

**Summary of Geophysical Field Work- 2017**  
**Magnetic survey of the CEE-1 Placer claim**  
**On the East Fork Gold Project**  
**NTS 115 N2, Yukon**

Whitehorse Mining Division

NTS 115 N2 Lat 63\*04'Long 140\*59'

By

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Hartley and Associates INC

And

Michael D. Hartley P. Geo.

1959281 Alberta INC

For

Whitehorse Mining Recorder

Dec 31 2017

# Magnetic survey of the CEE-1Placer claim 2017

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# Magnetic survey of the CEE-1 Placer claim 2017

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## 1.0 Executive Summary

The East Fork Project (formerly named the Longline Project in earlier reports) is located approximately 140 km southwest of Dawson City. The area is accessible by fixed wing aircraft from Dawson or by winter road from the Alaska Highway.

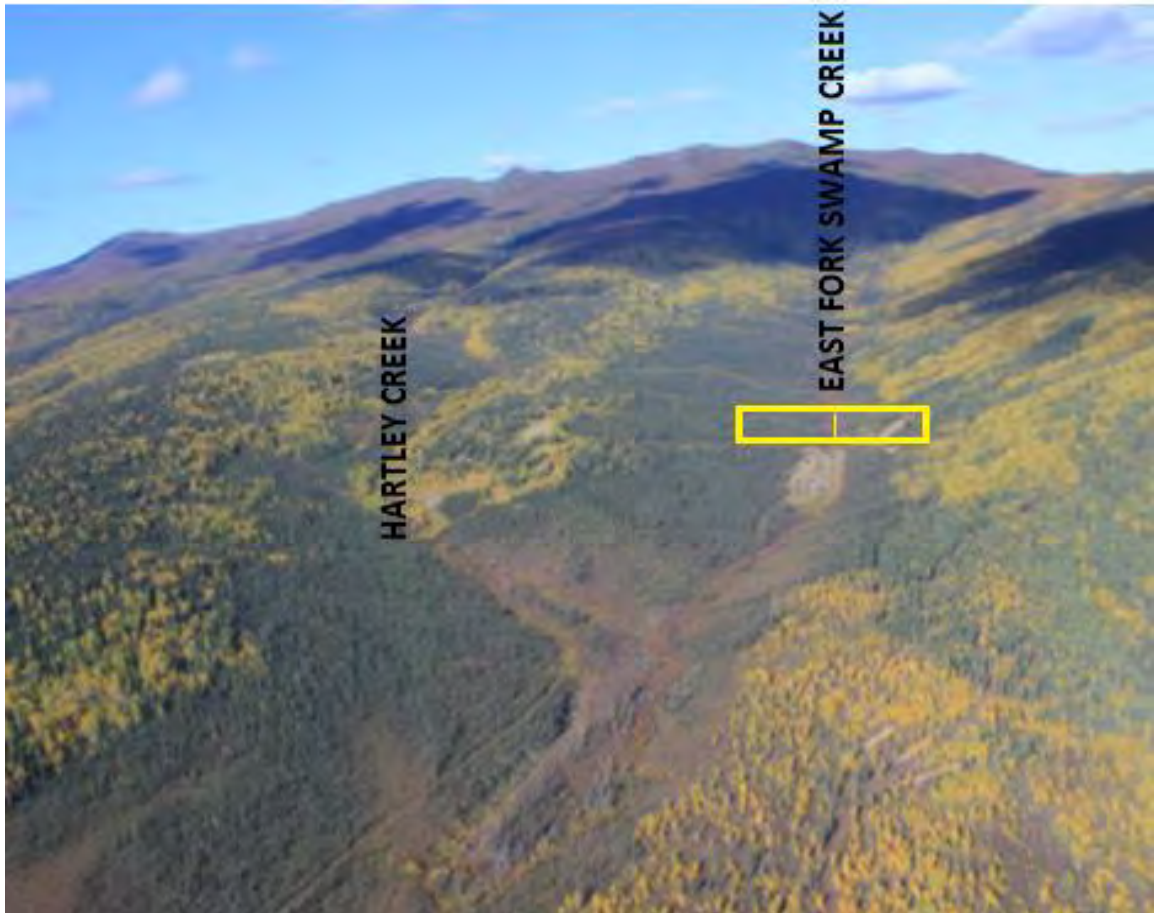
The area is recognized as a Lode and Placer Gold Exploration Target. The immediate area of the claims has produced approximately 70000 oz of placer gold since discovery in 1975. The key project claims were staked by the writer in 1983. The project now consists of 234 Quartz claims, all owned 100 percent by Hartley and Associates Ltd. The project also contains 23 placer claims.

High grade gold in quartz veins was first discovered in the early 1970's by Quintana Minerals Ltd and are the local source of the placer gold deposits. Placer mining continues on the east side of the Moosehorn Range in Great Bear Pup, a tributary of Kate Creek.

Diamond drilling conducted by various companies, since 1996, has established a lode gold resource of 2.8 million grams of Gold, in two of 17, indicated zones.

These as yet undrilled lode gold targets occur widely on the property, including high grade lode mineralization in the East fork drainage basin immediately adjacent to and upstream of the CEE-1 placer claim. These lode gold occurrences have undoubtedly contributed to the Placer gold potential of the claims of the East Fork area.

The Cee1 claim is located immediately upstream from a large area that has been stripped, the object of this survey was to determine if more stripping would be necessary.



**Photo 1:** South face of Moosehorn Mtn showing the location of the CEE-1 placer claim ( in yellow). Note that the existing placer pit is immediately downstream from the CEE-1 claim on the East Fork of Swamp Creek.

# Magnetic survey of the CEE-1 Placer claim 2017

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## 2.0 Location and Access

The East Fork Project is located in NTS 115N2, central Yukon, immediately east of the Alaska Yukon border, approximately 140 km southwest of Dawson City, and some 65km north of the community of Beaver Creek. The area is accessible by fixed wing aircraft from Dawson or by winter road from the Alaska Highway.

## 3.0 Physiography

The region is not glaciated. Outcrops are restricted to heights of land where boulders and felsenmeer predominate. Elevations range from 1353 m on Moosehorn summit to 670 m in creek valleys in the southern portion of the property. Thick residual soils cover the intermediate slopes, swamp bog covers the low areas. The area is designated as a continuous permafrost zone.

## 4.0 Claim status

The East Fork property consists of 234 quartz claims, and 23 Placer claims, covering approximately 5000 hectares. All the claims are owned 100 percent by Hartley and Associates Ltd.

## 5.0 History of the Area

The area has a long history of Artisanal gold mining. Although the names of the original placer miners are unknown. The author personally observed a prospectors cabin built on lower Kenyon creek during placer evaluation conducted in 1976. The cabin was at least 50 years old by its condition, and the condition of various tools left at the site.

The Moosehorn summit was staked in 1970 by Quintana Minerals and again by A. Harmon and M. Kenyon during the period 1972 to 1974. The Harmon claims became the property of Great Bear Mining. The Kenyon claims were optioned to Claymore Resources. Both companies conducted geophysics and diamond drilling near Moosehorn summit. These claims were allowed to lapse.

During 1982 Glenn Hartley recognized the vein occurrence, here described as V1 and staked the surrounding lode claims in the Swamp creek valley, as well as Placer claims in Hartley Creek and East fork of Swamp Creek.

Beginning in the mid 1980s, Hartley and G. Alberg has conducted geological, geophysical, and geochemical programs, and air track drilling. The V2, on Swamp Creek, and the H veins located on Hartley Creek and the East fork of Swamp creek, as well as several other gold occurrences were discovered by the air track drilling programs during 1993 and 1994. The key claims of the land package have been held by Hartley continuously since the 1982.

The CEE-1 placer claim is part of a contiguous group of placer claims located on Hartley Creek and the east fork of Swamp Creek, that drains the south east face of Moose Horn Mountain, located in NTS 115 N2. The placer claims referred to in this report are located on Hartley Creek and the east fork of Swamp Creek. These Placer claims, are located immediately east of Soya, Swamp, and Kenyon creeks, all historical creeks with considerable Placer Production.

## 6.0 Regional Geology

The Property is underlain by strongly weathered to massive foliated to nonfoliated grey biotite hornblende granodiorite of the Klotassin Batholith (Tempelman-Kluit 1974). This generally uniform lithological unit contains metasedimentary remnants and is intruded by porphyritic diorite, rhyolite and mafic dykes. This unit has been described by Tempelman-Kluit 1974 and in Yukon assessment reports 061387, Claymore 1974, Report 092880 Hartley 1990, Report 093282 Hartley 1994 and Report 093950 Bam 1998.

# Magnetic survey of the CEE-1 Placer claim 2017

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## 7.0 Rational for this Survey

Within the Moose horn range, placer gold deposits are typically associated with magnetite, cassiterite, and trace scheelite. Placer gold ranges from 730 to 820 fine and usually occurs as sub 10 mesh equigranular to flat sub 0.5 mm flakes.

A strong magnetic response has been noted in association with pay gravels. This survey has been conducted on the CEE- 1 placer claim in order to establish if a significant heavy mineral deposit exists, up stream of the present Placer pit, at the intersection of the pit and the coincident Lode gold vein system. That has previously returned grab samples assays of 47.8 g/t and trench assays of significant gold values over a combined width of 9 meters

## 7.1 Potential Sources of Placer Gold immediately proximal to the CEE1 placer claim

### The RT Zone

**Location: 502866E, 6987434N** This zone is located immediately east of the Hartley placer pit on the east fork of Swamp creek. Quartz veins, exposed in a old road cut, occurring immediately east of the creek were sampled by consulting Geologist Robert Tilsley, in 2014, and returned grab sample values of 47.8 g/t Au and 352 g/t Ag.

**Phase One Trenching:** The area was first trenched August 3<sup>rd</sup> 2014.

**Geological description:** Trenching exposed a stock works of thin quartz veins, an unusual 4cm massive sulphide vein, within a fresh looking, feldspathized and carbonitized phase of the local granodiorite intrusive with associated patchy silicification and sulfidation of local country rocks.

**Assay values:** Sampling returned a maximum of 1121ppb Au over 20 cm and the entire interval returned 760 ppb Au over 1.6 m.



**Photo 2: Phase 1 trenching of the RT zone, looking north. Stock works quartz structures are outlined in orange survey paint. Dip is 35 degrees toward the upper right of the picture.**

# Magnetic survey of the CEE-1 Placer claim 2017

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## RT Zone (Cont)

**Phase 2 Trenching:** A second trenching program was conducted on this zone September 3<sup>rd</sup> 2014. Initially approximately 1.5 meters of soil was removed from the area with a D8 dozer allowing permafrost in the area to thaw. An easterly trending 50 meter trench was made using a Cat 235 excavator.

**Geological description:** Beginning in at the westerly end of 50 meter the trench the section was described as: Approximately 2 meters of stock works quartz veins and silicified granodiorite, were with disseminated grey sulphide blebs, 3 m of weakly silicified granodiorite, 1 m of weathered Granodiorite, 5m of feldspathized granodiorite containing discrete red spots, rusty and silicified, 1m fine grained green dyke, 15m of altered granodiorite, 2m of feldspathized granodiorite with red spots and white mica, in part silicified, then, 1 m weathered granodiorite and fault gouge to the east end of the trench.

**Assay values:** The trench contains 5 discrete zones of weak gold mineralization totalling 9.2 m in thickness. The highest grade sample was 20 cm yielding 1323ppb within 1.6 m a section. Gold zones were from 0 to 1.6m above base assayed 442.9 ppb Au, a zone from 2.6 to 3.2m above base yielded 223ppb Au. A 2m section from 19 to 21m above base returned 220 ppb Au. A 3m section from 29 to 32m returned 314ppb Au, and lastly a 2 meter interval from 36 to 38m returned 314.9 ppb.

## 7.2 The Magnetic Survey

The survey was run utilizing a GeoMetrics UniMag Proton magnetometer model G836. Calibration was done after the sensor head was filled with strained kerosene as per recommended procedure (see Manual in appendix). The instrument was field tested several times at differing locations prior to commencement of this survey, and was in excellent working condition showing very good repeatability at various locations.

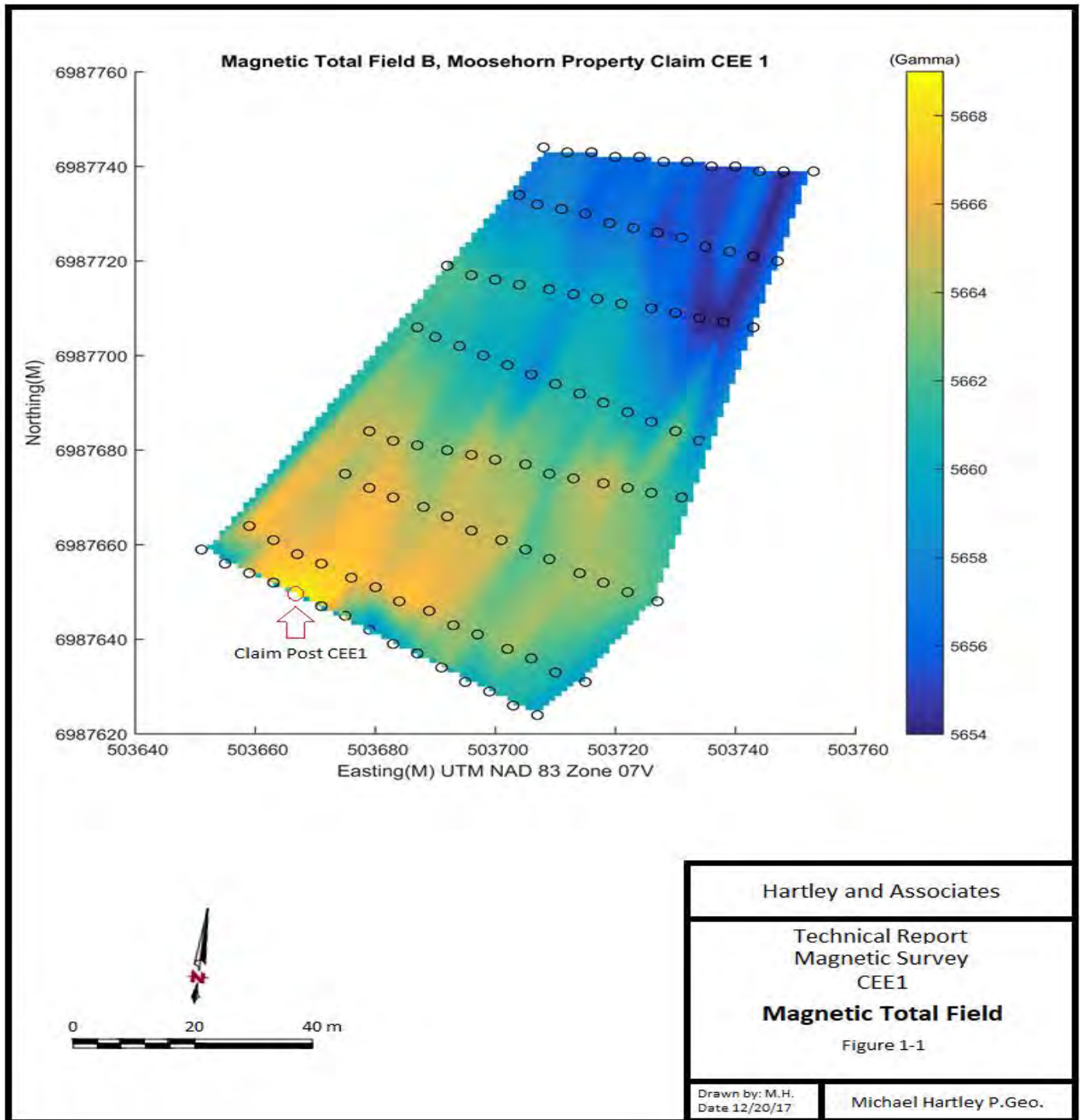
The survey team consisted of two persons, one instrument operator and one data recorder. All data including magnetic measurements, time of measurement and GPS position were recorded the data recorder at 5 meter intervals along arbitrarily chosen survey lines. Survey lines were 10 to twenty meters apart, marked by orange flagging and roughly perpendicular to the direction of the East Fork of Swamp Creek. Due to the steep topographic gradient of the bank of the creek, the survey lines were not extended up the slope of the east creek bank for more than 5 meters.

The Base station for the survey was located at Post 2 of CEE 1. Data was recorded in a closed loop path. After the survey was done in the field, all data recorded was corrected for each loop and subsequently plotted of the base map as color contours. Magnetic observations ranged from 56540 to 56680 gammas over the survey grid.

In addition to the color map presentation of the magnetic data, individual lines are plotted and presented in graphic form, and are included this report as appendix 3.

A table of the corrected magnetic data and GPS coordinates is presented in Appendix 4. It should be noted that the instruments digital data display is limited to 4 significant digits and the table of field data reflects that fact (see operating manual section 2.5 page 7.) Data are rounded to the nearest 10 gammas.

# Magnetic survey of the CEE-1 Placer claim 2017



# Magnetic survey of the CEE-1 Placer claim 2017

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## 8.0 Interpretation of the Magnetic Survey Data

The data shows that there are 3 easily definable sub parallel ( to the creek and to each other) magnetic trends to the west of the current location of the creek on the CEE1 claim. These magnetic trends do not extend beyond the upstream limit of the claim. Their origin may be placer derived concentrations of magnetic sands concentrated by stream processes at several differing times during the fluvial history of the creek. The creek has a natural niche point near this location.

It should be noted that the existing Placer pit begins immediately below the CEE1 claim and the pay gravels contain considerable amounts of magnetic black sands.

It should also be noted that during the test mining of Hartley Creek, in 1990, immediately to the west of the East Fork of Swamp Creek a similar subparallel zone of Placer enrichment was encountered immediately to the west of the current creek bed of Hartley Creek. These features may be produced by unstable conditions and the interaction of slope and soil creep with or prior to the development of permafrost terrain.

It also should be noted that to the west of Hartley Creek, Swamp Creek has an extensive drainage upstream from a similar niche point that did not contain a sufficient quantity of gold to justify previous placer mining efforts.

Thus it is probable that sufficient concentrations placer gold and magnetic sands were not deposited and not exist in the creek upstream of the CEE1 location.

# Magnetic survey of the CEE-1Placer claim 2017

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## 9.0 Summary of Exploration Costs

### Personnel

1. Geophysist M.D. Hartley P.Geo ,	2 days Field work @ \$700.00/day.....	1400.00
	2 days Data processing @ \$500.00/day.....	1000.00
2. Geologist G.S.. Hartley P.Geol	2 days Field work @ \$800.00/day.....	1600.00
	2days Report writing@ \$500.00/day.....	1000.00
	Total .....	5000.00

### Air Charter

Trans North Helicopters .....3720.00

### Equipment Rental

Geometrics UniMag magnetometer \$200.00/day/7days (min rental).....1400.00

Sat phone rental .....200.00

### Truck travel in the Yukon

1 trip Dawson, Watson lake ( return).....1000.00

\$11,320.00

# Magnetic survey of the CEE-1Placer claim 2017

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## 10.0 Statement of Qualifications

I, Glenn S. Hartley of Edmonton do here by state:

1. I am a graduate of the University of Alberta, Edmonton
2. I hold a BSc in Geology (1977)
3. I am a Member of APEGA since 1982
4. I have been employed in my profession since 1970

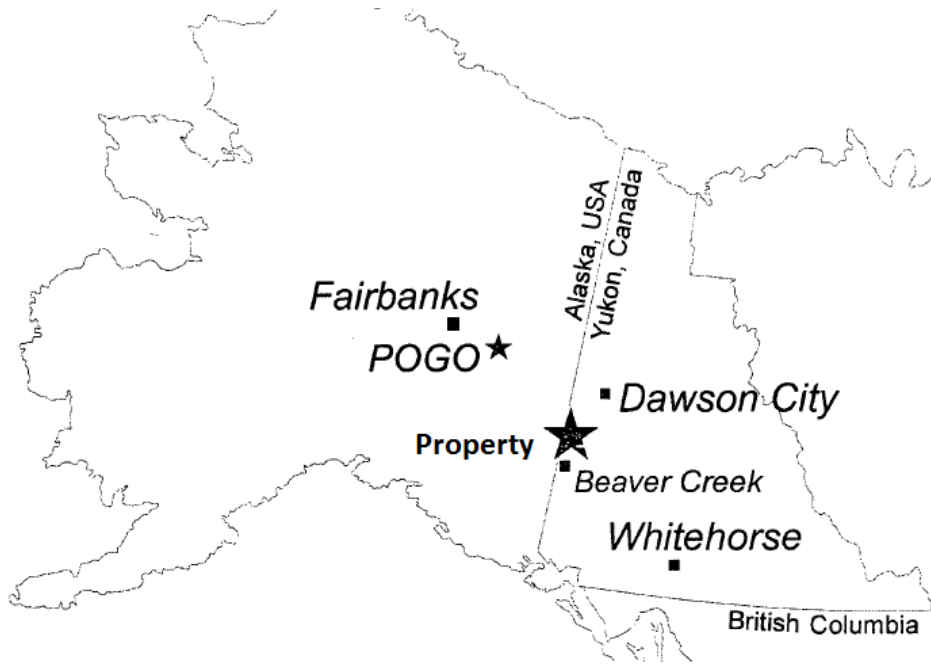
Signed \_\_\_\_\_ Glenn S. Hartley P.Geol \_\_\_\_\_ January 7<sup>th</sup> 2018

I, Michael D. Hartley of Calgary do here by state:

1. I am a graduate of the University of Saskatchewan, Saskatoon
2. I hold a Bsc.in Geophysics (2006)
3. I am a member of APEGA since 2013
4. I have been employed in my profession since 2006.

Signed \_\_\_\_\_ Michael D. Hartley P.Geo. \_\_\_\_\_ January 5<sup>th</sup> 2018

Appendix 1



Scale 1:1000000

East Fork Property Location Map



Appendix 2



Energy, Mines and Resources

# Claim Status Report

05 January 2018

Claim Name and Nbr.	Grant No.	Expiry Date	Registered Owner	% Owned	Excess NTS #'s	Grouping	Permit
R CEE 1	P 50702	2019/12/01	Hartley & Associates Inc.	100.00	2 115N02	GW01153	LP00788
R CEE 2 - 3	P 50703 - P 50704	2019/12/01	Hartley & Associates Inc.	100.00	2 115N02		
GAT 1	P 32892	2019/12/01	Hartley & Associates Inc.	100.00	7 115N02	GW01153	
R GAT 2	P 32893	2019/12/01	Hartley & Associates Inc.	100.00	11 115N02	GW01153	
R GAT 3 - 7	P 32894 - P 32898	2019/12/01	Hartley & Associates Inc.	100.00	8 115N02	GW01153	
GAT 8 - 10	P 32899 - P 32901	2019/12/01	Hartley & Associates Inc.	100.00	9 115N02	GW01153	
R LEY 7 - 9	P 25744 - P 25746	2019/12/01	Hartley & Associates Inc.	100.00	20 115N02	GW01153	LP00788
R PAT 16 - 21	P 47431 - P 47436	2019/12/01	Hartley & Associates Inc.	100.00	8 115N02	GW01153	
R TIG 1 - 2	P 25663 - P 25664	2019/12/01	Hartley & Associates Inc.	100.00	20 115N02	GW01153	
TIG 3	P 25665	2019/12/01	Hartley & Associates Inc.	100.00	20 115N02	GW01153	

**Criteria(s) used for search:**

CLAIM DISTRICT: 1000004 CLAIM NTS: 115N02 CLAIM STATUS: ACTIVE & PENDING OWNER(S): HARTLEY & ASSOCIATES INC. REGULATION TYPE: PLACER

Total claims selected : 25

Left column indicator legend:

R - Indicates the claim is on one or more pending renewal(s).

P - Indicates the claim is pending.

Right column indicator legend:

L - Indicates the Quartz Lease.

F - Indicates Full Quartz Fraction (25+ acres)

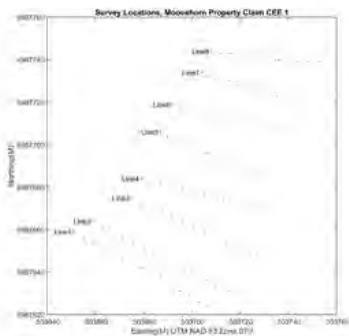
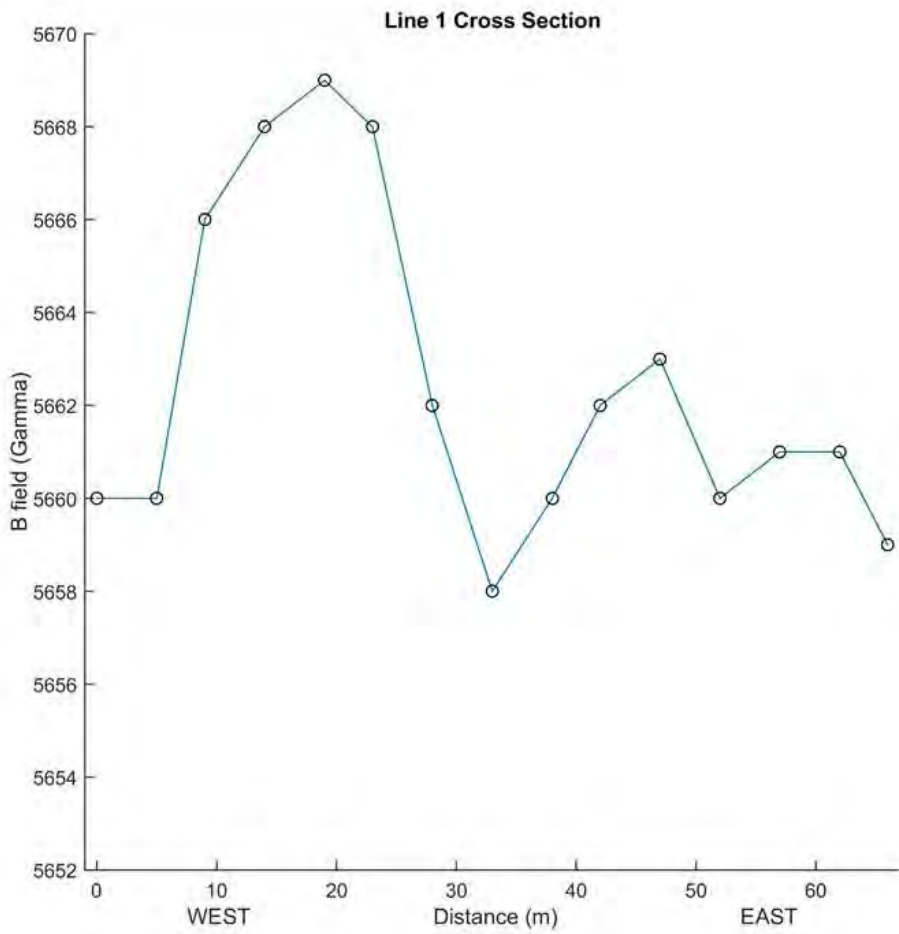
P - Indicates Partial Quartz fraction (<25 acres)

D - Indicates Placer Discovery

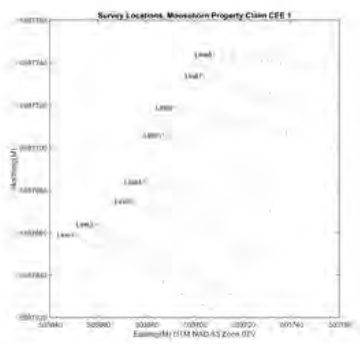
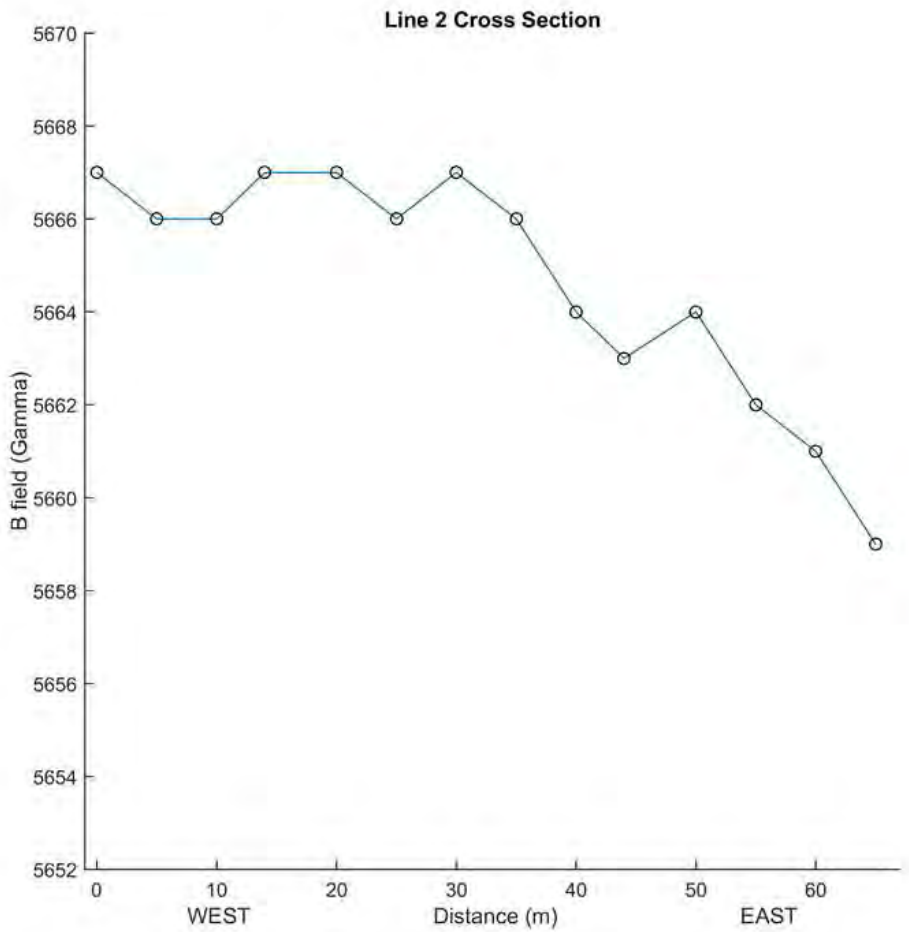
C - Indicates Placer Codiscovery

B - Indicates Placer Fraction

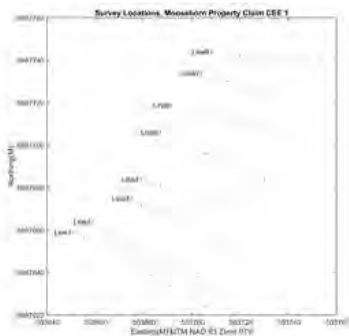
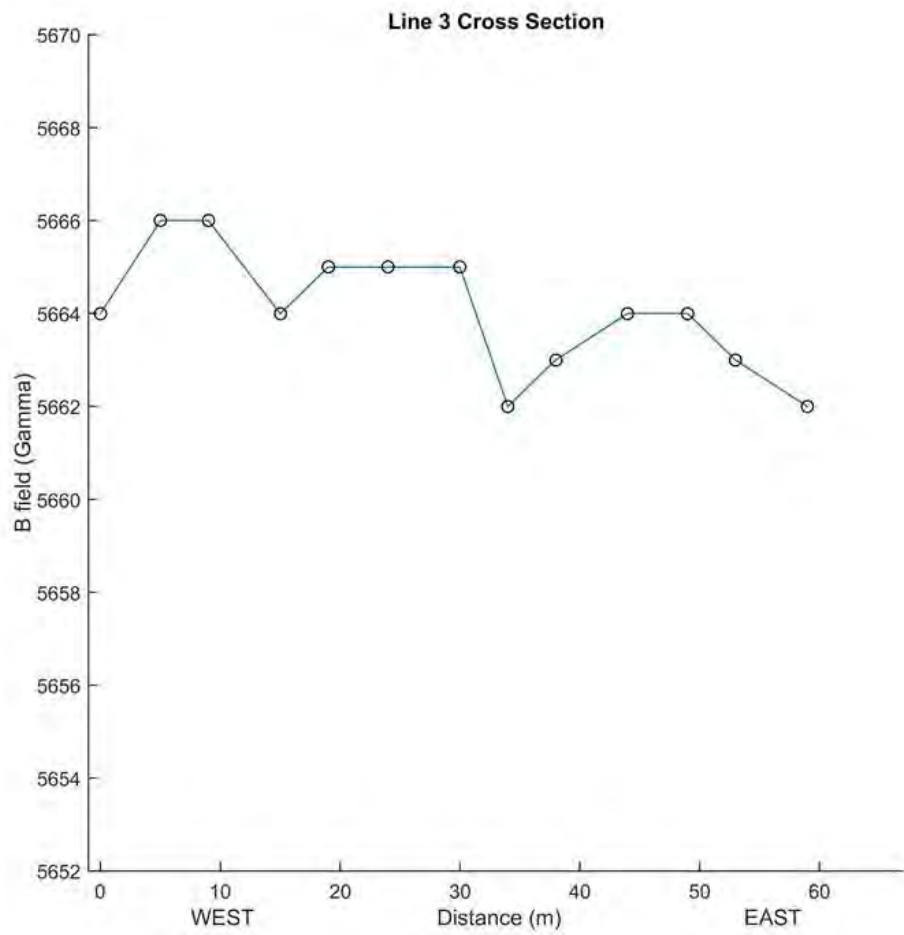
Appendix 3



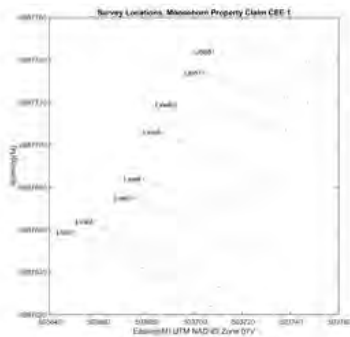
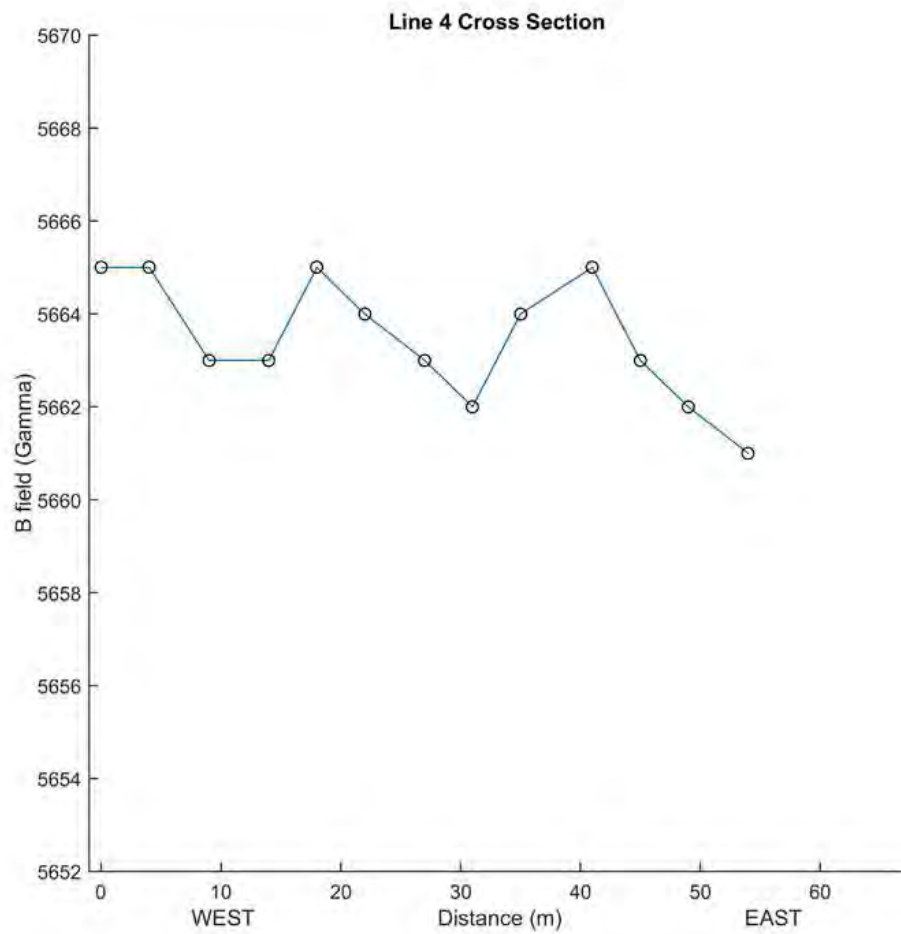
Hartley and Associates	
Technical Report Magnetic Survey CEE1 <b>Magnetic Field - Line 1</b>	
Figure 1.3	
Drawn by: M.H. Date 12/20/17	Michael Hartley P.Geo.



Hartley and Associates	
Technical Report Magnetic Survey CEE1 <b>Magnetic Field - Line 2</b>	
Figure 1.4	
Drawn by: M.H. Date 12/20/17	Michael Hartley P.Geo.



Hartley and Associates	
Technical Report Magnetic Survey CEE1 <b>Magnetic Field - Line 3</b> Figure 1.5	
Drawn by: M.H. Date 12/20/17	Michael Hartley P.Geo.



Hartley and Associates

Technical Report  
Magnetic Survey  
CEE1

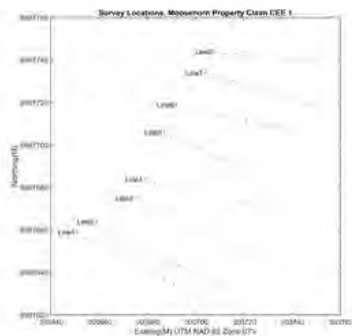
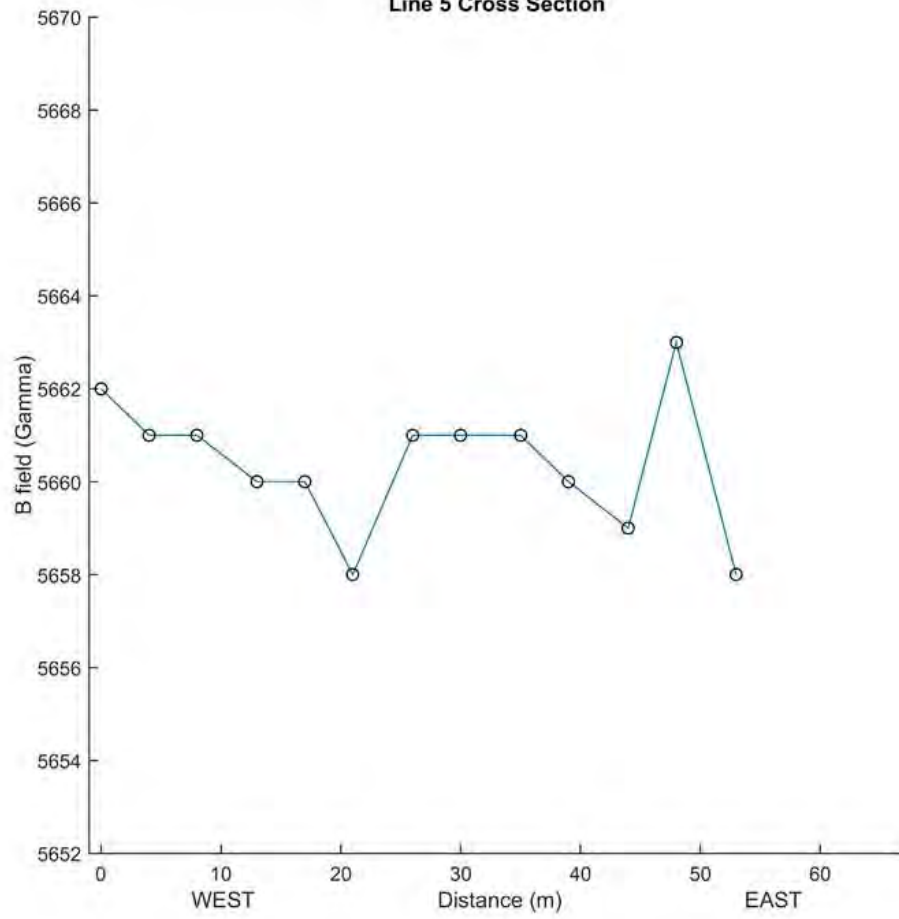
**Magnetic Field - Line 4**

Figure 1-6

Drawn by: M.H.  
Date 12/20/17

Michael Hartley P.Geo.

Line 5 Cross Section



Hartley and Associates

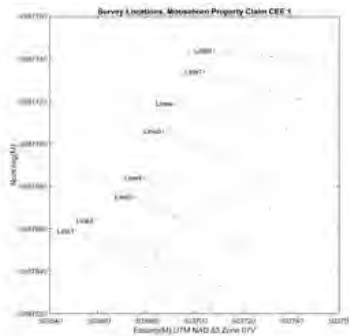
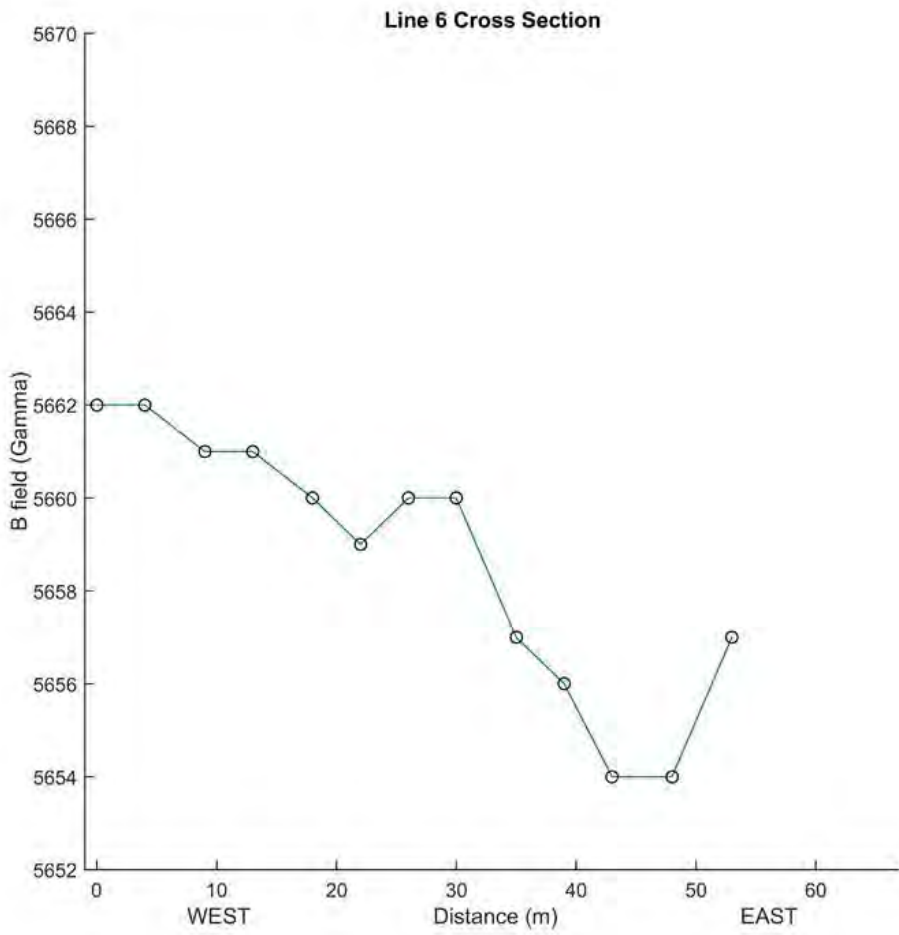
Technical Report  
Magnetic Survey  
CEE1

**Magnetic Field - Line 5**

Figure 1-7

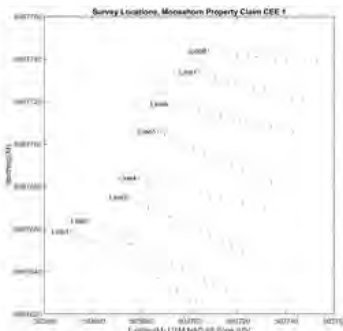
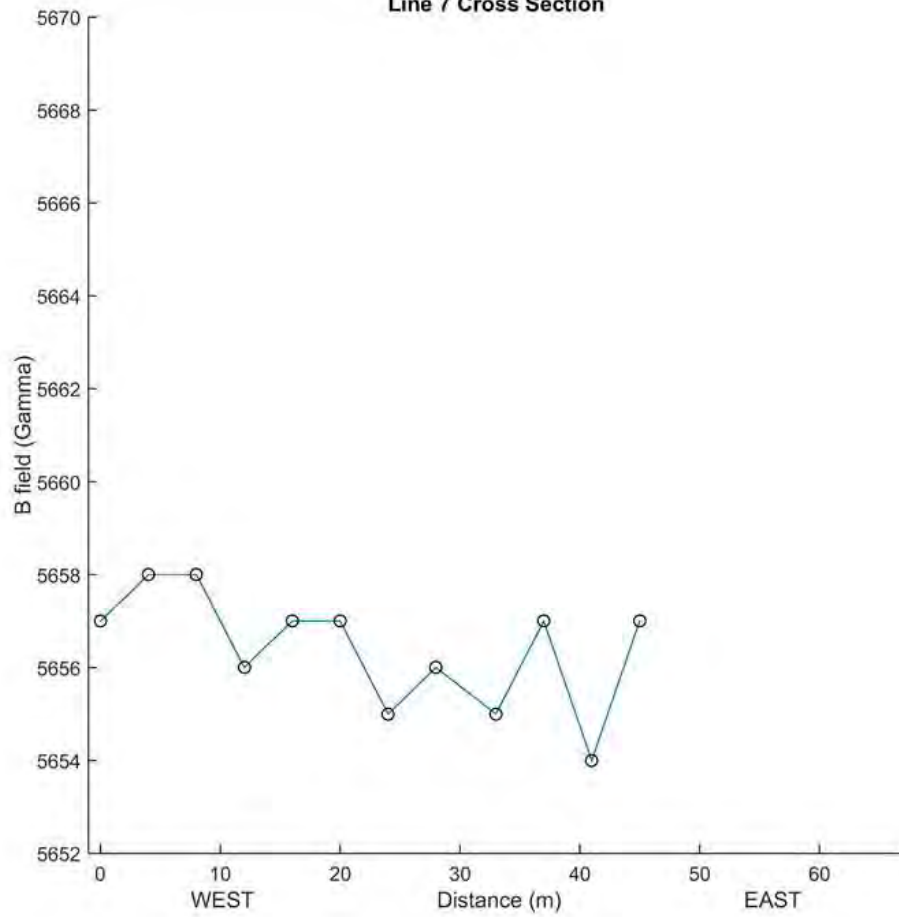
Drawn by: M.H.  
Date 12/20/17

Michael Hartley P.Geo.



Hartley and Associates	
Technical Report Magnetic Survey CEE1	
<b>Magnetic Field - Line 6</b>	
Figure 1-8	
Drawn by: M.H. Date 12/20/17	Michael Hartley P.Geo.

Line 7 Cross Section



Hartley and Associates

Technical Report  
Magnetic Survey  
CEE1

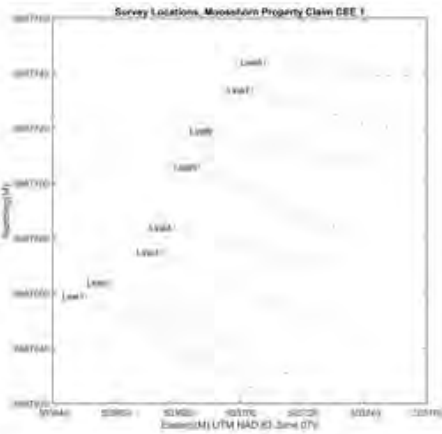
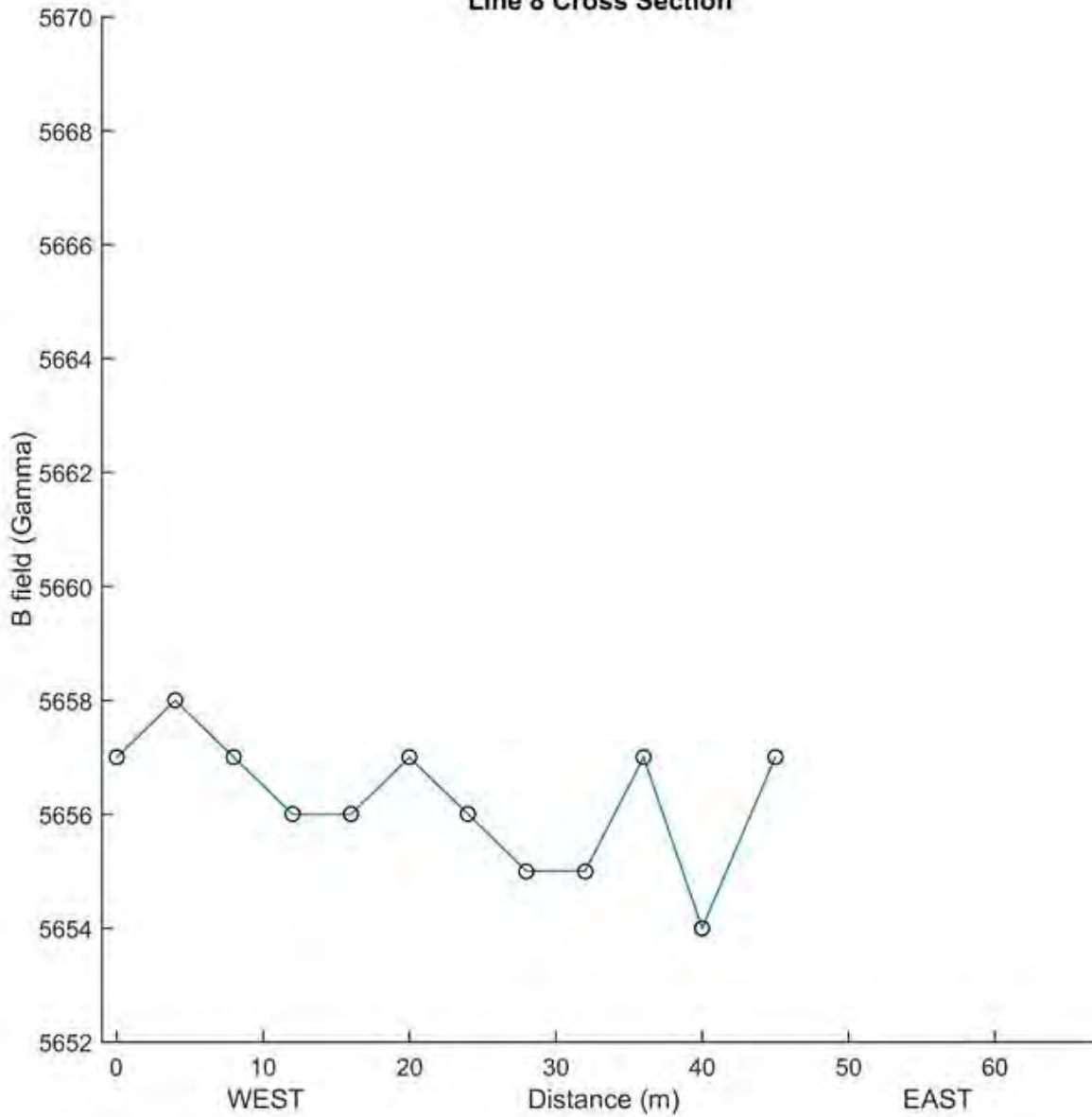
**Magnetic Field - Line 7**

Figure 1-9

Drawn by: M.H.  
Date 12/20/17

Michael Hartley P.Geol.

### Line 8 Cross Section



Hartley and Associates

Technical Report  
Magnetic Survey  
CEE1

### Magnetic Field - Line 8

Figure 1-10

Drawn by: M.H.  
Date 12/20/17

Michael Hartley P.Geo.

Appendix 4

line 1 Sta	Reading	location	line 2 Sta	Reading	location	line 3 Sta	reading	location	line 4 Sta	reading	location	line 5 Sta	reading	location	line 6 Sta	reading	location	line 7 Sta	reading	location	line 8 Sta	reading	location
15	5660	503651	14	5667	503659	13	5664	503675	13	5665	503679	13	5662	503687	13	5662	503692	12	5657	503704	12	5657	503708
14	5660	503655	13	5666	503669	12	5666	503679	12	5665	503683	12	5661	503690	12	5662	503696	11	5658	503707	11	5658	503712
13	5666	503659	12	5666	503669	11	5666	503683	11	5663	503687	11	5661	503694	11	5661	503700	10	5658	503711	10	5657	503716
12	5668	503663	11	5667	503671	10	5664	503688	10	5663	503692	9	5660	503698	9	5660	503704	9	5658	503715	9	5656	503720
11	5689	503672	10	5667	503676	9	5664	503696	9	5665	503696	8	5660	503702	8	5659	503709	8	5657	503719	8	5657	503724
10	5688	503671	9	5666	503680	8	5663	503696	8	5664	503696	7	5658	503706	7	5659	503713	7	5657	503723	7	5657	503728
9	5682	503673	8	5667	503684	7	5663	503696	7	5663	503700	6	5661	503706	6	5660	503713	6	5657	503723	6	5656	503728
8	5658	503679	7	5667	503688	6	5663	503701	6	5662	503705	5	5661	503710	5	5660	503717	5	5657	503723	5	5656	503728
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2	5661	503703	1	5659	503715	1	5662	503727	1	5661	503731	1	5658	503734	1	5657	503743	1	5657	503747	1	5657	503753
1	5659	503707	1	5659	503715	1	5662	503727	1	5661	503731	1	5658	503734	1	5657	503743	1	5657	503747	1	5657	503753

OPERATING MANUAL

Model G-836

UniMag™ PROTON MAGNETOMETER

**geoMetrics**

395 Java Drive  
Sunnyvale, California 94086 U.S.A.  
(408) 734-4616

Cable: "GEOMETRICS" Sunnyvale  
Telex No: 357-435

# geoMetrics

If any part of this instrument is returned to the factory for any reason, please include this completed form with the complete instrument or any individual part returned for repair.

SHIP TO:

geoMetrics, Inc.  
395 Java Drive  
Sunnyvale, CA 94086  
(408) 734-4616

Exploranium Division of geoMetrics  
Services (Canada) Ltd.  
436 Limestone Crescent  
Downsview, Ontario, CANADA  
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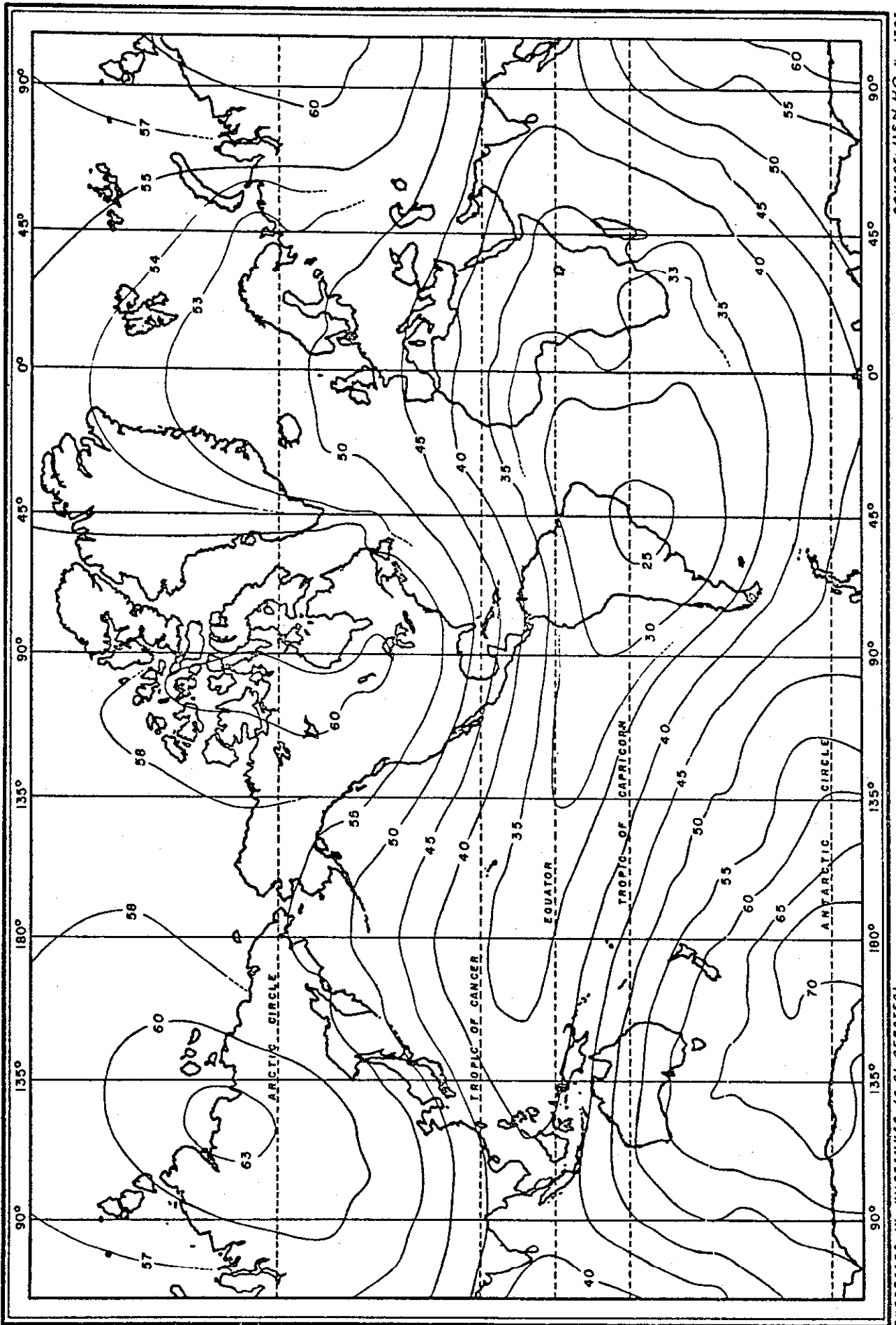
Telephone Number \_\_\_\_\_

Please describe symptoms of trouble as completely as possible or detailed reason for return  
(use additional paper if required):

## WARRANTY

GeoMetrics warrants this instrument against defective parts and workmanship for a period of one year from date of receipt, but in no event to exceed 15 months from the date of shipment. In the event of malfunction, GeoMetrics, at its own expense, will repair or replace any materials, equipment, work, or parts which prove defective or deficient under normal operating conditions. Except for the express warranty stated above, GeoMetrics disclaims all warranties of merchantability and fitness; and any stated express warranties herein are in lieu of all obligations or liability on the part of GeoMetrics for damages, including but not limited to special, indirect, or consequential damages arising out of or in connection with the use or performance of the equipment.

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SOURCE: USN H.O. No. 1703

The Total Intensity of the Earth's Magnetic Field

EXPRESSED IN KILOGAUSS (10.01 OERSTED)

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## 1.0 GENERAL INFORMATION

### 1.1 INTRODUCTION

The UniMag™ Portable Proton Magnetometer, Model G-836, is a complete system designed for general field applications requiring simple operation and stable measurements of the total intensity of the earth's magnetic field. UniMag provides 10 gamma resolution over a range from 20,000 to 100,000 gammas. Since the instrument measures total field intensity, the accuracy of each measurement is independent of sensor leveling. Furthermore, each measurement is based upon an atomic constant\* and is independent of temperature, humidity, and battery conditions. The unified simplicity of UniMag allows rapid, accurate measurements to be obtained from a single, compact field instrument without the need for external batteries, cables or a sensor and staff. UniMag is a precision instrument and reasonable care should be exercised to avoid damage from unnecessary field abuse.

### I-M-P-O-R-T-A-N-T

Read Chapter 3.0 Before Using UniMag on a Survey

### 1.2 MAGNETIC ENVIRONMENT

During survey operation, it is important that the earth's magnetic field is not biased or disturbed by allowing unwanted magnetic objects to come close to the sensor. Such objects include jewelry, keys, watches, belt buckles, pocket knives, mechanical pencils, zippers, some hats, notebooks, other survey equipment, etc. In normal use, UniMag is suspended from the adjustable shoulder strap, and held in front of the operator. This places the sensor approximately 2 ft. (61 cm) away from the operator, and typically 3 ft. (91 cm) above the ground. Under such conditions, 10 gamma surveys can be quickly and accurately performed.

Prior to survey use, however, objects that are suspected to be magnetic may be checked in the following manner:

1. Go to a magnetically clean area away from buildings, roads, automobiles, AC power-lines, etc.
2. Place the suspected object far away from UniMag, and take several readings by depressing the black pushbutton - releasing - and waiting for a digital readout to appear.
3. Observe the displayed readings. Each reading should repeat to within 10 gammas, i. e., the least significant digit (extreme right-hand number) should NOT change by more than one count.

\* Proton Gyromagnetic Ratio:  $(2.67513 \pm 0.00002) \times 10^4$  Radians/Gauss second.

4. Now place the suspected object at the distance from the sensor expected during actual survey operation. Take several more readings and note the measurements.
5. If the measurements made in Step 4 above differ by more than  $\pm 1$  count (extreme right-hand number) from those measurements made in Step 3, then the object is magnetic.

IF THE ARTICLE IS HIGHLY MAGNETIC, OR IF UniMag IS OPERATED INSIDE OR NEAR A BUILDING OR VEHICLE, THE SIGNAL WILL BE LOST, GIVING COMPLETELY ERRATIC READINGS AND LOSS OF  $\pm 1$  COUNT REPEATABILITY.

UniMag should not be operated in areas that are known sources of radio frequency energy, power line noise (transformers), or operated in buildings. UniMag will NOT operate properly if it is placed directly on the ground.

### 1.3 SPECIFICATIONS

Resolution:	10 gamma throughout tuning range
Tuning Range:	20,000 to 100,000 gammas (world-wide)
Tuning Mechanism:	Multi-position switch with twenty-four overlapping steps.
Sampling Rate:	Manual pushbutton, new reading every 4 seconds.
Output:	4 digit, illuminated display directly in gammas.
Power Requirements:	12V DC, 500 ma average
Power Source:	Two internally mounted and rechargeable 6 volt, 1 amp/hr non-spill gelled electrolyte batteries. Charge state or replacement signified by flashing readout display.
AC Battery Charger:	Input: 115/220V, 50/60 Hz AC Output: 14V DC
Temperature Range:	-40° to +60°C Note: Battery capacity decreases with low temperature operation.
Accuracy (Total Field):	10 gamma through -20° to +60°C temperature range

Operating Manual  
UniMag  
Portable Proton Magnetometer

Sensor: Noise cancelling, high signal.  
Internally mounted in console.

Console Size:  $22\frac{1}{2}$ " l.  $\times$   $3\frac{1}{4}$ " w.  $\times$  5" h. (58  $\times$  8.3  $\times$  12.7 cm)

Console Weight: 7 lbs. (3.2 kg) Includes batteries,  
sensor and shoulder harness.

1.4 INVENTORY INSPECTION

When received from the manufacturer, the UniMag™ Proton Magnetometer should include the following items:

- |                                    |         |
|------------------------------------|---------|
| 1. UniMag Console including sensor | 1 ea    |
| 2. AC battery charger              | 1 ea    |
| 3. Adjustable shoulder strap       | 1 ea    |
| 4. Battery Pack                    | 2 ea    |
| 5. Operator's manual               | 1 ea    |
| 6. Applications Manual             | 1 ea    |
| 7. Attaché Case                    | 1 ea    |
| 8. Teflon pipe tape                | 1 strip |

## 2.0 FIELD OPERATION

### 2.1 INTRODUCTION

UniMag is completely self-contained, and is ready for field survey operation. A few simple procedures should be observed to obtain optimum results, and it is recommended that the operator follow each step as outlined in this chapter to initially become familiar with the operation of the instrument. Refer to Figure 2-1 for identification of UniMag's controls and indicators.

### 2.2 CONSOLE OPERATION

PRELIMINARY CONSIDERATIONS: BEFORE USING UniMag, CHECK FOR:

1. Presence of sensor fluid:

The sensor is located in the forward, cylindrical portion of the instrument as shown in Detail "A" of Figure 2-1. Shake the instrument GENTLY and listen for a "sloshing" sound. If fluid is not present, or cannot be heard, it is necessary to fill the sensor PRIOR to operation:

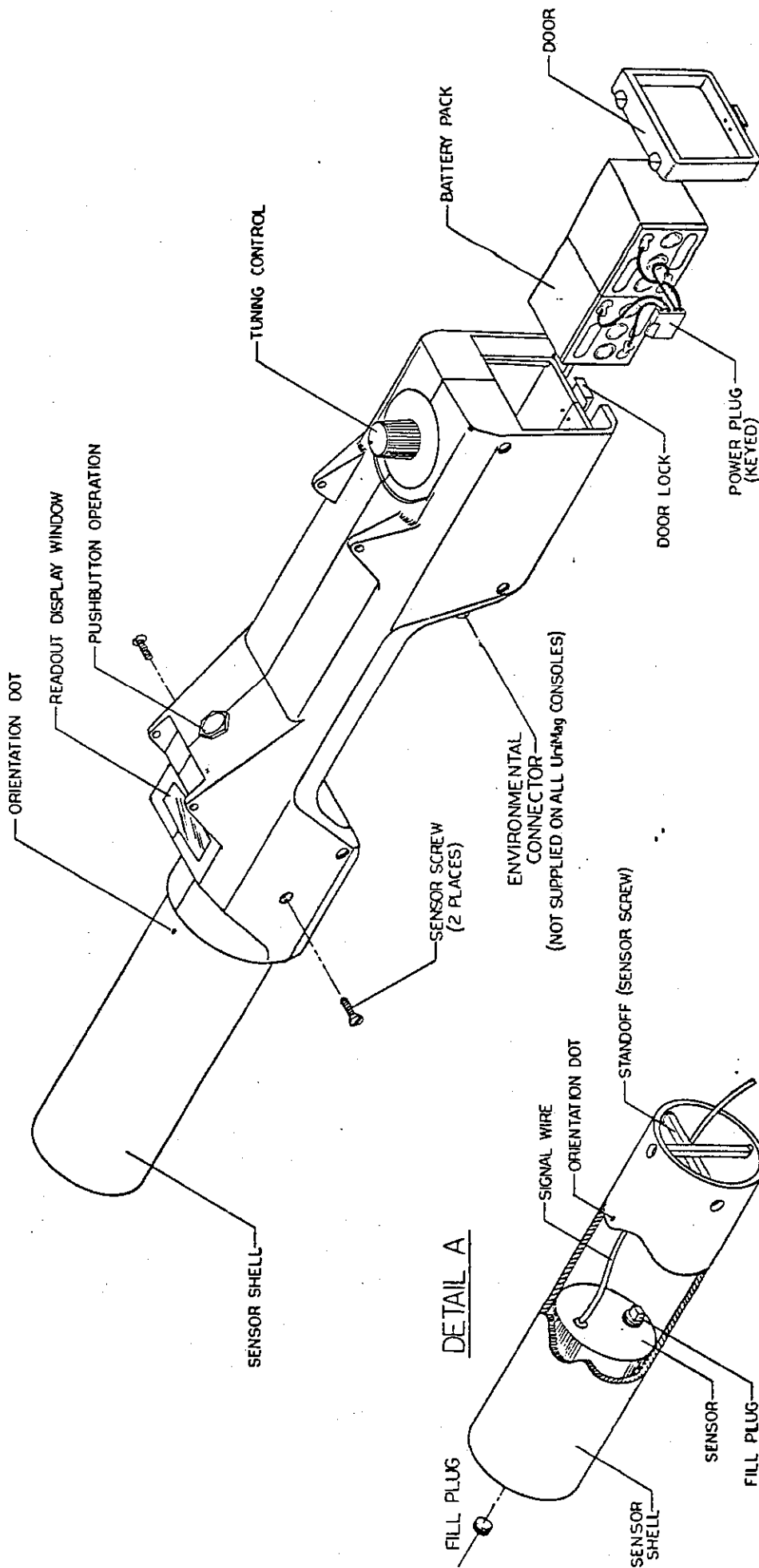
- a) Hold the UniMag console vertically with the sensor pointed up. Remove the slotted Fill Plug from the convex end of the sensor as shown in Detail "A" of Figure 2-1.
- b) Fill the sensor with STRAINED\* kerosene or unleaded gasoline completely. Then REMOVE approximately 2 tablespoons of fluid.

\*Note: The fluid MUST be strained several times through paper filters, i.e., paper towels, coffee filters, etc. NEVER use kerosene or gasoline directly from a pump or storage can as it may be contaminated with metal particles.

- c) Lightly wrap the Fill Plug with Teflon tape and replace in the sensor. Do NOT use excessive pressure to tighten the Fill Plug - a "snug" fit is sufficient.

2. Battery pack is fully charged:

To check the battery voltage, simply press the black pushbutton and observe the readout - if it "flashes" on/off during the display period, the battery pack is NOT fully charged. Refer to Chapter 3.0 for instructions of recharging the battery PRIOR to survey operation.



SENSOR ASSEMBLY

R/O	PART NUMBER	DATE	DESCRIPTION
		9-2-75	geometrics Sunnyvale California
SIGNATURE	DATE		
<i>R. Brown</i>	9-2-75		
UNT	CHECK		
REMOVE SURF & SHARP EDGES	APFD		
SURFACE FIN V	APFD		
APPLY			
DO NOT SCALE THIS DRAWING			
FINISH			
MATERIAL			

SIZE	CODE IDENT. NO.	DRAWING NUMBER	REV.
1/2	G-836	18013	0
SCALE	1/2	30° ISO.	SHEET
			OF

ONLY THREE SIMPLE STEPS ARE NECESSARY TO CORRECTLY TUNE  
AND OPERATE UniMag:

1. Lift the UniMag console out of the padded attaché case, and adjust the shoulder strap for a comfortable fit. Typically, the magnetometer is used on the operator's right or left side, with the shoulder strap suspended across the operator's chest from the OPPOSITE shoulder.
2. Adjust the TUNING-KILOGAMMAS knob to a position that correlates with the earth's known magnetic field. The earth's field, in any general location, can be estimated by using the world intensity map on Page II at the beginning of this manual.
3. Press the black pushbutton, and release; wait 2 seconds, and observe the 2 second illuminated display of the earth's total field directly in gammas.

NOTE: A true and repeatably correct reading can be made with the TUNING-KILOGAMMAS knob set in 3 or 4 tuning positions on either side of the "estimated" local magnetic field i. e., the tuning is quite broad and non-critical in most cases. Unless high field changes on the order of 4 or 5 thousand gammas occur during operation, it will not be necessary to retune the console.

### 2.3 SENSOR ORIENTATION

In low magnetic latitudes (where the field dips less than  $40^{\circ}$ , or below 40,000 gammas) such as near the magnetic equator where the field is horizontal, it may be necessary to rotate the black cylindrical sensor  $90^{\circ}$  as described below.

The small dot or line on the sensor is provided to allow proper orientation of the internal sensor axis, which must be placed perpendicular to the earth's field to produce optimum signal. The following procedure is recommended for easy rotation of the black sensor (Refer to Figure 2-1 for parts identification):

1. Remove the two slotted-head Sensor Screws completely.

2. Gently rotate the sensor  $90^\circ$  in either direction until the sensor holes are properly re-aligned to the corresponding holes in the UniMag console - secure with the two Sensor Screws. The orientation dot or line on the sensor should now be facing the SIDE of the UniMag console.

NOTE: The sensor should be rotated ONLY in survey areas where the local field intensity is less than 40,000 gammas.

#### 2.4 SURVEY OPERATION

During survey operation and after UniMag has been tuned to the local field intensity (see Section 2.2), the operator need only depress the black push-button and note the reading in a log or field notebook. If a reading is in question, i. e., a sudden shift of several hundred gammas, several readings should be taken with the console held as still as possible.

UniMag SHOULD EXHIBIT ONE COUNT STABILITY, WHICH CAN BE VERIFIED BY REPEATING A MEASUREMENT WITH THE CONSOLE HELD IN THE SAME LOCATION. If one count stability is not possible, then an unwanted ferromagnetic article is present (buried pipe, etc.) or an extremely high magnetic gradient has been encountered.

#### 2.5 DATA DISPLAY

UniMag provides an illuminated 4-digit display of the earth's magnetic field directly in gammas. Since the resolution of UniMag is 10 gammas, only the four most significant digits are displayed in the readout window. For example, given an earth's field intensity of 51,240 gammas, UniMag will display "5-1-2-4" with the least significant digit ("0") being omitted. It should be remembered, however, that the readout (5-1-2-4) actually represents a ten gamma measurement of the earth's field ranging from 51,235 gammas to 51,245 gammas.

#### 2.6 READOUT TEST

Occasionally, it is advisable to check the numeric readout display to guard against an erroneous reading due to a non-illuminating segment of the display. Simply depress and HOLD DOWN the black pushbutton until four number 8's appear (8888) - check each number. If any segments are missing, notify GeoMetrics and return the magnetometer immediately.

## 2.7 INSTRUMENT STORAGE

When not in use, all of the components except the battery packs should be stored in the attaché case to prevent damage, loss, or possible contact with magnetic particles that could be embedded in the sensor. If extended storage (1 week or longer) is anticipated, the battery pack MUST be stored in a refrigerator (see Chapter 3.0) to prevent permanent damage to the internal charge plates of the battery. After any storage time, always re-charge the battery pack.

NOTE: Gelled electrolyte batteries provide an excellent power/weight ratio, but do require special handling considerations. TO PREVENT DAMAGE FROM EXCESSIVE BATTERY DISCHARGE, READ CHAPTER 3.0 COMPLETELY BEFORE USING THE UniMag MAGNETOMETER ON A SURVEY.

### 3.0 BATTERY MAINTENANCE AND CHARGING

#### 3.1 INTRODUCTION

UniMag uses two Eagle-Picher "carefree" 6 volt, 1 amp/hr. gelled, lead-acid batteries fastened together and wired in series. A special keyed plug is used to connect this battery pack to the UniMag circuitry, or to the AC battery charger. On some UniMag models a special environmental connector is available on the console to allow charging without removing the battery pack.

NOTE: Lead-acid batteries REQUIRE careful attention to charging and storage procedures. To avoid unnecessary damage to the battery pack READ THIS CHAPTER COMPLETELY BEFORE USING THE UniMag MAGNETOMETER.

#### 3.2 CHARACTERISTICS OF LEAD-ACID BATTERIES

The batteries selected for use in UniMag represent the best available combination of useable power vs. weight and cost. When the battery has been allowed to excessively discharge over an extended period of time, however, the internal electrolyte is reduced to water which is a very poor conductor of electricity. Such a discharged condition increases the internal resistance of the battery making recharging difficult at best, and impossible with the charger supplied with UniMag. IT IS NECESSARY TO REMOVE THE BATTERY PACK FROM UniMag WHEN IT IS NOT IN USE - ALWAYS STORE THE BATTERY PACK IN A COOL ENVIRONMENT.

#### 3.3 LOW VOLTAGE INDICATORS

There are two methods of checking the available battery voltage:

1. Cycle the magnetometer by pressing the black pushbutton and observe the readout. If the readout "flashes" on and off (blinks) then the battery pack MUST be replaced with a fully-charged one. When the readout flashes, the battery pack has approximately 10 volts, which is not adequate for normal operation.
2. The second method of checking the battery pack involves the use of the charger supplied with the system. Remove the battery pack (see Section 3.5) and connect it to the charger using the keyed connector. On some models, an environmental connector

is supplied as part of the UniMag console (see Figure 2-1). Simply use the jumper cable supplied to connect the UniMag console to the BNC connector on the charger (this eliminates the need to remove the battery. It is also NOT necessary to plug the charger into an AC electrical outlet. Depress the TEST BUTTON and observe the TEST LAMP on the charger (see Figure 3-1); if it shows GREEN the battery pack can be used for a full day's survey activity. If the TEST LAMP shows RED, then the battery pack MUST NOT BE USED until it has been fully recharged. When testing the battery pack on models equipped with the environmental connector, hold the charger TEST BUTTON down and cycle the UniMag magnetometer. This places a load on the battery during the test. The TEST LAMP will be green when the battery voltage is 11 volts or greater, and red when the voltage is below 10.9 volts. Should the TEST LAMP show a yellow or orange color, consider it to be a RED indication as the available battery voltage is between 10.9 and 11.0 volts.

### 3.4 BATTERY STORAGE

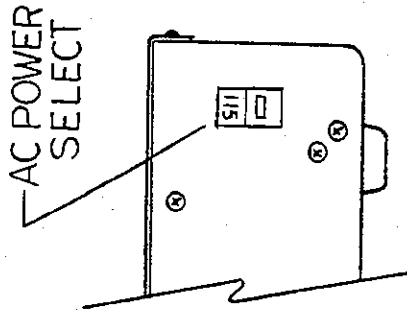
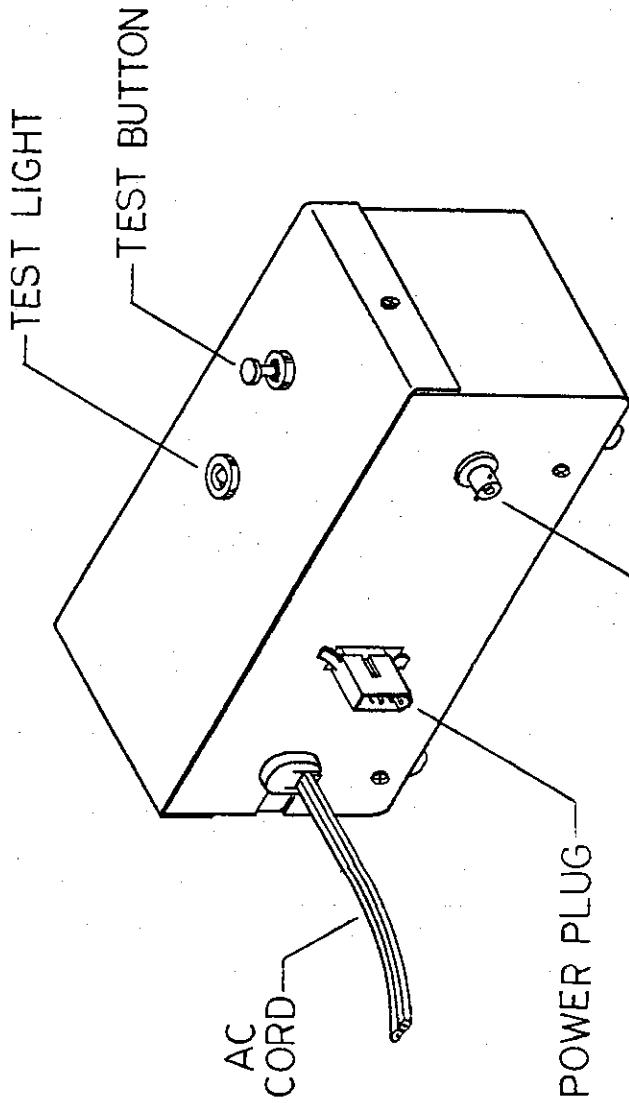
Batteries stored on a shelf will self-discharge as a function of temperature as shown in Figure 3-2 below:

Figure 3-2

Rate of Self-Discharge vs. Temperature

<u>Storage Temperature</u> <u>°F/°C</u>	<u>Estimated % Loss</u> <u>per day</u>	<u>Percent Capacity</u> <u>Loss in 6 months</u>
0°/-18°	0.03%	5%
30°/-1°	0.07%	13%
60°/16°	0.13%	23%
80°/27°	0.25%	45%
100°/38°	0.50%	90%
120°/49°	1.10%	100% in 90 days
140°/60°	1.60%	100% in 62 days

It is important to remember that water is one of the resulting products of battery discharge. When batteries are stored at low temperatures, therefore, they must be in a fully-charged condition to prevent water freezing. After delivering its full-rated capacity, a battery pack will freeze at approximately -6°F (21°C). If long term storage is anticipated, it is best to leave the battery pack on the charger for at least forty-eight (48) hours to ensure full charge. It should also be noted that when shipping the G-836 system, the batteries included should be at full charge.



BNC PLUG  
 USED ONLY WITH MODELS THAT  
 HAVE AN ENVIRONMENTAL CONNECTOR

REQ		PART NUMBER		DESCRIPTION		ITEM
SIGNATURE		DATE		geometrics		
DFT	<i>R. Brown</i>	10-24-77		Sunnyvale California		
CHECK				BATTERY CHARGER		
APP'D				UNIMAG MODEL G-836		
APP'D				FIGURE 3-1		
DO NOT SCALE THIS DRAWING				SIZE	CODE IDENT NO.	DRAWING NUMBER
FINISH:				A	G-836	18027
NEXT ASSEMBLY				USED ON		REV. Ø
APPLICATION						
MATERIAL:				SCALE	1/2	30° ISO
				SHEET		OF

Batteries in long term storage should be occasionally "boost" charged as a function of the storage temperature (see Figure 3-3 below) using the charger supplied with the UniMag. Allow 48 hours for boost charging.

Figure 3-3

Months in Storage Prior to Boost Charging

<u>Storage Temperatures</u>	<u>Months in Storage</u>
0° to 30°F (-18° to -1°C)	12
31° to 60°F (-.5° to 16°C) - - (Optimum) - - -	8
61° to 80°F (16.5° to 27°C) - - (Optimum) - -	4
81° to 100°F (27.5° to 38°C)	2

NOTE: Do not store the battery pack above 100°F (38°C).  
Maximum operating temperature is 140°F (60°C).

3.5 BATTERY INSTALLATION AND REPLACEMENT

The following steps should be followed for the initial installation or replacement of the battery pack (refer to Figure 2-1 for identification of parts).

1. Unsnap the plastic door lock on the bottom rear portion of the UniMag console. Remove the rear door assembly.
2. Remove the battery pack. A protective foam covering has been applied to the battery pack and it may be necessary to GENTLY shake the battery loose from the console. Avoid letting the battery pack fall out of the console as this could damage the connected wires. For initial installation of a battery pack, ignore this step.
3. Connect a fully-charged battery pack using the white, keyed, POWER PLUG. Position the Power Plug between the battery terminals, or as convenient to allow the battery pack to slide completely into the UniMag console.
4. Install the battery pack with the terminals facing the left side of the UniMag console (same side as the door chain retainer nut). Slide the battery pack into the console, replace the rear door and lock it in place.

CAUTION

The battery pack contains Sulfuric Acid which can cause severe burns to skin and eyes and damage to fabrics. In the event the battery leaks and contact is made with the Sulfuric Acid, immediately flush skin or eyes with water for at least 15 minutes. For eyes, seek immediate medical attention. A good neutralizing solution for Sulfuric Acid is water and household baking soda.

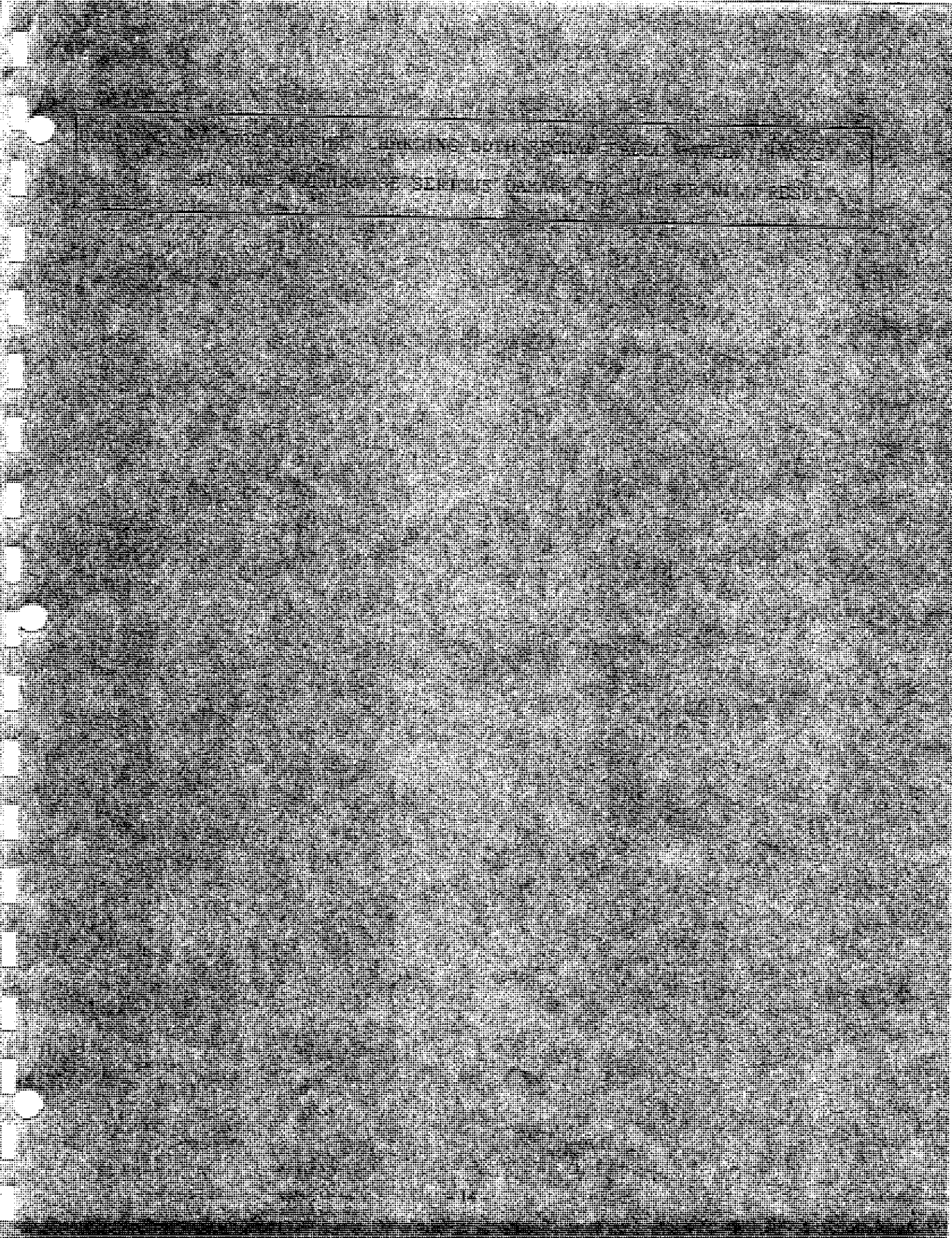
### 3.6 BATTERY CHARGING

The small battery charger supplied with UniMag is compatible with a standard line voltage of either 115 or 220 volts, 60/50 Hz AC power. An AC POWER SELECT slide switch is provided on the charger (see Figure 3-1); use a small screw driver or pencil to select the correct input power. The charger is a constant voltage type designed for boost charging; it does not have the capacity to recharge a battery that has been deeply discharged as discussed earlier in this chapter.

To charge a battery pack, plug the charger into AC power and connect it to the battery pack using the keyed POWER PLUG. On those models equipped with the environmental connector, use the jumper cable to connect the console to the BNC connector on the charger. (The environmental connector on the UniMag console eliminates the need to remove the battery pack.) Observe the following rules to correctly charge the battery pack:

1. Daily use of the UniMag Magnetometer: At the end of each day's use of the magnetometer, it is recommended that the battery pack be recharged overnight, or for at least twelve (12) hours. If it is necessary to use UniMag for longer than one day between charges, the spare (fully charged) battery pack should be installed when the readout display flashes. The discharged battery should then be recharged for a minimum of twenty-four (24) hours or as long as forty-eight (48) hours to ensure full capacity charging.
2. Non-daily use of the UniMag Magnetometer: If it is anticipated that UniMag is not going to be used for several days or weeks, the battery pack should be removed and stored in a refrigerator (see Figure 3-2); this applies to all UniMag models. The UniMag console has no ON/OFF switch, therefore a small amount of current will always flow. The small current drain (approximately  $50\mu$  amps), is insignificant to normal usage of the magnetometer, but if a partially discharged battery pack is left in the instrument for a long period of time, it is possible that this current drain could eventually cause a deep battery discharge. The charger supplied is not designed to overcome the internal resistance caused by a such deep discharge (refer to paragraph 3.2).

Careful attention to the above details regarding battery care and charging will allow years of service from the battery pack.



# geoMetrics

April 27, 1978

Gentlemen:

Geometrics is providing, at no additional cost to you, one 4 foot cable.

When using our new charger, it is possible to charge the battery without removing it from the Unimag. This procedure is as follows:

- Step 1. Insert Chrome Plug of the charging cable into the jack.  
Plug the other end into the charger.
  
- Step 2. After charging for approximately 16 hours, check the battery charge by pressing the Green Button on the charger. While holding in this button, press the cycle button on the Unimag. If the lamp on the charger stays Green, the battery is charged sufficiently. If the lamp on the charger stays Red the battery requires more hours of charging.

For additional information, please refer to the new manuals provided with these units-- or contact GeoMetrics, Customer Service Department, phone 408-734-4616, Ext. 470.

Sincerely,

*Robert B Crawford*  
Robert Crawford  
Customer Service