P.Eng.

To: Mr. R.E.G. Davis
Mr. E.O. Chisholm
Mr. J.S. Brock

February 1, 1967

From: Dr. A.E. Aho

PRELIMINARY PROPOSED AREAS FOR FURTHER RECONNAISSANCE EXPLORATION APART FROM SHELDON AND FYRE LAKE PROJECTS

1. Hess River

Reconnaissance supported by fixed wing and helicopter should be done in the general Hess River belt between the Canol Road and end of Mayo Lake, for the following reasons:

a) It is the next logical unexplored area to be covered, as originally proposed for the Dynasty Syndicate in 1963 and 1964.

b) The area has favourable geology, including intrusives, and a southeast projection of the major Mayo Lake anticlinal structure which appears to be one of the localizing structures for the Keno Hill deposits. In the vicinity of Old Pass and Rock Fork creeks south of Fraser Falls there is a belt of east-west structural disturbance and overturning which may also be significant.

c) It is an area of known mineral occurrences, including gold, silver-lead, lead-zinc, and copper, but with very little exploration done because of its former inaccessibility.

The program should consist of:

a) Initial phase of compilation of air photo data and photo-interpretation of structure and geology, since very little of it has been adequately mapped.

b) Ground follow-up with conventional prospecting, heavily supported by reconnaissance geochemistry.

2. McQuesten Mineral Belt

The mineral possibilities of this area are covered in some detail by my paper "Mineral Potential of the Mayo District", but emphasis is being placed on the unexplored western section of the district, mainly because of similar favourable complex geology,

intrusives, and varied mineral occurrences, particularly a gold, tin and tungsten association closely related to certain granitic stocks. Although mineralization is distributed around several such stocks, including those of Haggart, Highet, Boulder, Arizona, and Clear creeks, as well as some intrusives near the south and north forks of Klondike River, the main area of interest should be centred around Clear Creek for the following reasons:

a) The general Clear Creek vicinity is at the intersection of a projection of the east-west McQuesten anticlinal structure with accompanying belt of granitic stocks, and of a major northwest trending grain consisting of granitic stocks and mineral occurrences extending to the north Klondike, and also a major lineament sub parallel to the Tintina trench. In particular, the presence of this lineament which includes Little South Klondike, Clear Creek, and Thoroughfare Creek, may be significant in mineral localization similar to the zones of low topography along which the Faro, Vangorda and Swim Lakes deposits occur, and on which the Fyre Lake deposits are situated.

b) A number of varied mineral occurrences are known in the area, particularly a considerable concentration of tin at Barney Pup on Clear Creek.

c) Clear Creek is serviced by a road which can be easily made passable with a little cat work and has the advantage of an old dredge camp which can serve as a convenient base.

d) It is very probable that a commercial lode tin deposit, perhaps even a commercial placer, exists in this area, but has not been recognized because of the lack of attention to tin. The future world market for tin is excellent, and tin is easily recoverable in mining operations.

Exploration in this area would have to be almost entirely helicopter supported except for road access, because no lakes exist. The program should consist of contour soil sampling and panning of all streams, mainly because it is an unglaciated area with sparse and intensely weathered outcrops, and mineral occurrences can best be found by geochemistry or by panning for the resistant minerals such as tin and tungsten. Conventional prospecting of this area has been very limited and only done in the early days when weathered minerals or occurrences such as tin or tungsten were not recognized, the

emphasis being entirely on gold or silver-lead. This area is considered to be a top priority target because of its specifically known geologic setting in relation to mineral occurrences. Of utmost importance will be the establishment of field methods for geochemical detection of tin, as well as routine HCl-Zinc testing for tin in pannings.

General

The above two programs should be carried out in the same season by the same crew; the Clear Creek program should have financial participation by Silver Titan because the company was originally considered in the initial planning of this project.

February 1, 1967 A. E. Aho

To: Mr. R. E. Gordon Davis
Mr. E. O. Chisholm
Mr. C. L. Smith

From: A. E. Aho/J. S. Brock

January 25, 1967

PROPOSAL FOR SETTING UP TECTONIC RESEARCH DIVISION OF OUR ORGANIZATION

The purpose of this division is to devote the majority of its efforts to compiling data on tectonics, mineral occurrences, aeromagnetics, photo interpretation, and all regional information on a broad scale, beginning with the northwestern Cordillera, which includes Yukon and adjoining portions of Alaska and northern British Columbia. This approach is to be used as the main basis for determining areas of maximum mineral potential which can then be followed up by the best modern exploration techniques that appear to apply to any particular section of the region. This separate organization should consist of members who have considerable background in the region, and they should not be engaged in basic exploration projects which tie them down to any particular area.

It is proposed that there would be a division of exploration staff to include a research branch and basic exploration branch. The two would be combined only for the purposes of data exchange.

This project can be started immediately, with attention being devoted to certain areas already under consideration and, as cash flow is developed from Chile or from the Anvil project, this should be established as a separate branch to continue and complete the coverage. The project should be planned initially for a two-year basis.

The maps or compilations should be made in such a way that they can be added to, modified, and brought up to date with more detail supplied by basic exploration being done in any specific part of the area.

This organization could be under Dynasty Explorations, financed by Dynasty, and could provide the information to Atlas or others of the associated companies on some participation basis, and cash flow from Atlas operations would be used for the actual exploration program. Similar work can be done by the same organization in conjunction with personnel in Australia, South America, or the western States, it being necessary that someone with specific experience in a region be incorporated in the study.

It is recommended that personnel already actively engaged in the field in Canada, Australia, and Chile, be first considered for a research program of this type, due to their familiarity with respective geographic locations and general Atlas exploration policy. In the initial stages of research the only outside help that would be incorporated would be through government mineral department services and consultants. As more personnel would later be required they should probably become experienced with actual exploration field techniques before being incorporated into a research program.

As the research organization becomes established, it should also consider development of new techniques of exploration - in such fields as

geophysics, geochemistry, photo interpretation, etc. This is realized because combined saturation techniques cannot be efficiently applied for every area of exploration without first incorporating regional considerations.

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Gordon Davis, E. O. Chisholm, Clyde Smith - please comment with any additional suggestions. Please submit briefs on this proposal, including recommendations and mention of topics in which you may offer major contributions.

TELEPHONE 685-4331

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330 MARINE BUILDING
355 BURRARD STREET
VANCOUVER 1, B.C.

MEMO TO:

FROM: E. O. Chisholm DATE: February 21, 1967.

Re: PROPOSAL FOR SETTING UP TECTONIC RESEARCH DIVISION IN OUR ORGANIZATION

I will agree in principal that a project of this nature is necessary for intelligent planning and exploration campaigns, and it is pointed out that it was the basis of our 1966 pre-planning. The timing of the project, to what extent we should become involved, and the expenditures should be given careful consideration.

There has been a considerable amount of work done in the field in the broad framework of continental structures and even in world structures. To cite one example, I refer to a reprint attached from the Western Miner & Oil Review of October 1960 by Sherwin F. Kelly. The references in this report cover considerable research in the field. Dr. Brock's paper mentioned by J. S. Brock offers some new and original ideas on the tectonic framework of continents and suggests that marginal fault blocks are controlling economic features. He points out that their extension into areas of deep overburden or unexplored terrain may be the focus of major economic deposits.

Detailed papers on specific structural control in mining camps, of course, are found in many volumes of Canadian geology. There have also been excellent studies made by private interests; one of these which I am aware of is a study of the tectonics and the general geological framework of the mineral deposits in the area between Timmins and the Noranda camp. Noranda and other interests formed a separate company called Sygenore Limited with a budget of some $100,000 a year to compile all data relating to ore deposits and this important mineralographic district. The work is in the second year. Much of the expense of this

operation consists in correlating the geological horizons within the area in a detailed manner on aerial photographs. Some drilling follow-up has taken place at the Noranda end of the camp but results so far have been negative. In an area so well developed as this, it may be that procuring new data is an expensive operation. I bring this up to indicate the type of cost that may be involved in a program of this nature.

This may not apply, of course, to an undeveloped area like the Yukon Territory, and particularly in the region where we were working in 1966. There is very little drilling data, and indeed very little data in general, available. It would seem that one starting point would be the accumulation of analyses of all available regional data in this area that is proposed and in Number 2 by Dr. C. L. Smith in his comments on this program. This could probably be compiled at no great expense by a geologist working in the Whitehorse photo library and having access to the exploration reports filed there for assessment work. It was suggested to J. S. Brock that all the preliminary structural data available should be submitted to his uncle in South Africa to see if this region fits into his general theory. John Brock suggested that his uncle might be interested in receiving the data for research purposes in any event, and would not necessarily charge us a fee for the analyses. After the preliminary stage, other avenues of approach are suggested by Dr. Smith and could be explored, depending on the amount of money and personnel available.

I would like to point out at this time some inherent dangers in this type of approach to exploration:

Strict security of results must be maintained at all times to prevent expensive data and conclusions from falling into the hands of the competition. I can point out several cases where exploration data costing in the order of several millions to compile has fallen into the hands of competitive organizations at a crucial moment with a complete loss to the company that originated it. This does not necessarily imply that any of the staff guarding the data were dishonest, but sometimes even talk in the matter reaches competitive sources who make it their business to find out the results. This kind of approach often encourages armchair geological personnel, who use the job

itself as a means of keeping out of the field, and every effort must be made to see that meaningful data is collected in the field or from other active research projects. Short-term economic results must not be expected from this type of program and disappointment in this regard should not be permitted to stop its furtherance.

It will be difficult to compile, or even find out, new methods being used in this regard, as it is self-evident that any private company who develops a new and effective tool will be just as zealous to guard its security since the testing of such methods takes considerable money. As an example, I can point out the testing of the airborne AFMAG in the Timmins area by a large American company. The method was used as follows: All the economic fault structures in the Noranda-Timmins area were compiled, together with the drill hole results and geology from the resident geologist's files in Quebec and Ontario. This analysis took the better part of three to four months by two men. An attempt was made to compile all the electromagnetic and magnetic results available regarding this survey also. In the meantime the whole area was filmed at one-mile intervals by the AFMAG apparatus mounted on a helicopter. The flying time itself, of course, was the major cost in the operation. This flying and the compilation of results occupied approximately eight months and utilized a crew of two on the helicopter, a geologist on the ground, a geophysicist, and a draftsman at the office. The program was originally planned for an expenditure of $125,000 and, when partially completed, had gone well past this figure. On reliable information from one of the operators involved, the airborne AFMAG was completely useless for the purpose it was used. As a bizarre note it did not even pick up the Texas Gulf Sulphide orebody, one of the largest in the world. This orebody, as is well known, was delineated on practically every geophysical instrument heretofore known.

The plus side of such a program as we propose has been mentioned by many writers and for this reason I have mentioned some negative factors. I fully realize that the intelligent planning of exploration programs must be guided by some such research and that if caution is used we can develop useful guidelines to suit our purpose and budget. However, we should not lose sight of the fact that

primary prospecting in the Yukon, aided by a known geophysical and geochemical guidance, will be useful for several years to come and large sums of money should not be diverted from this approach, at the outset at least.

J.S. Brock

January 30, 1966

From: C.L. Smith

E.D. Chisholm
Copy

COMMENTS REGARDING PROPOSED TECTONIC RESEARCH DIVISION, AHO-BROCK MEMO, JANUARY 25, 1967

A research division, such as that outlined in the Aho-Brock memo, seems to me an excellent idea. Such a division would seem a necessity for effective and economical exploration on a continuing basis. Firstly, in order to provide thorough analyses of regions under consideration for exploration; e.g., to define areas of highest potential and to propose optimum methods of investigation. And, secondly, to keep up to date on exploration techniques and general academic development that could be of use in our program.

At first glance, it would seem logical to include the following five functions in such a division:

1) Study of factors which might apply to general economics of exploration, development, and production in regions being considered.

2) Accumulation and analysis of all available regional data in proposed exploration regions.

3) Low cost reconnaissance studies of proposed regions during the summer in order to provide the detailed planning for follow-up programs.

4) Research of existent exploration methods and tools.

5) Visits to field parties to check effectiveness of methods being used and to do whatever trouble-shooting may be required.

The first category would apply only to new regions in which we have little or no first hand experience, such as south-eastern Alaska, northeastern Washington, etc. To be considered would be government regulations, taxation, government assistance, market possibilities, logistics of field operations, physical settings of potential deposits, types of mining which could be required, possible concentrating and marketing costs, labour supply, etc.

A requirement of the second and third categories would be that regions be studied in depth so that the total geologic environment is understood. Such studies should be concerned with fundamental concepts such as geosynclinal evolution, stratigraphic basins, petrographic provinces, magma series, metamorphic facies distribution, volcanic suites, regional stress fields, periods of deformation and orogeny, ore deposit classification, etc. Only in this manner can the true regional controls of potential mineral deposits be understood. The cost of such an approach is minor, compared to what can be wasted through inadequate planning.

Summer field studies could be effectively done in most country by one man with a Super Cub. The goal of summer work should be to visit typical showings and properties, correlate airphoto features with rock units, and, in short, fill in the gaps in previous research. In such a way, the geologist could define portions of the region which have optimum exploration potential as well as doing research required in the field to determine effectiveness of exploration methods for the area. He should take such a study through to the stage of making proposals regarding logistics and suggesting type and size of field crews required. Oz Hachey has mentioned several times that the most effective program done by AMAX during his tenure was a Super Cub reconnaissance of the eastern Coast Range batholith by Bob Hodder, then a recent PhD graduate from Berkely.

The fourth category mentioned above should be concerned with the study of established techniques which have been proved effective by others in other areas (pure research or investigation of not yet established methods should not be considered, for time lost in such activities can often be great). Important literature should be read regularly and techniques pursued through literature, correspondence, discussions and actual experimentation. For example, the proper application of the following might be investigated: pathfinder elements (Hg vapor, arsenic, tellurium, etc.), pathfinder minerals (jasperoid, fluorite, rare earths, Mn oxides, etc.), oxygen isotope ratios, sulfur isotopes, biogeochemistry, semi-quantitative field kits, ultraviolet lamps, scintillometers, airborne infrared scanning, colour air photography, and airborne gravity, to name a few. The existence of new techniques is generally known, but the value or means of proper use of these techniques is seldom clear. Manuals on pertinent findings should be written and distributed to personnel concerned.

It is notable that the outside exploration phase of the Sheldon project will be designed somewhat along the lines proposed. Compilation of all known airmagnetic, photo-geologic (if time permits), regional geologic, and showings data is now in progress. A thorough regional mapping job is planned and targets for ground follow up will be defined on geologic-air magnetic basis. Furthermore, a few research techniques will be employed, such as bedrock geochemistry, petrographic work, and some biogeochemistry.

Regarding the request for a mention of topics in which we may make contributions, I would list regional tectonics, and areal geology, photogeology, aeromagnetics, and research or academic-based topics.

Clyde L. Smith
Senior Exploration Geologist
Atlas Exploration Limited

Development of Yukon's Major Resources

(Brief submitted to Federal Government by A. E. Aho and associates)

This brief and accompanying map offer general resource comment and three suggestions for development of major resources in Yukon and adjoining areas.

RESOURCE COMMENT

The main resources include hydro-electric power potential particularly on Yukon and Liard Rivers, natural gas and petroleum fuels in southeast Yukon as well as such potential in other areas, forests on Liard Plain and some other major valleys which could provide pulp and paper, potential coal reserves at Carmacks and elsewhere, and mineral deposits such as the lead-zinc orebodies of Anvil Mining Corporation and the huge iron ore reserves of Crest Exploration. These resources, prospects, and other potential are shown on the accompanying map.

Because of the obvious value and still predominantly undeveloped nature of these and other potential major resources, long-range resource study, planning, and development assistance of various types being carried out or planned by departments of the Federal Government is of prime importance for the most effective integrated development. It is essential that this be well-co-ordinated on a continuing basis to avoid pitfalls. Even one major development such as a smelter is so complex, with so many ramifications, that it should not be planned without intensive co-ordinated study.

Canadians hope to have a major part in the development and use of these resources and trust that they will be developed in the most effective manner to provide the most profitable integrated economy for this Territory, which is presently a deficit finance region in Canada.

Toward this end we offer three suggestions:

SUGGESTIONS:

(1) From a long-range view point it is recommended to consider the possibility of not only a rail extension through central Yukon to the Anvil and Crest deposits, but also a main east-west transportation system (partly along the Alaska highway route) connecting the Haines-Skagway-Whitehorse region, through the Watson Lake-Liard River region, over to the Pine Point raliway and perhaps onward through northern Alberta and Saskatchewan to connect with other trans-continental systems. Such a route would serve most of northwestern Canada, provide the shortest overall transportation to tidewater, and go closest to the greatest number of major resources as indicated on the accompanying map. Except for tidewater access this entire route goes through low, gravelly terrain ideal for construction, and avoids higher mountains necessitated by any other transcontinental route.

A lead-zinc smelter and other industries might be developed (a) in the Ross River area of central Yukon or (b) along this route either near Liard River close to major gas reserves to tie into inland shipping of its products, or near tidewater near major hydroelectric power and ocean transportation.

Tie-in routes could extend inland to the Anvil and Crest deposits, and to tidewater in the vicinity of the large stikine and Granduc deposits of British Columbia.

(2) We also feel strongly in favour of the Federal Government proposal to set up a Canada Development Corporation or finance organization to administer a fund similar to that used to encourage development in the Atlantic provinces. Some of the

advantages of this would be:

i) It could help private industry to finance northern development when financial institutions may not be inclined to do so for various reasons, such as lesser risk in other parts of the country.

ii) It could provide some protection for Canadians holding minority positions relative to foreign investors who are more financially capable of proceeding rapidly with a major project and thereby diluting Canadian interests beyond acceptable proportions.

iii) It could stimulate private industry to explore and develop the region.

Perhaps purchase of the Anvil project and establishment of a lead-zinc smelter based on the Anvil orebodies could be the first key asset of the Development Corporation, and other deposits developed by private industry (including perhaps Pine Point) could feed into this metallurgical center. If an inland transportation system is developed and phosphate is found in the region, fertilizer and other by-products could be fed inland to the central provinces.

(3) Publicity to promote industrialization and population of this region, should be increased by various media. Although the Yukon region is presently very sparesely populated, development of various industries could soon become an inducement for a larger northern concentration of population, a profitable economy and financial independence or province-hood.

CONCLUSION

Proposed development of the Yukon region should transcend political boundaries such as those of British Columbia, and Yukon, and also those of Alaska which necessitates close international liaison

The development can be speeded greatly by well co-ordinated an imaginative planning, assistance of various types, some type of major financing fund, and suitable publicity.

It is envisaged that this could become one of the most successfully productive regions of Canada with great benefits to our national economy.

Respectfully submitted,

AARO E. AHO, Ph. D., P. Eng.

June, 1967

Suggestions for prospecting area:

General

Prospecting should be done systematically by the usual tracing of float in creeks and sidehills aided by systematic silt sampling, use of air photos for possible breaks, etc. and geology.

Silt Sampling

Next to tracing float this is the most important tool because it is a direct guide to mineralization. Take fine clay or silt at intervals from each creek and tributary and sidehill soil samples in between.

Photo Interpretation

Although very useful when used in the field, this is an indirect guide at very best and can only give some geology, particularly linear features such as bedding, banding, fractures, and faults (breaks). Do not concentrate mainly on checking breaks indicated on the photos, but merely use it as a rough guide.

I did not have access to a stereoscope and therefore could not cover the eastern part of the area due to eyestrain, but I have added to the previous work by indicating only those linears which are more apt to be breaks, joints, or dikes, that may be of interest from a prospecting view point. Investigate only the ones that appear to be of interest in the area. Many of them will be of no consequence and many other significant ones may not be readily visible on the photos, or may not have been noticed on the first study. The most favourable breaks in a general sense may be the northeast to N-S ones that run across the granite and other rock types in the area, and the northwest ones such as the Grey Hunter zone which appeats to dip SW and are subsidiary to the Tintina Trench are also favourable.

A. E. AHO