REPORT ON

AIRBORNE GEOPHYSICAL SURVEY
MONTGOMERY, b 175, BRIDGLAND,
HAUGHTON AND GALBRAITH
TOWNSHIPS AREA, ONTARIO.

FOR

KERR - Mcgee
CORPORATION

BY

HUNTEC LIMITED
AND
LOCKWOOD SURVEY CORPORATION LIMITED
TORONTO, ONTARIO
NOVEMBER, 1968

SSM-1411
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I. INTRODUCTION.

Between September 17th and September 26th, 1968, an airborne geophysical survey comprising dual frequency electromagnetometer and total field fluxgate magnetometer, was carried out by Lockwood Survey Corporation Limited for Kerr-McGee, over 335 claims, in two irregular shaped blocks, totalling 354.35 line miles.

The airborne survey was over two areas including the claim blocks; about 25 miles north and east of Thessalon. Included are parts of the Townships of Montgomery, #175, Bridgland, Haughton and Galbraith; Mining District of Sault Ste. Marie.

Traverse lines were spaced at 1/16th mile, and flown in an east-west direction. Appropriate tie-lines were flown.

The mean terrain clearance for the E.M. transmitter and magnetometer in a stinger was 450 feet.

Photographs of the terrain below the aircraft were exposed at intervals of 1.8 secs. throughout the survey on 35 mm film. This photography was used to establish the actual flight path of the aircraft whilst on survey.

The area has been subdivided into two map sheets at a scale of 1 inch to 1,320 feet, with planimetry traced from uncontrolled...
mosaics.

The survey was undertaken by the following personnel:

G. Lehmann, Pilot.
W. Teece, Engineer.
D. Fenwick, Navigator.
T. Pederson, Operator.
R. Whitton, Data Reduction.

The aircraft used for the survey was a Queenair, registration CF-ROA.
II. THE MAGNETIC SURVEY.

II.1 The Airborne Magnetometer.

The instrument used for this survey was the Gulf MK III Fluxgate Magnetometer which measures the strength of the earth's total magnetic field in the direction of maximum force. The instrument was housed in the stinger section of the plane's tail, the controls and recorder being housed in the aircraft.

The instrument was used with full scale deflection of 600 gamma with a noise level of ± 2 gamma.

II.2 Presentation of Data.

The magnetic data is presented as contours of the total magnetic field at a basic interval of 20 gamma with multiple intervals where the gradient warrants.

The diurnal variation was removed by the standard procedure of closing the loop and distributing the misclosure.

The contour map has been reduced for convenience to an arbitrary datum of 5000 gamma; the 5000 gamma reading on the map represents a true reading of about 59,500 gamma.
II.3 Magnetic Constants.

The relevant magnetic constants for the area are:

- Total field strength: 0.595 oersted: 59,500 gamma
- Declination: 70 West
- Inclination: 760 North

II.4 Comments on Magnetic Data.

Matinenda Lake Area.

The area is typified by a relatively low order of magnetic relief, typically of only a few tens of gammas range, with many small closures of highs and lows; no strong gradients are developed. There appears to be no distinguishable magnetic contrast between the Gowganda Formation and the basic igneous rocks as mapped. Several weak north-westerly trends are observed but are not seen to coincide with any mapped geological feature. There is considerable evidence for many north-east trending faults which is generally consistent with the observed geology.

Dunns Valley Area.

This area shows considerably more magnetic relief than the former area even though the geology is essentially similar. To the northeast of Wanamaker Lake the area is generally flat with a tendency towards east-west trends. To the east and northwest the relief is
somewhat higher but still only moderate amplitude; this may reflect
the presence of the basic igneous masses at no great sub-surface depth.
There is evidence again for north-east faulting. To the northwest of the
road intersection is a pronounced circular feature which may represent
an igneous plug or vent.
III. ELECTROMAGNETIC SURVEY.

III.1 Electromagnetic System.

The electromagnetic system used for this survey was the dual frequency phase-shift measuring equipment developed by M. Puranen, A. Kahma and V. Ronka, working under the auspices of the Geological Survey of Finland. Further development work was undertaken by V. Ronka.

The instrument consists of a horizontal transmitting coil generating electromagnetic fields at two frequencies, 400 c.p.s. and 2,300 c.p.s., and a receiving coil located in a towed "bird" behind and below the aircraft; the horizontal transmitting coil is mounted between the wings and tail of the aircraft. Phase detecting circuits in the aircraft equipment allow the phase-shifts of the voltages generated in the receiving coils to be measured relative to the transmitted voltages as reference; the phase-shifts are displayed on a continuous graphical recorder together with a trace of aircraft terrain clearance as measured by a radar altimeter.

The measuring system records only the changes in phase of the total field along the axis of the receiving coil. The system is effectively compensated for quadrature variations from sources other
than the ground, therefore the movement of the bird does not affect the recorded data.

The measured quantity is the phase angle; for small angles this can be shown to be proportional to the quadrature component of the secondary field generated by ground conductors. In this survey the instrumental noise has generally been about $0.05^\circ$ or roughly 1 part in 1,200 of the primary field.

III.2 System Response Characteristics.


III.3 Presentation of Data.

The electromagnetic data is presented as contours of the anomaly in the low frequency response relative to the local background level at an interval of $0.2^\circ$. The peak value of the low-frequency response at an anomaly is presented in a circle as the ratio: peak low frequency value/corresponding high frequency value.
III.4 Comments on Electromagnetic Data.

Matinenda Lake Area.

The area is underlain almost exclusively by the Gowganda Formation of siltstones, arkose, quartzite, greywacke conglomerate and argillite. Some northeast trending faults are indicated in the centre of the area and two isolated copper shows are noted.

The response of the different frequencies throughout the area is marginal with the exception of the high frequency responses in the northwest. The low frequency response is generally below 0.3°, or little above the instrument noise level, however, accepting the anomalies at their stated values and considering ratios (low frequency/high frequency) of greater than unity to have most significance, it is observed that the most significant areas are immediately to the north and east of Williamson Lake in the close vicinity of the copper show. The observed ratios and values indicate a conductivity-width of about 15 feet-mho/meter at a depth sub-aircraft of 650 feet. These areas generally correlate with magnetically low areas.

Dunns Valley Area.

This area is geologically mapped as the Gowganda Formation with some diabase, quartz diabase, gabbro, granophyre or diorite. The low frequency response is again uniformly low with some low frequency responses attaining 0.6°, however, the ratios are
generally less than unity, predominantly less than 0.5 indicative of low values of conductivity width. A few isolated peaks attain ratios of approximately unity, but these appear to be randomly distributed, suggesting that either the peak values noted are superimposed on overburden responses or incorrectly chosen baseline. The activity is generally aligned in a north-south direction around the road in the southern part of Houghton Township; this could be the contact zone between the Gowganda Formation and the Nipissing Formation.

The general response in terms of conductive mineral horizons is rather disappointing in both areas, the only possible known correlation being with the copper in the Matinenda Lake Area.
IV. INSTRUMENT SPECIFICATIONS.

IV.1 Electromagnetic System:

Manufacturer: Lockwood Survey Corporation Limited (formerly Hunting Survey Corporation Limited).

Type: Dual Frequency Phase Shift System.

Frequency: 400 and 2,300 cycle per second.

Power Source: 28 volts.

Coil Size:
- Transmitter: 500 sq.ft.
- Receiver:
  - High frequency: 35 sq.inch.
  - Low frequency: 41 sq.inch.

Power Output:
- High frequency: 150 watt.
- Low frequency: 300 watt.

Coil Separation: 320 feet.

Sensitivity:
- 5° at 400 c.p.s.
- 10° at 2,300 c.p.s.

Noise Level: ± 0.50°.

Recorder: Mosely.

Chart Speed: 4 inches per minute.

Chart Ink:
- Low frequency: Red.
- Altimeter: Blue.
- High frequency: Green.
VI. 2 Magnetometer System.

Manufacturer: Gulf Research and Development Corp.
Type: Mark III Fluxgate.
Power Source: 28 volt.
Sensitivity: 600 gamma.
Step: 500 gamma.
Noise envelope: 2 gamma.
Recorder: Gulf.
Chart Speed: 6 inches per minute.

VI. 3 Elevation Control.

Type: Honeywell Radar Altimeter.
Power Source: 28 volt.
Calibration Range: 0-1,000 feet.
Power Output: 10 watt.
Operating Frequency: 4000 mega cycle.
Chart Speed: 4 inches per minute.

VI. 4 Camera.

Manufacturer: Canadian Applied Research.
Model: MK8.
Serial No: 8107.
Exposure interval: 2.1 second.
VI.4 Camera (cont.)

Film Size: 35 mm.
Shutter: Focal Plane.
V. SURVEY PROCEDURE.

All instrument calibrations were checked and adjusted immediately before and/or after take-off, and checked for normal function, e.g., pen alignment, automatic stepping, standardization and degree of noise. Assuming all systems were functioning satisfactorily, the flight would proceed following predetermined flight lines marked on uncontrolled mosaics at a scale of 1 inch to 1,320 feet, at the predetermined separation.

The aircraft followed a systematic predetermined pattern of flight lines and tie-lines at an average elevation of 450 feet.

The position of the aircraft was recorded by a vertically mounted camera; there was no significant lag between any instrument and the recorded position. Every time the camera fired, a reference mark was printed on all records and numbered to correspond with the film frame number.
VI. DATA REDUCTION AND PRESENTATION.

The flight produces positioning film, duly processed, magnetometer, electromagnetic and altimeter continuous records with appropriate frame numbers and field annotations, plus an operator's Daily Flight Report.

The track of the aircraft is recovered on the photographic mosaics by examination of the film; prominent features, i.e., roads, lake-shore, etc., are used for the transposition.

The intersections of tie and flight lines are accurately determined on film and transferred to the records. The frame numbers of the individual plotted points relocated on the mosaic are identified on each record.

The flight line network is divided into conveniently sized circuits and from one intersection as reference, the magnetic closure error around each circuit is determined and distributed uniformly around each circuit such that the correction applied to the magnetic baseline results in a uniform datum of all these magnetometer records throughout the area; this is the datum used for contouring. If the flight lines are very short a single control line is used to apply a constant datum to all lines assuming zero drift.
The electromagnetic record is baselined with respect to the local background level.

The data for each survey are individually transferred to separate intercept tapes; the data transferred consist of the plotted fiducial point and the intercept of the predetermined contour interval with the trace, and the position and values of high and lows.

The intercepted data are transferred to the flight line plot by linearly interpolating between plotted fiducial points. The transferred data are then contoured, and subsequently fair drawn.
VII. PERSONNEL.

Pilot: G. Lehmann,
National Aviation Management Corp.,
VANCOUVER.

Engineer: W. Teece,
Lockwood Survey Corporation Limited,
1450, O'Connor Drive,
TORONTO 16.

Navigator: D. Fenwick,
Lockwood Survey Corporation Limited,
1450 O'Connor Drive,
TORONTO 16.

Operator: T. Pedersen,
Lockwood Survey Corporation Limited,
1450 O'Connor Drive,
TORONTO 16.

Data Reduction: R. Whitton,
Lockwood Survey Corporation Limited,
1450 O'Connor Drive,
TORONTO 16.

Geophysicist: J.W. Prior, M.Sc., F.G.S.,
Huntec Limited,
1450 O'Connor Drive,
TORONTO 16.
VIII. RECOMMENDATIONS.

The interpretation of the survey embodied in this report is essentially a rapid geophysical appraisal of the survey area; as such it can incorporate only as much geological information as the interpreter has available. It should be judiciously used, therefore, as a guideline by geologist thoroughly familiar with the area and who are in a better position to have a "feel" for the geological significance of any particular feature. Unfortunately there are no strong anomalies suggestive of massive ore bodies, however, some minor anomalies are seen to coincide with copper shows.

The electromagnetic system used for this survey detects electrically continuous conductors, especially massive sulphides, at relatively shallow depths; therefore, any anomalous situation of further interest should be accurately located on the ground by a comparable E.M. system. It would be extremely advantageous for a geologist to accompany this crew, who, as soon as the peak response is located, could make a rapid geological appraisal of the site and if necessary call off further work if a graphitic or other non-metalliferous conductor is found. If all factors are favourable, a magnetometer traverse may assist in determining further parameters of the causative body; the airborne magnetics should be a guide in this. Depending on
the local geological detail, a decision then must be made to either drill or trench the anomaly in order to define the exact nature of the conductor.

HUNTEC LIMITED,


### ADDENDUM

**NUMBERS OF MINING CLAIMS TRAVERSED BY SURVEY**

<table>
<thead>
<tr>
<th>Township</th>
<th>Numbers of Mining Claims Traversed by Survey</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bridgland Township</td>
<td>SSM 88306 - SSM 88309 1 claims, 2 &quot;</td>
</tr>
<tr>
<td>Galbraith Township</td>
<td>SSM 88018 - SSM 88035 18 claims, 6 &quot;</td>
</tr>
<tr>
<td>Haughton Township</td>
<td>SSM 87930 - SSM 87965 36 claims, 18 &quot;</td>
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<table>
<thead>
<tr>
<th>Township</th>
<th>Numbers of Mining Claims Traversed by Survey</th>
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<tbody>
<tr>
<td></td>
<td>SSM 93217 - SSM 93266 50 claims, 25 &quot;</td>
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<tr>
<td></td>
<td>SSM 93705 - SSM 93729 25 &quot;</td>
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<tr>
<td></td>
<td>SSM 93915 - SSM 93951 11 &quot;</td>
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<tr>
<td></td>
<td>SSM 93954 - SSM 93964 2 &quot;</td>
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<td>SSM 94677 - SSM 94678 2 &quot;</td>
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<tr>
<td></td>
<td>SSM 102250 - SSM 102251 2 &quot;</td>
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127 claims

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<td>SSM 88000 - SSM 88017 18 &quot;</td>
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<td>SSM 88243 - SSM 88278 36 &quot;</td>
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<td>SSM 88304 - SSM 88305 2 &quot;</td>
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<td></td>
<td>SSM 88307 1 &quot;</td>
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<td>SSM 88310 1 &quot;</td>
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<td>SSM 88320 - SSM 88321 2 &quot;</td>
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<td>SSM 88378 1 &quot;</td>
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<td>SSM 89815 1 &quot;</td>
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99 claims
### ADDENDUM

**NUMBERS OF MINING CLAIMS TRAVERSED BY SURVEY**

<table>
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<th>Montgomery Township</th>
<th>Claim Numbers</th>
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<td>SSM 94316 - SSM 94324</td>
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<td>SSM 94664 - SSM 94667</td>
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<td>SSM 94669 - SSM 94676</td>
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<td>SSM 99484 - SSM 99490</td>
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<td>SSM 100158</td>
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<tr>
<td>SSM 102245 - SSM 102249</td>
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</tbody>
</table>

- **Total Mileage Flown**: 472.0 miles
- **Mileage flown over Claim Groups**: 354.4 miles
Dear Sirs:

Enclosed are two copies each of Magnetic and Electromagnetic maps covering an Airborne Geophysical Survey in the Matinenda Lake Area of Ontario.

Our client, Kerr-McGee Corporation, wishes to submit these for an assessment credit of 80 days per claim over the following claims:

SSM 102241 to SSM 102244 - 4 claims
SSM 100725 & SSM 100726 - 2 claims
All in Township No. 175.

SSM 100728 to SSM 100731 - 4 claims
All in the Township of Montgomery.

The original maps and reports for this area were filed with your office in Toronto on or about the 9th of December last. At that time, the above claims were not included on the maps but were covered by the report. The work report forms are being filed in the Sault Ste. Marie Recorders Office by Mr. K. Hatfield, Kerr-McGee's representative in that area.

Would you accept these maps and letter and credit an assessment of 80 days per claim to Kerr-McGee Corporation. Should you require further information please contact us at the above address.

Yours very truly,

LOCKWOOD SURVEY CORPORATION LTD.

J. R. Gray
Supervisor, Data Reduction Department.
Mean flight line spacing: 330 feet
Mean ground clearance: 450 feet
Fiducial points: 3690

Electromagnetic contours: 0°-20°-40°-60°
The contours represent the phase angle of the resultant field with respect to a 400 cycle primary. The contour interval is 1°.

For a particular anomaly the figures represent maximum 400 cycle response corresponding 2300 cycle response.

Matinenda Lake Area, Ontario
Electromagnetic Map

Lockwood Survey Corporation Limited
Toronto, Canada
1968