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3/8

*Operator:* TOODOGGONE SYNDICATE  
GEOPHYSICAL REPORT  
ON AN  
AIRBORNE MAGNETOMETER SURVEY  
**SPIKE CLAIM** LIARD MINING DIVISION  
LATITUDE: 57°30'N LONGITUDE: 127°23.5'W  
NTS 94E/6W,11W  
AUTHOR: Richard Hermary, B.Sc.,  
Geophysicist  
Glen E. White, B.Sc., P.Eng.,  
Consulting Geophysicist  
DATE OF WORK: March 13 & 29, 1986  
DATE OF REPORT: April 6, 1987

*Owner: C. Ashworth*

FILMED

**GEOLOGICAL BRANCH  
ASSESSMENT REPORT**

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APR 21 1987  
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VANCOUVER, B.C.

16,056



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FIGURE 2 - Magnetic Intensity Contour Map

PLATE 1 - Regional Geology

PLATE 2 - Magnetic Response Examples



## INTRODUCTION

In early 1986 an airborne magnetometer survey was conducted over the Toodoggone Gold Belt district. Over 10,000 line kilometers was flown over the district. Western Geophysical Aero Data Ltd. was commissioned by the **Toodoggone Syndicate** to recover and interpret the magnetic data obtained over the 20 unit **Spike** claim.

The **Spike** claim is in the Toodoggone Gold district and just north of the Thesis gold deposits. The purpose of this survey was to assist in the geological mapping of the area and direct further ground exploration to any favorably anomalous locations.

## PROPERTY

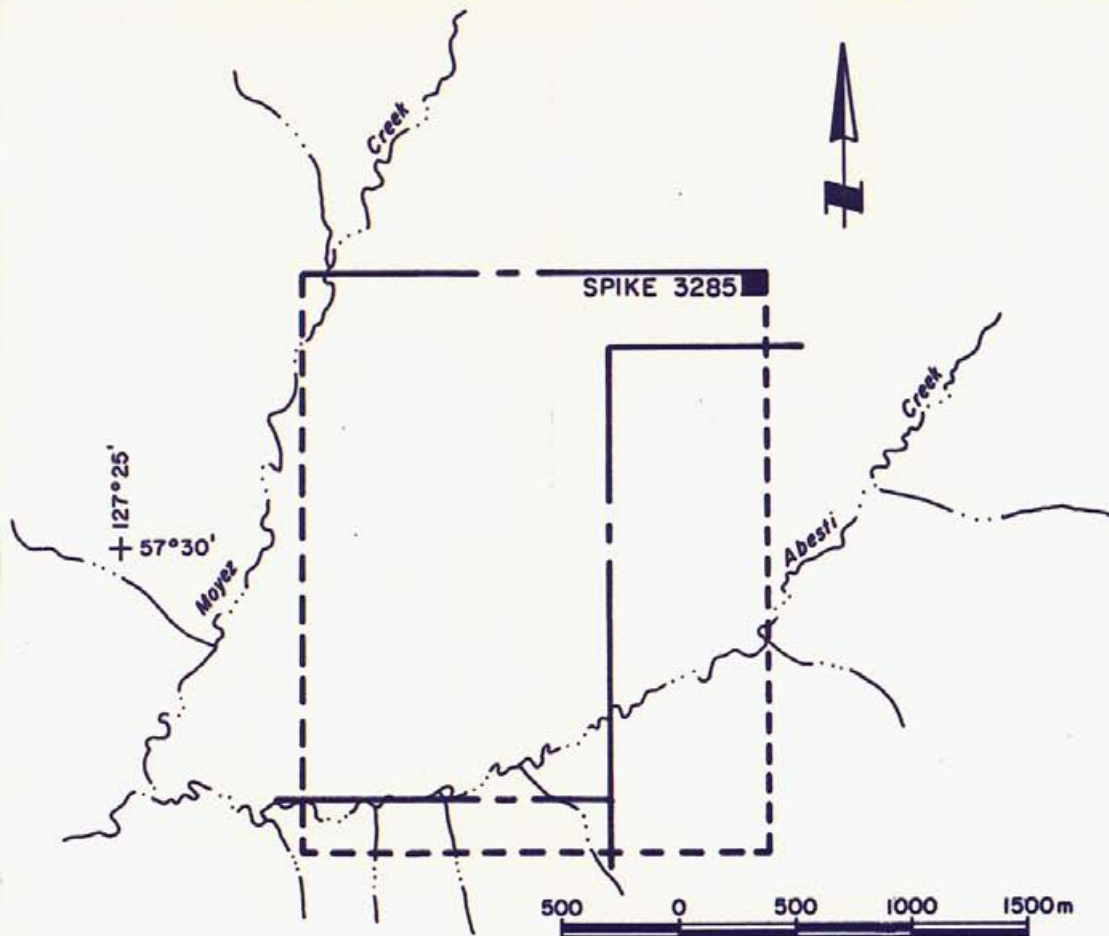
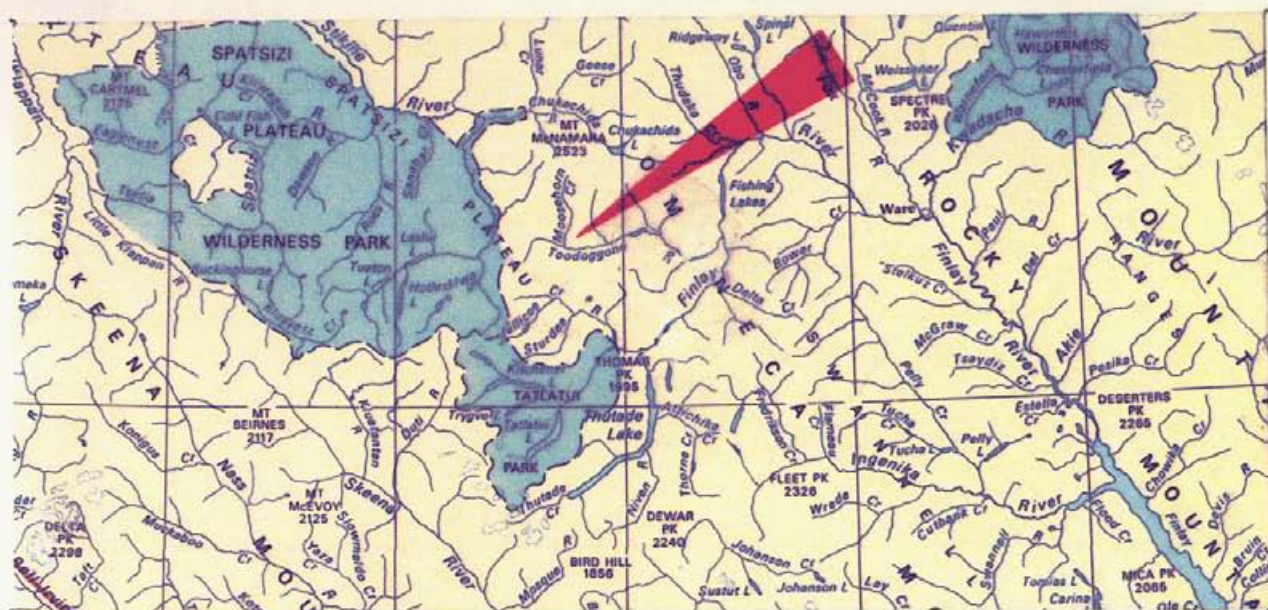
The **Spike** claim is a 20 unit claim with record number 3285, recorded on March 25, 1985.

## LOCATION AND ACCESS

The **Spike** claim is located in the Toodoggone River area. This area is located approximately 280 kilometers north of Smithers, B.C. The **Spike** claim is just northeast of the confluence of the Moyez and Abesti creeks, and 2 kilometers north of the Thesis gold deposits. It is situated within the Liard Mining Division of B.C. The NTS map coordinates of the claim are 94E/11W and 94E/6W. The approximate geographical coordinates are a latitude of 57°30'N and a longitude of 127°23'W.

Access to the area is usually achieved by fixed wing aircraft from Smithers, B.C. to the Sturdee River airstrip





TOODOGGONE SYNDICATE  
 SPIKE CLAIM  
 LOCATION AND CLAIM MAP



FIGURE 1

and then by helicopter to the specific claim area. The helicopters are usually based at the Sturdee River airstrip during the summer.

#### **HISTORY AND PREVIOUS WORK**

The Toodoggone area was investigated for placer gold in the 1920's and 1930's. A public company, Two Brothers Valley Gold Mines Ltd., undertook considerable test work, including drilling in 1934. Most of this work was directed towards extensive gravel deposits principally near the junction of McClair Creek and the Toodoggone River.

Gold-silver mineralization was discovered on the Chappelle (Baker Mine) property by Kennco Explorations (Western) Ltd. in 1969. DuPont of Canada Exploration Ltd. acquired the property in 1974 and began production at a milling rate of 90 tonnes per day in 1980.

Numerous other gold-silver discoveries were made in the 1970's and 1980's, including the Lawyers deposit which was discovered by Kennco in 1973 and optioned by SEREM Ltd. in 1979. Work on this property to date has included considerable trenching, drilling and underground development and a feasibility study is currently underway.

Within the belt, three properties show ore reserves: Baker Mine (Du Pont of Canada) 52,000 tonnes 1.07 oz/tonne Au, 23,2 oz/tonne Ag, Lawyers (Serem Inc.) 561,000 tonnes 0.21 oz/tonne Au, 7.1 oz/tonne Ag, Al (Energex Minerals Ltd.) 160,000 tonnes 0.37 oz/tonne Au (subsequently, Lawyers reserves were increased to 1,400,000 tonnes of unknown grade).



The Toodoggone area has been the scene of intense exploration activity during the past four years with numerous companies exploring over 3,000 mineral claim units. Exploration and development expenditures to 1985 are estimated to be in the order of \$33 million.

Previous work on the **Spike** claim was carried out by Baseline Resources Ltd. retained by Duke Minerals Ltd. in the summer of 1985. This work delineated two coincident geophysical and geochemical anomalies on the claim. The coincidental VLF-EM, magnetic and multi-element anomalous zones are in the northeast and southeast portions of the **Spike** claim. Anomalous gold values of 50 ppm were discovered in both zones. No other work, known to the author, has been recorded on the **Spike** mineral claim.

#### **REGIONAL GEOLOGY**

The general geology of the area is shown on Preliminary Map 61, B.C. Ministry of Energy, Mines and Petroleum Resources by L.J.Diakow, A.Panteleyev and T.G.Schroeder, 1985 and on Open File, Geologic Survey of Canada, by H.Gabrielse, C.J.Dodds, J.L.Mansy and G.H.Eisbacher, 1977.

The Toodoggone River area is set within the Intermontaine Belt. The main geologic units are the Upper Cretaceous Sustut Group, the Lower to Middle Jurassic Toodoggone Volcanics, the Upper Triassic Takla Group and Permian carbonate units thought to belong to the Asitka Group. Several intrusive bodies of quartz monzonitic to granodioritic composition, irregular in size and shape (belonging to the Omineca Intrusives) intruded the volcano-sedimentary complex in several localities. Swarms of dykes and small stocks are related to these intrusions.



The Asitka group limestones were deposited in a marine environment. The Takla rocks are the product of a volcanic event that may have been accompanied by an uplift of the whole area (possibly changing the environment from submarine to sub-areal). The result is a complex of interlayered volcanic and sedimentary units. This was followed by a period of regression and related deformations. These followed a volcanic episode during which the cyclic Toodoggone Volcanic rocks were formed. The event started with a quartzose acidic extrusion, followed by a mafic extrusion, and then by several intermediate extrusions. Much of the volcanics were porphyritic flows but within each cycle there are pyroclastic units and conglomerates, lahars and sandstones (reworked pyroclastics).

Of the structural elements, the most prominent are three fault zones, trending northwest-southeast, which are intermittently exposed where outcrop is developed and are clearly outlined by the airborne geophysics. They had a major role not only in distribution of geologic units, but also in the emplacement of minerals. The same, northwest-southeast trend is also the general strike of the majority of the lithostratigraphic members.

Local uplifts accompanying intrusions resulted in several domal structures, characterized by a circular distribution of volcano-sedimentary units surrounding an intrusive core.

The Toodoggone River area is an important host of numerous precious metal and base metal prospects. Four main mineral deposit types have been identified:

- porphyry - occurring mainly in Takla Group volcanics and Omineca intrusives.
- skarn - contact of limestones (Asitka, and some in Takla) with intrusive.



- stratabound - occurring in Takla limestones interbedded with cherts.

- epithermal - occurring mainly in Toodoggone Volcanics and in Takla rocks.

Of the four, the epithermal type is the most important, and has been subdivided into two subtypes: fissure vein deposits associated with fracture zones and possibly cauldrea formations, and hydrothermally altered and mineralized deposits (associated with major fault zones).

Most common ore minerals in epithermal type deposits are argentite, electrum, native gold and silver. Baker Mine and Lawyers Deposit are the two most prominent deposits of this type in the area. For the generalized geology refer to Plate 1A.

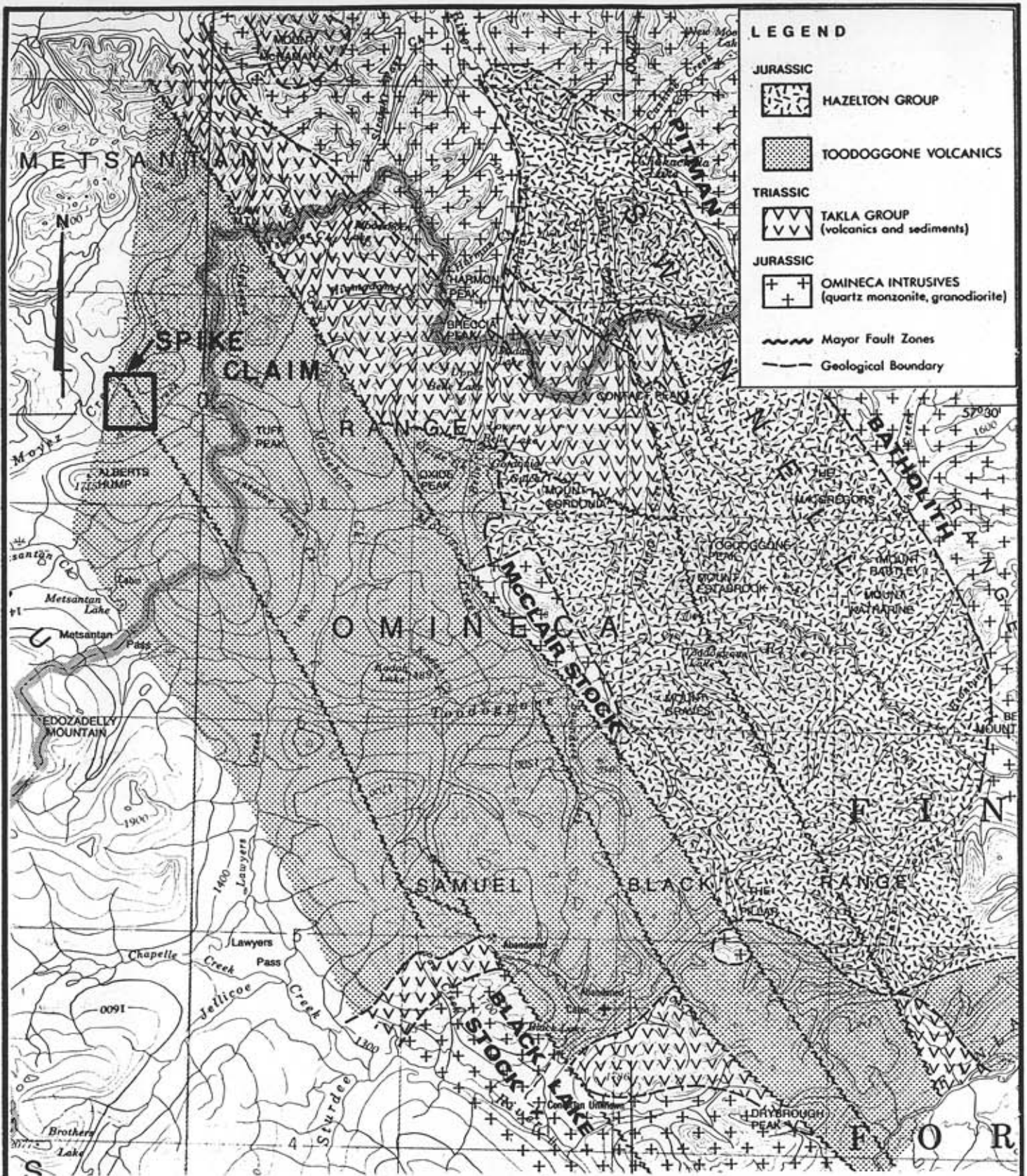
#### LOCAL GEOLOGY

The **Spike** claim is extensively covered by glacial till, varying in thickness from 0 to 10 meters with the valleys having the thickest till sections. Underlying the glacial till is an andesitic lithic-crystal tuff.

The interpretation of the magnetic data infers the locations of both intrusions of stocks and dykes, and heavy fracturing and faulting. There are two major inferred faults; one cutting the southern lower portion of the **Spike** claim and another paralleling just outside the western claim boundary. This complex geology of faulting and intrusive magmatic bodies has good potential for hydrothermal mineralization.







**TOODOGGONE SYNDICATE**  
**SPIKE CLAIM**  
**REGIONAL GEOLOGY**



## AIRBORNE MAGNETIC SURVEY

This survey monitors and records the output signal from a proton precession magnetometer installed in a bird designed to be towed 30 meters below a helicopter. A gimbal and shock mounted TV camera, fixed to the helicopter skid, provides input signal to a video cassette recorder allowing for accurate flight path recovery by correlation between the flight path cassette and air photographs of the survey area. A KING KRA-10A radar altimeter allows the pilot to continually monitor and control terrain clearance along any flight path.

Continuous measurements of the earth's total magnetic field intensity are stored in three independent modes: an analogue strip chart recorder, digital magnetic tapes and a digital video recovery system. A three-pen analogue power recorder provides direct, unfiltered recordings of the proton magnetometer. A Hewlett-Packard 9875 tape drive system digitally records all information as it is processed through an onboard micro-computer. The magnetic data is also processed through the onboard micro-computer, incorporating an analogue to digital converter and a character generator, then superimposed along with the date, real time and terrain clearance upon the actual flight path video recording tape to allow exact correlation between geophysical data and ground location. The input signals are averaged and updated on the video display every second.

Correlation between the strip chart, digital tape and the video flight path recovery tape is controlled via fiducial marks common to all systems. Line identification, flight direction and pertinent survey information are recorded on the audio track of the video recording tape.



## DATA PROCESSING

Field data is digitally recorded, with the time of day fiducial, on magnetic cassettes in a format compatible with the Hewlett-Packard 9845 computer. The recovered flight path locations are digitized and the field data is processed to produce plan maps of each of the parameters. A variety of formats are available in which to display this data.

Total field intensity magnetic information is routinely edited for noise spikes and corrected for any diurnal variations recorded on a base magnetometer located in the survey area.

## DISCUSSION OF RESULTS

The **Spike** claim was surveyed on March 13 and 29, 1986. One hundred forty-three line kilometres of magnetometer data have been recovered to examine this claim and its' surrounding area.

Survey lines were flown east-west on 200 meter centres with data being digitally recorded at one second intervals, providing an average station spacing of 25 meters. The sensors were towed beneath the helicopter and maintained an average terrain clearance of 60 meters. The magnetic data is presented in contour form on an orthophotomosaic base map of the area as Figure 2.

This survey was flown as part of a regional package covering the Toodoggone Gold Belt from the Finlay River in the south to the Chukachida River in the north. Over 10,000 line kilometers of data was gathered to assist the geological mapping of the area as well as to locate specific targets for ground exploration.



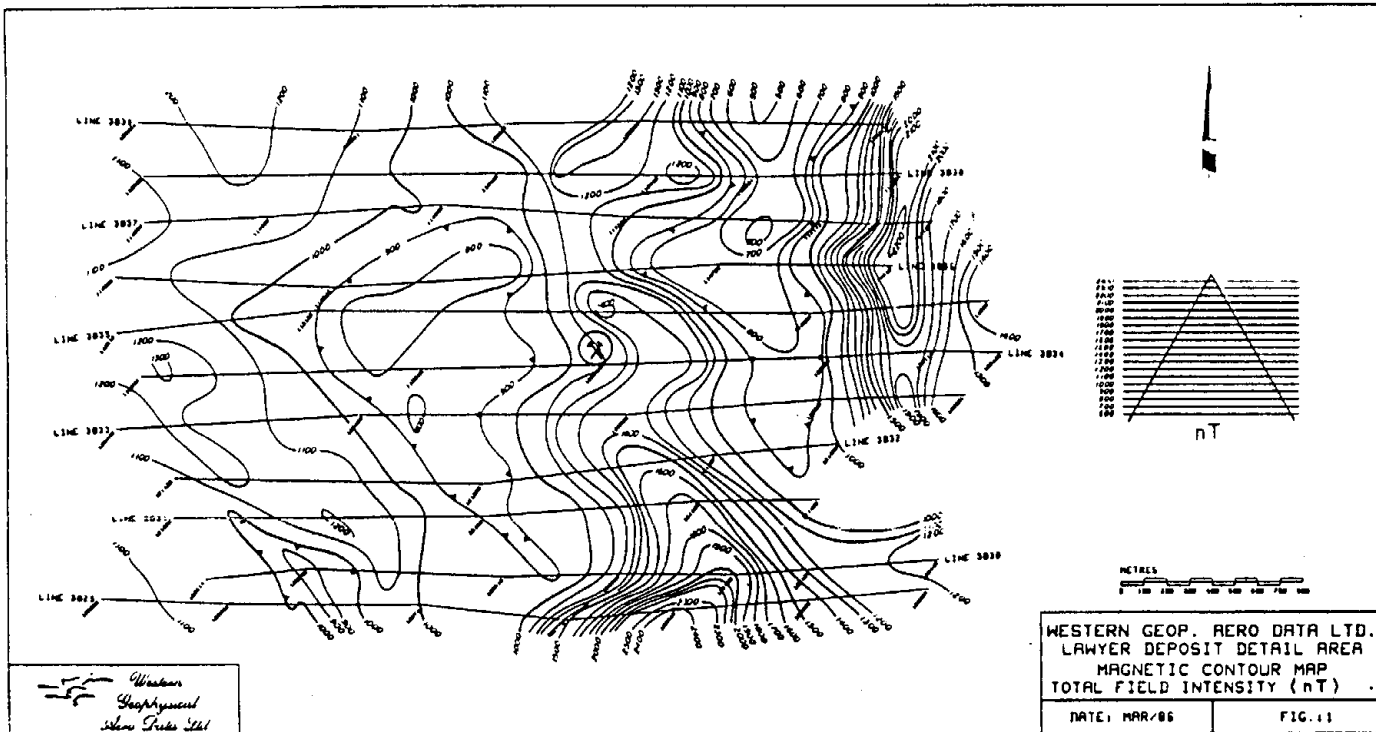
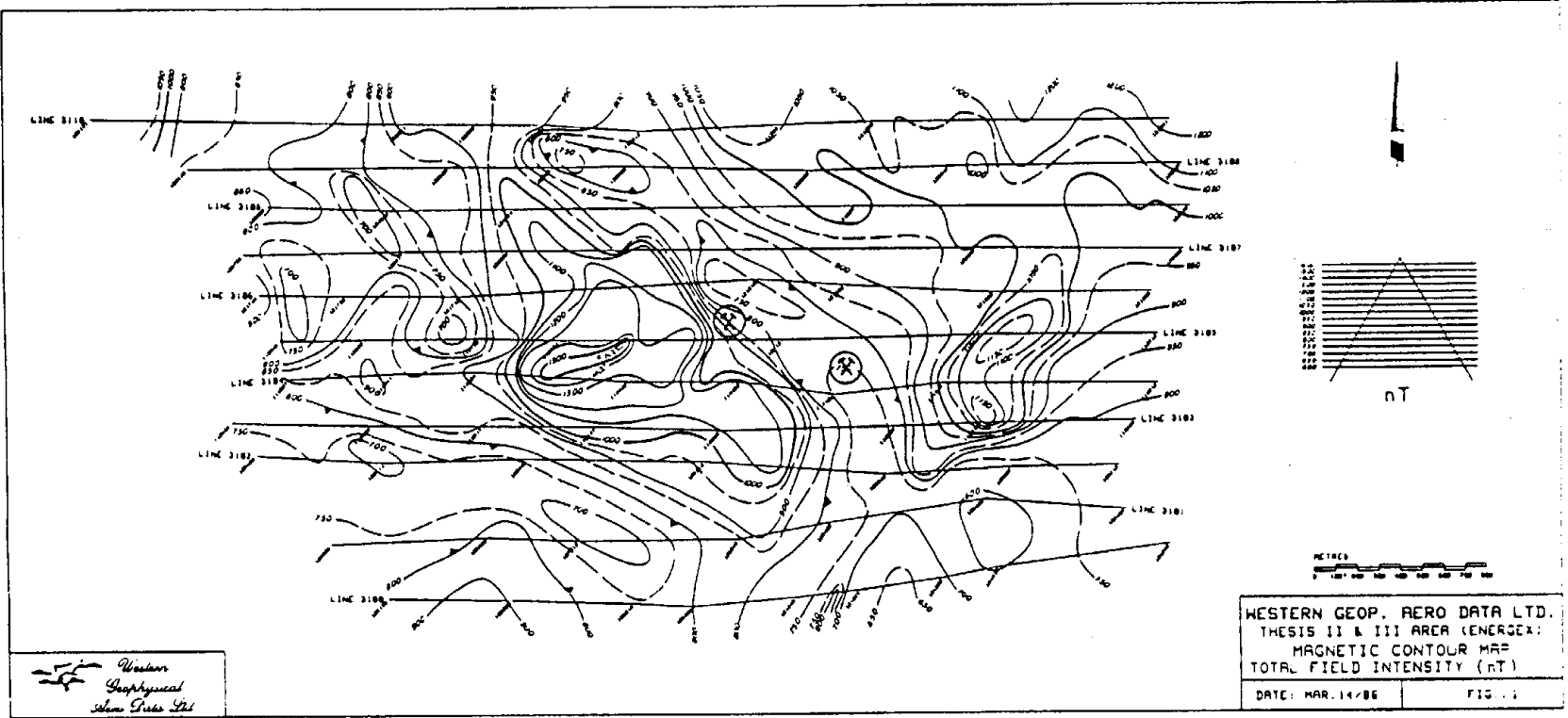
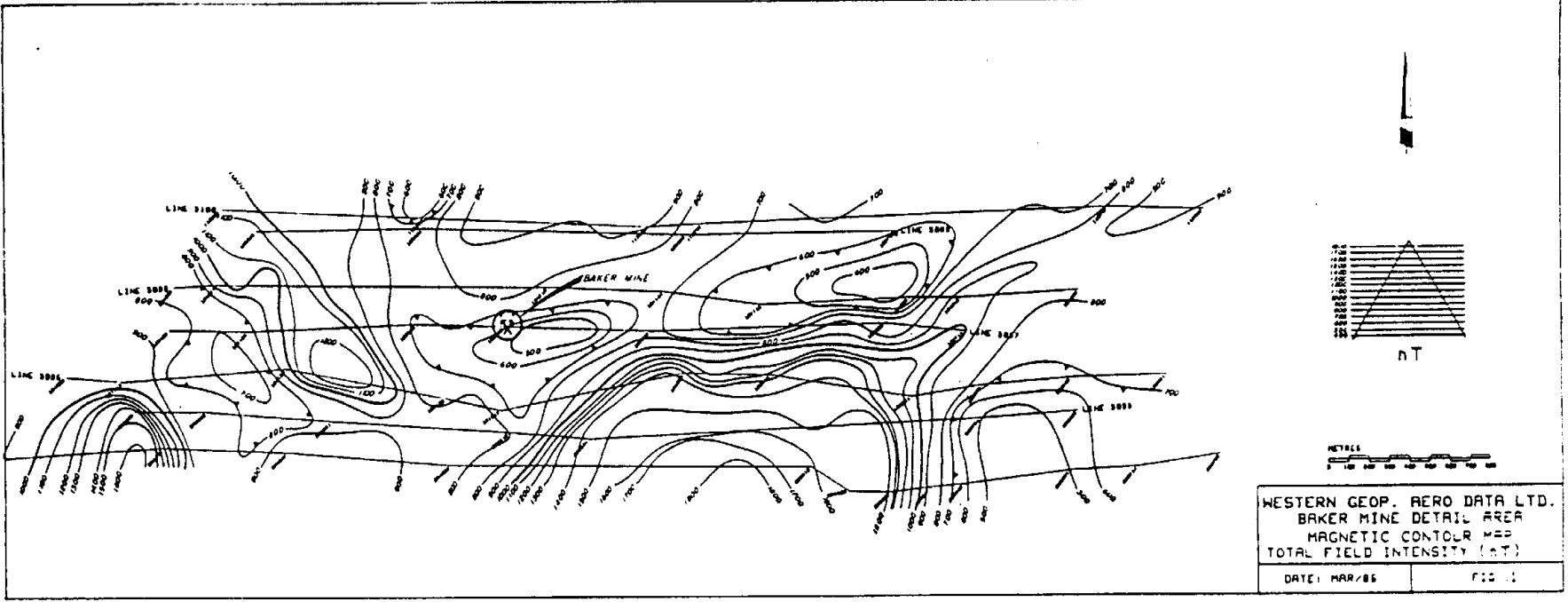
The magnetic data is a useful tool for mapping both regional and local geological structures. Many localized magnetic variations are observed which are attributed to lithological changes.

There are two distinctive magnetic signatures observed which appear consistent across the large survey area. Firstly, Jurassic intrusions appear as magnetic highs; typically with an intensity of greater than 59,300nT. Secondly, major fault and shear zones appear as linear magnetic lows, generally with intensities of less than 59,000nT, and often positioned along the flanks of intrusive bodies. The combination of these two signatures are observed across many of the larger epithermal precious metal deposits in the area. Plate 2 of this report illustrates this effect at the Baker Mine, Lawyers and Thesis deposits. The magnetic response is interpreted as reflecting only the general geological environment of these area and does not map any mineralization directly.

The magnetic contour map, Figure 2, is dominated by two very strong circular shaped magnetic highs, one due north and the other just northeast of the **Spike** claim. These anomalies are interpreted as reflecting late Jurassic intrusions. These intrusions are most likely stocks. They are probably geologically related by originating from the same magma source. These stocks could represent a collapsed cauldron overlain by sediments conducive to hydrothermal mineralization.

The stock due north of the **Spike** is near the surface because of its sharp magnetic profile. Whereas the stock northeast of the claim has a broader magnetic profile indicating greater depth. Both are part of the same intrusive body at depth because of the encompassing magnetic high surrounding





**GEOLOGICAL BRANCH  
ASSESSMENT REPORT**

MAGNETIC RESPONSE EXAMPLES  
BASE VALUE 58,000 - nT

**16,056**

*Western  
Geophysical  
Aero Data Ltd.*

both anomalies. These stocks are probably dioritic in composition because of its high magnetic susceptibility.

More importantly, though, is the steep magnetic gradient in the northwest corner of the **Spike** claim. The steep gradient is indicating either a fault, but more likely a contact along the flank of the collapsed cauldera of the stocks as noted previously. This area would be ideal for epithermal mineralization. The general trend of this contact runs north and slightly east along the western claim boundary.

Lower in the southern portion of the **Spike** claim there is a fault trending almost due east following the Abesti Creek. Another major fault trends north outside along the western claim border. These are major faults which are discernible from the magnetic contour map. Other crosscutting faults probably occur but aren't discernible because of the strong magnetic highs masking the weaker magnetic response of the cross-cutting faults.

#### **SUMMARY AND CONCLUSIONS**

The **Spike** claim was included as part of a regional airborne magnetometer survey conducted in early 1986. One hundred forty-three kilometers of the data has been recovered to evaluate the **Spike** claim.

The **Spike** claim is underlain by andesitic lithic-crystal tuffs. Varying degrees of hydrothermal alteration are present in the outcrops. The majority of the claim is covered by a layer of glacial till and is unmapped geologically.

The magnetic data clearly delineated a large late Jurassic intrusion north and northeast of the **Spike** claim. In the





northwest corner of the claim there is a steep magnetic gradient probably due to a fault or contact along a collapsed cauldron or possibly a combination of both. In the lower southern portion of the **Spike** claim a fault trends eastward along the Abesti Creek. The magnetic data, previous work and known nearby mineral deposits indicate a good potential for epithermal mineralization on the **Spike** claim.

### RECOMMENDATIONS

The most important type of economic mineralization identified in the Toodoggone area are epithermal precious and base metal deposits hosted principally by lower and middle units of Toodoggone volcanics. Mineralization occurs principally in fissure veins, quartz stockworks breccia zones and areas of silicification, generally close to major fault systems and associated with intrusive activity.

These conditions are satisfied within the **Spike** claim. There are major faults and nearby zones of intrusive stockworks. The claim definitely warrants further and more detailed exploration. Furthermore the claim is flanked to the north and south by proven gold and silver mineralization and to the east by anomalous geochemical gold soil sample values.

A ground program of detailed geochemical soil analysis for gold, silver and other common sulphide minerals is recommended as the next exploration phase. Similarly detailed ground mag and VLF-EM should be carried out simultaneously with the geochemistry, particularly in the anomalous geophysical gold geochemistry zones found in previous work. Then an induced polarization survey should follow to delineate silicified mineral zones. Finally, if

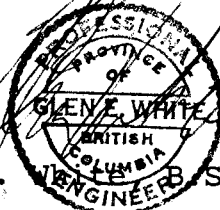


overburden conditions permit, any anomalous geochemical and geophysical trends should be trenched. If overburden is too deep for trenching, diamond drilling should be done over the anomalous zones.

Respectfully Submitted,

*R. Hermary*

Richard Hermary, B.Sc.,  
Geophysicist



Glen E. White, B.Sc., P.Eng.,  
Consulting Geophysicist





INSTRUMENT SPECIFICATIONSBARRINGER AIRBORNE MAGNETOMETER

**MODEL:** Nimbin M-123  
**TYPE:** Proton Precession  
**RANGE:** 20,000 to 100,000 gammas  
**ACCURACY:**  $\pm$  1 gamma at 24 V d.c.  
**SENSITIVITY:** 1 gamma throughout range  
**CYCLE RATES:**  
     Continuous - 0.6, 0.8, 1.2 and 1.9 seconds  
     Automatic - 2 seconds to 99 minutes in 1 second steps  
     Manual - Pushbutton single cycling at 1.9 seconds  
     External - Actuated by a 2.5 to 12 volt pulse longer than 1 millisecond.

**OUTPUTS:**  
     Analogue - 0 to 99 gammas or 0 to 990 gammas  
               - automatic stepping  
     Visual - 5 digit numeric display directly in gammas

**EXTERNAL OUTPUTS:**  
     Analogue - 2 channels, 0 to 99 gammas or 0 TO 990 gammas at 1 m.a. or 1 volt full scale deflection.  
     Digital - BCD 1, 2, 4, 8 code, TTL compatible

**SIZE:** Instrument set in console  
           30 cm X 10 cm X 25 cm

**WEIGHT:** 3.5 Kg.

**POWER**

**REQUIREMENTS:** 12 to 30 volts dc, 60 to 200 milliamps maximum.

**DETECTOR:** Noise cancelling torroidal coil installed in air foil.



INSTRUMENT SPECIFICATIONSFLIGHT PATH RECOVERY SYSTEMi) T.V. Camera:

Model: RCA TC2055 Vidicon  
Power Supply: 12 volt DC  
Lens: variable, selected on basis of  
expected terrain clearance.  
Mounting: Gimbal and shock mounted in  
housing, mounted on helicopter  
skid.

ii) Video Recorder:

Model: Sony SLO-340  
Power Supply: 12 volt DC / 120 volt AC (60Hz)  
Tape: Betamax 1/2" video cassette -  
optional length.  
Dimensions: 30 cm X 13 cm X 35 cm  
Weight: 8.8 Kg  
Audio Input: Microphone in - 60 db low  
impedance microphone  
Video Input: 1.0 volt P-P, 75Ω unbalanced, sync  
negative from camera.

iii) Altimeter:

Model: KING KRA-10A Radar Altimeter  
Power Supply: 27.5 volts DC  
Output: 0-25 volt ( 1 volt /1000 feet) DC  
signal to analogue meter,  
0-10 v (4mv/ft) analogue signal to  
microprocessor.  
Mounting: fixed to T.V. camera housing,  
attached to helicopter skid.



INSTRUMENT SPECIFICATIONSDATA RECORDING SYSTEMi) Chart Recorder

Type: Esterline Angus Miniservo III  
Bench AC Ammeter - Voltmeter  
Power Recorder.

Model: MS 413B

Specification: S-22719, 3-pen servo recorder

Amplifiers: Three independent isolated DC  
amplifiers (1 per channel)  
providing range of acceptable  
input signals.

Chart: 10 cm calibrated width z-fold  
chart.

Chart Drive: Multispeed stepper motor  
chart drive, Type D850, with  
speeds of 2,5,10,15,30 and 60  
cm/hr. and cm/min.

Controls: Separate front mounted slide  
switches for power on-off,  
chart drive on-off, chart  
speed cm/hr. - cm/min. Six  
position chart speed selector  
individual front zero  
controls for each channel.

Power Requirements: 115/230 volts AC at 50/60 Hz  
(Approximately 30 W).

Writing System: Disposable fibre tipped ink  
cartridge (variable colors)

Dimensions: 38.6 cm X 16.5 cm X 43.2 cm

Weight: 9.3 kg.



ii) Digital Video Recording System

Type: L.M. Microcontrols Ltd.  
Microprocessor Control Data  
Acquisition System.

Model: DADG - 68

Power Requirements: 10 - 14 volts DC, Maximum 2  
amps.

Input Signal: 3,0 - 100 mvolt DC signals  
1,0 - 25 DC signals

Microprocessor: Motorola MC-6800

CRT Controller: Motorola MC-6845

Character Generator: Motorola MCM-6670

Analogue/Digital  
Convertor: Intersil 7109

Multiplexer: Intersil IH 6208

Digital Clock: National MM 5318 chip  
9 volt internal rechargeable  
nickle-cadmium battery.

Fiducial Generator: internally variable time set  
controls relay contact and  
audio output.

Dimensions: 30 cm X 30 cm X 13 cm

Weight: 3 kg.

iii) Digital Magnetic Tape

Type: Hewlett Packard cartridge  
tape unit.

Model: 9875A

Power Requirements: 24 volt d.c.

Data Format: HP'S Standard Interchange  
Format (SIF)



Tape Cartridge: HP 98200A 225K byte cartridge compatible with HP Series 9800 desktop computers.

Tape Drive: Dual tape drives providing up to 8 hours continual recording time.

Controller: Internal micro-computer provides 23 built in commands External computer generated commands.



**COST BREAKDOWN**

This report detailing the results of the airborne magnetometer survey and a compilation of geological information was prepared for an all inclusive fee of \$8,005.00. This total is based on a cost structure of \$35/km for magnetometer data.

143 km - magnetic @ \$35/km .....	<u>\$5,005.00</u>
<b>TOTAL 143 KM</b>	<b>\$5,005.00</b>
Geological Compilation .....	805.00
Interpretation and Report .....	<u>2,195.00</u>
<b>TOTAL</b>	<b>\$8,005.00</b>
<b>TOTAL ASSESSMENT VALUE OF THIS REPORT</b>	<b>\$8,005.00</b>



**STATEMENT OF QUALIFICATIONS:**

**NAME:** HERMARY, Richard G.

**PROFESSION:** Geophysicist

**EDUCATION:** University of British Columbia -  
B.Sc. - Major Geophysics

**PROFESSIONAL**

**ASSOCIATIONS:** Society of Exploration Geophysicist

**EXPERIENCE:** Six months as field geophysicist,  
A & M Exploration Ltd.

Six months with Western Geophysical Aero Data



**STATEMENT OF QUALIFICATIONS**

**NAME:** WHITE, Glen E., P.Eng.

**PROFESSION:** Geophysicist

**EDUCATION:** B.Sc. Geophysics - Geology  
University of British Columbia

**PROFESSIONAL ASSOCIATIONS:** Registered Professional Engineer,  
Province of British Columbia.

Associate Member of Society of Exploration  
Geophysicists.

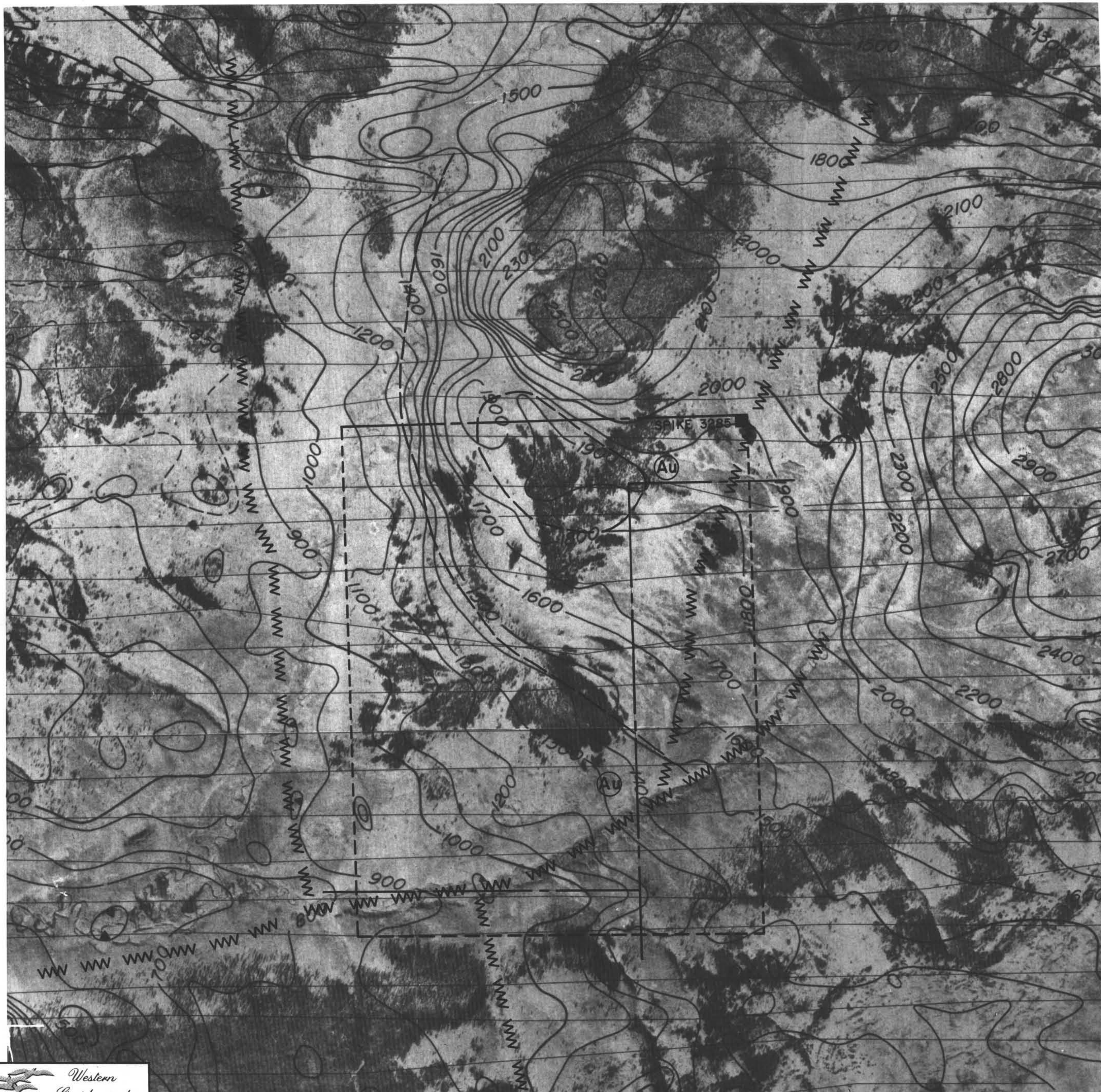
Past President of B.C. Society of Mining  
Geophysicists.

**EXPERIENCE:**

- Pre-Graduate experience in Geology -  
Geochemistry - Geophysics with Anaconda  
American Brass.
- Two years Mining Geophysicist with Sulmac  
Exploration Ltd. and Airborne Geophysics  
with Spartan Air Services Ltd.
- One year Mining Geophysicist and Technical  
Sales Manager in the Pacific north-west for  
W.P. McGill and Associates.
- Two years Mining Geophysicist and  
supervisor airborne and ground geophysical  
divisions with Geo-X Surveys Ltd.
- Two years Chief Geophysicist Tri-Con  
Exploration Surveys Ltd.
- Fourteen years Consulting Geophysicist.
- Active experience in all Geologic provinces  
of Canada.







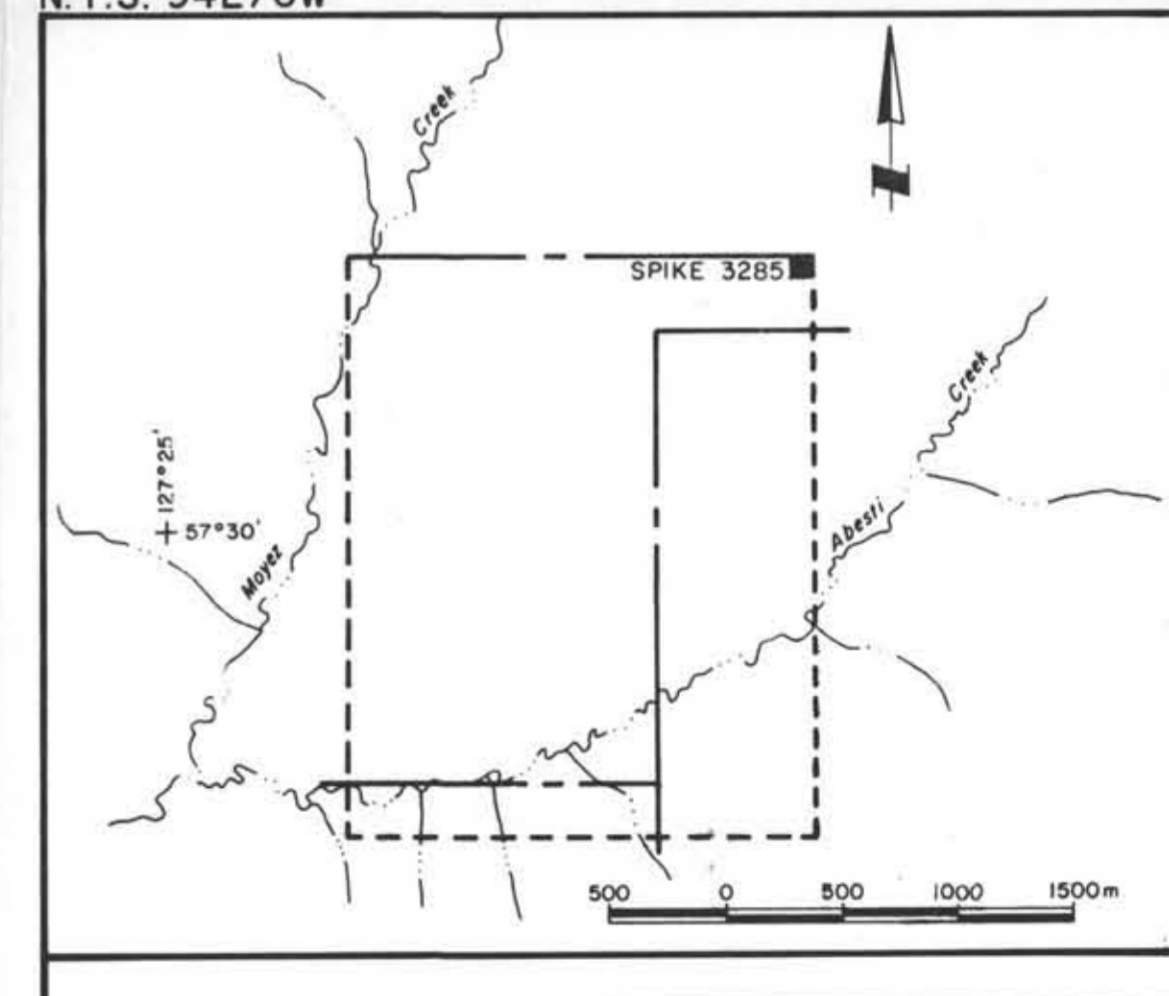
KEY

- INSTRUMENT : Barringer M-123 Magnetometer
- Data corrected for diurnal variations
- Base value = 58 000 nt
- Contour interval = 50 nt
- Sensor elevation = 60 metres
- Claim line = - - - - -
- Claim post = ■
- Inferred fault W W W W W W W W
- Magnetic low (Au)
- Mineralization (Au)
- Possible lithological contact or fault - - - - -

GEOLOGICAL BRANCH  
ASSESSMENT REPORT

16,056

N.T.S. 94E/6W



100 0 200 400 600 800 1000 1200m



TOODOGGONE SYNDICATE  
SPIKE CLAIM  
MAGNETIC INTENSITY CONTOUR MAP

DATE : MAR.86 / APR.87      FIG. : 2