THE RESULTS OF A MAGNETOMETER SURVEY ON THE CROWDUCK (COPPER ISLAND EAST CLAIM GROUP) PROPERTY CLEARWATER BAY AREA KENORA MINING DIVISION, ONTARIO

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MINING LANDS SECTION

NTS: 52E/10
LATITUDE: 49° 40' N
LONGITUDE: 94° 44' W
OWNER: Homestake Mineral Development Co. Ltd.
$1000 - 700 W. Pender St.
Vancouver, B.C. V6C 1G8
OPERATOR: Homestake Mineral Development Co. Ltd.
DATE: May, 1989
BY: Duncan McIvor
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1. SUMMARY AND RECOMMENDATIONS

The Crowduck Property of Homestake Mineral Development Company Ltd. is located approximately 23 kilometres southwest of the town of Kenora, in the Clearwater Bay Area of the Kenora Mining Division. In February 1988, Homestake personnel completed an 11.1 kilometre total field magnetics survey over a portion of the property.

The magnetics survey delineated an arcuate magnetic high believed to be a reflection of an underlying, magnetic, gabbroic intrusion. Two linear relative lows cut the high magnetic signature. Both are believed to reflect the presence of shear zones cutting the gabbroic rocks, along which hydrothermal alteration has destroyed all magnetic. These lows warrant a more detailed evaluation as they may host zones of economic gold mineralization.

2. INTRODUCTION

2.1 SCOPE OF REPORT

This report summarizes the results of a total field magnetics survey completed over the Crowduck Property, in the Kenora Mining Division of northwestern Ontario. The survey was completed by Homestake Mineral Development Co. Ltd. personnel during the period February 14 to February 16, 1988, on a grid established earlier in February of the year.

2.2 LOCATION AND ACCESS

The Crowduck Property is located approximately 23 kilometres southwest of Kenora, Ontario, in the Lake of the Woods region. (See Figure 1). The property is accessible via boat from Kenora, through Lake of the Woods to Ptarmigan Bay. The property is also accessible via float plane.

2.3 PROPERTY DEFINITION

The Crowduck Property is comprised of 14 unpatented mineral claims, totalling approximately 226 hectares (See Figure 2). The claims are wholly owned by Homestake Mineral Development Co. Ltd. Below are pertinent details;
2.4 EXPLORATION HISTORY

The history of exploration in the Lake of the Woods Area is extremely detailed. Only a brief summary is presented here. For more details regarding the early history of gold exploration in the Lake of the Woods area the reader is referred to work by Bread and Garrett (1976) and Clark (1984). Information on exploration work done in the area is derived from the Resident Geologist’s Files, Ontario Ministry of Northern Development and Mines, Kenora.

The area has a colourful history of gold mining dating back to the 1890’s. Mining activity occurred largely during two periods, from 1890 to 1910 and from 1934 to 1943.

While prospecting actually began as early as 1852, little real development occurred before 1885. In 1885 partial reconnaissance mapping of the Lake of the Woods Area was carried out by A.C. Lawson of the Geological Survey of Canada (Lawson 1885). This regional work spurred exploration activity in the area and during the period 1885 to 1895 a large number of gold discoveries were made and many properties were brought into production.

By the end of 1900 a large number of mines has closed down. Work continued intermittently until 1912 when discovery and development of the Porcupine gold fields virtually brought all mining activities in Northwestern Ontario to an end.
Figure 1. Map showing the location of the Copper Island East Claim Group, Clearwater Bay Area, Kenora Mining Division, Ontario (Property Location).
Figure 2. Detailed claim map of the Copper Island East Claim Group (claims are outlined in red).
Figure 3. Generalized geological map of the Clearwater Bay Area, Lake of the Woods (after Ayer and Sweeney, 1986).
A revaluation of gold in 1934 brought on a second major period of activity in the late 1930’s and 1940’s.

In 1935, J. E. Thomson of the Ontario Department of Mines carried out systematic geological mapping in the north central part of the Lake of the Woods (Thomson, 1937). Thomson’s work was one of the first detailed studies of the Lake of the Woods Area.

With the onset of World War II mining activity again ceased and only sporadic activity occurred in the area until the mid 1960’s and early 1970’s.

In 1966, Selco Exploration Company Limited diamond drilled three holes north of Rush Bay.

In 1971, Kerr Addison Mines Limited diamond drilled ten holes within a broad area on and around Corkscrew Island.

In 1975, Hudson Bay Exploration and Development Company Limited diamond drilled six holes within a broad area south of the western end of Zig Zag Island.

In 1984, Homestake Mineral Development Company flew airborne magnetic and VLF-EM surveys over the Crow Duck - Rush Bay Fault Zone. As a result of the airborne geophysical surveys several claim blocks were staked, including the Copper Island East Claim Group. Geological mapping and lithogeochemical sampling were conducted by a two person crew for four days in July 1985 and two days in August 1987. Mapping and sampling was primarily carried out along shorelines, but locally pace and compass traverses were run inland.


2.5 GENERAL GEOLOGIC SETTING

The regional geology of the Clearwater Bay Area was first described by Thomson (1937). A more recent study was carried out by Ayer and Sweeney (1986, 1987). A brief summary of the regional geology is presented here and summarized in Figure 3.
All bedrock is Archean in age with the exception of Early Proterozoic diabase dykes. The supracrustal rocks in the area consist of mafic and intermediate to felsic metavolcanics with minor clastic metasediments. These have been intruded by mafic and felsic bodies.

The oldest stratigraphic unit in the Clearwater Bay Area, the Lower Mafic Unit, occurs in the northern part of the map area. It consists primarily or pillowed to massive tholeiitic basaltic flows.

South of and conformably overlying, the Lower Mafic Unit is a diverse unit of calc-alkalic metavolcanics, the Upper Calc-Alkaline Volcanics. They underlie much of the map area and range in composition from basaltic andesites to rhyolites. In the Clearwater Bay Area, they consist predominantly of debris flow with some minor massive to pillowed flows. The central part of the map area is predominantly underlain by pillowed flows with subordinate debris flows and pillow breccias.

Intercalated felsic units have abundant quartz phenocrysts and locally lithic and/or pumaceous fragments. Most of these are interpreted to be primary pyroclastic deposits (Ayer and Sweeny, 1986). Locally within the more felsic units are thin, very fine grained cherty beds. In several areas thin beds of fine-grained wackes, mudstones, siliceous siltstones and chert-sulphide ironstone occur within the calcalkalic volcanic sequence.

Mafic sills intrude both the tholeiitic and calc-alkalic metavolcanics and the interflow metasediments, and are thought to be synvolcanic (Ayer and Sweeny, 1986). Locally the sills display differentiation with ultramafic phases at the base grading upwards into gabbro at the top.

Metasediments of the White Partridge Bay Group are interpreted to unconformably overlie the calc-alkalic metavolcanics and synvolcanic intrusions (Ayer and Gil, 1986). In the Clearwater Bay Area, they consist predominantly of fine grained, well-bedded and normally graded wackes and mudstones. Some intercalated conglomerate beds were noted along the north side of Corkscrew Island.

Several ages of granitic intrusives are apparent in the map area. The oldest are pre-tectonic tonalitic to granodioritic gneisses of the English River Subprovince in the north. Throughout most of the map area the contact between these gneisses and the metavolcanics of the Wabigoon Subprovince to the south is abrupt.
Several syn-to late-tectonic felsic intrusions are present in the map area. The Granite Lake Stock, which is totally enclosed within metavolcanics, consists of megacrystic granodiorite. The Rush Bay Stock, which occurs within the Crowduck Lake - Witch Bay Shear Zone, is a medium-grained porphyritic quartz monzo-diorite. The Canoe Lake Stock is a medium-grained equigranular quartz-porphyritic tonalite.

Several fold axes have been documented in the map area. Fold axes have been identified, to a large extent on the basis of reversals in facing directions (Ayer and Sweeny, 1986). A synclinal axis trends E-NE across the central part of the map area. A parallel anticline and syncline are well defined to the north of this syncline in the White Partridge Bay Group.

A NE trending anticline can be traced across Copper Island and is interpreted to extend across Corkscrew Island. A parallel syncline can be traced southwestward from Ptarmigan Bay to the Canoe Lake Stock.

A major zone of ductile deformation, identified as the Crowduck Lake-Witch Bay Shear Zone trends easterly across the southern part of the map area. This structure consists of alternating zones of highly and moderately strained rock which collectively attain widths of up to several kilometres (Ayer and Sweeny, 1986). The amount of deformation is typically in proportion to the competency of the original lithologies. Alteration, consisting of calcium and/or iron carbonatization is widespread. Zones of silicification (both pervasive and in the form of quartz veining) and sulphide enrichment are also present, but less widespread than the carbonatization.

Metamorphism is greenschist facies throughout most of the map area, but rises to amphibolite facies near the English River Subprovince boundary to the north.

The property itself is underlain predominantly by intermediate to mafic metavolcanics, with minor intrusions ranging in composition from quartz-feldspar porphyry to gabbro. Map 2, in Appendix 1, outlines the property geology.
3. DETAILED TECHNICAL DATA

3.1 SURVEY INSTRUMENTATION AND PROCEDURE

The survey was completed over an 11.1 kilometre grid established on the property, employing an east-west trending baseline, and north-south trending cross-lines. Line spacing is 100 meters. Station spacing along all crosslines is 12.5 meters.

The survey was completed using an Omni IV portable proton precession magnetometer. Readings of the total field were taken at 12.5 metre intervals along all crosslines. A closed-loop survey system was used to correct all readings for diurnal drift.

The results appear plotted and contoured on the enclosed plan map in Appendix 1. Note that a base value of 59,000 nT has been subtracted from each reading.

3.2 RESULTS AND INTERPRETATION

Magnetic relief on the property is relatively high, ranging from a low of 59,641 nT to a high of 61,798 nT. The majority of the claim group has a signature in the 59,700 to 60,000 nT range.

The most prominent magnetic feature on the property is an arcuate magnetic high, trending east-west across claim 803610, and turning north to cross claim 803611. This high is believed to be caused by an underlying, strongly magnetic gabbroic stock.

The remainder of the property exhibits a relatively flat magnetic signature in the 59,700 to 59,900 range, believed to be reflecting the relatively homogeneous underlying intermediate to mafic metavolcanics. Of interest are subtle but distinctive breaks in the previously discussed magnetic high. One trends east-northeast/west-southwest across the southern most portion of the mag high. Based on geological mapping and diamond drilling, this relative low reflects an underlying shear Zone within the gabbroic and mafic metavolcanic rocks. A second distinct relative low trend north-south along L2 + 00 W. This low may represent a previously unrecognized shear zone, and warrants a more detailed evaluation.
STATEMENT OF QUALIFICATIONS

I, DUNCAN FORBES MCIVOR, do hereby state that:

- I am a graduate of the University of Waterloo, with an Honours Applied B.Sc in Earth Sciences.

- I have been employed in the mineral exploration industry since 1974, holding positions with Esso Minerals Canada, Utah Mines Ltd., Utah International, and Homestake Mineral Development Company.

- I have personal knowledge that the information contained in this report is true, and accurate.

DUNCAN FORBES MCIVOR
REFERENCES


OMNI IV
"Tie-Line" Magnetometer

Four Magnetometers in One
Self Correcting for Diurnal Variations
Reduced Instrumentation Requirements
25% Weight Reduction
User Friendly Keypad Operation
Universal Computer Interface
Comprehensive Software Packages
The OMNI IV microprocessor-based "Tie-Line" Magnetometer incorporates a number of features designed to facilitate the storage, reduction and presentation of total field magnetic data.

**Major Benefits**

- **Four Magnetometers In One**
  The OMNI IV has been designed to operate in four different operating modes:
  1. As a self correcting or "tie-line" magnetometer (See page 3)
  2. As a portable field magnetometer (See page 4)
  3. As a recording base station magnetometer (See page 5)
  4. As a true simultaneous gradiometer. (See page 6)

The standard OMNI IV incorporates a number of features designed to facilitate the recording of data, once the OMNI IV has been programmed for the day's survey, the operator need only use the recording keypad for data storage. Recording of data is accomplished by pressing only 2 recording keys sequentially. A "Clear" data key has been incorporated to edit the previously stored data.

**Self Correcting for Diurnal Variations**

When used in the "tie-line" mode, the OMNI IV automatically corrects itself for variations in the earth's magnetic field. By tieling back into one tie-point or tie-lines) on the grid over the day or over the duration of the survey, the OMNI IV automatically calculates and applies the drift measured to the data stored.

Data is corrected using the linear interpolation method.

**Reduced Instrumentation Requirements**

Only one OMNI IV is needed to measure, store total field and gradient data and automatically correct the total field magnetic data, when in the tie-line mode.

The flexibility of the OMNI IV allows the user to purchase one console and through the use of different sensors or software create their choice of four different magnetometers.

**25% Weight Reduction**

The OMNI IV has been designed so that it is 25% lighter than EDA's existing PPM-350/375 OMNIMAG units for a total weight of 4 kg. This weight reduction has been achieved by the design of a smaller console and by the use of a lighter rechargeable or disposable power source.

**User Friendly Keypad Operation**

The OMNI IV incorporates two keypads, one for programming the unit for time and grid co-ordinates and the other for the recording of data. Once the OMNI IV has been programmed for the day's survey, the operator need only use the recording keypad for data storage. Recording of data is accomplished by pressing only 2 recording keys sequentially. A "Clear" data key has been incorporated to edit the previously stored data.

**Universal Computer Interface**

A simple, low cost, communication interface between the OMNI IV or OMNIMAG Series and any microcomputer is now available. This communication interface provides the necessary handshake requirements for the OMNI IV to dump directly into any microcomputer with ASCII code, into any standard parallel printer, or into many available serial magnetic tape recorders.

**Comprehensive Software Programs**

HP 85 and CP/M software packages for most computers such as IBM PC, APPLE, KAYPRO, OSBORNE, etc. are available to enable the user to edit the data, obtain line profiles and create plot files.

Many filtering programs are offered for further data analysis such as the Fast Fourier Transform, the Frequency Domain Filters or the Upward-Downward Continuation. Additional programs are also available to transfer the data from microcomputers to mainframes.
1. As a Self Correcting, "Tie-Line" Magnetometer...

Any survey can now be run and corrected automatically with only one OMNI IV.

The OMNI IV is able to store "looping" or "tie-line" data. This data is stored in a separate memory at the beginning of each survey. Total field readings are then subsequently stored in a second memory along with the field readings of the tie-points. At the end of each survey day, these two memories are merged to automatically correct the total field data for diurnal variations.

Features
The OMNI IV in the "tie-line" mode can:
- Store "looping" or "tie-line" data 3 ways:
  - using one "looping" base point,
  - using one "tie-line" comprised of a number of tie-points, or
  - using multiple "tie-lines",
- Store up to 100 tie-points in one survey area or divide these points into extensions of survey areas as needed.
- Store tie-points or tie-lines for the duration of the survey.
- Calculate the drift between established tie-points, to readily see variations in the earth's magnetic field.

Key Benefits
Eliminates Manual Correction of Data
Diurnal corrections, using the tie-line method, can be done automatically by the OMNI IV, eliminating hours of manual and tedious calculations. Corrected data can then be directly transferred to a computer for further data processing.

Flexibility of "Tie-Line"
The OMNI IV "tie-line" system offers the operator the flexibility of choosing the most appropriate tie-line method best suited for the survey, depending upon the size and character of the grid. The operator can choose from:
- a single base point,
- a single tie-line,
- multiple tie-lines, or
- a random scattering of tie-points.

Reduced Instrumentation Requirements
The self-correcting "tie-line" feature of the OMNI IV can remove base station requirements from some surveys.

Tie-Line Capability in Gradient Mode
The "tie-line" capability is also applicable when used as a gradiometer. The operator can therefore obtain corrected total field data without requiring a base station magnetometer.

Programmable Datum
The OMNI IV can be programmed to automatically remove a designated datum from field data. Removal of this coarse, background value facilitates plotting and interpretation of data.

Automatic Drift Calculations
The OMNI IV can automatically calculate the desired diurnal drift measured between consecutive tie-point readings.

Data Recall
"Tie-line" data can be recalled, even if stored on different days.
OMNI IV
"Tie-Line" Magnetometer

2. As a Portable Field Unit...
The OMNI IV is a portable proton precession magnetometer that measures and stores in memory the earth's magnetic field at the touch of a key. It identifies and stores the location, time of each measurement, computes the statistical error of the reading and stores the decay and strength of the signal being measured.

Features
- Packaged in a compact, lightweight and rugged housing, the OMNI IV measures and stores the following set of information:
  - total field magnitude
  - time of measurement
  - grid coordinates
  - direction of travel
  - statistical error of readings
  - signal strength and rate of decay
- Users have a choice of three data storage modes:
  - spot record
  - multi record
  - auto record
- Data stored in memory is completely protected by a lithium battery.
- Each reading is automatically assigned a record number which can also be used to identify readings measured off the grid.
- More than one reading can be taken at one point without updating the current station number.
- Characters shown on the LCD display are highly visible.

Key Benefits

Increased Productivity
Survey productivity is significantly increased with the OMNI IV because:
- a measurement can be read and stored in only 3 seconds.
- data is highly repeatable. A second measurement is usually not required.
- the statistical error is calculated for each measurement providing an indication of whether an additional reading may be required.
- the OMNI IV is up to 25% lighter and smaller.
This permits the operator to cover more ground and gather more data than would be otherwise possible.

Simplified Fieldwork
The OMNI IV makes surveys easier to conduct because:
- the need to write down field data is eliminated. Time, field measurement, grid co-ordinates, etc, are simultaneously stored when any one of the three record keys are pressed.
- the operator has the ability to clear the unwanted last reading
- the difference between the current reading and the previous one is calculated automatically
- the coarse magnetic field value or datum can be removed from the field data to simplify plotting of the field results
- diurnal corrections are automatically calculated.
System flexibility offers the following choices:
- If the OMNI IV is used as a field magnetometer or as a gradiometer, the total field data can be corrected by itself using the "tie-line" or "looping" capability.
- If the OMNI IV is used as a self-recording base station, it will correct the total field data in:
  a. another OMNI IV, used as a field magnetometer
  b. another OMNI IV, used as a gradiometer
  c. an OMNIMAG PPM-350
  d. an OMNIMAG PPM-375, used as a field magnetometer
  e. an OMNIMAG PPM-500 Vertical Gradiometer
Readings can be recalled either by record number or in sequence.

Unparalleled Repeatability of Data
The OMNI IV provides users with unparalleled data repeatability. This is a result of four leading-edge design features that eliminate the need for taking multiple readings:
- Patented Signal Processing Technique
- Constant Energy Polarization that maintains equal energy to the sensor
- Processing sensitivity to ± 0.02 gamma
- Automatic Fine Tuning which uses the previous reading as the base for the next reading

Other Benefits
- Error Analysis
This unique feature is a great timesaver because the calculation of the statistical error of each reading lets the operator make an on-the-spot decision whether that reading should be stored or not.

- Higher Gradient Tolerance
Higher tolerance to local gradients of up to 6000 gammas per meter (field proven), is possible due to a patented signal processing method and to a miniature sensor design utilizing a highly optimized sensor geometry.

- Complete Data Protection
Field data stored in memory is totally protected for a number of years by the lithium backup battery. This battery also provides power to the real-time clock.

- Data Recall
Readings can be recalled either by record number or in sequence.

- Decimal Spacing
A decimal digit is provided for intermediate station intervals of 12.5 meters.

- Power Supply Versatility
Users can choose from:
- non-magnetic rechargeable sealed lead-acid battery cartridge or belt
- nickel cadmium (NiCad) battery cartridge or belt
- disposable alkaline battery
3. As a Base Station Magnetometer...

The OMNI IV in the base station mode effectively measures and stores in its memory the daily fluctuations of the earth's magnetic field. The OMNI IV will automatically correct total field data of other OMNI IV or OMNIMAG Series units in just a few minutes.

Features

The OMNI IV in the base station mode can:

- Automatically correct magnetic field data for both diurnal variations and reference field values.
- Record the magnetic field activity in the following format:
  - time of measurement
  - magnitude of total field
  - difference from the reference field value
  - difference from the previous reading
  - sequential record number
- Store up to 5,000 sets of readings, the equivalent to approximately 14 hours of continuous unattended monitoring at a 10 second sampling interval. Cycling time between 5 seconds and 60 minutes in 1 second increments can be programmed by the operator.
- Simultaneously outputs data in a digital or ASCII format to a choice of data collection units at the same time as it is being stored in memory.

Key Benefits

Automatic Diurnal Corrections

The OMNI IV in the base station mode will automatically correct total field data stored in:
- another OMNI IV, used as a field magnetometer or as a gradiometer
- a PPM-350 Total Field Magnetometer
- a PPM-375 Portable/Base Station
- a PPM-500 Vertical Gradiometer

This is ideal where close, detailed monitoring of the earth's magnetic field is required.

Programmable Reference Field

The reference field can be programmed by the operator. The OMNI IV then calculates automatically the drift in the magnetic field for every reading. If at the end of the first survey day the proper reference field has not been entered, the operator can re-select a new one and the drift can be automatically re-calculated.

Programmable Cycling interval

The OMNI IV can be programmed to cycle at any interval, in one second increments, from 5 seconds to 60 minutes.

Other Benefits

- Stores & Prints Data Simultaneously
- Internal Real Time Clock

Real time clocks can be synchronized to the nearest second when using the OMNI IV with any other OMNI IV or OMNIMAG Unit.

Automatic Drift Calculation

The OMNI IV calculates automatically the difference between each reading and its programmed reference field. This can be presented in either digital and/or profile plot format. It can also be simultaneously output to a compatible printer for visual verification of the field's activity.

Calculates Differential Field Variations

The OMNI IV also calculates to 0.1 gamma, the difference between the current reading and the previous one. This assists the operator in ascertaining the degree of activity that is occurring i.e. magnetic storm or active conditions.

Programmable Cycling Interval

The OMNI IV can be programmed to cycle at any interval, in one second increments, from 5 seconds to 60 minutes.

Other Benefits

- Stores & Prints Data Simultaneously
- Internal Real Time Clock

Real time clocks can be synchronized to the nearest second when using the OMNI IV with any other OMNI IV or OMNIMAG Unit.
The OMNI IV provides the operator with an accurate means of measuring both the total field and the gradient of the total field. It reads and stores the measurements of both sensors simultaneously to calculate the true gradient measurement. The standard 0.5 meter gradient sensor staff, shown here, is made possible by this simultaneous measurement.

**Features**

The OMNI IV in the gradient mode provides:
- A visual readout and storage of the following information in an absolutely secure memory:
  - the gradient of the total field
  - the total magnetic field magnitude of upper sensor
  - the time of measurement
  - the grid co-ordinates where the measurement is taken
  - the statistical error of total field reading of lower gradient sensor
  - the signal strength and decay rate measurement of lower gradient sensor
- A simultaneous, not sequential, measurement of both sensors
- A choice of sensor lengths and configurations:
  - standard 0.5 meter sensor separation mounted on staff
  - optional one meter sensor separation mounted on staff
  - optional horizontal gradient sensors
- The staff length can be adjusted to achieve desired height of sensors from the ground.
- A choice of three data storage modes:
  - spot record, for readings without grid co-ordinates
  - multi-record, for many readings at one station
  - auto record, for automatic updating of station number

**Key Benefits**

**Reads Both Sensors Simultaneously**

The OMNI IV reads both sensors simultaneously and not sequentially. This type of measurement removes the effect of diurnal variations and magnetic storm interferences from the data. This is a true gradient measurement.

**Improved Productivity**

The need to take only one simultaneous gradient measurement instead of two sequential measurements cuts reading time substantially.

**Improved Data During Magnetic Storms**

Gradient surveys can be conducted during magnetic storms resulting in no lost survey time. This is another benefit of the simultaneous measurement of both sensors.

**No Diurnal Corrections of the Gradient Required**

The effect of diurnal magnetic variations on the gradient measurement is cancelled due to this simultaneous measuring technique. The total field measurement of the top sensor can be self-corrected by the OMNI IV when used with the "tie-line" mode or with another OMNI IV in the base station mode.

**Better Resolution of Total Field Anomalies**

The OMNI IV in the gradient mode more sharply defines the magnetic responses determined by total field data. Closely spaced anomalies are individually delineated rather than being identified collectively under one broad magnetic response.

**Direct Delineation of Vertical Contacts**

The OMNI IV is an ideal contact mapping tool especially in vertical to near-vertical contact or fault zones. These vertical contacts are expressed at the zero line of gradient contour or profile values. Vertical dyke-like bodies can also be mapped effectively.

**Enhances Near-Surface Anomalies**

Shallow, near-surface sources (higher frequency anomalies) are emphasized relative to deeper responses (lower frequency anomalies). This can provide an on-the-spot approximation of the depth of the anomalous source.

**Automatically Removes Regional Gradient**

The gradient measurements ability to differentiate between higher and lower frequency responses effectively removes background regional gradients from anomalous residual responses.

**Gradient and Total Field Readings Stored Simultaneously**

Data is enhanced by the ability of the OMNI IV to simultaneously record in memory both the gradient and total field measurements as well as the statistical error. Both types of data offer a unique alternative in the interpretation of magnetic field data. I.e. gradient vector diagrams, dip and strike length of body, etc.

**Gradient-Base Station Operation**

The OMNI IV can cycle automatically every 5 seconds in the gradient mode. This option can be used in stationary or mobile applications.

**Adjustable Sensor Heights**

The OMNI IV gradient sensor is mounted onto a sectional aluminum staff in which sections can be added or subtracted. This enables the operator to adapt the OMNI IV to local ground noise conditions, terrain effects and survey logistics. In doing so, near surface effects can be selectively emphasized or diminished depending upon the survey target.

**Choice of Sensor Separation**

The use of the 0.5 meter standard and/or 1.0 meter optional sensor separation provides unique interpretative information especially useful in near surface anomalous conditions. I.e. determining if the field has a linear or is linear.
Data Output Options

The OMNI IV universal communications interface enables the user to output and analyze data through a number of options and formats.

Any Computer with RS 232C

The OMNI IV can transfer uncorrected or corrected field data into any computer with an RS 232C port through the EDA universal communications interface. Computers with collection packages including either "X-ON, X-OFF" or "ENQ/ACK" communication protocol formats are also compatible. Data transfer from the field to the office is also possible through the use of an optional modem interface.

Comprehensive Software Packages

Once the OMNI IV data has been transferred to a microcomputer, it can be further analyzed through a number of available software packages:

1. a CP/M software package adaptable to many microcomputers such as the IBM PC, APPLE, KAYPRO, TRS, OSBORNE, etc... This package enables the user to edit the data, obtain true line profiles and create plot files.

2. The above CP/M software package is also available plus the added capability of merging the base station data of GEOMETRICS G856 with the OMNI IV to calculate diurnal variations. This enables users to increase the flexibility of their existing magnetometers.

3. An HP 85 software package that edits the OMNI IV data, provides true line profiles and creates plot files. The package also permits the use of the G856 together with the OMNI IV to calculate diurnal variations.

4. A Fast Fourier Transform program is available where space or time domain data is transformed to the frequency domain. From the examination of a power spectrum, filters may be customized to each data set.

5. A Frequency Domain Filter program is also available. The multi pass filter program allows user control of the turn on/off frequencies and filter decay rates. These filters are useful for performing regional/residual separation or filtering of noise from data.

6. The Upward-Downward Continuation program computes a 2-dimensional upward or downward continuation transfer function and applies the operator to the input array in the wave-number domain.

7. A Micro-to-Mainframe Computer program enables the user to transfer the data from his field computer to a mainframe where additional computation will be done.

Profile Plot Outputs

The OMNI IV can plot data as a profile through a printer. The operator can:

- select and program any gamma scale best suited for data presentation
- output the digital or plot formats simultaneously or separately
- choose a 40, 80, or 132 character printer paper width
- plot both the gradient and corrected total field data simultaneously
- transfer data plots to a printer as it is being stored in memory. This is ideal in base station applications.

Many Digital Recorder Options

The OMNI IV is compatible with many digital recorders with serial interface, such as MFE 2500, through its communications interface. EDA's digital recorder, the DCU-200, can store 21,000 readings and has a "read-after-write" capability.

Variety of Printer Options

The OMNI IV can transfer data into any printer with a standard parallel (Centronics) interface, such as the Epson printer, through its communications interface. The OMNI IV data can also be transmitted through two EDA printers:

- the DCU-040, which is a small 40 character AC only thermal printer.
- the DCU-400, which is a ruggedized 40 character thermal printer that is used either with its internal rechargeable batteries, a 12 volt DC power supply option or an AC power source.

With the external 12 volt DC power supply option linked directly to the DCU-400, data transfer and charging of internal batteries can be done simultaneously. There is now no dependence on a generator or AC power source for data transfer or battery charging. This is ideal where AC power is not available or where a back-up power source is required.

Data Output Capabilities

The OMNI IV outputs data in a choice of formats, depending upon the operating mode:

- corrected total field data
- uncorrected total field data
- base station data
- gradient field data
- corrected tie-line data
- tie-line data

Grid co-ordinates of the data can be output with their designated compass bearing, using N, S, E, W descriptors. Direction of travel along each grid line is programmable and will be reflected with or without a minus sign (-). I.e. travelling south or west is negative (-), travelling north or east is positive.
## Specifications

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Dynamic Range</strong></td>
<td>18,000 to 110,000 gammas. Roll-over display feature suppresses first significant digit upon exceeding 100,000 gammas.</td>
</tr>
<tr>
<td><strong>Tuning Method</strong></td>
<td>Tuning value is calculated accurately utilizing a specially developed tuning algorithm</td>
</tr>
<tr>
<td><strong>Automatic Fine Tuning</strong></td>
<td>± 15% relative to ambient field strength of last stored value</td>
</tr>
<tr>
<td><strong>Display Resolution</strong></td>
<td>± 0.1 gamma</td>
</tr>
<tr>
<td><strong>Processing Sensitivity</strong></td>
<td>± 0.02 gamma</td>
</tr>
<tr>
<td><strong>Statistical Error Resolution</strong></td>
<td>± 0.01 gamma</td>
</tr>
<tr>
<td><strong>Absolute Accuracy</strong></td>
<td>± 1 gamma at 50,000 gammas at 23°C, ± 2 gamma over total temperature range</td>
</tr>
<tr>
<td><strong>Standard Memory Capacity</strong></td>
<td></td>
</tr>
<tr>
<td>Total Field or Gradient</td>
<td>1,200 data blocks or sets of readings</td>
</tr>
<tr>
<td>Tie-Line Points</td>
<td>100 data blocks or sets of readings</td>
</tr>
<tr>
<td>Base Station</td>
<td>5,000 data blocks or sets of readings</td>
</tr>
<tr>
<td><strong>Display</strong></td>
<td>Custom-designed, ruggedized liquid crystal display with an operating temperature range from -40°C to +55°C. The display contains six numeric digits, decimal point, battery status monitor, signal decay rate and signal amplitude monitor and function descriptors.</td>
</tr>
<tr>
<td><strong>RS 232 Serial I/O Interface</strong></td>
<td>2400 baud, 8 data bits, 2 stop bits, no parity</td>
</tr>
<tr>
<td><strong>Gradient Tolerance</strong></td>
<td>6,000 gammas per meter (field proven)</td>
</tr>
<tr>
<td><strong>Test Mode</strong></td>
<td>A. Diagnostic testing (data and programmable memory)</td>
</tr>
<tr>
<td></td>
<td>B. Self Test (hardware)</td>
</tr>
<tr>
<td><strong>Sensor</strong></td>
<td>Optimized miniature design. Magnetic cleanliness is consistent with the specified absolute accuracy.</td>
</tr>
<tr>
<td><strong>Gradient Sensors</strong></td>
<td>0.5 meter sensor separation (standard), normalized to gammas/meter. Optional 1.0 meter sensor separation available. Horizontal sensors optional.</td>
</tr>
<tr>
<td><strong>Sensor Cable</strong></td>
<td>Remains flexible in temperature range specified, includes strain-relief connector</td>
</tr>
<tr>
<td><strong>Cycling Time (Base Station Mode)</strong></td>
<td>Programmable from 5 seconds up to 60 minutes in 1 second increments</td>
</tr>
<tr>
<td><strong>Operating Environmental Range</strong></td>
<td>-40°C to +55°C; 0-100% relative humidity; weatherproof</td>
</tr>
<tr>
<td><strong>Power Supply</strong></td>
<td>Non-magnetic rechargeable sealed lead-acid battery cartridge or belt; rechargeable NiCad or Disposable battery cartridge or belt; or 12V DC power source option for base station operation.</td>
</tr>
<tr>
<td><strong>Battery Cartridge/Belt Life</strong></td>
<td>2,000 to 5,000 readings, for sealed lead acid power supply, depending upon ambient temperature and rate of readings</td>
</tr>
<tr>
<td><strong>Weights and Dimensions</strong></td>
<td></td>
</tr>
<tr>
<td>Instrument Console Only</td>
<td>2.8 kg, 238 x 150 x 250mm</td>
</tr>
<tr>
<td>NiCad or Alkaline Battery Cartridge</td>
<td>1.2 kg, 235 x 105 x 90mm</td>
</tr>
<tr>
<td>NiCad or Alkaline Battery Belt</td>
<td>1.2 kg, 540 x 100 x 40mm</td>
</tr>
<tr>
<td>Lead-Acid Battery Cartridge</td>
<td>1.8 kg, 235 x 105 x 90mm</td>
</tr>
<tr>
<td>Lead-Acid Battery Belt</td>
<td>1.8 kg, 540 x 100 x 40mm</td>
</tr>
<tr>
<td>Sensor</td>
<td>1.2 kg, 56mm diameter x 200mm</td>
</tr>
<tr>
<td>Gradient Sensor (0.5 m separation-standard)</td>
<td>2.1 kg, 56mm diameter x 790mm</td>
</tr>
<tr>
<td>Gradient Sensor (1.0 m separation-optional)</td>
<td>2.2 kg, 56mm diameter x 1300mm</td>
</tr>
<tr>
<td><strong>Standard System Complement</strong></td>
<td>Instrument console; sensor; 3-meter cable, aluminum sectional sensor staff, power supply, harness assembly, operations manual</td>
</tr>
<tr>
<td><strong>Base Station Option</strong></td>
<td>Standard system plus 30 meter cable</td>
</tr>
<tr>
<td><strong>Gradiometer Option</strong></td>
<td>Standard system plus 0.5 meter sensor</td>
</tr>
</tbody>
</table>
**Report of Work**

**Ministry of Resources (Geophysical, Geological, Geochemical and Expenditures)**

**Geophysical (Total Field Magnetics)**

**Claim Holder(s):** Homestake Mineral Development Co. Ltd.

**Address:** 1000 - 700 W. Pender St., Vancouver, B.C., V6C 1G8

**Survey Company:** Homestake Mineral Development Co. Ltd.

**Date of Survey (from & to):** 01.02.88 - 02.08.88

**Total Miles of line Cut:** 11.1 KM

**Name and Address of Author (of Geo-Technicel report):**

Duncan McIvor c/o Homestake, 1000-700 W. Pender St., Vancouver, B.C. V6C 1G8

**Credits Requested per Each Claim in Columns at right**

**Special Provisions**

For first survey:
- Enter 40 days. (This includes line cutting)

For each additional survey:
- Enter 20 days (for each)

**Man Days**

Complete reverse side and enter total(s) here

**Expenditures (excludes power stripping)**

**Type of Work Performed**

**Performed on Claim(s):**

**Calculation of Expenditure Days Credits**

<table>
<thead>
<tr>
<th>Total Expenditures</th>
<th>Total Days Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>$</td>
<td>15</td>
</tr>
</tbody>
</table>

**Instructions**

Total Days Credits may be apportioned at the claim holder's choice. Enter number of days credits per claim selected in columns at right.

**Date:** May 3, 1989

**Certification Verifying Report of Work**

I hereby certify that I have a personal and intimate knowledge of the facts set forth in the Report of Work annexed hereto, having performed the work or witnessed same during and/or after its completion and the annexed report is true.

**Name and Postal Address of Person Certifying:**

Duncan McIvor, c/o 1000-700 W. Pender St., Vancouver, B.C., V6C 1G8

**Date Certified:** May 03, 1989
Ministry of Natural Resources

GEOPHYSICAL - GEOLOGICAL - GEOCHEMICAL TECHNICAL DATA STATEMENT

TO BE ATTACHED AS AN APPENDIX TO TECHNICAL REPORT
FACTS SHOWN HERE NEED NOT BE REPEATED IN REPORT
TECHNICAL REPORT MUST CONTAIN INTERPRETATION, CONCLUSIONS ETC.

Type of Survey(s)  Geophysical (Total Field Magnetics)
Township or Area  Clearwater Bay Area
Claim Holder(s)  Homestake Mineral Development Co. Ltd.
Survey Company  Homestake Mineral Development Co. Ltd.
Author of Report  Duncan Mcivor
Address of Author  c/o 1000-700 W. Pender St., Vancouver
Covering Dates of Survey  Feb 1 - 16, 1988  (linecutting to office)
Total Miles of Line Cut  11.1 KM

SPECIAL PROVISIONS
CREDITS REQUESTED

<table>
<thead>
<tr>
<th>Survey Type</th>
<th>DAYS per claim</th>
</tr>
</thead>
<tbody>
<tr>
<td>Geophysical</td>
<td></td>
</tr>
<tr>
<td>- Electromagnetic</td>
<td></td>
</tr>
<tr>
<td>- Magnetometer</td>
<td>40</td>
</tr>
<tr>
<td>- Radiometric</td>
<td></td>
</tr>
<tr>
<td>- Other</td>
<td></td>
</tr>
<tr>
<td>Geological</td>
<td></td>
</tr>
<tr>
<td>Geochemical</td>
<td></td>
</tr>
</tbody>
</table>

AIRBORNE CREDITS (Special provision credits do not apply to airborne surveys)

<table>
<thead>
<tr>
<th>Survey Type</th>
<th>DAYS per claim</th>
</tr>
</thead>
<tbody>
<tr>
<td>Magnetometer</td>
<td></td>
</tr>
<tr>
<td>Electromagnetic</td>
<td></td>
</tr>
<tr>
<td>Radiometric</td>
<td></td>
</tr>
</tbody>
</table>

DATE:  May 3, 1989
SIGNATURE:  Duncan Mcivor

Res. Geol. Qualifications  2.5111

Previous Surveys

<table>
<thead>
<tr>
<th>File No.</th>
<th>Type</th>
<th>Date</th>
<th>Claim Holder</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

TOTAL CLAIMS  7
**GEOPHYSICAL TECHNICAL DATA**

**GROUND SURVEYS** — If more than one survey, specify data for each type of survey

<table>
<thead>
<tr>
<th>Number of Stations</th>
<th>888</th>
<th>Number of Readings</th>
<th>888</th>
</tr>
</thead>
<tbody>
<tr>
<td>Station interval</td>
<td>12.5 metres</td>
<td>Line spacing</td>
<td>100 metres</td>
</tr>
<tr>
<td>Profile scale</td>
<td>n/a</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contour interval</td>
<td>200 nT</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**MAGNETIC**

<table>
<thead>
<tr>
<th>Instrument</th>
<th>EDA OMNI IV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accuracy — Scale constant</td>
<td>0.1 nT</td>
</tr>
<tr>
<td>Diurnal correction method</td>
<td>Closed Loop</td>
</tr>
<tr>
<td>Base Station check-in interval (hours)</td>
<td>n/a</td>
</tr>
<tr>
<td>Base Station location and value</td>
<td>n/a</td>
</tr>
</tbody>
</table>

**ELECTROMAGNETIC**

**GRAVITY**

**INDUCED POLARIZATION**

**RESISTIVITY**
## SELF POTENTIAL

<table>
<thead>
<tr>
<th>Instrument</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Survey Method</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Corrections made</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

## RADIOMETRIC

<table>
<thead>
<tr>
<th>Instrument</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Values measured</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Energy windows (levels)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Height of instrument</th>
<th>Background Count</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Size of detector</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Overburden</th>
<th>(type, depth — include outcrop map)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## OTHERS (SEISMIC, DRILL WELL LOGGING ETC.)

<table>
<thead>
<tr>
<th>Type of survey</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Instrument</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Parameters measured</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Additional information (for understanding results)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

## AIRBORNE SURVEYS

<table>
<thead>
<tr>
<th>Type of survey(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Instrument(s)</th>
<th>(specify for each type of survey)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Accuracy</th>
<th>(specify for each type of survey)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Aircraft used</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sensor altitude</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Navigation and flight path recovery method</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Aircraft altitude</th>
<th>Line Spacing</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Miles flown over total area</th>
<th>Over claims only</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
GEOCHEMICAL SURVEY – PROCEDURE RECORD

Numbers of claims from which samples taken

Total Number of Samples

Type of Sample  
(Nature of Material)

Average Sample Weight

Method of Collection

Soil Horizon Sampled

Horizon Development

Sample Depth

Terrain

Drainage Development

Estimated Range of Overburden Thickness

ANALYTICAL METHODS

Values expressed in:  

- per cent √
- p. p. m. □
- p. p. b. □

Cu, Pb, Zn, Ni, Co, Ag, Mo, As, (circle)

Others

Field Analysis ( tests)

Extraction Method

Analytical Method

Reagents Used

Field Laboratory Analysis

No. ( tests)

Extraction Method

Analytical Method

Reagents Used

Commercial Laboratory ( tests)

Name of Laboratory

Extraction Method

Analytical Method

Reagents Used

General
June 28, 1989

Mining Recorder
Ministry of Northern Development and Mines
808 Robertson Street
P.O. Box 5200
Kenora, Ontario
P8N 3X9

Dear Sir:


The assessment work credits, as listed with the above-mentioned Notice of Intent, have been approved as of the above date.

Please inform the recorded holder of these mining claims and so indicate on your records.

Yours sincerely,

W.R. Cowan
Provincial Manager, Mining Lands
Mines & Minerals Division

cc: Mr. G.H. Ferguson
Mineral and Lands Commissioner
Toronto, Ontario

Homestake Mineral Development Co. Ltd.
1000-700 West Pender Street
Vancouver, B.C.
V6C 1G8

Your file: W8901-128
Our file: 2.12495
Homestake Mineral Development Co. Ltd.
Clearwater Bay Area.

<table>
<thead>
<tr>
<th>Type of survey and number of Assessment days credit per claim</th>
<th>Mining Claims Assessed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Geophysical</td>
<td></td>
</tr>
<tr>
<td>Electromagnetic</td>
<td>31</td>
</tr>
<tr>
<td>Magnetometer</td>
<td></td>
</tr>
<tr>
<td>Radiometric</td>
<td></td>
</tr>
<tr>
<td>Induced polarization</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td></td>
</tr>
</tbody>
</table>

Section 77(19) See "Mining Claims Assessed" column

<table>
<thead>
<tr>
<th>Geological days</th>
<th>Man days</th>
<th>Airborne</th>
</tr>
</thead>
<tbody>
<tr>
<td>Geological</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Geochemical</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Special provision: Ground

- Credits have been reduced because of partial coverage of claims.
- Credits have been reduced because of corrections to work dates and figures of applicant.

Special credits under section 77(16) for the following mining claims

No credits have been allowed for the following mining claims

- not sufficiently covered by the survey
- insufficient technical data filed

The Mining Recorder may reduce the above credits if necessary in order that the total number of approved assessment days recorded on each claim does not exceed the maximum allowed as follows: Geophysical - 80; Geological - 40; Geochemical - 40; Section 77(19) - 60.
$$(40 + 7) - (7 + 2) = 31$$