REPORT NO. 183

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# DIGHEM$^{III}$ SURVEY

# OF THE

# UCHI LAKE AREA, ONTARIO



# FOR

# GETTY CANADIAN METALS, LTD.

BY

DIGHEM LIMITED

TORONTO, ONTARIO
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GEOPHYSICAL INTERPRETER

# INTRODUCTION

A DIGHEM$^{III}$ survey totalling 2734 line-km was flown with a 200 m line-spacing for Getty Canadian Metals, Ltd., from June 17 to July 2, 1983, in the Uchi Lake area of Ontario (Figure 1). In addition, two tie lines were flown totalling 71 line-km.

The CGNSM turbine helicopter flew at an average airspeed of 140 km/h with an EM bird height of approximately 30 m. Ancillary equipment consisted of a Sonotek PMH 5010 magnetometer with its bird at an average height of 45 m, a Sperry radio altimeter, a Geocam sequence camera, an RMS GR33 analog recorder, a Sonotek SDS 1200 digital data acquisition system and a DigiData 1630 9-track 800-bpi magnetic tape recorder. The analog equipment recorded four channels of EM data at approximately 900 Hz, two channels of EM data at approximately 7200 Hz, two ambient EM noise channels (for the coaxial and coplanar receivers), four channels of VLF-EM data (total field and quadrature) two channels of magnetics (coarse and fine count), and a channel of radio altitude. The digital equipment recorded the EM data with a sensitivity of 0.20 ppm and the magnetic field to one nT (i.e., one gamma).

Appendix A provides details on the data channels, their respective sensitivities, and the flight path recovery procedure. Noise levels of less than 2 ppm are generally maintained for wind speeds up to 35 km/h Higher winds may cause the system to be grounded because excessive bird swinging produces difficulties in flying the helicopter. The swinging results from the 5 $m^2$ of area which is presented by the bird to broadside gusts. The DIGHEM system nevertheless can be flown under wind conditions that seriously degrade other AEM systems.

It should be noted that the anomalies shown on the electromagnetic anomaly map are based on a near-vertical, half plane model. This model best reflects "discrete" bedrock conductors. Wide bedrock conductors or flat-lying conductive units, whether from surficial or bedrock sources, may give rise to very broad anomalous responses on the EM profiles. These may not appear on the electromagnetic anomaly map if they have a regional character rather than a locally anomalous character. These broad conductors, which more closely approximate a half space model, will be maximum coupled to the horizontal (coplanar) coil-pair and are clearly evident on the resistivity map. The resistivity map, therefore, may be more valuable than the electromagnetic anomaly map, in areas where broad or flat-lying conductors are considered to be of importance.

In areas where magnetite causes the inphase components to become negative, the apparent conductance and depth of EM anomalies may be unreliable.

There are several areas where EM responses are evident only on the quadrature components, indicating zones of poor conductivity. Where these responses are coincident with strong magnetic anomalies, it is possible that the inphase component amplitudes have been suppressed by the effects of magnetite. Most of these poorly-conductive magnetic features give rise to resistivity anomalies which are only slightly below background. These weak features are evident on the resistivity map but may not be shown on the electromagnetic anomaly map. If it is expected that poorly-conductive sulphides may be associated with magnetite-rich units, some of these weakly anomalous features may be of interest.

The effects of conductive overburden are evident over a large portion of the survey area. Although the difference channels (DIF I and DIF Q) are extremely valuable in detecting bedrock conductors which are partially masked by conductive overburden, sharp undulations in the bedrock/

overburden interface can yield anomalies in the difference channels which may be interpreted as possible bedrock conductors. Such anomalies usually fall into the 'S?' or 'B?' classification, and are generally considered to be of low priority.

A large, very strong magnetic anomaly is centered at Kesaka Lake, near the junction of sheets 1 through 4. Near the core of this lens-shaped feature, magnetic values exceed 70,000 nT in some instances. Occasionally, magnetic gradients appear to have been steep enough to exceed the gradient tolerance of the proton magnetometer. As the proton precession signal decays rapidly in high gradient areas, some of the erratic values near the core of this magnetic unit may be unreliable. Remanent magnetism also appears to have contributed to the erratic nature of the magnetic data in this area.

# SECTION I: SURVEY RESULTS

## CONDUCTORS IN THE SURVEY AREA

The survey covered a single grid with 2,734 km of flying, the results of which are shown on eight separate map sheets. Tables I-1 through I-8 summarize the EM responses on the eight sheets with respect to conductance grade and interpretation.

The electromagnetic anomaly map shows the anomaly locations with the interpreted conductor shape, dip, conductance and depth being indicated by symbols. Direct magnetic correlation is also shown if it exists. The strike direction and length of the conductors are indicated when anomalies can be correlated from line to line. When studying the map sheets for follow-up planning, consult the anomaly listings appended to this report to ensure that none of the conductors are overlooked.

A separate map showing probable bedrock conductors only, can be produced for the survey area, if requested. The resulting map would display only those anomalies which are interpreted as D, T, B and P (see EM map legend). All other anomalies attributed to horizontal layers (interpreted as S, H, and G) and cultural features (L and C) are intentionally deleted from this presentation to provide an uncluttered view of the more interesting anomalies.

Sheet 4

There are three major magnetic features evident on this sheet.

A second linear feature,

extends from the west end of the sheet, along the Papaonga River, east to Papaonga Lake, where a strong volcanic centre is indicated. An east-west trending magnetic low, from 820H to south of 900E, separates this feature from two more strong magnetic anomalies to the north. This complex magnetic anomaly continues to the east on sheet 5.

A well developed enhanced magnetic anomaly, which is not evident on the magnetic map, is coincident with anomaly 690C.

The resistivity contours show a general correlation with the VLF data, but the latter tends to provide additional structural information in the high resistivity areas on the northern half of the sheet. With the exception of the water covered areas, resistivities are generally in excess of 800 ohm-m. Three notable exceptions are the well defined resistivity lows coincident with anomalies 850A-870A and 900D.

| | |
|---|---|
| Anomalies 630D, 640E, 650B, 660xA, 670E, 690C, 712B, 712C, 712D, 780G, 850G | All anomalies and x-type responses in this group occur as isolated responses of very limited strike length which are considered to be of moderately low priority. Most reflect possible bedrock conductors which are partially masked by conductive overburden and/or the effects of magnetite. |

Anomalies 770C-780D,
770D-780E

Two conductors occur on the north and south edges of a strong magnetic anomaly. Anomaly 770D-780E reflects a zone of poorly conductive magnetite, while 770C-780D appears to be due to conductive material at the south edge of the magnetite zone. Both conductors are contained within the large magnetic complex at the southwest end of Papaonga Lake.

Anomalies 810E-890B,

The anomalies in this group reflect three parallel conductors which are also associated with the Papaonga Lake magnetic anomaly.

810E-890B is

coincident with a zone containing 15% to 30% magnetite while the former is attributed to a band of conductive material at its south edge.

Anomalies 850A-870A, 900D

The narrow bedrock conductor defined by 850A-870A probably represents the most attractive target on sheet 4. This feature is associated with a well defined resistivity low and an east-west trending enhanced magnetic anomaly which is only weakly evident on the total field magnetic map. This conductor is definitely a high priority target which warrants detailed investigation.

Anomaly 900D is a single-line anomaly which probably reflects a bedrock conductor of limited extent which is partially masked by conductive overburden. This is considered to be of lower priority, but should be followed up on the ground.

Anomaly 900I

This anomaly, which exhibits a direct magnetic correlation of 100 nT reflects the western end of an attractive bedrock conductor which continues southeast onto sheet 5 to anomaly 920M.

The most attractive massive sulphide targets on sheet 4 are anomalies 850A-870A and 900I.

Sheet 5

The magnetic and enhanced magnetic maps indicate a very complex geological structure in the area covered by sheet 5, particularly in the western portion of the sheet.

From line 910, at the western limit of sheet 5, a continuation of the major east-west magnetic lineament, which follows the Papaonga River on sheets 3 and 4, is evident. This unit, the approximate outline of which is defined by the 61,000 nT contour, extends through conductor 970E-980D to the vicinity of line 1050, where a strong, "plug-like" magnetic anomaly is evident between lines 1050 and 1200.

A 61,000 nT contour also defines the continuation of the complex magnetic anomaly centered near the northwestern shore of Papaonga Lake.

Another strongly magnetic unit occurs in the northwestern portion of the sheet, striking east-southeast from anomaly 940J to line 1110, where it decreases in amplitude bedrock conductors. These include areas in the vicinity of anomalies 910H, 930L, 980L, 1040N, 1220C,

In addition, there is a strong low resistivity zone with values of less than 20 ohm-m, which extends east from Papaonga Lake to line 1150.

The VLF map appears to emphasize structural trends which are aligned in an east-west direction. There is generally poor correlation between magnetic trends and VLF trends, particularly on the western half of the sheet. There are, however, a few VLF anomalies which exhibit direct correlation with magnetic units defined on the enhanced magnetic map. Three examples are the coincident VLF/ magnetic trends between anomalies 910H-920M, and 1200xB-1300C. In most cases, the VLF anomalies appear to be situated on the flanks of the magnetic peaks.

Anomalies 910H-920M,
930L-950K,
970L-990I

A thin, north-dipping bedrock conductor which is associated with a well defined resistivity low and a northwest-southeast trending magnetic anomaly, appears to be one of the more attractive targets on sheet 5. The western end of this conductor occurs on sheet 4 as anomaly 900I. This interesting conductor should be subjected to further investigation.

The bedrock conductor defined by anomaly 930L-950K also suggests a thin, dike-like source coincident with a sharp, moderately strong magnetic anomaly. The conductor axis exhibits a west-southwest/ east-northeast strike direction in contrast to other conductor axes in the immediate vicinity (i.e., 910H-920M and 970L-990I). Anomaly 950K exhibits different characteristics from anomalies 930L and 940J, suggesting that the former may not be part of this conductor axis. Its strike length may be less than that indicated on the EM map. The strong low resistivity zone associated with the west end of this conductor, also implies a strike length of about 200 m. The western portion of this conductor is considered to be an attractive target.

Anomaly 970L-990I is contained within a well defined resistivity low which is located near the peak of a very strong magnetic anomaly. This anomaly reflects a thin, near-vertical bedrock conductor which should be checked on the ground. The FEO channel indicates a zone of magnetite about 200 m to the north.

Anomalies 920L, 940xC,

With the possible exception of 920L, all anomalies and x-type responses in this group are considered to be of low priority.

Anomaly 920L is a weak anomaly, with a 50 nT magnetic correlation, which may be related to 930L. Response 940xC, may be influenced by aerodynamic noise while 950xC, on the northern flank of a strong magnetic anomaly, could be affected by conductive overburden.

Anomalies 1030E-1060D, 1081E-1090C

The conductors in this group are all contained within a broad low resistivity zone of less than 250 ohm-m, associated with the eastern arm of Papaonga Lake. The enhanced magnetic, VLF and resistivity patterns suggest two separate horizons; one near the north shore of the lake an the other near the south shore.

Anomalies 1030E-1060D, and 1081E-1090C appear to exhibit shorter strike lengths. The latter gives rise to a marked resistivity low which yields values of less than 20 ohm-m on line 1040. Additional work should be carried out to determine the cause of these interesting anomalies.

Anomalies 970E-980D, 1010D

Anomaly 970E-980D reflects possible bedrock conductors beneath conductive overburden which is associated with two parallel magnetic units, separated by a distance of about 400 m. Both weak conductors are of limited extent and appear to be moderately attractive targets. Anomaly 1010D occurs along the same geological horizon as 970E-980D and reflects a zone of conductivity associated with the north flank of a magnetite zone.

Anomaly 1030M-1040N

A well defined isolated resistivity low hosts anomaly 1030M-1040N which reflects a narrow, north-dipping bedrock conductor which is coincident with a similarly well defined magnetic anomaly. This conductor is deemed to be a high priority target which should be followed up.

Anomalies 1040L-1060L, 1080xA'-1100J, 1040K,

With the exception of anomaly 1040K which appears to be strongly influenced by poorly conductive magnetite, all conductors in this group appear to be related to a common stratigraphic horizon, as evidenced by the magnetic and VLF contours. These bedrock features all appear to be of interest but preference may be given to certain portions of the assumed contact where resistivity lows indicate a greater concentration of conductive material.

A possible offset between 1100J and 1110J may make this an attractive area as well.

Anomalies 1070L-1100L,

Anomaly 1070L-1100L reflects a bedrock conductor of moderate to short strike length. It is attributed to a fairly deep conductor with weak magnetic correlation of up to 80 nT, which is more evident on the enhanced magnetic map as an isolated unit. This conductor is a moderately high priority target which should be followed up.

Anomalies 1060C-1070xA',
1070D,
1070F-1081D,
1090B-1160C,
1120D-1160B,
1140F-1150E

The conductors formed by anomalies in this group are contained within the strong plug-like magnetic complex near the southeast end of Papaonga Lake. Conductors 1070F-1810D and 1090B to 1160C form the central east-west axis of a major resistivity low which yields values of less than 10 ohm-m over a strike length of more than 1 km. Magnetic correlation of up to 6,300 nT occurs with this strong conductive horizon which may be due to iron formation.

Anomaly 1140F-1150E reflects a flanking bedrock conductor which is situated between the highly conductive zone and the magnetite zone to the south, while conductor 1120D-1160B is contained within the magnetite zone. Resistivities associated with the latter conductor are erroneously high due to the effects of magnetite. A weak single-line anomaly, 1070D, located near the south flank of the magnetic anomaly, may be of interest. Anomaly 1060C-1070xA' reflects a satellitic conductor on the north flank of the same magnetic anomaly. Response 1070xA' may be influenced by a noise spike.

Anomaly 1190C-1220C

Anomaly 1190C-1220C reflects a probable bedrock conductor which is almost completely masked by conductive overburden associated with a small lake. The resistivity values, however, are somewhat lower than those observed in other water covered areas, and are therefore attributed to underlying bedrock conductivity. This probable bedrock conductor occurs within a relative magnetic low.

# SECTION II: BACKGROUND INFORMATION

## ELECTROMAGNETICS

DIGHEM electromagnetic responses fall into two general classes, discrete and broad. The discrete class consists of sharp, well-defined anomalies from discrete conductors such as sulfide lenses and steeply dipping sheets of graphite and sulfides. The broad class consists of wide anomalies from conductors having a large horizontal surface such as flatly dipping graphite or sulfide sheets, saline water-saturated sedimentary formations, conductive overburden and rock, and geothermal zones. A vertical conductive slab with a width of 200 m would straddle these two classes.

The vertical sheet (half plane) is the most common model used for the analysis of discrete conductors. All anomalies plotted on the electromagnetic map are analyzed according to this model. The following section entitled **Discrete conductor analysis** describes this model in detail, including the effect of using it on anomalies caused by broad conductors such as conductive overburden.

The conductive earth (half space) model is suitable for broad conductors. Resistivity contour maps result from the use of this model. A later section entitled **Resistivity mapping** describes the method further, including the effect of using it on anomalies caused by discrete conductors such as sulfide bodies.

## Geometric interpretation

The geophysical interpreter attempts to determine the geometric shape and dip of the conductor. This qualitative interpretation of anomalies is indicated on the map by means of interpretive symbols (see EM map legend). Figure II-1 shows typical DIGHEM anomaly shapes and the interpretive symbols for a variety of conductors. These classic curve shapes are used to guide the geometric interpretation.

## Discrete conductor analysis

The EM anomalies appearing on the electromagnetic map are analyzed by computer to give the conductance (i.e., conductivity-thickness product) in mhos of a vertical sheet model. This is done regardless of the interpreted geometric shape of the conductor. This is not an unreasonable procedure, because the computed conductance increases as the electrical quality of the conductor increases, regardless of its true shape. DIGHEM anomalies are divided into six

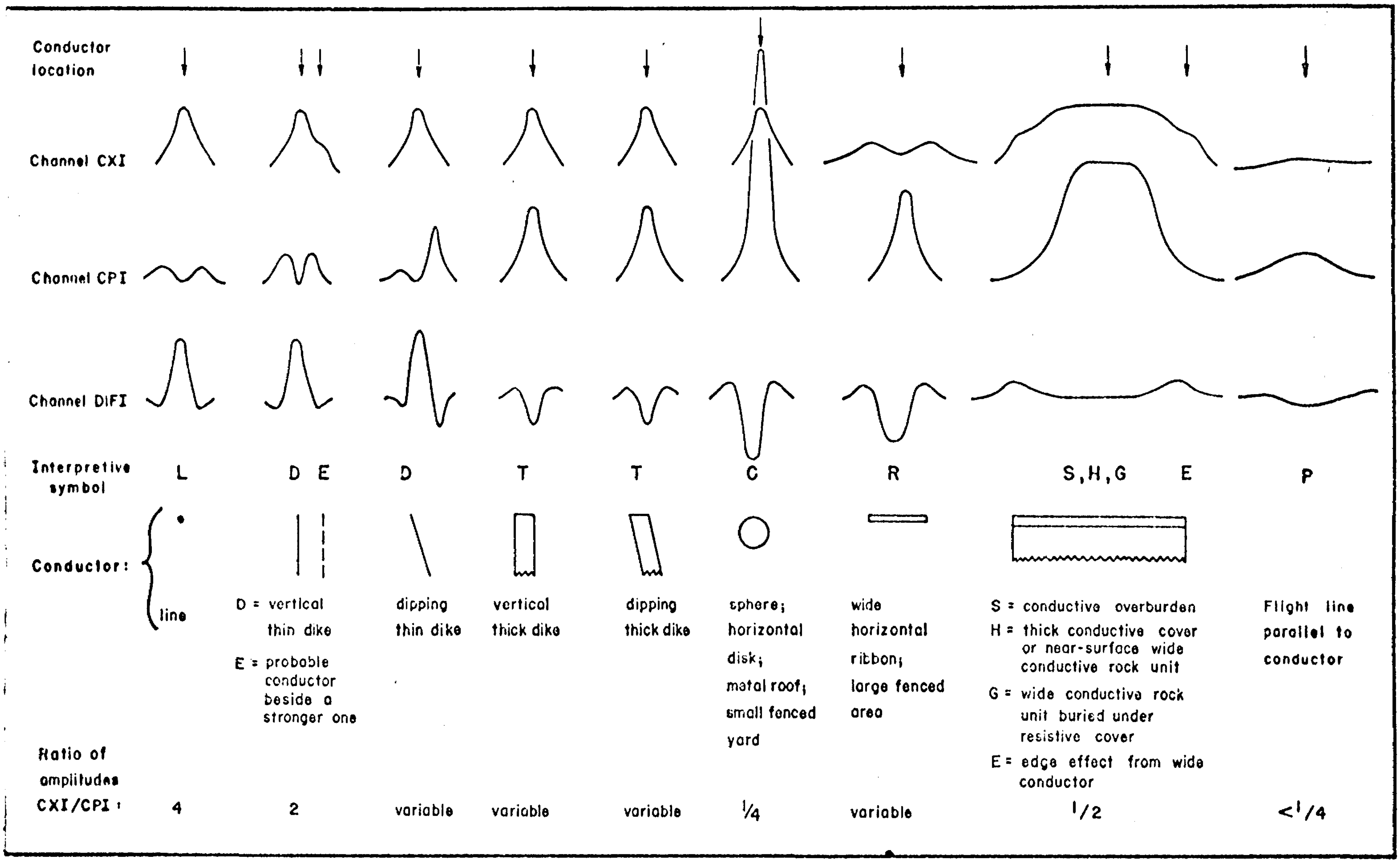


Figure II - 1 Typical DIGHEM anomaly shapes grades of conductance, as shown in Table II-1. The conductance in mhos is the reciprocal of resistance in ohms.

Table II-1. EM Anomaly Grades

| Anomaly Grade | Mho Range |
|---|---|
| 6 | > 99 |
| 5 | 50 - 99 |
| 4 | 20 - 49 |
| 3 | 10 - 19 |
| 2 | 5 - 9 |
| 1 | < 5 |

The conductance value is a geological parameter because it is a characteristic of the conductor alone; it generally is independent of frequency, and of flying height or depth of burial apart from the averaging over a greater portion of the conductor as height increases.[1] Small anomalies from deeply buried strong conductors are not confused with small anomalies from shallow weak conductors because the former will have larger conductance values.

Conductive overburden generally produces broad EM responses which are not plotted on the EM maps. However, patchy conductive overburden in otherwise resistive areas

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1 This statement is an approximation. DIGHEM, with its short coil separation, tends to yield larger and more accurate conductance values than airborne systems having a larger coil separation.

can yield discrete anomalies with a conductance grade (cf. Table II-1) of 1, or even of 2 for conducting clays which have resistivities as low as 50 ohm-m. In areas where ground resistivities can be below 10 ohm-m, anomalies caused by weathering variations and similar causes can have any conductance grade. The anomaly shapes from the multiple coils often allow such conductors to be recognized, and these are indicated by the letters S, H, G and sometimes E on the map (see EM legend).

For bedrock conductors, the higher anomaly grades indicate increasingly higher conductances. Examples: DIGHEM's New Insco copper discovery (Noranda, Canada) yielded a grade 4 anomaly, as did the neighbouring copper-zinc Magusi River ore body; Mattabi (copper-zinc, Sturgeon Lake, Canada) and Whistle (nickel, Sudbury, Canada) gave grade 5; and DIGHEM's Montcalm nickel-copper discovery (Timmins, Canada) yielded a grade 6 anomaly. Graphite and sulfides can span all grades but, in any particular survey area, field work may show that the different grades indicate different types of conductors.

Strong conductors (i.e., grades 5 and 6) are characteristic of massive sulfides or graphite. Moderate conductors (grades 3 and 4) typically reflect sulfides of a less massive character or graphite, while weak bedrock conductors (grades 1 and 2) can signify poorly connected graphite or heavily disseminated sulfides. Grade 1 conductors may not respond to ground EM equipment using frequencies less than 2000 Hz.

The presence of sphalerite or gangue can result in ore deposits having weak to moderate conductances. As an example, the three million ton lead-zinc deposit of Restigouche Mining Corporation near Bathurst, Canada, yielded a well defined grade 1 conductor. The 10 percent by volume of sphalerite occurs as a coating around the fine grained massive pyrite, thereby inhibiting electrical conduction.

Faults, fractures and shear zones may produce anomalies which typically have low conductances (e.g., grades 1 and 2). Conductive rock formations can yield anomalies of any conductance grade. The conductive materials in such rock formations can be salt water, weathered products such as clays, original depositional clays, and carbonaceous material.

On the electromagnetic map, a letter identifier and an interpretive symbol are plotted beside the EM grade symbol. The horizontal rows of dots, under the interpretive symbol, indicate the anomaly amplitude on the flight record. The vertical column of dots, under the anomaly letter, gives the estimated depth. In areas where anomalies are crowded, the letter identifiers, interpretive symbols and dots may be obliterated. The EM grade symbols, however, will always be discernible, and the obliterated information can be obtained from the anomaly listing appended to this report.

The purpose of indicating the anomaly amplitude by dots is to provide an estimate of the reliability of the conductance calculation. Thus, a conductance value obtained from a large ppm anomaly (3 or 4 dots) will tend to be accurate whereas one obtained from a small ppm anomaly (no dots) could be quite inaccurate. The absence of amplitude dots indicates that the anomaly from the coaxial coil-pair is 5 ppm or less on both the inphase and quadrature channels. Such small anomalies could reflect a weak conductor at the surface or a stronger conductor at depth. The conductance grade and depth estimate illustrates which of these possibilities fits the recorded data best.

Flight line deviations occasionally yield cases where two anomalies, having similar conductance values but dramatically different depth estimates, occur close together on the same conductor. Such examples illustrate the reliability of the conductance measurement while showing that the depth estimate can be unreliable. There are a number of factors which can produce an error in the depth estimate, including the averaging of topographic variations by the altimeter, overlying conductive overburden, and the location and attitude of the conductor relative to the flight line. Conductor location and attitude can provide an erroneous depth estimate because the stronger part of the conductor may be deeper or to one side of the flight line, or because it has a shallow dip. A heavy tree cover can also produce errors in depth estimates. This is because the depth estimate is computed as the distance of bird from conductor, minus the altimeter reading. The altimeter can lock onto the top of a dense forest canopy. This situation yields an erroneously large depth estimate but does not affect the conductance estimate.

Dip symbols are used to indicate the direction of dip of conductors. These symbols are used only when the anomaly shapes are unambiguous, which usually requires a fairly resistive environment.

A further interpretation is presented on the EM map by means of the line-to-line correlation of anomalies, which is based on a comparison of anomaly shapes on adjacent lines. This provides conductor axes which may define the geological structure over portions of the survey area. The absence of conductor axes in an area implies that anomalies could not be correlated from line to line with reasonable confidence.

DIGHEM electromagnetic maps are designed to provide a correct impression of conductor quality by means of the conductance grade symbols. The symbols can stand alone with geology when planning a follow-up program. The actual conductance values are printed in the attached anomaly list for those who wish quantitative data. The anomaly ppm and depth are indicated by inconspicuous dots which should not distract from the conductor patterns, while being helpful to those who wish this information. The map provides an interpretation of conductors in terms of length, strike and dip, geometric shape, conductance, depth, and thickness (see below). The accuracy is comparable to an interpretation from a high quality ground EM survey having the same line spacing.

The attached EM anomaly list provides a tabulation of anomalies in ppm, conductance, and depth for the vertical sheet model. The EM anomaly list also shows the conductance and depth for a thin horizontal sheet (whole plane) model, but only the vertical sheet parameters appear on the EM map. The horizontal sheet model is suitable for a flatly dipping thin bedrock conductor such as a sulfide sheet having a thickness less than 10 m. The list also shows the resistivity and depth for a conductive earth (half space) model, which is suitable for thicker slabs such as thick conductive overburden. In the EM anomaly list, a depth value of zero for the conductive earth model, in an area of thick cover, warns that the anomaly may be caused by conductive overburden.

Since discrete bodies normally are the targets of EM surveys, local base (or zero) levels are used to compute local anomaly amplitudes. This contrasts with the use of true zero levels which are used to compute true EM amplitudes. Local anomaly amplitudes are shown in the EM anomaly list and these are used to compute the vertical sheet parameters of conductance and depth. Not shown in the EM anomaly list are the true amplitudes which are used to compute the horizontal sheet and conductive earth parameters.

X-type electromagnetic responses

DIGHEM maps contain x-type EM responses in addition to EM anomalies. An x-type response is below the noise threshold of 3 ppm, and reflects one of the following: a weak conductor near the surface, a strong conductor at depth (e.g., 100 to 120 m below surface) or to one side of the flight line, or aerodynamic noise. Those responses that have the appearance of valid bedrock anomalies on the flight profiles are indicated by appropriate interpretive symbols (see EM map legend). The others probably do not warrant further investigation unless their locations are of considerable geological interest.

The thickness parameter

DIGHEM can provide an indication of the thickness of a steeply dipping conductor. The amplitude of the coplanar anomaly (e.g., CPI) increases relative to the coaxial anomaly (e.g., CXI) as the apparent thickness increases, i.e., the thickness in the horizontal plane. (The thickness is equal to the conductor width if the conductor dips at 90 degrees and strikes at right angles to the flight line.) This report refers to a conductor as thin when the thickness is likely to be less than 3 m, and thick when in excess of 10 m. Thin conductors are indicated on the EM map by the interpretive symbol "D", and thick conductors by "T". For base metal exploration in steeply dipping geology, thick conductors can be high priority targets because many massive sulfide ore bodies are thick, whereas non-economic bedrock conductors are often thin. The system cannot sense the thickness when the strike of the conductor is subparallel to the flight line, when the conductor has a shallow dip, when the anomaly amplitudes are small, or when the resistivity of the environment is below 100 ohm-m.

Resistivity mapping

Areas of widespread conductivity are commonly encountered during surveys. In such areas, anomalies can be generated by decreases of only 5 m in survey altitude as well as by increases in conductivity. The typical flight record in conductive areas is characterized by inphase and quadrature channels which are continuously active. Local EM peaks reflect either increases in conductivity of the earth or decreases in survey altitude. For such conductive areas, apparent resistivity profiles and contour maps are necessary for the correct interpretation of the airborne data. The advantage of the resistivity parameter is that anomalies caused by altitude changes are virtually eliminated, so the resistivity data reflect only those anomalies caused by conductivity changes. The resistivity analysis also helps the interpreter to differentiate between conductive trends in the bedrock and those patterns typical of conductive overburden. For example, discrete conductors will generally appear as narrow lows on the contour map and broad conductors (e.g., overburden) will appear as wide lows.

The resistivity profile (see table in Appendix A) and the resistivity contour map present the apparent resistivity using the so-called pseudo-layer (or buried) half space model defined in Fraser (1978)[2]. This model consists of a resistive layer overlying a conductive half space. The depth channel (see Appendix A) gives the apparent depth below surface of the conductive material. The apparent depth is simply the apparent thickness of the overlying resistive layer. The apparent depth (or thickness), parameter will be positive when the upper layer is more resistive than the underlying material, in which case the apparent depth may be quite close to the true depth.

The apparent depth will be negative when the upper layer is more conductive than the underlying material, and will be zero when a homogeneous half space exists. The apparent depth parameter must be interpreted cautiously because it will contain any errors which may exist in the measured altitude of the EM bird (e.g., as caused by a dense tree cover). The inputs to the resistivity algorithm are the inphase and quadrature components of the coplanar coil-pair. The outputs are the apparent resistivity of the

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[2] Resistivity mapping with an airborne multicoil electromagnetic system: Geophysics, v. 43, p. 144-172.

conductive half space (the source) and the sensor-source distance. The flying height is not an input variable, and the output resistivity and sensor-source distance are independent of the flying height. The apparent depth, discussed above, is simply the sensor-source distance minus the measured altitude or flying height. Consequently, errors in the measured altitude will affect the apparent depth parameter but not the apparent resistivity parameter.

The apparent depth parameter is a useful indicator of simple layering in areas lacking a heavy tree cover. The DIGHEM system has been flown for purposes of permafrost mapping, where positive apparent depths were used as a measure of permafrost thickness. However, little quantitative use has been made of negative apparent depths because the absolute value of the negative depth is not a measure of the thickness of the conductive upper layer and, therefore, is not meaningful physically. Qualitatively, a negative apparent depth estimate usually shows that the EM anomaly is caused by conductive overburden. Consequently, the apparent depth channel can be of significant help in distinguishing between overburden and bedrock conductors.

The resistivity map often yields more useful information on conductivity distributions than the EM map. In comparing the EM and resistivity maps, keep in mind the following:

(a) The resistivity map portrays the absolute value of the earth's resistivity. (Resistivity = 1/conductivity.)

(b) The EM map portrays anomalies in the earth's resistivity. An anomaly by definition is a change from the norm and so the EM map displays anomalies, (i) over narrow, conductive bodies and (ii) over the boundary zone between two wide formations of differing conductivity.

The resistivity map might be likened to a total field map and the EM map to a horizontal gradient in the direction of flight[3]. Because gradient maps are usually more sensitive than total field maps, the EM map therefore is to be preferred in resistive areas. However, in conductive areas, the absolute character of the resistivity map usually causes it to be more useful than the EM map.

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[3] The gradient analogy is only valid with regard to the identification of anomalous locations.

Interpretation in conductive environments

Environments having background resistivities below 30 ohm-m cause all airborne EM systems to yield very large responses from the conductive ground. This usually prohibits the recognition of discrete bedrock conductors. The processing of DIGHEM data, however, produces six channels which contribute significantly to the recognition of bedrock conductors. These are the inphase and quadrature difference channels (DIFI and DIFQ), and the resistivity and depth channels (RES and DP) for each coplanar frequency; see table in Appendix A.

The EM difference channels (DIFI and DIFQ) eliminate up to 99% of the response of conductive ground, leaving responses from bedrock conductors, cultural features (e.g., telephone lines, fences, etc.) and edge effects. An edge effect arises when the conductivity of the ground suddenly changes, and this is a source of geologic noise. While edge effects yield anomalies on the EM difference channels, they do not produce resistivity anomalies. Consequently, the resistivity channel aids in eliminating anomalies due to edge effects. On the other hand, resistivity anomalies will coincide with the most highly conductive sections of conductive ground, and this is another source of geologic noise. The recognition of a bedrock conductor in a conductive environment therefore is based on the anomalous responses of the two difference channels (DIFI and DIFQ) and the two resistivity channels (RES). The most favourable situation is where anomalies coincide on all four channels.

The DP channels, which give the apparent depth to the conductive material, also help to determine whether a conductive response arises from surficial material or from a conductive zone in the bedrock. When these channels ride above the zero level on the electrostatic chart paper (i.e., depth is negative), it implies that the EM and resistivity profiles are responding primarily to a conductive upper layer, i.e., conductive overburden. If both DP channels are below the zero level, it indicates that a resistive upper layer exists, and this usually implies the existence of a bedrock conductor. If the low frequency DP channel is below the zero level and the high frequency DP is above, this suggests that a bedrock conductor occurs beneath conductive cover.

Channels REC1, REC2, REC3 and REC4 are the anomaly recognition functions. They are used to trigger the conductance channel CDT which identifies discrete conductors. In highly conductive environments, channel REC2 is deactivated because it is subject to corruption by highly conductive earth signals. Similarly, in moderately conductive environments, REC4 is deactivated. Some of the automatically selected anomalies (channel CDT) are discarded by the geophysicist. The automatic selection algorithm is intentionally oversensitive to assure that no meaningful responses are missed. The interpreter then classifies the anomalies according to their source and eliminates those that are not substantiated by the data, such as those arising from geologic or aerodynamic noise.

Reduction of geologic noise

Geologic noise refers to unwanted geophysical responses. For purposes of airborne EM surveying, geologic noise refers to EM responses caused by conductive overburden and magnetic permeability. It was mentioned above that the EM difference channels (i.e., channel DIFI for inphase and DIFQ for quadrature) tend to eliminate the response of conductive overburden. This marked a unique development in airborne EM technology, as DIGHEM is the only EM system which yields channels having an exceptionally high degree of immunity to conductive overburden.

Magnetite produces a form of geological noise on the inphase channels of all EM systems. Rocks containing less than 1% magnetite can yield negative inphase anomalies caused by magnetic permeability. When magnetite is widely distributed throughout a survey area, the inphase EM channels may continuously rise and fall reflecting variations in the magnetite percentage, flying height, and overburden thickness. This can lead to difficulties in recognizing deeply buried bedrock conductors, particularly if conductive overburden also exists. However, the response of broadly distributed magnetite generally vanishes on the inphase difference channel DIFI. This feature can be a significant aid in the recognition of conductors which occur in rocks containing accessory magnetite.

EM magnetite mapping

The information content of DIGHEM data consists of a combination of conductive eddy current response and magnetic permeability response. The secondary field resulting from conductive eddy current flow is frequency-dependent and consists of both inphase and quadrature components, which are positive in sign. On the other hand, the secondary field resulting from magnetic permeability is independent of frequency and consists of only an inphase component which is negative in sign. When magnetic permeability manifests itself by decreasing the measured amount of positive inphase, its presence may be difficult to recognize. However, when it manifests itself by yielding a negative inphase anomaly (e.g., in the absence of eddy current flow), its presence is assured. In this latter case, the negative component can be used to estimate the percent magnetite content.

A magnetite mapping technique was developed for the coplanar coil-pair of DIGHEM. The technique yields channel "FEO" (see Appendix A) which displays apparent weight percent magnetite according to a homogeneous half space model.[4] The method can be complementary to magnetometer mapping in certain cases. Compared to magnetometry, it is far less sensitive but is more able to resolve closely spaced magnetite zones, as well as providing an estimate of the amount of magnetite in the rock. The method is sensitive to 1/4% magnetite by weight when the EM sensor is at a height of 30 m above a magnetitic half space. It can individually resolve steeply dipping narrow magnetite-rich bands which are separated by 60 m. Unlike magnetometry, the EM magnetite method is unaffected by remanent magnetism or magnetic latitude.

---

[4] Refer to Fraser, 1981, Magnetite mapping with a multi-coil airborne electromagnetic system: Geophysics, v. 46, p. 1579-1594.

The EM magnetite mapping technique provides estimates of magnetite content which are usually correct within a factor of 2 when the magnetite is fairly uniformly distributed. EM magnetite maps can be generated when magnetic permeability is evident as indicated by anomalies in the magnetite channel FEO.

Like magnetometry, the EM magnetite method maps only bedrock features, provided that the overburden is characterized by a general lack of magnetite. This contrasts with resistivity mapping which portrays the combined effect of bedrock and overburden.

Recognition of culture

Cultural responses include all EM anomalies caused by man-made metallic objects. Such anomalies may be caused by inductive coupling or current gathering. The concern of the interpreter is to recognize when an EM response is due to culture. Points of consideration used by the interpreter, when coaxial and coplanar coil-pairs are operated at a common frequency, are as follows:

1. Channels CXS and CPS (see Appendix A) measure 50 and 60 Hz radiation. An anomaly on these channels shows

that the conductor is radiating cultural power. Such an indication is normally a guarantee that the conductor is cultural. However, care must be taken to ensure that the conductor is not a geologic body which strikes across a power line, carrying leakage currents.

2. A flight which crosses a line (e.g., fence, telephone line, etc.) yields a center-peaked coaxial anomaly and an m-shaped coplanar anomaly.[5] When the flight crosses the cultural line at a high angle of intersection, the amplitude ratio of coaxial/coplanar (e.g., CXI/CPI) is 4. Such an EM anomaly can only be caused by a line. The geologic body which yields anomalies most closely resembling a line is the vertically dipping thin dike. Such a body, however, yields an amplitude ratio of 2 rather than 4. Consequently, an m-shaped coplanar anomaly with a CXI/CPI amplitude ratio of 4 is virtually a guarantee that the source is a cultural line.

3. A flight which crosses a sphere or horizontal disk yields center-peaked coaxial and coplanar anomalies with a CXI/CPI amplitude ratio (i.e., coaxial/coplanar) of 1/4. In the absence of geologic bodies of this geometry, the most likely conductor is a metal roof or

---

5 See Figure II-1 presented earlier.

small fenced yard.[4] Anomalies of this type are virtually certain to be cultural if they occur in an area of culture.

4. A flight which crosses a horizontal rectangular body or wide ribbon yields an m-shaped coaxial anomaly and a center-peaked coplanar anomaly. In the absence of geologic bodies of this geometry, the most likely conductor is a large fenced area.[4] Anomalies of this type are virtually certain to be cultural if they occur in an area of culture.

5. EM anomalies which coincide with culture, as seen on the camera film, are usually caused by culture. However, care is taken with such coincidences because a geologic conductor could occur beneath a fence, for example. In this example, the fence would be expected to yield an m-shaped coplanar anomaly as in case #2 above. If, instead, a center-peaked coplanar anomaly occurred, there would be concern that a thick geologic conductor coincided with the cultural line.

---

[4] It is a characteristic of EM that geometrically identical anomalies are obtained from: (1) a planar conductor, and (2) a wire which forms a loop having dimensions identical to the perimeter of the equivalent planar conductor.

6. The above description of anomaly shapes is valid when the culture is not conductively coupled to the environment. In this case, the anomalies arise from inductive coupling to the EM transmitter. However, when the environment is quite conductive (e.g., less than 100 ohm-m at 900 Hz), the cultural conductor may be conductively coupled to the environment. In this latter case, the anomaly shapes tend to be governed by current gathering. Current gathering can completely distort the anomaly shapes, thereby complicating the identification of cultural anomalies. In such circumstances, the interpreter can only rely on the radiation channels CXS and CPS, and on the camera film.

## MAGNETICS

The existence of a magnetic correlation with an EM anomaly is indicated directly on the EM map. An EM anomaly with magnetic correlation has a greater likelihood of being produced by sulfides than one that is non-magnetic. However, sulfide ore bodies may be non-magnetic (e.g., the Kidd Creek deposit near Timmins, Canada) as well as magnetic (e.g., the Mattabi deposit near Sturgeon Lake, Canada).

The magnetometer data are digitally recorded in the aircraft to an accuracy of one nT (i.e., one gamma). The digital tape is processed by computer to yield a total field magnetic contour map. When warranted, the magnetic data also may be treated mathematically to enhance the magnetic response of the near-surface geology, and an enhanced magnetic contour map is then produced. The response of the enhancement operator in the frequency domain is illustrated in Figure II-2. This figure shows that the passband components of the airborne data are amplified 20 times by the enhancement operator. This means, for example, that a 100 nT anomaly on the enhanced map reflects a 5 nT anomaly for the passband components of the airborne data.

The enhanced map, which bears a resemblance to a downward continuation map, is produced by the digital bandpass filtering of the total field data. The enhancement is equivalent to continuing the field downward to a level (above the source) which is 1/20th of the actual sensor-source distance.

Because the enhanced magnetic map bears a resemblance to a ground magnetic map, it simplifies the recognition of trends in the rock strata and the interpretation of

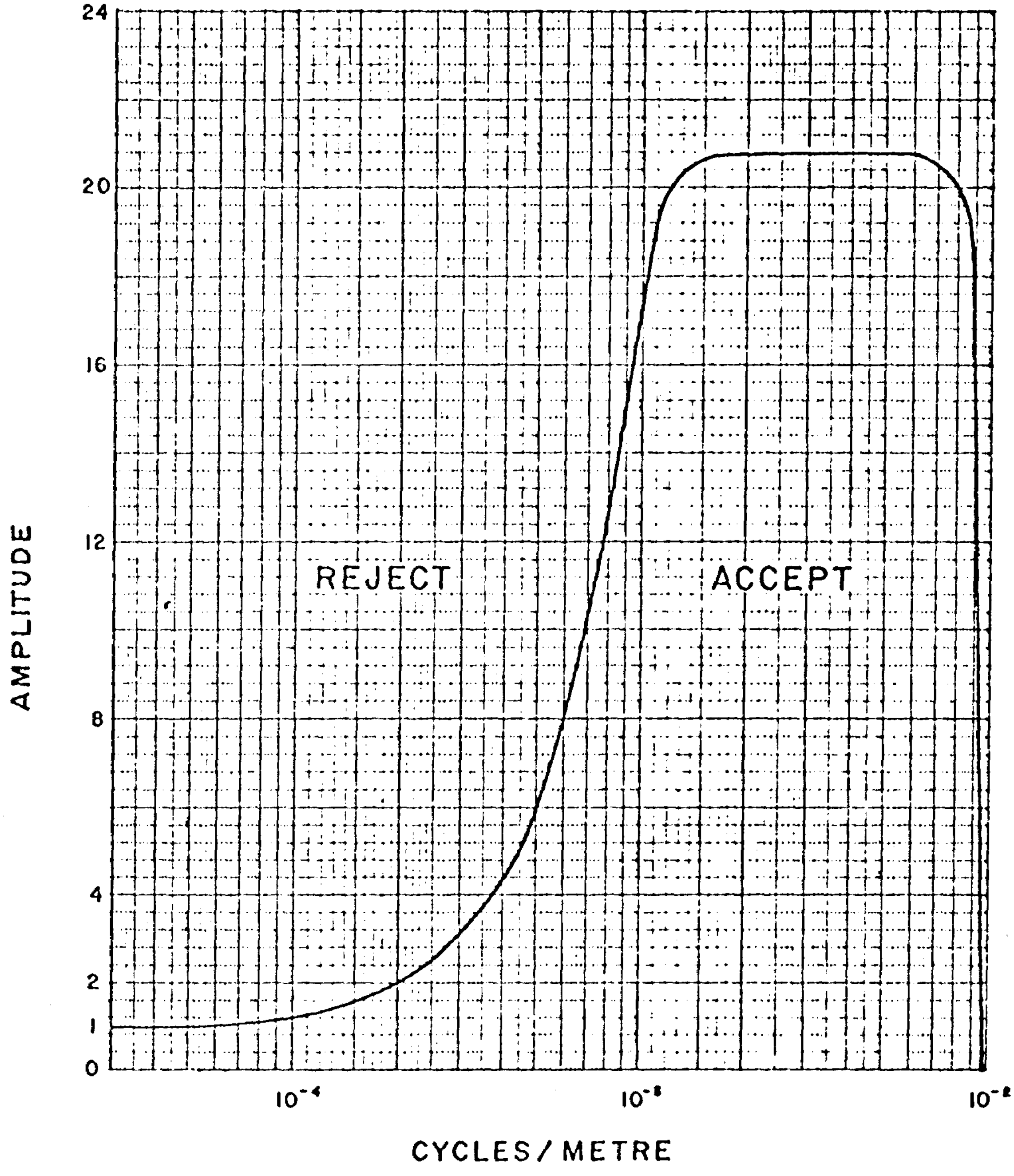


Figure II-2 Frequency response of magnetic enhancement operator.

geological structure. It defines the near-surface local geology while de-emphasizing deep-seated regional features. It primarily has application when the magnetic rock units are steeply dipping and the earth's field dips in excess of 60 degrees.

## VLF-EM

VLF-EM anomalies are not EM anomalies in the conventional sense. EM anomalies primarily reflect eddy currents flowing in conductors which have been energized inductively by the primary field. In contrast, VLF-EM anomalies primarily reflect current gathering, which is a non-inductive phenomenon. The primary field sets up currents which flow weakly in rock and overburden, and these tend to collect in low resistivity zones. Such zones may be due to massive sulfides, shears, river valleys and even unconformities.

The Herz Industries Ltd Totem VLF-electromagnetometer measures the total field and vertical quadrature components. Both these components are digitally recorded in the aircraft with a sensitivity of 0.1 percent. The total field yields peaks over VLF-EM current concentrations

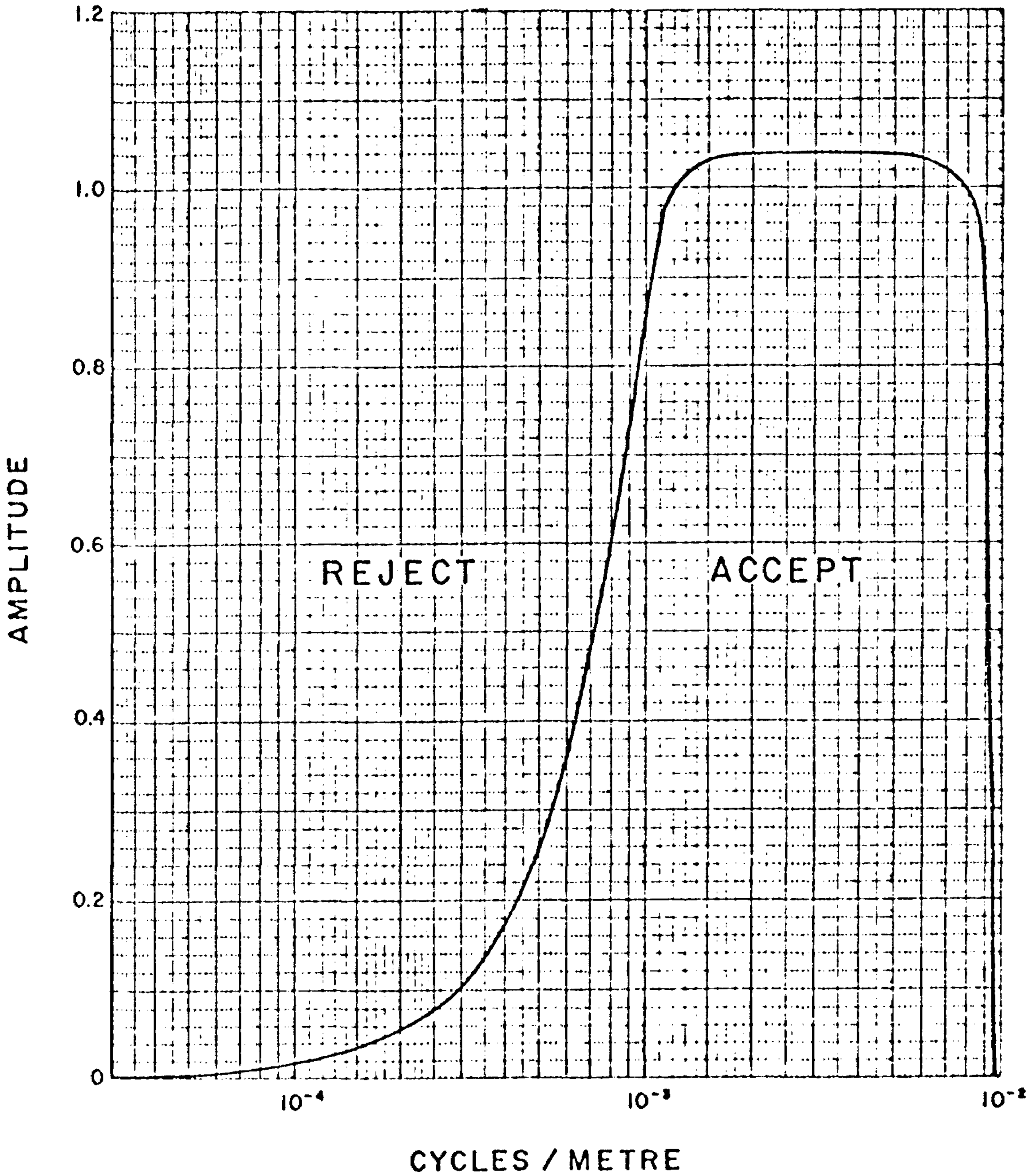


Figure II-3 Frequency response of VLF-EM operator.

whereas the quadrature component tends to yield crossovers. Both appear as traces on the profile records. The total field data also are filtered digitally and displayed on a contour map, to facilitate the recognition of trends in the rock strata and the interpretation of geologic structure.

The response of the VLF-EM total field filter operator in the frequency domain (Figure II-3) is basically similar to that used to produce the enhanced magnetic map (Figure II-2). The two filters are identical along the abscissa but different along the ordinant. The VLF-EM filter removes long wavelengths such as those which reflect regional and wave transmission variations. The filter sharpens short wavelength responses such as those which reflect local geological variations. The filtered total field VLF-EM contour map is produced with a contour interval of one percent.

# APPENDIX A

## THE FLIGHT RECORD AND PATH RECOVERY

Both analog and digital flight records were produced. The analog profiles were recorded on chart paper in the aircraft during the survey. The digital profiles were generated later by computer and plotted on electrostatic chart paper at a scale of 1:10,000. The digital profiles are listed in Table A-1.

In Table A-1, the log resistivity scale of 0.03 decade/mm means that the resistivity changes by an order of magnitude in 33 mm. The resistivities at 0, 33, 67, 100 and 133 mm up from the bottom of the digital flight record are respectively 1, 10, 100, 1,000 and 10,000 ohm-m.

The fiducial marks on the flight records represent points on the ground which were recovered from camera film. Continuous photographic coverage allowed accurate photo-path recovery locations for the fiducials, which were then plotted on the geophysical maps to provide the track of the aircraft.

The fiducial locations on both the flight records and flight path maps were examined by a computer for unusual helicopter speed changes. Such speed changes may denote an error in flight path recovery. The resulting flight path locations therefore reflect a more stringent checking than is provided by standard flight path recovery techniques.

Table A-1. The Digital Profiles

| Channel Name | (Freq) | Observed parameters | Scale units/mm |
|---|---|---|---|
| MAG | | magnetics | 10 nT |
| ALT | | bird height | 3 m |
| CXI | ( 900 Hz) | vertical coaxial coil-pair inphase | 1 ppm |
| CXQ | ( 900 Hz) | vertical coaxial coil-pair quadrature | 1 ppm |
| CXS | ( 900 Hz) | ambient noise monitor (coaxial receiver) | 1 ppm |
| CPI | ( 900 Hz) | horizontal coplanar coil-pair inphase | 1 ppm |
| CPQ | ( 900 Hz) | horizontal coplanar coil-pair quadrature | 1 ppm |
| CPS | ( 900 Hz) | ambient noise monitor (coplanar receiver) | 1 ppm |
| CPI | (7200 Hz) | horizontal coplanar coil-pair inphase | 1 ppm |
| CPQ | (7200 Hz) | horizontal coplanar coil-pair quadrature | 1 ppm |
| VLFT | | VLF-EM total field | 1 % |
| VLFQ | | VLF-EM vertical quadrature | 1 % |
| | | **Computed Parameters** | |
| DIFI | ( 900 Hz) | difference function inphase from CXI and CPI | 1 ppm |
| DIFQ | ( 900 Hz) | difference function quadrature from CXQ and CPQ | 1 ppm |
| REC1 | | first anomaly recognition function | 1 ppm |
| REC2 | | second anomaly recognition function | 1 ppm |
| REC3 | | third anomaly recognition function | 1 ppm |
| REC4 | | fourth anomaly recognition function | 1 ppm |
| CDT | | conductance | 1 grade |
| RES | ( 900 Hz) | log resistivity | .03 decade |
| RES | (7200 Hz) | log resistivity | .03 decade |
| DP | ( 900 Hz) | apparent depth | 3 m |
| DP | (7200 Hz) | apparent depth | 3 m |
| FEO% | ( 900 Hz) | apparent weight percent magnetite | 0.25% |

South

Ministry of Natural Resources
Ontario

# Report of Work
(Geophysical, Geological, Geochemical and Expenditures)

F.W.M. 84-19B

52K16NE0009 2.6562 CURIE LAKE

900

| Type of Survey(s) | Township or Area |
|---|---|
| Airborne Geophysics | Avis Lake - Curie Lake |
| Claim Holder(s): Getty Canadian Metals, Limited | Prospector's Licence No. |
| Address: 1200 - 150 York Street, Toronto, Ontario M5H 3S5 | |
| Survey Company: Dighem Limited | Date of Survey (from & to): 17 06 83 / 02 07 83 (Day Mo. Yr.) — Total Miles of line Cut: -- |

Name and Address of Author (of Geo-Technical report)
Paul Smith c/o Dighem Limited, Suite 7010, 1 First Canadian Place, Toronto, Ontario M5X 1C7

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

| Special Provisions | Geophysical | Days per Claim |
|---|---|---|
| For first survey: Enter 40 days. (This includes line cutting) | - Electromagnetic | |
| | - Magnetometer | |
| For each additional survey: using the same grid: Enter 20 days (for each) | - Radiometric | |
| | - Other | |
| | Geological | |
| | Geochemical | |

| Man Days | Geophysical | Days per Claim |
|---|---|---|
| Complete reverse side and enter total(s) here | - Electromagnetic | |
| | - Magnetometer | |
| | - Radiometric | |
| | - Other | |
| | Geological | |
| | Geochemical | |

RECEIVED JUN 08 1984 MINING LANDS SECTION

| Airborne Credits | | Days per Claim |
|---|---|---|
| Note: Special provisions credits do not apply to Airborne Surveys. | Electromagnetic | 20 |
| | Magnetometer | 20 |
| | VLF-EM ~~Radiometric~~ | 20 |

**Expenditures (excludes power stripping)**

Type of Work Performed

Performed on Claim(s)

RED LAKE MINING DIV. RECEIVED APR - 2 1984 A.M. 7 8 9 10 11 12 1 2 3 4 5 6 P.M.

Calculation of Expenditure Days Credits

Total Expenditures $ ÷ 15 = Total Days Credits

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.

**Mining Claims Traversed (List in numerical sequence)**

| Prefix | Number | Expend. Days Cr. | Prefix | Number | Expend. Days Cr. |
|---|---|---|---|---|---|
| KRL | 621632 | 60 | KRL | 621655 | 60 |
| | 621633 | 60 | | 621656 | 60 |
| | 621634 | 60 | | 621657 | 60 |
| | 621635 | 60 | | 621658 | 60 |
| | 621636 | 60 | | 621659 | 60 |
| | 621637 | 60 | | 621660 | 60 |
| | 621638 | 60 | | 621661 | 60 |
| | 621639 | 60 | | 621662 | 60 |
| | 621640 | 60 | | 621663 | 60 |
| | 621641 | 60 | | 621664 | 60 |
| | 621642 | 60 | | 621665 | 60 |
| | 621643 | 60 | | 621666 | 60 |
| | 621644 | 60 | | 621667 | 60 |
| | 621645 | 60 | | 621668 | 60 |
| | 621646 | 60 | | 621669 | 60 |
| | 621647 | 60 | | 621670 | 60 |
| | 621648 | 60 | | 621671 | 60 |
| | 621649 | 60 | | 621672 | 60 |
| | 621650 | 60 | | 621673 | 60 |
| | 621651 | 60 | | 621674 | 60 |
| | 621652 | 60 | | 621675 | 60 |
| | 621653 | 60 | | 621676 | 60 |
| | 621654 | 60 | | 621677 | 60 |

See attached list

Total number of mining claims covered by this report of work: 103

KRL 621632

| For Office Use Only | | |
|---|---|---|
| Total Days Cr. Recorded: 6180 | Date Recorded: April 2/84 | Mining Recorder: [signature] |
| | Date Approved as Recorded: 84.10.2 | Branch Director: [signature] |

| Date | Recorded Holder or Agent (Signature) |
|---|---|
| | |

**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

| Date Certified | Certified by (Signature) |
|---|---|
| | |

1362 (81/9)

Mining Claims Traversed (List in numerical sequence) contd...

#84-198

| Prefix | Number | Expend. Days Cr. | Prefix | Number | Expend. Days Cr. |
|---|---|---|---|---|---|
| KRL | 621678 | 60 | KRL | 621726 | 60 |
| | 621679 | 60 | | 621727 | 60 |
| | 621680 | 60 | | 621728 | 60 |
| | 621681 | 60 | | 621729 | 60 |
| | 621682 | 60 | | 621730 | 60 |
| | 621683 | 60 | | 621731 | 60 |
| | 621684 | 60 | | 621732 | 60 |
| | 621685 | 60 | | 621733 | 60 |
| | 621686 | 60 | | 621734 | 60 |
| | 621687 | 60 | | 621735 | 60 |
| | 621688 | 60 | | 621736 | 60 |
| | 621689 | 60 | | 621737 | 60 |
| | 621690 | 60 | | 621738 | 60 |
| | 621691 | 60 | | 621739 | 60 |
| | 621692 | 60 | | 621740 | 60 |
| | 621693 | 60 | | 621741 | 60 |
| | 621694 | 60 | | 621742 | 60 |
| | 621695 | 60 | | 621743 | 60 |
| | 621696 | 60 | | 621744 | 60 |
| | 621697 | 60 | | 621745 | 60 |
| | 621698 | 60 | | 621746 | 60 |
| | ~~621699~~ | ~~60~~ | | 621747 | 60 |
| | 621719 | 60 | | 621748 | 60 |
| | 621720 | 60 | | 621749 | 60 |
| | 621721 | 60 | | 621750 | 60 |
| | 621722 | 60 | | 621751 | 60 |
| | 621723 | 60 | | 621752 | 60 |
| | 621724 | 60 | | 621753 | 60 |
| | 621725 | 60 | | 621631 | 60 |

RED LAKE
MINING DIV.
RECEIVED
APR - 2 1984
A.M. P.M.
7 8 9 10 11 12 1 2 3 4 5 6

KRL 621672

| | Date Certified | Certified by (Signature) |
|---|---|---|
| | | |

1362 (81/9)

2.6562 North

Ontario — Ministry of Natural Resources

# Report of Work
(Geophysical, Geological, Geochemical and Expenditures)

#84-19A

?. W. M.

Mining Act

Instructions – Please type or print.
– If number of mining claims traversed exceeds space on this form, attach a list.
Note – Only days credits calculated in the "Expenditures" section may be entered in the "Expend. Days Cr." columns.
– Do not use shaded areas below.

| | |
|---|---|
| Type of Survey(s): Airborne Geophysical | Township or Area: Avis Lake - Curie Lake |
| Claim Holder(s): Getty Canadian Metals, Limited | Prospector's Licence No.: |
| Address: 1200 - 150 York Street, Toronto, Ontario M5H 3S5 | |
| Survey Company: Dighem Limited | Date of Survey (from & to): 17 06 83 – 02 07 83 (Day Mo. Yr.) ; Total Miles of line Cut: -- |
| Name and Address of Author (of Geo-Technical report): Paul Smith c/o Dighem Limited Suite 7010, First Canadian Place Toronto, Ontario M5X 1C7 | |

## Credits Requested per Each Claim in Columns at right

| Special Provisions | | Days per Claim |
|---|---|---|
| For first survey: Enter 40 days. (This includes line cutting) | Geophysical | |
| | - Electromagnetic | |
| | - Magnetometer | |
| For each additional survey: using the same grid: Enter 20 days (for each) | - Radiometric | |
| | - Other | |
| | Geological | |
| | Geochemical | |
| **Man Days** | Geophysical | Days per Claim |
| Complete reverse side and enter total(s) here | - Electromagnetic | |
| | - Magnetometer | |
| | - Radiometric | |
| | - Other | |
| | Geological | |
| | Geochemical | |
| **Airborne Credits** | | Days per Claim |
| Note: Special provisions credits do not apply to Airborne Surveys. | Electromagnetic | 20 |
| | Magnetometer | 20 |
| | VLF.EM ~~Radiometric~~ | 20 |

RECEIVED JUN 08 1984 MINING LANDS SECTION

## Expenditures (excludes power stripping)

Type of Work Performed:

Performed on Claim(s):

RED LAKE MINING DIV. RECEIVED APR - 2 1984 A.M. 7 8 9 10 11 12 1 2 3 4 5 6 P.M.

Calculation of Expenditure Days Credits

Total Expenditures $ ÷ 15 = Total Days Credits

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 | Recorded Holder or Agent (Signature) |
|---|---|
| | |

## Mining Claims Traversed (List in numerical sequence)

| Prefix | Number | Expend. Days Cr. | Prefix | Number | Expend. Days Cr. |
|---|---|---|---|---|---|
| KRL | 621589 | 60 | KRL | 621612 | 60 |
| | 621590 | 60 | | 621613 | 60 |
| | 621591 | 60 | | 621614 | 60 |
| | 621592 | 60 | | 621615 | 60 |
| | 621593 | 60 | | 621616 | 60 |
| | 621594 | 60 | | 621617 | 60 |
| | 621595 | 60 | | 621618 | 60 |
| | 621596 | 60 | | 621619 | 60 |
| | 621597 | 60 | | 621620 | 60 |
| | 621598 | 60 | | 621621 | 60 |
| | 621599 | 60 | | 621622 | 60 |
| | 621600 | 60 | | 621623 | 60 |
| | 621601 | 60 | | 621624 | 60 |
| | 621602 | 60 | | 621625 | 60 |
| | 621603 | 60 | | 621626 | 60 |
| | 621604 | 60 | | 621627 | 60 |
| | 621605 | 60 | | 621628 | 60 |
| | 621606 | 60 | | 621629 | 60 |
| | 621607 | 60 | | 621630 | 60 |
| | 621608 | 60 | | 621754 | 60 |
| | 621609 | 60 | | 621755 | 60 |
| | 621610 | 60 | | 621756 | 60 |
| | 621611 | 60 | | 621757 | 60 |
| | 621758 | 60 | | | |
| | 621701 | 60 | | | |

Total number of mining claims covered by this report of work: 48

| For Office Use Only | | |
|---|---|---|
| Total Days Cr. Recorded: 2880 | Date Recorded: April 2/84 | Mining Recorder: [signature] |
| | Date Approved as Recorded: 84.10.2 | Branch Director: [signature] |

## 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.

KRL 621589

Name and Postal Address of Person Certifying

| Date Certified | Certified by (Signature) |
|---|---|
| | |

File ____

Ontario

# 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) Airborne Geophysical

Township or Area Avis Lake - Curie Lake

Claim Holder(s) Getty Canadian Metals, Limited
1200-150 York St, Toronto, Ontario M5H 3S5

Survey Company Dighem Limited

Author of Report Paul Smith

Address of Author c/o Dighem Ltd, Suite 7010 1st Canadian Pl. Toronto M5K 1C7

Covering Dates of Survey 17/06/83 to 02/07/83
(linecutting to office)

Total ~~Miles~~ Km. of Line ~~Cut~~ Flown 2734 Km

**SPECIAL PROVISIONS CREDITS REQUESTED**

ENTER 40 days (includes line cutting) for first survey.

ENTER 20 days for each additional survey using same grid.

| | DAYS per claim |
|---|---|
| Geophysical | |
| - Electromagnetic | |
| - Magnetometer | |
| - Radiometric | |
| - Other | |
| Geological | |
| Geochemical | |

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

Magnetometer 20 Electromagnetic 20 ~~Radiometric~~ V.L.F.-EM 20
(enter days per claim)

DATE: [signature] SIGNATURE: [signature]
Author of Report or Agent

**MINING CLAIMS TRAVERSED**
List numerically

(prefix) (number)

SEE ATTACHED LIST

If space insufficient, attach list

TOTAL CLAIMS 103

OFFICE USE ONLY

Res. Geol. ____ Qualifications ____

Previous Surveys

| File No. | Type | Date | Claim Holder |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

837 (5/79)

# GEOPHYSICAL TECHNICAL DATA

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

Number of Stations ______ Number of Readings ______

Station interval ______ Line spacing ______

Profile scale ______

Contour interval ______

MAGNETIC

Instrument ______

Accuracy – Scale constant ______

Diurnal correction method ______

Base Station check-in interval (hours) ______

Base Station location and value ______

ELECTROMAGNETIC

Instrument ______

Coil configuration ______

Coil separation ______

Accuracy ______

Method: ☐ Fixed transmitter ☐ Shoot back ☐ In line ☐ Parallel line

Frequency ______ (specify V.L.F. station)

Parameters measured ______

GRAVITY

Instrument ______

Scale constant ______

Corrections made ______

Base station value and location ______

Elevation accuracy ______

INDUCED POLARIZATION
RESISTIVITY

Instrument ______

Method ☐ Time Domain ☐ Frequency Domain

Parameters – On time ______ Frequency ______

– Off time ______ Range ______

– Delay time ______

– Integration time ______

Power ______

Electrode array ______

Electrode spacing ______

Type of electrode ______

SELF POTENTIAL

Instrument ______ Range ______

Survey Method ______

Corrections made ______

RADIOMETRIC

Instrument ______

Values measured ______

Energy windows (levels) ______

Height of instrument ______ Background Count ______

Size of detector ______

Overburden ______

(type, depth – include outcrop map)

OTHERS (SEISMIC, DRILL WELL LOGGING ETC.)

Type of survey ______

Instrument ______

Accuracy ______

Parameters measured ______

Additional information (for understanding results) ______

AIRBORNE SURVEYS

Type of survey(s) Airborne V.L.F., EM, Magnetics

Instrument(s) Sonotek PMH 5010 magnetometer, Hertz Totem-2A, V.L.F., Dighem III EM system

(specify for each type of survey)

Accuracy ± 1 NT magnetics, ± 0.1% V.L.F., ± .2ppm @ $900H_z$, ± 0.4ppm @ $7200H_z$

(specify for each type of survey)

Aircraft used A Star Turbine Helicopter

Sensor altitude 43m magnetics, 51m V.L.F., 33m EM system

Navigation and flight path recovery method Visual, Geocam sequence camera

Aircraft altitude 51m Line Spacing 200m

~~Miles~~ Km flown over total area 2734 Km (ToT) Over claims only 83.7 Km (52 mi.)

# 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 ____________________

____________________

____________________

## SAMPLE PREPARATION

(Includes drying, screening, crushing, ashing)

Mesh size of fraction used for analysis ____________________

____________________

____________________

____________________

General ____________________

____________________

____________________

____________________

____________________

____________________

____________________

____________________

____________________

____________________

## 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 ____________________

____________________

____________________

____________________

____________________

____________________

____________________

____________________

____________________

____________________

Papaonga Lake - 60 days assessment credits for Geophysical surveys; 103 claims (March 1984)

**MINING CLAIM**

| PREFIX | NUMBER | PREFIX | NUMBER | PREFIX | NUMBER |
|---|---|---|---|---|---|
| KRL | 621632 | KRL | 621678 | KRL | 621743 |
| | 621633 | | 621679 | | 621744 |
| | 621634 | | 621680 | | 621745 |
| | 621635 | | 621681 | | 621746 |
| | 621636 | | 621682 | | 621747 |
| | 621637 | | 621683 | | 621748 |
| | 621638 | | 621684 | | 621749 |
| | 621639 | | 621685 | | 621750 |
| | 621640 | | 621686 | | 621751 |
| | 621641 | | 621687 | | 621752 |
| | 621642 | | 621688 | | 621753 |
| | 621643 | | 621689 | | 621631 |
| | 621644 | | 621690 | | |
| | 621645 | | 621691 | | |
| | 621646 | | 621692 | | |
| | 621647 | | 621693 | | |
| | 621648 | | 621694 | | |
| | 621649 | | 621695 | | |
| | 621650 | | 621696 | | |
| | 621651 | | 621697 | | |
| | 621652 | | 621698 | | |
| | 621653 | | ~~621699~~ | | |
| | 621654 | | 621719 | | |
| | 621655 | | 621720 | | |
| | 621656 | | 621721 | | |
| | 621657 | | 621722 | | |
| | 621658 | | 621723 | | |
| | 621659 | | 621724 | | |
| | 621660 | | 621725 | | |
| | 621661 | | 621726 | | |
| | 621662 | | 621727 | | |
| | 621663 | | 621728 | | |
| | 621664 | | 621729 | | |
| | 621665 | | 621730 | | |
| | 621666 | | 621731 | | |
| | 621667 | | 621732 | | |
| | 621668 | | 621733 | | |
| | 621669 | | 621734 | | |
| | 621670 | | 621735 | | |
| | 621671 | | 621736 | | |
| | 621672 | | 621737 | | |
| | 621673 | | 621738 | | |
| | 621674 | | 621739 | | |
| | 621675 | | 621740 | | |
| | 621676 | | 621741 | | |
| | 621677 | | 621742 | | |

Ontario

File ______

## 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) Airborne Geophysical

Township or Area Avis Lake - Curie Lake

Claim Holder(s) Getty Canadian Metals, Limited
1200-150 York St. Toronto, Ontario M5H 3S5

Survey Company Dighem Limited

Author of Report Paul Smith c/o Dighem Limited

Address of Author Suite 7010, 1st Canadian Place Toronto M5X 1C7

Covering Dates of Survey 17/06/83 to 02/07/83
(linecutting to office)

Total ~~Miles~~ Km of Line ~~Cut~~ Flown 2734 Km

**SPECIAL PROVISIONS CREDITS REQUESTED**

ENTER 40 days (includes line cutting) for first survey.

ENTER 20 days for each additional survey using same grid.

| | DAYS per claim |
|---|---|
| Geophysical | |
| --Electromagnetic | |
| --Magnetometer | |
| --Radiometric | |
| --Other | |
| Geological | |
| Geochemical | |

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

Magnetometer 20 Electromagnetic 20 ~~Radiometric~~ V.L.F.-EM 20
(enter days per claim)

DATE: [handwritten] SIGNATURE: [signature]
Author of Report or Agent

Res. Geol. ______ Qualifications 2.3420

**Previous Surveys**

| File No. | Type | Date | Claim Holder |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

OFFICE USE ONLY

**MINING CLAIMS TRAVERSED**
**List numerically**

(prefix) (number)

SEE ATTACHED LIST

If space insufficient, attach list

TOTAL CLAIMS 48

# GEOPHYSICAL TECHNICAL DATA

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

Number of Stations ______________________ Number of Readings ______________________

Station interval ______________________ Line spacing ______________________

Profile scale ______________________

Contour interval ______________________

**MAGNETIC**

Instrument ______________________

Accuracy – Scale constant ______________________

Diurnal correction method ______________________

Base Station check-in interval (hours) ______________________

Base Station location and value ______________________

______________________

**ELECTROMAGNETIC**

Instrument ______________________

Coil configuration ______________________

Coil separation ______________________

Accuracy ______________________

Method: ☐ Fixed transmitter ☐ Shoot back ☐ In line ☐ Parallel line

Frequency ______________________
(specify V.L.F. station)

Parameters measured ______________________

**GRAVITY**

Instrument ______________________

Scale constant ______________________

Corrections made ______________________

______________________

Base station value and location ______________________

______________________

Elevation accuracy ______________________

**INDUCED POLARIZATION RESISTIVITY**

Instrument ______________________

Method ☐ Time Domain ☐ Frequency Domain

Parameters – On time ______________________ Frequency ______________________

– Off time ______________________ Range ______________________

– Delay time ______________________

– Integration time ______________________

Power ______________________

Electrode array ______________________

Electrode spacing ______________________

Type of electrode ______________________

## SELF POTENTIAL

Instrument ______ Range ______

Survey Method ______

______

Corrections made ______

______

## RADIOMETRIC

Instrument ______

Values measured ______

Energy windows (levels) ______

Height of instrument ______ Background Count ______

Size of detector ______

Overburden ______

(type, depth – include outcrop map)

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

Type of survey ______

Instrument ______

Accuracy ______

Parameters measured ______

______

Additional information (for understanding results) ______

______

______

## AIRBORNE SURVEYS

Type of survey(s) Airborne V.L.F., EM, Magnetics

Instrument(s) Sonotek PMH 5010 magnetometer, Hertz Totem-2A V.L.F., Dighem III EM system

(specify for each type of survey)

Accuracy ± 1 NT magnetics, ± 0.1% V.L.F. ± 0.2ppm @ 900$H_z$, ± 0.4ppm @ 7200$H_z$

(specify for each type of survey)

Aircraft used A Star CG - NSM Turbine Helicopter

Sensor altitude 43 magnetics, 51m V.L.F., 33m EM system

Navigation and flight path recovery method Visual, Geocam sequence camera

______

Aircraft altitude 51m Line Spacing 200m

~~Miles~~ Km flown over total area 2734 Km Over claims only 38.64 Km (24 line miles)

## 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 ____________________

____________________

____________________

### SAMPLE PREPARATION
(Includes drying, screening, crushing, ashing)

Mesh size of fraction used for analysis ____________________

____________________

____________________

____________________

General ____________________

____________________

____________________

____________________

____________________

____________________

____________________

____________________

____________________

____________________

### 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 ____________________

____________________

____________________

____________________

____________________

____________________

____________________

____________________

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____________________

Papaonga Lake - 60 days assessment credits for Geophysical surveys; 48 claims (March 1984)

**MINING CLAIM**

| PREFIX | NUMBER | PREFIX | NUMBER |
|---|---|---|---|
| KRL | 621589 | KRL | 621614 |
| | 621590 | | 621615 |
| | 621591 | | 621616 |
| | 621592 | | 621617 |
| | 621593 | | 621618 |
| | 621594 | | 621619 |
| | 621595 | | 621620 |
| | 621596 | | 621621 |
| | 621597 | | 621622 |
| | 621598 | | 621623 |
| | 621599 | | 621624 |
| | 621600 | | 621625 |
| | 621601 | | 621626 |
| | 621602 | | 621627 |
| | 621603 | | 621628 |
| | 621604 | | 621629 |
| | 621605 | | 621630 |
| | 621606 | | 621754 |
| | 621607 | | 621755 |
| | 621608 | | 621756 |
| | 621609 | | 621757 |
| | 621610 | | 621758 |
| | 621611 | | 621701 |
| | 621612 | | |
| | 621613 | | |

1984 04 05

Your File:
Our File: 2.6562

Albert Scott Rivett
Mining Recorder
Ministry of Natural Resources
Ontario Government Building
Box 5003
Red Lake, Ontario
P0V 2M0

Dear Sir:

We have received reports and maps for an Airborne Geophysical (Electromagnetic, Magnetometer and VLF) Survey submitted on Mining Claims KRL 621589 et al in the Area of Avis Lake.

This material will be examined and assessed and a statement of assessment work credits will be issued.

We do not have a copy of the report of work which is normally filed with you prior to the submission of this technical data. Please forward a copy as soon as possible.

Yours sincerely,

S.E. Yundt
Director
Land Management Branch

Whitney Block, Room 6643
Queen's Park
Toronto, Ontario
M7A 1W3
Phone:(416)965-6918

A. Barr:mc

cc: Getty Canadian Minerals Limited
Suite 1200
150 York Street
Toronto, Ontario.
M5H 3S5

cc: Dighem Limited
Suite 7010
1 First Canadian Place
Toronto,Ontario
M5X 1C7
Attn: Paul Smith

Getty Canadian Metals, Limited | Suite 1200, 150 York Street, Toronto, Ontario M5H 3S5 • (416) 863-0487

March 29, 1984

Mining Recorder
Ministry of Natural Resources
P.O. Box 324
Red Lake, Ontario
POV 2M0

Attention: Mr. S. Rivett

Dear Scott:

RE: Report of Work - Airborne Geophysical Work
Uchi Project (Papaonga Property), Ontario

Attached are Getty Canadian Metals, Limited's two (2) Reports of Work dated March 29, 1984, for KRL 621632 et al and KRL 621589 et al. Getty respectfully requests your office's acceptance and approval of the subject airborne geophysical assessment work conducted by Dighem Limited, as indicated.

The related technical report has been forwarded to the Land Management Branch office in Toronto. A copy of the title page is enclosed for your records.

We trust you will find the attached to be in order.

Yours very truly,

GETTY CANADIAN METALS, LIMITED

G. C. Jarvis
Landman

GCJ/ht
Enc.
c.c. W. Ewert

E. F. Anderson
Land Management Branch, Toronto

South

Ministry of Natural Resources

Ontario

Mı

# Report of Work

(Geophysical, Geological, Geochemical and Expenditures)

Mining Act

Instructions: – Please type or print.
– If number of mining claims traversed exceeds space on this form, attach a list.

Note: – Only days credits calculated in the "Expenditures" section may be entered in the "Expend. Days Cr." columns.
– Do not use shaded areas below.

Type of Survey(s): Airborne Geophysics

Township or Area: Avis Lake - Curie Lake

Claim Holder(s): Getty Canadian Metals, Limited

Prospector's Licence No.:

Address: 1200 - 150 York Street, Toronto, Ontario M5H 3S5

Survey Company: Dighem Limited

Date of Survey (from & to): 17 06 83 (Day Mo. Yr.) 02 07 83 (Day Mo. Yr.)

Total Miles of line Cut: --

Name and Address of Author (of Geo-Technical report): Paul Smith c/o Dighem Limited, Suite 7010, 1 First Canadian Place, Toronto, Ontario M5X 1C7

Credits Requested per Each Claim in Columns at right

| Special Provisions | Geophysical | Days per Claim |
|---|---|---|
| For first survey: Enter 40 days. (This includes line cutting) | - Electromagnetic | |
| | - Magnetometer | |
| For each additional survey: using the same grid: Enter 20 days (for each) | - Radiometric | |
| | - Other | |
| | Geological | |
| | Geochemical | |

| Man Days | Geophysical | Days per Claim |
|---|---|---|
| Complete reverse side and enter total(s) here | - Electromagnetic | |
| | - Magnetometer | |
| | - Radiometric | |
| | - Other | |
| | Geological | |
| | Geochemical | |

| Airborne Credits | | Days per Claim |
|---|---|---|
| Note: Special provisions credits do not apply to Airborne Surveys. | Electromagnetic | 20 |
| | Magnetometer | 20 |
| | VLF-EM ~~Radiometric~~ | 20 |

Expenditures (excludes power stripping)

Type of Work Performed:

Performed on Claim(s):

Calculation of Expenditure Days Credits

Total Expenditures $ ÷ 15 = Total Days Credits

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: March 29/84 | Recorded Holder or Agent (Signature): [signature]

Mining Claims Traversed (List in numerical sequence)

| Prefix | Number | Expend. Days Cr. | Prefix | Number | Expend. Days Cr. |
|---|---|---|---|---|---|
| KRL | 621632 | 60 | KRL | 621655 | 60 |
| | 621633 | 60 | | 621656 | 60 |
| | 621634 | 60 | | 621657 | 60 |
| | 621635 | 60 | | 621658 | 60 |
| | 621636 | 60 | | 621659 | 60 |
| | 621637 | 60 | | 621660 | 60 |
| | 621638 | 60 | | 621661 | 60 |
| | 621639 | 60 | | 621662 | 60 |
| | 621640 | 60 | | 621663 | 60 |
| | 621641 | 60 | | 621664 | 60 |
| | 621642 | 60 | | 621665 | 60 |
| | 621643 | 60 | | 621666 | 60 |
| | 621644 | 60 | | 621667 | 60 |
| | 621645 | 60 | | 621668 | 60 |
| | 621646 | 60 | | 621669 | 60 |
| | 621647 | 60 | | 621670 | 60 |
| | 621648 | 60 | | 621671 | 60 |
| | 621649 | 60 | | 621672 | 60 |
| | 621650 | 60 | | 621673 | 60 |
| | 621651 | 60 | | 621674 | 60 |
| | 621652 | 60 | | 621675 | 60 |
| | 621653 | 60 | | 621676 | 60 |
| | 621654 | 60 | | 621677 | 60 |

See attached list

Total number of mining claims covered by this report of work: 103

For Office Use Only

| Total Days Cr. Recorded | Date Recorded | Mining Recorder |
|---|---|---|
| | Date Approved as Recorded | Branch Director |

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: W. D. Sweet c/o Getty Canadian Metals Limited, 1200, 150 York St Toronto

Date Certified: March 29/84 | Certified by (Signature): [signature]

1362 (81/9)

Mining Claims Traversed (List in numerical sequence) contd...

| Prefix | Number | Expend. Days Cr. | Prefix | Number | Expend. Days Cr. |
|---|---|---|---|---|---|
| KRL | 621678 | 60 | KRL | 621726 | 60 |
| | 621679 | 60 | | 621727 | 60 |
| | 621680 | 60 | | 621728 | 60 |
| | 621681 | 60 | | 621729 | 60 |
| | 621682 | 60 | | 621730 | 60 |
| | 621683 | 60 | | 621731 | 60 |
| | 621684 | 60 | | 621732 | 60 |
| | 621685 | 60 | | 621733 | 60 |
| | 621686 | 60 | | 621734 | 60 |
| | 621687 | 60 | | 621735 | 60 |
| | 621688 | 60 | | 621736 | 60 |
| | 621689 | 60 | | 621737 | 60 |
| | 621690 | 60 | | 621738 | 60 |
| | 621691 | 60 | | 621739 | 60 |
| | 621692 | 60 | | 621740 | 60 |
| | 621693 | 60 | | 621741 | 60 |
| | 621694 | 60 | | 621742 | 60 |
| | 621695 | 60 | | 621743 | 60 |
| | 621696 | 60 | | 621744 | 60 |
| | 621697 | 60 | | 621745 | 60 |
| | 621698 | 60 | | 621746 | 60 |
| | ~~621699~~ | ~~60~~ | | 621747 | 60 |
| | 621719 | 60 | | 621748 | 60 |
| | 621720 | 60 | | 621749 | 60 |
| | 621721 | 60 | | 621750 | 60 |
| | 621722 | 60 | | 621751 | 60 |
| | 621723 | 60 | | 621752 | 60 |
| | 621724 | 60 | | 621753 | 60 |
| | 621725 | 60 | | 621631 | 60 |

North

Ministry of Natural Resources
Ontario

# Report of Work
(Geophysical, Geological, Geochemical and Expenditures)

Mining Act

Instructions: – Please type or print.
– If number of mining claims traversed exceeds space on this form, attach a list.
Note: – Only days credits calculated in the "Expenditures" section may be entered in the "Expend. Days Cr." columns.
– Do not use shaded areas below.

Type of Survey(s): Airborne Geophysical
Township or Area: Avis Lake – Curie Lake
Claim Holder(s): Getty Canadian Metals, Limited
Prospector's Licence No.:
Address: 1200 – 150 York Street, Toronto, Ontario M5H 3S5
Survey Company: Dighem Limited
Date of Survey (from & to): 17 06 83 – 02 07 83
Total Miles of line Cut: --
Name and Address of Author (of Geo-Technical report): Paul Smith c/o Dighem Limited Suite 7010, First Canadian Place Toronto, Ontario M5X 1C7

## Credits Requested per Each Claim in Columns at right

| Special Provisions | Geophysical | Days per Claim |
|---|---|---|
| For first survey: Enter 40 days. (This includes line cutting) | - Electromagnetic | |
| | - Magnetometer | |
| For each additional survey: using the same grid: Enter 20 days (for each) | - Radiometric | |
| | - Other | |
| | Geological | |
| | Geochemical | |

| Man Days | Geophysical | Days per Claim |
|---|---|---|
| Complete reverse side and enter total(s) here | - Electromagnetic | |
| | - Magnetometer | |
| | - Radiometric | |
| | - Other | |
| | Geological | |
| | Geochemical | |

| Airborne Credits | | Days per Claim |
|---|---|---|
| Note: Special provisions credits do not apply to Airborne Surveys. | Electromagnetic | 20 |
| | Magnetometer | 20 |
| | ~~Radiometric~~ VLF.EM | 20 |

## Expenditures (excludes power stripping)

Type of Work Performed:

Performed on Claim(s):

Calculation of Expenditure Days Credits

Total Expenditures $ ____ ÷ 15 = Total Days Credits ____

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: March 27/84
Recorded Holder or Agent (Signature): [signature]

## Mining Claims Traversed (List in numerical sequence)

| Prefix | Mining Claim Number | Expend. Days Cr. | Prefix | Mining Claim Number | Expend. Days Cr. |
|---|---|---|---|---|---|
| KRL | 621589 | 60 | KRL | 621612 | 60 |
| | 621590 | 60 | | 621613 | 60 |
| | 621591 | 60 | | 621614 | 60 |
| | 621592 | 60 | | 621615 | 60 |
| | 621593 | 60 | | 621616 | 60 |
| | 621594 | 60 | | 621617 | 60 |
| | 621595 | 60 | | 621618 | 60 |
| | 621596 | 60 | | 621619 | 60 |
| | 621597 | 60 | | 621620 | 60 |
| | 621598 | 60 | | 621621 | 60 |
| | 621599 | 60 | | 621622 | 60 |
| | 621600 | 60 | | 621623 | 60 |
| | 621601 | 60 | | 621624 | 60 |
| | 621602 | 60 | | 621625 | 60 |
| | 621603 | 60 | | 621626 | 60 |
| | 621604 | 60 | | 621627 | 60 |
| | 621605 | 60 | | 621628 | 60 |
| | 621606 | 60 | | 621629 | 60 |
| | 621607 | 60 | | 621630 | 60 |
| | 621608 | 60 | | 621754 | 60 |
| | 621609 | 60 | | 621755 | 60 |
| | 621610 | 60 | | 621756 | 60 |
| | 621611 | 60 | | 621757 | 60 |
| | 621758 | 60 | | | |
| | 621701 | 60 | | | |

Total number of mining claims covered by this report of work: 48

| For Office Use Only | | |
|---|---|---|
| Total Days Cr. Recorded | Date Recorded | Mining Recorder |
| | Date Approved as Recorded | Branch Director |

## 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: W. D. Sweet (Regional Exploration Supt. Getty Canada) c/o Getty Canadian Metals Limited, 1200 – 150 York St. Toronto Ont.

Date Certified: March 27/84
Certified by (Signature): [signature]

1362 (81/9)

# DIGHEM III SURVEY

# OF THE

# UCHI LAKE AREA, ONTARIO

# FOR

# GETTY CANADIAN METALS, LTD.

BY

DIGHEM LIMITED

TORONTO, ONTARIO
SEPTEMBER 30, 1983

P.A. SMITH
GEOPHYSICAL INTERPRETER

Getty

Getty Canadian Metals, Limited | Suite 1200, 150 York Street, Toronto, Ontario M5H 3S5 • (416) 863-0487

March 29, 1984

Land Management Branch
Ministry of Natural Resources
Room 6450, Whitney Block
Queen's Park
Toronto, Ontario
M7A 1W3

Attention: Mr. E. F. Anderson

Dear Mr. Anderson:

RE: Technical Report - Airborne Geophysical Work
Uchi Project (Papaonga Property), Ontario

Enclosed is Getty Canadian Metals, Limited's technical report, in duplicate, for airborne geophysical work conducted by Dighem Limited on 151 mining claims located in the Avis Lake and Curie Lake areas of Ontario. We look forward to receipt of your acceptance and approval of the subject geophysical work, as indicated, in the near future.

We trust you will find the attached to be in order. If you have any questions, do not hesitate to contact our office.

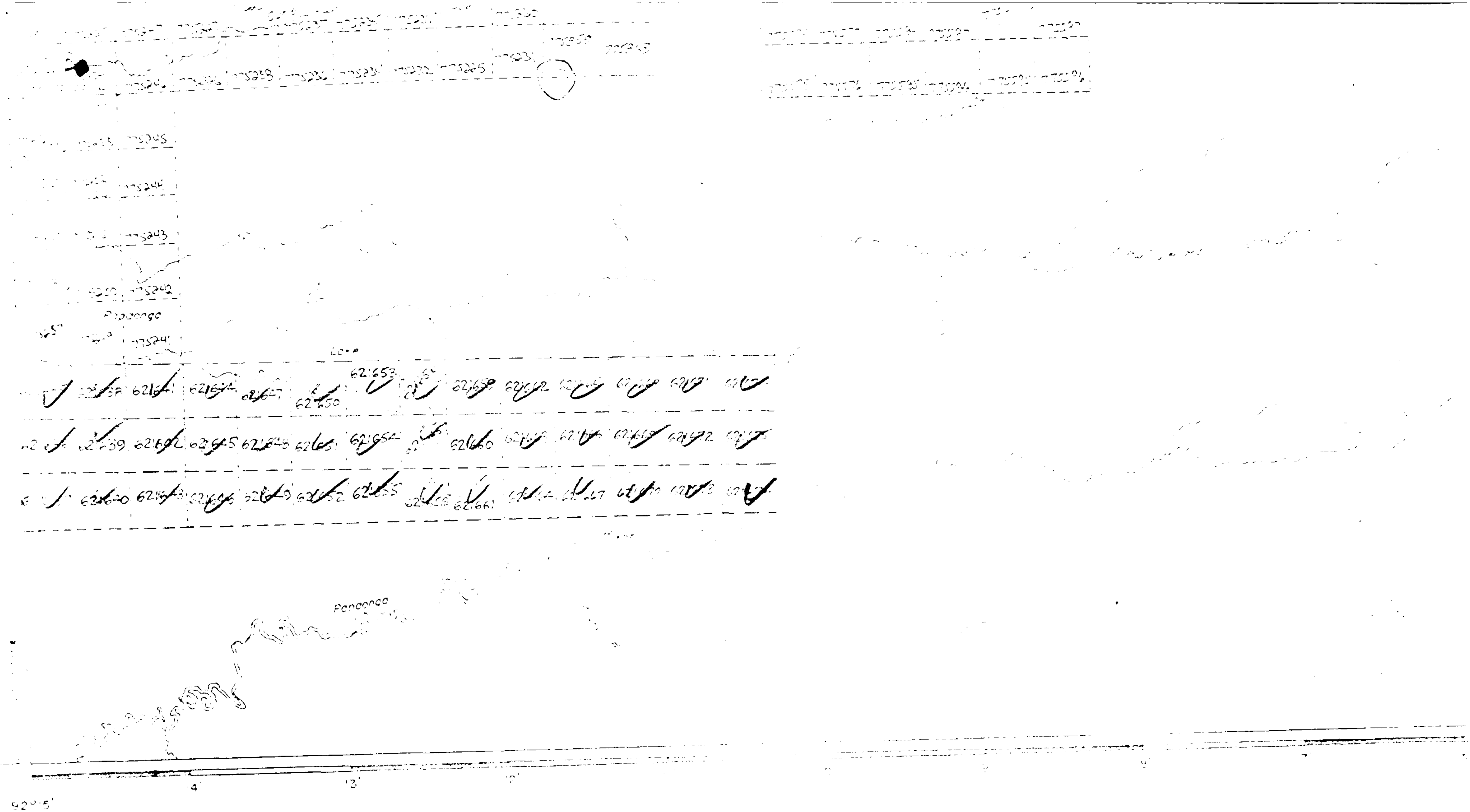
Yours very truly,

GETTY CANADIAN METALS, LIMITED

G. C. Jarvis
Landman

GCJ/ht
Attach.
c.c. W. Ewert

S. Rivett
Mining Recorder
Kenora-Red Lake District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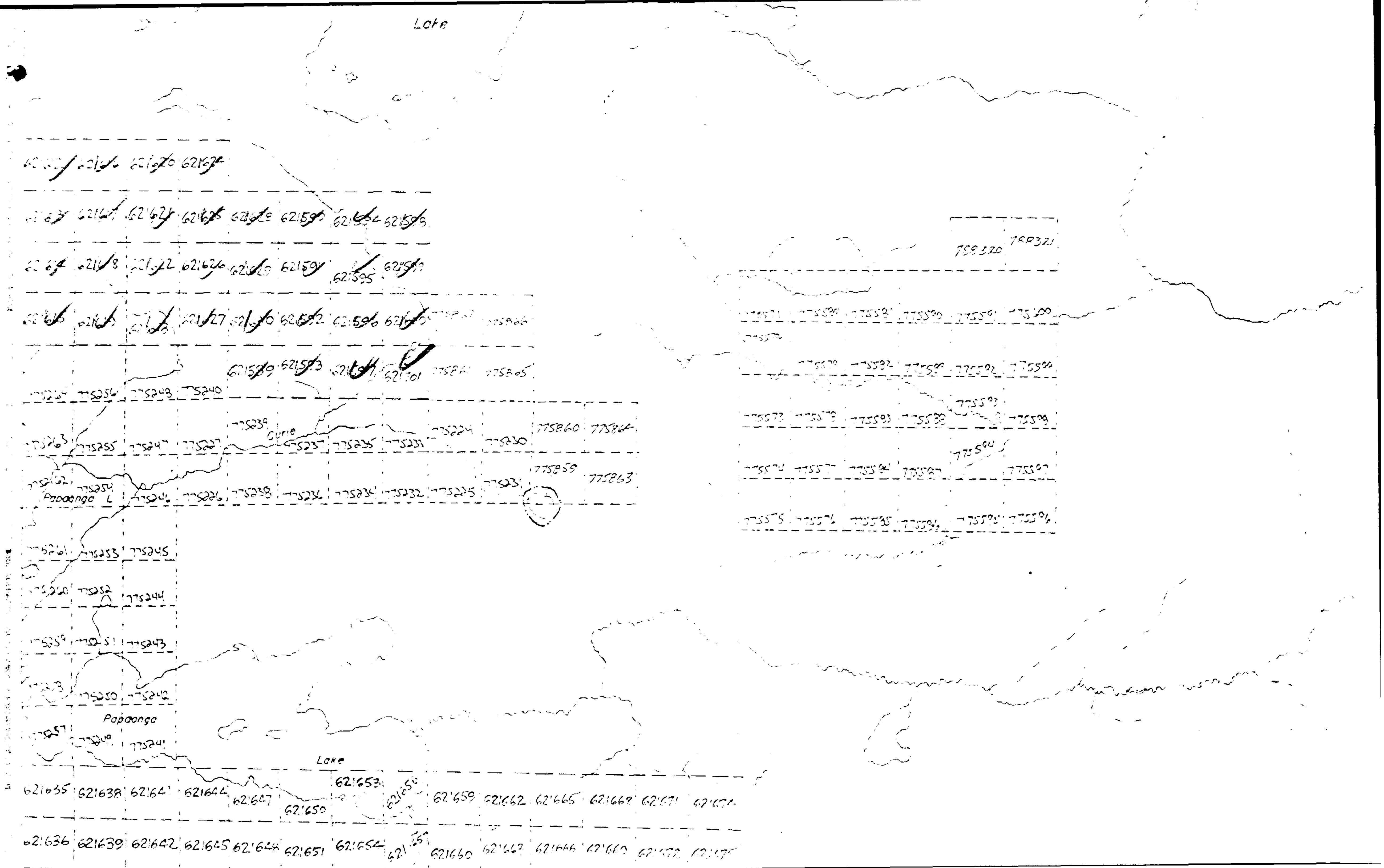

Lake
Curie
Papaonga L
Papaonga
Lake
775860
775864
775859
775863
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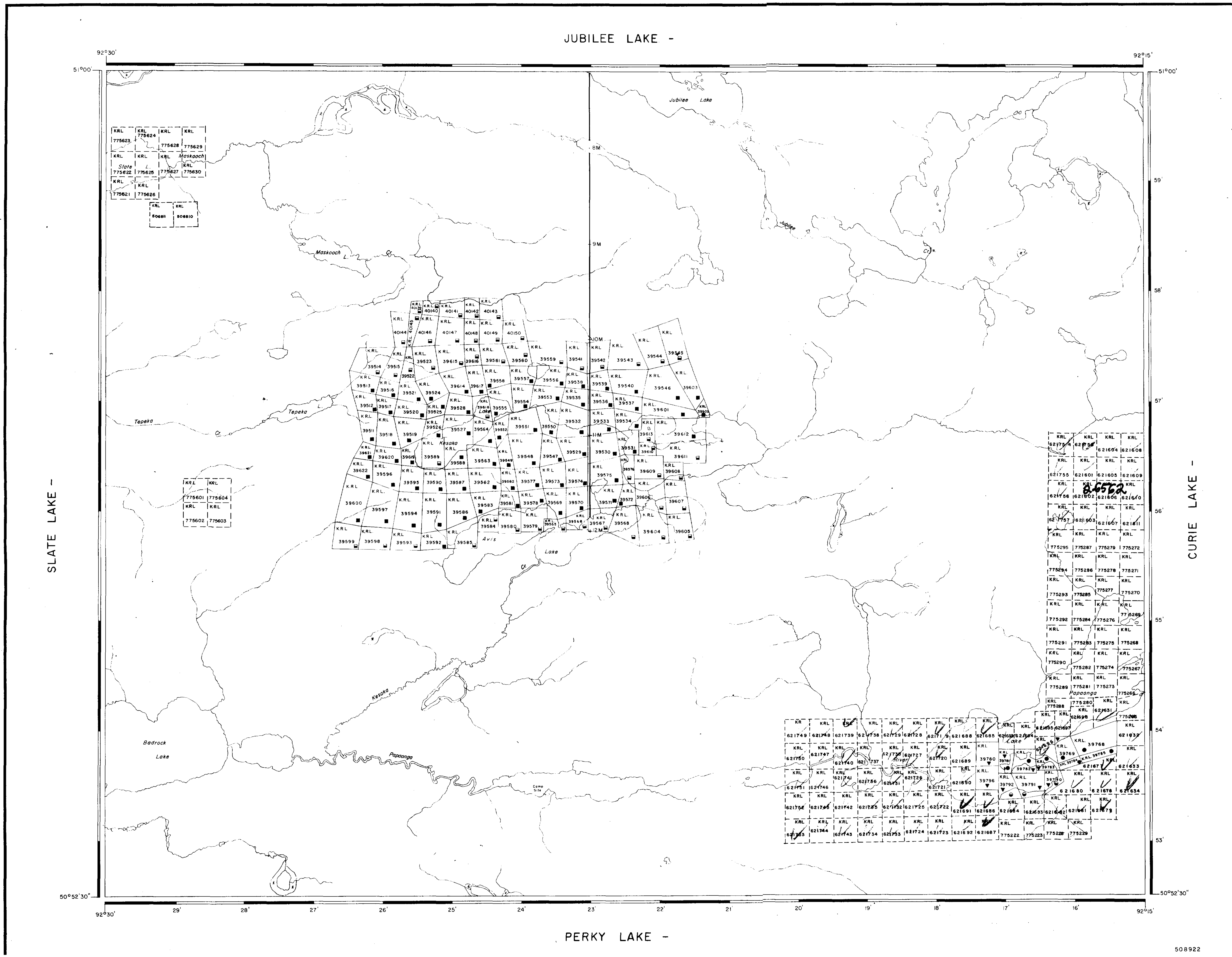


| R E F E R E N C E S |
|---|

**AREAS WITHDRAWN FROM DISPOSITION**

M.R.O. – MINING RIGHTS ONLY
S.R.O. – SURFACE RIGHTS ONLY
M.+ S. – MINING AND SURFACE RIGHTS

| Description | Order No. | Date | Disposition | File |
|---|---|---|---|---|

## LEGEND

HIGHWAY AND ROUTE No
OTHER ROADS
TRAILS
SURVEYED LINES
TOWNSHIPS, BASE LINES, ETC
LOTS, MINING CLAIMS, PARCELS, ETC
UNSURVEYED LINES
LOT LINES
PARCEL BOUNDARY
MINING CLAIMS ETC
RAILWAY AND RIGHT OF WAY
UTILITY LINES
NON-PERENNIAL STREAM
FLOODING OR FLOODING RIGHTS
SUBDIVISION OR COMPOSITE PLAN
RESERVATIONS
ORIGINAL SHORELINE
MARSH OR MUSKEG
MINES
TRAVERSE MONUMENT

## DISPOSITION OF CROWN LANDS

| TYPE OF DOCUMENT | SYMBOL |
|---|---|
| PATENT SURFACE & MINING RIGHTS | ● |
| " SURFACE RIGHTS ONLY | |
| " MINING RIGHTS ONLY | |
| LEASE SURFACE & MINING RIGHTS | ■ |
| " SURFACE RIGHTS ONLY | |
| " MINING RIGHTS ONLY | |
| LICENCE OF OCCUPATION | ▼ |
| ORDER-IN-COUNCIL | OC |
| RESERVATION | |
| CANCELLED | ⊗ |
| SAND & GRAVEL | |

**NOTE**: MINING RIGHTS IN PARCELS PATENTED PRIOR TO MAY 6, 1913, VESTED IN ORIGINAL PATENTEE BY THE PUBLIC LANDS ACT, R.S.O. 1970, CHAP. 380, SEC. 63, SUBSEC. 1.

SCALE: 1 INCH = 40 CHAINS

FEET 0 1000 2000 4000 6000 8000
METRES 0 200 1000 (1 KM) 2000 (2 KM)

**TOWNSHIP**

**AREA**

# AVIS LAKE

**M.N.R. ADMINISTRATIVE DISTRICT**

RED LAKE

**MINING DIVISION**

RED LAKE

**LAND TITLES / REGISTRY DIVISION**

KENORA

Ontario
Ministry of Natural Resources
**Land Management Branch**

**Date** JANUARY, 1983

**Number** G-1734

DATE OF ISSUE
JUN 2 ? 1984
Ministry of Natural Resources
TORONTO

G-1734

52K16NE0009 2.6562 CURIE LAKE

200


21,562

UCHI RECONNAISSANCE

PAPAONGA LAKE AREA

DRAWN BY
CHECKED BY
N.T.S.
DATE
DRAWING No.
SCALE

Getty Canadian Metals, Ltd.

210


DIGHEM SURVEY
UCHI LAKE AREA, ONTARIO
MAGNETICS
FOR
GETTY CANADIAN METALS, LTD.
Scale 1:10,000
PAPAONGA
LAKE
ISOMAGNETIC LINES
(total field)
LOCATION MAP
220

# DIGHEM III SURVEY

UCHI LAKE AREA, ONTARIO

ELECTROMAGNETIC ANOMALIES

FOR

GETTY CANADIAN METALS LTD.

Scale 1:10,000

1 Kilometres

1/2 Miles

UCHI RECONNAISSANCE

PAPAONGA LAKE AREA

Getty Canadian Metals, Ltd.

230


LEGEND

Contours in percent

The numbers face in the direction of increasing vals

REJECT

ACCEPT

CYCLES/METRE

Frequency response of VLF-EM filter

Tx NAA, CUTLER, Me f = 17.8 kHz

Tx NLK, SEATTLE, Wash f = 24.8 kHz

# DIGHEM SURVEY

UCHI LAKE AREA, ONTARIO

**FILTERED TOTAL VLF EM FIELD**

FOR

GETTY CANADIAN METALS, LTD.

Scale 1:10,000

1/2 0 1/2 1 Kilometres

1/4 0 1/4 1/2 Miles

Flight Line

Fiducial 2120 (Not recovered from film)

Fiducial 2118 (Recovered from film)

Fiducial 2110 (Not recovered from film)

Fiducial 2104 (Recovered from film)

Line number and Flight direction

REGISTERED PROFESSIONAL ENGINEER D.C. FRASER PROVINCE OF ONTARIO

UCHI RECONNAISSANCE

Getty Canadian Metals, Ltd

240